1005 SMIT

DEPARTMENT OF TRANSPORT

CHIEF DIRECTORATE: NATIONAL ROADS

A REVIEW OF THE TOLL ROAD POLICY FOR THE REPUBLIC OF SOUTH AFRICA

FINAL REPORT TO CABINET
VOLUME II

MARCH 1991

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The major characteristics of this design can be listed as follows:

a) The plaza approach and exit areas are paved with a concrete pavement with associated layerworks

b) Gradual tapers (1:15) are used for the widening of the plaza area.

c) Toll islands are constructed of bullnoses and New Jersey barriers on the entrance and exit side of the plaza.

d) A double skin canopy is used including a ceiling and roof covering.

e) The control building roof is constructed of a pre-coloured aluminium sheeting.

f) Booth protection structures, load gauges and impact attenuators cater for the safety of the operator's personnel and of the road user.

g) The entire plaza area is fitted with kerbing at the edge of the road, guardrails in certain places, as well as fencing.

h) In certain areas more expensive aluminium work has been done in the control building to obtain an aesthetically pleasing appearance.

i) The electrical design is based upon a back-up principle whereby two UPS systems are provided to feed essential loads to provide back-up in the lane area.

j) Generator sizing is calculated on the basis of being able to accommodate the full load in the case of a mains power failure.

k) A graded road lighting system is used on the exit side of the plaza and area lighting is provided alongside the ramps to provide visual guidance to the road user.

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The construction of an additional lane on the P202-1 (parts still under construction) between Ascot I/C and Sasolburg. Due to the high perceived benefit of this project a higher tariff than 10 cents per kilometre could be levied, it is estimated that this project would then be self-financing.

CLASS C;
LSR/CAPITAL COST > 0,5

K198	Randfontein to Roodepoort

CLASS C/D
LSR/CAPITAL COST APPROX. 0,5

PWV13	Continuation of R21 from Jan Smuts to N3 near Vosloorus.
N17	Extension of N17 to Krugersdorp

CLASS D;
LSR/CAPITAL COST > 0,25

N1	Middelfontein to Pietersburg. (This project is, however, self-financing if combined with the existing Kranskop Toll Road)
N1	Kroonstad to Bloemfontein
N3	Heidelberg to Villiers
N3	De Beer's Pass
N4	Wonderfontein to Montrose
N12	Libanon to Potchefstroom

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R40 Nelspruit to Witrivier

PWV9 Pretoria to N1-20 near Randburg

PWV16 Outer ring road south of Johannesburg linking the N1 at Misgund Interchange and the N3.

RESULTS OF CASH FLOW ANALYSIS

The results of the cash flow analysis are again graphically reflected.

Figure 15.4 compares the annual net toll income and the annual construction and rehabilitation cost for new freeways. Interest is not considered in this comparison.

As mentioned before, new toll road construction is programmed at between R300 and R400 million per annum (in 1991 rand).

It is predicted that net toll income from these new tolled freeways will climb fairly steeply, as new roads are completed and plazas commissioned, to just over R250 million in 2010.

As can, however, be seen from Figure 15.4, net toll income from new freeways does not yet cover the annual construction costs by the year 2010 and this clearly illustrates that a contribution from the National Road Fund (which it may obtain from the surplus income on tolling existing roads) will still be required for many years.

Figure 15.5 depicts the annual net toll income and the annual construction and rehabilitation cost for both the new and existing freeways. Interest is not considered in this comparison.

Construction and rehabilitation costs for existing and new freeways vary in a range between R400 million and R750 million per annum in the 1991-2010 period shown, i.e. an average of just below R600 million per annum. (all figures are in 1991 rand)

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Projected net income rises from nothing in 1991 to about R300 million per annum when the proposed plazas on existing freeways start to become operational to over R900 million per annum in year 2010. An average net toll income of about R500 million per annum is therefore achieved over the 20 year period. (all figures are in 1991 rand)

Figure 15.5 therefore demonstrates that the predicted annual net income of the proposed network of tolled existing and new freeways almost cover the annual expenditure associated with the network. (not considering interest at this stage)

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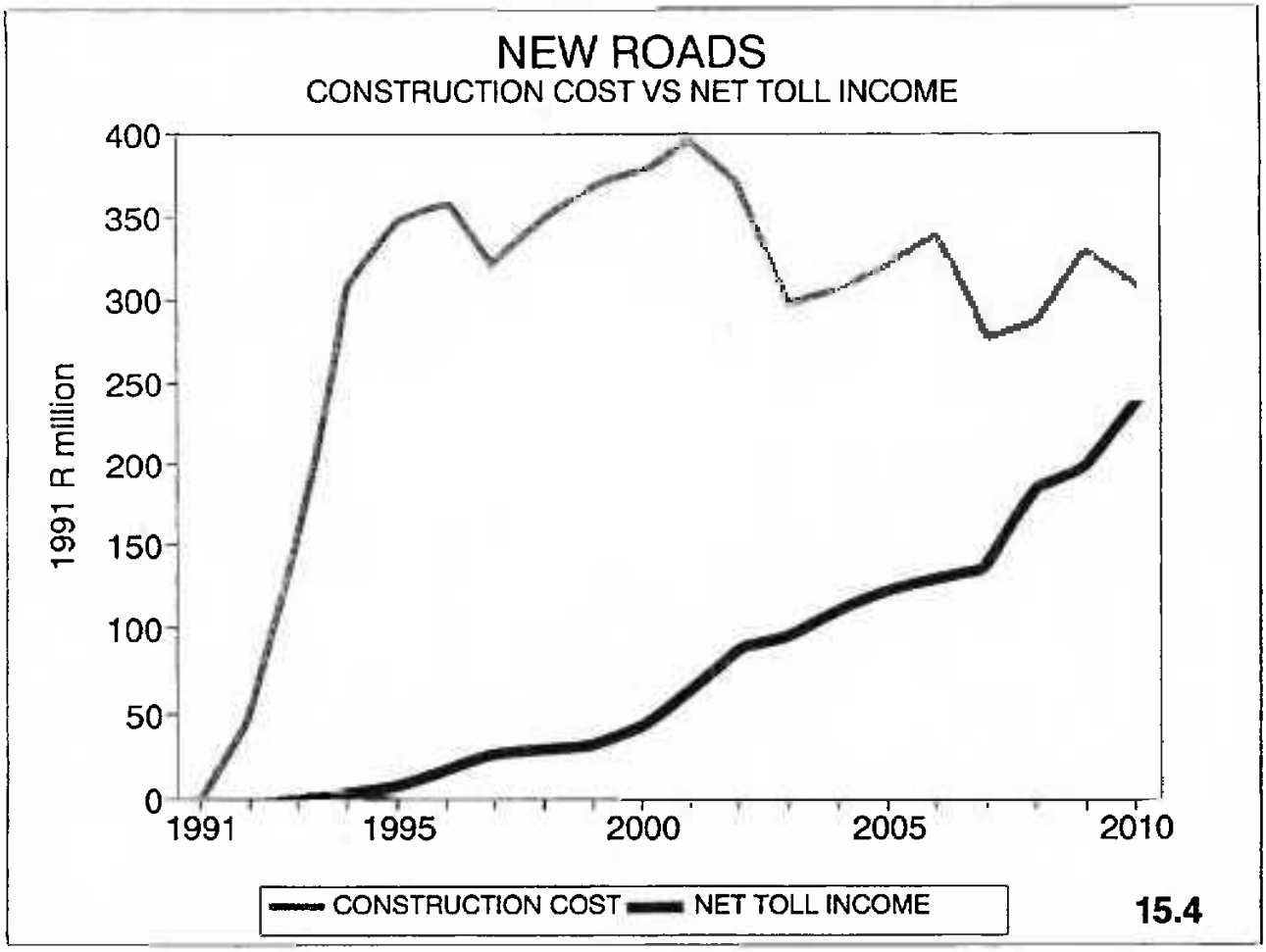

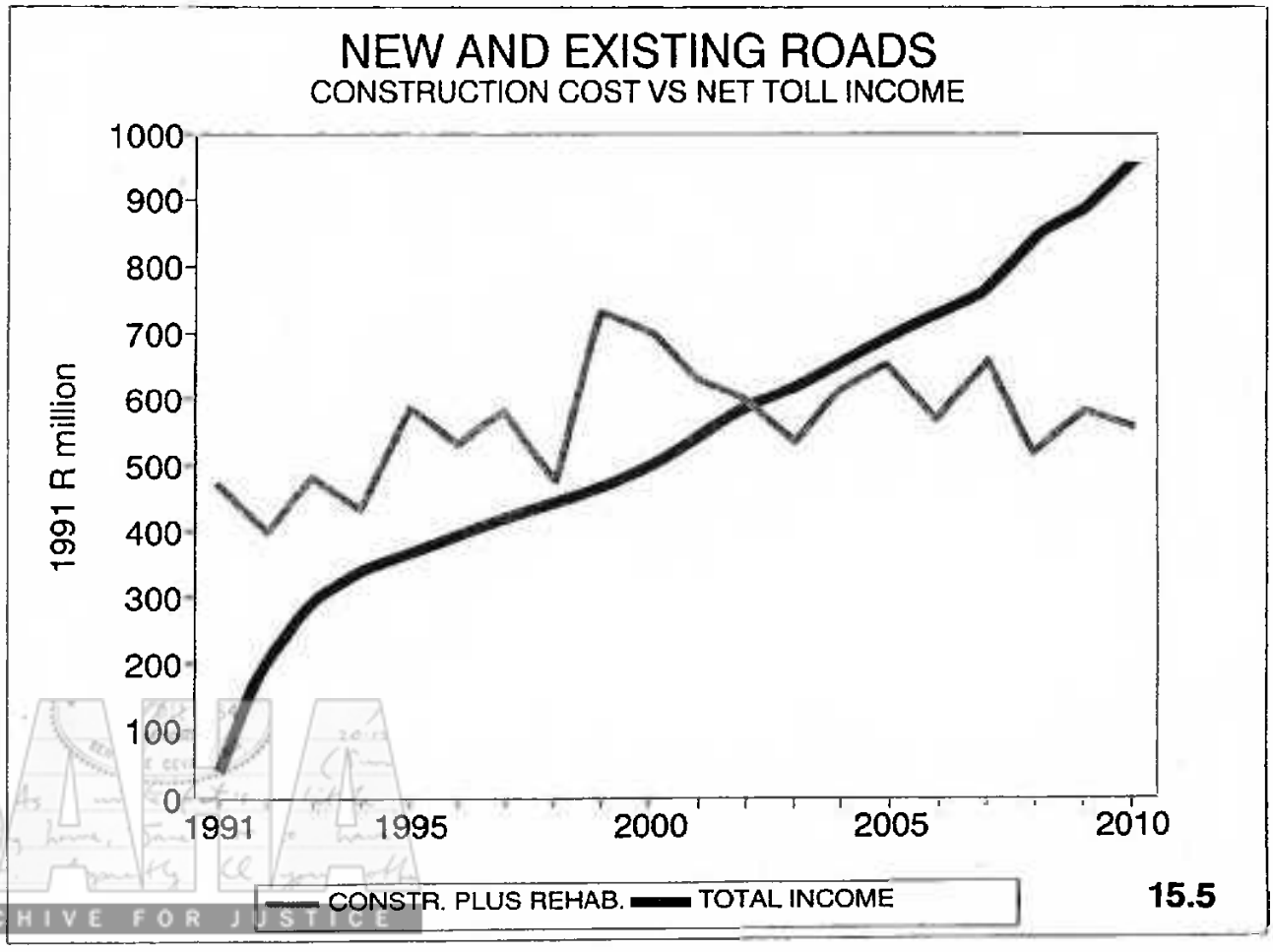

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15.4 ESTIMATION OF TOTAL INDEBTEDNESS

Two scenarios have been considered:

In the first scenario all shortfalls of net toll income over interest payments are capitalized in the knowledge that net toll income will grow in line with inflation-related increases in toll tariffs and traffic growth, such that the capitalized interest will be redeemed within a reasonable time scale.

In the second scenario all shortfalls of net toll income over interest are bridged by the National Road Fund. The National Road Fund has in the past made up shortfalls of net toll income over interest by way of medium term NRF loans. Thus, the more conservative approach avoids the possibility that the outstanding debt (in the form of capital market loans) accumulates to such an extent that it becomes unmanageable.

Figure 15.6 shows the projected accumulated total indebtedness of the proposed toll road system, i.e. including both existing and new freeways, assuming that no assistance is received from the National Road Fund in respect of bridging finance, i.e. interest is capitalised.

The analysis commences at the end of the 1991/92 financial year and includes the existing capital market debt which is of the order of R1,2 billion. Most of this debt has been incurred by Tolcon and THDC for construction of their projects and capitalisation of interest. The analysis with the Tolway and THDC market debt was performed in view of the distinct possiblity that the State would take over the loans of the private companies following the rejection of the proposed road privatisation legislation.

In order to demonstrate the financial viability of the scheme, it can be seen that clearing of the maximum debt of R5,2 billion (in 1991 rand) of the entire freeway system would be possible by the year 2016 in the theoretical case where no new construction would be undertaken after that date. This reduction of debt is shown by the upward moving line.

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With a continuation of the scheme, requirements for new roads, road upgrading and rehabilitation after 2007 will, however, lead to an increasing debt level after 2010 as the growing economy of the country continues to demand more well maintained freeways and this is shown by the dotted line.

Figure 15.7 shows the projected accumulated total indebtedness of the proposed toll road system, i.e. including both existing and new freeways, assuming that no assistance is received from the National Road Fund in respect of bridging finance, i.e. interest is capitalised but excluding the approximately R1 billion existing capital market debt which has been incurred by Tolcon and THDC.

Figure 15.8 shows the projected accumulated total indebtedness of the proposed toll road system, i.e. including both existing and new freeways, assuming that any shortfalls of net income over interest is bridged with medium term NRF loans.

The NRF medium term loans, excluding capital contributions currently reflected in the Department of Transport's budgets in lieu of extensions to existing toll projects, are depicted in Figure 15.9.

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CHAPTER 16

FUNDING

16.1 INTRODUCTION

The borrowing capacity and the cost of funds along with the major factors determining them are discussed and then applied on a comparative basis to the structures considered. This comparison is attached as Annexure A. Indicative rates per instrument as of 25 January 1991 are given for illustrative purposes only to assist with comparisons regarding any financing package.

Annexure B contains a brief discussion on finance sources and the differences between debt and equity finance.

A separate document (Annexure C) has been prepared on the funding strategy recommended for a public utility. Annexure D contains alternative approaches and suggestions on loan and bond management to enhance the status of an organisation as a borrower and to optimize conditions of the issue of loan stock.

16.2 BORROWING CAPACITY

Borrowing capacity of the organisation is one of the most important factors to be taken into account in formulating a funding strategy. The ability of a borrower to obtain funds from as wide a range of investor categories as possible, is primarily dependent upon the following:

Perception : The perception created by the borrower in the minds of lenders is an important consideration. A borrower who is perceived to be a low risk, well managed activity, will be able to borrow at a lower rate.

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Nett asset value : Lenders look to nett asset value as a form of security. A high nett asset value improves the risk profile of the borrower because of its ability to repay capital through disposal of assets. In the case of a toll authority this would not be the case no matter how high the nett asset value. There can be no question of the country's roads being sold to repay lenders.

Cash flow : Cash flow is a vital consideration as it indicates the ability of the borrower to repay both capital and interest. A very prudent borrowing policy of the organisation should be followed in the early stages while confidence is being created. In fact, as long as there is the ability to service the loans, repayment of capital becomes a secondary consideration over time in the case of a toll authority, as the underlying assets do not deteriorate if proper pavement maintenance procedures are followed.

Risk profile : Certain investors are averse to investing in stock that they perceive to be high risk. A high risk borrower has a more limited range of lenders to tap for funds.

Government backing: Direct or indirect guarantees from a low risk or a no risk guarantor such as the Central Government offers access to the broadest investor spectrum. The closer the organisation is to the State, the lower the points premium which is payable provided the State is not seen as being able to affect future policy too closely. Any form of intermediation increases the costs of

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borrowing with private companies paying the highest premium.

Generally government and semi-government organisations are perceived to be lower risk than private or public companies. This perception has been generated over the years by the State and the semi-government organisations themselves through the debt management policies adopted. A new borrower would, however, not enjoy the same status as these organisations have established. Currently there is no well-established debt rating agency in South Africa, as exists in the USA for example, although steps are being taken to try to create a rating system. Eskom, in particular, has earned a solid reputation in the market over many years.

Legislation : An entity's borrowing capacity is sometimes determined by legislation as in the case of Eskom, Rand Water Board and the Industrial Development Corporation. State involvement in the founding of a borrower, through legislation, state participation in the determination of policy as well as in operational decisions, improves the security rating of the organisation and, therefore, broadens its investor base because of perceived State commitment and involvement.

Marketability : An investment in a marketable stock is more easily redeemed by the lender. Marketability affords an investor the assurance that the investment is convertible into cash at market rates, without incurring a major penalty.

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l) Electronic equipment has been based upon operational requirements, as developed over the last 5 years, to cater for various payment methods as well as providing the necessary control to prevent fraud and ease of traffic management at the plaza.

m) Provision is made for certain back-up systems within the equipment design to cater for different modes of operation, which vary from a total loss of electronic equipment in the lane to a fully operational system, which allows the operator to provide a cost-effective service to the Department of Transport.

n) Booths are manufactured from stainless steel because of the durability of the material as well as ease of maintenance.

The general design principles for all the disciplines were based upon accepted standards either determined by the Department of Transport or bodies such as the S.A.B.S.

10.3.2 COST ESTIMATE FOR TYPICAL PLAZAS

A cost estimate was compiled for a typical six lane mainline plaza as well as for an eighteen lane plaza associated with an interchange. The reason for the choice of these configurations is that it is believed to present a broad range of capital expenditure from a small mainline plaza to more complex plaza arrangements.

In the calculation of the cost estimates, use was made of previous construction costs, which include costs for State toll plazas such as Mariannhill, Oribi, Pelindaba and Vaal Toll Plazas. Use was also made from recently obtained rates for the Tongaat Toll Plaza.

From all this information an estimate was made of the cost of a typical six lane and eighteen lane plaza. The contract prices and all rates were escalated to a December 1990 base date.

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It is, therefore, very important that the borrowing organisation should have a strategy to enhance the marketability of its stock. Marketability can be improved by secondary market and market making operations. The utility should decide:

(i) if its own treasury will act as market maker;

(ii) if an outsider such as a merchant bank will act as an "agent" on its behalf; or

(iii) if an outsider such as a merchant bank will act as market maker for its own account.

It may well be that initial use is made of a merchant bank to establish a secondary market with the operation being brought 'in-house' after a number of years. It is necessary to have a sufficiently large volume of stock in the market with a spread of years of maturity, in order to create viable secondary market activity. The starting point is probably of the order of R1,5 billion of outstanding stock.

16.3 COST OF FUNDS

a) General

The nature and financial strength of a borrower determines its bargaining base and the parameters within which it can operate in the financial markets. The nature of a borrower is determined by legislation, regulation and convention. Provisions with regard to, inter alia, stamp duty on instruments used, approved investment status of loan stock to be held by financial institutions and capital co-

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efficient required to be maintained by banks, enable a utility or a borrower with a government guarantee to negotiate more favourable terms than a comparable borrower without such backing. The perception of a borrower's status, often based on convention, also plays an important role: Eskom's enhanced status in the market is based on, among other factors, the perception that it has developed an efficient secondary market.

Cost margins are primarily determined by:

Balanced maturity : is considered to be one with which balanced management structure avoids cash flow bottlenecks.

High marketability : An issuer of marketable stock commands a more favourable rate because of the higher demand for such stock.

High risk profile : Higher risk investments appeal to a narrow spectrum of the market and at a comparatively higher yield.

Perceived State commitment : Involvement by the Central Authorities on Board and executive level, or even on the operational level, improves the borrowers' bargaining position.

Legislation : A broader investment base always enhances the status of a borrower, with a resultant lowering of interest charges.

b) Interest rates

The finance instruments referred to below are all relevant. Interest rates are quoted to show the rate spread from short to longer term commitments and are based on:

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16.3.1 THREE-MONTHS NON-LIQUID ACCEPTANCES

Term	:	Three-months (88 to 92 days). Longer periods can also be negotiated.
Interest Calculation and Payment	:	Interest is calculated on a discount basis and is payable three-monthly in advance.
Reference Rate (Basic Rate)	:	Best effort rate which can be obtained on non-liquid banker's acceptances on similar amounts and terms.
Cost to Borrower (Inclusive of all charges and stamp duty)	:	18,50% per annum, payable quarterly in advance.

16.3.2 OVERNIGHT CALL LOANS

Description	:	Overnight loan, the cost of which will be linked to the daily wholesale market rate.
Term	:	Overnight, for the full term of the facility.
Instruments to be Used	:	Call Bonds/Promissory Notes
Interest Calculation and Payment	:	Interest is calculated on a daily basis on the outstanding amount and is payable monthly in arrear.

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Reference Date (Basic Rate)	:	Best efforts rate which can be obtained in the wholesale call market.
Cost to Borrower (All Inclusive)	:	19,25% per annum, payable monthly in arrear.

16.3.3 FIXED RATE TERM FUNDS

Debentures/Loan Stock

Description	:	Term loan at a fixed rate.
Term	:	Periods of three years and longer.
Instruments to be Used	:	Debentures/Loan Stock.
Interest Calculation and Payment	:	Interest is calculated daily on the outstanding balance and is payable half-yearly in arrear.
Cost to Borrower	:	Total cost, including a handling fee and stamp duty, if applicable, shall be a best efforts rate which can be obtained in the market on similar amounts, dates and terms. Current rate on 3 year debentures (commercial paper) is ± 17,50% per annum; payable six-monthly in arrear.

16.3.4 BRIDGING BONDS

Description	:	Term loan at a fixed rate.

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Term	:	Periods of six to twelve months.
Instruments to be Used	:	Bridging Bonds.
Interest Calculation and Payment	:	Interest is calculated daily on the outstanding balance and is payable at maturity on instruments with a tenor of 12 months and shorter and six-monthly on instruments with a tenor in excess of 12 months.
Cost to Borrower	:	Inclusive cost: 6 months - 18,25% 12 months - 18,00%

16.3.5 LONG TERM STOCK

Description	:	Long term loan at a fixed rate.
Term	:	Three years and longer.
Instruments to be Used	:	Stocks.
Interest Calculation and Payment	:	Interest will be calculated daily on the nominal amount and shall be payable six-monthly in arrear.
Reference Rate	:	Johannesburg Stock Exchange - Actuaries Bond Yield plus a margin.
Cost to Borrower	:	Inclusive cost to a prime borrower: 3 Years - 16,85% 5 Years - 16,90% 10 Years - 16,80% 15 Years - 16,90%

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20 Years - 16,90%

16.3.6 (REDEEMABLE) PREFERENCE SHARES

Description	:	Term funding at a fixed and/or floating rate.
Term	:	Longer than three years.
Instruments to be Used	:	Redeemable preference shares.
Interest Calculations and Payment	:	Interest is calculated on a daily basis and is payable in arrear according to the pricing method chosen.
Cost to Borrower	:	Total cost, including a handling fee and stamp duty, if applicable, is a best efforts rate which can be obtained in the market on similar amounts, dates and terms.

Current rates on redeemable preference shares are ± 14,50% per annum; payable six-monthly in arrear or ± 71% of prime; payable monthly in arrear or 1,50% below prime; payable monthly in arrear.

16.4 CONCLUSION

All the models under consideration can be ranked in terms of borrowing capacity and cost. A government guarantee must be regarded as the single most important factor to enhance a borrower's status and to

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attract investors. A new entity with a full government guarantee or with the Central Government as its main or sole shareholder could command a better rating than the best "AAA"-private sector listed company.

It is assumed that the entity to be established will have a weak balance sheet with a cash flow that is inadequate to service the debt required during the initial period and that State support will be provided through share capital, subordinated loans, and/or guarantees. It is, therefore, essential that interest and capital on private sector loans be fully covered by a State guarantee if the structure used is not per definition part of the Central Authority. The new entity will then have access to the same markets as AAA private sector borrowers.

The operation of the new entity will impact on politically sensitive issues and will necessitate State involvement in its operational activities. Control and operational management of the new entity should, therefore, at least initially, be under State control.

The enhanced borrowing capacity and the favourable rates which, it is assumed, the new entity will enjoy, can further be improved through a well conceived funding strategy which takes due recognition of the importance of marketability, cash flow management, return on investment and relationship with investors.

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SENSITIVITY ANALYSIS: BORROWING POWERS AND COST

		PUBLIC COMPANY STATE GUARANTEE: WITH/WITHOUT		COMPANY WITHOUT GAIN STATE GUARANTEE: WITH/WITHOUT		IDC MODEL STATE GUARANTEE: WITH/WITHOUT		PUBLIC CORPORATION STATE GUARANTEE: WITH/WITHOUT	
1.	FACTORS DETERMINING BORROWING CAPACITY								
1.1	High nett asset value	Low	High	Low	High	Low	High	Low	High
1.2	High cash flow	Low	High	Low	High	Low	High	Low	High
1.3	High risk profile	Low	Very High	Low	Very High	Low	Very High	Low	High
1.4	Government backing								
	Direct : Guarantee	-	-	-	-	-	-	-	-
	Indirect : Control/Guarantee	Low	High	Low	High	Low	High	Low	High
1.5	Legislation								
	- Founding Legislation	Low	Moderate	Low	Moderate	Low	High	Low	Moderate
	- Supportive Legislation	Low	Moderate	Low	Moderate	Low	High	High	High
1.6	High marketability	Low	Very High	Low	Very High	Low	Very High	High	Moderate
2.	FACTORS DETERMINING COST								
2.1	Balanced maturity structure	Low	High	Low	High	Low	High	Low	High
2.2	High marketability	Moderate	High	Moderate	High	Low	High	Very High	Moderate
2.3	High risk profile	Low	Very High	Low	Very High	Low	Very High	Low	High
2.4	Perceived state commitment	Low	High	Low	High	Low	High	Low	High
2.5	Supportive Legislation	Low	High	Low	High	Low	High	Low	High

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SOURCING: AVAILABILITY PER TYPE OF STRUCTURE

	PUBLIC COMPANY	COMPANY WITHOUT GAIN	IDC MODEL	SA ROADS BOARD	PUBLIC CORPORATION
3. SOURCING					
3.1 Equity Funding					
- Ordinary Shares	Yes	Yes	Yes	No	No
- Preference Shares	Yes	Yes	Yes	No	No
- Reserves	Yes	Yes	Yes	Yes	Yes
3.2 Debt funding					
3.2.1 Long Term					
- Debentures	Yes	Yes	Yes	Yes	Yes
- Loan Stock	Yes	Yes	Yes	Yes	Yes
- Loans	Yes	Yes	Yes	Yes	Yes
3.2.2 Short Term					
Overnight Call	Yes	Yes	Yes	Yes	Yes
Bankers' Acceptances					
- Liquid	Yes	No	No	No	No
- Non Liquid	Yes	Yes	Yes	Yes	Yes
Commercial Paper	Yes	Yes	Yes	Yes	Yes
Bridging Bonds	Yes	Yes	Yes	Yes	Yes
Capital Project Bills	Yes	Yes	Yes	Yes	Yes

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FINANCING SOURCES

1. GENERAL

In South Africa, there are well developed markets for the trading of financial assets. For convenience they may be classified as the money market, mainly for the raising of short term finance with a life of three years or less, and the capital market, mainly for the raising of long term finance with a duration of longer than three years. The separation into money and capital markets should serve as a guideline only and is not intended to be a rigidly applied definition.

A distinction should also be made in the financial markets between the primary market, the market for new issues of finance, and the secondary market, which relates to the trading of securities already issued. The primary and secondary markets apply to both the money and the capital markets. The secondary market enhances the marketability and value of the securities because an investor can readily sell such instruments.

The sources of funding will be discussed under the two main headings of Debt Related Instruments and Equity Related Instruments.

2. DEBT RELATED INSTRUMENTS

Debt related instruments are divided between short, medium and long term finance. As a general rule short term finance extends to three years only, medium term finance would be for periods between three and ten years, and long term finance would be for longer periods.

A further classification of debt relates to the variability of the interest rate on the debt. A fixed interest denotes that the interest rate does not change for the period of the debt. A variable interest means that the interest fluctuates according to the market forces.

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The construction costs of the toll plazas on which the derived costs are based include the widened apron area from end beam to end beam. A small allowance was made for bulk earthworks. It is, however, difficult to calculate a figure for bulk earthworks as it is totally site-dependent. A clearer definition of the construction costs of a toll plaza as such includes only the apron area and associated layer works and the work to be done after platform preparation.

Table 2 lists those elements within each area of work which contribute to the cost of the plaza. These are the elements in respect of which cost savings have been sought. The percentages were calculated as a percentage of the total cost for the individual area in order to highlight the major cost contributors within each area.

Table 2

*	**Civil**	
	Concrete pavement	22 %
	Drains and culverts	8 %
	P & G	23 %
	New Jersey barriers & column bases	9 %
	Road signs	10 %
*	**Building Works**	
	Brickwork	22 %
	Roofing	7 %
*	**Canopy**	
	Canopy roof covering and ceiling	23 %
	Canopy ceiling	52 %
	Structural steel/protection structure	25 %

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Debt can also either be secured, so that in the event of liquidation the proceeds of the liquidated assets would first be applied to satisfying the claim of the secured creditor, or unsecured which means the creditor does not have any preferential claim on the assets of the borrower. The greater risk commands a higher interest rate, all else being equal.

The forms of debt generally available in South Africa are described below.

2.1 LONG TERM DEBT

2.1.1 Debentures

Debentures are medium or long term loans in specified denominations, which are usually issued by private sector companies. They are generally issued at a fixed interest rate with a specified redemption date. The return on the various forms of debentures will be influenced by the level of risk borne by the debentureholders. To increase marketability, provisions are made for the listing of debentures on the Johannesburg Stock Exchange.

2.1.2 Stock

Stock issues are used to cover the medium and long term requirements of capital projects. Redemption periods vary between three and twenty years with bi-annual interest payments. Typical issuers of stock are Eskom, Transnet, Armscor, Rand Water Board.

2.1.3 Loans

Loans are the lending of money by one party to another with a predetermined redemption period. The terms and conditions will be set to suit the requirements and

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preferences of the parties concerned. Loans are not denominated in specified units and are not listed on a stock exchange or traded on the secondary market. The conditions of issue deal primarily with the security: the loan may be secured or unsecured; and the interest: the loan can have a fixed or a variable interest rate. Restrictive covenants are sometimes included to protect the lender, i.e through a limitation on the borrowings and subordination of loans.

2.1.4 Short Term Debt

Short term finance is usually raised in accordance with the capital requirements of the borrower. Short term debt is frequently used as a form of bridging finance to augment the borrower's financial resources.

The more common sources of short term finance are mentioned below:

Bank Overdraft: Bank Overdraft is a facility used to make payments beyond the amount of money in the bank account.

Call Facility: Overnight facilities that are usually rolled over on a day to day basis to suit the borrower's ultra-short term needs.

Bankers' Acceptances: A Bankers' Acceptance is created when a company sells a bill of exchange to the bank to be settled on a pre-determined date, usually 90 days later. These instruments are either issued as liquid or non-liquid instruments according to criteria laid down by the Reserve Bank.

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Bills and Notes: These are bills and notes other than bankers' acceptances. Due to the ease of dealing in bankers' acceptances, however, and their quality (drawn on a bank) these instruments are less frequently used.

Capital Project Bills: Capital Project Bills are short term debt instruments issued to finance specific projects in the public sector until more permanent financing can be arranged. They have a maturity of 90 days. A typical issuer is Eskom.

Bridging Bonds: Bridging Bonds are issued by public sector entities such as local authorities, waterboards and public corporations, e.g. Armscor. They are usually used as bridging finance to cover short term financing requirements until more permanent funding can be raised. The maturity dates vary between six to twelve months.

Foreign Loans: A South African borrower could traditionally arrange term finance on the Euro-market, usually through banks. This market has not recently been accessible to local borrowers due to political and economic reasons. This situation may well change in the future.

3. EQUITY RELATED INSTRUMENTS

General

This section deals with finance provided to a company organised in terms of the Companies Act, 1973. The primary source of finance is usually provided by the owners of the company. This consists of share capital and retained earnings which are jointly referred to as equity.

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Equity is a combination of the following:

Ordinary Shares

The financial interest of ordinary shareholders is directly related to the performance of the company. Shareholder's wealth, expressed as return on investment, increases through capital growth and dividends received. The return to the shareholder, which consists of dividends plus capital growth, is typically higher than could be received on fixed interest investments. This is because the investor is bearing a greater risk in holding an equity investment.

The company can raise finance through the issue of new shares. If the issue price is acceptable, willing buyers for shares, in particular listed shares, are generally available. The majority of shareholders, i.e. investors, tend to be the large pension funds and insurance companies.

Part of the ordinary shareholders' equity is the earnings which are available for distribution, but which have been retained in the company. If they are distributed as dividends, alternative funds must eventually be found because the retention of earnings constitutes a source of finance.

The decision to retain earnings rather than to pay dividends is a complex one and is determined by a number of factors, inter alia the dividend policy of a company, the expected future growth and the prevailing money market and capital market rates.

Preference Shares

Preference shares are a hybrid, having some characteristics of both equity and debt. Preference shares generally promise a fixed dividend similar to debt.

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However, payment of a dividend may be passed if a company has insufficient funds which makes it comparable to equity because the company does not have an absolute fixed commitment to pay the dividends.

Various forms of preference shares are available to suit the particular requirements of a company and the needs of investors. These are participating preference shares, with elements of both preference shares and ordinary shares; redeemable preference shares where a company has an option to redeem them at a specified price on a particular date; and convertible preference shares where the holder has the right to exchange them for ordinary shares or securities under certain terms and conditions.

4. COMPARISON OF DEBT AND EQUITY

Certain features of debt and equity are discussed below on a comparative basis to highlight advantages and disadvantages. The headings are Return, Risk and Control.

Return

Debt has a fixed interest charge whereas equity does not. When the company is doing well and is earning more than the interest charged this is a decided advantage. The opposite applies, however, when the return on investment is lower than the interest charged.

Tax Deductibility: The interest charged on debt is usually tax deductible. Its effective cost to the company is, therefore, generally only half of the nominal rate. Dividends are not tax deductible and provide no tax relief for the company.

Risk

Commitment: Interest payments on debt must be met whether or not there are profits.

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Capital Repayment: Debt requires a capital repayment which can put a strain on the liquidity of a company and can even lead to liquidation.

Capital Structure: There is a limit to the amount of debt that can be raised before the company's risk profile will be unacceptable to the market, which will be reflected in the cost and availability of additional loan capital. At the same time, equity holders will require a greater return on their investment which will necessitate more debt at considerably higher interest rates due to the perceived increase in risk. Raising large amounts of debt, therefore, reduces the company's ability to raise future finance.

Control

Dilution of Control: Raising finance through the issue of equity dilutes the control of the existing shareholders.

Levels of Control: Control over the affairs of a company is generally exercised by the equity holder with the majority of shares. Depending on the percentage of issued capital held by an investor change in control is possible when more shares are issued.

5. INVESTORS IN DEBT INSTRUMENTS AND SHARES ISSUED IN THE SOUTH AFRICAN MARKET

Debt instruments and shares issued by the public and private sectors, attract a very wide range of investors. The most important investor categories are listed below:

- The Public Investment Commissioners;
- Insurers which consist of long and short term insurers;
- Private Pension and Provident funds;
- Unit Trusts;

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- The Banking Institutions
- Building Societies and Sundry Investors such as Medical Aid Schemes, Finance Companies, Trustees;
- Public Companies;
- Public Sector Bodies;
- Individuals
- Foreign Investors

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FUNDING

1. INTRODUCTION

In order to formulate a funding strategy for a public corporation the following factors have to be taken into account:

- borrowing capacity of the organisation;
- status of the stock to be issued;
- direct and/or indirect guarantees and by whom given;
- existing or new utility;
- cash flow considerations;
- the nature of the public utility;
- the capital structure of the organisation;
- the financial structure of the organisation;
- interest rate expectations;
- the degree of autonomy of the management of the utility i.e. is there direct or indirect involvement in operational matters;
- subsidies (Capital/Interest);

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- the power to issue bills and/or stocks;
- ownership and control of assets and the nature of the assets;
- the maturity spread of the stock; the variety of investors attracted; and whether or not the stock is marketed;
- trading at a discount or at a premium;
- the marketability of the stock (i.e. secondary market information)

2. 2.1 **Borrowing Capacity**

For a detailed discussion of borrowing capacity see 16.2.

