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Global Climate Change, Developing Countries and Transport Sector Options in South Africa

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Abstract

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The objectives of the study are to:

•Gather information on the development of the transport system in South Africa, the key drivers which have shaped the current system, and critical issues and priorities;

•Identify current policy goals and initiatives relating to the transport sector and their possible implications for the sector over the long term (i.e. 20 years);

•Assess the contribution by the transport sector to Greenhouse Gas Emissions;

•Identify possible measures (where appropriate) which can be employed to influence the transport sector in the South African context; and

•Set out scenarios for the transport sector in South Africa in such a way that stakeholders will understand the benefits of mitigation and how this can lead to the enhancement of economic growth opportunities, rather than constraining it.

In addressing the respective components of the project, an interview process was conducted by members of the project team. This involved a series of discussions with key role players in the transport sector in an attempt to obtain their views on current and future drivers of the system. The discussions were also used as input to the scenario generation process to formulate useful outlooks of the future of the transport sector in South Africa.

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Funding from the PEW Center for Global Climate Change

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PEW CENTRE ON GLOBAL CLIMATE CHANGE

GLOBAL CLIMATE CHANGE, DEVELOPING COUNTRIES AND TRANSPORT SECTOR OPTIONS IN SOUTH AFRICA

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2. OVERVIEW OF SOUTH AFRICA: THE PEOPLE AND THE ECONOMY

Unless otherwise stated, the information in this section comes from SA 2000: South Africa at a glance (2000).

2.1. Demographics and Economy

In recent history, a shifting economy and forces such as changing colonial rulers and struggles between peoples have shaped South Africa. This chapter briefly explores these changes within South Africa in order to explain the context in which South Africa exists today. The South Africa of today is itself in a state of change and now faces reconciling social, economic and physical infrastructures with a new vision for South Africa's place in an increasingly global economy.

Table 1 contains an overview of South Africa in terms of its demographics and its economy.

Table 1. Overview of South Africa: The People and the Economy

DEMOGRAPHICS	
Area	1 225 815km^2
Capital	Pretoria
Currency	Rand
Population	42,4m
Population per km^2	35
Average annual growth in population (1990 – 2000)	2,22%
Population under 15	37,3%
Population over 65	4,4%
Human development index	71,6
Men per 100 women	98,7
Adult literature	81,4%
Urban Population	51%
Fertility rate/ women	3,8%
Crude birth rate	29,7% (per 1000 population)
ECONOMY	
GDP	R543bn = $133bn
Real GDP growth (1990 – 1996)	1,2%
GDP per capita	$3 130
GDP per capita in PPP (USA = 100)	23
Agriculture	10,7%
Industry Of which manufacturing	34,9% 23,8%
Service	60,4%
Private consumption	59,3
Public consumption	20,8
Investment	18,7
Exports	30,5
Visitors exports = FOB	$29bn
Current account balance as % of GDP	± 1,5

Source : The Economist Intelligence Unit 1999

Comment: unit?

Comment: unit?

Comment: unit?

Comment: unit?

2.2. A Brief History of South Africa

2.2.1. The Colonial Era

The first known European expeditions to parts of the area now known as South Africa were lead by Portuguese explorers starting in 1488. The initial motivation for these sea trips was to explore the route round the Cape to enable trading between Europe and the Far East. Subsequent visits were aimed at finding the best location for the establishment of a replenishment station for these ships. In the race for world trading status during the era of Mercantilism, conflict inevitably arose between the rival European nations. This took the form of several maritime clashes between the Dutch and the Portuguese off the southern African coast. Eventually, the Dutch became the dominant maritime power at the Cape, and in 1652 Jan Van Riebeeck, an employee of the Hollandse Oos Indiese Kompanie (HOIK) was sent to the Cape to establish, develop and govern an provisioning station at the Cape.

This Dutch settlement eventually grew from a replenishment station into a colony. Although this brought resistance from the small migrant groups of Khoikhoi (local inhabitants, later known as Hottentots), such resistance was suppressed by the Dutch colonists. The Dutch, strengthened in number by slaves from the East and the arrival of the French Huguenots, gradually spread into the interior as farmers. A local language, Afrikaans, soon evolved from Indo-Germanic roots.

While these farmers were spreading north and eastwards, the Bantu tribes who had been living in the area north of the Limpopo River (i.e. from Zimbabwe northwards) for over 1,500 years, began to migrate to the south and east. Of the Nguni (a sub-group of the Bantu), the Zulu tribe occupied what is now KwaZulu-Natal and the Xhosa settled in what is now the Eastern Cape. Competition for grazing inevitably brought these tribes into conflict with white farmers, to such an extent that the first of nine frontier wars erupted in 1779 between the whites and the Xhosa on the eastern border of the Cape Colony.

The importance of the Cape sea route for trade between Europe and the Far East meant that Dutch rule would not last long. Britain annexed the Cape in 1795. Several years later, in 1803, the colony reverted briefly back to the Batavian Republic, the name for the Netherlands under Napoleonic rule. In 1806 the colony was reoccupied by Britain, whose rule was similarly authoritarian. The 1820 British settlers began to struggle for certain political and other rights. They also campaigned for an open border (i.e. colonists should be allowed to settle outside of the strictly enforced colony borders). The presence of significant numbers of British settlers (many of them farmers) combined with the fact that the Afrikaner people had by now been living in the Cape for almost 200 years, resulted in a sense of distinct “Boer” (the Afrikaans word for farmer) identity.

Simultaneously, turbulence continued along the eastern border. In 1834, 12,000 Xhosa launched an attack across the Keiskamma River (at that stage the eastern border of the Cape Colony). The colonists, however, had firearms, something which was unknown to the Xhosa, and this attack ended in defeat and, to a large extent, in the ruin of the Xhosa nation. The hinterland was now safer for White settlers and they could now venture further east, as far as Port Natal, which they later renamed Durban.

In 1834, the British abolished slavery in the Cape Colony. This angered the Afrikaner people who were reliant on slave labor for their farming to be viable. As a result of this and the general resentment felt by the Afrikaners towards British rule, a large group, known as the Voortrekkers, began a mass migration into the northern interior in 1835-1836. This migration became known as the Great Trek. At about this time the dominant Zulu chief, Shaka, united the Zulu’s into one kingdom. Various clashes took place between his successor Dingane and the Voortrekkers, culminating in the Battle of Blood River in 1838 which almost completely destroyed the Zulus military capability. These events were followed by the proclamation of the Boer independent Republic of Natalia, which they governed during the period 1838-1843. In 1843, however, Natal was proclaimed a British

colony. A representative government, based on a non-racial franchise was established in the Cape Colony. Natal followed suit in 1856

Conflict eventually arose between the British and the Zulus in Natal, as a result of British imperialism and the "scramble for Africa". Several violent clashes took place between the Zulu and the British It was only at Ulundi in 1879 that the Zulu kingdom was finally defeated.

Meanwhile, the Voortrekkers were permitted by the British to establish two independent Boer Republics, one between the Orange and Vaal rivers, known as Oranje Vrystaat, and the other between the Vaal and the Limpopo rivers, known as the Transvaal Republic.

2.2.2. Discovery of gold and diamonds

The discovery of diamonds in the Northern Cape in 1867 (at Kimberley) and the discovery of gold on the Witwatersrand in 1886 changed South Africa from an expensive colony to maintain, into a valuable imperial possession. This ultimately influenced British ambitions in Southern Africa and resulted in new conflict because of the location of the mining areas much of which lay in the Boer Republics of the Orange Free State and the Transvaal.

Fortune-seekers from all over the world flowed into this predominantly rural, pastoral land, and transformed it into a thriving industrial economy based on mining. Johannesburg became the economic heartland of the country. It also became home to sizeable Jewish, German, Greek, Portuguese and Italian communities. The rapid urbanization of both Blacks and Whites and the migrant worker system brought about discontent and many political problems.

The outbreak of the first Anglo-Boer War in 1880 was a result of rising tension between British settlers ("Uitlanders"), who demanded certain rights, as well as "the protection of the Motherland" and the Transvaal authorities. After initially annexing the two republics, Britain was forced to restore the right of self-government to the Transvaal after the British were defeated at Majuba in 1881. The second Anglo-Boer war broke out in 1899 after negotiations on rights for the "Uitlanders" had failed between the Transvaal President, Paul Kruger and the High Commissioner of the Cape Colony, Lord Milner. By 1902 Britain proclaimed the Union of South Africa.

The National Convention of 1908 was to lay the foundation of a new country, and the Union of South Africa was formally established on 31 May 1910. It was proclaimed a self-governing dominion within the British Empire, with full rights (franchise, etc) bestowed on Whites.

2.2.3. The rise of South Africa as an international power (1910-1945)

As a full member of the British Empire, the Union of South Africa played a vital role in upholding the interests of the Crown. South African volunteers (white and black) participated in World War I, in campaigns in German West Africa (now Namibia), East Africa (now Kenya) and Europe. The after-effects of the Great War were felt in the Union of South Africa, and the Union government (under Jan Smuts, a former Boer patriot) had to use force to suppress the Miners' Strike of 1922 and consolidate government authority. The Great Depression led to a considerable amount of poverty and large numbers of disaffected people.

The ascendancy of National Socialism in Germany in the 1930s led to a resurgence of nationalism amongst Afrikaners (many of whom had supported Germany during the World War I). The decision of Parliament to enter World War II on the side of Britain and as a member of the Commonwealth was a close vote. However, it was seen as a critical commitment to make if South Africa was to retain credibility and influence among the democratic powers. South African volunteer forces served in East Africa, North Africa and Europe. During this period, South Africa emerged as a key member of the international community with Prime Minister Smuts playing an advisory role to Prime Minister Winston

Churchill and President Roosevelt, out of all proportion to the size of the country. This culminated in the establishment of the League of Nations (forerunner to the United Nations) with South Africa under Smuts as one of the founder members.

2.2.4. The Apartheid Era

The period between the establishment of the Union of South Africa and the end of World War II in 1945 was one in which South Africa was rapidly transformed into a modern, industrial nation under the leadership of Smuts and a Union Party government. However, the political situation altered dramatically in 1948 with the rise of the National Party which advocated Afrikaner nationalism. The National Party's victory at the polls in 1948 was a result of a strong nationalist feeling amongst Afrikaners, who felt the need to protect their language, culture, and heritage from the Black majority, and to assert their political and economic independence from Britain. Consequently, a more rigid system of territorial, social and political segregation, known as ***Apartheid*** was introduced.

Apartheid gave legal effect to the racial segregation that had been inherent in South African society. As a result, Black opposition to White rule hardened and support for groups such as the African National Congress (ANC) (dating back to 1912), and the South African Communist Party (SACP) grew. The enforcement of Apartheid was met with increasing Black resistance and hostility.

The early 1960s was a time of civil unrest. In Sharpeville, 69 people were killed while demonstrating against "pass laws" (blacks needing passes to enter certain areas) It was also during this time that the ANC formed an armed wing known as Umkhonto weSizwe. This group embarked on a campaign of sabotage and political violence. This resulted, *inter alia*, in the 1964 arrest of Nelson Mandela (who was then leader of the ANC) and many other freedom fighters. Mandela was convicted and was sentenced to death. This was later changed to a sentence of life imprisonment. The more militant Pan Africanist Congress, under Robert Sobukwe, and its armed wing POQO, gained popularity.

In 1966, Premier Hendrik Verwoerd was assassinated. He was succeeded by B J Vorster and then P W Botha, who both instituted measures to soften Apartheid, while toughening internal security. However, by the 1970's, the balance of power began to change. Worker opposition, international sanctions, and the growing economic interdependence of black and white in a modernizing and urbanizing economy brought the Apartheid system into question. On 16 June 1976, schoolchildren in Soweto, a township outside Johannesburg, revolted against the imposition of Afrikaans in black schools, igniting a campaign of resistance designed to make the black townships ungovernable. A campaign of civil unrest followed.

2.2.5. A Democratic Country

The collapse of Portuguese colonial rule in Angola and Mozambique, as well as the independence of Zimbabwe, brought about a sense of liberation for Black South Africa. From 1990 onwards, more liberal elements within the National Party emerged. This led to the unbanning of the ANC and the SA Communist Party. Nelson Mandela was released from prison and negotiations over a new political dispensation for the country ensued. After lengthy negotiations, involving a wide range of political parties, an Interim Constitution was agreed upon and in April 1994 South Africans went to the polls on a universal franchise basis for the first time. The election ANC won the election by a wide margin and on 10 May 1994, Nelson Mandela became the country's first black president.

With the lifting of economic and other sanctions, South Africa reclaimed its seat in the UN General Assembly. Thereafter, the country became a member of the Organization of African Unity and the Commonwealth. On 10 December 1996, President Mandela signed the new Constitution.

3. THE APARTHEID CITY

3.1. Socio-Political Context

South Africa is a developing country, and shares many of the economic limitations typical of developing countries - pressing social demands that cannot be sufficiently met due in part to a limited tax base, lack of skills and schooling, and low labor productivity. This suggests that for South Africa, as for most developing countries, greenhouses gas emissions from the transport sector are not an issue of great priority. In addition, South Africa's apartheid system has had many subtle and indirect effects, e.g. through skewed expenditure which focused on private rather than public transport.

Additionally, apartheid left many poor, black people more dependent on transit than they might otherwise have been. At the local level, it produced the Apartheid City that will be discussed below. On a larger scale, it moved whole families to tribal homelands far from traditional industrial areas and employment centers. Efforts to move the industries along with them were only marginally successful. The long distances between home and work led to large numbers of commuters living in the cities (or in informal settlements outside the cities) during the week and then traveling hundreds of kilometers on weekends to spend time with their families.

These (mostly) poor people who, even in the post-apartheid era, cannot afford either to move their families to the cities or to find security in maintaining their land rights in the tribal areas, understandably need to travel by the cheapest transport available. The dependence of these travelers on cheap transport has made old, poorly maintained and overloaded cars, trucks, buses and minibuses moving along South Africa's national and regional roads each Friday and Sunday night a familiar sight. Although many of these vehicles undoubtedly make an impressive contribution to green house gas emissions on an individual basis, it is questionable whether their numbers are large enough to have a significant effect overall.

3.2. The Apartheid City Unpacked

This section contains a brief history of the development of the Apartheid City and the impact on settlement patterns due to the nature of the segregation involved.

Generally, social, financial and cultural factors determine where people locate themselves. The development of cities is likewise controlled by these elements. In South Africa, however, cities were developed primarily on the basis of race. The ruling (mainly White) population prevented people from other races from settling within prescribed white areas. This created a city structure where socio-economic and financial factors were less important elements in the location decisions of non-whites. The result of various laws created to enforce the '*separate racial development'*-ideology was the **Apartheid City**. The following section looks at the development of the Apartheid City and the economic implications arising from this city structure.

To date, the South African city has been transformed by three clearly distinguishable ideological phases, each of which has had a distinctive pattern regarding racial separation in urban areas. These phases (the pre-apartheid phase – pre-1948, the Apartheid phase - 1948 - 1985 and the neo-apartheid phase - since 1986) are illustrated in Figure 1.

