Maintaining roads

Experience with output-based contracts in Argentina

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Creating capacity and incentives for ongoing maintenance of capital investments is a challenge across all infrastructure sectors, but especially for services that cannot attract cost-covering user fees, such as low-volume roads. The Argentine government has responded to this challenge in its nonconcessioned road network by using output-based contracts with the private sector for rehabilitation and maintenance. The multiyear, lump sum contracts, funded by the government and the World Bank, specify required road service outputs and use incentive-based payment schedules to ensure the quality of the work. After three years of operation the 60 contracts (averaging US$10 million) in the first phase are working well. By 2002 around 75 percent of Argentina's nonconcessioned roads should be operating under output-based contracts.

Road maintenance and rehabilitation have traditionally been procured by the Argentine government through input-based contracts with the private sector. Several goals underlie its shift to output-based contracts: To cut the administrative costs associated with input-based contracts—in particular, the costs arising from the frequent requests for payments to cover necessary increases in inputs. To encourage innovation and cost-effectiveness by giving contractors more responsibility. To develop more stable funding for road maintenance (under traditional arrangements national funding dried up during a fiscal crisis). And to better meet road users' needs.

The contracting is run at the national level by the highways authority. The first step was a nationwide road survey to estimate traffic, define the minimum (rather than optimum) road standards, define the rehabilitation and maintenance required, and identify the size and shape of the subnetworks for contracting out. Roads with traffic in the range of 300–3,000 vehicles a day are eligible for output-based contracting. (Roads with traffic exceeding 3,000 vehicles a day are considered concessionable.) On the basis of the survey information the government set uniform national output indicators for the contracts. To help define the indicators, road users (who spend US$10 billion annually operating vehicles) were surveyed to find out what they consider an acceptable level of service. Contracts were awarded to the lowest lump sum bidder, and a share of the payments to contractors is based on how well they perform against these indicators.

In their initial application, the output-based contracts covered maintenance of paved roads, with payout schedules based on kilometers per month. The next stage covered rehabilitation and maintenance, with contracts requiring lumpy up-front payments to cover rehabilitation costs. A third stage under consideration would cover new construction of low-volume roads (less than 250 vehicles a day).

Starting out with maintenance contracts

Introduced in August 1995, the first output-based contracts are kilometer per month contracts spanning four years (and recently renewed) and covering a network of about 3,600 kilometers of paved roads. The 11 contracts cover roads that were in good to fair condition and expected to require only routine maintenance to remain in that condition over the next few years.

Contractors are paid equal monthly installments for specified services, as long as the quality of outputs complies with the technical specifications. If the outputs do not comply with standards, daily penalties are imposed (and sub-

tracted from future payments) until the necessary repairs are carried out. The penalties are based on deficiencies noted during monthly inspections. No penalties are imposed for the first two or three months following the award of a contract, giving the contractor time to repair any preexisting deficiency.

The contracts are working well. Routine maintenance is costing an average of about US$175 per kilometer a month. About 600 certificates of noncompliance have been issued, giving rise to penalties amounting to only 1 percent (US$300,000) of the total amount of the contracts. Given the satisfactory outcome, the contracts were renewed for four more years with the same contractors.

Adding rehabilitation

On the basis of the experience with the maintenance contracts, a contract was designed for combined rehabilitation and maintenance of paved roads. This contract, called *contrato de recuperación y mantenimiento* (CREMA), requires the contractor to rehabilitate and then maintain a network of roads for five years for a lump sum amount. Each contract covers a network comprising contiguous or area-specific road sections ranging in length from 100 to 300 kilometers. The contract specifies the sections that need rehabilitation and the minimum solution required to ensure a positive net present value for the investment.

Bidding

In designing the contract, different rehabilitation strategies were tested, involving spreading the rehabilitation across the life of the contract to avoid funding spikes, using contracts of different durations, and adjusting the payment schedules to reduce financing costs. The highways authority settled on contracts requiring rehabilitation works to be carried out during the first year, and routine maintenance activities throughout the five-year contract period.

Bidding is done through international competitive tenders. In early bidding rounds the payment schedule called for a 5 percent advance followed by two equal payments of 10 percent, with the rest in equal installments over the next four years. But the bids exceeded official estimates by nearly 100 percent because of high financial costs (since most expenditures would have been in the first year, contractors would have had to borrow). These early rounds were canceled, and a schedule with larger up-front payments was chosen to reduce contractors' financial costs.

Only after the contract is awarded does the contractor prepare a detailed engineering design. On the basis of its own risk assessment, the contractor is

free to propose any rehabilitation solution above the minimum threshold defined in the contract. (This involves judgments about how much up-front rehabilitation is required to get the roads to a level at which they can be cost-effectively maintained.) But the contractor is not allowed to change the agreed financial bid. The decision to postpone the detailed designs until after contract award was made to expedite the bid proposals (and thus the reduction in the rehabilitation and maintenance backlog) and to cut the bidding costs.

Payments and monitoring

The payment schedule is designed to provide incentives for the contractor to maintain the network for the full length of the contract. The contractor receives an advance payment of 5–10 percent, followed by 15–25 percent at the end of the first six months, when specified activities have been executed, and 25 percent at the end of the first year, when rehabilitation works have been completed. Thus up to 60 percent is paid by the end of the first year; the remaining payments are made in 48 equal monthly amounts. In addition, the contract requires a performance guarantee of 20 percent.

The contract allows reimbursement of cost overruns in certain circumstances beyond the control of the contractor, such as earthquakes, hurricanes, and bitumen shortages. The government uses the contractor's schedule of input prices submitted in the bid as a baseline for overrun estimates. The risk of excessive cost overrun is contained by a 25 percent cushion on these prices. If the contractor's estimate exceeds the baseline by more than 25 percent, the contract can be rebid.

