CAPE WINELANDS DISTRICT SPATIAL DEVELOPMENT FRAMEWORK

2019/2024

CAPE WINELANDS DISTRICT
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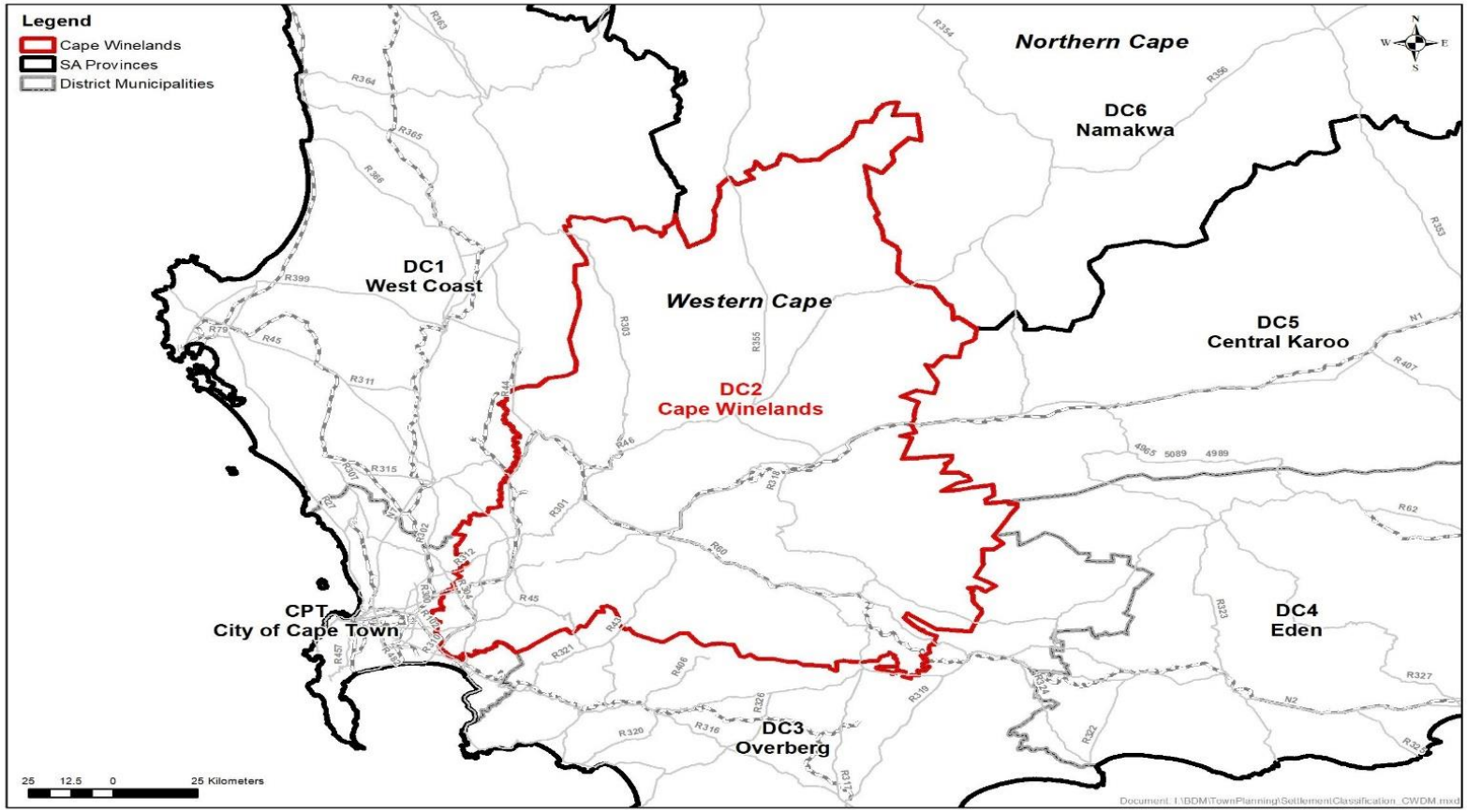
1. INTRODUCTION

1.1 STUDY AREA

The Cape Winelands district is situated next to the Cape Metropolitan area and encloses 22 309.47km². It is a landlocked area between two coastal regions, the West Coast and Overberg districts and inland regions, Namakwa (Northern Cape Province) and Central Karoo districts.



1.2 STRATEGIC CONTEXT

The Cape Winelands Spatial Development Framework identifies eighteen (18) key focus areas for intervention that are spread across four chapters (refer to table 1 below);

Chapters:	Key Focus areas:
A. DEMOGRAPHICS AND BUILT ENVIRONMENT:	1. Population growth & migration 2. Hierarchy of towns 3. Growth potential of towns 4. Municipal services financial model 5. Integrated district public transport network 6. Cultural landscapes: Sense of place 7. Water infrastructure 8. Energy & telecommunications infrastructure 9. Solid waste disposal 10. Disaster management
B. DISRTICT SPACE ECONOMY:	11. Economic growth sectors 12. Municipal space economy linkages 13. Agri parks
C. BIODIVERSITY & ECOSYSTEMS: SERVICES	14. Biodiversity 15. Ecosystem services 16. Invasive alien species 17. Cape Winelands Biosphere Reserve
D. CLIMATE CHANGE:	18. Rain and temperature

The key focus areas were chose based on the functions of the Cape Winelands District Municipality in terms of Section 84 (1) of the Municipal Structures Act (117 of 1998), assigned functions i.e. Disaster Management and relevant issues and concerns that have an impact on the Cape Winelands District and broader Cape Metropolitan Functional Region landscape.

Cognisance is also given to the structural deficiencies that was highlighted by the Greater Cape Metro Regional Spatial Implementation Framework (GCM RSIF) which are;

- Pervasiveness of socio-spatial segregation,
- Sprawling and low-density multi-nodal network of settlements,
- Mismatches between where people live and work,

- Isolated concentrations of poverty severed from economic opportunities, and
- Underinvestment in public transport and freight infrastructure, making the region inaccessible to most residents and inefficient for business to operate in.

These challenges must be addressed, although site specific and at a lower scale than the CWDM SDF's strategic focus, strategies will none the less be proposed to deal with these structural deficiencies that are evident throughout the CWDM.

Strategically, in the context of **human settlements**, the emphasis is on considering the functionality of settlements, their economic growth potential, migration and urbanisation challenges (bulk services, transport modes, solid waste disposal etc.) and the creation of a framework in which rational decisions can be made in terms of capital investment and social support programs.

The **district space economy** chapter highlights the strength of economic growth sectors that are located within the urban space economy, it also acknowledges the importance of the primary sector (agriculture). The industries that performs strongly in the urban space economy has backward linkages to agriculture. Strategically, this chapter emphasise the importance of integrated planning and the coordination of public sector investment within the urban space economy. The agri parks programme from the National Department of Rural Development and Land Reform will be implemented in each district municipality. In the case of the CWDM, the agri hub will be located in Ceres (Witzenberg Municipality). Various other towns were selected as farmer productions support unit points. The farmer production support unit points are aligned to poverty pockets. According to the Draft Rural Development Plan (19/12/2016) various projects were proposed for the farmer production support unit points. The CWDM SDF supports the proposed investment into the farmer production support unit points and agri hub (Ceres, Witzenberg Municipality) from a strategic perspective.

Biodiversity conservation remains a challenge in the CWDM area. Rapid urbanisation, agricultural expansion and the impact of climate change poses a major threat to the Cape Floristic Region as well as ecosystem sources (water, air, biodiversity and soil). The CWDM area consist of Fynbos, Succulent Karoo, Albany Thicket an Afro-temperate Forest biomes. The CWDM SDF spatially reflects the important areas for protection and refers users to the Western Cape Biodiversity Spatial Plan and its accompanying handbook.

The impact of **climate change** has already been felt with the recent and potential ongoing drought as well as rain surges that causes flooding. From a land use planning perspective various site-specific measures needs to be put in place as well as disaster risk related systems that relates more to adaptation to anticipated and un anticipated occurrences. Strategically, adaptation and mitigation measures are prioritised.

In conclusion, the purpose of the Cape Winelands Spatial Development Framework is to lay down a 'set of guidelines' to:

- Interpret and apply higher-order spatial policy within the Cape Winelands district;
- Guide regional and local policy interventions;
- Act as a strategic forward-planning tool to guide planning and decisions on land use and land development;
- Develop a spatial logic that guides public and private-sector investment;
- Ensure the social, economic, built and environmental sustainability of the area, and

- Formulate proposals to redress the spatial legacy of apartheid;

1.3 PRINCEPLES OF THE CWDM SDF

The CWD SDF adopts the principles of the Spatial and Land Use Planning Act (16 of 2013, which are;

Spatial Justice: A socially just society is one that embraces the qualities of equity, solidarity and inclusion. Whilst equal opportunity targets everyone in the community, social justice targets marginalised and disadvantaged groups. Inclusionary settlements focus on the public realm rather than on private enclaves; support civic interaction and equitable access throughout the public environment; and make urban opportunities accessible to all, especially the poor. Inclusionary economies have low barriers to entry, do not discriminate between the formal and informal sectors, and take active measures to empower those previously restricted in their access to the means of production. Past spatial imbalances are redressed by improving access to, and use of, land.

Spatial Sustainability: Land development should be spatially compact, resource- frugal, compatible with cultural land scenic landscapes, avoid alienating productive landscapes, and not compromise the functionality of ecosystems.

Spatial Resilience: Resilience is about the capacity of regions to withstand shocks and disturbances such as climate change or economic crises, and to use such events to catalyse renewal, novelty and innovation. The focus is on creating complex, diverse and resilient spatial systems that are sustainable in all contexts.

Spatial Efficiency: Efficiency relates to the form of regional settlements and use of resources compaction as opposed to sprawl; mixed- use as opposed to mono-functional land uses; residential areas close to work opportunities as opposed to dormitory settlement; and prioritisation of public transport over private car use. When a settlement is compact higher densities provide thresholds to support viable public transport, reduce overall energy use, and lower user costs as travel distances are shorter and cheaper. Spatially efficient economies are more productive as they minimize business transaction costs and maxsimise outputs. Spatially compact city-regions provide for the fluid exchange of ideas, goods and services, which establishes an enabling environment for businesses and households to operate in.

Spatial Governance: Effective governance of city-regions is based on collaboration and coordination, integration and alignment, and transparency. Planning is evidenced based, informs the budgeting process, and spatial targets are incorporated into public investment programmes.

1.4 VISION, MISSION AND OBJECTIVES

The Cape Winelands District Spatial Development Framework as a sector plan of the Cape Winelands District Integrated Development Plan (CWD IDP) adopts the CWD IDP's vision which is "A unified Cape Winelands of Excellence for sustainable development", mission, "All structures of the Cape Winelands co-operate together towards effective, efficient and economically sustainable development".

The objectives of the CWD SDF are;

- To improve the quality of life for the people of the region by ensuring principle led responses
- To plan in advance by considering future population growth, economic and climatic changes
- To manage the impact and exposure of external and internal threats to growth and development
- To restructure urban settlements through compaction and densification
- To promote sustainable resource use and responsible rural development
- To improve and conserve the district's natural environment

1.5 LEGISLATIVE REQUIREMENT FOR THE FRAMEWORK

The Cape Winelands District Municipality compiled a Spatial Development Framework for its area of jurisdiction in terms of Section 26 of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000). The CWDM is mandated to do a Spatial Development Framework as a sector plan of the CWDM Integrated Development Plan in terms of the Local Government: Municipal Systems Act, 2000 (Act No. 32 of 2000).

As per the Spatial and Land Use Planning Act, local government must compile a municipal spatial development framework in terms of Chapter 4, Section 12 (1) of the mentioned Act.

2. DEMOGRAPHICS AND BUILT ENVIRONMENT

2.1 POPULATION GROWTH AND MIGRATION

According to the South African Institute for Race Relations, the Western Cape has shown significant growth in its population. This increase is due to internal migration as people seek job opportunities, facilities and housing. The PSDF (2014) states that the Western Cape's population is growing faster than national averages, largely on account of in-migration (i.e. Stats SA estimate that the province received a net gain of 225 657 people between 2006 and 2011, 35% of whom were from outside the country, 31% from the Eastern Cape, and some 14% from Gauteng). The fertility rate in the Western Cape has declined considerably over the years and is lower than the rest of the country. Of significance is that in-migration accounts for approximately one-third of the population growth rate, which places additional burdens on government's service delivery efforts particularly in the main economic centres. In the Cape Winelands district, the current growth statistics are as follow;

Table 2: Municipal Annual Growth rates between Census 2001 and Census 2011(Source: Stats SA)

Municipality	**Total Population in 2001**	**Total population in 2011**	**Annual Growth rate between 2001 and 2011**
Witzenberg	83 567	115 946	3.27%
Drakenstein	194 417	251 626	2.6%
Stellenbosch	118 709	155 733	2.71%
Breede Valley	146 028	166 825	1.33%
Langeberg	81 271	97 724	1.84%

Table 3: Municipal Annual Growth rate between Census 2011 and Community Survey 2016

Municipality	**Total Population in 2011**	**Total population in 2016**	**Annual Growth rate between 2011 and 2016**
Witzenberg	115 946	130 548	2.37%
Drakenstein	251 626	280 915	2.2%
Stellenbosch	155 733	173 418	2.25%
Breede Valley	166 825	176 578	1.14%
Langeberg	97 724	105 483	1.53%

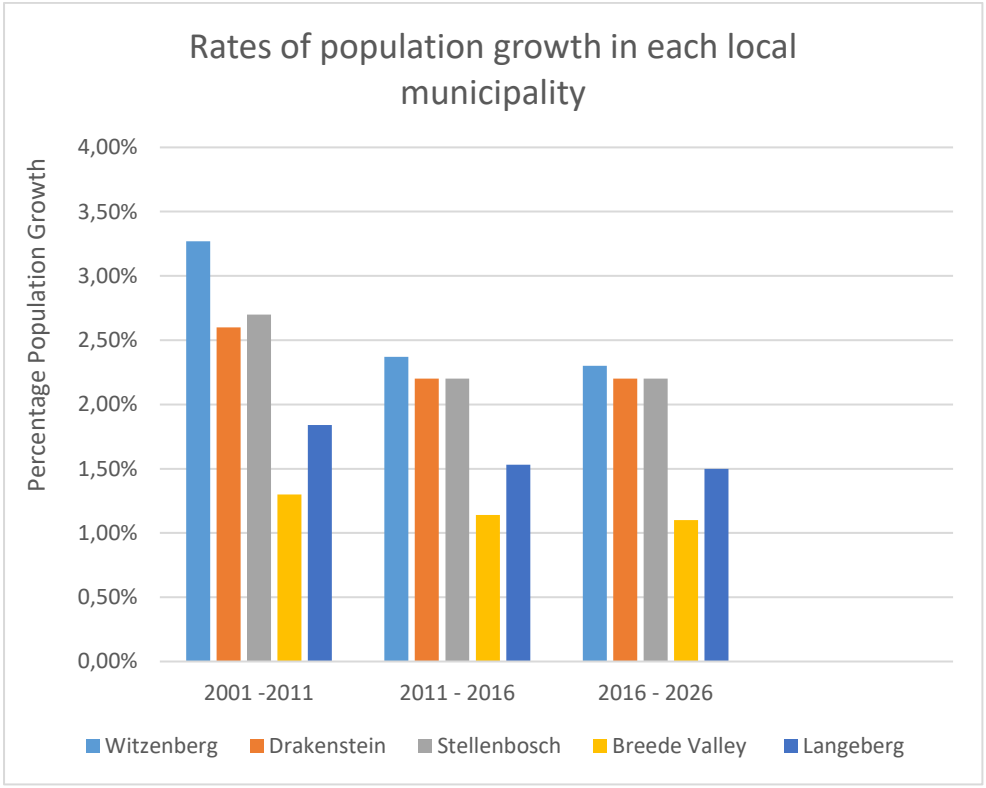
Table 4: Comparing annual population growth rates between two time frames, namely 2001 – 2011 and 2011 - 2016 to check if the growth rates themselves have increased or declined.

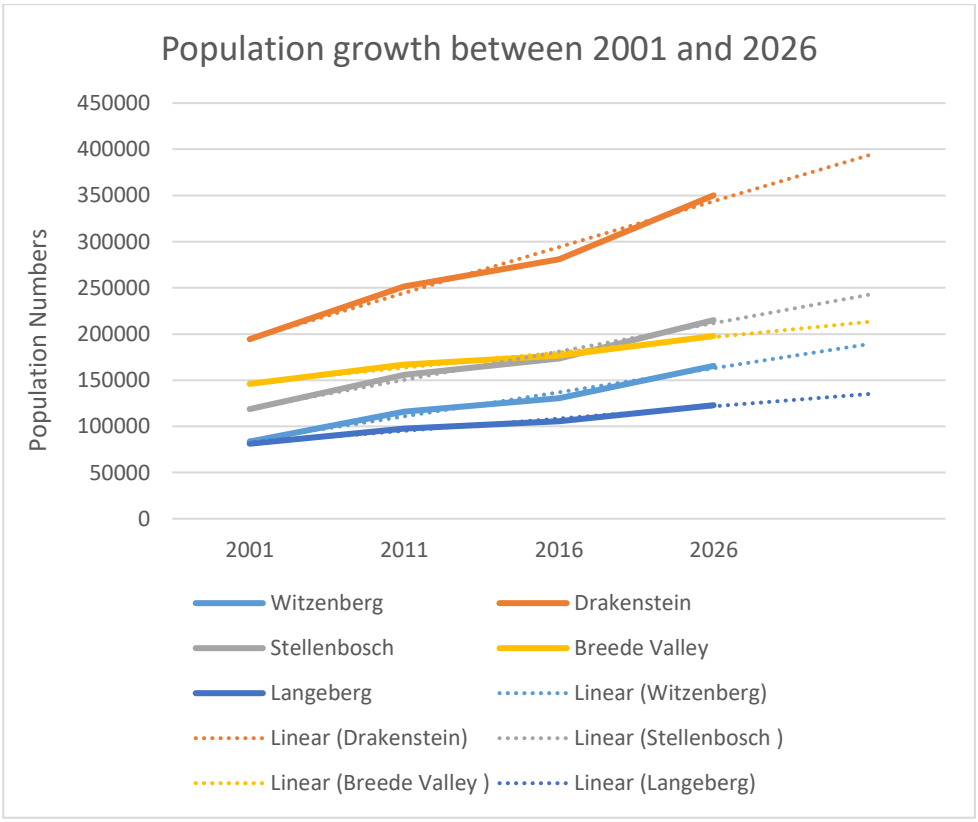
Municipality	Annual Growth rate between 2001 and 2011	Annual Growth rate between 2011 and 2016	Increase (↑) Or Decline (↓) in annual population growth rates comparing two time frames
Witzenberg	3.27%	2.37%	↓
Drakenstein	2.6%	2.2%	↓
Stellenbosch	2.7%	2.25%	↓
Breede Valley	1.3%	1.14%	↓
Langeberg	1.84%	1.53%	↓

Table 5: Population Growth Projections for 2026, based on the annual population growth rates between 2011 and 2016

Municipality	Population figures in 2016 according to the Community Survey	Annual projected population growth rates	Anticipated population growth rates for 2026
Witzenberg	130 548	2.4%	165 500
Drakenstein	280 915	2.2%	350 117
Stellenbosch	173 418	2.2%	215 040
Breede Valley	176 578	1.1%	197 827
Langeberg	105 483	1.5%	122 898

Graph 1: Rates of population growth per period 2001-2011, 2011-2016, 2016-2026

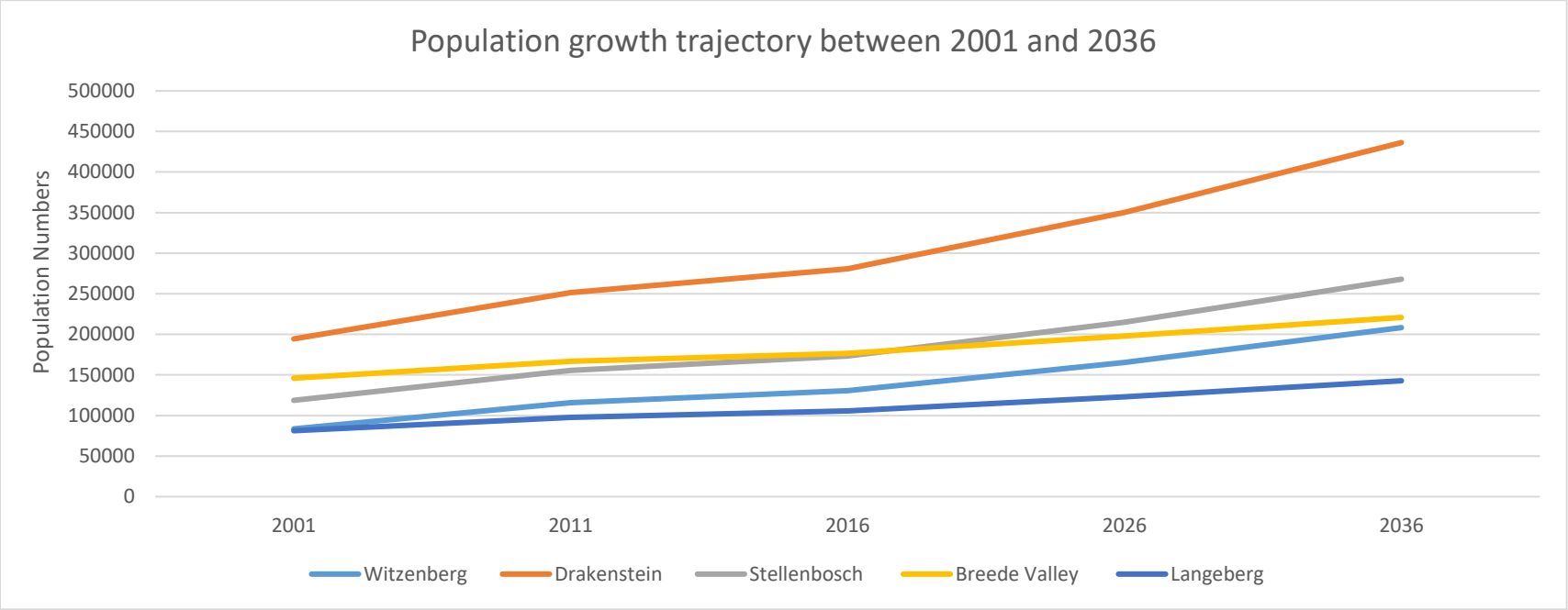




Graph 2: Population growth between 2001 and 2026

From the above it is interesting to note that by 2026 it is anticipated that the total population of Stellenbosch Municipality would have overtaken that of Breede Valley Municipality.

Graph 3: Population growth trajectory between 2001 and 2036



The above graph would seem to indicate that if population growth rates continue at the same levels that they did between 2011 and 2016, then Witzenberg's population will overtake that of Breede Valley soon after 2036. Witzenberg shows a similar growth trajectory to Drakenstein and Stellenbosch, with Breede Valley and Langeberg showing a slightly different growth trajectory.

We have entered a new planning paradigm in South Africa with the advent of SPLUMA. The mentioned Act requires that municipal spatial development frameworks must include a longer-term spatial development vision statement for the municipal area which indicates a desired spatial growth and development pattern for the next 10 to 20 years. Depending on the date of developing/reviewing spatial development frameworks, municipalities must include population growth estimates for the next five-year period. These estimates will be reviewed every five years to ensure that it is relevant. Stats SA does surveys on a five-year cycle (Formal Stats SA publications occur every 10 years with a Community survey in between). Municipal spatial development frameworks must also include estimates on the demand for housing units across different socio-economic categories and the planned location and density of future housing development. Proactive planning is essential to achieving good governance and efficient service delivery.

2.1.1 Potential risks associated with population growth and migration:

It is essential to guard against risks that manifests with population growth with specific emphasis on migration and the difficulties of migrants assimilating into regions that is culturally different. The impact of a growing labour-intensive agricultural sector that is making use of brokers whom source labourers from outside the province and the influx of foreign nationals is a common phenomenon in the CWDM area. Apart from impacts mentioned, the ability of municipalities and government to provide housing and related services remains nearly an impossible challenge.

Social conflict is highlighted in the CWDM Risk Assessment Report (2014) as being an 'extremely high-risk priority'. Early warning signals are identified as follow;

- Sudden demographic changes and population displacement
- Increasing population resulting in rising unemployment rates
- An increase in numbers of demonstrations or rallies especially around local elections
- An increase in new faces in the area, i.e. strange people attempting to organise unrest
- Organised land invasions
- Dissent with regard to new housing developments and allocations in areas
- Increase in foreign immigration
- Increase in spaza (informal) shops owned by foreign nationals in townships

2.1.2 Key findings: Population Growth and Migration

2.1.2.1 Over a 15-year period from 2001 to 2016, population growth statistics reflects substantial growth within the CWDM. Stellenbosch municipality (46%), Drakenstein municipality (45%), Witzenberg municipality (56%) municipality had the highest growth percentages. Breede Valley municipality (21%) and Langeberg municipality (30%) relatively lower than the others. The PSDF (2014) indicates that between 2006 and 2011, the province received a net gain of 225 657 people from which 80% were because of migration. It is essential that long term population growth projections must be done, at least 20-year projections. The CWDM area has 42 756 indigent households according to the CWDM Socio Economic Profile (2017), this figure will most likely increase. The proposed population projections will enable government to determine growth hotspots and plan accordingly for essential services to mitigate potential risks relating to social conflict.

2.1.2.2 Due to the labour-intensive nature of commercial farming, Commercial farmers source labour from Lesotho, Swaziland, Rural Eastern Cape etc. due to local inhabitants listed on databases from the Department of Labour not being interested in the opportunities presented in the agricultural sector. The potential impact of this is workers settling permanently in the relevant areas i.e. Ceres Koue Bokkeveld and Langeberg municipal area. This creates further issues in terms of housing provision and related indigent services.

2.1.2.3 Growth projections between 2016 and 2026 shows a slight decline if annual percentages between 2011-2016 is continued. External factors that have not been taken into calculations are drought and the impact of climate change as well as the national and municipal government elections. The external factors could either lead to further decline in population growth or a slight increase in certain municipalities.

2.1.3 Implementation proposals:

FOCUS AREA:	POPULATION GROWTH AND MIGRATION
STRATEGIES:	1. Population growth projections must be done at least every five years to determine future population growth and hotspots.
	2. The municipality must play a facilitative role and assist Commercial farmers in Witzenberg and Langeberg municipalities with the recruitment of local unemployed people registered on the database of the Department of Labor.
	3. Social conflict risks and early warning signals associated with migration must be included in municipal Integrated development plans and spatial development frameworks. Refer to the CWDM Risk Assessment Report (2014).
	4. Develop a migration policy to accommodate and manage new or relocated entrants. This must be dealt with as a developmental rather than a security concern.
	5. Indigent policies must be updated on a regular basis to keep up with new entrants into a municipal area.
	6. Facilitate the movement of households to larger urban areas as it may be as relevant as ad hoc social support and improvements in the most basic infrastructure services.
	7. Municipalities to register indigent cases.
PRIORITY:	HIGH

2.1.4 CWDM Implementation Plan : Population Growth and Migration

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Revision of Risk Assessment	R243 500, 00	Disaster Management Section	2018/2019

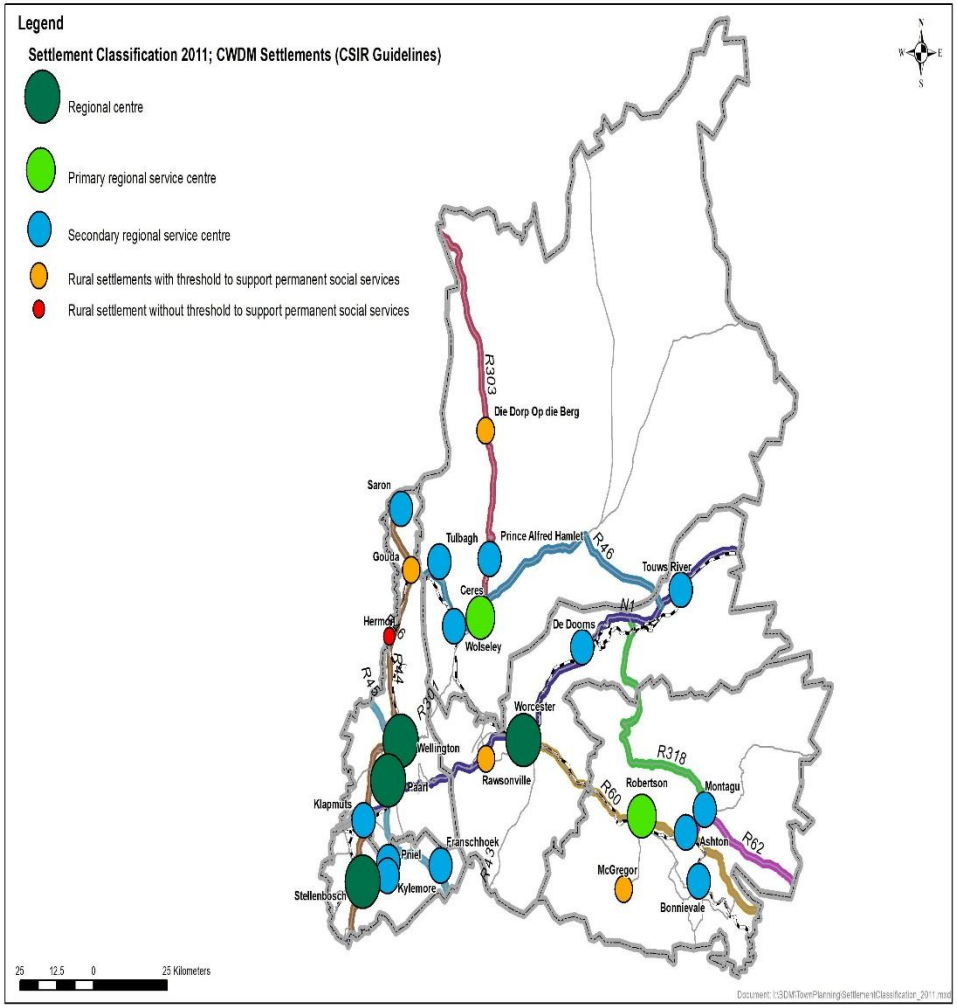
2.2 HIERARCHY OF TOWNS

Settlement classification based on the CSIR guidelines remains an important indicator of the distribution of existing primary social facilities in relation to settlement thresholds.

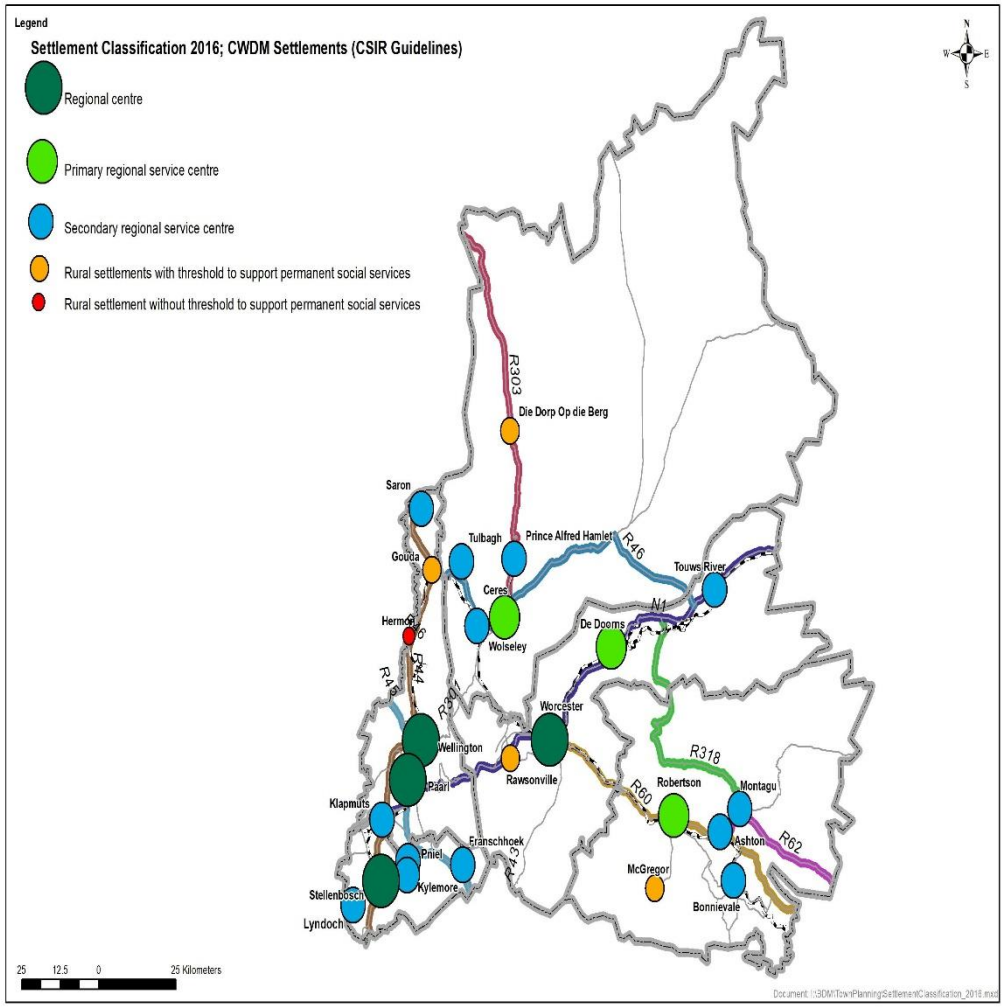
Table 6: PSDF 2014, Settlement Classifications; CWDM Settlements (CSIR Guidelines), Projections based on "Draft Data Estimate percentages, Data source: Statistics South Africa & Western Cape DEA&DP".

Settlements Classifications based on 2011 populations statistics (Stats SA)	Population Thresholds	Population, Community Survey (2016)	Population projection (2026)	Population projection (2036)
REGIONAL CENTRE Paarl, Stellenbosch, Wellington, Worcester,	**>70 000**	**REGIONAL CENTRE** **Paarl:** 126 975 **Stellenbosch:** 89 903 **Wellington:** 63 557+35 089 **Worcester:** 104 527	**REGIONAL CENTRE** **Paarl:** 162 539 **Stellenbosch:** 112 858 **Wellington:** 83 771+45 357 **Worcester:** 121 308	**REGIONAL CENTRE** **Paarl:** 208 063 **Stellenbosch:** 141 673 **Wellington:** 110 414+58 630 **Worcester:** 140 783
PRIMARY REGIONAL SERVICE CENTRE Ceres, Robertson	**>20 000-70 000**	**PRIMARY REGIONAL SERVICE CENTRE** Ceres: 36 043 Robertson: 30 675 De Doorns: 20 586	**PRIMARY REGIONAL SERVICE CENTRE** Ceres: 42 243 Robertson: 37 761 De Doorns: 26 352 Franschhoek: 21 692 Montagu: 23 587	**PRIMARY REGIONAL SERVICE CENTRE** Ceres: 49 510 Robertson: 46 484 De Doorns: 33 373 Franschhoek: 26 966 Montagu: 31 699 Klapmuts: 22 038 Prince Alfred Hamlet: 20 004 Wolseley: 27 328
SECONDARY REGIONAL SERVICE CENTRE Ashton, Bonnievale, **De Doorns,** Montagu,	**>5000-20 000**	**SECONDARY REGIONAL SERVICE CENTRE** Ashton: 14 133 Bonnievale: 10 229 Montagu: 17 551 Klapmuts: 9 495 Kylemore, Pniel, Lyndoch:12 031	**SECONDARY REGIONAL SERVICE CENTRE** Ashton: 15 924 Bonnievale: 12 967 Klapmuts: 14 466 Kylemore, Pniel, Lyndoch: 15 552 Prince Alfred Hamlet: 13 005	**SECONDARY REGIONL SERVICE CENTRE** Ashton: 17 941 Bonnievale: 16 437 Kylemore, Pniel, Lyndoch: 20 102 Saron: 13 837 Touwsriver: 19 964 Tulbagh: 17 906

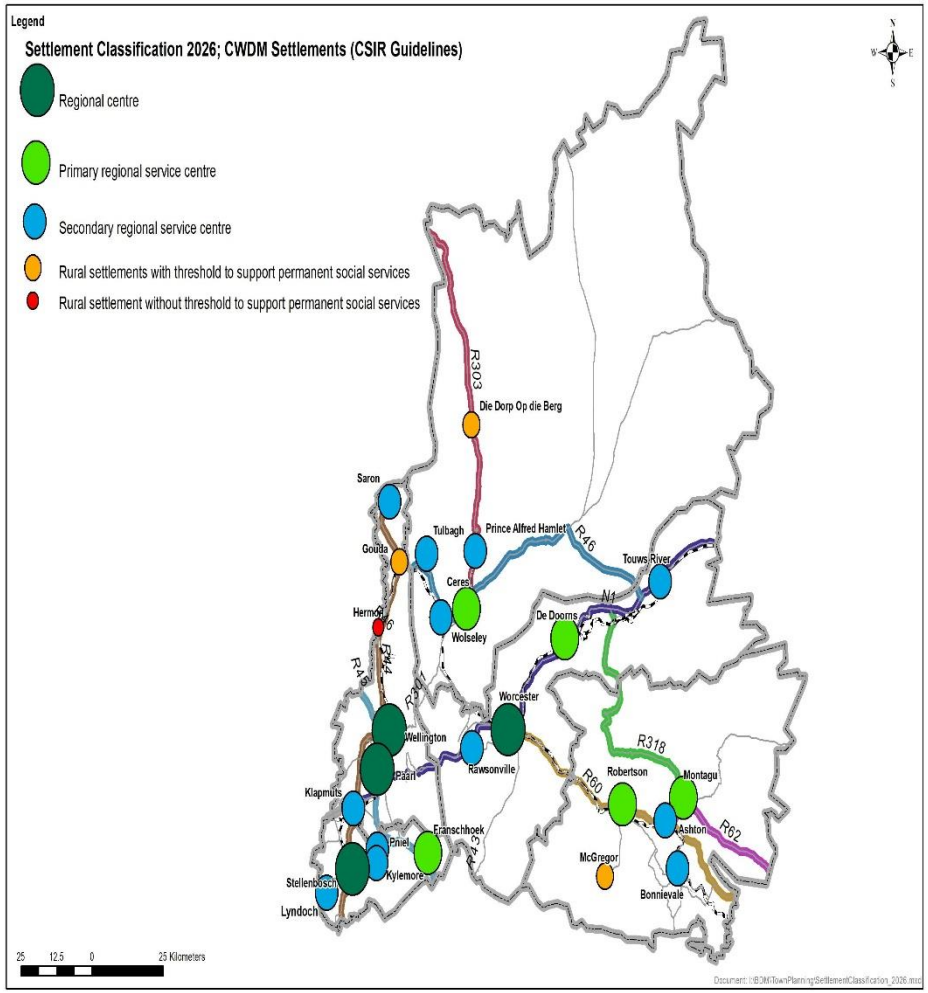
Klapmuts, Kylemore, Pniel Lyndoch Prince Alfred Hamlet, Saron, Touwsriver, Tulbagh, Wolseley, Franschhoek		Prince Alfred Hamlet: 8 455 Saron: 8 781 Touwsriver: 8 768 Tulbagh: 10 307 Wolseley: 14 276 Franschhoek: 17 450	Saron: 11 023 Touwsriver: 13 231 Tulbagh: 13 585 Wolseley: 19 752 Rawsonville: 5047	Gouda: 6232 McGregor: 5398 Rawsonville: 6983
RURAL SETTLEMENTS WITH THRESHOLD TO SUPPORT PERMANENT SOCIAL SERVICES Gouda, McGregor, Op Die Berg, Rawsonville,	**>1000-5000**	**RURAL SETTLEMENTS WITH THRESHOLD TO SUPPORT PERMANENT SOCIAL SERVICES** Gouda: 3878 McGregor: 3493 Op Die Berg: 1843 Rawsonville: 3648	**RURAL SETTLEMENTS WITH THRESHOLD TO SUPPORT PERMANENT SOCIAL SERVICES** Gouda: 4916 McGregor: 4342 Op Die Berg: 2676	**RURAL SETTLEMENTS WITH THRESHOLD TO SUPPORT PERMANENT SOCIAL SERVICES** Op Die Berg: 3886
RURAL SETTLEMENT WITHOUT THRESHOLD TO SUPPORT PERMANENT SOCIAL SERVICES Hermon	**< 1000**	Hermon	Hermon	Hermon



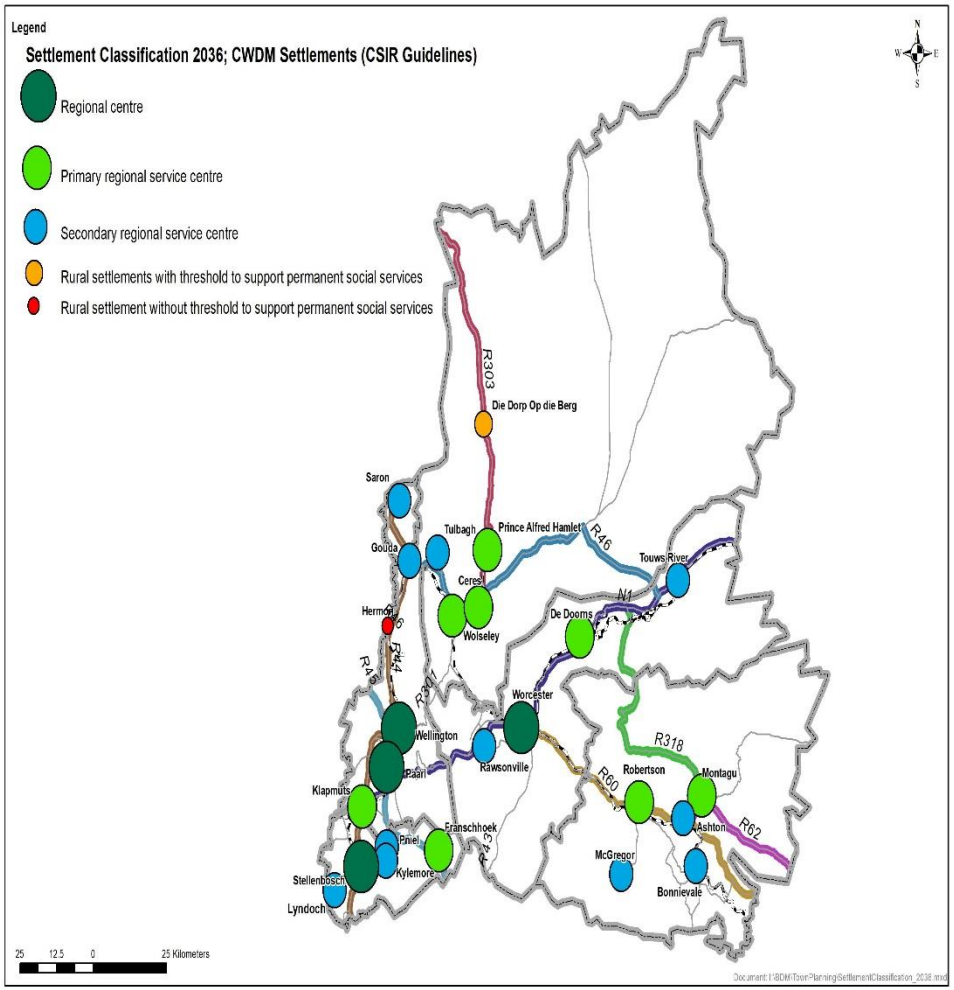
Map 1: CWDM Settlement Classifications 2011 (PSDF 2014)



Map 2: CWDM Settlement Classifications 2016 (based on Community Survey)



Map 3: CWDM Settlement Classification 2026 (based on projections)



Map 4: CWDM Settlement Classification 2036 (based on projections)

2.2.1 Regional Centres

The Draft Greater Cape Metro Regional Spatial Implementation Framework (GCMRSIF) highlights the importance and functionality of regional centres within the greater cape metro region. Stellenboch, Paarl/ Wellington and Worcester are in the CWDM. In the context of the CWDM, four regional centres exist;

Stellenbosch: Southern Winelands service & admin centre, tertiary education & research, agri processing, multi-national HQs, tourism destination, tech industry, very high growth potential;

Paarl-Wellington: Northern Winelands service & admin centre, tertiary education, agri processing & distribution, tourist destination, very high/high growth potential;

Worcester: Northern Boland service centre, admin centre, N/S & E/W regional logistics hub, specialist disability treatment, tertiary education, agri processing & distribution, high growth potential and;

Both Stellenbosch and Drakenstein Municipalities have identified Klapmuts as a prospective sub-regional urban node along the N1. Residential and industrial development opportunities have been identified north and south of the N1, and the area has also been identified as having potential to serve as a regional freight logistics hub. Stellenbosch and Paarl/Wellington falls within the functional region of the metro economy. These nodes function more as an extension of the metropolitan area rather than being significant centres for services and goods to the surrounding countryside. Worcester remains an important, and probably the only, 'major regional service centre' due to easy accessibility from surrounding towns and towns located in the Langeberg & Witzenberg municipal area.

2.2.2 Primary Regional Service Centre

Ceres: Agricultural regional service centre, regional gateway to Tankwa Karoo, Koue and Warmbokkeveld, administrative centre, linkages to N1.

Robertson: The Langeberg municipal area did not form part of the study area of the draft GCMRSIF. Robertson, Ashton, Bonnievale and Montagu fulfil important roles as service centres/agricultural service centres. Robertson has a medium growth potential forecast but can build upon being the largest town with the broadest economic base within the Langeberg municipal area.

2.2.3 Other Municipal Towns

The development of towns (district wide) is rooted in their role as service centres for the surrounding agricultural environment as rural communities need a centrally located core town for religious, health, educational and services/shopping facilities, as well as a market for their products. Apart from the economics that drive the growth and development of these towns, aspects regarding technological innovation, the environment, the particular spatial location, cultural patterns and management systems also play a role. Thus, each municipal area in the district has distinct growth forces and historically evolved relations between the towns, villages and neighbourhoods, which will shape the potential for future growth. It is critical for pro-growth (and pro-poor) municipal strategies that these towns and their development potential are taken into account.

Table 7: Social Facilities (CSIR Guidelines for the Provision of Social Facilities in South African Settlements, 2012)

Categories	Facilities
Health & Emergency Services:	Tertiary, Regional and District Hospital
	Community Health Centre
	Primary Health Clinic
	Fire Station
	Police Station
Social and Cultural (Public Service)	Performing Arts Centre
	Museum
	Library
	Civic Centre/City Hall Major Public Event Venue
	Home Affairs Office
	Thusong Centre
Civic Services	Labour Office
	Magistrate's Court
	Municipal Office
	Prison and Place of Safety
	Solid Waste Disposal Site and Recycling Depot
	Community Hall
	Children's Home
	Home for the Aged
	Hospice and Health Centre
	ICT Access Points
Social Services	Post Office/Agency and Post Boxes
	South African Social Security Agency (SASSA) Office and Social Grant Pay Point
	Cemetery and Crematorium
	Informal Urban Agriculture
	Local Market
	Worship Centre
Education Services	Further Education and Tertiary Institutions
	Special Education
	Secondary School
	Primary School
	Early Childhood Development (ECD): Grade R
	Early Childhood Development (ECD): Crèche
	Early Childhood Development (ECD): Resource Hub and Care Centre
Parks and Recreation Services	Parks
	Sports and Recreation: Overall Allocations for Sports Fields and Facilities

2.2.4 Key findings: Hierarchy of Towns

2.2.4.1. Settlement classification of CWDM towns per the PSDF (2014) based on the CSIR Guidelines is essential to indicate the distribution of existing primary social facilities in relation to settlement thresholds. This in tandem with population growth projections will assist government/municipalities in determining which towns are in a transition to a new classification (higher/lower order) which will in turn determine the types of social facilities that is needed.

2.2.5 Implementation proposals:

FOCUS AREA:	HIERARCHY OF TOWNS
STRATEGIES:	1. Population growth projections must be done at least every five years at settlement level to determine future population growth and hotspots.
	2. Settlements that are in transition to a higher/lower order classification as per the CSIR Settlement Classifications must be determined and included in municipal spatial development frameworks and integrated development plans well in advance to ensure that sufficient planning is done.
	3. Ensure higher levels of sustainable growth through, *inter alia*, focusing investment and development on a number of significant urban areas (according to a hierarchal order), whilst maintaining rural integrity and ensuring biodiversity conservation; to use growth as a catalyst to address poverty alleviation, spatial restructuring and the safeguarding of sustainability
	4. Consider and incorporate the growth and development of Cape Town as critical informant for district planning and implementation
PRIORITY:	HIGH

2.3 GROWTH POTENTIAL OF TOWNS

The Growth Potential Study (2013) determined the following growth potential for municipalities and towns in the Cape Winelands district based on assessing five thematic indices, namely: human capital, infrastructure availability, economy, physical attributes, and institutional capacity (refer to table 4 below);

The CW SDF does not propose an investment typology. Municipalities must assess settlements individually and consider strengths and weaknesses in terms of the thematic indices.

The GPS provides a comprehensive profile for each settlement based on 85 individual indicators. The information generated from these assessments can inform strategies and projects aimed at addressing the weaknesses of individual settlements and optimising the strengths to unlock opportunities for growth and development. These assessments are crucial and must be prioritised. Detail planning and broad consultations that include all stakeholders (private sector, government etc.) must have parity on the way forward.

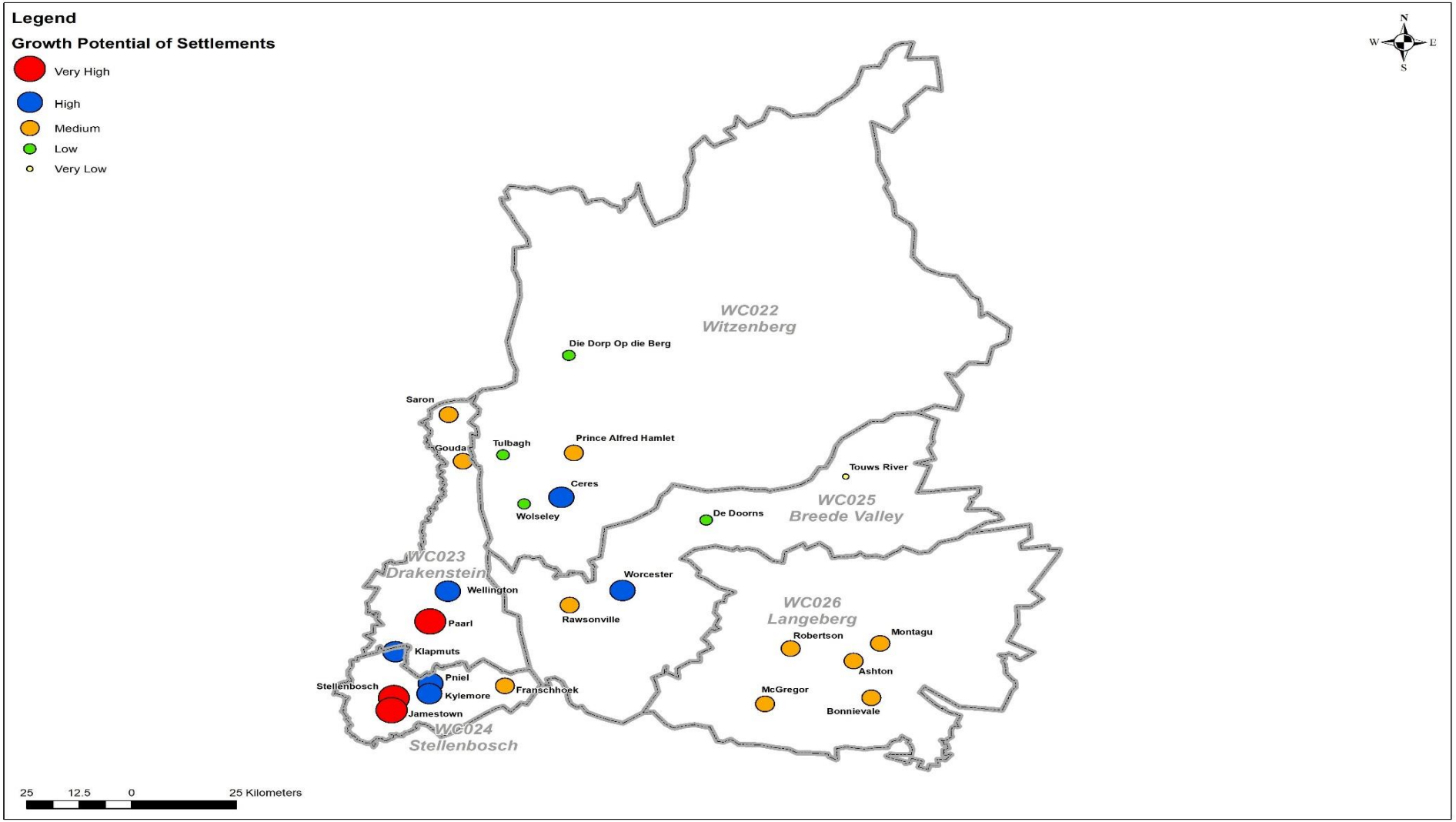
The PSDF (2014) identifies Stellenbosch, Klapmuts, Paarl, Ceres and Worcester as settlements that have very high growth potential and very high social needs. This is a deviation from the GPS (2013). The deviation is specifically aimed at Ceres and Klapmuts. Reasons given are based on the relationship between areas of urban growth pressure and important natural and agricultural resources.

Ceres as a primary regional service centre's growth outlook is strengthened by the proposed R45 000 000, 00 Agri-Park development that will be developed within the next five (5) years and as having a strong agricultural sector. Klapmuts, on the other hand, is near Stellenbosch, Paarl and the City of Cape Town. Klapmuts together with Paarl and Stellenbosch is located within the functional region of the Metro Economy.

Wellington is viewed by the draft GCMRSIF as a regional node in tandem with Paarl and has a very high/ high growth potential. This regional node fulfils a service, tertiary education, agri processing & distribution, tourist destination and administrative center function for the northern winelands region.

Table 8: Growth Potential and Socio-Economic Needs of CWDM Towns (GPS 2013)

B Municipalities:	Growth Potential: Settlement level	Growth Potential: Municipal level	Socio-economic needs
WITZENBERG		Low	
Ceres	*Medium (GPS 2013)* **Very High (PSDF2014)**		**High** **Very High (PSDF2014)**
Prince Alfred Hamlet	Medium		Medium
Op die Berg	Low		Medium
Tulbagh	Low		Medium
Wolseley	Low		Medium
LANGEBERG		Medium	
Montagu	Medium		Medium
Ashton	Medium		Medium
Robertson	Medium		**High**
MgGregor	Medium		Very low
Bonnievale	Medium		Medium
BREEDE VALLEY		Medium	
Worcester	**High**		**Very high**
Rawsonville	Medium		Low
De Doorns	Low		Low
Touwsrivier	Very low		Low
DRAKENSTEIN		Very high	
Paarl	**Very high**		**Very high**
Wellington	*Medium* **Medium -High (PSDF 2014)**		**Very high**
Gouda	Medium		Very low
Saron	Medium		Low
STELLENBOSCH		Very high	
Stellenbosch-Jamestown	**Very-high**		**Very high**
Pniel-Kylemore	**High**		Low
Franschhoek	Medium		Medium
Klapmuts	*Medium (GPS 2013)* **Very High (PSDF 2014)**		Low **Very High (PSDF 2014)**



Map 5: CWDM Growth Potential of Towns. The designations are informed by the GPS (2013), PSDF (2014) and draft GCMRSIF

2.3.1 Key findings: Growth Potential of Towns

- Ceres as a primary regional service centre's growth outlook is strengthened by the proposed R45 000 000, 00 Agri-Park development that will be developed within the next five (5) years and as having a strong agricultural sector. According to Witzenberg Municipality, the agricultural sector economy located within the Warm & Koue Bokkeveld are going to grow with 20-30% within the next five years. Farmers have planted new orchards etc. that will produce fruit within the mentioned period. The challenge for the municipality is the provision of adequate services and possible industrial land for cold storage facilities. The town of Ceres is further constrained by a lack of land for urban expansion. The expansion of the agricultural industry and in-migration must be monitored as can be seen from the high population growth percentages.
- The Growth Potential Study (2013) determined growth potential for municipalities and towns in the Cape Winelands district based on assessing five thematic indices, namely: human capital, infrastructure availability, economy, physical attributes, and institutional capacity. Municipalities must assess settlements individually and consider strengths and weaknesses in terms of the thematic indices. The latter will potentially highlight opportunities for investment.
- Stellenbosch, Paarl and Wellington are located within the functional metro economy of Cape Town. These towns function more as an extension of the metropolitan area, people live in the metro and work and make use of services in these towns and vice versa. The economic growth outlook will therefor always remain positive although the long-term impact of a "drying" Cape Winelands region is not known at this stage.

2.3.2 Implementation proposals:

FOCUS AREA:	GROWTH POTENTIAL OF TOWNS
STRATEGIES:	1. The thematic indices that was used to score municipalities and settlements in terms of potential for economic growth must be analysed. The high scoring thematic indices will present opportunities for investment and vice versa, the low scoring thematic indices will present strategic opportunities for investment that could improve the growth potential of a municipal area or settlement.
	2. Identify and consider the growth forces and historically evolved relations between the towns, villages and neighbourhoods as informants of future growth potential and options
	3. Integrate disadvantaged communities into the urban fabric through infill development on strategically located vacant land and corridor development along the main linkages between these communities and the major concentrations of job opportunities (where possible)
PRIORITY:	HIGH

2.4. INTEGRATED HUMAN SETTLEMENTS

Efficient settlements are underpinned by 'good' and effective governance/ municipal decision making, utilizing structural elements and existing resources efficiently to deal with legacy challenges (apartheid spatial layout of towns) and the availability of infrastructure. SPLUMA (16 of 2013) is founded on the development principle of efficiency whereby, "land development optimises the use of existing resources and infrastructure; decision-making procedures are designed to minimise negative financial, social economic or environmental impacts; and development application procedures are efficient and streamlined and timeframes are adhered to by all parties". The CW SDF embraces this as a key principle to enable efficient settlement.

The CWSDF will also build upon the three (3) frameworks that are mentioned below;

The Draft Greater Cape Metro Regional Spatial Implementation Framework (2016);

The GCMRSIF identified the following structural deficiencies which is applicable to most of the settlements in the CWDM, these structural deficiencies include;

- Pervasiveness of socio-spatial segregation,
- Sprawling and low-density multi-nodal network of settlements,
- Mismatches between where people live and work,
- Isolated concentrations of poverty severed from economic opportunities, and
- Underinvestment in public transport and freight infrastructure, making the region inaccessible to most residents and inefficient for business to operate in.

The Integrated Urban Development Framework (2016);

The Integrated Urban Development Framework (IUDF) provides Government's policy framework for transforming and restructuring South Africa's urban spaces. It is guided by the vision of creating 'liveable, safe resource-efficient cities and towns that are socially integrated, economically inclusive and globally competitive, where residents actively participate in urban life'.

In order to address the overall outcome of spatial transformation of the IUDF, the IUDF proposes an urban growth and management model premised on **compact, connected and coordinated cities and towns**. Yet it recognizes that the country has different types of cities and towns which have different roles and responsibilities. As such, the vision has to be interpreted and pursued in differentiated and locally relevant ways.

Strategic Goals:

1. **Spatial integration:** To forge new spatial forms in settlement, transport, social and economic areas
2. **Inclusion and access:** To ensure people have access to social and economic services, opportunities and choices

3. **Growth:** to harness urban dynamism for inclusive, sustainable economic growth and development

4. **Governance:** to enhance the capacity of the state and its citizens to work together to achieve spatial and social integration

The Strategic Goals inform the priority objectives of the nine policy levels, which are premised on the understanding that (1) integrated urban planning informs the basis of achieving integrated urban development, which follows a specific sequence of urban policy actions: (2) integrated transport that informs (3) targeted investments into integrated human settlements, underpinned by (4) integrated infrastructure network systems and (5) efficient land governance, which all together can trigger (6) economic diversification and inclusion, and (7) empowered communities; all of the above will demand effective (8) governance and (9) financial reform to enable and sustain these policy actions. The levers thus seek to address in combination the structural drivers that maintain the status quo.

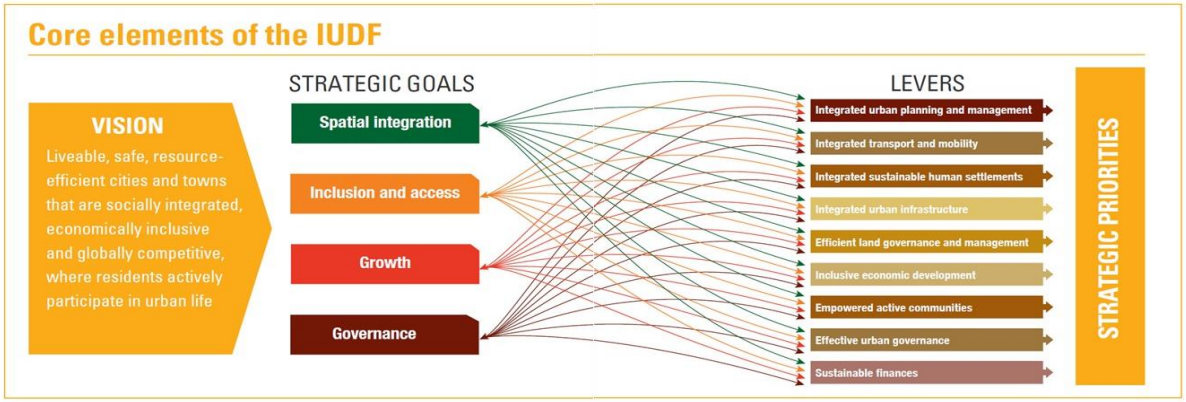
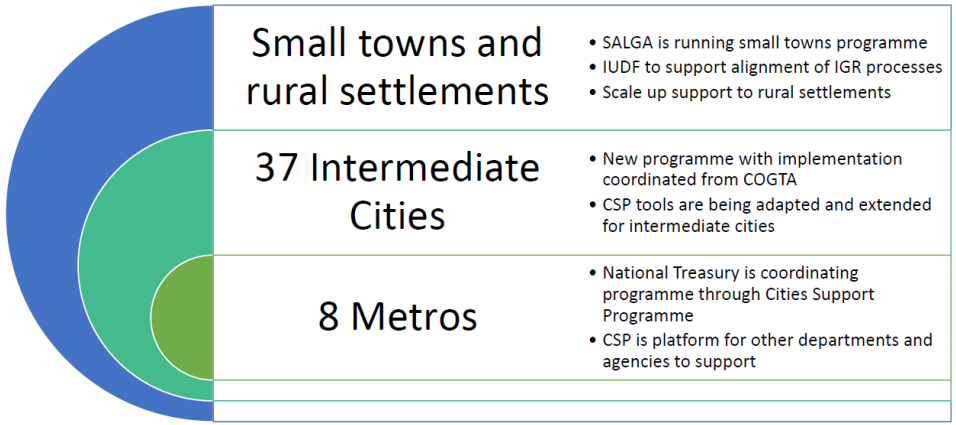


Figure 1: IUDF core elements.

In a letter addressed to the Director-General, Western Cape Provincial Government, 25 October 2016, from the National Department of Cooperative Governance (DCOG) notes that Cabinet resolved to implement the IUDF in a phased manner. During the Western Cape IUDF Forum meeting on 17 October 2017 it was noted that a differentiated implementation approach is required. The 8 Metros are already receiving support through National Treasury led City Support Programme (CSP) and SALGA is running with the Small Towns Regeneration Programme. The next phase will focus on providing support to 39, and not 37 as indicated in the figure 2 below, "Intermediate Cities" as they are expected to play a major role in the Country's approach to dealing with urbanisation.



Source: Extract from Presentation: Implementing the IUDF
Presented to: Western Cape IUDF Forum on 17 October 2017

Three Western Cape municipalities, namely Stellenbosch, George and Drakenstein, have been selected for the Intermediate Cities Municipalities programme. It needs to be noted that the selection of these intermediate cities will only be finalised once the selected municipalities have submitted their applications for the Integrated Urban Development Grant (IUDG) to DCOG and meet the minimum conditions of approval (i.e. top management stability, audit finding, capital expenditure of at least 70% of budget on average over the past two years, etc.). The benefits of the IUDG are:

- It offers municipalities flexibility to prioritise their local needs.
- Municipalities will no longer be required to submit business plans for projects on an annual basis but select projects from their 3-year Capital Programme derived from the 10-year Capital Expenditure Framework.
- It introduces a performance-based incentive component which the municipality can use at their discretion.

Irrespective of the outcome, the Cape Winelands District needs to be aware that the approval of the IUDG for the selected municipalities may have a considerable impact on the fiscal management and reporting structures of these municipalities.

The Provincial Spatial Development Framework (2014);

The PSDF (2014) proposes the following 'Settlement Policy Objectives' that must be implemented at municipal level. The 'Provincial Settlement Policy' objectives are to;

- Protect and enhance sense of place and settlement patterns
- Improve accessibility at all scales
- Promote an appropriate land use mix and density in settlements
- Ensure effective and equitable social services and facilities and
- Support inclusive sustainable housing.

2.4.1 THE MUNICIPAL FINANCIAL SERVICES MODEL (MSFM) [Read with Annexure 1]

The intention of the MSFM according to the PSDF (2014) is to investigate the impact of current spatial growth patterns of settlements on sustainability which include quantifiable financial impacts. Provincial spatial policy promotes the principles of urban compaction, integration and densification. Settlements however continue to sprawl peripherally as a result of decisions based on short term gains, be it political, economic or pragmatic.

The Municipal Financial Sustainability of Current Spatial Growth Patters was conducted as an informant into the 2014 PSDF. The objective of the Study was to investigate the impact of current spatial growth patterns on municipal sustainability in concrete and quantifiable terms. Provincial spatial policy has continuously promoted the principles of urban compaction, integration and densification yet our cities and towns continue to sprawl peripherally. Although the reasons for this continuous sprawl are complex, it is often a result of development decisions based on short-term gains. The study counteracts this short-term view with a longer-term perspective on what peripheral development does to the long-term financial sustainability of municipalities, as well as other non-financial impacts. It provides sound economic and financial evidence to support the spatial principles of compaction and densification and provides weight to spatial plans in the decision-making process.

The Study included applying the Municipal Services Financial Model[1] in seven case study municipalities. The model determined the municipal financial sustainability of two alternative spatial growth patterns namely: business-as-usual (BAU) and a compact scenario. The seven case study municipalities "were selected based on geographic spread and the degree to which they can be considered typical of their municipality category" and are included in the table below.

Table 9: Selected Western Cape Municipalities for the Municipal Financial Sustainability Model study.

[1] The Municipal Services Financial Model (MSFM) projects the infrastructure requirements and associated revenue and expenditure over a 10-year timeframe, using a calibrated baseline situation. The baseline position was developed from municipal documents and interviews with officials, while the future projections were based on municipal targets and a number of other growth assumptions. The critical assumptions regarded the form and density of residential development, and changes to capital and operating unit costs under the two spatial growth scenarios.

Selected WC Municipality	Category
City of Cape Town	A
Stellenbosch; George	B1
Saldanha Bay; Overstrand	B2
Theewaterskloof; Beaufort West	B3

A general finding of the Study was that the capital available to fund new infrastructure for growth as well as the rehabilitation of existing infrastructure fall far short of the calculated capital requirements. The current spatial growth patterns (BAU) increase this capital funding gap substantially.

Another key finding was that the case study municipalities are all vulnerable on their operating accounts, and that interventions will have to be undertaken to sustain the financial viability of municipalities, even without further spatial growth. The cumulative net position was shown as negative for all the case study municipalities however this can be improved with compaction and densification.

The implications of continuing urban sprawl in the province is that both capital and operating costs for municipalities will increase. Without an adequate increase in revenues to cover these costs, municipal financial viability will deteriorate at an ever-increasing rate over time. Through the provision of quantitative evidence, the Study concluded that the current spatial patterns are not sustainable for municipalities and are detrimental to the environment and the urban poor.

Table 10: Aggregate financial modelling results for the Western Cape.

Measure	**BAU**	**Compact**	**Difference**	**% Improvement**
Total capital investment required over 10 years (R million)				
City of Cape Town	106,877	88,095	18,782	18%
B1s	8,598	7,281	1,317	15%
B2s	14,824	12,688	2,136	14%
B3s	13,951	11,837	2,115	15%
Total for Western Cape	**144,250**	**119,900**	**24,350**	**17%**
Sum of net operating position over 10 years				

City of Cape Town	-15,556	-12,836	-2,720	17%
B1s	-2,628	-2,017	-611	23%
B2s	-2,372	-1,792	-580	24%
B3s	-3,394	-2,569	-825	24%
Total for Western Cape	**-23,950**	**-19,214**	**-4,737**	**20%**

The results of the Study are presented in Table 12 above. The Study notes that an analysis of the results should focus on the overall provincial picture and not necessarily on the category results.