Comment: show 3 phases as well

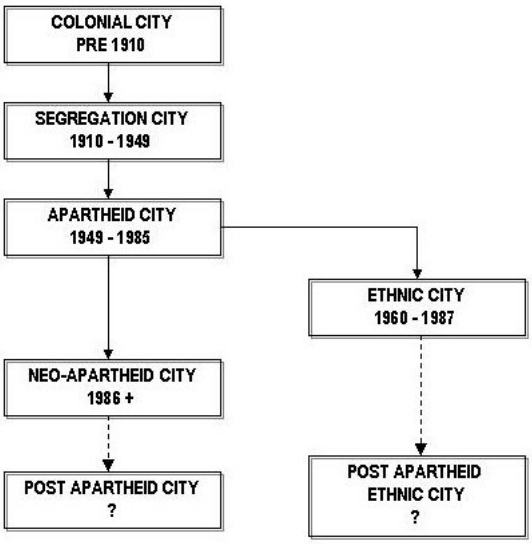


Figure 1. Phases of Residential Segregation in the South African City

In order to formulate scenarios about future development patterns in cities, it is important to consider the development of these three phases. From a spatial perspective it is expected that the two most dominant spatial processes which will influence the city in the future are urbanization (and urban growth) and graying, i.e. the gradual change of predominantly White residential areas and of predominantly Black residential areas into racially mixed residential areas. In this regard, the Post Apartheid City and Post Apartheid Ethnic City in Figure 1 are options for the future (uncertainty denoted by ?).

3.2.1. The Colonial City (1850's to 1910)

European urban and economical patterns were superimposed on colonized areas, and urban settlements were created by whites as white living and working space. Consequently, the indigenous people often referred to these areas as "*a white man's place*" (Welsh, 1971), "*the domain of the white man*" (Christopher, 1982) and "*a white man's land*" (Christopher, 1987).

Furthermore, since the establishment of urban settlements in South Africa, indigenous people have been used for labor. This economic interaction between European colonists and native groups, became part of the dominant-subordinate relationship which was extended into pre-Apartheid urban settlements (Davies, 1981): The influx of indigenous people was controlled. The dominant classes claimed the central parts of the urban areas, relegating the subordinate classes to the peripheries of the colonial cities. The peripheral location of indigenous groups led to congruent class and racial patterns. Indians (originally brought in as cheap labor from India), who held a fairly high socio--economic position settled themselves in enclaves above or beside their businesses within the older inner city (Davies, 1981).

3.2.2. The Segregation City (1910 to 1949)

During the latter part of the pre-apartheid phase, black residential areas were formally moved to the outskirts of growing urban areas, and even beyond, to within homeland boundaries. The main driving force behind this segregation was white fear of political domination and the perceived dangers blacks posed to the middle and upper classes.

During this period, the population of urban areas rapidly increased, from 1,5 million in 1911 to 5,3 million in 1951. Not only did the number of black urbanites exceed the number of whites during this period, but by 1951 the numbers of Indians and coloureds (people of

mixed race) in their respective cultural home cities (Durban and Cape Town) surpassed those of Whites. In spite of an almost five-fold increase in black people (from 0,5m to 2,3m), an ever-increasing limitation of the rights of blacks in cities (and on national level) took place. Tightened restrictions included limited access to “white areas”, and the abolition of black residential rights in certain areas, and finally, property rights altogether.

This policy was summarized by the Stallard Commission: "*The native should only be allowed to enter urban areas, which are essentially the white man’s creation, when he is willing to enter and to minister to the needs of the white man, and should depart there from when he ceases so to minister*" (Davenport, 1971).

This doctrine had far-reaching implications for the provision of services, property ownership, participation in administration and the morphology of black townships (Smith, 1985). Based on this policy, additional processes were put into effect and uniform legislation introduced to eliminate regional differences in racial separation: The Natives (Urban Areas) Act of 1923 was the first uniform policy regarding urban blacks. This Act and consequent amendments and modifications were included in the Natives (Urban Areas) Consolidation Act in 1945.

Various strategies and mechanisms were also applied to bring about increasing physical separation between the various non-white groups. Examples of this were the development of some residential areas solely for a particular population group; the provision of sub-economical housing within a particular area for a prescribed group; the inclusion of racial exclusion clauses in property deeds; and 'Pegging Acts' (1943 and 1946)[1]. A certain amount of mixing, however, took place in some residential areas during this phase.

The essential structural elements of the segregated city can be summarized as follows:

- a dominant white central business district with a CBD frame;
- sub-ordinate and peripheral Indian and/or Chinese central business districts;
- industrial sectors with white ownership but constituting a common employment space;
- a white residential core with sub-urban extensions in secrets of desirable environment, strongly differentiated by socio-economic status;
- centrally located Indian, coloured and Chinese residential enclaves in older inner residential areas;
- African working zone single quarters in barracks and compounds;
- African, Indian and coloured peripheral settlements in small townships, small patches and larger concentrations or zones of informal housing and privately developed housing of highly mixed quality;
- African domestic quarters, widely distributed; and
- mixing zones that represented black diffusion into white residential areas.

During the pre-apartheid phase, urban policies had been largely concerned with blacks. As a result of informal Apartheid planning, pre-apartheid cities were already highly, yet not completely, segregated: The Urban Foundation (Urban Foundation, 1990) calculates that prior to the Group Areas Act, South African cities recorded segregation indices[2] that were as high, and often higher, than their equivalent in the American Deep South at the time.

[1] In 1943, Natal passed the "Pegging Act", restricting the right of Asians to acquire land. Then, in 1946, the Union Government passed the Asiatic Land Tenure and Indian Representation Act to segregate Indians in trade and residence.

[2] A segregation index is a quantitative measure of the degree of racial segregation where 0 represents perfectly proportional distribution of different groups in each neighbourhood and where 1 represents complete segregation.

Interesting to note are the similarities in the situation just before the National Party's coming into power in 1948 and the situation in 1986 when reform legislation regarding certain Apartheid objectives came into effect:

- Political ideology vs. economical realities;
- The findings of the Fagan Commission (1948), and the Riekert, and Wiehahn Commissions (late 1970's) stated that black urbanization is a reality, influx control cannot be applied effectively, and that the permanence of urban blacks is an indisputable fact - this was still true almost 20 years later;
- Housing problems (housing backlogs, squatting, emergency camps, site-and-service schemes with rudimentary services, etc) was an issue during the pre-Apartheid years and was supposed to be addressed by Apartheid. It was still, in 1986, a problem;
- 1948 saw major opposition to the migrant labor system, whereas this opposition had been extended to include the hostel system by 1990's; and
- During the 1940's fear existed that Blacks might pose general health hazards. In the 1990's people fear AIDS.

3.2.3. The Apartheid City (1950's to 1990).

With the coming to power of the National Party in 1948, a policy was designed to create maximum residential segregation in cities. The architects of this policy were of the opinion that Apartheid would serve all population groups in the country by allowing each group to develop to independence at its own pace and in its own prescribed area. It was also believed that "boundaries bring peace". Formal spatial patterns, in line with the idealized Apartheid framework were based on pre-apartheid informal guidelines, structures and patterns.

At the dawn of the Apartheid era the ideological spatial strategy was more rigorously applied and on a larger scale. Existing processes of racial separation were speeded up and improved, and additional processes were put into effect to achieve planned spatial objectives. As Lemon (1991) suggests, Apartheid was more than simply the separation of people in a residential context (which was maintained in the pre-apartheid phase anyway) - the transformation of the city to an Apartheid City also led to a complete transformation of the urban community. The Group Areas Act became the cornerstone of separate education, health and other social services and amenities, as well as local administration and financing. In all this, Whites were assured of their dominance in the city, and boundaries were created to their benefit. Western (1981) constructed a theoretical Apartheid City to serve as an ideal group areas city as reflected in Figure 2.

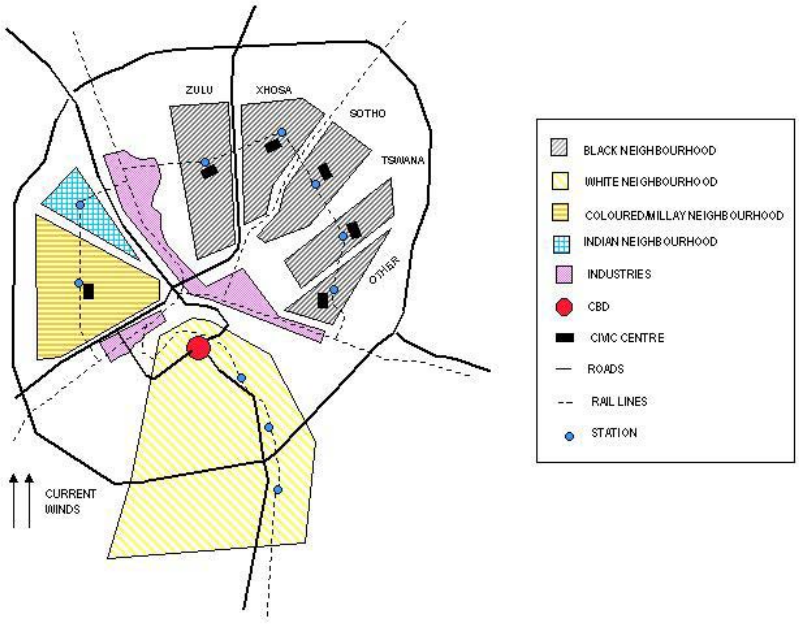


Figure 2. The Ideal Apartheid City

Based on Western's theoretical Apartheid City, the following patterns can be identified:

- a sector structure in the form of a wagon-wheel - the areas of each population group are directed at the city-center in such a way that each group has enough land for future expansion;
- white living space extended over higher-lying terrain which has the best residential locations; in a manner so that current winds blow away from this area towards the rest of the city (ensuring that city smog and industrial air pollution will not affect white residents);
- rivers, roads, railway lines and industrial areas are used as buffer strips between residential areas;
- the boundary between Coloured and Indian areas is not very prominent;
- black living-space is sub-divided on the basis of ethnicity - should a homeland be located within 70km of the hypothetical city, the ethnic group can be compelled to settle in the homeland;
- the industrial area is situated so that different population groups have direct access to its working space;
- the central business district also meets these requirements; and
- each population group has its own civic center.

Although this hypothetical model illustrates ideal spatial patterns according to Apartheid planning, post-1950 town planners had inherited a Segregated City from which an Apartheid City had to be created. Western (1981) describes the Apartheid town planners' problem as follows: "*They did not have a tabula rasa upon which to begin after 1948. All of the pre-existing urban fabric could not be pulled down, nor could a city be shifted en bloc to a new site more favorable for apartheid's particular purposes.*" The exception, however, was where urban areas were established after 1950, and could therefore be constructed according to the requirements of the ideal Apartheid City. The OFS-Goldfields' urban areas, for example, can be tested as ideal Apartheid cities.

The spatial patterns of the actual South African Apartheid City that came about through the processes described in the preceding sections had the following characteristics:

- a sector-structure in the form of a wagon-wheel;
- a dominantly white CBD and framework;
- a subordinate and periphery-directed Indian CBD (in some cities);
- industrial sectors in white possession, located so that direct access to this area was facilitated for all population groups, and simultaneously acted as a buffer between residential areas of different population groups;
- a white residential space which radiated in sectors around the central business nucleus in the opposite direction to non-white residential areas; white neighborhoods are strongly differentiated according to socio-economic status;
- peripherally located and consolidated Black, Coloured and Indian neighborhoods, structured in sectors to accommodate future expansion of the various non-white groups; these areas were situated either next to or near the industrial sector;
- ethnic zoning in post-1954 extensions of Black neighborhoods
- man-made or natural buffer strips surrounding the residential areas of the different population groups;
- widespread servants' quarters in white neighborhoods;
- clearing of mixture and slum areas; and
- clearing of squatter camps.

The Apartheid City comprised a more ordered spatial urban structure than the Segregated City. The systematic arrangement of land use prevalent in the sector structure leant itself to the enlargement of residential areas in the center of the city. The real model differed from the ideal Apartheid City model as non-white neighborhoods were located on the city outskirts without giving each group equal access to the CBD. To counter this accessibility problem, subsidized bus and train transport were established. Low-income, neighborhoods on the outskirts of the city were also different from other Western cities where middle and upper income groups tended to move towards the periphery, while lower income groups took their place towards the center.

The spatial development of South Africa's cities did not stop at the Apartheid City phase. During the 1960s the policy of separate development was introduced. This led to a phase of homeland consolidation and development.

3.2.4. Homeland Consolidation and Development – The Ethnic City (1960 – 1987)

Following the report of the Tomlinson Commission (1955), the Apartheid policy that came into operation after 1948 was reformulated during the 1960s (Voges, 1983). The main thrust of this new policy was the development of separate "homelands" for the various black population groups. This put a freeze on the development of residential areas for blacks in so-called "white South Africa". Existing Black residential areas in "white South Africa were not allowed to expand and therefore the natural population growth in these areas also had to be relocated to the homelands (Voges, 1983). This policy had the additional effect of relocating large numbers of "non-economically active" Black people to these homelands.

Some of the major towns in the homelands were as far as 80km from employment centers in white cities. Since the blacks in the homelands had little or no means of funding employment in these areas, Government developed a policy to facilitate the establishment of border industries. These were to form the base for large-scale development, and to enable the people in the homelands to increase their earning potential. In terms of this policy of industrial decentralization, subsidies were to act as incentives for such industrial development.

The policy did not, however, achieve the expected results and urban developments within the homelands retained their dormitory characteristics (Voges, 1983). This meant that most workers in these areas still had to commute on a daily basis to "white" areas to satisfy their employment needs.

Comment: What about the Neo-apartheid City, the Post-apartheid City and the Post-apartheid Ethnic City as shown in the Figure?

3.3. Present Day Legacies of Past Segregation Trends and Policies

3.3.1. Post-apartheid legacy at local level

All the cities in South Africa did not move through the same phases of segregation. Figure 3 below summarizes past urban development in South Africa and identifies the legacies of these trends and policies (Smith, 1985).

Stage 1 shows the pre-apartheid pattern of ethnic diversity with some segregation in the cities, a large and scattered Black population in the countryside, and a traditional subsistence economy in the reserves which were connected to the cities by migrant labor flows. This pattern is characteristic of the colonial and segregated stage of urban development.

Stage 2 shows the delineation of the social geography of the cities by the Group Areas Act and the resettlement of urban and rural Blacks into their so-called "homelands", a pattern characteristic of the early Apartheid City. White cities were still very much dependent on migrant labor.

In stage 3 the delineation of the Apartheid City continued by eliminating "black spots" and furthering "homeland" consolidation. In addition, the policy of industrial decentralization was introduced by Government. During this stage two distinct types of Apartheid City developed i.e. Partitioned Cities and Contained Cities. These two city types are represented in more detail in Figure 4 (Naude, 1988).

Stage 4 shows the borders between "White" South Africa and the homelands strengthened by the granting of independence. The industrial decentralization policy of the Government was at its most intensive and growth points straddling the borders were developed.

