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Government

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Western Cape Infrastructure Framework  
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# EXECUTIVE SUMMARY





## Background to the Western Cape Infrastructure Framework (WCIF)

The Western Cape Government is mandated to coordinate provincial planning under Schedule 5A of the Constitution. As part of this mandate, the Fore-sighting Sub Work Group of the Western Cape Infrastructure Working Group has produced the Western Cape Infrastructure Framework (WCIF), which is intended to align the planning, delivery and management of infrastructure, provided by all stakeholders (national government, provincial government, local government, parastatals and the private sector), to the strategic agenda and vision for the province.

The objectives of the framework are to:

- Align existing planning processes.
- Outline strategic decisions and trade-offs that need to be made to achieve the provincial 2040 vision in a complex and changing environment.
- Identify and guide the planning and execution of major infrastructure interventions for the period 2012–2040.
- Mobilise and direct new investments.
- Facilitate partnerships and collaboration.

## Status quo and deficit analysis

In general, the Western Cape is well served with infrastructure, having the highest national percentages of households with access to services on their property. However, large numbers of people still live in poorly serviced areas where low or very low levels of infrastructure are available. In addition, much of the bulk infrastructure has suffered from historic underinvestment in maintenance and rehabilitation, and is reaching (or has reached) its capacity. Further, existing infrastructure systems, particularly those of energy and transport, are carbon intensive, with high cost to the environment. And some systems, particularly those that are the responsibility of municipalities, suffer from inefficient management and use of resources.

In carrying out the analysis, to deal both with the above deficits and the provision of new infrastructure, infrastructure is divided into five major 'systems', with the priorities in each of these systems described briefly below:

**Energy:** The current deficits and uncertainties lie in the capacity to generate and source electricity to support an increased growth in demand. The energy focus in the province is on lowering the carbon footprint, with an emphasis on renewable and locally generated energy.

**Water:** The Western Cape has limited water resources options for future growth. To address this, increased water conservation and demand management are urgent and necessary, but alternative sources of water will also need to be found. The sanitation infrastructure priority is to rehabilitate and upgrade infrastructure assets. However, there is a chronic shortage of capital for water and sanitation projects.

**Transport:** The Western Cape has a well-developed transport network comprising airports, ports, roads and public transport, and rail lines. Port expansion is required in Cape Town and Saldanha in response to local and international markets and as economic catalysts. The provincial paved-road network has good coverage and is generally in good condition, but the gravel network is in poorer condition. However, there is a critical shortage of funding for road rehabilitation and maintenance. Rail freight lines in the province have adequate capacity but suffer from poor performance, due to power and signalling constraints. Passenger rail, particularly in Cape Town, has suffered from historical underinvestment, and rehabilitation and upgrading is a priority. The larger urban areas require more efficient and broader-reaching public transport systems.



**Settlement:** The Western Cape suffers from the apartheid legacy of segregated and spatially inefficient settlements. Within these settlements, the housing backlog is currently estimated at 425 000 households and is expected to increase in the short to medium term. The perpetual challenge of providing affordable housing to low-income households on well-located land is still unsolved. However, there is agreement around the need for more integrated settlements (providing public and social services and livelihood opportunities together with housing) and for densification along transport networks to make urban settlements more 'liveable' and efficient. The solid waste challenge differs across the range of settlements in the province. While larger municipalities are grappling with the costs associated with the stringent targets for waste minimisation and alternatives to landfill imposed by legislation, municipalities with smaller urban cores are still battling with basic waste collection and landfill management. The shortage of landfill airspace is a problem, as is the rising cost of waste transport.

**Information and Communication Technology (ICT):** Access to mobile communication has increased dramatically, but internet access has been stagnant. New technologies have the potential to improve the rate of access, and investment in fibre optic cabling is essential to provide the backbone for the mobile networks and to enable faster, cheaper and more reliable communication networks.

In addition to these sector-specific infrastructure priorities, there are some over-arching constraints to the provision of infrastructure in the province. A significant challenge is institutional capacity, including inter-governmental coordination and shortage of technical skills in the public sector, in not only the province but also the whole country. Another identified constraint is capital finance, particularly for water and general municipal infrastructure. The gap will need to be filled through a combination of increased national transfers and innovative mechanisms for increasing the availability of private sector funding (both local and international) and debt finance at local government level.

### The need for a new approach

Given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the next 28 years, a new approach to infrastructure is needed: one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome. This future vision for infrastructure in the province is distilled from three guiding documents: the draft Provincial Strategic Plan (containing the 11 Provincial Strategic Objectives), the One Cape 2040 Vision, and the draft Green Economy Strategy Framework. The 2040 vision requires a number of transitions, to shift fundamentally the way that infrastructure is provided and the *type* of infrastructure that is provided in the Western Cape.

## Infrastructure transitions

Two possible infrastructure '*development agendas*' have been analysed using an integrated set of spreadsheet models: a 'business as usual' (BAU) agenda, which assumes that demand trends will remain constant and that infrastructure will continue to be provided as in the past; and an 'optimised' agenda that assumes all the required transitions will be implemented to achieve the 2040 vision. The sections below summarise the transitions for each infrastructure system and provide the high-level results of the analysis.

### Energy

Key transitions:

- Introduce natural gas processing and transport infrastructure to make gas available as a transition fuel.
- Promote the development of renewable energy plants in the province and associated manufacturing capability.
- Shift transport patterns to reduce reliance on liquid fuels.

Between 2012 and 2040, the energy demand in the Western Cape is estimated to grow at 3.0% in the BAU agenda and 1.6% per annum in the optimised agenda. Growth in electricity specifically is projected at 2.7% and 1.4% per annum for each of the development agendas respectively. The BAU agenda is defined by the Department of Energy's 2011 Integrated Resource Plan for electricity supply, while the optimised agenda is based on a high proportion of renewables and gas as a transition fuel.

In comparing these two options for the *electricity system*, the high costs of the BAU energy mix are evident, driven primarily by the anticipated costs of nuclear systems and fossil fuel generating plants. While the costs of renewable energy plants are currently high, the rapidly developing technology is expected to bring down the unit costs of power generation plants. Operating cost trends have been assessed based on the above energy transitions in order to gain an understanding of the average price that needs to be charged to cover these costs. Relative price trends for electricity show an average annual increase in real terms of 3.5% for the BAU agenda and 2.7% for the optimised agenda.



## Water

Key transitions:

- Have more stringent water conservation and demand-management initiatives, particularly at municipal level.
- Develop available groundwater resources.
- Adopt more widely the reuse of wastewater effluent as standard practice.
- Adopt large-scale desalination once it becomes the “next best” option to resolve inevitable water shortages in Saldanha, Cape Town and the Southern Cape.
- Expand and diversify agriculture to increase availability of surface water but reduce the water intensity of the sector, given the limited availability of water for irrigation.

The optimised agenda assumes more water conservation and demand management, meaning that average water demand is 0.5% per annum, compared with 0.7% per annum in the BAU agenda. Agricultural demand, which is the largest consumer, is assumed to be flat (0.2%) for both agendas because of resource constraints.

Little change to infrastructure is envisaged in potable water services infrastructure, non-potable distribution infrastructure and sanitation infrastructure. However, major shifts are required in water resources interventions. Significant capital investment is required in the first 14 years, as water demand continues to increase (but reduces thereafter). Costing R260 billion over 28 years, the BAU agenda is R20 billion more expensive than the optimised agenda, mainly due to the need for more expensive water treatment infrastructure (desalination) and more water resources infrastructure. The introduction of effluent reuse and desalination is likely to increase the role of the private sector and the importance of public-private partnerships (PPPs). In both agendas, the operating costs for water increase dramatically because of more expensive treatment options, but the optimised agenda is calculated to be 11% cheaper than the BAU agenda.

## Transport

Key transitions:

- Invest in public transport and non-motorised transport (NMT) infrastructure, particularly in larger urban centres.
- Prioritise general freight rail over bulk rail freight.
- Shift freight traffic from road to rail along major routes.

The key issues for future passenger transport infrastructure are the increase in the number of motorised trips and the transport modes available for these trips. For this analysis, the total growth in motorised trips is projected at an average yearly growth rate of 2.8% over the 28-year planning period.

The public transport transitions are focused primarily on Cape Town and involve the substantial increase in passenger rail and Integrated Rapid





Transit (IRT) with the phasing out of standard buses and minibus taxis. But notably other transitions place greater emphasis on minibus taxis.

As the demand for general freight transport is projected to grow at 1% above the economic growth rate, the modal split to cater for this growth is an important strategic issue for the province. Currently the data shows the split to be 14% rail and 86% road freight. Changing this split will depend on the extent to which the Transnet infrastructure and associated service on the Gauteng line can be improved. An optimistic view of changed modal splits projects that 70% of the freight on the Gauteng route is moved by rail, up from the current 15%. The optimised agenda is based on an urban efficiency that emphasises more expenditure on public transport and general freight rail and less on roads and bulk rail. The total expenditure for the optimised agenda amounts to R234 billion over the 28-year planning timeframe, which is R9 billion more than the BAU agenda. The analysis of Cape Town's public transport system indicates that fares for public transport will rise by 2.4% per annum in real terms, while real freight costs in tons per kilometre are predicted to increase at 5.1% per annum.

### **Settlement**

Key transitions:

- Continue to provide basic services to achieve national targets.
- Diversify the housing programme, with greater emphasis on incremental options.
- Integrate settlement development, prioritising public service facilities in previously neglected areas.
- Improve energy efficiency in buildings through design standards.
- Consolidate management of state land and property assets for optimal use.
- Distribute health and education facilities equitably.
- Innovate in the waste sector to increase recycling and reuse, including the adoption of waste-to-energy in the longer term

The desired shift in human settlements is towards a diversified housing programme, with more emphasis on incremental options, integrated settlement development and a range of occupancy (tenure) options, including social rental. The modelled infrastructure delivery assumes that conventional housing delivery will continue for 28 years in the BAU, while in the optimised agenda an accelerated and diversified programme eliminates the backlog in 14 years. This requires more capital than the BAU agenda: R4.1 billion more for housing and R288 million more for public services. Expenditure on health and education is treated as non-negotiable and so is projected to be the same in both agendas.

The solid waste transition includes an emphasis on waste minimisation, inferring less transported and landfilled waste and theoretically less infrastructure. However, the shortage of landfill space implies that more transfer stations are required, while the emphasis on recycling means that more material recovery facilities will be necessary. The greatest cost implication, however, will be the introduction of waste-to-energy facilities, at an estimated cost of R4.2 billion to treat 50% of Cape Town's waste. Much of this capital may be provided by the private sector, and may be recouped through the sale of electricity, but the implication of this increased capital expenditure is higher solid waste tariffs.

### **ICT**

The availability of a strong broadband infrastructure network is central to efficient communications and internet services and will play a key role in achieving the provincial objectives. Infrastructure is required to satisfy existing backlogs in ICT coverage, increase the speed and functionality of existing networks and supply new technology as it becomes available. Projections of infrastructure supply are based on the Western Cape Government's well-developed ICT strategy, which is estimated to cost R6.5 billion over the 28-year period.

## Integration of infrastructure systems

The capital requirement for infrastructure in the Western Cape is clearly dominated by energy infrastructure, which is in turn dominated by the required expenditure on infrastructure for electricity generation. The other key transition is in the transport sector, where expenditure on public transport infrastructure and general freight rail is prioritised over road expenditure. The net result is that the total projected expenditure for both development agendas is much the same, but with reduced expenditure on energy and increased expenditure on transport infrastructure.

The combined impact of the desired infrastructure transition has been assessed qualitatively against the following seven criteria:

- Net provincial gross value add (GVA)
- Balance of payments
- Employment creation
- Household expenditure trends
- Total energy consumption
- Total water demand
- Total waste produced

The result of the assessment reflects a positive impact under the optimised development agenda in relation to the BAU agenda. In addition, while some costs are increased in the optimised option, notably expenditure on public transport infrastructure, the overall cost of this option is lower than the BAU option.

The two development agendas were also tested against the following three scenarios to test the robustness of the framework in an uncertain future:

- Stable World: Existing trends continue
- World in Crisis: Downward spiral as global economic, social and ecological challenges remain unresolved
- Brave New World: Bold shifts to new, less resource-intensive economy liberates innovation and rising living standards, and mitigates challenges

In all three scenarios, the optimised agenda is considered to fare better than the BAU agenda.

## Implications

### Institutional

National public entities dominate infrastructure that serves the Western Cape. The province has a stable institutional environment, but a transition is needed with a greater role for the private sector. The biggest concern is the technical or engineering capacity in all three spheres of government. Although things are improving, the lack of high-level skills will be a constraint in delivering infrastructure on the scale required, and a significant capacity-building initiative is required.

### Financial

Capital expenditure projections show that approximately R850 billion will be required for infrastructure investment in the Western Cape in the next 28 years. National government will remain a primary financier of infrastructure, with its role increasing under the optimised agenda. This increase is related primarily to the required increase in funding of public transport infrastructure – road and rail. However, in the case of water resources infrastructure and settlement infrastructure, a gap remains under the optimised agenda, and the role of national government finance in closing this gap is still uncertain. The role of provinces remains relatively stable, retaining the funding of roads and social infrastructure.

Municipalities will need to raise more finance from consumers and property owners in order to meet the increase in the amount of infrastructure required. However, the gap in funding of municipal infrastructure will remain unless the subsidy system is reviewed, specifically increased allocations of capital funding, primarily through the Municipal Infrastructure Grant.

Under the optimised agenda, the role of parastatals in funding infrastructure is reduced substantially, largely because of the lower requirement for nuclear and coal-based electricity generation infrastructure, which is the responsibility of Eskom. In contrast, the optimised agenda requires more finance from the private sector, largely to fund electricity generation infrastructure, but with the recognition that this infrastructure has the ability to provide a return on investment.

### **Spatial**

The transitions described above have significant spatial implications in their implementation. Infrastructure investment must unlock economic potential at all scales. The Growth Potential of Towns Study has identified areas of development potential, and economic infrastructure investment must support these areas, as well as act as a catalyst in specific cases.

Energy generation infrastructure must be aligned with the point of gas import, as well as areas of anticipated growth in electricity demand. The Ports of Saldanha Bay and Mossel Bay are likely to become significant in this regard.



The spatial location of areas where infrastructure is reaching, or has reached, capacity must directly inform, align and correspond to future infrastructure development plans. Housing allocations and public and social services facility allocations must not be planned in isolation but be aligned with infrastructure investment plans, growth areas and future development projects. The public transport infrastructure need is concentrated in the denser urban areas and future economic growth areas, but better transport links will also be created within functional regions and with other provinces.

The WCIF requires continued emphasis on environmental sustainability along the coast, with the understanding of the importance of tourism and sector diversity. Support for farming in the hinterland will continue but with increased diversity and water efficiency, on the understanding that water is a major constraint with only the Clanwilliam Dam likely to provide additional quantities.

### **Applying the WCIF**

The Western Cape Government is the custodian of the WCIF. However, if the WCIF is to be effective in guiding planning in the province, buy-in from key stakeholders is crucial. A framework for engagement and a process for decision making is proposed, which is strongly linked to the WCIF Implementation Guidelines and Prioritisation Model that have been produced as separate documents. The WCIF must also be more closely aligned to other planning processes, in particular the Provincial Spatial Development Framework and the Provincial Land Transportation Framework. Indicators for the monitoring and evaluation of the implementation of the WCIF have been prepared, and it is proposed that the framework be updated every 5 years.

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# Glossary of terms & abbreviations

- BAU** – business as usual
- DBSA** – Development Bank of Southern Africa
- GVA** – gross value add
- GWS** – Government Water Scheme
- ICT** – Information and communication technology
- IDP** – Integrated Development Plan
- IRP** – Integrated Resource Plan
- IRT** – Integrated Rapid Transport
- kWh** – kilowatt hours
- Mbps** – megabits per second
- NDP** – National Development Plan
- NMT** – Non-motorised transport
- NWMS** – National Waste Management Strategy
- PLTF** – Provincial Land Transportation Framework
- PPP** – Public-private partnership
- PRASA** – Passenger Rail Agency of South Africa
- PSDF** – Provincial Spatial Development Framework
- PSO** – Provincial Strategic Objective
- PT** – public transport
- SANRAL** – South African National Roads Agency Limited
- SIP 5** – Strategic Infrastructure Programme 5
- WCIF** – Western Cape Infrastructure Framework
- WMA** – Water Management Area

# INTRODUCTION



The Western Cape Government is mandated, under Schedule 5A of the Constitution to coordinate provincial planning. As part of this mandate, the Western Cape Infrastructure Framework (WCIF) is intended to align the planning, delivery and management of infrastructure, provided by all stakeholders (national government, provincial government, local government, parastatals and the private sector), to the strategic agenda and vision for the province. The need for such a guiding framework is articulated by the Development Bank of Southern Africa (DBSA):

Infrastructure delivery and expansion require a policy framework to guide resource allocation across and within sectors, and to ensure that such allocations and the sequencing of the expansion of infrastructure are aligned with the broader growth and development path... This review has highlighted two problems: first, the absence of coherent policy in certain infrastructure sectors (for example, rail and roads); and, second, where comprehensive policies are in place (for example, the port and ICT sectors), they are not implemented appropriately. The imperative is therefore for sector departments to close these gaps. Furthermore, no policy exists on the methodology of integrated infrastructure planning.<sup>1</sup>

The Western Cape has a strategic agenda to 'deliver an open society for all'. As part of this strategic agenda, the Fore-sighting Sub Work Group of the Western Cape Infrastructure Working Group has produced the WCIF to address the gap in integrated infrastructure planning.



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1 DBSA (2012) *The State of South Africa's Economic Infrastructure: Opportunities and challenges 2012*. p.102



# BACKGROUND





## 2.1 OBJECTIVES OF THE WCIF

Given the sector-based, and institutionally fragmented, history of infrastructure planning, the WCIF defines a new approach to coordinated and strategic planning. The objectives of the framework are to:

- Align existing planning processes.
- Outline strategic decisions and trade-offs that need to be made to achieve the provincial 2040 vision in a complex and changing environment.
- Identify and guide the planning and execution of major infrastructure interventions.
- Mobilise and direct new investments.
- Facilitate partnerships and collaboration.

The framework aims to quantify the scale and nature of the infrastructure requirements in the Western Cape, how and where infrastructure provision needs to evolve to satisfy a new agenda in a changing world, and who will be responsible for its implementation.

This document does not supersede existing planning, but seeks rather to coordinate what action needs to be taken when, and by whom, to achieve a shared vision for the province. The framework is intended to be used as a joint planning tool and discussion document by national, provincial and local government officials and decision makers, parastatal planners and civil society.

## 2.2 DEFINING INFRASTRUCTURE

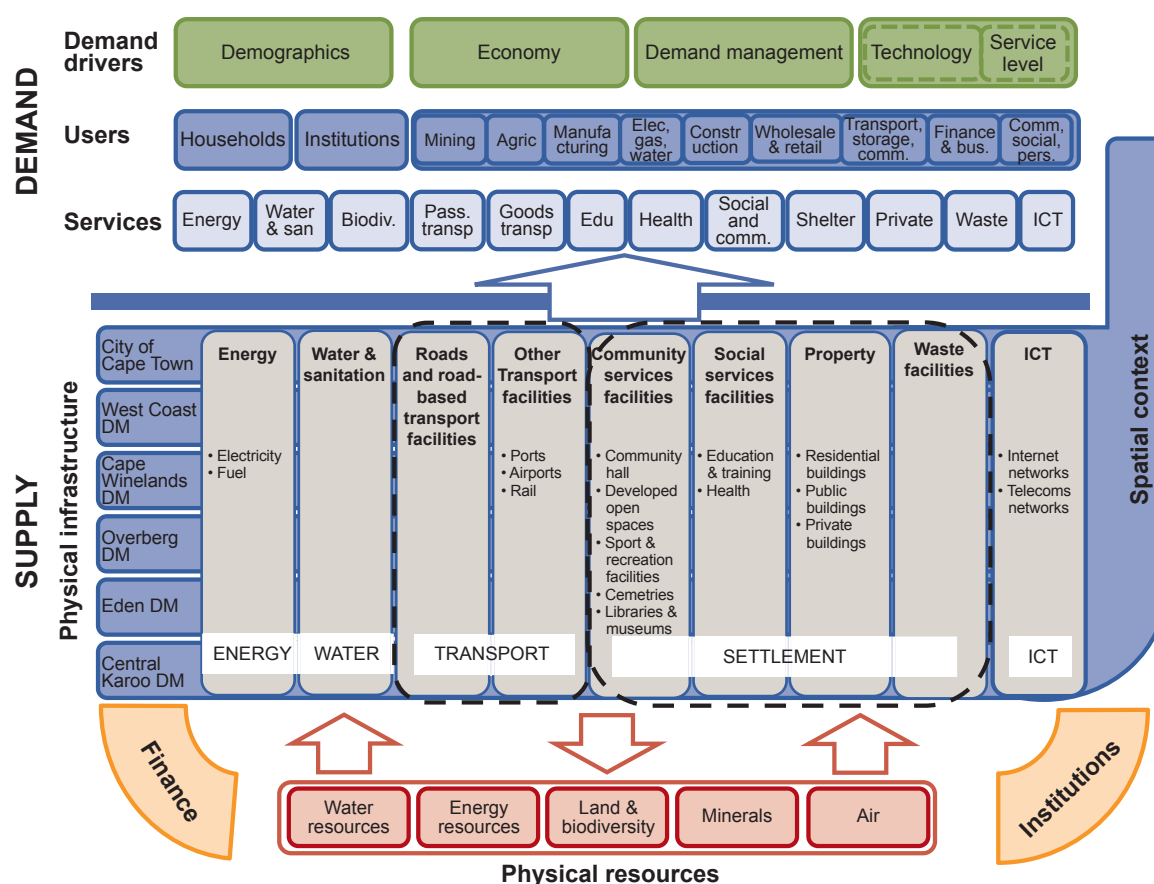
Infrastructure is defined in this project as ‘fixed assets in the built environment that facilitate the delivery of services’. Therefore, this definition excludes ‘natural infrastructure’ delivering ecosystem services but includes all traditional engineering infrastructure, social services infrastructure, property and buildings, as well as ‘virtual’ infrastructure in the form of mobile communications networks.