"The total capital cost premium attributable to the current spatial growth patterns (BAU) over the next 10 years is projected to be R24 billion, or 17%, when compared with an alternative, compact spatial form. The dominance of the City of Cape Town, and hence the significance of spatial form in this municipality, is clear from the results, with 77% of the savings coming from this municipality alone. The percentage savings in capital costs decreases with decreasing municipal size.

On the operating account, the cumulative net position is shown to be negative for all municipal categories, but this can be improved with densification. The improvement in the province as a whole is estimated to be 20%, with the largest possible improvement being seen in the smaller B2 and B3 municipalities, whose operating accounts are highly sensitive to expenditure increases."

Taking the lead from the PSDF, the Cape Winelands District Municipality investigated the possibility of running the Municipal Financial Impact Analysis in the B-Municipalities that make up the Cape Winelands District; namely:

- Stellenbosch Municipality;
- Drakenstein Municipality;
- Breede Valley Municipality;
- Witzenberg Municipality; and
- Langeberg Municipality.

The main purpose of running the Municipal Financial Impact Analysis in the B-Municipalities is to generate baseline information against which decisions on development plans can be assessed. Find the Municipal Financial Impact Analysis attached as Annexure 1.

Stellenbosch Municipality formed part of the original Study thus this municipality has already been baselined. As 4 years have passed since this baseline information was generated, we will be able to determine if the MFSM tool will be able to indicate whether or not the municipality is starting to move towards a more financially sustainable position based on development decisions taken during the last four years.

2.4.1.1 Stellenbosch Case Study (Source: Extract from the Municipal Financial Sustainability of Current Spatial Growth Patterns, 2013):

The Stellenbosch case study shows that compaction has the greatest capital benefit for public services, followed by electricity, while the benefits for the other sectors are more marginal (Figure 12,). Again, the impact of opting for a greater proportion of medium density low cost housing solutions manifests as a negative cost difference. The total capital saving for Stellenbosch due to compaction is estimated at R480 Million, or 12% less than the BAU scenario.

The cumulative net operating account for the compact scenarios is 21% better than that of the BAU scenario for Stellenbosch. The breakdown of operating position by services (Figure 13) shows the familiar pattern of maximum difference in sanitation, then solid waste, then water supply. The electricity difference is only slightly negative for Stellenbosch.

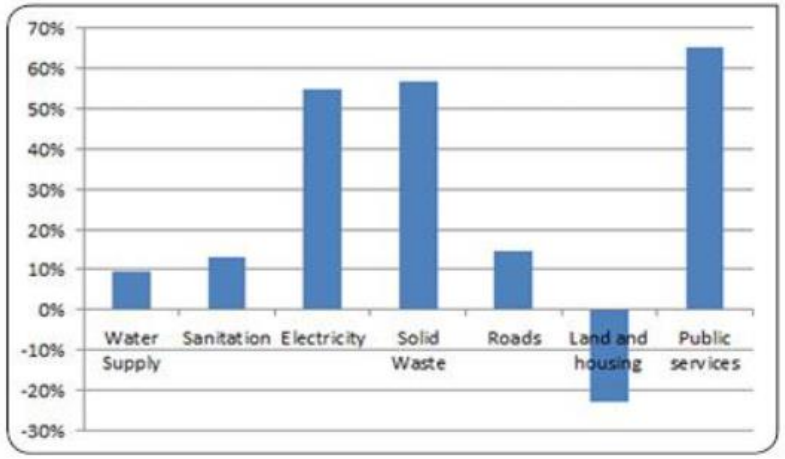


Figure 12: Savings on capital expenditure due to compaction by sector for Stellenbosch

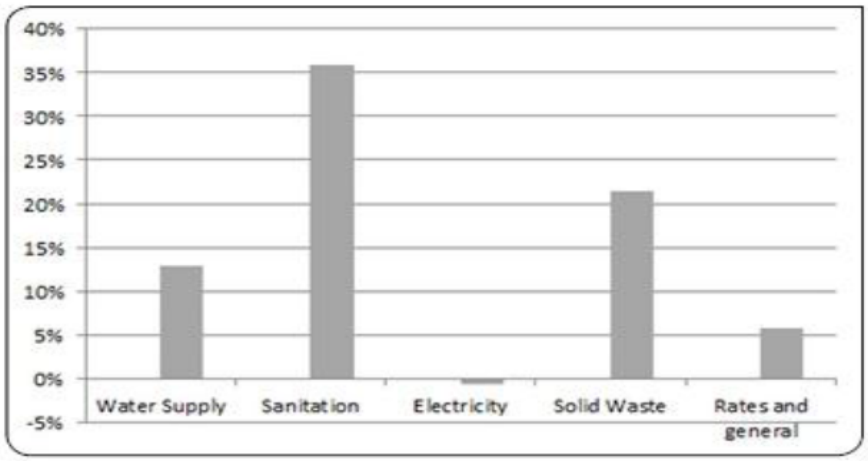


Figure 13: Cumulative improvement in operating account position by sector due to compaction for Stellenbosch

2.4.1.3 Implementation proposals for Annexure 1; Municipal Impact Analysis Cape Winelands, The Financial Impact of Spatial Growth Patterns.

FOCUS AREA:	MUNICIPAL FINANCIAL SERVICES MODEL
	1. Ensure compaction, managing growth and clustering urban functions within the urban footprint; contain existing lower order settlements (including hamlets) within the current urban footprint except if extended or popular ventures can provide sustainable growth opportunities (e.g. Klapmuts); ensure that all new developments include a 'range of elements' that contribute to a more sustainable urban environment.
	2. Focus on improving functioning of settlements and achieving design standards; create and apply urban design guidelines for historic precincts within urban areas.
	3. Create sustainable and liveable urban environments by ensuring access and choice to urban markets, services, amenities and provisions.
	4. Create integration of urban areas through physical (if possible) and socio-economic integration.
	5. Create a functional and sustainable urban open space network.
	6. Integrate the disadvantaged communities into the urban fabric through infill development on strategically located vacant land and corridor development along the main linkages between these communities and the major concentrations of job opportunities (where possible).
	7. Consider the significance of infrastructure investment programmes on urban form and structure (developers of all types of property prefer locations where bulk services are available).
	8. Locate high density residential accommodation and business opportunities, from informal street trading to formal shops, offices and factories at the appropriate scale, around clusters of community facilities grouped at the appropriate scale
	9. Buildings that accommodate community activities, as well as education, health and entrepreneurial development and business and skills training, should be located at points of highest access in urban settlements.
	10. 50% of the five major urban activities (public transport access points, residence, recreation, shopping and employment) should be accessible within walking distance (1000m) of residential dwellings
	11. Compile neighbourhood plans for the higher-order towns in the district (to also consider the structure, function and purpose of neighbourhoods); complete community-based planning as a prerequisite for sustainable development.
	12. Promote the establishment of integrated development zones.
PRIORITY:	HIGH.

2.4.2 INTEGRATED DISTRICT PUBLIC TRANSPORT NETWORK:

The **bulk of the population** of the CWDM lives in and around the more urban local municipalities of Drakenstein and Stellenbosch. There are also a large number of people living on farms and in the rural hinterlands of the CWDM. The largest concentration of people is found in the main urban hubs of Stellenbosch, Paarl/Wellington, Worcester, Ceres, Robertson and Ashton. Most of the CWDM has very low-density levels of persons per km². Distances between towns are also quite far which further increases the reliance on motorised modes.

The **public transport services** in the CWDM allow people to access destinations in their local area or other settlements to which they regularly travel, but which cannot be reached on foot or by other means of Non-Motorised Transport (NMT) modes. These destinations include essential services or activities accessed on a frequent basis, such as places of employment, shops, government services and schools. Public transport holds approximately 14% of the transport modal share, NMT 48% while 26% of people use private vehicles to reach their destinations in the CWDM.

Table 11: Public Transport Services by Mode

Mode	Type of Service
Train	Commuter service.
Bus	Mainly for the transportation of learners in terms of scholar bus contracts administered by the Department of Education.
Minibus-taxis	Commuter, scholar services and off-peak weekday services to shopping and hospitals/clinics.
Other Transport provided by farmers	Transport of farm workers over weekend to shops.
Department of Health fleet of vehicles	Serves various hospitals and clinics but mainly for own staff and transporting of medicine and medical equipment.

Currently the **Minibus-Taxi (MBT)** is the dominant public transport mode providing both commuter and long-distance services. MBT services operate predominantly out of the urban centres located within each municipality. Generally, it is these urban centres which are responsible for the majority of MBT passenger movements throughout the week. The Breede Valley and Drakenstein municipalities account for over 75% of total passenger demand in the CWDM.

Rail services within the CWDM are available in 4 local municipalities, namely Drakenstein, Witzenberg, Breede Valley and Stellenbosch municipality, and stop at 24 stations serving the CWDM. The CWDM have a train freight rail system which accommodates passenger transport. Commercial long-distance bus services that operate through the CWDM are those of InterCape, Greyhound, SA Road Link, and TransLux.

Public transport infrastructure in the CWDM consists of 42 formal and 21 informal MBT and bus facilities and 3 formal air strips. Roughly half of the formal MBT rank facilities are off-street facilities, designed for MBT operations, with demarcated lanes and bays according to destinations. There are shelters and mostly some amenity facilities for passengers, but there is a need for both the construction of additional facilities as well as for the upgrade of the inadequate facilities in the CWDM.

The **N1 rail and road corridor** and the **Breede River Valley corridor** are two major strategic corridors in the CWDM and they are major distributors of people, goods and services from the CWDM to other municipalities within the Western Cape, to other provinces. These major corridors are supported by other major roads **(R44, R45, R46, R318, R303, R60, and R6**2) which distribute goods and services to the people within the DM (refer to Map 6 below, Major Transport routes).

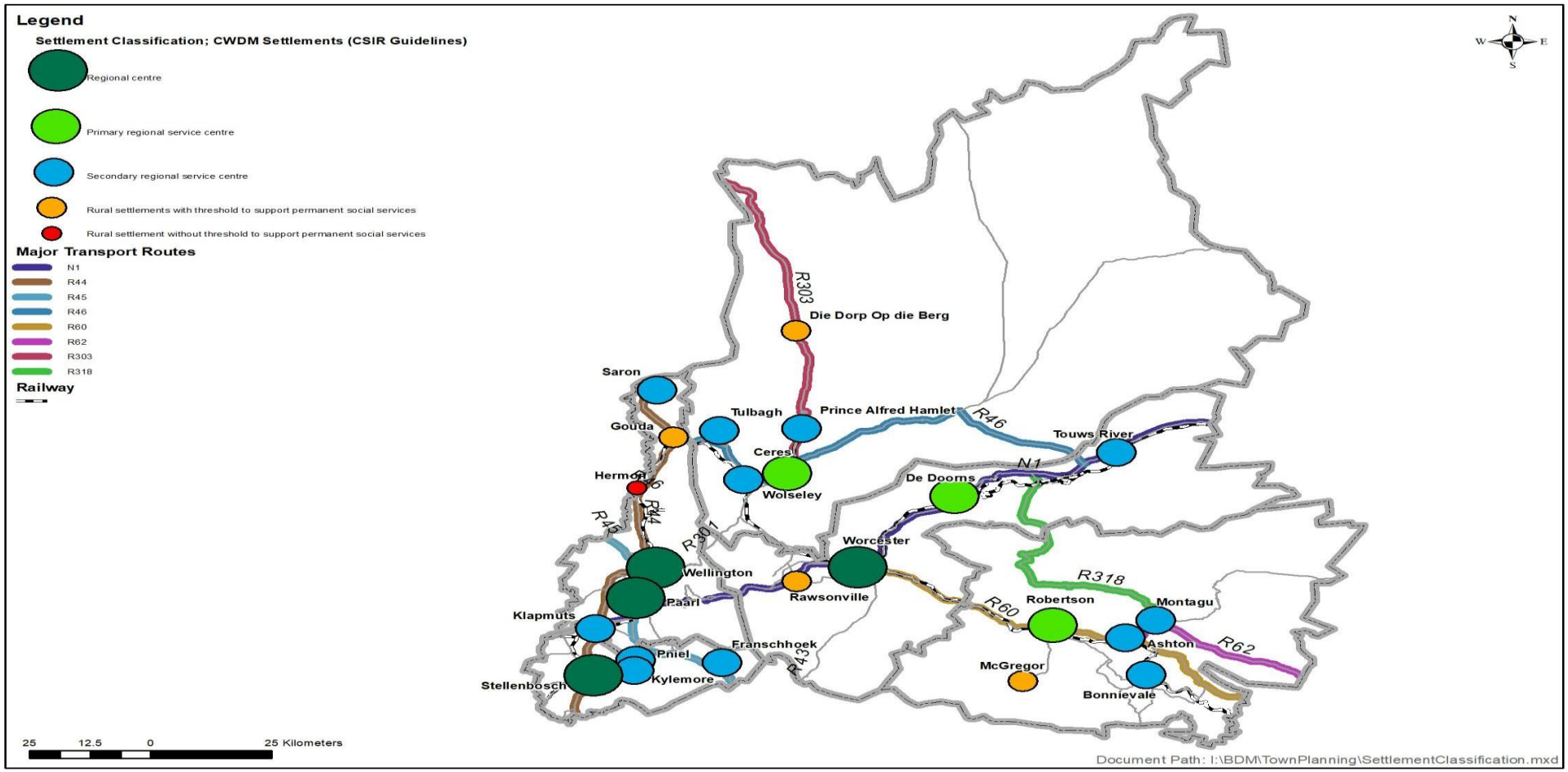


Table 12: Key Spatial Challenges per Local Municipality.

Local Municipality	Key Spatial Challenges
Drakenstein	• Lack of available land for transport and related infrastructure (Huguenot Station Precinct). • No park-and-ride facility at Huguenot Station. • Poorly defined transport and public spaces in Paarl Central Business District (CBD). • Key nodes (Wellington and Paarl) do not support NMT. • Poor transport-land use integration in Paarl CBD.
Stellenbosch	• Lack of integrated settlements within Municipality. • Dispersed rural settlements. • Derelict and unutilized rail infrastructure (Franschhoek rail connection). • Inter-city bus facilities are poorly located.
Breede Valley	• Poor transport-land use integration in Worcester CBD. • Worcester CBD does not support NMT. • Dispersed and non-integrated public transport facilities or ranks within • Worcester CBD (i.e. rail, long-distance bus, taxi). • Public transport services and facilities are non-existent or limited in rural areas.
Witzenberg	• Lack of integrated settlements, particularly at Ceres. • Dispersed public transport facilities within Ceres CBD. • Poorly located public transport facilities at Ceres and the underutilization thereof.
Langeberg	• Dispersed public transport facilities or ranks at Robertson CBD no integration. • Dispersed rural settlements with vast distances between them. • Poor NMT infrastructure. • Public transport facilities are limited within the rural settlements (McGregor, Montagu).

2.4.2.1Key findings: Integrated District Public Transport Network

2.4.2.1.1 Refer to table 12 (Key spatial challenges per local municipality)

2.4.2.1.2 The CWDM Integrated Public Transport Network Framework (2012) indicated that there is no integration between Spatial Planning/ Land Use Management and Integrated Transport Planning. The leads to the following challenges;

- General lack of transport and land use integration particularly in respect to nodes and corridors.
- Urban nodes are not dense enough to create the thresholds that can sustain affordable and convenient public transport services in the continued low-density urban sprawl pattern of development.
- Owing to the dispersed population distribution in the rural areas, public transport systems are not viable, and taxi-operations are relatively expensive over long distances.
- A large portion of the population still walks significant distances owing to low income levels and/or poor public transport service provision.
- The unavailability of land for transport and related infrastructure.
- The lack of integrated settlements.

2.4.2.2 Implementation proposals:

FOCUS AREA:	INTEGRATED DISTRICT PUBLIC TRANSPORT NETWORK
STRATEGIES:	1. Strengthen the transport and other communication networks that link the better located areas with those with less potential; Increase the ability to commute between higher order and lower order towns (refer to settlement classifications) by managing the operating environment, transport system and decision-making mechanisms relevant to transport planning; improve rural transport opportunities.
	2. Ensure mobility through affordable, reliable and time-starved transport opportunities, even if it means providing subsidised public transport where marginalised communities require government intervention (mainly rural areas) as a principle-led response; enhance mobility by locating residential areas close(r) to trip destinations.
	3. Apply the principles of densification and diversification along (selected) transport routes; Public transport services for special needs passengers; provide and ensure universal access to public transport facilities for persons with physical disabilities.
	4. Transport for learners: facilitate provision of improved public transport services for learners in rural areas; identify candidate pilot projects for specialized services.
	5. Non-motorized transport and road safety: improve the level of provision for pedestrians and cyclists.
	6. Institutional structures: establish institutional structures for the management of public transport at municipal level; increase capacity and resources for public transport planning and management; set up co-coordinating structures between municipalities.
PRIORITY:	HIGH

2.4.2.3 CWDM Implementation Plan: Integrated District Public Transport Network

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Road Safety Education	R1 148 000, 00	Public Transport Regulation	Annually
Sidewalks and Embayments	R3 980 000, 00	Public Transport Regulation	Annually
Integrated Public transport	R2 024 000, 00	Public Transport Regulation	2018/2019
CBD Public Transport Plans	R250 000, 00	Public Transport Regulation	2018/2019
Regional Taxi Council	R10 000, 00	Public Transport Regulation	Annually

2.4.3 CULTURAL LAND SCAPE: SENSE OF PLACE

The Cape Winelands is one of the few areas in the country where a specific regional character has established itself over the past three centuries. This regional character is of immense value and must be conserved and recognized as the guiding tenet for planning and development.

To achieve this, it is suggested that the principles pertaining to the protection, enhancement and integration of regional attributes, be recognized in development planning within the district. In this regard, "critical regionalism" which recognizes the quality and attributes of regional characteristics and builds upon the development of regional idiosyncrasies and variations, must be considered with regard to spatial planning and design decisions. The principles of "critical regionalism" specifically 'Sense of Place 'is described as the 'degree to which a place can be clearly perceived and mentally differentiated and structured in time and space by its residents, and the degree to which that mental structure connects with their values and concepts' (Lynch, 1998).

In evaluating a sense of place, one needs to recognise that there are various 'components of sense' that, together, provide a particular environmental quality for the observer. 'Sense of place' is based upon the sensed quality of the unique 'components of sense' of a particular place, including its identity, character, structure, local climate, topography, vegetation, building materials, building practices, and local authenticity.

In practice, in the preparation and consideration of development applications (including architecture and placement of new infrastructure), it is important to ensure that the above 'components of sense' are incorporated into the planning and design. For example, this implies that any development within the natural environment should inter alia reflect elements of the traditional vernacular of the area, make use of local natural building materials, and reflect a strong sense of local authenticity.

Protection of (parts of) the Cape Winelands Cultural Landscape is accomplished through an incremental approach and includes the following areas:

- Idas Valley, Dwars River Valley, Groot Drakenstein/Simondium and Simonsberg State Forest as provisionally protected areas, and
- The "listing" of the Cape Winelands Cultural Landscape as a World Heritage Site (WHS) at UNESCO.

The listing of the WHS does not represent a specific conservation area but merits further investigation to, inter alia, consolidate planning policy, map and layer the WHS and identify and "lift out" cultural landscapes. Cultural landscapes are highly sensitive to impacts that change the character and public memory of a place and include a landscape of high rarity value and scientific significance. Already in 2005, the areas of Stellenbosch, Franschhoek and Paarl were considered as National heritage sites in terms of Section 27 of the National Heritage Resources Act (25 of 1999). Other areas that might be considered as provincial heritage sites include the towns of Tulbagh, Robertson, McGregor and Montagu.

The provisionally protected areas of Idas Valley, Dwars River Valley, Groot Drakenstein/Simondium and Simonsberg State Forest are managed according to a formal Conservation Management Plan that operates under the auspices of a local Heritage Committee. Ten of these committees exist in the Stellenbosch/Drakenstein municipal areas with a dire need to sensitize communities regarding the existence and value of cultural landscapes.

Heritage Western Cape (HWC) is responsible for the management and protection of all provincial heritage sites, generally protected heritage and structures in the Cape Winelands district. Based on discussions with SAHRA, the following steps will advance the recognition and protection of the cultural landscape,

- Photographic/historic surveys (to include a fundamental shift in focus from surveying monuments to rural landscapes)
- To determine sensitivities
- To update existing surveys
- To include the cultural (rural) landscape in existing surveys
- To determine grading of sites
- Compile Conservation Management Plans, and
- Complete Heritage Impact Assessments (only when development applications are submitted to relevant decision-making authorities).

Within the interdependencies of sustainable development, the protection of cultural landscapes should feature in the ability of communities to impact on decision-making, the sharing of the burden and societies' caring and protection of a system of values.

The PSDF (2014) proposes the following 'Policy Objectives' to protect, manage and enhance critical regionalism specifically 'sense of place'

- Prevent settlement encroachment into agricultural areas, scenic landscapes and biodiversity priority areas, especially between settlements, and river corridors.
- Promote smart growth ensuring the efficient use of land and infrastructure by containing urban sprawl and prioritising infill, intensification and redevelopment within settlements.
- Respond to and enhance an economically, socially and spatially meaningful settlement hierarchy that considers the role, character and location of settlements in relation to one another while preserving the structural hierarchy of towns, villages, hamlets and farmsteads in relation to historical settlement patterns.
- Use heritage resources, such as the adaptive use of historic buildings, to enhance the character of an area, stimulate urban regeneration, encourage investment and create tourism opportunities, while ensuring that interventions in these heritage contexts are consistent with local building and landscape typologies, scale, massing, form and architectural idiom.
- Conservation strategies, detailed place-specific guidelines and explicit development parameters must supplement urban edges to ensure the effective management of settlement and landscape quality and form.

2.4.3.1 Key findings: Cultural Land Scape, Sense of Place

2.4.3.1.1 Heritage surveys with determined sensitivities that includes rural cultural landscapes, conservation management plans and Heritage Impact Assessments is not prioritised by the relevant role players.

2.4.3.2 Implementation proposals:

FOCUS AREA:	CULTURAL LANDSCAPE, SENSE OF PLACE
STRATEGIES:	1. Recognise the principles pertaining to the protection, enhancement and integration of regional attributes in development planning. 2. Consider "*critical regionalism*" which recognizes the quality and attributes of regional characteristics and builds upon the development of regional idiosyncrasies and variations with regard to spatial planning and design decisions. 3. Changes proposed to landscapes and urban settlements whether they be for agricultural or urban and rural development purposes, should consider any heritage resource policy that may be relevant including those which might be proposed, e.g. Proclaimed Urban Conservation Areas, SAHRA Regulations, World Heritage Site applications etc. 4. Foreign or unsympathetic styles of site layout and buildings should be discouraged in urban settlements and rural areas so as to strengthen the local sense of place and minimise visual impact. 5. Urban design and architectural guidelines should be prepared to control the function and appearance of the main street or streets and squares in all of the urban settlements. These should control, among other things, building styles and heights, materials and colours, advertising, roadways and pavements, encourage colonnades and other devices to shelter pedestrians and landscaping and tree planting, and respect historic buildings and precincts. 6. Tree planting, including appropriate indigenous, ornamental and fruit trees, urban greening (landscaping) and food gardens should be encouraged along streets and in open spaces as part of urban restructuring programmes in villages and towns. 7. Conduct a systematic process, starting at the scale reminiscent of the proposed WHS (or Cape Winelands Biosphere Reserve), to identify and grade sites (and routes) and classify landscapes to protect the cultural landscape; use these findings for the compilation of an inventory of the heritage resources by the planning authority and submission of such inventory to the relevant provincial heritage resources authority. 8. Conduct the necessary steps to give effect to the registration of the WHS. 9. Responsible heritage resource authorities and local authorities to establish partnerships between themselves and with nongovernmental organisations, business, farmer unions, etc to effectively manage national heritage resources. 10. Compile a visual resource management plan for the N1 route between the Hugenote Tunnel and Cape Town. 11. Include design and architectural guidelines (including reference to choice of building material) as a key component of localised planning (and SDFs of B Municipalities 12. Ensure sufficient resources (personnel and funds) within SAHRA and HWC to perform legislative mandates
PRIORITY:	HIGH

2.4.4 WATER INFRASTRUCTURE

In the CWDM area, 86.9% of households have access to flushing toilets and 97.7% of households have access to piped water. One of the most critical issues impacting on the economic-development process in the district is the water supply in the region and in each of the different towns and settlements, taking into account concerns about long-term water supply trends and climate-change processes.

For the Langeberg and Witzenberg municipalities, small local supply schemes meet almost all the urban water requirements. Augmentation of current urban supply schemes may be required in the future, depending on growth in requirements. However, all local authorities must first undertake and implement more efficient water use and water re-use from their existing resources, before consideration will be given to the development of new schemes. Invasive alien vegetation management remains as crucial as water infrastructure maintenance. Municipalities were tasked by National/Provincial government to development Invasive Alien Vegetation Management Plans. It is the intention of these plans to identify government/municipal land that needs to be cleared of invasive vegetation.

Table 13: Dams for domestic supply in the CWDM area.

Local Municipalities	Capacity (million m3)	Domestic use	Other use
WITZENBERG			
Koekedouw	22.5	Ceres, Prince Alfred Hamlet	
Lakenvlei	10.3	Roode Elsberg Dam for De Doorns.	Irrigation/Domestic As per Roode Elsberg
Tulbach Town Dam		Tulbagh	
LANGEBERG			
Poortjieskloof	9.2		irrigation
Klipberg	2.0		Irrigation
Pietersfontein	2.0		Irrigation
Moordkuil/Draaivlei	1.07		Irrigation
Grootvlei	1.6		Irrigation
BREEDE VALLEY			
Keerom,	10.4		Irrigation
Stettynskloof	15.5	Worcester, Rawsonville	Irrigation
Greater Brandvlei	319.3	Robertson, Ashton, Montagu, Bonnievale	
Elands Kloof	11.4	Touwsriver	Irrigation
Fairy Glen	0.5		Irrigation
Buffelsjag	5.2		
Roode Elsberg	7.7	De Doorns	Irrigation
DRAKENSTEIN			
Wemmershoek	58.8	CoCT, Paarl	
Voelvlei	164.1	CoCT, Cape West Coast	
Paarl Mountain		Paarl	
STELLENBOSCH			
Idas Valley 1	0.50	Stellenbosch	
Idas Valley 2	1.54	Stellenbosch	
Bergriver	130	CoCT, Franschhoek, Stellenbosch	

2.4.4.1 Potential risks associated with water infrastructure:

Dam failures and disruptions to basic services i.e. water supply is highlighted in the CWDM Risk Assessment (2014) as potential risks.

Dam failures; There were two dam failures reported since 2008, in Vlottenburg during 2012 (Stellenbosch Municipal area) and Tulbagh in 2016 (Witzenberg Municipal area). To date there was an extreme increase in rainfall with major floods causing damage of approximately R 1.6 billion.

Areas, communities or households most at risk;

- Communities, towns and property owners living downstream of a dam.
- Farming communities, under the category of agriculture, are the second biggest sector of water users after the City of Cape Town. Their dependency on water increases their vulnerability, should a dam break occur.
- Roads and other critical infrastructure situated close to the dam e.g. water purification systems and sewage treatment plants.

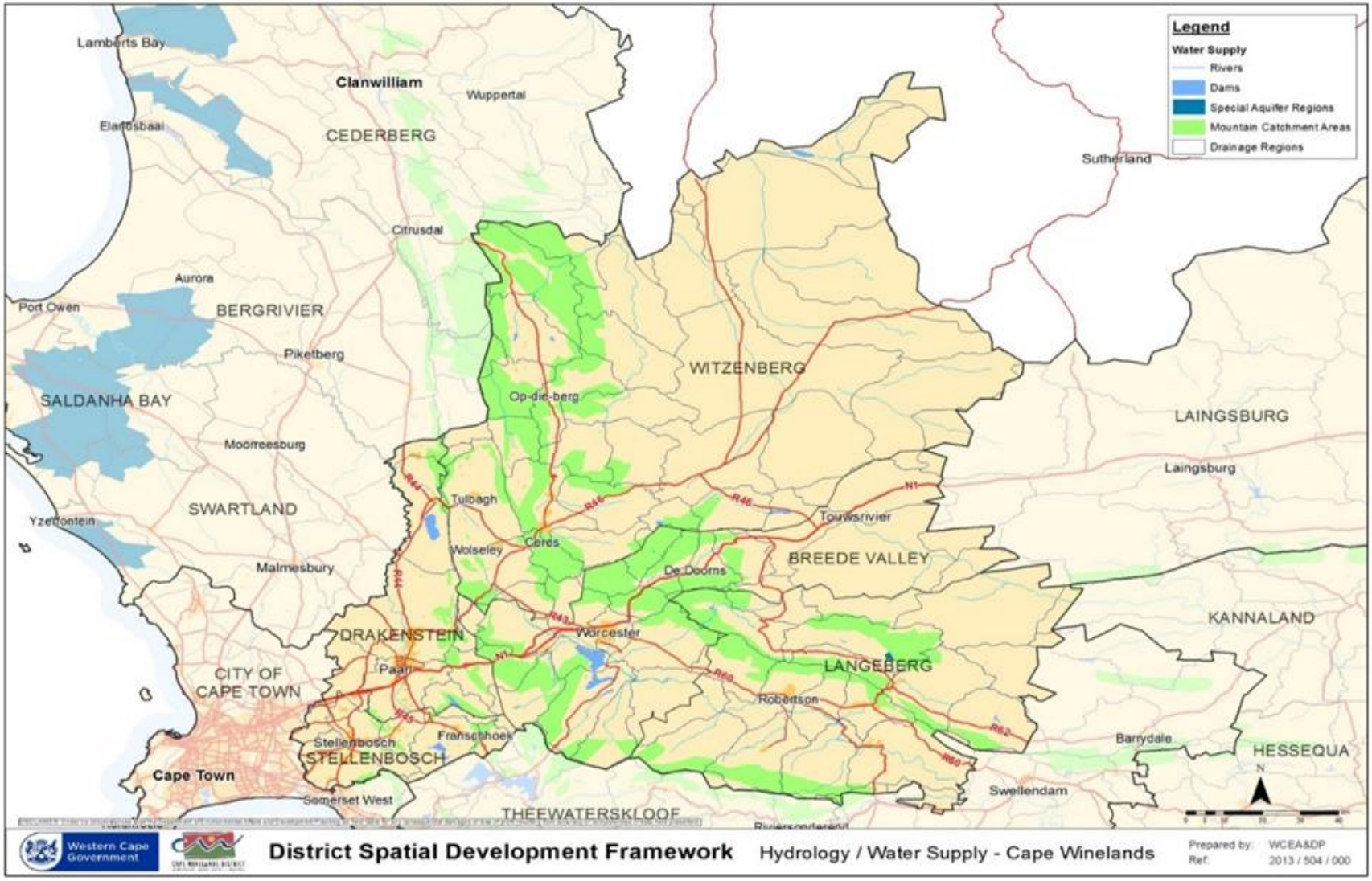
Disruption of Basic Services: Water Supply;

Water supply disruptions occur during maintenance or repair work. The CWDM area has many indigent households, the latter might have an impact on municipal maintenance budgets. It may be necessary for municipalities to develop significant indigent policies that does not add to the poverty trap. Likely impacts of disruptions could result in;

- Health and sanitation problems if prolonged interruptions occur
- Economic impact to businesses and industries due to a lack of production
- Discomfort to households

Conditions that increases the severity of water supply disruptions are;

- As a result of decreased rainfall (climate change), all resources, especially surface water resources, will be under pressure and will have lower safe yields
- Due to increased heat units, water demand from agriculture, as well as from towns will rise sharply even in the event that average rainfall would not
- reduce much, it is anticipated that much greater variability of rainfall will occur within a year and also between years due to more extreme climatic conditions.
- From a water service perspective, the most significant challenges are the augmentation of existing water sources, the replacement and upgrading of old infrastructure to accommodate development, the provision of sustainable basic services to informal settlements and to ensure the provision of basic services to rural communities located on private farms
- The elevated concentrations of dissolved salts from the naturally saline soils and groundwater are aggravated by intensive agricultural land use
- Effluents can be washed into rivers during high rainfall events increasing the organic loads to the receiving rivers influencing water quality.



Map 7: Hydrology and water supply.

2.4.4.2 Key findings: Water Infrastructure

2.4.4.2.1 Refer to disruption of basic services- water, specifically conditions that increases the severity of water supply disruption.

2.4.4.2.2 Municipalities must develop indigent policies, indigent household figures are as follow; Breede Valley 7315, Drakenstein 12429, Langeberg 7413, Stellenbosch 4217, Witzenberg 4572 (CWDM IWMP, 2015).

2.4.4.2.3 Catchments of the bulk of dams within the CWDM is infested with invasive alien plant species. The invasive plant species pose a major threat to water conservation.

2.4.4.2.4 Municipalities must complete their Invasive Alien Vegetation Management Plans. Implementing these plans through active alien clearing is as important as water infrastructure maintenance.

2.4.4.2.5 Increased risk of drought due to climate change will add extra pressure on water infrastructure. Municipalities should seek and employ alternative methods to augment water supply as well reduce the demand.

2.4.4.3 Implementation proposals:

FOCUS AREA:	WATER INFRASTRUCTURE
STRATEGIES:	1. Municipalities must complete their Alien Vegetation Management Plans for municipal properties; Increase alien clearing in catchments located throughout the entire District and B municipalities in partnership with Department of Water and Sanitation and LandCare Programme. 2. Ensure that the municipal infrastructure to provide basic services to communities is in place, effective and maintained; for this to be achieved within a common understanding in enough detail of the long-term objectives and direction of our society and a common vision. 3. Determine the impact of long-term water supply trends and climate-change processes on growth and development. 4. Invest in technologies and systems that decouple economic growth from rising raw water consumption 5. Where urban development proposals will exceed infrastructure capacity, applications should be refused until provision is made to deal with the additional loads 6. Local authorities to undertake and implement more efficient water use and water re-use from existing resources; management of infrastructure and optimizing operation of the works will ensure minimum water losses at all water works and pipelines; training of process controllers to increase awareness of the importance of operating and maintenance in the works. 7. Water augmentation possibilities that can be investigated and implemented by municipalities include: Aquifer recharge, subsidising grey water systems and rain tanks, making greywater systems compulsory for new developments, treating and storing storm water, treating sewerage for water use, small catchment management levies, rehabilitation of wetlands and riparian areas, alien clearing, gamifying water targets to increase participation/adherence by communities.

	8. Manage decreased water quality in ecosystem; Invasive aquatic weeds removal and management in Berg and Breede Rivers by the Cape Winelands District Municipality, B municipalities, DOWA, property/landowners and water user associations. Continuous clearing should be done annually between September and April. The specific area to be targeted is between the R45 and Hermon.
	9. Manage the quantity of water available for irrigation and drinking; Cape Winelands District Municipality to facilitate research into the re-use of wastewater within the District Municipality, with B-municipalities indicating which towns should be included in the research. The economic viability and quantities are important selection criteria. The replenishment of aquifers by infusion of purified waste water should form part of the research. Implementation by relevant Engineering Departments of B-municipalities. Cape Winelands District Municipality to facilitate the assessment of existing infrastructure for water storage. Implementation by Engineering Departments of B-municipalities.
PRIORITY:	HIGH

2.4.4.4 CWDM Implementation Plan: Water Infrastructure

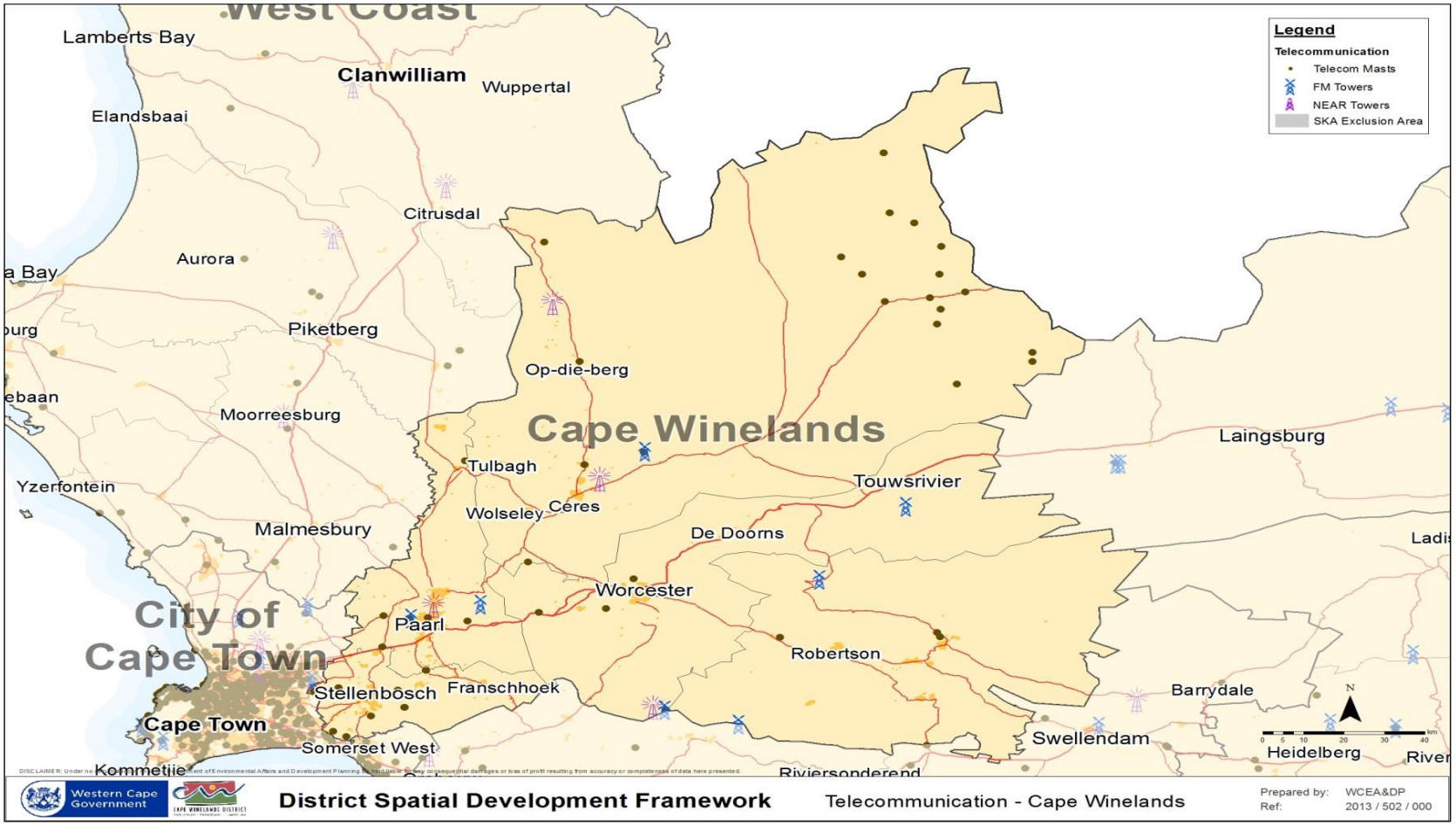
PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
EPWP Invasive Alien Vegetation Management	R 2 030 000, 00	Land Use and Spatial Planning Section	Annually
River Rehabilitation	R 360 000, 00	Land Use and Spatial Planning Section	Annually
Service Delivery Agreement with Cape Winelands Biosphere Reserve-Water Augmentation Programme; Aquatron Toilet System	R150 000, 00	Land Use and Spatial Planning Section	Annually
Subsidy: Water/Sanitation Rural areas/Farms	R1 000 000, 00	Municipal Health Services	Annually
Provision of Water to Schools	R500 000, 00	Projects and Housing	Annually

2.4.5 ENERGY & TELECOMMUNICATION INFRASTRUCTURE

According to the PSDF (2014) the built environment sector (i.e. households, commerce and services) only consumes 13% of total energy. Electrical distribution infrastructure is well established, has good coverage, and is in a reasonable condition. Current deficits and uncertainties lie in the generation and sourcing of electricity capacity. The provincial energy focus is on lowering carbon emissions and local generation (e.g. renewable and greater use of gas).

Map 8: below illustrates Eskom lines and substations and Wind Farm Applications.

Whilst access to mobile communication has increased rapidly, internet access has been stagnant. It is the strategy of Provincial Government that every citizen in the Western Cape has access to affordable high-speed broadband, has the necessary skills to use it, and uses it in their daily lives. Map 9 below illustrates telecommunication within the CWDM.



Map 9: Telecommunications Infrastructure

2.4.5.1 Implementation proposals:

FOCUS AREA:	ENERGY AND TELECOMMUNICATION INFRASTRUCTURE
STRATEGIES:	1. Provide low-cost high-speed network services in the main centres.
	2. Pipelines, transmission lines and telecommunications masts should be aligned along existing and proposed transport corridors rather than along point to point cross-country routes.
	3. As a principle-led (and policy) response, authorities to consider and promote the development of renewable energy power generation capacity subject to appropriate scale, form and location.
PRIORITY:	HIGH

2.4.6 SOLID WASTE DISPOSAL

According to the White Paper: Policy on Pollution, Waste Minimisation, Impact Management and Remediation (2000), municipalities are responsible for providing waste management services, and managing waste disposal facilities. Specific functions to be carried out by municipalities include;

- Compiling and implementing general waste management plans, with assistance from provincial government
- Implementation of public awareness campaigns
- Collecting data for the waste information system
- Providing general waste collection services and managing waste disposal facilities within their areas of jurisdiction
- Implementing and enforcing appropriate waste minimisation and recycling initiatives, such as promoting the development of voluntary partnerships with industry, including the introduction of waste minimisation and recycling initiatives, such as promoting the development of voluntary partnerships with waste minimisation clubs.

The CWDM's function is limited to the development of a District Integrated Waste Management Plan and the regionalisation of landfill, both investigation and possible management of a regional facility which will pose operational and financial challenges. The CWDM initiated the investigation of two regional landfill sites, a site for the eastern and western portion of the district. The investigation into a regional landfill site for the eastern portion of the CWDM was successful. The proposed site will service Langeberg, Witzenberg and Drakenstein municipalities. However, the outcome of the investigation for the western portion of the district which consist of Stellenbosch and Drakenstein municipalities indicated that there is no suitable space for a regional landfill site.

Currently a licence was issued for the regional landfill site in the eastern portion of the district. An appeal was lodged against the issuing of the mentioned licence due to the minister rejecting objections on the application for the licencing of the mentioned regional landfill site. Whilst the regional landfill site has not been constructed the local municipalities are managing waste disposal sites in their relevant municipal areas. These local waste disposal sites are going to be closed upon the construction and opening of the regional land fill site in the eastern portion of the CWDM. Waste disposal issues relating to a lack of a regional landfill

site for the western portion of the district (Stellenbosch & Drakenstein municipalities) could be solved by Drakenstein municipality's Waste to Energy programme. The CWDM will encourage possible negotiations between the two local municipalities.

2.4.6.1 Status Quo: Local Municipal Waste Management (CWDM IWMP, 2015)

Waste management in local municipalities resides under three municipal functions, i.e. waste collection, waste disposal and waste reduction.

Waste Collection; Where collection of domestic municipal waste is concerned, the majority of urban residents within the CWDM area are receiving a municipal collection service.

- Breede Valley Municipality; there is currently no collection service to farmers and rural households' due to the problem of transport distances and accessibility. Farmers offload their waste at the disposal sites free of charge. The unserviced areas in the municipality are the rural areas and farms. Received figures indicates that 7190 out of the 7315 indigent households receive free basic refuse removal, which is 98%.
- Drakenstein Municipality; in the rural areas and farms there are three scenarios: If the farm is on a collection route, the farm waste is placed by the owner outside his property boundary from where it is collected by the Municipality. Farmers also transport and offload their waste themselves to the Paarl Transfer Station or the Wellington Landfill and they make use of the coupon system. Farmers can also apply for the use and service of a waste skip that is placed on his property. He pays a monthly fee and the Municipality collects the filled skip when they are notified. Received figures indicate that 12 429 out of the 12 429 indigent households receive free basic refuse removal, which is 100%.
- Langeberg Municipality; the farming community delivers their own waste to landfill, as it is not economically feasible for the Municipality to collect waste at these remote locations. Received figures indicate that 6 932 out of the 7 413 indigent households receive free basic refuse removal, which is 94%.
- In Stellenbosch Municipality figures indicate that 4 217 out of the 4 217 indigent households receive free basic refuse removal, which is 100%.
- Witzenberg Municipality; the municipality does not collect waste at the remote farming communities, as this would be economically unsustainable. Farming communities deliver their own waste. Received figures indicate that 4 572 out of the 4 572 indigent households receive free basic refuse removal, which is 100%.

Waste Reduction; recovery for recycling is done by Material Recovery Facilities (MRFs) in the following towns/settlements;

- Breede Valley Municipality- Touws River Transfer Station and MRF.
- Drakenstein Municipality-Paarl MRF and Wellington Landfill Site.
- Langeberg Municipality-Robertson Composting Facility and Ashton, Montagu and Bonnievle MRFs.
- Stellenbosch Municipality- Source separated waste is collected in Stellenbosch with recycling taking place at the Kraaifontein Waste Facility in the City of Cape Town Metro.

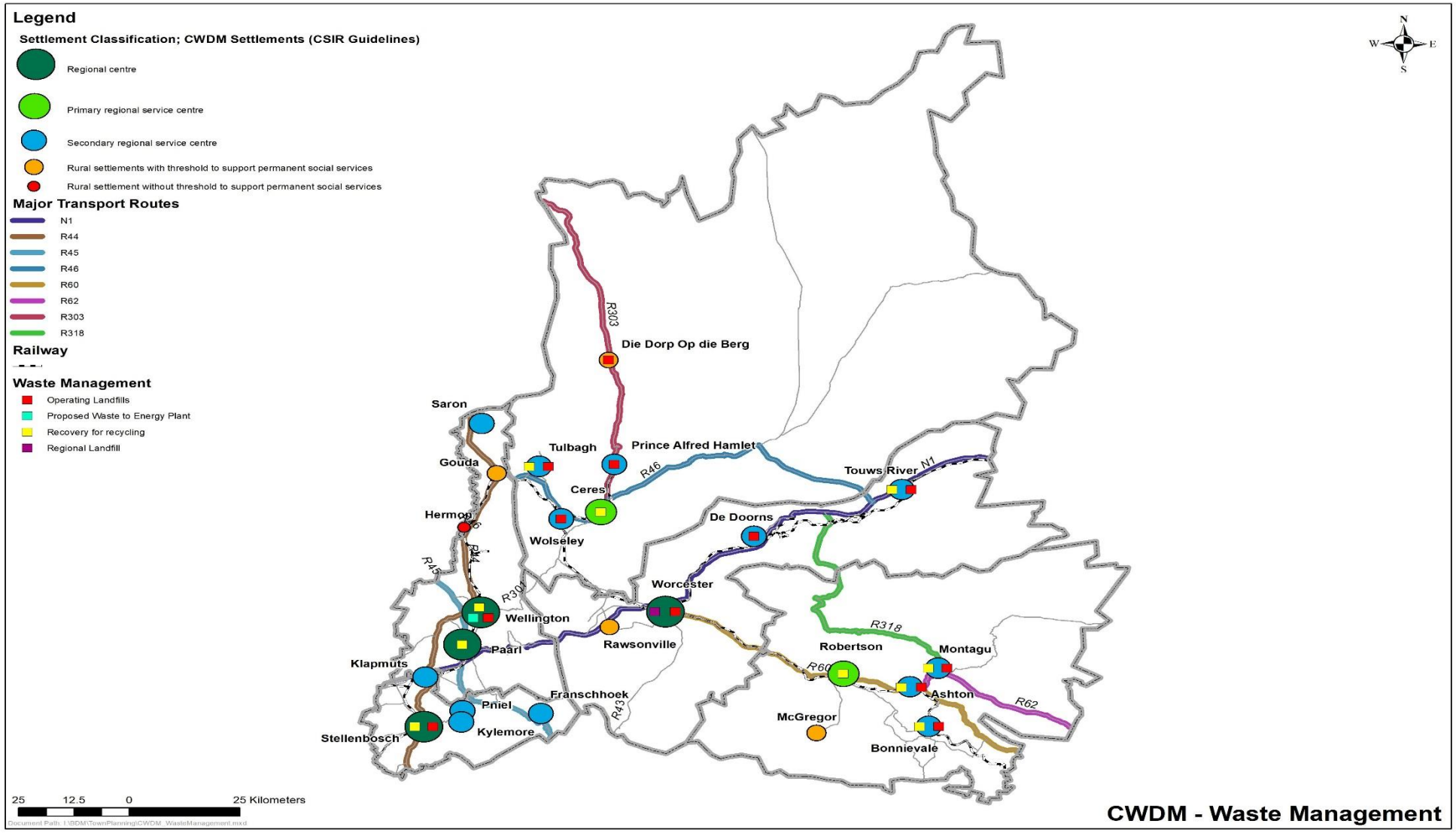
- Witzenberg Municipality-Tulbagh Landfill and Ceres, waste is separated outside Ceres and transported to Cape Town.

Waste Disposal; Operating landfills are located at the following locations (refer to map#;

- Breede Valley Municipality; Worcester, De Doorns and Touws River.
- Drakentein Municipality; Wellington.
- Langeberg Municipality; Ashton, Bonnievale and Montagu.
- Stellenbosch Municipality; Stellenbosch.
- Witzenberg Municipality; Wolseley, Tulbagh, Prince Alfred Hamlet, Op -Die-Berg.

Table 14: Cost of additional infrastructure to remain compliant up to 2030 (CWDM IWMP, Final report 2016)

Municipality	Facility	Establishment Costs
Drakenstein Municipality	Back up Transfer Station / MRF	R 17 928 000
	Closure and Rehabilitation of Wellington Landfill	R 46 707 700
Stellenbosch Municipality	Closure and Rehabilitation of Stellenbosch Landfill Cell 3	R 16 757 200
Witzenberg Municipality	Transfer Station / MRF in Wolseley	R 15 901 000
	Public Drop-off in Op-die Berg	R 2 680 300
	Closure and Rehabilitation of Op-die-Berg Landfill	R 4 635 200
Breede Valley Municipality	Public Drop-off in De Doorns	R 11 758 000
	Closure and Rehabilitation of Worcester Landfill	R 60 067 900
Langeberg Municipality	Public Drop-off in Bonnievale	R 2 680 300
	Closure and Rehabilitation of Ashton Landfill	R 17 993 300
	Closure and Rehabilitation of Bonnievale Landfill	R 12 459 400
Cape Winelands District Municipality	Establish new Regional Landfill	R 49 941 000
	Extension of landfill Phase 2	R 51 016 000
Total		**R310 525 300**



Map 10: Waste Management; Operating Landfills, Recovery and Recycling facilities and proposed Regional Landfill Site.

2.4.6.2 Key findings: Solid Waste Disposal

2.4.6.2.1 The strategic objectives of the CWDM relating to Waste Management places an emphasis on waste avoidance, waste reduction and waste disposal. Waste avoidance refers to avoiding materials of entering the waste stream e.g. by re-use, composting etc. Waste reduction refer to reducing the quantity of waste e.g. by doing recycling and waste disposal is defined as the storage, treatment or disposal of waste at licensed facilities. The CWDM IWMP highlights the fact that over the year's municipalities placed a greater emphasis on waste collection and disposal. The more sustainable approach of waste minimisation and reduction has been adopted recently. Municipalities will however have to shift to avoidance and reduction of waste rather than the disposal thereof.

2.4.6.2.2 Public awareness and education remain an issue, in order to move towards waste avoidance and greater reduction, public awareness and education must be prioritised.

2.4.6.2.3 According to the May 2016 Assessment of Municipal Integrated Waste Management Infrastructure, Phase 2 Draft Report of May 2016, the regional landfill site for the eastern side of the Cape Winelands district will cost R56 447 000 excluding VAT. Financing of the regional landfill site in terms of construction and management could be problematic since the CWDM does not receive MIG funding. Depending on how funding is sourced, the regionalisation of landfill could impose an extra financial burden on the relevant local municipalities.

2.4.6.2.4 The absence of a regional land fill site for the western portion of the CWDM will have implications for waste disposal in the Stellenbosch municipal area since local waste disposal sites are close to reaching their life span. Drakenstein municipality's Waste to Energy programme might present opportunities for Stellenbosch municipality to dispose their waste.

2.4.6.2.5 Municipalities must develop indigent policies. As indicated, indigent household figures are as follow; Breede Valley 7315, Drakenstein 12429, Stellenbosch 5757, Langeberg 7413, Witzenberg 4572.

2.4.6.3 Implementation proposals:

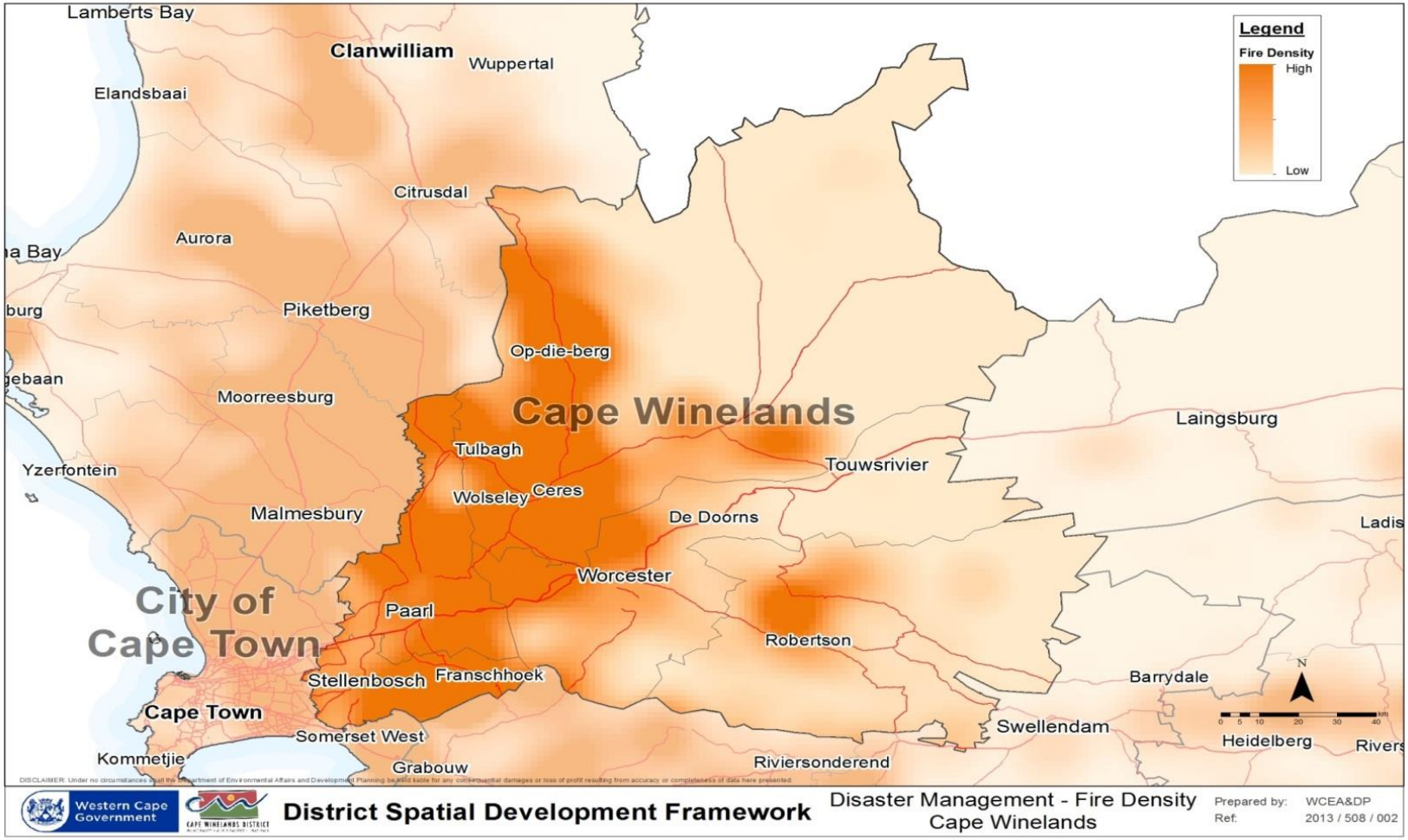
FOCUS AREA:	SOLID WASTE DISPOSAL
STRATEGIES:	1. Develop waste reduction strategies. 2. Prioritize public awareness in terms of waste reduction and avoidance. 3. Develop a Regional Landfill site for the Western and Eastern portion of the CWDM area. If a Regional Landfill site for the Western Portion of the CWDM is not practical, then the stalled Drakenstein Municipal Waste to Energy Program must be continued. The mentioned program must absorb the waste generated on the Western portion of the CWDM. 4. Investigate alternative technologies that can assist with the disposal of waste.
PRIORITY:	HIGH

2.4.6.4 CWDM Implementation Plan: Solid Waste Disposal

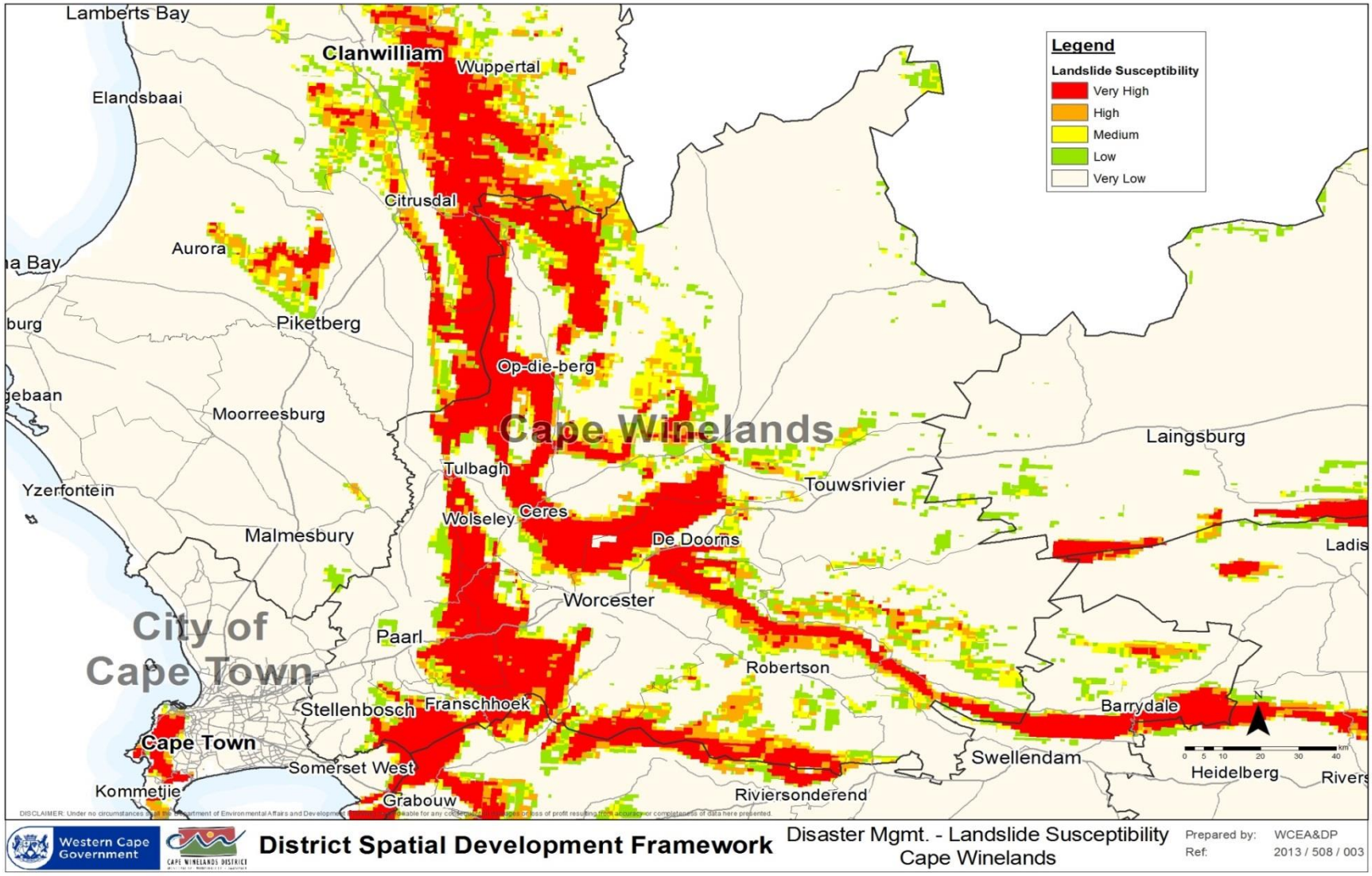
PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Regional Landfill Site Planning	R403 000, 00	Technical Services	2018/2019

2.4.7 DISASTER MANAGEMENT: GEOGRAPHIC RISK AREAS

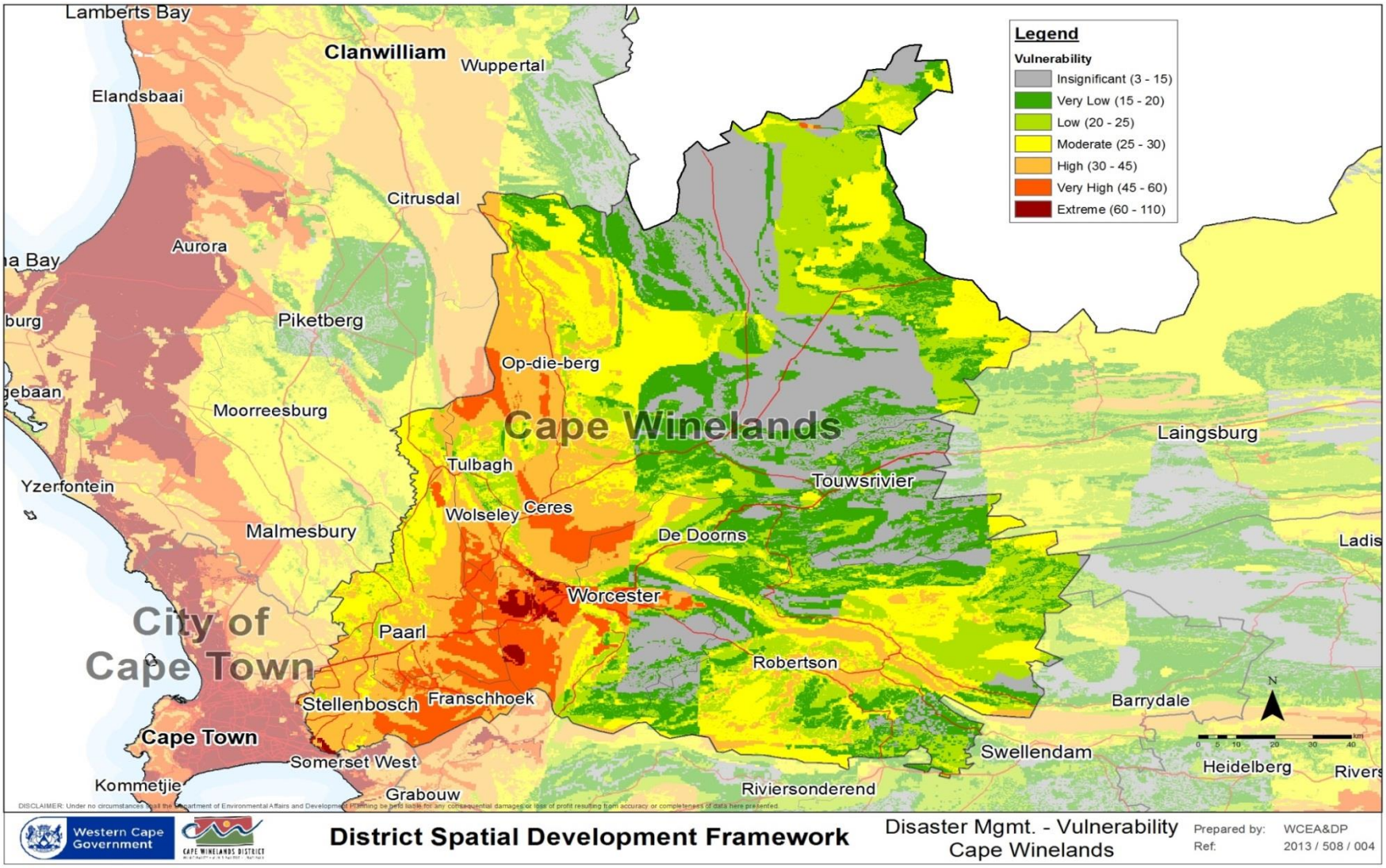
The PSDF (2014) identified the following high-risk areas pertaining to fire, landslides and overall vulnerability: refer to Map 13, 14 and 15.



Map 11: CWDM high risk fire areas.



Map 12: CWDM Landslide Susceptibility.



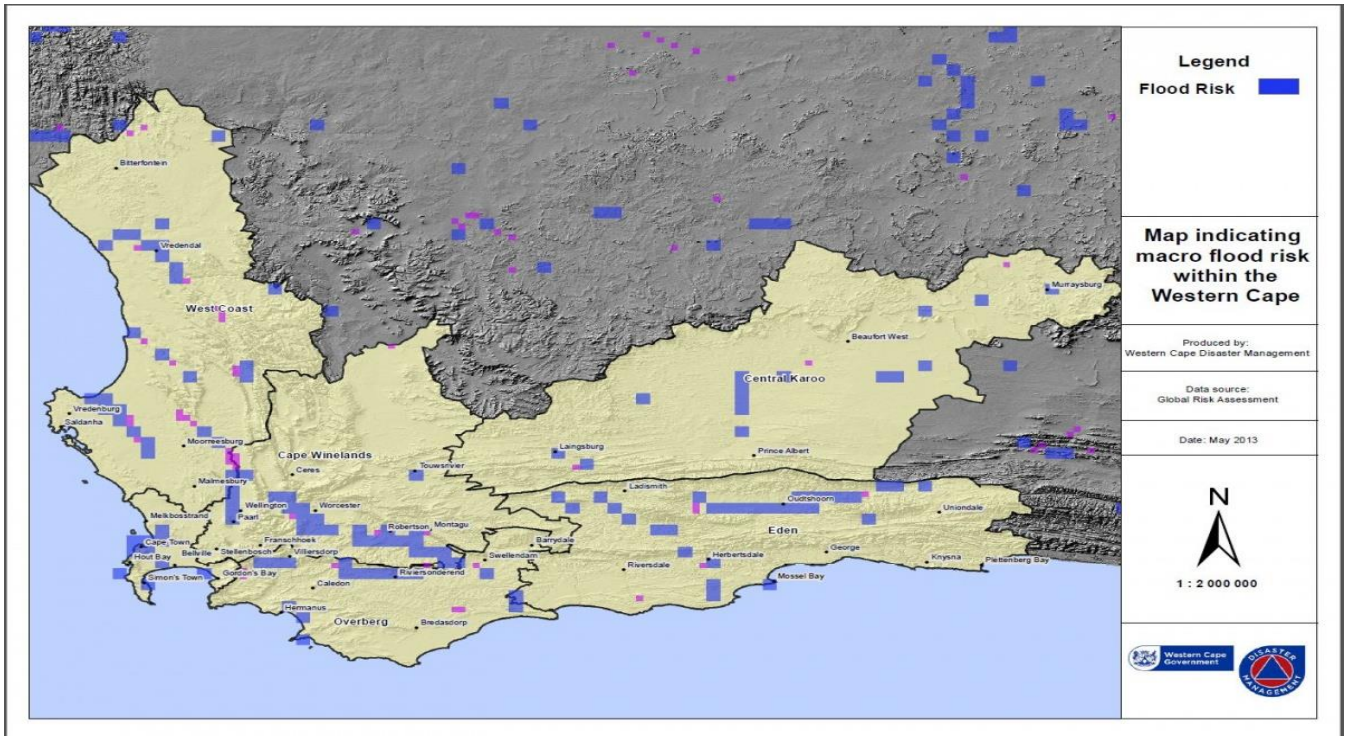
Map 13: Disaster vulnerability in the CWDM.

2.4.7.1 Potential risks associated with vulnerability spatial depiction (refer to map 13)

Flooding:

Flooding occurs at least once a year within the CWDM area. The largest and most important rivers in the area are the;

- Breede River
- Olifants River (of which only the headwaters lie within the study area)
- Doring River (the only large river that is still in a natural condition)
- Touws River (which is significantly modified)



Map 14: Flood risk areas

Table 15: Likely impacts of flooding

Economic:	Environmental:	Social:
• Extensive damage to both property and infrastructure • Large damage costs • Disruption in influx of tourists • Overflowing of dams and potential dam failure • Road closures • Disruption of services i.e. electricity, water, public transport and emergency services such as ambulances, hospitals etc. • Significant economic losses for businesses and farms	• Rivers spilling their banks resulting in flash floods • High run-off, severe erosion that leads to instability of steep catchments • Displacement of large amounts of sediment downstream • Slope failure, rock falls and mudslides on steep slopes or mountainous areas	• Low cost housing most affected • Injury and loss of lives to people and animals • Displacement of households and communities • Increase in the number of people with water borne diseases

Conditions that increase the severity of flooding;

- Irregular maintenance of storm water systems. For instance, litter, rubble and other dumped objects blocking storm water drains and streams, worsening the impact of the floods
- Debris-loading from soil erosion due to exposure of large tracts of land, along with vegetative debris loading associated with vegetation clearance can be washed into watercourses and swept downstream, where they obstruct culverts, channels and bridges.
- Increase and encroachment of low-cost housing or informal settlements in areas prone to flooding placing large numbers of people at risk.
- Rapid urban growth in floodplains that has hardened river catchments, increasing surface run-off.
- Under-investment in municipal maintenance and roads and protective stormwater systems.
- The risk of damage also increases when natural flood-paths of rivers are altered, and wetlands degraded in severe weather-exposed areas.
- Lack of household insurance.