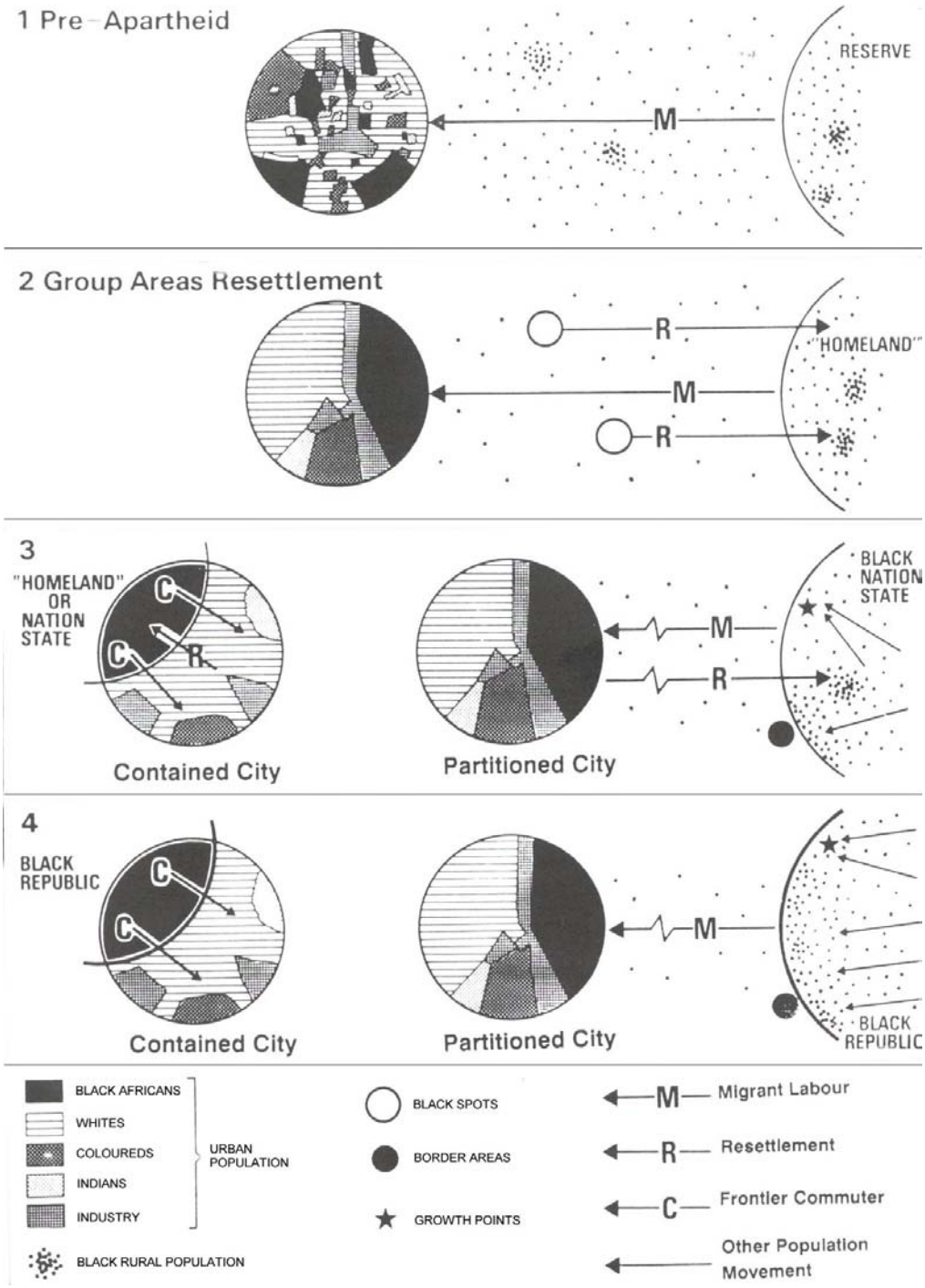


Figure 3. Stages in the Development of Apartheid Planning

i. The Partitioned City

In Partitioned Cities (Diagram A in Figure 4) such as Pretoria, Durban, Bloemfontein and Pietermaritzburg, unplanned (informal) residential settlement occurs mainly in peripheral, peri-urban areas. Stringent building regulations do not apply and lowered building standards allows a wide range of housing types to be developed. Housing backlogs appear to be relatively small. This type of city is heavily dependent on the provision of long distance subsidized public transport (Naude, 1988; and Clark, 1988).

ii. The Contained City

In Contained Cities (Diagram B in Figure 4) such as Cape Town, Port Elizabeth, Johannesburg and Uitenhage, informal settlement is restricted, and where it does occur, it is found within existing satellite towns or on their fringes (Clarke 1988). Housing backlogs appear to be generally much higher than in Partitioned Cities, especially in Johannesburg and Cape Town where the situation has become critical. Accessibility to major employment centers is generally low and people are heavily dependent on public transport. Even so, transport expenditure (both fare and subsidy) is generally lower than in Partitioned Cities (Naude, 1988).

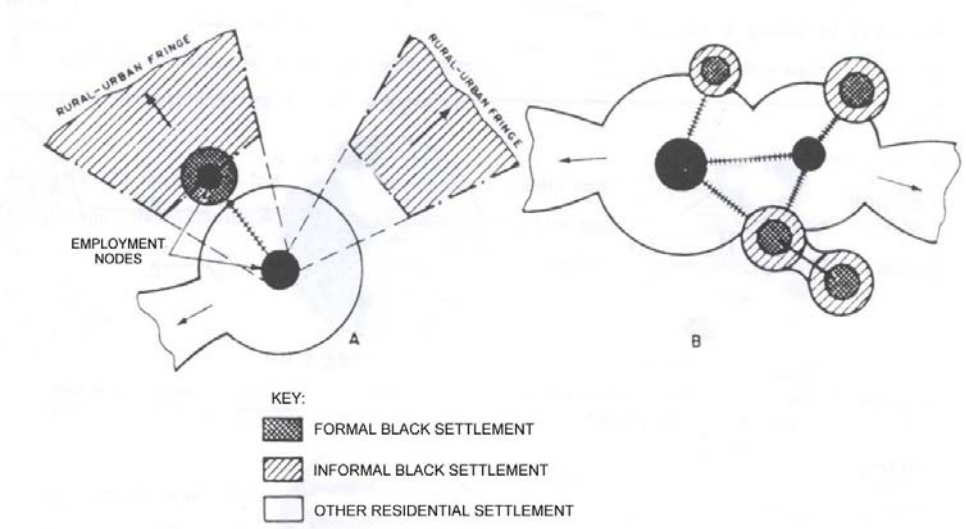
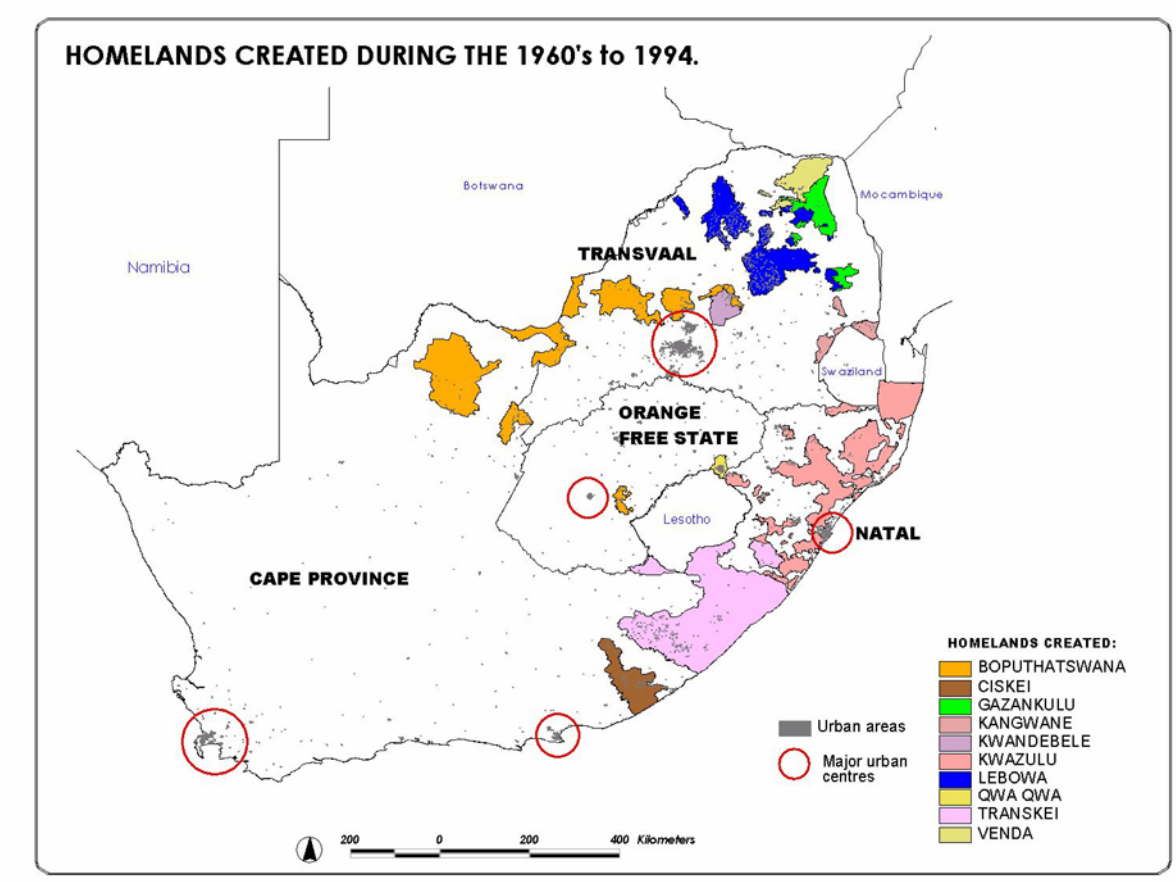


Figure 4. Types of Apartheid Cities

3.3.2. Post-apartheid legacy at national level

Figure 5 illustrates the result of the above policies at national level - the homelands appear as **racial islands (reservations)** within the South African morphology. By implementing certain economic incentives for industrial development, these areas were supposed to become decentralized growth points creating employment for the residents of such homelands. These growth points were therefore not based on existing economic potential within such areas, but rather on a series of measures that attempted to create a false attraction for industry. When Apartheid legislation was abandoned in the 1990's, these areas became even less attractive as the economic incentives that maintained them fell away. The result was that large pools of migrant labor had to seek employment in urban areas far from the homelands.

Figure 5. Homelands Created as a Result of Apartheid Policies



3.3.3. Impact of the Apartheid City on transport

Due to the Apartheid policies and to relocation, low-income townships (mainly black) were located on the outskirts of cities far away from employment opportunities. This is in conflict with locational economics of low-income people who locate as close as possible to employment opportunities to minimize transport costs. Such 'dislocation' of low income people meant that they became completely dependant on a long distance "line haul" type of public transport to access work opportunities. This type of service is inefficient, and operates almost exclusively during peak times. Government consequently had to subsidize public transport as the long distances between home and work resulted in an expensive public transport service which would not be affordable to low-income groups.

Due to long travel distances and low-density development, the energy usage of South African cities are not as low as those of more compact cities. Based on this it has been suggested that the inefficient city structure created by Apartheid policies also leads to higher vehicle emissions.

3.4. The Future of South African Cities

The spatial reality of Apartheid Cities has continued up to the present time. The *Moving South Africa*[3] policy document, published in 1998, describes the most important of these urban strategic challenges facing public transport. Of these, sub-optimal spatial planning is seen as the biggest cause of public transport costs and also the most difficult to "turn around". Other areas of concern that are highlighted in the document (all of which impact negatively on public transport vehicle utilization and reverse ridership) are long-distance line-haul travel, very limited in-fill development on major routes, and highly peaked travel demand.

In an attempt to improve the structuring of cities and the provision of public transport during the late 1990's, a few concepts started to come to the fore. Most notable of these is the **Fundamental Restructuring** process, the main aim of which is to restructure public transport in South African urban areas. The current public transport systems are still disjointed, uncoordinated and largely segregated on a racial basis. The current network requires rationalization and restructuring to become sustainable. This approach will impact the future South African city development in the form of high density and mixed land-use activity corridors to support the fundamental restructuring process.

[3] The National Department of Transport concluded the *Moving South Africa* (MSA) project in August 1998. The project involved the National Transport Policy White Paper and the development of a long term strategy for transport to the year 2020. The Moving South Africa Action Agenda is the final summary of that process and its outcomes, describing both the process and the recommended strategy for the South African transport sector.

4. TRENDS IN THE DEVELOPMENT OF THE TRANSPORT SYSTEM IN SOUTH AFRICA

4.1. Introduction - Institutional Change

The National Transport Policy Study (NTPS) in 1984 and the 1986 White Paper on National Transport Policy led to the deregulation of road freight transport.

A transport policy review process was initiated in 1994, leading to the 1996 White Paper on National Transport Policy. This was followed by Moving South Africa (MSA), an initiative to define optimal transport strategies. It led to the adoption of the MSA Action Agenda in 1999, a final summary of the process and its outcomes. It also recommends a strategy for the South African transport sector.

Government has also started a process, in consultation with representatives from labour, to restructure state-owned assets.

Some of the changes resulting from these and other concurrent processes were the establishment of various transport agencies such as Airports Company (ACSA), in 1993, Air Traffic and Navigation Services Company (ATNS), in 1993, National Roads Agency (SANRA), in 1998, Cross-Border Road Transport Agency (C-BRTA), in 1998, Maritime Safety Authority (SAMSA), in 1998, Civil Aviation Authority (CAA), in 1998, Road Traffic Management Corporation (RTMC), in 2000. The partial restructuring of Transnet and the commercialisation of some of its operations has also started to take place since the beginning in 2000.

The RSA Constitution of 1994 devolved additional transport functions from national to provincial governments. Local authorities were restructured, a process which is now nearing completion with the demarcation of local authority areas. These changes left the national Department of Transport with a diminished, but more strategic role, focussing on policy and substantive regulation.

4.2. Roads

At the time of the formation of the Union of South Africa in 1910, responsibility for roads was assigned to the various provinces. The need for co-ordination in road development and for a trunk road system throughout the country became evident, and a *National* Roads Board was established in terms of the National Roads Act (Act No 42 of 1935). Its original objectives were to improve access from farm to market (to "*get the farmers out of the mud*"), and to connect cities, major towns, and border crossings. The Transport (Co-ordination) Act of 1948 provided for the National Roads Board to be replaced by the National Transport Commission. The Commission's original objectives were largely met by 1961, when surfaced or high-standard gravel roads formed a national road network of 7 772 km - some of this has since been deproclaimed, and the network now amounts to approximately 6 200km.

The road construction era reached its peak during the 1960s and 1970s, with an emphasis on the construction of inter-city freeways by national and provincial authorities, and some urban freeways by local authorities. Rural (minor) roads were provided and maintained by the provinces on the criteria of traffic demand and economic justification, but the distribution was not socially equitable, with some communities being over-provided and others under-provided.

