

# **Contractual Procedures to Involve the Private Sector in Road Maintenance and Rehabilitation**

**César Queiroz  
Principal Highway Engineer  
World Bank  
1818 H Street, NW  
Washington, D.C. 20433 U.S.A.  
Tel: 202-473-8053; Fax: 202-614-0900  
E-mail: [cqueiroz@worldbank.org](mailto:cqueiroz@worldbank.org)**

**Transport Sector Familiarization Program**

**Washington, D.C., April 16 – 22, 1999**

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**by César Queiroz**

## **Abstract**

This paper reviews options for creating an enabling environment for the construction industry, thus leading to more involvement of private contractors and consultants in improved management of road assets. The process, which is of particular importance for economies in transition, begins with separating the functions of planning and management from implementation of road works. Forms of contract reviewed include price based and cost based, procedural to functional specifications (or method based and performance based), and short and long term. These different forms have several implications on the risk allocation between client and contractor; the risks to the highway agency tend to decrease as the agency shifts from force account (or direct labor) to short- and long-term forms of contract with the private sector, including concessions. Highway agencies have increased private sector involvement in an attempt to: reduce the amount of highway agency resources required on a highway project; reallocate performance risk; increase contractor innovation; increase the quality of constructed products; and reduce life cycle costs of highway projects. A summary of recent experience in the increased involvement of the private sector in highway asset management is summarized for countries such as Australia, New Zealand, the United State, the United Kingdom, and Argentina.

## **Introduction**

This paper reviews options for creating an enabling environment for the construction industry, thus leading to more involvement of private contractors and consultants in improved management of road assets.

The process, which is of particular importance for economies in transition, begins with separating the functions of planning and management from implementation of road works. Forms of contract reviewed include price based and cost based, procedural to functional specifications (or method based and performance based), and short and long term. These different forms have several implications on the risk allocation between client and contractor; the risks to the highway agency tend to decrease as the agency shifts from force account (or direct labor) to short- and long-term forms of contract with the private sector, including concessions.

Highway agencies have increased private sector involvement in an attempt to reduce the amount of highway agency resources required on a highway project; to reallocate performance risk, to increase contractor innovation; to increase the quality of constructed products; and to reduce life cycle costs of highway projects. A summary of recent experience in the increased involvement of the private sector in highway asset management is summarized for countries such as Australia, New Zealand, the United States, the United Kingdom, Argentina, and Brazil.

Adoption of competitive bidding in selecting contractors is essential for increasing transparency of the award process. While adoption of competitive bidding for road and other civil works has been the norm in most countries of the world, the countries of the former Soviet Union did not have independent contractors, and road works contracts were generally awarded to state construction agencies on a negotiated basis. It was common for suppliers of construction materials to have monopoly power in a region (Queiroz and Bousquet 1996).

## **Strengthening Road Construction Industry**

Developing a country's construction industry is vital to achieve increased involvement of private contractors in the management of road assets. International financing institutions such as the World Bank have provided assistance to developing countries and economies in transition to develop a local construction industry. It seems appropriate to classify this assistance in three generations of projects.

A first generation of projects supported a public sector monopoly (contractor). The main component of such projects is the purchase of equipment. An example is the Burma (Myanmar) Construction Industry Project of 1984, where 76 percent of the total project cost was used to finance equipment to the Construction Corporation, under the Ministry of Construction.

A second generation of projects provide support to a public sector supplier of equipment (or plant pool). The main components of such projects include purchase of equipment and financing of civil works. Examples are the Ghana Road Rehabilitation and Maintenance Project of 1985, which financed equipment to a plant pool under the Bank for Housing and Construction, and the Tanzania Integrated Roads Project of 1990, which financed equipment to the Plant and Equipment Hire Company Ltd.

Current projects, or third generation, seek to create an enabling environment for the construction industry. Such projects, in addition to financing civil works, serve as catalysts for the establishment of more appropriate policies. They usually include training, introduction/improvement of competitive bidding, use of standard bidding documents, appropriate design standards and quality control, fair arbitration, and increased transparency in the award and management of contracts.