2.2 Status of Bills, Bonds, Securities Issued

From 1989, insurance companies and pension funds are no longer required to invest in prescribed investments (prescribed investment requirements have been abolished).

Prescribed investment requirements were, however, replaced by maximum investments in certain approved assets i.e. a maximum of 20% of insurance companies and pension funds assets can consist of bills, bonds and securities issued or guaranteed by or loans to or guaranteed by Eskom and Rand Water Board, respectively.

A total of 40% of assets can be invested in this way.

It may happen in the future that bills will qualify as liquid assets. Even though they do not have marketability they do have a rediscount status and can be pledged.

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2.3 Spread of Investors

In determining a funding strategy it is important to decide in advance either to approach a wide spread or narrow spread of investors. A narrow spread of investors would be to the detriment of marketability but would be inevitable in respect of small issues (less than R100 million).

2.4 Term Structure

The term structure of the loan portfolio is a very important variable in any funding strategy as it caters for interest rate expectations and cash flow considerations. The solvency of any concern will be under pressure if all its loans should mature in the same year. A rule of thumb measure is that the nett present value of a loan should not exceed R500 million.

The ideal is to have loans maturing from short term (3 - 4 years), medium term (8 - 10 years) and long term (15 - 20 years). Interest rate policy and achievement in a toll authority is a vital consideration. Nett toll income will only keep pace with inflation either through traffic growth or tariff increases or a combination of both. The ideal is to have tariff increases at least in line with the consumer price index. Government policy in this latter regard must be taken into account as real rates of interest above those on which funding is based can, over time, cause major concerns in terms of cash flow and servicing of borrowings. Real rates of interest must be prudently determined. Past performance in regard to inflation and real interest rates is not necessarily an indicator of future trends.

2.5 Variety of Instruments to be Issued

Though the variety of instruments to be issued is, to a large extent, a function of the loan structure, it is to the advantage of the borrower to have at least two or more bonds and loan stock in the market.

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* Electrical work

Cabling and conduit	19 %
Distribution board panels	13 %
Building air-conditioning	7 %
Generator	18 %
Light masts	18 %

* Toll Collection Equipment

TCC	15 %
AVC	9 %
Magnetic card handler	11 %
Traffic control equipment	22 %
Data communication cables	4 %
Fare display unit	7 %
OCD	7 %

10.4 POSSIBLE DESIGN AMENDMENTS AND DISCUSSION OF ASSOCIATED COST IMPACT

10.4.1 CIVIL WORKS

a) Concrete Apron Slab

The concrete apron slab consists of an approach slab and an exit slab of an approximate total area of 3 200 m² for a six lane toll plaza and 11 000 m² for an eighteen lane toll plaza. By replacing the concrete exit slab with asphalt, a substantial saving can be obtained. It must, however, be noted that this is only feasible where the freeway is surfaced with asphalt.

On existing roads it is also cheaper to use the existing asphalt with silviacim on the approach side, instead of removing the asphalt and replacing it with concrete pavement at a high cost.

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The structure of the organisation will determine whether or not funding by means other than loan stock is appropriate or possible. This can also be determined by the nature of the underlying assets.

2.6 Capital Structure

If the proposed organisation can issue equity, it is important to determine the most appropriate debt/equity ratio. The public may, however, have concerns regarding a toll authority appearing to enrich shareholders through a 'user pays' form of taxation and this could affect the obtaining of shareholders' funds at reasonable levels.

2.7 Financial Structure

Capital structure should be distinguished from Financial structure as the latter includes short term debt plus all other liability amounts.

Interest rate expectations have a major effect on the organisation's funding mix strategy at any one time. If the expectation is that rates will fall, the mix will be weighted towards the short end and vice versa. This will be an ongoing evaluation of the market.

2.8 Issue of Discount/Premium Stock

The "age" and/or the lifecycle stage of the organisation will determine whether funding will take place in the form of a discount or premium stock issue.

If cash flow is a limitation, the organisation will issue low coupon stock. In the case of a mature organisation where cash flow is not a major factor, this is not a consideration.

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Certain borrowers prefer a low coupon stock issued at a discount, as this provides more flexibility when interest rates fall. In South Africa, investors are reluctant to pay more than nominal value for stock. There are also tax considerations, insofar as the lender is concerned, to be taken into account. Furthermore, a stock can be retained and re-issued at varying discounts if it carries a low coupon, whereas this is not desirable if the stock has to be issued at higher than the nominal value.

When the organisation structure and funding requirement has been determined, it will be necessary to prepare a detailed funding strategy. The initial indications of requirements can readily be handled by the South African market without disturbing interest rate patterns and the ability of other borrowers to fund their requirements. It is expected that, in due course, there will be access to overseas capital markets if needed. It should be noted, however, that overseas investors prefer and in some cases, are restricted to listed securities. The funding strategy prepared for the Lesotho Highlands Water Scheme is currently confidential but will be made available to the toll authority in due course. A funding strategy should, in any event, be prepared for the South African Roads Board prior to any change in toll authority organisational structure.

2.9 Ownership and Control over Assets

The nature of the control over assets and the discretionary powers to dispose of assets, can contribute towards a more flexible structure. Liquidity can be improved should the Corporation be able to exchange non-liquid assets into cash or if use is made of off-balance sheet financing such as leasing, rental, or suspensive sale agreements.

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ANNEXURE D

LOAN PORTFOLIO MANAGEMENT

1. INTRODUCTION

A loan portfolio management programme serves to improve the cost effectiveness of funding. The management programme requires an integrated approach to the primary market issues and the secondary market activities of the borrower. With this in mind the mechanics of the primary and secondary markets are also discussed in some detail. To achieve the objective stated above, the programme should provide for:

(i) the identification and selection of specialist institutions in the field of loan portfolio management, e.g. merchant banks and financial institutions with proven record in the field, as advisor(s) and participants;

(ii) commitment from banks to structured financing;

(iii) the identification of benchmark stock for reference purposes;

(iv) realistic objectives used as criteria for the measurement of the planned amount of reduction in the initial premium towards the benchmark stocks level;

(v) cost control to monitor the cost involved in launching and managing the programme;

(vi) the availability of standby facilities and/or alternative funding facilities in addition to the structured financing initially committed to by the banks.

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2. CONTRACTUAL CERTAINTY OF FUNDING

In order to provide for committed funding, a bank or consortium of banks ("the bank"), should be contracted to underwrite the initial funding requirements needed in the capital market for a predetermined period. The commitment should cover at least the capital requirements for the first five years and will ensure that stocks are created and placed selectively in the Market.

In addition, a banking facility should be offered to provide for the short term needs of the borrower and to provide access to the short term money market.

3. PRICING

3.1 Maximum Margins - Caps

The bank should guarantee, during the initial funding period and under normal conditions, a maximum margin, i.e. a cap, at the time of any primary issue, of not higher than approximately 100 points over and above the comparable benchmark stock ("the guaranteed differential").

The benchmark stock to be used against issues under the different term structures of short-, medium- and long term as defined within the capital market, could, for the purposes of this exercise be defined as the relevant Johannesburg Stock Exchange (JSE) actuaries bond index or the relevant Republic of South Africa (RSA) stock, whichever is the higher.

Term Structure of Issues

The maturity structure of the issues will be determined by the borrower and its bank, acting as an advisor. Should the advisor be called upon to perform in terms of its primary issue guarantees, the advisor will naturally reserve the right to

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choose the maturity of the relevant issues.

Underwriting Fee

An underwriting fee will be payable. This underwriting fee has two elements. First, the guaranteed availability of a predetermined amount over a specific period, and secondly the differential cap of around 100 points. This cap is the equivalent of a series of put options on the differential which, in accepted market practice, is payable upfront in the form of a premium.

The fee applicable to the guaranteed availability is negotiable.

4. CAPITAL MARKET PROGRAMME: ALTERNATIVE STRATEGIES TO ENSURE COST-EFFECTIVENESS OF FUNDING

Any approach to reduce the guaranteed differential to benefit from lower relative market yields of issues will, inter alia, be subject to:

(i) selecting the correct term structure of issues; and

(ii) the method of operations being used in the capital market.

4.1 Term Structure

The strategy to be formulated will be based on market conditions, investor's preferences close to the time of issue, the impact of those preferences on the issue, and the needs of the borrower.

Market conditions will determine the following factors:

(i) investor's preferences for different term structures;

(ii) the different rates in terms of the yield curve; and

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(iii) the extent of the margins above the defined benchmark rate in the different term structures.

4.2 Methods of Operation in the Capital Market

Three alternatives to ensure the success and cost-effectiveness of the borrower's funding requirements through its participation in the capital markets are presented:

(i) primary capital market issues supported by secondary capital market activities;

(ii) primary capital market issues linked to incentive schemes which are supported by secondary capital market activities; and

(iii) professional and dedicated secondary market-making which is supported by an initial primary capital market issue.

The first two alternatives focus on the primary capital market to procure funding and on supportive secondary market-making activities to improve the cost-effectiveness of the funding.

The third alternative concentrates on secondary market-making to obtain funding and achieve cost-effectiveness, combined with a single large primary issue.

Three alternatives are offered because each alternative places different demands on a borrower. It is the borrower's choice and its ability to satisfy these points that will determine the method to be used. These various requirements are in the areas of:

(i) the extent of the initial primary issue and of the subsequent primary issues;

(ii) the placement fee of the primary issues;

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(iii) the profit-sharing incentive schemes;

(iv) the secondary market-making and support facilities; and

(v) the cash-flow management requirements.

ALTERNATIVE 1: Primary capital market issues supported by secondary capital market activities

This method comprises the traditional approach to funding in the capital market by means of primary issues. All secondary capital market activities are supportive, with the emphasis on attempting to lower the relative market yields of subsequent primary issues, rather than raising additional funding.

To attract sufficient investor interest to ensure the lowest possible margin or premium, given a predetermined cap, the issues must be substantial. The initial primary issue should be R100 million with minimum trances of R50 million thereafter, subject to an annual maximum.

Supportive secondary capital market activities

Three approaches to market-making for secondary capital market activities may be followed. These approaches are as follows:

(i) the borrower's own treasury plays the role of the market-maker;

(ii) the advisor acts as the agent/market-maker on behalf of the borrower; and

(iii) the advisor acts as the market-maker for its own account.

The main difference between the three approaches is the distribution of the risks and rewards. In terms of the first two approaches, the risks and rewards are mainly for the account of the borrower. If the third approach is used, all risks and rewards are taken by the advisor with

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certain facilities provided by the borrower.

The more progressive the borrower becomes in any secondary capital market activities, the larger will be the benefit derived from lower relative market yields of its issues. However, the more progressive the activities are, the more complicated the cash flow management will be for the borrower.

ALTERNATIVE 2: Primary capital market issues linked to incentive schemes which are supported by secondary capital market activities

The main difference between this approach and ALTERNATIVE 1 is the method of remuneration. Incentive schemes are offered to the bank, as advisor, to further enhance the cost-effectiveness of the funding for the borrower.

The primary market issues are identical to those described in ALTERNATIVE 1. However, the bank will continually strive to improve the margin on any of the stock issues.

Supportive secondary market

The approaches to secondary capital market activities are identical to the three described in ALTERNATIVE 1.

It is in the interest of the advisor to improve the margins on any issues. Its remuneration will be linked to performance, therefore, cost-effectiveness is ensured.

ALTERNATIVE 3: Professional and dedicated secondary market-making which is supported by an initial primary capital market issue

In contrast to the above two methods of funding which are directed at the primary capital market, this alternative focuses on funding the borrower by maintaining continuous activities in the secondary capital market. The secondary capital market activity is combined with a single large primary capital market issue.

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The borrower must commit itself to issuing a substantial amount, e.g. R400 million, in the first and only primary issue. This issue could be any combination of short-, medium or long term stock, depending on the needs of the borrower.

After the initial primary capital market issue, there would be tap issues at any time for the required amount and for the maturity which is deemed the most appropriate at the time. This would never be at more than approximately 100 points above the relevant benchmark rates prevailing at the time.

5. ALTERNATIVE FUNDING FACILITIES

To further enhance the cost-effectiveness and flexibility of funding for the borrower, the following alternative funding facilities between the banking and capital market facilities, and within the capital market facility itself, should be secured.

5.1 Flexibility of Funding between the Banking and Capital Market Facilities

The guaranteed amount, referred to in 1(ii), should be well within the capital market funding capabilities of the bank. If necessary, this amount could be increased if it is decided to switch financing from the banking to the capital market facility, as negotiated with the borrower.

5.2 Flexibility of Funding within the Capital Market Facility

It is proposed that this facility be constructed so as to allow the borrower either to obtain funding within the capital market to use this option as a standby bridging facility in the money market, if capital market conditions are not favourable.

The capital market facility may thus be used either as a capital market, a bridging facility in the money markets if capital market conditions are unfavourable, or as a combination of both.

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6. DERIVATIVE MARKETS

The development in South Africa of the derivative markets, e.g. interest rate swaps and futures has been the most recent noteworthy feature of the money and capital markets. The advisor should implement these products on behalf of the borrower when it would be beneficial to the borrower.

ADDENDUM 1: PRIMARY CAPITAL MARKET ISSUES

Primary capital market issues can take place either by private placings or tenders. The modus operandi of the two methods are very similar. In the case of a traditional primary capital market issue, the borrower, in collaboration with its merchant bank(s), determines in advance the extent of the issue, the term structure and the price. In the case of a tender, only the first two variables are determined in advance.

A primary market issue involves, inter alia, the following activities:

1. PLANNING

Once the borrower's financial needs are established, the syndicate reviews the present and expected local economic and capital market conditions. From this a preliminary placement strategy is derived.

2. THE MARKET TEST

A market test is done to formally convey and disclose the borrowing requirements to possible investors, and to introduce the borrower as a long-term presence in the market.

3. STRATEGY MEETING

Following the market test, strategic planning is done and the borrower is fully briefed. Issues such as loan maturities, the minimum margin above the benchmark base rates and the final timing are discussed,

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The normal considerations relating to the life and maintenance of concrete versus asphalt roads also apply in this instance.

10.4.2 ISLANDS

In existing South African toll plazas, New Jersey barriers have been erected along the sides of the toll islands. Solid concrete bullnoses have been constructed on the approach and exit sides of the islands. The use of bullnoses on the exit side is only justified in the case of reversible lanes and a saving can, therefore, be obtained by omitting the New Jersey barriers and the bullnoses on the exit side where possible.

The toll booth and booth protection barriers can also be omitted and can be replaced by extending the New Jersey barrier through the area occupied by the toll booth and putting a fibre glass top or aluminium structure onto the New Jersey barrier to form a toll booth. Furthermore, instead of keeping the island symmetrical in relation to the centre line of the plaza, the island length can be reduced on the exit side. The island can stop just past the AVC area and instead of using the New Jersey barriers, a much cheaper Armco barrier or guardrail can be used to prevent people from walking across the lanes so as to maintain safety.

In the past, the general approach with regard to plaza design was to do extensions symmetrically about the centre-line of the carriageways. By performing future extensions asymmetrically, adding lanes to the side furthest from the buildings, the lengths of the service sleeve pipes, water pipes, electric and electronic cables and access road, as well as the width of area to be landscaped, can be reduced, which will result in a reduction in initial capital cost.

A further reduction in cost can be obtained by reducing the size of the manholes below the toll booths. Allowance should only be made in the manholes to accommodate certain equipment which was normally placed in the booths but which can for protection purposes be located in the manhole. In addition the design of the booth, may be simplified.

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cleared with the borrower and finalised.

4. PREPARATION OF THE PROSPECTUS

A prospectus is regarded as a very important marketing toll to ensue a successful primary placement. The contents should project the full image of the borrower.

5. THE ACTUAL PLACEMENT

According to the set timetable, the ultimate interest rates and final terms and conditions are discussed and agreed upon by the borrower and the bank before the prospectus is finally printed and the issue formally placed. At that time, investors are contacted to confirm final terms. Interest rates set are negotiated and participation secured. During this process, close contact is maintained with the borrower, and the prospectus is distributed to all market participants. These actions are co-ordinated by the bank. Marketing actions are then extended to ensure the largest possible participation.

It is the advisor's responsibility to obtain the amount required at the best possible interest rates because all future issues will be rated accordingly.

Once the issue is placed, the bank draws up allotment schedules, confirms allotments to participants and collects payments on behalf of the borrower.

6. POST-ISSUE RESPONSIBILITIES

Once the issue is placed:

(i) final arrangements are made for the JSE listing of the stock;

(ii) either the borrower itself or appointed transfer secretaries handle the registration of stockholders, the issue of stock certificates, payment of interest and repayment of capital on the

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redemption date;

(iii) the borrower and the major investors are constantly informed of each other's respective funding or investment requirements. Such action stimulates market-making and creates opportunities to structure special transactions to the advantage of the borrower; and

(iv) the bank remains responsible for matters relating to the issue. Any other information required or further enquiries made by the market, are referred to and handled by the advisor.

ADDENDUM 2: SECONDARY CAPITAL MARKET ACTIVITIES

To enhance the marketability of the stock issued in order to lower the relative market yields of funding, the promotion of a secondary market through market-making is important.

This activity, inter alia, entails the creation of the principle of a buyer and seller of last resort. The intentions to market-making must be firm and ongoing for as long as the particular securities remain unredeemed or the borrower expects to continue reducing its borrowing costs through active treasury management. The benefits are long term and positive, however, they are not easily measurable or quantifiable in the initial stages of the activity. The cost- savings are normally measured dynamically, relative to an agreed upon index or other relevant instruments.

In creating a market-making programme, the exact strategy to be followed will always remain subject to:

(i) the techniques and technology applied;

(ii) the propensity of the market-maker to accept a certain level of a risk/reward payoff relationship;

(iii) the ability to dynamically manage risk; and

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(iv) the implications for and demands on cash-flow management.

Three approaches to market-making for secondary activities can be followed. These approaches are:

(i) the borrower's own treasury plays the role of market-maker;

(ii) the advisor acts as agent/marker-maker on behalf of the borrower; and

(iii) the advisor acts as market-maker for its own account.

The main difference between the three approaches is the distribution of the risks and rewards. In terms of the first two approaches, the risks and rewards are mainly for the account of the borrower. When the third approach is used and all risks and rewards are taken by the syndicate with certain commitments undertaken by the borrower.

1. WHERE THE BORROWER ACTS AS MARKET-MAKER

Large borrowers in South African with ongoing capital need, have generally opted for the in-house development of highly efficient and expensive treasury operations. This enables them to manage their asset and liability operations effectively and to market-make their own instruments.

The main advantages of this approach for the borrower are:

(i) it controls its own risks associated with secondary activities by both trading and hedging in the different markets;

(ii) it controls the costs associated with secondary activities;

(iii) it determines the cost-effectiveness of its issues;

(iv) it controls the volume of trading in addition to the volume and price of buyback facilities (carry-financing) it is willing to extend to the market; and

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(v) it controls the cash-flow requirements of the liabilities.

The main disadvantages are:

(i) the instalment of elaborate trading and administrative systems; and

(ii) the employment of expensive personnel with the necessary trading expertise in both the cash and derivative market and in administration.

2. WHERE THE ADVISOR ACTS AS AGENT/MARKET-MAKER ON BEHALF OF BORROWER

As with the above approach, secondary activities will start once the initial primary issue has been placed. The main difference between the two alternatives is that all trading, implementation of hedging techniques, administration and settlements will be undertaken by the advisor on behalf of and in conjunction with the borrower.

Under this option the risk/reward relationship associated with market-making remains with the borrower. However, the size and scope of the treasury function is reduced. The activity levels in the market will be determined in consultations between the advisor and the borrower on a continuous basis. The remuneration will be determined by a flat commission on turnover or some other easily determinable non-risk related basis.

The main advantages are:

(i) no need for elaborate trading and administrative systems;

(ii) no employment of expensive trading personnel;

(iii) controls risks associated with activities in the cash and derivative markets;

(iv) controls costs;

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(v) controls cost-effectiveness of issues;

(vi) controls the volume of trading as well as the volume of buyback facilities the borrower is willing to extend to the market; and

(vii) controls the cash-flow requirements of the facility.

The main disadvantage is that some control over risks is lost as trading takes place via another party.

3. WHERE THE ADVISOR ACTS AS MARKET-MAKER FOR OWN ACCOUNT

Under this option, all market-making related risks are borne by the bank. It is in their interest to develop the acceptance level of the instruments issued and to manage the activity at rewarding levels. To enable the bank's market-makers to perform their functions effectively, they will require some firm undertakings by the borrower.

Full details of these requirements are as follows:

(i) the borrower must undertake to provide borrowing facilities on its stock to the advisor for a predetermined maximum amount of around R100 million in the event of the advisor becoming short of stock. This situation could occur in a strong bull run which effectively means that the borrower will be issuing its stock at progressively lower rates.

By a stock borrowing facility, it is meant the right to buy stock on a buyback basis from the borrower at market related rates.

(ii) the borrower must also be prepared to provide carrying facilities on its stock to the advisor at market related money market rates. This will occur when the advisor is long of stock.

By a stock carrying facility, it is meant the right to sell stock on a buyback basis to the borrower at market related rates.

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(iii) the borrower must undertake to provide (or write) options (calls and puts) to the advisor at market related rates (as pertains to the stock in sufficient volumes to allow the advisor to hedge itself.

(iv) for the above undertakings by the borrower, the advisor provides fulltime market-making activities in stock from its own account, i.e. at no risk to the borrower.

(v) if need be, the advisor could handle all the administrative procedures required for issuing stock, buying and selling stock, marketing stock, handling interest payments, etc. The reporting procedures and controls employed by the advisor are those used for ordinary capital market transactions in every day trading, and they are systems which have been approved by the auditors.

The advisor shall undertake to constantly make two-way prices in the stock via the Reuters network, and they will encourage investors and jobbers alike to get involved in various option strategies (straddles, strangles, butterflies, spread, etc.) in order to improve and ensure the marketability of the stock.

The main advantages are:

(i) no risks in any secondary market-making activities for the borrower, and;

(ii) effective method to enhance the cost-effectiveness of borrowing.

The main disadvantages are:

(i) no control over secondary activities;

(ii) large facilities to be made available to market-makers;

(iii) little practical experience for own treasury personnel; and

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(iv) complicated cash-flow management.

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PART V
PLANNING FOR PUBLIC ACCEPTANCE

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PART V : PLANNING FOR PUBLIC ACCEPTANCE

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10.4.3 ROAD TRAFFIC MARKINGS

In current plaza designs road traffic markings are used on the exit side of the toll lanes. These road markings can be eliminated completely which should result in a 30 % saving in respect of road traffic markings for the toll plaza.

10.4.4 KERBING

Generally the plaza area is fitted with kerbs along the edge of the pavement on the limits of the apron slabs. Although maintenance activities might increase slightly, it is believed that kerbing can be eliminated completely, provided that the drainage design caters for surface water to be drained from the apron area.

It must also be noted that the change in island design also has an impact on the concrete pavement in respect of the block layout and joining of these pavement sections.

Table 3 lists the detailed results of the elemental breakdown and cost estimate for civil works as well as the estimated saving which can be achieved by introducing the abovementioned proposals.

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CHAPTER 17

THE ECONOMIC RATIONALE FOR A TOLL ROAD NETWORK IN SOUTH AFRICA

17.1 INTRODUCTION

If the proposed concept of a toll road network is to be accepted by the general public, and in particular by those special interest groups that represent certain sections of it, it should be consistent with a logically defensible economic rationale. This is also necessary if the concept is to withstand scrutiny in the wider context of fiscal policy-making over the longer term.

This requires a set of principles to be established, which must be comprehensive, coherent and cohesive. Taken together, they should build a solid case for the desirability of funding certain roads in South Africa by way of user charges.

17.2 PRINCIPLES

It is proposed that the following principles should be adopted.

17.2.1 A DISTINCTION IS DRAWN BETWEEN "HIGH SERVICEABILITY" AND "NATIONAL STANDARD" ROADS

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

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

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

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

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

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

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

It is generally accepted that it is the government's function to provide communities with an acceptable level of basic access. Newly constructed national standard roads thus will be prevalent during the early part of the economic emergence of a country or a geographic region within it. Communities are at that stage both poor and scattered. The fruits of specialisation in economic activities establish a need for enhanced access to markets and raw materials that only roads can satisfy. However, such roads would initially carry

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limited traffic that could not bear the burden of high direct costs, so commercial provision of roads is out of the question. Thus there are strong grounds for supporting road construction out of general tax revenues, because the benefits of roads are spread throughout the community.

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

In South Africa, however, the issue is complicated by rapid urbanisation. New roads may need to be constructed which, while serving the purpose of providing basic access, also need to be of a relatively sophisticated nature because of the high traffic volumes that they will have to accommodate right from the start. It is important to note that, because of their principal purpose of providing basic access, these roads should be treated as "national standard" rather than "high serviceability" roads. This, in fact, requires merely that the "national standards" set by the Department of Transport should be able to accommodate situations of this type.

17.2.2 "HIGH SERVICEABILITY" ROADS -

<u>- should be financed by tolls</u>

As a general rule, governments should seek to promote efficiency in the economies that they control. The South African government is also committed to the pursuit of economic efficiency.

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

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

The provision of "high serviceability" roads is essentially a "commercial" type of government activity. Such roads are not true public goods because people can be excluded from the receipt of benefits, and externalities are limited. In fact, these roads could effectively be provided by the private sector were it not for the fact that they have certain natural monopoly features which make public control desirable.

Under these circumstances, user charging has several important advantages.

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

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

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

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

And fifth, user charges facilitate optimal allocation of traffic between roads and other transport modes.

User charging by way of tolling is, therefore, an appropriate way in which to have "high serviceability" roads controlled by the state but financed as the private goods which they rightfully are. In fact, were it not for the practical difficulty, and hence expense, of levying them, tolls would

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be seen more generally as the best way of ensuring efficient road provision. Often this expense prevents their use, but in the case of "high serviceability" roads, which by their very nature are provided mainly for the benefit of users in the higher income categories, and which have particular physical characteristics such as limited access, this objection falls away.

Tolls are thus a very appropriate means of charging for "high serviceability" roads. They also have the attraction of being readily enforceable, something which is not always true of user charges imposed in Third World situations.

- should exhibit the minimum possible degree of cross-subsidisation

It is possible that in some cases users of "high serviceability" roads could be tolled more than is necessary to support these facilities, and the "profit" made used for some other purpose. Such an approach would be dubious from an economic viewpoint.

Firstly, it would not be consistent with the economic efficiency criterion, which requires that rationing include having the user get what he pays for in addition to paying for what he gets. It must be stressed in this regard that allowing cross-subsidisation to occur would defeat the whole purpose of user charging, by effectively altering tolls to just another indirect tax. In such a scenario, tolling would be a very inefficient way indeed of raising indirect taxes!

Secondly, it would represent a gross misuse of the monopoly power conferred on the road tolling authority, especially in view of the fact that a major reason for wanting to keep road provision under overall government control is precisely the prevention of such misuse.

For reasons such as these, other public institutions in South Africa are attempting to phase out cross-subsidisation in their fee structures, in recognition of the fact that they do not serve single, homogeneous markets. A road network also is not a homogeneous product - different roads have different uses and users, as has a single road over different segments of its total length.

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Therefore, overcharging some road users in order to cross-subsidise others would not be acceptable on economic grounds.

Realistically, however, it must be recognised that a strict imposition of the rule of no cross-subsidisation may entail certain administrative difficulties. Accordingly the general principle that should be followed would be to restrict cross-subsidisation as much as possible, but with due recognition that tolls are only a proxy for direct charging and have certain limitations. It would, for example, be acceptable to allow cross-subsidisation between contiguous toll plazas on a stretch of freeway if these were in general used by the same group of motorists, and if it were significantly easier to maintain accounts for this freeway stretch rather than for each toll plaza individually.

- should be fully self-financing over the long term

Given that "high serviceability" roads are alternatives to "national standard" roads for users choosing to make use of them, they should in principle be paid for fully by those users. This standpoint over-rides the long-standing general debate over whether user charges, in the case of natural monopolies resulting from decreasing cost industries, should be set equal to long-run or short-run marginal costs: in the case of "high serviceability" roads this argument is simply irrelevant. For a "high serviceability" road to be justified therefore requires the revenues it can earn over its projected lifespan to be sufficient to cover all construction, upgrading and maintenance costs.

This does not mean, however, that tolls have to be set at a level high enough to make this possible. Were this to be done, toll rates would in many cases be higher than users would be willing to pay, and the high serviceability roads could not be built. This would result in the loss of two classes of benefits by the public at large.

Firstly, a high serviceability road will attract traffic - often including a large number of heavy vehicles - away from alternative national standard roads, resulting in savings in maintenance and possibly upgrading expenditures on the latter.

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Secondly, the user of a high serviceability road will only be prepared to pay a toll that is at most equal to the savings he perceives himself as deriving from the use of that road rather than an alternative national standard road. Usually his calculations in this regard will be unsophisticated, being restricted to direct fuel savings as a result of lower mileage plus some savings of time and inconvenience. For the economy as a whole, however, these are additional benefits that result from his using the high serviceability road. The most important are fuel savings resulting from the improved geometry of the road, and the reduced accident rates that occur for the same reason.

Both lower liquid fuel use and lower motor accident rates are national goals, and may be expected to become increasingly important in future. Consequently it is appropriate to encourage their achievement by the internalisation, in the calculus of the provision of high serviceability roads, of these positive economic externalities. This means simply that both marketing and cost-benefit analysis should be performed on high serviceability roads and, where there is a discrepancy between the benefits confessed and revenues that can be raised through user charges, this should be compensated for by a subsidy out of general revenues. This will require an appropriate subsidy formula to be devised.

The revenue accruing to a high serviceability road may, therefore, be defined as being equal to the tolls collected plus the appropriate formula-based subsidy and formed "adjusted toll revenue".

For new roads of this nature to be justified, adjusted toll revenue should be adequate to pay for the full cost of the road over its anticipated lifetime - which is tantamount to saying that the road should be justified in terms of cost-benefit analysis.

In the case of the upgrading of existing "national standard" roads to "high serviceability" roads, it is the cost of this marginal improvement, as well as future maintenance requirements, that should be met out of adjusted toll revenue over the projected twenty-year life of the road.

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Finally, there is the case of "high serviceability" roads that already exist. These would be high-level facilities for which alternative, lower-level options are available and which, for historical reasons, were funded from general revenues. With the benefit of hindsight regarding the state of the South African economy during recent years, arguably these roads should never have been provided out of public funds. They should have been financed as toll roads from the beginning, and the funds thus saved spent on other, less luxurious requirements, including the maintenance of "national standard" roads. There does, therefore, seem to be a case for charging tolls on such roads at a level which permits a modest "profit" to be made after maintenance expenditures (perhaps by costing "old" roads at replacement values), and for paying that profit into Treasury or the National Road Fund as if it were the repayment of a loan. This loan repayment could then be devoted to the financing of other types of state expenditure which may in retrospect be seen to have a higher priority than the provision of "high serviceability" roads.

This argument has important implications for the level of tolls that should be levied on "old" roads. In particular, it refutes the suggestion that "old" roads should necessarily bear lower tariffs than "new" ones, which is an ad hoc approach without foundation in any of the principles set out here. Instead, the appropriate guide to the level of tolls to be borne by a "high serviceability" road is the extent to which it has features making it superior to, or the extent to which it substitutes for, an equivalent "national standard" road.

Of course, in requiring "high serviceability" features of roads to be fully self-financing out of adjusted toll revenue over the long term, it is rather arbitrary to decide that this horizon should be set at twenty years. Although this is common practice, it is followed because discounted costs and benefits used in cost-benefit evaluations become negligible over periods longer then twenty years; it does not, therefore, suggest that a road will in any way become less serviceable once this period has elapsed.

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The consequence of this will be that "profits" over and above maintenance expenditures will begin to be made on "high level" roads after the twenty-year period has elapsed, even if traffic volumes have been predicted correctly. Equally possible, however, is that traffic volumes may grow more rapidly than initially anticipated, thus producing a "profit" even within the twenty-year horizon. There would seem to be three possible ways of dealing with these "profits".

Firstly, toll tariffs on the roads in question could be reduced to reflect the idea that they had been paid for and that only maintenance charges had in future to be borne by the user. This option does not seem attractive from the viewpoint of intergenerational equity, however, as it amounts to the over-charging of users within the first twenty years.

Secondly, the "profits" could be applied to cross-subsidise other roads. This alternative, too, is unattractive, for reasons that have already been advanced.

Finally, the "profits" could be paid into Treasury or the National Road Fund. This is the preferred solution, not only because it would reflect as well as possible the true situation that users in the first twenty years had unwittingly extended loans to subsequent ones, but also because it would be consistent with the treatment that has been suggested for those "high serviceability" roads already in existence.

- should be part of national priority assessments

It is a Cabinet requirement that any future toll road authority should ensure that road expenditure is not permitted on a "project whose national priority, compared with all other areas, is not the highest", and furthermore that "priorities shall be determined and strictly applied as to where and when new roads are to be built, and of what standard".

In cases where high serviceability roads can be financed exclusively from toll payments, and require no public subsidy to provide adjusted toll revenue, it may be argued that this requirement is irrelevant. For the foreseeable future, however, such cases are likely to be very limited if not impossible, and it is obvious that in all other instances prioritisation will be required.

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Attention thus will have to be given by the future toll road authority to ensuring that prioritisation procedures are appropriate, as these are indications that current practice in this regard has certain limitations that may discriminate against high serviceability roads relative to other forms of State expenditure.

- should be priced to maximise their contribution to economic welfare

"High serviceability" roads funded by tolls have an important role to play in extending consumers' choice. At the same time, however, they have significant natural monopoly features and, once provided, should be viewed as a national asset, especially as the overall benefits they confer on users are by definition required to be greater than the costs they impose. In addition, they should make the greatest possible contribution to reducing the burden that "national standard" road provision places on the general taxpayer.

This implies that the benefits of their use should be available to as many road users as possible. The revenue needed to supply and maintain them should be derived from a combination of tariffs that are as low as possible and traffic volumes that are as high as possible.

Naturally, in setting tariffs, proper attention will have to be given to price[1] and income[2] demand elasticities. However, this does not mean that tariffs may be set as high as the market will bear. As is the case with other public-utility type operations, both in South Africa and worldwide, tariffs should be based on costs.

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1 Price demand elasticity will be determined primarily by the relative quality of alternative roads (higher elasticity with higher quality), the quality of vehicles (higher quality means higher vehicle maintenance costs, means lower elasticity), and the proportion of disposable income spent on tolls (the lower this proportion, the lower will be price elasticity).

2 Income demand elasticity is determined by the extent to which "high serviceability" roads come to be viewed as necessities rather than luxuries as disposable incomes increase.

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TABLE 3 : COST ESTIMATE OF A TYPICAL TOLL PLAZA

CIVIL

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Establishment & Accommodation	706 136,00		505 521,00	
Earthworks, Cleaning & Grubbing	142 924,00		44 441,00	
Drains & Culverts	247 419,00	2 225,00	606 566,00	5 455,00
Kerbing, Channeling & Shutes	56 701,00	24 457,00	32 731,00	
Layerworks	181 462,00		170 819,00	
Prime Coat	-		-	
Asphalt & Surfacing	-		-	
Pitching, Stonework & Gabions	36 568,00		53 448,00	
Guardrails	47 618,00		140 000,00	
Fencing	63 382,00		79 227,00	
Road Signs	305 095,00		427 133,00	
Road Markings	27 565,00	8 269,00	25 000,00	7 500,00
Landscaping & Grassing	140 928,00	2 560,00	133 812,00	2 560,00
Finishing	30 128,00		2 025,00	
Island & Canopy Concrete Work	280 313,00	38 395,00	580 895,00	79 567,00
Concrete Pavement	655 448,00	97 358,00	909 447,00	134 618,00
Testing	7 870,00		21 072,00	
Dayworks	40 000,00		82 235,00	
Pressure Pipe & Sewerage	60 714,00		118 336,00	
Traffic Accomodation	5 000,00		7 000,00	
TOTAL	3 035 271,00	173 264,00	3 982 850,00	262 431,00
VALUE PER LANE	505 878,00	28 877,00	221 269,00	14 579,00

10.4.5 CANOPY AND STEELWORK

The current design for the canopy allows for a complete roof structure including a ceiling and roof cladding, as well as a bulkhead on both sides.

