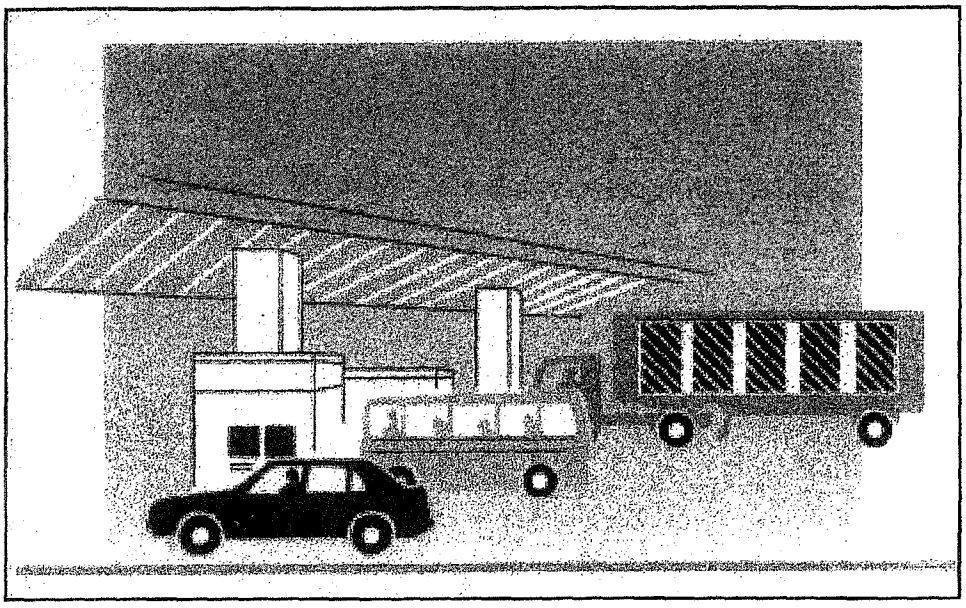
Koos Smit

DRAFT NO. 1

DISCUSSION DOCUMENT

ON

STRATEGIC OPTIONS & POLICY IMPLICATIONS FOR TOLL ROADS IN SOUTH AFRICA



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DISCUSSSION DOCUMENT

ON

STRATEGIC OPTIONS & POLICY IMPLICATIONS FOR TOLL ROADS IN SOUTH AFRICA

CONTENTS

e) Provision should be made for an access road to a toll road from a previously disadvantaged community to be declared a part of a toll project and funded from toll revenue.

3. ECONOMIC AND FINANCIAL FEASIBILITY AND FUNDING POLICY

a) Economic viability of the application of toll financing to a project

The following economic evaluations should be performed in respect of potential toll projects:

° The determination of indices of economic worth for the "before" and "after" toll levying cases and the comparison of these indices with the threshold values indicating economic viability.

° The number of years by which toll financing will have to bring a road project and, therefore, its benefits forward in order to make it economically more efficient than tax financing.

b) Financial feasibility

i) The minimum acceptable LSR contribution to the capital structure of a project is 20%.

ii) The financial safety factor in the calculation of LSRs should be, in order of priority:

- if warranted, a higher real interest rate.

- a safety factor which effectively reduces the predicted gross toll income by the application of a suitable percentage below 100% to it (e.g. 85% would be the current value of this safety factor).

iii) The application of value-capture levies in conjunction with toll roads should be further investigated.

iv) Possible future BOT agreements which include the transfer of an existing road to a concessionaire should allow for this to be a long-term loan against the BOT project which should be repaid if the expected nett income required by the most competitive concessionaire is exceeded.

4. INSTITUTIONAL FRAMEWORK

The following policy guidelines are proposed for discussion:

a) A public sector authority operated on commercial principles (autonomous or within the Department of Transport) using the private sector as much as possible.

b) Selected individual toll road projects given to the private sector on a concession basis. The concessionaire should be appointed on a competitive process without any financial guarantees.

These guidelines are offered as a means to stimulate debate. Based on the outcome of the evaluation procedure any one of the private sector alternatives are possible. The proposals assume that legislation can be altered to address the requirements of the institutional structure.

5. LEGAL FRAMEWORK

It is proposed that, irrespective of the legal requirements of the broader toll road issues detailed elsewhere in this Report, the following guidelines be considered at this stage. Further guidelines will be based on the conclusions drawn after discussion on this document has better defined the direction of toll policy.

- retain the existing Act but allow private sector to collect toll for their own account
- allow the setting of toll tariffs to be controlled by a representative regulating board

- retain the requirement of an alternative route where there is one available. Where no alternative exists the SARB must acknowledge this and make allowances to accommodate local traffic movements in the form of concessions or zero toll.

6. OPERATIONS AND MAINTENANCE OF TOLL ROADS

The following guidelines are suggested for discussion:

a) The private sector should continue to operate and maintain toll roads.

b) The selection of the operator should be by open public tender.

c) The tender period should be lengthened to 10 years.

d) The roadside maintenance and minor repairs of the toll road should be subcontracted to local small companies in order to create employment and to assist in the training of the youth.

7. TECHNICAL ASPECTS OF TOLL ROADS

° In view of the predicted economic viability of the introduction of ETC at many existing South African toll plazas, at reasonably low market shares, ETC should be introduced at these plazas.

° Electronic toll collection should, furthermore, be evaluated as a potential payment method for all new toll projects or when toll equipment replacement or additional toll plaza lanes are being considered.

° Law-enforcement should be based on the principle that violations should be identified before a transaction takes place.

8. PUBLIC RELATIONS, MARKETING AND PUBLIC INVOLVEMENT

It is not possible to provide a step-by-step approach to public involvement, because no two projects or programmes are ever identical. The PIP practitioner's skill lies in the ability to assess the project requirements and the demands in terms of the techniques that will be used and to then have the ability to facilitate between individuals and groups and to the benefit of the objectives of the programme. A number of essential components are, however, readily identifiable:

a) Determine the objectives and the definitions of the PIP:

- information is given outwards in an educative programme
- information is retrieved from the I&AP's
- the information thus retrieved is utilised to assist the decision makers to arrive at a more informed and acceptable decision

b) Identify the decision makers and arrive at an acceptable level of consensus regarding their appointment.

c) Identify the I&AP's in the involved and affected groups.

d) Determine the techniques that will be utilised at the levels of involvement. Typically these levels are national, regional and local.

e) Ensure that the methods that are utilised are able to draw the involved (technical) and affected (user) groups together and that there is constructive interaction between them within the scope of the programme objectives.

f) Ensure that the objective of providing input to the decision makers is attained.

g) Under no circumstances should the PIP be allowed to become a PR exercise or for the objectives to be compromised. All parties must be committed to full and open public involvement.

PART I - INTRODUCTION AND BACKGROUND TO THE REPORT

CHAPTER 1

INTRODUCTION

CHAPTER 2

ROAD FUNDING

CHAPTER 1

INTRODUCTION

1.1 Background to the Study

The SARB at their meeting in September 1993, after suggestion by the then Minister of Transport, asked that a study be undertaken into 'market related' toll tariffs. The terms of reference of this study were to investigate the legal, economic and financial possibilities of toll tariffs which were associated with the cost of the project and the public's willingness to pay, rather than the principle of perceived benefit which applied at that time. In a presentation to the SARB at their meeting in December 1993, it became clear that the benefits of increased revenues from market related tariffs could not be effectively used in terms of current legislative constraints. The Board considered that a policy where revenue collected on one toll road could be used to finance other "toll" roads, on which a toll may or may not be levied, would be of benefit to the country as a whole. This was not possible with the legislation in place at that time.

At their meeting in July 1994, the SARB requested that a study be undertaken to review toll road policy that would also consider the option of re-introducing a dedicated road fund for the financing of new roads as well as maintaining the existing national road network. The wider issues associated with general funding of national roads, including the role which the Provinces will play in future road planning which will have to be accommodated in this investigation, resulted in the decision that two studies should be undertaken. It was agreed in November 1994 that the first should investigate a toll road strategy for the country, while the second should concentrate on a review of the National Road funding policy. This review of strategy was also announced by the Minister of Transport at a public meeting in Northern Natal during November 1994.

This report satisfies the requirements of the first of the above mentioned studies, i.e. toll road strategy.

It should be noted that the focus of the study has been to identify all the issues which should be considered in the formulation of toll road policy. All the technical analyses have been carried out to allow a realistic evaluation of options to be considered at both a managerial

(technical, financial and organisational) and a political level. The need to allow wider issues (such as regional economy, upliftment of the poor and basic) to be included in the debate must be recognised and for this reason it is accepted that such political influences must be accommodated in the process of the formulation of toll road policy.

It should also be noted that the issues are presented in the report in a manner to stimulate and not to stifle debate on which issues are crucial in the formulation of toll road policy.

1.2 Terms of Reference

The SARB have requested that the study consider two fundamental strategic options:

- To continue with the present policy of tolling roads in accordance with existing legislation to supplement the funding allocated by Treasury
- To adopt a new policy which will permit the tolling of new and existing national roads for the purpose of providing finance for the construction and maintenance of roads defined as commercial goods and a road fund for the construction and maintenance of roads defined as public goods.

This report should initially result in a debate and discussion leading up to the formulation of a policy direction. Thereafter, a formal draft policy document will be drawn up for consideration prior to the generation of a Parliamentary green paper that will be used as the basis of a consultation process.

1.3 Context of the Report

As stated above, this report is the result of one of two studies commissioned by the SARB. It is important to note that any recommendations on toll road policy in this report should be read in conjunction with findings of the parallel study on the issue of National Road funding.

In keeping with the objective that this report is a document which will initiate discussion and debate leading up to the formalisation of a policy, a wide range of issues has been considered. All the appropriate technical analyses are included to ensure that the decisions reached are based on a sound realistic foundation and not on principles alone.

In addition, the current political and economic background of South Africa have been taken into account in the report, in particular the requirements of the Reconstruction and Development Programme as it represents overall Government policy and where the business of toll roads can support its objectives.

1.4 Goal and Objective of the Study

Noting the background and context of this study, the **GOAL** of the study has been defined as the development of long term toll financing strategies to preserve and develop the primary road system. These strategies should:

- include the envisaged role of toll financing
- be in line with overall government policies and goals (RDP)
- take due regard of the users' needs of the primary road system
- take due regard of the policy study on National Road funding.

The **OBJECTIVE** of the study is to define strategic options and associated policy implications to allow decision-makers to determine the most appropriate strategic option on which to base future policy. The options will be defined in terms of:

- types of road to be tolled
- financing mechanisms
- institutional mechanisms
- legal aspects
- economic aspects
- toll tariffs
- public involvement, marketing and public relations

1.5 General Issues Relevant to the Study

The prevailing issues which are relevant to this study are :

- Goals of the new Government
- The need to develop and maintain a major primary road network
- The relevance of international toll road policies and operational aspects with regard to South Africa.

Each of these is discussed briefly below.

1.5.1 Goals of the new Government

The formulation of toll road policy cannot be carried out without taking cognisance of the wider political environment. Under certain circumstances, the influence of political issues will outweigh the technical or financial issues of feasibility studies and operational aspects of proposed and existing roads.

The goals of the Government of National Unity (GNU) are best summarised in the preamble to the White Paper on the Reconstruction and Development Programme. In essence, these are:

- to gradually reduce fiscal deficit
- to ensure that recurrent government expenditure does not increase in real terms
- to reduce government dissaving over time
- to increase the proportion of capital expenditure in government spending
- to finance the RDP primarily through restructuring governmental budgets towards the RDP priorities
- to reorganise and train the civil service to ensure effective and efficient services
- to develop the country's human resources, to facilitate labour market reform and to establish effective collective bargaining-based rights for all.

These goals have been based on the GNU's commitment to effectively address the problems of poverty and the gross inequality evident in almost all aspects of South African society. They are based on the recognition that growth and development are more than interdependent, in fact they are mutually reinforcing. In addition, the Government recognises that to successfully stimulate growth and development, active participation by society, business and labour will be needed.

The goals which could be supported by toll roads include the reduction of fiscal deficit, increasing the proportion of capital expenditure (if guarantees are provided) and assisting in the development of the country's human resource via job creation on toll road projects.

1.5.2 Keys aspects of the Reconstruction and Development Programme

The philosophy of the RDP is based on the six basic principles, namely

a) An integrated and sustainable programme
b) A people driven process
c) Peace and security for all
d) Nation building
e) Link reconstruction and development
f) Democratisation of South Africa.

The Government recognises that the programme must be affordable, given the stated commitment to fiscal discipline and achievable goals. The programme will integrate growth, development, reconstruction, redistribution and reconciliation. This will be achieved by an infrastructural programme that will provide access to modern and effective services such as electricity, water, telecommunications, **transport**, health, education and training for all. This will apply to urban and rural areas alike. The toll road policy should support these principles where possible.

The five key programmes of the RDP are :

a) Meeting basic needs
b) Developing human resources
c) Building the economy
d) Democratising the State and society
e) Implementing the RDP.

As stated in the White Paper on the RDP, the people should be included in the decision-making process on RDP projects (including services and transport) and should therefore help to decide where infrastructure is located, be employed in its construction and be empowered to participate in the management and administration of large scale developments. It is important therefore that toll road policy recognise this aspect of government policy. This can be achieved by ensuring that proposed toll roads improve the quality of life as well as include community projects and include labour-based construction (and maintenance) methods in the design process.

It is recognised in the White Paper that, along with mining, manufacturing, agriculture, commerce and financial services, infrastructure is well developed. Accepting these as strengths, they must be used to build the economy and tackle the present weaknesses. In particular, if the use of toll roads can reduce the overall transportation cost of users and the cost to the economy of the provision of road infrastructure, one should expect this to have a positive impact on the economy.

In the context of GATT and building the economy the efficient production of goods for export is important. The development and maintenance of a reliable road network to ports and other exit points will assist in making South African goods more attractive to international markets. This should be considered in the formulation of toll road policy.

1.5.3 The Need to Develop and Maintain a Major Primary Road Network

Road transport is the dominant means of transport in most countries and investment in roads accounts for a major part of the government's stock of public capital. The replacement costs of main roads in developing countries is generally greater than the investment in power generation and distribution in these countries. Roads in general are important economic assets and need to be well managed to ensure they produce value for money. The preservation of the primary road network is critical, in order that the country sustain economic growth and become more competitive internationally.

The road networks are, nevertheless, nearly always administered by government departments and are subject to little market discipline. According to a World Bank discussion paper[1] most roads in developing countries worldwide are badly managed, poorly maintained and underfunded. Also, allocations for road maintenance have generally been so low that vast sums of the road infrastructure capital stock have been eroded. This situation is also starting to occur in South Africa.

South Africa has entered an era which is likely to usher in prodigious changes, not the least of which will be in the roads field. Bearing in mind the likely move towards redressing social inequities of the past, particularly in the provision of roads to less developed communities in both rural and urban areas, it is anticipated that the primary road system will suffer in respect of the provision of funds from the normal source, i.e. allocations from the Exchequer.

If South Africa is to prosper, and taking into account that its major industrial complex is situated at the centre of the country (far from its harbours and boundaries with its neighbouring countries), allied to the fact that export is a significant factor influencing growth, a reliable and well developed primary road system is a prerequisite for development and economic growth.

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[1] (Heggie, Ian G, Improving Management and Charging Policies for Roads - An Agenda for Reform, Discussion Paper INU92, World Bank, Washington 1991

Economic realities would seem to indicate that the primary road network can be regarded as a "commercial good", the provision of which should be based on "user pays" principles, whilst the secondary and lower order roads, which have a distribution function, can be regarded as "public goods" for which the general taxpayer should bear the primary responsibility. In this context, toll roads are seen to form part of the major primary road network, particularly that part which can sustain the financial cost of the infrastructure.

1.6 Relevance of International Experience

It is acknowledged that the international experience should only be used as a basis for developing policy guidelines and policy itself if the various aspects are specifically relevant to the South African situation. As an example, the successful public relations, marketing and public involvement mechanisms in use overseas would have to be carefully analysed to ensure that they are in fact relevant to our situation. The relevance of institutional mechanisms would also require close examination to ensure their applicability. On the other hand, experience of overseas toll authorities on issues such as advanced technologies, analysis techniques and financing mechanisms would be beneficial if suitably incorporated into the eventual toll policy.

Hence, where appropriate, the existing practices internationally have been considered in the development and evaluation of the various options in each of the categories identified in Section 3.2 below.

1.7 Structure of the Report

The report has been submitted in two volumes.

Volume 1 - Main Report includes the description of the various options, the evaluation of these options and the policy guidelines. The results of the various analyses and their likely impact on the relevant policy issues are also included. Volume 1 following is made up of the following Parts:

Part I	:	Introduction and Background to the Report
Part II	:	Role of Toll Financing
Part III	:	Institutional and Legislative Implications
Part IV	:	Functional Areas
Part V	:	Conclusions and Recommendations

Volume 2 - Appendices includes all detailed quantitative analyses as well as detailed descriptions of the various sections of the Main Report.

1.8 The Process of Strategic Planning leading up to Policy Implications

The elements of the Main Report have been based on normal practice with regard to the development of strategic (business) plans. In order to facilitate a creative policy review process, the following steps underlying creative strategic planning were followed:

1.8.1 Analysis for Strategic Insights

In order to provide information which will allow everybody involved in the policy review process to gain insight into each of the functional areas considered, existing practices are stated. To precipitate fresh strategic thinking issues related to these existing practices and any other matters in the functional areas are identified by viewing the toll business in new ways.

This part of the process has been documented in the report as:

- "Existing practices" and
- "Issues".

1.8.2 Creative Strategic Thinking and Building of Strategic Concepts

Using the strategic insights obtained as a platform, "creative leaps" in thinking have to be made. This involves a visualisation of the toll industry in the next 10 years and beyond and the generation of new strategic options involving potential new applications of toll financing,

new institutional mechanisms and new approaches to important issues in different functional areas.

This stage involves the transformation of new ideas into possible solutions. Care should be taken not to eliminate concepts prematurely. The potential feasibility of new applications of toll financing, new institutional mechanisms or new approaches in toll functional areas, however, had to be considered before formulation of potentially viable options.

This part of the process has been documented in the report under "Options".

1.8.3 Facilitating Strategic Decision-making

This part of the strategic planning process has been documented in the report as: "Evaluation of options".

In an attempt to facilitate discussion and eventual strategic decision-making and to sort the wacky from the workable, a qualitative and/or quantitative evaluation of options was performed. Although one should not become a prisoner of analytical methods, financial feasibility calculations are appropriate at this stage.

In view of the participative nature of this policy review process, no firm and final recommendations are made at this stage after the evaluation of strategic options.

1.8.4 Potential Vision, Mission and Policy Guidelines

Although the formulation of a vision, mission and policy guidelines for toll financing in South Africa cannot be undertaken until the Board itself has discussed and evaluated the options detailed in this Report, some potential visions, missions and policy guidelines have been included in the report to facilitate discussion.

These have been documented in the report under "**Potential Visions, Missions and Policy Guidelines**" in the Conclusions and Recommendations.

1.8.5 Tactical and Action Plans

The formulation of tactical strategies and action plans to implement the eventual strategic decision will have to be attended to after discussions and debate result in more clarity on the Vision and Mission.

1.9 Elements of Toll Road Policy

To support the strategic planning process described above, the report has considered the subject of toll road policy under the following categories :

Part II : Role of Toll Financing

- Identification of Toll roads
- Feasibilities
- Economics
- Financing
- Road Funding

Part III : Institutional and Legislative Implications

- Institutional Framework
- Legal

Part IV : Functional Areas

- Toll tariffs
- Operations
- Technical
- Public relations, marketing and public involvement

Each category has been analysed and discussed under the sub-category titles of :

- Existing Practices
- Issues
- Options - statement & description
- Evaluation of options
- Guidelines
- Conclusion

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CHAPTER 2

ROAD FUNDING

2.1 Integrated Road Management System

The South African Roads Board (SARB) and its administrative arm, the Department of Transport, has introduced an integrated road network management system which incorporates the principles of strategic management in order to develop the road system. This process is applicable at present because of the change to traditional policies and operating methods within the public sector. The role of the "bigger picture" is now more apparent.

Road funding is one of the major strategic management systems which needs to be addressed in order to achieve an integrated road network management system. In the past 20 years funds for roads have come from a dedicated road fund (via a fuel levy), toll roads and more recently directly from the Exchequer. The availability of funds for new national and provincial roads has declined steadily over this period from about R3000 million in 1975 to about R150 million in 1994 (in 1993 Rand).

Toll roads are part of the financing strategy which needs to be addressed in the integrated system. Toll financing is gaining in importance and its contribution has increased substantially in South Africa since the first toll road opened in 1984, especially in the provision of new roads. Many countries are now investigating or implementing a process to commercialise their major primary road network by charging for the use of roads. This usually subjects them to more market discipline and the network takes on the characteristics of private goods. The two most favoured mechanisms of pay-as-you-go system are toll roads and earmarked (or dedicated) road funds.

The minor primary roads and secondary network which give access to all, are primarily financed through general taxation at national, provincial or local level. These roads are treated as public goods on the grounds that users cannot easily be excluded from using them. Road users pay taxes which are credited to general revenues and road expenditures are then financed through budget allocations determined as part of the annual budgetary process. There is no clear user charge and there is no connection between road taxation, the cost of road usage and expenditures on roads.

These two levels of road funding mechanism, user charging and tax revenues should coexist within the same financing strategy. The decision which is required, however, is which mechanism is best suited to fulfil the goals of the overall integrated network strategy.

The Cabinet has decided that roads are one of the six economic priorities of the country. In order for the needs and limited financial resources to be reconciled, an holistic view to road funding is required. Strategic financial planning requires a matching of current actions and long term goals based on a view of future needs. A "business" plan is therefore required which will identify the necessary financial resources and methods of allocating these. The basis of this plan is one of going back to first principles (i.e. cleaning the slate) and allowing participation by all roleplayers.

This report is focused on toll road financing aspects but in drafting the strategic options and policy implications it was accepted that toll roads are only part of the overall road funding scene. The policy guidelines suggested in this report should be read in conjunction with policy options which have been identified by those dealing with the funding of other roads. The overall goal is, however, to create an integrated road funding strategy where all funding mechanisms are identified, analysed and evaluated and put to stakeholders for discussion. The conclusions in this report recognise this and, once discussions have taken place, will be focused into a comprehensive policy document.

PART II - ROLE OF TOLL FINANCING

CHAPTER 3

STRATEGIC OPTIONS IN RESPECT OF THE ROLE OF TOLL FINANCING

CHAPTER 4

ECONOMIC AND FINANCIAL FEASIBILITY AND FUNDING POLICY

CHAPTER 3

STRATEGIC OPTIONS IN RESPECT OF THE ROLE OF TOLL FINANCING

3.1 Existing Role of Toll Financing

3.1.1 Existing and approved toll projects[1)]

Since an amendment to the National Roads Act in 1983 legalised the tolling of national roads in South Africa, 12 South African toll roads covering a distance of approximately 660 kms have been established. These roads are being tolled at 16 mainline plazas, 6 sets of ramp plazas adjacent to mainline plazas and 9 sets of remote ramp plazas. Figure 3.1 shows the location of toll plazas on national roads in South Africa.

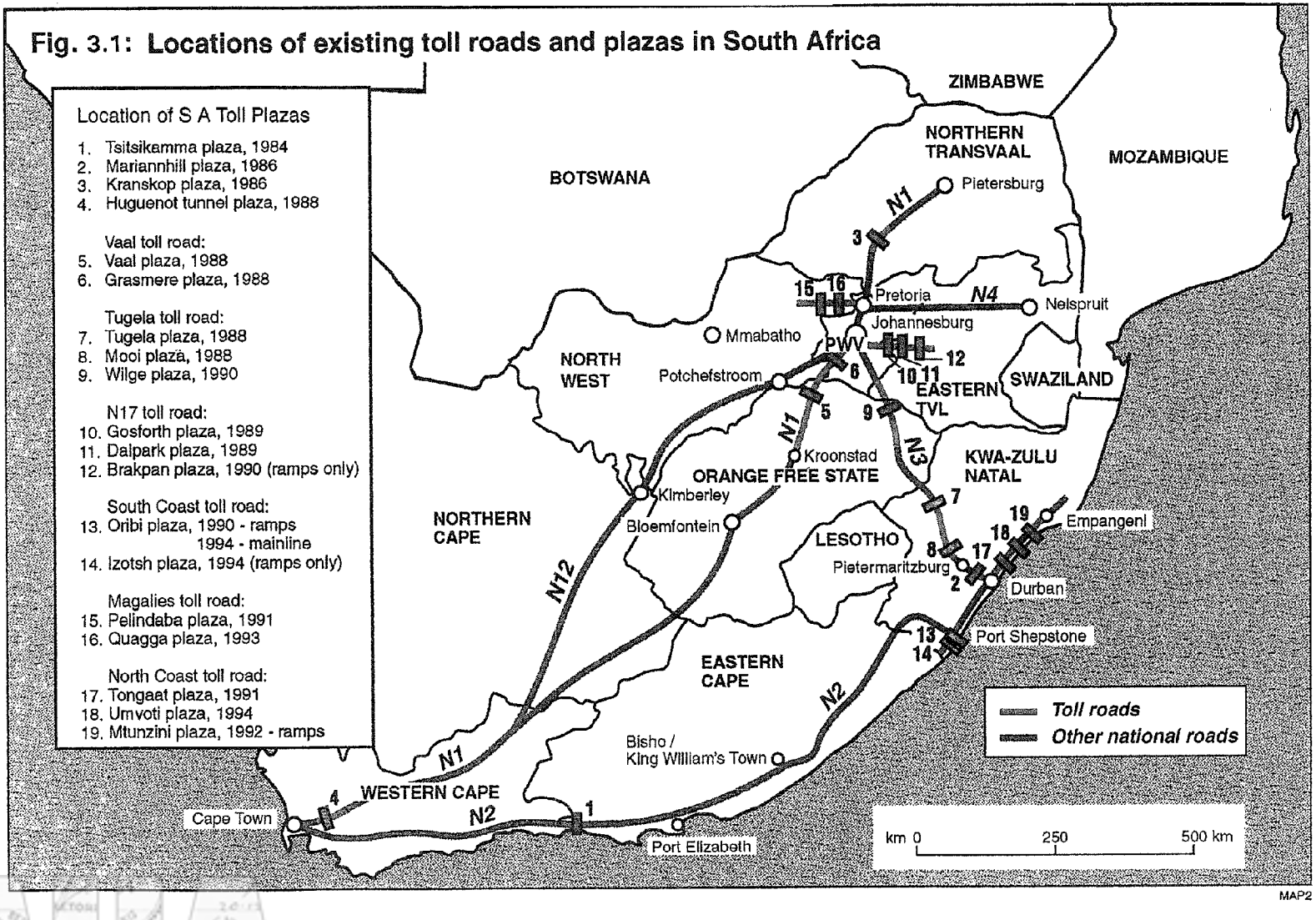
Apart from the toll plazas already in operation, the construction of the following plazas have been approved by the Roads Board:

- N1, Warmbaths - Pietersburg: Potgietersrus mainline and ramp plazas (1997)
- N2, Empangeni - Stanger: Mtunzini mainline and ramp plazas (1996)
- N2, Hibberdene - Marburg: Umtentweni northern ramp plazas (1997)
- N17, Germiston - Johannesburg: Gosforth western ramp plazas (1996).

3.1.2 Present financial contribution of toll financing

From a very humble beginning, when the Tsitsikamma toll road "pilot project", yielded a gross toll income of R689 666 in the 1984/85 financial year, the gross toll income of all South African toll roads has risen to R198,2 million in the 1993/94 financial year. A gross toll income figure of about R224 million is expected in the 1994/95 financial year.

Fig. 3.1: Locations of existing toll roads and plazas in South Africa



MAP2

Figure 3.2 depicts the rapid growth in gross toll income for each financial year since 1984/85, in actual rands as well as in 1984 real terms.

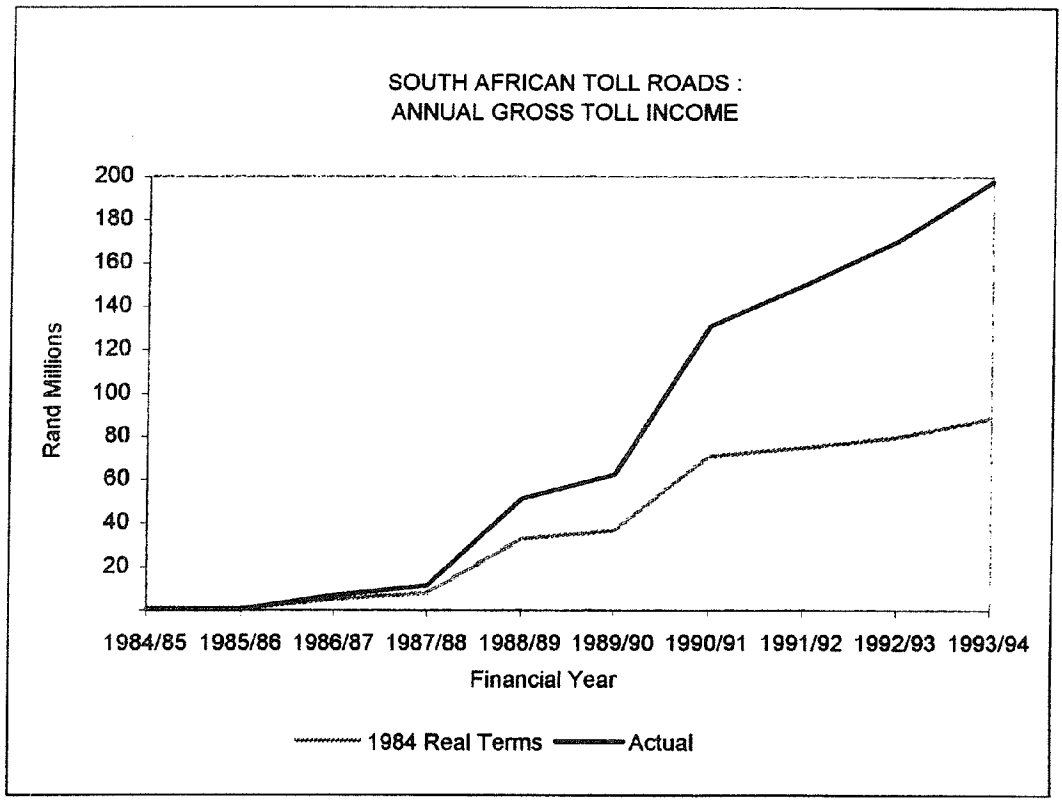


Figure 3.2

The first South African toll road stock of R15,4 million was issued in the capital market in January 1984 by means of a private placement. By March 1994, i.e. one decade later, toll road stock issued in the capital and money markets had grown to R1 749 million, with the cash value of outstanding loans amounting to R1 535 million. Figure 3.3 indicates how toll road stock issued in the capital and money markets grew in the period 1984 to 1994.

The financial contribution of modern toll financing in its first decade in South Africa can therefore be described as equivalent to about R150 million per annum (in 1994 Rand) or equivalent to about three years of NRF revenue from the fiscus (at 1994 levels).

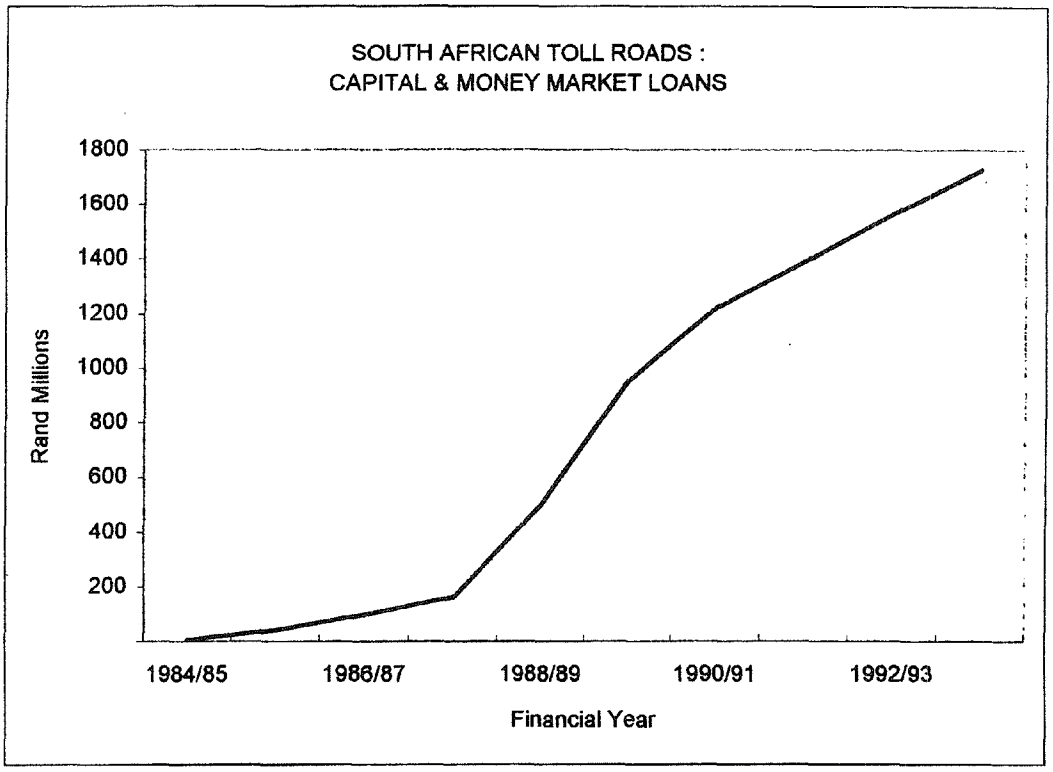


Figure 3.3

3.1.3 Toll financing contribution in overall road financing context

Although the gross income of South African toll roads is still relatively small in international terms, it constitutes about 35% of the annual allocation from the Exchequer to national roads in South Africa.

3.1.4 Factors affecting the role of toll financing

The extent to which toll financing is applied towards the funding of major roads, both locally and internationally, is determined, inter alia, by the following factors:

- The economic rationale for toll financing
- The potential financial contribution of toll financing
- The physical characteristics of the roads to be tolled and the alternative route concept
- The degree of road improvement before tolling of a road should commence
- The degree of flexibility in respect of the application of toll income
- The granting of the legal power to create toll projects to provinces and metropolitan authorities.

The influence of each of these factors will be discussed in the following subsection.

3.2 Issues Determining the Role of Toll Financing

3.2.1 The economic rationale for toll financing

a) The case for road user changes

The essence of the case for road user charges of which toll financing is a very direct form is presented by Walters[2] in the following way:

"The price for the use of the road should measure the value of the resources expended in providing that service. With a user charge reflecting the cost, the road user can decide whether his interests are best served by "buying" the road journey or by purchasing some other commodity; and the resources will be devoted to the use that most satisfies him. When prices reflect costs, resources will be efficiently distributed between road journeys and other things, and between one sort of road and another and between one agency and another."

b) Classical economic arguments on why only congested roads should be tolled

i) Short run marginal cost pricing

In terms of short run marginal cost pricing, the cost of a vehicle trip consists of the following:

° The private cost of the trip, i.e. the operating cost consisting of fuel, wear and tear and, perhaps, driver wages which the vehicle owner is legally obliged to meet and is therefore self-financing.

° The social cost of a vehicle trip with the following elements:

- **Variable road maintenance cost** which is borne by the road authority. If there is no congestion, this is the only social cost (excluding difficult to measure costs such as noise and accidents) which should be considered part of the cost of the journey.

  It is important to note that the construction and fixed maintenance cost of the highway are not part of the cost of a trip since no fraction of these resources can be saved if a motorist does not undertake an additional trip. The resources invested in the highway were committed in the past and are therefore sunk costs.

- **Congestion costs:** If an additional vehicle trip is added to a road in a congested condition, this vehicle will get in the way of other vehicles using the road and will cause their costs to increase as they waste more time in traffic jams and incur a higher vehicle operating cost per km in the congested traffic.

- The most economic use of resources, at a given time and over time, requires prices to be set equal to marginal costs. The objective of road user charges should then be to properly exact the most important social costs from the road user. If user charges are too low, too many trips will be undertaken, adding to congestion. It could be argued that user charges do not adequately reflect the congestion cost in large cities and that congestion and low speeds are the consequences.

  If, on the other hand, user charges exceed the sum of the variable road maintenance cost and the congestion cost, the vehicle owner will not be undertaking certain trips because of the high tax. Consequently the benefits offered by the road will not be fully utilized. It could be argued that such conditions are typical of most interurban and rural highways. In particular, examples are available of the under-utilisation of some rural toll roads.

  Road user charges should therefore reflect the social cost elements of a vehicle trip so that the private cost of the vehicle owner - including the "correct" user charge per vehicle-km - will reflect all the consequences of his decision to use the road.

ii) Rural and interurban roads

Some roads resemble "pure public goods" in the sense that one user's enjoyment of the good or service in no way inhibits anyone else from enjoying it. In practice, it seems that many rural and interurban roads do in fact approximate being public goods, since congestion is so infrequent and small that it can be ignored. For these roads, therefore, no price should be charged for their use. (For the purpose of this argument, variable road maintenance cost caused by the passage of one vehicle is neglected).

Whereas the use of such a road is a pure public good, the **provision of the road** involves alternatives foregone and the general principle of investment choice, therefore, remains, viz. that roads should be built so as to maximise the surplus of total benefits over total costs. Equity, furthermore, suggests that a levy should be charged in proportion to the benefits derived from an extension of the road system. Economic theory, however, then requires that, whichever system of financing is used, it should avoid, as far as possible, imposing any price on the use of an uncongested road.

iii) Congested urban roads[3)]

As has been shown in the previous sections, the most economic use of resources requires prices to be set equal to marginal costs. In the road sector, marginal cost can be equated to the costs avoided, that is the eventual costs not imposed on other users and on the road authority, when a trip is not undertaken.

On congested roads, mainly urban or suburban, the individual road user who pays the "average" cost does not pay the full marginal cost he imposes (See Figure 3.4 on the next page). Even if he pays the "average" marginal cost of the road system he will still not pay the full cost of the congested road use. While each user pays for his own vehicle operating costs and travel delays, he also imposes costs and delays on other road users, and increases the environmental pollution - traffic noise, exhaust fumes, etc. - and even the accident risk, for which the individual vehicle owner is not charged. On congested roads private cost may be lower than social cost, yet demand is based on private cost only. A toll equal to the difference between private and social cost, should reduce demand to its "economic" level. The congestion toll requires the user to pay the (marginal) cost of using the congested road, including "external" costs. To be fixed accurately it is necessary to test the elasticity of demand for trips on the congested road (and experience shows that this is by no means negligible); overcharging results in underutilised roads. **The toll is thus a device for selling scarce road space to the highest bidder.**

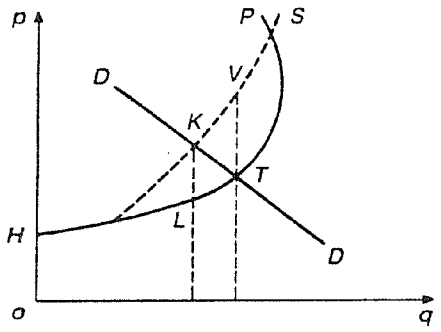


Figure 3.4

HP is the supply curve, i.e. the operating costs as perceived by the driver. HS is the marginal social cost curve. DD is the demand curve. Without tolls the effective demand(q) would be T, at which extra costs VT -externalities- would be incurred. By levying a toll KL, demand is reduced to the point K and no externalities apply.

