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## Financing, Private-Sector Involvement, and Market Processes in the Provision of National Roads in South Africa

M. F. MITCHELL AND J. L. BOTHA

In this paper is described the changing basis of the provision of rural roads in South Africa that led to the introduction of toll roads and, in the process, to an increasing degree of privatization in the provision of roads. The background financial and administrative arrangements for the provision of rural roads is discussed and national policy that influences the financing of roads is described. With the increasing shortage of funds for roads during the past decade, the need for better economic justification of specific road projects and the search for new sources of funds combined with the policy of user charging and of supporting the free market system has had a significant effect on the development of the rural road system. Before 1980 the private sector was involved in road provision to a varying extent through contracting, construction work, and consulting services. Following a decision in 1982 to implement toll roads on a limited basis on the national road system, private-sector involvement expanded to include financing and management of revenue collection activities. Greater attention was paid to the economic and financial justification of road projects. After the policy of toll financing of roads was established, the Department of Transport was approached by private-sector companies requesting the grant of concessions to finance, design, construct, maintain, and operate certain national roads and to collect tolls to defray the costs. These proposals, which would constitute further privatization in the road sector in South Africa, are currently under consideration.

South Africa covers an area roughly equal to 12 percent of the United States or 3.7 percent of the area of the whole of Africa. Its road system at present consists of approximately 3000 km of freeways, 50 000 km of rural two-lane blacktop roads, and 135 000 km of gravel roads. There are a total of more than 230 000 km of roads and streets.

The purpose of this paper is to describe the changing basis of the provision of rural roads in South Africa that led to the introduction of toll roads and, in the process, to an increasing degree of privatization of road provision. The limited introduction of certain market forces into the provision of roads in South Africa is described as is the increasing involvement of the private sector.

Until the end of the 1970s planning of the national road system in South Africa was based on the concept that the major cities of South Africa should be connected by a system of freeways. The road standards used were basically similar to U.S. standards modified to take into account the South African rule of the road (i.e., drive on the left) and climatological conditions. However, funds available for roads decreased dramatically in the mid-1970s, and it soon became apparent that expenditures on roads had to be better justified than previously and that new sources of revenue had to be explored. At about the same time, the government gave impetus to its policies of promoting the free market system and charging the user for services provided by government.

The need for better economic justification of roads and the search for new sources of funds for roads, combined with the

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policies of promoting the free market system as well as user charging, had a significant effect on the development of the rural road system. Potential national road projects became subjected to economic analysis and only projects with an acceptable rate of return, based on user benefits and road costs, were considered for implementation. The possibility of implementing toll roads was also investigated and found to be feasible on a limited scale. The implementation of toll financing of suitable projects was based on the traditional combination of using loans for the financing of roads and tolls for repayment of the loans. The floating of loans on the capital market brought about a significant increase in funds available for roads at the time. Furthermore, the need for financial discipline in establishing toll roads brought about a closer scrutiny of proposed projects. Because users are prepared to pay for only a portion of the benefit used in the economic analysis, the financial feasibility of a project was found to be a more stringent criterion than the economic analysis. A strategy was developed whereby economic and financial criteria were combined to arrive at a decision on the selection and scope of projects. Through this mechanism, the market forces of the users' willingness to pay and the prevailing interest rates and effects of inflation were brought into the project selection process.

Until 1982 the private sector was involved in road provision primarily through contracting for construction work and through consulting work. National roads are designed and constructed almost exclusively by the private sector, and the provision of provincial and local authority roads is divided almost equally between the private sector and in-house departmental forces. During 1984 when the economy was in a severe downturn and contractors were having difficulties obtaining adequate work, the Department of Transport was approached by major construction companies that wished to obtain concessions to finance, design, construct, maintain, and operate certain roads and to collect tolls to defray the costs. The decision was made by the Department of Transport to investigate and negotiate the award of concessions to consortia of private entities including construction companies, banks, consulting engineers, and toll operators. A strategy was sought to ensure that the effectiveness and efficiency of the private sector were used and, at the same time, to ensure accountability in the use of public funds.

## BACKGROUND FINANCIAL ENVIRONMENT

In the 18th century Adam Smith in *Wealth of Nations* outlined the essential functions of the state that are the determinants of the level of public expenditure: first, protection against external attack; second, protection against internal assault, injustice or oppression; and, third, the provision of public works and services "which it can never be for the interest of any individual . . . to erect and maintain, because the profit could never repay the expense to [the] individual . . ., though it may frequently do much more than repay it to a great society."

Today the issue of the scope and degree of public expenditure on those public goods to which Smith refers is a notoriously controversial one. Public-sector expenditure as a proportion of the national product has shown a rising secular trend in industrialized countries since World War II—so much so that it

has sometimes been referred to as the "fiscal revolution." Such expenditure springs from enlarged perceptions of Smith's third category because the public, in western countries in particular, has come to demand as of right a myriad of so-called entitlements guaranteeing minimum standards of income, job availability, public transport, health care, and other elements that make up that elusive entity the "quality of life."

