

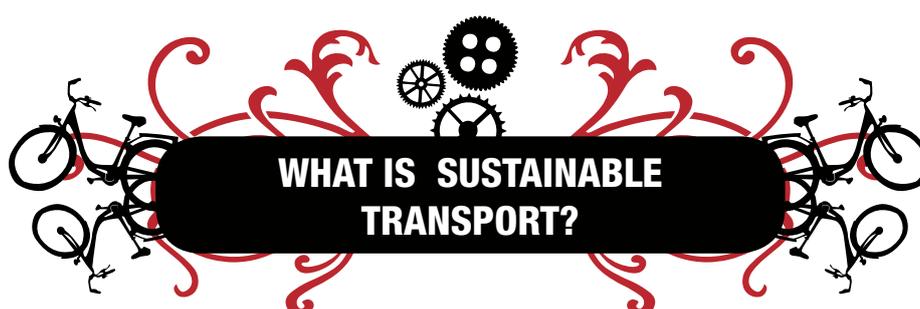
CHAPTER 7



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“I think that the suburban destiny is a pretty hopeless situation... I think it's going to be a political, economic and social shitstorm and we're not prepared for it... we're literally stuck up a cul-de-sac in a cement SUV without a fill-up ”

Author James Howard Kunstler (in *The End of Suburbia: Oil Depletion and the Collapse of the American Dream*, a film directed by Gregory Greene, 2004)



One possible measure of the overall (un)sustainability of an urban transport system is the vehicle-kilometres travelled (VKT) within the functional area of the relevant city to support its routine daily activities. Given the high degree of reliance of dominant transport technologies on fossil fuels – including electric vehicles drawing on electricity grids in which coal-fired powered stations are an important component – aggregate motorised travel correlates closely with levels of non-renewable resource consumption (oil, coal), on the one hand, and the emission of greenhouse gases, on the other. On a broader canvas, the VKT

measure could be extended to include the movement of people and goods into and out of the city, but this goes beyond the conventional understanding of what constitutes an urban transport system to incorporate elements of inter-urban and international transport systems.

Addressing the more restricted measure – and accepting that emergence of non-fossil fuel based (and non-greenhouse gas emitting) transport technologies available on a mass basis is unlikely in the foreseeable future – efforts to improve the overall sustainability of an urban transport system by reducing aggregate VKT would involve two primary strategies. The first would be directed towards reducing the number of vehicles in the urban passenger transport system by bringing about a shift from the use of low-occupancy private motorised vehicles (cars, motorcycles) to non-motorised transport modes (walking, cycling), where feasible, and to shared ride or public transport modes (both road and rail-based), where not.

The second strategy would be directed towards reducing the overall length of trips within the city by initiating and sustaining changes toward a more compact urban form, in particular by seeking to bring employment activities into closer proximity to residential activities which, in principle, would have the effect of decreasing the contribution of a major component of aggregate VKT in the form of daily commutes. Realistically, given the inertia literally built into current highly ‘automobile-dependent’ urban structures, the timeframe for any such strategy to take effect would have to be measured in decades or generations rather than the five or ten year periods commonly associated with planning cycles.

This suggests that the attainment of fully sustainable transport systems is certainly not a short term prospect and that the most that seems practically feasible right now is to begin to redirect urban form and the operation of associated transport services towards the more sustainable patterns suggested above. This, however, should in no way be treated as a reason to delay such intervention, whose urgency must be clearly apparent to those who are not in denial about the seriousness of the resource depletion and global climate change crises which confront us at both the local and the global levels.



A major shift in the orientation of South African urban passenger transport policy occurred during the 1990s, in part as a response to changing ideas about the appropriate framing of such policy internationally, but also – and more importantly perhaps – to address certain unacceptable conditions in passenger transport

systems as the country entered the post-apartheid era. Three key documents were central to the process: the White Paper on National Transport Policy (1996), Moving South Africa: The Action Agenda, A 20-Year Strategic Framework for Transport in South Africa (1999), and the National Land Transport Transition - *Act 22 of 2000* (2002) – the latter shortly to be replaced by the National Land Transport Act which, however, does not significantly revise the basic parameters of the policy shift.

