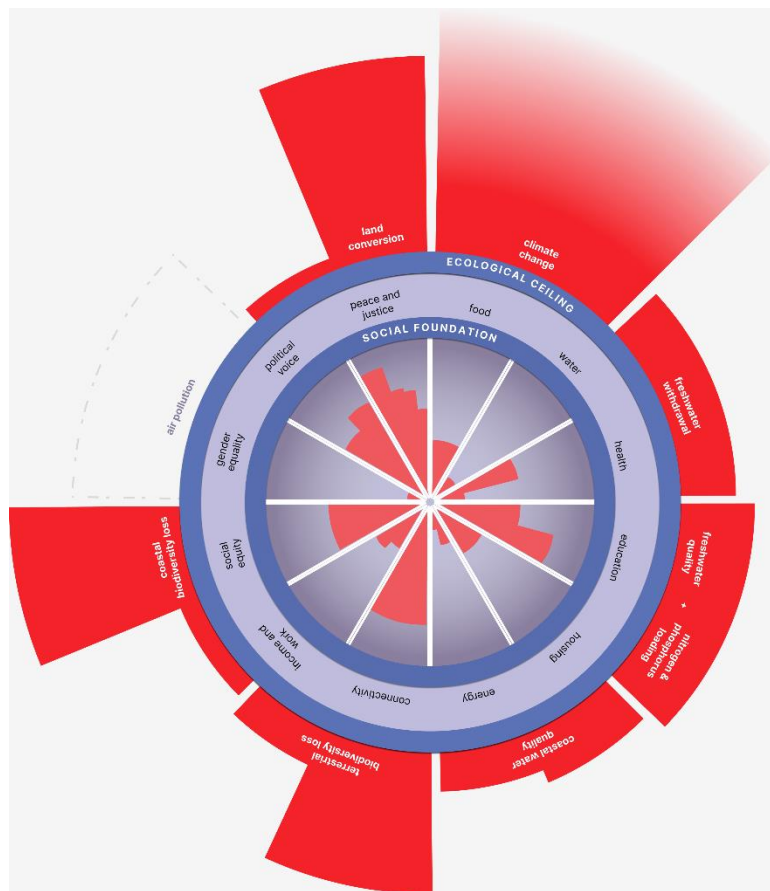


Doughnut Economics Indicators for Saldanha Bay Municipality



Report for The Green Connection by Michelle Fourie and Dr Odirilwe Selomane

1 September 2022

Summary

The Doughnut Economic model has allowed for a comprehensive view of the social and environmental state of Saldanha Bay Municipality (SBM). This work follows our work on both National and Provincial 'Doughnuts' for South Africa. The indicators for SBM have been compiled using numerous data sources, with the majority of data available at municipal level. However, this was not true for all the indicators as either there is a lack of up-to-date data for some indicators or there is no data available at all for South Africa. It is crucial for the municipality to have a holistic view of what is happening at a local level and the data indicates that the majority of environmental (planetary boundaries) and social indicators are of concern for the municipality.

With regards to planetary boundaries, we calculated eight planetary boundaries for SBM. The municipality overshoots six of the eight planetary boundaries, one planetary boundary is within the safe threshold (air pollution, although this is contested) and there is a lack of national and local data for another threshold (ocean acidification).

Indicator	Status	Summary of Concerns
<i>Climate Change</i>		Climate change can have a devastating impact on many industries in SBM because of the decrease in precipitation and increase in droughts, storms and flooding events. The carbon emissions data for the municipality is outdated and needs to be updated to understand the municipality's current contribution to greenhouse gas emission, especially considering the historic data that shows an extremely high per capita emission for the municipality.
<i>Ocean Acidification</i>		South Africa lacks data on ocean acidification which is of particular concern for the SBM because of the impact it will have on bivalves and the marine ecosystem. This in turn will have a large negative impact on the economy of the municipality which is highly dependent on the marine ecosystem. This is as an important gap in the current knowledge of the coastal ecosystem.
<i>Water Withdrawal</i>		Water withdrawal and water quality (freshwater and coastal) are of particular concern. This is because SBM forms part of the bigger Berg River catchment which is beyond the jurisdiction of the municipality. Water withdrawals from the Berg River catchment already exceeds the allocated amount and uses almost 50% of the defined ecological reserve. Exceeding the allocated volume of water withdrawal will negatively impact the surrounding ecosystems and groundwater recharge. The municipality has limited ground water sources of good quality and yield. The ground water system is an important source of freshwater for the Langebaan lagoon and requires careful management to limit the impact of extraction on the lagoon. A vulnerability assessment considers the majority of the high yielding groundwater sources to be at risk of water quality degradation.
<i>Water pollution</i>		Fresh water quality in the Berg River catchment is deteriorating, especially downstream from the source, as a result of human

		activities such as agriculture, industries and wastewater treatment that discharges pollutants into the river. Human activities are impacting negatively on the coastal water quality. The coastal water has shown a decline in oxygen availability, increase in heavy metal concentrations and faecal coliform loads that exceed the safe limits. This, in turn, will impact the aquatic ecosystem, the municipality's ability to provide safe drinking water to residents and industries that rely on water or ecosystems
<i>Air pollution</i>		Air pollution was the only indicator that was within the defined safe boundaries for air quality and dust fall. However, it remains a concern for community members.
<i>Land Conversion</i>		Almost half (48%) of natural land has been converted for human activities such as agriculture and urban settlements. The municipality has the largest percentage of degraded land in comparison to neighbouring municipalities (13% compared to an average of 1% to 6%). Most of the area is considered to have a low land capacity and high risk of soil erodibility which will impact agricultural productivity.
<i>Terrestrial Biodiversity Loss</i>		The biodiversity is negatively impacted by human activities in SBM. The terrestrial vegetation is highly threatened, 7 out of the 10 vegetation types are vulnerable, endangered, or critically endangered. The vulnerability of key animal species is not as alarming as vegetation types, but only a limited number of species were assessed. Degradation of terrestrial vegetation will impact the future abundance of animal species in the long term and therefore the tourism industry that relies heavily on some key species like fynbos.
<i>Marine Biodiversity Loss</i>		Similar to terrestrial biodiversity, coastal water vegetation is deteriorating. Seagrass and saltmarsh bed abundance has declined in the lagoon. Deterioration of vegetation will have a knock-on effect on other organisms that rely on vegetation for food and shelter e.g., a massive decline in wading and other coastal birds has been observed. Several fish stock in the bay and surrounding water has been over exploited which results in a decline in abundance. Changes in the coastal ecosystem composition can have a negative effect on the municipality's economy that relies on these natural resources e.g., the fishing industry and general food security for residents.

SBM performs well on many of the social indicators when compared to national performance of the same indicator. Despite the comparatively good indicators, SBM still has some very concerning indicators which will have extensive long-term implications for the municipality. Moreover, as

indicated in other reports, high levels of migration will need new and innovative solutions to ensure the social fabric of the municipality is maintained.

Indicator	Status	Summary of Concerns
<i>Water</i>		Treated water for residential consumption is of good quality despite the challenges in the catchment area. The majority of residents have access to piped water within a 200m radius of their dwellings and access to a flush or chemical toilet for sanitation.
<i>Food</i>		Household food security is a challenge in the municipality as almost 25% of households stated that they did not have sufficient money to purchase food at the end of the month. However, the malnutrition rate for infants under the age of one is comparatively low which could be a result of the municipalities proximity to the ocean where people can harvest seafood as a source of food.
<i>Health</i>		Residents in the municipality participate in high health risk activities like drinking, using drugs and smoking more frequently than neighbouring municipalities. Infant health is concerning as many mothers don't breastfeed their infants and childhood immunisation levels are low. The combined high-risk activities, low breastfeeding and poor immunisation levels in the municipality could lead to increasing health costs in the mid- to long-term.
<i>Education</i>		The biggest concern for the municipality should be the poor school retention rate and the large number of residents that do not complete matric (65% of residents 20 years and older). This impacts the resident's potential to participate in tertiary education and obtain skilled employment opportunities which negatively impacts development in the municipality.
<i>Housing</i>		Access to affordable formal housing seems to be a challenge as almost 20% of households live in informal dwellings which is similar to the percentages observed in some cities. The continuous population growth as a result of natural growth and influx of migrants has exacerbated this issue in the municipality.
<i>Energy</i>		The bulk of households have access to a safe source of electricity, but a small percentage of households (between 2 and 4%) still use unsafe energy sources like paraffin and wood for cooking and heating.
<i>Income & Work</i>		SBM has a broad unemployment rate of 26% and narrow unemployment rate of 18%. This means that a quarter of the working age population are not employed. High unemployment rates could lead to an increase in the prevalence of crime.
<i>Peace & Justice</i>		Drug related crimes and house burglaries are the most prominent crimes committed in the municipality. These are often symptoms of other social ills like poor income, unemployment, and lack of access to basic needs. Many residents expressed that they feel unsafe in their community, school and houses. Creating a safe space for residents is important for the community's wellbeing.

<i>Political Voice</i>		Having and using their political voice ensures that residents can participate in governance decision making in their community but often when residents don't feel appreciated, they withdraw from this crucial participation. Election turnout has decreased since the first democratic elections in SA. Residents' participation in the community is low as less than 30% of residents stated that they are active in the community and attend community meetings. Despite many residents being aware of the IDP only 12% had participated in IDP meetings. This indicates poor community participation in the municipality.
<i>Social equity</i>		There are high levels of social inequality apparent in SBM (the high levels of income inequality are indicated by the Gini coefficient = 0.62). Almost 50% of the residents don't have access to recreational facilities which is important for wellbeing. We have included vandalism as an indicator that further contributes to social inequalities as the municipality spent about R920 000 on vandalism over a three-month period which reduces the budget available to tackle other concerns in SBM.
<i>Gender equality</i>		There is a lack of data available on gender equality for SBM. However, national data indicates that there is still a big gap in education, income, assets and access to basic services between men and women.
<i>Networks</i>		A large number of residents don't have affordable access to internet which is an important education tool, especially considering the necessity of access to internet during the COVID-19 pandemic.

In conclusion, SBM faces numerous challenges with respect to environmental and social issues. Working with residents, the municipality could address these challenges to create a space where residents, human and non-human alike, can flourish.

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1. Introduction

The Doughnut Economics Model was used to explore the environmental and social issues in the Saldanha Bay Municipality (SBM). The report consists of two sections, the first section provides an overarching summary of the findings and the second section describes the findings in more detail per indicator. The report builds on existing data from various sources for the municipality and where local data wasn't available provincial or national data was presented.

2. Methodology

We used the City Portrait tool to downscale the Doughnut to a local level for SBM. for city-level holistic thinking and decision-making, while recognising cities (DEAL; Biomimcry 3.8; C40 Cities; Circle Economy, 2020). The City Portrait 'unrolled' the doughnut into four quadrants: local social, local ecological, global social, and global ecological. In this report we only explored the local social and local ecological quadrants of the City Portrait.

Data for each indicator of the local social and ecological quadrants were sourced from web search that included key words for each indicator and "Saldanha Bay Municipality". This was a broad data search approach to identify as many sources as possible including SBM, provincial and national government reports as well as research report. Data was extracted from the various sources and aligned to the appropriate indicator to inform a broad picture of SBM preformance.

3. Planetary boundaries

3.1. Climate change

Climate change is a result of an increase in greenhouse gases such as carbon dioxide, methane and nitrous oxide that are released into the air due to human activities such as burning fossil fuels and deforestation (Raworth, 2017). This intensifies Earths' natural greenhouse effect; trapping more heat within the atmosphere which leads to rising temperatures, extreme weather events and sea level rise (Raworth, 2017). The contribution of a region or activity to climate change is measured as the carbon dioxide equivalent (CO₂e) which is calculated as the total metric tonnes of CO₂ emissions plus emission of other gasses converted to CO₂ emission equivalent that has the same global warming potential as one metric ton of another (Intergovernmental Panel on Climate Change, 2022).

Climate change predictions indicate that SBM will experience moderate temperature rise but intense decline in precipitation (Engelbrecht, 2019). This will impact the future potential of the agricultural industry and could reduce productivity as a result of more frequent drought events and soil erosion (Legrange, 2016). Climate change is expected to increase flood events and ocean storm which increases the risk of coastal erosion and can impact the tourism industry (Legrange, 2016). The increase in frequency and intensity of storms will also impact port operations and other economic marine activities like fishing (Legrange, 2016).

The ability to assess the performance of SBM in line with emission reduction targets was impacted by the lack of up-to-date data about greenhouse gas emissions. The latest data available for the municipality was recorded in 2013 (Western Cape Government, 2013). The data highlights industries are the largest contributors to greenhouse gas emissions in SBM, which contributed to the extremely high emissions per capita (Figure 1) (Sustainable Energy Africa, 2015). However, the closure of the Saldanha steel plant in 2020 would have lowered the current emission. SBM's historic emission

emphasises the importance of considering the potential contribution of industries to climate change in the future development within the municipality.

Carbon emission intensity in South Africa has remained relatively stable over the last 8 years however South Africa is the 12th largest emitter of CO₂ equivalent in the world (DEA&DP, 2022). When estimating the CO₂ emission for the municipality based on the average per capita emission in South Africa (per capita emission average x 2021 population size of SBM) the municipality emits 914 542 tCO₂ (Climate Watch, 2020). It is important to ensure that there is recent data of CO₂ emissions so that the municipality has an accurate measure of performance: without an accurate measure implementing targets is impossible.