The International Monetary Fund speaks of a "revolution of rising expectations regarding what a government can and should do" and singles out the following elements:

- Stabilization of the economy,
- Promotion of economic growth,
- Redistribution of income,
- Guaranteed employment and levels of income,
- Aid for sick industries,
- Subsidies for specific goods and services, and
- Regulation or control of certain activities.

This broader perception of the state's responsibilities has inevitably placed escalating pressure on the expenditure side of the budget, which has been reflected in higher taxation that, in turn, has acted to inhibit growth. This situation calls for still higher taxation as long as the entitlements are regarded—as they invariably are—as sacrosanct.

The situation that confronts economists, financiers, and politicians in South Africa reflects the true nature of the country—a mixture of First and Third Worlds, or a more modern and sophisticated exchange sector that exists alongside a far less developed one. The elimination of the glaring disparities between the two is one of government's highest priorities and is one that is bound to cost a great deal of money.

Many development functions reside in the public sector because there has been a lack of entrepreneurial interest due mainly to inadequate rates of return on capital investment in certain developmental spheres. The government has thus been required to provide necessary facilities through the public sector. Government spending and employment in South Africa as a proportion of the gross domestic product, after a gratifying fall in the late 1970s has been rising during the 1980s. State employment today represents approximately 30 percent of the total economy, and it has been estimated that the disposal to the private sector of five major state corporations responsible for the production of electricity, steel and iron, air travel, rail travel, and postal services would allow 80 percent of the national debt to be retired immediately.

Because the reduction of the disparities between the First and Third Worlds in South Africa is likely to cost a good deal of money, government has been increasingly looking at the privatization of certain public-sector assets as a means of reducing the problem of public-sector funding.

## SOME THOUGHTS ON PRIVATIZATION OF ROADS

If, after all that is possible has been done to reduce public-sector spending, it is found that the sector is still taking too large a helping from the natural resources pool, then (leaving aside Herculean cuts and retrenchments) the options open to government include privatization on the one hand and extended

user charging on the other. These issues have been particularly pertinent and have aroused interest in roads in South Africa during recent years.

The main thrust of privatization involves what may be termed the return or transfer of productive resources to the private sector, where, *ex hypothesi*, they can often be more efficiently used than when they fall under the broadly defined public sector. No fingers are pointed at the public sector, but there are undeniably certain activities currently found under its umbrella—on all three tiers of government in South Africa—that could more rationally fit into the private sector. No doubt each and every activity could originally be justified on the grounds that the private sector was unwilling or slow to get involved, but government should be constantly alert to changing circumstances and demands rather than fixed on the probably quite different circumstances of the past.

It is not suggested that there are not services that in the nature of things must unquestionably be kept in public rather than private hands on grounds of socioeconomic or even political considerations, but government should be fearless in looking for suitable candidates for privatization at all levels and tiers and in all fields of public enterprise including the provision of roads. It is, after all, preeminently the private sector that creates wealth and thereby raises living standards, so the more resources channeled to the private sector, the greater the wealth generated.

The effects of privatization on the public sector should also be traced. There could well be, as is frequently argued, a multiplier effect in public-sector productivity as the work force in that sector shrinks. And this in turn, if coupled with an application of the user charge principle to which the South African government is committed, will mean a reduction of the public sector's share of gross domestic expenditure with all of the concomitant benefits for the taxpayer and thus for the economy at large.

Privatization can of course take various forms such as deregulation to liberalize competition and thus prevent monopolies, transfer of ownership of state assets (or the long-term leasing thereof), or encouragement of private-sector provision of collective services. In the provision of roads the second option, transfer or leasing of state assets (roads), and the third option are the most relevant.

A cardinal point that has been strongly emphasized in the South African context is the need to prevent the creation of natural monopolies and the consequent elimination of competition in the provision of roads. This problem can range from construction activities to the need to prevent captive road traffic markets due to the nonavailability of acceptable alternative routes. It would be ill-advised to exchange state monopolies for private ones, and competitive policy should be a major factor in evaluating potential procedures. The whole idea of privatization is to allow natural market forces to determine the price and volume of services such as roads so that in the long term such public goods will be provided at the lowest possible price.

The whole question of privatization is presently being considered in South Africa by a State President's Committee on Privatisation under the chairmanship of the Minister for Administration and Economic Advisory Services.

## DEVELOPMENT AND CURRENT STATUS OF THE SOUTH AFRICAN RURAL ROAD NETWORK

The earliest reference to road building in South Africa is to be found in the diary of Jan van Riebeeck, the leader of the original settlers. On August 4, 1653, he wrote "The bookkeeper Verburgh was [today] sent to the forest with 13 men, to make a good road for the wagon to transport wood."