Very schematically, three axes or vectors of this shift can be identified (Behrens & Wilkinson 2003; Wilkinson. 2008):

- from a ‘supply side’ orientation, involving the expansion of road networks to meet anticipated traffic volumes, together with the limited subsidisation of certain rail and bus commuter services, to a focus on serving the travel needs of differentiated ‘customer base’ – a ‘demand side’ orientation – as far as possible on a full cost recovery basis within a framework of ‘regulated competition’ among public transport operators;
- from a system of modally fragmented planning and management of transport provision, largely isolated from local land use planning, to a framework for integrated, cross-modal transport planning devolved to the local level, and undertaken in close cooperation with land use planning as part of the broader integrated development planning process undertaken by all municipalities;
- from an implicit prioritisation of the needs of private transport users reflected in the expansion of road networks and the gradual degradation of the levels of service offered by established public transport operations to an explicit commitment to putting ‘Public Transport First’ through prioritising investment in rationalised public transport (and non-motorised transport) facilities and services, together with appropriate travel demand management and road space management measures, including congestion charging, parking restrictions and other disincentives to the use of private vehicles.

References to the need to take issues of environmental sustainability into account tend to be muted in the current policy and legislative framework, and there is no overt reference to the global problems of oil depletion and global climate change, to which transport operations are quite evidently a major contributor. Nevertheless, the thrust of the current framework towards supporting and enhancing public and non-motorised transport modes while seeking to restrain the use of private vehicles is clearly an important indicator that movement in the direction of developing more sustainable passenger transport systems in South African cities is both mandated and possible.





A CAPE TOWN STUDY: THE PASSENGER TRANSPORT SECTOR

This chapter sets out to make a case for urgent intervention to initiate a radical transformation to a more sustainable pattern of resource use in a key component of Cape Town's transport sector. Attention is focused primarily on the city's passenger transport system, which certainly accounts for the large majority of aggregate vehicle-kilometres travelled (VKT) within the metropolitan area.

The significance of this is that a decrease in aggregate VKT would be a fundamental indicator of progress towards reduced petroleum-based liquid fuel consumption and reduced greenhouse gas emissions – two critically important preconditions for achieving a more sustainable urban transport system. While the intra-urban movement of freight should not be considered inconsequential in this regard, it presents a set of issues which are different from, and possibly even more intractable than those we wish to explore for passenger transport, and we will refer to it only in passing. A similar proviso applies in the case of supra-local or inter-city passenger and freight movements by ground, air and sea transport.

The paper has been structured as follows: first, we provide a brief and schematic overview of Cape Town's passenger transport system and outline the major environmental impacts associated with its current pattern of operation. Against the backdrop of rising concern about two key challenges in the contemporary world – the depletion of global oil and natural gas stocks and the prospect of global climate change induced by greenhouse gas emissions – we then draw out the possible implications for the sustainability of passenger transport operations in Cape Town.

Finally, we present some broadly framed ideas about what might constitute the elements of a strategic response to these problems and close with a somewhat blunt reminder of the urgency of the present situation, which – in our view – precludes any suggestion that fundamentally transformative action can be deferred to some later date.

Our explicit intention in the paper is to put forward a position on this particular issue, or cluster of issues, and we have written it accordingly in a style that is generally perhaps more polemical than is academically conventional. We are aware that some of our conclusions regarding the current situation, as well as some of the proposals we have put forward as to what might be done about it, are not substantiated by reference to the results of systematic and reliable empirical research. The relative paucity of such research in this field of enquiry is symptomatic, in our view, of the somewhat marginal status it appears to have been accorded to date.



Metropolitan Cape Town has a diverse and well-established transport infrastructure which has evolved gradually over some three centuries, but developed particularly rapidly during the second half of the twentieth century. Major sea and airport facilities connect the city externally into both national and international maritime and air transport systems, while comparatively extensive national road and rail networks accommodate the movement of people and goods at the regional and national scales.

Within the city, a relatively dense road network serves road-based public transport in the form of scheduled bus services and minibus-taxi operations as well as general traffic flows of private personal and freight transport vehicles. Uniquely in the contemporary South African context, the city's radially-configured passenger rail network carries the largest proportion of public transport users, specifically in peak periods.

Transport infrastructure¹

The total length of the city's road network was estimated in 2002 to be 8,200 kilometres, of which some 2,200 kilometres (27%) could be described as being of metropolitan significance in terms of traffic functions, with the remaining 6,000 kilometres (73%) comprising local distributor and access roads – representing a total asset replacement value then in the region of R16 billion. Regular scheduled maintenance of the road network was effectively suspended for a number of years in the face of budgetary constraints, but has since been resumed.

