

Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) Call for Landscape Nominations

Nomination of the Garden Route Gateway as a landscape for installation of long-term ecological research infrastructure

1. General Details of the Landscape

1.1. Name of the nomination : Garden Route Gateway site

1.2. Spatial extent of the proposed landscape

A consortium of partners made up of the Nelson Mandela University (lead), Garden Route and Gouritz Cluster Biosphere Reserves, LandCare, South African National Parks (SANParks) and Living Lands NGO are coming together to propose the Garden Route Gateway nomination. (Please see Annexure 1. for a short description of each of the core collaborators). The proposed site straddles the Eastern and Western Cape Provinces of South Africa and encompasses the Garden Route and Gouritz Cluster Biosphere Reserves, and the Garden Route National Park (GRNP) which forms the core zone of the Garden Route Biosphere Reserve (GRBR).

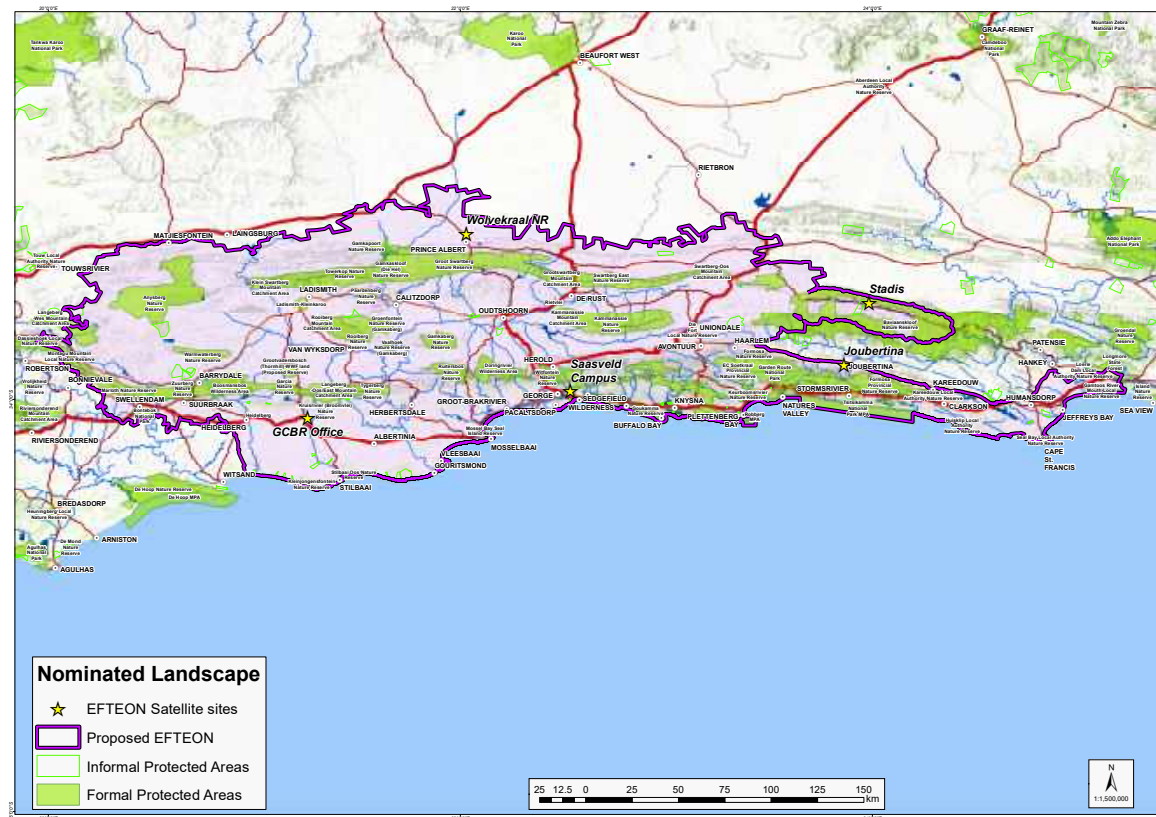


Figure 1. Map of the nominated landscape comprising the Gouritz and Garden Route Biosphere Reserves, Garden Route National Park and the Baviaanskloof.

The Garden Route Gateway site nomination proposes a network of sites, with a core site located at the Nelson Mandela University (NMU), George Campus, where the significant research infrastructure and facilities are located in the landscape. The network of sites would include satellite sites at Prince Albert, with a field offices at Wolwekraal; the Duiwenhoeks catchment with a field office at Gouritz Cluster Biosphere Reserve (GCBR) in Riversdal; Baviaanskloof with a field office at Living Lands at Studis and the Kromme River catchment with a field office at Living Lands in Joubertina.

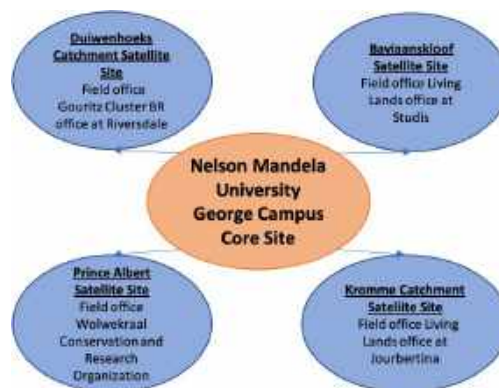


Figure 2. Wheel diagram representing the core and satellite sites in the Garden Route Gateway landscape.

The core site at Nelson Mandela University, George Campus provides access to research infrastructure, analytical facilities, laboratories, teaching and learning facilities and the provides the following benefits:

- Strong support structure for decentralized place based research in the landscape.
- Well established entry points to facilitate access to communities in the landscape
- Access to local expertise and facilities for research and learning within the landscape

2. Suitability of the landscape to meet the requirements of the EFTEON Research Infrastructure

To meet the intended outcomes of EFTEON research infrastructure, several principles need to be met:

Principle 1 – Long-term Environmental Research: The EFTEON focuses on long-term continuous co-operation and the primary purpose of the network is to provide long-term environmental data for the national and global research community. The core site and operations need to undertake measurements and observations that are of value in both the short and long term. As a result, the selected landscape needs to be available for multi-decadal operation and allow regular (daily) access to sites by the EFTEON staff and a wide range of approved researchers using the platform. The Nelson Mandela University core site located near George offers a secure and easily accessible site for EFTEON staff and visiting researchers as does the Garden Route National Park and the two biosphere reserves (Garden Route and Gouritz Cluster). The George Campus' long term future is protected by the Higher Education Act and the Nelson Mandela University strategic plan, which has led to significant financial investments in education infrastructure on the Campus since 2007. The Campus, formerly known as 'Saasveld', has an exceptionally long history in the landscape and has been operational as a natural resource academic and research institution since the late 1930s. Historical data, coupled with more recent data collected by the growing number of postgraduate and undergraduate students specializing in natural resource management at the George Campus, is an extremely valuable source of long-term data for EFTEON.

Principle 2- Research Platform: EFTEON is intended as a research platform with an open data and open platform use policy. This is in order to facilitate the use of the infrastructure and data by other researchers, both nationally and internationally. The George Campus, which is an integral part of Nelson Mandela University with its headquarters in Port Elizabeth, is well furnished with the necessary infrastructure and facilities. The Campus is able to draw on human, financial and

technical resources available across the entire University. There are laboratories, offices with the necessary communication and electricity infrastructure, accommodation, as well as spaces for research engagement on the campus. Furthermore, the Sustainability Research Unit and the International Research Laboratory – REHABS (a joint venture between the French research institution CNRS, the University of Lyon and Nelson Mandela University) are located on the campus and are both research entities which are focused on postgraduate teaching and learning, facilitating research in complex social-ecological systems and promoting international collaboration. Therefore the core site provides for the use of the facilities by multiple researchers or partners from multiple national and global research organisations. The secure and well-established campus infrastructure provides facilities for workshops, learning events, science dialogues and accommodation for visiting academics and scholars, especially during academic recess periods.

Principle 3- Spatial Diversity coverage: The landscape selected for the network represents five South African biomes, as well as some of the country's most significant wetlands and human-transformed ecosystems and their embedded aquatic systems. This represents a rich mosaic of near-intact protected areas, lived-in landscapes, and landscapes in transition (driven by climate change, fire dynamics and anthropogenic land-use change). The nominated meta-landscape can enable the long-term observation of the coupled terrestrial / aquatic systems in the face of climate change and includes representative samples of all relevant land-uses, including conservation areas of different sizes, tourism, plantation forestry, extensive and intensive agriculture, post-mining and post-plantation rehabilitation areas, peri-urban areas and urban settlements. This represents gradients and transitions of land transformation, rainfall, human-appropriated net primary productivity and governance systems where dynamic coupled social ecological systems are observable. The proposed meta-landscape provides an exceptionally good opportunity to observe global change processes where biodiversity, water provision, carbon sequestration and cultural values interconnect, driven proximately by land transformation and degradation, and ultimately by climate change and governance.

Principle 4- Historical observations and experimental datasets: Incorporation of existing research and linking to existing socio-ecological datasets is a strong focus of the EFTEON design concept. The availability of long-term existing social-ecological and earth system data sets is considered an advantage in the selection of the landscapes where a strong emphasis is placed on data archiving to ensure long-term availability and continuity of datasets. The Garden Route landscape has a history of long term research particularly occurring in the Afromontane forest biome which has been taking place since the 1970s in areas managed by South African National Parks and Cape Nature which partially surrounds the campus grounds. These forested areas are located in the Garden Route National Park also offering security of tenure and security for long term decadal monitoring and research. Historical long-term research undertaken by the former South African Forestry Research Institute, the Council of Scientific and Industrial Research (CSIR), SANParks, Cape Nature and the Department of Water Affairs and Forestry provide valuable background data. There has been ongoing water, weather and air quality monitoring done by SANParks, Garden Route District Municipality, South African Weather Services, the CSIR and Department of Water and Sanitation. Fauna and flora monitoring (faecal pellet, camera traps) of landscapes in various stages of transition after the exit of plantation forestry has been undertaken by SANParks and the Working for Water programme and numerous citizen science groups such as Custodians of Rare and Endangered Wildflowers (CREW) and the Coordinated Water bird Counts (CWAC) done by Birdlife South Africa since the 1980s. In the Baviaanskloof, landscapes in various stages of restoration and recovery are being monitored by Living Landscapes using integrated monitoring approaches.

Principle 5- Experiments and manipulations: The use of experiments and manipulations provides considerable insight into environmental processes. The landscapes must offer the opportunity to implement and sustain appropriate experiments, at a scale matched to the scales of key processes, to help elucidate process-level understanding of ecosystem changes. The Garden Route Landscape is affected by climate change and disturbances such land transformation, alien invasive species and

land degradation. Furthermore the governance systems in the landscape are complex and multi layered offers numerous opportunities to implement and sustain experiments to help elucidate process level understanding of ecosystem changes and the flow of ecosystem services. The gradient of landscapes in various stages of transformation and restoration represent unintended experiments where the impact of land use intensity, land degradation and transformation, the interfaces between these states, and the role of governance can be empirically assessed at multiple scales, from local to biome and catchment level.

Themes and gradients

The proposed meta-site, or network of sites represents notable gradients of aridity, altitude and human disturbance, presenting the opportunity to observe change across these gradients. The landscape represents five terrestrial biomes and important aquatic systems and wetlands. Each biome has a characteristic climate envelop, range of temperature and rainfall presenting aridity gradients. The transition between urban and rural land uses in the landscape present a further “developmental” gradient. The river systems in the landscape are characteristically short and respond rapidly, representing a scientifically valuable mountain to ocean altitudinal gradient.

Table 1. Matrix of ecosystem services across gradients, with examples of indicators that could be considered.

	ECOSYSTEM SERVICES			
Gradient	ES 1.Water	ES 2.Biodiversity	ES 3Production potential	ES 4, 5, 6 etc...
G1.Mountain to ocean – an altitudinal and aridity gradient	e.g. changes in river flow rates	e.g. changes in Turnovers in beta diversity across the gradient	e.g. changes in returns per hectare across the altitudinal gradient	
G2.Human population density – a rural to urban gradient	e.g. changes in rates of water consumption	e.g. changes in threats to rare and endangered species; population health of indigenous species sensitive to disturbance or over-exploitation	e.g. changes in demand for locally produced food vs. transferred food	
G3.Human appropriated net primary productivity – a land use intensity gradient	e.g. changes in rates of water use for agriculture purposes	e.g. changes in land degradation index. Biodiversity intactness indices	e.g. changes in extent of intensive agriculture and plantation forestry	
G4.Diverse multi-tiered governance systems – a cooperative governance gradient	e.g. changes in existence and functionality of cooperative governance forums for water management. Number, and attendance / decisions taken in catchment management meetings or similar coordinating structures, focus group discussions	e.g. changes in existence and functionality of cooperative governance forums for biodiversity management. Minutes of meetings, narrative analysis, focus group discussions	e.g. changes in existence and functionality of cooperative governance forums for agricultural resource and forestry management. Minutes of meetings, narrative analysis, focus group discussions	
G 5,6,7 etc..				