## 2.3 CONCEPT FOR CATEGORISING INFRASTRUCTURE

Figure 1 provides a conceptual framework for understanding infrastructure provision. The framework separates out the demand-side and supply-side factors that influence infrastructure provision. The physical infrastructure, which is the focus of this report, is grouped into five infrastructure 'systems': energy, water, transport, settlement, and information and communications technology (ICT). A careful distinction has been made between 'services' (e.g. water coming out of a tap, healthcare or an internet connection) and the 'infrastructure' that is needed to provide these services (e.g. water distribution network, hospitals and fibre optic cables).

FIGURE 1 Conceptual framework



## 2.4 THE PLANNING HORIZON

The WCIF is intended as a long-term strategic planning document, set in a timeframe from 2012 to 2040. This 28-year period has been selected to align with the One Cape 2040 vision<sup>2</sup>. It is considered sufficiently long term to achieve the key transitions outlined in the One Cape 2040 document and realise the associated changes in the way infrastructure is provided, without projecting too far into possible futures that are divergent and difficult to imagine.

2 Produced by the Western Cape Economic Development Partnership.

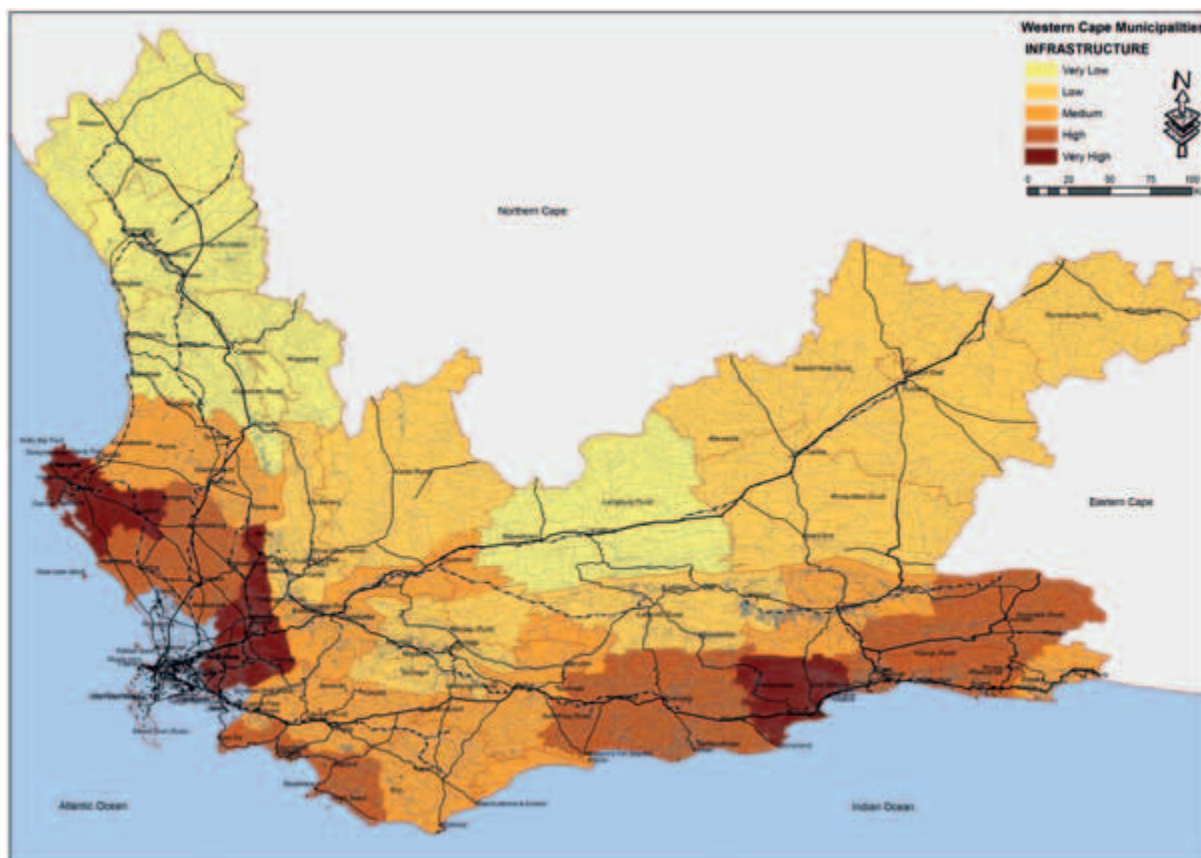
# STATUS QUO AND DEFICIT ANALYSIS





In general, the Western Cape is well served with infrastructure, having the highest national percentages of households with access to services on their property: water supply, flushing toilets, electricity for lighting and refuse removal according to Census 2011. However, large numbers of people still live in poorly serviced areas with low or very low levels of infrastructure (Figure 2).

**FIGURE 2** Western Cape municipalities classified by infrastructure availability  
(Source: *Growth Potential Study, University of Stellenbosch & CSIR, 2013*)



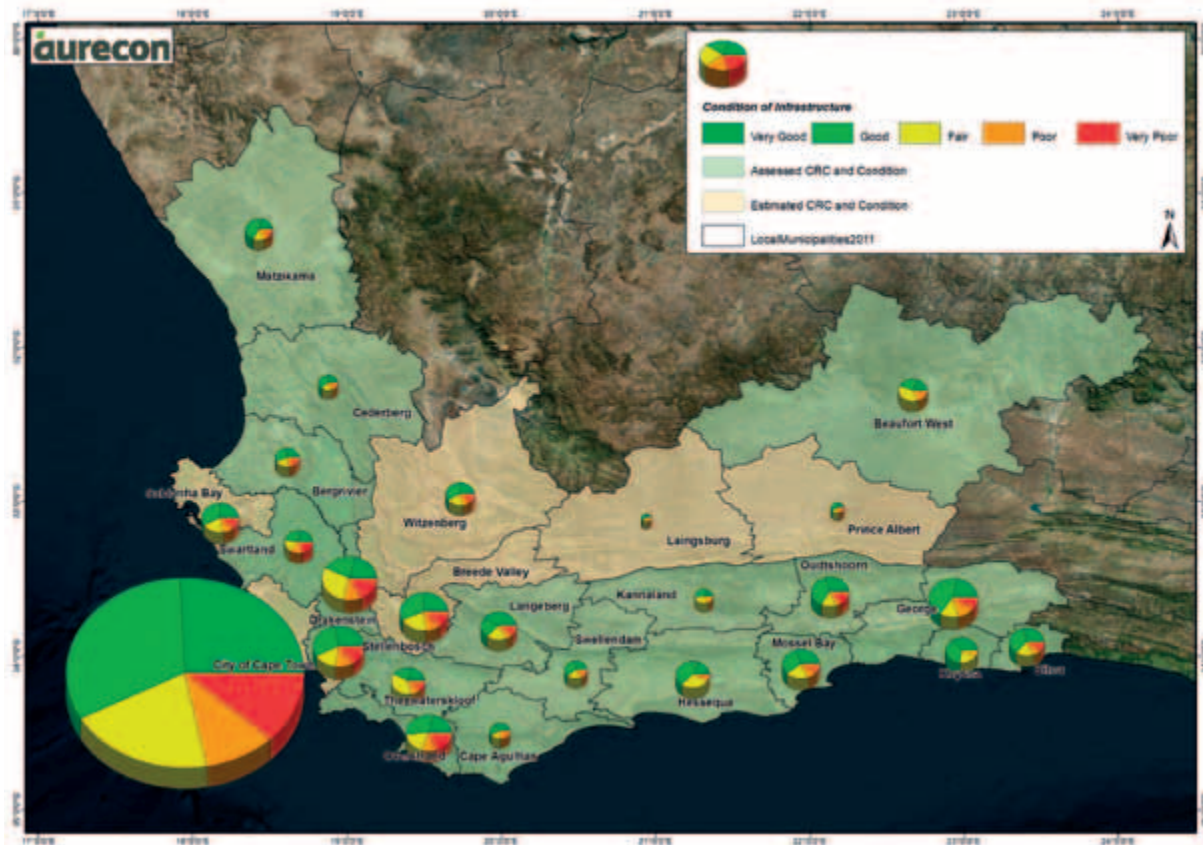
In addition, much of the bulk infrastructure has suffered from historic underinvestment in maintenance and rehabilitation and is reaching (or has reached) its capacity. Figure 3 illustrates the condition and scale of municipal infrastructure assets in the province. Existing infrastructure systems, particularly those of energy and transport, are carbon intensive, while municipal systems often suffer from inefficient management and use of resources. The specific challenges relating to each of the infrastructure systems in the Western Cape are described below.

### 3.1 ENERGY SYSTEM

Electricity distribution infrastructure in the Western Cape is well established, has good coverage (93% of households have access) and is in a reasonable condition (70% of assets are in good or fair condition). The current deficits and uncertainties lie in the capacity to generate and source electricity to support the projected growth in demand. In 2011, the total installed generation capacity in the province was equal to the peak load demand, which will soon be exceeded. While the national Integrated Resource Plan (IRP) makes specific provisions for this growth, it is debatable whether the provisions in the

plan are sustainable, particularly given the level of reliance on coal and nuclear energy sources. The National Development Plan (NDP) has taken up this debate, questioning the need for a nuclear energy expansion. Further, the Western Cape Government is committed to lowering substantially the province's carbon footprint, which implies a greater emphasis on renewable and locally generated energy.

FIGURE 3 Municipal asset condition and relative current replacement cost



Plans to increase the capacity of the transmission system will require attention and will depend on the location of future power generation plants in the province. The distribution system is managed by Eskom (about 40%) and municipalities (about 60%). While access to electricity by consumers in the province is good, there is an ongoing requirement to increase coverage and rehabilitate existing systems. Municipalities face difficulties in raising capital for these interventions.

## 3.2 WATER SYSTEM

The water supply infrastructure provides piped water to 88% of households. However, the critical infrastructure issues relate to the availability of water resources, which are near capacity in the Western Cape. The Berg Water Management Area (WMA), which serves approximately 78% of the population, has a surplus of only six years. Water resources infrastructure is at risk and not coping with demand (almost 80% of water stored in dams is used) and inadequate maintenance has resulted in high sedimentation and eutrophication<sup>3</sup> in the dams. Another serious problem is the river water quality in the Western Cape, which specifically threatens the agricultural economy.

3 Eutrophication is when the addition of excess nutrients to aquatic systems stimulates floral growth and reduces oxygen levels in the water.



The timing of plans to increase water resources and the success of water demand strategies are crucial. Hydrological studies indicate that finding additional surface water resources is unlikely, and no major dam development is envisaged (except for raising the height of the Clanwilliam Dam). While conservation and demand management measures will be prioritised, alternatives such as groundwater development, wastewater reuse and large-scale desalination will be necessary within the planning period of the WCIF.

Given the severe lack of capital, greater transfers from the national fiscus will be needed, particularly for new water resources infrastructure, rehabilitation of non-potable water distribution systems and bulk water services infrastructure, and implementation of “social” infrastructure projects.

Compared to national standards, sanitation coverage is advanced in the province, with 88% of households having access to a flush toilet. However, informal settlements are often unserved or under-served, and high densities mean that the lack of sanitation presents a serious health and environmental risk. Many of the wastewater treatment works in the province are old and in need of upgrading or rehabilitation. The Bulk Infrastructure Master Plan (Water and Wastewater)<sup>4</sup> indicates that R2.1 billion is required to eradicate the backlog in bulk sanitation infrastructure.

### 3.3 TRANSPORT SYSTEM

The Western Cape has a well-developed transport network comprising airports, ports, roads and public transport, and rail lines.

The Cape Town International Airport and the regional George Airport serve the commercial air transport sector adequately in the province, and there are no immediate infrastructure deficits.

Port development is focused around the two ports of Cape Town and Saldanha. Port expansion is heavily dependent on the national, regional and global economy, and the competitiveness of the port's pricing (both locally and internationally). Development in Cape Town needs environmental approval for seaward expansion and improvement to the back-of-port area and logistics networks. One of the national Strategic Infrastructure Projects (SIP 5<sup>5</sup>) is the planned development of Saldanha, which is envisaged as a catalyst, not a response to an existing infrastructure deficit.

The provincial road infrastructure consists of 6 400 km of paved network and 10 500 km of gravel network. Approximately 63% of the paved network is in good condition, while more than 50% of the gravel network is in poor condition. The provincial Department of Roads and Public Works has embarked on a drive to reduce maintenance and upgrading backlogs, but road funding (provincial and municipal) is critically short, and alternative funding models need to be investigated. The continued increase in road freight traffic is a concern, as heavy vehicles impose far higher stress on roads than lighter vehicles, which is a motivation for shifting to rail freight along major corridors.

The rail-freight network comprises the export ore system from the Northern Cape to Saldanha and the Gauteng to Cape Town system, which deals with containers, domestic coal (including to Saldanha) and other general freight. Both systems have sufficient capacity, but the Cape Town to Gauteng system suffers from poor performance because of constraints in the signalling system and power supply. Rail infrastructure has suffered heavily from historical underinvestment, and the rehabilitation and upgrading of existing passenger and freight rail systems is a priority.

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4 Prepared by PD Naidoo & Associates for the Western Cape Department of Local Government, August 2011

5 The development of the Saldanha—Northern Cape corridor through rail and port expansion, increasing back-of-port industrial capacity and strengthening maritime support capacity to the gas and oil industry.

The larger urban areas in the province require more efficient and broader-reaching public transport systems. The motivating factors are poor access to public transport, escalating costs of private transport, road congestion and high carbon emissions from road-based transport. The devolution of the public transport function to cities will resolve the structural barriers (of the funding framework and institutional fragmentation) but carries a high risk, as the cities take on fare collection. In the rural areas, public transport is dependent on better logistics and not necessarily infrastructural solutions.

## 3.4 SETTLEMENT SYSTEM

### 3.4.1 Housing and public services

The Western Cape suffers from the apartheid legacy of segregated and poorly functioning spatial settlements that has proved extremely difficult to shift. The housing backlog is currently estimated at 425 000 households<sup>6</sup> and is expected to increase in the short to medium term. The state's response to the housing demand, in the form of a mass roll-out of subsidised housing, has neither reduced the backlog nor integrated cities. The policy shift inherent in the Breaking New Ground policy, which allows for flexibility in the application of the housing subsidy, has yet to be realised. While the perpetual challenge of providing affordable housing to low-income households on well-located land is still unsolved, there is agreement around the need for more integrated settlements (providing public and social services, and livelihood opportunities together with housing) and for densification along transport networks to make urban settlements more 'liveable' and efficient.

Public service facilities, including community halls, recreational facilities, libraries and cemeteries are unevenly distributed around the province, and clearer norms and standards are needed for access levels and thresholds for the provision of this infrastructure.<sup>7</sup>

State land and property assets are currently not optimally utilised and the management of these assets is fragmented and uncoordinated.

### 3.4.2 Education

The Western Cape has recently experienced challenges with the distribution of schools so that resources are maximised. Some schools are underutilised, while others suffer from severe accommodation pressures. This highlights the need for demand to be planned, coordinated and monitored, particularly in areas of high growth. The province lacks at least one Further Education and Training college due to a lack of funding.

### 3.4.3 Health

The Western Cape is served by 54 public hospitals and 38 private hospitals. However, 3.5 times more citizens are uninsured than carry medical insurance. The uninsured rely on public health facilities, which is where the greatest infrastructure demand lies. The province is well-served by secondary and tertiary health facilities, but demand is growing for primary facilities that are suitably located to ensure equal and equitable access.

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6 Western Cape DoHS *Annual Performance Plan 2012/13*, 2012:11. The 'backlog' is taken to be households that do not have access to a permanent top structure or equivalent.

7 It is noted that provincial norms and standards for these facilities are in the process of being finalised.

### 3.4.4 Waste

One of the biggest challenges in the solid waste sector is the lack of information about waste volumes and composition.<sup>8</sup> This information is required to plot demand more accurately and plan infrastructure interventions.

The solid waste challenge in urban and rural areas is different. While larger municipalities are grappling with the costs associated with the stringent targets for waste minimisation and alternatives to landfill imposed by the Waste Act<sup>9</sup> and the National Waste Management Strategy (NWMS)<sup>10</sup>, rural municipalities are still battling with basic waste collection and landfill management. The shortage of landfill airspace is a problem. While regionalisation is debated as a potential solution, the escalating costs of transporting waste large distances can be prohibitive. Poor recovery of costs through tariffs, and general under-allocation of other funding sources to the waste management function, has meant a shortage of funds to manage these services properly and to provide adequate infrastructure.

Recycling initiatives have grown considerably in the province, but the fraction of the waste stream diverted from landfill is still low. Private sector recycling is on the increase, and sector-specific initiatives are gaining traction but are susceptible to volatility in the recyclables market.

If Western Cape municipalities are to meet the targets set in the NWMS, there needs to be a large improvement in the permitting and management of landfills, greater investment in recycling and other waste minimisation initiatives, and the adoption of alternatives to landfill (at least in the larger centres) in the long term.

## 3.5 INFORMATION AND COMMUNICATIONS TECHNOLOGY (ICT) SYSTEM

An ICT infrastructure is essential for stimulating economic development and creating a knowledge-based economy. Over the past 10 years, mobile communication has increased dramatically: 89% of the Western Cape population now has access to mobile telephones. However, access to internet has been stagnant over the past seven years: only 44% of households in the Western Cape have access. New technologies e.g. 3G and high-speed downlink packages have the potential to improve the rate of access. Investment in fibre optic cabling is essential to provide the backbone for the mobile networks and to enable faster, cheaper and more reliable communication networks.

The Western Cape is well connected to the national telecommunications infrastructure, which consists of copper lines and 140 000 km of fibre optic cable. Therefore, infrastructure investment must target the distribution network within the province. This will require additional investment, building the capacity of contractors and well-structured negotiations with service providers to expand the network, especially to remote communities that lie beyond the reach of the government's ICT access facilities.

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8 Except in the City of Cape Town, where waste information is good. The WC Department of Environmental Affairs and Development Planning is rolling out a Waste Information System, and coordinating the development of Integrated Waste Management Plans by municipalities (2nd generation), which will improve planning and data on waste and waste infrastructure needs.

9 Republic of South Africa (2009) *National Environmental Management: Waste Act*, No 59 of 2008. Government Gazette.

10 Department of Environmental Affairs (2011). *National Waste Management Strategy*. [www.sawic.org.za](http://www.sawic.org.za).

## 3.6 OVERARCHING DEFICITS AND PRIORITIES

### 3.6.1 Institutional capacity

Cooperation between the spheres and tiers of government is crucial for the success of large-scale infrastructure initiatives but is often not what it should be. The formal structures set up under the Intergovernmental Relations Act have not been effective and lack capacity. In many instances distrust and political posturing have bedevilled relationships.

Greater devolution of responsibility, either to provincial or local government, is important in several areas, especially planning. In many instances, the lack of cooperation between national parastatal organisations and provincial and local government has hampered coordinated planning.

Skills shortage in the public sector is acute, and skills development is an urgent priority. Although the numbers of engineers are increasing, the problem remains that too few are in the public sector, particularly experienced individuals who can mentor young professionals.

### 3.6.2 Finance

Infrastructure investment is at the heart of national and provincial government objectives to provide employment, reduce poverty and inequality, and grow the economy. This is reflected in the R845 billion allocated to national infrastructure initiatives over the next three years.<sup>11</sup>

However, the availability of state funding for infrastructure depends on economic growth (for tax revenue) and on the appetite and ability to borrow and to grow the national state deficit. With economic projections set at maximum levels of around 5%, the scope is minimal for radical increases in the current levels of state expenditure on infrastructure, unless a more aggressive borrowing policy is pursued, in the hope that the economic benefits will ensure adequate return on the investment. This, in turn, depends on the credit-worthiness of national government and its parastatals, and municipalities, which will need to be improved.<sup>12</sup>

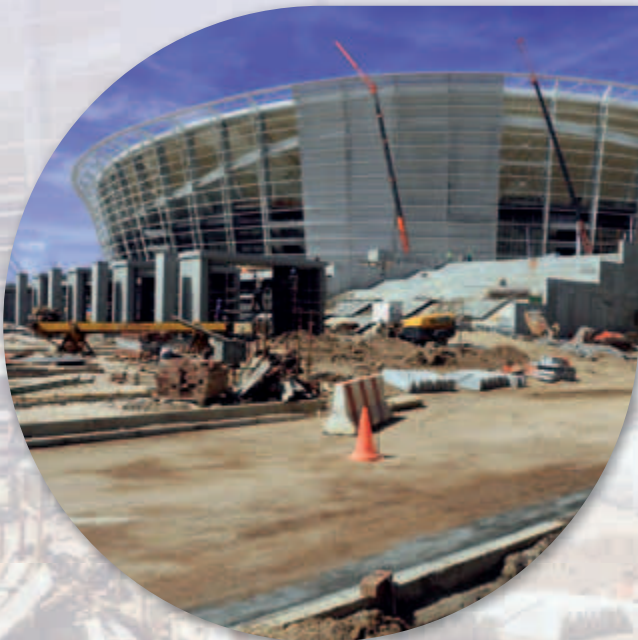
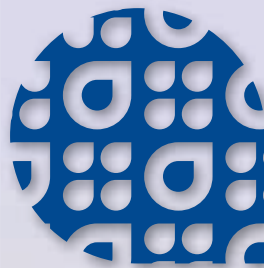
There is a shortage of capital funds for water resources infrastructure and for local government infrastructure generally. This gap will need to be filled through a combination of increased national transfers and innovative mechanisms for increasing the availability of private sector funding (both local and international) and debt finance at local government level.

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11 National Treasury. 2012. *Budget Review 2012*. Pretoria: National Treasury, 22 February 2012.

12 Currently both Eskom and Transnet are facing difficulties in raising sufficient debt finance to cover the costs of major expansions. The result is a tendency to fund capital works from cashflow which requires rapid increases in tariffs in the early years of the expansion programme.