The total length of passenger rail track in the metropolitan area is currently of the order of 260 kilometres, served by 97 stations. The combined asset replacement value of rail track and rolling stock was estimated at R14 billion in 2002. The integrity of signalling systems has often been compromised by cable theft, leading to delays and cancellation of services, while vandalism of rolling stock remains a serious problem.

Provision for non-motorised transport (NMT) modes – predominantly walking and, very much less significantly, cycling – has been limited to the installation of conventional sidewalk and pedestrian crossing facilities in most areas and the establishment of some limited and disconnected cycleway routes. The very high incidence of accidents involving pedestrians, including a significant proportion of fatalities, suggests that the accommodation of pedestrian movements within the system remains patently inadequate.

¹ Unless otherwise attributed, statistics included in this and the following sections are drawn from Behrens & Wilkinson (2003), which incorporates data from various official sources, or the 2004/5 Current Public Transport Record (CoCT. 2005).

Vehicle fleets and rolling stock

The fleet of private vehicles of all types in Cape Town totalled 790,000 in 2000, including some 570,000 registered cars – an estimated ratio of 190 cars/thousand people, which appears to be significantly higher than that found in other South African cities (Venter. 2007). The mean annual growth rate of registered cars in the metropolitan area was 3% between 1995 and 2000, while the number of daily car commuters grew from around 285,000 in 1980 to 680,000 in 2001 at a mean annual rate of around 4.6%.

The rate of growth in car usage exceeds population growth in general as well as growth in vehicle registrations, and has resulted in relatively sharp increases in daily traffic volumes on the major road network with a concomitant intensification of peak period congestion levels.

The primary modes of public transport in the city – passenger rail services operated by the South African Rail Commuter Corporation (SARCC), scheduled bus services operated primarily by Golden Arrow Bus Services (GABS), and unscheduled and only partially regulated minibus-taxi services provided by numerous individual and small-scale operators – together serve a daily market of some 1.13 million passenger trips.

In 2004, the SARCC was operating 66 train sets in peak periods, employing rolling stock comprising 231 motor coaches and 770 passenger coaches, serving a 54% share of this market. Plans to upgrade and replace the aging rolling stock through very substantially higher levels of investment than were previously undertaken were announced recently.

In 2004, GABS was operating a fleet of 852 single deck buses with an average capacity of 90 passengers (60 seated) on 736 scheduled service routes during morning peak periods, using 50 terminals and 80 ranks as well as 2 holding areas, with a 17% share of daily passenger trips in the public transport market. In the same year, some 7, 500 licensed and unlicensed 15-seater minibus-taxis operating on 555 routes in morning peak periods from 112 terminals and 61 ranks, as well as 30 holding areas, provided unscheduled services to 29% of this market.

Ongoing replacement and extension of the bus fleet has been negatively affected by uncertainty regarding plans to reform the road-based public transport system, while the much delayed government-funded taxi recapitalisation programme has yet to have any significant impact on replacement the minibus-taxi industry's generally aging vehicle fleet.

Modal split

Broadly indicative data on commuter travel patterns in Cape Town obtained from household surveys conducted in 1991 and 2004 reveal an overall shift during this period from public to private modes of transport and, within the public transport sector, a shift from scheduled bus and rail services to minibus-taxi services (see table below).²

² The substantial discrepancy in the public transport sector modal split for 2004 between this data set and that obtained from the 2004/5 Current Public Transport Record (cited in the previous section with respect to public transport passenger market shares) is not explained but the overall directions of the key trends are likely to remain generally correct.

Changing modal split in commuter travel, 1991 - 2004

	Private transport	Public transport			Walk / other
		Rail	Buses	minibus-taxis	
1991	44%	27%	16%	6%	7%
2004	48%	13%	7%	13%	13%

Source: CoCT 2006

The first of these trends accords with other evidence which suggests that – at least until the recent sharp escalations in both fuel prices and finance charges substantially altered the parameters of such choices – those public transport users able to acquire private vehicles have done so as soon as their economic circumstances have permitted this, largely due to dissatisfaction with the levels of service offered by the public transport system.

The modal shift within the public transport system towards minibus-taxis has long been evident and has been attributed to their higher levels of convenience relative to the scheduled modes, despite widespread concerns about their higher (unsubsidised) fares, overcrowding and compromised safety due to poor driving behaviour.

