Standing Committee
for Economic and Commercial Cooperation
of the Organization of Islamic Cooperation (COMCEC)

COMCEC

Pricing of Transport Infrastructure
In the OIC Member States

COMCEC COORDINATION OFFICE
March 2020

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List of Abbreviations

ADB	: Asian Development Bank
ALS	: Area Licensing Scheme
ANPR	: Automatic Number Plate Recognition
ARF	: Additional Registration Fee
AVI	: Automated Vehicle Identification
BNKB	: Excise Duties of Vehicle Ownership Rename
BOT	: Build-Operate-Transfer
BPJT	: Indonesian Toll Road Authority
CBD	: Central Business District
CCTV	: Closed Circuit Television
DBOT	: Design-Build-Operate-Transfer
DSRC	: Dedicated Short Range Communications
EC	: European Commission
ELE	: Electronic Law Enforcement
ERP	: Electronic Road Pricing
ETC	: Electronic Toll Collection
FED	: Fuel Excise Duty
FERMA	: Federal Roads Maintenance Agency
GDP	: Gross Domestic Product
GNSS	: Global Navigation Satellite System
GPS	: Global Positioning System
HDM	: Highway Development Model
ITS	: Intelligent Transport System
IU	: In-vehicle Unit
LAZ	: Limited Access Zone
LEZ	: Low Emission Zone
LCC	: London Congestion Charge
LCC	: Lekki Concession Company
LTA	: Land Transport Authority
MDICI	: Ministry of Development, Investment and International Cooperation, Tunisia
MHA	: Malaysian Highway Authority
MOT	: Maintain-Operate-Transfer
NIIMP	: National Integrated Infrastructure Master Plan
NIS	: Network Information Services
NMT	: Non-Motorized Transport
NTIS	: National Traffic Information Service
NTP	: National Transport Policy
OBU	: On-Board Unit
OIC	: Organization of Islamic Cooperation
ORR	: Office of Rail and Road
PKB	: Motor Vehicle Tax
PPP	: Public Private Partnership

RFID	: Radio-Frequency Identification
RPS	: Road Pricing Scheme
RUC	: Road User Charge
SA	: South Africa
SANRAL	: South African National Roads Agency Limited
SPV	: Special Purpose Vehicle
STA	: Tunisia Highways Company
STMP	: Strategic Transport Master Plan
TfL	: Transport for London
TMU	: Traffic Monitoring Unit
ULEZ	: Ultra Low Emission Zone
VRF	: Vehicle Registration Fee
WTA	: Willingness to Accept
WTP	: Willingness to Pay

Executive Summary

Global demand for road space has increased exponentially over the years, while funding has reduced in relative terms and the condition of road networks has deteriorated accordingly. In many OIC countries, funding roads from taxation is insufficient not only for provision and maintenance of roads but also for paying for the external costs. Literature also suggests that there appeared to be a growing crisis in road funding, especially in developing economies.

This Study elaborates road infrastructure pricing practices in OIC geography and best practices all over the World. Its ultimate aim is to establish a conceptual foundation for pricing practices regarding road infrastructure in OIC Member States. The Study is structured based on a framework of eight subject areas: 1) political factors, 2) institutional and organizational factors, 3) economic and financial factors, 4) technical and technological factors, 5) legislative factors, 6) procedural factors, 7) data collection method, and 8) capacity building.

Three case studies outside the OIC geography were chosen as best practices from which success factors and challenges can be learned. These are Singapore, the UK, and South Africa. Furthermore, three OIC countries (Indonesia, Tunisia, and Nigeria) were visited to allow in-depth analysis and face-to-face meetings with key stakeholders in road pricing. A questionnaire survey is also conducted by Fimotions in order to gather the views of OIC Member States on road pricing practices in their countries.

The Study finds that road pricing is implemented in the OIC region in the forms of road tolling, vehicle taxes and fuel tax. At the time of writing, there is no OIC country that imposes congestion charging. Road tolling systems are implemented by OIC countries mainly to ease the burden of Government through road users' participation. The paradigm used by OIC countries in implementing road pricing is mainly to provide new infrastructure and improve road performance, a paradigm followed by developed countries in the past. Many (developed) countries have been shifting their policy objective from providing infrastructure to managing demand, hence some of them have been implementing or intend to implement Electronic Road Pricing.

The questionnaire survey results show that the funding from road users charging is insufficient to pay for road maintenance. Yet, very few OIC countries have an earmarking mandated by law that regulates a certain proportion of road charging revenues to be dedicated to road construction and maintenance, and to public transport development.

In terms of technical and technological factors, many OIC countries with road tolling systems already apply electronic toll collection systems, due to efficiency reasons and to reduce moral hazard risks related to cash payments. However, very few countries if not none, integrate the electronic payment systems with transport data collection system, which should make it possible to develop a smart database system that can be accessed by different institutions for various purposes, such as to support policy making process.

High political support on road tolling systems in OIC countries is also shown in strong law and legislations that regulate toll roads development. While PPP is the most common mechanism applied in the OIC region to accelerate road infrastructure provision, a dedicated PPP law that provides an attractive legal environment for investors, is not always in place.

Outreach activities carried out by OIC countries before the implementation of road pricing schemes, mainly aim at informing road users on the new plan, not to gather feedback from them, while these activities are essential to increase public acceptance.

Finally, the skills needed to plan, operate and manage road pricing and congestion charging are generally insufficient in OIC developing countries. Countries with successful road pricing schemes mostly have established transport planning academies or transport research agencies under their Ministries of Transport, and their performance is regularly reviewed and monitored.

The Study is concluded with policy recommendations for OIC countries, which are summarized below:

Framework area	Key policy recommendations
1. Policy level	• A new transport-planning paradigm that puts more emphasis on improving accessibility rather than maximizing mobility needs to be promoted among OIC countries. • Transport policies need to provide more guidance on infrastructure pricing that is demand side orientated and based on the willingness to pay than on cost recovery. • The difference in policy objectives between road pricing and urban congestion charging must be underlined
2. Institutional and organizational	• A dedicated unit for the management of road pricing system is essential to ensure better coordination among government institutions. • Transport planning, including congestion charging, road pricing and related activites, should be devolved from central government to provincial, district or local government. • A strong leadership is key to address the challenge of the various levels of autonomy of government institutions that mainly cause contradictions between legislations.
3. Economic and financial	• Pricing must ensure that equity is not compromized by any road payments systems • Earmark to specific road funds and public transport development, regulated by laws, should be determined. • In the longer term, countries should aim to apply a universal road pricing system that replaces all other user charges and is based on willingness to pay linked to levels of service.
4. Technical and technological	• The ETC architecture system should integrate payment and data collection systems. • The interoperability between ETC and ERP systems should be considered early in the implementation phase. • The chosen technology should support an effective enforcement mechanism. • In the long term, the application of GNSS based systems should be aimed for.
5. Legislative	• An enabling legal environment to promote PPP needs to be promoted, by developing PPP laws that highlight the government's commitments and the mechanisms of risk transfer. • Highways legislation should make it clear what the obligations are for both provider and the user of roads. • Rigid legislations on the channeling of fuel levies and toll income to be spent exclusively on roads, should be relaxed to be spent on all sorts of transportation interventions.
6. Procedural	• Stakeholder engagement should be done continuously to gather public feedback to improve the road pricing system. • Public should be informed on the rationale of road pricing mechanisms and to where the revenues will be channeled. • Outreach activities should highlight the benefits of road pricing scheme and promote the impact of complimentary measures.
7. Data collection	• A robust mechanism of transport data collection needs to be developed, which is integrated in a smart database system and can be accessed by different institutions to be used for various purposes. • Various survey instruments need to be developed to systematically collect data. • Data collection and performance monitoring should be done by an independent unit that has nothing to gain or loose from its recommendations.
8. Capacity building	• A transportation research and development agency could be established under the Ministry of Transport in association with national universities that have majors in transport. • Governmental structures should be flexible to allow a combination between government employees and non-government technical staff to address the insufficiency of government's capacity in transportation planning,

1. Introduction

1.1. The Context for the Research and Study

An efficient and effective road transport system is vital for the socio-economic functioning of any society. To ensure that road infrastructure has kept pace with the needs of developing an economy, road (and by extension rail, water and air) networks have expanded consistently. By 2012, the global inventory of roads was 65 million kilometres of which 10 million kilometres were paved[1]. By 2050, an additional 50 million kilometres of new road is estimated to be needed (Laurance et al., 2014). Similarly, in 2010 the number of registered motorized vehicles exceeded 1 billion globally, which is 150 vehicles in 1000 population, a figure which is expected to increase as economies grow, most notably in developing countries.

Whilst global demand for road space has increased exponentially over the years, funding has reduced in relative terms and the condition of road networks has deteriorated accordingly. Governments have increasingly struggled to fund roads from taxation and have amongst others sought partnerships from the private sector to invest in, manage and maintain road space smarter and more effectively. As a result, governments continue to seek smarter and more effective ways to provide and maintain roads. As a general rule of thumb, governments in developing countries need to allocate about 2% of their GDP (Crist et al., 2013; Gwilliam et al., 2008) to road infrastructure if their road assets are to be preserved and developed. Few Governments are however able to achieve this mark, including the USA, as demonstrated by Shatz et al. (2011).

The principle of cost recovery from transport users is widely accepted (Lo and Szeto, 2009; De Palma, 2011; Maibach, 2008). Road users are generally charged a combination of different fees such as tolls, taxes and levies for two basic reasons. The first and most widely applied reason for road user charges is to help generate revenue for the provision and maintenance of roads. The second reason is to limit or manage the use of road space where demand exceeds supply, as is typically the case in inner cities. Examples of so-called congestion charging are found in Stockholm (Eliasson, 2009), London (Beevers and Carslaw, 2005) and Singapore (Santos, 2005). Congestion charging is also used in at least 20 other cities around the world and in the USA. Yet there are almost no examples of congestion charging in Africa and the Middle East.

In both cases of charging, i.e. for cost recovery or for managing the demand-supply equilibrium, it can be argued that road users are not treated as customers by road suppliers (typically road authorities). One of the indicators to substantiate this is that there is no evidence of contracts between road suppliers and road users anywhere and consequently there are no explicit guarantees regarding performance (Gwilliam and Shalizi, 1999). It is largely because of this that road users in many countries have shown resistance to further tolls and charges and also because they are seen as overlapping with other fees paid such as fuel levies (Lave, 1994). Generally tolls are seen as taxes rather than a fee paid for a service rendered (Jones, 1995).

The difficulty for governments to establish equitable methods for the internalization of external costs is even more profound than raising funds for road maintenance or for demand management. External costs may be defined as the difference between social costs and private costs (Newbery and Santos, 1999). For road accidents, Edlin and Karaca-Mandic (2006) suggests that car insurance

[1] Various data exists including IRF World Bank and CIA to name a few.

premiums might include a component that at least partly, covers external costs. To charge for transports' contribution to climate change, cost recovery could be based on the emissions of CO_2 (and other greenhouse gasses) related to a particular vehicle type (including fuel type) travelling at a given speed over a defined distance and applying the traded price of CO_2. For congestion, external or social costs could be recovered based on the marginal total cost of adding an additional vehicle to a certain part of the network at a certain time of day (De Palma and Lindsey, 2007).

Whilst governments generally do not internalise external transport costs, they certainly hold to account those culpable for major transport incidents. Plenty of examples exist including oil spills (Thébaud et al., 2005), plane crashes (Kakalik et al., 1988), maritime (Schuda, 1991) and railways disasters (Forkenbrock, 2001). However, private road users appear, by and large, to be immune from such responsibility (Blincoe et al., 2002). Whilst political or social acceptability maybe a profound reason for this anomaly, the main reason could be attributed to lack of appropriate technology as well as political will. Arising from these issues, it became apparent many years ago that new ways of providing and managing road networks need to evolve.

More recently Wachs (2006) noted that there appeared to be a growing crisis in road funding. The crisis is not only funding for provision and maintenance of roads but also for paying for the external costs as well. As indicated earlier it has been stated that on average 2% of GDP should be allocated to road provision and maintenance, whilst 2.5% of GDP represents the cost of road accidents, 1.5% of GDP is estimated to be the cost of CO_2 emissions and 1% of GDP the cost of traffic congestion. This puts the total costs of road usage to around 7% of [2].

Revenue generated from road users includes direct charges such as transit fees, tolls, fuel levies and parking fees, or indirect charges in terms of road license fees, insurance and VAT on vehicle acquisition (Calthrop et al., 2000). Taking into account all elements, direct and indirect, road user charges amount to less than 1.5% of GDP (Newbery and Santos, 1999; Gwilliam and Shalizi, 1999), which contrasts to the 7% of GDP spent on roads and their use.

There is no doubt that further research into the funding of road infrastructure will provide a useful contribution to the body of knowledge.

1.2. Scope of Work

The Standing Committee for Economic and Commercial Cooperation of the Organization of Islamic Cooperation (COMCEC) has clearly recognized the importance of the abovementioned issue and intended to explore its concept and applicability to the OIC Member States. For this purpose, the COMCEC Coordination Office-CCO (Presidency of Strategy and Budget of Presidency of Republic of Turkey - PSB) conducted an analytical study on "Pricing of Road Infrastructure in the OIC Member States" with the following objectives:

1. To identify the basic concepts and steps of the pricing of road infrastructure.
2. To investigate the major and successful practices regarding the pricing of road infrastructure (outside the OIC geography).
3. To describe the general situation related to the pricing of road infrastructure in the OIC Member Countries and to analyze six selected countries with respect to pricing practices in transport infrastructure as detailed case studies.

[2] This excludes the vehicle operating costs.

4. To propose recommendations for improving pricing practices regarding road infrastructure among the OIC Member States.

The ultimate aim of the study is to establish a conceptual foundation for pricing practices regarding road infrastructure in OIC Member States. The study is also expected to draw attention to the importance of infrastructure pricing as well as to trigger surveys and a debate amongst key stakeholders around road pricing from the point of view of Islamic countries.

1.3. Background to Work Undertaken

A literature review, including desk research on transport infrastructure pricing in both OIC and non-OIC regions has been undertaken that examined not only problems and challenges but also success factors with regard to road pricing practices worldwide. The literature review and the case studies are structured in eight framework areas as outlined in Table 1-1.

Table 1-1: Road pricing aspects included in the eight framework areas

Framework area	Aspects of analysis
1. Policy level factors	• Objectives to road pricing • Policy • Social Inclusion • Hypothecation • Perceptions of road user • Road user responses
2. Institutional and organizational factors	• Integration, decentralization subsidiarity and level of autonomy • Commercialization, accountability & separation of client - supplier roles • Private sector engagement
3. Economic and financial factors	• Taxation and tolls • Road Funding • Equity • Performance of road user charging pricing and tolls • Cost recovery • Determination of price levels • Allocation of revenues, sources and mechanisms of finance.
4. Technical and technological factors	• Charge collection systems and methods • Tolling systems and technology • Electronic law enforcement
5. Legislative factors	• Legal requirements / experience from user charges, road pricing and congestion charging • Mandates, regulations, transactions, and obligations on road providers and rights of road users. • PPP mechanisms • Enforcement schemes
6. Procedural factors	• Concession schemes • Design and planning of pricing system • Stakeholder approach, participation, and communication
7. Data collection method	• Transport and traffic data collection methods • Surveys on Willingness to Pay • Traffic flow monitoring
8. Capacity building	• Level of competence in transport economics, traffic modelling and specifically in road user charging studies • The skills needed to plan operate and manage road pricing and congestion charging. • The existence of proactive human resource planning

1.4. Questionnaire Survey

In the framework of the Study, a questionnaire is developed for OIC member states in order to gather their views on road pricing practices in their countries. The questionnaire is sent in the period of December 2019 – January 2020 to 57 OIC member states. The response rate was 39%, which allows to give a representative view. The responses had a good even spread over the Arab, Asian and African OIC groups, with respectively 36% (N=8), 44% (N=8) and 35% (N=6). All respondents completed the questionnaires in full.

Looking specifically at the three geographies in OIC (within the limits of the small sample), some interesting similarities and differences can be observed. The questionnaire result, generated from responses from 22 OIC member states, is presented throughout the report.

2. Literature Review: Conceptual Framework for the pricing of Road Infrastructure

2.1. Introduction

2.1.1. The Aim of Literature Review

The purposes of the literature review are as follows:

1. To identify the main concepts and definitions regarding the pricing of road infrastructure;
2. To provide a summary of the theoretical background of road user charges;
3. To provide an outline of the latest trends and implementation of road user charging policies and practice;
4. To start a discussion regarding the major barriers, challenges, and success factors among OIC countries.

Context

Transport infrastructure is a key element for economic development. It enables productive private investment, the creation of new activities (supply chains), and the reshaping of economic geography. The pricing of transport infrastructure can be done for a number of reasons, such as to source public finance, for allocation of road capacity, for the recovery of costs, to control demand for transportation services, to charge transport sector externalities, including greenhouse gas emissions, to stimulate modal shift, and/or to influence the usage of road and vehicles. There are various ways to generate the revenue from the use of road transport infrastructure, such as tolls, levies, vehicle tax, fuel tax, mileage tax, and vignettes.

Fuel taxes have been primarily aimed at raising government revenues

There is rich literature on policy instruments to reduce transport sector externalities, such as climate impacts. Low emission zones, for example, are widely spread over European, American and Asian urban areas, and are particularly well described in literature and deal with carbon taxes, sulphur taxes and NOx taxes, due to its relation to climate change. Implementation of congestion charging schemes, amongst others for the purpose of climate change, are however limited to a number of cities, such as Singapore, London, New York and Stockholm.

Background

Fuel taxes have been primarily aimed at raising government revenues. It is estimated that fuel taxes contribute to as much as 20% of total government revenues in some countries, such as, Niger, Nicaragua, South Korea and Ivory Coast (Timilsina, 2008). Fuel taxes are interpreted as policy instruments used to reduce transport sector externalities because the level would be higher without such taxes.

Apart from the instruments applied, charging for the use of transport infrastructure implies many more aspects, such as the relationship with investment, operations and maintenance of the infrastructure, the entities involved in the pricing, and the effect of the pricing on the users' response.

Structure of the review

This wide range of information, as found in literature and other sources, is presented in this chapter, and structured as follows:

- Policy Level Factors

- Institutional and Organizational Factors
- Economic and Financial Factors
- Technical and Technological Factors
- Legislative Factors
- Procedural Factors
- Data Collection Method, including Statistics and Survey
- Capacity Building

The first part of each section (i.e. 2.X.1) describes what the particular aspect entails. In the second part, the successful pricing practices regarding the transport infrastructure outside the OIC geography are presented. The third part describes the general situation of pricing practices regarding the transport infrastructure in OIC Member Countries.

2.2. Policy Level Factors

2.2.1. Introduction

Transport is a precondition for the proper functioning of any society. Over time successive investments in roads have led to the accumulation of a major asset-base. The use of roads induces additional wear and tear of the assets and thus related maintenance costs. Combined with the operations expenses these costs are more or less equivalent to the short-term marginal costs (Hasselgren, 2013). When adding costs external to the operation of the system, such as noise, accidents, pollution, congestion, ae included a short term social marginal cost construct is arrived at. This total cost base further increases when depreciation and investment costs for re-construction and new- construction of roads are considered as well.

According to Jakob and Edenhofer (2014), the physical capital stock of infrastructure, a common good, tends to be undersupplied in the absence of policy. It hence is a central task of public policy to provide sufficient levels of infrastructure. Bom and Ligthart (2014) and Klenert (2016) point at infrastructure being largely underprovided in most countries, although public investment policies exist.

Barro (1990) identified that there is a trade-off between the growth-enhancing effects of infrastructure and the detrimental effect of its financing which determines the optimal level of its provision. A balance needs to be found between, on the one hand, the growth effect infrastructure has, and on the other hand the adverse effects on growth of raising revenue for financing infrastructure and infrastructure's decreasing returns to scale have.

There are two important concepts that determine the approach taken to charge for the use of road transport infrastructure, i.e. 'the common good' and 'the user pays' approach. The common good is an important concept in political and economic philosophy, it determines how goods and services, especially in the public domain are allocated and paid for. A comprehensive definition of the common good is provided in the text box below.

Box 1: Definition of the Common Good

In ordinary political discourse, the "common good" refers to those facilities—whether material, cultural or institutional—that the members of a community provide to all members in order to fulfill a relational obligation they all have to care for certain interests that they have in common. Some canonical examples of the common good in a modern liberal democracy include: the road system, public parks, police protection and public safety, courts and the judicial system, public schools, museums and cultural institutions, public transportation, civil liberties (such as the freedom of speech and the freedom of association), the system of property, clean air and clean water, and national defence. The term itself may refer either to the interests that members have in common or to the facilities that serve common interests. For example, people may say, "the new public library will serve the common good" or "the public library is part of the common good".

Source: Stanford Encylopedia (2019)

It can be seen from the definition that roads are considered to be a common good. The conventional wisdom is that roads are public services that should be funded directly through taxation as they are considered to be common good (Benson, 2003). The common good is also seen as providing benefits that are beyond the intrinsic value of those goods and services such as economic development, better living conditions, education and employment opportunities. The existence of external benefits has often provided the rationale of state support. However, the counter argument is that this should not be the basis for state intervention because almost all goods and services have both direct benefits to the consumer and indirect benefits to the rest of society so by extension, the state should be prepared to fund almost everything (Roth, 1996). There is no reason to suppose that the benefit to the community from a new or improved road is any greater than the benefit from an improved supply of electricity, water supply or other utility for which payment is made (Block, 1983). It is argued that there is a crisis in funding roads because there is no direct payment (other than in the case of toll roads) and new thinking is necessary (Wachs, 2006).

The user pays principle is one where a pricing approach is based on the idea that the most efficient allocation of resources occurs when consumers pay the full cost of the goods or services that they consume. The implication is that indirect funding of roads through taxation is being replaced by levies tolls and other mechanisms to charge more directly for the utility being provided. However, the paradigm objective that the user pays for roads is related somehow to the quality of the mobility system has yet to emerge. Road pricing should be linked to level of service in traffic engineering, and prices should be managed to cross space, time and transport modes in such a way that provision of service is made with good quality in all components (Rioja, 2003). It may be deduced that being independent of quality of service delivery, a fundamental aspect of the transaction between a supplier of road space and its consumers is missing as is shown in various case studies. This applies equally in both OIC and non-OIC countres.

Pricing of road infrastructure also provides an effective way to manage congestion. The alternative to pricing congestion is queuing. While levies that increase the cost of using cars, such as congestion charges, parking fees and fuel taxes can be regressive, they have been found to be progressive in some circumstances (OECD, 2018). The revenues from fuel taxes are expected to decline, as higher efficiency and electrification make vehicles using less fuel. Needing to make up the funding shortfall and to be able to manage the system better, governments could now explore the possibility to taxing road use rather than fuel use through means, such as electronic road pricing. According to OECD (2018), however the primary objective of road pricing should really be to cut congestion and manage the demand-supply equilibrium for the use of private vehicles rather than for raising revenue. Other

forms of taxation, that cost less to administer, are more adequate if revenue generation is the sole purpose.

In addition, road pricing is helpful to achieve better utilization of urban space, which should have a similar effect to building new roads in increasing productivity and improving access to jobs. OECD (2018) adds that, coupled with investment in public transport, road pricing will drive more transit oriented urban development and contain sprawl. Better utilization of road space will ultimately make city living more attractive, and reduce commuting time as well as emissions of air and noise pollution from traffic.

2.2.2. Policy Level Factors Outside OIC Geography

Rationale and objectives to road pricing

According to the Transportation Research Board of the National Academies (2006), Governments must decide on the goals of authorities for a) setting road user fees, b) mechanisms for controlling revenue, c) the basis for determining fees, d) how best to involve the private sector and e) resolution of privacy and fairness concerns - which will be a prerequisite.

Pricing of transport infrastructure serves various objectives:

- as a source of public finance, to generate revenues;
- to attract private finance, as the revenues will serve the return on investment;
- internalization non-market priced effects, to charge transport sector externalities;
- to enforce the user pays principle;
- to create efficiency and allocate capacity, and to prevent overuse;
- to recover costs related to the infrastructure;
- to control demand for transportation services;
- to stimulate modal shift, and create fair competition between modes;
- to manage usage of the road

Regarding the evolution and implementation of transport pricing policy, the European Commission is probably the most explicit and co-ordinated (Matthews, 2010). Outside of the EU, road pricing has also become a prominent theme within transport policy. The most notable developments having occurred in:

- Singapore, where there has been a system of road pricing since 1975;
- Norway where several urban road pricing schemes have been introduced since 1986;
- the USA where several road pricing schemes have been introduced as part of the Value Pricing Pilot Programme since 1991; and
- Switzerland where a heavy vehicle fee was introduced in 2001.

The European Commission's green paper "Towards fair and efficient pricing in transport" (EC, 1995) reflected a major shift in transport pricing policy development at the European level towards pricing reflecting external costs. Previous discussion of EC pricing policy emphasised maintenance and operating costs. "In contrast to the benefits, the external and infrastructure costs of transport are, without policy intervention, generally not borne by the transport users and hence not considered when they make a transport decision. By internalizing the external and infrastructure costs (i.e. making these costs part of the decision-making process) the efficiency of the transport system can be increased." (EC, 2019)

In the strategy document "Fair Payment for Infrastructure Use" (EC, 1998), the European Commission stresses the need a) to relate prices more closely to the underlying marginal social costs

associated with infrastructure use, b) extending these costs to include external costs, c) to depart from prices that are purely based on the direct costs of infrastructure use when cost coverage requirements need to be met, d) to ensure transparency, and e) to facilitate fair competition between modes, within modes, and across user types. In the document the Commission recognizes the contribution of transport services to the enhancement of industrial efficiency and European competitiveness.

In "A Sustainable Future for Transport" (EC, 2009), the commission identifies climate change, the future price of oil and current and ongoing congestion as three of the most urgent problems facing the sector, and sets out the key priorities as being "better integration of the different modes of transport as a way to improve the overall efficiency of the system and the acceleration of the development and deployment of innovative technologies — within an approach that always keeps the transport users and workers, with their needs and rights, at the centre of policymaking".

In the 1920s, Arthur Pigou laid the research foundation for congestion pricing. It was introduced in practice only in the mid-seventies by Singapore. Desired impacts of congestion charges are reduced vehicle mileages and vehicle emissions, to some extent. Whether congestion charge improves welfare, depends on various factors such as revenue neutrality of the tax, population groups that are being charged for using networks, the mode of transportation used for commuting, and the ways in which revenues collected are ultimately allocated (Klenert, 2016). Besides the congestion charge, vehicle taxes have proven to be successful in containing private vehicles in cities such as Singapore and Hong Kong.

Road pricing is controversial because of equity reasons. For example, drivers with a high value of time, gain more from reduced journey time than those with lower values of time (OECD, 2018). Drivers with a low value of time have less capacity to pay for time savings due to issues of affordability. As a consequence, those on low incomes may be obliged to change departure times, switch to a less convenient mode or pay a charge that exceeds the value of their time-savings. It is also controversial because the revenues raised are typically larger than the direct benefits to drivers; the biggest benefits fall to the community more widely, including people using public transport. Therefore, according to (OECD 2018b), it is important to better understand the interplay between public transport and road pricing and stress the importance of understanding the social and distributional impacts of demand management policies.

Box 2: Rationale behind concessions as a way of pricing infrastructure, the case of Chile

Forced by deteriorated and antiquated infrastructure, the government of Chile in the early 1990s made a policy decision to seek private capital to support needed investments (Lorentzen, 2000). A program was launched, under which concessionaires would finance highways and other infrastructure in the private capital markets, without raising taxes or increasing public-sector debt. An additional advantage was that concessionaires wanted to tap into a new pool of private-sector talent to manage the construction, maintenance, and operation of their projects. This led to an increase in efficiency of construction and operations of the infrastructure. It enabled a sustained growth based on the expansion of exports. (Fisher and Babbar, 1996)

Box 3: Rationale behind congestion charging, the cases of London and Stockholm

In 2002 the average traffic speed in the London inner city was lower than 12 km per hour. The economic impact was estimated between USD $3 million and $6 million every week in terms of time lost due to congestion. The goals of London's congestion charging scheme include reducing gridlock, improving public transport service, improving journey time reliability for car trips, and making the distribution of goods and services more efficient (Provonsha et al., 2018). More is written on this in the case studies chapter.

In 2003, Stockholm's City Council adopted a proposal to conduct congestion charge trials due to growing traffic congestion that was choking the bridges and roadways into the inner city. In 2004, the Swedish Parliament passed a congestion pricing pilot program, despite the pilot being a politically divisive issue in Stockholm with low public support. The trials consisted of three elements, being the expansion of public transport, the construction of additional park-and-ride facilities, and the introduction of a congestion charge. The pilot became a success, with higher levels of public support. The initial investment in the system, including the trial and first year operations, was USD $236 million). It is a fully automatic fee payment system through automatic number plate recognition by cameras. (Provonsha et al., 2018)

Pricing instruments

Various types of road pricing are distinguished by Rouhani (2014) and are listed below:

- road tolls,
- congestion pricing and
- other types of road pricing, including
  - cordon or area tolls, (e.g., Trondheim toll ring),
  - high occupancy toll (HOT) lanes (e.g. Interstate 15 in San Diego),
  - distance-based charges such as mileage fees (e.g. tolls on trucks in Germany),
  - road space rationing (e.g., ration peak period vehicle-trips or vehicle-miles using a revenue-neutral credit-based system, etc., e.g. car free Sundays in parts of Paris, or license plate rationing during working days in Mexico City).

ADB (2018) classifies tolls into four main categories:

1. Distance-based: users pay in proportion of the distance traveled on a particular road. The distance is calculated based on in which gate the vehicle has entered and in which gate it has left. This system is referred to as closed tolls.
2. Point-based: payment is made for a single use of a particular section. This system is common for bridges, tunnels, and an open tolling system.
3. Time-based: it allows users to drive along some roads for a period of time irrespective of the level of use. It is also referred to as "vignettes," derived from a sticker or vignette affixed on the front windscreen. Whether this system should be considered properly as tolls or as a type of tax is subject to discussion.
4. Perimeter-based: fees charged to vehicles that wish to circulate inside a defined perimeter, normally city centre. It is also referred to as congestion charges. They can be time-based, i.e., an entry permit that allows the vehicle to circulate inside the area as many times as desired during a period of time (such as the London Congestion Charge) or cordon-based, i.e., that every time a vehicle enters the perimeter, a charge is levied (such as for Oslo, Norway; Singapore; or Stockholm, Sweden). (Mahendra, Grant, and Swisher 2012)

Road tolls also include bridge tolls, Eurovignette, weight-distance taxes. It is important to realise that the border between infrastructure and rolling stock is blurry. Both through driver behaviour and technological innovations there are multiple interactions between vehicles and their drivers/operators and the requirements related to infrastructure[3]. Fiscal instruments applied to the use of road transport should also be seen as types of road pricing, although more of an indirect type. SEPA (2000) and Timilsina and Dulal (2008) list these types of indirect road pricing:

- Vehicle purchase taxes (ownership, licensing, registration fee and others),
- Circulation taxes (annual registration tax),
- Scrappage incentives,
- Fuel duties (any excise tax on fuel),
- Emission and/or pollution tax or charge (e.g. carbon tax, sulphur tax),
- Subsidies (e.g., subsidies for clean fuels, efficient vehicles, and public transportation).

The selection of these instruments depends on the objective (e.g. reduction of congestion, reduction of emissions, private finance, government revenues), the urgency to solve of problem, the flexibility to achieve the goals, and the cost and complexity of the policy instruments. Developing cities, with no serious congestion or emission problems, requiring additional government revenue sources, might consider fuel taxes. Mega-cities that are congested with predominantly private vehicles may prefer to apply (space and time dependent) congestion charges. Subsidies for public transportation, a common and conventional phenomenon in all countries, reduce the demand for infrastructure, the congestion and the emissions and provide wider access to transportation (Timilsina and Dulal, 2008). Subsidies promoting clean fuels (ethanol producers in the United States or consumers in Brazil for example) or clean vehicles (leading to reduced income tax in The Netherlands) reduce the external costs related to the infrastructure. Subsidies for cleaner vehicles (e.g., electric vehicles, hybrid vehicles, CNG buses) are becoming popular in many countries, such as China, India, the United States and Japan.

Recently public investment in infrastructure received much attention as an attractive option to promoting efficiency and growth, as well as reducing inequality in wealth (Klenert, 2016). Evidence from literature suggests that investment in infrastructure might decrease inequality while in parallel enhancing growth (Calderón and Servén, 2014). This links also to pricing, as pricing and provision of infrastructure are intertangled.

Hypothecation

Few years ago, three research projects in New Zealand considered the changing world and how the transport systems, including funding, can be future proofed, while adapting to known and uncertain economic, environmental and social changes (New Zealand Ministry of Transport, 2014). Future funding aims at land transport funding, regarding how much should be invested in the land transport system and how to raise the financial means.

The objective of the study was to replace the current system of road user charges with electronic road pricing (ERP) which could be used to charge for distance travelled, type and location of road,

[3] Examples are the impact of on-board navigation, of GPS tracking, interaction between road facilities and on-board units, and in rail transport the ERTMS technology shifting from road infrastructure to on-board units.

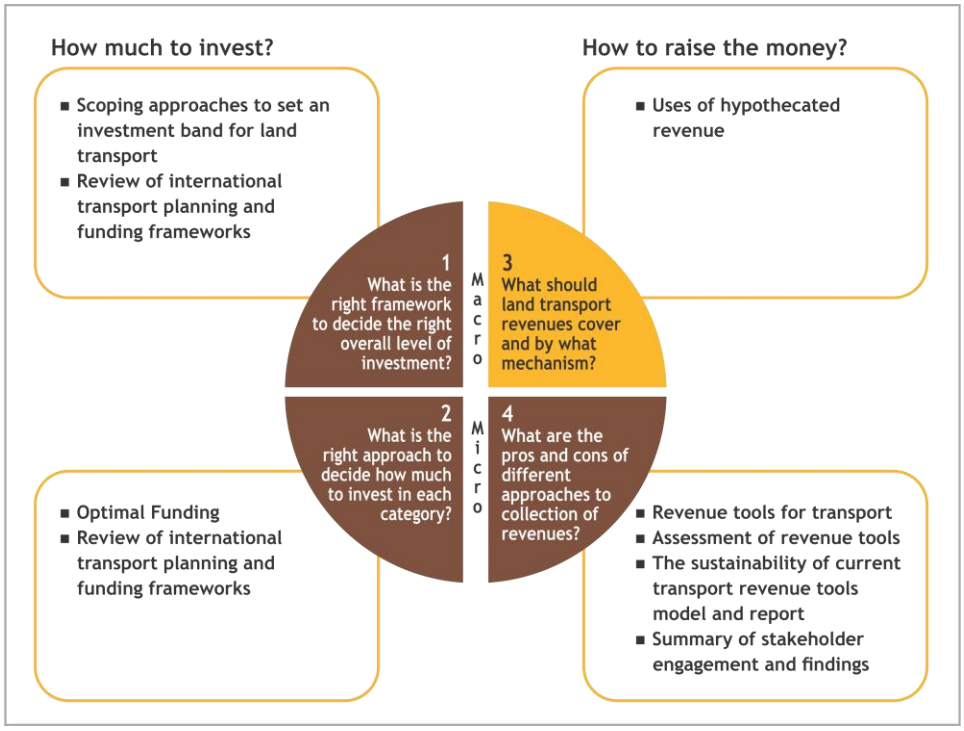
type or weight of vehicle and time-of-day. Currently revenues from road users come from charges such fuel excise duty (FED) and registration fees.

The New Zealand Ministry of Transport (2014) identified four general principles for use of revenue hypothecated from road users (see Figure 2-1). These are:

- most of the revenue should be spent on roads: operating and maintaining them, and capital investment (rebuilding and/or upgrading existing roads and building new ones)
- the revenue should cover related services whose costs are caused by road use, such as the road enforcement aspect of police costs, safety programs, and overhead costs of New Zealand Transport Authority
- the revenues should contribute to services that result in lower road congestion than would otherwise occur, to the benefit of road users (public transport and bike lanes)
- the revenues should not be used for activities unrelated to road use.

According to New Zealand Ministry of Transport (2014), these principles do not cover revenues from other sources that are also used for roads. The two main ones are local authority rates, for local access by road and footpath, and additional road and bike trail projects funded directly by government.

Figure 2-1: Key question of future funding



Source: New Zealand Ministry of Transport (2014)

Transport Justice

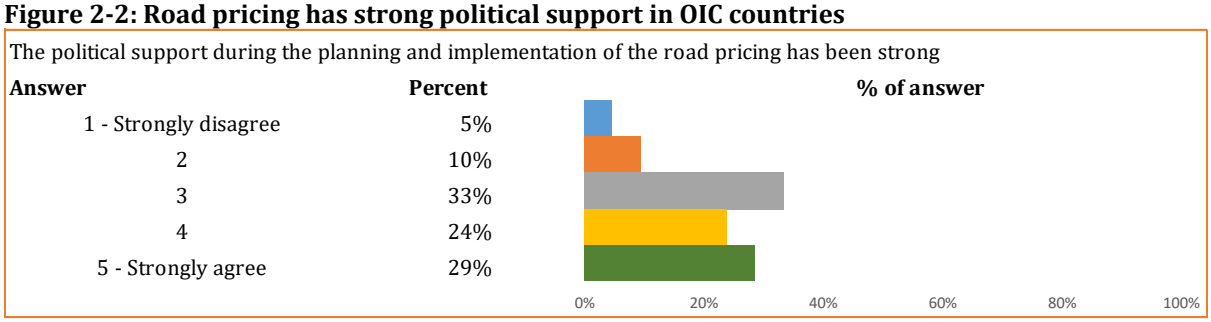
More recently a new paradigm for transport planning based on the principles of social justice has been proposed by Martens (2017). He claims that the financing of all transport infrastructure and services should be based, as much as practically possible, on user charges whereby these charges are based on marginal cost pricing, dependent on time and location of the use of infrastructure. The charges will cover essential operational and maintenance costs of the infrastructure as well as the

initial capital investment. In addition, a fair taxation scheme is introduced to allow for deviations from marginal costs pricing whenever persons have insufficient mobility and accessibility due to high costs of transport (for them). Furthermore, this tax is used to invest in parts of the transport system (not just roads), which are sub-standard in terms of the level of mobility, and accessibility they provide. Any expansions to the system that are not warranted from the principle of justice should then be self-financing based on user charges. This is a radical new way of thinking in transport that is dealing with the disparities in mobility and accessibility and aims to provide virtually every person with adequate transportation and thus of mitigating the social disparities that have been created over the past decades.

2.2.3. Policy Level Factors in OIC Countries

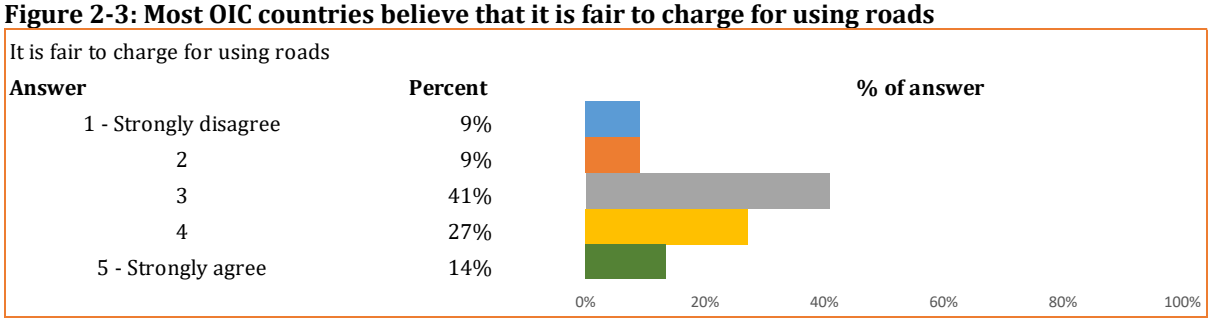
A challenge in many OIC member countries is the availability, the quality and the safety of the available transport infrastructure. Road pricing is a way to make ends meet, and this view is shared by policy makers in the majority of OIC countries (Figure 2-2), who also believe that it is fair to charge for using roads (Figure 2-3). However, OIC countries are neutral or disagree to the idea that the road users should pay for all the costs (Figure 2-4).

Figure 2-2: Road pricing has strong political support in OIC countries



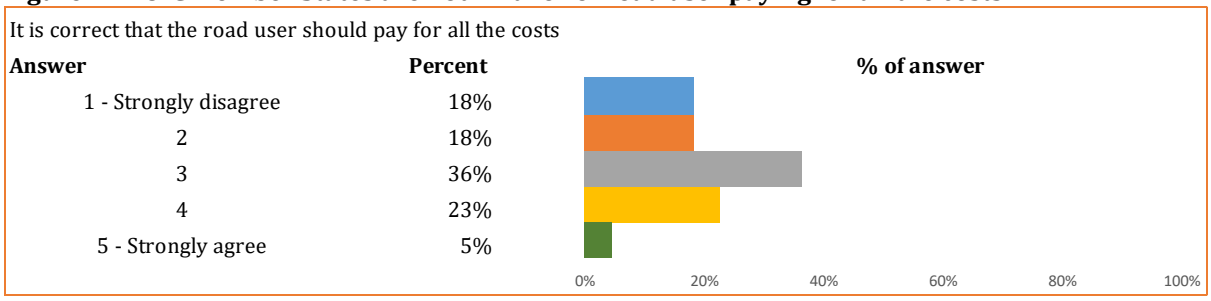
Source: Fimotions, survey result

Figure 2-3: Most OIC countries believe that it is fair to charge for using roads



Source: Fimotions, survey result

Figure 2-4: OIC Member States are not in favor of road user paying for all the costs



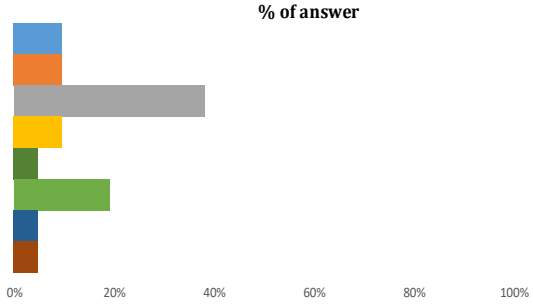
Source: Fimotions, survey result

In the OIC region, road pricing is applied in the forms of road tolling, vehicle taxes, fuel tax , and the combination thereof (Figure 2-5).

Figure 2-5: OIC Member States show a strong preference for toll roads, vehicle taxes, and the combination

In your country, what types of pricing of transport infrastructure are applied (multiple answers are possible):

Open Answer	Percent
Toll road	10%
Toll road + Toll bridges	10%
Toll road + Vehicle taxes	38%
Toll road + Toll bridges + Vehicle taxes	10%
Toll road + Toll bridges + Vehicle taxes+tax on gasoline	5%
Vehicle taxes	19%
Vehicle taxes + truck user charges	5%
Fuel Tax	5%



Source: Fimotions, survey result

Availability of road infrastructure and road safety are an important impediment to the development process. To mitigate the risk of traffic accidents, Ahmed et. al. (2017) identifies a set of measures, such as traffic education in schools, provision of information on the risks, creation of corridors for ground pedestrians, setting up of institutional attention for road safety, data analysis, illegal operations to obtain driver's licences. But he also points at infrastructural measures, being:

- The expansion of road networks inside and outside the cities.
- Road repairs and processing of tags and optical signals according to international standards and specifications;

These safety measures all need funding, which, at least in part, could be obtained through road pricing measures. Especially toll roads do provide availability of infrastructure and safety, more than the non-tolled roads.

Failure of governments' efforts is another reason to enter into road pricing schemes. Fisher and Babbar (1996) analyzed the Malaysia North-South Express Highway. This is the first private toll road of Malaysia and was brought under a concession structure to complete a failed public project.

Thirdly, as more and more developed OIC countries, such as the UAE and Indonesia, are struggling to combat increasing traffic congestion in their main cities (Dubai and Jakarta respectively), congestion charging becomes a serious alternative, especially after the 3-in-1 car-pooling system in Jakarta was disbanded and the space rationing system based on license plates became too difficult to administer. The common thing between these two countries is that the targeted cities have a relatively good public transport system, thus providing an alternative to congestion charging.

2.3. Institutional and Organizational Factors

2.3.1. Introduction

A vital part of providing a solid basis for road pricing to OIC members is to make changes to road subsector management in general and in the ways that it is funded in particular. Notwithstanding the general reforms that are needed the main drivers of such changes can be listed as:

- The need for a more integrated approach,
- Decentralization and promoting subsidiarity,
- Furthering commercialization,
- Improving value to road users,

- Being more accountable to road users and road interest groups,
- Greater economic efficiency,
- Change of management,
- Separation of policymaking and implementation,
- Pressure on the national budget,
- Leveraging private sector for funding and financing infrastructure,

Conventional Roads Subsector Management Structure

A number of institutions and organizations have varying roles in the formation of road pricing and congestion charging policy, legislation, planning, implementation monitoring and evaluation and regulation. The hierarchy of institutions and organisations is illustrated in Table 2-1. Brief explanations of the roles of each of the entities are given below:

Ministries of Transport – often combined with communications or with works - sets transport policies, write legislation, regulate the sector, prepare strategic plans and monitor their implementation. Ministries also are responsible for sector management, including allocation of funding to transport infrastructure and determining the balance between capital, maintenance and operational expenditure. Subsector management, such as road, rail, air and water, prepare their own plans and report to the lead ministry on performance. They also have controlling interests in transport network management agencies that are mandated to develop and maintain road infrastructure for example. Ministries of Transport are responsible for traffic laws, safety, licencing and in some countries transit permits. The determination of road user fees such as tolls and dedicated fuel levies also fall under Ministries of Transport.

Ministries of Finance and/or Economic Planning are generally mandated to formulate sound economic policies, maximize revenue mobilization, and ensure efficient allocation and accountability for public resources so as to achieve the most rapid and sustainable economic growth and development. For many developing countries, this Ministry is responsible for the preparation of long term visions (such as a Vision 2050) as well as shorter term National Development Plans (of typically 5 to 10 years). Such planning may also set out proposals as to how the sectors are to be funded, such as through public private development partner or from user charges. Developed countries seem not to prepare such vision statements or have national development plans. Most planning is carried out by subsectors.

Local Government is primarily responsible for planning and the provision of services, education, health systems and environmental protection. They are also normally responsible for local planning and economic development, but the level of planning authority that local government has varies. In developed countries there is more subsidiarity and more delegated powers to local government, for less developed countries, control is typically more centralized. Local government may for example be responsible for the implementation of passenger transport projects including mass transit, bus and taxis. They may also be responsible for travel demand management and traffic management including car restraint measures, parking and congestion management, including charging.

Land Use and Transport Planning Authority is normally responsible for preparing integrated land use spatial and strategic long-term planning at the national level. In addition, regional metropolitan transport authorities are also set up for large conurbations under the control of several local councils to develop and implement integrated transport solutions for all transport modes.

Road Authorities and Agencies are autonomous or semi-autonomous organizations responsible for the development, maintenance and operation of national or state level highways/road networks.

District and rural roads are normally under the jurisdiction of local government. Roads Authorities have delegated powers from the Ministry of Transport to enter into agreements with third parties to develop toll roads under concession agreements. Road Authorities may also be responsible for determining the budget and priorities for roads expenditure, some under the direction of the Ministry of Transport. Most road authorities in OIC and non OIC countries belong to the regional associations of road authorities and the World Road Association.[4]

Road Funding Agencies are set up in many cases to ensure that fund management and allocation are independent from development maintenance and operations. This is typical of funds that have been derived from specially hypothecated fuel levies. Normally this is motivated by the need to control abuses and ensure effective control of spending.

Road Tolling Companies and Associations are usually private companies that have agreed long term contracts with Road Authorities to provide, develop, maintain and operate mostly routes but also sections of road networks. They will all charge tolls at toll plazas and some may receive payment from the authority based on estimates of traffic volumes (applying the concept of shadow tolling). To ensure increasing professional standards there is also an international association to which many tolling companies belong[5].

Table 2-1: Institutional Hierarchy of Road Institutions

Role	Institution and Organization
Policy and Legislation	Ministry of Transport
	Ministry of Finance and Economic Planning
Planning	Local Government
	Land Use and Transport Planning Authority
Funding and Execution	Road Authorities and Agencies and Associations
	Road Funding Agencies
Implementation	Road Tolling Companies and Associations
Consumers	Road Users and Associations
Oversight	Toll Road and Road Pricing Regulator

Source: Fimotions

Road Users and Associations represent the road customer who was and still is very much neglected in the road reform process. There are many forms of associations: Taxi Bus and Trucking Industry Associations and Road Users (Figure 2-6). Representatives of these organizations invariably are invited to sit on Boards of Road Agencies and Road Funds.

In addition, they typically organize road side assistance, and are involved in promoting road safety, placement of traffic signs and signage (as the AA in the UK, and ANWB in The Netherlands) and they play a major role in advocacy, engaging with public, the industry and government regarding issues of road infrastructure, including road pricing.

[4] https://www.piarc.org/en/
[5] https://www.ibtta.org/

Figure 2-6: Road Users Association Nigeria

Source: https://roadusersassociation.com.ng/

Toll Regulator - Toll road and road pricing regulators are typically independent economic regulators tasked to set fair, enforceable prices for road users, rather than the Road Authority itself as the authority could have a conflict of interest to maximize income for the road provider rather than value to the road user. This is why in China for example there is an entity to ensure that toll setting is fair. This is also the case in Indonesia that has a Toll Road Authority since 2005. There are few references to a separate toll regulator, but this could be worth considering.

The extent to which all of the foregoing are involved will vary between countries and even location and this part of the research aims to examine this. Naturally, the purpose of the exercise is to learn from others, benchmark, revise and to make recommendations for institutional change in OIC countries that will encourage progress to be made in implementing road pricing/congestions charging.

2.3.2. Institutional and Organizational Factors outside OIC Geography

The UK has congestion charging schemes in London and attempted to do so in Edinburgh. In London the scheme is run by Transport for London (TfL), which is part of the Greater London City Council. The entry to the London Congestion Charge (LCC) is about $15 per vehicle per day[6]. The charges are used to subsidize busses and trains in London as well as to maintain the city roads. Attempts have been made to have similar charges in Manchester and Edinburgh, but the residents of both cities reject the proposals with an overwhelming 78 and 74% against respectively. The results of public referenda in December 2008 in these cities are shown in Table 2-2 and Figure 2-7.

Table 2-2: Votes in response to the Manchester Congestion Charge Referendum

Region	Turnout (%)	YES	NO	YES (%)	NO (%)
Bolton	48.8	20,529	79,910	21	79
Bury	57.4	16,563	64,001	21	79
Rochdale	50.8	17,333	68,884	20	80
Oldham	54.4	17,571	68,884	20	80
Wigan	45.3	27,810	78,565	26	74
Salford	57.0	14,603	79,326	16	84
Manchester	46.1	43,593	113,064	28	72
Tameside	60.7	16,323	83,105	17	83
Trafford	63.6	20,445	83,568	20	80
Stockport	59.0	24,090	103,706	19	81

Source: Manchester Evening News C-Charge Results

[6] https://tfl.gov.uk/modes/driving/congestion-charge

Figure 2-7: Edinburgh Congestion Charging Referendum 2008

NO vote	YES vote
133,678	45,965
Against: 133,678 **(74.4%)**	In favour: 45,965 **(25.6%)**
Turnout	**Total votes cast**
61.7%	179,643

Source: Manchester Evening News C-Charge Results

So the only example of UK congestion charging remains in London. Learning from the UK experience, questions have been asked retrospectively whether the changes that have been made over the last 30 years or so have actually achieved what they set out to do. Such as better transport planning, a more balanced modal share, improved accessibility and lower transport costs. Ultimately as transport is only a means to an end, an enabler of other sectors, efficiency must be its highest goal. The results of research by Marsden and May (2006) suggest that, "although the different institutional models share a broadly common set of objectives, there are differences in devolved responsibilities and in the extent to which various policy options are within the control of the bodies charged with transport policy delivery". Marsden and May (2006) conclude that "the existence of several tiers of government, coupled with the many interactions required between these public sector bodies and the predominantly private sector public transport operators, appears to create extra transactional barriers and impedes the implementation of the most effective measures for cutting congestion". More analysis of the LCC congestion charge is covered in the UK Case Study (section 3.2).

In Norway and Sweden, who both have congestion charging schemes in place, a review of the institutional reaction to the strengths, weaknesses, opportunities and threats of cordon tolling revealed that four factors were of importance, i) the experience of having a congestion problem; ii) that someone takes leadership in the process; iii) high level of trust among the actors, and iv) the establishing of incentives (Oddgeir and Leiren, 2006). Experience with congestion charging is that most of the stakeholders in Table 2-1 are involved collectively in working groups and committees that are set up to investigate and if necessary develop congestion charging in a big city. Oslo has a combined congestion charge and low emission zone. The cost of the road toll is dependent on the Euro standard and fuel type, as well as time and distance. It operates between 06:00 - 18:00, Monday to Friday. Rush hour is from 06:30 - 09:00 and 15:00 - 17:00[7].

The demand for local agreement leads to a situation where every key actor necessary for such a broad agreement has a veto-position in the decision-making process. This is also an important explanation for the lack of interest and support for road pricing/congestion charging schemes in Norway. Hence, the institutional strategy in Sweden was that of managing political conflict rather than consensus-building, a strategy that proved successful because the same coalition held a majority at both national and city level. In other words: altering these conditions are among the lessons to be learnt for Norwegians or others who want to follow in the foot-steps of Stockholm when it comes to introduction of congestion charging. Sweden was one of the first countries to have

[7] https://urbanaccessregulations.eu/countries-mainmenu-147/norway-mainmenu-197/oslo-charging-scheme

congestion charging initially in the city of Stockholm and then followed by Goteborg[8]. Both schemes were set up by Transport Styrelsen (Ministry of Transport). The institutional strategy in Stockholm was of understanding that of political conflict needed to be overcome, rather than consensus-building. The strategy proved successful. The lesson learned from Sweden is to be pragmatic and involve both pragmatists and antagonists when planning congestion charging (Oddgeir and Leiren, 2006).

Most EU Member States (see Table 2-3) have limited access urban traffic control and low emission control initiatives of various forms. The practice is supported by the EU as a part of its programme to have smarter and cleaner cities.

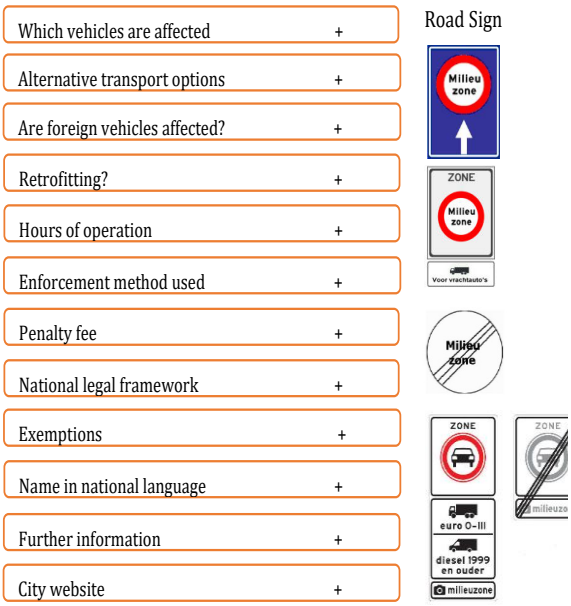
Table 2-3: EU Countries with Urban Access Controls, Pricing and Restrictions

Austria	France	Latvia	Romania
Belgium	Germany	Malta	Slovenia
Bulgaria	Greece	Netherlands	Spain
Czech Republic	Hungary	Norway	Sweden
Denmark	Ireland	Poland	Switzerland
Finland	Italy	Portugal	United Kingdom

Source: https://urbanaccessregulations.eu/countries-mainmenu-147

A good example is Amsterdam, which has introduced Low Emission Zones (LEZ) and Limited Access Zones (LAZ) based on rationing by vehicle type and access permissions. These are both evidence of a management and operations strategy, which is shown in Figure 2-8.

Figure 2-8: Amsterdam LEZ and LAZ Framework, Road Signs and Access Regulations



From some point in 2020, all Dutch LEZ schemes will have the same rules for passenger cars, delivery vans, trucks and buses running on diesel.

LEZ	Date	Who is affected?	Minimum standard/built after
Amsterdam LEZ	Since **January 1, 2017**	• **commercial vehicles** and motorhomes/**camper vans** (N1 vehicles) with a diesel engine built 1-1-2000 or later (Euro 3)	• Euro 3; built 1-1-2000 or later
	Since **Januari 1, 2018**	• **mopeds**	• built 1-1-2011 or later (note, this applies to the entire urban area of Amsterdam)
		• **diesel taxis**	• Euro 5; built 1-1-2009 or later
		• **all buses and coaches**	• Euro 4; built 1-1-2005 or later within A10 ring road
	From **January 1, 2020**	• The area of the **bus** and **coach** LEZ will be extended to the whole built up area	• Euro 4
	From **November 1, 2020 "Green LEZ"**	• **diesel passenger cars** • **diesel delivery vans**	• Euro 4
	From **2022**	• **buses and coaches**	• Euro 6
	From **2025**	• **mopeds** in the built-up area of Amsterdam • **trucks, delivery vans, taxis, public transport, and coaches** within the A10 ring road • **passenger ferries, pleasure boats and public transport boats** within an emissions-free area	• **Zero Emission Zone**
	From **2030**	• **all vehicles**	

Source: Urban Access Regulations[9]

[8] https://transportstyrelsen.se/en/road/Congestion-taxes-in-Stockholm-and-Goteborg/
[9] https://urbanaccessregulations.eu/countries-mainmenu-147/netherlands-mainmenu-88/amsterdam

While all countries practice some form of general road user charging, there are only a few cities with urban congestion charging. For example, New York City (NYC) is the first and only city in the USA to introduce a Congestion Pricing Surcharge in February 2019. The fee is about $2.50 per entry. The scheme is operated by NYC. San-Francisco should be the next US city to have congestion charging. The proposed congestion pricing charge is part of a mobility and pricing study being carried out by the San Francisco County Transportation Authority (SFCTA) and supported by the U.S. Department of Transportation. The objectives are to reduce congestion at and near central locations and to reduce its associated environmental impacts, including cutting greenhouse gas emissions. The funds raised through the charge would be used for public transit improvement projects, and for pedestrian and bike infrastructure and enhancements.

Singapore was the first city in the world to introduce congestion charging in 1975. Its scheme has evolved and is discussed in detail in another case study (see section 3.1). The schemes are managed by Land Transport Authority[10].

The institutional strategy has evolved successfully by involving the public from the outset. It was always totally clear the area-pricing regime was to reduce congestion and fund public transport improvements. This contrasts with South Africa whose general fuel levy and toll pricing legislation prohibits the funding being used for other than road maintenance (see section 3.3). The charging in Singapore has always been packaged in such a way that all stakeholders get something from it. This means that the people in Singapore reacted favourably to the pricing and accompanying package of improvements. Early scepticism was addressed effectively via information and on-ground experience. It seems the public has come to accept and respect bold policy initiatives like pricing and have largely trusted the authorities as purveyors of effective public services[11].

Seoul, South Korea, has had a congestion charge since 1990 as an essential component of its transport demand management (TDM) policy. Legislation was passed that enabled local government to decide the timing and details of a congestion charge. The objectives of the charge were to facilitate traffic flow, improve air quality, or promote the efficient use of the transportation infrastructure. The legislation determined that a Regional City Transportation Policy Deliberation Committee should set up and develop the system. The City of Seoul developed two type of TDM programs: i) mandatory programs regulated by law; and ii) voluntary programs that encourage residents and/or businesses to become involved[12].

Regarding general road subsector management every country has a slightly different approach. Most institutional divergency comes from the issue of autonomy of funding – in other words ensuring a high level of independence in the management and allocation of road funding. The main aspects of institutional reforms that can contribute to improve this situation include:

- improved institutional structures,
- separation of the client and supplier functions,
- separation of client and supplier organizations,
- privatization of the supplier organizations,

[10] https://www.lta.gov.sg/content/ltagov/en.html
[11] https://ops.fhwa.dot.gov/publications/fhwahop08047/02summ.htm
[12] https://www.seoulsolution.kr/en/content/seoul%E2%80%99s-transportation-demand-management-policy-general

- establishment of an executive agency or a commercialized (client) organization,
- user participation through oversight boards,
- improving management information systems,
- seeking additional sources of financing.

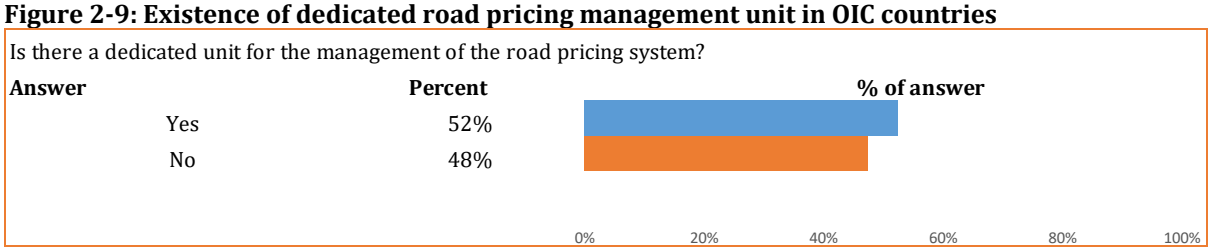
While there are differences between institutional arrangements of managing road networks in different countries they do have certain concepts in common:

- furthering commercialization
- the involvement of the private sector through PPP
- placing more emphasis on users taking into account their needs (World Bank, 2010).

2.3.3. Institutional and Organizational Factors in OIC Countries

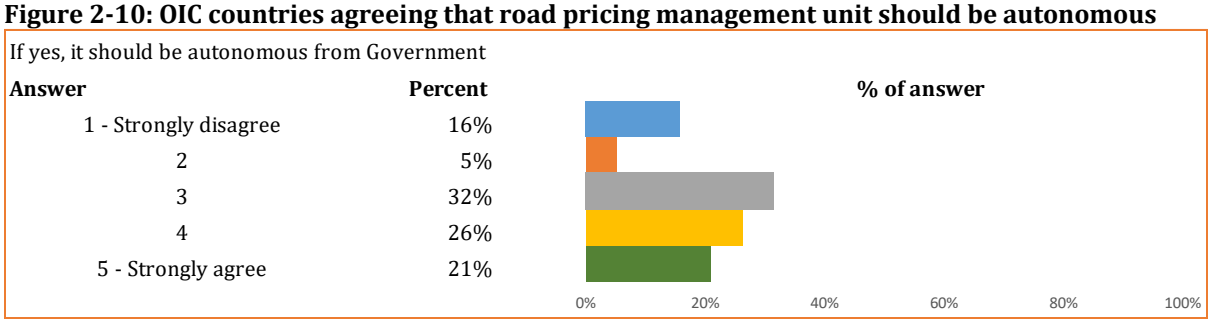
While OIC members have road user charging and tolling, they do not yet have bespoke urban congestion charging schemes. Indications from the questionnaire survey showed that 52% have a dedicated unit for managing road user charges tolls and pricing (Figure 2-9) and 21% agree that such units should be under government rather than be autonomous (Figure 2-10). Oman's Ministry of Transport and Communications is studying the feasibility of introducing toll collection systems on certain highways aimed at attracting private investment in the development of a smart road system in the Sultanate. The move is broadly in line with the Omani government's strategic goal to strengthen road communications thereby enhancing the Sultanate's global rankings as a logistics-friendly destination. Enabling toll collection is seen as key to attracting private investment in the road construction sector under a Public-Private-Partnership (PPP) model — an approach that the Implementation Support & Follow-up Unit (ISFU) is looking to implement under Tanfeedh (The National Programme for Enhancing Economic Diversification). Jakarta (Indonesia) has been planning the development of ERP and formed a special ERP Management Unit (see section 3.4.2), although it is still yet to be implemented.

Figure 2-9: Existence of dedicated road pricing management unit in OIC countries



Source: Fimotions, survey result

Figure 2-10: OIC countries agreeing that road pricing management unit should be autonomous



Source: Fimotions, survey result

Kuala Lumpur, Malaysia, in addition is studying the introduction of a congestion charge, but its introduction is conditional upon having a good public transport system13. Similarly in Dubai, although traffic congestion cost $790 million in 2013, as can be seen in Figure2-11. There are no activities as yet to introduce a congestion charge because the priority is first to build a good public transport system[14]. Research carried in Istanbul, Turkey, showed that the introduction of a congestion charge would increase public transport and reduce traffic congestion - the change in demand was estimated using stated preference (SP) analysis (Ozengel and Henry, 2017). Such SP technique is described in more detail in section 2.8 and is advocated for congestion charging studies. Despite good research, Turkey has yet to move forward with congestion charging.

Figure 2-11: Dubai Sharjah Traffic Congestion

Source: Khaleej Times

In terms of general road administration within the OIC region, the level of autonomy varies from country to country, but normally the Ministry has oversight and approves the appointment of the Board of Directors. Their organizations are similar – an example is given of the Nigerian - Federal Roads Maintenance Authority (FERMA), which consists of:

- Office of the Managing Director
- Operations
- Planning & Engineering Services
- Road Maintenance Management Services (RMMS)
- Administration & Human Resources Development
- Finance & Account
- Board Secretariat/ Legal

Road Management Agency Performance Review

A comprehensive review of the performance of 46 road authorities of OIC and non-OIC members was carried out in 2014/15, much of the lessons of them are very current. The principle recommendations were: i) Establishing appropriate institutional structures and relationships with stakeholders, ii) Separating the client and supplier functions, iii) Separating the client and supplier organizations, iv) Privatizing the supplier organizations, v) Establishing an executive agency or a

13 https://www.thestar.com.my/metro/metro-news/2018/10/17/kl-to-impose-congestion-charges-on-motorists-only-after-improving-public-transport

14 https://www.arabianbusiness.com/traffic-congestion-cost-dubai-790m-in-year-rta-581463.html

commercialized (client) organization, vi) Ensuring user participation through oversight boards, vii) Improving management information systems, and viii) Seeking additional, sustainable sources of financing (Pinard, 2015).