# THE NEED FOR A NEW APPROACH





Given the status quo of infrastructure in the province, and the changing and uncertain world facing the Western Cape over the next 28 years, a new approach to infrastructure is needed: one that satisfies current needs and backlogs, maintains the existing infrastructure, and plans proactively for a desired future outcome leading to 'resilient and inclusive growth en route to a vibrant, equitable and low-carbon society'.<sup>13</sup>

Evidence suggests that a series of global shifts are underway with the potential to change substantially existing patterns of infrastructure provision. Current global trends raise the following questions:

- Are we at the start of a major disruptive global shift to a "green economy" paradigm requiring major infrastructure adjustments?
- Will envisaged changes to the global regulatory regime in response to climate change concerns require major reductions in the emissions produced by our energy and transport infrastructure?
- Will global resource-use patterns tip key global ecosystems into disequilibrium and large-scale disruptive decline (e.g. climate, oceans, water resources and fossil fuels), and what are implications? What if climate change or oil peak effects are significantly more severe than current expectations?
- Are we entering an era of much lower global growth rates, and what are the implications of such a trajectory? Similarly, what are the infrastructure implications for a global economic shift towards emerging economies?
- In a world where employment in the agricultural and manufacturing sectors continues to decline, will the imperatives of job creation and social inclusion have an impact on what infrastructure is required and how it is best provided?

## 4.1 INFRASTRUCTURE VISION IN THE PROVINCE

The WCIF project is guided in the future vision for the Western Cape by three key documents. The first is the Draft Provincial Strategy, which outlines the 11 provincial strategic objectives (PSOs), which are the primary informants of the intended outcomes and services ultimately provided by the infrastructure. A strong link can be made between the PSOs and the core themes in the NDP, particularly that of expanding infrastructure.<sup>14</sup> Infrastructure delivery per se is not an explicit objective but a cross-cutting way to achieve various national and provincial objectives.

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13 CHEC (Cape Higher Education Consortium). 2012. *Future Cape Contextual Report – Discussion Document*. Cape Town: African Centre for Cities and The Sustainability Institute, February, p. 29.

14 See WC Department of the Premier, 'Response to the National Development Plan: Vision 2030', 9 May 2012 for a full comparison between the PSOs and the objectives of the NDP.

**TABLE 1** The provincial strategic objectives

PROVINCIAL STRATEGIC OBJECTIVE (PSO)	
PSO1: Creating opportunities for growth and jobs	PSO7: Mainstreaming sustainability and optimising resource efficiency
PSO2: Improving education outcomes	PSO8 and 9: Promoting social inclusion and reducing poverty
PSO3: Increasing access to safe and efficient transport	PSO10: Integrating service delivery for maximum impact
PSO4: Increasing wellness	PSO11: Creating opportunities for growth and development in rural areas
PSO5: Increasing safety	PSO12: Building the best-run regional government in the world
PSO6: Developing integrated and sustainable human settlements	

The second guiding document is the One Cape 2040 vision developed by the Western Cape Government, the City of Cape Town and the Western Cape Economic Development Partnership, which defines six key transitions (see Key transitions (2012–2040) in One Cape 2040) that can be used to define infrastructure-related shifts.

**TABLE 2** Key transitions (2012–2040) in One Cape 2040

	FROM	TO
<b>Knowledge transition</b> <i>(Educating Cape)</i>	Unequal variable quality education plus limited innovation capacity	High-quality education for all plus high innovation capacity
<b>Economic access transition</b> <i>(Working Cape)</i>	Factor and efficiency-driven economy with high barriers to entry and low productivity and entrepreneurship rates	Innovation-driven economy with low barriers to entry, high productivity and entrepreneurship rates
<b>Ecological transition</b> <i>(Green Cape)</i>	Unsustainable, carbon-intensive resource use	Sustainable, low-carbon resource use
<b>Cultural transition</b> <i>(Connecting Cape)</i>	Barriers to local and global connectivity (language, identity, distance, parochial attitudes)	High level of local connectivity and global market fluency
<b>Settlement transition</b> <i>(Living Cape)</i>	Unhealthy, low access, often alienated, low opportunity neighbourhoods	Healthy, accessible, liveable, multi-opportunity communities
<b>Institutional transition</b> <i>(Leading Cape)</i>	Defensive, adversarial structures	Open, collaborative systems

The third guiding document is the Green Economy Strategy Framework,<sup>15</sup> which aims to position the Western Cape as the leading green economic hub<sup>16</sup> in Africa. The framework outlines the risk to the Western Cape posed by climate change, as well as the economic opportunity presented by a paradigm shift in infrastructure provision. The Green Economy Strategic Framework centres around six strategic objectives:

- Become the lowest carbon province
- Increased usage of low-carbon mobility
- Diversified, climate-resilient agricultural sector and expanded value chain
- Emerging market leader in resilient, liveable and smart built environment
- High growth of green industries and services
- Secure ecosystem infrastructure

## 4.2 INFRASTRUCTURE TRANSITIONS AND DEVELOPMENT AGENDAS

The concept of **development agendas** is introduced as a way of dealing with the varying strategic choices available for infrastructure in the province. As the wide range of options cannot be assessed individually, the infrastructure options are grouped under conceptually similar “development agendas”. A number of such agendas were considered but finally only two are applied:

- A **business as usual** (BAU) agenda, which is closely aligned to ‘doing what has been done before’, while still accepting existing planning.
- An **optimised** agenda, under which key infrastructure transitions are considered to achieve the strategic vision for the province as described above.

Development agendas can be defined in many ways and adjusted in future if necessary. For the results presented here, it has not been possible to apply rigid principles about what is included in each of these agendas. Therefore, certain decisions were taken for each system in order to complete proposals for this report.

The two development agendas manifest as a set of assumptions, which have been modelled as future projections of infrastructure demand and supply. The high-level transitions required to achieve the optimised development agenda are described below:

### 4.2.1 Energy

- Introduce natural gas processing infrastructure to use gas as a transition fuel.
- Promote the development of renewable energy plants in the province and associated manufacturing capability.
- Shift transport patterns to reduce reliance on liquid fuels.

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<sup>15</sup> Currently in draft format

<sup>16</sup> Green Economy is defined as economic activity which results in increased human well-being and social equity, while significantly reducing environmental risks and ecological scarcities (UNEP, 2011. Towards a Green Economy)

### 4.2.2 Water

- Have more stringent water conservation and demand-management initiatives, particularly at municipal level.
- Develop available groundwater resources.
- Adopt more widely the reuse of wastewater effluent as standard practice.
- Adopt large-scale desalination once it becomes the “next best” option to resolve inevitable water shortages in Saldanha, Cape Town and the Southern Cape.
- Expand and diversify agriculture to increase availability of surface water but reduce the water intensity of the sector, given the limited availability of water for irrigation.

### 4.2.3 Transport

- Invest in public transport and non-motorised transport (NMT) infrastructure, particularly in larger urban centres.
- Prioritise general freight rail over bulk freight.
- Shift freight traffic from road to rail along major routes.

### 4.2.4 Settlement

- Continue to provide basic services to achieve national targets.
- Diversify the housing programme, with greater emphasis on incremental options.
- Integrate settlement development, prioritising public service facilities in previously neglected areas.
- Improve energy efficiency in buildings through design standards.
- Consolidate management of state land and property assets for optimal use.
- Distribute health and education facilities equitably.
- Innovate in the waste sector to increase recycling and reuse, including the adoption of waste-to-energy in the longer term.

### 4.2.5 ICT

The availability of a strong broadband infrastructure network is central to efficient communications and internet services and will play a key role in achieving the provincial objectives.

### 4.3 HOW WILL THESE TRANSITIONS FARE IN A CHANGING WORLD?

Scenarios can be used to identify those important (but uncertain) factors most likely to influence provision of the core infrastructures in different directions in the 28 years to 2040. These critical uncertainties, and the various possible ways in which they might evolve, form the basis of different future scenarios. A process was undertaken to identify nine critical uncertainties that have an impact on the future demand and supply of infrastructure.<sup>17</sup> The uncertainties, which were used to develop three scenarios that reflect various degrees of stability or turbulence going forward, are:

- Economic growth rates
- Rate and scale of technological innovation
- Household income profiles and consumption preferences
- Infrastructure management capacity
- Scale and impact of global climate regulatory environment
- Level of public innovation leadership
- Extent of new finds increasing available resources
- Level of available public fiscal resources for infrastructure
- Extent of private sector involvement in providing and funding infrastructure.

The three scenarios are depicted in Figure 4.

**FIGURE 4** Three headline scenarios for testing the WCIF



The Stable World scenario is the predictable future that unfolds in line with established historic trends and is typically used to do long-term infrastructure planning. The challenge in developing a really robust infrastructure framework is to anticipate alternative feasible futures, which represent a substantial break with historic patterns and trends, in order to ensure that the WCIF also works in these futures. This analysis is provided in Section 8.

<sup>17</sup> A separate document is available for full description of the process



# ANALYSIS METHODOLOGY



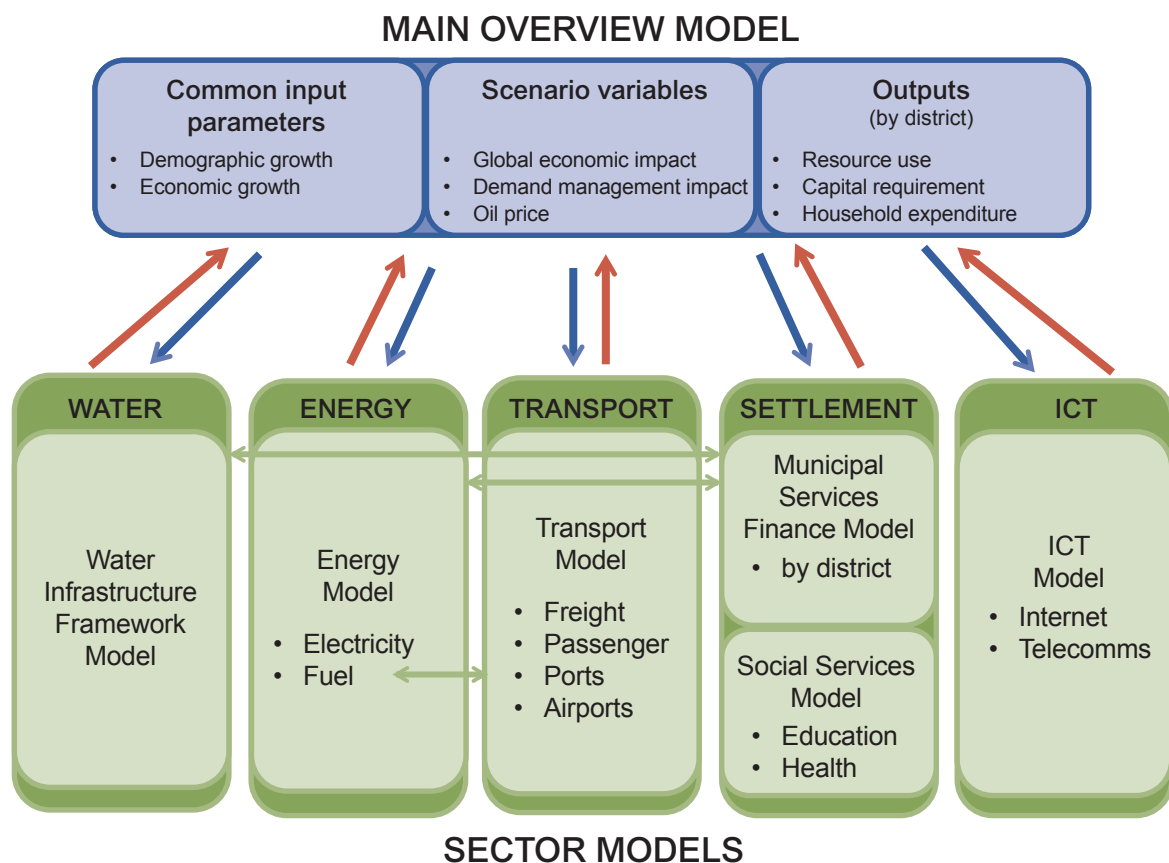
## 5.1 DATA SOURCES

The data used for to analyse and project infrastructure needs in the province was collected in the research and analysis phase of the WCIF project, a summary of which is provided in the Research and Analysis Report. Data sources include government reports, infrastructure plans and strategies, parastatal plans and annual reports, interviews with key stakeholders and a stakeholder workshop held in November 2012.

## 5.2 MODELLING

Spreadsheet models were used to project future infrastructure demand and to calculate the capital and resource requirements. While many infrastructure projections exist, these are sector- or institution-specific, and the WCIF requires all these projections to be collated under a common set of growth assumptions. A diagrammatic representation of the modelling exercise is provided in Figure 5: Municipal asset condition and relative current replacement cost.

FIGURE 5 Structure of the WCIF modelling



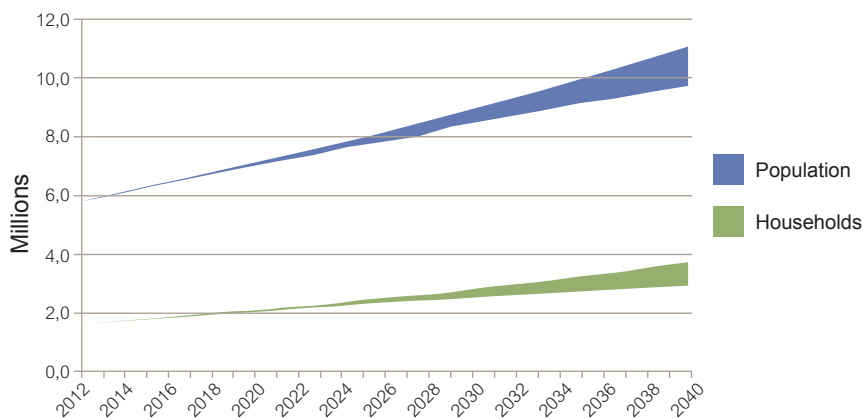
## 5.3 PRIMARY DRIVERS OF INFRASTRUCTURE DEMAND

Infrastructure demand is driven by two key variables, which are common to all infrastructure systems: demographic growth and economic growth. These two variables were fed into all the models.

### 5.3.1 Demographic trends

The 2011 Census has provided invaluable data on demographics in the province. Although in-migration to the Western Cape is the second highest in the country, the average population growth declined marginally, from 2.7% between 1996 and 2001 to 2.6% between 2001 and 2011. While this declining growth is expected to continue in line with international trends, a simultaneous phenomenon is the reduction in household size, which declined from 3.7 to 3.4 people within a decade (2001–2011). The impact is significant on infrastructure, which is often provided on a household basis. The framework assesses the impact of three combinations of population growth and household size, built up by district, as shown in Figure 6.

**FIGURE 6** Population and household projection envelopes

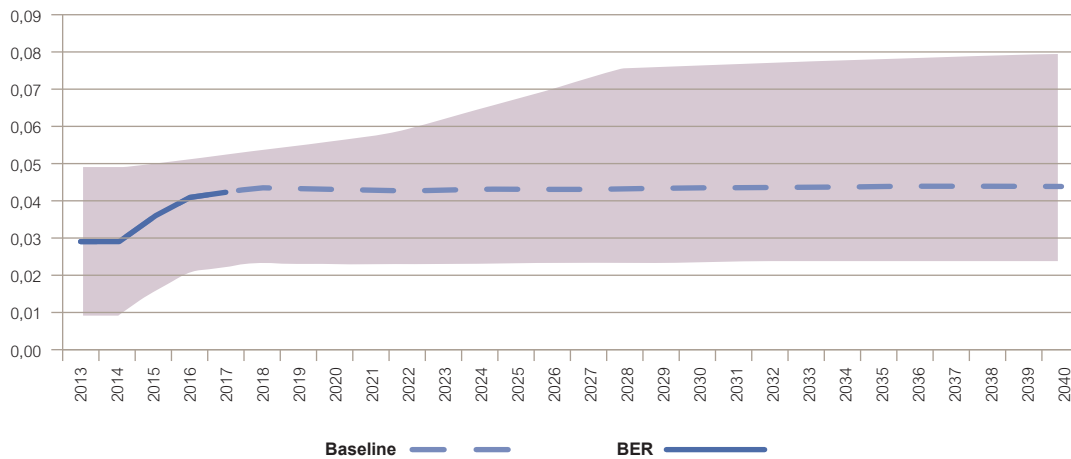


In the high-growth scenario, the population of the Western Cape could nearly double, from 5.8 million in 2012 to 11.1 million by 2040.

### 5.3.2 Economic growth

Economic growth affects almost all types of infrastructure demand. It is a key uncertainty and has two dimensions. The first is the external impacts of the global economy on South Africa and the Western Cape. The second is the impact of strategic policy and investment decisions to assist or impede certain economic sectors. As a starting point, the economic growth projections for the frameworks were built up using the current sectoral make-up and growth rates of the economies in each district. Then the growth in each sector was projected forward in three strategic scenarios for an economic baseline, which is based on Bureau of Economic Research projections up to 2017. On top of this baseline the impact of the global economy was assumed to be either stable (no external impact), positive (2% above baseline) or negative (2% below baseline). The net impact of these scenarios and assumption is an envelope of economic growth as shown in Figure 7.

**FIGURE 7** Envelope of economic growth projections



In light of no better data, the baseline scenario has projected economic growth to be stable at around 4.3% after 2018, but growth of up to 7.5% is possible (and necessary to meet the New Growth Path target of 7% average over 10 years).

# INFRASTRUCTURE SYSTEMS





## 6.1 ENERGY SYSTEM

### 6.1.1 Demand projections

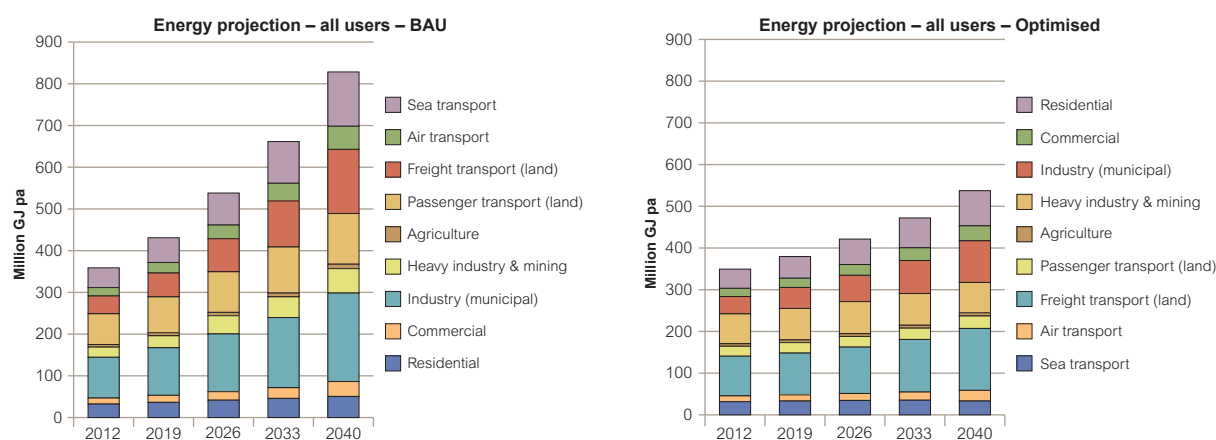
The demand projections have two components: the growth in the economy, which is related to increased production, and both price-related and technology-related demand-management inventions, which will drop the rate of increase below the economic growth rate. Table 3 gives the anticipated percentage below/above the economic growth rate for both development agendas, with a brief motivation for the difference.

**TABLE 3** Energy demand growth factors

CONSUMER GROUP	GROWTH RATE IN RELATION TO ECONOMIC GROWTH		KEY FACTORS INFLUENCING DEMAND TRENDS
	BAU	Opt.	
Residential			Driven by a mix of demographics and economic factors, as well as the recent energy efficiency standards <sup>18</sup> for new buildings, which will drop demand.
Commercial	-0.9%	-2.0%	Demand management gains are taken as significant.
Industry (municipal)	-1.4%	-2.6%	Industries facing high cost escalation, new technology and dropping demand.
Heavy industry & mining	-1.0%	-3.4%	Industries facing high cost escalation, new technology and dropping demand.
Agriculture	-2.3%	-3.4%	Agriculture sector also hard hit by rising energy costs and applying efficiency measures. Further, agriculture production is increasingly de-linked from economic growth, as it is constrained by supply-side factors.
Passenger transport (land)	-2.4%	-4.1%	The BAU agenda version of the passenger transport model provides for a moderate shift towards public transport and, in the outer years, electric cars
Freight transport (land)	0.5%	-1.0%	International data indicates that freight tonnage increases at about 1% above economic growth. Some efficiency is provided for, while the optimised agenda shows a negative relationship.
Air transport	-0.5%	-2.0%	Passenger numbers increase faster than the economic growth rate, but significant gains are made in aircraft fuel efficiency.
Sea Transport	-0.5%	-2.0%	International data indicates that freight tonnage increases at about 1% above economic growth. Some efficiency is provided for.

Taking these growth factors into consideration, energy demand in the Western Cape is calculated to grow at 3.0% between 2012 and 2040 for the BAU agenda and 1.6% in the optimised agenda, distributed as shown in Figure 8.

<sup>18</sup> South African National Standard (SANS) 10400-XA

**FIGURE 8** Growth in energy demand in the WC for BAU and optimised development agendas

The energy source for this projected growth is calculated based on estimated shifts, which are described for the optimised agenda in Table 4.