Systemic duality and differentiated mobilities

The dualistic structure of the passenger transport system is both derived from and reinforced by the legacy of socio-spatial segregation inherited from apartheid era urban planning practices. On the one hand, when they can afford it, members of lower income households, predominantly situated in what are often geographically peripheralised townships and informal settlements, constitute the majority of ‘captive’ users of public transport – or they otherwise walk.

On the other hand, members of middle and higher income households, situated in wealthier and sometimes more conveniently located suburbs, for the most part have acquired and routinely use private vehicles rather than public transport. The routine travel patterns and experiences of people within these two broadly defined segments within the passenger transport market therefore remain effectively discrete, reflecting significantly different mobilities.

Most immediately, such differentiated mobility is evident in the lack of convenience, comfort and safety routinely endured by ‘captive’ users of the three primary public transport modes, but it is also apparent in lengthy travel times and transport expenditures which tend to be relatively less affordable than those incurred by wealthier households using private transport. Lower income households – those earning less than R500/month – can end up committing as much as 35% of their total income to meeting basic transport costs, while this figure falls to 5% for wealthier households earning more than R3,000/month, which are likely to own and use private transport (DoT. 2005).

Aggregate travel patterns

Although not uniformly so, the city's present spatial structure is dominated by sprawling, low density development patterns. Together with the geographical eccentricity of its historical core area in which a large proportion of economic activities and employment opportunities continue to be concentrated, this imposes long average trip lengths on much of the population, particularly the lower income people living in the metropolitan south-east sector in the more recently developed and heavily populated residential areas and informal settlements.

The overall pattern of significant geographical separation between zones of employment and major residential zones leads to the phenomenon of 'tidal flow' in commuter traffic, in which peak period congestion and overcrowding of public transport in one direction is combined with the presence of unused or underused road capacity and public transport passenger capacity in the reverse direction. This reflects what is probably the single most significant inefficiency imposed on the operation of the passenger transport system.

Institutional framework

The institutional framework governing the operation of Cape Town's passenger transport system is characterised by a high degree of fragmentation, resulting in poorly coordinated, occasionally incoherent, planning and regulation, as well as generally inefficient operational management (Wilkinson. 2008). The fragmentation cuts across the parastatal and private agencies involved in operating the different modes of public transport and across the three spheres of government responsible for different aspects of infrastructural provision, and the planning, regulation and disbursement of public subsidy funding within the system.

The establishment of local level transport authorities to integrate and coordinate the execution of most of these functions – excluding those associated with the provision of passenger rail services – has been legally possible since the passage of the National Land Transport Transition Act (NLTTA) in 2000. For complex reasons, however, to date there has been no effective progress in this regard in Cape Town, although there is some expectation that the recently published National Land Transport Bill, which is intended to replace the NLTTA, may resolve some of the difficulties that have been seen to obstruct the installation of a suitably constituted metropolitan transport authority.





The impacts of transport system operation and associated patterns of travel behaviour described in the preceding section on resource use and the surrounding biophysical environment are considered here in terms of fuel consumption and gaseous emissions.

The significance of the inefficiency and contribution of Cape Town's transport system to energy consumption and greenhouse gas (GHG) emissions discussed needs to be viewed within the context of global concerns about oil depletion (Box 1) and climate change (Box 2). Clearly transport systems have a variety of aural and visual pollution effects, as well as 'barrier' or 'severance' affects, on local communities but these are arguably less significant from the perspective of resource use sustainability, and are therefore excluded from more detailed discussion here.

With regard to fuel consumption, according to a 2008 report by the Sustainability Institute, the transport sector is the largest consumer of energy, accounting for 47% of the city's total energy consumption, followed by commerce and industry (38%) and households (14%) (see table below)³. Within the transport sector, 60% of liquid fuel consumption is in the form of petrol, and 20% in the form of diesel⁴.

Table 2 illustrates that the energy use profile for the city as a whole is dominated by petrol (28%), electricity (29%) and diesel (18%), with paraffin, liquefied petroleum gas, coal, heavy furnace oil, jet fuel and wood accounting for the remaining 24% of energy.

