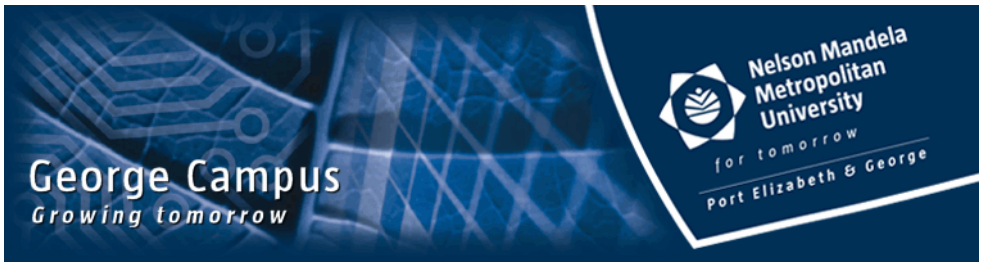

Challenges to sustainability in the Garden Route: Water, Land and Economy

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Chapter 1

Problem statement, scope and purpose

1.1 Introduction

The term *Garden Route* generally refers to the area sandwiched between the Outeniqua and Tsitsikamma mountains and the Indian Ocean, extending from Mossel Bay in the west to the Storms River in the east. Major towns along the route are Mossel Bay, George, Knysna and Plettenberg Bay. The Garden Route rate among the most popular tourist attractions in South Africa and is popular among both local and overseas visitors for its scenery and moderate climate.

This area is well known for its biodiversity in terms of species richness as well as the variety of ecosystems reflected by the high density of Provincial and National Parks. Other attractions to the area include the scenic and diverse coastline, the lakes and estuaries (Wilderness and Knysna), the Outeniqua mountains, the indigenous forests and the fynbos. Vegetation within the Garden Route forms part of the Cape Floral Kingdom, one of only six Floral Kingdoms in the world.

Not only tourists, but also immigrants from the impoverished rural areas of the Eastern Cape in search for jobs, are attracted to the area. Another group of immigrants come from a higher socio-economic class and is drawn by the lifestyle possibilities of the region. The Western Cape has been identified as one of the provinces in South Africa being most at risk from projected climate change-induced temperature and rainfall changes. Population growth and climate change impact on the environment and social systems and put considerable pressure on the available resources.

The purpose of this study is to provide a provisional overview and analysis of the challenges to the sustainability in the Garden Route with the aim to set an agenda for future action and research.

1.2 Methods

This study investigates challenges to sustainability in the Garden Route in relation to three key issues:

- Water
- Land
- Economy

For the purpose of this study, a modified version of the DPSEEA indicator framework will be used to identify challenges to sustainability in the Garden Route. The acronym DPSEEA stands for *driving forces, pressure, state, exposure, effect, action.* A modified version of the DPSEEA indicator framework will distinguish the following components: driving forces, pressure, state, risk and vulnerability and action.

Driving forces This refers to the factors which motivate and push the environmental or social processes involved.

Pressure Pressure is the observable effect of the driving forces on the environment or socio-cultural system.

State The state of the environment or social system is altered as a result of the pressures. State is measured in the quality and quantity of resources.

Risk and Vulnerability Risk is the probability of an effect of a certain magnitude given the presence of pressures of a certain intensity. Risk is determined by the frequency and intensity of the pressure and also by the current state of the environment and social systems involved. Vulnerability refers to the characteristics of a person or group or system in terms of its capacity to anticipate, cope with, resist and recover from the impact of natural or man made hazards (John 2006).

Action Actions undertaken to mitigate vulnerability by affecting any of the above four components.

In Chapter 2 the above framework will be used to determine a set of indicators that can be used to describe and analyse the sustainability in Garden Route with respect to the natural resources *Water* and *Land*. The indicators will be discussed briefly and where applicable, the discussion will be supplemented by qualitative presentation of information. *Economy* is not a natural resource and will be discussed in terms of a number of standard economic indicators.

The study will make extensive use of studies commissioned by local municipalities as well as Eden District Municipality. Data will be obtained from institutions like the Department of Water Affairs and Forestry, Statistics South Africa and the Agricultural Research Council as well as MTO Forestry Ltd. This will be supplemented by general literature and an internet survey. A series of interviews with knowledgeable individuals will be conducted to supplement this data.

1.3 Study area

This study investigates challenges to sustainability in the Garden Route. The Garden Route is well known as a particularly scenic part of South Africa. Although there is no official definition for the Garden Route, the term commonly refers to the area between the Outeniqua and Tsitsikamma mountains and the Indian Ocean from Mossel Bay in the west to the Storms River in the east. All but the small portion between the Bloukranz river and the Storms river falls within the Western Cape and the Eden District Municipality. Major towns along the Garden Route are Mossel Bay, George, Knysna and Plettenberg Bay.

This area is contained by five local municipalities: Mossel Bay, George, Knysna, Bitou and also Kou Kamma which forms part of the Eastern Cape. Only a small part of the Kou Kamma Municipality and no major town within this municipality forms part of the Garden Route. It is not always possible to isolate information about this portion of the Kou Kamma Municipality from available data and therefore it is not taken into consideration in all cases.

Chapter 2

Results

2.1 Water

In this section the challenges to the sustainability in the Garden Route in relation to water use will be investigated with reference to the indicator framework discussed in Section 1.2.

A special feature of the Garden Route is the estuaries and lakes. Some of the important estuaries in the Garden Route include the ones at the mouths of Klein Brak, Groot Brak, Swartvlei, Knysna and Keurbooms rivers. The Wilderness Lakes system comprises of the estuarine Swartvlei Lake and four fresh-water lakes: Langvlei, Bo-Langvlei, Rondevlei and Groenvlei. Estuaries constitute a unique habitat type that supports and protects unique fona and flora. Not only do estuaries create an environment for breeding and juvenile marine fish species, but also provide feeding and roosting areas for a number of resident and migratory bird species. Estuaries also contribute to the economy in the Garden Route in terms of fisheries and the attraction it holds for eco-tourism.

In *A Status Quo, Vulnerability and Adaption Assessment of the Physical and Scion-Economic Effects of Climate Change in the Western Cape (2005)* the impact of global climate change on the estuaries are discussed in detail under the following structure:

- Changes in precipitation and runoff with the following consequences
  - Modification in the extent of intrusion by seawater
  - Changes in the frequency and duration of mouth closure

  - Decrease in nutrients
  - Decrease in the dilution and or flushing of pollutants
  - Changes in the magnitude and frequency of floods and sediment deposition

- Rising temperatures
- Sea level rise
- Changes in ocean circulation patterns
- Increase in frequency and intensity of coastal storms

In the same chapter the potential impacts of climate change on individual estuaries are summarized.

Estuaries in the Garden Route are not utilised for water supply to humans, while rivers in the Garden Route do play an important role in water supply. For the purpose of this study the emphasis will therefore be on rivers and dams, keeping in mind that estuaries, rivers and dams are interdependent and factors that influence the one will also impact on the other. The rivers in the coastal river drainage area are given in Table 2.1.

Table 2.1: Rivers in the coastal drainage area

Hartenbos River	Karatara River
Beneke River	Diep River
Brandwag River	Gouna River
Moordkuil River	Knysna River
Little Brak River	Keurbooms River
Great Brak River	Bloukrans River
Kaaimans River	Kruis River
Rooi River	Elands River
Maalgate River	Tsitsikamma River
Malgas River	Groot River
Touws River	Krom River
Swart River	Kruisfontein
Duiwe River	Seekoei River
Hoekraal River	Kabeljous River

2.1.1 Drivers

Different categories of water users were identified, since the quality and quantity of water needed is directly correlated to the inherent characteristics of the different end users. The four users identified are

- Households
- Industry
- Agriculture
- Forestry

The drivers in the above four categories are briefly discussed and are summarised in Table 2.2. The first column distinguishes between the different categories of water users. The second column gives the underlying drivers operative in each of these users and the third and fourth columns indicate the direction of these drivers in terms of quality and quantity of water needed. An increase in a driver can lead to an increase, decrease or no change in terms of the quality and the quantity of water required.

Table 2.2: Drivers:Water

Water User	**Drivers**	**Direction of drivers: quality of water**	**Direction of drivers: quantity of water**
Household	Number of households	↔	↑
	Desire for a higher standard of living	↔	↑
Industry	State of technology and common practice	↔	↕
	Demand for industrial products	↔	↑
Agriculture	State of technology and common practice	↔	↕
	Demand for agricultural products (local and export market)	↔	↑
Forestry	State of technology and common practice	↔	↕
	Demand for forestry products	↔	↑

In households, the need for water is determined by the number of households and the desire for a higher living standard.

For household users, an increase in the number of households will not influence the demand for higher quality of water since households already consume water of the top quality category, but it will lead to an increased demand on the quantity of such water. Likewise, an increase in the standard of living will not influence the demand for higher quality of water, but will again lead to a higher demand on the quantity of water suitable for domestic use. A higher standard of living is associated with increased recreational and aesthetical use of water eg. swimming pools, maintenance of golf courses and gardens.

Industrial water use is determined by technical and economic factors. The technology and management practices used in each industrial process constitute the technical factors. In the long term economic demand for the product of each industrial process will constitute the main economic determinant of industrial water use.

In much the same way, agricultural and forestry water use is determined by the state of technology and management practices together with the demand for specific agricultural and forestry products.

2.1.2 Pressures

The effect of drivers are observable as changes in the environment. The natural water drainage system within the study area has already been irrevocably changed by the construction of a number of dams. Apart from a myriad of smaller dams, there are several large dams in the area. The *Wolwedans Dam* situated in the Great Brak River, plays an important role in the Mossel Bay Municipality. The three main users, and the water allocated to these users per year, are: The Mossel Bay Municipality (5.8 million cubic metres), PetroSA (5.6 million cubic metres) and the Groot Brak Estuary (one million cubic metres) (Kriel 2009). The George Municipality is to a large degree dependent on the *Garden Route Dam* supplemented by water from the Touws River. Knysna Municipality mainly uses water from the Knysna and the Karatara rivers. The Bitou Municipality utilises several water sources, including four permanent bore holes, the Roodefontein Dam and most importantly, the Keurbooms River (about 70% of the supply). The pressures exerted by each water use category on natural and man-made water systems are presented in Table 2.3.