Veld Fires:

The Western Cape 's fire season is generally from November to April, when temperatures are highest. During these months, there is greater use of natural recreational areas and the indigenous fynbos is also more likely to burn. Fires should generally not occur more than once every seven years, to avoid a loss of species that have not matured and produced seeds. The Western Cape 's fire season officially ends at the end of April.

Areas, communities or households most at risk;

- The whole district is fire prone with less frequent fires occurring towards the north of Ceres.
- Mostly in urban rural edge - informal settlements located at the urban edge where these fires usually start, which spreads to the veld and forests.
- Houses located at the urban edge with limited access.
- Mountainous areas are at high risk in the CWDM area.
- Areas with a high presence of alien plants.
- Commercial or small farms in isolation. Recreational areas i.e. picnic and hiking trails where many fires tend to start.
- Three major fires occurred in the Franschhoek area since 1999, i.e. February 1999, December 2005 (6-year gap) and January 2013 (7-year gap).

Table 16: Likely impact of veld fires

Economic:	Environmental:	Social:
• Damage and loss of property and infrastructure • Loss of farming lands, forestry and plantations • Claims against municipalities	Positive impacts: • Control of invasive alien plants • Promotion of desirable plants Negative impacts: • Loss of biodiversity (if fynbos burns too frequently or direct animal mortality • Loss of vegetation cover and increased erosion • Increased alien infestation (in disturbed areas where alien plants are often pioneer species) • Habitat fragmentation • Loss of ecosystem services, i.e. water production.	• Evacuation of people from homes • Reduction in potable water • Injury and loss of lives • Loss of employment / reduction in hours worked which affect livelihoods • Loss of personal items and special memorabilia.

2.4.7.2 Key findings: Disaster Management, Geographic Risk Areas

2.4.7.2.1 Refer to conditions that increase the severity of flooding.

2.4.7.2.2 Veld fires are exacerbated by warm, dry and windy conditions. The recent El Nino worsened the severity of veld fires in the Western Cape province.

2.4.7.3 Implementation proposals

FOCUS AREA:	DISASTER MANAGEMENT, GEOGRAPHIC RISK AREAS
STRATEGIES:	1. Plan and provide access roads for fire trucks in informal settlements; provide suitable roads as evacuation routes in informal settlements; provide informal areas with fire-resistant materials; provide fire hydrants in informal settlements 2. Plan fire services in line with new development needs 3. Apply an acceptable housing density (relevant to the specific housing development) that would limit the spread of fire 4. Ensure that development of residential dwellings only takes place after adequate bulk services are provided 5. Provide additional fire hydrants in all areas 6. Install watch towers, fire breaks, fire extinguishers in forestry areas 7. Ensure that fire hydrant water supply is sufficient in higher lying areas 8. Ensure the enforcement of an Environmental Impact Assessment (EIA) with all development projects (according to the NEMA guidelines) 9. Plan for the upgrading of existing infrastructure to cope with new developments 10. Identification and plotting of vacant high-risk flood areas for future reference and avoid human settlements in such areas 11. Avoid development and settling of communities along rivers and within the flood line 12. Apply and update zoning regulations regularly in response to changed disaster management requirements; develop zoning codes for high risk areas 13. Identify alternate suitable venues/facilities for emergency services 14. Apply low intensity land use in 1:100 flood line areas 15. Study and understand the impact of climate change on development 16. Ensure proper and appropriate signage regarding flood risk especially in low-lying areas 17. Plan and build retention dams to reduce risk of flooding 18. Restore and maintain water catchment areas 19. Build retaining walls to protect buildings from stormwater 20. Improve and upgrade stormwater reticulation systems regularly 21. Develop and maintain sustained cleaning programmes for rivers and dams 22. Plan and construct dams with larger capacity to regulate flow of water 23. Identify earthquake prone areas / geological faults 24. Development of suitable building codes (enforcement thereof) 25. Limit development in high risk areas 26. Approval of only single-storey buildings in disaster prone areas and at appropriate densities 27. Enforce area-specific building material/methods/codes

	28. Design strong earthquake resistant infrastructure services 29. Create a zoning for major hazardous installations (MHI) 30. Proper planning be done regarding the placement of factories and plants 31. Limit population figures around MHIs 32. Enforcement and evaluation of risk assessment for major hazardous installations 33. Monitoring, restricting and managing of routes for hazardous materials (hazmat) in transit (railways/roads) 34. Provide specific parking areas along the roadside for vehicles transporting hazardous material 35. Increase hazmat capabilities on main routes where hazmat freight vehicle parking areas are to be found Identification of containment sites and measures
PRIORITY:	HIGH

2.4.7.4 CWDM Implementation Plan: Disaster Management, Geographic Risk Areas

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Annual Environmental Health Education Programme	R445 537, 00	Municipal Health Services	Annually
Food-Water Samples and Testing	Operational Budget	Municipal Health Services	Annually
Disaster Management	Operational Budget	Disaster Management Section	Annually
Revision of Risk Assessment	R243 500, 00	Disaster Management Section	2018/2019
Fire Services	Operational Budget	Fire Services Section	Annually

3. DISTRICT SPACE ECONOMY

3.1 ECONOMIC GROWTH SECTORS

The spatial logic as per the Provincial Space Economy is to;

1. **Capitalise** on the Knowledge Economy

2. **Consolidate** investment in economically vibrant areas

3. **Connect** regional economic infrastructure

4. **Cluster** investment of economic infrastructure.

The above spatial logic can be applied within the growth potential forecast of the CWDM towns with the five (5) regional centres (Stellenbosch, Paarl-Wellington, Worcester, Ceres and Robertson) being the main growth centres. According to the MERO (2017), the CWDM GDP experienced an average growth rate of 2.9% per annum since 2010. However, growth rates are declining, with an estimated growth rate of 0.5 per cent for 2016.

In the case of the CWDM area the Cape Winelands GDP contribution per sector in 2015 was:

- **Agriculture, forestry & fishing**; 9,3%, **Mining & quarrying**; 0,2%, **Manufacturing**; 15,7%, **Electricity, gas & water**; 2,2%, **Construction**; 6,9%, **Wholesale & retail trade, catering & accommodation**; 18,4%, **Transport, storage & communication**; 9,8% **Finance, insurance, real estate & business services**; 19,8%, **Community, social & personal services**; 7,5%, **General government**; 10,2%

Table 17: Cape Winelands District GDPR contribution per sector (%), MERO, 2017.

Sector	Cape Winelands	Witzenberg	Drakenstein	Stellenbosch	Breede Valley	Langeberg
Primary Sector	**9.3**	**17.4**	**6.6**	**5.7**	**10.6**	**12.9**
Agriculture, forestry and fishing	9.1	17.3	6.4	5.5	10.4	12.8
Mining and quarrying	0.2	0.0	0.2	0.2	0.2	0.1
Secondary Sector	**24.9**	**26.1**	**26.6**	**24.1**	**21.4**	**25.9**
Manufacturing	15.7	14.2	16.0	17.0	13.4	18.2
Electricity, gas and water	2.2	3.3	2.6	1.4	2.0	1.8
Construction	6.9	8.5	8.0	5.6	5.9	5.9
Tertiary Sector	**65.9**	**56.5**	**66.8**	**70.3**	**68.0**	**61.2**
Wholesale and retail trade, catering and accommodation	18.4	16.9	17.7	20.2	18.3	19.2
Transport, storage and communication	9.8	7.0	8.9	11.0	11.0	11.1
Finance, insurance, real estate and business services	19.8	15.4	21.2	21.6	20.4	16.2
General government	10.2	10.4	10.6	10.6	10.2	8.0
Community, social and personal services	7.5	6.9	8.4	6.8	8.0	6.6

A similar trend follows with the urban-based economic growth sectors (i.e. manufacturing 15.7 %, wholesale & retail trade, catering & accommodation 18.4% and finance, insurance, real estate and business services 19.8%) being the leading drivers of growth within the Cape Winelands district this however does not detract from the importance of the agricultural sector and its linkage with urban economies within the district.

Declining Economy

A cause for concern is that after 2014, the economy of the Cape Winelands District grew at a slower rate each year, with 2016 experiencing the lowest growth rates since the recession in 2009. Reasons as put forward by the MERO (2017) are due to national and international developments affecting the economy. This can be broken down to;

- General increases in food prices due to the drought
- Rising national unemployment and increasing interest rates having a negative impact on investment while volatility in the Rand against currencies such as the US Dollar, Pound Sterling and Euro are contributing to rising inflation as South Africa is generally a net importer of goods.
- Other factors are, declining business confidence, political instability and the sub investment credit rating by agencies are all contributing to the deteriorating economic conditions.

Table 18: Municipal GDPR Growth trends (MERO, 2017).

Municipality	Contribution to GDPR (%) 2015	Trend 2005-2015	2010-2015	Real GDPR Growth (%) 2011	2012	2013	2014	2015	2016
Witzenberg	13.9	5.0	4.4	4.9	4.6	4.8	5.7	2.1	0.9
Drakenstein	32.8	2.8	2.5	3.2	2.8	2.6	2.6	1.3	0.4
Stellenbosch	24.0	2.8	2.6	3.2	3.0	2.5	2.5	1.6	0.5
Breede Valley	19.1	3.4	3.0	3.7	3.3	3.2	3.4	1.5	0.4
Langeberg	10.2	3.6	3.2	3.5	3.5	3.2	3.9	1.9	0.1
Total CWDM:	**100**	**3.3**	**2.9**	**3.5**	**3.2**	**3.1**	**3.3**	**1.6**	**0.5**
WC Province:		**3.0**	**2.6**	**3.8**	**2.9**	**2.6**	**2.2**	**1.5**	**0.7**

The following sectors are regarded as key in driving growth, job creation and poverty reduction in the Cape Winelands:

Agriculture: significant for its forward linkages within the economy; direct contribution to turnover and employment; robustness and resilience; and potential for new activities and markets.

As noted, agriculture remains the backbone of the provincial economy despite the importance of secondary and tertiary economic activities. This is especially the case in the Cape Winelands District which is home to a third of the province's agricultural

sector employing 21% of the District's workforce (CWD Socio-economic Profile 2014:10). In the Cape Winelands, around 90 per cent of goods exports are from the agri-processing value chain (PERO 2016: 47). This sector, together with tourism, and oil and gas, were selected as strategic priority areas for provincial focus due to their conduciveness to inclusive growth.

Wholesale and retail trade, catering and accommodation: key sector owing to established foreign markets and networks; potential for expansion in the domestic market; generation of foreign currency; backward linkages to agricultural sector; lateral linkages to services sector; and the existing built and natural capital within the region.

Financial/ Real Estate/ Insurance and Business Services Sector: leading growth sector currently; potential to attract the 'Call Centre' and Business Processes

Outsourcing industry into the region, in particular the Dutch industry; and the region's ability to attract Johannesburg and Cape Town based firms' headquarters the Cape Winelands is definitely the 'place to be'.

Manufacturing: established sector with strong backward linkages to agriculture; potential for SMME development; and an important job generator.

3.1.1 Other sectoral opportunities:

The Green Economy

It is essential that in applying the spatial logic (Capitalise, Consolidate, Connect and Cluster), the transitioning to a green economy is prioritised. A green economy is defined as an economy that aims at reducing environmental risks and ecological scarcities that aims for sustainable development without degrading the environment.

The Western Cape Government has realised the potential of benefits of a green economy and started an initiative called "Green is Smart" (Western Cape Government, 2013a). This is a green economy strategy framework and aims to optimise green economic opportunities and enhancing environmental performance in the Western Cape. The framework aims for the Western Cape to become the lowest carbon intensive province and a leading green economic hub of the African continent, through the following five drivers: "smart living and working", "smart mobility", "smart eco-systems", "smart agri-production", and "smart enterprise" (Western Cape Government, 2013a) (Van Niekerk, Brent and Musango 2013).

The green economy prospects will carve a pathway in the Cape Winelands District since the agricultural industry continues to play a big part in the economy of the district and province. The region's agricultural contribution (11 per cent) is smaller than that of the West Coast (14.6 per cent); however, it is the largest in the Western Cape Province accounting for more than a third of the Province's agricultural real value add. The agriculture and agro-processing industries are also responsible for the bulk of the region's exports (Cape Winelands Regional Development Profile 2013:50).

Further, the PERO 2014 identifies agriculture and tourism as sectors in which the Western Cape has comparative advantage. Both sectors have been highlighted in the Green is Smart strategy as priorities for support and intervention. The vibrant agricultural and tourism sectors of the province make it particularly sensitive to environmental risks. Over and above biophysical risk, agriculture is also exposed to indirect regulatory and market-related risk through carbon taxes, increasing energy prices and related changing preferences in the main export markets.

The Knowledge Economy

Given the many challenges currently facing developed and developing countries, the demands made on skills training, applied as well as fundamental research and the utilisation of research are huge. This also applies to South Africa which faces the challenges of both, developed and developing societies. The Western Cape is currently still relatively better placed (in terms of most knowledge-generation indicators) to tackle these challenges. This is relevant for Stellenbosch and the Stellenbosch-Paarl axis, but also for some of the other places in the district.

The knowledge economy must be viewed as both an input into and an output of economic growth. The type of sectors and niches which characterize the Cape Winelands economy demand fairly sophisticated skills and technology inputs (even the agricultural niches!). On the other hand, many new or growing enterprises are directly engaged in the research, development and training fields (e.g. alternative energy, organic food and environmental care). Thus, "knowledge generation" can be viewed as a growth sector in the Cape Winelands economy.

Fourth Industrial Revolution

The Fourth Industrial Revolution (4IR) builds on the Third Industrial Revolution, or digital revolution. It is characterised by the increased complexity, development and use of artificial intelligence, robotics, blockchain, nanotechnology, quantum computing, biotechnology, The Internet of Things, 3D printing and autonomous vehicles. The resulting effects cause and increased integration or 'blurring of lines' between the technology, biology and physical spheres. This revolution is having and will have serious effects on many areas of the economy, leading potentially to increased efficiency, sustainability and the creation or requirement of new types of skills, jobs or careers. However, this will likely lead to the loss of jobs in some areas, especially the unskilled labour areas.

The Fourth Industrial Revolution has already been identified as a serious impactor on the future agricultural sector of the Western Cape. Water saving technology, drones, robotics, farm-management software, precision agriculture, predictive analytics and genetic developments can have positive effects on the sustainability of the sector and food security into the future.

3.1.2 Key findings: Economic Growth Sectors

3.1.2.1 Due to various reasons (national and international), there is a decline in the economy of the Cape Winelands District. The sectors that performed the strongest is sectors located within the urban space economy therefor Public-Sector investment remains crucial. Spatial targeting as coordinated by the Western Cape Provincial Government and pursued by various other government departments could assist in guiding public-sector investment. The latter however does not detract from the importance of the agricultural sector and its economic linkages to the urban economies within the district.

3.1.2.2 Opportunities exist in the green and knowledge economy (refer to 3.1.1), municipalities/government must investigate these sectors and capitalise on it.

3.1.3 Implementation proposals:

FOCUS AREA:	ECONOMIC GROWTH SECTORS
STRATEGIES:	1. B-municipal Spatial Development Frameworks must facilitate spatial targeting processes, coordinating and identifying government infrastructure/capital investment locations within the urban settlements. 2. Seek partnerships with industries, local businesses, academic institutions, NGO's and other civil society stakeholders to promote interventions in skills trainings as well as research and the utilization of research. 3. Prioritise the implementation of the following drivers: "smart living and working", "smart mobility", "smart eco-systems", "smart agri-production", and "smart enterprise" (Western Cape Government, 2013a) (Van Niekerk, Brent and Musango 2013). 4. Strengthen rural support programmes for commercial and small-scale farming and develop the potential of the agricultural value chain. 5. Attract outside investors or entrepreneurs and encourage further diversification of local business.
PRIORITY:	HIGH

3.1.4 CWDM Implementation Plan: Economic Growth Sectors

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Investment Programme	R550 000, 00	Local Economic Development & Tourism Section	Annually
Mentorship Programme	R611 000, 00	Local Economic Development & Tourism Section	Annually
Business retention expansion	R700 000, 00	Local Economic Development & Tourism Section	Annually
Skills Development	R200 000, 00	Rural and Social Development Section	Annually

3.2 MUNICIPAL SPACE ECONOMY

Within the district, Stellenbosch is the largest and fastest growing regional economy (R17 Billion of the District's GDPR of R50 billion in 2013), this is followed by Drakenstein (R15.5 billion), Breede Valley (R7.5 billion), Langeberg (R5.5 billion) and Witzenberg (R4.5 billion) (Stellenbosch Draft IDP Bureau for Economic Research Report 2014: 42).

3.2.1 Drakenstein and Stellenbosch Municipal area:

Over the past decade(s), Stellenbosch and Paarl/Wellington has seen growth in each of the following sectors:

- Higher education and research (Paarl/Wellington to a lesser extent)
- Agriculture and agri-processing
- Tourism
- Corporate headquarters and business services
- Retirement settlements, and
- Other sectors that include a resilient retail sector and diverse (small and medium-sized) industrial enterprises. These could be related to agriculture, forestry, furniture making, publishing or the craft sector.

Drakenstein and Stellenbosch municipality falling within the functional region of the metro economy has seen significant growth in manufacturing, wholesale

& retail trade, catering & accommodation and finance, insurance, real estate & business services (refer to table). Paarl/Wellington has higher education facilities which gives this area a strong base in education, though in no ways comparable to Stellenbosch with its university-dominance. The research and innovation at Stellenbosch Technopark and its close relationship with the Stellenbosch University has made Stellenbosch the most important contributor to the science and technology sector in the District. Similar to Stellenbosch, Paarl also has corporate headquarters and, due to its slightly stronger manufacturing base, seems well placed to attract others.

Being the largest town in the Drakenstein municipal area, Paarl/ Wellington have attracted all the major retail chains, making retailing a further growth sector. The nearby N1 has been a strong drawcard for retail expansion. To some extent, this as well as the broad sector base has also stimulated financial, property and business services.

In 2015 Drakenstein Municipality (29.33 per cent) and Stellenbosch Municipality (20.32 per cent) collectively employed 50% per cent of individuals in Cape Winelands District. The population of both municipalities is likely to increase further, the sector base of both is broad and the different growth sectors complement each other well. Both Stellenbosch and Drakenstein Municipalities have identified Klapmuts as a prospective sub-regional urban node along the N1. Residential and industrial development opportunities have been identified north and south of the N1, and the area has also been identified as having potential to serve as a regional freight logistics hub.

The following key infrastructure projects have been identified for Paarl;

- *Paarl CBD Upgrade*: Paarl is the economic centre of the Drakenstein municipality and is home to at least four major international companies namely Pioneer Foods, Nampak, Imperial Logistics and Distell. As a result, the relocation of businesses to the CBD and upgrade of the central town have been identified as an important project and economic opportunity. The Municipality entered into a Public Private Partnership Agreement with a consortium of property owners in the Paarl CBD in 2010. The first phase of the Agreement included upgrades to parking facilities and pavements in the area. The second phase of the Paarl CBD regeneration includes upgrades to Wamakers Square which currently house Pick 'n Pay and Woolworths as anchor tenants. Structural changes are planned with landscaping and beautification in the surrounding areas. The CAPEX R-Value is estimated at R100 million.

- *Paarl Waterfront Development*: Identified as a key catalytic project which will boost the tourism sector. The project consists of mixed use developments (including a hotel, restaurants, office blocks, sport science institute, etc.) located on the Berg River. This project is in the form of a PPP and the proposed use of the land has been as a luxury mixed use waterfront lifestyle development. This project has been put on hold. The Land Use Rights are in place and the ROD was transferred back to the Municipality. The Municipality envisages issuing a tender for development proposals with all of the rights in place. Total capex for the project will be approximately between 40 and 60 million rand for the sale of the land. This excludes any other infrastructural services. The anticipated total capex investment could be between R500 million and R1 billion rand.

3.2.2 Breede Valley Municipal area:

The area covered by Breede Valley Municipality consists basically of the N1-transport corridor between the entrance to the Karoo and Du Toitskloof Pass, together with the Wemmershoek mountain in the south west of the area. Worcester fulfils a multiple role in this area with the smaller places along the N1 corridor either directly linked to the transport sector or agricultural activities in the more immediate vicinity. Thus, Touws River derived its significance from the station and its role as transfer from steam to electricity – a role that has been lost and which caused the shrinking of the town's economic base. De Doorns has been linked to agriculture, with special focus on export grapes, where increased global competition has caused local stagnation. Rawsonville is agri-processing based, with additional activities due to its location at the inland edge of Du Toitskloof Pass. Smaller places to the north of the N1 are mostly linked to tourism (like Goudini and Matroosberg) and dispersed agricultural activities.

Worcester is the commercial, industrial, services and administrative hub of Breede Valley municipality, for development purposes the town has spare capacity i.e. sanitation, water and vacant developable land-industrial and residential. Through the N1 corridor and railway connections the town has optimal access to

the markets of the Cape Town metropolitan area. On a macro (district) scale it is believed that Worcester should be subject to an investment focus as a 'major service centre' due to being the largest town in the Northern Boland region with the broadest economic base. Worcester is also easy accessible from surrounding towns/towns located in the Langeberg & Witzenberg municipal areas. Breede Valley Municipality through Worcester as its economic hub contributed 18.9% towards the Cape Winelands district GDP, the highest after Drakenstein 33.3% and Stellenbosch 23.9%.

3.2.3 Witzenberg Municipal area:

In the Witzenberg municipal area the activities around towns are essentially agriculture based, with the towns being "agricultural service centres", with some agri-processing as well, related to wine, fruit, vegetable and other niche products. The proposed Agri Parks development and potential expansion of the agricultural sector will further stimulate economic growth in this municipal area.

Some places are well-known for their niche-products, like Ceres for its nearby cherry orchards in the mountainous hinterland. Parallel to agriculture, this municipal area is also strong in the tourism field, catering for Cape Town and other Western Cape day- and weekend tourists as well as up-country seasonal tourists. Once again, the continuation of diversified agriculture, some forestry and river fishing strengthen the attractiveness of the area for outside visitors. In addition, the diversity of small towns interspaced with farms and other rural sights (like snow-capped mountains) make the area particularly attractive for short-term visitors. The fact that these destinations are just a short distance from the N1 (and a mere 150-200 km from Inner-Cape Town) further adds to the comparative strength of the area for tourists.

3.2.4 Langeberg Municipal area:

Although the Langeberg municipal area has certain parallels with the Witzenberg area, there are also distinct differences, such as a relatively lower population growth.

The Langeberg area is far more strategically located, with the R60- south, linking with the N1, the R317 with the Overberg and the R60-north with Worcester as well as the N1 and the northern cluster of the District. In addition, Montagu provides the links to the R62, which is the main tourism route through the Klein Karoo, including Oudtshoorn and other Eden destinations.

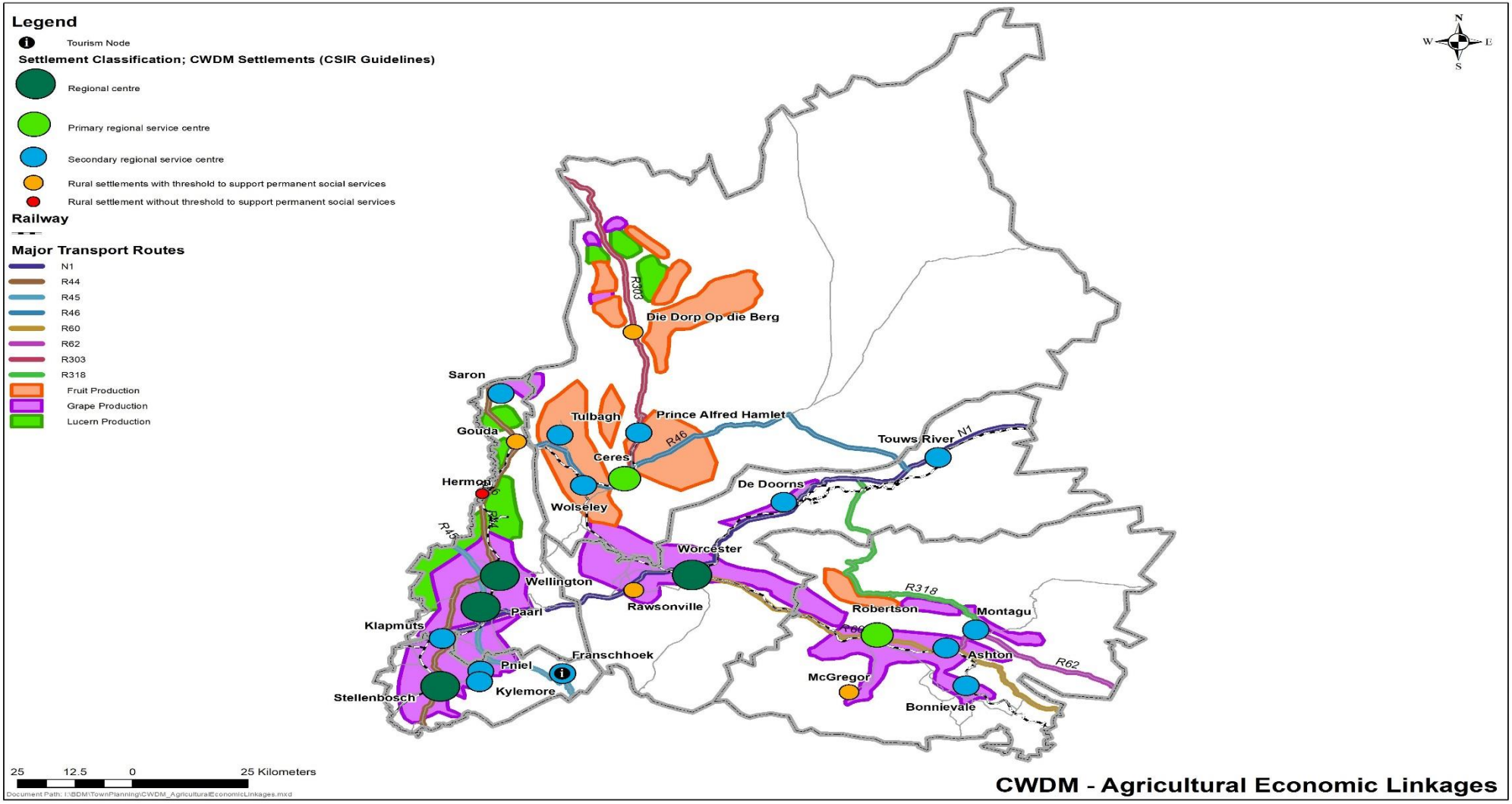
While Ashton is the industrial centre of the cluster, Robertson is the largest town and has the broadest economic base. This is further enhanced by its closeness to Worcester and its central location vis-à-vis the other places in the cluster.

Local economic development in this area is based on:

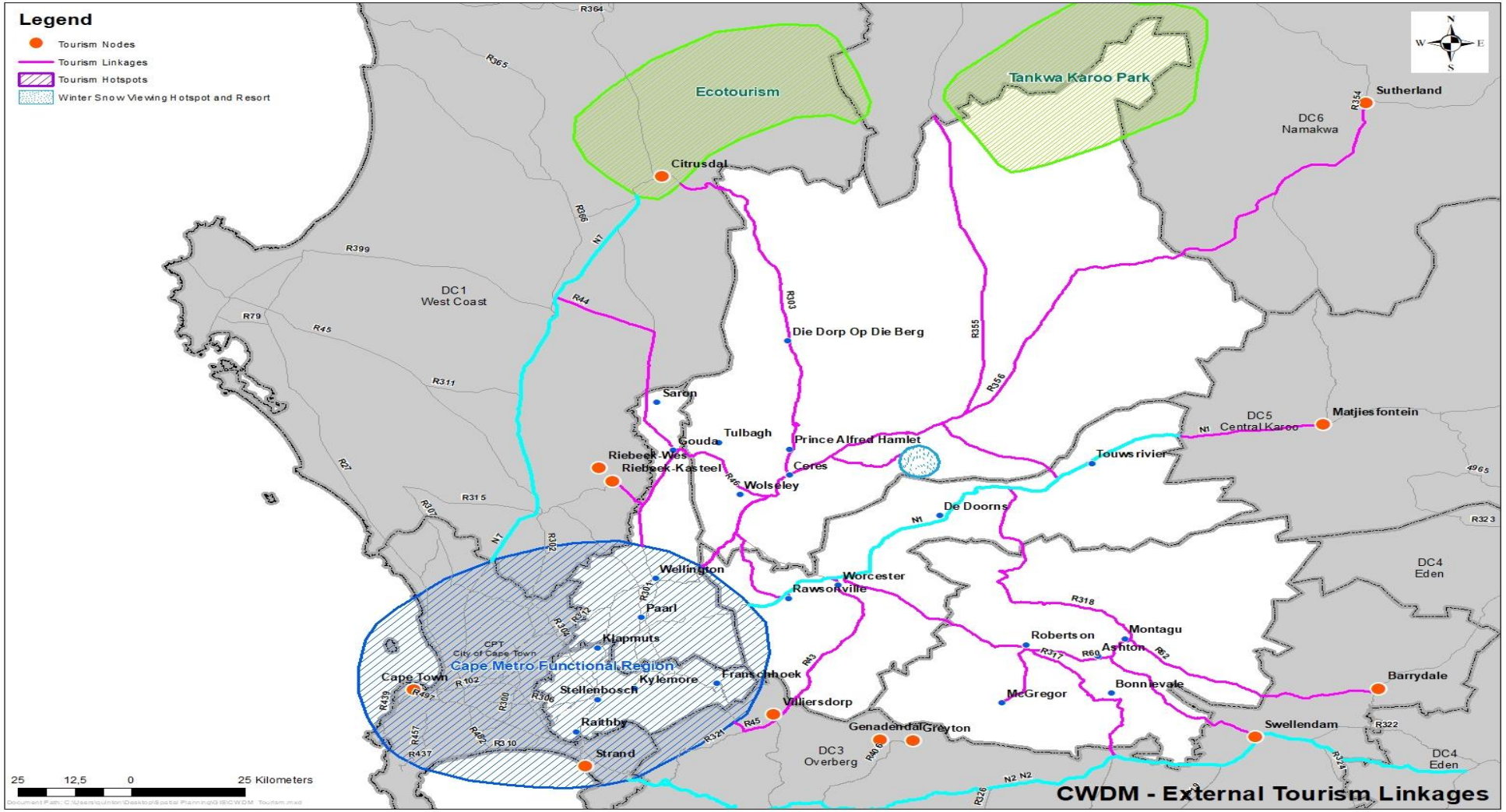
- diversified agriculture (including wine/grapes)
- tourism (catering for day, weekend, event, 'route', adventure/sport, health and cultural tourists)

- agri-processing
- retirement settlement
- other small-town functions

It is important to be aware of the opportunities arising out of the complementarity of these growth sectors. If anything, the diversity factor is even stronger here than in the Witzenberg area, although the respective towns are relatively small, so that economics of scale are not easily achieved. The proximity to both the N2 and the N1 is, however, a further advantage.



Map 15: CWDM Economic linkages, connecting routes, Settlements Classifications and tourism corridors (MERO, 2017).



Map 16: External tourism linkages

3.2.5 Implementation proposals

FOCUS AREA:	MUNICIPAL SPACE ECONOMY
STRATEGIES:	1. Stellenbosch Municipality: to watch carefully how growth impacts on the environment, on its "urban edge" and on the competition between different land uses; create a conducive policy environment to facilitate land use that strengthen sustainable economic growth sectors. 2. Drakenstein Municipality: view the current sector structure of this urban area in a positive light (sector base is broad and the different growth sectors complement each other well); create a conducive policy environment to facilitate land use that strengthen sustainable economic growth sectors 3. Breede Valley Municipality: improvement of service delivery to existing enterprises and households to prevent them from moving elsewhere or getting into profitability crises; ensure the closest possible interaction and co-operation between the public and the private sector; as far as poverty and unemployment pockets are concerned to facilitate the movement of households to larger urban areas may be as relevant as ad hoc social support and improvements in the most basic infrastructure services. 4. Witzenberg Municipality: be aware of the need to increase revenue base to ensure service delivery and maintenance of municipal services. 5. Langeberg Municipality: encourage the rationalization of agriculture and industry 6. Ensure that planning and implementation correspond with growth and development objectives of the private sector; promote pragmatism, flexibility and the closest possible interaction and cooperation between the public and the private sector; identifying which roles are best fulfilled by the state, and which should be left to the private sector and civil society - achieving most things in partnerships with other key stakeholders; government to facilitate on a joint basis efforts and assure that public programmes interact with private initiatives on a partnership basis; higher profiles are needed than what exist at present, together with proactive Public Private Partnership initiatives, possibly with stronger support from local universities. 7. Consider the most prominent factors influencing the agricultural economy to include land reform, land and water use, loss of natural habitat and urban expansion. 8. Counter the limited local development base of most towns with progressive strategies to optimize the use of available resources and infrastructure to, inter alia, give effect to a transformation agenda. 9. Strengthen the linkages between nodes/settlements to improve access for households from the areas with less economic potential to areas with greater potential to access employment and social opportunities. 10. For the 'small' towns like Hermon, Gouda, Saron, Prince Alfred Hamlet and Op-die-Berg where diseconomies of small scale will make it almost impossible to maintain personal services it seems as if it will be left to local community, corporate or small enterprise initiatives – encouraged, facilitated and monitored by municipalities and other public support agents – to address the needs. 11. Consider tourism nodes outside municipal boundaries that attracts traversing traffic; these tourism routes must be considered as potential development corridors (promoting land uses that comply with relevant Integrated Zoning Schemes and Municipal Bylaws).

	12. Optimize tourism potential of prominent tourist attractions/destinations.
PRIORITY:	HIGH

3.2.6 CWDM Implementation Plan: Municipal Space Economy

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Tourism training	R850 000, 00	Local Economic Development & Tourism Section	Annually
Tourism month	R27 350, 00	Local Economic Development & Tourism Section	Annually
Mayoral Tourism Awards	R122 000, 00	Local Economic Development & Tourism Section	Annually
Mayoral Tourism Awards Media Launch	R28 570, 00	Local Economic Development & Tourism Section	2018/2019
Educationals	R150 000, 00	Local Economic Development & Tourism Section	Annually
LTA Projects	R300 000, 00	Local Economic Development & Tourism Section	2018/2019
Tourism Campaign	R109 000, 00	Local Economic Development & Tourism Section	Annually
Tourism Events	R700 000, 00	Local Economic Development & Tourism Section	Annually
Township Tourism	R400 000, 00	Local Economic Development & Tourism Section	Annually

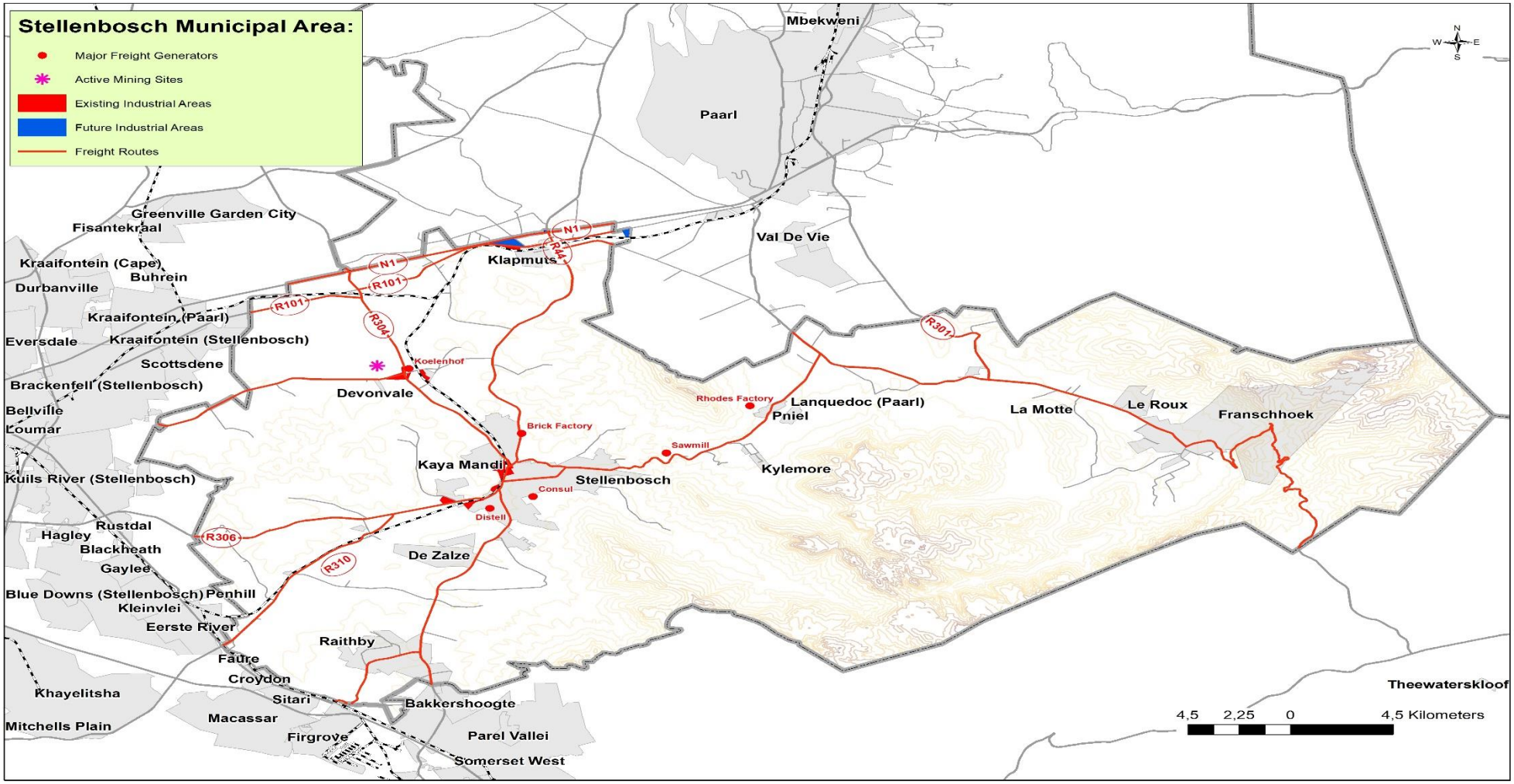
3.3 FREIGHT TRANSPORT AND ROUTES

According to the Cape Winelands Freight Transport Strategy (2013) the total freight volumes by surface transport (road and rail), as well as the volumes by rail analysis show that road freight is the most dominant freight mode currently in the CWDM and is likely to continue in the near future. Currently more than 95% of all freight will continue to be moved via road. Consultations with the Transnet Freight Rail (TRF) whom developed a Transnet Transport and Demand Model (2007) confirmed that the TRF does not foresee any rail network improvements in the next 20 years to accommodate freight movement. The existing rail network is deemed adequate to accommodate the expected increase in rail freight in the next 20 years.

Land use that have an impact on freight within the CWDM area is;

- Mining
- Industry-this refers mostly to industrial areas in towns
- Agriculture and agri-processing. Agri-processing refers specifically to processing that takes place outside of the established industrial areas in the towns of the Cape Winelands Impacted Freight Routes per B-municipal area;

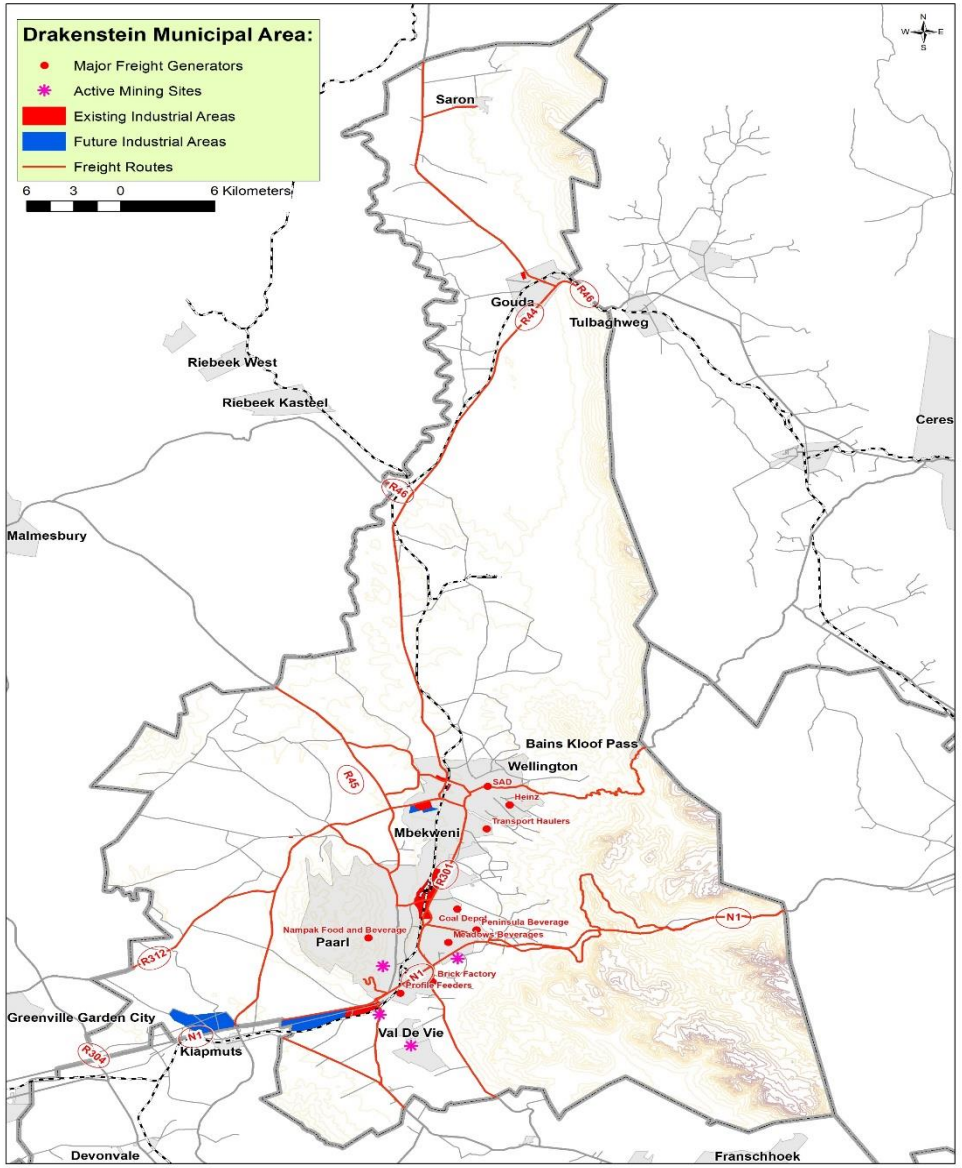
3.3.1. Stellenbosch Municipality/follows:



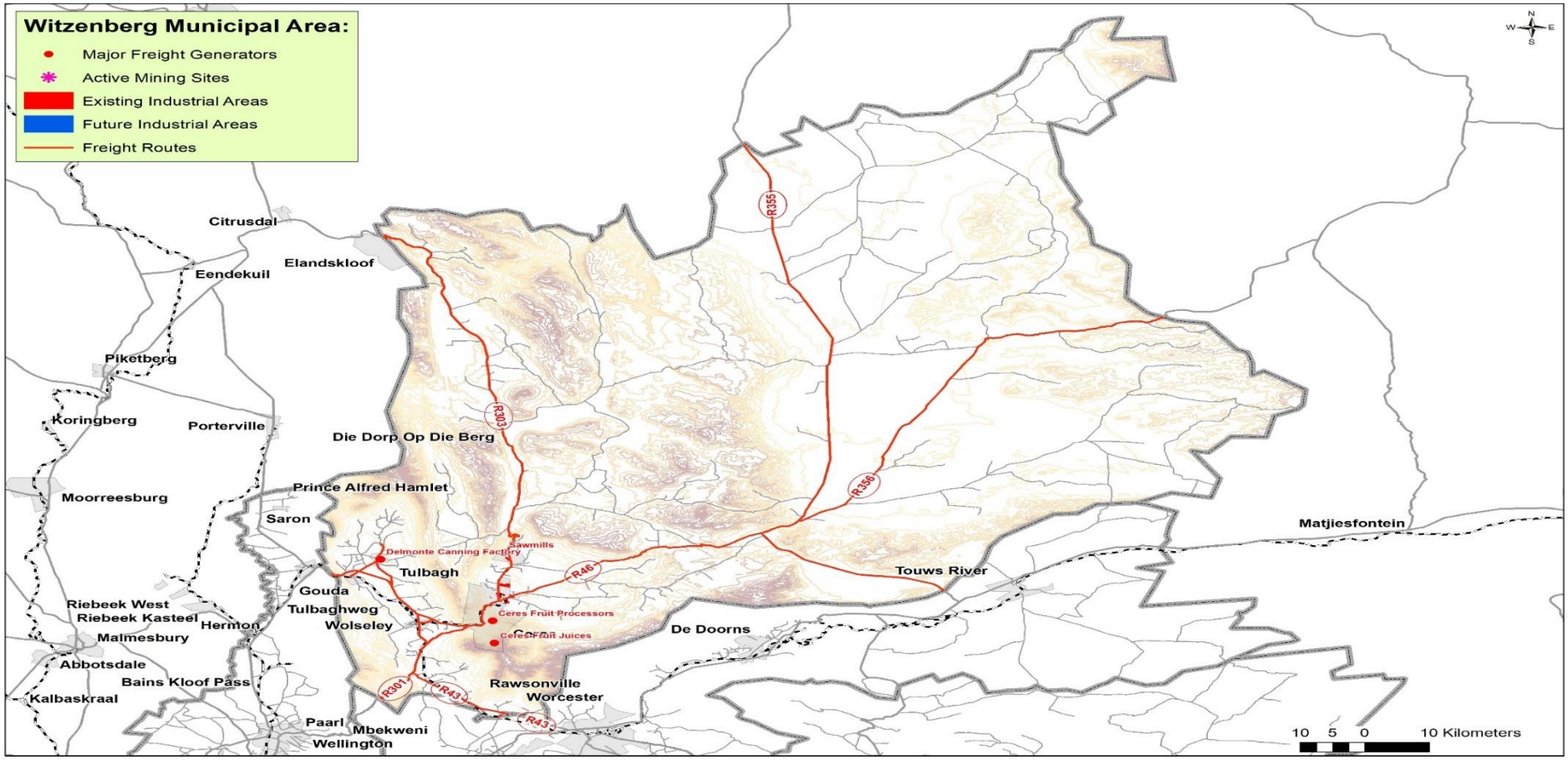
Map 17; the distribution of wine cellars and the agri-processing plants (major freight generators), as well as the location of industry in the Stellenbosch area illustrates that the main routes that connect Stellenbosch to Somerset West (the R44), Kuils River (R310), Klapmuts (R44), Brackenfell (R304) and Franschhoek (R310), as well as the R45 between Franschhoek and Paarl, carry significant amount of freight. In addition, secondary routes that provide access to farming areas off these routes also carry freight in the form of inputs into agri-processing (e.g. delivery of bottles) and distribution of the finished product (e.g. delivery of wine to the Cape Town Harbour for export).

3.3.2 Drakenstein Municipality

Map 18 (opposite); the R44 between Wellington and the N1, the R45 which connects Wellington to Gouda, Tulbagh and beyond and the R101 (Old Paarl Road) running parallel to the N1, Jan van Riebeeck Drive between Wellington and Paarl which connects to the N1 further south, and the R301 and R45 serving the Simondium Groot Drakenstein area, are important freight routes in the municipal area. The large number of freight companies situated in the area adds to the burden of heavy vehicles on these roads. Take out towns and blow up-check routes)



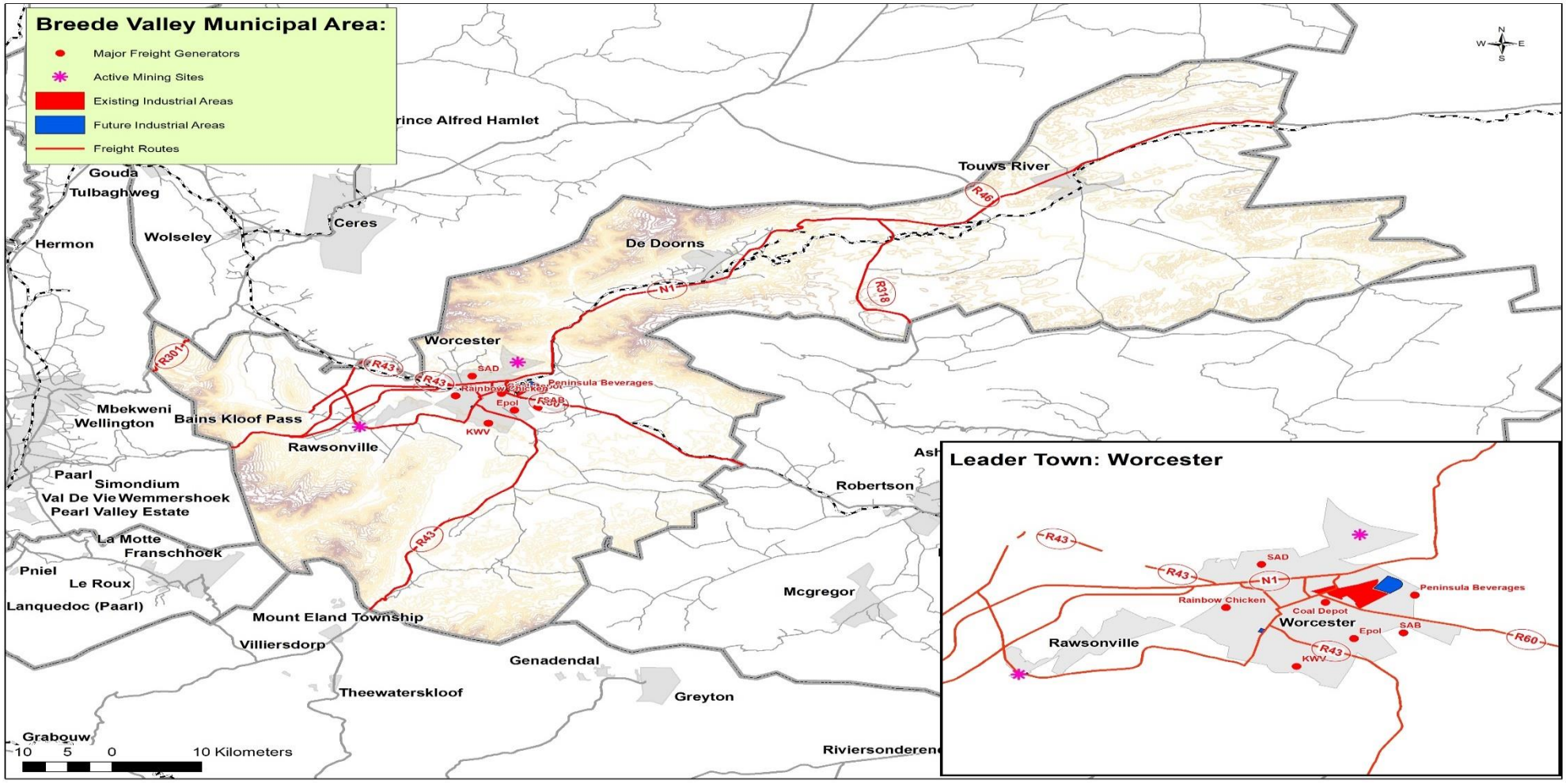
3.3.3 Witzenberg Municipality



Map 19; The transportation of high-quality fresh fruit and vegetables for export purposes is critical to the economy of the Witzenberg local municipality. Roads that are in a poor condition causes damage to the fruit which impacts negatively on grading and the selling price of the fruit. Important freight routes in this area includes the R301 to Op -die Berg and beyond, the R46 between Ceres and Gouda and the R44 from Gouda which then connects to the N1, and the R46 between Ceres and Touws River. The R43 between Ceres and Worcester are also important, it is used to transport packaging material for agri-processing in Witzenberg.

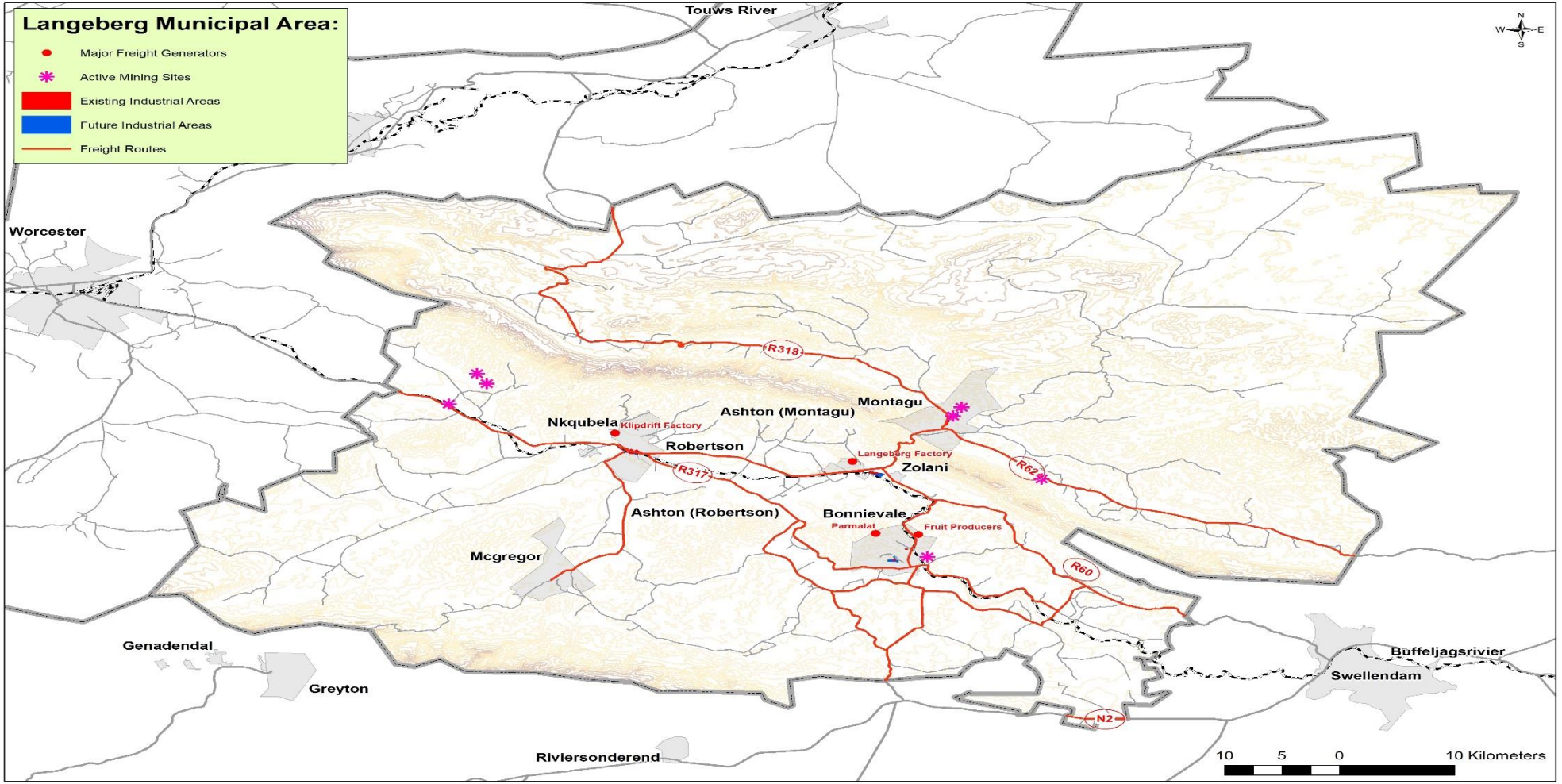
In addition to the quality of roads used to transport fresh produce, the fact that heavy vehicles en route between the N1 and the West Coast and other parts of the Western Cape pass through the town of Ceres (on Main Road) has been noted as a concern. The introduction of a weighbridge in the area has been put forward as a solution to at least discourage heavy vehicles who try to avoid weighbridges on the N1 to use this route.

3.3.4 Breede Valley Municipality/ follows



Map 20; freight generators in the Breede Valley are generally located close to major routes such as the N1 and the R60(to Robertson) and the R43(to Ceres), such as the high valuable table grapes crops of the Hex River Valley. Local officials noted the problem with heavy vehicles passing through the centre of Worcester en route to and from the R60 as an issue. The planned eastern bypass to the town, that will also provide additional access to its industrial area will solve this problem once implemented.

3.3.5 Langeberg Municipality



Map 21; the R62 and the R60 (from Ashton to Swellendam) are the most important freight routes in the Langeberg Municipal area, as they are used to distribute the produce of the region to the market. In addition, all roads that carry fruit to Ashton for processing is of vital importance to the local economy, including the route between Montagu and Ashton which is in the process of being upgraded. The historical and scenic value of the route will however possibly not result in increased carrying capacity. The R317 between Bonnievale and Robertson is also important as it provides access for local wine cellars and the Parmalat plat in Bonnievale.

3.3.6 Key findings: Freight Transport and Routes

3.3.6.1 Many of the Issues (Table 20) indicated by the CWDM Public Transport Regulation Section relate to locational inefficiencies of logistical distribution facilities. Products from the CWD is transported to Epping, Bellville etc. and then redistributed back to the CWD towns. i.e. fruit being transported to the Drydock in Bellville, Wine, dairy products being distributed to facilities in Epping and then transported back. Further logistical distribution inefficiencies are due Company procurement policies and internal economy stimulation e.g. Ceres Fruit Juice/Pioneer purchasing their packaging material at a "sister" company in Durban as opposed to purchasing the material at a company in Worcester.

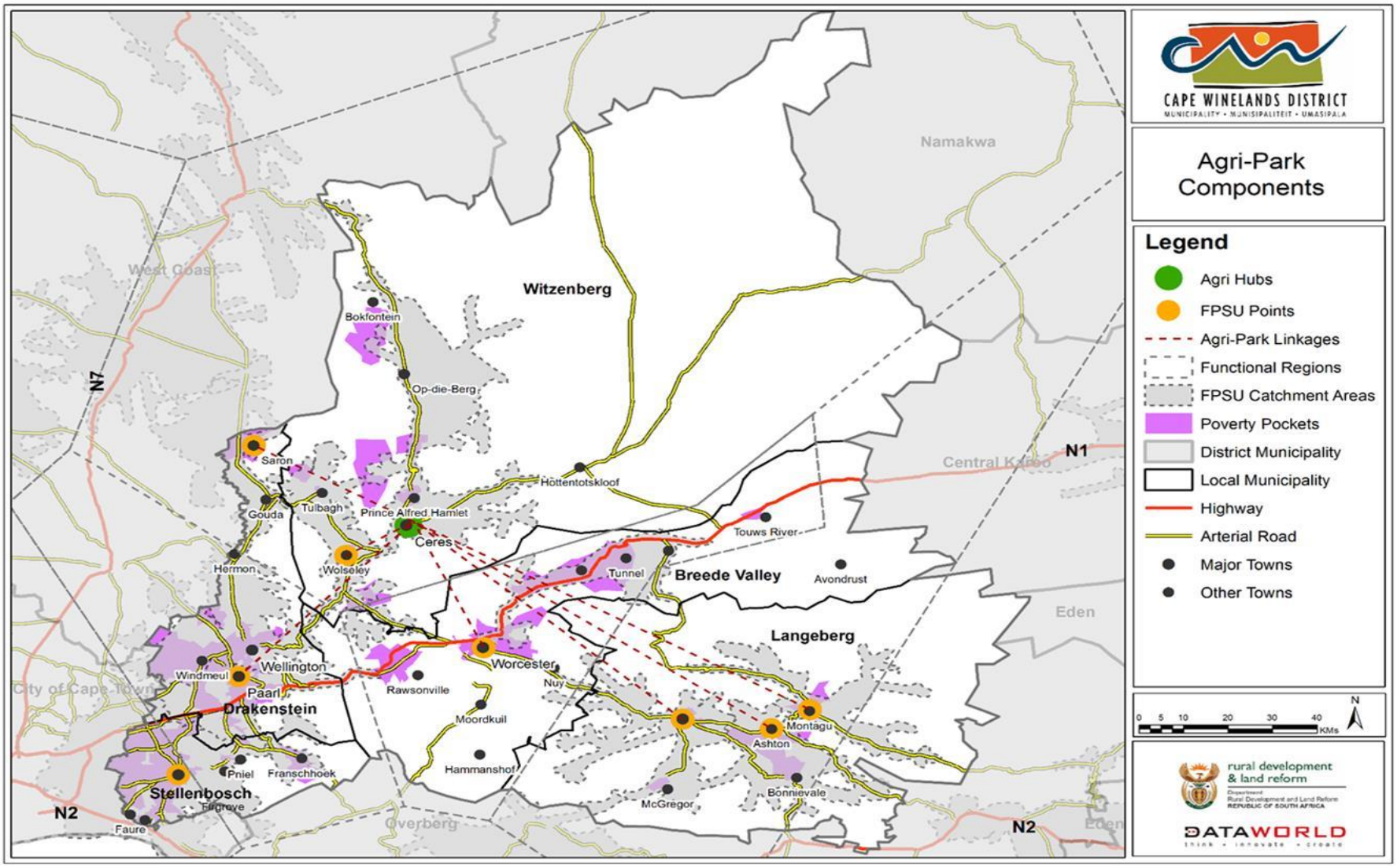
Table 19: Key issues and suggestions for freight and related routes.

Organisation	Issues	Suggestions
Imperial Cargo	• Vehicle movement through Paarl CBD area towards N1	• Upgrading of the Bo-dal Road to be able to accommodate heavy vehicles
Parmalat	• The R60 between Bonnievale and the N2 is closed to traffic after a large section collapsed • Operational efficiency at overloading control points	• Upgrade and maintenance of the R317 through Bonnievale to the N2 • Improve operational efficiency
APL Cartons	• Location of the weighbridge • Unreliability of rail service is main reason for not using it	• Truck stop facility (100 - 150 trucks) needed in Worcester • Improve rail service as it is ideally suited for inbound freight
Ceres Beverage Company	• Operational efficiency at overloading control points • Will make use of rail if there could be a siding at CBC	• Improve operational efficiency • Improve rail service and it could be used by many in Ceres • CWDM could assist in driver training and education
KWV	• Operational efficiency at Port in Cape Town • Lack of rail service to transport bulk wine	• Improve rail service and it could be used by many in Wellington
Unitrans	• Conditions of the rural roads • Impact of roadwork on cost (summer) • Access to the area north of the N1 in Worcester as trucks may not use N1/R60 IC	• Knowledge and communication around road works and condition of the roads • The Worcester bypass, with the inclusion of a link between the R60 and the R40 • Improve truck stops

	• Heavy vehicle traffic in the main road of Worcester • Truck stops; drivers avoid stopping at the truck stops	
Windmeul Eggs	• Traffic congestion on the roads towards Cape Town • The condition of the roads has a negative impact on costs. • Operational efficiency at overloading control points	• Improve operational efficiency at overloading control points
Distell	• Lack of rail service to transport bulk wine • Operational efficiency at Port in Cape Town • Operational efficiency at overloading control points	• Improve rail service • Improve operational efficiency • Improve operational efficiency
Hortgro	• Minutes	• Congestion at the entrance of the port in Cape Town. • Bypass opportunities on the R45 between Gouda and Wellington • Heavy vehicles with fruit greatly affect Ceres and Paarl.

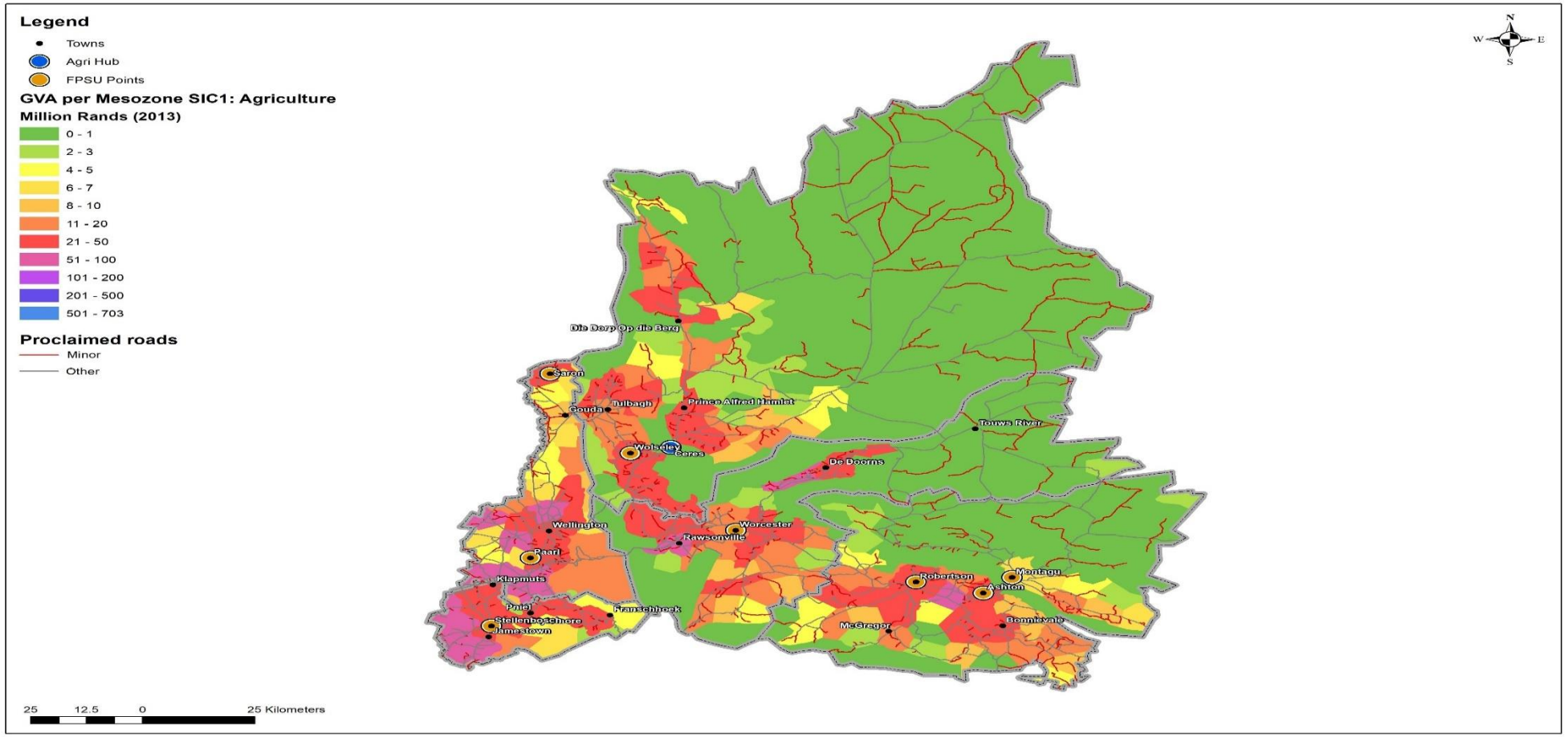
3.4 AGRI PARKS DISTRICT LEVEL IMPLEMENTATION: SPACE ECONOMY LINKAGES

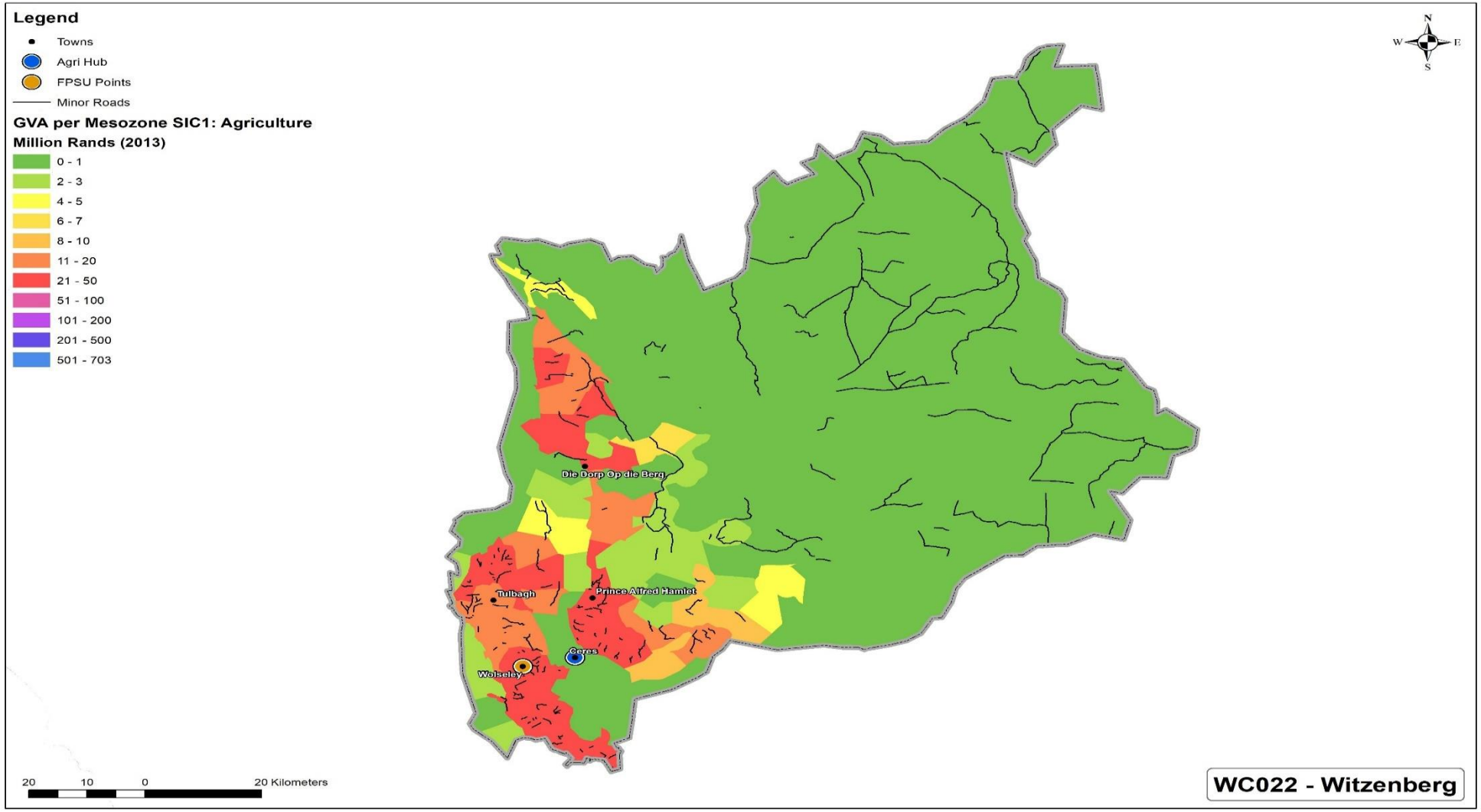
The Department of Rural Development and Land Reform (DRDLR) will be focussing resources and budgets on the various catchments surrounding the identified Farmer Production Support Units (FPSU's). These catchments have been identified based on a 30km distance along the existing road network and will enable various role players to target suitable strategic land for production support as well as land reform purposes. The DRDLR has prioritised Agri-park implementation in Saron, Stellenbosch, Ceres for the 2017/18 financial year and Paarl, Robertson, Montagu, Ashton and Worcester for the years thereafter. Here the focus will be on the establishment of the necessary Farmer Production Support (FPSU) Infrastructure as well as support to emerging farmers and the local community within the FPSU catchments (refer to Map 23 below).



