DEPARTMENT OF TRANSPORT
Directorate of Land Transport

PRINCIPLES AND POLICIES FOR POSSIBLE TOLL FINANCING OF ROADS IN SOUTH AFRICA

SEPTEMBER 1981

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EXECUTIVE SUMMARY

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PREFACE

This executive summary is based on a document prepared under the direction of the Toll Road Investigations Co-ordinating Committee, under the chairmanship of the Department of Transport. The committee was established in 1980 to co-ordinate the various investigations into the feasibility of toll financing of road projects in the Republic of South Africa. The committee consisted of representatives from the following organisations:

The Department of Transport
The Transvaal Provincial Administration
The Department of Finance
Metroplan (A planning group within the Land Transport Directorate of the Department of Transport)
Bruinette Kruger Stoffberg Incorporated
Keeve Steyn and Partners Incorporated
Compagnie Générale d'Automatisme
National Institute for Transport and Road Research
Institute of Foreign and Comparative Law
Van Niekerk Kleyn and Edwards Incorporated

Advice and input was also provided by Professor A.E. Scheurkogel of the University of Stellenbosch.

The main report on the principles and policies for the possible toll financing of roads in South Africa should be read in conjunction with the following two reports on the feasibility of introducing toll collection on specific projects.

1. Keeve Steyn and Partners Incorporated and Compagnie Générale d'Automatisme. Feasibility of Toll Road Facilities for Du Toitskloof Tunnel N1/1, Major Bridges on N2/8&9, Frere-Warden N3/5&6. Report prepared for the National Transport Commission. September 1981.

2. Bruinette Kruger Stoffberg Incorporated. Feasibility Study : Proposed Gold Reef Toll Road. Report prepared for the Transvaal Provincial Administration, October 1981.

The executive summary is also available in Afrikaans.

1. INTRODUCTION

The purpose of the study was to investigate the principles and policies relevant to toll financing of roads and to make recommendations regarding aspects concerning the possible implementation of toll financing of roads in South Africa. It was not the purpose of the investigation to make a comparison between different sources of revenue which may be used to fund roads. Presently, such studies are being carried out by the National Institute for Transport and Road Research of the CSIR and by the Department of Transport.

Toll financing of roads usually consists of the collection of money from drivers at specific points on the road and using this revenue to defray costs associated with the road. These costs may include financing costs and construction costs as well as maintenance, operation and administration costs. Toll collection may also be imposed in order to generate revenue which may be used for other purposes. Furthermore, it may also be imposed for the purpose of direct pricing or charging for the use of the road.

The concept of charging tolls for the passage over property, is nothing new.(1) In fact it is almost as old as civilization itself. The Assyrians are known to have constructed one of the earliest toll roads from Syria to Babylon. In Britain, toll concepts date back to the year 1189, when payment for passage through the gates of a city wall was decreed. Currently toll roads exist in several European countries, in North America and in a number of countries in the Far East. Toll facilities are also part of South African history. In the nineteenth century toll gates were established in various

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(1) History adapted from "The Economics of Toll Facilities" by C. de J. Crafford, Technical Report RT/48/80, NITRR, CSIR, December, 1980

parts of Southern Africa. In the Cape Province, tolls on roads were introduced by the Governor of the Cape Colony as early as 1817 to raise funds for road repairs. Toll gates were erected at several locations of which a very well-known one was at Sir Lowry's Pass. In Natal a toll gate was in use at the top of Berea Road in Durban from 1886 to 1900. The money collected was spent on the construction and maintenance of Berea Road. In 1872 the first toll gates were erected in the Orange Free State after the promulgation of a law in 1871 whereby magistrates, field-cornets and members of the Volksraad were instructed to take the responsibility in their respective districts for investigating and approving applications of funds for new roads.

In this investigation of toll financing of roads, the following aspects were considered:

- Economic Aspects
- Financial Aspects
- Administrative Aspects
- Legal Aspects
- Social and Political Aspects
- Operational Aspects
- Engineering Aspects
- Technological Aspects
- Research and Monitoring Aspects.

2. GENERAL CONCLUSION AND RECOMMENDATION

Toll financing of certain freeways presents a viable source

of revenue under current government economic policies and there will not be any technical problems with toll collection which could not be overcome. It is therefore recommended that should the decision be taken to consider the implementation of toll charging on certain roads, this investigation be continued, with a view towards establishing the form of an appropriate toll authority within the broad outlines of the preliminary study.

3. MAJOR FINDINGS

3.1 Economic Aspects

Alternative methods of toll financing of roads were discussed and placed in the general context of the overall financing of transportation infrastructure. The trend in government economic policy was discussed and the extent to which toll collection complies with this policy was investigated. A discussion on the characteristics of toll financing of roads was also presented. The major findings are:

(a) Economic, social and political considerations limit the level of expenditure on transportation infrastructure which includes the expenditure on roads. There is also a limit on the overall level of taxation and extent of user charging which may be used to finance government services. It is a keystone of current South African economic policy to curb government spending and stimulate the private sector. In view of this policy and the increased demand for government funds for defence and the provision of social and other services to the less privileged sections of the population, it is reasonable to expect that the share of funds for roads will decrease at a faster rate than the share for government spending, unless other sources of revenue are found for investment in roads.

(b) It is also the policy of the government to promote self-financing of government activities and user charging. Toll financing of roads is in line with this policy. A characteristic of user charging is that the level of expenditure is determined by the income (or willingness to pay). By subjecting the level of income to the market mechanism in this manner, a higher level of expenditure than before may be effected, but the market may conversely indicate that a lower level of expenditure is required. It should be pointed out however, that toll financing is only regarded as a feasible method of funding high standard facilities or high cost facilities such as freeways, bridges and tunnels, but should also be compared with other methods of funding. Furthermore, it must be emphasized that toll financing does not present an overall solution to the financing of roads. Lower type facilities have to be funded by other means and may therefore be considered as an additional source of revenue. If toll financing were to be implemented, care should be taken not to neglect the overall road system.

(c) Tolls as a general or sole source of revenue for the funding of all roads are not recommended because of the high cost of collection as opposed to the costs of collection of other general sources of revenue. If tolls are used in combination with loans, they offer an advantage since tolls are a visible form of income directly tied to the facility for which the loan was obtained. The management of a toll facility and method of raising revenue can therefore be easily evaluated by investors if loan repayment difficulties were to arise.

(d) It is concluded that loan financing of roads will normally be advantageous since benefits can be provided at an earlier stage and part of the burden of providing the service can be shifted to future users. It should be kept in mind however, that there are financing costs involved.

(e) Under existing legislation general government agencies cannot directly negotiate loans (with the exception of local authorities). It was found that a public corporation (e.g. Escom) or a government enterprise (e.g. South African Railways and Harbours) can obtain loans and appear to be the most advantageous types of administration for the administration of a toll system under current economic policies and legislation.

(f) It was estimated that loan funds to the amount of R300 million may be available for investment in roads by 1985/6. This would represent a substantial increase in funds available for investment in roads.

3.2 Financial Aspects

The effect of market and revenue and cost constraints on the financial feasibility of a toll road were analysed. The market constraints include the availability of funds, loan periods and interest rates and the rate of inflation. The revenue is a function of what the users are willing to pay for the use of the toll facility while the cost elements consist

of construction cost or loan repayment and interest charges, maintenance and operational costs which include administrative and toll collection costs. The major findings are:

(a) As a result of increasing interest rates and decreasing loan periods, the conditions for toll financing of roads have become less favourable than during the time when most North American toll roads were established. The result is that, based on overseas experience, toll roads, although financially feasible in the long term, may experience short term deficits. A favourable method to overcome this problem is to cross-subsidise between established (or existing) toll roads and new toll roads. It should be pointed out that cross-subsidisation between roads does occur in South Africa under the present financing system.

(b) If the responsibility for the provision of all freeways were to be allocated to or co-ordinated through a central toll administration, only those freeways which are financially feasible would be constructed. Also, better programming of investment in other roads would be achieved, since the funding of freeway construction can cause major disruptions in the road financing programmes of lower road authorities. Care should be taken, however, not to jeopardize the funding of lower order roads.

3.3 Administrative Aspects

A discussion on various administrative functions was presented

and the advantages and disadvantages of various forms of administration investigated. The forms of administration considered were : a general government agency, a government enterprise, a public corporation and a franchised private company with or without government aid.

It was found that short term considerations e.g. initial operation of a toll road, favour an administration with the freedom of action of the private sector and with experience in the operation of a toll road. Long term considerations related to co-ordination of investment in roads, favour more government involvement. Taking into account financial considerations and considering long term interests to be the more important, it was found that a public corporation or government enterprise would probably be the most likely candidates for the administration of a toll system.

3.4 Legal Aspects

A preliminary investigation into the legal implications of toll collection on roads in South Africa and the powers of the different levels of government to legislate on this matter, was carried out. Legal aspects regarding selected forms of administration were also investigated.

Indications are that tolls cannot be levied under existing legislation, but no serious legal obstacles exist which would prevent a change of legislation in order to collect tolls.

Depending on the type of administration selected and the financial structure of a toll administration, substantial changes in legislation may be necessary.

3.5 Social and Political Aspects

The possible resistance to toll collection on roads and the possible method of informed assessment of public feeling were discussed. The importance of public communication after a possible decision to collect tolls, was also explored. The major findings are:

(a) Political opposition to toll collection may be decreased if toll collection were to be implemented throughout South Africa. Geographical discrimination as well as discrimination against certain population groups will therefore be largely avoided. Since account can be kept on a toll road of the vehicle-kilometres of travel, an assessment could be made of fuel tax paid by the toll road users and this fuel tax repaid to the toll authorities. In this manner, double taxation may be avoided.

(b) Public communication will be important if toll roads were to be implemented. A possible approach may be to initially assess public feeling by communicating with and informing public leaders and other major interested parties and organisations and then proceed, if necessary, with more comprehensive public communication programs.

3.6 Operational Aspects

The operational aspects of a toll road were assessed. It

was found that there are advantages and disadvantages to both open and closed systems of toll collection and the suitability of a particular system should be assessed under local conditions. The same applies to the design of interchanges.

3.7 Engineering Aspects

The standards and engineering features of a toll facility were analysed and it was found that the design and maintenance standards of a toll road are usually very high, especially if the road has to compete with an alternative route. Several aspects of the design e.g. rest and service areas, have to be approached with the objective of selling the service.

3.8 Technological Aspects

Elements of a toll collection system were discussed and an assessment was made regarding the technological problems which may be experienced if toll collection on roads were to be introduced in South Africa. It was found that :

(a) No serious technological problems should be experienced in the construction and operation of a toll road. Only a relatively small portion of the equipment needs to be imported based on the availability of technology in South Africa. It may be cheaper, however to import. It is recommended that non-patented technology be employed wherever possible, should import problems arise

(b) Traffic control and vehicle weight control may be integrated with toll collection and these advantages may to some extent offset the cost of toll collection.

3.9 Research and Monitoring Aspects

Toll collection on roads in South Africa would be a new

concept and the desirability of monitoring new toll projects was discussed. The information obtained would enhance prior assessment of the feasibility of possible future toll roads.

4. FEASIBILITY STUDIES AND CONSIDERATIONS FOR THE ESTABLISHMENT OF A TOLL AUTHORITY

It has already been stated that toll financing of freeways presents a viable source of revenue under current government economic policies. It is suggested that initially the establishment of a toll authority be considered with one or more pilot projects, which may be selected from the projects for which feasibility studies have been conducted. These are:

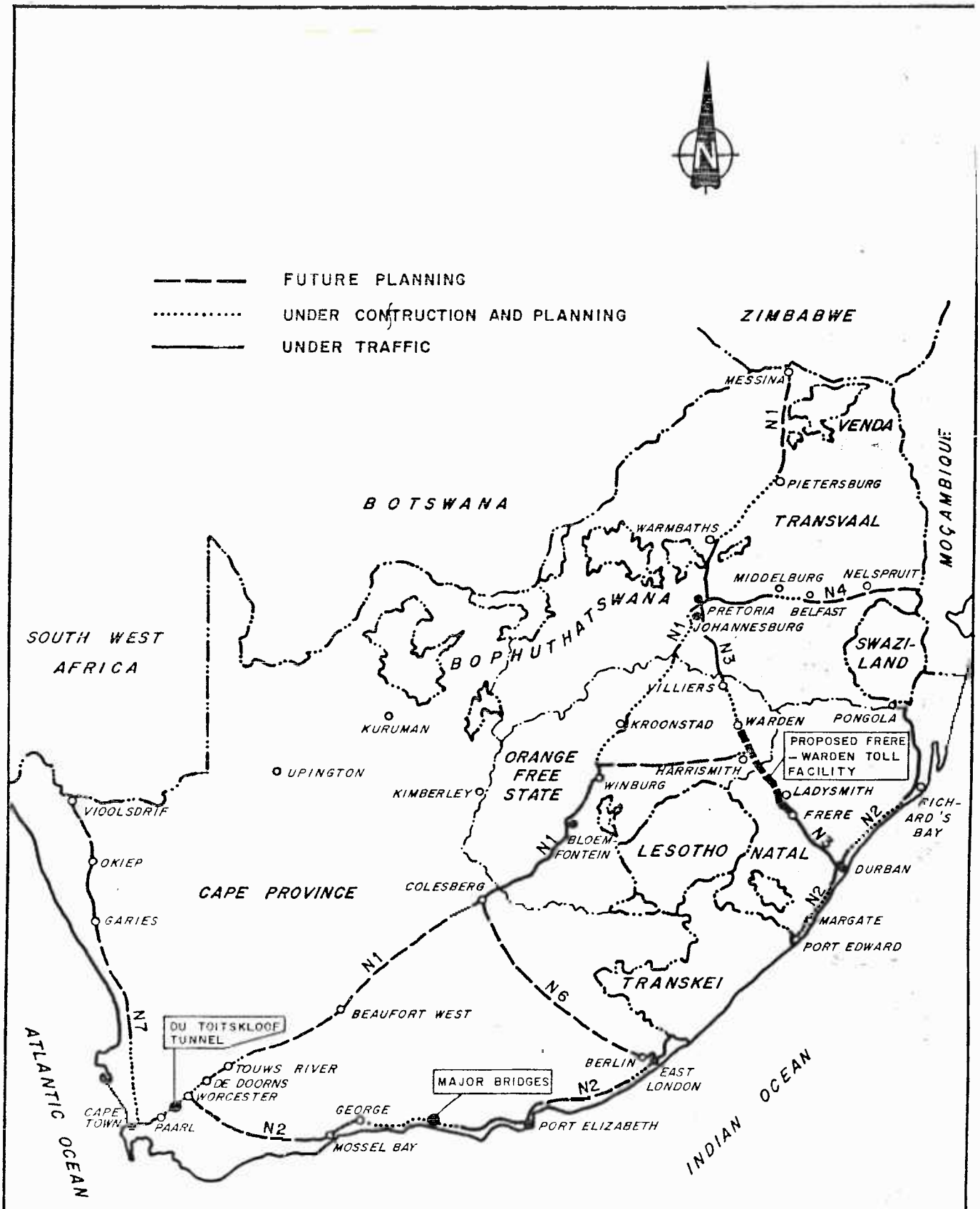
(a) Three National Road Projects (see figure 1 for locations):

(i) The Du Toitskloof Tunnel on Route N1 between Cape Town and Worcester.

(ii) Three major bridges on the Garden Route (Route N2) over the Bloukrans River, Groot River and Bobbejaans River.

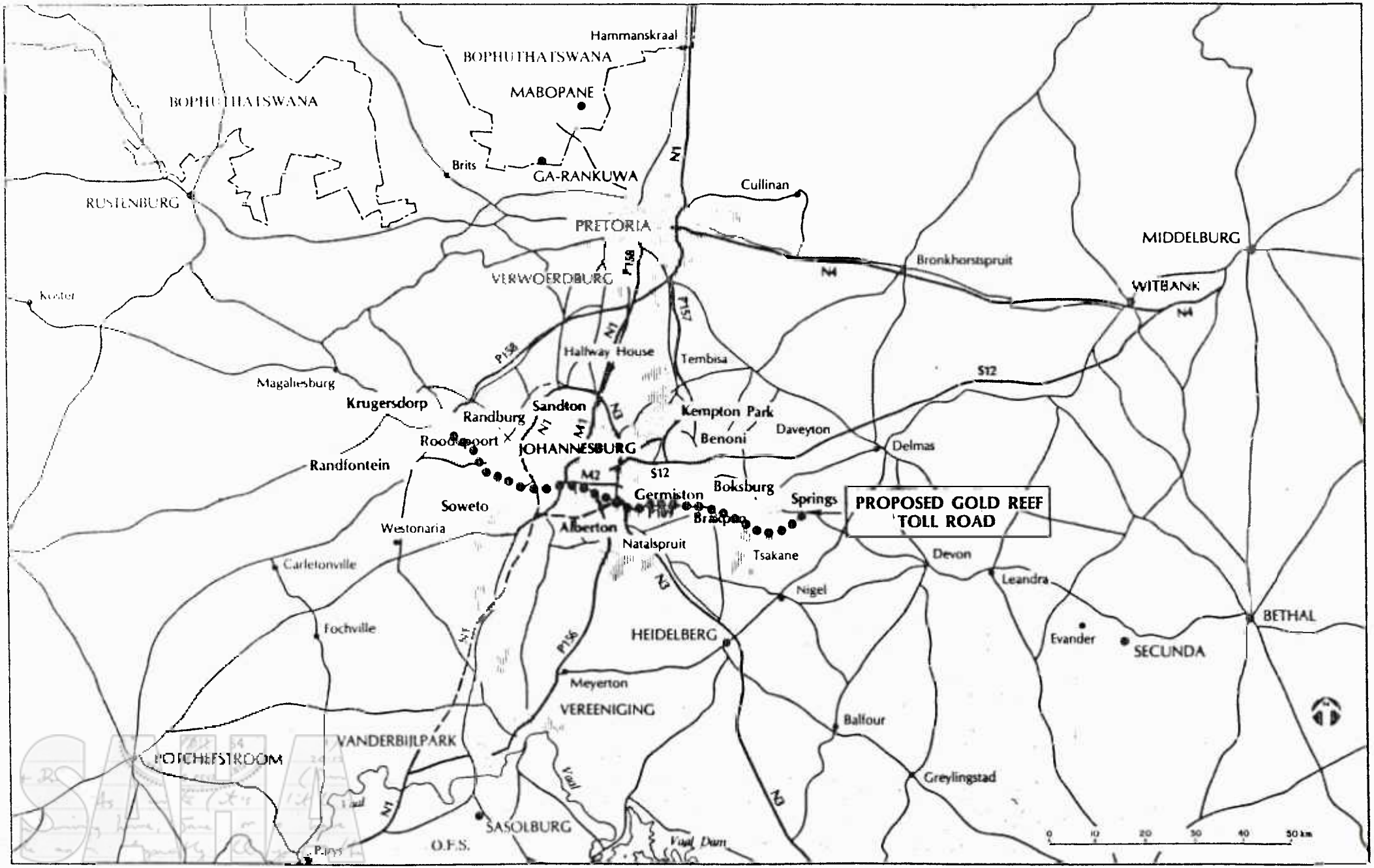
(iii) The proposed road between Warden and Frere on Route N3. It is, however, not recommended at this stage that this project should form part of the list of pilot projects, since the proposed development axis in the National Physical Development Plan lies on the route through Ladysmith and Newcastle.

(b) The proposed Gold Reef Toll Road, between Krugersdorp and Springs on the route PWV 12A-M4 - P109/1 (see figure 2 for the location of the road).



LOCATION OF PROPOSED TOLL FACILITIES — DU TOITSKLOOF TUNNEL, MAJOR BRIDGES ON THE GARDEN ROUTE, FRERE-WARDEN ON ROUTE N3.

FIG. 1



LOCATION OF PROPOSED GOLD REEF TOLL ROAD

FIG. 2

Highlights of the findings of the feasibility studies are presented in the following paragraphs. For more details reference should be made to the relevant feasibility reports.

4.1 The National Roads Projects

(a) The Du Toitskloof Tunnel

The purpose of this tunnel is to reduce the distance (by 11 kilometres) and steep grades now encountered on the Du Toitskloof Pass. The expected traffic volume by 1986 (the earliest possible opening date of the project) is expected to amount to an average of 6 000 vehicles per day of which 20 percent can be classified as heavy vehicles. The traffic volume is expected to grow at 6 percent per annum. At a toll rate of R1-00 per car; R1-50 for a car and trailer; R5-00 for a heavy truck or bus and R10-00 for any heavy vehicle with three or more axles, 80 percent of all light vehicles and 95 percent of all heavy vehicles are expected to use the tunnel.

The expected cost of the project (both tunnel and road) is R119 million (in 1981 rands) and the toll-related capital cost is estimated at R1,2 million for the single toll plaza required. Toll collection costs are estimated to be R393 000 per year and maintenance costs at R550 000 per year. All costs are escalated at 9,2 percent. Interest on a 20-year loan is taken at 12 percent.

With toll rates escalated at the rate of inflation, the financial analysis indicates that the project will finance itself.

(b) The Bridges on the Garden Route

These bridges are designed to bypass the Groot River and Bloukrans passes saving 15 kilometres in distance and the passage of two steep passes. The expected average daily traffic by 1985 is 2 600 per day with 9 percent heavy vehicles. Traffic is expected to grow at 4 percent per annum. At a toll rate of R1-50 per car, R2-00 for a car and trailer, R7-50 for a truck or bus and R15-00 for heavy vehicles with three or more axles, 70 percent of light vehicles and 95 percent of heavy vehicles are expected to use the toll facility.

The construction cost of the bridges and road is estimated at R52 million (in 1981 rands) and the cost of the single toll plaza and other toll-related capital cost at R600 000. Toll collection costs are estimated at R217 000 per year and maintenance costs at R290 000 per year. All costs are escalated at 9,2 percent. Interest charges on a 20-year loan are taken at 12 percent.

With toll rates escalated at the rate of inflation, indications are that the project will not be self-financing unless traffic grows at a higher rate, i.e. 6 percent or toll rates are increased by 33 percent.

(c) Warden-Frere

This road will effect a saving of 35 kilometers in distance over the existing road via Ladysmith. For analysis purposes this section of road was considered in two stages:

Stage (i) Frere - Keeversfontein.
Stage (ii) Keeversfontein - Warden.

Stage (i)

By 1987 the average daily traffic is expected to amount to 6 200 vehicles per day including 26 percent heavy vehicles. The traffic growth is projected at 6 percent per year. At toll rates of R1-50 per car, R2-00 for a car and trailer, R5-00 for heavy trucks and buses and R10-00 for heavy vehicles with 3 or more axles, 60 percent of all light vehicles and 70 percent of the heavy vehicles are expected to use the road.

The construction cost of the section scheduled for opening in 1987 is estimated at R60 million (in 1981 rands) and toll-related capital costs for the single toll plaza at R1,3 million. Toll collection costs are estimated at R405 000 per year and maintenance costs at R750 000 per year. All costs were escalated at 9,2 percent and the interest rate on a 20-year loan was taken at 12 percent.

Indications are that the project will be self-financing, using toll rates escalated at the rate of inflation.

Stage (ii)

By 1990 the average daily traffic is expected to amount to 6 600 vehicles per day of which 26 percent can be considered as heavy vehicles. Traffic growth is projected at 6 percent per annum. At toll rates of R2-00 per car, R2-50 for a car and trailer, R5-00 for heavy trucks and buses and R10-00 for heavy vehicles with more than

3 axles, 60 percent of all light vehicles and 70 percent of heavy vehicles are expected to use the road.

The construction cost of stage (ii) scheduled for opening in 1990 is expected to be R110 million (in 1981 rands) and toll-related capital costs at R600 000 (for enlargement of the toll plaza). Additional toll collection costs are small and maintenance costs are estimated to be R556 000 per annum. All costs were escalated at 9,2 percent and the interest rate on a 20-year loan was taken at 12 percent.

With toll rates escalated at the rate of inflation, the project will require a short extension of one year in order to pay for itself.

It is recommended however that this project should not be considered as a pilot project, since the proposed development axis in the National Physical Development Plan lies on the route through Ladysmith and Newcastle.

Several alternative layouts were investigated for all the projects and sensitivity analyses performed for the different variables.

4.2 The Proposed Gold Reef Toll Road

This road is a vital element of the road system in the east - west Witwatersrand corridor between Krugersdorp and Springs. Main Reef Road, the most important existing arterial in the corridor, and its parallel arterials are at present heavily congested and large operating and time costs are incurred by motorists and commercial traffic. Current traffic volumes in the corridor range between 40 000 vehicles per day near Krugersdorp and Springs to approximately 120 000 in the central section. Approximately 13,6 percent of the average daily traffic volume in the corridor is classified as heavy vehicles.

It is expected that during the first year of possible operation (1986) toll road mainline volumes are expected to range from approximately 5 000 vehicles per day at the ends to approximately 40 000 near the centre of the route. By the year 2 000, these daily volumes are expected to have grown to about 50 000 and 70 000 respectively. The average trip length of potential toll road users is about 20 km of which 13 km is expected to be on the toll road at a 1981 toll rate of 1,6 cents per axle per kilometre.

Various alternative toll collection schemes and road layout schemes were investigated. Total construction cost for the most feasible alternative is estimated at R203 million (1981 rands), excluding R52 million already incurred in construction cost. The toll-related capital cost is estimated at R5,8 million (1981 rands) while toll collection costs are expected to be R2 million in the first year of operation and maintenance costs R0,3 million per year in the first year. Construction costs are estimated to escalate at a rate of 20 percent [illegible] the end of 1985 and 11 percent from that time onwards. [illegible] increase in other costs are estimated to be 15 [illegible]

[illegible] loans at 11 percent and short term investments at 9 percent.

The result of the financial analysis, taking capital and yearly costs and revenue into account (toll rates are escalated at the rate of inflation), indicates that the toll road will be feasible in the long term, but will require short term financing.

4.3 Conclusion

From the feasibility studies discussed above, it may be concluded that at least one of the projects considered, i.e. the Gold Reef Toll Road, will definitely be financially feasible within the existing economic constraints. The Du Toitskloof Tunnel and the section of road between Keeversfontein and Frere may also be considered feasible, although the feasibility of these projects is more sensitive to the toll rate increases and traffic growth. The feasibility of the other projects is dependent upon the acceptance of higher toll rates and higher traffic growths. It should be kept in mind, however, that the economic lifetimes of especially the bridges and the tunnel are considerably longer than the 20 years of loan period considered. If a financing method could be found whereby the repayment period may be extended (by rolling over the loans), these projects may become feasible.

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1. INTRODUCTION

The purpose of this document is to discuss the principles and policies relevant to toll financing of roads and to make recommendations regarding aspects concerning the possible implementation of toll financing of roads in South Africa. It should be pointed out that it is not the purpose of this investigation to make a comparison between different sources of revenue which may be used to fund roads. Presently, such studies are being conducted by the National Institute for Transport and Road Research of the CSIR and by the Department of Transport.

Toll financing of roads usually consists of the collection of money from drivers at specific points on the road and using this revenue to defray costs associated with the road. These costs may include financing costs, construction costs, maintenance, operation and administration costs. Toll collection may also be imposed in order to generate revenue which may be used for other purposes. Furthermore, tolls may also be imposed for the purpose of direct pricing or charging for the use of the road. These objectives will be further discussed in the body of the report.