Table 2.3: Pressures: Water

Water User	**Pressures**	**Number of units**	**Current consumption per unit**
Household	Water consumption by households	George: ±42 700 households [a] Mossel Bay: ±32 203 households [b] Bitou: ±16 000 households (10 000 high income, 6 000 low income) [c] Knysna: ±17 400 households [d]	Low income: ±6 kilolitres per month Higher income: ±7-30 kilolitres per month
Industry	Industrial consumption		George: 1 971Ml/a [e] Mossel Bay: 5 600Ml/a Bitou: Not significant Knysna: Not significant
Agriculture	Irrigation		Approximately 93 091 093 thousand litres p/a [f]
Forestry	Forestry consumption		Only rainwater, at least 800mm p/a [g]

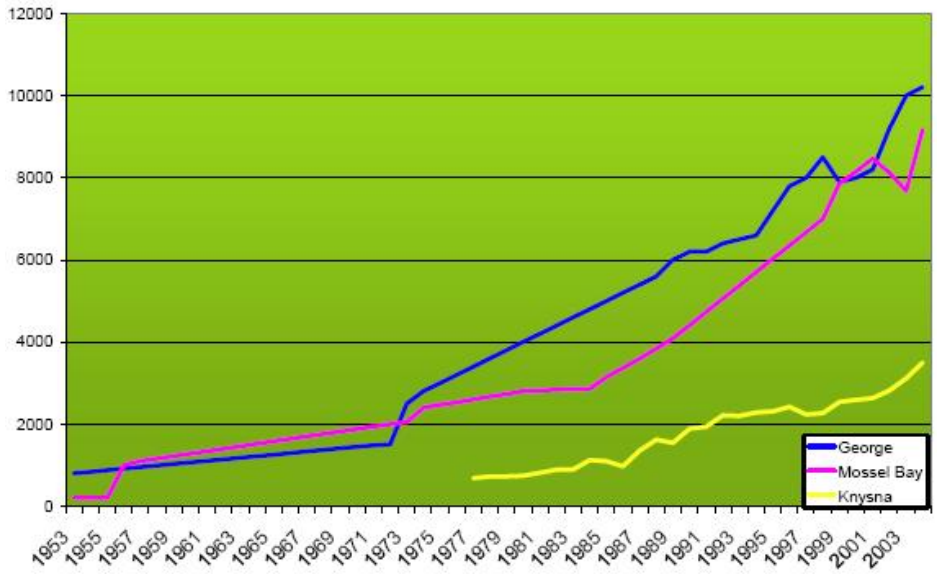
[a](May 2009)
[b](Liebenberg 2009)
[c](Lombaard 2009)
[d](Statistics South Africa 2007)
[e](May 2009)
[f](Visser 2009)
[g](van Lill 2009)

Approximate number of households per municipality are given in Table 2.3. To determine the total water usage by households one should keep in mind that water usage per household will vary greatly especially for the higher income households. Water usage for lower income households are often limited to the maximum free water allowance. An increase in the number of households will thus increase the pressure on water sources, where the pres-

sure factor of higher income households can easily be five times that of a low income household. While industrial consumption in the Knysna and Bitou Municipalities are not of significance, it is the highest in Mossel Bay Municipality due to PetroSA (5 600 mega-litres p/a). Industrial consumption in George Municipality is in the order of 2 000 mega-litres p/a.

The increasing water demand at municipality level is illustrated in Figure 2.1 (Eden District Municipality 2008 with reference to Matjie and Associates 2006). George Municipality water usage increased from 800Ml p/a in 1953 to 6 600Ml p/a in 1994 and to 10 210Ml p/a in 2004. This upward trend is continuing as a result of population growth, urban development and high living standards.

Figure 2.1: Historical water consumption for George, Mossel Bay and Knysna Municipalities, 1953 to 2004



The consumption of municipal water by commercial farmers in the area is small. Most farmers make use of smaller dams, bore holes or pump water directly from rivers. DWAF keeps record of the water used by farmers in the different water catchment areas. These numbers are approximations of the true water consumption by commercial farmers and should only be used as an indication of the order of magnitude of water consumption in the agriculture sector.

The water requirements (in million m^3/a) for the coastal river drainage region recorded by DWAF 2005 (in Eden District Municipality 2008), is given in

Table 2.4. The highest demand is from agriculture, in the form of irrigation, with households (urban and rural) in second place. From the same report, the available water is reported as 55 million m^3/a, thus indicating a negative balance of 43 million m^3/a. Though this data was for the year 2000, there is no reason to believe that the situation has change for the better, rather, trends suggest that the situation might even have changed for the worse.

Table 2.4: Water requirements in 2000 (million m^3/a) DWAF 2005

User	**Irrigation**	**Urban**[a]	**Rural**[a]	**Industrial**[b]	**Afforestation**[c]	**Total**
million m^3/a	43	32	3	6	14	98

a) Includes components of Reserve for basic human needs at 25l/c/d
b) Mining and industrial water users that are not part of the urban system
c) Quantities given refer to the impact of the yield only

2.1.3 State

The main dams in the coastal river drainage region are given in Table 2.5. This table gives the name of the dam in the first column and the river that supplies the specific dam in the second column. The full storage capacity in million cubic meters is given in column three while the percentage full on the 12th October 2009 appears in the fourth column. The last column gives the percentage full on the same date in 2008.

Table 2.5: Main Dams in the Coastal River Drainage Region

Dam Name	**River**	**FSC(Nett)**	**% full 2009**	**% full 2008**
Ernest Robertson Dam	Groot Brak River	0.4	77.9	100.8
Garden Route Dam	Swart River	9	33.9	67.1
Hartebeestkuil Dam	Hartenbos River	7.1	66.1	77.2
Impofu Dam	Krom River	105.8	62.4	86.4
Kromrivier Dam	Krom River	35.2	33.8	66
Wolwedans Dam	Groot Brak River	25.1	43.4	80.6
		182.6	**53.1**	**80.4**

Source: Department of Water Affairs and Forestry

Without exception, the 2009 percentage full is lower than the 2008 percentage full. In total the percentage full on 12 October 2009 is 53.1% of the combined

storage capacity compared to the 80.4% on the same date in 2008. This represents a decrease of 66% from the 2008 level.

Because of the roles the Wolwedans Dam and the Garden Route Dam play in the Mossel Bay and George Municipalities, the trend in the state of these dams over the last decade or more is important. Below is given, for each of these dams, the percentage full per month for the past year (Figure 2.2 and Figure 2.4) , and the percentage full per month for the past 10 years (Figure 2.3 and Figure 2.5).

Figure 2.2: Percentage full per month for 2009: Wolwedans Dam

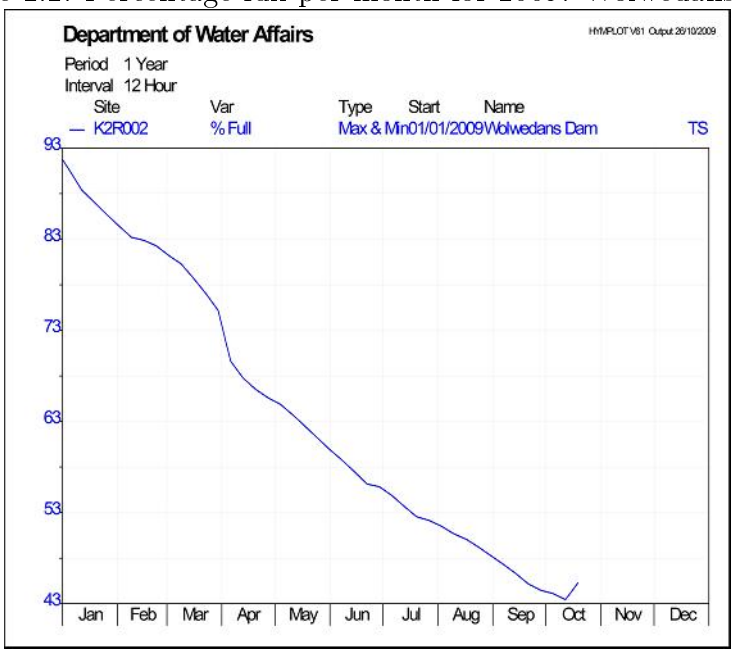


Figure 2.3: Percentage full per month for the past ten years: Wolwedans Dam

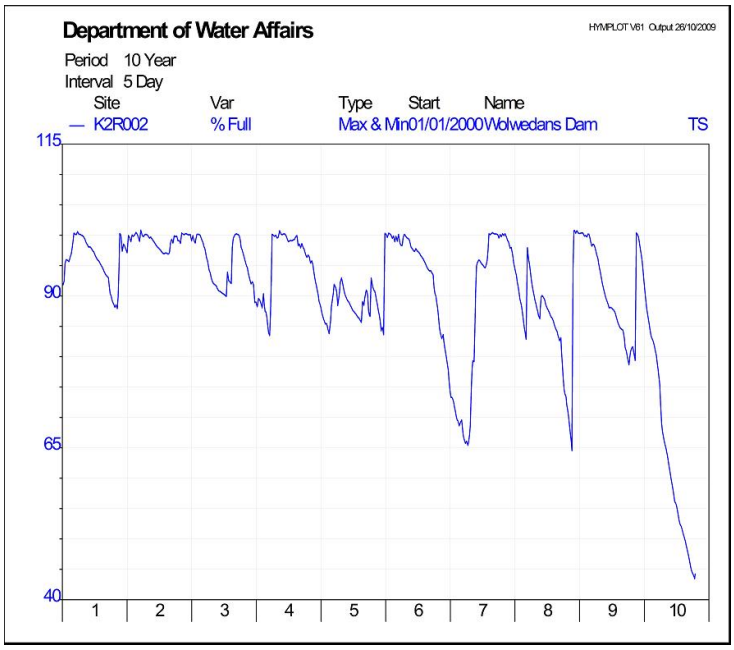


Figure 2.4: Percentage full per month for 2009: Garden Route Dam

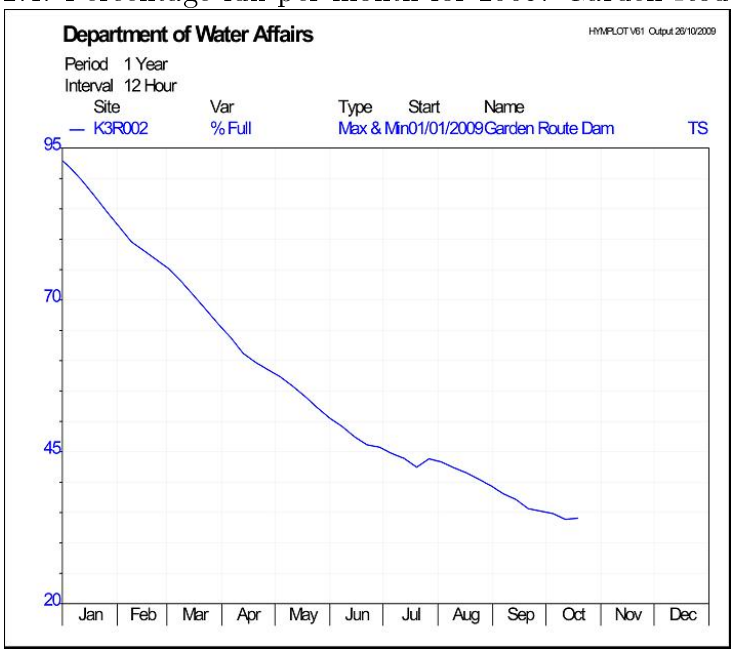
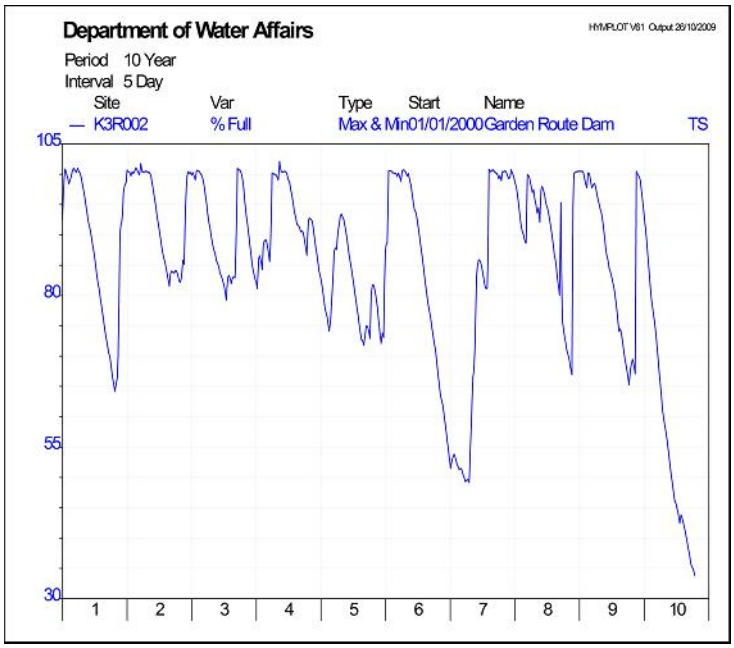


Figure 2.5: Percentage full per month for the past ten years: Garden Route Dam



The level of the Wolwedans Dam shows a steady decline since January 2009. The 10 year percentage full graph shows a clear seasonal pattern, however, the year-on-year loss that is also apparent on this graph, is unsettling.