Indeed, no road was built; Verburgh and his 13 men merely mared out a route, thus setting the pattern for the following 150 years. The oxwagons of the time followed footpaths and game trails over the mountains. It was only with the coming of the British at the beginning of the 19th century, as a result of the Napoleonic wars, that road building was undertaken in earnest. By 1825 the first engineered pass (the Fransch Hoek Pass) over the mountains encircling Cape Town had been built. In 1828 Govenor Sir Lowry Cole wrote "Because [the farmers] are cut off from a market for their produce there is no stimulus for industry and the inhabitants will continue in their present state of poverty for ever." He acted to some effect after writing this because Sir Lowry's Pass over the Hottentots Holland mountains was opened in 1830. This pass had been built by Major Charles Mitchell at the then cost of £3000 in the intervening 2 years. This route, much improved in the interim, is still in use today.

In 1843 John Montagu was appointed Colonial Secretary and he set about a further program of road building. He appointed a Central Road Board of three officials and three nominees to help him. The Road Board received a property rate of 1 penny on the pound (0.4 percent), which was supplemented by tolls collected at tollgates, bridges, and ferries. The first 40 km of hardened road was completed by 1845 at a cost of £40 000. It was calculated at the time that the savings in transport costs would be £20 000 per year, an early example of economic analysis.

At this point two great names in South African road-building history enter the scene, the Bains, father and son. Under their supervision a large mileage of roadway, with many mountain passes, was completed. Much of this work remains in use. The tollgates that helped to pay for it can still be seen in many locations, the Montagu and Garcia passes for example, and some of the Bains' bridges have been declared national monuments.

With the discovery of diamonds, and subsequently gold, in the interior, railways were rapidly extended, and roads were relegated to a feeder role. At Union in 1910 roads were made a provincial responsibility, but not much progress was made. By 1925 the longest continuous stretch of bituminous road was the 75 km between Cape Town and Wellington at the foot of Bain's Kloof.

The motor vehicle was by this time making its presence felt, and after investigation a National Roads Board was set up in 1935 with the object of providing a network of national roads linking provinces and main centers. This board adopted a program with a total length of 8600 km, which it proposed to build in 5 years. Funds for this program were provided by a levy of 3 pennies per gallon of imported fuel, a percentage rate of about 20 percent. The program not surprisingly was too

ambitious and by 1946 (World War II also delayed matters) only 5900 km had been completed. By 1970 the approved program had expanded to 13 000 km, most of which was complete.

In 1971 the National Transport Commission, which superseded the National Roads Board in 1948, decided to reduce the national road network to its essentials and to rebuild these essentials in the form of freeways. It gradually became apparent that this was an error and that sundry sections of the old system, which had been ceded to the provinces, should have been retained. It was patently impossible to redevelop all of the roads to freeway standards and many of them did not justify such a step in any case.

A reassessment of what routes should be national routes was thus undertaken in 1984, and it was acknowledged that the roads in this system might be of different standards according to the needs of the route. This new system includes approximately 10 000 km of road, about 3000 km less than the 1971 system of 13 000 km, and represents 5.4 percent of all rural roads and 20 percent of all paved rural roads in the republic. It is proposed to redeclare this entire system a national road network as and when funds become available for the purpose.

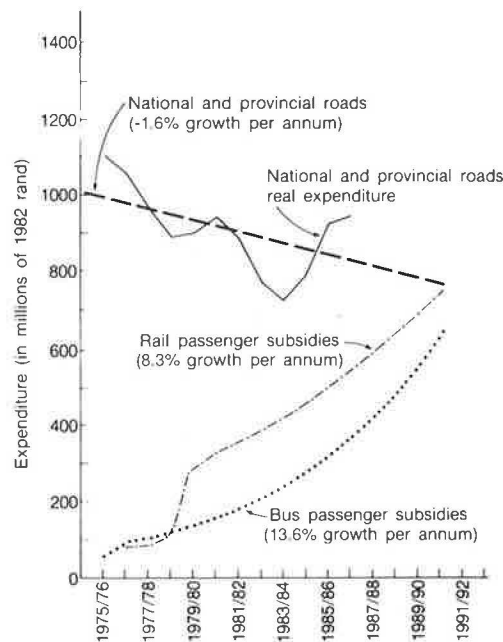
Average traffic figures on the South African road system are fairly light. In Cape Province much of the system has average daily traffic (ADT) of around 1,000 vehicles per day (vpd) as a result of the sparse development in desert and semidesert country. In the Transvaal figures of around 3,000 vpd are common and it is in this province that most difficulty is expected in accommodating traffic growth. In Natal traffic is chiefly confined to the erstwhile national road system and can be rather high in places, ranging up to 16,000 vpd on single-carriageway roads during holiday periods. Of course much higher figures are common around the cities. ADTs of from 40,000 to 120,000 can be expected in these areas, and at these levels freeways are of course required.