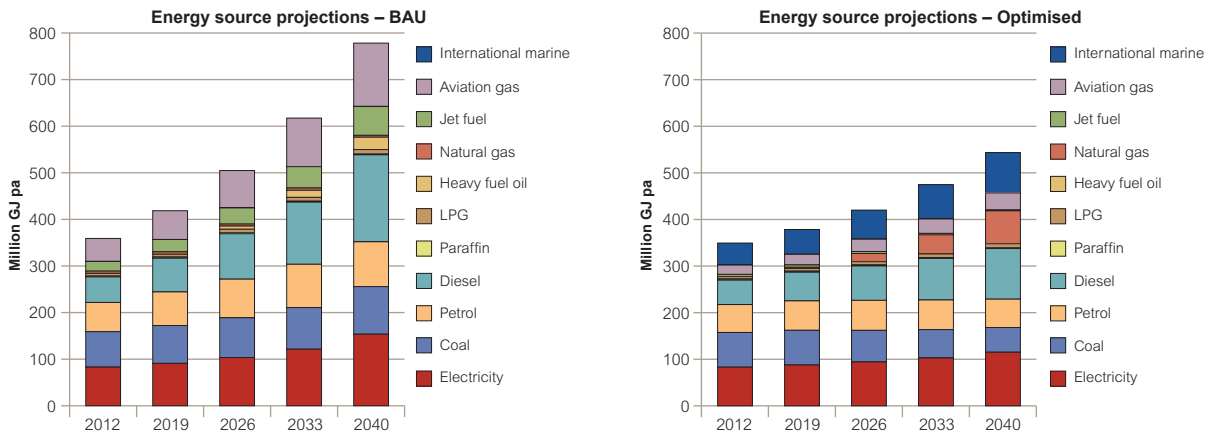
**TABLE 4** Optimised energy-use transitions for residential and industrial consumer groups

RESIDENTIAL ENERGY MIX	2012	2019	2026	2033	2040
Electricity from grid	93.5%	90.5%	85.5%	78.3%	67.0%
Solar water heating	1.9%	5.0%	8.0%	12.0%	16.0%
Solar PV	0.0%	0.0%	2.0%	5.0%	12.0%
Paraffin	3.0%	2.5%	2.0%	1.5%	1.0%
LPG	1.6%	2.0%	2.5%	3.2%	4.0%
INDUSTRIAL ENERGY MIX	2012	2019	2026	2033	2040
Electricity	30.7%	32.0%	32.0%	29.5%	28.0%
Coal	63.3%	60.0%	50.0%	40.0%	30.0%
Heavy furnace oil	3.9%	4.0%	3.0%	2.0%	1.0%
LPG	2.1%	2.0%	2.0%	1.5%	1.0%
Natural gas	0.0%	2.0%	13.0%	27.0%	40.0%

It should be noted that including natural gas in the primary energy source mix is subject to debate. Here natural gas is included as a “transitional” source pending the evolution of renewable energy generation technology.

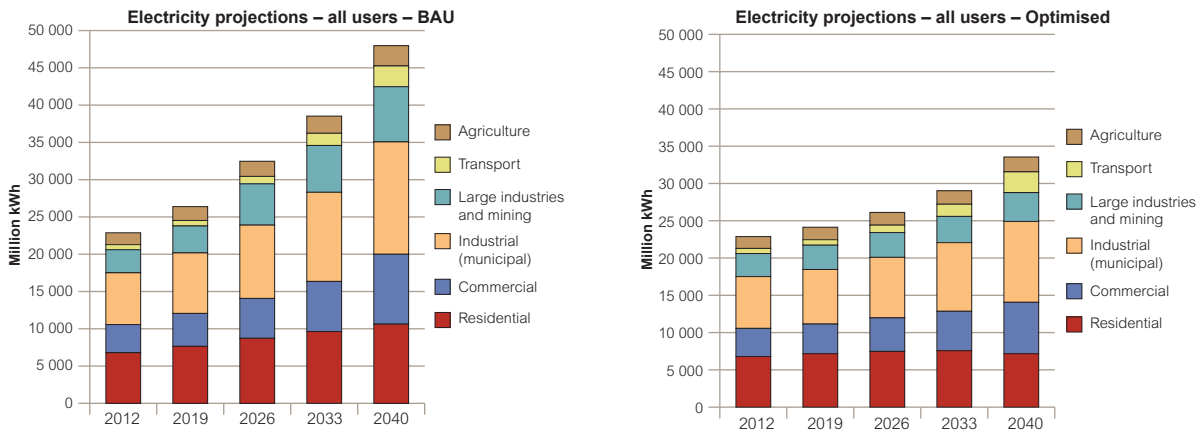
The resulting energy-use trends by energy source are shown in Figure 9.

**FIGURE 9** Trends relating to energy use in the Western Cape by source of energy



Turning to electricity specifically, as Figure 10 illustrates, an average growth rate of 2.2% and 1.4% is projected over the 28-year period for the BAU development agenda and the optimised agenda respectively.

**FIGURE 10** Trends with respect to electricity demand in the Western Cape



### 6.1.2 Supply options

In a sector as complex as the energy sector in South Africa, a wide range of supply options exist in the electricity and fuel sectors.

#### Electricity

The BAU agenda for the energy system is best defined by the IRP for electricity supply, which was completed by the Department of Energy in 2011. The IRP has a range of options – referred to as scenarios – and the one selected for comparison is referred to as the ‘base scenario’.<sup>19</sup> However, the base scenario assumes a high electricity growth rate in the country – 2.8% growth as far as can be ascertained. Therefore the approach taken here is to use the IRP ‘base’ primary energy mix, which is nuclear intensive, but not the growth trends.

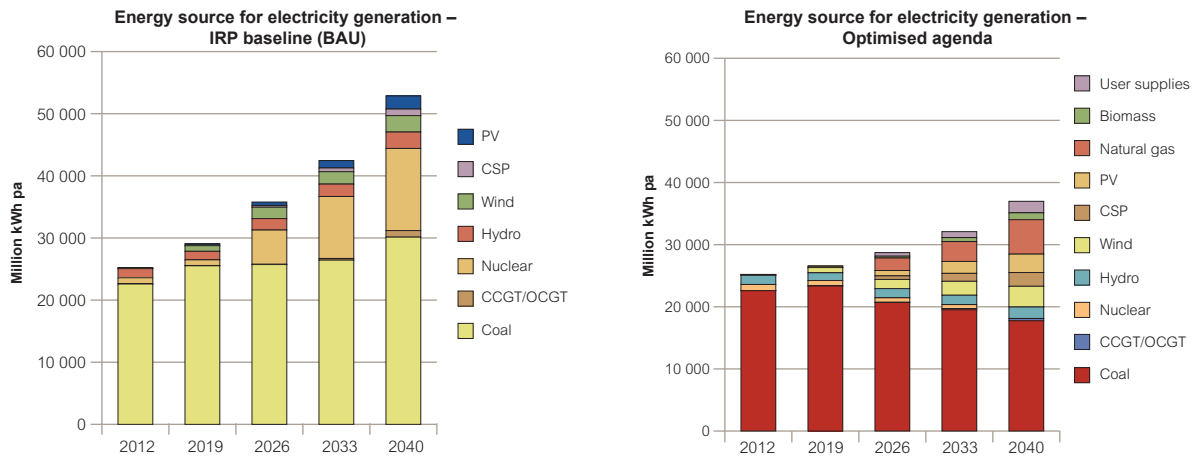
In contrast, an optimised agenda is aligned with the “green economy”, which represents an approach consistent with the Western Cape government’s current thinking. This is based on a high proportion of renewable energy complemented by natural gas, which is assumed will become available at reasonable

<sup>19</sup> There is some uncertainty here as to what the scenario names are. The selected one is included in the WCIF Phase 1 energy report.

cost, primarily from the African east coast gas fields. This optimised agenda envisages using natural gas as a transition, while renewable energy generation capacity is built up. However, by 2040 there will not be the time to ‘wind down’ the natural gas component. The optimised agenda also allows for individual users to feed dispersed generation into the grid.

The primary energy mix for these two options is illustrated in Figure 11.

**FIGURE 11** Comparative primary energy source mix for two electricity system options – WC portion



**Fuel**

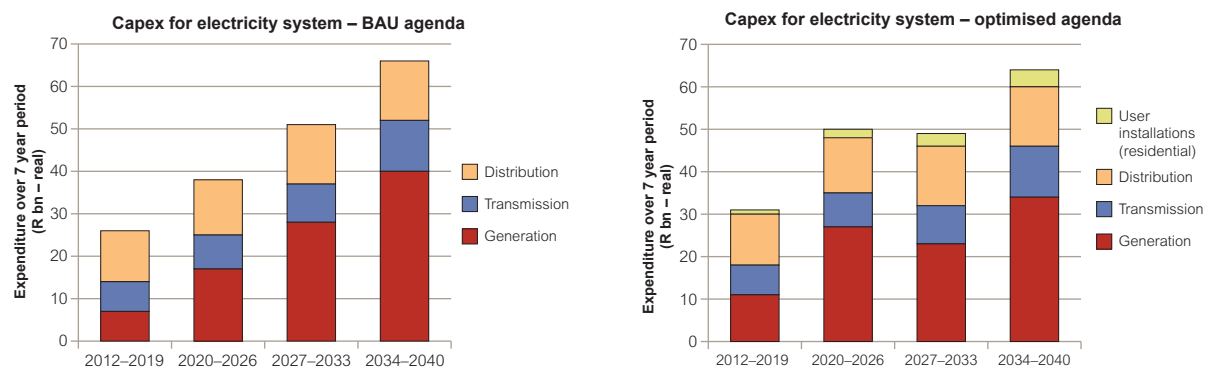
The fuel sector is dominated by liquid fuels, with the addition of coal used for combustion primarily in industrial plants. A BAU agenda is defined as continued use of coal and natural gas use for liquid fuel production much at the current levels (sourced from the Mossgas plant for example). The optimised development agenda will have reduced use of coal (see Table 4) and increased use of natural gas for liquid fuel production and direct combustion. Hereafter, only the optimised mix of primary energy is reported, as the data to allow for a proper comparison of options has not been sourced.<sup>20</sup>

**6.1.3 Capital requirements**

**Electricity system**

The relative capital requirements over the coming 28 years for the two options considered are shown graphically in Figure 12.

**FIGURE 12** Relative capital requirements for two electricity system options (WC portion of national system)<sup>21</sup>



20 This data on liquid fuel production rests primarily in the private sector.

21 Note that the big increase in the BAU scenario comes at the point where building of nuclear power stations commences.

The financing of this capital is divided among three institutional groupings:

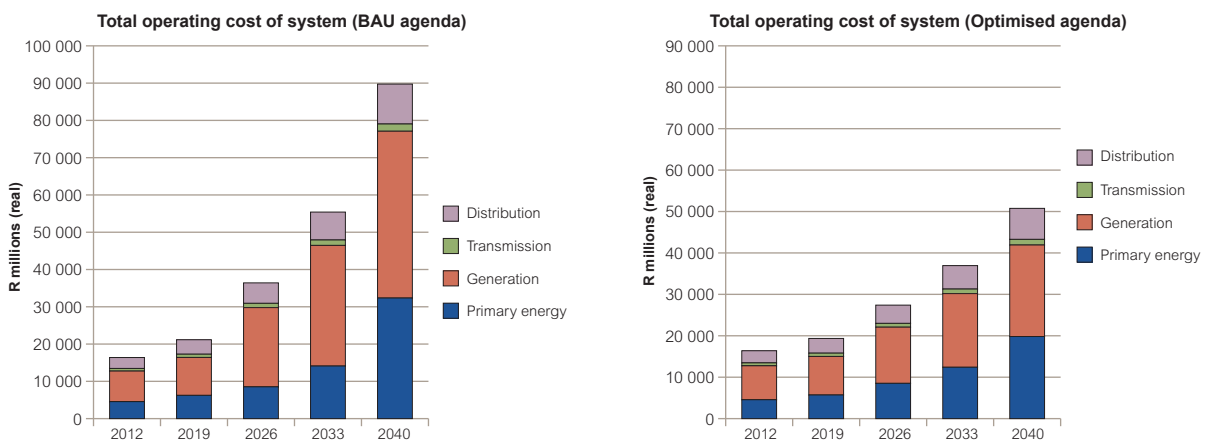
- **Eskom** is responsible for coal and nuclear power generation, a proportion of other power generation plants, the transmission system and part of the distribution system. This is financed off Eskom’s own balance sheet either in the form of debt or equity.
- **Municipalities** are responsible for financing the balance of the distribution system (an estimated 60%). They do this through a mix of grants, debt finance and accumulated reserves. Almost all municipalities are capital constrained.
- The **private sector** is able to develop and finance a large proportion of new power generation plants, specifically in the renewable energy field. A capital allowance for household generation of power through photovoltaic cells has been provisionally made, although the future costing of these systems is uncertain.

In comparing these two options the capital costs for the two options are similar. For the BAU energy mix, the cost is driven primarily by the anticipated costs of nuclear systems, which are assumed to escalate at a relatively high rate. In contrast, while the costs of renewable energy plants are currently high, the rapidly developing technology is expected to bring down the unit costs of power generation plants, but households will be responsible for the capital costs of dispersed generation.

### 6.1.4 Electricity operating costs and price trends

The relative trends with regard to operating costs of the electricity system are shown in Figure 13.

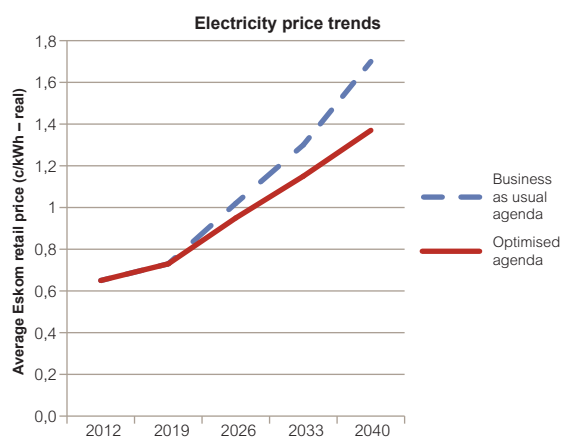
FIGURE 13 Relative operating cost of electricity system – WC proportion



The high cost of fossil fuel generating plants is evident. While renewable energy plants have to finance the capital works, these costs are assumed to decline as unit capital costs decline.

The operating cost has a direct relationship to the average price that needs to be charged to cover these costs. Relative price trends for the two options considered are illustrated in Figure 14. The starting point is an average price of 67 cents per kilowatt hours (kWh), which is somewhat below Eskom’s current price application of 71 cents per kWh.

FIGURE 14 Electricity price trends for two electricity system options





These figures amount to an average annual increase of 3.5% for the BAU agenda and 2.7% for the optimised agenda.

### 6.1.5 Liquid fuel price trends

Based on approximate trends for prices of primary energy (coal and natural gas), refining, distribution and tax, an average price increase of 2.8% (real) is projected for liquid fuels. This is based on the assumption that currently 34% of the price of fuel is retained for the primary energy cost.<sup>22</sup>

Based on the analysis presented, the energy future is substantially different for the BAU development agenda and the optimised development agenda. The big decisions relate to the inclusion of nuclear power in relation to the rate at which renewable energy distributed generation of electricity can be rolled out.

## 6.2 WATER SYSTEM

### 6.2.1 Demand projections

Demand projections for residential potable water demand are driven by household service levels, consumer income profiles and demand reductions due to behaviour change. Non-residential potable demand is driven by economic growth, while non-potable demand is assumed to grow below the economic growth rate because of efficiency gains and economies of scale. The demand reduction assumptions for the two agendas are shown in Table 5 and Table 6.

**TABLE 5** Residential water demand factors

INCOME GROUP	UNIT CONSUMPTION IN 2040 AS % OF 2012 CONSUMPTION		KEY FACTORS INFLUENCING DEMAND TRENDS
	BAU	OPTIMISED	
High income	80%	70%	Some demand management interventions are assumed for the BAU agenda, but this is increased to a 30% saving in the optimised case.
Low income with house connections	90%	80%	Less savings are assumed in lower income households due to lower baseline unit consumption.
Low income with lower levels of service	100%	100%	Households with low levels of service are not expected to consume below their present levels of consumption, which are already constrained by access to water.

**TABLE 6** Non-residential water demand growth factors

CONSUMER GROUP	GROWTH RATE IN RELATION TO ECONOMIC GROWTH		KEY FACTORS INFLUENCING DEMAND TRENDS
	BAU	OPTIMISED	
Agriculture	20%	20%	Agriculture sector growth is limited by supply-side factors, specifically the availability of water for irrigation, and the relationship to economic growth is small. Net effect is low growth projections for irrigation water in both scenarios.

<sup>22</sup> 20% distribution and retail, 26% tax and 20% refining cost; the latter figure is only a rough estimate.

CONSUMER GROUP	GROWTH RATE IN RELATION TO ECONOMIC GROWTH		KEY FACTORS INFLUENCING DEMAND TRENDS
	BAU	OPTIMISED	
Mining	75%	60%	Assumed that demand management interventions will keep growth below economic growth, but more so in the optimised agenda due to greater demand management effort.
Manufacturing	75%	60%	As above
Tertiary sector	75%	60%	As above

Taking these growth factors into consideration, between 2012 and 2040 water demand in the Western Cape is calculated to grow at an average of 0.7% per annum in the BAU agenda and 0.5% in the optimised agenda, distributed as shown in Figure 15. Residential average demand growth is 1.7% in the BAU agenda and 1.3% in the optimised agenda. Agricultural demand growth is projected at an average of 0.2% per annum in both agendas because of limited water resources for agriculture.

FIGURE 15 Growth in water demand in the WC – BAU and optimised agendas

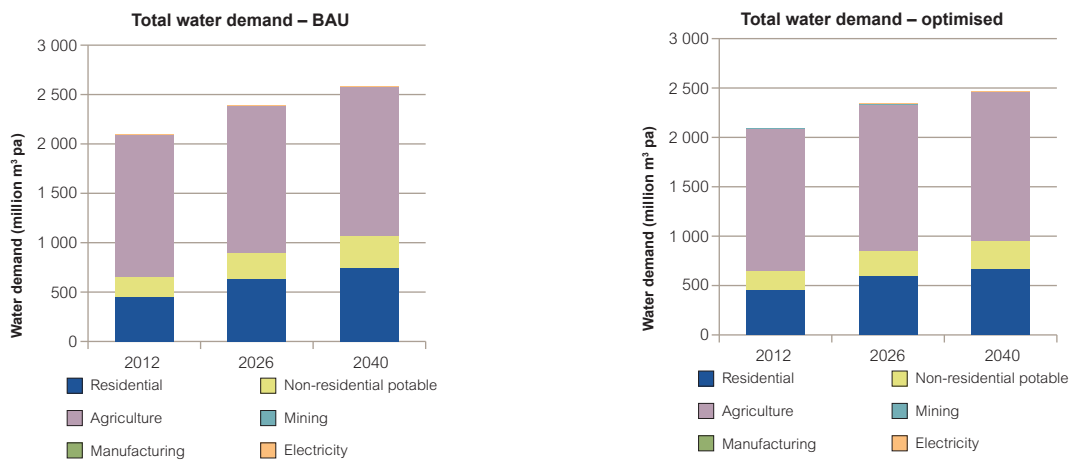
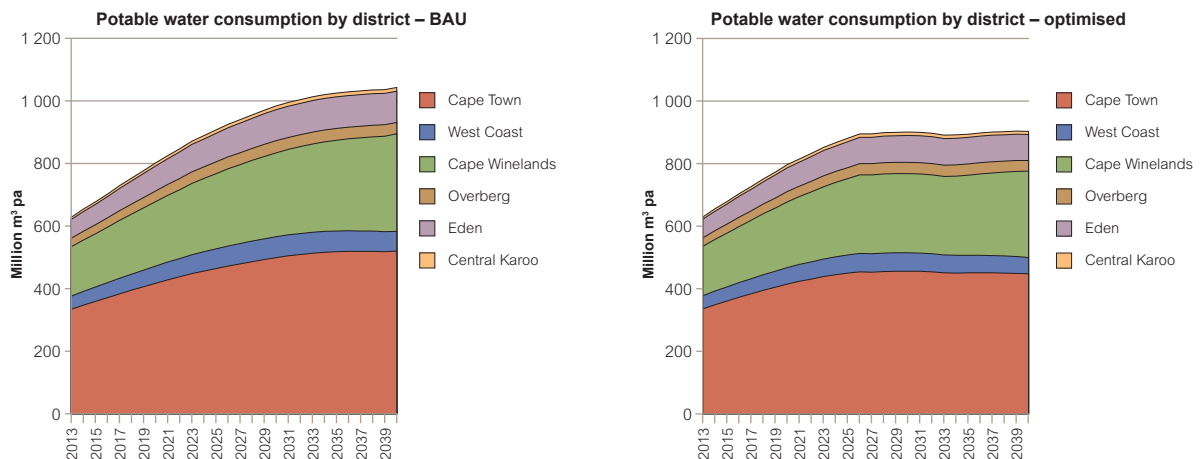


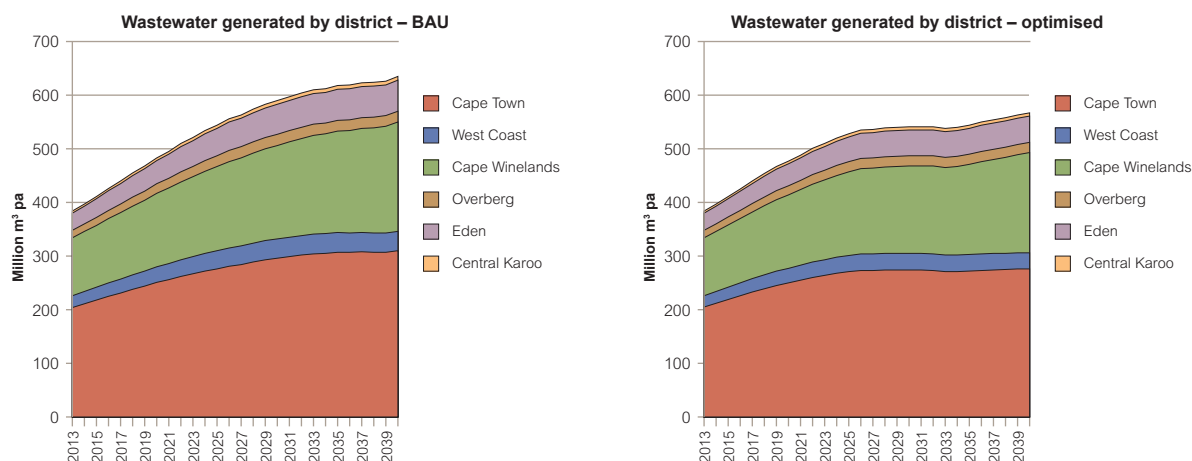
Figure 16 shows the breakdown in potable water demand by district.

