# The Long and Winding Path to Private Financing and Regulation of Toll Roads

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## 1. Introduction [1]

Road transport has long been, and will be for a long time, the dominant form of transport for freight and passenger movement throughout the world.[2] In Latin America, for instance, road transport accounts for more than 80% of domestic passenger and over 60% of freight movements—over 85% in some countries such as Brazil. In Africa, the proportions are even higher. Not only is the sector large, but it is still growing rapidly in many parts of the world. In Asia, from 1984-1994, the road networks of Indonesia, Korea, Malaysia and Pakistan grew in length by more than five percent per year. In Eastern Europe, countries historically dominated by rail are now witnessing a rapid expansion in the demand for road transport. In Russia, the total freight moved by road is expected to increase from just over ten percent to almost forty percent within the first decade after the end of the Soviet Union.

Because most road projects require investments with slow amortization periods and because many of these projects will not generate sufficient demand to make them self-financed through some type of user fee or toll, the road sector continues, and will continue to be, in the hands of the public sector to a much larger extent than the other transport activities. [3] But fiscal crisis and competing demands from other sectors such as health and education are bringing changes in the extent of public-private partnership in the expansion and operation of road networks. Governments throughout the world, including many poor African and South Asian countries, are commercializing their operations to cut costs, improve user orientation and increase sector specific revenue.[4]

The search for increased private sector participation in the road sector applies to national, high traffic roads (at least 15,000 vehicles per day is a good bet for viable tolling of roads) as well as to roads falling under the responsibility of all government levels. Many urban roads, often under the responsibilities of sub-national governments, are now also facing strong increases in demand. From Argentina to Thailand, Australia to Canada, major arterial roads are being built under toll road concession schemes. Since in many of these countries the governments are increasingly finding it difficult to finance the costs up front, they are giving the private sector concessions to construct and operate these urban roads for a specified period of time before inheriting these assets at the end of the contract, typically at a zero cost. Toll roads (publicly or privately managed) can represent a very large

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[1] For additional information and more data, see the World Bank web site on toll roads at www.worldbank.org/html/fpd/tranport/roads/toll_rds.htm. We are also endebted to Nils Bruzelius, José Carbajo, José A. Gómez-Ibáñez, Andrés Gómez-Lobo, José L. Guasch, José L. Irigoyen, Alfred Nickesen, Vincent Piron and Emile Quinet for useful discussions and comments on earlier versions of the paper.

[2] See Ian Heggie and Piers Vickers, *Commercial Management and Financing of Roads*, (Washington: World Bank, 1998), chapter 2, for more details on the overall role of the sector.

[3] In addition, pricing decisions in this sector tend to be influenced in many countries by strong trucking lobbies that aim to keep cost recovery as slow as possible.

[4] These partnerships are not only aimed at convincing the private sector to finance its investment needs but also to participate in reforms to cut costs in its operation and maintenance but this chapter focused on toll roads. For a more detailed discussion of the commercialization of the sector and of other forms of public-private partnerships in the sector, see Heggie and Vickers (1998) and Ecole Nationale des Ponts et Chaussees (1998), "*Road Financing - Construction, maintenance and operation*", Presses Ponts et Chaussees

proportion of the high traffic highway systems (up to 80-100% in some countries) but they generally represent a very small share (5-10%) of the total paved road network (but up to over 30% in some countries such as Argentina, France and South Korea).

To be effective, toll road projects must meet many requirements to ensure that the implementation and monitoring of these concessions by a regulator is smooth. This paper focuses on the lessons of the international experience with toll road privatization and regulation. It is oriented toward project finance because the contract can achieve much more for "road regulators" than for other sectors. This means that an effective design of the contract at the project time is crucial since often there is little more for a regulator of a road concession to do than monitor that all involved parties comply with their contractual commitments. Furthermore, in many ways, the renegotiation of a contract is often a replay of the initial negotiation with a different distribution of information between the regulator and the concessionaire. Full grasp of the basics of contract design in project finance is quite important for the regulators.

While there seems to be a demand for toll roads in specific settings, the problems met by many of this "first generation" of road concessions from Mexico to Thailand have given toll projects a poor reputation. Many mistakes were made; what is obvious that tolling is not the best solution for every road. There are many ways to design a project to get the private sector involved without having to toll the road (see Box 1.1). Most of these alternatives aim at improving efficiency (i.e. lowering costs). But there are also many ways of getting the private sector involved in toll roads and thus reducing public sector financing requirements for the sector. Understanding the context in which toll roads are viable is necessary both for their initial success and for effective long run regulation.

This paper provides a broad overview of the issues at stake from the view point of a privatization team but also from the perspective of a regulator responsible to supervise the commitments made by the government and the operation to each other and to the users through the contracts.

## 2. TOLL ROAD SERVICES [5]

### 2.1. THE BROAD RELEVANT ECONOMIC CHARACTERISTICS OF THE ACTIVITY

When considering an increased role for private activity in the road sector, the most immediate challenge to confront is the enormous range in the development, quality and performance of the sector in any given country. These varied settings create different operating and investment requirements and hence potentially very different types of possible packaging to make roads attractive to private investors. The most relevant stylized economic facts surrounding the decision to toll roads packages is summarized in this section.

[5] Part of this discussion draws on J.A. Gomez-Ibanez, "Pricing", in J.A. Gomez-Ibanez, W.B. Tye, and C. Winston, editors, *Essays in Transportation Economics and Policy*, (Washington: Brookings, 1999), pp. 119-127.

**Box 1.1: Contracting out planning and management of roads**

Road agencies are increasingly contracting out:

* planning and management of selected roads to consultants and contractors;

* entire road networks, and

* donor-financed small infrastructure projects.

The first model is being used in the UK, Argentina, Australia and New Zealand. In the UK, the process started in 1986 when the UK Department of Transport decided to package parts of the motorway network into commissions and then invited bids from consultants to take on the responsibility for maintaining all roads and related structures within the commission to a prescribed standard. The winning consultant then organizes a competitive Term Contract between the owner (Department of Transport) and the contractor who then carries out all work on instruction from the consultant. In one of the largest commissions (West Yorkshire, with 330 lane-km, 305 bridges, 420 km of drains, 950 road signs and 3,400 lighting columns) costs fell by well over 15%, 29 of the 34 DOT staff who were made redundant were taken on by the consultant (one moved to another job and 4 took early retirement), and quality and flexibility of the maintenance regime increased.

The second model involves contracting out the management function for the whole network under the jurisdiction of a selected road agency. In industrialized countries this is generally being done to increase efficiency and as part of the redefinition of the role of government. In developing countries, it is mainly being done to ensure that a competent body that remains answerable to the local district council manages small urban and district roads. This model is being used in some small municipalities in the US at the County Council, at the District level in UK (where it is called externalization), and is also being used for both urban and rural district councils in Zambia. These arrangements offer great potential for dealing with small road networks.

The third model is being used extensively in francophone Africa. The AGETIP is a contract executing agency (like a private sector project implementation unit), set up to execute donor-financed infrastructure projects. The agency generally has a board composed of well-known figures (which does not include government representatives), a general manager appointed by the board, other line managers (administrative & financial manager and technical manager), and staff hired under private sector terms & conditions of service who are paid competitive salaries. The agency is set up as a private, non-profit association and pays no taxes. The agency works on behalf of local authorities that delegate certain functions to the agency. The local government usually reserves the right to select the projects and the agency then: (i) recruits consultants to carry out detailed engineering; (ii) invites bids and awards contracts for supervision and works, manages the contracts, and pays the contractors directly from a special account opened in its own name. The agency is subject to bi-monthly management and financial audits and an annual technical audit.

Source: Heggie, I.G. and Vickers (1998), Commercial Management and Financing of Roads, World Bank Technical Paper No. 409

### *2.1.1 THE OVERALL SUPPLY OF GOOD ROAD SERVICES IS STILL LIMITED..*

The overall market potential is good because the unsatisfied demand for good road services is great. Moreover, the need for improvements in networks is, in many countries, at least just as great. Indeed, many of the new public-private partnerships are for road upgrading and paving rather than for greenfield projects. Even if 100% paving of existing roads is unlikely to be a realistic target for many countries, the margin for improvements suggest a reasonably good market for private road operators and interested construction companies. Indeed, in developing countries, the proportion of the main road network that is paved averages to a modest 45.5% (it varies from a low of around 2.5% to a high of 100%).

Furthermore, road maintenance can also easily be improved by their private operators. In Latin America for instance, over the last fifteen years or so, most governments have spent roughly one-fourth of what they should have spent to maintain roads. On the other hand, this is why it is not uncommon for new private operators to find out that rehabilitation costs are higher than expected when they take over the responsibility from the

government. This often a subject of dispute between regulators and private concessionaires once private operation has been in place for a while. Overall, from a strategic viewpoint, contracting out road improvements can provide a smooth phase-in or learning process into the development of a future relationship with potential private investors into new roads.

### *2.1.2 THE DEMAND FOR HIGH TRAFFIC ROADS IS STILL GROWING*

The demand for road services will continue to grow and hence so will the need for investment. Worldwide, the stock of motor vehicles is growing at nearly three percent per year. Since the number of vehicle kilometers traveled tends to grow somewhat faster than the stock of motor vehicles, this implies that at least for some segments of the road network, the demand prospects are quite good. The fast urbanization of the developing world adds another dimension that cannot be ignored and explains the strong demand for urban access roads in many of the most populated countries of the world. The challenge here is to bet on the right horses. Demand will increase but only on some segments of the network and it is tempting for a government to oversell a specific road based on aggregate traffic growth prospects.

Even holding the effects of toll levels constant, traffic volumes are very sensitive to income and economic growth. The failure to recognize this may be one of the main reasons why so many toll road projects have failed or ended in bitter renegotiations. Motorization and vehicle-kilometers traveled tend to increase faster than income levels. This high income elasticity, especially for leisure trips, makes toll roads especially sensitive to macroeconomic conditions. For roads that serve export activities, exchange rate changes can dramatically affect trade, leading to major changes in demand patterns.

Many toll road projects in the last decade have dramatically overestimated traffic levels. In some of the Mexican road concessions, traffic volumes were only one-fifth of the forecasted levels. In Hungary, the M1 Motorway attracted only fifty percent of its expected volume in its first year of operation. The Dulles Greenway, outside of Washington, only attracted one-third of its expected daily volume. Even after a toll reduction of forty percent, the Greenway still was only able to achieve two-thirds of its originally forecast volume.[6]

### *2.1.3. THE DEMAND FOR SAFETY IS GROWING AS WELL*

Investment needs and types will have also to address the need for improved safety. Each year, over 700,000 people are killed and over ten million are injured in road accidents, costing the global economy about $500 billion. About seventy percent of these accidents take place in developing and transition countries. In developing and transition countries, road accident rates per 10,000 vehicles tend to be twenty to thirty times higher than in industrialized countries and cost up to two percent of GDP. This is a major concern for policymakers and is becoming a concern for private roads operators as well, since policymakers tend to include requirements in concession contracts that address the need to drastically increase highway safety. A peculiar problem arises when governments change

[6] The Dulles Greenway experience suggests a toll price elasticity of -2.3, a very high sensitivity. This result is due in part to the upgrading of a parallel alternative route. Other estimates range from -1.4 to -2.5, quite income elastic in all cases.

safety regulation in the course of a contract, thereby implicitly changing the investment requirements and hence the terms of the agreement with the private operators.

#### *2.1.4 THE DEMAND FOR A NETWORK OFTEN DOMINATES THE DEMAND FOR A SPECIFIC ROAD*

The demand for a toll and hence the risk attached to a road often depend on the fact that the toll roads have to be build into integrated networks. It is often forgotten that the tolled part of a road network benefits tremendously from the existence of a public road network around it. In fact, the value of a specific road depends a lot on the extent to which it benefits from a complement of public and private roads. More specifically, the network characteristics of the sector means that benefits from investment at one point in the system can depend on service flows and capacities at other points. This implies that a number of service obligations that need to be taken account by both public and private roads operators.

#### *2.1.5 THE MARKET FOR TOLL ROADS IS VERY SENSITIVE TO THE GLOBAL FINANCIAL CONDITIONS*

The financial crises that affected many emerging markets in 1996-1999 had a dramatic affect on the evaluation of toll road projects. Project sponsors and creditors experienced difficulties due to macroeconomic factors, and financing became much more costly and of shorter term, thereby adding refinancing risks. Many toll road projects that were required to generate returns of fifteen percent in the early 1990s have been re-evaluated in light of project experiences to date and because of macroeconomic uncertainty. The result is that required returns for toll road projects appear to have risen to twenty percent or more. The key factors are cost, average daily traffic volumes and the willingness to pay tolls. Overall, average daily traffic volumes in excess of 10,000 vehicles per day seem to be required to attract private capital. Below this traffic volume, various types of government support, such as grants or guarantees, are likely to be required. The effect is to make many proposed concessions non-viable, or at least to cause their deferral until greater corridor demand is assured and a more stable financing environment exists.

However, a project's ability to obtain financing is not solely determined by its underlying cost and demand. The country and concession environment and the nature of public-private risk management also have important effects on the viability of toll road programs. A stable economic and political context has been essential for a sustained toll road program. Since toll roads typically are high performance highways, they are particularly dependent on income levels and economic activity. Moreover, since toll roads also tend to be politically visible, they may be subject to attempts to influence project selection, implementation and operation, especially through attempts to delay tariff increases and to evade toll collection entirely.

### 2.2. THE SPECIFIC ECONOMIC CHARACTERISTICS OF THE ACTIVITY

National characteristics are important in developing a greater private role for the road sector. At the same time, the economic characteristics of each toll road package must be clearly understood to design an appropriate public-private partnership. These economic characteristics are determined by a number of factors, including the project's function, its physical characteristics and the underlying market demand.

### *2.2.1. THE PURPOSE OF A TOLL ROAD*

The economic characteristics of the project should be the starting point for designing the appropriate role for the private sector, Why is the toll road being put in place is the first to question to ask. In many instances, tolling is being considered for fiscal reasons. Governments often want new, stable sources of finance and regulators must be quite aware that this can influence tremendously the choice of a toll road design and pricing form as discussed later. Toll roads can be classified as congestion relievers, inter-city arterials, development roads, or bridges and tunnels. Their main characteristics are typically categorized as follows:

- *Congestion relievers* are relatively short roads that are built to relieve traffic on existing urban routes. SR-91, for example, expands capacity of a major highway in southern California in the United States.[7] Congestion relievers, while expensive to build due to land costs, generally have significant revenue potential because they tend to serve heavy traffic demand. However, the high land acquisition and construction costs may require high tolls if privately financed, so pricing decisions and regulatory oversight become very important. Also, since congestion may be concentrated at peak periods, time-of-day and other variable pricing schemes may be required. Tolling is becoming more widely used as a mechanism to manage traffic demand on increasingly congested highways, a change made easier by advances in tolling technology that have made tolling more efficient and more convenient.