Annual energy use by user group and fuel type (1,000 gigajoules)

	Electricity	Diesel	Petrol	Paraffin	LPG	Wood	Coal	Heavy furnace oil	Jet fuel	Total	Total %
Households	17,969	-	-	2,587	547	359	43	-	-	21,505	14%
Industry / commerce	24,755	13,160	-	444	2,718	561	10,788	4,696	-	57,123	38%
Local authority	1,747	234	119	-	-	-	-	-	-	2,100	1%
Transport	-	14,337	42,294	-	-	-	-	-	13,616	70,246	47%
Total	44,472	27,731	42,413	3,030	3,265	920	10,831	4,696	13,616	150,975	100%
Total (%)	29%	18%	28%	2%	2%	1%	7%	3%	9%	100%	

Source: Sustainability Institute 2008

³ An earlier study in 1997 estimated that the transport sector was responsible for 44% of energy consumption (Wicking-Baird et al 1997) – suggesting perhaps that the transport sector's relative energy consumption has grown.

⁴ A limitation of these data is their omission of electricity consumption by the city's extensive rail operations.

TRANSPORT AND GLOBAL OIL DEPLETION

Key debates in the area of global oil depletion revolve around when and how the operation of transport systems, and of economic systems more generally, will be impacted. As oil is a finite resource, the rising production of oil that has underpinned economic growth over the last 150 years cannot continue indefinitely. Currently, oil accounts for around 35% of global energy supply. As an energy source it is used for electricity generation, heating and as a liquid fuel for transport systems. The world's transport systems (including land, air and sea transport modes) depend on oil for around 90% of their energy requirements (Wakeford. 2007).

Global energy supply by fuel type (2004) (million tons of oil equivalent)

	Million tons of oil equivalent	Percentage
Oil	3,947	35%
Coal	2,769	25%
Gas	2,310	21%
Combustible renewables and waste	1,177	10%
Nuclear	718	6%
Hydro	247	2%
Geothermal/solar/wind	56	0.5%

Source: Wakeford 2007 (citing the International Energy Agency)

Hubbert (1956) assessed discovery rates, production rates and cumulative production in the oil industry and predicted that production in any given region would follow a bell-shaped curve (subsequently known as the 'Hubbert curve'), rising to a peak when approximately half of the total oil had been extracted, and thereafter gradually falling toward zero as extraction becomes progressively more difficult and costly.

The Association for the Study of Peak Oil (ASPO) argues that there is growing evidence that global oil production is nearing, or at, the top of the 'Hubbert curve' (a point of production referred to as 'peak oil'). This evidence includes, amongst other things, a steady decline in new 'conventional oil' discoveries since the 1960s, oil consumption rates exceeding discovery rates since 1981, and 33 out of the 48 significant oil-producing nations passing their individual production peaks (Wakeford. 2007).

Predictions about the timing of the world peak vary amongst oil geologists and energy agencies (see Wakeford. 2007). Some predict 'peak oil' within the next five to ten years, while others predict a peak in about 25 years. The main sources of contention revolve around the accuracy of reported Middle

Eastern reserves, and potential yields from 'unconventional' sources (e.g. tar sand and shale). On the current evidence, it appears unlikely that production will increase substantially beyond its current level (at around 86 millions barrel/day), and that following a 'bumpy plateau' of several years it will begin to decline. The impact of stagnant or declining oil production, and the probable unavailability in the short term of alternative fuels distributable on a mass basis will be a growing supply-demand gap, with inevitable consequences for fuel prices. As a heavy user of oil, Cape Town's transport system is likely to be hard hit.

With regard to gaseous emissions, important quantifiable emissions from the transport sector which either directly or indirectly contribute to the 'greenhouse effect' include: carbon dioxide (CO₂), methane (CH₄), nitrous oxide (N₂O), mono-nitrogen oxides (NO_x), carbon monoxide (CO) and sulphur dioxide (SO₂) (ERI 2002).

A study of photochemical smog, or 'brown haze', in Cape Town in 1997 estimated that the transport sector was the largest contributor to nitrous oxide, and the largest contributor to photochemical smog (52%) in the city (Wicking-Baird et al. 1997). In Cape Town, 2,815,566 kg of CO₂ were estimated to have been emitted from petrol consumption in 2001, and 1,487,441 kg from diesel consumption (CoCT. 2003).

An update of GHG emissions data in Cape Town by Kennedy et al (2008) is illustrated in Table 4. These provisional data suggest that ground transport is responsible for some 12.7 megatons of CO₂ equivalent per year, representing around 33% to 45% of total direct GHG emissions.