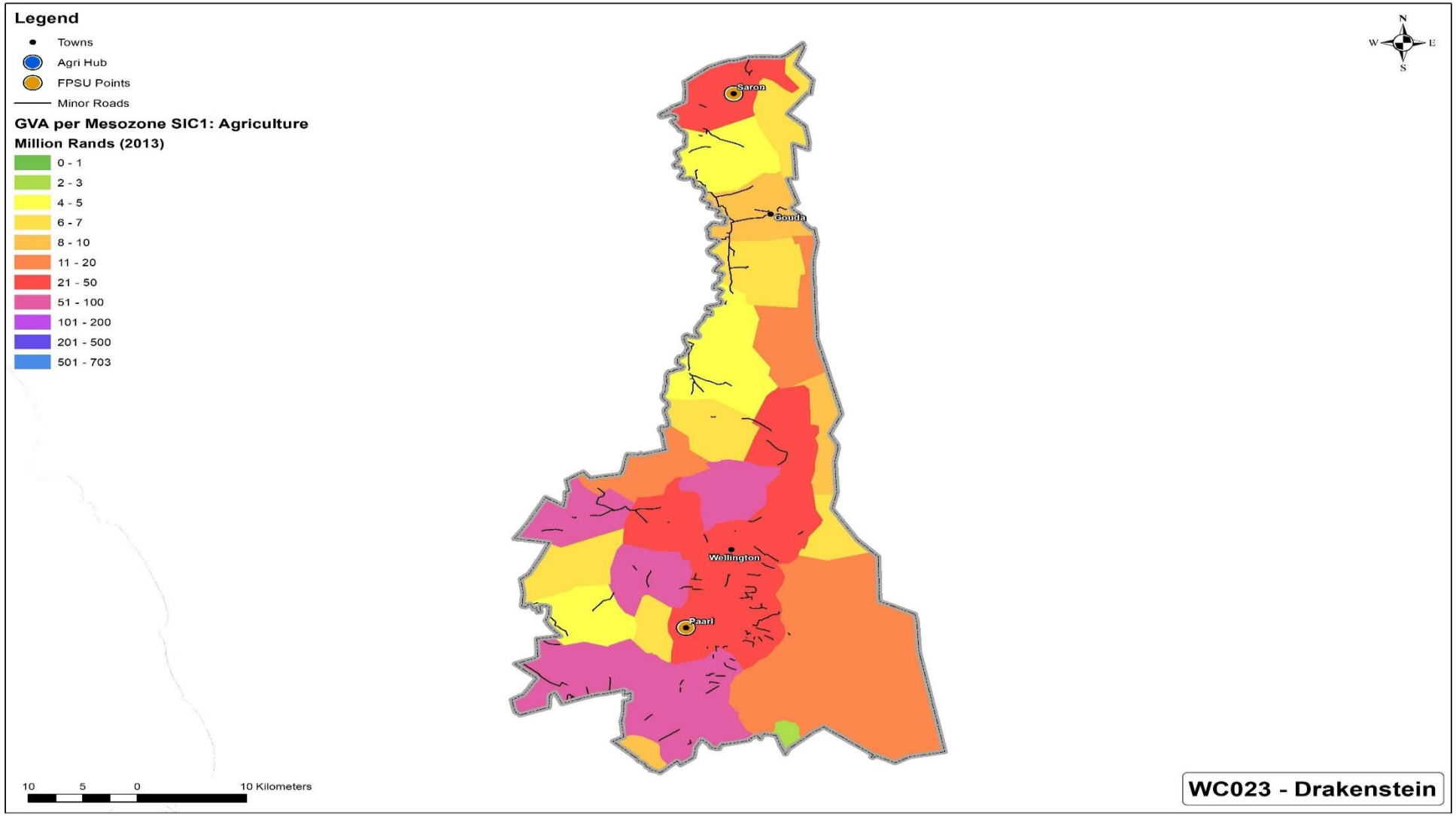
Map 22: Agri-Park components.

Map 23 illustrates the proposed Agri Park Components and Gross Value Added per Mesozone in terms of Agricultural production and important minor and primary routes. The CWDM fulfil a Roads agency function on behalf of the Western Cape Provincial Government. This function entails maintaining provincial roads but does not include important minor roads that are used by the agricultural sector due to insufficient funding that is provided by the Western Cape provincial government. It is crucial that these minor roads that at least fall within the middle to high end mesozones must be maintained due to regular use for transporting goods from these areas.

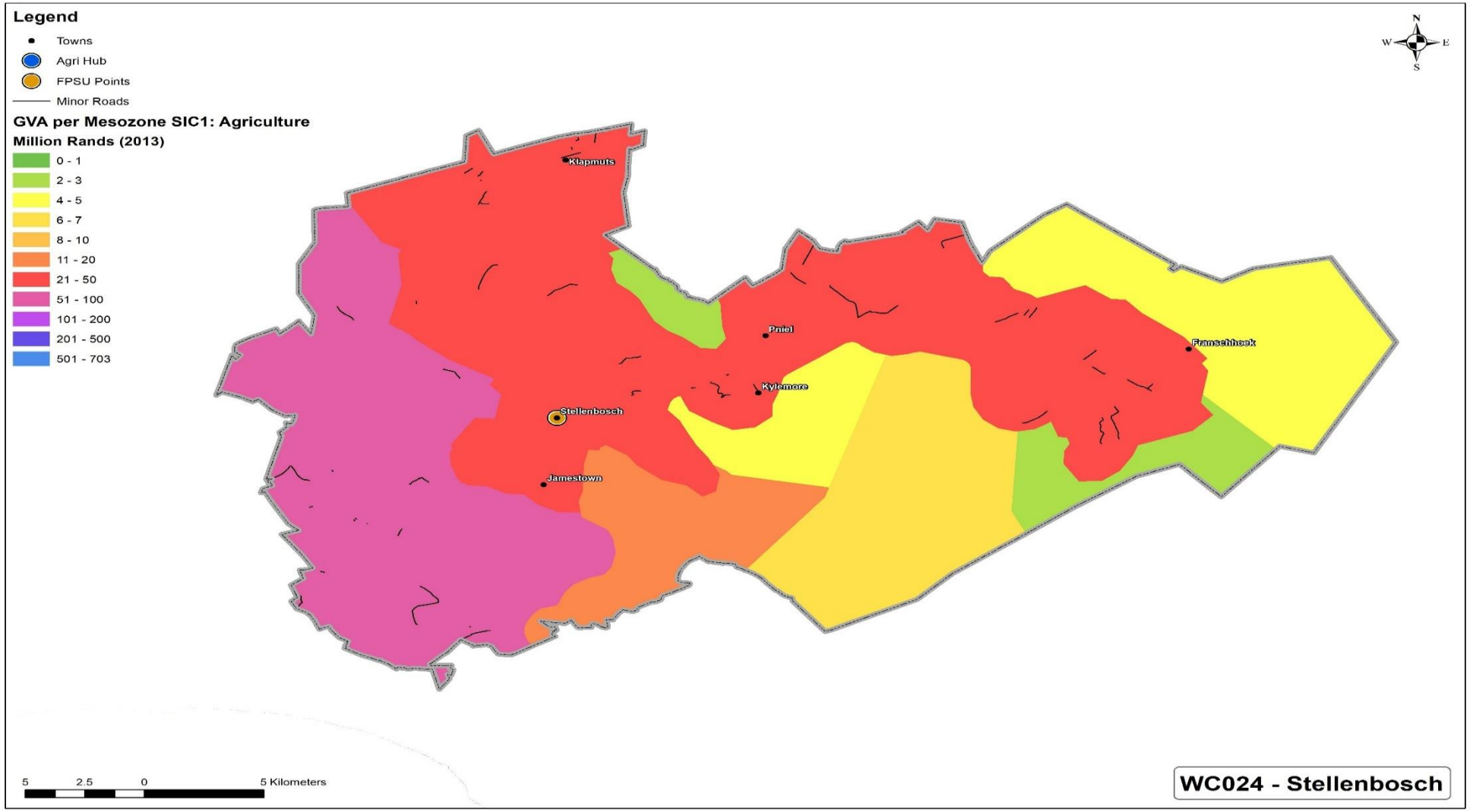




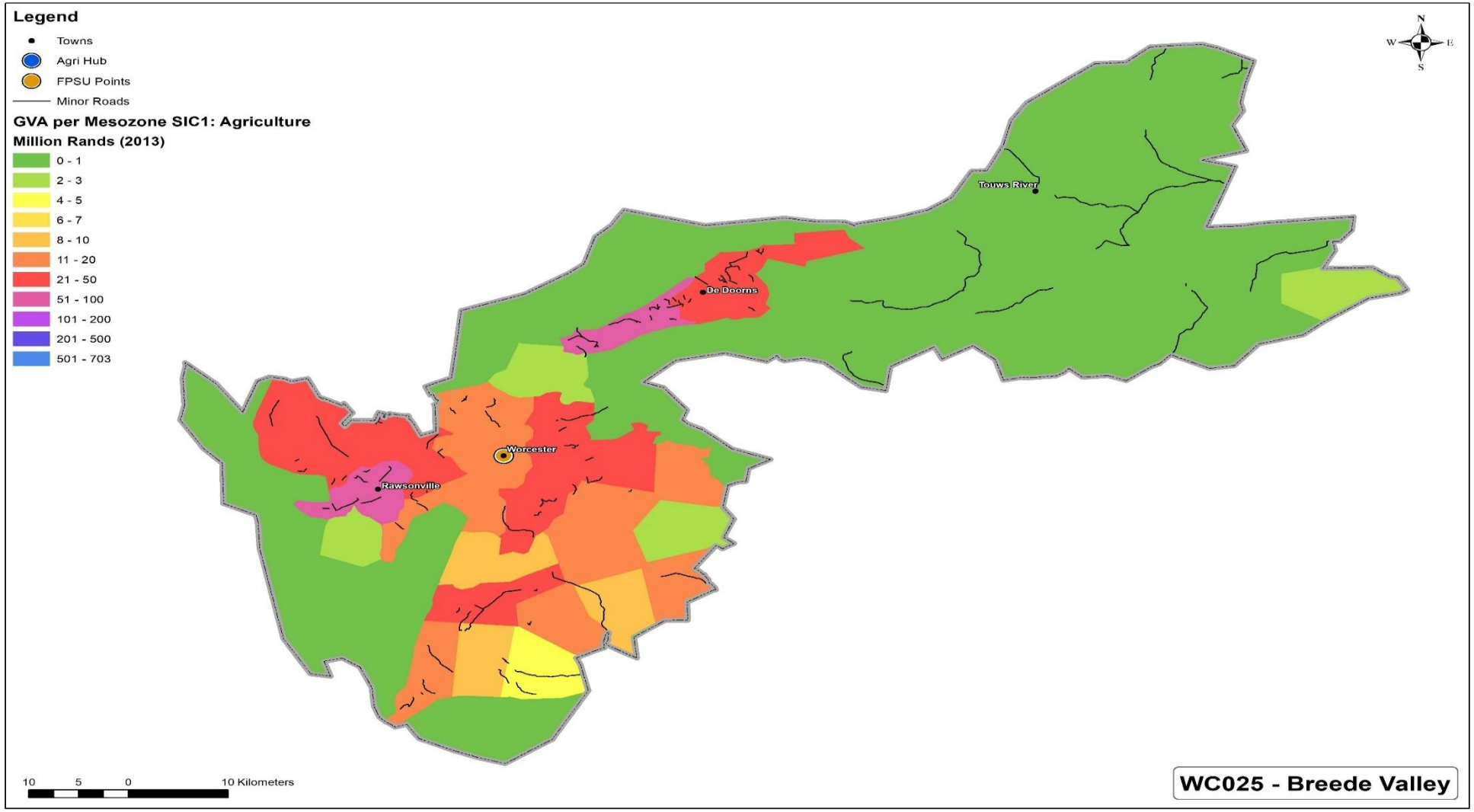
Map 24: Witzenberg agricultural mesozones and minor roads.



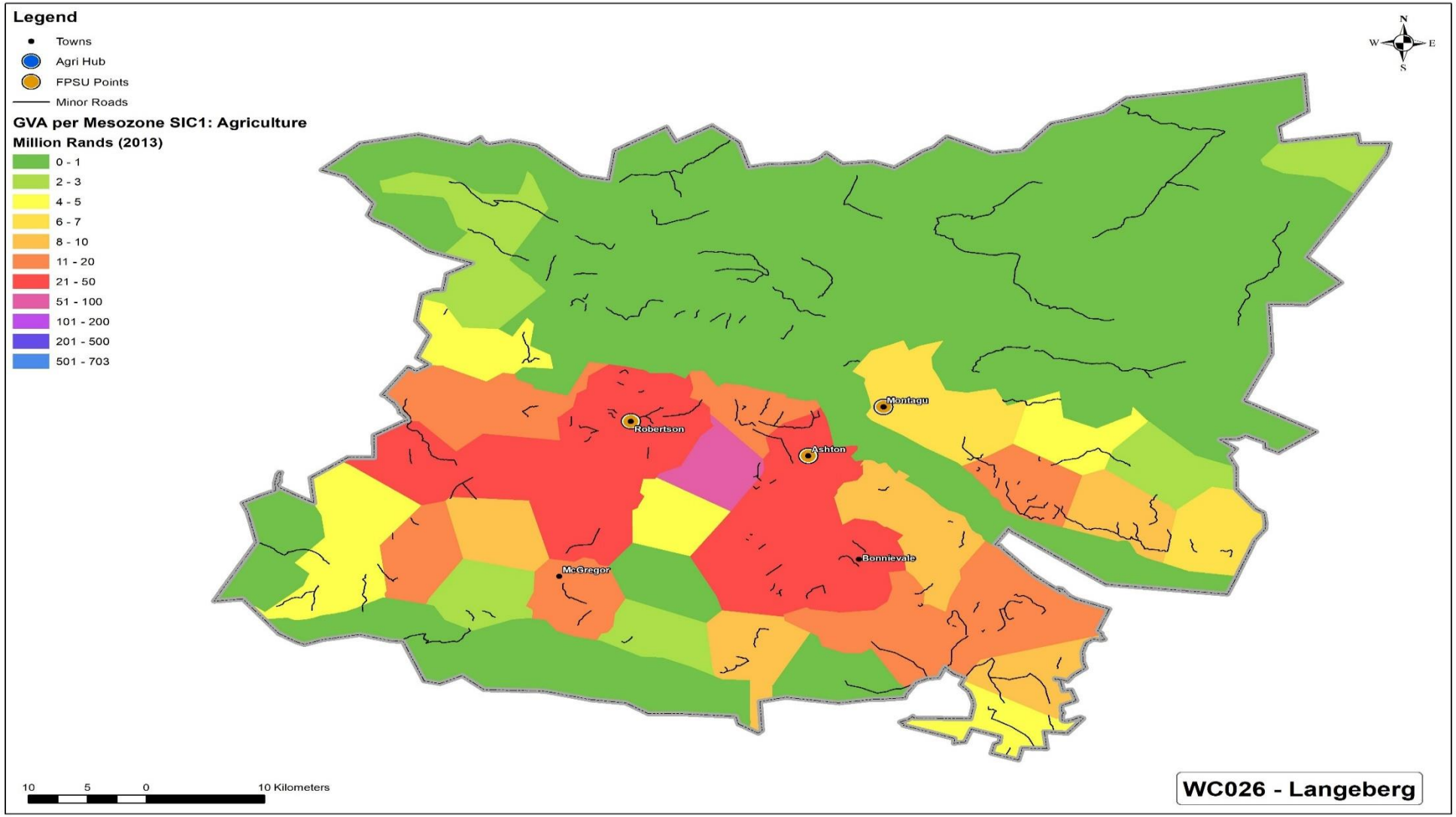
Map 25: Drakenstein agricultural mesozones and minor roads.



Map 26: Stellenbosch agricultural mesozones and minor roads.



Map 27: Breede Valley agricultural mesozones and minor roads.



Map 28: Langeberg agricultural mesozones and minor roads.

3.4.1 Key findings: Agri Parks District Level Implementation: Space Economy Linkages

3.4.1.1 Support is needed from all relevant stakeholders (National, Provincial, Local Government, NGO's and private sector) to ensure that the Agri Parks proposal is implemented successfully.

3.4.1.2 The CWDM fulfil a Roads agency function on behalf of the Western Cape Provincial Government. This function entails maintaining provincial roads but does not include important minor roads that are used by the agricultural sector due to insufficient funding that is provided by the Western Cape provincial government. It is crucial that these minor roads that at least fall within the middle to high end mesozones must be maintained due to regular use for transporting goods from these areas (refer to map 21).

3.4.1.3 The Department of Rural Development and Land Reform proposes the following agriculture related projects [Draft Rural Development Plan for the CWDM, 19 December 2016]; Table 20 (below): Agriculture projects; Livestock

Project Name	Project Description	Project Driver
Small scale farming on municipal commonage	This project entails the establishment of farming opportunities for existing small scale livestock farmers.	Witzenberg LM
Increasing the size of the communal in De Doorns	Communal land in De Doorns is being used for the grazing of livestock in the area. The demand for this land is exceeding supply, it is therefore proposed to make more land available.	To be determined (possibly Breede Valley LM)
The use of grey water for the irrigation of communal pasture	There is currently not enough water to irrigate the communal pasture in Worcester. It is therefore proposed that grey water/treated waste water be used for irrigation.	To be determined (possibly Breede Valley LM)
Agrarian reform program (Klapmuts)	This project entails the facilitation of grazing opportunities for small scale farmers on vacant land (portions of Erf 736 Klapmuts) and to support the local food chain	Drakenstein LM, CWDM
Commonage livestock pen in Ashton	Overcrowding of livestock and inappropriate housing of livestock has led to the realisation of the need for a livestock enclosure in the town of Ashton.	To be Determined
Osdam abattoir	This is an agri parks project aimed at increasing the meat processing capacity in Ceres (Skoonvlei industrial park). The abattoir will process sheep and cattle to produce red meat.	DRDLR
Local mobile egg farming operation	This is a mobile egg farming business. The owner of this business has been in operation for the past 43 weeks. He is currently seeking funding from DRDLR to expand his business as he believes there is considerable scope for demand for his product in the area.	To be determined

Table 21: Agriculture projects; Crops

Project Name	Project Description	Project Driver
Small farmers support program	This program supports small scale farmers in the district with the objectives of: • Promoting BBBEE • Creation of alternative income for seasonal and unemployed workers • Address issues of poverty and social development The program provides direct assistance such as the purchasing of equipment, provision of grants etc.to small scale farmers in various locations in the CWDM.	CWDM
Bella fruit cold storage	The BA Kamer company is seeking to build a controlled atmospheric complex (cold storage unit) for pears and apples in Bella Vista in Witzenberg LM. This will create the necessary capacity to meet the high demand for cold fruit storage in the area.	BA Kamer company /DRDLR
Agri life fruit project	This is a 65% black owned agricultural business focusing on agri processing and is situated in the town of Wolseley. The project aims to provide post-harvest services to fruit farmers in the Witzenberg area (mainly around the Ceres-Tulbagh area).	To be determined
CCS cold storage	This project entails the construction of a cold storage unit consisting/making use of 'dynamic control atmosphere' technology to increase the lifespan of fruits in storage. The project will be located in Ceres.	To be determined
Mentoring & training: Nduli	This project focuses on mentoring & training of a vegetable production enterprise which is a supplier to Freshmarkets and Ceres Spar.	DRDLR: REID

Table 22: Agriculture projects; Agri processing/

Project Name	Project Description	Project Driver
Cape Winelands District Municipality Skills Development	This project forms part of the Agri Parks Initiative and entails the skills development of the small holder farmers and farm workers in small scale agriculture, the fostering of business partnerships between private and public sector and the promotion of agricultural value chain linkages in the CWDM.	DRDLR
Agri processing hub (Saron)	Consolidate industrial requirements for surrounding farmers and local agriculture at central processing hub for small scale production and packaging. Identify and secure municipal land	Drakenstein LM
Upgrading of infrastructure to connect underutilised land in Worcester	Utilities infrastructure such as electricity cables and water pipes are needed to connect underutilised land in Worcester. It is envisioned that this land can serve the agricultural industry through creating new producers (small holder farmers on lease.)	To be determined (possibly Breede Valley LM)
Provision of an irrigation dam in the Touwsrivier area	It is proposed that an investigation into the provision of an irrigation dam is conducted, this dam is to supplement the available water for small holder farmers in the Breede Valley area.	To be determined (possibly Breede Valley LM)
Increasing the wall of the Brandvlei Dam	The aim of this project is to increase the water storage capacity of the Brandvlei dam. This may create further opportunities for increased agricultural activity.	Breede Valley LM
Agricultural Graduates (2015/16): Skills Development	This is the recruitment and placement of unemployed agricultural graduates on DRDLR: REID land reform projects. Graduates in the Cape Winelands specialise (as interns) in: Animal Production, Hydroponics, Plant Production, Agricultural Economics.	DRDLR: REID
Halaal Industrial park (possibly in Cape Winelands	Establishment of an industrial park dedicated to agri-processing of halaal food products for export and local consumption has been proposed. Cape Town and Stellenbosch has been proposed as possible sites for this project.	To be determined
Selfsorg centre – food garden in Prince Alfred Hamlet	The aim of this project is to enable the community to produce their own food and to beautify the town of Prince Alfred Hamlet. This will contribute to tourist activities as well as promote food security in the town.	WCDoA
Bella Vista food gardens	The aim of this project is to enable the community to produce their own food and to beautify the town of Bella Vista.	WCDoA
Bella Vista bakery	This project entails the funding of the construction of a bakery in Bela Vista which will focus on the processing of agricultural produce and the production of confectionary and pastry foods.	WCDoA/Casidra
Nduli food laboratory	This project will entail the establishment of a food lab in which the quality of food and agricultural products will be tested and graded before distribution.	WCDoA/Casidra
Agri processing plant in Ceres	The market for agri processing is not yet saturated. It has therefore been proposed that a new agri processing plant be developed focusing on the processing of crops such as deciduous and stone fruits.	To be determined
Ceres fruit growers' cold storage	Development of a fruit cold storage unit in the town of Ceres in order to overcome the seasonality of supply (especially of fruit).	Ceres Fruit Gowers Pty (Ltd) & DRDLR: REID

3.4.2 Implementation proposals:

FOCUS AREA:	AgriParks District Level Implementation: Space Economy Linkages
STRATEGIES	1. Strengthen rural support programmes for commercial and small-scale farming and develop the potential of the agricultural value chain. 2. Prioritize maintenance of minor roads in higher value mesozones.
PRIORITY:	HIGH

3.4.3 CWDM Implementation Plan: Agri Parks District Level Implementation: Space Economy Linkages

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
Road Maintenance	R128 173 608, 00	Technical Services	2018/2019
Agri Parks Coordination	R47 500 & operational budget	Local Economic Development & Tourism Section	2018/2019
Infrastructure Rural Area Farmers	R1000 000, 00	Projects and Housing Section	Annually
Clearing of Road Reserves	R1 075 000, 00	Projects and Housing Section	Annually

4. BIODIVERSITY AND ECOSYSTEM SERVICES

4.1 BIODIVERSITY

The Cape Winelands District Municipality (CWDM) lies within one of the world's greatest biodiversity hotspots, the Cape Floristic Region (CFR) now known as the Core Cape Sub-Region (CCR), and includes parts of the Fynbos, Succulent Karoo, Albany Thicket and Afro-temperate Forest biomes[1]. The Fynbos and Succulent Karoo biomes have exceptionally high levels of plant diversity and endemism (species that occur only in a specific area and nowhere else). The CCR contains around 9383 vascular plant species with an endemism rate of just over 68%[1].

The high species diversity along with the range restriction of many species makes the CCR especially vulnerable. Of the 2577 taxa threatened nationally, 71% are located in the Western Cape[1]. They are predominantly from low-lying areas where agriculture and urbanisation has had the biggest Impact. Fynbos habitat loss is rated to be just over 30%. In the Fynbos biome 3087 taxa are of conservation concern with 1736 in danger of extinction[1]. 34% of taxa of conservation concern are due agricultural crops and 27% due to urbanisation and infrastructure developments. A further 20% of taxa are affected by invasive alien species. *Pinus* and *Hakea* species are affecting many mountain flora, a particularly important aspect for the CWDM which contains many mountainous areas.

Fire plays an important role in the health and maintenance of biodiversity in Fynbos. Many flower species have evolved to appear after fires and are then succeeded over the years by longer lived shrubs[1]. The composition of species is thus affected by the fire interval and the season in which a fire occurs. Increased fire frequency poses an especially big risk to slow growing alpine species and serotinous taxa. Those areas close to human settlements and roads are most at risk.

The Succulent Karoo boasts more than 5000 species with more than 50% of plant species endemic to the biome[2]. However, only around 5,8% of the biome is formally protected[3].

Being situated in such a unique area, the CWDM and local municipalities have a responsibility to aid in the protection of the CCR for present and future generations both locally and from around the world as it has such great value.

Development decisions should consider the Western Cape Biodiversity Spatial Plan and its accompanying handbook. Developments should especially avoid impacting on Critical Biodiversity Areas and Ecological Support Areas:

Critical Biodiversity Areas (CBAs): Areas that are required to meet biodiversity targets for species, ecosystems or ecological processes and infrastructure. These include:

- All areas required to meet biodiversity pattern (e.g. species, ecosystems) targets;
- Critically Endangered (CR) ecosystems (terrestrial, wetland and river types);

• All areas required to meet ecological infrastructure targets, which are aimed at ensuring the continued existence and functioning of ecosystems and delivery of essential ecosystem services; and

• Critical corridors to maintain landscape connectivity.

CBAs are areas of high biodiversity and ecological value and need to be kept in a natural or near-natural state, with no further loss of habitat or species. Degraded areas should be rehabilitated to natural or near-natural condition. Only low-impact, biodiversity-sensitive land uses are appropriate. In the maps, a distinction is made between CBAs that are likely to be in a natural condition (CBA 1) and those that are potentially degraded or represent secondary vegetation (CBA 2). This distinction is based on best available land cover data, but may not be an accurate or current reflection of condition.

Ecological Support Areas (ESAs): Areas that are not essential for meeting biodiversity targets, but that play an important role in supporting the functioning of PAs or CBAs, and are often vital for delivering ecosystem services. They support landscape connectivity, encompass the ecological infrastructure from which ecosystem goods and services flow, and strengthen resilience to climate change. They include features such as regional climate adaptation corridors, water source and recharge areas, riparian habitat surrounding rivers or wetlands, and Endangered vegetation.

ESAs need to be maintained in at least a functional and often natural state, in order to support the purpose for which they were identified, but some limited habitat loss may be acceptable. A greater range of land uses over wider areas is appropriate, subject to an authorisation process that ensures the underlying biodiversity objectives and ecological functioning are not compromised. Cumulative impacts should also be explicitly considered.

In the maps, a distinction is made between ESAs that are still likely to be functional (i.e. in a natural, near-natural or moderately degraded condition; ESA 1), and Ecological Support Areas that are severely degraded or have no natural cover remaining and therefore require restoration (ESA 2).

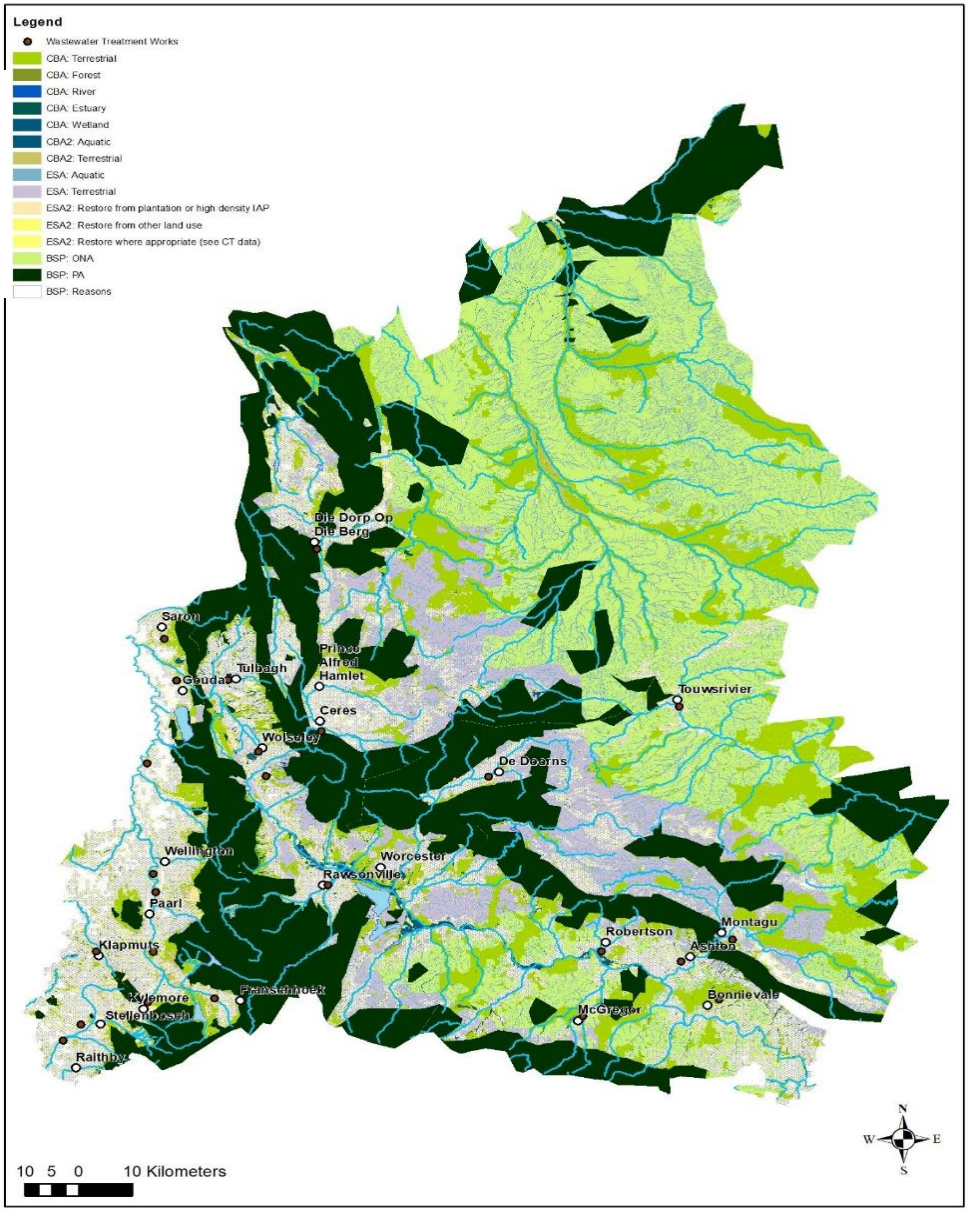
Other Natural Areas (ONAs): Areas that have not been identified as a priority in the current biodiversity spatial plan but retain most of their natural character and perform a range of biodiversity and ecological infrastructure functions. Although they have not been prioritised for meeting biodiversity targets, they are still an important part of the natural ecosystem.

ONAs should be managed or utilised in a manner that minimises habitat and species loss and ensures ecosystem functionality through strategic landscape planning. These 'other natural areas' offer considerable flexibility in terms of management objectives and permissible land uses, but some authorisation may still be required for high impact land uses.

Severely Modified to No Natural Remaining (NNR): Areas that have been modified by human activity to the extent that they are no longer natural, and do not contribute to biodiversity targets. These areas may still provide

limited biodiversity and ecological infrastructure functions, even if they are never prioritised for conservation action. These areas offer the most flexibility for land use, but these should be managed in a biodiversity-sensitive manner, aiming to maximise ecological functionality. Authorisation is still required for high-impact land uses.

Map 29 indicates areas important for the protection of biodiversity and ecosystem services (WCBSP 2017).



4.2 ECOSYSTEM SERVICES

Ecosystem services are the benefits humans get from ecosystems. These are grouped into four main categories: Provisioning (e.g. production of food and water), regulating (e.g. Control of climate and disease), supporting (e.g. Nutrient cycling and crop pollination) and cultural (e.g. Spiritual and recreational activities).

Sustainable cities are only possible through healthy ecosystems and incorporating ecosystem services into planning and development can lead to significant municipal savings, boost local economy and improve the quality of life for residents[4]. Maintaining ecosystem services is the most affordable approach to meeting people's needs[4].

The lack of understanding by policy makers of the economic value of fynbos ecosystems is often what leads to a lack of funding for environmental management[5]. This clearly demonstrates the need for local municipalities to evaluate the economic value of the ecosystems services in their area to facilitate funding. A 1997 study, taking into account water production, wildflower harvesting, hiker visitation, ecotourism visitation, endemic species and genetic storage, estimated the value of a 4km^2 area fynbos between R19 mil and R300 mil depending on the valuation and management methods (1USD = 4.50ZAR)[5].

The ICLEI TEEB Manual for Cities suggest the following steps to incorporate ecosystem services into urban management:

1. Specify and agree on the problem or policy issue with stakeholders
2. Identify which ecosystem services are most relevant
3. Determine what information is needed and select assessment methods
4. Assess (future changes in) ecosystem services
5. Identify and assess management/policy options
6. Assess the impact of the policy options on the range of stakeholders

Steps should be taken to ensure the protection of freshwater ecosystems due to the arid nature of the CWD and the Western Cape in general. Initiatives should be undertaken to clear alien species, restore/protect riparian zones and wetlands, and implement farming best practices, to maximise the amount of available water, its quality and maintain the flood regulating benefits gained from healthy freshwater ecosystems.

4.3 INVASIVE ALIEN SPECIES

Invasive alien plants are having a serious impact, not only on our biodiversity, but also on the ecosystem services provided by fynbos, especially relating to water provisioning. Invasive plants significantly increase the biomass and transpiration in water catchment areas reducing runoff and streamflow, meaning less water for the population. Reductions between 30 and 100 percent have been estimated for downstream yield due to alien species[5,6]. Furthermore, the increased fuel load created by alien plant infestations has increased fire frequency, a subsequent rise in surface water runoff and top soil erosion[6].

Invasive species are likely to have significant impacts on pollination, water purification, pest control, natural hazards and climate mitigation services obtained from ecosystems. They can narrow waterways and decrease water retaining capacity, thereby increasing flood risk[6].

Furthermore, invasive species can have detrimental effects on human wellbeing[7]. However, conflict can arise between those aiming to remove the invasive species and rural/poor communities who rely on the invasive populations for fuel and building material.

It has been demonstrated that invasive species can reduce the value of fynbos ecosystems by over US$11,75 million[7].

4.4 CAPE WINELANDS BIOSPHERE RESERVE

The Cape Winelands Biosphere Reserve (CWBR) was designated by UNESCO in accordance with the Man and the Biosphere (MAB) Programme

in September 2007. It covers an area of 322 030 ha. It is stated the CWBR would support the development of the Cape Winelands as "an area of excellence and good practice for people, culture and nature". The main purpose of the CWBR therefore is to promote biodiversity, sustainable development and education. It shares a border with the Kogelberg Biosphere Reserve in the south and covers an area northward along the Cape Fold Mountains and valleys of the Cape Winelands. It covers the Stellenbosch local Municipality and parts of the Breede Valley, Witzenberg and Theewaterskloof local municipalities (Map 30). It consists of three regions: the core (pristine area where no intrusive development is allowed), buffer zone (protects the core) and transition zone (sustainable land use practices are supported). Core areas are made up of wilderness areas, statutory protected areas, Critical Biodiversity Areas (CBA), Ecological Support Areas (ESAs), rivers and ecological corridors. Sections of the core area also form part of the extensive Cape Floral Region Protected Areas World Heritage Site. This was a serial nomination and the site was inscribed on the World Heritage List in 2004. It is made up of eight protected areas of which the Boland Mountain Complex includes, inter alia, the Hottentots Holland, Jonkershoek and Limietberg Nature Reserves, all of which form part of the CWBR core areas. The buffer areas are found next to core areas and are intended to reduce the impact of human activities on core areas as well as link core areas by creating biodiversity corridors. They mostly consist of natural and near-natural land which is not formally conserved in accordance with the Protected Areas Act, and could include private nature reserves and other conservation areas. Transitional areas allow for a variety of land uses, including intensive agriculture as well as urbanisation.

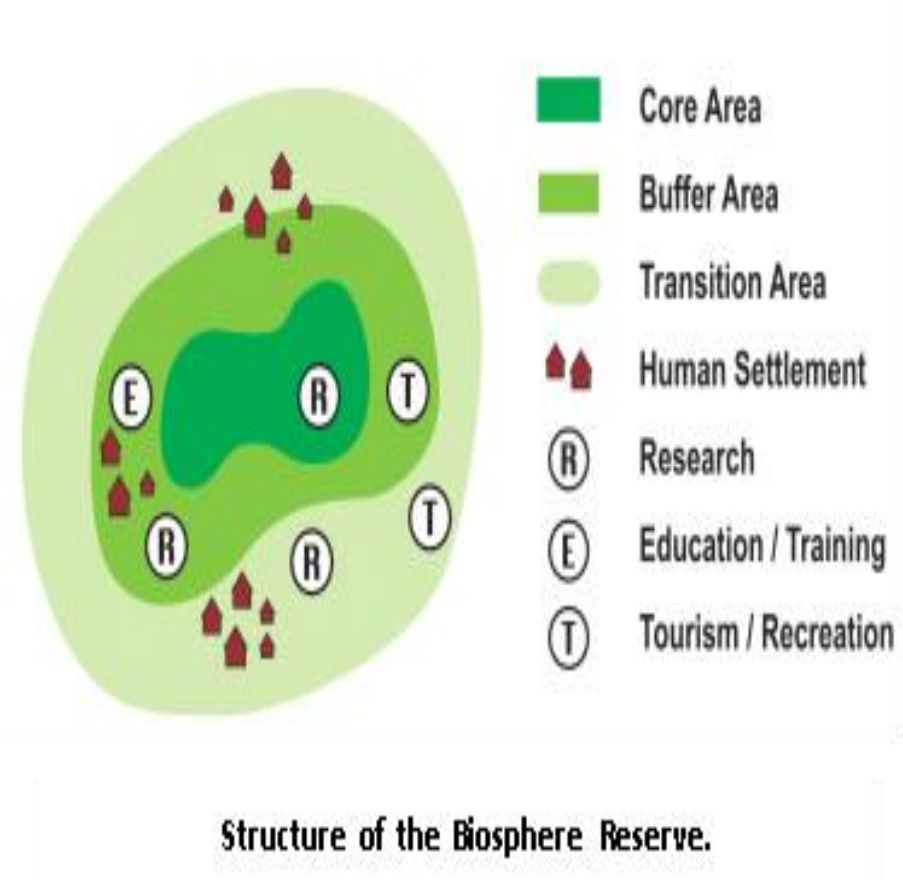
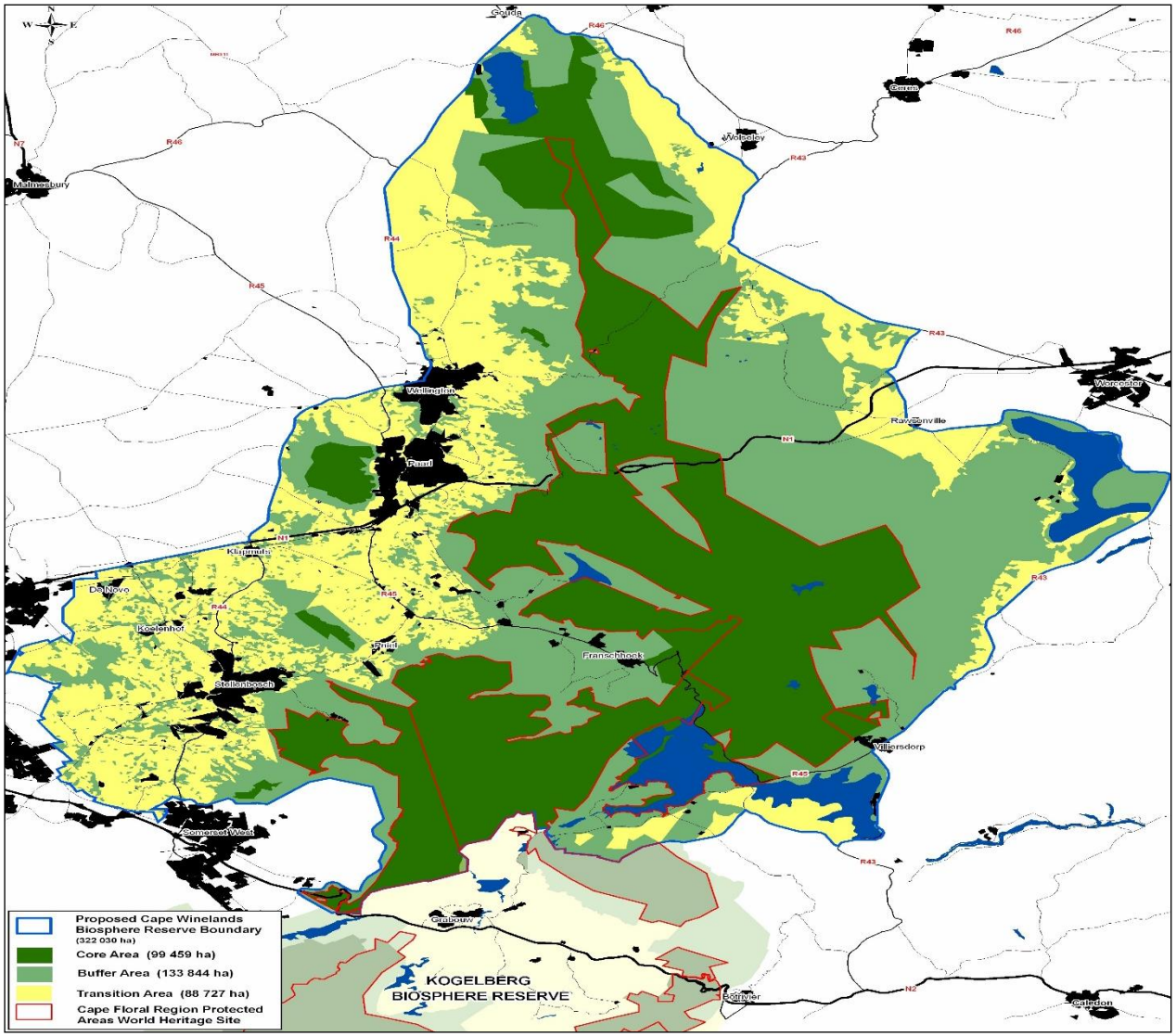


Figure 3; Structure of a Biosphere Reserve.



Map 30: Cape Winelands Biosphere Reserve

4.5 Key findings: Biodiversity and Ecosystem Services

4.5.1 Habitat loss.
4.5.2 Change in fire regime.
4.5.3 Invasive Alien Species.
4.5.4 Urban and agricultural development.
4.5.5 Over extraction of water sources.
4.5.6 Loss of ecosystem services.
4.5.7 River health/Lack of protection of freshwater ecosystems.
4.5.8 Integrate ecosystem services into planning and development.
4.5.9 Degradation of wetlands.
4.5.10 Stake holder disagreements relating to alien clearing.
4.5.11 Largely unknown economic value of ecosystem services.

4.6 Implementation proposals:

FOCUS AREA:	BIODIVERSITY AND ECOSYSTEM SERVICES
STRATEGIES:	1. Prevent the loss and degradation of Critical Biodiversity Areas (CBAs) and Ecosystem Support Areas (ESAs); incorporate CBAs into protected area networks. 2. Restore CBAs and ESAs where appropriate to maintain ecosystem services and protect biodiversity. 3. No further loss of wetlands; increase protection of freshwater ecosystems. 4. Ensure adequate buffer areas around wetlands and Core Areas. 5. Remove invasive alien species. 6. Maintain buffer areas of the Cape Winelands Biosphere Reserve to protect Core Areas and maintain the integrity of the reserve. 7. Ensure developments follow required processes and assessments and adhere to requirements of this document, the Western Cape Biodiversity Spatial Plan, the Cape Winelands Biosphere Reserve and other relevant SDFs and documents. 8. Promote conservation agriculture. 9. Improve and maintain ecological corridors across farms to facilitate the migration of flora and fauna. 10. Discourage the introduction of exotic species as outlined in the Biodiversity Act. 11. Minimise factors that impact on pattern and process integrity in Core Areas, CBAs and ESAs. 12. Encourage environmental education and non-consumptive low impact eco-tourism. 13. Harvest natural resources sustainably. 14. River bank development should be set back behind the ecological setback lines including flood and storm surge lines (1:50 year flood line: property boundaries; 1:100 years flood line: building platform).

TOOLS AND RESOURCES:	15. Cape Farm mapper: https://gis.elsenburg.com/apps/cfm/ 16. Western Cape Biodiversity Spatial Plan 2017: http://bgis.sanbi.org/Projects/Detail/194 17. Cape Winelands Biosphere Reserve: http://capewinelandsbiosphere.co.za/
PRIORITY:	High

4.7 CWDM Implementation Plan: Biodiversity Conservation

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
EPWP Invasive Alien Vegetation Management	R 2 030 000, 00	Land Use and Spatial Planning Section	Annually
River Rehabilitation	R 360 000, 00	Land Use and Spatial Planning Section	Annually
Service Delivery Agreement with Cape Winelands Biosphere Reserve	R150 000, 00	Land Use and Spatial Planning Section	Annually

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5. CLIMATE CHANGE

5.1 RAIN AND TEMPERATURE

Although there are variations between models, some predictions of future climate patterns are more certain. Climate models indicate hotter and dryer conditions in the Western Cape in the mid future (2046 to 2065)[1–5]. In the CWDM we can expect a decrease in mean annual rainfall and the number of days with a rainfall above 5mm,10mm and 20mm[1]. Furthermore, there is a chance of a slight increase in the number of days with no rain in the CWDM[1]. Even though, the mean annual rainfall will likely decrease, it is possible that we may experience an increase in rainfall intensity. This would increase flooding risks.

Despite evidence of a drier future for the WC and CWDM, there are also predictions of increased rain over the mountains, and so in spite of predictions of a drier future it is important that planning takes into account the possibility of a wetter future[6]. However, since a drier future is of higher concern planning should prioritize preparing for it. There are also possibilities of rainfall shifting into autumn and spring[6].

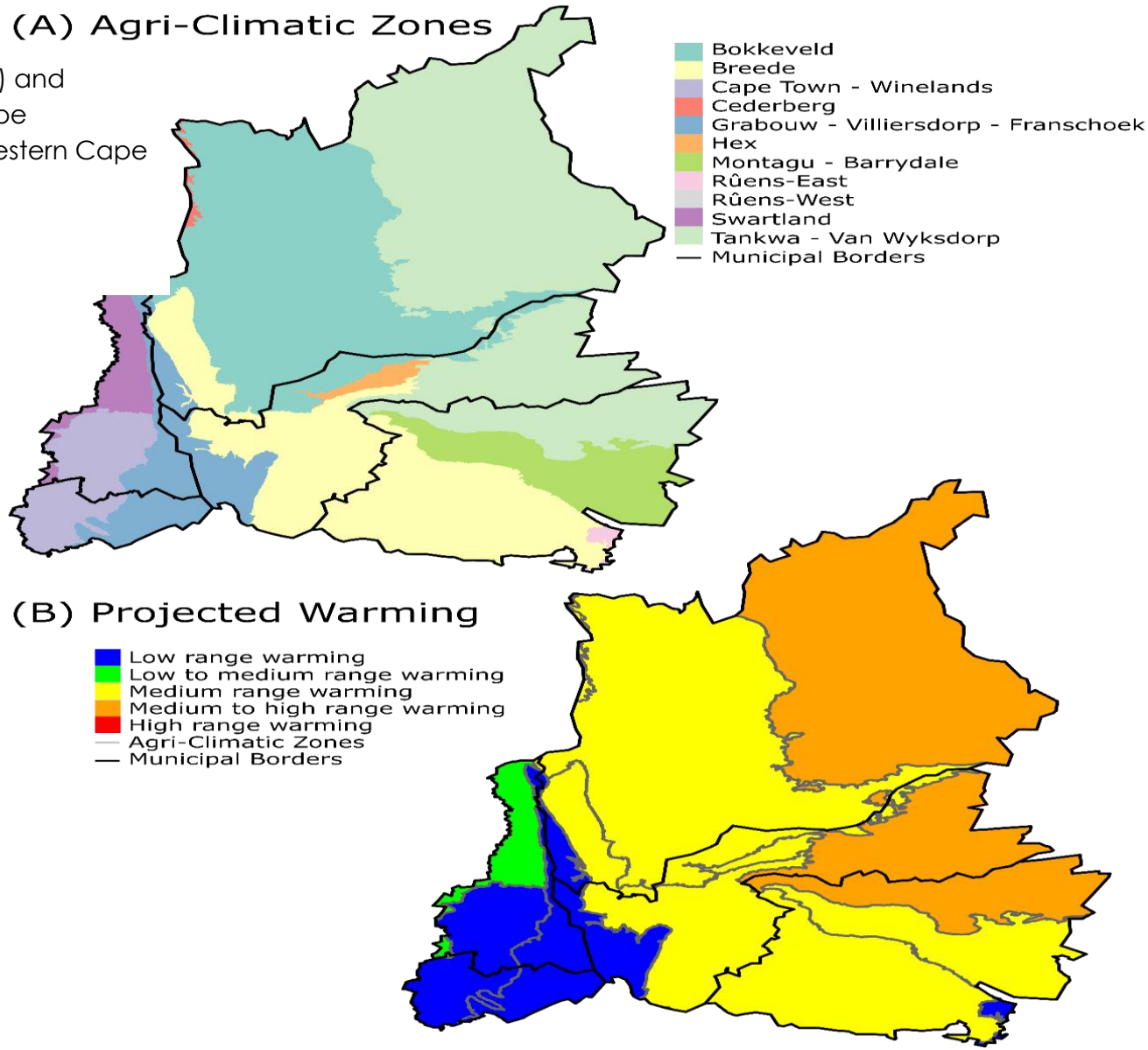
Streamflow is predicted to decrease in the future, with future demand for water to exceed the supply due to climate change[7,8]. A reduction in streamflow is predicted for the Breede River, to the point where it may drop below the ecological requirement[8]. The Breede River is an important water source during the summer months, and so a reduction in streamflow is of great concern.

Temperatures are predicted to increase by 1.5˚C to 3˚C across the Western Cape[9]. In the CWDM, local municipalities covering, and to the south west of the Boland Mountains, will experience low levels of warming (Fig). This includes Stellenbosch and Drakenstein municipalities as well as small parts of the Witzenberg and Breede Valley municipalities (Fig 4.1). However, the Langeberg Municipality and the majority of the Witzenberg and Breede Valley municipalities will experience medium to high warming (Map 32 (B)).

5.1.1 Agriculture

Due to the combination of decreased rainfall and increased temperatures, agricultural crops and livestock will experience increased heat and water stress. Increased evapotranspiration could lead to crops experiencing drought conditions even when rains have been good[5].

The total agricultural potential of the CWDM remains high as long as dams fill up in the future [6]. To the Southwest of the CWDM irrigation is extensive and due to the existing infrastructure, these producers are well positioned to deal with lower rainfall. However, the Tankwa-van Wyksdorp agro climatic region to the Northeast of the CWDM will experience a slow decline in productivity due to increased temperatures and decreased water availability[6].



Map 31: Agri-climatic zones (A) and projected warming for the Cape Winelands District (B). Data: Western Cape Department of Agriculture.

Increased reliance on irrigation would place even further stress on our water resources. Although, planting drought resistant crops or varieties could mitigate the reliance on irrigation.

Additionally, warming will have a significant impact on Daily Positive Chill Units (DPCU). In warmer areas, an increase in as little as 1˚C will severely affect apples, while an increase of 2˚C will cause all years to not reach the required 800DPCU target for current cultivars[10]. Cooler areas (Koue bokkeveld) will be able to absorb an increase of up to 2˚C, and still exceed 800DPCU.

Similarly, wine vineyards in the hotter areas are most at risk while those in cooler areas such as southern mountain slopes will have some buffering. Cultivars that are most at risk include Shiraz, Merlot, Sauvignon Blanc and Chardonnay[11]. Although there is differing views of the total impact on wine grape production, there is concern that vineyards may move higher up mountains into cooler regions causing conflict with conservation goals[11].

Of great concern is the water quality in the Lower Berg River. Irrigation water not complying with standards for export, could lead to serious economic impacts. Further impacts from climate change could include smaller fruit, changes in pest and disease levels, fruit colour, seasonal shifts and insufficient ground water recharge among others[10,12]. Because the relationship between climate change and agriculture is so complex, it's important that decision makers and planners make use of the resources provided by the SmartAgri project and consult experts since each crop and cultivar may require a different response.

Export markets are changing in response to climate change, with importers aiming to become carbon neutral by reducing "food miles". Most of the pressure to reduce their footprint is put on suppliers[6]. However, the main driver for this change is still profit. Local producers and suppliers can take advantage of this "green" market by supplying and producing "green" products.

Conservation agriculture (CA) has great potential to reduce greenhouse gas emissions (GHG) emissions from the agricultural sector and to improve food security. Reports of improved soil fertility, yields, water retention and a decrease in water and wind erosion have emanated from the practice of CA. A look into the effect of CA on wheat production showed that a no-till approach reduced diesel consumption by at least 60% compared to traditional methods.

The major sources of GHG emissions in the agricultural sector are electricity, due to the large-scale use of coal power stations, and diesel consumption. It is estimated that at a farming level, 70% of GHG emissions are from electricity consumption and 13% from diesel consumption for fruit and wine farms.

Table 23: Impact of climate change on agro-climatic zones of the CWDM (Source: Midgeley et al, 2016)

Agro-climatic zone	Municipalities	Crops	Agricultural Potential (2040-2060)
Cape Town- Winelands	Stellenbosch, Drakenstein Municipalities	Wine and table grapes, wheat, stone fruit, vegetables, olives, canola, berries, Broilers, egg layers, pigs	Remains high as long as dams fill up
Swartland	Stellenbosch, Drakenstein Municipalities	Wheat, wine and table grapes, canola, lovies, dairy, pigs, sheep, cattle	Remains high for small grains but with increasing yield variability
Grabouw-Villiersdorp-Franschhoek	Stellenbosch, Drakenstein, Breede Valley and Witzenberg Municipalities	Pome fruit, wine grapes, wheat, barley, stone fruit, berries	Remains high as long as dams fill up
Breede	Langeberg, Breede Valley and Witzenberg Municipalities	Wine grapes, wheat, stone fruit, pome fruit, olives, Broilers, egg layers	Remains high as long as dams fill up
Hex	Breede Valley Municipality	Table grapes, citrus	Remains high as long as dams fill up
Montagu-Barrydale	Langeberg Municipality	Stone fruit, wheat, barley, wine grapes, pome fruit, citrus, olives, sheep	Remains high as long as dams fill up
Tankwa-Van Wyksdorp	Langeberg, Breede Valley, Witzenberg Municipalities	Wheat, stone fruit, wine grapes, sheep, goats, pigs, cattle, game, ostrich, dairy	Slowly declining productivity constrained by heat and water availability
Bokkeveld	Breede Valley, Witzenberg Municipalities	Pome fruit, wheat, stone fruit, onions, potatoes, cattle	Remains high as long as dams fill up
Ruens-east	Langeberg Municipality	Wheat, barley, canola, sheep, cattle, dairy, pigs, ostrich	Currently becoming marginal for small grains but could improve given possible increases in rainfall

5.1.2 Biodiversity and Ecosystem Services

Biodiversity and intact ecosystem services will be vitally important for adaptation to climate change. "Soft" approaches, such as using intact wetlands for flood control, may be more effective and cost less than "hard", engineered approaches, such as building dams[13]. Linking biodiversity, development and social goals are thus important to adapting to climate change and building a sustainable future.

It has been estimated that climate change may lead to the extinction of 21% to40% of Protea species[14]. This is largely driven by the loss of suitable habitat range, especially the loss of suitable ranges within protected areas as ranges shift due to climate change[15]. It follows that corridors should be created to facilitate the movement of species in response to climate change. It is furthermore paramount that critical biodiversity and ecological support areas are conserved.

Fire will play a significant role in shaping biodiversity in the future. They are likely to increase in both frequency and intensity. Shorter fire intervals will decrease population viability compared to longer fire intervals[16]. Hence, fire management will play an important role in mitigating the impact on biodiversity.

Hannah et al. (2007) found that taking into account both current and future conservation goals simultaneously, can significantly reduce the area needed to attain conservation goals and so in turn the costs[17]. Consequently, it is recommended that environmental/conservation planners consider not only current conservation goals but also those of the future simultaneously.

*This does not account for land use change in the future, which will also be strongly affected by climate change

5.1.3 Infrastructure

Changes in temperature and precipitation will also affect the speed at which infrastructure decays and the amount of maintenance required to keep buildings and roads up to standard.

Higher temperatures will increase the rate at which new cracks form and reduce the expected lifetime of paved roads[18]. Increased bleeding, flushing and rutting may be expected on older or poorly constructed roads[18]. Increased rain intensity could cause erosion damage, especially to dirt roads, even though overall rainfall may decrease.

Costs incurred due to buildings is predicted to be of a much greater concern[19]. Most of the costs will be due to school buildings as they form the largest number of public buildings. However, of concern are the costs from hospitals, since this can be directly linked to health risks. Chinowsky et al (2012)[19] assumed in their analysis that costs due to damage to cladding and roofing would be minimal; thus costs are mainly attributed to heating, ventilation and air conditioning (HVAC) systems.

Early adaptation by upgrading roads and buildings may reduce the costs incurred by climate change in the long term. However, in some cases opportunity costs can be higher for the adaptation scenario than for the no adaptation scenario. Since data is lacking, especially at a district and local scale, it is important that studies are done to assess the impact for local municipalities to inform decision making.

5.1.4 Socio-economic

The poor and disadvantaged will be the most affected by climate change as they lack the resources to deal with the impacts. In the agricultural sector these include smallholder farmers, peri-urban farmers, new farmers and farm workers (especially seasonal and ad-hoc labourers)[6]. Attention should be given to women in these groups. They regularly face more obstacles as they are often the caretakers of the families and so are choice limited.

Climate extremes pose a significant threat to farm workers. Threats include among others heat stress, water borne diseases due to poor water quality, vector borne diseases and risks from fires[6]. Workers may also experience decreased productivity due to warming, worsened by food insecurity, hunger and malnutrition[6]. Climate change may also worsen existing health challenges related to HIV and TB.

Decreased agricultural production would lead to decreased employment.

It is predicted that urban-rural migration will form a large part of future urbanisation and suspected to be greatest in countries and regions most affected by climate change[20]. Increased urbanisation will place extra stress on cities to supply basic services to the increasing population. As subsistence farmers and small scale are likely to be hardest hit from climate change, and so migrate to cities, it will be important to introduce measures to help them adapt and allow them to continue to rely on natural resources for their livelihoods. However, curbing urbanisation is rarely successful and local governments should be prepared. Buhaug and Urdal(2013)[20] found that economic shock was one of the best predictors for social disorder and so local governments should likely focus more on mitigating the economic impacts of climate change than fight increased urbanisation due to climate change.

Adger et al. (2008)[21] argues that there are social limits to adaptation. These limits are affected by ethics (how and what we value), knowledge (how and what we know), risk (how and what we perceive) and culture (how and why we live). Social limits, however, are not constant and may be changed. Society's ability to adapt in a timely fashion is severely hampered by the interaction between individual and societal characteristics, and underlying values which form subjective yet changeable limits. Risk perceptions is a highly important characteristic, since individual adaptation affected by whether impacts, past or future, are perceived as a risk and should or could be acted on.

Nonetheless, community-based initiatives and activities can help individuals feel enabled and implement behavioural alternatives[21]. This suggests the importance for the continuation and implementation of education and community-based initiatives to be able to successfully adapt to climate change in the present and future. However, there is currently little indication of larger scale initiatives with equivalent outcomes.

5.2 Key findings: Climate Change

5.2.1 Increased dependence on irrigation due to warming and reduced rainfall.
5.2.2 Increased heat and water stress for citizens, animals and crops.
5.2.3 Increased flooding risk due to increased rainfall intensity.
5.2.4 Higher incidence of heat waves.
5.2.5 Increased fire risk – impacts agriculture, biodiversity and health.

5.2.6 Possible increase in prices of agricultural products due to reduced yields and/or increased farming costs.
5.2.7 Increased strain on ecosystem services.
5.2.8 Possible job losses due to impact on agriculture.
5.2.9 Potential reduction in agricultural exports due to decreased quality.
5.2.10 Loss of ecotourism due to biodiversity loss and degradation of natural environment.
5.2.11 Loss of biodiversity.
5.2.12 Loss of ecosystem services.
5.2.13 Increased food prices.
5.2.14 Loss of international export standards due to poor water quality in the Berg river.
5.2.15 Increased heat-island effect.
5.2.16 Social limits to adaptation.

5.3 Implementation proposals:

FOCUS AREA:	CLIMATE CHANGE
STRATEGIES:	1. Find ways to reduce water demand and investigate water efficient ways of expanding the agricultural economy 2. Clear alien invasive species 3. Protect riparian zones a. Allow for a buffer along river banks to protect the banks from flood damage b. No further development may be permitted on river banks that are prone to flooding and below the 1:50 year flood lines (erven) and the 1:100 year flood lines (building platforms) 4. Prevent the loss and degradation of Critical Biodiversity Areas (CBAs) and Ecosystem Support Areas (ESAs) 5. Restore CBAs and ESAs where appropriate to maintain ecosystem services and protect biodiversity 6. Prevent further loss and degradation of wetlands 7. Reduce greenhouse gas emissions 8. Ensure new developments to adhere to standards of high energy efficiency, low embedded carbon and good accessibility to public transport 9. Promote changes to existing developments that will increase the efficiency of energy use in power, heating and transport (e.g. insulation) 10. Promote land uses that serve as carbon sinks (e.g. community woodlands) 11. Encourage the development and use of renewable resources of energy, preferably local (e.g. solar, wind power, biomass etc.) 12. Reduce the amount of waste (particularly biodegradable waste), the volume sent to landfill and maximise capture and use of greenhouse gasses, particularly methane (e.g. waste minimisation, composting)

	13. Guide new development to locations that best offer protection from likely impacts – including flooding and drought, sea level rise, storminess, soil subsidence and heave and implications for supply and demand of essential services (e.g. preference to locations that have sustainable existing water supply rather than those that require long distance supply) 14. Ensure that the design and layout of new developments (including buildings, open spaces and infrastructure) will be resilient or adaptable to the likely impacts during the development's lifetime (e.g. designing in flood protection and water saving features; orientation to take advantage of solar gain for PVs etc.) 15. Promote changes to existing development that will enhance its resilience or adaptability to likely impacts during its lifetime (e.g. improving site drainage; introducing grey water recycling etc.) 16. Increase in the length and width of ecological corridors in altitudinal, North-South and East-West directions 17. The current area of each of the natural areas should not be reduced or fragmented 18. Institute measurable outcomes to track successes and failures (Area covered by invasive plants, carbon emissions etc.)
TOOLS AND RESOURCES:	19. Cape Farm mapper: https://gis.elsenburg.com/apps/cfm/ 20. Western Cape Biodiversity Spatial Plan 2017: http://bgis.sanbi.org/Projects/Detail/194 21. Cape Winelands Biosphere Reserve: http://capewinelandsbiosphere.co.za/
PRIORITY:	High

5.4 CWDM Implementation Plan: Climate Change

PROJECT/ACTIVITY:	BUDGET:	RESPONSIBLE:	DURATION:
EPWP Invasive Alien Vegetation Management	R 2 030 000, 00	Land Use and Spatial Planning Section	Annually
River Rehabilitation	R 360 000, 00	Land Use and Spatial Planning Section	Annually
Service Delivery Agreement with Cape Winelands Biosphere Reserve	R150 000, 00	Land Use and Spatial Planning Section	Annually
Provision of Water to Schools (Water Tanks)	R500 000, 00	Projects and Housing	Annually
Infrastructure Rural Area Farmers (Renewable energy)	R1000 000, 00	Projects and Housing Section	Annually
Subsidy: Water/sanitation-Farms	R1000 000, 00	Municipal Health Services	
Revision of Risk Assessment	R243 500, 00	Disaster Management Section	2018/2019

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Western Cape Government

BETTER TOGETHER.

ANNEXURE 1: MUNICIPAL FINANCIAL IMPACT ANALYSIS CAPE WINELANDS

The Financial Impact of Spatial Growth Patterns

Department of Environmental Affairs and Development Planning for
the Cape Winelands District Municipality

Contents

1) Introduction

The Cape Winelands District Municipality is in the process of drafting a new District Spatial Development Framework, with the intention of adopting the policy before the current LGMTEC cycle concludes. The Department of Environmental Affairs and Development Planning is providing assistance, including an investigation of the financial impact of spatial growth patterns within each Cape Winelands Local Municipality. The investigation involves quantifying the potential financial implications of two spatial growth scenarios, a business-as-usual scenario and a compact development or densification approach, using the Municipal Services Financial Model, developed by PDG for the Department of Local Government, and the Development Bank South Africa. The model is provided as a public resource to assist with planning of infrastructure services.

This study is intended for strategic use only. The results of the model are dependent on many inputs, including current and future infrastructure and service needs, default services costs, and other infrastructure and budget related information. Information for this study has been obtained from Municipal officials, through a questionnaire, STATSSA, Municipal Financial Statements, and other reliable sources. A number of assumptions are made where information is not readily available.

Similar studies have been conducted for the Western Cape Provincial Spatial Development Framework, 2014, the Mossel Bay Growth Study, as well as the Breede Valley Long Term Financial Plan, *inter alia*. The Municipal Financial Sustainability Study for the PSDF contained seven case studies - including the City of Cape Town, Stellenbosch, George, Saldanha Bay, Overstrand, Theewaterskloof and Beaufort West Municipalities.