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This means that, in some cases, toll tariffs will be set lower than the rate that a majority of road users would be prepared to pay, simply because the lower rate is all that is required to finance the road. This situation will usually arise where the road serves richer communities.

The opposite case, where the road serves poorer communities, will often require tariffs to be set lower than is required for full cost recovery even after adjusted toll revenue has been taken into account, at least in the beginning, because of the joint influence of price and income elasticities that makes for perceived inability to pay. Of course, in such circumstances there must be a reasonable degree of certainty that this inability to pay the rate required for full cost recovery will be of strictly temporary duration; if this is not the case, the "high serviceability" road should not be built at all.

Given that toll tariffs form a greater proportion of commuters' disposable income than they do of infrequent travellers' disposable income, price elasticity is likely to be considerably less in the former case. Consequently, it would be consistent with the pricing rules to provide concessions to commuters.

17.2.3 **"NATIONAL STANDARD" ROADS -**

- should be provided out of general revenues

Economic efficiency is not a government's only goal when considering road provision. There is also a need for equity.

It is readily apparent that the majority of members of South African society feel the need to have government alter the prevailing distribution of incomes and welfare, because they perceive this distribution to be unjust.

They are thus willing to sacrifice the efficiency of the market determined outcome for one which their sense of social justice finds more equitable. In short, therefore, a message is being sent to government demanding that, in certain instances at least, where a trade-off is required between allocative efficiency and distributional equity, the latter is to be favoured.

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Economic theory demonstrates that in an ideal world income or wealth redistribution should be undertaken by way of cash transfers (a negative income tax, for example) and not indirectly by way of the provision of goods and services, amongst which road infrastructure would be included.

The outcome would be a system whereby income and wealth would be redistributed through a direct tax and subsidy system, and users would then pay for the goods and services for which they had dominant preferences. Thus, users would pay for roads to the extent that they found it worthwhile to use them.

This is impractical, however. In a country such as South Africa it will be necessary to use indirect methods of redistribution for many years to come. This means that, to the extent that roads display elements of "merit" in the developmental sense, there is a case to be made for making them available to users free of direct charges, by financing them out of general tax revenues. And as it happens, South Africa's particular economic history has meant that many road construction and upgrading projects will be of this nature at the present time, simply because they serve developing communities that urgently need improved access to economic opportunities.

From this it follows that the use of road provision as an instrument of redistribution would require that some users at least should not pay for the benefits they obtain from road use. Specifically, these will be users of roads that provide basic access, rather than "high serviceability". Thus the determining factor in deciding whether a road should be financed by way of user charges or general tax revenues will be the purpose that the road serves.

It is the responsibility of the Department of Transport to ensure that all communities have basic access, and it will do so by defining appropriate "national standards". In the process, it will have to take cognisance of the fact that what constitutes basic access is a matter of subjective opinion, and that the public perception of this concept may be biased by past experiences.

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The Department will, therefore, often be in the difficult position of having to reconcile the public wish list with prevailing budgetary realities. In this regard, the proposed toll road network offers a potential, if partial, escape from the dilemma by creating the option of providing more and better roads than would otherwise have been possible, but at predominantly private and not public expense.

Allied to this, however, is a continued commitment by government to the provision of roads serving basic access requirements, without resort to tolling. As has been emphasised by the World Bank for many years, where a road is of the basic access type, and justified as an investment by an excess of benefits over costs, actions (such as tolling) which tend to reduce the flow of benefits (by reducing traffic volumes) should, in principle, be avoided.

In practice, however, it may be difficult for the government to meet this commitment. Reference was made earlier to the massive urbanisation currently under way in South Africa. New urban communities continue to mushroom almost overnight. These must be provided with access and, given the large numbers of people involved, it will frequently be preferable to supply high-level facilities right from the start. Where this occurs, such facilities should be viewed as "national standard" rather than "high serviceability" roads, and so not tolled.

However, this could lead to delays in building such roads, or to their not being built at all. In such circumstances, it might be better to levy tolls at a low level on such roads, and subsidise those tolls out of Treasury or National Road Fund sources. In such cases, it would be appropriate to consider that roads of a basic access nature should be provided as soon as possible, depending on the availability of Treasury funds and other demands thereon, and hence to adopt a policy of pricing so as to enhance development opportunities as much as possible. Thought could also be given to the provision of basic access roads as a joint effort between the toll road authority and economic development organisations such as the Development Bank of Southern Africa, or perhaps the institution of some system of matching grants.

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Of course, such compromises of expediency fail to address the objections of the World Bank. Fortunately, however, if rather coincidentally, the loss of benefits through tolling directed at vehicles rather than individual occupants is likely to be minimised in the case of poor communities - where it might otherwise have been expected to be the most severe - by the high vehicle occupancy rates that generally characterise such communities' travel patterns. On the assumption, then, that the perceived benefit criterion which will govern the setting of toll tariffs will in the case of roads serving poor communities, serve to keep those tariffs low, it can be expected that the reduction of traffic, and hence benefits, that results from tolling is also likely to be low.

The tolling of roads of high technical standards that provide basic access is, therefore, seen to be a better option than not providing such roads at all.

- should be part of national priority assessments

"National standard" roads are paid for by the general taxpayer. Accordingly, their priority must be judged against that of other claims on general revenues.

Unfortunately, however, such prioritisation raises important difficulties, as it usually depends on the application of cost-benefit analysis (CBA).

Over the past few years, a considerable amount of research work has been devoted to the development of CBA procedures for use in the selection of road projects. When such procedures are extended to the "prioritisation" of projects, however, they reveal important theoretical shortcomings that need not be discussed here. These shortcomings do, however, have important repercussions when standard CBA procedures are employed to prioritise roads serving less developed communities, which will often be the case with "national standard" roads in South Africa.

Because CBA is at its weakest when attempts are made to quantify in economic terms externalities or spillover effects that are inherently non-monetary and often qualitative,

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standard CBA procedures for roads in South Africa have sought to avoid this pitfall by restricting themselves to what is termed "economic evaluation", as distinct from "comprehensive evaluation".

"Economic evaluation" is consequently defined as incorporating only the following five cost components: facility construction costs, facility maintenance costs, vehicle running costs, accident costs and time costs. Explicitly excluded from "economic evaluation", therefore, are such factors as "convenience", "political factors" and "income distribution".

A significant number of "national standard" roads will have as their raison d'être the provision of basic access to as yet underdeveloped communities. It will be readily apparent that their principal source of justification will lie in those benefits specifically excluded from consideration in the restriction of CBA to imply "economic evaluation". In other words, if a "national standard" road serving a less developed community is in some fundamental sense of the word a "good" project, this "goodness" may only be revealed by "comprehensive evaluation", and not by the more limited "economic evaluation".

It can be concluded, therefore, that current CBA procedures do not provide an adequate basis for prioritisation of at least some "national standard" roads. Worse, they have an outright bias when such roads are prioritised relative to those serving more developed communities. The reason for this is that savings of time and accident costs play an important role in determining the outcome of an "economic evaluation". The higher those savings, the greater is the likelihood that a project will be given a high priority. But for roads serving underdeveloped communities, by definition the time and lives of people in those communities is of a much lower "economic" value than is the case in rich communities.

The difficult political problems of this result aside, it has a downright bizarre effect on the allocation of public funds. Recall that this discussion concerns basic access roads, which are provided by the public sector primarily for purposes of income redistribution to ameliorate inequities perceived to exist by the tax paying and voting public.

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Recall, too, that it has been concluded that richer communities can and should pay for at least some of their own roads by way of user charges. The use of "economic evaluation" to prioritise basic access roads goes directly counter to this overall proposition by redirecting public funds away from the poorest communities and back towards those that are better off, thus perpetuating the poverty trap and underdevelopment (and, incidently, reinforcing the inherent regressivity of "free" provision of roads that results from the progressivity of motor vehicle use).

At a more general level, the use of CBA to prioritise expenditure between government functions would often have the same result of benefiting richer communities.

This is clearly unacceptable. It follows, therefore, that although it is desirable that the funding of "national standard" roads should be subjected to a prioritisation procedure, a great deal of further work appears to be required before such a procedure can be presumed to be achieving what it sets out to do.

17.2.4 **CONTROL OF THE TOLL ROAD NETWORK WILL BE VESTED IN THE PUBLIC SECTOR**

"High serviceability" roads are better seen as private rather than public goods. Hence the argument that they should be tolled. However, this does not mean that they should be supplied by the private rather than the public sector.
In no country in the world is the provision of roads left entirely to the discretion of the private sector. Instead, where roads are not in fact supplied by governments as such, they are provided by some form of combined public-private sector activity: a nationalised industry, a public utility, or a regulated private sector.

The reason for this is that the market for roads is not a competitive one, but rather what is known as a "natural monopoly", stemming from the fact that scale-economies can be achieved over a very wide range of output levels. In such circumstances, an unregulated market would not produce competitive results, and hence consumers' interest would not be protected. A private, unregulated monopoly would be able to extract surplus profits from the consumer. This is because higher prices can be charged by a monopolist than would result under competitive supply conditions, resulting

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in lower traffic volumes. As was pointed out under principle 17.2.2 above, this is precisely the opposite of what is required.

It has long been recognised that attempts to introduce competitive elements into markets characterised by natural monopoly features are an unsatisfactory way of trying to ensure reasonable prices. As a consequence, monopoly in particular markets has been accorded public sanction and even protection. But this has been, and must continue to be, accompanied by regulation, especially regulation of the price level.

It is also worth noting, in this regard, that there are unlikely to be any efficiency gains from the privatisation of toll roads. Such gains as can be obtained will result from the privatisation of road construction, upgrading and maintenance programmes, but it is possible to achieve these through public tendering without resorting to transfer of asset ownership.

As long as final control of the toll road authority is in the hands of the public sector, it is immaterial from an economic point of view what form that authority takes. It should be noted, however, that the choice of an organisation structure may have certain implications for the national budget. It is the practice to restrict the size of government revenue to a certain proportion of total economic activity. Thus, if the toll road authority is organised in such a way that it is viewed as part of the government sector, its revenues and expenditures will tend to displace public sector equivalents; on the other hand, if it is viewed as part of the private sector, its effect will be to substitute for other forms of private spending.

17.2.5 **THE PROPOSED TOLL ROAD NETWORK SHOULD BE PHASED IN GRADUALLY**

As is the case with most public policy changes, the introduction of a toll road network will result in "windfall" gains and losses accruing to certain groups. The latter inevitably will be resisted by those affected, for example firms whose costs will be raised or commuters whose expenses will increase. Especially where the intention is to toll

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existing roads, these groups will object that they located their work premises or homes in the expectation of the free use of roads, or that roads have already been paid for by the public out of the dedicated fuel levy.

Whether or not these objections are logically valid is not the point at issue here. What is of concern is that they can be minimised by deciding upon the form which the toll network plan should eventually take, announcing it publicly and stressing its advantages, but implementing it in a series of phases.

This would provide the opportunity for those groups who perceive themselves to be disadvantaged by the proposed charges to take steps to minimise those disadvantages. It would also permit a structure that is desirable in the long-term to be reconciled with the one that is politically feasible in the short-term, and provides a means of dealing elegantly with certain technical features of the roads in question which are awkward to reconcile with what is theoretically desirable. For example, some of the requirements that need to be satisfied in the final scheme of things, but which pose operational difficulties for the immediate future, are the definition of a total toll road network, the levying of tolls at rates high enough for "high serviceability" roads to be financially self-sufficient, and the minimisation of cross-subsidisation between user groups.

Meeting these requirements presupposes a reasonable level of maturity of the toll road system overall. It needs to be recognised that this maturity will only be reached after a period of transition once the new system begins to replace the existing, quite different, road-financing mechanism. It is also strategically necessary to acclimatise the public to an environment of road tolling gradually, by setting tolls that are initially lower than economic concerns would require.

Accordingly, it must be accepted that, in its early phases, the toll road network may display elements which for the sake of both logic and principle, should subsequently be removed. Many desirable features of a toll road network will have to be viewed as longer-term goals, and in the shorter term they

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will be realised only imperfectly. In order for the short term results not to appear ad hoc in consequence, a transitionary phase should be included explicitly in the planning for the introduction of the toll road network.

17.3 ANTICIPATED RESULTS

17.3.1 GENERAL

The implementation of a toll road network strategy will have an impact on a number of economic variables, and this section considers what that impact will be. Before this can be done, however, it is necessary to ask the question, "Impact relative to what?" In other words, as a point of departure, the road financing mechanism that constitutes an alternative to a toll road network needs to be spelt out.

Recent history, which has seen funds for road provision dwindle significantly in real terms, does not appear to provide a useful bench-mark in this regard. The shortage of funding which has resulted would seem to be untenable over the longer term if the overall road network is to maintain adequate standards, especially on the assumption of an eventual economic recovery.

Accordingly, it is the longer-term financing stream that would be replaced by toll revenues that provides the appropriate basis for comparison. Historically, some 50% per cent of the Department of Transport's roads budget has been spent on the provision of roads of the type envisaged as being incorporated in the toll road network. It is therefore assumed here that this percentage, amounting to some R400 million per year in 1990 terms, is the amount by which the Department's required expenditure would be permanently reduced by the introduction of the toll road network. This reduction can be viewed as corresponding to an adjustment in public expectations regarding government's funding capacities as a result of changed economic conditions.

In Section 17.3.2 below, it is thus the impact of reducing government expenditure by R400 million per annum, and levying tolls instead, that will be evaluated. This analysis does not reflect the full picture, however. One of the principal advantages of introducing a toll road network in South Africa will be to free a part of the present road funding problem

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from the constraints of government budgets. If, as the road authorities aver, too little money is currently being devoted to road provision, and this is to the detriment of the road-using public, then it can be expected that this public will wish to spend more money on roads if allowed to do so. Tolling makes this possible.

It is conceivable, therefore, that more revenue will be generated by tolls than will be lost through reduced taxes. What is more, the time profile of spending on "high serviceability" roads as a result of tolling may differ significantly from what it was before, because tolls will provide a borrowing capacity, so that expenditure on road provision may be considerably higher than toll revenue in the early years of the scheme.

It is impossible to undertake an impact analysis of these broader issues, however. There are too many unknowns, and even if this were not so, a highly complex economic modelling exercise would be required. Nevertheless, in Section 17.3.3 below, an opinion is provided as to the likely effect of the proposed toll network on the South African economy as a whole.

17.3.2 PARTIAL IMPACTS

R400 million per annum is a small amount of money in the context of the total South African economy and the government budget. Moreover, the principal effect of the introduction of the proposed toll road network will be to reduce the size of the required total tax base, which is made up of about 70 per cent indirect and company taxes and 30 per cent personal tax. The tolls themselves will have an effect similar to indirect tax that is, very similar to that of the revenue stream they replace.

Consequently, there will be little change in the overall flow of funds as a result of the new scheme, and all the partial impacts discussed below can be expected to be correspondingly small.

Impact on tax burdens

Because roads are financed out of general revenues, rather than any dedicated part of them, the impact of a reduction in road expenditures would in practice be spread

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Instead of using a roof and ceiling sheeting, a new design was developed which indicates that a canopy with ceiling sheeting which will also act as roof sheeting, can be constructed. A lighter and cheaper structure will therefore be the result.

It is also believed that the current design in use for impact attenuators can be revised. It is proposed to use only the vertical face bullnose with a sloping low profile concrete structure increasing in height towards the bullnose, which will provide protection to the road user in contributing to the reduction of speed of the vehicle before it might hit the bullnose. This approach will result in a substantial saving. However, the risk in respect of injuries to the road user is higher.

Furthermore, if the revised booth/New Jersey barrier approach is followed, it will not be necessary to provide any additional booth protection as the New Jersey barrier comprising the lower part of the toll booth will fulfil this function.

As discussed elsewhere in the document, it is also possible on larger plazas to dedicate certain lanes to light vehicles, in which case it is also not necessary to have any load gauges on the bullnoses thus leading to a further saving. For the purpose of this comparison it was assumed that 40 % of the lanes will be fitted in this manner.

By keeping approximately 60 % of all lanes normal operating lanes, the dedication of some lanes to light vehicles is not expected to reduce the plaza capacity as a whole, as more than 60 % of traffic consists of light vehicles.

Another proposal to obtain a cost saving is to reduce the canopy clearance height from 5,7 m to 5,1 m, which is the standard for bridge clearances. This, however, would result in a very small saving (± R3 000,00 for a six lane plaza) and with experience gained at other toll plazas, where damage occurred to road signs lower than the 5,7 m height below the canopy, it is recommended not to incorporate this proposal in the revised designs.

Table 4 lists the results of the elemental cost breakdown as well as the estimates of savings if the above design changes are introduced. It is clear from Table 4 that a saving of 35 % can be achieved in respect of an eighteen lane plaza.

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across the entire revenue base. Compared to South Africa's total tax collections in 1989/90 of some R65 billion, the amount of "savings" that could be achieved through the establishment of a toll road network is fairly insignificant.

In macro-economic terms, therefore, the impact on tax burdens will be small. Nevertheless, for policy purposes, it could be argued that these "savings" would be substituted for a particular revenue source, for instance the personal income tax. A reduction of R400 million per annum in personal income tax, if spread proportionally across all taxpayers, would permit average tax rates to be lowered by roughly one or two percent. This would constitute a small but useful contribution to Government's stated intention of lowering personal income tax burdens.

Furthermore, if it is desirable for policy reasons to emphasise the reduction in personal income tax that would result from the toll road network, consideration could be given to applying the R400 million per year in full as an increase in some specific rebate or deduction (although the general desirability of tax expenditures may be felt to run counter to this suggestion).

Impact on income distribution

At first sight, it may appear that a shift in the source of road expenditures from general tax revenues to tolls must necessarily be regressive, by being equivalent in many respects to a shift from direct to indirect taxation, and this impression will be emphasised if tolls are justified as being necessary to allow income tax reductions. To deal with this possibility first, it must be noted that any such regressivity would be ameliorated substantially by tolling mainly "high serviceability" roads (and thus excluding those primarily serving poor communities); it would be reduced further by providing concessions to commuters.

However, it is far from a foregone conclusion that the present road financing system is progressive in its impact. On the revenue side, progressive income tax forms a fairly modest part of the total tax base out of which roads are financed, and a large share of the residual portion is made up of regressive indirect taxes. In addition, on the expenditure side of the equation, the progressive nature of vehicle ownership and utilisation, and the high vehicle

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occupancy rates of the low income groups, suggest that the benefits of "free" roads accrue largely to the wealthier classes.

Turning to the proposed new system, it seems reasonable to suggest that the cost of toll roads will impact more on high income groups because of their greater vehicle ownership and use, and their lower vehicle occupancy rates. The real effect, therefore, is likely to be an increase in "indirect tax" (tolls) for higher income groups, and a reduction in indirect taxes (GST, etc.) paid by lower income groups.

As for the second-round effects that will occur through forward-shifting of toll levies by commercial vehicle owners, these will be regressive, but both small and once-off, although in some industries they could be multiplied through linkage effects.

The net impact of the toll road network on income distribution is, therefore, likely to be small and reasonably neutral.

Impact on regional development

South Africa has devoted considerable amounts of effort and money to regional development over the past decade or more, much of it directed to the encouragement of industrial decentralisation.

Policies in this regard have been reviewed recently, and indications are that in future they will take on a freer, less regulated character, with the location of firms being based more strongly on the comparative economic advantages of various geographic areas.

In support of this new approach, there is also an intention to counter "urban bias", that is, the tendency for public spending on infrastructure to be focused on urban areas to such a degree that these areas are in fact subsidised out of the general tax base. Urban bias leads to various ill-effects associated with over-concentration of economic activities. The provision of roads as "free" goods is argued to be a prime example of such urban bias, simply because the bulk of benefits accruing from freely available road services are enjoyed in, or in close proximity to, urban areas.

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Because toll plazas will be concentrated in the urban areas where there are the greatest traffic volumes, it can be concluded that the proposed toll network could have a positive influence on regional development objectives by reducing urban bias.

It should be noted, however, that to the extent that urban bias should be countered, it is existing roads that most often provide that bias, having been built in response to traffic pressures. Consequently these "old" roads should, at a minimum, be tolled at the same tariffs as new roads. To toll them at a lower rate would, in fact, simply perpetuate, and indeed formalise, the urban bias which currently exists.

In contrast to this last argument, is one which suggests that it is inequitable to levy relatively high tolls on existing roads because firms and individuals have based their location decisions on the "free" availability of these roads.

There are three reasons for rejecting this line of reasoning.

The first is that existing roads are, as a rule, upgraded before being tolled and hence subsequently provide a superior level of service.

The second is that past mistakes - in this case involving the creation of urban bias and the pursuit of untenable financing methods for "high serviceability" roads - should not be perpetuated simply because their remedy would entail certain inconvenient side-effects. In particular, purely local concerns should not be allowed to stand in the way of improved national policies.

The third reason is that a certain amount of "horizontal inequity" (meaning inequality of impact on groups in like circumstances) will follow virtually any government policy change. The point is that "inequity" should not be defined in so narrow a way: it is equally valid to argue that "inequity" has occurred in the reverse direction in the past because the firms or individuals have been in receipt of "free" road services to which they had no real entitlement.

"Equity", therefore, is an altogether broader concept, and it has been argued above that the toll road network may in many ways serve to enhance it. Thus a pragmatic approach needs to be adopted: one should search out and eradicate the greatest

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sources of societal disbenefit, rather than attempt to define and then pursue its greatest possible good. Small inconsistencies or disadvantages that occur as a result need to be kept firmly in the perspective of the overall improvement that will be achieved.

It must also be remembered that the envisaged toll rates are quite low, and consequently any unfavourable impacts they may have must be commensurably small, and would be reduced still further if the toll road network is introduced gradually, as proposed in Section 17.2.5 above.

Impact on inflation

A slight inflationary effect could result from increased investment spending, but this would be offset by crowding-out of other forms of investment.

By contrast, the cost-raising effects of tolls on consumer goods should by definition be smaller than the cost-lowering benefits that "high serviceability" toll roads confer on commercial vehicles using them. A net deflationary impact may thus be expected, although this would depend on the extent to which forward-shifting takes place. If, as may well be the case in the present climate of inflationary expectations, costs are more readily shifted forward onto consumers than are benefits, then this effect may in fact be neutralised or even reversed. Again, however, the net effect is likely to be small because of the forces offset against one another.

A certain amount of inflationary impact could be expected from the reduction of taxes, but whether or not this would materialise would depend on overall fiscal management, within which context R400 million per annum is an insignificant sum.

In summary, a negligible impact on costs could be expected. As importantly, any impact would be a once-off occurrence, and thus not contribute to inflation as such.

Impact on interest rates

This issue is addressed elsewhere in the overall report on the commercialisation of the primary road network.

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Impact on GDP growth

As this impact would encompass the net results of all the others discussed above, it is clearly highly indeterminate. Over the short term, however, all indications are that it will be negligible.

17.3.3 The overall impact on the economy

By standing back from the partitive aspects discussed in the previous few sections, it is possible to provide a more holistic impression of the desirability or otherwise of the impact that the proposed toll road network would be likely to have on the South African economy. This requires the assumption to be relaxed that a long term "saving" of R400 million per annum in required revenue would represent the total impact of the toll road strategy.

The provision of adequate roads, especially those of the "high serviceability" type, out of general revenues, is unlikely to be possible in the foreseeable future. In practice, the alternative to the adoption of a toll road network is likely to be a steady degradation of the road system overall, and especially an inability to provide "high serviceability" roads at all.

This scenario is likely to have severely detrimental repercussions. Given the criteria for construction of "high serviceability" roads, these roads must by definition confer positive net benefits on their users. The failure to provide such benefits may have subtle but far-reaching economic disadvantages. Current perceptions of overcapacity on certain sections of the primary road network are in part due to the slack economic conditions of the past decade. Deregulation of road transport creates the climate for a rapidly growing demand for roads if economic circumstances improve, and it is potentially dangerous to adopt a less accommodating approach in the case of supply. In general, a continuation of the harmful recent trend of increasing government expenditures on services at the expense of capital investment will inevitably be detrimental to future economic growth.

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In addition, the unavailability of funds for road provision is also likely to have detrimental consequences for future income distribution and the economic development of backward communities, by limiting opportunities for participation in the formal economy.

In sum, therefore, the proposed toll road network, which will enable these constraints to be overcome, must on a general level be seen as potentially highly advantageous to the South African economy over the longer term. This advantage may be enhanced if careful thought is given to the proper use of the "profits" that are made from the tolling of existing roads.

As an indication of the benefits to be derived from adequate road provision, a number of illustrative cost-benefit analyses were performed. Across a wide range of road types, including both high serviceability and national standard roads, very positive results were obtained. Accordingly it was concluded that the provision of adequate road infrastructure has wide-ranging benefits for the whole society which appear to be not always appreciated fully. It will be important to refine these analyses in future in relation to the discussion presented under sections 17.2.2 and and 17.2.3 above.

Finally, another important benefit of the proposed toll road network lies in its extension of the principle of user charging for publicly-provided services in South Africa. Demands for a large array of social services which can only be provided effectively by government intervention will continue to grow massively for many years to come in South Africa. Attempts to meet these demands will threaten to expand public sector activity to levels that are dangerous in a free-market economy. It follows that every opportunity to shed almost-private activities should be seized by the government, especially where equity can be enhanced in the process, as in the present instance.

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CHAPTER 18

MARKETING AND PUBLIC RELATIONS STRATEGY

18.1 INTRODUCTION

One of the most important factors in the rejection of the road privatisation proposals has been the public perception that there were insufficient consultations with and involvement of road users prior to the conditional implementation of these proposals. In spite of the existing-roads controversy, public opinion of toll financing has been fairly positive. In this regard, it is interesting to note that 82% of respondents in a July 1989 survey by the AA supported toll roads with reasonable tariffs. It should furthermore be kept in mind that State toll roads have not been controversial, and that a large measure of negative sentiment has been caused by the privatisation process. However, initial indications are that a greater understanding of the difficulties facing the Department of Transport has taken root, particularly in the economic and financial sector. In order to build on this perception and on existing support, and to nourish it, it is necessary to timeously formulate a strategy for expanding public acceptance of the concept of road commercialisation.

18.2 CABINET REQUIREMENTS

One of the requirements stated by Cabinet is that the extension of the tolling of roads, which is in line with Government policy on the broadening of the tax base and the shifting of the tax load from direct to indirect taxation, should be marketed as making a contribution towards lowering personal income tax and being fair on the basis of user charging. An additional aspect mentioned by Cabinet in this regard is the fact that the tolling of the primary road network would lead to a reduction in the amount of State funds spent on road construction.

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18.3 EXISTING PUBLIC OPINION ENVIRONMENT

As mentioned in the introduction, public opinion in respect of toll financing has been on the whole fairly negative, especially as regards the privatisation exercise and the tolling of existing roads. However, there are ameliorating factors in this regard, the most important of which are:

18.3.1 The administration of toll roads by the SARB has up to now not attracted any adverse public reaction. If the recommendations of this report in respect of organisational structure are accepted, this favourable climate can be expected to continue.

18.3.2 As mentioned above, 82% of respondents in a July 1989 survey by the AA (when public opinion against the tolling of existing roads was at its height) supported toll roads with reasonable tariffs.

18.3.3 The greatest factor in the negative public reaction has been the perception that the privatisation of toll roads would lead to exploitation of road users by private profit-orientated companies. If the SARB manages all South African toll roads, this perception will undoubtedly wane.

18.3.4 Cabinet has indicated that it will require its approval, prior to implementation, of all tolls on existing roads. Negative public reaction to the tolling of existing roads can thus be anticipated and pre-empted.

18.3.5 As indicated above, there has been a slow but steady change in perceptions about toll financing, especially in the financial sector.

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18.3.6 However, there still exists widespread misapprehension of the role of the levy on fuel in road financing, which leads to the argument that roads in any event paid for from the fuel levy should not be tolled.

18.3.7 The present attitude of the public can be summarised as being that roads should not be tolled to put after-tax profits in the pockets of private shareholders, but that toll income should be used to put a high-standard road network at the disposal of the road user.

18.4 MARKETING STRATEGY

The main aim of a marketing strategy would be to promote understanding of the reasons for tolling a network of roads by consulting and informing all relevant road user representatives and local authorities, both broadly in the media and specifically through meetings, and to convey to the target market the advantages and benefits of toll finance. By implementing this strategy it will be necessary to pay particular attention to the tolling of existing roads; and to consult with persons living within a 20km radius of proposed toll plazas, in accordance with the requirements of the South African Roads Board Act.

To ensure public acceptance of the commercialisation process, it seems advisable to address the marketing strategy by using a two-pronged approach consisting of advertising and public relations campaigns, separately co-ordinated by two firms of consultants. To successfully market toll roads as a concept and a product, a fairly intensive advertising campaign would be required, backed up by a public relations effort aimed more directly at affected road users. Such an interactive approach would have a greater chance of attaining success than a unidirectional approach would have. The rationale behind the use of two firms of consultants is that the skills required to mount an effective campaign using both strategies is seldom present in one firm, and it would be detrimental to the interests of the marketing campaign to neglect one field in favour of another. However, should a firm consider itself capable of handling both strategies, it should be

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TABLE 4 : CANOPY AND STEELWORK

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Canopy Sheeting	144 864,00	53 485,00	589 469,00	160 457,00
Steelwork and Paint	328 618,00	60 606,00	762 504,00	173 618,00
Protection Structures	157 022,00	96 000,00	408 974,00	288 000,00
TOTAL	630 504,00	210 091,00	622 075,00	262 431,00
VALUE PER LANE	105 084,00	35 015,00	97 830,00	34 554,00

10.4.6 BUILDING WORKS

In respect of potential cost savings on the control and plant buildings the following items were considered:

a) The control and plant buildings can be joined to form one building.

b) Instead of prepainted roof sheeting, use can be made of concrete roof tiles.

c) The sloped laminated solar shield glass windows can be replaced by vertical plain laminated glass with tinted film on the windows to provide the required security.

d) Rhino Board or herculite ceilings can be used instead of an acoustic suspended ceiling.

e) Cavity walls are only necessary at coastal areas. In inland areas a normal 230 mm brick wall is sufficient.

f) Locally manufactured standard fittings (lights, door-handles and locks, etc.) should be used instead of imported and non-standard fittings.

g) Under current manning configurations the control room is occupied by only two persons. Accordingly the floor area can be reduced while retaining sufficient space to accommodate all necessary equipment. This will, however, result in a less ergonomical utilization of area as a considerable number of loose fittings need to be positioned in the control room.

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permitted to submit tenders for both campaigns.

18.5 CONSULTANTS

To successfully market the commercialisation programme, it will be necessary to appoint high-calibre consultants to assist in the formulation of a more detailed strategy. As stated above, at this stage it seems advisable to use two firms of consultants, one dealing with advertising per se, and the other with public relations and liaison. The most important consideration here is that consultation and information should start as soon as possible, so as to prevent recurrent criticism in this regard. Consultants should include in their strategy specific working objectives, target audience definition, means of communication and a detailed schedule of implementation.

The consultants will also be required to submit profiles of their companies, including previous experience, services offered, members of staff and their functions, list of clients, etc. Profiles of affiliated companies would be required if a consortium is formed.

A budget cost is also to be submitted by each consultant which should include:

- an estimated fee for retaining the services of the consultants over a period of 12 months.

- a contingency amount covering general costs such as exceptional travel, translations, mailing, etc.

- an indication of the cost of the proposed campaign, including the cost of producing and issuing brochures and other printed matter as well as other means of communication, plus a recommendation on the quantity of material that would be required to conduct an efficient public relations/advertising campaign.

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18.6 MESSAGE TO BE CONVEYED

The message which is to be conveyed to the target audience in order to obtain public acceptance can be broadly divided into two spheres, these being the economic acceptance of tolling limited grade-separated access roads, and the political, or traditional public relations message.

18.6.1 ECONOMIC ACCEPTANCE

The main arguments advanced to ensure acceptance in this field would centre on the direct and indirect economic advantages of toll financing. The most important of these are:

- Toll financing imposes a market-related discipline on the construction of roads and thus ensures that only roads that are in fact needed as a priority are constructed.

- Toll financing is in line with Government policy on user charging. Instead of levying an indirect general tax, the cost of the construction of the road is recovered from those who use it.

- The application of the user charging policy results in an equitable approach to road construction: the road user pays for the road. Simultaneously the tax base will be broadened, and the tax base will move from direct to indirect taxation.

- By reducing the overall Government expenditure on roads, toll financing will eventually contribute to a lowering of the income tax rate. This argument has considerable weight in the economic sphere and should therefore be emphasised.

- High serviceability roads would under the present proposals be tolled with minimal cross-subsidisation, as they would to a very large extent be self-financing.

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- Basic access roads would be prioritised and subsidised to allow for their construction, so that road could still fulfil their important infrastructural function.

- In addition, emphasis could be placed on the fact that the collective good would be served by the provision of a high-standard road network.

- The fact that the proposed structure does not have a profit motive, and that the public interest is protected by road user and private sector representation, will help to refute criticism to the effect that road privatisation was being attempted again.

18.6.2 POLITICAL ACCEPTANCE

The principal aim of the public information campaign would be to promote understanding amongst the road-using public of the reasons for the implementation of the road commercialisation initiative, and to convey to them the benefits and advantages of toll financing so as to facilitate public acceptance of the commercialisation process. In addition to emphasising the above advantages of toll financing, specific attention should also be paid to the following aspects:

- Toll financing is the only way in which a well-maintained functional primary road system can be put at the disposal of the public. This consideration should be seen as the main thrust of the marketing programme.

- Toll roads generally offer a substantial saving in time and transport costs if compared with the alternative route.

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- Roads represent a considerable investment of public funds. Toll financing provides the means to protect this investment because of the fact that sufficient funds will always be available for rehabilitation and maintenance.

- The fact that the levy on the sale of fuel is no longer dedicated to the National Road Fund, but used for general State expenditure, should be succinctly conveyed, in view of public misapprehension in this regard.

- Generous concessions and discounts are offered to road users who are adversely affected by the tolling of existing roads, and commuter cards allowing a 40% discount on peri-urban toll roads are introduced as a matter of policy.

- The proposed tolling of existing roads is to be individually submitted to Cabinet for approval, thereby removing the possibility of politically imprudent decisions being taken.

- The tolling of existing roads should be phased and regionally dispersed so as to minimise inequity and negative local public reaction.

- Furthermore, specific attention should be paid to ensure that prospective users are acquainted with specific details relating to that project, including tariffs alternative routes and the various methods of payment which are available.

- Should the tolling of existing municipal roads be seen as undesirable, these roads may be eliminated from the study without having an unduly detrimental effect on the financial viability of the network.

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18.7 TARGET AUDIENCES

In general, the marketing campaign should have as its target small groups of influential delegates from institutions and organisations representing the general public. In particular, attention should be paid to road user organisations such as the Automobile Association, the Road Freight Association and others, so as to reach their members. As a number of road user organisations have an economic interest in a high-standard road network, they should be persuaded to accept the principle of toll financing as being in their interest, both financially and from a road safety point of view.

In addition, specific attention should also be paid to the media through briefings, as well as to individual road users, both private car owners and heavy vehicle operators who are not necessarily affiliated with a representative organisation. Furthermore, an attempt should be made to cultivate a positive attitude towards toll roads among Government institutions (local, provincial, departmental) and parastatals, especially those institutions who have large fleets of vehicles, for instance the SA Defence Force, the SA Police, the Department of Post and Telecommunications, etc.

The business sector, and specifically representative organisations such as the SA Chamber of Business and the Afrikaanse Handelsinstituut, should also be targeted in a marketing campaign. In this regard, the financial and economic benefits of toll financing should be emphasised.