Provisional estimate of direct greenhouse gas emissions in Cape Town

	Annual GHG emissions (megaton CO ₂ equivalent)	Percentage of total emissions included in estimate
Electricity	8.6	22.6%
Heating and industrial	3.7	10.6%
Ground transport ¹	12.7	33.5%
Air and marine transport ²	12.6	33.3%
Direct industrial	not determined	
Waste	not determined	
Vegetation	not determined	
Total ³	37.6	100%

Source: Hansen and Gasson 2008

Notes:

- ¹ The estimated split between petrol and diesel is 8.9 megaton and 3.8 megaton of CO₂ equivalent respectively.
- ² This estimate allocates 100% of emissions generated from the consumption of fuels put on board in Cape Town, to the Cape Town area.
- ³ If it is assumed that only 25% of marine and air transport emissions are allocated to the Cape Town area, the total is reduced to 28 megaton CO₂ equivalent.

From an energy and emissions perspective, Cape Town’s transport system will therefore be central to any attempt to place the city on a sustainable resource use path.

TRANSPORT AND GLOBAL CLIMATE CHANGE

The Intergovernmental Panel on Climate Change (IPCC) has concluded that most of the observed increase in globally averaged temperatures since the mid-1900s is very likely due to observed increases in anthropogenic GHG concentrations via an enhanced ‘greenhouse effect’ (IPCC. 2007).

Paleoclimatic studies of ice cores spanning the last 650,000 years indicate that global atmospheric concentrations of CO₂, CH₄ and N₂O have increased markedly as a result of human activities since the mid-1700s and now far exceed pre-industrial values (IPCC. 2007). The recent global increases in CO₂ equivalent concentration are argued to be due primarily to fossil fuel use and land use change.

The following table illustrates the contemporary relative contributions of key sectors to global GHG emission, with the transport sector estimated to be responsible for 14% (Stern. 2006).

	Gigatons CO ₂ equivalent	Percentage
Power	10.08	24%
Land use	7.56	18%
Agriculture	5.88	14%
Industry	5.88	14%
Transport	5.88	14%
Buildings	3.36	8%
Other energy related	2.10	5%
Waste	1.26	3%

Source: Stern. 2006

Climate model projections summarised by the IPCC (2007) indicate that average global surface temperature will likely rise a further 1.1°C to 6.4°C over the next century if no significant action is

taken. The Stern Review on the economics of climate change in 2006 argued that such a radical change in the physical geography of the world must lead to major changes in its human geography (Stern. 2006). Even at more moderate levels of warming, climate change will have serious impacts on economic systems and human life. These predicted impacts include, amongst other things, increased flood risk, reduced water supplies, decreased crop yields, rising sea levels, and reduced biodiversity (Stern. 2006).



Imminent international political pressure to substantially decrease GHG emission through the introduction of carbon pricing (and trading) measures or penalties for exceeding emission constraints, as well as sustained increases in the price of petroleum fuels, will have significant implications for Cape Town's transport system. We believe that the more important of these are likely to include the following:

- The accelerating 'automobilisation' – acquisition and use of private cars – experienced in the city's passenger transport sector over the last 50 years is likely to be gradually halted and then permanently reversed. In the likely event that affordable alternative fuels are not readily available at least in the short term, a substantial number of 'choice' passengers will be unable to bear the growing cost of extensive car use. A significant level of private car (and perhaps motorcycle) usage is, nevertheless, likely to remain in the medium term future, unless additional constraints are introduced and the levels of service offered by the public transport system improved significantly.
- Generally within the public transport passenger market, a shift from minibus-taxi services back to the commonly cheaper, publicly subsidised rail and bus services is likely where such services are reasonably accessible. More specifically among the poorest sections of the 'captive' public transport passenger market, reliance on non-motorised travel (NMT) modes, particularly walking, is likely to deepen as public transport fares rise to incorporate fuel price increases and any form of motorised travel becomes increasingly unaffordable.
- The likely effects of possible future carbon pricing measures and associated energy price escalations would be felt across both electrified and petroleum fuel-based transport systems. In the inter-city land freight transport sector, such price escalations, in conjunction with those induced by oil depletion, would probably lead to a shift from road to electrified rail services, provided the reliability and competitiveness

of the latter can be improved and the long-term decline in its 'reach' or penetration across the national space-economy can be reversed. Within the intra-urban land freight transport sector, however, a similar shift from road back to rail is less likely due to inherent inertia in the current locational patterns of economic activities in the city's land use system.