The system of divided control of road building between the National Road Authority and the provinces does not encourage a logical or rational division of road funding, with funds going to the most economic or most deserving cases. In the future it could well be that all road-building funds in the country will be combined in one fund and that the distribution will then be determined in a logical manner based on economic prioritization and actual needs instead by the fairly subjective method used at present. The total budget for rural road construction and maintenance is currently of the order of R1,500 million per year.

### FINANCING OF ROADS IN SOUTH AFRICA

In South Africa, as in most countries throughout the world, concern is being expressed about the trend of declining revenue for road financing that, together with severe inflation in road construction costs, is leading to a cost-revenue squeeze. The problem is related to four basic factors:

- A decreasing rate of revenue growth,
- A diminishing effectiveness of revenue because of the effects of inflation on construction costs,



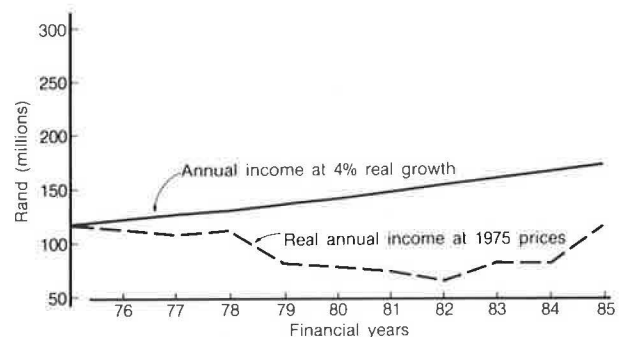
**FIGURE 1** Projections of expenditures for selected transport-related items based on historical growth rates.

- A trend toward the siphoning off of a portion of the revenue generated by the road user into multimodal general transportation funds to subsidize uneconomical transportation forms such as suburban railway services (Figure 1), and
- Increasing maintenance and operating costs on the more highly trafficked facilities.

Continually increasing demands are being made on road user taxes, especially the fuel tax. In addition, the percentage of the fuel tax allocated to road construction has diminished considerably in recent times. As an example of this tendency, the National Road Fund at its creation received 17 percent of the total cost of fuel for road construction; currently this figure stands at 8 percent.

Figure 2 shows the trend in road financing that has prompted road authorities to seek additional sources of income for the provision of road facilities.

The Department of Transport (DOT) administers the



**FIGURE 2** National Road Fund: revenue from levies on fuel sales.

National Road Fund (NRF) on behalf of the National Transport Commission (NTC) and is responsible for the national road system as well as for certain other road facilities such as roads in national parks.

The NRF is a statutorily dedicated fund that is financed solely from a levy on petrol and diesel sales. At present (April 1986) this levy is 7c and 8c per liter on petrol and diesel sales, respectively. Income from the fuel levy accrues directly to the fund via the oil companies who remit payments on a monthly basis. Capital expenditure on road projects is directly controlled by the NTC and is administered by personnel from the DOT. The financial structure of the NRF is based strictly on cash flow without any capitalization of expenditure or accrual of income and expenditure. This suits the nature and objective of the NRF (i.e., to expand the national road network using funds as and when they become available). Recourse to the capital market to fund deficits in the NRF is the exception rather than the rule and occurs only when warranted by urgent capital expenditure.

Provincial administrations, through their roads departments, are responsible for the construction, maintenance, and operation of provincial roads of various classes. The provincial administrations derive their incomes mainly from the Treasury; small additional sources of income are vehicle and other licences and permits, provincial taxes and levies, and the NRF (a 70 percent subsidy on special roads). The magnitude of the annual budget of each province is determined by the central Treasury using a formula that takes account of, inter alia, land area; length of road system; car, tractor, and truck population; and traffic volumes as well as indices of construction and maintenance prices. The Treasury allocates to each province the difference between the formula amount and the province's own income. Although part of the allocation to each province is earmarked for roads, the provinces are not bound to spend exactly this amount on roads. The greatest part of the provinces' road budgets are spent on their provincial road systems, and small contributions are made to municipal roads.

In an effort to identify appropriate levels of road expenditure, and also as an aid to the rational allocation of funds to various projects, the DOT in 1980 initiated a countrywide road needs study. This study has confirmed, and continues to confirm, the inadequacy of funds for road construction to meet the country's road traffic demands.