Since congestion is unlikely to occur on limited access interurban roads it could, from an economic efficiency point of view, simply be argued that there should be no toll financing of such roads. In theory, road user charges (excluding tolls) should provide enough revenues to cover adequate road maintenance of justified roads, built to adequate capacity and government budgets should be able to finance the required recurrent expenditure to make roads last as long as intended and realise the potential benefits.

c) Toll roads and accelerated roads development[3)]

In practice, toll financing is employed to allow the construction of certain roads to start earlier than if general tax revenue had to be relied upon. Where this is the case, the earlier appearance of user benefits can be viewed as a benefit of tolling.

The extent to which toll financing can be employed to bring forward the realisation of the user benefits of a new facility depends upon the availability of funds from other sources.

In practice, also, funds for maintenance are, more often than not, insufficient and/or not available when required. The use of toll revenues from a particular facility is normally prioritised to ensure adequate maintenance. In this scenario, toll financing, therefore, improves resource allocation by ensuring the preservation of assets.

d) Tolling of "high serviceability" roads versus "national standard" roads

In the 1991 review of South African toll road policy,[4] an economic case was made by the Council for Scientific and Industrial Research (CSIR) and Tolplan for the provision of "high serviceability" roads, including existing roads with those characteristics, by means of toll financing, while using tax revenues for "national standard" roads. In view of the importance of this economic rationale in the context of strategic options on the role of toll financing, the case is repeated here:

i) A distinction is drawn between "high serviceability" and "national standard" roads

South Africa's road system must provide a certain minimum level of service. This must be suited to the demands of road users, which are derived in turn from the characteristics of the country's spatial economy. It must also be commensurate with the country's financial ability. Accordingly, the level of service that is appropriate will alter from time to time as a result of fluctuations in the economy.

It is the Department of Transport's responsibility to determine the appropriate level of service by defining a "national standard" for roads in general, which balances prevailing demand and supply levels.

It may, however, be that certain groups of road users demand higher standards of roads, and are able to pay for them. It is necessary in a free market economy to allow such affordable preferences to be met.

Allowance should therefore be made for the provision of "high serviceability" roads alongside "national standard" ones. The latter will serve to keep road standards in South Africa in line with conditions in other sectors of the economy, while the former will permit free market preferences to be exercised.

"National standard" roads are defined as roads that conform to standards laid down by the Department of Transport, or which already exceed such standards by virtue of higher standards having existed in the past. "High serviceability" roads are those which will, as a result of either upgrading or new construction, come to exceed the national standards that are in force at the time of their upgrading or construction. Whether a road is to be viewed as a "high serviceability" facility will thus depend on the physical standards it exhibits, the traffic volumes it carries, the speed limits that are enforced, and the alternative roads or transport modes for which it is a substitute. "High serviceability" roads will also include those roads that have been built in the past explicitly in order to provide unusually high level facilities, generally requiring special funding arrangements.

Where existing roads are concerned, it follows that certain unusually high level facilities may immediately be considered to be "high serviceability" roads, simply because they were built specifically with that objective in mind. For the rest, the distinction between "high serviceability" and "national standard" will become relevant when a road is to be upgraded and there is a choice of the degree to which this should be done.

Where new roads are to be constructed, the distinction as to whether they are "high serviceability" or "national standard" roads will depend on the purpose they are to serve.

It is generally accepted that it is the government's function to provide communities with an acceptable level of basic access. Newly constructed national standard roads thus will be prevalent during the early part of the economic emergence of a country or a geographic region within it. The fruits of specialisation in economic activities establish a need for enhanced access to markets and raw materials that only roads can satisfy. Such roads would, however, initially carry limited traffic that could not bear the burden of high direct costs, so commercial provision of roads is out of the question. There are then strong grounds for supporting road construction out of general

tax revenues, because the benefits of roads are spread throughout the community.

New "high serviceability" roads, by contrast, are found in mature communities with a strong economic base. Access to these communities already exists in the form of a well-established road network of reasonably high quality. It might, however, well be the case that certain of those roads are beginning to deliver declining serviceability levels to their users, primarily because of congestion. There is, therefore, a demand for upgraded facilities, but it is of great importance to recognise that this emerges from certain road user groups and not from the general public. Consequently, it is reasonable to provide such facilities, but not at public expense - their "publicness" is, at best, minimal.

ii) "High serviceability" roads should be financed from tolls

As a general rule, governments should seek to promote efficiency in the economies that they control.

The term efficiency here refers to a maximisation of the level of satisfaction of society's unlimited wants that can be achieved with the limited resources that are available. In short, an efficient outcome is one that maximises individual economic welfare.

User charging is a means of achieving efficiency because it matches, or "rations", the supply of resources - in the present instance roads - to sources of effective demand. Such rationing is absolutely essential to the achievement of efficient economic outcomes and is the fundamental factor that causes free market mechanisms to be efficient in their resource allocation.

The provision of "high serviceability" roads is essentially a "commercial" type of government activity. Such roads are not true public goods because people can be excluded from the receipt of benefits and externalities are

limited. In fact, these roads could effectively be provided by the private sector were it not for the fact that they have certain natural monopoly features which make public control desirable.

Under these circumstances, user charging has several important advantages.

- It facilitates investment decisions by government. Existing roads will tend to be over-utilised and become congested if they are provided free, leading to demands for excessive investment in increased capacity.

- Adequate charges that limit the use made of roads prevent waste in the form of congestion and distorted locational decisions that favour excessive distances from resources or markets.

- User charging frees general tax revenues for use in meeting other high-priority societal needs.

- There is no justification for making the general taxpayer foot the bill for a service that benefits certain individuals directly, unless user charges would result in severe burdens on low-income groups.

- User charges facilitate optimal allocation of traffic between roads and other transport modes.

User charging by way of tolling is, therefore, an appropriate way in which to have "high serviceability" roads controlled by the state but financed as the private goods which they rightfully are. In fact, were it not for the practical difficulty, and hence expense, of levying them, tolls would be seen more generally as the best way of ensuring efficient road provision. Often this expense prevents their use, but in the case of "high serviceability" roads, which by their very nature are provided mainly for the benefit of users in the higher income categories, and which have particular physical characteristics such as limited access, this objection falls away.

3.2.2 The potential financial contribution of toll financing

The role played by toll financing is, of course, dependent upon the extent to which toll financing can contribute financially to the initial capital cost of the road facility to be funded.

The philosophy[1] upon which the South African toll financing system was predicated was that capital and money market loans, redeemed by nett toll income, could provide a mechanism for the partial or total funding of necessary road projects which would otherwise not have been possible to fund from the Exchequer. The practical expression of this philosophy is that a price is exacted from the motorist for the use of a "high serviceability" road while allowing him or her the option to choose an alternative "national standard" road. In order to be financially conservative and to achieve a high attraction rate to the toll roads, toll tariffs on South African toll roads have been set at a level where the tariff amounts to a portion, only, of the total b by the toll road when compared to the best alternative route. If a parallel is drawn between "user benefits" in economic analysis and "toll income" (resulting from tariffs based upon a portion of user benefits) in financial analysis, it becomes clear that a toll road may be economically viable, but not necessarily fully self-funding.

The actual financial contribution of toll road capital and money market loans, supported by future nett toll revenue, to the capital funding structure of all South African toll roads at 31 March 1994, is shown in Table 3.1.

TABLE 3.1
CAPITAL FUNDING STRUCTURE OF SOUTH AFRICAN TOLL ROADS AT 31 MARCH 1994

Capital/money market loans (cash value)	NRF long term loans	Total capital invested
R1 535 million 49%	R1 598 million 51%	R3 133 million 100%

If the cash value of toll road stock in March 1994 Rand is compared with the value of National Road Fund long term loans at the same time, it can be concluded that the current capital structure of existing toll roads consists of roughly equal amounts of private sector loans and NRF long term loans.

3.2.3 The physical characteristics of the roads to be tolled and the alternative route concept

When demand for high-speed limited access divided highways emerged in the United States of America in the 1940s, it was toll financing and not traditional tax financing, that sparked the era of the superhighway[5]. Modern toll financing has, therefore, come to be associated virtually exclusively with limited-access grade-separated highways and the South African experience to date has been no exception.

Since a limited-access, grade-separated highway is very rarely the first major road in a corridor or urban area to be provided, a natural result of the practice to toll only such limited-access grade-separated highways is that a secondary alternative route (usually a provincial road or urban arterial), serving the same origins and destinations, is usually available.

In this situation, the debate about an alternative route is virtually always a debate about the quality of the alternative route. This is borne out by case studies of previously existing roads in South Africa being tolled after minor or major rehabilitation and/or upgrading. In all these cases, tolled at the Mooi, Grasmere, Gosforth and Mvoti toll plazas, alternative routes did not have to be constructed - they were available. In all cases, it turned out, however, to be necessary to spend of the order of R5 million-R15 million to upgrade the alternative routes in order to increase acceptance of their suitability by the travelling public.

There are, however, some limited-access roads which have gravel roads as their alternative routes. These are, in many cases, facilities in respect of which the long-term planning is for present at-grade intersections to become interchanges. The roads listed in Table 3.2 have been pointed out to the study team by Mr L Terblanché of the Department of Transport (also see Figure 3.5):

TABLE 3.2
LIMITED-ACCESS ROAD SECTIONS ON FREEWAY ALIGNMENTS WITH PRESENT AT-GRADE INTERSECTIONS AND WITH GRAVEL ALTERNATIVE ROUTES

°	N1	Bloemfontein - Colesberg in the Free State
°	N2	Empangeni - Kwazulu-Natal/Eastern Transvaal border in Kwazulu-Natal
°	N7	Bitterfontein - O'Kiep in the Northern Cape
°	N2	Gonubie - Mooiplaas in the Eastern Cape*
°	N10	Britstown - Noupoort in the Northern Cape
°	N14	Olifantshoek - Namibia border in the Northern Cape
°	P109-1	Springs - Devon in the Eastern Transvaal

*some uncertainty regarding status of alternative route

The N2 between Empangeni and Mkuzi is on the current 5-year budget of the Roads Board for rehabilitation at a cost of about R60 million.

Should some of these cases be considered for tolling as part of a new policy, some local road users will be deprived access to any toll-free "national standard" route. This will be the situation unless the available gravel road alternatives are considered to be acceptable "national standard" routes.

Freeways with gravel alternatives and non-freeways requiring rebuilding/rehabilitation 3.5

Another result of the practice to only toll limited-access, grade-separated roads and the resultant availability of some secondary route (albeit a gravel road, in a few cases) to travel between the same origins and destinations, is that no individual is put into the situation where access to his/her home or work is only possible by means of a toll road, i.e. there is the element of freedom of choice.

An evaluation of the five-year budget of the Roads Board and of the Pavement Management System of the Department of Transport indicated that many of the important improvements to the national road network required in the next 5-10 years involve the rebuilding and rehabilitation of existing two-lane single carriageway routes, for example (See Figure 3.5):

- the N2 through the previous Transkei and Ciskei areas of the Eastern Cape
- the N2 between Port Shepstone and Kokstad in southern Kwazulu-Natal
- the N4 between Wonderfontein and Machadodorp in Eastern Transvaal
- the N4 between Kaapmuiden and Komatipoort in Eastern Transvaal
- the N1 between Winburg and Kroonstad in the Free State
- the N1 between Pietersburg and Messina in Northern Transvaal.

Although many potential strategic options exist for the funding of these needs, the aspect of importance here is the fact that the rebuilding, upgrading and/or rehabilitation of such routes will not necessarily lead to the provision of a road facility with the limited-access, grade-separated features of the classical toll facility with its natural alternative route being the secondary road in the corridor.

In terms of the economic rationale for tolling "high serviceability" roads, as presented in subsection 3.2.1d) above, such roads should only be tolled if their rebuilding, rehabilitation or upgrading will turn them into "high serviceability" rather than "national standard" roads.

An important implication of the possible tolling of such improved road sections is that the only major road between two towns and a road giving direct access to many private properties will be tolled. This, in effect, means that a "national standard" road will no longer be available to local road users and that only a "high serviceability" road, involving toll payment, will become available. Longer-distance users may still have other national standard

routes available (albeit over longer distances) and it could, therefore, be regarded as acceptable to toll such users. Should no alternative longer-distance "national standard" road be available, a political decision in favour of tolling such a project by the affected communities would be the only defensible basis for a decision to toll such roads.

If tolling of the above-mentioned road facilities, however, is to be pursued seriously, the impact of tolling such facilities on local users will have to be overcome by exempting local road users with no toll-free access to a "national standard" facility from toll payment. Although by no means exactly similar cases (since alternative routes did exist in these cases), precedents of local road users being treated more sympathetically because they are worse-off than most other road users in similar situations already exist in the cases of the road sections tolled at the Mooi, Grasmere and Mvoti plazas.

An important prerequisite for tolling a rebuilt or upgraded existing primary road which is the only facility providing access to certain properties is, therefore, that toll-free passage should be provided to those local road users who will have no alternative access to a "national standard" or other high standard road. This probably also applies to local road users in the case of limited-access toll roads with a gravel road as the only alternative road in the corridor.

What constitutes a national or high standard road is, of course, a debatable matter and, should this philosophy end up as policy, the alternative route legislation will have to be amended to make provision for this no-alternative route situation.

Concerns regarding potential fraud have in the past been primarily responsible for a negative attitude towards local concessions amongst decision-makers. Additional control measures and the associated software development for a local concession system is currently taking place and control should, therefore, be somewhat improved in future.

One of the following features in respect of the physical characteristics of the roads to be tolled and the alternative route concept was, therefore, selected in the definition of each of the strategic options, which is fully defined in section 3.3.

- Toll plazas should only be erected on limited-access, grade-separated roads, with tarred alternative routes also for local road users.

- Toll plazas may also be erected on limited-access roads with at-grade intersections and with gravel alternative routes. In this case, one of the following decisions should be taken in respect of the alternative route

  - a gravel route is an acceptable alternative in that particular situation

  - toll-free passage will be given to those local users whose only access to a "national road" standard or other high standard road will be via the toll plaza.

- Toll plazas may be erected on any primary road, provided that toll-free passage be provided to those local road users whose only access to a "national standard" or other high standard road will be via the toll plaza.

The above-mentioned features, including the option of tolling on any primary road, which is rather uncommon internationally, have been built into some of the strategic options to be evaluated.

3.2.4 The degree of road improvement before tolling of a road should commence

Internationally, common practice in respect of toll roads is that new facilities are being built and funded from loans serviced and redeemed by future toll revenue. Practical experience with the implementation of new toll roads in South Africa also led to relatively little public resistance. This is largely due to the democratic choice feature inherent in a system of a new, better toll road at a price versus an older alternative route at no price.

During the South African road privatisation initiative of the eighties, the tolling of existing roads was, however, included to improve the financial viability of the relevant projects.

When the previous Executive Director of the International Bridge, Tunnel and Turnpike Association in the United States of America was requested to talk on this subject in South Africa in the late eighties, he indicated that he would gladly accept the invitation, but that he would not be able to say anything on the subject, based upon previous experience, since no previously existing road had ever been tolled in America.

International examples of existing roads being tolled are, however, available. In the case of the North-South Expressway in Malaysia[9], the private firm to which a concession was given to construct and operate the 504 km Expressway was given the entire then existing 424 km, constructed at a cost of $3,1 billion Malaysian dollars, as part of the concession, while the Malaysian government continued to take responsibility for the debt associated with the original 424 km it had built.

The introduction of tolling on the following three previously existing South African freeways took place in 1988 and 1989.

- the N3 between Frere and Cedara in Kwazulu-Natal, tolled at the Mooi plaza, after rehabilitation and geometric improvements at a capital cost, including the toll plazas, of about R68 million.

- the N1 between Johannesburg and Vanderbijlpark (Louisrus), tolled at the Grasmere plaza, after capital expenditure, including the plaza, of about R63 million.

- the N17 between Germiston and Brakpan, tolled at the Gosforth plaza, after a reseal and the implementation of an SOS system, at a capital cost, including the toll plaza, of about R30 million.

One or more of the following features in respect of the degree of road improvement before commencement of tolling was, therefore, selected in the definition of each of the strategic options, which is fully defined in section 3.3.

- New limited-access, grade-separated roads or such facilities in respect of which significant capacity addition has taken place (e.g. a second carriageway has been added) will be tolled after completion of their construction.

- Rebuilt and/or rehabilitated and/or upgraded limited-access, grade-separated existing roads will be tolled only after such improvements.

- Rebuilt and/or rehabilitated an/or upgraded primary roads that are not limited-access, grade-separated facilities will be tolled only after such improvement.

- Unimproved limited-access, grade-separated existing roads will be tolled as soon as possible.

If the case histories of the establishment of toll roads in South Africa are considered, it becomes quite clear that tolling of existing roads, even after substantial improvement, always meets with very negative public reaction. In the case of the Mooi plaza, it went as far as significant public disorder and "toll-busting" which was only brought under control when very significant (87,5%) toll tariff discounts to local users were introduced.

In order to ensure that the tolling of previously existing roads is dealt with realistically, it needs to be provided with features to achieve public acceptability. Two golden threads run through the introduction of toll on previously existing roads in South Africa:

- In all cases (the Mooi, Grasmere, Gosforth and Mvoti plazas), negatively affected local users were initially led to believe that they would receive no special tariff or other concession. In all these cases, they fought bitter battles to obtain such special concessions and in all cases, they were eventually granted these concessions. In the cases of Mooi, Grasmere and Mvoti, the concessions took the form of significantly lower tariffs and in the Gosforth case, the introduction of a new interchange made it possible to utilise virtually the entire toll road without toll payment.

If the tolling of existing roads is therefore contemplated seriously, it would appear to be sensible to eliminate the wastage of political energy and the potential failure of the projects by including very significant local concessions into the package from the beginning. Consider, for example, the income losses resulting from local concessions with the total loan supportable by revenue gains offered by these projects in Table 3.3 below. (Gosforth has been excluded in view of the different nature of its concession).

TABLE 3.3
COMPARISON OF ESTIMATED PRESENT VALUES OF INCOME LOSSES AND LOANS SUPPORTABLE BY TOLL REVENUE (LSR) OF PREVIOUSLY EXISTING TOLL PROJECTS WHICH WERE TOLLED (IN MARCH 1994 RAND)

Toll Road	Initial capital requirements at the time of tolling	Estimated 30 year LSR (4% p.a. real interest rate)	Income loss resulting from local concessions
N3, Frere - Cedara (tolled at Mooi plaza)	R 68 million	R445 million	R53 million
N2, Ballito - Stanger (tolled at Mvoti plaza)	R216 million	R260 million	R 6 million
N1, Johannesburg - Vanderbijlpark (tolled at Grasmere plaza)	R 54 million	R 83 million	R25 million

The figures in Table 3.3 indicate that although the income losses resulting from local concessions are not insignificant, they are relatively small in comparison with the income-generating potential of the new toll roads created by obtaining the acceptance of the local road users in this way.

A feature to be built into strategic options involving the tolling of existing roads, even after significant improvement, is therefore that significant concessions should be given to local road users.

- In all cases (Mooi, Grasmere, Gosforth and Mvoti), negatively affected local users insisted upon improvements to the alternative routes. In all cases, these improvements (at a capital cost of the order of R5 million-R15 million) were initially refused and later granted.

  Although this feature has not been built into the financial evaluation, it is considered that the power of the expenditure of relatively small amounts on an alternative route in order to overcome public resistance and create a valuable source of funding in the same corridor should be utilised, where warranted by the expected diversion of traffic and the safety situation on the alternative route.

3.2.5 The degree of flexibility in respect of the application of toll income

A change to the National Roads Act in 1992 made it possible to create toll routes which include previously declared toll road sections (after their de-declaration). Although this has not been done yet, the implication of this is that an entire national route could be declared as one toll road with the flexibility to apply all the toll income collected on the route in respect of any road section on the route

If the declaration of a national route as a single toll road is limited to that part of the route between major cities, it will still be able to link the benefits offered by the toll road to the toll payments of the users of the facility.

If this concept is taken somewhat further, viz. to the point where the toll roads in a metropolitan area is considered to be one business unit, it could still be argued that users paying toll are very likely to use some or all of the facilities within the business unit.

If the concept is expanded to a province, it may still be applicable in the case of Gauteng, where the province is one large metropolitan area, but not in the case of larger provinces, where the link between toll payment on a specific toll road and usage of other toll roads in the province may become rather weak.

Maximum flexibility will, of course, be achieved by creating only one toll road network business unit with unlimited application of toll income to any toll road section. This will, however, violate the positive views on toll financing as a direct user charge.

In order to allow for a full range of strategic options to be considered, the following potential features on the degree of flexibility in respect of the application of toll income have been allowed for:

- Application of toll income only in respect of the declared toll road sections on which the toll is collected.
- Application of toll income only in respect of the declared toll route (such as the N3 between Pietermaritzburg and Johannesburg) on which the toll is collected.
- Application of toll income in respect of the metropolitan area in which the toll is collected.
- Application of toll income in respect of all declared toll projects in South Africa.

3.2.6 The granting of the legal power to create toll projects to provinces and metropolitan authorities

The present National Roads Act requires that only national roads may become toll projects.

During the first 12 years of modern toll financing in South Africa, only two provincial roads were declared national roads in order to become toll projects, viz. the N4 Magalies Toll Road and the N17.

The rationale behind the above-mentioned approach was that the application of toll financing carries responsibilities in respect of millions of rands of loans and that specialised management of and attention to this aspect should be centralised within the South African Roads Board and the Department of Transport.

It may, however, be argued that since the national road authority is unlikely to actively pursue the potential application of toll financing to provincial freeways, the power to do so should be given to provinces in order to maximise the potential role of toll financing.

Should this power be given to provinces, good co-ordination should be emphasized and it should possibly be accompanied by certain conditions which should be met to address the above-mentioned concern.

3.3 Statement and description of strategic options

3.3.1 Summary of features utilised to define strategic options in respect of the role of toll financing

Figure 3.6 summarises the features utilised to define strategic options in respect of the role of toll financing.

The features utilised to define strategic options have been arranged under the following headings:

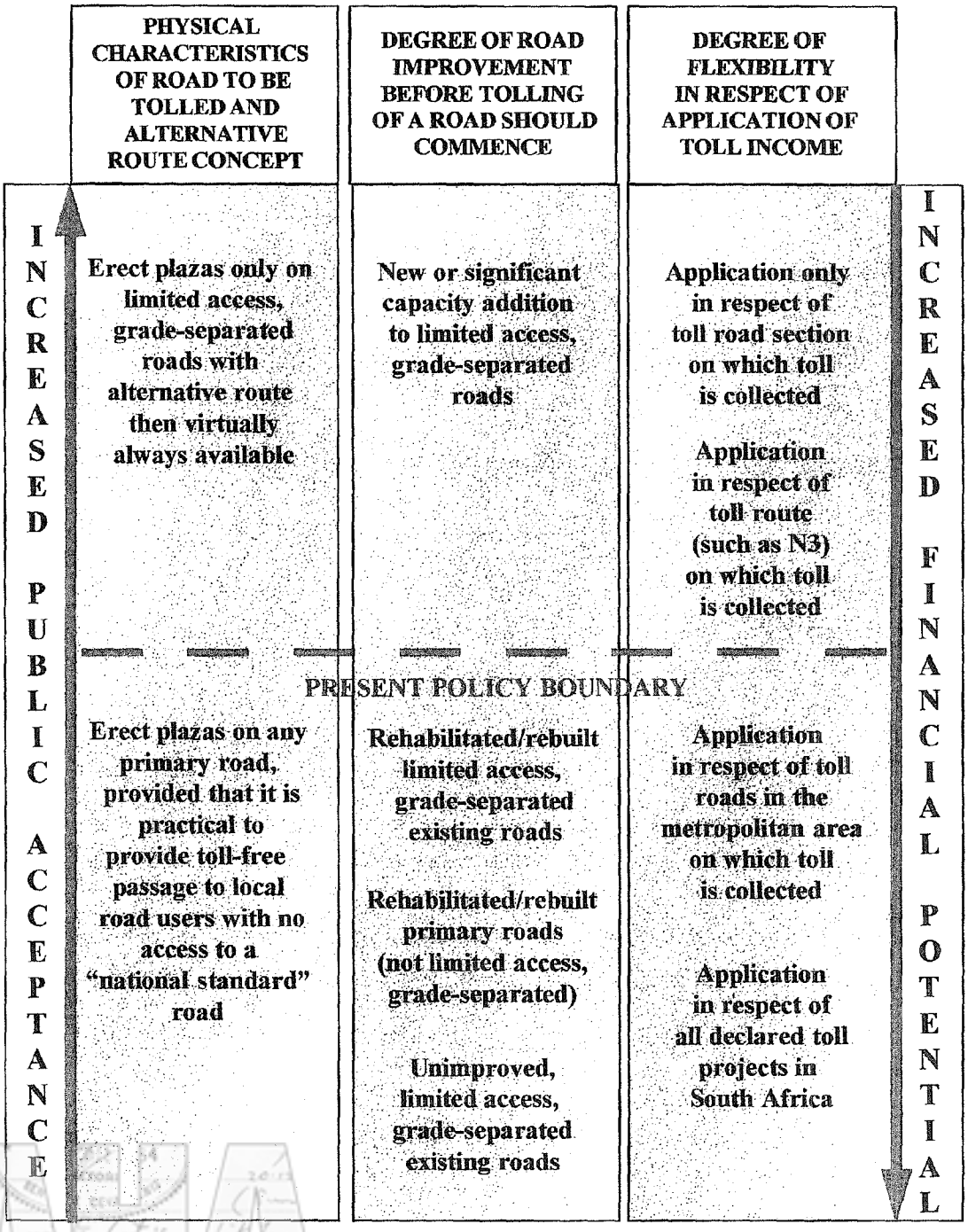
- physical characteristics of roads to be tolled and the alternative route concept
- degree of road improvement before tolling of a road should commence
- degree of flexibility in respect of application of toll income.

Under each of the column headings the features have been arranged so that those which enjoy wide public acceptance are at the top, while the least acceptable features are at the bottom of the table. The financial potential of features, on the other hand, increases from the top to the bottom of the table.

In order to provide perspective on where the **current policy boundary** is, it is indicated in a dotted red line. As is clear from the position of current policy features at the top of the table, it leans towards public acceptability rather than the maximisation of financial potential.

FIGURE 3.6

FEATURES UTILISED TO DEFINE STRATEGIC OPTIONS IN RESPECT OF THE ROLE OF TOLL FINANCING



It is interesting to note that legislation is not a limiting factor as far as the required degree of improvement of a road before it may be tolled, is concerned.

3.3.2 Matrix of strategic options

In order to reflect various degrees of emphasis or balance between maximising the financial potential of toll financing and public acceptability, four groups of strategic options were identified. The options vary from the status quo which has significant restrictions from a financial potential point of view but which appears to be acceptable to the public to an option involving maximum flexibility in respect of the physical characteristics of roads to be tolled and the application of toll income. This option will provide maximum flexibility from a funding point of view but will be less acceptable to the public because of the tolling of existing roads and the indirect tax properties which tolling begins to assume. A number of "compromise" options are also included.

Four groups of 3 options each have been identified by considering only the aspects of physical toll road characteristics and the degree of road improvement before tolling commences. The second and third options in each group were identified by adding options in respect of the application of toll income.

Group I

Option 1: Status Quo

- Toll only limited-access, grade-separated roads which are new or in respect of which significant capacity addition has taken place.
- Alternative routes legally required and, in practice, virtually always available.
- Toll income may be applied in respect of the entire toll route.

Option 2: Status quo with application of toll income in a metropolitan area to any toll project in that area.

Option 3: **Status quo with application of toll income to any toll project in South Africa.**

Group II

Option 4: **Toll existing freeways after rehabilitation**

° Toll the following:

- new limited-access, grade-separated roads
- rehabilitated/rebuilt limited-access grade-separated existing roads.

° Alternative routes legally required and in practice virtually always available.

° Toll income may be applied in respect of the entire toll route.

Option 5: **Tolling existing freeways after rehabilitation and application of toll income in a metropolitan area to any toll project in that area.**

Option 6: **Tolling existing freeways after rehabilitation with application of toll income to any toll project in South Africa.**

Group III

Option 7: **Tolling unimproved existing freeways**

° Toll the following:

- new limited-access, grade-separated roads
- unimproved limited-access, grade-separated existing roads.

° Alternative routes not legally required, but in practice, virtually always available

Where, in highly exceptional cases, local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage should be given to local road users.

° Toll income may be applied in respect of the entire toll route.

Option 8: **Tolling unimproved existing freeways and application of toll income in a metropolitan area to any toll project in that area.**

Option 9: **Tolling unimproved existing freeways with application of toll income to any toll road project in South Africa.**

Group IV

Option 10: **Maximum flexibility in respect of physical characteristics of roads to be tolled**

° Toll the following:

- new limited-access, grade-separated roads
- rehabilitated or unimproved limited-access, grade-separated existing roads
- rehabilitated/rebuilt limited-access roads with at-grade intersections (planned freeways)
- rehabilitated/rebuilt primary roads (not limited-access, grade-separated).

° Toll income may be applied in respect of the entire toll route.

° Alternative routes:

- not legally required, but virtually always available for limited access, grade-separated roads.

- where local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage to local road users should be given.

- where longer distance road users will also not have toll-free access to a "national standard" or other high standard road, only a political decision in favour of tolling the project by the affected communities should lead to it being tolled.

Option 11: **As 10 above, with application of toll income in a metropolitan area to any toll project in that area**

Option 12: **As 10 above, with application of all toll income to any toll project in South Africa.**

Table 3.4 summarises the options in a matrix format.

TABLE 3.4
STATEMENT OF STRATEGIC OPTIONS IN RESPECT OF THE ROLE OF TOLL FINANCING

Physical characteristics and degree of road improvement before tolling is considered	Degree of flexibility in respect of application of toll income		
	Toll income may be applied in respect of entire toll route	Application of toll income in a metropolitan area to any toll project in that area	Application of toll income to any toll project in SA
Status Quo	Alternative routes legally required and, in practice, virtually always available	Alternative routes legally required and, in practice, virtually always available	Alternative routes legally required and, in practice, virtually always available
Toll existing freeways after rehabilitation	Alternative routes legally required and, in practice, virtually always available	Alternative routes legally required and, in practice, virtually always available	Alternative routes legally required and, in practice, virtually always available
Toll unimproved existing freeways	Alternative routes not legally required, but in practice, virtually always available. Where, in highly exceptional cases, local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage should be given to local road users.	Alternative routes not legally required, but in practice, virtually always available. Where, in highly exceptional cases, local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage should be given to local road users.	Alternative routes not legally required, but in practice, virtually always available. Where, in highly exceptional cases, local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage should be given to local road users.
Maximum flexibility in respect of physical characteristics of roads to be tolled	Alternative routes: - not legally required, but virtually always available for limited access, grade-separated roads. - where local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage to local road users should be given.	Alternative routes: - not legally required, but virtually always available for limited access, grade-separated roads. - where local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage to local road users should be given.	Alternative routes: - not legally required, but virtually always available for limited access, grade-separated roads. - where local alternative routes are gravel roads or no toll-free access to a "national standard" or other high standard road will be available, toll-free passage to local road users should be given.

3.4 Evaluation of strategic options

3.4.1 Financial evaluation

a) Strategic options evaluated

In view of the time limits in the study (November '94 - February '95), the Group I option which consists of potential new toll projects in the country could not be evaluated financially. This could, however, be included in a next draft report, if required.

The Group II strategic options which also involve the tolling of existing freeways after rehabilitation and the Group II strategic options which also involve the tolling of unimproved existing freeways were evaluated to determine the financial potential of these additional tolling actions.

The Group IV strategic options which also include tolling of rehabilitated/rebuilt primary roads have also not been evaluated financially, because of time and information constraints.

b) Approach to the financial evaluation of Group II and Group III strategic options

i) General

The approach adopted was that it should be possible to identify, for all the Group II and Group III options, what the loans supportable by revenue (LSRs) are of the additional tolling involved in the options over and above the possible LSRs of tolling of new limited-access, grade-separated facilities and over and above the LSRs of existing toll projects.

ii) Existing freeways included in the evaluation

Specific national, provincial and metropolitan existing freeway sections were identified as possible toll road sections. This differs from the 1991 policy study[4] in the sense that the financial information from that study is available for an intercity route or for all the roads within a metropolitan area together and not for individual road sections. The rationale behind this partitioning of the potential toll road system into the individual toll road sections is to be able to consider the financial results for any combination of toll road sections, which is a pre-requisite if all Group II and Group III options are to be quantified.

The following aspects were considered when identifying potential toll road sections/projects:

- Location of each possible toll road section relative to the existing toll road sections.

- The practicality of providing a toll plaza on a specific road section. Aspects such as existing or planned plaza locations, practical knowledge of the road system and the length of the road section to be tolled.

- The daily traffic volume on the road section to be tolled.

The following maps provide details of the road sections and toll plazas identified:

° Figure 3.7 indicates the existing freeway sections to be tolled countrywide without plaza locations.

- Figure 3.8 indicates the existing freeway sections to be tolled in the Gauteng metropolitan area with schematic, provisional plaza locations.

- Figure 3.9 indicates the existing freeway sections to be tolled in the Cape Peninsula metropolitan area with schematic, provisional plaza locations.

- Figure 3.10 indicates the existing freeway sections to be tolled in the Port Elizabeth metropolitan area with schematic, provisional plaza locations.

- Figure 3.11 indicates the existing freeway sections to be tolled in the Durban metropolitan area with schematic, provisional plaza locations.

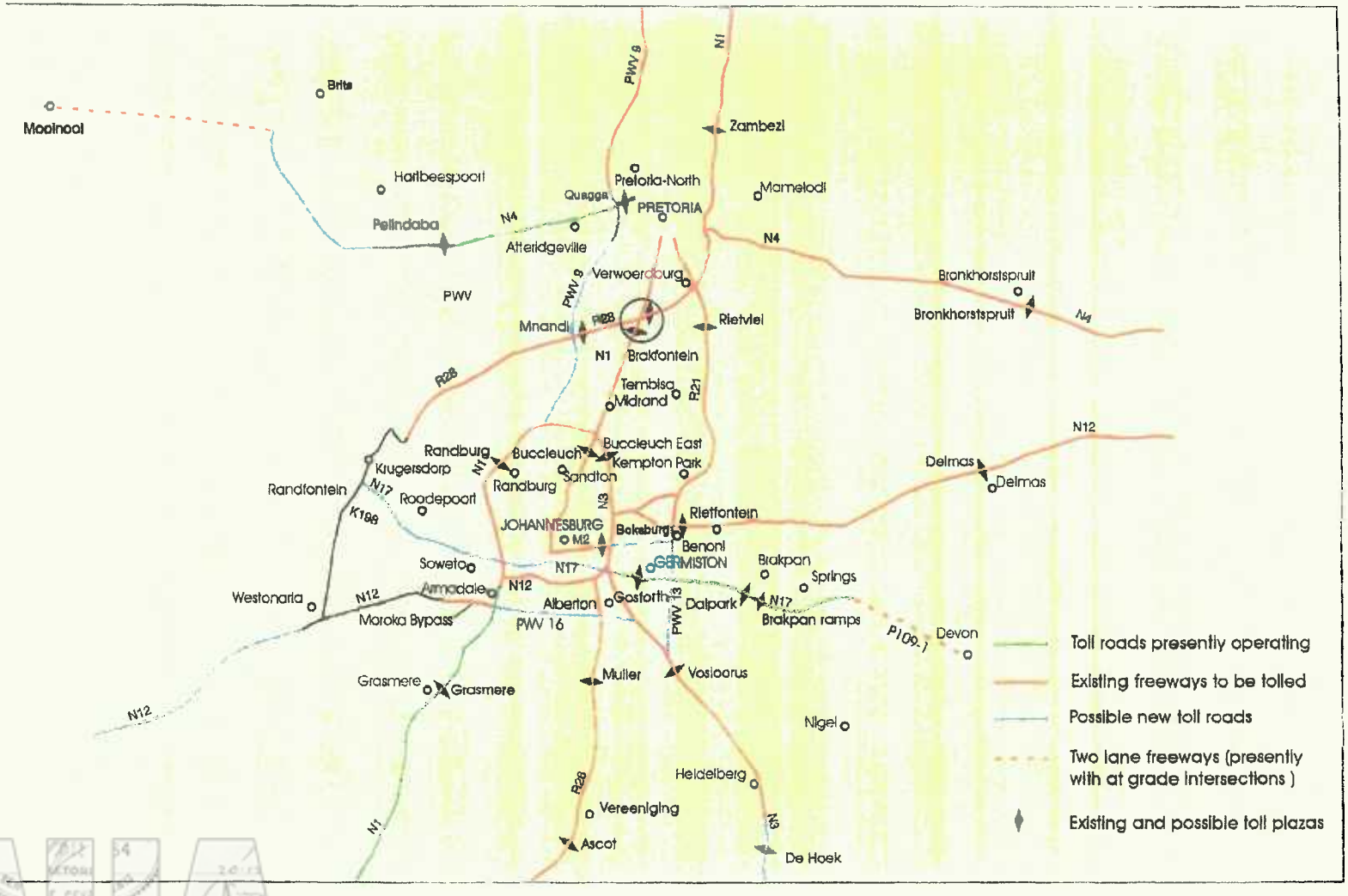
iii) Gross toll income

The potential gross toll income of the identified existing freeway sections was determined by combining the following variables:

- the length of the toll road section
- a unit tariff per kilometre (different for urban and rural toll road sections)
- present average daily traffic volumes
- a toll road traffic attraction rate (different for urban and rural toll road sections)
- a relationship between light and heavy vehicle tariffs (different for urban and rural toll road sections)
- the percentage of gross income losses resulting from special local concessions on previously existing roads being tolled (different for urban and rural toll road sections).