Table 2-4: Road Authorities Performance Review

Countries with Road Funds			Countries with Road Authorities		
1. Benin	10. Gabon	**19. Namibia**	1. Burkina Faso	**10. Mozambique**	**19. Zambia**
2. Burundi	**11. Ghana**	20. Niger	**2. Congo Republic**	**11. Namibia**	
3. Cameroon	12. Guinea	**21. Rwanda**	**3. Cote d'Ivoire**	**12. Rwanda**	
4. Congo Republic	**13. Kenya**	22. RCA	**4. Ethiopia**	13. Senegal	
5. Chad	14. Lesotho	**23.Tanzania**	**5. Ghana**	14. Sierra Leone	
6. Cape Verde	**15. Madagascar**	24. Togo	**6. Kenya**	15. South Africa	
7. Cote d'Ivoire	**16. Malawi**	**25. Zambia**	**7. Madagascar**	16. Sudan	
8. Djibouti	**17. Mali**	26. Zanzibar	**8. Malawi**	**17. Tanzania**	
9. Ethiopia	**18. Mozambique**	27. Zimbabwe	**9. Mali**	18. Uganda	

Bold Letter: Country with both a Road Fund and a Road Authority

Source: Pinard (2015)

2.4. Economic and Financial Factors

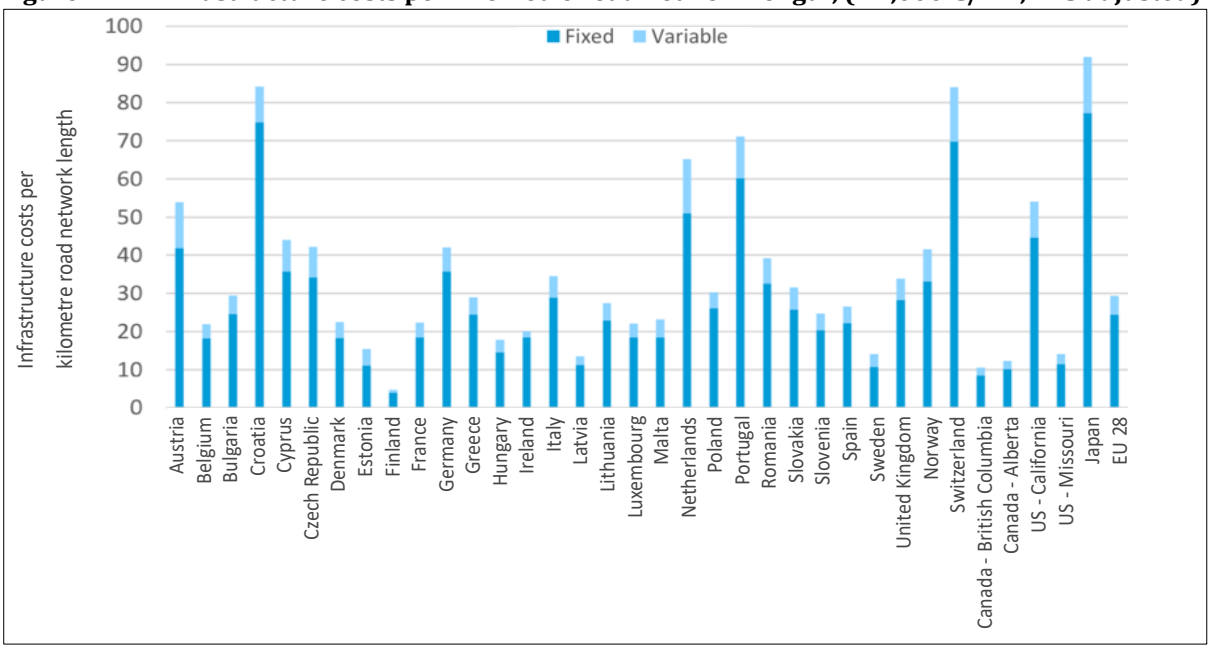
2.4.1. Introduction

The pricing of transport infrastructure is as old as mankind: highways in the old Mesopotamia, trade routes through Arabia and India, mountain passages by the Germanic tribes, are few examples of tolled infrastructure. A more recent example is the river Rhine where the increasing number of toll chains and blockades almost completely obstructed shipping, until the Mannheim treaty (1831) opened the way for the inland shipping, leading to prosperity in Western Europe. Italy had the first European motorway in 1924. More countries followed. A highway network was developed via concessions, without burdening national state budgets.

Road networks provide a vital connectivity and are an extremely valuable asset, which need to be maintained. Figure 2-12 reflects the spending on road infrastructure for a set of European and non-European states.

The efficiency of the current practices to fund projects is key for its sustainability, and for the realization of projects in order to contribute to national and international goals (safety, transport efficiency, competitiveness, and economic growth). Traditional funding sources have been mainly relying on taxes and real tolls. The User Pays Principle whereby users pay per use is gaining position and perceived to be fairer than taxes charged to all citizens. But there is a common good to the provision of road infrastructure, which is beyond the direct benefits that are perceived by the individual in the price that is paid as has been discussed previously.

Figure 2-12: Infrastructure costs per kilometre road network length, (x 1,000 €/km, PPS adjusted)



Source: Fimotions based on CE Delft and Schroten (2019)

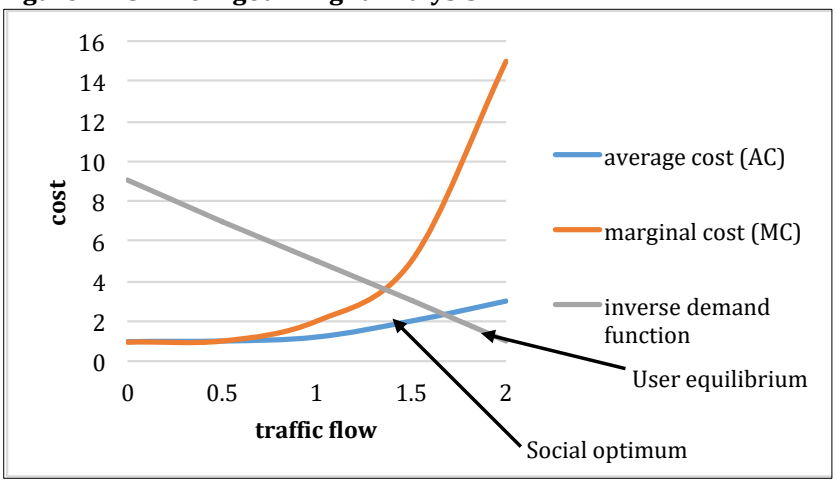
Inadequate infrastructure is a constraint on economic growth world-wide, which is a problem for governments (CEDR, 2017):

- most countries simply are not spending enough to provide the infrastructure needed to support the economy;
- poor planning and coordination, weak analysis underpinning project selection, competing political objectives, and other considerations, sometimes mean that limited resources are often spent on the wrong projects;
- infrastructure assets are often poorly maintained, thereby increasing life cycle costs and reducing benefits.
- The construction of infrastructure requires high investment and a commitment to maintenance

Economic theory says that marginal social cost pricing results in an efficient allocation of transport resources. However, there are alternative approaches of internalization appropriate in the context of policy making:

- Marginal social cost pricing results in an efficient amount and allocation of transport.
- Average cost pricing: charging vehicles at their average costs, ensuring that total external and/or infrastructure costs are covered;
- Baumol pricing: setting taxes/charges at a level at which a certain objective (e.g. congestion level) is met.
- Ramsey pricing: charging levels in a way that total revenues are maximised.

Figure 2-13: The Pigou-Knight Analysis



Source: Walters (1961) as referred to by Timilsina and Dulal (2008)

Timilsina and Dulal (2008) provides us with an example of congestion pricing. "The theory of congestion pricing states that the charges imposed should equal the difference between the social marginal cost and the private cost for the flow, which will prevail only after imposing the charges (Jansson, 1969). Congestion charges are meant to internalize their external costs (Teubel, 1998). Pigou (1920) and Knight (1924) established a foundation to describe misallocation of resources resulting from free access to public roadways (see Figure 2-13). As illustrated in the figure the average time taken for a motorist to travel a particular road segment increases with an increase in traffic flow. With the increased congestion, average speed decreases and average travel time increases for the driver. Thus, an increased travel time causes the average (AC) and the marginal travel costs (MC) to increase."

Pricing equals valuation. The road user will compare the price asked with the value the service represents, hence the user equilibrium. Elasticity of demand, the way demand reacts upon changes in pricing, depends on the identity of the actual user— the transportation company or the driver— and on the user's willingness to pay (WTP). Marginal social costs pricing would internalize the external costs and drive the user equilibrium to the social equilibrium point (by charging the difference between AC and MC). Due to elasticity of demand the demand will reduce when charging the difference, hence the dual effect of pricing.

The issue of the alternative non-tolled road to that being tolled, is complex and goes with major complications for the acceptability and coherence of toll road schemes. Sometimes, the compromize to grant an alternative free road appears as a compensatory measure to offset opposition to toll roads that do not take into consideration all the implications and side effects. The theoretical functions of the alternative free road. The rationale for a 'free road' stems from three types of functions it is expected to perform (ADB, 2018). These three functions usually appear intermingled but are different in nature:

1. a competition-related function: an alternative non-tolled road is expected to limit the monopoly position of the toll road operator in a given corridor.
2. a social function: a free alternative road is seen as a safeguard to ensure mobility to those unwilling or unable to pay tolls.
3. a mobility function: when the toll road has limited access gates, another non-tolled road has to be in service to provide local access and short-haul mobility.

Considerations stemming from the functions expected to perform the alternative non-tolled road and from what may happen in practice, are (ADB, 2018):

- The mere existence of an alternative may be the result of the approach used to build the new road rather than the application of any principle.
- Granting a free alternative may be conceptually incompatible with the application of the "user pays principle," especially when toll revenue is dedicated to other public objectives (e.g., road maintenance, public transport, etc.). In this case, the mere existence of a free alternative is against the government's own principles and interests.
- Sometimes, traffic along a corridor may not be heavy enough to sustain a tolled highway and a parallel free road. Insistence on granting a free road risks making the expected high capacity new one unattractive to private investment. Providing both options with public money may be a waste of resources.
- When the toll road operator is a government entity or a public corporation, the competition considerations do not apply.
- Concerns about the effects of tolls on the poor or on local residents may be dealt with by other means such as waivers, discounts, etc.

2.4.2. Economic and Financial Factors Outside OIC Geography

Funding and Financing of Road Infrastructure

There is certain confusion between Funding and Financing. According to World Road Association (PIARC, 2004), "Funding refers to how the road is finally paid for, while financing refers to how to raise funds to pay for an infrastructure. Thus, funding answers to the question "where the money for the concession ultimately comes from" and financing answers to "where investment (or other cash necessities) comes from". Funding can be a prerequisite for making a project financeable or bankable.

CEDR (2017) identifies seven different funding mechanisms currently available for road construction and maintenance:

- All Purpose Taxes,
- Special Purpose Road User Taxes and Fines,
- Road User Charges,
- Development cost charges (value capture),
- Grant Funding,
- Private Donations,
- Hybrid funding mechanisms.

Table 2-5: Roads Funding Catalogue

Category	Funding Mechanism	Characteristics
All Purpose Taxes	General taxes	Charges applied to salaries, goods and services purchase, companies incomes, etc. Generally earmarked to feed Government's General Budget, but in some countries earmarked to specific road funds.
Special Purpose Road User Taxes and Fines	Vehicle taxes	Payments per vehicle on a one-off and on an annual basis. Variable payment depending on vehicle characteristics. These fees can be charged in the purchase and/or in the periodic vehicle examination or licensing of the vehicle for road use
	Fuel taxes	Payments applied to the oil and diesel products that are consumed by the vehicle.
	Green taxes	The charge depends on the distance driven and/or the pollutant emissions features of the vehicle.
	Fines	Charges applied to penalize law violations
Road User Charges	Distance based charges	Payments are applied strictly to the distance travelled varying with the vehicles features
	Time based charges (vignettes)	Payments based on the amount of time that the infrastructure is available rather than the distance.
	Tolls	Payments made by user to the concessionaire who operates a road built or maintained using public-private finance initiative
	Road pricing	Charges applied to user within a certain area, so demand can be regulated with these pricing schemes.
	International transit fees	Transit charges can be imposed taking into account the transit distance, quantity of goods and other aspects
Development cost charges (value capture)	Commercial areas access contribution	Payments imposed to new commercial areas where the infrastructure has been developed.
	Urban development contribution	Payments imposed to municipalities or new residents where the infrastructure has been developed
Grant Funding		Non-repayable funds disbursed by one party. Aims to strengthen economic and social cohesion by correcting imbalances between different countries or its regions
Private Donations		Individuals, organizations or businesses can help maintaining roads, having the option to participate as volunteers or hire a maintenance service provider to perform the work on their behalf.
Hybrid Funding Mechanisms		For instance, subsidized toll roads, partially granted funding, etc

Source: CEDR (2017)

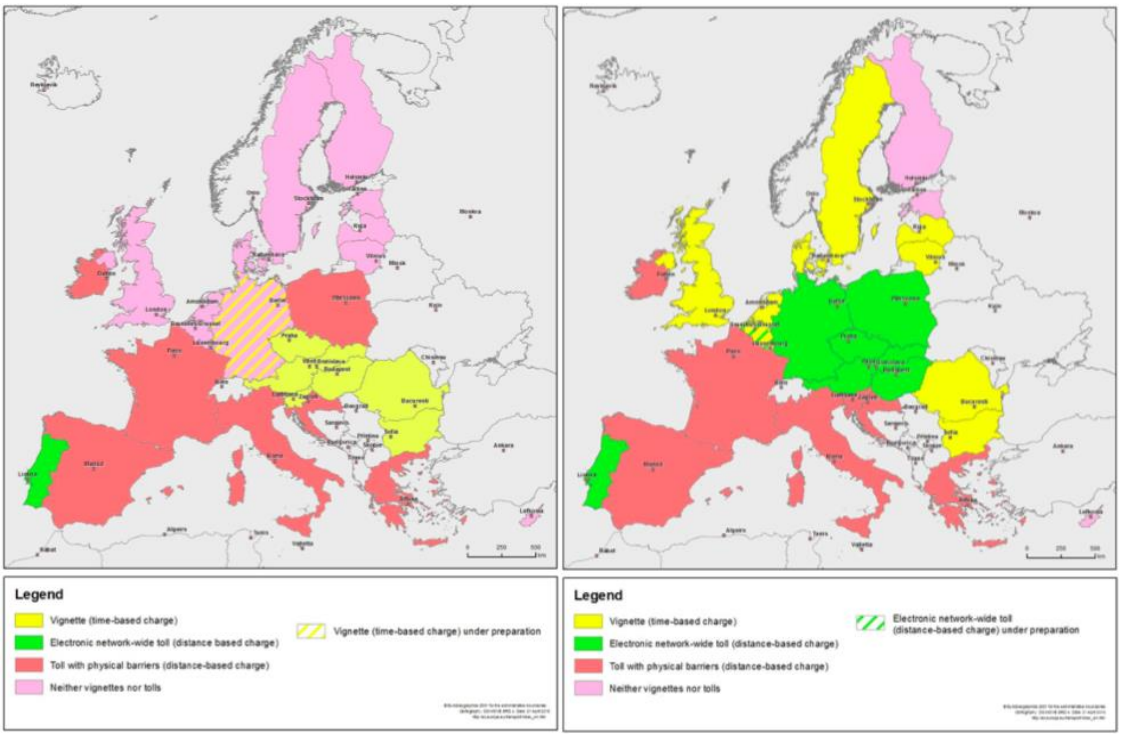
In Table 2-5 the funding mechanism and the characteristics of each of the seven mechanisms is shown. Nevertheless, not every formula suits every situation. It is very important to adequately select which formula to be used in each situation, ensuring that legal framework allows its usage, and that this decision will be the most efficient one in terms of public budget and effectiveness for investing. According to Rouhani (2014), road pricing can be done at various scales:

- Point: Charging users when passing a point such as a tunnel or a bridge
- Facility: Pricing a roadway section, e.g., per km base –entrance and exit
- Corridor: Pricing all roadways in a corridor
- Cordon: Charging users when traveling on all roads in an area such as CBD"

In practice, there are large differences in the approaches followed in the various countries that apply internalization in the pricing of infrastructure (see Figure 2-14). In the Eurovignette Directive

(amended in 2006 and in 2011), the European Commission provides the basis for the EU charging policy for heavy goods vehicles. This Directive enables Member States to charge the full infrastructure costs and, since its 2011 revision, also some external costs (air pollution and noise). In addition, charges can be differentiated in order to reduce road congestion and to provide incentives to use cleaner vehicles.

Figure 2-14: Road infrastructure charges for light Private Vehicles (left) and for Heavy Goods Vehicles (right)



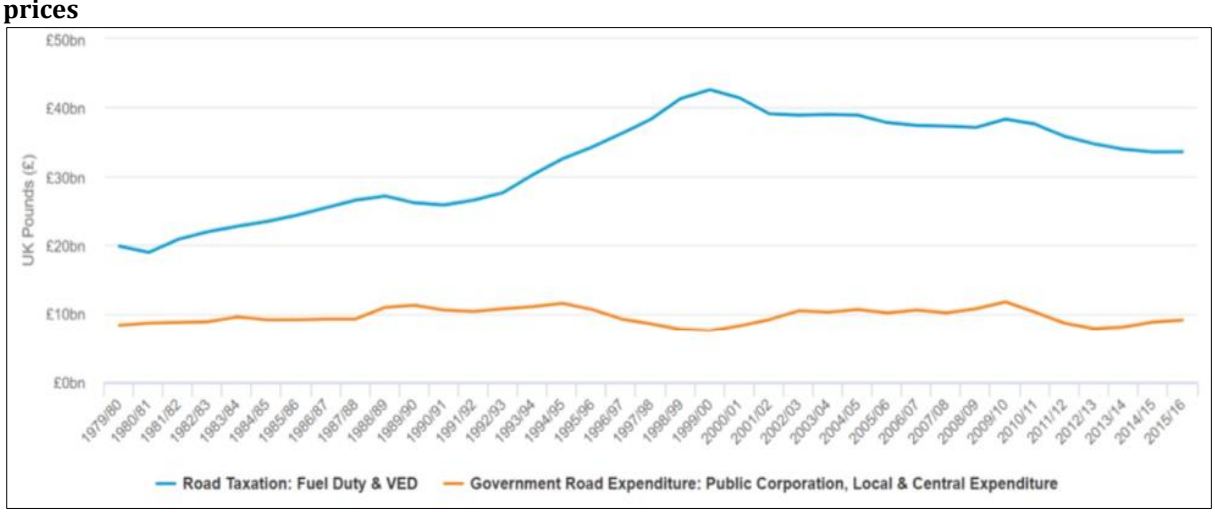
Source: CEDR (2017)

In 2017, the European Commission presented a proposal to amend the Eurovignette Directive again, among other things, by extending its scope to buses/coaches and light vehicles, including cars, and by enabling the modulation of charging according to CO_2 emissions (EC, 2017).

Full/Partial Cost Recovery/Revenue-expenditure balance

There is a sound economic basis for charging the users of the road system only for the short term social marginal costs. If also the depreciation of the current systems, as well as investment costs for re-construction and new-construction of roads and railroads are considered, the cost basis becomes considerably much wider. There are many countries where the total revenues from road users far outweigh the national expenses on road infrastructure. Farrell (1999) estimated the road user revenues in Western Europe to be double the total expenditures. For the United Kingdom, this was almost three times. OECD (2018) presents comparable outcomes: in the UK, fuel and vehicle excise duty produced revenues roughly three times expenditure on the roads (Figure 2-15).

Figure 2-15: Public road expenditure and taxation in Great Britain, inflation adjusted at 2015/16 prices



Source: RAC Foundation, using data obtained from the UK Department for Transport to 2016/17, as referred to in OECD (2018)

Although this picture is not universal, current taxes and charges related to road use vary greatly across countries, both in absolute terms and in relation to expenditure on the roads. In some countries, fuel excise and vehicle duties are generally insufficient to fund the investments required to meet demand. In others, the revenues exceed expenditure. The extent to which revenues from these taxes and charges are earmarked to spending on road or transport infrastructure also varies greatly. In the US, the Federal Highway Trust Fund was financed entirely with dedicated funds from Federal fuel taxes until 2008, when transfers from General Funds began to be required to ensure the Fund remained solvent. Since then the gap has widened with fuel taxes frozen in nominal terms and fleet average fuel economy improving. In 2016, general funds contributed twice the amount of the dedicated fund.

The reason why taxing care use are used in some countries to contribute to general government revenues well in excess of road expenditure, is that demand is relatively inelastic. Taxing car use is less distorting than taxing more elastic consumption of goods and services as it has less impact on the allocation of resources in the economy (OECD, 2018).

The Transportation Research Board of the National Academies (2006) further explains the USA situation, where revenues derived from highway users were fully dedicated to paying for highway construction and operation. These revenues covered all such costs other than those for local streets. With trust funds the connection between user fee, revenue and spending was enforced. The taxpayers perceived the arrangement as fair. However, in the evolution of transportation finance arrangements, this original conception had been compromised, because adherence to the user-pays finance principle weakened as a result of:

- devolution of responsibilities to local governments;
- diversion of highway user revenue to non-highway purposes;
- resort to expedient sources of revenue in the face of pressing needs;
- and growing demands for transit improvements, which are unable to cover a major portion of their costs with fees.

In part as a result of these changes in the structure of the program but also on account of broader trends, the public and legislators no longer supported fuel tax rates and fees necessary to sustain the

programs, and the merit of the user-pays principle was no longer recognized, to the extent that the user fee finance system historically has had a positive effect on program performance, divergence from the principle has been harmful.

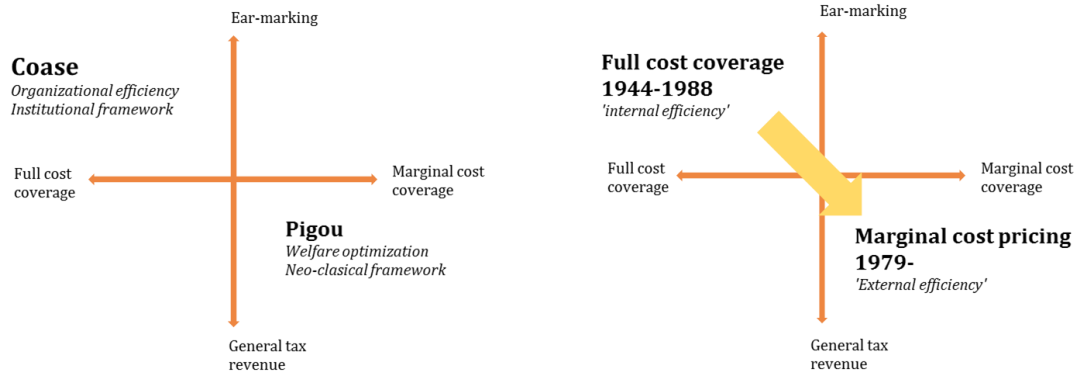
Sweden made a large shift from full cost coverage to marginal cost pricing (Hasselgren, 2013):

- The full cost coverage period 1945-1978
- The mixed pricing policies period 1979-1988
- The social marginal cost period 1989-

The transition is reflected in Figure 2-16 (left). Coase's model (1960) combines full cost coverage with ear-marking. The Pigovian welfare model (1920) combines marginal cost coverage with the treatment of revenues from taxes and fees as general tax income. Figure 2-16 (left) shows this focus-change has also been combined with a move from a principle of ear-marking of the Swedish government's revenues from (primarily) road transport to be used for road-maintenance and investments, to a model where all government revenues are treated as general tax revenues to be used at the discretion of the Parliament and government in yearly budget decisions.

Hasselgren (2013) observes that in the 1990s the Swedish government moved from a market-economy stance expressed e.g. by the 1944 Transport Committee, to a market-failure stance as the dominant view on the functioning of the transport infrastructure system. The Swedish government shows signs of a more open view toward alternative financing, such as congestion charging, road tolls for specific sections of the road system and raised rail-road fees, often framed in terms of short term social marginal costs. In the financing these measures have brought a higher degree of ear-marking. The move made by the Swedish government cab be seen as a revival of the Coasean view on transport infrastructure financing with a stronger organizational focus.

Figure 2-16: Different views on cost coverage and financing for transport infrastructure



Source: Hasselgren (2013)
Note: Left: Coase and Pigou – different views on cost coverage and financing; Right: Shifting cost coverage view and financing policies for transport infrastructure

The determination of tolls levels by willingness to pay

An important concept often used in non-OIC Countries to set prices or price ranges for toll roads and congestion charges involves estimating the willingness to pay by road users. Even though the basis for having road pricing is cost recovery – and this may full or partial as has been explained, interestingly the willingness to pay derived prices have no regard at all to road provider costs as they have been determined totally by consumer preferences.

The willingness to pay (WTP) is the amount an individual is willing to pay (sacrifice) to procure goods or services that avoid a lesser state (Hanemann, 1991). An important qualification to this

statement is that the additional value may be not be monetary, but it could also be time, convenience, comfort or well-being in general. For the sake of definition, price is used, understanding that time is also of relevance. Thus the price of any goods or service paid for a transaction is a point between a buyer's 'willingness to pay' and a seller's 'willingness to accept' (WTA) payment (Shogren *et al*., 1994).

Understanding WTP and WTA are important elements of behavioural economics (Horowitz and McConnell, 2003). In the case of roads, history of commercial transactions being made are few and generally neither the buyer nor the seller is aware of the correct price to be charged or the value to be derived, this makes establishing WTP more problematic but at the same time more expedient. In the examination of 100 toll roads, there was a wide discrepancy between actual and traffic forecasted due to extensive optimism bias (Bain, 2009) which is noteworthy.

WTP estimation is particularly relevant to public services where the normal market relationship between supplier and consumer does not exist. The WTP for roads has not been researched extensively, which is another indication of the lack of commercialization in the sub-sector. One might say that there has been a lack of willingness, by suppliers of roads, to study willingness to pay for them. However, some research has been carried out. The WTP for improvements in travel for measures that reduce traffic congestion in San Diego USA showed that whilst there was a relationship between WTP and savings in travel time, the savings in travel time exceeded the willingness to pay for them by a consistent factor. (Brownstone *et al*., 2003). Such a conclusion may resonate for the WTP for road quality in that the economic benefits of smoother roads and lower vehicle operating costs may well exceed that of the WTP for that benefit. Where price is less than economic benefit, a case can be made for subsidy. WTP research has been used to value road safety improvements (Rizzi and Ortúzar, 2006) and compared to methods that valued risk reductions, noting that the WTP for road safety improvements reduced with the cost and scale of those improvements. Furthermore, the extent to which road users were prepared to pay for upgrading gravel roads has also been modelled by VanWechel (2006) who found that users were more willing to pay for carrying heavier loads than faster journey times. The WTP for improved transport reliability has also been determined (Li *et al*., 2010) as has the WTP for improved traveller information (Molin and Timmermans, 2006). The argument may be that once built, roads must be properly maintained, so why bother to ascertain the WTP for roads in suboptimal condition? Whilst true in principle, between 20% and 50% of roads are not in acceptable condition – depending on the region; yet users are expected to pay as if they were in good condition. More profoundly, road users are not paying for the use of roads, as other services are paid for, and the WTP for roads in general has yet to be rigorously ascertained and that based on road quality not at all.

At this point it is imperative to introduce and to discuss the concept of utility. The underlying theory of choice modelling is based on behavioural economics and psychology. It postulates that a rational individual will attempt to maximize his or her utility, or minimize his or her regret, of choosing one option over another provided it helps to reach that individual's goal. While it is not possible to exactly predict choice for an individual, as there are a multitude of reasons for an individual to act according to wide range of hidden motives resulting in heterogeneity, it is possible to make "utility maximizing" judgments about a statistically significant population. This approach enables resolution of all random and hidden reasons why a particular choice was made, as they tend to statistically approximate. The utility model that is commonly applied is thus called a random utility model, such that the utility derived by an individual n for a product or service j that is described by attributes $x_{n,j,k}$ equals the addition of the utility of the measured variable or deterministic component v and the un-observed and stochastic component ε; so the general utility equation is written:

$$u_{n,j} = v_{n,j} + \varepsilon_{n,j} \text{ with } v_{n,j} = f(\beta, x_{n,j}), \text{ and:}$$

$$v_{n,j} = \beta_{n,1} \times x_{n,j,1} + \ \ldots + \beta_{n,K} \times x_{n,j,K}$$

The decision maker n now has a vector of tastes (preferences) β_n, with $\beta_{n,k}$ associated with $x_{n,j,k}$. Often modellers fix the preferences β_n for the decision makers, making it β . The random utility term ε_{nj} is generally assumed to be distributed independently and identically across alternatives and respondents. The underlying theory in choice modelling was derived by Nobel Laureate (McFadden, 1986). One of its core models is the multinomial logit model where the random utility term has dropped out given the above assumption. The logit model reads:

$$P_n(i) = \frac{\exp(\mu V_{n,i})}{\sum_j^J \exp(\mu V_{n,j})}$$

where μ is a scale parameter, with higher value meaning lower variance of $\varepsilon_{n,j}$. The WTP can now be estimated by the ratio of the attribute's coefficient to the price coefficient, e.g. β_{time} or β_{CO2} for travel time saving or greenhouse gas mitigation respectively divided by the cost coefficient (e.g. β_{cost} for toll).

Discrete choice experiments are conducted to get the data for estimating these models. This technique is supported by the European Union (Commission, 2010) that sought to determine a standard approach for WTP that could be applied in the EU as a part of its competition policy. The reason why it is pertinent to competition policy that EU member states avoid employing different methods to measure WTP for services supplied as they will produce different results. Having different prices for supplying similar services might be potentially anti-competitive, hence the need to recommend a standard approach to measuring WTP.

The application of stated preference surveys and WTP calculations for deriving tolls and congestion charges is advocated in this report for OIC countries because it takes into account the preferences of road users and is a more politically acceptable basis for introducing road pricing. It is important however to ensure that there is a quid pro quo, that road prices are not seen as a proxy tax but as a price paid for a service provided. It has the distinct advantage of explaining that the new toll charged is the equivalent to the added value actually perceived by road users over non-tolled roads and not an abstraction based on time savings.

Price differentiation

As mentioned earlier, price differentiation is a way to structure the road user tariff. The 2006 EU Directive provides for variations according to a number of factors such as:

- the distance travelled;
- infrastructure type and location, as expenditure on maintenance on a trunk road varies from that on a motorway, and infrastructure type and location also influence accident rates and the cost of noise and air pollution;
- the vehicle type which includes characteristics such as axle weight and suspension type which influence infrastructure repairs and maintenance. Engine type, energy source and emission standards influence air pollution levels and vehicle size as larger vehicles make a bigger contribution to congestion;
- the time of day, which also affects congestion levels as it varies from peak and off-peak times.

Furthermore, the 2006 Directive allows member states the ability to increase tolls with a 'mark-up' (they can charge up to 15% more or 25% on cross border routes) on roads in particularly sensitive

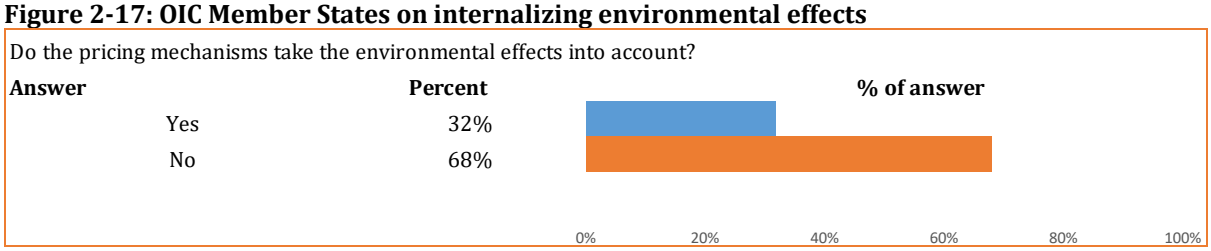
mountainous areas. The income from the mark-ups must then be used to optimize the transport system, which can include paying for infrastructure on alternative modes such as rail.

OECD (2018) advocates to differentiate road pricing by location and time. According to OECD, pricing road use with differentiated kilometre charges to manage congestion and demand, is much more efficient than using proxies such as fuel tax alone. The size of distributive effects will depend on travel patterns by income group and the spatial location of jobs and residential zones. The blunter the pricing scheme the more adverse impacts result because users are not priced strictly according to use. Fine differentiation of pricing by time of use allows travellers to select their preferred departure time to match their willingness to pay. This enables most users to adjust travel patterns rather than be priced off the road, minimizing distributional impacts.

2.4.3. Economic and Financial Factors in OIC Countries

In OIC Member states the pricing of road infrastructure, in most cases is not based on external costs. External costs are those costs that are not priced via the market, such as congestion, air pollution, noise pollution, road unsafety and anthropogenic climate change. As shown by the survey results in Figure 2-17, in 68% of OIC Member States, the pricing mechanisms do not take the environmental effects into account.

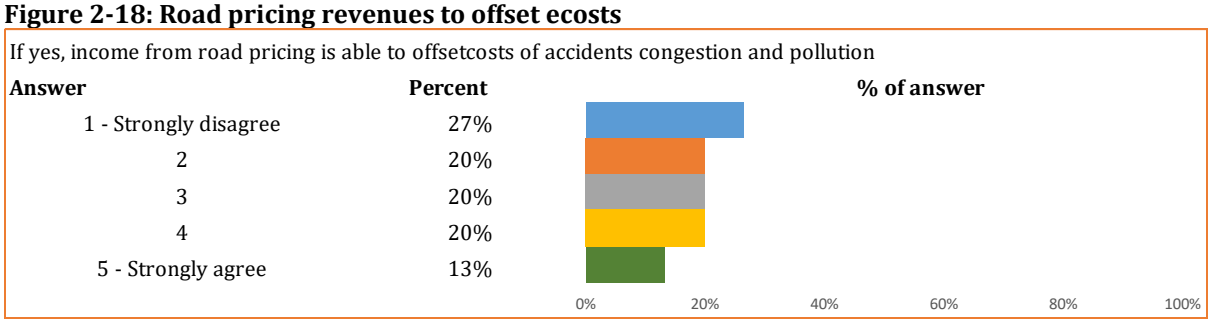
Figure 2-17: OIC Member States on internalizing environmental effects



Source: Fimotions, survey results.

In the cases when environmental effects are included in the road pricing, only seldom these specific revenues are sufficient to offset the costs of accidents, congestion, and pollution (Figure 2-18).

Figure 2-18: Road pricing revenues to offset ecosts



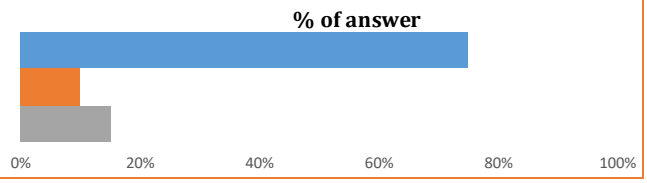
Source: Fimotions, survey results.

In 75% of OIC Member States, road pricing is cost-based determined (Figure 2-19). In this case, cost based must be interpreted as the cost of operating and maintaining the road. In some cases, depreciation might include in the definition. Certainly, external costs are not included in this definition. Some of the OIC Member States apply the willingness to pay approach in order to determine pricing levels.

Figure 2-19: OIC Member States on "How is road pricing estimated?"

How is road pricing estimated?

Open Answer		Percent
a	Cost-based	75%
b	Willingness to pay	10%
c	Others, please specify *	15%



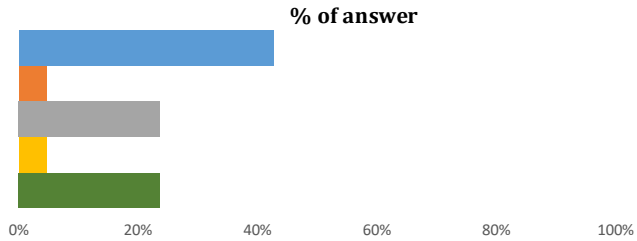
Source: Fimotions, survey results.

Earlier the issue of full versus partial cost recovery is mentioned. OIC Member States are balanced about whether the funding from road users charging is sufficient to pay for maintenance, or not, as shown by the survey results in Figure 2-20.

Figure 2-20: Sufficiency of road users charging in OIC Member States to cover maintenance costs

The funding from road users charging is sufficient to pay for maintenance

Answer	Percent
1 - Strongly disagree	43%
2	5%
3	24%
4	5%
5 - Strongly agree	24%



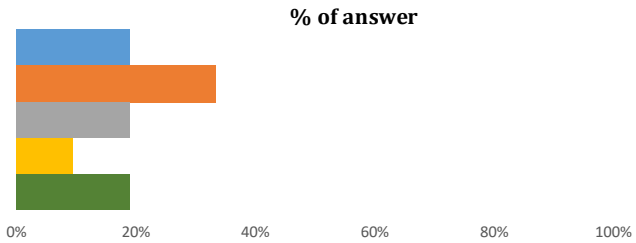
Source: Fimotions, survey results.

OIC Member States are divided about whether the costs and benefits of roads toll are equitably distributed (Figure 2-21). This distribution can be interpreted in geographical wise (regions within the country) or socio-economic (where the rich live, where the industry is, where the poor live).

Figure 2-21: OIC Member States on "The costs and benefits of roads toll are equitably distributed"

The costs and benefits of roads toll are equitably distributed

Answer	Percent
1 - Strongly disagree	19%
2	33%
3	19%
4	10%
5 - Strongly agree	19%



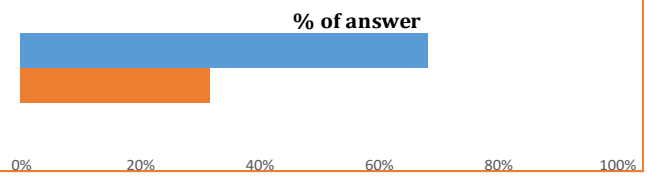
Source: Fimotions, survey results

68% of surveyed countries stated that there are specific taxes related to the use of transport infrastructure (Figure 2-22) and that these taxes are differentiated between private and commercial use vehicles (Figure 2-23), and determined basedon vehicles' technical specifications (Figure 2-24).

Figure 2-22: Existence of dedicated tax for transport infrastructure use in OIC countries

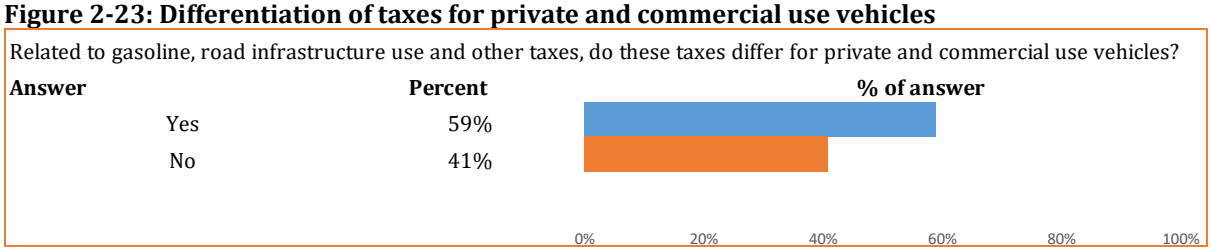
Is there a dedicated tax for transport infrastructure use?

Answer	Percent
Yes	68%
No	32%



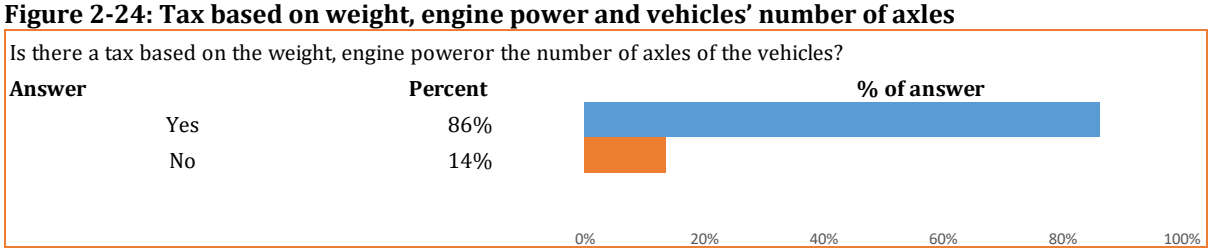
Source: Fimotions, survey results.

Figure 2-23: Differentiation of taxes for private and commercial use vehicles



Source: Fimotions, survey results.

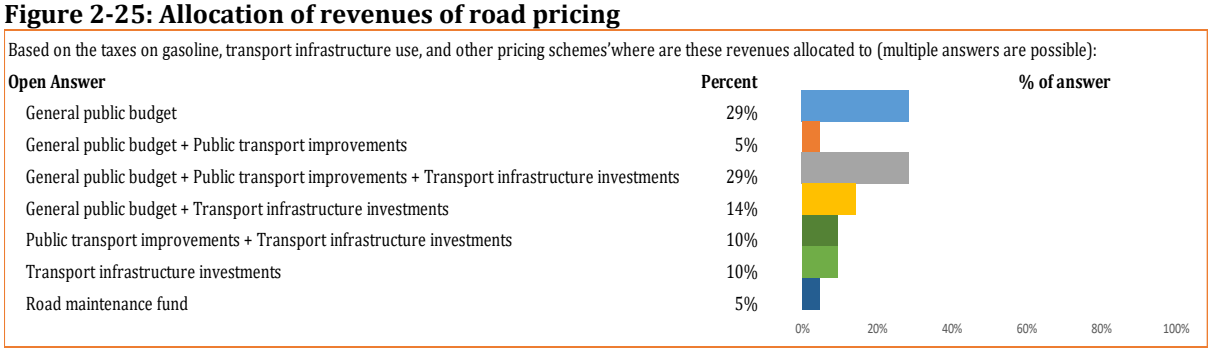
Figure 2-24: Tax based on weight, engine power and vehicles' number of axles



Source: Fimotions, survey results

The highest share of the taxes revenues in the OIC geography is channeled to the general public budget, from which government's expenses are paid. Only 5% of the OIC surveyed countries have road maintenance fund (Figure 2-25).

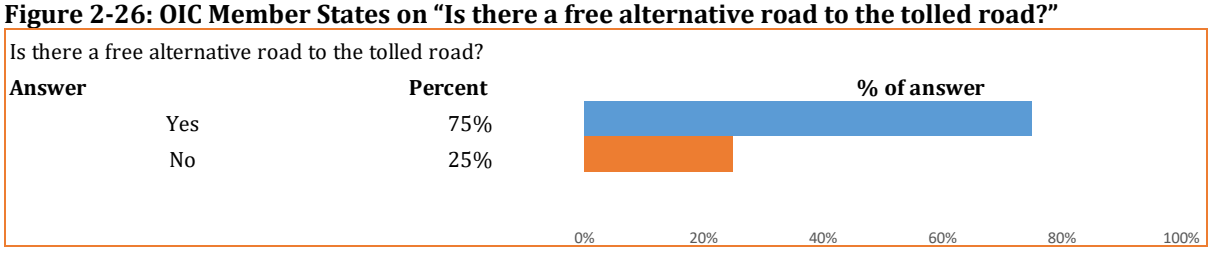
Figure 2-25: Allocation of revenues of road pricing



Source: Fimotions, survey results

Finally, the majority of OIC Member States (75%) that have toll roads do provide free alternative roads (Figure 2-26).

Figure 2-26: OIC Member States on "Is there a free alternative road to the tolled road?"



Source: Fimotions, survey results.

2.5. Technical and Technological Factors

2.5.1. Tolling Categories

There are two basic toll collection systems: toll plazas and electronic tolls (ADB, 2018). **Toll plazas** consist of a series of toll gates, where each gate only opens once the driver pays the toll by cash, bank cards, vouchers, or others. Collection can be done by employees, automatic machines, or a combination of both. **Electronic tolls** allow toll payment without requiring vehicles to stop and, with the more sophisticated systems, not even slow down. Vehicles are required to carry an authorized on-board unit (OBU), electronic tag or transponder, which is commonly attached to their windshield. Compared to toll plazas, this system needs no toll gates, which minimizes construction works, makes it very suitable to be implemented in high-density road networks. Some countries have a hybrid system where conventional toll plazas coexist with electronic tolling systems. In these cases, toll plazas have some direct lanes where vehicles carrying an authorized OBU do not need to fully stop to pay the toll.

ADB (2018) outlined two most common technology approaches to such electronic tolling: tag-and-beacon systems and satellite-based systems.

Figure 2-27: ANPR technology

Source: http://www.traffic-tech.com/security_systems.php

- **Tag-and-beacon systems** are the most tested and widespread systems. It is basically an Automated Vehicle Identification (AVI) system. Most current AVI systems rely on Radio-Frequency Identification (RFID), where a vehicle equipped with an OBU communicates with a transponder on an overhead or roadside gantry via Dedicated Short Range Communications (DSRC) to register its passage through the charge point. Unequipped users will typically have their number plate recorded by a camera and identified via Automatic Number Plate Recognition (ANPR) systems. These systems only detect vehicles as they pass across beacons on gantries or roadside poles, not distance. Thus, the actual distance traveled can only be measured if applied in closed tolls highways.
- **Satellite-based systems** that rely on a global navigation satellite system (GNSS), require vehicles to be equipped with a GPS receiver onboard. This technology may achieve true distance-traveled charging and consider factors such as place (i.e., different toll rates in different road segments) and time (i.e. toll rates set at different levels during peak and off-peak hours).

The advantages and disadvantages of these technologies are outlined in Table 2-6.

Table 2-6: Comparative analysis of technologies in ETC system

Type	Advantages	Disadvantages
ANPR	1. Real time monitoring and surveillance 2. Can be used as traffic law enforcement 3. The system acts as a deterrent to traffic rules violators, thereby reducing these cases 4. Capable of license plate read rates of 98% in good conditions	1. Privacy concern, relating to how is the data related to people's movements handled? 2. Not every ANPR system can record high resolution pictures 3. Lapses are observed in general manned surveillance 4. System architecture, which includes installation and maintenance, is very expensive 5. Expensive fixed infrastructure 6. The system can be ineffective in bad weather conditions or any hindrances 7. In bad weather conditions, manual checking is required, which increases processing costs 8. Promotes 'rat running' behaviour in motorists, whereby, motorists opt for minor streets to avoid toll charges 9. Data processing algorithms are computationally intensive 10. Higher complexity involved in image processing
DSRC	1. Can be used for both vehicle to vehicle and vehicle to infrastructure communication 2. Low operational costs 3. More suited for lesser road network density and higher traffic volume scenarios 4. Inexpensive OBU units for vehicles 5. Most widely used system in road pricing 6. Distance based charging system can be formulated with combination of toll points 7. Relatively easy to expand depending on the road network	1. High traffic density could lead to high interference in the communications channels and could lead to lower reliability 2. With higher traffic speeds, the reaction time for the transponder has to be improved to detect vehicles 3. High investment costs and expensive fixed infrastructure 4. Needs ANPR system for enforcement backup 5. Performance of the DSCR system primary depends upon the quality of the OBUs 6. With increase in road network density, it requires higher number of toll points, making it less cost efficient on a dense road network 7. Promotes 'rat running' behaviour in motorists, where by, motorists opt for minor streets to avoid toll charges
RFID	1. Inexpensive RFID tags for vehicles 2. Higher speeds (85 kph) for vehicle passage is possible 3. Ultra high frequency range from the RFID readers can detect the RFID tag in vehicles consistently 4. Easy card payments with radio frequency identification technology	1. Additional data security system is required for the RFID tags 2. At higher vehicular speeds (>90kph), the reading of the RFID tag is inconsistent 3. Low and high frequency range from the RFID reader, requires the RFID tag to be in close contact

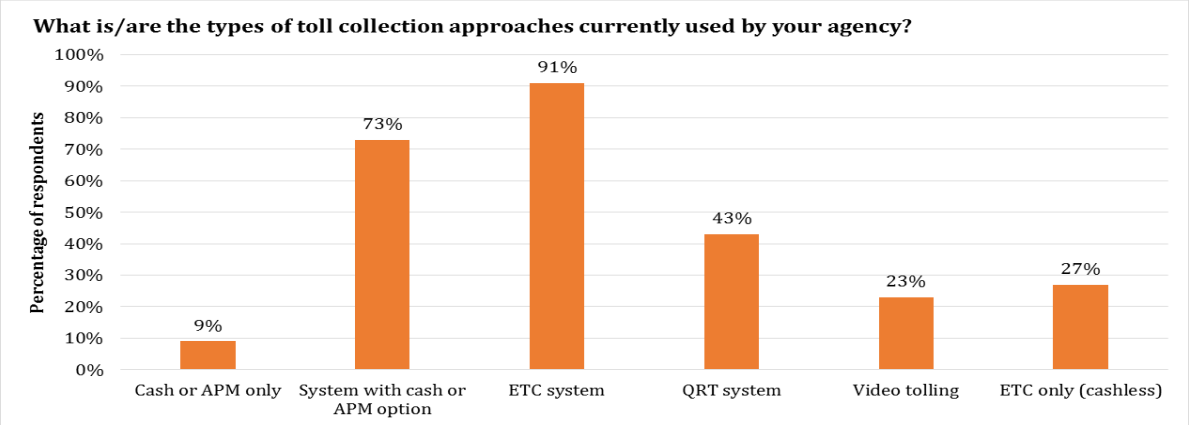
GNSS	1. Does not require on-road infrastructure 2. More suited for higher road network density with lesser traffic scenarios 3. Time, distance and place type of toll charging system can be implemented 4. Provides wider range of travel patterns, which could be used in transport demand management 5. With increasing accuracy of GPS systems, GNSS is expected to deliver higher accuracy results 6. Is perceived to be fairer and more effective pricing system by experts, since it considers time and distance	1. High investment and operational cost (Central systems, OBUs, other state of art digital technologies) 2. Expensive OBU units for vehicles 3. Needs ANPR system for enforcement backup 4. GNSS system is still in a preliminary stage 5. Issues with receiving signals in urban scenario is still being developed 6. In urban environments with high rise buildings, more equipment's is required to counter the canyon effect, which drastically increases the costs.

Source: Nash II et al. (2016), K.P et al. (2017), Bankar et al. (2007), De las Heras Molina et al. (2016), Abdulla et al. (2018), Fali Oklilas et al. (2019), Zabic (2011), Atanassov (2012), FHWA (2008)

2.5.2. Technical and Technological Factors outside OIC Geography

A survey carried out by KPMG International (2015) on 43 private and public entities involved in toll road operations across the Americas, Europe and Asia, concluded that 91% of respondents indicated that they offer some form of ETC.

Figure 2-28: Toll collection methods



Source: KPMG International (2015)
APM = Automatic Payment Machine, ETC = Electronic Toll Collection, ORT = Open Road Tolling

Electronic tolling using a tag-and-beacon system is applied by the Massachusetts Department of Transportation (MassDOT). In 2017, it has demolished all toll plazas along Interstate 90 (the Massachusetts Turnpike), the Tobin Bridge, and Boston tunnels and replaced them with an electronic tolling system. The initiative aimed to improve driver convenience and safety, and reduce GHG emissions as the new system allows drivers to maintain regular highway speed as they pass under all-electronic tolling (AET) gantries,

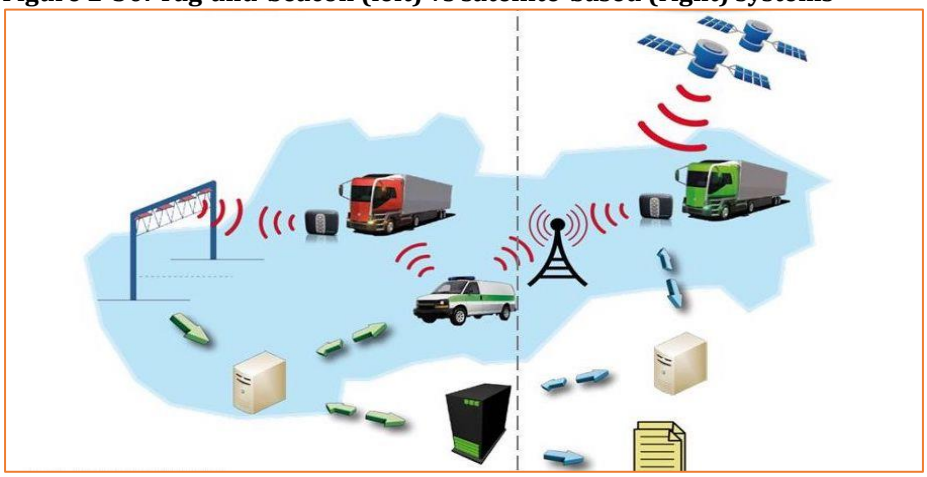
Figure 2-29: Electronic tolling system on Tobin Bridge, Massachusetts

eliminating the need for drivers to sharply reduce speed and idle in toll booth lines.[15]

The Slovak Electronic Toll System, a satellite-based tolling, is the longest tolled roadway systems in the EU. In 2010, it started to implement GNSS, together with an installed unit, to track a vehicle's movements. Only vehicles over 3.5 tones are required to pay the toll. When the vehicle crosses a specific point, the satellite tracks the movement and the unit in the vehicle records the transaction. As a result, tolling stations and the delays they cause are no longer needed.[16] The implementation of the system has resulted in the increase of the number of roadways where tolls are collected without constructing any toll gates, as shown in Table 2-7.

In addition, this kind of system allows for all sorts of differentiated toll collection (based on various parameters such as distance, travel time, time of day/week etc.). Wangsness (2018) even proposed a distance-based road pricing scheme, that is differentiating across vehicle types, areas, time periods but also includes electric vehicles (which have distinctly different external costs).

Figure 2-30: Tag-and-beacon (left) vs satellite-based (right) systems



Source: Bobošik (2011)

Table 2-7: Impact of satellite-based systems on tolled-road network in Slovak Republic

	Period	1st class tolled roads	Average length of a section	Number of segment	Number of toll gates
Tag-and-beacon system	June 2010	1,820 km	2.06 km	884	884
	July 2010	1,769 km	1.19 km	1,493	1,487
Satellite-based system	June 2010	1,820 km	2.06 km	884	0
	July 2010	1,769 km	1.19 km	1,493	0

Source: Bobošik (2011)

At the time of writing, Singapore is planning to replace the current DSRC-based ERP system with a GNSS-based system by 2020 (see section 3.1.4).

[15] https://blog.mass.gov/transportation/massdot-highway/massdot-moves-forward-on-all-electronic-tolling/
[16] https://www.gsa.europa.eu/news/slovakia-s-satellite-tolling-system-receives-international-recognition

2.5.3. Technical and Technological Factors in OIC Countries

Most OIC countries apply toll plazas (cash and card) and tag-and-beacon based electronic tolling to collect toll fees. Electronic toll gate systems utilizing ANPR and/or RFID-technology-based tag are applied in many Asian, Middle Eastern and North African OIC countries such as Indonesia, Iran, Malaysia, and the UAE. Electronic payment is compulsory on all expressways in Malaysia, applying three types of ETC systems:

1. Touch 'n Go card unit, where motorists "touch in" before entering the expressway at respective toll plazas and "touch out" at the exit of toll plaza.
2. SmartTAG on board unit, is an extension of Touch 'n Go that allows motorists to make a non-stop payment at toll plazas. The toll charge is deducted automatically from the value stored in the Touch 'n Go card inserted into a reader device installed in the vehicle. SmartTAG utilizes infra-red communication that communicates with transceivers mounted at the ceilings of toll plazas.
   Both Tounch 'n Go and SmartTAG require drivers to slow down.
3. RFID tag, which functions like a barcode scanning and allows vehicles (that are equipped with a chip-embedded sticker) to pass toll plazas without stopping. The tag is "read" by an overhead scanner through electromagnetic waves with a frequency of between 850MHz and 950MHz, and scanning can reach ranges of over 27m, with a 10 millisecond response time[17].

Figure 2-31: Touch 'n Go and SmartTAG lanes

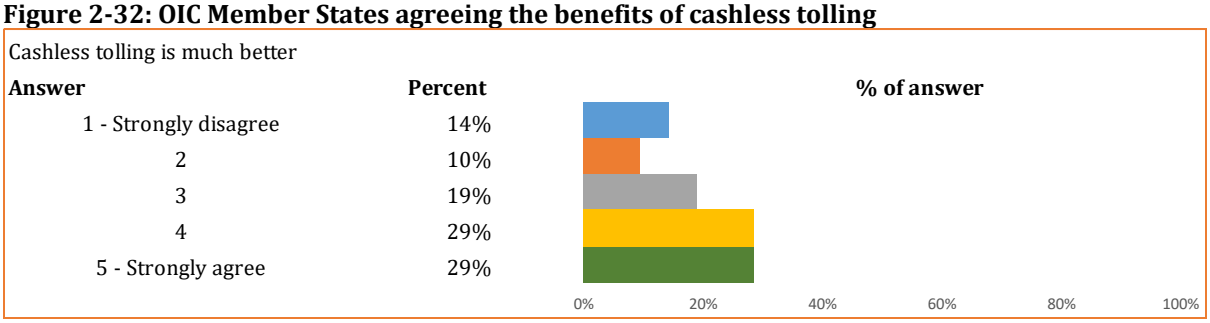
Source: Proudtek[18]

Turkey decided to introduce a mandatory ETC and demonstrated the efficiency and the cost effectiveness of RFID technology as an alternative to existing DSRC solution (4icom and Gleave, 2015). No OIC country in Sub-Saharan Africa applies such technology yet as not many OIC countries in this region have toll-road systems. While satellite-based systems are applied nowhere in the OIC regions.

As previously discussed, electronic toll systems have many benefits, mainly related to efficiency such as reduction of transaction times at toll gates. Furthermore, this technology minimizes moral hazard risks related to cash payments and promotes a safer work environment for employees. OIC countries are aware of these benefits as shown by the survey results in Figure 2-32, where 92% of the surveyed countries (strongly) agree that cashless tolling is much better than cash tolling.

[17] https://themalaysianreserve.com/2017/09/15/rfid-technology-toll-collection-by-mid-2018/
[18] http://m.protekrfid.com/news/rfid-sticker-as-ticket-for-toll-collection-10511271.html

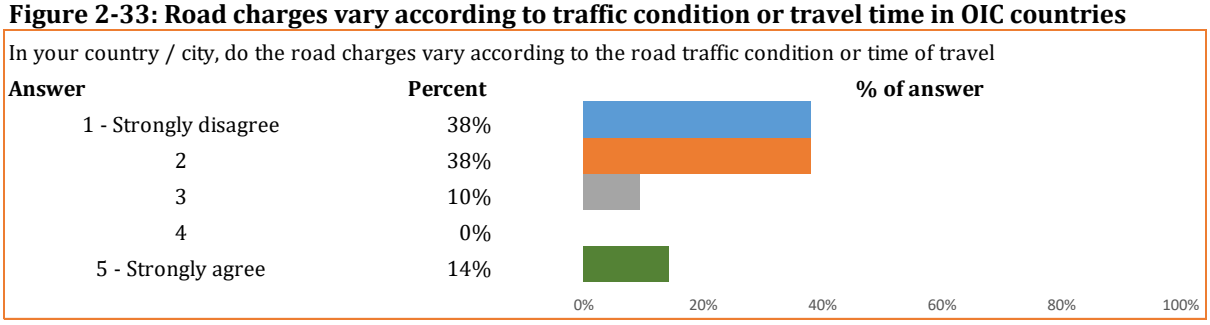
Figure 2-32: OIC Member States agreeing the benefits of cashless tolling



Source: Fimotions, survey results.

Currently, no OIC country implements a satellite-based system, as such it is not possible to impose road charges based on real time traffic condition, as shown by the questionnaire result (Figure 2-33).

Figure 2-33: Road charges vary according to traffic condition or travel time in OIC countries



Source: Fimotions, survey results.

2.6. Legislative Factors

2.6.1. Introduction

The types of legislation that generally covers transport and related issues in all countries both inside and outside OIC members are presented in Table 2-8.

In column one a typical title of each item of legislation is given followed by a brief description and relevance to the transport sector is provided in columns two and three.

Table 2-8: Typical Transport Related Legislation

Name of law/regulation	Description	Relevancy to the transport sector
The Constitution	The Constitution of a country provides its supreme law and all other laws and regulations (including transport sector laws and regulations), must not be in conflict or inconsistent with it.	Lays the foundations for the current laws and regulations in the transport sector, including where necessary modifying the current legislation/through amendments or repealing them and replacing them with new laws.
		Contains a number of national objectives and principles which all laws and regulations including transport sector laws, must comply with.
		Guarantees a right to development and enjoins the state to facilitate rapid and equitable development and to encourage private initiatives and self-reliance.
		Guarantees a right to own personal or private property but also empowers its agencies to compulsorily acquire private property for

Name of law/regulation	Description	Relevancy to the transport sector
		development projects.
Land Legislation	Land Legislation puts in place a legal framework for land management and use and provides for land tenure and proprietary rights in land of both owners and occupiers.	Provides security for tenure by private owners.
		Reinforces the right of a Government to acquire privately owned land for development services either through negotiations with private owners or through compulsory acquisition.
		Maintains a balance between the proprietary rights of land owners and the right of Government to locate or carry out development projects.
Land Acquisition Legislation	Sets out procedure, arbitration and compensation governing compulsory land acquisition	Compulsory acquisition of land is necessary for public interests such as transport development projects
Environmental Legislation	Provide the principal legislation governing the environment to minimise impacts of transport and provide for sustainable management of the environment.	Provides for emerging environmental issues including climate change.
		Provides for strategic environment assessments
		Provides a framework for the protection of the environment and puts in place environmental requirements for development projects such as environmental and social impact assessments for projects and also imposes obligations for environmental protection.
Public Private Partnerships	Provides for commercial and economic relations between the private sector and government to develop projects of mutual interest - including transport infrastructure	Legislation may specifically cover roads, rail, subway, water and air transport facilities, including harbour and port facilities, airport and air facilities.
Public Enterprises Reform and Divestiture	Provides for public sector restructuring, reform and sale / disposal of public assets and enterprises - covering privatisation	The definition of public enterprises covers and applies to institutions in the transport sector such as roads authority and prescribes the possible level of private sector participation.
Local Government Legislation	Implement a Government's policy of decentralisation and devolution of powers and services delivery to district councils and other lower government units.	Entrusts the provision and maintenance of rural roads with district councils and makes local governments crucial players in the rural and urban transport sub-sectors.
Public Procurement and Disposal of Public Assets Legislation	This legislation regulates all procurement of works as we as the disposal of public assets.	Such legislation sets out a detailed national legal and institutional framework for all aspects of public procurement of goods and services (including transport sector works and services) as well as disposal of assets.
Traffic and Road Safety Legislation	Normally the principal legislation regulating road transport and safety.	Provides, among other things, for the licensing of vehicles and drivers, the use of motor vehicles on the road and the control of traffic.

Name of law/regulation	Description	Relevancy to the transport sector
		Establishes the Transport Licensing Institutions to regulate the use of public service vehicles, private buses and also goods vehicles.
		Establishes the Road Safety Institutions among other things promote road safety
National Roads Authority Legislation	Legislation to create an autonomous roads agency	Sets up an independent entry to plan, develop and maintain the national roads network and axle load control and advise on roads policy.
Road Fund Legislation	Legislation that establishes and governs the Funding of all roads	Regulates an Independent Road Funding Authority and empowers it with various functions such as financing constructing new road and their maintenance using funding obtained from dedicated user charges as well as government revenue according to as approved annual road programme.
Railways Legislation	Provides the principal legislation governing the rail sub-sector.	Establishes entities that supply and regulate railway services including engineering standards, operations, safety security and commercial matters.
Aviation Authority Legislation	Provides the principal air transport sub-sector legislation	Establishes the basis for the government and regulation of the aviation sub-sector often through an aviation authority or similar autonomous body the principle objective of promoting safe use and development of civil aviation inside and outside a country.
Inland Water Transport Legislation	Provides for the governance of the inland waterways subsector	The legislation sets up the structures needed to provide oversight to of the use of water ways for the purpose of moving goods and passengers including safety, navigation and technical standards.
Registration of vessels	Regulation made to provide for registration of all vessels.	Regulates the types and standards of vessels used in inland water transport.
Capital City Authority Legislation	Capital City and or Metropolitan Authority Legislation defines boundaries and basis for local authorities to combine to govern and finance a greater metropolitan area including the capital city in an integrated and coordinated manner.	Establishes appropriate entities with various functions such as development or urban mass transit, construction and maintenance of roads, congestion charging traffic management, installing and maintaining street lights and constructing and maintaining major drains, organising and managing traffic and carrying out physical planning in the greater area including the capital city.
National and Urban Planning Legislation	Determines the assignment of planning and development to entities such as a national planning authority and metropolitan authority	Prescribes the roles and responsibilities of a high level entity for the preparation of national urban land use and national development planning and spatial planning. Often linked to a ministry responsible for economic planning.

Source: Fimotions

2.6.2. Legislative Factors Outside OIC Geography

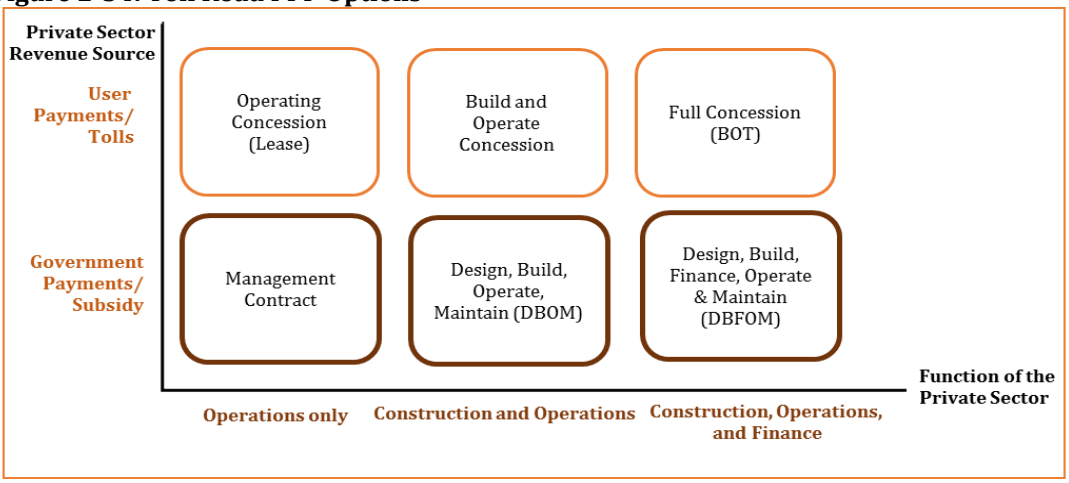
A government may decide to enact a PPP law or a concession law for a number of reasons, such as to give priority to a process of developing, procuring and reviewing PPP projects that will take priority over sector laws, or to establish a clear institutional framework for developing, procuring and implementing PPPs. PPP laws can also be used to close gaps in the laws of a host country may need to allow for successful infrastructure PPP projects, such as enabling the grant of step-in rights to lenders and requiring open and fair procurement processes. These modifications may be embodied in sector-specific law, or in the case of procurement, a procurement or competition law, or they can be included in a general concession or PPP law.

While guidance and examples can be useful, each PPP/concession law needs careful drafting to be consistent with the host country's existing laws. Experience shows that a balance is needed between setting ground rules that encourage transparency and imposing general restrictions that may hinder bidding teams from achieving value for money or sensible solutions.

For planning toll roads using PPP the estimation of risk is very important. Toll road demand forecasting has been sometimes very inaccurate causing significant problems for the sustainability of the toll road projects. The importance of accurately forecasting traffic has ramifications for the legal transaction used for the establishment of the toll road.

Various combinations of relationships are available to be applied by Governments to PPP projects concessions and toll road as shown by Figure 2-34. The lessons learned from all these options are discussed next.

Figure 2-34: Toll Road PPP Options



Source: Bull et al. (2017)

The participation of the private sector in road provision has become a critical aspect in transport policy, strategy and planning. All of the management options set out in Figure 2-34 will be based on legal agreements between stakeholders. Aiming at learning from past errors and providing a global perspective on best legal practice, the European Bank for Reconstruction and Development (EBRD) legal team produced a detailed analysis using the following international documents to recommend core principles that should be followed when the public sector and private sector engage with each other:

- UNIDO BOT Guidelines [19];
- OECD Basic Elements of a Law on Concession Agreements;
- UNCITRAL Legislative Guide on Privately Financed Infrastructure Projects [20];
- UNCITRAL Model Legislative Provisions on Privately Financed Infrastructure Projects[21].

A Modern Concession Law (MCL) should be based on a clear policy for Private Sector Participation.

1. MCL should create a sound legislative foundation for concession.
2. MCL should provide clarity of rules.
3. MCL should provide a stable and predictable concession legal framework.
4. MCL should promote fairness, transparency and accessibility of concession rules and procedures.
5. MCL should be consistent with the country's legal system and particular laws.
6. MCL should allow for negotiability of concession agreements.
7. MCL should allow for enforceable court or arbitral determinations.
8. MCL should allow for state undertakings and guarantees.