The concept of charging tolls for the passage over property is nothing new, in fact it is almost as old as civilization itself.[1] The Assyrians are known to have constructed one of the earliest toll roads from Syria to Babylon. In Britain, toll concepts date back to the year 1189, when payment for passage through the gates of a city wall was decreed. Currently toll roads exist in several European countries, in North America and in a number of countries in the Far East. Toll facilities are also part of South African history. In the nineteenth century toll gates were established in various

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parts of Southern Africa. In the Cape Province, tolls on roads were introduced by the Governor of the Cape Colony as early as 1812 to raise funds for road repairs. Toll gates were erected at several locations of which a very well-known one was at Sir Lowry's Pass. In Natal a toll gate was in use at the top of Berea Road in Durban from 1886 to 1900. The money collected was spent on the construction and maintenance of Berea Road. In 1872 the first toll gates were erected in the Orange Free State after the promulgation of a law in 1871 whereby magistrates, field-cornets and members of the Volksraad were instructed to take the responsibility in their respective districts for investigating and approving applications of funds for new roads.

In the consideration of toll financing of roads, several aspects have to be given consideration in order to identify the possible problems related to toll financing of and the implementation of toll collection on roads. These aspects are as follows:

(a) Economic Aspects
(b) Financial Aspects
(c) Administrative Aspects
(d) Legal Aspects
(e) Social and Political Aspects
(f) Operational Aspects
(g) Engineering Aspects
(h) Technological Aspects
(i) Research and Monitoring Aspects

These aspects will be discussed in the following sections and conclusions will be made regarding the implications of each aspect. Subsequently, general conclusions will be drawn and recommendations made.

2. ECONOMIC ASPECTS

2.1 Introduction

Toll revenues may be considered a supplemental source of revenue for the financing of road infrastructure. It should be recognised, however, that other supplementary sources of revenue, e.g. earmarked sales tax, could also be exploited. Tolls do, however, have certain advantages and disadvantages as compared to other existing or supplementary revenue sources utilised for the purpose of investment in roads. As stated before, it is not the purpose of this investigation to make a comparison between different methods of raising revenue, but toll collection on roads, for the purpose of investment in roads, will be placed in perspective.

Toll collection on roads is usually associated with loan financing of roads. Tolls are then collected on a road to redeem a loan utilised to finance the cost of construction and any other costs but also to defray other current costs associated with the road. It should be noted that tolls need not be used to redeem the loan - other sources of revenue could be used to repay the loan. On the other hand, tolls could be collected on a road and utilised for other purposes - the toll revenue could be paid into a general revenue fund. The point to be made is that loan financing and toll collection are two separate issues which may be combined with resulting advantages and disadvantages.

The above issues will be discussed in the following subsections:

(a) Alternative methods of toll financing.
(b) Toll financing as part of the overall financing of roads.
(c) Aspects of loan financing related to toll financing.
(d) Tolls as a source of revenue.
(e) General economic aspects related to toll financing.

2.2 Alternative Methods of Toll Financing

Several methods of financing of roads, incorporating toll collection, may be used. These alternatives are discussed below.

2.2.1 Loans redeemed through the collection of tolls

This method is widely used in the United States. As stated previously, the issue of loan financing may be viewed separately from toll collection and loans may be redeemed from revenue sources other than tolls. Tolls, however, provide a revenue source which is directly tied to the facility and is visible to the institutions or persons providing the loans. It will therefore be relatively simple to identify problems and modify the financial management of the facility in the event of difficulties arising with debt redemption. In the case of redeeming loans from general revenue sources, financial discipline may not always be observed and associated problems may not always be readily identifiable. Examples of facilities which utilise loans combined with tolls are the New Jersey Turnpike and the North Dallas Tollway.

2.2.2 Loans redeemed through toll collection and supplemented by other revenues

This method of financing is used in Portugal, Italy, Japan, Brazil, Austria and the Philippines. One of the primary reasons for using this method is that interest rates on loans have increased in recent years and loan periods have decreased, with the result that financing costs have risen dramatically. If a project is financially feasible over its whole lifetime, i.e. the total revenues exceed the total cost, difficulty may

still be experienced in financing the project in the initial few years when traffic volumes are still relatively low. Cross-subsidisation from other toll facilities (using a pooled revenue concept) or subsidisation from other revenue sources may be used to overcome this problem.

2.2.3 Loans redeemed through toll collection and using surplus tolls for other purposes

The use of surplus tolls to subsidise other roads was mentioned above. In some cases, however, surplus tolls are used to subsidise facilities other than roads. An example of such a case is the Garden State Parkway in the state of New Jersey in the USA. Surplus tolls are used to fund the Garden Arts Center (for performing arts). It is frequently contended that the collection of tolls is an expensive way to collect revenue and that other sources of revenue, e.g. fuel tax or sales tax are cheaper to exploit and easier to administer. If tolls are not to be collected to redeem a loan (requiring a visible method of revenue collection) or to be implemented as a pricing mechanism (to be discussed in a later section), but collected for general purposes, then less expensive methods of revenue collection should be considered.

2.2.4 Utilizing tolls for general investment in road infrastructure

Within this alternative the case of collecting tolls on an existing road, to subsidise other roads, can again be identified. It should be stressed again, however, that this should normally only be considered if toll collection is to be used as a pricing mechanism or if toll collection is to be used to cross-subsidise other roads for which loans have been obtained.

2.2.5 Utilizing tolls for general purposes

It has already been pointed out in the preceding paragraphs that there are less expensive and easier methods of revenue collection for general purposes.

2.2.6 Conclusions

From the preceding discussion, it can be concluded that toll collection is an expensive method of raising revenue, and is therefore not suitable as a general revenue source. Tolls as a revenue source do, however, have the advantage of being tied to a specific project or projects and is therefore a visible form of revenue collection which is an advantage when competing for loans.

2.3 Toll Financing as Part of the Overall Financing of Roads

Two principal means of revenue collection may be utilized for the financing of roads, i.e. taxes and charges (pricing). In general, there is no direct relationship between the source and amount of a tax and the investment of this collected revenue. In the case of a charge, however, revenue is collected for the purpose of providing a specific service. A tax then, is supply orientated whilst a charge is demand orientated. It may be stated that in the case of a charge, a customer is in fact paying directly for a service and has the option of paying, but in the case of a general tax, a choice does not usually exist.

In the previous section, it was concluded that tolls are not suitable as a general revenue source but may be suitable as a charge for the purpose of redeeming loans obtained for road construction and other road-related expenditures. It should

be noted, however, that in the case of utilizing loans guaranteed by the government, an advantage is implied relative to other services (also services provided by the private sector) since the government guarantee will result in lower interest rates and also result in advantages for the acquirement of loans.

There are two major differences between a tax and a charge which warrant consideration in this context. In the first instance, the collection of revenues through charges, has the characteristic of being more indicative of the required level of investment, since the market mechanism will determine the demand-supply equilibrium. In the case of a general tax, it is more difficult to determine the required level of investment. The second major difference is that general taxes are progressive in so far as the rates increase as the income being taxed increases, while a charge is regressive as the ability to pay is usually not a basic consideration.

If tolls were to be implemented in South Africa, the situation will exist wherein roads will be funded from both charges and taxes (charges currently exist in the form of fuel tax, license fees etc., while for instance provincial road authorities obtain funds from general tax sources via the Treasury). It should be pointed out, however, that taxes and charges cannot be levied totally independently, since consideration has to be given to the fact that both are collected from the individual. The total level of investment in road infrastructure should then be made taking both taxes and charges into account. This total level of investment is usually determined by economic, social and political considerations. These considerations are discussed in the following subsections.

2.3.1 Economic considerations

A specified level of investment in the Transport Sector (which does not include, for instance, personal transportation) will affect a certain level of output of the Gross National Product (GNP). In order to accommodate a corresponding level of activity in the Transport Sector, a corresponding level of investment is required in transport infrastructure. Investment in transport infrastructure is required by most sectors of the economy, e.g. Mining,Agriculture, Manufacturing, etc. These requirements can be equated to the demand for transportation. This demand also includes the demand for commuting to work and recreational travel. There is, however, a limit to the amount of investment which could be made, since there is a demand for the use of capital for other purposes, e.g. investment in equipment, etc. which also have an influence on the economic growth. The available capital has to be distributed among these different demands in a manner which will ensure maximum growth.

A further aspect of these macro-economic considerations is the overall level of taxation. Socialist states generally have a high level of taxation and the state assumes responsibility for the provision of a larger proportion of services than in capitalist states, where a larger dependance is placed on the private sector to provide the necessary services. The use of charges as opposed to taxation is more akin to capatalist states than socialist states.

2.3.2 Social considerations

Decisions regarding the level of investment in road infrastructure are not taken entirely from an economic viewpoint. Social considerations are very often taken into account, e.g.

provision of free transportation for the handicapped. Such investments are not necessarily economically optimal, but are nevertheless considered necessary. Decisions are sometimes also made in general economic terms, i.e. less economic growth will be accepted with a higher level of employment. Such macro-economic decisions will influence the overall level of economic investment, inter alia the level of investment in transportation infrastructure.

2.3.3 Political considerations

In addition to economic and social considerations which may influence the level of investment in transportation infrastructure, political considerations (in their broadest context) have to be taken into account. Throughout the world pressure groups may succeed in having facilities, including transportation facilities, established in a manner which is not necessarily economically optimal. Furthermore, roads may be required for strategic purposes.

2.3.4 Conclusions

The following conclusions may be reached from the foregoing discussion:

(a) The financing of roads through toll collection (a charge) will be more indicative of the required level of investment than a general tax since the market mechanism will determine the demand-supply equilibrium and therefore also the correct level of investment.

(b) If toll financing of roads were implemented in South Africa, the total funding of roads will consist of both taxes and charges. Since both will be obtained from the individual, charges cannot be levied independent from the taxes collected for investment in roads - consideration has to be given to the total level of revenue collection and the corresponding level of investment.

(c) Economic, social and political considerations determine the level of revenue collection for government investment, inter alia in road infrastructure. The level of revenue collection for road investment has to be determined bearing in mind not only the need for roads but also the demand for the limited available capital for other government objectives and for the private sector.

2.4 Aspects of Loan Financing Related to Toll Financing

In the following sections, certain aspects of loan financing, which may be used in conjunction with toll financing, will be discussed. These aspects are as follows:

(a) The advantage of loan financing versus financing from current revenues.
(b) Loan financing as affected by the ability to obtain loans.
(c) Sources of loan financing.

2.4.1 The advantages of loan financing versus financing from current revenues

If current revenue exceeds required expenditure, there will be no necessity to employ loan funds. Schutte and Jurgens of the

NITRR (20) have presented a detailed analysis of the appropriateness of loan financing when a shortage of current revenue is experienced.

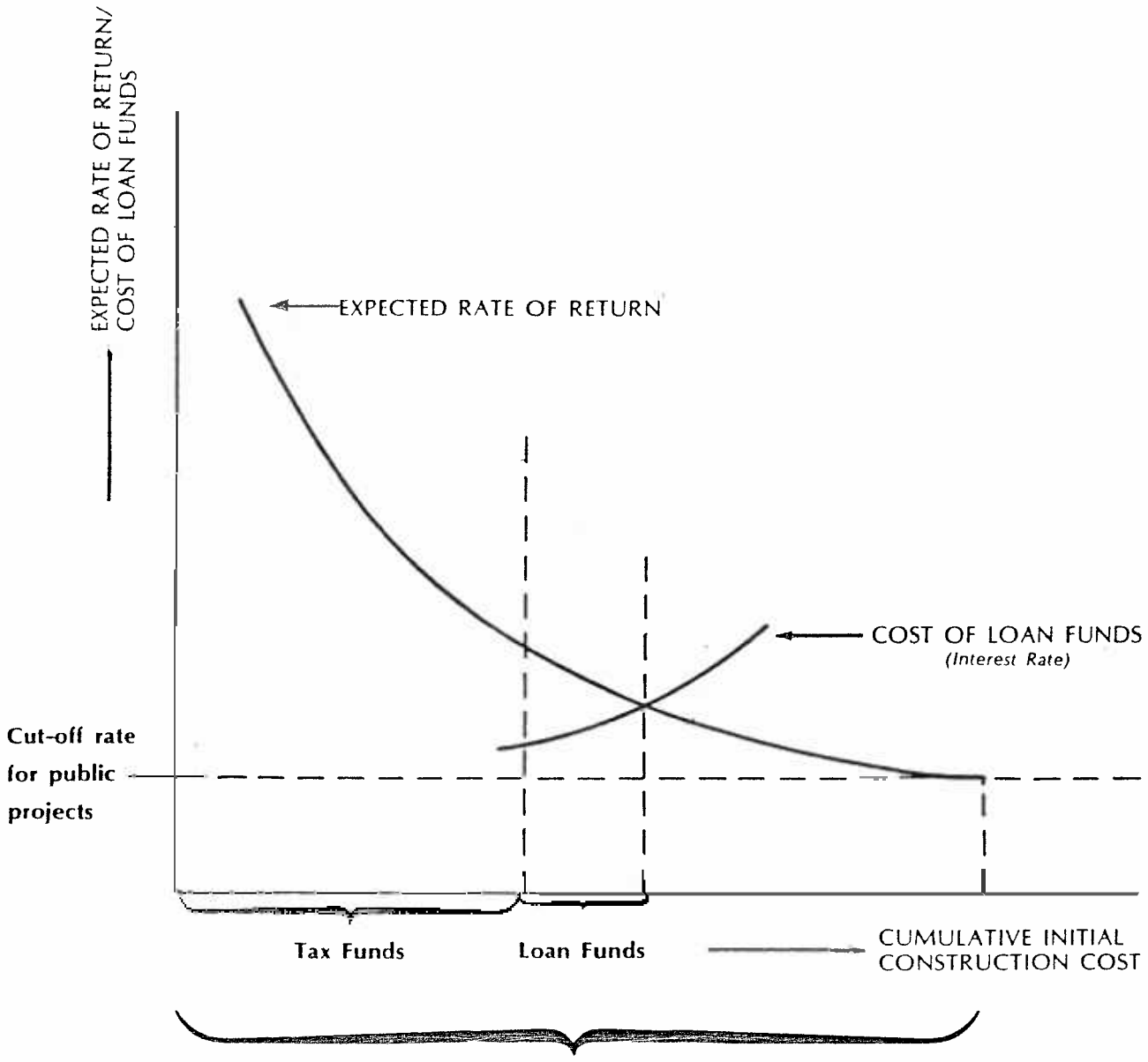
Under conditions of no inflation, the appropriateness of the use of loan funds can be illustrated as shown in figure 2.1. From the figure it can be seen that loan funds should not be used in cases where the internal rate of return is less than the interest rate on the loans.

Under conditions of inflation, however, it is necessary to compare the real internal rate of return with the real cost (interest rate) of loan funds or alternatively to compare the rate of return in monetary terms with the monetary or apparent cost of loan funds. Schutte and Jurgens derived the real interest rate per annum as follows:

$$i^{*} = \frac{i - I}{1 + I}$$

where i^{*} = real interest rate per annum
I = inflation rate per annum
i = monetary interest rate per annum

Schutte and Jurgens went on to prove that the use of loan funds always provides an authority with the ability to provide more infrastructure sooner than would have been possible for the situation where loans are not used. Another important observation is made, i.e. that since it is impossible to forecast the timing, duration and extent of economic recessionary conditions, it would be unwise to use too much tax income for loan redemption. It should be pointed out, however, that the cost of toll collection should also be considered when the comparison of loan financing versus financing from current revenue is made.



(Source: Schutte I.C. and Jurgens F.X. *The Use of Loan Funds for Capital Projects.* Draft Technical Report: RT/47/80, National Institute for Transport and Road Research, CSIR, South Africa, September 1980.)

RELATIONSHIP BETWEEN CUMULATIVE INITIAL CONSTRUCTION COST AND EXPECTED ROR/COST OF LOAN FUNDS	FIG. 2.1

Another very important aspect of loan financing which warrants consideration, is the effect of the timing of the payment for the facility. When repaying the loan, part of the burden of the cost is shifted to future users who also benefit from the use of the facility.

2.4.2 Loan financing as affected by the ability to obtain loans

Capital is a scarce resource. Theoretically the use of capital is paid for through interest charged and the allocation of the available capital is accomplished through the relative demand by different uses for the capital. If one use can afford higher interest rates than another use, then the capital should be allocated to the use with the higher interest rate. The fact that a higher interest rate can be afforded, is a result of higher benefits resulting from the use of the capital. Another aspect which should be considered, is the element of risk. Lower interest rates are usually associated with lower risk related to the ability of the borrower being able to pay the interest and to redeem the loan. In the case of a government loan, the associated risk is usually lower than for a private loan.

Before discussing the effect that the ability to obtain loans may have on loan financing, as associated with toll financing, it will be useful to identify the methods of administration with a view towards determining how these methods of administration may affect the acquisition of loans. (Administrative aspects will again be discussed in Chapter 4).

Two broad categories of administration may be identified:

(a) Administration with government and political involvement.
(b) Administration without government and political involvement.

Although the latter option may exist in theory, it may be disqualified in practice. Government involvement will be required to some extent, especially when extensions to a road system are envisaged. Expropriation powers, for instance, will be required.

According to the Bureau for Economic Policy and Analysis of the University of Pretoria (9), three broad categories of government "actors" may be identified.

(a) General government. "General government agencies include all the departments and agencies of the central government, provincial administrations, local authorities and the homeland governments responsible for typical government services such as defence, the maintenance of law and order, the administration of economic and social policy, education, health services and other social and community services as well as research institutions, boards and trusts which are established by the government to perform specific functions. The essential characteristic which distinguishes general government institutions from government enterprises is that they do not finance the costs of operation by meeting an economic demand confirmed in the open market by the willingness of people to pay for what they have to offer. Instead, these general government agencies meet demands as expressed through political processes, elections, proposals by executive bodies, debating by legislative bodies and finally the voting of money to be used for specific forms of expenditure. Thus these institutions normally render their services without a direct quid pro quo. Even where fees are charged, they normally do not dover the cost of the services which is financed mainly from taxes."

(b) Government enterprises. "Government enterprises are business enterprises directly under political control. These enterprises produce goods and services to be sold to any buyer who is prepared to pay the purchase price. The price normally covers the cost of production. Thus, government enterprises are expected to meet their costs from the proceeds of their sales rather than from grants out of general government funds.

In South Africa, the following institutions are considered to be central government enterprises: the SA Railways and Harbours, Department of Posts and Telecommunications, State Alluvial Diggings of the Department of Mines, Boring Services of the Department of Water Affairs, SA Mint, Government Printing Works, Government Motor Transport and State Airports of the Department of Transport, Government Guano Islands of the Department of Industries and State Forestry of the Department of Forestry. (The SA Railways and Harbours Administration and Department of Posts and Telecommunications are not financially integrated with the rest of the central government but have their own budgets controlled by Parliament.) In the case of local authorities the following departments are organised as business enterprises: water, electricity, gas, transport, markets, abattoirs and housing."

(c) Public corporations. "Public corporations are business enterprises established by the Government but incorporated under the management of independent boards of directors such as the South African Iron and Steel Industrial Corporation (Iscor), South African Coal, Oil and Gas Corporation (Sasol), Electricity Supply Commission (Escom), South African Reserve Bank, Economic Development Corporation, South African Broadcasting Corporation, Industrial De-

velopment Corporation and the various agricultural control boards. The government normally holds the majority of the shares in these corporations and/or appoints the majority of the directors.

These corporations are also expected to meet their current outlays from current income and to finance their capital outlays by the issue of loans or shares which may be taken up by either the Government or private concerns."

In addition to institutions of government which are responsible for the implementation and protection of services, government institutions may also participate through regulation. A private company may thus be franchised to construct and/or operate a toll facility, while being regulated by a government agency. This type of administration is used in France and in Spain. In South Africa, this type of administration is not uncommon. Several bus companies, e.g. City Tramways in Cape Town, are administered in this manner.

Another form of administration is a hybrid between a government agency and a franchised private company. This type of administration is used in Portugal and Italy.

From the preceding discussion, five possible methods of administration can be identified:

(a) A general government agency (central, provincial or local).
(b) A government enterprise.
(c) A public corporation.
(d) A franchised private company with government aid.
(e) A franchised private company.

In the following sections, the ability of these types of administrations to acquire loans, will be discussed.

(a) A general government agency

According to the Exchequer and Audit Act, Act No. 66 of 1975 (14), "... a department of State shall not borrow any moneys on behalf of the State and shall not, without the approval of the Treasury, accept any financial assistance from any person." (Clause 16 (2)).

A direct result of this clause is that neither the Department of Transport nor the provincial administration may currently raise loans. The Urban Transport Act, Act 78 of 1977 (15) and the National Roads Act, Act 54 of 1971 (16) do make provision for the Minister of Transport Affairs, out of moneys made available by Parliament to grant loans to the National Transport Commission for the purposes of the Acts. Loan financing is therefore not excluded, but in practice, this type of loan financing is not used or considered a viable proposition. A unitary budget is used and the total government deficit is principally financed from loans. Major changes in existing legislation will therefore be required if loan financing were to be utilised by a government agency.

According to the Third Report of the Commission of Enquiry into Fiscal and Monetary Policy in South Africa (17) loans contracted by local authorities are controlled by the provincial authorities and indirectly by the Treasury. This control is directed at evaluating the ability of the local authorities to meet the capital redemption and interest burden. The Treasury exercises control over loans of

more than R1 million per year that these authorities wish to raise in the capital market. This control enables the Treasury to promote order in the capital market and to ensure that these authorities receive a fair share of the available funds and pay market related rates of interest on their loans.

(b) A government enterprise

Government enterprises such as the South African Railways and Harbours and the Department of Post and Telegraphs are subject to Parliamentary and Cabinet control, but not to direct or overall Treasury control, since separate budgets are submitted to Parliament by the two Ministers concerned. Loan funds are supplied out of the Exchequer and thereby affording the Treasury a modicum of control.

(c) A public corporation

Capital is supplied to public corporations in various ways. In the case of Iscor and the Fisheries Development Corporation (Fishcor), the government has provided share capital on which dividends may be paid. Share capital in these instances is normally voted directly by Parliament. In the case of public corporations such as Iscor, the corporations are wholly dependent on loan capital which may be obtained from the government, from foreign sources or from the local capital market. Loans on the domestic or foreign capital markets are negotiated in consultation with the Treasury.

(d) A franchised private company with government aid

A franchised private company may be partly financed by the government to offset losses or to provide capital for initial construction. In South Africa, this type of undertaking is not common, although it has occurred. The Richards Bay Coal Terminal, for instance, has received some government loans. For additional loan capital, the company may of course compete for loans in the capital market.

(e) A franchised private company

A private company can only obtain its loan capital from the capital market. In general, such loans carry a higher interest rate than government loans, because of the higher risk involved. Because of the magnitude of the loans required for the construction and operation of a road, it is doubtful whether a private company would be able to raise the loans without a government guarantee. There may also be some doubt with investors as to the ability of the borrower to meet its initial interest payment commitments.

From the preceding discussion it can be concluded that in order to utilise loans under existing legislation, toll facilities should be administered by an administrative body other than a general government agency (with the exception of local authorities, which may contract loans).

2.4.3 Source of loan financing

In the foregoing section, the different types of administration were identified and their ability to obtain loans was discussed. It was pointed out that, inter alia, because of the magnitude of the loans in question, private companies would probably be unable to acquire sufficient loan capital without government guarantees. It therefore appears appropriate to assume that the sources of loan financing usually exploited by the public sector should be investigated.

According to the Quarterly Bulletin of the South African Reserve Bank (21), foreign debt accounted for only 3 percent of the total government debt and may therefore not be a significant factor in loan financing of roads. Of the domestic debt, 80 percent consisted of marketable stocks, bonds and bills, and it may therefore be expected that loans for roads would primarily be obtained through such issues. Detailed information regarding the total government debt are presented in table 2.1.

If loans were to be taken up, Senbank estimated that an amount of approximately R300 million may be available by 1985/86 for borrowing for the purpose of investment in roads or communications (see Appendix A). The total expenditure on roads and streets for 1980/81 was R1 052 million and on major roads and streets R832 million (5). If the projected available loan funds were utilised, a substantial increase in expenditure on roads would be realised. If the toll authority were administered as a public corporation, the utilization of the available loan funds would also lead to a substantial impact on the amount of loan funds taken up by public corporations (Public corporations issued stock in 1980 amounting to R1 177 million (see Table 2.2)). Local authorities only issued stock to the value of R56 million in 1980 and the utilisation of a portion of R300 million by 1985 would

TABLE 2.1
TOTAL GOVERNMENT DEBT
(R millions)

End of	Domestic debt								Foreign debt[2]			Total debt
	Marketable			Non-marketable				Total domestic debt	Marketable stock	Non-marketable stock	Total foreign debt	
	Stock and bonds	Bills	Total	Stock and bonds	Bills	Loan levies[1]	Total					
1974	6 145	388	6 532	365	137	441	944	7 476	243	267	509	7 986
1975	7 259	730	7 989	342	358	519	1 220	9 208	273	613	886	10 094
1976	8 312	781	9 093	419	519	750	1 688	10 781	295	1 030	1 325	12 106
1977	9 976	781	10 757	618	113	1 127	1 858	12 615	297	1 059	1 356	13 971
1978	11 929	684	12 613	977	56	1 419	2 452	15 065	297	888	1 184	16 249
1979	12 589	1 218	13 808	1 517	261	1 666	3 443	17 251	261	673	934	18 185
1980	14 205	1 263	15 467	1 819	308	1 786	3 913	19 380	219	387	606	19 986

1. Including tax redemption certificates, personal and savings fund levies and tax bonds.
2. Adjusted for higher commitments in respect of foreign loans as a result of foreign exchange rate adjustments.

(Source: South African Reserve Bank. *Quarterly Bulletin No. 139, March 1981.***)**

TABLE 2.2

NET ISSUES OF MARKETABLE SECURITIES
(R millions)

	Central Government				Public corporations			Local authorities			Private Sector[4]		
	Government stock subscribed for by				Stock subscribed for by			Stock subscribed for by			Stock, Debentures notes and preference shares	Ordinary shares	Total
	Monetary banking sector	Private non-banking sector	Government sector[2]	Total	Monetary banking sector	Private non-banking sector	Other[3]	Monetary banking sector	Private non-banking sector	Other[3]			
1973	167	99	212	478	76	74	84	40	63	42	104	180	284
1974	-90	59	263	232	16	25	150	10	51	64	123	56	179
1975	365	248	506	1 119	91	87	112	11	150	31	182	302	484
1976	405	278	375	1 058	-8	66	117	21	173	35	120	255	375
1977	478	456	730	1 664	65	232	690	1	232	-6	190	265	455
1978	445	282	1 237	1 964	151	361	952	3	132	9	222	137	359
1979	-316	-167	1 151	668	459	274	795	2	104	19	190	303	493
1980	486	54	1 074	1 614	128	199	850	3	56	-3	597	488	1 085

1. Cash receipt less cash repayments in the case of public sector issues. Only cash receipts are included in the case of private sector issues.
2. Mainly the Public Debt Commissioners.
3. Mainly the Public Debt Commissioners and internal funds. Johannesburg Stock Exchange.
4. Data refer only to securities of companies listed or to be listed on the Johannesburg Stock Exchange. Funds raised by, for example, a holding company for the purpose of taking up an issue of a subsidiary or another company are included only once.