Overarching questions

We propose the use of an 'essential variables' framework developed by Guerra et al. (2019) to guide a systems approach to variable selection, actor identification and agreeing on monitoring priorities in the landscape. Integrated monitoring is needed to capture essential variables on biodiversity change but also knowledge on the dynamics of ecological processes and their effects on human well-being.

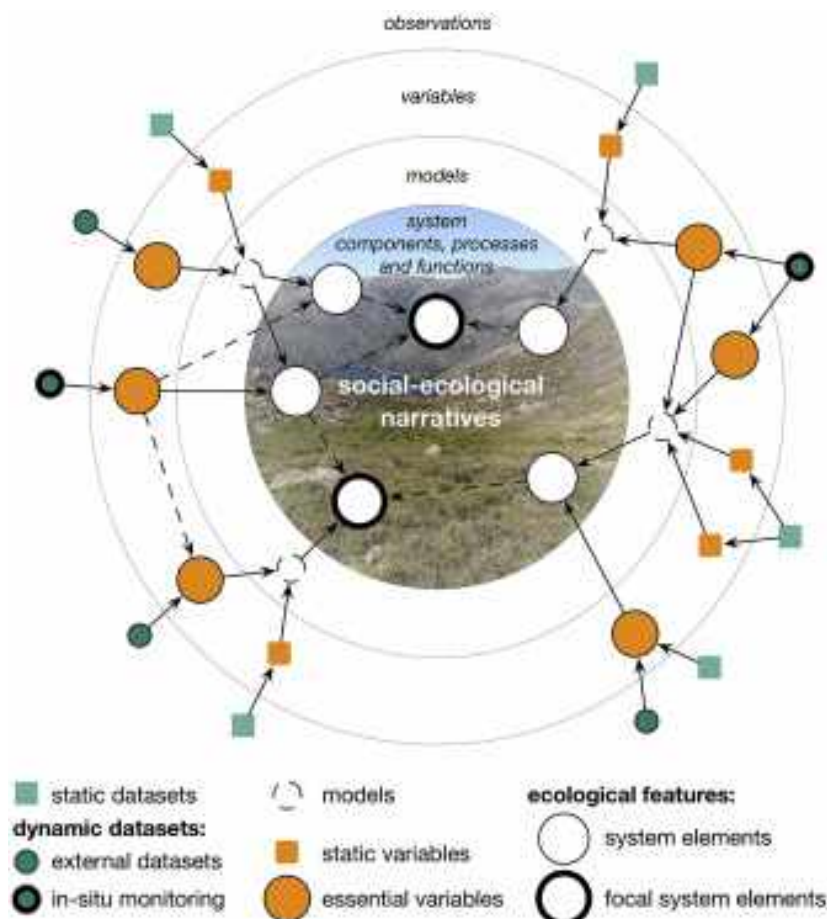


Figure 3. Conceptual representation of a social ecological systems approach to identify essential variables and monitoring priorities. The arrows in the Figure differentiate between direct data dependencies (full lines) and the expected causal relations between system components and essential variables (dashed lines) (Source: Guerra et al 2019).

The overarching questions we propose for the landscape include:

- Across the aridity gradient, what are the feedbacks between land transformation, aridity, human appropriation of net primary production (HANPP) and ecosystem services:
 - sustainable water security (a provisioning ecosystem service)
 - sustainable food production (a provisioning service)
 - ecological intactness of vegetation (a regulating ecosystem service)
 - place attachment (a cultural ecosystem service).
- What is the relationship between governance and institutional arrangements (sensu Ostrom & Cox 2010) and sustainable management and use of ecosystem services, across a cooperative governance gradient?

2.1. Biomes represented

Garden Route - The Garden Route Biosphere Reserve (GRBR) landscape represents the Cape Floristic Region biodiversity hotspot, Afrotropical ecoregion and the Subtropical thicket biome. The critical biodiversity area (CBA) mapping for the GRBR domain revealed aquatic and terrestrial ecosystems comprising nine biomes which have been identified across the landscape (Vroman et al. 2010; Vlok, Euston-Brown, & Wolf, 2008). The main biomes are Fynbos (64%); Forest (12%); Aquatic sources and drainage areas (13,4%); Renosterveld (5%); Thicket (3%); and Coastal Dune vegetation (1%). A total of 39 broad habitat types are recognized; six of these are aquatic habitat types. At the vegetation unit level, 86 units are recognized, 15 in the aquatic ecosystems and 71 in the terrestrial ecosystems (Holness et al. 2010; Vlok, Euston-Brown, & Wolf, 2008).

The Baviaanskloof is remarkable in terms of the diversity of its natural ecosystems. Seven of South Africa's eight biomes are represented here including Fynbos, Forest, Grassland, Succulent Karoo, Nama-Karoo, Sub-tropical Thicket and Savanna. On the northern slopes are the Spekboomveld and Valley Bushveld. On the southern slopes flourishes the Cape Fynbos. In the long side valleys concentrations of the Knysna Forest vegetation are found and on the mountain plateaus Renosterveld and Grassland dominate.

Gouritz Cluster – Four biomes occur within the Gouritz Cluster Biosphere Reserve (GCBR) domain, and their vegetation types differ vastly in nature. They are the Fynbos, Succulent Karoo, Albany Thicket and Afro temperate Forest biomes (Mucina & Rutherford 2006). Even within each of these biomes the vegetation varies much, both in structure and in species composition, with 466 different vegetation units identified in fine-scale studies of the biosphere reserve (Vlok et al, 2005; Vlok & de Villiers 2007). It is a unique place in that it is the only area in the world where three global biodiversity hotspots converge and overlap: The Fynbos, Succulent Karoo and Maputoland-Tongoland-Albany hotspots.

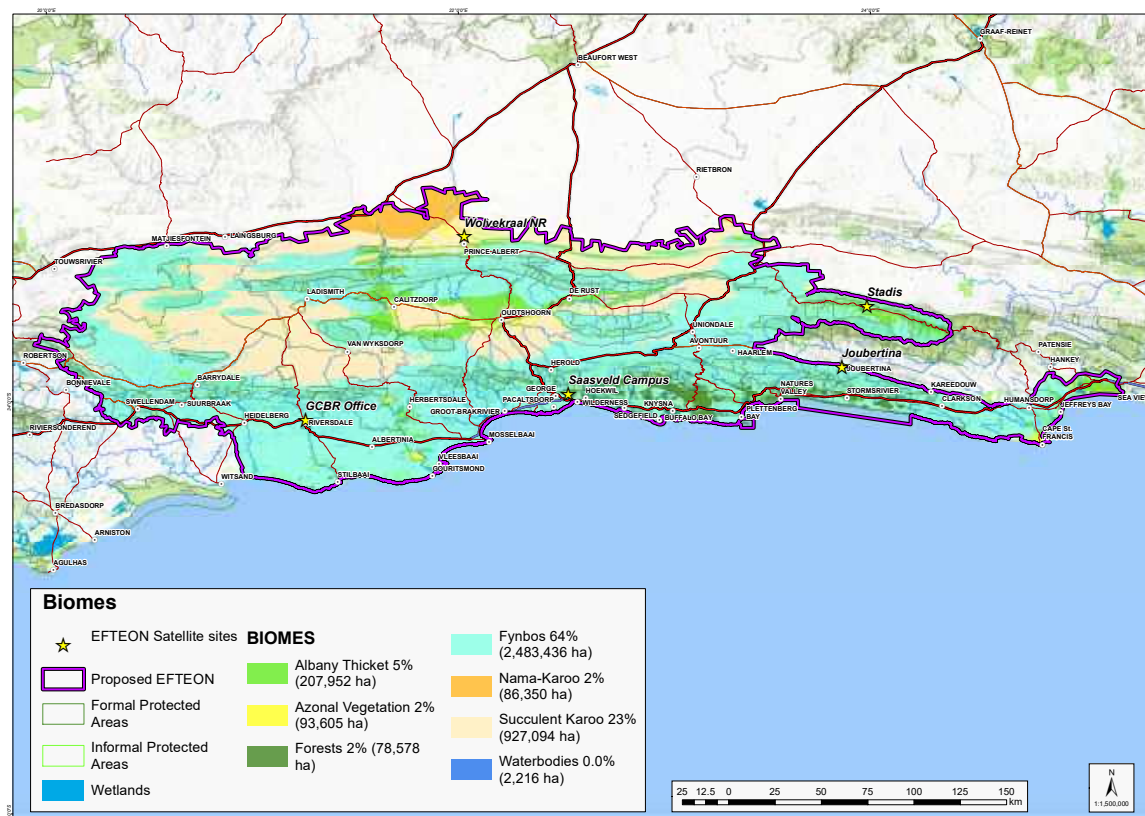


Figure 4. Biomes and their extent represented in the Garden Route Gateway Site landscape.

2.2.Land uses

The nominated landscape is characterised by a mosaic of multi-functional land uses. The Garden Route Spatial Development Framework (2019) identified six dominant land use types, namely conservation and tourism, agriculture, plantation forestry, urban residential, rural dwelling and urban and rural public infrastructure. Furthermore the Cacadu District Municipality Spatial Development Framework (2013) identified protected areas and game farms, cultivated dry and irrigated lands, grazing, plantations and urban areas as broad land cover types in the Baviaanskloof and Kromme River areas.

Conservation and tourism - The GRBR incorporates several legally protected areas that are established as nature reserves, national parks, private conservation areas and heritage sites. These are under the jurisdiction of statutory bodies that include South African National Parks (SANParks), CapeNature and Eastern Cape Parks and Tourism Agency. They include the Garden Route National Park, Robberg Nature Reserve, Goukamma Nature Reserve, Outeniqua Nature Reserve, Keurbooms Nature Reserve, Formosa Nature Reserve, Baviaanskloof Nature Reserve, Tsitsikamma, Robberg and Goukamma Marine Protected Areas (MPAs). The Kammanassie, Soetkraal, and Formosa Nature Reserves in the Garden Route Biosphere Reserve area. There are also private nature reserves and game farms in the landscape such as Gondwana, Sanbona, Wolwekraal, Rietkraal Blue Hills Nature reserve and a number of formally recognized Conservation Stewardship sites. These protected areas represents the highest biodiversity intactness in the landscape. In the GCBR the conservation and tourism areas include the Langeberg Mountain Catchment Area including the Garcia and Spioenkop Nature Reserves, Anysberg, De Hoop and Ruiterbos, Groot Swartberg, Towerkop and Ruiterbos Nature Reserves.

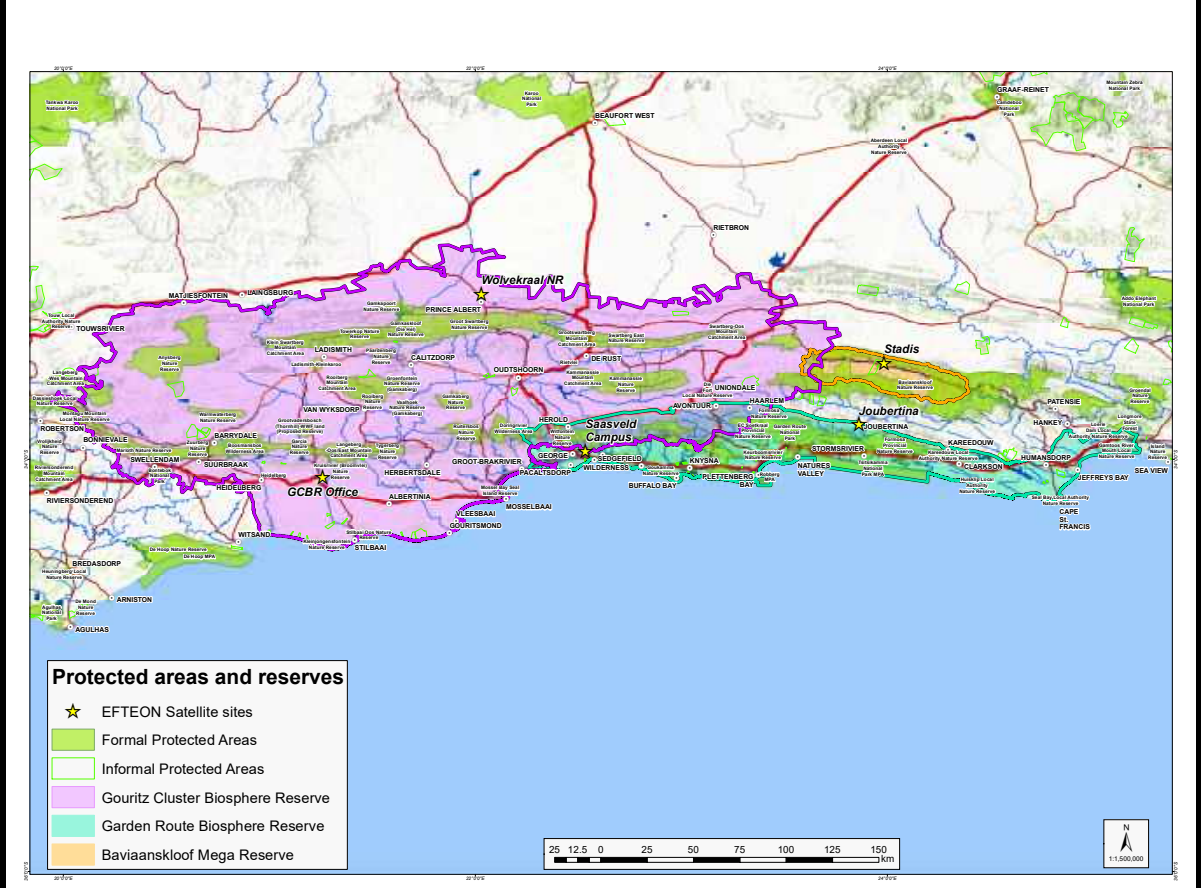


Figure 5. Formal and informal protected areas in the Garden Route Gateway landscape.