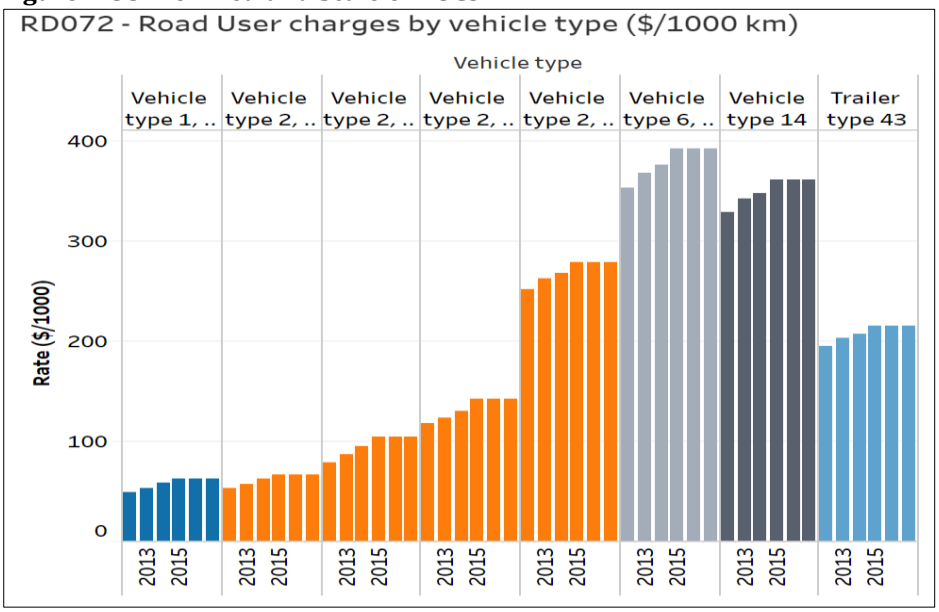
A comprehensive legal analysis for future reference is provided in Appendix 1.

Vehicle registration and licencing outside the OIC geography has the purpose of monitoring vehicle ownership and legitimacy as well as the age and quality of vehicles that is operated. Such legislation includes i) assigning a unique registration number to a vehicle; ii) association of a vehicle with a legal owner and certified driver; iii) vehicle condition and safety through having a valid road worthiness test certificate; and iv) the application of minimal insurance coverage. All countries will use this information to create a vehicle registration database that enables the enforcement of traffic and related legislation and also provides information for the management of the roads sub-sector. Payment is normally required for the annual renewals of vehicle registration that contributes the list of road user charges. Road user charges will normally vary by vehicle type and also use – whether private or commercial and also engine size. Such charges enable application of transport and environmental policies. Very high charges tending to influence the number of road vehicles while zero charges of electric vehicles aims to promote the conversion of the road fleet from internal combustion using fossil fuels to electric power. An example of the typical scale of road user charges set out in New Zealand by The Road User Charges Act 2012 was a part of a package of reforms to simplify and modernize the road user charges (RUC) system. Regulations, like those previously described, associated with the new Act also came into force at that time.

The normal range of vehicle classes extends from private car (type 1) to large commercial trucks and buses (types 6, 14 and 43 in Figure 2-35).

[19] United Nations Industrial Development Organisation
[20] United Nations Commission on International Trade Law
[21] http://www.ebrd.com/country/sector/law/concess/assess/index.htm

Figure 2-35: New Zealand Scale of RUCs

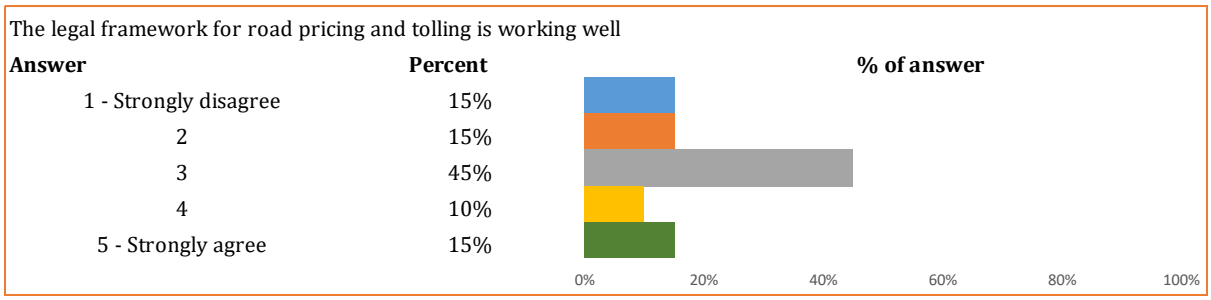


Source: New Zealand Transport Agency[22]

2.6.3. Legislative Factors in OIC Countries

There is no reason why road pricing and toll road establishment should have or need different legislation, institutions and other requirements to those in non-OIC geography. As regards tolling legislation, according to the Asian Development Banks, it should provide for toll road operators to set up and apply processes to collect payments from users of a specific road section or area and penalise if road users avoid payment or commit other offences. Legislation should also provide the basis to make revisions of tariffs and apply economic regulations depending on the commercial and other objectives of the specific toll road schemes including market segmentation of different types of users (ADB, 2018). According to the survey results, the majority of OIC countries seem not sure whether their legal systems for road pricing and tolling work well (Figure 2-36).

Figure 2-36: Opinion of surveyed OIC countries on whether legal framework works well



Source: Fimotions, survey results.

The ownership of toll roads may be public, private or both. The ownership has obvious implications in law. The range of ownership and participation of Public and Private interests is set out in Table 2-9. The range is from entirely private to entirely public, both of which are described as being rare

[22] https://www.transport.govt.nz/mot-resources/transport-dashboard/2-road-transport/rd075-national-land-transport-fund-revenue/rd072-road-user-charges-by-vehicle-type-1000-km/

and uncommon. The most common form is of toll road development are variations of PPP as described. The financing of toll roads is discussed in section 2.4.

Almaty By-Pass and Ring Road 2019

Many governments have taken steps to implement PPP developed toll roads. For example the Government of Kazakhstan prepared the first toll road project under a proper public–private partnership (PPP) scheme in 2013 and following a good experience is planning another. What is interesting about this project is that it is a ring road. The 66 km Almaty Ring Road PPP Project aims to reduce travel times by up to an hour, handling transit traffic and serving commuters from three districts neighbouring greater Almaty. The role of the International Finance Corporation was to set up the processes from feasibility studies to completion of the transactions between all the stakeholders. A 20-year concession to design, finance, build, transfer, operate, and maintain the 6/4-lane "Category I-A" bypass motorway. The consortium will invest about US$ 740 million for construction in the first 4.5 years, after which it will maintain the road and collect tolls from road users on behalf of the government. Government will compensate the private-sector partner with annual availability payments, set against strict performance criteria. As a result of legislative amendments, standard project finance features, including payments in case of early termination of the contract, international arbitration, lender step-in provisions, are present in the contract. Importantly, this is the first infrastructure PPP of its type and magnitude in Kazakhstan and Central Asia. The system will be equipped with modern traffic management and toll collection technology[23]. There is however a concern that dual objectives of both serving commuters and providing for through traffic could prove to be conflicting and problematic. The former group needs to bypass the city, the latter desiring to enter it. Having differential toll rates according to journey purpose would be challenging to apply but is not impossible.

Other OIC countries are far more developed and advanced than the Central Asia Regional Economic Cooperation Program (CAREC). In the UAE, for example, publicly owned toll roads provide much of the busiest national road infrastructure which started with manually collected tolls, then transponders and eTags and most recently switched to ANPR, as described below.

[23] https://www.ifc.org/wps/wcm/connect/0410507a-0bc7-4563-b6ae-fd8dae9616b5/PPP-Stories-Almaty-Ring-Road-2018.pdf?MOD=AJPERES&CVID=mh.HpIC

Table 2-9: Public and Private Participation in Toll Roads in Asian Countries.

No	Who Owns the Road	How Investments Are Financed	Who is Responsible for Construction[a]	Who is Responsible for Maintenance[a]	Who is Responsible for Toll Collection[a]	Description	Where Is It Found
1	Private sector	Private Sector	Private Sector	Private Sector	Private Sector	This is a fully private road	Very rare. Only found in a private premises
2	Public sector	Private equity and debt[b]	Private Sector	Private Sector	Private Sector	This is a build-operate-transfer (BOT) scheme with a fully private operator. The infrastructure will be handed over to the public sector after a period of time stipulated in a concession contract	Very common
3	Public sector	Equity with minority participation from public sector Private debt[b]	Predominantly private sector	Predominantly private sector	Predominantly private sector	In this case, the operating company under a BOT contract is a joint venture between public and private partners. The public sector may sell its stake during the concession period (full privatization) or not.	Rather common
4	Public sector	Equity with a majority (or full) participation from the public sector Private debt[c]	Predominantly public sector	Predominantly public sector	Predominantly public sector	In this case, the operating company is acting under a license or franchise contract. Total or partial privatization may be envisaged in the medium or long term.	Common in countries with little experience and/or incipient public-private partnership markets.
5	Public sector	Government budget	Public sector	Private sector	Private sector	Government entrust the full operation and maintenance of an existing road to a private company for a period. This is commonly referred to as an operation and maintenance concession.	Rather common (e.g. in Latin America)
6	Public sector	Bonds financing a public sector corporation	Public sector	Public sector	Public sector	National or state governments create a public sector corporation allowed to issue government-backed debt. The corporation stakes cannot be sold to the private sector.	Common in the United States, rare elsewhere.
7	Public sector	Government budget	Public sector	Public sector	Private sector	This is the case when the authority in charge of roads outsources toll collection to private specialized companies. Usually it will not involve commercial risk. It may be a variation of models 4 and 6, where public or semipublic companies outsource toll collection.	Rather uncommon
8	Public sector	Government budget	Public sector	Public sector	Public sector	This is the case of a 100% public funded and operated road where tolls are collected directly by staff from the roads authority or other civil servants.	Rather uncommon

Source: ADB (2018)

SALIK Dubai

The UAE have been operating toll roads for 25 years. In 2007, it introduced Salik (meaning "clear and moving" in Arabic). Salik is the electronic toll road system in Dubai based on RFID technology, which automatically deducting a fee when a toll gate is passed. The toll roads and tolling system was launched by Dubai's Roads and Transport Authority (RTA). The system requires transponders to be fixed on the front windscreen of the vehicle. Differential toll rates apply according to points of entry and exit – this is to apply different transport planning objectives. Due to the electronic nature, tolls can be varied according to the time of day so the peak time tolls are higher than off-peak tolls.

The system advanced to using APNR in 2019. Vehicles owners are required to open a toll account, through which they can process online payment. An integrated online registration system, open since 2019, automatically created accounts at no charge for Abu Dhabi registered vehicles. For vehicles registered outside Abu Dhabi, the owner is required to register in the system before crossing the tollgates. Vehicles are automatically identified by their plate number without having to stick a tag on the windshield. The toll is being introduced in accordance with Law No. 17 of 2017 on Road Tolls in the Emirate of Abu Dhabi.

The main aim of the system is to replace the manual systems with an automated system with proper identification and localization of the number plate information

Data protection has become a critical issue in the last ten years with social media selling personal data for commercial and political purposes. The same concerns have applied to the big data of mobile telephone users and ANPR systems. In Germany, 34,000 citizens filed a lawsuit against data retention of vehicle registration by road tolling agencies (both public and private), which led to the third decision of the 'Bundesverfassungsgericht' to require a time limit on public data retention that relates to the purpose for which the data was collected. In the case of ANPR systems, it is solely to ensure road users make payments for using certain roads, it is not for surveillance for security purposes (Hornung and Schnabel, 2009). While this ruling set a precedent in the EU, it is not clear if OIC members would apply similar standards of data protection. For road users, that of ensuring data protection in the application of road tolling is a significant consideration.

2.7. Procedural Factors

2.7.1. Introduction

Design and assessment of infrastructure pricing

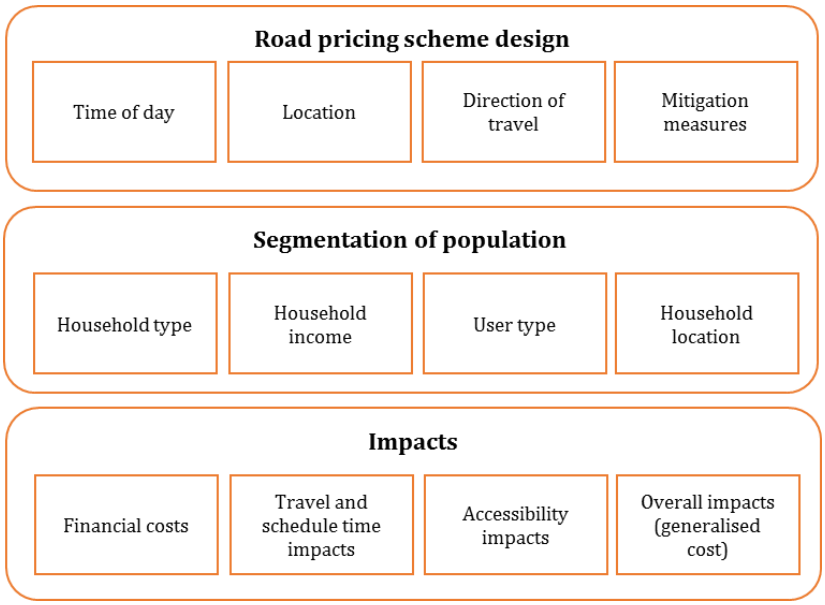
An assessment framework is important for screening options at an early stage of policy development, for weeding out unpromising options, and to allow analytical resources to focus on the main alternatives. Figure 2-37 summarizes the dimensions and assessment framework needs to consider. Three of the most important aspects are: road pricing options and scheme designs, mitigation measures and use of revenue from congestion charging (both discussed in the previous section) and analytical dimensions to identifying vulnerability.

In section 2.4 the concept of marginal cost pricing has been introduced. To estimate marginal infrastructure costs, several approaches can be applied (Fraunhofer-ISI and CE Delft, 2008); TML, 2016):

- Econometric approach: based on time or cross section data on annual road costs or expenditures and traffic volumes, econometric models are estimated assessing the relationship between traffic volumes and costs.

- Engineering approach: using engineering cost functions and maintenance models, the length of maintenance periods is estimated based on data on traffic volumes and infrastructure characteristics. Based on the estimated impact of traffic volumes on maintenance periods, marginal infrastructure costs can be derived.
- Cost allocation approach: assuming that the marginal infrastructure costs are equal to the variable average infrastructure costs, the marginal costs can be estimated by distinguishing between fixed and variable infrastructure costs when estimating the total/average infrastructure costs.

Figure 2-37: Aspects to consider in an assessment framework



Source: MRCagney Pty Limited (2017)

Both the econometric and engineering approach are very data intensive. Often instead, the cost allocation approach and use the variable average infrastructure costs are used as proxy for the marginal infrastructure costs. Yet for setting incorporating marginal social costs in the price level the econometric approaches are preferred.

In the design phase of the pricing scheme, a decision has to be made who will be taxed. Road tolls and congestion charges are levied at the consumer. Fuel taxes are not collected directly from the consumer; instead, the tax is collected from the importer or the producer of the taxable fuel product.

OECD (2018) recommends to reconcile economic, practical and political aspects in the design of road pricing schemes. Thorough exchange between decision makers and experts on the design of pricing schemes is essential.

Procedural aspects of concessions

Following ASECAP (2014), we define a road concession, in general, as a public–private partnership under which a public authority, the Concession Authority, grants specific long-term rights to a private or semi-public organisation, the Concessionaire, to construct, overhaul, maintain and operate an infrastructure. Via the agreement, the Concessionaire is committed to use all utility assets conferred on him and has the responsibility for all operations and investments. Asset ownership remains with the Concession Authority and the assets revert to the authority at the end of the concession period.

- In principle, for the Concessionaire there are three mechanisms for obtaining revenues (see Table 2-10):
- Direct road tolling: concessionaire collects tolls from the users.
- Indirect road tolling: users pay a toll to the public authority, usually on the basis of a "vignette".
- Shadow toll system: the public authority delegates the construction, funding and management of a road to a managing company. The concessionaire collects no toll from the users, but is directly remunerated by the public awarding authority.

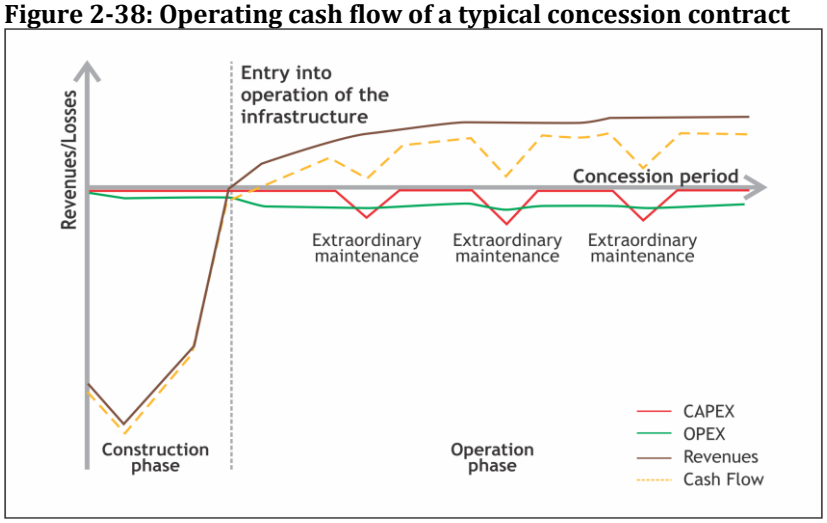
Table 2-10: Concession payment mechanisms: pros and cons

Direct Tolls	Indirect Tolls	Shadow Tolls
Features		
• Road users pay for the use of the road infrastructure • Concessionaire made for making road available for public use • Tolls applied to vehicles are generally differentiated on the basis of number of axles, period of time (day/week) and Euro standard class	• Sometimes mixed with real tolls so that Concessionaire pays a non-availability payment to authority for road or lane closures out of toll revenue • Amountof deduction/non-availability payment usually determined by reference to factors including: length of project road, number of lanes affected, duration of unavailability, time of day of unavailability	• No actual tolls are collected from public • Concessionaire is paid by authority on road use – the more the road is used the more the Concessionaire is paid • Usually have banding mechanism, which applies different shadow toll payments to different levels of traffic
Advantages		
• Application of the user-payer principle • Maintenance of the existing network is guaranteed • Investments in infrastructure can be augmented • Zero cost to the Government • Government has fiscal space to fund other projects • Optimisation of utilisation of the transport network (traffic spread, inter-modal sharing of traffic load, etc)	• Absence of traffic/revenue risk simplifies project • Lower level of due diligence needed • Reduces risk on Concessionaire – making project cheaper • Removes emphasis on monitoring traffic flows during operational period • No consumer resistance	• Where environment is perceived to be hostile to real tolls, it can introduce PPP structures • Prepare way for real-tolled roads in due course by cultivating an industry used to taking traffic risk • Mechanism of traffic risk transfer may reduce the complexity of project and the level due diligence required
Disadvantages		
• High capital construction costs mean that projects traffic volumes may be considered as an insufficient revenue stream to meet debt service and equity return for sponsors • Potential consumer resistance to paying for the road use and required mitigation strategies to solve it	• No revenue generation device – total cost of project falls on public purse • Concessionaire is not concerned on the quantity of traffic volume and so do not transfer traffic or revenue risk • Limited price signals (affecting traffic behaviors)	• No revenue generation device - total cost of project falls on public purse • If traffic volumes are significantly exceeding forecasts, government may have to pay higher "toll" than it budgeted for • Price signals (affecting traffic behaviors) are not given to the users

Source: ASECAP (2014)

Figure 2-38 illustrates the cash flow of the Concessionaire, highlighting the costs, both CAPEX and OPEX, both initially incurred to construct the infrastructure; and incurring after the entry into operation of the infrastructure; the revenues and the operating cash flow.

Figure 2-38: Operating cash flow of a typical concession contract



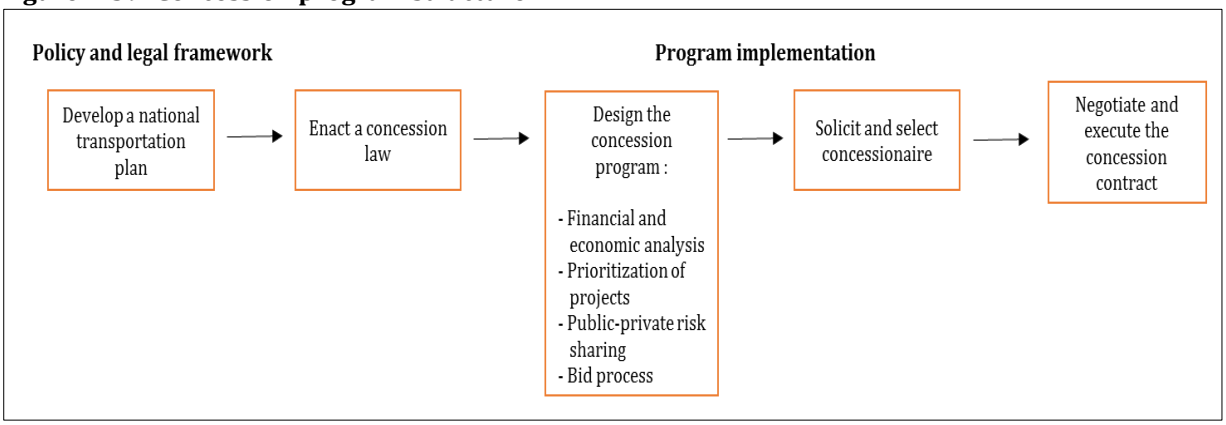
Source: ASECAP (2014)

Two aspects are particularly relevant when dealing with a concession scheme: the scope of the contract and the risk allocation between Concession Authority and Concessionaire. In general, there are four categories of risk for a concession contract: (1) political and legal risks, (2) technical risks, (3) commercial risks, and (4) economic and financial risks (Fisher and Babbar, 1996). In theory, the risk allocation follows the principle that not all risks are equal and should be carried out by the entity that is best in mitigating these risks.

A private toll road program should be integrated with national, regional, and local transportation policies and programs and should be enabled by a concession law (see Figure 2-39). The interaction between a private toll road program and the overall transportation policy raises several critical issues:

- What types of roads should be targeted for tolling?
- Is a specific toll road concession law necessary, or can the program be implemented under the existing contract and investment law?
- How specific should the concession law be with respect to program structure?
- What government entity should be authorized to implement the program?"

Figure 2-39: Concession program structure



Source: Fisher and Babbar (1996)

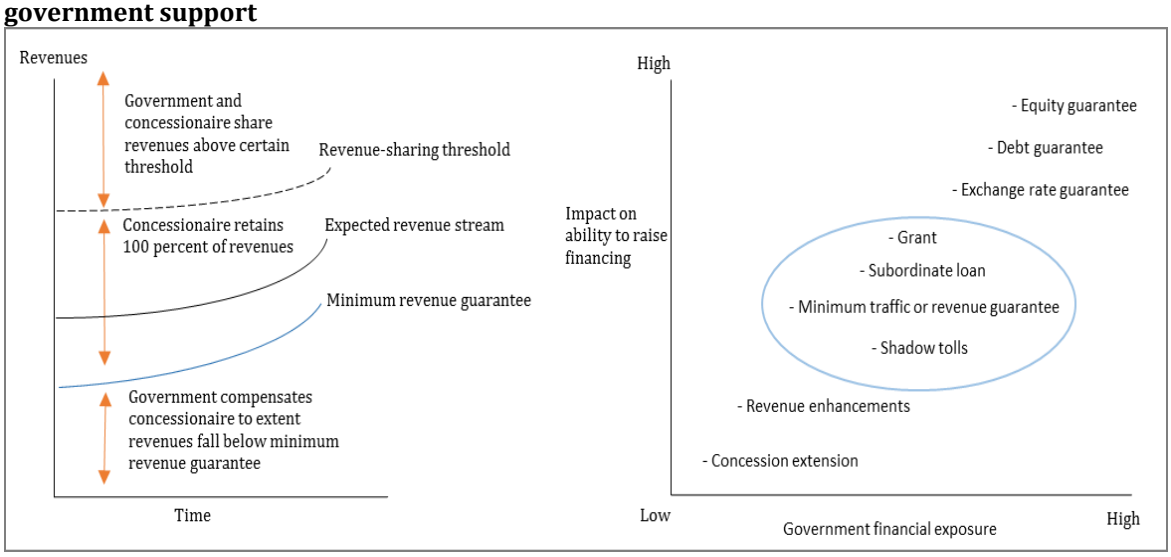
One of the first steps in a private toll road program is selecting the roads that are the most appropriate or attractive projects to concession. Early successes are important in establishing

credibility for future programs. When targeting private finance, roads with strong project economics are preferable to projects that require extensive government financial support, as the concession process is costly and time-consuming. In the case of a concession policy combining toll financing and public funds for road development, projects with the strongest economics should be targeted for concession and the weaker projects be funded with public funds. Some governments do the contrary, funding high-priority and high-demand projects with public funds, and offering low-priority projects with relatively weak economics for concession.

Once the policy and legal framework is in place and initial projects have been selected, a sound implementation process accelerates the schedule, improves the quality of bids, and ensures meeting government objectives. Important issues to an implementing a program are (Fisher and Babbar, 1996):

- Who should be responsible for funding preliminary design, environmental, and traffic and revenue studies?
- What bidding criteria should be used?
- How should the facilities be financially regulated?
- How flexible or defined should the project design be?
- Should the concession contract be negotiated, competitively negotiated, or fully defined prior to bidding?
- Should minimum traffic or revenue guarantees, in which the government compensates the concessionaire, be applied? And the "upside" potential be shared? (see Figure 2-40 left).
- Should additional government financial support, such grants, subordinated loans, and shadow tolls be included, so to increase a project's ability to raise financing (see Figure 2-40 right).

Figure 2-40: *Left*: Example of public-private revenue sharing. *Right*: Range of options for government support



Source: Fisher and Babbar (1996)

Stakeholder approach, participation, communication

The definition of stakeholders differs between countries. The narrow definition is that stakeholders are the other authorities and organisations to whom the project has an interface, such as shared interest, supplier relation, or financier. The wide definition includes civil groups representing specific mutual or conflicting interests, in the social, financial, environmental field.

According to Ubels and Verhoef (2004), road pricing measures generally meet resistance. Public acceptance by engaging stakeholders is a crucial component of the success of the introduction of a fee system. Toll roads and other pricing mechanisms can be negatively perceived by users, as they have the idea of double-paying, as they would consider that their taxes alone are enough to fund road infrastructure. Pricing of infrastructure will impact on traffic and driver choice. Assessing this impact should be included when preparing financial models, also to secure future scheme procurement. The measurement of the users' satisfaction through data collection feedback is important for proper implementation of different systems and in order to correct any deviation (CEDR, 2017). It is important that the cost of a toll road, and the user's willingness to pay for its use are balanced. The benefits of the road scheme may need to be highlighted more strongly by road authorities in terms of greater safety, greater journey time savings and more efficiency.

According to OECD (2018), experience shows that where road pricing has been introduced, the new norm is rapidly accepted and pricing supported by the population affected. However, concern over distributional effects is legitimate whenever a public policy intervention creates gainers and losers.

2.7.2. Procedural Factors Outside OIC Geography

Procedural aspects of concessions

Toll road concession models in Europe foresee the obligation for the Concessionaire to maintain and operate the motorway network or section by means of toll charged to the users. Concession models can be clustered on the basis of the nature of the concessionaire. Three different concession models have been detected (ASECAP, 2014):

- Concession to a private company: company owned exclusively by private investors;
- Concession to a public company: company owned by a government or other public bodies;
- Concession to a mixed capital company: company in which the State acts as a partner of private capital.

Stakeholder approach, participation, communication

Stakeholder attitude can fundamentally change over time. This is illustrated by the earlier pilot project done for the Stockholm congestion charging scheme (Provonsha, 2018). The concept of congestion pricing had very low public support before the 2006 trial, with polls showing roughly 80% resident opposition. However, traffic across the cordon dropped immediately after the trial launched, which resulted in reduced travel delay and congestion throughout the city. After a few weeks, the decrease in traffic volumes across the cordon during the trial period stabilized around 22% compared to 2005 levels, resulting in congestion reductions around 30-50%. The reduced congestion also meant that travel time reliability increased. Drivers switching from car to public transport meant that the number of passengers in the transit system increased by around 4-5%. Public attitudes changed toward congestion pricing and media publications celebrated its success.

After the trial significantly reduced traffic, Stockholm residents voted to make the system permanent in a referendum that determined that the majority of Stockholm voters were in favour of keeping the charges. The media interest for the charges faded after having been in the headlines almost daily for four years. Rather than discussing the existence of the charges, Sweden's political parties and other stakeholders gradually moved on to discussing how the charges could be redesigned and how the revenues should be used. The permanent congestion pricing system officially launched in January 2007, after the Parliament decided that the fees would be levied as a tax. This new infrastructure tax would help to finance the maintenance of the bridges as well as public transit improvements.

Box 5: Procedural aspects of toll roads, the case of Chile

Chile designed a concessions program to encompass the construction, operation, and maintenance of transportation infrastructure, including roads, ports, and airports. Although initially stimulated by budgetary constraints, the program doubled as a mechanism to increase economic efficiencies by passing responsibility for the construction and maintenance of infrastructure to the private sector. The country started with its most pressing infrastructure need: upgrade and modernize the national highways. Underspending for design, construction, and maintenance left Chile's heavily travelled highways in need of major improvements. Growing labour mobility and increased business travel created additional demand for road transportation. By 1990, the situation called for a level of investment that would place a heavy burden on the national budget and crowd out investments in the social sectors (Lorentzen 2000).

The concessions law set forth the criteria applied for awarding bids. The twelve concessions—all granted between 1994 and 1998—were selected because of their economic importance and cover nearly 2,000 kilometres of road and represent an overall investment of about US$3.3 billion.

The Ministry of Public Works is responsible for supervising the construction and the operations of the contract. The concessionaire may contest penalties by seeking relief from a three-person conciliation commission who has jurisdiction over all disputes and claims originating from the interpretation and implementation of the concession contract and may act as an arbitration tribunal. Alternatively, concessionaires may bring the conflict to the appropriate court of appeals.

The concessions law establishes that concession contracts may be modified by the ministry at any time for reasons of public interest. The costs of expropriation are borne by the concessionaire unless the bidding documents specify otherwise. The Ministry of Public Works carries out the expropriation, surveying the land required for the project.

The concessions scheme changed how resources are allocated to road infrastructure. Before the concessions program began, the Ministry of Public Works ranked all of the investments that had to compete for public sector resources. Those rankings were evaluated by the Ministry of Planning before funds could be allocated by the Ministry of Finance and approved by Congress. The Ministry of Public Works now has greater autonomy. Concession projects are selected, designed, and approved by the ministry, but they do not compete for resources with other public sector projects.

The increased autonomy requires that the policies, strategies, and guidelines used to select concession projects be very well defined. They must include the public-private distribution of risks and the long-term financial exposure that the public sector is prepared to assume through guarantees and subsidies. Projects are subjected to a market test through the bidding process.

Lorentzen (2000) lists observations made:

- Foreign construction companies dominate the Chilean road concessions market.
- The government used "special payments" as the key selection criterion for bid evaluation and to test the seriousness of firms interested in participating.
- It takes at least five years for a proposed concession to become a fully operational toll road..
- Concessionaires have found it difficult to arrange long-term financing during the construction phase. The banks requested guarantees to cover construction risks. Most of the projects under study were obliged to use some form of bridge financing from local banks to cover the construction phase.
- Minimum revenue guarantees were a key factor in providing comfort to investors and financiers.
- When projects have a high economic and social impact, but externalities do not translate into high private returns, public- private distribution of risk becomes critical. Externalities were obvious, but usually they could not be translated into revenues to the private investor. The policy of setting uniform tolls along the expressway network further limited the ability of potential concessionaires to improve their return on investment.
- Government members of conciliation commissions should have adequate authority to accept and enforce negotiated agreements.
- Concessionaires should have only one government interlocutor in each phase of a project.

2.7.3. Procedural Factors in OIC Countries

Procedural aspects of concessions

Fisher and Babbar (1996) analyzed the Malaysia North-South Express Highway. Regarding the bid process and the evaluation criteria of this highway, they observed:

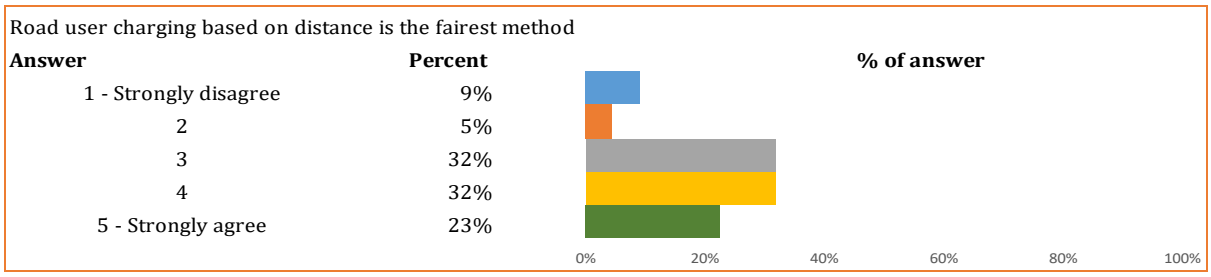
- Open, competitive bid process
- One of five submitted proposals selected based on undisclosed criteria
- Negotiations permitted

The contractual regulatory mechanism included toll rates specified through 1996 and indexed to local inflation thereafter. Also it was determined that all increases must be approved by the government and compensation is paid by the government if toll increases are deferred.

Survey results for OIC Member States

The majority (87%) of OIC Member States agreed that determining road user charges based on distance is the fairest method, as shown by the survey results in Figure 2-41.

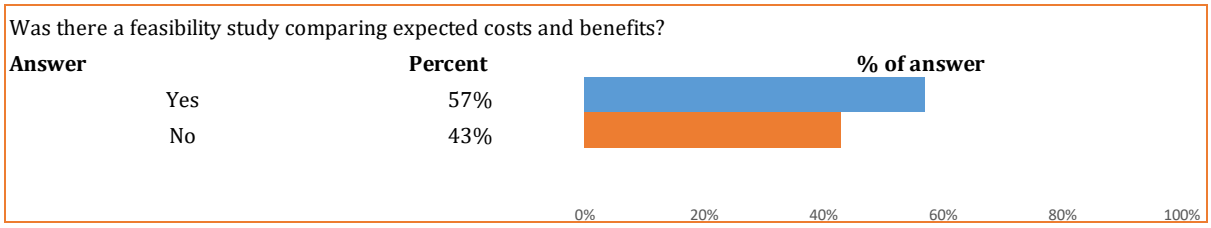
Figure 2-41: OIC Member States on "Road user charging based on distance is the fairest method"



Source: Fimotions, survey results.

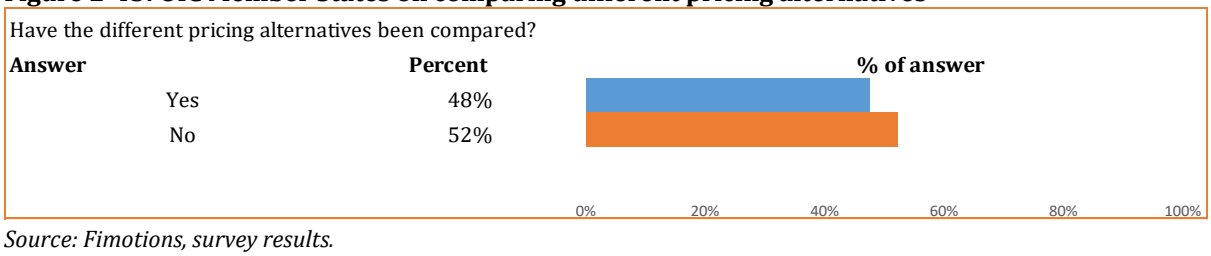
Earlier in this chapter we discussed the design and assessment of infrastructure pricing. One of the ways to assess the value and the impact the pricing scheme will have is in studying the feasibility. The majority (55%) of OIC Member States do carry out a feasibility study to compare expected costs and benefits, as shown by the survey results in Figure 2-42. However, less than half (48%) of OIC Member States comparing different pricing alternatives in the feasibility studies (Figure 2-43).

Figure 2-42: OIC Member States on "Was there a feasibility study comparing expected costs and benefits?"



Source: Fimotions, survey results.

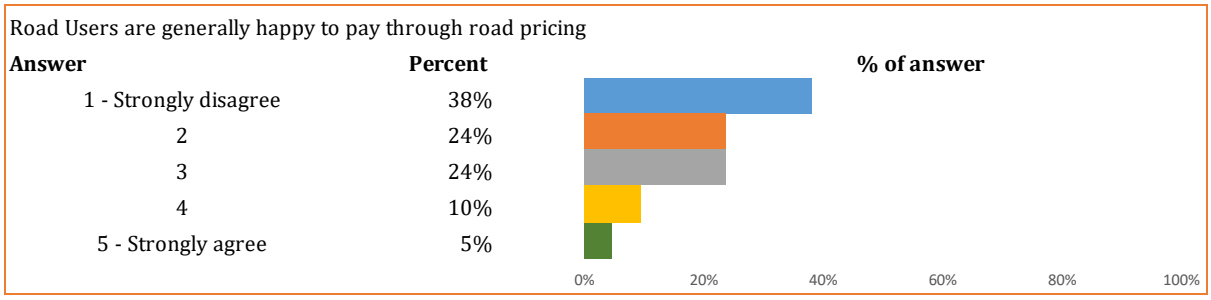
Figure 2-43: OIC Member States on comparing different pricing alternatives



Source: Fimotions, survey results.

Only 15% of the surveyed OIC countries stated that road users in their countries are happy to pay through road taxes (Figure 2-44). There can be many reasons for this statement. A reason could be that users consider roads to be a common good. Another one is most probably because road user charges are seen as taxes, which makes it difficult to gain political acceptance.

Figure 2-44: Road users perception on paying through road pricing



Source: Fimotions, survey results.

2.8. Data Collection Method

2.8.1. Data Collection

With increased and varied travel and activity patterns in the recent years, there has been an increase in complexity in understanding the travel behavior of individuals. Data collection is the first step in understanding the complex travel patterns. The quality of the data is directly related to the quality of data analysis and influences transport models. Since these models help in predicting the transport demand and traffic volume in the future, they highly depend on accuracy of the existing travel patterns. Traffic volume forecasts are also essential in the fundamental decision on whether the road should be tolled and in setting and adjusting toll levels (Wegener, 2009).

Data collection is therefore a prime task, and it is also observed that there is significant project time dedicated in the same. Data collection helps to determine how well the system is working by understanding the individual's travel behavior, the change in travel trends, travel patterns for different segments of individuals, and the existing capacity of the transport system. The ultimate goal is to facilitate decision making and improve quality of decisions.

In general data can be segregate into two types, quantitative and qualitative.

- Quantitative surveys are generally expressed in numbers or figures. It mainly provides the answers to the questions who? when? where? what? how many? Some of the basic quantitative traffic surveys are traffic volume count, traffic characteristics, level of service of road sections, origin and destination, trip purpose, etc. This data helps to understand the actual context in the current scenario and help to test the existing ideas and future predictions. The collection of quantitative data is generally easier and cost effective when compared to qualitative data.
- Qualitative surveys might not be directly measurable but help in understanding the individuals' perception and behavior of travel. It mainly provides answers to the questions why? and how? Some of the basic qualitative surveys are road user surveys and stated preference surveys. The road user surveys focus on topics like safety perception, travel experience, satisfaction levels, etc. The stated preference surveys focus on individuals behavior to changes in transportation systems.

The data collection methods can vary from the basic Manual counts to advances Detector technologies such as Inductive loops, Light barrier, Infrared, Ultrasonic, Laser, Radar, Video, Magnetic field, Scanning of Bluetooth IDs, etc (Leduc, 2008).

When road pricing is an idea that is still yet to be implemented, collecting data about people's reaction to a full range of road pricing options and scenarios is of necessity. Road pricing measures will generally face public resistance and the acceptability can form a barrier to the implementation success of pricing measures. This situation will add a new twist to data collection. Whittles (2017) argued that people have no shared experience of it and that researchers will not be able to make sense of some responses because they do not share the same idea as the respondents about the form of road pricing might take. When a country or city intends to increase road network performance by introducing time-varying road-pricing charges, Verhoef et al. (2008) proposed a two-step data collection system: 1) a questionnaire with questions about the current travel behavior of respondents, the characteristics of their non-chosen alternatives (if available), and their socio-economic status; 2) a stated choice experiment, where the answers given to the questionnaire is used to determine the values of attributes presented to respondents, which can then be converted to WTP values and their statistical properties. In the stated choice experiment an illustrative market is designed, and then the individuals are asked about their choice preferences to estimate the preference coefficients that define the value of the WTP or WTA, and can be used to assess whether to improve or not improve the quality of a given product (Mirbaha et al., 2013). In addition, data for estimating econometric models or engineering cost functions and maintenance models need to be collected to be able to present realistic attribute levels in the choice experiment.

Finally, collecting data can serve monitoring purposes. Depending on the rationale and objectives to road pricing, impact areas that can be monitored are traffic reduction, environment and emissions, road safety, business and economic activities, and revenues. Automated data collection can collect a wealth of information and present it based on the authorities' need to increase efficiency of monitoring process. The application of advanced technology, i.e. ICT application and the use of GPS devices and smartphones, is essential. Therefore, the upfront costs are normally higher than for instance the application of mileage permit (purchase a license to drive a certain number of miles), but it will normally be cost-effective in the long run.

A survey carried out by KPMG International (2015) on 43 private and public entities involved in toll road operations across the Americas, Europe and Asia, found out that many toll operators collect a significant amount of data on their users (particularly those that use ETC) but few use their data for more than simply tracking and billing customers. KPMG International (2015) also argued that those that are able to develop a core capability in data and analytics should be well placed to reap the benefits of their data, such as to adjust their pricing to reflect the value to the users and to fully understand the cost to serve each customer across various channels in order to inform future investment and marketing decisions. Such data would also be very relevant for further behavioral surveys on extensions or adaptation of the system.

Survey on Public Acceptance and Willingness to Pay

The success of road pricing schemes depends largely upon the public's response (to different toll rates). It is important to understand and estimate the implications, externalities and people's perception of road pricing schemes. As per KPMG International (2015), the major obstacle for congestion pricing is no longer financial and technical problems, but public acceptance. The author mentions that, congestion pricing trial, and a referendum after that trial, help in successful development of a congestion pricing scheme.

Negative externalities like increase in 'rat running' behaviour (Sakuragi et al., 2017), in which motorists prefer narrow local streets to avoid the toll, is one of the major issues. With pricing of the road, which is previously a 'free' good, there are equity, freedom of choice and data privacy concerns,

which are also linked to acceptance levels and play a major role in success of these projects. (Liu et al., 2018). Public acceptance (WTA and WTP) surveys help in understanding the perceptions of motorists which can be taken as a base in negating these externalities caused by introduction of toll pricing , and for assessing feasibility of the approach.

As indicated earlier the WTP can also be used to value other transportation related goods such as emissions of pollutions to the air, the emission of noise, improvement in transportation and improvement in road surface, traffic safety, externalities that could be included as well (Mahirah et al., 2015).

2.8.2. Data Collection Method Outside OIC Geography

Many countries collect toll in urban areas. In Norway, for instance, where road user charging is primarily applied to cover external costs, the urban toll is determined based on the impact on choice of transport modes, time of day, and vehicle environmental parameters. As such, accurate, reliable and available information and data is essential to calculate road user charges in a correct and fair way. The data sources are collected from vehicles and roadside equipment (for real time and dynamic data) and from central registers (for historic and static data).

Figure 2-45: Survey participants use of Melbourne cordon area

Source: Transurban (2016)

In 2015, Melbourne Road Usage Study was conducted to test two road-charging models: 1) **Usage-based model**, to test participant responses to a user-pays funding model, and 2) **Congestion-based model**, to test how motorists responded to demand-management road charging based on area and time of day (Transurban, 2016). Quantitative data from 1,400 drivers across Melbourne was collected to test whether road user charging can relieve congestion through the changing of drivers' behavior. The data was collected by installing GPS devices in the vehicles for 8-10 months to test three charging scenarios; 1) a flat distance-based charge of 10 cents per kilometer; 2) a time-of-day charge of 15 cents per kilometre at peak times and 8 cents at other times, and 3) a distance-plus-cordon charge where drivers were charged 8 cents per kilometre at all times plus $8 if they entered the inner city between 7am and 6 pm on Monday to Friday. Qualitative data was captured through a series of survey involving over 2,200 Australians. This research was undertaken to engage the community prior to reforming road-charging in Australia.

The data collected alongside road pricing can also serve other purposes. To make the most of it, clear thinking about what data to collect is required. Lehe (2019) argued that the success of downtown congestion-pricing systems is often concluded by analyzing data on inflows, i.e. the number of vehicles—sometimes broken out by type—coming into the tolled zone per day or during rush hour, which might be true if pricing is applied to discourage delivery trips. However, this data fails to capture how far and how long vehicles circulate after they enter the tolled zone. The sharp increase in the number of vehicles engaged in for-hire service or delivery, for instance, has been blamed for slowing traffic in London in recent years, even as the number of vehicles entering the Charging Zone has remained about the same.

In the period 2003-2008, following the implementation of congestion charging in 2002, Transport for London (TfL), through its London Congestion Charging Impacts Monitoring Program, published annual reports with deep analyses on traffic patterns. Until 2007, there was a 16% reduction compared to the 2002 baseline (1). TfL used moving vehicle observer surveys, monitoring and enforcement cameras, trip diaries, travel surveys, data from parking providers, business surveys, environmental indicator assessment and economic case studies on specific sectors and locations (D'Artagnan Consulting, 2008).

Table 2-11: Key year-on-year changes to traffic entering the central London charging zone during charging hours, 07:00-18:00.

	2003 vs 2002	2004 vs 2003	2005 vs 2004	2006 vs 2005	2007 vs 2006	2007 vs 2002
All vehicles	-14%	0%	-2%	0%	0%	-16%
Four or more wheels	-18%	-1%	-2%	-1%	0%	-21%
Potentially chargeable	-27%	-1%	-3%	0%	1%	-29%
- Cars and minicabs	-33%	-1%	-3%	-1%	0%	-36%
- Vans	-11%	-1%	-4%	2%	1%	-13%
- Lorries and other	-10%	-5%	-4%	6%	9%	-5%
Non chargeable	17%	1%	-1%	-1%	-1%	15%
- Licensed taxis	17%	-1%	1%	-3%	-5%	7%
- Buses and coaches	23%	8%	-4%	-3%	5%	31%
- Powered two-wheelers	13%	-2%	-9%	0%	-3%	-3%
- Pedal cycles	20%	8%	7%	7%	12%	66%

Source: Transport for London (2008)

A cordon-pricing scheme in the city center is also introduced in Milan in 2008 with an aim to reduce both congestion and air pollution. All vehicles entering the area 7.30 am to 7.30 pm Monday to Friday had to pay a pollution charge, proportional to their emission class, correspondent to € 0, 2, 5 or 10 per day. The scheme, called "Ecopass", was in force until the end of 2011. In January 2012 it was replaced by a congestion charge scheme, called "Area C", characterized by a flat charge of €5 (IEFE, 2016). The entrance gates were controlled by an electronic system of cameras, reading the license plates of the vehicles accessing the area.

Survey on Public Acceptance

Table 2-12 shows survey results of public acceptance levels of congestion pricing schemes in different cities. Interestingly, the only two projects which are 'accepted and implemented' are the ones having higher than 50% acceptance levels.

Table 2-12: Public acceptance levels of congestion pricing

City	Year of Survey	Acceptance (%)	Outcome
Edinburg	2002	34	research only
	2005	26	failed and not implemented
Stockholm	2006	51	accepted and implemented
Manchester	2008	21	failed and not implemented
Milan	2011	80	accepted and implemented
Athens	2008	34	research only
New York	2006	44	research only
	2008	67	research only

Source: Liu et al. (2018)

Surveys on public acceptance can also be carried out after the start of implementation in order to assess whether the acceptance rate has changed. As shown by Table 2-13, in a well-developed congestion pricing system, the acceptance rate tends to increase post implementation. Liu et al.

(2018) argued that people are short-sighted to toll charges before implementation as they only see the negative externalities, but this could change after the implementation as they also see the benefits.

Table 2-13: Change in public acceptance rates

City	Year of implementation	pre implementation acceptance rate (%)	Survey time after implementation	post implementation acceptance rate (%)
Bergen	1986	49	1 year	63.5
Oslo	1990	30	1 year	36
Trondheim	1991	28	2 months	52
London	2003	40	6 months	over 50
Stockholm	2007	36	4 months	66

Source: Liu et al. (2018)

In cities like Singapore, London, New York, and Stockholm, the influencing factors for congestion pricing are analysed by surveys. For example some of the observed factors are privacy, equity, complexity and uncertainty (Gu et al. 2018). Similarly, it is important to understand, what factors influence the acceptability of people in different cities.

Complexity or simplicity also plays a role in public acceptance. People are more likely to reject a complex system, even though it might be beneficial in the long run. In the case of Singapore, when the ALS system was introduced, a flat 1.3S$ was charged to maintain simplicity. Later when the ERP system was introduced, a complex distance-based fare system was implemented. This gave a time period for people to get a general idea of the system, thereby accepting the complex systems in the future.

Finally, privacy is a major issue while implementing congestion pricing schemes as any transactions made could involve the people's personal information. This was the major factor in the rejection of the scheme in Hong Kong. Taking a clue from the Hong Kong experience, Singapore and London addressed these issues before the implementation of the schemes. The smart card system in Singapore, does not store any personal information of the individuals. Similarly, it is important for cities planning to implement the congestion pricing schemes, to investigate and address the loop holes in this system in other cities before implementation.

2.8.3. Data Collection Method in OIC Countries

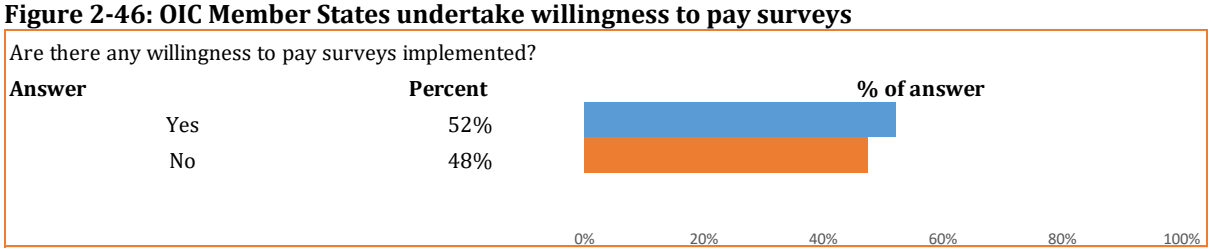
Countries in the MENA region, as elsewhere in the world, conduct Household Travel Survey (HTS), as shown in Table 2-14. However, according to Delatte (2016), the sharing and dissemination of data is inadequate due to factors that limit the easy exchange of data: complexity of organizational governmental entities and reliability of the data due to diverse methods of collection. Although HTSs are conducted, the data remains mostly under the ownership of local authorities and access to the raw data are limited for external entities, such as academia, researchers and the private sector. The main findings of the analysis of the surveys are sometimes highlighted in various reports and researches, nevertheless, specific and in-depth analyses of the results on socio-economic characteristics of households or individuals in correlation with the mobility patterns are not easily accessible.

As discussed in section 0, in terms of toll fee collection method, most OIC countries applies electronic tolling utilizing ANPR and/or RFID-technology-based tag. By using this technology, data collection cannot be automated. There is no information available as to the analytical tools that are used to determine the charge rate. The same applies to public engagement and consultation prior to the implementation of the charging scheme.

Survey on Public Acceptance and Willingness to pay

Evidence from the surveys supports that 52% of the surveyed OIC Member States undertook willingness to pay surveys before implementing road pricing systems, as shown in Figure 2-46.

Figure 2-46: OIC Member States undertake willingness to pay surveys



Source: Fimotions, survey results.

Table 2-14: Characteristics of Household Travel Surveys in various MENA cities

	Year	Initiator and Data Owners	Objectives	Data Collected	Methods
Abu Dhabi	2009, 2015	Department of Transport (DoT)	Update DoT's Strategic Transport Evaluation and Assessment Model STEAM	• Individually Mobility Patterns • Travellers Mobility Patterns • Socio-demographic and economic characteristics • Car ownership • Traffic: Time spent to find a parking space; Daily Traffic Profile of Vehicles Crossing; Urban Cordons; Freight Carried by Heavy Goods Vehicles	• Interviews with a random sample of Abu Dhabi's residents • Surveys done with passengers at the Airport, Shopping Malls, and major business centers • Surveys done with passengers on Abu Dhabi's buses about their journeys on one day.
Amman	2008	Greater Amman Municipality	Develop the 2008 Transport Mobility Master Plan for Amman	• Socio-demographic and economic characteristics • Traffic volume and vehicles occupancy	• Transport Counts • Journey Time Surveys • Household Survey • Origin-Destination Surveys
Dubai	2003, 2007, 2014	Road and Transport Authority (RTA)	• Revise and update the road and transport strategic plans • Build the Dubai Strategic Transport Models for 2020 and 2030	Information about all society segments and mobility patterns of individuals	Telephone and field surveys over three months
Mashhad	2008	Mashhad Traffic & Transportation Organization	• Update the four-step travel demand modelling • Forecast the future travel demand for Mashhad • Develop long-range transportation plans • Evaluate the network operation	• Traffic volume and vehicle occupancy • Travel time on some selected streets • Socio-Economic parameters of 253 Traffic Analysis Zones (TAZ) • Car Ownership	• Passenger/Vehicle O-D survey (in terminals and cordons) • Screenline survey • Household O-D survey • Pilgrimage trips to holy shrine
Tehran	2014	Deputy of study and planning, Tehran Municipality	Build the Tehran transportation models: four-step model since 1994 and in 2014 we decided to develop an activity-based model	• Data base of streets, highways and facilities • Car volume in highways and arterial street, number of metro passenger, number of airport passenger • Sample of citizens daily trips completed with some social and economical information, like age, car ownership, house ownership, number of family members, education level, etc	

Source: Delatte (2016)

In Malaysia, a study involving 366 respondents was conducted to examine the willingness to pay for reducing traffic congestion in Klang Valley. The results showed that household income, respondents' occupation and price bid toll payment have significant effects on the willingness-to-pay to reduce traffic congestion (Mahirah et al. 2015). The same applied by Iran before the implementation of urban congestion priced zone in Tehran, which involved 4000 respondents. Through questionnaires, the travelers were asked about the restricted zone by offering various levels of prices as well as their opinion about omitting trip or choosing an alternative mode instead of personal car for entering to Even-Odd traffic zone. The main parts of the questionnaire are as follows (Mirbaha et al. 2013):

- Information about personal, social, and economic characteristics of the individuals;
- Trip information and their mode choice
- Information concerning individuals' response to the policies and changes expected by the researcher.

The survey results showed that with 50,000 Rials (IRR) toll for Tehran CBD area; 27 % of users will use their personal cars for entering the congestion priced area. This rate is reduced to 7 % if the toll increases to 200,000 Rials[24].

In 2015-2016, Road User Satisfaction Survey was conducted by Uganda Road Fund through which road users can provide feedback to road agencies on the quality of road services. The result highlights road users' perceptions about the road network as a basis to inform road agencies on areas that need improvement in order to improve user experiences on Uganda's roads[25]. Through the survey, 56.8% of respondents expressed their willingness to pay road usage fees[26]. These road users' views were then used by the Roads Authority and Ministry of Works to fine-tuning toll fees at Kampala-Entebbe Expressway, which is planned to be operational by June 2020[27].

2.9. Capacity Building

2.9.1. Introduction

Capacity building is an important part of the process towards road pricing. The following aspects will be considered in this review:

- The skills needed to plan operate and manage road pricing and congestion charging.
- Whether the public or private sector is best placed to provide appropriate services to implement road pricing and congestion charging.
- The productivity of various road agencies – based on number of staff length of roads traffic volumes and size of budget.
- Whether roads agencies have proactive human resource planning.

2.9.2. Capacity Building Outside OIC Geography

Outside OIC geography, where more progress has been made to commercialize the road subsector, it is recognized that similar sets of skills are needed as in managing almost any other enterprise. It being increasingly understood that dedicated road pricing, including congestion charging, has

[24] As of 31 May 2013, 1 USD = 12283.55 IRR (https://www.poundsterlinglive.com/best-exchange-rates/us-dollar-to-iran-rial-exchange-rate-on-2013-05-31)
[25] http://demo.omnitech.co.ug/urf/research-surveys/
[26] https://www.newvision.co.ug/new_vision/news/1462386/ugandan-roads-public-perception-opportunities
[27] https://allafrica.com/stories/201912060531.html

customers that pay a fee in return for receiving an acceptable service. The entity that provides this service must be set up in the same way as any other corporation.

It maybe that shareholders are mostly Governments, but that should not mean that the operation of the business of supplying road space need be a typical government bureaucracy, although public accountability does provide another layer that needs consideration in terms of skills set. This way of thinking is what has driven the establishment of autonomous roads agencies throughout the world. Human resources and competencies follow accordingly. It must also be noted that part of the rationale for road pricing is to secure an income for road asset management. In review of the institutional status road asset management, the need for demonstrable success is emphasized[28].

1. establish goals and performance targets to manage, explain, deliver, and adjust their roads budgets and internal activities;
2. establish effective and achievable performance levels based on input from the public, elected officials, and the business community;
3. demonstrate good governance and accountability in meeting or exceeding performance expectations.

Besides the normal management accounting and personnel skills needed for any large corporation, there are special skills needed to implement the three critical performance requirements noted above. The technical skills to plan operate and manage road pricing and congestion charging may be listed as follows:

- Transport Planning and Modelling: Traffic and business forecasting
- Transport Economics: Pricing services and impact assessment
- Transport Market Research: Customer needs and satisfaction
- Highway Engineering: Technical standards and level of service
- Highway Maintenance: Asset preservation and quality assurance
- Highway Operations and Safety: Productivity and security

In terms of Human Resource Development Policy, reference must be made to China, which has a 132,638 km network of fee collecting or tolled expressways[29]. The network developed through the application of innovative methods of funding, but also through devolving responsibilities to provincial government and the private sector. Owning to its immense success, it is worth appreciating that its long-term strategy for transport sector 2050 includes human resource development, which is set out as follows[30][31]:

- Fostering the cultivation of innovative workforce and talents
- Cultivating high-level transport technology talents
- Adhering to the guidance of high-quality, top-notch, and urgently needed training strategic, scientific and technological talents, scientific and technological leaders, young scientific and

[28] http://siteresources.worldbank.org/INTTRANSPORT/Resources/336291-1227561426235/5611053-1229359963828/TP-32-Road_Asset_Mgmt.pdf
[29] http://www.xinhuanet.com/english/2018-08/25/c_137418689.htm
[30] https://www.sustainabletransport.org/archives/7316
[31] On September 19th, 2019, the *Outline for Building China's Strength in Transport* was released. The document was approved by the *Communist Party of China Central Committee* (CPCCC) and the *State Council* and describes the future vision and roadmap of China's transport sector with a clear message: China wants to become a global transport superpower by 2050.

technological talents and innovative teams on international level, cultivating innovative talents in transport, and supporting talents from all fields to enter the transport-related industries,
- Promoting the construction of high-end think tanks for transport and improving the expert work system.

Educating highly-qualified labour force in the transport sector

- Promoting the spirit of the model workers and the spirit of artisans, and creating a high-quality knowledge, skill, and innovation-based labour force,
- Cultivating transport technology and technical oriented talents to support China's manufacturing, and building a modern vocational education system that meets the needs of transport industry and development.

Building a team of high-quality professional transport cadres

- Implementing the requirements for building a team of highly qualified and professional cadres, and building a team of high-quality loyal cadres,
- Focusing on professional ability training, and enhancing the ability of cadres to adapt to the requirements of modern integrated transport development,
- Strengthening the development of outstanding young cadres and strengthening the development of international transport organizations.

Considering the role of the private sector, reference is made to one global company. Abertis became a world leader in toll road management that is based in Spain. It owns 8,600 km of tolled roads in more than 20 countries; employs 15,000 and in 2017 generated toll revenue of Euro 5.3 billion or $6.5 billion. In terms of productivity, Abertis personnel per km of tolled road is 1.74, while revenue per employee is $433,000. To achieve this performance the Group states that it strives to create a culture of respect, inclusion, collaboration, safety and health in the workplace, a reflection of corporate values[32].

- Responsibility and trust in people
- Dialogue and collaboration
- Innovation and continuous improvement
- Efficiency, simplicity and pragmatism
- Transparency, integrity and credibility

The lessons to be learned from Abertis is that toll roads have become an international business, they are totally private quoted on the Madrid exchange and are able to generate the capital needed to fund high quality roads. In terms of human capacity, they have clearly built up a talented and dedicated world-wide team by applying a progressive human resource strategy. Abertis is a good example of a private company being able to take on the role from governments in road provision.

China tells a similar story. Governments outsourcing toll road management to specialists but in their case, government started the asset building process first, then obtained buy-in from the private sector. It's an excellent model that works. Small companies involved in the provision of road services can become international companies and contribute to the national economy. Governments do not have to struggle to obtain competencies that exist in the private sector to provide, manage and

[32] https://www.abertis.com/en/the-group/human-team/human-resources-policy

operate toll roads and pricing schemes. Toll roads and indeed congestion charging, should be seen as new services, provided to new markets and generating new opportunities for the economy. The role of government is to have the right polices, regulations to leverage the processes.

2.9.3. Capacity Building in OIC Countries

The skills needed to plan, operate and manage road pricing and congestion charging are generally absent in OIC developing countries. There are exceptions such as Malaysia, Indonesia and the UAE, from which the same lessons can be learnt as from countries outside OIC geography. The main challenges in terms of capacity building to provide and manage toll roads and congestion charging services are political not technical. That is whether capacity should be built by the public or the private sector. In other words whether the public or private sector is best placed to provide appropriate services to implement road tolling systems. Only Government can decide this.

The Malaysian Highway Authority is a public not private body with 1,821 km of expressway to manage. The MHA Act of 1980, MHA sets out the mandate, to supervise and execute the design execution construction regulation operation or interurban highways, to impose and collect tolls, to enter into contracts to provide the aforesaid services[33]. MHA employs 348 (as of 2017) personnel with a salary of $650. Labour productivity is 5.20 km per employee and turnover is $128,660 per employee. Its productivity is higher than the private Abertis, but its earning is lower (LITRAK, 2017). It is not known if the Government of Malaysia plans to privatize it and in one sense it does not really matter. What does matter is providing the best value to customers and asset value to share-holders, which is government at the moment. MHA has active HRD planning that places a priority on skills development aiming to increase the competencies and performance of its personnel.

What is unfortunate, is that as a public body the MHA would probably not contemplate following the likes of Abertis into the world of road management business opportunities – to set up and run tolling operations in other OIC countries - because one feels that they would be very good at it. Such a move would appear to be a very smart one and it would be interesting if COMCEC considered promoting it.

The United Arab Emirates has tolled roads. The first toll gates in Abu Dhabi, opened in 2019 but Dubai has had road tolls in place since 2007. There are now seven Salik gates across Dubai, including Al Garhoud, Al Barsha, Al Maktoum Bridge, Al Safa, Airport Tunnel, Al Mamzar South and Jebel Ali.

Information on toll incomes and productivity are not published by The Emirate's Roads and Transport Authority, which operates Salik. An old item reported that the ERTA was projected to contribute some 3.4bn dirhams ($925.7m), or 11.5% of last year's budget income. The actual Salik contribution has not been made public. Dubai slashed its projected budget gap to 3.78bn dirhams for 2011, around 1.1% of gross domestic product and the lowest since 2007. A detailed breakdown is not available. A challenge for this research in OIC geography is the lack of transparency.

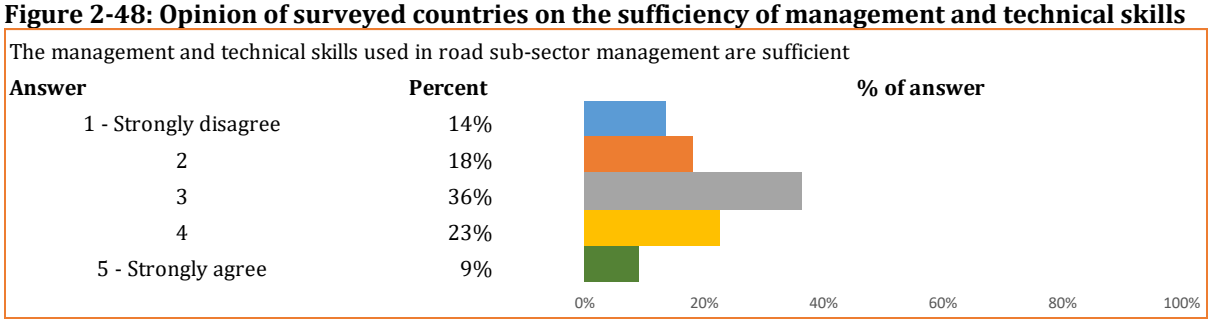
[33] http://www.llm.gov.my/

Figure 2-47: New Abu Dhabi Tolling 2020

Source: Arabian Business[34]

The survey accordingly showed that some OIC countries feel they have sufficient management and technical skills in house, others not. There clearly is a need for capacity building.

Figure 2-48: Opinion of surveyed countries on the sufficiency of management and technical skills



Source: Fimotions, survey results.

[34] https://www.arabianbusiness.com/transport/430320-abu-dhabi-to-postpone-collection-of-toll-charges-until-january-1-2020

3. Case Studies Review

The purpose of the case study is to advise readers of the road pricing status quo in both OIC and non OIC member states.

This chapter reviews road pricing practices in six specific countries that are selected as case studies. Each major OIC region (Arab, Asia and Africa) is represented by one case study, which is developed based on a study visit. The other three case studies, are developed based on desktop researches, are non OIC countries with good road pricing practices.

Table 3-1: Selected case studies

Country	Visit/Desktop
Tunisia	Study visit
Indonesia	
Nigeria	
Singapore	Desktop research
UK	
South Africa	

3.1. Singapore

Singapore is a small densely populated island city-state with a land area of just over 700 km^2. The reason Singapore was selected as a case study is because it was the first country in the world to introduce congestion charging. Due to its limited land resource, road pricing is an important component of Singapore's overall transportation strategy (Goh, 2014).

Brief History

In 1975, road pricing was introduced in Singapore specifically to reduce car ownership that was growing at 8.8% pa at that time (Button and Pearman, 1985). The charging system came under the Area Licensing Scheme (ALS), a cordon-based pricing scheme applied to a Restricted Zone (RZ), which was marked by overhead gantries at entry points. During ALS operating hours, non-exempt vehicles were required to buy and display a paper license on their windscreen to enter the restricted zone[35]. In 1995, the ALS was extended with Road Pricing Scheme (RPS) to cover expressways. RPS is a point-based pricing. Control points were marked by overhead gantry signs, and like in the ALS, motorists had to display a license to pass through gantries. Enforcers were stationed at control points to monitor compliance. Both RPS and ALS were manual schemes that were labor intensive and prone to human error. In 1998 both schemes were replaced by the Electronic Road Pricing (ERP) system, which is both cordon and point based.