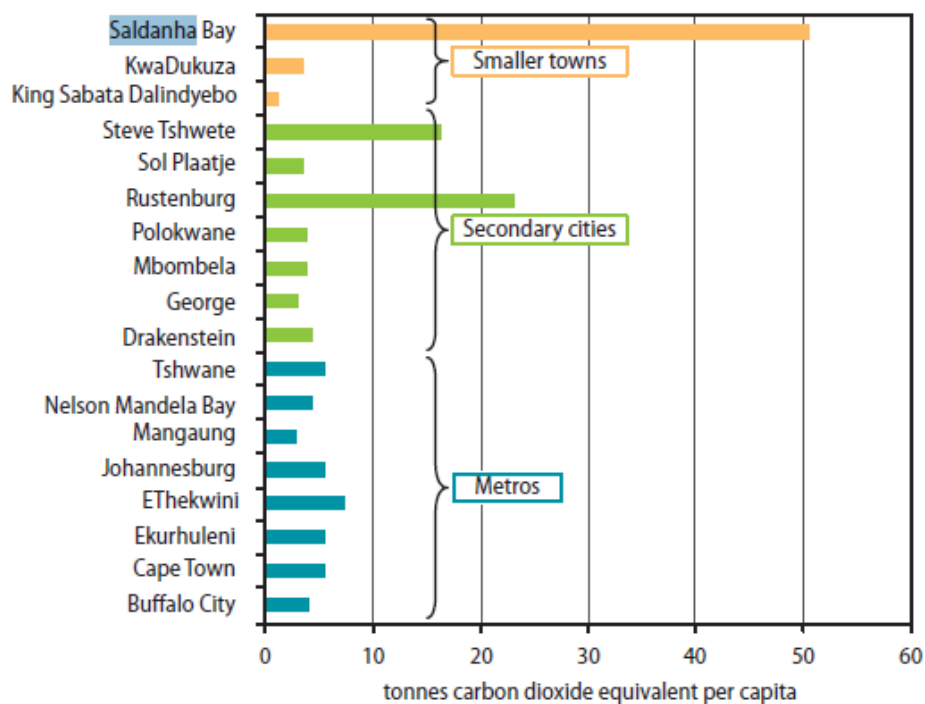


Figure 1 Energy related emission per capita for selected cities in South Africa (Sustainable Energy Africa, 2015)

3.2. Ocean acidification

Ocean acidification refers to a reduction in the pH of the ocean as a result of carbon dioxide (CO₂) absorption from the atmosphere. Almost a quarter of the carbon dioxide emitted by humans is dissolved by the oceans, where it forms carbonic acid and decreases the pH of the surface water. This makes the ocean more acidic and reduces the availability of carbonate ions that are essential building blocks for many marine species for shell and skeleton formation. Without this, it makes it harder for corals, shellfish and plankton to survive, endangering the ocean ecosystem and its food chain.

Ocean acidification is a concern for coastal economies because it impacts bivalves like mussels and oysters (Zhao et al., 2020) which could affect the future viability of aquaculture in SBM. However, there is currently no data about ocean acidification in South Africa. This should be an area for further research to get an understanding of the impact of ocean acidification in our oceans.

3.3. Fresh Water withdrawal

Water is essential for life, and it is widely used by agriculture, industry and households. Freshwater withdrawal is defined as freshwater extracted from ground or surface water sources and for human

activities (Raworth, 2017). Excessive withdrawals of water, can dry up rivers and aquifers, damaging ecosystems and altering the hydrological cycle and climate (Raworth, 2017). The South Africa government has defined an ecological reserve for water source which is a defined volume of water that should remain in water source to sustain the ecosystem (le Roux et al., 2019). The ecological reserve is established to ensure that there is sufficient water flow to maintain aquatic ecosystem which includes regulating water quality and quantity for future use (le Roux et al., 2019). Extracting water beyond the ecological reserve reduces water availability for ecosystems which can negatively impact water quality regulation, organism survival in water bodies, vegetation surrounding rivers and groundwater levels (le Roux et al., 2019).

SMB receives drinking water from the Misverstand Weir that forms part of the Berg River Catchment. SMB in the larger Berg River catchment shows that it shares water sources with many other towns, municipalities and the City of Cape town (Chapman & Jonker, 2019; le Roux et al., 2019; Legrange, 2016). It also indicates that activities in regions upstream can influence water availability and quality in the SBM which is situated at the lower end of the catchment (Chapman & Jonker, 2019). Water security in the municipality is reliant on efficient water withdrawal and pollution management upstream indicating a vulnerability due to the lack of control of upstream activities.

Water withdrawal in the Berg River catchment already exceeds the safe allocated amount and utilises almost 50% of the defined ecological reserve (Figure 2). During the drought in 2018 the full ecological reserve was utilised (le Roux et al., 2019).

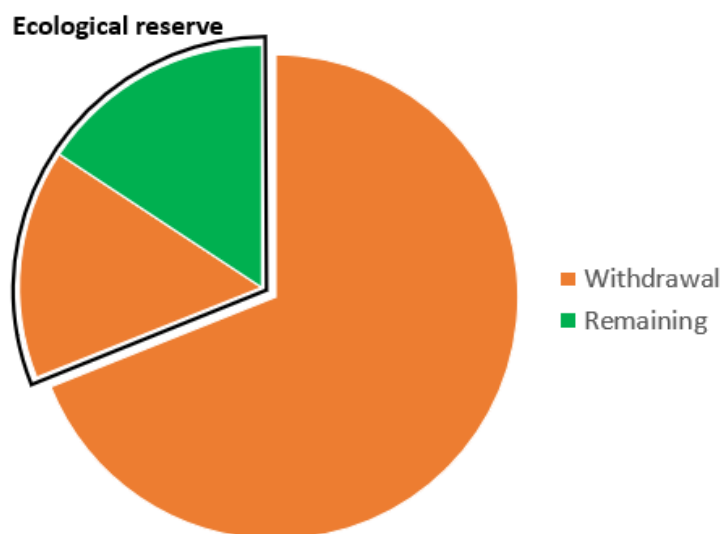


Figure 2 Total annual water extraction from the Berg River Catchment considering the allocated extraction and defined ecological reserve.

Between 2015 and 2019 water consumption in SBM decreased as a result of restrictions implemented due to the drought (Figure 3 Per capita water consumption for SBM between 2010 and 2019 (Chapman & Jonker, 2019)(Chapman & Jonker, 2019). However, the municipality was at the limit of daily allocation between 2010 and 2012 and started exceeding the limit of daily water allocation in 2013 and 2014 (Chapman & Jonker, 2019). This highlights that at catchment and municipal level, water consumption exceeded the allocated quantities which could impact ecosystems and the future availability of water in the region.

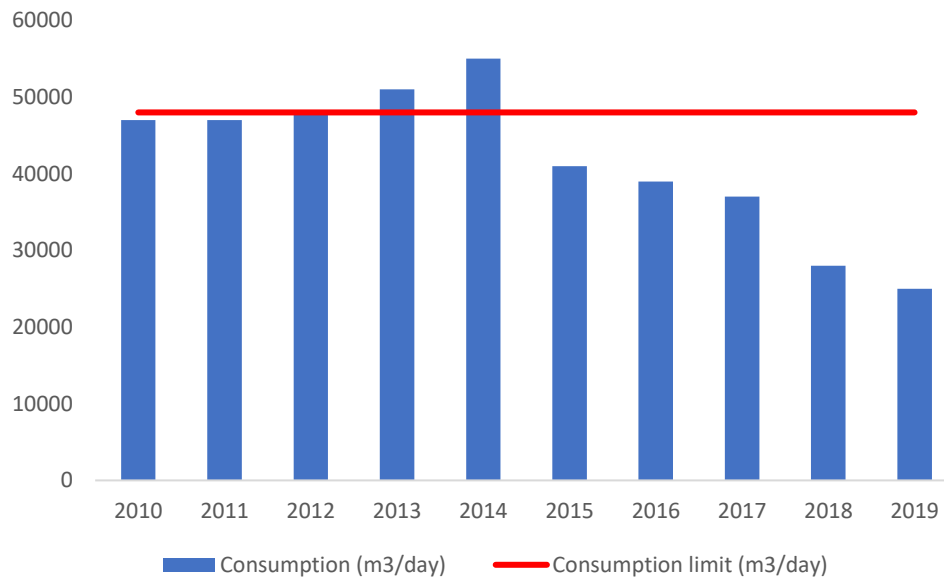


Figure 3 Per capita water consumption for SBM between 2010 and 2019 (Chapman & Jonker, 2019)

Groundwater extraction (which includes aquifers) has been explored as an alternative water source however limited potential for extraction potential has been identified in SBM (Figure 6) (Stroebe et al., 2019). Currently groundwater is already being used for agricultural production (various groundwater sources) and phosphate mining (Elandsfontein Aquifer) (Stroebe et al., 2019). The Langebaan Road Wellfield has been in operation since 1999 but supply is continuously disrupted by vandalism (Stroebe et al., 2019). The Hopefield Wellfield is in the final stages of construction and awaiting the finalisation of licensing. The potential for further groundwater extraction is limited as groundwater is also crucial to maintain the Langebaan lagoon ecosystem (Stroebe et al., 2019), especially in the central part which is the highest yielding area (Figure 6). In the eastern part extraction is limited due to the low yield from groundwater sources (Figure 6). In general, groundwater potential in the municipality is limited and not sufficient to replace surface water supply.

A groundwater sensitivity analysis which considers depth of groundwater, recharge potential, geology, and water flow (Stroebe et al., 2019) was completed. The analysis revealed that most of the groundwater in the area that is viable for extraction is vulnerable due to the shallowness of the groundwater and unconsolidated aquifer materials (Figure 7). Groundwater in the region is at risk of being contaminated by surface-based contaminants and should be managed with caution.

Considering the level of the current water withdrawal from the Berg River catchment and the potential and vulnerability of groundwater sources in the SBM, in combination with predicted decline in precipitation due to climate change, there are grounds for concern with regard to future water availability.

3.4. Chemical pollution

Chemical pollution occurs when toxic compounds like synthetic organic pollutants and heavy metals are released into the biosphere (Raworth, 2017). When they accumulate in the living tissues of animals, they reduce fertility and cause genetic damage, endangering ecosystems on land and the oceans (Raworth, 2017).

3.4.1. Water quality and nitrogen & phosphorus loading

Water quality is defined as a measure of the suitability of water for a particular use based on specified physical, chemical, and biological indicators. It is influenced by natural geology but can be

altered by human activities such as agriculture, polluted urban runoff, wastewater discharge, mining and other processing industries like fish and wine factories (Chapman & Jonker, 2019). Nitrogen and phosphorus loading is the accumulation of nitrogen and phosphorus in water as a result of excess runs off from fertiliser application. This causes algae blooms that can be toxic and kill off other aquatic life by starving it of oxygen

The Department of Water and Sanitation produced a report on the state of the Berg River catchment which provided insights into water quality (Department of Water and Sanitation, 2004). The data showed that water near the source at mountain peaks is mostly in a natural state and of good quality, but water quality deteriorates downstream as most sections are of poor or fair quality (Figure 4). The only monitoring point within SBM was at Hopefield and was of fair quality. Unfortunately, this data was published in 2004 which means that it is outdated, and an updated report is required.

A more recent analysis of water quality by Chapman & Jonker (2019) observed that water quality in the Berg River Catchment deteriorates downstream, specifically showing an increase in salinity, biological and inorganic components, including nitrogen, phosphorus and heavy metal contamination.

Downstream water quality is expected to continue declining at the Misverstand Weir which supplies the municipality (Chapman & Jonker, 2019; Legrange, 2016). The sensitivity analysis conducted to identify the potential risk of high concentrations of contaminants in the catchment (Figure 5) indicates that the major concerns are eutrophication, inorganic pollution and microbial contamination.

According to the Green Drop report (Department of Water and Sanitation, 2022b) all WWTW are performing well which indicates a low impact on water quality as a result of wastewater discharge. In other words, the municipality itself is not responsible for any further decline in water quality. However, considering the impacts of upstream activities water quality is a major concern for the catchment and the municipality.

The following human activities were identified as having a negative impact on coastal water quality in SBM: Frontier Power SA Gas to Power, Karpowership, the Saldanha Bay Industrial Development Zone, the Sishen-Saldanha oreline expansion project, the development of liquid petroleum gas facilities in Saldanha Bay, Liquefied Natural Gas Import Facilities, the gas-fired independent power plant, the crude oil storage facility, Elandsfontein phosphate mine, Zandheuvel phosphate mine, Manganese storage expansion, the Vessel Repair Facility (VRF) at Berth 205, Moss gas Jetty, the floating dry dock for the inspection of Offshore Supply Vessels, the Marine Environmental Impact Assessment, the dredging and port expansion, shipping, ballast water discharges, and oil spills, effluent discharges, reverse osmosis plants, the Transnet NPA Desalination Plant, the West Coast District Municipality Desalination Plant, the ArcelorMittal RO plant, Sewage and associated wastewaters, storm water runoff, Sea Harvest Fish Processing Plant, re-commissioning of the Premier Fishing fish processing plant, fisheries, Saldanha Bay Aquaculture Development Zone, Shellfish marine aquaculture, and Finfish cage farming.) (Clark et al., 2021). Coastal development can result in habitat loss and increase stormwater run-off and pollution which will inevitably impact coastal ecosystems (Legrange, 2016). Maintaining coastal water quality is important for the integrity of marine ecosystems and economies that rely on natural resource such as industries and recreational tourism activities like swimming, fishing, etc.