## INTRODUCTION OF TOLL ROADS IN SOUTH AFRICA

In the light of the steadily decreasing real value of funds for the construction of national roads in South Africa during the 1970s, officials from the DOT, following an overseas visit in 1980 to countries in which toll roads formed part of the road system, reported that "the toll system of financing roads projects was technically feasible in South Africa and could make a modest contribution to road revenue" (Principles and Policies for Possible Toll Financing of Roads in South Africa, unpublished DOT document, Sept. 1981).

A parliamentary select committee considered a proposal to introduce toll roads in South Africa and, after hearing all of the offered opinion, including a report from the DOT, recom-

mended in its report in June 1982 that toll financing of roads on a limited scale be introduced.

In June 1983 the National Roads Act was amended to facilitate the levying of tolls on national roads. In the terms of the act, a toll road project has to be a portion of a national road, the toll road has to be described in detail, and the toll tariffs must be published in the Government Gazette. A number of potential toll projects have been analyzed and evaluated, and during 1984 the first of nine current toll projects was opened to road traffic.

## FINANCIAL STRUCTURE OF TOLL ROADS

The very nature of toll road financing as opposed to fuel levy funding necessitated a different financial structure for the National Roads Toll Fund (NRTF), though it ultimately has the same end as that of levy financing. Rigorous financial management is an essential requirement for toll financing because this form of financing is expensive and is exposed to the vagaries of fluctuating interest rates, the capital and money markets, and the like.

The requirements of a financial structure for toll roads are to provide systems for

- Identifying potential projects;
- Evaluating projects using accepted economic and financial analysis (e.g., rate of return, cost-benefit analysis);
- Setting the financial parameters within which the project is to operate (e.g., finance period, interest rate, rate of capital expenditure);
  - Actually financing projects (e.g., capital market borrowing, other borrowing, grants);
  - Operating the toll road (financial and traffic management including recording and control of operating income and expenditure);
  - Accounting financially for each individual toll road and the NRTF as a whole;
  - Servicing of all loans; and
  - Establishing redemption funds and repaying the loans.

Of the nine identified toll roads in South Africa, possibly only one could be considered completely self-financing as a toll project and this one only marginally so. This has led to a mixed financing strategy, namely toll financing and "soft" loans from the NRF. The degree of toll financing is established by determining that portion of the total project costs that can be supported from net toll income. It is believed that this portion should be at least on the order of 50 percent of the total project costs including the cost of the toll facility itself. The balance is financed from the NRF. The calculation of the load supportable by revenue for a toll project implies that if a loan equal to this present worth is taken out, interest commitments will be paid or repaid (if capitalized) during the analysis period (provided that the same interest rate is used). In this way toll financing makes a substantial contribution to the project cost, thereby releasing levy funds to other less viable projects and to maintenance of the whole road network. Thus there exists a toll- and a fuel-levy-financed portion of the total project cost for each toll road. The toll-financed portion is provided by the capital mar-

ket in the form of short-, medium-, and long-term loans, all of which are repayable within the financing period determined for that project (usually 20 years). The levy-financed portion is provided by the NRF in the form of a long-term loan. The terms of this loan set a moratorium on interest and capital repayments for as long as it takes to repay the capital market loans for each individual toll project (usually 20 years). The interest rate is based on a construction index so that the NRF is repaid in real terms. Theoretically when the capital market and the NRF loans have been repaid for a particular toll project, tolls will be abolished on that project.

The different character of the two forms of funding (viz toll and fuel levy funding) lends itself to applying each form of funding in a different manner. The levy funding is easily obtainable from the NRF, simply by the transfer of funds from one account to another. In practice it is simpler still because all capital and current expenditures (whether toll or fuel levy funded) must be routed through the NRF, which is later refunded that portion of the expenditure that should have been toll funded.

Toll funding is more formal than fuel levy funding and requires planning for the placement of loans on the market, which may often result in under- or oversubscription. The combination of toll and levy funding therefore provides an attractive financing mix from the point of view of budgeting (i.e., one is a flexible, informal funding and the other a more structured and formal funding). The levy funds are also used for funding deficits on current expenditure, but here the term of the loan is short (usually on the order of a few months). Thus the fuel levy funds are used for both capital and current expenditure, and the current expenditure is repaid as a priority after external current loans are repaid.

The fuel levy fund will pay interest on capital market loans during the project construction period and contribute to interest payments during the initial project years when net toll revenue will be inadequate to service the loans. To guard against an overcommitment of the levy funds available to the NRF, a limit of 15 percent was placed on interest payments as a percentage of total levy income.

## ANALYSIS OF POTENTIAL TOLL PROJECTS

The methodology used to analyze toll projects in South Africa addresses three separate areas (1):

- Traffic analysis,
- Economic analysis, and
- Financial analysis.

### Traffic Analysis

In view of the extreme sensitivity of the results of economic and financial analysis to base year traffic volumes and the sensitivity of toll revenue estimates to vehicle fleet composition, emphasis is placed on accurate traffic analysis. To this end, extensive use was made of the so-called Traffic Engineering Logger developed at the National Institute for Transport and Road Research.