(Source: South African Reserve Bank. *Quarterly Bulletin No 139*)

represent a very substantial impact on local authorities.

From the preceding discussion it may be concluded that:

(a) R300 million may be available by 1985/86 in loans for investment in roads.

(b) The available amount will represent a substantial increase in road expenditure (if the other traditional sources are not curtailed) and will also have a substantial impact on the amount of capital now utilised by public corporations and local authorities.

2.5 Toll Financing as a Source of Revenue

The collection of tolls on roads for the purpose of investment in roads, can be classified as a user charge as opposed to income tax collection for investment in roads, which is not a user charge.

The different types of user charging were classified as direct and indirect charges by Freeman (4), and are presented in figure 2.2. Indirect pricing involves payment for products or services related to road use, whereas direct pricing involves payment for road use itself. From the figure it can be seen that an open toll system corresponds to an indirect road pricing system, while a closed system is a direct pricing system. When a vehicle enters a closed toll system, a ticket is issued which identifies the point of entrance. At the exit from the system, the ticket is collected and payment made

THE TYPES OF ROAD USER CHARGING SYSTEMS

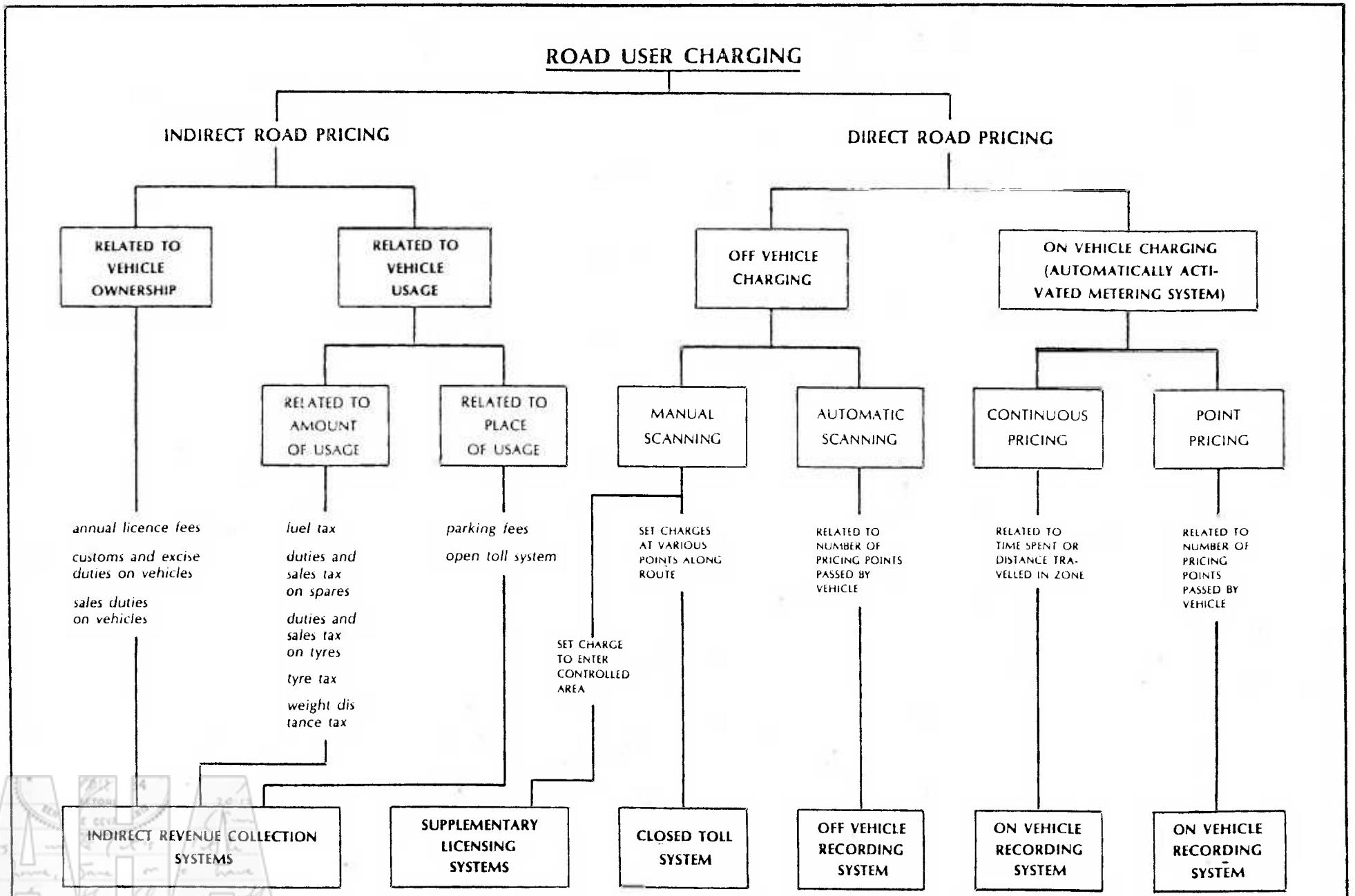


FIG. 2.2

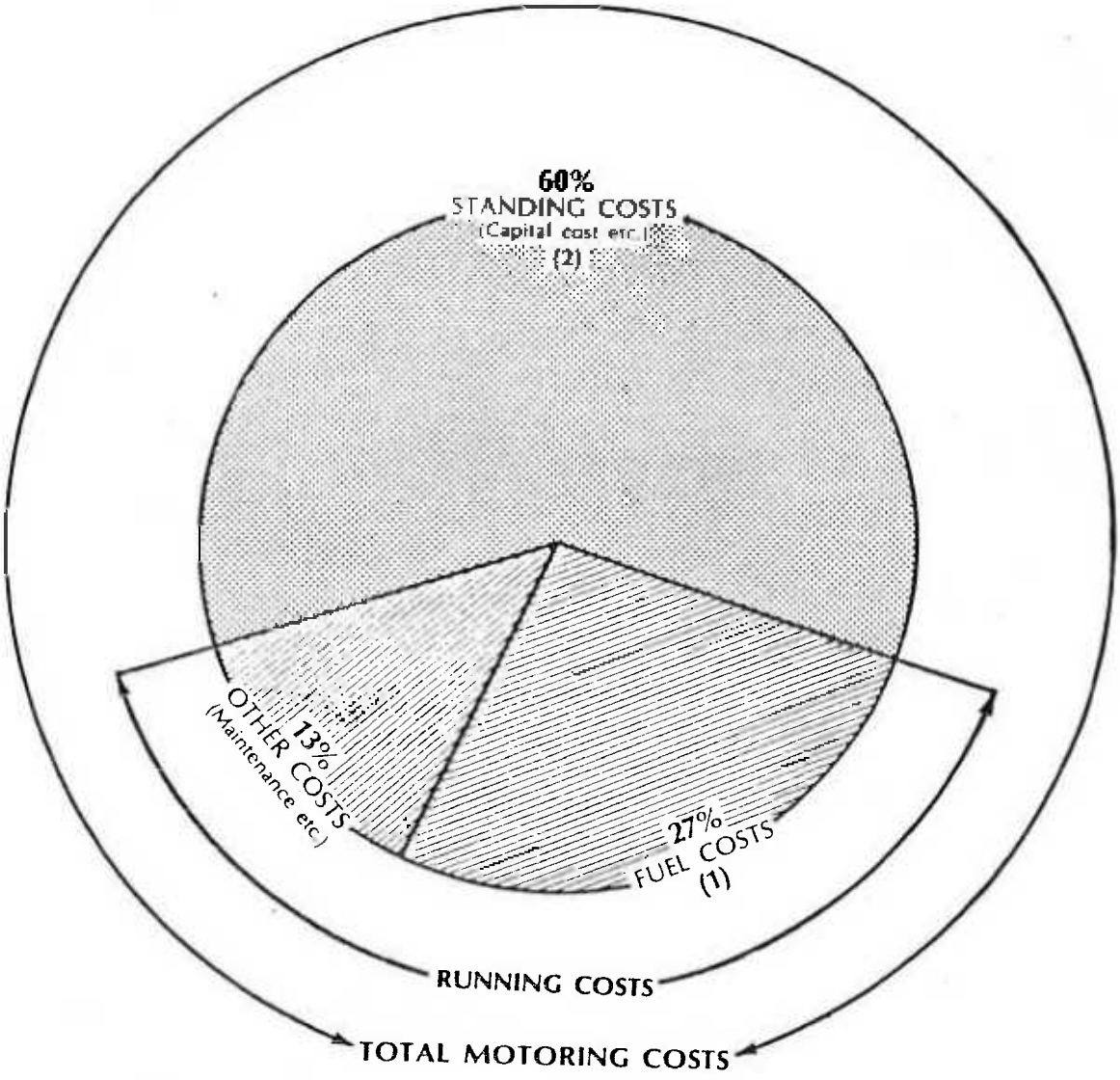
(Source: Freeman P.N.W. Road User Cost Recovery Theory and Practice (Preliminary Report) Technical Report RT/16/81 National Institute for Transport and Road Research, CSIR, March 1981.)

to the distance travelled and the classification of the vehicle. In an open toll system, payment is made at intervals along the road and this payment is not precisely in direct relation to the distance travelled. If, however, the intervals along the road, at which tolls are collected, become relatively shorter, then the open system becomes closer to the closed system and therefore closer to a direct pricing system. This direct method of pricing which may be considered applicable to both open and closed systems, has a number of distinct advantages:

(a) The marginal cost pricing method can be used to recover the costs, which leads to a better allocation of resources than an average cost method of cost recovery.

(b) The revenue collection is tied to the facility on which it is collected and is therefore a very visible method of revenue collection which is advantageous when loan financing is considered.

The impact of toll collection on the motorist may be assessed by determining the increase in motoring cost due to toll. The mean motoring cost profile for the average motorist, derived from cost indices provided by the Automobile Association (1) based on cars in the R7 000,00 - R12 000,00 price class used for an average of 12 000 to 18 000 km per year is shown in figure 2.3. Although different toll rate structures are applied on various toll facilities in the USA, Europe and Japan, all may be reduced to a cost per kilometer. The impact of toll on motoring costs, assuming no relief in fuel tax, is shown in figure 2.4. It should be noted that the reduction in travel cost on a toll road instead of on available alternative route is not reflected by these figures. These figures merely serve to illustrate the magnitude of the toll rates.



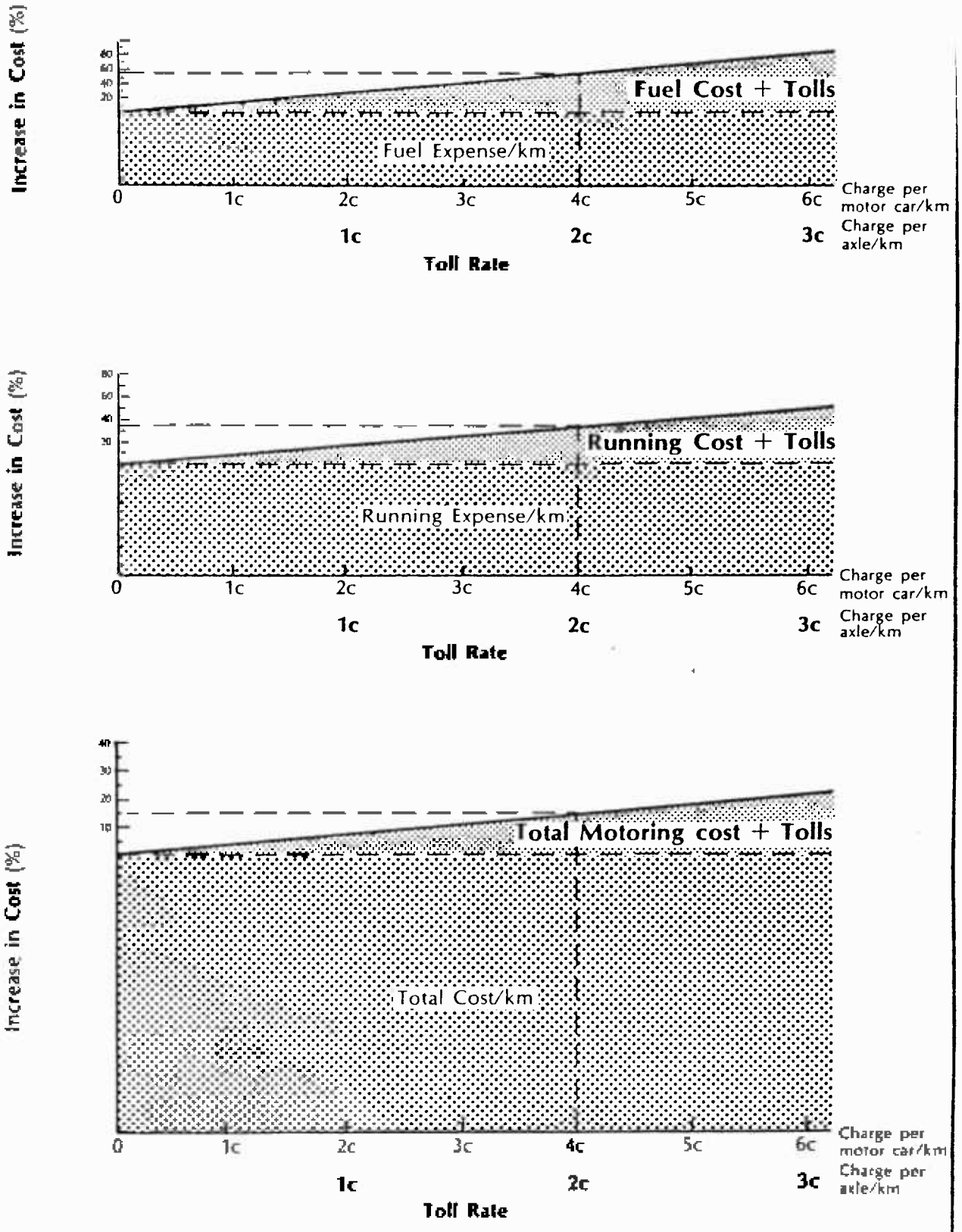
Notes

(1) Fuel tax amounts to ± 4,3% of fuel cost

(2) Licence fees amount to ± 86% of standing cost

MOTORING COSTS PROFILE

FIG. 2.3



IMPACT OF TOLLS ON MOTORING COST

FIG

If a toll of 2 cents per axle were levied, the direct out of pocket costs (fuel cost plus tolls) will be increased by between 50 and 60 percent. The corresponding increase in total running cost will be between 30 and 40 percent and on total motoring cost, between 10 and 20 percent. It may therefore be concluded that tolls will have a pronounced effect on a motorist frequently using a toll road and that a toll road will have to provide substantial benefit over an alternative route.

2.6 General Economic Aspects Related to Toll Financing

In the following paragraphs, general economic aspects related to toll financing of roads will be discussed. From correspondence and discussions with the Department of Finance the following general government policy emerged:

It is the policy of the government that, wherever possible, a government undertaking should become self-financing.

From table 2.3 it can be seen that the major road system is not self-financing since the amount of direct user payments is less than the expenditure on just the major roads. Furthermore, the Urban Transport Act, Act 78 of 1977 (15) makes provision for funding of metropolitan roads by the central government. Depending on the magnitude of such funding (envisaged as R74 million per year (in 1974 Rands) in the Report of the Committee of Enquiry into Urban Transport Facilities in the Republic (18) and as R36 million in the subsequent White Paper (19), the account in terms of self-financing for major roads may show a very large deficit, which would then have to be financed from central government funds or other sources of revenue, one of which may be tolls. It would therefore appear reasonable that tolls collected on roads may be used to substitute for current revenues which are not road related if the policy of self-financing is adhered to.

TABLE 2.3
COMPARISON OF ROAD USER PAYMENTS AND ROAD EXPENDITURE 1980/81

PAYMENTS BY USERS AND NON-USERS		R million
Direct user payments	National Road Fund Petrol Revenue	141
Direct user payments not earmarked for expenditure on roads	Motor vehicle and fuel levies (excluding State Oil Fund, Equalisation Fund and general sales tax)	326
	Road department revenue	7
	Vehicle licences and permits	171
	Other	1
		646
Non-user payments	Municipal rates, grants, subsidies and other payments	332
	General Revenue	84
TOTAL		**1 052**

EXPENDITURE BY ROAD CATEGORY		R million
Rural, intercity, and major urban	Construction, maintenance and administration	832
Urban access roads and streets		220
TOTAL		**1 052**

(**SOURCE:** Freeman P N W *Preliminary Results of the Road User Cost Recovery Project.* Technical Note TT/27/81, National Institute for Transport and Road Research, CSIR, 1981.)

It should be kept in mind, however, that toll financing is not suitable for the funding of all types of roads. If tolls were substituted for current revenues, the effect on the financing of roads other than toll roads should be carefully investigated. Tolls are usually collected on roads with access control, e.g. "freeways" and at bridges and tunnels. The collection of tolls on these types of facilities can be managed relatively easily, while on other types of road facilities tolls are difficult to collect. Furthermore, these types of road facilities are the most expensive types of road facilities and the financing of these facilities cause disruptions in the financing programmes of road authorities which are also responsible for the financing of other types of road facilities. For this reason, toll financing of the expensive facilities will relieve the financial burden of road authorities and will also lead to better programming of investment in road infrastructure. It should again be stressed, however, that the effect of substitution of revenues should be carefully investigated so as not to result in underinvestment in other types of road facilities.

Further to the argument of self-financing, it should be pointed out that of the primary economic infrastructure types in South Africa, i.e. railways, electricity, telecommunications and roads, road infrastructure is the only type that is not wholly or in part operated as a government enterprise or public corporation. It therefore appears that the provision of road infrastructure in the pursuit of the goal of self-financing and minimisation of central government subsidies, lags behind other types of economic infrastructure.

There is another aspect of this issue which should be pointed out, i.e. the effect of not utilising loan funds and subjecting the investment level to the market mechanism. If funding for

roads were obtained by direct user charging, there will be a saturation level above which additional revenue cannot be obtained and the demand-supply equilibrium for transport would be reached. This level could be lower or higher than the level of funding now in existence. If this level were in fact higher, then it could be assumed that the funds not being utilised at this point in time, are being utilised for other purposes and inter alia for other economic infrastructure. Furthermore, the fact that loan funds are not being utilised for investment in road infrastructure, with the exception of local authorities, could mean that the available loan funds are being utilised by other institutions at the expense of road infrastructure investment. As has been stated it is normally advantageous to utilise loan financing since benefits will be provided sooner.

The rationale behind the abovementioned points is illustrated by an excerpt from a paper by Paul McCracken et al (10).

> "There are some instances of public expenditure where much of the expenditure on the programme concerned meets the needs of people who are not really poor. In these cases, the efficiency of the programme could be improved by resorting somewhat more to user charges, i.e. charging the immediate beneficiaries of certain public services at a level equal to the actual cost less the estimated value of the external benefits involved. Reform along these lines would not only have the advantage of helping in a way to control public expenditure; more fundamentally, it would help to establish more clearly the connection between the demand for particular public services and the price which the community is prepared to pay for them."

The control of public expenditure, which is related to the self-financing of public services, is a central element of South Africa's economic policies. Following, is an excerpt from the Minister of Finance's budget speech of 1980:

> "A further point to stress is that restraint on government spending remains a keystone of our strategy. As before, our growth policy will consist essentially of providing the private sector with both the scope and initiative for rapid economic expansion. Excessive increase in government spending at this stage would soon bring us to the point where, in order to avoid living beyond our means as a nation, we might have to impose restrictive measures on private sector expansion. If that happens, the public sector would be guilty of 'crowding out the private sector' - a phenomenon which is well known and feared in many countries, but which the government is determined to avoid in South Africa."

It may also be concluded, from the above excerpt and with reference to the fact that major roads are not self-financing, that traditional funding of roads will not increase dramatically. As a result of a larger than proportional increase in defence spending and increased emphasis on provision of services to the black population of South Africa, spending on roads may decrease. Self-financing of roads through toll collection therefore becomes an attractive means to provide the necessary road infrastructure. With reference to figure 2.2 it may be observed that there are not many alternative practical methods of direct user charging, which are more directly related to the principles of user charging, i.e. balancing demand and supply.

A further aspect of toll financing which warrants discussion, is the relationship to the economic cycle. If a toll authority were administered as a public corporation or a government enterprise, loan funds having savings as origin, may be used for investment. This method of funding is non-inflationary. The scheduling of these investments may be made taking into consideration the current government fiscal and monetary policies. At times when the government is committed to curb inflation by not using subsidy funds for investment, the investments may be made utilising such loan funds. This is an advantage over financing using only general taxes as a major source of revenue.

3. FINANCIAL ASPECTS

3.1 Introduction

For the purpose of this document, the financial aspects related to toll roads will be defined as those aspects which are related to the economic and financial feasibility of a toll road or a toll road system itself. The macro-economic and overall financial principles were considered in the previous chapter.

Traditionally, toll roads were supposed to be financially feasible i.e. revenues accrued through toll collection and other related revenues linked to the facilities under consideration were supposed to offset any costs incurred in connection with the toll road or toll road systems. This has generally been the case in the United States (23). In Europe, institutions operating toll roads attempt to make a profit. In such cases, it is clear that the benefits observed by the users exceed the cost of travel which includes the toll. In some cases, however, the revenues collected on a toll road may not exceed the costs associated with the road, but it may still be economically justifiable to construct the toll road. An example of this is the case where one toll road with a revenue shortage feeds into another toll road which is very profitable and the profitability is dependent upon the traffic fed into the main road. It is clear that in this case the system as a whole should be evaluated. Another example is the case where the opportunity cost of energy is considered. A toll road with high geometric design standards may effect energy savings with accompanying opportunity costs which may not be perceived by the user, therefore the user may not be willing to pay for such savings. In this case, a subsidy may be justified. Under normal circumstances, however, the financial feasibility of a toll road is first determined and only then can

other considerations be taken into account. In the following sections, the elements of financial feasibility will be discussed and subsequently reference will be made to the circumstances under which a road will be financially feasible.

3.2 Elements of Financial Feasibility

The major elements of feasibility are the market constraints and revenue and cost constraints. These two major elements will be discussed in the following two sections.

3.2.1 Market constraints

The market constraints are set outside the toll road entity and consist of the magnitude of available funds, loan period, interest rates and inflation rates. As stated before, R300 million in loan funds may be available by 1985/86 in loan funds. (Refer to Appendix A). According to Senbank (see Appendix A) the loan period could not be expected to be longer than 25 years and will probably be shorter in future. The Bureau for Economic Research at the University of Stellenbosch (3) estimated that interest rates will be between 14,5 and 15 percent at the end of 1981. Senbank estimated that interest rates will vary between 9 and 14 percent depending upon the loan period and the time at which the loan is negotiated (see table 3.1). The rate of inflation for 1981 is expected to be slightly above 15 percent, although it is expected that this will decrease to 9,2 percent in the long term (9).

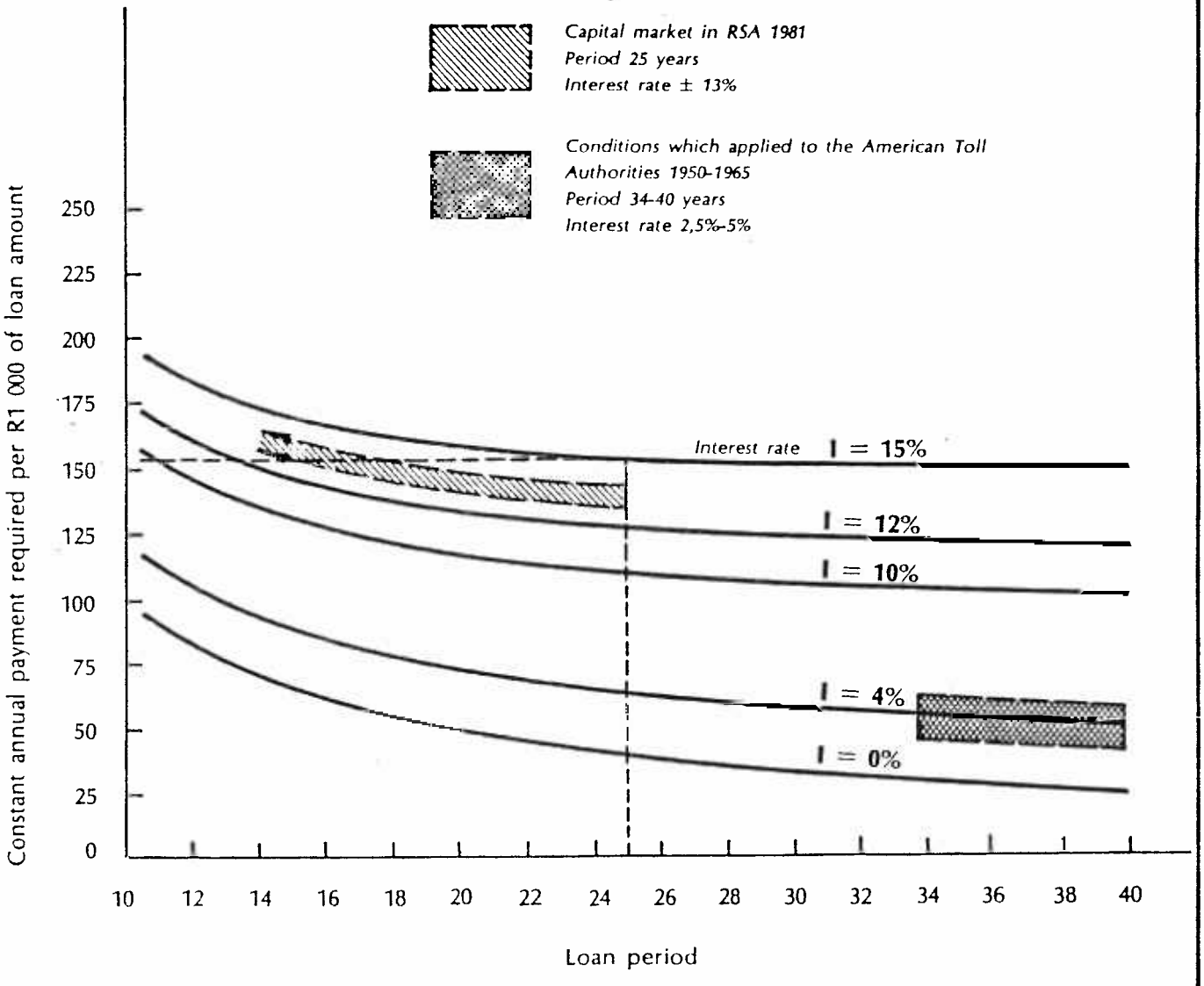
The impact of loan period and interest rates is shown in figure 3.1. From the figure it can readily be seen that a loan of for

TABLE 3.1
ESTIMATED INTEREST RATES

LOAN PERIOD (YEARS)	1982	1983	1984	1985
5	14,00	12,00	10,00	9,00
10	13,50	12,25	10,50	9,25
15	13,50	12.25	10,75	9,50
20	13,50	12,40	11,00	9,75
25	13,50	12,50	11,50	10,00

(Source: Senbank)

Loan serviced by constant value annual payments.