Finding money for the building and maintenance of roads had always been a problem: From 1935 to 1985, national roads had been financed by a levy on fuel, provincial roads from vehicle registration and licensing fees, supplemented by allocations from general provincial budget, and local roads and streets from local taxes. National road funding from

a dedicated fuel levy ended in 1986, and was replaced by allocations from the national budget, with the fuel levy income being absorbed into national income. Expenditure on roads decreased, while defence, and (later) social services - housing, education, health, etc - received higher priority.

By 1980 rural, inter-city and local and metropolitan roads in *developed* areas were generally adequate to meet demand. In rural and urban *developing* areas, however, road facilities were barely adequate to meet relatively low existing demand levels. With the acceleration of urbanisation in these areas in the 1980s, local authority funds were completely inadequate to meet infrastructure demands.

Since the 1980s there has been a long-term decline in the financing of roads in real terms, (both in developed and developing areas) and an infrastructure provision and maintenance backlog has developed. The situation was exacerbated by the demise of the dedicated fuel tax in 1988, due to pressure on the fiscus from the areas of defence and social needs. Although the fuel tax continued to be collected, it was no longer a dedicated levy with the proceeds going to the National Road Fund, but became a general tax in line with Government's policy of general fund financing.

In response to the growing backlog in road building and maintenance and a decline in funding levels from conventional sources, new sources of financing were sought. With the reduction of the threat of energy sanctions, strategic energy funds were made available for the upgrading of rural road infrastructure. From 1980, toll financing was introduced to supplement the financing of higher-volume "economic" roads (mainly inter-city). This was, however, not a viable option for lower-volume "social" roads (mainly access) which make up the bulk of the South African road network. This rationale led to the establishment in 1998 of the South African National Roads Agency (SANRA), the purpose of which is to manage the primary road network (inter-city freeways or "economic" roads) of the country. The "social" road component (low volume roads key to basic access and development) is currently the responsibility of the nine provinces and local authorities.

The MSA Action Agenda[4] defines the key strategic actions for road infrastructure and operations as being:

- to define the strategic tourism road network;
- to manage road infrastructure investment; and
- to charge for road use and associated externalities

and for rural transport as being:

- to develop a co-ordinated framework across national government that will guide infrastructure investment in rural areas on the basis of a shared definition of rural sustainability; and
- to fund social or non-economic infrastructure in a transparent manner.

4.3. Road Traffic

A provincial responsibility, road traffic regulation was co-ordinated among the then four provinces by a set of uniform Road Ordinances promulgated in 1966. These have been amended many times, and were finally replaced by new National and Provincial legislation in 1996. South Africa has recently acceded to a Protocol on Transport, Communications and Meteorology for the South African Development Community (SADC) region which covers road policy, infrastructure, transport and traffic, as well as railways.

[4] The National Department of Transport concluded the *Moving South Africa* (MSA) project in August 1998. The project involved the National Transport Policy White Paper and the development of a long term strategy for transport to the year 2020. The Moving South Africa Action Agenda is the final summary of that process and its outcomes, describing both the process and the recommended strategy for the South African transport sector.

South Africa's road accident indices in terms of total accidents and particularly, casualties per number of population, per vehicle, and per passenger kilometre, compare unfavourable with all developed countries and many developing countries. Various initiatives have been taken to improve the traffic accident situation. In particular, the enactment of the National Road Safety Act in 1972 achieved modest success.

The steadily increasing vehicle fleet in South Africa only compounds stresses on the road network, and safety issues. It is estimated that car ownership levels currently stand at 95 vehicles per 1000 population, but this could alter dramatically if income redistribution occurs in South Africa. Figure 6 shows the steady increase in the car population over time from 1998 to the current level of over 3,5 million vehicles.

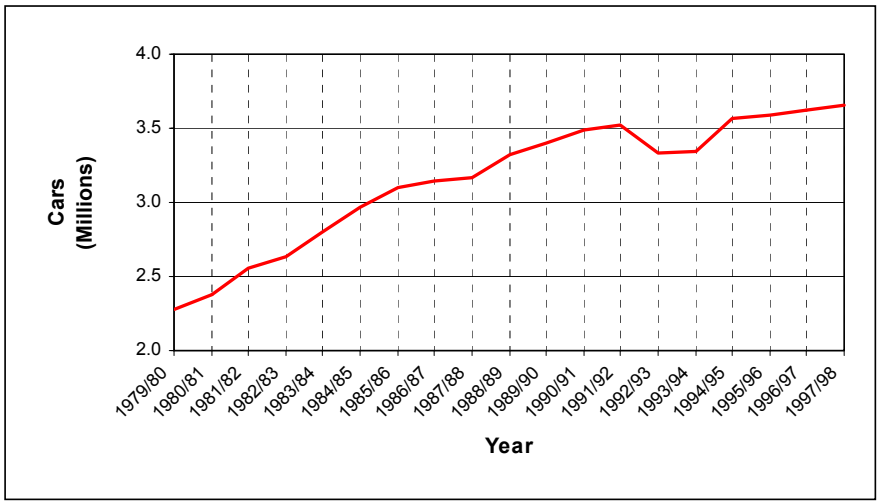


Figure 6. South African Motor Vehicle Population (Cars)

4.4. Energy for Road Transport

During the 1970s and 1980s, some countries applied sanctions against South Africa. The oil embargo posed a major threat to the South African Government of the time due to the dependence of any modern economy on energy imports. South Africa responded, *inter alia*, by increasing the capacity of its oil-from-coal manufacturing capability, and by building up strategic stockpiles of imported crude oil.

Other than as a contributor to the cost of transport, energy consumption for transport purposes has never been considered as a problem *per se*, until the disruptions in crude oil supplies from the Middle East in 1973 and 1977. Energy conservation measures such as restricted hours of fuel sale and drastically lowered speed limits (introduced for the duration of the disruptions), had a significant effect in reducing travel (and fuel use) and accidents.

The price of fuel (petrol and diesel) used by road vehicles is regulated by Government, and a significant proportion of the price paid by the user constitutes tax (see section 4.2). It has been speculated that increases in the price of fuel, either as a result of increases in the cost of production, or increases in the tax component, would increase the cost of private vehicle usage to such as an extent that it could be used as a policy instrument to limit private vehicle usage to and transfer travel to public transport modes, particularly rail.

4.5. Rail

The South African Railways (SAR) was established in 1910, and with time expanded to cover other modes of transport, namely Harbours (South African Railways and

Harbours - SAR&H), South African Airways (SAA), and Road Motor Transport The SAR&H was superseded by the South African Transport Services in terms of the South African Transport Services Act of 1981. Stemming from the findings of the De Villiers study of 1985, SATS, in terms of the South African Transport Services Amendment Act of 1986, was superseded by Transnet (its major divisions being Spoornet, Portnet, Petronet, Autonet, and South African Airways[5]), and the South African Rail Commuter Corporation (SARCC). Spoornet took over all of the SAR rail infrastructure, rolling stock, and operations, except for those relating to urban commuting, which became the responsibility of SARCC. SARCC owned the commuter rail infrastructure and rolling stock, and contracted with Spoornet to operate these commuter rail services.

Spoornet focused on the transport of freight, containers, and main-line passengers by rail. Its bulk freight operations (bulk coal between Mpumalanga and Richards Bay - COALLINK, and bulk ore between Sishen and Saldanha - OREX) are profitable, but its general freight and main-line passenger operations are not. Spoornet is currently restructuring, and is considering the commercialisation of some of its operations.

A separate business unit of Transnet, Metrorail, was established in 1997 to operate suburban commuter trains in the metropolitan centres of South Africa. Currently SARCC contracts all of its rail commuting services to Metrorail. SARCC is expected to invite tenders for a commuter rail concession, probably on the East Rand, in 2001, and this could result in the entry of a new rail operator. The pilot project could be followed after five years by concessions for commuter rail services in other metropolitan centres.

4.6. Land Freight Transport

The regulation of road freight transport was introduced with the Motor Carrier Transportation Act (Act No 39 of 1930). This effectively resulted in the protection of the SAR's freight and passenger rail services, and the slow growth of public road motor transport for many decades. Although regulation was rationalised in 1977 with the promulgation of the Road Transportation Act (Act No 74 of 1977), it remained in place.

Arising from recommendations of the National Transport Policy Study (NTPS) in 1984 and the White Paper on National Transport Policy in 1986, road freight was progressively deregulated from 1988 in terms of the Transport Deregulation Act (Act No 80 of 1988), with quantity regulation being replaced by quality regulation. This has resulted in such a rapid growth of road freight supply, particularly in the commercial sector, that there is now estimated to be an oversupply. The intense competition between road haulers has reduced tariffs. The MSA study identified a "first tier" of road freight operators, mainly large publicly-owned firms, well-managed and operating at high levels of service. These are quite profitable and offer internationally competitive tariffs. A "second tier" is, however, only marginally viable and many business operators in this tier have failed. A "third tier" comprises small entrepreneurs, often with single vehicles. These businesses are generally viable through the absence of overheads, and in many cases through delivering of a low-quality service, often with badly maintained vehicles, and in an unsophisticated segment of the market. There is a possibility that this small-freight sector might grow rapidly, in a fashion equivalent to that of the minibus-taxi industry.

The lowering of road freight tariffs has forced Spoornet to lower its rail freight tariffs to a point where Spoornet maintains that it has to lower its tariffs for general (i.e. non-bulk) freight to below cost in order to stay cost-competitive. Competition for the freight market has, however, to an increasing degree, become based on quality of service, with Spoornet having advantages of reliability and predictability, and road haulers advantages of faster door-to-door service. Although road haulers have won market share from rail since

5 The activities of Transnet's business units are as follows: Spoornet – rail (long distance freight & passenger); Portnet – port infrastructure & operations; Petronet – pipeline conveyance of bulk fuels; Autonet – road freight operations; South African Airways – National Flag Carrier.

deregulation, the situation is currently fairly static. Road user cost responsibility and charging studies have revealed that the cost recovery from some categories of road hauling is insufficient. Recovery of full road use costs and the costs of externalities from such haulers might result in increases in their tariffs, and some shift of market share in favour of rail.

After establishing an extensive rail and harbour infrastructure, SAR and its successors have continued to invest in recent years in freight infrastructure where such investment has favourable economic potential, unlike the case of rail passenger services. The biggest recent investment was in the Mpumalanga-Richards Bay export coal line and port. The Sishen-Saldanha ore export rail line and port was a private investment, subsequently taken over by SATS.

The White Paper on National Transport Policy of 1996 reaffirmed the policy of non-regulation of the road freight sector, and the MSA Action Agenda defined key strategic actions for freight transport as being the following core strategies:

i. System-wide actions:
- build densities of operations;
- use each mode (road, rail sea and air) more effectively and appropriately; and
- improve firm-level competitiveness.

iii. Strategic actions in rail infrastructure and operations:
- focus investments in strategic network;
- configure the appropriate sustainable supporting network;
- remove barriers to attaining cost efficiencies;
- invest in operational efficiencies; and
- financially separate appropriate services and customer groups.

iii. Strategic actions in road freight infrastructure and operations:
- define the freight network
- manage road infrastructure investment
- charge road haulers for road use and externalities
- enforce limits on gross vehicle mass

4.7. Public Passenger Transport

4.7.1. Rail

The SAR was historically the main provider of urban commuter services. Fares were low, and for political and social reasons Government limited the fare increases that would have been necessary to cover rising costs. This meant that in later years SAR and subsequently SATS were forced to cross-subsidise loss-making commuter transport services from profitable freight services. The low fares did, however, play a role in retaining rail's market share, especially when competition from the road modes developed later.

Provision of new commuter rail infrastructure, particularly to serve new housing and industrial developments or growth points was possible with capital funding approved by Parliament. From the 1980s, however, Government was no longer prepared to fund the large capital requirements as it had done in the past, with a resulting decline in the extension of the commuter rail infrastructure (track and stations) and replacement of rolling stock.

Figure 7 shows the changes in rail passenger trips over time. From the figure it becomes apparent that the usage of rail in terms of passenger trips per annum has been falling since the 1980s. This decline seems to have accelerated since the deregulation of taxi transport in 1989.

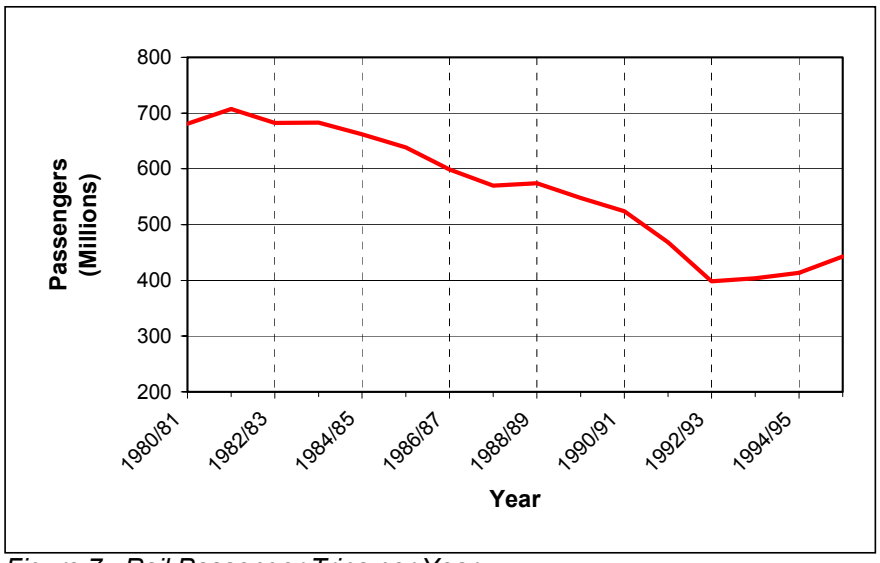


Figure 7. Rail Passenger Trips per Year

As with commuter services, the SAR was historically the major provider of main-line long-distance passenger transport services. The growth of private vehicle ownership, and the deregulation of inter-city coach services in the 1980s, have resulted in a decline in main-line rail passenger ridership, to such an extent that Spoornet now provides only limited budget main-line rail services. It does provide a few luxury main-line services targeted mainly at international tourists.

4.7.2. Bus

As from 1952 subsidisation of bus passengers was introduced in order to ensure a supply of labour to industrial and business centres. This took place in terms of the Black Services Levy Act (Act No 64 of 1952), the Black Transport Services Act (Act No 53 of 1957), and the Transport Services for Coloured Persons and Indians Act (Act No 27 of 1972). The subsidy grew rapidly, and the initial funding source, a levy on employers, proved inadequate and was replaced by direct funding from Central Government. The subsidised bus transport was in many areas the only option available to commuters, and therefore did not generally compete with rail transport. The growth of bus subsidy reached a peak in the 1990s, when Government was unable to meet the demands for subsidy. Competitive tendering for bus routes is now being introduced to replace the previous subsidy system, with Government (now devolved to the provinces) making up the difference between the tendered cost of a service and the income from fares, which keeps bus transport affordable for the poor.