- *Inter-city arterial roads* are built to improve access between major cities, to airports or to port/terminal complexes. An example is the Malaysian North-South Expressway, linking the Thai border through Kuala Lumpur with Singapore. These roads tend to be expensive since they are generally long, high-capacity, and built to serve heavy truck traffic. Tolling decisions between different types of user groups are particularly important for these roads.

- *Development roads* link more remote areas with urban centers or with major transport routes. An example is the Chilean South Access project that links a forestry region to the port of Concepcion and the Pan-American Highway. While development roads can provide a stimulus to economic growth, traffic volumes generally are not financially sufficient in the early years, and thus are seen as speculative investments that require substantial public participation.

- *Bridges and tunnels* are typically very short, very expensive to build per kilometer relative to roads, and (in most cases) serve high volumes of traffic. They are often built as congestion relievers and may have a similar strong financial capability due to traffic volumes. Examples include the Rio-Niteroi Bridge in Brazil and the Dartford Bridge outside of London.

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[7]. Capacity can be expressed in terms of the variable passenger car unit (pcu). A pcu is a measure equivalent to the space occupied by a car, so a coach that occupies approximately twice the space of a car corresponds to 2 pcus and a truck to 2.5 pcus.

*2.2.2. THE COSTS OF A TOLL ROAD.*

Once the purpose of the toll road is clearly recognized, its costs must be identified. A project's physical characteristics are the primary determinants of its costs. Important aspects include whether the project is a new facility or an expansion of an existing road, the length, capacity and design, geographic and geologic aspects, and toll collection mechanisms. New facilities are more costly per kilometer than expansions or rehabilitations of existing facilities. Rehabilitation and expansion typically require less construction work than new facilities.

Moreover, expansion projects that involve pre-existing tolled facilities may be able to use the toll revenues to lower external financing requirements. For example, the Buga-Tulua expansion project in Colombia, which connects three major cities, was able to use existing tolls for about one-third of project costs. Wider roads (number of lanes), their thickness and construction technique, and the type of geography traversed also are key determinants of project costs. As a result, project costs can vary over a wide range. The South Access project in Chile, which featured favorable geography and mostly rehabilitation work, cost about US$0.2 million per kilometer. By comparison the Guangzhou-Shenzen highway, which involved six lanes through a region subject to flooding, cost over US$15 million per kilometer. Bridges and tunnels, because of design requirements, tend to be much more expensive; the Dartford Bridge cost US$247 million for 2.8 kilometers, or US$88 million per kilometer. [8] The proposed Colonia Bridge connecting Argentina and Uruguay was forecast to cost in excess of US$22 million per kilometer (over US$800 million total cost).

Finally, it is important to recognize that road capacity presents high levels of "indivisibility". For example, each lane in a highway typically represents a maximum offer of two thousand vehicles per hour, but it also represents the minimum offer per lane. If demand is about three thousand vehicles per hour, capacity will end up being four thousand vehicles per hour and the market will have excess capacity. So while a bus or a train company can adapt the number of vehicles to fluctuations in demand, in road service, full capacity is offered at all times. Therefore, if capacity is designed for peak periods, during off-peak periods, the road will be underused. This means that if investment in capacity in road infrastructure is carried out for long periods, schemes must be introduced across the board in the toll design to recover investment cost while preventing motorists from being overcharged.

*2.2.3 THE DEMAND FOR A SPECIFIC TOLL ROAD*

The next crucial component of the economic picture of a toll road is determined by demand considerations. Market demand can be measured in terms of actual or expected traffic levels, predictability of expected traffic, and the willingness to pay tolls. Each of these measures is critical to the design of toll road projects because they determine whether there is a revenue stream large enough and predictable enough to obtain financing. The

[8] Mercer (1996),

markets served, the number and quality of competitive alternative routes, and the toll road's links to the rest of the transport network also affect traffic levels. Predicting traffic levels is especially difficult for two reasons. New projects are unable to rely on existing traffic volumes as the basis for demand forecasts. As a result, they must turn to other methods of demand estimation, such as stated preference models, which may be less reliable.[9] Judgments must be made about the new road's ability to draw traffic from existing alternatives and to generate new traffic. The second reason is that in cases where projects are to be stand-alone, the level of tolls required to cover costs and provide required financial returns may be far above existing toll levels, if tolls are levied at all. In these cases, estimates of price sensitivity and willingness to pay for new facilities become very hard.

### *2.2.4 THE WILLINGNESS VS. THE ABILITY TO PAY FOR A ROAD*

It is often forgotten that road investments must take into account the need to serve different user groups, including very poor users in rural areas that may not be able to afford the toll levels that are required to allow the operators to recover their investments. This is quite important since road investments are "irrecoverable" or "sunk" in the sense that, once built, they cannot be converted to other uses or moved elsewhere.[10] While investors must be guaranteed the fair opportunity to recover their investments, the ability to pay for all segments of the concerned population must be considered at the time the privatization is being prepared, in order to avoid future tensions between users and operators. This is why the political challenge of introducing tolls is quite different for greenfield and rehabilitation/upgrading projects. For a given contract duration, tolls for new roads will often be much higher than for rehabilitation projects because amortization costs tend to be much higher for greenfield projects.

More generally, the experience of Latin America and Eastern Europe shows that the standard assumptions that toll road users are willing to pay high tolls to compensate for reductions in travel time and vehicle operating costs are not as realistic as many academics would like them to be. This is a major problem since the tolls that users in these regions are willing to pay for may not be sufficiently high to attract private equity (or debt for that matter). Some practitioners are arguing that the standard traffic models used to forecast the demand for the roads are too mechanical and do not recognize well enough the behavioral changes that toll brings about. For instance, Piron reveals that for a series of toll road projects in France, a number of critical factors had been omitted from the traffic forecast models. These included the importance of the use of the toll for the overall budget of the private or commercial users of the facilities and the change in the willingness to pay with the distance to be covered by the user. [11]

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[9] For a review of demand estimation methodologies, see K. Small and C. Winston, "The Demand for Transportation: Models and Applications," in J.A. Gomez-Ibanez, W.B. Tye, and C. Winston, editors, *Essays in Transportation Economics and Policy*, (Washington: Brookings, 1999), pp. 11-56.

[10] The fact that road investment is sunk, rather than subject to economies of scale, is an important distinction. Highway operating costs (with the possible exception of costs imposed by heavy axle loadings) tend not to be very sensitive to volume.

[11] Piron, V. (1999), "Urbain-Interurbain: La Problematique est devenue globale", Transport, No 393, Jan. Feb.

## 3. PRIVATIZATION AND REGULATORY TRENDS

### 3.1. THE MOVEMENT TOWARD PRIVATELY FINANCED TOLL ROADS

The trend toward increased tolling of roads is clear. The precursors were in the United States and Europe. In the first half of the nineteenth century, private toll roads outnumbered public roads in the United States. But during the late nineteenth and early twentieth century, the growth of the railways and problems with toll evasion led to a decline in private toll roads. Toll road development in the United States further slowed after 1956, when the Federal Highway Act established a federal gasoline tax to fund the interstate highway system and prohibited tolling on new, publicly financed highways. By the late 1980s, though, public funding constraints and infrastructure demands stimulated new interest in toll roads, mostly as congestion relievers in metropolitan areas.

European countries have had more experience with toll roads in recent decades, but with mixed results. Toll financing developed in Europe after World War II due to rapid growth and budget constraints. In France, public toll financing was used in the 1950s and early 1960s, while private toll concessions were introduced in the late 1960s and early 1970s. Only one in four of the French concessionaires have survived, however. In Spain, private toll financing for inter-city motorways was introduced in the 1960s; nine of the twelve original concessions continue to have a major role in Spain's road network. In Italy, more than twenty concessionaires have built over 5,000 kilometers of toll roads. The largest of the Italian concessionaires, Autostrade, operates most of the highway network. Toll systems also are in widespread use in Austria, Denmark, Greece, Norway and Portugal. The Norwegian system is quite unusual in that concession companies are used to collect tolls, while the government road administration retains responsibility for design, construction and maintenance.

The latest wave of toll roads is in developing countries, where economic and population growth and growing links with international markets led to pressures for more highways. Mexico launched perhaps the most ambitious program of new roads, to build more than 5,000 kilometers of new roads between 1989 and 1994, the majority of which have not met projections and have had to be restructured with significant public contributions. Expansion of existing toll road systems has met better, although still mixed, success in other Latin American countries, most notably Chile, Argentina and Brazil. Private or public-private toll concessions also have been pursued in China, Colombia, Ecuador, Hong Kong, Hungary, India, Indonesia, Malaysia, Peru, the Philippines and Thailand. Many of these projects are discussed in the context of particular issues in the sections that follow.

In terms of numbers, *Public Works Financing*, one of the publications monitoring the development of infrastructure projects, has identified 121 projects in developed countries between January 1985 and October 1998.[12] The average project value was around $750 million (driven by a number of EEC-sponsored mega-projects in Europe). A World Bank database for developing countries identified 280 roads projects in partnership with the

[12] Public Works Financing (1998), "International Major Projects Survey", PWF International

private sector between 1990 and 1997. The average project size was around US$190 million but with a very large dispersion across regions. Eastern European projects have reached enormous proportions while South Asian projects have tended to be the smallest one. As seen in Table 1.1, the bulk of these projects were in East Asia and Latin America.

**Table 1.1: Divestitures, concessions and O& M contracts in developing and transition economies (1990-1997)**

| | AFRICA | EAST ASIA | EASTERN EUROPE | LATIN AMERICA | SOUTH ASIA | TOTAL |
|---|---|---|---|---|---|---|
| Number of transactions | 5 | 102 | 2 | 93 | 6 | 208 |
| Value in million US$ | 426 | 18,567 | 1086 | 18,794.8 | 63.5 | 38,937.3 |
| **Average project size (in million US$)** | 85.2 | 182 | 543 | 202 | 10.6 | 187 |

Source: World Bank PPI database

Table 1.2 summarizes the scope of toll road provision in selected countries. While toll roads are typically only a small share of the total road network, they tend to be located in the most densely traveled corridors and thus have the potential to play major roles in the transport network. Toll roads in many countries comprise a dominant share of the expressway network and thus may play particularly important roles in urban areas and in inter-city trade.

**Table 1.2: Tolled and other roads in selected countries (km)**

| Country | Total Road Network | Total Expressway Network | Tolled Road | Tolled Roads as % of total | Tolled Roads as % of Expressway |
|---|---|---|---|---|---|
| Argentina [1] | 500,000 | 10,400 | 9,800 | 4.54% | 94% |
| Brazil [2] | 1,980,000 | n/a | 856 | 0.04% | n/a |
| Chile [2] | 79,800 | n/a | 3 | 0.00% | n/a |
| France [1] | 966,000 | 14,886 | 6,305 | 0.65% | 42% |
| Hungary [1] | 158,600 | 435 | 57 | 0.04% | 13% |
| Indonesia [1] | 260,000 | 530 | 530 | 0.20% | 100% |
| Italy [1] | 314,360 | 6,444 | 5,550 | 1.77% | 86% |
| Japan [1] | 1,144,360 | 15,079 | 9,219 | 0.81% | 61% |
| Korea, Rep. [1] | 77,000 | 1,880 | 1,880 | 2.44% | 100% |
| Malaysia [1] | 94,000 | 1,702 | 1,127 | 1.20% | 66% |
| Mexico [1] | 303,262 | 5,683 | 5,683 | 1.87% | 100% |
| South Africa [1] | 525,000 | 1,440 | 825 | 0.16% | 57% |
| Spain [1] | 343,200 | 7,194 | 2,255 | 0.66% | 31% |

Sources:

1. I, Heggie and P. Vickers, Commercial Management and Financing of Roads (updated for Indonesia from Dr. Bambang Bintoro Soedjito, Bappenas, Speech to Seminar in Tokyo, 1999 and Malaysia, Spain and Japan, PadeCo Co. Ltd. (4) report)
2. PadeCo Co. Ltd., Asian Toll Road Development Program: Review of Recent Toll Road Experience in Selected Countries and Preliminary Tool Kit for Toll Road Development, 1999

## 3.2 EXPERIENCES IN PRIVATIZATION[13]

Many toll road projects have been undertaken, each with different design and investment demands and political and organizational arrangements. Many toll roads have been negotiated quite loosely and have often been the outcome of informal agreements between the government and a construction company. Other programs have been overly ambitious and have resulted in partial or total failures because they were implemented too quickly. Sound toll roads require good planning. The government should consider funding preliminary studies that demonstrate public commitment, increase the future regulator's knowledge base and help reduce the costs of delivering road services. These studies might involve such matters as studies of environmental and land acquisition needs and indicative traffic and revenue projections (which are essential preparation for both contract design and renegotiation )and project design criteria. Design specifications can range from virtually no public sector responsibility for road features to detailed specifications with respect to route, alignment, capacity, locations of interchanges, materials, pavement, etc. A lower level of public involvement allows the private sector to provide potentially innovative solutions and better match infrastructure provision to market demand. However, allowing this flexibility reduces the ability to compare proposals, since different bidders may take different approaches to project design. Projects that have limited opportunities for innovation should be more explicit in design and award criteria.

Experience suggests that three key project selection and design issues should be addressed early in the concession process: whether a parallel free road should be required; the feasibility of cross-subsidies; and whether concessions should be for a single road in a network or for a "package" of roads.

### *3.2.1 PARALLEL FREE ROADS*

While the idea of having competition between roads is a good one in principle, the evidence so far suggests that traffic levels in most developing countries cannot sustain duplication from free alternative routes. Toll road traffic in such cases has generally fallen well below projections. The Mexican toll road program illustrates the challenges imposed by parallel roads. Launched in 1985, this program introduced a toll road development plan with a range of conditions, one of which was the provision of a free alternative parallel route. Traffic predictions for the concessioned roads suggested that trucks would form about 20-45% of the traffic. In fact they turned out to be only about 5%. A black market in toll receipts developed by which truckers used the parallel free roads yet produced toll receipts for their employers in order to reap financial benefits. This problem was overcome when the road operators agreed to exempt trucking companies from paying a toll.