Agriculture - Throughout the nominated meta-site, agriculture is a significant land use with dairy farming taking place in the Kouga, Kou-Kamma and Mossel Bay local municipal areas. Aloes cattle, citrus, ostriches, sheep, vegetable and wine farming occurs in the Mossel bay area, and plantation forestry is also a common land use in the Kou-Kamma, George and Mossel bay areas. There is dry

and irrigated cultivated agricultural land for example Honey bush tea production in the Kromme catchment and production of Aloe sap and essential oils production in the Baviaanskloof, while both these catchments support varying levels of livestock farming, including goats, sheep (Baviaanskloof and Kromme), and cattle (Kromme). Dairy farming and ostrich farming also take place in the GCBR region.

Urban residential (built up areas) in the main coastal municipalities and inland - There are numerous urban residential areas in the landscape. The most prominent towns in the Garden Route include Mossel Bay, George, Knysna, Plettenberg Bay, Jeffery Bay, Cape St Francis and St Francis Bay along the coastal boundary and Humansdorp, Riversdal and Oudtshoorn inland. There is also informal residential land use associated to these towns and small community settlements in the rural areas of the landscape such as Kareedouw.

Urban and rural public infrastructure (dams, transport networks, service infrastructure) - The N2 Highway run longitudinally through the entire landscape and there is significant water infrastructure in all sections which includes 16 raw water storage dams and 31 operational water treatment facilities in the Garden Route District. Desalination plants to augment water supply exist at Mossel Bay, Sedgefield, Knysna and Bitou. Effluent re-use schemes are operational in George and Knysna. There are rural water supply schemes in Oudtshoorn and Heidelberg areas. The Garden Route Dam on the Swart River and a weir on the Touw River are responsible for supplying all towns and settlements in the George Municipality with water. The Garden Route district has 37 operational wastewater treatment facilities all operated by the various local municipalities. No regional wastewater schemes exist in the area. The Churchill and Impofu dams are found on the Kromme River. The Kouga Dam is fed by the Kouga and Baviaanskloof Rivers. The Churchill, Impofu, and Kouga Dams make up the bulk of the Algoa Water Supply System that supplies Nelson Mandela Bay Municipality including city of Port Elizabeth and surrounding areas. In the Kouga municipality the towns of St Francis Bay and Cape St Francis are served through the Churchill pipeline and 8 operational boreholes. Humansdorp receives water from several vlei fountains to the north of the town. Jeffreys Bay obtains its potable water from the Churchill pipeline and borehole cluster.

Eskom is the main distributor of electricity in the Garden Route District, and in addition to supplying the rural areas and major private consumers, also supplies all the municipalities in the area. The supplies to the municipalities are generally at bulk supply points and at Medium Voltage, from where the municipalities are responsible for distribution within their areas of supply. In 2013, the Garden Route district had 22 general waste disposal sites (many operating at full capacity), 5 transfer stations, 2 recycling facilities, 1 treatment plant and 1 hazardous storage site. All formal residential erven are receiving a weekly door-to-door waste collection service. A two bag system is in operation at five of the seven local municipalities to encourage recycling. The region has a good road network and linkages between towns. Garden Route District Municipality Road Agency services an area of approximately 47 000 sq km of road surface.

2.3.Strategic Water Source Areas

Strategic Water Source Areas (SWSAs) are defined as areas of land that either: (a) supply a disproportionate (i.e. relatively large) volume of mean annual surface water runoff (i.e. water in streams, rivers and wetlands) in relation to their size and so are considered nationally important; or (b) have relatively high groundwater recharge and groundwater forms a nationally important resource (has high levels of use or settlements depend on it); or (c) areas that meet both criteria (a) and (b). A SWSA is one where the water that is supplied is considered to be of national importance for water security.

The landscape comprises Water Region K ("coastal catchments") of Water Management Area 16 and includes the Hartenbos, Little Brak, Great Brak, Kaaimans, Touw, Karatara, Knysna, Keurbooms, Bloukrans, Lottering, Storms, Sandrif, Groot, and Tsitsikamma rivers. The landscape also comprises

of two surface water SWSA (Tsitsikamma and Outeniqua) and two overlapping groundwater SWSAs (Upper Keurbooms and George and Outeniqua).

The short, steep catchments of the coastal rivers and many estuaries contribute to an extraordinary altitudinal diversity in a relatively small, narrow area between the Cape Fold Mountains and the ocean. On the coastal peneplane the rivers slow down, meander and contribute to the lake and wetland ecosystems that characterize the landscape and received recognition under the RAMSAR Convention. The dynamic nature and diversity of land uses and land cover in the catchments present an opportunity to observe change processes along these gradients under a variety of land use and cover states where we can understand landscape change and the key drivers downstream on ecosystem services. There is an opportunity to observe the impacts of land use change along these gradients in terms of water related ecosystem services and water allocation trade-offs. The Outeniqua SWSA supplies 100 percent of the water supply for the George and Wilderness areas (Le Maitre et al. 2018)

The Baviaanskloof River catchment is located in the Western part of the Eastern Cape and forms part of the Western Water Supply System, which along with the Kromme River, supplies approximately 66% of the water used by the Nelson Mandela Bay Municipality. The Kromme catchment is a regionally important water supply area with the Churchill and Impofu Dams in stream. Furthermore the Baviaanskloof and Kouga catchments drain into the Kouga Dam which has a capacity of 128,453 million³ and supplies water to the surrounding towns of Hankey and Patensie and the farmers in the Gamtoos Valley, while also supporting water supply to the Nelson Mandela Bay Metropolitan through the Loerie holding dam. Instream dams like the Churchill and Impofu Dams impact sediment and water supply to their estuaries and questions can be asked about how have they have altered the form, function, and biodiversity of these estuaries.

Despite their critical value, these water source areas are faced with multiple threats, including land degradation and climate change. The Garden Route District is particularly vulnerable to climate change which is already impacting food production, and these impacts are projected to increase over time, with potentially devastating effects. The projected climate change impacts in these areas include higher mean, maximum temperatures and a general drying trend which will impact on the hydrology and cause increased evaporation and a decreased water balance in catchments. Climate change will ultimately influence the supply of both ecological services and will influence agricultural practices, water management and human livelihood strategies. These SWSAs present an important opportunity to observe climate change in these areas.

Within the Gouritz water management area (catchment J), lies portions of the Outeniqua, Langeberg, and Swartberg SWSA surface water priorities. The Gouritz water management area contains the Van Wyksdorp as well as some portion of the George and Outeniqua SWSA ground water priority. The catchment includes the Gouritz, Olifants, Kamanassie, Gamka, Buffels, Touws, Goukou and Duiwenhoks Rivers.

Climate change projections for the Western Cape Province predicts a reduction in winter rainfall, a monthly rainfall change of 10 mm or more and an increase in air temperature by 2-3°C for both maximum and minimum temperatures. The greatest increases are likely to be inland and the lowest along the coast.

Irrigation currently accounts for 75% of all the water used in the Gouritz Water Management Area (WMA) and 84-92% of the water used in the three main tributaries. (Le Maitre et al. 2009). The low water storage capacity of the area renders it vulnerable to periods of low rainfall.

Water demand in the region is higher than the supply and projected to increase significantly by between 23% and 150% by 2025. This highlights the importance of improving irrigation by ensuring that the most efficient technologies are used in both water delivery and application. The use of

crops with a higher water-use efficiency and value should also be assessed. Research is needed to get a better understanding of the dynamics of the groundwater resource, particularly recharge, and its sustainable yield in different parts of the Gouritz WMA. Alien vegetation control should be implemented, particularly in the SWSA's.

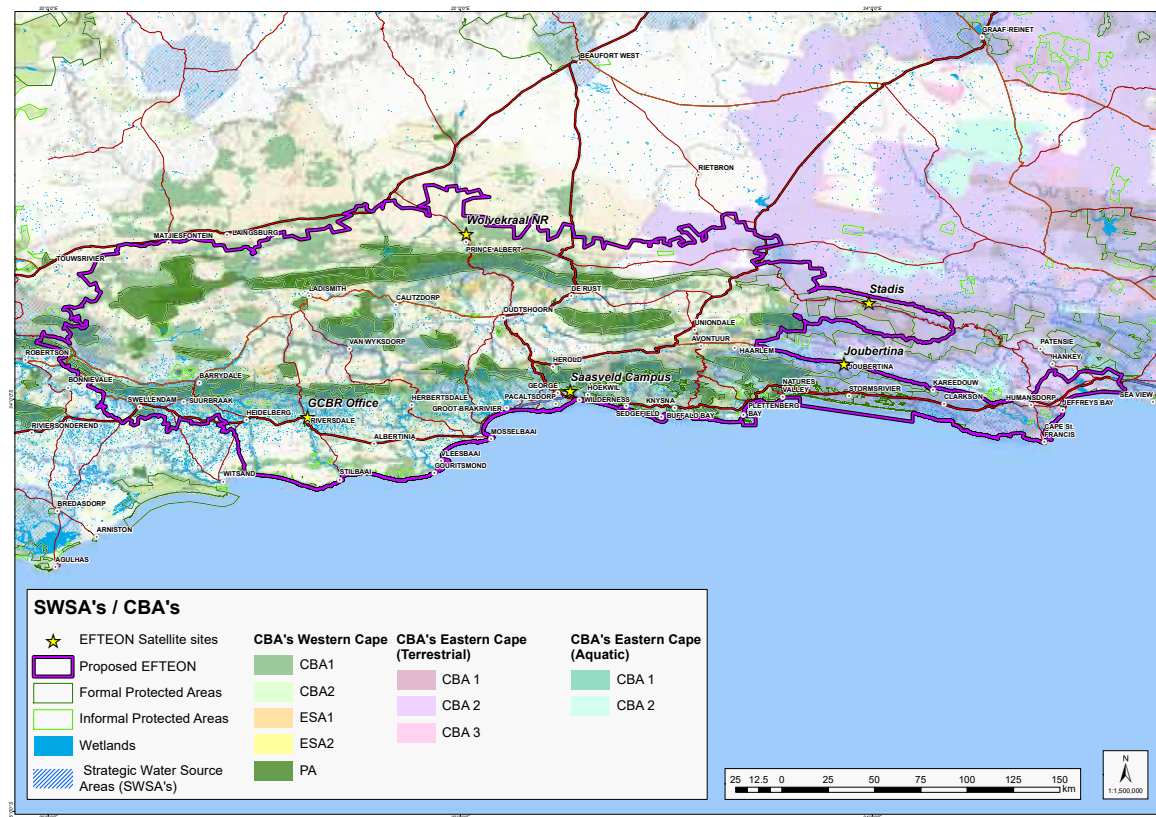


Figure 6. Strategic Water Source Areas (SWSAs) and Critical Biodiversity Areas (CBAs) in the Garden Route Gateway landscape.

2.4. Biodiversity hotspots

Garden Route - The Garden Route Biodiversity Strategy (Vroman et al. 2010) identified a mosaic of critical biodiversity areas (see Figure 4) and ecological support areas within the landscape.

Critical Biodiversity Areas were identified as terrestrial, freshwater aquatic or marine areas required to meet biodiversity pattern and/or process thresholds, e.g. remaining areas of **Critically Endangered habitat types**; Special habitats (areas required to protect special species and habitats); listed **Threatened Ecosystems** (See Figure 7) in terms of the National Biodiversity Act (10 of 2004); remaining areas are protected by the National Forest Act (84 of 1998). Any area that is required for meeting ecological process thresholds including: ecological or **landscape corridors** (comprising upland-lowland, river, coastal and sand movement corridors); hydrological process areas (estuaries, wetlands, important catchment areas).