A key step in the introduction of competitive bidding is the separation of planning and management from implementation of road works. This will help to avoid conflicting responsibilities, control costs, and maintain quality. Highway agencies have reported that competition has led to cost reductions in the order of 20-30 percent. There have been different approaches for separating the functions:

- Maintain an integrated structure of the highway agency, but assign the procurer and producer functions to separate divisions (e.g., Norway).
- Divide road agency into client and civil works organizations. Finland and Sweden are examples where most of the periodic and routine maintenance is subject to competitive bidding. Production units remaining in the public sector will eventually be privatized.
- Keep road agency as procurer and contract out all producer functions to the private sector (most countries, including the United Kingdom, the United States, Australia, New Zealand). In the United Kingdom all road maintenance is competitively tendered. Contracts can be awarded to private sector, local authority consortia, or joint private sector/local authority entities.

## **Forms of Contract**

A contract with the private sector can be awarded on a cost base or price base. Cost base or cost-reimbursable are contracts where the payments are based on actual costs (open book accounting) plus overheads and profit (sometimes including an incentive related to savings beyond the initial target costs).

Price based contracts, preferred by highway agencies, can be:

- Lump sum - payment based on a single price for the total work
- Admeasure - payment based on the quantity of completed work and tendered rates (bill of quantities)
- Performance-based contracts - payment based on performance (results) achieved.

In recent years, several countries have gradually moved from procedural (method) to performance (end-product, functional, results) specifications. For example, a performance contract may specify pavement performance in terms of roughness, rutting, or surface friction. Performance-based contracts tend to minimize the amount of supervision required of the highway agency, and encourage contractors to find the best way to meet performance requirements. Some of the reasons for highway agencies to adopt performance-based contracts include:

- Reduced effort to measure the amount of works carried out.
- Avoiding frequent claims and contract amendments to increase quantities of activities which have plagued some traditional contracts.
- Increased client focus: pay on the basis of user-related performance indicators.
- Increased responsibility to contractors stimulates innovative capacity.

Routine and periodic maintenance can be contracted separately or combined, on specific routes (for example, Algeria, Brazil) or within geographic areas (for example, Argentina, Canada, Chile, Colombia, the United Kingdom). Information on the experience with performance (functional) contracts is provided later in the paper for several countries.

### **Allocation of Risks and Innovation**

Public agencies are accountable for the management of extensive public assets and hence for the management of risks associated with the ownership of those assets. Risk should be the responsibility of the party best able to manage it.

Robinson (2000) provides a good comparison of risk allocation under method-specification and performance-based specification. Under a traditional method-specification, the contractor takes the risk on physical performance in accordance with specifications (subject to external factors), and other risks are allocated by the contract. Under a long-term performance-based specification, the risks associated with asset management, planning, and method are transferred in large measure to the contractor. With a method-specification based contract there will be very little room for innovation. With an outcome-oriented, performance-based type of specification, however, there is scope for the contractor to offer innovative solutions to maintenance needs, such as introducing new or modified materials and methods.

As a highway agency moves from force account (or direct labor) to different forms of contract maintenance, there is a re-distribution of risks as illustrated in Figure 1. Agency risks tend to decrease and contractor risks increase when long-term contracting procedures are adopted, particularly if a concession-type approach is used. A highway agency remains responsible for the overall performance of the highway assets under its responsibility, thus increasing the importance of properly monitoring the tasks transferred to the private sector. Countries such as Australia and the United Kingdom have adopted a partnering approach (between the public and private sectors) to help ensure successful outcomes in the long-term performance-based contracts. As indicated in Figure 1, reform-oriented highway agencies, which successfully switch from force-account (direct

labor) to contract maintenance, and replace the traditional quantities and unit price-based contracts by performance-based contracts, are able to transfer a significant degree of risk to the private sector.

Contracting out maintenance is a growing trend and generally results in cost savings over traditional practices. The private sector has demonstrated its ability to respond to the opportunities, which has led to innovation and efficiency in delivering a quality product. However, there are potential downsides related to setting the appropriate end-result specifications, the risk of contractor defaults, ineffective dispute resolution procedures and loss of politically driven decisions (Haas and Raymond 1999).