Residents of areas in close proximity to toll plazas will also specifically have to be consulted in order to comply with the requirement set out in section 8(c) of the South African Roads Board Act, No. 74 of 1988 that the SARB shall take into account the effect the tolling of a specific road would have on the transport of persons living within a 20 km radius of a proposed toll plaza.

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18.8 SCHEDULE OF IMPLEMENTATION

Except for preparatory, low-intensity information periodically released from the moment Cabinet approval is obtained, the campaign should not be initiated before Parliamentary approval is given. Intensive positive coverage should commence after Parliamentary approval has been obtained until the first toll plazas on existing roads are opened. This should be followed by lower intensity coverage for a period of approximately six months. Specific campaigns in respect of individual projects should start 4-6 months before tolling is initiated. A more specific schedule for implementation should be drawn up after discussion with the consultants appointed.

18.9 CONCLUSION

To obviate the negative public reaction associated with the road privatisation exercise, and to promote a climate favourable to the introduction of the commercialisation process, it is of the utmost importance that a co-ordinated marketing strategy be fully devised and implemented as soon as possible with the assistance of expert consultants. The main thrust of the marketing campaign should emphasise that toll financing is the only way in which a well-maintained functional primary road system can be put at the disposal of the public. Accent should also fall on the fact that the tax base will be broadened by the tolling of roads and the fact that the tax load will be moved from direct to indirect taxation which will make a contribution towards lowering income tax. The equitability of the user-charging principle should also be emphasised in a marketing campaign.

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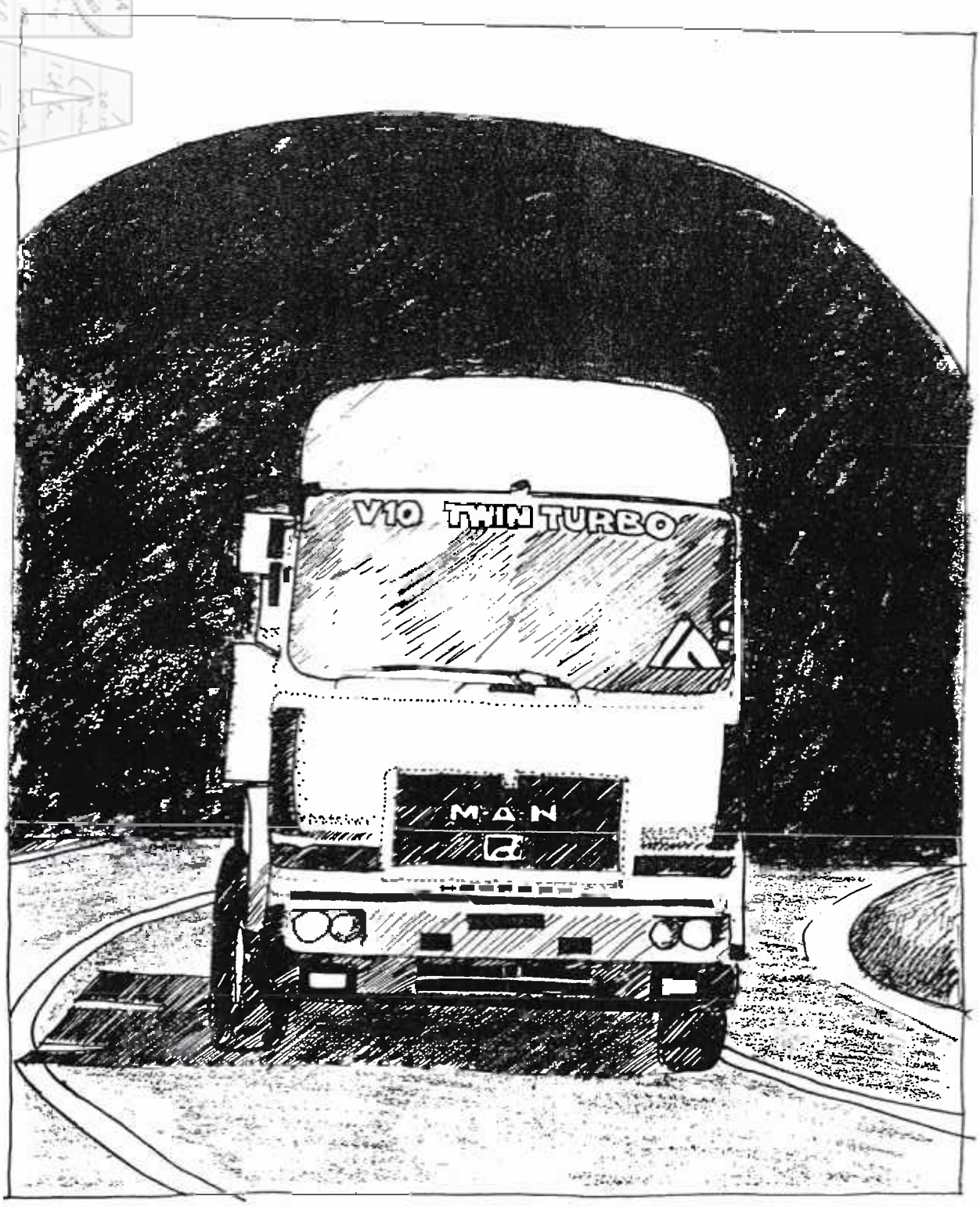
PART VI
FINDINGS AND RECOMMENDATIONS



PART VI : FINDINGS AND RECOMMENDATIONS

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CHAPTER 19

CONCLUSIONS

19.1 SHORTAGE OF FUNDS FOR MAINTENANCE AND REHABILITATION

In order to protect the present investment in roads in South Africa of approximately R80 billion it is important that the highest priority be given to maintaining the existing infrastructure. At present there is a need to spend between R1850 million and R2500 million per annum to safeguard the existing road network. The present rural road funding levels are only slightly higher than that required to safeguard the road network at a reasonable minimum standard.

The provision of funding for the maintenance and rehabilitation is approximately 75% of the needs.

It is clear, therefore, that unless the Government changes its priorities with respect to funding, the road system in South Africa will deteriorate to the point where the network will be forced to contract and existing surfaced roads be allowed to become gravel.

One solution to this problem is the tolling of existing roads where the toll income will be used to finance the present and future maintenance and rehabilitation needs of these roads.

19.2 TOLL ROADS HAVE DEMONSTRATED THEIR ABILITY TO CONTRIBUTE TO THE ROAD NETWORK.

At present there are 6 State operated toll roads open to traffic and 7 operated by the two private companies, Tolcon and Tollway. In total some 400 km of new high standard road have been constructed at a total cost of R1600 million. Of this amount some R1240 million (including capitalised interest) has been financed from the capital market.

There are also a number of toll roads planned and under construction which will add a further 300 km to the national road network.

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h) The sizes of the generator and uninterruptible power supply (UPS) rooms can be reduced with an associated reduction in the size of the units (discussed elsewhere).

i) The width of the paving around the building can be reduced from 2 m to 1 m.

j) Smaller and lighter category safes and vaults can be installed which will, however, result in reduced cash storage capacity at the plaza.

k) Air-conditioning of the building can be limited to the control room, offices and cash room.

l) In the cash room the counting booths can be replaced by loose furniture.

m) Tiling in toilets can be done up to half-height but this will result in a slightly higher maintenance cost in respect of the painting of the toilet area.

n) The roof overhang of the buildings can be reduced and a gable roof with concrete tiles can be constructed instead of a roof with hips.

o) Hailguards on the buildings can also be omitted.

p) A simple facia design and standard gutters can be used on the building, although it would have a negative effect on the aesthetical appearance of the building.

q) The thickness of insulation normally placed on top of the ceiling can be reduced from 80 mm to 40 mm. This might result in a slightly decreased performance of the air-conditioning.

r) Carports can also be reduced in number and standard units as available from various suppliers can be used.

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All of these toll roads cannot cover their total construction cost from toll income but make a singificant contribution towards that cost.

It is concluded therefore that toll financing has made a contribution towards the extension of the National Road network.

19.3 FUEL LEVY VERSUS TOLL FINANCING

The cost of collection of toll funds is expensive when compared to the collection cost of other sources of revenue such as the fuel levy. The collection of toll involves additional costs in terms of both capital such as the building of toll collection facilties and the provision of toll collection equipment as well as the ongoing cost of toll plaza operations. Steps have been taken to ensure that these costs are minimised by calling for competitive tenders from private contractors and the average cost of collection for the State toll plazas varies between 15c - 45c of every one Rand collected.

It is acknowledged that there are cheaper ways of collecting funds but unless the Government changes its policy regarding dedicated funds and revises its policy on spending for the road infrastructure there would appear to be no better form at present.

19.4 ORGANISATIONAL STRUCTURE

In view of the fact that the only viable alternative to the status quo, a public corporation, requires the promulgation by Parliament of a major piece of legislation, and in view of the fact that the SARB/Department of Transport structure is at present operating satisfactorily, it can be concluded that the introduction at the present time of such an organisation does not seem to be warranted. Although public corporations have internationally been used for the operation of toll networks, they also tend to breed burgeoning bureaucracies, a characteristic which is not compatible with present government policy. The South African Roads Board, with the Department of Transport acting as its secretariat, should therefore continue functioning as it has been up to now.

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19.5 RELATIONSHIP WITH OTHER ROAD AUTHORITIES

An important guideline in respect of the relationship between different road authorities is provided by a Cabinet requirement that if the toll authority is responsible for the building of new roads, this responsibility should be taken away from other existing road authorities, and that confusion in this regard should be avoided. Since it is envisaged that all limited access grade-separated roads will eventually be tolled, it follows that the South African Roads Board will be the only body in the country with the responsibility for maintaining, operating and constructing such roads. These roads, be they provincial or municipal, would be declared national roads and hence transferred to the control of the SARB. Furthermore, no such roads could be constructed by any other body than the SARB.

19.6 TOLL ROAD DECLARATIONS

Following legal opinion from senior counsel, the toll roads declared originally cannot be extended by declaring an adjacent section part of it. In the light of this opinion, it would have been advantageous to declare longer stretches of national roads, including the newly constructed sections, as toll roads. The original toll road declarations were too cautious in this regard and future declarations should cover longer portions of national roads.

This is perceived to be a limitation but, in practice, this will not be the case for the foreseeable future even in the case of existing roads, since the toll income generated by existing roads can be used to repay the National Road Fund for the specified costs associated with construction and the National Road Fund can then utilise these contributions to meet other expenditure incurred by the Fund. At the present time, few new roads appear capable of repaying out of toll income their full construction cost to the National Road Fund. There is, therefore, no immediate need to change the legislation in this regard, especially if care is taken in the declaration of new toll roads.

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19.7 AN EQUITABLE TOLL ROAD NETWORK THROUGH TOLLING EXISTING ROADS

Toll financing in South Africa during the eighties was characterized by the development of individual toll projects (tolling new roads only) and, with the advent of road privatisation, the development of individual toll routes (also tolling existing roads). Subsequent to the rejection of road privatisation legislation, the tendency towards tolling routes instead of short sections of road continued (North Coast Toll Road, for example), but tolling is being limited to new projects.

The disadvantage of the continuation of this policy of tolling only new roads is that it will concentrate tolling on roads primarily used by those communities or regions which have been disadvantaged in the past for whatever reason (lack of political leverage, insufficient traffic volumes to warrant improvements, more important corridors required expenditure, etc.) In this regard, it is noteworthy that a number of the vital new urban roads considered for tolling will affect poorer communities more significantly than more affluent communities.

If all the limited access grade-separate roads, i.e. freeways in the country, including existing freeways, are tolled at a reasonable rate, a more equitable toll system would be achieved. This would be achieved by expecting existing roads to repay from tolls at least a part of their original construction cost (with interest) to the National Road Fund. The National Road Fund would then financially be in a position to assist with the financing of new toll projects which are, in South Africa, hardly ever self-financing.

19.8 CROSS-SUBSIDISATION LIMITED TO AN INTER-URBAN ROUTE OR A METROPOLITAN FREEWAY NETWORK

Although maximum financial flexibility will be achieved through unlimited cross-subsidisation within the primary road system and the legal changes to achieve this should be effected in the medium term, it is considered that, from the point of view of marketing the concept, tolling existing roads will be much more acceptable to the travelling public if the concepts of intercity routes and metropolitan networks as

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self-financing entities are promoted. If this approach is adopted, a road user paying toll on an existing freeway would at least be contributing towards a route between two major centres which he is using or towards a metropolitan road network in the area where he lives and travels regularly.

19.9 ALL EXISTING FREEWAYS SHOULD BE TOLLED, WHERE TECHNICALLY AND FINANCIALLY FEASIBLE

In order to achieve equitability and convince the public that tolling existing roads has become the new financing policy for the primary (freeway) road network, all freeways whether they are currently under the jurisdiction of the national or a provincial or local authority, should be tolled where financially and technically feasible. This will require that provincial and municipal freeways be transferred to the jurisdiction of the South African Roads Board.

19.10 ADOPTION OF THE OPEN TOLL SYSTEM

In order to keep the cost of collection reasonable, the open toll system has been adopted.

The open system is far cheaper to implement than the closed system and the physical difficulty of locating plazas on existing interchange ramps which have not been designed with the concept of tolling in mind can be avoided, especially in the urban context where development has in many cases already taken place along road reserve boundaries.

This conclusion, however, presupposes that absolute equity will not be achievable as a limited amount of toll avoidance is inherent in the open system.

19.11 TIMING OF IMPLEMENTATION OF TOLLING EXISTING ROADS

In view of the need for significant rehabilitation expenditure, the existing freeways should be tolled within the next few years (1992/93 - 1994/5) in order to utilise their net income to help service the

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capital market loans that it is proposed should be taken out to finance rehabilitation.

19.12 PRIORITISE NEW ROADS ACCORDING TO LOAN SUPPORTABLE BY REVENUE (LSR) OVER CAPITAL COST RATIO

The construction of new freeways all of which should first and foremost meet economic viability criteria, should be prioritised on the basis of the LSR/Capital Cost ratio.

Roads with a higher LSR/Capital Cost ratio are able to bear a larger portion of the financial burden of establishment and would therefore require less financing assistance initially.

This prioritisation strategy ensures that the ability of the toll road system to pay for its own operating, maintenance and rehabilitation cost will not be diminished.

19.13 TOLLING EXISTING AND NEW FREEWAYS WILL CREATE A SELF-FINANCING PRIMARY ROAD NETWORK

Tolling the existing freeway system of South Africa at 5c per km and new freeways at 10c per km and allowing for a 40% discount for daily commuters, will make available enough net toll income to meet long term loan commitments to enable spending of R500 - R700 million per annum on the upgrading and rehabilitation of existing roads and the construction of new roads to start from the 1992/93 financial year. Of the R500 - R700 million, between R250 and R300 million per annum could be spent on the upgrading or rehabilitation of existing roads and between R300 and R400 on constructing new roads.

It can, therefore, be concluded that, if the existing freeway system of South Africa is tolled, enough net toll income will be created to maintain and, where necessary, rehabilitate that network and to finance many urgently required economically viable new freeway projects.

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It is foreseen that, once established, such a financing system could indefinitely continue to finance the primary road network of the country. The evaluation has, however, shown that, if the toll financing system is to be discontinued for whatever reason it will be able to repay the debt which is projected with the projects in this analysis to reach a maximum level of just below R6 billion (in 1991 rand).

19.14 FUNDING AVAILABILITY

The total amount of funding required for toll road construction and rehabilitation over the indicated time frame is not significant in relation to the capital market's ability to provide funds. The funding necessary can be provided by the market without distorting interest rates or inhibiting access by other borrowers to the market. This will be even less of a limiting factor when access to overseas funding again becomes available.

A strategy for creating a secondary market in the stocks of the road authority will be advantageous in reducing interest rates payable. Overseas funding will require that the stock issues are listed on the stock market.

19.15 MARKETING

To obviate the negative public reaction associated with the road privatisation exercise, and to promote a climate favourable to the introduction of the commercialisation process, it is of the utmost importance that a co-ordinated marketing strategy be fully devised and implemented as soon as possible with the assistance of expert consultants. The main thrust of the marketing campaign should emphasise that toll financing is the only way in which a well-maintained functional primary road system can be put at the disposal of the public. Accent should also fall on the fact that the tax base will be broadened by the tolling of roads and the fact that the tax load will be moved from direct to indirect taxation which will make a contribution towards lowering income tax. The equitability of the

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user-charging principle should also be emphasised in a marketing campaign.

19.16 UNIFORM TARIFF PER KILOMETRE POLICY

It is considered viable to adopt a uniform tariff per kilometre policy for the different categories of new rural, new metropolitan, existing rural and existing metropolitan toll roads without causing immediate radical changes to the existing tariff structure. The Huguenot Tunnel is, however, a special case.

In time (5 - 20 years) the gap in tariffs between new and existing roads can be eliminated.

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CHAPTER 20

RECOMMENDATIONS

It is accordingly recommended that:

1. Cabinet confirm its decision on the organisational structure of the body controlling toll roads in South Africa which is a public corporation fully owned and controlled by the State; tolling of existing freeways should, however, commence in terms of the legislative status quo and, if successfully established in terms of public acceptability, management of the commercialised toll road network should be transferred to a State-owned and State-controlled public corporation.

2. The mission of such a public corporation be as follows:

   The mission of the toll authority is to operate, maintain and construct at the lowest possible cost to the road user all South African freeways in accordance with a prioritised programme, by employing toll and other financing methods in such a way as to optimise the utilisation of public funds while protecting the public interest.

3. Authority to plan, design, construct, operate and maintain freeways be centralised in initially the SARB and later a public toll corporation and that no other body should have that authority; freeway planning should, however, remain a function of the SARB.

4. Cabinet confirm their acceptance of the network concept of tolling freeways as a viable method of financing the rehabilitation and maintenance of existing freeways and the construction, rehabilitation and maintenance of new freeways.

5. The proposed tolling of each existing freeway be separately presented to Cabinet for final approval.

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6. Public relations consultants be appointed as soon as Cabinet gives its approval to market the toll network system on the basis of an ultimate reduction in the level of personal income tax, that toll income derived from tolling the freeway network will be solely applied to the freeway network and that limited cross-subsidisation within an intercity route or within a metropolitan network will enable an equitable and financially viable approach to freeway provision.

7. Further investigations be undertaken to ascertain whether municipal freeways may be eliminated from the network to render it more marketable and whether existing roads should not only be tolled after significant rehabilitation work has been carried out on such a road.

8. A uniform tariff per kilometre policy be adopted, but that differential tariffs be accepted for new and existing freeways as well as for rural and metropolitan freeways and that the Huguenot Tunnel be treated as a separate case.

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s) Single walls only can be used internally as none of the internal walls normally have a load-bearing capacity with regard to the roof.

Table 5 lists the results of the elemental cost breakdown with the associated possible savings. From the results it can be seen that an approximate saving of 25 % can be achieved by introducing the above proposals.

TABLE 5 : BUILDING WORKS

ITEM	SIX LANES (± 123 m²)		EIGHTEEN LANES (565 m²)	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Foundation & Earthworks	22 236,00		66 292,00	
Brickwork & Waterproofing	48 741,00	1 800,00	143 827,00	3 796,00
Roofing	74 316,00	32 321,00	239 336,00	137 818,00
Carpentry & Joinery	37 764,00	1 310,00	148 691,00	4 100,00
Floor coverings	3 187,00		12 403,00	
Metalworker/Ironmonger	126 158,00	29 998,00	234 703,00	53 700,00
Plaster, Paver, Paint	18 238,00	7 000,00	68 802,00	4 000,00
Plumbing	7 621,00		18 866,00	
ADDITIONAL ITEMS				
Joining of Plant & Control Room		10 000,00		15 600,00
Smaller Control Room		8 000,00		14 000,00
Smaller UPS/Plant Room		7 000,00		12 600,00
TOTAL	338 261,00	97 429,00	932 920,00	245 614,00
VALUE PER LANE	56 376,00	16 238,17	51 828,00	13 645,00
VALUE / m²	2 750,00	792,00	1 651,00	434,27

10.4.7 ELECTRICAL WORKS

a) Preliminary and general

When the site of a toll plaza is determined the location from where the electricity will be fed from should be taken into account as this can have a significant cost impact upon the provision of a high voltage reticulation supply from the responsible Authorities.

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Inevitably some of the original claims were extravagant and promises could not be fulfilled. Furthermore, practical considerations required solutions that had not been addressed in the planning stage. Nevertheless, the Dallas Freeway experiment by Amtech Inc. lead to a number of trials in the United States and a proliferation of suppliers mostly based in North America.

The advantages beyond toll applications were noted and development work is taking place in areas such as:

- Heavy vehicle tracking to prevent theft.
- Heavy vehicle routing to reduce costs.
- Linkage to onboard computers in heavy vehicles especially for monitoring activity and automatic payment for petrol/diesel supplies.
- Access control for parking lots, secure distribution centres and so on.
- Onboard vehicle guidance systems including the very sophisticated systems under trial in Hamburg and London.
- Vehicle history maintenance.
- Vehicle licence controls including theft (non payment) policing. The Heavy vehicle Electronic Licence Plate (HELP) development programme is a major study which is being funded to an amount of some $3 billion by a number of co-operating states in the US.

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It will be seen from the above list, which is not exhaustive, that a substantial development activity is in place. Many of the trials and much of the development work is coming to fruition so that the number of installations is gathering momentum. In South Africa, this knowledge is having to be gleaned second hand to a large extent because of the lack of involvement of North American companies in the South African economy. This position is changing and expressions of interest are being received.

11.2 THE TOLL INDUSTRY

The cost of collection of tolls is a major concern in the toll industry. This includes the capital cost of the toll gates as well as the operating expenses. In addition, there are delays at the toll gates which can cause frustrations, to say nothing of the cost to heavy vehicle operators of having to have heavy vehicles come to a halt and pull away again. The ideal is to have a toll plaza which is, to all intents and purposes, invisible so that motorists are either debited with the toll cost or have a prepayment depleted without having their journey interrupted. There would be savings in capital costs as well as in labour costs of collection and savings through motorists not being delayed on their journey. As things stand at present this is not yet possible, but AVI is a move in this direction.

The savings achievable by introducing AVI into a new plaza design are higher than incorporating AVI into an existing plaza. Nevertheless, the advantages of AVI in the toll industry are such that it is easy to see why toll operators are so interested in this aspect and in developing the necessary systems and procedures. When the cost of AVI equipment is taken into account, the advantages are even more apparent.

The equipment at a plaza consists of a radio frequency (RF) antenna which can be either mounted alongside the toll lane or laid in the ground.

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This antenna links into the plaza computer and combines with automatic vehicle classification equipment to determine the amount to be charged and to whom. Remarkable accuracy is being obtained in operational situations. The cost to equip a lane is currently estimated to be a maximum of R100 000 at 1990 prices. The decision regarding the mounting of the RF antenna determines where the responders (tags) are mounted on the vehicle. This latter element is the major cost factor as tags can cost up to R100 each although they have a life of 8 years for an active tag and longer for a passive tag.

Tags vary according to the degree of sophistication desired and can be very simple or can incorporate readouts showing the toll to be paid and the value remaining in the tag (if a prepaid system is used). The more sophisticated the tag, the more expensive it inevitably becomes. Systems are being developed for both closed and open tolling methods.

Two methods remain to be addressed in terms of principle, as opposed to the actual systems development, in the situation which applies in South Africa. The first relates to law enforcement. The methods of dealing with offenders, who drive through an AVI lane at a plaza illegally, still need furter development. The second concerns the toll gate operation and the question of whether or not vehicles will need to come to a standstill at the plaza, needs to be resolved. Tags are accurate at speeds of up to 80 km/h and, in some cases, higher.

11.3 TECHNOLOGY

The basic principles have been defined but work on the technology to be applied and the actual systems to be adopted remains to be undertaken. Decisions need to be taken on a wide range of alternatives including, for example, the use of high or low frequency antennas and the suppliers to be used. The potential savings of some R2 million per plaza (based on a new plaza with 10 lanes or more) indicate that these aspects are worth pursuing.

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Considerable development work is taking place internationally. These vary from dedicated bus lanes in New York with the tags mounted on the roof to Autostrade's closed toll system. The throughput achievable varies from 1 000 to 2 000 vehicles per hour per lane. This is significantly higher than the 350 - 500 vehicles per hour achievable by manual toll collection. In the bus experiment a throughput of 1 200 vehicles per hour is being achieved and the bus operators are most enthusiastic as delays at toll gates have been significantly reduced. An indication of acceptance is that the Dartford Tunnel in England has gone to tender (October 1990), although the outcome of the tenders is not known at this time.

There is one system in development which alerts the device to the fact that a toll gate is being approached and the amount of toll payable is indicated on a display on the tag. The HELP project referred to earlier will probably recommend a combination of licence fee payment procedure and toll tag being incorporated in the licence plate of heavy vehicles. More will be known about this when Dr Walker of Austec Inc from Canada visits South Africa later in 1991. Austec Inc are the selected consultants and suppliers to the HELP project.

11.4 OTHER DEVELOPMENTS

11.4.1 GENERAL

The excitement generated by ETTM/AVI is such that other developments tend to be overlooked. Every effort is being made to simplify procedures, equipment and systems. The South African toll industry has gone through a development phase in this regard over the past 6 or so years and a degree of maturity is now discernable. A document dealing with these aspects is incorporated as Chapter 10 under the heading "Cost Effective Engineering and Technology". This document generally incorporates known and proven methods of reducing toll collection costs. It is not the intention in this chapter to repeat these findings.

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11.4.2 WEIGH-IN-MOTION

The other development apart from ETTM/AVI which is attracting attention is the aspect of weigh-in-motion. There is concern generally about the damage caused to the pavement by heavy vehicles which are either overloaded in terms of the legal maximum or incorrectly loaded so that excessive weight is applied to an axle. The public generally perceives this to be a major factor in the costs of maintenance of roads, and this perception is borne out by pavement studies. It might, however, be considered to be a law enforcement factor rather than a toll related matter.

Some toll operators have introduced the weight of the vehicle as a factor in the calculation of the toll fee. This has some attraction to the heavy vehicle operators as, for example, a vehicle on a return journey through the Huguenot Tunnel would pay less than the same vehicle going through fully laden. Currently there are some operators who avoid the toll plaza when the vehicle is travelling empty and who take the alternative route. Other operators are violently opposed to the introduction of weigh-in-motion.

Development work in this regard is continuing but, at this time, the degree of accuracy being achieved is not yet satisfactory. This aspect is worth pursuing and results are being monitored.

11.5 CONCLUSION

The natural tendency is to hanker back to the simple methods of the past, when toll collection was cheaper. It is true that not all modern technology lives up to the claims made for it and that there are problems regarding accuracy and maintenance. Modern technology is not generally to be had at a cheap price.

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It is, however, a fact that the volume of traffic, the impatience of drivers, the cost of delays and the need to contain fraud mean that old-fashioned simple procedures are not able to cope with the demands of a modern toll plaza.

Every effort should be made to keep procedures and technology as simple as possible and this is taken into account in all systems development. A watchful eye is being kept on developments overseas and only tried and tested technology will be proposed. There is no need for South Africa to be on the cutting edge of technology. The South African toll industry is developing into one of the more extensive and co-ordinated in the world and this must be taken into account when future trends in technology are considered.

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By positioning the plaza as close as possible to the feeding point a saving of up to 40 % can be obtained on this item.

b) Cables and cabling

If the extent of lighting alongside the ramps is reduced and on the approach side, eliminated, a considerable saving can be achieved in respect of cables and cabling.

In the case of a large plaza, if toll booths are not situated at the ramps of interchanges, the elimination of associated cabling can result in an additional saving. However, for the calculation purpose of this study it was assumed that two ramp plazas need to be serviced.

If a common bus bar system was introduced for both utility and UPS power to the lane area, the cost of cabling can be reduced. While this might only be a very small reduction, there would be an associated reduction in lightning protection units as well as in the size of the plant room building. The bus bar type of system allows for one cable for utility supply to all booths and only one cable for UPS supply from the plant building. The toll collection equipment and canopy uplighters will be fed from this supply.

Each booth basement can be fitted with a combined UPS/ utility distribution board with the required isolators to facilitate the isolation of a booth. The disadvantage of this approach, however, is that it will not provide an easy way of isolating a specific lane from a remote location. Furthermore, an electrical fault in one lane could cause a temporary disruption in the supply to all the lanes.

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c) **Power distribution**

Regarding the uninterruptable power supply units, the standard design makes use of standby units serving alternative lanes in order to ensure that whenever one of the UPS systems fails simultaneously with a generator, 50 % of the plaza would still be operational. However, if only one UPS unit is used it can result in a considerable saving of approximately R36 000,00.

The bus bar system will also have a saving of approximately R30 000,00 for an eighteen lane plaza in respect of the lightning protection units.

d) **Diesel Generator**

A saving of approximately 20 % can be obtained if the size of the generator at an eighteen lane plaza is reduced from 150 kVA to 100 kVA. However, this will result in a situation where it would not be possible to feed the whole plaza with power from the generator, but only certain canopy lights and other essential loads.

e) **Permanent Buildings**

Up to now certain provisions have been made for fire and smoke alarms in the buildings, as well as a fairly high number of socket outlets etc. By reducing these items an additional saving can be achieved.

f) **Lighting Mast**

If lighting masts are eliminated on the approach side of the plaza and especially at the ramps, a considerable saving can be achieved. However, this might increase road hazards for motorists travelling at night.

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g) Luminaires

Associated with the reduction in the area of lighting as discussed under the previous heading, there will be a saving in respect of the number of luminaires that are necessary.

The design changes proposed above will result in an overall design which is not in accordance with the proposed S.A.B.S. standard and will, therefore, to a certain extent be a sub-standard design. However, as road users become more and more familiar with toll plazas and the functioning of these plazas, a lower design standard might not have a dramatically negative effect on safety aspects.

The result of the elemental cost breakdown and the possible savings if the above proposals are adopted are tabulated in Table 6. These savings amount to an approximate saving of 18 % of the current electrical cost.

TABLE 6 : ELECTRICAL WORK

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Cable Trenching	14 588,00		30 898,00	
Cables & Cabling	164 500,00	40 000,00	368 204,00	72 600,00
Power Distribution	111 448,00		329 509,00	65 900,00
Building Air-conditioning	61 424,00		89 269,00	
Booth Air-conditioning	30 713,00		171 495,00	
Generator Set	161 040,00	59 412,00	120 769,00	20 000,00
Building Electrical	65 769,00		179 907,00	16 250,00
Lightning Masts	161 757,00	40 000,00	306 403,00	70 000,00
Luminaries	49 717,00		148 983,00	29 000,00
Preliminary & General	61 098,00		233 500,00	60 000,00
TOTAL	882 054,00	139 412,00	1 867 937,00	333 750,00
VALUE PER LANE	147 009,00	23 235,00	103 774,00	18 541,00

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10.4.8 TOLL COLLECTION EQUIPMENT

In order to provide satisfactory control over the collection of money as well as the recording and reporting of money collected, it is necessary to provide certain electronic toll collection equipment situated in the toll lane. During the past five years considerable technological developments have taken place, which provide the opportunity at this stage to introduce certain cost savings without substantially reducing the functionality of the required system from an operational perspective.

The following items were considered:

a) **Automatic Vehicle Classification (AVC)**

In the case of dedicated light vehicle lanes the AVC system can be simplified to be only a vehicle detection loop. It can also be mentioned that, depending on the technology used for the AVC system, the life expectancy of the AVC system can be increased from approximately 1 million axles to about 20 million axles.

b) **Toll fare display**

The existing mechanical toll fare display can be replaced with an electronic light emitting diode (LED) display mounted on the traffic light poles.

This can lead to an approximate saving of about 70 % on this specific item.
In dedicated lanes where only light vehicles are allowed, no such display is needed and only a fixed sign stating the fare is required.

c) **Overhead lane signs**

Up to now a very effective fibre optic lane indication system has been used, but this can be replaced by a traffic light type sign manufactured locally. Although not as highly visible as the fibre optic sign, it is believed to still be adequate for the purpose.

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d) Entry booms

Electromechanical entry booms, similar to the ones used in parking garages, are used to close off the lanes. However, it is believed that a simple chain with a "No Entry" sign attached to it can be used to close off lanes.

e) Debit Cards

Up to now State toll roads have made use of a debit card system which has a relatively high capital cost in respect of equipment maintenance and operations. This system can be replaced by a debit card system based upon an internationally accepted standard used for credit cards, whereby the balance is stored on the plaza computer or other related systems and use is only made of a swipe card reader in the lane.

Investigations also indicate that financial institutions are quite prepared to co-operate in setting up such a system, which will result in considerable saving in respect of lane equipment. The magnetic card handler can also be omitted and replaced by a simpler swipe card reader.

f) Operations control desk (OCD)

An operational control desk has been provided in the control room to enable the supervisor to know what the status is in the lanes at any stage. It is possible to replace the operations control desk by using a visual display unit linked to the plaza computer which will supply the same information. The disadvantage of this approach is that, in the case where the plaza computer or the communications to the lanes are down, status monitoring will not be possible. However, it is felt that this should not present a large operational problem, especially on smaller plazas. However, certain control actions cannot be fulfilled without this information being available.

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g) Dedicated lanes

Dedicated lanes have reduced equipment requirements. Dedicated height restricted light vehicle lanes can be supplemented with normal lanes (light/heavy), thereby reducing overall AVC and toll fare display requirements. The vehicle classes will consist of one light vehicle class and the existing multiple heavy vehicle classes.

h) Data communications

In principle, it is possible to reduce the toll equipment to facilitate "stand alone" lane systems without communication to the plaza computer, thereby saving on communication cables and optic fibres. This approach has negative operational and functional implications that will have to be balanced against the cost saving which is only approximately 4 % of the toll collection equipment cost. In view of this consideration the introduction of this option is not recommended, as it also limits flexibility in terms of catering for the road user's requirements in terms of information availability and payment methods.

i) Use "off the shelf" equipment

Another way to reduce toll collection equipment is to introduce the use of "off the shelf" electronic equipment as far as possible. One option is to base all lane computers on the standard 80286 AT computer which is currently replacing the 8088 XT computer in the market.

A PC suitable for toll collection purposes will consist of a standard motherboard, keyboard, screen, communication board, data storage devices and printer. A standard tube screen poses problems in direct sunlight and can be replaced with a LCD four line forty character display.

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It will also be necessary to perform modifications on the normal keyboards in the toll environment in order to cater for input requirements into the system. It can also be noted that the supply and maintenance expertise in respect of "off the shelf" computers are widely available and, therefore, should reduce maintenance cost in the long term. This approach was recently adopted by a Spanish company.

Adopting the above approach can result in an approximate saving of about 20 % per toll collector terminal. Table 7 lists the results of the elemental cost breakdown as well as the proposed savings. By introducing the above proposals an approximate saving of 30 % can be achieved regarding lane cost of the toll collection equipment.

TABLE 7 : TOLL COLLECTION EQUIPMENT

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Booth Unit (excl. A/C)	252 600,00	144 000,00	756 000,00	432 000,00
Site Work - Installation	1 000,00		3 000,00	
TOTAL	253 000,00	144 000,00	759 000,00	432 000,00
VALUE PER LANE	42 167,00	24 000,00	42 167,00	24 000,00

10.4.9 TOLL BOOTHS

Because of the long life and durability of stainless steel, the latest trend has been to use stainless steel booths. However, over the last two years the increase in cost of these booths has been very steep and a stainless steel toll booth excluding any air-conditioning, currently costs in the region of R42 000,00. Because of this high cost, alternatives were sought and combined with the proposed extension of the New Jersey barrier to serve as the lower part of the toll booth. Other options have also been investigated, including fibre glass and aluminium.

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It is also the intention to simplify the internal layout of the booth to reduce cost and to place all equipment normally situated and accommodated inside the booth in the manhole underneath the booth.

Regarding fibre glass toll booths, quotations were obtained. Fibre glass booths are constructed from an isolating layer between two 4 mm fibre glass layers. The cost of the booth is greatly influenced by the once off mould cast cost which has to be divided amongst the number of units to be manufactured. The cost per booth, based upon a six lane order, amounts to approximately R17 000,00.