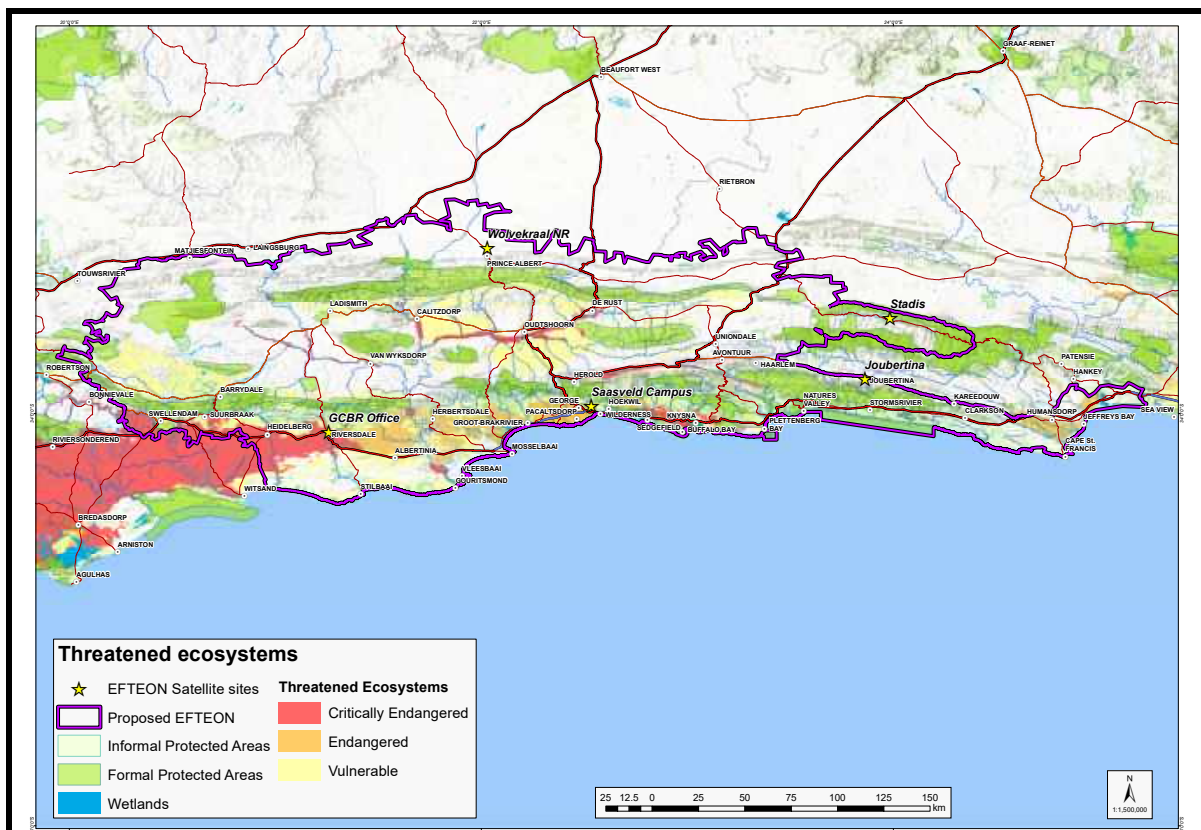


Figure 7. Threatened ecosystems in the Garden Route Gateway landscape.

Ecological Support Areas were identified as those required to prevent degradation of Critical Biodiversity Areas and Protected areas; remaining catchment and other process areas (river, fire, etc) that also required to prevent degradation of Critical Biodiversity Areas and formal Protected Areas; and areas that are already transformed or degraded but which are currently or potentially still important for supporting ecological processes e.g. transformed or alien plant infested areas that have transformed or degraded the natural buffer area of a wetland or river.

Inland and coastal corridors are critical to ecosystem functioning in the proposed landscape. Corridors are critical for ecological processes and for long-term survival of wild animals and plants, especially in the context of climate change. The landscape also contains several Marine Protected Areas along the south coast (e.g. Tsitsikkamma Stillbaai, Goukamma and Robberg) with some of South Africa's most important estuaries, such as the Knysna Estuary which is ranked first in the country for its conservation value (Turpie and Clark 2007). It contains the second largest salt marsh area in the country and is also home to the Wilderness Lakes which forms an area listed as a RAMSAR Site of International importance (www.ramsar.org), and Swartvlei Estuary which is ranked

There are several priority special habitats in the Garden Route Gateway landscape. These include:

- **Riverine Saltmarsh** - This is an important habitat for estuarine species living in the Knysna Estuary (Knysna Municipality), Keurbooms Estuary (Bitou Municipality) and the Groot River Estuary (Bitou Municipality) as well as the Kromme Estuary in the Eastern Cape portion of the landscape.
- **Ericaceous Fynbos** - This habitat grows on the steep upper mountain slopes in the landscape and serves an important water catchment function. It is the source of most perennial streams and is found in all municipalities in the landscape.
- **Forests** - The forests are very rich in plant species and are highly conservation worthy. They are protected by the National Forest Act occurring throughout all municipalities.

- **Aquatic dependent habitats** - These habitats depend on the presence of either fresh or brackish surface water, associated with aquatic ecosystems and occur within all three municipalities.
- **Groenvlei-Swartvlei mouth dunes** - This dune area includes the Groenvlei Dune Field, a rare and ancient dune field (parabolic) located east of the Swartvlei Estuary at Sedgefield (Knysna Municipality).
- **Kaaimans River** - The lower reaches of the Kaaimans River support the Near Threatened and endemic Eastern Cape Redfin (*Pseudobarbus afer*) and is home to one of five populations classed as belonging to the group (lineage) of redfins associated with forest environments (George Municipality).
- **Keurbooms River and Estuary** - This system supports several important fish species, e.g. Eastern Cape Redfin (*Pseudobarbus afer*). The river and estuary are also home to several red data bird species, for example the Blue Crane (*Anthropoedus paradisea*), and the Half-Collared Kingfisher (*Alcedo semitorquata*) (Bitou Municipality).
- **Goukamma River** - This large river system provides habitat for a population of Eastern Cape Redfin (*Pseudobarbus afer*), one of only four known populations; and Cape Kurper (*Sandelia capensis*), which belongs to a distinct group (or lineage) associated with forest (Bitou Municipality).
- **Wilderness Lakes Area and Swartvlei** - They are considered to be some of the most productive coastal lakes and estuaries in South Africa (George and Knysna Municipality).
- **Knysna Western Heads** - This area is home to several rare plants and butterfly species and to an unusual vegetation type related to its unique geology (Edge et al. 2008) (Knysna Municipality).
- **Critically endangered Peat wetlands** – Duiwenhoeks and Kromme rivers contain Palmiet (*Prionium serratum*)
- **Kromme**- An endangered Palmiet wetland occurs in the river and is nestled within an agricultural landscape that threatens its functioning. The river has also recently been surveyed for its aquatic biodiversity and records have been made of the endangered *Pseudobarbus senticeps* (Kromme River Redfin) and widespread occurrence of Invasive alien fish species such as Large-mouth Bass (*Micropterus salmoides*) and Bluegill Sunfish (*Lepomis macrochirus*). Past records also show the presence of *Galaxias zebratus* in the upper reaches, but these have not been sited during the most recent surveys.

The Baviaanskloof is remarkable in terms of the diversity of its natural ecosystems. Seven of South Africa's eight biomes are represented here including Fynbos, Forest, Grassland, Succulent Karoo, Nama-Karoo, Sub-tropical Thicket and Savanna. On the northern slopes are the Spekboomveld and Valley Bushveld. On the southern slopes flourishes the Cape Fynbos. In the long side valleys is concentrated the Knysna Forest vegetation. On the mountain plateaus are Renosterveld and Grassland. The widespread Succulent Karoo bush in the valley is probably why the Baviaanskloof is classified as a part of the Little Karoo. Because of this spectacular diversity of plant species, an impressive variety of birds can be found in the valley. Several priority special habitats include:

Gouritz Cluster – The entire domain of the Gouritz Cluster Biosphere falls within the Cape Floristic Region - the smallest, but one of the richest of the six floral kingdoms of the world. The biosphere reserve is rich in endemic plant species, accounting for more than 670 of the ca. 5 000 plant species present in the area. Two of the six phytogeographic centres of the Cape Floristic Region occur in the area (Goldblatt & Manning 2000). Unpublished data for the arid inland portion of the biosphere reserve also indicates that at least 400 of the 3 200 plant species present are endemic to the region (Vlok & Schutte-Vlok, 2010). Globally the area is unique as it is the only place in the world where three recognized biodiversity hotspots overlap.

- In the **Fynbos biodiversity hotspot** three major vegetation types are recognised: Fynbos, Renosterveld and Strandveld (Mucina & Rutherford 2006). These major types can be subdivided into many smaller units that each have a distinctive structure and flora, with

195 Fynbos, Renosterveld and Strandveld vegetation units recognised in the biosphere reserve (Vlok et al, 2005; Vlok & de Villiers, 2007). Almost all of these are endemic to the biosphere reserve.

Even when viewed at a coarse national scale the biosphere reserve plays an important role in conserving the biodiversity of the Fynbos biome as 22 of the 119 nationally recognised Fynbos vegetation units are endemic to the reserve. These units include the North Outeniqua Sandstone Fynbos, South Outeniqua Sandstone Fynbos, North Rooiberg Sandstone Fynbos, South Rooiberg Sandstone Fynbos, North Swartberg Sandstone Fynbos, South Swartberg Sandstone Fynbos, Swartberg Altimontane Sandstone Fynbos, North Kamanassie Sandstone Fynbos, South Kamanassie Sandstone Fynbos, Albertinia Sand Fynbos, Swartberg Shale Fynbos, Kango Conglomerate Fynbos, Canca Limestone Fynbos, Swellendam Silcrete Fynbos, Montagu Shale Renosterveld, Mossel Bay Shale Renosterveld, Uniondale Shale Renosterveld, Langkloof Shale Renosterveld, Kango Limestone Renosterveld, Blombos Strandveld and the Groot Brak Dune Strandveld.

Mucina and Rutherford (2006) list some of the plant species that are endemic to the 22 vegetation units which in turn are endemic to the biosphere reserve. Their lists are not complete, but Goldblatt and Manning (2000) indicate that the level of endemism for the two phytogeographic centres is 15.4% and 11.7%. A confirmation of the high degree of endemism comes from one of the best-known families in the Fynbos, the Proteaceae. Twenty-four species of this family are endemic to the biosphere reserve. They are: *Protea pruinosa*, *Protea aristata*, *Protea venusta*, *Protea montana*, *Paranomus centaureoides*, *Paranomus longicaulis*, *Paranomus spathulatus*, *Paranomus roodebergensis*, *Spatalla nubicola*, *Spatalla barbigera*, *Leucospermum pluridens*, *Leucospermum praecox*, *Leucospermum muirii*, *Leucospermum erubescens*, *Leucospermum hamatum*, *Leucospermum winteri*, *Leucospermum secundifolium*, *Leucospermum mundii*, *Leucospermum saxatile*, *Mimetes chrysanthus*, *Leucadendron olens*, *Leucadendron ericifolium*, *Leucadendron singulare* and *Leucadendron osbornei*. Other plant families that have a high number of endemic species in the local Fynbos are the Asteraceae, Ericaceae, Fabaceae, Iridaceae and Rutaceae.

In terms of threatened larger mammals the biosphere plays an important role in conserving two unique genetic (and original) populations of Cape Mountain Zebra (*Equus zebra zebra*) and those of the Bontebok (*Damaliscus pyrgargus pyrgargus*). Original and natural populations of Leopard (*Panthera pardus*) are also still present in most of the mountainous areas. Threatened invertebrates of the area include seven endemic species of the enigmatic beetle genus *Colophon* and 14 endemic butterfly species (*Thestor swanepoeli*, *Thestor montanus pictus*, *Thestor tempe*, *Aloeides trimeni southeyae*, *Poecilmitis swanepoeli*, *Poecilmitis hyperion*, *Poecilmitis henningi*, *Poecilmitis pyramus*, *Poecilmitis daphne*, *Poecilmitis ballii*, *Poecilmitis nigricans zwartbergae*, *Lepidochrysops ballii*, *Lepidochrysops littoralis* and *Lepidochrysops outeniqua*).

- **The Succulent Karoo biodiversity hotspot** – On a national scale Mucina and Rutherford (2006) recognise 63 vegetation types in the Succulent Karoo biome. Five of these vegetation types (Western Little Karoo, Western Gwarrieveld, Little Karoo Quartz Vygieveld, Eastern Little Karoo, and Prince Albert Succulent Karoo) are endemic to the biosphere reserve. When viewed at a much finer scale, the complexity of the local Succulent Karoo becomes clear. Vlok et al (2005) recognised 94 vegetation units in the Succulent Karoo of the biosphere reserve. All of these finer-scale units are endemic to the biosphere reserve and many are threatened.

Abundant and characteristic plant families are the Asphodelaceae, Aizoaceae, Asteraceae, Crassulaceae and Euphorbiaceae. Of the Asphodelaceae, most of the members of the

genus *Haworthia* present in the area are endemic. In the Aizoaceae five of the genera (*Antegibbaeum*, *Bijlia*, *Octopoma*, *Smicrostigma* and *Zeuktophyllum*) and almost all the species in the genera *Gibbaeum* and *Glottiphyllum*, are endemic to the biosphere reserve. Several of the Asteraceae, notably in the genus *Euryops*, are rare and localised endemic species. There are a number of endemic *Crassula* and *Euphorbia* species and many of the Iridaceae present, especially species of the genus *Moraea*, are also endemic to the Succulent Karoo vegetation in the biosphere reserve.

Four tortoise species occur in the local Succulent Karoo vegetation, but none of them are endemic to the biosphere reserve. Very little is known about the invertebrates of the area, but some of the Stone Grasshoppers (genus *Trachypetrella*) and Jewel Beetles (genus *Julodis*) are probably rare endemic species.