### Long Term Performance-based Contracts in Australia and New Zealand

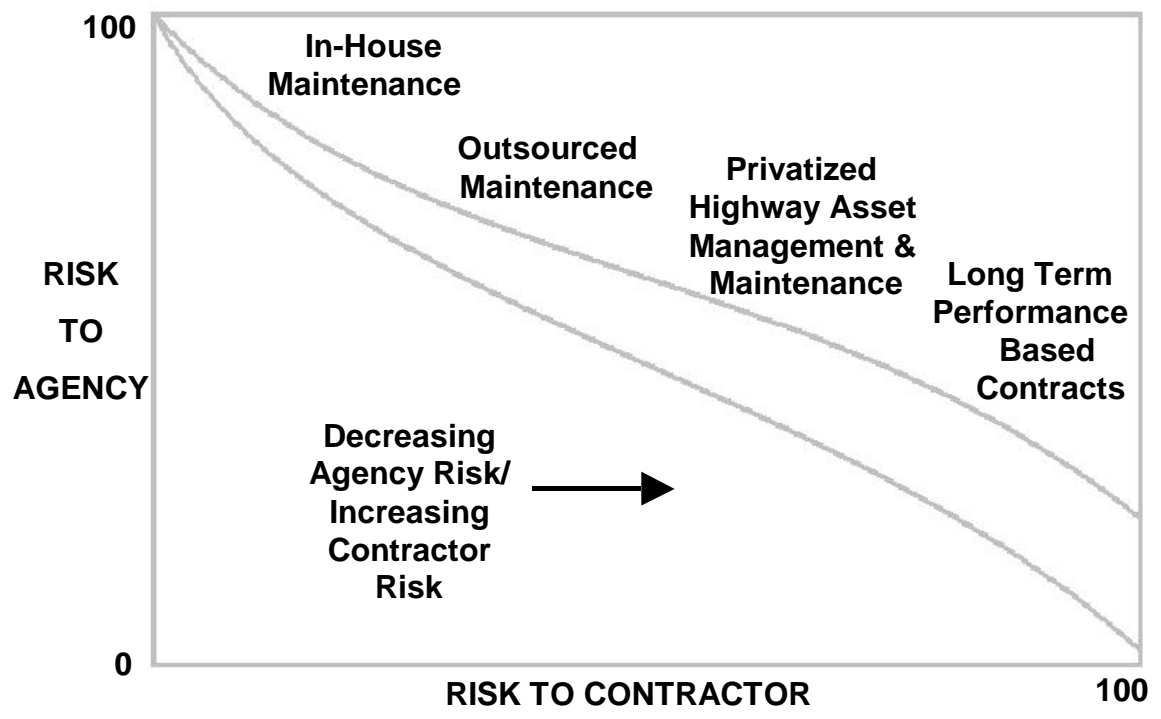
A number of states in Australia and New Zealand have introduced competitively tendered medium (3-5 years) and long-term (10 years) contracts for highway networks. Long-term performance-based contracts (LTPCs) are also known as performance specified maintenance contracts (PSMCs).

Robinson (2000) explains that, as a result of the move to maintenance by contract (MBC), preventative rather than reactive maintenance is now the rule.

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**Figure 1.** *Distribution of Risks with Different Contract Approaches*

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Payment is based on objectively measured outcomes. The combination of maintenance work items into a lump sum contract can be open ended as contracts that were previously schedule of rates (SoR) based can be progressively combined in lump sums (LS) as the client's confidence in the service provider's ability grows. A schedule of rates contract is one in which each work item is individually priced. In lump sum contracts, all individual work items are aggregated together and covered as a single cost item, thus giving more freedom to the contractor in the execution of works. In the past this has generally applied to routine maintenance items only, but the new LTPCs are now also being let as lump sum contracts covering all aspects of maintenance (routine, periodic, and rehabilitation) up to an agreed ceiling price.

Determination of appropriate performance appraisal criteria and intervention levels are still evolving and continue to be the subject of much debate (Frost and Lithgow 1998). The development of firm specifications is required and should include performance bonus, penalties, or both. As an example, the British Columbia Ministry of Transportation and Highways has developed a comprehensive manual on Standards for Road and Bridge Maintenance Services (British Columbia 1995). In Argentina, the following requirements are stipulated for the pavement surface condition after construction (Cabana, Liataud, and Faiz 1999):

- DNV Condition Index >8 (with 10 being best, and 0 bad)
- Roughness IRI: <3.1 m/km, 4.1 m/km, 3.9 m/km for asphalt concrete, surface dressing, and cement concrete surfacing, respectively
- Rut depth <4 mm
- Cracking <2% (type 2)
- Raveling and potholes = 0%
- Friction coefficient >0.4 (skid resistance).