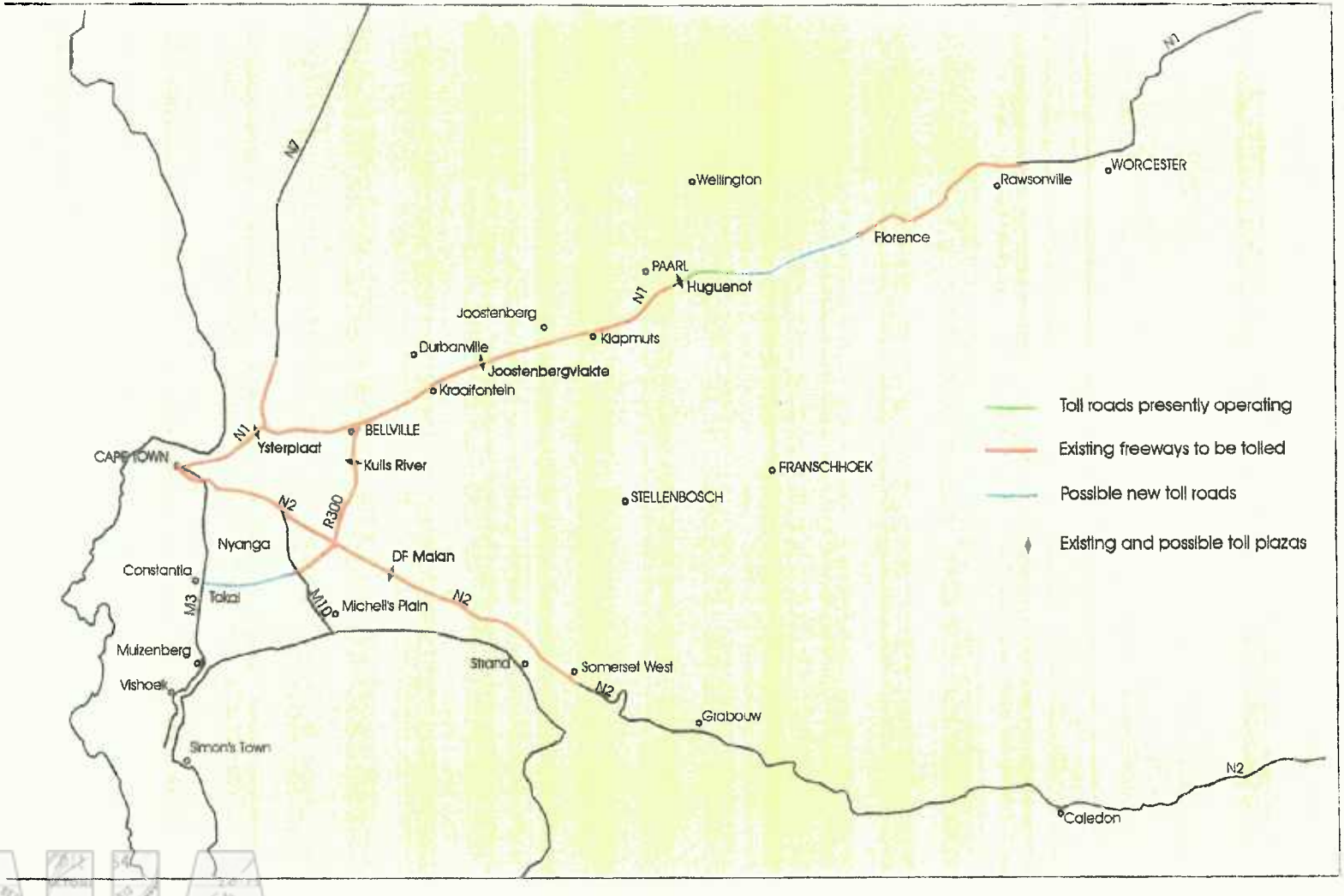
Operating and approved toll roads and existing freeways to be tolled

3.7



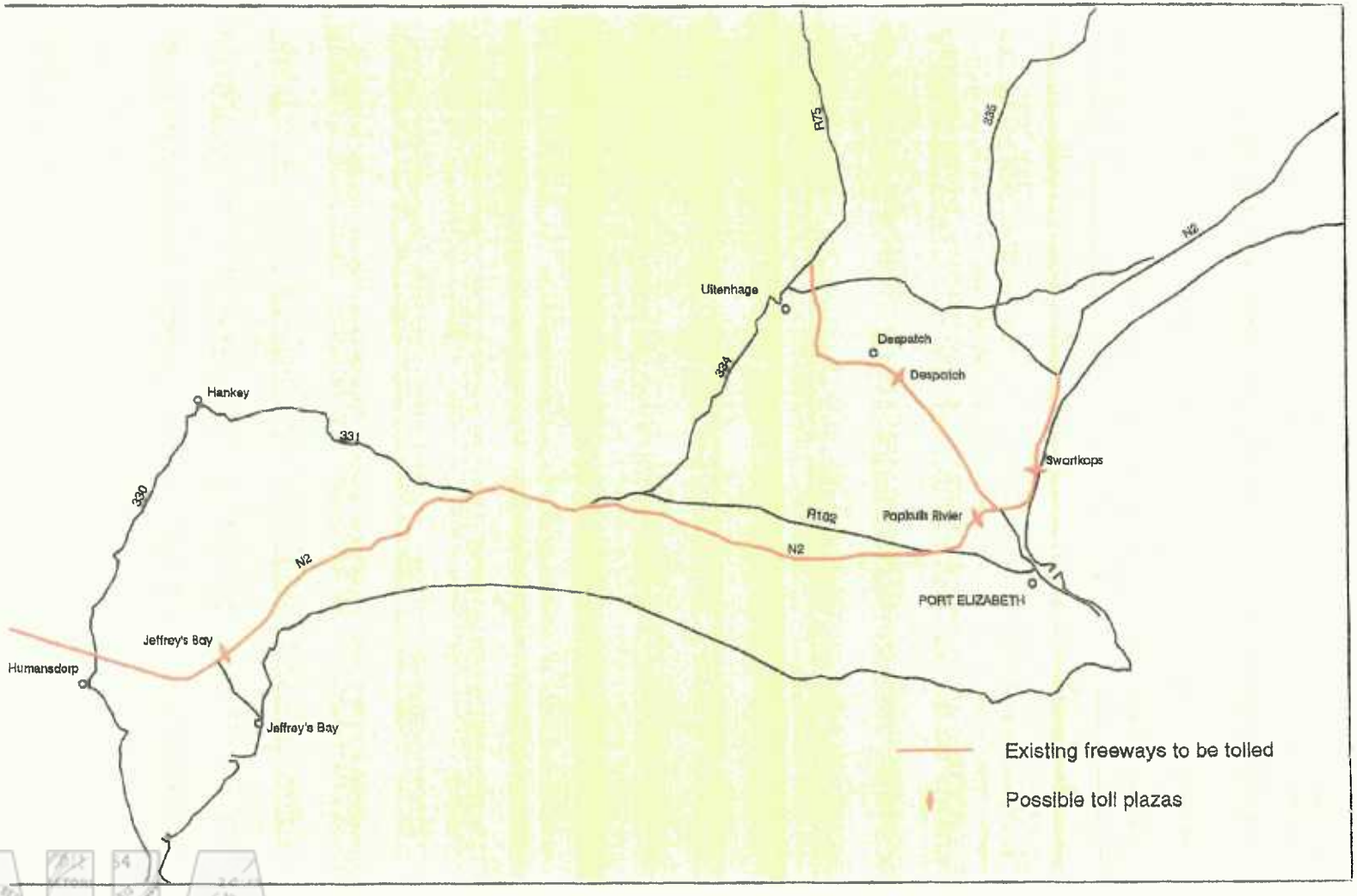
Gauteng metropolitan area: possible toll road system

3.8



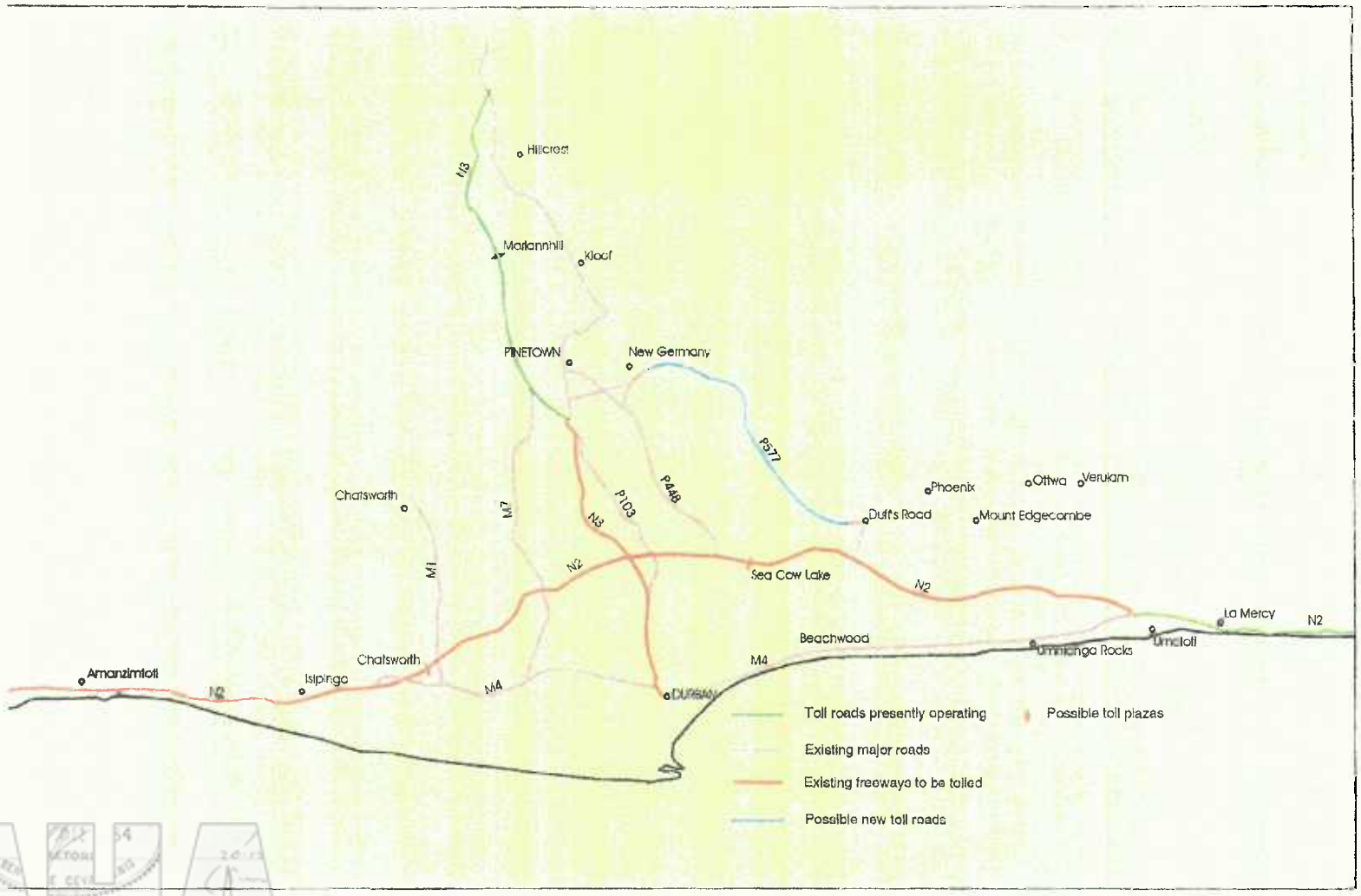
Cape Peninsula: possible toll road system

3.9



Port Elizabeth metropolitan area: possible toll road system

3.10



Durban metropolitan area: possible toll road system

iv) Toll tariffs

The present light vehicle tariff of 8c per km at the Mooi plaza, which is the only previously existing rural toll road being tolled, was adopted for all rural toll road sections.

The average light vehicle tariff of 6c per kilometre presently being charged at the Grasmere and Gosforth plazas, the two previously existing urban toll roads being tolled, was adopted for all urban toll road sections.

In the case of urban toll roads, many users do not necessarily use the full length of the toll road section. In order to introduce additional conservatism, it was assumed that, on average, a motorist would be using only two-thirds of an urban toll road section. The toll tariff per kilometre was therefore, further reduced to two-thirds of 6c per kilometre, i.e. 4c per kilometre. Furthermore, all light vehicle toll tariffs less R1,00 were rounded upwards to R1,00.

By considering current tariffs being charged, the average heavy vehicle tariff was estimated to be 3 times that of a light vehicle for rural toll roads and 2,5 times that of a light vehicle for urban toll roads and these relationships were used in the estimation of gross toll income.

v) Average daily traffic volumes and traffic growth rates

The 1994 average daily traffic volumes on road sections were estimated from the 1991 Comprehensive Traffic Observations (CTO) Yearbook (which is the latest issue of the yearbook available) by applying a 3% p.a. traffic growth rate. Where this information was not available from the CTO yearbook, other sources of information were used.

An annual traffic growth rate of 3% p.a. for the first 20 years and 2% p.a. thereafter was used in the analysis.

vi) Toll road traffic attraction rates

Based upon existing traffic attraction to toll roads, toll road traffic attraction rates of 75% for rural road sections and 60% for urban road sections were adopted.

In practice, it is unlikely that such large volumes of traffic will be tolled off the urban road sections in view of the inability of secondary routes and arterials to accommodate such volumes. In order to be financially conservative, the above-mentioned 60% attraction rate was, however, used.

vii) Toll-related operations costs

A linear regression analysis of the number of toll lanes versus toll-related operating cost for existing toll plazas (excluding Tolcon and THDC operated plazas) indicated a statistically significant correlation. The initial number of toll lanes required at toll plazas on each of the existing road sections was estimated and employed with the above-mentioned relationship to determine the toll-related operating cost on each road section.

viii) Annual road maintenance costs

Routine annual road maintenance costs were based on such costs for 1 300 kilometres of existing national roads obtained from the previous Transvaal Provincial Administration.

ix) Rehabilitation costs

As part of the 1991 policy study, resealing and rehabilitation strategies were designed for each existing freeway section. The rehabilitation strategy depended upon the traffic class, climate and pavement type. Other aspects, such as the existing condition of the pavement, age and immediate maintenance needs were also considered when a rehabilitation strategy was

designed. A rehabilitation design typically consisted of a cycle of fog spray, seal, light rehabilitation and heavy rehabilitation (depending upon the type of base of the pavement).

For this study, the rehabilitation design had to be extended up to the year 2030/31. Furthermore, the 5 year construction and rehabilitation programmes of the South African Roads Board were consulted to determine if resealing or rehabilitation had already taken place or whether/when rehabilitation is due to commence. The future rehabilitation design was then adjusted to take into account the 5 year programme.

x) Toll equipment replacement and toll plaza expansion costs

In order to provide for toll related capital expenditure during the evaluation period, a toll equipment replacement cost of R340 000 per lane and a toll lane addition cost of R1,45 million were used in the evaluation.

xi) Financial inputs

The following financial inputs were used in the determination of the loans supportable by revenue:

- a rate of toll tariff increases equal to the inflation rate
- an inflation rate of 9% per annum
- real interest rates of 3% p.a., 4% p.a. and 5% p.a. respectively.

c) Results of financial evaluation

The loans supportable by revenue (LSRs) for the Group II strategic options, which involve the tolling of existing freeways after light rehabilitation (i.e. not after fog sprays or resealing only) were determined for the period from the next required light rehabilitation of the individual road sections until 2030/31. This gave an average evaluation period of approximately 30 years. The LSRs for the Group III options,

which involve the tolling of unimproved existing freeways, were evaluated from 1997/98, the earliest potential opening date, until 2030/31, i.e. an evaluation period of 34 years.

Table 3.5 provides the LSRs, with and without provision for rehabilitation, for the Group II strategic options for each intercity national route section outside the metropolitan areas at a 4% p.a. real interest rate.

TABLE 3.5
GROUP II* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION FOR NATIONAL ROUTES OUTSIDE METROPOLITAN AREAS (IN 1994/95 RAND)

National Routes	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
N1 - Pretoria to Warmbaths	R 870 million	R 200 million	R1 070 million
N1 - Winburg to Bloemfontein	R 225 million	R 75 million	R 300 million
N2 - Cape Town to Port Elizabeth	R 70 million	R 270 million	R 340 million
N2 - Port Elizabeth to East London	R 105 million	R 95 million	R 200 million
N2 - Hibberdene to Durban	R 280 million	R 150 million	R 430 million
N4 - Pretoria to Middelburg	R 520 million	R 290 million	R 810 million
N12 - Benoni to Witbank	R 490 million	R 110 million	R 600 million
TOTAL FOR NATIONAL ROUTES	R2 560 million	R1 190 million	R3 750 million

*Tolling of existing freeways only after the planned rehabilitation of individual road sections

Table 3.6 provides the LSRs, with and without provision for rehabilitation, for the Group III strategic options for each intercity national route section outside the metropolitan areas at a 4% p.a. real interest rate.

TABLE 3.6
GROUP III* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION FOR NATIONAL ROUTES OUTSIDE METROPOLITAN AREAS (IN 1994/95 RAND)

National Routes	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
N1 - Pretoria to Warmbaths	R 870 million	R 230 million	R1 100 million
N1 - Winburg to Bloemfontein	R 260 million	R 115 million	R 375 million
N2 - Cape Town to Port Elizabeth	R 70 million	R 325 million	R 395 million
N2 - Port Elizabeth to East London	R 125 million	R 125 million	R 250 million
N2 - Hibberdene to Durban	R 405 million	R 220 million	R 625 million
N4 - Pretoria to Middelburg	R 515 million	R 475 million	R 990 million
N12 - Benoni to Witbank	R 760 million	R 200 million	R 960 million
TOTAL FOR NATIONAL ROUTES	R3 005 million	R1 690 million	R4 695 million

*Tolling of unimproved existing freeways from 1997/98 onwards

Table 3.7 provides the LSRs, with and without provision for rehabilitation, for the Group II strategic options for the toll projects in each of the metropolitan areas at a 4% p.a. real interest rate.

TABLE 3.7
GROUP II* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION FOR THE TOLL PROJECTS IN THE METROPOLITAN AREAS (IN 1994/95 RAND)

Metropolitan area	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
Gauteng	R2 080 million	R 800 million	R2 880 million
Cape Peninsula	R 390 million	R 290 million	R 680 million
Durban	R 305 million	R 140 million	R 445 million
Port Elizabeth	R 125 million	R 70 million	R 195 million
TOTAL FOR METROPOLITAN AREAS	R2 900 million	R1 300 million	R4 200 million

*Tolling of existing freeways only after the planned rehabilitation of individual road sections.

Table 3.8 provides the LSRs, with and without provision for rehabilitation for the Group III strategic options for the toll projects in each of the metropolitan areas at a 4% p.a. real interest rate.

TABLE 3.8
GROUP III* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION FOR THE TOLL PROJECTS IN THE METROPOLITAN AREAS (IN 1994/95 RAND)

Metropolitan area	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
Gauteng	R2 735 million	R1 195 million	R3 930 million
Cape Peninsula	R 425 million	R 400 million	R 825 million
Durban	R 275 million	R 215 million	R 490 million
Port Elizabeth	R 150 million	R 80 million	R 230 million
TOTAL FOR METROPOLITAN AREAS	R3 585 million	R1 890 million	R5 475 million

*Tolling of unimproved existing freeways from 1997/98 onwards

Table 3.9 summarises the loans supportable by revenue with and without provision for rehabilitation for all Group II strategic options, i.e. for tolling only after rehabilitation of existing freeways on national routes as well as in metropolitan areas at a 4% per annum real interest rate.

TABLE 3.9
GROUP II* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION (IN 1994/95 RAND)

Project Group	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
National routes	R2 560 million	R1 190 million	R3 750 million
Metropolitan areas	R2 900 million	R1 300 million	R4 200 million
All existing freeways	R5 460 million	R2 490 million	R7 950 million

*Tolling of existing freeways only after planned rehabilitation of individual road sections

Table 3.10 summarises the loans supportable by revenue with and without provision for rehabilitation for all Group III strategic options, i.e. for tolling of unimproved existing freeways on national routes as well as in metropolitan areas at a 4% per annum real interest rate.

TABLE 3.10
GROUP III* STRATEGIC OPTIONS: ESTIMATED LOANS SUPPORTABLE BY REVENUE WITH AND WITHOUT PROVISION FOR REHABILITATION (IN 1994/95 RAND)

Project Group	LSRs with provision for rehabilitation	Present value of rehabilitation	LSRs without provision for rehabilitation
National routes	R3 005 million	R1 690 million	R4 695 million
Metropolitan areas	R3 585 million	R1 890 million	R5 475 million
All existing freeways	R6 590 million	R3 580 million	R10 170 million

*Tolling of unimproved existing freeways from 1997/98 onwards

The difference in the present values of rehabilitation of the Group II options (tolling only after **light** rehabilitation) and the Group III options (tolling of unimproved existing freeways from 1997/98 onwards) of about R1 090 million can be ascribed to maintenance work which is less costly than light rehabilitation (fog spays, seals) which will occur between 1997/8 and the date of light rehabilitation.

d) Evaluation of financial results

i) Although the LSRs are not very conservative in that they reflect only a 4% per annum real interest rate and tariff increases at the inflation rate, the totals of about R8 billion with tolling only after light rehabilitation and R10 billion with immediate tolling indicate that tolling of the existing freeways do have significant financial potential.

ii) In view of the slightly better public perception of tolling following rehabilitation, it is noteworthy that the postponement of tolling until after light rehabilitation led to a 22% reduction in LSR. Although this is a significant reduction, it is perhaps not as severe as expected.

iii) Even with relatively conservative toll tariffs, it is noteworthy that only 30-35% of the LSRs will be required for the rehabilitation and resealing of the existing freeways themselves. A significant part of the LSRs, viz. R5,5 - R6,5 billion is available for application elsewhere.

iv) Although prioritised road needs information is not currently available on a project by project basis, tables 3.5 and 3.6, dealing with LSRs on national routes, indicate that some additional LSR ability exists on every intercity national route section.

These additional LSR abilities are not as impressive on the few existing freeway sections on the N2 between Cape Town and Port Elizabeth and between Port Elizabeth and East London, but significant rehabilitation expenses of existing freeway sections themselves will be covered.

Very noteworthy is the rather high LSRs associated with the following sections and, staying for the moment with a philosophy of toll income application within the same intercity national road, their potential applications to other road sections on the same intercity national route:

- N1 Pretoria - Warmbaths with an LSR of R870 million.: This could potentially be applied to assist with the upgrading of the N1 Pietersburg - Messina section (if economically warranted in future, the extension of the N1 dual carriageway) and to fund access routes to the N1 between Pretoria and Messina from previously disadvantaged communities in the Northern Transvaal.

- N1 Winburg to Bloemfontein with an LSR of R225 - R260 million: This could potentially be applied to assist with the funding of the N1 Kroonstad - Winburg or the N5 Winburg - Bethlehem upgrading/rehabilitation needs (if economically warranted in the future, the creation of a four-lane facility south of Kroonstad should be considered). This view may be upset if a different more fundamental decision is taken that the N1 should be more direct via Welkom. In this situation, the N5 to Bethlehem could gain from the above-mentioned LSR which will then be lower (because of some traffic loss to the N1).

- N2 Hibberdene to Durban with an LSR of R280 - R405 million: This could potentially be applied to assist with the upgrading of the N2 Port Shepstone - Umtata section and to fund access routes to the N2 from previously disadvantaged communities.

- N4 Pretoria to Middelburg and Benoni to Witbank: This could potentially be applied to assist with the upgrading of the N4 from Wonderfontein (east of Middelburg) to Nelspruit and Komatipoort, and possibly the provision of a four lane facility, provided that it is an economically viable project. Once again, access routes to the N4 from previously disadvantaged communities could also be funded.

v) It is not surprising that the existing Gauteng freeways show significant financial potential as toll roads. Some very important new freeways (which should also be tolled) which may be partially funded from this toll income if it is applied to all toll projects in the area, are the following (See Figure 3.8):

- N17 Central and West between the Johannesburg CBD, Soweto and Krugersdorp.

- PWV13 between Jan Smuts Airport and the N3 (a second Johannesburg Eastern Bypass).

- PWV14 between the N12 south of Jan Smuts Airport and the M2.
- PWV9 between Sandton and Pretoria West which will become critical as Ben Schoeman is beginning to reach capacity south of Johannesburg.
- PWV16 south of Johannesburg between the N1 and N3.

In the Cape Peninsula the completion of the R300 route to improve access between the southern and northern municipalities is an important priority which could be partially funded from toll income on existing metropolitan freeways.

In the Durban area, the outer ring road serving as a second north-south bypass and serving commuter traffic between Kwa-Mashu and the Pinetown industrial areas would benefit from tolling the existing N2 bypass. (The N2 bypass would also benefit from peak hour traffic congestion relief).

3.4.2 Qualitative evaluation of strategic options

a) <u>The financial potential of strategic options and Reconstruction and Development Programme goals</u>

It is considered that options with higher financial potential will assist in the achievement of the following Reconstruction and Development Programme goals:

i) The reduction of fiscal deficit: The more income that can be generated from traditionally non-income generating infrastructure provided by Government, the higher the contribution of such a strategic option to the reduction of the fiscal deficit.

ii) The increase in the proportion of capital expenditure in government spending: Strategic options with more financial potential will be able to contribute more to the achievement of this goal.

iii) The development of human resources will be facilitated by the significant job creation resulting from increased capital expenditure, and long-term community projects such as roadside maintenance programmes which will be sustainable by the steady income stream associated with toll roads. Once again, the impact of strategic options with higher financial potential will be more.

Table 3.11 provides an evaluation of strategic options from the perspective of their potential contribution to the above-mentioned RDP goals.

TABLE 3.11
EVALUATION OF STRATEGIC OPTIONS FROM THE PERSPECTIVE OF THEIR POTENTIAL CONTRIBUTION TO RDP GOALS

Physical characteristics and degree of road improvement before tolling is considered	Degree of flexibility in respect of application of toll income		
	Toll income may be applied in respect of entire toll route	Application of toll income in a metropolitan area to any toll project in that area	Application of toll income to any toll project in SA
Status Quo	Limited, since few new toll projects will be self-funding		
Toll existing freeways after rehabilitation	Significant, since many new road projects will become possible. Some delay in view of introduction of tolling after rehabilitation.		
Toll unimproved existing freeways	Even more significant, since toll income will become available sooner and implementation can be immediate.		
Maximum flexibility in respect of physical characteristics of roads to be tolled	Even more significant, provided that sensitive issues regarding no local access to national standard routes are addressed correctly.		

b) Potential public acceptability of strategic options

The positive attitude of the travelling public towards reasonable toll charges on new toll roads and the negative attitudes towards tolling of existing roads, bad alternative routes (usually in respect of previously existing roads) and cross-subsidisation have been mentioned in the section describing the issues determining the role of toll financing.

Table 3.12 indicates an evaluation of strategic options from the perspective of the conditions for public acceptance which is a vital pre-requisite for the financial potential of the various options to be realised.

TABLE 3.12
EVALUATION OF STRATEGIC OPTIONS FROM A PUBLIC ACCEPTANCE PERSPECTIVE

Physical characteristics and degree of road improvement before tolling is considered	Degree of flexibility in respect of application of toll income		
	Toll income may be applied in respect of entire toll route	Application of toll income in a metropolitan area to any toll project in that area	Application of toll income to any toll project in SA
Status Quo	Excellent, provided toll tariffs remain at present levels (in real terms)	Poor, since the few new toll projects in a metropolitan area may be difficult to link to each other	Very poor, since toll then becomes a very inefficient indirect tax!
Toll existing freeways after rehabilitation	Public acceptance is achievable, provided that significant local concessions are awarded and communicated from the inception of the project and, in extreme cases, alternative routes are slightly improved		Very poor, since toll then becomes a very inefficient indirect tax!
Toll unimproved existing freeways	Public acceptance will be difficult, but not impossible to achieve provided that significant local concessions are awarded and communicated from the inception of the project and, in extreme cases, alternative routes are slightly improved Also: a reasonable to strong link between the projects to be funded and users of the existing facility to be tolled should be sought		Very poor, since toll then becomes a very inefficient indirect tax!
Maximum flexibility in respect of physical characteristics of roads to be tolled	Public acceptance is achievable, provided that local communities with no toll-free access to "national standard" routes be provided with toll-free passage. If longer-distance traffic also has no toll-free alternative, a political decision by all affected communities should be taken.		Very poor, since toll then becomes a very inefficient indirect tax!

3.5 Potential Policy Guidelines

In view of the very real question raised by, inter alia, the Minister regarding the potential application of toll financing to a route like the N2 through the previous Transkei area, these potential policy guidelines have been formulated to maximise the role of toll financing as a user charge (and not as an indirect tax):

i) Toll financing should be applied in respect of new "high serviceability" roads which would typically be provided alongside "national or provincial" standard roads as a response to congestion problems or a demand for a higher quality facility from certain road user groups.

"High serviceability" roads are typically limited-access, grade-separated facilities (freeways) but may also be other primary roads which will, either as a result of upgrading or new construction, exceed the current national or provincial standards.

"National or provincial" standard roads are defined as roads that conform to minimum standards laid down by the national or provincial transport department.

ii) Toll financing should also be applied to existing "high serviceability" roads, preferably after their rehabilitation, but also without any improvement of such facilities in order to apply the loan-supporting capability so generated to bring forward the construction of another economically warranted toll road section on the same intercity route or in the same metropolitan area. In the case where no improvement of an existing freeway takes place before tolling commences, a reasonable link between usage of the new project to be funded and the existing road to be tolled is required.

In order to achieve public acceptance of such tolling of existing "high serviceability" roads, very significant tariff concessions to local road users should be included into the project planning and communicated to local road users from the conceptual planning of the project. The need to improve the alternative national or provincial standard road should also be evaluated from a safety point of view and be submitted to the Roads Board for a decision.

iii) Toll financing should, in the absence of sufficient funding from ii) above, also be applied to freeway standard roads with gravel alternative routes or to non-freeway standard primary roads which require funds to be upgraded to "high serviceability" roads in their geographical context, provided that:

- if toll-free access to a national or provincial standard road (for local road users) is not available, such users should be given toll-free passage.

- if toll-free access to a national or provincial standard route (for longer-distance users), albeit indirectly, is not available, the project should only be tolled if a political decision in favour of such tolling is taken by most of the affected communities.

iv) In all the above-mentioned cases, the toll income collected as a toll project should only be applied in respect of a toll road section on an intercity national or provincial route or in respect of a toll project in the same metropolitan area.

v) Provision should be made for an access road to a toll road from a previously disadvantaged community to be declared a part of a toll project and funded from toll revenue.

3.6 Conclusion

It is concluded that:

- expanding the role of toll financing to include the tolling of existing freeways and even of rebuilt/rehabilitated non-freeway primary roads has the potential to contribute significantly (R8-10 billion) to the goal of preserving and expanding the national road network.

- such expansion of the role of toll financing will support the following goals of the Reconstruction and Development Programme;

  - the gradual reduction of the fiscal deficit
  - the increase of the proportion of capital expenditure in government spending
  - the development of the human resources of the country.

- pushing the role of toll financing beyond the funding of new freeways to the tolling of existing freeways and non-freeway primary roads will require the political insight not to violate the perceptions of especially local road users regarding equitability and the basic right to toll-free access to a national or provincial standard road. This will require that such concerns be addressed, not after the local road user threaten to break down the toll plaza, but from the very inception of the project.

  It will also require the insight to recognise that what may seem like an unnecessary income loss in respect of local or other concessions may, in fact, be unlocking the significant financial potential of the project as a toll project by making the project politically possible.

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CHAPTER 4

ECONOMIC AND FINANCIAL FEASIBILITY AND FUNDING POLICY

4.1 Existing feasibility criteria and funding policy

4.1.1 Economic viability criteria for new toll projects

In order to ensure optimum use of scarce capital resources in South Africa, a fundamental principle underlying all major road and, therefore, also toll road investment decisions taken by the South African Roads Board is that the project has to be economically viable. This means that, after consideration of the effects of levying toll, namely lower user benefits resulting from traffic diversion and toll-related capital, operating and maintenance costs, the project should still have acceptable indices of economic worth, namely a positive nett present value and an acceptable internal rate of return on invested capital. Although a minimum of an 8% per annum economic internal rate of return was regarded as acceptable during the early eighties when capital was more readily available, a minimum of 15% per annum is currently being utilised in view of the severe budget constraints under which the Roads Board is currently functioning.

4.1.2 Financial feasibility criteria

Given the philosophy in respect of the self-funding ability of toll projects indicated in section 3.2.2, potential toll roads established by the State (as opposed to those established as part of an unsuccessful privatisation initiative) have been evaluated financially on the following basis:

- A significant percentage of the initial project capital cost has to be funded from capital and money market loans which can be serviced and repaid from the predicted future nett revenue of the project. This has led to the concept of the **loan supportable by revenue** (LSR) of a toll project which is the amount of capital/money market loans that may be procured to assist with the financing of the initial capital cost. In the original feasibility studies for State toll roads, the LSR was determined by

discounting the predicted nett toll revenue of a project to present worth at a 4% per annum real interest rate for a 20 year evaluation period.

- A "significant" contribution from loans has, on the basis of the projects approved to date, empirically been determined as at least 30%. (All current projects, except the Tsitsikamma and Magalies Toll Roads, comply with this requirement).

- The predicted cost of toll collection over the life of the project had to be "reasonable"; approved projects (except Tsitsikamma and Magalies) have, in practice, achieved costs of collection of below 30% of gross toll income and this compares favourably with international figures which vary, according to an Organisation for Economic Co-operation and Development[1] study, from an average 10% in France to 27% in Japan and 35% in the United States of America.

4.1.3 **Funding policy**[2]

a) Funding policy up to 1994

The mixed financing approach in respect of South African toll projects came about by limiting the capital/money market funding to the predicted LSR of a project, i.e. what a project can afford to pay from its future nett revenue, with the balance of the initial capital expenditure being provided by means of a long term loan from the National Road Fund (NRF). Decisions on the repayment of these long term loans are taken at the time when projects became capable of such repayment.

In order to be financially conservative and to not have to capitalise interest in the form of additional capital and money market loans, the National Road Fund also makes up the shortfall in interest payments during the construction period and first 7-10 years of operation when nett revenue (after operating expenditure) is not sufficient to pay all the interest on the capital and money market loans. In terms of the financial discounting exercise in which the LSR is determined, these medium term NRF loans can be repaid by the project with interest within the evaluation period.

The specific financing strategy which was employed for the State financed toll projects up to March 1994 was as follows:

PHASE I : THE CONSTRUCTION PERIOD

° Procurement of capital and money market loans to the extent that the future nett toll revenue can support these loans.

° Payment of interest on the capital and money market loans from National Road Fund medium term loans.

PHASE II : INITIAL YEARS OF OPERATION OF THE PROJECT

° Rolling over of capital and money market loans

° Payment of interest on the capital and money market loan from the nett toll revenue and National Road Fund medium term loans.

PHASE III : MIDDLE PART OF THE PROJECT EVALUATION PERIOD

° Rolling over of capital and money market loans.

° Payment of interest on capital and money market loans from nett toll revenue.

° Payment of interest on National Road Fund medium term loans.

° Repayment of medium term NRF loans from nett toll revenue.

PHASE IV : LAST PART OF THE PROJECT EVALUATION PERIOD

° Payment of interest on capital and money market loans from nett toll revenue.

° Establishment of redemption funds.

° Repayment of capital market loans from the redemption funds and nett toll revenue.

PHASE V : AFTER INITIAL PROJECT EVALUATION PERIOD

° Repayment of the National Road Fund long term loans, including interest at a rate to be decided upon by the SARB.

b) Financing Policy Changes Resulting from the 1994 Toll Road Refinancing Strategy

Since the NRF income has, in recent years, continued to be reduced in real terms, the desirability of the provision by the NRF of medium and long term loans to toll projects from its allocation by the Exchequer was increasingly questioned.

Furthermore, it became apparent from a comparison of predicted and actual private sector debt levels of South African toll roads that, with the exception of the N17 and N4 Magalies toll roads, South African toll roads are performing significantly better than required to repay the private sector loans against the projects. It had also been observed that a 20 year payback period was rather short in comparison with international practice where 30 years and longer periods are quite common.

The ability of all South African toll roads to support loans from future nett revenue up to 30 years after the completion of individual projects was, therefore, re-assessed. This re-assessment indicated that at a 4% per annum real interest rate and with traffic growth rates of not more than 3% per annum for 20 years and 2% per annum for the last 10 years, an additional R1 270 million of private sector loans can be supported by the expected future nett toll revenue of South African toll projects.

A re-financing strategy was, therefore, devised in terms of which each toll project, to its loan-supporting ability, will procure additional private sector loans to repay, partially or totally, the National Road Fund for its loans to each specific project. This approach is necessary to comply with the current National Roads Act which explicitly limits the application of toll revenue from a project to the repayment of the debts of that project. In terms of a legal opinion expressed by the State Attorney, the

National Road Fund will be in a position to utilise the repayment of loans to it by individual toll projects as is deemed appropriate by the South African Roads Board.

The following important policy changes therefore resulted:

- NRF long term loans to new toll projects are being provided from the repayment of NRF medium and long term loans by existing toll projects rather than from the income allocated to the NRF by the Exchequer. The existing toll projects fund these repayments by procuring additional capital and money market loans to their loan-supporting ability.

- No NRF medium term loans to toll projects to cover interest shortfalls during the initial years are being provided anymore and toll projects have to fund such shortfalls by procuring additional capital and money market loans, i.e. by capitalising interest.

- The repayment period for private sector loans was increased from twenty to thirty years.

4.2 Issues, New Options and Evaluation of such Options

4.2.1 Economic feasibility criteria for toll projects

a) Issue

The current practice in respect of the evaluation of potential toll projects from an economic viability point of view is to predict "before" and "after" toll indices of economic worth (economic internal rate of return, benefit-cost ratio, etc.) and to evaluate the compliance of "after toll" indices with the minimum required levels of such indices. Although this methodology gives some comfort regarding the eventual economic viability of toll roads, it does not really address the issue of whether toll financing rather than tax financing should be utilised to fund the project.

b) New options

i) The earlier implementation of projects when using toll financing as the economic benefit of toll financing vs. tax financing[3)]

The major attraction of toll facilities is their potential self-sufficiency, especially when tight budgetary constraints and sizeable repair needs are forcing governments to limit the funds available for new highways. By establishing a steady stream of revenue earmarked for the construction of particular highway projects, the creation of financially independent toll facilities can expedite the construction of new highway capacity that might be delayed for many years while waiting for general tax funds. Toll financing can allow the benefits of new roads to be realized sooner while reducing the need for future increases in taxes, and possibly freeing some existing tax receipts for the repair and upgrading of non-toll highways.

Moreover, debt-financed facilities such as toll roads can be built more quickly. The availability of all necessary funds at the start of a project can speed the construction of toll facilities as compared to tax-supported routes built under a cash-flow approach. Because toll roads must make bond interest payments during construction, they have an additional incentive to complete construction quickly and begin collecting revenues.