- **The Maputoland-Tongoland-Albany hotspot** is the most recently recognised hotspot in Africa. It is scientifically not well known and goes under many names, but on a national level is recognised as the Albany Thicket biome (Mucina & Rutherford, 2006). Although there is still much scientific dispute about its extent (what should be included or excluded) this is probably one of the most ancient vegetation types in Africa (Cowling & Pierce, 2009), if not globally. It occurs mostly in an ameliorated climate, and the presence of this vegetation type and the postulated origin of modern man along the coastal part of the biosphere reserve is probably not coincidental.

One of the 14 vegetation units of this biome recognised by Mucina and Rutherford (2006) is endemic to the biosphere reserve. Their contemplation of the vegetation of this biome was, however, very conservative. In a more detailed survey of the region several more distinctive vegetation units were recognised (Vlok et al, 2005; Vlok & de Villiers, 2007), many of which are endemic and severely threatened.

Rarely understood and recognised to date in scientific studies of the South African vegetation types is the interlinking between seemingly vastly different floras, which is perhaps the reason for the many differences of opinion about the extent of this biodiversity hotspot. It seems to be an odd linkage to both the temperate and subtropical vegetation of South Africa. This complex vegetation type was a mystery to past researchers; a key to better understanding of the immense biodiversity of the Cape Floristic Region lies in further research of this vegetation type.

Typical and characteristic species are an abundance of trees that show a sub-tropical phylogenetic affiliation such as *Euclea undulata* and *Pappea capensis* and members of the Celastraceae such as *Gloveria integrifolia*, but none of them are endemic to the area. They merely represent the western extreme of this ancient biome that probably occurred in the Gondwanaland and later fluctuated all over the African continent.

2.5.Areas of high carbon sequestration potential

Areas of high carbon sequestration in the landscape present opportunities to understand carbon cycling and the ecosystem engineering and sequestration potential of various vegetation types. It also presents an opportunity to understand how active restoration projects influence carbon stocks.

Garden Route - Carbon sequestration is one of the tools being used to respond to climate change risks, and commercial forests are considered a significant provider of carbon sequestration. The commercial forestry areas in the landscape present an interesting opportunity to observe the sequestration benefits of plantations especially in light of the forestry exit plan and the pine

plantations influence on carbon storage. However, time frames for evaluating wood use can affect conclusions about sequestration benefits; a long-term perspective and large spatial scale may help clarify these issues. (Loehle, 2020).

Gouritz Cluster and Biaviaanskloof- *Portulacaria afra* (Spekboom) is a key species in Spekboomveld and has a high potential for carbon sequestration. It also has the potential to stimulate biodiversity recovery, as it can act as an 'ecosystem engineer'. Spekboomveld is part of the Thicket Biome and holds a wide diversity of succulent, forb and shrub species however it has been severely degraded in many places over the past century (Hoare et. al. 2006). The mapped area, in the surrounding vicinity of VanWyksdorp, has a potential of up to 5300 ha of severely degraded Spekboomveld that is currently being restored through the Jobs for Carbon project (J4C).

The results of a recent study in the Klein Karoo show that there is significant potential to sequester carbon through successful restoration from a baseline of 18.02 (SE: 2.31) t C ha⁻¹ to a potential of ~168 t C ha⁻¹ as found in intact sites in the VanWyksdorp area (Bulus et al. 2019). This is similar to the previous studies: degraded Spekboomveld carbon baseline of 17.89 (SE: 2.51) t C ha⁻¹ (Bulus et al. 2019). This could potentially be a gain of up to ~150 t C ha⁻¹, when fully restored to the intact state. However, this will likely take more than 30 years to reach depending on the restoration success.

2.6.Landscapes of high cultural value

Garden Route - The Garden Route National Park and Nelson Bay Cave on Robberg Nature Reserve have received global recognition, with the latter being incorporated as a UNESCO World Heritage Site due to the unique, endemic and spectacular biodiversity and palaeo- anthropological significance. Also, ongoing research at Knysna Heads is uncovering evidence of humans in a little-known period of our past. Further to the east on the Tsitsikamma coast near Humansdorp are the Klasies River Caves. Three main caves and two shelters are located at the base of a high cliff. Evidence dates the caves back to the Middle Stone Age, with habitation being approximately 125 000 years ago. Deposits show that people living there hunted small and big game, fish, shellfish and collected plants, cooking on hearths and managing their land. Evidence suggests that the people were seasonal and anatomically modern. Hominid bones (cranial fragments, mandibles with teeth, ulna, and metatarsals) have been found at the site. The site (5 caves/shelters) is protected by the South African Heritage Resource Agency and the Department of Environmental Affairs and Tourism (DEAT), having been declared a National Heritage Site. In 2015, a submission was made to UNESCO for World Heritage Site status for six cave sites in South Africa (including Klasies River Mouth) that have contributed evidence for palaeo-environmental conditions during the mid to Late Pleistocene period. The Khoikhoi who were cattle herders migrated to the southern Cape coast from the northern parts of southern Africa about 2000 years ago. Kranshoek, just outside Plettenberg Bay, is one of a few places that has a surviving community of Griqua's. Their history dates back to the 1700's and for over 200 years they were subjected to displacement from their home territories in the Cape. The Griqua prophet, Andrew Andries Stockenström Le Fleur died in 1941 and is buried on the Robberg Peninsula, close to Kranshoek. His grandson is now the Paramount Griqua Chief. In modern times the Garden Route is a tourism hotspot as well as a focal point for the revival and resurgence of Koi-San cultural awareness. Place attachment is a strong driver of stewardship across the landscape.

Gouritz Cluster and Kouga-Baviaanskloof Complex- The GCBR and Baviaanskloof complex are centres with immense historical significance. Based on recent and ongoing research, the southern Cape coast is believed to be the place where our species, *Homo sapiens*, became cognitively modern, aptly termed "The Cradle of Human Culture". The caves at Pinnacle Point near Mossel Bay have yielded proof of the earliest human exploitation of shellfish 164,000 years ago, and the earliest known use of fire for technology in making stone tools 72,000 years ago. Blombos Cave has

revealed numerous evidence of symbolic reference and art. It is globally acknowledged that the oldest piece of art created by our species was found there and dates back 73,000 years ago. An important intangible cultural heritage found within the GCBR is that of the Hessequa people. Their heritage has been key to understanding natural resource economies which aided researchers in creating a resourcescape as an important aspect of this human origins research.

General –Traditional medicine within the region has a deep-time cultural legacy originating from the large number of Khoikhoi and San (Bushman) descendants who retain more than is generally recognised of their Indigenous knowledge and culture. Historically this area of the Cape (Southern Cape, Little Karoo, Great Karoo) is rooted in inherited KhoiSan culture, than further East where Black African Nguni Iron Age / agricultural lifeways had already overrun the KhoiSan, and were already in place when European Settlers first arrived there. Pre-colonial San and Khoi in the Cape in general were thoroughly overcome and apparently assimilated into what was to become the “Coloured” community.

The Western Cape Government, Culture and Sport, has created a tourism initiative termed “The Cradle of Human Culture”. Three anchor sites, with many sites linking them, have been identified, Diepkloof (west coast), Blombos and Pinnacle Point. The route has now been extended to include the eastern Cape and Kwazulu-Natal. The African Centre for Coastal Palaeo-science at Nelson Mandela University is a role player in the formation of this incentive. This route intends growing awareness of local heritage in indigenous communities by involving them in job creation and including heritage aspects in tours.

2.7.Areas of anticipated significant land use or social change

General – The IPBES Land Transformation and Degradation assessment (Willemsen et al. 2020) and the IPBES Global Assessment on Biodiversity and Ecosystem Services (Diaz et al. 2019) have highlighted the alarming loss of biodiversity and nature's contributions to people, with land degradation, unsustainable exploitation, pollution and invasive species identified as the primary causes. The proposed landscape represents a gradient of land transformation, which is a function of aridity and intensity of historical and contemporary human disturbance. These two axes represent a two dimensional gradient where the relationship between climate and social change can be monitored and understood.

Dominant drivers of land use and social change across the meta-landscape include:

- Demographics (in-migration to the Western Cape, in particular to coastal towns)
- Economy (economic drivers influencing demographics, as well as land use and social change: e.g. agricultural practices, business opportunities and challenges)
- Changing climatic conditions (e.g. requiring farmers to adapt to hotter and drier circumstances.)
- Technology (linked with agricultural practices – e.g. increased water abstraction techniques)
- Societal values and trends (e.g. rise in “lifestyle” farmers, resulting in changes in land use, fencing, game management).

Garden Route – Land use change and social change are also the main drivers of ecological change in the Garden Route (Guerbois et al. 2019), where change has been drastic and rapid over the past three decades. The Garden Route offers a site to research transformative adaptation of social-ecological systems to understand the relationships between landscape dynamics, land use change, flow of ecosystem services, and nature's contributions to people using the IPBES conceptual framework (Diaz et al. 2015) as a foundation. The GRBR provides an exceptionally good platform for place-based Long-Term Social-Ecological Research (LTSER) to investigate society-nature interactions, the feedbacks between land use change, nature and nature's benefits to people, and to understand ultimate drivers of landscape dynamics.

Gouritz Cluster – The Gouritz Cluster Biosphere Reserve received formal UNESCO recognition in 2015 and is located across parts of the Western, Southern and Eastern Cape of South Africa. The domain covers a range of biomes and also human transformed ecosystems. These range from extensive natural areas (e.g. Swartberg and Langeberg), to intensive agriculture (e.g. dairy farms along the coast), urban areas (e.g. Mossel Bay, Riversdale, Oudtshoorn), and marine protected areas (e.g. Stilbaai). The GCBR is, in itself, a long-term experiment. Within the domain, the GCBR gathers data on carbon baselines, extent of restored areas, water quality and socio-economic parameters. It is well positioned to conduct experiments that explain ecosystem changes within the domain.

2.8. The opportunity presented by this landscape to observe the coupled terrestrial and aquatic (fluvial and/or groundwater) systems.

Garden Route – Freshwater ecosystems (rivers and wetlands) are a defining feature of the Garden Route landscape, being a key determinant of its scenic appeal, biodiversity (distribution of species and ecological processes), and potential for human well-being (providing water for various domestic, economic and recreational uses, and contributing to overall sense of place).

- Rivers: More than 70% of the rivers flowing through the Garden Route National Park (GRNP) are regarded as being in good ecological condition. These rivers represent seven of South Africa's 223 river ecosystem types. Almost 75% of the river length in the GRNP has been selected as national Freshwater Ecosystem Protected Areas (FEPAs), the highest

proportion of river length in any of South Africa's national parks (Roux et al. 2013). The hydrology as well as the main chemical and physical characteristics of rivers associated with the Touw system, Swartvlei system and Knysna system have been documented, but less so for the Tsitsikamma systems (thirteen rivers).

- Wetlands: A national wetland data layer indicates that the majority (>75%) of modelled wetlands in GRNP are in good ecological condition and that 64% of these wetlands have been identified as FEPAs. The wetlands of the GRNP are estimated to represent 19 of the 791 national wetland ecosystem types (Roux et al. 2013). The accuracy of this data has not been verified by field studies. Only the wetlands in and around Knysna have been mapped at a fine scale and these represent opportunities for rehabilitation (Hayes et al. 2016). Except for these semi-urban wetlands, the wetlands of the GRNP are largely unmapped and remain poorly understood.
- Groundwater: Very little information is available on the groundwater aquifers that directly relate to the GRNP.
- Management challenges - The main freshwater management challenges are related to:
 - a) *Fragmented catchment ownership*: Freshwater ecosystems are highly connected systems and impacts across a catchment tend to result in cumulative downstream effects. The fragmented nature of the conservation areas in the Garden Route poses significant challenges to the conservation of especially downstream river reaches as well as lakes and estuaries. For example, the majority of the rivers associated with the GRNP flow through parts of the park as opposed to being contained within the park boundaries. In the Tsitsikamma section of the GRNP, mainly the very lower reaches of the major rivers occur in the park. Notable exceptions are the upper reaches of the Palmiet River in the contractually managed Soetkraal properties, and the Groot (West) River that occurs within the park. For the majority of rivers, many anthropogenic changes to rivers originate in catchment areas outside of parks and are consequently processes or activities over which SANParks has little or no influence.
 - b) *Reduced ecosystem variability*: The long-term resilience of most ecosystems is maintained through extreme events, rather than average occurrences. For river systems, high flows or flood events are particularly important. However, human activities such as water abstraction and damming of catchment drainage has reduced hydrodynamic extremes and altered ecological processes associated with some of the rivers that flow through the GRNP. As a result, these systems are on trajectories of change with a large degree of uncertainty as to the states that they may change into in future.
 - c) *Overlapping legislative mandates*: The Department of Water and Sanitation (DWS) is the national custodian of water resources and responsible for regulating its use, sometimes through catchment management agencies where these exist. SANParks can influence such management through participation in relevant fora. Catchment Management Agencies (CMAs) are in theory the appropriate institutional structures for engaging in local-scale water resource management. Two of South Africa's nine CMAs overlap spatially with the proposed landscape, namely the Breede-Gouritz CMA in the west and the Mzimvubu-Tsitsikamma CMA in the east.
- Ecosystem services - The multiple services and benefits that people get from freshwater ecosystems in the Garden Route, including water provision, recreation and sense of place, is a defining feature of the area. The concept of ecosystem services could provide useful

framing for future research and learning about the relationship between the conservation of freshwater ecosystems and the contribution of freshwater to human well-being. Assessment of water-related ecosystem services (and disservices) presents a promising way of advancing understanding of the sustainability of, and trade-offs between, critical services, and improving equity in the distribution of associated benefits. Such work may best be advanced in partnership with external research partners