FIGURE 16 Potable water demand by district



Wastewater generation in the province increases more rapidly than water demand because of the higher levels of service, with little difference between the BAU and optimised agendas.

**FIGURE 17** Wastewater generation by district



## 6.2.2 The supply options

To distinguish the different institutional players involved, water infrastructure is divided into water services and water resources infrastructure, as well as into potable and non-potable.

### Potable water services infrastructure

The good coverage in the province and the relatively good asset condition reflect the significant historical investment in water services infrastructure. No significant transition is required in water services infrastructure, apart from making existing networks “smarter”. The priorities for water services are: better gathering and use of information, and improved pressure management and leak detection to reduce water losses.

### Non-potable water services infrastructure

Non-potable water services infrastructure generally serves agricultural users, transferring water from the resource to the point of use. It includes all the Government Water Schemes (GWSs) in the province and private networks. Since limited expansion is projected in this sector, the priority is maintaining and rehabilitating existing schemes and better management to reduce losses.

### Water resources infrastructure

Given the water scarcity in the province, the sector’s overall priority is undoubtedly water resources. On the demand side, the importance of water conservation and demand management is acknowledged and needs to be a pre-requisite for any new water resource development. In addition, alien vegetation removal can release more surface water (and create employment), and further work needs to be done on improving hydrology and determining ecological reserves from existing surface water sources. The protection of fresh water rivers and wetlands is critical for the correct functioning of ecosystems and the improvement of water quality, failing which the affordable water options are severely reduced.

In the short term, the limited available surface water resources are likely to be exploited, which will involve mostly transfer schemes and extending existing water resources infrastructure; future dam development is unlikely. The only major surface water scheme planned is the raising of the Clanwilliam Dam.

The alternative options being considered include groundwater development, water reuse and desalination. Groundwater yield is uncertain and even over-exploited in some areas. Future groundwater yield from the Table Mountain Group aquifer to serve the Berg WMA is estimated at 20 million m<sup>3</sup> per annum. Treated effluent is becoming a more viable option, and potential supplies are estimated at 100 million m<sup>3</sup> per annum. This is the amount of reused wastewater assumed for the optimised agenda, compared to the BAU agenda that assumes only 10% of this amount is taken up. If industrial symbiosis is undertaken, this may increase the amount of effluent reused and decrease industrial demand.

Desalination has been viewed as a “last” option because of the cost but is already employed in small plants in the Southern Cape. The technology cost of desalination is declining, while energy costs are increasing. Once costs become the equivalent to other options, desalination will be employed in the Western Cape. It is assumed that the bulk of new water demands towards the end of the projection period will be satisfied by two types of desalination: decentralised desalination serving smaller towns and centralised desalination serving the West Coast and Cape Town.

The key transition in the water sector will be decisions around the allocation of water between agriculture and urban use. This has the potential to alleviate the need for desalination, but at the cost of the agricultural sector. Should the agricultural sector continue to be supported and grow, as is promoted in the Green Economy Strategy Framework, then desalination will become inevitable.

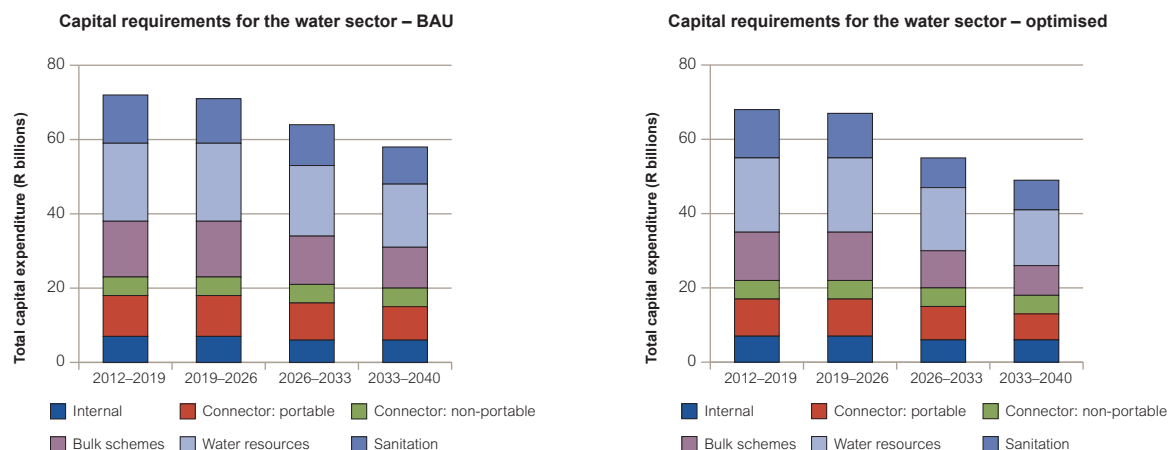
### Sanitation infrastructure

Sanitation infrastructure needs to expand in order to satisfy the existing backlog – largely in informal settlements and rural areas. However, the priority is to upgrade and rehabilitate existing treatment works, which are old and in generally poor condition. While sewage treatment technologies are improving, no significant infrastructural transition is expected.

## 6.2.3 Capital requirements

Figure 18 shows the capital requirements for each of the sector components. The shape of the curve indicates that significant capital investment is required to accommodate increasing water demand in the first 14 years, but thereafter, as demand stabilises, less investment is needed. The BAU agenda, costing R267 billion over 28 years is R25 billion more expensive than the optimised agenda, mainly because of the need for more expensive water treatment infrastructure (desalination) and more water resources infrastructure.

**FIGURE 18** Capital requirements for water and sanitation infrastructure



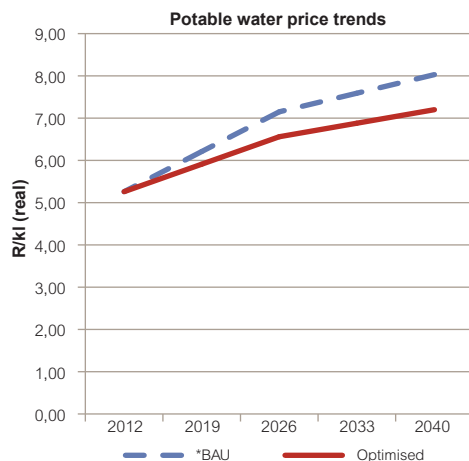
The financing of this capital is divided among three institutional groupings:

- The **Department of Water Affairs (DWA)** is responsible for developing water resources infrastructure, which is financed through an infrastructure charge in the raw water tariff. However, this infrastructure may be financed off-budget by the Trans-Caledon Tunnel Authority, or a private party as a public-private partnership (PPP), which is very likely in the case of desalination. The split cannot be determined at this time. DWA is also responsible for the funding of some non-potable water services (GWSs).
- **Municipalities** are responsible for financing the bulk and distribution infrastructure for potable water and sanitation, which is estimated at R5.4 billion per annum. They do this through a mix of grants, debt finance and accumulated reserves. Almost all municipalities are capital constrained.
- The **private sector** is currently only responsible for some non-potable water services infrastructure and small dams. However, this is likely to increase with developments in effluent reuse and desalination, which are well suited to project financing options and PPPs.

## 6.2.4 Water operating costs and price trends

In both agendas, the operating costs for water increase dramatically because of more expensive treatment options (wastewater effluent reuse and desalination). While the impact on tariffs and household expenditure cannot be determined accurately because it depends on the financing arrangements, Figure 19 provides an indication of the likely increases in the average potable water tariffs in the two agendas. If off-budget project finance is used (which is likely), then the tariff impact will be direct. The critical issue then becomes how to distribute the cost of new, more expensive supplies in light of cheaper existing supplies and inter-basin transfers.

**FIGURE 19** Potable water price trends in the two development agendas



The non-potable water tariff is not projected to increase, as no significant new water resources infrastructure is envisaged for non-potable users.



## 6.3 TRANSPORT SYSTEM

### 6.3.1 Demand projections

#### Passenger transport

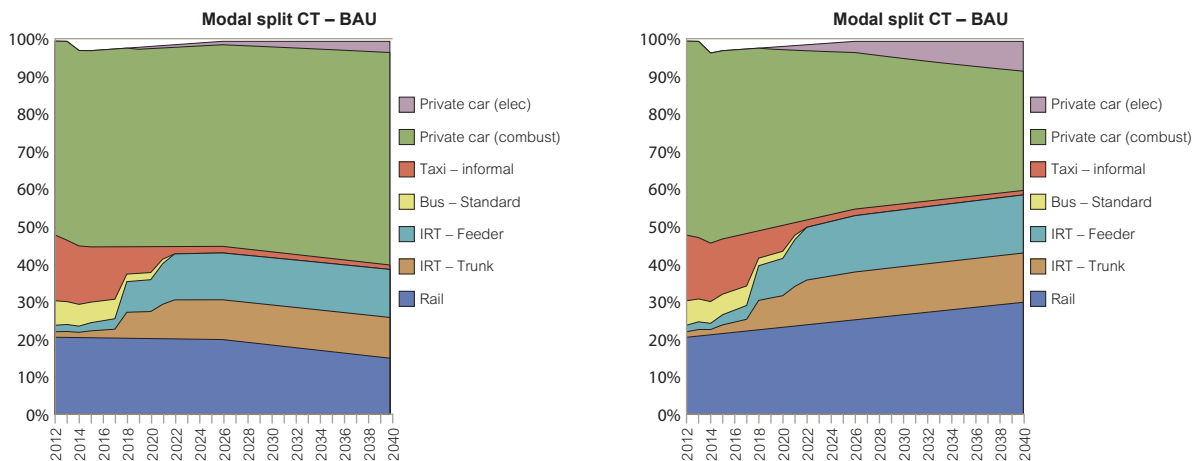
The demand for passenger transport relates to the number of trips required, with motorised trips being most relevant because they have the biggest impact on infrastructure requirements. The key issues for future infrastructure are the increase in the number of motorised trips and the transport modes available for these trips. In the case of the former the trends are driven partly by demographics (more people make more trips) and partly by the economy (more people travelling to work means more motorised trips). For this analysis the total growth in motorised trips is taken to be 1.5% below the growth rate of the provincial economy, which gives an average yearly growth rate of 2.8% over the 28-year planning period.

With regard to modes, as a metropolitan area, Cape Town has a specific situation where mass transit options are required. The key interventions driving demand passenger transport in the city are to:

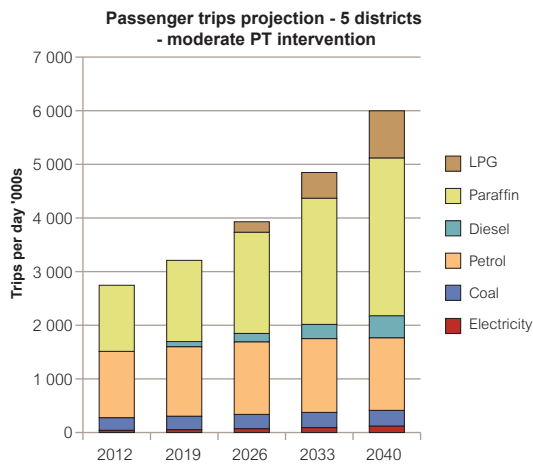
- Expand and improve the performance of the rail system.
- Roll out the Integrated Rapid Transit (IRT) system centred on the MyCiti service.
- Make electric cars available.
- Improve and expand NMT facilities for walking and cycling.

The BAU development agenda assumes that the City of Cape Town IRT plans are rolled out, but private car usage continues to grow faster than that of public transport. For the optimised agenda, rail usage is increased substantially, reducing private car usage to 40% of the mode share by 2040, 8% of which is assumed to be electric cars. The two modal split assumptions are shown in Figure 20.

FIGURE 20 Passenger transport modal split projections for Cape Town

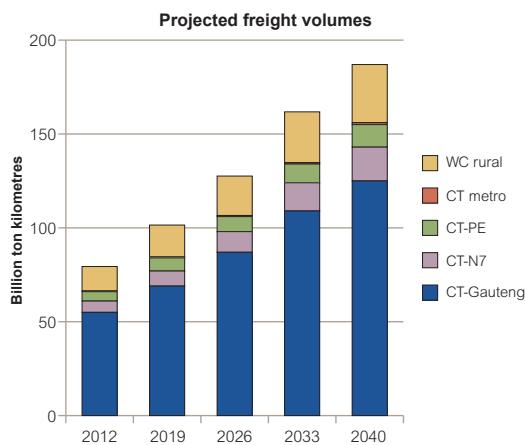


For passenger trips in the five districts, the modal split will be somewhat different because, with little need for mass transit systems, the primary intervention will be aimed at improving the bus and minibus taxi system, introducing new municipally run bus services (such as the one planned for George) and accessing electric cars. The trend under the BAU agenda is shown in Figure 21.

**FIGURE 21** Moderate passenger transport demand projections for the five Western Cape districts

### General freight transport – road and rail<sup>23</sup>

The demand for general freight transport – excluding bulk freight on the Sishen–Saldanha line – is analysed in the freight logistics plans based on five divisions: the three corridors leaving Cape Town (to Gauteng, up the West Coast (N7) and along the South Coast to Port Elizabeth); movements within the metro; and movements in the remaining (mostly rural) areas of the province. Trends are strongly associated with economic growth, and the literature typically indicates a growth rate in freight movements of at least 1% above the economic growth rate. The resulting projections for Western Cape are shown in Figure 22.<sup>24</sup>

**FIGURE 22** Trends with demand for general freight transport in the province<sup>25</sup>

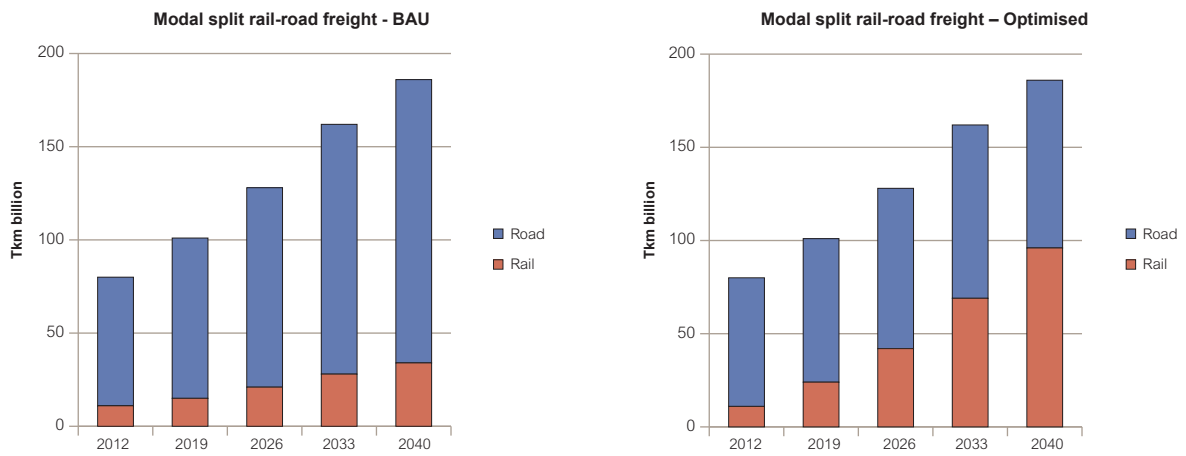
The modal split for the freight service is an important strategic issue for the province. Currently the data shows the split to be 14% rail and 86% road freight. Changing this split will depend on the extent to which the Transnet infrastructure and associated service on the Gauteng line can be improved. Figure 23 shows an optimistic view of changed modal splits for the optimised agenda, based on 70% of freight being moved by rail on the Gauteng route (up from the current 15%), while the split is kept at current levels for the BAU agenda.

23 Other freight infrastructure (ports and bulk rail line to Sishen) are only covered as capital items here.

24 It is notable that the data plotted here has a very low proportion of freight for the Cape Town metro. This is based on the CSIR freight logistics plan for the province (2007). However, national freight statistics contradict this data, showing much higher proportions for freight movements within metros. The former figure is used partly because it was not possible to get the fuel balance working with higher metro numbers.

25 Regarding the units: one ton kilometre is one ton of cargo moved one kilometre

FIGURE 23 Modal split projections for general freight transport

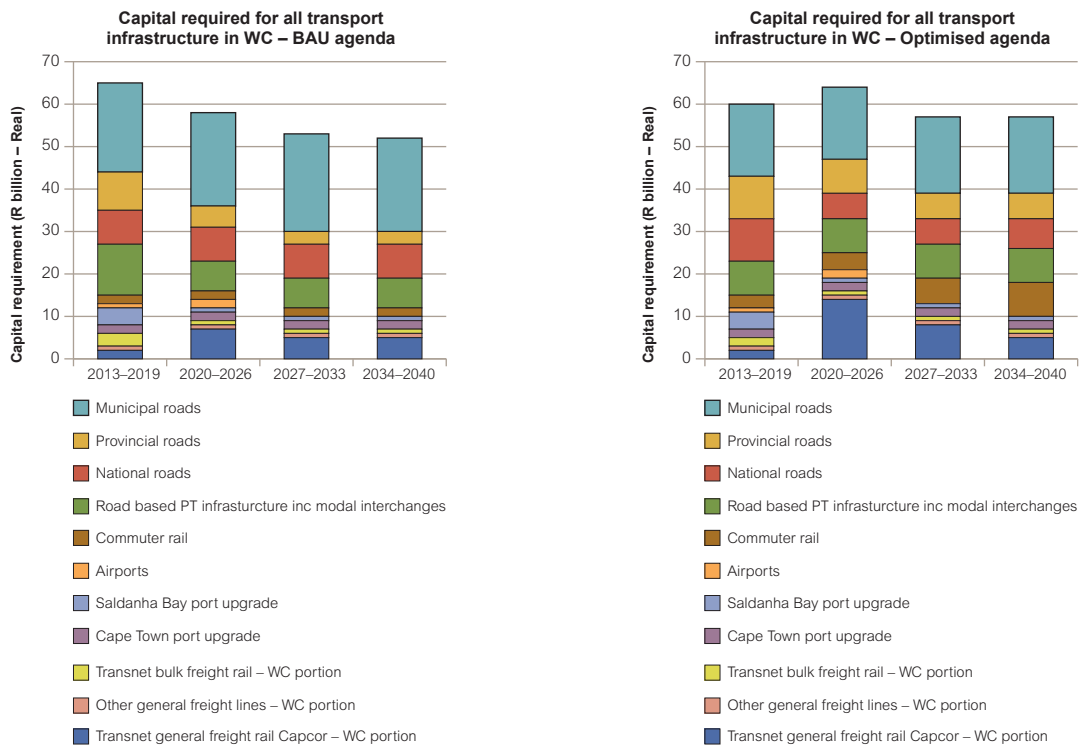


### 6.3.2 Supply options

To a large extent the supply options have already been identified in the preceding section, since the demand for transport services depends on the available transport mode and its associated technology.

### 6.3.3 Capital requirements

FIGURE 24 Transport capital expenditure projections for both development agendas



The amounts shown in Figure 24 and their significance are summarised in Table 7.

**TABLE 7** Impact of the BAU and optimised agendas for transport<sup>26</sup>

SUB SYSTEM	PROJECTED CAPEX 28 YEARS (R BILLION)		BASE OPTION (BAU AGENDA)	IMPACT AND ALTERNATIVE (OPTIMISED AGENDA)
	BAU	OPT.		
Transnet general freight rail Capcor - WC portion	19	29	Assumes that Transnet estimates for upgrade of Gauteng line will be cut back due to low level of demand on this line.	High priority for the province due to reduced freight costs and lower emissions. Transnet budget for Gauteng line upgrade used, with 70% allocated to WC.
Other general freight lines - WC portion	2	2	Estimate only – no data sourced for this.	High priority to keep existing primary lines functional and efficient.
Transnet bulk freight rail - WC portion	6	4	Transnet budget for Sishen–Saldanha line upgrade used, with 40% allocated to WC	Directly linked to heavy industry and minerals export strategy. The impact of this development approach is open to debate, so the alternate, optimised option has reduced expenditure on this line.
Cape Town port upgrade	8	8	Seven-year capital plan for port upgrade included. Rough estimate for future expansions	It is assumed that port upgrades are equally important for both agendas.
Saldanha Bay port upgrade	6	6	Seven-year capital plan for port upgrade included. Rough estimate for future expansions	It is assumed that port upgrades are equally important for both agendas.
Airports	3	3	Provision for runway upgrade included plus small additions. No provision for new airport in 28-year planning period.	Airport upgrades are equally important for both agendas.
National roads	33	28	SANRAL three-year projection for non-toll roads with half of provision for new expansion (WC portion taken as 11.6% based on road length). Extended for further four years. Reduced expenditure for outer 21 years.	As the validity of SANRAL budget provisions in the early period is debatable, the optimised agenda reduces them to R10 billion in the first seven-year period and then provides for one billion per year for the remaining 21 years.
Provincial roads	31	31	Province budget for roads capital works – extended to 28 years with no increase in real terms.	No change, as it is assumed that the provincial roads budget provides for optimised expenditure with limited expansion of the roads system.
Commuter rail	9	22	The BAU agenda provides for PRASA figures from the 2008 rail plan which are relatively modest.	The optimised option provides for substantial increase in capex, consistent with the view that a key transition is much improved mass transit systems in Cape Town.

<sup>26</sup> Note that none of these proposed changes have been discussed with stakeholders.