To the extent that toll financing expedites construction of a needed facility, it allows the economic benefits of the new route to be realised sooner than if the facility were constructed with tax financing. If, for example, toll financing were to allow a needed road to be financed and built four or more years faster than under the financing alternatives, it might well pay to build the road as a tollway, as long as projected traffic volumes and other conditions make tolling financially feasible. On the other hand, if toll financing were to expedite construction by only a year or two, tolling would probably be a less desirable choice. Of course, this suggests only the general magnitude of the time advantage needed for the benefits of toll financing to

outweigh the higher costs resulting from tolls. Analyses in the United States of America show that the number of years' advantage required is highly sensitive to differences in the overall level of benefits to be provided by a road and to differences in the rates of traffic diversion caused by tolls. In general, the better the project, the shorter the time advantage required for toll financing to prove worthwhile.

ii) Possible additional economic feasibility criterium

A possible new option in respect of economic feasibility criteria for toll projects is, therefore, to determine by how many years a project will have to be brought forward in order for earlier toll financing of the project to begin to yield better indices of economic worth (economic internal rate of return, benefit-cost ratio or present value of benefits minus cost) than later tax financing of the project.

The supply of this information, viz. the number of years by which toll financing will have to bring a project and its benefits forward in order to make it an economically more efficient funding method will enable decision-makers to judge whether to implement a toll-funded project immediately or wait for anticipated tax (or fuel levy?) funds.

c) Evaluation of new option

It is considered that the proposed additional economic feasibility criterium will improve the evaluation of the potential efficiency of toll funding of a project. It may be argued that it will be difficult to determine if and when a project will be implemented by means of tax financing. This may be so, but a conservative estimate of this time could become a powerful negotiating instrument in the public participation process.

4.2.2 A reasonable degree of self-financing ability for a toll project

a) Issue

There appears to be no norm for determining when the LSR contribution of a toll project is significant enough to consider toll financing to be worthwhile.

b) New options

i) Status quo in respect of self-financing ability

In order to provide an updated perspective on the ability of toll projects to be self-financing over the longer 30 year evaluation period selected by the Roads Board in 1994, the following analysis was performed:

° the value of toll road assets was expressed in March 1994 Rand for all existing South African toll projects by applying the actual historic inflation rate to historic cost information.

° the March 1994 value of the nett income over 30 years was determined by adding the following:

- the actual nett toll income since the opening of the toll road which was escalated to March 1994 Rand by using the actual historic inflation rate.

- the estimated LSR of the project for the period from 1994/95 until the end of the 30 year evaluation period with tariff increases at 100% of the inflation rate and at a 4% p.a. real interest rate.

Table 4.1 compares the values of toll road assets and the project life cycle LSRs and indicates the real capital funding structure of toll projects.

TABLE 4.1
REAL CAPITAL FUNDING STRUCTURE OF TOLL PROJECTS
(All monetary figures are in March 1994 Rand)

Toll Plaza	Value of toll road assets	Full life cycle (30 years) LSR	Effective Capital funding required from NRF
Tsitsikamma	R282 million	R 61 million (22%)	R221 million (78%)
Mariannhill	R362 million	R191 million (53%)	R171 million (47%)
Kranskop	R170 million	R350 million (>100%)	-
Huguenot Tunnel	R555 million	R276 million (50%)	R279 million (50%)
North Coast:			
- Tongaat	R193 million	R118 million (61%)	R 75 million (39%)
- Mvoti	R216 million	R260 million (>100%)	-
- Mtunzini	R632 million	R192 million (30%)	R440 million (70%)
South Coast	R516 million	R168 million (33%)	R348 million (67%)
Magalies	R 86 million	R 7 million (8%)	R 79 million (92%)
Mooi	R259 million	R674 million (>100%)	-
Tugela	R407 million	R604 million (>100%)	-
Wilge	R527 million	R578 million (>100%)	-
Grasmere	R138 million	R153 million (>100%)	-
Vaal	R443 million	R441 million (99%)	R 3 million (1%)
N17	R718 million	R172 million (24%)	R546 million (76%)

ii) New conclusions in respect of self-financing ability of toll projects

The conclusions which can be drawn from Table 4.1 are as follows:

° There are at least 7 of the 15 projects presented in Table 4.1 (if Vaal is added) which appear to be potentially self-funding. They can be arranged into two groups of projects, viz.:

- Upgraded previously existing roads which were subsequently tolled including:
  Mvoti (rural)
  Mooi (rural)
  Grasmere (urban)

  The asset values of these projects do not reflect their original construction cost. If their original construction costs were added, Grasmere would definitely not be self-funding; Mooi might be and Mvoti might be significantly but not totally self-funding.

- New rural toll roads offering significant distance savings compared to their alternative routes, viz. Kranskop, Tugela, Wilge and Vaal.

  It is perhaps noteworthy that these roads have the highest tariffs of 15 - 25 c per km.

  It can, therefore be concluded that it is not unreasonable to expect a new rural toll road offering significant distance savings (10 kms or more) to be self-funding.

- The only case of a new rural toll project with a distance saving of below 10 km (Mtunzini at 7 km) gives a conservative prediction of 30% self-financing ability.

- Semi-urban toll projects (new and previously existing) are not doing well in terms of being self-funding:

Magalies	8%
N17	24%
South Coast	33%
Mariannhill	53%
Tongaat	61%

It can, therefore, be concluded that a 30% self-funding ability is a reasonable expectation for a semi-urban toll project.

c) Evaluation of new options

It could, quite correctly, be argued that there is no need for a norm in respect of the degree of self-financing ability of a toll project, provided that economic viability criteria are met.

The new conclusions arrived at in section 4.2.2b)ii) are, however, useful as guidelines rather than norms of what could be expected of certain classes of toll projects.

4.2.3 Financial safety factors

a) Issue

In the design of the re-financing strategy for South African toll roads, a financial safety factor was built in for those toll projects in respect of which the Roads Board had not already been committed to certain levels of capital and money market loans.

The safety factor involves that the LSR is calculated with toll tariff increase at 80% of the inflation rate. This safety factor has the potential drawback that no incentive will exist to increase tariffs at the inflation rate to achieve an even better financial performance.

b) New options

i) Since the gross toll income which is dependent upon tariffs and traffic volumes is one of the most important uncertainties in a financial prediction for a toll road, it is considered more appropriate to build in a safety factor related to the percentage of the gross income that will materialise.

ii) In view of the current high real interest rates, accept that tariffs would have to increase at the inflation rate and increase the long-term real interest rate used in the calculations from 4% p.a. to 5% p.a. or 6% p.a..

c) Evaluation of option

i) Table 4.2 indicates what the safety factor would have to be for various toll roads, (if it is assumed that the tariffs will rise at the inflation rate) in order to yield the same LSRs as for the cases where the tariffs will rise at 80% of the inflation rate.

TABLE 4.2 SAFETY FACTOR (% OF GROSS INCOME) EQUIVALENT TO TARIFF INCREASES AT 80% OF THE INFLATION RATE	
Tsitsikamma	87,1%
Mariannhill	86,4%
Kranskop	88,5%
Mooi	84,8%
Tugela	85,2%
Vaal	83,9%
Grasmere	86,5%
Average	86,1%

From Table 4.2 it can be concluded that a safety factor which is a percentage of the predicted gross income, of the order of 85%, would yield the same LSRs that are currently used in the toll road re-financing strategy.

ii) The real interest rate is a very sensitive variable in the LSR calculation and any uncomfortability in this regard should be addressed first and foremost.

4.2.4 Improvement of the financial performance of toll projects

a) Issue

Is the full financial potential of the improved access to a high-standard toll facility being achieved?

b) New options

During a study tour by a Tolplan director in the USA, he was informed that some Floridian toll projects earn about 25% of their gross income from value-capture related levies.

c) Evaluation of option

The over-riding requirement for the implementation of value capture levies is a market-driven economy. Without a detailed evaluation of the option here, it could certainly be concluded that it is relevant in the South African situation and could improve the financial viability of especially urban toll projects like the N17.

4.2.5 **Protection of the toll funding potential of toll projects, should they become part of Build-Operate-Transfer (BOT) projects**

a) Issue

The N1 and N3 rural toll projects play an important role in the current toll road re-financing strategy in that they are repaying more than R700 million of NRF loans. These repayments are then utilised to provide NRF long term loans to other developing toll projects.

If the road privatisation process during the 1980s was successful, all this funding potential would have gone to the private sector shareholders and possibly to the fiscus. It would, therefore, have been lost to the National Road Fund.

b) New options

If Build-Operate-Transfer projects involve a public contribution such as an existing project to be "donated" to the project to ensure its viability, it is considered that the agreement should make provision for this to be a long-term loan against the BOT project which should be repaid if the expected nett income required by the most competitive concessionaire is exceeded.

c) Evaluation of option

Without measures such as the above-mentioned, the "crown jewels" may be given away.

4.3 Potential policy guidelines

a) Economic viability of the application of toll financing to a project

The following economic evaluations should be performed in respect of potential toll projects:

- The determination of indices of economic worth for the "before" and "after" toll levying cases and the comparison of these indices with the threshold values indicating economic viability.

- The number of years by which toll financing will have to bring a road project and, therefore, its benefits forward in order to make it economically more efficient than tax financing.

b) Financial feasibility

i) The minimum acceptable LSR contribution to the capital structure of a project is 20%.

ii) The financial safety factor in the calculation of LSRs should be, in order of priority:

- if warranted, a higher real interest rate.

- a safety factor which effectively reduces the predicted gross toll income by the application of a suitable percentage below 100% to it (e.g. 85% would be the current value of this safety factor).

iii) The application of value-capture levies in conjunction with toll roads should be further investigated.

iv) Possible future BOT agreements which include the transfer of an existing road to a concessionaire should allow for this to be a long-term loan against the BOT project which should be repaid if the expected nett income required by the most competitive concessionaire is exceeded.

4.4 Conclusions

4.4.1 The present economic viability criteria can be enhanced to include an evaluation of the economic efficiency of the earlier implementation of a toll project versus the later implementation of a tax-financed project.

4.4.2 The financial safety factor presently applied in financial viability analysis should be changed to prevent it from being a disincentive for tariff increases.

4.5 Bibliography

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PART III - INSTITUTIONAL AND LEGISLATIVE IMPLICATIONS

CHAPTER 5

INSTITUTIONAL FRAMEWORK

CHAPTER 6

LEGAL FRAMEWORK


SAHA
ARCHIVE FOR JUSTICE

CHAPTER 5

INSTITUTIONAL FRAMEWORK

5.1 Existing Practices

5.1.1 South Africa

Toll roads in South Africa are administered by the South Africa Roads Board (SARB) with the Department of Transport as its administrative arm, subject to Ministerial approval in respect of certain key decisions. A SARB toll roads committee has also been created in the National Roads Act to perform the functions delegated to it by the Board. The current mechanism used is that central government finances and manages the toll toads but the private sector designs, constructs, operates and partially maintains the system on a competitive basis.

The SARB's primary function is to provide for the construction and control of national roads in terms of the National Roads Act. The SARB derives its funds from the National Road Fund and is accountable in terms of Treasury regulations. By its nature it is exempt from tax and is financially administered like a government department. Apart from private sector representation on the Board, the organisation does not resemble a private sector institution. The SARB is motivated by the principle concerning the protection of the public interest.

The Department of Transport, being a government department is more suited to traditional public administration activities than to a semi-business activity such as the operation of a toll road system. However the required transformation has already taken place with respect to the business nature of managing toll roads. Examples of this are the accounting system which is based on generally accepted accounting practice (GAAP) which includes the accruals principle whereas other roads are accounted for on a cash basis. The Department of Transport has established a separate toll road directorate which acknowledges the importance of these roads within the overall provision of national roads. This directorate manages toll roads with the objective of financial accountability and transparency required in a high profile, publicly sensitive service. These objectives however require constant explanation and discussion with roads user organisations.

In the second half of the 1980's the SARB embarked on a road privatisation initiative which failed due to legislative problems in 1988 and 1990. This was a attempt to grant build, operate and transfer (BOT) concessions to the private sector. These concessions were however perceived by the public to be monopolistic by nature, especially with regard to the toll tariffs that were levied. The fact that these concessions were not issued through a competitive bidding process compounded the problem. The major lesson learnt in this process was that road privatisation should not proceed unless the legislation is in place.

The advantages of the current mechanism is that the Department of Transport is more responsive to dissatisfaction with planned toll schemes because of the political pressures with can be brought to bear. This has resulted in a reasonably priced service for the road user. The private sector is used as 'sub contractors' on a competitive basis to undertake most of the work. This has the advantage of keeping the right of way in public hands but allows the Department of Transport to benefit from private sector efficiency and innovation.

The disadvantage this mechanism is that the extent to which the State can finance toll roads is limited by the extent of loans the Department of Finance is willing to approve. A further possible disadvantage is that, because of the business nature of toll roads, a central government department may not be the best institutional structure to manage these roads.

5.1.2 International Models

a) Public Sector

A number of countries, including Australia and New Zealand, have adopted a policy of corporatising their national road agencies to make them more autonomous, improve performance and generally strengthen market discipline. In Australia this has led to reorganisation of some state road agencies under a Board of directors consisting of the heads of various functional departments. In the United States autonomous toll road authorities have been established for some time. The major benefit of these arrangements are that such authorities maintain their accounts along normal commercial lines. One of the most ambitious toll roads systems is that of Japan. It is operated as a public enterprise with about 4700 km of toll roads in operation. It

uses commercial accounting systems finance its operations through tolls, bonds and long term loans and receives little support from the government. In 1990 it earned 6% on its capital employed.

The degree of autonomy enjoyed by toll roads internationally varies greatly. In most cases the company is a public utility which is controlled by the government of the day. The management of such a utility company is usually drawn from the private sector. The powers of the company are contained in the contract between the government and the authority. Unless there are alternative routes to the toll road the authority will operate a monopoly and will need to be regulated by government. The balance between government intervention and effective management is always a matter of concern. The main factors which require regulation are toll tariffs and the generation of surpluses. The toll authority cannot be held responsible when government holds down tolls at unreasonably low levels (as happened in Mexico) resulting in the financial failure of the authority. On large toll road networks (in Italy, for example) high tariffs can be charged without diverting significant volumes of traffic. Abnormal surpluses can be made resulting in a possible disproportionate investment in the road network. Regulation can also have a similar effect leading to inflated costs because the authority would rather indicate a higher operating cost than a reduction in income.

The various types of toll authority, the countries in which they are in use and a brief description of the institutional framework is indicated in Annexure A

b) Private Sector

There is growing interest internationally in involving the private sector in the provision of roads. This is done for numerous reasons (mainly political) in order to draw on private sector finance. Schemes range from full ownership such as the Channel Tunnel (build, own, operate and transfer) through concession agreement (build, operate and transfer) to purchasing an existing project (finance, operate and

transfer). See Annexure A for a full list of private institutional structures and the countries where they occur. A full description of institutional mechanisms is contained in Volume 2.

c) Specific Examples of Institutional Structures

1. **Eastern Europe**[1,2]

In 1991, the European Bank for Reconstruction and Development (EBRD) was established to foster the transition towards open market-oriented economies and to promote private and entrepreneurial initiative in the central and eastern European countries committed to and applying the fundamental principles of multiparty democracy, pluralism and market economies.

The EBRD aims to help its countries of operations to implement structural and sectoral economic reforms, including de-monopolisation, decentralisation and privatisation, taking into account the particular needs of countries at different stages of transition. Its activities include the promotion of private sector activity, the strengthening of financial institutions and legal systems, and the development of the infrastructure needed to support the private sector.

The EBRD encourages co-financing and foreign direct investment from the private and public sectors, helps to mobilise domestic capital, and provided technical cooperation in relevant areas. Its works in close cooperation with international financial institutions and other international organisations. The Bank promotes environmentally sound and sustainable development in all of its activities.

The EBRD has 59 members (57 countries and the EC and EIB), including 25 countries from central and eastern Europe and the former Soviet Union.

The EBRD operates in both the private and public sectors. It merges the principles and practices of merchant and development banking, providing funding for private or privatisable enterprises and for physical and financial infrastructure projects to support the private sector.

Guidelines for the Bank's participation in Transport Infrastructure Concession Projects are attached as Annexure C. In summary, the following aspects are of interest:

- The sponsor (or concession company) can be made up of contractors, operators, financial investors, host government bodies and local private counterparts.

- The Bank requires a detailed review of the project including technical alternatives. The justification of the project within the country's overall transport strategy is required.

- The Bank differentiates between private sector and public sector finance in transport projects. The Bank will only consider granting finance to a private sector financed project if the concession company has been selected and controlled as a result of a transparent, open international tendering procedure. Public sector finance will be granted to authorities which are majority owned or controlled by national or local governments or are government agencies.

- A public participation process should take place prior to the Bank's involvement. Interested parties should be given the opportunity to participate in terms of reference for an environmental assessment of alternatives.

- A detailed traffic and revenue analysis is required by consultants expert in toll roads. This is normally undertaken in conjunction between the State and potential bidders.

- Detailed capital, operating and maintenance cost estimates need to be provided.

- An economic viability study is required to determine whether the project has a satisfactory economic rate of return. A cost/benefit analysis of the project with regard to the local and international economy is also required.

- A detailed financial plan is necessary in order to determine feasibility and all relevant financial ratios per annum. The concession company must establish a "banking case" such that the senior debt service cover ratio of 1,5 is met for each year of the project. A discounted debt service cover ratio of 2,0 over the life of the loans is also required. The Bank expects that the concession company should contribute a minimum of 20% of the project cost as equity. An analysis of major risks is required, especially financial and tariff acceptability risks.

- The EBRD will normally participate as a financier of BOT projects but may also underwrite loans. It limits its overall financial participation to 35% of the total projects cost.

a) **Hungary : Motorway M5**

The Ministry of Transport, Communication and Water management of the Republic of Hungary have concluded BOT concession agreements with two consortia for the main north/south routes through the country. The first of these is part of the road linking Budapest to the Austrian border (M1/M15) while the other is the road south of Budapest to the Romanian/Croatian border (M5). The M1/M15 is under construction at present while an agreement is being finalised with the concession company on the M5.

The most recent process for selection of the concessionaire concerns the M5. This is as follows:

- Prequalification of bids: Five companies prequalified for the project based on technical and financial BOT expertise.

- Detailed tender for project: The five companies were required to tender the lowest toll tariff over a 30 year concession period (after completion of construction). Two consortia were selected to proceed to the next round of negotiations.

- Detailed Negotiation of terms of the concession: Technical, financial, operational and the toll strategy were negotiated in detail. The Government finally selected one concession company in April 1994.

The concession for the M5 consists of 3 phases totalling 187 km:

- Phase 1: Construction of 28 km of a second carriageway of the existing 85 km motorway. The concession allows the tolling of the existing motorway.

- Phase 2: Construction of a new road bypassing a major town of 18 km. This bypass is not to be tolled.

- Phase 3: Tolling of a new motorway south of the main town for 24 km.

The construction of the remaining 60 km to the border will proceed only if the first 127 km of toll road is successful. The project is being financed by a syndicated capital market loan, loans from the EBRD and the concession companies equity.

b) **Romania : Trans European Motorway Network**

Romania is in the centre of Eastern Europe and forms the link between the Baltic/Middle Eastern countries and Western Europe. It is a country which, for the last 50 years, has been under the control of a communistic government and hence had a centralist economy. After the democratisation of the Eastern European countries the new government in Romania has been committed to stimulating the economy. Coupled to this is the war being fought in Serbia/Croatia which effectively blocks off the most direct road link between Western Europe and the Baltic States. The transportation planners have therefore realigned the so-called "Trans-European Motorway" through Romania.

The Government of Romania is currently investigating a toll road policy as well as institutional structures to manage the toll motorway system. A company will be formed which will be a commercialised, market-oriented corporate entity whose equity will be held 100% by the State.

This company will oversee the initial implementation of toll roads on both a traditional basis using State resources as well as private sector concessions on certain of the roads. It is anticipated that this toll road authority will evolve as the toll road network develops. Options being investigated are that the authority remains state owned but can a) establish joint private-public sector subsidiaries, b) award operating concessions to private service contractors for specific motorways and/or c) award Build-Operate-Transfer (BOT) concessions for specific motorways. The final option is to privatise the toll authority itself.

2. Western Europe[2,3,4,5,6]

A number of countries in western Europe have succeeded in financing all their road infrastructure programmes from budgetary resources, i.e. by way of taxation. Germany and the Netherlands fall into this category. Others have used tolls only for individual bridges and tunnels. Some countries, however, have succeeded constructed their major motorway networks by means of toll financing. France, Italy and Spain are cases in point. The major toll operating countries will be discussed in this report. There are countries operating only a few toll project and these will not be included.

a) France

After the Second World War the French motorway system was in need of reconstruction. In 1955 the State passed an Act allowing motorways to be constructed by way of toll concessions. The first 5 public works concessions between 1956 and 1969 were granted by the French Government to the public sector with the participants being national public entities and regional and local authorities through which the toll road passed. The toll roads were financed from private sector loans guaranteed by the State with some State subsidies. Recent changes to the initial financing arrangement have eliminated the guarantees and subsidies by the State. The loans were redeemed over 35 years. The State set the construction programme and technical standards.

In 1969 the existing Act was amended to allow fully private toll roads consisting of banks and contractors. Four companies were formed. Three of the four companies unfortunately experienced financial difficulties and were taken over by the State to form public/private companies. One of the companies (Cofiroute) continues to operate today as a fully private company on a BOT concession over 35 years. France has also applied the concession system to major bridges and tunnels. These were formed into one public/private company.

The large debt which was built up by the loans required to construct the toll roads necessitated the reform of the financing and management of the public/private toll concessions. All nine public/private companies (8 motor and 1 bridge/tunnel) have been incorporated into a single public corporation in order to control costs. The objective of this organisation has been to ensure profitability of the whole toll road network and not just individual sections. The State has full control over the setting and increases in toll tariffs. An effort has been made to rationalise the toll tariffs throughout the network into a uniform rate per kilometre. Traffic growth is meeting expectations. On average some 85% of the traffic uses the toll motorways while the other 15% use the alternative, free routes.

b) Italy

In 1924 the first toll road opened in Italy. Various sections have been added over the years resulting in a network of toll motorways. The most significant developments of the network came in the second half of the 1960's and early 1970's. Toll roads in Italy are run by 22 concession holding companies, all of which are majority owned by public bodies or local authorities. The largest of these concession companies is Autostrade which manages 52% of all toll motorways. There are approximately 5 400 km of tolled motorways.

Toll motorways are administered by concession whereby the State entrusts the task of financing, constructing and administrating to an organisation for a given period (30 to 35 years). At the end of this period the entire facility is returned to the State free of charge. No financial profit is earned by the concession companies. The Government is, however, reviewing this policy for new toll roads.

This concession policy has resulted in the formation of a number of single concession companies administering one project and a concession for the network of motorways. The toll motorway network has been developed in such a way that the more profitable sections of the network subsidise the less profitable. Thus it is now possible for sections of road which could not normally be funded and constructed from State revenue to proceed at a much earlier date.

The State's involvement is limited to 10% of the total investment in the project, the other 90% coming from capital market loans. The State guarantees these loans. On average 90% of all cars and 10% of all heavy vehicles use the toll roads.

c) Spain

In 1973 the Government of Spain passed an Act allowing the construction of roads, bridges and tunnels to be funded from tolls and that concessions be granted for the administration of these projects. This was an all-encompassing legislation setting technical standards, financial conditions and the alignment. Once these had been established for a particular toll project the State offered it to the private sector by concession for a period not exceeding 50 years.

The financing of toll projects in Spain is unusual in that the State decreed that at least 45% of the investment should come from foreign capital markets while between 10% and 25% should be funded by equity in the concession company. Because of the condition of foreign loans and the risk of foreign exchange losses the State guaranteed up to 75% of these borrowings.

Eleven concessions were granted to the private sector under these conditions. Of these 3 were not successful and the State had to step in and take over the company. This prompted the establishment of a "National Motorway Company" which not only manages these 3 companies but oversees the performance of the other 8. This company has also been responsible for the development of new toll roads in recent years funded from both the private and public sector.

This arrangement has led to the construction of more than 2 000 km of tolled motorways. The State is also developing and improving the non-tolled network allowing better access to the toll roads.

3. United Kingdom[3,5]

Toll roads were abandoned in the 19th century but were again mooted in the 1950's after the war. They were again rejected on the basis that diversion to free roads would make them unviable. The Government did, however, decide to toll large bridges and tunnels (mostly estuarine crossings). At present there are 11 toll bridges and tunnels. They have been financed from government loans and subsidies as well as capital market loans obtained by affected local authorities.

In 1987 the government issued a green paper on private toll roads. The first project to be identified was the Dartford River Crossing. The State issued a "Request for Proposal" (RFP) to interested private sector groups in the form of a competition. The arrangement was that a second crossing had to be provided (bridge or tunnel) and that the existing tolled tunnels could be incorporated into concession. The winning group chose a suspension bridge and have 30 years to redeem the loan.

In 1990 a Private Act was passed in Parliament empowering the use of private funding for toll roads. In 1991 the State issued a RFP for the construction of the northern Bypass of Birmingham, Birmingham Northern Relief Road (BNRR). A competitive BOT process was followed and a concession company was appointed in 1992. The Government, however, insisted that the public enquiry process start from scratch. This has led to many delays due to the sensitive nature of the project.

In August 1994 the Highways Agency of the Department of Transport issued prequalification documents for 4 Design-Build-Finance-Operate (DBFO) projects. These DBFO concessions consist of private sector companies which will be:

- responsible for the design, construction, maintenance (i.e. capital, routine and winter maintenance) and operation of the project road;

- granted a long term right of access (possibly up to 25 years) to the project road by the DOT for those purposes; and

- paid by the DOT in relation to traffic usage of the project road and satisfactory achievement of performance criteria, in the form of regular payments over the life of the contract.

Thus, while there are no toll plazas on these roads, the concession company will be reimbursed by the Government for usage. This is know as "shadow tolling". It is anticipated that the first contract of this type will be let in July 1995.

4. United States of America[2,3,4,7,8]

The concept of financing roads by way of toll has long been used in the United States. After World War Two 19 States created toll authorities. By 1954 some 2 200 km of toll roads was under construction and a further 5 300 km was being planned. This explosion of toll financing concerned the Federal Government and in 1956 an Act was passed limiting the use of federal aid in the development of toll roads. The Act also stipulated that the turnpikes had to be integrated into the Interstate network if the routes were identical, if the standards were the same and if there was an alternative route available. The restriction that tolling had to cease once the loans were redeemed was also maintained.

Currently about two-thirds of the total length of the turnpikes form part of the Interstate network and about 5% of the network is tolled. All 88 turnpikes are owned and operated by the States or local authorities as self financing entities. These

Turnpike Authorities employ required staff and resources including construction and maintenance teams as well as toll collection, accounting and legal personnel. State Police are seconded to the Authority and paid by them. The ability to collect toll is governed by a "covenant" which was issued when the toll road was first mooted. This agreement defines the alignment of the route, the engineering standards, the level of toll and increases as well as the financial framework of the authority. Most covenants make allowance for extensions of the toll road when the initial loans are about to be repaid thereby allowing their continued existence.

In 1991 the Intermodal Surface Transportation Efficiency Act (ISTEA) was passed which requested that a National Highway System (NHS) be defined in detail. These are the major primary roads in the USA and are limited to 155 000 miles (248 000 km). Part of the ISTEA legislation was the provision of Federal aid reimbursements (subsidies) to States for direct expenditures and loans for toll road projects. These projects could be partnerships between State, DOT's and other public and private entities.

An example of the public-private partnerships is the planned tolled highway around Houston, Texas. In this project federal and State funds as well as capital market loans were pooled in order to expedite the project. Once the loans are redeemed the Texas DOT assumes ownership, maintenance and toll free operation of the facility.

In a recent survey of a broad range of existing and planned toll projects conducted amongst the States of the USA it was found that some $6 billion (R21 billion) toll roads have been constructed during the past 5 years. Another $10 billion (R55 billion) are being planned. In total 18 States have relied on some level of public-private partnerships to develop their toll roads. The survey also requested suggestions to improve the innovative financing provisions of the ISTEA Act. One of them was to allow tolls on existing toll-free Interstate highways.

The first privately financed road in recent history will be opening in 1995. This is the construction of the 16 km section of State Route 91 in Orange Country, California. This road will be constructed in the median of an existing freeway. The

tolls will be collected by fully automatic vehicle identification technologies as toll plazas could not be constructed in the limited space available. Tolls will vary depending on the time of day and congestion levels on the freeway. Authorised car pools of 3 or more occupants will be given free or heavily discounted access. Funds are being raised and are guaranteed by the private sector. The road is to be returned to the State within 30 years.

Another toll road in California is the San Joaquin Hills Transportation Corridor. The first part of a 3 leg system is scheduled to open in 1995. It is 24 km long. The contract to design and build the project has been let and the winning bid was $779 million (R2,73 billion). Some 90% of this cost will be financed from loans. This project is being managed by the Transport Corridor Agencies, a public authority. Its task is to manage the toll operator and set tariffs. The toll operator is responsible to design, develop, install and operate the toll collection system over a 5 year contract period. The toll revenue is paid over to the State. The State DOT maintains ownership of the road and is responsible for the maintenance of the road.

The Dulles Toll Road Extension is a fully private toll road being developed in Virginia, USA. The road is an extension to the Dulles Toll Road, a State owned road. Private financing of toll roads was legislated by the Virginia Highway Corporation Act of 1988. This Act allows corporations to construct, finance and operate public roads. The Act contains several provisions to safeguard public safety and financial interests such as:

- traffic laws of the State apply
- speed regulations must conform to State practice
- the Virginia DOT inspects and approves construction

- the corporation does not have power of expropriation
- the corporation is regulated as a public utility company
- the State sets the toll tariffs and establishes the corporation's rate of return

When the road is completed the corporation plans to sell it to a financial institution at cost and have the institution lease the road back to the corporation for operation. The proceeds from the sale of the road will be used to redeem the construction debt. The financial institution will sell bonds to finance its investment and use the corporation's lease payments to retire the bonds. The corporation will derive its income from the toll revenues. The State will provide no funding for the project and any profits will be considered taxable income by the state. The corporation will use its equity capital to cover the deficit in the early years of operation. When revenues exceed costs and the established rate of return, the corporation must commit the excess revenues to a fund to improve local roads around the toll road.

5. Canada[8]

The first major Canadian toll road is Highway 407 near Toronto, Ontario. This road is a bypass to Toronto and is one of the busiest highways in North America. The Ontario Government decided to develop the road through a public/private partnership between a private consortium and a new Crown (or State) Agency. The Government of Ontario created the Agency through an Act. The Act also allows:

- The tolling of new highways and extensions to existing highways.
- Toll will be removed once the highway has been paid for.
- Toll revenue can only be used for purposes relating to that particular highway and not for any other purpose.

The toll road will be 69 km and will cost $1,5 billion (R5,25 billion). A process for the selection of the successful private sector partner was as follows:

- Prequalification: two consortia prequalified.

- Value engineering assessment: prior to the request for proposals both consortia had to submit a value engineering assessment (redesigning the project in order to optimise costs and benefits). A saving of $200 million (R700 million) was made.

- Request for Proposals: to finance, design, build, operate and transfer the highway as a toll road. The tenderers had to provide a guaranteed maximum price to design and construct the facility as the State reserved the right to finance the project itself. The State funded a "banking base" traffic and revenue forecast. The RFP made provision for the right to select the preferred tenderer and negotiate changes, amendments or modifications to the proposal without offering the other tenderers the opportunity to amend their proposals.

- Selection: once the final selection was made the State Agency decided that the financial offer was too onerous and opted to finance the project itself. A Development and Design/Build Agreement has been signed and not a BOT Agreement.

The Agency selected to project-finance the facility because the levels of risk to the Government were unacceptable at the financing cost proposed. By financing the project itself the overall cost was reduced because:

- The cost of debt financing was lower because the Province was borrowing the funds.

- There were no equity returns to the private sector partner.

As a result the tolls were lowered making the project more acceptable to the public.

6. Japan[3,9]

The tolling of Japan's motorways began in the mid 1950's. A law was passed allowing the construction of a network of toll motorways financed from private capital. A Public Highway Company was set up to establish a network of motorways while other primary link roads are developed and managed by local authorities (both urban and rural). All of the toll companies have a concession to collect toll for 30 years after opening. If the debt is redeemed before this then the road must be made toll free.

Toll rates are determined from three criteria:

- Toll revenue should cover the costs of construction, maintenance, operations and interest.

- Tolls should be equitable and relate to the users' ability to pay. Tariffs should compare to other modes of transport.

- Tolls should not exceed the limits of the benefit to use the toll road.

While the covering of cost remains a basic principle the level of toll is dependant on the type of road being tolled. For the primary motorway network (rural and urban) the equitability principle is important, while for other primary link roads the principle of user benefit applies. This differentiation is important because on the motorway network toll revenue is pooled, that is, high income sections assist those portions with a lower toll income. The toll tariff is therefore uniform. The link roads, however, are basically independent sections and tariffs relate to the benefit of using the toll road.

The construction of toll roads are financed by Government borrowing and private loans. Government borrowing consists of loans guaranteed by the State on behalf of various public funds. Private loans are raised by the toll authority themselves.

Toll roads are constructed to higher standards than other roads and offer a higher level of service.

7. Malaysia[9,10]

The most prominent toll project in Malaysia is the North-South Expressway covering a distance of 785 km between Singapore and the Thai border with an additional 143 km of link roads. The project was divided into 12 sections and a construction period of 5 years for the entire project was set. Unfortunately each of the sections proceeded at their own rate resulting in completed sections of the Expressway not being linked to their adjacent section. The project timetable began to fall behind and in order to coordinate the project the Malaysian Highway Authority was set up. This Authority decided to fund the completion of the project by way of toll. Loans were raised from various institutions, including the World Bank, to finance the balance of the project. Due to escalating costs and a reduction in the standard of the facility the World Bank withdrew their support for the project. The Government then decided to privatise the project. In 1987 a concession to complete the construction and operate the road for 30 years was signed. As part of the agreement the concession company was given (at no cost) the entire road corridor to toll, of which some 424 km had already been constructed. In addition the concession company assumed very little risk because up-front finance was granted for the construction and operational periods; traffic volume was guaranteed; the State assumed the risk on adverse foreign exchange and local interest movements and penalties for late completion were dropped due to factors such as changes to government policies. Even though the concession was granted on these favourable conditions private sector finance was difficult to obtain because Government were not prepared to issue guarantees on the loans. Finance was, however, raised from State owned banks and the project was substantially completed in 1992.

8. Mexico[9,10]

The Mexican toll highway system was started in 1952 with 62 km of road and by the end of the 1980's it had expanded 940 km. Most of the toll roads are in or around Mexico City. In addition to the federal toll highway network, State (or Provincial) Governments are also operating toll roads. In all cases the toll roads have free alternatives as required by the constitution. This requirement has made tolling more acceptable to the Mexican people.

In 1963 a toll highway authority was established to operate toll highways and bridges. This Authority was attached to the Federal Secretariat of Communications and Transport (equivalent to the DOT). The directors were appointed by the Government.

The toll road authority was expected to cover its operating, maintenance and administration costs and generate a surplus to cover some capital investment. The Government, however, contributed most of the finance for capital works, usually in the form of loans. During the mid 1980's, however, the financial situation deteriorated and the authority began reporting operating losses. The main reason for this was the lack of political will to increase toll tariffs during a period of relatively high inflation. Because of this loss the Authority was placed under the control of the Secretariat of Finance and was funded from general tax revenues. Tolls were also paid into the general revenue account thereby making them a tax.

The toll tariffs were originally set based on the recovery of operating, maintenance, administration and interest costs but not the redemption of loans. However, when the financial situation of the Authority worsened tolls were raised by almost 300% to a level which the market could bear without significant diversion. These large increases were attempts to catch up with inflation in the earlier years.

Mexico began investigating private concession toll roads in 1986. The initial mechanism used was the formation of a private trust controlled by a public works development bank. (Although owned by the Government, the bank is financially

independent.) This was required in order not to amend legislation. The Government assigned the right to collect toll to this trust and to invest in toll roads with the objective of obtaining a reasonable rate of return (over and above the original investment). Private investors would also be entitled to invest in the trust.

Selected contractors were invited to participate in the scheme and agreed to finance up to 25% of the investment needed by being paid only 75% of their invoices. The contractors were paid from the trust fund. Interest was capitalised as the net cash flow was negative in the initial years. Investors only received returns once there was a positive net inflow.

The concessions were granted under the following conditions:

- The Secretariat of Communications and Transport (SCT) set the technical standards.

- The roads would be operated by the State toll authority under contract.

- Toll rates and increases had to be approved by the State.

- Concession period was 20 years.

Fully private toll roads are also underway. This required amendment to the legislation. These concessions are subject to public bidding based on the shortest concession period as well as a combination of the most suitable toll tariffs and guarantees from the State. Some 6 000 km of toll road network is planned and about $16 billion (R56 billion) for the period 1995 to 2000 has been budgeted. However, the terms of the privatisation appear to be onerous becuase the short concessions terms being bid (as little as 5 years) has led to unacceptably high toll tariffs, discouraging traffic and failing to produce sufficient toll revenue.

9. India : Private Toll Roads[11]

India is a vast country, spread over 3,3 million square kilometres. Over the years it has built considerable infrastructure for development including roads. The country has a 2 million km road network, the third largest in the world, of which 34 000 km consist of national highways or primary roads.

Industrialisation of the country has brought in its wake many transport related problems. Growth in vehicle population is one such problem. Vehicle population has grown from 306 000 in 1951 to 21 million in 1991, nearly seventy-fold increase in four decades.

Growth of freight traffic on Indian roads has also been phenomenal. From 6 BTK (Billion Tonne km) of freight traffic in 1951, it has risen to 295 BTK in 1992 (nearly fifty-fold increase). The user preference for road transport has left the railways behind as the main transport mode. Now, roads carry as much as 58% of the freight and 80% of the passenger traffic.

While traffic has been growing at a fast pace, growth rate being as high as 10% per annum in some of the important corridors, it has not been possible to provide matching investment on roads, due to competing demand from other sectors. Low level of investment on roads has, therefore, led to a large number of deficiencies in the existing network. Many sections of the highways are in need of further capacity through addition of lanes, grade separation of intersections, upgradation to expressway standards, etc. There are congested routes through towns where bypasses are required in order to reduce delays. Many old bridges are in need of replacement. In order to augment the Government's efforts for making these improvements, it has been decided to invite private companies (or joint ventures, or consortia) to invest their own funds for taking up some of these projects.