- Estuary management in GRNP -The Garden Route National Park is a world-renowned conservation area and tourism destination famous for the diversity and extent of its Forest, Fynbos, estuary and marine ecosystems. Of all of these ecosystems, estuaries are arguably the most intensively utilised, altered and endangered. There are eleven estuarine systems in the GRNP representing all five different South African estuarine types, including an estuarine bay (Knysna) permanently open estuary (Salt), temporarily open/closed estuary (Groot West) estuarine lakes (Wilderness; Swartvlei) and river mouths (Bloukrans, Lottering, Elandsbos, Storms, Elands, Groot East). A portion of the mouth of a twelfth estuary, Noetsie, at times migrates to within GRNP. Some estuaries may comprise more than one type, with the upper portion of the Knysna system functioning as a permanently open estuary, and two temporarily open/closed estuaries (Touw, Swartvlei) connecting the lake systems with the marine environment. Finally there are ten small river inlets, mostly along the Tsitsikamma coastline (Kranshoek, Brak, Helpmekaars, Klip, Witels, Geelhoutbos, Kleinbos, Bruglaagte, Langbos, Sanddrif), which although unlikely to permanently support estuarine biota, will at times like estuaries, discharge fresh water, land derived sediments, particulate matter and nutrients into the marine environment. Several of the estuaries in the GRNP, particularly the larger systems, are high conservation value ecosystems assessed according to their physical and biological attributes, habitat importance and rarity, whereas the river mouths along the Tsitsikamma coastline are of lower conservation value (Turpie et al. 2002). Out of South Africa's ±250 estuaries those in the GRNP are ranked (from West to East): 24th (Wilderness), 6th (Swartvlei), 1st (Knysna), 223rd (Noetsie), 83rd (Salt), 81st (Groot West), 102nd (Bloukrans), 186th (Lottering), 210th (Elandsbos), 144th (Storms), 225th (Elands), and 215th (Groot East).

In addition many GRNP estuaries have high economic value in terms of the services they provide for recreation and property value, subsistence utilization, nursery function through providing habitat and nursery grounds for marine and estuarine organisms which can either be exploited directly in the estuary or later in life in coastal areas, as well as largely none monetary scenic value. Particularly valuable in monetary terms are the larger, extensively developed system of Knysna, Wilderness and Swartvlei (Table 2), with several of the smaller systems being highly valued in terms of their scenic beauty and perceived high biodiversity (Table 2).

Table 2. Estimates of the recreational, subsistence and nursery value of estuaries, and their relative existence value (which is largely associated with scenic beauty), modified from Turpie et al. (2012).

Estuary	Value: Recreational (R millions/y)	Subsistence (R millions/y)	Nursery (R millions/y)	Scenic/Existence
Wilderness	>100	0.05-0.1	10-20	Medium
Swartvlei	50-100	0.05-0.1	50-100	Medium
Knysna	>1000	>0.5-1	>100	High
Noetsie	0.05-0.5	<0.05	0.1-0.5	Medium
Salt	<0.05	<0.05	1-5	High

Groot (West)	5-10	<0.05	1-5	High
Bloukrans	0.05-0.5	<0.05	<0.1	Medium
Lottering	0.05-0.5	<0.05	0.5-1	Medium
Elandsbos	0.05-0.5	<0.05	0.1-0.5	High
Storms	0.05-0.5	<0.05	<0.1	Medium
Elands	0.05-0.5	<0.05	<0.1	Medium
Groot (East)	0.05-0.5	<0.05	<0.1	Medium

The high value of several GRNP estuaries comes at an environmental cost, with several being intensively utilized, developed and manipulated. The nature and extent of alteration and manipulation varies between systems and includes changes in freshwater inflows, artificial breaching of total organic carbon systems, shoreline developments, bank stabilization, resource utilization particularly fishing and baiting, recreational use particularly boating, disturbance of biota, introduction and establishment of alien biota, sedimentation and pollution and so forth. Particularly affected are the four larger systems of Knysna, Wilderness, Swartvlei and Groot (West), with the Salt and the river mouths being relatively unaffected other than in some cases concerns about freshwater deprivation and pollution. The objective of SANParks is to identify, prioritize, and implement management actions for the conservation and wise use of estuaries in the GRNP, thereby minimizing, mitigating and where possible reversing deleterious changes and maintaining healthy, diverse and productive systems for the benefit and enjoyment of all.

Gouritz Cluster – The Dorps River rises on the north side of the Swartberg in the northern extreme of the GCBR. This river is the major source of municipal and irrigation water for the village of Prince Albert. The past 30 years has seen the population of this small village increase from 3500 to 13,000 people. Demands on the water source has increased while increasing temperatures, floods, fires and reduced rainfall have made river flow more stochastic.

Wolwekraal Nature Reserve lies immediately downstream of the village and sewage works and includes a two kilometre stretch of the Dorps River. However, over the past five years the river has ceased to flow as a result of socioeconomic impacts and climatic changes, with the resultant death of the riparian trees and reduction or disappearance of riparian fauna including amphibians, insects, birds and mammals. Some of the functions of the river, in terms of provision of water and biomass production, may have been replaced by flows of partially treated sewage effluent into the nature reserve from the water treatment works. Furthermore, the solid waste disposal site adjacent to the Dorps River poses a threat to ground water quality through potential for seepage and dispersion when the river floods. The Dorps River system is in many ways typical of other river systems in the Gouritz-Baviaanskloof area.

The effect of climate change on the hydrology of the Dorps River catchment, and of land use and socioeconomic changes on the downstream hydrology and ecology of this river hydrology, water quality, and river geomorphology has not been quantified, nor has the concept of the ecological reserve for rivers been tested for this or other rivers supplying both ecological services and human and agricultural needs in the Gouritz –Baviaanskloof system. The Dorps River mountain to plains system is a microcosm offering many opportunities for trans-disciplinary case studies in terrestrial-fluvial-groundwater interactions.

2.9. The opportunity presented by this landscape to observe social-ecological systems in the South African developmental context.

Bretagnolle et al. (2019) describes a social ecological system as an entity composed of two coupling interfaces, the adaptive management interface and the ecosystem services interface, both set within an explicit landscape context and presents a conceptual framework of a social ecological system which we adopt. The originality in this framework is the emphasis on explicit components that will directly contribute to changing the trajectory of social ecological systems (Bretagnolle et al. 2019). We also emphasise the intertwined nature of social-ecological systems (Folke et al. 2016), i.e. that “social” and “ecological” processes are intimately linked in the landscape, and that the categorization of these into two different subsystems is essentially arbitrary.

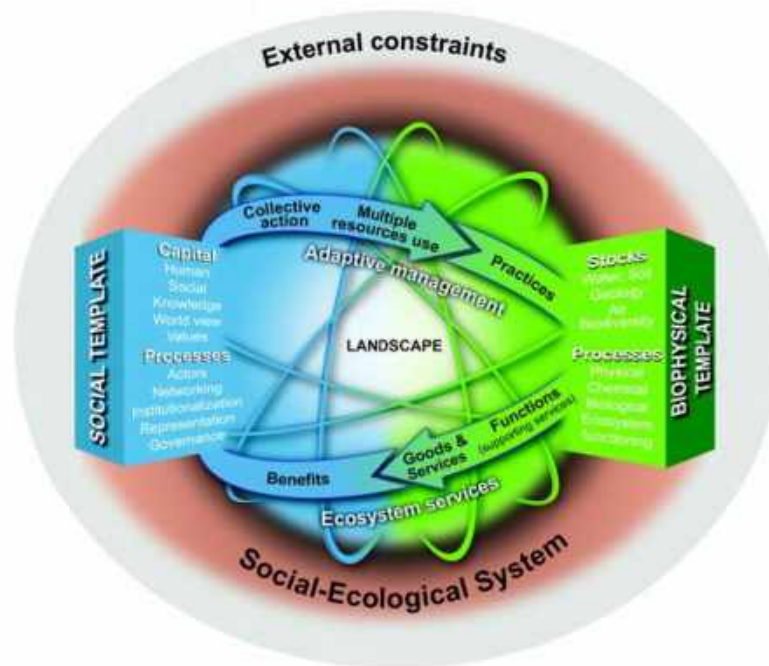


Figure 8. Social ecological systems (SES) conceptual framework developed by Bretagnolle et al. (2019).

The Bretagnolle et al. (2019) framework presented in Figure 9, combined with the ‘essential variables’ framework of Guerra et al. (2019) presented earlier (Figure 3) provide a powerful scaffolding for long term social-ecological data collection. The meta-landscape is a multi-functional mosaic that provides food security, water, tourism, recreation and livelihood opportunities, maintenance of species and ecological functions, and meets cultural, aesthetic and recreational needs. Therefore instead of dividing the landscape into its social and ecological components, we thus recognize it as a multi-functional mosaic that provides ecosystem services. All of these “elements” include social and ecological processes, and are also intricately linked to each other. For example, healthy water catchments that provide clean water to communities downstream and buffer against floods and fire are dependent on ecological processes as well as watershed management, and also impact aesthetic, cultural and recreational values of the landscape, which in turn feedbacks to positive or negative changes in ecological systems and support for watershed management, protection and governance.

Given the intertwined and complex nature of social-ecological systems, understanding such change goes beyond noticing social and ecological change processes. To understand the connections and feedbacks between these processes requires the involvement of many different stakeholders and knowledge systems at different scales, engaged social learning, and systems that can respond to change though, for example, collaborative adaptive management. Perhaps one of the greatest strengths of this landscape is the capacity of partners to engage in these transdisciplinary processes (some partners are world leaders on topics such as social learning and adaptive governance), and their long history of transdisciplinary engagement. These documented learnings, together with

extensive historical social and ecological data (see section 2 and 4.2.), puts this proposed landscape at a distinct advantage for observing and understanding complex social-ecological change.

Below we describe some of the social-ecological changes that characterize the Garden Route and Gouritz Cluster.

Garden Route - The Garden Route National Park which is embedded in the landscape forming the core zone of the GRBR incorporates towns such as Knysna, Wilderness and Sedgefield in its bounds. These areas represent interesting lived-in, integrated urban conservation landscapes in transition to understand trade-offs, practices, social processes, institutional arrangements, government strategies and systems. The Kromme River catchment, of which parts fall within the GRBR, is a mainly agricultural landscape with the town of Kareedouw as its economic hub. The river is well situated for research on peatlands, indigenous fishes, and hydro geomorphological phenomena. The riparian zones have been highly invaded by *Acacia mearnsii* (Black wattle), which significantly impact on the hydrology of the river and its capacity for consistent quality and quantity of water supply to its instream dams and the upstream agricultural lands. The land use in the Baviaanskloof catchment ranges from essential oil production (mainly rosemary and lavender) to livestock farming (mainly goats and sheep) and large-scale Lucerne production. Small community settlements in the lower reaches of the catchment represent interesting social ecological dynamics to understand in the South African development context.

Gouritz Cluster – Landscapes in the GCBR are characterised by astounding variety and transition. An extensive coastal platform ranging from five to forty kilometres wide links the coastal zone to the foothills of the Outeniqua and Langeberg Mountains. While the intact upland landscapes are largely state owned and managed for nature conservation and water production, much of the less rugged foothills have been cleared for agriculture. The Little Karoo basin is a semi-arid landscape where irrigated agriculture is restricted to riparian areas with access to perennial streams. The area is a major centre of ostrich production. These, and other livestock, have caused extensive degradation of the natural vegetation (Lombard et al 2010). In addition, over the past century large areas have become invaded by alien trees. The historical development of the social ecological system has seen increasing exploitation of, and dependence on, water resources and decreasing resilience, both ecological and social. The modified system is now fragile and vulnerable to climatic and economic volatility. Threats to natural habitat, especially soils, come from out-dated agricultural practices, invasive alien vegetation, too-frequent and catastrophic fires. Overgrazing and severe trampling by livestock has led to a reduction in vegetation cover. Riparian vegetation is typically more productive than the adjacent dryland environments, and as a result has been heavily grazed. Together with large-scale clearing for cultivation, has led to severe land degradation (Le Maitre and O'Farrell 2008). In addition, the entire domain has inherited problems caused by farming in marginal areas. Abandoned farms and old lands cause severe erosion, impacting greatly on water quality and flow patterns of rivers. The situation is aggravated by a changing climate towards hotter, drier conditions with more frequent flash floods.

Landscape degradation has undermined vital ecosystem services, including *inter alia* soil erosion and flood control, water infiltration, biodiversity, nature-based tourism, and carbon capture and storage. These in turn has led to rising costs, lower farming returns, chronic unemployment and vulnerability to shocks. With the loss of vegetation cover and erosion, soils become depleted, lowering plant productivity and hence livestock yields. In an economy dominated by agriculture this has had serious consequences especially for poor households. High levels of poverty in the landscape require a special focus on livelihoods, and there is a need to generate opportunities for the urban and rural poor. The depressed economy has led to out-migration of skilled individuals, leaving a weak social system with little capacity to innovate.