3.1.1. Political Factors

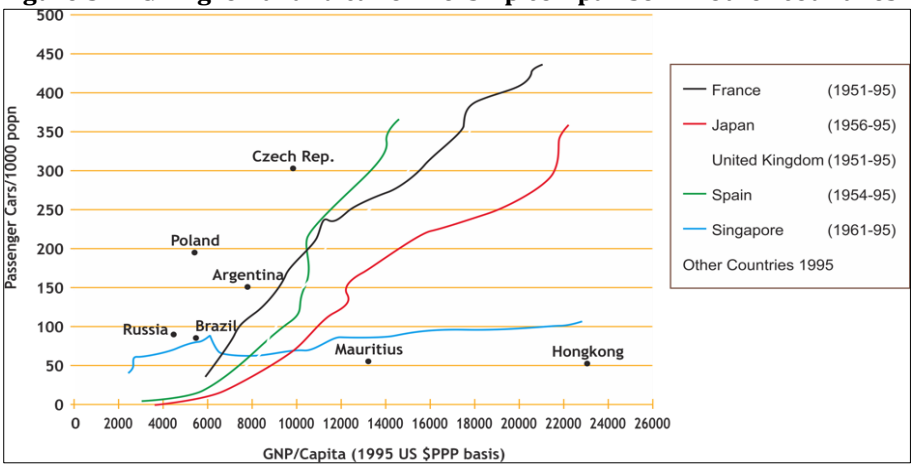
Singapore in the early 1970's has seen a rapid rise in vehicle ownership, mainly related to the high growth in income levels (Willoughby, 2001). As shown in Figure 3-1, the vehicle ownership rate in Singapore reached its peak in 1973 with nearly 100 cars per 1000 inhabitants, higher than the rate in countries with similar GNP per capita like France, Spain and Japan.

The Central Business District (CBD), which was about 5.6 sq.km. in area, experienced the most congestion and the average traffic speeds were measured 19 kph in the peak hours (Phang and Toh,

[35] https://development.asia/case-study/case-electronic-road-pricing

2004). Due to its limited land area and as 12% of the total land area is taken up by roads (compared to 14% for housing), Singapore could not afford to build more roads to keep up with the vehicle ownership growth.

Figure 3-1: GDP growth and car ownership comparison in other countries



Source: Willoughby (2001)

There were two principle measures adopted by the government of Singapore to control traffic volume and manage traffic flow:

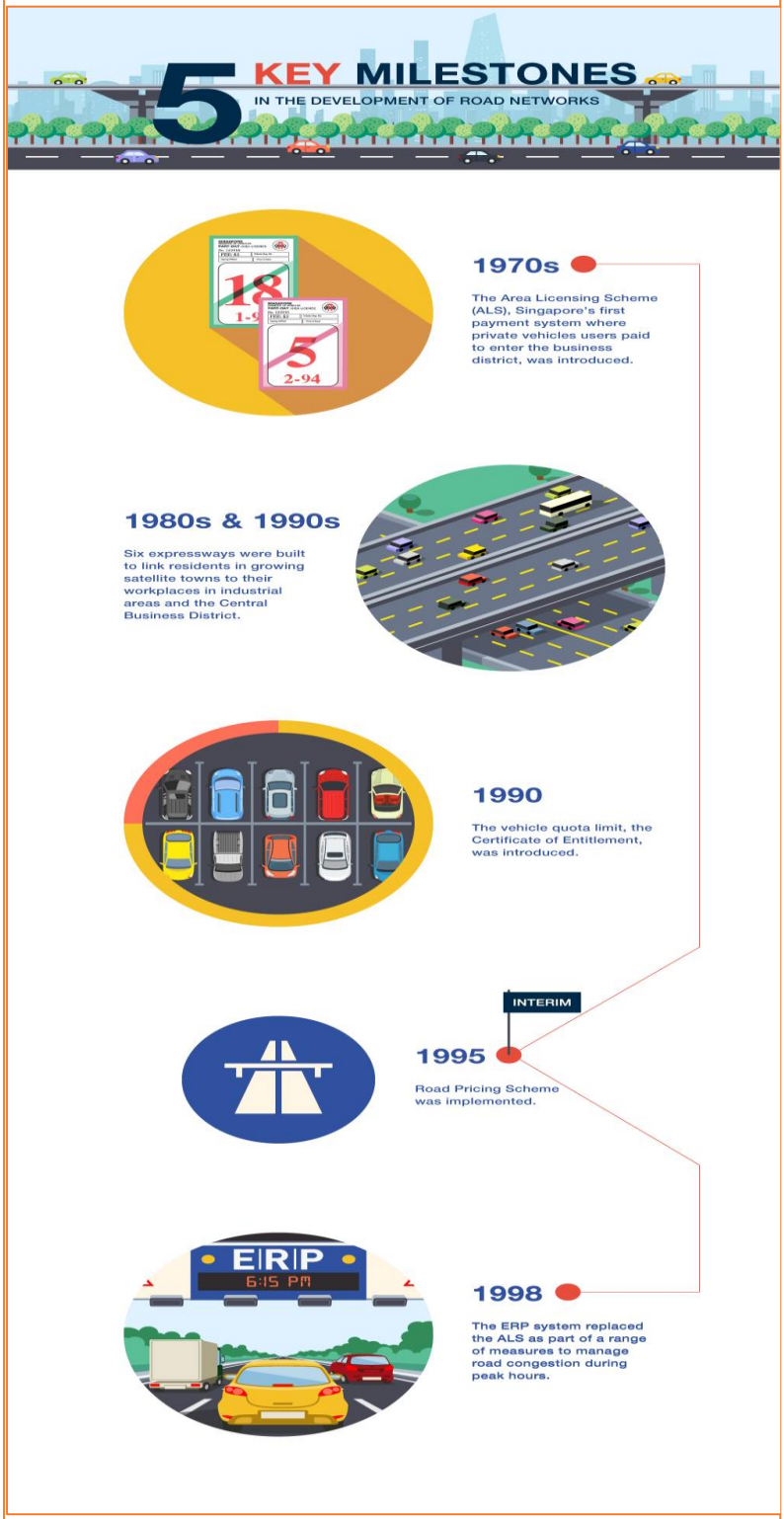
1. Discourage **vehicle ownership**
   In order to discourage vehicle ownership, the government imposed very high taxes (further elaborated in section 3.1.3) and adopted a vehicle quota system. These are considered as indirect measures and blunt tools as they targeted all vehicle owners regardless of the distance and time they actually spent on the roads. One of the disadvantages was that with high sunk costs to own a car, drivers were more likely to drive to maximize utilization and reduce vehicle operating costs as the marginal cost of car usage is comparatively low.
2. Regulate **vehicle usage**
   Road pricing schemes and petrol duty fall under this category.

To restrict traffic flow to the CBD region in the morning and evening peak hours, the country implemented, the first of its kind, a comprehensive road pricing system, in terms of ALS. This scheme was implemented in 22 entry points to the CBD and with a price of S$3 per day or S$60 per month, during the 7:30 am to 9:30 am from Monday to Saturday. Additional to that, parking fees were also increased by 100% in the Restricted Zone area. Vehicles with occupancy of four or more were exempted from the road pricing charges to encourage car sharing or carpooling. Park and ride facilities with 15,000 parking spaces and shuttle services as connection to CBD were provided at the fringe areas. (Phang and Toh, 2004). Currently, car pools are no longer exempt, only scheduled buses, police vehicles, and emergency vehicles.

Although reducing car ownership was a transport policy objective for the Island, the following were the main goals for the introduction of the road pricing schemes (Provonsha and Sifuentes, 2018):

1. To reduce congestion in the peak hours
2. To improve the travel time reliability to the car users

Figure 3-2: History of road pricing schemes in Singapore



Source: Website of LTA Singapore

Since the implementation of the first scheme, the ALS, the political support on road pricing in Singapore has been high. It started with the recommendation from the State and City Planning (SCP) project in 1971 that restraints on car ownership and usage in the city area were clearly necessary. In 1973, a high-level inter-ministerial committee was set up to coordinate transport planning measures and formulate transport policies to improve the transport situation (World Scientific, 2016). The committee comprised technical staff from the Public Works Department of the Ministry of National Development and helmed by permanent secretaries of several ministries (Centre for Liveable Cities and Land Transport Authority, n.d.). The result was the formulation of the ALS scheme.

In 1995, the ALS was extended with RPS. The RPS charged motorists for passing through a certain route, thus encouraging those who did not want to pay the extra charges to look for alternative routes or times. This resulted in better traffic distribution between the expressways that lead into the CBD during the morning peak hours (Centre for Liveable Cities and Land Transport Authority, n.d.).

In 1998, the ALS and RPS schemes were replaced by the Electronic Road Pricing due to the limitations of the previous schemes as manual systems. In the new system, charges were determined based on a pay-as-you-use principle. The more the use, the greater the payment. The coverage of the

new ERP was also extended to bottlenecks on other expressways and major roads that suffer severe congestion.

The charges varied according to time, location, and traffic flow. The scheme encouraged motorists to consider driving at non-peak hours, taking public transport, or doing away with the trip completely. ERP charges were designed to target congestion so drivers faced a higher marginal private cost. The ERP also reflected a policy of taxing road usage more than vehicle ownership, to control congestion.

3.1.2. Institutional and Organizational Factors

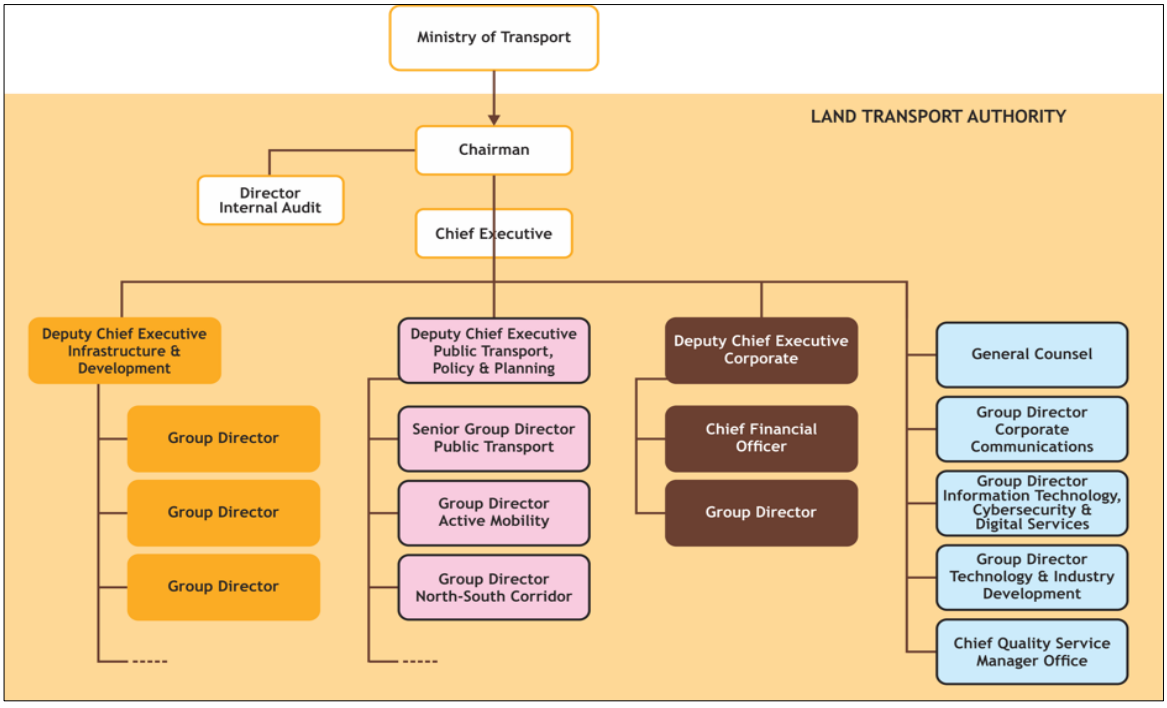
The Land Transport Authority (LTA) of Singapore was established in 1995 to integrate different areas of land transportation in Singapore including planning and regulatory functions for both public and private transport, policy work and physical infrastructure development. It was formed through the merger of the Roads and Transportation Division of Public Works Department, Registry of Vehicles, the Mass Rapid Transit Corporation, and the Land Transport Division of the then Ministry of Communications.

The LTA is a statutory board under the Ministry of Transport with the mission statement of '*Connecting People and Places, Enhancing Travel* Experience'. Besides executing the ministry's policies and tactical directions, the main functions of LTA are (Kumar and Agarwal, 2013; LTA, 2019):

- Policy formulation for land use and transport
- Planning, design, implementation and management of road transit and road infrastructure systems
- Public transport network planning
- Regulation of private vehicle ownership and usage

The fact that the management of the whole land transport comes under one organization, i.e. LTA, is the major advantage for Singapore for any decision making.

Figure 3-3: Organizational structure of LTA



Source: Website of LTA. Accessed on 23 December 2019.

The implementation of ERP involves the following institutions:

- Financing: Government of Singapore
- Planning and design: Public Works Department, SingTel, and National Computer Board
- Executing Agency: Land Transport Authority

One of the LTA's stated objectives, related to infrastructure pricing, is *Develop and implement policies to encourage commuters to choose the most appropriate transportation mode.* This objective characterizes LTA's management of the road network as it aims to optimize the use of its relatively finite road capacity while establishing policies that strongly encourage consideration of public transportation (Perez et al., 2011).

3.1.3. Economic and Financial Factors

As discussed in section 3.1.1, to control traffic volume and manage traffic flow, the government of Singapore imposes taxes and levies to discourage vehicle ownership, and adopts road pricing to regulate vehicle usage.

Motor Vehicle Taxes

- Vehicle Registration Fee (VRF): a registration fee that is collected upon registration of a car. At time of writing, this fee is S$220.
- Additional Registration Fee (ARF): based on percentage of the Open Market Value (OMV) of a car. It takes into account purchase price, freight, insurance and other charges incidental to the sale and delivery of a car from the manufacturer to Singapore. It is payable upon the registration of a vehicle. The ARF for cars continued to be increased since 1970s (Table 3-2), reflecting the ineffectiveness of this fiscal tool to curb the car population. Since 1978, this is even more than buying a new car. People then started substituting the high-end cars with cheaper models to offset the higher taxes. The car population continued to grow faster than desirable and traffic condition worsened.

Table 3-2: ARF rates in 1970s – 1983

Year	Additional Registration Fee of Cars (as percentage of Open Market Value)
Before 1972	10% - locally assembled 15% - imported Commonwealth 25% - imported non-Commonwealth
1972	25%
1974	55%
1975	100% (Preferential ARF Scheme was also introduced)
1978	125%
1980	150%
1983	175%

Source: World Scientific (2016)

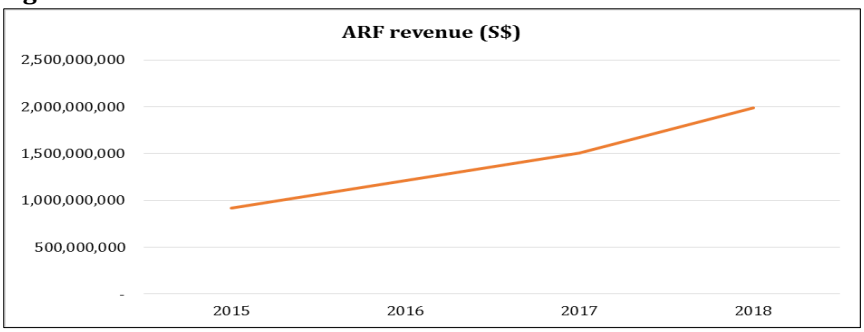
At the time of writing, the ARF structure is determined as shown in Table 3-3.

Table 3-3: ARF rates in 2019

Vehicle Open Market Value	AFR rate (% of OMV to pay)
First $20,000	100%
Next $30,000 (i.e. $20,001 to $50,000)	140%
Above $50,000	180%

Source: One Motoring[36]. Accessed on 23 December 2019

Figure 3-4: ARF revenue 2015-2018



Source: Singapore Budget 2018[37]

- Road tax on vehicles
  Road tax is part of the vehicle ownership tax. Every registered vehicle in Singapore must have valid road tax. The road tax structure is outlined in Table 3-4.

Table 3-4: Road tax structure

Road Tax (for Petrol, Petrol-Compressed Natural Gas (CNG), CNG or Diesel Cars)	**Engine Capacity (EC) in cc**	**6-Monthly Road Tax**
	EC ≤ 600	$200 x 0.782
	600 < EC ≤ 1,000	[$200 + $0.125(EC-600)] x 0.782
	1,000 < EC ≤ 1,600	[$250 + $0.375(EC-1,000)] x 0.782
	1,600 < EC ≤ 3,000	[$475 + $0.75(EC-1,600)] x 0.782
	EC > 3,000	[$1,525 + $1(EC-3,000)] x 0.782
Road Tax (for Petrol-Electric or Electric Cars)	**Power Rating (PR) in kW**	**6-Monthly Road Tax**
	PR ≤ 7.5	$200 x 0.782
	7.5 < PR ≤ 32.5	[$200 + $2(PR-7.5)] x 0.782
	32.5 < PR ≤ 70	[$250 + $6(PR-32.5)] x 0.782
	70 < PR ≤ 157.5	[$475 + $12(PR-70)] x 0.782
	PR > 157.5	[$1,525 + $16(PR-157.5)] x 0.782
Special Tax (for Diesel or Diesel-CNG Cars)	**Emission Standard**	**6-Monthly Special Tax Rate**
	Pre-Euro IV compliant	6 times the Road Tax of an equivalent petrol-driven car less $50
	Euro IV compliant	$0.625 per cc for 6 months less $50 Subject to a minimum payment of $575 per 6 months
	Euro V or JPN2009 compliant	$0.20 per cc for 6 months less $50 Subject to a minimum payment of $150 per 6 months

Source: One Motoring[38]. Accessed on 23 December 2019.

[36] https://www.onemotoring.com.sg/content/onemotoring/home/buying/upfront-vehicle-costs/tax-structure.html
[37] https://www.singaporebudget.gov.sg/budget_2018/BudgetSpeech/RevenueExpenditure
[38] https://www.onemotoring.com.sg/content/onemotoring/home/buying/upfront-vehicle-costs/tax-structure.html

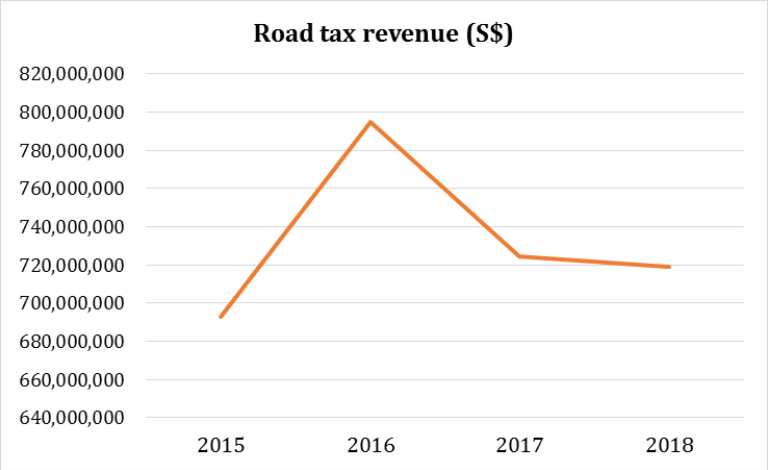
- Road tax surcharge
  The disadvantage of VRF and ARF is that people may respond by buying older, less fuel-efficient vehicle models that tend to break down more often and cause traffic congestion. Therefore, the government imposes road tax surcharge on vehicles that are more than 10 years old to keep the vehicle population young.

Table 3-5: Annual road tax surcharge

Age of vehicle	Annual road tax surcharge
More than 10 years old	10% of road tax
More than 11 years old	20% of road tax
More than 12 years old	30% of road tax
More than 13 years old	40% of road tax
More than 14 years old	50% of road tax

Source: One Motoring[39]. Accessed on 7 January 2020.

Figure 3-5: Road taxes revenue 2015-2018



Source: Singapore Budget 2018[40]

Petrol Duty

Petrol duty is aimed at discouraging excessive use of private vehicles and encouraging fuel conservation and energy efficiency. In Singapore, petrol duty is a fixed amount per litre. It does not increase with the price of petrol. Petrol duty varies as per the fuel type. At the time of writing, based on various sources, petrol duty in Singapore is as follows:

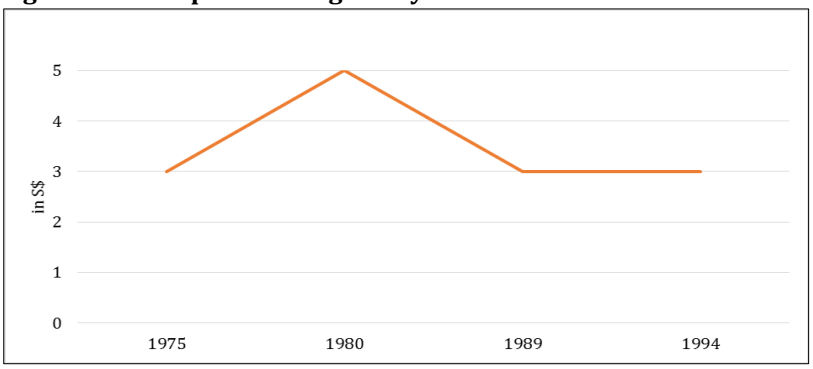
- Unleaded petrol tax: 56 cents per liter; while leaded petrol is 64 cents
- Diesel tax: 20 cents per liter

[39] https://www.onemotoring.com.sg/content/onemotoring/home/owning/ongoing-car-costs/road-tax.html#How_to_renew
[40] https://www.singaporebudget.gov.sg/budget_2018/BudgetSpeech/RevenueExpenditure

Road Pricing

When ALS was started in 1975, it charged a flat fee for unlimited entries. A car that entered the restricted zone only once paid the same amount as a vehicle that made multiple entries in a day and contributed more to traffic congestion. As shown in Figure 3-6, the ALS charge was started at S$3 in 1975 and increased to S$5 in 1980. In 1989 until the system is replaced by ERP, the charge was decreased back to S$3.

Figure 3-6: ALS price through the years



Source: Author, adopted from Goh (2014).

Table 3-6: ALS scheme charges – Singapore

Implementation Date	Weekday hours of operation	Daily license fee in Singapore Dollars				
		Private Car	Company Car	Taxi	Commercial Vehicle	Motor-cycle
Initial Scheme						
2 June 1975	7:30 am – 9:30 am	3	3	0	0	0
23 June 1975	7:30 am – 10:15 am					
1 August 1975				3		
Subsequent Changes						
1 January 1976		4	8	4		
1 April 1977				2		
1 March 1980		5	10			
13 February 1984						
19 November 1986						
1 June 1989	7:30 am – 10:15 am 4:30 pm – 7:00 pm	3	6	3	3	
1 July 1989						1
1 December 1989						
31 January 1990	7:30 am – 10:15 am 4:30 pm – 6:30 pm					
3 January 1994	Whole Day License M-F: 7:30 am – 6:30 pm Sat: 7:30 am – 3:00 pm	3	6	3	3	1
	Part Day License M-F: 10:15 am – 4:30 pm Sat: 10:15 am – 3:00 pm	2	4	2	2	0.70
2 May 1995	Restricted hours end at 2:00 pm instead of 3:00 pm on Sat					

Source: Phang and Toh (1997)

ERP charges were determined based on the Passenger Car Unit (PCU) equivalent, location of the gantry, and time of entry into a restricted zone. Currently, during peak hours, charges change every half hour to control traffic volumes. The operating hours of cordon ERP are generally from 8 AM to 8 PM on weekedays, and from 12:30 PM to 8 PM on Saturdays for two cordons. While for expressways and arterial roads, they are from 7AM to 9:30 AM and from 5:30 PM to 8 PM for two expressways. There are no ERP charges on Sundays and public holidays. The current lowest rate charged for 1 PCU vehicle for a half-hour is 50 cents and the highest is S$6[41].

Table 3-7: Vehicles categorization for ERP

Vehicle Type	Passenger Car Unit (PCU)
Cars, taxis, and light goods vehicles	1.0 PCU
Motorcycles	0.5 PCU
Heavy goods vehicles and small buses	1.5 PCU
Very heavy goods vehicles and big buses	2.0 PCU

Source: https://development.asia/case-study/case-electronic-road-pricing

ERP rates are reviewed every quarter and in June and December for the major school holidays. Rates are adjusted to ensure that traffic speeds are within the optimal speed range of between 45 and 65 kilometers per hour (km/h) for expressways and between 20 km/h and 30 km/h for arterial roads. If the average speed in an ERP area exceeds the upper limit, the rate for that area for that half-hour will be reduced by 50 cents for 1 PCU. If the average speed is lower than the lower limit, the rate will be increased by 50 cents.

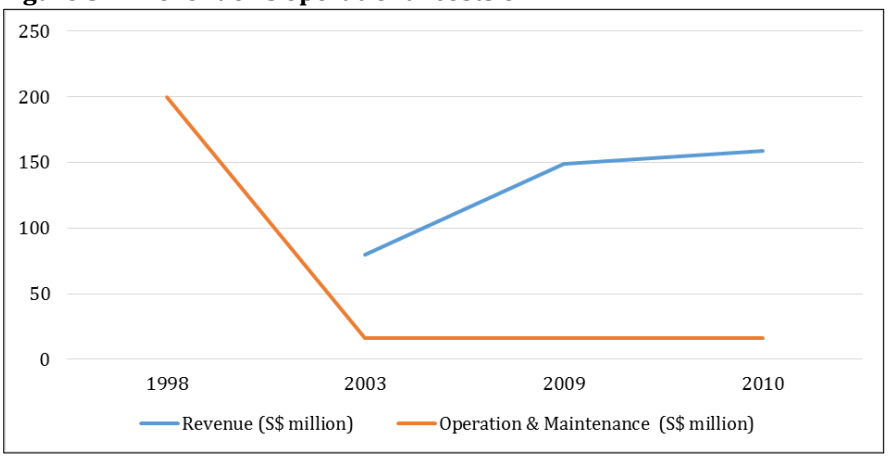
When the ERP was put into operation, the government reduced the vehicle registration fee, ARF, and the road taxes on vehicles.

Singapore focused on transport equity by diverting the majority of toll revenue to the improvements in public transport systems (King, Manville, and Shoup, 2007). With the revenue it generated from the ALS system, the Government developed the Mass Rapid Transit System (MRTS) in 1988 and Light rail network in 1999 (TRB, 2003). With factor like increase in public transport ridership, improvements in public transport systems, reduced congestion, and improvements travel time reliability, contributing to the improved travel experience, the public acceptance increased for the congestion charging system.

When the ERP was put into operation, the government reduced the vehicle registration fee, ARF, and the road taxes on vehicles. It also provided the in-vehicle unit free of charge. These measures were carried out to lessen the cost burden on motorists as well as to gain public acceptance of ERP. The ERP system, inclusive of the IUs installed, costs about S$200 million in 1998. The revenue from the ERP charges goes to the Government Consolidated Fund, and is not hypothecated for transport-related expenditure. As shown by Figure 3-7, the revenue of ERP is far above the operational and maintenance costs.

[41] 1 US$ = 1.355 S$ as of 19 December 2019

Figure 3-7: Revenue vs operational costs of ERP



Source: Various.

3.1.4. Technical and Technological Factors

The ERP system is using a DSRC technology of 2.54 GHz band. It charges motorists every time the vehicle passes under an ERP gantry. All Singapore-registered vehicles must install an in-vehicle unit (IU). There are different IUs for different classes of vehicles, i.e. for cars, taxis, light goods vehicles, heavy goods vehicles, buses, motorcycles and emergency vehicles (fire engines, police cars and ambulances). This is necessary because the ERP charges are different for different classes of vehicles (Table 3-7). The IUs are color coded so that illegal switching of IUs between classes of vehicles can be discouraged. (Goh, 2014)

The IU communicates with the ERP gantry to deduct the ERP charge. There are two ways of payment:

1. A stored value contact smart card, called CashCard, inserted into IU: motorists need to ensure that the card has sufficient value. There are several providers of CashCard. It can be purchased for instance in supermarkets, at petrol stations and at providers' payment points. While topping up the balance in the card can also be done through ATMs.
2. Backend payment services: the payment is made via credit/debit card, as such no smart card is needed. Motorists only need to register their credit/debit card in advance.

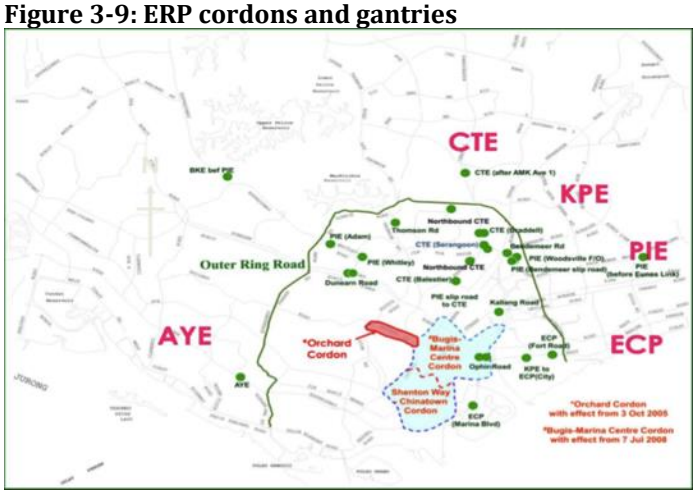
Figure 3-8: In-vehicle Unit

Source: The Straits Times[42]

[42] https://www.straitstimes.com/multimedia/photos/in-pictures-electronic-road-pricing-through-the-years

ERP gantries were placed at all roads linking into the central business district and along expressways and arterial roads with heavy traffic to discourage usage during peak hours. As of 2014, there were 77 ERP gantries in Singapore.

Figure 3-9: ERP cordons and gantries



Source: Goh (2014)

Figure 3-10: ERP gantry

Source: The Straits Times[43]

The new system is more effective as it gives Land Transport Authority (LTA) the flexibility to target specific roads, areas, or specific time periods. As such, it redistributes traffic away from congested areas and times.

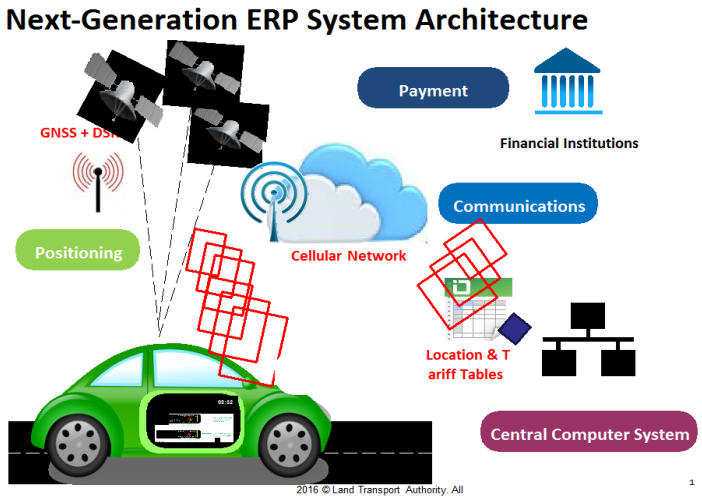
Singapore has planned to upgrade the ERP into a GNSS-based system by 2020, which will allow distance-based road pricing. The government argued that the current gantry system will no longer be financially prudent because of the increasing maintenance cost, and most of them are coming to the end of its cycle and will have to be replaced, even if the new system would not have beeen implemented. A S$556 Million contract for the new ERP has been awarded.

All ERP gantries will be dismantled. Existing IUs will be replaced with new on-board units (OBUs). The unit will be able to send notifications to drivers about priced roads and charges, and to provide real-time traffic information, such as drivers can take informed decisions on when to drive, which

[43] https://www.straitstimes.com/multimedia/photos/in-pictures-electronic-road-pricing-through-the-years

route to take, or leave the car at home and take public transport instead. However, concerns about the data collected by the government were raised, as the new system will track every movement of the motorists. Proponents of the new system argued that data tracking could also be done through the use of smartphones[44].

Figure 3-11: New satellite-based ERP system



Source: The Straits Times[45]

3.1.5. Legislative Factors

Road pricing in Singapore is regulated through the Road Traffic Act for the regulation of road traffic and the use of vehicles and the user of roads and for other purposes connected therewith. At the time of writing, the most recent version that regulates ERP is **Road Traffic (Electronic Road Pricing System) Rules 2015**, regulates road traffic that includes in-vehicle units, levying of road-user charge, and offences and other provisions such as ERP signage. The rules specify 7 types of unlawful entry that are liable on conviction to a fine or imprisonment or both, such as no IU installed in the vehicle, the IU is not properly installed or defective, and no ERP card with sufficient stored value has been properly inserted in the IU of the vehicle.

The ERP system requires vehicles to have an In-vehicle Unit and smart card. The smart card is inserted to the IU and then functional when entering into the control points. For the cases of low balance in the smart card, a fine of S$10 were levied and further S$70 were levied when this fine is not paid within 28 days. Vehicles entering the control points without the smart card were levied S$70.

Prior to the implementation of ERP in 1998, a Driving-Offence Points System was introduced in 1983, whereby offenders of certain congestion-related offences were imposed with fines and demerit points. Those who received demerit points repeatedly would be disqualified from driving for at least one year. This shows that for the effective implementation of ERP, stringent enforcement is one of the prerequisites. Enforcement actions against traffic offences and implementing ERP are complementary to each other and synergetic.

[44] https://vulcanpost.com/539781/singapore-satellite-based-erp-data-tracking-concerns-are-overrated/
[45] https://www.straitstimes.com/singapore/transport/ncs-mhi-to-build-islandwide-satellite-based-erp-for-556m

3.1.6. Procedural Factors

Before ALS was implemented, the government undertook outreach activities, a one-year dialogue on the details and some subsequent modifications (World Scientific, 2016). The government also conducted yearlong studies, assessments and educational programs, before implementing the system. (Provonsha and Sifuentes, 2018). The system was also continuously improved based on public feedback, which further enhanced public acceptance.

- **Studies**

Before ERP was implemented to replace the manual systems in 1985, the government studied electronic road pricing trial in Hong Kong. Unlike Hong Kong, the Singapore government did not conduct cost benefit studies, most probably because in fiscal year 1993, it collected S$4.7 billion from taxes and levies on motor vehicles, with S$1.6 billion coming from the monthly auctions of COEs. Given the substantial contribution of motor vehicle taxes and auction incomes. ERP could be implemented by using funds from user charges (the benefit principle). The five-year S$39 million operating cost of the ERP works out to S$39 million/ 5 years/ 642,000 vehicles = S$12 per vehicle per year, insignificant considering the fact that the road tax on a subcompact Mazda 323 is S$1440 a year. (Phang and Toh, 1997).

- **Outreach activities**

After the government passed the legislation to introduce ERP, pamphlets were sent to all motorists explaining how the ERP system works and whereabouts of IU installation centers, along with a notice for a free IU unit and installation (Menon and Guttikunda, 2010). There were frequent articles in the newspapers, on television and radio on ERP. Public forums were held to explain the ERP scheme and to highlight the benefits of the scheme, which include faster travel times, increased economic opportunities, and improved quality of life. It also promoted the impact of complimentary measures, such as improving public transport systems. Feedback from the public on the system and the pricing structure was also gathered.

- **IU collection and installation**

At the IU installation center, motorists received a free IU unit and had it installed. They also received a booklet on how the unit worked and on simple trouble-shooting tips. The IU fitting program to the vehicles were carried out for 10 months from September 1997. Vehicles were divided into batches and are invited to have the IU fitted to them batchwise, to avoid last minute rush. Within the 10-month period, the fitting of the IU was free of cost, but after this period, it was charged of S$150. The scheme saw a huge success with 98% of the vehicles fitted with IUs. For foreign vehicles, temporary battery powered IU were made available (Keong, 2002).

Figure 3-12: Public awareness campaigns in the newspapers

Source: Menon and Guttikunda (2010)

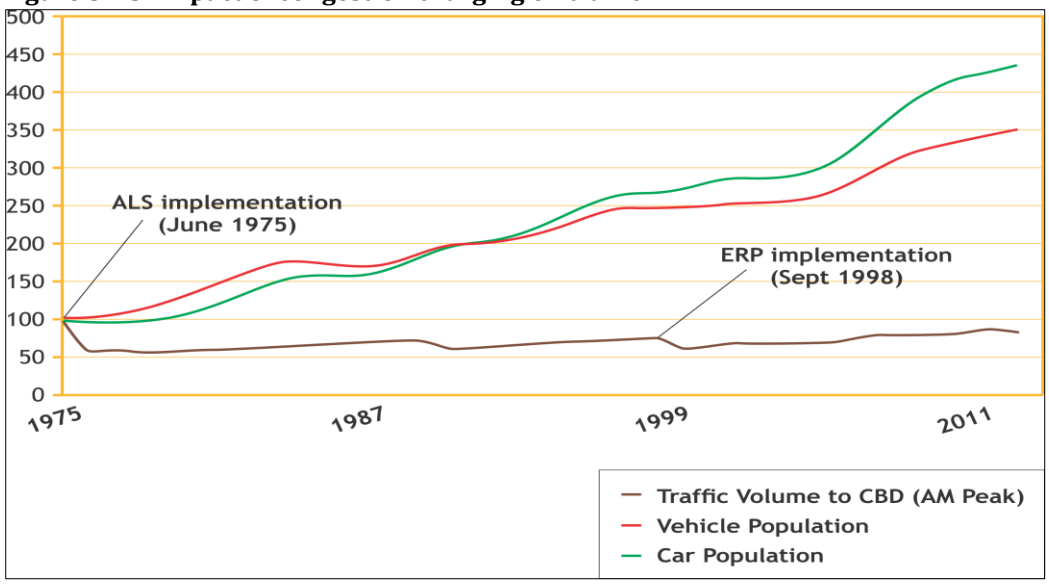
- **Test drive**

A test drive was initiated three months prior to ERP start of operation. By this time, most of the vehicles had their IUs fitted and Cashcards were readily available. During the trial period, the motorists were not charged, but advised to check their IUs and CashCards by driving under any operational ERP gantry and report errors, if any. Motorists experiencing problems with their IUs or CashCards were advised to return to the workshops to have their IUs checked or to exchange their faulty CashCards with new ones. (Menon and Guttikunda, 2010)

3.1.7. Data Collection Method

By implementing road pricing, Singapore has been able to ease traffic congestion in the city center despite the continued growth in car population. As shown by Figure 3-13, the implementation of ALS in 1975 and then ERP in 1998 resulted in immediate decrease of the traffic volume to the CBD. Traffic volume has been staying below 1975 levels. Over the 14-year period from 1998 to 2012, the vehicle population in Singapore has increased by 3% per year, but the traffic volume to the CBD has only increased marginally by 0.8% per year (Goh, 2014).

Figure 3-13: Impact of congestion charging on traffic

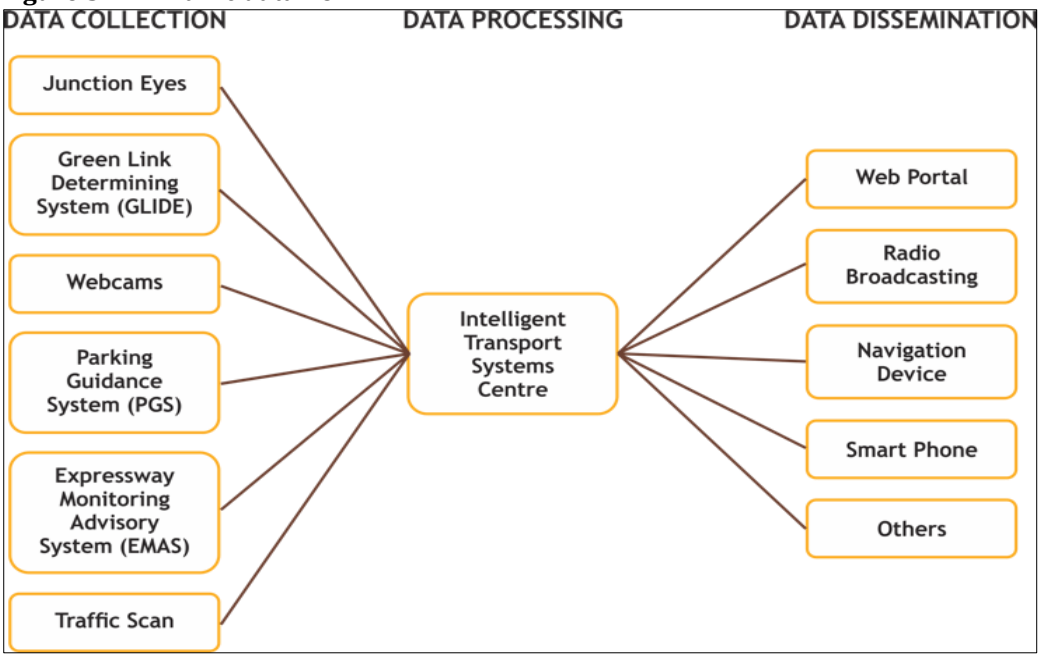


Source: Goh (2014)

The effectiveness of the ERP system to promote modal shift to public transport is measured through household surveys. According to the latest household survey in 2015, more than half of Singapore's resident working persons commuted to work by public bus or the MRT, which is higher than the numbers in 2010. In particular, the proportion commuting to work by MRT with a transfer to/from public bus increased from 17.6 per cent in 2010 to 24.8 per cent in 2015. Conversely, those who used cars as the only mode of transport to work decreased from 24.8 per cent to 21.9 per cent over the same 5-year period (Department of Statistics Singapore, 2015).

Traffic data is collected by the LTA through advanced Intelligent Transport Systems (ITS) such as Expressway Monitoring Advisory System (EMAS) and Traffic Scan. Data is aggregated, integrated and disseminated at the ITS Centre for the purpose of traffic monitoring, incident management, and traffic analysis and planning.

Figure 3-14: Traffic data flow



Source: LTA Singapore

Although outreach activities were elaborately done before the implementation of ERP started, there is no information as to whether WTP and WTA surveys were conducted to examine the motorists' response to the ERP rates. There are two most probable reasons for this. First, the ERP rates are flexible and determined based on real-time traffic volumes, instead of flat rates, as such motorists did not directly see a "number" as to how it would impact their expenses. Secondly, the absence of the surveys might come from the fact that Singapore is a centrally controlled country with a heavy dose of state intervention in the economy.

3.1.8. Capacity Building

In 2006, LTA Academy is established as the capability building arm of the LTA with the following vision and mission:

- *Vision*: to be a leading global institution on land transport
- *Mission*: to share Singapore's experience and expertise on land transport, and promote research and the exchange of best practices within the global land transport community.

LTA Academy serves as a one-stop focal point for governments, organizations and professionals around the world to tap Singapore's know-how and exchange best practices in land transport management and development. It leverages in-house expertise and strong collaborations with strategic partners to[46]:

Figure 3-15: LTA Academy

Source: Website of LTA

- Deliver practical knowledge and holistic learning through professional programs, seminars, international conferences, study visits and advisory services.
- Support long-term manpower needs of the public transport industry, and develop strategies and programs. Drive knowledge management by capturing and sharing institutional knowledge for the development of human capital.
- Develop thought-leadership in urban transport policy and planning through active engagement with the sector and facilitate strategic alliances for collaborative research.

There are three key programs delivered by LTA Academy: 1) Policy and Planning; 2) Transport Infrastructure; and 3) Transport and Innovation Systems. ERP system falls under the last category, together with other innovation systems such as ITS, public transport telematics, and driverless automated train systems.

3.1.9. Lessons Learned

Since its inception in 1975, road pricing in Singapore has been effective in controlling traffic volume even though vehicle population keeps growing. The scheme has also been very successful in managing congestion in restricted zones in the CBD, on arterial roads and expressways. It not only controls the number of cars registered but also imposes a very restrictive car usage system. The ERP system has been so successful in controlling car usage that many other cities in the world, including London, have emulated the concept. The scheme sees hefty entry charges for private cars on all major and minor roads leading into the central business district.

The success factors are, among others:

- The availability of viable alternatives for motorists who do not want to pay the congestion charges, i.e. an alternative route or time of travel, and a good quality, attractive and affordable public transport system.
- Intense publicity and communications are of utmost importance, especially to communicating the rationale of the scheme to road users and communities. Singaporeans were generally well informed and support the policies of the government.

46 www.lta.gov.sg/content/ltagov/en/industry_innovations/industry_transformation_map/academies/lta_academy.html

- Testing of the devices and the system reliability have to be planned carefully and executed without causing unnecessary hassle to the motorist.
- The "pay per use" concept and the rates adjustments of six times a year (to adapt to changing and seasonal traffic patterns), are perceived fairer by motorists and non-motorists and create awareness that the pricing scheme is a traffic management tool and not a revenue-generating one.
- The flexibility and adaptability of the ERP charging strategy, as such those who pay are those who contribute to traffic congestion.
- Regular traffic monitoring and traffic data collection are necessary to understand exactly how the implemented road pricing scheme is affecting the traffic conditions and what remedial measures can be introduced.

3.2. United Kingdom

3.2.1. Introduction

This is a case study of road pricing in a non-OIC member state – United Kingdom. It was selected because of its long experience in congestion charging in its capital city London. The UK also attempted by failed to introduce it in other cities. The UK has limited tolling in bridges but no direct road pricing on its roads, so it is informative to understand this. National roads have been autonomously managed for many years but there is no hypothecation of funding for roads, which is almost entirely paid for from UK Government revenues.

Road Network

The UK road network is a radial system centring on London comprising 3,497 km of motorways, 46,904 km of main roads and 344,000 km of paved roads. The full network is shown in Figure 3-16.

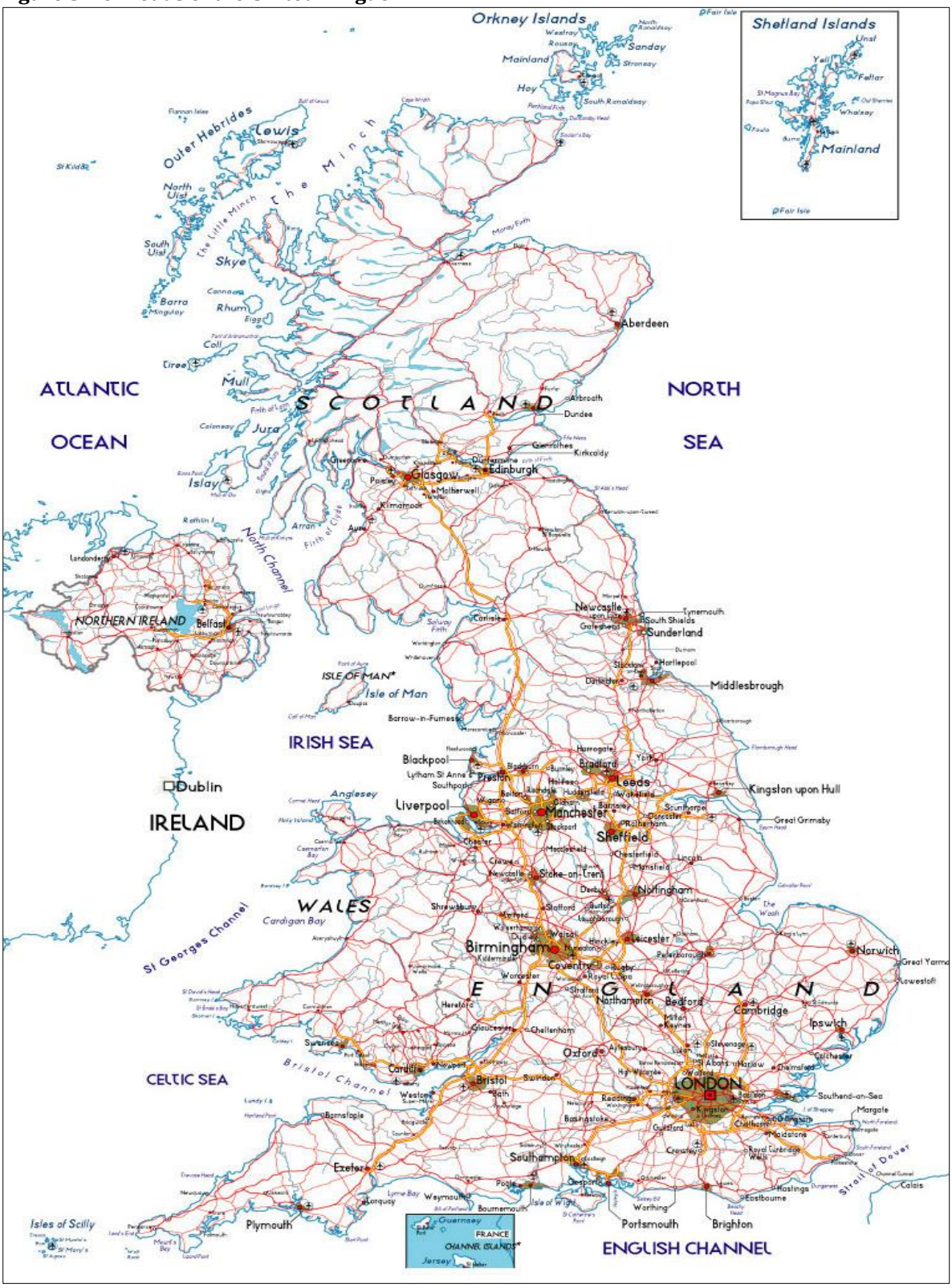
Management and Administration of National Roads

Road provision maintenance and operation is fully devolved to each of the national domains of England, Scotland, Wales and Northern Ireland, each of which has been commercialised as this case study will show. This case study will focus mostly on England, while referring to the national policy and legal context as necessary. Highways England Company Limited is the 100% government-owned company charged with operating, maintaining and improving England's motorways and primary roads.

London Congestion Charge

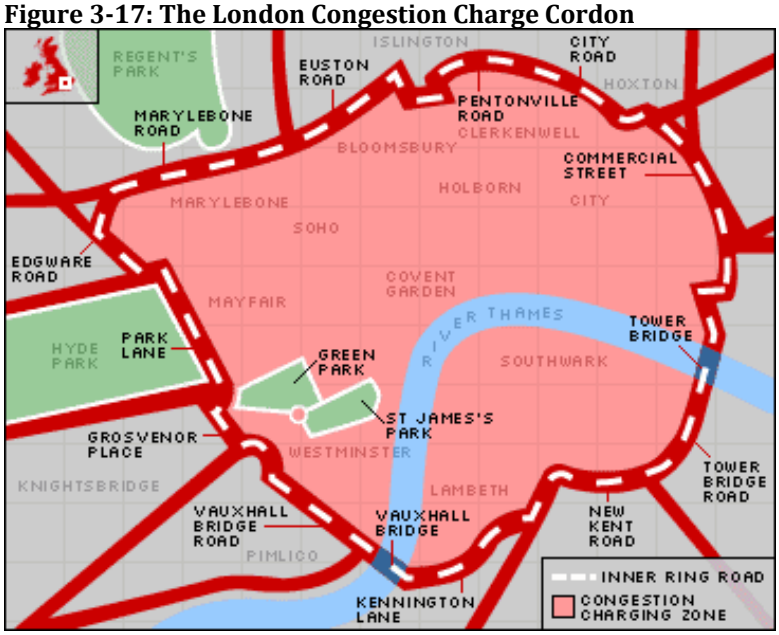
The London Congestion Charge was one of the first to be introduced in the world in 2003 to cut traffic levels and help ease severely clogged roads. The scheme was intended to raise money to re-invest in the capital's transport system including metro and busses. The area in which charges apply is a zone measures 21 square kilometres, within the Inner Ring Road - the most central and heavily congested part of London (refer to Figure 3-17). Charges apply between 7am and 6.30pm from Monday to Friday, excluding public holidays. Cars were £5.00 in 2003, which increased to £10.00 currently. It is run by local government, i.e. TfL.

Figure 3-16: Roads of the United Kingdom



Source: http://www.maps-of-britain.co.uk/large-road-map-britain.html

Figure 3-17: The London Congestion Charge Cordon



Source: BBC News[47]

The London Congestion Charge zone was rebranded to be the Ultra Low Emission Zone (ULEZ) from April 2019. The area covered remains the same as the congestion charge until 2021 when it is expanded up to the London Outer Orbital (M25) as shown in Figure 3-18. The objectives have changed since 2003 from reducing traffic congestion to reducing pollution.

Figure 3-18: Limits of the ULEZ

Source: https://www.bbc.com/news/uk-england-london-47815117 and the TfL

[47] http://news.bbc.co.uk/1/shared/spl/hi/uk/03/congestion_charge/exemptions_guide/html/what.stm

Figure 3-19: The London Ultra Low Emission Zone

Source: BBC News[48]

The case study will consider both national road pricing and the congestion charging using the systematic approach that is set out earlier.

3.2.2. Political Factors

Establishment of Autonomous Highway Agencies

The need to have separate agencies for the provision of roads was recognised long ago in the 1968 Transport Act that initiated many new transport sector management concepts. This included setting up semi-autonomous highways Agencies and also integrated land use and transport planning and metropolitan transport authorities. There is political acceptance that roads should be managed as an entity like rail and air and have similar disciplines to those of the private sector. Many have called the process, commercialisation because it requires a very business-like approach, especially to the procurement of works through contracting. More recent changes have seen political support for outsourcing road maintenance on routes and areas. However, despite becoming more business-like, road users are not directly paying a price for road usage and only a very small section of road and a few major estuarine and river bridges and tunnels are tolled as shown in Figure 3-20.

The Common Good

The conventional wisdom in the UK and elsewhere is that roads are public services that should be funded directly through taxation as they are considered to be common good (Benson, 2003). The common good is also seen as providing benefits that are beyond the intrinsic value of those goods and services such as better living conditions, education and employment opportunities. The existence of external benefits has often provided the rationale of state support. However, the counter argument is that this should not be the basis for state intervention because almost all goods and services have both direct benefits to the consumer and indirect benefits to the rest of society so by extension, the state should be prepared to fund almost everything (Roth, 1996). There is no reason

[48] https://www.bbc.com/news/uk-england-london-47815117

to suppose that the benefit to the community from a new or improved road is any greater than the benefit from an improved supply of electricity, water supply or other utility for which payment is made (Block, 1983).

Figure 3-20: UK Map of tolled sections of roadway

Source: RAC[49]

Supporting the London Congestion Charge

When introduced the congestion charge at £5 a day in February 2003 with the aim of reducing traffic congestion in and around the charging zone. The political force driving the LCC was that it would generate much needed funding for public transport and it wold reduce the congestion in Central London. Politicians quickly saw that it was a good source of funding increased the basic charge to . Among other aims, the congestion charge was to reduce the length of journeys and travel time within the congestion zone, improve bus services and encourage motorists to use public transport instead of their cars. The charge also attempts to collect net revenues to improve public transport facilities in London, as, by law, the proceeds raised by the congestion charge must be added to expenditure on public transport in London. The LCC faced criticism since its inception that needed addressing. Opponents challenged its regressive nature, and lack of equity some have described the congestion charge as a 'tax on the poor'. The impact of the congestion charge on businesses within central London was a source of contention due the increase in costs that charging would create.

The congestion charge was welcomed by environmentalists as a way of reducing carbon emissions and encouraging people to use public transport, and town planners across the UK have begun looking into the scheme as a way of cutting congestion. However, the decision to extend the

[49] https://www.rac.co.uk/drive/advice/legal/a-guide-to-uk-toll-roads-bridges/

congestion charge zone to the west from February 19th 2007, reignited the debate in London. A Transport for London consultation found 70 per cent of the public and 80 per cent of businesses in the capital were against further extension. To appease its critics, the timing of congestion charge across was reduced by 30 minutes from 18:00, rather than 18:30.

An expensive anomaly was that a number of embassies in London refused to pay the congestion charge as they believed they are exempt under the Vienna Convention, which grants ambassadorial staff immunity from local taxes and so it is that diplomats owe $150 Million[50].

A very useful political advance was attempted to charge for the most polluting vehicles to in 2008 but it faced much opposition was dropped. LCC received a political boost when research suggested there could be unexpected health benefits from the reduction of exposure to nitrogen dioxide. (NO2 levels increase when combustion efficiency reduces in slow moving traffic). The negative impact on health was ceased upon to restart the process to expanding the LCC. As a result the Ultra Low Emissions Zone was established. The lesson learned here is that health is a very good political driver to introducing congestion charging.

3.2.3. Institutional and Organizational Factors

Department of Transport

The main government body responsible for transport in the United Kingdom is the Department for Transport or DfT. It provides a fully integrated service covering all the transport subsectors[51]. Its mandate is listed as follows:

- providing policy, guidance, and funding to English local authorities to help them run and maintain their road networks, improve passenger and freight travel, and develop new major transport schemes
- investing in, maintaining and operating around 4,300 miles of the motorway and trunk road network in England through Highways England
- setting the strategic direction for the rail industry in England and Wales – funding investment in infrastructure through Network Rail, awarding and managing rail franchises, and regulating rail fares
- improving English bus services through funding and regulation
- working to make our roads less congested and polluted by promoting lower carbon transport, including cycling and walking
- encouraging the use of new technology such as smart ticketing and low carbon vehicles
- maintaining high standards of safety and security in transport
- supporting the maritime sector by producing the overall strategy and planning policy for ports in England and Wales
- setting national aviation policy, working with airlines, airports, the Civil Aviation Authority and National Air Traffic Control.

[50] https://metro.co.uk/2019/05/09/foreign-diplomats-owe-uk-116000000-unpaid-congestion-charge-fees-9474172/
[51] https://www.gov.uk/government/organisations/department-for-transport/about

Roads Organizations

The DfT roads sections are listed in Table 3-8 under its three main responsibilities, which are regulatory, operational, and development. The title Roads Places and Environment Group (RPEG) suggests a contemporary approach to subsector management. This is shown in the various roles of units with the RPEG where roles for environmental protection, pollution, land use and economics are evident.

Table 3-8: Department for Transport – Roads Organisation Functional Analysis

UK Department for Transport		
Roads Places and Environment Group		
Regulations	**Operations and Technology**	**Infrastructure and Investment**
Driver and vehicle standards agency	Dangerous goods/transport infrastructure planning	Local infrastructure
People, communications and engagement	Traffic and technology	Local and regional transport analysis
Finance and corporate services operations	Government car service	Active and accessible travel
Operations (South)	Energy, Technology and innovation	Regions, cities and devolution
Enforcement	Low environmental strategy	North and devolution
Strategy, policy, digital and technology	Low carbon fuels	London, south, east and housing
Driver and vehicle licensing	Office of low emission vehicles	South west and regional programmes
Human resource and estates	International vehicle standards	Strategic roads, economics and statistics
Customer services	Centre for connected and automated vehicles	Roads invesment strategy futures
Strategy, policy and communications	Joint air quality unit	Roads investment strategy client
Vehicle certification	Environmental analysis	Roads economics
Technical and statutory operations	Local transport	Statistics, road and freight
Corporate affairs	Buses and taxis	
Road safety, standards and services	Statistics travel and safety	
Operator licensing and roadworthiness		
Road user licensing, insurance and safety		
EU exit domestic		
EU exit international		
EU exit borders and motoring services		
Freight		

Source: UK Department for Transport[52]. Fimotions for analysis and design of table

[52] https://www.gov.uk/government/organisations/department-for-transport/about

Highways England

Highways England Ltd. is the wholly government company charged with operating, maintaining and improving England's motorways and major A roads. The history of road subsector management commenced with selling off regional road construction units (RRCUs) in 1979 to consulting companies. The job of RRCUs was to design and construct primary roads according to the national road development programme. Road maintenance remained separated private companies until it was renationalized in 2015. As part of this transition, government set out its vision for the future of the strategic road network in its Road Investment Strategy. Highways England is now undertaking £15 billion of investment between 2015 and 2020 to improve the network in response to this. Almost all of the investment is public sector, tolled roads in the UK being limited to one short section in the Midlands and some important bridges and tunnels. Note that there are separate roads agencies for Scotland and Northern Ireland. Highways England is a private company limited by shares, wholly owned by the Government. The Highways England Board is accountable to the Secretary of State for Transport; responsibility for operations is that of the Chief Executive Officer (CEO) who is accountable to the Permanent Secretary of the DfT for the application of public funds; both the CEO and PS are ultimately accountable to Parliament for the activities and performance of Highways England.

Highways England is responsible for:

- Implementing the roads development strategy and maintenance for England through area teams.
- Performance Monitoring and customer satisfaction
- Traffic conditions and information
- Health and safety of road users.

Area teams are responsible for the development, maintenance, management and operation of the national motorway network. The areas being awarded contracts to implement business plans which are entirely funded by the state. The areas manage traffic flow, including responding to accidents and incidents. Emergency services are provided by another group that are responsible for road safety – this group is linked to the police and ambulance services, so there are very specific services equipped for first responses to road accidents and break downs. Traffic information is provided by another unit that provides information for variable message signing the media – including route and timing notifications and information about accidents and traffic congestion. An interesting and noteworthy aspect of road subsector management is that performance of areas teams is independently monitored by the Office of Rail and Road (ORR) that purports to represent the interests of transport users.

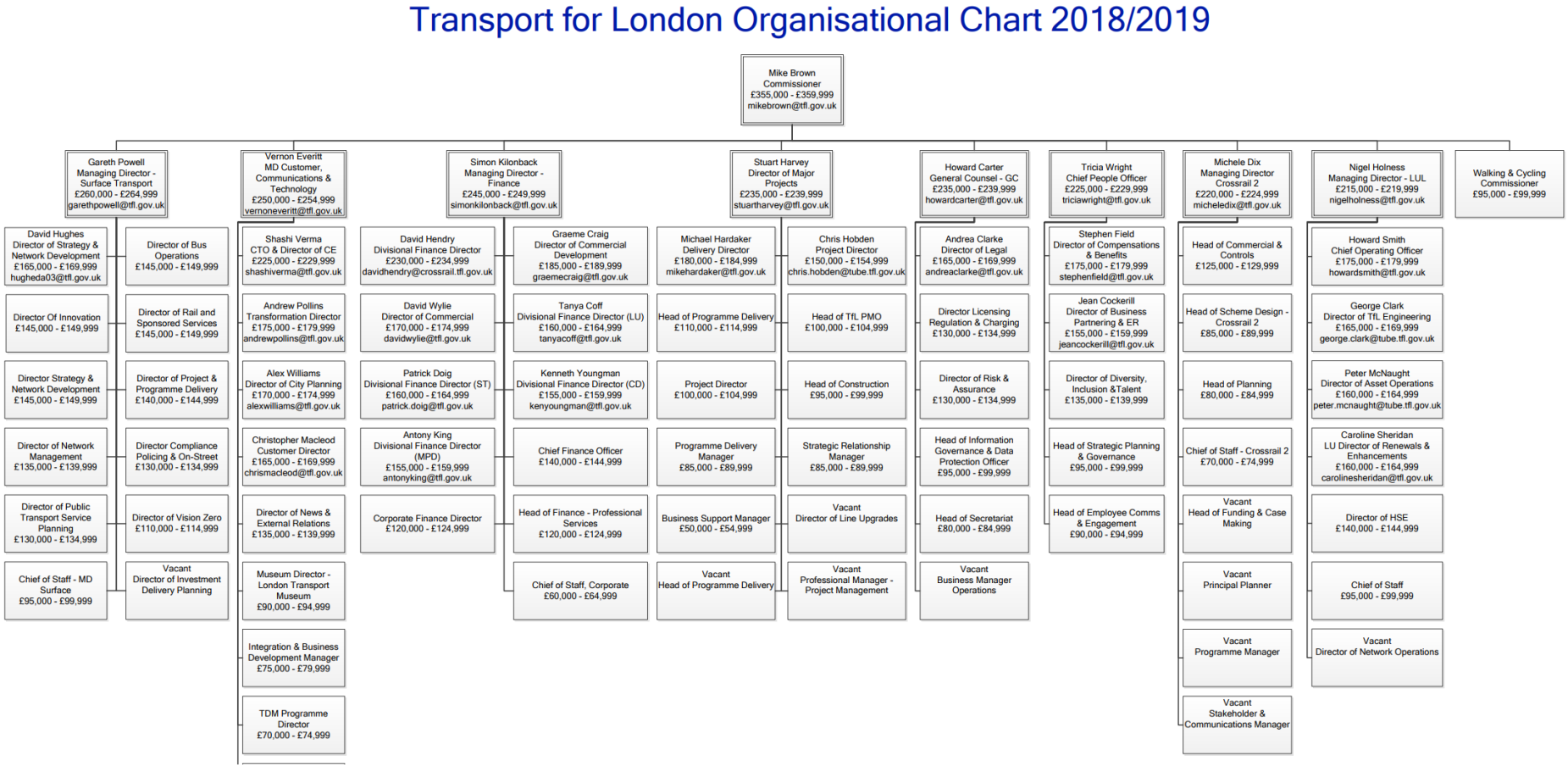
In this way roads are said to be commercially managed. However, such commercialisation applies to the supply side and not the demand side and in that way commercialisation is incomplete. It is noteworthy that there is no direct income from road users nor any transaction contract or commitment between road providers and users that is legally binding on the road authority – Highways England. Nor is there any hypothecation of government revenues that must be allocated to roads. While there are many sources of revenue generated by road users, there is no specific price paid for road usage, in other words the road user pays approach is not applied in the UK.

Transport for London (TfL)

TfL is responsible for all transport in the capital city including road and public transport. TfL is responsible for managing the congestion charge - the income from which is dedicated to transport and nothing else. This is not the case nationally as has already been pointed out. TfL has a budget of

about $18 billion and is controlled by a Commissioner for TfL. TfL is part of the Greater London Authority, which is the local government political entity. The organization of TfL is provided in Figure 3-21. The chart is available on the TfL web site to show who the senior officers are and how much they are paid as well as how the TfL is organized. There is much emphasis placed on transparency in London's Local Government and this helps to implement and manage various aspects of transport provision including the London Congestion Charge.

Figure 3-21: Transport for London – Organizations



Source: http://content.tfl.gov.uk/data-transparency-organisational-chart.pdf

3.2.4. Economic and Financial Factors

National Roads

England and Wales currently have a sizeable network of roads, and funding is currently provided at two different levels. The major roads (the strategic road network) are funded by the central government and managed by the Highways Agency. Local roads, on the other hand, are the responsibility of local authorities. UK road users contribute indirectly through specific and general taxation but because there is no hypothecation or special account for expenditure on roads, allocation is a matter for the annual budgeting process. This has meant that it requires special study to examine exactly what has been paid by road users in the UK. Such an exercise was last carried out in 2008 the results are shown in Table 3-9. Note that tolling accounted for only 0.6% of revenue raised from road users. This confirms the point made earlier that while there are road user charges, there is almost no direct road pricing at the national level in the UK and this remains the case at the current time.