Private sector participation in the highway sector is envisaged under Build, Operate and Transfer (BOT) concept. Private parties who invest their funds in identified highway projects will be permitted to recover their investment by way of collection

of tolls for specified periods. At the end of the agreed concession period, the facilities will revert to the government.

The BOT projects will cover the following type of facilities:

- expressways
- bypasses
- major bridges

Initially 27 such projects have been identified.

The companies intending to participate in these BOT schemes are expected to fully satisfy themselves about the financial viability of the project based on accurate traffic forecasts. Design and specifications for construction and operation of the facility will be in accordance with the standards laid down by the government. The rate of toll charges as well as the period of concession can be negotiated by the companies with the government.

Land required for construction and operation of the facilities will be provided by the government free of charge and free from encumbrances. Private parties would also be allowed to develop service and rest areas along the road entrusted to them.

The government will provide a preliminary feasibility report on a project indicating its economic viability and some other relevant details. However, financial viability and other details of the project would required to be investigated by the companies through consultants or otherwise.

BOT agreement terms can be negotiated with the government once the companies are ready with their proposals following investigations.

The government is quite optimistic about the success of the BOT schemes on the basis of changes being brought about under the policy of economic liberalisation. Repatriation of profits is freely permissible. There is no bar on appointment of

foreign experts and technicians. Procedure for import of construction and other equipment is greatly simplified.

The government intends to create a National Highway Authority in order to oversee the privatisation process. The World Bank has been approached to assit the Government with possible financing of a programme that will develop/manage and maintain a large network of toll financed private projects.

10. Brazil

The Brazilian Federal Government have been involved in a process over the last two years to privatise approximately 7 000 km of existing Federal roads, some of which were toll roads before 1986. The processes that have been followed to date have been conducted on a three phase approach as follows:

- Phase 1 : Prequalification
- Phase 2 : Technical Proposal
- Phase 3 : Commercial Proposal

During phase 2 part for the technical proposal each company or consortium that is participating in the bidding process has to submit a complete technical solution for the project. After this phase the Brazilian Department of Transport DNER can extract from any of the documents the best possible solution and then include this information in the final phase 3 specifications.

All companies which then participate in the phase 3 : Commercial must comply to these specifications. The final concession is then awarded to the company which tenders the lowest toll tariff. The process that has been followed to date is a very expensive process for the various companies that tender and the typical costs that have been incurred to compile their tenders for the Rio Niterio Bridge have been in excess of US $1 million per company. To be able to submit a proposal most companies have to appoint specialist consultants who have to provide detailed technical solutions for various technical problems. By following this process a lot of

the smaller companies could potentially be excluded from the process through the high cost of bidding. An alternative approach which may be more cost effective could be to specify the minimum technical requirements from the outset. This would save a duplication of effort during phase 2 by the various tenderers. The full benefit of contractor innovation can still be achieved by also considering alternative tenders when a commercial bid is received based on certain minimum technical requirements.

The financing of the toll road is under private concession to the Federal Government. All of the projects exist at present, some of which require major rehabilitation. The concession scheme is to finance, operate and transfer (FOT) the project over a 30 year period. The Government will supply the infrastructure at no cost. Limited guarantees are granted by the Federal Government on some projects.

Certain of the major projects which are currently being privatised include the following:

- Rio Niterio Bridge (concession awarded)
- Rio - Saû Paulo (Dutra Highway)
- Rio - Juiz de Fora
- Porto Alegra - Osorio
- SC 401, Santa Caterina (concession awarded)

The State of Saû Paulo also currently has approximately 20 toll roads which are run on a similar approach that is followed in South Africa, i.e. the roads are being tolled on behalf of the State.

5.2 Issues

5.2.1 Private sector is more efficient than the public sector?

The usual explanation given to the use of concession agreements between the private sector and government to construct roads is that managerial skills and finance are more readily available from that sector. Another reason usually given is that raising foreign investment

when domestic resources are constrained could be a problem. Yet another is to improve market discipline. It has been shown in France that private sector toll roads are 10 to 15 percent cheaper to design and construct than are public roads. However, in many countries where toll road concessions are used there is no clear evidence that the mechanism of raising capital, constructing, operating, and maintaining the road are more efficient than in the public sector.

5.2.2 Off balance sheet financing reduces the public sector borrowing requirement

The advantage which this may have to government depends on the way the financial risks are distributed between the financier, the operator and the government. When there is genuine limited recourse financing without government guarantees and the operators and financiers have to cover all costs out of revenues, there could be some advantage. In practice however most schemes include some sort of guarantee. Once this becomes part of the concession's financing arrangement most private financiers and international development banks would include the guarantees into the debt commitments of the country.

5.2.3 State guarantees to private concession companies

Typically, concessionaire agreements require government guarantees to protect the concessionaire against risks involved in the construction, maintenance and operation of the toll road system. These risks include, for example, lower traffic volumes than forecast, government intervention to promote public goals and unforeseen changes in the financial market. Without guarantees for the risks entailed interest costs are likely to be high in order to attract private financing. If the government does provide guarantees, it could assume the risks itself and lessen the cost of the development as it would most likely be able to borrow at a lower interest rate.

5.2.4 Private sector does not have social objectives

The development of a toll road by concession agreement is often a complex set of contractual obligations which are difficult to administer and even more difficult to monitor. One of the attractions to a concessionaire in such a venture is the opportunity to maximise his financial

return, rather than meeting social economic objectives. A government would have to establish clear regulations in the contract and may have to compensate the concessionaire for ensuing loss of revenue.

5.2.5 A profit motive could be contrary to the goals of prioritisation

The provision of roads should be balanced against the need of other infrastructure and services such as health and education. Toll roads, because of the nature of their financing, make use of loans and are therefore subjected to a strict analysis regarding feasibility. If the loans are obtained by the state, they can be included in the overall budget process. Concessionary finance, however, is sometimes used as a means to avoid the application of economic efficiency criteria when considering the project. This is particularly relevant to toll roads because the economic rate of return could be seriously affected when traffic is diverted to the alternative route if high tariffs are charged. Unless strong specific requirements are built into the agreement, the concession process can be used to bypass the normal public budget process.

5.3 Policy Options

The logical flow of reasoning regarding the identification of various options is to ask the following questions:

Should toll roads be in the hands of the public sector or the private sector?

If the public sector, should the toll road system be managed by the SARB / Department of Transport or an autonomous toll road authority?

If the private sector, which of the 8 different mechanisms identified from various countries are the most relevant?

The issues raised in section 2 above indicate that there is no clear evidence that private sector concessions are easier, more flexible, or more efficient and effective than the public sector when developing road infrastructure. The complexities of these agreements are often

substantially greater in some respects. This means that in most cases government depends heavily on regulation rather than the market to provide the desired service. This said however, there is a role which each sector could play depending on the toll road system chosen.

5.3.1 Statement and Brief Overview of Options

a) Option 1 - Retain status quo ; SARB / Department of Transport

The primary function of the SARB is the construction, maintenance, and operation of the national road network in South Africa. In exercising the powers and duties of the Board, the Department of Transport acts as its secretariat, thereby establishing the public sector nature and culture of this structure. The Board consists of 8 ministerially appointed members, with the Director General of Transport act as ex officio chairman. The relevant Department of Transport directorate consists of a director, deputy director and 5 (3 after February 1995) other engineers. The directorate is assisted by consultants in the fields of feasibilities, finance, design, public relations and operations. Loans are raised by the SARB from the capital market with approval of the Minister of Transport and in consultation with the Minister of Finance. Road construction, toll plaza operations and road maintenance is undertaken by the private sector by open tender.

The Directorate : Toll Roads could be managed as a commercial unit with a strong team of professional managers.

b) Option 2 - Autonomous toll road authority

A toll road authority would be formed as a public utility company by an Act of Parliament. Its would plan, design, construct, operate and maintain the toll road network in the most cost effective manner using loans and grants from the central government. The company would be controlled by a ministerially appointed Board of Directors, with a large degree of private sector representation. The utility company would be capable of employing its own staff at market related salaries. It should also

have the power to appoint private contractors and consultants. The performance of the company should be measured on internationally accepted criteria such as return on capital employed and 'profit'.

c) Option 3 - Private sector concessions

If the private sector is to become involved with toll roads a mechanism which would best suit South African conditions will have to be sought. Most likely the SARB would be the authority to issue 'Requests for Proposals' leading to the negotiation of a concession. Legislative changes allowing such concessions will have to submitted to Parliament (bearing in mind that previous attempts were not successful).

Seven different alternatives have been identified regarding the private sectors involvement in toll roads from various international models. These are:

- Build, (Finance), Operate and Transfer. This is the most popular method of developing toll roads at present.
- Build, Own, Operate and Transfer.
- Sale and lease back of project once it has been developed. This also includes the operations.
- The formation of a private trust to finance toll concession.
- Financing, Operate and Transfer. This involves the purchase of the project by the private sector as a going concern after the State has developed it.
- Design, Build, Operate and Transfer. The State finances the project as a partner.
- Design, Build, Finance and Operate. This is known as shadow tolling in the UK and involves the State paying the concessionaire directly for the use of the road.
- (Design), Build, Finance and Transfer. This is the "Pietersburg Toll Road" option. The design of the road as part of the package is optional.

5.4 Evaluation of Options

5.4.1 Evaluation Criteria

The four institutional structures identified above will be evaluated according to the following criteria:

a) compliance with Government policy regarding the RDP

The three goals of the Government of National Unity which affect toll roads are - to gradually reduce fiscal deficit, to increase the proportion of capital expenditure in government spending and to reorganise and train the civil service to ensure effective and efficient services.

The RDP has five basic programmes which define the strategies and the policies of the Programme. These are - meeting basic needs, developing human resources, building the economy, democratising the state and society and implementing the RDP. Attached to each of the programmes are relevant principles which motivate and support the strategies and relate to toll road financing. These relevant principles are shown in Annexure B.

b) financial, economic and legal aspects

The financial characteristics of each of the options would include aspects such as regulation of profit and the rate of return, the risk reward equation, financial guarantees, and the capacity to borrow capital. The economic aspects consider monopolistic practices, the allocation and prioritisation question, the development of a toll network or routes and the inclusion of existing routes into the toll road system. The legal characteristics of each structure is defined by the necessity to amend legislation.

c) public acceptability and protection of public interest

The structures which are proposed will have to be assessed against the acceptability of whether the public are willing to allow the private sector to develop public infrastructure and enjoy abnormal profits in doing so. The question of protecting the road user against exploitation regarding toll tariffs must also be addressed.

5.4.2 Evaluation Procedure

A matrix of evaluation criteria and institutional structures has been produced as Figure 1. This sets out to answer the question: ' Does the institutional structure meet the following criteria?'. Each of the criteria are listed as indicated above in section 5.4.3 including the goal and objective of the study. A colour coding has been used to indicate in a globlal sense which of the structures are more acceptable than others. Green indicates acceptablity, yellow shows uncertainty and red indicates the structure does not meet the intention of the criteria.

5.4.3 Indicative Results

This is a rather crude form of analysis but is used here because the idea is to not present a final answer. The colours show that there is an tendency toward a public sector type structure based on the criteria given. There is no clear indication which of the three public sector organisations are the most suitable. No one private sector alternative stands out either, although the design, build, operate and transfer alternative appears to satisfy most of the criteria.

5.5 Policy Guidelines

The following policy guidelines are proposed for discussion:

5.5.1 A public sector authority operated on commercial principles (autonomous or within the Department of Transport) using the private sector as much as possible.

VALIDITY OF INSTITUTIONAL STRUCTURE

DOES THE INSTITUTIONAL STRUCTURE MEET THE FOLLOWING CRITERIA

CRITERIA	PUBLIC SECTOR			PRIVATE SECTOR							
	FTRA	PTRA	SDOT	BOOT	BOT	DBOT	FOT	SLB	TF	DBFO	DBFT
STUDY GOAL :											
Preservation of the Network	Yes	?	?	No	?	Yes	No	?	?	?	No
STUDY OBJECTIVE :											
Financial independence & upgrade network	Yes	Yes	?	?	?	Yes	No	?	?	?	No
RDP GOALS (relevant Goals)											
- Reduce fiscal deficit	No	No	No	Yes	Yes	No	Yes	Yes	?	No	Yes
- Increase the proportion of capital expenditure	Yes	Yes	Yes	No	?	?	No	?	Yes	Yes	?
- Effective and efficient civil service	?	?	Yes	No	No	?	No	No	?	?	No
RDP PROGRAMS											
- Meeting basic needs	Yes	Yes	Yes	No	No	Yes	No	?	?	?	No
- Developing human resources	Yes	Yes	?	?	?	?	?	?	?	?	?
- Building economy	?	?	?	Yes	Yes	?	?	?	?	?	Yes
- Democratising state & Society	Yes	Yes	Yes	Yes	No	?	No	No	?	?	No
- Implementing the RDP	Yes	Yes	Yes	No	?	?	?	?	?	?	?
Financial efficiency	Yes	Yes	?	Yes	?	Yes	Yes	?	Yes	Yes	?
Economically sound	Yes	Yes	?	?	?	Yes	?	?	?	Yes	?
Legal aspects accountable to Parliament	Yes	Yes	Yes	No	No	Yes	No	?	No	Yes	No
Public acceptability	Yes	Yes	Yes	?	?	Yes	?	?	Yes	Yes	?
Protection of public interest	Yes	Yes	Yes	No	No	Yes	No	No	Yes	Yes	?

FTRA : Full toll road authority
PTRA : Partial toll road authority
SDOT : SARB/Dept. of Transport
BOOT : Build, Own, Operate and Transfer
BOT : Build, Operate and Transfer
DBOT : Design, Build, Operate and Transfer
FOT : Finance, Operate and Transfer
SLB : Sale and Lease Back
TF : Trust Fund
DBFO : Design, Build, Finance and Operate
DBFT : Design, Build, Finance and Transfer

FIGURE 5.1

5.5.2 Selected individual toll road projects given to the private sector on a concession basis. The concessionaire should be appointed on a competitive process without any financial guarantees.

These guidelines are offered as a means to stimulate debate. Based on the outcome of the evaluation procedure any one of the private sector alternatives are possible. The proposals assume that legislation can be altered to address the requirements of the institutional structure.

5.6 Conclusions

5.6.1 Overseas experience indicates that both the private and public sector have a role to play in the development of toll roads.

5.6.2 The precise institutional structure is not clear at this stage although there appears to be a tendency toward a public sector organisation.

5.6.3 The involvement of the private sector on a concession basis should take the risk and reward equation into account before committing the state to a long term relationship

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INSTITUTIONAL FRAMEWORK	COUNTRIES APPLICABLE	PUBLIC SECTOR FINANCING	PRIVATE SECTOR FINANCING	CONDITION APPLICABLE
A. PUBLIC SECTOR AUTHORITIES				
1. Public toll road authority (full control) - all functions are undertaken by authority ° finance ° design ° construction ° toll collection ° maintenance	U S A Japan Italy U K (bridges/tunnels)	Bonds are obtained from Federal and State Organisations. State/Federal Government subsidises capital investment: ° U S A - up to 35% ° Japan - interest free loans ° Italy - up to 10% ° U K - up to 10%	Revenue and Municipal bonds are obtained from capital markets by the toll authority and are guaranteed by the State or local authority.	- Most of the turnpikes in the USA are operated on commercial principles - State sets tariffs - Alternative routes available (where applicable) - Made toll free after redeeming loans - Concessions : 30 years for Italy - No profit motive
2. Public toll road authority (partial control) - authority manages private sector who are involved in ° finance ° design ° construction ° toll collection ° maintenance	Romania France	National/local government participation in the form of grants/loans Government subsidies in France of up to 30%	Loans from capital markets guaranteed by State.	- Public works concessions of up to 35 years - Directors appointed by Government - State sets tariffs - Commercially operated
3. State Agency/Deparment of Transport - private sector undertakes most functions - control through Board of Trustees/Statutory Body - control by local county council	South Africa Mexico U K	48% medium and long term NRF loans 100% subsidies - funds obtained from central fiscus - grants on interest shortfall - 60% government loans - 40% local authority loans	52% capital and money market loans. None None	- Repayment of loans over 30 year period. - Not commercialised - Loans taken over by the State - State sets tariffs in all 3 countries

ANNEXURE A

INSTITUTIONAL FRAMEWORK	COUNTRIES APPLICABLE	PUBLIC SECTOR FINANCING	PRIVATE SECTOR FINANCING	CONDITION APPLICABLE
B. PRIVATE SECTOR TOLL ROADS	Hungary	Inclusion of existing motorways and tolled.	Syndicated loans, EBRD, Equity	- Phased construction over 10 year period
1. Build, (Finance), Operate and Transfer (BOT)	Romania	Inclusion of existing motorways but not tolled.	EBRD, capital market loans	- Only mooted at this time
- driven by profit motive and rate of return	France	Financial & traffic guarantees.	Banks, contractors, petroleum companies	- Longest operating BOT project in the world (since 1970)
- State grants use of right of way - Risk/reward must be established	Spain	Guarantee of up to 75% of foreign investment.	10%-25% equity in participation. Stock market listing of concession companies	- State financing access roads to toll roads
- Public tender mechanism recommended for granting concession	U K	Inclusion of existing tunnels into concession.	Contractors, banks	- Public enquiries delaying implementation of toll roads
- Construction is undertaken by contractors holding equity in concession	U S A	Toll road in median of existing road.	Contractors, banks	- First private toll road this century
- Finance is arranged by consortium of banks	Malaysia	Inclusion of 60% of existing motorways which are tolled.	Contractors, government banks	- Political interference made private banks nervous
- "Operate" includes road maintenance and management	Mexico	None.	Contractors, banks	- Lack of planning has led to some financial problems
- Transfer to the State after 30 to 50 years	India	None.	Not yet underway	- Private sector studying opportunities
- Most popular form of toll road privatisation	Brazil	None.	Contractors, banks.	- Political instability delaying implementation

INSTITUTIONAL FRAMEWORK	COUNTRIES APPLICABLE	PUBLIC SECTOR FINANCING	PRIVATE SECTOR FINANCING	CONDITION APPLICABLE
2. Build, Own, Operate and Transfer (BOOT) - developer must provide all aspects of project including right of way - the transfer back to the State is usually over a long period or never	U K - Channel Tunnel	No direct invovlement. Government providing infrastructure linking the tunnel to Paris and London.	Funds raised from floating shares on stock market No government guarantees High financial input from concession shareholders	- Competitive bidding - Cost of land is high for roads - Best suited to tunnels and bridges - Developer sets own tariffs - Alternative routes not usually present
3. Sale and lease back of Toll Project - After construction road sold to financial institution at cost - Corporation debts redeemed - Institution leases road to corporation to finance loans - Corporation can use toll income	U S A - Dulles Toll Road Extension	None	Construction financed from 98% loan and 2% equity Equity will also be used to finance deficit in initial years	- No competitive bidding - Profits will be taxable - After rate of return achieved excess funds go to improving local roads - No transfer to State
4. Trust Fund - Private concern - Controlled by State Bank - Private sector investments allowed in trust - Trust issues concessions	Mexico	States invested up to 25% in the trust Government provides right of way	Capital market loans (revenue bonds) Government guarantees Construction industry finances 25% of cost Interest is capitalised	- No competitive bidding - Federal toll authority to operate toll roads - Toll increases approved by Government - Concession 20 years

INSTITUTIONAL FRAMEWORK	COUNTRIES APPLICABLE	PUBLIC SECTOR FINANCING	PRIVATE SECTOR FINANCING	CONDITION APPLICABLE
5. Finance, Operate and Transfer - existing toll road or toll free road sold to private sector - State can develop road and sell off as going concern	Brazil (5 projects)	Federal Government provides road/bridge to concessionaire at no cost	Contractor's equity capital market loans	- Concession period 30 years - Most projects require substantial upgrade - Lowest tariff wins tender by competitive bidding
6. Design, Build, Operate and Transfer (DBOT) - Government project finances toll road - All other aspects managed by concessionaire	Canada (1 project)	Government raises loans on capital market. Interest rates substantially lower because Government raising loans	Concessionaire requires equity for construction performance guarantee Concession required to give guaranteed maximum price	- 35 year concession period - Value engineering assessment required before tender - Competitive tender process
7. Design, Build, Finance and Operate (DBFO) - Shadow tolling - Government pays concessionaire not road user - No toll plazas, only traffic counters	United Kingdom (4 projects)	Existing motorways will be incorporated in scheme	Equity, capital market financing	- In prequalification phase - Scheme could be transformed into road pricing system at later stage

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ANNEXURE B

RELEVANT PRINCIPLES

MEETING BASIC NEEDS	-	Transport is a priority
	-	Public works and unemployment
	-	Need of increased mobility
	-	Emphasis on public transport
	-	Improve tertiary road network
	-	Road safety
	-	Role of provincial and local structures
DEVELOPING HUMAN RESOURCES	-	Education and training
	-	Youth development through community projects
BUILDING THE ECONOMY	-	Public sector investment
	-	Improve quality of rural life
	-	Encourage small business
	-	Integrated transportation system
DEMOCRACY STATE AND SOCIETY	-	Restructuring the public sector
	-	Transparency, participatory, accountability policies
ECONOMICS AND FINANCE	-	Public roads vs commercial roads
	-	National priorities
	-	Dedicated full levy

ANNEXURE C

GUIDELINES FOR EBRD PARTICIPATION IN TRANSPORT INFRASTRUCTURE CONCESSION PROJECTS

The purpose of these guidelines is to set out the basis under which the European Bank for Reconstruction and Development (EBRD) may be willing to consider participation in a transport sector Build-Operate-Transfer (BOT) concession. A "concession" is taken here to mean contractual arrangements between a State and a concession company whereby the State grants rights to the company for a specified period to finance, build, operate and maintain infrastructure, and to levy user charges. These guidelines apply only to BOT concessions and not to sovereign lending for transport infrastructure.

In considering possible participation in a BOT project, the Bank will have regard to the following:

The Sponsor The sponsor (or sponsoring consortium) may include contractors, operators, suppliers, financial investors, host government bodies and local private counterparts. The sponsor should provide a description including: a) background and experience, b) financial standing, c) proposed financial contribution and exposure to risk, and d) rationale for the involvement of any foreign partner.

The Project The bank will wish to review the project background, its scope and rationale, together with its technical and organisational characteristics. The sponsor should set out the physical and technical options considered, and the reasons for those selected. The sponsor should also demonstrate the role of the project within a coherent, sustainable national transport strategy.

Procurement The Bank classifies operations as *"public sector" or "private sector"* for procurement purposes (this is separate from the classification made internally by the Bank for portfolio management purposes). The classification criteria for procurement purposes are set out in the Bank's Procurement Policies and Rules (Revised August 1994):

"Para 3.2: For the purpose of these rules, *public sector operations*[1] are operations:

a) which are guaranteed by the government or a public agency or instrumentality of the country of operations;

b) for public utilities[2] majority owned or controlled[3] by national or local governments, or government agencies of the country of operations; or

c) for national or local governments of the country of operations or agencies and enterprises majority beneficially owned[4] by any of them, other than such enterprises that in the Bank's judgement are operating autonomously in a competitive market environment[5] and are subject to bankruptcy or insolvency law."[1]

For a concession classified by the Bank as a *private sector operation* for procurement purposes, Section 4 of the Bank's Procurement Policies and Rules apply. For transport concession projects other than rail transport concession projects, the beneficiary of the Bank's financing will be considered to be operating in a competitive market environment for purposes of paragraph 3.2(c) of the Bank's Procurement Policies and Rules if the private sector equity partner was selected and contracted as a result of transparent, open international tendering acceptable to the Bank. If the beneficiary of the Bank's financing also satisfies the other requirements of paragraph 3.2(c) of the Bank's Procurement Policies and Rules (i.e. it is operating autonomously and is subject to bankruptcy or insolvency law), the Bank would not require open international tendering of works, equipment and services. The Bank would, however, wish to satisfy itself that the

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[1] "Operations" refers to loans, equity investment or guarantees of the Bank.

[2] Authorities or undertakings exercising one of the following activities: the provision or operation of, or supply to, fixed networks providing a serivce to the public in water, electricity, gas, heat, telecommunications or rail transport.

[3] Control is measured by the ability to effectively determine the decisions and policies of the utility, and not merely by the ability to set tariffs.

[4] "Majority beneficially owned" refers to indirect forms of ownership. For example, if Company A owns shares in Company B which, in turn, owns shares in Company C, Company A is a beneficial owner of Company C.

[5] In the case of concessions, competitive selection procedures acceptable to the Bank would be considered as meeting the objectives of a competitive market environment for this purpose.

concessionaire uses appropriate procurement methods, which ensure a should selection of works, goods and services at fair market prices, and that capital investments are cost effective.

For a concession classified by the Bank as a *public sector operation* for procurement purposes, Section 3 of the Bank's Procurement Policies and Rules apply, including open tendering for civil works.

The Bank would generally require the appointment by the concessionaire of an independent engineer, with adequate powers under the contract to perform its role in the long term interests of the concession company and investors. Lenders will generally wish to appoint a Lenders' Technical Adviser.

The Bank would remain strictly neutral during any tender to select a concessionaire, but would be prepared to act as a participant during the later stages of negotiations between representative of the State and the potential concessionaire(s) to ensure that the requirements of lenders are taken into consideration in drafting the concession contract and other agreements.

Public Participation

If public participation has not already taken place, a scoping meeting would need to be held in the project area as soon as possible, to which inhabitants and non-governmental organisations would be invited. The meeting would identify project alternatives and would prepare and agree the terms of reference for an environmental assessment of alternatives. If public participation has taken place, it should be fully reported, recording what meetings and exhibitions were held, feedback from the public, and how issues and concerns have been addressed in the final design and associated mitigation works.

Environmental Sustainability

The Bank requires an Environmental Assessment (EA) of all major transport infrastructure projects. An EA should ensure that project options under consideration are environmentally should and sustainable, and that the

environmental costs and benefits of options are identified. An EA will identify ways to improve the project by preventing, minimising, mitigating or compensating for any negative environmental impacts.

Where adverse environmental impacts are anticipated, a mitigation plan should be available and the mitigation measures should form an integral part of the proposed project. To the extent that previous studies have not covered all aspects adequately, additional environmental assessment work would have to be commissioned and carried out to the satisfaction of the relevant Ministry of Environment and the Bank.

Traffic and Revenue Forecasts

Prior to making any commitment, the Bank would wish to review the results of an up-to-date, state-of-the-art traffic and revenue study, carried out by international consultants with market credibility. The study should be based on recent survey data and take into account competition from other routes/ services/modes. The Bank recommends that where possible, potential bidders and the State collaborate to organise a single study which should be designed to be acceptable to all parties, including eventual financiers. The study (which may be jointly financed by the bidders) should cover surveys and base year analysis/modelling and, depending upon the circumstances, may include traffic and revenue forecasting. At its discretion, the Bank may require an independent audit of any traffic and revenue study presented by a potential concessionaire or that the concessionaire should finance a new study, to be carried out by competent, independent consultants according to terms of reference acceptable to the Bank.

Capital Expenditure

The sponsor should estimate the cost of implementing the project and set out: a) the basis for the cost estimates, b) allocation of the costs between land, civil works, equipment, services, permanent working capital and start-up expenses, c) split between local currency and foreign exchange, d) proposed procurement procedures, and e) phasing of progress payments.

Operating and Maintenance Costs

The cost of operating and maintaining the project facility should be estimated, including: a) the basis for the estimate, b) breakdown into key cost components, and c) split between local currency and foreign exchange.

Economic Viability

Based on the findings of the traffic study referred to above, the proposed investment must have a satisfactory "global" economic internal rate of return (EIRR) and a satisfactory "national" EIRR under a reasonable set of "Banking Case" assumptions. When the EIRR are not satisfactory, the proposed project should be reformulated, postponed or cancelled.

Other Project Costs and Benefits

A description should be presented of the expected benefits to the local economy and the international economy. The description may include summary material on: a) the role in expanding private sector participation in the sector, b) other benefits such as job creation or environmental improvements, which may not be reflected in above calculations, c) any economic costs not reflected in above calculations, and d) any foreign exchange generation potential.

Financial Overview and Viability

The sponsor should set out a financial overview of the project, including: a) project sources and uses of funds, b) disbursement schedules, c) key operating assumptions (capital expenditure, operating costs, revenues, depreciation, tax calculations), d) financial projections (Cash Flow and preferably also Profit & Loss and Balance Sheet statements) on a basis consistent with the key operating assumptions, e) debt schedule (cash flows, current and capitalised interest, debt draw down), and f) financial ratios such as annual and preferably loan life debt service cover ratios, debt/equity ratios and equity returns.

Project development costs incurred by sponsors may be taken into account, but should be identified and justified. The Bank reserves the right to have such costs audited at the appropriate time.

The project sponsor should demonstrate that, based on a reasonable "Banking Case" set of assumptions, the proposed project could be expected to meet senior debt service cover ratios of at least 1.5 for each and every year of the loan life from the year of opening[5], and a discounted debt service cover ratio of at least 2.0 over the life of the loans (including any agreed public sector contributions).

Financing Plan The documentation should include the proposed structure of the financing, including a) balance between senior debt, subordinated debt (if any) and shareholders' equity, b) sources of supplier credits, local loans, foreign loans and equity, c) terms and conditions required to assure adequate funding and liquidity, d) identification of gaps in the financing plan, and e) dividend policy. Sponsors would be expected to contribute a minimum of 20% of the project cost as concession company equity in order to demonstrate long-term commitment to the investment.

Market Appetite The concessionaire's financial adviser should advise on the project size in relation to the market's likely appetite for infrastructure financing in the given country on the proposed timescale.

Risk Analysis Major project risks should be identified and a brief description given of how these may be mitigated, including: a) risk that the project will not be completed on time and within budget (potential causes of overrun, contracting mechanism, i.e. turnkey or packaged contract, performance penalties or guarantees, sponsor or third party guarantees), b) operating cost risk (potential for overrun or performance shortfall, contractual provisions), c) revenue risk (demand levels, tariff/toll indexation arrangements, contractual provisions), d) foreign exchange risk (convertibility, exchange rate

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[5] (gross revenue - operating expenses - maintenance and renewal expenses - tax)/(interest payments + principal repayments on senior debt)

depreciation), e) exchange rate risk, f) force majeure risk, g) contractual performance risk (financial standing of contractual counterparts, credit enhancement by third parties), h) proposed insurance arrangements.

Role of the Bank The sponsor should present a concise description of the role the Bank is requested to play, which may include a combination of: a) direct foreign currency loans to the concession company, b) syndicating exposure to other lenders, c) local currency loans, d) guarantees, e) underwriting, f) facilitation of sourcing of local finance, g) equity investment, and h) advisory services. The Bank would generally expect to limit its overall financial participation in a BOT concession to no more than 35% of total project cost.

Legal Agreements The proposed contractual structure for the project should be explained, including a summary of all key agreements. All legal agreements must be acceptable to the Bank (Concession Agreement, Construction Contract, Operations Contract, Independent Engineer's Contract etc). The Bank must be satisfied that: a) there is an appropriate legislative framework for granting of the concession, b) the granting authority (if not the State) is the body properly authorised under applicable legislation to grant the concession, and c) any financial and other obligations by the granting authority in the concession contract and related documents are obligations of the State, or are backed by appropriate State guarantees. All necessary approvals under national law would have to be obtained from the relevant authorities (e.g. Ministry of Environment).

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CHAPTER 6

LEGAL FRAMEWORK

6.1. Existing Practices

The basis for legislation for toll roads is the National Roads Act (No. 54 of 1971) which has been amended as follows:

- Second National Roads Amendment Act, 1983 : Act No 79 of 1983
- National Roads Amendment Act, 1992 : Act No 100 of 1992
- National Roads General Amendment Act, 1994 : Act No ????? of 1994

The National Roads Act, the South African Roads Board Act (No. 74 of 1988), as well as general legal principles, are the framework under which the tolling of roads in the Republic of South Africa currently takes place. These Acts were framed in such a way as to permit the State to toll national limited access roads and also, at the same time, to overcome certain objections regarding toll financing. These objections covered such basic concerns as:

(i) ensuring that the users' payments were spent on the road for which payment had been made and

(ii) providing those motorists, who wish to avoid payment of a toll, with an alternative route to reach the same destination.

Satisfying these concerns resulted in certain constraints being imposed on toll operations.

Inevitably these constraints have meant that the State does not have a free hand in a number of areas of activity. In addition, it should be noted that these constraints have been subjected to scrutiny by legal advisors to the Department of Transport and the South African Roads Board and, in some instances, by Senior Counsel.

These constraints have, however, not been so onerous that it has not been possible to work within the requirements of the National Roads Act and all the toll roads are operating satisfactorily at this time. However, problems arise when attempts are made to introduce new concepts. For this reason, there is a strong argument in favour of continuing to operate through the South African Roads Board as presently constituted until such time as a comprehensive overhaul of the legislation is appropriate.

The constraints of the Acts which have particular relevance are:

a) **Definition of a national road.**

Any existing road or proposed road may be declared a national road by the Minister of Transport by notice in the Government Gazette, provided the boundaries have been fixed by survey.

The Minister can in this regard only act on the recommendation of the Board and after consultation with certain interested parties including the Administrator of each province in which the road in question is or will be situated.

b) **Definition of a toll road.**

A toll road may be a national road or a portion thereof and this includes the whole length of a national road. The toll road must be declared in the Government Gazette. Once a toll road has been declared, there is a provision for the declaration to be changed by rescinding the declaration and redeclaring a longer portion which includes the original declared portion. Thus a portion of a national road, once declared as a toll road can be lengthened or shortened.

This definition of a toll road has important consequences as will be discussed. It is important, too, that careful consideration is given to the determination of the national road which is being declared. It should be noted that in order for a road to be declared a national road and thereafter a toll road the co-ordinates must be fixed.

A national road does not have to be a direct route between two points, but cannot be in the form of either a spider's web or the spokes of a wheel.

For completeness, it should be mentioned that any bridge or tunnel on a national road can also be declared a toll road by the Board.

c) **General powers of the SARB**

The Board has the power to conduct a survey or investigation which is deemed desirable in connection with a national road or toll road. This power also extends to an existing road, i.e. a provincial or local road can be investigated as a possible national road and toll road. The planning, design, construction and maintenance of a toll road is one of the functions which the SARB has in exercising its duties.

d) **Accounting for a toll road**

i) General

The toll road as declared must be accounted for as a separate unit. Two or more toll roads as declared can be combined into a single unit for accounting purposes if they are adjacent. If each section's declaration is withdrawn the combined sections of the toll road is declared as one toll road. This can be accounted for as a single unit. If two sections of a toll road cannot be combined continuously then each unit must be accounted for separately. This is a vital constraint because the National Roads Act is very specific regarding the expenditure which is permissable out of the toll income and interest received.

ii) Income

A separate account must be kept in respect of all monies received by way of toll in respect of each declared toll road (a particular toll road in the Act) and of all interest on investments of such monies. Other sources of income must also be accounted for separately.

Only the State may toll a road for its own account. This has been confirmed in the courts.

iii) Expenditure

In the first instance, the South African Roads Board must submit to the Minister of Transport annually, for his approval, estimates of expenditure to be defrayed. No payment may be made except in accordance with the estimates so approved. This is an onerous provision and places a responsibility on the Board to ensure that the Act is being complied with when expenditures are being approved.

The expenditure permissable from the toll income and interest is defined in the Act. Legal opinion is unanimous that the income from a toll road as declared must be expended only on that toll road and must conform to the categories provided for in the legislation. No cross-subsidisation between toll roads is permitted. (The opinion goes further, however, and states that this does not mean that income and expenditure must balance every year. A toll road may have a surplus of income over expenditure for a number of years prior to say a major rehabilitation. The National Road Fund would then be able to invest such a surplus during the interim period, provided that the funds would be available when required. This is not an immediate practical consideration but could become relevant in due course.)

The legislation is very specific regarding the expenditure which may be met out of toll income and interest. The details which are given in this note do not follow the sequence in the Act nor does the Act impose an order of priority. The expenditures are:

- Operation of toll gate(s) and facilities on the toll road
- Operation of the toll road
- Maintenance of the toll gate(s) and facilities
- Maintenance of the toll road
- Recovery of expenditure incurred by the National Road Fund in connection with:

    - acquisition of land
    - investigations and surveys relating to the toll road
    - designing and planning of the toll road
    - construction of and any other work in connection with the toll road
    - erection of any toll gate(s) and facilities in connection therewith
    - certain incidental costs such as publicity material

    This expenditure may, according to legal opinion, have been incurred at any time prior to the road being declared a toll road.

- The redemption of any loan taken out by the Board relating to that particular toll road including the interest on the loan.

Legal opinion also advises that there is no provision under the expenditure headings which permits a profit to be earned on a toll road other than would be permitted in the normal course of business in carrying out any of the work involved. Thus, a return on an equity capital investment would not be legal if it were defined as a profit.

e) **Borrowing Powers**

The Board has power to borrow funds with the approval of the Minister of Transport, which approval is granted in consultation with the Minister of Finance. This can be extended to the borrowing of funds to pay any interest shortfall which might arise at different stages of a project. The Board may determine the terms of such borrowings and these terms will be taken into account by the Ministers concerned when approvals are being considered.

f) **Toll Tariffs**

Toll tariffs are determined by the Minister of Transport on the recommendation of the Board. There can be different tariffs for different toll roads, different vehicles or categories of vehicles and even different times. It is required that a minimum of 14 days notice of the date on which a tariff becomes payable shall be given in the Government Gazette. Any alteration in the toll payable is subject to the same requirements.

Legal opinion has been given that any action by the Minister which restricts his powers under the Act would be illegal in that his powers cannot be fettered nor can he tie the hands of any successor in this regard.

The Board is entitled to grant exemption from the payment of toll for certain categories, users or times and to withdraw the exemption. It should be noted that the exemption from payment of toll is granted to the South African Police Services, the South African National Defence Force and the Prison Services by the founding Acts of these institutions. Under the Post Office Act, it is illegal to demand payment of toll for official vehicles travelling on official business.

g) **Fuel Levy**

The National Roads Act permits the Minster of Transport, with the concurrence of the Ministers of Finance and of Mineral and Energy Affairs, to impose a levy on fuel for the benefit of the National Road Fund. In 1988, the Cabinet decided that, as a matter of policy, such dedicated funds would no longer apply and the fuel levy became part of the general income to the Exchequer.