For a performance-based contract to be successful, it is essential to accurately determine the condition of the road asset at the start of a contract and what its condition should be at the end of the contract, after three, five or ten years. Having several years of road condition data would be the ideal. Many road system performance measures directly relate to the physical and financial condition of the road asset. The condition of the asset may be described using either the physical parameters that reflect its structural capacity and serviceability for road users, or the financial parameters that reflect its capital worth to the community. Measuring the condition of the rate of change is critical in enabling effective management options to be assessed. A road asset management system to do this may be maintained by the client or the contractor.

Pavement condition information, a foundation for LTPCs, can be provided by a good asset management system (AMS). Key performance indicators must be objective, measurable, and achievable. They are developed on pavement structure (including cracking, rutting, roughness), environment (topography, climate), road geometry, safety (road width, lane marking, sealed/unsealed, skid resistance, visibility), driver comfort, travel time, and cost. Specification of levels of service, for successful implementation, should be based on consultation between all parties -- client, manager, service provider, ratepayers, road users and other stakeholders (Robinson 2000).

For more transparency at the tender stage, tenderers must be able to establish their credentials at pre-qualification. Experience in the relevant field of activity must be demonstrated. It has been recognized in Australia and New Zealand that many smaller size contractors may have greater experience in road maintenance contracts than the bigger organizations who have concentrated on major construction projects, and that there may be opportunities for specialist sub-contractors or consortia bids. A positive point is that some major contracting organizations have taken on the challenge of mastering road network asset maintenance with investment in experienced human resources such as senior personnel formerly employed by state and local government road agencies.

### **Warranty Contracts in the United States**

Warranty is a form of performance-based contract that has been used in the United States as an attempt to (a) reduce the amount of highway agency resources required on a highway project; (b) reallocate performance risk; (c) increase contractor innovation; (d) increase the quality of constructed products; and (e) reduce life cycle costs of highway projects. Hancher (1994) has defined warranty as "a guarantee of the integrity of a product and of the maker's responsibility for the repair or replacement of deficiencies." Under a warranty specification, quality is measured based on actual end product performance, not on properties of construction materials.

With a warranty, the contractor assumes post-construction performance risk in addition to that assumed during the construction process. Annual inspection of the end product by the highway agency (or its consultants) replaces the construction quality assurance portion of the typical quality control/quality assurance (QC/QA) specification. Statistically-based QC/QA procedures, such as stratified random sampling, may be used to monitor the performance of the end product. Under a warranty program, a contractor has more freedom to select materials and construction methods than under a traditional specification, and a contractor may develop a tailored quality control program to fit each project. With warranty contracting, a contractor's knowledge and experience may be fully utilized, without the restrictions inherent in method-based specifications (Thompson et al. 2000).

A highway agency interested in applying the warranty process should be aware that the method requires resources to be invested up front for training, writing of the warranty specifications, gathering of data for distress indicators and threshold values, and administering the warranty provision.

Based upon data collected from state highway agencies in the United States, Thompson et al. (2000) have proposed guidelines for the use of warranty contracting for highway works. Their proposal is comprised of eight phases:

- Conceptual Planning
- Program Planning

- Bidding
- Contract Award
- Construction
- Maintenance and Evaluation of Performance
- Evaluation of the Pilot Project
- Evaluation of the Organizational Program.

Agencies are usually interested in implementing a warranty program to accomplish objectives such as: (a) improved quality; (b) augmentation of agency expertise; (c) re-distribution of performance risk; and (d) reduction of agency design, testing, and inspection personnel.

Some warranty programs currently in use by highway agencies in the United States include: (a) asphalt pavement contracts in Indiana, Michigan and Wisconsin; (b) bridge painting programs in Maryland and Michigan; (c) pavement maintenance warranty program in Michigan; (d) program for pavement marking in Pennsylvania; (e) warranties for intelligent transportation system components in North Carolina; (f) Portland cement concrete pavement warranties in Wisconsin (Thompson et al. 2000).