In respect of aluminium toll booths, suppliers manufacturing caravans were contacted and indications of prices were received from them. The approximate cost for aluminium based toll booths is R17 750,00 per booth. For the purpose of evaluating cost effectiveness and savings, the prices for aluminium toll booths were used as tabulated in Table 8. From these figures it is clear that a saving of approximately 57 % can be achieved.

TABLE 8 : TOLL BOOTHS

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Civil Works	3 035 271,00	173 264,00	3 982 859,00	262 431,00
Canopy & Steelworks	630 504,00	210 091,00	1 760 947,00	622 075,00
Buildings	338 261,00	97 429,00	932 429,00	245 614,00
Electrical Work	882 054,00	139 412,00	1 867 937,00	333 750,00
Toll Equipment	940 586,00	273 014,00	2 468 572,00	706 214,00
Toll Booths	253 000,00	144 000,00	759 000,00	432 000,00
TOTAL	6 079 676,00	1 037 210,00	11 772 235,00	2 062 084,00
VALUE PER LANE	1 013 279,00	172 868,00	654 013,00	144 560,00
PLAZA COST/LANE		840 441,00		509 452,00

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10.4.10 SUMMARY OF PLAZA COST ESTIMATES

Table 9 provides a summary of the plaza cost estimates as well as an after-saving cost per lane for a six and eighteen lane toll plaza.

TABLE 9 : SUMMARY OF PLAZA COST ESTIMATES

ITEM	SIX LANES		EIGHTEEN LANES	
	COST (R)	SAVING (R)	COST (R)	SAVING (R)
Civil Works	3 035 271,00	173 264,00	3 982 859,00	262 431,00
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TOTAL	6 079 676,00	1 037 210,00	11 772 235,00	2 062 084,00
VALUE PER LANE	1 013 279,00	172 868,00	654 013,00	144 560,00
PLAZA COST/LANE		840 441,00		509 452,00

From the results in Table 9, it is clear that unit cost per lane varies considerably with plaza size. Furthermore, the use of the rate per lane is an over-simplification, as certain cost items are not directly related to the number of lanes eg. (buildings). However, it is believed that the figures do provide a guideline to determining plaza cost and, furthermore, provide information as to the quantification of savings as discussed.

10.5 ADDITIONAL FUTURE COST SAVING

10.5.1 AVI (Automatic Vehicle Identification)

AVI was not considered in detail in this exercise as relevant figures are not available. However, it is believed that within the foreseeable future, AVI will become a definite part of the toll industry and it is already the trend overseas to introduce AVI for the processing of vehicles.

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The management of the Dartford Tunnel recently put to tender the installation of AVI at the toll plaza. It is, therefore, regarded extremely important that development of AVI should be monitored closely because it might be necessary to introduce this technology, especially when plazas are constructed on high volume commuter roads. By introducing AVI lanes on commuter roads, any increase in traffic throughput can to a certain extent be accommodated by using AVI, thereby reducing the physical size of the plaza and saving up to R675 000,00 per plaza for each lane that does not need to be built.

10.5.2 TENDER PROCESS

Over the last twelve months certain prices were obtained for the construction of toll plazas, based upon negotiated supplementary agreements as well as open tender. From the results obtained from these processes it is clear that there is a definite benefit for the employer to use the open tender process as far as possible.

It deserves to be mentioned that the civil cost per lane for the Tongaat Toll Plaza was in the region of R280 000,00 per lane, which was obtained in an open tender process, whereby the costs for civil work per lane for Pelindaba and Oribi Toll Plazas varied between R670 000,00 and R411 000,00 per lane. These latter prices were the result of negotiated contracts and represent a 43 % higher cost per lane for Oribi Toll Plaza as compared to Tongaat Toll Plaza. The cost per lane for civil works at Mtunzini Toll Plaza was R311 000,00 and was obtained on open tender, which is 32 % lower compared to Oribi Toll Plaza.

10.5.3 "TANDEM" TOLL BOOTHS

The number of toll plaza lanes required can be reduced by introducing so-called "tandem" toll booths, i.e. two toll booths per lane. This practice has been reported to increase lane throughput by 25 % - 50 %. However, this innovation has not been tested locally and plans to test this within the next twelve months are being considered.

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This technique is also useful in areas where there is limited space available to position a toll plaza.

10.5.4 BULK ORDERING

Bulk ordering enables suppliers to mass-produce equipment which can lead to a saving estimated at 15 %. A bulk order, comprising 75 - 100 units, can be placed by combining supply contracts for several plazas.

10.6 CONCLUSION

From the results of the elemental cost breakdown as well as the demonstrated possible saving, it is clear that the cost per lane varies with the size of the plaza.

On average the cost of a plaza, after the introduction of some of the above savings, will amount to approximately R675 000,00 per lane, which compares favourably with a current figure of R900 000,00 per lane inclusive of all aspects. However, by refining certain design items further, as well as developing other technology, it is believed that this amount can be reduced even further.

It must also be noted that the cost per lane is not always a true reflection of the cost of a plaza, as some of the cost aspects related directly to the number of lanes. However, it is regarded prudent to use a figure which is attainable within the near future for the calculation of the feasibility of projects.

In addition, it is clear that in order to further reduce costs, a more concentrated effort should be made regarding specialised civil work as this still remains the main contributor to the cost of a plaza.

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CHAPTER 11

FUTURE TRENDS IN TECHNOLOGY

11.1 ELECTRONIC TOLL AND TRAFFIC MANAGEMENT (ETTM)

11.1.1 INTRODUCTION

Probably the most significant advance in toll collection has taken place in the past two or three years with the introduction of automatic vehicle identification (AVI) systems based on radio frequency transmissions. The AVI systems have been incorporated in the overall term Electronic Toll and Traffic Management (ETTM), but this also includes more wide-ranging and far-reaching aspects than just toll collection. Once these wider aspects are taken into account, there is a tendency for the toll aspect to be somewhat submerged in the great potential versatility.

The development of AVI stems from work undertaken at the United States National Research Laboratories at Los Alamos in New Mexico. The results of the work were wide-spread but as far as the toll industry is concerned, the major invention was a micro-chip which responded to radio signals. This chip could be 'passive'; in other words it responded to the radio signal which could 'read' of its existence and the data it contained. The radio signal could then amend the data. The chip could, on the other hand, be 'active', which required the incorporation of a long life (± 8 years) lithium battery. Communication between the chip and the radio receiver/transmitter is enhanced by the active chip. These chips are incorporated in 'tags' or 'transponders' which can be as small as the size of an average credit card, but only slightly wider. For some applications the 'tag' or 'transponder' can be larger but this does not mean that the micro-chips contained in the smaller tags are any less powerful.

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The technology will be described in more detail later in this chapter but essentially it is based on a radio signal which can be either high or low frequency. Development has taken place rapidly over the past two years and ETTM/AVI is one of the few aspects where there is a separate task force created by the International Bridge, Tunnel and Toll Association (IBTTA). Every conference and working group of IBTTA has some time devoted to this aspect. In the normal course of events, it would be expected that a development of this nature would take time to mature. The speed of acceptance and adoption of this technology is such as to indicate clearly the need for the benefits that AVI offers to the toll industry.

11.1.2 APPLICATIONS

The research at Los Alamos was funded by certain private organisations in concert with the U S Government. In return for this funding support, various patents were granted to these companies. Initially there was some uncertainty regarding the applications for which the technology would be most suitable. Railways were perceived to be one area of known demand and shipping containers another. Tests in both areas proved highly satisfactory but the railroads were slow to move beyond the test phase. The shipping lines wanted significant international agreement through the International Standards Organisation (ISO) before committing themselves to a particular supplier whose equipment might not be compatible with that supplied to other companies. In the event, it was the toll industry that took over the lead in applications for AVI and one of the first live installations was on the Dallas Freeway in Texas. One of the reasons for this advance was the fact that, in the United States, the individual toll operations in the different States, and sometimes even within a State, do not co-operate directly. A toll operator could, thus, proceed without having to consult other operators.

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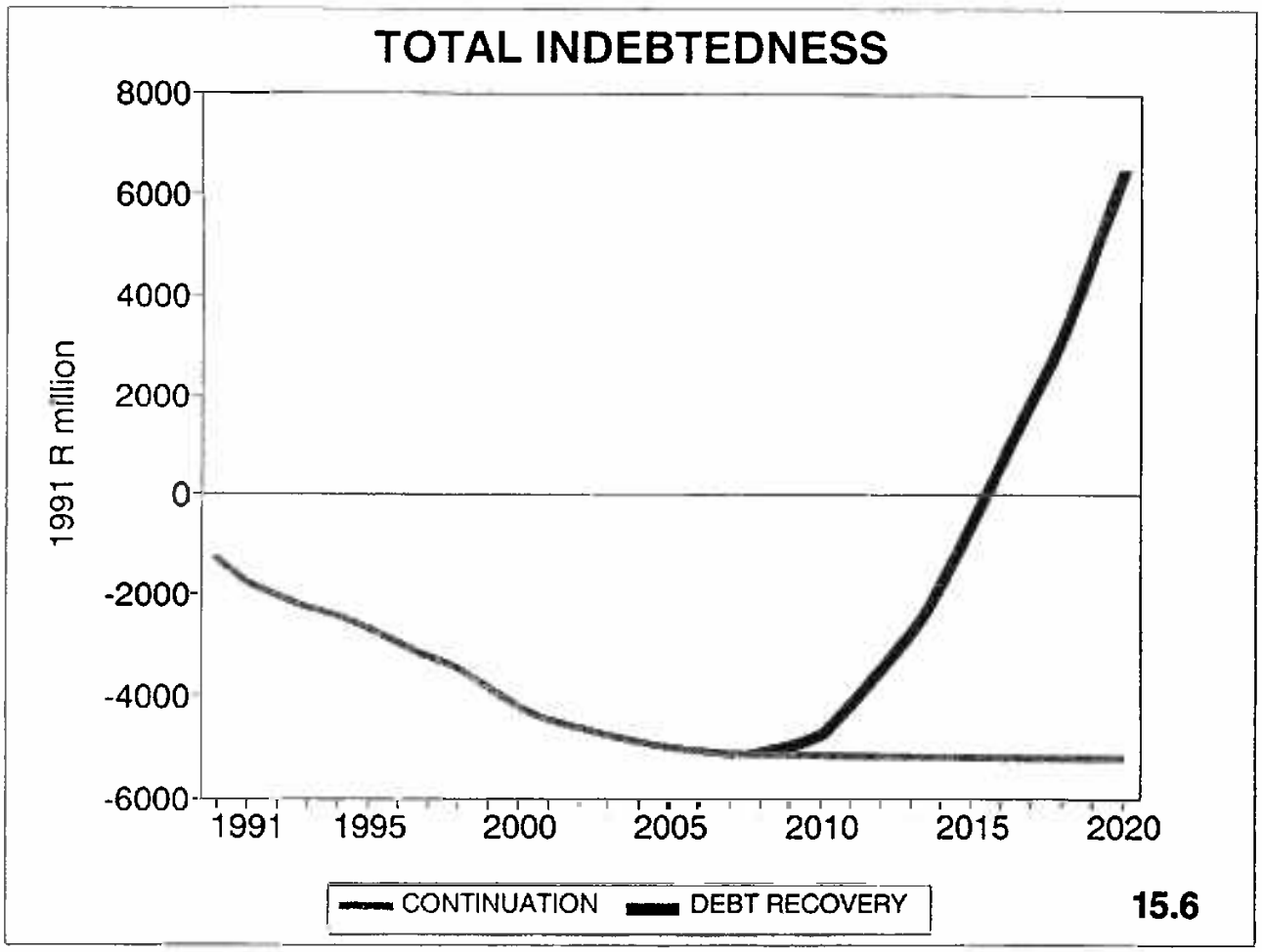

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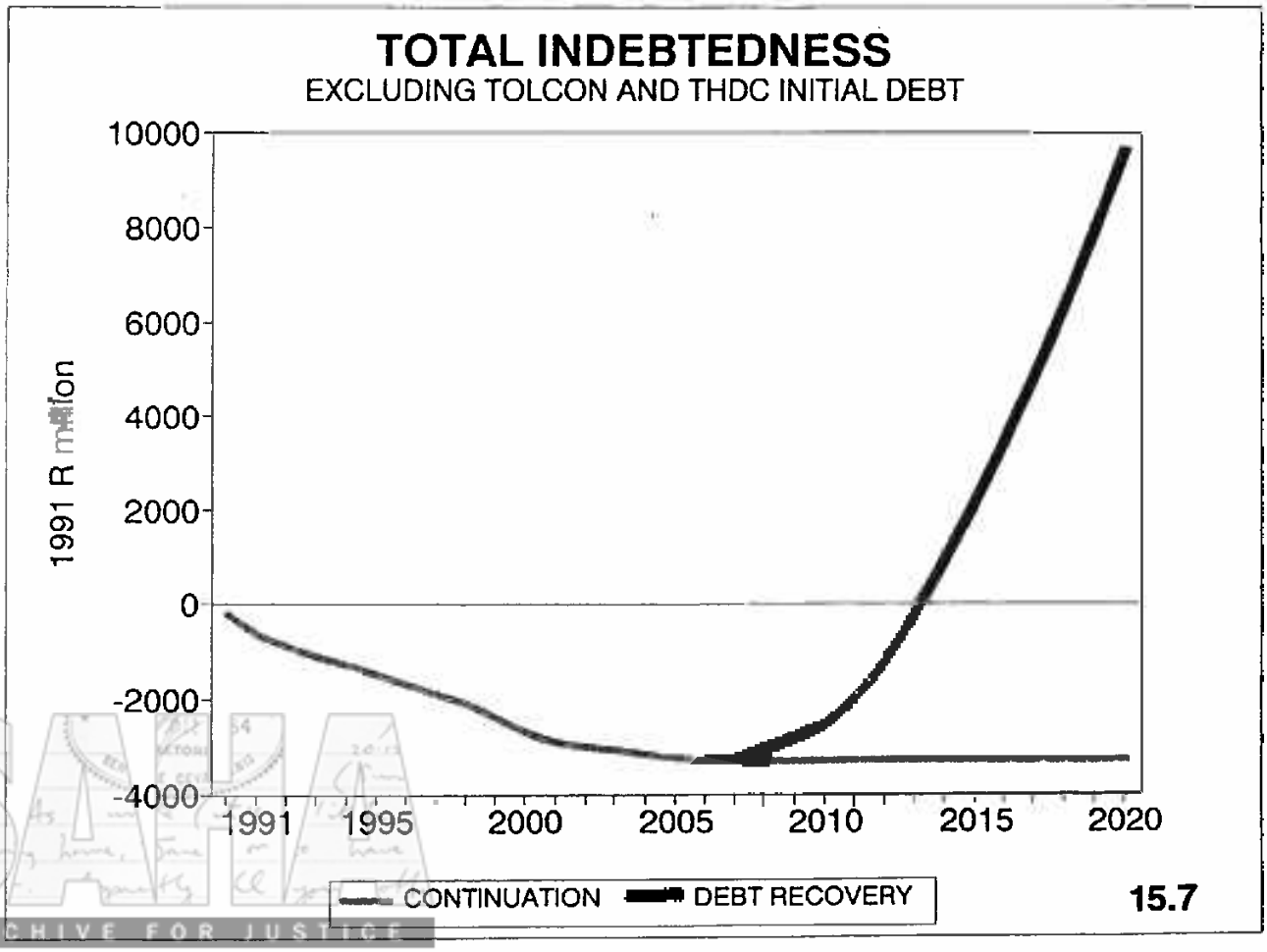

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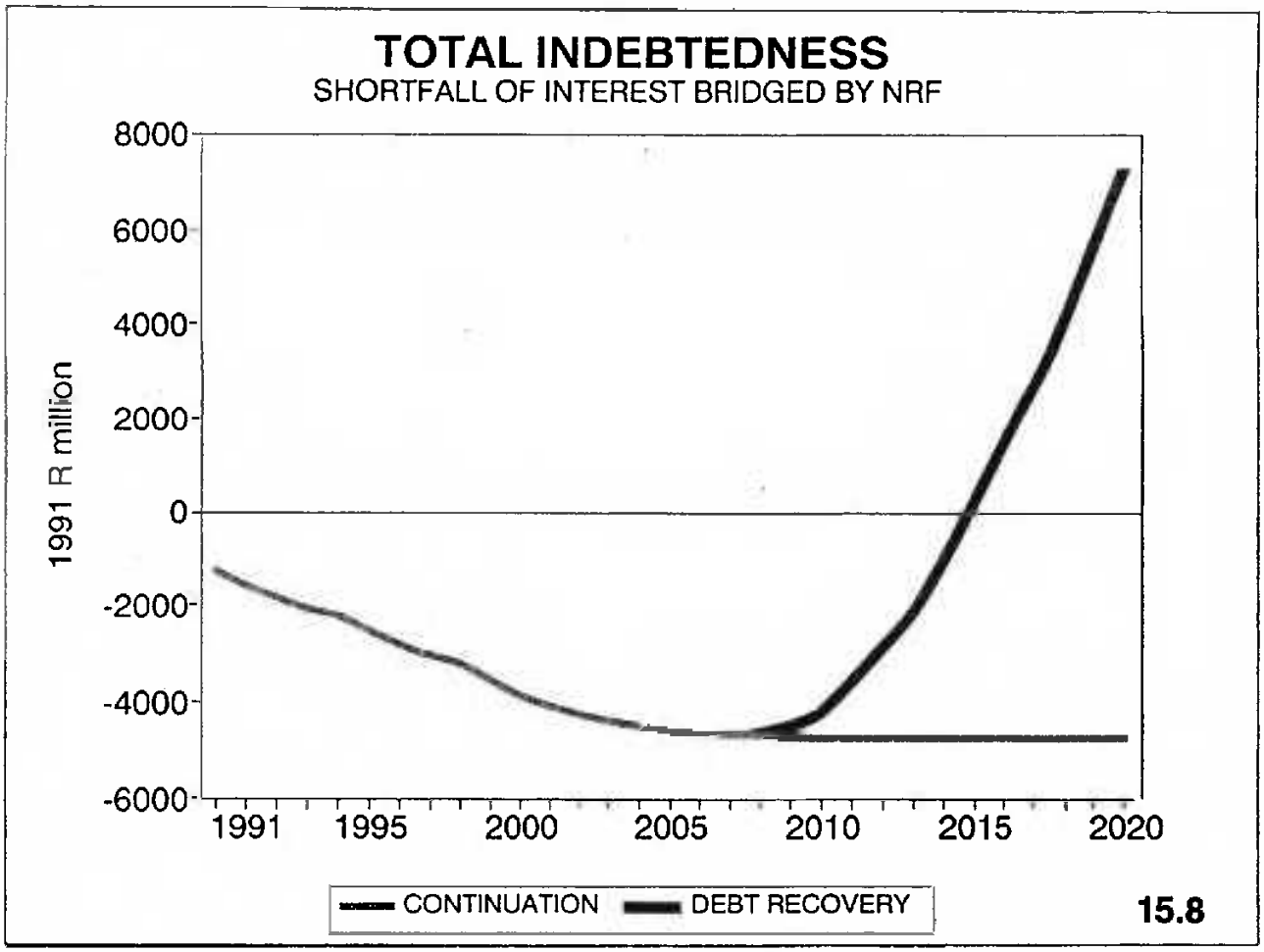

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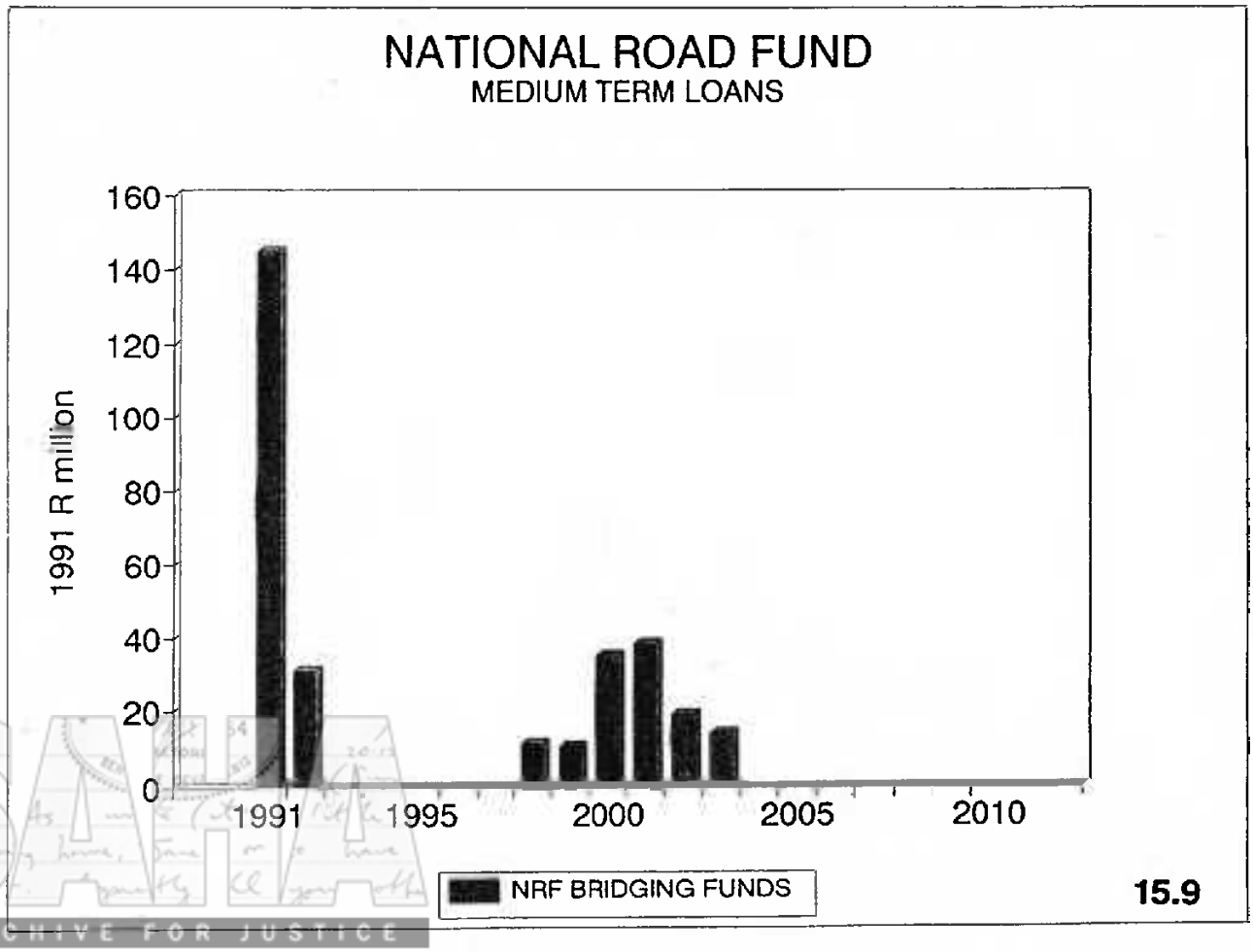

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15.5 SENSITIVITY ANALYSIS

The sensitivity of the total indebtedness to variations in the real rate of interest and the traffic growth rate was analysed.

In the expected case presented on the previous figures a real interest rate of 4% per annum and a traffic growth rate of 4% p.a. were used.

In this optimistic scenario shown in Figure 15.10 a traffic growth rate of 6% per annum and a real rate of interest of 2% per annum is assumed. The total indebtedness under these assumptions would not exceed R3 billion and, to demonstrate the financial viability of the scheme, it will be able to repay the debt by 2009.

In this pessimistic scenario shown in Figure 15.11 a traffic growth rate of only 2% per annum together with a high real rate of interest of 5% per annum was assumed.

Under these circumstances, with the currently programmed construction schedule, the maximum level of indebtedness would be almost R10 billion and debt repayment will only start by 2013.

This situation would however not be allowed to arise as the net toll income and interest burden would be continuously monitored as is the case at present, and the construction schedule of new projects adjusted accordingly.

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15.6 CONCLUSION

It can, therefore, be concluded that, if the existing freeway system of South Africa is tolled, enough net toll income will be created to maintain and, where necessary, rehabilitate that network and to finance many urgently required economically viable new freeway projects.

It is foreseen that, once established, such a financing system could indefinitely continue to finance the primary road network of the country. The evaluation has, however, shown that, if the toll financing system is to be discontinued for whatever reason it will be able to repay the debt which is projected with the projects in this analysis to reach a maximum level of just above R5 billion (in 1991 rand).

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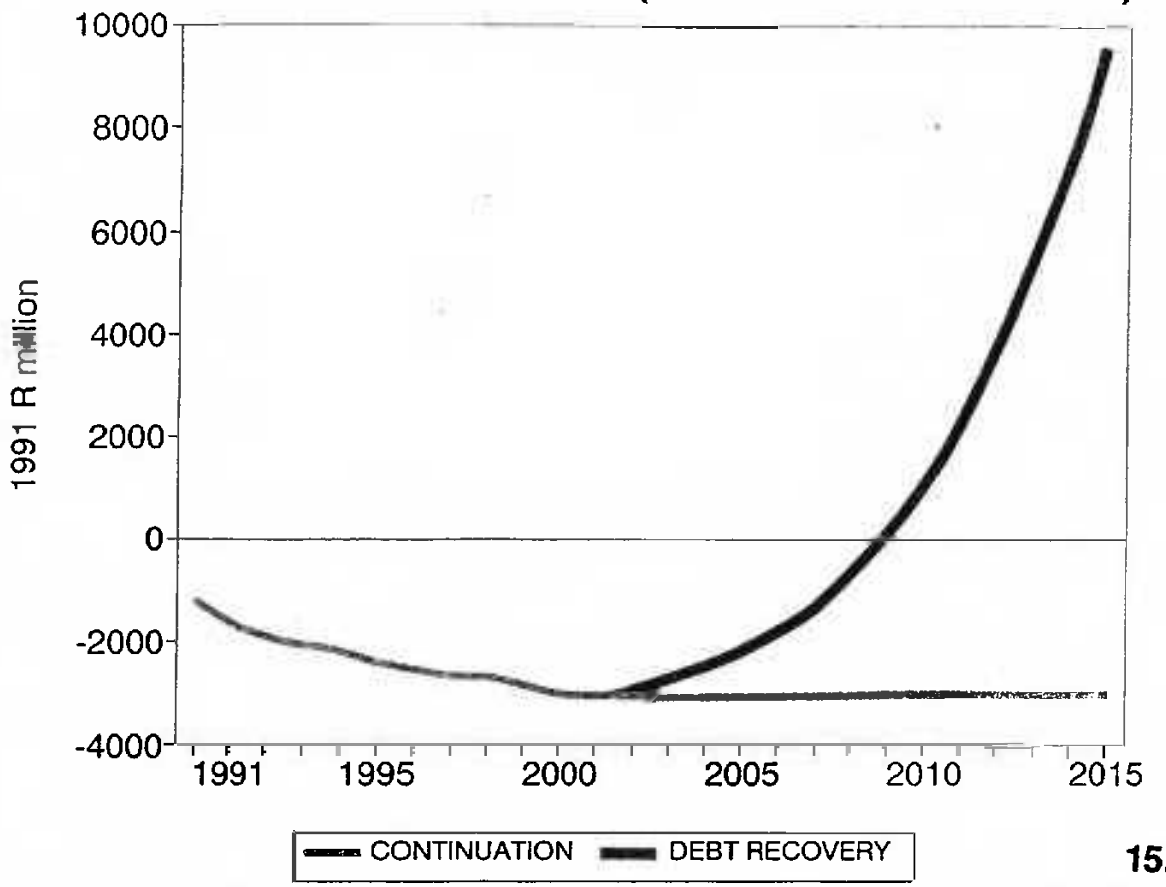
TOTAL INDEBTEDNESS (POSITIVE SCENARIO)



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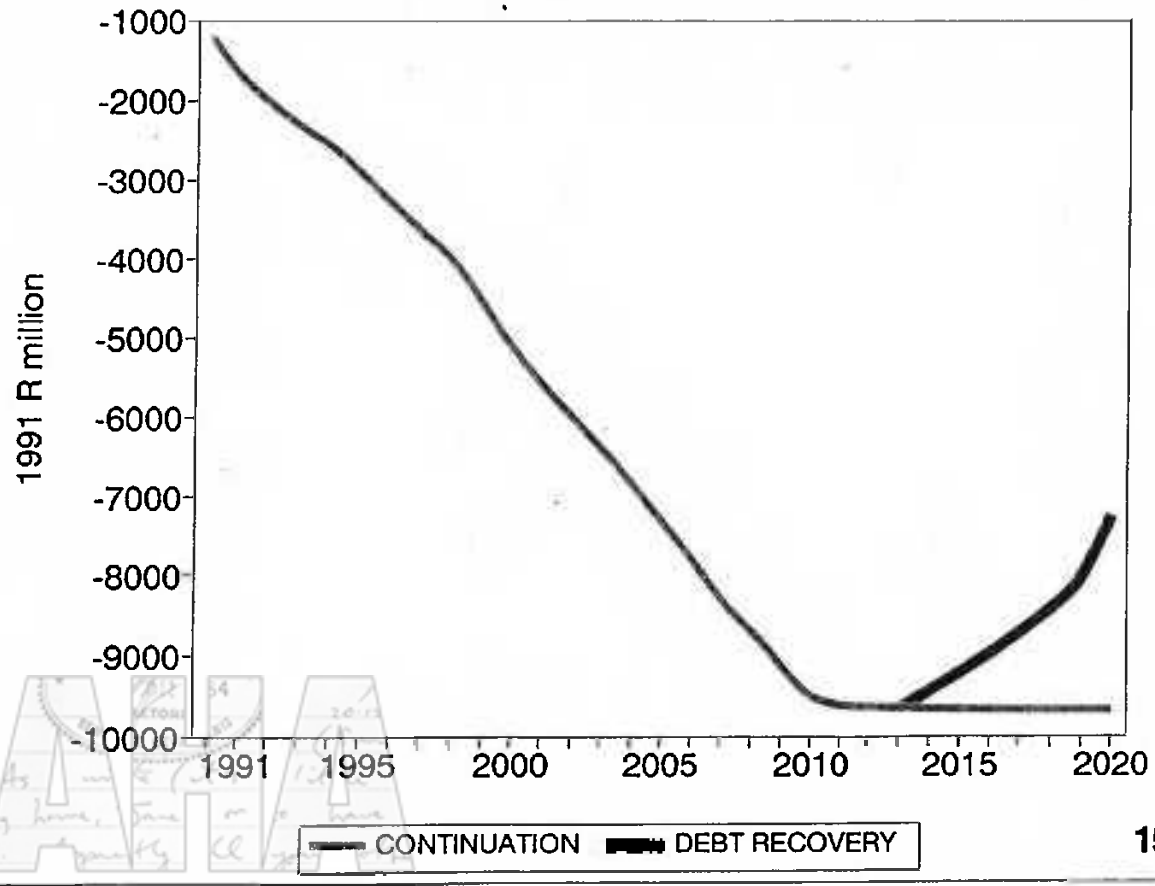
TOTAL INDEBTEDNESS (NEGATIVE SCENARIO)



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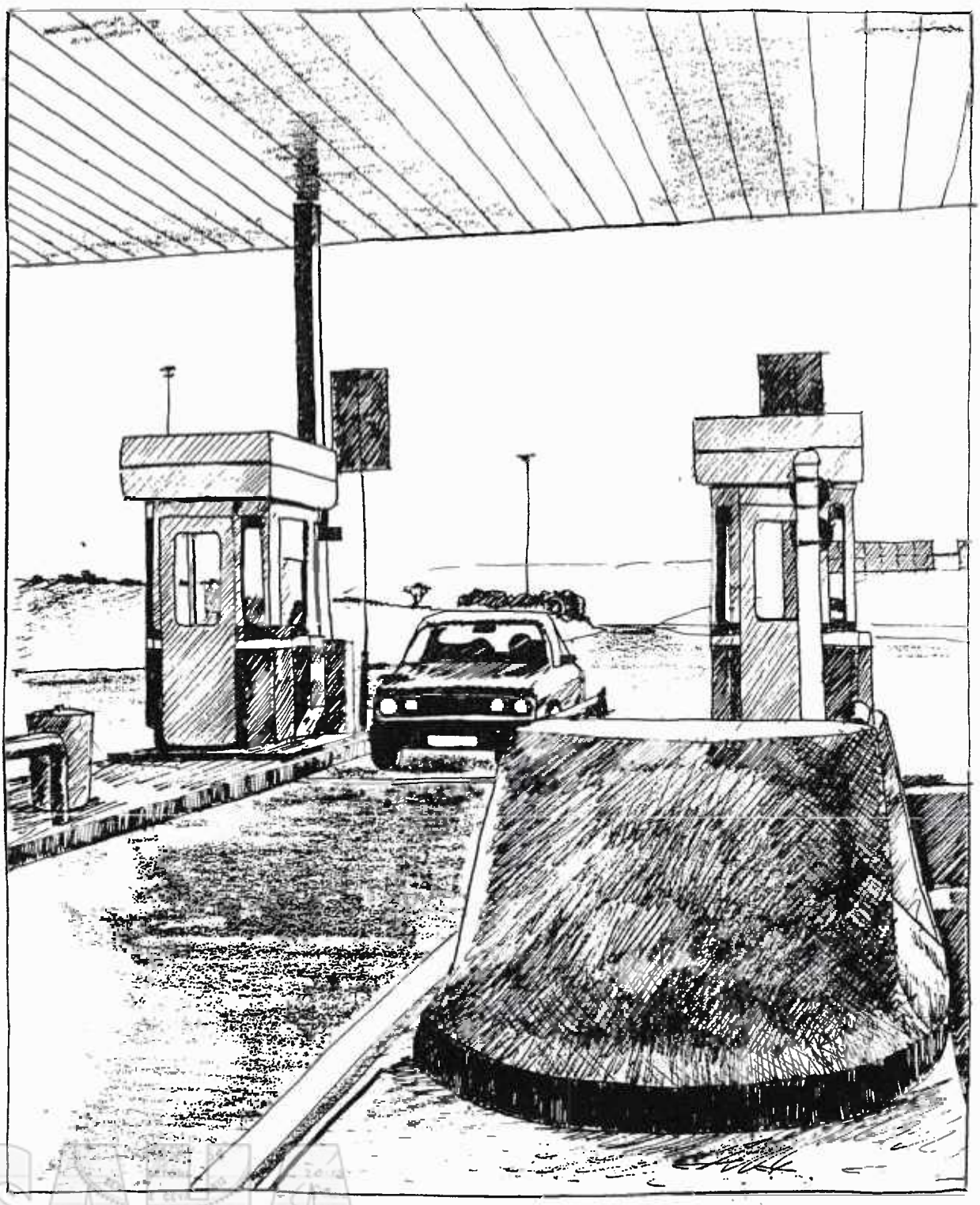

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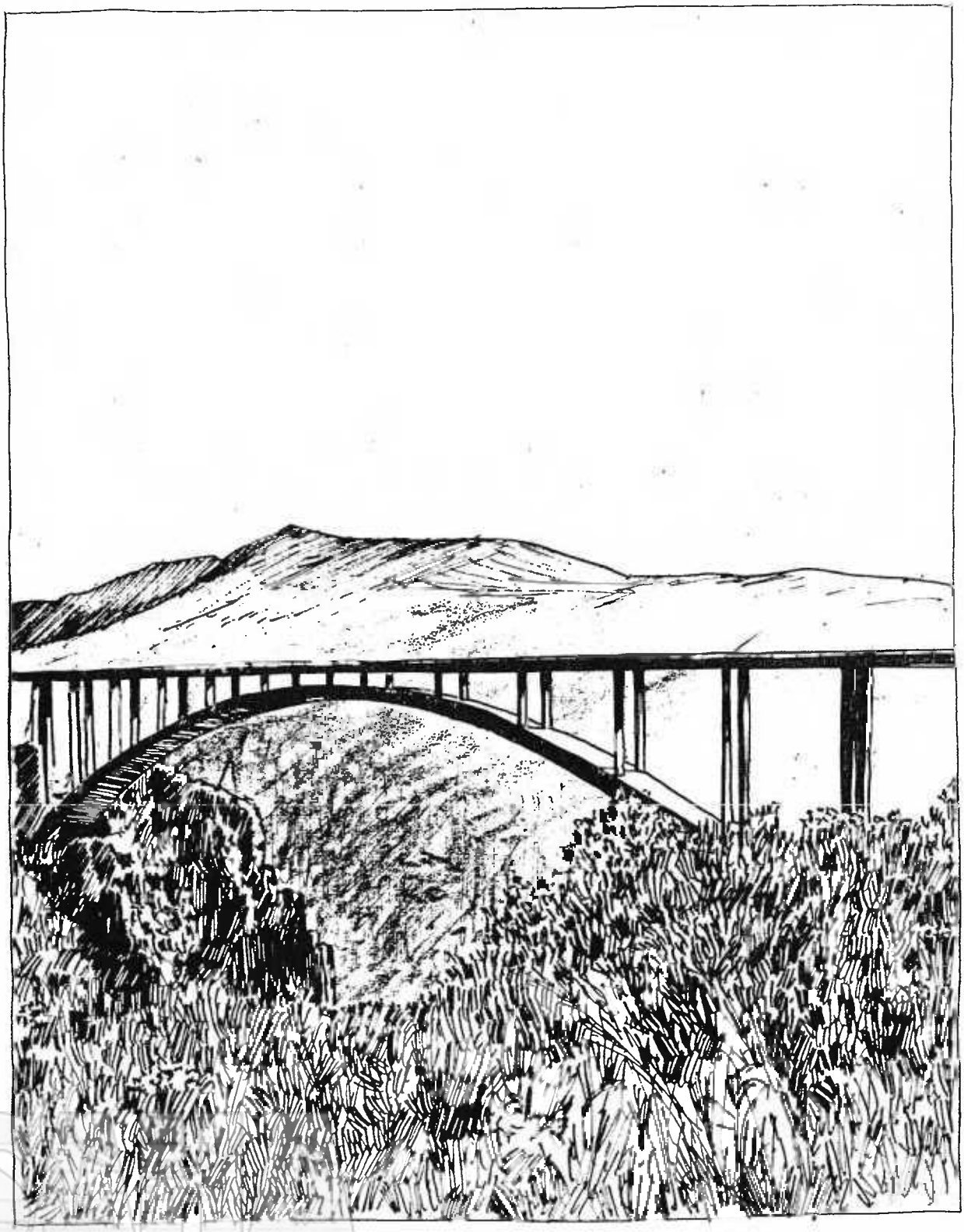

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PART IV : IDENTIFICATION OF FINANCIALLY VIABLE TOLL ROAD NETWORK

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CHAPTER 12

THE FUTURE ROLE OF TOLL FINANCING IN THE FINANCING OF THE FREEWAY NETWORK

In view of the fact that, since 1988, no part of the levy on fuel is any more dedicated to the National Road Fund and in view of the decline in real terms of the allocation of funds for the expansion and maintenance of the primary road network, additional sources of funds which will not impact upon the budget will have to be found to avoid the degeneration of the road network and accommodate the need for infrastructure to accommodate economic growth. In this regard, toll financing, as a direct user charge which motorists are willing to pay, is one of the legs upon which the future financing of the primary road network in South Africa will have to be built.