SUB SYSTEM	PROJECTED CAPEX 28 YEARS (R BILLION)		BASE OPTION (BAU AGENDA)	IMPACT AND ALTERNATIVE (OPTIMISED AGENDA)
	BAU	OPT.		
Road based public transport (PT) infrastructure including modal interchanges	3	29	2008 Cape Town IRT projections for four phases. Complete by 2016. Much lower expenditure projected for outer 14 years. Probably substantial under-estimate.	As with commuter rail, provision is included for substantially increased expenditure on the road-based IRT system. This is an indicative number only, as evidently no sound numbers are available for the outer years.
Municipal roads	88	70	Municipal Services Finance Model figures. All backlogs removed. All necessary rehabilitation undertaken. Likely over-estimate.	The impact of expenditure on municipal roads is debatable. The optimised option includes an 80% reduction on this component.
Total (over 28 years)	225	234		

In essence, the optimised agenda is based on an urban efficiency that emphasises more expenditure on public transport and general freight rail and less on roads and bulk rail. The total expenditure for the optimised agenda amounts to R9 billion, which is more than the BAU agenda over the 28-year planning timeframe.

### 6.3.4 Price trends

The analysis of Cape Town's public transport system indicates that fares for public transport will rise by 2.4% per annum, driven by increased investment in vehicles and rising fuel prices. However, much will depend on the subsidy system, which is open to considerable debate and is not addressed here.

Real freight costs in ton per kilometre are predicted to increase at 5.1% per annum.<sup>27</sup> This is due partly to fuel price increases and partly to the cost of mostly imported vehicles.

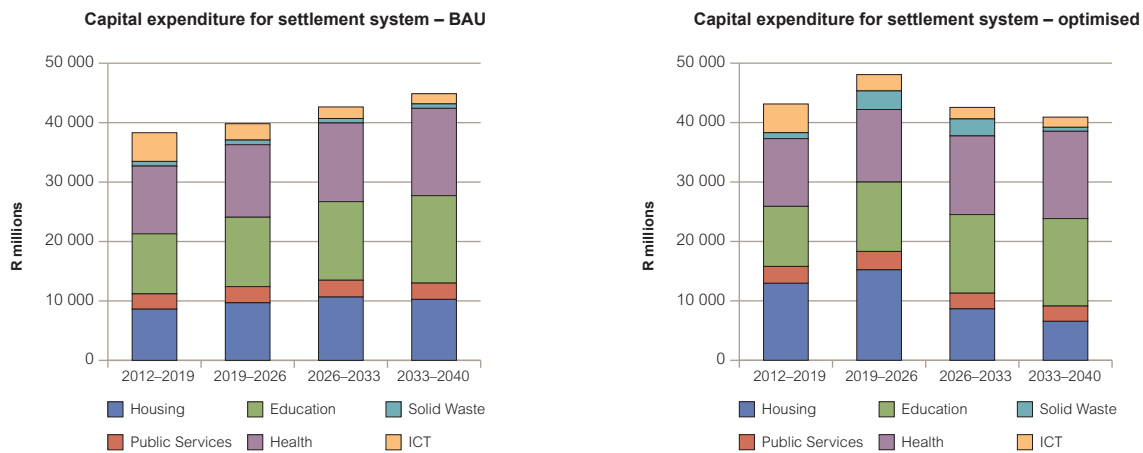
## 6.4 SETTLEMENT SYSTEM

The settlement system comprises four sub-sections: housing, public services (including municipal buildings), social services (education and health) and solid waste. The overall capital expenditure for the settlement system is shown in Figure 25 for the BAU and optimised agendas, with each of the sub-sections considered in more detail in following paragraphs.

<sup>27</sup> This high cost increase which results from the initial analysis needs further examination.



FIGURE 25 Capital expenditure on settlement system<sup>28</sup>



## 6.4.1 Housing

### Demand projections

Housing demand is driven primarily by demographic changes (growth, in-migration, household fragmentation) and by changes to household affordability levels. A significant factor is the latent backlog, which comprises households that are inadequately housed or that share dwellings with other households (overcrowding). The housing backlog is currently estimated at 425 000 households. Projected demand will depend on the rate of housing delivery, while still allowing for natural growth in demand. In turn, the rate of delivery is dependent on the finance and land available, and the targets set for various housing types.

### Supply options

The desired shift in human settlements is towards a diversified housing programme, with more emphasis on incremental options, integrated settlement development and a range of occupancy (tenure) options, including social rental.<sup>29</sup> This implies accepting informality in the short to medium term and focusing on land and infrastructure rather than top structure, but with the 2040 vision being adequate housing for all.

Under this paradigm, the eradication of the backlog does not equate to eradicating informal settlements, as settlements will be in various stages of upgrading. The infrastructure implications of urban informality include: reform of infrastructure norms and standards; more differentiation in the level of service provision to households (upgradable systems); greater upfront delivery of high-quality community facilities and amenities to informal settlement areas; infrastructure delivery to informal economic activities; and linking of upgrading to employment opportunities.

The assumptions that have been made in the two development agendas are provided in Table 8: Housing delivery assumptions for development agendas and the impact on housing delivery is shown in Figure 26 and Figure 27.

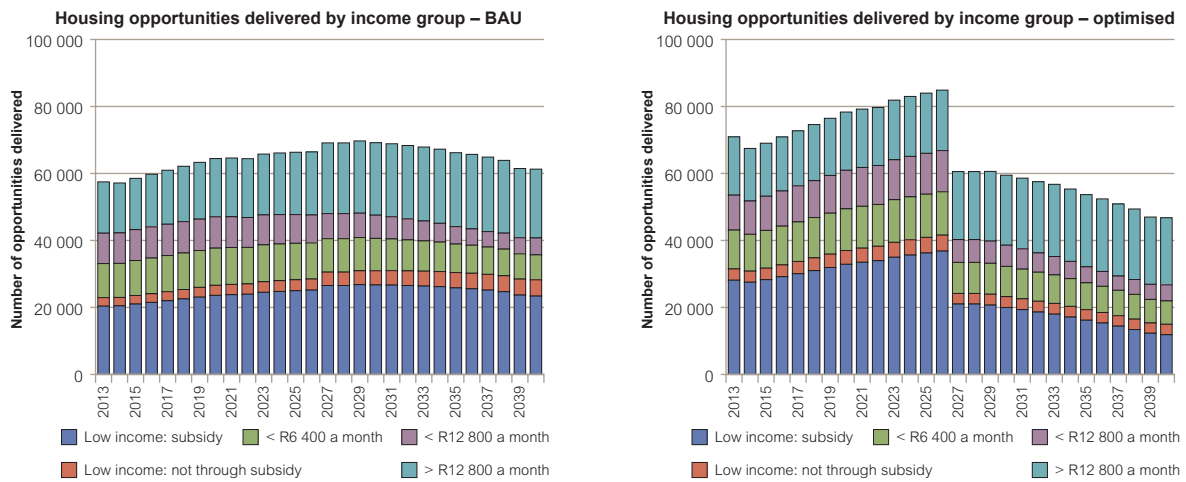
<sup>28</sup> Note that education and health figures only include public spending, not private contributions

<sup>29</sup> The Provincial Human Settlements vision for 2040 has not yet been determined

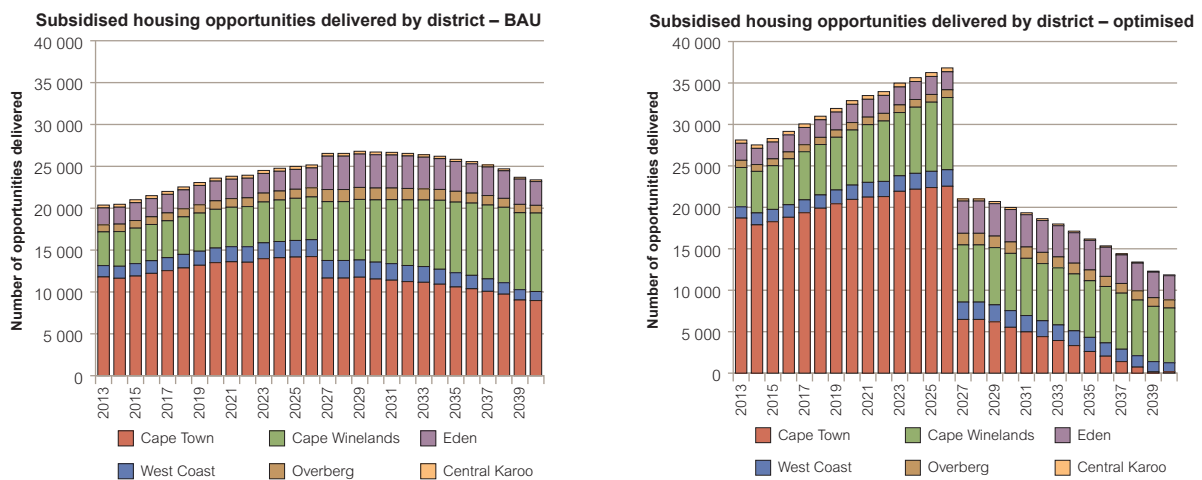
**TABLE 8** Housing delivery assumptions for development agendas

	BAU	OPTIMISED
Target date for backlog eradication	2040	2026
Single formal units	80%	20%
Medium-density units (including social rental housing)	10%	30%
Incremental upgrading	10%	50%

**FIGURE 26** Number of housing opportunities delivered by income group



**FIGURE 27** Number of subsidised housing opportunities delivered by district



The BAU agenda results in the relatively constant supply of low-income, subsidised housing, amounting to 682 000 opportunities in 28 years. The optimised agenda requires accelerated delivery for the first 14 years, peaking at 37 000 opportunities per annum, but only requires 689 000 opportunities over the full period. Although the projections are provided in numbers of opportunities delivered, the location of these opportunities (close to employment and work opportunities) and the integration of infrastructure and housing may be more important.

## Capital requirements

To provide an indication of the level of subsidies required in the province for the two agendas, Table 9 shows capital requirements for low-income, subsidised housing only. Despite a focus on incremental options, the optimised agenda is calculated to cost R4.1 billion more because of the increase in medium-density options, which are much more expensive than single units. However, social housing institutions (supported by capital subsidies) are expected to finance the capital allocated to medium-density units, reducing the burden on local municipalities or on national grants. Land has not been specifically addressed here, as it is not infrastructure, but will have a significant impact on the capital requirements, particularly if the location of low-income settlements improves.

**TABLE 9** Capital requirements for low-income, subsidised housing

R MILLIONS	BAU					OPTIMISED				
	2012 to 2019	2019 to 2026	2026 to 2033	2033 to 2040	Total	2012 to 2019	2019 to 2026	2026 to 2033	2033 to 2040	Total
Cape Town	4,689	5,256	4,244	3,751	<b>17,940</b>	8,331	9,423	2,050	643	<b>20,447</b>
West Coast	564	701	750	544	<b>2,560</b>	657	801	892	654	<b>3,005</b>
Cape Winelands	2,088	2,348	3,588	4,266	<b>12,291</b>	2,527	3,490	3,330	3,236	<b>12,582</b>
Overberg	341	390	513	403	<b>1,647</b>	350	373	579	486	<b>1,788</b>
Eden	813	875	1,449	1,212	<b>4,350</b>	893	920	1,688	1,467	<b>4,968</b>
Central Karoo	120	123	110	85	<b>438</b>	197	214	116	70	<b>597</b>
Total	8,616	9,693	10,655	10,261	<b>39,226</b>	12,955	15,221	8,654	6,556	<b>43,386</b>

The Human Settlement Development Grant for the province is currently equal to approximately R1.8 billion per annum. Assuming it remains constant until 2040, this grant would amount to R49 billion, which would make both development agendas affordable. However, land prices and infrastructure costs may be the capital-constraining factor for the delivery of housing opportunities.

## Operating costs and price trends

The modelling does not deal with the implications of housing development on property rates. The transition to denser, more integrated cities brings numerous opportunities for more efficient resource use and reduced living costs, but care needs to be taken to ensure that property prices and rates do not escalate beyond the reach of the poor.

## 6.4.2 Public services and social services

### Demand projections

The demand for public and social services is a function of demographic growth and historical backlogs, which in turn is driven by norms and standards around access. A number of planning processes are mapping the coverage of public and social services within the province, and presenting the spatial demand in this detail is beyond the scope of the WCIF.

### Supply options

The future focus is on 'access, adequacy and efficiency, equity and quality'.<sup>30</sup> The transition required is from fragmented and exclusionary settlements to 'liveable' settlements. If the supply of public and social services infrastructure (usually buildings, but occasionally developed spaces such as parks and

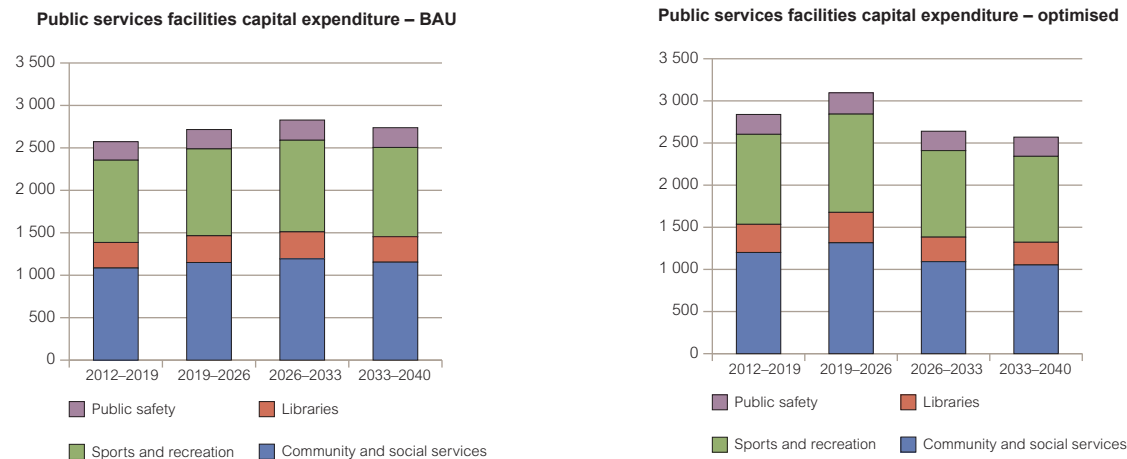
sports grounds) are provided according to the norms-driven demand,<sup>31</sup> then there is little infrastructural difference between BAU and the optimised case, other than a higher level of spending on these facilities than in the past. One important difference between the two agendas is the spatial location of these facilities, which is guided by Provincial and Municipal Spatial Development Frameworks, and which involves a ‘micro’ level of analysis to be included in more detailed infrastructure planning.

Education and health are accepted as the foundations of building the vision for the province in 2040 and achieving growth and employment for all. Therefore, no transition is required from the projected path of adequate infrastructure provision of education and health facilities.

### Capital requirements

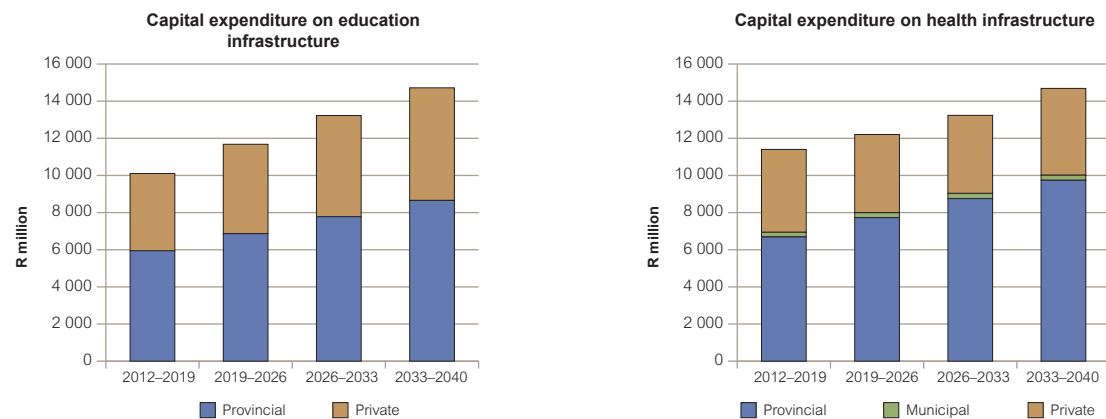
High-level estimates have been made of the capital required for public services under each development agenda, with the optimised agenda requiring R288 million more in total to ensure higher levels of service.

**FIGURE 28** Capital expenditure on public services facilities for both development agendas



The capital expenditure growth on social services facilities (education and health) have been projected to grow at the rate of demographic growth in a single development agenda. These figures include estimates of private sector contributions, although these figures are not currently known.

**FIGURE 29** Projected capital expenditure on social service infrastructure



31 See CSIR Guidelines for the Provision of Social Facilities in South African Settlements published by the CSIR in 2012 for the best norms and standards for these facilities.

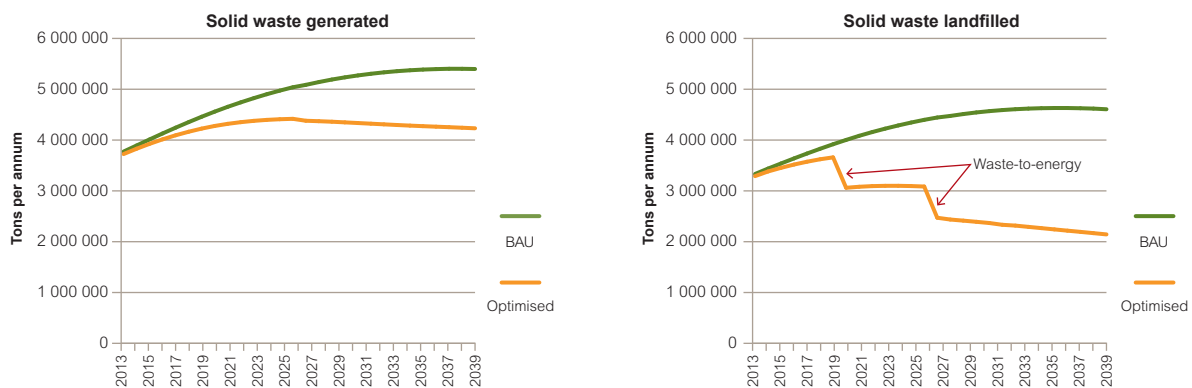
### 6.4.3 Solid waste

#### Demand projections

In addition to demographic and economic growth (the latter having a significant effect on waste generation), demand for waste infrastructure is a function of the service being offered. An additional demand driver that differentiates the solid waste sector from other sectors is national legislation, which requires specific interventions to reduce or proactively manage waste. The National Environmental Management Waste Act requires municipalities to fundamentally reconsider and augment traditional waste management practices, infrastructure and services that will benefit the economy, society and the environment. Waste infrastructure demand will increase with demographic and economic growth and better levels of service, but will be balanced by reduced waste generation by individual households, particularly in cities where current waste generation levels are high. This is likely to result in an increase in smaller towns and a per-household reduction in larger centres.

Figure 30 presents waste generation rates and landfill rates the two development agendas. The BAU case shows waste generated increasing from 3.8 million<sup>32</sup> to 5.4 million tons per annum over the 28-year period, while the optimised agenda has the potential to reduce the 2040 figure to 4.6 million tons. The waste landfilled is strongly influenced by the assumptions of the increase in recycling and waste-to-energy (see Table 10).

**FIGURE 30** Solid waste generated and landfilled in the two development agendas



#### Supply options

For much of the province, the waste collection infrastructure is likely to remain unchanged, with the emphasis in smaller municipalities on 'getting the basics right'. However, the form of waste processing and disposal infrastructure presents opportunities in the green economy.

Avoiding waste is a priority to reduce the cost and impact of solid waste. Specific infrastructure is not required for interventions that include industrial symbiosis for reuse of waste products, modifications to packaging and on-site reuse.

Organic waste composting is already in place and is likely to be expanded. However, separating all organic waste from the waste stream will reduce the viability of waste-to-energy, and this trade-off needs to be evaluated. Each municipality will have a different context, according to its location and climate, and population size.

To achieve the NWMS targets, transfer stations and landfill sites will need to be equipped as materials recovery facilities. As the availability of landfill airspace reduces, waste will have to be transferred

32 As stated in the Provincial Integrated Waste Management Plan, WC Department of Environmental Affairs and Development Planning, (2010), this is assumed to include waste that is collected privately



further, and the volume of waste passing through transfer stations is expected to increase, while tighter regulations on landfills will result in more expensive systems of lining, weighing and containment. Landfill gas-to-energy is imminent in Cape Town and can be extended to other areas. This intervention reduces greenhouse gas emissions (thereby helping to achieve climate change targets) and landfill volume, and generates energy and revenue, particularly if the Clean Development Mechanism<sup>33</sup> continues. Landfill gas-to-energy infrastructure should therefore become standard practice at municipal landfills, if found to be viable after a feasibility assessment. In certain circumstances these facilities can be self-financing.

Regionalisation of waste facilities is being debated, but much will depend on the economies of transport versus the availability of local waste sites and resources.

Although not yet economically viable, in the projection period waste-to-energy is expected to become viable because of lower technology costs and increased transport and energy costs. These facilities can process municipal solid waste, municipal sewage sludge, and commercial and industrial waste. The large capital costs of these schemes and potential returns from the sale of energy make them suitable for off-budget project financing involving PPPs.

Waste has important synergies with other infrastructure sectors, which need to be exploited to achieve efficiencies in all sectors involved. The potential for electricity generation from waste (municipal solid waste, green waste and sewage sludge) has already been mentioned, and wastewater effluent reuse has been discussed in the water section. In addition, the increased use of rail for mass waste transport can have the dual advantage of reduced waste transport costs and reduced road-pavement loading, particularly in the context of increased waste regionalisation.

The waste assumptions used in the modelling to distinguish the BAU from the optimised scenario are presented in Table 10.

**TABLE 10** Solid waste transitions

	BAU	TRANSITION
	2040	2040
Waste to transfer stations	20%	50%
Recycling (including composting)	5%–15%	25%
Minimisation (residential and non-residential)	10%	20%
Waste-to-energy	0%	35% (50% of Cape Town and includes sewage sludge)
Landfill gas	0	50 GigaWatt hours

### Capital requirements

The capital costs for the two development agendas are shown in Figure 31. In the optimised agenda, although some capital is saved in disposal costs, increased capital is required for transfer stations and recycling facilities, as well as two tranches of significant investment in waste-to-energy.