This experience suggests that the competition argument is difficult to implement in an environment where traffic is not strong enough and lobbies are powerful. The best argument in favor of free parallel roads is one of social equity, to ensure that the poor can still have access to the road network, but this often detracts from the new toll road's effectiveness in alleviating congestion and may also cause problems for cost recovery if the toll cannot produce enough revenue. In general, tariff differentiation, as discussed later, will

[13] This section draws on the World Bank toll road web site

be a much better solution to help the poor, therefore reducing the case for a parallel toll free road.

### *3.2.2. USING EXISTING CONCESSION REVENUES TO FUND NEW PROJECTS*

In some cases, existing roads have been tolled in order to provide revenue for the construction of new segments in the network. The French pioneered this technique whereby new roads with higher construction costs are supported by operating surpluses from existing toll roads.[14] The Japanese also have been very committed to this concept, having used tolls to generate revenue for road construction since the mid-1960s.[15] In 1972 a "toll revenue pooling system" was introduced. The pools are separate for urban expressways and for regional networks. Tolls are set equally on all routes and segments of the network, no matter what the construction costs or traffic levels. The Japanese felt that traffic forecasts could only be achieved if the full network was in place, and that profitability of some routes would be improved by the opening of connecting routes. Politically, it was easier to establish common tolls across the network because it avoided confusion and was "fair", since all roads provide essentially the "same" service. More generally, it is very common to 'create' profitability to fund a new road or concession. Similar stories can be told about several Asian toll roads programs.

While these examples illustrate that tolling can assist in releasing funds for new construction, from a regulator's viewpoint, the standard risks implied by cross subsidies require close monitoring of the cost structure of the various roads to ensure that the average toll is not higher than it needs to be. It is important to monitor the transfer of resources from one group of consumers to another because those who are paying tolls on the existing road are thereby paying for the construction of a new road, which would otherwise have been funded by taxpayers and will provide benefits for other future users. This may be part of a government program of regional development that needs to be explicitly recognized. Toll roads are often developed in congested corridors of a capital city because good revenue streams there are easier to predict. Where this is the case, the investment in the road is benefiting more affluent areas of the country. If this crowds out other investments in less affluent areas of the country, then other regional equity issues are raised.

### *3.2.3 SHOULD CONCESSIONS BE "PACKAGES" OR INDIVIDUAL PROJECTS?*

The project economics of toll roads suggest that traffic volumes must be in the range of 10,000-15,000 vehicles per day in order for toll revenues to be sufficient to cover construction, operating and financing costs. In many countries, only a few such corridors exist. For other roads that may serve important transport roles, it may be possible to bundle a package of roads into a single concession. The pooling of existing roads reduces the volatility of overall concession cash flows and may thus increase financial viability. In

[14] See F. Papon, "Comparaison des Principes de Financement des routes dans Differents Pays," in Le Financement de La Route, (Paris: Presses de l'ecole nationale des ponts et chaussees, 1998), pp. 481-490.

[15] Operating and maintenance costs and interest costs on the construction loans took up 57% of the total pooled toll revenue on the 6,416 km National Expressway Network in 1997. Approximately 50% of routes generated revenue in excess of their operating, maintenance and interest costs. Source: Jun-ichi Matoba, Director for Toll Road Development, Ministry of Construction, Japan, "Toll Road System in Japan: Expressway Network Development through Public Corporations", paper to Tokyo conference 1999.

some cases, this may involve transfer of an existing toll road or major untolled route that may need upgrading or expansion, along with an associated feeder network. If properly designed, the feeder network could serve to enhance the viability of the main toll road.

### 3.3. ORGANIZATIONAL OPTIONS

There are many ways of designing a road concession. Table 1.3 presents a spectrum of alternatives for the involvement of the private sector in the provision of toll roads, ranging from maintenance contracts through full Build-Operate-Transfer concessions and Corridor Management. Each option is described in terms of the nature of public and private involvement and typical features (e.g., duration and project size). The principal responsibilities for toll road development include design, maintenance, toll collection, financing and legal ownership. In practice however, governments seldom follow a pure strategy and end up combining various types of contractual arrangements (illustrated by Argentina's restructuring experience, discussed in Box 1.2).

**Box 1.2: Increasing private participation in roads: Argentina's experience**

The general privatization strategy was to unbundle financially viable roads into build-operate-transfer (BOT) concessions awarded through competitive bidding. Most of the traffic is concentrated near major city nodes, such as Buenos Aires and Rosario and Córdoba to a lesser extent. The national concession program has so far focused on the multi-lane roads and freeways serving these cities, along with other inter-city and major city access roads. It applies now to almost 9,500 km of 38,000 km of national roads. The concession program was complemented by an auction of management contracts (generally for five years) for rehabilitation and maintenance, now covering about 12,000 km of national roads divided into 400 sections and auctioned out into 61 contracts. Also, non-toll concession contracts cover about 1,900 km of national roads (six corridors) and allow the government to rely on a private financing of the initial rehabilitation in exchange for a commitment to future disbursements of monthly subsidies during the ten year terms of the concessions. A more recent program called "km/month" covers basic maintenance and service contracts for 4,100 km of less traveled roads. Overall, about 70% of the national road network is *de facto* under private operation.

The Build-Operate-Transfer (BOT) model has been most widely used. This structure can be broadly defined to include variations such as Build-Own-Operate-Transfer (BOOT); Build-Lease-Transfer (BLT); Rehabilitate-Operate-Transfer (ROT); and similar arrangements that are used to develop new facilities or rehabilitate existing roads. Under the generic BOT model, a private consortium receives a concession to finance, build, control and operate a facility for a limited time, after which the facility is transferred back to the government. What makes the road sector so special in this context is that in most countries, the consortium includes a major foreign and/or local construction company mostly interested in the short term use of its assets (essentially machinery) and skills. This often has an influence on the way in which contracts are drafted and also on the speed of the investments to be made. Governments should pay close attention to ensure that investments are driven by demand rather than by the short term concerns of a consortium motivated by the opportunity for construction profits - as has been the case in too many toll roads projects.

## Table 1.3: Characteristics of organizational options for toll roads

| | A: Maintenance Management Contract | B: Turnkey | C: Operate & Maintain | D: ROT | E: BOT | F: Corridor Management |
|---|---|---|---|---|---|---|
| **Definition** | • Maintain | • Design & Build | • Maintain and operate | • Finance, rehabilitate, maintain and operate | • Finance, design, construct, maintain and operate | • Finance, design, construct, maintain & operate<br>• Develop corridor / network |
| **Examples** | • New South Wales<br>• Chile, Brazil | • USA<br>• Hong Kong | • Argentina<br>• Hong Kong | • Argentina, Colombia | • Malaysia; Philippines; Thailand;<br>• Argentina, Mexico | • UK (DBFO)<br>• Colombia, Brazil |
| **Direct Cost recovery from users** | • No<br>• Payment from government to operator | • No<br>• Fixed Payment from government to operator | • Some degree of toll revenue sharing with government | • Concessionaire may pay government or vice-versa | • Government investment usually required;<br>• Ex-post subsidies not uncommon | • Government contributes existing roads and other investment usually required |
| **Scale of Private Investment** | • Very low | • Considerable for very short term | • Low | • Medium | • High | • Medium / High |
| **Private Sector Risks** | • Maintenance | • Design<br>• Construction | • Traffic & revenue levels<br>• Political<br>• Financial | • Rehabilitation<br>• Traffic & revenue levels<br>• Political<br>• Financial | • Design<br>• Construction<br>• Traffic & revenue levels<br>• Political<br>• Financial | • Design<br>• Construction<br>• Traffic & revenue levels<br>• Political<br>• Financial |
| **Public Sector Risks** (land acquisition and relocation risks always carried) | • Design<br>• Construction<br>• Traffic & revenue levels | • Planning<br>• Traffic & revenue levels | • Revenue<br>• Macro<br>• Some regulatory | • Force majeure<br>• Some regulatory | • Planning<br>• Macro/<br>• Some regulatory | • Planning<br>• Force majeure<br>• Macro<br>• Some regulatory |
| **Typical Contract size ($)** | • Small | • Medium / Large<br>• $50 - $800 m | • Small / Medium | • Medium / Large | • Very Large<br>• c. $100m - $1 b | • Medium / Large<br>• c. $90 - $300 m |
| **Minimum size concessionaire required** | • Small / Local construction firm | • Small / Local construction firm | • Construction firm with management skills | • Larger construction firm with management skills | • Consortium incl. major construction firms | • Consortium often with major construction firms |
| **Typical duration** | • 2-10 years | • Defined construction period | • 2-10 years | • 10-20 years | • c. 30 years | • c. 30 years |

Note: For more details and some differences see also ADB: Developing Best Practices for Promoting Private Sector Investment in Infrastructure: Roads, 1999 (Forthcoming)

The consortium typically assumes primary responsibility for constructing the project, arranging financing, maintaining the road and collecting tolls, while the public sector retains legal ownership and regulatory oversight of the concession contract. In most projects, design responsibility is shared, with the public sector taking the lead in corridor identification and preliminary design, leaving specific details to the private sector, subject to government approval. In practice, the government often ends up sharing some of the demand risks through the payment of subsidies. Typical BOT concessions are twenty to thirty years in length, whereas maintenance concessions tend to be shorter, typically five to fifteen years. They differ in length because of the different financial requirements. The duration of the concession may either be set in advance by the government or be part of the decision criteria in selecting the concessionaire.

Overall, BOT concessions are most likely to be successful under the following conditions:

- Projects minimizing costs in existing high traffic corridors, e.g.:
  - Projects with missing links such as river crossings, since they minimize land costs,
  - Inter-urban projects with low implementation costs, and
  - Urban area projects at grade or elevated since they keep construction costs low;
- Projects in countries where there is a tradition of paying public tolls, or at least where the willingness to pay the proposed toll level has been carefully assessed;
- Projects where tolls are set at, or close to, the revenue maximizing tariff and toll escalation formulas are invoked; and
- Projects where there is an existing income stream from which to draw revenues from day one, perhaps even during the construction period.

### 3.4. Risk Allocation Options[16]

The choice among the options for private participation shown in Table 1.3 depends on the particular needs of a country and the nature of risk-sharing between the public and private sectors. Risk allocation is a complex and difficult process, and for all practical purposes, it is a negotiated process. Unfortunately, these initial negotiations seldom involve the future regulators, even when their outcome is critically important to regulatory decisions. This is why one of the first tasks a new regulator has to address in its new position is to understand the distribution of risks to which each party is committed through the contract, since in many renegotiation or regulatory disputes, the responsibility will be based on the assignment spelled out in the contract.

The rule of thumb is that private road infrastructure projects work best when project risks and responsibilities are assigned to the party that can best bear them. The private sector generally is better at managing commercial risks and responsibilities, such as those associated with construction, operation and financing. In contrast, toll roads may also depend on public participation in areas such as acquisition of right-of-way, political risk,

[16] For a much more detailed analysis, see Irwin, T. et alt. (1997)," Dealing with Public Risk in Private Infrastructure", World Bank Latin American and Caribbean Studies.

and in some cases, traffic and revenue risk. Successful projects have been characterized by a broad level of risk-sharing between the public and private sectors. Privately-supported toll road projects work best when experienced, well-capitalized firms have some discretion over design and confidence in toll policy to accept construction and some degree of traffic risk, while the government assumes the risks that it controls and considers giving financial support or guarantees if traffic levels in the early years are insufficient.

In practice, this theory of risk allocation is often not applied. Part of the reason is that risk levels and types tend to change. The 1998 Asian crisis sufficiently increased risk levels around the world, increasing the cost of capital to unbearable levels for many potential investors. On the other hand, governments can also be subject to a "fear-greed cycle" in which governments become afraid of program failure and thus offer increasingly better terms. On the other hand, prospective concessionaires may worry that they will be "left out" and end up making unrealistically optimistic bids. Subsequently, the element of greed takes over and governments may fail to live up to commitments and the private sector seeks ways to privatize gains and socialize the project risks.

The main risks facing toll road projects are pre-construction activity, construction, traffic and revenue, currency, force majeure, tort liability, political risk and financial risk. These risks must be addressed in a satisfactory manner before debt and equity investors will commit to project funding. The standard risk identified in contracts are: pre-construction, construction, traffic and revenue, financial, regulatory and political. In addition, force majeure and legal liability are commonly addressed in contracts since they have proven to be serious sources of cost overruns in the sector.

### *3.4.1. PRE-CONSTRUCTION RISKS*

Many projects have been delayed because of difficulties of acquiring right-of-way or environmental clearance that were underestimated by both the governments and the operators. The most relevant effect is cost overrun during project development. In general, the public sector often ends up taking on the responsibility for most of these risks since it is often easier for the public sector to take the responsibility for acquiring the right-of-way, paying for it, and contributing this asset to the project. Problems often arise when the government is not providing the road itself. If a private sector partner is undertaking construction, the delineation of responsibility and phasing of development by the different parties is particularly important.

Regulators end up having to address this kind of risk. A new segment of the Don Muang Tollway in Bangkok, Thailand will connect the airport with another toll road. In 1989, the Don Muang Tollway Public Company Limited (led by a German firm) received a 25-year concession from the Department of Highways to build the US$407 million, 15.4 km initial segment of the project. One clause in the concession agreement specified that the government would remove flyovers on a parallel road which competes with the toll road and would then construct new flyovers to allow radial movement. However, the government did not deliver for more than two years. In addition, it blocked toll rate increases until the completion of the new flyovers. As a result, toll revenues were almost 30% lower than had been forecast for the period. The sponsor ended up close to bankruptcy, which forced the government to provide significant compensation in exchange

for a 40% stake in the company, thereby helping refinance the loans.[17] One way of reducing transaction costs is to come up with a clearer contractual commitment for the government to take on that risk and possibly to have the government put a guarantee fund together to establish the credibility of its commitment, in the same way that governments ask concessionaires to fund commitments through guarantee funds. The general principle is the same: credible, rule-driven decisions are always easier for the regulator to implement.

### *3.4.2. CONSTRUCTION RISKS*

A common cause of cost overrun stems from design changes and unforeseen weather conditions during the construction phase. For instance, between the time that a concession is signed and when the concessionaire takes over the business, a hurricane can significantly increase construction costs. Who should pay for the consequences of the hurricane? The private sector typically bears primary responsibility for such risks and may attempt to cover some of them through insurance. However, the public sector may assume responsibility for risks under its control, such as completing complementary facilities (connecting roads or interchanges) or allowing cost increases associated with major design changes. It is also common for governments to at least cost share in projects that face major construction uncertainties (e.g., toll roads through mountains).