Over the course of 2009, the level of the Garden Route Dam also showed a constant decline, with the exception of a slight increase after the July rains. Again the level over the past 10 years shows a clear seasonality and although the highest level per year seems to remain relatively constant, the annual minimum level shows increasingly low levels with the 2009 low point the most extreme.

As discussed under 2.1.2, the state of the Great Brak, Touws, Knysna, Karatara and Keurbooms rivers are of particular importance for the Garden Route area. For each of these five rivers, the volume (in cubic metres) at the flow stations are given per month for the past 10 years in Figure 2.6 - Figure 2.10.

Figure 2.6: Volume flow (in cubic metres) for the past 10 years: Great Brak river

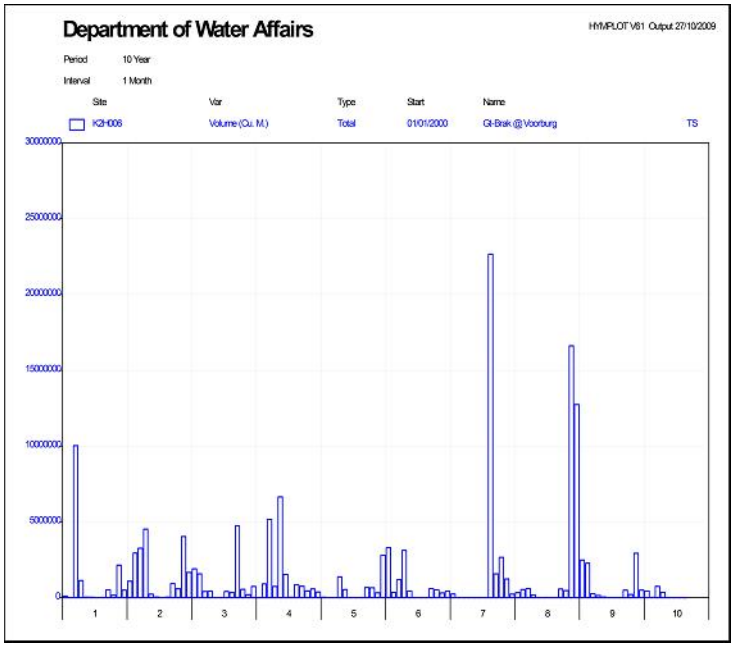


Figure 2.7: Volume flow (in cubic metres) for the past 10 years: Touws river

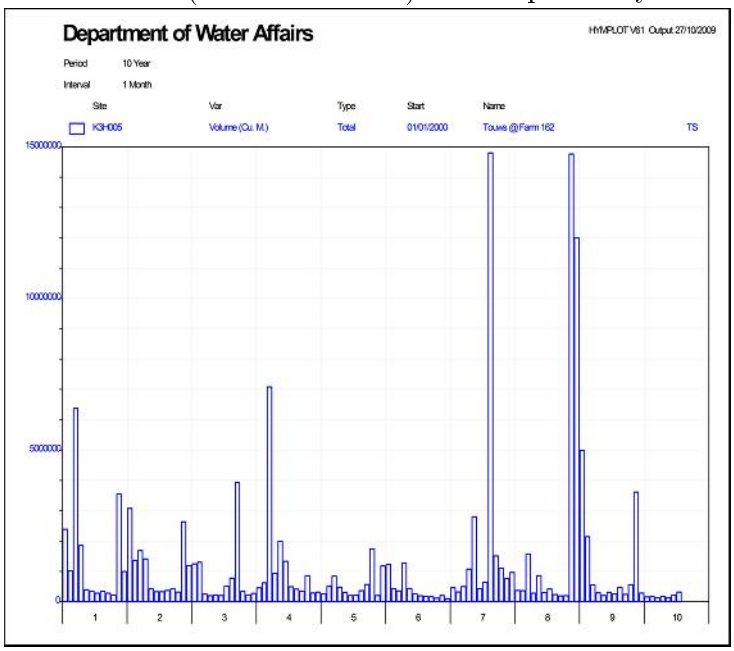


Figure 2.8: Volume flow (in cubic metres) for the past 10 years: Knysna river

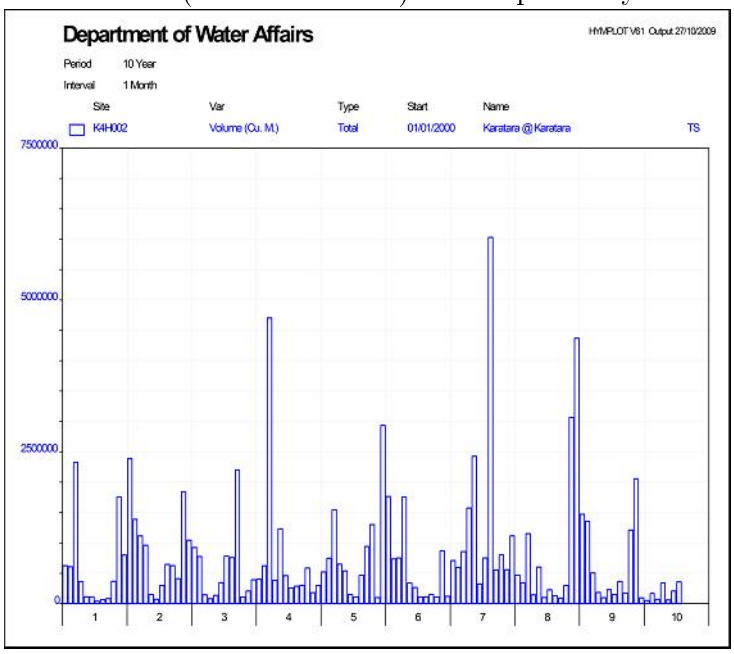


Figure 2.9: Volume flow (in cubic metres) for the past 10 years: Karatara river

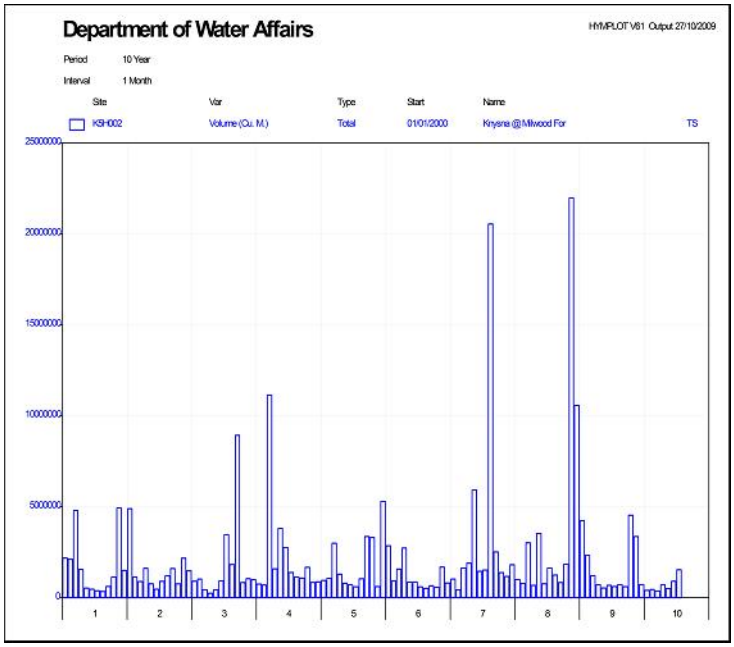
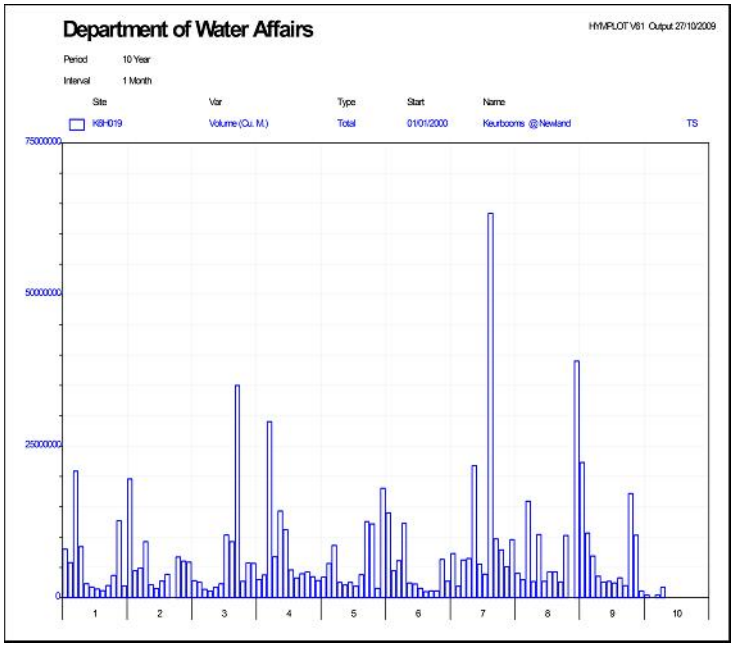


Figure 2.10: Volume flow (in cubic metres) for the past 10 years: Keurbooms river



The patterns observed in the volume flow for the five rivers are very similar. There is a clear seasonality observable in all the graphs. Also, the August 2006 and November 2007 floods, depicted by the extreme tall bars, can be seen on all of the graphs. Without exception, the low bars in the last period indicates the dry conditions experienced in 2009. Long-term trends are not always clearly distinguishable in a single decade, but the above graphs, when plotted for a longer term, may aid in the recognition and calculation of the frequency of extreme events such as floods and droughts.

2.1.4 Risks and vulnerability

The main users of dams owned by municipalities and the Department of Water Affairs, are households and industries. In the case of a drought, these two users will therefore be directly influenced by critically low dam levels. The impact will however differ for the two users. For households the first effect will be in the form of a down scaling of life style. This will include less water for the maintenance of gardens and recreational activities such as swimming pools and golf courses. On a more critical level there will not be enough water for basic needs, including drinking water, water for personal

Table 2.6: Water risk: Drought

Water User	**Risk**	**Indicator**	**Graduated impact**
Household	Drought	Dams below critical level	Life style effect Basic need effect Health hazard
Industry			No expansion Change of technology and processes Cease production
Agriculture		Dams, rivers, ground water below critical level	No expansion Change of crop/life stock type and production methods Cease production
		Continued lower than average rainfall	
Forestry		Continued lower than average rainfall	Loss in production due to diseases Increased fire risk Cease production

hygiene and sanitation. Too little water for basic needs will soon develop in health hazards like the breakout of diseases like cholera.

Industries might react to drought first by not expanding. If the drought situation continues, industries will be forced to change to technologies and processes that use less water. The worst impact for industries will be to stop production.