IMPACT OF LOAN PERIOD AND INTEREST RATE ON LOAN SERVICING

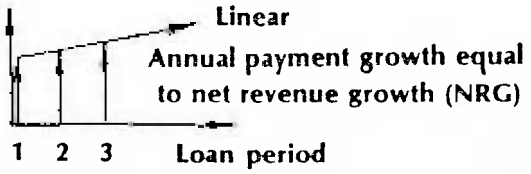
FIG. 3.1

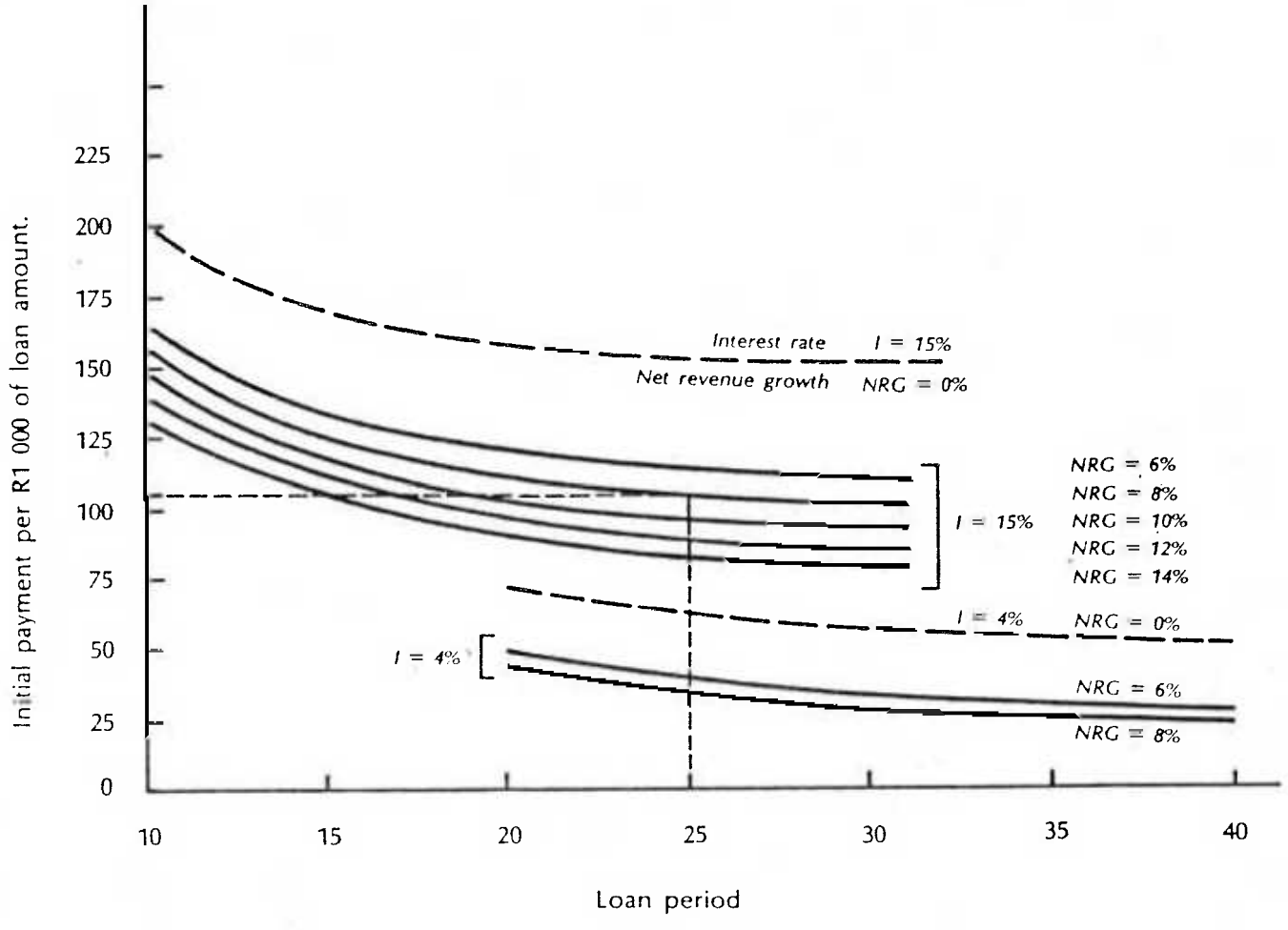
instance R200 million over 25 years at 15 percent interest, will require an annual repayment of R31 million. This implies that a toll entity should be able to earn R31 million per year in addition to funds required for annual maintenance and operation costs (including administration cost). Usually, however, a borrower is required to demonstrate that earnings will be more than capital and interest redemption. In the case of the proposed Fox Valley Toll Road in the U.S.A. (23), a first year interest coverage (first year revenue divided by first year interest) of 1,25 and a level debt service ratio (total earnings over lifetime of loan divided by total repayments of loan) of 1,50 were used. This requires net earnings of R37,5 million for the purpose of first year interest coverage and a total earnings of an average of R46,5 per year over 25 years in order to meet the level debt service requirement.

Also shown in figure 3.1 is the comparison between current conditions in the South African market and the conditions which applied to the American toll authorities during the period between 1950 and 1965. A typical loan then was for up to 40 years at interest rates in the region of 2,75 percent to 4,0 percent (see table 3.2) while indications are that the capital market in South Africa could only currently accommodate lifetimes up to 25 years at interest rates in the region of 14 percent by the end of 1981. Under these circumstances payments increase by a factor of approximately 3 over the quoted American conditions.

The conclusion can be made that conditions are much less favourable for loan financing in South Africa than was the case at the time when most of the American toll roads were established.

Loan serviced in the following assumed pattern:





IMPACT OF SERVICING LOAN IN ACCORDANCE WITH NET REVENUE GROWTH

FIG. 3.2

TABLE 3.2
EXAMPLES OF USA BOND ISSUES

Institution	Bond issue amount	Date of issue	Loan Period (years)	Interest rate (percent)
Richmond-Petersburg Turnpike	$ 69 000 000 $ 6 150 000 $103 000 000	1955 1958 1972	40	3,45 4,5 4,754
New Jersey Turnpike Authority	$771 100 000 $210 000 000 $365 000 000	1966-1969	40	4,75 5,87 6
New Jersey Highway Authority	$285 000 000 $ 44 000 000 $ 40 000 000 $ 50 000 000	1953/54 1954/64 1971 1978	35 24/34 30 33	3 - 2,75 3,25 - 3,4 4,25 5,3 - 6,6
New York State Thruway Authority	$500 000 000 $ 472 000	1953-1960 1954-1962	40 40	 3,21
Illinois Tollway	$415 000 000 $ 64 000 000 $ 14 250 000 $135 000 000	1955 1958 1966 1970	40 40 33 40	3,75 4,25 4 6,75
Texas Turnpike Authority	$ 4 580 000 $ 4 620 000	1977 1977	40 40	6,3 - 7,5 7
Dallas North Tollway	$ 33 650 000	1965	40	4

SOURCE:

F H Blackwell, Toll Facilities Manager, *The Richmond-Petersburg Turnpike, September 1979.*

Virginia Department of Highways and Transportation *Richmond-Petersburg Turnpike: Financial Statements, Year ended June 30, 1980.*

New Jersey Turnpike Authority *Annual Reports 1979 and 1980.*

New Jersey Highway Authority *Annual Report 1979.*

New York State Thruway Authority *Annual Report 1979.*

The Illinois State Toll Highway Authority *Annual Report 1979.*

Texas Turnpike Authority *Financial Statements: October 31, 1980.*

If, however, it was possible to negotiate repayment of a loan whereby repayment is made according to the growth in revenue as a result of inflation and growth in traffic, a project which cannot generate sufficient revenue under the previous scheme may become feasible as a result of smaller initial payments in the initial years when traffic volumes are low. The effect of this strategy is shown in figure 3.2. The initial payment of a loan of R200 million repaid over 25 years at 15 percent interest, then reduces to R21 million versus R31 million in the previous scheme, assuming a net revenue growth of 8 percent.

Gross toll revenue generated by a toll facility may be calculated by the product of axle-km travelled on the facility and the toll rate (expressed as an effective charge per axle-km). With reference to the aforementioned loan repayments, at least 1,4 million car-kilometers per day (or 14 000 cars travelling 100 km per day) would have to be tolled to service a loan requiring a first year payment of R21 million and 2,1 million car-kilometers per day for a first year payment of R31 million; assuming a toll rate of 2c per axle-km.

3.2.2 Revenue and cost constraints

The revenue and cost constraints are connected to the toll road or toll system itself. The revenue is a function of what the users are willing to pay for transportation and of the cost of using parallel routes. The cost elements include construction cost or loan repayment and interest charges, maintenance and operational costs which include administrative and toll collection costs.

The toll rate structure may be based on vehicle weight or the number of axles (discussed in chapter 4). Rates charged in the U.S.A., vary between 1 cent per axle-km and 3 cents per axle-km (6). It should be noted, however, that these charges do not necessarily represent the charge at which toll revenue will be maximised. The reason for this is that loan repayments in the U.S.A. do not always necessitate high toll rates, since loans were obtained at low interest rates and with long repayment periods. In the initial years of operation of North American toll roads inflation was low and toll rates were not raised periodically with the result that the American public is not used to periodic increases in toll rates. Presently, this results in political opposition when toll rate increases are proposed. Another aspect which makes an increase in toll rates difficult is that the Federal Government required that parallel routes of a high standard be provided in cases where the roads connecting at the terminals of a toll road were built with federal aid. The policy was that users using the federal-aid highway system should not be forced to use a toll road and competition with the parallel roads precludes substantial increases in toll rates. In Japan, however, this policy does not exist and subsequently competition with parallel routes is decreased. Since users do not have the option of using a high standard alternative route, the toll rates are higher in Japan, of the order of 4 cents per axle-km (from discussions with Japanese authorities).

Statistics on road construction and maintenance costs were not locally available, but estimates of construction costs obtained from consultants indicated construction costs of between R2 million and R3 million per kilometre of freeway. Maintenance costs are estimated at R1 000 per lane-km annually with major reconstruction of the pavement at a lifetime of 30 years.

PRINCIPLES AND POLICIES FOR POSSIBLE TOLL FINANCING OF ROADS IN SOUTH AFRICA

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Private Bag X193
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File No N1/2/1/1
September 1981

PREFACE

This document was prepared under the direction of the Toll Road Investigations Co-ordinating Committee, under the chairmanship of the Department of Transport. The committee was established in 1980 to co-ordinate the various investigations into the feasibility of toll financing of road projects in the Republic of South Africa. The committee consisted of representatives from the following organisations:

The Department of Transport
The Transvaal Provincial Administration
The Department of Finance
Metroplan (a planning group within the Land Transport Directorate of the Department of Transport)
Bruinette, Kruger, Stoffberg Inc.
Keeve Steyn and Partners Inc.
Compagnie Générale d'Automatisme
National Institute for Transport and Road Research
Institute of Foreign and Comparative Law
Van Niekerk, Kleyn and Edwards Inc.

The following members were responsible for the contents of the report:

Metroplan - Chapters 1, 2, 3, 4 and 11, co-ordination and final preparation of report
Bruinette, Kruger, Stoffberg Inc. - Chapters 7 and 8
Keeve Steyn and Partners Inc. - Chapter 9
Compagnie Générale d'Automatisme - Chapter 9
National Institute for Transport and Road Research - Chapters 6 and 10
Institute of Foreign and Comparative Law - Chapter 5

Advice and input was also provided by Professor A.E. Scheurkogel of the University of Stellenbosch.

All members of the committee were given the opportunity to comment on the contents of a preliminary report.

Depending on the toll rate structure and the type of toll system used, operational costs may be estimated at between 15 and 20 percent of gross toll revenues (based on U.S.A. figures from estimates obtained from the FHWA). Under South African conditions this figure should be lower due to lower labour costs and higher toll rates.

3.3 Feasibility of Toll Roads

In general three cases of revenue versus costs may be encountered for the situation where tolls are used to repay loans and offset other costs:

(a) The toll roads generates adequate revenue to repay the loan and offset other annual costs, not only in the long term but also in the short term viz first year interest coverage.

(b) The toll road generates adequate revenue to repay the loan and annual costs, but does not generate adequate revenue in the short term.

(c) The toll road does not generate adequate revenue to repay the loan in the long term and cover annual costs.

The feasibility of case (a) is simple - the toll road is feasible.

Consideration of the feasibility of case (b) is more complex. Based on international conditions with rising interest rates and shortening of loan periods such cases will be more prevalent than case (a). In fact, this is the situation existing in Japan. In general it may be concluded that the toll road is feasible. In the case of financing roads from current revenue as is currently

the case in South Africa, the economic viability of roads is evaluated on a long term basis with long term benefits compared with long term costs. The road is usually considered economically viable if the internal rate of return is found adequately high. Evaluation of the road in this fashion is similar to the feasibility of case (b). The problem reduces to the financing of the road in the short term. This may be accomplished by government subsidies, short term loans or cross-subsidisation from other toll roads. The use of government subsidies will be contrary to the principles set out in chapter 2, although it may be advantageous in times of economic recession to stimulate the economy by constructing roads, using government subsidies. Short term loans may only be viable in some cases, since investors may be concerned about the security of their loans if the feasibility is based on projections too far into the future. The use of short term loans will thus only be feasible when the toll road will generate adequate revenue within the first few years of its operation. Cross-subsidisation between toll roads is used in Japan. Revenues from established toll roads are used to subsidise other toll roads in the initial years of operation. This system is not unlike funding roads from fuel tax now used in South Africa. Fuel tax generated on existing roads is used to finance new roads. A distinction should also be drawn between this type of cross-subsidisation and cross-subsidisation which is used to finance projects unable to pay for themselves. In the case of the cross-subsidisation of toll roads, the road is able to pay for itself in the long term and the cross-subsidisation is only used to provide initial financing. Ultimately surplus revenues from the particular road may be used to cross-subsidise other roads.

A toll road corresponding to case (c) can generally not be considered feasible. If, however, the road is part of a toll road system and feeds traffic into the system to such an extent that such benefits or revenues created can offset financial losses, the construction of the road as a toll road may be considered.

Feasibility studies of toll financing of projects have been conducted in South Africa. These studies were conducted for the following projects:

(a) Three National Roads Projects: (see figure 3.3 for locations)

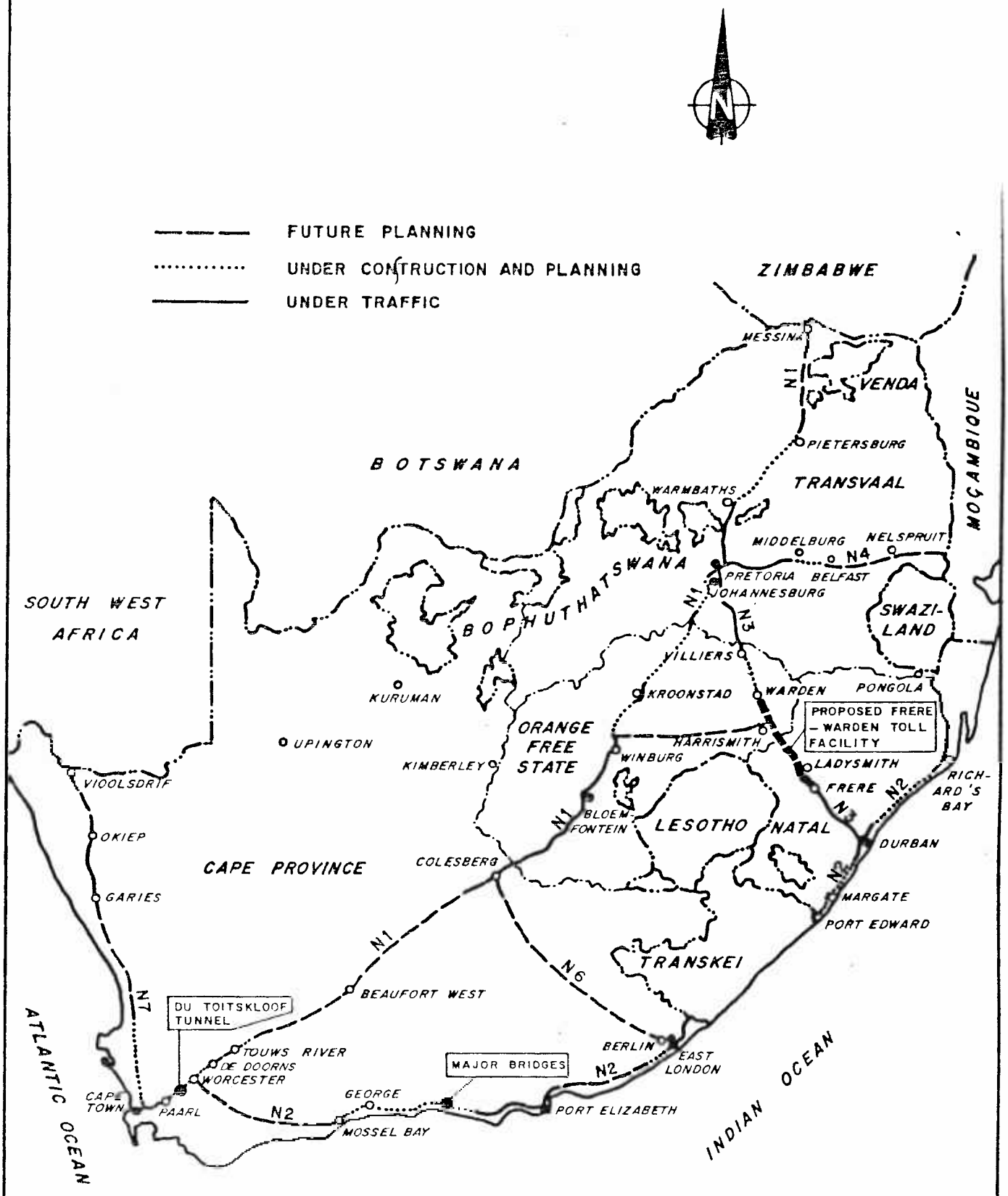
(i) The Du Toitskloof Tunnel on Route N1 between Cape Town and Worcester.

(ii) Three major bridges on the Garden Route (Route N2) over the Bloukrans River, Groot Rivir and Bobbejaans River.

(iii) The proposed road between Warden and Frere on Route N3.

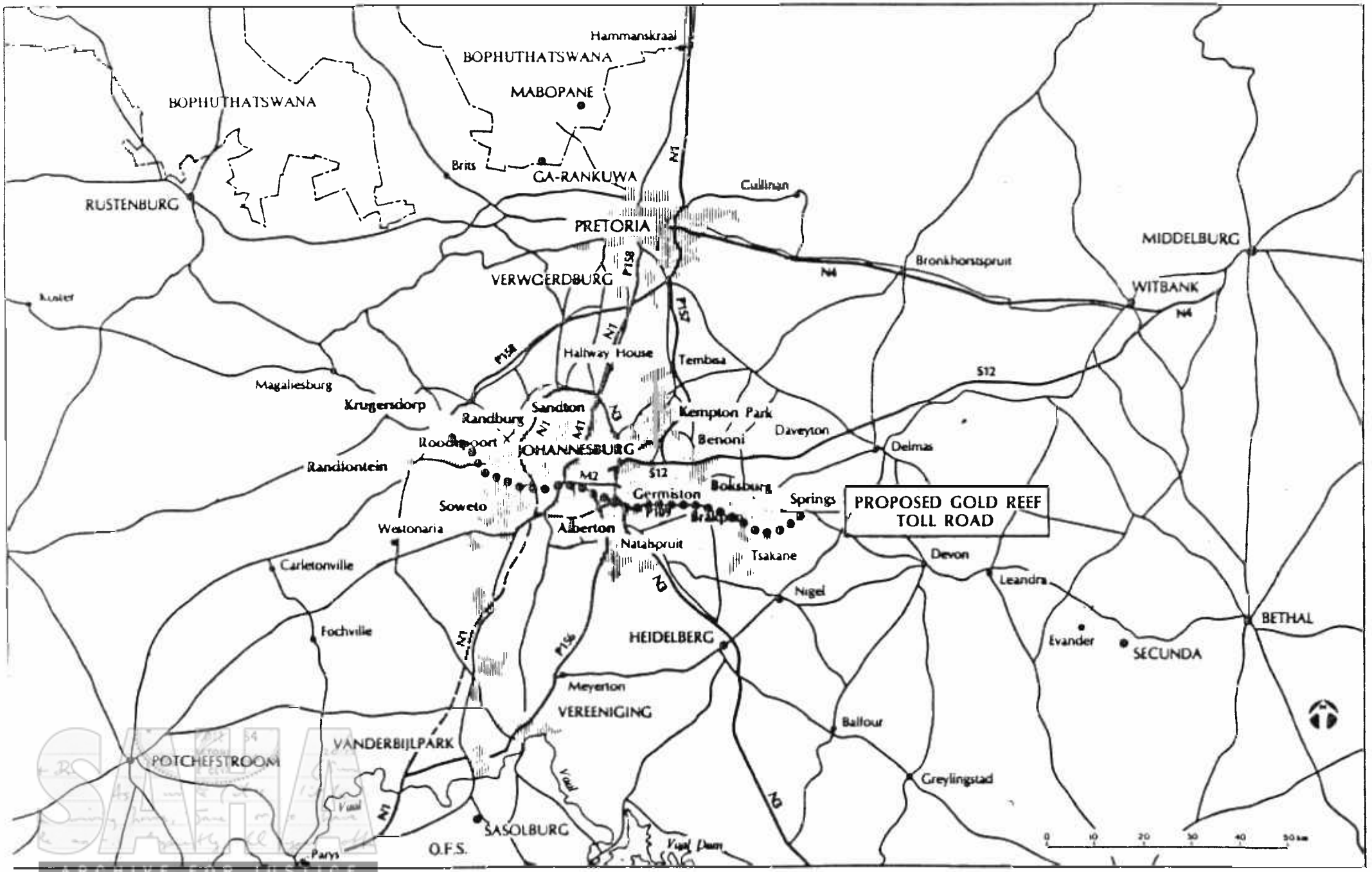
(b) The proposed Gold Reef Toll Road, between Krugersdorp and Springs on the route PWV 12A - M4 - P109/1 (see figure 3.4 for the location of the road).

Highlights of the findings of the feasibility studies are presented in the following paragraphs. For more details reference should be made to the feasibility reports (2, 7).



LOCATION OF PROPOSED TOLL FACILITIES: DU TOITSKLOOF TUNNEL, MAJOR BRIDGES ON THE GARDEN ROUTE, FRERE-WARDEN ON ROUTE N3.

FIG. 3.3



LOCATION OF PROPOSED GOLD REEF TOLL ROAD

FIG. 3.4

(a) The National Roads Projects

(i) The Du Toitskloof Tunnel

The purpose of this tunnel is to reduce the distance (by 11 kilometres) and steep grades now encountered on the Du Toitskloof Pass. The expected traffic volume by 1986 (the earliest possible opening date of the project) is expected to amount to an average of 6 000 vehicles per day of which 20 percent can be classified as heavy vehicles. The traffic volume is expected to grow at 6 percent per annum. At a toll rate of R1-00 per car; R1-50 for a car and trailer; R5-00 for a heavy truck or bus and R10-00 for any heavy vehicle with three or more axles, 80 percent of all light vehicles and 95 percent of all heavy vehicles are expected to use the tunnel.

The expected cost of the project (both tunnel and road) is R119 million (in 1981 rands) and the toll-related capital cost is estimated at R1,2 million for the single toll plaza required. Toll collection costs are estimated to be R393 000 per year and maintenance costs as R550 000 per year. All costs are escalated at 9,2 percent. Interest on a 20-year loan is taken at 12 percent.

With toll rates escalated at the rate of inflation, the financial analysis indicates that the project will finance itself.

(ii) The Bridges on the Garden Route

These bridges are designed to bypass the Groot River and Bloukrans passes saving 15 kilometres in distance and the passage of two steep passes. The expected average daily traffic by 1985 is 2 600 per day with 9 percent heavy vehicles. Traffic is expected to grow at 4 percent per annum. At a toll rate of R1-50 per car, R2-00 for a car and trailer, R7-50 for a truck or bus and R15-00 for heavy vehicles with three or more axles, 70 percent of light vehicles and 95 percent of heavy vehicles are expected to use the toll facility.

The construction cost of the bridges and road is estimated at R52 million (in 1981 rands) and the cost of the single toll plaza and other toll-related capital cost at R600 000. Toll collection costs are estimated at R217 000 per year and maintenance costs at R290 000 per year. All costs are escalated at 9,2 percent. Interest charges on a 20-year loan is taken at 12 percent.

With toll rates at the rate of inflation, indications are that the project will not be self-financing, unless traffic grows at a higher rate, i.e. 6 percent or toll rates are increased by 33 percent.

(iii) Warden - Frere

This road will effect a saving of 35 kilometers in distance over the existing road via Ladysmith. For analysis purposes this section of road was considered in two stages:

Stage (i) Frere - Keeversfontein.
Stage (ii) Keeversfontein - Warden.

Stage (i)

By 1987 the average daily traffic is expected to amount to 6 200 vehicles per day including 26 percent heavy vehicles. The traffic growth is projected at 6 percent per year. At toll rates of R1-50 per car, R2-00 for a car and trailer, R5-00 for heavy trucks and buses and R10-00 for heavy vehicles with 3 or more axles, 60 percent of all light vehicles and 70 percent of the heavy vehicles are expected to use the road.

The construction cost of the section scheduled for opening in 1987 is estimated at R60 million (in 1981 rands) and toll-related capital costs for the single toll plaza at R1,3 million. Toll collection costs are estimated at R405 000 per year and maintenance costs at R750 000 per year. All costs were escalated at 9,2 percent and the interest rate on a 20-year loan was taken at 12 percent.

Indications are that the project will be self-financing, using toll rates escalated at the rate of inflation.

Stage (ii)

By 1990 the average daily traffic is expected to amount to 6 600 vehicles per day of which 26 percent can be considered as heavy vehicles. Traffic growth is projected at 6 percent per annum. At toll rates of R2-00 per car, R2-50 for a car and trailer, R5-00 for heavy trucks and buses and R10-00 for heavy vehicles with more than 3 axles, 60 percent of all light vehicles and 70 percent of heavy vehicles are expected to use the road.

The construction cost of stage (ii) scheduled for opening in 1990 is expected to be R110 million (in 1981 rands) and toll-related capital costs at R600 000 (for enlargement of the toll plaza). Additional toll collection costs are small and maintenance costs are estimated to be R556 000 per annum. All costs were escalated at 9,2 percent and the interest rate on a 20-year loan was taken at 12 percent.

With toll rates escalated at the rate of inflation, the project will require a short extension of one year in order to pay for itself.

Several alternative layouts were investigated for all the projects and sensitivity analyses performed for the different variables.