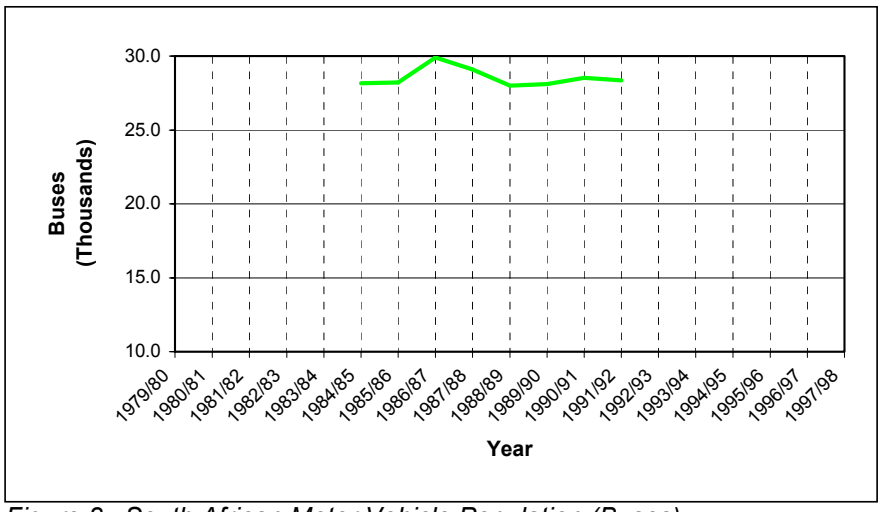


Figure 8. South African Motor Vehicle Population (Buses)

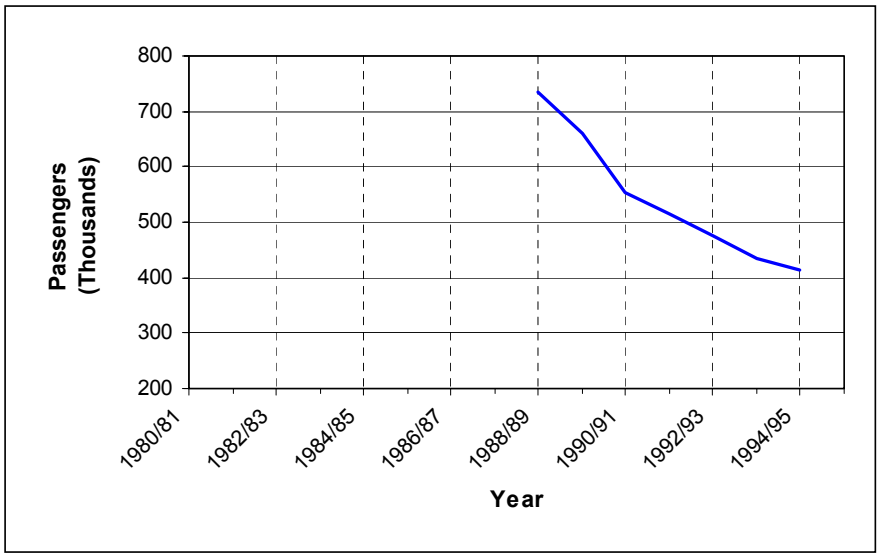


Figure 9. Bus Passenger Trips per Year

Figures 8 and 9 have been compiled from available (and incomplete) data. What the figures seem to suggest is that bus passenger transport has declined in South Africa in recent years, with the number of buses remaining constant (Figure 8) and the number of passenger trips sharply declining from 1989 to the present. This could be attributed to the deregulation of minibus taxi transport from 1989 which drew many commuters from rail and bus.

4.7.3. Minibus-taxi

Beginning in the 1950s, unmetered taxi services operating in large sedan cars began to provide public transport services in townships. In 1977 the regulations relating to taxi services were relaxed[6] , permitting a maximum of eight passengers. This legalised operations with the 8-seater kombi or minibus available at the time, and initiated a rapid growth of the minibus-taxi sector, initially with 8- and later with 16-seater vehicles. Such vehicles, intended by the manufacturers for family use rather than public transport, were

[6] Road Transportation Act – Act No 74 of 1977

ill-suited to heavy loads and continual usage. Attempts by authorities to regulate and limit entry of new operators were overruled by Government in order not to stifle the growth of the entrepreneurial informal sector. This resulted in a huge growth of the sector, to the present stage of over-saturation. Figure 10 shows this growth in minibus taxis. This rapid growth is partially due to the relative ease of obtaining permits and partially to the large portion of pirate operators (without permits). During the past two decades the minibus-taxi has captured more than 60% of the commuter market share - a remarkable feat, particularly as the minibus-taxi industry receives no direct subsidy.

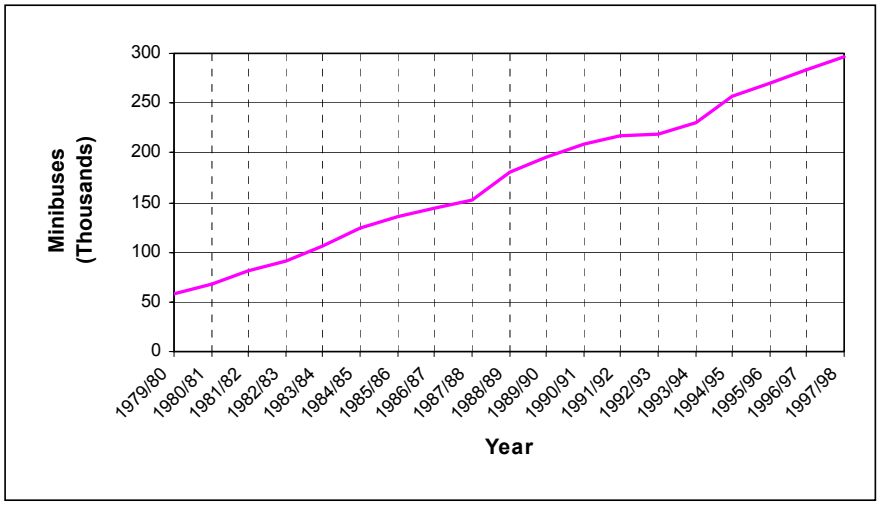


Figure 10. South African Motor Vehicle Population (Minibuses)

The unsuitability of vehicles, high road accident rates, a generally low quality of service, and inter-operator strife associated with the sector has led Government to initiate measures to formalise the industry. These measures include the registration of associations and operators, heightened enforcement of permit requirements, roadworthiness, and traffic rules, and the proposed recapitalization of the industry, with the replacement of the ageing 16-seater minibus fleet by more suitable 18- and 35-seater, diesel vehicles.

4.7.4. General issues

Although both the White Paper on National Transport Policy and MSA emphasize the need to reduce long commuting distances, *inter alia* by revising land use policies (e.g. densification and infilling). Divided cities remain and are being perpetuated as a result of land developers giving little consideration to the cost implications of long commuting distances when making development decisions.

The MSA Action Agenda defined key strategic actions for passenger transport as being:

i. Densification of transport corridors:
   - innovative local-level co-operative governance;
   - local transport/land use solutions.

ii. Optimal deployment of modes to meet customer service requirements:
   - customer-based transport planning;
   - corridor-supportive infrastructure investment;
   - tough road-space management.

iii. Improving firm-level performance:
- well-planned tenders;
- regulation and enforcement;
- improving sustainability;
- stable and consistent funding.

4.8. Urban Transport

The Driessen Committee of Inquiry into Urban Transport Facilities in 1974, and the Urban Transport Act of 1977 resulted in the establishment of Metropolitan Transport Areas and the formalisation of urban transport planning processes. The limited funding available, however, resulted in relatively little implementation of urban transport improvement projects, with priority being given to traffic management and public transport rather than the funding of infrastructure improvements.

The functions under the Urban Transport Act have now been devolved to the provincial authorities. Urban and public passenger transport planning is carried out by metropolitan and local authorities, which are currently being restructured as a result of a local authority demarcation process. Funding is derived mainly from local rates and taxes and an employment levy, with contributions (mainly for public passenger transport services) from the provinces. Funding levels, however, still remain inadequate.

4.9. Air Transport

Domestic air transport was deregulated by the Air Services Licensing Act of 1990 and the Aviation Amendment Act of 1992. Other airlines started to compete with SAA, with a resultant growth in domestic air travel. The deregulation of long-distance road coach services resulted in increased competition between air and road transport - largely based on passengers' and tourists' pricing and speed considerations.

International air transport was deregulated in 1993 by the International Air Services Act. The political change in South Africa which culminated in a change of government in 1994, brought with it an end to energy and other sanctions. The number of foreign airlines providing international services to South Africa increased rapidly, with an associated increase in international air travel.

5. OVERVIEW OF THE CURRENT SOUTH AFRICAN TRANSPORT SYSTEM

This section contains an overview of current state of the South African transport sector across all modes. As such, it provides a snapshot of the size of the various components of the sector and can be used as a basis for building an outlook for the future of the sector. Table 2 refers. Table 2.

Table 2. Overview of the South African Transport System (1996)

COMPONENT	MAGNITUDE
ROAD	
Infrastructure:	
National	6 140 km
Provincial	176 290km
Local	84 000km
Vehicles:	
Passenger cars	3 838 000
Minibus taxis	120 000
Commercial vehicles	1 250 000
Freight:	
Million ton conveyed	250
Million Ton km	81 000
Passengers:	
Million pax trips	
Taxi	2 500*
Bus	624*
Million pax km	
Taxi	67 500
Bus	17 472
RAIL	
Infrastructure:	
Spoornet	33 000km
Metro Rail	2 500 km
Vehicles:	
Electric locos	2 164
Diesel locos	1 376
Rolling stock	133 000
Freight (Spoornet):	
Million tons	175
Million ton km	78 000
Passengers (SARCC):	
Millions pax trips	520*
Million pax km	10 400
AIR	
Infrastructure:	
ACSA airports	9
Provincial/Local airports	121
Private airports	74
Usage:	
Aircraft movements	490 000
Passengers	14 945 800
Freight (tons)	193 600
SEA	

Table 2. Overview of the South African Transport System (1996)	
COMPONENT	**MAGNITUDE**
Infrastructure: Portnet ports	7
Usage: Shipping movements (vessels) Cargo handled (tons)	 13 422 139 262 000

Source: Department of Transport, 1997) (* Moving South Africa estimates)

5.1. Vehicle Population

5.1.1. Road transport

The rate of growth in the motor vehicle population has exceeded the rate of human population growth since 1970. The motor vehicle population has increased by an average of 4.1% per annum over the period 1970 – 1980 and 3.85 per year between 1980 and 1990, during which time the human population grew at an average of 2.8% and 2.5% per annum, respectively (Mirrilees et al, 1996).

The total estimated number of vehicles registered in South Africa is shown in Table 3. An important point to bear in mind is that since 1992, no reliable data exists on the registered vehicle population of South Africa, necessitating estimates for the project. Estimates for the project were compiled using the 1992 registration data as a base and extrapolating upwards using MSA data, vehicle sales data, population growth and estimates for GDP growth.

Table 3. Estimated total motor vehicle population of South Africa, 1996 to 2020						
Year	**Cars**	**Minibuses**	**Comm. Vehicles****	**Buses**	**Motor cycles**	**Total**
1996	3 838 000	230 300	1 222 000	29 900	262 000	5 582 200
2020	6 371 100	302 800	3 070 300	39 400	222 800	10 006 400

(Source: Department of Transport, Transport Statistics, 1997)
(Source: International Road Federation, 1999) *(Project estimates)

**Commercial vehicles in this case include light, medium, heavy and extra heavy vehicles commercial, and construction vehicles.

From the data in Table 3, it is apparent that in 1996, out of the 5,6 million vehicles on the road, 3,8 million were private cars. The greatest increase in vehicle type during the 1990s has occurred in minibuses, with the deregulation of the minibus taxi industry in 1989. The increasing share of the passenger transport market to minibus taxis has meant very little change in the number of buses over time. Meanwhile, high import duties on motorcycles have led to a decline in sales of this mode. The deregulation of freight transport has led to an increase in the number of vehicles, most of this occurring in the long haul sector as traffic has switched from rail to road.

A further concern in terms of environmental impacts is the apparent slow retirement of vehicles (see Table 4 below).

Table 4. Average Age of Motor Vehicles (Years), 1985 to 1992					
Year	**Car**	**Minibus**	**Comm. Vehicle**	**Bus**	**Motorcycle**
1985	7.4	6.5	7.3	7.7	5.2
1992	9.6	8.0	9.6	10.7	10.2

Comment: Adjust Table

(Source: Department of Transport, Transport Statistics, 1997)

An analysis of vehicles on the road indicates that the average age of cars has increased from 7.4 years in 1982 to 9.6 years in 1992. It has been estimated that the average age of cars on South African roads will be around 12.5 years in the year 2000 (Van Zyl, 1989). The increasing proportion of older vehicles will have a significant impact on long-term fuel use.

The public transport system, normally offered as an alternative to private car transport in many countries, is largely a commuter system in South Africa with traditionally low levels of service. An operator-based bus subsidy system, with no incentives for the operator to keep maintenance costs down, has translated into the slow retirement of buses. Operating conditions in the minibus taxi industry have similarly resulted in low levels of capital reinvestment in minibus fleets. The average age of minibus taxis is estimated to be approximately 9 years, while that of buses is estimated at more than 11years, with obvious implications in terms of energy consumption and emissions levels.

The growth in the vehicle fleet projected in Table 3 can therefore only partly be substantiated by the retail sales of new vehicles given in Table 5. From Table 5 it is evident that sales of new vehicles were generally in decline over all vehicle types during the 1990s, with the exception of 1995, where a pronounced surge in confidence took place in the wake of the country's democratic elections. This could also have been the result of vehicle purchases postponed over a number of years immediately prior to 1994, as purchasers adopted a "wait and see" attitude during the period of uncertainty in the run up to the elections. The purchases since 1995 have again levelled off and resumed their downward pattern from 1995 to 1998.

Table 5. Retail Sales of new vehicles, 1989 to 1998

Year	Passenger Cars		Light Commercial vehicle		Medium & Heavy Commercials	
	Total sales	% growth p.a.	Total sales	% growth p.a.	Total sales	% growth p.a.
1989	221 554	NA	116 999	NA	13 944	NA
1990	209 636	(5.4)	112 488	(3.9)	12 655	(9.2)
1991	197 750	(5.7)	100 391	(10.8)	9 934	(21.5)
1992	183 662	(7.1)	91 606	(8.8)	8 691	(12.5)
1993	195 032	6.2	95 150	3.8	7 869	(9.5)
1994	191 979	(1.6)	102 186	7.4	8 958	13.8
1995	236 584	23.2	128 397	25.7	11 803	31.8
1996	249 838	5.6	129 575	0.9	13 567	14.9
1997	239 762	(4.0)	114 354	(11.8)	12 759	(6.0)
1998	203 821	(15.0)	99 078	(13.4)	11 511	(9.8)

(Source: NAAMSA)

5.2. Energy Usage by the South African Transport Sector

Transport has about the same energy use as residential (each accounting for 24.9% of total consumption, i.e. 2.4 billion Tetra Joule each), and as such they take second place after industry, which represents 35.4% of the total energy use in the country.