In most cases, though, fixed price construction contracts are used, with some provision for severe disruptions. For example, in Brazil, a "financial equilibrium clause" enables contractors to renegotiate contract terms if major design changes are required. When there are massive cost overruns, contract renegotiation may be required in exchange for the provision of additional financing by sponsors and creditors. This occurred in the Guangzhou-Shenzen project in China, where an additional US$700 million equity investment was made by the private sponsors in exchange for an increase in the profit sharing agreement during the first ten years of operation.

It may be worth mentioning that the use of fixed construction prices in the contract is consistent with the idea of facilitating the work of regulators, but it also illustrates the costs and risks involved with accepting rules too readily. It is not uncommon for concession units to be staffed with members of the public roads department. In some countries, this staff has an established contact with many of the local construction companies through procurement and maintenance contracts for the public roads, and the bidding rules for these contracts are not as competitive as they should be, resulting in construction prices that are not consistent with best practice. Thus, the risk is that unit prices built into concession contracts are based on the wrong prices (in the best of cases), or they reflect collusion between the concession unit and the concessionaires (in the worst case scenario). In other words, regulators should not always take construction unit prices for granted when they have the option to review them.

### *3.4.3.TRAFFIC AND REVENUE RISKS*

Demand uncertainty continues to be a major problem at the conception stage and ends up haunting many, if not most, projects. Traffic and toll levels may not be sufficient to

[17.] For more details , see ADB, Developing Best Practices for Promoting Private Sector Investment in Infrastructure: Roads, 1999 (Forthcoming).

cover all costs, including construction, operation and maintenance. An approximate rule of thumb is that 10,000-15,000 vehicles per day (vpd) are needed to fully cover operating and capital costs. Coverage of operating costs alone generally requires traffic in excess of 3,500 vpd. Recovery of toll collection costs requires approximately 1,500 vpd.[18] The handling of traffic and revenue risks ranges from full private sector assumption to government-provided traffic and revenue guarantees. The policy issues involved with managing these risks are major strategic choices that are discussed in detail later in this chapter and vary tremendously depending on the time and location of the project.

The main concern of a regulator in this context is to make sure that it has access to the demand studies that were conducted in preparation for the tolling of the road network. As explained earlier, forecasting demand is a challenging task that is often underestimated by privatization teams. Over-optimism is common for privatization teams who focus on convincing private operators of the value of their business and for potential operators who want to make a deal and are convinced that they can renegotiate almost anything once they have taken over the business. To be somewhat credible, much more so than in most other transport studies, the analysis of the willingness to pay for a toll road has to be combined with a study of ability to pay, in order to fairly assess the traffic and revenue risks. In many toll road renegotiations, the main concern of the regulator is the need to avoid boycotts of the road by users who are unwilling or unable to pay for the toll. The solution is often to cap the toll and adjust the duration of the contract, but the adjustment often entails significant transaction and political costs that most regulators wish to avoid.

### *3.4.4. CURRENCY RISKS*

The main currency risk is driven by the impact of fluctuations in the exchange rate on the value of the business. In addition, the toll concession can be subject to a convertibility risk that refers to the possibility that the operator may not be allowed to exchange local for foreign currency. These are major issues for toll roads that are financed with foreign capital because revenues are commonly in local currency and adjustments for inflation and exchange rates may lag or encounter political opposition. Projects can reduce this risk by tapping domestic capital markets where possible. Most projects attempt to mitigate exchange risk by including provisions for indexing to inflation, although in practice, the magnitude of exchange volatility has made such requirements difficult to enforce.

In Peru, for instance, this risk is addressed and shared in the following way in the concession contracts. To begin with, the initial basic toll unit is expressed in dollars. This tariff is adjusted every six months with the consumer price index, by a devaluation index published by the National Statistics Office. The devaluation adjustment only kicks in when the devaluation rate is higher than inflation. The toll is adjusted by 50% of the difference between devaluation and inflation. A general formula would look like this:

$$\mathbf{P_{t\,MN} = P_{t-1\,MN} * (1 + CPI_{t-1}) * [1 + b * (DEV_{t-1} - CPI_{t-1})]}$$

**if** $DEV_{t-1} > CPI_{t-1}$, and where:

$P_{t\,MN}$ :Toll base adjusted in national currency for the period t

[18] Source: Fayard, Alain. The East-West European Road Conference, Varsovie, 22-24 September, 1993. Toll Financing, Risk Financing, How to fit the needs without dogmas: The French experience

$P_{t-1\ MN}$ :Toll base in national currency for the previous period
$\beta$ :Factor by which the difference between devaluation and inflation can be passed on through tolls, which essentially is the variable over which a negotiation takes place between the government and the concessionaire.
$CPI_{t-1}$ :Consumer Price Index in the period t-1
$DEV_{t-1}$:Devaluation in the previous period

Having an explicit formula like this is always a blessing for regulators and is now becoming standard in concession contracts so that when an explicit rule is not available, regulators only have to check compliance rather than arbitrate a negotiation between the government and the concessionaire.

### *3.4.5 FINANCIAL RISKS*

Financial risk is the risk that project cash flows might be insufficient to cover debt service and then pay an adequate return on sponsor equity. Financing constraints, especially the lack of long-term debt capital, significantly hinder toll road development. Since the advent of financial crises in emerging markets, few projects have been able to generate returns on investment that are sufficient to attract private capital. Required debt ratios have fallen from 70% to 40%-50%, with costs of capital rising to 20% or more. This suggests that until macroeconomic risk premiums decline and traffic growth is more established, only the highest density projects will be undertaken without substantial government support. The financial crises will force many programs to slow down and will force debt restructuring of many existing concessions. There is a need to promote more secure financing structures to reduce the risk of potential bailouts.

Because toll roads are long-lived investments with high start-up costs, countries with local capital markets that are capable of providing long-term financing have many advantages in supporting toll road concessions. Of particular importance is the available maturity of domestic finance. In many countries, new toll concessions have been unable to obtain financing for longer than five to six years, which creates a major refinancing risk that either renders the project nonviable or requires government guarantees of such a rollover.

In theory, financial risk is best borne by the private sector, but in toll road projects there is likely to be substantial government risk-sharing, either through revenue or debt guarantees, or participation by state or multilateral development institutions. There also may be cash grants or other financial contributions that serve to improve the project's rate of return on private finance.

### *3.4.6 REGULATORY RISKS*

Regulatory risk stems from the weak implementation of regulatory commitments that are built into the contracts and the laws or other legal instruments that are relevant to the value of the transaction as it was originally assessed. Essentially, the question is whether the regulator will exercise its authority and responsibilities over prices, public obligations, competition rules and similar rules that are specified in the contracts, and whether that will influence the value of the business. This risk is more common than it appears, and pressures

on regulators are a major source of concern that investors incorporate into their required rate of return. In 1999, a major factor in the restructuring of Mexico's toll road program was the pressure on regulators to cut tolls. In Thailand, a similar concern resulted in a decision by the government to cut a toll level by 50% of what it had committed to in a BOT contract. The outcome was that the government ended up taking over the toll.

The solution is to try to make sure that regulators have rules to follow and that they are independent enough to be able to enforce them. First, the rules must cover the possibility of adapting the contract terms during the tenure of the concessionaire. Toll roads concessions tend to be quite long, and the legal environment in reforming countries tends to change during that period. For instance, environmental and safety concerns are increasing in many countries. New laws are introduced during the term of many toll roads. The rules that allocate the financial consequences of these changes between the government, the users and the operators are critical, yet often forgotten.

Even if regulatory rules are clear, they are only as effective as the regulator. The best designed regulatory contract is useless if the regulator is not independent or fair, which has been a major source of concern in Brazil. For example, in a concession between Rio and Teresopolis, illegal access and egress has been estimated at 3,000 vehicles per day. This "leakage" has been championed by the mayor of Mage (a small town along the route), who feels that his citizens should not have to pay what are perceived to be very high charges for local access users. Regulators have not been able to enforce the contractual commitments made to the operator.

### *3.4.7 POLITICAL RISK*

Political risk concerns government actions that affect the ability to generate earnings. These could include actions that terminate the concession; the imposition of taxes or regulations that severely reduce the value to investors; restrictions on the ability to collect or raise tolls as specified in the concession agreement; and the preclusion of contract disputes to be resolved reasonably. Governments generally agree to compensate investors for political risks, although in practice, governments may cite justifications for their actions to delay or prevent such payments. Thus, private investors generally assume the risks that are associated with dispute resolution and the ability to obtain compensation if the government should violate the concession agreement. The issue of meeting financial obligations while disputes are resolved may be achieved by requiring debt service reserves, escrow, or standby financing.

In Brazil, local political interference has affected several toll road projects. A state-level concession in Parana is the most significant example to date. In this case, new tolls were introduced during peak harvest season and the governor forced the concessionaire to charge only 50% of the original tariff. The case is now nearing a decision in court, but all of the other concessions are paying close attention. If the original toll contract structure is not fully upheld, it will be more difficult to accomplish refinancing and to attract capital on favorable terms for a second wave of concessions. Investment bankers cautioned that if these court issues regarding toll revisions in Parana are not resolved, an additional 200 basis points could be required for those projects in regions with particularly populist governors or mayors. In total, including the costs of the Asia crisis, the costs of debt have

risen from approximately 11% in late 1998 to 16-17% in early 1999. At these cost of debt levels, most of projects are not viable at their planned toll levels.

The credibility of the government to uphold contractual obligations and their willingness and ability to provide compensation for political risks are key issues for private investors in toll roads. Issues with delays or denials of toll increases have made many prospective parties wary of entering into new projects. This is especially true for foreign capital, which is perceived as especially vulnerable to political risks. Some of the more risky emerging markets may require support form multilateral or bilateral financial institutions to reduce this risk exposure. In addition, political risk insurance may help manage issues of inconvertibility, transfer and confiscation. Box 1.3 shows how all of these risks might be put together by a regulator into a single quantitative indicator.

**Box 1.3: How should a regulator consider risks?**

Risk factors can be pulled together in the concept of cost of capital, which represents the required rate of return that all investors blended together might expect on a project. For most regulatory decisions, a regulator will have to assess the impact of its decisions on the cost of capital through its impact on each one of the risk levels. Algebraically, we can simplify and write this as:

*Cost of capital =*
*(Required rate of return on debt) x (Percentage of debt in the project) +*
*(Required rate of return on equity) x (Percentage of equity in the project)*

Since interest expense typically is tax deductible, we can calculate the cost of capital either on a before-tax or an after-tax basis. It is important to understand that the tax rate that is relevant is the one that applies to project sponsors.

*The Required Rate of Return on Debt.* The required rate of return on debt (that is, the borrowing cost) includes a number of risk factors, each of which commands a premium that must be paid to investors in order for them to bear that particular risk:

*Required rate of return on debt =*
*Risk-free borrowing rate for specified time horizon +*
*Premium for country/financial risk +*
*Premium for currency risk +*
*Premium for project or sector risk (including construction) + Premium for regulatory risk*

*The Required Rate of Return on Equity.* Similarly, the required rate of return on equity investment can be seen as being equal to a risk free rate plus a premium for the higher risk faced by equity relative to debt, as well as all four risk factors above. The equity risk premium is a function of how risky a specific sectoral investment is relative to equity markets overall. (This adjustment factor is known as beta and has an average value 0.6-0.8 for toll roads.) Thus,

*Required rate of return on equity =*
*Risk-free borrowing rate for specified time horizon +*
*Equity risk premium (adjusted by project beta) +*
*Premium for country/financial risk +*
*Premium for currency risk +*
*Premium for project or sector risk (including construction)+*
*Premium for regulatory risk*

While in many cases the risk premiums required would be similar for debt and equity, this will not always be the case. For example, regulatory lags in approving pricing decisions may have a greater effect on equity holders since creditors have a prior claim.

### *3.4.8. OTHER RISKS*

Force Majeure refers to risks that are beyond the control of both public and private partners, such as floods or earthquakes, which impair the project's ability to earn revenues. While some private insurance is becoming available for catastrophic risks, the public sector generally is faced with the need to restructure the project should such disasters occur. This may take the form of extending the concession term, or to provide additional financial support. The rule is that remedies in the event of force majeure risks should be stated in the contracts; for example, cash compensation or an extension of the concession term equal to the length of the disturbance. Finally, Tort Liability refers to liability for legal awards as a result of accidents or negligence on the toll road. This responsibility is borne by the private sector and is typically covered through private insurance. Governments, however, should make sure that such coverage is adequate and that the insuring party is financially sound.

## 3.5. REGULATORY OPTIONS FOR MITIGATING RISK

At the start of the concessioning process, there are two main reasons for the government to commit to support toll road projects at the beginning of a project: (i) to offset the financial or exchange risks by reducing capital expenditures or to improve revenues to the extent necessary for a project to cover debt service and provide a reasonable equity return; and (ii) to offset the demand and traffic risk and protect investors (especially lenders) from the risk that actual cash flows will fall below expected cash flows and thus be inadequate to cover debt service. When unexpected events arise and renegotiation of a contract arises, these two are often the main problems that a regulator must address. The name of the game is to come up with a mix of government actions that ensures that an acceptable financial return can be generated. These actions may include some redesign of the financing schemes to include guarantees as well as the redesign of the project design, including its duration.

### *3.5.1. THE VARIOUS INSTRUMENTS AVAILABLE TO A REGULATOR*

If public financial support is appropriate, a variety of mechanisms can be used to support private toll financing. These instruments range from revenue enhancements to equity guarantees:

- Equity guarantees: provide a concessionaire with the option to be bought out by the government at a price that guarantees a minimum return on equity. Although the liability is contingent, the government effectively assumes project risk and reduces the corresponding private sector incentives.

- Debt guarantees: guarantee that the government will pay any shortfall related to principal and interest payments. The government may also guarantee any refinancing that is scheduled. This creates significant government exposure and reduces private sector incentives, although it may decrease the cost or increase the amount of debt available to the project.

- Exchange rate guarantees: are when the government agrees to compensate the concessionaire for increases in financing costs due to exchange rate effects on foreign financing. Exchange rate guarantees expose the government to significant risk and increase the incentive to utilize foreign capital.

- Grants/subsidies: are contrary to equity and debt guarantees that create contingent liabilities for the government. Alternatively, governments can furnish grants or subordinated loans at project inception, buying down the size of the project that needs private finance. (In Chile, the size of the government grant was one of the criteria used in awarding the South Access toll road concession.) Alternatively, explicit subsidies can be given as part of the renegotiation process. In Argentina, this subsidy took the form of the forgiveness of accumulated payments due to the government for the right to operate the concession. In general, these grants or subsidies have no provision for repayment.