(b) The Proposed Gold Reef Toll Road

This road is a vital element of the road system in the east - west Witwatersrand corridor between Krugersdorp and Springs. Main Reef Road, the most important existing arterial in the corridor, and its parallel arterials are at present heavily congested and large operating and time costs are incurred by motorists and commercial traffic. Current traffic volumes in the corridor range between 40 000 vehicles per day near Krugersdorp and Springs to approximately 120 000 in the central section. Approximately 13,6 percent of the average daily traffic volume in the corridor is classified as heavy vehicles.

It is expected that during the first year of possible operation (1986) toll road mainline volumes are expected to range from approximately 5 000 vehicles per day at the ends to approximately 40 000 near the centre of the route.

By the year 2000, these daily volumes are expected to have grown to about 50 000 and 70 000 respectively. The average trip length of potential toll road users is about 20 km of which 13 km is expected to be on the toll road at a 1981 toll rate of 1,6 cents per axle per kilometre.

Various alternative toll collection schemes and road layout schemes were investigated. Total construction cost for the most feasible alternative is estimated at R203 million (1981 rands), excluding R52 million already incurred in construction cost. The toll-related capital cost is estimated at R5,8 million (1981 rands) while toll collection costs are expected to be R2 million in the first year of operation and maintenance costs R0,3 million per year in the first year. Construction costs are estimated to escalate at a rate of 20 percent until the end of 1985 and 11 percent from that time onwards. The increase in other costs are estimated to be 15 percent until the end of 1985 and 9 percent afterwards.

Interest on a 20-year loan is taken at 12 percent, short term loans at 11 percent and short term investments at 9 percent.

The result of the financial analysis, taking capital and yearly costs and revenue into account (toll rates are escalated at the rate of inflation), indicates that the toll road will be feasible in the long term, but will require short term financing.

From the feasibility studies discussed above, it may be concluded that at least one of the projects considered, i.e.

the Gold Reef Toll Road, will definitely be financially feasible within the existing economic constraints. The Du Toitskloof Tunnel and the section of road between Keeversfontein and Frere may also be considered feasible, although the feasibility of these projects is more sensitive to the toll rate increases and traffic growth. The feasibility of the other projects is dependent upon the acceptance of higher toll rates and higher traffic growths. It should be kept in mind, however, that the economic lifetimes of especially the bridges and the tunnel are considerably longer than the 20 years of loan period considered. If a financing method could be found whereby the repayment period may be extended (by rolling over the loans), these projects may become feasible. Other considerations may also be taken into account such as the opportunity cost of energy (discussed at the beginning of the chapter) when making a final decision regarding the financial feasibility of the projects.

3.4 General Financial Considerations

From the previous section it was pointed out that it may be expected that a toll road may be feasible in the long term but short term financing problems will have to be overcome. It was also pointed out that cross-subsidisation between toll roads may be used to overcome this problem. In South Africa, this system may be implemented by incorporating the whole freeway system into a toll road system though tolling existing facilities would not be an easy task to accomplish. Revenue collected on existing freeways can then be used to cross-subsidise new toll roads. It should again be pointed out that this cross-subsidisation is not unlike the system now in use wherein fuel

tax generated on existing roads is used to finance new roads. It should also be pointed out that by tolling the freeway system the system of funding of other roads may be unaffected. For instance, in a toll road system, accurate accounts of vehicle-miles travelled can be kept and fuel taxes collected for other purposes on these roads can be returned to the toll system as part of its revenue. Thereby, double taxation can be avoided and the self-financing of the system can be retained.

4. ADMINISTRATIVE ASPECTS

4.1 Introduction

In chapter 2 of the report, five basic feasible types of administration of toll roads were identified:

(a) A general government agency.
(b) A government enterprise.
(c) A public corporation.
(d) A franchised private company with government aid.
(e) A franchised private company.

The ability of these administrations to obtain loans and the probable magnitude of the loans were discussed in the previous chapter. It was concluded that neither the first type of administration noted above, nor the last type of administration is feasible under current financial constraints and legal conditions (Local authorities may be considered but the scope of their financing abilities would have to be expanded considerably before large projects could be undertaken). There are, however, other aspects which have to be considered before deciding upon the appropriate type of administration. These aspects are:

(a) The extent to which various administrative functions can be performed, e.g. finances, maintenance, etc.

(b) The initial establishment of the organisation, i.e. one form of administration may be easier to establish than another within the existing constraints.

These aspects will be discussed in the following sections. In addition, the elements of the organisational structure will be discussed.

4.2 Administrative Functions

The major administrative functions which may be identified are:

(a) Toll collection
(b) Policing
(c) Personnel management
(d) Operation
(e) Planning of and investment in extensions or improvements
(f) Maintenance
(g) Public Information Systems
(h) Financial management

These functions will be discussed in the following paragraphs:

(a) Toll collection

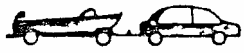
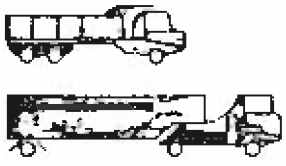
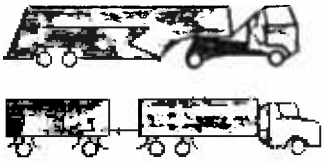
The magnitude of the task of toll collection depends mainly upon the toll collection strategy, the volume of vehicles, the type of system and method of collection, toll rate, structure and the number of collection points.

In chapter 7, toll collection strategies will be discussed. In short, variable tolls may be collected during various times of day, which includes the option of not collecting tolls at all. If tolls are not collected, for instance during early morning hours, toll collectors will not be required, which reduces the required number of toll collectors. In off-peak times, fewer collectors are required.

The two major types of toll collection, i.e. open and closed systems, will result in different numbers of toll collectors. In a closed system, a driver collects a ticket at the point of entrance and pays at the exit according to the

distance travelled. If the toll tickets are automatically dispensed at the entrance, fewer collectors will be required than in the case of manual dispensing. In the case of an open system, where a fixed amount of toll is collected at regular intervals on the road, fewer collectors are generally required than in a closed system. Automatic toll collection machines may be installed together with a number of toll collectors to cater for drivers who do not have the correct change and for trucks and other vehicles, which pay higher tolls than cars.

The toll rate structure may be based on the weight of the vehicle, the number of axles or on a system combining both. Charging vehicles according to weight appears attractive from the viewpoint of charging the full cost according to the damage done to the roadway, but such a system has not yet been implemented, primarily due to the problems encountered with dynamic weighing of vehicles and the resistance to charging vehicles according to damage caused to the pavement. A toll rate structure based on the number of axles is in use, e.g. by the Richmond Metropolitan Authority in the USA. Such a system does not have the advantage of charging vehicles according to the damage done to the roadway, since, for instance, cars, two-axle trucks and buses pay the same toll. It does, however, facilitate simple operation of toll collection, since collected tolls and the number of axles may very easily be correlated. A relatively small amount of information has to be collected and supervision related to fraud detection can be minimised. A system based on a distinction between heavy and light vehicles may be used. An example of such a system, used in France, is shown in figure 4.1. A distinction between light and heavy vehicles is made by measuring bonnet height and measuring the number of tires on each axle. As a result of measuring more variables than in a simple axle-based toll rate structure, more difficulties and opportunities for fraud may be encountered, necessitating more supervision and an increased toll collection staff.

CLASS 1	MOTORCYCLES	
	CARS WITH SHORT WHEELBASE	
	CARS WITH MEDIUM SIZE WHEELBASE	
	CARS WITH LONG WHEELBASE	
CLASS 2	CARS WITH SINGLE AXLE TRAILER	
	CARS WITH TWO AXLE TRAILER	
CLASS 3	TRUCKS OR UTILITY VEHICLES WITH TWO AXLES AND SINGLE WHEELS SMALL BUSES	
	TRUCKS WITH TWO AXLES AND TWIN WHEELS LARGE BUSES	
CLASS 4	TRUCKS WITH 3 AXLES	
	TRUCKS WITH MORE THAN 3 AXLES	

VEHICLE CLASSIFICATION BASED ON DISTINCTION BETWEEN LIGHT AND HEAVY VEHICLES

FIG. 4.1

The number of collection points, which is a function of the length and number of access points to the system, will have an appreciable effect on the required number of toll collectors. An urban road with a great number of access points, will require more collectors than a rural road of similar length.

Considering all the factors discussed above, it may be concluded that the number of required toll collectors will depend on the characteristics of a particular toll road. In order to assess the order of magnitude of the number of collectors required, two toll roads i.e. the New Jersey Turnpike and the Garden State Parkway in the USA may be taken as examples. Both roads carry heavy traffic - 4,8 billion vehicle-km on 220 km and 4,3 billion vehicle-km on 270 km respectively per year (11, 12, 13). From information provided by the two authorities, it was calculated that the number of toll collectors required amounted to 26 and 24 respectively per 100 km per lane of road. The New Jersey Turnpike has a closed toll collection system while the Garden State Parkway has an open toll collection system.

(b) Policing

Routine traffic law enforcement has to be maintained on a toll road in addition to the detection of toll evasion. A special police force similar to the Railway Police may be created which could then be paid for out of toll revenues. Alternatively, policing may be contracted for with normal police forces, which will probably be the more feasible option for South Africa.

(c) Personnel management

Staff members responsible for personnel management have to be provided.

(d) Operation

During the normal operation of the facility, removal of breakdowns and traffic control are the primary functions which have to be fulfilled. The closed nature of a toll road, especially in the case of using a closed system, lends itself to operating the system at optimal efficiency e.g. through ramp control. Furthermore, overweight vehicles may be detected and deviated from the system. Another operational function is the arrangements which have to be made to accommodate special vehicles e.g. oversize vehicles at toll plazas.

(e) Planning of and investment in extensions or improvements

During the evolution of a toll road or toll system, extensions and improvements will become necessary. Continuous monitoring of the needs for and feasibility of extensions and improvements will be required. Planning staff will therefore be necessary.

(f) Maintenance

Maintenance operations normally associated with a roadway have to be carried out. In addition, maintenance of toll collection equipment and related facilities also has to be undertaken.

(g) Financial management

The purpose of a toll road or toll system is to be financially feasible i.e. revenues must exceed costs in the long term. It is therefore imperative that the financial management of a toll road or toll system be of a very high standard. The financial management does not only include the most cost-effective management of all the administrative functions of the authority in addition to the retirement of existing loans, but also the financial planning of improvements and extensions to the system.

(h) Public information systems

Most toll authorities surveyed, issue some type of public information periodically. In order to issue such information, many authorities have created Public Information Departments within the framework of their administrations.

The distribution of information by the New Jersey Turnpike (11, 12) is carried out via news releases and a switchboard answering service. The news releases can concern information related to various topics e.g. accidents, weather conditions, traffic levels, road works in progress, expected delays and fuel availability. In addition, the New Jersey Turnpike also publishes newsletters via the Public Information Department. The "Trailblazer" has been distributed free to patrons since 1976, and covers turnpike news stories and special features on a monthly one sheet page. Other newsletters are "Pike Interchange" for employees and "Over the Fence", a newsletter for turnpike neighbours. In addition to these operations, the Public Information Department is also responsible for issuing maps and guides, investigating complaints against the turnpike, meeting

and escorting dignitaries and citizens interested in Turnpike affairs, issuing photographic material to the media and liaison with television film news. Several toll road authorities have similar public information systems. Variations include provision of information on tourist attractions and accommodation and also radio broadcasts.

It should be kept in mind that a toll road or system is a financial concern selling a product. Advertising the product effectively is therefore of vital concern. In the U.S.A., toll roads compete with alternative routes of high standard and have to offer several luxuries such as faster snow removal and greater security in order to sell the use of the toll road.

From the above discussion it may be concluded that the administrative functions of a toll authority include the functions normally performed by a road authority, but deviates from the normal functions in that financial discipline is more emphasized as well as marketing of the product. Taking these deviations from normal road authority functions into account, the candidacy of a government enterprise, a public corporation or a franchised private company as opposed to a government department, as probable forms of administrations, is underlined. A private company as a form of administration does, however, present problems in terms of policing and planning and implementation of improvements and extensions to the system as a result of a lack of expropriation rights.

4.3 Initial Establishment

In the initial establishment of a toll system, two major difficulties may be expected to arise i.e. with new technology and the operation of the system, and also with the handing over of existing facilities, if this were to be contemplated.

If a company with experience in the establishment and operation of toll roads were franchised to operate a toll system, initial establishment problems will be minimised. If existing facilities were incorporated in the toll system, as outlined in chapter 3, the handing over of such facilities to a private company many, however, present difficulties. From the viewpoint of initial establishment of a toll system, it therefore appears that there are advantages and disadvantages inherent in government versus private orientation. It does appear logical that long term considerations should override short term considerations and there are distinct long term advantages when aspects such as co-ordination with government road authorities in the planning and implementation of toll systems are considered.

4.4 Elements of the Organisational Structure

In chapter 3 it was concluded that the type of facilities most likely to be the subject of toll collection will probably be restricted to high standard freeway facilities. Inherent in the planning, construction and operation of such facilities is co-ordination. It is therefore imperative that all levels of government or road authorities have an input into the co-ordination of the activities of a toll authority. This co-ordination is furthermore important in view of the necessity to eliminate conflicting priorities of different road authorities. The fact that the facilities under consideration constitute the highest level of road systems and because the scope of such an undertaking is beyond the scope of local authorities under current circumstances (discussed in chapter 2), indications are that the primary responsibility should be with a central authority.

From the above discussion, it may be concluded that a toll authority should be centralised, but with input from the authorities where such facilities will be operated. A possible model of the policy-making board of such an undertaking may be to appoint as chairman the Director-General of Transport, with members of the board to include the Chief Director of Land Transport as well as the Director controlling Land Transport Finance within the Land Transport Directorate as well as the directors of provincial road authorities, with additional appointed members and also representatives from major metropolitan areas. At regional level only a core section of the policy-making board may be retained and supplemented with metropolitan representatives. If the board is constituted in this fashion, the centralisation of the policy-making will be retained but input from the metropolitan level will be realised.

If existing freeway facilities were to be taken over by the toll authority, representation of authorities currently responsible for such facilities will be essential in the transition period.

During the initial establishment of a toll road system, only a limited number of toll facilities may be established, while other road-related activities have to proceed in the normal manner, thus a small staff outside the existing road authorities will have to be created for the establishment and operation of the toll facility.

5. LEGAL ASPECTS

5.1 Introduction

A study of the legal aspects of toll road financing requires a detailed analysis of a number of Acts, including regulations made in terms of such. It also requires analysis of provincial ordinances and possibly also some regulations and bye laws emanating from local authorities. The interpretation of legislation which has relevance to the question of toll financing must be done with due regard to general rules of interpretation as expressed and amplified by the South African courts over the years. An analysis of the exact legal nature of tolls is also necessary, since in the present day system of financing of roads, toll financing is a new approach. Provisions in existing legislation which may at first glance appear to include toll financing could on further interpretation prove inapplicable to this means of financing. A complete study of the various legal implications of toll road financing must therefore include not only an interpretation of possibly relevant Acts but must also encompass, where applicable, an analysis of appropriate common law principles and of South African case law.

An investigation into the legal issues of toll financing of South African roads entails three basic elements, i.e. first, a study of existing legislation, both national and provincial, second, a survey of legislation in some countries where such toll financing has been introduced and third, an investigation of the possible administrative systems to provide for such toll financing and the legislative measures which will be necessary to introduce these systems. These elements are discussed below. In view of the fact that an exhaustive study of the legal aspects was not

feasible and justified at this stage of the investigation of toll financing of roads, only very pertinent legal aspects were considered. Preliminary findings regarding these aspects are also presented in this chapter.

5.2 Elements of the Legal Aspects of Toll Financing

5.2.1 Existing South African legislation

In analysing existing South African legislation so as to investigate the possibility of introducing toll financing of roads, the following aspects have to be taken into account:

(a) The constitutional powers of the central government, provincial and local authorities as regards territorial jurisdiction, powers to tax, raise loans and deal with expenditure as well as powers to create administrative systems to implement toll financing. Also, the powers of national states and possible restrictions emanating from existing legislation concerning Black and other areas, have to be explored.

(b) Existing legislation concerning roads and road transportation such as the Urban Transport Act 1977 and National Roads Act 1971 as well as other and provincial legislation must be scrutinised to establish how a suggested system of toll financing might influence the present state of affairs.

(c) Legislation concerning other institutions such as the South African Railways and Harbours, utility and development corporations (e.g. Escom, etc.) and other government departments also have to be considered to obtain an overall picture of the implications of toll financing.

5.2.2 Foreign legislation

An investigation of foreign legislation should mainly concentrate on the way in which the system of toll financing is regulated in other countries and what appropriate lessons, from a legal point of view, can be deduced therefrom. Two aspects will have to be noted, i.e. the financing and administering of the system involved.

5.2.3 Administrative systems

This part of the investigation will have to deal with the practical way in which toll financing can be introduced and regard should be given to such aspects as speed limits, access and egress, advertising, collection and administration of income, penalties, jurisdiction, services, maintenance and control. Also the possibilities of a state operated system or a system operated by public or private utility corporations should again from a legal point of view, be distinguished as far as such matters as liability, control, jurisdiction, etc. are concerned.

5.3 Preliminary Findings Regarding Existing Legislation

As stated before, the introduction of toll financing inherently raises a number of complex legal issues. In addition to the main consideration of probable amendment of existing legislation

or introduction of new legislation to facilitate the establishment of a system of toll financing, a comprehensive study of the legal implications of the introduction of such system must necessarily cover a wide range of ancillary legal aspects pertinent to its administration. This is further complicated by the fact that several alternatives exist regarding the exact manner in which tolls may be introduced. For example, a system of toll financing can be as a means of supplementing existing financing of roads or an alternative to the present system for certain types of roads. The legal implications of the former approach naturally would differ from the latter. Furthermore, there are different ways in which such system could be administered and the authority, organisation or enterprise which would be charged with its administration.

The following summary and comments illustrate the legal problems which existing legislation could pose if a system of toll financing of roads were to be introduced.

5.3.1 Power of the central government to legislate on toll financing

The legislative power of the Republic is vested in the Parliament (s 24 of the Constitution Act 32 of 1961). Parliament is the sovereign legislative authority in this country and is empowered to legislate on all matters conducive to peace, order and good government (s 59). It is, therefore, able to amend existing legislation or introduce new legislation which would provide for the establishment of a system of toll financing of roads.

In view of the comments made above regarding the different alternatives as to how the toll system could be structured and administered, a study of the legal implications of such a

system as seen within the framework of existing legislation would naturally involve a lengthy and detailed investigation of a number of Acts, regulations etc., all evaluated in the light of the number of different possible proposals regarding its structure and administration. For example, a decision to introduce a system of tolls as a primary or only method of road financing, and a further decision to entrust its administration to some newly constituted body or enterprise could possibly involve substantial changes in the provisions of a number of Acts, e.g. the National Roads Act 54 of 1871 and probably the introduction of new legislation.

5.3.2 Powers of a provincial council to pass ordinances concerning the collection of revenue by means of the imposition of tolls

(a) Fundamental legislative powers of provincial councils

Consideration of the powers of provinces to introduce toll financing is important should a province decide to proceed with the establishment of such a system even in the absence of a decision at a national level to do so.

The fundamental powers of a provincial council to legislate on matters concerning the province, are set out in the Constitution Act 32 of 1961. It should, however, be noted that the fundamental powers have been given greater definition in certain instances by the provisions contained in other Acts of Parliament, e.g. the Financial Relations Act 65 of 1976. An investigation of the question as to whether a provincial council has power to legislate on

toll financing therefore requires a study, not only of the Constitution Act, but also of all other legislation which might be of relevance to it. Before proceeding to consider the provisions of these various Acts, however, it is convenient to briefly set out certain general principles which have evolved out of judicial decisions over the years, concerning the interpretation of legislative provisions empowering provincial councils to pass ordinance.

(b) General principles of interpretation

The power of a provincial council to legislate is an "original and not delegated authority" *(Johannesburg Consolidated Investment Co v Marshall's Township Syndicate* 1917 AD 662 at 666). Therefore, once the provincial council has been empowered to legislate on a matter it may do so as freely and effectively as Parliament. Two fundamental rules however limit a council's ability to legislate:

(i) A provincial council may only legislate on matters which are within its jurisdiction. If, however, a matter is within its jurisdiction the power to legislate is meant to be exercised to the full. Therefore, in addition to the express powers granted to it the following implied powers are included:

(1) Those which are necessary to effect the exercise of the expressly granted powers *(Middelburg Municipality v Gertzen* 1914 AD at 552; *Sindwane v Escourt Town Council and Another* 1958 1 SA 725 N);

(2) Those such as would normally go with or be associated with the express power *(R v Kemp* 1933 NPD 451; *Steyn v City Council of Johannesburg* 1934 WLD 145);

(3) Those such as would be helpful even if not necessary to the exercise of the express power *(R v Dickson* 1934 AD 231).

(See in general Steyn *Die Uitleg van Wette* 4d and VerLoren van Themaat en Wiechers *Staatsreg* 2d).

As regards the specific question of implied powers to tax or collect revenue, however Steyn on p 278 states: "Om gelde of belastings op te lê sonder 'n uitdruklike of duidelike versweë magtiging skyn as net so 'n onbillikheid beskou te word as 'n onnodige of oormatige inbreuk op regte. Die bevoegdheid om gelde of belastings op te lê word dan ook in die algemeen nie aangeneem nie dan alleen waar dit ten duidelikste blyk dat dit die bedoeling van die wetgewer was om daardie bevoegdheid te verleen." The intention of legislator to grant authority to the provincial council to collect revenue must therefore be clear and unmistakable.

(ii) An ordinance of a provincial council may not conflict with an Act of Parliament. Parliament retains its authority over the whole domain of legislation and may repeal, directly or impliedly, any ordinance passed by a provincial council *(Middelburg Municipality v Gertzen* 1914 AD 544 at 550).

The abovementioned principles must be borne in mind when considering whether the existing legislative provisions granting provincial councils the power to legislate would empower a council to pass legislation regarding tolls.

(c) The Constitution Act 32 of 1961

(i) Section 80 of the Constituion Act provides: "Subject to the provisions of this Act, all powers, authorities and functions which immediately prior to the commencement of this Act were vested in or exercised by the executive committee of a province in terms of the South Africa Act 1909, shall as far as the same continue in existence and are capable of being exercised after the commencement of this Act, be vested in the corresponding executive established under this Act."

A detailed consideration of these extended powers of the executive is not necessary in the light of provisions of s 6(2) of the Financial Relations Act 65 of 1976 which will be discussed below.

(ii) Section 84(1) provides: "Subject to the provisions of this Act, the Financial Relations Consolidation and Amendment Act, 1945 (Act No. 38 of 1945), and the assent of the State President as hereinafter provided, a provincial council may make ordinance in relation to matters coming within the following classes of subjects, namely -

(a) direct taxation within the province in order to raise revenue for provincial purposes;

(g) local works and undertakings within the province, other than railways and harbours, and other than such works as extend beyond the borders of the province and subject to the power of the House of Assembly to declare any work a national work and to provide for its construction by arrangement with the provincial council or otherwise;

(h) roads, outspans, ponts and bridges, other than bridges connecting two provinces;

(m) all other subjects in respect of which Parliament may by law delegate the power of making ordinances to the provincial council."

The Financial Relations Consolidation and Amendment Act 38 of 1945, has been replaced by the Financial Relations Act 65 of 1976. The relevant provisions of this Act must obviously be considered before any attempt is made at interpreting the abovementioned provisions of the Constitution Act in relation to the power to legislate in respect of tolls.

(d) The Financial Relations Act 65 of 1976

(i) Section 2 provides: "All expenditure incurred by any province in respect of matters entrusted to that province shall be defrayed from the provincial revenue fund".

(ii) Section 3 provides: "The funds required by a province for the defraying of its expenditure in respect of matters entrusted to it shall be derived from revenue as defined in Section 1 of the Provincial Finance and Audit Act, 1972 (Act No. 18 of 1972), and which has, in terms of the provisions of section 2 of that Act, to be credited to the revenue account referred to in that section, and a province shall not apply its funds to any purpose other than solely in respect of matters entrusted to it."

(iii) Section 1 of the Provincial Finance and Audit Act 18 of 1972 defines "revenue" as all taxes, rates, fines and casual and other receipts of a province, from whatever source they may arise, over which the provincial council has power of appropriation, and includes capital grants and other moneys paid from the State Revenue Fund to the provincial revenue fund."

(iv) Section 6(2) of the Financial Relations Act provides "Notwithstanding anything to the contrary contained in sections 80 and 84 of the Republic of South Africa Constitution Act, 1961 (Act No. 32 of 1961), a provincial council shall, unless and until Parliament by law otherwise provides, have power to raise revenue by way of taxation through the sources specified in Schedule 1 and through no other souces whatever."

(v) Section 6(3) provides: "The said sources of revenue shall, for the purposes of those sections of the Republic of South Africa Constitution Act, 1961, referred to in subsection (2), be deemed to be matters in respect of which a provincial council may, subject to the provisions of this Act, make ordinances, and any law which the provincial council was competent to make, which was in force in any province on 1 April 1945 and which provides for raising or management of any such revenue, shall be deemed to be a law which the provincial council of that province may by ordinance repeal or amend in so far as it relates to such a source of revenue."

(vi) Schedule 1 provides, *inter alia,* for :

4. Wheel tax or tax on vehicles, including motor and other vehicle propelled by mechanical power.

(e) Conclusion

From the above provisions the following conclusions can be drawn:

(i) That a provincial council may only collect taxes or revenue where the enabling legislation clearly confers such power on it. See para (b) above.

(ii) That while the provisions of s 84(1) of the Constitution Act might at first glance give rise to a possibility that provincial councils might have power to legislate on the matter of tolls the provisions of the Financial Relations Act, as read with the quoted provision of

the Provincial Finance and Audit Act, have defined and limited the provincial councils' powers to collect revenue. The only provision in Schedule 1 to the Financial Relations Act which could remotely be considered relevant to toll financing, is that referring to wheel and motor vehicle taxation. It is submitted, however, that such taxes would probably not be capable of being seen as including toll revenue. The exact legal nature of toll revenue requires further study. The taking of tolls has been described as "a method of taxing the public for the cost of construction, repair of roads and reimbursement of capital invested" *(Geiger v Perkiomen and R Turnpike Road* 167 Pa 582, 3 1 A 918). This would suggest that toll revenue would not be capable of inclusion under the taxation described in Schedule 1.

(iii) Section 3(2) of the Financial Relations Act provides that a provincial council is limited to collection of taxation through the sources enumerated in Schedule 1 "unless and until Parliament otherwise provides". Analysis of all possible legislation which could extend the provincial councils' powers to include a power to impose tolls, has not as yet been completed. However, the most obvious Acts which could have extended such power viz the Urban Transport Act 78 of 1977 and the National Transport Act 54 of 1971 would not appear to contain any provisions which would empower a provincial council on its own accord to introduce such legislation.

(iv) In the light of the above it is submitted in this preliminary stage that a provincial council would not appear to have the power to legislate in respect of toll financing and that such a power would have to be conferred on it in terms of s 84(1)(m) of the Constitution Act and s 11 of the Financial Relations Act.