The following methodologies are employed to determine toll-eligible traffic (i.e., that part of the corridor traffic for which the toll road would be a "minimum travel cost" option depending on the degree of complexity of the road network).

- In the case of a proposed new road with one or a few alternative routes, an origin-destination survey is undertaken to determine the percentage of corridor road users with interim and final origins and destinations such that the toll road would constitute the minimum travel cost route. In some instances, several different major traffic streams, each with its own relationship of toll-eligible traffic to total traffic, are identified and a weighted average toll-eligible traffic percentage is determined for the total corridor traffic stream.

- In the case of a potential toll road that would form part of an urban road network, the toll-eligible traffic volumes on the potential toll road are determined by applying a computerized urban transport planning package, such as DELTRAN.

The perceived road user benefit with respect to a vehicle in a specific vehicle class is defined, for the purpose of the toll road studies, as savings in fuel and time costs for a vehicle in that vehicle class if the potential toll road were used instead of an alternative route. The methodologies employed to determine the savings in time and fuel cost include the RODES II computer program for rural roads and for urban roads the DELTRAN computer program. Comparisons of travel time and fuel consumption at the expected average speeds during the peak and off-peak periods on the toll road and the alternative routes, respectively, are also made.

The outcome of the traffic analysis has two major applications: (a) it serves as a basic input to the economic and financial analyses, as described later, and (b) it is used in the design of toll plazas.

### Economic Analysis

The second major area investigated for potential toll roads is their potential economic benefits. Indices of the economic worth of a road project (benefit-to-cost ratios, net present values, and internal rates of return) are developed for the before- and after-toll cases. In the "after-toll" case the following negative effects on the economic performance of a project that result from tolling the project are taken into consideration:

- The reduction in road user benefits that results from some road users being tolled "off" the new facility and
- The introduction of toll-related capital and operating costs.

The values of these indices for the project, if tolled, are then compared with those values of the indices that are considered the threshold values for economic feasibility to determine whether that specific project, if tolled, will comply with the threshold values.

Where present worth is determined, the minimum acceptable rate of return is used as the discount rate (currently 6 percent per annum is prescribed by the Department of Finance). To provide more information, the exercise is, of course, also per-

formed at other discount rates and sensitivity analyses are carried out.

In the "before-toll" analysis, the present worths of the new road right-of-way, construction, maintenance, and future rehabilitation cost are determined. In the after-toll analysis, the present worth of toll-related capital cost (including road widening at the toll plaza, control building, electrical works, toll-booths, and electronic equipment) and toll-related operating and maintenance costs are added to the before-toll analysis figures.

In relation to benefits, the present worth of savings in time, fuel, oil, tires, vehicle depreciation, vehicle maintenance, and accidents as well as the present worth of the residual value of the project is determined. For the after-toll case, the present worth of project benefits is reduced as a result of reduced traffic volumes on the new tolled facility.

By including in the total package of economically viable road projects those projects that, if tolled, would still have acceptable indices of economic worth, more economically viable road projects can be implemented with the combination of toll financing and the other sources of income than would otherwise have been the case. Figure 3 graphically shows the economic analysis with respect to a particular project.

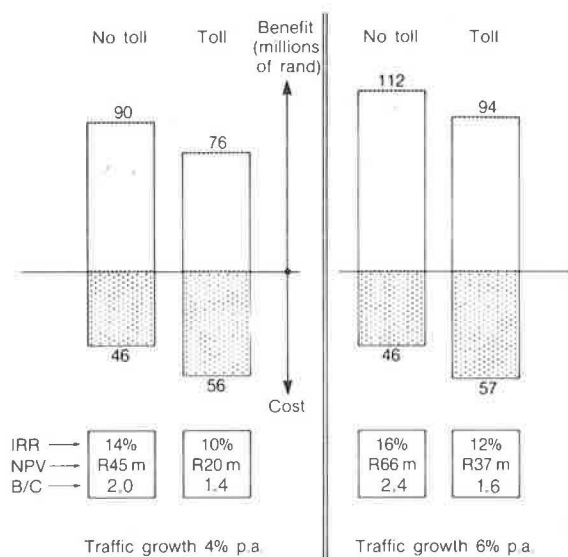


FIGURE 3 Typical results of economic analysis.

### Financial Analysis

The basic premise in the conceptual framework of the financial analysis of potential toll projects holds that even though the project is economically viable after being tolled, it is not a prerequisite for the financial feasibility of the project that the toll revenue should repay the toll costs associated with the project. The objective of the financial analysis of potential toll projects is, therefore, to determine whether toll revenue can make an acceptable financial contribution to the repayment of the construction cost after meeting operating and maintenance cost. Acceptability in this sense is determined by the decision maker who must carefully consider the cost at which this financial contribution is obtained.