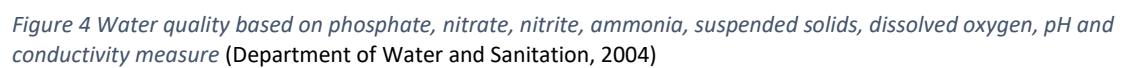


Figure 4 Water quality based on phosphate, nitrate, nitrite, ammonia, suspended solids, dissolved oxygen, pH and conductivity measure (Department of Water and Sanitation, 2004)

Berg River

Sensitivity

- Very high
- High
- Moderate
- Low

Saldanha Bay Local Municipality

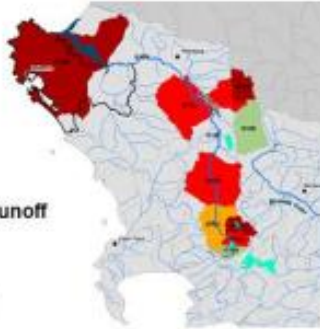
■ Berg river estuary (Condition C: Moderately modified)

■ Dams

— Rivers



Runoff



Salinization



Eutrophication



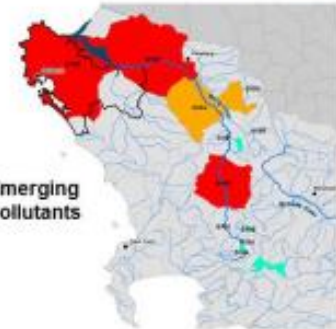
Inorganic pollution



Microbial contamination



Emerging pollutants



DATA: WRC: 2011
 THREATS: 2011
 COORDINATE SYSTEM: SCS 1984
 DATUM: WGS 1984
 UTM: Zone
 Date: 14/07/2019



Figure 5 A map of the sensitivity of parts of the Berg River catchment, concerning the water quantity and quality parameters including eutrophication, salinization, microbial contamination, non-organic pollution and emerging pollutants. Blank spaces lack monitoring data (Chapman & Jonker, 2019)

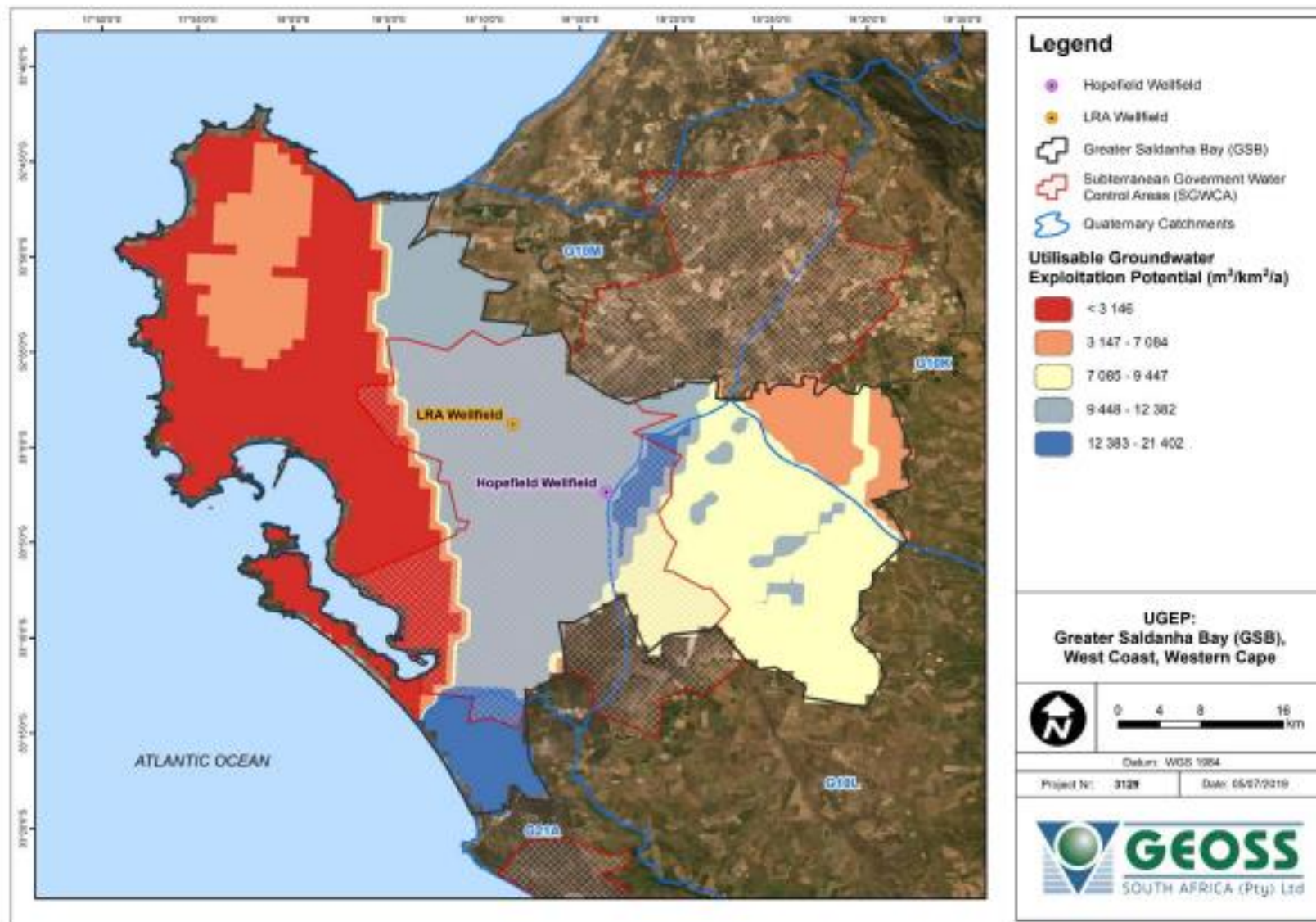


Figure 6 Utilisable groundwater exploitation potential map (Stroebe et al., 2019)

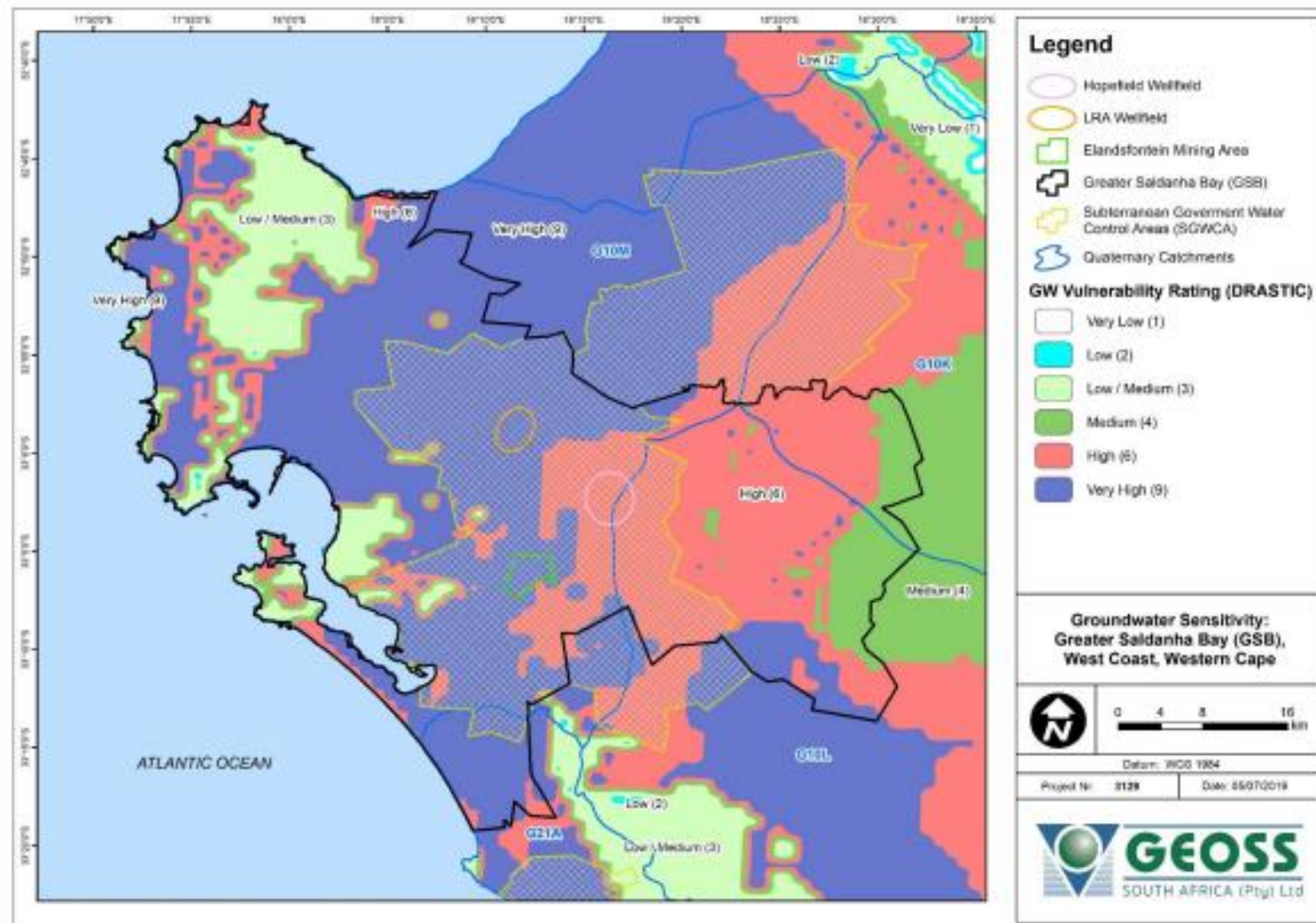


Figure 7 Groundwater vulnerability for the study area (Stroebe et al., 2019)

The State of the Bay Report (Clark et al., 2021) indicates that the construction of the ore terminal has changed the current strength, circulation and wave intensity of the ocean and has contributed to water quality deterioration in the bay. This has resulted in a decrease in the concentration of dissolved oxygen in Small Bay which are often below the concentration required for organisms to survive (Clark et al., 2021). These events are aggravated by high nutrient loads that result in algal blooms that further lower oxygen concentrations. Other industrial activities such as fish processing factories also release wastewater with high organic material into coastal waters which contributes to eutrophication events and can negatively impact these ecosystems (Legrange, 2016).

The bay has continuously experienced faecal coliform pollution from wastewater discharge (Table 1). This has been addressed to an extent by the municipality by improving wastewater treatment infrastructure (Department of Water and Sanitation, 2022b) which reduced the faecal coliform concentrations in many measuring sites. There are two sites (Hoedjies Bay Hotel beach and Bok River Mouth beach) which are still in poor condition and two in fair condition (Small craft harbour and Saldanha Bay yacht club) when considering recreational guidelines (Clark et al., 2021). The mariculture guidelines regarding faecal coliform counts are stricter than recreational guidelines. In term of mariculture guidelines, three sites in Small Bay exceed the limits (Hoedjies Bay Beach, Caravan park beach and Bok River mouth) and three sites in Big bay are of concern as they had faecal coliform counts close to the safe limit over the last few years (State of the Bay Report, 2021) (Clark et al., 2021). A raised faecal coliform count is harmful to people and marine organisms but also increases the nutrient load in water which can result in harmful algal blooms.

Heavy metal pollution in the bay is measured as a concentration in mussels and oysters (Clark et al., 2021). This is considered to be a good indicator of water quality as filter feeders accumulate trace metals, hydrocarbons and pesticides in their flesh. The State of the Bay Report (Clark et al., 2021) found that lead and cadmium concentrations predominantly exceed the safety limits (Figure 8). Similarly, after the adjusted safety limits for arsenic were implemented, the concentration regularly exceeds the limits. Mercury concentration is within the safety limits (Figure 8) but the high concentration of lead, cadmium and arsenic are concerning as this high concentration can impact consumer health and indicate the presence of heavy metal pollution in the bay (Clark et al., 2021; Legrange, 2016).

Oxygen depletion events, raised faecal coliforms counts and the presence of heavy metals in bivalves indicate that there is a potential decline in water quality in the coastal water surrounding the municipality. Declining water quality can be harmful to people and can impact the coastal ecosystems which are crucial for the municipality's economy.

3.4.2. Air pollution

Air pollution occurs when micro-particles, or aerosols, emitted into the air such as smoke, dust and pollutant gasses can damage living organisms (Raworth, 2017). Furthermore, they interact with water vapour in the air and affect cloud formation (Raworth, 2017). When emitted in large volumes, these aerosols can significantly alter regional rainfall patterns, including shifting the timing and location of monsoon rains in tropical regions (Raworth, 2017).

The iron-ore and steel factories in SBM contribute to particle emission which can be harmful to human health (Legrange, 2016). The municipality has two air quality monitoring stations (Saldanha Bay and Vredenburg) that monitor for harmful chemicals in the air (SO₂, NO₂, O₃, PM-10 and PM-2.5). The latest report shows that air quality in the area is good as there were no measures that exceed the RSA Air quality standards at either site (Agros Scientific SA, 2022). However, there is no available data for particulate matter concentration (PM-10 and PM-2.5).

The municipality also monitors dust fallout at seven sites. The dust monitoring data shows that between August 2019 and March 2021 dust fall out is within the legal limits with the exception of two readings at individual sites that exceed the limits (*Argos Scientific Test Report: Dust Fallout Monitoring*, n.d.). The first exceeded the non-residential limit in December 2019 and the second in February 2020.

Despite the monitoring indicating that air quality and dust fallout is within safe parameters, air quality remains a big concern for the residents (Legrance, 2016) as the impact on residential properties affects the aesthetics of the area and limits tourism potential. The emission from industries in SBM can contaminate food production and groundwater quality (Legrance, 2016). This is concerning as groundwater in SBM is highly susceptible to pollution seepage (Chapman & Jonker, 2019). The community has also expressed concern for industrial workers that are exposed to higher concentrations of pollutants. Therefore, additional measure of air quality should be considered to ensure that community concerns are addressed.