In view of the fact that toll financing is envisaged as forming a revenue fund which should be used specifically to defray the costs of road construction and maintenance the question arises as to how the revenues collected could be administered. One aspect of administration involves the question as to the fund into which the revenue would have to be paid. Section 88 of the Constitution Act provides for the establishment of a provincial revenue fund into which all revenue, as defined in s 1 of the Provincial Finance and Audit Act, must be paid. Assuming, therefore, that a provincial council did have the power to pass ordinances providing for toll financing, the revenue collected in this way would have to be paid into the provincial fund. Furthermore, in terms of s 5 of the Provincial Finance and Audit Act "moneys in the provincial revenue fund shall be appropriated for the services of the province by an appropriate ordinance."

5.3.3 Power of local authorities to impose tolls

The power of local authorities to impose tolls in respect of roads within their area of jurisdiction must be evaluated,

not only in the light of powers granted by the provincial authority, but also of other legislation which might grant a local authority any specific power. For example, s 21 of the Urban Transport Act, provides that a local authority of which the area under its jurisdiction, or of which a portion under its jurisdiction, has been included in any metropolitan transport area may, with the approval of the administrator, impose a levy on, *inter alia,* "specified classes of motor vehicles entering specified portions of the metropolitan transport area in the area under its justification at specified times." This provision would appear to have been directed principally at a system which would discourage motor vehicle use in congested urban areas. The interpretation of this provision as being wide enough to include a power to levy tolls, is debatable. In any event the funds collected in terms of this provision must be paid into the Consolidated Metropolitan Fund provided for in s 18, and the money may be utilized only to defray expenditure as described in s 18(2) of the Act.

A detailed study of all Acts, Regulations and Ordinances giving powers to local authorities to collect and administer revenue and to administer roads, is required before a conclusion can be drawn as to how toll financing could be established by such authorities, or how a toll financing system established on a national or provincial level would affect their legal position.

5.3.4 Selected important relevant acts

To complete the study of existing South African legislation one will be required to investigate and analyse all statutes concerned with roads, motor vehicles and road transportation. Although it will be necessary to scrutinize all such legislation in order to properly assess the impact of the introduction of toll financing, it is immediately apparent that certain statutes

will be more important than others, especially in the preliminary stages. These are the Transport (Co-Ordination) Act No. 44 of 1948; the National Roads Act No. 54 of 1971 and the Urban Transport Act No. 78 of 1977. A brief summary of the substance of these Acts follows.

(a) Transport (Co-Ordination) Act No. 44 of 1948

This Act abolished the Central Road Transportation Board and the Civil Aviation Council and provided for the establishment of a National Transport Commission and an Advisory Commission on roads. It set out the purpose of the Commission as being to promote and encourage the development of transport in the Repbulic and, where necessary, to co-ordinate various phases of transport in order to achieve the maximum benefit and economy of transport service to the public.. Amongst the other functions of the Commission, which relate specifically to roads, is the obligation to take existing and contemplated transport facilities into consideration in the performance of its functions in terms of the National Roads Act 1971 and the Urban Transport Act 1977. A further function of the Commission is to advise and direct the local road transportation boards in the exercise of their powers.

(b) National Roads Act No. 54 of 1971

The main object behind the introduction of this Act was to provide for the construction and control of national roads. The Act repealed the National Roads Act of 1935 and the

amendments to it but specifically provided that the National Road Fund should continue to exist under the control of the National Transport Commission. Subject to Parliament and the provisions of s 12 of the Transport (Co-ordination) Act 1948, the Commission shall pay from it all expenditure incurred in connection with the exercise and performance of its powers, functions and duties in terms of the National Roads Act and the regulations made thereunder.

Amongst other things the commission may, as it deems fit, defray the cost or part of the cost incurred by an Administrator or local authority in connection with a road or other works which the Commission feels has become necessary as a result of the construction of a national road. Two additional matters, also of particular relevance to the introduction of a toll system, are provision for the Commission to defray the cost or part of the cost of any publication or publicity material which, in the Commission's opinion, will promote the objects of the Act, and, provision for the payment of compensation to any person for loss, damage or inconvenience suffered, in the Commission's opinion, as a result of the exercise of its powers or duties under the Act.

The Act sets out the powers, functions and duties of the Commission for the purposes of the Act, which include powers of purchasing, hiring or otherwise acquiring movable or immovable property and land adjoining a national road; to erect any buildings or other structures on such land; to conduct surveys or investigations which it deems desirable in connection with a national road; to

plan design or construct any national road; to recommend to the Minister the introduction of legislation relating to roads or road traffic; to do all such work in connection with roads in general or in connection with a particular road (whether a national road or not) as the Minister may approve or may direct the Commission to do.

The Commission has power to delegate most of its powers under the Act to the Administrator of a province to be exercised by the Administrator concerned in that province or in respect of a particular national road or other matter in that province.

The Act also deals with such matters as entry upon land; expropriation of land, material on or in land and the right to use land temporarily (a study of the Expropriation Act 1975 will be required here); advertisements on or visible from a national road (the Advertising on Roads and Ribbon Development Act 1940 is relevant too); and the control of traffic on and use of a national road.

The State President and the Minister of Transport may, on the recommendation of the Commission make regulations on many subjects in terms of the Act.

(c) Urban Transport Act No. 78 of 1977

The purpose of this Act is the promotion of the planning and provision of adequate urban transport facilities. It provides for the establishment of metropolitan transport areas and metropolitan advisory boards; the establishment and administration of an urban transport fund and for every metropolitan transport area the establishment of a metropolitan transport fund.

The functions of the National Transport Commission regarding the objects of the Act are, *inter alia*, the regulation and control of the formulation and application of an urban transport policy in any metropolitan area, which the Commission believes to be efficacious; the determination of the functions of any authority concerned in the implementation of such policy; the power to ensure that such authority implements such policy properly in all respects and the co-ordination and supervision of all matters concerning urban transport in the Republic.

The Commission is to administer the Urban Transport Fund and shall defray from it, except where Parliament provides otherwise and subject to s 12 of the Transport (Co-ordination) Act 1948, all expenditure incurred in connection with the exercise of its powers or functions in terms of this Act or the regulations made thereunder.

The general powers of the Commission are several but include the powers to consider and approve a properly prepared transport plan in relation to any metropolitan transport area which an Administrator has submitted, effect such alterations to any such plan as it may consider necessary; purchase, hire or otherwise acquire movable or immovable property for the purposes of the Act; recommend to the Minister of Transport the introduction of legislation regarding any matter connected with urban transport or urban traffic control which it believes will further the objects of the Act and take any other steps, with the approval of the Minister, which it considers necessary to achieve the objects of the Act.

The Act also sets out the functions of the metropolitan transport boards which are mainly directed towards advising the Administrator on transport matters within the metropolitan transport areas concerned and making recommendations to the Administrator concerned concerning the utilization of moneys made available from the Urban Transport Fund for the implementation of any transport plan.

For every metropolitan transport area, in which the areas or a portion thereof, under the jurisdiction of two or more local authorities have been included, the Minister of Transport, after consultation with the Administrator concerned, shall designate one such local authority as the core city. Where the area or portion thereof, under the jurisdiction of only one local authority has been included in a metropolitan transport area, that local authority shall be the core city. The functions of a core city are described in the Act and include the administration of the consolidated metropolitan transport fund for its metropolitan transport area.

Powers of local authorities, including the powers to expropriate land, impose levies and to make regulations are dealt with by the Act.

Although the statutes described above deal, in varying degrees, with matters which will become important with regard to the "mechanics" of organizing and introducing a toll system they give a far from complete picture. Examples of other legislation which must be studied are the Road Transportation Act 1975; the Expropriation Act 1975; the Advertising on Roads and Ribbon Development Acts. In addition, there are many regulations

are many regulations and the relevant case law to be considered. Furthermore, most legislation dealing with roads is to be found in the Provincial Ordinances.

5.4 Preliminary Findings Regarding Administrative Structures

It has been suggested a toll financing system, expecially if organized on a total major road basis, might best be administered in South Africa in the form of a government enterprise or a public corporation. Accordingly, some of the legal aspects attaching to both these forms of administration, are considered below.

5.4.1 Government enterprise

A government enterprise functions as part of the executive government within the existing state machinery under the appropriate minister and with all the functions and powers authorized by the enabling statute.

An excellent example of the administration of a government enterprise may be seen in the South African Railways and Harbours Administration. In this context the term "Administration" refers to the State President, the Minister of Transport, and the Railways and Harbours Board. The actual management and working of the railways are carried on by the General Manager, subject to the control of the Minister, The Railway Board Act of 1962, as amended, has consolidated the laws designating the authorities charged with the administration, control, management and working of the railways, ports and harbours of the Republic and defined the powers, duties and functions of the Railways and Harbours Board.

Apart from special statutory provisions, the Administration of the Railways and Harbours has normal contractual and delictual capacity rights and liabilities. In other words, the Administration is in the same position as any ordinary trading company. Further by virtue of s 1 of the State Liability Act 1957, a government enterprise has been made specifically liable for the wrongs committed by its servants.

The powers of the Administration are far-reaching and cover all aspects of rail and harbour control. Whether or not a power may be exercised despite the fact that it will cause interference with private rights depends upon the nature of the particular act contemplated. The enquiry in each case is whether an interference with private rights is justified, having regard to the common law rights of third persons.

In the exercise of its powers, any government enterprise will be subject to the doctrine of ultra vires. This means that the administrative body must act within the confines of the power conferred upon it by its enabling statute. In addition, all administrative action, in accordance with the general principle of legality, must take place within the bounds of the empowering act, and must also comply with all the common law rules which postulate the intention of the ideal legislature (unless the rules have been excluded specifically or by necessary implication).

The servants of the administration are public servants and it is the State President who is vested with the powers of appointment and discharge, and of increasing or reducing their emoluments. He is empowered however to delegate these powers by regulation. Disciplinary infringements and offences are also dealt with by statute.

(a) Representation

As a government enterprise is a State authority the composition of its governing body will be regulated by statute. Such composition may be effected by government appointment, by nomination by statutorily defined constituencies such as provincial executives and local authorities within a circumscribed region, or by the government after consultation with these constituencies.

An example of a varied composition in a state body may be seen in that of the National Housing Commission. The Housing Act 1966 states that the Commission shall consist of not less than eleven and not more than fourteen members. The relevant section then specifies that three members must be of particular professions; that three shall be persons with general knowledge of or experience in local government, one of whom shall also have special knowledge of rural housing conditions; that two shall be designated by the Minister of Co-operation and Development and finally that at least one member must be a woman.

(b) Establishment

Any statutory board is established by statute; its powers and functions must be set out and its functions will commence on a given date, sometimes by notice in the Government Gazette. Turning again to the example of the South African Railways and Harbours, Act 70 of 1957 gives the Administration wide powers regarding control, management and superintendence within its area of jurisdiction. The area of jurisdiction is

also defined by the act which enables the Administration to function and organize across the whole of the country.

(c) Handling over of existing facilities

Providing that the enabling statute makes such provision, a government enterprise should be able to acquire existing facilities either by means of expropriation and/or by the use of its power to contract independently. For instance, the Community Development Board established under the Community Development Act 1966 may meet the cost of expenditure incurred in the exercise of its powers in carrying out its functions and in the performance of its duties. One of the fund's sources of revenue is moneys derived from the sale or lease of land or buildings owned by the Board. For the purpose of achieving its objects the Board has power, inter alia, with the approval of the Minister, given either generally or in a particular case, and subject to such conditions as he may, in consultation with the Minister of Finance, determine to acquire or hire such property as it may consider necessary for the effective performance of its functions; and subject again to the approval of the Minister, to acquire by purchase, exchange or otherwise any immovable property.

The Administration of the South African Railways and Harbours is empowered to expropriate property, whether movable or immovable including servitudes or other rights for the purpose of pursuing its lawful activities, subject to the provisions of certain other Acts of Parliament and to any

obligations lawfully imposed affecting the property. If the Administration and the owner cannot agree on the amount of compensation, the matter must be decided by a court of law. In negotiating the amount of compensation by voluntary agreement, the administration has no constraints placed upon it but a court of law must apply the considerations laid down by the Act.

Apart from actually acquiring land the Administration has wide powers to enter and effect works upon land; and it may also have rights of servitude, which must be exercised reasonably.

(d) Government subsidies

Statutory Boards receive funds through parliamentary estimates and appropriation and are under Auditor General and fiscal control. The National Housing Fund, established under the Housing Act 1957, for example receives such subsidies; amongst other things the fund consists of -

"all moneys appropriated by Parliament from time to time for the purposes of this Act and paid over to the Secretary at such times and in such manner as determined by the treasury. (S 3 Housing Act 1966)."

On the other hand the Community Development Fund referred to above consists of, inter alia,

"loans granted to the board, on such conditions as the Minister of Finance determine, out of moneys appropriated by Parliament for the purpose."

The South African Railways and Harbours Administration is financially independent and accountable to Parliament. It is engaged in a business concern and must employ business principles in carrying out its work.

5.4.2 Public Corporation

Although the concept of a public corporation as a form of public enterprise is firmly established in South African law, very little legal authority exists on the specific subject of the fundamental legal principles which govern such corporations. As a result the following comments concerning general and specific aspects of public corporations are largely based on a systematic analysis of existing legislation concerning general and specific aspects of public corporations are largely based on a systematic analysis of existing legislation concerning public corporations as evaluated in the light of applicable general legal concepts and principles. In the very brief time available for this investigation, it has been impossible to conduct an in depth investigation of all legal questions which might be raised were a public corporation established to administer a total major road system. Furthermore, as regards certain of the specific questions which arise, it has not in all instances been possible to offer conclusive answers and solutions at this stage. In such cases the nature of the legal problems have been outlined and tentative indications as to their possible solution offered.

The term "public corporation" embraces a number of different types of corporate entities which vary not only in respect of their various objectives but also as regards their structure and general operation. This renders concise definition of a

public corporation difficult, if not impossible. However, a study of the various existing public corporations reveals sufficient common elements as would allow certain basic deductions concerning the nature of, and principles applicable to such corporations. Some of these are set out below.

A public corporation is created by an Act of Parliament (e.g. the Broadcasting Act 22 of 1936, now replaced by the Broadcasting Act 73 of 1976, established the SABC; the Electricity Act 42 of 1922, now replaced by the Electricity Act 40 of 1958, established ESCOM; the Iron and Steel industry Act 11 of 1928, now replaced by the South African Iron and Steel Industries Corporation Limited Act 119 of 1979, established ISCOR). The constituent statute must confer independent corporate personality. In other words, the corporation is a juristic person and is therefore, for example, capable of entering into contracts, suing, being sued, acquiring and alienating property, etc. The constituent statute must entrust the corporation with a limited range of functions of a governmental nature. Such functions are exercisable over a defined but fairly extensive geographical area often comprising the whole country. A public corporation is legally independent of the central government, with the possible exception of matters affecting general policy.

As has already been mentioned public corporations may in practice differ from each other in a number of ways. One reason for such differences is the fact that the purpose and nature of work undertaken may vary substantially from corporation to corporation.

In some instances public corporations in reality assume the nature of commercial businesses, while in others they are more in the nature of managerial or regulatory agencies. These differences naturally result in variations in the provisions which a constituent statute will contain. However, it is possible to isolate certain broad categories which will normally be contained in constituent statutes viz those providing for the establishment of the corporation, its objects, general powers, functions and duties; those providing for the composition, appointment and duties of a governing body; those providing for its financial structure and operation (including accounting requirements); and a number of provisions concerning matters ancillary to, and necessary for the efficient operation of the corporation, e.g. matters concerning employees, powers of expropriation, powers to acquire undertakings, etc.

A public corporation, especially one which has the nature of a commercial business, may in many ways be compared to a private or public company. It is, however, normally exempt from the operation of the Companies Act unless such provisions which are not inconsistent with the provisions of the constituent statute, are expressly applied to it (e.g. s 30 of Act 73 of 1976; s 35 of Act 119 of 1979). In general the constituent statute will provide that the corporation can only be dissolved by an Act of Parliament.

As mentioned above, the constituent statute of a public corporation will set out the objectives, powers and functions of the corporation. The activities of the corporation must be undertaken in accordance with these provisions and may not

go beyond them. The corporation therefore is subject to the operations of the ultra vires doctrine. It has been mentioned above that public corporation may in practice closely resemble companies in its commercial operations. However, it appears that a public corporation, unlike companies, are subject to the added requirement that their operations be conducted in the public interest (Garner Administrative Law 5ed p 348).

(a) Representation

The present system of road administration involves the participation, at different levels and in different areas, of various agencies of e.g. the Department of Transport, the National Transport Commission, the provincial authorities and the various metropolitan authorities. If a public corporation were established to administer a total major road system, the question would arise as to whether the existing authorities could obtain representation on its governing body or other body of the corporation.

The constituent statute of a public corporation will contain provisions regarding all matters concerning the composition, appointment and duties of the governing body of the particular corporation. The actual composition, appointment and conditions for appointment of members of the governing body may vary substantially from one corporation to the next. In general, however, provision will be made for the creation of a governing body, e.g. a commission board, board of directors etc., the members of which will normally be appointed either by the State President (as in the case of ISCOR). Provision will

usually be made for the appointment of a chairman. In some instances, as in the case of ISCOR, additional provision is made for the appointment of a managing director.

Each constituent Act will normally contain provisions concerning conditions for the appointment of persons as members of the governing board, including certain restrictions as to persons who may not be appointed as members. In general persons will be disqualified from being members if they have been declared insolvent or have been convicted of a criminal offence and sentenced to imprisonment without the option of a fine. Apart from these general restrictions certain other provisions disqualifying a person from membership may be made, e.g. that a member may not be a member of the Senate, the House of Assembly, a provincial council etc. (as in the case of ISCOR); that he may not have a financial interest in an undertaking conducted by the corporation (e.g. ESCOM); that he shall not be a member of a specified government department or enterprise (e.g. ESCOM); that he may not engage in remunerative employment outside of the corporation (e.g. ESCOM).

It will be noticed from the above that apart from the general restrictions mentioned, there are not strict rules applicable to all public corporations as to classes of persons who are disqualified from becoming members of the governing body. it is, however, suggested that as a rule persons would be disqualified from membership where their appointment could lead to a conflict of interests as a result of their holding office in, or being otherwise employed by a government agency, department, enterprise or other commercial enterprise.

As regards representation on the governing body of a public corporation of present road administration interests, much would depend on the actual objectives structure, powers and functions of such a corporation as this would form a basis for a decision whether a possible conflict of interest situation could arise.

The above discussion has concentrated on the question of representation on the governing body. It should, however, be mentioned that representation could also be considered by way of membership of advisory boards, committees (e.g. as in the case of the SABC) or other subsidiary boards charged with specific limited functions (e.g. ESCOM). It is possible that such a system of advisory bodies could be adopted to ensure representation of interests of a regional nature.

(b) Establishment

As has already been indicated a public corporation is created by an Act of Parliament. The constituent statute makes provision for the constitution, powers, functions and duties of the corporation and all matters relevant to its effective operation. It would serve no purpose to deal here with the various forms which a public corporation administering a total major road system could take, nor to discuss provisions which would have to be contained in the constituent statute. One question which, however, merits some consideration is that as to whether a public corporation

established to administer a total major road system could, at least in the initial stages, confine its functions to a limited number of roads or road systems.

In principle there would appear to be no reason why a public corporation could not be granted the necessary powers to gain control of the major roads in stages provided that the necessary provisions for this were incorporated in the constituent statute. An example of powers for progressive acquisition of undertakings can be found in s 7 of the Electricity Act which provides for the acquisition of undertakings by ESCOM either after investigation by the Commission or on the direction of the Minister. However, it should be noted that while it is suggested that in theory there would probably be few impediments to the acquisition of roads in stages, practical difficulties could, however be encountered. Whereas ESCOM came into existence during the early stages of development of electricity supply facilities in this country, a public corporation established to administer certain types of major roads would be required eventually to take over a fairly extensive existing system of roads which until its establishment were administered under a comprehensive and somewhat complex administrative system. Until such time as the corporation took over such existing major roads, the present system of road administration would have to be maintained at least in some form. Questions relating to jurisdiction in a large number of matters would naturally be raised and would have to be investigated in detail. Furthermore, since the National Transport

Commission is charged with a number of powers and duties regarding roads, a number of legal problems could be encountered were it planned to transform this agency into or replace it with a public corporation.

(c) Handing over existing facilities

As indicated in the previous section the constituent statute can, where necessary, provide for the acquisition of existing undertakings or facilities by a public corporation.

The question whether existing facilities could be acquired without payment of compensation depends on a number of factors, inter alia on how the facility was originally financed. In the case of roads the matter is rendered somewhat easier by the fact that the cost of construction of such facilities would to a large extent have been met by government subsidies. A decision as to whether facilities could be transferred to a public corporation without demanding compensation requires detailed investigation of a number of legislative instruments. Lack of time has prevented a detailed study of such statutes. It is however suggested that if any legal barriers presently exist to such transfer, these could possibly be solved by amendment of existing legislation.

(d) Government subsidies

Public corporations, especially those having the nature of a commercial business, are often intended to pay their own way. However, this would not appear to imply that a public corporation may not receive any form of government

subsidisation (Garner p 353). In addition to pure subsidisation there exist a number of other types of financing, such for example, long term, low interest loans. Public corporations normally have powers to raise loans in various ways thus facilitating this method of financing.

(e) The National Transport Commission

The present system of road administration in practice requires the involvement of a number of authorities. It has been suggested that the establishment of yet another agency concerned with the administration of roads would constitute an unacceptable further fragmentation of the overall administrative function. It has further been suggested that if a public corporation were established, it could possibly take the place of the National Transport Commission or that the National Transport Commission could be converted into such a corporation. Certain problems regarding such a proposal would be encountered. Firstly, the National Transport Commission does not only concern itself with matters concerning road transportation, but also has certain functions which concern civil aviation. Although in practice the aviation and road transportation functions are conducted separately substantial changes to the Transport (Co-ordination) Act 44 of 1948 would be required. Furthermore, even as far as road transportation is concerned, the National Transport Commission is charged with the performance of a number of functions which are not related to major freeways, e.g. its functions relating to metropolitan transport areas as provided for in the Urban Transport Act 78 of 1977.

The above comments are not intended at this stage to suggest that the replacement of the National Transport Commission by a public corporation for the purpose of road financing, is totally impossible but rather to illustrate that a number of legal problems would have to be carefully considered before such a step could be taken.

6. SOCIAL AND POLITICAL ASPECTS

6.1 Introduction

The introduction of toll collection on roads in South Africa will encounter some measure of political opposition, especially if only selected roads are tolled. It is reasonable to assume that at least part of the opposition will be due to misunderstanding and lack of public knowledge regarding the complex financing and other issues involved. For this reason public communication regarding toll financing will be important. These aspects will be discussed in the following sections.

6.2 Socio-political Issues

Unfavourable reaction to toll collection which may be encountered include:

(a) Resistance to tolls based on the grounds that the road user is already contributing to infrastructure development through fuel taxes, vehicle licences, etc. In this case it must be made clear to all parties concerned whether current user charges are sufficient to account for the expenditure on major roads (shown in chapter 2 not to be the case) Furthermore, the necessity for the construction of additional roads and the need for toll financing should be demonstrated.

(b) Resistance to tolls as a result of geographical discrimination, i.e. if tolls we collected in one region and all other taxes in this region remain unchanged. If, for instance, fuel taxes collected on the toll facility

are returned to the toll authority and used to defray part of the costs of the road, then the problem may be alleviated. The problem of discrimination may be accentuated if the toll road serves a homogeneous group such as one with low incomes or one particular race.

(c) Opposition resulting from inconvenience to local residents because a proportion of road users are unwilling to pay tolls and subsequently divert to local roads and streets. If a good alternative route existed, this problem may be partly avoided.

All of the above unfavourable reaction may to a large extent be circumvented if the decision to construct a toll road as opposed to no road is properly reached and explained to the users.

6.3 Public Communication

The importance of public communication in the early stages of establishment of a toll facility has already been stressed. Such public communication may range from extensive open meetings with the public and subsequent surveys of opinion to less comprehensive informed assessment of opinion by dealing only with public leaders. As this communication process is expensive, extensive surveys in the preliminary investigations of the feasibility of toll financing are not recommended. For the initial stages it is recommended to have group discussions with community leaders combining both information dissemination and collection. During such discussions the strength of feeling regarding the unfavourable and favourable reactions can be assessed.

If the outcome of the initial investigations are favourable, then a more extensive public communication process is desirable to obtain detailed reactions to assist in the planning and design of individual systems. This should begin with the setting of clear objectives (for example whether a comprehensive public participation programme is to be undertaken, or whether it be limited to information dissemination or to opinion assessment). The techniques used will depend on the objectives and will differ between projects.

It is likely that the attitudes of South Africans to the new concept of tolls will be easily influenced by the mass media, and that these attitudes will change rapidly with time. This will need to be borne in mind when planning and interpreting the results of public communication. For these reasons it will also be desirable to assess attitudes throughout South Africa and not only in the immediate vicinity of proposed facilities. The mass media should also be drawn in very closely in any public communication exercise.

7. OPERATIONAL ASPECTS

7.1 Introduction

In the following sections, several concepts and issues related to the operational aspects of toll roads will be discussed in order to clarify these concepts with a view towards qualitatively assessing costs and the impact of alternative systems of operation. The following points will be discussed:

(a) Toll collection systems
(b) Interchanges
(c) Traffic diversion and toll collection strategies
(d) Rest areas and other facilities
(e) The treatment of special vehicles and reduced toll rates

7.2 Toll System Alternatives

Highway toll collection systems are of two distinct types:

(a) the open system with toll plazas across the main roadway and generally at certain entrance and exit ramps; and

(b) the closed system with toll plazas at each end of the toll road and off the main roadway at all points of entrance and exit.

Under the open system, patrons pay a toll at each toll plaza as toll tickets are not used. Under the closed system, each patron is issued a ticket as he enters the toll road which he surrenders as he pays his toll at the exit toll plaza. Some toll roads with high traffic volumes employ a combination of both systems. To facilitate the movement of commuters in certain

sections at peak hours, an open system is often used, generally with many points of free access and egress. Closed systems are generally employed in toll roads which supplement existing highways in high volume, long trip length traffic corridors, and require an adequate network of connecting highways to serve the widely spaced interchanges - 15 to 25 kilometres apart.

Several considerations have to be taken account of in designing a toll collection system, some of which are listed below:

Closed system advantages

1. It is possible to charge a precise toll rate per kilometre travelled because the entrance and exit points of each user are known.

2. Detailed traffic statistics are readily available through analysis of the information punched in the toll tickets.

3. Each vehicle stops no more than two times for toll purposes, once on entering the road and once on leaving. Drivers pay a toll only once.

4. Traffic flow is uninterrupted on the main roadway except at the terminal barriers.

Closed system disadvantages

1. High toll-related construction and operating cost, since all ramps are tolled and must therefore be equipped and attended.

2. The nature of a closed system requires tickets to be carried which identify the point of entry. These tickets may not be lost or damaged in which cases automatic determination of the fares cannot be done.

3. Sophisticated equipment is required to determine the fares and to monitor the amount of toll collected.

4. All traffic has to stop twice: once at the entrance ramp where a ticket is received, and once at the exit ramp where the toll is paid.

5. Higher capital cost trumpet-type interchanges are used in the closed system so all ramp traffic will move through a single toll plaza, thus minimising toll collection costs.

Open system advantages

1. Certain toll gates may be operated unattended with simple automatic toll equipment, resulting in lower operating costs.