2) Methodology

As indicated above the Municipal Services Financial Model projects the capital and operating requirement for infrastructure provision in a municipal area over a ten-year period.

The model allows users to define the level of service delivery and estimates the infrastructure costs to identified and future consumers in urban formal, urban informal and rural areas.

The model looks at seven functional groupings, namely: governance, administration, planning and development facilitation (GAPD); public services; housing; water services; electricity; roads and solid waste.

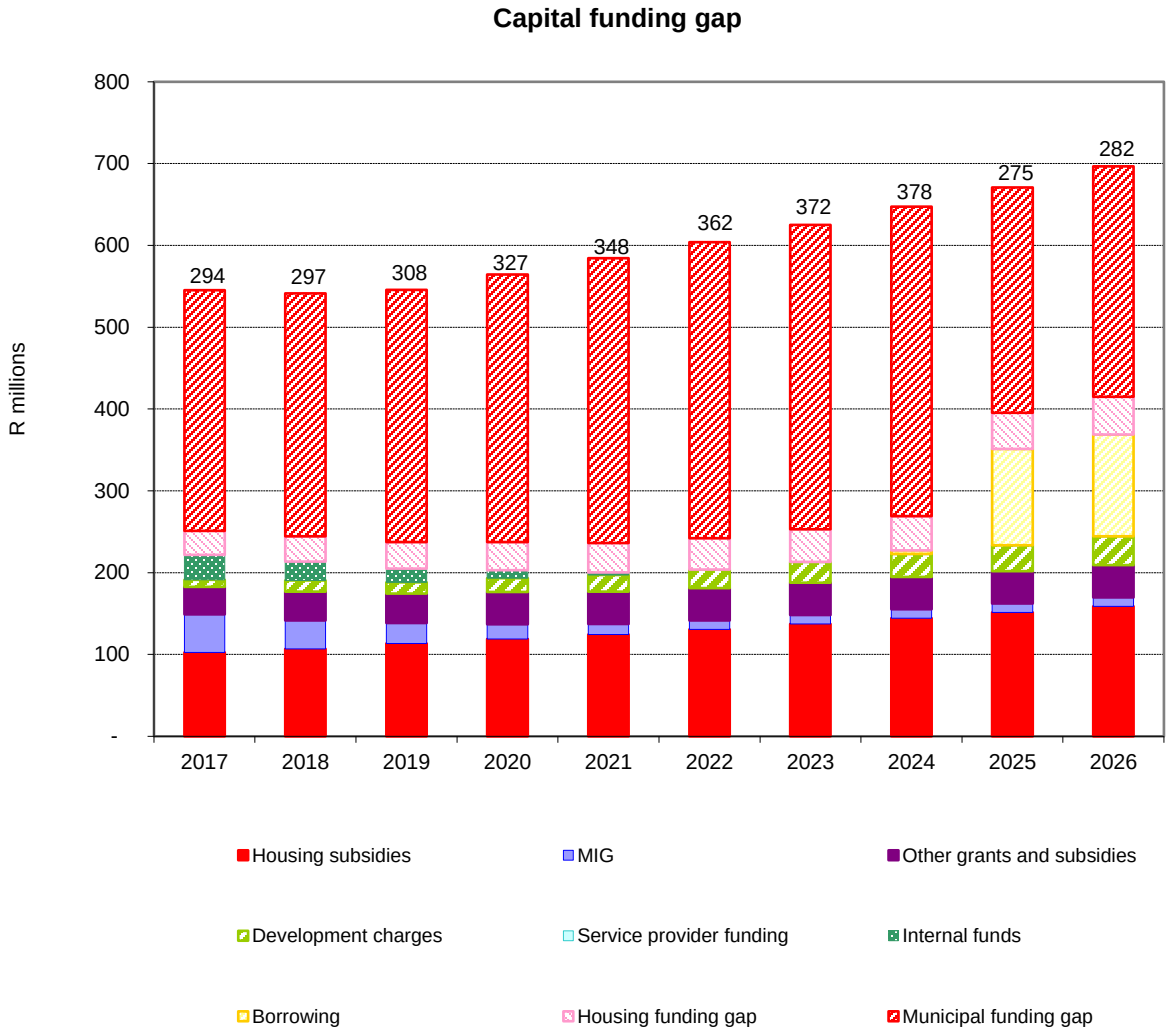
In the case of capital expenditure, the model considers expenditure on new infrastructure (bulk and connector as well as internal infrastructure financed through housing subsidies) and on the rehabilitation of existing infrastructure.

Data used in the model was obtained from a variety of sources. The primary source of information was a survey questionnaire, completed by municipal officials with knowledge and expertise in each of the functional groupings. Other credible information sources such as Statistics South Africa and National Treasury municipal budget and expenditure information have been used. Where data was unavailable, estimates have been used based on national datasets and experience in applying the model to other municipal contexts.

A 2016/17 base year was selected to coincide with CS2016, which is a prominent data source. The base year is the year in which data is entered.

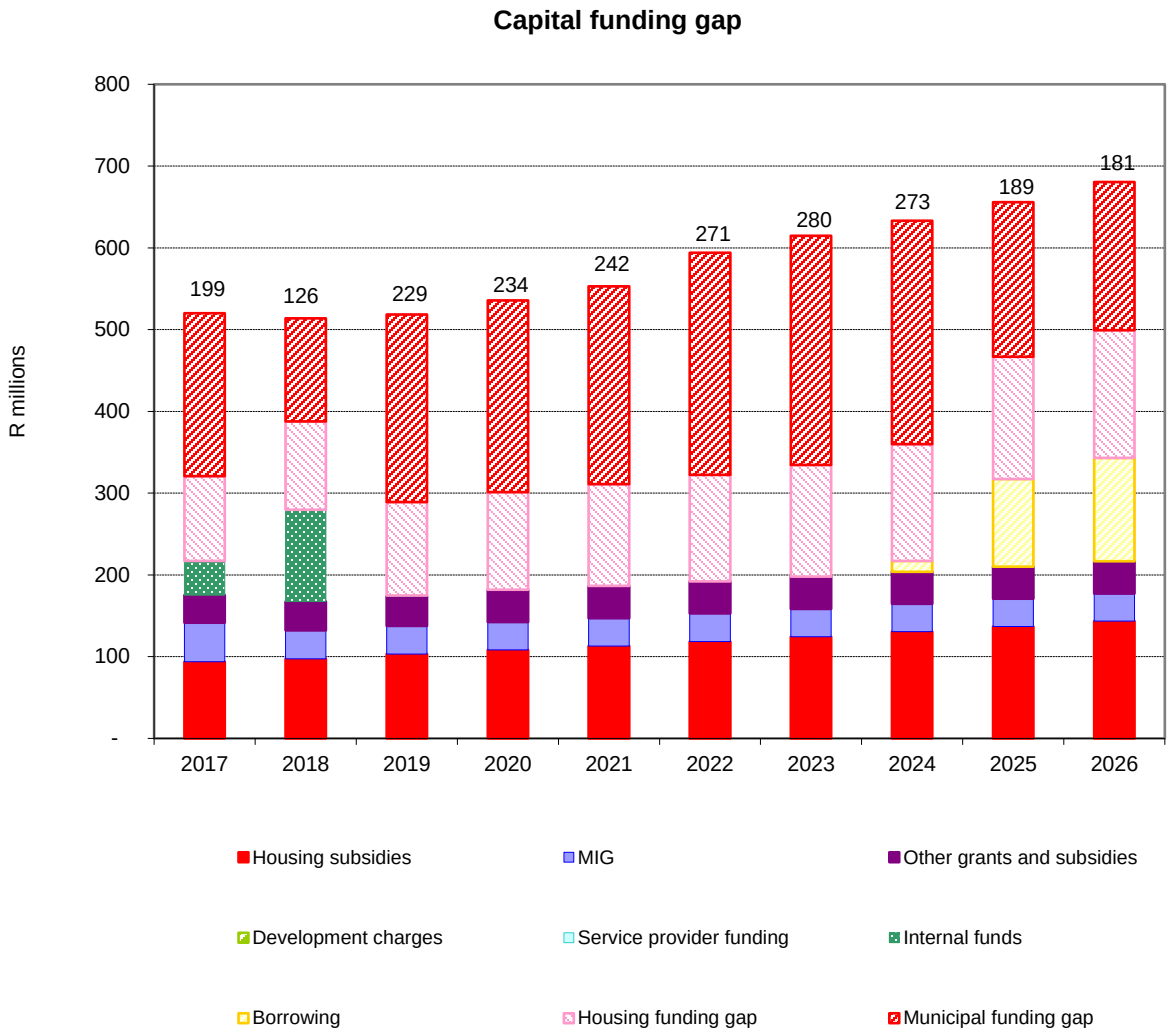
3) Findings

a. Drakenstein Municipality – Business as usual



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*545*	*542*	*546*	*565*	*584*	*604*	*625*	*647*	*671*	*697*
Funding gap	*294*	*297*	*308*	*327*	*348*	*362*	*372*	*378*	*275*	*282*

b. Drakenstein - Densification

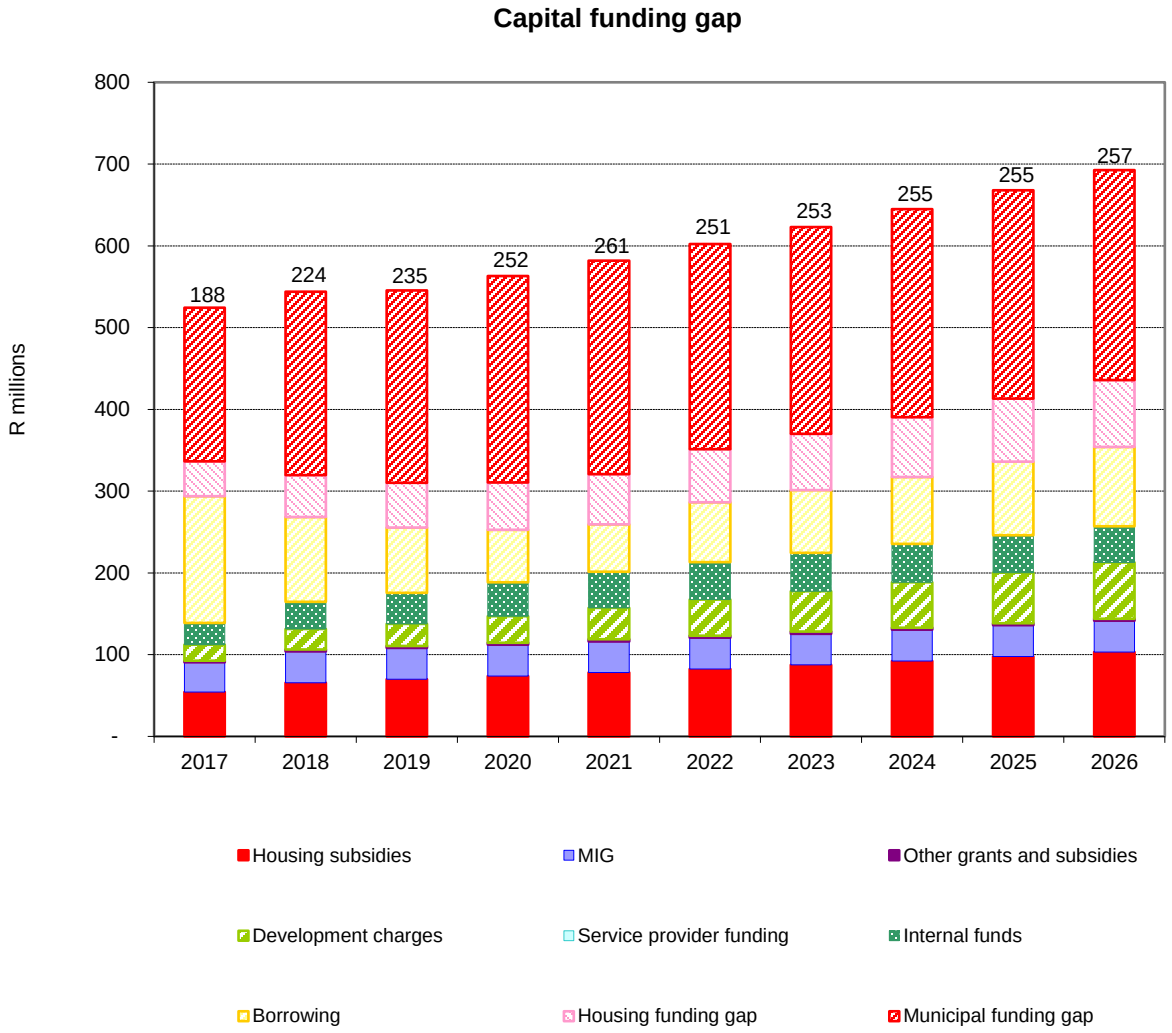


	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*520*	*514*	*519*	*536*	*553*	*594*	*615*	*633*	*656*	*680*
Funding gap	*199*	*126*	*229*	*234*	*242*	*271*	*280*	*273*	*189*	*181*

c. Drakenstein financial analysis

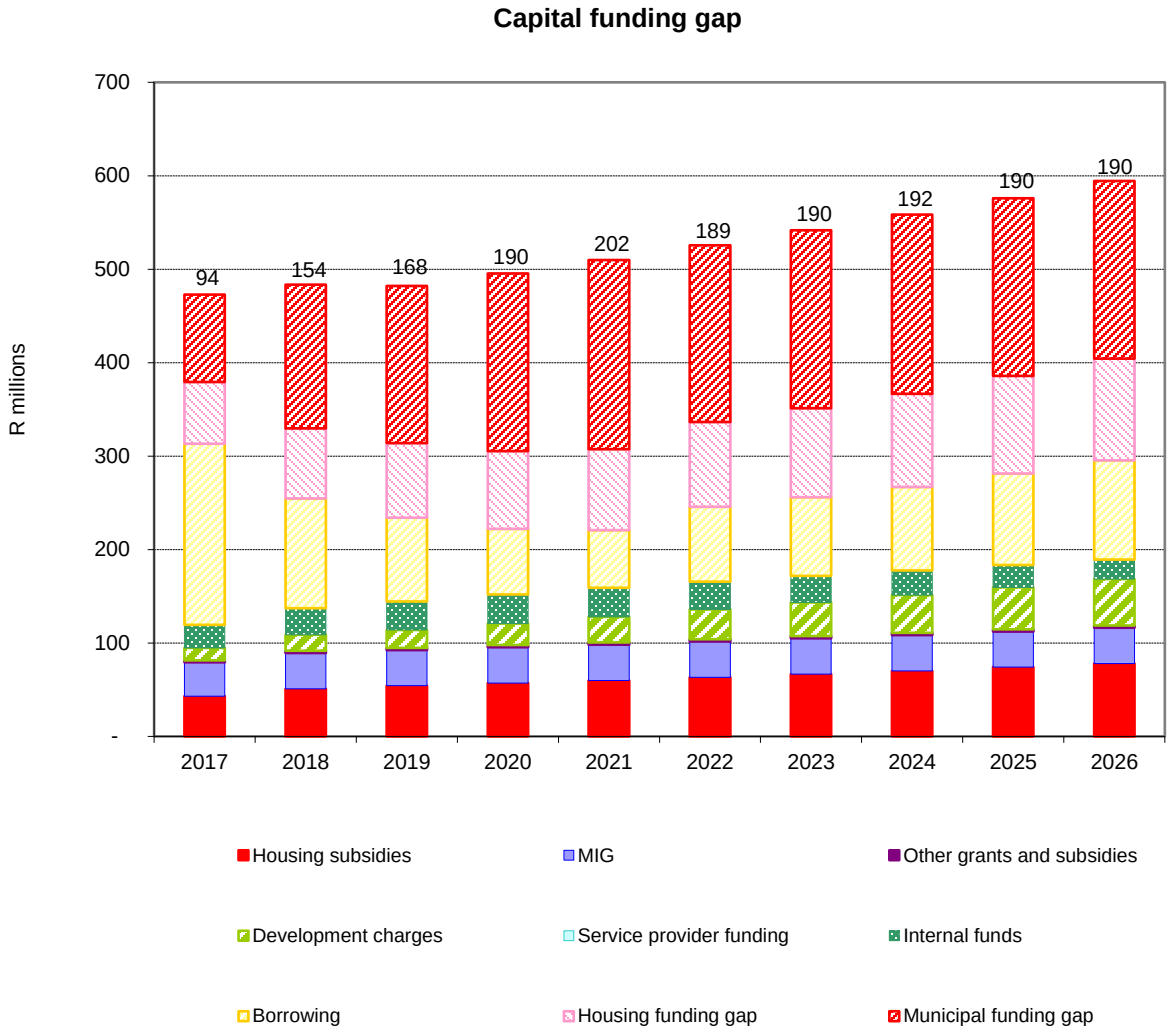
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital finance required – current development trend	*545*	*542*	*546*	*565*	*584*	*604*	*625*	*647*	*671*	*697*
Capital finance required – Compact development	*520*	*514*	*519*	*536*	*553*	*594*	*615*	*633*	*656*	*680*
Capital saving	*25*	*28*	*27*	*29*	*31*	*10*	*10*	*14*	*15*	*17*
Percentage capital saving	*4.6%*	*5.2%*	*4.9%*	*5.1*	*5.3%*	*1.7%*	*1.6%*	*2.2%*	*2.2%*	*2.4%*
Funding gap – current development trend	*294*	*297*	*308*	*327*	*348*	*362*	*372*	*378*	*275*	*282*
Funding gap – Compact development	*199*	*126*	*229*	*234*	*242*	*271*	*280*	*273*	*189*	*181*
Difference in required funding	*95*	*171*	*79*	*93*	*106*	*91*	*92*	*105*	*86*	*101*
Required funding saving	*32.3%*	*57.6%*	*25.6%*	*28.8%*	*30.5%*	*25.1%*	*24.8%*	*27.8%*	*31.3%*	*35.8%*

d. Stellenbosch -Business as usual



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*524*	*544*	*545*	*563*	*582*	*602*	*623*	*645*	*668*	*693*
Funding gap	*188*	*224*	*235*	*252*	*261*	*251*	*253*	*255*	*255*	*257*

e. Stellenbosch – Densification

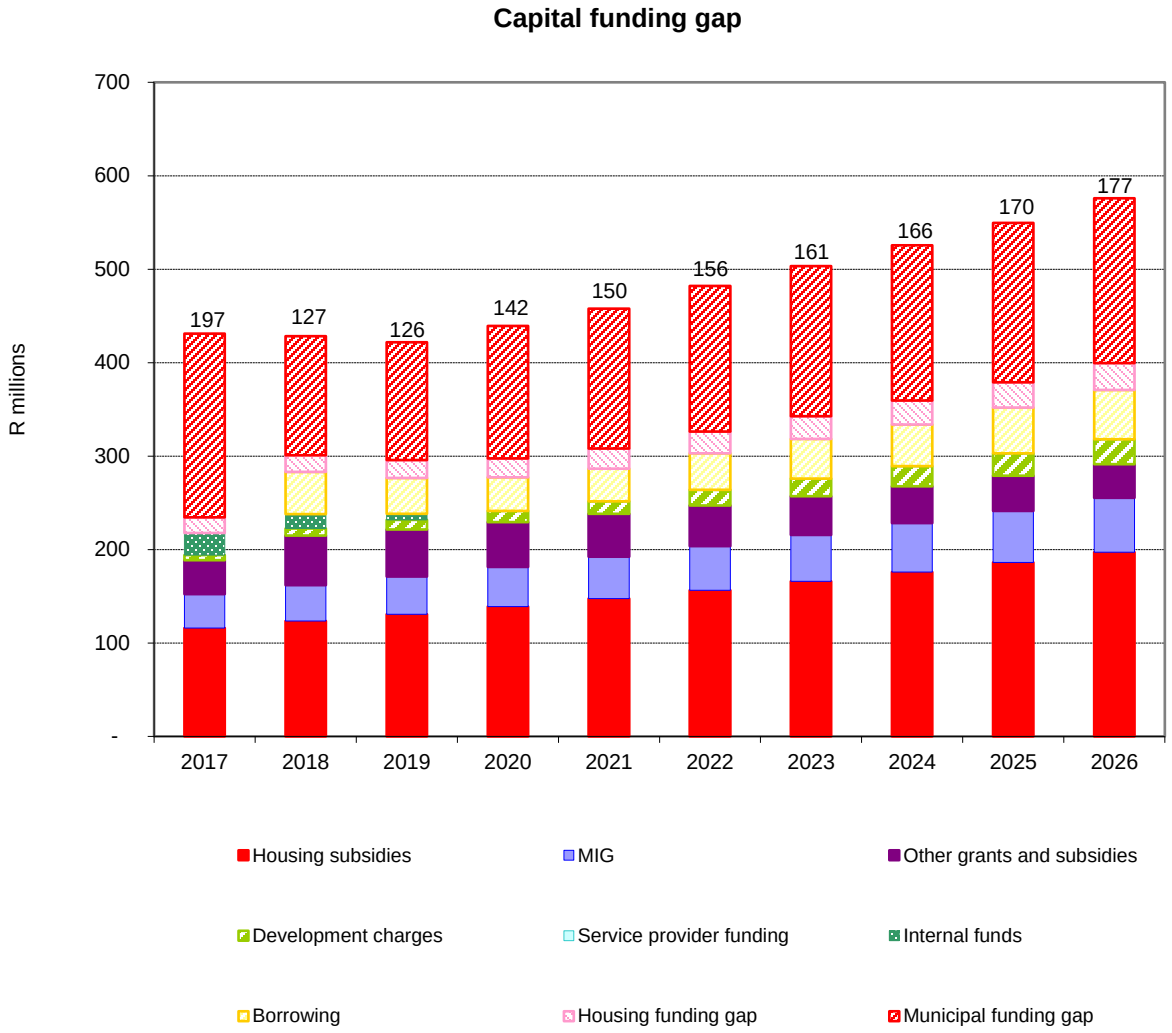


	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*473*	*483*	*482*	*496*	*510*	*526*	*542*	*558*	*576*	*594*
Funding gap	*94*	*154*	*168*	*190*	*202*	*189*	*190*	*192*	*190*	*190*

f. Stellenbosch financial analysis

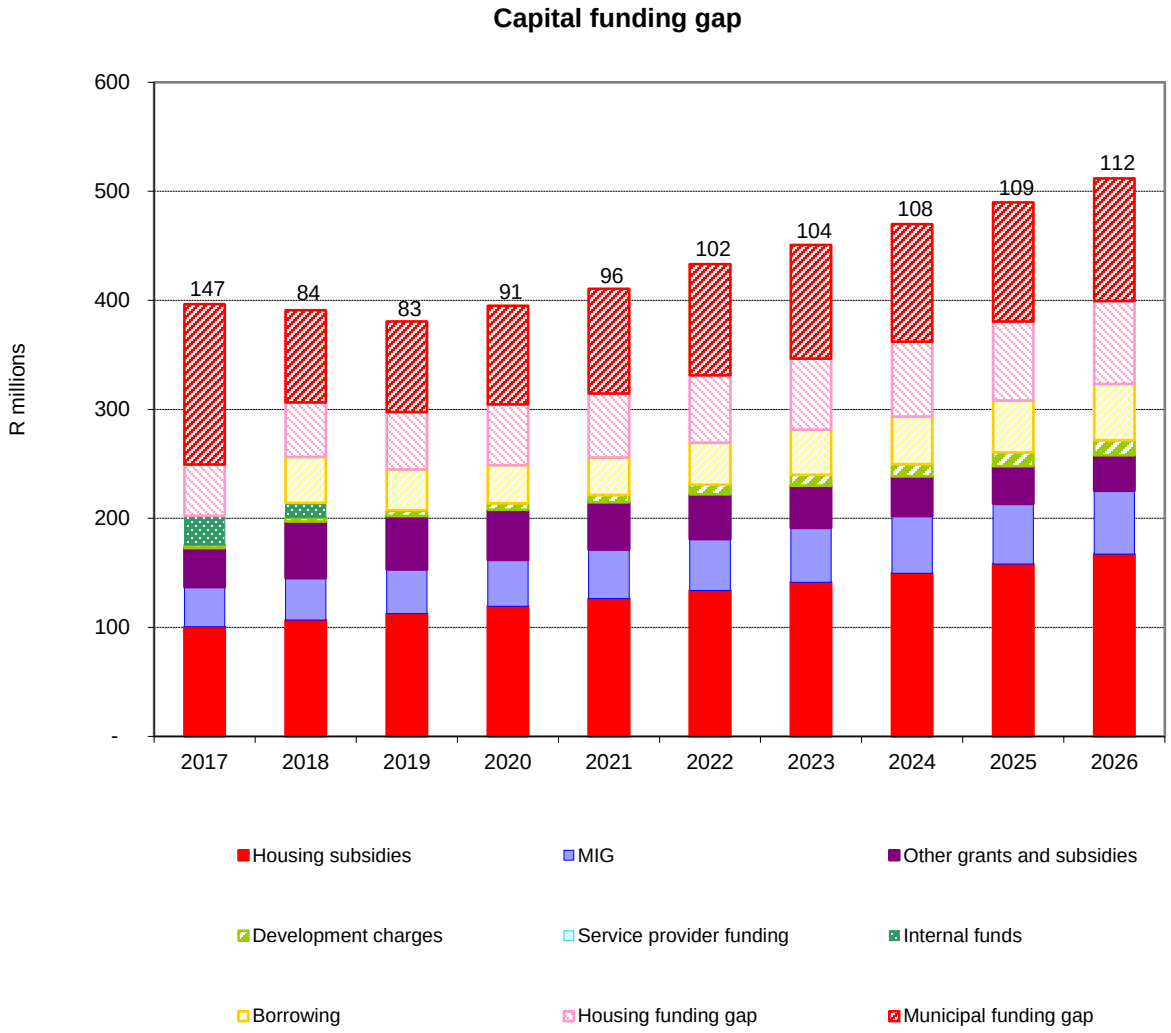
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital finance required – current development trend	*524*	*544*	*545*	*563*	*582*	*602*	*623*	*645*	*668*	*693*
Capital finance required – Compact development	*473*	*483*	*482*	*496*	*510*	*526*	*542*	*558*	*576*	*594*
Capital saving	*51*	*61*	*63*	*67*	*72*	*76*	*81*	*87*	*92*	*99*
Percentage capital saving	***9.7%***	***11.2%***	***11.6%***	***11.9***	***12.3%***	***12.6%***	***13%***	***13.5%***	***13.8%***	***14.3%***
Funding gap – current development trend	*188*	*224*	*235*	*252*	*261*	*251*	*253*	*255*	*255*	*257*
Funding gap – Compact development	*94*	*154*	*168*	*190*	*202*	*189*	*190*	*192*	*190*	*190*
Difference in required funding	*94*	*70*	*67*	*62*	*59*	*62*	*63*	*63*	*65*	*67*
Required funding saving	***50%***	***31.3%***	***28.5%***	***24.6%***	***22.6%***	***24.7%***	***24.9%***	***24.7%***	***25.5%***	***26.1%***

g. Breede Valley – Business as usual



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*431*	*428*	*422*	*439*	*458*	*482*	*503*	*526*	*550*	*576*
Funding gap	*197*	*127*	*126*	*142*	*150*	*156*	*161*	*166*	*170*	*177*

h. Breede valley – Densification

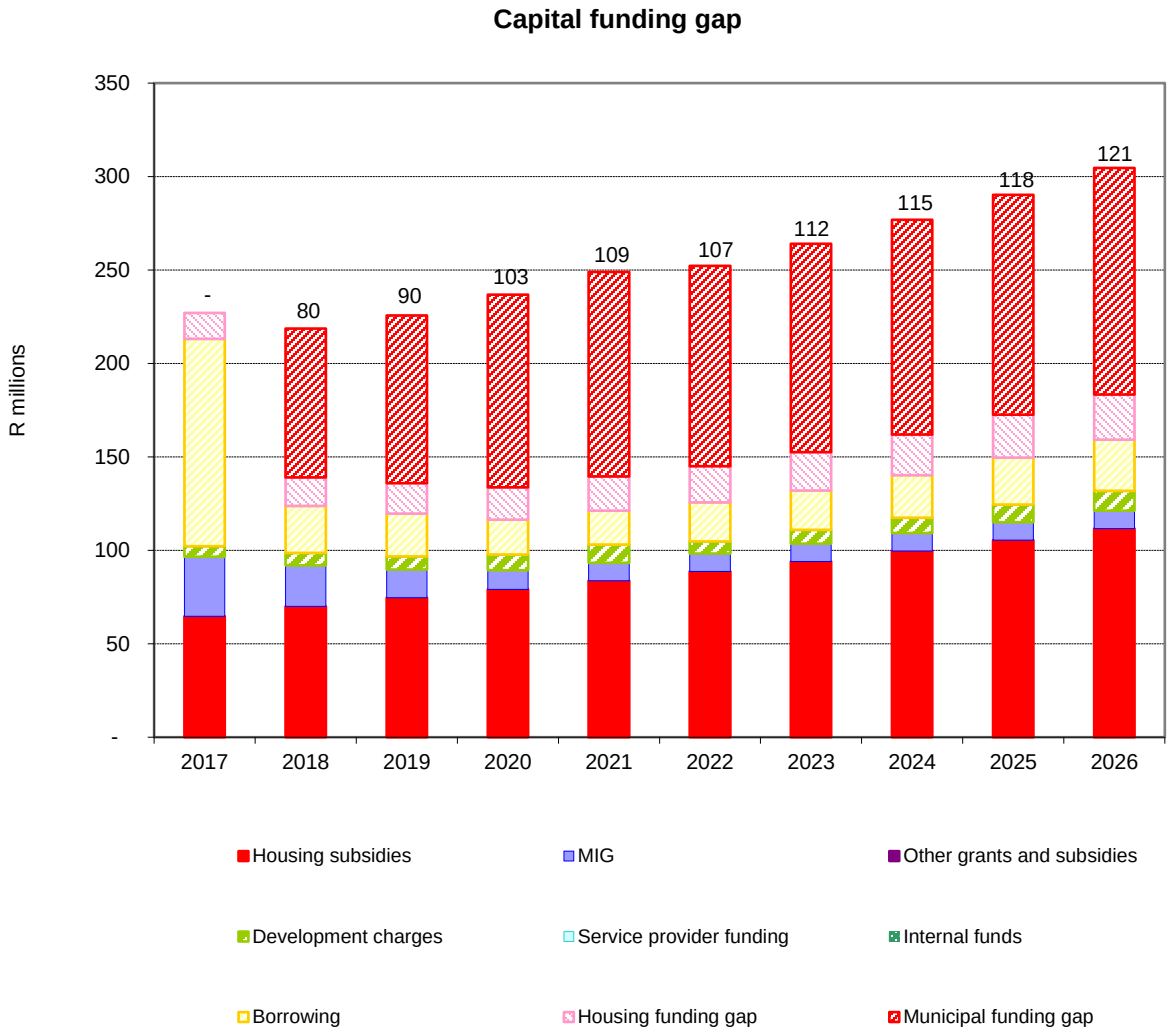


	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*396*	*391*	*381*	*395*	*410*	*433*	*451*	*470*	*490*	*512*
Funding gap	*147*	*84*	*83*	*91*	*96*	*102*	*104*	*108*	*109*	*112*

i. Breede Valley financial analysis

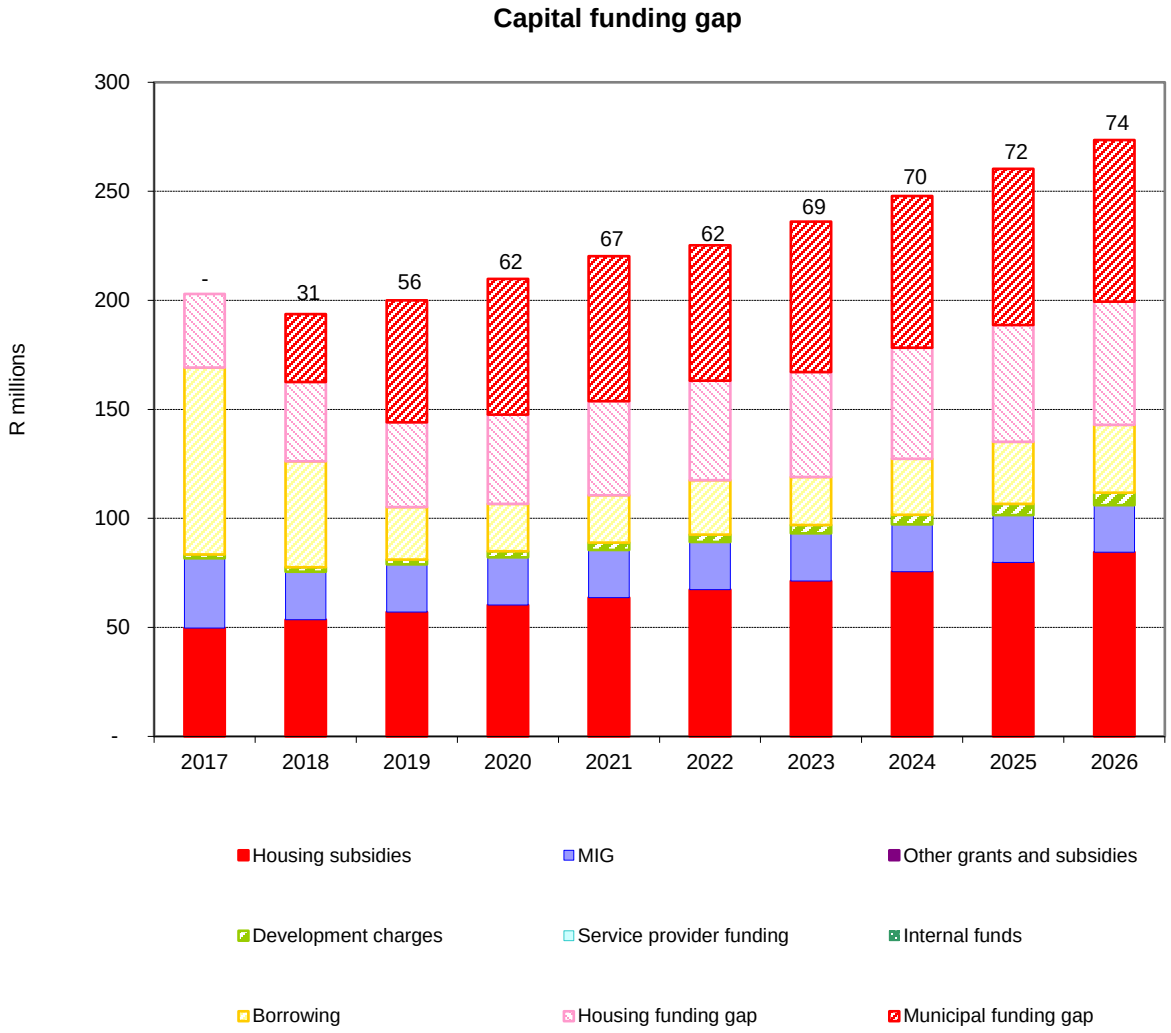
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital finance required – current development trend	*431*	*428*	*422*	*439*	*458*	*482*	*503*	*526*	*550*	*576*
Capital finance required – Compact development	*396*	*391*	*381*	*395*	*410*	*433*	*451*	*470*	*490*	*512*
Capital saving	*35*	*37*	*41*	*44*	*48*	*49*	*52*	*56*	*60*	*64*
Percentage capital saving	***8.1%***	***8.6%***	***9.7%***	***10%***	***10.5%***	***10.2%***	***10.3%***	***10.6%***	***10.9%***	***11.1%***
Funding gap – current development trend	*197*	*127*	*126*	*142*	*150*	*156*	*161*	*166*	*170*	*177*
Funding gap – Compact development	*147*	*84*	*83*	*91*	*96*	*102*	*104*	*108*	*109*	*112*
Difference in required funding	*50*	*43*	*43*	*51*	*54*	*54*	*57*	*58*	*61*	*65*
Required funding saving	***50%***	***31.3%***	***28.5%***	***24.6%***	***22.6%***	***24.7%***	***24.9%***	***24.7%***	***25.5%***	***26.1%***

j. Langeberg – Business as usual



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*227*	*219*	*226*	*237*	*249*	*252*	*264*	*277*	*290*	*305*
Funding gap	*-*	*80*	*90*	*103*	*109*	*107*	*112*	*115*	*118*	*121*

k. Langeberg – Densification

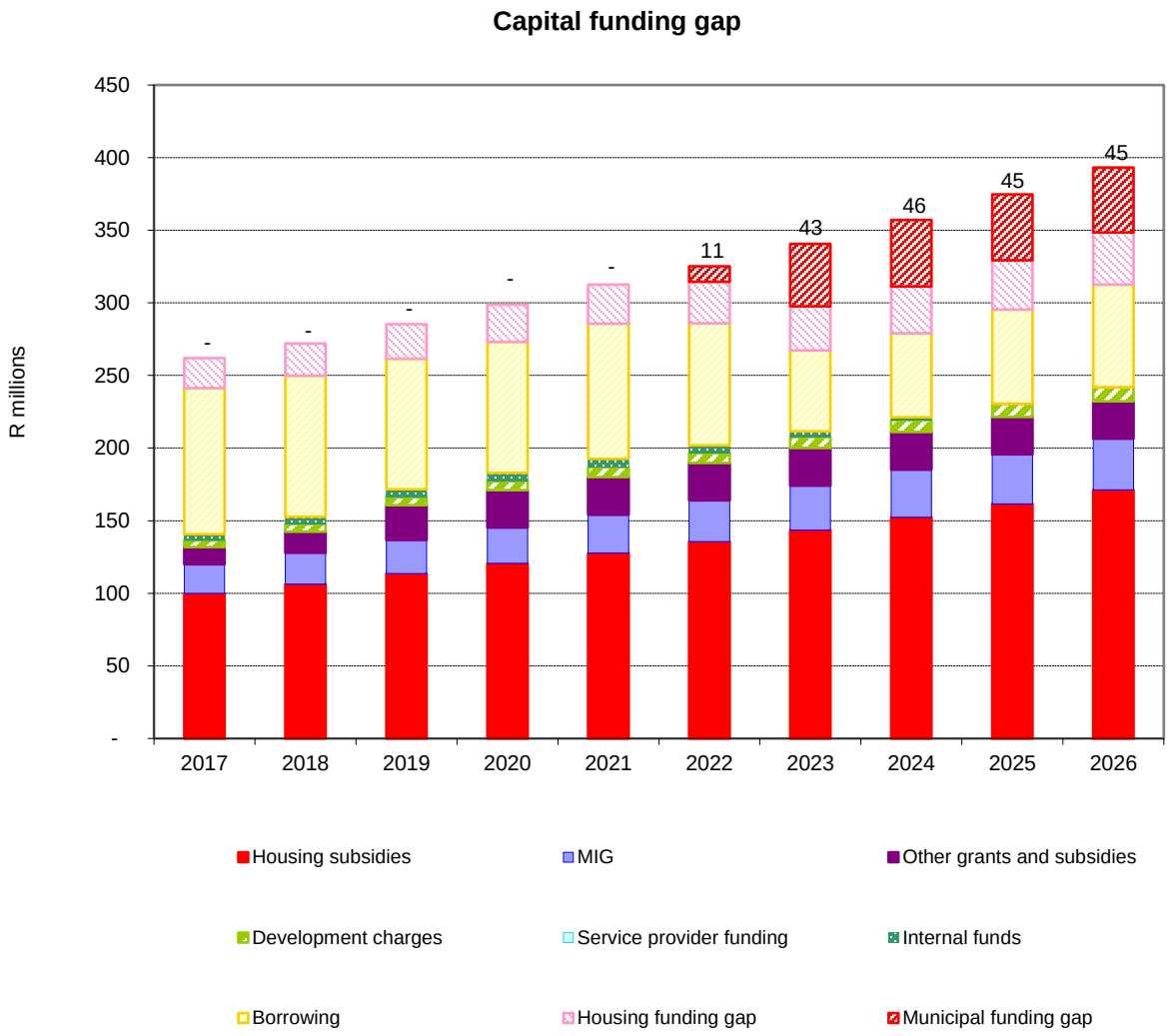


	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*203*	*194*	*200*	*210*	*220*	*225*	*236*	*248*	*260*	*274*
Funding gap	*-*	*31*	*56*	*62*	*67*	*62*	*69*	*70*	*72*	*74*

I. Langeberg financial analysis

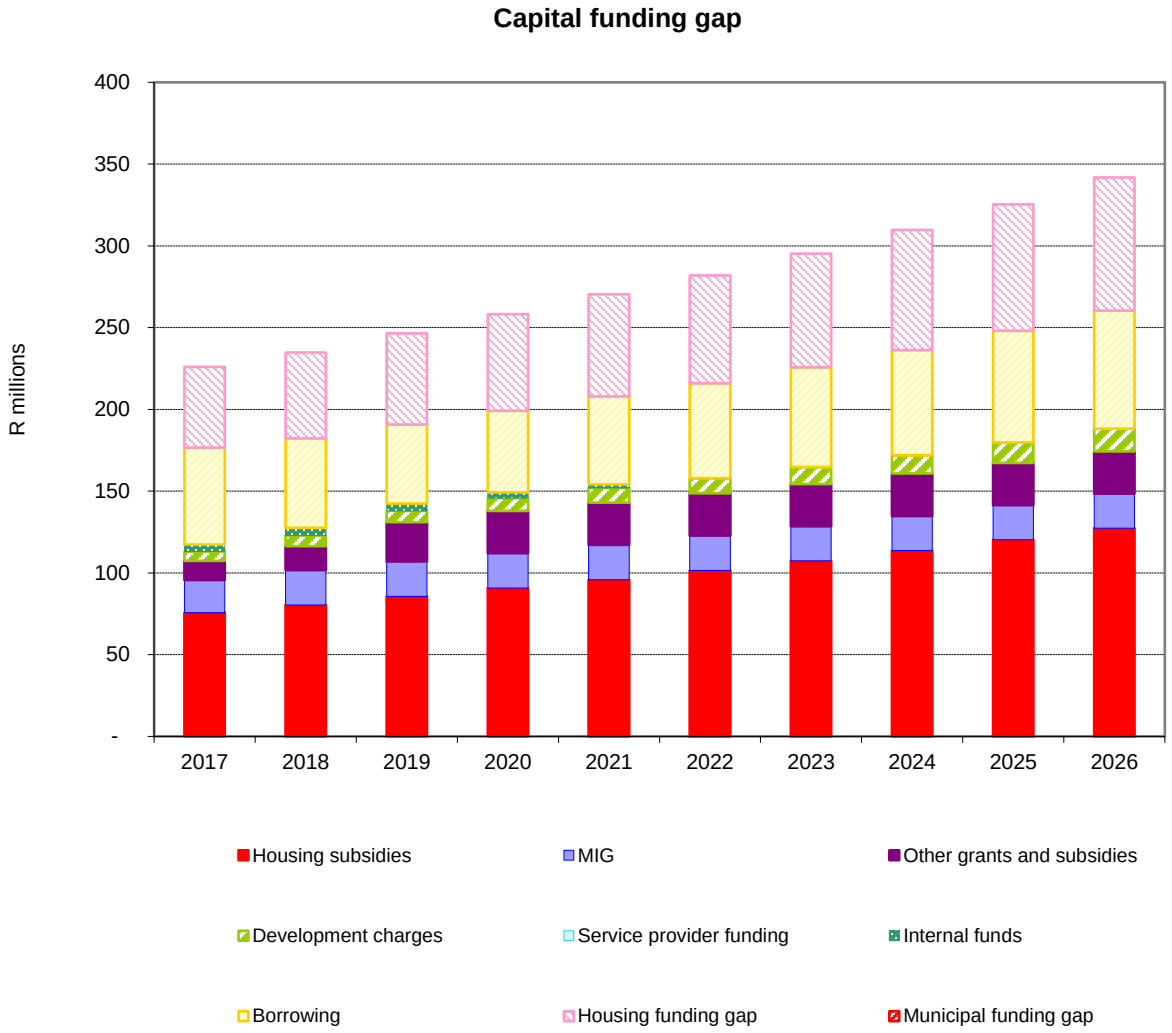
	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital finance required – current development trend	*227*	*219*	*226*	*237*	*249*	*252*	*264*	*277*	*290*	*305*
Capital finance required – Compact development	*203*	*194*	*200*	*210*	*220*	*225*	*236*	*248*	*260*	*274*
Capital saving	*24*	*25*	*26*	*27*	*29*	*27*	*28*	*29*	*30*	*31*
Percentage capital saving	***10.6%***	***11.4%***	***11.5%***	***11.4%***	***12.7%***	***10.7%***	***10.6%***	***10.5%***	***10.3%***	***10.2%***
Funding gap – current development trend	*-*	*80*	*90*	*103*	*109*	*107*	*112*	*115*	*118*	*121*
Funding gap – Compact development	*-*	*31*	*56*	*62*	*67*	*62*	*69*	*70*	*72*	*74*
Difference in required funding	*-*	*49*	*34*	*41*	*42*	*45*	*43*	*45*	*46*	*47*
Required funding saving	**-**	***61.3%***	***37.8%***	***39.8%***	***38.5%***	***42.1%***	***38.4%***	***39.1%***	***39%***	***38.7%***

m. Witzenberg – Business as usual



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*262*	*272*	*285*	*299*	*313*	*325*	*341*	*357*	*375*	*393*
Funding gap	-	-	-	-	-	*11*	*43*	*46*	*45*	*45*

n. Witzenberg – Densification



	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Total	*226*	*235*	*247*	*258*	*270*	*282*	*295*	*310*	*325*	*342*
Funding gap	-	-	-	-	-	-	-	-	-	-

o. Witzenberg financial analysis

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026
Capital finance required – current development trend	*262*	*272*	*285*	*299*	*313*	*325*	*341*	*357*	*375*	*393*
Capital finance required – Compact development	*226*	*235*	*247*	*258*	*270*	*282*	*295*	*310*	*325*	*342*
Capital saving	*36*	*37*	*38*	*41*	*43*	*43*	*46*	*47*	*50*	*51*
Percentage capital saving	***13.7%***	***13.6%***	***13.3%***	***13.7%***	***13.7%***	***13.2%***	***13.5%***	***13.2%***	***13.3%***	***13%***
Funding gap – current development trend	-	-	-	-	-	*11*	*43*	*46*	*45*	*45*
Funding gap – Compact development	-	-	-	-	-	-	-	-	-	-
Difference in required funding	-	-	-	-	-	*11*	*43*	*46*	*45*	*45*
Required funding saving	**-**	**-**	**-**	**-**	**-**	***100%***	***100%***	***100%***	***100%***	***100%***

p. Cape Winelands consolidated

	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	Total
Capital finance required – current development trend	*1989*	*2005*	*2024*	*2103*	*2186*	*2265*	*2356*	*2452*	*2554*	*2664*	*22598*
Capital finance required – Compact development	*1818*	*1817*	*1829*	*1895*	*1963*	*2060*	*2139*	*2219*	*2307*	*2402*	*20449*
Capital saving	*171*	*188*	*195*	*208*	*223*	*205*	*217*	*233*	*247*	*262*	*2149*
Percentage capital saving	***8.6%***	***9.4%***	***9.6%***	***9.9%***	***10.2%***	***9.1%***	***9.2%***	***9.5%***	***9.7%***	***9.8%***	***9.5%***
Funding gap – current development trend	*679*	*728*	*759*	*824*	*868*	*887*	*941*	*960*	*863*	*882*	*8391*
Funding gap – Compact development	*440*	*395*	*536*	*577*	*607*	*624*	*643*	*643*	*560*	*557*	*5582*
Difference in required funding	*239*	*333*	*223*	*247*	*261*	*263*	*298*	*317*	*303*	*325*	*2809*
Required funding saving	***35.2%***	***45.7%***	***29.4%***	***30%***	***30.1%***	***29.7%***	***31.7%***	***33%***	***35.1%***	***36.8%***	***33.5%***

		2016/17	2017/18	2018/19	2019/20	2019/20
Drakenstein	Transfers recognised - capital	*65,400*	*160,320*	*74,507*	*50,037*	*92,662*
	Public contributions & donations	-	-	-	-	-
	Borrowing	*453,019*	*597,245*	*331,835*	*173,603*	*166,183*
	Internally generated funds	*25,900*	*81,104*	*47,699*	*56,397*	*68,817*
	Total sources of capital funds	***544,360***	***838,669***	***454,040***	***280,037***	***327,662***
Stellenbosch	Transfers recognised - capital	*118,377*	*60,137*	*82,402*	*77,453*	-
	Public contributions & donations	*13,174*	-	-	-	-
	Borrowing	-	*160,000*	*80,000*	-	-
	Internally generated funds	*351,029*	*197,920*	*157,112*	*149,420*	-
	Total sources of capital funds	***482,580***	***418,057***	***319,514***	***226,873***	**-**
Breede Valley	Transfers recognised - capital	-	*147,951*	*99,296*	*123,972*	-
	Public contributions & donations	-	-	-	-	-
	Borrowing	-	*24,298*	-	-	-
	Internally generated funds	-	*84,331*	*78,735*	*40,921*	*54,958*
	Total sources of capital funds	**-**	***256,560***	***178,031***	***164,893***	***54,958***
Langeberg	Transfers recognised - capital	-	*29,295*	*29,743*	*21,342*	*22,790*
	Public contributions & donations	-	-	-	-	-
	Borrowing	-	-	*20,124*	*14,876*	-
	Internally generated funds	-	*24,526*	*38,244*	*27,324*	*8,850*
	Total sources of capital funds	**-**	***53,821***	***88,111***	***63,541***	***31,640***
Witzenberg	Transfers recognised - capital	*38,670*	*34,670*	*49,092*	*47,271*	*32,923*
	Public contributions & donations	*54,014*	-	-	-	-
	Borrowing	-	*3,526*	*1,550*	*3,000*	-
	Internally generated funds	*22,558*	*27,397*	*25,333*	*20,233*	*10,165*
	Total sources of capital funds	***115,242***	***65,593***	***75,975***	***70,504***	***43,088***

In both scenarios, the capital needed to fund new infrastructure or maintain and rehabilitate existing infrastructure for development growth over the next ten years far outweighs the available capital in all municipalities in the Cape Winelands. The total capital cost for development with the current generally sprawling growth patterns is R22,5 billion, with an anticipated saving of over R2,1 billion over the same period with a densified, compact development approach. This equates to a saving of almost 10% on the capital required to accommodate growth in the district over the next 10 years.

The category B1 municipalities, Drakenstein and Stellenbosch, have the highest capital budgets to service the needs of current and future populations. These are the growth nodes and fastest growing municipalities in the district. A compact development approach is even more critical in these municipalities to minimise future financial risk, and savings could be significant.

Most municipalities could see capital savings of between 5% and 15% per year.

ANNEXURE 2: CAPE WINELANDS DISTRICT CAPITAL INVESTMENT FRAMEWORK

2019/2024

CAPE WINELANDS DISTRICT
MUNICIPALITY • MUNISIPALITEIT • UMASIPALA

CONTENT

1. CAPE WINELANDS DISTRICT MUNICIPALITIES PROVINCIAL INFRASTRUCTURE EXPENDITURE AND TRANSFERS FOR 2018/2019

The Local Government Municipal Systems Act (32 of 2000) requires that a Municipal Spatial Development Framework must have a Capital Investment Framework that projects current and future spending on capital/infrastructure projects. The capital transfers listed in this document is not directly linked to strategic proposals, it contains the outcomes of provincial forward planning emanating from higher order provincial strategies and policies.

For **Cape Winelands District Municipalities**, the adjustments published in November 2018 shows a general upward and unchanged trend. The table below sets out more detail. [1]

Note: Your attention is drawn to the fact that the infrastructure projects are in various stages of planning and implementation and the information may be subject to change, depending on fiscal constraints and the availability of resources.

The summary of planned infrastructure expenditure and transfers to municipalities, as outlined in the Adjusted Estimates of Provincial Expenditure 2018 and Provincial Gazette Extraordinary 8005, 22 November 2018 are as follows:

i. The adjusted infrastructure budget of the **Department of Transport and Public Works** decreases for the 2018/19 period and the total adjusted appropriation amounts to R184, 382million. Note the department added five (5) additional planned projects, which is indicated in green in the tables below.

ii. The adjusted infrastructure budget of the **Department of Health** decreases for the 2018/19 period and the total adjusted appropriation amounts to R18, 170million. Note the department added an additional four (4) planned projects, which is indicated in green in the tables below.

iii. The adjusted infrastructure budget of the **Western Cape Department of Education** decreases for the 2018/19 period and the total adjusted appropriation amounts to R12, 950million. Note the department added an additional six (6) planned projects, which is indicated in green in the tables below.

[1] Western Cape Government: Provincial Treasury. Adjustment Estimates of Provincial Revenue and Expenditure, 2018. ISBN 978-0-621-46880-9. Published 22 November 2018 and Provincial Gazette Extraordinary 8005 published 22 November 2018.

1.1 Cape Winelands District: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Transport and Public W	Provincial infrastructure payments and estimates	Twee Jonge Gesellen DM	Cape Winelands Distri	7,400	3,600	11,000	
Transport and Public W	Provincial infrastructure payments and estimates	CW DM regravel	Cape Winelands Distri	1,450	25,050	26,500	
Transport and Public W	Provincial infrastructure payments and estimates	CW DM reseal	Cape Winelands Distri	4,995	11,900	16,895	
Transport and Public W	Provincial infrastructure payments and estimates	Maintenance CW DM	Cape Winelands Distri	-3,000	62,000	59,000	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Cape Winelands Distri	-74	74	0	
Local Government	Transfers to local government	Local Government graduate internship grant	Cape Winelands Distri	72	0	72	
Local Government	Transfers to local government	Municipal service delivery and capacity building grant	Cape Winelands Distri	400	0	400	

1.2 Breede Valley: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Education	Provincial infrastructure payments and estimates	Worcester HS	Breede Valley	650	0	650	
Education	Provincial infrastructure payments and estimates	Zwelethemba SS	Breede Valley	750	0	750	
Health	Provincial infrastructure payments and estimates	De Doorns - De Doorns Ambulance Station - Replacement	Breede Valley	-3,187	3,500	313	
Health	Provincial infrastructure payments and estimates	Worcester - Avian Park Clinic - New	Breede Valley	-15	800	785	
Health	Provincial infrastructure payments and estimates	De Doorns - De Doorns CDC - Upgrade and Additions	Breede Valley	634	50	684	
Health	Provincial infrastructure payments and estimates	Worcester - Worcester CDC - Dental Suite Additions and Alterations	Breede Valley	127	1	128	
Health	Provincial infrastructure payments and estimates	Worcester - WCCN Boland Campus - Nurses Accommodation at Erica Hostel, R & R	Breede Valley	-100	600	500	
Health	Provincial infrastructure payments and estimates	Worcester - Worcester Hospital - Fire Compliance	Breede Valley	-2,085	3,000	915	
Health	Provincial infrastructure payments and estimates	Worcester - Worcester Hospital - Relocation of MOU	Breede Valley	-15	150	135	
Health	Provincial infrastructure payments and estimates	Worcester - Worcester Hospital - Upgrade Ph5	Breede Valley	984	200	1,184	
Health	Provincial infrastructure payments and estimates	Touwsrivier - Touwsrivier Ambulance Station - HT - General upgrade, extension for wash bay, and	Breede Valley	109	200	309	
Social Development	Provincial infrastructure payments and estimates	De Pyp	Breede Valley	53	0	53	
Social Development	Provincial infrastructure payments and estimates	Mooihoek	Breede Valley	88	0	88	
Social Development	Provincial infrastructure payments and estimates	Weltervrede	Breede Valley	49	0	49	
Human Settlements	Transfers to local government	Human Settlements Development grant (Beneficiaries)	Breede Valley	-13,260	118,080	104,820	
Human Settlements	Transfers to local government	Title deeds restoration grant	Breede Valley	1,334	0	1,334	
Transport and Public V	Provincial infrastructure payments and estimates	Worcester - Kleinplasie -Upgrading of electrical	Breede Valley	658	4,000	4,658	
Transport and Public V	Provincial infrastructure payments and estimates	C1051.2 Worcester area	Breede Valley	130	0	130	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Breede Valley	-93	93	0	
Local Government	Transfers to local government	Municipal service delivery and capacity building grant	Breede Valley	750	0	750	
Local Government	Transfers to local government	Local Government graduate internship grant	Breede Valley	72	0	72	

1.3 Drakenstein: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Education	Provincial infrastructure payments and estimates	Dal Josaphat PS	Drakenstein	-1,500	2,500	1,000	
Education	Provincial infrastructure payments and estimates	Wellington PS	Drakenstein	150	0	150	
Health	Provincial infrastructure payments and estimates	Gouda - Gouda Clinic - Replacement	Drakenstein	667	250	917	
Health	Provincial infrastructure payments and estimates	Paarl - Paarl CDC - New	Drakenstein	100	399	499	
Health	Provincial infrastructure payments and estimates	Paarl - Paarl Hospital - Acute Psychiatric Unit	Drakenstein	160	0	160	
Health	Provincial infrastructure payments and estimates	Wellington - Wellington CDC - Pharmacy Additions and Alterations	Drakenstein	488	681	1,169	
Health	Provincial infrastructure payments and estimates	Wellington - Windmeul Clinic - Upgrade and Additions	Drakenstein	-1,148	1,200	52	
Health	Provincial infrastructure payments and estimates	Wellington - Saron Clinic - HT - General maintenance and upgrade (Alpha)	Drakenstein	255	400	655	
Social Development	Provincial infrastructure payments and estimates	Sizamile Educare	Drakenstein	173	0	173	
Social Development	Provincial infrastructure payments and estimates	Khanyisa Day Care	Drakenstein	102	0	102	
Human Settlements	Transfers to local government	Human Settlements Development grant (Beneficiaries)	Drakenstein	-7,730	101,810	94,080	
Human Settlements	Transfers to local government	Provincial contribution towards the acceleration of housing delivery	Drakenstein	17,325	0	17,325	
Human Settlements	Transfers to local government	Title deeds restoration grant	Drakenstein	2,784	0	2,784	
Transport and Public V	Provincial infrastructure payments and estimates	C999 Suid Agter Paarl Road	Drakenstein	2,728	0	2,728	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Drakenstein	-111	111	0	
Local Government	Transfers to local government	Local Government graduate internship grant	Drakenstein	72	0	72	

1.4 Langeberg: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Education	Provincial infrastructure payments and estimates	Bonnievale PS	Langeberg	100	0	100	
Education	Provincial infrastructure payments and estimates	Jakes Gerwel HS (Bonnievale)	Langeberg	5,000	1,000	6,000	
Education	Provincial infrastructure payments and estimates	Wakkerstroom Wes PS	Langeberg	750	0	750	
Education	Provincial infrastructure payments and estimates	Wakkerstroom Wes PS	Langeberg	-2,000	2,000	0	
Human Settlements	Transfers to local government	Human Settlements Development grant (Beneficiaries)	Langeberg	23,340	20,290	43,630	
Human Settlements	Transfers to local government	Title deeds restoration grant	Langeberg	845	0	845	
Transport and Public V	Provincial infrastructure payments and estimates	C1050.1 Montagu area	Langeberg	268	300	568	
Transport and Public V	Provincial infrastructure payments and estimates	C818 Ashton-Montagu	Langeberg	-128,812	180,000	51,188	
Transport and Public V	Provincial infrastructure payments and estimates	C1054.5 Robertson area	Langeberg	322	0	322	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Langeberg	-19	19	0	

1.5 Stellenbosch: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Health	Provincial infrastructure payments and estimates	Stellenbosch - Stellenbosch Hospital - EC Upgrade and Additions	Stellenbosch	-11	500	489	
Health	Provincial infrastructure payments and estimates	Stellenbosch - Stellenbosch Hospital - Hospital and Stores Repairs and Renovation	Stellenbosch	379	100	479	
Health	Provincial infrastructure payments and estimates	Stellenbosch - Stellenbosch Hospital - HT - EC Upgrade and Additions	Stellenbosch	-200	200	0	
Health	Provincial infrastructure payments and estimates	Stellenbosch - Stellenbosch Hospital - OD and QA - Replacement	Stellenbosch	220	0	220	
Human Settlements	Transfers to local government	Title deeds restoration grant	Stellenbosch	1,650	0	1,650	
Transport and Public \	Provincial infrastructure payments and estimates	Elsenburg New Research Facility	Stellenbosch	-5,012	10,000	4,988	
Transport and Public \	Provincial infrastructure payments and estimates	Elsenburg Sewer and Water Upgrade	Stellenbosch	1,694	500	2,194	
Transport and Public \	Provincial infrastructure payments and estimates	Stellenbosch- Assegaaibosch Nature Reserve - New Security Fence	Stellenbosch	426	1,550	1,976	
Transport and Public \	Provincial infrastructure payments and estimates	Stellenbosch - Elsenburg Farms - Access Control Security	Stellenbosch	-316	316	0	
Transport and Public \	Provincial infrastructure payments and estimates	C914.1 Spier Road	Stellenbosch	794	0	794	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Stellenbosch	-56	56	0	
Local Government	Transfers to local government	Local Government graduate internship grant	Stellenbosch	72	0	72	

1.6 Witzenberg: Adjusted provincial infrastructure expenditure and transfers for 2018/19 (R'000)

DEPARTMENT	CATEGORY OF PAYMENT	PROGRAMME NAME	MUNICIPALITIES	ADJ AMOUNT (R'000)	MAIN APPROPRIATION 2018/19 (R'000)	ADJ APPROPRIATION 2018/19 (R'000)	DIRECTION OF CHANGE
Education	Provincial infrastructure payments and estimates	Cloetesville PS	Witzenberg	-26,000	26,000	0	
Education	Provincial infrastructure payments and estimates	Tulbagh HS	Witzenberg	-2,500	5,000	2,500	
Education	Provincial infrastructure payments and estimates	Tulbagh PS	Witzenberg	300	0	300	
Education	Provincial infrastructure payments and estimates	Waveren SS	Witzenberg	-250	1,000	750	
Health	Provincial infrastructure payments and estimates	Prince Alfred Hamlet - Prince Alfred Hamlet Clinic - Replacement	Witzenberg	-639	2,000	1,361	
Health	Provincial infrastructure payments and estimates	Wolseley - Wolseley Clinic - Replacement	Witzenberg	1,255	5,060	6,315	
Health	Provincial infrastructure payments and estimates	Ceres - Ceres Hospital - New Acute Psychiatric Ward	Witzenberg	80	160	240	
Health	Provincial infrastructure payments and estimates	Ceres - Ceres Hospital - Hospital and Nurses Home Repairs and Renovation	Witzenberg	491	50	541	
Health	Provincial infrastructure payments and estimates	Prince Alfred Hamlet - Prince Alfred Hamlet Clinic - OD and QA - Replacement	Witzenberg	60	0	60	
Health	Provincial infrastructure payments and estimates	Wolseley - Wolseley Clinic - OD and QA - Replacement	Witzenberg	60	0	60	
Human Settlements	Transfers to local government	Human Settlements Development grant (Beneficiaries)	Witzenberg	-5,000	32,839	27,839	
Environmental Affairs	Transfers to local government	RSEP/VPUU municipal projects	Witzenberg	-2,000	2,000	0	
Transport and Public V	Provincial infrastructure payments and estimates	C997 Wolseley reseal	Witzenberg	1,441	0	1,441	
Local Government	Transfers to local government	Community development workers (CDW) operational support grant	Witzenberg	-148	148	0	

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ANNEXURE 3: CAPE WINELANDS CLIMATE CHANGE ADAPTATION SUMMARY REPORT

2019/2014

CAPE WINELANDS DISTRICT
MUNICIPALITY • MUNISIPALITEIT • UMASIPALA

Climate Change Adaption Summary Report

November 2017

Approved with CWDM SDF 2019/2024

Developed through the Local Government Climate Change Support Program

This climate change plan was developed through the Department of Environmental Affairs, Local Government Climate Change Support Program (LGCCSP). The LGCCSP is part of the International Climate Initiative (IKI) and is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

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1 Executive Summary

Cape Winelands District Municipality recognises climate change as a threat to the environment, its residents, and to future development. Therefore, measures should be implemented to reduce or eliminate carbon emissions and enhance greenhouse gas sinks (mitigation) (Böckmann, M 2015). However, due to lag times in the climate and biophysical systems, the positive impacts of past and current mitigation will only be noticeable in the next 25 years (Jiri, O 2016). In the meanwhile, adaptation is regarded as inevitable and a necessary response to the changes that are projected to take place in the District. Cape Winelands District Municipality has therefore prioritised the development of a Climate Change Vulnerability Assessment and Climate Change Response Plan.

The Climate Change Vulnerability Assessment and Response Plan was developed through the Local Government Climate Change Support (LGCCS) program (http://www.letsrespondtoolkit.org/), led by the Department of Environmental Affairs. The LGCCSP is part of the International Climate Initiative (IKI) and is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

Through this program key climate change vulnerability indicators for the Cape Winelands District Municipality were identified. These indicators demonstrate areas that may be at high risk of climate change impacts.

A summary of the key vulnerability indicators is provided in the table below.

Table 1: Key Vulnerability indicators for Cape Winelands District Municipality

No	Sector	Name Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
5	Agriculture	Change in viticulture (grapes) production	Yes	High	Low
6	Agriculture	Change in fruit production	Yes	High	Low
10	Agriculture	Increased risks to livestock	Yes	High	Low
12	Biodiversity and Environment	Loss of High Priority Biomes	Yes	High	Low
14	Biodiversity and Environment	Increased impacts on environment due to land-use change	Yes	High	Low
28	Human Settlements, Infrastructure and Disaster Management	Loss of industrial and labour productivity	Yes	High	Low
29	Human Settlements, Infrastructure and Disaster Management	Increased impacts on strategic infrastructure	Yes	High	Low

No	Sector	Name Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
30	Human Settlements, Infrastructure and Disaster Management	Increased impacts on traditional and informal dwellings	Yes	High	Low
31	Human Settlements, Infrastructure and Disaster Management	Increased isolation of rural communities	Yes	High	Low
36	Water	Decreased water quality in ecosystem due to floods and droughts	Yes	High	Low
37	Water	Less water available for irrigation and drinking	Yes	High	Low

Based on the key indicators identified in the table above, the following sub-projects and actions are prioritised as a response to each of the indicators.

1.1 Agriculture

The Cape Winelands District Municipality's agricultural sector will be adversely affected by climate change. Increased temperatures, drought, and the increase in frequency and severity of storm events will impact on the crops that can be grown and potentially result in a loss of livestock.

The following key agricultural indicators, sub-projects and actions were identified:

Project	Sub-Project
Manage the change in viticulture (grapes) production	Commission research and improve understanding of climate change impacts on viticulture production.
	Optimise climate resilient land-uses of existing agricultural areas.
	Promote knowledge generation, knowledge sharing, stakeholder participation and raise awareness regarding alternative agricultural production in the western and southern Cape.
	Promote knowledge generation, knowledge sharing, stakeholder participation and raise awareness regarding viticulture in new growth areas.
Manage the change in fruit production	Generate and share scientific, social and indigenous knowledge that will minimise the loss of areas suitable for the growth of fruit.
	Identify climate resilient land-uses that will support new agricultural opportunities that will minimise the new areas and new crops thus reducing climate change impacts on current agricultural potential.
	Implement evidence based monitoring initiatives that feed into the management systems for fruit production.

Project	Sub-Project
	Promote knowledge generation, knowledge sharing, stakeholder participation and raise awareness regarding the decline in suitable areas for the growth of fruit.
	Research and improve understanding of climate change impacts on fruit.
	Strengthen management plans, to enable continuous monitoring and the ability to effectively respond to change.
Manage increasing risks to livestock	Commission research and improve understanding of how climate change impacts livestock and land availability.
	Develop a framework that will assist and educate farmers with adjusting to reduced rainfall.
	Generate and share scientific, social and indigenous knowledge that will assist with adapting to the reduction in herbage yields.
	Improve collaboration and partnership on existing programs (e.g. LandCare Programme, EPWP and River Health Programmes).
	Strengthen management plans, to enable continuous monitoring of water and herbage availability for livestock.

1.2 Biodiversity and Environment

Climate change predictions include the shifting of biomes across South Africa.

The following key biodiversity indicator, sub-project and actions were identified:

Project	Sub-Project
Manage Loss of High Priority Biomes	Implementation of fire breaks in local municipalities (Langeberg) by 2022 through the Disaster Management Unit.
	Identification/Inclusion of high priority biomes in local Spatial Development Frameworks during the review process.
Manage Increased impacts on environment due to land-use change	Develop programmes to diversify community livelihoods strategies to earn income from activities such as ecotourism and other non-farming activities.
	Incentivize small scale farmers to practice sustainable and conservation agriculture
	Incorporate sustainable land use management and planning into other sectors' plans.
	Research and improve understanding of land use change in the municipality.
	Strengthen institutional capacity to deal with pressure on land use change.