It is recommended that the bidding process for warranty contracting include a pre-bid conference to ensure that all parties understand the warranty process. As an example, the following issues were discussed in a pre-bid conference held by the California Department of Transportation--CalTrans (Huckabay and Nankervis 1993):

- A description of the project, the warranty requirements, and the length of the warranty period.
- An emphasis on the reason for using the warranty method (e.g., to achieve a higher quality product).
- A description of the contractor's responsibilities, especially those that are different from a traditional project. CalTrans stressed that the quality control plan was the contractor's responsibility, described the guidelines for developing the mix design, listed minimum requirements for some materials, and described two tests that needed to be performed and submitted to CalTrans.
- An explanation of why and how the warranty period was selected. CalTrans explained that a five year warranty period was chosen because, historically, pavement failures associated with sub-standard quality had occurred in the first four years of pavement life.
- A reiteration that the thickness of the pavement was to be designed by CalTrans and that CalTrans would not pay for additional thickness.
- A reminder to the contractor that CalTrans personnel and testing equipment would not be available to the contractor and that the contractor was responsible for providing quality control testing equipment and personnel;
- An explanation as to how the retained funds (or bonds) may be invoked, or the contractor billed if CalTrans was forced to perform repairs for which the contractor was responsible under the warranty provisions.
- A clarification of the emergency repairs policy explaining the process that goes into effect should an emergency repair situation arise.

- A description of any special considerations regarding measurement or evaluation information. CalTrans explained that cracks would be measured in the winter when the temperature is cooler and the cracks are more likely to be wider.

### **Concessions for Improved Asset Management**

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

Because of the magnitude of needs to maintain and upgrade a country's infrastructure, and the difficulty of financing the totality of these needs out of budgetary resources, countries have been looking for alternative sources of financing.

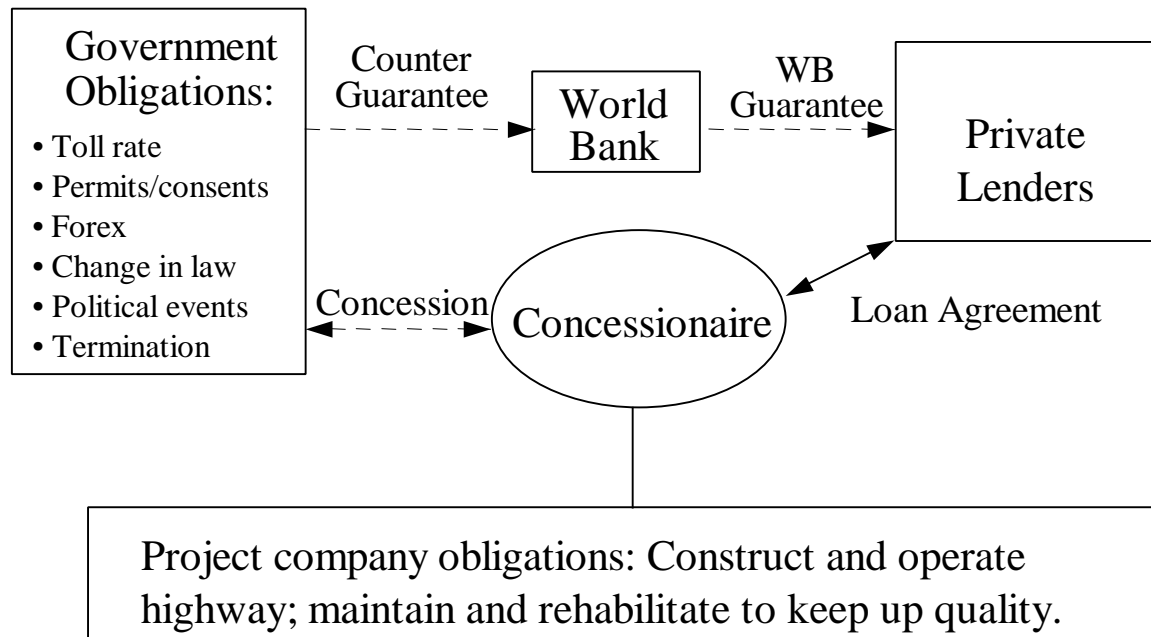
Since the 1980s, an increasing number of countries have been using private financing to help improve their road networks. Involving the private sector can also enhance the efficiency of operations, thus reducing the total cost of providing countries with an adequate road infrastructure.