Table 1 Sampling site compliance for recreational use based on *E. coli* counts for 10 sites in Small Bay, 5 sites in Big Bay and 5 sites in Langebaan Lagoon. (ND = insufficient data) and (Ex. = excellent) (State of the Bay Report, 2021)

	Site	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	
Small Bay	1. Beach at Mussel Rafts	Fair	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	ND	
	2. Small Craft Harbour	Ex.	Fair	Good	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	
	3. Sea Harvest - Small Quay	Fair	Fair	Ex.	Ex.	Fair	Ex.	Fair	Ex.	Ex.	Ex.	Good	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	
	4. Saldanha Yacht Club	Poor	Poor	Poor	Fair	Poor	Poor	Poor	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	
	5. Pepper Bay - Big Quay	Poor	Fair	Poor	Fair	Fair	Fair	Fair	Poor	Ex.	Ex.	Fair	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Poor	Good	
	6. Pepper Bay - Small Quay	Poor	Fair	Fair	Good	Ex.	Good	Ex.	Ex.	Good	Ex.	Good	Good	Ex.	Good	Fair	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Ex.	Ex.
	7. Hoedjies Bay Hotel - Beach	Fair	Fair	Poor	Fair	Good	Poor	Poor	Good	Fair	Ex.	Fair	Fair	Poor	Poor	Fair	Good	Fair	Good	Fair	Poor	Poor	Poor	Poor	
	8. Beach at Caravan Park	Fair	Fair	Fair	Poor	Ex.	Fair	Poor	Ex.	Good	Poor	Fair	Fair	Fair	Poor	Good	Fair	Ex.	Fair	Fair	Fair	Fair	Fair	Ex.	
	9. Bok River Mouth - Beach	Poor	Fair	Poor	Poor	Poor	Poor	Poor	Poor	Ex.	Fair	Poor	Poor	Good	Ex.	Poor	Fair	Good	Ex.	Poor	Poor	Fair	Fair	Good	Poor
	10. General Cargo Quay - TNPA	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	
Big Bay	11. Seafarm - TNPA	Ex.	Fair	Ex.	Ex.	ND	ND	Ex.	Ex.	Ex.	ND	Ex.	ND	ND	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	
	12. Mykonos - Paradise Beach	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	
	13. Mykonos - Harbour	Fair	Fair	Ex.	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	Good	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	
	14. Leentjiesklip	ND	ND	Good	Fair	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Good	Ex.	Ex.	Ex.	ND	Ex.	Ex.	Ex.	
Langebaan Lagoon	15. Langebaan North - Leentjiesklip	Ex.	Fair	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Poor	Good	Ex.	Good	Ex.	Good	Ex.	Ex.	Fair	Ex.	
	16. Langebaan - Main Beach	ND	ND	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	ND	Ex.	Good	Ex.	
	17. Langebaan Yacht Club	ND	ND	ND	ND	ND	Poor	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Good	Ex.	Ex.	Fair	Good	ND	Ex.	Ex.	Ex.	
	18. Tooth Rock	ND	ND	ND	ND	ND	Fair	Ex.	Ex.	Ex.	Ex.	Fair	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Ex.	Ex.	Ex.	
	19. Kraalbaai North	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Fair	Ex.	Ex.	
	20. Kraalbaai South	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	Ex.	Ex.	Ex.	Ex.	Ex.	Ex.	ND	Ex.	Fair	Ex.	

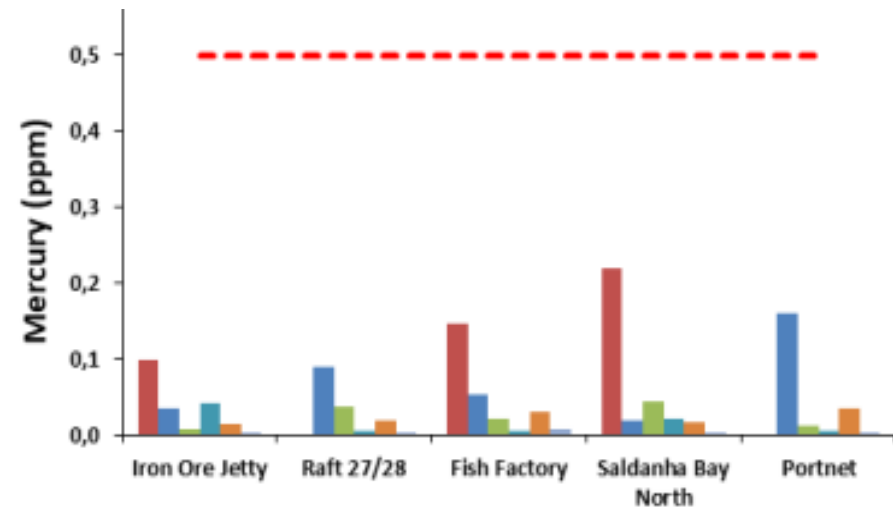
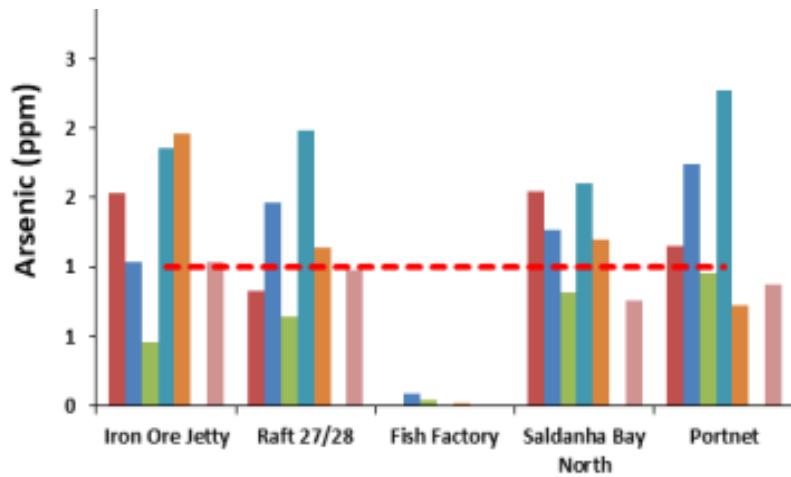
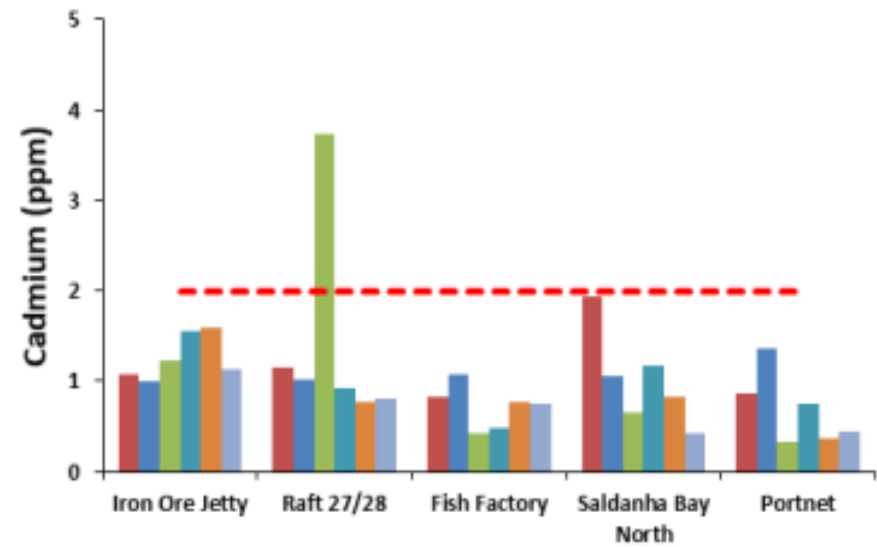
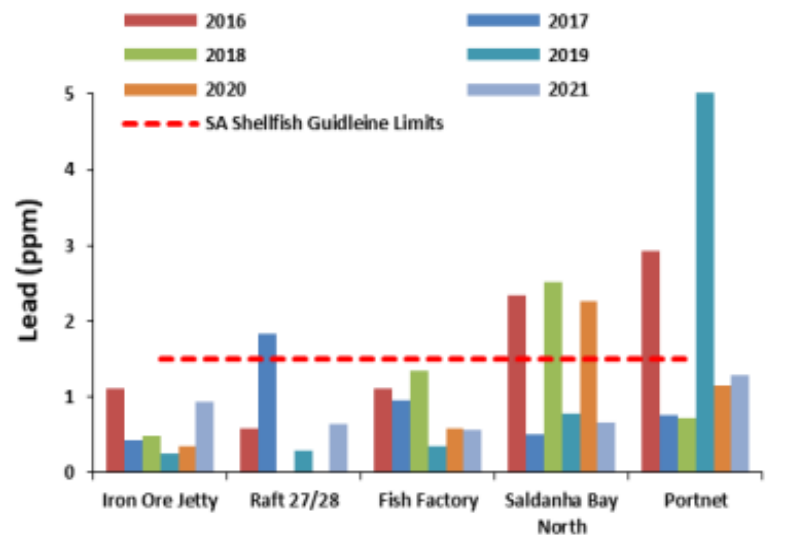


Figure 8 Heavy metal concentrations in wet mussel flesh from five sites in Saldanha Bay. Red dotted line indicates the safety limit for heavy metal concentrations

3.5. Land conversion

Land conversion occurs when natural land is converted for human use such as turning veld and wetlands into cities, farmlands, and roads (Raworth, 2017). This depletes the earth's carbon sinks, destroys wildlife habitats and undermines the land's role in continually cycling water, nitrogen and phosphorus (Raworth, 2017).

It is estimated that 48% of natural land has been transformed by human activities in the SBM (Snyman-van der Walt et al., 2019). According to Maree & Vromans (2010) 13% of SBM is considered to be degraded (Figure 9). This includes fallow agricultural land older than 10 years and areas with dense alien vegetation cover. This is much higher than surrounding municipalities that only have 6% (Berg), 3% (Cederberg) and 1% (Matzikama) of land that is considered degraded (Maree & Vromans, 2010).

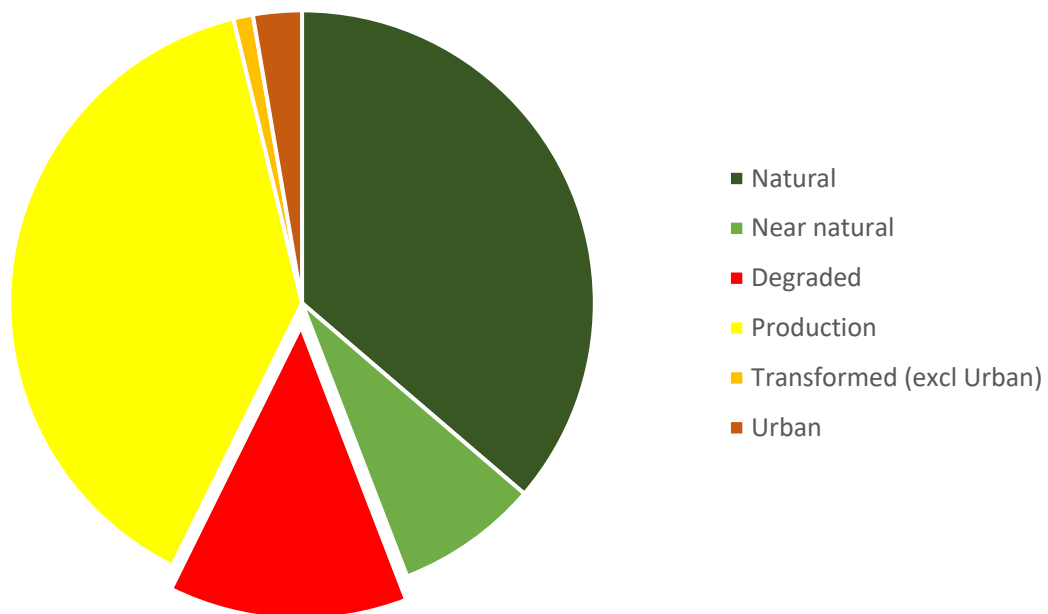


Figure 9 Percentage of land cover categories in the SBM (Maree & Vromans, 2010). Natural= pristine natural vegetation and aquatic features. Near-natural = some degree of degradation but restoration and rehabilitation should be considered. Degraded = severely impacted and rehabilitated at great cost. Production = agricultural lands which are currently under production (including fallow fields less than 10 years old). Transformed =land which has undergone irreversible development, and includes the urban built-up environments, infrastructure (such as dams) and mining areas.

The region is also vulnerable to soil erosion, often an indication of unsustainable land use that contributes to the degradation of natural vegetation with 89% of municipal soil having a high or very high soil erodibility risk and the remainder having a moderate risk (11%) (Figure 10a). Land capability which is a combination of land, soil, terrain, and climate capability is also of concern in the area as the land capability is predominantly low (Figure 10b).

Economic activities such as tourism and agriculture are reliant on natural vegetation and fertile soil. Similarly natural vegetation provides many other ecosystem services that regulate the environment by reducing runoff and increasing water filtration which is crucial in water scarce areas. Therefore, the state of the soil and vegetation should be a concern for the municipality.