2. Lower cost diamond or cloverleaf interchanges may be used because many ramps are free, and full-time coverage by toll collectors would not be required at all ramps.

3. Because they are low in cost and need not all be attended, closer spaced interchanges to provide greater traffic service for present or future secondary traffic generators are permissible under the open system. In this way, the open system will encourage more uniform land development.

4. Many users need stop at only one toll plaza, and depending on the system only very long trips need stop at more than one or two. In the case of a closed system each vehicle always has to stop twice.

5. Experience has shown that drivers stopping at a mainline toll barrier frequently report accidents or disabled vehicles which otherwise might be undetected for longer periods.

Open system disadvantages

1. The amount of toll paid is not always precisely related to the distance actually travelled. Generally, the more mainline barriers are introduced, the closer related the amount of toll to the distance travelled.

2. Trips along the toll road cannot be monitored exactly.

3. Depending on the type of open system, traffic is stopped on the main line, sometimes more than once.

Apart from these considerations, certain basic questions also emerge from the analysis. Depending on the answers to these questions, a variation of principles in open system configuration can evolve:

1. Should a person be allowed to enter the toll road without having paid? This principle implies in effect a system where all on-ramps are being tolled, while all exit ramps are free.

2. How many stops would be permissible for the average trip or a through trip? In other words, will a system comprising five mainline barriers have an unacceptable irritating effect on the users as compared to a system comprising only two mainline barriers on a route of say 70 Km long.

3. What degree of inequality is allowable in assessing the toll rate structure? Obviously the degree of inequality in toll rates vary from about zero with a closed system (where everybody pays precisely according to the distance travelled) to very high with a system where only the entrance ramps are tolled at a constant rate. In general, in the case of a combined open-closed system, the more ramp and mainline barriers in the system, the closer the amount of toll paid in relation to the distance travelled.

4. Can certain low-volume and short trip movements be allowed toll-free use of the facility or should all movements always be tolled?

5. What system would be the most preferable from a public acceptance point of view: a system where free entrance and exit are permitted, and tolls are being charged at a mainline barrier only, or a system where traffic is also tolled at the appropriate entry or exit ramps?

6. Should an urban toll road always be able to control traffic demand during peak hours through a metering system? If affirmative, the system where all entrance ramps are tolled is again advantageous.

7.3 Interchanges

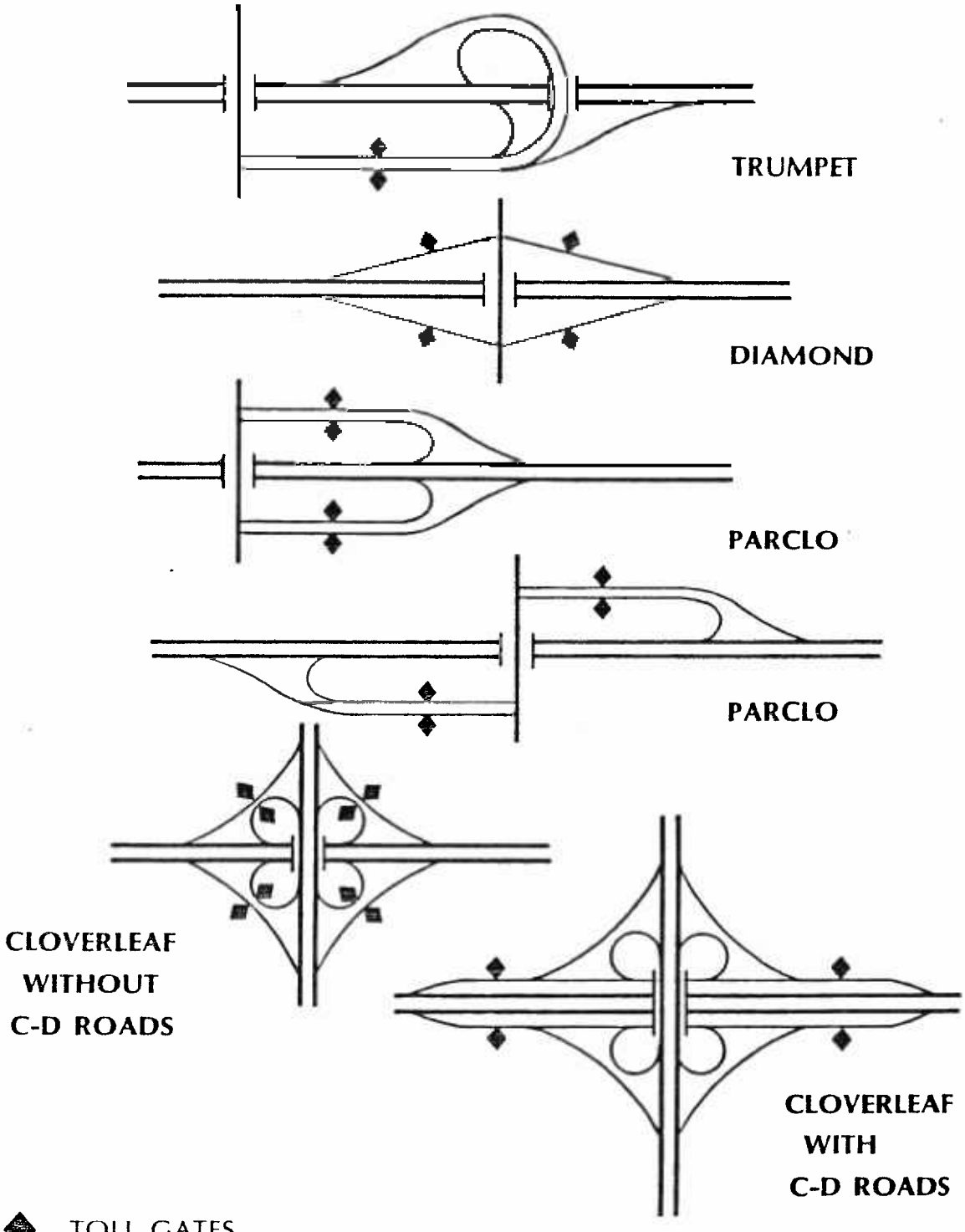
Interchanges on a toll road should be designed taking into consideration the cost of construction as well as maintenance and operation (which includes toll collection cost).

Examples of such interchanges are shown in figure 7.1.

A trumpet interchange is normally used with a closed system only and will result in the minimum cost regarding toll facilities, since only one barrier is required. It does require an extra bridge, which is not required at a diamond interchange. This additional cost may offset the cost savings related to the toll facilities. A parclo requires fewer isolated toll facilities than a diamond interchange, but requires either a widening of a bridge or an extension of the ramps, resulting in higher construction cost than the diamond.

In the case of freeway to freeway interchanges, several variations may be used. Toll barriers may be constructed on a full cloverleaf interchange, as shown in figure 7.1, but problems may be encountered with stopping at the toll barriers on the loops with high traffic volumes.

In conclusion it may be stated that every interchange should be evaluated seperately, taking into account expected traffic and local construction conditions and thereby choosing the solution resulting in minimum total construction, maintenance and operating cost.



ALTERNATIVE INTERCHANGE LAYOUTS WITH TOLL PLAZAS

FIG. 7.1

7.4 Traffic Diversion and Toll Collection Strategies

The total volume of traffic on a toll road will be dependant on:

(a) The total travel demand in the corridor.

(b) The cost of travel on the toll road as opposed to alternative routes.

The cost of travel is mainly composed of vehicle operating cost and time cost. Considerations such as comfort and convenience may also influence the driver's choice of route. In the case of the toll road, the toll is then added to the other costs and the consideration of comfort and convenience. As the toll level increases, traffic will accordingly divert from the toll road to alternative routes. From a financial viewpoint, the toll level should be increased up to the point where the total revenue (traffic volume multiplied by the toll rate) is a maximum.

In off-peak times operating cost may be reduced by decreasing the number of collectors or not collecting tolls at all e.g. during early morning hours. By following such strategies, the total net revenue (total revenue minus operating cost) may be increased. This policy does, however, have disadvantages. Road safety may be impaired since people travelling just before toll reduction time may stop to ensure not paying the toll, while those travelling shortly before toll collection starts will tend to speed for the same reason. It is also difficult to apply this strategy on long roads in a closed system, where average travel time is of the order of several hours. A considerable amount of toll evasion might occur.

From a road pricing point of view, it is desirable to charge tolls according to the marginal cost principle, which effectively will result in higher tolls during peak hours. It will tend to spread the peak hour volume, but again, undesirable affects may arise immediately before and after times prior to the time when toll rates are charged.

From the above it may be concluded that variable toll rates may be theoretically desirable, but may have serious practical implications.

7.5 Rest and Service Areas

Any long haul toll road necessitates the provision of rest and service areas at convenient locations. To avoid additional tolling, these facilities must be included inside the system.

Service areas comprise at a minimum a service station with parking space, public toilets, and optionally, a store, snack bar or restaurant.

Concession of service areas to oil companies may result in sizeable revenue to the toll road operators.

Siting of rest areas (equipped with toilet facilities) and restaurants at scenic locations, would be an added attraction for the road users.

Service areas are commonly located about 40 km apart, the rest areas being placed about halfway between these service station areas. Rest and service areas are not normally provided on urban/suburban toll sections serving essentially short haul traffic.

Rest and service areas must also be clearly signposted with an indication of the distance to the following rest and service area.

7.6 The Treatment of Special Vehicles and Reduced Toll Rates

Free travel on toll roads is normally restricted to police, service and maintenance vehicles, emergency vehicles, road official vehicles, military and possibly government vehicles.

As far as reduced toll rates are concerned, it is important to note that the toll being levied is normally on the vehicle and not on its occupants, so that in the case of carpools and buses they already benefit by a reduction since the fare is divided amongst the passengers. The problem of reduced rates for certain categories of users is therefore more a social or political one than that of toll. In the case of physical restrictions, where expansion of a toll facility becomes impossible and additional travel demand cannot be accommodated, or in the case where a shortage of capital makes expansion impossible, consideration may be given to encourage car-pooling and use of public transport, by reducing rates.

Reduced tariff rates or free travel vehicles should be processed in a normal toll lane with the help of special tickets or passes dispensed through the proper authority, and not through a loosely monitored procedure, as this would tend to create an uncontrollable fraud source.

Emergency vehicles must be able to by-pass toll lanes to avoid time loss, especially at times of maximum demand. To this effect full road barrier plazas and large ramp plazas have to be equipped with by-pass lanes. These by-pass lanes must be wider than normal heavy vehicle lanes to permit the passage of abnormal sized vehicles as well. They should be operated by manually or remotely controlled barriers to avoid illegal use by unauthorised traffic.

8. ENGINEERING ASPECTS

8.1 Introduction

In chapter 3 it was concluded that a toll facility would normally be a high standard or extraordinary facility with high volumes of traffic. Another characteristic of a toll facility, is that it constitutes a financial enterprise and therefore the provision of additional facilities e.g. rest areas becomes a matter of financial concern and not only of necessity.

In the following sections, road standards, provision and layout of facilities and equipment will be discussed.

8.2 Road Standards

A toll road is usually designed as a multi-lane divided freeway. Additional road and safety standards are sometimes incorporated as part of selling the toll road. Such additional safety and comfort features include rest and service areas at frequent intervals, a high level of policing, high geometric design standards, reliability to move traffic at a high level of service under all traffic and weather conditions, neatly and well maintained facilities and roadway environment.

8.3 Layout and Facilities at Toll Plazas

Toll roads have additional features which are not normally associated with a road.

The primary additional features are toll plazas. An example of a toll plaza is shown in figure 8.1.

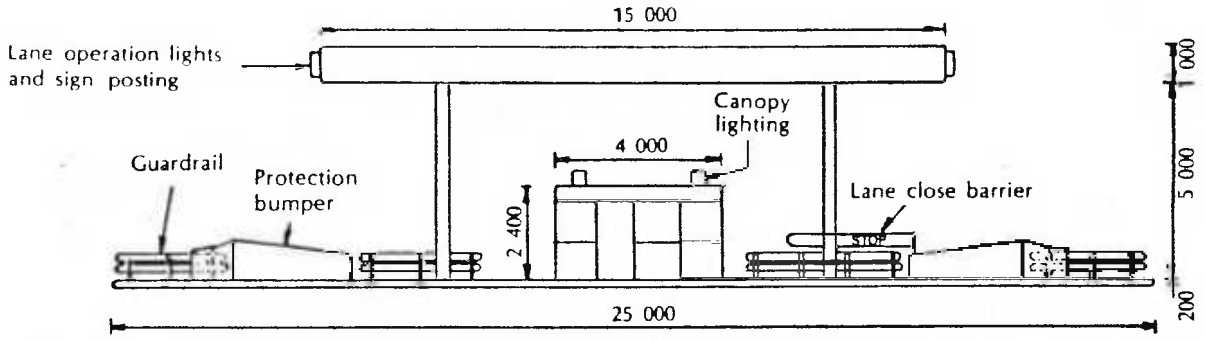
The general layout of the toll plaza consists of a number of parallel toll lanes separated by islands accommodating toll equipment and/or booths.

To take care of alternative peak traffic periods the central lanes should be equipped for operation in either direction. To allow this, the road median must be discontinued for some distance on both sides of the barrier.

It is common practice on large plazas to reserve the central lanes for passenger car traffic which gives them a higher capacity and which allows automatic toll collection.

The noses of the islands (or both noses in the case of reversible lanes) should be equipped with a protecting concrete barrier to avoid a vehicle crashing into the booth. The width of the islands and lanes are as shown on figure 8.1.

The whole of the toll gate barrier facility must be covered by a canopy which does not have to extend to the extremities of the islands but only cover the central part, thus protecting booths and equipment. At both extremities of the barrier (i.e. in each direction) a by-pass lane must be provided for emergency and abnormally loaded vehicles. These lanes should be of a width sufficient to accommodate most, if not all, abnormally sized freight. These should be operated by a barrier remotely controlled from the control building. The control building ranging in size from 20 x 10m to 5 x 10m, depending on the size of the plaza, is located laterally on either side of the road.



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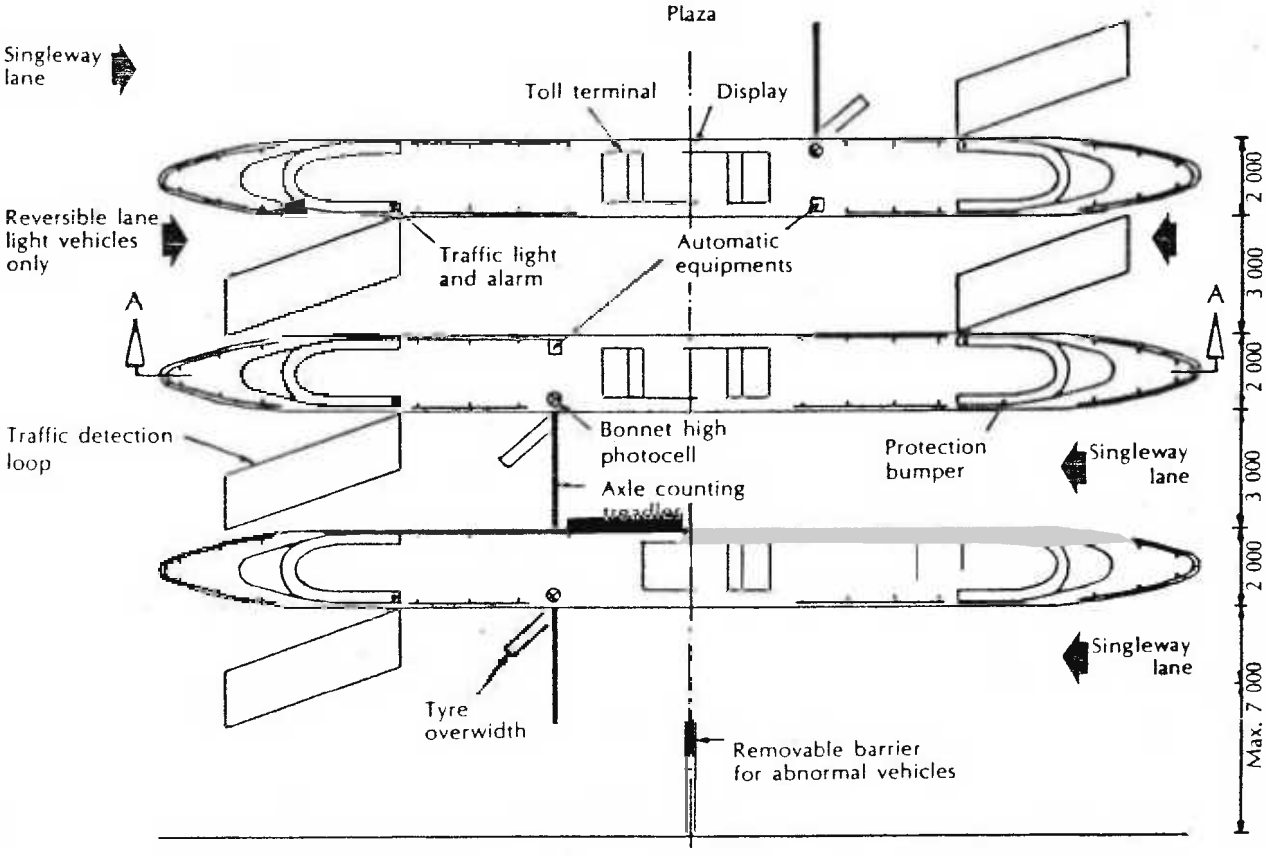

LAYOUT OF TOLL PLAZA

FIG. 8.1

The control building will normally accommodate;

- A control room facing the road and containing all toll monitoring equipment, data collection processor if any, and power control panel.

- A strong room.

- A dressing room with cupboards for the attendants.

- Toilets.

On larger plazas it would also comprise an accounting room for the attendants, a room for the police and a rest room for staff.

At large mainline plazas the services between control building and the toll booths should preferably be in a service and pedestrian tunnel. This arrangement provides safety to the toll collector and facilitates money bag handling.

Besides automatic toll equipment or toll booth equipment, each toll lane has to be provided with:

- Vehicle detectors: one activating loop at the toll equipment position, preferably supplemented by a second loop for trailer detection and one passage loop for vehicle departure detection, and an axle counting treadle.

- Traffic lights or control barrier with alarm siren.

- Lane operation lights indicating to the approaching driver whether the lane is open or closed (this should preferably be supplemented by a manual barrier).

- Optionally automatic vehicle classification equipment comprising:

  - axle counting treadle

  - double wheel or wide wheel detecting treadle

  - vehicle height and trailer coupling optical scanner detection (if vehicle height is used as part of the classification system).

It is to be noted that in practice automatic vehicle classification equipment can only be used for post-classification, that is, checking of the classification keyed in by the toll attendant. Preclassification would require that classification equipment be located at a distance up-stream of the toll booth at least equal to the maximum length of truck-trailer combinations. Due to varying vehicle length, correlation between classification and vehicle present in front of the toll booth would be lost.

Particular attention must be given to signposting problems, especially at points where the driver has the choice between a tolled and untolled route. The signs should be large, legible and repeated at least twice.

Other places where clear signposting is essential are approaches to toll plazas (particularly mainline barriers) where speed reduction, indication of truck lanes, automatic lanes for light vehicles with change and/or credit cards, should be clearly displayed sufficiently in advance. Signposting of toll tariffs for light vehicles and of coin types acceptable for automatic toll collection is also advantageous.

9. TECHNOLOGICAL ASPECTS

9.1 Introduction

If toll collection were to be introduced on roads in South Africa, it will necessitate the introduction of a new technology system not normally encountered on roads. The new technology system will primarily be associated with the process of toll collection. The cost of the collection of tolls is an extra cost not currently associated with the provision of roads in South Africa and although this cost may be offset by benefits associated with toll roads, it is important to assess cost implications fairly accurately. Also, since it will be important to effectively operate the toll collection system, it is important to assess the extent and implications of such a system.

In the following sections, the elements of a toll collection system will be discussed and attention given to the possible automation of the system as well as the integration of other traffic related functions such as traffic control and weight measurement. A tentative assessment of costs will be made and the availability of related available technology in South Africa will be discussed.

9.2 Elements of a Toll Collection System

A toll collection system has the following main functions:

(a) Classification of the vehicle
(b) Calculation of the toll amount
(c) Collection of the toll
(d) Registration of non-paying vehicles
(e) Control of fraud (secondary function)
(f) Data collection (secondary function)

These functions will be discussed in the following paragraphs.

(a) Classification of the vehicle

The possible classification systems were discussed in chapter 4. In short it amounts to either using a system based on the number of axles or on the size (or weight) of the vehicle. Classification of the vehicle is usually manually carried out by a toll collector. Automatic classification of vehicles (as a primary function and not as a fraud control function) may be carried out by having cars use automatic toll collection lanes.

(b) Calculation of the toll amount

In an open system, the calculation of the toll amount is relatively simple, since the amount is fixed for each vehicle class. Passenger cars can also make use of automatic toll lanes, paying a fixed toll amount.

In closed toll systems, the calculation of the toll amount is made according to the vehicle classification and the distance travelled. This may be carried out manually or automatically by collecting a magnetic card with the vehicle class and entrance point recorded and inserting the magnetic card into a minicomputer which automatically calculates the toll amount.

(c) Collection of the toll

Tolls may be collected manually or automatically, but a minimum amount of manual collection will be required for the purpose of making change for drivers without correct change and issuing receipts or in lieu of using credit cards or coupons.

(d) Registration of non-paying vehicles

As discussed in chapter 7, certain vehicles, e.g. emergency vehicles and military vehicles may be exempted from paying tolls. However, such vehicles will have to be registered in order to balance checks (discussed in a following paragraph) or to prepare accounts for remuneration by authorities of which vehicles are exempted from tolls.

(e) Control of fraud

From discussions with various toll authorities in overseas countries it was concluded that the main source of fraud in toll operations is due to toll collectors rather than users. Fraud may occur as a result of the false registration of the number of vehicles, underclassification of vehicles, incorrect trip lengths on closed systems etc. Fraud is generally difficult to detect, since monitoring has to be done manually. The introduction of modern electronic systems has allowed complete registration of all pertinent data and has facilitated the investigation of abnormal occurrences. Essentially, the toll collector is required to register all toll collections and balance this with the toll money. Classification and registration of vehicles are then carried out through an independent parallel system and compared with the toll collector's data. In a vehicle classification system based on the number of axles, a treadle mounted in the toll lane can record the number of axles which can then be compared with the number of axles recorded by the toll collector. In a system based on vehicle size and number of axles, the vehicle may be classified electronically by measuring the vehicle height and further classified by measuring the number of axles. The data may be recorded in a micro-processor and compared with the toll collector's data.

(f) Data collection

As outlined above, data collection is necessary for fraud control, but data collection is also required for other purposes, i.e. financial management and planning. Aggregate statistics on income are required to assess the financial situation of the toll authority and also to determine travel patterns which may serve as input to decisions regarding the raising of toll levels and improvements and extensions to the system.

There are usually three levels of data gathering:

(i) For each booth and for each shift total receipts by vehicle class. These data are registered by each toll collector and also by the independent parallel system.

(ii) For each plaza, the data are aggregated.

(iii) Data for each plaza are transmitted to headquarters.

9.3 Automation of the Toll Collection System

Modern technology has made the automation of the toll collection system possible. Where labour is expensive, automation may decrease costs and also facilitate the control of fraud. The decision whether to automate should be based on the consideration of costs and the consideration of providing employment.

Automation may be introduced in various aspects of the toll collection system. Automatic collection of tolls from passenger cars on an open system usually occurs by having the driver deposit the exact toll in a basket, from where the coins go into

a coin counting machine. The introduction of electronics has resulted in better monitoring and performance of automatic lanes. Electronic coin selectors allow easy reprogramming so that no remodelling is necessary for a change in toll rate due to inflation or a change of coin types. Coupons may also be used for payment in open systems. Furthermore, on both open and closed systems the introduction of modern equipment has allowed payment to be made with either multi-trip, prepaid or credit cards, which does away with change problems thereby increasing the number of transactions which can be processed automatically. On a closed system, the driver has to feed in both his toll card (obtained at the entrance and which may be dispensed automatically) and his credit card. The toll card is retained by the equipment, the toll amount being displayed, and the credit card returned to the driver, followed by a receipt, if requested. In general, automatic payment can only be applied to passenger cars, since classification is required for heavy vehicles.

It should be noted that on some systems, e.g. the Richmond Downtown Expressway in the USA, which employs an open system, toll collectors only make change and the driver then deposits the correct change in a basket. This method of toll collection has the advantage of decreasing the opportunity for fraud, since the transaction is between the toll collector and the driver only.

From discussions with overseas toll road operators it was concluded that automation of toll collection has advantages regarding the maximum throughput of the system. The following capacities were estimated:

Automatic entrance lane on closed system:		500 vehicles per hour
Automatic open system lane	:	350 - 600 vehicles per hour
Manual lane (open or closed systems)	:	250 - 350 vehicles per hour

The introduction of modern computer technology has allowed more comprehensive accounting, auditing and recording of operations. The toll booth equipment is usually designed with limited data storage and printing capacity, but a mini-computer connected to all equipment on a toll plaza (including the independent vehicle classification system) can record all pertinent information. Such data gathering and editing equipment is required in the case of using credit cards, since data regarding such transactions have to be stored for processing and invoicing for payment at a later stage. This data may be stored on a removable medium or transmitted to the headquarter's computer.

9.4 Integration of Traffic Related Functions

The traffic related functions which may be integrated with toll collection are traffic control and weight control.

Traffic control constitutes the measurement of traffic conditions along the road and subsequently the control of traffic flow in order to affect maximum throughput under prevailing conditions. Speed and density measurements are taken at several points along the road and the input of vehicles at ramps are then controlled with the purpose of affecting the maximum throughput. This may be accomplished by closing toll lanes at specific entrance points. By doing this, optimal use of the facility may be attained and the largest number of customers will be served.

Overweight vehicles cause great structural damage to the roadway. Weight measurement at toll plazas may be carried out and overweight vehicles diverted. The cost savings obtained in this manner may offset some of the cost of toll collection. This system is in use in Japan.

9.5 Costs of Toll Collection

In addition to the costs related to staff, discussed in chapter 4, the cost of equipment has to be determined.

The cost of equipment will depend on the type of system used, the type of lane (entrance, exit, reversible, automatic or manual), type of payment (cash, coupons or credit cards), the type of vehicle classification and the level of data requirements. For discussions with overseas toll road operators it was concluded that as a rough guide, an amount of R50 000 can be taken for the equipment cost per lane, which includes the booth, vehicle detectors, traffic and guide lights and the portion of plaza data processing equipment corresponding to one toll lane, The booth equipment itself may be estimated at R25 000 per booth (included in the figure of R50 000). In addition to these costs, other toll related costs have to be included, i.e. extra land costs, costs associated with widening of the road, buildings, canopy, lighting, power supply, etc. In France, these costs have been estimated at R125 000 per lane, although this figure may be lower in South Africa due to lower construction cost.

9.6 Availability of Technology in South Africa

An assessment of the availability in South Africa of the technology required for toll collection equipment, is necessary

for two reasons. The existing international political situation may develop into a situation where the import of equipment may be curtailed and local manufacturing of equipment may become necessary. Furthermore, back-up and maintenance of a system are facilitated if components are in local use and locally manufactured.