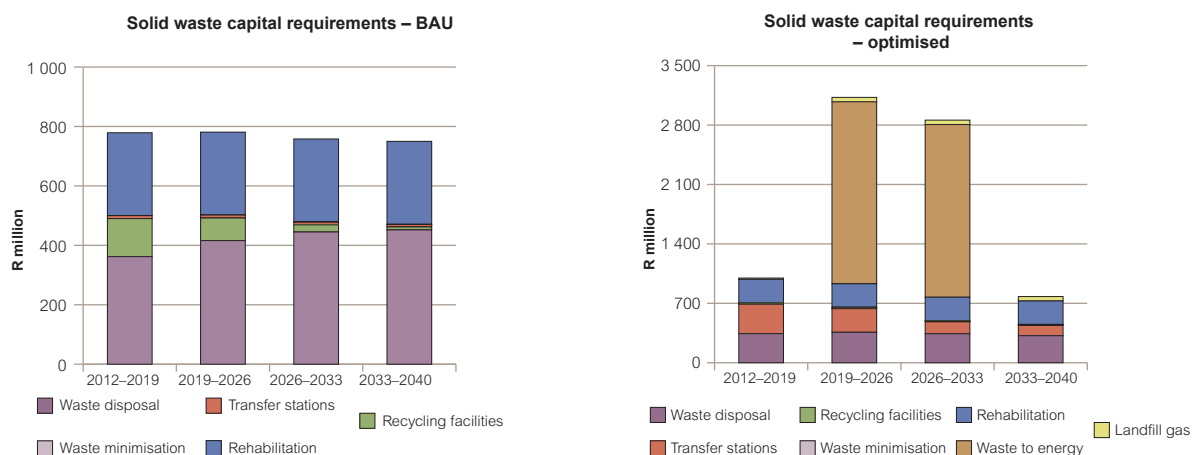
### Operating costs and price trends

Municipal solid waste collection costs are generally not fully recovered directly through tariffs, with the result that the remaining costs are recovered through general rates or national subsidies. Municipalities, citizens and businesses also do not bear the cost of the environmental externalities. As legislation attempts to limit the environmental impact, the cost of solid waste infrastructure will increase, and these

33 An international mechanism through which 'carbon credits' can be traded in an open market

externalities will be internalised into the solid waste tariff. This, together with a general increase in waste transport costs, will result in a sharp increase in the municipal tariffs.

**FIGURE 31** Solid waste capital requirements



## 6.5 ICT SYSTEM

### 6.5.1 Demand projections

The demand for ICT infrastructure comprises three elements:

- Existing backlogs in infrastructure coverage
- Bottlenecks in speed/functionality of existing networks
- Introduction of new technology as it becomes available

While the existing backlogs in access have been quantified, the bottlenecks are less clear, and the timing of new technology is not known. However, although the Western Cape is better serviced than the rest of the country, an initial intervention will be needed to raise the province to international standards, followed by further interventions to maintain this status.

### 6.5.2 Supply options/key transitions

Launched in 2012, the Western Cape Government's investment strategy involves building the provincial backbone to the network infrastructure and creating an enabling environment to support the connection of communities, government offices and businesses to the network.

The ICT infrastructure framework is described in seven-year intervals, with the main milestones shown in Table 11.

**TABLE 11** Key milestones in ICT strategy

OBJECTIVE	TARGET	BY WHEN
Connected Government	70% government buildings connected	2014
Connected Communities	100% of public schools connected.	2014
Connected Citizens	100% access to public ICT facilities (in every ward)	2014
Connected Business	Large government buildings and targeted industries in the metropolitan area connected via 'fibre to the premises'.	2014

OBJECTIVE	TARGET	BY WHEN
Connected Households	<ul style="list-style-type: none"> <li>100% access to broadband infrastructure in rural and urban areas.</li> <li>Improved access to affordable broadband infrastructure at network speeds in excess of 100Mbps in the metropolitan areas.</li> </ul>	2020
	100% access to affordable broadband infrastructure at a minimum network speed of 1000Mbps.	2030

The targets described in Table 11 are steeper than the national targets, which are to provide universal broadband access by 2020 and public ICT access within a two-kilometre radius by 2019.

No specific transition is defined for the ICT sector because it is core to the transitions required in other sectors and for the achievement of the PSOs. The investment framework is driven largely by the need to stimulate economic growth; support government functions and public services; and promote the private sector. The eight core projects discussed in this framework will:

- provide the necessary network to integrate government offices and improve public services, such as public safety and disaster management communications;
- improve internet access at a household level;
- reduce the cost of international bandwidth;
- improve connection to businesses.

The provincial ICT investment strategy is thus seen as essential and has the potential to fundamentally change the way that certain services are experienced (e.g. education, healthcare and general government services).

### 6.5.3 Capital cost

The new infrastructure proposed in the province's 10-year strategic plan will require an estimated R4.58 billion, while an additional R1.9 billion is estimated for new infrastructure in the period 2022–2040.

Table 12 shows the breakdown of the investment required for new infrastructure and replacement costs by district municipality.

**TABLE 12** Capital investment in ICT infrastructure

R MILLIONS	2012–2019	2019–2026	2026–2033	2033–2040
City of Cape Town	3,160	1,797	1,271	1,123
West Coast District Municipality	316	180	127	112
Cape Winelands District Municipality	586	333	236	208
Overberg District Municipality	228	130	92	81
Eden District Municipality	485	276	195	172
Central Karoo District Municipality	56	32	23	20
Total	4,832	2,748	1,943	1,717

### 6.5.4 Price trends

No specific projections of price trends can be made, but the interventions described above are all intended to reduce the cost of ICT. Therefore, the costs are expected to decline rapidly initially, due to increased application of new technology and market competition, and then at a slower, steady rate as universal access is achieved and the speed of technological development decreases.

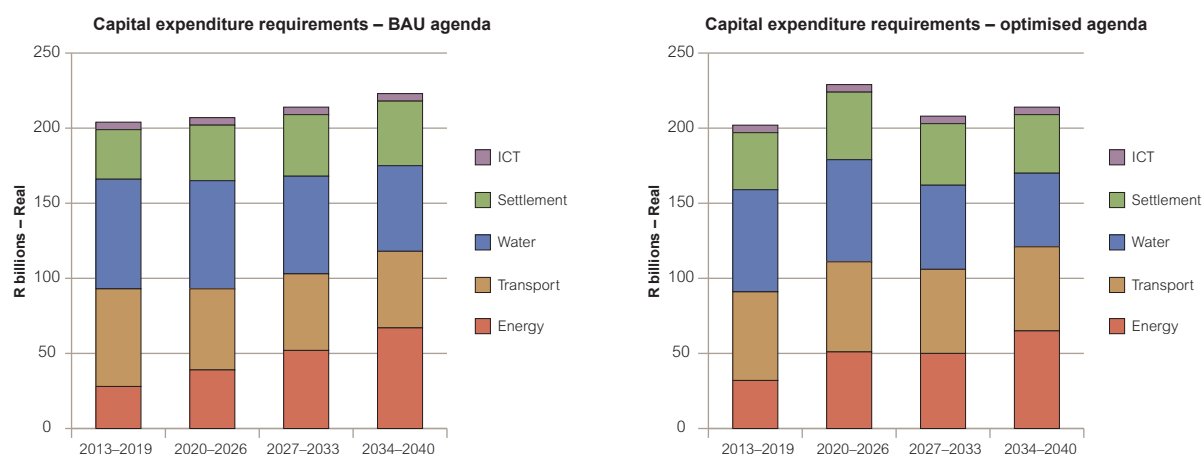
# INTEGRATION OF INFRASTRUCTURE SYSTEMS



## 7.1 AGGREGATE CAPITAL EXPENDITURE PROJECTIONS

Figure 32 shows the capital expenditure requirements for each of the five main infrastructure systems over 28 years, for both BAU and optimised options.

**FIGURE 32** Comparative capital expenditure required for infrastructure for the two development options



The net result is that the total projected expenditure is much the same, but with different timing of investment on energy and transport infrastructure. The BAU agenda has more upfront expenditure on transport and later expenditure on energy, while the optimised agenda shows the reverse. The increased capital in the second seven-year period for the optimised agenda is caused by the increased expenditure on renewable energy, public transport and housing. The combined impact of this transition is discussed in the following section.

## 7.2 COMBINED IMPACTS

### Criteria for assessing the impact of an infrastructure strategy

In optimising the infrastructure provision in the province, and in making strategic choices, some indicators of the impacts need to be defined. While any number of indicators could be used, a simplified list is proposed in Table 13, divided into economic, social and environmental impacts.

**TABLE 13** Infrastructure impact indicators

IMPACT	CRITERION	SIGNIFICANCE OF CRITERION
Economic	Net provincial gross value add (GVA)	GVA is a measure of the value businesses add to the economy and, as such, is an important criterion.
	Balance of payments	Minimising imports benefits the SA economy, and infrastructure interventions that rely on local goods and services are preferred.
	Employment creation	GVA has its limits as a measure of economic activity, and in SA the importance of job creation is strong. The delivery of infrastructure has a role to play in creating direct and indirect employment opportunities, especially in a low-growth economic environment. Infrastructure interventions which increase employment are favoured.

IMPACT	CRITERION	SIGNIFICANCE OF CRITERION
Social	Household expenditure trends	Households benefit from using infrastructure but also have to pay, with subsidies used to improve affordability. But high-cost infrastructure typically leads to high-cost services, which households experience as higher monthly expenditure. Therefore, infrastructure with lower operating and finance costs is favoured, causing lower costs to households. Transport and energy costs are used as the primary indicators.
Environmental	Total energy consumption	Lowering energy use conserves resources. Energy consumption is projected by economic, transport and demographic drivers, including varying assumptions regarding demand management.
	Total water demand	Water consumption is projected by economic and demographic drivers, including varying assumptions regarding demand management and supply constraints.
	Total waste produced	The term waste is used here to include solid and hazardous waste, which bring negative environmental impacts. The assessment of impact is done qualitatively due to the complexity of waste streams.

In applying these criteria to assess impacts, it is important to recognise the limitations of the WCIF: the infrastructure is complex and brings a multifaceted set of costs and benefits. Therefore, only a “broad brush” impact assessment can be done. Further, although data can be found to measure quantitatively some of the impacts, considerable reliance is made on qualitative assessment, which could be improved by including expert groups in an assessment process.

A simple rating system is applied for comparing interventions that make up the two development agendas, as shown in Table 14.

**TABLE 14** Impact assessment rating table

+2	Very positive
+1	Quite positive
0	No substantial change in impact
-1	Quite negative
-2	Very negative

### Rating of relative impact impacts

The ratings are applied to the interventions for each system in Table 15.



**TABLE 15** Summary of provisional impacts assessment – comparing optimised option with BAU option

	ENERGY		TRANSPORT		WATER		SETTLEMENT		ICT	
Economic – GVA change	Lower energy prices in the long term benefit all economic sectors.	+2	Shift to rail freight should reduce cost of business; more PT increases urban efficiency.	+2	Higher potable water tariffs will impact negatively on the cost of business.	-1	Waste costs may go up somewhat. Household expenditure will replace Less state expenditure on housing top structure.	-1	Both development agendas have a maximum investment in ICT.	0
Economic – employment	Higher employment due to diverse smaller projects.	+2	Rail likely to use less labour. Transition from taxis will reduce employment to a degree.	-1	Employment potentially reduced through more high technology water and wastewater treatment systems and 'smarter' networks.	-1	Recycling is relatively employment intensive, as is housing construction employment.	+1		
Economic – balance of payments	Avoiding nuclear and further large coal plants reduces foreign exchange required.	+2	Importing rolling stock and PT vehicles is offset by reduced imports of cars and trucks.	0	Advanced treatment technology is likely to require imports	-1	No major difference, but waste incineration technology may require imports.	0		
Social – affordability to households	Although electricity and fuel prices escalate, increases are lower than BAU.	+1	Cost of goods reduced a bit through freight efficiency; PT costs go up but travel times go down.	0	Although potable water tariffs escalate, increases are less than BAU.	+1	It is assumed that reduced expenditure on house top structure is replaced with community support.	0		
Environmental – change in emissions	Lower use of fossil fuels and substituting gas for coal substantially reduce emissions.	+2	Both freight and PT interventions reduce fuel use significantly, hence emissions reduced.	+2	Optimised agenda requires less desalination, therefore less emissions, given existing electricity generation profile.	+1	Reduction in waste landfilling reduces carbon emissions.	+1		
Environmental – increase in water required	Excluding nuclear will increase water required for power stations.	-2	No significant change.	0	Optimised agenda results in significant water saving.	+1	Perhaps increased water use associated with recycling.	-1		
Environmental – change in waste generation	Nuclear waste is a serious concern. Renewable options have relatively low waste.	+2	No significant change	0	Less wastewater is produced and more is recycled.	+1	Quantity of waste entering environment decreases.	+1		

Overall, the results show a positive impact under the optimised development agenda in relation to the BAU agenda. In addition, while the optimised option results in some increased costs, notably expenditure on public transport infrastructure, the overall cost is lower than the BAU option.

# SCENARIO TESTING



The performance of each of the development agendas under the three scenarios is assessed as indicated in the Table 16. Each agenda is assessed on its effectiveness in the three scenarios and scored accordingly on the basis of the following scale:

- Very effective (+2)
- Effective (+1)
- Neutral (0)
- Ineffective (-1)
- Very ineffective (-2)

**TABLE 16** Evaluation of development agendas in three future scenarios

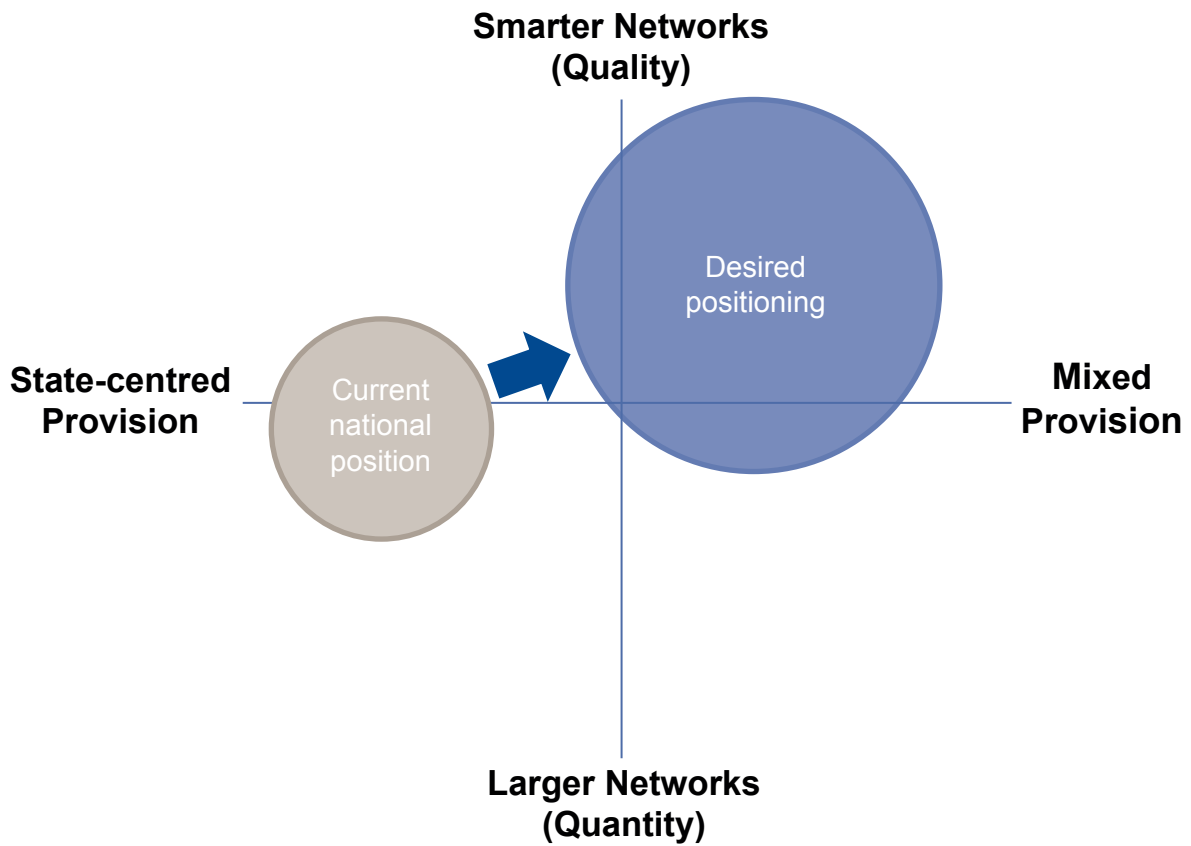
SCENARIO 1 : STABLE WORLD	SCENARIO 2 : WORLD IN CRISIS	SCENARIO 3 : BRAVE NEW WORLD
<b>BAU</b>		
<p>The core assumption of the BAU agenda is that change happens in a stable and predictable way, and that planning for infrastructure planning can safely be based on existing concepts as well as current trends.</p> <p>The BAU agenda will be well adapted to a stable world scenario and will be fairly robust and resilient in such a scenario.</p> <p>However, because the BAU approach is not focused on driving cost and resource-use efficiencies, it will be a more costly and less efficient approach than the optimised agenda.</p> <p>It is thus assessed to have a largely neutral impact in this scenario.</p>	<p>The absence of any major global or national action to regulate carbon emissions and resource-use efficiency would act to reinforce current resource-inefficient BAU practices.</p> <p>However, at the same time, massive pressure on the ability of the BAU to respond effectively would come from rising water, energy and other resource prices due to resource shortages, the growing numbers of indigent people in the region and stagnating public revenues. This would result in a massive financial squeeze, making it very difficult either to expand infrastructure to meet growing need or to maintain existing infrastructure.</p> <p>This growing funding and provision gap would be further reinforced by skills shortages, the weak public leadership and the cautious approach of the private sector to infrastructure investment.</p>	<p>A number of factors in the Brave New World scenario can help to sustain the BAU agenda, such as the availability of increased public funding for infrastructure and greater private sector capacity to fund infrastructure. Similarly, the rising prosperity results in rising consumer demands on infrastructure, but the growing middle class also provide the growing revenue base required to sustain BAU infrastructure.</p> <p>However, the BAU agenda is not able to respond proactively to the global and national regulatory imperatives to reduce the energy and resource intensity of infrastructure. Similarly, the inherent very cautious approach to infrastructure innovation means that the Western Cape would lag behind similar regions in the world in its ability to adopt new infrastructure technologies and institutional models. The Western Cape misses out on the green economy boom.</p> <p>The long-term impact of BAU in this scenario would be that the Western Cape would lag considerably behind global trends. This would incrementally corrode regional competitiveness and undermine the province's development potential.</p>
0	-2	-1

SCENARIO 1 : STABLE WORLD	SCENARIO 2 : WORLD IN CRISIS	SCENARIO 3 : BRAVE NEW WORLD
<b>Optimised</b>		
<p>The optimised agenda is well adapted to the Stable World scenario.</p> <p>The continuity and relatively predictability of the context supports the planned phasing in of a range of institutional and technological improvements that help to improve cost and resource efficiencies.</p> <p>This innovation requirement is reinforced by the constrained public and private resources available for infrastructure investment.</p> <p>The optimised agenda performs very effectively in this scenario.</p>	<p>The World in Crisis scenario poses major challenges for the infrastructure provision, but these are partly mitigated by the shifts and innovations associated with the optimised agenda.</p> <p>The depressed economic conditions and limited public funding make the new infrastructure investments to achieve optimisation a hard sell, in a political climate that is risk averse and focused on short-term demands. The absence of strong global regulatory pressure to change current resource-use patterns tends to reinforce this.</p> <p>However, the optimised model makes provision for smaller-scale, more local, efficiency-focused investments geared to improving infrastructure efficiency that are more fundable, as well as producing some of the cost efficiencies and private sector investment opportunities that incremental system optimisation requires.</p> <p>The optimised agenda will produce infrastructure that is more resilient and flexible in tough economic and resource-scarce times.</p>	<p>This optimised agenda is aligned with a world where technology innovation dominates and where increased devolution in the provision of infrastructure is favoured.</p> <p>The surge in proven new infrastructure technologies, combined with the increased availability of public and private investment in infrastructure, enables major efficiency improvements in both the costs and resource intensity of infrastructure services.</p> <p>The approach enables the Western Cape to remain in touch with the global shift to a “green economy” and to mitigate to some extent the tough global regulations on carbon emissions.</p> <p>A more radical agenda focused on the early adoption of cutting-edge infrastructure innovations might potentially have been more effective in this scenario. However, such an agenda would have much lower success potential in the other scenarios.</p>
+2	+1	+1

Overall, this high-level assessment of the two agendas in relation to the scenarios shows that the optimised agenda should be strongly favoured as a way of taking the province into the future with minimised infrastructure risks.

The performance of each of the proposed agendas can also be assessed in relation to broad institutional and infrastructure scale transitions as illustrated in Figure 33.

**FIGURE 33** Diagrammatic illustration of institutional and infrastructure scale transitions



Inherent in the desired transition illustrated here is the preference for greater diversity in two ways: (1) less dominance by the state institutions, which implies greater participation by sub-national government, the private sector and civil society; (2) smaller-scale infrastructure, which allows for greater participation by a wider range of economic actors, implying a greater robustness in the infrastructure system. It is evident that the optimised development agenda is favoured for this desired transition.



# IMPLICATIONS





## 9.1 INSTITUTIONAL

### Overall capacity of the infrastructure sector

The Phase 1 report on institutions raises several concerns about the capacity to deliver infrastructure nationally with some reference to the Western Cape situation. The biggest concern is the technical or engineering capacity in all three spheres of government. Although things are improving, the lack of high-level skills will be a constraint to delivering infrastructure on the scale required.

Before drawing conclusions on what can be done, the responsibilities allocated to each of the institutional groupings needs to be considered.