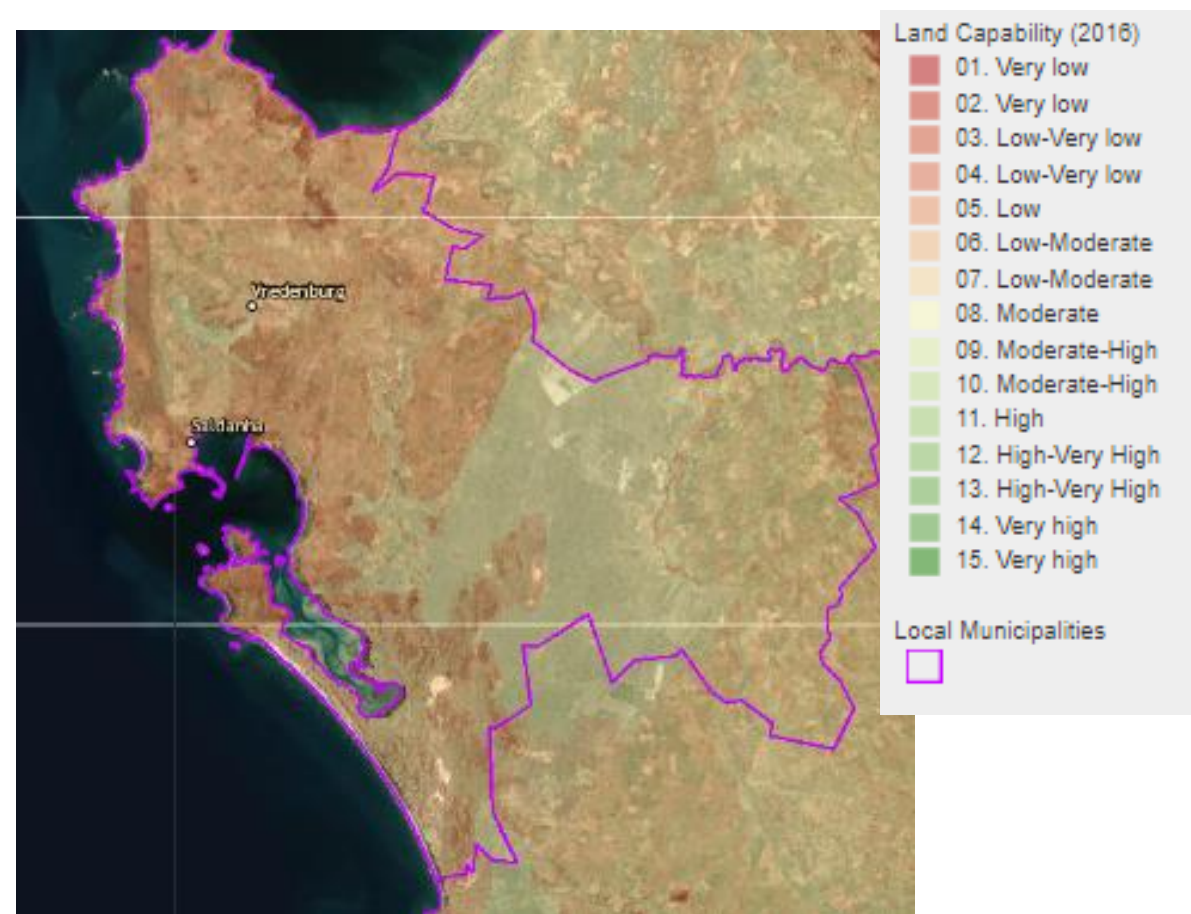
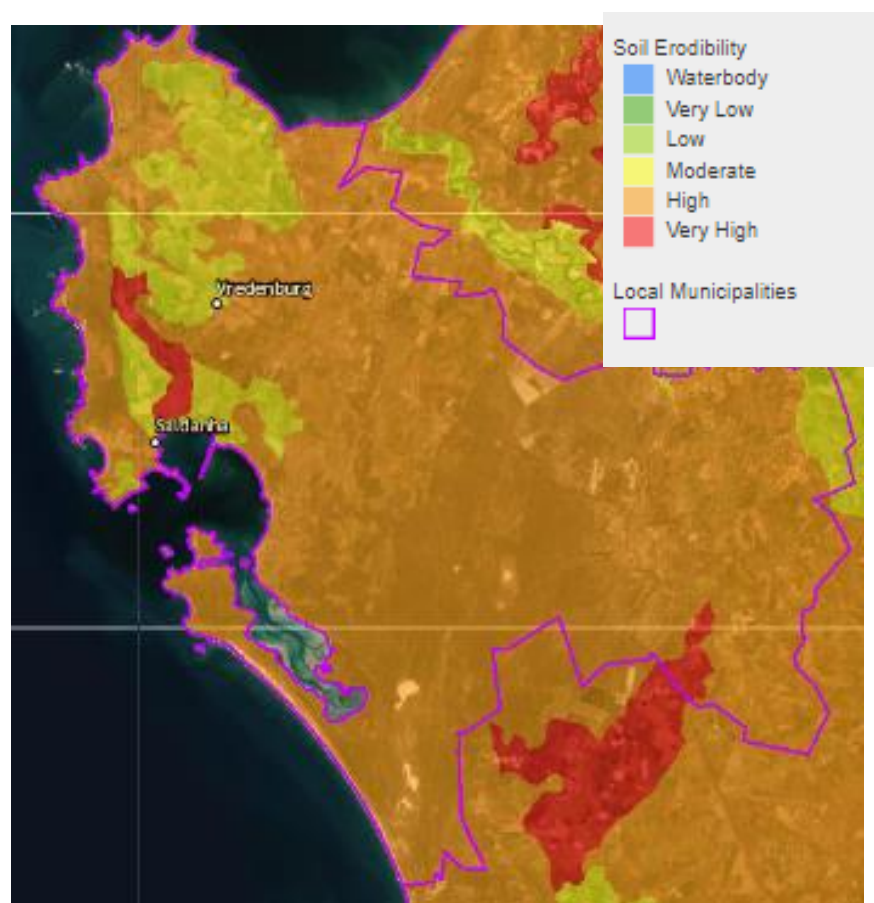


Figure 10 Map of a) soil erodibility and b) land capability for Saldanha Bay Municipality (Cape Farm Mapper)

3.6. Biodiversity loss

Biodiversity loss is the decline in abundance and diversity of species which damages the integrity of the ecosystems and accelerates species extinction (Raworth, 2017). This increases the risk of abrupt and irreversible changes to ecosystems, reducing their resilience and undermining their capacity to provide food, fuel, and materials for us to sustain life (Raworth, 2017).

3.6.1. Terrestrial

The National Biodiversity Assessment found that a large share of the terrestrial environment in SBM is considered to be critically endangered or endangered (Skowno et al., 2019). This is reflected in the threatened status of the vegetation types in the region as Swartland Alluvium Renosterveld is listed as vulnerable, Saldanha Flats Strandveld is listed as endangered and five vegetation types are listed as critically endangered (Saldanha Granite Strandveld, Saldanha Limestone Strandveld, Swartland Shale Renosterveld, Swartland Silcrete Renosterveld and Piketberg Quartz Succulent Shrubland) while only three of the vegetation types are listed as least concern (Hopefield Sand Fynbos, Langebaan Dune Strandveld and Cape Seashore Vegetation) (Walt, 2019). This indicates that 70% of vegetation types in the municipality are considered to be threatened.

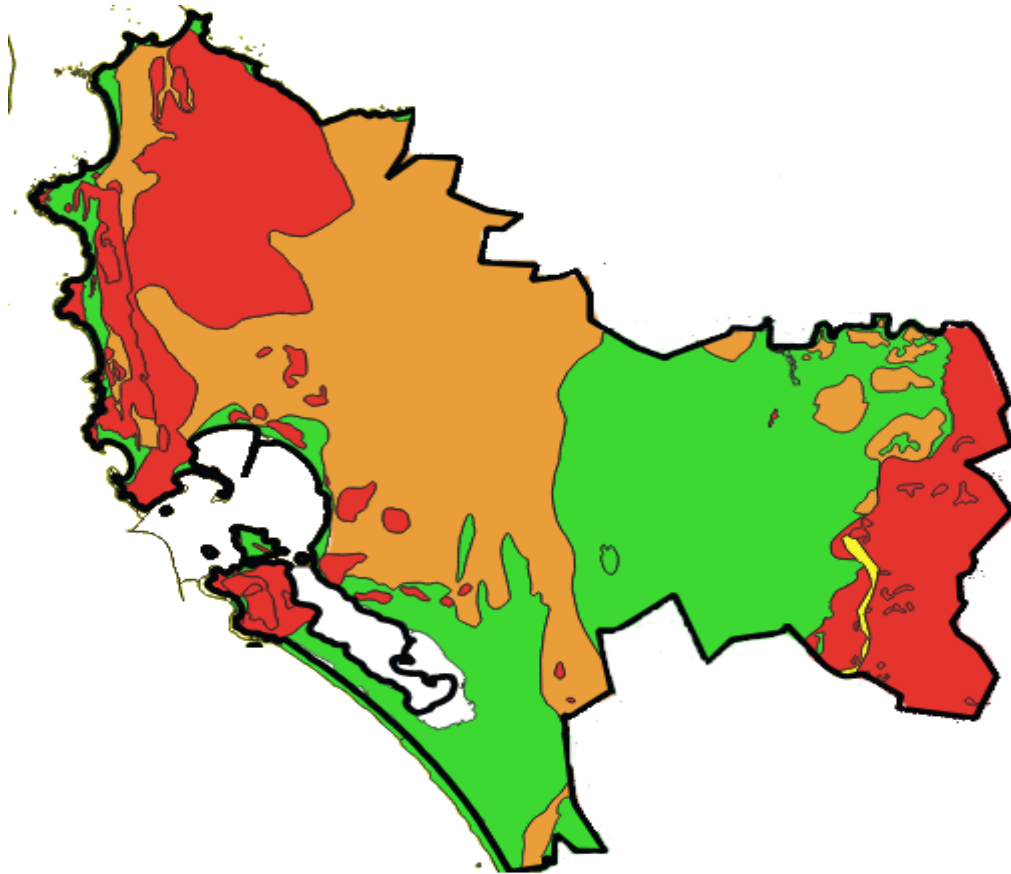


Figure 11 Threatened status of terrestrial biodiversity in the SBM. Red = Critically endangered, Orange = Endangered, Yellow = Vulnerable and Green = Least concern (Skowno et al., 2019)

The greatest threat to biodiversity in the municipality is direct loss of natural habitat or species, habitat fragmentation and introduction of alien invasives species as a result of agriculture, mining and urban development (Walt, 2019). The threatened status of some key species was also explored but this was not as concerning as the vegetation types. However, it is important to

consider that animals are reliant on the vegetation for food and shelter and degraded vegetation can reduce the abundance of animal species over time.

Table 2 Threatened status of key species in the Greater Saldanha Bay region (Walt, 2019)

Group	Species	Status
Birds	Black Harrier	EN
	Ludwig's bustard	EN
	Karoo chat	LC
Mammals	Van Zyl's Golden Mole	EN
	Cape Dune Molerat	LC
	Cape Gerbil	LC
	Grant's Golden Mole	LC
	Honey Badger	LC
	Cape Horseshoe Bat	LC
	White-tailed Mouse	VU
Reptiles	Geometric Tortoise	LC
	Armadillo girdled lizard	LC
	Cape Girdled Lizard	LC
	Cape Sand	LC
Insects	Endemic darkling	Unknown

3.6.2. Marine

The National Biodiversity Assessment indicates that the coastal region of the municipality is vulnerable, while the bay is endangered, and the mouth of the lagoon is critically endangered (Figure 12) (Skowno et al., 2019). The assessment also shows a strip offshore that is vulnerable and endangered. The State of the Bay report provides more in-depth detail of the biodiversity in the bay and lagoon (Clark et al., 2021).

The first area of concern is the decline in eelgrass and saltmarsh beds both of which are important habitats for juvenile fish and invertebrates, stabilise sediment and provide food for organisms in the lagoon (Clark et al., 2021). These habitats are considered to support higher species richness, abundance and diversity in comparison to areas that lack vegetation (Clark et al., 2021). Research indicates that some areas of seagrass beds have experienced a large decline in abundance and one area, Klein Oesterwal, has been transformed from a seagrass bed to an unvegetated sand area (Pillay et al., 2010). Similarly, 8000m² of saltmarsh was lost per annum from 1960 to 2000 which resulted in an 8% decrease in abundance by 2000 (Gericke, 2008). A more recent analysis using satellite images was used to estimate the occurrence of reed beds, seagrass beds and saltmarshes which confirmed that the lagoon has experienced a decline in reedbeds whereas seagrass beds and saltmarshes were

highly variable over the last couple of years (Clark et al., 2021). A visual representation shows that large areas of seagrass beds have been lost in the lagoon (Figure 13).

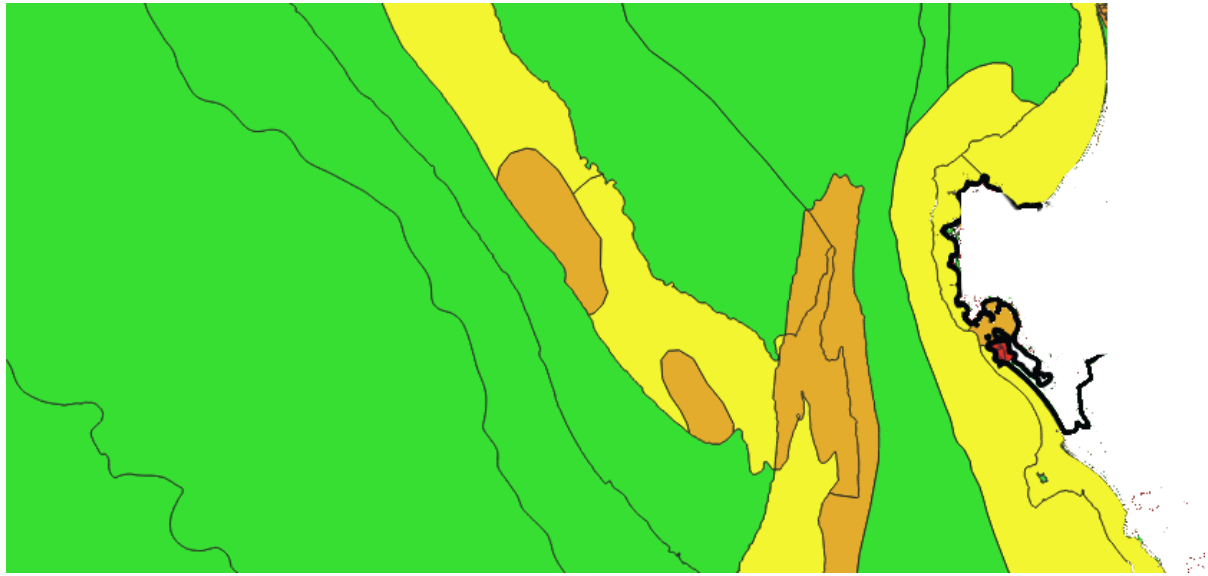


Figure 12 Threatened status of marine biodiversity around the SBM (green = least concern, yellow = vulnerable, orange = endangered and red = critically endangered) (Skowno et al., 2019)

One expected impact from the loss in seagrass and saltmarsh beds is a change in wading bird species that rely on these habitats for food. Between 1990 and 2021, the presences of migratory wading birds in the summer decreased by 60% (Clark et al., 2021). Resident wader populations also showed a decline in abundance since 2007 (Clark et al., 2021). This is attributed to changes in feeding and breeding grounds in the lagoon and the impact of human activities that result in disturbances in wading habitats (Clark et al., 2021). Bird watching in the lagoon is a common tourist activity which relies on the abundance of wading birds, specifically migratory birds to attract tourists. Therefore, the decline in wading birds can affect the natural ecosystem as well as the economy in the municipality.