In many countries, the private sector has been involved in financing infrastructure through concessions. Broadly defined, a concession is a legal arrangement in which a firm obtains from the government the right to provide a particular service (Kerf 1998).

With many countries increasingly interested in attracting private capital to infrastructure projects, institutions such as the World Bank can contribute through greater use of their guarantee power. Partial risk guarantees are particularly relevant in the context of the major worldwide shift toward privatization and private financing of infrastructure. Such guarantees cover specific government obligations spelled out in a support agreement with the project entity (for example, concession agreement, implementation agreement, build-own-operate-transfer (BOOT) contract, build-own-operate (BOO) contract). Partial risk guarantees are appropriate for enhancing a project's limited recourse project financing, the most common method of financing concessions for transport infrastructure. Figure 2 provides an illustration of how a partial risk guarantee can apply to a highway concession contract (Queiroz 1999).

Henriod and Lantran (2000) have presented a description of one of the most daring build-operate-transfer (BOT) ventures in transport, the Channel Tunnel (Chunnel"), between England and France. The following is an abridged version of their text. The project was initially launched through a 50 million pounds sterling equity issue, taken up by 10 contractors and three banks. At a later stage, the concessionaire venture Eurotunnel was formed, still including the initial equity partners; this concessionaire venture raised further equity and loans for a total of about 5 billion pounds sterling. Revenues come

**Figure 2.** *Structure of a Highway Concession Contract and World Bank Guarantee*



from road tolls and from contracts with British and French Railways. Several types of contracts were let by Eurotunnel, including:

- Lump sum contracts for laying railway track and building the intermodal transfer facilities, which were defined and quantified before the start of work. Cost-plus-fee contracts, tied to target incentives, for construction of the tunnel, perhaps the best approach for tunneling work under considerable risk. The contractors were partners in the concessionaire venture, and thus interested in minimizing the capital cost of the tunnel.
- Management contracts for the procurement of rolling stock and other equipment, a good approach, given the amount of negotiation involved with many potential suppliers, and the need for close collaboration in designing equipment, which is specifically tailored to the Chunnel's operational characteristics, between the management contractor and the suppliers.

The above three types of contract imply a varying degree of risk for the contractor; from the almost total risk of the lump sum contract, through the intermediate state of cost plus fee and incentive, in which risks centers on the amount of the fee, to the management contract, in which risk is minimal. However, underlying the contracts is the risk of success of the whole venture, in itself a potent motivator for efficiency and economies.

## **Performance-based Contracts in Argentina**

The "Contratos de Recuperacion y Mantenimiento" (CREMA) in Argentina provide an example of areawide performance-based contracts. These contracts cover about 14,000 kilometers (45 percent of the national paved road network). Each contract comprises rehabilitation and subsequent maintenance of 100-300 kilometers over a five-year period according to the following schedule:

- In the first year, rehabilitation (for example, slurry seal, surface dressing, overlay, reconstruction)
- In years 1 through 5, maintenance (for example, patching, cleaning drainage system, renew signs, clearing roadsides)

The main contract features are: (a) each contract specifies the minimum rehabilitation solution; (b) the contractor carries out detailed engineering design; (c) about 50 percent of the contract payment is made up to rehabilitation completion; and (d) the remaining payment is made in equal monthly amounts. Payments depend on meeting specified levels of service as shown in Table 1 (Cabana, Liautaud, and Faiz 1999).

## **Concessions Maintenance and Rehabilitation in Argentina**

Argentina provides an example (later followed by Brazil) of concessioning maintenance (with possible upgrading) and operations. Concessioning on the major road network started in 1990. The country had an established, well-connected but poorly-maintained network. Maintenance had received low priority because of shortage of public funding and of the high cost of public sector construction and maintenance. Argentina's main objectives were therefore reconstruction and maintenance of existing roads, rather than new construction, and simultaneously a reduction of the public support required by the sector. Involving the private sector in exchange for the right to charge user tolls was seen as a way to shift the financial burden to the users, and at the same time to maintain roads more efficiently than previously. Most of the road traffic is concentrated around the national capital, Buenos Aires, a few provincial capitals, and on the inter-city links serving them. A review of the contractual procedures adopted in Argentina is presented by Cabana, Liautaud and Faiz (1999).