Municipal dams seldom provide commercial farmers with water for irrigation purposes. Farmers make use of water from rivers, privately owned dams, ground water and rain. Continued below average rainfall, up to the point where dams, rivers and ground water reach critical levels will impact on agriculture. Farmers will probability react to the situation by not expanding. Changing to drought tolerant crops or life stock types or changing production methods might be another reaction. If the situation is not resolved, farmers will eventually stop production and even sell off some of their land.

Forestry is dependent on rainwater since trees are not watered from any other water sources. Production is therefore directly related to adequate rain (800mm p/a). In the event of drought, not only will the rate of tree growth decrease, but also the immunity of trees will decrease. A tree under stress is more prone to diseases which will also slow down tree growth or even kill a tree. A serious impact of drought on forestry is the increased frequency and intensity of fires. If the drought situation reaches a critical level, production has to stop.

The trends and projections of climate change in the Western Cape were investigated in a report *A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-Economic Effects of Climate Change in the Western Cape* (2005). In this report the Western Cape climate projections is summarised as

> ...a drying trend from west to east, with weakening of winter rainfall, possibly slightly more summer rainfall (mainly in the east of the province) a shift to more irregular rainfall of possibly greater intensity, and rising mean, minimum and maximum temperatures everywhere.

Recent temperature trends in the Western Cape supports this projection, though rainfall trends are not as clearly identifiable. Figure 2.11 and Figure 2.12 give the seasonal rainfall (1 July-30 June) as a percentage of the long-term mean, first for the season 2008/2009. The seasons from 1999/2000 to 2007/2008 follow. Shades of red indicate seasonal rainfall less than the long-term mean, whereas shades of blue indicate seasonal rainfall more than the long-term mean. One has to keep in mind that rainfall patterns are complex and influenced by a multitude of external factors, such as humidity, circulation and altitude. Also, 10 years is a short time to study long-term trends. However, colour coded figures are still useful tools in initial assessment of a situation and can be followed up by more advanced research and models.

Figure 2.11: Seasonal rainfall as percentage of long-term mean 1 July 2008-30 June 2009

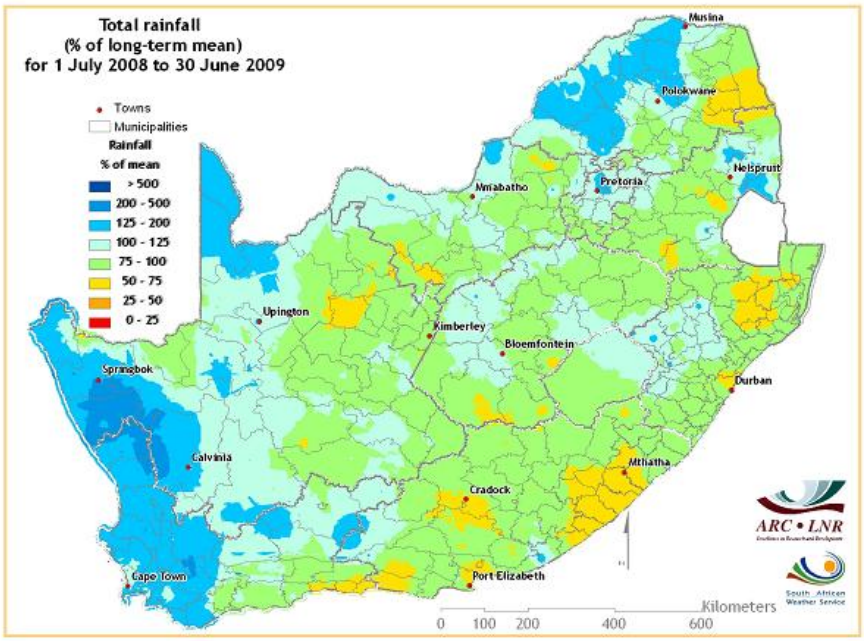
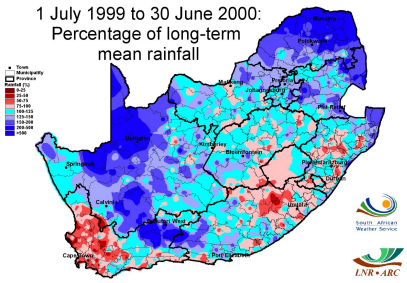
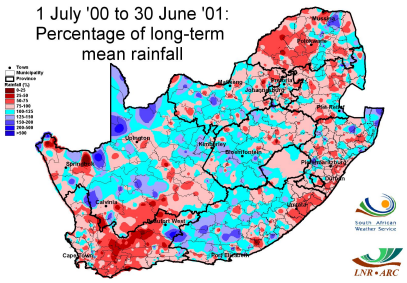
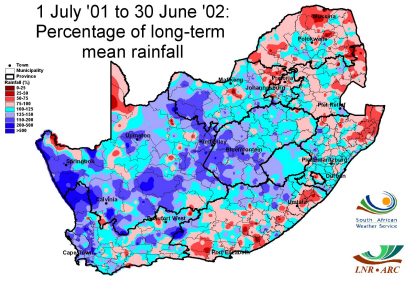
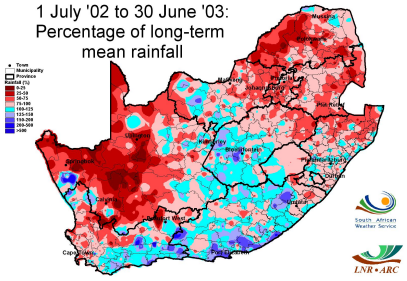


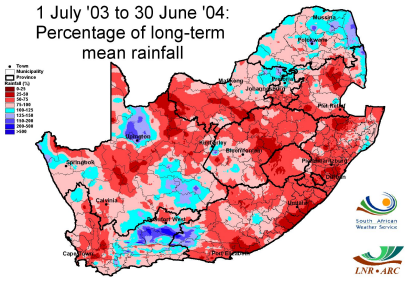
Figure 2.12: Seasonal rainfall as percentage of long-term mean: 1999-2008

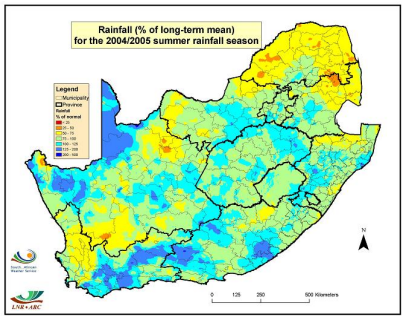


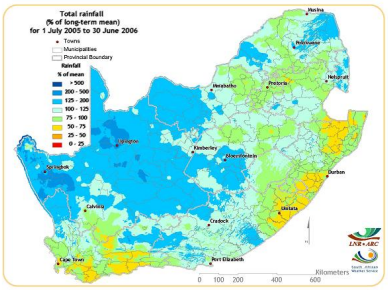


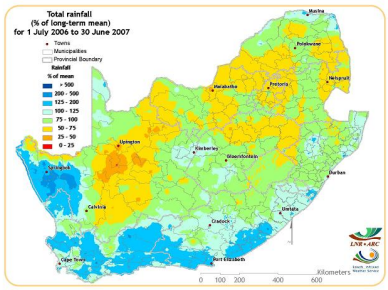


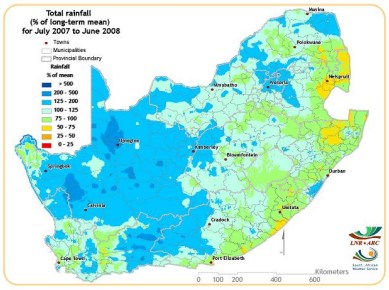








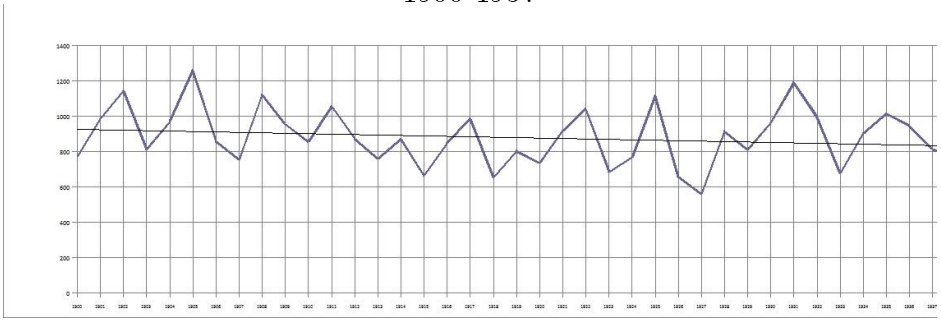




The mean rainfall for George since 1900 is given in Figure 2.13. There are clear cycles of wetter and dryer seasons. Cycles are of varying lengths of between 2 and 6 years in duration, the mode cycle length being 3 years. What is disturbing though, is the long-term trend that shows an undeniable negative slope.

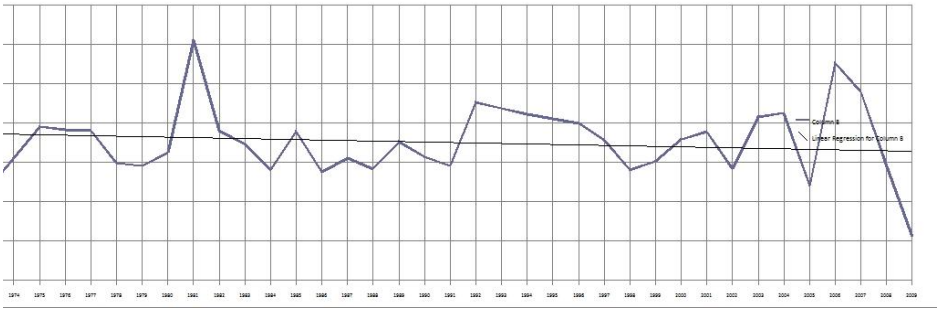
Figure 2.13: Mean rainfall for George 1900-2009

1900-1937



1937-1974

1974-2009



Source: South African Weather Service

Another risk identified is infrastructure degradation due to disaster, specifically floods, see Table 2.7.

Table 2.7: Water risk: Floods

Water User	**Risk**	**Indicator**	**Graduated impact**
Household	Infrastructure degradation: disaster	Frequency and magnitude of floods	Damage to infrastructure Interruption of services Total collapse of infrastructure
Industry			
Agriculture			Erosion Damage to infrastructure Production loss
Forestry			

For households and industry the implications are damage to infrastructure which often also implies interruption of services. If the frequency and magnitude of these disasters exceed critical levels, it will lead to total collapse of infrastructure. Floods will impact on agriculture and forestry in the form of erosion and top soil loss, damage to infrastructure and production loss.

Water infrastructure requires continual maintenance. At the same time an expanding population and/or growing economy requires the establishment of new infrastructure. The risk exists that both these aspects will not receive adequate attention. The correspondence between the resources available and the cumulative work load of the above mentioned aspects serves as an indicator for this risk.

2.1.5 Action

> ...where water is available, it is mostly already fully utilised, primarily for irrigation"(Midgley et al. 2005:p33)

Agriculture, mainly through irrigation, places the highest demand on water resources in the Garden Route area. Since the demand for agricultural goods in the study area will most probably show an increase because of a growing population, reduction in production is not desireable. Therefore, because of the reliance on irrigation, special attention must be given to irrigation efficiency, which is currently very low (Midgley et al. 2005 with reference

to Basson and Rossouw 2003). This may include research and investment in technology (e.g. drip irrigation systems, soil-water sensors), changing crops/live stock and associated practices and the implementation of soil-moisture conservation practices. More efficient irrigation applications will also have a positive effect on water quality. Better irrigation practices will result in less run-off, which is often the source of salination of water.