### Role of Western Cape Government

The Western Cape Government has taken on the role of overseeing the coordination of infrastructure delivery, and this framework is an important tool. The requirements relating to the application of the framework are dealt with in Section 10. As regards the actual management of the infrastructure, the Western Cape Government has a direct responsibility for provincial roads, schools and health facilities. In addition, the role of the Western Cape Government in supporting municipalities is particularly important. While no major changes are proposed as part of this framework, the following will be important:

- Improving the level of engineering expertise in the Department of Local Government in order to improve support to municipalities.
- Building on the new systems for managing social infrastructure established under the Infrastructure Delivery Improvement Programme (IDIP).
- Retaining expertise in the Roads Department.

### National public entities (parastatals)

Infrastructure which serves the Western Cape is dominated by national public entities. A summary of their respective roles in the province is given in Table 17.

**TABLE 17** Roles of parastatals in infrastructure management and financing

SECTOR	ENTITY	ROLE IN MANAGING INFRASTRUCTURE	ROLE IN FINANCING INFRASTRUCTURE
Freight (pipeline, ports, rail)	Transnet	Key player in the province. The ability of Transnet to upgrade the CT to Gauteng freight rail system is central to one of the key transitions identified as part of the WCIF.	Required to raise R49 billion in funds (WC portion) over the next 28 years for system upgrades identified in Transnet plans (optimised agenda). The level of funding drops for the BAU agenda.
Passenger rail	PRASA	Public transport in Cape Town is identified as a key transition and PRASA, along with the city, have to make this happen.	Data on the capex necessary for the full implementation of new rail infrastructure over the coming 28 years has not been located. Provision is included for commuter rail at R22 billion over this period under the optimised agenda. The figure for the BAU agenda is much lower (R9 billion) mainly aimed at keeping the existing system functioning effectively. PRASA cannot raise its own capital and therefore a transfer from the national fiscus is required.

SECTOR	ENTITY	ROLE IN MANAGING INFRASTRUCTURE	ROLE IN FINANCING INFRASTRUCTURE
Roads	SANRAL	Continues in its role of providing national roads, with some debate regarding the extent to which they take over strategic roads in the province.	SANRAL funds most of infrastructure through transfers from the national fiscus. The option of toll roads is on the table for upgrading and expanding the strategic road system but has not been addressed here. R33 billion required over 28 years, reducing to R28 billion under the optimised option.
Airports	ACSA	Continues to manage the two major airports in the province.	Provision is included for R3.4 billion in investment, mainly for upgrading the runway at Cape Town International Airport.
Electricity	Eskom	Eskom's role in <b>generation</b> is subject to substantial change as the nature of generation options changes. The optimised agenda indicates a declining role for the parastatal, with greater diversity of electricity generation to independent power producers.  With regard to <b>transmission</b> , the role of Eskom remains essential.  In the case of <b>distribution</b> , there are options for municipalities to take over some of the Eskom's distribution systems. This has not been assessed in any detail here.	Investment required (28 years):  <b>Generation</b> R78 billion for BAU agenda R22 billion for optimised agenda  <b>Transmission</b> R36 billion  <b>Distribution</b> R20 billion
Energy (liquid fuels and gas)	CAF	Liquid fuel production from natural gas is likely to remain important, but a new source of natural gas for the Mossgas plant is required. There are options for private companies to become involved.	No figures available.
ICT	Telkom,	Continues to play a role but with greater diversity in the market.	No figures available.
ICT	Broad-band InfraCo	As above	No figures available.
Water sector project development	TCTA	Likely to be restructured into an integrated unit with DWA water resources unit.	Increased role in off-balance sheet funding of water resource infrastructure.
Bulk water supply	Overberg Water	May be incorporated into municipal structures or become a water user association.	Limited to refurbishment of existing infrastructure from own revenue.

## National government

Numerous national government departments are responsible for infrastructure policy making and regulatory oversight of delivery and management in the Western Cape. However, the only national government department responsible for actual infrastructure delivery is the **Department of Water Affairs**, which will continue to be responsible for water resources planning and development. Its management role is likely to change, as new national water resources infrastructure and catchment management agencies change. In addition, **National Treasury** has oversight of the system of transfers to provinces, parastatals and municipalities, which has a direct influence on infrastructure delivery in the province.

## Municipalities

**TABLE 18** Roles of municipalities in infrastructure management and financing

INSTITUTION	ROLE IN MANAGING INFRASTRUCTURE	ROLE IN FINANCING INFRASTRUCTURE
City of Cape Town	Due to its scale as a metro, Cape Town has responsibility for important infrastructure transitions, with the roll-out of public transport infrastructure being the most significant.	Raise substantial debt finance and use own resources. The city's role in direct provision of public transport requires investigation.
Winelands DM	Agriculture sector, roads and water for irrigation will be significant. Diverse economies in Stellenbosch and Drakenstein need to be promoted. Substantial opportunities in the green economy and innovation.	Stellenbosch and Drakenstein have the ability to raise debt finance.
West Coast DM	Saldanha Bay and associated harbour and industrial development will create a substantial transition. Coordination of water supply and demand will be significant.	Substantial dependence on grant finance.
Overberg DM	Rural and coastal character is an important consideration, but opportunities for economic diversity need to be promoted.	Substantial dependence on grant finance.
Eden DM	Key for future development will be improved access to water, issues associated with national roads and the implementation of a bus system.	Substantial dependence on grant finance.
Karoo DM	Rural nature of area will continue to dominate the style of infrastructure, but the benefits of large-scale infrastructure passing through the district need to be maximised.	Substantial dependence on grant finance.

## Private sector

**TABLE 19** Roles of the private sector in infrastructure management and financing

SECTOR	ROLE IN MANAGING INFRASTRUCTURE	ROLE IN FINANCING INFRASTRUCTURE
Energy	<p><b>Electricity</b></p> <p>Large opportunities for electricity generation.</p> <p><b>Fuel</b></p> <p>Currently major player in liquid fuel sector.</p>	<p>Primarily through Independent Power Producers.</p> <p>Funding of refineries remains important.</p>
Transport	The private sector is not responsible for managing any of the land freight or passenger transport infrastructure in the province.	<p>Freight and passenger transport operators do not fund infrastructure but invest heavily in vehicles.</p> <p>The subsidising of the cost of new buses, which are part of the IRT system in Cape Town, is an issue but is not considered to be part of infrastructure.</p>

SECTOR	ROLE IN MANAGING INFRASTRUCTURE	ROLE IN FINANCING INFRASTRUCTURE
Water	<p>Farmers are primary users of non-potable water and are responsible for managing water distribution systems, both independently and through Water User Associations.</p> <p>Desalination and wastewater effluent reuse will become important and can be provided by private sector.</p> <p>It is possible for treatment works to be provided on a BOT (build, operate, transfer) basis, but opportunities are limited and are not considered here.</p>	<p>Some individual farmers and Water User Associations contribute capital for irrigation system expansion and rehabilitation. But, overall, there is a substantial capital shortfall.</p> <p>Desalination systems and wastewater effluent reuse can be funded by the private sector (although TCTA may be a competitor here).</p>
Settlement	<p>Waste management transition provides opportunities for private sector businesses. Innovative, cross-sectoral waste management may lead to partnerships as part of the intended economic development objectives.</p>	<p>Private sector firms own and operate waste landfills and could increase their stake in the waste system through financing increased recycling activity and possibly waste incineration.</p>
ICT	<p>The private sector is dominant in the ICT sector, managing an increasing share of telephone and internet connections.</p>	<p>Private sector has a large financial stake in the ICT system.</p>

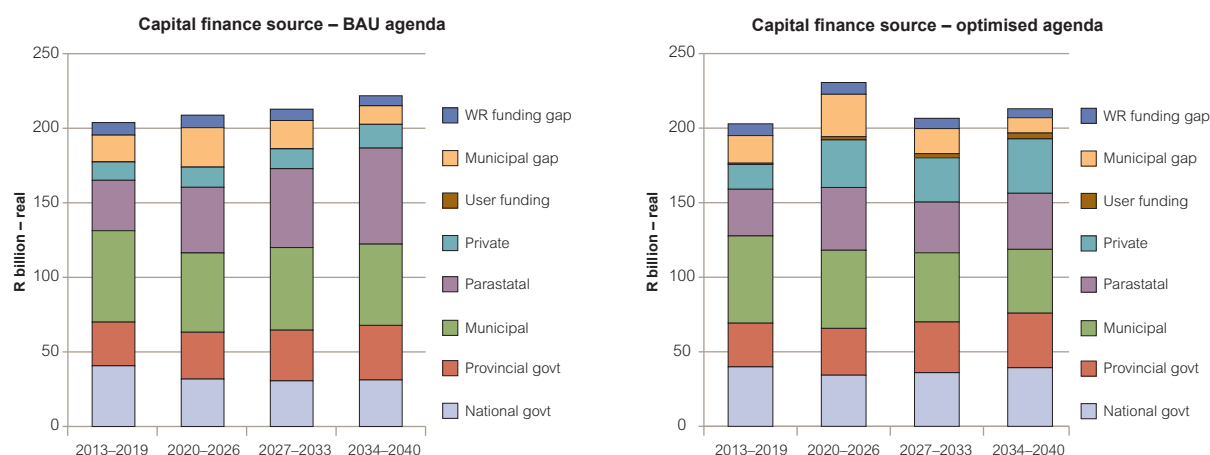
## Summary

Generally there is a stable institutional environment in the province, but a transition is needed with a greater role for the private sector.

## 9.2 FINANCIAL

Figure 34 gives the capital expenditure projections for the two development agendas. Clearly the ability to raise the funding for infrastructure is essential if these agendas are to be implemented. Based on the institutional arrangements covered above, the financial responsibility for raising the funds can be assigned to specific organisations. The result is shown in the Figure 34 for the two development agendas.

**FIGURE 34** Relative capital finance projections for infrastructure under two development agendas



Some key observations relating to these finance projections and the extent to which the finance will be available:

- a) The role of the national government in providing funding for infrastructure increases with the optimised agenda, with primarily increased funding of public transport infrastructure – road and rail. In the case of water resources infrastructure and settlement infrastructure,<sup>19</sup> a gap remains under the optimised agenda which may well need to be filled by funding from the national fiscus.<sup>20</sup>
- b) The role of provinces remains relatively stable, with the funding of roads and social infrastructure retained, albeit through the national fiscus.
- c) An increase in the amount of infrastructure required in municipalities means an increase in the finance they need to raise from consumers and property owners. However, the gap in funding of municipal infrastructure will remain unless the subsidy system is reviewed specifically with increased allocations of capital funding, primarily through the Municipal Infrastructure Grant.
- d) Under the optimised agenda, the role of parastatals in funding infrastructure is reduced substantially, largely because of the lower requirement for nuclear and coal-based electricity generation infrastructure, which is the responsibility of Eskom. Finance required from Transnet and other parastatals is reduced marginally. The importance of reducing the capital finance burden on parastatals needs to be stressed. The indications are that Eskom and Transnet, the biggest stakeholders in the province, will have difficulty in raising the necessary debt finance to cover the capital expenditure provided for in their plans under the BAU agenda. This means they will have to turn to annual cashflow to fund a substantial portion of their capital programmes, which pushes up tariffs in the first years that the infrastructure is in place.
- e) In contrast, the optimised agenda requires more finance from the private sector, largely to fund electricity generation infrastructure,<sup>21</sup> but this infrastructure has the ability to provide a return on investment. While the private sector has shown a willingness to invest in infrastructure, projects need to be packaged in such a way as to be attractive to investors,
- f) The gap shown for municipal providers of infrastructure is perhaps the biggest concern within the funding framework: municipalities have a central role to play in providing socially important services and creating a platform for economic development, but their limited access to capital is a major constraint.
- g) Finally the existing gap with regard to funding water resources is still evident under the optimised agenda. This requires a change in the way water resources infrastructure is funded and needs further attention.

### 9.3 SPATIAL

Some general spatial principles to be applied in the implementation of the framework are as follows:

- a) Infrastructure investment must unlock economic potential at all scales. Areas of development potential have been identified in the Growth Potential of Towns Study (Figure 35) and economic infrastructure investment must support these areas.

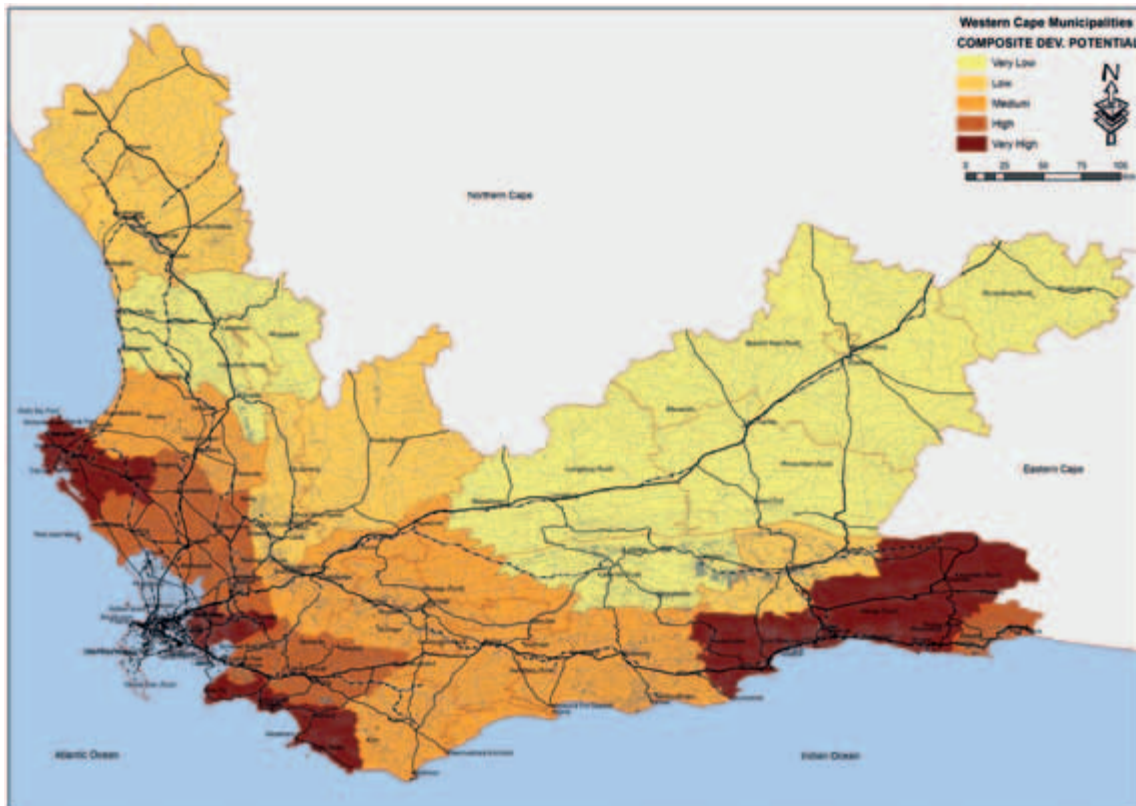
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19 But note that the settlement infrastructure under the optimised agenda includes less emphasis on state funding of housing.

20 There is arguably inconsistency here in that, under the optimised agenda, a major allocation of public funds is provided for public transport but not for municipal infrastructure.

21 Note that the issue of road tolls has not been addressed in this analysis. But it is evident that this funding option will promote the transition where more funding is available for public transport and less incentive for people to use private cars.

**FIGURE 35** Composite development potential of WC local municipalities  
(Source: *Growth Potential Study, University of Stellenbosch & CSIR, 2013*)



- b) Energy generation infrastructure must be aligned with the point of gas import, as well as areas of anticipated growth in electricity demand.
- c) Housing allocations and public and social services facility allocations must be aligned with infrastructure investment plans, growth areas and future development projects, and not planned in isolation.
- d) The spatial location of areas where infrastructure is reaching, or has reached, capacity must directly inform, align and correspond to future infrastructure development plans.
- e) The public transport infrastructure need is concentrated in the denser urban areas and future economic growth areas.

Implications of the proposed infrastructure transitions in specific areas can be summarised as follows:

- a) Better transport links with other provinces, Gauteng specifically.
- b) Greater efficiency within the Cape Metropolitan Functional Region through improved public transport, which will also create better linkages with Malmesbury, Stellenbosch and Drakenstein.
- c) The ports, in particular Saldanha Bay and Mossel Bay, are likely to become significant if LNG is adopted as transition fuel.
- d) Provision for development of the Saldanha Bay area as an industrial area, but the merits of the iron ore export option are debatable and water is most likely to be provided by desalination. Other mineral exports and beneficiation and industrial development is likely to cement Saldanha's status as an industrial hub.
- e) Continued emphasis on environmental sustainability along the coast, with the understanding of the importance of tourism and sector diversity.
- f) Continued support for farming in the hinterland but with increased diversity and water efficiency, on the understanding that water is a major constraint.



# APPLYING THE WCIF



# 10



## 10.1 PLANNING AND DECISION-MAKING ARRANGEMENTS

The Western Cape Government is the custodian of the WCIF. However, if the WCIF is to be effective in guiding planning in the province, buy-in from key stakeholders is crucial. Considerable work will be required to achieve the necessary support, given the wide range of organisations involved with infrastructure in the province.

### Planning

In the first instance the WCIF serves as a basis for coordinating the planning of infrastructure and the associated spatial arrangement of the built environment of the province. This is achieved through:

- Sharing information on demand drivers.
- Getting a common view of trends with regard to demand for infrastructure.
- Understanding the situation of provincial and national scale infrastructure when planning for regional and local infrastructure.
- Having a shared vision on the impacts of infrastructure and the favourable supply-side options that allow for improved benefits.
- Understanding how infrastructure affects the built environment and associated spatial arrangements in the province.

### Investment decision making

While planning remains important, it means little if implementation of infrastructure projects does not follow. This requires investment and decisions on which projects should be funded and implemented. The framework assists in this regard through:

- Providing a funding envelope for the infrastructure systems and sub-systems.
- Relating this envelope to responsible institutions.
- Describing desired transitions that create a basis for setting up project priorities.
- Providing a high-level assessment of the viability of infrastructure investments.
- Establishing a basis through which the Western Cape Government can negotiate with other stakeholders regarding investment priorities.

The process of applying the framework to determine regional priorities and select infrastructure projects is described in detail in the *WCIF Implementation Guideline*, which is available as a separate document and is accompanied by a spreadsheet model for project prioritisation. This includes recommendations on aligning sectoral infrastructure planning and capital budgeting with national, provincial and local planning.

## 10.2 INTERACTION WITH OTHER PLANNING FRAMEWORKS AND PROCESSES

The WCIF does not exist as a planning framework in isolation and needs to align with and inform many other processes. The five main documents and processes relevant to the WCIF are:

### National Infrastructure Plan

The National Infrastructure Plan outlines infrastructure projects that are of national strategic importance, some of which will occur in the Western Cape. The WCIF therefore needs to align with the national agenda.

### Provincial Spatial Development Framework (PSDF)

The PSDF and the WCIF will inform each other. The PSDF will provide spatial direction to development priorities, while the WCIF will contribute infrastructure limitations and opportunities to the PSDF. The review of the PSDF was not complete at the conclusion of this version of the WCIF, but it is strongly recommended that both documents be reviewed concurrently in future.

### Provincial Land Transportation Framework (PLTF)

The PLTF and the WCIF will inform each other. Although transport is a sub-set of infrastructure, the PLTF provides more detail than the WCIF and should be the basis for the transport vision set out in the WCIF. However, the WCIF provides a higher-level overview of cross-cutting infrastructure issues that the PLTF needs to consider. The review of the PSDF was not complete at the conclusion of this version of the WCIF, but it is strongly recommended that both documents be reviewed concurrently in future.

### Integrated Investment Plans (IIPs)

An IIP is the generic term for a long-term infrastructure plan. These are not uniform or legislated documents, but are, or should be, undertaken by individual organisations or sector departments (national government, provincial government, local government and parastatals) and need to interact with regional infrastructure planning as described in the *WCIF Implementation Guidelines*.

### Integrated Development Plans (IDPs)

The WCIF is intended to influence the municipal IDP development process through longer term infrastructure priorities identified in IIPs to inform the projects that are adopted in the IDP. While the WCIF provides the strategic infrastructure vision to which the individual IDPs must align, the Implementation Guidelines and Prioritisation Model provide detailed guidance on how to align local and regional project priorities.

## 10.3 TIMING

It is clear that to be effective in guiding planning and decision-making, the WCIF needs to be promoted with a sense of urgency. The implications of investment decisions are substantial, and the framework can bring greater efficiency and sustainability to the process of rolling out infrastructure. In this regard it is proposed that:

- Stakeholder engagement continues following the WCIF preparation process.
- Other provincial planning initiatives are aligned with the framework over the remainder of 2013.
- During 2013, ongoing engagement is promoted with key stakeholders through existing forums in order to get increased buy-in to the framework.

## 10.4 MONITORING AND EVALUATION

It is important for the Western Cape Government, as custodian of the framework, to assess how implementation is taking place and how aligned it is with the provisions in the framework. This requires not only a set of indicators and a structure for data collection, but also a process of engagement to gather data from stakeholders and monitor infrastructure delivery.

### Indicators and data collection

The process of developing the WCIF has highlighted challenges with data collection and the advantages of provincial-scale datasets relating to infrastructure. Numerous datasets relating to infrastructure already exist, and it is proposed that this information not be duplicated (and the burden on institutions increased) for the purposes of monitoring the framework's implementation. Indicators, including the existing datasets to be used or the new data to be collected, will need to be developed as part of the application of the WCIF.

### Process

It is not appropriate to establish any new governance structures to monitor the implementation of the WCIF, and the following process is proposed:

- Ongoing liaison with national government and parastatal bodies, which includes an assessment of how they view the framework and how they are aligned with its provisions.
- Use of the Transversal Management System structure in the Western Cape Government to monitor internal alignment with the framework.
- Incorporation of the framework concept into existing monitoring structures for municipalities and into the process of IDP review.

It is recommended that an evaluation of the way infrastructure is being delivered in the province be undertaken in 2015/16, using the framework as a basis for assessing performance. Following this evaluation it is recommended that the framework be revised and updated every five years, and the period of analysis be fixed at 30 years.