Landowners tend to focus on enterprise survival with little regard for a big picture landscape or economy. With large scale long-lived plant die-offs, Karoo productivity is unlikely to recover to former levels. Emerging conditions are likely to make future farm enterprises more vulnerable, with

limited resources for long term management, but with incentives for short term exploitation and survival. Furthermore, public conservation initiatives are at risk with declining government investment in a post-COVID pandemic economy and public finances in a very perilous state.

With climate change, the Klein Karoo is seeing large-scale abandonment of extensive agriculture as a land use, coupled with shifts towards intensification where water allows and game farming in the remaining unproductive land. Recent fire trends in mountain protected areas highlight suboptimal fire regimes putting high value biodiversity at risk. In the coastal plain, conventional farming techniques are placing pressure on adjacent ecological systems. A strategic opportunity is to encourage or incentivise a shift from unsustainable farming towards a nature-based economy, largely with conservation agriculture and ecotourism. There are now several successful examples of privately financed conservation estates, like Sanbona, Gondwana and numerous stewardship sites, effectively managing biodiversity. Also, conservation wheat farming methods are showing higher returns to farmers during drought, and reduce agricultural impacts on ecology.

3. The landscape location in the face of global change.

3.1. The presence of representative near-natural land cover

Garden Route - Garden Route National Park, the numerous Nature Reserves and mountainous regions in the landscape mentioned above in section 2.2 and illustrated in Figure 5 represent near natural land cover where key ecological processes are autonomous. Together with the near natural landcover the areas transformed for a diversity of land uses such as agriculture and pine plantations contribute to the patchwork of novel and hybrid ecosystems, conservation areas, plantation forestry, wetlands, coastlines and estuaries in the landscape.

In the Garden Route area 285442ha (48.0% of the total land area) is natural and/or supports indigenous vegetation, whereas 68464 ha (11.5%) supports plantations, 117931ha (19.8%) is used for agriculture, 14570ha (2.5%) is under urban development, 1340ha (0.2%) is covered by impoundment, and the remaining 106888ha (18.0%) is either heavily degraded or supports various densities of invasive alien vegetation. Of this latter category, 15768ha (2.7%) is heavily invaded. Of the remaining natural areas, approximately 53194ha (18.6%) supports indigenous forest, 170236ha (59.6%) is predominantly Fynbos, 20686ha (7.2%) is riparian, 5512ha (1.9%) is renosterveld, 6502ha (2.3%) is thicket, and 196ha (0.1%) supports grasslands.

Over the past 20 years 26377ha of land previously managed by Mountain to Ocean (MTO) has been transferred to SANParks for incorporation into the GRNP. This land, known as exit areas, was in many instances previously used for plantations, and has, or will be, rehabilitated to support indigenous vegetation. Areas transferred in different forestry compartments are Bergplaas (6079ha), Buffelsnek (7558ha), Homtini (6262ha) and Jonkersberg (6478ha).

Gouritz Cluster – The Core areas of the GCBR consists of established, legally protected areas. These include government properties which are long established as nature reserves to declared private conservation areas which are protected by legislation (Total size of all properties included terrestrial (605675.3 ha) and marine (3169.5 ha). The primary objective of all these core conservation areas is the conservation of biodiversity and associated ecological processes.

There are several classes of conservation/protected areas located within the core area of the GCBR. They consist of statutory protected areas and land owned by WWF-SA (Protected Areas and Declared Mountain Catchment Areas managed by the Western Cape Nature Conservation Board), statutory protected areas managed by SANParks, Declared Private Mountain Catchment Areas (private land protected under the Mountain Catchment Areas Act, 1970 (Act 63 of 1970)), and Stewardship sites (Contract Nature Reserves and Biodiversity Agreement Sites registered in terms

of the Western Cape Nature Conservation Board Act, 1998 (Act 15 of 1998)) or the NEM: Biodiversity Act (section 44 of the Biodiversity Act, 2004 (Act 10 of 2004)).

3.2.The projected climatic impacts

Due to its physical location, topography and the climatic conditions of the Garden Route District Municipality the area is particularly vulnerable to the impact of climate change. Climate change is already harming food production and these impacts are projected to increase over time, with potentially devastating effects. The area will experience higher mean, maximum and minimum temperatures; general drying trends in the western parts of the country, a shift to more irregular rainfall with intensification of rainfall events together with drier conditions. Furthermore the region will experience increased mean sea level rise associated to storm surges. More frequent and large scale droughts and flooding will put a further strain on the already critical water problem that the Garden Route District is currently experiencing. The impacts will include increased evaporation and decreased water balance.

The most threatening aspects of climate change to the conservation of the biodiversity of the Garden Route District are shrinking optimal bioclimatic habitats with warming and potential drying; changes in ecosystem structure and composition in response to modification of environmental conditions; increase of fire frequency; impact on freshwater ecosystems (floods and droughts); sea level rise impacting on marine organisms and coastal ecosystems infrastructure; soil biodiversity especially related to soil fertility and the production landscape.

High risk areas, predominantly closer to estuaries and lagoons, include the Groot Brak and Kaaimans River. The areas with the greatest overall average risk include Sedgefield- Swartvlei lagoon; Wilderness East and Wilderness West; Knysna; Bitou; Hartenbos; Keurbooms-Bitou; Nature's Valley; Klein-Brakrivier; Groot- Brakrivier; Walker's Bay and Mossel Bay as well as Hessequa and Stilbay (DEADP 2017). The highest risk periods are during winter months when storm events, due to passing frontal systems, are more likely. (Garden Route District Municipality IDP 2020-2021).

In the Eastern Cape portions of the GRBR landscape climate change predictions suggest higher temperatures, increased unpredictability of rainfall regimes, more intense rainfall (flooding), longer dry spells (drought periods), increased storm events and sea level rise. A study by Hewitson and Crane (2006) suggests increased summer rainfall in the interior and eastern parts of South Africa. This is likely to cause biodiversity changes or losses, for example decline in grasslands and increase in thicket vegetation types, changes in species distributions increased woody alien species and sea level rise coupled with increased pressure on natural resources by society, impacting significantly on coastal vegetation types, particularly where transformation will prevent species movement inland. Scientists estimate that the extent of Fynbos will decline by 51- 65% over the next 50 years due to climate change, depending on the climate change scenario, including 51- 61% of Succulent Karoo (Kouga Local Municipality -SDF 2015). Responses of biodiversity, fire regimes, catchment hydrology, geomorphology, agricultural practices, water management, and human livelihood strategies to these changes in climate can be observed. Observations of the salt marshes in the estuaries like the Kromme to accrete sediment at the same rate as current sea-level rise and what the implications will be of accelerated sea-level rise. Furthermore considering how the Kromme River and Impofu Dams impact sediment and water supply, the reduction in sediment supply from the catchments is of interest. Changes in form function and biodiversity can be observed.

3.3. Transition zones between biomes that occur within the proposed landscape.

Garden Route – The Garden Route landscape is a multi-functional mosaic of land uses which simultaneously provide food security, water, tourism, recreation and livelihood opportunities, maintenance of species and ecological functions, and meets cultural, aesthetic and recreational needs. In addition to the priority special habitats, rare species and biodiversity hotspots, much of the landscape consists of constantly adapting, novel, hybrid ecosystems (Evers et al. 2018) which are altered by humans and therefore have different species composition and ecological processes, relative to their previous unaltered state. Novel ecosystems can be self-organizing and can produce useful bundles of ecosystem services, yet with unknown trade-offs for food, tourism, biodiversity, water and timber compared to more intact ecosystems. These habitats present opportunities to understand the key drivers of biodiversity change and ecosystem services due to human disturbance. The governance of these landscapes however illustrates the challenges of environmental governance in the Anthropocene, with many provincial, national and local government entities, civil society bodies and community-based institutions playing governance roles. Biosphere reserves are well placed to understand which policies, management strategies and governance systems promote long term sustainability.

Biome transitions - The Kromme catchment area lies at the eastern extent of the Fynbos biome and the Table Mountain Group (TMG) geological region with near transitions to Albany Thicket to the east and Karoo vegetation to the north. Inclusion of the neighbouring Kouga and Baviaanskloof catchments in a larger monitoring network would allow for exploration of the transitions between biomes. The Baviaanskloof represents a merger of seven biome types of South Africa: Fynbos, Grassland, Forest, Subtropical Thicket, and Succulent Karoo, Nama Karoo and Savanna. The spatial, climatic, and social heterogeneity of the landscape makes for an incredibly diverse and useful case study.

Mountain to ocean transitions - In the landscape the topography ranges from steep mountain areas to floodplains to the coastal plains and estuaries present a catchment to coast transition. The catchments also contains valley-bottom wetlands (peatlands) in varying states of integrity all of which present ideal opportunities to observe altitudinal variants from mountain to ocean in the landscape.

Land use and land cover transitions – Notable land use and land cover transitions to date have been conversion of Fynbos and Palmiet (*Prionium serratum*) wetlands to *Phragmites spp.*, or into fields and orchards, invasion by *Acacia mearnsii*, and grazing, harvesting, and fire management in less completely transformed areas. The Kromme catchment includes both protected and relatively pristine areas, as well as human transformed systems and areas of dense invasive alien vegetation and extensive ecosystem restoration attempts by Working for Water and Wetlands. Some areas that have been completely transformed for agriculture (mostly pastures and fruit orchards) or settlement, and areas impacted by managed burning, grazing, and IAP infestation. Additionally, in the Baviaanskloof the land-use types range from small, secluded settlements within a largely agricultural landscape, to protected natural areas which can add to the complexity of the system. These transitions from near pristine areas to transformed landscapes present an opportunity to understand the dynamics of these transitions. Impacts of these forms of land use change on biodiversity, catchment hydrology, water quality, river geomorphology, and linked ecosystem services can be explored and how different faunal groups respond to land use and cover changes can make for useful comparisons.

Gouritz Cluster - The GCBR is subdivided into four sectors or clusters: Towerkop, Kammanassie, Langeberg and St. Blaize. The landscape is characterized by remarkable variety and transition and is where three recognized biodiversity hotspots converge (Fynbos, Succulent Karoo and

Maputoland-Tongoland-Albany). Along the shore fine-grained sandy beaches and dunes alternate with wave-cut platforms and exposed headlands. Deeply incised river valleys cut into the coastal platform, terminating in estuaries and forming coastal lagoons in places. The Outeniqua and Langeberg Mountains separate the coastal region from the Little Karoo, forming a natural barrier between the southern cape and the interior. Inland the Kammanassi, Kouga and Swartberg mountain ranges form the northern and eastern boundaries of the reserve.

3.4. Expected development pathways for the landscape

A number of development corridors and 'anchor towns' in South Africa have been earmarked by the government as areas for potential growth, with plans to support and fund them under a new Draft National Spatial Development Framework (NSDF). The spatial development plan will focus on strengthening areas along major roads and uplift 'anchor towns' with the coastal corridor from Richards Bay, through to Cape Town which will receive attention. It would strengthen and consolidate existing regional development anchor towns on strategic routes including George and Mossel Bay. The Coastal Growth and Development Corridor along the south coast (N2) is supported as an area of strong interconnection between high-value rural resource production, ecological resource regions, popular tourist destinations, comfortable climatic zones and urban nodes. The development plan will see the strengthening and consolidation of existing corridors including the Garden Route (Mossel Bay to Nelson Mandela Bay).

The Garden Route District Municipal area growth and development strategy is provided in the latest 2020-2021 Integrated Development plan. The district hopes to focus on environmental sustainability strategic infrastructure investment in order to spatially reconfigure the district, generate jobs and boost economic activity. An infrastructure audit is planned to guide investment. Other focus strategic areas include economic development and support in sectors such as tourism, agriculture, agro-processing; education and skills development to mobilise stakeholder around a single human resource development strategy for the region that addresses life long and quality learning with the aim of ensuring higher employment, productivity and entrepreneurship levels in the communities. Furthermore safety and empowerment of communities and institutional development will also be focused on.

At a Garden Route Investment Conference held in 2018, future initiatives were also announced. These included a Garden Route International Convention Centre; a new precinct focused on light industry, warehousing and logistics; the development of the Silicon Park Science and Technology project; the establishment of a hub for business process outsourcing; an ICT incubator and broadband expansion; the establishment of an Agri park and the creation of the Destiny Africa Ecosphere Project tourism and business hub, and the establishment of a resort for tourists at the Gwaing River mouth 10km from George (Wesgro Property Report 2019).

Additionally, In February 2019, French oil major, Total, discovered a world-class oil and gas reservoir in the Outeniqua Basin off the coast of Mossel Bay, 46kms from George, which could conservatively deliver over R1 trillion to the South African economy over the next 20 years. The growth that this could bring to the Garden Route District is significant, boosting job opportunities as well as demand for infrastructure and housing, the latter of which, in particular, could also boost George's already diverse and well-developed property market (Wesgro Property Report 2019).

In the Kromme region area of expected future development include urban, agriculture, mining or energy.

4. Logistical and operational suitability of the core and associated sites, including interalia:

4.1. Security of tenure for the operations, particularly for the core site

The consortium is proposing the George Campus of the Nelson Mandela University as the core site in the landscape. Nelson Mandela University's George Campus owns and manages a minor portion (approximately 80 Ha) of the proposed landscape. The campus is surrounded by Afro-montane Forest, pine plantations and Fynbos.