Islands off Saldanha Bay and Langebaan are important feeding and breeding grounds for other water birds like gulls, cormorants, penguins etc. (Clark et al., 2021). Population monitoring of bird species indicates that there is a decline in the abundance of other water bird species due to changes in fish abundance, increasing competition with fishing industries and an increase in the Cape Fur seal population that predares on numerous bird species (Clark et al., 2021). The African penguin, Kelp Gull, Cape Gannet, Bank Cormorant and White-breasted Cormorant populations have experienced the largest decline and are of particular concern (Clark et al., 2021). This again will impact the ecosystem balance and tourism industry.

The potential expansion of port activities will increase the number of large ships that enter the bay and ballast water discharge (Legrange, 2016). This increases the risk of introducing alien invasive species into the bay which can negatively impact local species (Legrange, 2016). SBM needs to consider the risk of invasive species introduction as a result of current and future port operations and the impact it can have on the tourism, aquaculture and fishing industries.

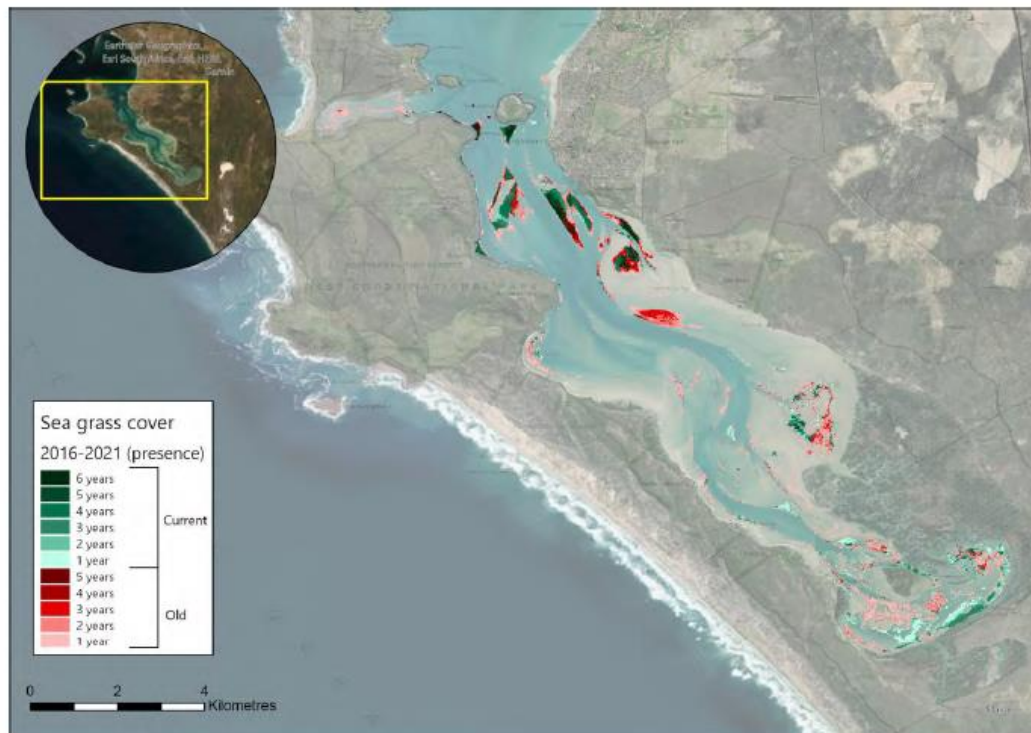


Figure 13 Change in sea grass beds in Langebaan Lagoon between 2015 and 2021 (Clark et al., 2021)

The State of the Bay report (2021) also considered the health of the benthic macrofauna (organisms fundamental to the coastal marine food web), rocky intertidal species and fish species. The benthic macrofauna and intertidal communities have been relatively stable over the last two decades with the exception of newly introduced alien invasive species (Clark et al., 2021). The fish populations indicate that Big Bay and the lagoon are in good condition but Small Bay is considered to be in moderately poor health (Clark et al., 2021). Some species have been completely absent from Small Bay (pipe fish and gurnards) while other like the white stumpnose, gobies, and black tails have experienced a decline in population across the bay. This is of particular concern as the lagoon and bay are important breeding grounds for juvenile fish that support fish stocks.

The two most commercially important fish species in the region are the white stumpnose (commercial and recreational) and harders (commercial) (Clark et al., 2021). Both species are considered to be over exploited and threatened (Clark et al., 2021). This is illustrated by the decrease in white stumpnose catches (Figure 15) and the decline in harder size which indicates overfishing (Clark et al., 2021). Depleting fish stocks can impact the future economic viability of the fishing industry as well as the resilience of the coastal ecosystem.

The data indicates that there is some concern regarding fish stocks in the bay and lagoon specifically regarding economically important species (Table 3). Considering the broader health of South African fish stocks, a number of economically important species for the West Coast are over exploited and threatened (Figure 16), including Abalone, West Coast Rock Lobster, White Stumpnose, Harders and Silver Kob (DEFF, 2020). This is a common trend observed worldwide due to over exploitation of fish stocks and has been observed to have catastrophic impacts on the ecosystem balance, and livelihoods and food security of local communities (Jones & Gibbon, 2013).

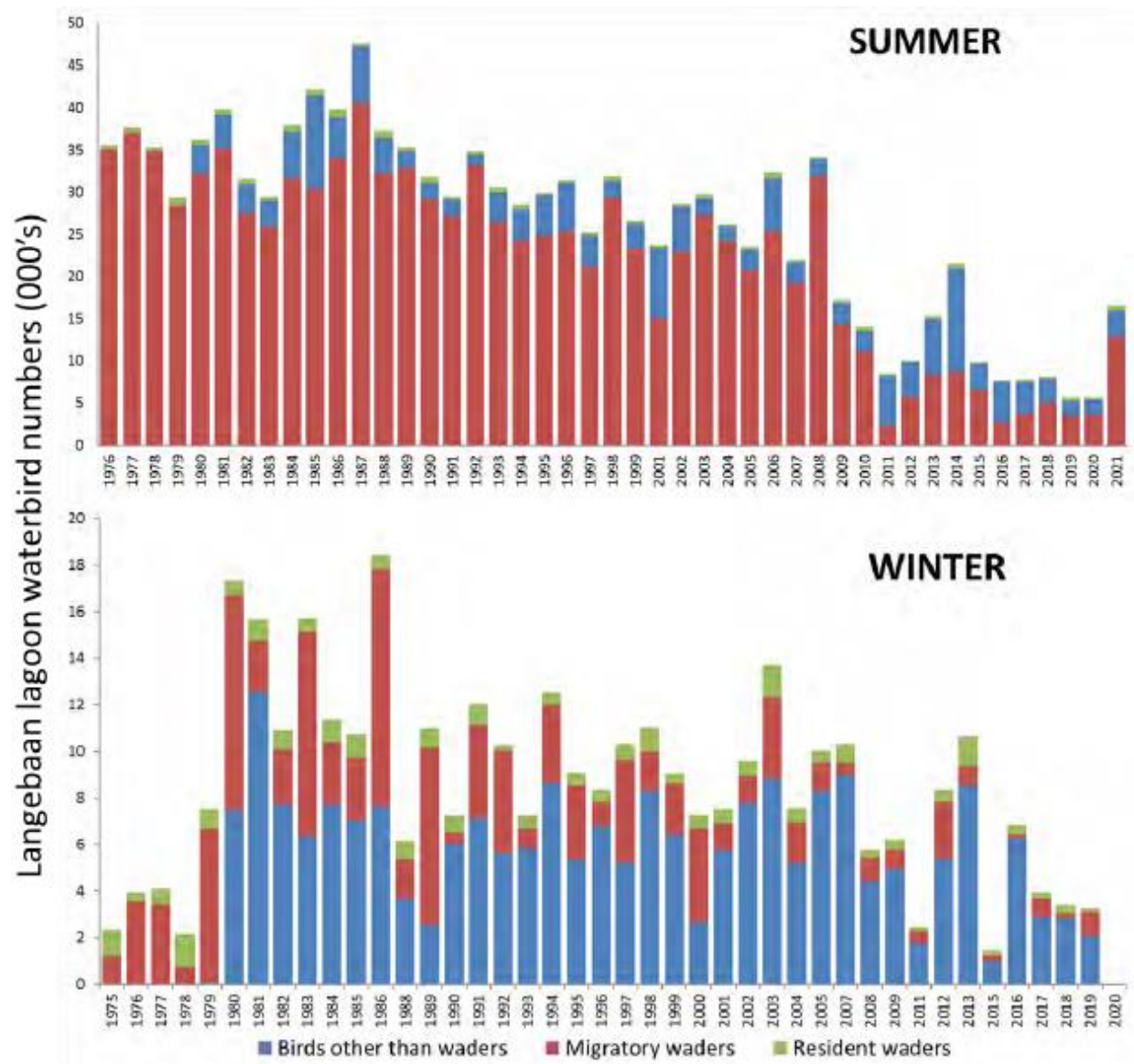


Figure 14 Change in number of waterbirds the Langebaan Lagoon during summer (top) and winter (bottom) (1975 – summer 2021). Data was not collected for summer of 1975, and winters in 1987, 2006, 2010, 2014 and 2020 (Clark et al., 2021).

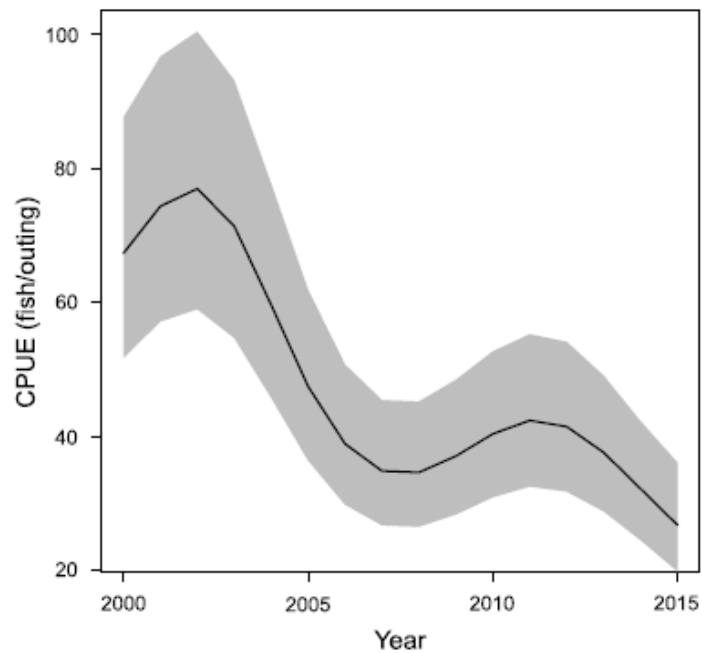


Figure 15 Annual Catch Per Unit Effort (CPUE) estimates ($\pm$ 95% Confidence Interval) of white stumpnose derived from commercial boat catches logged in the National Marine Linefish Systems (Clark et al., 2021)

Table 3 Threat status of fish recorded across seasons at West Coast National Park Marine Protected Area between 2018 and 2019 (Clark et al., 2021)

Species	Scientific name	IUCN Status
Superklipfish	<i>Clinus superciliosus</i>	LT
Cape silverside	<i>Atherina breviceps</i>	Not evaluated
Steentjie	<i>Spondylusoma emarginatum</i>	LT
White stumpnose	<i>Rhabdosargus globiceps</i>	VU
Hottentot	<i>Pachymetopon blochii</i>	LT
White seacatfish	<i>Galeichthys feliceps</i>	Not evaluated
Strepie	<i>Sarpa salpa</i>	LT
Spearnose skate	<i>Rostroraja alba</i>	FN
Doublesash butterflyfish	<i>Chaetodon marleyi</i>	LT
Blacktail	<i>Diplodus capensis</i>	LT
Smooth-hound shark	<i>Mustelus mustelus</i>	VU
Puffadder shyshark	<i>Haploblepharus edwardsii</i>	EN
Cape gurnard	<i>Chelidonichthys capensis</i>	LT
Elf	<i>Pomatomus saltatrix</i>	VU
Cuttlefish	<i>Sepia vermiculata</i>	Data deficient

4. Social indicators

4.1. Water

Water is essential to all human activities and is a basic human right. Water is of major concern from a planetary boundary perspective for SBM however from a social perspective the municipality performs well. The majority of households in the municipality have access to piped water within 200m from their dwellings (99%) as well as to a flush or chemical toilet (96%) (Western Cape Government, 2021). The drinking water supply from the municipality is considered to be low-risk based on the treatment plant capacity, chemical and microbial monitoring, and technical skills at the plant (Department of Water and Sanitation, 2022a). However, the report indicates that the municipality should focus on reducing the number of samples that exceed microbial and chemical limits and seek to employ additional skilled individuals (Department of Water and Sanitation, 2022a).