Three toll financing scenarios were considered, viz. the possible tolling of a large part of or the entire national road system (scenario 1), the tolling of new roads and widened existing roads only (scenario 2) and the tolling of those major routes or sub-networks in the primary road network which could contribute significantly to their own capital, operating and maintenance cost or to the income of the National Road Toll Fund. (scenario 3)

In the following discussion the conclusion is reached that scenario 3 is the desired long term scenario but that it may have to be achieved by a phased step by step implementation.

SCENARIO 1: Possible Tolling of a Large Part of or the Entire National Road System

The advantages of adopting this scenario as future policy are:

- If all national roads, including existing roads, are tolled at a reasonable rate, tolling will be depoliticised to some degree because of greater equity. This follows from the fact that the Department of Transport is considering plans to provide vital new urban and rural road links through toll financing and that poorer and some other communities will be affected more significantly than more affluent communities, raising the question of the equity of tolling only new projects. If all national roads, including existing ones, are tolled at a reasonable rate, cross-subsidisation from existing to new roads (i.e. from more affluent to less affluent communities) will take place and this will be perceived to be more equitable.

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° The tolling of all national roads will probably generate enough income to facilitate the implementation of new projects by means of cross-subsidisation from excess toll income collected on existing national roads. This could be a major boost for the implementation of much needed road projects which are very seldom self-financing as toll projects in lesser developed regions or a lesser developed part of a metropolitan area.

The disadvantages of adopting this scenario as future policy are:

° Tolling the entire national road system, in principle, will have the disadvantage that toll plazas may be erected on many road sections where they would not be financially justifiable and where tolls would, therefore, introduce a significant expense without adding significant net revenue to the National Road Fund.

° Fierce opposition can be expected, since tolling existing roads has met with considerable opposition during the implementation of road privatisation projects and a very large percentage of AA members questioned in 1989 rejected the tolling of existing roads. The South African Chamber of Business, representing 3 500 firms engaged in commerce and industry, took a strong stand against tolling existing roads and cross-subsidisation between toll roads in its official policy on toll roads as well as at the 1990 Annual Transportation Convention. The Road Freight Association and the Transport Consultative Committee have also voiced their objection to the tolling of existing roads in the past. Since the South African public is still used to having well-maintained roads without specifically paying for them it is difficult to see support for the concept on the basis of the promise of a well-maintained road system or altruistic cross-subsidisation motives.

° Current legislation does not allow for cross-subsidisation and therefore legislative amendments will be require before this approach can be implemented.

It is considered that, if it should be decided to pursue this option, extensive public support should be sought before implementation. Implementation should, ideally, be accompanied by a general tax cut,

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license fee or fuel levy reduction to reflect the removal of this expenditure from national and, possibly, provincial budgets.

SCENARIO 2: Tolling of New Roads and Widened Existing National Roads

In view of the successful implementation of a number of new toll road projects, there appears to be good grounds for evaluating all new major road projects in terms of their suitability as potential toll projects. A 1990 AA survey, furthermore, indicates that 85% of motorists are willing to pay toll for upgraded (including widened) existing road facilities. If this approach is adopted in the interest of a practical policy to assist in the provision of road infrastructure improvements where economically justified, then projects complying with the following proposed norms could proceed as toll projects:

- an economic internal rate of return of higher than 8% per annum.

- a contribution to the initial construction cost of a project from loans of at least 20% and of the upgrading cost of a project of at least 30%.

- a cost of toll collection as a percentage of toll income of less than 30% over the life of the project.

- interest payments in respect of all the toll roads from the National Road Fund should not exceed 15%.

Although this approach could be viewed as only concentrating tolling where new roads with reasonably high volumes are required, the existing and planned toll projects in Natal, the Orange Free State and Transvaal are increasingly growing into a network and it is important to appreciate that toll road networks in France, Italy and Japan evolved over 30-40 years by means of the construction of new toll road sections.

The advantages of adopting this scenario as future policy are as follows:

° In general, public support of the concept is well-established and, provided that significant commuter concessions are introduced, it should not prove to be too controversial.

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° There is a clear link between the income and expenditure of a particular toll project, as required by present legislation.

° This scenario can be implemented in terms of present legislation.

° The fact that some links can be provided by means of toll-supported loans, will relieve the National Road Fund of that cost burden which will in turn free funds for the rest of the network and in this way benefit the whole network.

The disadvantages of adopting this scenario as future policy are:

° It will, in some cases, concentrate tolling in the short to medium term in those communities or regions which have been disadvantaged in the past for whatever reason (lack of political leverage, insufficient traffic volumes to warrant improvements, more important corridors required expenditure, etc).

° It could be argued that the resulting toll network will be concentrated in areas where new road works are being undertaken and that a system concept will not be achieved in the short to medium term.

° Financing of that part of the construction cost which cannot be supported by a toll revenue supported loan, the interest on loans during the construction period and part of the interest during the first few years of operation will become increasingly difficult as the National Road Fund income continues to decrease in real terms.

° The advantages of cross-subsidisation in order to benefit the whole network cannot be achieved directly.

SCENARIO 3: <u>Possible Tolling of those Routes or Sub-Networks in the Primary Road Network which can make a Significant Contribution to their own Costs or to the National Road Toll Fund</u>

In view of the fact that tolling new or widened roads only would still require significant National Road Fund finance and not resolve the equity problem in the short to medium term, another scenario would be to toll all those routes

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or sub-networks in the primary road network which can make a significant contribution to their own costs or to the National Road Toll Fund.

This approach would, therefore, include investigating all national roads, major provincial roads and metropolitan motorways in the primary road network.

The practical advantages of adopting this approach as future policy are:

° It would still leave a major part of the primary road network (e.g. in the sparsely populated rural Cape Province) to be maintained and rehabilitated from Treasury allocations instead of cross-subsidised toll income and it would therefore not eliminate the need for funds from Treasury; it may, however, eliminate the need to provide a general tax cut or a license fee or fuel levy reduction as in the case of scenario 1 where financing of primary roads has been totally removed from national and provincial budgets.

° Toll financing can be employed in respect of routes and sub-networks which constitute viable toll projects in the sense that a reasonable contribution to their own cost or the National Road Toll Fund will be made.

° A degree of equity could be achieved in the sense that public support for tolling existing roads could be sought on the basis that all routes or regional networks in the country which are viable contributors will be tolled; the public will, therefore, perceive this as a country-wide financing method, being applied where it is financially sensible to do so. To enhance this approach, regional projects should be formulated in such a way that existing road users are offered increased capacity of a route or a network which they are also likely to use; in other words, those paying for toll on an existing road section forming part of a whole route or the network in a region would be able to see some other benefit to them apart from merely covering the cost of the maintenance of an existing road which they are using and cross-subsidising the construction of other national roads.

° This scenario can be partially implemented in terms of present legislation.

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A disadvantage of this approach may be that public support will still be difficult to achieve. In order to achieve public support for this scenario, careful consideration should be given to concessions to regular users and commuters.

RECOMMENDATION: It is recommended that scenario 3 should be viewed as the long term strategy but that a phased step by step application be employed in the short and medium term to achieve it, since this would lead to a more "natural" application of toll financing in the sense that it will be employed when an existing road has to be widened or significantly upgraded. The fact that scenario 3 is the ultimate objective could be used to answer equity queries in the short to medium term.

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11.1 ELECTRONIC TOLL AND TRAFFIC MANAGEMENT (ETTM)

11.1.1 Introduction

11.1.2 Applications

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CHAPTER 13

PROPOSED NEW TOLL TARIFF POLICY

13.1 INTRODUCTION

The Parliamentary Select Committee into Toll Financing of Roads recommended in 1982 that the tolls levied should constitute a portion only of the user's saving if the toll road is used rather than the alternative route. Section 2.2.8 of this report indicates how this policy has been applied to South African toll roads during the eighties.

13.2 INTERNATIONAL PRACTICE

In view of the higher traffic volumes which typically occur in those countries with many kilometres of toll roads, the toll systems in such countries are mostly closed.

In such a closed system two mainline plazas are erected, one at each end of the toll road, and all on and off ramps are tolled. A user receives a ticket at the toll station where he starts using the toll road and where he leaves the toll road, he hands the ticket to a toll collector who then determines how much toll the road user has to pay based upon the classification of the vehicle and the distance travelled on the toll road.

These closed toll systems have internationally led to a distance-proportional toll tariff philosophy.

In Japan, for example, the toll rates for the "... distance proportional toll system ..." are as follows:

18,40 yen/km (R0,35/km)	Light vehicles and motor cycles
23,00 yen/km (R0,44/km)	Regular vehicles
24,38 yen/km (R0,47/km)	Middle-sized vehicles
35,65 yen/km (R0,68/km)	Large vehicles
63,25 yen/km (R1,21/km)	Extra large vehicles.

The toll rates in urban areas are 20 per cent higher than the above rates, and tolls are reduced for trips over 100 km by 25 per cent of the distance exceeding 100 km and by 30 per cent of the distance

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exceeding 200 km. The tolls are fixed for each interchange and a basic fee 150 yen (R2,88) is added to the tolls calculated by the above rates. A pay-later system has also come into being with a certain discount for users who pay tolls of more than 12.000 yen (R230,00). Since December 1987, a prepaid card system with a certain discount, called "Highway Card", has been introduced.

In the United States of America, where 72 toll roads and 22 toll bridges and one toll tunnel are operated by many different authorities, the levels and structures of toll rates vary widely. For passenger cars using toll roads, for example, the average rate ranges from a low of 1 cent per mile to a high of 9 cents per mile (see Table 13.1). Rates are generally higher on newer facilities than on older toll roads built when construction and interest costs were markedly lower than they are today. In addition, toll highways in urban locations tend to have higher toll rates than do rural or interurban routes, since construction and right-of-way costs tend to be much greater in urban areas. While the 1985 average toll rate for passenger cars for all U.S. toll roads was 2,5 cents per mile, the average for urban tollways was 5 cents per mile, with recently constructed urban routes charging not less than 7 cents per mile. Bridge and tunnel toll rates also show considerable variation, with passenger car rates per crossing ranging from 25 cents or less for a number of small bridges to $9,00 (for the Chesapeake Bay Bridge-Tunnel crossing).

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TABLE 13.1 AVERAGE RATES ON SELECTED U.S. TOLL ROADS, 1985
(In US cents per mile)

Name of Facility	Passenger Cars	Five-Axle Trucks
Interurban Toll Roads		
Blue Grass Parkway (Kentucky)	1,8	5,5
Everglades Parkway (Florida)	1,0	3,8
Indiana Toll Road	3,0	9,3
J.F.K. Memorial Highway - Delaware Segment	9,1	27,3
New Jersey Turnpike	2,3	7,7
Turner Turnpike (Oklahoma)	2,3	7,6
Urban Expressways		
Dallas North Tollway (Texas)	5,0	12,0
Dulles Toll Road (Virginia)	7,0 a/	b/
Massachusetts Turnpike - Boston Extension	6,3	16,3

SOURCE: Congressional Budget Office, adapted and updated from International Bridge, Tunnel and Turnpike Association, Toll Rates Survey (July 1985)

a. Estimate based on results of an April 1985 survey of users, provided by Vollmer Associates.

b. Information not available.

Many U.S. toll facilities also issue coupon books, annual permits or use other mechanisms to offer discounts to commuters, carpools, commercial operators and other regular users.

13.3 EVALUATION OF PRESENT TARIFF POLICY IN TERMS OF A POSSIBLE TARIFF PER KILOMETRE POLICY

To evaluate the potential application to the South African situation of a tariff proportional to distance, an analysis of existing South

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African toll tariffs per km of toll road was undertaken. It should be noted that all these existing tariffs (except those for the first phases of the South Coast and Magalies Toll Road where short sections of toll road with indirect access are involved) were determined on the basis of the user's saving on the toll road compared to the alternative.

The tariffs on existing South African toll roads, mostly determined on the basis of the tariff being a percentage of the user saving, have been further reduced on "existing" roads that were tolled subsequently. This occurred in June 1989 when the then Minister of Transport Affairs decided to lower tariffs on "privatised" existing toll roads as a result of the extremely negative public reaction to the high level of these tariffs. These lower tariffs, therefore, accommodate the perception of users that they are being required to pay for a facility, albeit upgraded, that they could use toll free before.

The low attraction rate (50 to 60%) of corridor traffic to the first South African urban toll road, i.e. the N17 between Germiston and Brakpan, leads one to conclude that commuters are not willing to pay, on a daily basis, as high a tariff as rural road users appear to be willing to do. This has already led to the introduction of commuter concessions as described in chapter 2 of this report, but, because of the small number of urban toll roads, it is not clear yet whether these concessions are contributing to attracting volumes of traffic required to maximise revenue.

In view of the above phenomena, there appears to be a need to differentiate among five categories of toll roads, viz.:

- new rural toll roads
- existing rural toll roads
- new toll roads in metropolitan areas
- existing toll roads in metropolitan areas
- special cases.

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13.3.1 NEW RURAL TOLL ROADS

In the evaluation of light vehicle tariffs on new rural toll roads, three road sections on which tariffs had been determined within the road privatisation context and two State toll roads are being compared in table 13.2.

TABLE 13.2 PRESENT SOUTH AFRICAN LIGHT VEHICLE TARIFFS: NEW RURAL ROADS

Tsitsikamma	R 3,00/27 km	=	11,1c/km
Kranskop	R 4,00/33 km	=	12,1c/km
Tugela Toll Road (Tugela Plaza)	R 8,00/52,8 km	=	15,2c/km
Tugela Toll Road Ext (Wilge Plaza)	R11,00/92,8 km	=	11,9c/km
Vaal Toll Road (Vaal Plaza)	R10,00/96 km	=	10,4c/km

Table 13.2 shows a reasonably consistent present tariff for new rural toll roads of between 10 and 15c per km with an average of 12c per km and it would appear to be feasible to treat this as a category of toll roads for which the same rate per kilometre may be charged.

13.3.2 NEW TOLL ROADS IN METROPOLITAN AREAS

In this category one toll road section (the N17 tolled at Dalpark) of which the tariff was determined in the context of road privatisation and one traditional State toll road (Mariannhill) as well as the first phases of the South Coast and Magalies Toll Roads were considered.

Table 13.3 shows the outcome of expressing existing tariffs on these new toll roads on a per km basis.

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TABLE 13.3 SOUTH AFRICAN LIGHT VEHICLE TARIFFS: NEW METROPOLITAN TOLL ROADS

N17 Toll Road (Dalpark Plaza)	R1,70/18,5 km	= 9,2c/km
Mariannhill	R0,70/19,6 km	= 3,6c/km
South Coast	R1,00/12 km	= 8,3c/km
Magalies Toll Road	R1,00/12 km	= 8,1c/km

Although the tariffs per km appears to be of the order of 8 to 9c per km on the basis of this comparison, it should be realised that the tariffs for the first phases of the South Coast and Magalies Toll Roads (which have difficult indirect access for through-traffic at some ends of these roads) are higher than they would be if they were based on the user's saving and the attraction rates on these roads are therefore quite low. It is considered that a "correct" tariff for this category may only emerge with more experience of and surveys on the reaction of urban road users to toll roads.

The generally lower level of the tariffs (8 to 9c per km vs 10 to 15c per km for new rural roads), however, reflects the fact that a small or no distance saving is typically offered on metropolitan toll roads whereas new rural toll roads typically offer a substantial distance saving.

13.3.3 EXISTING RURAL TOLL ROADS

There is only one rural road which was tolled as an existing motorway viz. the extension of the Tugela Toll Road between Frere and Pietermaritzburg and this is the section where the tariff at the Mooi Plaza was reduced as a result of negative public reaction. The tariff of 5c per km is significantly lower than for the new rural toll roads where it is 10 to 15c per km. In view of this practical experience, there is definitely a need for this category of road to have a lower tariff per km to reflect the political sensitivity of tolling existing roads.

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13.3.4 EXISTING TOLL ROADS IN METROPOLITAN AREAS

The two cases in this category are both tariffs set by the Minister as part of the process of reduction of tariffs on existing toll roads in 1989. Table 13.4 shows the existing tariffs, expressed on a per km basis, for tolled existing metropolitan roads.

TABLE 13.4 PRESENT SOUTH AFRICAN LIGHT VEHICLE TARIFFS: EXISTING METROPOLITAN TOLL ROADS

N17 Toll Road (Gosforth Plaza)	R0,70/17,5 km	=	4,0c/km
Vaal Toll Road (Grasmere Plaza)	R3,00/78,8 km	=	3,8c/km

Although two cases are not a firm foundation for generalisation, there seems to be a degree of consistency in this category at a tariff level of 4c per km. This is lower than the 5c per km on existing rural roads and significantly lower than the 8 to 9c per km (albeit an inconclusive figure) for new metropolitan toll roads.

13.3.5 SPECIAL CASES

In spite of its relatively short length, the Huguenot Toll Tunnel and its approach roads provide a significant transport cost saving. In spite of a tariff of 41c per km for light vehicles, it is attracting more than 80% of the light vehicle traffic and this tariff is therefore considered to be correct from an income-maximisation point of view.

13.4 POSSIBLE NEW POLICY/PROCEDURE FOR TARIFF DETERMINATION

In view of the reasonably consistent tariff per kilometre (based on user savings) which is being charged on South African toll roads, if considered in the four different categories of new rural, new metropolitan, existing rural and existing metropolitan toll roads, it is considered to be viable to adopt a tariff per km policy for these different categories of roads without causing immediate radical changes to tariffs.

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It is therefore recommended that:

- a tariff per km policy be adopted because of its simplicity and ease of public understanding

- differences in new/existing and rural/metropolitan tariffs and the Huguenot Toll Tunnel as a special case be accepted

- when tariffs are revised, a new tariff per km for each group of toll roads be decided upon, taking into consideration:

  - user benefits (which lead to reasonably similar tariffs per km as shown)

  - political sensitivity of existing roads

  - willingness of urban toll road users to pay toll;

  in this tariff revision process, the individual toll road tariffs could then be determined on the basis of the determined tariff per km for the group of roads and rounded off to reflect a convenient coin or note value

- in time (5-20 years), the gap between new and existing roads can be closed.

13.5 TARIFFS USED IN THE FINANCIAL EVALUATION OF THE EXISTING AND SOME ELEMENTS OF THE PLANNED NEW FREEWAY NETWORK

The tariffs used in the financial evaluation of this study for the various categories are as follows:

- for new rural - 10c/km (which is relatively low in comparison with existing tariffs)

- for existing rural roads - 5c/km (which is the same as for the one actual case where an exiting road was tolled)

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- for new urban roads - 10c/km (which is higher than for existing cases, but a 40% discount for commuters has been allowed for in the calculations)

- for existing urban roads - 5c/km (which is only slightly higher than the two existing cases where an average tariff of 4c per km is being charged).

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11.2 THE TOLL INDUSTRY

11.3 TECHNOLOGY

11.4 OTHER DEVELOPMENTS

11.4.1 General

11.4.2 Weigh-In-Motion

11.5 CONCLUSION

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CHAPTER 14

TOLL ROAD NETWORK IDENTIFICATION

14.1 BACKGROUND

The terms of reference of the study require that the following should be reported on:

- An appropriate network, rural and urban separately, and including existing freeways, to comply with the toll network concept approved by Cabinet.

- The identification of specific plazas and the proposal of applicable tariffs on this network.

Due to the scope of the study and the short time frame allowed for its completion a policy decision was taken that no new traffic modelling or traffic counts would be commissioned. Information gaps were rather filled by means of averaging, interpolation, extrapolation or professional judgement. Due to the scale of the proposed implementation in relation to the amount of missing information it is not thought that this decision would materially affect the validity of the financial evaluation.

14.2 PROCUREMENT OF INFORMATION ON EXISTING AND PLANNED FREEWAY SECTIONS IN THE REGIONS OF SOUTH AFRICA

The information collected on the primary road network can be divided into three categories:

- identification of sections of road for which information should be collected,
- traffic and capacity information, and
- maintenance and rehabilitation information. Each of these categories is described separately below.

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14.2.1 IDENTIFICATION OF SECTIONS OF ROAD FOR WHICH INFORMATION SHOULD BE COLLECTED

Only grade separated limited access roads, of either single or dual carriageway standard, were considered in view of the proposed mission of the toll authority, contained in Chapter 9. These were classified as national, provincial and metropolitan and as rural or urban. Information was also obtained on existing toll roads and roads that are likely to be constructed within the next ten years. Future roads currently not included in any authorities' five or ten year budget due to lack of funds, but which would make a positive contribution to the toll network, were also identified.

14.2.2 ROAD SECTION DESCRIPTION, TRAFFIC, GEOMETRIC AND CAPACITY INFORMATION

The following traffic, geometric and capacity information was obtained for each section of limited access road identified as described above:

a) **Description of Section**

A kilometre distance and/or a cross-route number and/or a locality description was used to define the beginning and end of each section.

b) **Section Length**

The section length refers to a section of road with a uniform cross-section and ADT. Where either of these variables changed significantly, a new reporting section was identified.

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c) **Interchanges**

The kilometre distance of all interchanges and the relevant cross-road number were recorded.

d) **Cross-section**

A dimensioned sketch of the cross-section pertaining to each particular section was drafted indicating the number of carriageways, the number and width of lanes, the widths of shoulders and whether they are paved, and the width of the median, if any.

e) **Current ADT**

The total number of vehicles per day in both directions was obtained.

f) **Historical traffic growth rate**

The historical traffic growth rate was derived from relevant statistics where these were available, and for other sections, the growth rate was estimated from previous studies.

g) **Peak hour volumes**

The thirtieth highest hourly volume recorded on the road in the vicinity of the proposed plazas was estimated.

h) **Predominant trip type**

It was determined whether the traffic on a particular section is commuter traffic, long-distance inter-urban traffic, or consists of a high percentage of local traffic.

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i) **Existing capacity**

The existing capacity was determined using level of service E for urban roads and level of service D for rural roads, as defined in the Highway Capacity Manual.

j) **Feasible additional capacity**

The maximum number of vehicles per hour per direction which could feasibly be accommodated in addition to the existing capacity, either by widening the road in the median or on the outside of the carriageway was estimated.

14.2.3 INFORMATION ON PROPOSED FUTURE ROADS

The following information was obtained, when available, for proposed future roads:

a) **Interchanges and cross-section**

Relevant information was obtained from basic planning or detail design.

b) **Projected traffic volumes**

These projections were derived from design reports where available, otherwise estimates were made.

c) **Current planning status**

The current planning status was recorded as either:

- No planning to date,
- route location,
- basic planning, or
- detail design.

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d) **Capacity as designed**

Capacity information was based on design or proposed cross-section, using level of service E for urban roads and level of service D for rural roads.

e) **Likely or actual start of construction date**

The date of commencement on the relevant road authority's current programme was determined.

f) **Estimated construction cost**

The construction cost was estimated in March 1991 Rands, excluding CPA, but including contingencies.

g) **Other information**

Any other information was recorded where relevant. The likely attraction of traffic to a future road from existing roads was also estimated.

14.2.4 MAINTENANCE AND REHABILITATION COSTS

The following procedure was used to estimate maintenance and rehabilitation life cycle costs:

a) **Data Collection**

Information on:

- Inventory data,
- Present Pavement Condition Category, and
- Present Pavement Maintenance Need Category

was obtained from the pavement management system of the relevant road authority.

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b) Determination of maintenance strategy

Uniform road segments were defined. These uniform segments are either the same as the sections determined for the traffic information, or subdivisions of these sections.

The inventory data were used to select appropriate maintenance strategies for each uniform road segment from a pre-defined set of maintenance strategies.

The present pavement condition and present maintenance needs were used to determine the current position of each road segment in the selected maintenance strategy.

c) Calculation of maintenance life cycle cost

The life cycle maintenance strategy was largely determined from the following parameters:

- the condition of the road section,
- the type of pavement and structural material,
- the status of pavement management or position on the maintenance life cycle,
- the prevailing climatic conditions, and
- the predicted and historic traffic carried by that road section.

d) Flow chart

A flow chart of the procedure followed is set out below:

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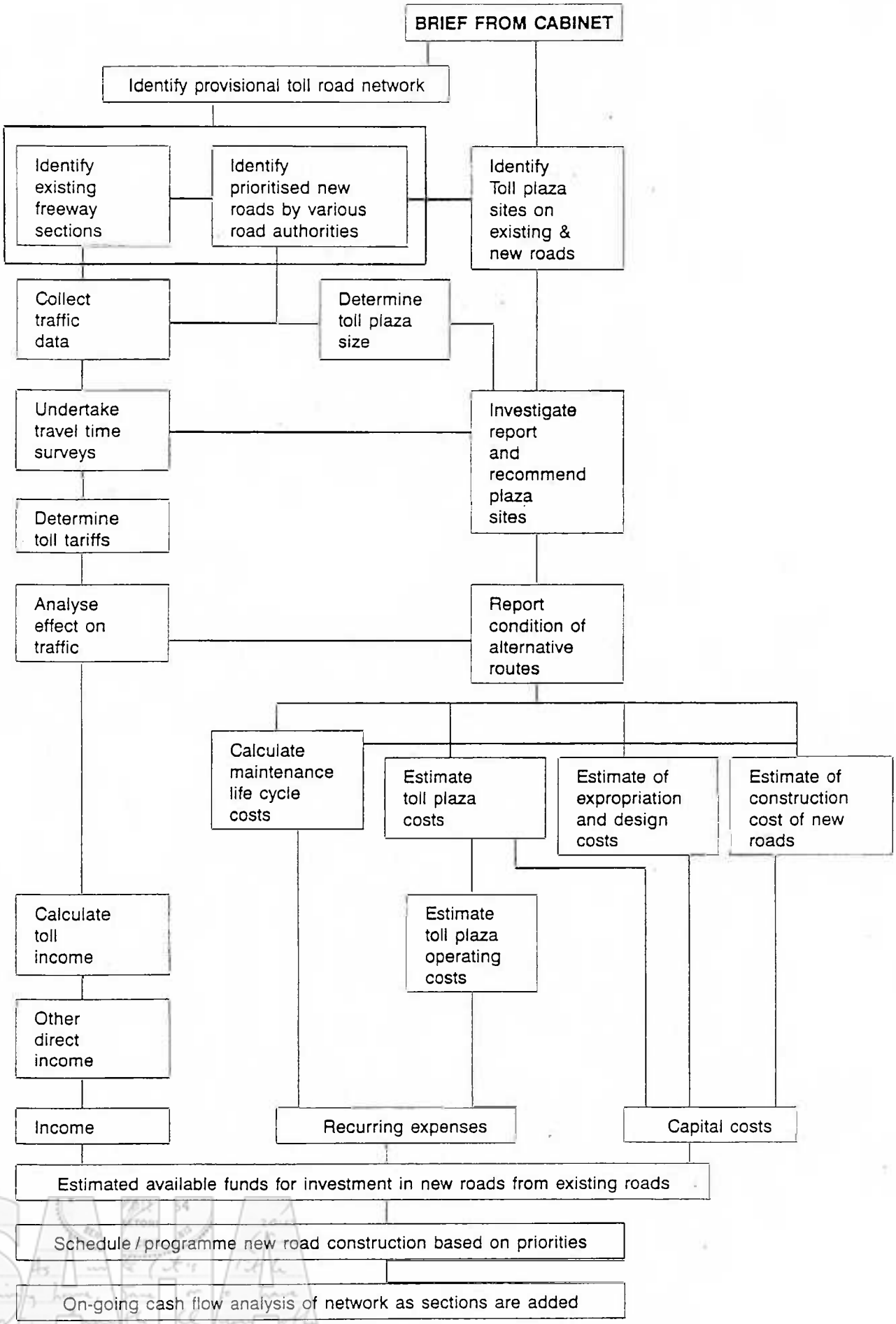

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14.3 IDENTIFICATION OF REGIONAL AND METROPOLITAN TOLL ROAD NETWORKS

14.3.1 LEGAL CONSTRAINTS

As indicated in Chapter 4, legal opinion indicates that a declared toll network of either a national road corridor between major metropolitan centres or a network of roads within each metropolitan centre is not permissible under the current Act.

14.3.2 PUBLIC ACCEPTABILITY OF CROSS-SUBSIDISATION

Even if a network concept were to be possible under an amended National Roads Act, the paying of toll in one area of the country which will be used to construct roads in another part is unlikely to be acceptable. It is therefore considered necessary to view toll networks as being individual projects which serve communities using only that road, for example, the Johannesburg-Durban road or the Ring Road around Johannesburg.

14.3.3 RURAL TOLL ROAD NETWORK

At the end of this chapter are a set of maps, Figures 14.1 to 14.6, showing the development of a rural toll road network from the present situation of declared and approved toll roads throughout South Africa to an eventual network of toll freeways envisaged sometime in the future.

The currently declared toll roads are the following (see Figure 14.1):

- State operated toll roads
  - Tsitsikamma Toll Road
  - Mariannhill Toll Road
  - Kranskop Toll Road
  - Huguenot Toll Tunnel
  - South Coast Toll Road
  - Magalies Toll Road

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- Toll roads operated by Tolcon as agent of the State.
  - Vaal Toll Road (N1, Johannesburg - Kroonstad)
  - Tugela Toll Road (N3, Besters to Pietermaritzburg and Villiers - Warden)

- Toll road operated by THDC as agent of the State.
  - N17, Hendrik Schoeman Expressway (Germiston - Springs)

In the current financial year (1990/1991) it is envisaged that the extension to the Huguenot Tunnel to Worcester will be declared. The entire N2 along the Natal North Coast has been declared a toll road and both the Umdloti to Ballito and the Mtunzini to Mariedal Sections of the N2 North Coast Toll Road will start operating during the 1991/92 financial year.

After the 1991/92 financial year it is envisaged that all existing national, provincial and metropolitan freeways will be tolled where feasible from a toll strategy point of view. By doing this the network of toll roads will be expanded as shown on Figure 14.2. The proposed sections to be tolled are as follows:

EXISTING RURAL FREEWAYS TO BE TOLLED BY 1995

NATIONAL ROAD

N1 Huguenot Toll Tunnel (Paarl to Helderzicht)
Orange River to Kroonstad
Vaal Toll Road (Kroonstad to Johannesburg)
Pretoria to Warmbaths
Kranskop Toll Road (Warmbaths to Middelfontein)

N2 Mossel Bay to George
Tsitsikamma Toll Road
Humansdorp to Port Elizabeth
King William's Town to East London
Natal South Coast Toll Road (Umtentweni to Southbroom)

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Hibberdene to Umlodti
Natal North Coast Toll Road (Umlodti to Stanger and Mtunzini to Mariedal)

N3 Alberton to Heidelberg
Tugela Toll Road Extension (Villiers to Warden)
Tugela Toll Road and Extension (Drakensberg to Pietermaritzburg)
Pietermaritzburg to Key Ridge

N4 Pretoria to Wonderfontein

N12 Benoni to Witbank
Potchefstroom to Klerksdorp

PROVINCIAL ROADS

R26, R42 Alberton to Sasolburg

Toll plaza sites have been identified at various points on the above-mentioned existing roads. These toll plazas are to be built based on the priority of maximum net toll income.

14.3.4 URBAN TOLL ROAD NETWORK

Four urban toll road networks have been identified and information has been obtained on existing roads and planned new roads.

It is envisaged that between 1991 and 1995, existing limited access urban roads in the PWV, Durban, Cape Town and Port Elizabeth metropolitan areas will be tolled where possible. These roads will include national, provincial and municipal roads within each of the above metropolitan areas. The existing urban freeway sections which are proposed to be tolled are as follows:

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EXISTING URBAN FREEWAYS TO BE TOLLED BY YEAR 1995

NATIONAL

PWV	N1, N3, N12*	Johannesburg Ring Road
	N1	Buccleuch to Zambezi Road
	N4	Magalies Toll Road
	N17	Springs to Krugersdorp
Durban	N2	Durban Ring Road
	N3	Durban to Paradise Valley
		Mariannhill Toll Road (Paradise Valley to Key Ridge)
Cape Town	N1	Cape Town to Paarl
	N2	Cape Town to Somerset West
Port Elizabeth	N2	Green Bushes to Swartkops

* Assuming legal court order sorted out

PROVINCIAL

R21	Pretoria to Jan Smuts	
R28	Pretoria to Brakfontein	
	Brakfontein to Krugersdorp	
R29	Moroka Bypass to South of Soweto	
PWV9	Pretoria	Daspoort to Rosslyn
R300	Cape Town	Bellville to DF Malan
R75	Port Elizabeth	Port Elizabeth/Despatch/Uitenhage

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METROPOLITAN

PWV

M1	Johannesburg Metro
M2	Johannesburg Metro

Durban

M4	Durban - Umhlanga Rocks (Snell Parade)

Public acceptance for this concept will most likely be the most difficult to obtain in the urban areas. It is therefore necessary to investigate the toll strategy which will result in the least number of stops for the largest number of commuters coupled to the lowest possible toll tariff.

After 1995 it is envisaged that the major origin-destination routes will be linked, for each of the metropolitan areas, into comprehensive and rational toll networks. By doing this it will be possible to standardise toll tariffs and also to cross-subsidise between viable and less-viable roads within each network. It is not envisaged that cross-subsidisation will take place between different metropolitan areas as the public will most likely not accept this concept.