In contrast with input-based contracts, under the CREMA payments are made when the contractor achieves a specified level of service. Performance is assessed during monthly on-site inspections by the government engineer and the contractor. Throughout the contract period the rehabilitation works must comply with the specified minimum and maximum standards (box 1). The compliance with maintenance standards is inspected visually on a monthly basis. Penalties for noncompliance are set for each indicator. For example, a pothole left unrepaired beyond the authorized time limit will cost the contractor US$400 a day until it is patched. Penalties are deducted from the monthly payments.

Road users can also monitor performance, voicing concerns about the quality of service in a claim book available at the contractor's site office. Entries in the claim book are publicized in the local media. Contractors must signpost each network with information about how they can be contacted.

BOX 1

Rehabilitation and maintenance indicators

Throughout the contract period rehabilitation works must:

- Meet or exceed the minimum thickness of overlay.
- Not exceed the maximum level of roughness, rut depth, cracking, or raveling.

Regular visual inspections of maintenance activities focus on a few essential items in ensuring compliance with the specifications:

- Potholes, cracking, and rutting.
- The condition of shoulders, culverts and drains, and the roadside environment.
- Guardrails and vertical and horizontal signs.

And a representative of the user community is periodically allowed to participate in monthly inspections.

Bidding for phases 1 and 2

The CREMA program was designed to be implemented in two phases. The first phase involved a network totaling 11,700 kilometers in length, 55 percent of the nonconcessioned national paved network. That network was generally in good to fair condition, with 25 percent in poor condition, and had daily traffic averaging about 750 vehicles. In a process following international competitive bidding practices, 60 contracts were let in 1997, covering subnetworks averaging about 180 kilometers in length.

The contracts were awarded to mostly local construction companies for a total of US$650 million, equivalent to US$11,000 per kilometer a year. With the larger up-front payments, the lowest bids exceeded the budget estimate by about 24 percent. Rehabilitation works accounted for 74 percent of the total bid amount, and routine maintenance for 26 percent. (The costs—US$66,000 per kilometer for rehabilitation over the 8.25-year life of the works and an estimated US$3,000 per kilometer each year for maintenance—are roughly in line with those in other parts of Latin America.) Private sector participation was high, with each contract attracting 5–20 bid proposals. The average contract price was US$10 million.

The second phase involves a network of 4,000 kilometers and 20 contracts. Bidding of the first two subnetworks, initiated in August 2000, received a positive response from the private sector: the lowest evaluated bidders offered financial proposals 5 percent below official estimates. This outcome is probably the result of increasing private sector comfort with the contracting process, a higher share of up-front payments (and thus lower financing costs),

and better estimating by the highways authority. The remaining subnetworks are expected to be tendered in 2001.

Assessing results for phase I contracts

The first phase was successful in many respects during its first three years:

- By requiring contractors to perform their own quality control, the system has cut the government's cost of supervising the network.
- The fixed price contracts reduced the risk of cost overruns. The only cost increases so far have been due to natural disasters or force majeure events (mostly related to El Niño) and have amounted to about 3 percent of the total contract price.
- The requirement that contractors carry out detailed engineering designs before initiating the works has minimized delays in project implementation. In traditional programs such delays are due to lack of stocks of government-prepared subprojects.
- By making the long-term payment obligations legally binding on the government, the CREMA has deterred the Treasury from failing to provide funding for road maintenance.
- The performance indicators have been simple enough to apply and monitor, and they get the desired results. (Output indicators invariably involve a tradeoff between accurate measurement of the road service required and unambiguous and low-cost measurement.)
- The contractors' obligation to maintain the roads over a five-year period has reduced the risk of unsatisfactory quality in the rehabilitation works.
- The system has fostered some innovation in the programming and execution of works, since payments are tied not to rigid specifications on workmanship but to outputs. Nevertheless, as contractors get used to the new system, they are starting to question the appropriateness of uniform national standards and to ask that they be allowed to set the standards once the government has defined the quality of service.
- Ex post financial and economic evaluations showed that the rehabilitation and maintenance funding yields an economic rate of return of 60 percent (at a 12 percent cost of capital). The contracts will reduce the need for capital investments by nearly 30 percent: after the five-year implementation period better quality roads will lead to a drop in ongoing capital and maintenance expenditures from about US$11,300 per kilometer a year to US$8,000.

- Rates of return for the contractors have not been assessed. But the competition for the contracts and the fact that only one of the 60 contracts has had to be canceled because of a contractor's financial difficulties suggest that the contracts are financially attractive to the private sector.
- The CREMA program has substantially improved the condition of the network, reducing the share of roads in poor condition from 25 percent to less than 5 percent by the end of 1999. As a result, road users' costs have been reduced by more than 10 percent.
- Damage to roads caused by vehicle overloading is being addressed by asking contractors to provide and operate devices for measuring axle loads on-site and to report any excess load problems to the highways authority. But the contractors still have to rely on the government for enforcement.

Conclusion

Argentina's approach to road maintenance offers an effective means to improve efficiency and public accountability. By holding contractors accountable for the future quality of the roads, output-based contracts keep them more alert to quality during the execution of road works. And by passing some monitoring functions on to contractors—and requiring the permanent presence of their maintenance crews on-site—the contracts guarantee efficient monitoring of pavement and traffic conditions, leading to more timely corrective actions.

In the long run this approach could both reduce the cost of maintenance and improve its quality. The approach is one that could be transferred to other countries. Indeed, pilot initiatives with similar contracts are already under way in Brazil, Chile, Colombia, Guatemala, Paraguay, and Uruguay.