Households is the second largest user of water in the study area. With population and economic growth, current water consumption levels are unsustainable. It is therefore important that households increase water use efficiency. This can be achieved through various measures including pricing mechanisms, water restrictions and general awareness of water scarcity, of which the current water scarcity campaigns of the local Municipalities are examples. In times of drought households are forced to change water use patterns, eg. re-using bath water to water the garden. If simple and affordable technologies are available, eg. a small water pump to pump water from the bath to the garden, these temporary water use patterns will change into permanent behaviour. The installation of rainwater tanks is another example where simple technology will change water use patterns on a permanent basis. Strategies for reducing water demand in infrastructure, which include household use, are discussed in detail in *A Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-Economic Effects of Climate Change in the Western Cape* (2005:p109-111).

Though forestry do not extract water directly from dams and rivers, it influences stream flow and thus also dam levels. MTO Forestry, which is the largest forestry company in the Garden Route, is in the process of phasing out large areas of plantations. This exit strategy was started in 2005 and is planned to be finished by 2020 (van Lill 2009). With fewer plantations in the area, more ground water will be released. In large areas of the Garden Route the coastal plateau between the mountains and the sea is narrow and therefore this ground water will flow directly into the sea if not contained. This stresses the need for research and planning on the possibility for the construction of new dams in the area.

Other strategies for increasing water supply include the modification of catchment vegetation. An excellent example of this strategy is the *Working for Water* programme, initiated by DWAF. The purpose of this programme is to remove invasive alien tree species from catchments, thus increasing stream flow and water supply. Desalination is another option for alternative water sources. In the past the energy intensity and high financial cost of production have made this technology unviable. However, as technology is improving, this option is becoming more attractive. Currently a desalination plant is

under construction outside Sedgefield. If this project proves successful, it might set the example for more plants to follow.

2.2 Land

In this section the most basic division of land use will be used to identify the main land uses, similar to the categories identified for water use in the previous section. These main land uses are

- Human settlements (urban and rural)
- Agriculture
- Forestry
- Natural areas

2.2.1 Divers and Pressures

The drivers and pressures in the above four categories are briefly discussed and are summarised in Table 2.8 .

The first column distinguishes between the different categories of land users. The second column gives the underlying drivers operative in each of these users and the third column summarises the pressures associated with these drivers.

Table 2.8: Drivers and Pressures: Land

Land User	**Drivers**	**Pressures**
Human settlement	Population growth	Increased demand for housing Increase in infrastructure
	Economic growth	Increased demand for luxury housing Increased demand for recreational areas Holiday homes Infrastructure
	Lifestyle migration	General demand for housing and infrastructure Increased demand for specialized residential developments (e.g. retirement villages and golf estates)
Agriculture	Population growth	Increased demand for land competes with agricultural use
	Economic growth	Demand for agricultural products
Forestry	Forestry management strategy	Phasing out of marginal plantation
Natural areas	Nature conservation awareness	Development of private and public conservation areas
	Conservation policy	

The change in land use patterns in the Garden Route is influenced by two main drivers: population growth and economic growth. The estimated populations in 2007 and percentage annual growth rate (2001-2006) in the Garden Route area are given, per municipality, in Table 2.9. For all four the municipalities the growth rates from 2001-2006 are positive. There is no reason to believe that these rates have decreased after 2006, therefore there is a constant upward trend in population size in the Garden Route.

Table 2.9: Population size per Municipality in the Garden Route area

Municipality	**Population 2007**	**% annual growth rate 2001-2006**
George	136 542	2.38%
Mossel Bay	117 838	1.02%
Knysna	65 045	1.42%
Plettenberg Bay	39 002	3.96%

Source: Stats SA CS 2007 in Eden District Municipality (2008/2009)

The growing population creates pressure on land use in the form of increased demand for housing and the provision of basic infrastructure. The population growth can be attributed to natural increase and immigration. The socio-economic profile and the reason for immigration will determine type of housing required by immigrants. One such group is immigrants from the impoverished rural areas of the Eastern Cape who come in search of employment. The increased presence of people from this socio-economic profile leads to increased demand for subsidy housing. Another group of immigrants generally comes from a high socio-economic group and is drawn by the lifestyle possibilities of the region. The increase in luxury residential estates over the past few years is evidence of this phenomena.

A peculiar feature of the Garden Route is the way in which the demand for land responds to economic development elsewhere in South Africa. This is seen in particular in the market for holiday homes. These houses are often only occupied during holiday seasons by the non-residential population from other provinces.

Apart from maintaining the status quo, there are two trends discernable as far as agricultural land use is concerned. The first one is the tendency to utilise former farm lands for residential development. The second trend is where game is re-introduced in former stock farms. These farms are then developed for eco-tourism (Eden District Municipality 2008:p25). At the same time an increase in population or per capita income will necessarily lead to an increase in demand for agricultural products.

MTO Forestry, the largest forestry company in the Garden Route, is in the process of phasing out large areas of sub-economic plantations.

There is an increase in land used for both private and national conservation areas. The Garden Route National Park was declared in March 2009 and covers a total area of approximately 157 000 hectares. This Park includes existing National Parks (Tsitsikamma and Wilderness), the protected Knysna lakes area and other land currently under SANParks management. The GRNP is made up as follows: indigenous forest (43 500 ha), fynbos and mountain catchment areas (80 000 ha), lakes and estuaries (3 400 ha), marine (27 500 ha) and infrastructure (2 600 ha).

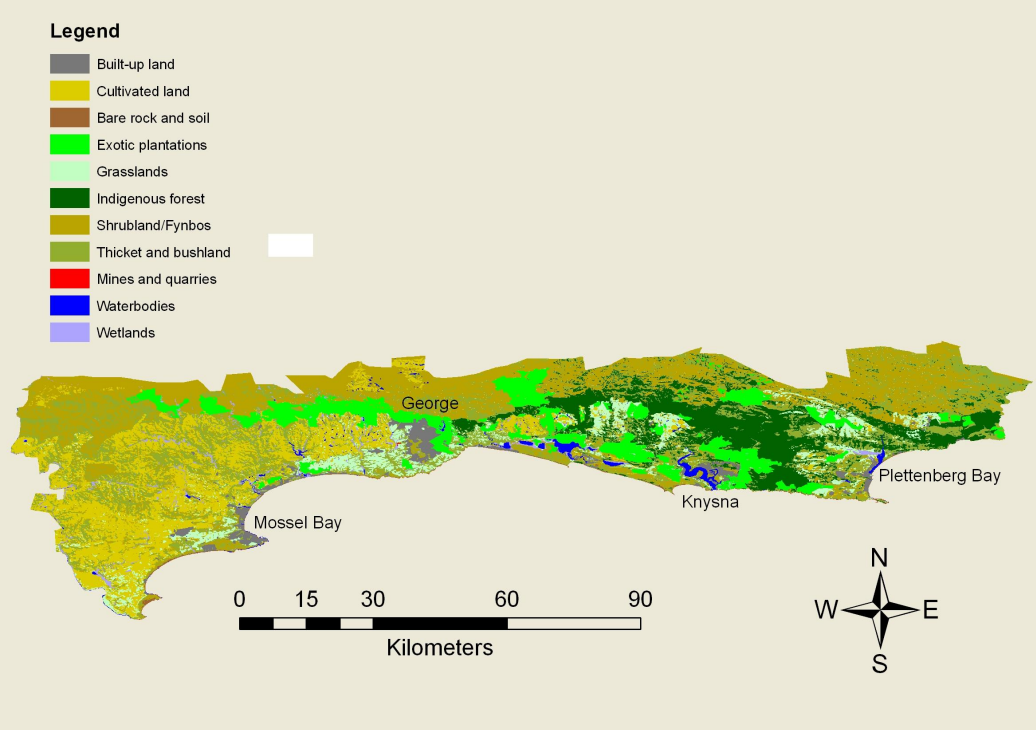
2.2.2 State

This subsection will describe the state of land in the Garden Route area in terms of its uses or potential uses.

Land cover describes which parts of the land retain their natural cover (eg. indigenous vegetation and water bodies) and which parts have been changed by human intervention (eg. residential areas and cultivation). Land cover can therefore be used as a measure to determine the spatial extent of land utilisation and land transformation.

Land cover data has been provided by the Geoinformatics Division of the Institute for Soil, Climate and Water (Agricultural Research Council). The GIS map in Figure 2.14 and the distribution of land cover in Table 2.10, was done by Dr I.P.J Smit of SANParks.

Figure 2.14: Land cover within the Garden Route



Source: Geoinformatics Division of the Institute for Soil, Climate and Water (Agricultural Research Council), GIS map by Dr IPJ Smit SAN Parks

The majority of the land cover (28%) falls within the category *Shrubland / Fynbos*. This area includes most of the mountainous areas. The second largest land cover is *Thicket and bushland* (21%) which seems to cover areas between *Cultivated land*, which is the third largest category covering almost 17%. The western part of the Garden Route area is characterised by cultivated land, however, moving towards the eastern part the character changes

Table 2.10: Distribution of land cover within the Garden Route

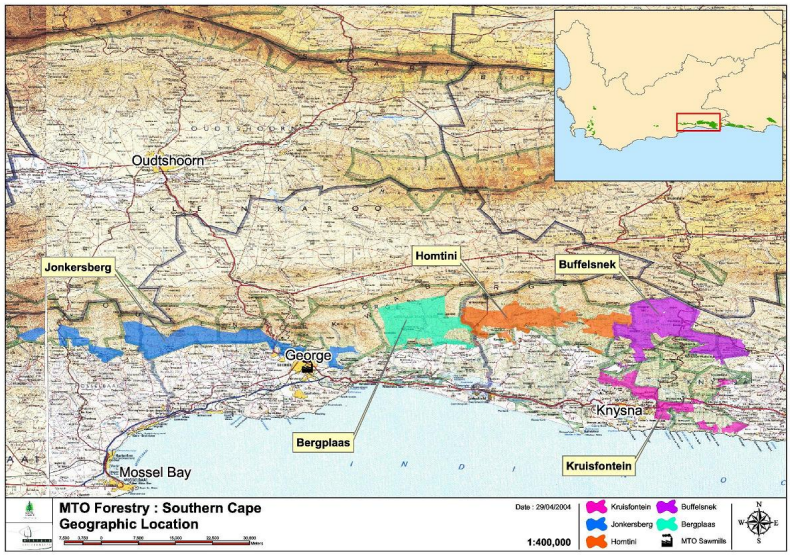
Land cover	**Hectares**	**Percentage**
Built-up land	12 971	2.53
Cultivated land	85 138	16.59
Bare rock and soil	2 551	0.5
Exotic plantations	50 339	9.81
Grassland	32 787	6.39
Indigenous forest	62 406	12.16
Shrubland / Fynbos	145 128	28.28
Thicket and bushland	109 561	21.35
mines and quarries	24	≈ 0
Water bodies	5 503	1.07
Wetlands	6 796	1.32
TOTAL	**513 204**	**100**

to that of *Indigenous forest* (12%) and *Exotic plantation* (10%), the fourth and fifth largest categories respectively. *Built-up land* only covers 2.5% of the area.