14.3.5 PRIORITISED ADDITIONS TO TOLL ROAD NETWORK BY YEAR 2000 AND YEAR 2010

As indicated in Chapter 4, indirect cross-subsidisation is quite possible through repayment of the National Road Fund for previous expenditure incurred. Additional new toll road construction could be partially financed by surplus income earned on existing freeways.

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It is proposed that new roads be prioritised on the basis of the ratio of loan supportable by revenue to construction costs. The rationale for this method of prioritisation is given in Chapter 15. A programme of road construction up to the year 2000 and year 2010 has been obtained from national and provincial authorities as a starting point for this prioritisation.

Proposed additions to the toll road network which have been prioritised (on the basis of LSR divided by construction cost) for substantial completion before year 2000 and year 2010 are as follows (see Figures 14.3 and 14.4 respectively):

ADDITIONS TO TOLL ROAD NETWORK BY YEAR 2000

RURAL

N1	Middelfontein to Pietersburg
	Huguenot Tunnel east portal to Worcester
N2	Elandsbos River to Elands River (Eastwards extension of Tsitsikamma Toll Road)
	Mtunzini - Stanger (Extension of North Coast Toll Road)
	Hibberdene - Marburg (Extension of South Coast Toll Road)
N4	Pelindaba to Brits (Extension of Magalies Toll Road)

URBAN

N17	Extension of N17 to Krugersdorp
P202	Vanderbijlpark bypass to Sasolburg
PWV9	Pretoria to N1-20 near Randburg
PWV13	Continuation of R21 from Jan Smuts to N3 near Vosloorus.

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K198 Randfontein to Roodepoort

ADDITIONS TO TOLL ROAD NETWORK BY YEAR 2010

RURAL

N1 Kroonstad to Bloemfontein via Goldfields

N3 Heidelberg to Villiers

N3 De Beer's Pass

N4 Wonderfontein to Montrose

N12 Libanon to Potchefstroom

R40 Nelspruit to White River

PWV 11A Pretoria North

PWV16 Far southern bypass of Johannesburg linking the N1 at Misgund Interchange to the N3.

As can be seen from Figures 14.1 to 14.5 a network of roads is being developed. The eventual network of rural roads as envisaged by the Department of Transport has also been included as an indication of planning which will result in a comprehensive network of roads throughout South Africa.

14.4 IDENTIFICATION AND CONFIRMATION OF PHYSICAL FEASIBILITY OF TOLL PLAZA SITES

14.4.1 OPEN AND CLOSED TOLL SYSTEMS

There are two main types of toll systems:

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a) **The closed system**

In a closed system vehicles are issued with a ticket at the toll plaza where they enter the toll road. On leaving the toll road the ticket is handed to the toll collector who determines the toll tariff in accordance with the classification of the vehicle and the distance travelled on the toll road. The vehicle is thus stopped on two occassions, i.e. on entering the toll road and on leaving it, regardless of the distance travelled.

For this system to be implemented, toll plazas are required at all entrances and exits to the toll road.

b) **The open system**

In an open system there is one toll plaza on a section of road, say between two towns. Toll is determined according to the benefit derived by the different vehicle classes in comparison to using the alternative route. Each vehicle class is charged a different toll as the travel cost benefit enjoyed by the different vehicle classes differ.

Because vehicles may enter and leave the toll road at any interchange and so avoid paying toll, it is important that the toll plazas are located in such a way that the major portion of traffic using the toll road pays toll.

The cost of collection of toll funds is higher than the collection costs of other sources of revenue. The collection of toll involves additional costs in terms of both capital, such as the building of the toll collection facilities and the provision of toll collection equipment, as well as the ongoing cost of toll plaza operations.

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In order to keep the cost of collection reasonable, the open toll system as described above has been adopted in this study. It is far cheaper to implement the open system than the closed system and the physical difficulties of locating plazas on existing intersections which have not been designed with the concept of tolling in mind can be avoided, especially in the urban context where development has in many cases already taken place along road reserve boundaries.

14.4.2 IDENTIFICATION OF PLAZA SITES

Sections of the limited access/freeway portion of the primary road network which can be served by a single toll plaza have been identified. The end points of these sections are in most cases towns or intersections with other primary roads.

Potential toll plaza sites were identified on each existing freeway section using the following criteria, where feasible:

i) toll avoidance should require a significant deviation along the alternative route,
ii) rural plazas should be sited at least 50 kilometres apart, and
iii) urban plazas should be located in such a way that the majority of commuters would only pass through one plaza on home-work trips.

A detailed inspection of each potential plaza site was undertaken in order to determine the physical suitability thereof. The following factors were considered:

i) horizontal and vertical alignment of the road (ideally located on a crest),
ii) availability of services especially telephone, water and electricity, and

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iii) availability of sufficient space within which to construct the required number of plaza lanes and other physical constraints.

The following is a list of the proposed plaza sites for implementation by year 1995. Inspection reports of the potential plaza sites have been prepared. The locations of the plazas listed below are shown on Figure 14.6 to 14.10. The predicted traffic pattern in Year 2000 is shown on Figure 14.11.

TRANSVAAL

N1	-	Zambesi
N1	-	Brakfontein Interchange
N1	-	Buccleuch Interchange North Ramps
N1	-	Diepkloof
N3	-	Buccleuch Interchange East
N3	-	Old Barn Interchange
N3	-	Suikerbosrand River
N4	-	Bronkhorstspruit
N4	-	Middelburg Bypass
N12	-	Delmas
N12	-	Rietfontein
M1	-	Buccleuch Interchange South
M2	-	Geldenhuis Interchange
R21	-	Rietvlei Dam
R26	-	Muller Interchange
R28	-	Mnandi
PWV9	-	Orchards

O.F.S.

N1	-	Kroonstad Bypass
N1	-	Spitskop
N1	-	Bloemfontein Bypass
N1	-	H F Verwoerd Dam

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R42 - Ascot

WESTERN CAPE

N1 - Joostenberg
N1 - Ysterplaat
M3 - Tokai
N2 - Khayelitsha
R300 - Kuils River

SOUTHERN AND EASTERN CAPE

N2 - P W Botha Airport
N2 - Jeffreys Bay
N2 - Papkuils River
N2 - Swartkops
R75 - Despatch
N2 - Fort Jackson

NATAL

N3 - Camperdown
N2 - Pennington
N2 - Chatsworth
N2 - Sea Cow Lake
M4 - Beachwood

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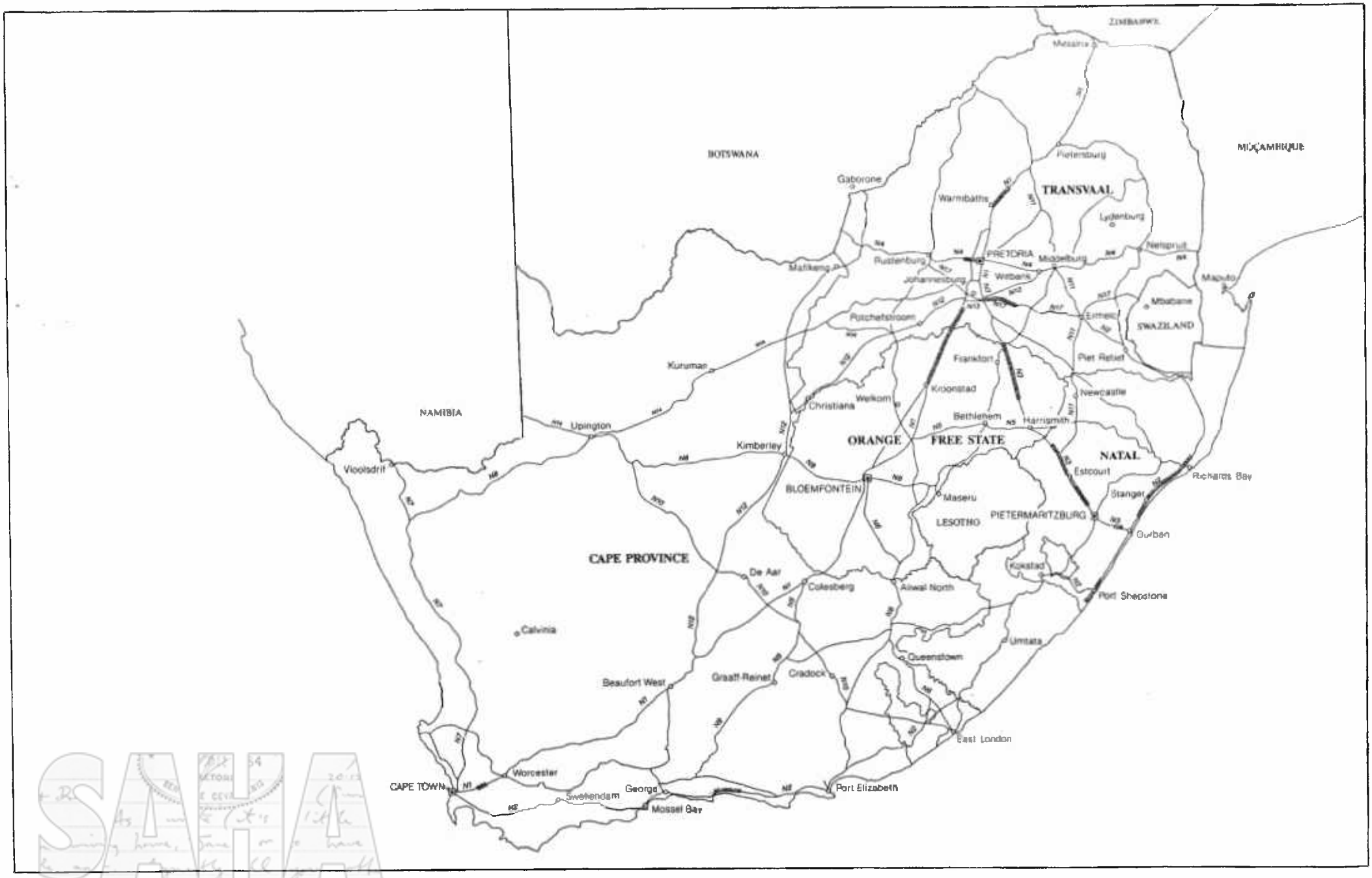

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Toll roads presently operating and approved **14.1**

CHAPTER 10

COST EFFECTIVE TECHNOLOGY FOR TOLL FACILITIES AND EQUIPMENT FOR STATE TOLL ROADS

10.1 SCOPE

The scope of work related to the construction of a toll plaza includes an asphalt and/or concrete surfaced road widening, toll islands with protection structures, a canopy of structural steel and cladding, a control building, installation of services, fencing, road signs and road markings, electrical works and electronic equipment.

This chapter presents the results of an elemental cost analysis of present toll plaza facilities as well as the identification of alternatives which can minimise capital cost without significantly increasing operating costs or adversely affecting the safety of the road user.

The initial toll plazas constructed in South Africa were based on overseas designs. However as local expertise developed and has now reached a mature stage potential savings have now been identified and quantified with a material lowering of standards.

10.2 INVESTIGATION APPROACH

In order to determine the main contributors to the capital cost of a toll plaza, an approach was followed whereby the contribution from each main area or discipline was calculated. This gave an indication regarding the areas in which efforts should be concentrated in an attempt to reduce cost. Furthermore, an elemental cost analysis was done within each discipline to determine the contribution of the constituent elements towards the cost incurred in each specific discipline.

The above analysis was done for a typical six lane mainline toll plaza, as well as for an eighteen lane toll plaza associated with an interchange, in order to quantify what the unit cost variance would be with respect to the variance in plaza size. It is known that the cost of an eighteen lane plaza associated with an interchange and ramp toll

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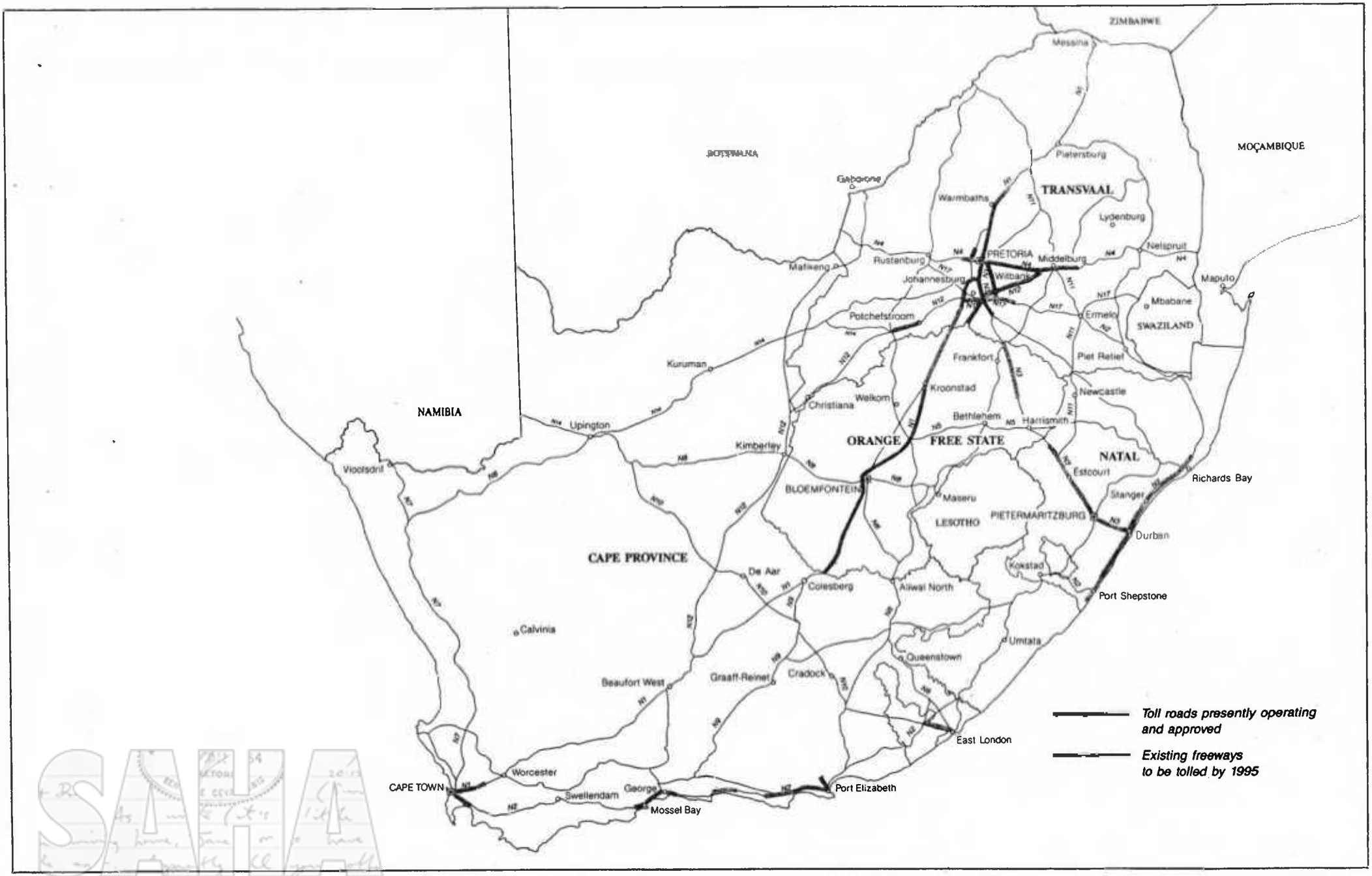

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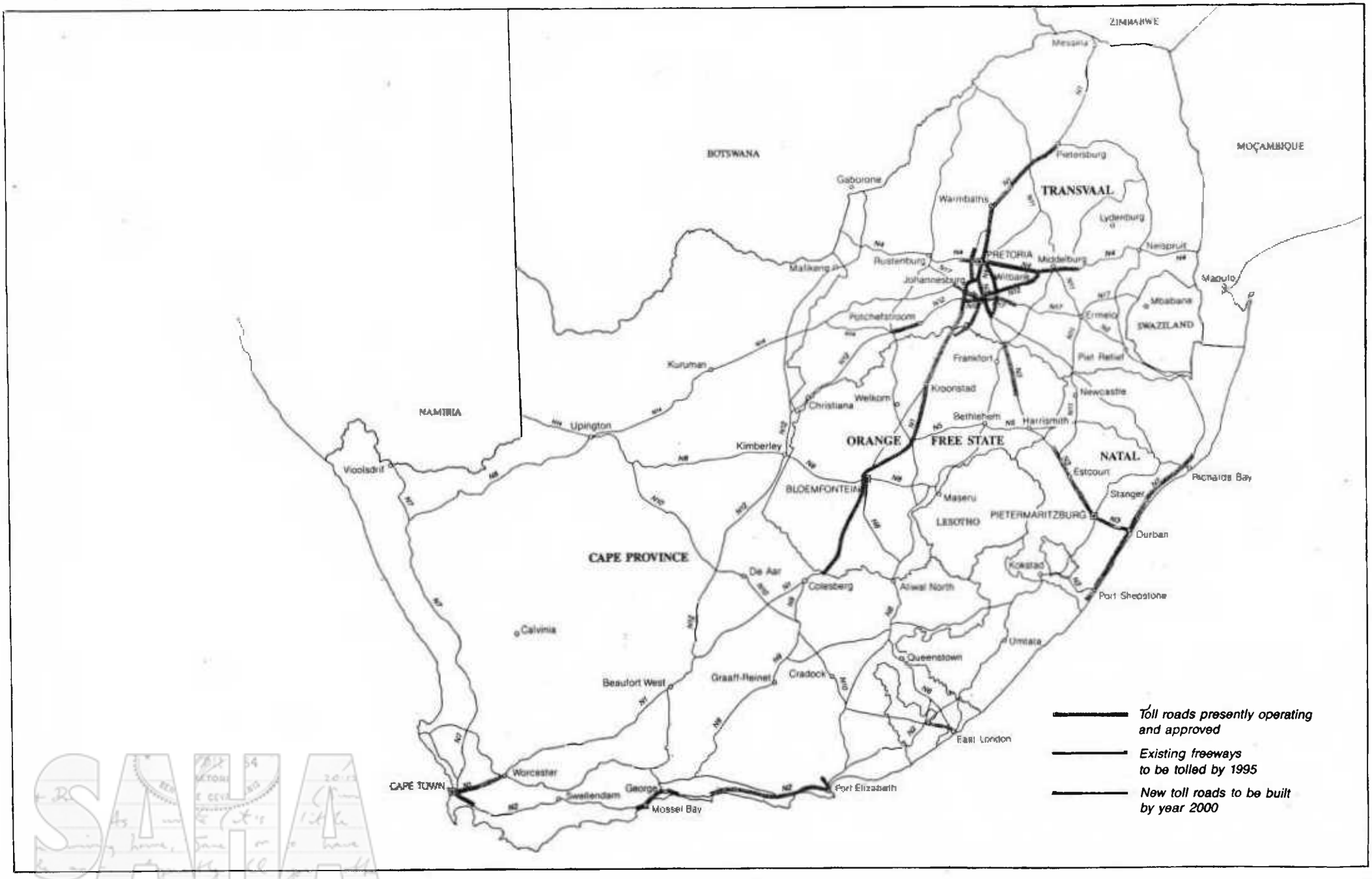
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Warmbaths
Lydenburg
Nelspruit
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Rustenburg
Mafikeng
Johannesburg
Witbank
Potchefstroom
Ermelo
Mbabane
SWAZILAND
Maputo
MOÇAMBIQUE
Kuruman
Frankfort
Port Retief
Kroonstad
Newcastle
Christiana
Welkom
Bethlehem
Harrismith
NAMIBIA
Upington
Kimberley
ORANGE FREE STATE
NATAL
Vioolsdrif
Estcourt
Richards Bay
BLOEMFONTEIN
Maseru
Stanger
LESOTHO
PIETERMARITZBURG
Durban
CAPE PROVINCE
De Aar
Colesberg
Aliwal North
Port Shepstone
Calvinia
Umtata
Queenstown
Beaufort West
Graaff-Reinet
Cradock
East London
Worcester
CAPE TOWN
George
Port Elizabeth
Swellendam
Mossel Bay
Toll roads presently operating and approved
Existing freeways to be tolled by 1995
New toll roads to be built by year 2000

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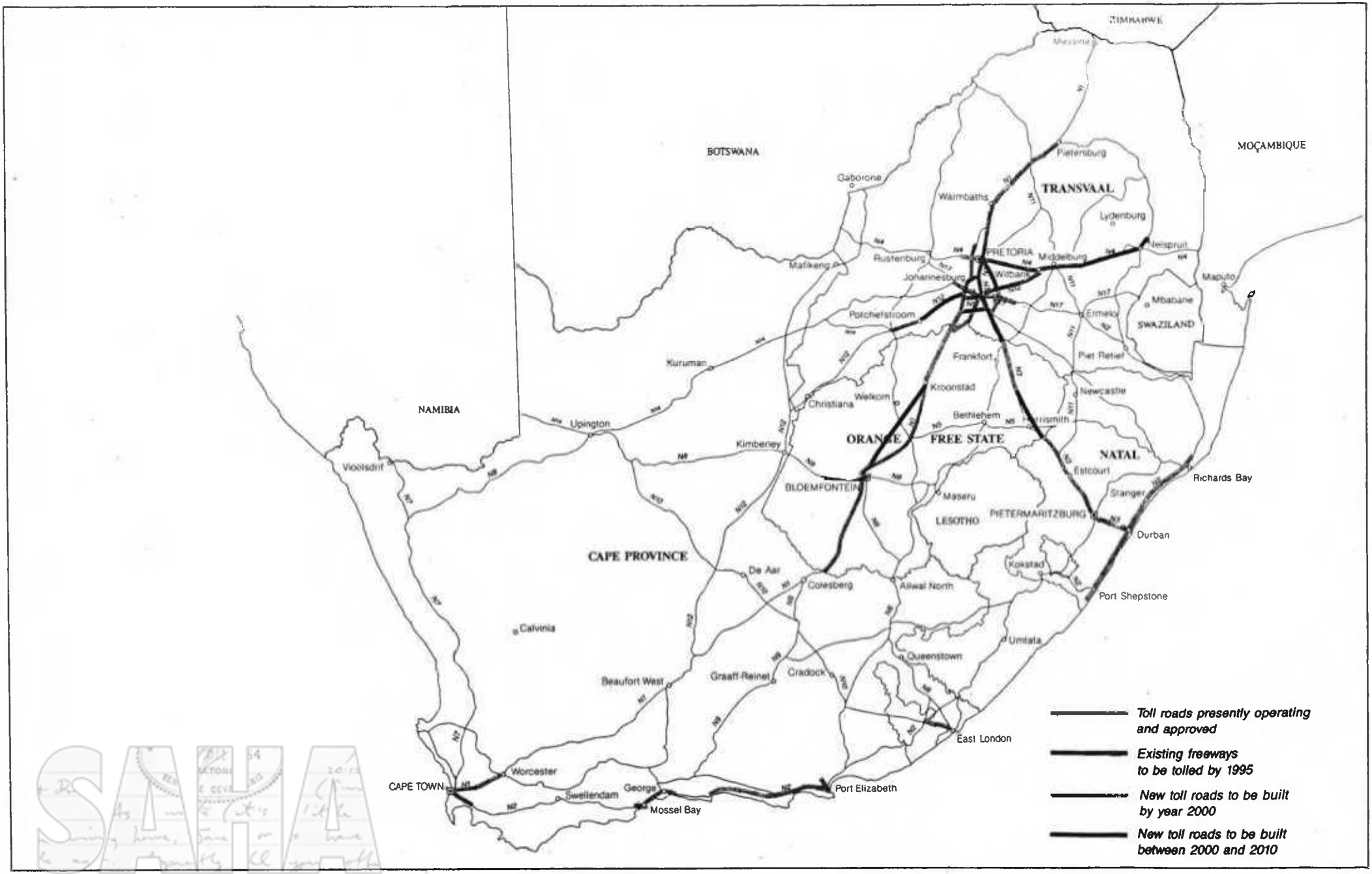

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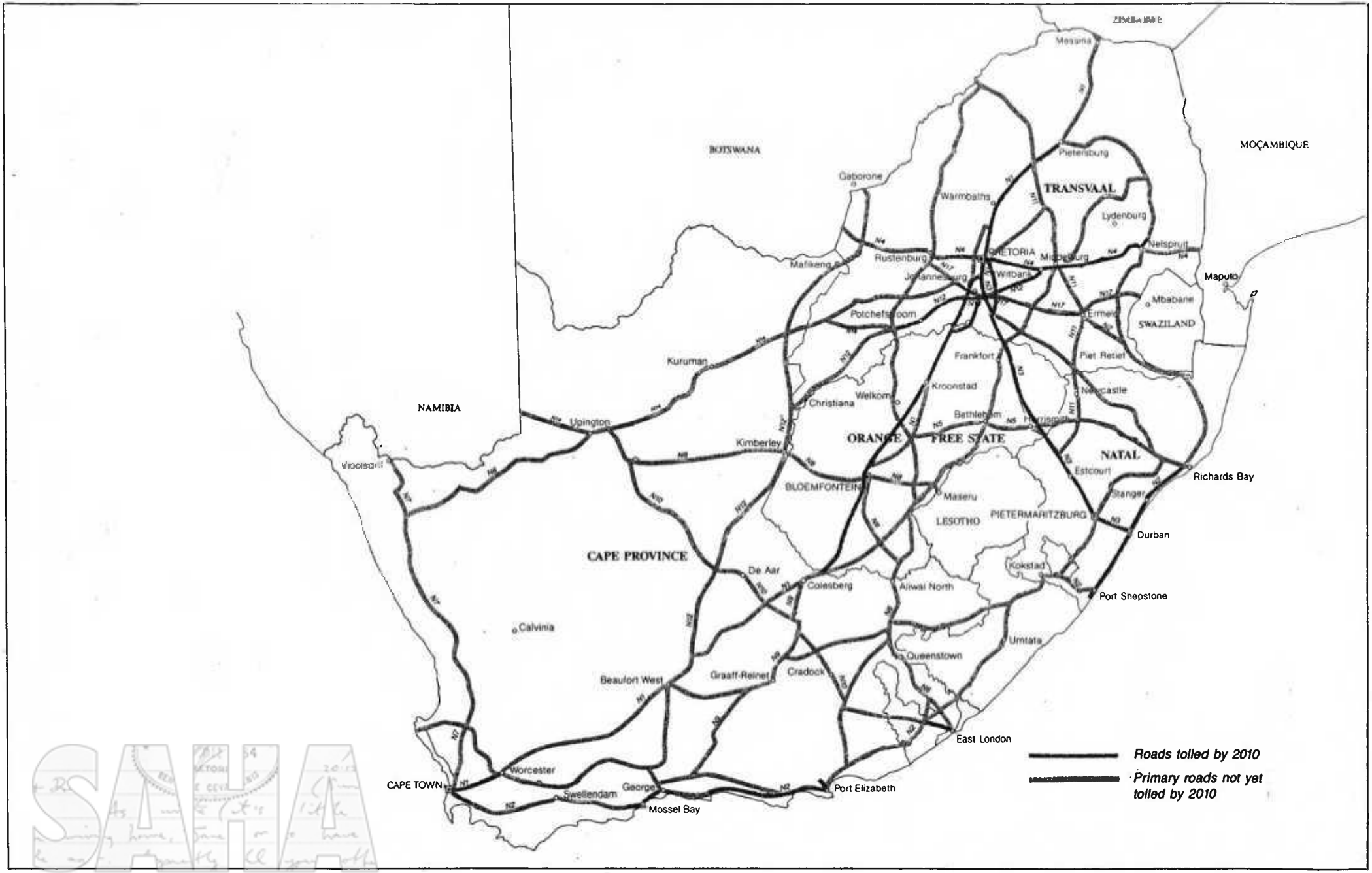

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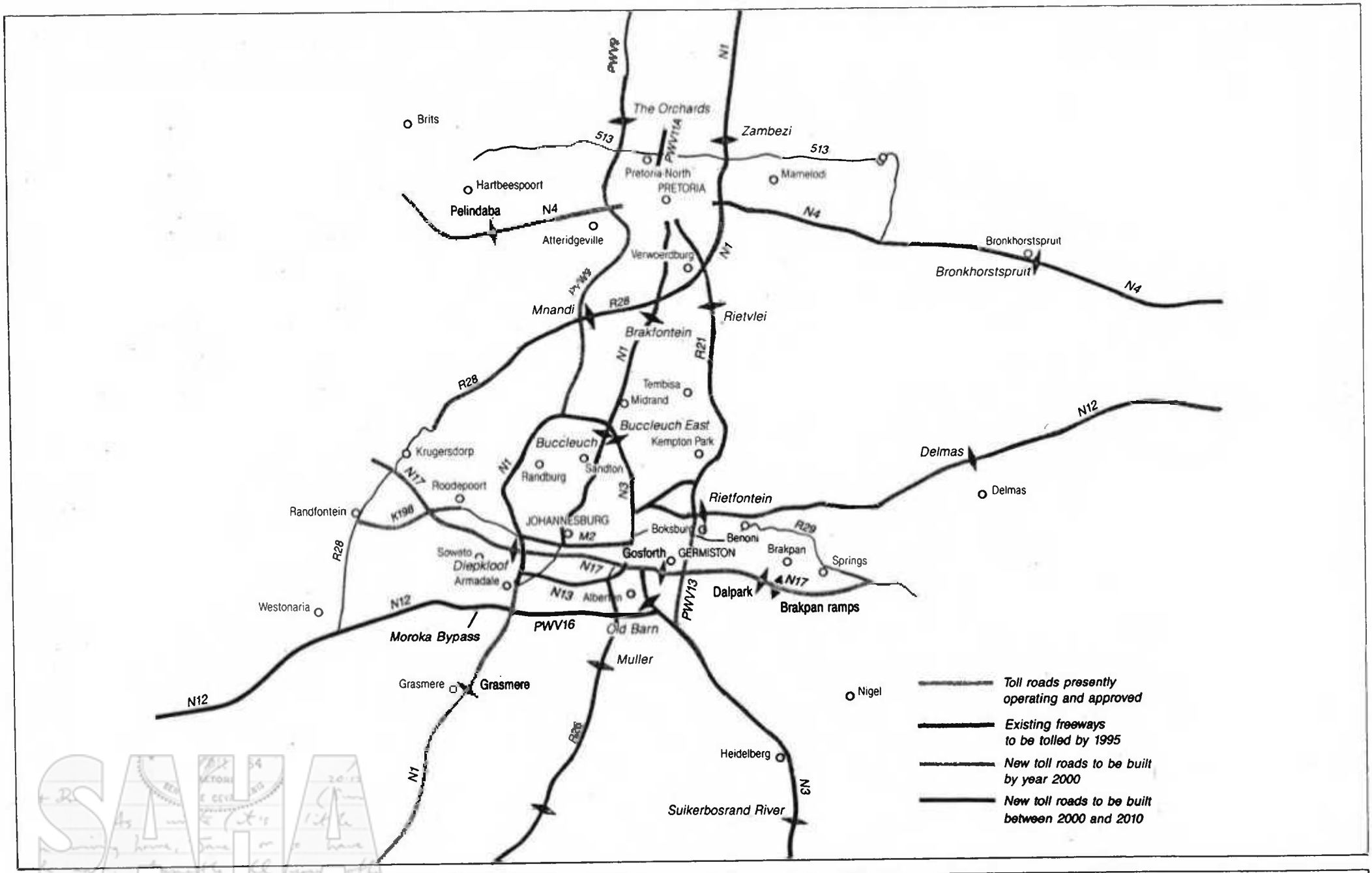
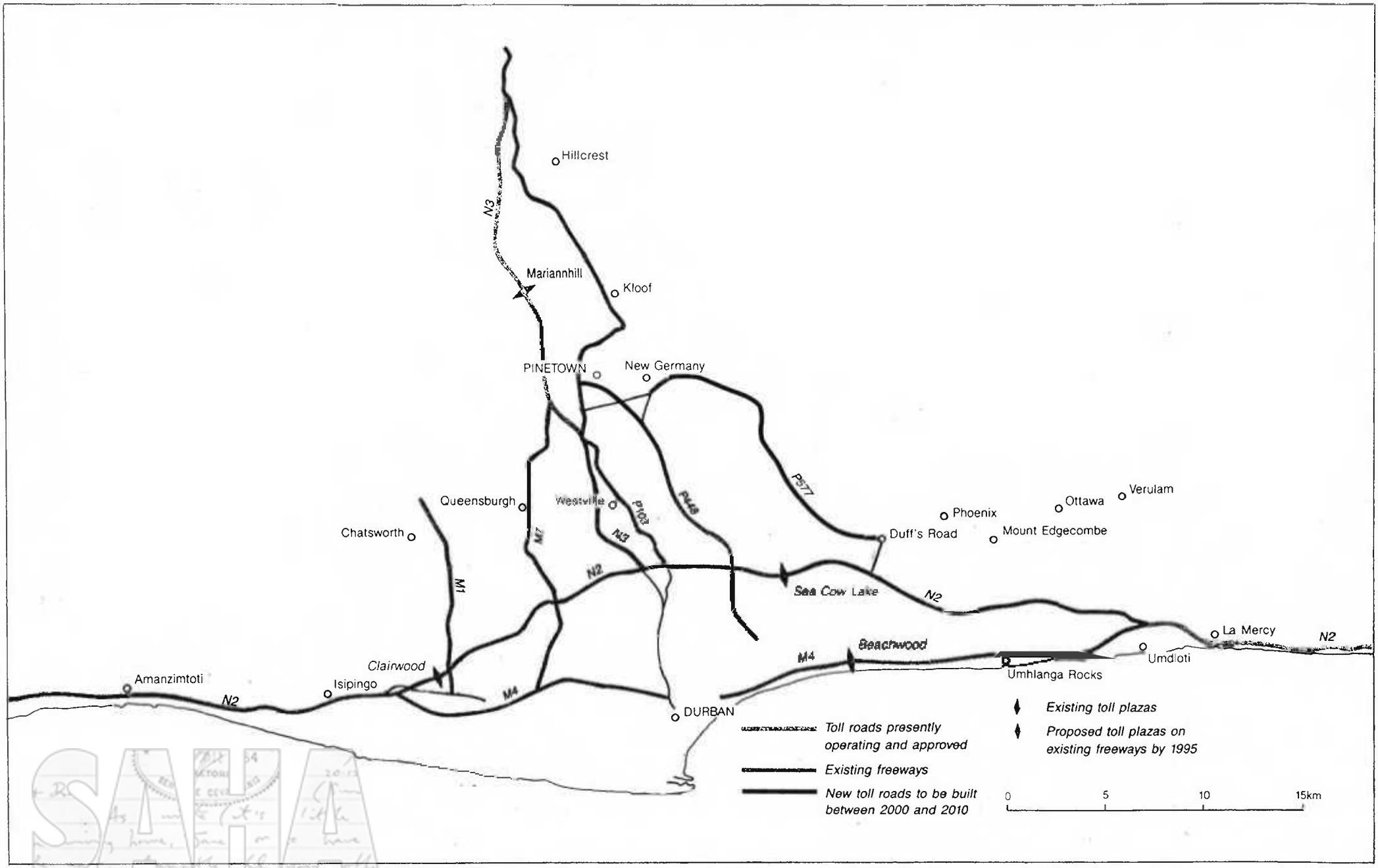
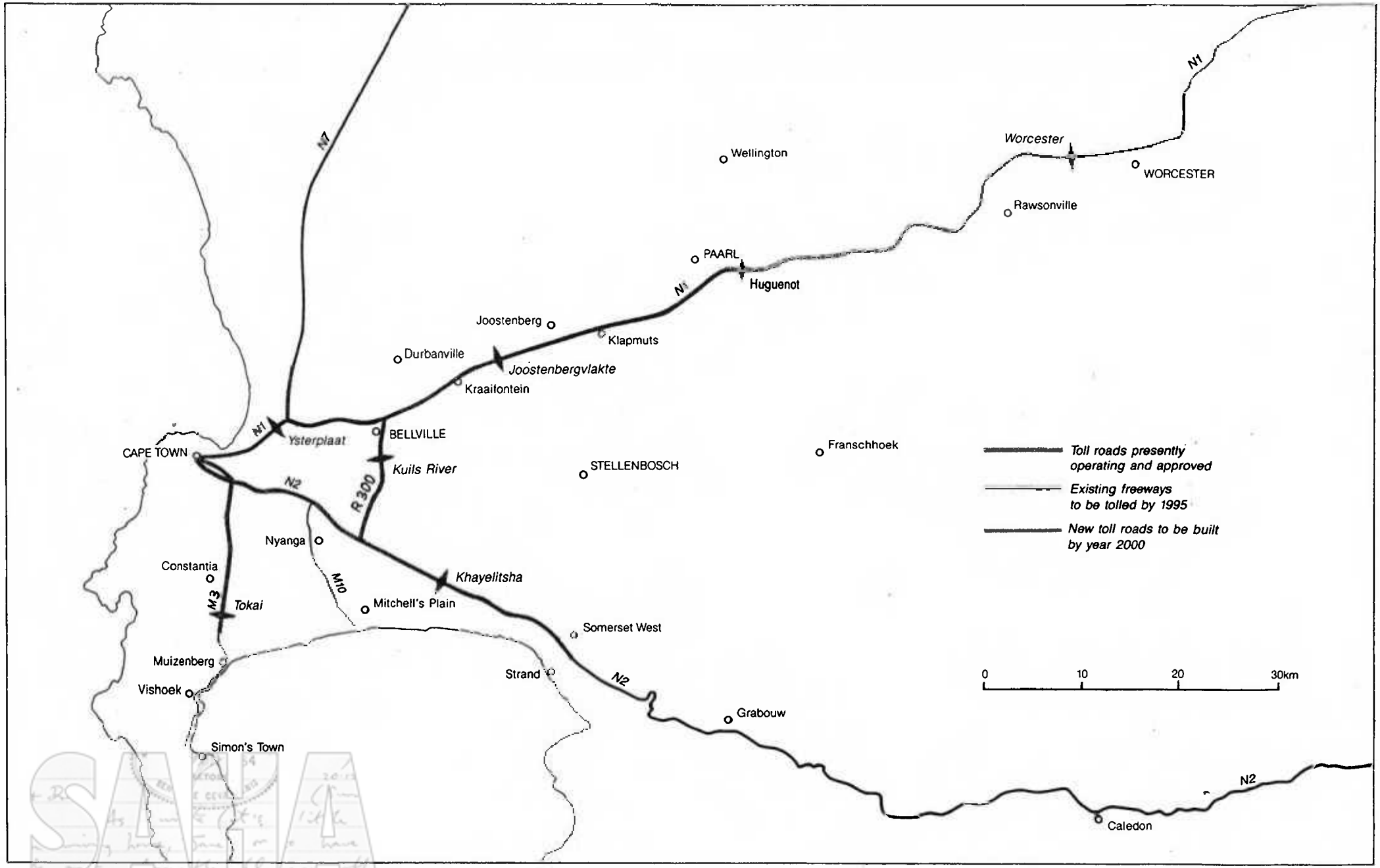