The modal use of energy by the South African transport sector is summarised in Table 6. Over 90% of transport energy is derived from liquid fuels. The remainder is mostly provided by electricity.

A certain amount of the petrol and diesel that is used by the transport industry is synthetically produced from coal. This process aggravates CO_2 emissions. Most important in this regard is the role of Sasol in the provision of transport fuel through the "fuel from

coal"-process. Sasol provides approximately 23% of the liquid transport fuel used in South Africa (Department of Minerals & Energy, 1999). The remainder of transport fuels are supplied by oil companies using conventional refining processes.

In addition, electricity, which is consumed by electrical rail locomotives, is produced by coal-burning power-stations, which in themselves are pollutant. Although these are not issues of transport *per se*, they could be classed as "upstream" processes to the transport sector.

In 1995, coal sales totalled 211.9 million ton, of which 152.2 million ton (about 72%) was used locally. About 57% of this local coal consumption was used to generate electricity, and a further 30% for liquid fuels production (South African Year Book, 1996).

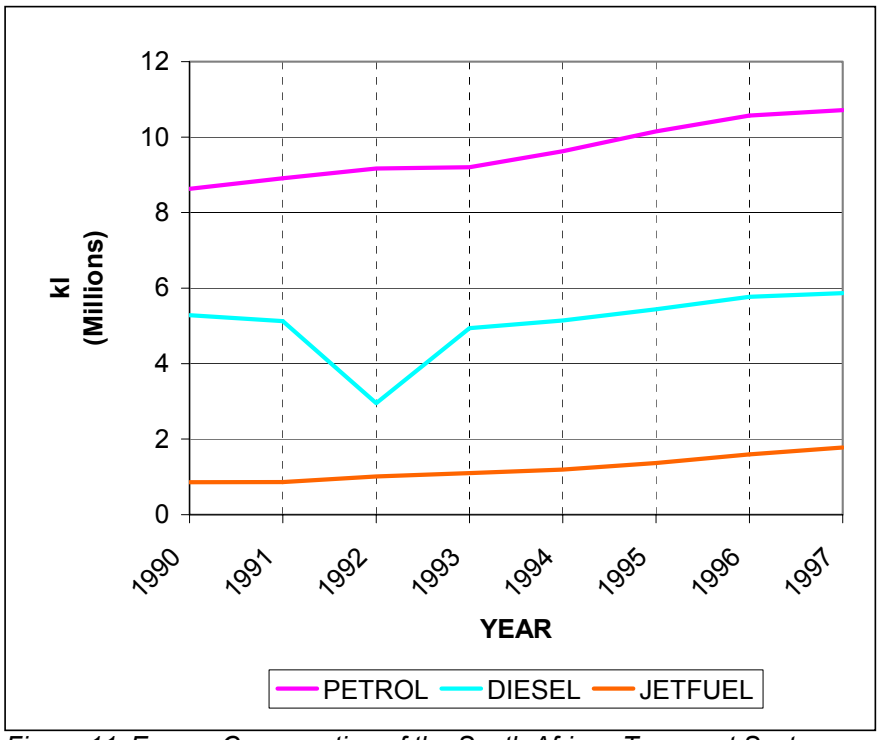


Figure 11. Energy Consumption of the South African Transport Sector

Table 6. Energy Consumption by the SA Transport Sector, 1996						
Mode	**Coal (tons)**	**Electricity (GWh)**	**Petrol (kl)**	**Diesel (kl)**	**Avgas (kl)**	**Jet fuel (kl)**
Road	-	7 539	10 467 734	3 315 331	-	-
Rail	23 402	3 446 195	-	196 375	-	-
International Air	-	-	-	-	-	855 173
Domestic air	-	12 890	-	-	25 157	745 293
Pipeline	-	59 092	-	-	-	-
Other	-	748 618	3 161	3 153	-	-
Total	23 402	4 274 334	10 470 895	3 514 879	25 157	1 601 006

(Source: Department of Minerals & Energy, Digest of South African Energy Statistics, 1998)

5.2.1. Road transport

The demand for energy per mode for road transport has been estimated in this section to correspond to the fuel consumption data published by DME. This serves as a check on vehicle registration numbers, around which there is some uncertainty in South Africa. It also provides a useful comparison of vehicle kilometres and associated fuel usage per mode for road-based transport. Calculating annual VKT per vehicle type from the vehicle population data in Table 3 and the data for AADT in Schutte & Pienaar (1996), then multiplying by the fuel consumption data in Schutte & Pienaar (1996), (which is based on relevant VOC models for South Africa), provided an. estimate which was then verified by comparison with the (audited) DME figures. Table 7 contains the estimated demand for energy per road transport mode as of 1996.

Table 7. Estimated Transport Energy Use by Mode, 1996

Comment: Adjust Table

Mode	Fuel usage (kl)[7]	Vehicles	Vehicle-km (Million)[8]
Private car	8 366 840	3 838 000	76 760[9]
Light commercial	1 494 080	667 000	13 340
Minibus	605 934	160 300	4 328
Sub-total - Petrol	**10 466 854**	**4 665 300**	**94 428**
Private car	49 840	28 000	560
Minibuses	3 375	1 000	27
Buses	236 808	29 900	1 076
Light Commercial	228 690	115 500	2 310
Heavy Commercial vehicles			
Trunk (HGVs)	2 154 177	64 760	4 986
Distribution (LGVs)	645 744	122 300	4 035
Sub total – Diesel	**3 318 634**	**361 460**	**18 297**

(Source: Project estimates).
(Source of vehicle operating cost data – Schutte & Pienaar, 1996)

The consumption of leaded (93 and 97 octane) versus unleaded (91 and 95 octane) petrol also presents cause for concern in the transport sector. Approximately 92% of the petrol sold in 1996 was leaded. Although the use of unleaded petrol has increased slightly (by 1% between 1996 and 1997), the large proportion of leaded fuel is a source of concern in terms of local air pollution.

5.2.2. Estimates of land transport energy usage 1996 to 2020

The overall use of petrol and diesel by the transport sector is expected to increase. Future (2020) petrol and diesel consumption was estimated using the long-term energy forecasting and trend modelling work undertaken by Essmann (1992) for the Department of Minerals and Energy (DME). This forecast is shown in Table 8. The forecast for diesel

7 Fuel usage estimates were made using fuel consumption data per mode in Schutte & Pienaar (1996) in litres per 1000VKT. These were: petrol cars – 109l/1000VKT; petrol minibuses – 140l/1000VKT; petrol LCVs – 112l/1000VKT; diesel cars – 89l/1000VKT; diesel minibuses – 125l/1000VKT; diesel LCVs – 99l/1000VKT; Buses – 419l/1000VKT; LGVs – 160l/1000VKT & HGVs – 432l/1000VKT.

8 Vehicle kilometres traveled (VKT) was derived using estimates for average annual distance traveled (AADT) per mode contained in Schutte (1996): cars – 20000km; minibuses – 27000km; LDVs – 20000km; Buses – 36000km; LGVs – 33000km & HGVs – 77000km.

9 On average private cars in South Africa thus travel 20 000 kilometers per year, which is substantially higher than the often quoted 10 000 miles (or 16 000 kilometers) per year for private vehicles in the United States.

is higher than that for petrol, probably because of the deregulation of road freight in 1989, with road freight traffic increasing at the expense of rail.

Table 8. Petroleum and Diesel Consumption (in kl) by the Transport Sector, 1996 & 2020

Year	Petroleum	Diesel
1996**	10 470 895	3 514 879
2020*	17 604 649	6 359 300
Avg. annual growth (%)***	2.1	2.4

***(Source: Essmann, 1992)
**(Source: Department of Minerals & Energy, 1998)
*(Project estimates)

5.2.3. Pricing and taxation of the transport sector

Governmental revenue is obtained directly from transport users through taxes incorporated into the fuel price. (See Table 9 for a breakdown of the fuel price of petrol and diesel in Johannesburg – Gauteng Zone 9C).

Until 1988 the fuel levy went directly into the National Road Fund (NRF). The fund was used to finance construction and maintenance of road infrastructure, primarily at national level, but also to some extent at provincial level. In 1988 the situation was altered significantly, with revenues from the fuel levy being channelled into the general fiscus. The fuel levy thus became a form of general tax.

The post-1988 system allowed for the financing of road infrastructure through budget allocations from Central Government to the NRF. Institutions such as the South African Roads Board (SARB) and the Function Committee: Roads of the Department of State Expenditure decided on the allocation of funds. Since April 1998, *national* roads in South Africa have been managed by the South African National Roads Agency (SANRA), and have been funded by an earmarked portion of the fuel levy (approximately 6c/l). *Provincial* roads are funded through provincial allocations.

Until now, the administration of the fuel levy, in terms of assessment and collection, has involved the Department of Finance (DoF), Department of Minerals & Energy (DME) and the oil companies operating in South Africa[10].

As a result of the role of the oil companies in collecting the tax (through submissions to DoF in terms of depot sales), they have substantial data on the number of litres sold per fuel type and the magisterial district in which the sale took place. The system had been primarily supply-oriented because of the importance that the previous government attached to the task of ensuring fuel supplies in the country during the sanctions era (pre-1994).

[10] The oil companies operating in South Africa are: AfricOil (Pty) Ltd, BP Southern Africa (Pty) Ltd, Caltex Oil (SA) (Pty) Ltd, Engen Petroleum (Ltd), Exel Petroleum (Pty) Ltd, Sasol Oil (Pty) Ltd, Shell South Africa (Pty) Ltd, Tepco (Pty) Ltd, Total South Africa (Pty) Ltd, Zenex Oil (Pty) Ltd.

In general, the fuel pricing and taxation system in South Africa has the following characteristics:

- Leaded petrol (93 and 97 octane), unleaded petrol (91 and 95 octane) and diesel fuel is sold;
- South Africa is divided into a number of fuel price zones, each comprising a number of magisterial districts;
- Each fuel price zone has a petrol price allocated to. This price is published in the Government Gazette. Price changes are made periodically via the Gazette;
- Changes to the diesel price in a price zone is recommended via the DME.

At present, the fuel tax component of the fuel price is readily identifiable and generally amounts to about 30 percent of the price of unleaded petrol, 31 percent in the case of leaded petrol and 31 percent of the price of diesel, as shown in Table 9.

Table 9. Breakdown of Fuel Price into Components (Gauteng Zone 9C December 1999)

COMPONENT	93-OCTANE		91-OCTANE (ULP)		DIESEL	
	c/l	%	c/l	%	C/l	%
Estimated Landed cost	114.442	39.4628	116.642	40.7839	109.250	45.1913
Transport cost	11.300	3.8966	11.300	3.9510	11.300	4.6743
Equalization fund	8.000	2.7586	8.000	2.7972	8.000	3.3092
Wholesale margin	17.558	6.0545	17.558	6.1392	17.550	7.2596
Customs & Excise	4.000	1.3793	4.000	1.3986	4.000	1.6546
IP tracer dye levy*					0.150	0.0620
Retail margin**	24.500	8.4483	24.500	8.5664		
RAF	14.500	5.0000	14.500	5.0699	10.300	4.2606
Fuel tax	90.600	31.2414	84.400	29.5105	76.100	31.4788
Delivery cost	5.100	1.7586	5.100	1.7832	5.100	2.1096
TOTAL	**290.000**	**100.0000**	**286.000**	**100.0000**	**241.750**	**100.0000**

* IP tracer dye levy applies only to diesel fuel[11]

** Retail margin applies only to petrol

If all the other tax components are considered (i.e. customs and excise, RAF levy, Equalisation Fund levy *and* fuel tax), the *overall* tax component of the fuel price amounts to 40 percent for leaded petrol, 39 percent for unleaded petrol and 41 percent for diesel fuel.

11 Owing to extensive fuel fraud through the illegal dilution of diesel fuel with illuminating paraffin (a cheaper fuel), a tracer dye has been inserted into paraffin. The levy on diesel is intended to cover monitoring and enforcement of regulations regarding the sale of undiluted diesel fuel to users. (The dilution of diesel fuel may also imply that the diesel vehicle estimates in Table 7 are underestimates).

The total revenue obtained from taxation of the transport sector is shown in Table 10.

Table 10. Revenues Obtained from the Transport Sector, 1996	
Component	**Revenue (Rm)**
Fuel tax	10 159
RAF levy	1 243
Equalisation fund levy	1 489
Customs & excise duty	705
Value added tax (VAT) on new vehicles	1 994
Tolls	285
TOTAL	**15 875**

(Source: South African Reserve Bank; Project estimates)

6. POLICIES IMPACTING ON SOUTH AFRICA'S TRANSPORT SECTOR

This section contains extracts from relevant government policy documents published by various line function departments within the South African government. The objective of the section is to identify the key thrusts which will shape transport, energy and environmental policy in the future. This will be especially useful for the scenario formulation component of this project.

6.1. The National White Paper on Transport Policy (August 1996)

The vision of the White Paper on National Transport Policy aims to minimize the sector's energy and environmental impact in order to achieve sustainability:

6.1.1. Transport vision

"Provide safe, reliable, effective, efficient, and fully integrated transport operations and infrastructure which will best meet the needs of freight and passenger customers at improving levels of service and cost in a fashion which supports government strategies for economic and social development whilst being environmentally and economically sustainable."

6.1.2. Policy goals

The following policy goals were identified to address the sector's energy and environmental impacts:

- To support the goals of the RDP for meeting basic needs, growing the economy, developing human resources, and democratising decision making;
- To enable customers requiring transport for people or goods to access the transport system in ways which best satisfy their criteria;
- To improve the safety, security, reliability, quality and speed of transporting goods & people;
- To improve South Africa's competitiveness and that of its transport infrastructure and operations through greater effectiveness and efficiency to better meet the needs of different customer groups, both locally and globally;
- To invest in infrastructure or transport systems in ways which satisfy social economic, or strategic investment criteria; and
- To achieve the above objectives in a manner which is economically and environmentally sustainable, and minimises negative side effects.

6.1.3. Land passenger transport

For land passenger transport the above policy goals imply the promotion of:

- more efficient urban land use structures, correcting spatial imbalances and reducing travel distances and times for commuting to a limit of 40km or one hour in each direction;
- the use of public transport over private car travel, with the goal of achieving a ratio of 80:20 between public transport and private car usage; and
- the use of more energy efficient and less pollutant modes of transport.

6.1.4. Land freight transport

For land freight transport these policy goals should translate into measures that:

- level the playing fields to enable fair competition between the various land transport modes; and
- encourage integration, intermodalism and partnerships between the modes, provided this does not result in monopolies.

6.2. The Moving South Africa (MSA) Action Agenda (May 1999)

The MSA project sought to establish a national strategy for transport to the year 2020. The main policy thrusts coming from MSA in terms of passenger and freight transport are highlighted below.