The concessioning program was established in two steps. First, in 1990 the Government concessioned about one-third of the inter-city highway system by awarding twelve 12-year concessions. The roads involved had traffic of the order of 2,000-2,500 vehicles per day, and in return for the right to collect tolls, the concessionaires were required to undertake a program of maintenance, rehabilitation, and capacity improvements. The bidding was competitive, with a total of 147 bids submitted for the 12 sections. Then, in 1992 the government launched the second stage, for the maintenance, operation, and improvement of three of the strategic arteries radiating from Buenos Aires. For this latter stage, the government benefited from its experience of the bidding on the inter-city links, and designed simple, straightforward concession terms and bidding criteria.

**Table 1. CREMA Technical Specifications and Penalties**

<i>Service Provided</i>	<i>Performance Indicators</i>	<i>Penalties (US\$)</i>
Rehabilitated Sections Riding & Strength Quality	Pavement cross-section features to remain within specified standards, throughout contract period	
	Roughness IRI <3.3 m/km after rehabilitation and throughout the contract period	440/wk/2 km section
	DNV Surface Condition Index to be >6 and PSI to be >2.8	1,760/wk/2 km section
	Rut depth to be kept below 12 mm after rehabilitation and throughout contract period	440/wk/2 km section
	Cracking to be <20% after rehabilitation and throughout the contract period	220/wk/2 km section
	No raveling after rehabilitation and throughout contract period	220/wk/2 km section
	Thickness of asphalt concrete overlay to comply with specification and total wearing course thickness at the end of contract not to be less than initial thickness	n.a.
	No chip seal allowed on asphalt concrete without Engineer's authorization	n.a.
Sections under Routine Maintenance Riding quality (Smoothness)	No pothole more than 2 cm deep on paved roads	440/day/pothole
	All cracks to be sealed	220/2 km section
Safety Features	Trafficability ensured at all times	220/km/day
	Rut depth to be <3 cm, cracks to be <30%, and no raveling on paved shoulders with structural strength	440/wk/km
	No rut, raveling, no cracks, and adequate cross-slope on paved shoulders without strength	440/wk/km
	No erosion/rut and good profile, min. width = 3 m, drop-off <3 cm on unpaved shoulders	440/wk/km
	Culverts and drains to be clean, free from debris, and with adequate longitudinal slope	
	Vertical signs to be clean, visible at all times, and complying with DNV standards	44/sign/day
	Guardrails to be in good condition and visible at all times	440/wk/length
	Lighting system and traffic lights to be in good working condition	220/day
	Bush height to be <15 cm over first 6 m and <1 m beyond and up to 10 m	44/ha/wk
	Roadway to be free from litter and debris	44/day/km
Trees and vegetation to be properly maintained	44/day/km	
Work program activities, to be executed on schedule	26,400/wk of delay	
Rehabilitation works to be completed on schedule	cancel contract if delay >50%	

n.a. Not applicable

wk Week

km Kilometer

ha Hectare

Source: Cabana, Liautaud, and Faiz 1999

What can we learn from the Argentine experience?

- The importance of having simple and transparent criteria for the bidding. In the initial round for the inter-city concessions, bidders had to contend with a long list of technical and financial criteria, all with different weightings; in contrast the bidding for the Buenos Aires access road used a single criterion, and investment obligations were discussed with potential investors before the bidding documents were finalized.
- The rules for re-negotiating contracts, if that should become necessary or desirable, should be defined as early and as clearly as possible in the negotiating process.
- Institution building must be taken seriously, particularly when central and provincial responsibilities are involved. Before the program was initiated, responsibility for the main technical functions relating to the national highway system (planning, design, construction, and maintenance) was vested in the center, and responsibility for the provincial systems with the provinces. The reform transferred management and control of all roads to the provinces. The central agencies had a national planning and coordinating function, responsible for allocation of resources and auditing their use on national highways, and also acting as a regulator on the national system. At the start of the concessioning program, the central body did not perform either function satisfactorily; it did not adequately supervise the concessionaires, nor did it require meaningful reporting by them. For example, concessionaires were allowed to collect the tolls before they had invested in the required improvements; this led to a political revolt by the truckers and other road users.