Table 3-9: Road User Charges UK 2018

Tax or Charge	Revenue raised £billion per annum (gross)[1] 2007-08	Main transport impact
Taxes and charges specific to road users		
Fuel duty	24.9	Reduce vehicle mileage and encourage fuel efficiency
Vehicle Excise Duty	5.4	Encourage purchase of more fuel-efficient vehicles
Tolls (bridges, tunnels, M6 Tolls, etc)	0.3[2]	Fund specific infrastructure and manage demand
London Congestion Charge	0.3[3]	Reduce traffic and congestion in central London; fund transport infrastructure and services
Total specific to road users	*30.9*	
General taxes paid by road users		
VAT on fuel	6.8[4]	Reduce mileage and encourage fuel efficiency
VAT on vehicle sales	6.9[5]	Reduce rate of new vehicle purchase
Insurance premium tax	1.0	No specific transport impact
Company Car Tax and Fuel Benefit Charge[6,7]	2.5	Encourage purchase of more fuel-efficient vehicles
Total general taxes	*17.2*	
Total Paid	**48.1**	

Source: House of Commons (2009)
Notes:

1. Figures rounded to nearest £0.1 billion. Main source is HM Treasury Ev 219
2. Estimated by National Alliance Against Tolls-Ev122
3. TfL, *Central London Congestion Charge: Sixth Annual Monitoring Report, July 2008, p220*
4. Figure provided by the RAC –Ev 172. According to HM Treasury (Ev219). "HMRC does not collect data on VAT in a way that allows for isolating road users".
5. Figure provided by the RAC – EV 172
6. This is the element of Income Tax and National Insurance Contribution paid on the benefit in kind derived from the provision of company cars and company fuel.
7. Figure is for 2005-06

By comparison, expenditure on roads in 2008 was £9 Billion, which is less than 25% of the government revenues raised from vehicle users[53]. Of the £9 billion, £6 billion was spent on local roads and 3 billion on national roads and 60% on maintenance and 40% on capital projects. Direct expenditure on roads does not address the issue of externalities. The direct cost of providing and maintaining roads is not the total cost of road use. The DfT estimated the average marginal external cost of driving a car an additional kilometre is 15.5p ($0.23, 2008). The external costs are real enough covering traffic congestion, road accidents, local air quality, noise and greenhouse gases. The DfT determined that congestion was the largest component at 13.1p/km. The income from road user charges however amounted to just 3.6p p/km or 23% of the marginal external cost. Given that income amounted to about 25% of direct expenditure. The general conclusion regarding road funding in the UK is that the total income from road users is sufficient to cover both direct expenditure and externalities.

Vehicle Excise Duty (VED)

Current Schedule of vehicle registration tax is presented in
Figure 3-22. The basis for charging is engine is emissions control. Fees are based on a complicated formulation of engine size, year of manufacture, vehicle mass and commercial or private. As basic private car registered after 2001 will cost £265 or $500 if greater 1549 cc or £160 or $300 if less than 1549 cc, while a motorcycle is £91 or $170 and discounts are given to hybrid and electric vehicles. The VED for the heaviest G class with an 8900 cc 400 hp engine is £2050 or $3,800 while for class A1 is £156 or $295. It would appear that on the basis of cc a heavy truck should pay about 6 times more than a car of LDV, whereas they actually pay 7.6 times more.

[53] Source: HM Treasury: Public Expenditure Statistical Analyses (2006–2008 editions), Table 5.2

Figure 3-22: Vehicle Excise Duty UK 2019

Driver & Vehicle Licensing Agency

Rates of vehicle tax

for heavy goods vehicles, special vehicles, private heavy goods vehicles, small island vehicles, buses, combined transport, recovery vehicles and general haulage vehicles

V149/1

Use the tables below to determine the total VED and levy payable for your vehicle based on the revenue weight, axle configuration and Euro status (if applicable) e.g. a two axle rigid weighing 14,500kgs pays B2 i.e. an annual rate of £199 (Euro VI) or £231 (Euro 0-V). **Note** – Where a vehicle exceeds 44,000kgs the VED paid is equal to that for special types vehicles (£1,585 annual/£792.50 six months), levy band G applies (£900/£540 Euro VI, £1,200/£720 Euro 0-V). The following rates are applicable from 1 February 2019.

Rigid goods vehicles

Revenue weight of vehicle, kg		Two axles	Three axles	Four or more axles
Over	Not over			
3,500	7,500	A0	A0	A0
7,500	11,999	B0	B0	B0
11,999	14,000	B1	B1	B1
14,000	15,000	B2	B1	B1
15,000	19,000	D1	B1	B1
19,000	21,000	D1	B3	B1
21,000	23,000	D1	C1	B1
23,000	25,000	D1	D1	C1
25,000	27,000	D1	D1	D1
27,000	44,000	D1	D1	E1

Tractive unit with two axles

Revenue weight of vehicle, kg		One or more semi-trailer axles	Two or more semi-trailer axles	Three or more semi-trailer axles
Over	Not over			
3,500	11,999	A0	A0	A0
11,999	22,000	A1	A1	A1
22,000	23,000	A2	A1	A1
23,000	25,000	A5	A1	A1
25,000	26,000	C2	A3	A1
26,000	28,000	C2	A4	A1
28,000	31,000	D1	D1	A1
31,000	33,000	E1	E1	C1
33,000	34,000	E1	E2	C1
34,000	38,000	F	F	E1
38,000	44,000	G	G	G

Tractive unit with three or more axles

Revenue weight of vehicle, kg		One or more semi-trailer axles	Two or more semi-trailer axles	Three or more semi-trailer axles
Over	Not over			
3,500	11,999	A0	A0	A0
11,999	25,000	A1	A1	A1
25,000	26,000	A3	A1	A1
26,000	28,000	A4	A1	A1
28,000	29,000	C1	A1	A1
29,000	31,000	C3	A1	A1
31,000	33,000	E1	C1	A1
33,000	34,000	E2	D1	A1
34,000	36,000	E2	D1	C1
36,000	38,000	F	E1	D1
38,000	44,000	G	G	E1

Vehicle Excise Duty (VED) and levy bands and rates for articulated vehicles and rigid vehicles without trailers

Heavy Goods Vehicle (HGV) – Tax class 01 (under 12,000kgs)

VED band	Non Direct Debit		Direct Debit		
	12 months	Six months	Single 12 month payment	Total payable by 12 monthly installments	Single six month payment
A0	£165	£90.75	£165	£173.25	£86.63
B0	£200	£110	£200	£210	£105

Heavy Goods Vehicle (HGV) – Tax class 01 (12,000kgs and over)

VED band and rate	Total VED and levy (Euro VI vehicles)		Total VED and levy (Euro 0-V vehicles)		VED rates		Levy bands	Levy rates (Euro VI vehicles)		Levy rates (Euro 0-V vehicles)	
	12 months	Six months	12 months	Six months	12 months	Six months		12 months	Six months	12 months	Six months
A1	£156.50	£85.90	£182	£101.20	£80	£40					
A2	£160.50	£87.90	£186	£103.20	£84	£42					
A3	£176.50	£95.90	£202	£111.20	£100	£50	A	£76.50	£45.90	£102	£61.20
A4	£222.50	£118.90	£248	£134.20	£146	£73					
A5	£227.50	£121.40	£253	£136.70	£151	£75.50					
B1	£189.50	£104.20	£221	£123.10	£95	£47.50					
B2	£199.50	£109.20	£231	£128.10	£105	£52.50	B	£94.50	£56.70	£126	£75.60
B3	£219.50	£119.20	£251	£138.10	£125	£62.50					
C1	£426	£234.60	£498	£277.80	£210	£105					
C2	£481	£262.10	£553	£305.30	£265	£132.50	C	£216	£129.60	£288	£172.80
C3	£505	£274.10	£577	£317.30	£289	£144.50					
D1	£615	£339	£720	£402	£300	£150	D	£315	£189	£420	£252
E1	£1,136	£625.60	£1,328	£740.80	£560	£280	E	£576	£345.60	£768	£460.80
E2	£1,185	£650.10	£1,377	£765.30	£609	£304.50					
F	£1,419	£782.40	£1,662	£928.20	£690	£345	F	£729	£437.40	£972	£583.20
G	£1,750	£965	£2,050	£1,145	£850	£425	G	£900	£540	£1,200	£720

CUSTOMER SERVICE EXCELLENCE CSE

INVESTORS IN PEOPLE | Silver Until 2019

Source: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/770275/v149x1-rates-of-vehicle-tax.pdf

Congestion Charges

The daily LCCs have been progressively increased since they were introduced and are currently double what they were in 2003. For information, details of the charges are set out as published.

London Congestion Charges – 2019

1. £10 if paid in advance or on the day of travel
   £12 if paid by midnight the charging day after travel
   £9 if registered for Congestion Charging Auto Pay
2. Residents registered for the 90 per cent discount:
   If registered for CC Auto Pay
   90p daily charge
   If paying by other methods:
   £5 weekly (5 consecutive charging days)
   £20 monthly (20 consecutive charging days)
   £252 annual (252 consecutive charging days)
3. Fleet operators:
   The minimum number of vehicles a fleet can register for Fleet Auto Pay has been reduced from 10 to six.
   If registered for Fleet Auto Pay: £9 daily charge
   If paying by other methods: £10 daily charge
4. Greener Vehicle 100 per cent Discount:
   The GVD will allow a 100 per cent discount from the Congestion Charge for cars that emit 100g/km or less of CO2 and that meet the Euro 5 standard for air quality. Owners must register for the discount and pay an annual £10 fee per vehicle.
5. Electric and plug-in hybrid electric vehicles 100 per cent discount:
   Plug in electric hybrid vehicles are now eligible for the electric vehicle 100 per cent discount. Owners must register for the discount and pay an annual £10 fee per vehicle.
   9+ seat 100 per cent discount
   In order to receive the 100 per cent discount, owners of vehicles with nine or more seats must now make an annual £10 payment per vehicle.

During the first ten years since the introduction of the scheme, gross revenue reached about £2.6 billion up to the end of December 2013. From 2003 to 2013, about £1.2 billion has been invested in public transport, road and bridge improvement and walking and cycling schemes. Of these, a total of £960 million was invested on improvements to the bus network. Therefore with respect to the first objective of providing funding for transport in London the LCC has been successful. With regards to the second objective, that of reducing traffic congestion, a 10% reduction in traffic volumes from baseline conditions has been recorded. In fact the TfL has concluded that congestion in central London are close to pre-charging levels after 10 years of operation. In summary, the effectiveness of the congestion charge in reducing traffic volumes means that conditions would be worse without the Congestion Charging scheme[54]. However, earlier studies concluded that the London congestion charge, which is a technical and political success, seems to be

[54] https://consultations.tfl.gov.uk/roads/cc-changes-march-2014/user_uploads/cc-impact-assessment.pdf

an economic failure, the benefits generated by slight improvements in travel time savings have not been sufficient to cover the cost of LCC operations (Prud'homme, 2005). Taking all into account, the LCC has been a long-term success that has generated funding for public transport and contained traffic congestion. However, the future of the LCC will be as an instrument to reduce emissions as ULEZ and its effectiveness remains to be evaluated.

3.2.5. Technical and Technological Factors

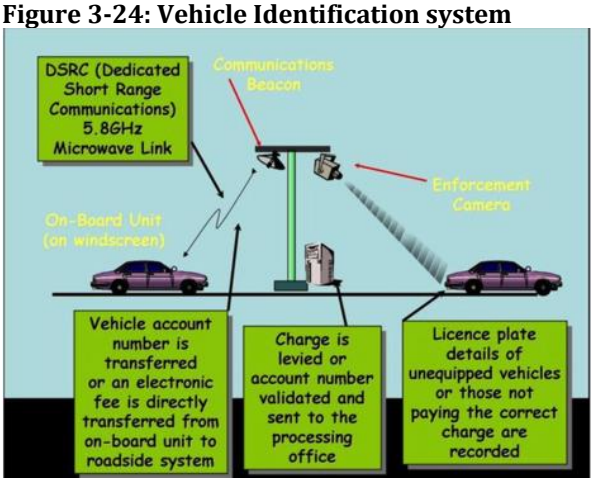
Detection

ANPR is used to control the London Congestion Charge using CCTV. The camera-based vehicle access control uses smart tolling which has become the preference over on-board transponders and is used by the LCC – refer to Figure 3-23 and Figure 3-24.

Figure 3-23: CCTV Cameras London Congestion Charging System

Source: COMPASS[55]

Figure 3-24: Vehicle Identification system



Source: Tully and Blythe (2005)

Payment

The preferred method of payment is on-line and discount is offered to encourage road users to use the on line payment system. The automated payment system will record the number of charging

[55] http://81.47.175.201/compass/index.php?option=com_content&view=article&id=500:3201-camera-based-vehicle-access-control&catid=21:smart-ticketing-and-tolling

days a vehicle travels within the charging zone each month and automatically take payment from your debit card, credit card or via direct debit each month[56].

3.2.6. Legislative Factors

Highways Act

The common laws of England and Wales define a highway as being where there is a public right of passage over land at all times "without let or hindrance" that follows a particular route. For example a footpath is a highway under this legal definition - over which there is a public right of passage for pedestrians. As mentioned earlier Scotland and Northern Ireland have their own Highway jurisdictions. The basic Highways Act of 1980 (1980 c.66) sets out most of the current legal basis for providing and funding roads in England and Wales. It consolidated with amendments several earlier pieces of legislation. Many amendments relate only to changes of highway authority, to include new unitary councils and parks. The Act has also been amended to take into account certain policy changes the Government's White Paper on the Future of Transport. Cm 3950. TSO 0101395027 1998. The Act is split into 14 parts covering 345 sections, it also includes 25 schedules.

- Part 1 Highway authorities and agreements between authorities and includes sections 1 to 9 of the Act. The legislation contained in these sections covers, setting up and funding Highway Authorities and Agreements between authorities.
- Part 2: sections 10 to 23 of the Act establishes the basis for classifying roads, metropolitan roads, special roadshttps://en.m.wikipedia.org/w/index.php?title=Highways_Act_1980&action=edit&section=2 such as trunk roads, other national classified roads, metropolitan roads and special roads such as motorways.
- Part 3: includes sections 24 to 35 of the Act covering the creation of new highways;
- Part 4 includes sections 36 to 61 of the Act. The legislation contained in these sections covering Highways maintainable at public expense, the maintenance of privately maintainable highway and the powers covering enforcement of liabilities and recovery of costs
- Part 5 includes sections 62 to 105 of the Act. The legislation contained in these sections covers widening of highways, installation of guardrails and the construction, reconstruction and improvement of bridges.
- Part 6: Navigable waters and watercourses includes sections 106 to 111 of the Act and covers
- construction of bridges over and tunnels under navigable waters and diversions of watercourses
- Part 7: Provision of special includes sections 112 to 115 of the Act covering provision of picnic sites, provision of public conveniences, provision of areas for parking heavy goods vehicles and road-side services.
- Part 8: Stopping up of highways includes sections 116 to 129 of the Act and covers stopping up and diversion of highways and stopping up means of access to highways
- Part 9: Lawful and unlawful interference with highways includes sections 130 to 185 of the Act and covers protection of public rights, damage to highways, obstruction of highways, danger or annoyance to highway users, precautions to be taken in doing certain works and constructing a vehicle crossing over a footpath.

[56] https://tfl.gov.uk/modes/driving/congestion-charge/paying-the-congestion-charge

- Part 10: New streets includes sections 186 to 202 of the Act covers new street byelaws, requirements and prohibitions as to new streets and enforcement of byelaws.
- Part 11: Making up of private streets, includes sections 203 to 237 of the Act covering private street works code, payments code and powers relating to private streets
- Part 12: Acquisition, vesting and transfer of land, includes sections 238 to 271 of the Act covering, acquisition of land for highway works, compensation relating to compulsory acquisition of land
- Vesting of land the transfer of property and liability when the status of a highway changes
- Part 13: Financial provisions include sections 272 to 281 of the Act and covers the various rules on financial transactions relating to highways. Noteworthy in part 13 is the obligations of developers towards highways which allows private developers to either fund or complete works to public highways outside or beyond the development site itself, such as traffic calming and capacity improvements. The document is signed by the local highway authority and the developer to ensure that works are completed to the highway authority's satisfaction.
- Part 14: Miscellaneous and supplementary powers and includes sections 282 to 345 of the Act which overs inquiries, disputes about compensation, prosecutions and appeals, regulations, schemes and orders.

Transaction between user and supplier of Roads

The Highways Act of 1980 and as subsequently amended also covers the defence in respect of specific matters in legal action against a highway authority for damages for non-repair of highway. This is a very interesting part of the legislation that covers the rights of road users to recover costs incurred due to suboptimal roads. Other legal schedules are listed below for completeness. Thus to some extent the Act attempt to set up a quasi-transaction between the road user and road provider. However, the Act does not go so far as to directly connect the payment for user roads with the levels of service that should be provided in return for that payment. This remains a big challenge in most countries.

London Congestion Charge

General Conditions

The Mayors of London were given the power to introduce "Road user charging" by the Greater London Authority Act 1999. The Act establishes the Greater London Authority (GLA) and provides for elections for the Mayor of London and the London Assembly. It establishes the financial arrangements for the Authority and sets out terms and conditions of service for the Mayor and the members of the Assembly that includes the following provisions.

- Responsibility for developing the GLA's strategies for transport, planning and the environment in London and will have a range of powers to implement them.
- Approval of strategies for economic development and culture and ensuring strategies take each other into account.
- Setting a budget for the GLA and its four functional bodies
- Making appointments to the boards of the four functional bodies and other London organizations.
- Producing an integrated transport strategy for London according to the Government White Paper *A New Deal for Transport: Better for Everyone* (Cm 3950), which was published in July 1998. ,

- Providing enabling powers, which would allow them to introduce road user charging, and a levy on workplace parking in the context of the Mayor's integrated transport strategy.

Specific Provisions

The Act is not confined to address the issue of congestion charging only, rather it sees congestion charging more holistically so makes specific provision for the following:

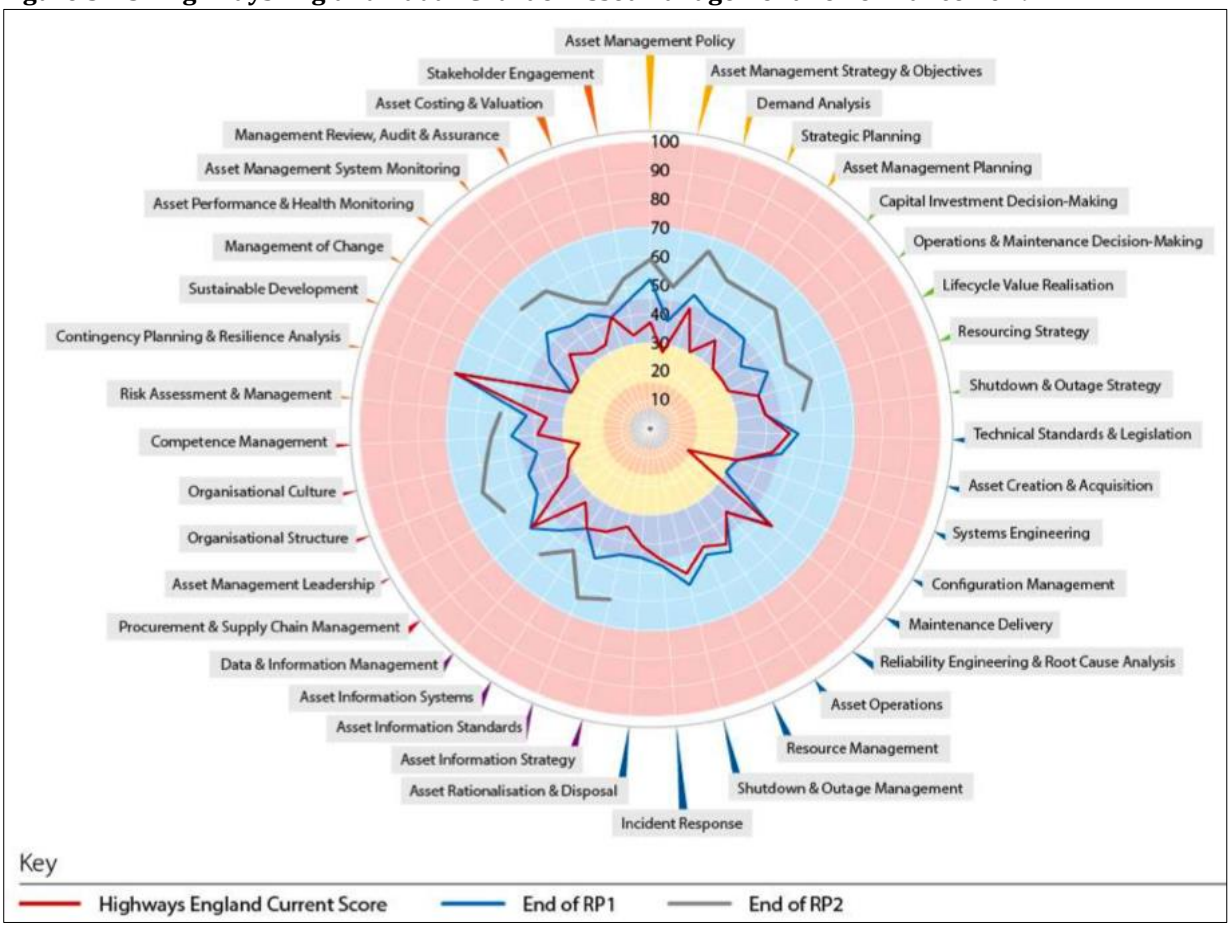
- Public-private partnership agreements for the London Underground
- Unifies responsibility for transport in London by establishing a single body, Transport for London (TfL), (replaced the London Regional Transport (LRT)
- take over the functions of other transport bodies.
- Responsibility for road maintenance and traffic management on the most important London roads.
- Powers to regulate taxis and minicabs and promote river services.
- Powers of direction over all TfL activities.

3.2.7. Procedural Factors

Highways England

Procedures for the allocation of funds are based on an asset management programme where priorities are determined in a systematic way using econometric modelling. Depending on the amount of funding available government allocates funding from the national budget. The ORR Group independently monitors performance as it is critically important that the maintenance of the highways network is efficiently executed in terms of optimising expenditure and effective in maintaining and indeed maximising asset value. The radar chart in Figure 3-25 shows the difference from the end of RP1, road programme 1 blue line to RP2 red line. It can be seen that for most attributes performance has deteriorated. Of concern is the attribute 'life cycle value realisation' which measures the extent to which the planned asset life is to be realized. This is quite worrying and possibly reflects economic austerity that has been UK Government policy for the last 10 years following the 2008/9 financial crisis. What this means is that there will be a lot of backlog maintenance needed to restore asset value on the primary road network. The process of monitoring and evaluation is very important and lessons can be learned from the processes used by Highways England.

Figure 3-25: Highways England Radar Chart of Asset Management Performance 2019



Source: AMCL (2018)

Roadside assets and technology such as signing and lighting also require systematic maintenance [57].

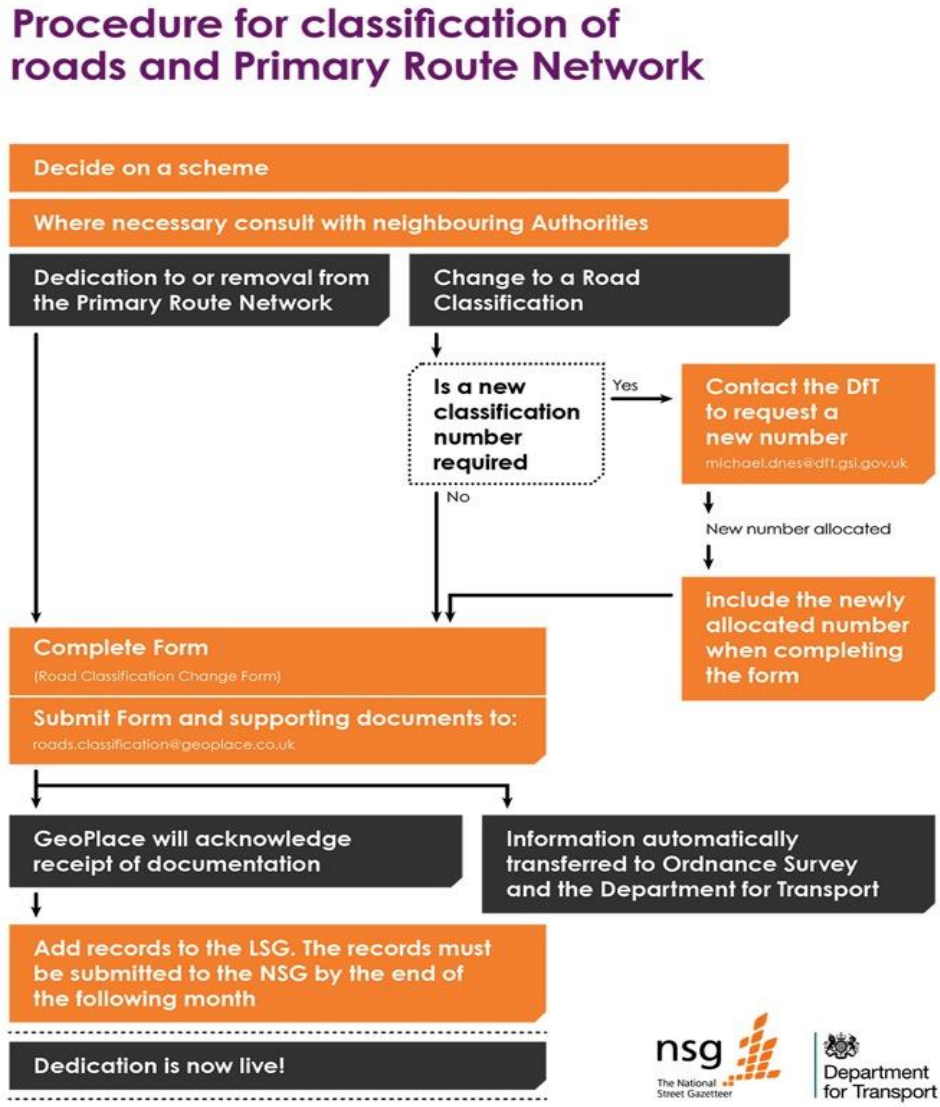
Road Classification Procedure

Another procedural aspect that is worth describing is the new devolved basis for road classification in the UK. Under a new approach, local highway authorities are now responsible for classifying roads which give them the power to title 'A', 'B', 'C' and 'U' roads without the need for central government approval. The reasoning behind this change is that local knowledge and local control of roads should help to reduce traffic jams and enable easier flow of people and vehicles through the road system.

In order to carry out these functions, local authorities need to fill in a single form for each change in road classification, submit the form to the central repository along with any associated documental evidence.

[57] https://orr.gov.uk/__data/assets/pdf_file/0005/41477/review-of-highways-englands-asset-management-of-road-technology.pdf

Figure 3-26: Procedure for classification of roads and Primary Route Network



Source: GeoPlace[58]

London Congestion Charge

The procedural aspects for implementing the LCC have been referred under various other headings in the case study. It is important to appreciate that such a system takes time and flexibility is needed. For example, there was controversy about the congestion charge operators, Capita RAS and in October 2003, the firm was fined £1 million for its poor performance dealing with both drivers and equipment. Having said this the operating company was given an extra £31 million to help administer the charge as the amount of effort needed was underestimated. Refer also to above comments that the costs of operating the LCC hardly cover the benefits from travel time savings. Operating costs may well come down as more automated satellite-based solutions to toll collection are implemented.

[58] https://www.geoplace.co.uk/streets/services-and-nsg-data/classification-of-roads-and-prn

3.2.8. Data Collection Method

National Traffic Information Service (NTIS)

Network Information Services (NIS) is implemented by a consulting joint venture, operates the National Traffic Information Service (NTIS) on behalf of Highways England. NTIS is the information hub of England's strategic road network. The service is based in Birmingham and is responsible for providing accurate, historical, real-time and predictive traffic and incident information to businesses, the travelling public and Highways England's operations. It collects real-time traffic information from over 10,000 fixed sites on the motorway and all-purpose trunk road network from the Traffic Monitoring Unit (TMU) that uses electronic loops in the road surface and ANPR cameras at the roadside. Additionally, it uses anonymous floating vehicle traffic data (FVD) from vehicles to supplement the fixed traffic monitoring sites. NTIS also has access to nearly 2,000 CCTV cameras, 300 weather stations, 4,600 roadside electronic signs, 16,000 roadside electronic matrix signals and incident data from over 250 operational partners including the police and local authorities. It processes this data to create useful intelligence for operational decision making and dissemination of current and predictive information to the public using the 4,600 roadside variable-message signs. The Highways England web site (including a mobile version), social media channels such as Twitter and the telephone-based Highways England customer contact centre as well as distributing information to the media and businesses through a number of data feeds. These feeds are widely used by organisations such as the BBC and local newspaper websites for their own traffic information. Services such as Google Maps and sat-nav operators also use Highways England's data for their traffic information.

Performance Monitoring

The legal basis for monitoring performance of Highway England using ORR has been discussed earlier. The ORR is responsible for monitoring and enforcing the performance and efficiency of Highways England and advising the Secretary of State for Transport on its compliance against the Road Investment Strategy and Licence. Data collected on all aspects of road subsector and asset management is collected and analysed by the ORR.

3.2.9. Capacity Building

Highways England

Highways England employs over 4000 including uniformed traffic officers; on-road and control room, as well as specialist staff for work in engineering, surveying, accountancy, and administration. There is a graduate entry scheme, with general entry and specialist engineering entry options. For the Traffic Officer Service each team is supervised by a team manager, one of between six and eight such managers generally working together, to ensure 24-hour management cover. The ORR reviewed the performance of Highways England identified gaps and recommended a number of improvements to the capacity of the organization, which included the following.

- Improving capabilities office culture and skills
- Improving commercial management of procurement and supply chains
- Improving the handling and processing of data and information ensuring it is used in the right place and at the right time
- Improving process efficiencies in delivering end to end asset management
- Improving embedded efficiencies in decision making and planning
- Improving delivery efficiencies that focus on achieving realisable benefits

Transport for London

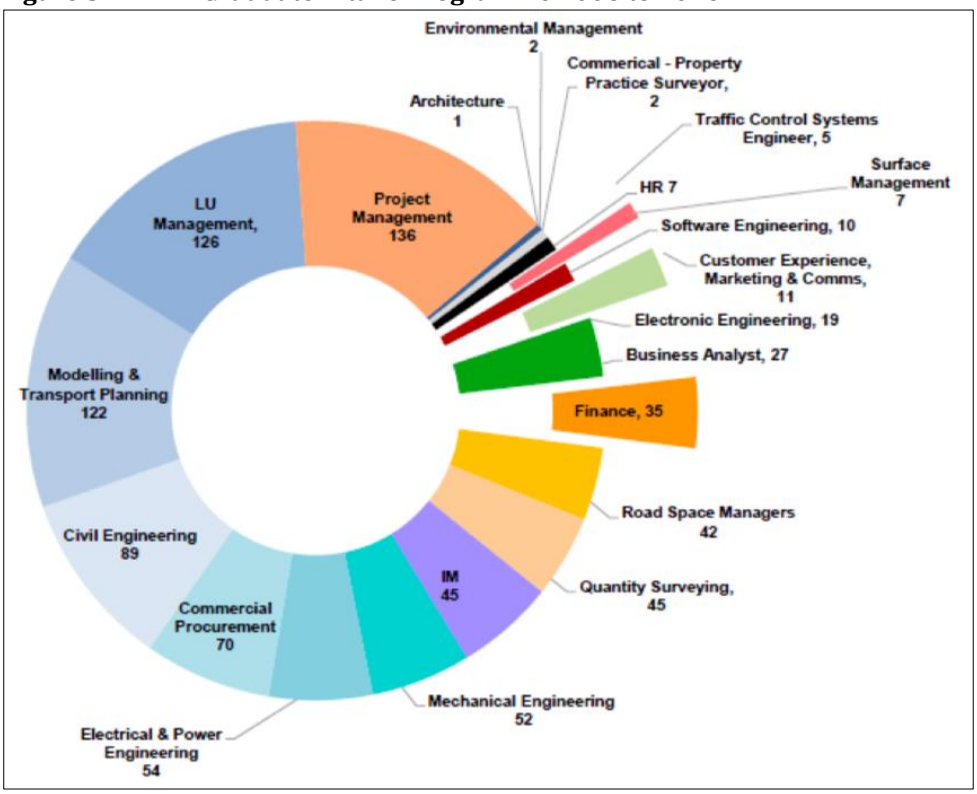
TfL has an active human resource management function. Possibly of particular interest to this case study is the graduate intake programme the results of which are shown in Figure 3-27.

Since 2006, 907 graduates have joined TfL with 73% still working in the business. This is made up of 45% alumni and 28% still on various graduate schemes. Of the overall population, 52% (473 individuals) come from the following four schemes:

- Project Management
- LU Management
- Modelling & Transport Planning
- Civil Engineering

The retention rate for the graduates, in these four schemes, is 75%, which is 2.1% higher than the 73% retention average across all schemes. The main reason of the successful retention of graduates is that they enter fast tracking for senior positions. The concept of promotion by seniority has long disappeared in the public sector.

Figure 3-27: TfL Graduate Intake Programme 2006 to 2016



Source: Transport for London (2017)

3.2.10. Lessons Learned

Political Factors

There remains political resistance in the UK to road tolling and road pricing in general which is why roll out of tolling is limited to certain bridges and only one short section of road. The reasons are the roads are considered to be a common good and road pricing is not equitable. The introduction of Area Wide toll of the London Congestion charge in 2003 started to change political perceptions. A

lesson to be learnt form this is that proponents of road pricing need to be able demonstrate its benefits and that they are not another means of obtaining more revenue from road users.

Institutional and Organizational Factors

The main lesson to be learnt from the UK is that its ministry (DfT) is fully integrated providing policies strategies and guidance to all transport modes – also directly responsible for the Strategic Road Network of England. Transport is also devolved to the UK provinces of Scotland and Northern Ireland. The roads department within DfT is called the Roads Places and Environment Group and, as the name suggests, is contemporary because it covers innovation, environment such as air quality and customer services, as well as regulation and investment,

Another lesson to be learnt is that having an autonomous roads agency works very well. 'Highways England' is a semi-autonomous agency that is responsible for the strategic motorway network. It is set up as a limited company with the Government owning 100% of the shares. This implies that at some stage Highways England can be privatized. The funding is almost entirely Government.

The main lesson that can be learnt from the London congestion charging, is the benefit of localizing its implementation. Transport for London is the local government entity that is responsible for transport in the capital city. Unlike national roads, much of the TfL revenue is sourced from the London Congestion Charge. Urban Traffic Congestion Charging should become mandatory for designated urban areas.

Economic and Financial Factors

There is a complex list of charges taxes and duties that road users pay which have many objectives but there is no hypothecation of government revenues in the UK. So all the income goes into the central treasury. Road tolling is very limited, only 0.6% of revenue is provided from tolling. The case study provides the latest schedule of vehicle taxes for private and commercial vehicles. Road taxes are mostly related to vehicle type age and engine size. Revenues raised directly and indirectly from road users are about four times more than the on-account expenditure on road provision and maintenance. But when taking the off-account or external costs of congestion, pollution and accidents into account, income from road users is about the same as the total costs that are generated. The lesson learnt in the UK is that the sum total of all road user charges approximately balances both on and off account expenditures – internal and external costs.

The economic case for the LCC has not proven to be a strong one because the costs of operating the LCC have barely been offset by benefits from time savings. As regards financial and technical matters the LCC income has been very successfully and used to fund public transport. The LCC objectives have recently switched to reducing pollution. Health is proving a far better political basis and motivation for area road user charging than transport efficiency. The message from London is that traffic has reduced and congestion chargin income has been successfully used to subsidise public transport making it an equitable policy.

Technical and Technological Factors

The congestion charge is paid on-line and control is exercised using number plate recognition from CCTVs. So far it can be said that this provides the most technically efficient solution to collect payments.

Legislative Factors

While much of its transport legislation is progressive, the UK has no tolled network nor does it have specific road pricing. But importantly, the Highways Act sets up the rights of road users regarding

compensation due damages from poor roads. This is something that is rare in the developing world and something that helps to sell the concept of road pricing to road users.

The LCC is implemented by local government that see it as a part of their transport planning strategy, to control traffic levels, provide funding for public transport and implement a low emissions zone.

Procedural Factors

Route classification provides the basis for the allocation of resources for operations and maintenance of roads and it can be devolved to local government from central government provided the criteria are clearly set out.

The lesson from this case study is that periodic measurements of organisational performance should be carried out – the method used by the Highways England is very interesting.

Data Collection Method

Information collection and processing is vital both for any organisation and for the road user also and sufficient resources need allocating to carry this out this important task effectively. In terms of performance monitoring, this should be done by an independent unit that has nothing to gain or loose from its recommendations

Human Resources

A graduate intake programme to build capacity in key areas and fast tracking for potential senior management to minimize turnover. Critical areas that needed attention were:

- Improving capabilities office culture and skills
- Improving commercial management of procurement and supply chains
- Improving the handling and processing of data and information ensuring it is used in the right place and at the right time
- Improving process efficiencies in delivering end to end asset management
- Improving embedded efficiencies in decision making and planning
- Improving delivery efficiencies that focus on achieving realisable benefits

3.3. South Africa

3.3.1. Introduction

This is a case study of road pricing in a non-OIC member state – South Africa that has been included because it is the only country in the non-OIC African region with a developed toll road system and sufficient data to report on the experience. The governments of East African nations – Kenya, Tanzania and Uganda – are looking to road tolls to raise money for the financing of public infrastructure projects in the future. Uganda as one short section of toll road between Kampala and Entebbe but so far has yet to collect tolls.

Background to South Africa Roads

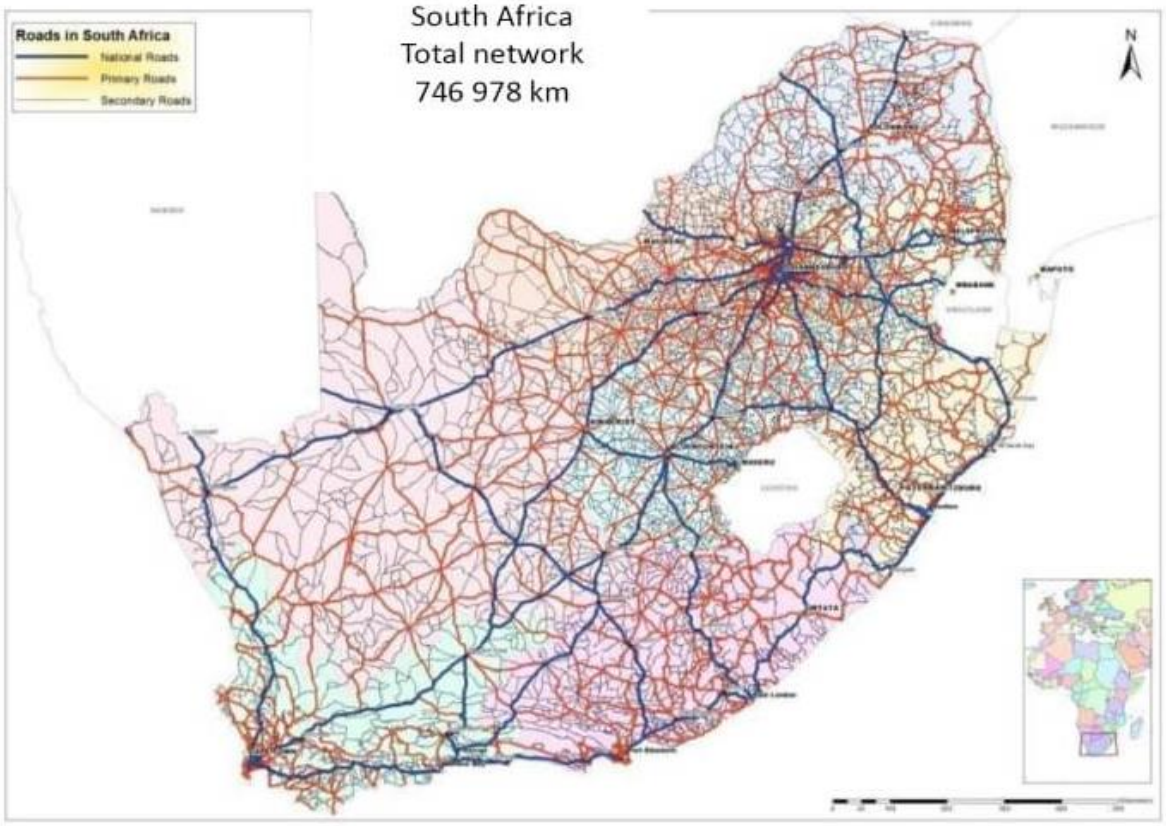
The South African National Roads Agency Limited (SANRAL) is an autonomous roads authority, which published information on the country's 746,978 km road network shown in Figure 3-28. According to SANRAL, the total number of kilometres of paved roads in SA is 158,124km (21%), 21,946 km of these routes are operated by SANRAL. The land area is 1.22 M km^2, so road density is 61 km/per 100 km^2. Population of SA is 56.67 M so the road density is 131.8 km per

100,000 population. For reference, the density of roads in the USA is 67.7 km[59] implying that the SA road network is mature and well developed.

Traffic

In 2017, there are 12 Million registered vehicles in South Africa, that is 210/1000 population which is above global average of 160/1000. Traffic has grown at about 3.5% per year, which is ahead of the economy that has grown at around 2% since 1994.

Figure 3-28: The Road Network of The Republic of South Africa



Source: https://www.arrivealive.co.za/print.aspx?s=5&i=1254

3.3.2. Political Factors

Rationale and objectives to road pricing

Road pricing has a long history. In 1982/83 the National Roads Act was amended to allow government to levy tolls and the first toll road was opened in 1984[60]. The toll road was publicly owned and operated. The objectives for introducing road pricing and tolling in its various forms generally fell into two categories. Firstly, pricing to raise funding for the provision of road space and secondly, to influence demand. In the first case undoubtedly South Africa was, like so many countries, facing a huge challenge to fund its road network. Road funding became a policies imperative in the 1996 White Paper. The legislation that followed, set up the Road Authority

[59] https://landportal.org/book/indicator/fao-21017-6124
[60] Tsitsikamma Toll Road, some 27 kilometres in length with some major viaducts.

SANRAL and road tolling. The other rationale of road pricing to reduce demand and traffic congestion, would apply to the Johannesburg Pretoria Area – also known as Gauteng. However, congestion charging has yet to fully evolve.

Pricing policy is not clear, while it is understood that income will be derived from different sources, such as the fuel levy, from tolls, licence fees and transit fees, there is no clear understanding as to how these are to be fixed and what the income allocation formula should be. Moreover, while the principle of user pays is implied, it is not actually legislated for. The consequences for not regulating the derivation and composition of toll prices is that there will be political points of contention, its use as a planning tool will be constrained as will its use to build climate change resilience. This is because the main objectives to road tolling are simply to leverage private capital and expertise, not planning, economic or environmental. A further aspect to road pricing is in ensuring the policy objectives remain relevant. In South Africa, the original objectives were to fund new roads – provide more road capacity, but policy is changing. More contemporary thinking is that transport demand should be managed more sustainably, road building stimulates more traffic, consumes more resources and generates more external costs. This is understood in South Africa, which has put more emphasis on public transport, carbon taxation and traffic constraint. Transport planners everywhere are understanding that accessibility, not mobility, should be the driver of transport policy. Maximising moblity through building more road capacity may not improve accessibility but aggravate it. Therefore, pricing takes on a different role of not maximizing revenue for road providers but in reducing traffic demand and promoting alternative and more sustainable transport. The policy is aligned to the concept of decoupling. That is to say reducing resource consumption but increasing economic growth. Road pricing should become an instrument of decoupling, to de-intensify the economy.

The Draft White Paper on Roads Policy (2018)[61] aims to clarify some but not all of the issues and these have been analysed below.

i) Role clarification in terms of responsibilities, applicability and scope for the various role-players including central government, local government, private entities, civic society and the road user has helped to distinguish the roles of each stakeholder. At the outset policy tended to load most of the responsibility to the private sector – practically washing its hands of responsibility. This was understandable given the limited capacity of the immediate post-apartheid government. And this abrogation of responsibility by the public sector to the private sector is not uncommon in other countries in the early days of PPP. A more contemporary approach that involves all stakeholders and taps into their various interests provides a more robust and sustainable solution (see section 3.2.3).
ii) Funding options in the road infrastructure investments, road safety and security was developed in the contemporary policy because it is understood that road provision is much more than providing capacity for motorized traffic. Sharing costs of the more socially necessary but less commercially desirable elements of roadways has now become a matter of policy, which previously it was not.
iii) Providing policy certainty with a clear and concise regulatory framework for roads management became expedient because at the outset issues such as access for road

[61] https://www.gov.za/sites/default/files/gcis_document/201803/41488gon203.pdf

maintenance standards, safety, security, health, gender, environment were not so comprehensive. Another reason is that all tolled schemes were due to be run as concessions and that after (30 years) would be transferred to the state. The condition of the roads at the point of transfer was not so precisely set out.

iv) Maximize jobs creation and skills development became an imperative for all public utilities because of the very high rate of unemployment in SA (the unemployment rate in South Africa edged up to 29.1% in the Q3 2019, its highest level since comparable data began in Q1 2008). Youth aged 15–24 years are the most vulnerable in the South African labor market as the unemployment rate among this age group was 55.2% in the first quarter of 2019. Generally the impact of social issues such as poverty, employment and health, have largely been ignored by those the gestate traffic plans project and solutions.

v) Integration of NMT as a recognized mode of transport was simply a matter of applying more contemporary thinking to road design.

vi) Proving direction for monitoring, evaluation and reporting in the roads management environment. Interestingly, the Paper proposed to set up a 'Toll Regulator' whose job would be to provide independent oversight which implied that SANRAL, as a government authority was not impartial but a stakeholder with vested interests

vii) Unfortunately, as stated previously, the white paper failed to set out the rules as to how tolls and road pricing should be calculated. The details of price determination are covered in the section on economics. Ideally prices should be based on willingness to pay rather than cost recovery. There is a lack of capacity in Africa in applying stated preference analysis. Analysis of the pricing systems are that they are developed to recover maintenance and operating expenditure as variable costs and contribute to fixed costs. Road pricing maybe based on the recovery of marginal costs, partial costs or full cost (including construction). Or pricing might be based on willingness to pay and independent of cost.

viii) Moreover, the draft policy is silent on whether the pricing should include the recovery of externalities, which is quite a big omission given the climate crisis. Importantly, the Draft Policy does not set out what the motivations for pricing should be, whether to raise funds for provision and maintenance or to regulate demand or both.

The policy implies that traffic growth is expected to continue to grow in line with the economy rather than be decoupled from it. More contemporary transport policies that advocate economic decoupling tend emphasise accessibility rather than mobility as being the main driver of demand.

Level of Political Support

Political support for tolling or direct pricing of the use of roads was based on two factors: i) that all receipts from tolling or road pricing would be spent on roads and nothing else and ii) that there would always be a choice for road users – an alternative route available so that road users could avoid the paid route if they chose – even though there may be disadvantages in longer travel times and lower quality. Based on these fundamentals, the level of political support for improving roads and building new tolled expressways was high during the early phases as the benefits of improved mobility became apparent. But resistance to e tolling from road users – has been long and painful for SANRAL. Electronic tolling or eTolling involves the insertion of a tag or transponder – inside the vehicle that is automatically identified when passing through toll plazas or passed road-side sensors. The motivation to introduce eTolling was to reduce the waiting time at toll plazas and improve the efficiency of toll collection especially where it was to be applied in dense urban networks such as in Guateng, but more importantly it would allow congestion charging.

Road users do not like the idea of tagging for two reasons i) they contend that roads are a common good and should be funded from general taxation and ii) they saw it to be an infringement of their liberties.

It is plain to see in South Africa that the development of eTolling and tagging is a serious political issue. To help resolve the impasse, SANRAL offered a range of discounts for frequent use that would significantly lower the cost. But that did not persuade antagonists especially those opposing congestion charging in principle. The group called 'Opposition to Urban Tolling Alliance' (OUTA) argued that: i) an alternative road financing sources should be found, ii) the introduction of e-tolls was done without adequate public consultations, iii) the plan faced difficulties in enforcing the billing system, iv) the dispute mechanism was inadequate and not independent and v) equivalent alternative means of transport are not available in South Africa.

There are lessons to be learned here about the integrated nature of introducing eTolling and congestion charging in order to better prepare the landscape during the planning and implementation of the congestion charging system.

i) While the degree of political support for the pricing of transport infrastructure was apparent and obvious due to declining levels of service on all roads, the way that it was introduced, failed to take into account the transport planning exigencies of integration – especially for congestion charging and of providing choice.
ii) Official documents fail to show how road tolling and congestion charging would impact on other modes of transport, on spatial planning and on economic policy. The preoccupation with the road user charging and pricing through tolling is supply side bias. The objective being mostly to generate funds for road provision operation and maintenance and not on better meeting users' needs – the demand side.
iii) This pre-occupation with the supply side by SANRAL led to the many problems being experienced in South Africa (and elsewhere): i) No alternative routes planned; ii) No integrated road improvements – simply put – other roads were neglected; iii) No variable pricing or discounting; iv) The availability of alternative quality modes of transport; v) The deployment of intelligent transport systems; and vi) Good levels of public information and consultation. It is evident from the case study that SANRAL was very limited in its approach.

New integrated national plans, programs, sectoral strategies are needed that are demand centric and not supply centric which places emphasis on accessibility and not mobility. The rationale for this being that while SANRAL (and road agencies elsewhere) have a revenue maximising objective to fund road provision and maintenance, transport planning expediency is subjected to a lesser consideration. Generally it is not in the interests of a road authority to promote rail, bus or transport demand substitution that will improve accessibility while reducing the mobility upon which their business depends. However, SANRAL is talking to the rail company, especially as failure of the rail company led to a lot more traffic on their roads. SANRAL is also looking at pedestrians – from the point of view of pedestrians on their roads.

Stakeholder Engagement

SANRAL has a mandated duty to engage in stakeholders, local governments and other sector organizations. The purpose is as follows:

i) communicate with local/central governments to improve the public acceptance of the charging systems, that would improve significantly if pricing was based on a market driven approach

such as willingness to pay. Such an approach is being developed in neighbouring Botswana (Rasbash and Bollane, 2017).

ii) empowerment of civil society is needed because roads are a public utility with a high level of positive externality.
iii) involvement in community development projects as part of a comprehense coprporate social responsibility programme that is partly motived to improved political support for e tolling.
iv) programmes of communication vital in this age of social media, to reach all sections of society.
v) improving stakeholder relations, especially to other economic sectors that rely totally on efficient transportation such mining industry agriculture and tourism ,
vi) promoting road safety programmes are vital with unprecedentedly high fatality rates (25.1/100,000), costs ZAR 142,95 billion every year – equating to 3.4 per cent of the country's GDP (Labuschagne et al., 2017).
vii) building university partnerships will stimulate research and innovation while improving human capacity in the subsector this will include carrying out science programmes for learners, parents and teachers.
viii) job creation and skills development as explained previously reducing unemployment is a number one priority for the SA government .

The general public are well aware of all of the issues and their opinion and contribution is more knowledgeable and constructive.

The South African National Road Agency has two categories of stakeholder engagements: i) targeted meetings that are linked to specific construction projects or issues – such as implementing the new Transformation Policy; and ii) broader engagement with the public to explain the agency's role more broadly. SANRAL 2018/19 Annual Report states that it convened a total of 39 targeted stakeholder events including business organisations, labour federations, and faith-based organisations. In addition it has engaged in outreach to the general public SANRAL organizing a total of 112 events in 2018/19 designed to interact with the public in all provinces. Its advertising and marketing campaigns aimed at raising awareness of road safety, explaining the agency's role and showing the impact of investment in national roads spread across television and radio.

Tolling Debate

While economists continue to support road pricing they also acknowledge the political difficulties[62]. In South Africa, the courts maybe the final arbiter, challenging the legitimacy of the tolling. Despite, government advocacy, the ruling African National Congress (ANC) is divided about enforcing the new system.

There have been many public enquiries and debates on the issue of road tolling at all levels, but the most significant was RSA Supreme Court (2013), whose ruling in law that adjudicated on such subjects as the right to toll and collect fees for road usage to the discretion of the Government to approve new road and transport projects from which to raise particular revenue – other than through taxation. Of the many judgements the one below is cited in full:

[32] In addition, so we are told, there are backlogs for the maintenance of the national roads network covering approximately 18 000 kilometres, for which SANRAL is responsible, to the tune of about R149

[62] https://transportist.org/2013/12/23/

billion. If this backlog is to be addressed over the next ten years, at least R15 billion will be required each year. If the backlog is not addressed, the maintenance cost will rise exponentially. Apart from this, SANRAL estimates that capacity improvements and new roads on the national road network will require an additional amount of R10.3 billion per year. If it is obliged to fund the GFIP from its own resources, so SANRAL says, all these projects will come to an end. In consequence, the setting aside of the impugned decisions will not only affect the GFIP. It will have a detrimental impact on the countrywide network of national roads as a whole with a clear knock-on effect on the economy. Moreover, at this stage SANRAL is unable to pay the interest on the R20 billion loan because it is foregoing the anticipated toll income of R200 million per month. This in itself has already led to the downgrading of SANRAL by Moody's, a credit rating agency. It follows that the setting aside of the impugned declarations will render it virtually impossible for SANRAL to borrow money at all in the future.

South Africa is a progressive nation that aims to improve its governance in an increasingly complex world. The Court ruling was pragmatic rather than purist, recognising that funding roads required a multidimensional response. That road provision has to be paid for is self-evident, the question of how remains an open one in South Africa, but one that is increasingly focussing on modalities rather than principles.

3.3.3. Institutional and Organizational Factors

Road Agency Corporation and Structure

The body that is responsible for delivering both tolled and non-tolled roads in South Africa is South African National Road Agency SOL Ltd or SANRAL. SANRAL was established in 1998 by Act. SANRAL is a parastatal incorporated as a limited company whose only shareholder is the state, represented by the Minister of Transport (MoT). SANRAL is an agency, in other words a body acting on behalf of it's client, in this case the Department of Transport (DoT). SANRAL is governed by an eight-member Board of Directors. Five voting members, the chairperson and four others, are appointed by the MoT for a term of three years. Two government officials are non-voting members, one from the DoT and nominated by the MoT and the other from the National Treasury and nominated by the Minister of Finance. The Chief Executive Officer (CEO), who is appointed by the MoT on the recommendation of the Board, is *ex officio* a non-voting member of the Board.

An institutional expediency is for organisations to have vision and mission statements. That of SANRAL is *Ensuring our national road transport system delivers a better South Africa for all*.

The mission is to deliver a safe, efficient, reliable and resilient national road transport system for the benefit of all the people of South Africa.

There is a problem with such generalized vision statements is that there is no attempt to relate the socio-economic factors with the core business of road provision. Simply put, SANRAL performance is not measured by socio-economic outcomes but by technical and operational outputs. For example in South Africa, the economic and social situation has been deteriorating over the same period that SANRAL has been in existence. Poverty and unemployment have increased, the GDP has slowed to recession levels, credit rating is almost junk status. In reading the report of the SANRAL Chairperson and Chief Executive, even they do not relate SANRAL to the socio-economic status quo in the 2018 Annual Report despite the vision being socio-economic. This disconnect by the road agency with socio-economic realities and outcomes presents a very serious gap in transport infrastructure provision.

Congestion Charging Management

There is no congestion charging system anywhere in Africa, although one is being studied for Lagos (Nigeria). So this is yet to materialize. The reasons for this are technology and management capacity as well as a lack of political will to impose additional taxes on poor people.

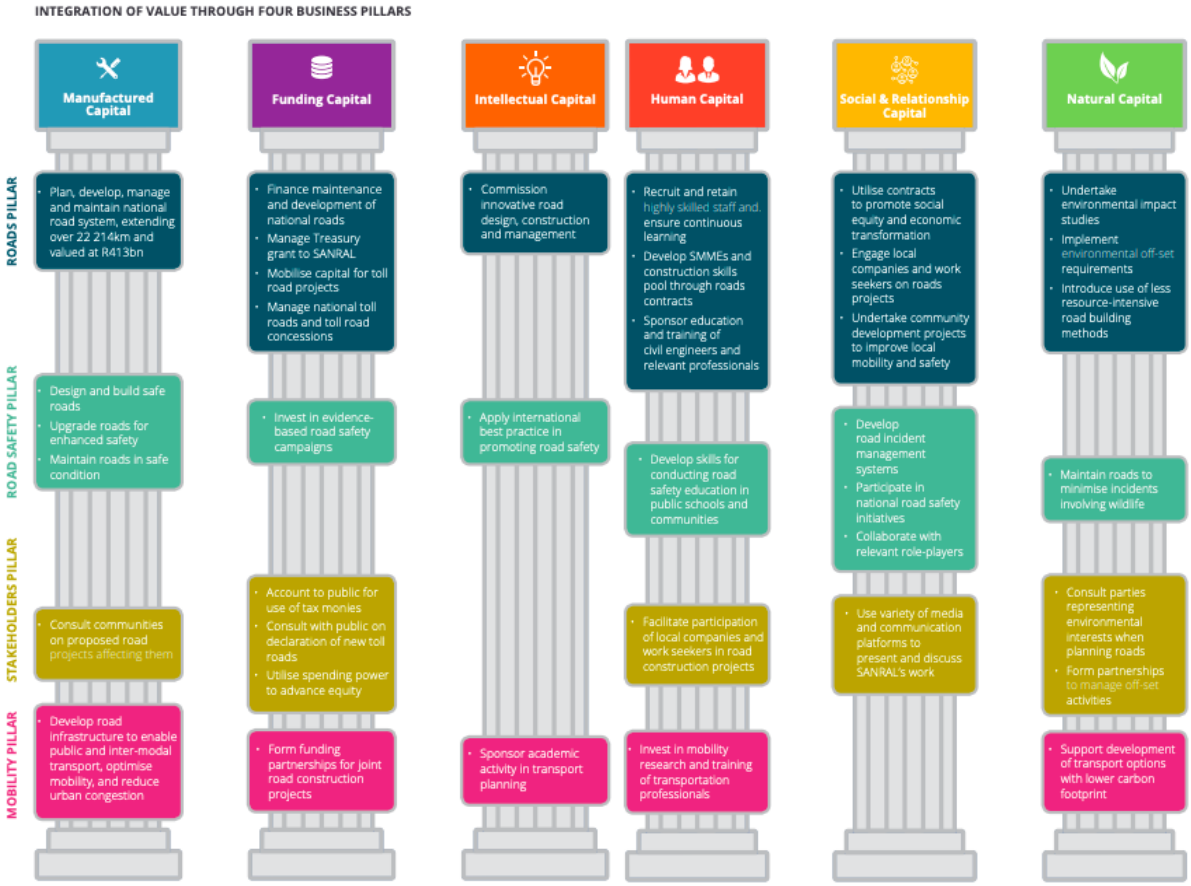
Road Fund Management

SANRAL funding comes from two sources, fuel levy for non-tolled roads and tolls from the tolled road network. The incomes from each are separately accounted for as mandated. Only the Minister can authorize income to be switched from one account to another. This was done in 2018 because toll revenue was too low to meet expenditure needs.

Business Planning

SANRAL develops and implements a business strategy for roads in South Africa and part of its mandate is for road management to become commercially smarter. The business model is built on the six pillars as shown in Figure 3-29. Pillar One 'Manufacturing Capital' is intended to add asset value by the creation of new markets – in the case of road, this is new higher quality infrastructure. Pillar Two 'Funding Capital' is intended to ensure that funding is obtained at the lowest cost and its application provides best value and that asset values are maintained and the third pillar, 'Intellectual Capital' reflects a desire to support design research and innovation in the roads subsector. Human Capital is the main focus of Pillar 4 because in South Africa building skills is especially needed. The fifth pillar is about building capital through social relationships, which includes connecting with civil society and also improving the wellbeing of road users through safety of operations and pillar six called 'Natural Capital' concerns environmental protection. What can be observed is that reference to users or customers in the model is missing – accept regarding road safety. The business strategy is supply side only and because of that, the agency cannot be considered to fully commercialized. This is common for most road agencies. The model has been to maximise benefits and minimise costs for example, it would acknowledge that the source of toll and levy revenue is the user and that their satisfaction should be maximized. But this is not the case.

Figure 3-29: SANRAL Business Strategy



Source: SANRAL Integrated Report 2019, Volume 1, September 2019

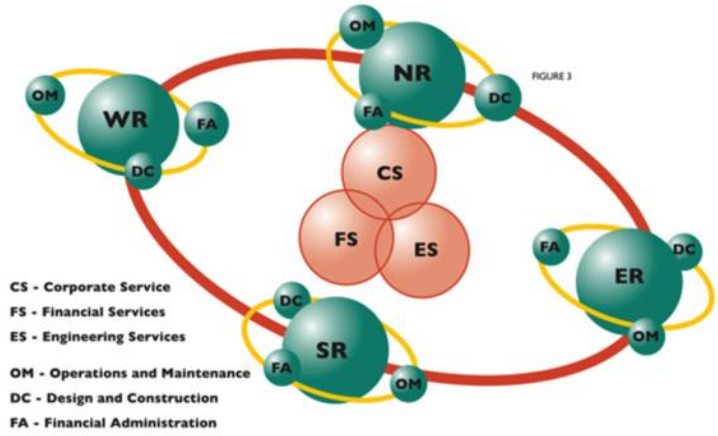
Road Agency Organization

The organization is driven by the following functions:

i) Plan, design, construct, operate, maintain and rehabilitate South Africa's national roads.
ii) Generate revenue from the development and management of assets.
iii) Undertake research and development to advance knowledge in the design and construction of roads and related fields.
iv) Advise the Minister of Transport on matters relating to South Africa's roads. Plan, design, construct, operate, maintain and rehabilitate South Africa's national roads.
v) Generate revenue from the development and management of assets.
vi) Undertake research and development to advance knowledge in the design and construction of roads and related fields.
vii) Advise the Minister of Transport on matters relating to South Africa's roads.
viii) Level of Autonomy, agency, direct government, outsourced, toll road companies, commercialization

A model of the organization is presented in Figure 3-30. The organization is said to be built around clusters of activities – as shown in green. The organization has regional offices that roll out its networking and social programmes through various types of events.

Figure 3-30: SANRAL Organizational Structure



Source: https://www.nra.co.za/live/content.php?Item_ID=18

SANRAL has only about 400 staff despite the size of South Africa, because it outsources everything to the private sector. It does not plan, design, construct or maintain its road assets internally because it has a mandate to create jobs and maximize employment in a nation with very high unemployment. In this regard SANRAL takes it social responsibilities very seriously.

3.3.4. Economic and Financial Factors

Road Funding

Road Fund RMI initiative[63] was set by the World Bank up to address the problem of lack of funding for road maintenance in the 1980s and has been successful to an extent. In the RSA, there is a General Road Fund Levy (GRFL) and an Accident Fund Levy (AFL), which are dedicated to roads only. The funds are derived from the sale of fuel, which is a very good proxy to being distance based. However it has several disadvantages:

Global warming will reduce demand for oil, there will be more hybrid electric or hydrogen celled vehicles, fuel levy income will fall further and electric car users will not pay anything.

i) Fuel consumption increases as road quality reduces at an indicative rate of 4.5% for each 10% reduction in the road condition index (Zaabar, 2010). This means that the revenue to road maintenance agencies will increase as road quality deteriorates, which is counter intuitive.
ii) The fuel levy is a tax and not a price for using roads – a price being the value placed on goods or services through choice, whereas a tax is levy imposed by government to raise revenue for the state.
iii) Global warming will reduce demand for oil, there will be more hybrid electric or hydrogen celled vehicles, fuel levy income will fall further and electric car users will not pay anything.
iv) The fuel levies are not intended to influence demand. Their objective is to be used to raise funding for road maintenance, whereas transport Policy aims to reduce demand for private transport in favor of public transport.

[63] https://www.ssatp.org/sites/ssatp/files/publications/WorldBank-TechnicalPapers/TP275/TP275.pdf

The GRFL and ARFL together account for 29% of road funding – refer to

Table 3-10. Note that toll income in 2014 accounted for just 4% of total income according to Van Rindberg (2019). But it is clear that the Fuel Levy cannot fund the Road Network[64]. '*The fuel price would increase by at least 50 percent if the fuel levy alone were used to fund roads and about R7.80*[65] *would be payable, per litre, in fuel tax to maintain current roads and support a 1 percent increase in the road network annually. (R6.18 per litre in tax would be enough only to meet our current upkeep and replacement requirements.)*'. Note that current prices for petrol and diesel in South African are R15.48 and R14.53[66] and the amount of increase needed would not be acceptable to road users.

It is clear the fuel levies are suboptimal, not able to deliver contemporary transport policies or provide users with a rational basis for paying a price that is linked to level of service and road quality - so needs replacing.

Tolls

Regarding issues of equity, SANRAL is prohibited by law to use toll revenue from its network for any other purposes than maintaining that network. It cannot be used to cross subsidize national roads so there is no possibility for any redistribution of toll revenues. Tolls are obtained from 36 routes in South Africa, using closed tolling and toll plazas. An example of toll rates from one of the many operators in South Africa is given in Figure 3-31. It shows the schedule to be quite complex. There is no open tolling at this stage as would be needed for congestion charging. Compulsory eTagging has been on the table for ten years or more but faces considerable challenges. Given that it only accounts for 4% of total road user charges, its redistribution would not make much impact.

On the other hand, the GRFL is set up to be allocated according to needs without geographic limitations. Of course other tax revenues for road related indirect user charges are not hypothecated and can be used in implementing socio economic policies.

Vehicle taxation charging and equity

Vehicle taxation and tolls are based on the weight, engine power or the number of axles of the vehicles. The differentials between vehicle classes vary according to road section and the traffic mix. The toll rate difference between class 1 and class 4 vehicles ranges from x4 to x5 times, but is this entirely rational? Axel loads vary from 1 ton for a class 1 to 8 tons for class 4. Road design is based on Equivalent standard axels or (ESALs) - a single axle load is with dual wheel carrying 80 KN load or 8 tons. The strength and cost of roads is linked to the stress in induce by the dynamic loading that are exerted upon it. Pavement research aims to predict how many repeated loads can a pavement take - this determines economic life. The number of repeated loads relates to the approximately the power of -3.3 of the stress induced.

In other words, an axle load of a heavy truck of 8 tons will exert $8^{3.3}$ more stress than a car of 1 ton[67]. It appears that the pricing differential on SANRAL roads is not based on the structural design

[64] Mike Schüssler, African Transport Forum, 2018, https://www.iol.co.za/business-report/opinion/fuel-levy-alone-cant-fund-road-network-26685734
[65] Rand Dollar Exchange Rate Rand to Dollar 0.68
[66] The average rand/US dollar exchange rate for the period 01 November 2019 to 28 November 2019 was 14.8037.
[67] http://www.dot.state.mn.us/research/documents/2011-02.pdf

requirements of road pavements but more on the space taken by each vehicle – a truck with 7 axles taking about 4 to 5 times as much road space as a car with 2 axles.

Toll charges estimation in SA is based on partial cost recovery, that is to say, covering maintenance and operations and contributing to fixed costs like loan and interest payments, where possible. Charging is based on cost recovery rather than revenue maximisation. The reason is that SANRAL is not expected to be a profit maximiser. The willingness to pay for toll roads has not been asserted by academia in South Africa and certainly has not been used for calculating road pricing. Environmental externalities are to some extent included in the pricing schemes because of the road accident fund RAFL. The total cost of Road Traffic Crashes (RTC) was estimated to amount to R 142.9 billion per year, based on the available 2015 fatal RTC data, which represents about 3.4 per cent of the Gross National Product (GDP)[68]. Referring again to Table 3-10, the revenue collected for the RAFL of R 22 Billion (2014) represents only 15.3% of the social cost or accidents, however the cost of insurance would need to be considered as well. There is a carbon tax rate of about $8.34 per ton of CO_2 equivalent which must be paid from 2020 by the fuel providers[69] and this is passed onto the consumer through price. Once congestion charging is finally introduced, as planned that has the potential to internalize congestion externalities.