6.2.1. Main policy thrusts

i. Passenger transport

- *"Densify in corridors and nodes to achieve economies of scope, effectively turning around the current trend towards dispersal;*

- *Optimise modal economies and service mix through infrastructure investment to support the corridors, and by selecting the optimal mode based on the cost/service trade-off. This involves also facilitating differentiated service and choice where ever possible, but with subsidisation only for the optimal mode, if at all. Tough road space management is necessary to prioritise public transport and subsidies should be targeted at affordable access to the optimal mode; and*

- *To improve firm level performance through competitive tendering to the private sector with incentives for productivity innovations, effectively regulating all modes, especially taxis, and improving sustainability through capital investment".*

ii. Freight transport

- *"Build density in the transport system through focussing freight flows in select corridors by supporting and reinforcing current trends to build the backbone of the system;*

- *Build economies of scale within the different modes by focussing the role of the modes, maximising scale economies within each mode and offering differentiated services where economically sustainable; and*

- *Improve firm level competitiveness by removing obstacles, improving integration, ensuring sufficient reinvestment to maintain infrastructure, restoring price and value signals between customers and providers and building an industry platform which drives differentiation and innovation".*

iii. Urban passenger transport

Based on surveys, MSA estimates the current modal split for urban passenger transport according to income group to be the percentages shown in Table 11.

Table 11. Urban Passenger Modal Split (%) by Income Group

Income group (Rand p.a.)	Train	Bus	Taxi	Car	Walk / Other
<6001	8	10	29	10	43
6001-9600	16	17	28	7	31
9601-16800	19	16	35	13	17
16801-30000	13	13	34	26	14
30001- 48000	6	7	20	57	11
48001-72000	3	5	7	78	6
>72000	2	1	3	92	2

(Source: Moving South Africa, 1998)

It is clear that, at earnings above R30 000 per annum, car use begins to dominate - this car dependency has important implications for transport energy demand.

MSA also split the urban passenger market into various segments, as shown in Table 12.

Table 12. Urban Passenger Segmentation

Segment	Criteria	% of Urban Population	Number (1996) M	% Growth to 2020
Strider (prefers to walk or cycle)	Cost	23	5.4	28
Stranded (no affordable public transport available)	Cost	12	2.8	28
Survival (captive to cheapest PT option)	Cost; speed	17	4.1	24
Sensitive (captive to PT but selects best option)	Cost; speed; choice	10	2.1	25
Selective (can afford car but willing to use PT)	Speed; choice; convenience	19	4.1	39
Stubborn (only uses car)	Speed; convenience	19	3	88
Total urban population		21.4m		38% (1.4% p.a.)

(Source: Moving South Africa, 1998)

It is significant for transport energy consumption that the highest growth forecast is in the "stubborn" segment.

6.2.2. Key strategic issues

A number of key strategic issues were identified by MSA as far as urban passenger transport is concerned.

i. Lack of affordable basic access

As can be seen in Table 12, 2.8 million people (12% of the total urban population) fall into the category of "stranded", i.e. with no access whatsoever (physical or financial) to public transport of any kind. This segment is projected to grow by 28% to 3.6 million by the year 2020. Even with the payment of R2.8 million in public transport subsidies (1997), only 40 per cent of the "stranded" apparently have access to bus transport, 20 per cent have access to train, while a major portion (78 per cent) say they have access to the unsubsidised taxi mode.

Comment: This does not make sense

ii. Ineffective public transport

The public transport system, when offered as an alternative to private car transport, has significant shortcomings in terms of access time, travel time, safety and comfort. The system is largely a commuter system with traditionally low levels of service, an operator-based subsidy system, with all incentives geared to the operator to keep costs to

an absolute minimum. This has been translated into poor levels of capital investment in vehicle fleets. The average age of minibus taxis is approximately 9 years, while that for buses is 11 years, with obvious implications for emissions levels. Fare recovery is extremely poor, with revenue covering a mere 30% of costs in rail, and 50% in bus transport. The sustainability of the public transport system will thus become a major concern in future.

iii. Increasing private car dependence

Increasing private car usage is widely expected in South Africa over the next 20 years, with the "stubborn" category of the population (currently 3 million) projected to grow by 88% (see Table 12). Likewise, the "selective" element is set to grow by 39%. Partly due to the lack of an attractive public transport system as alternative to travel by private car, and partly as a result of incentives such as company cars and car allowances that make the use of a car a relatively cheap and attractive option, it is estimated that the car fleet in South Africa will grow by 64% between 1996 and 2020.. The issue is therefore not only to get the "stubborn" out of their cars, but also to keep a substantial portion of the "selectives" on public transport.

iv. Sub-optimal spatial planning

The Apartheid system's legacy of dormitory townships on the urban periphery is being exacerbated by current land use planning in South Africa which locates new low-cost housing on the cheapest land and away from the urban centres. In addition, the current development practice of locating commercial development outside the CBD and in the suburbs, creates urban sprawl, and renders the service of these areas by public transport non-viable. The average urban commuter trip distances in South Africa is 17km for private vehicles and 20km for public transport, compared with 10km in European and Latin American cities.

6.2.3. Key initiatives

In addressing the above challenges, the MSA Action Agenda advocates a number of actions.

i. Stopping the dispersion of activities

Densification of settlements and commercial activities needs to be undertaken. The commitment to it already exists in government policy, e.g. in the Urban Development Strategy, the White Paper on Transport Policy, Integrated Development Plans (IDP's) and the Development Facilitation Act. This would involve the densification of transport corridors in order to concentrate activities and users.

ii. Investment in public transport as an antidote to congestion

The MSA Action Agenda argues against the notion of building more roads to relieve congestion, as this usually encourages further growth in vehicle usage. Instead, it argues for some form of travel demand management (TDM), be it in the form of control mechanisms (e.g. parking and access controls), pricing, or incentives (e.g. HOV lanes to promote ride sharing). This should occur in conjunction with investment in the public transport system to create a feasible alternative.

iii. Externalities

Arising from the problems inherent in urban passenger transport, i.e. the increase in private car dependency and the expense required to create a viable public transport system as an alternative, the MSA Action Agenda was explicit in identifying the need to examine transport externalities in South Africa.

The externalities arising from accidents was estimated by MSA to be R12 billion per annum. Of this amount, only 56 per cent is covered by insurance, as drivers are often not insured. MSA perceived externalities arising from congestion and emissions to be an even more severe long-term threat and accordingly recommended in the Action Agenda that transport externalities be internalised. To achieve this objective, three actions must be taken:

- *The role of the fuel tax must be determined* - should it be a general tax or should it be a road user charge? In the case of the latter, an additional charge should be levied to internalise externalities, and road needs will be met from this funding source. If it is a general tax, mechanisms to allocate funds from Treasury to the transport sector ought to be more apparent;

- *Externality costs are to be assessed and allocated* - an estimate of the externality costs associated with transport in South Africa needs to be made;

- *Allocation of externality costs* - once determined, the responsibility for externality costs needs to be determined and factored into the price of for example fuel.

6.3. White Paper on Energy Policy (December 1998)

During the sanctions era, the prime task of Government was to ensure sufficient fuel supplies to the country. Accordingly, a highly organised system of fuel acquisition and distribution was set up to achieve this objective. The primary focus of the system was on the "supply" of fuel, to the detriment of "demand" policies and issues. Although it is impossible to ignore supply issues completely, the emphasis has lately shifted more towards demand issues.

The draft White Paper on Energy Policy includes some important points on transport energy aspects:

- **Pricing of liquid fuels -** a suitable tax differential between diesel and petrol is to be determined through research and negotiation between government departments and stakeholder interest groups;
- **Efficiency of transport energy use -** DME is to advise other government departments, e.g. DOT and DOF, on the energy efficiency implications of alternative modes and public transport subsidy policies, and will provide assistance in the formulation of fiscal and transport policies to promote energy conservation and efficiency. Information on fuel use characteristics of new vehicles (a cross-cutting issue) will be provided by DME;
- **Environmental impacts of transport energy use -** the impacts of congestion and emissions is to be taken into account (another cross-cutting issue);
- **Alternative fuels -** research is to be undertaken on alternative fuels for various modes, e.g. electricity, gas or diesel;
- **Intergovernmental co-ordination -** an interdepartmental Transport Energy Co-ordinating Committee is to be established to co-ordinate and integrate policy formulation between the Department of Minerals & Energy and other relevant departments; and
- **Transport energy and land-use policy – the** Transport Energy Co-ordinating Committee is to give attention to the formulation of guidelines to assist metropolitan and other planning authorities to consider the transport energy use impacts of land use, transport and traffic management plans.

6.4. South African Studies Relevant to the Valuation of Externalities

Comment: Dates please – I have already put in the dates of the White Papers as requested

Several recent South African studies are relevant to the determination of transport externalities in South Africa. These are:

- Land Transport Pricing Study (LPTS), funded by the National Department of Transport;
- Land Transport Financing Study, funded by the National Department of Transport;
- Transport Externalities Study, initiated by the National Department of Transport;
- Motor Vehicle Emissions Study, initiated by the Department of Minerals & Energy; and
- Greenhouse Gas Emissions Inventory, funded by the Department of Environmental Affairs and Tourism.

6.4.1. Land Transport Pricing Study

The objective of the Land Transport Pricing Study (LTPS), initiated by the National Department of Transport (NDoT), was to examine the

"... costs of provision of land transport infrastructure, determining the extent to which these costs are attributable to the various categories of users of that infrastructure, and recommending policy measures for internalising these costs so as to present the transport market with appropriate pricing signals" (LTPS, 1998)."

This was undertaken for national road corridors in South Africa. In addition to the objective of attaining an optimal pricing mechanism for infrastructure usage by mode, the study also examined the issue of price adjustments in order to internalize the external costs of land transport in South Africa. Of major importance was the allocation of responsibility for these externality costs across modes, at least at a strategic level.

6.4.2. Land Transport Financing Study

In a recent study on the financing of Land Transport in South Africa (Department of Transport Contract Report CR-98/038), it was estimated that R15 500 million would be required annually to fund the needs of urban land transport in South Africa. At present, only R10 000 million can be obtained from existing sources. The report recommended that the externalities associated with motor vehicle transport be internalized through a system of user charges on private motor vehicle use in urban areas, and that these charges be earmarked for the financing of public transport.

"These charges should consist of an urban petrol levy and TDM-related levies, and should be collected at local level. This recommendation is consistent with proposals in the White Paper on Local Government." (Department of Transport Contract Report CR-98/038).

The final recommendation of the report was that current revenues be channelled into the numerous Land Transport Funds that are to be established. The remaining R5 500 million needed, could be raised through an urban fuel levy, which would imply an increase in the price of petrol of approximately 40c/litre.

6.4.3. Department of Transport Externalities Study

Comment: INSERT HERE AS BECOME AVAILABLE

6.4.4. Department of Minerals and Energy: Emissions Study

The Department of Minerals and Energy funded a study to sample vehicle emissions in the main urban centers of South Africa. Phase 1 of the study (DME Report EV9404, 1995) has been published, and contains important information on the scope of the detailed work to follow, as well as on the present status of transport emissions work in South Africa.

Report EV9404 identified the following atmospheric pollutants associated with vehicle emissions:

- Ozone (O_3);
- Carbon monoxide (CO);
- Carbon dioxide (CO_2);
- Oxides of nitrogen (NO*x*);
- Non-methane hydrocarbons (NMHC); and
- Lead (Pb).

The contribution by transport to each of these is estimated to be, in terms of percentage of the total (Institute for Futures Research, 1998):

- Carbon monoxide (CO): 70%;
- Oxides of nitrogen (NOx): 40%;
- Hydrocarbons (HCs): 50%;
- Benzene (a non-methane hydrocarbon): 80%; and
- Atmospheric lead emissions: 50%.

Table 13 sets out the major pollutants emitted by the transport sector, from the South African perspective (1995).

Table 13. Summary of Contribution of Pollutants from Vehicles				
Pollutant	**Incurrence**	**Relative Contribution (U.S. data)**	**South African evidence**	**Comments**
Hydrocarbon losses	Fuel transfer and refilling along product chain: Refinery → depot → pump → vehicle	Transport – 40% Combustion - 12% Solvents – 32% Other – 17%	Spillages & leakages through transfer of fuels suspected to be significant.	Evidence of transport's contribution to be underestimated.
Nitrogen oxides (NOx)	Vehicle exhaust emissions	Transport – 40 to 45% Power stations - 30 to 35% Industry – 20%	Likely to emerge as more data becomes available.	Trade-off between reduced HC, CO and increased NOx unless three- way catalytic converters used.
Carbon monoxide (CO)	Vehicle exhaust emissions	Aggravated by concentration of vehicles. Supplemented by cigarette smoking.	Daily mean - 2 to 4 ppm. Office - 10 to 15 ppm.	
Sulphur dioxide (SO_2)	Vehicle emissions - diesel engines.	Aim to reduce sulphur content so as to fit catalytic converters to diesel engines	SO_2 pollution associated with refining/synthesis of fuels significant	NOx could aggravate respiratory effects of SO_2
Lead (Pb)	Vehicle exhaust emissions	Demise of leaded fuels a mitigating factor.	Alkyl lead compounds added to SA petrol as octane enhancer - reduced from 0.84g/l to 0.4 g/l	Current split of leaded: unleaded fuels (92:8) a source of concern. Increased usage of unleaded will mitigate.

(Source: Terblanche, 1995)

A comparison of emissions from motor vehicles and industries is possible through the data compiled by the Department of Environment Affairs and Tourism (DEAT) in terms of pollution inventories. Data for vehicle emissions in Table 14 is for different years and varies between sources. Data for industrial emissions is categorised according to height of emission stacks above ground level.

Table 14. Motor Vehicle Emissions and Scheduled Industrial Emissions (tons/year)

Component	DEAT – ICV (1995)	Σ ICV (Eskom 1992)	Scheduled industries		
			<10m	10<150m	≥150m
CO	3 239 280	1 370 000	263 530	196 339	23 066
HC	443 219	129 000	60 453	277 243	1 300
Nox	277 080	203 000	47 163	86 864	609 310

Where: ICV = Internal combustion vehicle
(Source: Department of Minerals & Energy, 1995)

The data in Table 14 illustrates the potential for variation in vehicle emissions estimates in the South African context. This is not surprising in view of the uncertainties around the extent of vehicle emissions internationally (Department of Minerals & Energy, 1995).

Phase 2 of the study, the actual sampling of the vehicle population, has just been completed, with results being finalised before publication of the full report. It is believed that the study has included estimates for the following urban pollutant levels: Carbon monoxide (CO), nitrogen oxides (NO_x), non-methane volatile organic compounds (NMVOC), and sulphur dioxide (SO_2)

Once the study has been published, the results can be incorporated into the current project to validate the estimated transport externalities.

6.4.5. Department of Environmental Affairs and Tourism Greenhouse Gas Emissions Inventory Study

DEAT has recently completed a Greenhouse Gas Emissions Inventory (DEAT, 1999). In terms of this study, estimates were made of the level of emissions attributable to mobile combustion sources (i.e. transport). These results are shown in Table 15.