### **Other Sources of Revenues**

While tolls are expected to continue to provide most of the revenues for a highway concessionaire, other sources of revenues can contribute to the financial feasibility of private financing of road infrastructure. Davis Barber, in a January 2, 2000, article in the New York Times, provides a good description of new sources of revenue and new ways to enhance traditional sources. Examples include selling shares on the stock market, leasing telecommunications cable to telecommunications companies, building retailing outlets on the right of way, and establishing commercial radio stations to supply motorists with highway information.

In several countries, private and government-owned highway operators began to sell shares on the stock market. Companies like Brisa Auto-Estradas de Portugal S.A. and Autopistas del Mar Nostrum S.A. of Spain have been taken public in recent years. In December 1999, in the biggest such offering yet, Italy sold off virtually all the shares in its national highway management company, Autostrade S.p.A., for almost \$7 billion. The remaining shares, less than 5 percent, will go to management in the form of bonuses.

Many highways have telecommunications cable to connect toll plazas, emergency roadside phones, road maintenance points, and other services related to running the roads.

Some highway operators are trying to exploit such cable networks through leases with telecommunications companies. In one such instance, Brisa, the Portuguese company, has sought alliances with local phone companies to make its highway communications system the backbone of a fixed-line phone network. And in Italy, Autostrade has begun selling capacity on its 3,000 kilometer of fiber optic lines to data and multimedia providers; it also owns about one-third of Blutel S.p.A., a cellular phone service provider that will begin operating next year.

Some concessionaires see potential in toll roads for retailing outlets. For example, seven million Italians use Autostrade roads at least once a month, and of those, two million hold a toll payment card called ViaCard, which lets them pay tolls automatically but also provides a huge customer base for marketing other things. One idea is to establish minimalls at highway rest stops.

Cofiroute, a French private highway operator, is using a commercial radio station it operates to supply motorists with highway information. Together with the French automakers Renault and Peugeot, the company is developing an information system that will, for instance, know when a motorist turns on the windshield wipers or fog lights, thus prompting instant weather reports to broadcast to other drivers and sell to other commercial stations and weather services.

### **Design, Build, Finance, and Operate (DBFO) in the United Kingdom**

The United Kingdom long-term performance contracts cover a 30-year period for roads requiring major rehabilitation or new investments. Payments are indexed to traffic flows. This type of contract requires well-developed contractors and a highly professional road agency.

DBFO has developed as an option for procuring a highway management service for trunk roads in the United Kingdom. A similar approach has also been adopted in other countries, including Finland and Portugal. DBFO can be considered a form of concession where the contractor is paid by the highway agency based on "shadow tolls," that is, a cash amount based on the volume and composition of traffic on the road, instead of real toll collection.

Nicholson (1996) reports that the government has two main aims when seeking DBFO contracts to: develop a private sector road operating industry providing an equivalent level of public safety and service to that which exists on the rest of the trunk road network; and transfer significant risk to the private sector, and minimize the project cost and extent of the risk borne by the public sector.

The U.K. Highways Agency has developed a model contract seeking to achieve the principal objective of the DBFO policy--maximum risk transfer, the provision of a long term service, and the value for money.

## **Summary and Conclusion**

This paper presented options for creating an enabling environment for the construction industry, thus leading to more involvement of private contractors and consultants in improved management of road assets. The process begins with separating the functions of planning and management from implementation of road works.

Forms of contract reviewed include price based and cost based, procedural to functional specifications (or method based and performance based), and short and long term. These different forms have several implications on the risk allocation between client and contractor; the risks to the highway agency tend to decrease as the agency shifts from force account (or direct labor) to short- and long-term forms of contract with the private sector, including concessions. Highway agencies have increased private sector involvement in an attempt to reduce the amount of highway agency resources required on a highway project, to reallocate performance risk, to increase contractor innovation, to increase the quality of constructed products, and ultimately to reduce life cycle costs of highway projects.

Experience in the increased involvement of the private sector in highway asset management was summarized in the paper for several countries. Most of the concessions and long-term maintenance contracts reported in this paper have been implemented for only a few years. Consequently, caution is required in assessing the potential success of these long-term projects.

## **Acknowledgments**

The author benefited from comments of Ewa Rodzik and Ralph Haas.

This paper reflects only the author's views, and should be used and cited accordingly. The findings, interpretations, and conclusions are the author's own. They should not be attributed to the World Bank, its Board of Directors, its management, or any of its member countries.

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