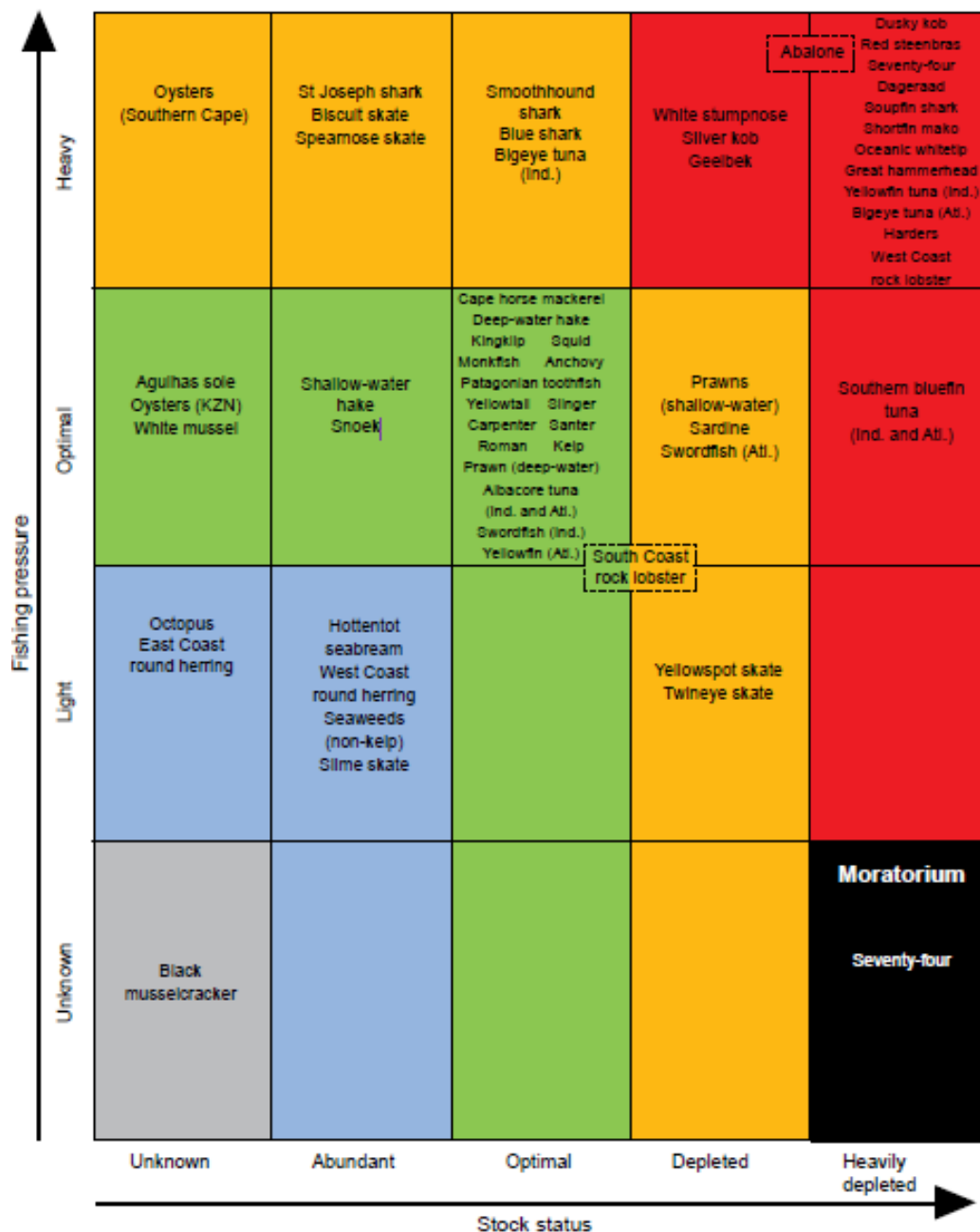


Figure 16 Indication of fish stock health and fishing pressure on common economic fish species in South Africa (DEFF, 2020)

4.2. Food

Food security is defined as access to sufficient, safe and nutritious food at any time. It has been a global concern for decades and was put under the spotlight during COVID-19. Moderate and severe food insecurity in South Africa increased from 24% in 2019 to 38% during COVID-19 in 2020 (StatsSA, 2022).

In SBM, the malnutrition rate for children under the age of five is low (0.4 per 1000) (Western Cape Government, 2021). However, when considering buying power, almost a quarter of households (24,8%) reported that they run out of money to buy food before the end of the month at least once in a year (StatsSA, 2016). This indicates that despite the low malnutrition rate many households still face food insecurity. The low malnutrition rate can be a result of the close proximity to the ocean that provides households with access to fishing grounds (Simmanee et al., 2022). Community members also expressed that food insecurity had increased during COVID-19 due to the loss of income for many residents (Heyns, 2020).

4.3. Health

Poor health, especially from a young age impacts a person's quality of life, therefore the health of residents is important to create a flourishing community. In comparison to other municipalities in the West Coast District, SBM residents have better access to emergency services (Bradley & Mulder-Rous, 2019). However, residents had the highest rate of high-risk health behaviour in the West Coast District (Bradley & Mulder-Rous, 2019). This includes the frequency of alcohol consumption, drug-use and smoking. The municipality also had the highest prevalence of HIV/AIDS patients in the district which could be a result of the high sexual activity, poor living conditions and inadequate education on healthy living (Bradley & Mulder-Rous, 2019; Legrange, 2016).

SBM has seen a decrease in neonatal mortality per 1 000 live births in the past year (decreased from 7.0 to 4.4) (Western Cape Government, 2021). However, SBM has the lowest rate of breastfeeding for all municipalities in the Western Cape with only 69% of mothers indicating that they breastfed their last child (StatsSA, 2016). This is an important health indicator as children that are breastfed have a reduced risk of obesity and chronic diseases as adults (StatsSA, 2016). Additionally, only 61.2% of children under the age of one in the municipality had received the necessary immunisations (Western Cape Government, 2021) to protect children from preventable diseases like polio, tetanus and diphtheria (Department of Health, n.d.).

The high-risk behaviour and low rate of breastfeeding and immunisation in the municipality impacts the community's health and quality of life. Poor health can become a burden to the municipality as a result of increasing health demands and costs.

4.4. Education

Education is crucial to develop critical thinking skills and prepare people for future employment.

SBM has one of the lowest learner retention rates in the district (64.3%) (Western Cape Government, 2021). Furthermore, a survey indicated that only 35% of the population that is 20 years or older has completed matric or a level of higher education (StatsSA, 2016). This has improved since 2011 when only 28% of residents 20 years and older stated that they completed matric (Legrance, 2016). The data also showed that only 4% of the population has some tertiary education while 3% have no form of formal education. The low levels of education should be a big concern for the municipality as many of the residents do not have the required skills to move into the job market and can rely on low skilled jobs only. SBM needs to assess the challenges regarding the matric pass rates, standard of education, and access to educational facilities (Legrance, 2016).

Community members said that there are only a few high schools in SBM and students often have to travel far distances, incurring additional costs, and leading to dropouts. Other social issues like poverty could also contribute to dropout rates in the community. The municipality needs to understand why pupils don't complete school to address the problem.

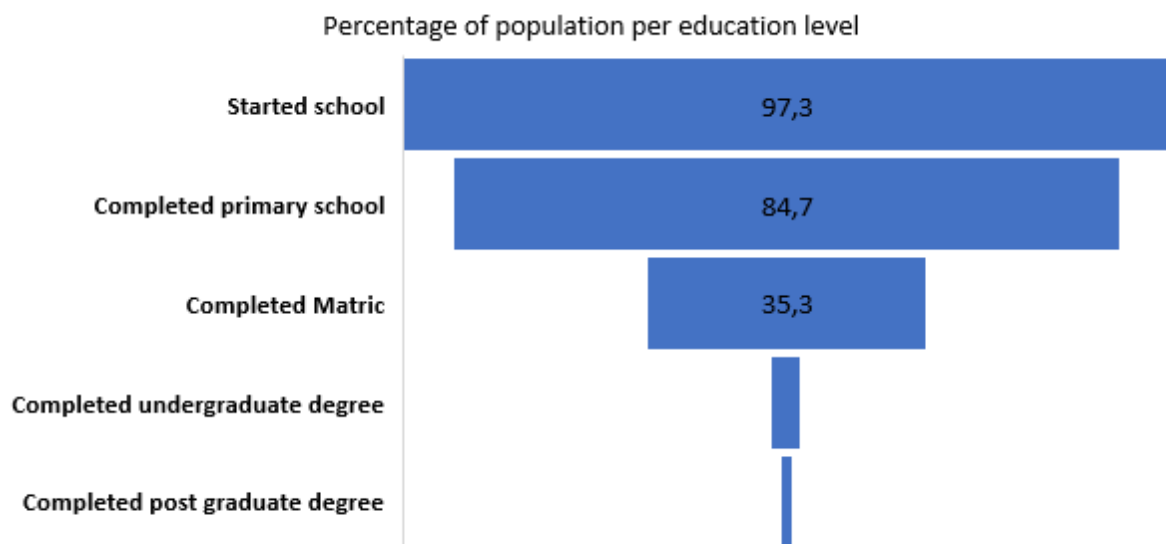


Figure 17 Percentage of residents in SBM that are 20 years or older that completed a recognised level of formal education (StatsSA, 2016)

4.5. Housing

Poor housing conditions can have a negative effect on people's health and social ability. Just under 20% of residents in SBM live in informal housing. This is similar to the percentage of households living in informal dwelling in the City of Cape Town and Johannesburg (SACN, 2022; Smith, 2022). SBM has the highest percentage of households living in informal settlements in the West Coast District (Western Cape Government, 2021).

The State of South African Cities has indicated that the majority of cities in South Africa experienced a decline in the percentage of people living in informal dwellings between 2015 and 2019 with the exception of Cape Town that is experiencing an increase (SACN, 2022). The same trend that has been observed across the Western Cape as a result of natural population growth and an influx of migrants could apply to the increase in informal dwellings in SBM. This is an important issue to address as poor housing conditions can impact the quality of life of residents and unregulated establishment of informal settlements can lead to further degradation of the natural environment.

4.6. Energy

Access to electricity is considered a basic human right and no household in the municipality should need to rely on unsafe energy sources even for cooking. Access to safe energy is crucial for enhancing residents' quality of life. The largest share of households has access to electricity (93%) but 2% of these households have an illegal and unsafe electricity connection while the remaining 7% have no access to electricity. Another measure of safe energy access is energy used for cooking and heating. A small number of households still rely on paraffin (cooking = 1.6% and heating = 2.4%) and wood (cooking = 0.4% and heating = 2.2%) as their main energy source for cooking and heating, neither of which is considered safe (Statistics South Africa, n.d.).

4.7. Income & work

Employment opportunities are essential for the economy as well as the livelihoods of residents. SBM has a broad unemployment rate (all residents of working age that are unemployed) of 26,5% and narrow unemployment rate (residents of working age that are unemployed and actively seeking employment) of 17,6% (Statistics South Africa, n.d.). This is lower than the national unemployment rate, but it is still worrying that almost 18% of active job seekers are unemployed.

It is also concerning that 14% of households have no income and a large share of households (35%) have an income below R 38 000 a year (Figure 18). The low annual income per household could be a result of the job market predominantly consisting of low skilled (40,2%) and semi skilled (40,7%) positions (Western Cape Government, 2021). The data emphasises the need for additional employment opportunities that result in improved household income and reduce poverty and inequality.

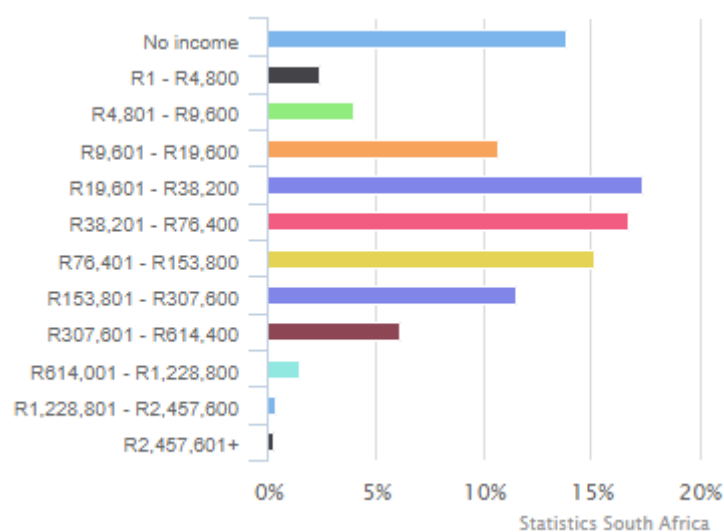


Figure 18 Average annual household income in SBM (Statistics South Africa, n.d.)

4.8. Peace and Justice

Community safety is important for wellbeing. A survey highlighted that only a small percentage of residents feel safe in their community (11%), at school (17%) or in their houses (38%) (Bradley & Mulder-Rous, 2019). The most frequent crimes in SBM are burglaries and drug-related crimes (Figure 19) although there has been a decrease in the latter over the past three years (Western Cape Government, 2021).

A study by Henrico et al (2022) explored the impact of COVID-19 on crime in SBM. This indicated that crime decreased during the COVID-19 lockdown period. The study also highlighted that gender-based crimes such as rape and sexual assault makes up 7% of contact crimes but represents less than 1% of all crimes (Henrico et al., 2022). Crime is centred around Vredenburg with the lowest number of incidents being reported in Langebaan (Figure 20).

Reducing crime and promoting community safety in the municipality is important to create spaces where residents feel safe and can flourish.