- Subordinated loans: can fill a gap in the financing structure between senior debt and equity. From the government's perspective, they also have the attractive feature that they can be repaid with a return if the road is successful. Subordinated loans improve feasibility by increasing the debt service coverage ratio on senior debt and by reducing the need for private equity, which requires a higher return. However, because subordinated debt does eventually require repayment, it does not improve project feasibility to the same degree as a similarly sized grant. Another alternative would be for the government to contribute financing that has characteristics of both debt and equity. One such instrument would be a "reverse convertible" contribution that would remain as equity unless the project was successful, at which point it would convert to debt for repayment.

As an alternative to these instruments, the regulator could rely on “playing” with the design of the contract. This involves considering changing the time profile of toll revenue as well as the toll levels and types, or adjusting the investment specification and other service obligations or the contract duration.

- Minimum traffic and revenue guarantees:[19] are a relatively common form of support for toll roads where the government compensates the concessionaire if traffic or revenue falls below a minimum threshold. Typically, the threshold is set 10-30% below the expected volume, and it is generally more desirable to rely on a revenue guarantee if the goal is to facilitate the access of the operator to the financial market. This trigger reduces government exposure while providing sufficient revenue coverage to support the debt component of the capital structure. In addition, traffic and revenue guarantees help retain financial incentives in the project, unless conditions deteriorate well below what was forecast. If the government shares "downside risk" with the private sector through guarantees, it should also consider seeking instruments that allow profit on the "upside". One way to do this is with a revenue-sharing arrangement where the government receives a portion of revenues above a maximum traffic threshold.

- Shadow tolls: are a way of providing subsidies where the government contributes a specific payment per vehicle to the concessionaire. In effect, they are an ongoing revenue stream from the government in lieu of an up-front grant or loan. Because they

[19] Note that in some countries, such as Chile for example, minimum income guarantees to protect the operator are introduced jointly with a revenue sharing scheme that allows the government a 30-50% share of extra profits (i.e. revenue that generates a return in excess of 15%) when traffic is consistently above what was forecast.

are paid over time, they may be less of a burden on the public budget. The drawback of shadow tolls is that they may not provide investors with much protection from revenue risks. That is, shadow toll payments are highest when traffic volumes are large. As a result, government payments may be inadequate to protect investors when traffic is low and may be unnecessarily high when traffic volumes are high. In addition, the payment of shadow tolls over time creates a credit risk for concessionaires. These inefficiencies can be reduced in a number of ways, such as by implementing a declining payment schedule as volumes increase or a maximum traffic level beyond which shadow tolls are not paid. Because they tend to "top off" private revenues, shadow tolls may be particularly valuable as support to low volume roads that require upgrading or rehabilitation rather than new construction.

- Concession extensions and revenue enhancements: provide financial support that involves limited public sector risk, but do little to support or enhance private financing. First, a government can extend the concession term if revenues fall below a certain amount. Second, a government can restrict competition or allow the development of ancillary services by the concessionaire.

- Changes in contractual obligations: allow the redesign of contractual obligations. Slower or less investment and fewer service obligations are all ways of cutting costs and transforming a non-viable road into a viable one.

### *3.5.2. CHOOSING AMONG THESE INSTRUMENTS*

In general, the most advantageous types of support for the concessionaire are those which provide early funding streams (when revenues from the toll road are low or non-existent during the construction period) and which give guarantees for unexpected problems (for example, exchange rate guarantees). This is true at the time the contract is initially signed as well as whenever the regulator is asked to renegotiate to restore financial viability to a project that has lost its viability. The least significant are those that themselves are unpredictable, i.e., additional rights for development around the road. These various mechanisms of government support can also be used in combination when a project is not feasible on its own and where revenue risk is substantial. In such cases, grant plus minimum revenue guarantees may be sufficient to induce private participation. Governments should avoid broad guarantees that reduce lenders' scrutiny and due diligence. In many cases, the availability of these guarantees induced lenders to provide funds based on guarantees and sponsor strength rather than underlying project risks and revenues.

When assessing the value of these adjustments, regulators must recognize that the value of government support also depends on the credibility and credit risk of the government itself. Investors may be inclined to discount the value of various support mechanisms that have not been upheld in the past, or which are tendered for long periods of time. Governments also need to improve the management of their contingent liabilities in order to maintain fiscal credibility and thereby reduce macroeconomic risks that directly affect toll roads through traffic volumes and financing costs. On the other hand, it is sometimes tempting for governments to increase support far above expected levels when the sponsors are well connected politically, have better advisors, or threaten to withdraw at the last minute. To prevent this requires the government to be well prepared with the specification and design of its part in support of that preparation. The upshot is that

determining if a project requires government support and how such support should be structured requires a detailed analysis of project costs, revenues and risk, as well as an understanding of what debt and equity investors require. Most regulators have ignored the importance of this information and have not been able to appropriately monitor or arbitrate disputes as a consequence. Before bidding a concession, governments should be aware of the project's critical elements, including environmental issues, traffic and revenue potential, preliminary design and costs, permit requirements, and the views of potential investors. Governments can improve the likelihood of having successful projects by undertaking studies of these issues and by working with experienced advisers. Box 1.4 tells how Peru prepared its toll road program effectively. Unfortunately, lack of political commitment to the program is still delaying its implementation. The regulators will however have all the required information once the program is implemented, thanks to an effective preparation.

**Box 1.4: Preparing for a toll road program: a lesson from Peru**

Faced with rapidly growing motorization, Peru decided in 1997 to launch new initiatives in road transport and to transform its public tolled highway network into a wider private tolled network. A Special Committee quickly began the process of selecting consulting firms to undertake studies of the existing national road facilities, as well as demand and detailed engineering studies for an expanded system of national toll roads to be offered through a system of concessions. Using the existing toll network as a base for expansion, the engineering and very preliminary demand studies led the Special Committee to designate twelve prospective concessions, totaling 6,750 km. Estimated cost for the total network of improvement and expansion is $1.1 billion. Most of the proposed concessions incorporate segments of the existing toll road system. Each new proposal develops a plan for upgrades and expansion, and then grafts an additional new segment on to this "base" road. The result is a set of concessions for which prospective traffic volumes will vary enormously over the different road segments. This creates concessions that, by design, have included cross-subsidies of low density segments with high density ones. The essential assumptions of this preliminary study included a traffic growth rate of 3-5%/year, periodic maintenance costs per kilometer every five years between $10,400 and $14,500 depending on the road; rehabilitation costs around US$100,000/km and reconstruction costs of US$350,000/km. Tolls would be set at $2.00/100 km and would automatically be adjusted for inflation and exchange rates. (The precise mechanism for dealing with the interaction of inflation and exchange rates remains to be settled.)

These assumptions allowed an estimate of the net present value of toll revenues (net of operating and maintenance requirements). Subtracting the estimated net present value of net toll revenue from the estimated net present value of the investment (excluding land costs) yields the estimated new present value of each road project. Only three of the eleven projects have positive net present values at a 15% real discount rate in dollars. Those three proposed concessions incorporate sizable amounts of the existing toll network, and as such, face relatively low expenditures on land and improvements. It is important to note that even on the perimeter of Lima, high investment costs overwhelm higher traffic density.

The preliminary studies indicated that low traffic volumes and large required investments would not allow concessions to be let on the basis of financial payments to the government. As a result, a negative concession plan was developed. Concessions would be bid on the basis of the lowest amount of investment to be made by the central government and would run 25-30 years, with subsequent transfer of the roads to the government. The government's contribution would not be considered as part of the equity in the concession. The government would delegate the responsibility for the enforcement of the contract to a transport regulatory agency OSITRANS, which would resolve disputes or pass them on to the judicial system.

## 3.6. CONTRACT DESIGN FROM A REGULATORY VIEWPOINT[20]

The concession agreement is the principal contract governing a private toll road project. It can be designed in many ways. In some countries, the governments provide many of the details in the information sets provided to the bidders and the bids are for very specific proposals. In others, the government asks the bidders to make many of the suggestions to implement the road. Whatever the sequence, here is a minimum list that needs to be covered by the overall contract packages to allow the regulator to referee in case of conflicts between users and the concessionaire or the government and the concessionaire:

- *A Definition of the legal context.* Toll road projects, whether wholly private or mixed in character, require a clear legal context defined by well-drafted laws and regulations regarding concessions.[21] Since there are many different forms of toll road development, such legislation may be general in character, enabling different types of private participation. Why should a regulator care? Because these laws must clearly identify the respective rights and obligations of the private and public sectors, which is a crucial element of the settlement of any dispute between the concession agency and the concessionaires. It is also fundamental that these rights and obligations be seen as valid, binding and enforceable through a legal process that is fair, timely and not overly costly. In addition, the regulator needs to be informed of the way that the toll road program is integrated with national, regional and local transport policies and is enabled by a concession law. It is important for an effective toll road program to be coordinated with broader transport and road policies. The entire process should be designed to be competitive, transparent and based on reasonable evaluation criteria.

- *The Administrative background.* As with any type of contract, it is crucial for the regulator to be able to refer to a set of definitions for all of the key concepts covered in the contract; including items such as the definition of the concession area, the zone of added services, maintenance, what constitutes force majeure, what constitutes basic or special services, the key monetary and technical units, the standards to be used, and the key players involved in the sector. From a regulatory viewpoint, of particular importance is the specification by the contract of those events that would constitute default on the part of each party, including remedies and the procedures for obtaining compensation. Finally, the administrative requirement may also have to provide a definition of what constitutes the basic documents that give all of the required information to all parties involved. The minimum set includes the explanation of the administrative, technical and financial requirements. Increasingly, countries are also including in this definition any ulterior clarification to be issued as a result of mistakes identified by potential bidders when reviewing the documents. Taken together, these documents provide the basis of the information to be used by the regulator.

- *Estimate of the costs of the project.* The regulator needs to get an idea of the value of the task at stake. In some cases, this results in the unit costs and the maximum cost

[20] See also G. Fishbein and S. Babbar, Private Financing of Toll Roads, RMC Discussion Paper 117, (Washington: World Bank, December 1996), pp. 34-36.

[21] The policy framework should address the types of roads targeted for tolling, the types of organizational structures allowed, and which government entities are responsible for overseeing the program.

of the project as estimated by independent engineers, which is also to be specified in the bidding documents to provide a benchmark. Often, the government will have several independent studies that include demand and as well as cost studies.

- *The asset valuation rules.* The government should be interested in the way in which the assets are evaluated for fiscal reasons as well as for regulatory reasons. Indeed, the value of business will be at the core of many regulatory decisions involving the toll level or the duration of the contract.

- *The economic content of the technical documents.* The technical documents must at least cover a few items that the economic regulator needs in order to sort out the financial and economic consequences of the operator's actions, whether imposed by the bidding documents or proposed as part of the bid. The main aspects are the investment and maintenance plan and timetable and the toll system description (including technology and location). They should also cover information on weights allowed for each type of vehicle, which is relevant for the calculation of the maintenance costs and the related toll levels. The rules of the game for the evaluation of these technical bids should also be clearly defined to allow the regulator to settle any related dispute.

- *The various types of guarantees/warranties.* This section frequently includes requirements regarding insurance, performance bonds, minimum equity contributions and corporate structure. They may apply to all stages of the process (offer, construction and operation) and generally cover specific amounts for the various stages and apply to both the concessionaire and the government. For the government, they may include commitments regarding approvals and right-of-way permits, expropriations, etc. These sections provide one way of telling the regulator how much is at stake in the decisions regarding compliance with obligations on all parts to the contract. In principle, the guarantees should have an economic meaning in the sense that the amounts involved should somehow be related to the risks of non-compliance, but in practice, they seldom are related. They tend to be somewhat arbitrary amounts, negotiated to be "large enough" to induce private participation or financing.

- *The identification of the various types of risks and their distribution between the parts.* This section typically covers the specific responsibilities of each party for funding, acquiring and preparing the right-of-way, including risks of delay or cost overruns. It also includes responsibilities for developing and constructing the project, including environmental compliance, permits and designs. The agreement should address the risk borne by each party in the event of unplanned events such as delays and cost overruns. In addition, the agreement should address the possibility that financing will not be raised. The contract also should specify any rights or responsibilities of the concessionaire to modify or expand the road in the future beyond the requirements of the initial concession. The agreement should specify the conditions under which profits or revenues are shared with the government. For example, if a maximum traffic or revenue ceiling is used, the agreement should state the maximum traffic or revenue threshold for each year of the concession, the revenue sharing formula, and the procedure for calculating and transferring the payment to the government. If incentive provisions are used, the agreement should specify the events that would trigger the incentive payment and the size and timing of such payments.

- *Concession rights and obligations.* This should include an explicit definition of the concessionaire's exclusive right to design, build, finance and operate the project during the concession period, which will provide the regulator with basic benchmarks to assess compliance with commitments. The contract should include the service obligations (i.e., farmers can use some portion of the road for free) and related compensations to which the operator is entitled, the conditions under which the concession may be extended or amended, any payments required either by the concessionaire or by the government; and specifications as to who holds the legal title and how any transfer will occur. The concession contract should define the responsibilities of each party for operations, including toll collection, maintenance, enforcement and safety, auxiliary services and administration. Also, any mechanisms committed by the government to support the project should be made explicit (and ideally, formula-driven), including magnitude, timing of payments, duration of support and conditions under which support is phased out or withdrawn. Specific facilities such as connecting roads or interchanges that the government or concessionaire is committed to provide should be addressed, including dates and remedies in case of delays or nonperformance. This section also should define the recourse of the concessionaire should the government not honor its financial commitments under the agreement.

- *The penalty rules.* In addition to relying on the threat of cashing-in deposits for *gu*arantees, regulators need to have access to a clear set of fines which relate the penalty for non-compliance on more operational matters to the damage resulting from the non-compliance. Here, the practice seems to be to set pre-defined amounts for specific types of violations to minimize the arbitrariness of regulatory decisions. The concession contract for Road 5 from Santiago to Talca identifies and defines 81 types of violations and specifies the amounts involved and the application criteria (i.e. every day, every time, etc.). To the extent possible, and to make it easier to regulate, established performance standards should relate to the penalties for noncompliance.

- *The regulatory regime.* The regulatory approach and enforcement mechanism must be specified. If rate of return regulation is used, the agreement must specify the basis for the regulation, the maximum rate of return allowed, and the calculations required to monitor the concession performance. If toll rate regulation is used, the agreement should specify the maximum toll by vehicle type, the index used to adjust toll rates, and the time period for toll rate adjustments. Some degree of creativity is allowed here. In Peru, for instance, the standard formula is adjusted to include a premium for improvements in safety over the targets spelled out in the contract. The contract also should include the specific procedure for calculating and revising the toll schedule (See section below for additional discussion of the specific pricing rules.).