Road Funding

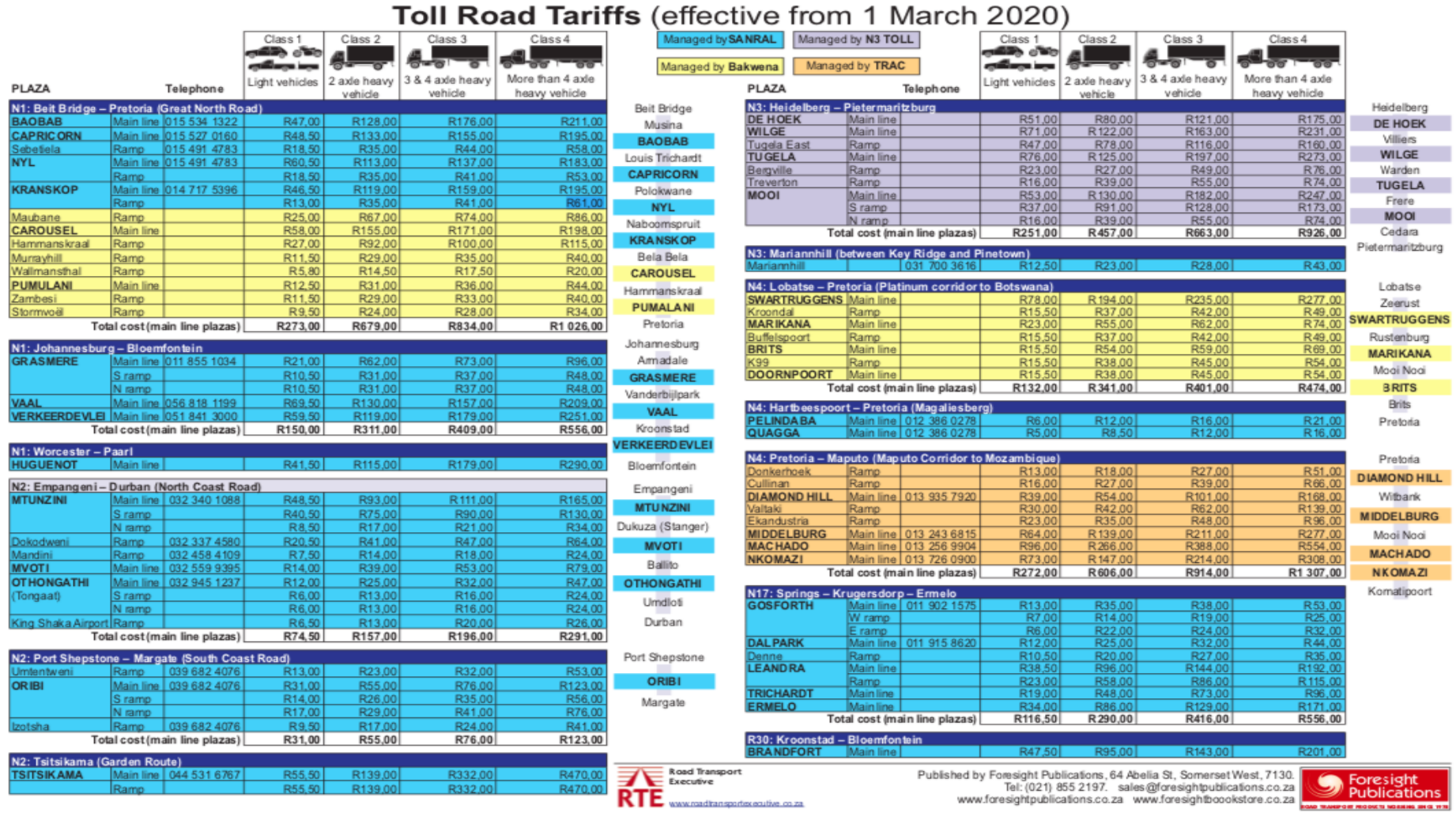
An analysis of income from the road sub-sector is set out in

Table 3-10. Conclusions from the analysis are that direct charging from the fuel levies account for 42% of the income, other direct charges not varying with usage, account for 17%. Indirect charges form taxation accounted for 40% of revenue. Hypothecation applies to the 42%, which must by law be spent on roads. The other 58% goes to the treasury for any public expenditure.

For road development the use of PPP is applied in the road concessions as mentioned, otherwise roads are funded form general taxation the reasons being that they are considered as a common good. Soft loans are not available from development partners as South Africa is not eligible for IFI funding. It is possible that sources of revenue open to SANRAL may be broadened in the proposed Transport Economic Regulations Act that is being drafted such as the revenues from property for example are a good source.

[68] http://www.satc.org.za/assets/2c_labuschagne.pdf
[69] https://www.npr.org/2019/05/26/727154492/south-africas-carbon-tax-set-to-go-into-effect-next-week

Figure 3-31: Schedule of tolls 2019



Toll Road Tariffs (effective from 1 March 2020)

Managed by SANRAL | Managed by N3 TOLL | Managed by Bakwena | Managed by TRAC

PLAZA		Telephone	Class 1 Light vehicles	Class 2 2 axle heavy vehicle	Class 3 3 & 4 axle heavy vehicle	Class 4 More than 4 axle heavy vehicle
N1: Beit Bridge – Pretoria (Great North Road)						
BAOBAB	Main line	015 534 1322	R47,00	R128,00	R176,00	R211,00
CAPRICORN	Main line	015 527 0160	R48,50	R133,00	R155,00	R195,00
Sebetiela	Ramp	015 491 4783	R18,50	R35,00	R44,00	R58,00
NYL	Main line	015 491 4783	R60,50	R113,00	R137,00	R183,00
	Ramp		R18,50	R35,00	R41,00	R53,00
KRANSKOP	Main line	014 717 5396	R46,50	R119,00	R159,00	R195,00
	Ramp		R13,00	R35,00	R41,00	R61,00
Maubane	Ramp		R25,00	R67,00	R74,00	R86,00
CAROUSEL	Main line		R58,00	R155,00	R171,00	R198,00
Hammanskraal	Ramp		R27,00	R92,00	R100,00	R115,00
Murrayhill	Ramp		R11,50	R29,00	R35,00	R40,00
Wallmansthal	Ramp		R5,80	R14,50	R17,50	R20,00
PUMULANI	Main line		R12,50	R31,00	R36,00	R44,00
Zambesi	Ramp		R11,50	R29,00	R33,00	R40,00
Stormvoël	Ramp		R9,50	R24,00	R28,00	R34,00
Total cost (main line plazas)			**R273,00**	**R679,00**	**R834,00**	**R1 026,00**
N1: Johannesburg – Bloemfontein						
GRASMERE	Main line	011 855 1034	R21,00	R62,00	R73,00	R96,00
	S ramp		R10,50	R31,00	R37,00	R48,00
	N ramp		R10,50	R31,00	R37,00	R48,00
VAAL	Main line	056 818 1199	R69,50	R130,00	R157,00	R209,00
VERKEERDEVLEI	Main line	051 841 3000	R59,50	R119,00	R179,00	R251,00
Total cost (main line plazas)			**R150,00**	**R311,00**	**R409,00**	**R556,00**
N1: Worcester – Paarl						
HUGUENOT	Main line		R41,50	R115,00	R179,00	R290,00
N2: Empangeni – Durban (North Coast Road)						
MTUNZINI	Main line	032 340 1088	R48,50	R93,00	R 111,00	R165,00
	S ramp		R40,50	R75,00	R90,00	R130,00
	N ramp		R8,50	R17,00	R21,00	R34,00
Dokodweni	Ramp	032 337 4580	R20,50	R41,00	R47,00	R64,00
Mandini	Ramp	032 458 4109	R7,50	R14,00	R18,00	R24,00
MVOTI	Main line	032 559 9395	R14,00	R39,00	R53,00	R79,00
OTHONGATHI (Tongaat)	Main line	032 945 1237	R12,00	R25,00	R32,00	R47,00
	S ramp		R6,00	R13,00	R16,00	R24,00
	N ramp		R6,00	R13,00	R16,00	R24,00
King Shaka Airport	Ramp		R6,50	R13,00	R20,00	R26,00
Total cost (main line plazas)			**R74,50**	**R157,00**	**R196,00**	**R291,00**
N2: Port Shepstone – Margate (South Coast Road)						
Umtentweni	Ramp	039 682 4076	R13,00	R23,00	R32,00	R53,00
ORIBI	Main line	039 682 4076	R31,00	R55,00	R76,00	R123,00
	S ramp		R14,00	R26,00	R35,00	R56,00
	N ramp		R17,00	R29,00	R41,00	R76,00
Izotsha	Ramp	039 682 4076	R9,50	R17,00	R24,00	R41,00
Total cost (main line plazas)			**R31,00**	**R55,00**	**R76,00**	**R123,00**
N2: Tsitsikama (Garden Route)						
TSITSIKAMA	Main line	044 531 6767	R55,50	R139,00	R332,00	R470,00
	Ramp		R55,50	R139,00	R332,00	R470,00

Beit Bridge
Musina
BAOBAB
Louis Trichardt
CAPRICORN
Polokwane
NYL
Naboomspruit
KRANSKOP
Bela Bela
CAROUSEL
Hammanskraal
PUMALANI
Pretoria
Johannesburg
Armadale
GRASMERE
Vanderbijlpark
VAAL
Kroonstad
VERKEERDEVLEI
Bloemfontein
Empangeni
MTUNZINI
Dukuza (Stanger)
MVOTI
Ballito
OTHONGATHI
Umdloti
Durban
Port Shepstone
ORIBI
Margate

PLAZA		Telephone	Class 1 Light vehicles	Class 2 2 axle heavy vehicle	Class 3 3 & 4 axle heavy vehicle	Class 4 More than 4 axle heavy vehicle
N3: Heidelberg – Pietermaritzburg						
DE HOEK	Main line		R51,00	R80,00	R121,00	R175,00
WILGE	Main line		R71,00	R122,00	R163,00	R231,00
Tugela East	Ramp		R47,00	R78,00	R116,00	R160,00
TUGELA	Main line		R76,00	R125,00	R197,00	R273,00
Bergville	Ramp		R23,00	R27,00	R49,00	R76,00
Treverton	Ramp		R16,00	R39,00	R55,00	R74,00
MOOI	Main line		R53,00	R130,00	R182,00	R247,00
	S ramp		R37,00	R91,00	R128,00	R173,00
	N ramp		R16,00	R39,00	R55,00	R74,00
Total cost (main line plazas)			**R251,00**	**R457,00**	**R663,00**	**R926,00**
N3: Mariannhill (between Key Ridge and Pinetown)						
Mariannhill		031 700 3616	R12,50	R23,00	R28,00	R43,00
N4: Lobatse – Pretoria (Platinum corridor to Botswana)						
SWARTRUGGENS	Main line		R78,00	R194,00	R235,00	R277,00
Kroondal	Ramp		R15,50	R37,00	R42,00	R49,00
MARIKANA	Main line		R23,00	R55,00	R62,00	R74,00
Buffelspoort	Ramp		R15,50	R37,00	R42,00	R49,00
BRITS	Main line		R15,50	R54,00	R59,00	R69,00
K99	Ramp		R15,50	R38,00	R45,00	R54,00
DOORNPOORT	Main line		R15,50	R38,00	R45,00	R54,00
Total cost (main line plazas)			**R132,00**	**R341,00**	**R401,00**	**R474,00**
N4: Hartbeespoort – Pretoria (Magaliesberg)						
PELINDABA	Main line	012 386 0278	R6,00	R12,00	R16,00	R21,00
QUAGGA	Main line	012 386 0278	R5,00	R8,50	R12,00	R16,00
N4: Pretoria – Maputo (Maputo Corridor to Mozambique)						
Donkerhoek	Ramp		R13,00	R18,00	R27,00	R51,00
Cullinan	Ramp		R16,00	R27,00	R39,00	R66,00
DIAMOND HILL	Main line	013 935 7920	R39,00	R54,00	R101,00	R168,00
Valtaki	Ramp		R30,00	R42,00	R62,00	R139,00
Ekandustria	Ramp		R23,00	R35,00	R48,00	R96,00
MIDDELBURG	Main line	013 243 6815	R64,00	R139,00	R211,00	R277,00
MACHADO	Main line	013 256 9904	R96,00	R266,00	R388,00	R554,00
NKOMAZI	Main line	013 726 0900	R73,00	R147,00	R214,00	R308,00
Total cost (main line plazas)			**R272,00**	**R606,00**	**R914,00**	**R1 307,00**
N17: Springs – Krugersdorp – Ermelo						
GOSFORTH	Main line	011 902 1575	R13,00	R35,00	R38,00	R53,00
	W ramp		R7,00	R14,00	R19,00	R25,00
	E ramp		R6,00	R22,00	R24,00	R32,00
DALPARK	Main line	011 915 8620	R12,00	R25,00	R32,00	R44,00
Denne	Ramp		R10,50	R20,00	R27,00	R35,00
LEANDRA	Main line		R38,50	R96,00	R144,00	R192,00
	Ramp		R23,00	R58,00	R86,00	R115,00
TRICHARDT	Main line		R19,00	R48,00	R73,00	R96,00
ERMELO	Main line		R34,00	R86,00	R129,00	R171,00
Total cost (main line plazas)			**R116,50**	**R290,00**	**R416,00**	**R556,00**
R30: Kroonstad – Bloemfontein						
BRANDFORT	Main line		R47,50	R95,00	R143,00	R201,00

Heidelberg
DE HOEK
Villiers
WILGE
Warden
TUGELA
Frere
MOOI
Cedara
Pietermaritzburg

Lobatse
Zeerust
SWARTRUGGENS
Rustenburg
MARIKANA
Mooi Nooi
BRITS
Brits
Pretoria

Pretoria
DIAMOND HILL
Witbank
MIDDELBURG
Mooi Nooi
MACHADO
NKOMAZI
Komatipoort

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Source: Road Transport Executive Foresight Publications

Table 3-10: Sources of Road Funding in South Africa Source

Income Sources	2010	2011	2012	2013	2014	%	Collected by
Fuel levy	R34 417 577.00	R36 602 263.00	R40 410 389.00	R43 300 000.00	R47 516 564.00	29	National
Road accident fund	R14 474 058.00	R16 989 071.00	R17 380 217.00	R20 352 981.00	R22 457 948.00	13	SOE
Fines/fees and permits	R9 011 537.00	R10 988 624.00	R12 933 722.00	R10 853 033.00	R10 678 864.00	6	Provincial
License fees	R5 057 977.00	R5 953 006.000	R6 530 434.000	R6 765 016.000	R7 349 077.000	4	SOE and local
Toll fees: concession†	R3 987 937.00	R4 605 700.00	R5 029 190.00	R5 420 129.00	R5 846 819.00	3	SOE
Toll fees: SANRAL	R2 073 060.00	R1 987 379.00	R2 199 090.00	R2 759 839.00	R4 221 433.00	3	SOE
CO_2 emissions	R625 891.00	R1 617 353.00	R1 567 382.00	R1 636 848.00	R1 684 160.00	1	National
DSML	R51 000.00	R53 000.00	R152 000.00	R140 000.00	R170 000.00	<1	National
Pipeline levy	R31 000.00	R32 000.00	R33 000.00	R35 000.00	R37 000.00	<1	National
IP marker levy	R1000.00	R1000.00	R1000.00	R1000.00	R1000.00	<1	National
VAT on vehicle sales	R28 197 380.00	R31 099 740.00	R34 993 000.00	R37 154 040.00	R37 893 660.00	23	National
Import duties: vehicle	R10 442 000.00	R14 348 000.00	R18 702 000.00	R21 635 000.00	R22 567 000.00	3	National
VAT on vehicle parts	R3 909 640.00	R4 126 080.00	R4 496 380.00	R4 788 700.00	R5 009 760.00	14	National
Custome and excise levy	R817 000.00	R847 000.00	R875 000.00	R922 000.00	R981 000.00	<1	National
Total income‡	R113 097 057.00	R129 250 216.00	R145 302 804.00	R155 763 586.00	R166 414 285.00	100	-
Direct income	R69 731 037.00	R78 829 396.00	R86 236 424.00	R91 263 846.00	R99 962 865.00	60	-
Indirect income	R43 366 020.00	R50 420 820.00	R59 066 380.00	R64 499 740.00	R66 451 420.00	40	-

Source: Arrivealive, 2016, *2003 Traffic offense survey: Comprehensive report on fatal crash statistics and road traffic information,* viewed 30 November 2016, from https://www.arrivealive.co.za/2003-TRAFFIC-OFFENSE-SURVEY-Comprehensive-Report-on-Fatal-Crash-Statistics-and-Road-Traffic-Information-11; Bakwena, 2016, *Toll Tariffs,* viewed 01 June 2016, from https://www.bakwena.co.za/toll-tarrifs/; Department of Energy, 2013, *Fuel price margins,* viewed 02 June 2016, from http://www.energy.gov.za/files/esource/petroleum/petroleum_fuelprices.html; International Transport Forum, 2015, *Transport infrastructure investment and maintenance spending,* OECD, viewed 25 August 2016, from https://stats.oecd.org/index.aspx?DataSetCode=ITF_INV-MTN-DATA; National National Treasury, 2014b, *National budget,* National Treasury, Pretoria, South Africa; National Treasury, 2014c, *National budget income 2014,* National Treasury, Pretoria, South Africa; National Treasury, 2014d, *Provincial budget,* National Treasury, Pretoria, South Africa; National Treasury, 2015, *Provincial budget and expenditure review 2010/11 – 2016/17, South Africa,* National Treasury, Pretoria, South Africa; SANRAL, 2016, *Toll tariffs,* viewed 01 June 2016, from https://www.nra.co.za/live/content.php?Item_ID=202; SAPIA, 2014, *SAPIA annual report 2014,* SAPIA, NOVA Communications, Pretoria, South Africa; Statistics South Africa, 2014, *Satistical release motor trade sales, Pretoria,* StatsSa, Pretoria, South Africa; Statistics South Africa, 2016, *Gross domestic product first quarter 2016,* StatsSa, Pretoria, South Africa; Trans African Concession, 2016, *Toll tariffs,* viewed 01 June 2016, from http://www.tracn4.co.za/toll-plazas-toll-fees/.

SANRAL, South African National Road Agency; CO_2, carbon dioxide; DSML, demand side management levy; IP, illuminating paraffin; VAT, value-added tax; SOE, state-owned entities.

†, This is an estimate based on Annual Average Daily Traffic and tariff.

‡, Other income sources from road user include: (1) developer contribution, (2) parking fees and permits, and (3) tyre tax (R500 000 000 in 2015).

Source: Van Rensburg and Krygsman (2019)

Performance of road user charging, pricing and tolls

There can be no doubt that tolling has enabled more funds to be generated to provide road space – adding 2,500 km of high-quality roads that would not be otherwise be there. Concessioning has also provided for private sector expertise to be used to ensure that such roads are operated in best condition. What is important to note is the difference in maintenance funding between tolled and non-tolled roads. Periodic maintenance on strategically important roads is scheduled approximately every 8 years. However, in South Africa, this is postponed by up to several years, the rate of road deterioration increases so creating a back log of repairs. Road users see that road condition is not improving and are not happy with this. SANRAL classifies maintenance intervention as follows:

1. ROUTINE AD-HOC (R): This comprises works that need to be undertaken on an ad-hoc basis to address extensive road reserve maintenance backlogs or extensive minor pavement related repairs that cannot be performed under the routine operations contracts.
2. PERIODIC MAINTENANCE (P): This comprises works that are scheduled to be undertaken at intervals of several years.
3. SPECIAL MAINTENANCE (S): This comprises works whose frequencies cannot be estimated with certainty in advance and is normally emergency driven.
4. ROUTINE OPERATIONS (O): This comprises works that need to be undertaken on an annual basis to ensure effective operation of the road facility.

Expenditure on maintenance and capital works for toll and non-tolled roads are shown in Table 3-11. For the tolled roads, operating expenditure equalled capital expenditure over the four-year period, whereas for the non-tolled roads operating expenditure was less than half that of capital expenditure. It is also noteworthy that routine maintenance of tolled roads was significant whereas routine maintenance of non-tolled roads was small.

Traffic management varies on all roads from excellent on tolled roads to non-existent on tertiary roads. In urban areas, traffic is well managed with good traffic regulations and enforcement. However, drunk driving and speeding remain prevalent and account for most serious accidents. Road tolling and fuel levies cannot be used for anything other than road provision so there is no possibility to use to improve public transit or any other transport investment. SANRAL is able to gain income from other sources of funding to be exploited including rentals for the use of road reserves, advertising, way leaves and value-added services. Unfortunately, because of the way SANRAL is mandated, there is little possibility to tackle equity issues. As regards road subsector indirect taxation, matters of equity are addressed.

The GRFL is sufficient for 40% of national roads funding, meaning that 60% of maintenance funding is from the recurrent budget. The switch from state to user pays funding is slow in South Africa due to the prevalence of high unemployment and poverty. The fuel levy applies to the entire network so it is possible to envisage it covering all road costs, but as cited earlier, the increase would be unacceptable.

Table 3-11: SANRAL Toll (R) and Non Toll Road (L) Income and Expenditure

R'million	2012/13	2013/14	2014/15	2015/16		R'million	2012/13	2013/14	2014/15	2015/16
Toll income	**3,690**	**3,341**	**4,839**	**5,392**		**Treasury Allocation**	**9,728**	**10,341**	**10,961**	**11,466**
						Other Income	601	184	250	271
Operating Expenditure	**2,424**	**2,304**	**2,010**	**1,719**		**Operating Expenditure**	**3,635**	**4,451**	**3,350**	**2,743**
Techincal support and Admin	23	24	25	-		Techincal support and overheads	656	750	781	775
Ad hoc Maintenance	11	13	8	20		Ad hoc Maintenance	101	54	55	56
Routine Operations	2,179	1,953	1,832	1,655		Routine Operations	490	671	592	536
Periodic Maintenance	169	301	145	44		Periodic Maintenance	1,655	1,830	1,509	1,304
Special Maintenance	42	13	300	-		Special Maintenance	733	1,145	412	71
Capital Expenditure	**2,236**	**1,785**	**1,620**	**2,669**		**Capital Expenditure**	**6,276**	**6,505**	**7,864**	**8,992**
Strengthening	168	126	538	680		Land acquisition & sundry	121	176	106	67
Improvements	991	743	527	1,614		Community Development	141	130	264	371
New Facilities	1,077	916	555	375		Strengthening	3,375	3,225	3,366	2,684
						Improvements	1,710	2,271	2,761	4,614
						New Facilities	929	702	1,364	1,257
Net Income	(969)	(748)	1,209	1,004						
Finance charges	(3,048)	(3,167)	(3,394)	(3,755)						
(Operation cost)/Repayment of debt	**(4,017)**	**(3,914)**	**(2,185)**	**(2,751)**		**Closing Balance**	**1**	**3**	**2**	**3**

Source: https://www.nra.co.za/live/content.php?Item_ID=205

3.3.5. Technical and Technological Factors

Tolling

Tolls are collected at plazas, like that shown in Figure 3-32, manually or through open road tolling using transponders in the vehicle as shown in Figure 3-33. Manual toll collection creates delays, requires a lot of personnel and is subject to revenue losses. Tolls are restricted to routes only and not areas. Geographic Navigation Satellite Systems (GNSS) are used extensively for vehicle tracking but not tolling. There is no area wide tolling for congestion charging at present – this applies to all of Africa.

Figure 3-32: Typical Small Size Toll Plaza

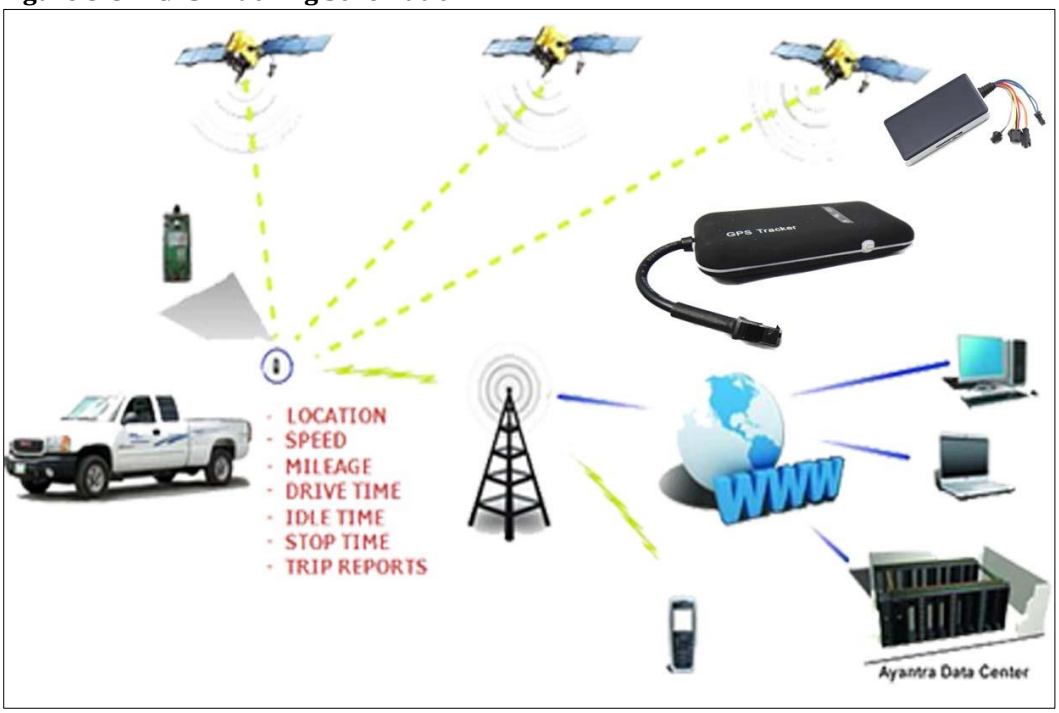
Source: https://www.bakwena.co.za/

Figure 3-33: SANRAL E Tag Automatic Toll Collection Device

Source: https://www.bakwena.co.za/

The feasibility of GNSS Systems is being explored. Vehicle Tracking Systems or VTS are important applications upon which road payment systems will be based. Typically, a VTS uses a microcontroller, which connects the various hardware components, a GSM Modem and GPS receiver. Usually 3 to 4 satellites are used to triangulate the position of the moving vehicle to with a very high degree of accuracy. Signals received from the satellite then fix the location of the vehicle on a map which is installed into the tracking system. A graphic of a VTS is shown in Figure 3-34.

Figure 3-34: GPS Tracking Schematic



Source: EST India[70]

The variable tolling system showed that a dedicated stream data management system outperforms a relational database. The steaming data consist of 4 types of tuples (a data structure of several parts) namely Position Report, road tariff, account balance and expenditure.

- A position report comprises Time, Vehicle ID, Speed, Route Name, Lane, Direction, Segment, Position (GPS Coordinates)
- Road User Tariff comprises the tariff charged at that location based on road condition
- Account Balance comprises a request of the vehicles account balance
- Expenditure is the daily expenditure of that vehicle on that particular day

The system must calculate the payment required for every kilometre that the vehicle travels and debit that to the account of the vehicle. The ongoing account balance will need to be clearly displayed to the road user. There must be protocols that permit limited continued road use if balances go negative.

3.3.6. Legislative Factors

Road Agency SANRAL

The road pricing and regulations have been in place in South Africa since 1998 with the creation of SANRAL. National road infrastructure is provided by the South African National Roads Agency Limited (SANRAL), replacing the South African Roads Board. SANRAL was established through the

70 https://www.google.com/url?sa=i&url=http%3A%2F%2Festindia.com%2Fvehicletracking.html&psig=AOvVaw0LqeTC2kdiECfJf_sPlT7U&ust=1581158106003000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCKi9s4afv-cCFQAAAAAdAAAAABAD

South African National Roads Agency Limited and National Roads Act 7 of 1998. The compliance with all legislation affecting SANRAL and its business is a non-negotiable commitment by SANRAL to its stakeholders and the community in general. The South African National Roads Agency Limited and National Roads Act, Act 7 of 1998, the Public Finance Management Act, Act 1 of 1999, The Employment Equity Act, Act 55 of 1998, the Labour Relations Act, Act 66 of 1995, are but a few of the many Acts that guide and regulate the activities of SANRAL.

The legislation provides for the clear separation of tolling and general road pricing. In other words, toll revenue must be used for the maintenance and operation of toll roads and not generally. Moreover, the legislation's enactment has further entrenched the autonomy of the national road's agency and, accordingly, SANRAL is solely responsible for the design, construction, operation, management, and maintenance of the national road network. SANRAL may be described as a "commercialised public service delivery entity" (Department of Transport, 2006:16). SANRAL is established to operate on a commercial basis at an arm's length from the government (Department of Transport, 2006). As a state-owned company (SOC), however, SANRAL has the dual goal of being partly self-sustaining, with limited reliance on transfers from the fiscus, while at the same time enhancing social welfare.

Tariffs changes need to comply the SANRAL Act, vary according to vehicle type and distance travelled, are linked to the consumer price index[71] and must be published.

Open Road Tolling legislation is in place and is used for the SANRAL tolled road network. Its objective is that of improving efficiency by reducing queue lengths at toll plaza. So far it has not been used on an area wide basis – such as congestion charging as previously stated. Generic road pricing policy legislation and regulations have been in place for since 1981 in South Africa with regards to the road fund levy. There are no other specific road pricing mechanisms.

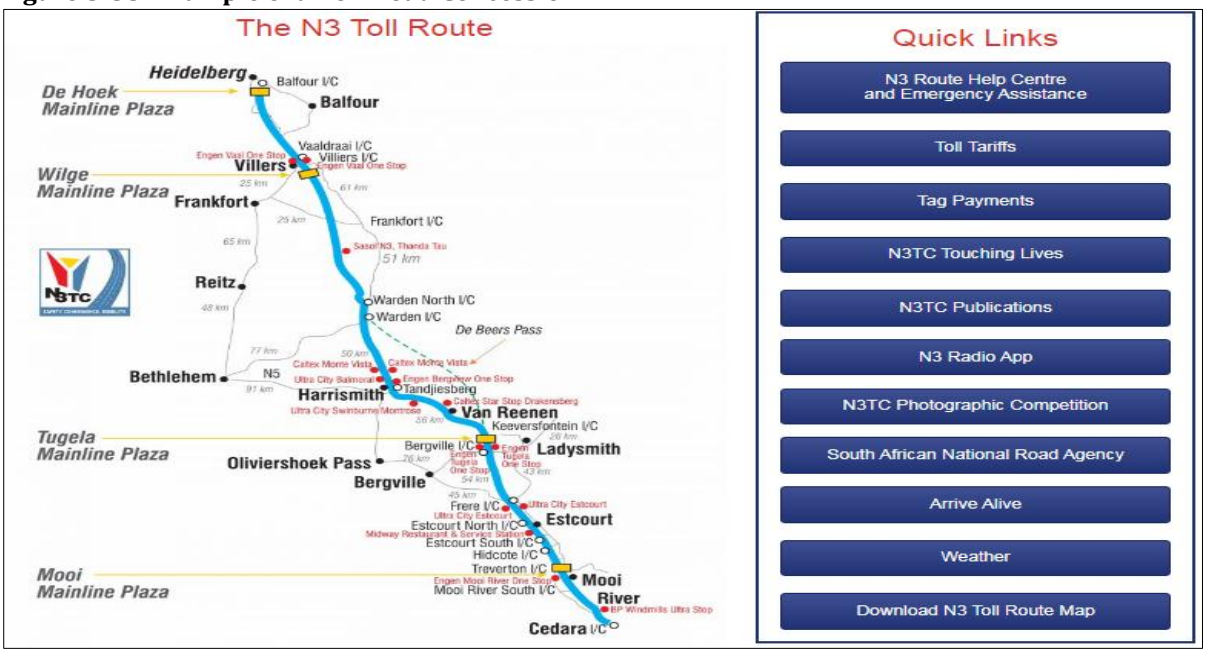
3.3.7. Procedural Factors

Concessions

The toll roads routes are concessioned to private operators on a Design Build Operate and Transfer (DBOT) model network. For example; the N4 Toll Route is a Build, Operate and Transfer (BOT) toll road, and is approximately 570 kilometres long. The concessionaire, TRAC has a 30-year concession with the South African and Mozambican national roads agencies – SANRAL and ANE respectively – signed in 1997 to develop, manage and maintain the road in a bid to stimulate and facilitate trade and investment in three key economical regions – Gauteng, Mpumalanga and Mozambique. NSTC is another concessionaire who is responsible for N3. Its mapping and value added services are shown in Figure 3-35.

[71] https://www.polity.org.za/article/sanral-2018-toll-tariff-adjustments-2018-03-29

Figure 3-35: Example of a Toll Road Concession



Source: N3 Road Map[72]

Other Procedural Matters

Stakeholder consultation is not only very common in South Africa but mandatory. SANRAL must show they have consulted widely with civil society before recommending changes to the Minister for approval. The increase in the GRFL is a government matter. The rates have been gradually increased over the years to increase the revenue needed for maintenance. Other than the GRFL there is no other road pricing mechanism. All road development is subject to normal planning procedures requiring full public participation. Utilities are charged for the right to use the road-reserve but the rate is low.

Road Reclassification and Access

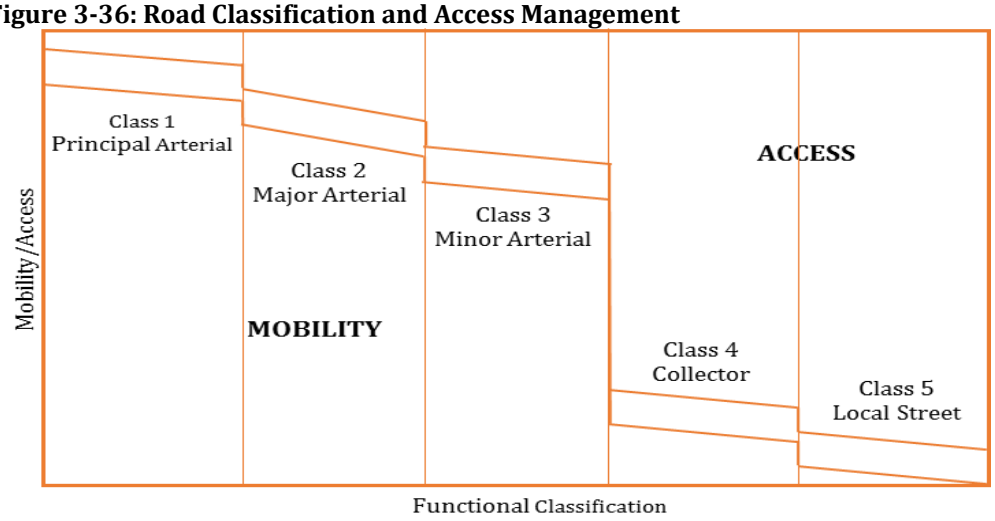
Access and classification in South Africa is informed by the TRH26 South African Road Classification and Access Management Manual and overseen by the DOT. The manual sets out a uniform classification system for South Africa to inform the planning, development and management of roads. It includes the following aspects:

- The benefits of functional road classification and access management;
- The functional classification system according to which roads are classified;
- The methodology according to which such classification must be undertaken;
- Management requirements (access management) to ensure that the various authorities' roads can function as intended; and
- Retrofit measures that can be implemented in situations where roads are not serving their intended function.

72 https://www.google.com/url?sa=i&url=http%3A%2F%2Fwww.n3tc.co.za%2F&psig=AOvVaw1tOjni8nzzilJPS3QYrN2J&ust=1581158368504000&source=images&cd=vfe&ved=0CAIQjRxqFwoTCID9toGgv-cCFQAAAAAdAAAAABAD

Entry on the public highway is a right, but one that requires approval and payment for the works. TRH26 informs that *every development, regardless of size or political influence, should be treated equally.* TRH26 goes on the advise that *While some individual developers may believe that they cannot thrive without direct access to the major road network, this must not be allowed if it prejudices the majority of road users.* In this guide it is recognised that roads designed to provide a one level of service cannot be used for another. For example, expressways cannot be used as local access roads and drive ribbon development. Yet experience shows that where major freeways cut through local communiities they do get used for local access, which has proven to be very dangerous. TRH26 allows for the review and re-classification of roads from time to time, to realign service standards with traffic levels. The underlying basis for road classification and access is shown in Figure 3-36.

Figure 3-36: Road Classification and Access Management



Source: COTO (2012)

3.3.8. Data Collection Method

Road Management Systems

Data on road condition is collected automatically every four years by a specially equipped vehicle, which is processed and then fed into the pavement management system dTIMS that determines an optimised programme for the allocation of funding.

SANRAL has also implemented a Freeway Management System (FMS) for active management of its road networks. SANRAL road sections are actively managed using ITS technologies, including devices such as high speed positioning CCTV cameras, Variable Message Signs, traffic detectors, etc to enable the active monitoring of freeways.

Data Availability

South Africa has extensive national and provincial data and well-resourced to analyse and apply it.[73] Road User and Origin-Destination (O-D) Surveys are carried out from time to time, invariably project related, road condition and level of service data is collected regularly but stated preference modelling is rare. The FMS also generates continuous data on freeway use, crashes and other information 24/7.

[73] http://www.statssa.gov.za/

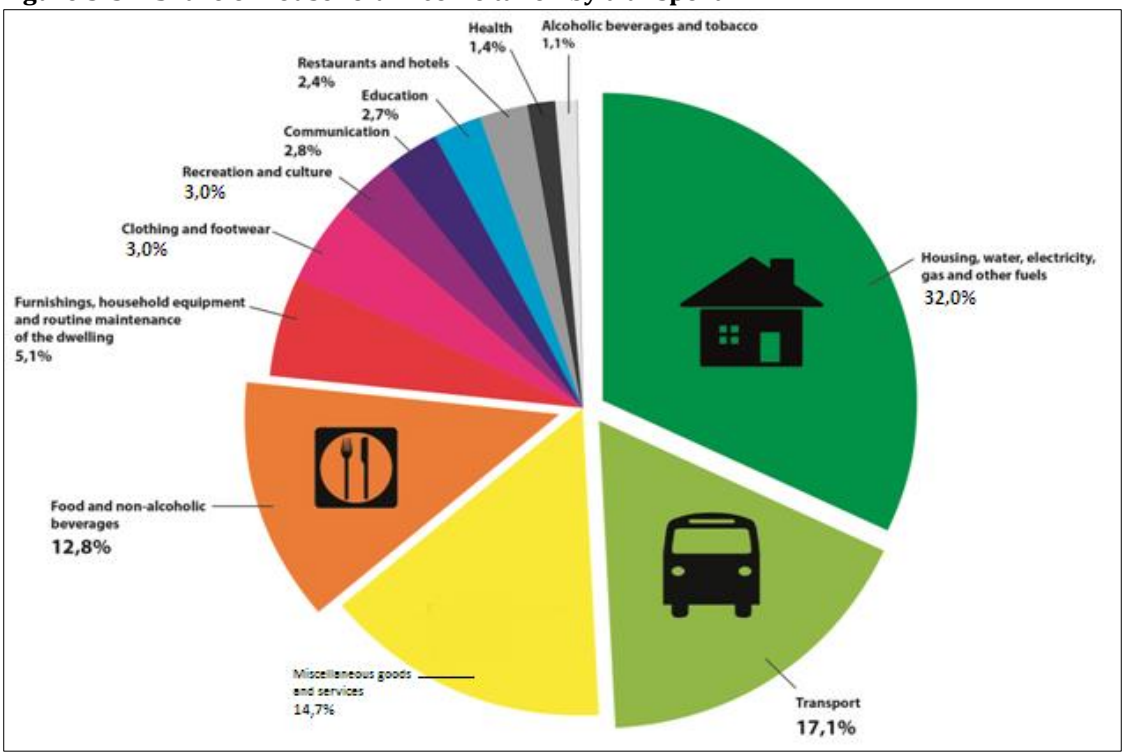
Road Construction and Maintenance Cost Information

The South Africa buildings and construction index provides oversight to the changing costs associated with works projects. Data is collected from all public tenders and processed. The Construction Industry Development Board produced a study of the Drivers of Construction Costs[74]. This is crucial to ensure the cost escalation is contained. Despite the public sector having an annually balanced programme, public works – including roads, costs have increased by 30% (about 6% pa).

Social and Economic Considerations

Naturally, South Arica has a comprehensive range of socioeconomic data that is used for transport planning. More specifically, an interesting survey of transport/household consumer spending reveals a wide disparity by province. Poverty income disparity and unemployment remains very serious. Toll and road pricing are non-discriminatory and therefore in-equitable. The GINI coefficient being 0.69 implies that the percentage of people on the lowest 10% are 69% compared with the percentage of incomes in the highest decile. An important survey ascertained that transport consumed 17% of total household expenditure as shown in Figure 3-37. This implies that increasing toll rates hits poorer families hardest. Attending to issues of equity are vital when promoting road pricing.

Figure 3-37: Share of household Income taken by transport



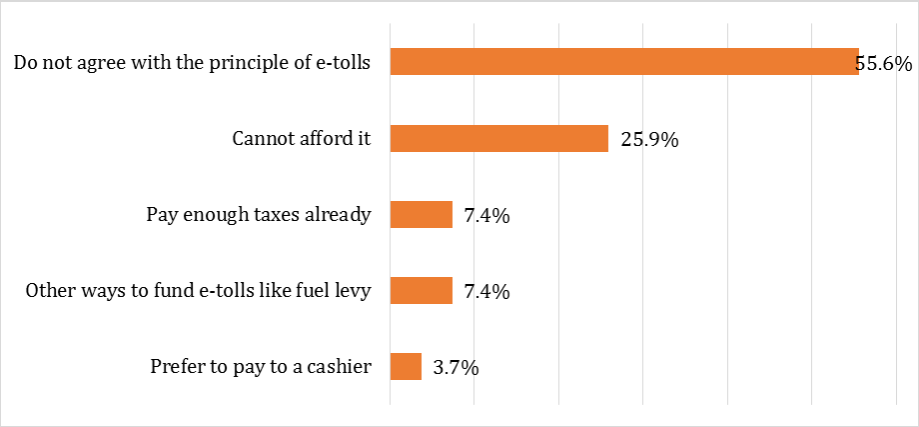
Source: STATS SA[75]. Accessed on 7 February 2020.

[74] http://www.cidb.org.za/publications/Documents/Drivers%20of%20Cost%20of%20Construction%20Assessment%20and%20Recommendations.pdf

[75] http://www.statssa.gov.za/?p=944

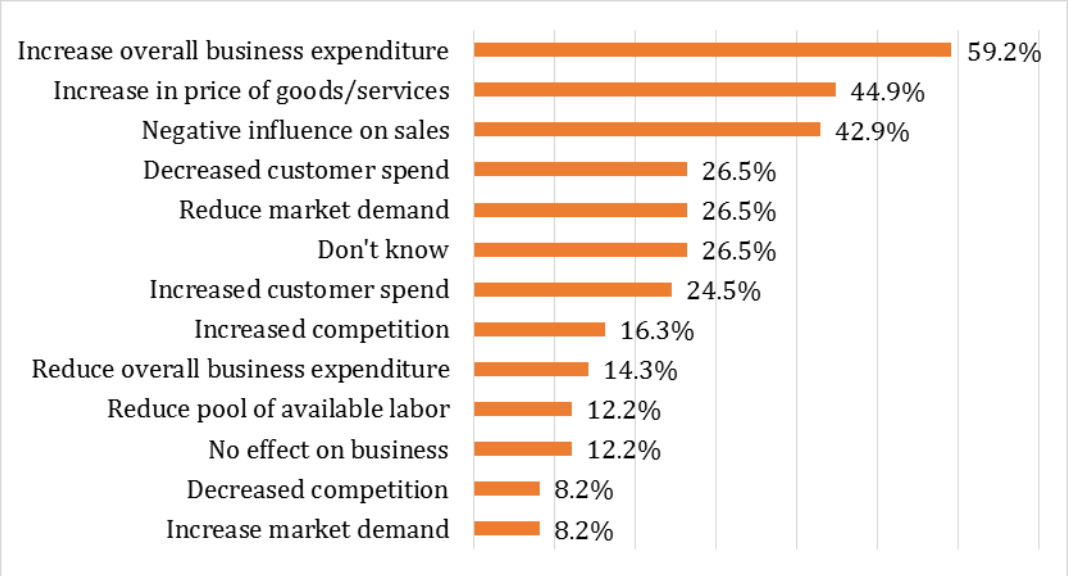
South Africa has toll roads but no congestion charging yet. But a study to understand the resistance to congestion charging revealed that there was a fundamental objection to the principle (Figure 3-38) and that the main reason was that it would increase business costs (Figure 3-39).

Figure 3-38: Frequency Analysis of e- tagging Acceptability



Source: Manley and Gopaul (2015)

Figure 3-39: Assessed Impacts of e-Tagging



Source: Manley and Gopaul (2015)

3.3.9. Capacity Building

Transport Planning

The level of competence in transport economics, traffic modelling and specifically in road user charging studies is generally low in Africa but is much better in South Africa, although still limited. South Africa has at least three universities that provide training in these techniques, University of Pretoria, University of Cape Town and Stellenbosch University.

Furthermore, SANRAL sponsors three endowed professorial chairs in Transport Planning and Engineering (University of Cape Town), in Pavement Engineering (Stellenbosch University) and in Mathematics, Natural Sciences and Technology Education (University of the Free State).

General Competency

SANRAL is dedicated to skills development, which it considers is crucial to changing the racial nature of our economy to promote the historically disadvantaged, does not exclude minorities and enhances effectiveness of the organisation. Despite the vision SANRAL actually does not appear to have a Human Resource Development Plan that is aligned to its corporate objectives.

Local Contractors

One of the core objectives are to develop the capacity local or indigenous companies to carry out road works and consulting. Various initiatives are in place to do this.

3.3.10. Lessons Learned

Political Factors

South Africa has a good record in transport policy and planning and over the year made a number of good transport plans. But new integrated national policies, plans, programs, sectoral strategies are needed that place more emphasis on improving accessibility rather maximising mobility – as this is no longer considered sustainable. Therefore, pricing needs reflect a new paradigm which aims at reducing demand and decoupling transport resource consumption from economic growth. Transport policies need to provide more guidance on this. Much of the case study has indicated the level to which South Africa road provision has been commercialised – but as can be seen from the foregoing, commercialisation has been dedicated to the supply side – to improve capacity and not to the demand side. Progress is needed especially in becoming more demand side orientated – pricing needs to be based more on the willingness to pay, than on cost recovery. Policies of sustainable development and reducing climate change could be helped by ensuring tolls and road prices internalize external costs, this would reduce environmental impacts through improved cost consciousness. Generally, road pricing through tolls as well as other road user charges, are seen by road users as taxes - an alternative narrative is needed that convinces road users that road prices are no different to prices paid for other services and goods.

Institutional and Organisational Factors

SANRAL is the principal body for providing and managing the primary and tolled road network. Its vision and mission statements are typically vague ill-defined and not measurable. Though the role is socio-economic, a better alignment is needed between the provision of roads and socio-economic development, which would impact on the nature of the organisation. SANRAL is a lean organization with a good structure that provides oversight but not services - which are mainly outsourced - this is good model that could provide a useful reference elsewhere. Its main fault is that it is no sufficiently customer focussed.

Economic and Financial Factors

It is firstly recommended that clarity is needed in terms and definitions. Road User Charges (RUC) is a generic term that includes all direct and indirect payments made by road users. Road Pricing is a specific payment made for a service delivered, such as a toll, congestion charge and parking fee. Road Pricing is based on distance and vehicle type and is independent of road quality or levels of service – this needs to change to make it more commercial and acceptable to road users. Income for spending on road provision comes from road user charges and indirect taxation. The fuel levy contributes to the general fund for road maintenance. Generally, South Africa sees development as a greater priority than maintenance. Part of the problem for road users in South Africa and possibly elsewhere, is that road condition does not seem to be improving, even though road user

prices are increasing, so maintaining technical standards should become a policy imperative rather than an option. Pricing must ensure that equity is not compromised by any road payments systems and that this can be avoided by supporting public transport and funding rural development. Overall, the range of RUCs are complex, are not entirely policy based, contemporary and, as regards to the road fund levy will be less useful, as fossils fuels get replaced as the leading source of transport energy. A new system of road pricing is needed that is based on willingness to pay linked to levels of service – such as road condition - and delivered through GNSS.

Technical and Technological Factors

South Africa has applied contemporary road management systems including intelligent transport systems, variable signing and the use of e tolling using transponders or tagging. It has not used GNSS systems with onboard units yet but will do so. eTagging is resisted because of concerns over use of personal data and other reasons. Therefore it needs to be more acceptable politically by ensuring that personal data is protected, but also by using GPS tracking to improve safety and security.

Legislative Factors

The legislation is rigid on the application of fuel level and toll income to be spent exclusively on roads and this should be relaxed to be spent on transport.

Procedural Factors

The introduction of congestion charging has been problematic in South Africa owing to concerns mostly about equity. It is vital that congestion charge income is spent on improving public transport. Introduce congestion charging on a limited basis to demonstrate its impact. A further consideration not specifically covered, is that wider use of discriminatory use of road pricing will improve land use planning though more rational decision making and smarter more integrated land use and transport planning.

Data Collection Method

Data collection is comprehensive covering road condition travel and expenditure patterns. More market-based information would be useful for WTP studies.

Capacity Building

SANRAL Develop and Human Resource Development Plan is well aligned to current but not the future needs of implementing contemporary transport policy.

3.4. Indonesia

Road user charging in Indonesia is applied in the forms of tolling and vehicle taxes. At the time of writing, ERP in Daerah Khusus Ibukota/DKI (Capital Special Region) Jakarta, after this will be indicated as Jakarta, has been planned for 10 years. This is the reason why Indonesia is chosen as a case study.

The first tolled road in Indonesia, with the length of 59 km, was commissioned in 1987, connecting the capital Jakarta and Bogor and Ciawi (neighboring cities). It was funded from the government budget and foreign loans. After the commissioning of this toll road, private institutions began to participate in the highway developments as toll road operators. As of 2019, there were 1,785 km of highways, spread across main islands of Indonesia, operated as open and closed toll systems (Figure 3-40).

There are five road classes in Indonesia in accordance with the authority of the central and local governments: 1) national roads, 2) provincial roads, 3) regency roads, 4) urban roads, and 5) rural roads.

Roads that are tolled are national roads, and roads that will be charged through a congesting pricing scheme in Jakarta are provincial roads.

Figure 3-40: National toll roads

Source: http://gis.bpjt.pu.go.id. Accessed on 18 December 2019.

3.4.1. Political Factors

The Mid Term National Development Plan (RPJMN) 2020-2024 outlines three focuses of infrastructure development of Indonesia: 1) Infrastructure for Equitable Development; 2) Infrastructure for Economic Development; and 3) Infrastructure for Urban Development. Road tolling systems and congestion charging fall under the third focus. The RPJMN is then elaborated into a yearly work plan by each ministry. In terms of road infrastructure, the objective is to reduce travel times on main corridors on each island. The RPJMN also outlines the indicators to be used to monitor the achievement of this objective, i.e. length of tolled and non-tolled roads (km), percentage of roads in good condition, and percentage of national roads that meet the standard width. Interestingly, there is no indicator that measures journey time considering travel time reduction as the main objective.

Road tolling

The Road Act (further discussed in section 3.4.2) allows government to levy tolls. It defines a toll road as a public road, which is part of the road network, where users are obliged to pay a certain amounts of money (toll). A toll road is an **alternative** to existing public roads. This law also requires toll roads to have higher design standards than non-tolled roads in order to provide higher reliability to its users.

The objectives for introducing road tolling, according to the Road Act, are:

1. to improve traffic flows in developed areas
2. to improve the road transport performance in moving goods, services and people, in order to support the economic growth
3. to ease the burden of Government funds through road users' participation
4. to increase the equity of development outcomes.

It is obvious that the policy objective is to provide new infrastructure. In developed countries, for instance Singapore, they already shifted their objective from providing infrastructure to managing demand, which is something that the upcoming ERP intends to do.

Vehicle Taxes

Vehicle taxes in Indonesia are collected and managed by provincial governments. Those related to road user charging are Motor Vehicle Tax (*PKB*), Excise Duties of Vehicle Ownership Rename (*BNKB*), and Vehicle Fuel Tax (*PBBKB*). The Ministry of Finance regulates the tax rates by determining the range or the maximum of the rates, through Regional Taxes and Retribution Act no. 28/2009. The provincial governments have authorities to determine the tax rates as long as within the ranges set by the central government and these rates must be written in their regional regulations.

The synthesis of PKB and BNKB regulated in the Act is as follows:

1. PKB is tax on ownership of motorized vehicles on land and water, paid yearly in advance and is repaid for a period of 1 year. Progressive rates are imposed as follows:
   - 1-2% for the first vehicle and from the second applies progressive rates of 2-10%
   - for government's vehicles, public transport, ambulance and fire engine, the tax rate is 0.5-1%.
   - At least 10% of the revenue of PKB must be allocated to road construction and maintenance, and to public transport.
   - The basic tax calculation is reviewed annually.

   30% of the revenue is channeled to the city governments.
2. BNKB is tax on the transfer of ownership rights of a motorized vehicle as a result of sale and purchase, exchange, grant, inheritance, or importation into a business entity. Progressive rate is also adopted on this tax, i.e. maximum 20% for the first submission and 1% for each of the next submission. 30% of the revenue is channeled to the city governments.
3. PBBKB is capped at ≤ 10% of the selling price (exclusive of VAT), which is very low compared to 20-70% in other (developed) countries. This tax is collected by fuel suppliers and 70% of the revenue is channeled to the city governments. Nuriyanis (2010) argued that vehicle fuel tax can only cover 25% of road maintenance costs.

The above rates of PKB and BNKB are multiplied by the output of *open market value x weight*. The weight represents the level of road damage and/or environmental externalities due to the use of motorized vehicles. Weight value of 1 means the externalities are at an acceptable level, and higher than 1 means beyond the acceptable level. Weight values are determined based on axle load, fuel type, and vehicle type, age and engine power.

PKB discourages people to have more than one motorized vehicle, while BNKB discourages people to buy new vehicles. Thus, the pricing mechanisms do take the environmental effects into account by reducing Well-to-Tank CO_2 emissions (by discouraging new vehicle production), not through vehicle fuel tax that normally represents Tank-to-Wheel emissions. Only PKB is regulated to have a portion dedicated to transportation developments (earmark).

Congestion Pricing

At the time of writing, an ERP system is being planned in the capital Jakarta, which will be the first congestion charging system in the country. The implementation of ERP mechanism is regulated back in 2009 with the issuance of the Road Traffic and Transport Act 22/2009, based on which Government Regulations (*PP*) and Presidential Regulations (*Perpres*) were issued to implement the

regulation. Since then, new legislations have been issued to complement the previous ones. It shows a very strong political will to get closer to the operationalization of ERP. However, a Regional Regulation (*Perda*) that specially regulates ERP has not yet existed. Perda is a policy instrument that executes higher laws and regulations and harmonizes various interests. A Perda is developed by Regional House of Representatives, agreed by the Governor (Jakarta has 'provincial government level' status).

Table 3-12: Legal framework of ERP mechanism in Indonesia

Legislation	How ERP is regulated
Road Traffic and Transport Act 22/2009 about Road Traffic and Transport	ERP mechanism is one of traffic demand management strategies to increase the efficiency of road space and to manage traffic flow.
PP 32/2011 about Traffic Management and Engineering, Traffic Impact Assessment	Limiting traffic volume by imposing levies can be applied on a road that meets the following criteria: 1) VCR > 0.9, 2) dual carriageway with two lanes, 3) average traffic speed in the peak hours ≤ 10 km/jam, 4) public transit with minimum service standards is available.
PP 97/2012 about Traffic Control Levies and Levies for Extending Licenses to Employ Foreign Workers	- Levies can only be imposed on provincial and regency/urban roads. - Levies can be imposed on personal and goods vehicles that pass a certain road segment, road corridor, or a certain area. - Motorcycles, public transport, fire engine and ambulance are exempt from the levies - Revenue from traffic control levies is used for increasing traffic performance and public transport service. - The levies must be determined in such a way that traffic control can be implemented effectively and the costs can be covered.
Perpres 61/2011 about National Action Plan to Reduce Greenhouse Gas Emissions	The implementation of ERP system is one of the measures to reduce GHG emissions from the transport sector.
Governor of DKI Jakarta Regulation no. 223/2015 about Minimum Service Standards for ERP System	This is a specially drafted regulation regarding the minimum service standards of ERP system in the DKI Jakarta Province.
Governor of DKI Jakarta Regulation no. 25/2017 about Traffic Control by Limiting Motor Vehicles Volume Through Electronic Road Pricing	- Tariff is determined based on traffic volume, traffic speed, corridor/segment/time, and classification and type of vehicles - Operation time is everyday from 07.00 to 20.00, except on Saturdays, Sundays and public holidays.

Source: Indonesia Ministry of Transport, Transportation Research and Development Agency (obtained during study visit in January 2020).

3.4.2. Institutional and Organizational Factors

Road Tolling

Indonesian Toll Road Authority (BPJT) is authorized by and responsible to the Ministry of Public Works and Public Housing to undertake the operation of the toll roads. The establishment of BPJT is mandated by Road Act no. 38/2004 concerning Roads, regulated in Government Regulation no. 15/2005 concerning Toll Roads and stipulated through Ministry of Public Works Regulation

295/PRT/M/2005 concerning Toll Road Regulatory Agency[76]. In 1978-2004, before these legislations came into force, Jasa Marga (now the state-owned toll road company) was the regulator and a toll road operator in Indonesia. These roles are then split as mandated by the Road Act that also covers the regulation, operation and supervision of toll road companies. Toll road companies (TRCs) are engaged in the toll roads operation through a concession agreement with the national government. They are responsible for funding, technical planning, construction, operation and maintenance of toll roads. At the time of writing, there are 52 entities operating 73 toll roads in Indonesia.

BPJT's tasks are to:

1. recommend the initial tariff and adjusted toll rates to the Ministry;
2. take over the concession rights of toll roads at the end of the concession period and recommend further operations to the Ministry;
3. undertake temporary takeover of concession rights that have failed in the implementation of the concession, and then to tender it back;
4. make preparations for toll road concessions which include financial feasibility analysis, feasibility studies, and EIA preparation;
5. conduct toll road investment procurement through transparent and open auctions;
6. assist the process of implementing land acquisition in terms of securing land acquisition funds;
7. monitor the implementation of planning, construction, operation and maintenance of toll roads carried out by business entities; and
8. supervise business entities on the implementation of all toll road concessions and report it periodically to the Ministry.

The roles of the Ministry of Transport in the toll roads development are:

- Participating in the development of Toll Roads Network Plan, which is part of the National Roads Network Plan and Road Traffic and Transport Network Master Plan.
- Traffic engineering management (which odd-even traffic rule being part of)
- Being part of the road function examination team to ensure the safety of toll road users.

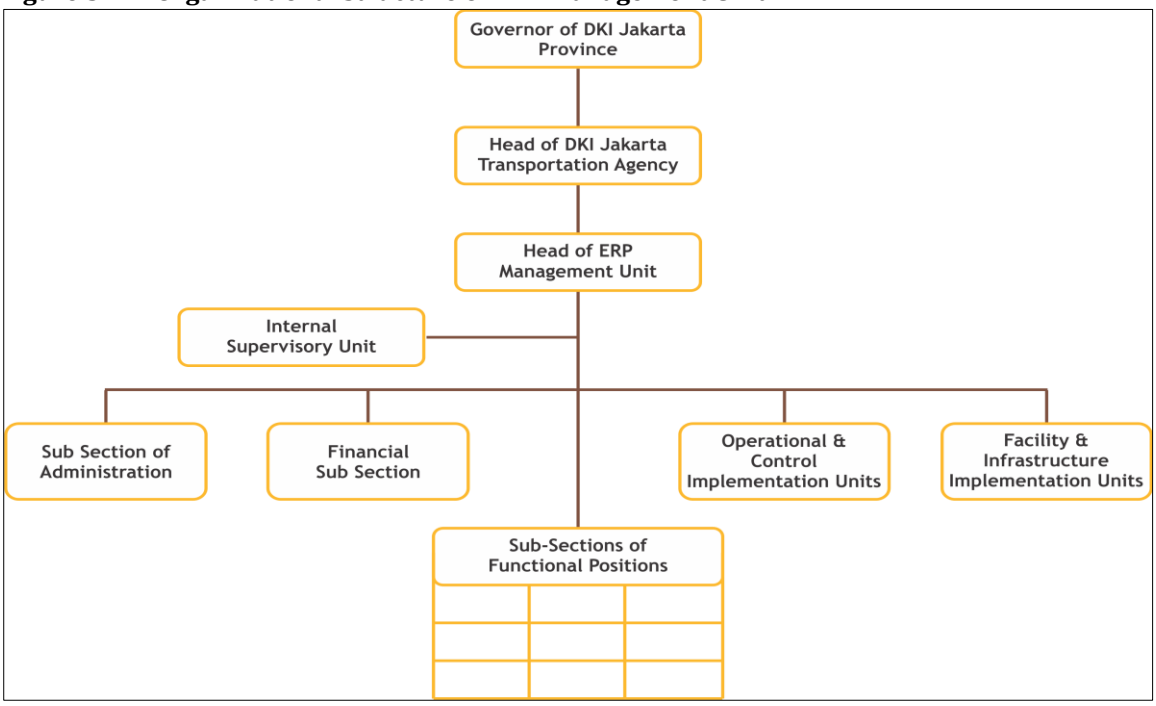
Congestion Charging

For the implementation of ERP in Jakarta, an ERP Management Unit is established. Its tasks, among others, are to develop operational and maintenance plans of the ERP system, carry out monitoring and maintenance of the ERP system, calculate ERP tariff and unit cost, appoint operators, and control the implementation and operation of the ERP system.

This unit is a part of the Department of Transport of DKI Jakarta. The head of ERP Management Unit is responsible to the Head of Department, and the latter is responsible to the Governor of Jakarta (Figure 3-41).

[76] http://bpjt.pu.go.id/konten/bpjt/sekilas-bpjt

Figure 3-41: Organizational structure of ERP Management Unit



Source: ERP Management Unit (obtained during study visit in January 2020).

3.4.3. Economic and Financial Factors

Road Tolling

Equity principle does not apply to the tolling system in Indonesia. The Road Act regulates that the toll revenue must be used for investment return, maintenance and development of toll roads. It is thus prohibited by law to use toll revenue for any purposes other than to finance the toll road network. It cannot be used to cross subsidize national roads or public transport, so there is no possibility for any redistribution of toll revenues.

The initial toll tariff per kilometer and their adjustments are calculated based on three approaches:

1. Willingness to Pay and Ability to Pay
2. Efficiency of vehicle operating costs, which is the difference between operating costs and time value of using a toll road and its alternative routes. The cap is determined at 70%.
3. Investment feasibility, which is based on transparent and accurate estimates of all costs during the concession agreement term, which allows the business entity to obtain an adequate return on its investment.

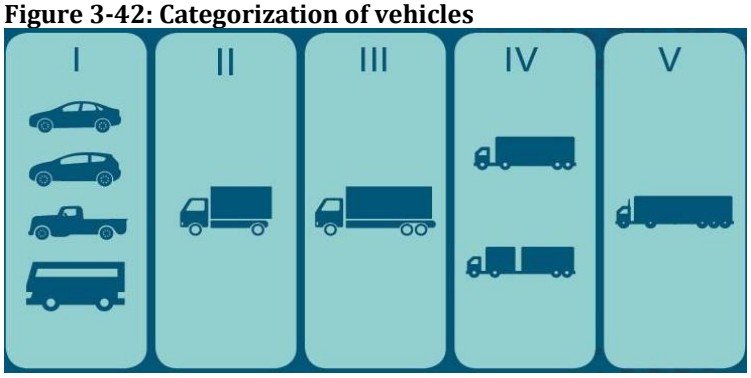
The output of the calculation is then multiplied by a coefficient, resulted in tariffs to be paid by toll road users that vary depending on the vehicle axle load (Table 3-13). Toll tariffs are outlined in the agreement between the Government and the operator. As shown by Table 3-14, a Ministerial Decree is issued to legalize the toll tariff for each toll road. The tariffs are evaluated and adjusted every two years to incorporate inflation rates.

Table 3-13: Multiplying factor of toll tariff based on axle load

Class	Vehicle Type	Toll Tariff Multiplication Coefficient
Class I	Sedan, jeep, pick up/small truck and bus	1x
Class II	Truck with 2 axles	1.5x
Class III	Truck with 3 axles	1.5x
Class IV	Truck with 4 axles	2x
Class V	Truck with 5 axles	2x

Source: Ministerial Decree of Public Work no. 380/KPTS/M/2018

Figure 3-42: Categorization of vehicles



Source: Detik Finance[77]

For a closed toll system, a transaction starts at an entry toll gate and ends at an exit toll gate. In this case motorists pay the tariff at the exit gate and the tariff is determined based on the distance travelled. For an open toll system, all transactions take place at one gate and the tariff is determined based on Average Trips Length (ATL). The ATL is calculated based on O-D surveys.