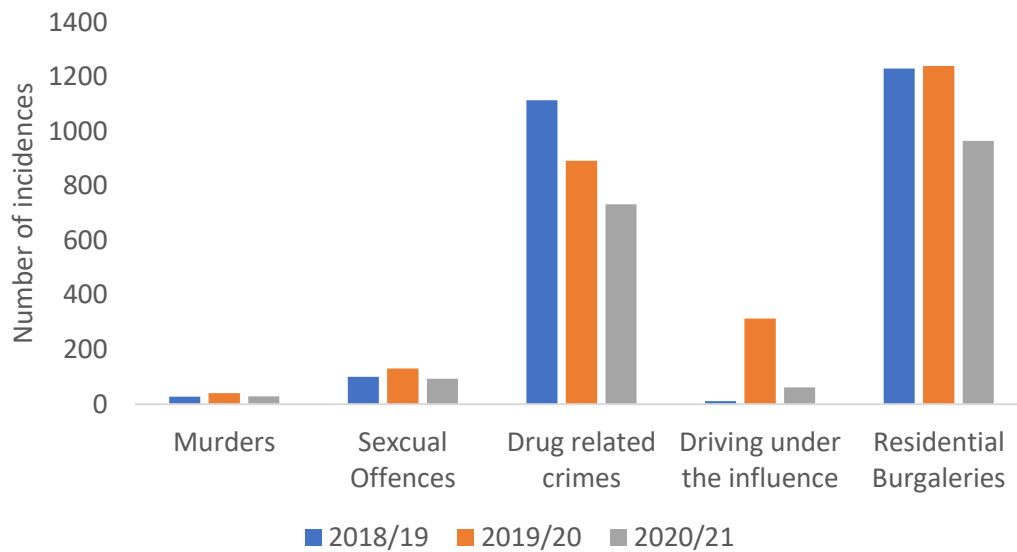


Figure 19 Crime committed in SBM (Western Cape Government, 2021)

4.9. Political voice

Participating in elections is fundamental to a democracy to ensure that governance is representative of residents. Voting turn out for municipal and national elections has decreased over the past few elections (Kreuser & Slade, 2021). A similar trend was observed at national level. In the 2019 municipal elections only 51.1% of registered voters in the municipality casted their votes (Electoral Commission of South Africa, 2022).

Figure 3: Getis-Ord Gi* hotspot map showing clusters of crime activities in the SBM (April 2017 to March 2020)

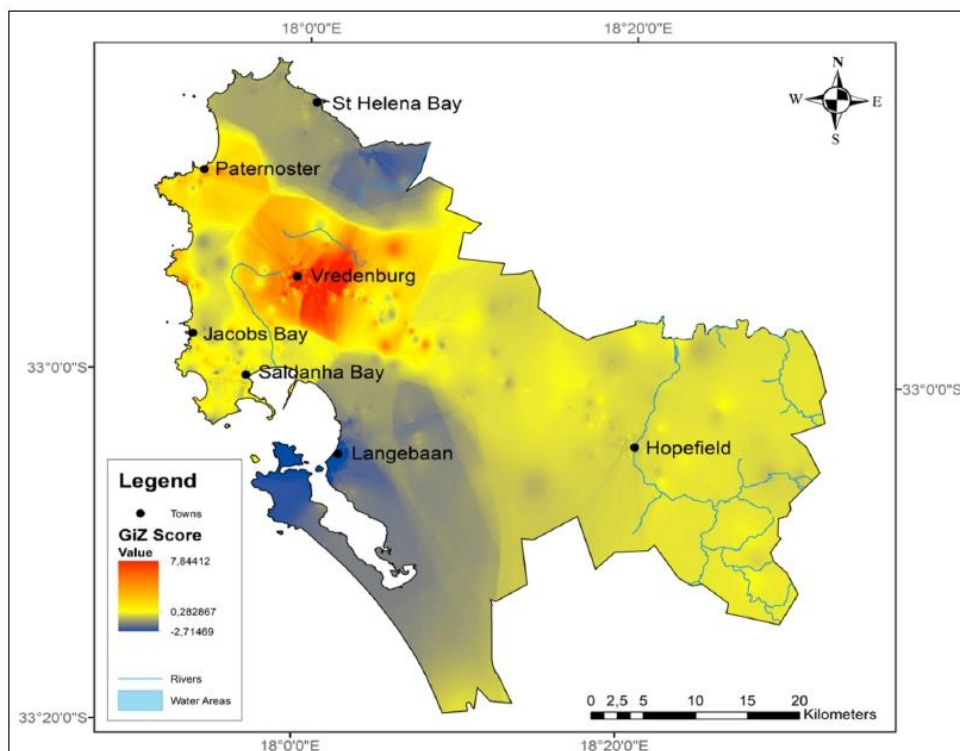


Figure 20 Hotspot map that indicates the cluster of crime in SBM between 2017 and 2020 (Henrico et al., 2022)

Community participation in SBM is low as only a quarter of survey participants indicated that they are involved in their community and 28% indicated that they attend community meetings (Bradley & Mulder-Rous, 2019). A large number of survey participants had heard of the IDP (39%) but not even half of them were able to attend IDP meetings (12%) (Bradley & Mulder-Rous, 2019).

4.10. Social equity

Equality is important to ensure that each residents have the same opportunities to make the most of their lives.

The Gini coefficient (Western Cape Government, 2021) measures income distribution across a population on a scale from 0 to 1, with 0 indicating equality and 1 a total lack thereof. The higher the Gini coefficient for a population the greater the income inequality.

SBM has a Gini coefficient of 0.62 which indicates extremely high inequality of income distribution (Western Cape Government, 2021).

Fatherlessness was raised as a concern by community members as it can have a negative impact on youth. In SBM almost a third of households are female-headed with no male household heads (StatsSA, 2016). Poor role models were also raised as a concerns that influence the future of youth in SBM, especially considering trends in crime, vandalism, alcohol and drug abuse (Legrange, 2016).

Access to recreational activities is important to build healthier and safer communities as previous research has found it is crucial for youth development: residents that participate in recreational activities would rate themselves healthier and areas with recreation participation often have lower crime rates (Atchison, 2018; Ndhlovu, 2022; Özgen & Baler, 2015; Petersen et al., 2021). Half of the residents in SBM don't have access to recreational activities in their community (Bradley & Mulder-Rous, 2019).

Vandalism is a big problem, in South Africa, and in SBM. Over a three-month period the municipality spent about R 920 000 on addressing damage caused by vandalism which amounts to over R 3,6 million a year (Saldanha Bay Municipality Vandalism Reports, 2022). Vandalism has been identified as a form of social inequality as the money gets removed from the annual budget and takes away from other residents in the community.

Reducing inequality within the municipality is crucial to create a community with equal opportunities where residents can flourish.

4.11. Gender equality

Another form of inequality that impacts community dynamics is gender inequality. There was no specific data on gender inequalities for SBM, but it is prevalent across South Africa and national statistics were used to illustrate gender inequality. In South Africa men often outperform women when it comes to levels of education, income, expenditure and access to basic services (Maluleke, 2019). For example, women without matric earned 54% of the income of men with similar level of education (Maluleke, 2019). For a number of indicators women are starting to close the gap (Figure 21) but this still requires attention to create a more equal society.

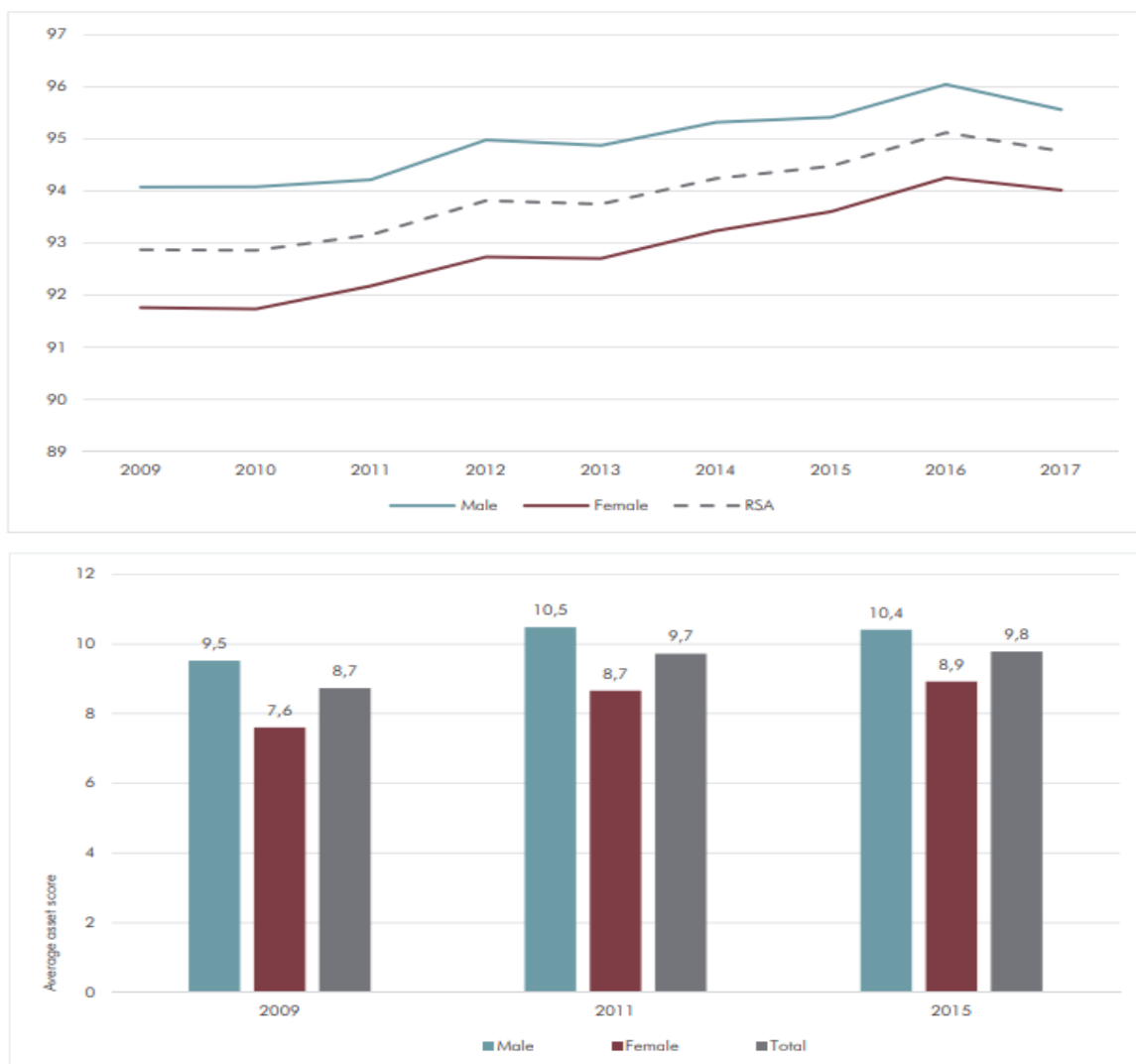


Figure 21 Gender inequalities between 2009 and 2017 illustrated as a) literacy rate by sex for individuals over the age of fifteen and b) assets score of household heads by sex (Maluleke, 2019)

4.12. Networks

Internet access has become a basic human need, especially when COVID-19 forced many people to interact remotely specifically for schooling and working which relies on internet access (Dow-Fleisner et al., 2022). The internet is also an important education tool (Chen et al., 2021) and increased internet access has been observed to reduce poverty in rural areas (García-Mora El Colegio de México C et al., 2021).

In SBM 63% of the population has no access to internet (Figure 22). This could contribute to increasing inequality in the municipality, especially with the municipality looking towards IT solutions like software applications for communicating with residents.

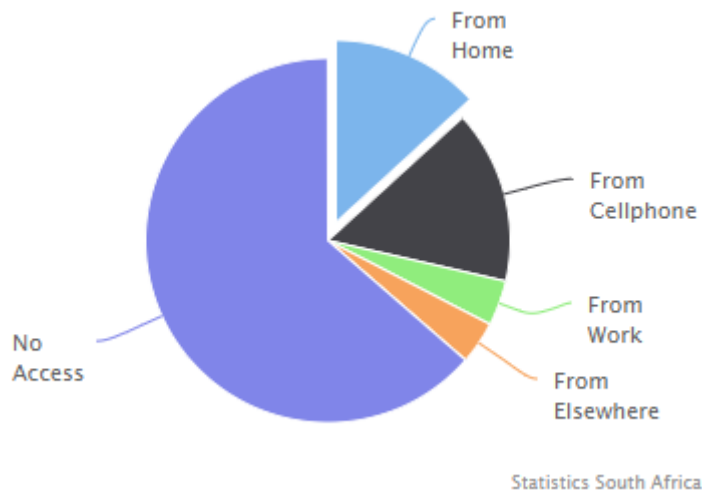


Figure 22 SBM residents' access to internet (Statistics South Africa, n.d.)

5. Conclusion

Economic activities and livelihoods in SBM are close linked to the terrestrial and marine environments. SBM is already exceeding most of the planetary boundaries considered in this report. Exceeding these planetary boundaries will deteriorate the natural environment ultimately leading to a decline in biodiversity abundance, water availability and water quality. The looming threat of climate change will exacerbate these impacts. This will negatively impact residents that are already facing many social challenges face many challenges and industries that rely on the natural resources.

SBM performs well in meeting the basic needs of residents in comparison to other municipalities in South Africa. However, some social indicators like education, health, community safety, equality and housing need to be improved to enhance the wellbeing of residents and development in the municipality.

The wellbeing of the community and natural environment is interlinked and key for successful development of the municipality. Therefore, it is crucial for SBM to address the environmental and social issues as part of the development road map to ensure that people have equal opportunities in an area where the planetary boundaries are respected.

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