- *The information the operator will be required to provide to the regulator.* The contract should specify the type and timing of information to be provided to the government to monitor the agreement. The contract should also specify the conditions under which the regulator can ask for additional information that is not covered by the contract. Typically, the operator will be asked to provide the regulator with monthly data reports on hourly, daily and monthly vehicle flows, classified per vehicle type, as well as monthly data reports on congestion, accidents and changes in regular traffic

patterns. In addition, quarterly reports on auxiliary services will provide sufficient information on any related service obligation imposed by the contract. Every six month, the regulator should expect reports on maintenance costs, actions taken and total and unit costs, as well as a report on paving progress if specified in the contract .

- *The acceptance conditions.* The contract should specify the conditions under which the government will accept the completed facility and approve the start of operation. This is particularly important when tolling is scheduled to begin before the project is completed. In Brazil, this approach provided a means to generate early revenue, while allowing the public to see the improved road before having to pay for it through tolls.

- *Limitations on competing facilities.* The contract should specify the corridor, if any, under which the government is restricted from constructing, expanding, or granting concessions for competing roads or other facilities. As mentioned earlier, the existence of parallel free roads is a matter of concern for many operators and regulators may have to arbitrate challenges by governments to operate almost parallel routes.

- *Rights to access third party operated facilities.* The contract should spell out any specific rights of the concessionaire to access land or roads owned by third party activities as part of the concession, including how this access should be paid for. In most conflicting events, the regulator will be called to assess the access pricing rule demanded by the owner of the facility to be shared.

- *Assignment and termination of the concession.* The regulator also needs to have clear instructions on the terms and conditions under which the concession may be transferred to a party other than the original concessionaire, including the specific conditions under which the concessionaire or the government can cancel the concession and the consequences of termination, including penalties and replacement.

- *The Renegotiation rule.* Renegotiation happens. It is in fact quite common and the contracts should be quite clear and try to have pre-established rules to avoid the conflictive situations that were frequently observed in the first part of the 1990s across infrastructure contracts. More recent contracts spell out these rules quite carefully in Latin America. Chile's example discussed in Box 1.5 may be the best so far.

Contract design should be as specific as possible with respect to ongoing adjustments for inflation, etc., so that these risks are handled routinely. However, project risks and uncertainty in the economic and financial environment will inevitably create situations that require contract renegotiation. The concession contract should specify the conditions that would allow the contract terms to be renegotiated, what type of event could trigger renegotiation and how frequently reviews can occur. However, project risks and uncertainty in the economic and financial environment will inevitably create situations that require contract renegotiation. The contract also should specify what remedies are available to the regulator for restructuring. For example, whether concession length might be extended or an investment program might be modified. Too often, contract renegotiation has been initiated for a specific issue and then expanded to other issues. This approach is prone to corruption and creates incentives for sponsors to seek contract revisions on a regular basis.

## Box 1.5 Rule-based renegotiations: lessons from Chile

In order to provide flexibility without compromising the interests of the concessionaire, the Chilean Contracts include detailed procedures to constraint and assess financially government requests for additional work. The government can demand additional work for up to a maximum of 20% of the initial official cost estimate of the project, up to two years before the concession ends. During the construction stage, additional work can only be demanded for up to 5% of the official cost estimate and new investment at that stage is valued according to a unitary pricing schedule contained in the tendering documents. Bidders implicitly accept these unitary costs when they participate in the franchising process.

The valuation of new investments required during the operational phase must be agreed between the Ministry of Public Works and the concessionaire. If they do not agree, differences must be settled based on technical reports produced by consultants from each party. The compensation can be through increased tolls; increased duration of the concession; or direct payments by the state.

To avoid conflicts the most recent concessions place explicit restrictions on the compensation mechanism. For example, in the Río Bueno-Puerto Montt concession, tariff increases during the life of the contract cannot exceed 25% and the increase in concession duration cannot be exceed 120 months. Furthermore, an explicit formula is included in the contract to calculate the required compensation. This is given by:

$$\sum_{i=k+1}^{N+S} \frac{Y_t - T_t}{(1+r)^{i-k}} = I_k + \sum_{i=k+1}^{N+S} \frac{C_t}{(1+r)^{i-k}}$$

where: $I_k$ = Additional investment in period *k;* $N$ = Initial duration of concession; $S$ = Extension of contract and $Y_t$ = Additional income due to increase in tariffs, where:

$$Y_t = \begin{cases} r_t P_t Q_t + G_t & t = k+1,\ldots,N \\ (1+r_t) P_t Q_t + G_t & t = N+1,\ldots,N+S \end{cases}$$

and $P_t$ = Tolls prior to compensation; $Q_t$ = Projected traffic levels for new investment at initial toll levels; $r_t$ = Percentage increase in tolls; $G_t$ = Direct payments by state; $C_t$ = Operational and maintenance costs associated with new investment; $T_t$ = Taxes due on additional toll income; $r$ = Discount rate

The additional operational and maintenance costs, the projected traffic levels and the discount rate must be based on an expert's report. If disagreements arise over these parameters, the Conciliatory Commission must be convened. However, the tender documents are usually more explicit on how to estimate the discount rate and they place an upper limit on the risk premium that the concessionaire can receive.

In order to avoid imposing additional traffic risks on the concessionaire, there is a payment at the end of the concession to compensate for the difference between the projected traffic levels used in the above calculations and the real traffic level observed. This compensation is calculated as:

$$R_{N+S} = \sum_{i=k+1}^{N+S} \frac{Y_t - T_t - \left(\hat{Y}_t - \hat{T}_t\right)}{(1+r)^{1-k}} * (1+r)^{N+S-k}$$

where the '^' symbol indicates the *ex-post* real value observed of the variable. There is no compensation, however, for operational and maintenance costs that differ from the original estimates. Otherwise, the concessionaire would have an incentive to inflate these costs in order to receive extra compensation at the end of the concession period. However, these costs are usually small in comparison to investments. Differences between the expert's estimate used to calculate the compensation and real *ex-post* costs are unlikely to have a significant affect on the profitability of the concession.

Source: Gomez-Lobo and Hinojosa (1999)

- *Dispute resolution.* The agreement should explain the procedures for settling disputes in a fair and timely manner, including provisions for arbitration or mediation. Foreign concessionaires may request that such disputes be resolved in a neutral jurisdiction. This was recognized by Peru in its recent draft contracts and they now standardly include a clause explaining how disputes will be settled and when international arbitration will be used. In a nutshell, technical conflicts will be resolved locally by an expert (picked randomly if the parties cannot agree to one) and non-technical conflicts over a certain amount will be resolved by an international arbitration commission. Below that amount, they are resolved locally. All local decisions are taken within specific time limits. In Chile, the main dispute settlement mechanism is the Conciliatory Commission. This Commission has three members, one nominated by the concessionaire, one by the authorities and the third by mutual accord. Members of the Commission must be nominated at the beginning of the concession before any controversies have arisen. The Commission is established when one of the parties raises a demand. In the case of the state, contracts stipulate an explicit and limited set of circumstances whereby it can raise a demand to the Commission. The concessionaire has more flexibility in this respect. The Commission's initial task is to conciliate the diverging positions. If an agreement is not reached, the concessionaire, and only the concessionaire, has the choice of either taking the matter to the judicial system or requesting the establishment of the Arbitration Commission. This last Commission is formed by the same members as the Conciliatory Commission and its decision is binding and not subject to appeal in the courts. [22]

### 3.7. Toll Road Auctions and Award Criteria

As in most infrastructure sectors, competition in the road sector is essentially *for* the market. Since the toll franchise has a degree of exclusivity, the auction is a crucial element to help ensure that services are being provided efficiently. Given the complexity of road infrastructure projects and the diversity of objectives road agencies tend to have for their projects, it is often difficult for governments to come up with an ideal bidding rule. The diverse approaches that have been used are shown in Table 1.4. Many countries have adopted a two-stage process in which technical proposals are evaluated separately from and prior to financial proposals. The winning bidder is then selected from those who pass the technical evaluation.

While technical validation helps reduce the risk of project failure, it may also have important drawbacks. It often involves considerable discretion and judgment by the evaluation committee, which reduces the overall transparency of the process. Experience also has shown that changing market conditions after the contract award may require operators to make significant changes to the project; and these changes reduce the meaningfulness of the initial technical evaluations to the extent that they relied on the base forecasts.

[22] For more details on Chile, see A. Gomez-Lobo and S. Hinojosa, "Broad Roads in a Thin Country: Infrastructure Concessions in Chile," mimeo, World Bank Institute, April 1999

| Table 1.4: Award criteria in selected Latin American toll road concessions | | |
|---|---|---|
| **Country** | **Award Criteria** | **Concession Duration** |
| **Argentina road corridors** | Highest lease fee paid to government | Fixed by government but extended after re-negotiation |
| **Argentina-urban access** | Lowest toll | Fixed by government but extended after re-negotiation |
| **Brazil- Federal** | Lowest toll | Fixed by government |
| **Brazil- Sao Paulo** | Highest lease fee paid to government | Fixed by government |
| **Brazil, Parana** | Largest network length | Fixed (but likely to be extended as a result of politically imposed cut in toll) |
| **Chile- 1st generation** | Multiple criteria | Fixed by government |
| **Chile- 2nd generation** | Least Net Present Value | Unknown |
| **Colombia 1st generation** | Multiple criteria | Fixed by government |
| **Colombia 2nd generation** | Least cost to government | Fixed by government |
| **Mexico** | Shortest term | Fixed by bid |
| **Peru** | Shortest term | Fixed by bid |
| **Peru** | Least subsidy | Fixed by government |
| **Uruguay** | Shortest term | Fixed by bid |

*Source*: Irigoyen, J.L. (1999), Toll Road Development in Latin America, presentation at the Seminar on Asian Toll Road Development in an Era of Financial Crisis, Tokyo, March 9-11 and various World Bank internal reports

To remedy this, many governments are issuing a preliminary set of technical standards to be achieved, which is subject to discussion and modification with prospective bidders. This has been Chile's experience.[23] Interaction often takes place with the regulator, which is desirable since the regulator will eventually be responsible for monitoring compliance. After this consultation, the bidding package is finalized so that parties bid on the same technical specifications and requirements and the winner is picked from the financial proposal. This is wonderful from a regulator's viewpoint since, if there are enough potential bidders participating in the discussion and there is no collusion between the various bidders, the process converges toward what could be defined a "consensus engineering cost". The regulator now has some idea of what best practice investment, maintenance and operation costs should be for a specific road.

This is not the end of it. There are still many different options for structuring financial proposals for road concessions. Some of the more common options include:

- Lowest toll level;
- Shortest duration of the concession;
- Highest Payment to the government for existing infrastructure; and
- Lowest subsidy required from the government;

Less common options include the lowest income guarantee requested from the government or the amount of new investment and/or its speed, as well as some innovative ideas discussed later. It is interesting that as regulators learn about past mistakes, there is an evolution in the way toll roads are being auctioned.

[23] See A. Gomez-Lobo and S. Hinojosa, 1999.

### *3.7.1 THE INITIAL EXPERIENCES WITH COMPETITION FOR THE MARKET FOR TOLL ROADS*

The earliest road concessions (such as the first generation of Argentine and Chilean toll roads) were trying to be everything to everyone and were awarded following complex weighted multiple criteria picked from the list just described. This was a source of opaque and often subjective if not corrupt decision-making. Next, when governments started to see that simpler is better and decided to focus on a single criteria, bidding tended to be based either on the minimum toll (as in the second generation of Argentine toll roads) or, if the toll was specified, the shortest duration for the franchise (as in the initial Mexican toll road program). Both of these approaches presented significant incentive problems. Bidding on the basis of the minimum toll may result in poor price signals in congested corridors. If tolls are set exclusively to cover investment, maintenance and operating costs, then high tolls result when low traffic volumes are expected and low tolls result in high traffic and congested conditions.

Similarly, bidding based on the shortest concession period also has problems, especially if tolls are not specified. In Mexico, where projects were tendered based on the shortest concession duration offered by firms for a given traffic flow, shorter concession durations necessitated the setting of higher tolls in order to finance the projects. The resulting high tolls produced important traffic diversions and many complaints to regulators from users with limited ability to pay. It did not help that Mexico required alternative freeways for each concession. The ultimate outcome was a financial situation so catastrophic that it required a subsequent government bailout for many roads.

Bidding on the basis of investment commitments has been used to develop road networks, but this has also had problems that often result in demands for renegotiation by the operators. By locking in future investment levels, the concessionaire is prevented from adjusting investment to meet changing market conditions. Second, it may encourage over-optimism and excessive investment (see Box 1.6).

**Box 1.6: Why were consortia initially so optimistic about road projects?**

Regulators also need to understand the motivation behind the optimism, since in many cases the outcome of excessive optimism is renegotiation. Indeed, many of the earlier road concessions have experienced problems. Concessionaires have been either overly optimistic or overly aggressive in bidding, leading to a host of restructuring and renegotiations. There are several reasons why firms pursue this strategy:

- There is a "first mover" advantage to grab when several projects are going to be concessioned. By winning the first bid, firms signal that their low cost or aggressive behavior to other bidders, with the goal of discouraging future competition.
- Since construction firms are often the key consortium partner, construction contracts rather than the subsequent operation of the concession are the dominant interest, and bidding below cost secures the construction contracts, with disregard to the long-term financial viability of the concession which will be the problem of the other consortium members or of the creditors.
- Firms may bid low just to win the franchise with the sincere intention of renegotiating the conditions of the contract as soon as possible. Few governments have refused to renegotiate. Indeed, if the concession runs into financial problems in the future, there are associated political problems as well as costs and delays in re-tendering the project. Therefore, bidding low and renegotiating afterwards may be a viable strategy for a potential concessionaire (a phenomenon called "low balling").
- Finally, one cannot rule out optimization mistakes on the part of bidders, possibly related to the poor assessment of demand uncertainty (winner's curse), or the complexity of tendering mechanisms.

Source: Based on Gomez-Lobo and Hinojosa (1999)

### *3.7.2 THE NEW IMPROVED COMPETITION FOR THE TOLL ROADS MARKETS*

In the wake of the bailouts, new schemes have been developed to improve incentives and reduce the risks of road concessions. In Peru, bidding has taken place in terms of the minimum amount of required government investment in each concession. This serves to "buy down" the size of the project and reduce the financial risk exposure of the concessionaire. In Britain, the Design-Build-Finance-Operate (DBFO) scheme establishes the payment of "shadow tolls" by the government based on traffic volumes. This provides a long-term mechanism for government support that phases out as traffic volume grows.