[77] https://finance.detik.com/infografis/d-3756985/tarif-tol-dalam-kota-naik-ini-daftarnya

Table 3-14: Toll tariff and tariff per km on several toll roads

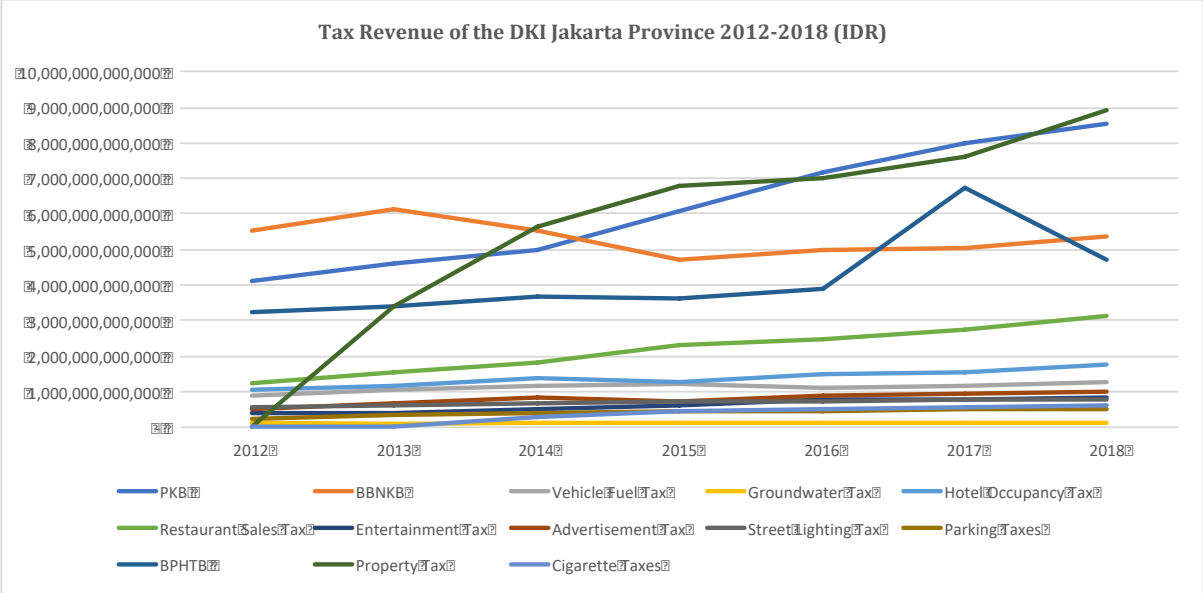
NO	Toll road name	Length (Km)	Rate (IDR)					Rate/km (IDR)					Ministerial Decree
			I	II	III	IV	V	I	II	III	IV	V	
1	Jagorawi Terbuka	52	7K	11,5K	11,5K	16K	16K	380	625	625	870	870	NO. 1175/KPTS/M/2019, 11 December 2019
2	JAKARTA-TANGERANG (ATL: 21.35 km)	26.8	7,5K	11,5K	11,5K	15K	15K	280	429	429	560	560	NO. 874/KPTS/M/2019 20 September 2019
3	ULUJAMI-PONDOK AREN (ATL: 4.41 km)	5.5	15K	30K	30K	45K	45K	2,727	5,455	5,455	8,182	8,182	NO. 710/KPTS/M/2018 14 September 2018
4	BELMERA	34.1	8K	13K	14,5K	18K	21,5K	235	381	425	528	630	NO. 975/KPTS/M/2017 30 November 2017
5	PALIKANCI	28.84	12K	15K	21K	27K	32K	416	520	728	936	1,110	NO. 976/KPTS/M/2017 30 November 2017

Source: Jasa Marga

Vehicle taxes

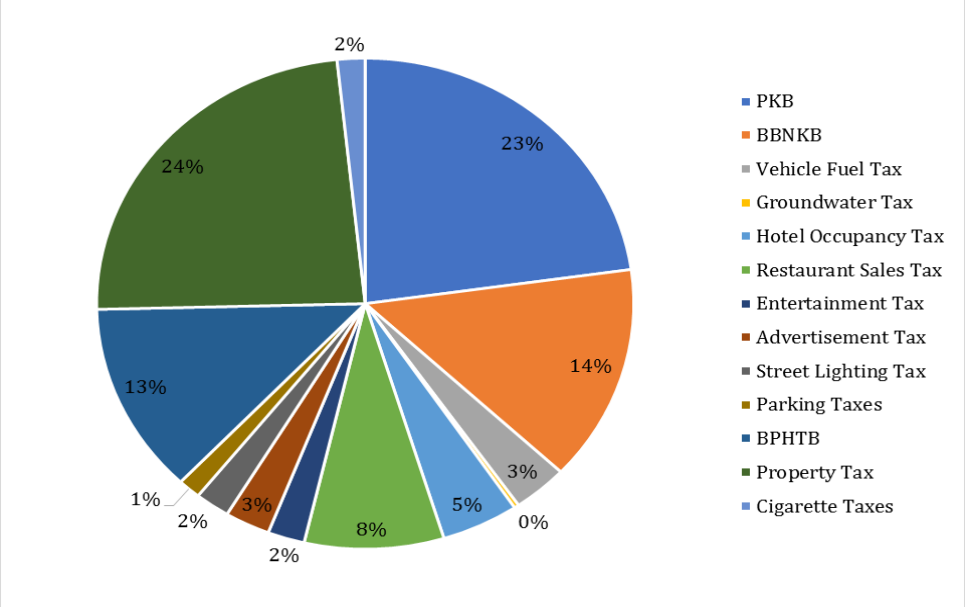
Whilst tolling is direct charging on the use of road. Indirect charging is adopted through vehicle taxes that are collected and managed by provincial governments. In some provinces, vehicle taxes form the largest income of the government. In DKI Jakarta Province for instance, PKB and BBNKB contribute to 37% of the total tax revenue of the government (Figure 3-44).

Figure 3-43: Tax revenue of the DKI Jakarta Province 2012-2018



Source: Regional Tax and Retribution Agency of DKI Jakarta Province (data obtained during study visit in January 2020).
Note: BPHTB = Duty on Land and Building Right Acquisition

Figure 3-44: Tax revenue of the DKI Jakarta Province in 2018



Source: Regional Tax and Retribution Agency of DKI Jakarta Province (data obtained during study visit in January 2020).

Note: BPHTB = Duty on Land and Building Right Acquisition

Congestion Charging

As regulated in Regional Regulation no. 5/2014 about Transportation, ERP tariffs are calculated based on the following principles:

1. Effectiveness of congestion control
2. Cover the implementation costs, which include investment cost, operational and maintenance costs, and interest cost.

This regulation does provide for equity issues as it stipulates that the revenue from congestion charging will be used to improve road-based public transport services and to increase the traffic performance of the ERP roads, after the implementation costs (as described in point 2 above) have been covered.

The planned ERP system in Jakarta will apply progressive tariffs based on:

- zone (economic zone such as CBD area will be more expensive)
- traffic volumes (the higher the volume, the higher the tariff)
- ATP and WTP

The first ERP area will be the Central Business District (CBD), not only due to its congestion but also because this area is already served by mass transit system. The ERP system is planned to replace the current odd-even traffic rule, which is considered not effective to solve the congestion problems of Jakarta because people tend to buy two vehicles (with an even and an odd number), which results in a higher vehicle ownership rate.

3.4.4. Technical and Technological Factors

Technology for toll collection

E-tolling has been implemented in Indonesia since 2009. Road drivers can pay the toll fee using an RFID-contactless smart card. The rational behind the implementation of this system is to reduce the transaction time at toll gates from 7 seconds (cash transaction) to less than 4 seconds, as such long vehicle queue can be prevented especially during rush hours[78]. However, the sensitivity of the card readers needs to be improved to meet the promised "reading time" (Zulkifli, 2020). Electronic payment also intends to reduce *moral hazard* as toll personnel do not receive cash anymore. At the time of writing, all toll gates in Indonesia already utilize electronic payment, no more cash payment is possible. According to Lesmana (2020), one of the challenges that still need to be addressed is that the motorists need to ensure sufficient balance on their smart cards. If this is not the case, long queue will still occur when the motorists need to top up their cards at the gates.

[78] https://en.tempo.co/read/912183/bi-to-distribute-e-money-cards-for-free

Figure 3-45: E-toll card

Source: https://en.tempo.co/read/912183/bi-to-distribute-e-money-cards-for-free

At the time of writing, BPJT plans to implement the following new payment systems along with the current smart-card payment system:

1. QR code
   Toll road users only need to put their smartphones on their dashboards. With this system, transaction time can be reduced from 7 to 1-2 seconds.
2. Electronic Toll Collection (ETC)
   The rationale to the implementation of ETC is to reduce congestion at toll plazas. ETC is currently being tested in the capital on single lane free flow (SLFF) and later on, on multi-lane free flow (MLFF). The following technologies are under consideration:
   a. Radio Frequency Identification (RFID)
      The main challenge to apply this technology in Indonesia is the mismatch between the operating frequency of the RF Scanners (that need to be imported from other countries) and the frequency band for tolling system regulated by the Ministry of Communication and Information no. 1/2019.
   b. Dedicated Short Range Communications (DSRC)
      According to Dwitasari (2020), the DSRC technology is more efficient in the long run. However, it can create a challenge when new OBU operators come to the market. It is yet unknown whether the operated gantry technology can communicate with various OBUs. Furthermore, it will also be challenging to oblige motorists to purchase OBUs.
   c. Automatic Number Plate Recognition (ANPR)
      The advantage of this technology is no on-board equipment needed. However, the application requires a real-time database of vehicle ownership, which is not yet the case in Indonesia.

GNSS is not considered because Indonesia has many highways with multilevel intersections. Applying this technology would either be very costly or unreliable.

In determining the most suitable ETC technology, Multi Criteria Analysis is applied by the Transportation Research and Development Agency on 11 criteria (cost, reliability, environmental impact, flexibility, data speed, acceptance rate, implementation, technology readiness, ease of use, system complexity, and legal framework) (Zulkifli, 2020). At the time of writing, the provisional results show that the most determinant criterion is Reliability and that DSRC technology scored best.

Technology for congestion charge collection

At the time of writing, which tag-and-beacon system (RFID, DSRC, or ANPR) to be used to collect congestion charging in Jakarta, is still under consideration. The chosen technology must meet the following criteria:

1. Safe and internationally standardized payment system
2. Interoperable to promote a multi-vendor and multi-operator system.
3. Equipment are certified by the Ministry of Communication and Information
4. Multi Lane Free Flow
5. Electronic enforcement system
6. Vehicle electronic identity to support electronic enforcement system.

As congestion charging in Jakarta will be the first in the country, much attention is paid to determine the most suitable technology because other cities in the Jakarta Metropolitan Area (namely Bogor, Depok, Tangerang, and Bekasi) also plan to implement such a system and await Jakarta's experience to start with. As ERP is not yet implemented, now would be the good time to consider interoperability between the ETC and ERP systems to increase users' convenience, acceptance, and to ensure data compatibility.

3.4.5. Legislative Factors

Road Tolling

The toll road regulations in Indonesia are in place since 1980 with the issuance of law No.13/1980 about Roads. It is then replaced by No. 38/2004 to accommodate various developments such as the autonomy of the local governments under law No. 22/1999 (see further text), global competition challenges, and the needs for an increase role of the community in the administration of roads. The fundamental differences between these two laws are shown in Table 3-15.

Table 3-15: Main differences between the old and new law of toll road regulations

Aspects	Law 13 of 1980	Law 38 of 2004
Determining of a toll road section, types of vehicles, the amount of tolls.	President	Ministry
Authority to operate and manage toll roads	State-owned toll road company	Toll road companies
Regulating and operating roles	State-owned toll road company	BPJT as the regulator, toll road companies as operators

Source: Various

Giving the exploiting role to toll road companies through a concession mechanism, aims to accelerate the realization of the expressway network as part of the national road network. Toll road concessions are granted within a certain period to meet the investment return and reasonable profits for the TRCs.

This PPP mechanism works very well. PPP for the toll roads development is the most successful PPP in Indonesia besides oil and gas sectors. The success factor is the enabling environment that gives certainties to the private sector, such as review of toll tariff every two years and regulations on land acquisition.

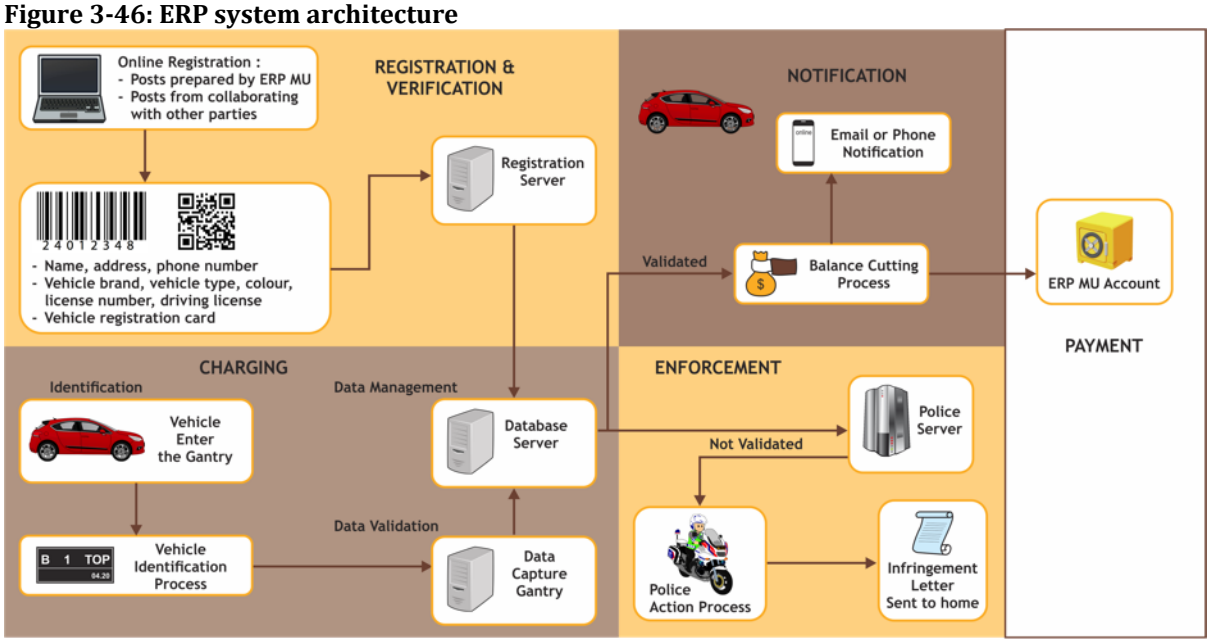
Congestion Charging

The implementation of ERP will also mark a full implementation of Electronic Law Enforcement (ELE) in Indonesia to address the weaknesses of manual enforcement, which include:

1. High bribery and corruption rates.
2. Insufficient Police personnel to handle all traffic violations on the roads.
3. Statistic of traffic violation does not reflect the actual numbers (due to point 2 above), but merely the number of violations prosecuted by police officers. As such, it is not a reliable database to support related stakeholders in decision making processes[79].
4. Manual enforcement does not give deterrent effects.
5. It cannot be connected to the driving license management system.

Figure 3-46 shows the planned architecture of the ERP system in Jakarta including ELE. To ensure the success of the system, it is essential that the Police share the database of vehicles ownership, which is not yet the case.

Figure 3-46: ERP system architecture



Source: ERP Management Unit (obtained during study visit).

ERP for motorcyclists

In the DKI Jakarta Province, the population of motorcycles is around 8 million, which is 68% of the total of motorized vehicles. Considering this significant mode share, motorcyclists should also pay for road usage. However, the legislations are unclear regarding this issue.

According to PP 32/2011 (

Table 3-12), limiting motorcycle traffic is allowed when two criteria are met: 1) VCR ≥ 0.5 and 2) public transit with minimum service standards is available. This means when the VCR limit already reached, motorcycles cannot enter an ERP zone. While PP 97/2012 mandates that motorcycles are exempt from traffic control levies, or in other words, motorcycles can pass an ERP gantry without paying, even though the VCR limit has been reached. This contradiction needs to be solved before ERP can be applied to motorcyclists, which is very important to increase road safety and to reduce

[79] Adopted from document "*Implementation Plan of ERP System in the DKI Jakarta Provice*" by Department of Transport of DKI Jakarta. Obtained by Fimotions during the study visit on 9 January 2020.

GHG emissions and air pollution. Such legal issues are the reason why congestion charging cannot be implemented yet although its mechanism has been regulated by law since 2009.

3.4.6. Procedural Factors

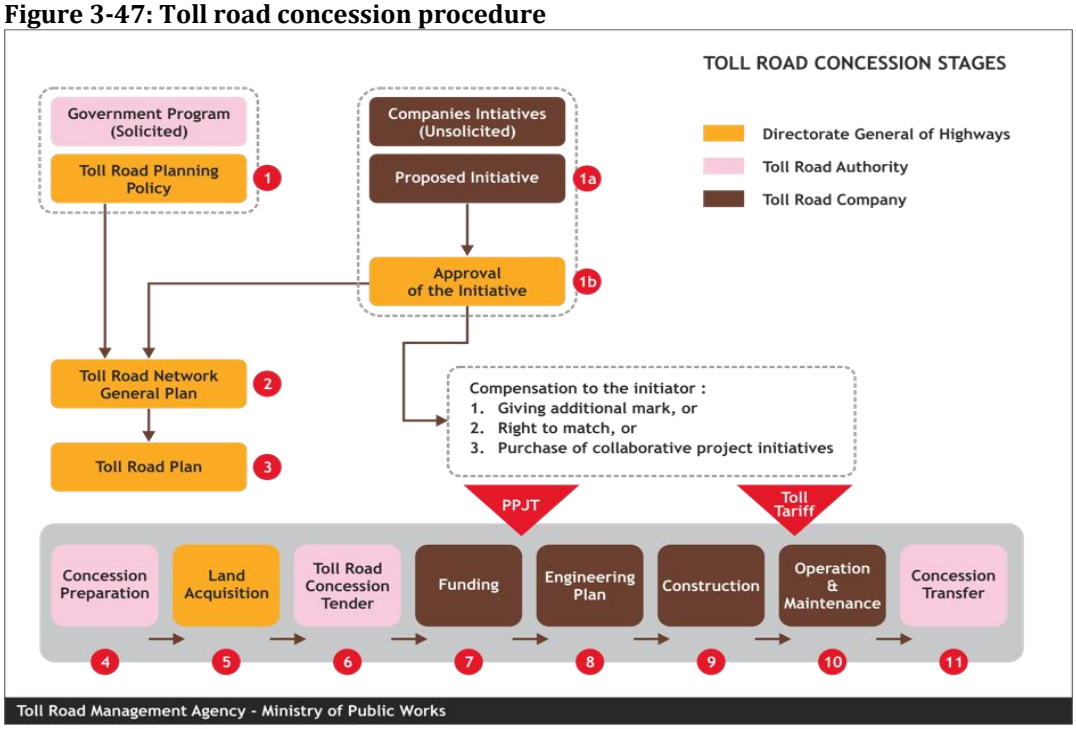
Toll road concession procedure

There are three ways to obtain a toll road concession:

1. Increasing the stock share of profitable toll roads. This could be done by the state-owned toll road company.
2. Following a tender organized by the Government (solicited).
3. Proposing to develop a toll road that is not included in the Government's plan (unsolicited).

Figure 3-47 shows the procedures for solicited and unsolicited concession. Unsolicited procedure means a toll road company proposes to develop a new toll road to the Government. For this procedure, the company undertakes a feasibility study and the necessary surveys. If the Ministry agrees to the proposal, a tender still needs to be organized. However, the proposer will get compensations in terms of extra points and a right to match the lowest bid.

Figure 3-47: Toll road concession procedure



Source: Website of BPJT[80]. Accessed on 11 January 2020.

The state-owned toll road company, Jasa Marga, is very dominant having 61% of toll road market share and capable to take high risk investments. It operates 13 toll roads under its holding and is a majority shareholder in 20 toll road companies.

[80] http://bpjt.pu.go.id/konten/investasi/tahapan-makro-pengusahaan-jalan-tol

User engagement

Road tolling system has been implemented in Indonesia since 1980s and until now there is no record of resistance from the public. There can be two reasons of this. Firstly, road tolling has been there for four decades and users accept it as a part of the transportation system. Secondly, the toll tariff (apart from the tariff of the toll roads built recently) is relatively low, starting from as low as IDR3,000[81] per entry. On the other hand, the silence of the public could be the reason of the absence of approach to road users. Based on the study visit, it is understood that new toll roads have low traffic volume because users resist to pay high tariffs, showing that they are not informed on how the tariffs are determined. Comparing the tariffs of existing and new toll roads are unfair because most of the existing toll roads have achieved break even point.

3.4.7. Data Collection Method

In Indonesia, road tariffs are determined based on surveys on Willingness to Pay (WTP) and Ability to Pay (ATP), that are conducted as part of fesibility studies. The results of the surveys are used to determine the maximum and minimum prices. This procedure has been applied in the tolling system and in the upcoming ERP in Jakarta.

Road Tolling

At the planning stage of toll road development, WTP and ATP surveys are carried out by the government, except for unsolicited concession procedure (as elaborated in section 3.4.6), by interviewing road users surrounding the location of the planned toll road.

At the operational phase, surveys on the road condition are done regularly by a toll road company to monitor the roughness of the roads under its concession. The results are reported to BPJT as a regulator, who also regularly does on-site checks of the road condition.

Congestion Charging

For the implementation of ERP system in Jakarta, a feasibility study was conducted in 2012, which also includes the results of WTP and ATP surveys on 25 roads (53 km) that are currently operated under the odd-even traffic rule. Interviews were conducted to 930 road users along these roads to collect information, among others, on household income and how much they are able and willing to pay for road charging. The survey results can be summarized as follows[82]:

- ATP for road charging (including road toll) per day[83]:
  - car users = IDR 125,000 (≈ US$9.1)
  - motorcyclists = IDR 75,000 (≈ US$5.5)
- WTP for congestion charging (average value) for various traffic speeds:
  - <10 kph = IDR 19,900
  - 10-15 kph = IDR 11,300
  - 15-20 kph = IDR 8,450
  - 20-25 kph = IDR 6,700
  - 25-30 kph = IDR 5,450

[81] As of 10 January 2020, IDR3,000 ≈ US$0.22.
[82] Based on interview with ERP Management Unit on 9 January 2020.
[83] US$1 = IDR 13,574 as of 11 January 2020

- 30-35 kph = IDR 3,500

These amounts are the WTP for using 5 kms of ERP roads.

3.4.8. Capacity Building

The Ministry of Transport has a Transportation Research and Development Agency that carries out research and development in the field of transportation. Its functions are, among others, to formulate technical research, development policies, plans and programs, and research and development in the areas of multimodal transportation management, land transportation, sea transportation, and air transportation. In relation to the role of the Ministry of Transport in the toll roads development, the agency is involved in studies of electronic toll collection (ETC), toll road accidents, and speed limit on toll roads. The researches also include focus group discussions that cover various stakeholders, mostly from government institutions. The findings are used to develop recommendations for the Ministry of Transport and when applicable, to the Ministry of Public Works and Public Housing.

In terms of ERP implementation, due to its very technical nature, it is very difficult to rely only on government employees (Zulkifli, 2020). A special organizational structure within the ERP Management Unit, that combines government employees and non-government technical staff, is therefore needed.

3.4.9. Conclusions and Policy Recommendations

Political Factors

Political will in road pricing in Indonesia is very strong. In terms of road tolling, this has resulted in a strong and successful PPP mechanism for the highways development. In terms of congestion charging, the strong political will is shown by a number of legislations that were developed in the past years to strengthen the legal framework of the ERP implementation. However, contradictions occur between legislations, showing a poor relationship management among the involved government institutions. A strong leadership is key to address this challenge to ensure that the related institutions work together towards the same goal.

Institutional and Organizational Factors

- One of the success factors of PPP in toll roads in Indonesia is the separation between the roles of toll regulator and toll operator in 2005.
- The established ERP Management Unit showed a good determination to manage the upcoming ERP system effectively.
- The involvement of Road Users Associations is almost missing in the decision making process. As representatives of road users, they should be invited as advisors to BPJT and ERP Management Unit when new policies are formed, such as new toll tariffs, to ensure high acceptance from road users.

Economic and Financial Factors

- It is prohibited by law to use toll revenue for any purposes other than to finance the toll roads. This ideally should be relaxed to be spent on all sorts of transportation interventions, especially for the toll roads that have reached break even point.
- Of all road pricing mechanisms, only the Motor Vehicle Tax has an earmark for non-tolled road construction and maintenance, and public transport development. This might explain the low quality of road infrastructure in Indonesia. In the future congestion charging mechanism, its

revenue will be used to improve road-based public transport services only when implementation costs have been covered. It is recommended to determine an earmarking in the congestion charging revenues, which should be channeled to public transport[84].

- Vehicle taxes take environmental costs into account by discouraging new vehicle production. It is recommended to also include these external costs in the vehicle fuel tax to reduce travel demand.

Technical and Technological Factors

The current ETC system in Indonesia still needs the motorists to ensure sufficient balance on their smart cards. If this is not the case, long queue will still occur when the motorists need to top up their cards at the gates. Speeding up the implementation of a tag-and-beacon system is necessary to increase traffic flows at toll gates. Researches have been done by the Ministry of Transport to determine the most suitable system, using 11 criteria. At the time of writing, the provisional results show that the most determinant criterion is Reliability and that DSRC technology scored best. As ERP is not yet implemented, now would be the good time to consider interoperability between the ETC and ERP systems to increase users' convenience, acceptance, and to ensure data compatibility.

Legislative Factors

- In order to ensure a successful implementation of electronic law enforcement and to reduce corruption risks, a mechanism of integrated electronic data needs to be developed by integrating population registry, database of vehicle registration owned by the Police, and database of vehicle taxes owned by Tax and Retribution Agency. To ensure the success of the system, it is essential that the Police share the database of vehicles ownership, which is not yet the case.
- It is recommended to align the different regulations with regard to imposing congestion charging to motorcyclists. Considering its significant mode share, motorcyclists should also be charged.

Procedural Factors

- Procedures for toll road concessions in Indonesia are considered good practices, contributing to the success of PPP mechanism in this sector.
- Determining the CBD as the first ERP area is the right decision because this area is already served by a mass transit system. This is one of the success factors of ERP Singapore, in which viable alternatives for motorists are provided.
- More attention needs to be paid to user engagement, especially when new toll tariffs are introduced. Users need to be educated on how the tariffs are determined. For the upcoming ERP implementation, user engagement should be on the agenda. Singapore case study shows that Singaporeans were generally well informed on the rationale of the scheme, resulting in high acceptance and support to the policy.

Data Collection Method

- WTP and ATP surveys are conducted to be used as a basis to determine the maximum and minimum toll tariffs and congestion charges.

[84] This recommendation is also supported by the result of questionnaire for Academia in Indonesia.

- An integrated transport data collection system needs to be established, in such a way that data can be shared and disseminated to multiple government entities. For this, a robust data collection method is essential.

Capacity Building

The Indonesia Ministry of Transport has a Transportation Research and Development Agency, from whom other countries can learn.

As ERP is a new system in Indonesia, building the capacity of ERP Management Unit is key for a successful implementation of this system. Developing a special organizational structure, that combines government employees and non-government technical staff, is therefore needed to support the Unit.

3.5. Tunisia

3.5.1. Introduction

The Republic of Tunisia is situated in the Northern part of African continent. The country neighbours with Algeria and Libya and borders the Mediterranean Sea with a coastline of about 1,300 kilometres. Tunisia is a member of amongst others, the Arab Maghreb Union, the Arab League, the OIC, the Greater Arab Free Trade Area, the African Union, and has an association agreement with the European Union.

Tunisia's infrastructure and logistic quality are poor. EBRD forecasts that Tunisia would need to spend 23.8 per cent of GDP on infrastructure to catch up with advanced economies, maintain existing, and build new infrastructure, within short term (EBRD, 2018). Bringing key pieces of infrastructure under PPPs has been delayed so far.

Figure 3-48: Road map of Tunisia

Source: Nations Online Project

According to Henda and Riadh (2018), urban traffic congestion is growing in Tunisia, and the situation is likely to become critical in the near future. The rapid increase of car ownership has led to a series of related problems, such as high energy consumption, increase in number of accidents and air pollution.

This phenomenon is the result of a number of factors, such as increase in per capita income of the middle class, the quasi stagnation of the public transport supply, low fuel prices and low toll fees for the highway network, and loss of attractiveness of non-motorized transportation.

The Government is firmly committed to making greater use of public-private partnerships (PPPs) for key investments. Since political reform of 2011, Tunisia has relied mainly on concessional resources to finance its growing balance of payments deficit, and in recent years has enjoyed favourable international market access supported by bilateral guarantees. However, its sovereign credit ratings have deteriorated over the last year and a half. Tunisia's modest economic recovery is expected to continue in 2020.

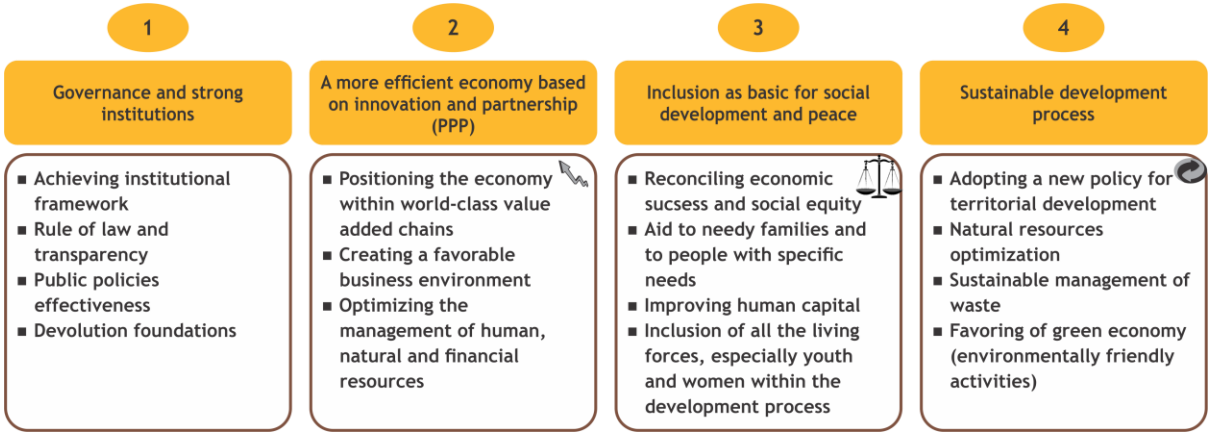
Tunisia maintains about 20,000 kilometres of classified roads, and 22,000 kilometres of non-classified roads. Classified roads include highways, national, regional and local roads. Tunisia started to build and operate the motorway network in 1981 with the A1 Motorway Tunis-Turki (36 km), and currently there are three highways in Tunisia.

3.5.2. Political Factors

Tunisia has gone through a successful political transition, has consensus on its new vision and is undertaking a profound structural reform process (MDICI, 2019). Tunisia's commits itself to an alternative development model (Figure 3-49). The four pillars are:

- Governance and strong institutions
- A more efficient economy, based on innovation and partnership (PPP)
- Inclusion as basis for social development and peace
- Sustainable development process

Figure 3-49: Commitment to Alternative Development Model



Source: MDICI (2019)

The Tunisian government shows a strong focus on the mitigation of regional disparities, the extension of the transport infrastructure network and on strengthening the public transport. A significant imbalance is observed in terms of development between the coastal region (from Tunis to Sfax) (Gouider and Nouira, 2015) and the rest of the. According to the Development Plan of Tunisia

2016-2020, the upgrade and extension of transport infrastructure is a key route to reaching the target of reducing regional disparities. The goal is to facilitate connections to remote areas, support regional mobility, and improve access to ports and logistics areas. This is expected to boost external commerce and employment, particularly in remote regions. (OECD, 2019)

The road freight industry is an activity that horizontally affects many other sectors of economic activity and so plays a key role in market integration (Achour and Belloumib, 2015). The approach to pricing of infrastructure, so far, has been strongly influenced by social (affordability) and political elective motives. Most infrastructure is freely available. The charge on the limited stretch of toll roads is very low.

In 2016 the Ministry of Transport, in collaboration with the World Bank, prepared a White Paper to support, upgrade and develop regional infrastructure, with a focus on inland regions (railway, roads, urban transport, power, water and sanitation) (World Bank, 2016).

Seven major directions were adopted for the 2016-2020 period:

- Develop transport infrastructure and encourage public private partnership;
- Pay particular attention to the quality of the services provided, the total quality and the safety and security of transport;
- Restructure public enterprises and revise their mode of governance;
- Confirm the priority given to the collective transport of people through investments in both rail infrastructure and road and rail rolling stock;
- Develop the rail transport sector for people and goods;
- Improve the efficiency of the logistics system with the objective of reducing the cost of logistics and improving Tunisia's ranking compared to the logistics performance index; and
- Adopt intelligent transport systems by using new information and communication technologies for sustainable transport.

3.5.3. Institutional and Organizational Factors

The successional 5-year plans reflect the national strategy. These plans include aspects of road transportation. The Road Master Plan, published in 2004 by a steering group, comprising of various ministries amongst others the Ministry of Transport, provides the long-term plans concerning road infrastructure.

In the Republic of Tunisia six departments are involved in the activities of road transportation:

- The Ministry of Transport, which is the main ministerial department that intervenes in the management of transport and has the mandate to provide the country with a global, economical and safe transport system and to control its proper functioning with a view to make it an essential factor of economic and social development;
- The Ministry of Equipment and Housing, which is responsible for the administrative and technical management of road infrastructure, in particular the classified road network;
- The Ministry of Development, Investment and International Cooperation, which is in charge of drawing up five-year development plans and therefore planning investment in the sector;
- The Ministry of Finance, which is responsible in particular for transport taxation and customs facilitation;
- The Ministry of Interior, which is responsible in particular for maintaining public order and civil protection throughout the territory, including the safety and movement of people and goods;
- The Ministry of Environment and Spatial Planning, which is responsible for implementing state policy in the field of environmental protection for the country’s sustainable development.

The multi-departmental approach that Tunisia follows is rather challenging from the viewpoint of coordination of road transport related issues. Especially, when considering new technologies, creating a blurry frontier between infrastructure and rolling stock, this organization might meet its limitations.

When it comes to implementation, the Tunisia Highways Company (STA) operates and manages the motorway network as a concessionaire. The STA was set up in 1992, with 100% state ownership. In 2009, the STA started the operations of a road tolling system for a large part of the Tunisian highway network. The toll price of the STA network is set by the Ministry of Finance.

Tunisia has established a Concessions Unit that aimed to support the implementation of PPP as an alternative procurement option. This unit advises line ministries and local authorities on the various technical aspects of PPP project identification, appraisal and procurement.

Tunisia has set the expansion of its highway network as target. The present 565 kilometres (as of October 2018) have to be 900 kilometres (by 2022) and 1300 kilometres (by 2030). A new highway company, apart from STA, is foreseen. Currently a feasibility study of the participation, financing and operation of the highways in Tunisia by private parties, is ongoing.

3.5.4. Economic and Financial Factors

Fuel subsidy

Tunisia subsidizes fuel consumption. The state contributes about 25% of each litre of fuel consumed by road users. This makes road transportation an activity with a strong financial unbalance, where the State makes a considerable net contribution to the users. Public servants' salaries, interest payments and subsidies absorbed two-thirds of government spending in 2016, leaving little room for investment in social and physical infrastructure, its maintenance and efficient operation, and for programs in favour of the poorest population. What is needed, then, is to improve the quality of public spending in order to make it more equitable and supportive of inclusive growth. (OECD, 2018)

Table 3-16: Tunisia Government budget balance 2018

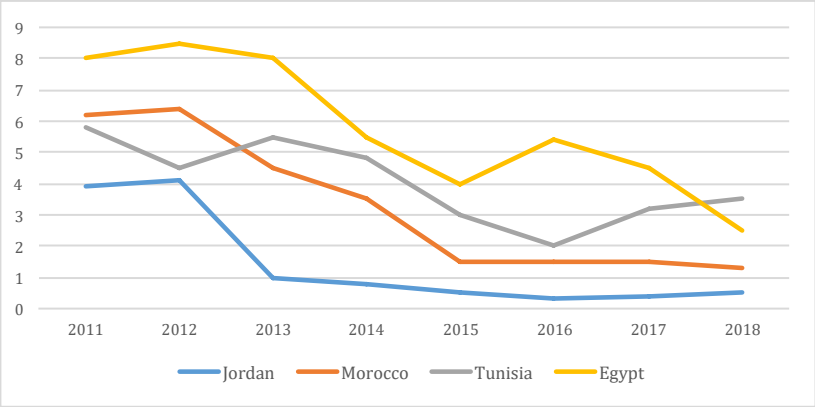
2018 Government budget balance Tunisia (in Million USD)			
Fiscal revenues	8,700		
of which VAT		2,700	
of which customs dues		400	
of which excise taxes		1,000	
of which vehicle tax (vignette)			5
Non fiscal revenues	1,200		
of which from petroleum industry		750	
Total revenues	**9,900**		
Total expenditures	**11,700**		
Budget defisit	**1,800**		
Total public debt per 31 Dec 2018	**30,000**		
of which foreign		22,500	

Source: Fimotions. Analysys based data on the website of Ministry of Finance of Tunisia. Accessed on February 2020.

As the national budget is beyond its limits, and public debt increases year by year, the IMF has urged the government to lift the cap on fuel prices (Table 3-16). Measures have been taken to reduce subsidy costs. The government's objective is to lower the fiscal deficit in order to stabilise the public debt at below 70% of GDP by the year 2020, while boosting investment spending and social outlays.

Data from the Ministry of Finance show that in 2017, energy subsidies amounted to 1.6% of GDP and food subsidies 1.5%. Price controls and subsidies to consumption are common in other Southern and Eastern Mediterranean countries, but the degree of price restrictiveness and the value of subsides provided in Tunisia appear to go beyond the levels of many comparable economies. (OECD, 2019)

Figure 3-50: Food and fuel subsidies in four MENA countries (% of GDP)



Source: IMF in OECD (2019)

In addition, the state intervenes in the market through several state-owned enterprises (SOE), such as the public transport company for Tunis (TRANSTU). The exposure to credit risk from guarantees, on-lending, and treasury loans to SOEs and public financial institutions amounted to around 14% of GDP in 2016. The 20 largest SOEs (excluding social security) had a total net loss of TND 1.3 billion in 2016 (1.5% of GDP), of which the 5 largest lossmakers were the national airline company TUNISAIR with 12%; the public transport company for Tunis (TRANSTU) with 1%; and the railway company with 5.%. (World Bank, 2018)

The rationale of this choice is social and political of nature. Important background information is that Tunisia has almost no fossil fuel resources, and is a net importer of fuels, and that since 2011 the national debt increased structurally, from 40% of GDP in 2010 to 70% in 2019. Currently 75-85% of the Tunisian government budget is covered by revenue. The remaining 15-25% is debt funded from external resources (Table 3-16).

Currently Tunisia is working on improvements of the road transport system. The budget is not sufficient to pay for the investment required for the extension of the network, and at the same time to pay for the necessary maintenance of the existing network. So far extensions have been prioritized, and massive backlogs of maintenance are accepted. According to the Government, the ongoing degradation has become unacceptable, and it is time to reconsider the overall structure. The ambition is to create a road agenda.

Road tolling

The toll price is about US$ 0.01 (0.027 Dinar) per kilometre (

Table 3-17) and has not changed since 2010. In the international context, this is a very low price. The toll price structure distinguishes three categories of vehicles:

- Category 1: vehicles with 2 or 3 axles, with a height, at the front axle, of less than 1.3 metres
- Category 2: vehicles with 2 axles, with a height, at the front axle, of more than 1.3 metres
- Category 3: vehicles with 3 axles, with a height, at the front axle, of more than 1.3 metres

Category 2 vehicles pay double the price (+100%) compared to vehicles of category 1. Category 3 vehicles pay two and a half times (+150%) the price compared to vehicles of category 1.

The revenues of Tunisia Autoroutes have increased by 8,4% per year, however due to devaluation of the Tunisia Dinar, the capital expenses have almost doubled between 2015 and 2018, effecting a net loss of 80 million Dinar for 2018 (revenues 80 MTD, total expenses 160 MTD). The total investment of the tolled roads exceeds 3 billion Tunisian Dinar, of which 2 billion during the last decade. (World Bank, 2019). Furthermore, the toll revenue is insufficient to cover the cost of maintenance of the STA road network. All STA deficits are covered by the general state budget.

In Tunisia, provision of a free alternative route is mandatory and determined by law. One of the principles is that infrastructure should be freely available, and be paid from general public sources. Tunisia even puts priority to the acceleration the development of the road network. On the paid sections, the State is able to provide road users with additional safety, quality, reliability and comfort.

Table 3-17: A1 Toll Road Tariff in 2014

El Hancha Sfax	El Jem Sfax	El Jem El Hancha	Karkar Sfax	Karkar El Hancha	Karkar El Jem	El Bourjine Sfax	El Bourjine El Hancha	El Bourjine El Jem	El Bourjine Karkar	M'saken Sfax	M'saken El Hancha	M'saken El Jem	M'saken Karkar	M'saken El Bourjine	Distance travelled / Categories of vehicles	
0,600	1,300	0,700	1,800	1,200	0,500	2,400	1,700	1,000	0,600	2,600	2,000	1,300	0,800	0,200		Category 1: Vehicles with 2 or 3 axles, with a height at the front axles, of less than 1,3 metres
1,000	2200	1100	3000	1900	0,800	3,900	2,800	1,700	0,900	4,300	3,200	2,100	1,300	0,400		Category 2: Vehicles with 2 axles, with a height at the front axles, of more than 1,3 metres
1,500	3,000	1,600	4,200	2,700	1,200	5,500	4,000	2,400	1,300	6,000	4,500	2,900	1,800	0,500		Category 3: Vehicles with 3 axles, with a height at the front axles, of more than 1,3 metres

Source: STA

3.5.5. Technical and Technological Factors

There are two toll collection systems in Tunisia: cash and electronic, with the majority of transactions is in cash. The charge is imposed per section of the road. Road users who make a long stretch passing a series of gates, will make a series of sub sequential payments. A typical price is 1.50 TD for a stretch of about 50-60 kilometres. Tollgates are manned and a payment is manual.

Figure 3-51: Toll gate operated by Tunisia Highways Company

Source: Tunisia Highways Company/STA

The ETC system utilizes the RFID technology, with an electronic badge in the vehicle and an antenna at the toll gate (Figure 3-52). The system was introduced in 2010 and designed for regular users of the toll roads. Compared to cash collection, the transaction time of electronic collection is shorter; thus, it can handle the passing vehicles faster. It is operated at a reserved lane. As soon as the vehicle stops, the barrier opens automatically. STA explained in the media "No more windows to drop, no more tickets to reserve, and no more receipts to keep". It reflects flexibility, speed of user management, and is based on new information and communication technologies.

Figure 3-52: Tunisia electronic badges as introduced in mid 2018

Source: Tunisieauto.tn.

There are two types of electronic badges: prepaid electronic toll cards and automatic badges. In 2019, STA has suspended the use of prepaid electronic toll cards. Currently there are about 75,000 automatic badges in circulation. STA's ambition is to reach 150,000 badges in the near future.

3.5.6. Legislative Factors

Reforms have slowly progressed, according to the Tunisia Ministry of Development, Investment and International Cooperation (MDICI), one of the main reforms that are considered urgent and high priorities is reform of the tax system.

Tunisia has a history of user-based concession projects and a potentially attractive environment for PPP investment. Whilst the domestic banking sector has limited capacity, long-term foreign currency funding may be a viable option for project funding. Tunisia already has a Concession Law (Law no. 2008-23 of 1 April 2008), but its applicability to PPP projects, where the private sector does not take demand risk, lacks the certainty, which international funders are, as a rule, likely to seek (EIB, 2011).

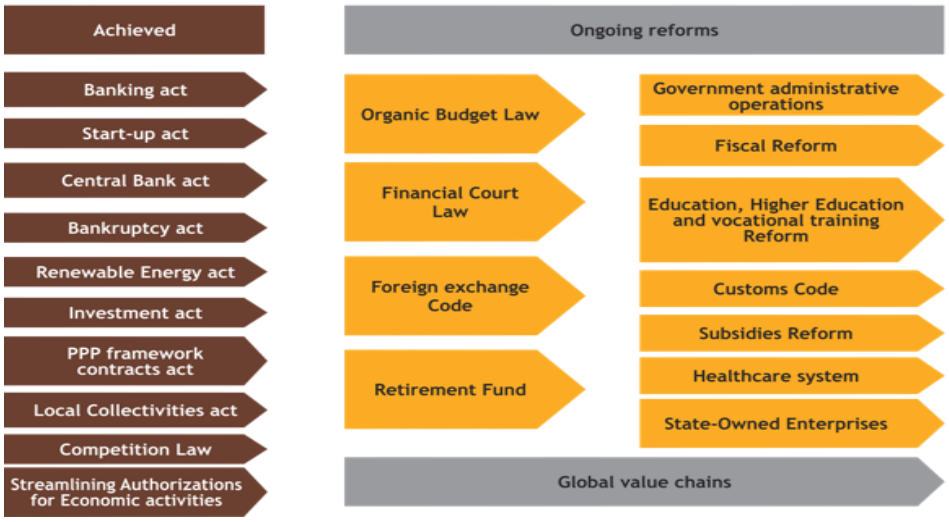
The Tunisian Concession Procurement Decree (2010-1753, of 19 July 2010), secondary legislation under Concession Law determines that the bidder with the lowest price evaluation for the financial offer is selected if it has met the minimum technical threshold. If there is a pass/fail evaluation in relation to the technical offers followed by a lowest price evaluation for the financial offer, there is a danger that the procuring authority may not select the best technical solution to meet its needs and therefore not achieve the best value for money. An alternative could be to use sophisticated award criteria, which apply weightings to different components of the bid and does not rely overwhelmingly on price. It is essential that thought is given to specifying individual criteria, since if no criteria is specified, "lowest price" applies by default.

However, recently there has been symbolic but encouraging progress (Figure 3-53). A decisive step was taken concerning investment financing in Tunisia with the adoption of the Law on Public-Private Partnerships (PPP) on 13 November 2015. The government plans to accelerate the pace of reform approvals. Considered as the overarching piece of Government's policy to boost the economy, the Strategic Development Plan (SDP) 2016-2020 was approved on 12 February 2017. These steps aimed at improving the institutional environment in order for Tunisia to generate a sustained and high-level growth (AfDB, 2017).

The 2018 Budget Law has been marked by a clear commitment to control public expenditures in order to make public finances regain sustainability. The objective is to contain the budget deficit at around 4.9% of GDP. At the same time, the 2018 Budget Law calls for a reduction in energy subsidies through the adoption of automatic quarterly adjustments of hydrocarbon prices at the pump. (World Bank, 2018)

Tunisia Highways Company has been created on the basis of Legislative Decree 89-9 (1 February 1989) and updated and added Decree 94-102, 96-74, 99-38 and 2001-33. The tolling has its base in Legislative Decree 2004-33 and 1986-17. Electronic toll collection is legally supported by Legislative Decree No. 2011-111 of 24 October 2011, authorizing the ratification of the guarantee agreement concluded in Tunis on 19 September 2011 between the Tunisia Government and the African Development Bank for the contribution to the financing of project to build the Gabès - Medenine - Ras Jedir motorway link (Medenine - Ras Jedir section). (EIB, 2011; AfDB, 2011)

Figure 3-53: Implementing reforms



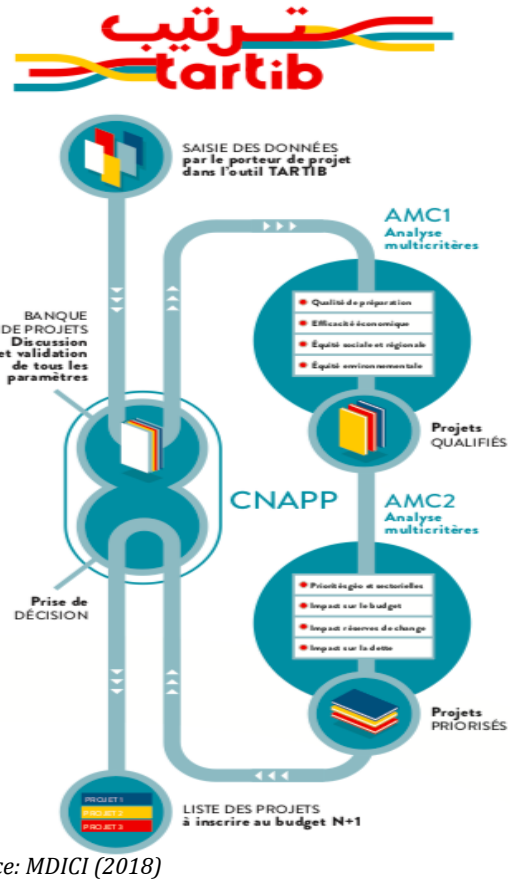
Source: MDICI (2019)

3.5.7. Procedural Factors

The MDICI played a key role in making the 5-year plan and also in public projects. Regarding project appraisal and project management, Tunisia follows international guidelines, with attention for social, environmental and hygiene aspects. Tunisia complies to the highest international norms.

Tunisia applies the TARTIB method (multicriteria analysis) for the selection and prioritising of public investment projects (Figure 3-54). The method is legally imbedded (Decree 2017-394 of 29 March 2017) to attain budget optimizing and effective projects. The National committee for the approval of public projects (CNAPP) plays a key role in this structure. In consultation with the World Bankand the Bureau Expertise France, the MDICI has established this mechanism for identifying and monitoring public projects. Part of this structure is to establish a database relating to the projects to be studied using objective criteria, while considering the economic, social and regional return as well as the methods of their financing. This mechanism supports the work of the CNAPP, as part of the technical support provided by the World Bank. For urban transport projects, a steering committee is formed, with participating ministries. Urban transport projects are chaired by the ministry of transport.

Figure 3-54: TARTIB method for selection of public projects



Source: MDICI (2018)

WTP is one of the methods to determine the appropriate price of transportation infrastructure. Henda and Riadh (2018) developed a survey on the WTP in Tunis City in order to evaluate reaction using the Contingent Evaluation Method. The results of their research show that Tunisians are reluctant to abandon the use of their private cars despite their awareness of the phenomenon of congestion, of its high costs and of its socio-economic and environmental constraints. Their paper constitutes a first attempt in Tunisia aiming to quantify, explain and determine the factors of WTP of the private car users in order to reduce the congestion problems and consequently to ensure a smooth flow.

As mentioned, traffic congestion is growing in Tunisia, and the situation is likely to become critical in the near future. Road users are aware of the problems and costs of urban transport congestion in the Tunisian urban area. Henda and Riadh (2018): "However, their willingness to pay to reduce congestion is low because they consider that the price paid for fuel is already high and that the level of congestion has not yet critical. The results give a strong correlation between the WTP of users, level of schooling and income. Thus, the higher their incomes, the more the users will be willing to keep the use of their automobiles. Despite the congestion and its costs, users are not willing to reduce car usage. Therefore, the private car is a luxury good whose consumption increases with income. Individuals who do not own a car are equally sensitive to the phenomenon of congestion, suggesting different solutions such as the institution of the toll and the improvement of public transport. Several factors explain the low willingness of the users to limit car use to improve traffic flow, namely poor quality of public transport, multiplication of travel interests within the same household, lack of public transport stops nearby the workplaces."

According to Henda and Riadh (2018), an urban toll would be the best resolution that offers individuals the choice of using their cars or not, on payment of the nuisance caused to the community. A spreading of the working hours during the sensitive period and the introduction of incentives (carpooling, public transport, etc.) could encourage workers to reduce car use are also recommended solutions in order to limit the phenomenon of congestion.

3.5.8. Data Collection Method

The sector lacks current traffic data and a statistical system that produces accurate and reliable analysis. In the absence of a statistical system, the government is unable to develop public policies in this area. The need to boost the quantum and currency of data in general and for transport sector in particular is has been recognised.

In October 2017, AfDB approved a loan to finance the Tunisian government's 'Digital Tunisia 2020' National Strategic Plan. The implementation of this project is ongoing. 'Digital Tunisia 2020' will strengthen public services through the use of digital platforms on a grand scale. The activities include the implementation of online administrative and sectoral information services and the development of a digital ID system and a data exchange platform. The programme covers a wide geographical area and will reduce the current regional disparities significantly. Once implemented, Digital Tunisia 2020 will help create a climate of open government and provide impetus to the digital economy, providing much-needed job opportunities for young graduates. (AfDB, 2017)

The National Institute of Statistics is responsible for collecting, collating and analyzing a wide range of data for all the sectors including transport[85]. Its roles are:

- Ensuring that data gathering, processing and analysis as well as disseminating statistical information are in coordination with the other public statistics organizations.
- Conducting censuses and demographic, social and economic surveys.
- Elaborating national accounts according to its different scopes (national, quarterly)
- Elaborating indicators for the business cycle and insuring the follow-up and the analysis of this cycle.
- Organizing national statistical documentation by gathering data issued by the organizations of the national statistics system.
- Ensuring technical coordination for public statistics activities.
- Ensuring a permanent secretariat for the Statistics National Council.
- Organizing international cooperation in the field of statistics.

With regard to road transport, the following databases are maintained[86]:

- Registration of vehicles by category
- Registration of vehicles by brand
- Evolution of the number of accidents per environment
- Evolution of the number of injuries by cause
- Evolution of the number of accidents, of wounded and killed

Regarding more specific data relating to transport infrastructure investment, this is collected on a project basis by consulting companies and research agencies. It is evident that more transport data would be very helpful to Government to better plan transport infrastructure.

3.5.9. Capacity Building

Tunisia's capacity to educate technical engineers, financial and logistics experts is sufficient. However, regarding transport economists, Tunisia almost fully relies on services from foreign countries.

In order to minimize risks and costs, and to ensure the quality of PPPs, strong administrative and institutional capacities are necessary from the project development phase. According to the OECD questionnaire on the PPP framework in Tunisia, the government's capacity to initiate cost-benefit analyses could be further developed, including to measure the environmental effect of investment projects (OECD, 2015). These analyses, once initiated, are currently commissioned to private consultants. Strengthening of the support staff for PPPs, particularly within the future PPP unit, is underway and will undoubtedly help guide the contracting authorities in the preparation of contracts, which can be particularly complex. It is also good practice to subject the evaluation process of any project to external and independent opinions capable of balancing any bias for or against PPPs.

The major training institutes regarding pricing transport infrastructure and related issues are:

[85] http://www.ins.tn/fr/statistiques
[86] http://www.ins.tn/en/themes/transport

- The Faculty of Economic Sciences and Management of the University of Tunis El Manar: it is the most important educational and research institution in the fields of economics and management through its historical heritage and the number of its teachers and students, as well as the quality and diversity of training. that ensures. The FSEGT, created in 1958, is the first faculty of economics and management in Tunisia.
- CNAM Transport and Logistics: CNAM via its National Institute of International Transport and Ports (ITIP), is a Tunisian-French training establishment. The diploma is a professional license in international transport and logistics.
- Higher Institute of Transport and Logistics of Sousse: The Higher Institute of Transport and Logistics of Sousse is an institution dependent on the University of Sousse. Its mission is to provide the following training in applied license: Transport and Logistics Management, Logistics Engineering, Transport and Logistics Technologies, Basic license: Sciences of Transport and Logistics.

3.5.10. Conclusions and Policy Recommendations

Political Factors

- As in many other OIC countries, Tunisia is focussing on expanding its transport infrastructure network, in order to reduce disparities. However, fuel is subsidized and vehicle taxes are negligible. Little room is available in the general public budget for investment and maintenance of transport infrastructure. Furthermore, toll tariffs are too low to cover the maintenance costs.
- It is recommended to determine an earmarking, mandated by law, in the vehicle taxes to be dedicated to road infrastructure investment and maintenance.

Institutional and Organizational Factors

Transport planning requires to be more integrated within the sector, with land use and also with the main productive sectors such as Tourism, Minerals and Agriculture and some institutional realignment would be beneficial. Integrating road infrastructure with public transport would create a synergetic result. Good communications and allocation of responsibilities between the departments of Transport and the Ministry of Works (Equipment), would pay back, in terms of money and adequacy.

Economic and Financial Factors

- Expanding the transport infrastructure network and strengthening the public transport system will reduce regional disparities, which have been a focus of Tunisia. This can be done through appropriate pricing, i.e. relatively high pricing where demand and congestion are high, in order to create funding for infrastructure with a high social value.
- The budget of road infrastructure should cover adequate maintenance of existing infrastructure, and should be conditional to decisions regarding extension of the network. Funding for high-quality public transport may be derived from building more equity into road user charges such that funding can be used for public transport.

Technical and Technological Factors

The choice for electronic toll collection is well founded, as it serves the quality of the road experience.

Legislative Factors

- In line with all political and institutional commitments, strengthening the PPP mechanism is of necessity to expand financial and operational possibilities. The unique selling point of Tunisia is in its political stability, which is a value when it comes to attracting investment.
- Tunisia has been enabling its institutional environment, such as the 2018 Budget Law aimed at regaining stability in public finances.

Procedural Factors

Applying a multicriteria analysis, mandated by the law, for selection and prioritization of investment projects results in a robust projecs pipeline. It enables a good investment environment to attract investors to expand transport infrastructure in Tunisia.

Data Collection Method

- It is recommended to develop a solid database on transportation and transport infrastructure. Data collection and data availability is crucial to undertake evidence–based policy transport research. This would provide a solid base for a sustainable policy framework for transport development in Tunisia.
- Research on willingness to pay might result in new opportunities, as Tunisians are confronted with increasing congestion, and at the same time, attach high value to the use of private cars.

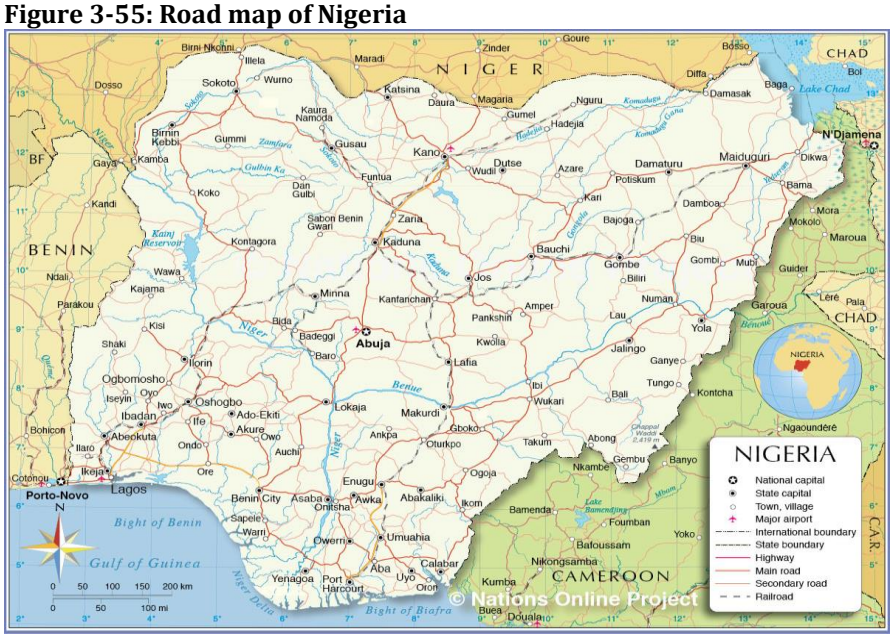
Capacity Building

Developing capacity in the field of transport economics would help Tunisia to optimize the allocation of its transport infrastructure related means.

3.6. Nigeria

The Federal Republic of Nigeria is a country in West Africa. Nigeria borders Benin in the west, Niger in the north, Chad in the northeast, Cameroon in the east and the Gulf of Guinea in the south (Figure 3-55). The capital city is Abuja. It is Africa's most populated country with 206 million people and has a long history of toll roads.

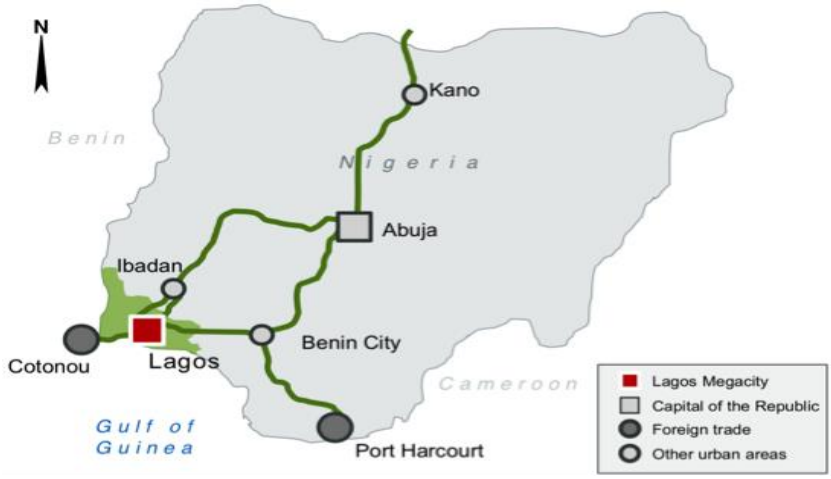
Figure 3-55: Road map of Nigeria



Source: Nations Online Project

Within Nigeria, the Lagos Metropolitan Area is by far the largest urban area of the country, and of the continent (Figure 3-56). Lagos, the capital of Nigeria since its amalgamation in 1914, went on to become the capital of Lagos State after its creation. Lagos is the financial centre of Africa, and the most populous city of Sub Saharan Africa. The Lagos metropolitan area spans 140 kilometres East-West (along the shore of the Atlantic) and 80 kilometres to the North (land inward). All toll roads and bridges in Nigeria are situated within Lagos Metropolitan Area.

Figure 3-56: Location of Lagos Megacity in the Republic of Nigeria



Source: LAMATA (2014)

Adequate road infrastructure is central to Nigeria's economic growth. It is at the core of good governance and public welfare. Any improvement in road infrastructure positively impacts the nation's GDP.

Nigeria has a national road network of about 200,000km. Of this total Federal roads make up 18% (about 35,000km), State roads 15% (about 17,000km), and Local Government roads 67% (about 150,000km), with most Local Government roads being unpaved. The road sector accounts for about 90% of all freight and passenger movements in the country.

The lack of investment in road infrastructure has impacted Nigeria's economic development (Agbigbe, 2016). According to Bhadmus (2015), "Nigerian roads need urgent attention (maintenance) and one of the main sources of generating revenue for such maintenance is by re-introducing toll gate facilities in Nigeria, considering the fact that in average 50 people die every day by road accidents, as claimed by an accident survey by Federal Road Safety Corps (FRSC)."

Nigeria's road infrastructure, measured as road density and percentage of paved roads, generally lags behind its global income peers. Nigeria is estimated to have only 2.1 km of total roads per thousand hectares of land area, whereas the average for Pakistan, India and Indonesia is around 11 km per thousand hectares. The pressure on expanding road infrastructure is very high. Lagos is looking for innovative ways of solving its structural congestion problem. Providing more roads does not work. The only solution to put a halt to this spiral mechanism lies in the provision of adequate public (mass) transport. Lagos is developing integrated multimodal public mass transport (Figure 3-57). The Lagos State Strategic Transport Master Plan (STMP) includes 7 urban rail links (metro line), 14 BRTs, waterborne ferries, each with a capacity of 50-100 passengers and an integrated common ticketing system. Lagos wants to eradicate social exclusion: every community should have a station within a distance of 500 metres. The new transport system will be more affordable.

Figure 3-57 Bus Rapid Transit Lite in Lagos

Source: The Guardian Nigeria[87]

Way back Nigeria had express ways tolled by federal government. Nigeria's tolling history goes back to 1970's with the trunk road Lagos – Badau - Ibadan (A1) express way and the Abuja – Kano (A2) express way. However, they were run in a non-transparent way, and were not being maintained. Before the demolition of toll gates, much of the generated funds were not accounted for. Little amount was actually spent on the maintenance of roads (Bhadmus, 2015). Revenues were not properly or equitably allocated by government. In 1999, President Obasanjo abolished and dismantled the tolling system, because people asked about the rationale of paying for a non-maintained road. The public benefit disappeared. Roads have to be fixed, in order to deliver the dividend of democracy. Then the tolling was cancelled. The rationale was that an increase of the fuel price would be better.

Nigeria's more recent tolling track record consists of two toll roads and one toll bridge, all situated in Lagos State.

- The toll road linking Murtala Muhammed International Airport with Ikeja, a Federal Government concession since the 1990's. The Federal Airport Authority of Nigeria (FAAN) is the owner of the toll plaza and a private operator (I-Cube) is the concessionaire.
- In 2005, the operation of the Lekki-Epe expressway started. It has a length of 49 kilometres and is operated for a 30-year (Lagos State) concession period by the Lekki Concession Company (LCC) with Lagos State as the grantor. Toll is levied since 2011. (LCC 2011; Brocklebank 2014).
- The Lekki-Ikoyi Link Bridge is a 1.36 km cable-stayed toll bridge in Lagos State. It links Lekki with Ikoyi district of Lagos. The bridge is restricted to private and commercial vehicles with a total seating capacity not exceeding 26 passengers. Lagos State is the grantor.

Outside Lagos State, tolling ideology is returning. Nigeria Federal Government recently decided to (re-)introduce a 'friendly' tolling system on its trunk roads, throughout the country. Two upgrade projects (2x3 lanes) plus installation of toll plazas include:

- Abuja-Kaduna-Zaria-Kano express way (2x2 lanes, built 30 years ago)
- Lagos-Sagamu-Ibadan express way (2x2 lanes)
- Second Niger Bridge

[87] https://guardian.ng/news/commuters-to-pay-more-for-brt-lagbus-from-march-1/

Tolling will start after the completion of the works.

3.6.1. Political Factors

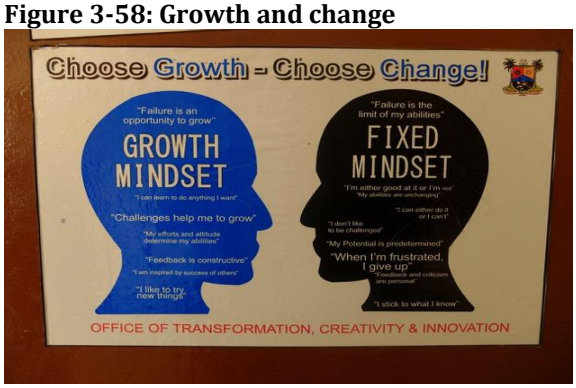
There are three ways of paying for infrastructure: taxes, subsidies (transfers of public money) and tolls. In Nigeria, road users are not being taxed. Transfers and tolls have been the options used in the past. Currently tolling is on the table, while PPP mechanism is preferable to attract private involvement. The aim of the tolling is to balance additional quality with payments. The Federal government expects to carefuly balance toll introduction with quality increases, will not stop traffic from growing. This aspect of actually promoting the growth of private car traffic is typical of African and developing countries and needs careful review as a matter a policy.

Moreover PPP remains a challenge. The private sector will always select projects that are of commercial interest leaving the Government to pay for financially unfeasible schemes. This means that the true value of risk sharing is not comprehended. Illustrative is the case of Virgin Nigeria. When Richard Branson initiated Virgin Nigeria, he was unable to understand the socio-economic reality of Nigeria. He was stuck so much to EU and USA standards and parameters, that his business case did not work. After 3-4 years, Virgin Nigeria pulled out. Willingness to pay was low and aspiration of corruption was too strong (LCC, 2011; Brocklebank, 2014).

The issue of competition between governments has been a major issue. It seemed to be forgotten that governance should be a continuum. There is no robust roadmap. A clear government policy on transportation seems to be on the verge, as, at the time of writing, the Draft National Transport Policy (NTP) is being reviewed, and is expected to be approved the National Assembly soon. Efforts by successive administrations to implement the NTP have failed. In 2017, it was mentioned that "the journey for the development of a National Transport Policy for Nigeria began in 1986". (Sumaila 2013) argued that the Nigerian mobility crisis has been exacerbated by the fact that there is yet no clearly articulated policy for transport development in Nigeria, although government investment and funding decisions, reflected the aspirations and desires expressed in subsequent draft documents.

Deregulation is now the global practice, which the nation has adopted and must pursue. The current reforms of government, especially privatization and commercialization of major public transport enterprises, and appropriate road pricing, must be supported by a sound national transport policy. There is a call for growth and change (Figure 3-58). These issues are alos included in the current Draft NTP.

Figure 3-58: Growth and change



Source: Joel van der Beek, Lagos, February 2020.

Willingness to pay for mobility and infrastructure is flawed, because, according to the users, the price is set too high, which consequently creates negative public opinion. People think that Nigeria

makes money from oil, which is sufficient to provide free infrastructure. Tolling of the Lekki-Ikoyi Link Bridge has been controversial with some Lagosians believe that since the bridge was built with public funds, its use should be available at no cost. The Lagos State government, on the other hand, has argued that the collection of tolls is not only required to maintain the bridge but also to generate funds for building other bridges to link parts of Lagos.

3.6.2. Institutional and Organizational Factors

Nigeria has a three-level road system: Federal, State and Local Government roads. As such, the planning, financing, construction and maintenance of these road types fall under the separate responsibilities of Nigeria's three tiers of government.

According to Oyesiku et al. (2013), there is a need for effective coordination among the national, state and local levels, on capital investment of transport projects. An organizational challenge is that the Federal State Ministry of Transport manages road traffic, and the Ministry of Works manages the construction. Historically, Ministry of Works was part of Ministry of Transport. The ministries were separated during the governance of president Jonathan Goodluck (2010-2015). Now there is a new argument to bring the two ministries together. This is proposed in the Transport Sectoral Reform Bill, on road, rail and inland water.