The loan supportable by revenue (LSR) is the most important single indication of the financial potential of a toll project compared with the present value of project capital cost.

LSR is determined by first calculating the net toll revenue for each year of the analysis period by deducting from the gross toll revenue in each year (a) toll plaza and head office operating expenditure, (b) toll plaza and toll equipment maintenance expenditure, (c) road maintenance expenditure, and (d) road rehabilitation expenditure.

The loan supportable by future toll revenue is then determined by discounting the net toll revenue in each future project year to its present worth, using the expected real interest rate as a discount rate, and summing the future year net toll revenues.

The toll road financial analysis strategy, which is employed for state toll projects and for which financial parameters have to be quantified, includes the following phases:

#### Phase 1: construction period

- Procurement of capital market loans to the extent that the future net toll revenue can support these loans,
- Procurement of the remainder of the construction cost from the fuel levy income of the NRF, and
- Payment of interest on the capital market loans during the road construction period from the NRF.

#### Phase 2: initial years of the project

- Payment of interest on the loan from net toll revenue (after provision for toll operating and maintenance expenditure) and the fuel levy income of the NRF and
- Short-term capital market loans that can be "rolled over."

#### Phase 3: rest of project life

- Payment of interest on capital market loans from net toll revenue;
- Establishment of redemption or other special funds and the buying back of NTC stock in the secondary capital market;
- Repayment of medium- and short-term capital market loans from net toll revenue and the partial roll over of loans;
- Payment of rehabilitation cost from one or a combination of the following sources: (a) the fuel levy income of the NRF, (b) current net toll revenue, and (c) the redemption fund;
- Repayment of the long-term or, particularly, rolled-over short- and medium-term capital market loans when due; and
- Repayment of the NRF for its contribution to interest payments and to construction cost (to the extent that the latter is possible).

### PROPOSALS FOR ROAD CONCESSIONS

At present (April 1986) toll road projects in South Africa are constructed and operated by the DOT using a small task force within the National Roads Division, termed "Tollplan." As has been described, the financial planning and control of the toll projects are exercised through a National Toll Road Fund.

Recently the department received a proposal from a private-sector consortium made up of road contractors, consulting engineers, and financial institutions for the complete financing,

construction, and operation of certain toll road projects over a period of from 25 to 30 years, with the facilities to revert to government control after expiration of the particular contract or franchise.

To ensure public accountability and also to provide any other interested parties with the opportunity to partake in a possible concession system for portions of the road infrastructure, the Minister of Transport Affairs publicly requested interested bodies to submit proposals for such concessions to the department.

Seven separate groups responded and, on the basis of their potential abilities and financial standing, for groups were chosen by the department to partake in the privatization scheme. These four groups, by mutual arrangement, amalgamated to form two separate potential concessionaires.

The two consortia involved in the offers are so large that they in effect control approximately 80 percent of the country's total private road-building strength. Their proposals could virtually involve the creation of two separate monopolies—one for the Johannesburg region and another for rural toll road construction on the country's two major routes—with the resulting control problems involved in monopolistic situations.

The offers are still under consideration because certain financial guarantees were required by the consortia. From the early negotiations it appears likely that some form of statutory body for the control of toll roads is likely to emerge and that ownership will remain under significant government control until the stage at which full private ownership of the facilities can be considered is reached.

Privatization has a number of advantages and in the department's case the main advantages are that the department is placed in a position to undertake necessary construction projects sooner with earlier resulting benefits to road users and the NRF moneys are freed for other necessary work that cannot be carried out on a fully self-supporting basis.

There are naturally a number of disadvantages or difficulties in the approach. Private enterprise is essentially based on self-interest, and caveat emptor has become part of existence. Progress runs on profit, but there is also the need for optimization in the use of resources and, as explained in the initial part of this paper, for a reduction of public-sector involvement in the provision of basic infrastructural needs. The role of government tends to become that of an arbitrator between private and public interests but with the handicap that decision making has to be based on information supplied by a well-informed interested party to the action. In this light various measures for achieving a workable solution that is fair to all have to be considered. Time will tell whether the approach is practical or not. It is understandable that under such circumstances the government's approach has to be on the cautious side because constraints can always be lifted or relaxed but are not easily imposed later.