MTO Forestry is the largest forestry company in the Garden Route area and the five plantations managed by MTO in the area are Jonkersberg, Buffelsnek, Homtini, Bergplaas and Kruisfontein (see Figure 2.15).

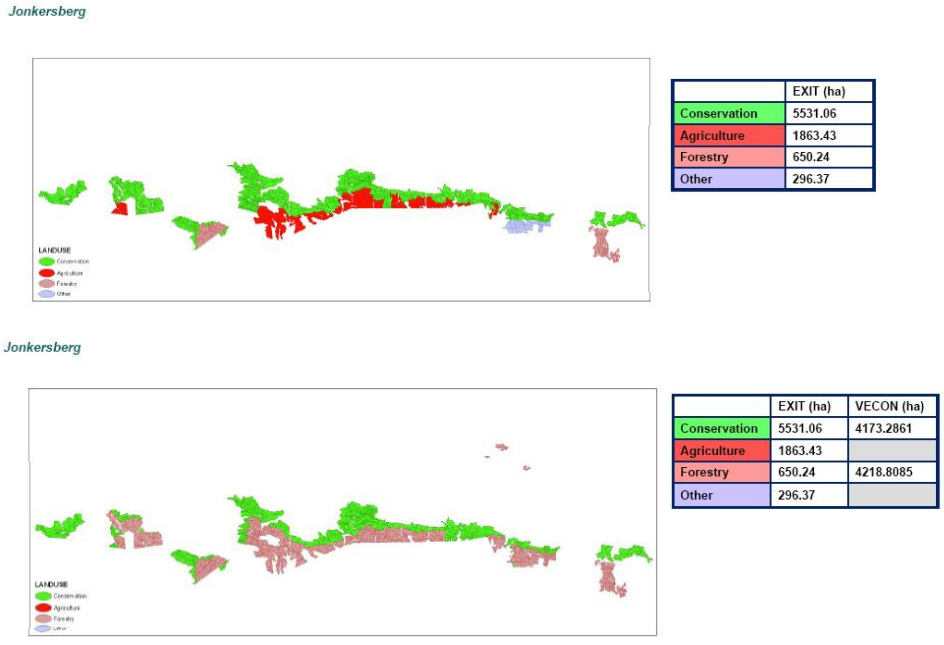
Since 2005 MTO is in the process of phasing out large areas of plantations. This exit strategy is depicted for Jonkersberg and Buffelsnek in Figure 2.16 and Figure 2.17 and is summarised for all the plantations in Figure 2.18. EXIT refers to the original exit strategy put forward by Government before the lease contract with MTO. VECON refers to the proposal by MTO to utilise some of the areas originally destined for the exit program till the expiry of the lease contract between Government and MTO in 2075.

Figure 2.15: Plantations in the Garden Route under MTO Forestry management



Source: MTO Forestry (Pty) Ltd. MTO assumes no responsibility for the completeness or accuracy of the data contained within.

Figure 2.16: MTO Forestry Exit Strategy: Jonkersberg and Buffelsnek

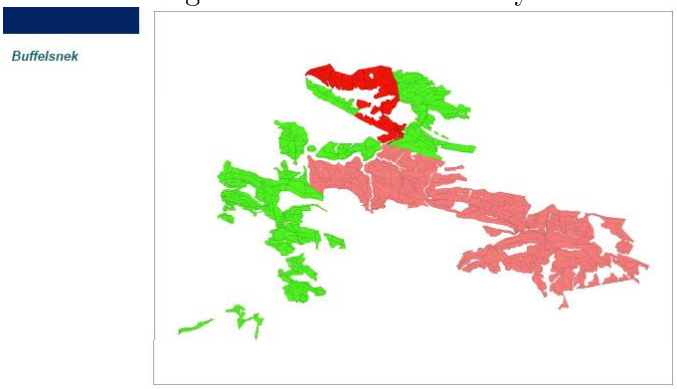


	EXIT (ha)
Conservation	5531.06
Agriculture	1863.43
Forestry	650.24
Other	296.37

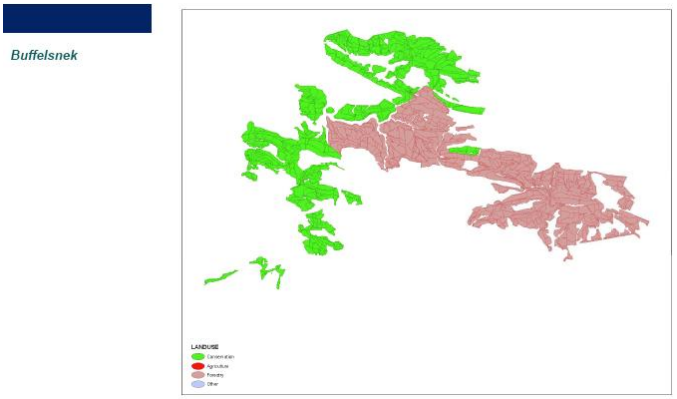
	EXIT (ha)	VECON (ha)
Conservation	5531.06	4173.2861
Agriculture	1863.43	
Forestry	650.24	4218.8085
Other	296.37	

Source: MTO Forestry (Pty) Ltd. MTO assumes no responsibility for the completeness or accuracy of the data contained within.

Figure 2.17: MTO Forestry Exit Strategy: Buffelsnek



	EXIT (ha)
Conservation	3197.10
Agriculture	719.93
Forestry	4360.65
Other	0.01



	EXIT (ha)	VECON (ha)
Conservation	3197.10	3729.50
Agriculture	719.93	
Forestry	4360.65	4548.19
Other	0.01	

Source: MTO Forestry (Pty) Ltd. MTO assumes no responsibility for the completeness or accuracy of the data contained within.

Figure 2.18: MTO Forestry Exit Strategy: all plantations

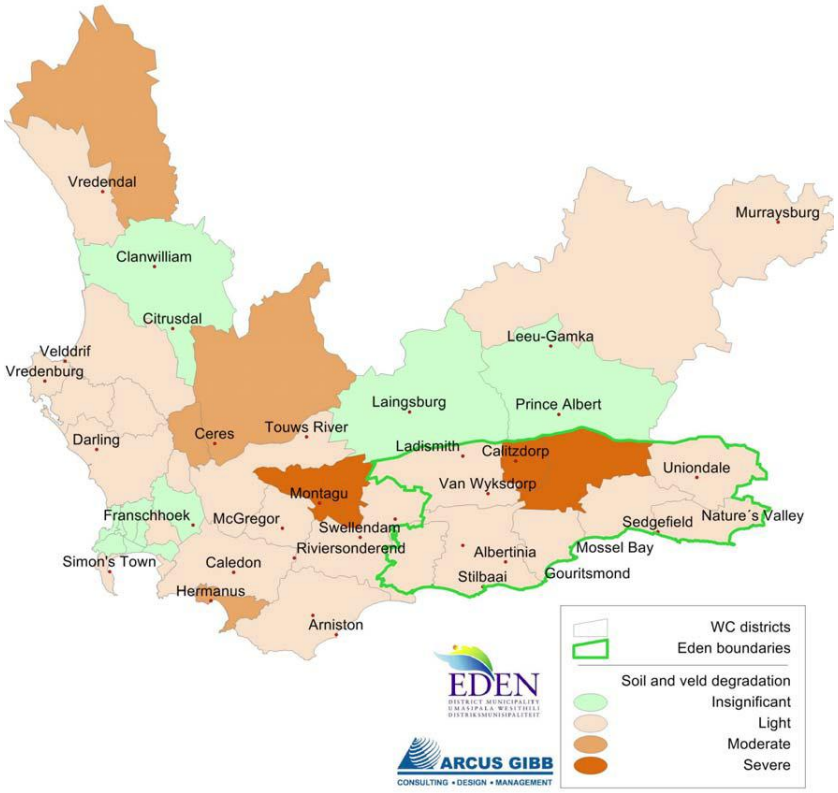
Plantation	EXIT Conser-vation	VECON Conser-vation	EXIT Agri-culture	VECON Agri-culture	EXIT Forestry	VECON Forestry	EXIT Other	VECON Other	Total ha
Kluitjieskraal	2260.15	1989.80	1183.57	277.26		1176.67			3443.74
Grabouw	5394.81	2427.70	1587.12	58.49		4686.61	190.77		7172.80
Lamotte	2427.50	3095.20	1309.42		173.86	1041.63	222.59		4136.83
Bergplaas	6079.18	1665.98	537.72			4955.92			6621.90
Buffelsnek	3197.10	3729.50	719.93		4360.65	4548.19	0.01		8277.69
Homtini	5693.94	5991.06	514.62		568.47	787.15			6778.21
Jonkersberg	5531.06	4173.29	1863.43		650.24	4218.81	296.37		8392.09
Total ha	30583.73	23072.53	7715.80	335.77	5753.22	21414.98	709.74		44823.26

Source: MTO Forestry (Pty) Ltd. MTO assumes no responsibility for the completeness or accuracy of the data contained within.

From Table 2.18 it is clear that for these areas identified by the exit strategy, land use will change from forestry to mainly conservation and also agriculture. The areas identified where forestry will be phased out are usually areas that proved less productive. Appropriate conservation and agricultural activities must therefore be identified to ensure future productive use of the land.

Land degradation implies diminished potential of the land. Land degradation is manifested in the soil and in the veld. Soil degradation comprise of erosive forms (water and wind erosion) and non-erosive forms (acidification and salination). Veld degradation is reflected in loss of cover and changes in species composition, deforestation and alien plant invasion. The Combined Land Degradation Index (CDI) is a widely recognised measure for the combined effect of soil and veld degradation (Eden District Municipality 2008with reference to Hoffman 1999). From Figure 2.19 it can be seen that the CDI for the Garden Route is light.

Figure 2.19: Combined Land Degradation Index (CDI) for the districts in the Western Cape



2.2.3 Risks and vulnerability

Four land uses, namely human settlement, agriculture, forestry and natural areas have been identified in Section 2.2. The allocation of land to each use is dictated by the inherent qualities of the land in interaction with economic and cultural forces. The use of a specific area may change over time owing to the vicissitudes of these forces. However, land use transitions can only take place between some categories. For example, fynbos can be turned into grazing and, given enough time, vice versa but natural forest that has been transformed into exotic plantations can hardly be restored to its original state. The risk in terms of future land uses is that land is degraded to such an extent that it cannot be restored for another use in future, or that land is transformed into uses from where land use transitions will be impossible and the final land use represents a less than optimal usage of the land. A situation where it is impossible to transform land from its current state or where the cost of a transition exceeds the nett value of the transitional use, can be described as a *transitional dead end*.

At least three such transitional dead ends exists. They are:

- Degraded land
- Alien plant occupation
- Unsustainable human settlements

Degraded land in the Garden Route area seems less of a problem than alien plant occupation and unsustainable human settlements. On the other hand, alien plant invasion is a serious problem in the Garden Route, as it is in the whole province.

> The Western Cape has the most serious invasive alien plant problem in South Africa, with mountain catchments, riparian zones, and coastal dune systems being particularly badly affected... up to 70% of natural fynbos is invaded to some degree, about 2.5% severely.(Midgley et al. 2005:p74with reference to Le Maitre et al. 2002 and Rouget et al. 2004)

Detailed catchment-level studies conducted by Le Maitre et al. (2002) (referred to in Midgley et al. 2005) have shown that 54% of the Keurbooms catchment has been invaded to some degree. The reduction in natural river

flows attributed to this invasion is about 22.1% . If the invasion is not controlled it can potentially increase to 77% and the projected flow reduction would then increase to 95.5%. The estimated cost of control programmes is about R59.4 million. This cost can rise to R123 million should the catchment be allowed to become fully invaded before control programmes are started.