Perhaps the most innovative road concession programs have been developed in Chile. As a reaction to the low bidding problem, Chile tendered its Route 5 Temuco-Rio Bueno concession on the basis of a minimum toll, *within a band set by the government*. The floor of the band is set sufficiently high to guarantee a minimum revenue stream to the concessionaire. In addition, the duration of the contract is fixed in the bidding documents. Setting this minimum toll level and the duration of the contract effectively puts a floor on the expected earnings of the concession company. Therefore, the risk of future financial distress for the concession firm (which would force the government to renegotiate the contract) is minimized. If two or more firms bid the minimum value, the winner is the one that offers the highest transfer directly to the government.[24]

In effect, this bidding mechanism significantly reduces the chance of renegotiation, but does not lower the competitive pressure of the process. It is possible that sponsors may still try to renegotiate the contract *ex-post*, but they will not have one of their main bargaining chips at their disposal; namely, that the concession firm is effectively in financial distress.[25] It is unlikely that governments will feel pressure to renegotiate because the financial results of the (possibly international) sponsors are negative. If the concession firm is in good shape and there are no risks of disruption to its activities due to financial distress, governments should be better equipped to resist re-negotiation pressures. This transfer mechanism from sponsors has served to generate close to US$150 million in the four concessions where it has been used. The proceeds are deposited in an Infrastructure Fund that is then used to cross-subsidize other projects or pay for minimum income guarantees.

### *3.7.3 THE NEWEST FORMS OF COMPETITION FOR THE MARKET.*

Chile also has pioneered, at least academically, another bidding approach that holds some promise for dealing with the fixed-term nature of traditional franchising contracts and that is being considered in Colombia and Mexico for both roads and airport runways.[26] The bidding variable, instead of toll levels or anther conventional variable, is the present value

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[24] Because this transfer does not affect the income or capital structure of the concession firm, sponsors can bid as much as they like without jeopardizing the financial stability of the concession. If investors make a mistake and bid too much, the consequent loss will show up in the sponsor's financial returns, not the concession company. For much more detail, see Gomez-Lobo and Hinojosa.

[25] Engel, Fisher and Galetovic in several of their articles point out that the LPVR auction may also reduce the occurrence of low-balling. Their argument rests on the assumption that the LPVR bid of the winning firm offers the government a credible threat to terminate the concession quickly and compensate the firm if it tries to renegotiate. This will be discussed further below in relation to the LPVR auction mechanism.

[26] Britain was the first country to apply a variable length concession with an LPVR flavor in the Severn Trent and Dartford Bridge concessions

of revenue throughout the life of the concession that firms are willing to accept to undertake the project. The firm that bids *the lowest present value of revenue* wins. The duration of the concession is then flexible and depends on the effective traffic levels encountered. Once the concessionaire has received (in present value terms) the amount that he bid, the concession ends and the infrastructure reverts to public ownership. If real traffic levels are lower than expected, the duration of the concession is extended automatically, while if traffic is higher than expected, the opposite occurs. Therefore, income uncertainty due to traffic variations is largely eliminated for the concessionaire.

In addition, the LPVR auction reduces potential conflicts related to the early termination of a concession. In a ten to thirty year contract, excessive traffic growth or other events may occur that require added investments. It would be optimal to cancel the original contract and re-tender the concession with the extended projects, rather than negotiate the additional investments with the existing concessionaire. This seldom happens because it would require a difficult estimation of compensation for the forgone future income stream owed for an early termination of the contract. The LPVR auction reduces this problem substantially by giving the concessionaire the difference between what he originally bid and what he has already earned. From the viewpoint of a regulator, another important characteristic of the LPVR mechanism is that tolls can be adjusted without having to negotiate new terms with the concessionaire. If tolls are deemed too high or low, the authorities could change them without affecting the concessionaire's expected income stream and without engaging in a potentially protracted negotiation process. As stressed in EFG (1997a), this flexibility may be important in urban road concessions where it may be very difficult to determine the optimal tariff *ex-ante,* especially during congestion periods.

The LPVR mechanism also has its drawbacks. It may lower the incentive of concessionaires to make demand-enhancing investments such as quality improvements. The increase in demand from these expenditures results in an earlier termination of the contract, with little benefit to the concessionaire.[27] Perhaps a more important difficulty is that the LPVR auction does not resolve possible cash flow problems that a concessionaire may face when traffic levels drops.

Another limitation occurs in cases where operation and maintenance costs are relatively high compared to construction costs. A situation of low traffic then puts the concessionaire in trouble since the extension of the contract generates increasingly high maintenance costs which eventually may make the project unsustainable. Hence, although the risk of demand is reduced under LPVR, it is not completely eliminated. Bidders still have to estimate the future level of traffic to compute their required revenue. A possible way to refine the LPVR mechanism is to require bidders to provide separate offers for construction and average annual operating costs. [28]

[27] Early termination of the contract would save the concessionaire the additional maintenance and operation costs that would have been incurred during the original period, but these are usually small.

[28] For more details on this refinement, see de Rus and Nombela (1999)

## 4. PRICE REGULATION

One of the main reasons why toll projects fail is that privatization teams have a hard time assessing demand prospects. In turn, one of the main reasons why demand prospects are hard to assess is that traffic levels often depend on the what economists call the elasticity of demand with respect to price, i.e. how sensitive demand is to changes in prices. In practice, this matters a lot, particularly in developing countries where the ability to pay is often limited and regulators are sometimes expected to make recommendations based on the social impact of pricing decisions. This explains why there are so many differences in toll design and toll levels across countries. In principle, they have to reflect costs, but the specific costs to be covered can vary (construction/rehabilitation costs, operations costs, maintenance costs, environmental costs, safety costs, congestion costs). In general, the first three types of costs have been reflected in the toll calculation, and the last two are beginning to be incorporated.. Environmental costs have tended to be included only to the extent that they entitle specific recoverable expenditures by the operator.

Table 1.5 shows that in general, countries tend to fix the toll levels needed to recover investment, operation and maintenance costs. It shows that the price cap is now a common form of regulation in the sector just as in many of the others. The last column suggests that in many cases, they end up restructuring the toll levels at some point (jointly with subsidies to the toll operators or the extension of a contract term). These contractual changes are such that price caps are transformed into rate of return regulation, since the main purpose of the adjustment is to shift part of the risk imposed on the operator through price cap back to the users (through longer contracts) or to the government (through subsidies).

**Table 1.5: Toll design and levels in selected Latin American toll road concessions**

| Country | Toll Design | Per km car rates (in US cents) | Restructuring needed |
|---|---|---|---|
| **Argentina- road corridors** | Fixed | 1.56 | Yes |
| **Argentina- urban access** | Capped | 3.5 | Yes |
| **Brazil- Federal** | Capped | 2.3-5 | Yes |
| **Chile- 1st generation** | Capped | 2-3 | No |
| **Colombia - 1st generation** | Fixed | 3-4 | No |
| **Mexico public toll roads** | Fixed | 2-11 | Yes |
| **Mexico private toll roads** | Fixed | 13-50 | Yes |
| **Uruguay** | Fixed | 3.5 | Yes |
| **Venezuela** | Fixed | 1 | No |

Sources: Irigoyen, J.L. (1999), Toll Road Development in Latin America, presentation at the Seminar on Asian Toll Road Development in an Era of Financial Crisis, Tokyo, March 9-11, and various World Bank internal reports

The uncertainty with respect to the introduction of direct pricing in the sector is one of the main concerns that road operators have to address and regulators have to understand. In defining the regulation of prices, the following challenges must be tackled:

- ***Question 1: How much should the operator recover through the toll system?*** More specifically, what is the level investment the operator should be allowed to recover, given current and forecast traffic levels? Unfortunately, this investment is a moving target since roads tend to alternate between excess capacity at off-peak times and congestion and capacity shortfalls at peak time. This problem also arises in a longer

term sense. Indeed, since it takes time to build road capacity, what appears to be excess capacity today may meet demand in five years time and it makes sense, to minimize costs over time, for an operator and a government to take some bets (for example, a four-lane bridge may only cost 50-60% more than a two-lane bridge). This is, of course, often also a political challenge that a regulator has to justify since opposition to tolls is sometimes based on the excess capacity observed at the beginning. One solution to minimize the perception of overcharging is to allow the operator to look for alternative sources of financing from sub-concessions such as gas stations, restaurants, playgrounds or advertising, but these seldom yield much more than 5-10% of the revenue needed.

- ***Question 2: Should tolls be fixed or should they vary greatly during the lifetime of the investment?*** [29] This is a complex regulatory question with multiple dimensions and viewpoints.

  - The economist's answer will be that when a facility first opens, the optimal price will be close to zero, or at least very low since it only needs to cover operation and maintenance, because the road, which was sized for future traffic growth, will be uncongested in the early years and hence it has a negligible marginal cost. Later, as traffic builds up, congestion and the optimal road price will grow as well. But when traffic reaches the maximum and new road capacity is added, the optimal price will again fall sharply.

  - The typical politician's answer will be to keep the toll stable. The domination of this position around the world is reflected in the vast majority of "fixed tolls" identified throughout Latin America as seen in Table 1.5. The consequence of fixed tolls is that road operators tend to overcharge in the early years and undercharge later.[30]

  - The economic problem is, in practice, under control, since many contracts now have toll escalation clauses (generally subject to regulatory approval, but in some cases automatic) that are related to a local consumer or construction price index, increasingly calculated in dollars, to offset the potential effects of a devaluation.

  - In addition, there is an increased recognition that the option to price congestion is a good one and this eases the possibility of future toll increases. In many countries, peak and off-peak tolls are already different. In the longer run, a larger share of the day will end up being considered peak time and hence ease the recovery of revenue needed to cover higher maintenance costs resulting from higher traffic. Once more, the ideal arrangement for a regulator is to have to ensure compliance with formula driven adjustments.

  - Finally, it may be worth pointing out that the answer to this question depends largely on the amortization rules allowed for the road operator. If, for whatever fiscal reason, the operator can follow a fast track amortization for investment in a road, the toll will be high at the beginning and lower once the road is amortized

[29] Economists refer to this problem as the difference between short-run and long-run marginal costs.

[30] This pricing problem is made worse in many cases by debt service requirements that are concentrated in the middle years of a facility's life. Such financing burdens are even greater for developing countries with limited access to long-term capital markets.

fiscally, since the only expenses left to recover are operation and maintenance. The monitoring and possibly definition of these amortization rules is one of the responsibilities of the regulator in this sector, as in most of the other sectors. Without clear rules, it is one of the instruments that operators use to argue for toll increases to strategically distribute costs over time.

- ***Question 3: Should the regulator require toll to be differentiated across users?***

There are several dimensions to differentiation that can be considered.

- *The different road damages imposed by different vehicles.* This arises because autos and trucks impose different requirements on roads (see Box 1.7 for a technical explanation), which is why most concession contracts allow at least some degree of differentiation between cars and trucks/buses. In practice, unit tolls will vary according to the number of axles on the vehicle as an approximation for the "wear and tear" imposed by each vehicle on the road pavement. In general, trucks and buses are charged two to four times the level of auto tolls, with the precise amounts varying depending on size, weight, traffic mix and development objectives.

- *The political viability of differentiating tariffs across regions of a same country*. In many countries, tolls/km are imposed to be the same across a country because some politicians find it difficult to have to explain that inter-regional toll differences can be justified by differences in construction and maintenance costs. As explained earlier, this means that explicit subsidies may sometimes be required or that cross-subsidies need to be tolerated for some operators, but this also means that regulators must have access to sufficiently detailed cost data to ensure that there is no abuse and that users are not overcharged

- *Social pricing.* In many poor countries around the world, the main interurban roads are likely to be important infrastructures for rural users who need to take their products to urban centers. This represents serious social concerns, as well as strong interest groups with political clout. This may be why it is quite common for governments to impose a special treatment of some user groups and to have their use of the roads financed through some type of shadow toll or subsidy/voucher. This is one of the solutions considered in Peru, for instance, to address farmers' protests against the tolling of some highways. Similarly, for urban access roads, it makes sense to allow lower tolls for the users of public transportation, since very often these are likely to include the poor, and in addition, the use of buses reduces congestion and pollution.

**Box 1.7: A brief lesson in engineering for the price regulator**

Costs, and hence toll differentiation, should be driven by the demands that different vehicles place on the shared road. Highway costs can be divided into two types: the basic capacity to carry traffic and pavement durability and smoothness. Civil engineers measure the demands that different vehicle types place on capacity relative to that of a standard passenger car (known as PCE, or passenger car equivalent units). The number of PCEs of capacity needed by a heavy truck varies according to terrain and other factors. For example, on a level road, a truck may only represent the equivalent of 1.2 cars, while on a moderate-grade road, the lower horsepower-to-weight ratio of trucks might make them the equivalent of four passenger cars. The number of lanes, lane width, grades, curves and other factors determine the traffic-carrying capacity of a road. Pavement durability is determined by the type of pavement, its thickness and the stresses to which it has been subject since construction.

Road damage is a function not of the size of the vehicle, but of the weight being borne on the axles of a vehicle. Road engineers measure the demands that different vehicle types place on roads in terms of the damage caused by the passage of a reference axle weighing 18,000 pounds, approximately the weight on axles on many heavy trucks. This is known as an equivalent standard axle-load, or ESAL. Pavement damage increases at the third or fourth power of axle weight, so that the 1,000-pound axle loading on a typical car produces only about 1/10,000 the pavement damage of a typical heavy truck axle. This non-linear damage impact is offset to some degree by the fact that the number of ESALs that a road can withstand before it needs to be resurfaced or rebuilt is a power function of pavement thickness. For example, a pavement that is eleven inches thick is about twice as durable as one that is nine inches thick, yet it costs only a fraction more to build.

These can be major issues from the view point of a private operator, since car volumes dominate carrying capacity metrics and truck characteristics and volumes are key to pavement durability aspects. In essence, cars tend to be responsible for how many lanes, while trucks are responsible for how thick each lane should be. In economic terms, road charges should have two components: one for pavement damage, based on ESALs, and one for congestion, based on PCEs. In practice, though, road pricing tends to use total weight rather than axle loadings for trucks, and there are only beginning to be some attempts at congestion pricing based on PCEs (Singapore, California and Britain)

- ***Question 4: How high can a toll really be?*** There is a limit of course. A users' willingness to pay tolls is a function of income, the value they assign to time savings, reductions in vehicle operating costs, and the cost and quality of competing alternatives. On average, toll rates have ranged from US$0.01 to US$0.10 per kilometer per car. Some congestion-related tolls in Europe and the United States run between US$0.15 and US$0.20 per kilometer per car, while some bridge and tunnel tolls may range up to US$0.50 or more per kilometer. There also are special situations in which toll levels are far above these averages (the result of high costs and legal requirements for inflation adjustments). In Mexico, tolls have risen to more than US$0.60 per kilometer in a couple of cases. This experience clearly shows that there is a ceiling to the willingness to pay, since in these cases, traffic volumes have tended to be quite low relative to capacity. These concessions frequently have encountered severe financial problems and congestion on alternative roads has not really been alleviated. Eventually, regulators have been forced to accept renegotiation.