- The viability of air transport for both freight and passenger movements – particularly those of a discretionary (e.g. tourism) and short-haul nature – is likely to decline fairly rapidly in the face of aviation fuel price increases. Given the substantial investment currently being made in the expansion of the city's facilities to service anticipated growth in air transport, there must be some possibility that such new infrastructure could become an underutilised 'white elephant'.



Ideally, to achieve a more sustainable pattern of resource use in Cape Town's transport sector, the routine movement of both people and goods would need to become as 'localised' and non-dependent on carbon energy sources as possible. The key indicator of progress in this regard would be a reduction in the total amount of vehicle-kilometres travelled (VKT) both within the metropolitan area and in connecting it externally to other cities and regions, specifically in travel using the conventional motorised modes.

Petrol and diesel-powered vehicles obviously fall into this category but, given the current level of reliance of the national electricity grid on coal-based generation, the use of electrically-powered vehicles on either the road or the rail networks would also have to be regarded as problematic, at least for the foreseeable future. In the absence of practical alternatives, the growing economic significance of the city's external connections – particularly those made by air transport – presents what is probably an even more pressing problem from this perspective.

Focusing most immediately here on the issue of intra-metropolitan passenger movement, however, the feasibility of bringing about a significant reduction of VKT can be seen to be determined primarily by the realistic prospects of reducing the need to travel in the first place and, where that is not possible, by promoting the use of more fuel-efficient and less polluting modes of motorised transport, particularly public transport, as well as the key NMT modes of walking and cycling. The first of these prospects – reducing aggregate travel demand – is shaped directly by the pattern of accessibility of workplaces, of shops, of schools, health care, recreational and other public facilities embodied in the spatial fabric of the city, which has evolved historically over long spans of time and which therefore has a substantial degree of inertia built – literally – into

it. Transforming the current pattern of accessibility into one which is less structured to accommodate, and consequently is dependent on, motorised transport is therefore by no means an option likely to be realised in the short or even medium term.

The second prospect – that of promoting a shift towards the use of more sustainable modes of transport, including NMT – can be realised only through the emergence of a very significant shift in current patterns of travel behaviour. In the context of contemporary Cape Town, as in other South African cities, the key target here would be that relatively more wealthy segment of the dualistically structured passenger transport market which relies largely or exclusively on petrol or diesel-driven private transport (cars and two wheelers) to meet its mobility needs. The absolutely essential preconditions to effect appropriate change in such people's travel behaviour would be to establish a well-integrated, reliable and safe public transport system – which nevertheless remains affordable to its current mainly lower income users – and to provide much more systematically and comprehensively than at present for the needs of pedestrians and cyclists – not least in terms of enabling them to access public transport facilities safely and conveniently.

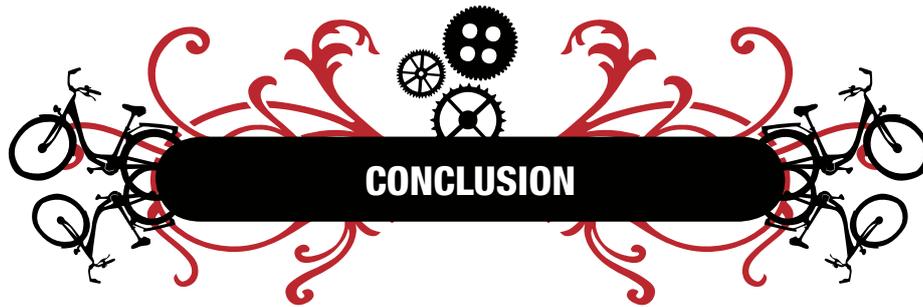
Building on this still provisional and undoubtedly incomplete understanding of the issues involved, we would advocate that a strategically framed response to the complex and difficult task of inducing movement towards more sustainable resource use in Cape Town's passenger transport sector should incorporate, and appropriately elaborate, at least the following set of key policies or actions:

- Introduction of an appropriately structured and phased programme of travel demand and road space management measures, including – but not limited to – the prioritising of available road space for public transport operations over any accommodation of general traffic flows (though the provision of dedicated public transport lanes, intersection signalling priority, etc), instituting direct or proxy road use pricing for private vehicles, encouraging the formation of lift clubs, firm-based travel planning and other 'mobility management' measures, and the promotion of compressed working week schedules or telecommuting options, or both in combination, among local employers.
- The establishment of a systematically planned public transport network which operates efficiently and effectively across appropriately and comprehensively integrated road and rail-based modes to facilitate the easy ('seamless'), reliable, safe and affordable passage of its users throughout the metropolitan area. Very substantial amounts of capital expenditure, as well as public funding for operating subsidies are likely to be involved.
- Initiation of a programme of significant investment in the extension and upgrading of pedestrian and cycling infrastructure, systematically integrated with current and planned public transport facilities but also offering opportunities for safe non-motorised travel within and between local areas.
- As the corollary of prioritising provision for public transport and NMT modes, investment in infrastructure or facilities which primarily or exclusively serve the least sustainable modes of transport – particularly the

use of private cars and air travel – should be discontinued, other than in cases justified on the basis of careful and comprehensive assessment of the full range of social and environmental costs that may be involved to realise any claimed benefits of such investment.

- The planning and regulation of integrated public transport operations should explicitly acknowledge and build upon the significant physical and human capital assets represented by key components of the current public transport system – local passenger rail services, in particular, but also the privately-operated and long-established scheduled bus services, as well as, perhaps more problematically, the minibus-taxi industry. This implies the modification of any proposed tabula rasa or ‘clean sheet’ approaches to the necessary far-reaching reform of the city’s public transport system in such a way that present contextual realities are appropriately accommodated.
- The formulation of robust, well-grounded and widely canvassed plans (‘spatial development frameworks’) which seek to promote, through appropriate land use management measures and careful planning of the installation of urban infrastructure, the evolution over time of less travel-intensive patterns of urban development. These would generally include, but not be limited to, the emergence of polycentric spatial structures at the city scale and the facilitation of ‘transit oriented’ mixed use and higher density development associated with public transport interchange, terminal or station precincts at the local area or neighbourhood scale. This obviously requires the abandonment of any planning or regulatory practices which underpin the extension of current patterns of low density and spatially fragmented ‘urban sprawl’ and ‘automobile dependent development’ at either the city-wide or the local area scales.
- Spatial development plans should, to the degree possible in the face of uncertainties and imponderables in this regard, allow for and support the increased ‘localisation’ of appropriately reconfigured economic activities as transport costs become increasingly burdensome, including, perhaps most importantly, the production and marketing of foodstuffs.





It seems clear that both at the global and at the immediately local scale, we are rapidly approaching what may prove to be a critical 'tipping point' in the way that our present transport systems operate, which in turn will have fundamental implications for the manner in which our cities themselves are structured and function. When liquid fuel prices exhibit a sustained rise above some threshold level which we cannot readily predict but may be imminent, the now unaffordable travel behaviour of many people will unavoidably have to change, and with it all or most of their essential 'lifestyle' choices – where to live and work, where to send children to school, and where to shop and recreate, among others. The viability, not only of our transport systems in particular, but also of our urban systems more generally, will certainly then be thrown dramatically into question.

In addition, while this remains the object of ongoing controversy, it is possible that another critical tipping point, which will have equally significant – if not even more fundamental – impacts on our behaviour and lifestyles may already have been passed. There is now a weight of informed opinion that anthropogenic climate change as a result of increased GHG emissions, to which transport systems have been a major contributor, is already a reality.

Even if we were to manage to reduce the absolute volume of GHG emissions immediately – requiring a massive and fundamental transformation of the way our social and economic systems work – we may already have set processes of irreversible climate change in motion on a planetary scale. At the very least, then, acceptance of the so-called 'precautionary principle' would imply that we need to act now to contain and reduce the level of such emissions in all sectors, but certainly, from the perspective of our concerns here, in the transport sector.

The expectations some may hold that technological 'fixes' will inevitably emerge in the form of greatly more fuel efficient and less polluting or non-petroleum-based vehicle propulsion systems which will obviate the need for any radical systemic transformation are, in our view, likely to prove self-deluding. As in other arenas of contemporary existence, the issue is primarily not one of simply substituting one technology for another, but rather of reforming or transforming the social structures and practices in which the use of any technology is embedded.

Efforts to suppress recognition of the urgency of the current situation, and to delay intervention to secure transition towards a more sustainable urban transport system in the interests of continuing 'business as usual', we believe can no longer be seen as tenable.