1.3 Disaster Management, Infrastructure and Human Settlements

Climate change will affect Disaster Management, Infrastructure and Human Settlements in several ways in Cape Winelands District Municipality. Increases in the severity of storm events and an increase in flooding will damage infrastructure which may result in a loss of industrial productivity

and service delivery. The impacts of storm events will particularly affect communities located in informal settlements, on flood plains and where there is poor drainage infrastructure. In addition, communities in rural areas that depend on subsistence farming may be unable to grow crops that they have grown in the past due to the changing climate. It is predicted therefore, that there will be an increase in rates of rural-urban migration. Rural communities may also become more physically isolated due to extreme events impacting on key infrastructure.

The following key human settlement indicators, sub-projects and actions were identified:

Project	Sub-Project
Manage potential loss of industrial and labour productivity.	Research and implement water efficiency projects in industrial processes.
Manage potential increased impacts on strategic infrastructure.	Implement a water augmentation project that will help reduce reliance on surface water and seek alternative sources of water (e.g. recycling of water).
	Upgrade and maintain storm water infrastructure so that it considers extreme weather events such as flooding.
	Upgrading and maintenance of road infrastructure.
Manage increased impacts on traditional and informal dwellings	Develop and upgrade informal settlements.
	Partner with research institutions to implement a research project to develop a model aimed at achieving sustainable informal settlements with lower risk exposure.
Manage potential increased isolation of rural communities.	Build Climate change resilient road infrastructure that serves as a link for rural areas.
	Develop economic nodes and improved service provision in rural areas to improve connectivity.
	Identify alternative access routes to rural communities.
	Identify local responses that will reduce isolation of rural communities.
	Identify roads at risk of flooding and erosion and prioritise those for upgrading and maintenance.
	Implement flood drainage systems that will reduce impacts on rural roads.

1.4 Water

Water resources are the primary medium through which climate change impacts will be felt by South Africans (Schulze et al., 2014). Climate change will affect Cape Winelands District Municipality's water accessibility, quantity, and quality (Parikh, J 2007) through drought, reduced runoff, increased evaporation, and an increase in flood events.

The following key water indicators, sub-projects and actions were identified:

Project	Sub-Project
Manage decreased water quality in ecosystem.	Invasive aquatic weeds removal and management in Berg and Breede Rivers by the Cape Winelands District Municipality, B municipalities, DOWA, property/landowners and water user associations. Continuous clearing should be done annually between September and April. The specific area to be targeted is between the R45 and Herman.
Manage the quantity of water available for irrigation and drinking.	Cape Winelands District Municipality to facilitate research into the re-use of wastewater within the District Municipality, with B-municipalities indicating which towns should be included in the research. The economic viability and quantities are important selection criteria. The replenishment of aquifers by infusion of purified waste water should form part of the research. Implementation by relevant Engineering Departments of B-municipalities.
	Cape Winelands District Municipality to facilitate the assessment of existing infrastructure for water storage. Implementation by Engineering Departments of B-municipalities.
	Increase alien clearing in catchments located throughout the entire District and B municipalities in partnership with Department of Water and Sanitation and the LandCare Programme.

2 Introduction

This document outlines key climate change vulnerabilities and responses to address these vulnerabilities for Cape Winelands District Municipality. The Climate Change Vulnerability Assessment and Response Plan were developed through the Local Government Climate Change Support Program (LGCCSP), an initiative of the National Department of Environmental Affairs and the International Climate Initiative (IKI) and is supported by Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH on behalf of The Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (BMUB).

The three primary objectives of the LGCCSP are to:

- Undertake a desktop analysis of the municipality to provide context on change vulnerabilities and responses;
- Undertake district municipal specific engagements to draft climate change vulnerabilities and responses;
- Facilitate capacity building and knowledge-transfer throughout the program to enhance implementation of prioritised climate change adaptation options.

For more details on the LGCCSP please visit the website: http://www.letsrespondtoolkit.org/.

Through the LGCCSP, a Climate Change Vulnerability Assessment Toolkit was developed to assist municipalities to identify and prioritise climate change indicators to facilitate the assessment of adaptive capacity. Indicators are a range of potential impacts which have been identified using the Long Term Adaptation Scenario (LTAS) reports (Department of Environmental Affairs 2013e). Indicators are grouped into the following themes:

- Agriculture
- Biodiversity and Environment
- Human Health
- Disaster Management, Infrastructure and Human Settlements
- Water

The LGCCS Toolkit was applied to the Cape Winelands District Municipality to assist with the development of its Climate Change Response Plan.

2.1 Climate Change Introduction

2.1.1 Climate change defined

Climate change is a natural phenomenon that takes place over geological time. However, over the past few decades the rate of climate change has been more rapid and the magnitude of global warming has increased dramatically (Warburton, M.L and Schulze, R 2006; Warburton, M.L 2012). This change has been attributed to increased anthropogenic greenhouse gas emissions (Koske, J and Ochieng, M.A 2013). For example, the burning of coal to generate electricity, the burning of petrol in cars, some chemical processes in industries, and many farming activities all contribute to the increased concentration of greenhouse gasses in the atmosphere.

Climate change is not just an increase in average global temperatures but changes in regional climate characteristics such as rainfall, relative humidity and severe weather extremes (Davis, C.L 2011). Climate change can manifest as a shock or a stress (Ziervogel, G and Calder, R 2003). Shocks are defined as discrete, extreme events (rapid onset) such as floods, while gradual change (slow onset) such as long-term climate variability is classified as a stress (Ziervogel, G and Calder, R 2003).

The negative impacts of climate change "are already felt in many areas, including in relation to, *inter alia*, agriculture, and food security; biodiversity and ecosystems; water resources; human health; human settlements and migration patterns; and energy, transport and industry" (United Nations WomenWatch 2009, 1).

2.1.2 Climate Change Policy Context in South Africa

Climate change is a relatively new area of policy development in South Africa. As policies and structures are developed, it is necessary to ensure that they are evidence-based, coordinated and coherent. This section introduces international and national climate change policies and structures:

- The United Nations Framework Convention on Climate Change (UNFCCC). This international treaty provides guidance on setting agreements pertaining to the reduction of greenhouse gas emissions.

- The Paris Agreement, came into effect on 4 November 2016. This is the first agreement all countries have committed to and stipulates that all countries must reduce carbon emissions to limit global temperature increase to 1.5 degrees Celsius above pre-industrial levels.

- South Africa's Nationally Determined Contributions, came into effect after the Paris Agreement was signed. South Africa is therefore required to report on mitigation and adaptation efforts. Concerning mitigation, South Africa is to reduce emissions by a range between 398 and 614 million metric tons of carbon equivalent by 2025 and 2030. There are several instruments to ensure reduction in carbon emissions including car tax and company carbon budgets among other instruments. With reference to adaptation, a National Adaptation Plan is currently being developed, and climate change is to be incorporated in all policy frameworks, institutional capacity is to be enhanced, vulnerability and adaptation monitoring systems are to be in place, vulnerability assessment and adaptation needs frameworks are to be developed and there needs to be communication of past investments in adaptation for education and awareness.

- The National Climate Change Response White Paper (NCCRWP) was adopted in 2011 and presents the South African Government's vision for an effective climate change response in the long-term, to transition to a climate-resilient and lower-carbon economy and society.

- The National Development Plan, focuses on eliminating poverty and reducing inequality by 2030 and creating an environmentally sustainable country through mitigation and adaptation efforts.

- Long Term Mitigation Scenarios, outline different scenarios of mitigation action for South Africa.

- Long Term Adaptation Scenarios, consist of two phases. Phase one, was the identification of climate change trends and projections as well as impacts and responses for the main sectors. Phase two focussed on integrating issues such as climate information and early warning systems, disaster risk reduction, human settlements and food security.

2.1.3 Climate Change Impacts in South Africa

South Africa's temperature is expected to increase to 1.2° C by 2020, 2.4° C by 2050 and 4.2° C by 2080 (Kruger, A.C and Shongwe, S 2004). Contrary to the global increase in rainfall, South Africa's rainfall is expected to decrease by 5.4% by 2020, 6.3% by 2050 and 9.5% by 2080 (Kruger, A.C and Shongwe, S 2004). The frequency and intensity of climate extremes, *inter alia,* droughts, floods, storms and wild fires will increase (Davis, C.L 2011; Böckmann, M 2015). Climate change evidence indicates changes in frequency and intensity of flood and prolonged drought events at small scales (Meyiwa, T et al. 2014). Furthermore, the sea level will continue rising and ocean acidification will get worse (Böckmann, M 2015).

There are however uncertainties associated with climate projections because they are based on the potential rates of resource use in the future, and associated greenhouse gas emissions (Nicholson-Cole, S.A 2005).

To assist with assessing the potential impacts from climate change, the country has been divided into six hydrological zones (Figure 1 below). These hydrological zones not only reflect water management areas but have also been grouped according to common climatic and hydrological characteristics (Department of Environmental Affairs 2013a). Based on a range of data and projections, four possible climate scenarios have been identified for South Africa:

- Warmer/wetter (with greater frequency in extreme rainfall events),
- Warmer/drier (with an increase in frequency of drought and somewhat increased frequency of extreme rainfall events),
- Hotter/wetter (with substantially greater frequency of extreme rainfall events), and,
- Hotter/drier (with a substantial increase in the frequency of drought events and greater frequency of extreme rainfall events).

Projections on rainfall have also been developed for each of the hydrological zones (Department of Environmental Affairs 2013a). The following four climate change scenarios have been described for the Breede-Gouritz-Berg Hydrological Zone (the dominant zone in the Western Cape) in the Department of Environmental Affairs' Long Term Adaptation Scenarios Reports. These are:

- Warmer wetter scenario - Decreased rain in autumn & increased in winter & spring
- Hotter drier scenario - Decreased rain in all seasons & strongly decreased in west
- Hotter wetter scenario - Decreased rain in autumn & increased in winter & spring
- Warmer drier scenario - Decreased rain in all seasons & strongly decreased in west

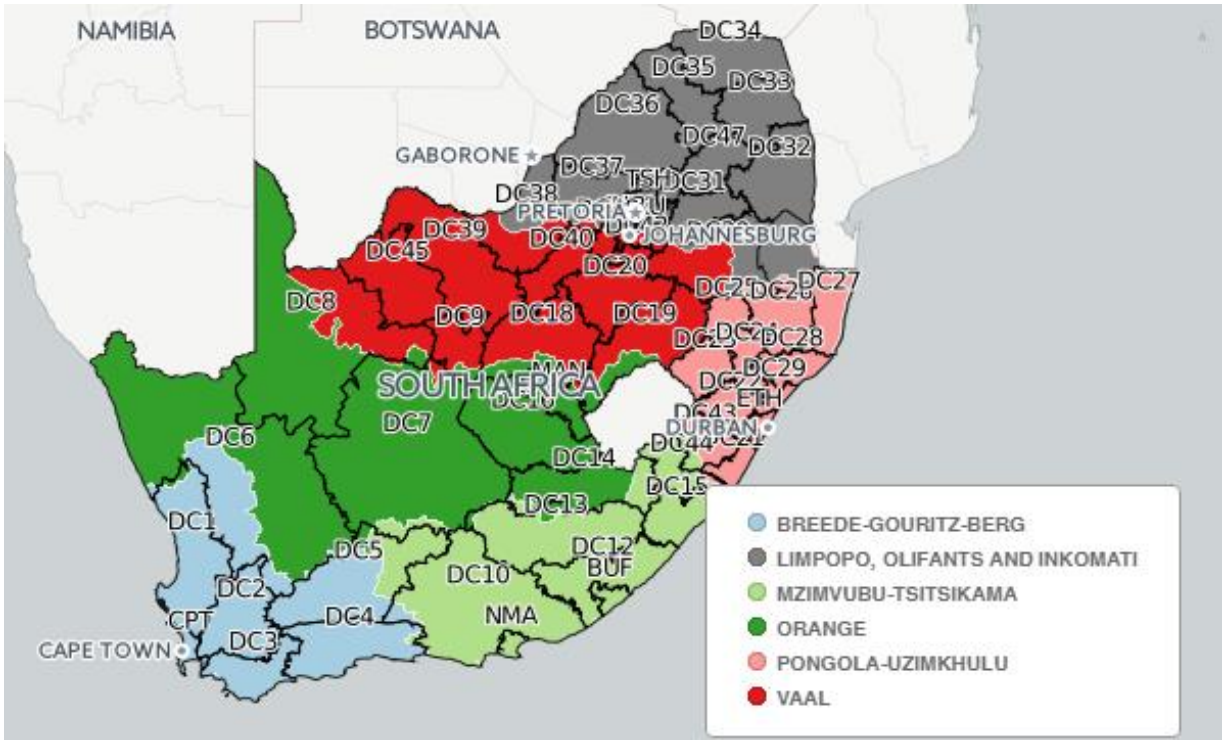

Figure 1: Hydrological Zones of South Africa

2.1.4 Provincial Climate Change Context

The Western Cape has a well-developed climate change policy environment. In 2005, the Western Cape government carried out a study titled "Status Quo, Vulnerability and Adaptation Assessment of the Physical and Socio-economic Effects of Climate Change in the Western Cape" and in the same year, the Western Cape government signed the Montreal Accord to protect the Ozone layer (Department of Environmental Affairs and Development Planning 2008). The Western Cape Climate Change Strategy and Action Plan was then developed in 2008 (Department of Environmental Affairs and Development Planning 2008; Coastal & Environmental Services 2011). A lot of emphasis was placed on adaptation to allow for developmental priorities (Coastal & Environmental Services 2011). The Climate Change Strategy was then updated in 2014 to align with the National Climate Change Response Policy and "geared to strategically direct and mainstream climate change actions and related issues throughout relevant Provincial transversal agendas" (Western Cape Government: Environmental Affairs and Development Planning 2014).

The province experiences drought and flood events with significant adverse impacts (Pasquini, L, Cowling, R.M, and Ziervogel, G 2013). Historically the province has been the most disaster prone in the country (Western Cape Government 2015) and increased temperatures in the future are certain for the Western Cape (Western Cape Government 2015). Rainfall projections are less certain, some projections reveal increased rainfall while others reveal decreased rainfall in the future, decreased rainfall has the most adverse impacts in comparison to increased rainfall (Western Cape Government 2015).

The City of Cape Town local sea level rise scenarios range from 2m to 6.5m (Coastal & Environmental Services 2011; Pasquini, L, Cowling, R.M, and Ziervogel, G 2013). Concerning wildfire, the frequency and intensity is expected to increase with climate change (Pasquini, L, Cowling, R.M, and Ziervogel, G

2013). The frequency and intensity of other extreme events are expected to increase as well (Department of Environmental Affairs and Development Planning 2008).

The table below is a summary of the key climate change impacts in the province as outlined in the climate change strategy and action plan for the Western Cape.

Table 2: Climate change impacts for the Western Cape province

Change to climate variable	Vulnerability Details
Higher mean temperatures	• Increased evaporation and decreased water balance • Increased wild fire danger (frequency and intensity)
Higher maximum temperatures, more hot days and more heat waves	• Heat stress in humans, livestock, crops and wildlife • Increased incidence of heat-related illnesses • Increased incidence of death and serious illness, particularly in older age groups • Decreased crop yields and rangeland productivity • Extended range and activity of some pests and disease vectors • Increased threat to infrastructure exceeding design specifications relating to temperature (e.g. traffic lights, road surfaces, electrical equipment, etc.) • Increased electric cooling demand increasing pressure on already stretched energy supply reliability • Exacerbation of urban heat island effect
Higher minimum temperatures, fewer cold days and frost days	• Decreased risk of damage to some crops due to less frost and increased risk to others such as deciduous fruits that rely on a cooling period in autumn • Reduced heating energy demand • Extended range and activity of some pests and disease vectors • Reduced risk of cold-related deaths and illnesses
General drying trend in western part of the country	• Decreased average runoff, and stream flow • Decreased water resources and potential increases in cost of water resources • Decreased water quality • Decrease in shoulder season length threatening the Western Cape fruit crops • Increased fire danger (drying factor) • Impacts on rivers and wetland ecosystems
Intensification of rainfall events	• Increased flooding • Increased demand on storm water systems in urban settlements • Increased soil erosion • Increased river bank erosion and demands for protective structures • Increased pressure on disaster relief systems • Increased risk to human lives and health • Negative impact on agriculture such as lower productivity levels and loss of harvest

Change to climate variable	Vulnerability Details
Increased mean sea level and associated storm surges	• Salt water intrusion into ground water and coastal wetlands • Increased storm surges leading to coastal flooding, coastal erosion and damage to coastal infrastructure • Increased impact on estuaries and associated impacts on fish and other marine species

The provincial climate change strategy also lists a number of priority responses in each of the key sectors. These are summarised in the table below

Table 3: Priority Climate Change Adaptation Responses for the Western Cape province

Adaptation Category	Adaptation Responses
Water Security and Efficiency	• Invasive alien vegetation clearing • Prioritisation, valuation, mapping, protection, and restoration of ecological infrastructure in catchments • Effective utilisation of irrigation water • Resource nexus 18 decision support • Develop ecosystem goods and services (EGS) investment opportunities
Biodiversity and Ecosystem Goods and Services	• Prioritisation, valuation, mapping, protection, and restoration of ecological infrastructure • Landscape initiatives/biodiversity corridors and identification of requirements for climate change adaptation corridors • Biodiversity stewardship • Mainstreaming of conservation planning into decision making
Food Security	• Farming practices that are in harmony with nature, i.e. 'conservation agriculture'; • Climate smart agriculture; • Agricultural water technologies that reduce consumption and increase efficiency; • Research on climate resilient and alternative crops and livestock applicable to the Western Cape; • Addressing climate vulnerability through the Municipal Support Programme; • Assessing food security in the context of the resource nexus.
Managing the effects of increased temperature on human lives	• Societal adaptation to human health impacts from temperature increases associated with climate change.
Healthy Communities	• Monitoring health trends in relation to climate trends; • Research linkages between human health and climate change in the WC context. These include: Air quality, Water quality, Food security, Heat stress, Disease vectors

3 Methodology

This climate change response plan was developed through a combination of desktop research and stakeholder engagement activities. Initially, desktop research was conducted on the climate change status quo for each of the key sectors in the district. This research was used for the basis of the stakeholder engagement activities.

The workshop methodologies were based on the active-based learning theory approach. Action learning is an approach used to train and to encourage stakeholders to solve real life problems. The workshop methodologies ensured there was a focus on knowledge exchange and capacity building at the workshops.

There were three stakeholder engagement occurrences. These were:

- Provincial level workshop, where key stakeholders were introduced to the core concepts of climate change and the LGCCSP program. The exposure component of the vulnerability assessment was also undertaken by various stakeholders at this workshop, including government officials and other key community members. The workshop therefore involved presentations, participatory exercises and associated discussions.
- A District Municipality Level workshop, where the focus was specifically on the identification and review of key climate change vulnerabilities for the area. A more detailed vulnerability assessment was undertaken by the participants. The process included the identification of context specific climate change indicators, assessing exposure, sensitivity and adaptive capacity. Participants also developed priority climate change responses.
- A final Provincial Level workshop, where key stakeholders were invited to present their municipal climate change plans.

These workshops aimed to provide the necessary tools, build capacity and provide support to stakeholders to develop and review existing Climate Change Vulnerability Assessments and response plans.

3.1 What is a Vulnerability Assessment?

According to the IPCC (Parry et al. 2007) "vulnerability to climate change is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with, adverse impacts of climate change". A vulnerability assessment therefore is a multifaceted assessment of an area's vulnerability to climate change. Nelitz et al. further define a climate change vulnerability assessment as "a process for assessing, measuring, and/or characterizing the exposure, sensitivity, and adaptive capacity of a natural or human system to disturbance" (Nelitz, M, Boardley, S, and Smith, R 2013). The methodology used in assessing climate change vulnerability for the district used the three assessment criteria, namely: exposure, sensitivity and adaptive capacity.

- **Exposure** refers to the magnitude and extent, to which a municipal area is exposed to climate change impacts (Amos, E, Akpan, U, and Ogunjobi, K 2015) and is a function of one's location and environment.
- **Sensitivity** on the other hand refers to the extent to which a municipal area is affected by the climate change impacts
- The IPCC (Parry et al. 2007) formally defines **adaptive capacity** as: "The ability of a system to adjust to climate change to moderate potential damages, to take advantage of opportunities, or to cope with the consequences".

Exposure and sensitivity, increases one's vulnerability to climate change while adaptive capacity decreases vulnerability. The above-mentioned components allow for more detailed characterizations of climate change vulnerability.

3.2 Steps involved in a Vulnerability Assessment

Four steps were followed when conducting a vulnerability assessment, they are:

- Step 1: Identify indicators' potential impacts.
- Step 2: Assess whether the impact will take place (exposure).
- Step 3: Assess how important the risk is (sensitivity).
- Step 4: Assess if you can respond to the risk (adaptive capacity).

Figure 2 below illustrates how the components of a Climate Change Vulnerability Assessment link to each other.

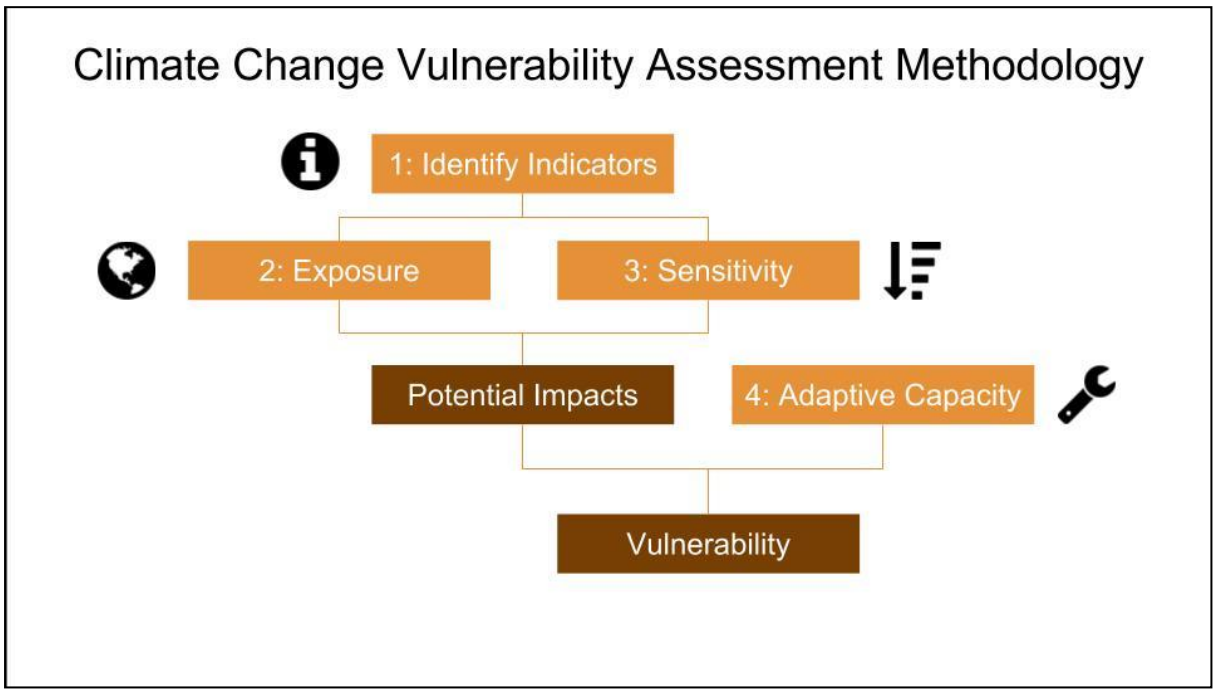

Figure 2: Vulnerability Assessment Methodology

3.3 Step 1: Develop Climate Change Indicators

As mentioned above, the first step in a Climate Change Vulnerability Assessment is the identification of context specific indicators. Essentially, indicators are potential climate change induced impacts in a specific area. The LGCCSP Vulnerability Assessment Toolkit developed a draft of several indicators using the Long Term Adaptation Scenario Reports (Department of Environmental Affairs 2013e). The indicators are grouped into six sectors (agriculture; biodiversity and environment; coastal and marine; human health; disaster management, infrastructure and human settlements; and water).

3.4 Step 2: Assessing Exposure

The assessment of exposure followed the identification of indicators. Exposure assessment aimed to ascertain whether the identified indicators are relevant in the District Municipality. If the District Municipality was exposed to an indicator, stakeholders scored that indicator a 'yes'.

3.5 Step 3: Assessing Sensitivity

The third step of the Climate Change Vulnerability Assessment 'asks' the question, "if you are exposed, how important is the potential impact?" This is termed "sensitivity" and is assessed using a graded scale (High, Medium or Low). If an indicator scored a "yes" in the exposure assessment, the sensitivity of the Municipality to that indicator was than analysed using the graded scale.

3.6 Step 4: Assessing Adaptive Capacity

Once exposure and sensitivity were determined, the next step was the assessment of adaptive capacity. The question directed at stakeholders during the workshop was "If there are going to be significant impacts due to climate change, do you have the necessary systems (policy, resources, social capital) in place to respond to the change?"

The indicators that scored "yes" for the exposure questions and "high" or "medium" for the sensitivity questions, were then assessed in terms of adaptive capacity. For the LGCCS Vulnerability Assessment Toolkit, the guiding question was "Do you have high, medium or low adaptive capacity (policy, institutional, social and finance) to respond to the change?" The adaptive capacity answers were scored using a graded scale (high, medium or low).

Those that scored a "low" or "medium" were recorded as indicators with potential adaptive capacity constraints in Cape Winelands District Municipality.

3.7 Step 5: Develop Response Plans for Priority Indicators

Upon completion of the exposure, sensitivity and adaptive capacity assessments, priority indicators were identified using the criteria below:

- Exposure - Yes
- Sensitivity - High or Medium
- Adaptive Capacity - Low or Medium

Priority indicators are perceived to be the ones the district are most vulnerable to. A response plan was then developed to address climate change vulnerabilities and inform resource allocation for climate change adaptation. To facilitate the development of a response plan, stakeholders were given a LGCCS generic response plan template for each sector, which was used as a starting point to develop sector specific response plans for Cape Winelands District Municipality.

3.8 Desired Adaptation Outcomes

The Department of Environmental Affairs (DEA) has developed (ongoing process) a set of Desired Adaptation Outcomes (DAOs). The DAOs provide evidence of climate change impacts and of responses to climate change in South Africa. DAOs identify desired states that, individually and in combination, will contribute to climate resilience in the short to medium-term (i.e. over the next five to 20 years). They aim to provide clear insights into climate change adaptation in South Africa and help capture the country's unique circumstances to aid reporting on adaptation at national and international levels. They also provide a means of assessing the capacity of 'at risk' sectors and their stakeholders to adapt to climate change and whether the measures being taken are appropriate, efficient and effective.

The current set of DAOs are provided below:

- G1 - Robust/integrated plans, policies and actions for effective delivery of climate change adaptation, together with monitoring, evaluation and review over the short, medium and long term.

- G2 - Appropriate resources (including current and past financial investments), capacity and processes (human, legal and regulatory) and support mechanisms (institutional and governance structures) to facilitate climate change adaptation.
- G3 - Accurate climate information (e.g. historical trend data, seasonal predictions, future projections, and early warning of extreme weather and other climate-related events) provided by existing and new monitoring and forecasting facilities/networks (including their maintenance and enhancement) to inform adaptation planning and disaster risk reduction.
- G4 - Capacity development, education and awareness programmes (formal and informal) for climate change adaptation (e.g. with tools to utilise data/outputs and informed by adaptation research).
- G5 - New and adapted technologies/knowledge and other cost-effective measures (e.g. nature-based solutions) used in climate change adaptation.
- G6 - Climate change risks, impacts and vulnerabilities identified and addressed.
- G7 - Systems, infrastructure, communities and sectors less vulnerable to climate change impacts (e.g. through effectiveness of adaptation interventions/response measures).
- G8 - Non-climate pressures and threats to human and natural systems reduced (particularly where these compound climate change impacts).
- G9 - Secure food, water and energy supplies for all citizens (within the context of sustainable development).

The activities in the Sector Response Plans below have a column to allocate the DAOs. This will assist the DEA to monitor and evaluate the implementation of climate change adaptation throughout the country.

4 District Snapshot Cape Winelands District Municipality

Cape Winelands District Municipality is one of five district municipalities within the Western Cape Province. The district is in the Boland region and comprises of the Breede Valley, Drakenstein, Langeberg, Stellenbosch, and Witzenberg local municipality. The district municipal area has a total population of 787 491 more than 10% of the province's total population (Statistics South Africa 2011). Drakenstein local municipality is home to a greatest proportion of the district's population and Langeberg local municipality is home to the smallest proportion of the district's population. The district is largely rural in nature (Cape Winelands District Municipality 2017) with only 0.5% of land located to towns (SRK Consulting 2011). Climate related hazards in the district include: floods, seismic activity, and veld fires (SRK Consulting 2011). Climate change is likely to exacerbate the above-mentioned hazards in the future. Furthermore, climate projections reveal reduced rainfall and increased temperatures in the future (SRK Consulting 2011).

4.1 Key District Indicators

The table below provides a summary of the key indicators for the District. The table lists the national indicators for comparison purposes. Many of these indicators are used in the climate change vulnerability assessment process below.

Table 4: Key District Municipal Indicators for the Cape Winelands DM compared to the National Average

General Information	Cape Winelands District Municipality	South Africa
Code	DC02	
Province	Western Cape	
Seat	Worcester	
Area (km²)	22309	1219740
Census Statistics		
Criteria	**Cape Winelands District Municipality**	**South Africa**
Population	**787491**	**51770553**
Age Structure		
Population under 15	25.84%	29.17%
Population 15 to 39	43.98%	44.30%
Population 40 to 64	25.05%	21.19%
Population over 65	5.13%	5.34%
Dependency Ratio		
People in age group 0-14 & 65+, supported by age group 15-64	44.9%	52.7%
Employment (between 15 and 64)		
Employed	53.30%	38.87%
Not economically active	35.68%	39.21%
Unemployed	8.74%	16.50%

Discouraged work-seeker	2.28%	5.41%
Education (aged 20 +)		
Post School Qualification	8.56%	9.94%
Grade 12/Matric	23.33%	27.83%
High School	35.61%	32.16%
Less than High School	21.59%	16.43%
Other	10.90%	13.64%
Vulnerability Indicators		
Criteria	**Cape Winelands District Municipality**	**South Africa**
Household Dynamics		
Households	198261	14450151
Average household size	3.97	3.58
Percentage households involved in agricultural activities	7.60%	20.56%
Dwelling Type		
Percentage Households that are Informal Dwellings	15.96%	13.58%
Percentage Households that are Traditional Dwellings	0.60%	7.89%
Combined Percentage Households that are Traditional and Informal Dwellings	16.57%	21.47%
Sources of Water		
Percentage of Population that sources water from Boreholes	5.21%	1.76%
Percentage of Population that do not source water from piped water schemes	21.55%	21.82%
Percentage of Population that source water from Service Providers (e.g. Municipalities)	78.45%	78.18%
Percentage of Population that sources water from Water Tanks	1.18%	2.67%
Electricity Usage		
Percentage of households that use alternatives to electricity for cooking	12.16%	26.12%
Percentage of households that use alternatives to electricity for cooking, heating or lighting	6.60%	17.77%
Sanitation		
Percentage Population with flush toilets	91.28%	56.51%
Percentage Population using pit latrines	0.79%	30.73%
Percentage of Population with no toilet facilities	2.41%	5.34%
Percentage of Population with other toilet facilities	5.52%	7.42%

Refuse		
Percentage of Households with no rubbish disposal	1.45%	5.97%
Percentage of households with refuse removed by local authority/private company	82.66%	59.40%
Health		
Percentage of young (<5yrs) and elderly (>64yrs)	14.53%	16.32%
Percentage workforce employed in the informal Sector	16.00%	12.20%
Vulnerability Tool Indicators		
Criteria	**Cape Winelands District Municipality**	**South Africa**
Percentage households involved in agricultural activities	7.60%	20.56%
Percentage Population with flush toilets	91.28%	56.51%
Percentage of young (<5yrs) and elderly (>64yrs)	14.53%	16.32%
Percentage Households that are Traditional and Informal Dwelling	16.57%	21.47%
Percentage of Households with no rubbish disposal	1.45%	5.97%

4.2 Cape Winelands DM Agriculture Sector Summary

The agriculture sector in the Cape Winelands District Municipality is a key sector in terms of employment and food security within the municipality(Cape Winelands District Municipality 2017). Most of the land in the District Municipal Area that is not either mountains or natural vegetation (i.e. fynbos and veld) is covered by commercial agriculture and some commercial forestry (Cape Winelands District Municipality 2017). The main commercial agricultural activities in the district are the production of grapes, wine, poultry and horticulture such as fruit, nuts and cut flowers (Cape Winelands District Municipality 2009, 2017). The Cape Winelands District Municipality is known for its viticulture and it is estimated that roughly 56 % of all South African wine grapes are grown in the District Municipality (Cape Winelands District Municipality 2009). Additionally, about 68 % of South Africa's wine is produced in the District Municipality(Cape Winelands District Municipality 2009).

Much of the agricultural production in the Cape Winelands District Municipal Area is irrigated and this has led to the agriculture sector becoming the largest water user in the District Municipality (Cape Winelands District Municipality 2009, 2015). The District Municipality is already a water stressed area (Cape Winelands District Municipality 2015) and the high use of water in the District Municipal Area has caused sections of some rivers inside the District Municipal Area to run dry by midsummer (Cape Winelands District Municipality 2017). This is a failure to meet the obligation of maintaining the ecological reserve, which requires that a portion of the available water stays in rivers to maintain the biological life found there (SRK Consulting 2011).

Being so varied and large, the agriculture sector is one of the most important employers in the Cape Winelands District Municipal Area, however, employment in the agriculture sector is declining (Cape Winelands District Municipality 2017). Overall, employment in the agriculture, forestry and fisheries sector accounted for 76,820 or approximately 20.5 % of the total number of people employed within the District Municipality in 2015 (Cape Winelands District Municipality 2017). However, between 2005 and 2015 the agriculture sector experienced a net decrease in employment of approximately

23,334 jobs, which represents an average decrease of 2.3 % per annum (Cape Winelands District Municipality 2017).

Furthermore, the South African National Census of 2011 estimated that only 7.60 % of households in the Cape Winelands District Municipality(Figure 3) are involved in agricultural activities (Statistics South Africa 2011). This is lower than the national average of 20.56 % (Statistics South Africa 2011).

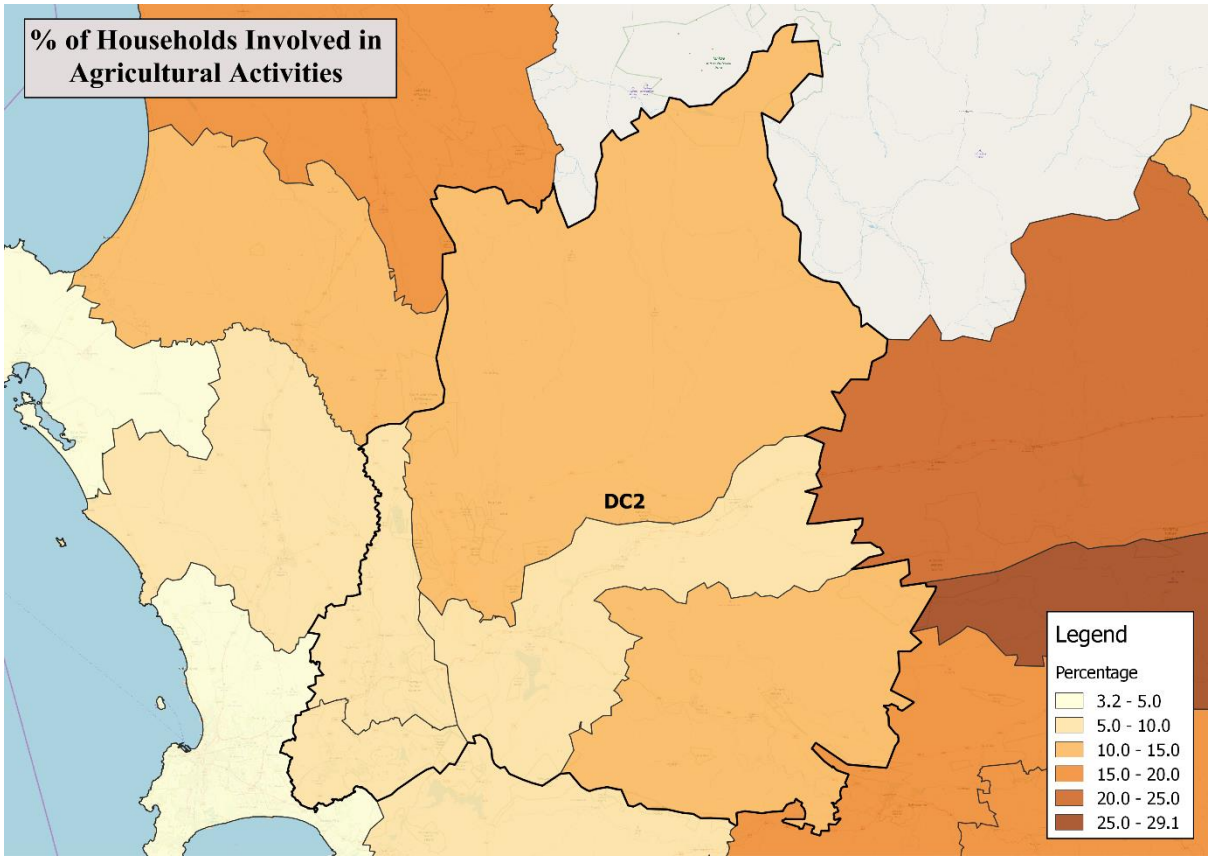

Figure 3: Percentage of households involved in agricultural activities across the District Municipal Area. Darker areas indicate higher involvement in agricultural activities. (Statistics South Africa 2011)

In contrast to the decrease in employment is the change in the agriculture sector's contribution to the Cape Winelands District Municipal Area's economy. Between 2005 and 2015 the agriculture sector's contribution to the District Municipal Area's gross domestic profit (GDP) grew by 2.0 % per annum on average (Cape Winelands District Municipality 2017). Overall, the agriculture, forestry and fisheries sector contributed R4.54 billion (or approximately 10.3 % of the total GDP) to the Cape Winelands District Municipal Area's economy in 2015 (Cape Winelands District Municipality 2017). The GDP refers to the total value of all the goods and services produced in the District Municipal Area (Blignaut and De Wit 2004). Clearly, the agriculture sector is a key contributor to the economy and employment in the Cape Winelands District Municipal Area.

Within the Cape Winelands District Municipality, agriculture can be split into nine SmartAgri Zones, of which only one, the Hex SmartAgri Zone, falls entirely within the District Municipal Area (Figure 4) (Western Cape Department of Agriculture 2017).

The future agricultural potential of the Hex, Bokkeveld, Breede, Cape Town-Winelands, Montagu-Barrydale and Grabouw-Villiersdorp-Franschhoek SmartAgri Zones are all predicted to maintain high agricultural potential as long as sufficient water is available (SmartAgri and African Climate and Development Initiative 2015). However, due to higher average temperatures, the farming of apples

in the Grabouw-Villiersdorp-Franschhoek SmartAgri Zone is predicted to become unviable (SmartAgri and African Climate and Development Initiative 2015). While in the Swartland SmartAgri Zone, future agricultural potential is predicted to remain high for small grains (such as wheat and barley), however, the variability of these yields is expected to increase (SmartAgri and African Climate and Development Initiative 2015).

Additionally, the Tankwa-van Wyksdorp and Cederberg SmartAgri Zones are predicted to become less productive due to water availability and heat-related issues (SmartAgri and African Climate and Development Initiative 2015).

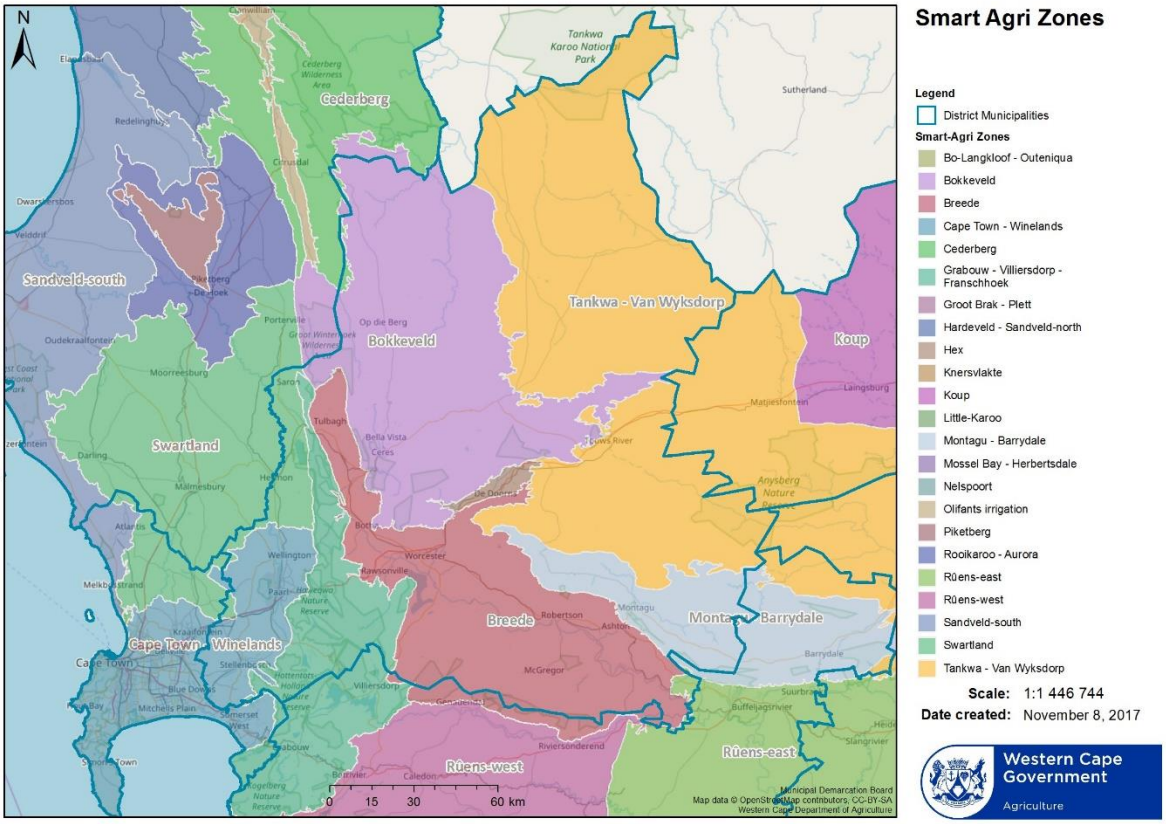

Figure 4: SmartAgri Zones in the District Municipal Area (Western Cape Department of Agriculture 2017)

The northern part of the Cape Winelands District Municipal Area has the highest grazing capacity (i.e. the highest number of hectares required per large stock unit for viable grazing) in the District Municipal Area, while the west has the lowest grazing capacity (Figure 5) (Western Cape Department of Agriculture 2017). Much of the south of the District Municipal Area has been categorised as "Transformed rangeland" and thus has no grazing capacity (Western Cape Department of Agriculture 2017). It should be noted that the data for this map is from 1993 and so the grazing capacities may have changed somewhat in the intervening years.

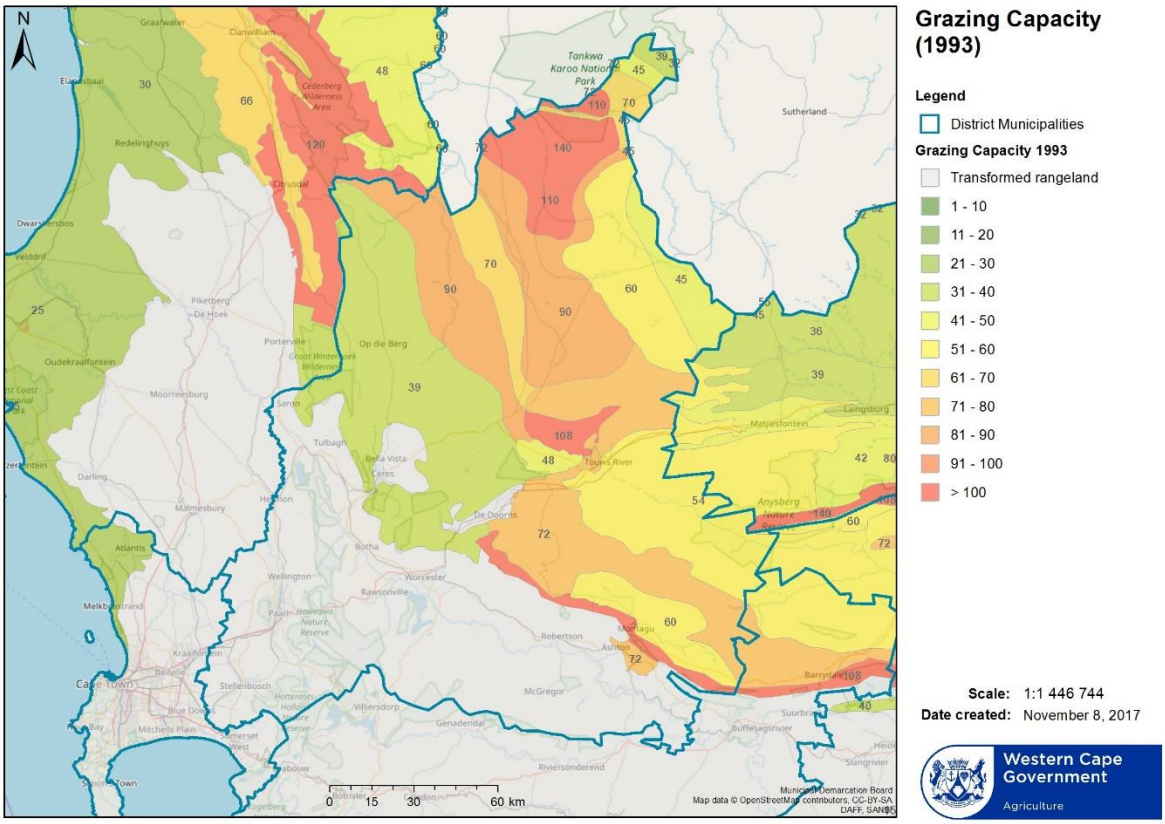

Figure 5: Grazing capacity in the District Municipal Area (Western Cape Department of Agriculture 2017)

Looking at specific livestock density levels (i.e. the number of animals per square kilometre), small stock occurs in limited amounts within the Cape Winelands District Municipal Area (Figure 6) (Western Cape Department of Agriculture 2017). Specifically, the highest density of small stock occurs in a small area in the centre in the District Municipal Area, followed by the southwest and southeast with lower small stock density levels (Western Cape Department of Agriculture 2017).

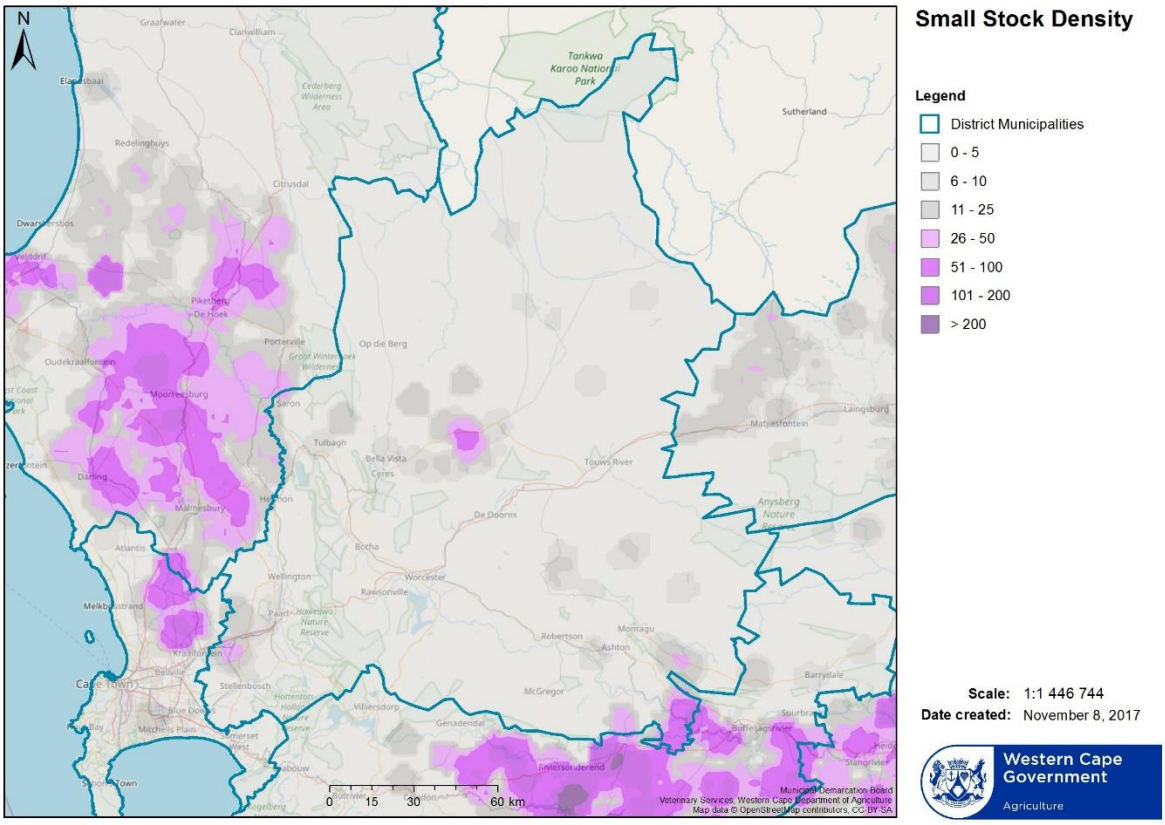

Figure 6: Small stock density levels in the District Municipal Area (Western Cape Department of Agriculture 2017)

Similarly, bovine density levels (Figure 7) are mostly low in the Cape Winelands District Municipal Area (Western Cape Department of Agriculture 2017). Specifically, cattle density levels are at their highest in the south of the District Municipal Area (Western Cape Department of Agriculture 2017).

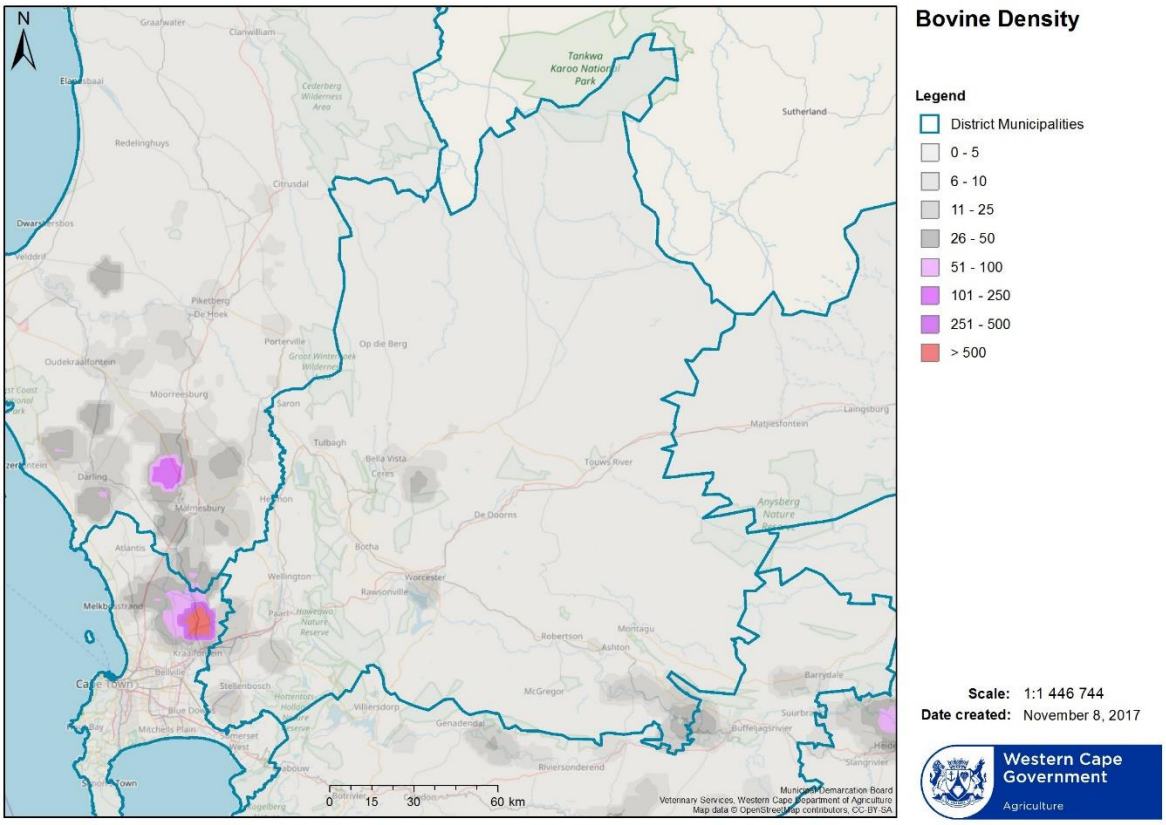

Figure 7: Bovine density levels in the District Municipal Area (Western Cape Department of Agriculture 2017)

Furthermore, ostrich farming (Figure 8) is very limited in the Cape Winelands District Municipal Area, occurring in four small areas with limited density levels (Western Cape Department of Agriculture 2017).

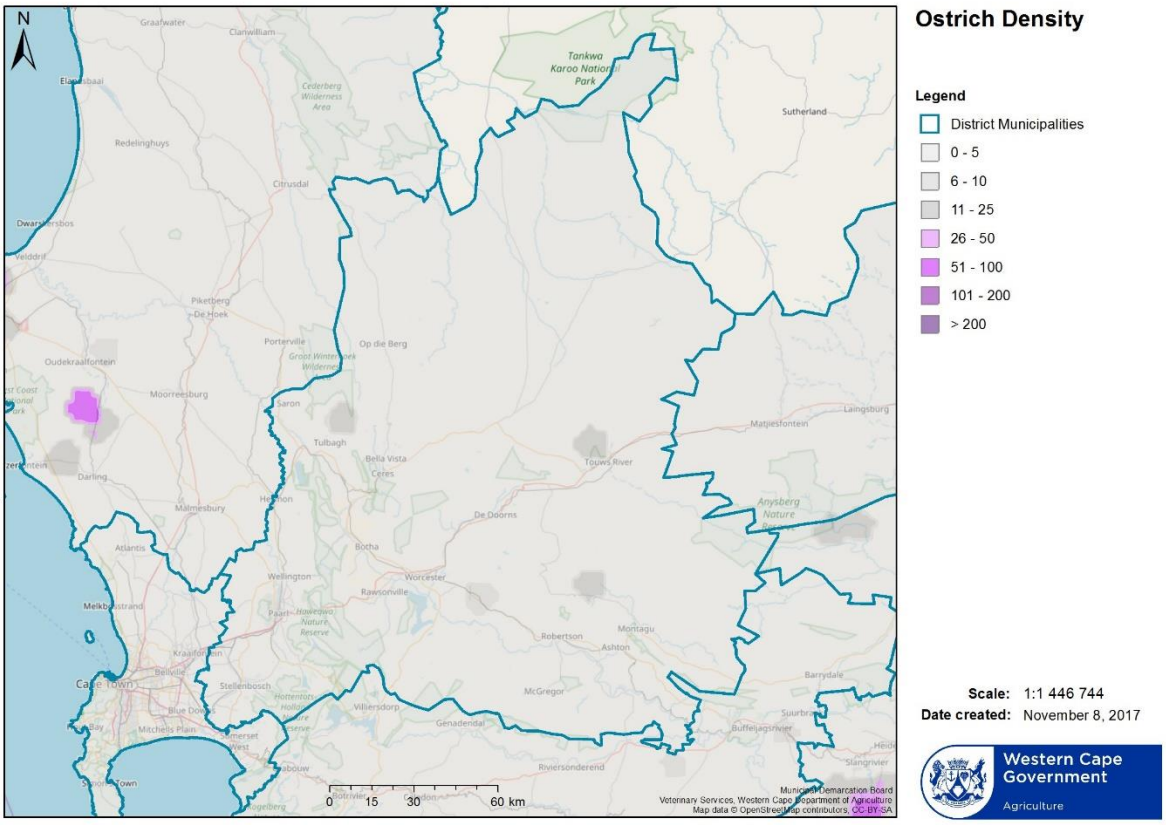

Figure 8: Ostrich density levels in the District Municipal Area (Western Cape Department of Agriculture 2017)

While the grazing capacities in the Cape Winelands District Municipal Area are mostly low, the crop census (Figure 9) shows that there is a lot of crop production in the District Municipal Area, largely in the southern and western parts (Western Cape Department of Agriculture 2017). Much of this crop production occurs alongside the District Municipal Area's rivers (Western Cape Department of Agriculture 2017). The main crops grown in the District Municipal Area are 'grapes', 'planted pastures', 'grains and mixed', 'pome fruit' (such as apples) and 'citrus' (Western Cape Department of Agriculture 2017).

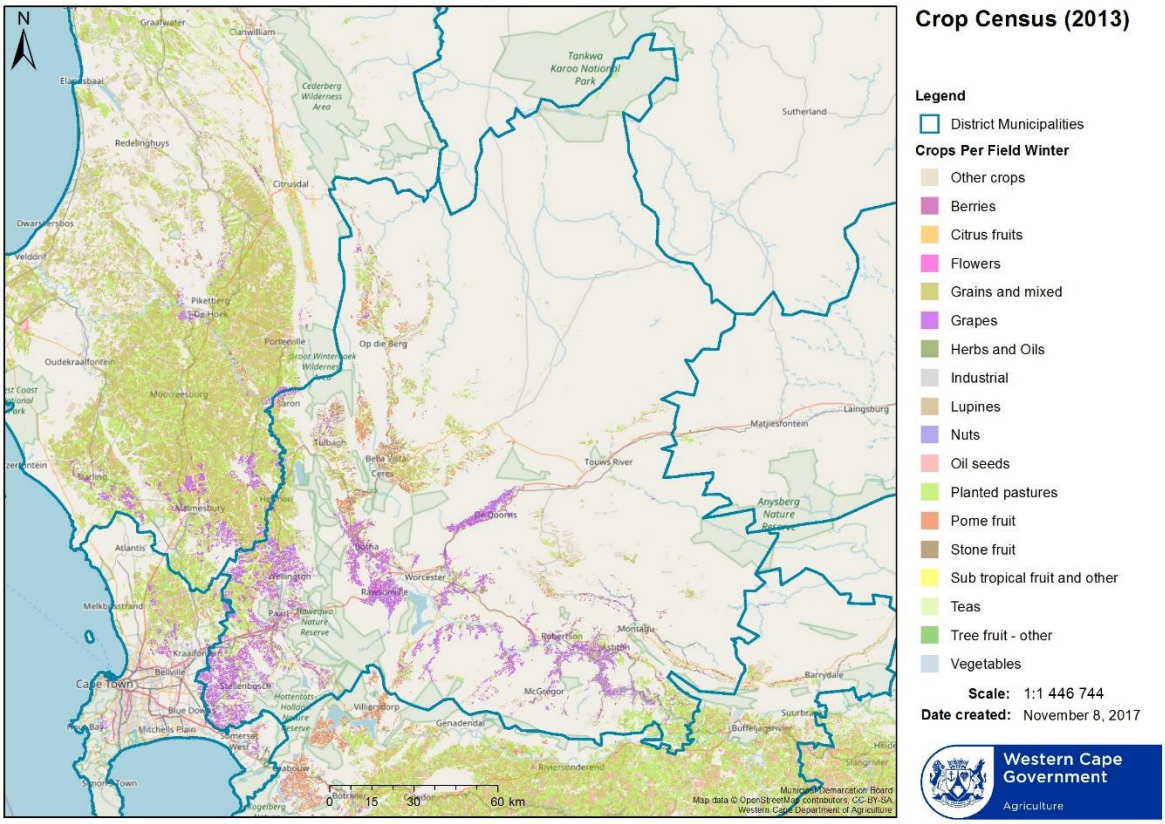

Figure 9: Crop census in the District Municipal Area (Western Cape Department of Agriculture 2017)

There are eleven Wine of Origin districts that occur mainly within the Cape Winelands District Municipal Area (Figure 10), as the District Municipal Area is (unsurprisingly given its name) the most important viticulture and winemaking area in South Africa (Western Cape Department of Agriculture 2017). Wine of Origin districts are more specific than wine regions and they signify that all the grapes came from the same specific area (Western Cape Department of Agriculture 2017). The Wine of Origin districts that occur mainly in the District Municipal Area are the Ceres Plateau, Tulbagh, Worcester, Wellington, Breedekloof, Franschhoek, Paarl, Stellenbosch and Robertson Wine of Origin districts.The Overberg and Swellendam Wine of Origin districts fall partially within the District Municipal Area (Western Cape Department of Agriculture 2017).

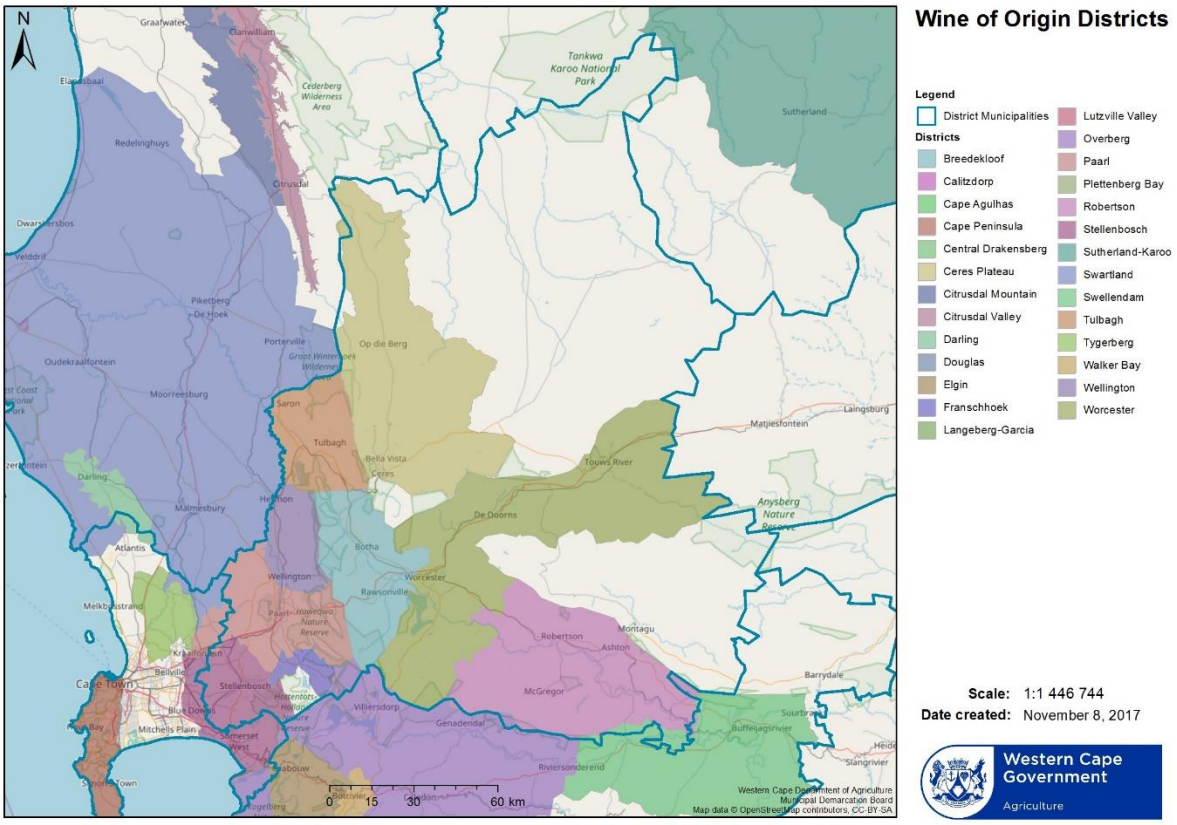

Figure 10: Wine of origin districts in the District Municipal Area (Western Cape Department of Agriculture 2017)

Additionally, some small commercial plantations consisting of *Pinus* species are scattered in the southwest of the Cape Winelands District Municipal Area (Figure 11) (De Lange 2013). Plantations are predicted to be exposed to greater risk due to an increase in the frequency and severity of fires caused by climate change related increases in average temperatures (Cape Winelands District Municipality 2015).

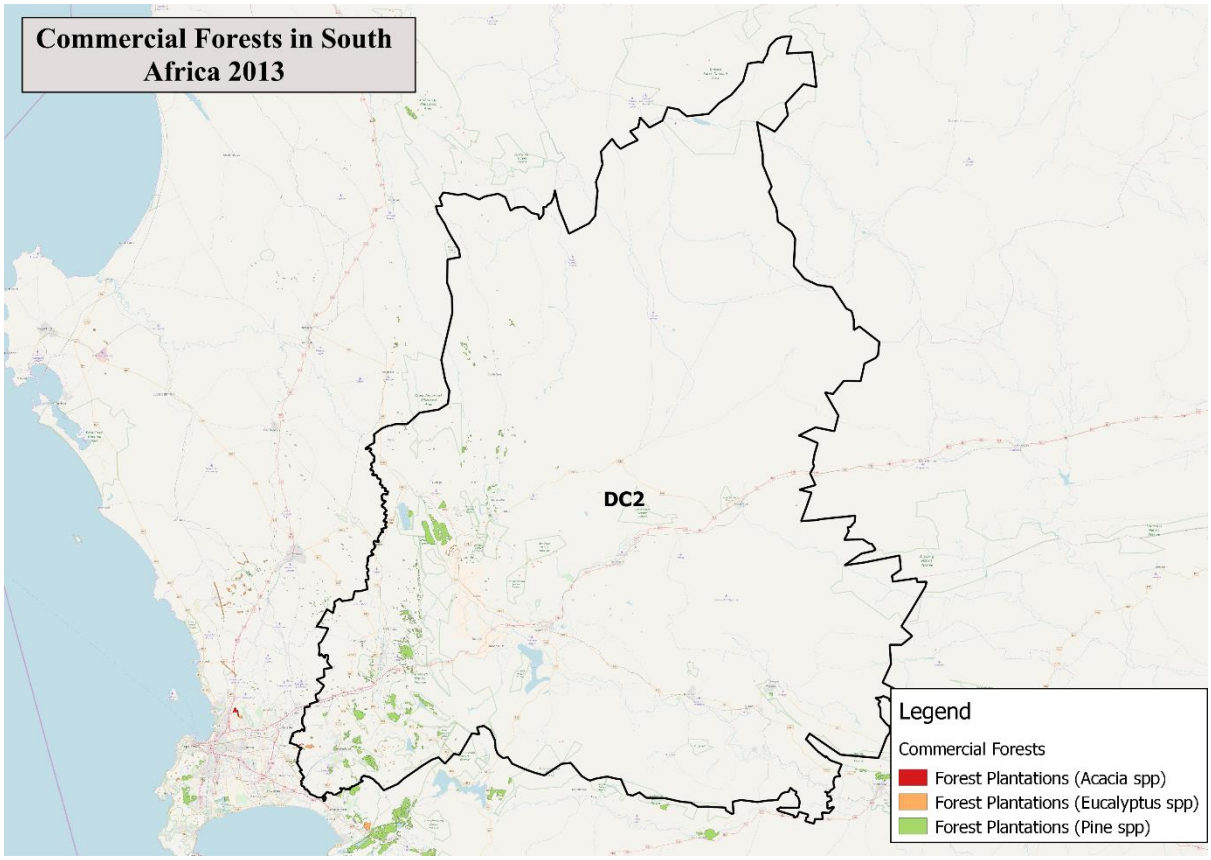

Figure 11: Commercial forestry distribution across the District Municipal Area (De Lange 2013)

Despite the potential for expanding agricultural production in the Cape Winelands District Municipal Area, it is predicted that climate change will affect the agriculture sector both positively and negatively. The Long Term Adaptation Scenarios Flagship Research Programme (LTAS) has forecast that climate change is predicted to increase temperatures and rainfall variability, while decreasing the total average rainfall in the west of South Africa (Department of Environmental Affairs 2013c).

The predicted increases in mean average temperature (Figure 12) in the Cape Winelands District Municipal Area, show that mean average temperatures are projected to increase in bands from 'low range warming' in the southwest to 'medium to high range warming' in the northeast of the District Municipal Area (Western Cape Department of Agriculture 2017).