The toll collection equipment consists of equipment required for the collection of data and equipment required for data processing. Data processing equipment is used for various purposes in South Africa and it follows that it will be advantageous to use equipment already in widespread use. Some of the data collection equipment required may be cheaper to import than to manufacture locally, but it will be advantageous to use non-patented equipment, should it become necessary or cheaper to manufacture locally.

10. RESEARCH AND MONITORING ASPECTS

10.1 Introduction

Toll collection on roads will be a new concept in South Africa and it will be desirable to monitor the reactions if and when toll systems are introduced. This will provide basic data and assist in decisions on any future new toll facilities as well as the management of an established toll facility. Two main fields of interest can be distinguished, namely travel behaviour and public opinion. These are discussed below.

10.2 Travel Behaviour

Aspects which may be monitored, include the following:

(a) Extent and effects of traffic diversion. Different user groups may have different reactions to the levels of toll rates and the extent of diversion to alternative routes will differ. For this reason, the use of overseas data is limited and necessitates the acquirement of local data for future use.

(b) Effects on travel patterns and traffic conditions. Tolls may be utilized as a pricing mechanism and by charging users the full cost of travel (it was stated before that users are not paying the full cost of providing roads) the overall demand for travel may be lowered or a shift to alternative modes may occur. Furthermore, local travel patterns may change in order to avoid paying tolls at toll plazas.

(c) The value placed on travel time. A user of a toll facility makes a direct trade-off between travel cost (which consists of vehicle operating cost tolls and time cost) on the toll facility and the travel cost on alternative routes. An assessment of this trade-off will lead to a better understanding of the value placed on travel time which will not only be valuable for future toll feasibility studies, but also for other transportation related undertakings where travel time influences decisions.

Ideally, a before tolls and after tolls study will yield the best results. In the case of a new facility, a before assessment will not be possible, but in the case of instituting toll collection on an existing facility, a pure before and after study may be carried out. It will, however, be necessary to have adequate notice of the decision to institute toll collection well in advance, in order to devise a proper before study.

10.3 Public Opinion

The importance of assessing public opinion has already been discussed (refer to chapter 6). Public opinion is subject to change and it is therefore important to monitor public opinion at suitable times after the opening of a toll facility in order to be able to make better decisions regarding future toll facilities.

11. CONCLUSIONS AND RECOMMENDATIONS

The following major conclusions were reached:

(a) Economic, social and political considerations limit the level of expenditure on transportation infrastructure which includes the expenditure on roads. There is also a limit on the overall level of taxation and extent of user charging which may be used to finance government services. It is a keystone of South African current economic policy to curb government spending and stimulate the private sector. In view of this policy and the increased demand for government funds for defence and the provision of social and other services to the less privileged sections of the population it is reasonable to expect that the share of funds for roads will decrease at a faster rate than the share for government spending, unless other sources of revenue are found for investment in roads.

(b) It is also the policy of the government to promote self-financing of government activities and user charging. Toll financing of roads is in line with this policy. A characteristic of user charging is that the level of expenditure is determined by the income (or willingness to pay). By subjecting the level of income to the market mechanism in this manner, a higher level of expenditure than before may be effected, but the market may conversely indicate that a lower level of expenditure is required. It should be pointed out, however, that toll financing is only regarded as a feasible method of funding high standard facilities or high cost facilities such as freeways, tunnels and bridges, but should be compared with other methods of funding. Furthermore, it must be emphasized that toll financing of roads does not present an overall solution to the financing of roads, since lower type

facilities have to be funded by other means and may therefore be considered as an additional source of revenue. If toll financing were to be implemented, care should be taken not to neglect the overall road system.

(c) Tolls as a general or sole source of revenue for the funding of all roads are not recommended because of the high cost of collection as opposed to the costs of collection of other general sources of revenue. If tolls were used in combination with loans, they do, however, offer an advantage, since tolls are a visible form of income directly tied to the facility for which the loan was obtained. The management of a toll facility and method of raising revenue can therefore be easily evaluated by investors if loan repayment difficulties were to arise.

(d) It is concluded that loan financing of roads will normally be advantageous since more benefits can be provided at an earlier stage and part of the burden of providing the service can be shifted to future uses. It should be kept in mind, however, that there are financing costs involved.

(e) Under existing legislation general government agencies cannot directly negotiate loans (with the exception of local authorities). It was found that a public corporation (e.g. Escom) or a government enterprise (e.g. South African Railways and Harbours) can obtain loans and are the most advantageous types of administration for the administration of a toll system, under current economic policies and legislation.

(f) It was estimated that loan funds to the amount of R300 million may be available for investment in roads by 1985/6. This would represent a substantial increase in funds available for investment in roads.

(g) As a result of increasing interest rates and decreasing loan periods, the conditions for toll financing of roads, have become less favourable than during the time when most North American toll roads were established. The result is that based on overseas experience, toll roads, although financially feasible in the long term, may experience short term deficits. A favourable method to overcome this problem is to cross-subsidize between established (or existing) toll roads and new toll roads. It should be pointed out that cross-subsidisation between roads does occur in South Africa under the present financing system.

(h) If the responsibility for the provision of all freeways were to be allocated or co-ordinated through to a central toll administration, only those freeways which are financially feasible would be constructed. Also, better programming of investment in other roads would be achieved, since the funding of freeway construction can cause major disruptions in the road financing programmes of lower road authorities. Care should be taken, however, not to jeopardize the funding of the lower order roads.

(i) Short term considerations e.g. regarding initial operation of a toll road, favour an administration with the freedom of action of the private sector, possibly with experience in the operation of a toll road. Long term conditions related to coordination of investment in roads, favour more government involvement. Taking into account financial considerations and considering long term interests to be the more important, it was found that a public corporation or government enterprise would be likely candidates for the administration of a toll system.

(j) Indications are that tolls cannot be levied under existing legislation, but no serious legal obstacles exist which would prevent a change of legislation in order to collect tolls. Depending on the type of administration selected and the financial structure of a toll administration, substantial changes in legislation may be necessary.

(k) Political opposition to toll collection may be decreased if toll collection were to be implemented throughout South Africa. Geographical discrimination as well as discrimination against certain population groups will therefore be largely avoided. Since account can be kept on a toll road of the vehicle-kilometers of travel, an assessment could be made of fuel tax paid by the toll road users and this fuel tax repaid to the toll authority. In this manner, double taxation may be avoided.

(l) Public communication will be important if toll roads were to be implemented. A possible approach may be to initially assess public feeling by communicating with and informing public leaders and other major interested parties and organisations and then proceed, if necessary, with more comprehensive public communication programmes.

(m) The operational aspects of a toll road were assessed. It was found that there are advantages and disadvantages to both open and closed systems of toll collection and the suitability of a particular system should be assessed under local conditions. The same applies to the design of interchanges.

(n) The design and maintenance standards of a toll road are usually very high, especially if the road has to compete with an alternative route. Several aspects of the design, e.g. rest and service areas, have to be approached with the objective of selling the service.

(o) No serious technological problems should be experienced in the construction and operation of a toll road. Only a relatively small portion of the equipment needs to be imported based on the availability of technology in South Africa. It may be cheaper, however, to import. It is recommended, however, that non-patented technology be employed wherever possible, should import problems arise.

(p) Traffic control and vehicle weight control may be integrated with toll collection and these advantages may to some extent offset the cost of toll collection.

(q) It was pointed out that it would be desirable to monitor a toll road, if constructed, very closely to assess the impact. This would enhance prior assessment of the feasibility of possible future toll roads.

In general it may be concluded that toll financing of freeways presents a viable source of revenue under current government economic policies. It is therefore recommended that, should the decision be taken to consider the implementation of toll charging on certain roads, this investigation be continued, with a view towards establishing the form of an appropriate toll authority within the broad outlines of this preliminary study. Although it is recommended that a continuation of this investigation be carried out with a view towards establishing a toll authority within the broad outlines presented in the preliminary study, it would be prudent to initially consider the establishment with pilot projects (or experimental projects).

The pilot projects may be selected from the projects for which feasibility studies have been conducted:

(a) Three National Roads Projects:

(i) The Du Toitskloof Tunnel and Route N1 between Cape Town and Worcester.

(ii) Three major bridges in the Garden Route (Route N2) over the Bloukrans River, Groot River and Bobbejaans River.

(iii) The proposed road between Warden and Frere was also investigated, but since the proposed development axis in the National Physical Development plan lies on the road through Ladysmith and Newcastle, it is not recommended at this stage that this project form part of the list of pilot projects.

(b) The Proposed Gold Reef Toll Road, between Krugersdorp and Springs on the route PWV 12A-M4-P109/1.

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APPENDIX A

DIE SUID-AFRIKAANSE KAPITAALMARK

Senbank

(Geregistreerde Aksepbank)

Sentrale Aksepbank Beperk
Sanlamsentrum, Jeppestraat
2683, Johannesburg 2000
8-7659, 8-7310
37-5340
SENBANK

18 Junie 1980

U verwysing:
Ons verwysing: BRUN/M/71/HG

Brunette, Kruger & Stoffberg Ingelyf
Konsultingenieurs
Posbus 3173
PRETORIA
0001

Vir aandag : Dr J L Botha

Geagte Meneer

DIE SUID-AFRIKAANSE KAPITAALMARK

Ek verwys na ons vergadering op 12 Mei 1981 en maak 'n opsomming vir u inligting van die volgende besonderhede betreffende die struktuur van die Suid-Afrikaanse kapitaalmark en die moontlike beskikbaarheid van fondse deur Suid-Afrikaanse instansies ten opsigte van padkonstruksielenings. Die volgende punte word oorweeg :

1) Institusionele kontantvloei

Suid-Afrikaanse institusionele kontantvloei verhoog tans teen die koers van 25% per jaar. Hierdie instansies - dit is private pensioenfondse en lewensversekeringsmaatskappye - sal waarskynlik nie in staat wees nie om hierdie groeikoers gedurende die hele tagtigerdekade te handhaaf. In die lig van die struktuur van hierdie fondse kan 'n mens egter aanneem dat die groeikoers hoog gaan wees. Dit beteken dat 'n mens in die toekoms 'n netto kontantvloei van R5 000 miljoen vir 1981 kan verwag wat teen 1985 na ongeveer R10 000 miljoen kan styg. Hierdie verwagte kontantvloei verteenwoordig netto nuwe fondse wat vir belegging beskikbaar is.

2) Beskikbaarstelling van kontantvloei

In die beskikbaarstelling van die instansie se kontantvloei moet 'n mens die belangrike oorweging in die tweede verslag van die De Kock-kommissie in gedagte hou wat definitief sekere aanbevelinge betreffende die voorgeskrewe beleggingstoestande van die Suid-Afrikaanse instansies sal maak. Tans kan 'n mens 'n op-die-praktyk-ingestelde-berekening koop - verwag dat ongeveer 45% van alle institusionele beleggings in voorgeskrewe beleggings gaan wees.

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Hierdie voorgeskrewe beleggings word eerstens beskryf as deel A wat RSA-belegging is, en tweedens as deel B wat semi-prima beleggings en kontant en deposito's by goedgekeurde Suid-Afrikaanse instansies is. 'n Mens verwag van die De Kock-kommissie dat hierdie voorgeskrewe vereistes gedurende die tagtigerjare ingekort sal word, wat beteken dat 'n reguit berekening van wat vir voorgeskrewe belegging beskikbaar gaan wees, effens moeilik kan wees. Uit ons uitvoerige studies blyk dit egter dat nieteenstaande 'n vermindering in dié tipe belegging in terme van die bedrag wat deur die wet voorgeskryf is, die instansies waarskynlik steeds aansienlik in hierdie gebied sal belê - veral in die tipe effekte wat verhandelbaar en bemarkbaar is en wat geredelik in die mark geaktiveer kan word. Gebaseer op hierdie oorweginge en op die oorweging van wat teen aantreklike koerse in terme van alternatiewe diskresionêre beleggings beskikbaar sal wees, is ons van mening dat 'n gemiddeld van ongeveer R2,2 biljoen per jaar in terme van die voorgeskrewe of vasrentende effekte oor die volgende vyf jaar beskikbaar sal wees.

3) Die beskikbaarheid van fondse in terme van padkonstruksiefinansiering

Met inagneming van die kontantvloeibeskikbaarstellings en die beskikbaarheid van fondse en ook via ons eie uitvoerige interne navorsing betreffende RSA- en ander prima openbare korporasiebehoeftes, blyk dit dat 'n bedrag van ongeveer R50 miljoen vanaf 1983 vir 'n pad- of 'n kommunikasiestelsel voorgeskrewe bate beskikbaar kan wees, en hierdie syfer kan teen 1985/1986 na ongeveer R300 miljoen per jaar styg. Hierdie fondse sal egter slegs deur instansies beskikbaar wees indien 'n sekuriteit geskep kan word wat vir hulle 'n betekenisvolle lener sal wees, en 'n lener wat 'n lewendige belangstelling in die aktivering van die mark sal toon met die doel om hulle in staat te stel om vrylik in belangrike effekte handel te dryf.

4) Termyn : Aanvang van die termyn

Struktuur van die Suid-Afrikaanse mark. In die lig van inflasieverwagtinge en die onsekerheid wat teweeggebring is deur die inflasionêre faktor in die plaaslike ekonomie blyk dit dat die termynstruktuur van die Suid-Afrikaanse lener besig is om te vernou.

Ingevolge die padkonstruksiefinansieringsprojek blyk dit dat die mees optimale termyn 'n 40-jaarlening sal wees. Meer onlangs was hierdie tipe finansiering nie in Suid-Afrika beskikbaar nie, en dit is ook onwaarskynlik dat dit in die nabye toekoms beskikbaar sal wees as gevolg van die hoë rentekoersstrukture. Tans is die langste termyn wat nog op die Suid-Afrikaanse kapitaalmark gesien is die onlangse Evkom-25-jaarlening wat 'n allesinsluitende rentekoers van 13,07% gehad het. Selfs die RSA wat onlangs na die mark gekom het met hulle eie lening teen 'n maksimum termyn van 22 jaar, leen nie teen daardie termynstruktuur nie. Alles in ag geneem lyk dit

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dus asof die Vervoerraad of Finansieringkonsortium vir paaie onder huidige omstandighede na 'n maksimum finanssieringstermyn in die omgewing van 25 jaar moet kyk. Dit kan egter steeds wesenlik oor die volgende paar jaar verander, veral in die lig van die inflasie-onsekerheid. Indien inflasie nie onder beheer gebring word nie, gaan 'n aantal leners/uitleners op 'n kortertermynstruktuur aandring. Daar moet ook in gedagte gehou word dat dit vir die lener nie geskik is om te leen of om hom te verbind teen huidige rentekoerse vir die lang termyn nie, aangesien finansiering oor die langer termyn baie duur bewys sal word indien inflasie na meer aanvaarbare vlakke daal. Opsommenderwyse in terme van hierdie termynstruktuur kan 'n mens sê dat langtermyngeld - maksimum 25 jaar - tans beskikbaar is, maar dat hierdie termynstruktuur in ooreenstemming met internasionale termynstrukture homself wel oor die volgende jaar of twee kan verlaag na 'n tydperk van 10 - 12 jaar.

5) Sekuriteit

Indien plaaslike instansies in terme van die finansiering van padkonstruksieskemas genader word, blyk dit asof hulle deur die regering verseker sal moet word betreffende die lewensvatbaarheid van die skema en dat die rente en die aflossing van die lening deur die RSA gewaarborg sal moet word. 'n Voorgeskrewe beleggingstatus impliseer nie noodwendig 'n volle Suid-Afrikaanse regeringswaarborg ten opsigte van alle rente- en aflossingsbetalings nie. Om dus die papier aanvaarbaar vir plaaslike instansies te maak - of daar voorgeskrewe status is al dan nie - sal impliseer dat 'n sekere vorm van waarborg deur die RSA uitgereik moet word.

6) Rentekoerstendense - kapitaalmark

Die kapitaalmarkvooruitsig kan as volg opgesom word :

i) Onlangse koersneiginge

Gedurende die afgelope paar jaar was Suid-Afrikaanse rentekoerse vêr onder die plaaslike inflasiekoers. Dit kan toegeskryf word aan die hoë plaaslike likiditeitsvlak wat die gevolg was van die aansienlike surplus op die betalingsbalans (die hoë goudprys was die belangrikste faktor), regeringsbeleid om leningskoste oor die algemeen laag te hou, en 'n omslagtige stelsel om geldvoorraad te beheer.

Die neiging van langermynrentekoerse met betrekking tot die inflasiekoers word duidelik in die volgende grafiek weerspieël :

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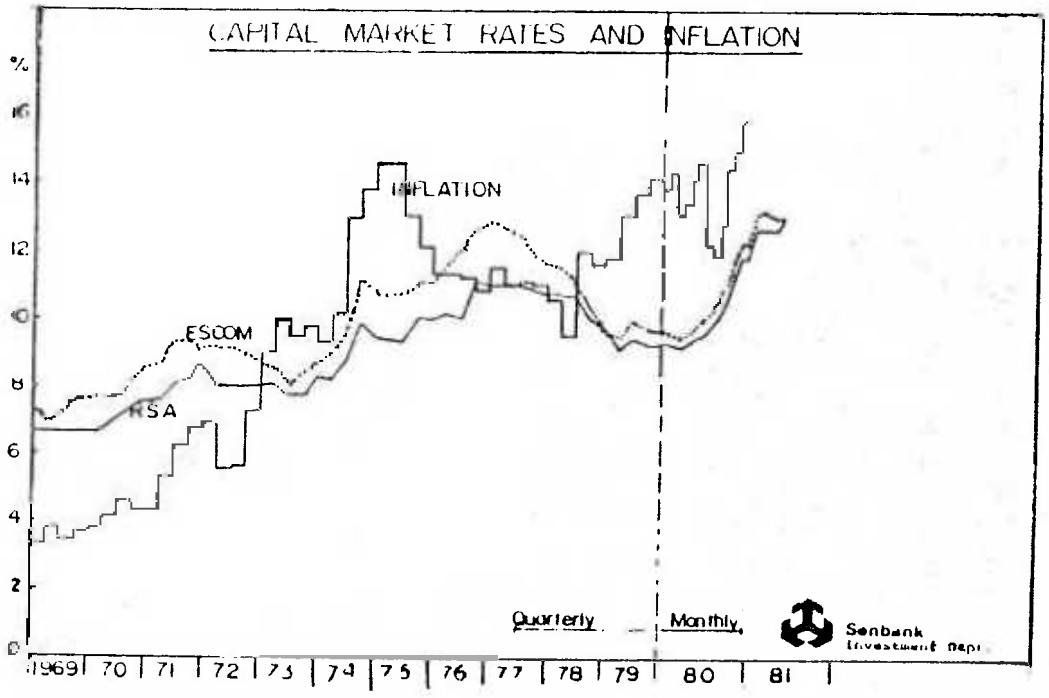


ii) Suid-Afrikaanse monetêre beleid

In die verlede was die Suid-Afrikaanse monetêre beleid beperkend en is dit ook gekenmerk deur talryke vorms van beheer. Met die aanbevelinge van die De Kock-kommissie sal die monetêre beheerstelsels oor die volgende paar jaar wesenlik verander.

In hoofsaak behels die stelsel die afskaffing van beperkende monetêre maatreëls en die toelating van rentekoerse om hulle eie vlak in die mark te vind. Monetêre beheer sal deur opemarkbedrywighede via die Suid-Afrikaanse Reserwe Bank toegepas/uitgeoefen word.

Die netto resultaat van die stelsel, wat vandag toenemend in die Westerse wêreld toegepas word, is dat daar 'n groter waardering vir die waarde van geld bestaan. Tans, met hoë inflasiekoerse in die VSA en VK, het die koste van geld merkbaar gestyg en dit sal op sulke hoë vlakke bly totdat die inflasiekoers inkrimp en beleggers tevrede is met 'n reële opbrengs op hulle fondse.

Met die nuwe bedeling wat via die De Kock-era verrys, behoort die tydperk van relatiewe goedkoop kapitaal aan die verlede en sal die koste van geld in die toekoms nou verband hou met die reële opbrengsverwagting van beleggers.

Ingevolge die reële opbrengsveronderstelling van beleggers is dit interessant om daarop te let dat korttermynrentekoerse wesenlik hoër is as langtermynkoerse in die lande waar monetêre beleid deur geldvoorraadbeheer beheer word. In die VSA is die prima bankuitleenkoers byvoorbeeld 18% terwyl tienjaarregeringslenings 12,75% is.

Hierdie premie is 'n duidelike aanduiding van die pessimisme wat bestaan t o v die korttermyn bereffende inflasionêre verwagtinge terwyl daar betreffende die langtermyn 'n diskonto (d i aansienlik laer inflasie) verwag word.

'n Soortgelyke neiging is tans besig om in Suid-Afrika te voorskyn te kom. Twaalf maande gelede was die volgende opbrengskromme duidelik :

1-jaarkoers - 6,0%
5-jaarkoers - 7,5%
10-jaarkoers - 9,0%
20-jaarkoers - 9,5%

Tans is die volgende opbrengskromme van toepassing :

1-jaarkoers - 14,50%
5-jaarkoers - 13,25%
10-jaarkoers - 13,45%
20-jaarkoers - 13,50%

Die opbrengskromme is dus bykans plat.

iii) Toekomstige koersneiginge

Met inagneming van die verandering in die Suid-Afrikaanse monetêre beleid tesame met die agteruitgang wat besig is om in die Suid-Afrikaanse betalingsbalans in te tree, kan daar verwag word dat rentekoerse oor die volgende agtien maande aansienlik sal styg.

Vir die doeleindes van hierdie aanbieding is ons van mening dat die volgende koersneiginge in die tweede kwartaal van 1981 van toepassing sal wees :

Prima uitleenkoers - 18,0%
Langtermyn-Evkom-effekte - 13,5%

Hierdie koersverwagtinge impliseer duidelik 'n omgekeerde opbrengskromme van 'n aansienlike aard. Die toestand sal egter nie van permanente aard wees nie en in vergelyking met die Verenigde State en die Verenigde Koninkryk sal dit beslis 'n kort tydjie duur. As gevolg van die volgende redes is ons van mening dat Suid-Afrikaanse rentekoerse slegs tot die tweede helfte van 1981 op baie hoë vlakke sal wees :

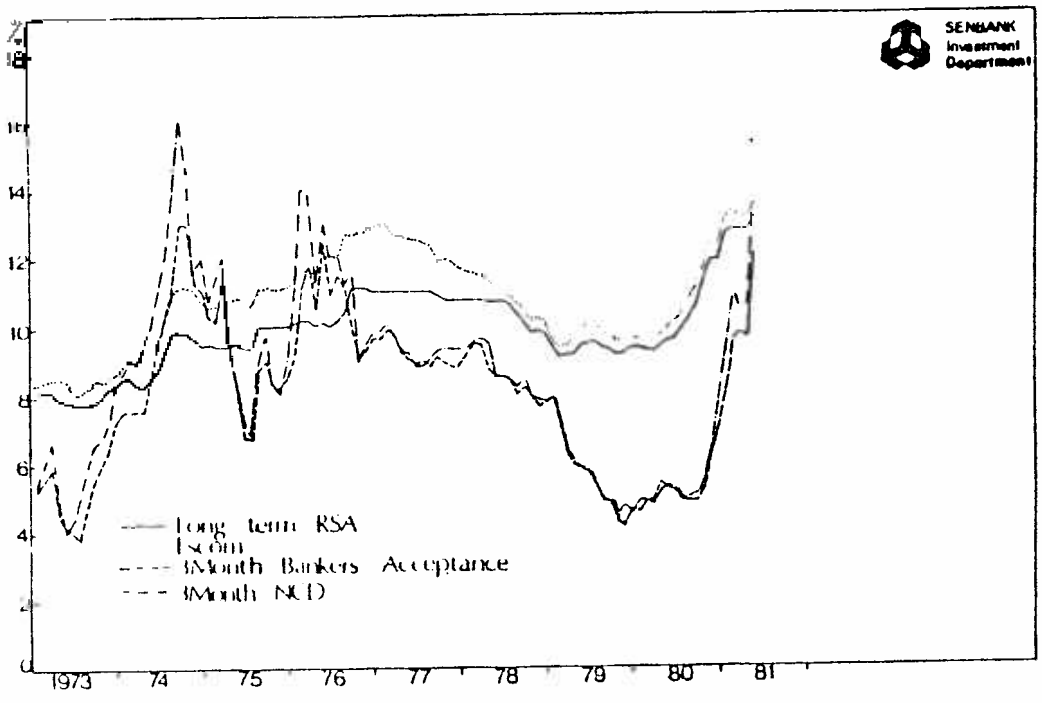
6/.....

(a) die Suid-Afrikaanse inflasiekoers is meer buigbaar as wat die geval in ander Westerse lande is;

(b) teen 1984 sal Suid-Afrika bykans geheel en al selfvoorsienend betreffende sy energiebehoeftes wees. Indien daar in 1983 tot 1985 'n wesenlike styging in Opec se oliepryse is, behoort Suid-Afrika grootliks onaangetas te bly;

(c) prima metaal- en mineraalpryse en uitvoervolumes sal teen die middel van 1982 begin herstel, wat die betalingsbalans sal versterk;

(d) al die bogenoemde faktore sal tot 'n versterking van die rand lei wat die koers van ingevoerde inflasie sal verlaag.



iv) Rentekoersprojeksies

Met inagneming van die bogenoemde verwagtinge in betalingsbalans, inflasie- en plaaslike ekonomiese neiginge glo ons dat die patroon van termynkapitaallaste moontlik sal wees :

7/.....

Termyn	1982	1983	1984	1985
5-jaar	14,00	12,00	10,00	9,00
10-jaar	13,50	12,25	10,50	9,25
15-jaar	13,50	12,25	10,75	9,50
20-jaar	13,50	12,40	11,00	9,75
25-jaar	13,50	12,50	11,50	10,00

Die koerse is gebaseer op 'n primalener op die plaaslike kapitaalmark soos byvoorbeeld Evkom. 'n Padkonstruksielening sal teen provinsie op Evkom staan van tussen 10 tot 20 punte.

Ingevolge die bogenoemde oorweginge verwag ons dat die plaaslike inflasiekoers na 1981 aansienlik sal daal en dat wanneer die betalingsbalans in 1983 herstel, plaaslike rentekoerse sal daal. Dit is egter te betwyfel of korttermynkoerse na dieselfde vlakke as in 1979 - 1980 sal daal.

Ons het hierbo sommige van die bepalinge en voorwaardes van die Suid-Afrikaanse kapitaalmark uiteengesit asook die bedrag wat ons van mening is beskikbaar sal wees in terme van die finansiering van u voorgestelde skemas. Ons het die bostaande inligting aan u beskikbaar gestel as breë agtergrond ten opsigte van die struktuur van die Suid-Afrikaanse mark asook die beskikbaarheid van finansiering. Indien daar enige verdere inligting is wat u verlang of enige verdere studies is wat in hierdie verband onderneem moet word, sal ons dit waardeer indien u ons in kennis sal stel.

Die uwe

P R DU TOIT
ASSISTENT-HOOFBESTUURDER