This study illustrates that when alien plant invasion is not adequately controlled, the rehabilitation from alien plant occupation may not be economically viable. This is an example of a transitional dead end.

Human settlements can hardly be transformed to other uses. Great care should therefore be taken in the extension of human settlements, although such extensions are inevitable in the light of current demographic trends.

2.2.4 Action

There are several national, provincial and local policies and programmes in place to address the issue of sustainable land use. A comprehensive list of these responses and descriptions of the objectives of each, can be found in Eden District Municipality's State of the Environment Report (2005) and Growth and Development Strategy (2007).

These responses address the need to

- Conserve biodiversity and control alien plant invasion
- Protect agricultural land
- Manage urban growth

Some of the responses are briefly reviewed:

The *Garden Route Initiative* (GRI) under the auspices of South African National Parks is in the process of establishing critical biodiversity habitats and ecological process areas from the Gouritz River in the west to the edge of the Nelson Mandela Bay Metro in the east. Through the control of alien plant invasion, the *Work for Water Programme* (WFW) rehabilitate degraded land and enhance water security.

The *Conservation of Agricultural Resources Act* (Act 43 of 1983) provides for the conservation of natural agricultural resources and the *Subdivision of Agricultural Land Act* (Act 70 of 1970) prevents the subdivision of viable agricultural portions smaller than 9 ha.

The *Provincial Urban Edge Guidelines* sets forth criteria for the preparation and management of urban edges. The objective is to enable local authorities to incorporate urban edges into planning documents in order to guide urban growth.

The *National Spatial Development Perspective* (NSDP), the *Western Cape Spatial Development Framework* (WCSDF), *Eden District Spatial Development Framework* and the *SDFs* of local municipalities all provide direction to the nature and location of future development in the associated area.

2.3 Economy

2.3.1 Data Source

Most of the data in this section has been provided by Statistics South Africa. The most recent census was conducted in 2001 and the next census is scheduled for 2011. When the decision has been taken to move away from 5-year to 10-year censuses an information gap was created between Census 2001 and Census 2007. It was therefore decided to carry out the *Community Survey* (CS) in 2007. The Community Survey is the largest survey conducted by Stats SA and provides information at the municipality level. The 2007 CS covered 274 348 dwelling units across all provinces of which a total of 238 067 dwellings had completed questionnaires (Statistics South Africa 2007). Other surveys conducted by Stats SA include: the *General Household Survey* (GHS), the *Gross Domestic Product* (GDP) and the *Income and Expenditure Survey* (IES). These surveys are conducted on a more regular basis, however, they do not provide information on a municipality level but only on provincial level. For the purpose of this study the Garden Route is considered the combination of local municipalities Mossel Bay, George, Knysna and Bitou. This section made extensive use of Census 2001 and CS 2007, and in some cases Census 1996, to identify trends in the Garden Route over the past years. It should be kept in mind that CS 2007 is a survey and not a census. Survey data, along with certain adjustments, were used to arrive at best estimates on national, provincial and municipality level. The CS 2007 is thus not a replacement of the Census, but the best available data on municipality level to compare with Census 2001.

Table 2.11: Population figures (1996, 2001 and 2007) for the Garden Route

Municipality	1996 census	2001 census	% change	2007 CS	% change
Mossel Bay	59 542	71 493	20.1	117 840	64.8
George	107 723	135 409	25.7	136 541	0.8
Knysna	42 975	51 468	19.8	65 043	26.4
Bitou	18 354	29 183	59.0	39 002	33.6
Garden Route	228 594	287 553	25.8	358 426	24.6

Source: Stats SA, Census 1996, Census 2001 and CS 2007

2.3.2 Basic Demographics

Table 2.11 gives the 1996 Census, 2001 Census and 2007 Community Survey population figures for the four local municipalities and for the Garden Route. From this table it is clear that there has been population growth in all four municipalities and therefore also in the Garden Route. The population growth in the Garden Route from 1996 to 2001 has been a significant 25.8% and from 2001 to 2007 a further 24.6%. This growth can be attributed to natural growth and also to immigration. Unfortunately it is not known what portion of growth can be attributed to these two factors.

Immigration can be split up into two main groups: Immigrants from poorer neighboring provinces in search for employment and immigrants drawn by the lifestyle possibilities of the region, specifically retired people. These two groups play different roles in the economy and an in-depth study on the trends of immigration will contribute to insight in the economy of the area.

Table 2.12 gives the age distribution in percentage for the Garden Route, the Western Cape and South Africa in 2001 and 2007. For the purpose of this analysis, the labour force is considered those people from age 15 years to age 64 years. When comparing the Garden Route (GR) with the Western Cape (WC) and South Africa (SA) in 2001, the GR and the WC have a similar proportion of people of working age (66.7% and 67.5% respectively). For South Africa as a whole, the labour force is slightly lower at 63.2%. It is interesting to note that in the group of older people (65+ years), the GR has the highest percentage of 6.2% compared to the 5.1% for the WC and the 5% for SA. When looking at the 2007 CS numbers one observes a very similar pattern to the 2001 data. Again the GR and WC have similar labour force percentages of 68.5% and 68% respectively, compared to the lower labour force percentage of 63.6% for SA. The 65+ years group contributes 6.2% to the Garden Route population and again contributes slightly less to the

WC population (5.7%) and the SA population (5.4%). The 2001 and 2007 population proportion for the 65+ years group in the Garden Route remained stable at 6.2%. This means that the proportion of older people in the Garden Route is not increasing, but only that there is a relatively large group of older people in the area and that this group increases at the same rate as the general population .

Table 2.12: Age distribution in 5 year categories (percentage)

Age			**2001**			**2007**
	Garden Route	**Western Cape**	**South Africa**	**Garden Route**	**Western Cape**	**South Africa**
0-4	8.83	9.00	9.90	9.48	9.38	10.28
5-9	9.01	9.00	10.80	8.10	8.74	10.55
10-14	9.31	9.30	11.30	7.70	8.17	10.20
15-19	9.57	9.90	11.10	8.79	9.11	10.50
20-24	8.31	9.50	9.60	10.12	9.70	9.88
25-29	8.96	9.40	8.80	9.84	8.93	8.38
30-34	8.76	8.70	7.50	8.80	8.36	7.71
35-39	8.02	8.00	6.90	7.69	7.82	6.63
40-44	6.77	6.80	5.80	7.10	7.04	5.85
45-49	5.35	5.30	4.70	5.25	5.81	4.97
50-54	4.34	4.20	3.70	4.29	4.62	4.06
55-59	3.47	3.10	2.70	3.21	3.74	3.23
60-64	3.14	2.60	2.40	3.39	2.91	2.39
65-69	2.33	1.90	1.80	2.64	2.19	1.98
70-74	1.72	1.40	1.40	1.65	1.50	1.37
75-79	1.11	0.90	0.80	1.00	0.97	0.99
80-84	0.61	0.50	0.60	0.61	0.63	0.54
85+	0.39	0.40	0.40	0.34	0.38	0.50
Total	100	100	100	100	100	100

Source: Stats SA, Census 2001, CS 2007

2.3.3 Sectoral trends and contribution to gross domestic product

Economic indicators are recorded on a municipality level by Statistics South Africa. For the purpose of this study the combination of the four municipalities Mossel Bay, George, Knysna and Bitou were considered for the Garden

Route. Data on the GDP growth rate for these municipalities has been requested from Statistics South Africa but has not been received at the time of writing. GDP growth data for the Eden District Municipality is however available from the *Growth and Development Strategy* report (Schroeder et al. 2007). In addition to the above mentioned four municipalities, Eden District Municipality also includes the following municipalities: Oudtshoorn, Hessequa, Kannaland and District Management Area 12. Eden District Municipality showed an economic growth of about 3.5 to 4.5 percent (real) per annum over the 2004/2005 period, which was slightly higher than the average for the Western Cape (Schroeder et al. 2007:p12).

Table 2.13 gives the conventional economic sectors and contribution to the gross domestic product as a means to identify trends and the relative importance of the respective sectors. This is given for each of the local municipalities in order to identify whether the relative importance of the sectors differ between the municipalities. Table 2.14 gives the contribution, per sector, to the gross domestic product for the Garden Route.

Table 2.13: Sector contribution to GDP 2007 per Municipality

Sector	**Mossel Bay**		**George**		**Knysna**		**Bitou**	
	GDP (in R1000)	**% contribution**	**GDP (in R1000)**	**% contribution**	**GDP (in R1000)**	**% contribution**	**GDP (in R1000)**	**% contribution**
Agriculture, forestry and fishing	67 498	2.98	117 616	3.15	30 703	2.73	23 456	4.23
Mining and quarrying	31 350	1.39	5 066	0.14	490	0.04	3 570	0.64
Manufacturing	653 853	28.91	482 908	12.94	119 332	10.60	91 350	16.47
Electricity and water	26 499	1.17	73 973	1.98	10 957	0.97	8 295	1.50
Construction	148 568	6.57	266 607	7.14	123 294	10.95	77 477	13.97
Wholesale and retail trade, catering and accommodation	322 742	14.27	809 083	21.68	267 735	23.77	115 239	20.77
Transport and communication	243 256	10.75	289 585	7.76	101 418	9.01	46 500	8.38
Financial and business services	441 307	19.51	1 120 872	30.03	297 373	26.41	119 144	21.48
Community, social and other personal services	326 970	14.45	567 074	15.19	174 820	15.52	69 737	12.57
	2 262 043		3 732 784		1 126 121		554 768	

Source: Western Cape Provincial Treasury calculations based on Quantec Research data, 2007

George Municipality was the largest economy in the Garden Route and accounted for 49% of the Garden Route's economy. For all the municipalities the category *Financial and business services* and the category *Wholesale and retail trade, catering and accommodation* played important roles in the contribution to the GDP. *Manufacturing*, probably because of PetroSA, contributed most to the Mossel Bay economy. The percentage contribution by *Agriculture, forestry and fishing* to the economy is very stable across the municipalities and is relatively low with a contribution percentage of approximately 3%.

Table 2.14: Sector contribution to GDP 2007 for the Garden Route

Sector	**GDP (in R1000)**	**% contribution**
Agriculture, forestry and fishing	239 273	3.12
Mining and quarrying	40 476	0.53
Manufacturing	1 347 443	17.55
Electricity and water	119 724	1.56
Construction	615 946	8.02
Wholesale and retail trade, catering and accommodation	1 514 799	19.73
Transport and communication	680 759	8.87
Financial and business services	1 978 696	25.78
Community, social and other personal services	1 138 601	14.83
Total	**7 675 717**	

Source: Western Cape Provincial Treasury calculations based on Quantec Research data, 2007

The financial and business services contributed the highest percentage to the economy in the Garden Route (26%). Wholesale and retail trade, catering and accommodation contributed the second highest percentage (20%).