In this regard, it should be noted that the dedicated funds policy does not extend to toll income except when a surplus of income over expenditure is achieved. This exception has been made in terms of the fact that there is a specific limitation on the expenditure.

h) **Authority to Delegate**

In terms of the law it is stated that 'Delegatus delegare non potest'. This means that it is not permissable to delegate powers which have already been delegated. This is recognised in the National Roads Act and specific powers of delegation by the Board are stipulated. These include:

- Construction of roads
- Construction of toll roads
- An investigation, survey, design, planning or other work which the Board is empowered to do under the Act in connection with roads, toll roads or routes
- The collection of money payable by way of toll
- The operation of a toll gate(s)

The terms and conditions under which such work may be delegated may be determined between the Board and the person to whom the activity is being delegated. It is noted that the raising of finance and other aspects of funding are not within the compass of this authority to delegate. Certain aspects of financing could, however, be covered by a clause which permits the Board to delegate any of its powers if it is deemed necessary for the efficient performance of the work specified above.

i) **Alternative routes to toll road**

The National Roads Act stipulates that the SARB cannot declare a road a toll road until they are satisfied that an alternative route is in place when a toll road is declared and must be in existence for as long as the toll road remains as such. The alternative route must have the same destination or destinations as those of the toll road. Legal opinion is that the toll road and alternative route can fall on the same alignment. The Act does not specify the standard of the alternative route.

j) **Public involvement and consultation**

The Board cannot declare a toll road unless they have invited interested parties including the Administrator of the Province in question and affected local authorities to make written representations regarding the proposed toll road and have considered the viewpoint offered. These representations may also include the position of the toll gate. The Board is obliged to indicate the approximate position of the proposed toll gate to all interested parties before the toll road is declared. This requirement is also necessary if the road has already been declared a toll road.

These constraints should be addressed if amendments to existing Acts or new Acts are to be considered.

6.2 Issues

In the context of the formulation of toll policy, the legal issues relate to the powers that the Government will require to enforce policy. This should be addressed once the policy direction has been agreed. However, the more fundamental issues which can already be identified are listed below.

National Roads: Any road can be declared a national road. This includes provincial and local roads. Thus the identification of major primary roads as part of a toll road network is not an issue. This declaration would be motivated by the Department of Transport and approved by the Minister. Linked to this is the fact that any national road can be declared a toll road. Hence, the mechanism exists for any road in the country to be declared a toll road. It is worth noting that the standard of the national road is not an issue in the process of declaring it a toll road, i.e. our self imposed standard of major primary roads is not a legal constraint.

Toll network : At present the legislation allows the whole length of a national route to be declared as a toll road as well as portions. It would appear that there is nothing in the Act and its amendments which would preclude the declaration of a network of national roads as a toll network as long as the roads in the network are contiguous. However, if the intention is to allow transfer of funds within the toll network (refer Chapter 4) then legal opinion on this issue should be sought.

Alternative Routes : The legal requirement for alternative routes to be provided when toll roads are constructed should be reviewed if the policy supports improved financial efficiency of the toll network. The international position in this regard supports both the provision of alternative routes (as a legal requirement) and the support for toll roads without alternative route provided. This issue will have to be debated in various fora if the requirement for an alternative route in South Africa is to withdrawn.

Toll Roads Act : As stated above, the legislation controlling toll roads is part of the National Roads Act (with Amendments). If the toll road policy intends to increase the size of toll network together with amendments regarding private sector participation, consideration should be given to the drafting of a separate Toll Roads Act incorporating the relevant legislation.

Approval of toll tariffs : This issue includes not only the approval of tariffs for new roads but also the increases for tariffs for existing roads. At present this approval is granted by the Minister after recommendation by the SARB which could lead to a situation where political influences might affect the financial performance of the toll roads. Consideration might be given to the formulation of a regulatory body to consider tariffs for new roads as well as tariff increases.

Transfer of Funds : At present, the law requires that income from a toll road as declared must be expended only on that particular toll road. This is restrictive particularly if transfer of funds between different toll roads is to be considered in the formulation of toll road policy. If the transfer of funds is supported, this section of the National Roads Act should be amended.

Toll income to the State : The present legislation has the restriction that toll income can only be for the state's account. This should be amended to allow the private sector to collect toll.

6.3 Options

There are three fundamental options available for the legislative framework.

6.3.1 **Option 1** is to retain the existing Act with no major amendments. This would be a possible option if the new policy is not too different to the existing policy.

6.3.2 **Option 2** is to retain existing Act with required major amendments. This would be acceptable if the new policy differs from the existing policy to such an extent that significant amendments are required. In particular, the restrictions on transfer of funds, collection of toll income accruing to the State, alternative routes, etc. would dictate the need for amendments.

6.3.3 **Option 3** is to draft a separate Toll Road Act which will incorporate the following major issues :

- it should allow for the collection of toll for profit
- there should be no requirement for the provision of alternative routes
- the SARB or a regulating body should determine toll tariffs
- declaration of a network of toll roads should be possible

6.4 Evaluation of Options

The evaluation of the legal options cannot be carried out in isolation as the legal framework provides the mechanisms to introduce and enforce the toll policy as discussed in the other Chapters of this report. Hence, the outcome of the discussion generated by this Report will indicate the direction of toll policy in the future. Once this is defined, a decision of the likely legal framework required will be made.

However, three primary factors should be considered at this stage :

- whether the changes proposed are of such a nature that a new Act is required
- the practical implications of drafting a new act should be considered
- it should be determined if the level of decision making (with respect to tariffs, tariff increases, etc.) will be based on political or regulatory structures.

6.5 Policy Guidelines

It is proposed that, irrespective of the legal requirements of the broader toll road issues detailed elsewhere in this Report, the following guidelines be considered at this stage. Further guidelines will be based on the conclusions drawn after discussion on this document has better defined the direction of toll policy.

- retain the existing Act but allow private sector to collect toll for their own account
- allow the setting of toll tariffs to be controlled by a representative regulating board
- retain the requirement of an alternative route where there is one available. Where no alternative exists the SARB must acknowledge this and make allowances to accommodate local traffic movements in the form of concessions or zero toll.

6.6 Conclusion

The major restriction of the existing National Roads Act is that it does not allow for the private sector to develop toll roads. An amendment should be drafted in order to allow for this, but also taking care to regulate the industry.

A review of the legal framework required to enforce toll road policy should be carried out once the proposed policy direction has been determined.

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PART IV - FUNCTIONAL AREAS

CHAPTER 7

TOLL TARIFFS

CHAPTER 8

OPERATIONS AND MAINTENANCE OF TOLL ROADS

CHAPTER 9

TECHNICAL ASPECTS OF TOLL ROADS

CHAPTER 10

PUBLIC RELATIONS, MARKETING AND PUBLIC INVOLVEMENT


ARCHIVE FOR JUSTICE

CHAPTER 7

TOLL TARIFFS

7.1 Toll Tariffs

The issue of toll tariffs includes the following fundamental elements:

- Principles and methodology used in the setting of tariffs
- Level of tariff (of an individual toll road and also in relation to each other)
- Annual tariff increases
- Concessions and discounts
- Vehicle categorisation

Worldwide, the problems associated with each of the above elements revolve around the basic conflict between the need to generate income to satisfy the financial requirements of the project and the effect that increasing tariffs have on the user's willingness to pay. Various mechanisms are used internationally to address and quantify each of the above elements of toll tariffs and these can be considered in the South African context. In addition, detailed aspects must also be resolved such as other possible sources of income.

7.1 Existing Practices

7.1.1 International Situation

Internationally, the basis for setting toll tariffs varies between a pre-determined flat rate per kilometre (cents/km) which applies to a number of toll roads to an almost independent assessment of each road on the basis of the governing criteria for that road at the time.

Flat rates are typically used on a network of toll roads where it can be shown that the user benefits are associated with the network as a whole and not only the specific road that he might be using. This principle is important since the concept of a flat rate is generally inequitable when used on an open toll system (as is the concept of a flat fare on public transport modes). The associated benefits (and costs) might vary on the different road sections. Where affordability is not a problem, flat rates tend to be more acceptable to the users than differential rates based on the benefits offered by each road.

Flat rates are the norm on Italian and Japanese toll road networks although the rates on the link roads providing access to the network are generally determined on a perceived cost basis.

Elsewhere in the world, toll tariffs are set on the basis of financial requirements and/or perceived benefits for the specific toll road (or toll corridor). The tariffs set are dependent on the type of toll system used by the authority. In an open system (e.g. a bridge or a toll tunnel) the tariff is based on financial criteria as in most cases there is no real alternative route against which user benefits can be determined. On a closed system the toll is determined from distance travelled on the toll road. These toll rates relate to the alternative route (or routes), especially in an urban area. Sophisticated transportation models can be used in assigning traffic to the toll road. These models are usually based on the drivers' perceived value of time and cost.

7.1.2 Local Situation

In South Africa, the determination of toll tariffs has changed since the introduction of the first toll roads. In 1982, the Parliamentary Select Committee recommended that the toll tariff should constitute only a portion of the user's saving and should be differentiated according to vehicle class.

In 1983 the National Roads Act (Act 54 of 1971) was amended to facilitate the levying of tolls on national roads. One of the aspects included in the Amendment was that an alternative route must exist which serves the same origins and destinations as the toll road. These requirements led to the initial policy of setting toll tariffs in the period 1984 to 1988. This was based on the 'perceived benefit' of using the toll road compared to the alternative route. Perceived benefit for light vehicles is defined as being the time and fuel saved when using the toll road compared to the cost of using the alternative route. For heavy vehicles this benefit is defined as the value of variable cost saving (fuel, lubricants, maintenance and tyres) and time saving offered by the toll road.

In the period between 1988 and 1991 this policy was amended for toll roads operated by Tolcon and THDC. In terms of the interim agreements at that time, the toll tariffs for light and heavy vehicles on these roads were limited to not more than 75% of the total (or

economic) transport cost savings, if the toll road was used instead of the alternative route. The total transport cost savings included for:

- fuel
- time
- oil
- tyres
- vehicle depreciation
- vehicle maintenance and repairs
- accidents
- financing interest
- insurance
- licence fees

This resulted in toll tariffs significantly higher than those levied at State established plazas at the time. These tariffs were subsequently also applied on roads that had previously been untolled (i.e. the Mooi River and Grasmere plazas). This led to strong public reaction and consequently the then Minister of Transport reduced the tariffs on these roads. The tariff on these previously untolled roads was then calculated on the basis of the future maintenance and rehabilitation needs only.

In the March 1991 report on the review of policy the SARB approved, in principle, the gradual implementation over five years of a distance related toll tariff for light vehicles. In March 1992 the Board took note of, but did not approve, this decision together with the recommendation that new tariffs based on rates per kilometre be increased annually with inflation. The tariffs on toll roads that have opened between 1991 and the present have been calculated based on a combination of perceived benefits and tariff per kilometre.

With regard to discounts, a general discount policy on toll roads has been operational since 1984. Numerous specific policies have been formulated over the years mainly due to pressure exerted by various road user groups. Currently the SARB is undertaking market research into the most effective mechanism and amount of discount which should be offered to the road user.

A limitation of existing policy is that it is not prescriptive and there is no "escalation" formula which can be used to calculate the tariff increases. In terms of the financial strategy approved by the then National Transport Commission (NTC) in 1983 toll tariffs (and hence toll income) had to at the very least remain constant in real terms in order for the loans to be repaid. Consequently tariff adjustment proposals were initially submitted to the NTC and latterly the SARB on an annual basis. These proposals were not always approved and as a result toll tariffs have lagged the inflation rate by some 12% over the past 12 years (i.e. 88% of the inflation rate over the period). Fortunately, higher than expected traffic growth rates have ensured that the income projections have remained within the boundaries set by the feasibility studies.

The decision not to increase the tariff in any one year means lost opportunity. The tariff cannot be increased twice as much the following year to make up the shortfall. Regular and sufficient adjustments are required, otherwise the toll road operating cost will overtake the toll income and a net operating loss will occur.

The adjustment in tariff has been based on the inflation rate to date. However, future increases could be based on project 'rise and fall' of major cost components which affect the tariff and financial performance of the toll road. These are the interest rates, the operating costs of the road and plaza as well as the traffic volumes. Tariffs could therefore be adjusted annually to reflect these changes.

In 1993 the then Minister of Transport requested the SARB to consider moving away from the concepts of perceived benefits and uniform rates per kilometre and to introduce market related tariffs. These were tariffs that the public were willing to pay without deviating significant amounts of traffic onto the alternative routes.

7.1.2.1 Market Related Toll Tariffs

The setting of market related toll tariffs is based on three main considerations, the financial aspects, the economic consequences and the willingness to pay.

a) Financial Aspects

The tariff charged when the toll road opens combined with subsequent increases have a direct effect on the financial performance of a toll project. The current financing policy of the Board is to determine the LSR of a toll project and the balance of the construction cost, if any, is contributed by the National Road Fund. If a high tariff is set on opening of the road without deviating a significant amount of traffic, the greater the net toll income resulting in a larger LSR (and subsequently a reduced loan from the NRF).

Toll roads in South Africa are governed by the National Roads Act. The Act is specific regarding the requirement that separate accounts must be maintained for each section of declared toll road, and toll income generated by that road can only be used to meet expenditure as defined in the Act for that specific declared portion. Toll tariffs charged for a particular portion of new road and the resulting income can therefore only be allocated to that portion of road. It is therefore futile to increase tariffs on operational toll roads or set high tariffs on new roads which will drive the LSR to level above the construction cost. The highest market related tariff is therefore that which gives a LSR equal to the present worth construction cost.

b) Economic Consequences

One of the disadvantages of toll roads is the diversion effect of users being required to pay directly for the use of a facility. The National Roads Act stipulates that an alternative route to the toll road must exist in order that those who do not wish to pay may exercise their democratic right by choosing to travel on the parallel free route. The relationship between level of toll and diversion has been observed locally and overseas. The diversion cannot be determined with any certainty as numerous factors influence the user's decision to pay the toll or not. These include disposable income levels as well as perceptions of safety, security and value for money, amongst others. The economic consequence of diverting traffic off a toll road and onto an alternative route connecting the same points is to introduce inefficiencies in the system. The economic justification of a toll project may be reduced as the traffic volumes fall. If

a significant amount of traffic is lost from the toll road the economic rate of return could fall to below that which makes the project economically viable. The tariff which reduces the rate of return to the minimum acceptable to the SARB, is a further boundary to the market related toll tariff envelope.

c) Willingness to Pay

Although toll roads are becoming part of life in South Africa, it is unlikely that they will ever be actively welcomed in view of the deep-rooted tradition of freedom of movement, underpinned by the increasing use of the private car. Apart from the financial and economic standpoints addressed above, is the impact of tolls on user behaviour and especially the extent to which they may cause drivers to re-route to alternative roads.

With respect to willingness to pay, a distinction must be drawn between the transport industry and private users.

The transport industry (freight carriers, etc) rely on good roads to ensure their livelihood. Toll roads are, in most cases, more economical to use than the alternative routes. Hauliers have a good idea how much it costs to run a vehicle and the reaction to payment of toll for heavy vehicles is less emotive than for cars. The willingness to pay toll for heavy vehicles is related to the financial benefits derived by using the toll road. The percentage attraction of heavy vehicles on rural toll roads in South Africa is generally higher than light vehicles as a decision to use the toll road is based on commercial factors rather than perceived benefits.

Private users (mainly light vehicles) are far more likely to base their decision to use a toll road on perceived benefits. These savings may include both tangible (fuel and time) and intangible (safety and convenience) benefits. The intangible benefits are often referred to as "motorway bonus" in Europe.

The willingness to pay toll can also be related to the magnitude of the project. Certain new structures such as large bridges over rivers or long tunnels are more acceptable to users than motorways. This is because the perceived benefits of a road compared to the alternative route tend to be lower. There may also be vehicles who do not make full use of the toll road, especially in an open system. These open systems are used on all toll roads in South Africa and tend to penalise the short distance traveller. This is one reason why the Department of Transport should resist opening up short sections of toll roads in a piecemeal fashion as users feel they are not getting value for money.

Forecasting willingness to pay is difficult on most toll projects. Computer programs which model route choice can be used to predict drivers' behaviour. However, a good dose of common sense is needed to check these results based on actual experience. The main factor contributing to the predictive accuracy is that users are not homogeneous but belong to many different sectors of the economy. A segmental analysis of the traffic should be undertaken in order to determine the social and occupational structure of the traffic. The expectations of business travellers, tourists and daily commuters are different.

In summary, the principles used in the determination of toll tariffs in South Africa have changed from perceived benefits to economic benefits and finally to a combination of a tariff per kilometre and perceived costs. Work has been carried out on the principles of financial, economic and willingness to pay although these have not yet been applied in the determination of tariffs.

7.2 Issues

The fundamental issues which should be considered when determining policy on toll tariffs are discussed below.

Principles adopted in setting toll tariffs: The principles used in determining the toll tariffs for each toll road are perhaps the single largest issue. Various methods could be used which range from a flat rate per kilometre, using benefits offered by the toll road or employing market related pricing techniques.

However, the principles which are used to determine a tariff should be understandable and easily explained to the general road user. It is considered essential to arrive at a transparent and equitable toll tariff policy.

Adjustments to existing tariffs: There is little doubt that excessive increases to existing tariffs would not be well received by the users and public at large. Any recommended increases higher than the current inflation rate would have to be well motivated with a public involvement exercise involving the different roleplayers.

Perceived benefits: As detailed in Section 7.1.2 above, the determination of perceived user benefits has varied since 1983. If user benefits are to be the basis for tariffs, the calculation of these benefits in a manner acceptable to the user should be addressed. In particular, the extent of the benefits and the unit value of the user's time need to be agreed.

Willingness to pay/affordability: Although not the same, these two issues are closely related. The willingness by potential users to pay the tariff is that issue which determines the extent of the diversion of traffic onto the alternative route. It is closely linked to the subjective issue of perceived benefits. Willingness to pay and affordability cannot be excluded from the process of setting toll tariffs.

Financial and economic criteria: Although perceived benefits, willingness to pay and affordability are important issues in the setting of tariffs, it has to be recognised that there are economic and financial criteria which set base values. In terms of the income to the plaza to ensure the financial success of the toll road, there is a minimum income below which the road is not viable. Similarly, in terms of volume of traffic, there is a minimum traffic volume below which the road is no longer

economically justified. Only political issues should outweigh these criteria and even then only with a thorough analysis of the implications.

Redemption of loans: This should be clearly defined beforehand to determine the action to be taken if total income can be increased above the level required to repay the loan. At present the options are to repay the loan or support other portions of that specific toll road. Current legislation does not allow the transfer of funds to other toll roads.

Are tariffs market related? : This issue is affected by the financial repayment policy described above. If tariffs are not market related and increases can be motivated, the allocation of the increased income would have to be predetermined before any increase was introduced. The question of whether tariffs should be market related should also be asked as the economic aspect of the road infrastructure as a "public good" needs to be clarified.

Vehicle classification: At present there are four vehicle classes on South African toll roads. It is not envisaged that this should change although certain international toll roads do have as many as ten vehicle classes and others as few as two classes.

Equitability of toll tariffs for the vehicle classes : There is a perception at present that light vehicles "subsidise" the heavier vehicles in terms of the toll tariff. The tariffs for light heavy vehicles are based on tariffs per kilometre and perceived benefits while the tariffs for heavy vehicles are based on savings in operational costs. (These costs are usually obtained from the Road Freight Association.) From the users' point of view it could be reasoned that, as is the case at present, the toll tariffs should only reflect the benefit which is obtained when using the toll road and not alternative route. However, from the authority's point of view (as the party responsible for the provision and maintenance of the road infrastructure), the tariffs should also reflect the relative damage caused by the different vehicle classes. It is an undisputed fact that heavy vehicles cause by far the most damage to the road structure. The question therefore arises whether it would not be more equitable if the

relative damage caused by a (heavy) vehicle should also be taken into account when setting a tariff.

Other sources of income: The generation of additional income should be considered and accommodated in the appropriate legislation to supplement current income. Such sources would include the value capture aspects of adjacent facilities (Ultracities, etc.), advertising (particularly adjacent to plazas), etc.

Concessions: Concessions have tended to be given to local communities near toll plazas of previously untolled roads where the payment of the toll would affect their daily travel costs. In particular, Mooi, Grasmere and Mvoti plazas are relevant. The principle of concessions and the circumstances under which they are provided should be clearly and fairly defined.

Discounts: "Bulk discounts" for frequent users (all vehicle classes) should be considered as a basic business principle. If the financial benefit of the increased use of the facility exceeds the cost associated with granting discounts then this system should be offered.

Variation in tariff/kilometre costs : A variation in existing tariffs/kilometre exists between the different toll roads. The existing toll roads were categorised into urban or rural and new or upgrade of existing road (i.e. previously untolled roads). Tariffs per kilometre were calculated for each toll road and the results for each category analysed to determine the average rate and the variance. Table 7.1 shows the summary of this analysis. These results show that within each category there is considerable variation in the rates.

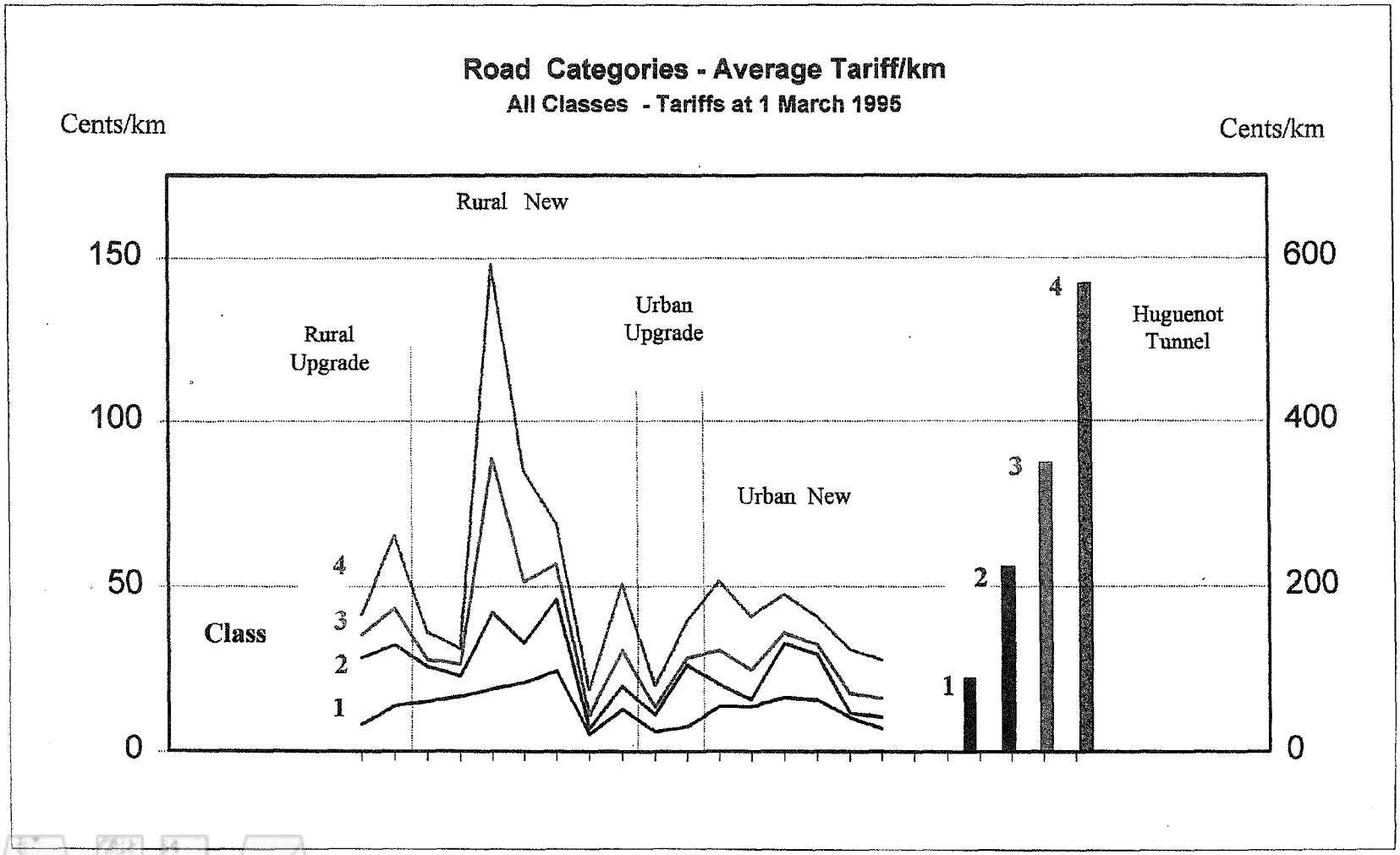


Table 7.1 - Road Tariff Statistics

Road Type	Toll Tariff / km			
	Maximum	Minimum	Average	Std. Dev.
Class 1				
Rural - new roads	24,6c	12,9c	18,4c	3,9
Rural - existing roads	14,0c	8,3c	11,2c	2,8c
Urban - new roads	16,7c	10,5c	14,1c	2,2c
Urban - existing roads	7,7c	6,25c	7,0c	0,7
Class 2				
Rural - new roads	46,4c	20,1c	32,0c	9,8c
Rural - existing roads	32,8c	28,9c	30,8c	1,9c
Urban - new roads	33,3	11,9c	22,4c	8,1c
Urban - existing roads	26,5c	11,5c	19,0c	7,5
Class 3				
Rural - new roads	88,8c	26,8c	47,2c	21,9c
Rural - existing roads	43,7c	35,6c	39,6c	4,1c
Urban - new roads	36,2c	17,9c	28,6c	6,5c
Urban - existing roads	28,7c	13,67c	21,2c	7,5c
Class 4				
Rural - new roads	148,1c	31,6c	70,2c	39,3
Rural - existing roads	65,5c	41,7c	53,6c	11,9c
Urban - new roads	51,8c	31,3c	42,7c	7,0c
Urban - existing roads	39,8c	20,2c	30,0c	9,8c

These results are also presented graphically in the graph "Road Categories - Average Tariff/km".

Peak period tolls: In urban situations the demand for road space is considerably higher during the peak periods. As the toll road will provide a higher benefit during the peak hour, it could be justifiable to charge an additional peak period toll. The MIS systems and toll equipment at South African toll plazas can accommodate peak period tolls. Further, the introduction of peak period tolls in urban/metropolitan areas could also be the first step in future congestion pricing projects.

Motorcycle toll tariffs: At present, motorcycles are categorised as "light vehicles - Class 1". However, the benefits which are offered by a toll road to motorcycles are probably less than that of a light vehicle. Further, from a traffic flow point of view,

a motorcycle is considered to be approximately 0,3 of an equivalent passenger vehicle. On this basis, consideration could be given to a reduced toll tariff for motorcycles (relative to that of light vehicles). From an operational point of view, the identification of a motorcycle by the MIS system would have to be addressed.

7.3 Options

With regard to the determination of toll tariffs and the introduction of the tariff on the ground, there are a number of aspects which will be common to all the options identified.

7.3.1 Public Involvement

The primary concept in the setting and introduction of tariffs is the need for public and user support. Hence, the system of determining tariff levels should be fair and accepted by the stakeholders. The mechanism of perceived benefits, operating cost savings, etc. should be included in the acceptance process. In particular, this acceptance and approval should be sought when the toll road is an upgrade of an existing road.

7.3.2 Equitability of toll tariffs for the different vehicle classes

A second aspect common to all the options is the issue of equitability of toll tariffs for the vehicle classes taking into account the relative damage done to a road by a heavy vehicle when compared to that of a light vehicle. The question to be answered is "should heavy vehicle tariffs be related to their axle load". The positive facet is that empty trucks would pay less than loaded trucks, which is not the case at present.

To illustrate the relative road damage caused by heavy vehicles, the ratio of road damage (based on the number of E80's) of a heavy vehicle relative to that of a light vehicle was calculated. For one case, it was assumed that the heavy vehicles are loaded to the legal axle limit and for the other case, it was assumed that the vehicles are loaded to 50% of the legal axle limits.

Table 7.2 - Relative Vehicle Road Damage

Vehicle Class	Number of Axles	Relative Road Damage	
		100% of Legal Limit	50% of Legal Limit
Class 1	Light - 2	1	1
Class 2	Heavy - 2	6 890	750
Class 3	Heavy - 4	13 775	1 500
Class 4	Heavy - 6	15 645	1 700

The above table illustrates two important points, namely:

- that heavy vehicles are by far the largest contributors to road damage, and
- that there is a large difference in road damage being done between vehicles that are fully loaded and vehicles with smaller loads.

Thus, if the tariffs take into account the actual loading of a vehicle, it could be argued that it is a more equitable way of charging tolls. However, equipment at the plazas to weigh vehicles would have to be introduced or statistical methods employed on a regular basis to determine average axle loads for the various classes of heavy vehicles.

A possible negative consequence of setting the tariff based on the actual mass of the vehicle is that heavily loaded vehicles, close to or exceeding the legal limit, may well choose to use the alternative route. The resultant damage to this route may in fact be greater than the possible damage to the toll road itself.

7.3.3 Discounts and Concessions

The principle of discounts and concessions should apply whichever option is determined to be most appropriate. Typically, business principles should dictate if discounts should be offered, while social or economic issue should determine if concessions are warranted.

7.3.4 Options

The SARB have requested that a standard toll tariff in the form of a rate per kilometre be investigated which will provide the toll authority with the mechanisms to define an acceptable means of determining toll tariffs for new toll roads.

From the need to determine a standard toll tariff per kilometre, several options have been investigated to establish uniform principles and methodologies in tariff setting. The following options were identified:

Option 1: Using existing toll tariff structures on existing operational toll roads to determine a possible relationship between distance saving and toll tariff per kilometre. This option thus examines the status quo to determine a possible uniform principle embedded in the existing toll tariff structures.

Option 2 is to define a mechanism to calculate toll tariffs which is based on fundamental user perceptions. This mechanism will be based on an empirical approach to weight each of the user perceptions and arrive at a tariff per kilometre for a given category of toll road and associated alternative route. The mechanism will be calibrated against the operational toll road tariffs.

Option 3 is to maintain the system of project specific analyses based mainly on perceived benefits with an indication of a rate per kilometre.

Option 4 is to adopt the principle of market related tariffs based on financial aspects, economic consequences and willingness to pay.

As stated above, each of the above options must be saleable to the users and the public at large and must define the criteria required to qualify for concessions and discounts.

7.4. Evaluation of Options

7.4.1 Option 1 - Existing Toll Tariff Structures

All of the operational toll roads were categorised according to urban or rural and new or upgrade of existing road (i.e. previously untolled roads). Each category is addressed separately. At this stage, only Class 1 vehicles have been considered.

Table 7.3 below shows the present "new rural" toll roads, together with their distance savings and tariffs per kilometre. Mtunzini should, however, be disregarded because it does not offer a distance saving and further it represents a toll road which is not yet complete.

Table 7.3 New Rural Toll Roads - Class 1 vehicles

Route	Plaza	Distances (km)			Tariff	
		Alt Route	Toll Road	Dist Saving	Tariff (Mar '95)	Tariff/km (Cents)
N3	Tugela	68,8	52,8	16,0	R 13,00	24,6c
N1	Kranskop	46,0	33,0	13,0	R 7,00	21,2c
N1	Vaal	106,5	95,0	11,5	R 16,00	16,8c
N3	Wilge	107,3	97,2	10,1	R 15,00	15,4c
N2	Tsitsikam	37,0	27,0	10,0	R 5,20	19,3c
N2	ma	27,2	22,9	4,3	R 3,20	14,0c
N2	Mvoti	33,5	34,8	(-1,3)	R 1,90	(5,5)c
N2	(Mtunzini					
	)				Mean:	18,1c
					Std Dev:	3,42c

The mean value is 18,1 cents/km with a standard deviation of 3,4 cents/km. The relatively high standard deviation indicates that a flat rate per kilometre may not be a possible option for new rural roads. A regression analysis shows that the distance saving versus tariff/km relation has a R^2 value of 0,9. Thus, a possible solution is to set toll tariffs for "new rural" roads based on distance savings. Table 7.4 illustrates a possible strategy where the "Distance Savings" are the distance saved by using the toll road instead of the alternative route.

Table 7.4 **Possible tariff structure for new rural roads - Class 1 vehicles**

Distance Savings	Tariff/km
Up to 5 km	10
5,1 to 10 km	15
10,1 to 15 km	20
15,1 to 20 km	25
20,1 and over	30

Table 7.5 below shows the present "new urban" toll roads, together with distance savings and toll tariffs/km. Mariannhill, with the biggest distance saving also has the lowest unit tariff. However, this road should not be compared to the other roads in this category as the initial tariff level was based on only time and fuel cost savings.

Table 7.5 New Urban Toll Roads

Route	Plaza	Distances (km)			Tariff	
		Alt Road	Toll Road	Dist Saving	Total (Mar '95)	Tariff/km (Cents)
N17	Dalpark	18,5	17,7	0,8	R 2,80	15,8c
N2	Tongaat	20,8	19,3	1,5	R 2,70	14,0c
N2	Oribi South	24,1	24,9	-0,8	R 3,20	12,9c
N4	Pel &	21,3	21,4	-0,1	R 2,50	11,7c
N3	Quagga Mariannhill	22,5	19,6	2,9	R 1,30	6,6c
					Mean:	13,5c
					Std Dev	1,5

With Mariannhill considered an exception, the mean unit tariff is 13,5 cents/km with a standard deviation of 1,5 cents/km. From this, an option could be considered to use a standard rate/km for new urban toll roads of 13,5 cents/km based on the present tariff structure.

Hence, on the basis of the investigation into Class 1 vehicles, it would appear that a flat rate per kilometre or a "distance saving" based rate could be defined based on the tariff levels on the existing operational roads.

7.4.2 Option 2 - Empirical Mechanism

The difficulty in determining a flat rate based on current tariffs suggests that possibly another approach should be considered. On a given toll road system, it could be argued that if there are two toll roads of similar characteristics but the respective alternative routes differ (one is safe, comfortable and with reasonable speeds achievable while the other is dangerous, uncomfortable with reduced speeds recommended) then the benefits to the user would also differ (benefits measured as a cost saving). Hence, similar toll tariffs on the two roads might not be justified. In other words, the standard of the alternative route should be considered when setting the tariff. The fact remains that in the user's mind, the standard of the alternative route is a consideration. This consideration cannot be easily measured on a scientific basis as the perceptions of the user are the basis for the decision and the perceptions of a group of users cannot be easily quantified.

Hence, a elementary mechanism has been investigated to determine if the comparative standards of the toll road and the existing route can be used to determine the toll tariff. It is believed that to be worthwhile in the setting of tariffs which have to be accepted by the public, the analysis should be uncomplicated and based criteria which could be expected to rate highly in the users decision on whether to use the toll road or the alternative route.

It should be noted that this analysis has not been refined but rather investigated to a level to determine if the approach warrants further research. The criteria listed are not necessarily the complete list that should be included and similarly, the index values determined may be further refined through further analysis or involvement of typical users.

The criteria considered are believed to be those which are uppermost in the user's mind when deciding if the toll road or alternative route should be used. The categories defined for each criteria have been kept simple. The criteria and categories are :

Table 7.6 - User Criteria and Categories

CRITERIA	CATEGORIES
Topography	Hilly, rolling and flat
Distance saved (as a percentage of the alternative route distance)	○ less than -5% (i.e. toll road longer than alternative route) ○ ± 5% ○ +5% to +15% ○ > 15% ○ Tunnels/bridges
Nature of the toll road.	○ minor upgrade ○ major upgrade ○ new road
Road standard (measured by likely average speed)	○ less than 60 d ○ 60 - 100 d ○ greater than 100 d
Comfort - riding quality	○ poor ○ average ○ good
Safety	○ dangerous ○ average ○ safe

The approach that was adopted was to categorise each of the existing operational toll roads into its relevant categories listed above. The index value for each road was than calculated as a product of the six criteria indices. For each class of vehicle, the quantification of the indices was done empirically on the basis of a comparison between the toll road and the alternative route. For example, for Class 1 vehicles, the indices for topography are :

Table 7.7 - Topographical indices

		Toll Road		
		Hilly	Rolling	Flat
Alternative Route	Hilly	1,00	1,42	1,70
	Rolling	0,71	1,00	1,20
	Flat	0,59	0,83	1,00

Hence, if the toll road is flat and the alternative route is hilly, the index value is 1,70. Similarly, if the alternative route is rolling, the index value reduces to 1,42. This could be expected to be the users response (in terms of orders of magnitude).

The determination of index values was based on a calibration exercise using the existing tariffs expressed as a rate per kilometre. The product of all the relevant indices for a toll road were compared to the rate per kilometre for that route. The comparison was done on the basis of :

$$y = ax + b$$

where :

y = calculated rate/km
x = product of indices
a = constant
b = constant

The calibration exercise involved adjusting specific index values to maximise the R^2 coefficient of the regression analysis which compared - for a given class of vehicle - the calculated index values (as a set) with the actual rates per kilometre.

The values of 'y' (for the complete set of existing toll roads) was then compared (on a vehicle class basis) with the actual rates per km. The results are listed below and presented graphically in following pages

TOLL PLAZA	ROAD CATEGORY		Rate / km (cents / km)							
			Class 1		Class 2		Class 3		Class 4	
			Index	Actual	Index	Actual	Index	Actual	Index	Actual
MOOI	Rural	Minor	7.59	8.33	30.5	28.8	34.4	35.5	56.86	41.66
MVOTI	Rural	Major	15.0	13.9	32.0	32.7	40.2	43.6	67.6	65.50
WILGE	Rural	New	10.5	15.4	21.1	26.2	25.4	28.2	40.0	36.5
VAAL	Rural	New	10.5	16.8	21.1	23.1	25.4	26.8	40.0	31.5
TSITSIKAMMA	Rural	New	28.3	19.2	42.0	42.5	93.7	88.8	245.3	148.8
KRANSKOP	Rural	New	23.2	21.2	28.7	33.3	44.9	51.5	83.4	84.8
TUGELA	Rural	New	19.9	24.6	22.6	46.4	40.7	56.8	69.6	69.1
MTUNZINI	Rural	New	10.5	5.4	22.6	7.2	34.8	11.2	25.2	18.9
ORIBI SOUTH	Rural	New	8.2	12.8	22.2	20.0	23.5	30.9	16.4	51.0
HUGUENOT	Tunnel	New	98.5	90.0	222	225	362	350	528	570
GRASMERE	Urban	Minor	5.4	6.2	19.3	11.4	22.7	13.6	9.7	20.1
GOSFORTH	Urban	Minor	5.3	7.7	19.3	26.5	22.7	28.7	9.7	39.7
TONGAAT ML	Urban	New	10.5	13.9	21.1	20.7	25.4	31.0	40.0	51.8
QUAGGA	Urban	New	11.9	13.7	29.1	16.2	29.7	25.0	53.2	41.2
BRAKPAN	Urban	New	11.9	16.6	29.1	33.3	29.7	36.2	53.2	47.8
DALPARK	Urban	New	8.7	15.8	23.4	29.9	28.1	32.7	22.0	41.2
PELINDABA	Urban	New	8.9	10.4	21.5	11.9	25.4	17.9	19.9	31.3
MARIANNHILL	Urban	New	14.8	7.1	25.7	10.7	29.8	16.3	58.5	28.0
Regression fit (R^2)				94%		96%		98%		95%

The tables of index values and plots of actual tariffs per kilometre and calculated values are presented in the tables "Empirical Analysis of Toll Tariffs".