Table 15. Greenhouse Gas Emissions from Mobile Combustion Sources during 1988

Fuel used		NO_x		CH_4		NMVOC		CO		N_2O		CO_2	
Source	Distance traveled (Mill km)	Emission Factor (g/km)	Emission (Gg/y)	Emission Factor (g/km)	Emission (Gg/y)	Emission Factor (g/km)	Emission (Gg/y)	Emission Factor (g/km)	Emission (Gg/y)	Emission Factor (g/km)	Emission (Gg/y)	Emission Factor (g/km)	Emission (Tg/y)
Road Vehicles													
Petrol Cars	51 367	2.1	110	0.174	8.94	6.33	325.2	40.62	2 086.5	0.005	0.26	399	20
Petrol light trucks	26 251	2.6	69	0.174	4.57	8.54	224.2	44.55	1 169.5	0.006	0.16	466	12
Diesel Cars	1 048	1.0	1	0.01	0.01	0.52	0.5	1.06	1.1	0.014	0.01	537	1
Light diesel trucks	796	1.5	1	0.02	0.02	0.83	0.7	1.61	1.3	0.017	0.01	559	0
Heavy diesel trucks	8 245	16.8	138	0.1	0.82	2.99	24.7	8.54	70.4	0.031	0.26	1249	10
Motorcycles	2 701	0.2	1	0.329	0.89	6.50	17.6	23.80	64.3	0.002	0.01	186	1
Air transport (PJ)													
Jets	26.6	0.3	8	0.002	0.05	0.01	0.5	0.12	3.2	0.0	0.00	71.5	2
						8							
Avgas	1.1	0.1	0	0.06	0.07	0.54	0.6	24.00	26.4	0.000	0.00	69.3	0
										9			
Rail transport (PJ)													
Locomotives [c]	19	1.8	34	0.006	0.11	0.13	2.5	0.61	11.6	0.002	0.04	73.3	1
Sea Transport (PJ)													
Bunkerage [d]	89.6	2.1	188	0.000	0.00	0	0.0	0.04	4.1	0.002	0.18	77.4	7
								6.00					
Equipment (PJ)													
Farm	56.72	1.5	85	0.011	0.62	0.23	13.0	0.60	34.0	0.002	0.11	73.3	4
Mining & Construction	27.6	1.2	33	0.004	0.11	0.09	2.5	0.38	10.5	0.002	0.06	73.3	2
TOTAL			**480**		**16.21**		**612.0**		**3 478.8**		**0.92**		**53**

Notes

b. The Emission coefficients quoted by Dutkiewicz (1993) for heavy vehicles are quite similar to those given by IPCC (1993)< once converted to the same units.

c. Sum of automotive diesel, heavy furnace oil and paraffin used by the South African Railways.

(Source: Department of Environment Affairs & Tourism, 1999)

7. SCENARIO ANALYSIS

Overarching growth prospects
The scenario for real GDP growth for South Africa was 2,8% per annum between 1996 and 2020. This was the estimate put forward by the MSA project of the National Department of Transport for the long term. This was below the most optimistic scenario of the GEAR strategy but was intended as a "middle of the road" scenario framework for the transport sector in the country. This scenario is assumed as the economic base case for this project.

7.1. Scenario 1: More of the Same (Business as Usual)

Urban passenger
This scenario assumes that growth in the various categories of users of the urban passenger segments grows as set out in MSA (see Table 16).

Table 16. Urban Passenger Segmentation

Segment	Criteria	% of Urban Population	Number (1996) M	% Growth to 2020
Strider (prefers to walk or cycle)	Cost	23	5.4	28
Stranded (no affordable public transport available)	Cost	12	2.8	28
Survival (captive to cheapest PT option)	Cost; speed	17	4.1	24
Sensitive (captive to PT but selects best option)	Cost; speed; choice	9	2.1	25
Selective (can afford car but willing to use PT)	Speed; choice; convenience	19	4.1	39
Stubborn (only uses car)	Speed; convenience	19	3	88
Total urban population		21.4m		38% (1.4% p.a.)

(Source: Moving South Africa, 1998)

Land use
Objectives of MSA are densification, establishment of corridors are not attained. Housing policy continues to exacerbate urban sprawl, thereby preventing establishment of a viable public transport system. The apartheid city continues to ensure that most people are located far from work opportunities, necessitating lengthy commuting trips and continued subsidization of public transport.

Public transport modal split
Current modal split continues into the future, with the taxi element retaining 50% ridership and bus 25 % and rail 25%. Conversion of the taxi fleet to diesel from petrol is not attained

due to agitation and conflict with the taxi industry, with resultant political pressure. Vehicles in the taxi fleet remain the 11 seater variety and conversion to larger (18 seater vehicles does not occur). Growth in the public transport sector overall is in line with population growth.

Private car transport
Growth in the car population likely to be at least 2,4% per annum. Private car usage continues in line with projections of MSA (88% between 1996 and 2020). Major cities such as Johannesburg and Pretoria continue to develop as pockets of congestion. Budget constraints place restrictions on construction of new road infrastructure, exacerbating the congestion problem.

Freight transport
The modal split within freight transport stabilizes at around 55% road 45% rail for long haul traffic. Growth in the sector likely to be around 3,2% per annum to 2020 (slightly faster than average annual growth in real GDP forecast by MSA at 2,8%). Distribution activities are predominantly road, with courier services expanding as e-commerce gradually takes off in South Africa. Road freight sector consolidates into a handful of large operators with diversified activities, e.g. car hire, courier, and long haul operations. Road freight sector concentrates on value added goods, leaving low value high bulk sector to the low cost mode, rail (e.g. coal, iron ore)

Greenhouse Gas Emissions/Environmental awareness
Awareness of GHG issue remains negligible across society/government. Government remains entangled in crisis management, ignoring "green" issues because of the urgency of health and education issues, as well as social unrest caused by skewed income distribution.

7.2. Scenario 2: MSA Succeeds

7.2.1. Private cars vs. public transport

Public transport is very poorly developed in South Africa, despite the national Department of Transport's official policy of promoting it. The classic vicious circle that affects public transport in many parts of the world is also found in this country: As soon as people's income rises to a point that allows them to, they move from public to private transport; thus eroding public transport's revenue base and necessitating reductions in service levels. This in its turn causes a further loss of passengers.

The only apparent way of reversing this vicious circle is by making huge investments in improving public transport, while at the same time placing curbs on the use of private vehicles. If done properly, this could raise the quality of public transport to a level where it could be viewed as a plausible alternative to private vehicles in many cases. But where are these investments to come from? They cannot come from the general tax base, where they face too much competition from politically more attractive expenditures such as education, health and housing - areas which, for the majority of South Africans, were underfunded by the previous government. Moreover, with authorities at all levels of government under pressure to increase social spending of this type, there are no obvious unutilized sources of revenue yet to be tapped.

A study undertaken two years ago concluded that the only apparent and logical source from which to obtain the investments necessary would be a user charge on private car use. This would encourage a shift to public transport from both a "carrot" (incentives for the user) and a "stick" (disincentives) approach. Because the existing fuel levy can be interpreted as such a charge, one might argue that this levy could be earmarked to support public transport The Department of Finance is, however, strongly opposed to the hypothecation of its income streams, and this process is unlikely to take place.

In the absence of a much-improved public transport system, any curbs on the use of private motor vehicles will probably be too unpopular to be politically feasible. Thus the vicious circle that was described above seems set to continue for the foreseeable future. The situation is ironic because, with a very large proportion of South Africans having no access to private motor vehicles, one would expect curbing their use to be much easier in this country than it has proved to be in many others.

Unfortunately, therefore, it must be concluded that any attempts to shift travel from private to public motor vehicles is not likely to have any significant effect on the level of motor vehicle emissions within the time horizon of this study. The rate of growth of private car transport envisaged under this scenario likely to not be less than 2,1% per annum. Public transport likely to grow at 1,1% per annum in line with population growth.

7.2.2. Recapitalization of the taxi industry

The current efforts by Central Government to recapitalize South Africa's aging minibus taxi fleet by replacing the existing taxis are also aimed at introducing more order to this vital but fairly lawless element of the transport sector. It is hoped that this will lead to improved vehicle maintenance and a reduction in vehicle emissions. In addition, recapitalization would reduce the number of taxis, as the new taxis that are proposed are larger than those currently in use.

Government's efforts are being met with some resistance from the taxi operators themselves, ostensibly because they threaten job losses, but probably for other more obscure reasons as well. Even if this effort is successful, the number of vehicles involved is small relative to the South African vehicle fleet, and the impact on total emissions is likely to be small as well. Nevertheless, because minibus- taxis are used so intensively, there may be some impact. A change in the composition of emissions can also be expected, as the present taxis are petrol-driven and the new ones will be diesel-powered; this is to assist South Africa's oil refineries to balance their petrol/diesel production ratio. The likely rate of growth for the taxi industry was placed at 1,1% (in line with population growth).

7.2.3. Densification, corridors, integration of transport

It is the national Department of Transport's policy to encourage the densification of urban areas. It is not clear, however, whether local authorities, who must implement this policy, take it very seriously, or whether they will be prepared to enforce it if it happens not to coincide with the intentions of private sector property developers. South African cities are at present changing very rapidly, with large-scale inner-city decay and a flight of businesses to the suburbs. It is doubtful whether urban planning will be able to control such rapid change effectively. Certainly, casual observation gives no indication that urban sprawl is being contained or even slowed, and traffic planning seems characterized more by crisis management than by the implementation of any overall philosophy or strategy.

At most, densification will take place very slowly. It is also not clear how it would affect motor vehicle emissions. If it leads to a switch away from the use of private vehicles towards public transport, it might be beneficial. However, this seems unlikely for reasons that have already been cited. It might, therefore, only worsen congestion. On balance, therefore, it does not appear that this factor should be depended upon for any significant reduction in emissions. This will not result in more than a 1,1% growth in public transport in the areas concerned, due to rationalization of the public transport sector in the corridors.

Comment: Which reasons? – it is not all that clear from this sentence

7.2.4. Energy efficiency

As new vehicle technology trickles down to South Africa from the more developed countries, it will bring with it improved energy efficiency and reduced emissions. Although most new additions to South Africa's vehicle fleet will embody the new technology to some degree, only the more expensive vehicles will have it in abundance. All things remaining equal, emissions will therefore increase more slowly than will the vehicle fleet.

7.2.5. Road vs. rail freight transport

Until the late 1980s, most of South Africa's long distance freight moved by rail. The government-owned railway held a monopoly, protected by legislation that allowed road transport only when rail could not provide an alternative service. Behind this protection, the rail operator became very inefficient. When, in 1989, road freight transport was deregulated, rail could no longer compete with road and lost a major part of its traffic.

For a few years, road transport experienced a boom. More and more operators entered the market, intensifying competition. This has led some operators to overload their vehicles and to neglect maintenance, with detrimental consequences for emission levels. Policing is generally poor because traffic departments are under-resourced.

A degree of consensus appears to be emerging that the growth in road freight transport has been too fast, and that there are many reasons why some freight should be encouraged to return to rail. This will not be easy to achieve. At a minimum, it will probably require full cost recovery from road operators, who are generally considered not to pay their fair share for the damage they cause to roads, or the delays they cause for other road users. It will also be necessary to bring about a major improvement in the service offered by rail. Daunting as these requirements might be, there are signs that they will in the near future receive attention with the cooperation of both the road and rail sectors. Should this happen, it will have a positive effect on motor vehicle emissions within the time horizon of this present study. The overall impact is likely to be small, however. The overall level of growth of freight transport felt to be no more than 2,4% per annum for road, and 1,5% for rail.

7.3. Scenario 3: Intervention Scenario

It is possible that Government could intervene to reduce motor vehicle emissions. There are three underlying factors that make such intervention unlikely, however.

- Firstly, environmental issues are not high on the South African Government's list of concerns. Understandably, given its political constituency, the Government's focus is on stimulating economic growth and employment. Many decision-makers still view environmental concerns as a threat to growth, much as the rest of the world did in the 1970s. In general, therefore, environmental issues do not get as much attention as they perhaps deserve from government officials or politicians. This is not to say that nobody in South Africa cares about the environment - many individuals do, although at present their voices are too muted to have a very significant effect. Efforts are being made to change this through the establishment of a forum of debate outside government circles. It must be recognized, however, that even if these efforts are successful, motor vehicle emissions in general, and in greenhouse gas emissions in particular will not be very high on the agenda of such a forum.

- Secondly, emissions would in all likelihood be viewed as a future, rather than a present problem. The South African Government, in general, seems at present to have very little interest in long-term environmental planning. Only a few government departments, notably those that provide infrastructure, seem to take the longer term view, and it seems to be noticeably lacking from those departments that are the most influential in determining the country's overall economic growth path.

- Lastly, it is unclear where the responsibility for limiting motor vehicle emissions would lie. Clearly, the Departments of Transport, Minerals and Energy, and Environmental Affairs and Tourism all have an interest. Possibly the Department of Health does too, but none of these departments, as far as is known, is controlling emissions through a line function for which someone can be held accountable.

In summary, therefore, motor vehicle emissions are simply not an issue of sufficient concern to prompt government intervention. There also does not seem to be any factors that could trigger a change in this situation in the foreseeable future. Moreover, even if interventions were to occur, what form would they take? A number of options are discussed below, but it will be seen that all would be difficult to implement.

7.3.1. Alternative fuels

The infrastructure that would be needed for alternative fuels would be very expensive to install on the nationwide scale that would be required. It is therefore likely that alternative fuels will only be provided once a clear demand for them emerges. The South African motor trade is not very innovative, being content to follow the lead of international parent companies. It follows that there will only be the impetus to adapt alternative fuels once a pent-up demand emerges through a backlog in the transfer to South Africa of alternative fuel technologies from the more developed countries.

When looking at the experience in bringing unleaded fuel to this country, it may be said that the introduction of alternative fuels is hardly likely to be encouraged or accelerated - several years after its introduction, unleaded fuel still accounts for only some ten per cent of all fuel sales, despite being marginally cheaper than leaded fuel. Therefore, the consumption of traditional versus alternative fuels likely to be not more than 80:20 over the next 20 years.

7.3.2 Tax incentives

It was indicated above that motor vehicle emissions may be of concern to a number of government departments, although it is not clear that they are actually the responsibility of any single one of them. None of the departments concerned has any authority to impose taxes. It was also indicated that the Department of Finance, which does have the authority to tax, is little interested in environmental matters. Fuel tax is an important government revenue source and the miserly reduction in the price of unleaded fuel, relative to that of leaded fuel, despite the latter's well-known dangers, point to a reluctance to adjust this tax to bring it in line with environmental issues. In addition, tax incentives that favor new technology also favor the rich who are able to afford it, and so would be regressive. Thus they are politically unattractive. This will probably result in a growth of petrol consumption of not less than 1,8% per annum.

7.3.2. Mode switching

More forceful policies around mode switching are unlikely to be attempted due to the importance of the motor manufacturing industry in South Africa. However, if restrictions are enforced, it was felt that private car transport would still increase by 1,8% per annum, and public transport (bus, taxi) would then increase by an estimated 1,5% per annum.

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