Yet, the reform of the road sector has taken 40 years, so far. The aim of the reform is to set up a Federal Road Authority (FRA) that is responsible for planning, designing, constructing, maintaining and tolling roads. FRA was planned to be established since 1970's and will be positioned as the armlength of the Ministry of Works. The main reason for establishing the FRA is to promote PPP solutions. Nigeria is at a turning point, reaching out for private sector participation, however, tolling policy, including setting of the rate has not yet passed the National Assembly.

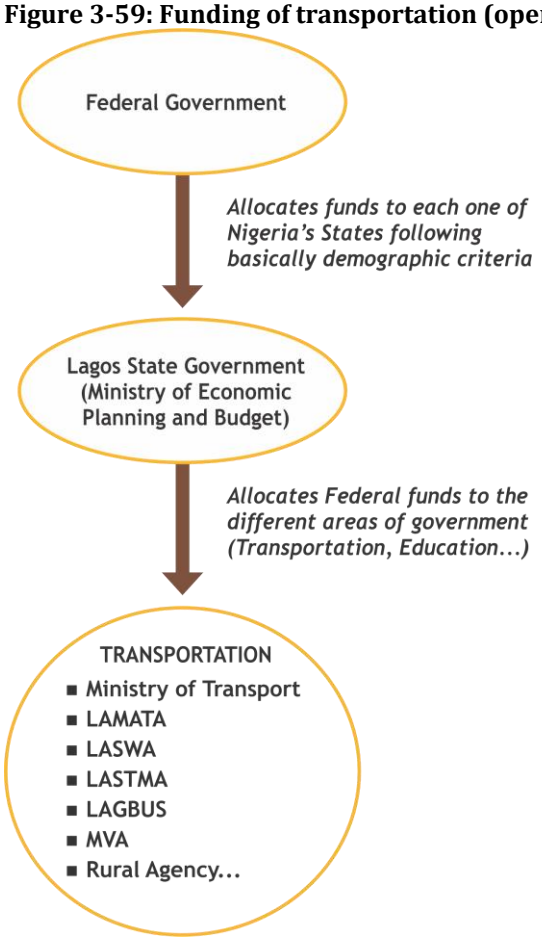
The proposed National Road Fund aimed at maintaining and developing the total network based on dedicated funding. The bulk of the road funding revenues (80%) will come from the petroleum levy (from the production of petrol), and some from toll and vehicle registration. The size of the fund is uncertain as the value of oil reserves has become uncertain, due to the trend of decarbonization.

It is interesting to note that the Nigerian Government is partnering the UK and South Africa to make progress with toll roads.

When it comes to pricing of road infrastructure, the following organizations and their roles are highlighted:

- The Infrastructure Concession Regulatory Commission (ICRC). It is established in 2008 to ensure that market is ready to attract private investment. The objective of ICRC is to developm and implement PPP framework for the provision of infrastructure services and to regulate the PPP endeavours of the Federal government.
- Lagos State PPP Office. It is an SPV established recently by Lagos State with comparable objectives as ICRC.
- Federal Roads Maintenance Agency (FERMA). It is a statutory organization aimed at managing and maintaining federal roads.
- Bureau for Public Procurement (BPP). It determines infrastructure projects.
- Lagos Metropolitan Area Transport Authority (LAMATA). It was established in 2003 and is currently developing the Lagos State Strategic Transportation Plan.
- Lagos Bus Services Limited (LBSL). It was incorporated in 2016 as a Transport Asset Acquisition, Operations, and Advisory Services Company to provide a compass and guide to the operation of bus services in Lagos.

Figure 3-59: Funding of transportation (operations and infrastructure)



Source: LAMATA (2014)

3.6.3. Economic and Financial Factors

Nigeria has a challenge in pricing of its road infrastructure. The public expenses on road transport infrastructure are not covered by anything, but direct and indirect taxation. Two major sources of Government revenues are oil and VAT (Figure 3-59 and Table 3-18).

Table 3-18: Government Budget Balance 2020

2020 Government budget balance Nigeria (in Billion USD)			
Fiscal revenues	5,1		
of which VAT		0,8	
of which customs dues		1,7	
of which corporate taxes		2,3	
of which vehicle tax			0,0
Non fiscal revenues	17,8		
of which from petroleum industry		7,7	
Total revenues	**22,8**		
Total expenditures	**28,9**		
Budget defisit	**6,1**		
Total public debt per 30 Sep 2019	**85,4**		
of which domestic		58,5	

Source: Fimotions based on Ministry of Finance (2019) and Debt Management Office (2019)

Nigeria subsidizes fuel by 25%. Fuel subsidy is an elective sensitive issue. The IMF has urged the government to lift the cap on prices.

According to the Ministry of Finance, Nigeria has the world's 10th largest crude reserves yet will likely spend 1.24 billion USD on fuel subsidies in 2020. Nigeria's current spending on oil subsidy is more than four times what the country spends on building schools and health centres.

In order to supplement the limited resources to provide road infrastructure, Nigeria is exploring PPP mechanisms. The ambition is to start the tolling as soon as possible, starting when the upgrade of the roads is finished, which is expected in 2021. The Federal Government is convinced that revenue from toll exceeds the cost of maintenance plus depreciation of the roads. The model foreseen to be followed is that only economically viable roads will enter into concession. The non-concessioned roads will remain under FRA/FERMA.

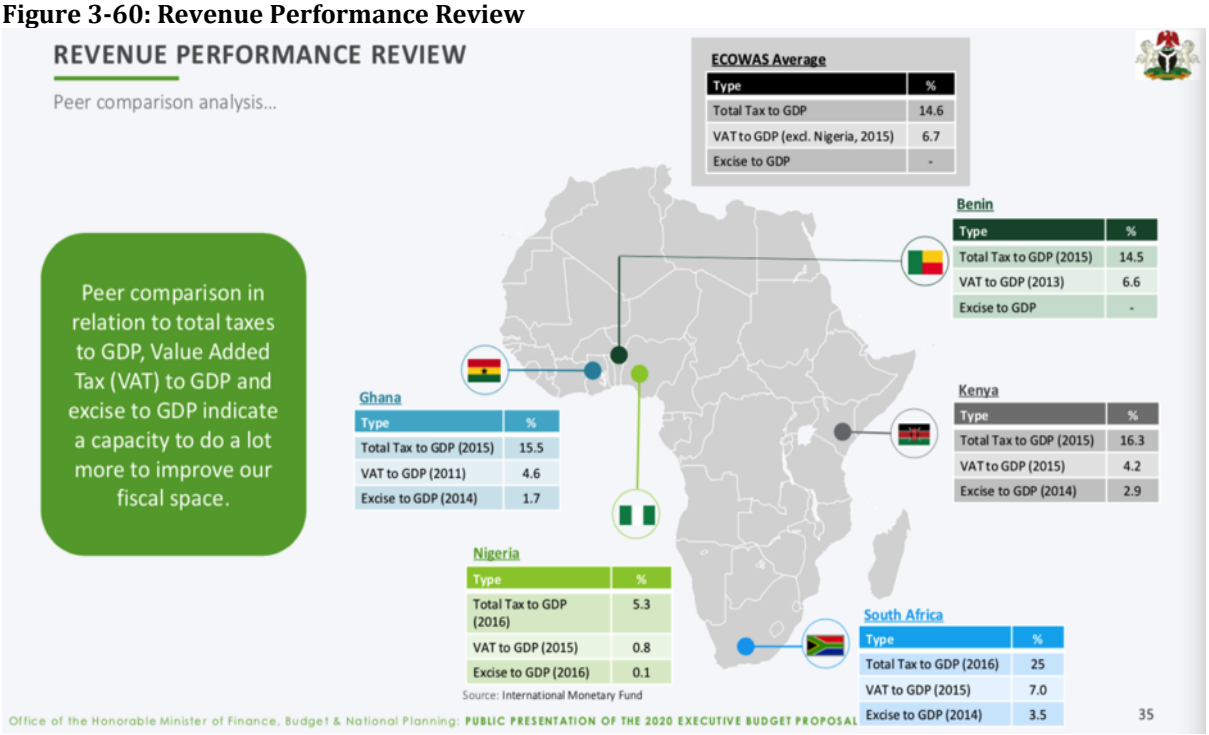
Nigeria's tolling policy does not allow a free alternative road. The argument is that this reduces the economic viability, and the alternative road will deteriorate due to lack of maintenance funds. Despite, the tolled Lekki-Epe Expressway has a free alternative road.

In 2005, Lagos State started the tolling of the Lekki-Epe expressway. The investment is financed by AfDB debt plus funding by UK Standard Bank andvsix local banks. Total sum was about USD 200 million (mezzanine financed)[88]. Financing the Lekki-Epe expressway by bonds proved to be difficult as it was a greenfield structure. In contrast, in a brownfield situation, one can see the cashflows, so it lowers the risk considerably and attracts finance.

The toll revenue is sufficient to cover for maintenance and to contribute to cover capital expenses. The majority of decisions made are not scientifically substantiated. Political elective arguments dominate the scene. Nigeria has very low taxes compared to its peers (Figure 3-60). The average road users are not willing to pay, and can only afford low quality roads. Illustrative: the life vests on ferryboats are fake, just because real life vests are unaffordable under the present pricing regime. This might be the consequence of the unequal distribution of income in Nigeria.

[88] Mezzanine finance is a hybrid of debt and equity. This gives the lender the right to convert to an equity interest in the company in case of default, after venture capital companies and other senior lenders are paid.

Figure 3-60: Revenue Performance Review



Source: Ministry of Finance (2019)

3.6.4. Technical and Technological Factors

The Federal government will re-introduce toll gates on major four-lane federal roads across the country. The plan is to reinstall the toll plazas on the locations where there used to be toll plazas in the past. Toll collection will be electronic, not cash. The toll gates will incorporate rest areas, shopping malls, conveniences, petrol stations, security outposts, first aid kiosks and towing facilities. The new toll plazas are designed to be business enterprises that will be managed by private investors. Funds generated from the toll plazas will be invested in the maintenance of the roads. The highways will be made friendly with the provision of adequate road furniture like road signs, route assurance signs, place names, rumble strip within built up areas and distance to destination signs. Trailer parks are proposed for construction on major routes to ensure that the level of abuse being experienced on federal roads is minimized.

Because overloading is such a problem that risks undermining investment in roads, the Federal Government is reactivating weighbridges across the country, as a result of dilapidated state of the roads caused mainly by heavy duty trucks. The maximum load is 10.5 tonnes per axle. The charge for overload is 2,700 USD per tonne (1 million Naira). Twelve weighbridges are already in operation, 22 installations are ongoing. The weighbridges will be concessioned to private entrepreneurs to operate and manage.

Table 3-19: Tariffs for Lekki-Epe express way

Admirally Circle Plaza Tariff						
	Motorcycle	Salon Cars & Tricycle	Sports Utility Vehicles	Light Trucks & 2-Axle Buses	Heavy Duty Trucks/Buses with 2 or more heavy axles	Commercial Danfo Buses
Cash	100	200	250	400	1000	100
Etag	-	180	225	360	900	90

Lekki-Ikoyi Link Bridge Plaza Tariff				
	Motorcycle	Salon Cars	Mini Vans, Sports Utility Vehicles & Light Trucks	Light Trucks & 2-Axle Buses
CASH		-	-	-
E-TAG	-	270	360	900

Source: www.lcc.com.ng/tariffslist.asp

Right from inception, both for the Lekki-Epe express way and the Lekki-Ikoyi Link Bridge, users have the options of using either the swift pass system, the e-tag system or paying cash.

The swift pass system requires the use of a card that clients swipe against a sensor at the toll both. For the e-tag system, a sticker is put on the windshield and the camera reads the sticker and deducts the payment from the clients' account as they pass. The vehicles do not need to stop at all.

Since 1 January 2020, the option of cash payment on the bridge has stopped (Figure 3-61).

Figure 3-61: LCC has abolished cash toll collection for the Lekki-Ikoyi Link Bridge

Source: Lekki Concession Company

The cashless tolling is to provide respite to Lagosians in terms of adequate traffic management and to ensure seamless passage for road users, as well as improve motorists' journey and travel times. The benefit of this cashless policy on the bridge is that traffic will flow faster because drivers do not need to stop at the toll plaza to collect change.

3.6.5. Legislative Factors

Under the Highways Act 1971, the Federal Ministry of Transportation obtained the power to apply road tolls. The Public Enterprises (Privatization & Commercialization) Act in 1999 promoted greater private sector involvement in public infrastructure projects. Act No. 7 2002 created the Federal Roads Maintenance Agency (FERMA), made it responsible for maintaining federal roads and provided funding from central government, donors and tolls. In addition, the 2002 Act gave FERMA the ability to set guidelines for, and the authority to enter into, Maintain-Operate-Transfer (MOT) concession contracts with the private sector. (Brocklebank, 2014)

The federal government established the general PPP framework for Nigeria by the ICRC Act 2005. ICRC is the national PPP unit and is responsible for policy guidance and for preparing, procuring and implementing all federal PPP projects. The Federal Ministry of Works develops the policy and are responsible for both MOT and BOT concession contracts.

The Lekki-Epe Expressway concession is an initiative of the Lagos State Government, which was an early promoter of private sector finance in Nigeria. The 2007 Law was superseded by the Lagos State Public Private Partnership Law 2011, which extended the remit of the Office of PPP from roads to all government sectors.

The Lekki-Epe Expressway procurement largely preceded the establishment of the Lagos State Government institutional framework (the Office of Public Private Partnerships established in 2008 and the Lagos State Public Private Partnership Law 2011). For the Lekki-Epe expressway, an SPV, the LCC, was established. LCC collects fees and maintenance. The rationale is the fee being a charge for maintenance. Adequate maintenance, the condition of the road and the proper collection of fees are being monitored. Measuring average daily traffic, traffic modelling and a process of evaluation ensures the optimal functioning of the road and prevents the propensity to take too high fees, related to disposable income. The Lekki-Epe system has a 5-year review period. The State of Lagos performs a range of studies in order to determine the WTP. The fee is periodically revised to GDP growth and inflation. These data are collected by the Nigeria National Bureau of Statistics. The current annual GDP growth ranges 1.2 to 1.6%.

The Lekki-Epe expressway concession contract allowed the right to periodically adjust the fee, to the cost of steel, cement, inflation, etc. According to the contract, the tolling was meant to start in 2010. A shadow toll regime was started and government stepped in. Toll started effectively in 2011, at 150 naira (about 0,45 USD) per journey. The price was determined by the bankability of the project. The project had to demonstrate its value for money: a journey trip of 3 to 4 hours was reduced to a journey time of 60 to 90 minutes (to and from). A free alternative road is also provided. These led to high public acceptance.

In 2013, when the tolling of the Bridge commenced, WTP was applied. According to the contract, the concessionaire could revise the toll every 90 days. This became a challenge when the price was augmented and consequently the traffic volume dropped. Soon the situation became no longer viable for the concessionaire. As it became apparent that revising the toll was not an option, the choice was to reposition the next toll plaza (from km20 to km42). The Lagos State had to buy the concession back in 2014.

One of the conditions of the Lekki-Epe expressway was that there would be no competitive transport within a radius of 10 kilometres. When a tolled bridge project was launched within 5 kilometres, immediately the fear of leakage of volume arose. The grantor had to prove complementarity, instead of competition, and was forced to an upfront payment. In reality volumes rose on both projects.

According to McKinsey & Company (2014), “The Nigerian regulatory regimes for road and rail transport needed much work. The key issues arising are the need to make regulations for pricing and standards and the enforcement of those regulations.”

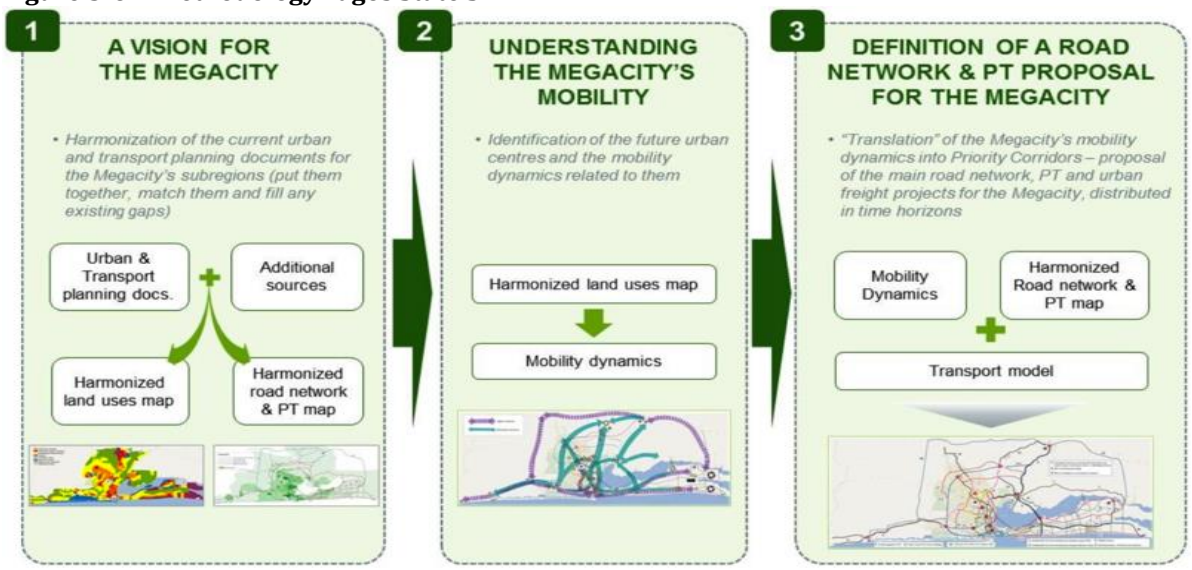
3.6.6. Procedural Factors

Political approval has been a challenge during the last years. Both at the Federal and the State Government levels excellent studies are being prepared. In these studies, traffic analysis, traffic modelling, HDM-4[89], RAMS, what-if scenario and cost benefit analysis are applied. Through the years political approval has been a challenge. This holds for the Lagos STMP, the National Integrated Infrastructure Master Plan (NIIMP), and for the National Transport Policy (NTP). All these documents have been for a very long time 'under preparation' and having the draft status. The documents are awaiting approval by the national Assembly.

Regarding transport plans, the quality of forecasts plays a crucial role. For most projects, the challenge is in their viability. Often this creates a problem with forecasts, as researchers and consultants tend to overpredict. The risk is that during the implementation of the project, volumes are lower than planned.

In its plans for tolling of road infrastructure, the Federal Government aims at estimating the WTP on a road by road basis. Traffic demand is the key driver. On the federal roads, e-tolling will be applied. Further there is a plan for 5 KPI's, pilot performance, definition of service levels, and performance-based road maintenance contracts.

Figure 3-62: Methodology Lagos State SMTP



Source: LAMATA (2014)

Lekki-Epe expressway concession project was a success. It won several international awards:

- Africa Investor 2008 Transport Deal of the year
- Euromoney International 2008 Africa PPP of The Year
- Reuters 2008 African Infrastructure Deal of The Year
- IFC/ Infrastructure Journal Top 40 Emerging-Market Award in 2013.

[89] The Highway Development Model of the World Bank that provides an economic evaluation of road schemes

The user-based payment plus limited cost to shareholders was a novel idea for West Africa. The challenge was in creating a continuum for the shareholder engagement. The setup included three toll points within the first 15 kilometres, within one and the same local government.

One of the keys to success was stakeholder engagement. There was deep engagement with people. For example, there had been a fear of violating serenity for people living in the vicinity of the express way. Early identification of this aspect led to forbidding of articulated trucks and motor bikes. In order to set prices, a payment study and affordability analysis have been performed. The result was a massive success with no resistance.

Dedicated slip roads for commuters were included in the design, in order to prevent congestion. What the authority and the concessionaire ensure, is 'good, safe, free of congestion'. The challenge is in the incremental approach. Under the condition of a limited budget, the choice was not trying to spread the efforts over six states, but instead concentrate on one project, and ensure a competent operator, that is solid, robust and tested.

Regarding procurement and the identification of private partners, Nigeria has two routes in the pipeline:

- Solicited: the Ministry of Transport develops the project, prepares the business case, then analyses the feasibility, based on own priority. Next steps are, Request for Proposal, or Request for Quote, followed by the financial assessment and the commercial agreement.
- Unsolicited (not asked for, private sector initiative): according to the World Bank there are three methods to create competition: 1) best final offer, 2) bonus, and 3) Swiss challenge. Nigeria adopts the Swiss challenge system[90].

Both Oyesiku et al. (2013) and Agbigbe (2016) concluded that good supervision of construction work, adequate administrative capacity for maintenance, good anti-corruption legislation at all three levels—local, state, and national—and adequate checks and balances between the executive and judicial arms of government would be beneficial for the successful implementation of roads. Agbigbe (2016) added that Nigeria needs to develop a comprehensive road and transportation infrastructure development strategy that involves citizens as stakeholders in both the development of the strategy itself and in the monitoring of its usefulness for enhancing sustainable economic development.

3.6.7. Data Collection Method

Regarding data collection, Nigeria has a poor record as it lacks historical data. The country is aware that data is key for good decision making. The government has conducted traffic counts in two periods (2017 and 2019) in order to identify changes in traffic volume. The Ministry of Works is responsible for data collection.

The Federal government is planning to have permanent embedded sensors on trunk road network for traffic counts. In 2009, assisted by the World Bank, LAMATA started to set up data sets on households, origin-destination data, traffic data and simulation models.

[90] This is a form of public procurement, which requires a public authority, which has received an unsolicited bid for a public project, or for services to be provided to the government, to publish the bid and invite third parties to match or better it.

On the Lekki-Epe expressway, quantitative data is being collected structurally. The system tracks the volumes and calculates the average daily traffic. These data are being used for analytical purposes, such as to decide between constructing a fly over or a roundabout, to monitor accidents, and to measure the response on changes in the toll fees.

According to Sumaila (2013), "Nigerian policy makers would also need to support more policy–based research and empirical studies in policy formulation, design and implementation strategies. The problem of dearth and unavailability of data in Nigeria to undertake transport research deserves emphasis as this provides the greatest impediment to evidence – based policy research. The option is to undertake a nation-wide Transportation Survey for a more holistic characterisation of Nigerian transportation system. This would provide the data base for the formulation of an enduring and sustainable National Transport Policy. This would enable the country to look beyond the threshold of hope to consider the future of transportation and the transportation of the future in Nigeria. In these lie the challenges of building a sustainable policy framework for transport development in Nigeria."

3.6.8. Capacity Building

Nigeria is sufficiently endowed with technical skills and adequate human resources in road infrastructure policy design and pricing. The country has high quality policy makers to develop solid plans. Nigeria has several academic institutes that prepare students and professionals to be engaged in the field of pricing of transport infrastructure. Four relevant institutes are described here below.

The School of Transport at the Lagos State University (LASU). This is the first school of its kind, and came into existence in response to the need for capacity building in the transport sector. It started 30 years ago as part of the department of geography. Because of the position of Lagos, it deserved its own position since 2008. The school has 3 departments, vertically organized through all modes: transport planning and policy; transport operations and management; transport technology and infrastructure. In the near future the school also plans to introduce a horizontal structure, organized along the various modes. The school accommodates about 10 Academic PhD students per year, and about 40-50 professional masters, professionals from industry, per year.

The University of Lagos (UNILAG). Since its establishment in 1962, the institution has been playing a key role in nation building by moulding the youth population through its teaching, research and community services. Of specific interest is the Faculty of Social Sciences. The Faculty was established at the inception of the University of Lagos in 1962 and it started as the School of Business and Social Studies. The Faculty is dedicated to training and producing quality graduates with the capacity to address the numerous challenges confronting Nigeria in its quest for development. Through its seven departments of Economics, Geography, Mass Communication, Political Science, Psychology, Social Work and Sociology, the Faculty has been in the forefront of producing high calibre experts.

Nigeria Institute of Transport Technology (NITT) Zaria. NITT was established on 14 March 1986 through Decree No.6 (CAP 116, LFN, 2004) to among other things address the problems of the transport sector such as inefficient and low productivity, fast depreciation of capital investments, deficient management and maintenance of infrastructure. NITT provides courses in management, logistics and ICT. Although NITT was conceived as Railway Training Institute, it was expanded to serve as a Multi-Modal institute covering rail, road, water, air and pipeline. The institute was backed by law and was formally commissioned and upgraded to a Grade A Parastatal under the Federal Ministry of Transport, putting it at par with universities

Daura University is being developed and will soon be operational. The university would, among other things, pave the way for (the) domestication of railway engineering and general transportation

sciences in Nigeria thereby bridging the technology and skill gap in the railway and ultimately transportation sector. The aim of the university is to establish a domestic railway industry. The university is an investment of the China Civil Engineering Construction Company (CCECC) with the support of the federal government with guidelines to ensure domestication that will support local infrastructure."

3.6.9. Conclusions and Policy Recommendations

Political Factors

- The policy stance of promoting means of public mass transport, both at State and Federal level, indicates deep and valuable insight, and requires political recognition. In Nigeria, funding road transport infrastructure is a challenge because road users are not being taxed. Alternative methods of providing moblity such as mass transport systems will generate significant benefits,.
- Increases in road user charges would gain more political support if they were legally bound to be allocated to public transport on the basis of promoting equity.
- For the congested urban areas, there might be a wide spread gain in making public transport more available and attractive, and parallelly, making the use of private cars more expensive. As congestion charging might not be feasible (for Lagos), reducing the fuel subsidy and start charging parking fee might be an option.

Institutional and Organizational Factors

The establishment of a Federal Road Authority to promote PPP solutions in Nigeria, and National Road Fund to develop and maintain dedicated funding for road infrastructure, needs to be recognized.

Economic and Financial Factors

Appropriate pricing is essential to construct and maintain a national, regional and urban road infrastructure network. Below cost pricing might have a social face but hurts deep. This view is shared at Nigeria's academic institutes.

Technical and Technological Factors

It is important to see toll plazas primarily as locations where traffic moves, rather then be stopped to make business and promote development. . One would not want to stop traffic but to speed it up. Using toll plazas as a focus for commercial development should not be obstructive for the traffic flow.

Legislative Factors

The road pricing legislations in Nigeria need to be strengthened. Taxing road users through vehicle taxes might be considered, along with an earmarking dedicated to road infrastructure investment and maintenance.

Procedural Factors

- Stakeholder engagement is key to infrastructure design and pricing. The success of Lekki-Epe expressway concession was largely due to the stakeholder engagement by Lagos State Government and Lekki Concession Company. The Concession project has won several international awards.

- Good communication and allocation of responsibilities both, between State and Federal government, and between the departments of Transport and of Works, would pay back, in terms of money and adequacy.

Data Collection Method

It would be recommendable that Nigeria improves its data collection system. Data collection and data availability is crucial to undertake evidence–based policy transport research. This would provide a solid base for a sustainable policy framework for transport development in Nigeria.

Capacity Building

Nigerian policy makers would also need to support more policy–based research and empirical studies in policy formulation, design and implementation strategies. Strengthening cooperation with universities is essential.

4. Lessons Learned and Policy Recommendations

This chapter presents a summary of the key findings of the study. In addition, this chapter provides recommendations and identifies prioritized possible policy options using the framework developed for this study. The recommendations build upon the analysis of the previous chapters and aim to provide a basis for understanding infrastructure pricing in the OIC region for each of the eight aspects of road pricing used throughout the study.

4.1. Lessons learned from best practices

1. Policy Level factors

Experience has shown that political factors have the greatest influence over the modality and extent of pricing road infrastructure. For example, in the UK there remains political resistance to road pricing in general, tolling in particular, which is why the roll out of tolling is limited to certain bridges and only one short section of road. The key reasons being that roads are considered to be a common good and road pricing is not equitable. The introduction of an Area Wide toll through the London Congestion Charge in 2003 started to change political perceptions. A lesson to be learned from this is that proponents of road pricing need to be able to demonstrate its benefits and that road pricing is more than a means of obtaining more revenue from road users. Whilst for example South Africa has a good record in transport policy that allows for road pricing through fuel levies and tolling of certain roads. South Africa's road provision is organized by SANRAL, which is a parastatal separated from the department of transport. Case studies show that such separation improves supply side efficiency, but may put pressure on budgets and affordability. Government's commitment to addressing issues of sustainable development and combating climate change could bring an opportunity to get more political and public buy-in for tolls and road pricing as this would allow for internalizing external (environmental and social) costs. Road pricing as a road user charge is a demand management measure and could reduce environmental impacts as it could change behaviour (in terms of shifts in departure time choice, destination choice, modal shift, route shifts etc). Road user charges are however not popular and could make it difficult to gain political acceptance. Yet, there are several examples where popular acceptance levels changed by example and good communiation. Also, often, such as in the case of Singapore, the availability of viable alternatives for motorists who do not want to pay the congestion charges was important politically. In addition, a clear demonstration that the congestion charging is indeed improving traffic flow and levels of service is essential. In the case of South Africa, for example, the e-tolling was introduced long after the infrastructure was put in place, making consumers not see that the e-tolling was actually for paying the same. In summary, making motorists and non-motorists aware that the pricing scheme is a traffic management tool and not simply a revenue-generating one is essential to get popular and with that political buy-in.

2. Institutional and organizational factors

Road pricing works best within a framework of an integrated transport policy and contemporary transport sector government institution and devolved implementing agencies. This is the case for the UK where its ministry (Department for Transpot - DfT) is fully integrated, providing policies strategies and guidance to all transport modes. The DfT is also directly responsible for the Strategic Road Network of England, whilst it is also devolved to the UK provinces. The DfT is contemporary because it covers innovation, environment such as air quality and customer services, as well as regulation and investment. Lessons are to be learnt from having an autonomous roads agency such as Highways England Ltd., which is a semi-autonomous agency responsible for the strategic

motorway network. It is even set up as a limited company with the Government owning 100% of the shares. This implies that at some stage Highways England can be privatized. The funding is almost entirely Government led.

The main lessons learnt from the London congestion charging regime is the benefit of localizing its implementation. Transport for London (TfL) is the local government entity that is responsible for transport in the capital city. Unlike national roads, much of the TfL revenue is sourced from the London Congestion Charge.

SANRAL is the principal body for providing and managing the primary and tolled road network in South Africa. SANRAL is working to align the provision of roads and socio-economic development. SANRAL is a small and lean organization with a good structure that provides oversight but not services - which are mainly outsourced - which is a good model that could provide a useful reference elsewhere. The disadvantage of this however, that customer care is more difficult.

A notably successful (and one of the older) scheme of road pricing can be found in Singapore. One of the success factors is that the management of all aspects of land transport come under one organization, i.e. LTA. From transport and land use policy, road infrastructure planning, public transport planning, to regulating private vehicle ownership. The major advantage of this institutional mechanism is its efficiency in decision making process, but it needs to recognized that Singapore is a small territory that is centrally controlled. In a general sense however, the principle of subsidiarity should apply such that decision making is devolved to the level at which it is most sensitive to needs and acountability best obtained.

3. Economic and financial factors

The research revealed some overlap and confusion about the terms road pricing and road user charges. The former is considered to be a payment made for service rendered, while the latter covers the widest range of revenues generated from vehicle owners and users. Regarding road user charges, there is a complex list of road user related taxes, duties and fees paid directly into Government treasury – so nothing is earmarked for transport – another term for earmarking taxes is hypothecation. A good example where there is no hypothecation of government revenues is the UK, where all income irrespective of source goes into the central treasury. Road pricing exists in the form of tolling and congestion charging, but it is very limited, only 0.6% of revenue is provided from tolling in the UK. Road taxes are mostly related to vehicle type age and engine size. It is noteworthy that revenues raised directly and indirectly from road users are about four times more than the on-account expenditure on road provision and maintenance. But when taking the off-account or external costs of congestion, pollution and accidents into consideration, income from road users is about the same as the total costs that are generated. The lesson learnt in the UK is that the sum total of all road user charges approximately balances both on and off account expenditures – internal and external costs.

There are only a few cases of full urban congestion charging from which to draw experience. Congestion charging is an area wide toll applied to a defined urban area – normally a city centre – with the specific intention of reducing traffic. Two well known examples have been covered in this study: Singapore and London. One of the Singapore's success factors is the flexibility and adaptability of the ERP charging strategy, as such those who pay are those who contribute to traffic congestion. The success is measured as less traffic, better travel times and more transit use. The London Congestion Charge (LCC) has not proven to be economically strong one because the costs of operating the LCC have barely been offset by benefits from time savings. However, as regards financial and technical matters, the LCC income has been very successful and the incomes from the

LCC have been used to fund public transport. Unlike Singapore, the LCC objectives have recently switched to reducing pollution. Health is proving a far better political basis and motivation for area road user charging than transport efficiency. The message from London is that traffic has reduced and congestion charging income has been successfully used to subsidize a transport alternative, in this case public transport, making it an equitable policy.

South Africa sees development as a greater priority than maintenance. Part of the problem for non-tolled open roads in South Africa, and possibly elsewhere, is that road condition does not seem to be improving even though road user prices such as fuel levies are increasing, so maintaining technical standards should become a policy imperative rather than an option.

4. Technical and technological factors

- The technology used to collect road user payments is changing from physical collection to remote methods. For example, the LCC is paid on-line and controls are exercized using license plate recognition from CCTVs. So far it can be said that this provides the most technically efficient solution to collect payments.
- South Africa has applied contemporary road management systems including intelligent transport systems, variable signing and the use of e-tolling through transponders or tagging. Note should be taken of data protection and confidentiality issues.
- In Singapore, experience showed that extensive testing of the devices and the system to determine their reliability have to be planned carefully and executed without causing unnecessary hassle to the motorists.

5. Legislative factors

- The UK Highways Act sets up the rights of road users regarding compensation due to damages from poor roads. This is something that is rare in the developing world and something that helps to sell the concept of road pricing to road users.
- The LCC is implemented by local government that see it as a part of their transport planning strategy, to control traffic levels, provide funding for public transport and implement a low emissions zone.
- In South Africa, the legislation is rigid on the application of fuel level and toll income to be spent exclusively on roads.
- The legal basis in Singapore has evolved to ensure that its area wide ERP system is effectively enforced.

6. Procedural factors

- In many developed countries, implementation of road pricing mechanisms has mostly started with feasibility studies (which includes among others WTP studies, comparison of costs and benefits, and different pricing alternatives), outreach activities and test and trial periods. This is certainly the case of Singapore before this country implemented Area Licensing Scheme in 1975.
- In the UK, one of the procedures prior to the implementation of LCC is Route Classifiation, which provides the basis for the allocation of resources for operations and maintenance of roads.
- Although South Africa is a good example for African countries in terms of road pricing, it wasn't successful in implementing an electronic road pricing scheme in its largest province Gauteng, mainly because of public disapproval after lacking early communication about the system.

7. Data collection method

Information collection and processing is vital both for any organization and for the road users, and sufficient resources need allocating to carry out this important task effectively. In Singapore, regular traffic monitoring and traffic data collection are carried out to understand exactly how the implemented road pricing scheme is affecting the traffic conditions and what remedial measures can be introduced. In developed countries, data collection is comprehensive in covering road condition travel and expenditure patterns. More market-based information would be useful for willingness to pay studies.

8. Capacity building

Having an established transport academy and/or a transport research and development agency is crucial to deliver high quality in-house expertise. The Land Transport Authority Singapore (LTA), for instance, has an LTA Academy as the capacity building arm of the LTA. The academy does not only serve the country, but also a one-stop focal point for governments, organizations and professionals around the world to tap Singapore's know-how and exchange best practices in land transport management and development. Finally, continued performance review is essential to identify gaps and the necessary capacity improvements. Such a review is for example done regularly by Highways England.

4.2. Lessons learned from OIC Member States

1. Policy level factors

- Road pricing is implemented in the OIC region in the forms of road tolling, vehicle taxes and fuel tax, including Indonesia, Iran, Uganda, Morocco, Pakistan, Sudan, Niger and Tunisia.
- The political support for improving roads and building new tolled expressways seems to be very high especially in Cote d'Ivoir, Pakistan, Kazachstan, Morocco, Niger and Guinea . The main objectives to road tolling are mainly to leverage private capital and expertise, not for planning, economic or environmental reasons. Exceptions are Cote d'Ivoir, Guinea, Iran, Turkey, Pakistan, Sudan and Niger who explicitly mention environmental concerns as a reason to implement road pricing.
- Currently there is no OIC country that imposes congestion charging, while many OIC countries have highly congested capitals. The main reason is because not many OIC countries have a good public transport system in order to provide transport alternatives to road users who are not willing or able to pay congestion charges. Not surprisingly, OIC countries that are currently considering to combat increasing traffic congestion by imposing congestion charging, are those who already have an established mass rapid transit system, such as the UAE and Indonesia. The latter is even at the planning stage of implementing electronic road pricing.
- The paradigm used by OIC countries in implementing road pricing is mainly to provide new infrastructure and improve road performance, which are very common in developing countries that still need to expand their transport infrastructure. In developed countries, the paradigm has been shifted to travel demand management in addition to funding for infrastructure development, maintenance and management.

2. Institutional and organizational factors

- In terms of general road administration in OIC geography, the level of autonomy varies from country to country, but normally the Ministry has oversight to the administration.

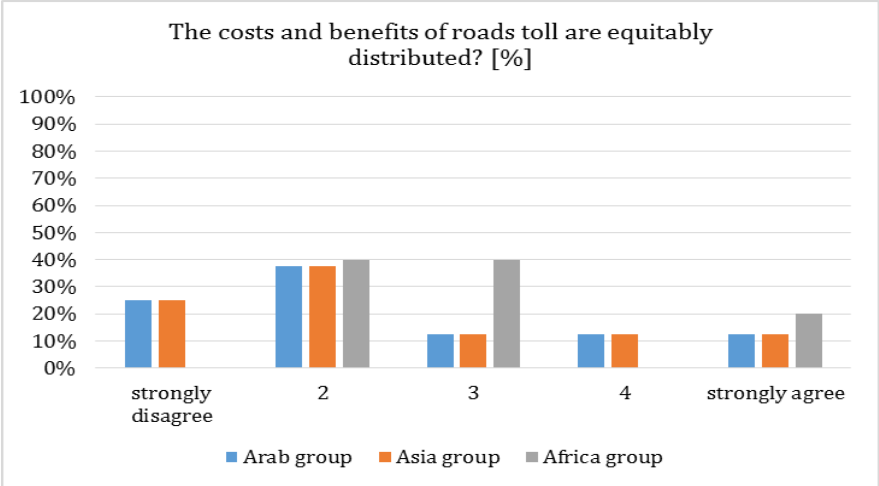
Contradictions occur between legislations, showing a poor relationship management among the involved government institutions.

- Most surveyed OIC countries do have a dedicated road pricing unit.
- Road tolling systems are implemented by OIC countries mainly to ease the burden of Government, in improving the road transport performance to support economic growth, through road users' participation. Enabling toll collection is also seen as key to attracting private investment in the road construction sector under the PPP model. One of the success factors of PPP in toll roads in Indonesia is the separation between the roles of toll regulator and toll operator in 2005. The established ERP Management Unit also showed a good determination to manage the upcoming ERP system effectively.
- In OIC geography, the involvement of Road Users Associations is almost missing in the decision-making process. As representatives of road users, they should be invited as advisors to the Government when new policies are being formed, such as new toll tariffs, to ensure high acceptance from road users.

3. Economic and financial factors

- Equity principle does not apply to the transport infrastructure pricing in many OIC countries . Vehicle and fuel taxes are mostly channeled to general public budget, and road toll revenue is to be used for investment return, maintenance and development of toll roads (Figure 4-1). For the latter, the Africa group seems more positive than the Asia and Arab groups who disagree that the costs and benefits are equitably distributed.

Figure 4-1: Equity principle in road tolling system



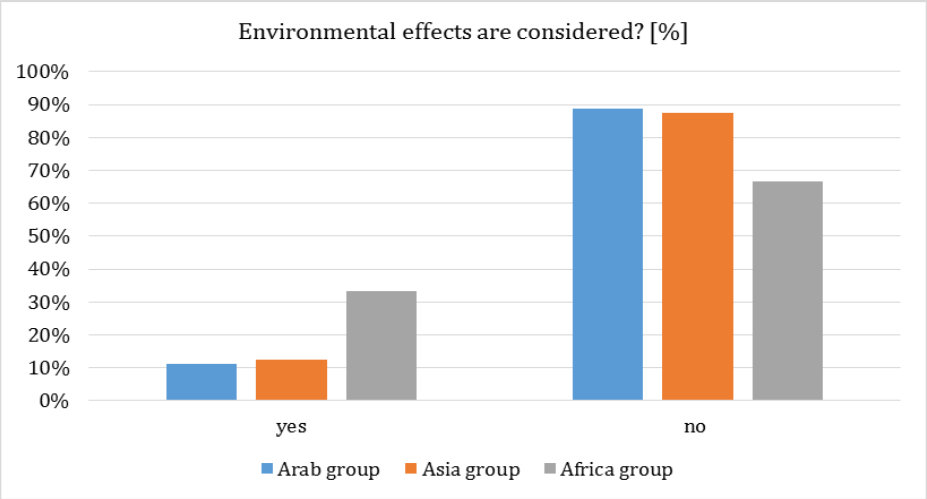
Source: Fimotions, survey results.

- Public transport improvement tends to be funded from general public budget, while ideally this should be funded from the revenue hypothecated from road users, because these revenues should contribute to services that result in lower road congestion than would otherwise occur, to the benefit of road users. Very few OIC countries regulate earmarking of (indirect) road charges to be allocated to road construction and maintenance, and to public transport. Indonesia is a good example, earmarking at least 10% of the revenue of motor vehicle tax for road construction and maintenance, and for public transport.
- Very few OIC countries have road funding agencies, while setting up such an institution can ensure the independency of fund management and allocation from development, maintenance and operations. Nigeria has proposed the establishment of National Road Fund aimed at

developing and maintaining the road network based on dedicated funding, of which 80% will come from the petroleum levy, road toll and vehicle registration tax. In the other two OIC case study countries, road funding mechanisms are missing.

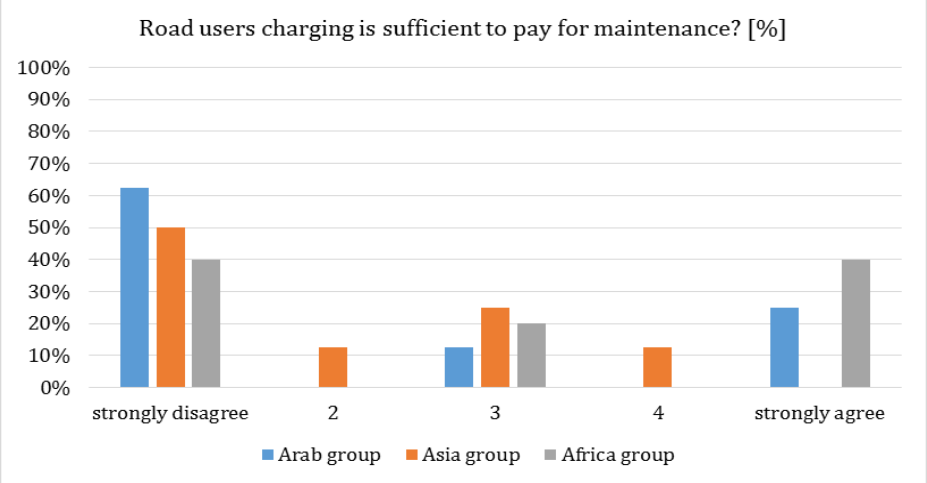
- With respect to considering environmental effects, these are generally not considered as a motivation for road pricing in the OIC geography (Figure 4-2). With a changing climate and the international best-practices discussed, this argument is likely to change in the future. It is interesting to note that the African geography stated that the road user charging in their countries is sufficient for covering maintenance costs (Figure 4-3).

Figure 4-2: Environmental effects consideration in road pricing mechanisms



Source: Fimotions, survey results.

Figure 4-3: Sufficiency of road user charging to cover maintenance costs



Source: Fimotions, survey results.

4. Technical and technological factors

- Many OIC countries with road tolling systems already apply electronic toll collection (ETC) systems, mostly utilizing prepaid smart cards and RFID tag-and-beacon-based technology. These countries are aware of the benefits of ETC system, mainly related to efficiency, such as reduction of transaction times at toll gates, moral hazard risks related to cash payments and the promotion of a safer work environment for employees. Prepaid smart cards have another

downside: motorists still need to ensure sufficient balance on their smart cards. If this is not the case, long queues will occur when the motorists need to top up their cards at the gates.

- Those who still utilize cash payment methods, are planning to replace them and make ETC a mandatory payment method. The most used technology in OIC countries is RFID. One of the disadvantages of the tag-and-beacon technology is that data collection cannot be automated. Very few OIC countries in Sub-Saharan Africa applies such technologies yet as not many of them have toll-road systems. Nigeria is one of the few that will commence the application of e-tag system. While satellite-based systems are applied nowhere in the OIC regions.

5. Legislative factors

- High political support on road tolling systems in OIC countries is shown in strong law and legislations that regulate toll roads development.
- While PPP is the most common mechanism applied in the OIC region to accelerate road infrastructure provision, a dedicated PPP law that provides an attractive legal environment for investors, is not always in place. Tunisia is a good example that has adopted a PPP law for this particular objective, while Nigeria has a national PPP unit that is responsible for policy guidance and PPP projects coordination.
- ERP could promote the implementation of Electronic Law Enforcement (ELE), something that is hardly applied in OIC countries. In Indonesia, the planned system architecture of the upcoming ERP in Jakarta includes the ELE to address the weaknesses of manual enforcement and to promote database sharing among related institutions.
- Lessons learned from Indonesia also show the importance of aligning different, sometimes contradictory, regulations when planning an ERP system, for example in terms of exempt vehicles. This is essential, especially for OIC countries that also have a significant mode share of two- and three-wheelers.

6. Procedural factors

- The majority of the surveyed OIC countries carry out a feasibility study before implementing road pricing mechanisms. The study covers expected costs and benefits and the comparison of different pricing alternatives.
- Tolled schemes are mostly as concessions in the form of Build-Operate-Transfer (BOT) mechanism, in which the roads would be transferred to the state at the end of the concession period (30-40 years). However, the condition of the roads at the point of transfer is normally not so precisely set out.
- Outreach activities carried out by OIC countries before the implementation of road pricing schemes, mainly aim at informing road users on the new plan, not to gather feedback from them.

7. Data collection method

- Many OIC countries conduct household travel surveys to collect travel behavior data at the city level, with various levels of data quality. The surveys are normally carried out by the Department of Transport of a city, and this institution remains the owner of the data. Very few countries have a mechanism of data exchange among governmental institutions, mainly due to the complexity of organizational government entities and reliability of the data due to diverse methods of collection. Many institutions have thus limited access of the raw data to make in-depth analyses of the results on socio-economic characteristics of households or individuals in

correlation with the mobility patterns. At the national level, traffic surveys are mostly done using automatic data logger or road tube traffic counters.

- For transport infrastructure pricing, a WTP survey is essential to determine the road user charges. Based on the questionnaire survey, more than half of the surveyed OIC Member States do undertake willingness to pay surveys before implementing road pricing systems. These countries are aware of the importance of gaining input from road users to ensure a successful implementation of road pricing in the forms of road tolling and congestion charging. It is interesting to note that Indonesia also applies Ability to Pay survey besides WTP survey in the feasibility study phase. The results of both surveys are used as a basis to determine the minimum and maxium of toll prices, and the upcoming ERP.

8. Capacity building

The skills needed to plan, operate and manage road pricing and congestion charging are generally insufficient in OIC developing countries. There are exceptions such as Malaysia, Indonesia and the UAE, from which the same lessons can be learnt as from countries outside OIC geography. The main challenges to capacity building to provide and manage toll roads and congestion charging services are political not technical. That is whether that capacity should be built by the public or the private sector. In other words whether the public or private sector is best placed to provide appropriate services to implement road tolling systems.

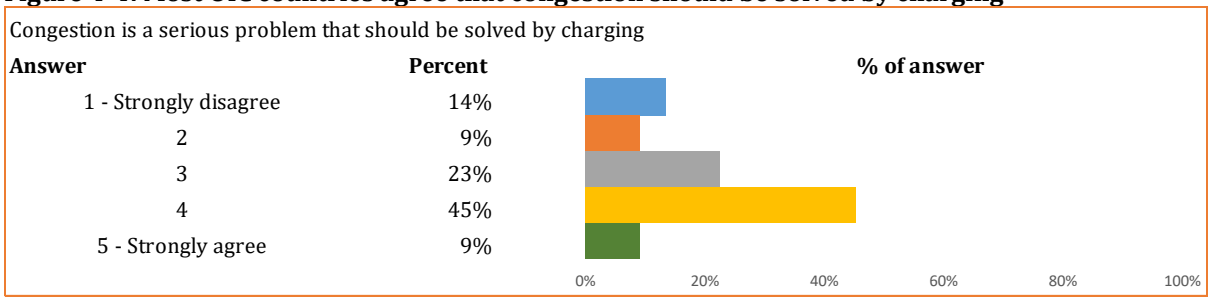
4.3. Policy Recommendations for OIC Member States

Although it is not suggested that road pricing challenges or solutions are the same for all OIC countries, this recommendations section is an effort to consolidate the results of the analysis and provide some specific suggestions towards improving pricing practices, based on our research, observations, and good practice examples.

1. Policy level factors

- A new transport-planning paradigm that puts more emphasis on improving accessibility rather than maximizing mobility needs to be promoted among OIC countries. Road pricing can help in this and should aim at reducing demand and decoupling transport resource consumption from an economic growth point of view. The majority of OIC member states actually already share this view, as shown by the survey result in Figure 4-4.

Figure 4-4: Most OIC countries agree that congestion should be solved by charging



Source: Fimotions, survey results.

- Transport policies need to provide more guidance on infrastructure pricing that is demand side orientated and based on the willingness to pay than on cost recovery. Furthermore, road users should be educated that road user charges are not taxes, but merely prices paid for a service, i.e. using road, just like a rail or bus fare.

- Having an excellent public transport system alternative is a precondition to introducing a congestion charge. It is a case of building a metro first then imposing a congestion charge. OIC countries can learn from the Singapore Model, where congestion charges are part of an integrated package that satisfies all stakeholders through a well-resourced programme of outreach and community involvement.
- The difference in policy objectives between road pricing and urban congestion charging must be underlined. The former is to raise funds to develop and maintain capacity and the latter being to reduce demand and even capacity. Policy must make sure that funds collected from dedicated congestion charging are allocated only to road development and maintenance and improving public transport as a way of ensuring equity.
- An alternative narrative is needed that convinces road suppliers and users that road prices are no different to prices paid for other services and goods and should be related to the road condition and level of service. Road users should also be educated that congestion charging is a traffic management expediency, not another tax.

2. Institutional and organizational factors

- OIC countries that have not yet done so, are encouraged to establish a dedicated unit for the management of road pricing system, to ensure better coordination among government institutions. A concrete vision and mission statement should be provided with unambigous goals and realistic, achievable and measurable. Furthermore, the unit should be kept lean and works should be outsource to the private sector.
- Semi-autonomous road agencies should be set up to develop and maintain the highway network to ensure best managerial practices are engaged.
- To increase the success rate of PPP in toll roads, OIC countries might need to consider splitting the roles of regulator and operator. This will give more confidence and certainties to private toll road operators.
- Transport planning, including congestion charging, road pricing and related activites, should be devolved from central government to provincial, district or local government. Appointed authorities should have the mandate to do the work and the capacity to sustain their responsibilities.
- Hypothecation policy should be strictly applied by the administrating entity, and, in the case of urban road pricing, allocation is to public transport.
- A strong leadership is key to address the challenge of the various levels of autonomy of government institutions that mainly cause contradictions between legislations. Finally, an excellent communications plan with roll-out aligned to comprehensive stakeholder mapping, is strongly recommended.

3. Economic and financial factors

- It is firstly recommended that clarity is needed in terms and definitions. Road User Charge (RUC) – is a generic term that includes all direct and indirect payments made by road users. Road Pricing is a specific payment made for a service delivered, such as a toll, congestion charge and parking fee. Road Pricing is based on distance and vehicle type and is independent of road quality or levels of service – this needs to change to make it more commercial and acceptable to road users. Income for spending on road provision and maintenance comes from road user charges and indirect taxation.

- Pricing must ensure that equity is not compromized by any road payments systems and that this can be avoided by building a non-tolled alternative, supporting public transport and funding rural development.
- Earmarking to specific road funds including public transport development, regulated by laws, is strongly recommended. This may lead to the establishment of road funding agencies, to ensure that fund management and allocation are independent from development maintenance and operations.
- Plans to phase out fuel leveys should be made because electric vehicles will replace fossil-fueled vehicles.
- In the longer term, countries should aim to apply a universal road pricing system that replaces all other user charges and is based on willingness to pay linked to levels of service, such as road condition. This policy should also internalize external costs of congestion, accidents, air pollution and to apply carbon taxation to mitigate climate change. OIC countries should be made aware of that fuel levies will be less useful as fossils fuels get replaced as the leading source of transport energy.

4. Technical and technological factors

- For many OIC countries that have been utilizing ETC systems, it is recommended to improve the architecture by integrating payment with data collection. For countries that are planning to migrate to ETC, it would be good to include these in the initial phase of the architecture system development, to ensure an organic system that is able to adapt well to changes.
- As no OIC country has implemented congestion pricing yet, now would be the good time to consider interoperability between ETC and ERP systems to increase users' convenience, acceptance, and to ensure data compatibility.
- The chosen technology should be tested thouroughly prior to implementation and ensure an effective enforcement mechanism. In the long term, the application of GNSS based systems should be aimed for.

5. Legislative factors

- In order to promote PPP, governments in OIC countries need to create enabling legislation that provides assurance to the private sector, such as regulations on land acquisition for toll roads, and on regular toll tariff revisions.
- Countries that have not yet done so, are encouraged to develop PPP laws, involving the creation of a common regulatory framework to ensure that the legal environment is attractive for investors. Such a framework will also deliver confidence to government officials to adopt PPPs. The framework should highlight the government's commitments and the mechanisms of risk transfer.
- Highways legislation should make it clear what the obligations are for both provider and the user of roads and include provisions for compensations of road pricing discounts where the expected levels of service are not provided according to law. Focussing on customers' needs, rights and protection is paramount if road pricing is to become accepted.
- While in many OIC countries, the legislation is rigid on the application of fuel levies and toll income to be spent exclusively on roads, this ideally should be relaxed to be spent on all sorts of transport.

6. Procedural factors

- Stakeholder engagement is an important part of the implementation of road pricing schemes, in order to increase public acceptance. The activities should not only be done prior to the implementation start, but also thereafter to continuously gather public feedback to improve the system.
- It is very important to inform the public on the rationale of road pricing mechanisms and to where the revenues will be channeled. The ERP system in Singapore for instance, the rates are perceived fair by road users because they have been educated that the pricing scheme is a traffic management tool and not a revenue-generating one.
- When it comes to congestion charging, the outreach activities should highlight the benefits of the scheme and promote the impact of complimentary measures, such as improving public transport systems.
- Stakeholder mapping is essential to ensure that all interests are covered when developing road pricing.

7. Data collection method

- OIC countries are encouraged to develop a robust mechanism of transport data collection that is integrated in a smart database system that can be accessed by different institutions to be used for various purposes. Ministry of Transport and/or Works can take the lead to coordinate and oversee the process. Such endevour will involve high initial costs but it is essential to create awareness among various government institutions that the investments will be cost-effective in the long run. The main benefit would be that policy makers will be provided with robust data and analyses to make informed decisions.
- Various survey instruments need to be developed to systematically collect data. Automatic traffic counting and classification systems are advisable. The use of big data (such as mobile telephone) is increasing and should also be considered.
- Data collection and performance monitoring should be done by an independent unit that has nothing to gain or loose from its recommendations. In order to support a successful law enforcement and to reduce corruption risks, a mechanism of integrated electronic data needs to be developed by integrating population registry, database of vehicle registration, and database of vehicle taxes.

8. Capacity building

- To enhance their capacity on planning, operating and managing road pricing and congestion charging, OIC countries are encouraged to be members of the CLARS (Charging, Low Emission Zones, other Access Regulation Schemes) Platform[91]. This platform is developed for public authorities that are operating, planning, or considering to implement a Low Emission Zone, Congestion Charging, urban road user charging, access regulation, vehicle access restriction, etc. Being member will give access to a huge range of resources on these topics and knowledge exchange from other countries.

[91] https://urbanaccessregulations.eu/public-authorities

- A transportation research and development agency should be established under each Ministry of Transport, or possibly at the level of the OIC, in association with and international universities that have majors in transport and do research in the field.
- Finally, government's organizational structures should be flexible to allow for a combination between government employees and non-government technical staff to address the insufficiency of government's capacity in transportation planning.

4.4. Recommendations on further research

The report has listed barriers to implementation of road pricing classified as political, technical, institutional/legal, capacity building challenges, including user perceptions and preferences. Evidence of these barriers and ways to mitigate mainly comes from research done in non-OIC countries.

Research activities in our view should concentrate on studying opportunities for road pricing measures through a series of targeted surveys and small research projects on road pricing in several OIC countries, involving local academics. This would allow for comparisons between countries in the geography and a better understanding of the role of context therein. First, the surveys aim to identify barriers, which can then be translated to constraints for policy makers. Second, surveys should aim to study the composition and level of possible charges and user responses to these (in order to determine WTP amongst other parameters) through a stated preference survey across the OIC geography, which would be one of a kind in the world. In addition, an in-depth study into technology-choice available, affordable and implementable across the geography needs to be conducted. Technology options can then be used to study the possible degree of differentiation of road charges possible in the geography, and set out pathways for implementation, without losing an eye on context and path dependency. Differentiation studied will not only by distance and time of day, but also by vehicle/fuel type, etc, and may include a discussion on user charges based on the levels of mobility and accessibility available (affordable) to the user, as such adopting a transport justice framework.

Finally, transport simulation models need to be developed for the various cities/areas using local traffic behavioural data to study the impact of road pricing on congestion and on the use of the alternative infrastructure (non-tolled roads, public transport system etc), welfare, land uses, alternative modes, equity and more.

Appendix 1

Legal Analysis of Modern Concession Laws (MCL)

Principles	Explanation	Sources
A Modern Concession Law (MCL) should be based on a clear policy for Private Sector Participation.	A sound legislative framework, clear government policy/strategy for the Private Sector Participation (PSP) is important for signalling the commitment of the government to develop a stable and attractive investment environment and to reflect its efforts in improving the legal environment. Such strategy should generally be developed on the level of a government approved document.	UNIDO BOT Guidelines stress the importance of adopting the government PSP strategy in order to communicate the commitment of the state to promote favourable political, legal and regulatory conditions and thus enhance the interest of potential investors.
MCL should create a sound legislative foundation for concession.	Effective participation of the private sector in the development of infrastructure and effective functioning of the concessions regime requires an enabling legal framework. An enabling legislative foundation is important for establishing roles and responsibilities of all parties and estimating a so-called country risk by potential investors. The concession legal framework may be represented by the European Commission Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions (2004); European Commission Guidelines for Successful Public-Private Partnerships (2003). European Commission Interpretive Communication on Concessions under Community Law (200/C 121/02), Part 2.4. European Commission Guidelines for Successful Public-Private Partnerships (2003); European Commission Interpretive Communication on Concessions under Community Law (200/C 121/02). UNIDO BOT Guidelines, Chapter 4, pp. 42-43. 2 either a specific concession law or a comprehensive set of sector-specific laws that foster a clear, fair, predictable and stable legal environment for concession projects.	The importance of an enabling legal framework for concession projects is reflected in Recommendation 1 of the UNCITRAL Legislative Guide. The Recommendation emphasises the importance of solid concession legislation not only for clarity and stability of the investment regime but also for signalling a political commitment of the state.

Principles	Explanation	Sources
MCL should provide clarity of rules.	The concession law should clearly define the scope of its application, i.e. the legal relations to which the law extends. Such clarity is essential for the predictability of the concession regime, for the stability and validity of the concession agreement as well as for the prevention of ungrounded arbitrary actions by the contracting authorities. With this purpose, the MCL should provide an exhaustive definition of "concession", a list of sectors concerned, contracting authorities, and eligible concessionaires.	Based on Recommendations 2-5 of the UNCITRAL Legislative Guide.
MCL should provide a stable and predictable concession legal framework.	As a rule, privately financed projects are long-lasting. However, many different factors influencing projects may change in the course of their implementation, one of them being legislation. The risk of changing legislation may endanger the validity of the project agreement and thus the sustainability of the project itself. In order to ensure the stability of the project agreement and the parties' capacity to carry out their rights and duties, the state should avoid frequent changes to concession-related legislation and the concession law should foresee a mandatory provision in the agreement stipulating the surviving applicability of the regime in force at the moment of agreement or other mechanisms for dealing with legal risks.	Recommendation 58 of the Legislative Guide states that concession law should require the concession agreement to address the potential legal risk and set forth provisions regarding compensation for the negative consequences of legislative changes as well as mechanisms for revising the terms of the agreement following the occurrence of such changes. The OECD Basic Elements of a Law on Concession Agreements also contain a so-called "stability clause" that is meant to protect the concessionaire from the possible changes in legislation. See also UNCITRAL Model Legislative Provisions 39-40.

Principles	Explanation	Sources
MCL should promote fairness, transparency and accessibility of concession rules and procedures.	This principle relates to the fairness, transparency and accessibility of the rules and procedures governing the selection of concessionaires, awarding and further implementation of a concession. Under this principle, the MCL should foresee the process which would guarantee a transparent and competitive selection process (including exceptions from competitive procedure), equal treatment of potential investors, opportunity to challenge the rules and decisions of contracting authorities and competitive rules for unsolicited proposals.	Sources used: A number of the UNCITRAL Legislative Guide recommendations have been used in drafting this principle. Specifically, Recommendations 9 and 10 of the Guide state that regulatory procedures and rules on concessions should be objective, transparent and accessible (made public). Moreover, Recommendation 10 also stresses the importance of having in place the procedures for a review of the regulatory decisions by an independent body. Fairness and transparency of the concession rules and procedures is also reflected in Recommendation 14 of the UNCITRAL Legislative Guide, which refers to the importance of guaranteeing fair competitive procedures for the selection of concessionaires and in Recommendation 39, which guarantees the right to apply for a review of the contracting authorities' acts 16 UNCITRAL Legislative Guide, Recommendation 58. OECD Basic Elements of a Law on Concession Agreements, 1999-2000, Art. 18. UNCITRAL Legislative Guide, Chapter 1, para 46. 19 UNCITRAL Legislative Guide, Recommendation 10, Chapter 1, para 49. 20 UNCITRAL Legislative Guide, Recommendation 14, Chapter 3, para 10-16. 4 during the selection procedure.21 The UNCITRAL Legislative Guide also suggests having a procedure in place for non-competitive proposals (Recommendation 28) and unsolicited proposals (Recommendation 30-35). Principle 5 is also supported by the European Commission's Interpretive Communication, the European Commission Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions and the OECD Basic Elements of a Law on Concession Agreements.22 (See also UNCITRAL Model Legislative Provision 6, 18-23, 28).

Principles	Explanation	Sources
	MCL should be consistent with the rest of the country's legislation so as to avoid unnecessary collisions of laws and inconsistency in their application. Appropriate amendments should be made to legislative acts to ensure the coherence and consistency of the legislative base.	Recommendation 1 of UNCITRAL Legislative Guide states the importance of the conformity of the concession law to constitutional provisions, both as regards restrictions and guarantees.23
MCL should allow for negotiability of concession agreements.	Freedom to negotiate concession agreements is important because it allows the factoring in of a greater variety of circumstances while allocating risks between the parties and thus elaborating a more creative and financially efficient approach to risk allocation. Successful implementation of this principle also requires the clear identification in the concession law of the body authorised to negotiate the agreement, implement and monitor the performance under the agreement, including the clear division of powers between central and local authorities.	Recommendation 2 of the UNCITRAL Legislative Guide, in order to ensure the effective negotiation and further implementation of a concession project, it is important to identify persons or offices empowered to enter into commitments at different stages of agreement negotiation.24 It is also important to foresee in the concession law the proper allocation of powers between the different levels of government (central and local authorities) during the negotiation and implementation of the project.25 In order to consider a wide range of factors and thus allocate risks effectively, Recommendation 12 of the UNCITRAL Legislative Guide 21 UNCITRAL Legislative Guide, Recommendation 39, Chapter 3, para 127-28. 22 European Commission Interpretive Communication on Concessions under Community Law (200/C 121/02), para 3.1.1. (rules for the selection of concessionaires should be made public, they should be equally applied; principle of competition should be adhered to); para 3.1.2. (transparency of the selection rules and procedures, advertising); para 3.2.3. (rules and decisions are available for a review); European Commission Green Paper on Public-Private Partnerships and Community Law on Public Contracts and Concessions, para 29 (transparency of the selection procedure, advertising, competition); OECD Basic Elements of a Law on Concession Agreements, para 5.2, 6.1 (transparency of the selection process); para 11.1 (clear regulation of non-competitive procedures). 23 UNCITRAL Legislative Guide, Chapter 1, para 7-9. 24 UNCITRAL Legislative Guide, Recommendation 2, Chapter 1, para 17. 25 UNCITRAL

Principles	Explanation	Sources
		Legislative Guide, Chapter 1, para 17. 5 advises against drafting legislative provisions that limit unnecessarily the negotiating ability of the parties.26
MCL should allow for enforceable court or arbitral determinations.	According to this principle, the MCL should ensure the possibility to protect the rights and interests of both parties under an effective system of dispute resolution (including the possibility for international arbitration and enforcement of arbitral awards). This principle is especially important for creating a more secure, predictable and attractive climate for investors.	Recommendation 69 of the UNCITRAL Legislative Guide, which stresses the importance for the MCL law of awarding parties the freedom to agree to a dispute settlement mechanism that is regarded by them as the most suitable according to the nature of the project.27
MCL should allow for state undertakings and guarantees.	This principle refers to the importance of the MCL containing provisions that allow the government a possibility to support the project financially or guarantee the contracting authority's proper fulfilment of its obligations. Government support is often essential for increasing the level of comfort of potential investors, enhancing the attractiveness of investment as well as for supporting the execution of projects. Sources: Recommendation 13 of the UNCITRAL Legislative Guide suggests that the MCL should contain clear provisions with regard to both the type of authorities that may provide support and the type of support provided. MCL should accommodate security interests. Explanation: As a rule, only approximately 30% of a concession project is financed by the concessionaire itself. The other 70% is usually borrowed from the banks (lenders) under a security arrangement according to which the concessionaire gives to the lenders security over its rights under the concession agreement. However, in order for this security to be effective, the state should also provide an assurance that in case of the security's enforcement, the proper procedures would allow the concession to be carried out and the lenders to "step-in" to the concession agreement. Thus, this mechanism guarantees the continuation and sustainability of the concession project and effectiveness of the investment.	Recommendation 49 of the UNCITRAL Legislative Guide emphasises the importance of inclusion in the MCL provisions guaranteeing the right of a 26 UNCITRAL Legislative Guide, Recommendation 12, Chapter 2, para 21. 27 UNCITRAL Legislative Guide, Recommendation 69. See also Model provision 49 of the UNCITRAL Legislative Provisions. 28 UNCITRAL Legislative Guide, Recommendation 13. 29 OECD Basic Elements of a Law on concession Agreements. Explanatory notes to Art. 16, p. 27. 6 concessionaire to secure any financing required for the project with a security interest in its property, pledge of shares of the project company, proceeds and receivables or other suitable security.30 This principle is also supported in Article 16 of the OECD Basic Elements of a Law on Concession Agreements, which states that the concessionaire can create security over its rights to any payments and receivables under the concession agreement. (See also UNCITRAL Model Legislative Provision 35).

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