Based on the closeness of fit of the two sets of data, it would appear that an acceptable mechanism can be defined which, based on user perceptions and calibrated against existing tariffs, allows the toll tariffs to be determined for different categories of toll roads and their associated alternative route.

However, this mechanism should be refined if it is to be introduced.

EMPIRICAL ANALYSIS OF TOLL TARIFFS - Class 1 Vehicles

TOLL PLAZA	Length of road				Topography				Nature of		Road Standard (w.r.t. speed)				Comfort				Safety			
	Toll	Alter	Distance saved		Toll	Alter	Index		Toll road		Toll	Alter	Index		Toll	Alter	Index		Toll	Alter	Index	
	km	km	%	Index	(H, R, F)	(H, R, F)	Code	Value	Category	Index	kph	kph	Ratio	Value	(P, A, G)	(P, A, G)	Code	Value	(D, A, S)	(D, A, S)	Code	Value
MOOI	90.0	104.2	14%	1.10	F	R	FR	1.20	Minor	1.50	120	60	2.00	1.85	G	P	GP	1.25	S	D	SD	1.90
MVOTI	22.9	27.2	16%	1.90	F	R	FR	1.20	Major	1.40	120	50	2.40	1.85	G	P	GP	1.25	S	D	SD	1.90
WILGE	97.2	107.3	9%	1.10	F	F	FF	1.00	New	2.20	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15
VAAL	95.0	106.5	11%	1.10	F	F	FF	1.00	New	2.20	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15
TSITSIKAMMA	27.0	37.0	27%	1.90	F	H	FH	1.70	New	2.20	120	40	3.00	1.85	G	P	GP	1.25	S	D	SD	1.90
KRANSKOP	33.0	46.0	28%	1.90	F	R	FR	1.20	New	2.20	120	80	1.50	1.90	G	P	GP	1.25	S	A	SA	2.15
TUGELA	52.8	68.8	23%	1.90	F	R	FR	1.20	New	2.20	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15
MTUNZINI	34.8	33.5	-4%	1.00	F	R	FR	1.20	New	2.20	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15
ORIBI SOUTH	24.9	24.1	-3%	1.00	R	F	RF	0.83	New	2.20	120	50	2.40	1.85	G	P	GP	1.25	S	A	SA	2.15
HUGUENOT	10.0	21.0	52%	5.80	F	H	FH	1.70	New	2.20	120	80	2.00	1.85	G	P	GP	1.25	S	D	SD	1.90
GRASMERE ML	78.8	80.4	4%	1.00	F	F	FF	1.00	Minor	1.30	120	80	1.50	1.90	G	A	GA	1.10	S	A	SA	2.15
GOSFORTH	18.1	16.8	-8%	1.00	F	F	FF	1.00	Minor	1.30	120	70	1.71	1.90	G	A	GA	1.10	S	A	SA	2.15
TONGAAT ML	19.3	20.8	7%	1.10	F	F	FF	1.00	New	2.50	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15
QUAGGA	8.0	8.5	6%	1.10	F	F	FF	1.00	New	2.50	120	60	2.00	1.85	G	P	GP	1.25	S	A	SA	2.15
BRAKPAN	13.8	14.6	5%	1.10	F	F	FF	1.00	New	2.50	120	60	2.00	1.85	G	P	GP	1.25	S	A	SA	2.15
DALPARK	17.7	18.5	4%	1.00	F	F	FF	1.00	New	2.50	120	60	2.00	1.85	G	A	GA	1.10	S	A	SA	2.15
PELINDABA	13.4	12.8	-5%	1.00	F	F	FF	1.00	New	2.50	120	80	1.50	1.90	G	A	GA	1.10	S	A	SA	2.15
MARIANNHILL	19.6	22.5	13%	1.10	R	H	RH	1.42	New	2.50	120	101	1.19	1.85	G	A	GA	1.10	S	A	SA	2.15

Toll No	Rate / km Index cents/km	Rate / km Actual cents/km
12	8 700	8 333
13	14 025	13 974
1	10 588	15 432
4	10 588	16 842
11	31 222	19 259
14	25 613	21 212
15	21 946	24 621
16	11 551	5 480
17	9 115	12 851
10	95 309	90 000
3	5 842	6 250
9	5 842	7 735
2	12 032	13 960
5	13 673	13 750
6	13 673	16 667
7	10 938	15 819
8	11 234	10 448
18	17 045	7 143
Sum	328 9343	319 786

20.0%	1.000
-5.0%	1.000
5.0%	1.000
5.1%	1.100
15.0%	1.100
15.1%	1.900
100.0%	1.900
Tunnel	5.8

FF	1.000
FR	1.200
FH	1.700
RF	0.833
RR	1.000
RH	1.417
HF	0.588
HR	0.706
HH	1.000

Rural

Minor	1.500
Major	1.400
New	2.200

Urban

Minor	1.300
Major	N/a
New	2.500

100.0%	1.850
119.5%	1.900
120.0%	1.900
200.0%	1.850

GP	1.250
GA	1.100
GG	1.000

SD	1.900
SA	2.150
SS	1.000

$y = ax + b$

$a = 1$

$b = 0$

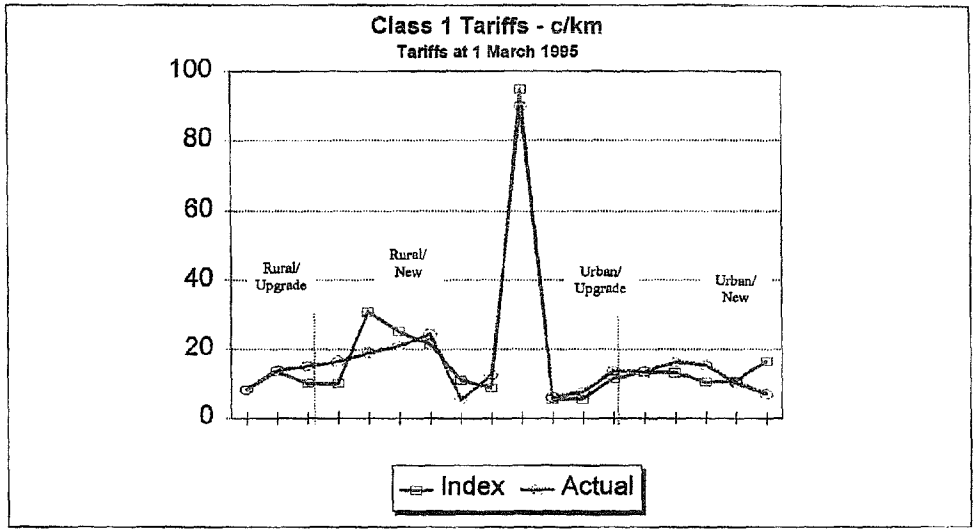
Topography (litres / 100km)

	Toll Road & Alter. Route		
	Hilly	Rolling	Flat
l/100k	17	12	10

		Toll Road			Weighting
		Hilly	Rolling	Flat	
Alter. Route	Hilly	1.00	1.42	1.70	1.00
	Rolling	0.71	1.00	1.20	
	Flat	0.59	0.83	1.00	

Distance saved - relative

	Toll road / Alt. route					Weighting
Rural	< 5%	< ± 5%	5% - 15%	> 15%	Tunnel / Bridge	
	1.00	1.00	1.10	1.90	5.80	1.00
Urban	< 5%	< ± 5%	5% - 15%	> 15%	Tunnel / Bridge	
	1.00	1.00	1.10	1.90	5.80	1.00



Nature of the toll road

	Toll Road			Weighting
	Minor Upgrad	Major Upgrade	New Road	
Rural	1.50	1.40	2.20	1.00
Urban	1.30	N/a	2.50	1.00

Comfort - (riding quality)

		Toll Road			Weighting
		Poor	Average	Good	
Alter. Route	Poor			1.25	1.00
	Average			1.10	
	Good			1.00	

Regression Output:	
Constant	1.4027
Std Err of Y Est	4.8037
R Squared	93.8%
No. of Observations	18
Degrees of Freedom	16
X Coefficient(	0.895
Std Err of Coe	0.057

Road Standard (w.r.t. speed)

		Toll Road (kph)			Weighting
		< 60	60 - 100	> 100	
Alter. Route	< 60			1.85	1.00
	60 - 100			1.90	
	> 100			1.85	

Safety

		Toll Road			Weighting
		Dangerous	Average	Safe	
Alter. Route	Dangerous			1.90	1.00
	Average			2.15	
	Safe			1.00	

EMPIRICAL ANALYSIS OF TOLL TARIFFS - Class 2 Vehicles

TOLL PLAZA	Length of road				Topography				Nature of		Road Standard (w.r.t. speed)				Comfort				Safety			
	Toll	Alter	Distance saved		Toll	Alter	Index		Toll road		Toll	Alter	Index		Toll	Alter	Index		Toll	Alter	Index	
	km	km	%	Index	(H, R, F)	(H, R, F)	Code	Value	Category	Index	kph	kph	Ratio	Value	(P, A, G)	(P, A, G)	Code	Value	(D, A, S)	(D, A, S)	Code	Value
MOOI	90.0	104.2	14%	1.20	F	R	FR	1.40	Minor	1.00	120	60	2.00	1.80	G	P	GP	1.50	S	D	SD	1.70
MVOTI	22.9	27.2	16%	1.00	F	R	FR	1.40	Major	1.30	120	50	2.40	1.80	G	P	GP	1.50	S	D	SD	1.70
WILGE	97.2	107.3	9%	1.20	F	F	FF	1.00	New	1.30	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70
VAAL	95.0	108.5	11%	1.20	F	F	FF	1.00	New	1.30	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70
TSITSIKAMMA	27.0	37.0	27%	1.00	F	H	FH	2.10	New	1.30	120	40	3.00	1.80	G	P	GP	1.50	S	D	SD	1.70
KRANSKOP	33.0	48.0	28%	1.00	F	R	FR	1.40	New	1.30	120	80	1.50	1.50	G	P	GP	1.50	S	A	SA	1.70
TUGELA	52.8	68.8	23%	1.00	F	R	FR	1.40	New	1.30	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70
MTUNZINI	34.8	33.5	-4%	1.00	F	R	FR	1.40	New	1.30	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70
ORIBI SOUTH	24.9	24.1	-3%	1.00	R	F	RF	0.71	New	1.30	120	50	2.40	1.80	G	P	GP	1.50	S	A	SA	1.70
HUGUENOT	10.0	21.0	52%	7.00	F	H	FH	2.10	New	1.30	120	80	2.00	1.80	G	P	GP	1.50	S	D	SD	1.70
GRASMERE ML	76.8	80.4	4%	1.00	F	F	FF	1.00	Minor	1.10	120	80	1.50	1.50	G	A	GA	1.20	S	A	SA	1.70
GOSFORTH	18.1	16.6	-9%	1.00	F	F	FF	1.00	Minor	1.10	120	70	1.71	1.50	G	A	GA	1.20	S	A	SA	1.70
TONGAAT ML	19.3	20.8	7%	1.20	F	F	FF	1.00	New	1.10	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70
QUAGGA	8.0	8.5	6%	1.20	F	F	FF	1.00	New	1.10	120	60	2.00	1.80	G	P	GP	1.50	S	A	SA	1.70
BRAKPAN	13.8	14.6	5%	1.20	F	F	FF	1.00	New	1.10	120	60	2.00	1.80	G	P	GP	1.50	S	A	SA	1.70
DALPARK	17.7	18.5	4%	1.00	F	F	FF	1.00	New	1.10	120	80	2.00	1.80	G	A	GA	1.20	S	A	SA	1.70
PELINDABA	13.4	12.8	-5%	1.00	F	F	FF	1.00	New	1.10	120	80	1.50	1.50	G	A	GA	1.20	S	A	SA	1.70
MARIANNHILL	19.6	22.5	13%	1.20	R	H	RH	1.50	New	1.10	120	101	1.19	1.20	G	A	GA	1.20	S	A	SA	1.70

Toll No	Rate / km Index cents/km	Actual cents/km
12	30 507	28 889
13	32 049	32 751
1	21 185	26 235
4	21 185	23 158
11	42 074	42 593
14	28 708	33 333
15	22 693	46 402
16	22 693	7 184
17	22 229	20 080
10	222 516	225 000
3	20 078	11 458
9	20 078	26 519
2	19 755	20 725
5	26 541	16 250
6	26 541	33 333
7	21 694	29 944
8	20 078	11 940
18	23 633	10 714
Sum	644 1982	846 5086

-20 0%	1 000
-5 0%	1 000
5 0%	1 000
5 1%	1 200
15 0%	1 200
15 1%	1 000
100 0%	1 000
Tunnel	7

FF	1 000
FR	1 400
FH	2 100
RF	0 714
RR	1 000
RH	1 500
HF	0 476
HR	0 667
HH	1 000

Rural	
Minor	1 000
Major	1 300
New	1 300

Urban	
Minor	1 100
Major	N/a
New	1 100

100 0%	1 200
119 5%	1 500
120 0%	1 500
200 0%	1 800

GP	1 500
GA	1 200
GG	1 000

SD	1 700
SA	1 700
SS	1 000

$y = ax + b$

$a = 2.4$

$b = 12$

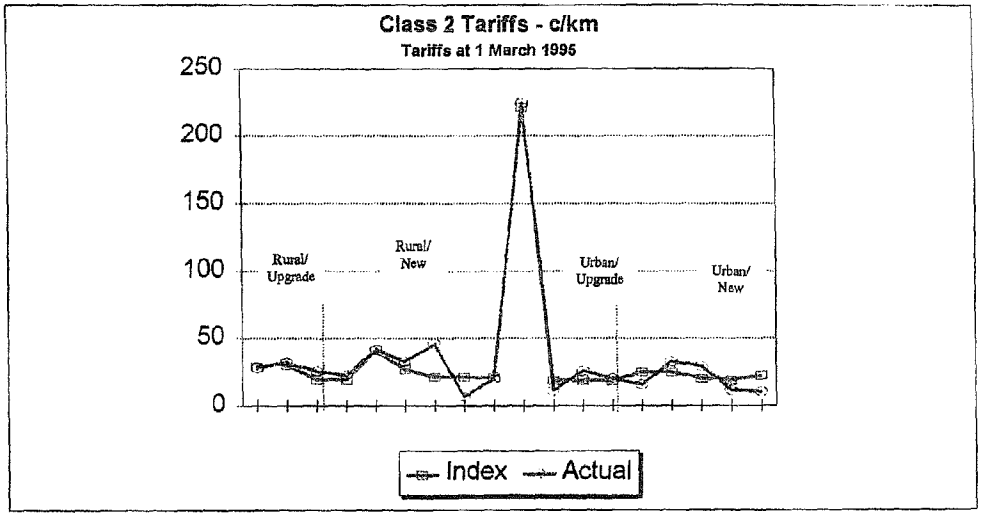
Topography (litres / 100km)

	Toll Road & Alter. Route		
	Hilly	Rolling	Flat
l/100k	42	28	20

		Toll Road			Weighting
		Hilly	Rolling	Flat	
Alter. Route	Hilly	1.00	1.50	2.10	1.00
	Rolling	0.67	1.00	1.40	
	Flat	0.48	0.71	1.00	

Distance saved - relative

	Toll road / Alt. route					Weighting
Rural	< 5%	< ± 5%	5% - 15%	> 15%	Tunnel / Bridge	
	1	1	1.2	1	7	1.00
Urban	< 5%	< ± 5%	5% - 15%	> 15%	Tunnel / Bridge	
	1.00	1.00	1.20	1.00	7.00	1.00



Nature of the toll road

	Toll Road			Weighting
	Minor Upgrad	Major Upgrade	New Road	
Rural	1	1.3	1.3	1.00
Urban	1.1	N/a	1.1	1.00

Comfort - (riding quality)

		Toll Road			Weighting
		Poor	Average	Good	
Alter. Route	Poor			1.5	1.00
	Average			1.2	
	Good			1	

Regression Output:	
Constant	-0.329
Std Err of Y Est	9.4585
R Squared	96.4%
No. of Observations	18
Degrees of Freedom	16
X Coefficient(	1.013
Std Err of Coe	0.049

Road Standard (w.r.t. speed)

		Toll Road (kph)			Weighting
		< 60	60 - 100	> 100	
Alter. Route	< 60			1.8	1.00
	60 - 100			1.5	
	> 100			1.2	

Safety

		Toll Road			Weighting
		Dangerou	Average	Safe	
Alter. Route	Dangerous			1.7	1.00
	Average			1.7	
	Safe			1	

EMPIRICAL ANALYSIS OF TOLL TARIFFS - Class 3 Vehicles

TOLL PLAZA	Length of road				Topography				Nature of		Road Standard (w.r.t. speed)				Comfort				Safety			
	Toll	Alter	Distance saved		Toll	Alter	Index		Toll road		Toll	Alter	Index		Toll	Alter	Index		Toll	Alter	Index	
	km	km	%	Index	(H, R, F)	(H, R, F)	Code	Value	Category	Index	kph	kph	Ratio	Value	(P, A, G)	(P, A, G)	Code	Value	(D, A, S)	(D, A, S)	Code	Value
MOOI	90.0	104.2	14%	1.00	F	R	FR	2.75	Minor	0.50	120	80	2.00	1.50	G	P	GP	1.20	S	D	SD	1.30
MVOTI	22.9	27.2	16%	1.40	F	R	FR	2.75	Major	0.50	120	50	2.40	1.50	G	P	GP	1.20	S	D	SD	1.30
WILGE	97.2	107.3	9%	1.00	F	F	FF	1.00	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20
VAAL	95.0	106.5	11%	1.00	F	F	FF	1.00	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20
TSITSIKAMMA	27.0	37.0	27%	1.40	F	H	FH	5.00	New	1.00	120	40	3.00	1.50	G	P	GP	1.20	S	D	SD	1.30
KRANSKOP	33.0	46.0	28%	1.40	F	R	FR	2.75	New	1.00	120	80	1.50	1.00	G	P	GP	1.20	S	A	SA	1.20
TUGELA	52.8	68.8	23%	1.40	F	R	FR	2.75	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20
MTUNZINI	34.8	33.5	-4%	1.00	F	R	FR	2.75	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20
ORIBI SOUTH	24.9	24.1	-3%	1.00	R	F	RF	0.36	New	1.00	120	50	2.40	1.50	G	P	GP	1.20	S	A	SA	1.20
HUGUENOT	10.0	21.0	52%	6.50	F	H	FH	5.00	New	1.00	120	60	2.00	1.50	G	P	GP	1.20	S	D	SD	1.30
GRASMERE ML	76.8	80.4	4%	1.00	F	F	FF	1.00	Minor	0.50	120	80	1.50	1.00	G	A	GA	1.00	S	A	SA	1.20
GOSFORTH	18.1	16.6	-9%	1.00	F	F	FF	1.00	Minor	0.50	120	70	1.71	1.00	G	A	GA	1.00	S	A	SA	1.20
TONGAAT ML	19.3	20.8	7%	1.00	F	F	FF	1.00	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20
QUAGGA	8.0	8.5	6%	1.00	F	F	FF	1.00	New	1.00	120	80	2.00	1.50	G	P	GP	1.20	S	A	SA	1.20
BRAKPAN	13.8	14.6	5%	1.00	F	F	FF	1.00	New	1.00	120	80	2.00	1.50	G	P	GP	1.20	S	A	SA	1.20
DALPARK	17.7	18.5	4%	1.00	F	F	FF	1.00	New	1.00	120	80	2.00	1.50	G	A	GA	1.00	S	A	SA	1.20
PELINDABA	13.4	12.8	-5%	1.00	F	F	FF	1.00	New	1.00	120	80	1.50	1.00	G	A	GA	1.00	S	A	SA	1.20
MARIANNHILL	19.6	22.5	13%	1.00	R	H	RH	1.82	New	1.00	120	101	1.19	1.00	G	A	GA	1.00	S	A	SA	1.20

Toll No	Rate / km Index cents/km	Actual cents/km
12	34 479	35 556
13	40 270	43 668
1	25 400	28 292
4	25 400	26 842
11	93 710	88 889
14	44 948	51 515
15	40 780	56 818
16	34 850	11 207
17	23 535	30 924
10	382 225	350 000
3	22 700	13 672
9	22 700	28 729
2	25 400	31 088
5	29 720	25 000
6	29 720	38 232
7	28 100	32 768
8	25 400	17 910
18	29 818	16 327
Sum	938 1647	925 4372

-20.0%	1 000
-5.0%	1 000
5.0%	1 000
5.1%	1 000
15.0%	1 000
15.1%	1 400
100.0%	1 400
Tunnel	6.5

FF	1 000
FR	2 750
FH	5 000
RF	0 364
RR	1 000
RH	1 818
HF	0 200
HR	0 550
HH	1 000

Rural

Minor	0 500
Major	0 500
New	1 000

Urban

Minor	0 500
Major	N/a
New	1 000

100.0%	1 000
119.5%	1 000
120.0%	1 000
200.0%	1 500

GP	1 200
GA	1 000
GG	1 000

SD	1 300
SA	1 200
SS	1 000

$y = ax + b$

$a = 4.5$

$b = 20$

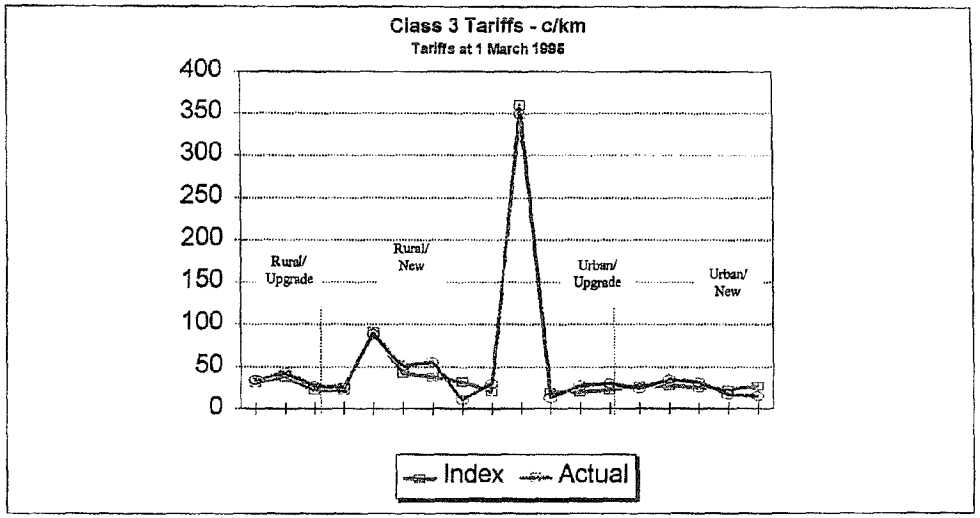
Topography (litres / 100km)

	Toll Road & Alter. Route		
	Hilly	Rolling	Flat
l/100k	100	55	20

		Toll Road			Weighting
		Hilly	Rolling	Flat	
Alter. Route	Hilly	1.00	1.82	5.00	1.00
	Rolling	0.55	1.00	2.75	
	Flat	0.20	0.36	1.00	

Distance saved - relative

	Toll road / Alt. route					Weighting
Rural	< -5%	< ± 5%	5% - 15%	> ± 5%	Tunnel / Bridge	
	1	1	1	1.4	6.5	1.00
Urban	< -5%	< ± 5%	5% - 15%	> ±4%	Tunnel / Bridge	
	1.00	1.00	1.00	1.40	6.50	1.00



Nature of the toll road

	Toll Road			Weighting
	Minor Upgrad	Major Upgrade	New Road	
Rural	0.5	0.6	1	1.00
Urban	0.5	N/a	1	1.00

Comfort - (riding quality)

		Toll Road			Weighting
		Poor	Average	Good	
Alter. Route	Poor			1.2	1.00
	Average			1	
	Good			1	

Regression Output:	
Constant	1.1576
Std Err of Y Est	9.4532
R Squared	98.6%
No. of Observations	18
Degrees of Freedom	16
X Coefficient(	0.963
Std Err of Coe	0.029

Road Standard (w.r.t. speed)

		Toll Road (kph)			Weighting
		< 60	60 - 100	> 100	
Alter. Route	< 60			1.5	1.00
	60 - 100			1	
	> 100			1	

Safety

		Toll Road			Weighting
		Dangerou	Average	Safe	
Alter. Route	Dangerous			1.3	1.00
	Average			1.2	
	Safe			1	

EMPIRICAL ANALYSIS OF TOLL TARIFFS - Class 4 Vehicles

TOLL PLAZA	Length of road				Topography				Nature of		Road Standard (w.r.t. speed)				Comfort				Safety			
	Toll	After	Distance saved		Toll	After	Index		Toll road		Toll	After	Index		Toll	After	Index		Toll	After	Index	
	km	km	%	Index	(H, R, F)	(H, R, F)	Code	Value	Category	Index	kph	kph	Ratio	Value	(P, A, G)	(P, A, G)	Code	Value	(D, A, S)	(D, A, S)	Code	Value
MOOI	90 0	104.2	14%	2.50	F	R	FR	1.50	Minor	1.20	120	60	2 00	1.80	G	P	GP	1.90	S	D	SD	2.50
MVOTI	22.9	27 2	16%	3.00	F	R	FR	1.50	Major	1.20	120	50	2.40	1.80	G	P	GP	1.90	S	D	SD	2.50
WILGE	97.2	107.3	9%	2.50	F	F	FF	1.00	New	3.00	120	101	1.19	1.40	G	A	GA	1.80	S	A	SA	1.40
VAAL	95 0	106 5	11%	2.50	F	F	FF	1.00	New	3.00	120	101	1 19	1.40	G	A	GA	1.80	S	A	SA	1.40
TSITSIKAMMA	27.0	37 0	27%	3.00	F	H	FH	2.25	New	3.00	120	40	3 00	1.80	G	P	GP	1.90	S	D	SD	2.50
KRANSKOP	33 0	46 0	28%	3.00	F	R	FR	1.50	New	3.00	120	80	1 50	1.80	G	P	GP	1.90	S	A	SA	1.40
TUGELA	52 8	68 8	23%	3.00	F	R	FR	1.50	New	3.00	120	101	1.19	1.40	G	A	GA	1.80	S	A	SA	1.40
MTUNZINI	34 8	33 5	-4%	1.00	F	R	FR	1.50	New	3.00	120	101	1 19	1.40	G	A	GA	1.80	S	A	SA	1.40
ORIBI SOUTH	24.9	24 1	-3%	1.00	R	F	RF	0.67	New	3.00	120	50	2.40	1.80	G	P	GP	1.90	S	A	SA	1.40
HUGUENOT	10.0	21 0	52%	7.00	F	H	FH	2.25	New	3.00	120	60	2.00	1.80	G	P	GP	1.90	S	D	SD	2.50
GRASMERE ML	76 8	80.4	4%	1.00	F	F	FF	1.00	Minor	2.00	120	80	1.50	1.80	G	A	GA	1.80	S	A	SA	1.40
GOSFORTH	18 1	16 6	-9%	1.00	F	F	FF	1.00	Minor	2.00	120	70	1 71	1.80	G	A	GA	1.80	S	A	SA	1.40
TONGAAT ML	19 3	20 8	7%	2.50	F	F	FF	1.00	New	3.00	120	101	1 19	1.40	G	A	GA	1.80	S	A	SA	1.40
QUAGGA	8.0	8 5	6%	2.50	F	F	FF	1.00	New	3.00	120	60	2.00	1.80	G	P	GP	1.90	S	A	SA	1.40
BRAKPAN	13.8	14 6	5%	2.50	F	F	FF	1.00	New	3.00	120	60	2 00	1.80	G	P	GP	1.90	S	A	SA	1.40
DALPARK	17 7	18 5	4%	1.00	F	F	FF	1.00	New	3.00	120	60	2 00	1.80	G	A	GA	1.80	S	A	SA	1.40
PELINDABA	13.4	12 8	-5%	1.00	F	F	FF	1.00	New	3.00	120	80	1 50	1.80	G	A	GA	1.80	S	A	SA	1.40
MARIANNHILL	19.6	22 5	13%	2.50	R	H	RH	1.50	New	3.00	120	101	1 19	1.40	G	A	GA	1.80	S	A	SA	1.40

-20 0%	1 000
-5 0%	1 000
5 0%	1 100
5 1%	2 500
15 0%	2 500
15 1%	3 000
100 0%	3 000
Tunnel	7

FF	1 000
FR	1 500
FH	2 250
RF	0 667
RR	1 000
RH	1 500
HF	0 444
HR	0 667
HH	1 000

Rural	
Minor	1 200
Major	1 200
New	3 000

Urban	
Minor	2 000
Major	N/a
New	3 000

100 0%	1 400
119 5%	1 600
120 0%	1 600
200 0%	1 800

GP	1 900
GA	1 800
GG	1 000

SD	2 500
SA	1 400
SS	1 000

Toll No	Rate / km Index cents/km	Actual cents/km
12	56 865	41 667
13	67 638	65 502
1	40 044	36 523
4	40 044	31 579
11	245 393	148 148
14	83 438	84 846
15	69 679	69 129
16	25 226	18 966
17	16 406	51 004
10	568 583	570 000
3	14 290	20 182
9	14 290	39 779
2	40 044	51 813
5	53 274	41 250
6	53 274	47 826
7	22 051	41 243
8	19 934	31 343
18	58 566	26 061
Sum	1489 039	1418 864

$y = ax + b$

a = 1 4

b = 3

Topography (litres / 100km)

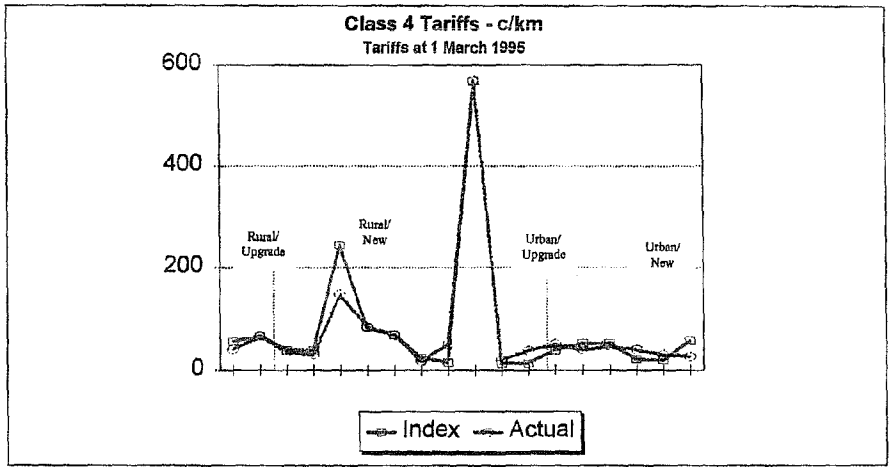
	Toll Road & Alter. Route			
		Hilly	Rolling	Flat
l/100k		22.50	15.00	10.00
		90	60	40

4

		Toll Road			Weighting
		Hilly	Rolling	Flat	
Alter. Route	Hilly	1.00	1.50	2.25	1.00
	Rolling	0.67	1.00	1.50	
	Flat	0.44	0.67	1.00	

Distance saved - relative

	Toll road / Alt. route					Weighting
Rural	< 5%	< ± 5%	5% - 10%	> 15%	Tunnel / Bridge	
	1.00	1.10	2.50	3.00	7.00	1.00
Urban	< 5%	< ± 5%	5% - 13%	> 18%	Tunnel / Bridge	
	1.00	1.10	2.50	3.00	7.00	1.00



Nature of the toll road

	Toll Road			Weighting
	Minor Upgrad	Major Upgrade	New Road	
Rural	1.2	1.2	3	1.00
Urban	2	N/a	3	1.00

Comfort - (riding quality)

		Toll Road			Weighting
		Poor	Average	Good	
Alter. Route	Poor			1.90	1.00
	Average			1.80	
	Good			1.00	

Regression Output:	
Constant	1.5216
Std Err of Y Est	27.27
R Squared	95.6%
No. of Observations	18
Degrees of Freedom	16
X Coefficient(	0.934
Std Err of Coe	0.05

Road Standard (w.r.t. speed)

		Toll Road (kph)			Weighting
		< 80	80 - 100	> 100	
Alter. Route	< 80			1.80	1.00
	80 - 100			1.60	
	> 100			1.40	

Safety

		Toll Road			Weighting
		Dangerous	Average	Safe	
Alter. Route	Dangerous			2.50	1.00
	Average			1.40	
	Safe			1.00	

7.4.3 Option 3 - Tariff per Kilometre and Perceived Benefits

This option is the existing mechanism used to determine toll tariffs for new toll roads. A detailed investigation of this option has not been carried out since the details are known and the mechanism is sound. This is based on the fact that the financial performance of the toll roads is better than expected during the planning stages although problems with tariffs have arisen and have been dealt with on a project specific basis.

7.4.4 Option 4 - Market Related Tariffs

The issue of market related tariffs has previously been researched at the request of the SARB. The results of the research (based on the Marianhill toll road) indicated that an increase in tariffs could be justified to bring the tariffs into line with the market prices. At the time, this also applied to the other operational toll roads. However, legislative constraints would only allow the increased income to be used on the Marianhill toll road, i.e. transfer of funds to other toll roads was not legally possible.

Hence, with regard to market related toll tariffs (based on the **financial** aspects, the **economic** consequences and the **willingness to pay**) it is accepted that existing toll tariffs could be increased but the legislative constraints would have to be addressed before any such increases were introduced.

7.4.5 Equitability of differential toll tariffs for heavy vehicles based on different vehicle classes

Option 1 : Using Existing Toll Tariff Structures

At present, vehicles are divided into 4 different vehicle classes, namely;

Class 1 : Light vehicles (2 or more axles)
Class 2 : Heavy vehicles (2 axles)
Class 3 : Heavy vehicles (3 and 4 axles)
Class 4 : Heavy vehicles (5 and more axles)

° New Rural Roads

The tariff structures for the new rural roads were investigated and Table 7.8 below shows the results for the new rural roads. For each class, the average tariff per kilometre and standard deviation are shown together with the ratio of the heavy vehicle tariff per kilometre to that of the Class 1 (i.e. light vehicles) tariff per kilometre.

The tariffs for Tsitsikamma and Mtunzini were found to be inconsistent with the rest of the new rural toll roads. The alternative route of Tsitsikamma is basically a mountain pass while Mtunzini plaza represents basically an uncompleted toll road.

Thus, the tariff comparison for different vehicle classes for new rural toll roads in table 4.3 excludes Tsitsikamma and Mtunzini plazas.

Table 7.8 New Rural Roads : Existing Tariff Structure

Vehicle Class	Average Tariff/km	Standard Deviation	Ratios of Unit Tariff Relative to Class 1	Standard Deviation
Class 1	18,01	3,55	1	-
Class 2	30,08	8,27	1,66	0,27
Class 3	36,56	12,34	2,00	0,44
Class 4	48,19	19,45	2,64	0,86

It can be seen that an average tariff per kilometre cannot be used as there is a high standard deviation when compared to the average tariff. However, when ratios of the heavy vehicle tariffs were related to those of Class 1, it was found that the standard deviation is relatively small.

Thus, based on the existing toll tariff structures, a possible policy option is to use fixed ratios between the tariffs of light vehicles and the heavy vehicle classes as is found in the present tariff structure.

° New Urban Roads

The existing tariff structures for new urban roads are shown in Table 7.9 below. Again, the average tariff per kilometre and the standard deviation are shown for each vehicle class. The ratio of the heavy vehicle tariff per kilometre to that of light vehicles is also shown. Mariannhill was also considered to be an exception due to its unmotivated low unit tariff.

Table 7.9 New Urban Roads : Existing Tariff Structure

Vehicle Class	Average Tariff/km	Standard Deviation	Ratios of Unit Tariff Relative to Class 1	Standard Deviation
Class 1	13,45	1,68	1	-
Class 2	20,65	5,70	1,51	0,25
Class 3	28,69	5,13	2,12	0,23
Class 4	45,02	7,48	3,37	0,50

Although the standard deviation of the tariffs per kilometre relative to the average tariff per kilometre for light vehicles seems to be acceptable, the standard deviations for the heavy vehicle classes are relatively high. If the ratios of heavy vehicle tariffs relative to a light vehicle are considered it can be seen that there is a smaller standard deviation relative to the average value.

Thus, based on the existing toll tariff structures, a possible policy option is to use fixed ratios between the tariffs of light and heavy vehicles as is found in the present tariff structure.

7.5 GUIDELINES

The decision on which mechanism should be used to determine toll tariffs cannot be made on technical issues alone. Discussion and debate should focus attention on the pros and cons of each of the above-mentioned options and determine - on political, economic and technical issues - which option is to be adopted. However, the following guidelines should be considered:

- the existing tariff structure has been proved to be sound
- the toll tariff structure should be equitable and acceptable to both users and the public
- a flat tariff structure will be difficult to achieve from the existing tariffs although a structure based on distance saving could be defined
- the users perceptions should be incorporated into any new mechanism
- a mechanism to introduce tariff increases should be introduced which should be based on the inflation rate and other related factors.

7.6 CONCLUSION

It is generally accepted that the issue of toll tariffs is an emotive issue and that any mechanism introduced to define toll tariffs must be seen to be fair by the users and the public. The decision on which mechanism to adopt is also influenced by the legislative and institutional issues which must be considered.

In the context of toll road policy, it should be noted that although other mechanisms exist which can be used to determine toll tariffs, the existing tariff structure is sound, as proved by the financial performance of the operational toll roads.

CHAPTER 8

OPERATION AND MAINTENANCE OF TOLL ROADS

8.1 Existing Practice in South Africa

The operations policy is described in terms of vehicle classification, methods of payment and operations and maintenance contract policy.

8.1.1 Vehicle Classification

The 1982 report of the Parliamentary Select Committee recommended that there should be differentiation in toll tariffs according to vehicle mass and type. Vehicle classification for state developed toll roads were originally based on a tariff per axle for light and heavy vehicles respectively, with payment in the case of light vehicles for a maximum of 4 axles and in the case of heavy vehicles for a maximum of 5 axles (except for the Tsitsikamma toll roads which classified according to vehicle type) . The toll roads developed by Tolcon and THDC adopted a classification based on vehicle type. Both of their classification systems were different. Consequently there were 4 different systems in operation up to October 1993 after which the SARB standardised the system as follows:

Class I - all light vehicles
Class II - 2 axle heavy vehicles
Class III - 3 and 4 axle heavy vehicles
Class IV - 5 or more axle heavy vehicles

This system is in operation at all toll plazas, except the Tsitsikamma toll road, which retains its original system.