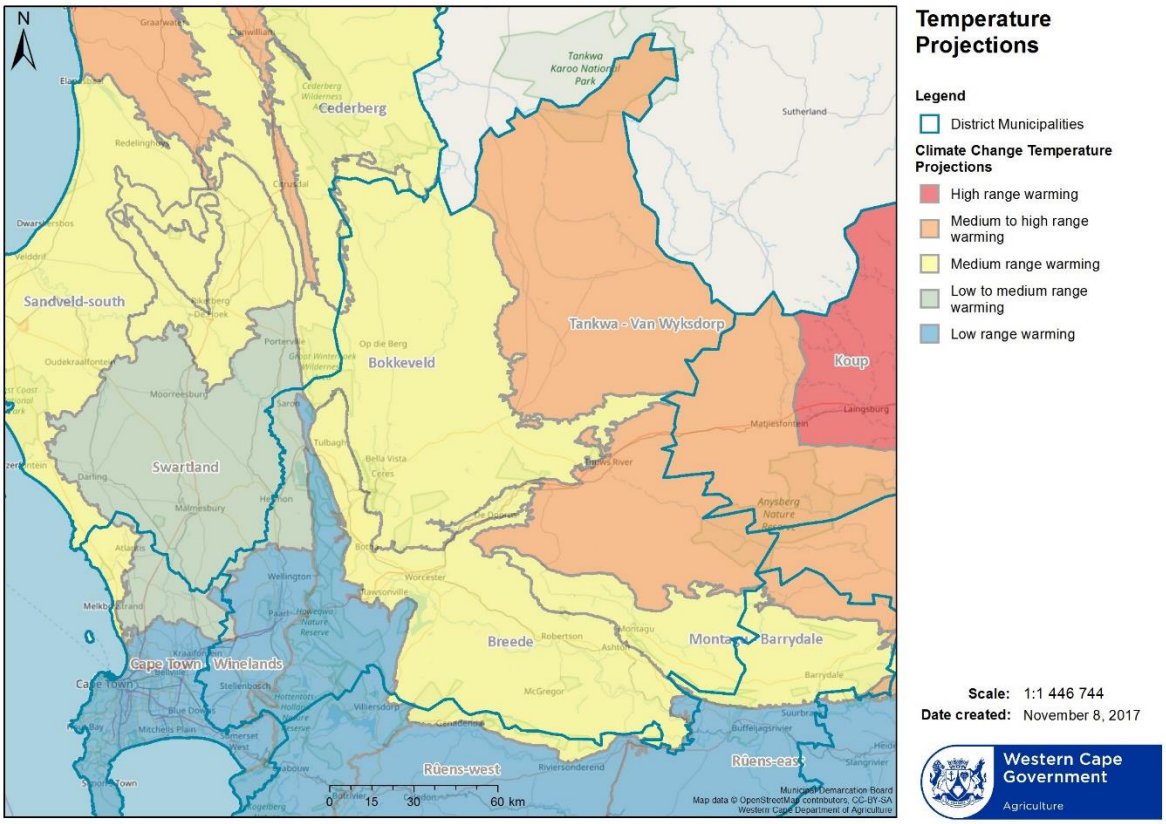

Figure 12: Temperature projections in the District Municipal Area (Western Cape Department of Agriculture 2017)

The mean annual rainfall (average rainfall per year) is highest in the southwest of the Cape Winelands District Municipal Area (Figure 13) and is lowest in the northeast of the district (Western Cape Department of Agriculture 2017). Mean annual rainfall in parts of the southwest of the District Municipal Area are more than double the South African average (approximately 450 millimetres per year) for mean annual rainfall (Department of Water Affairs 2013). However, if the mean annual rainfall is considered with the projected increases in average temperature, it is apparent that evaporation rates are expected to increase, which will increase water insecurity in the District Municipal Area (Western Cape Department of Agriculture 2017).

Furthermore, most of the aquifers in the Cape Winelands District Municipal Area are already either highly or moderately vulnerable to contamination by pollution (Figure 14) (Western Cape Department of Agriculture 2017). If these aquifers were to become polluted or over-utilised, then water security in the District Municipal Area would diminish and the vulnerability of the people who rely on them would increase (Western Cape Government 2016; Cape Winelands District Municipality 2017).

In 2012, groundwater quality in the Cape Winelands District Municipal Area was mostly in the lower categories of electrical connectivity (Figure 15), however, groundwater in some small areas in the west and southeast of the District Municipal Area already had very high levels of electrical connectivity (Western Cape Department of Agriculture 2017). These electrical connectivity categories represent how salty the groundwater is, which is one way of measuring the water quality in the aquifers (Western Cape Department of Agriculture 2017). The higher the level of salts in the water, the poorer the quality of groundwater (Western Cape Department of Agriculture 2017).

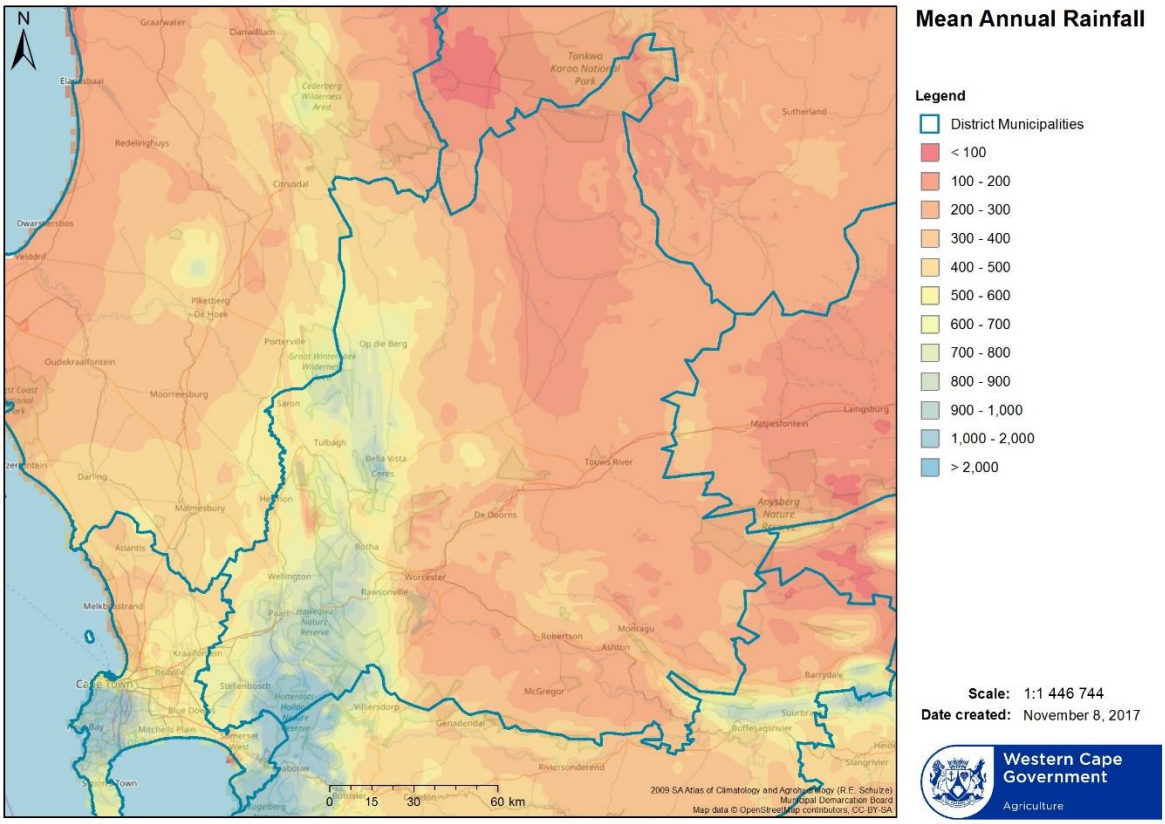

Figure 13: Mean Annual Rainfall in the District Municipal Area (Western Cape Department of Agriculture 2017)

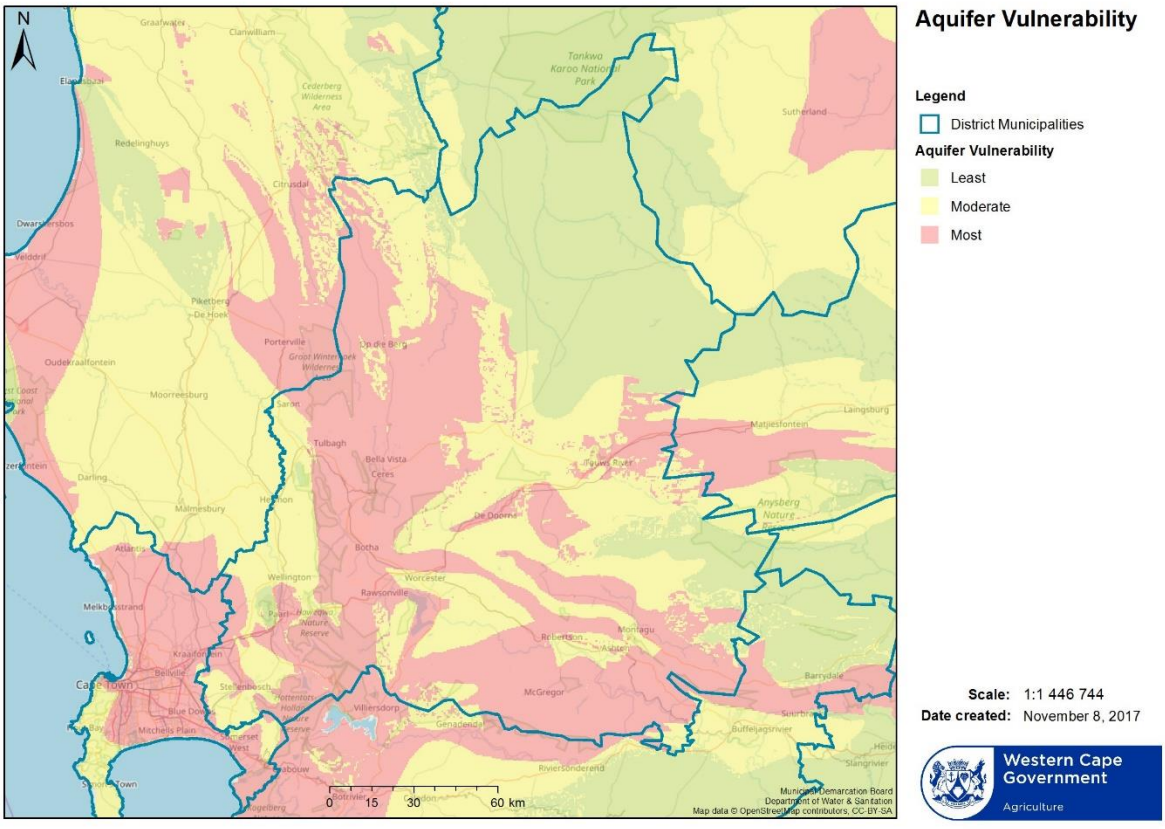

Figure 14: Aquifer vulnerability in the District Municipal Area (Western Cape Department of Agriculture 2017)

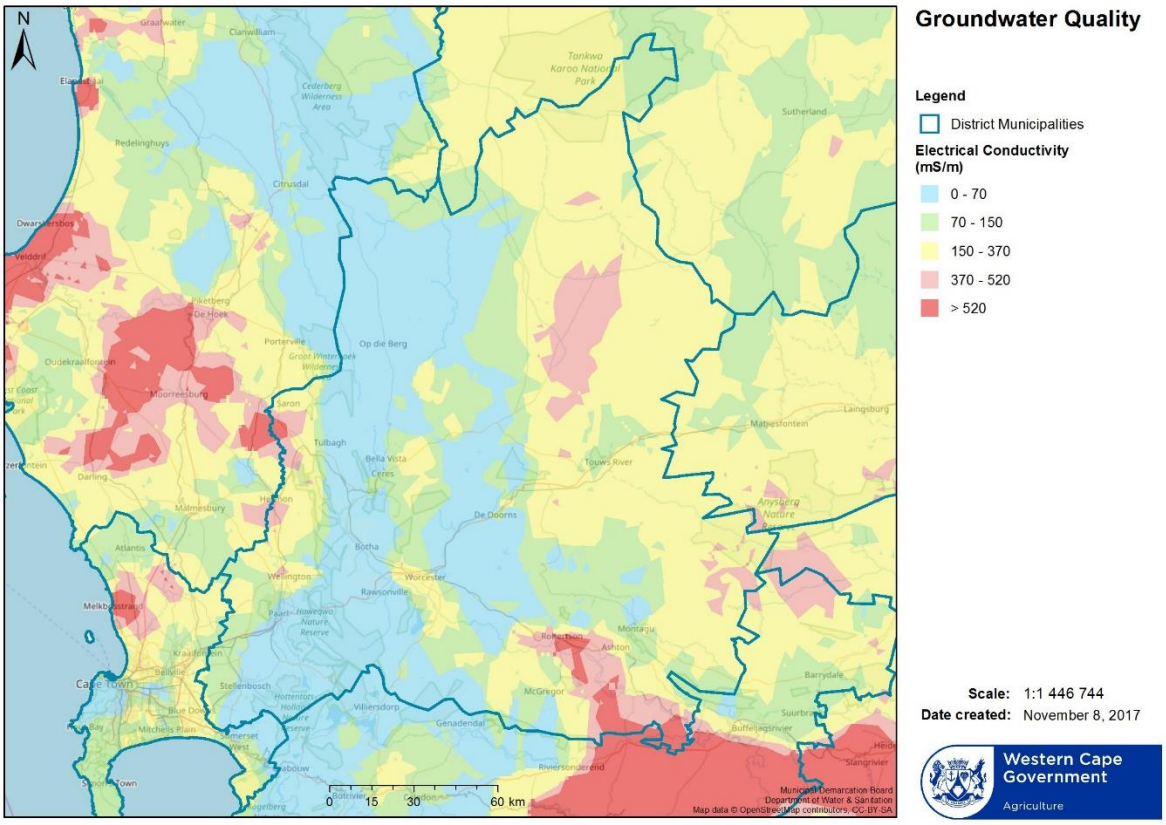

Figure 15: Groundwater quality in the District Municipal Area (Western Cape Department of Agriculture 2017)

These predicted changes in average rainfall and temperature are forecast to reduce the areas that are suitable for viticulture or shift them to areas that are higher or cooler than current locations (Department of Environmental Affairs 2013c). The reduction in rainfall (and runoff) is forecast to reduce the yields of fruit and vegetables, notably deciduous fruit and rain-fed wheat production in the Western Cape (Department of Environmental Affairs 2013c). Furthermore, the production of fruit, such as apples and pears, and sugar cane will be increasingly vulnerable to damage from a predicted expansion of the areas affected by agricultural pests (Department of Environmental Affairs 2013c).

By decreasing agricultural yields, climate change could also impact the agriculture sector by reducing profitability and job opportunities in the sector as well as increasing food security risks, especially amongst subsistence farmers and their dependents (Department of Environmental Affairs 2013c; Cape Winelands District Municipality 2017, 2009). Indeed, the Cape Winelands District Municipality's 2017/2018 Integrated Development Plan has noted that climate change impacts could have dire consequences for the agriculture sector in the District Municipal Area (Cape Winelands District Municipality 2017). Specifically, impacts such as droughts, fires, floods and changes in rainfall patterns are predicted to not only result in agricultural losses but also impact other sectors of the local economy (Cape Winelands District Municipality 2017).

Moreover, these predicted changes are not only future-related considerations. Impacts to the agricultural sector, which have been attributed to climate variability have already been observed in the Cape Winelands District Municipal Area (Cape Winelands District Municipality 2017). For example, during the 2015/2016 municipal financial year, the Witzenberg Local Municipality suffered from an intense drought and was declared a declared a disaster area by the National and Western Cape Governments (Cape Winelands District Municipality 2017).

4.3 Cape Winelands DM Biodiversity Sector Summary

Most of the Cape Winelands District Municipality is covered by the Fynbos Biome (Figure 16). A sizable area of Succulent Karoo Biome is also found in the district, mostly in the north and east. The Fynbos Biome is part of the Cape Floristic Kingdom (one of six recognised floral kingdoms globally), consisting of the fynbos and renosterveld, and includes an extremely high number of species (Mucina and Rutherford 2006). Both the Fynbos and Succulent Karroo Biomes are renowned for their high levels of endemism (Mucina and Rutherford 2006). The Succulent Karoo Biome is extremely dry and is characterised by low winter rainfallwith prevailing vegetation in the Succulent Karoo biome being characterised by dwarf, succulent shrubs, and large displays of flowers (annuals) in the spring (Mucina and Rutherford 2006). For the size and aridity of the Succulent Karoo Biome, it has a very high number of plant and flower species (Mucina and Rutherford 2006).

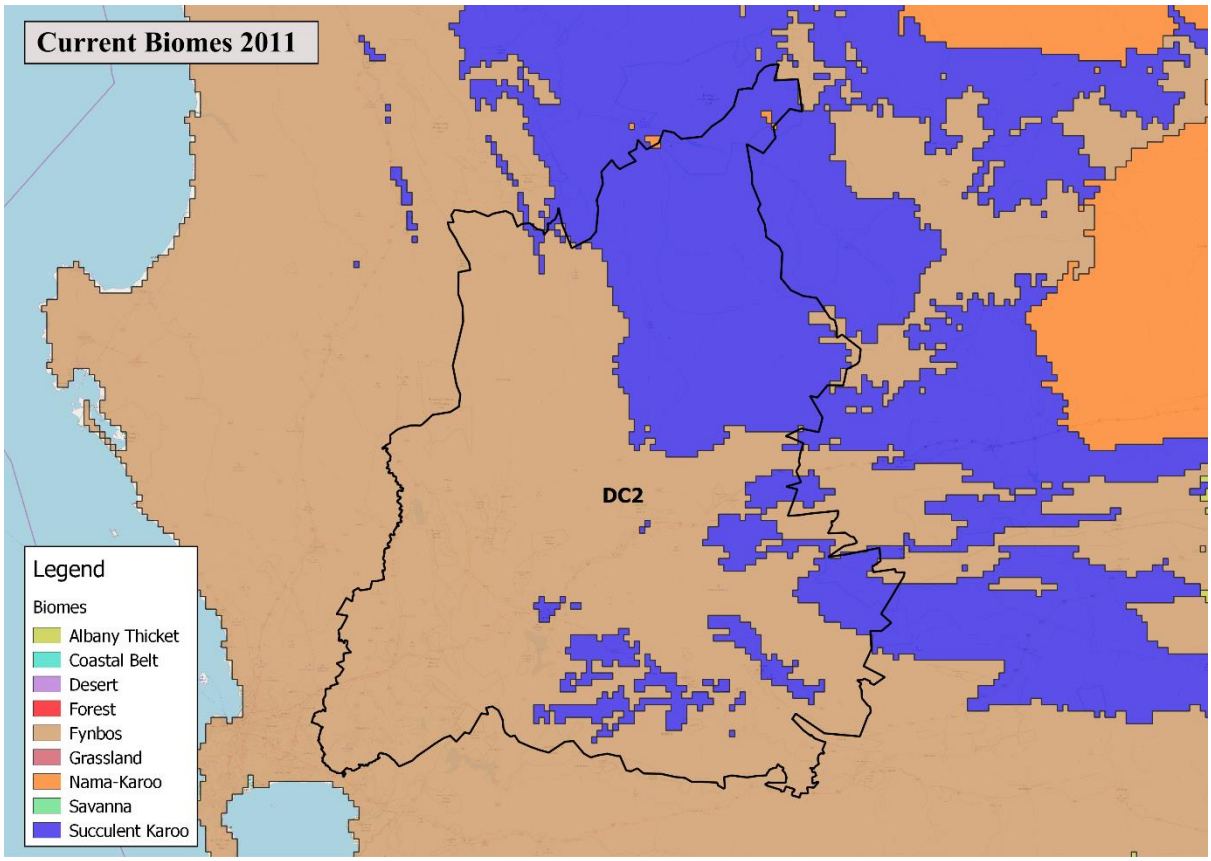

Figure 16: Current biome delineation in the District Municipal Area (South African National Parks 2011a)

Climate change is predicted to shift the biomes in South Africa, resulting in a change to the ecosystems and vegetation found in the Cape Winelands District Municipal Area. The Long Term Adaptation Scenarios Report on biodiversity highlights the following biomes as the most vulnerable and "in need of strong protection, restoration and/or research" (Department of Environmental Affairs 2013b).

- High priority for action: Fynbos and Forest.
- Medium priority for action: Nama Karoo and Succulent Karoo.

The maps below (Figure 17 and Figure 18) show the shift in biomes in the Cape Winelands District Municipal Area given different climate scenarios modelled by the South African National Biodiversity Institute (SANBI) in 2011. It is forecast that under a medium risk climate scenario, the Succulent Karoo Biome will expand into areas currently covered by the Fynbos Biome. Additionally, the Albany

Thicket Biome will appear in the southeast of the Overberg District Municipal Area, at the expense of both the Succulent Karoo and Fynbos Biomes. Under a high-risk climate scenario, it is forecast that the Fynbos Biome will be substantially reduced by the Succulent Karoo Biome. Additionally, the Albany Thicket Biome will decrease (compared to the medium risk climate scenario) and the Nama-Karoo, Desert and Savanna Biomes will appear.

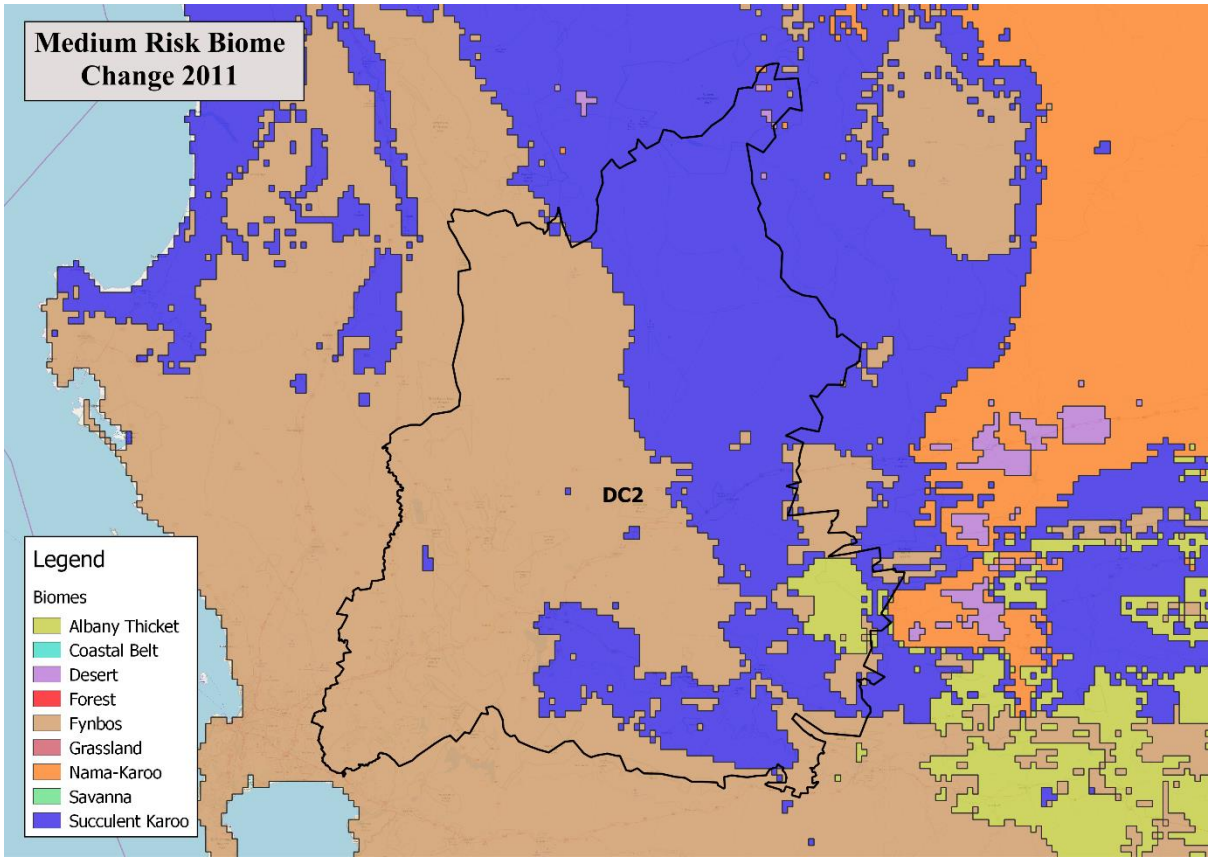

Figure 17: Predicted shift in biomes in the District Municipal Area using a medium risk scenario (South African National Parks 2011c)

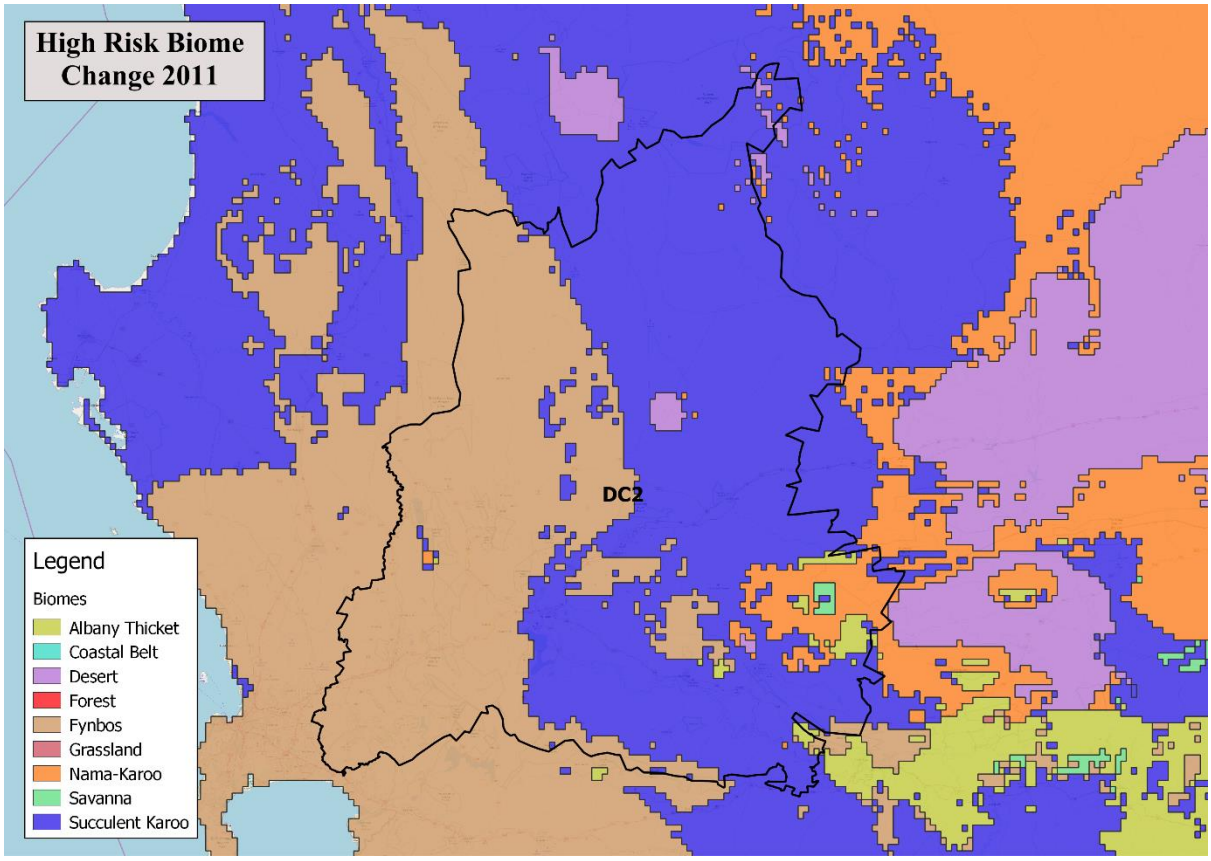

Figure 18: Predicted shift in biomes in the District Municipal Area using a high risk scenario (South African National Parks 2011b)

Within the Biomes found in the Cape Winelands District Municipal Area, there are numerous threatened ecosystem types (Figure 19). The Eastern Rûens Shale Renosterveld, Cape Lowland Alluvial Vegetation, Muscadel Riviere, Elgin Shale Fynbos, Kogelberg Sandstone Fynbos, Swartland Granite Renosterveld, Cape Flats Sand Fynbos, Swartland Alluvium Fynbos, Atlantis Sand Fynbos and Swartland Shale Renosterveld are all categorised as critically endangered ecosystem types (South African National Biodiversity Institute 2011). There are also a few ecosystem types categorised as endangered or vulnerable in the Cape Winelands District Municipal Area (South African National Biodiversity Institute 2011).

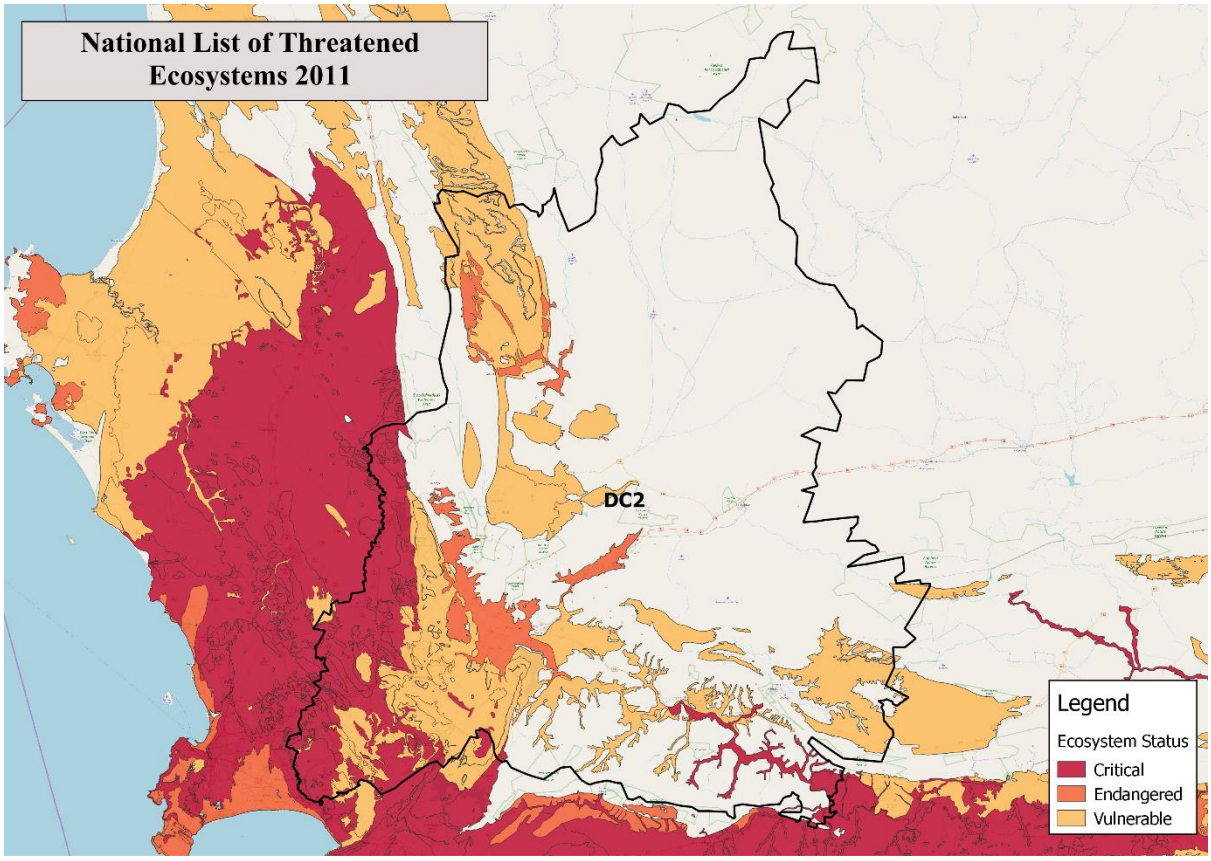

Figure 19: Threatened ecosystem types in the District Municipal Area (South African National Biodiversity Institute 2011)

In South Africa, a 'protected area' is defined as areas of land (e.g. a national park) or ocean (e.g. a marine protected area) that is legally protected and managed for the conservation of biodiversity, as per the National Environmental Management: Protected Areas Act (No. 57 of 2003) (Department of Environmental Affairs 2009). Internationally, the International Union for Conservation of Nature's (IUCN) definition of protected area includes areas that are not legally protected, which the Department of Environmental Affairs refers to as 'conservation areas' (Department of Environmental Affairs 2009). Within the Cape Winelands District Municipal Area there are 50 protected areas (Figure 20).

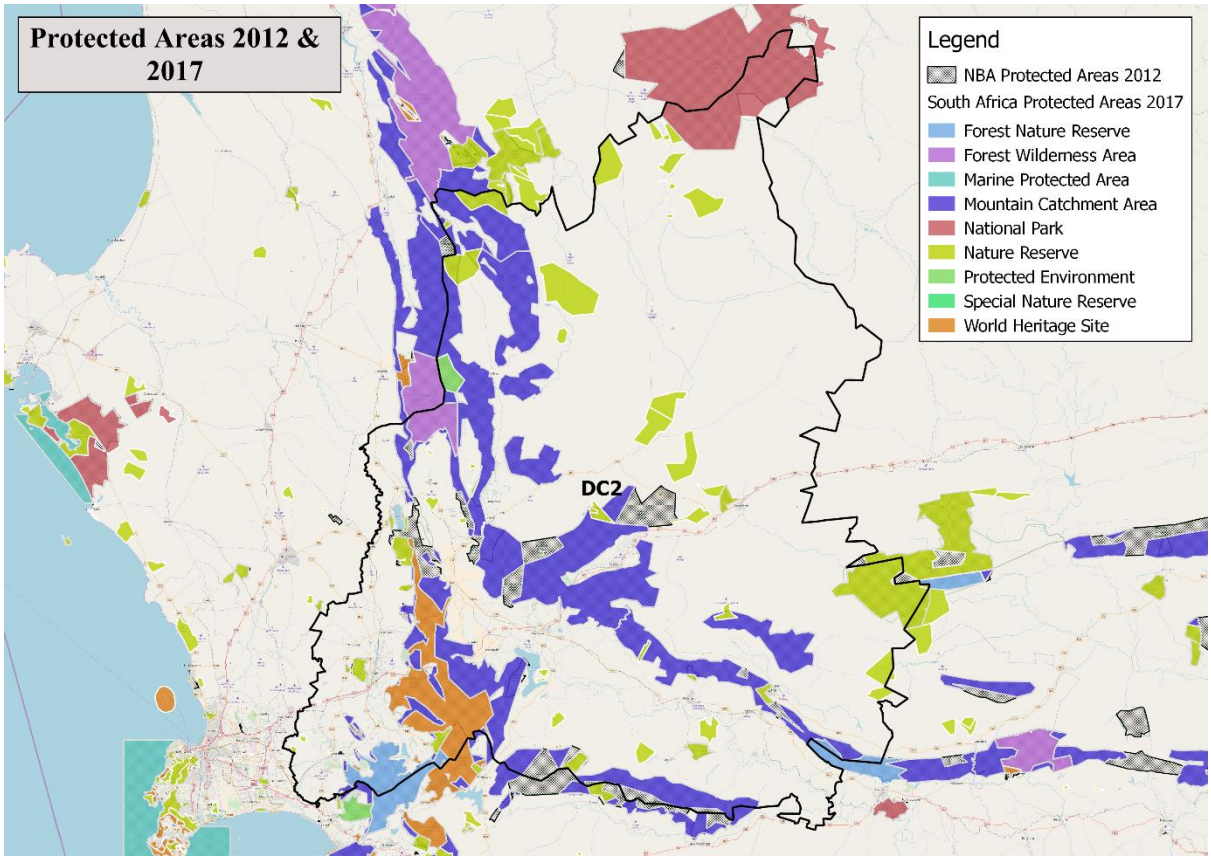

Figure 20: Protected areas in the District Municipal Area (South African National Parks / South African National Biodiversity Institute 2011; Department of Environmental Affairs 2017)

In South Africa, 65% of wetlands are threatened, 48% are critically endangered, 12% are endangered and 5% are vulnerable (Driver, A. et al. 2012). Wetland degradation is caused by inter alia: poor land management practises, spatial developments near urban areas, the spread of invasive alien plants, pollution, agricultural practises and the building of dams (Driver, A. et al. 2012).

In the Cape Winelands District Municipal Area (Figure 21), most wetlands are classified as 'heavily to critically modified' (less than 25% of the wetland land cover is natural) (Council for Scientific and Industrial Research 2011). Wetlands classified as 'moderately modified' (between 25% and 75% of the wetland land cover is natural) are less frequent, and those classified as 'mostly natural or good' (more than 75% of the wetland land cover is natural) are the lowest in number (Council for Scientific and Industrial Research 2011).

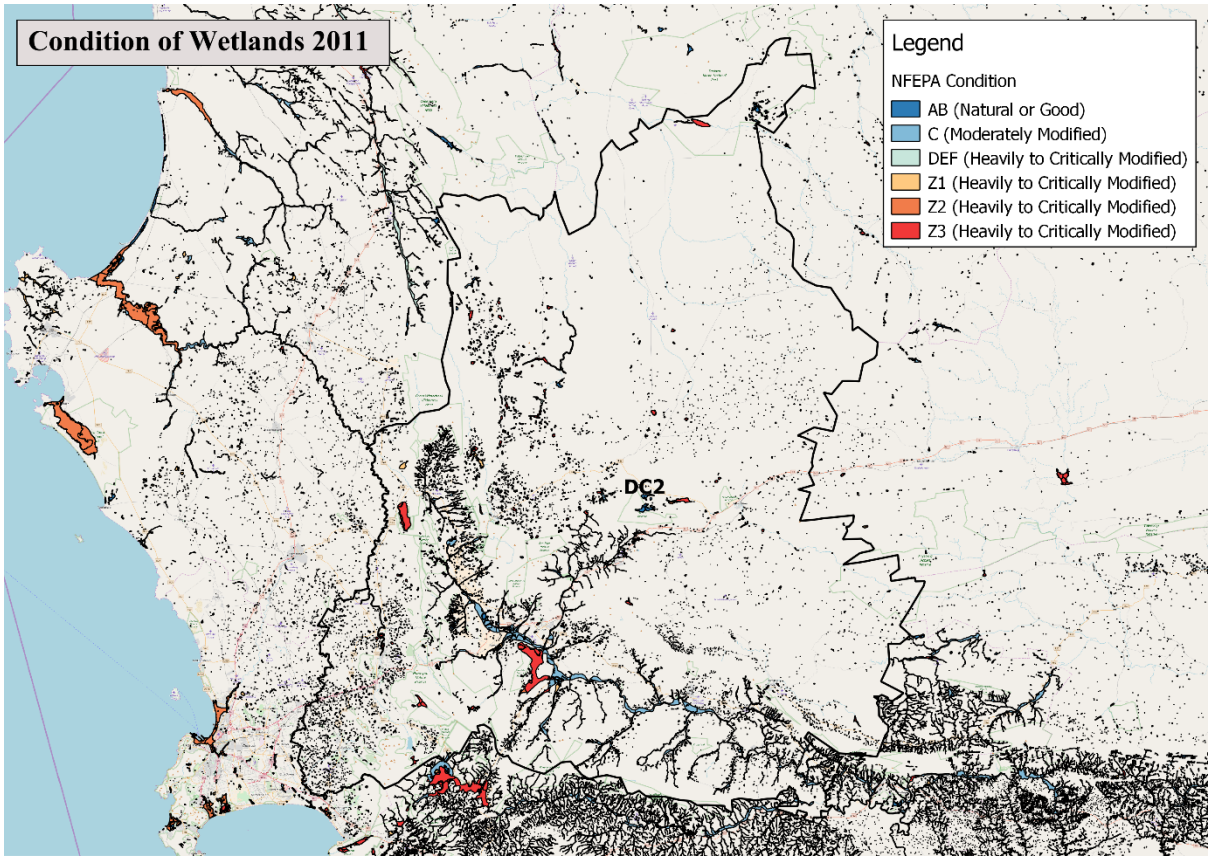

Figure 21: Condition of wetlands in the District Municipal Area (Council for Scientific and Industrial Research 2011)

Most of the Cape Winelands District Municipal Area is mountainous. Land use in the Cape Winelands District Municipality is predominantly agriculture based (Cape Winelands District Municipality 2017, 2016). Other land uses include conservation areas, forestry (plantations), urban areas and some limited mining areas (Cape Winelands District Municipality 2017, 2016). These land uses have had varying effects on the biodiversity of the Cape Winelands District Municipal Area.

Biodiversity in the Cape Winelands District Municipal Area has been positively influenced by the conservation areas. It has been negatively influenced by: the spread of invasive alien species, unsustainable harvesting of natural resources, land degradation (mainly due to poor land management practises and overgrazing), soil erosion, increased pollution, population growth, spatial development (such as the expansion of agricultural and urban areas), an ongoing drought and climate change (Cape Winelands District Municipality 2017, 2016, 2015).

According to the Millennium Ecosystem Assessment (2005) ecosystem services are “the benefits that people obtain from ecosystems”, which can be divided into four categories: provisioning (e.g. timber), supporting (e.g. nutrient recycling), regulating (e.g. water purification), cultural (e.g. recreational activities) (Millennium Ecosystem Assessment 2005). The existing challenges that negatively affect the biodiversity in the Cape Winelands District Municipal Area (discussed above) have also reduced ecosystem services (particularly provisioning services and regulating services) in the Area and will continue to do so, if these impacts are not reduced.

If the biodiversity and related ecosystem services in the Cape Winelands District Municipal Area are badly reduced, it could have direct negative consequences for the economy and social structures in the Cape Winelands District Municipality. These consequences could have a detrimental effect on efforts to reduce poverty, inequity and unemployment in the Cape Winelands District Municipality.

Furthermore, it is predicted that climate change will exacerbate these challenges and their effects on the biodiversity and related ecosystem in South Africa.

It is widely accepted that in South Africa, climate change is expected to have an impact on socio-economic development as well as the water and sanitation, food security, health, and energy sectors (Department of Environmental Affairs 2011). In the Cape Winelands District Municipal Area, it is predicted that climate change will increase average temperatures and the variability of rainfall as well as exacerbate the risk and frequency of severe weather events such as floods, droughts, veld fires and damaging storms (Cape Winelands District Municipality 2017, 2016, 2015).

Climate change has been identified as a key issue and major strategic risk for the Cape Winelands District Municipality (Cape Winelands District Municipality 2017, 2016, 2015). Following the publication of the *Western Cape Climate Change Response Strategy* in 2014, the Cape Winelands District Municipality developed the *Framework for a Draft Climate Change Response Strategy* in 2015 (Cape Winelands District Municipality 2015, 2017). The Cape Winelands District Municipality intends to review the *Framework for a Draft Climate Change Response Strategy* annually so that budget-related changes are incorporated (Cape Winelands District Municipality 2017).

The purpose of the *Framework for a Draft Climate Change Response Strategy* is to identify ongoing climate change-related projects and programmes in the Cape Winelands District Municipal Area as well as to provide strategic direction to the various sectors within the Cape Winelands District Municipality (Cape Winelands District Municipality 2015, 2017). The *Framework for a Draft Climate Change Response Strategy* is more focussed on climate change adaptation than on mitigation because of the Cape Winelands District Municipality's limited functions (Cape Winelands District Municipality 2015, 2017).

It has been acknowledged that key barriers to responding to climate change in the Cape Winelands District Municipal Area (as well as other district municipalities in the Western Cape) include a lack of capacity and limited financial resources (Cape Winelands District Municipality 2017, 2015). The Cape Winelands District Municipality has emphasised the need for increased institutional capacity and capacity-building at both district and local municipality levels (Cape Winelands District Municipality 2017, 2015). It also stressed the need for increased awareness campaigns and education programmes in the Cape Winelands District Municipality regarding environmental health, water supply and sanitation, waste management, and climate change and its predicted effects (Cape Winelands District Municipality 2017, 2016, 2015).

4.4 Cape Winelands DM Health Sector Summary

A great proportion (82.4 %) of South Africa's population are dependent on the public health sector for health related services of which there are 3,880 public facilities (Health Systems Trust 2012). These public facilities are divided into two main groups: 3,487 primary health care facilities (consisting of 3,074 clinics, 238 community health centres, 125 satellite clinics, 44 community day centres, four specialised clinics and two health posts) and 391 hospitals (of which six are central hospitals, 10 tertiary, 55 regional, 254 district and 66 specialised hospitals) (Health Systems Trust 2012). 42 clinics, four district hospitals, two regional hospitals and five other hospitals fall within the Cape Winelands District Municipal Area (Massyn et al. 2016).

According to a health care facilities audit by the Health Systems Trust, the Cape Winelands District Municipal Area received a score of 64 % on vital measures in the six ministerial priority areas for health care facilities and 67 % for the infrastructure of health facilities (Health Systems Trust 2012). The score on vital measures in the six ministerial priority areas relates to patient-centred care, specifically focusing on: positive and caring attitudes, waiting times, cleanliness, patient safety, infection prevention and control, and availability of medicines and supplies (Health Systems Trust 2012). The infrastructure score meanwhile is based on the assessment of mainly: building and site infrastructure, facility infrastructure management and standards around the availability of space (Health Systems Trust 2012).

The young (<5yrs age group) and elderly (>64yrs age group) constitute 14.53 % of the total populationand are said to be the most vulnerable to climate change impacts (Statistics South Africa 2011).

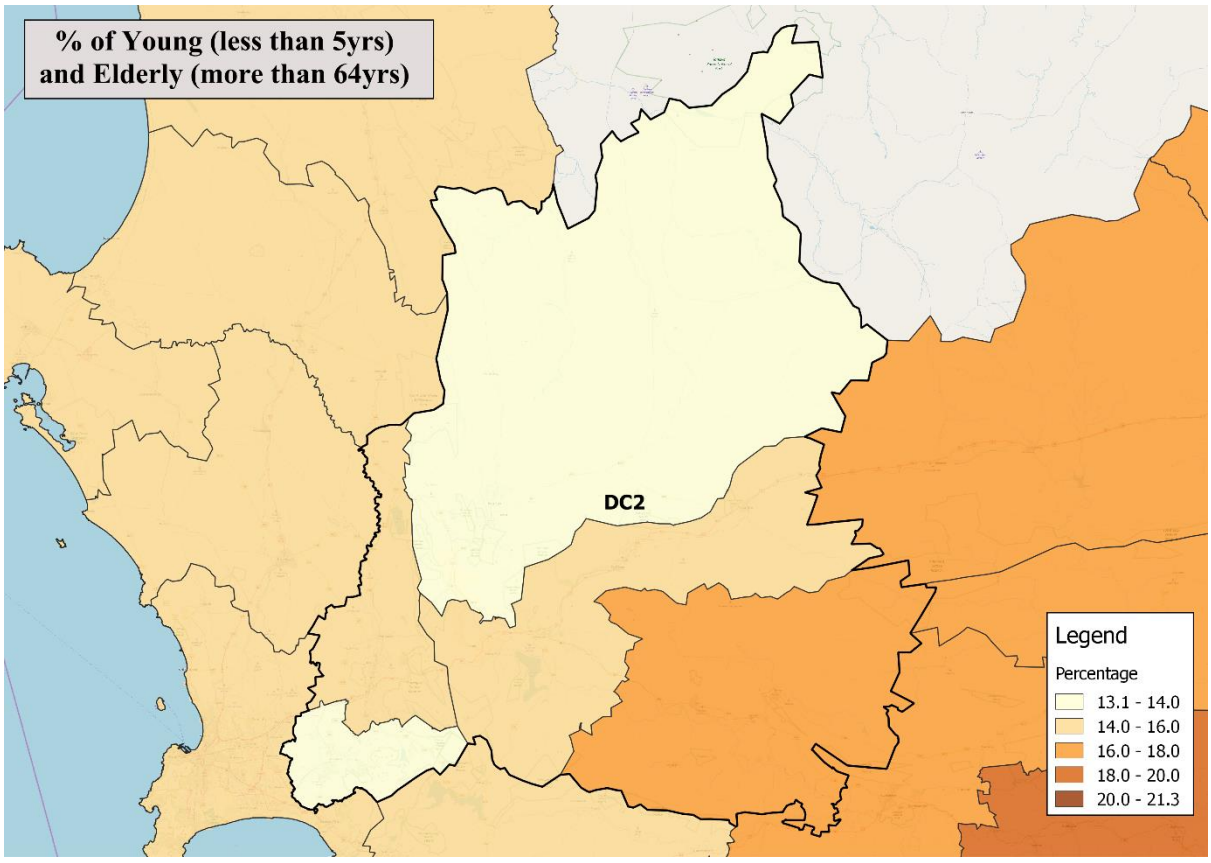

Figure 22: Percentage of young (<5yrs age group) and elderly (>64yrs age group) across the Cape Winelands District Municipal Area. Darker areas indicate a higher percentage of young and elderly people. (Statistics South Africa 2011)

In 2015, the total number of deaths in South Africa was 460,236, of which 6,609 occurred in the Cape Winelands District Municipal Area (Statistics South Africa 2015). The distribution of deaths by age for South Africa revealed that in, 2015, 7 % of the deaths occurred in children under the age of five, while individuals over the age of 64 accounted for 34.4 % of the deaths (Statistics South Africa 2015).

In 2015, the top ten underlying natural causes of death within the Cape Winelands District Municipal Area were: tuberculosis, HIV, cerebrovascular diseases, diabetes mellitus, tuberculosis, chronic lower respiratory diseases, ischaemic heart diseases, malignant neoplasms, malignant neoplasms of respiratory and intrathoracic organs, hypertensive diseases, and other forms of heart disease (Statistics South Africa 2015).

The leading causes of death for children under five years of age, for the 2009 to 2014 period, in the Cape Winelands District Municipal Area were a group of communicable (infectious) diseases together with perinatal, maternal and nutritional conditions (Massyn et al. 2016). Diarrhoeal diseases (17.5 %) were the leading cause of children's (<5yrs age group) deaths, followed by preterm birth complications, which accounted for 16.0 % of deaths (Massyn et al. 2016). The "children under five years diarrhoea case fatality" (that is children under five years who died in hospital from diarrhoeal disease) the District Municipal Area ranked 6th (where 1st represents the best performance and 52nd represents the worst performance in South Africa) with a diarrhoea case fatality rate of 0.1 % during the 2015/16 period (Massyn et al. 2016). The national average for "children under five years diarrhoea case fatality" was 2.2 % over the same time period (Massyn et al. 2016).

Furthermore, for the "Child under 5 years severe acute malnutrition case fatality rate" (that is children under five years who died from acute malnutrition) the Cape Winelands District Municipal Area ranks 7th, with a rate of 2.9 % during the 2015/16 period (Massyn et al. 2016). This is below the national average of 8.9 % over the same time period (Massyn et al. 2016).

Leading causes of death for the elderly (>64yrs age group) in the Cape Winelands District Municipal Area were a group of non-communicable diseases (which cannot be transferred from one person to the next) that accounted for 59.0 % of the deaths between 2009 and 2014 (Massyn et al. 2016). Of these non-communicable diseases, ischaemic heart disease was the leading cause (15.4 %) of deaths, followed by cerebrovascular disease (15.2 %) (Massyn et al. 2016).

With regards to specific non-communicable diseases for 2015/2016, the number of newly diagnosed cases of diabetes mellitus was approximately 0.9 occurrences per 1,000 people in the Cape Winelands District Municipal Area (Massyn et al. 2016). Additionally, the number of newly diagnosed cases of hypertension in 2015/2016 was approximately 8.4 occurrences (in people over the age of 40) per 1,000 people in the District Municipal Area (Massyn et al. 2016).

Furthermore, in the Cape Winelands District Municipal Area between 2009 and 2014, meningitis/encephalitis was ranked as the 7th most common cause of death in the age group 5 to 14 years old, accounting for 2.2 % deaths in this age group (Massyn et al. 2016).

Concerning waterborne and communicable diseases, approximately 21.55 % of the Cape Winelands District Municipal Area's households do not source water from piped water schemes (Statistics South Africa 2011) and are therefore vulnerable to waterborne diseases. Presently the water supply in the District Municipal Area is insufficient with climate change and its associated impacts predicted to exacerbate this water scarcity (Cape Winelands District Municipality 2017).

In terms of risks posed by working conditions, about 53.3 % of the Cape Winelands District Municipal Area's economically active population are employed, of which roughly 16.0 % are employed within the informal sector (Statistics South Africa 2011). Many of the people employed in the informal sector work outdoors in poor conditions, with limited infrastructure and services such as shade, and limited access to amenities such as water and sanitation (Statistics South Africa 2011).

Additionally, 7.60 % of the Cape Winelands District Municipal Area's households are involved in agricultural activities (Statistics South Africa 2011). People who work outdoors, like those involved in agricultural activities, are especially vulnerable to the impacts of extreme weather conditions. Moreover, climate change is forecast to exacerbate the frequency and severity of extreme weather events (Department of Environmental Affairs 2013c). Consequently, predicted impacts for households involved in agriculture include reduced agricultural yields and water security as well as increased food insecurity.

Climate change impacts affect the social and environmental determinants of health which include clean air, secure shelter, safe drinking water, and sufficient food (World Health Organization 2017). Below are some general climate change manifestations and their associated impacts on human health.

- Natural disasters - The frequency and severity of natural disasters has increased. Natural disasters destroy health facilities and homes. People may be forced to vacate their properties leading to increased risk to a wide range of health effects including communicable diseases and mental disorders (World Health Organization 2017).
- Increased storm events - These affect the supply of fresh water consequently increasing the risk of diarrhoeal diseases (World Health Organization 2017).
- Floods - The frequency and intensity of floods has increased. Floods pollute water supplies and increase the risk of water borne diseases. In addition, people lose their lives as a result of drowning or physical injuries, property is damaged and the supply of health services is disrupted (World Health Organization 2017). Climate change will also impact the distribution and causes of several communicable diseases including cold-influenza and dry-meningococcal meningitis among others (Singh and Kistnasamy 2014).
- Changes in climate conditions also affect vector-borne diseases that are transported through organisms such as snails, insects and other cold-blooded animals (World Health Organization 2017). With climate change the transmission season will lengthen and the geographic range of some vector borne diseases will change (World Health Organization 2017).
- Increased temperatures and variable rainfall are likely to reduce agricultural yields consequently increasing the prevalence of malnutrition and hunger as a result of food insecurity (World Health Organization 2017).
- Increased heat stress leads to death which can be attributed to cardiovascular and respiratory diseases (World Health Organization 2017).
- Increased air pollution and increased occupational health problems (World Health Organization 2017).

The main disaster risks that are likely to affect human health in the Cape Winelands District Municipal Area are wild fires, drought, severe storms and floods (SRK Consulting 2011; Cape Winelands District Municipality 2017). It is predicted that these disasters will be exacerbated by climate change (Cape Winelands District Municipality 2015).

From the information above, the predicted impacts of climate change on human health and health services are mostly negative. Hence, there is a need for climate change adaptation (and mitigation)

to limit the negative impacts and encourage any positive effects of climate change on human health in the Cape Winelands District Municipal Area.

4.5 Cape Winelands DM Human Settlements Sector Summary

The Cape Winelands District Municipality population is approximately 787,491 (Statistics South Africa 2011). Of the District Municipalities within the Western Cape, the Cape Winelands District Municipality has the highest population (Cape Winelands District Municipality 2017).. 43.98% of the total population are between 15 and 39 years old, while children under 15 years make up 25.84% of the total population (Statistics South Africa 2011). People between the ages of 40 and 64 constitute 25.05% of the total population, while people over 64 years old constitute the smallest (5.31%) part of the total population (Statistics South Africa 2011). The most populous Local Municipality within the District Municipality is the Breede Valley Local Municipality (SRK Consulting 2011)

Regarding education levels in the District, 35.61% of the population have some secondary schooling, while 21.59% have some or completed primary schooling, 23.33% of the total population have completed matric and 8.56% of the population have earned post-school qualifications (Statistics South Africa 2011). The remaining 10.90% have been classified as "other" in terms of their level of education (Statistics South Africa 2011).

The non-economically active population in the District constitute 35.68% of the District's working-age population (those aged 15 to 64) (Statistics South Africa 2011). Approximately 53.30% of the working-age population is employed (Statistics South Africa 2011). The formal sector is the largest employer, accounting for 76% of employed people (Statistics South Africa 2011). Within the formal sector, the agricultural sector employs the highest proportion of people (23%) in comparison to other sectors (Cape Winelands District Municipality 2017). The unemployed constitute 8.74% of the working-age population, while 2.28% are discouraged work-seekers (Figure 23) (Statistics South Africa 2011).

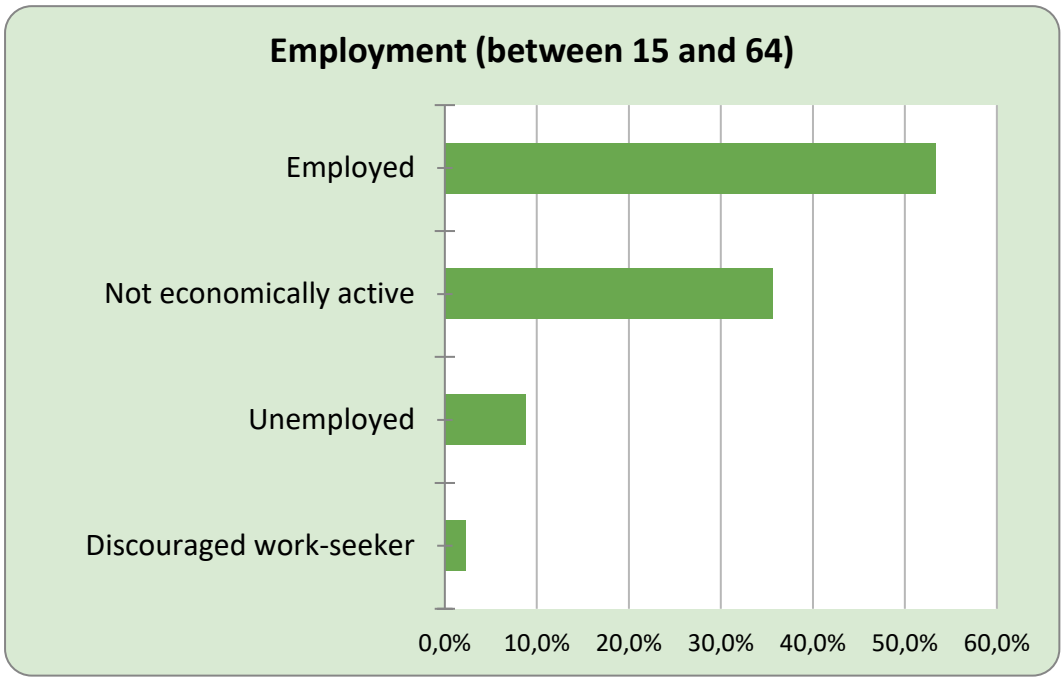

Figure 23: Employment status in the District Municipal Area (Statistics South Africa, 2011)

The District Municipality is described as one of the 'pearls of South Africa's rural and small-town sub-regions' due to its largely agricultural nature (Cape Winelands District Municipality 2017) with only 0.5% of District's land located to towns (SRK Consulting 2011). There are 198,261 households and on average four individuals per household in the District Municipality (Statistics South Africa 2011).

About 64.5% of the District Municipality's dwellings are formal[1] (house) , while 5.4% are apartments, 15% are Informal dwellings and about 15.1% of the dwellings have not been specified (Statistics South Africa 2011) (Figure 24). About 12.16% of the households within the District Municipality use alternatives to electricity for cooking, while 6.60% use alternatives to electricity for cooking, heating and lighting (Statistics South Africa 2011). Furthermore, water service providers are the biggest source of water, they supply 78.45% of the District's population with water (Figure 24) (Statistics South Africa 2011). Additionally, 5.21% of the population get water from boreholes and 1.18% from water tanks.

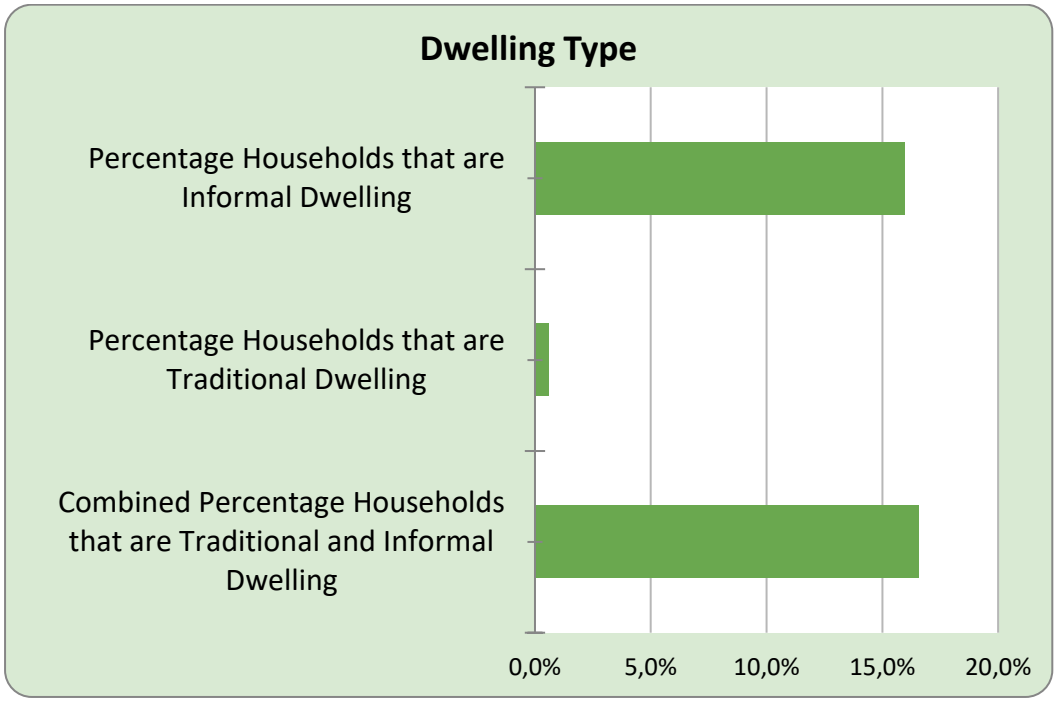

Figure 24: Households by type of dwelling in the District Municipal Area (Statistics South Africa, 2011)

Concerning sanitation services (Figure 26), 91.28% of the population have access to flush toilets, while 0.79% use pit latrines, 5.52% have access to other toilet facilities and 2.41% of the population have no toilet facilities (Statistics South Africa 2011).

[1] "Formal House" includes cluster houses, flat or apartment, house/flat/room in backyards, house or brick/concrete block structure on a separate stand or yard or on a farm, room/flatlet on a property or larger dwelling/servant's quarters/granny flat and semi-detached houses.

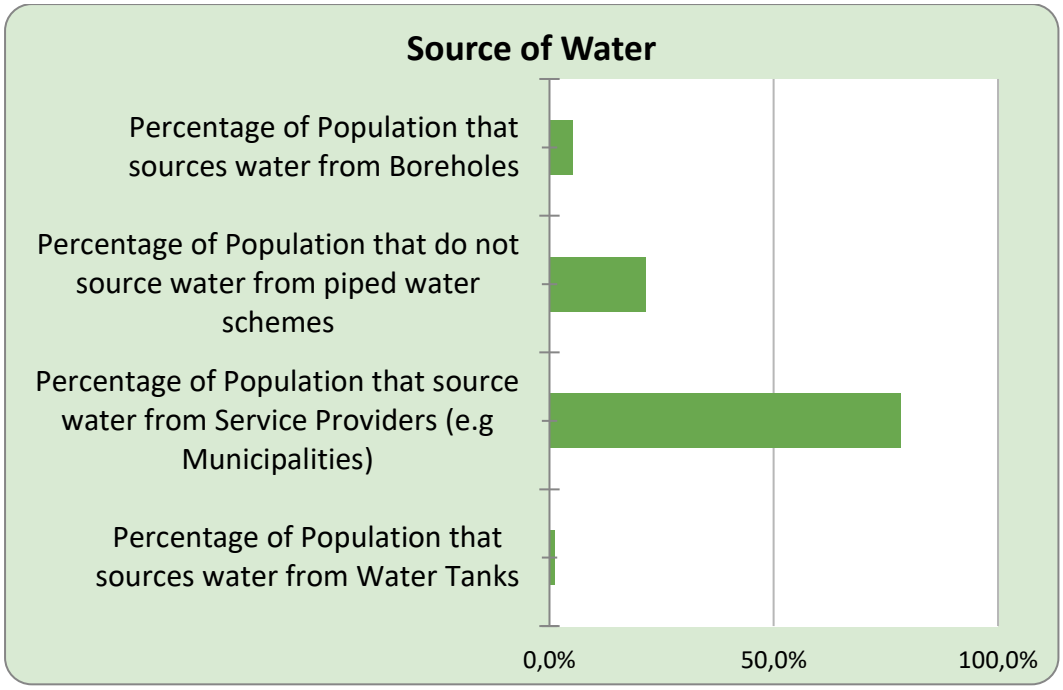

Figure 25: Household water sources in the District Municipal Area (Statistics South Africa 2011)

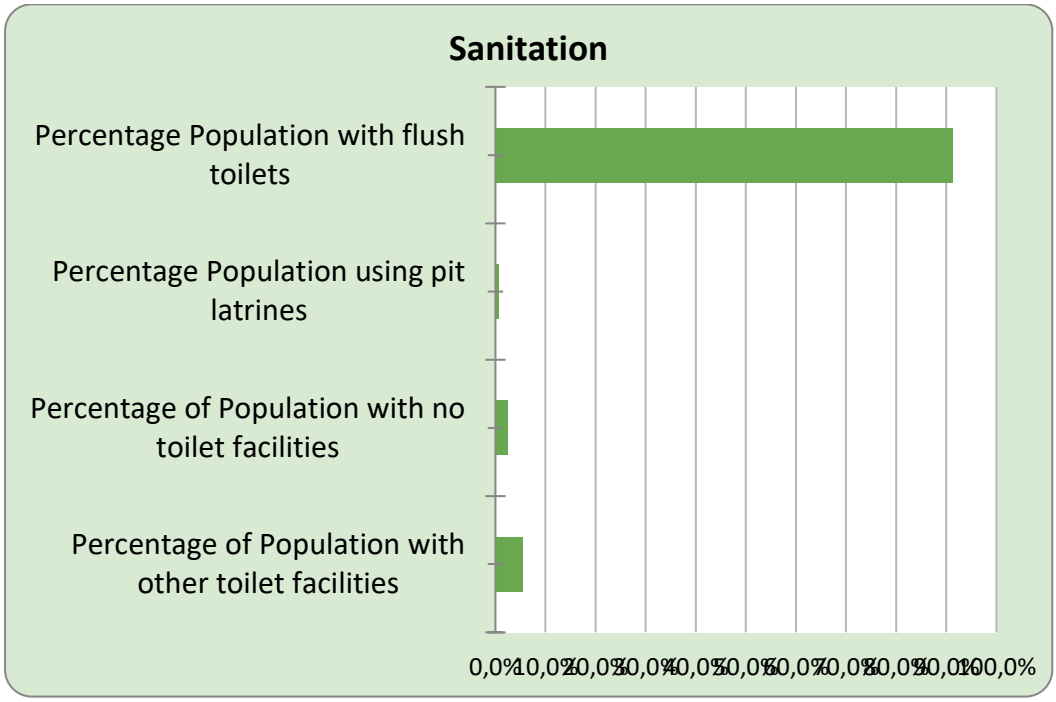

Figure 26: Sanitation facilities in the District Municipal Area (Statistics South Africa 2011)

National, provincial, main, divisional and minor roads facilitate movement within the District Municipality (Cape Winelands District Municipality 2007). Rail routes also traverse through the district (Cape Winelands District Municipality 2017). In addition, two aerodromes are found within the District's boundaries, with one aerodrome at Sanbona and the other at Ceres (Cape Winelands District Municipality 2007). The Sanbona aerodrome is under-developed, not serviced by proper roads or refuelling facilities among other essential services, and is not used to it fullest potential because it is leased to an individual (Cape Winelands District Municipality 2007).

Climate related hazards in the District include: droughts, floods (flood risk in the District is among the highest in the country), severe storms, seismic activity; and veld fires (SRK Consulting 2011). The District is prone to veld fire hazards for about six months of the year (Cape Winelands District Municipality 2017). In addition most of the District has an extremely high veld fire risk, however, there are areas in the north and east that have low veld fire risks (Figure 27) (Department of Agriculture, Forestry and Fisheries 2010).

Climate change predications for the District indicate reduced rainfall and increased average temperatures in the future (SRK Consulting 2011). As water supply is already insufficient in the District, climate change and associated impacts are predicted to exacerbating water scarcity in the future (Cape Winelands District Municipality 2017).

Water scarcity and predicted increases in average temperatures will negatively affect the agricultural sector leading to reduced agricultural production and consequently job and economic losses (Cape Winelands District Municipality 2015). These job losses may increase pressure on social services and infrastructure in the District (Cape Winelands District Municipality 2015). Additionally, the reduced agricultural production coupled with environmental degradation will have direct impacts on benefits derived from the tourism industry leading to further economic losses (Cape Winelands District Municipality 2015).