The basic aim behind road concessions allied to toll financing is to obtain funds from the private sector at a reasonable cost and on a regular and long-term basis. From the entrepreneur's point of view the aim appears to be to limit equity during the earlier stages of a project and then, as returns improve, to expand the loans. The negative factors involved in the approach are that the loans involved are large; that overseas experience with toll roads has indicated a degree of risk,

particularly during periods when high interest rates prevail; that long payback periods are unavoidable; and that the facilities revert to the government at the end of the concession period. This leads to a situation in which there has to be some balance between risk and reward. In the absence of adequate guarantees and given the undertaking involved in this relatively new kind of venture in South Africa, the required return on investment could be fairly high. To overcome the political and other problems that could result from possible excess profits at some future stage, an approach suggested is to limit profits to an agreed real rate of return and to syphon off the excess into a road-related fund that could be used for expansion of the toll road system. As an alternative, a portion of the fund could be turned into equity for public participation in the operation.

Because of the risk factors involved, and because private-sector entrepreneurs cannot realistically be expected to be concerned with socioeconomic interests at the expense of profits for their shareholders, only roads with potentially high traffic volumes can be considered in the privatization move unless some risk sharing is introduced into the agreement. Other factors such as possible government interaction through the provision of alternative high-quality facilities, the possible creation and control of private-sector monopolies, and the need to ensure free competition in road construction work so that market forces prevail require detailed examination.

At this stage investigations and negotiations concerning the relative merits of two alternative approaches are being carried out. The two alternatives are

- Granting of concessions to individual consortia for portions of the national road network and
- Creation of a statutory toll road authority constituted in such a way that private-sector ownership would eventually result; this body would carry out toll road functions on a tender basis.

To enable the proposed enterprise to be successful two conditions must be met:

- Government must be in a position to ensure and to demonstrate that adequate road facilities for the development of the country are provided in an accountable manner and
- Private-sector institutions undertaking the provision of certain public facilities through privatization must be able to access sufficient funds at a cost that will ensure that in the long term to enterprise will yield adequate profits.

Unless these conditions are met, any attempt to privatize roads will fail.

## CONCLUSIONS

Because of other pressing demands, the allocation of public funds to the road sector in South Africa has been diminishing during the last decade and has been insufficient to meet the needs of road traffic.

In an environment in which government has adopted a policy of reducing public expenditure and encouraging private-sector involvement in the provision of public goods, two new direc-



tions in road financing have been considered during the past 5 years.

Tolling of roads, partly financed by loans taken out on the capital market by the state, has been implemented and, viewed in broad terms, has proved successful. Although the cost of toll collection has been higher than other methods of collection of funds, more efficient use has been made of resources and higher expenditure on roads has resulted.

The granting of concessions to private companies to finance, design, construct, maintain, and operate national roads and to collect tolls is also being considered. Although this will result in greater use of private-sector resources, there is a danger that the public may be exploited or alternatively that the private-sector companies may experience difficulties in the long run. The creation of a statutory body, with a large involvement by

the private sector, to provide certain needed and justified toll roads might well be a better solution to guard against possible exploitation of the public.

#### ACKNOWLEDGMENT

The permission of the Director General, Transport, to publish this paper is gratefully acknowledged.

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# New Thinking on Private-Sector Toll Roads in India: Rationale and Issues

D. P. PENDSE

India's effort to involve the private sector in the provision of tolled roadways is outlined in this paper. Relevant provisions of the Seventh Five-Year Plan (1985–1990) and concerns of the private sector are discussed, and questions that remain to be resolved are summarized.

India has the fourth longest road network (1.7 million km) in the world (Table 1), about 0.8 million km of which are paved, but the unfinished tasks are stupendous: merely to connect by road all villages of 500 or more people by the year 2001 and to raise road density to 0.82 km/km<sup>2</sup> from the present 0.46 km/km<sup>2</sup>, the length of the road network would have to be increased to 2.7 million km.

#### RATIONALE

Some of the many weaknesses of India's road system have been well summed up in the Seventh Five-Year Plan (1985–1990):

As much as 65 percent of the villages in the country are without an all-weather road. Only 47 percent of the road length in the country is provided with a proper surface. Besides, the pavement width of most of the road length is only single-lane. Even in respect of National Highways, 30 percent of the length has a single-lane road pavement. The grid as a whole suffers from serious deficiencies and there is a growing mismatch between traffic needs and available infrastructure, thus resulting in severe capacity constraints, delay, congestion, fuel wastage and higher vehicle-operating costs. It has been estimated that fuel wastage due to bad roads alone costs the country nearly Rs 5,000 million [as of October 28, 1986, the exchange rate was about U.S. \$1 = Rs 12.90] a year, the loss due to extra wear and tear of tyres, spare parts and other components being many times larger.

The task ahead is tremendous because, due to an acute resources crunch, investments sanctioned for roads in successive five-year plans are falling far short of requirements. For example, 600 bridges were needed on the national highways during the sixth plan period (1980–1985), but only 60 were included in the plan, and, in the first 3 years, only 9 were actually sanctioned. Because of cost escalations, the divergence between targets and physical achievements has become even wider (Table 2), and the adverse effects of poor and inadequate roads on the economy and on fuel consumption are becoming clear.