8.1.2 Methods of Payment

The following methods of payment are currently accepted at all toll plazas:

- Cash - applicable to all classes of vehicle
- Bank credit cards - Visa and Mastercard are accepted at all plazas and are mainly used by light vehicles

- Frequent user cards - available only to light vehicles. These cards offer discounts on a sliding scale according to usage. The steps which are applicable are 0 to 20 times per calendar month - no discount; 20 to 40 times per calendar month - 20% discount and over 40 times per month - 40 % discount.
- A deposit account system, for mainly heavy vehicles, enables companies using a toll facility regularly to print warrants with the company name and other details and issue these to their drivers who present these warrants at the toll plazas. If the account is paid within 30 days, a discount is granted.
- Bank fleet cards and Transkard, a dedicated toll payment card for heavy vehicles, is in operation at all toll plazas.

8.1.3 Toll Plaza Operations and Maintenance Contracts

Contracts on the traditionally state developed toll roads are awarded to private sector companies for a period of 3 to 5 years after an open tender process. The contract involves traffic management, vehicle classification, toll collection, toll collection control, the transfer of collected toll to the Reserve Bank account of the toll project, maintenance of the toll plaza lane area, canopy, buildings, toll equipment, emergency generator and other equipment and gardening and refuse removal. At some plazas SOS telephone monitoring is required. Recently the operations contract has been broadened to include roadside maintenance and minor repairs.

Operations and maintenance contracts have also been negotiated with Tolcon and THDC for a period of 3 years with an option to extend them to 5 years. These agreements involve all the aspects covered under the standard operations and maintenance contracts but also include some project management of road services and maintenance.

8.1.4 Open verses Closed Toll Systems

At present all toll roads in South Africa are operated on the basis of an 'open' system. This is the payment of toll at various stages on a route or at the entrance or exit of a road and does not relate to the distance travelled on the facility. A 'closed' system, on the other hand, charges toll according to the total distance travelled on the toll road. By definition therefore

an open system is less expensive to operate than a closed system which requires toll plazas at all on and off ramps of the freeway.

Toll roads are frequently used by both long distance through traffic as well as commuter traffic and short distance traffic. Under such circumstances the main operating criterion is that the total number of stops that users are obliged to make are minimised.

8.1.5 Location of Toll Plazas

Plazas in the country are located mainly where the traffic on the toll road would find it difficult to avoid paying toll. This is necessary in order to generate the greatest amount of income from the road users. Unfortunately this often leads to an interchange being tolled which affects the movement of local residents. Examples of this are Tsitsikamma and Kranskop on new roads and Mooi and Grasmere on existing previously toll free roads. These locations result in negative publicity for the SARB and ultimately lead to deep discounts or concessions for the local residents. The position of the plazas requires a balance between equity for the road user and maximising toll income.

8.1.6 Maintenance of Toll Plazas and Toll Roads

Currently maintenance consists of:

a) <u>Toll Plaza Maintenance</u>

- Day to day cleaning, gardening and domestic services rendered by the Operator in terms of a rate tendered for the works.
- Civil and building maintenance, viz. painting and minor maintenance repairs normally on a quotation basis under control of the Operator who is appointed on an open tender basis by the SARB.
- Electrical and mechanical maintenance related to routine, preventative and breakdown actions regarding the generator(s), air conditioning systems, UPS, high mast/area lighting and internal electrical reticulation, all performed in terms of a SARB contract with a specialist contractor approved on an open tender process.

- Electronic toll collection and control systems maintenance including routine, preventative and breakdown actions related to the toll collection lane equipment, AVC control system and SOS and TEL systems where applicable, all performed in terms of an independent SARB contract with a specialist electronic equipment contractor appointed on an open tender basis.
- MIS support performed by a specialist in terms of an independent SARB contract awarded on an open tender basis.

This mechanism of toll plaza maintenance is established at the majority of toll plazas in South Africa in a cost effective way so that a group of plazas in an area is included under one contract. At the N1 and N3 Tolcon operated toll plazas the operator is either carrying out the specialist maintenance himself or conducts it on a quotation basis. The new standard of independent maintenance in certain instances has, however, been implemented to prevent fraud.

b) Toll Road Maintenance

The toll road maintenance includes grass cutting, clearing of drains and stormwater channels, road marking and painting, fencing repairs, signage repairs and minor pavement repairs along the toll route. The standard specification of toll facility operation and maintenance allows for the performing of these works in terms of a selected SARB subcontract under control of the Operator. There are, however, some toll roads where these maintenance works are carried out by either independent contractors appointed by the provincial administrators or by working teams employed by the provinces themselves.

8.2 Issues

8.2.1 Operational Criteria

The key objectives that a toll collection system should aim at are:

- reduce collection costs to a minimum by balancing staff costs and collection equipment

- maximise throughput by simplifying the transaction and minimising the time required for it by informing the user before the payment is made
- offer the user the widest choice of payment options, especially credit cards by swipe card readers
- audit control must be sound, preferably using electronic means such as automatic vehicle classification
- reduce the use of cash at the plaza which assists in the problem of counting and reconciliation as well as security.

8.2.2 Cost Effective Financial Control

The cost of collection is often cited as a disadvantage to toll financing. The average cost of collection in South Africa is approximately 16 cents in the Rand. The main item of expenditure on a toll plazas operations contract is personnel costs (about 75%) followed by management and computer costs. A balance must be achieved between sophisticated fraud-proof systems with the resultant outlays and the marginal benefits which result from these systems (spending a R1000 to account for R1.00)

8.2.3 Operations and Maintenance Contract Period

The operations and maintenance contract of toll roads is usually let for a period of 3 to 5 years. The process of choosing a operator is not only based on the lowest tendered cost but also on past experience and quality of service. The policy of renewing the contract after a short period leads to uncertainty regarding employment and staff are usually nervous and demotivated as the contract period nears completion. If the contract period was increased to say 10 years (with a clause allowing termination after 3 or 5 years) this would provide longer term employment opportunities for the operator's staff.

8.2.4 Maintenance of the Roadside and Minor Maintenance of the Road

The maintenance of the roadside is normally labour intensive (grass cutting, removing litter, etc.) and should be undertaken by small subcontractors under the main operations contractor. These subcontractors should be selected from the local communities in order to generate employment and the contract could be for the same length of the operations contract . A form

of incentive should be used to ensure that standards are maintained (financial bonus and penalties). Other ideas such as a competition for the best maintained route could also be considered.

The minor maintenance of roads such as repairing potholes, road marking and signs can also be undertaken by local contractors. These contracts could be on an ad hoc basis or over a longer term. The contract could also include a youth training programme.

8.2.5 Classification of Motorcycles

Four classes of vehicles are used to charge toll. Class I is for all light vehicles including motorcycles. This is regarded as being unfair because these vehicles take up very little space on the road and their axle masses are negligible. A fifth class should be defined where motorcycles pay no toll or a much reduced toll.

8.3 Options

The options relating to toll road operations and maintenance are dependant on the decision regarding which institutional structures will be acceptable. If the management of toll roads remain within the SARB / Department of Transport then the options are to:

Option A: Issue open tenders for the operation and maintenance of a toll road for a period of not less than 5 years but preferably up to 10 years. The roadside maintenance and minor repairs can be undertaken as a subcontract to the main operations contract using labour intensive methods. Effective procedures should be employed to ensure that the operating cost is kept to a minimum.

Option B: Negotiate the operations and maintenance contract with the major players in the industry, that is, Intertoll, Tolcon and THDC for a period of at least 10 years. The maintenance of the roadside and minor repairs are let separately under the management of the Department of Transport.

Option C: The SARB / Department of Transport employ their own staff as public servants to operate and maintain the toll road.

8.4 Evaluation of Options

The evaluation criteria for the selection of the most suitable option depends on the minimisation of costs. Experience in South Africa and other similar countries such as Pakistan indicate that the use of the private sector to collect toll and maintain the toll road will result in a more efficient operation. The main reason is that a competitive tender process ensures productivity is maximised otherwise the prospective tenderer will not be awarded the contract. Furthermore the terms of the contract are usually well defined especially with regard to the protection of toll income. Guarantees and other mechanisms can be used to ensure that the state receives the correct amount of toll and fraud is minimal.

A cost comparison between the Department of Transport and the private sector operating a plaza is therefore required in order to evaluate the correct option. This was done in 1983 when the first toll plaza was put to tender. The work study section of the Department of Transport priced the tender document. Their price was third lowest, the two lowest being private sector companies.

8.5 Policy Guidelines

The following guidelines are suggested for dicussion:

8.5.1 The private sector should continue to operate and maintain toll roads.

8.5.2 The selection of the operator should be by open public tender.

8.5.3 The tender period should be lengthened to 10 years.

8.5.4 The roadside maintenance and minor repairs of the toll road should be subcontracted to local small companies in order to create employment and to assist in the training of the youth.

8.6 Conclusions

8.6.1 The operation and maintenance of a toll road is an on going task related to that particular toll road. The advantage of toll financing is that a guaranteed income is available to ensure that the road is adequately maintained over the lifetime of the project.

8.6.2 The private sector appears to be best suited to operate and maintain toll roads. This however should be tested once again by requesting the Department of Transport to submit a tender when the next contract is let to tender.

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CHAPTER 9

TECHNICAL ASPECTS OF TOLL ROADS

9.1 Existing Practice

9.1. The nature and benefits of electronic toll collection technology

Technical issues concerning toll plazas can include numerous aspects related to the planning, design and construction supervision of toll plazas, the planning, design and procurement and installation supervision of toll equipment and the management information system.

The one technical issue which should, however, be considered to be included in a future toll policy is that of non-stop Electronic Toll Collection (ETC) by means of automatic vehicle identification technology.

The high cost of toll collection as well as the relatively low traffic throughput at conventional toll lanes led to the development of electronic toll collection. Benefits of ETC to the toll authority are savings in toll plaza capital and operating cost, while benefits to road users are savings in travel time and fuel. More security of toll income is also obtained as a result of a larger portion of toll income being collected by means of electronic payment.

ETC uses transponder/toll lane telecommunication devices, (Automatic Vehicle Identification, or AVI technology) to increase toll lane throughput by means of non-stop toll transactions. ETC utilises both read-only and read-write AVI systems and uses short-range communications between vehicles and the readers in the toll lanes.

The transaction debiting process can be done centrally (with read-only AVI technology) while read-write AVI enables decentralised transaction debiting, i.e. each transponder keeps its own account. Payment is usually done on a pre-payment basis, although post-payment can also be done.

9.1.2 South African experience to date

Two demonstration projects were implemented in South Africa at existing toll plazas in the past. The first was a field trial undertaken at the Mooi toll plaza on the N3 in 1990 and the second a field trial at Gosforth toll plaza on the N17 in 1992. These field tests were viewed as successful at that time.

After the field trial at the Mooi toll plaza on the N3, the then Minister of Transport appointed an Automatic Vehicle Identification (AVI)/Electronic Toll and Traffic Management (ETTM) Review Committee under the chairmanship of Mr A Jacobs of the National Association of Private Transport Operators.

The Committee conducted a review of AVI/ETTM systems available in South Africa, to consider their suitability against the minimum requirements as determined by the Department of Transport and to take into account the requirements of the users.

Based on certain decisions made by the Review Committee, the South African Roads Board approved at a meeting held on 6 December 1991, that:

- A specification for hardware, software, installation and maintenance be compiled within the framework laid down by the Jacobs Review Committee;

- All possible suppliers of AVI be invited to install their equipment at a toll plaza in order to implement a demonstration project for the technical performance evaluation of such systems within the same toll environment; and

- A contract be compiled for the signature of all relevant parties, in which provision is made for items such as guarantees, insurances and spares required by the different parties and all other contractual items necessary to take care of specific operational aspects.

During 1992 the South African Roads Board requested proposals for the supply, installation, operation and maintenance of AVI and ETTM systems on South African toll roads. A total of 11 proposals from different companies were received which provided an overview of the state of technology which could possibly be implemented in South Africa.

In 1993, the Roads Board awarded a research contract to Tolplan to investigate the long term application of automatic vehicle identification in the transport industry which, of course, includes ETC.

9.1.3 International experience

Internationally, ETC has been implemented successfully at numerous toll plazas. In some cases existing plazas were converted to incorporate ETC (such as the Dallas North Tollway in the USA), while other plazas were fully designed with ETC in mind (such as the Oklahoma Turnpike in the USA).

Table 9.1 provides, as an illustration, a summary of the characteristics of certain ETC projects in the USA. It can be seen that ETC is implemented at toll roads where the daily traffic varies from as low as 3 250 vehicles/day to very high daily traffic flows. The ETC market share also varies considerably in the examples. An indication is also given of the extent to which ETC is used. Mixed ETC lanes (i.e. lanes where both manual and ETC payments are possible) as well as dedicated ETC lanes (i.e. ETC lanes only) are used in various combinations.

Table 9.1 Examples of toll roads in the USA where ETC are used

Project Name	ADT	% Market Share	Lanes	No of Tags Issued
E-470 Public Highway	3 250	43%	4 dedicated ETC 2 mixed ETC	1 460
Lake Pontchartrain Causeway	22 500	60%	6 mixed	11 500
Crescent City Demonstration	60 000	30%	3 dedicated ETC 9 mixed ETC	25 000
Thomas Hatem Bridge - MD	21 382	80%	5 mixed ETC	110 000
Oklahoma Turnpike	100 000	32%	46 automatic 56 dedicated ETC 117 mixed ETC	99 553
Lincoln Tunnel	57 313	3% buses only	12 manual 1 dedicated ETC	55 752
Dallas North Tollway	196 700	25%	4 dedicated ETC 59 mixed ETC	not available
Florida Turnpike	407 000	20%	32 dedicated ETC 213 mixed ETC	92 000
Illinois State Toll Authority	694 366	25%	179 manual 49 automatic 167 mixed ETC	157 000
New Hampshire Turnpikes	195 700	40%	34 manual 13 automatic 31 mixed ETC	55 000

9.2 Issues

° Motivation to implement ETC

The motivation for ETC in general is that it provides savings in:

- capital costs, as the required size of the toll plaza is reduced
- operational costs, as fewer toll collectors are required, and
- user costs, as time costs and vehicle operating costs are reduced.

The above savings should be quantified for a specific plaza by performing an economic and financial evaluation of the potential ETC investment.

° Market share

The market share of ETC is one of the key aspects affecting the economic and financial viability of an ETC project.

As ETC has not yet been implemented in South Africa, no local experience exists to estimate potential market shares. Local ETC market shares can possibly be estimated from the present usage of credit cards at various plazas as well as from experience abroad.

It is expected that ETC market shares will be higher in urban than in rural areas while heavy vehicles are also expected to have a higher ETC market share than light vehicles.

° Determination of existing toll plazas which should be equipped with ETC

Only those plazas at which it will be economically viable should be equipped with ETC. The following key aspects will determine the viability of introducing ETC:

- average daily traffic volume
- ETC market share and toll tariff
- cost of converting existing toll lanes to ETC or to build new ETC lanes
- continuous availability of ETC along a route or within a road system.

° Possible new plazas on existing untolled freeways: reduction in plaza size by means of ETC

Some of the existing freeways in urban areas experience very high traffic flows which would necessitate extremely large toll plazas. As expropriation in urban areas is extremely costly, or even impractical in certain cases, the question arises whether AVI can reduce the plaza size to minimize land required.

° Standardisation of ETC

Standardisation of ETC means that a motorist could use the same AVI tag at any toll plaza. This could, however, lead to an unwanted monopoly in the toll industry by a supplier. At the other end of the scale, the decision to implement an ETC system could be left to market forces which could lead to a variety of ETC systems. A motorist using a toll route could then be forced to use more than one AVI tag.

9.3 Options

° Mode of Operation

To implement ETC, three basic options are possible, namely:

- Mixed AVI lanes : In this mode a normal toll lane is equipped with ETC equipment which means that vehicles with an AVI tag will have to use the same lane as motorists paying with cash or with credit cards.

- Dedicated AVI lanes : In this mode, a normal toll lane is dedicated for AVI use only. This is often the case when an existing manually operated toll lane is converted to ETC. The advantage of this mode over the previous one is that ETC users will experience less delay as vehicles will be able to drive non-stop at relatively low speeds through the plaza.

- Express ETC Lanes : Express toll lanes are specially designed toll lanes where motorists can drive through the plaza at high speeds, up to 100 km/hr. These lanes are usually separated from the conventional toll lanes in order to eliminate the danger of large speed differentials between the express AVI traffic and the plaza traffic. In extreme cases, the AVI traffic is separated from the toll plaza by means of a special bypass and an example is the Oklahoma Turnpike.

Table 9.2 below compares the throughput of different types of toll lane operations. It can be seen that dedicated and express AVI toll lanes have much higher capacities than those of conventional toll lanes.

Table 9.2 Capacities of Different Toll Lane Operations

	Lane Type	Vehicles/hour
1.	Manned (with change making transactions, receipt issuing etc)	200 - 400
2.	Manned (with distributing commuter tickets and such)	500 - 575
3.	Automatic Coin Machines (only coins - no tokens)	450 - 500
4.	Automatic Coin Machines (receiving primarily tokens - few coins)	650 - 1 100
5.	Mixed AVI (includes any of types 1 - 4 as well as AVI in the same lane)	700 - 750
6.	AVI (dedicated AVI lanes in conventional plaza with booms)	800 - 1 200
7.	Express AVI (dedicated AVI lanes in a highway speed pass through)	1 500 - 1 800

The high throughput of ETC lanes results in a possible reduction in plaza size which can reduce capital cost requirements.

To the users, the obvious benefits are savings in travel time. From literature, the following average speeds through different toll plaza lanes were found:

Table 9.3 **Average Vehicle Speeds for Different Toll Lanes**

Lane Type	Speed (km/hr)
Manned	4
Automatic Coin Machine	8
Mixed AVI	11,5
AVI (dedicated)	25
Express AVI	90

Again, it can be seen that dedicated and express AVI toll lanes hold greater potential benefits to road users than other types of toll lanes.

- Cost of different types of ETC toll lanes

Express ETC lanes are the most expensive as this involves specific geometrical requirements to allow high speed passage. Dedicated ETC lanes are less expensive as this involves converting existing manual toll lanes to ETC lanes. This can also involve certain traffic management measures to channel AVI traffic on the approach side of the plaza. Mixed ETC lanes are the least expensive as this mostly involves installation of ETC equipment.

The cost per lane of different ETC systems (mixed, dedicated and express) was determined and is summarized in Table 9.4. The total cost includes AVI equipment and changes to electronic equipment, MIS, traffic signs, civil costs and other costs.

Table 9.4 Cost of ETC per Lane for Different Modes of Operation (1994 Rand, Thousands)

Mode	Electronic Lane Equipment	MIS	Traffic Signs	Civil and other costs	Total
Mixed	90	5	5	115	215
Dedicated	120	5	25	175	305
Express	120	5	55	710	890

° Law Enforcement

For law enforcement, two basic approaches are available, namely:

- to identify a violation in the approach lane to the plaza and to prevent such a vehicle from proceeding through the plaza, by means of a traffic signal and boom system, or

- to identify a violating vehicle while passing through the plaza and by means of image capturing techniques, obtain the vehicle's registration number for prosecution afterwards.

In the South African context, the first option would probably be the best solution as it will prevent expensive prosecution procedures.

° Centralised/Decentralised

A centralised system means that the accounting/debiting as well as the processing are done at the plaza (or any central location). This means that the AVI tag should only be an electronic numberplate with one-way (i.e. read-only) communication. The biggest implication is that considerable strain could be put on the centralised computer system due to the large processing requirements.

In a decentralised system the processing is done within the AVI tag. This means that the tag should be able to communicate in both directions, i.e. a read-write tag. This type of tag will be slightly more expensive than the read-only tag but the obvious advantage is that the system will have increased capabilities with respect to processing. Since virtually all American toll authorities are opting for this system, it is becoming the industry norm.

9.4 Evaluation

9.4.1 Introduction of ETC to existing toll plazas

The potential to implement ETC at existing toll plazas was evaluated on an economic basis. All savings and costs, to whomsoever it might accrue, were quantified and expressed in terms of the economic indices. The role players which were identified were the toll road user and the road authority (which includes the toll operator).

The possible savings offered by ETC to road users are savings in time, fuel and vehicle operating costs. The costs incurred by road users due to ETC are the cost of the AVI tags.

The possible savings offered by ETC to the authority are a reduction in plaza operating cost as well as a possible saving in capital expenditure due to a delay in the need for future plaza expansions.

The following toll plazas were omitted from the analysis because low traffic volumes, often or mostly requiring only one toll collector per traffic direction, limit the potential for operating cost savings by means of ETC:

- the N1 Tsitsikamma Toll Road
- The Oribi mainline and ramp plazas on the N2 South Coast Toll Road
- the Izotsha ramp plazas on the N2 South Coast Toll Road
- the Mtunzini northern ramp plazas on the N2 North Coast Toll Road
- the Quagga and Pelindaba plazas on the N4 Magalies Toll Road
- the Brakpan ramp plazas on the N17 Toll Road.

The Mvoti and Mtunzini mainline plazas on the N2 North Coast Toll Road were also omitted from the analysis because they had not yet been opened to traffic at the time of the evaluation.

In order to determine the cost and potential savings from ETC, various possible ETC system designs were evaluated for possible implementation at South African toll plazas. Each existing plaza (except these mentioned above) was subsequently analysed, using a dedicated and an express type of ETC system.

The following basic assumptions and methodologies were used in determining the economic indices:

- In order to determine time savings, speed profiles were developed for each mode (i.e. dedicated ETC, express ETC and the status quo, i.e. without ETC) of operation and for different vehicle classes.
- Fuel savings were based on acceleration, deceleration and idling fuel consumption rates.
- Cost of AVI tags was taken into account.
- Savings in personnel (i.e. toll attendants) were determined.
- The installation and construction related costs of each system design were quantified, which include electronic lane equipment, MIS lane upgrading, traffic signs and civil works.
- Future needs for plaza expansions were also quantified for each alternative.
- An evaluation period of 8 years, which is the expected lifetime of electronic equipment, was used.
- The following ETC market shares were assumed for use in this evaluation. The percentages were based on that of overseas experience, as well as the local credit card and fleet card market shares.

Table 9.6 Range of Potential ETC Market Shares at South African Toll Plazas

Toll plaza	Predicted percentage market share			
	Low	Below Average	Above Average	High
Urban plazas	15	20	25	30
Rural plazas	5	10	15	20

The internal rate of return (IRR) for implementing ETC was hence determined for each toll plaza. An IRR was determined for express and dedicated ETC systems as well as for four different ETC market shares. A distinction was also made in the IRR when time savings were included as well as when time savings were excluded.

From an evaluation of the results of the economic evaluation to introduce ETC at present toll plazas, the following possible guidelines are proposed for consideration:

- Urban toll roads with an IRR exceeding 15% (using a 20% ETC market share) should be considered for ETC implementation. The following plazas fall into this category:
  - Gosforth plaza
  - Dalpark plaza
  - Mariannhill
  - Tongaat
- Rural toll roads, with an IRR exceeding 15% (using a 15% ETC market share) should be considered for ETC implementation. The following plazas fall into this category:
  - Mooi plaza
  - Huguenot Tunnel
  - Kranskop
  - Vaal
  - Tugela
  - Wilge

9.4.3 Possible sizes and plaza costs on existing untolled freeways

The plazas sizes, with and without ETC, for the identified existing freeway sections to be tolled, were determined. (It was found that certain plazas, should existing freeways be tolled, would require 20 or more toll lanes without ETC). Different ETC market shares were used to determine the possible reduction in number of lanes due to ETC.

Table 9.6 below shows the total number of toll lanes for the identified toll road sections in the Gauteng area with and without ETC. It can be seen that with low ETC market shares, the required number of toll lanes with ETC is actually higher than without ETC. The table also shows that, from approximately a 50% ETC market share, the number of toll lanes required reduces significantly if compared to the case without ETC.

Table 9.6 Existing freeways in the Gauteng metropolitan area: Total number of toll lanes required with different ETC market shares

No. of toll lanes without ETC	ETC market share					
	1%	10%	30%	50%	70%	90%
160	184	171	144	117	95	68
Percentage reduction relative to without ETC	-15%	-7%	10%	27%	41%	58%

A high ETC market share for urban areas in a voluntary usage situation is considered as only 30% in the evaluation performed in section 9.4.1 above. With a 30% ETC market share, it can be concluded that the plaza sizes would not be reduced significantly.

The above table indicates that plaza sizes can only be reduced significantly when AVI tags are made compulsory within a metropolitan area or region such as Gauteng. In other metropolitan areas, such as in the Western Cape, Durban or Port Elizabeth, the number of possible toll plaza locations are too few to warrant the compulsory use of AVI tags for ETC purposes.

It can finally be concluded that plaza sizes can only be successfully reduced by making AVI usage compulsory. Only the Gauteng area would possibly warrant such a step due to the relatively high number of possible existing road sections to be tolled.

9.5 Potential policy guidelines

- In view of the predicted economic viability of the introduction of ETC at many existing South African toll plazas, at reasonably low market shares, ETC should be introduced at these plazas.

- Electronic toll collection should, furthermore, be evaluated as a potential payment method for all new toll projects or when toll equipment replacement or additional toll plaza lanes are being considered.

- Law-enforcement should be based on the principle that violations should be identified before a transaction takes place.

9.6 Conclusion

A recent research project has indicated that the introduction of electronic toll collection will be economically viable at many South African toll plazas and it should, therefore, be implemented at these plazas and considered as a payment method at future toll plazas.

CHAPTER 10

PUBLIC RELATIONS, MARKETING AND PUBLIC INVOLVEMENT

10.1 Introduction

All activities of public interest require that the public should be aware of and involved in the various stages of development of that activity. Activities which utilise and employ public funds, employ public assets or affect the everyday lives of members of the public encompass a right to involvement. The planning, funding, construction and operation of toll-road facilities are no exception to this right and indeed are possibly a serivce which requires that a considerable level of detail should be applied to public involvement. A number of distinctive issues regarding public involvement as it affects the formulation of toll road policy should be addressed.

10.1.1 The Parties Involved

Common terms for members of the public are "Stakeholders" and "Involved and Affected Parties" (I&AP's). In this context the term I&AP will be used as it is considered that it best describes the three major parties involved.

a) Involved parties

Those persons or bodies who provide the good or service to the broad public or who contribute towards the provision of the good or service. The involved parties typically include local authorities, contractors, consultants, operators and maintenance teams. In almost all cases the main interest of the Involved Parties is of a technical or business nature.

b) Affected parties

Those persons or bodies who do not contribute to the provision of the good or service, but who derive benefit from it either at a fee or free of charge. This by and large is the user group. In most instances the intricacies and details of the technical and business issues are not in the direct field of interest of the affected parties.

c) Decision makers

This could be an individual or a group of persons who is ultimately charged with the task of putting ideas into practice. Decisions are made at all stages from inception of basic planning through to construction, implementation and operation. An important aspect is that the decision-makers should be identified, accepted and respected for their role. This acceptance is a crucial element in the result of the public involvement process.

10.1.2 The Role of the I&AP's

In general, public Involvement Programmes (PIP) are initiated for three main reasons:

- To inform I&AP's
- To derive input from I&AP's
- To provide input to the decision-making process such that decisions reflect the input from the I&AP's.

The public (I&AP's) must be capable of influencing the decision - even to the point of suggesting major modification to the thoughts that have been put forward or to cancel/delay the activity altogether.

10.1.3 The Relationship Between Public Involvement and Other Disciplines

Public Involvement includes disciplines such as Public Relations (PR), Marketing, Advertising, Media Relations and Market Research. Public Involvement practitioners use these techniques and most often employ specialists in these fields in order to provide a full public involvement service.

It is important to note that Public Involvement includes aspects of these disciplines, but that none of these disciplines in isolation is Public Involvement.

10.1.4 Toll Roads and Public Involvement

In any exercise to determine the scope of public involvement as it should be applied to toll roads, it should be noted that toll roads are infrastructural investments with a long-term, commercial good with a cost and a benefit. Toll roads are not a consumable product or a public facility which might be seen as the right to be received at no direct cost.

10.2 Existing Practices

10.2.1 Local Experience

The current legislation calls for a policy of "Advertise the intended action and allow a certain time for comment". This is considered to be not only reactive to any given situation, but is also a responsive PR exercise. The facts are given to I&AP's as a fait accompli and no provision is made for input which can assist the decision-maker.

10.2.2 International Experience

The concept of Project Partnerships has resulted in well defined and comprehensive public involvement programmes being undertaken within almost all programmes which have a public interest. Public Involvement is extended beyond the planning and implementation stages and includes for continued information dissemination and retrieval throughout the life of the good or service. Not only is the concept of public ownership important where

it applies, but the concept of user-driven marketing and hence involvement comes into the issues. Developed countries have well advanced public involvement programmes of this nature.

10.3 **Issues**

In drawing a distinction for public involvement the following issues should be noted:

10.3.1 A Public Involvement Programme (PIP) is not marketing or PR

10.3.2 A PIP is aimea at providing meaningful input to decision making:

- The decision maker/s retain their autonomy
- The decision is influenced by public input
- The PIP can modify, change or stop the plan
- There is some up-front basic or sketch planning. Thereafter, planning and PIP run in parallel
- Often certain mile-stones have to be reached before the plan is exposed.

10.3.3 Any member of the public can be a stakeholder - even if he does not live or work in the vicinity and is not affected by the toll road.

10.3.4 PIP is important at all stages - planning, construction and operating.

10.3.5 All aspects of PIP must be transparent including the Programme itself.

10.3.6 Information and education are important aspects as the I&AP's must be informed of:

- Their rights, participation and activities in the PIP
- The extent to which the I&AP's can influence decisions
- All aspects of the good or service which is the subject of the PIP.

10.3.7 PI can be used as a promotional tool, provided the promotion is transparent and honest, but promotion is not PI.

10.3.8 PI is not public relations, marketing, selling or advertising. It is also not an information service.

10.3.9 It is wrong to think that acceptance will be gained by PI. The public (I&AP's) will inform the decision-makers that a good or service is acceptable in a certain form only if it is acceptable, not as the result of a promotional "public involvement" exercise.

10.3.10 The educative process in PI is not top down but involves all I&AP's, including decision-makers.

10.3.11 The concept of "planning partnerships" must be addressed for meaningful PIP to take place.

10.3.12 All PI Programmes are different and must be aligned to the product, the I&AP's, the locality and the circumstances.

10.3.13 It is advisable that PI facilitators should not be involved parties and should be visibly independent of any vested interest.

10.3.14 PI facilitators provide a more suitable service because they are independent of the process and can focus on the objectives of the PI programme without being prejudiced by the objectives of the project.

These issues focus on the public involvement aspects. Issues concerning toll roads such as the funding mechanisms and user-pays principles are discussed in other sections of this document.

10.4 Options

Given that the policy statements might point towards some contentious thoughts, the following will probably fit well with the approach:

Option 1

° Continue with the reactive public relations and marketing strategy employed by the Department of Transport through the Toll Road Publicity Committee.

Option 2

° Define the concept of Public Invovlement Programmes (PIP) on a national level, regional level and local level.

Option 3

° Implement a more proactive public relations and marketing exercise within the Department with some public involvement as required.

In all instances a strong media strategy is important. This is the overlap with PR and Marketing and it illustrates the need for the integration of all skills. The concepts contained in the subject cannot be taken to the general public at national and regional levels so the I&AP's work will be of a committee nature with the media strategy following closely so as to inform the "electorate" that their representatives are "sticking to the rules".

An important component is the Reconstruction & Development Programme. Even at national level, where the focus is on policy and principles, the question should remain "How will this issue satisfy RDP principles?"

10.5 Evaluation of Options

A recommendation as to which of the three options would best suit the objectives of the new toll road policy cannot be made at this time. The most comprehensive of the three options is the PIP strategy which would involve both options 1 and 3. A description of the second option is therefore given below in order to give the policy makers ideas for discussion.

10.5.1 National Level

The issues are policies and philosophy. Examples are funding - through tolls, taxes or fuel levy - dedicated use of funds, public or private ownership, levels of maintenance, affordability, macro economics, alternative modes of travel, etc.

The approach is high level and informed. Therefore the education aspect through public involvement is more prevalent while the media PR and marketing campaign will provide basic facts.

The public involvement methods are aimed at Standing Committees and other elected or representative bodies. Public hearings could be used. Televised debates would be the most powerful medium. In all instances the committee system must allow for the public to influence the committee participants who in turn influence the decision-maker/s. CODESA was a good example of this application.

This is a costly and time-consuming exercise and cognisance must be taken of the time and money costs.

All members of the public are participants at this level.

10.5.2 Regional Level

The distinction between national and regional PIP is not always clear.

The issues relate to, say, the network of toll-roads. Issues become more regionally specific, but they do retain an element of national concern. Whilst all I&AP's will comment, whether they live or work in the vicinity or not, there will be a focus on specifics relating to certain geographic areas.

The PIP methods would be more aligned to local and regional authorities, but it would still not be site-specific. Public hearings would be used with delegates representing the public interest, that is, public involvement is important.

Public meetings would be avoided as they do not allow for clear input from the man in the street. Vocal people tend to dominate.

Public knowledge of the proceedings is by means of the media. The outcome and decision-makers' task is made available to all in a readily accessible way.

In this and the local level, the facilitator's task is to bring the Involved parties and the Affected parties together in such a way that the outcome can make a constructive and transparent contribution to the decision. The difficulty of translating the technical issues of the Involved parties to be absorbed and utilised by the Affected parties is the skill required of the facilitator.

10.5.3 Local Level

This level addresses issues that affect the individual and his property or lifestyle. Workshops and interest-group meetings are the most successful. I&AP's must be carefully identified and the methods used must allow for the fullest possible participation whilst taking account of the costs (time and cash) as well as the objectives of decision-making. The man in the street is a more active participant on a personal basis, but the public meeting method must only be used for educative and presentation purposes. Media, posters, leaflets, newsletters and other means would be used to disseminate information.

Presentation skills and the facilitation skills are more important here as the wider interests of the public will be addressed. The technical/non-technical interface is also important.

10.6 Guidelines

It is not possible to provide a step-by-step approach to public involvement, because no two projects or programmes are ever identical. The PIP practitioner's skill lies in the ability to assess the project requirements and the demands in terms of the techniques that will be used and to then have the ability to facilitate between individuals and groups and to the benefit of the objectives of the programme. A number of essential components are, however, readily identifiable:

a) Determine the objectives and the definitions of the PIP:

- information is given outwards in an educative programme
- information is retrieved from the I&AP's
- the information thus retrieved is utilised to assist the decision makers to arrive at a more informed and acceptable decision

b) Identify the decision makers and arrive at an acceptable level of consensus regarding their appointment.

c) Identify the I&AP's in the involved and affected groups.

d) Determine the techniques that will be utilised at the levels of involvement. Typically these levels are national, regional and local.

e) Ensure that the methods that are utilised are able to draw the involved (technical) and affected (user) groups together and that there is constructive interaction between them within the scope of the programme objectives.

f) Ensure that the objective of providing input to the decision makers is attained.

g) Under no circumstances should the PIP be allowed to become a PR exercise or for the objectives to be compromised. All parties must be committed to full and open public involvement.

10.6 Conclusion

Public involvement is an important component in any project in which the public is affected, particularly if the project involves public funds or the payment of money for goods or services. The legal requirements for PIP to be part of the planning process must also be acknowledged. The objectives of a PIP, as opposed to other forms of community interaction such as public relations, cannot be compromised. All involved and affected parties must be educated to the process and must develop a full and lasting commitment to it. There is no getting away from the fact that decision makers are more and more often going to have to accept that decisions cannot be made without the input of the public and a transparent decision making process that is open to all interested parties.

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PART V - CONCLUSIONS AND RECOMMENDATIONS

CHAPTER 11

CONCLUSIONS

CHAPTER 12

RECOMMENDATIONS

CHAPTER 11

CONCLUSIONS

The conclusions summarised from each of the chapters are given below:

11.1 Strategic options in respect of the role of toll financing

It is concluded that:

° expanding the role of toll financing to include the tolling of existing freeways and even of rebuilt/rehabilitated non-freeway primary roads has the potential to contribute significantly (R8-10 billion) to the goal of preserving and expanding the national road network.

° such expansion of the role of toll financing will support the following goals of the Reconstruction and Development Programme;

- the gradual reduction of the fiscal deficit
- the increase of the proportion of capital expenditure in government spending
- the development of the human resources of the country.

° pushing the role of toll financing beyond the funding of new freeways to the tolling of existing freeways and non-freeway primary roads will require the political insight not to violate the perceptions of especially local road users regarding equitability and the basic right to toll-free access to a national or provincial standard road. This will require that such concerns be addressed, not after the local road user threaten to break down the toll plaza, but from the very inception of the project.

It will also require the insight to recognise that what may seem like an unnecessary income loss in respect of local or other concessions may, in fact, be unlocking the significant financial potential of the project as a toll project by making the project politically possible.

11.2 **Economic and financial feasibility and funding policy**

a) The present economic viability criteria can be enhanced to include an evaluation of the economic efficiency of the earlier implementation of a toll project versus the later implementation of a tax-financed project.

b) The financial safety factor presently applied in financial viability analysis should be changed to prevent it from being a disincentive for tariff increases.

11.3 **Institutional framework**

a) Overseas experience indicates that both the private and public sector have a role to play in the development of toll roads.

b) The precise institutional structure is not clear at this stage although there appears to be a tendency toward a public sector organisation.

c) The involvement of the private sector on a concession basis should take the risk and reward equation into account before committing the state to a long term relationship

11.4 **Legal framework**

The major restriction of the existing National Roads Act is that it does not allow for the private sector to develop toll roads. An amendment should be drafted in order to allow for this, but also taking care to regulate the industry.

A review of the legal framework required to enforce toll road policy should be carried out once the proposed policy direction has been determined.

11.5 Operations and maintenance of toll roads

a) The operation and maintenance of a toll road is an on going task related to that particular toll road. The advantage of toll financing is that a guaranteed income is available to ensure that the road is adequately maintained over the lifetime of the project.

b) The private sector appears to be best suited to operate and maintain toll roads. This however should be tested once again by requesting the Department of Transport to submit a tender when the next contract is let to tender.

11.6 Technical aspects of toll roads

A recent research project has indicated that the introduction of electronic toll collection will be economically viable at many South African toll plazas and it should, therefore, be implemented at these plazas and considered as a payment method at future toll plazas.

11.7 Public relations, marketing and public involvement

Public involvement is an important component in any project in which the public is affected, particularly if the project involves public funds or the payment of money for goods or services. The legal requirements for PIP to be part of the planning process must also be acknowledged. The objectives of a PIP, as opposed to other forms of community interaction such as public relations, cannot be compromised. All involved and affected parties must be educated to the process and must develop a full and lasting commitment to it. There is no getting away from the fact that decision makers are more and more often going to have to accept that decisions cannot be made without the input of the public and a transparent decision making process that is open to all interested parties.