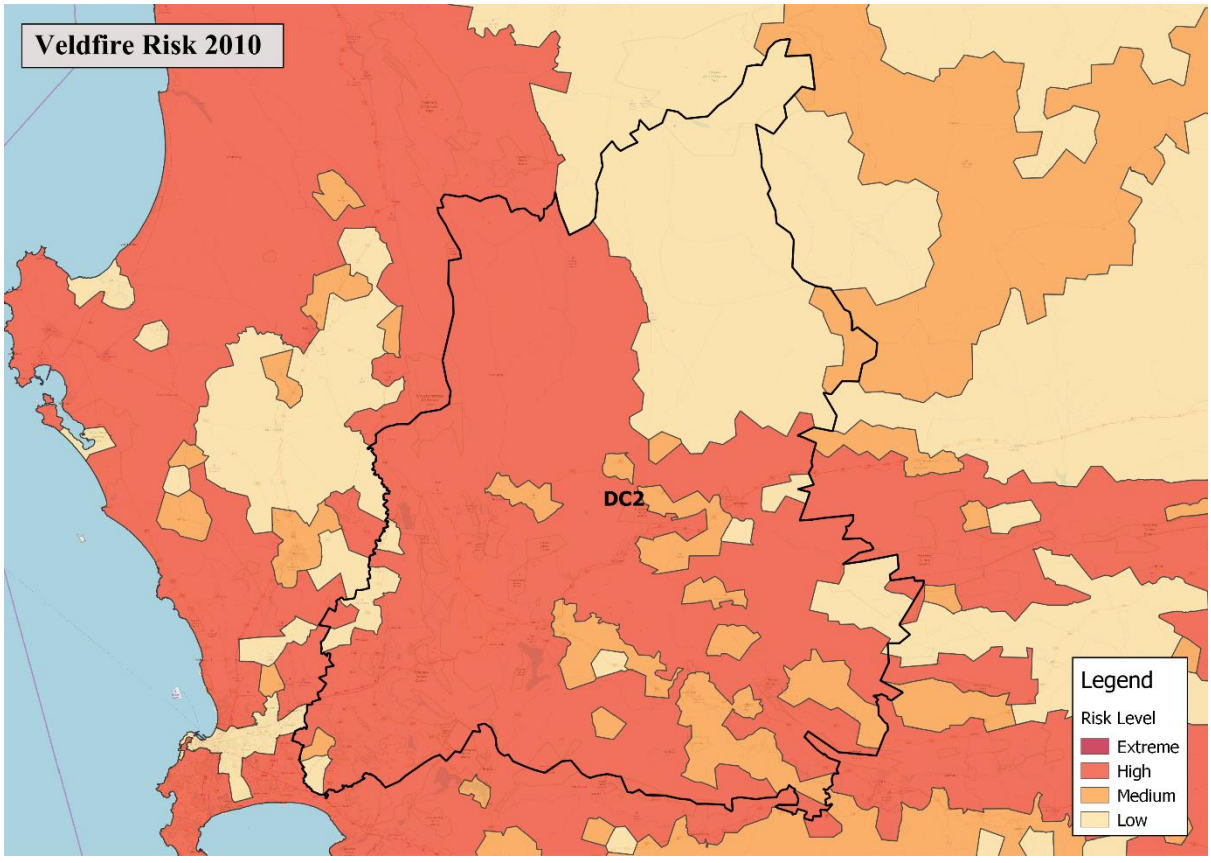

Figure 27: Veld fire risk for District Municipality Area (Department of Agriculture, Forestry and Fisheries 2010).

4.6 Cape Winelands DM Water Sector Summary

The Cape Winelands District Municipality falls under the Breede-Gouritz/Berg Hydrological Zone (Figure 28) (Department of Environmental Affairs 2013d). As outlined above (in Figure 1), in the warmer wetter scenario, the Breede-Gouritz/Berg Hydrological Zone is predicted to experience an increase in rainfall in winter and spring, and a decrease in autumn (Department of Environmental Affairs 2013d). While in the hotter and drier scenario, the region will experience a decrease in rainfall in all seasons and a strong decrease in rainfall in the west of the Hydrological Zone (Department of Environmental Affairs 2013d).

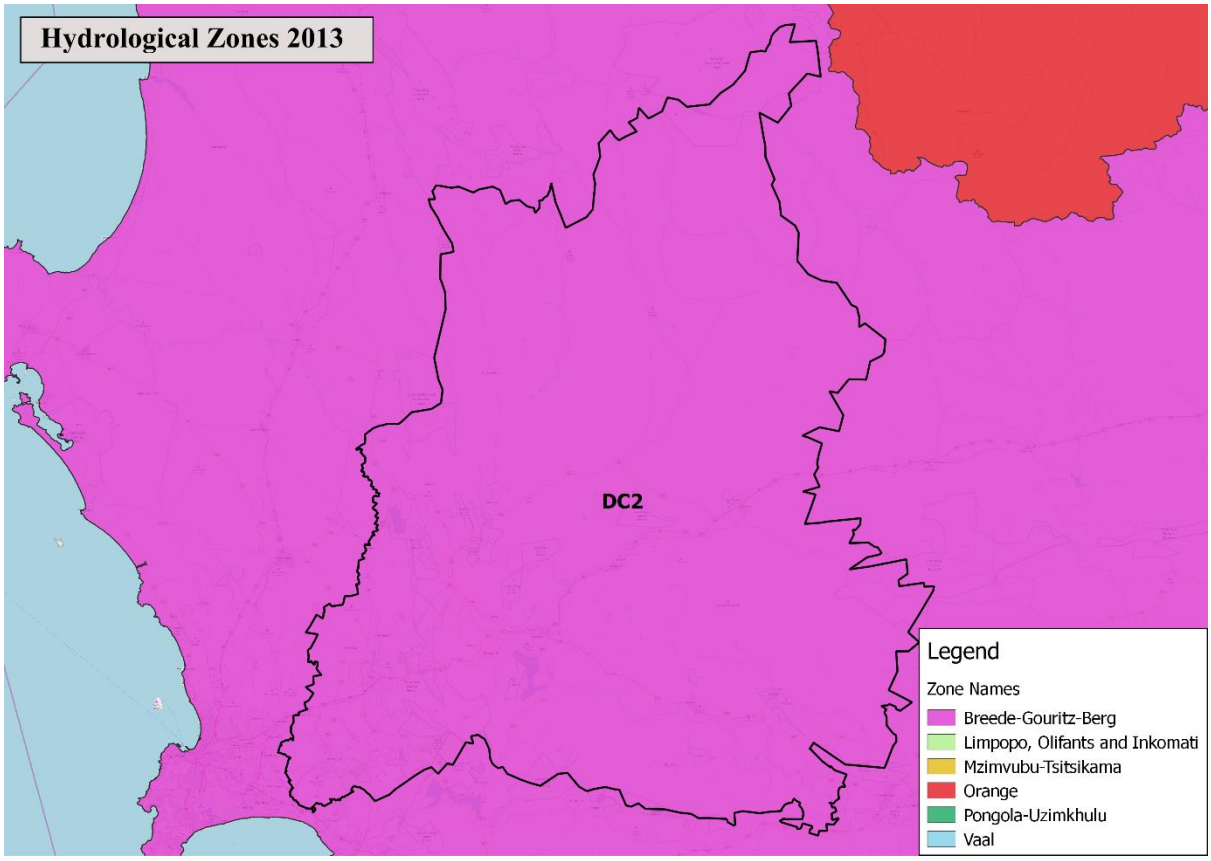

Figure 28: Hydrological Zone for the District Municipal Area (Department of Environmental Affairs 2013d)

Some hydrological zones cover multiple water management areas. The majority of the Cape Winelands District Municipality falls into the Berg-Olifants Water Management Area (Figure 29), while much of the southeast of the District Municipality Area falls into the Breede-Gouritz Water Management Area (Department of Environmental Affairs 2013d). Within the Cape Winelands District Municipal Area there are 18 main water resources (such as dams and lakes), some of which are the: Berg River, Brandvlei, Voelvlei, Keerom and Bushmanskrantz Dams (Department of Water and Sanitation 2016b). These resources are mostly found in the south of the District Municipal Area (Figure 30).

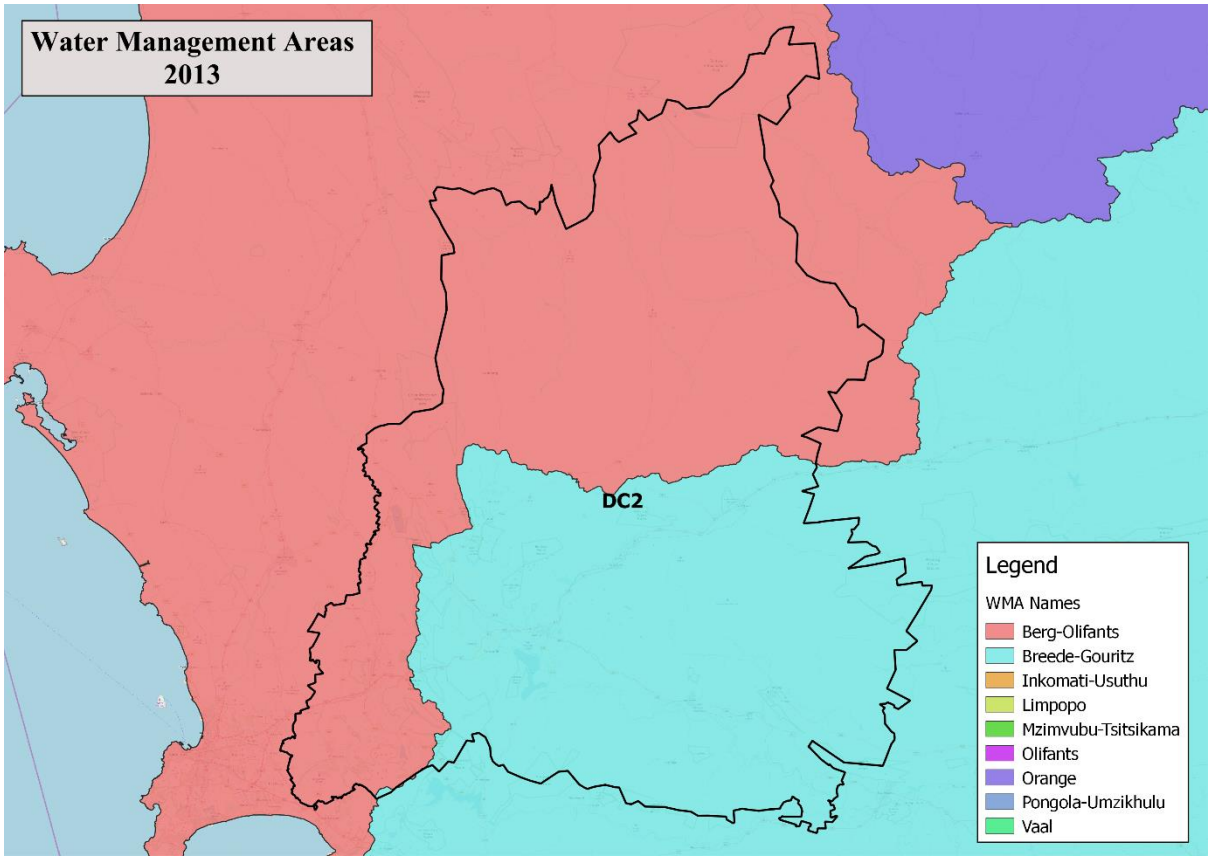

Figure 29: Water Management Area for the District Municipal Area (Department of Water Affairs 2013)

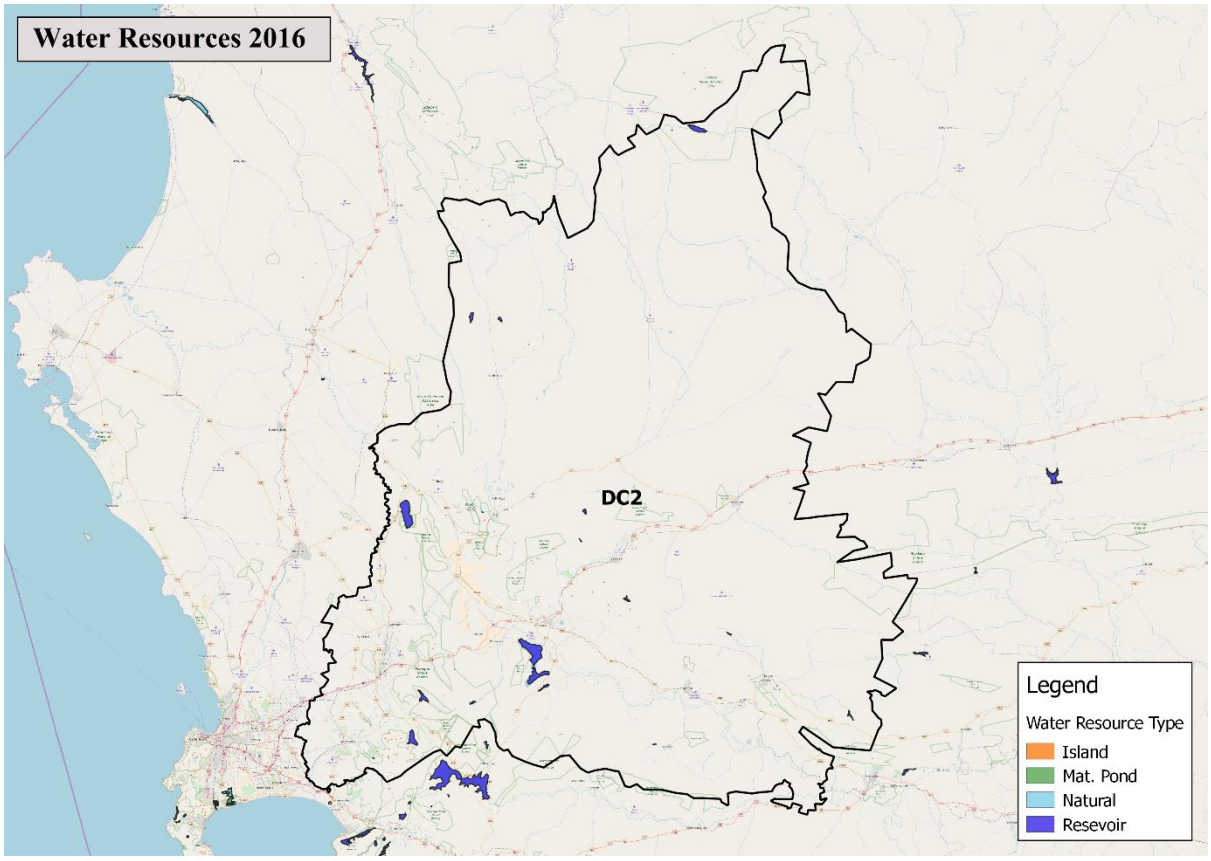

Figure 30: Water resources within the District Municipal Area (Department of Water and Sanitation 2016b)

The river quality within the Cape Winelands District Municipal Area is varied, which means that only some rivers are able to contribute towards river ecosystem biodiversity targets (SANBI 2011). The health of a river system is graded into one of several categories (SANBI 2011). These categories are listed in Text Box 1.

Text Box 1: Freshwater Ecosystem Priority Areas (FEPAs) classification for river ecosystem conditions

River conditions in South Africa have been classified according to the Freshwater Ecosystem Priority Areas (FEPAs) for river ecosystems (SANBI 2011). The different grades are provided below:

A = Unmodified, Natural
B = Largely Natural with Few Modifications
Ab = A or B Above
C = Moderately Modified
D = Largely Modified
E = Seriously Modified
F = Critically/Extremely Modified
Ef = E or F Above
Z = Tributary Condition Modelled as Not Intact, According to Natural Land Cover

Rivers that are unmodified or in their natural state are able to contribute towards river ecosystems biodiversity targets (SANBI 2011). In contrast, rivers that are categorised as 'largely modified' or worse are unable to contribute towards river ecosystems as they are not in a good state.

Some of the main rivers in the Cape Winelands District Municipality Area (Figure 31) such as the Hex and Touws Rivers as well as most of the Berg Rivers are classified as 'largely modified' (SANBI 2011). Additionally, the Breede and Olifants Rivers are classified as 'moderately modified', while the Doring and Riet Rivers and the upper section of the Berg River are classified as 'largely natural with few modifications' (SANBI 2011). Furthermore, most tributaries are classified as 'largely natural with few modifications', while some are classified as 'tributary conditions modelled as not intact, according to natural land cover' (SANBI 2011).

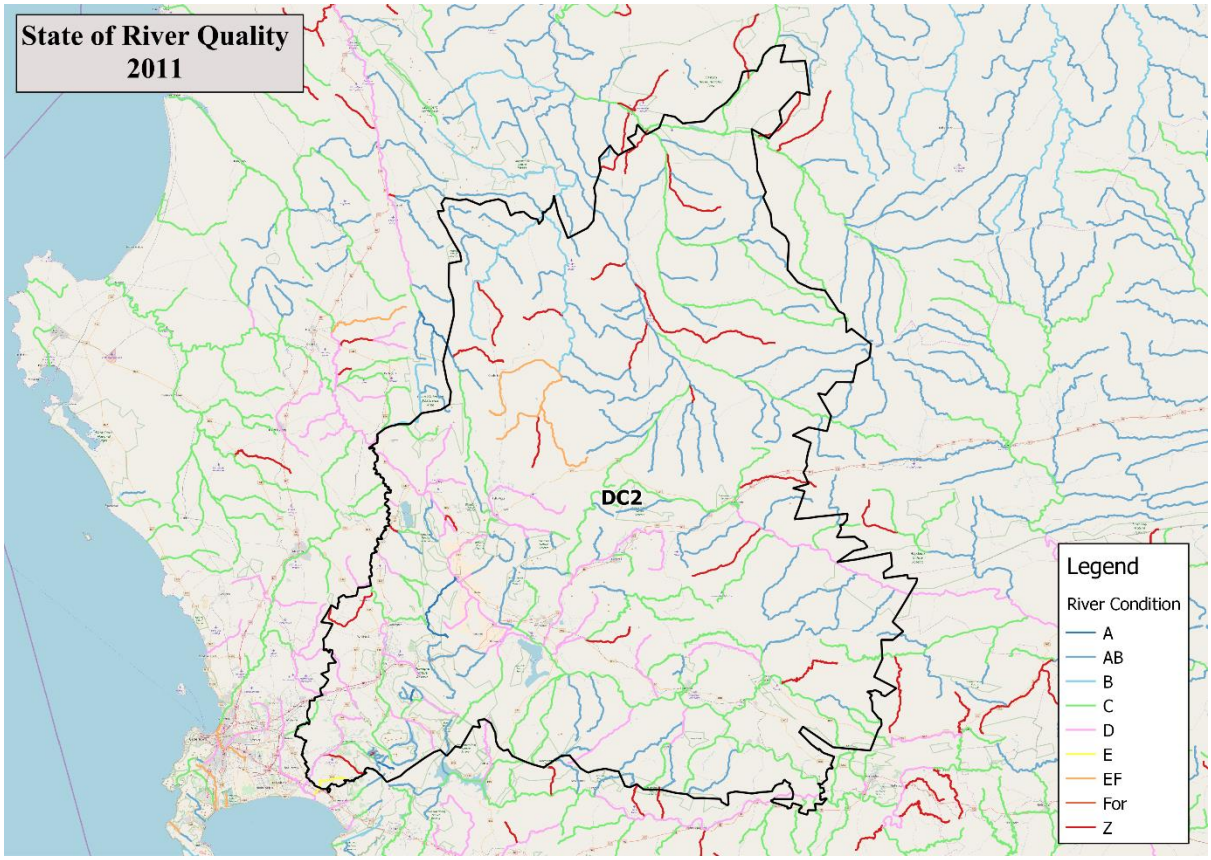

Figure 31: State of water quality in rivers in the District Municipal Area (SANBI 2011)

Water resources in any catchment are largely depended on rainfall. The Historical Climate Monthly Averages include long-term historical monthly average rainfall totals and monthly averaged minimum and maximum temperatures for a particular spot (Climate System Analysis Group 2017b). The Historical Climate Monthly Averages for the Cape Winelands District Municipal Area have been calculated using the nearest weather data station to the Municipality, which is the measuring station at Robertson (Figure 32). The graph (in Figure 32) shows that average temperatures peak in summer while rainfall peaks in winter (Climate System Analysis Group 2017b). The lowest average monthly rainfall historically occurs in January, which averages less than 13 mm (Climate System Analysis Group 2017b).

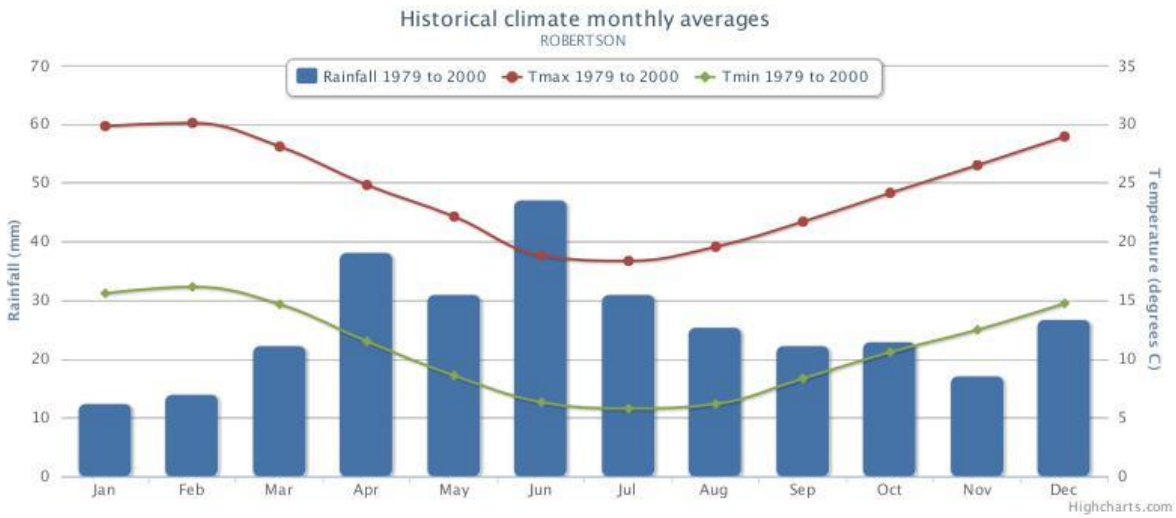

Figure 32: Historical Climate Monthly Averages for Robertson (Climate System Analysis Group 2017b)

Linked to the rainfall and rivers in the Cape Winelands District Municipal Area are the water and sanitation services. Specifically, a total of 21.55 % of households in the Cape Winelands District Municipal Area do not receive their water from piped water schemes, which is slightly lower than the national average of 21.82 % (Statistics South Africa 2011). Furthermore, the percentage of the population with flush toilets in the Cape Winelands District Municipal Area is 91.28 % while the national average is 56.51 % (Statistics South Africa 2011). This indicates a very good spread of sanitation access within the Cape Winelands District Municipal Area.

Although the Cape Winelands District Municipality has high scores for the provision of water and sanitation services to households in the District Municipal Area, there are still issue regarding water quantity and quality in the District Municipal Area. Water resources are very limited in the Cape Winelands District Municipal Area and overconsumption of available water resources has caused sections of some rivers to run dry in mid-summer (Cape Winelands District Municipality 2017). The erosion of river banks (and the resulting siltation of water supply infrastructure) and the invasion of alien plants have also reduced water quantity and quality in the District Municipal Area (Western Cape Department of Environmental Affairs and Development Planning 2013; Cape Winelands District Municipality 2015). Furthermore, pollution from land-fill sites, informal settlements, farming activities and inadequate wastewater treatments works have negatively affected water quality in the Cape Winelands District Municipal Area (Cape Winelands District Municipality 2017).

Directly linked to water and sanitation services in the Cape Winelands District Municipal Area are the Blue and Green Drop scores. Blue Drop scores rate the quality of drinking water, while Green drop scores rate the quality of wastewater. The Blue Drop score can be understood using the following scale: 90 – 100 % = ‘Excellent situation’; 75 - <90 % = ‘Good status’; 50 - <75 % = ‘Average performance’; 33 - <50 % = ‘Very poor performance’; and, 0 - <33 % = ‘Critical status’ (Department of Water Affairs 2011). There is no 2014 Blue Drop score for the Cape Winelands District Municipality, rather there is a Blue Drop score for each local municipality within the Cape Winelands District Municipality (Department of Water and Sanitation 2014).

The 2014 Blue Drop scores of each local municipality within the Cape Winelands District Municipality are as follows: The Breede Valley Local Municipality scored 89.16 %; the Drakenstein Local Municipality scored 72.14 %; the Langeberg Local Municipality scored 72.30 %; Stellenbosch Local

Municipality scored 80.12 %; and the Witzenberg Local Municipality scored 95.77 % (Department of Water and Sanitation 2014).

The Green Drop score rates the quality of wastewater management in municipalities. The Green Drop score can be understood using the following scale: 90 – 100 % = 'Excellent situation'; 80 - <90 % = 'Good status'; 50 - <80 % = 'Average performance'; 30 - <50 % = 'Very poor performance'; and, 0 - <30 % = 'Critical state' (Department of Water and Sanitation 2016a). There is no 2013 Green Drop score for the Cape Winelands District Municipality, rather there is a Green Drop scores for each local municipality within the Cape Winelands District Municipality (Department of Water and Sanitation 2013).

The 2013 Green Drop scores of each local municipality within the Cape Winelands District Municipality are as follows: The Breede Valley Local Municipality scored 90.21 %; the Drakenstein Local Municipality scored 77.79 %; the Langeberg Local Municipality scored 51.58 %; Stellenbosch Local Municipality scored 40.16 %; and the Witzenberg Local Municipality scored 97.96 % (Department of Water and Sanitation 2013). This mix of Green Drop scores indicate that the majority of wastewater services in the Cape Winelands District Municipality are being managed according to the expectations of the Department of Water and Sanitation as assessed by the Green Drop score.

In addition to the Green Drop scores, 82.66 % of households have their refuse removed by local authority/private company in the Cape Winelands District Municipal Area (Statistics South Africa 2011). This is much better than the national average for household refuse removal, which is 59.40 % (Statistics South Africa 2011). Nevertheless, uncollected waste often still ends up in water and sanitation infrastructure, blocking storm water drains and polluting rivers. It is predicted that climate change will affect these water and sanitation challenges.

Climate change is predicted to have an impact on rainfall patterns in South Africa. Future rainfall projections for the Cape Winelands District Municipality (using the measuring station at Robertson) for the period 2020 to 2040 (Figure 33) are made using the Representative Concentration Pathways (RCP) 4.5 greenhouse gas concentration trajectories (Climate System Analysis Group 2017a).

The bar charts (Figure 33) show the potential change in rainfall, with the blue bars indicating a potential increase in average rainfall and the red bars indicate a potential decrease in average rainfall (Climate System Analysis Group 2017a). The grey lines represent the various models used for this projection. It is therefore projected across most of the models that Cape Winelands District Municipality could experience an increase in rainfall in the months of January, February, March, April, August, September, October and December, and a decrease in rainfall during May, June, July and November (Climate System Analysis Group 2017a).

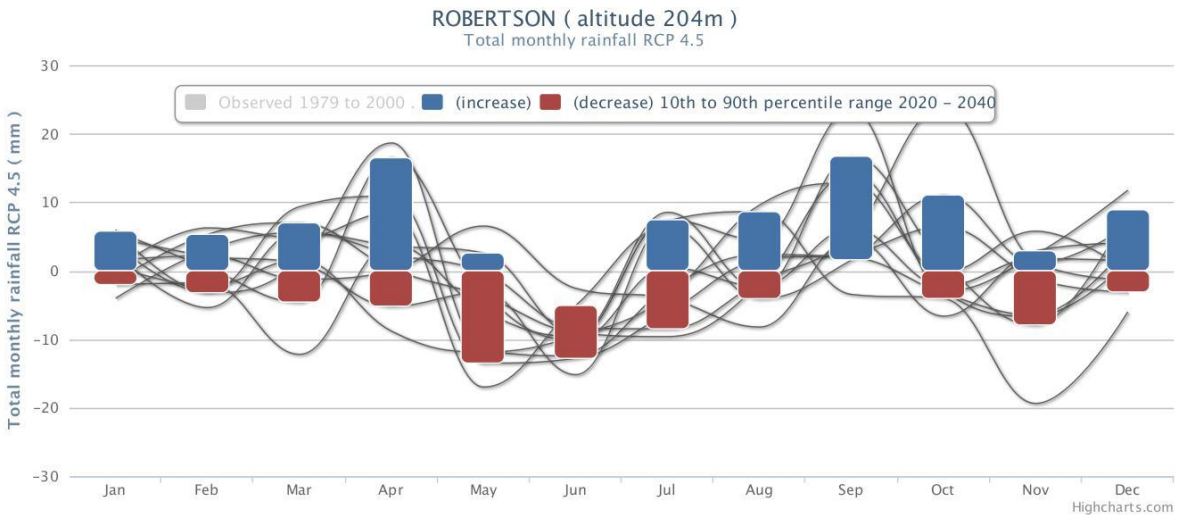

Figure 33: Rainfall Projections for Robertson (Climate System Analysis Group 2017a)

Climate change is predicted to increase the pressure on the Cape Winelands District Municipal Area's already insufficient water supply (Cape Winelands District Municipality 2017, 2015). It is also predicted to increase the variability of rainfall as well as increase the frequency and severity of droughts, wildfires and floods in the Cape Winelands District Municipal Area (Cape Winelands District Municipality 2017, 2015). Increased average temperatures, linked to climate change, are also predicted to lead to an increase of bacteria concentrations such as E. Coli within the Cape Winelands District Municipal Area (Cape Winelands District Municipality 2015). These increases could put additional strain on the human health and water sectors within the Cape Winelands District Municipal Area (Cape Winelands District Municipality 2015).

5 Vulnerability Assessment Results

The following section provides a summary of the Vulnerability Assessment conducted for Cape Winelands District Municipality.

5.1 Agriculture

Table 5: Agriculture Vulnerability Indicator Table Cape Winelands District Municipality

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
1	Change in grain (maize, wheat & barley) production	Areas towards the west of RSA are likely to become less suitable for grain production.	Do you grow or have potential to grow grains in your area?	Yes	Wheat is grown on a small scale.	How important is grain to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	Low	Wheat is a low priority crop in the District. SmartAgri Document for the Province notes that conservation agriculture has increased production and profit from wheat farming.		

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
2	Change in Sorghum production	Sorghum yields are projected to increase in parts of western KZN, inland areas of the Eastern Cape and the eastern Free State, with some areas in the north registering losses compared with present climatic conditions.	Do you grow or have potential to grow Sorghum in your area?	No	Sorghum is currently not grown, and we do not foresee it being grown in the future.	How important is sorghum to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low				
3	Change in Soya Bean Production	Areas in the east of RSA lost to potential production, with an expansion of suitable areas inland towards the central/west or RSA.	Do you grow or have potential to grow Soya Bean in your area?	No	Soya Bean is currently not grown, and we do not foresee it being grown in the future in the District.	How important is soya bean to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low				

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
4	Change in Sugarcane Production	Increase in <10% in many parts of the present cane growing areas, but by up to 30% in new growth areas further inland.	Do you grow or have potential to grow Sugarcane in your area?	No	Sugarcane is currently not grown, and we do not foresee it being grown in the future in the District.	How important is sugarcane to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low				
5	Change in viticulture (grapes) production	Areas suitable for viticulture could be substantially reduced or shift to higher altitudes and currently cooler, more southerly locations.	Do you grow or have potential to grow grapes in your area?	Yes	Throughout the District, except in Langeberg and Witzenberg based on temperature, rainfall and chill units.	How important is viticulture (grapes) to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low /No Priority Crop = Low	High	Viticulture is a high priority crop in the District with 56 % of all South African wine grapes, and 68 % of South Africa's wine, grown in the District. The District is the most important viticulture and winemaking area in South Africa	Low	Risks highlighted in the W-Cape CC Response Framework, but implementation not clear. SmartAgri, Climate Change Response Strategy. Research has been done on the impacts of climate change on the wine sector in South Africa.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
6	Change in fruit production	Projected reduction of the area suitable for fruit production (e.g. 28% reduction in apple and pears) by as early as 2020.	Do you grow or have potential to grow fruit in your area?	Yes	Throughout the entire District, except in Langeberg and Witzenberg based on temperature, rainfall and chill units. Includes apples and citrus.	How important is fruit to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	High	Already strained by restricted water supply. Impacted more by extreme events than by changes in averages.	Low	Risks highlighted in the W-Cape CC Response Framework, but implementation not clear. SmartAgri, Climate Change Response Strategy.
7	Change in other crop production areas (e.g. vegetables, nuts, etc.)	Crop production may vary depending on a warmer wetter or warmer drier climate.	Do you grow or have potential to grow other crops in your area?	Yes	Vegetables are grown in Witzenberg and Langeberg. Nuts can be found in Langeberg (there are even some farms in Montagu).	How important are other crops to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	Medium	Other crop production is of medium contribution to the agricultural sector within the District.	Medium	SmartAgri, Climate Change Response Plan

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
8	Increased areas for commercial plantations	The total area suitable for commercial forestry plantations would increase along the eastern seaboard and adjacent areas.	Do you have or have potential for commercial forestry plantations in your area?	Yes	Small commercial plantations consisting of Pinus species	Is there capacity for commercial plantation expansion (water use licence, land availability, demand for plantation products)? High Potential for Expansion = High; Medium Potential for Expansion = Medium; Low/No Potential for Expansion = Low	Low	Not a priority crop		

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
9	Increased exposure to pests such as eldana, chilo and codling moth	Exposure to eldana would increase in areas suitable for sugarcane by ~10% to > 30%. The area subject to damage by chilo would increase substantially (sugarcane). The area subject to damage by codling moth would increase substantially (apples, pears, walnuts and quince).	Are you or will you be exposed to agricultural pests in your area?	Yes	This is relevant throughout the entire District. This is due to change in climate variables: higher temperatures and less rainfall.	How important are crops that are vulnerable to pests to the local economy and livelihoods? High Priority Crop = High; Medium Priority Crop = Medium; Low/No Priority Crop = Low	High	The production of fruit is increasingly vulnerable to damage due to projected expansion of areas affected by agricultural pests.	Medium	The SmartAgri - Regional and Commodity Briefs highlights the need for innovative responses in order to increase sector resilience to pests and diseases, leading to greater cohesion and giving rise to new industries. SmartAgri.
10	Increased risks to livestock	Projected decreases in rainfall and hence herbage yields would result in negative health impacts for livestock.	Do you or will you have livestock in your area?	Yes	Intensive livestock production- chickens, eggs, pigs.	How important is livestock farming to the local economy and livelihoods? High Priority = High; Medium Priority = Medium; Low/No Priority = Low	High	Poultry farming is one of the most important agricultural activities in the District.	Low	Some adaptive responses highlighted in SmartAgri Plan. Climate Change Response Strategy.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
11	Reduced food security	Reduced food security, particularly of subsistence farmers, and resultant increase in malnutrition.	Do you or will you have food insecurity in your area?	No		Percentage households involved in agricultural activities More than 20% = High; Between 20% & 10% = Medium; Less than 10% = Low				
53	Reduced food and feed security	Reduced food security, particularly of subsistence farmers, and resultant increase in malnutrition.	Do you or will you have food insecurity and feed insecurity in your area?	Yes	Subsistence, emerging and smallholder farming systems are expected to be at high risk due to their poorer access to irrigation water and technologies, financial support and other resources.	Percentage households involved in agricultural activities More than 20% = High; Between 20% & 10% = Medium; Less than 10% = Low	Low	Only 7.6% of households are involved in agricultural activities.	High	The District's 2016/2017 IDP acknowledges the need for a more integrated system-wide response with all role players as this would help the agricultural sector to scale up effective strategies, innovate, and move towards a longer-term transformation.

5.2 Biodiversity and Environment

Table 6: Biodiversity Vulnerability Indicator Table Cape Winelands District Municipality

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
12	Loss of High Priority Biomes	High Priority Biomes (including Grasslands, Nama-Karoo, Indian Ocean Coastal Belt, Fynbos, Forest) to be replaced by other biomes such as savanna and desert.	Do you currently have high priority biomes in your area?	Yes	Throughout the entire District. This is due to higher temperatures, less rainfall, fire frequencies and invasive alien species.	How much of this High Priority Biome will be lost due to climate change? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	It is forecast that the Fynbos Biome will be substantially reduced by the Succulent Karoo Biome.	Low	The 2016 Fynbos Forum: Ecosystem Guidelines document covers the lowland, midland and mountain Fynbos ecosystems in-depth, discussing the current state of the Fynbos biome, how it is being damaged and what is needed to reduce and reverse future degradation and change. Langeberg: The National Fire Protection Agency assisted the municipality with preparing plans and maps on where to implement fire breaks. Langeberg now needs support and financial resources to implement. The Succulent Karoo is currently "taking a punch" due to the increased incidents of veld fires and lower rainfall. There is not enough research being done in the District on the specific impacts of climate change with regards to the loss of high priority biomes. The District needs to understand what the impacts of this loss will be on each sector, e.g. tourism, agriculture, economy etc. Provincial SoER, SDFs, EMF's.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
13	Increased impacts on threatened ecosystems	Loss of threatened ecosystems due to changes in climate.	Do you currently have threatened ecosystems in your area? (Classified as critically endangered, endangered or vulnerable)	Yes	The entire District due to higher temperatures and less rainfall.	How much of your Municipality is covered by threatened ecosystems? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	There are numerous threatened ecosystems types present in the District which are categorised as critically endangered. There are also quite a few ecosystems categorised as endangered or vulnerable.	Medium	The District's IDP states the need for a joint management approach with adjacent authorities regarding sensitive ecosystems and protected areas. If indicator number 12 (Loss of priority biomes) is prioritised, this indicator will indirectly be covered. Provincial SoER, SDFs, EMF's.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
14	Increased impacts on environment due to land-use change	Loss of biodiversity and degradation of natural habitat due to significant land use change (such as alien invasion, soil erosion and urbanisation) which impacts on ability to respond to climate change	Are you currently experiencing land use change?	Yes	The entire District due to farming practices, urbanisation, population growth etc.	Have you experienced significant loss of habitat since 1990? Above 10% = High; Between 5-10% = Medium; Under 5%= Low	High	The natural environment is under pressure from intensive agricultural practices, coastal population growth and the expansion of urban areas.	Low	Although there is a lack of statistics regarding land use change and degradation, the Provincial State of the Environment Report highlights the need of provincially developed programmes to achieve more sustainable land management practices for the future. Provincial SoER, SDFs, EMF's.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
15	Loss of Priority Wetlands and River ecosystems	Changes in rainfall patterns and temperature are likely to impact on wetlands and the ecosystem services they provide.	Do you have priority wetlands and river ecosystems in your area?	Yes	The entire District, due to development and changes in climate variables (rainfall/temperature). Increase in alien invasive species and animals, plants and animals also play a role.	How important are wetlands and river ecosystems in providing ecosystem services in your Municipality? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	Wetlands provide important ecosystem services and have been degraded or irreversibly lost as a result of human activities. A significant number of wetlands in the District have been heavily to critically modified.	Medium	The Working for Wetlands Programme focuses on the rehabilitation of wetlands and has increasingly shifted its emphasis to the protection of targeted wetlands and promoting sustainable use of others. Working for Wetlands is however not active throughout all local municipalities across the District. Funding for these types of programmes is not continuous. The focus of these types of programmes is that most of the emphasis is placed on job creation and sometimes loses focus of the aim of the project. Provincial SoER, SDFs, EMF's.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
55	Loss of Soil Fertility	Changes in rainfall and temperature will impact on the biology, chemistry and physical properties of soil.	Are you expecting drastic changes in rainfall and temperature that may impact on soil fertility?	Yes	Soil conditions are a contributing factor to plant growth and therefore food production.	How important is soil fertility in supporting ecosystems and livelihoods in your Municipality? A significant amount= High; A moderate amount= Medium; None/a low amount = Low	High	Agriculture and infrastructural development have led to the pollution and erosion of soil (particularly on the lower mountain slopes).	Medium	The Department of Agriculture's LandCare Program is an integrated community-based approach to the sustainable management and use of agricultural natural resources, including detailed sections in the guidelines which cover soil and land management.

5.3 Human Health

Table 7: Health Vulnerability Indicator Table Cape Winelands District Municipality

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
21	Health impacts from increased storm events	Increased storms will result increased risk of drowning, injuries and population displacement impacts.	Are you or will you experience increased storm events in your area?	Yes	Areas within the District expect severe climate change impacts and are experiencing increased vulnerability to extreme weather events.	How populated are areas vulnerable to storms events (e.g. flood zones)? Densely populated = High; Partially populated = Medium; Sparsely or not populated = Low	High	Increased flood impacts along and adjacent to river course in the District due to a change in the magnitude and frequency of extreme rainfall events.	High	Key interventions include a disaster management plan (complete) and review of a disaster risk assessment. Also, the National Disaster Management Act sets a solid regulatory basis for efficient and effective responses. Infrastructure - housing projects. Finance projects. Black frost. Decision support tool - WC Disaster Management Centre.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
22	Increased heat stress	Increases in average temperatures and extreme events (such as heat waves) are projected to induce heat stress, increase morbidity, and result in respiratory and cardiovascular diseases.	Are you or will you experience increased heat waves in your area?	Yes	The entire District, due to a change in higher temperatures.	Is there a high percentage of young and elderly in the area? More than 20% = high; Between 15% & 20% = Medium; Less than 15% = low	Medium	Almost 15% of the District's population is young or elderly.	Medium	The District has resources e.g. 40 ambulances, 3 responses and 5 rescue vehicles as well as 83 public health care facilities. Construction, agriculture, impact on burden of diseases. Climate info portal. SmartAgri- doc. WC Climate Change Response Strategy.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
23	Increased vector borne diseases from spread of mosquitoes, ticks, sandflies, and blackflies	Vector borne diseases such as malaria is projected to spread within regions bordering current malaria areas, which are presently too cold for transmission.	Are vector borne diseases present or likely in your area?	No	The District does not border any current malaria regions.	Are you in or neighbouring an area with vector borne diseases (e.g. malaria)? Already in a vector borne disease area = High; Neighbouring a vector borne disease area = Medium; Not near a vector borne disease area = Low				
24	Increased water borne and communicable diseases (e.g. typhoid fever, cholera and hepatitis)	Favourable conditions for the incubation and transmission of waterborne diseases may be created by increasing air and water temperatures.	Are waterborne and communicable diseases present or likely in your area?	No		Have you had an incidence of waterborne and communicable diseases (e.g. typhoid fever, cholera and hepatitis) in the past 3 years Yes = High: No = Low				

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
25	Increased malnutrition and hunger as a result of food insecurity	Climate Change will affect food systems, compromising food availability, access and utilisation, leading to food insecurity (particularly of subsistence farmers).	Do you or will you have food insecurity in your area?	Yes	At a very small scale due to increases in temperature and reduced rainfall. Stunted growth, unemployment, substance abuse, more of an economic impact (Climate change will exacerbate these).	Child under 5 years severe acute malnutrition case fatality rate More than 10% = high; Between 5% & 10% = Medium; Less than 5% = low	Low	2.9% fatality rate of children under 5 years with malnutrition.	Low	Despite the low number of recorded malnutrition cases, the District's 2016/2017 IDP shows concern with where most cases have occurred (Breede Valley). SmartAgri- doc.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
26	Increased air pollution	Health impacts in resulting from exposure to air pollutants include eye irritation, acute respiratory infection, chronic respiratory diseases and TB, and sometimes death.	Do you or will you have air pollution in your area?	Yes	Increasing frequency of fires, air temperature inversions, drier periods, increases in particulate matter, effects of spraying regimes. Urbanisation: Indoor air pollution, particularly in informal dwellings as a result of cooking indoor.	Would you consider your area a high priority in terms of air pollution (e.g. SAAQIS Priority Areas)? Yes = High; Somewhat = Medium; No = Low	Low	CWDM is not a high priority area.	Medium	Air pollution priority areas (already identified and potential sources) or 'hotspots' have been identified in the District, and include agricultural areas, landfills, industries and domestic fuel burning areas. 13 industries in CWDM, all of them have AEL's, emitters are controlled. WC Health Impact Report on air quality. AQMP, SoER, Provincial Health Air Quality Report.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
27	Increased Occupational health problems	Temperature is a common climatic factor that affects occupational health (for example, agricultural labourer's productivity) by causing heat stress and dehydration.	Do people work outside or are in conditions that cannot be cooled in your area?	Yes	Occupational health problems may occur throughout the District in various sectors and may affect farm workers, construction workers and municipal labourers.	Do a significant percentage of people work outside or are in conditions that cannot be cooled? Significant = High; Some = Medium; Low/No = Low	High	The agricultural sector alone is responsible for 23% of formal employment opportunities.	Medium	Occupational health services will be required in all workplaces with heat risks. Informal systems in place. Develop SOP's specific conditions (e.g. morning or night spraying). UCT Research in progress on impacts of climate change on health.

5.4 Disaster Management, Infrastructure and Human Settlements

Table 8: Disaster Management, Infrastructure and Human Settlements Vulnerability Indicator Table Cape Winelands District Municipality

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
28	Loss of industrial and labour productivity	Direct impacts of weather on construction, electricity generation and other industries, resulting in loss of productivity.	Do you have industrial activities in your area?	Yes	The entire District is affected including the various types of agricultural production, wine and brandy processing, juice products, dried and tinned fruits.	How significant is the Mining/Industrial/Manufacturing sector for the local economy? Significant = High; Somewhat = Medium; Low/No = Low	High	The manufacturing sector is vulnerable to changes in the economy. Climate change is a threat, but this sector may also be affected through government policies (such as carbon taxes), an increase in production costs and varying customer behaviour.	Low	Limited systems in place to deal with impacts on productivity. SmartAgri-, LED strategies, Local Municipalities and District Municipalities, Provincial Economic Review Outlook.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
29	Increased impacts on strategic infrastructure	Increased disruptions to key strategic infrastructure (e.g. WWTW, storm water, roads, rail, bridges) as a result of extreme weather events.	Do you have strategic infrastructure in your area?	Yes	The entire District, due to fires and severe weather events.	How important is this strategic infrastructure to the functioning of your municipality? Significant amount = High; Moderate amount = Medium; Minimal or no = Low	High	Floods and fires are disaster risk priorities with reference to the current and future condition of strategic infrastructure.	Low	Additional input from other municipalities and departments is required. Lack of capacity (Disaster Management). Budget constraints. Risk Assessment, Provincial Disaster Risk Profile. Uncertainty around implementation of policies and plans. District's Climate Change Response Adaptation Strategy.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
30	Increased impacts on traditional and informal dwellings	Increased risk of extreme weather events to already vulnerable traditional and informal dwellings, that are often unplanned, and without extensive service or infrastructure.	Do you have traditional and informal dwellings in your area?	Yes	Only informal dwellings (including backyard dwellings). Areas across all municipalities.	What percentage of households are in traditional and informal dwellings in your area? More than 15% = high; Between 15% & 10% = Medium; Less than 10% = low	High	15.96% of the households within the District are informal settlements. Informal settlements are often located in areas prone to flooding and other natural hazards.	Low	District's Climate Change Response Adaptation Strategy. Specific information is required from all local municipalities. Additional input from other municipalities and departments is required. Lack of capacity (Disaster Management). Budget constraints. SDFs, Provincial Informal Settlement Plan.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
31	Increased isolation of rural communities	Physical isolation of rural communities as a result poor rural roads and increased flooding and erosion.	Do you have isolated rural communities in your area?	Yes	Farming areas, Witzenberg, Langeberg, and remote towns.	Is your area predominantly Rural? Mostly Rural = High Equally Urban and Rural = Medium Mostly Urban = Low	High	Majority of the area is agricultural land. Remote towns.	Low	District's Climate Change Response Adaptation Strategy. Specific information is required from all local municipalities. Additional input from other municipalities and departments is required. Lack of capacity (Disaster Management). Budget constraints. SDFs, Provincial Informal Settlement Plan.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
32	Increased migration to urban and peri-urban areas	Increased migration from rural settlements to urban and peri-urban settlements.	Do you have rural urban migration in your area?	Yes	Throughout the District people migrate from rural to urban areas due to lack of opportunities.	Is there a strong rural economy? Low opportunities in rural areas = High; Some opportunities in rural areas = Medium; Strong rural economy = Low	Medium	There has been limited transformation of the rural economy which contrasts strongly with the formal sector.	Low	The District has a strategic objective to empower the poor and rural communities using developed programmes such as the Small Farmer Support Programme. Impacts/success of projects in rural areas to be established. Impact of drought on agricultural sector (seasonal workers). Provincial informal settlement support plan, PERO, MERO.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
33	Increased risk of wildfires	Increased risk of wildfires linked to higher ambient temperatures, dry spells and more frequent lightning storms.	Is this or will this take place in your area?	Yes	Veldfires occur between December and April when temperatures are at their highest with the 2017 season being particularly bad (more than 1500 fires reported costing the District approximately R17 million).	What is the Veld Fire Risk Status of the area? Extreme or High = High; Medium; Low	High	About 75% of the District's land area has a high risk level of veldfires.	Medium	The District's Fire Services prides itself on efficient and effective service delivery and works closely with various role-players (such as Henley Air (helicopter services), SAAF and members of the Winelands Fire Protection Association). Availability of water in firefighting is a challenge. Role of FPA. Risk assessment, Fire Services Seasonal Preparedness Plan.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
34	Decreased income from tourism	Reduced income from tourism as a result of reduced recreational opportunities and increased impact on tourism-supporting infrastructure, such as conservation area access roads.	Do you have tourism assets that can be impacted by climate change in your area?	Yes	Wine tourism (both domestic and overseas) and Fynbos Biome.	How significant is tourism to the local economy? Significant contributor = High; Some contribution = Medium; Low/No contribution = Low	High	The wine industry is a large contributor to the tourism sector (tourism real estate, wine activities, culinary events, wine competitions, harvest festivals etc). Cultural experiences.	Medium - Low	The provincial Climate Change Response Strategy highlights the importance of safeguarding the unique cultural, scenic and coastal resources on which the tourism economy depends. Biodiversity Strategy and Action Plan, SmartAgri.

5.5 Water

Table 9: Water Vulnerability Indicator Table Cape Winelands District Municipality

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
35	Decreased quality of drinking water	Deterioration in water quality due to increased salt concentrations in dams, wetlands and soil/plant systems from enhanced evaporation rates.	Is this or will this take place in your area?	Yes	The entire District is under pressure due to reduced rainfall, invasive alien species, intensive and poorly managed agricultural activities as well as lime production.	What is the Blue Drop Score for the area (2012 Report)? Less than 50% = high; Between 50% & 90% = Medium; More than 90% = low	Medium - High	Blue Drop scores 2014: Witzenberg LM: 96% Breede Valley LM: 89% Langeberg LM: 72% Drakenstein LM: 72% Stellenbosch LM: 80% Control of water supply is dependent on City of CPT.	Low	The District's Climate Change Adaptation Strategy (draft) highlights various key interventions for securing future water quality such as the Working For Water Programme, Cape Winelands Invasive Alien Vegetation Management Programme and the Cape Winelands River Rehabilitation Programme. Source more information from what local municipalities are doing. Possibility of water augmentation from CPT. Alien cleansing mechanical plans. WC Climate Change Response Strategy. WC Sustainable Water Management Plan. Risk Assessment.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
36	Decreased water quality in ecosystem due to floods and droughts	More frequent floods result in increased effluent overflow into rivers. Increased drought means less water is available to dilute wastewater discharges and irrigation return flows to rivers.	Is this or will this take place in your area?	Yes	In the entire District, due to reduced rainfall, invasive alien species, agricultural activities and lime production. Increased pressure on infrastructure as a result of informal settlements.	What is the Green Drop Score for the area? Less than 50% = high; Between 50% & 90% = Medium; More than 90% = low	High	Green Drop Scores for 2013: Witzenberg LM: 97.96% Breede Valley LM: 90.21% Langeberg LM: 51.58% Drakenstein LM: 77.79% Stellenbosch LM: 40.16% Water quality has been identified as a major risk within the District.	Low	The River Health Programme primarily makes use of biological indicators to assess the condition or health of river systems, which is useful for detecting, identifying and reporting on emerging problems facing aquatic ecosystems. Research source of pollution - agriculture fertilisers as source of pollution. Invasive aquatic weeds. Alien cleansing mechanical plans. WC Climate Change Response Strategy. WC Sustainable Water Management Plan. Risk Assessment.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
37	Less water available for irrigation and drinking	Increased periods of drought mean less water is available.	Is this or will this take place in your area?	Yes	The entire District is affected because of reduced rainfall and extended periods of drought, uncontrolled invasive alien species, poorly managed agricultural activities as well as increased pressure on infrastructure as a result of informal settlements. Another challenge is the transportation of sewage effluent due to reduced water availability.	Years of drought over the past 20 years More than 7 incidence = High; Between 7 & 2 incidence = Medium; Less than 2 incidence = Low;	High	Water availability is closely linked to climate variability and rainfall is unevenly distributed across the province, this limits development.	Low	The District's Climate Change Adaptation Strategy (draft) highlights that to combat tightening water supply conditions, adaptation regarding the efficiency of water use is required. Possibility of water augmentation from CPT. Alien cleansing mechanical plans. WC Climate Change Response Strategy. WC Sustainable Water Management Plan. Risk Assessment.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
38	Increased impacts of flooding from litter blocking storm water and sewer systems	Human health and ecosystem impacts, associated with increased rainfall intensities, flash floods and regional flooding resulting in litter and washed-off debris blocking water and sanitation systems.	Is this or will this take place in your area?	Yes	Increased pressure on infrastructure and service delivery as a result of informal settlements.	Percentage of Households using no rubbish disposal More than 10% = High; Between 10% & 5% = Medium; Less than 5% = Low	Low	Only 1.45% of households no access to rubbish disposal services. Not utilised properly by the community. Informal settlements do not have adequate services.	High	Regarding refuse removal, the District's IDP (2016/2017) shows that it is currently performing better than the national infrastructure performance. Awareness and education campaigns and programmes. Landfill sites capacity decreasing Alien cleansing mechanical plans. WC Climate Change Response Strategy. WC Sustainable Water Management Plan. Risk Assessment.

No	Indicator Title	Indicator Description	Exposure Question	Exposure Answer	Exposure Comment	Sensitivity Question	Sensitivity Answer	Sensitivity Comment	Adaptive Capacity Answer	Adaptive Capacity Comment
39	Increased fish mortality	Increased freshwater fish mortality due to reduced oxygen concentrations in aquatic environments and mortality of temperature-sensitive fish species.	Do you have fresh water fish in your area?	Yes	Less rainfall, increased pollution of freshwater resource, and uncontrolled spread of invasive fish species.	How significant is fresh water fish to livelihoods? Significant to livelihoods = High; Some dependence = Medium; Low/No dependence = Low	Medium	Investments are being made in the aquaculture sector and it has become an emerging industry throughout the province.	Medium	The Western Cape State of the Environment Outlook Report states that with careful management, it is possible to support aquaculture farming without compromising the conservation of indigenous fish species. WC SoER, State of River Health Report, Biodiversity Strategy and Action Plan.
52	Less groundwater availability	Increased extraction of ground water results in boreholes collapse and lower water table levels	Is this or will this take place in your area?	Yes	The Breede-Gouritz Water Management Area has a high UGEP (utilisable groundwater exploitable potential) of 362.9 million cubic metres per annum (m3/annum).	If it takes place how significant will it be?	Medium	Regions in the Western Cape have only localised threats of over-abstraction (predominantly in farming areas).	Medium	The District's Climate Change Adaption Strategy (draft) describes how the National Water Policy and the National Water Act will be achieved through the Catchment Management Agencies which have been established in each of the country's Water Management Areas.

5.6 Vulnerability Assessment Summary

The tables below list the high and medium priority climate change indicators for the municipality.

5.6.1 High Priority Climate Change Indicators

Based on the above vulnerability assessment the following indicators were identified as high priority climate change vulnerabilities for the municipality. These were shortlisted by answering "yes" to exposure, "high" to sensitivity and "low" to adaptive capacity.

Table 10: High Priority Indicators Cape Winelands District Municipality

No	Sector	Name Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
5	Agriculture	Change in viticulture (grapes) production	Yes	High	Low
6	Agriculture	Change in fruit production	Yes	High	Low
10	Agriculture	Increased risks to livestock	Yes	High	Low
12	Biodiversity and Environment	Loss of High Priority Biomes	Yes	High	Low
14	Biodiversity and Environment	Increased impacts on environment due to land-use change	Yes	High	Low
28	Human Settlements, Infrastructure and Disaster Management	Loss of industrial and labour productivity	Yes	High	Low
29	Human Settlements, Infrastructure and Disaster Management	Increased impacts on strategic infrastructure	Yes	High	Low
30	Human Settlements, Infrastructure and Disaster Management	Increased impacts on traditional and informal dwellings	Yes	High	Low
31	Human Settlements, Infrastructure and Disaster Management	Increased isolation of rural communities	Yes	High	Low
36	Water	Decreased water quality in ecosystem due to floods and droughts	Yes	High	Low
37	Water	Less water available for irrigation and drinking	Yes	High	Low

5.6.2 Medium Priority Climate Change Indicators

Based on the above vulnerability assessment the following indicators were identified as medium priority climate change vulnerabilities for the municipality. These were shortlisted by answering "yes" to exposure, "medium" or "high" to sensitivity and "low" or "medium" to adaptive capacity.

Table 11: Medium Priority Indicators Cape Winelands District Municipality

No	Sector	Name Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
7	Agriculture	Change in other crop production areas (e.g. vegetables, nuts, etc.)	Yes	Medium	Medium
9	Agriculture	Increased exposure to pests such as eldana, chilo and codling moth	Yes	High	Medium
53	Agriculture	Reduced food and feed security	Yes	Low	High
13	Biodiversity and Environment	Increased impacts on threatened ecosystems	Yes	High	Medium
15	Biodiversity and Environment	Loss of Priority Wetlands and River ecosystems	Yes	High	Medium
55	Biodiversity and Environment	Loss of Soil Fertility	Yes	High	Medium
21	Human Health	Health impacts from increased storm events	Yes	High	High
22	Human Health	Increased heat stress	Yes	Medium	Medium
25	Human Health	Increased malnutrition and hunger as a result of food insecurity	Yes	Low	Low
26	Human Health	Increased air pollution	Yes	Low	Medium
27	Human Health	Increased Occupational health problems	Yes	High	Medium
32	Human Settlements, Infrastructure and Disaster Management	Increased migration to urban and peri-urban areas	Yes	Medium	Low
33	Human Settlements, Infrastructure and Disaster Management	Increased risk of wildfires	Yes	High	Medium
34	Human Settlements, Infrastructure and Disaster Management	Decreased income from tourism	Yes	High	Medium - Low

No	Sector	Name Indicator Title	Exposure Answer	Sensitivity Answer	Adaptive Capacity Answer
35	Water	Decreased quality of drinking water	Yes	Medium - High	Low
38	Water	Increased impacts of flooding from litter blocking storm water and sewer systems	Yes	Low	High
39	Water	Increased fish mortality	Yes	Medium	Medium
52	Water	Less groundwater availability	Yes	Medium	Medium

6 Sector Response Plans

6.1 Agriculture

6.1.1 Introduction

	Project Name
	Agriculture Sector Adaptation to Climate Change
	Project Custodian/Driver
	Overview of Key Issues
	The South African agricultural sector is highly diverse in terms of its activities and socio-economic context. This sector can be described as two-tiered (commercial vs. small-holder and subsistence farmers), with activities across a wide variety of climatic conditions (especially of rainfall). Roughly 90% of the country is sub-arid, semi-arid, or sub-humid, and about 10% is considered hyper-arid. Only 14% of the country is potentially arable, with one fifth of this land having high agricultural potential. Climate is important in determining potential agricultural activities and suitability across the country, especially in smallholding and homestead settings. Irrigation and conservation tillage practices can overcome rainfall constraints, especially in the high-value commercial agricultural sector. Irrigation currently consumes roughly 60% of the country's surface water resources, with important implications for agricultural exports, and food and water security in the context of climate change.
	Objectives
5	Manage the change in viticulture (grapes) production
6	Manage the change in fruit production
10	Manage increasing risks to livestock

6.1.2 Responses

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
5	**Manage the change in viticulture (grapes) production**	Commission research and improve understanding of climate change impacts on viticulture production.				25%	50%	75%	100%
		Optimise climate resilient land-uses of existing agricultural areas.				25%	50%	75%	100%
		Promote knowledge generation, knowledge sharing, stakeholder participation and awareness-raising regarding the alternative agricultural production in the western and southern Cape.				25%	50%	75%	100%
		Promote knowledge generation, knowledge sharing, stakeholder participation and awareness-raising regarding viticulture in new growth areas.				25%	50%	75%	100%
6	**Manage the change in fruit production**	Generate and share scientific, social and indigenous knowledge that will minimise the loss of areas suitable for the growth of fruit.				25%	50%	75%	100%
		Identify climate resilient land-uses that will support new agricultural opportunities that will minimise the new areas and new crops thus reducing climate change impacts on current agricultural potential.				25%	50%	75%	100%
		Implement evidence based monitoring initiatives that feed into the management systems for fruit production.				25%	50%	75%	100%
		Promote knowledge generation, knowledge sharing, stakeholder participation and awareness-raising regarding the decline in suitable areas for the growth of fruit.				25%	50%	75%	100%
		Research and improve understanding of climate change impacts on fruit.				25%	50%	75%	100%

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
10	**Manage increasing risks to livestock**	Strengthen management plans, to enable continuous monitoring and the ability to effectively respond to the change.				25%	50%	75%	100%
		Commission research and improve understanding of climate change impacts livestock and land availability				25%	50%	75%	100%
		Develop a framework that will assist and educate farmers with adjusting to reduced rainfall.				25%	50%	75%	100%
		Generate and share scientific, social and indigenous knowledge that will assist with adapting to the reduction in herbage yields.				25%	50%	75%	100%
		Improve collaboration and partnership on existing programs (e.g. LandCare Programme, EPWP and River Health Programmes)				25%	50%	75%	100%
		Strengthen management plans, to enable continuous monitoring of water and herbage availability for livestock.				25%	50%	75%	100%

6.2 Biodiversity and Environment

6.2.1 Introduction

	Project Name
	Biodiversity and Environment Sector Adaptation to Climate Change
	Project Custodian/Driver
	Overview of Key Issues
	Biodiversity is crucial to ecosystem health, and healthy ecosystems are central to human well-being. Healthy ecosystems interlinked with working landscapes and other open spaces form the ecological infrastructure of the country and are the foundation for clean air and water, fertile soil and food. All South Africans depend on healthy ecosystems for economic and livelihood activities, including agriculture, tourism and a number of income generating and subsistence level activities. These natural ecosystems are under pressure from land use change and related processes causing degradation, as well as invasive alien species. Accelerated climate change (resulting in increasing temperature, rising atmospheric CO2 and changing rainfall patterns) is exacerbating these existing pressures. Well-functioning ecosystems provide natural solutions that build resilience and help society adapt to the adverse impacts of climate change. This includes, for example, buffering communities from extreme weather events such as floods and droughts, reducing erosion and trapping sediment, increasing natural resources for diversifying local livelihoods, providing food and fibre, and providing habitats for animals and plants which provide safety nets for communities during times of hardship. Sustainably managed and/or restored ecosystems help in adapting to climate change at local or landscape level.
	Objectives
12	Manage Loss of High Priority Biomes
14	Manage Increased impacts on environment due to land-use change

6.2.2 Responses

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
12	**Manage Loss of High Priority Biomes**	Implementation of fire breaks in local municipalities (Langeberg) by 2022 through the Disaster Management Unit.				25%	50%	75%	100%
		Identification/Inclusion of high priority biomes in local Spatial Development Frameworks during the review process.				25%	50%	75%	100%
14	**Manage Increased impacts on environment due to land-use change**	Develop program to diversify community livelihoods strategies to earn income from other activities such as ecotourism and other non-farming activities.				25%	50%	75%	100%
		Incentivize small scale farmers to practice sustainable and conservative agriculture				25%	50%	75%	100%
		Incorporate sustainable land use management and planning into other sectors plans.				25%	50%	75%	100%
		Research and improve understanding of land use change in the municipality.				25%	50%	75%	100%
		Strengthen institutional capacity to deal with pressure on land use change				25%	50%	75%	100%

6.3 Disaster Management, Infrastructure and Human Settlements

6.3.1 Introduction

	Project Name
	Human Settlements, Infrastructure and Disaster Management Sector Adaptation to Climate Change
	Project Custodian/Driver
	Overview of Key Issues
	South Africa is a diverse country, not just in terms of populations and biodiversity, but also in terms of its human settlements. These settlements face severe challenges, even before climate change is taken into account. The implications of the compounding impacts of climate change will be profound, and human settlements therefore represent a crucial part of national adaptation strategies. The overarching strategic framework for the development of human settlements is described in the National Development Plan (NDP) and, more specifically in relation to the implications for climate change, in the National Climate Change Response (NCCR). However, to develop appropriate adaptation responses a more nuanced understanding of the challenges and options for human settlements is required, building on the insights of the NCCR. This understanding needs to take into account the unusually diverse urban forms of human settlement in the South African context, and the importance of ecological infrastructure in supporting service delivery and building resilient communities.
	Objectives
28	Manage potential loss of industrial and labour productivity.
29	Manage potential increased impacts on strategic infrastructure.
30	Manage increased impacts on traditional and informal dwellings
31	Manage potential increased isolation of rural communities.

6.3.2 Responses

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
28	**Manage potential loss of industrial and labour productivity.**	Research and implement water efficiency projects in industrial processes to improve the efficiency of water usage.				25%	50%	75%	100%
29	**Manage potential increased impacts on strategic infrastructure.**	Implement a water augmentation project that will help reduce reliance on surface water and seek alternative sources of water (e.g. recycling of water).				25%	50%	75%	100%
		Upgrade and maintain stormwater infrastructure so that it considers extreme weather events such as flooding.				25%	50%	75%	100%
30	**Manage increased impacts on traditional and informal dwellings**	Upgrading and maintenance of road infrastructure.				25%	50%	75%	100%
		Develop and upgrade informal settlements.				25%	50%	75%	100%
		Partner with research institutions to implement a research project to develop a model aimed at achieving sustainable informal settlements with lower risk exposure.				25%	50%	75%	100%
31	**Manage potential increased isolation of rural communities.**	Build Climate change resilient road infrastructure that serves as a link for rural areas.				25%	50%	75%	100%
		Develop economic nodes and improved service provision in rural areas to improve connectivity.				25%	50%	75%	100%

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
		Identify alternative access routes to rural communities.				25%	50%	75%	100%
		Identify local responses that will reduce isolation of rural communities.				25%	50%	75%	100%
		Identify roads at risk of flooding and erosion and prioritise those for upgrading and maintenance.				25%	50%	75%	100%
		Implement flooding drainage systems that will reduce impacts on rural roads.				25%	50%	75%	100%

6.4 Water

6.4.1 Introduction

	Project Name
	Water Sector Adaptation to Climate Change
	Project Custodian/Driver
	Overview of Key Issues
	South Africa's climate is generally arid to semi-arid, with less than 9% of annual rainfall ending up in rivers, and only about 5% recharges groundwater in aquifers. In addition, rainfall and river flow are unpredictable in time and unevenly distributed in space, with only 12% of the land area generating 50% of stream flows. Decadal rainfall variability also results in extended dry and wet periods across the country. The main users of surface water resources are agricultural irrigation, domestic, industrial, mining and power generation, while plantation forestry intercepts and reduces runoff before it reaches the rivers and groundwater. Surface water resources were already over-allocated by the year 2000 in five of nineteen water management areas historically used for water planning and management purposes. The potential demand for water is expected to increase with economic growth, increased urbanisation, higher standards of living, and population growth. Because of the critical importance of water in the South African economy the country has a sophisticated water resources planning capacity, founded on a good understanding of the country's variable rainfall. This planning capacity will be a key capability for adaptation planning under ongoing and future climate change.
	Objectives
36	Manage decreased water quality in ecosystem.
37	Manage the quantity of water available for irrigation and drinking.

6.4.2 Responses

No	Project	Sub-Project	DAO	Activity Manager	Annual Target	Q1 Target	Q2 Target	Q3 Target	Q4 Target
36	**Manage decreased water quality in ecosystem.**	Invasive aquatic weeds removal and management in Berg and Breede Rivers by the Cape Winelands District Municipality, B municipalities, DOWA, property/landowners and water user associations. Continuous clearing should be done annually between September and April. The specific area to be targeted is between the R45 and Herman.				25%	50%	75%	100%
37	**Manage the quantity of water available for irrigation and drinking.**	Cape Winelands District Municipality to facilitate research into the re-use of wastewater within the District Municipality, with B-municipalities indicating which towns should be included in the research. The economic viability and quantities are important selection criteria. The replenishment of aquifers by infusion of purified waste water should form part of the research. Implementation by relevant Engineering Departments of B-municipalities.				25%	50%	75%	100%
		Cape Winelands District Municipality to facilitate the assessment of existing infrastructure for water storage. Implementation by Engineering Departments of B-municipalities.				25%	50%	75%	100%
		Increase alien clearing in catchments located throughout the entire District and B municipalities in partnership with Department of Water and Sanitation and LandCare Programme.				25%	50%	75%	100%

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