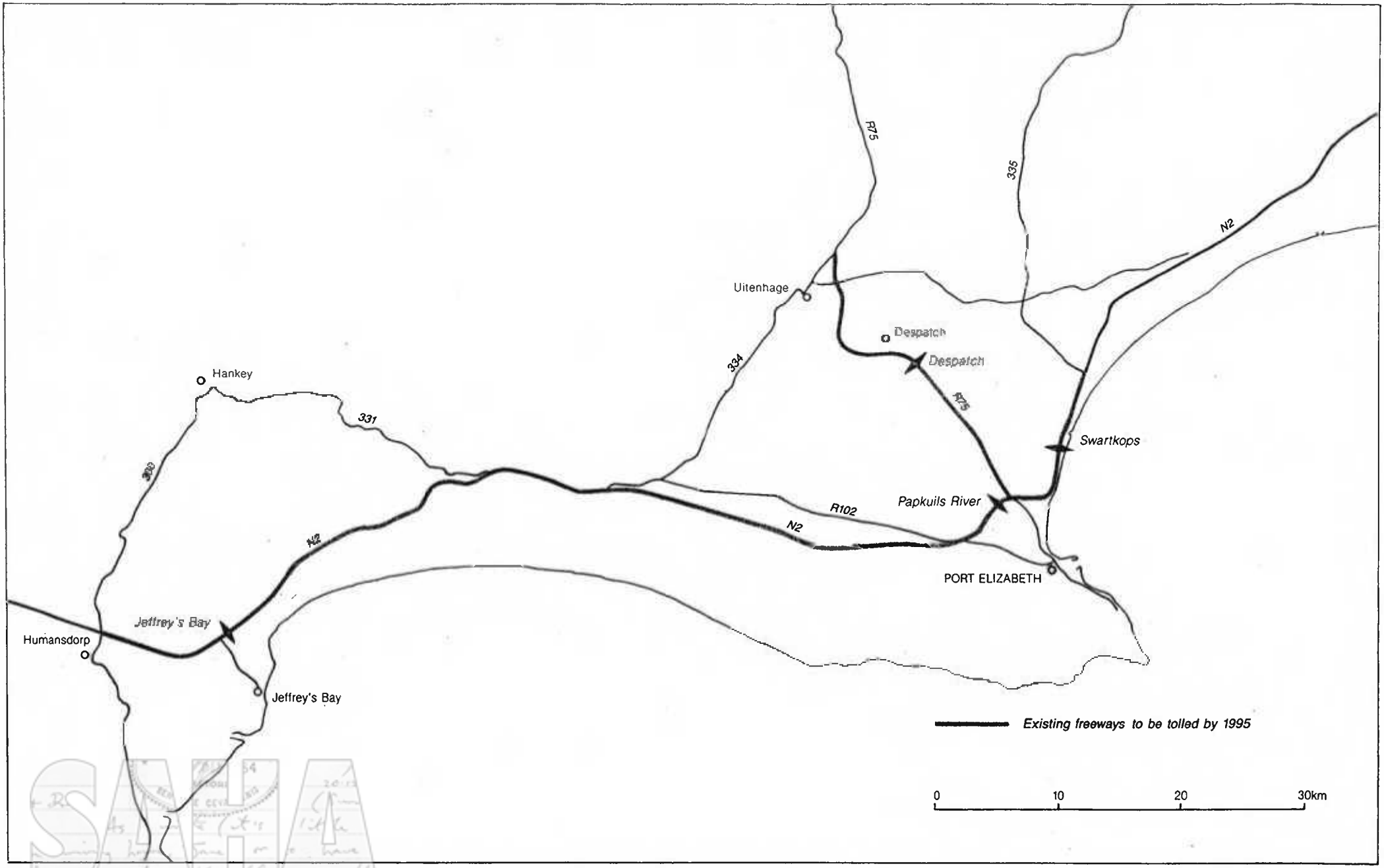
PWV area: proposed toll road system **14.6**



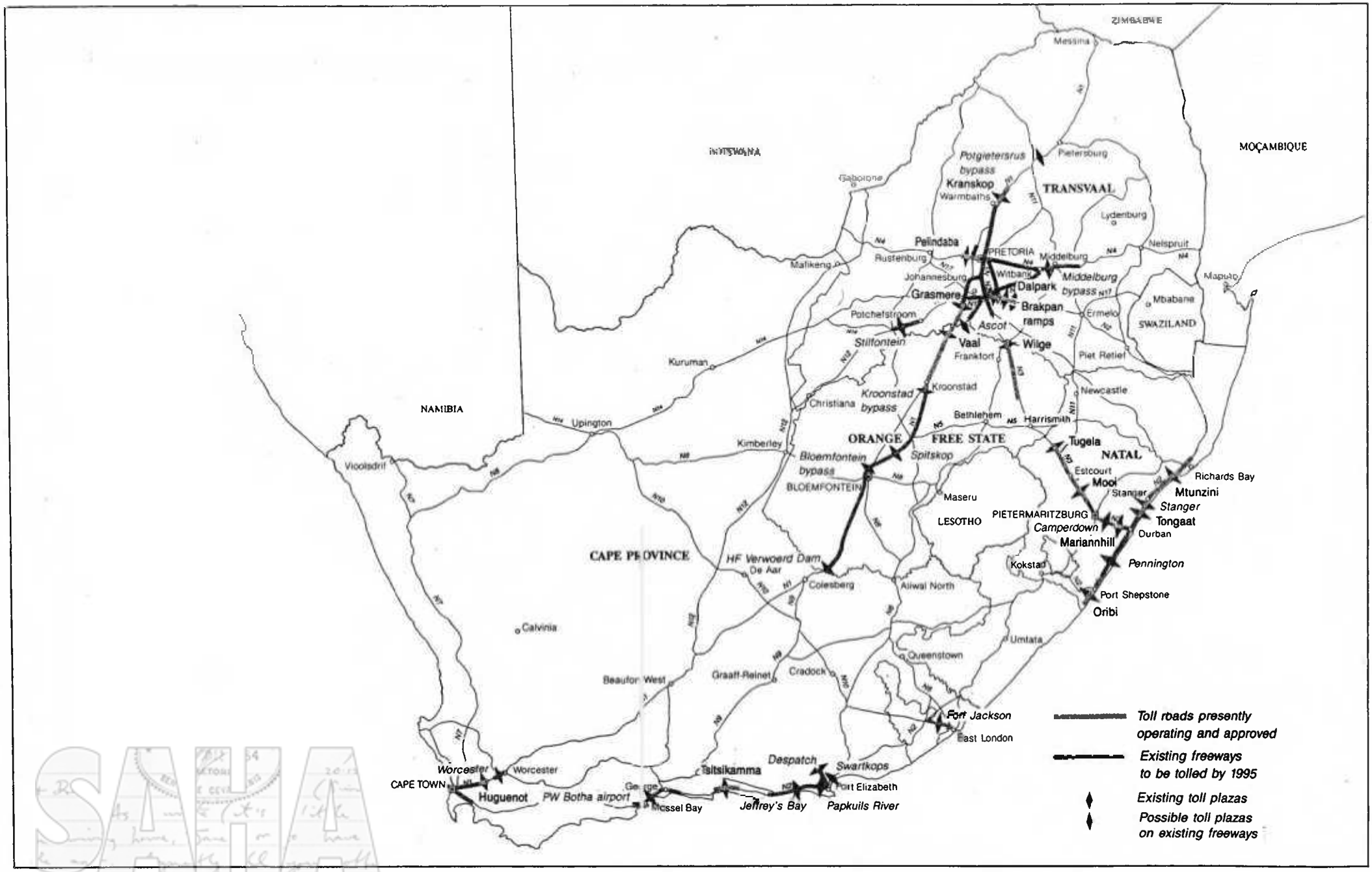
Greater Durban: proposed toll road system **14.7**



Western Cape: proposed toll road system **14.8**



Greater PE: proposed toll road system **14.9**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Kranskop
Warmbaths
TRANSVAAL
Lydenburg
Pelindaba
PRETORIA
Middelburg
Nelspruit
Rustenburg
Witbank
Middelburg bypass
Johannesburg
Dalpark
Grasmere
Brakpan ramps
Mbabane
Ermelo
Mafikeng
Potchefstroom
Ascot
SWAZILAND
Stilfontein
Vaal
Wilge
Frankfort
Piet Retief
Kuruman
Kroonstad
Kroonstad bypass
Newcastle
Christiana
Bethlehem
Harrismith
NAMIBIA
Upington
ORANGE FREE STATE
Tugela
NATAL
Kimberley
Bloemfontein bypass
Spitskop
Estcourt
Mooi
Richards Bay
Vioolsdrif
BLOEMFONTEIN
Stanger
Mtunzini
Maseru
Stanger
PIETERMARITZBURG
Tongaat
LESOTHO
Camperdown
Durban
Mariannhill
CAPE PROVINCE
HF Verwoerd Dam
De Aar
Kokstad
Pennington
Colesberg
Aliwal North
Port Shepstone
Oribi
Calvinia
Umtata
Queenstown
Beaufort West
Graaff-Reinet
Cradock
Fort Jackson
East London
Worcester
Despatch
Swartkops
CAPE TOWN
Worcester
Tsitsikamma
Port Elizabeth
Huguenot
PW Botha airport
Mossel Bay
Jeffrey's Bay
Papkuils River
Toll roads presently operating and approved
Existing freeways to be tolled by 1995
Existing toll plazas
Possible toll plazas on existing freeways

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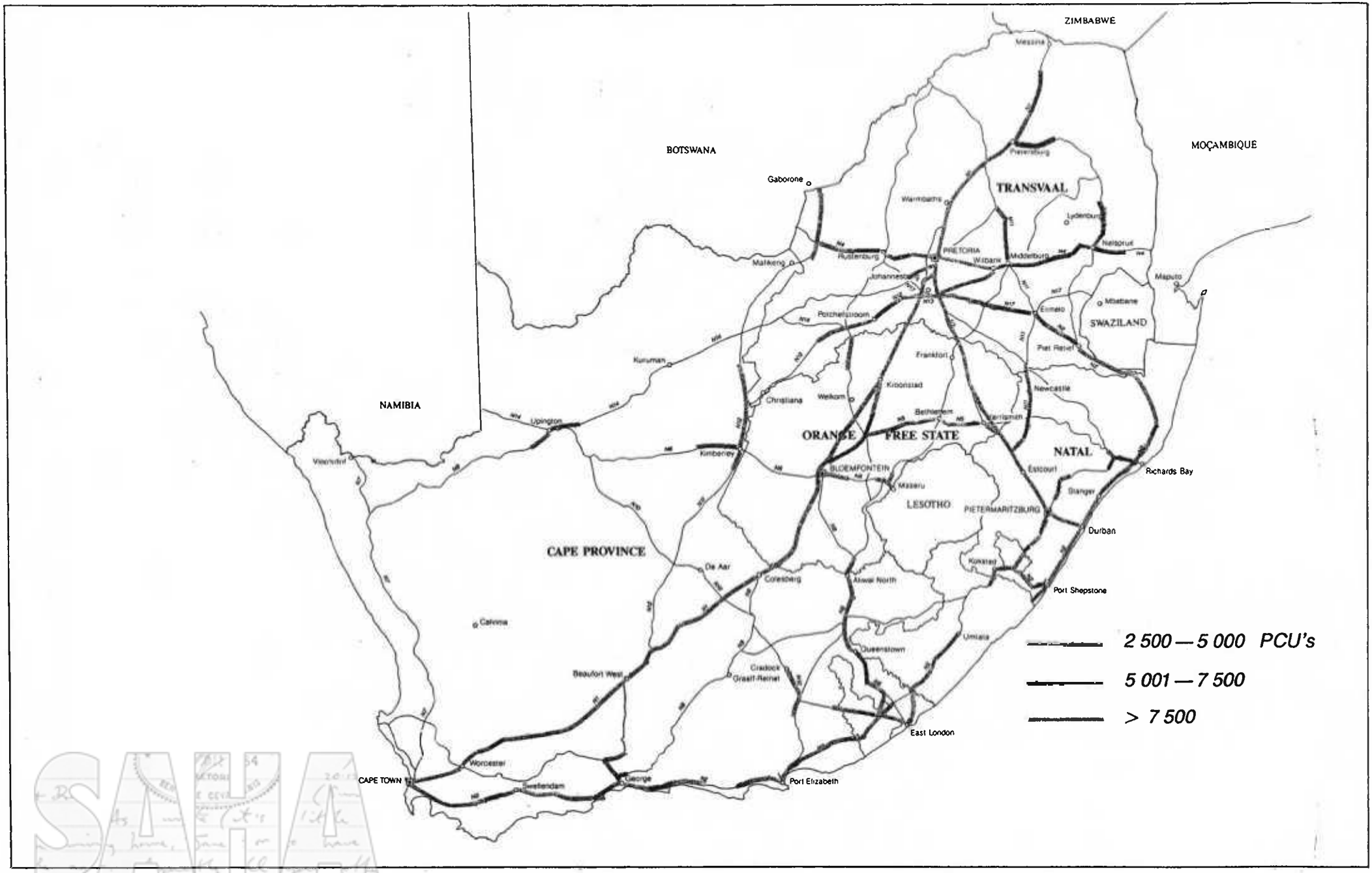

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Toll network: traffic pattern for the year 2000 **14.11**

plazas would be higher than the cost of an eighteen lane mainline toll plaza. The prior option was, therefore, chosen as an indication of the upper limit of toll plaza capital cost.

Table 1 lists the results of the estimates with respect to the cost contribution from each area of work. From these results it is clear that the main areas of cost are civil works, toll collection equipment and electrical work.

TABLE 1 : PROPORTIONAL COST CONTRIBUTION TO PLAZA COST

	Six Lane	Eighteen Lane
Civil works	49,9 %	33,8 %
Canopy & Steel work	10,4 %	15,0 %
Buildings	5,6 %	8,0 %
Electrical work	14,5 %	15,8 %
Toll equipment	15,5 %	21,0 %
Toll booths	4,1 %	6,4 %

It is also apparent from these results that if the size of the toll plaza decreases, the contribution of civil works towards to the total cost of a toll plaza increases from 33,8 % for an eighteen lane toll plaza to 49,9 % for a six lane toll plaza.

Although the percentage contribution of toll booths to the total cost of a toll plaza is relatively low, it was possible with a revised booth and island design to make a contribution to effect a lower unit rate per lane for toll plazas.

10.3 BASIS OF ESTIMATE

10.3.1 EXISTING PLAZA DESIGN PARAMETERS

In order to quantify possible savings it is necessary to determine the basis on which this analysis will be calculated. The plaza design used as a basis complies with the existing designs used up to now by the Department of Transport.

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CHAPTER 15

FINANCIAL VIABILITY

15.1 BACKGROUND

The terms of reference require that an aggregated cash flow analysis, taking all costs, including maintenance costs, into account, and separately scheduled for rural and metropolitan roads, should be reported on.

The analysis of the financial viability of the proposed toll road network comprises three separate phases:

Phase 1: The financial evaluation of tolling existing freeways or limited access sections of the National, Provincial and Metropolitan road network.

Phase 2: The prioritisation and financial evaluation of proposed new sections of road with toll potential under consideration by the various road authorities.

Phase 3: The estimation of a schedule of indebtedness relating to the total proposed toll road system.

The following items are included in the cash flow analysis:

15.1.1 FUNDS OUTFLOW

a) Capital cost of plaza construction and of new road construction

b) Road maintenance life cycle costs and cost of increasing capacity

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Road cycle maintenance costs (rehabilitation) account for the major outflow of funds relating to the existing freeway network. In order to comply with budgetary constraints it has often been necessary for road authorities to schedule the resealing and rehabilitation of roads at below the technically optimum level. Pavement management programmes obtained from the various authorities would thus reflect the amount of funds available to each authority rather than be a true barometer of the status of the pavements under that authority's control.

In order to ensure that the demands for maintenance and rehabilitation of proposed toll road sections at present managed by different authorities are comparable, the study team adopted standard life cycle costs.

c) **Annual maintenance**

A per kilometre cost was determined for minor maintenance such as grass cutting, maintaining road furniture etc.

d) **Plaza equipment replacement and cost of increasing plaza capacity**

15.1.2 FUNDS INFLOW

a) **Toll income net of plaza operating expenditure**

Gross toll income is largely dependent on the following parameters:

- The base year traffic,
- the traffic growth rate,
- discounts if any,
- the attraction rate, and
- the tariff.

The annual cost of operating a plaza is a function of the number of plaza lanes provided (peak traffic) and the number of vehicles processed (ADT).

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15.1.3 OTHER ASSUMPTIONS

Other assumptions made in the financial viability analysis are as follows:

- Real rate of interest 4%
- Traffic growth rate 4%
- Inflation rate 12%
- Escalation for construction 15%
- Period of evaluation 20 years

15.2 TOLLING OF EXISTING TOLL ROADS AND EXISTING FREEWAYS IDENTIFIED AS HAVING TOLL POTENTIAL

Notwithstanding the opinion that present legislation does not make provision for toll routes (unless declared as such from the beginning) or toll networks and that each separately declared toll road should be accounted for separately, it was decided to group elements of the existing freeway and toll road system that would eventually either serve a rural corridor between two or more major cities or serve a metropolitan area for the purposes of the analysis. Firstly roads or sections of road were categorized as rural or urban. Rural roads were then grouped by national road number between major cities or by roads sharing common broad markets. Urban roads were grouped according to metropolitan area.

The contribution of each plaza was evaluated individually as were the road life cycle costs analysed for each section of road. These costs were, however, accumulated at group or "network" level. The problem of arbitrarily apportioning specific sections of road to individual plazas could be avoided, especially in the urban context. It was therefore possible to view each grouping as a system and to optimize the number of plazas, i.e. a single plaza could serve more than one section of road.

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It is suggested that these groupings could form the basis of future toll road routes in a rural context and networks in an urban context. This approach is recommended from the point of view of presenting a saleable product to the travelling public, i.e. a motorist would be more willing to pay if he knows that the money will at least be spent on the route he travells between two major cities or in the metropolitan area in which he regularly travels.

The groupings are as follows:

Rural roads

- N1 Cape Town to Bloemfontein
- N1 Bloemfontein to Johannesburg
- N1 Pretoria to Pietersburg
- N2 Cape
- N2 Natal
- N3
- N4 and N12

Urban toll road networks

- PWV
- Durban
- Port Elizabeth
- Cape Town

RESULTS OF PHASE 1

The results of the financial viability analyses can best be represented graphically.

Fig. 15.1 compares the predicted annual construction and rehabilitation costs in respect of existing freeways with the annual net toll income (all in 1991 millions of rand). Interest is not considered in this comparison.

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The net toll income has been taken as the estimated toll income net of plaza operating costs and routine annual road maintenance, and it is projected to grow from about R300 million per annum in 1993 to R700 million per annum by the year 2010 (both figures are in 1991 Rand), mainly as a result of the predicted traffic growth.

The construction and rehabilitation costs start at a very high level because of the construction of toll plazas and expenditure in respect of postponed rehabilitation.

These costs include extensions to the Magalies, South Coast and North Coast toll roads net of already budgeted for NRF contributions towards these projects, as well as life cycle expenditure relating to all existing freeways proposed to be tolled by 1995. The life cycle expenditure includes resealing the pavement layer as well as major structural rehabilitation and road widening when required.

It can be seen that from 1994 onwards, when a large percentage of the proposed plazas on existing freeways are operational, the annual net toll income exceeds the annual construction and rehabilitation costs of the existing freeways.

Fig. 15.2 compares the predicted annual construction and rehabilitation costs in respect of existing rural freeways with the annual net income, and Figure 15.3 compares the predicted annual construction and rehabilitation costs in respect of existing urban freeways with the annual net income.

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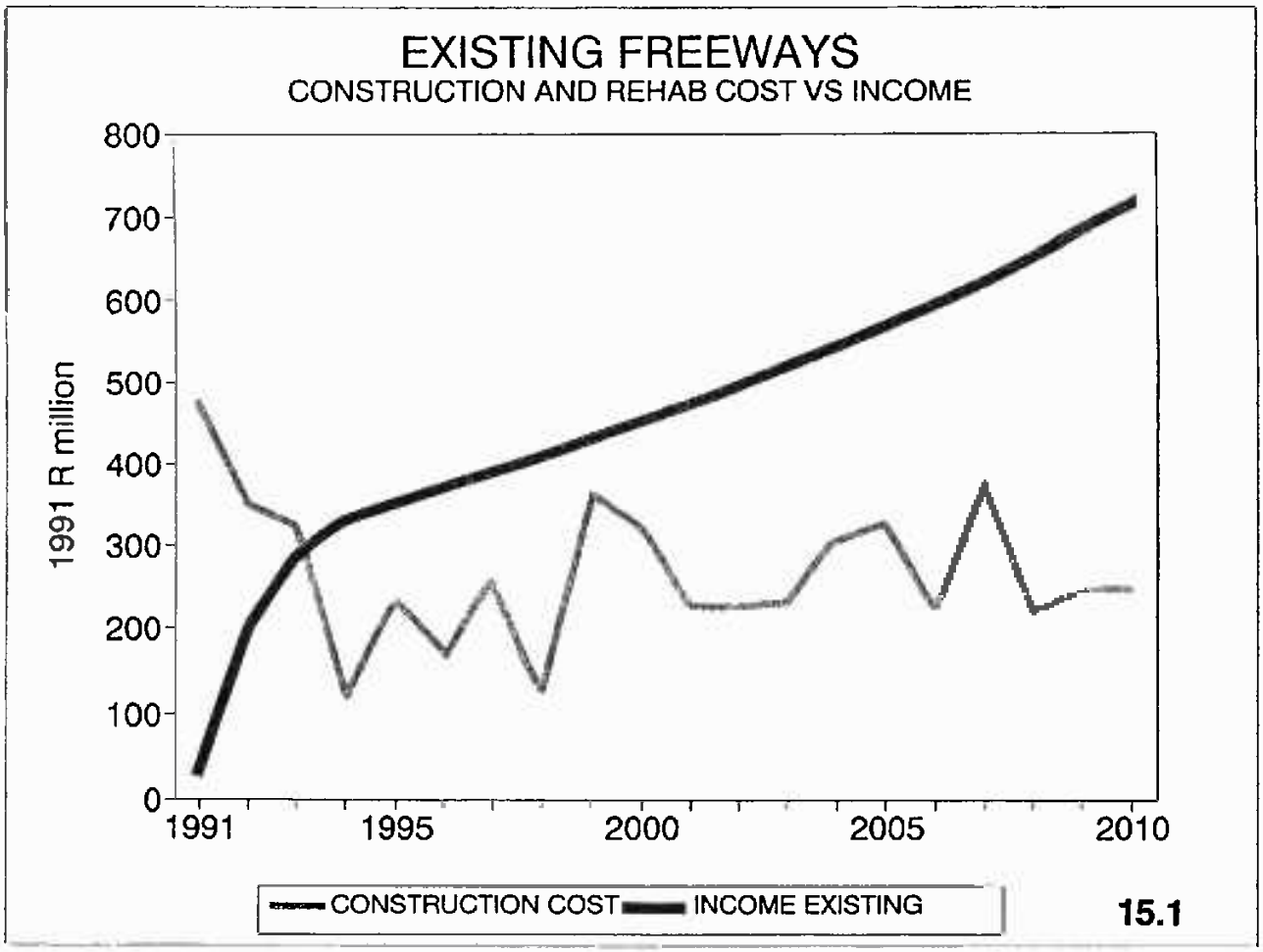

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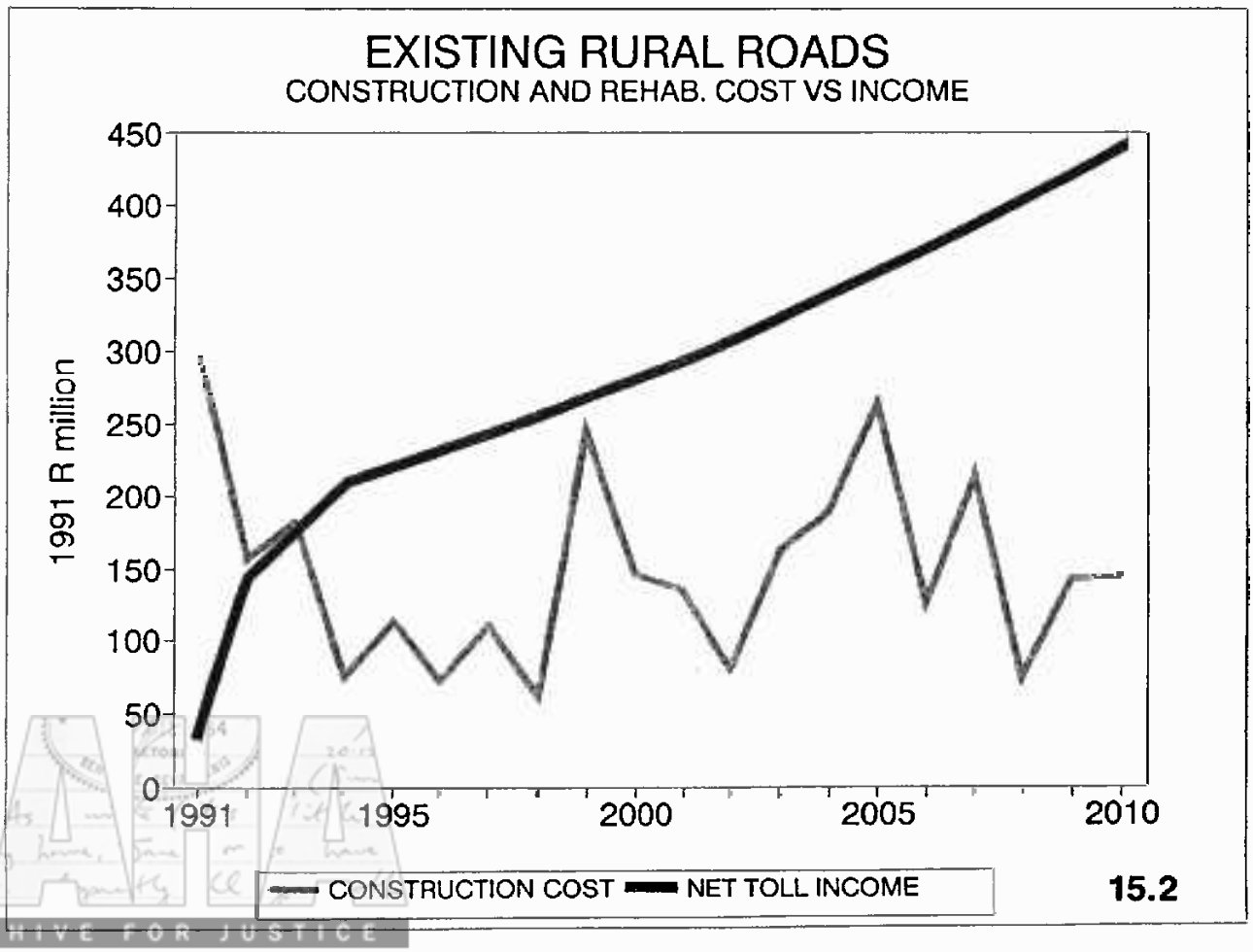

15.2

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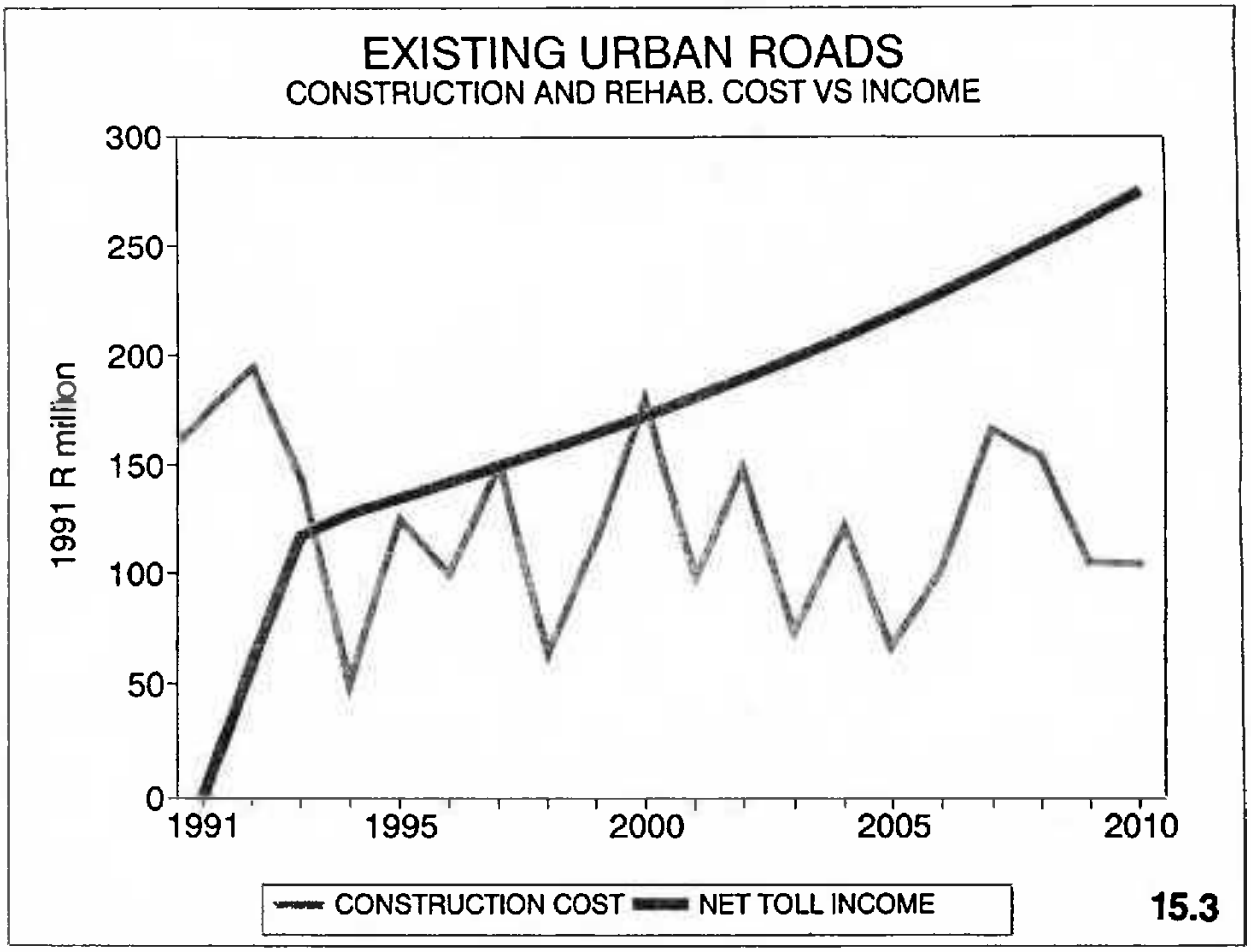

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15.3 PRIORITISATION OF NEW TOLL ROAD CONSTRUCTION

Proposed new sections of freeway currently being planned by the various road authorities were identified and prioritised as follows:

> The (Loan Supportable by Revenue) LSR was converted into a ratio of the estimated construction cost of the road and the estimated establishment cost of the toll plaza. Roads with a higher LSR/Capital Cost ratio were afforded a higher priority.

The Loan Supportable by Revenue can be defined broadly as the Net Present Value of all operating cash inflows and outflows inclusive of life cycle costs but exclusive of establishment (initial construction) costs. + land expropriation costs.

Those sections which did not support their own life cycle costs i.e. showed a negative LSR were excluded. These roads could, however, be included at a later stage when the forecast traffic was perceived to have increased sufficiently to warrant the construction of the road and tolling thereof.

Roads with a higher LSR/Capital Cost ratio are able to bear a larger portion of the financial burden of establishment and would thus be less of a drain on financial resources.

Roads with an LSR of less than the combined construction cost of the road and plaza would be financed by capital market loans only to the extent that the loan could be supported by the toll revenue, i.e. the loan apportioned to a specific road would not be allowed to exceed the LSR. The excess of construction cost over LSR would be provided by surplus income from existing roads. These roads having lower LSR/Capital Cost ratios would be scheduled as lower priority roads.

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The advantage of using the LSR/Capital Cost ratio for prioritisation is that it not only reflects the financial viability of a proposed road, but is to some extent also a reflection of the volume/capacity ratio of the road since a constant rate per kilometre tariff has been used in calculating the "comparative" LSR's of the new roads.

RESULTS OF PHASE 2

RESULTS OF PRIORITISATION

The results of the prioritisation analysis are as follows:

(Please note that these are comparative LSR's determined at 10 cents per kilometre. Where the perceived benefit indicates this tariff to be highly unrealistic a lower tariff was used. Actual circumstances may be such that in some cases a marginally higher or lower tariff would be proposed after a more detailed analysis.)

CLASS A;
LSR/CAPITAL COST > 1

None

(Upgrading of the P206-1 between Corlett drive and Buccleuch, upgrading the N3 between Key Ridge and Cato Ridge, and other upgrading and rehabilitation projects were included in the analysis of existing roads and extensions to existing toll plazas i.e. in Phase 1 of the analysis.)

CLASS B;
LSR/CAPITAL COST > 0,75

P202 Vanderbijlpark bypass to Sasolburg

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