- ***Question 5: How much freedom should the operator be allowed to differentiate its toll structure?*** As long as the operator stays within the allowed rate of return or overall price cap, and as long as there is no competition (such as predatory pricing aimed at capturing business from a competing mode on a specific road), there is no reason why the regulator should interfere with a tariff structure design aimed at making the most of user willingness to pay or at expanding the regular customer base. There are many

ways in which an operator can design its tariff structure to achieve these goals and maximize profits:

- *Variation by time of day is quite commonly allowed*
- *Congestion pricing is now becoming increasingly popular*
- *High speed lanes:* the idea of allowing the price of one lane to change with the degree of congestion to service users in a rush allows the operator to make the most of *differences in the value of time of the various users*.
- *Discounts for loyal customers:* tolling technology is now allowing the recognition of a "frequent user" basis among commuters, and to promote the growth of these clients, some companies are proposing special discounts to well-targeted groups, including local residents or car pool commuters. In Argentina for instance, the users of an electronic toll get a discount on some segments. Their prices vary from US$0.80 and US$1.10, compared to the normal toll of US$1.40 to US$1.50.

## 5. QUALITY REGULATION

The main quality issues that an economic regulator must be concerned with for the performance of the concession are the technical quality of the road, compliance with the contractual obligations, and safety and environmental issues.

### 5.1 THE TECHNICAL QUALITY OF ROADS

Road quality issues need to be considered at the outset of concession design and technical specification. Technical matters such as pavement materials, thickness, and construction techniques must be specified from the beginning since these aspects will help determine the facility's performance and future maintenance and investment needs. An inventory of the initial state of the assets is a minimum requirement for effective economic regulation. Asset quality indicators include: pavement roughness and deterioration, condition of lighting, markings, signaling, quality of fire and rescue equipment, condition of maintenance, and weather-related equipment (e.g., snow plows). The monitoring, inspection and certification of the initial construction and investment is essential and should include all related investments such as signage, pavement markings, toll collection facilities, fire and rescue services and access points. It also may extend to ancillary and support facilities such as service stations and restaurant plazas.

Once the toll road is in operation, quality aspects shift to making sure that the assets are maintained, that performance standards are achieved, and that additional investments are made when performance "triggers" are reached. Performance standards, which should be established in the original concession agreement, should include asset quality, operating conditions, safety indicators, and emergency readiness.

The regulatory authority should be prepared to audit records and inspect equipment on a regular basis. It is also necessary to make sure that the concessionaire has reserved sufficient funds for maintenance and repair of the assets. This is particularly problematic in the later years of the contract, where incentives to maintain equipment and facilities are lower. Also, if any of these services are provided by subcontractors, the regulatory

authority should also be able to monitor the contract terms and the financial capability of all of the parties to the contract.

In practice, what regulators generally do in an increasing number of countries is to match that performance against the established parameters and quality standards set in the World Bank Highway Management Program. This is effective enough to identify performance outliers for most technical variables.

### 5.2. Operating Quality of Road Services

While maintenance of the assets is required for quality service, the regulator should not forget that the goal is to provide transport services worth paying for. The operating performance of the system is central to public support and to determine at what point additional investment may be required. The concession contract should establish performance standards that cover

- Lane availability and shutdowns,
- Traffic volumes and average speeds, both peak and off-peak,
- Toll queue performance: waiting times and availability,
- Capacity, speed and visibility during inclement weather,
- Access conditions and bottlenecks,
- Activity levels at service plazas, and
- Response times and service aspects of emergency vehicles.

The concessionaire should be required to provide data on these performance aspects on a regular basis (monthly or quarterly), subject to review and audit. If actual performance is below the standard, the contract should specify the nature and type of sanctions to be imposed or the nature and timing of investments to be undertaken in response. This can be quite tricky in practice. For example, not meeting a performance standard concerning the length and time in toll queues could be the result of traffic growth (requiring new investment) or poor maintenance of collection equipment (requiring improved performance by the concessionaire). This issue is particularly important when new investment requirements require revisions to the concession contract.

### 5.3 Safety Aspects

Safety regulation takes a number of different forms. First, the facility itself must be designed to handle the anticipated traffic volume and mix under a variety of operating conditions. These dimensions include such technical factors as capacity, speed, grades, roughness, signaling, lighting and emergency services.

However, safety is not only a function of the physical characteristics of the road, but also the quality and operation of the vehicles using the road. In particular, speeding, unsafe driving practices, and poor vehicle inspection practices can lead to accidents. Most road concessions, however, rely on existing police and motor vehicle registration/inspection services provided by the government, usually on a reimbursement basis. Here again, performance standards can help evaluate whether safety problems are the result of the facility or from traffic enforcement shortcomings. For example, if average speeds are above the statutory limit, this may indicate reduced or ineffective enforcement.

Another aspect of safety involves vehicle standards, especially truck size and weight requirements. Since revenues from trucking activity are critical to toll road viability, how trucking regulation is handled is very important. In some cases, truck inspection and weighing stations are operated by concessionaires; in other cases, they are handled by public authorities on a reimbursement basis. Problems have arisen where stricter enforcement of weight regulations (overloading) has led truckers to avoid toll roads. However, if enforcement is relaxed, this leads to a much faster rate of pavement deterioration, and in many cases, higher accident frequency and severity.

Overall, safety aspects of toll roads should be "built in" to design and operating standards. In practice, though, the nature of traffic and vehicle enforcement in the country will shape accident rates and safety performance. Because of this, countries should consider toll road initiatives as providing an opportunity to improve public safety throughout the road network.

### 5.4 Environmental Aspects

Environmental issues first emerge in contract design during siting and planning decisions and must take into account geography, construction techniques and operating practices of the facility. Initially, mitigation measures could include the adaptation of designs with respect to alignments, materials used and standards for construction. During construction, the concession should specify particular investments required to improve environmental aspects, including noise barriers, retention ponds and other remedial measures, as well as relocation and resettlement issues, if they arise. During both construction and operation, the regulatory authority should ensure that environmental laws are complied with, including such aspects as use of salt and chemicals, runoff and recycling of pavement materials. In practice, this aspect is often controlled by the environmental agency rather than by the road authority, although there are obvious interactions between the two institutions.

### 5.5. Working With User Feedback

In addition to monitoring assets and performance, road concessions should have a mechanism for public participation and feedback. This can be handled through a regular system of surveys as well as the designation of a user group that can provide information on the qualitative aspects of the concession. Since toll roads tend to be highly visible, and in many cases controversial, designing mechanisms for public input is important for evaluating performance, to extend public knowledge of the project, and to build public support.

This has to be handled with some care however. In Brazil, for instance, each concession is required to survey customer satisfaction every six months or so. Overall, user satisfaction with the toll roads has been quite positive, although it is deteriorating. The problem is that these results are biased because users have already demonstrated their belief in the value of the toll road by using it and continuing to use it increasingly, in spite of what appears to be a worsening of the satisfaction. Indeed, users who were extremely satisfied with the immediate improvements in quality in the first year of road operation quickly forgot about the initial conditions of the road and started to focus on their unhappiness at having to pay for a (bad) road that used to be free. Improvements are being noticed but they are also being managed by improvements in customer service which have nothing to do

with road services. Special events for children, presents for drivers and similar campaigns just before the surveys can be quite effective in managing the emotions of the toll road users at the right time.

## 6. PERFORMANCE INDICATORS AND INFORMATION REQUIREMENTS

We now have the new economics of private road concessions. We have learned about the extent to which road concessions are vulnerable to macroeconomic conditions, exchange rate shocks and income growth. Demand has proven quite sensitive to toll levels, income, GDP and trade activity. These sensitivities, along with incentives to "buy in and then get well" on the part of sponsors and creditors, have meant that many "private" toll roads have required public financial support. The challenge is to design new structures that take into account the reality of public-private linkages and a more activist role for the public sector in monitoring and regulating concessions.

Regulators will not be able to work on such a structure unless they have enough information. Once more, the contract has a key role to play in this context. Road concession contracts should contain an annex that specifies specific reporting requirements (including clear definitions) for the concessionaire, the frequency of the reporting requirements and their format to facilitate comparisons across projects. This information is required not only to monitor contract compliance, but also to identify when additional investments are needed and to help resolve disputes.

Too often, public authorities have placed great emphasis on technical specifications and sponsor prequalification in contract design, but pay less attention to making sure they have good, timely information about the performance of the concession and sponsor. But even in situations where technical and operating information is consistently supplied, governments have been faced with problems emerging from heavily leveraged projects or from weak sponsor balance sheets. In principle, non-recourse project financing of toll roads should place primary emphasis on the economics of the project itself. The need for more equity capital in toll road projects means that profits from construction activities are not enough, so that both project cash flows *and* sponsor financial condition must be stronger than in the past. However, the 1990s have seen a large number of construction company bankruptcies, so sound projects may be at risk because of weak sponsors. This could occur through a lack of investments being made due to a shortage of funds, due to losses on other projects reducing the sponsor's equity capital, or due to financial risks from exchange rate or refinancing risks.

Thus, regulatory authorities need a range of technical, operational and financial information not only about the project, but about the project participants themselves. This information is not intended to be used to micro-manage the concession, but rather to serve as an "early-warning system " to reduce the likelihood and costs of restructuring and bailout. Such information should include the data in Table 1.6.

| Table 1.6 : Reporting requirements for road concessions |
|---|
| **Concession Operating Performance** |
| Lane availability |
| Average speed by time of day |
| Toll station availability |
| Toll station queueing time by time of day |
| Accident and safety indicators |
| Availability of emergency equipment |
| Engineering quality indicators (roughness, signage, lighting) |
| **Revenue Indicators** |
| Traffic volume by vehicle class |
| Traffic volume by time of day (peak/off-peak) |
| Revenue collected by vehicle class |
| Revenue collected by time of day (peak/off-peak) |
| Revenue generated by ancillary services |
| Revenue from enforcement levies |
| Revenue and volumes from different discount programs (commuter, high frequency) |
| **Cost Indicators** |
| Operating expenses by activity: |
| Toll collection |
| Road maintenance |
| Road operations |
| Emergency services |
| Cost of special services for particular users (e.g., truck weigh stations) |
| **Investment Indicators** |
| Investment spending vs. budget (including variance analysis) |
| Physical investment (e.g., lane km resurfaced) |
| **Project Financial Indicators** |
| Profit as % revenues |
| Working capital |
| Debt service coverage |
| Debt service projections |
| Debt:equity ratio |
| Debt:assets ratio |
| Return on assets |
| Return on equity |
| **Assets by Class (gross and net of both tax and regulatory amortization):** |
| Road infrastructure |
| Equipment |
| Ancillary services |
| Maintenance and renewal program |
| **Sponsor Financial Information** |
| Income statement, balance sheet and cash flow statements (audited) |
| Working capital |
| Debt service schedule and currency structures |

The Project Operational Indicators are intended to monitor the physical aspects of the project, from pavement and equipment conditions to performance in terms of facility availability, safety and technical efficiency. The Revenue Indicators are intended to

monitor the performance of the contract, and are especially important when the government is providing revenue or traffic guarantees. Reporting of revenues across time periods and by user groups is needed to understand the structure of demand and to monitor efforts by sponsors to raise revenues through discounting, etc. Revenues from ancillary services are needed to understand the basis for rate of return or price cap regulation and to understand the interaction between direct toll and ancillary revenues. Cost data is needed to make sure services are being provided at the lowest cost, and to monitor costs to be included in regulatory calculations.

Since many road concessions are designed to bring new investment, information is needed about ongoing investment activity compared to contract requirement and budget plans. This investment information should be compared with traffic volumes to validate prior forecasts and to determine whether these programs should be delayed or accelerated.

Project financial indicators are intended to monitor the liquidity, solvency and profitability of the concession. These indicators are similar to those contained in covenants imposed by creditors and are needed for rate of return or price cap regulation.

The importance of detailed information about the quality and value of assets has tended to be under-appreciated by regulators. First, the quality of assets is central to the performance of the road. Second, the long-lived nature of road infrastructure means it is relatively easy to defer maintenance in the short-run to boost returns, allowing road and equipment to deteriorate and accelerate major overhaul requirements. Third, the treatment of asset depreciation and amortization is very important in determining the "base" form which rates of return are computed. In general, tax policies typically allow the write off of road infrastructure on an accelerated basis or with a shorter tax life than economic life. This disparity means that after the facility is depreciated for tax purposes, there is reduced incentive to maintain the asset. Moreover, if regulatory accounting for the concession uses a longer amortization period than tax accounting, the higher regulatory net asset values at any point in time will lead to higher tolls to provide a specified rate of return on assets. The sponsor thus receives higher returns in the early years from tax depreciation, then higher returns from the regulatory accounting that includes asset valuations that already have been written off for tax purposes. There is a need either to harmonize regulatory and tax treatment of assets, or to make sure that regulatory rate of return calculations take into account tax benefits from accelerated depreciation.

Finally, there is a need for ongoing financial reporting by the sponsors themselves, beyond the specific project. Sponsors should be required to provide audited financial statements to make sure that the prequalification status is maintained throughout the life of the concession. Standard financial statements should be supplemented by debt servicing schedules and working capital positions. This data will help make sure the specific project is not put at risk by financial troubles of the parent, a "twist" on the traditional concerns of non-recourse financing.

We know a lot more about the challenges involved in getting highways and urban access roads tolled than we did at the beginning of the 1990s. All players know much more about it: the sponsors are more prepared to face risks that they understand better; the construction companies are probably even more anxious to get involved; and the users have also learned about how to fight for their rights more effectively. Regulators also know

much more, but their knowledge is more an appreciation of how little they have known about the business of the monitoring toll road packages prepared by consultants or privatization teams. Regulators have also learned that they will often been firefighters and that the only way to be effective in that role is to better prepare for the job while they can. Too few toll road regulators have been successful in improving their preparation, but hopefully with a little help from this chapter, they will be asking more and better question from the teams that are preparing toll road packages, and they will be able to argue more effectively with concessionaires who are trying to renegotiate commitments to the government.

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