2.3.4 Labour market rates

It must be remembered that the economy must serve the people and therefore economic growth that does not bring along job opportunities for the common man, is an economy that only serves a certain portion of the population. Table 2.15 gives the trends in the labour market rates for the Garden Route, the Western Cape and South Africa for the years 2001 (Census) and 2007 (CS). The *labour participation rate* is the proportion of the working-age population that is economically active. This is measured as the sum of the employed and the unemployed expressed as a percentage of the total working-age population. The *labour absorption rate* is the proportion of the working-age population that is employed. The *unemployment rate* is the proportion of the working-age population that were unemployed according to the *official* or *strict* definition. According to this definition the unemployed are those who were not employed during the survey but who had taken active steps to look for work or to start some form of self-employment in the four weeks before the survey was conducted. This definition therefore excludes

discouraged work seekers. It is calculated as the ratio of the unemployed to the sum of the employed and the unemployed. The *not economically active rate* is the proportion of the working-age population that is not economically active. This includes students, homemakers, those too ill to work and anyone not seeking work.

In 2001 the labour absorption rate for the Garden Route is slightly better than that of the Western Cape and significantly better than the absorption rate for South Africa. This trend is repeated in 2007. The unemployment rate in 2001 for the Garden Route and the Western Cape are compareable and much lower than the unemployment rate for South Africa. In 2007 the unemployment rate for the Garden Route is again better than the unemployment rates for both the Western Cape and South Africa. The labour absorption rate shows an increase from 2001 to 2007 for the Garden Route and the unemployment rate for the Garden Route shows a decrease from 2001 to 2007, thus indicating positive trends in the labour market for the Garden Route from 2001 to 2007. However, one should be cautious when comparing rates between 2001 and 2007, keeping in mind that Census 2001 most probably underestimated employment, especially in the informal and subsistence agricultural sector (Statistics South Africa 2004:p51).

Table 2.15: Labour market rates amongst those aged 15-65 years

	2001			**2007**		
	GR	**WC**	**SA**	**GR**	**WC**	**SA**
Labour absorption rate	51.0	48.5	33.7	59.1	55.1	41.3
Unemployment rate	27.5	26.1	41.6	18.0	22.2	32.9
Labour force participation rate	70.3	65.6	57.7	72.1	70.8	61.5
Not economically active rate	29.7	34.4	42.3	27.9	29.2	38.5

Source: StatsSA, Census 2001 and CS 2007

Unemployment is not only an indicator of too few job opportunities, but probably also of an unskilled work force. Therefore, when investigating the issue of unemployment one should study both the trends and possibilities with respect to job opportunities and also the level of education of the labour force. Table 2.16 gives the highest level of education for the Garden Route population in 2001 and 2007. The categories used in the 2001 Census and the 2007 Community Survey differ slightly, but comparison is still possible.

Table 2.16: Highest level of education of the Garden Route population in 2001 and 2007

Level of education	**2001**		**Level of education**	**2007**	
	Number of persons	**%**		**Number of persons**	**%**
No schooling	21 671	8.27	No schooling	13 423	4.29
			Grade 0	5 188	1.66
Grade 1	10 116	3.86	Grade 1	6 597	2.11
Grade 2	7 383	2.82	Grade 2	10 899	3.48
Grade 3	10 621	4.05	Grade 3	11 643	3.72
Grade 4	12 778	4.87	Grade 4	11 700	3.74
Grade 5	13 992	5.34	Grade 5	15 045	4.81
Grade 6	16 760	6.39	Grade 6	16 188	5.17
Grade 7	20 985	8.01	Grade 7	22 652	7.24
Grade 8	23 005	8.78	Grade 8	24 533	7.84
Grade 9	17 679	6.74	Grade 9	23 935	7.65
Grade 10	24 555	9.37	Grade 10	34 844	11.13
Grade 11	13 048	4.98	Grade 11	21 143	6.75
			Attended Grade 12, but not completed Grade 12	20 816	6.65
			Grade 12 (without university exemption)	37 608	12.02
Grade 12 / matric	47 587	18.15	Grade 12 (with university exemption)	7 603	2.43
Certificate with less than grade 12	858	0.33	Certificate with less than grade 12	4 823	1.54
Diploma with less than grade 12	755	0.29	Diploma with less than grade 12	5 505	1.76
Certificate with grade 12	3 364	1.28	Certificate with grade 12	1 790	0.57
Diploma with grade 12	9 430	3.60	Diploma with grade 12	6 074	1.94
Bachelor's degree	3 349	1.28	Bachelor's degree	4 969	1.59
Bachelor's degree and diploma	1 634	0.62	BTech	1 193	0.38
			Post graduate diploma	1 253	0.40
Honour's degree	1 061	0.40	Honour's degree	1 722	0.55
Higher degree (Master's or Doctorate)	1 515	0.58	Higher degree (Master's or Doctorate)	1 860	0.59

Source: StatsSA, Census 2001 and CS 2007

The percentage of the Garden Route population with no schooling in 2001 was 8.3%, this decreased to 4.3% in 2007. However, the percentage of the population with highest qualification matric decreased from 18.2% in 2001 to 14.4% in 2007. People with any post-matric qualification was 7.1% of the 2001 population and slightly less at 6% of the 2007 population. The proportion of people with top qualifications (Master's and Doctorate degree) remained stable at 0.6% of the population in both 2001 and 2007.

Tables 2.13 and 2.14 reflect the relative importance of the different economic sectors with respect to the contribution to the GDP. However, the importance of a sector to a region's well-being must also be measured by the contribution to employment by the sector. These numbers are given in Table 2.17. If the unspecified categories are not taken into consideration, then the three most important sectors with respect to employment are:

- *Wholesale and retail trade, catering and accommodation (including tourism)*
- *Construction*
- *Community, social and other personal services*

Table 2.17: Contribution to employment in the Garden Route by economic sector in 2007

Sector	**Employed**	**% contribution**
Agriculture, forestry and fishing	10 009	7.17
Mining and quarrying	477	0.34
Manufacturing	16 491	11.81
Electricity and water	1 103	0.79
Construction	21 639	15.50
Wholesale and retail trade, catering and accommodation	23 491	16.82
Transport and communication	4 092	2.93
Financial and business services	11 781	8.44
Community, social and other personal services	19 331	13.85
Other and not adequately defined	13 930	9.98
Unspecified	17 277	12.37
Total	**139 621**	**100**

Source: Stats SA,CS 2007

Comparing the information in Tables 2.14 and 2.17 it is interesting to note that the sector *Wholesale and retail trade, catering and accommodation* plays an important role in the Garden Route economy, both in terms of contribution to GDP and in terms of employment.

2.3.5 Household income

The annual household income for 2007 are given in Table 2.18 for both the Garden Route and the Western Cape.

Table 2.18: Annual household income for the Garden Route and the Western Cape 2007

Income Category	**Garden Route**		**Western Cape**	
	Households	**Percentage**	**Households**	**Percentage**
No income	3 805	4.58	69 204	6.29
R1-R4 800	2 201	2.65	25 944	2.36
R4 801-R9 600	5 505	6.62	51 989	4.73
R9 601-R19 200	15 806	19.02	162 178	14.75
R19 201-R38 400	18 783	22.60	214 486	19.50
R38 401-R76 800	15 784	18.99	204 861	18.63
R76 801-R153 600	10 691	12.86	154 511	14.05
R153 601-R307 200	6 773	8.15	120 124	10.92
R307 201-R614 400	2 443	2.94	64 545	5.87
R614 401-R1 228 800	762	0.92	21 116	1.92
R1 228 801-R2 457 600	314	0.38	6 562	0.60
R2 457 601 or more	242	0.29	4 324	0.39

Source: StatsSA, CS 2007

As one would expect, income is positively skew distributed for the GR and the WC with most households falling in the lower income categories and only a few households in the upper income categories. Household income in the GR is comparable to household income in the WC. The percentage households with no income in the GR is slightly lower (4.6%) than the corresponding percentage for the WC (6.3%). It is interesting to note that the percentage households with an annual income of more than R307 200 for the GR is only 4.5% compared to the 8.8% for the WC.

Chapter 3

Conclusions and recommendations

3.1 Conclusions

This study investigated three aspects of the sustainability of the Garden Route. Through the course of this investigation it became clear that these aspects are interrelated. Water can be considered the most basic of these factors because it is a critical determinant of all eco-systems. Without water human civilization is impossible.

It is generally agreed that climate change is a reality. There are indications that rainfall has been declining in the Garden Route over the past century. The population of the Garden Route is increasing rapidly with influx a major contributor. The current water shortage experienced in the Garden Route should therefore not be seen as a temporary problem, but rather as structurally entrenched by increased demand on a declining resource. Agricultural use is the water use category that uses the most water. This is followed by household use.

Large areas of the Garden Route is covered by fynbos and bushland which contribute to the unique character of the Garden Route. Approximately seventeen percent of the Garden Route area is covered by cultivated land. The proportion of land under conservation is increasing due to the transformation of former farm lands into private nature reserves and the proclamation of the Garden Route National Park. Alien plant invasion affects large areas of the Garden Route and presents a major threat to eco-systems placing significant pressure on water resources throughout the region. The intensity of this problem is set to escalate if left unmanaged.

As far as labour absorption rate and the potential labour force is concerned, the Garden Route performs comparable with the Western Cape and better than South Africa. Of all economic sectors, *Wholesale and retail trade, catering and accommodation,* which includes tourism, makes the second largest contribution to the GDP of the area and is the largest employer of all sectors. *Financial and business services* is the largest contributor to the GDP, but only the fifth largest employer.

3.2 Recommendations

3.2.1 Water use efficiency

This study has shown that the scenario of a permanent shortage of water is one of the central challenges to the sustainability of the Garden Route. In the light of the existing low water use efficiency that has been referred to in subsection 2.1.5, it is important to increase the water use efficiencies of the major water users, namely agriculture, households and industry. There are numerous existing technologies and management practices that would increase water use efficiency, if applied. The current drought in the Garden Route should be viewed as an opportunity to overcome the barriers to the transition to more efficient technologies and practices. With more efficient water use practices established, the region will be much less vulnerable to the expected fluctuations and possible decline in regional rainfall.

3.2.2 Alternative water sources

There are multiple possibilities for establishing alternative water sources in the region. These include new dams, pipelines from water-rich regions, desalination, re-use and rainwater harvesting by households. The cost-benefit of each option, as well as its relation to specific users and other possible water sources, has to be determined through an in-depth analyses by experts.

3.2.3 Land use transition model

Land use changes over time as a result of economic and cultural influences. The threat to productive land use is not the changes as such, but the possibility that a transitional dead end, as described in 2.2.3 is reached. Insight into the dynamics of land use transitions will enable decision makers to avoid

transitional dead ends. It is therefore necessary to understand how each land use category in the region may be transformed to another category and what the probability, cost and duration of each transition is.

3.2.4 Alien plant invasion control

This study has once again drawn attention to the well-known fact that alien plant invasion is a threat to water supply, eco-systems and economic land use and requires constant and aggressive control. The Working for Water programme of DWAF is one measure already implemented to manage alien plant invasion. In the light of the additional job creation benefit by this programme and the prospect of continued water shortages, this programme should be intensified.

3.2.5 Modelling the water intensity of the economy

This study has concluded that the availability of water in the region sets limits to human activities. Economic growth is a generally desired goal. It is thus necessary to determine optimal ways in which the economy can grow, subject to the water limitation. There is a need for a regional water use intensity index that expresses the economic activity relative to water consumption, possibly expressed as *litre/Rand*. Such an index will enable existing economic role players to understand and manage their water use intensity. It will furthermore aid decision makers to take strategic decisions with respect to future developments in the region.

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