Figure 9. Aerial view of the Nelson Mandela University, George Campus embedded in the natural landscape.

The campus grounds has 24 hour security and a protective services team which control entry onto the campus grounds and regularly patrol the site. Furthermore, access to buildings on the campus is also controlled. This offers the core site peace of mind in terms of the security of offices, equipment and the instrumentation that may be placed on the campus grounds.



Figure 10. Security office and access boom at the entrance of the Nelson Mandela University, George Campus.

A large portion of the proposed landscape (GRNP) is in the custodianship of the SANParks, one of the consortium partners. The GRNP constitutes the core area of the Garden Route Biosphere Reserve, with government-owned, private, and municipal land constituting the remainder.

The Garden Route and Gouritz Cluster Biosphere Reserves, together with SANParks can offer EFTEON the necessary security of tenure for long term operations and placement of instrumentation in the landscape. As consortium partners in this nomination, their full support is provided.

4.2. Existing facilities for hydrological observations including inter alia, gauging weirs, dams, testing boreholes et cetera.

Garden Route – The DWS Report List of hydrological gauging stations July 1990 G.P.-S. 028-0165 lists multiple historic and active gauging weirs, gauging plates and sample points in rivers and impoundments in the Garden Route region including the rivers Hartenbos, Brandwag, Moordkuil, Groot Brak, (Mossel Bay area) Kaaimans, Rooi, Malgate, Malgas, Touw, Swart (George area), Hoekraal, Karatara, Diep, Gouna, Knysna (Knysna area), Keurbooms, Bloukrans, Kruis and Elands, (Tsitsikamma area). In stationary waterbodies gauging stations occur or have occurred in Wolwedans Dam, Garden Route Dam, Touw Estuary, Eilandvlei, Langvlei, Rondevlei, Swartvlei, Groenvlei and Groot Estuary. DWS monitoring of aspects of water chemistry in the Wilderness lakes, principally phosphorous and nitrogen based plant nutrients and salts, has been undertaken mostly monthly since the mid-1970s

There is a database of 50 past and present meteorological stations in the Garden Route, either private or mostly publicly owned, with many operated indirectly by the South African Weather Service (SAWS). These range from high level stations such as at the George Airport, to a rain gauge at an isolated forestry station. Weather.co.za lists 27 active online, mostly privately owned or sponsored weather stations throughout the Garden Route, several of them providing real-time information on rainfall, temperature, humidity, wind speed and direction.

Several long term hydrological observations are being taken in the Baviaanskloof area. These include:

- The River Health status of Rivers is being monitored by DWS at 21 localities in all quaternary catchments within the landscape.
- Long-term monitoring of catchment hydrology has been undertaken by SAEON in the Baviaanskloof.
- SAEON tipping bucket gauges at 6 sites in the Baviaanskloof (2014-ongoing, with 1 site 2011-ongoing), ECPTA tipping bucket gauges at 2 sites in the Baviaanskloof (2012-ongoing), SAWS & Agricultural Research Council have various historical daily datasets (Baviaanskloof: none ongoing, 2013 most recent; Kouga: 6 ongoing), DWS at Kouga Dam (1959-ongoing)

- Estimated daily inflow from Kouga & Baviaanskloof Rivers into the Kouga Dam using dam balance (1961-ongoing), SAEON instream water level logging with rating curves at 3 sites (2012 ongoing)
- Floodplain alluvial aquifer shallow groundwater levels - Baviaanskloof: Living Lands staff gauges in open groundwater pits reading quarterly at a minimum (2011-ongoing), SAEON 3 transects of 6 piezometers each (18 total) in and around a floodplain wetland (3 have hourly logging pressure transducers, 15 read manually, 2012-ongoing)
- Bedrock aquifer water levels - Baviaanskloof: SAEON 3 boreholes instrumented with hourly logging pressure transducers (2016-ongoing)
- Water temperature, pH, electrical conductivity: SAEON & University of the Western Cape (UWC) collect quarterly (at minimum) from the river and deep and shallow groundwater monitoring sites in the Baviaanskloof listed above (2016-ongoing)
- Natural stable isotopes (O&H): UWC collect quarterly (at minimum) from the river and deep and shallow groundwater monitoring sites in the Baviaanskloof listed above (2016-2018)
- DWS regular water quality testing downstream of waste-water treatment from Joubertina (Kouga Catchment) and at Kouga Dam
- Estimates of streamflow (since 1957) for the Kromme catchment.
- River water level & estimated streamflow been observed by SAEON & UWC who have 4-5 sites since 2017; Rhodes University (RU) who have 2-3 sites since 2016
- Dam water level & estimated streamflow inflow has been measured by the DWS in the Churchill Dam since 1949 & Impofu Dam since 1983
- SAEON: 20 physical stations in the Kromme Estuary with 4 in situ conductivity/temperature mooring stations; 5 water quality stations since 2012 and NMU with 9 Rod-Set Elevation Table (RSET) sites to measure sediment accretion since 2009
- Soil moisture is being measured from private commercial orchards logging probes by SAEON & UWC and logging probes at *A. mearnsii* stand & paired cleared sites since 2017
- Piezometer shallow (2-3 m depth) groundwater levels are being measured by RU: arrays at 3 sites since 2016, mix of logging & manual; SAEON & UWC: arrays at 3 sites since 2017, mix of logging & manual
- Borehole groundwater levels are being measured by DWS manually and monthly at a minimum of 3 sites in the lower Kromme since 1993; by RU who are logging data at 1 borehole 2016-2019; and SAEON who are logging data at 2 boreholes from 2017
- River & groundwater physico-chemical properties (temperature, pH, electrical conductivity) are being measured by SAEON & UWC at sites across the Kromme River catchment above the Churchill Dam, 4-5 times per year since 2017
- The DWS do routine monitoring at the Kareedouw Waste Water Treatment, Churchill and Impofu Dams
- SAEON are gathering data at 5 water quality sites in the Kromme estuary since 2012 (NH₄, NO₃⁻, Si, PO₄, Chlorophyll)
- Temperature: SAEON & ECPTA gauges in the Baviaanskloof listed above logging hourly, SAWS & ARC various historical daily datasets (Baviaanskloof: none ongoing, 2013 most recent; Kouga: 3 ongoing)
- ECPTA weather station in Formosa Nature Reserve,
- DWS weather stations by Churchill & Impofu Dams, SAWS weather station at the Kareedouw police station), as well as on privately owned properties.
- Due to the farming and the large water supply infrastructure in Baviaanskloof, there is long-term climate data (rainfall gauge data since 1925 and temperature and evaporation pan since 1943) collected by the SAWS, ARC, DWS, ECPTA, SAEON and rainfall data in the Kromme River Catchment
- Evaporation pan data has been collected by the DWS at Churchill Dam since 1949 and the Impofu Dam from 1983)

Gouritz Cluster – The Duiwenhoks catchment has a western and a eastern leg/tributary. The Department of agriculture has focused on the western leg with approximately 30 gabion structures

installed to stabilise severe erosion of the riverbanks, accompanied by alien invasive clearing which is still on-going. Two of these structures are weir type structures that may be used for measuring of flow, although it would be advised that concrete road structures be used for measuring purposes, as the permeability of the gabion structures may complicate accurate measurement. In the eastern leg DWS has been taking measurements at the Duiwenhoks concrete dam wall. Furthermore Overberg Water are measuring flow at an extraction point upstream of the town of Heidelberg which can detect changes caused by interventions implemented in the system. Furthermore the Grootvadersbosch Conservancy is also assisting with alien clearing in the catchment and have been undertaking water quality monitoring.

4.3.Existing long-term observations or experiments

Garden Route - Existing long term sites and research activities in the landscape include:

Forestry

- Long term indigenous forest monitoring sites with permanent plots at Groenkop (established in 1972), Diepwalle (1974), Koomansbos (1988) and Witelsbos (1988) forming part of a national system of plots established for long-term monitoring of growth and mortality in indigenous forests. Gap dynamics research has been on-going in Lottering forests and Storms River, with permanent photo monitoring in several Forest and Fynbos sites
- Consumptive use of timber and non-timber forest products at Diepwalle and Tsitsikamma with more than 800 monitoring plots to track timber utilization impacts over four decades, since 1980;
- Succession and rehabilitation of 'plantation exist areas' in the Garden Route, of which 26,377 ha has been handed over to SANParks for restoration and incorporation into Garden Route National Park
- Costs of forest and plantation management, including invasive species management costs and benefits are being monitored in multiple sites, and has been on-going since the mid 1990s with the establishment of Working for Water's social responsibility projects;
- Plantation forestry trends and water use: private forestry companies and DWA

Biodiversity

- Plant species of conservation concern are being monitored by Custodians of Rare and Endangered Wildflowers (CREW), under the auspices of SANBI, with all occurrences stored in a GIS;
- Wildlife monitoring using faecal pellets started in 1976 and is still on-going, while rare monitoring with camera traps started in 1990
- Water bird species composition in the Garden Route lakes and estuaries have been monitored in winter and summer since the early 1980s;
- Angler activity has been monitored on an on-going basis at Nature's Valley since the early 1990s
- Citizens science involving bird counts; butterfly monitoring; rare plant monitoring via CREW; fish monitoring; river pollution monitoring; problem animal monitoring; distribution of wild species through iNaturalist media. Many of these citizen science activities are being coordinated by the Garden Route Botanical Garden Trust. At a much larger spatial and temporal scales, the Astronomical Society of South Africa has an active branch in the Garden Route. Nature's Valley Trust coordinates a host of citizen science initiatives in the Tsitsikamma-Plettenberg Bay area.
- Research pertaining to plant community assemblages has also been done since monitoring first started in 1991, 2011, and is expected to continue from 2021. This work evaluates plant community assemblages within the context of species functional types and environmental conditions (Aiello-Lammens et al., 2017).

- A set of permanent plots have been laid out by SAEON to monitor plant community composition with respect to varying ecological niches (J. Slingsby).
- Invasive alien plant data: collected and managed by SANParks and Dept of Environmental Affairs Working for Water

Land use

- Provincial land use is being monitored under the Garden Route Regional Spatial Implementation Framework of 2019, and the Garden Route Spatial Development Framework of 2017. Regional Value 1 (economic social and environmental value and resilience) require the long term monitoring of 1) alien vegetation land cover; 2) river health; 3) land use planning decisions; 4) urban development, in relation to scenic areas and coastal setback lines; 5) fire management practices; 6) waste recycling.
- Long term tourism statistics are being kept by Wesgro under the Western Cape Provincial Government, as well as various local municipalities.
- Several historical experimental sites are located along the catchment, ranging from soil manipulation to improved infiltration and reduced erosion. This is especially relevant in the Baviaanskloof area where large-scale environmental degradation has significantly reduced plant cover and has left soil unprotected.
- Land use data: managed by GRDM to inform the Garden Route Spatial Development Framework
- Agricultural production and land use: Western Cape Dept of Agriculture

Social data and Tourism

- Social data: Statistics SA as well as Global Insight and Quantec data obtained by GRDM
- Tourism data: managed by GRDM and various larger local municipalities (George, Knysna, Plettenberg Bay, Mossel Bay)
- Long term studies undertaken by SANParks on e.g. lake sedimentation; water bird numbers and distribution; forest dynamics.
- Researchers from international universities, e.g. Exeter in the UK, Arizona State in the US, Raadboud in Netherlands, Monash in Australia, University of Bonn in Germany, University of Lyon and Angers University in France and CNRS in France have been conducting social-ecological research in the proposed landscape. CSIR, supported by Santam Insurance, has been conducting disaster resilience work as well as integrated catchment management research in the study area.

Weather and air quality

- Air quality and emissions: GRDM database
- Weather data collected by SAWs at the George Airport

Water quality

- Water quality: collected by DWA in more than 20 sites
- Estuarine water quality monitoring by local municipalities

Garden Route District Municipality's (GRDM) Disaster Management Unit

- Disaster risk assessment data: weather, land use and climate change data managed by the Garden Route District Municipality (GRDM) and Garden Route Environmental Forum (GREF)
- Coastal setback lines and sea level rise data: managed by GRDM

Baviaanskloof - Existing data and studies done in the Baviaanskloof includes:

- Soil properties: SAEON & Rhodes University floodplain soil texture, organic matter, and rock content for transects across a floodplain in the central Baviaanskloof including floodplain wetland; Living Lands & Wageningen University soil texture, organic matter, and rock content under Spekboom Thicket and paired degraded open areas across a fence-line contrast in the Baviaanskloof;
- The soil carbon baselines for the Subtropical Thicket Restoration Project included: soil C, bulk density, rock volume, soil depth. The data was limited to 30 plots on 3-4 farms.
- The soil carbon baselines for the GEF5 SLM Project included: soil C, bulk density, rock volume, soil depth. The data was limited to 30 plots on severely degraded thicket, 30 in moderately degraded thicket and 30 plots in intact thicket (on 2 farms).
- Soil stabilization and revegetation projects are underway in the Baviaanskloof, for which vegetation cover changes are monitored via fixed-point photography and drone imagery.
- Work towards a restoration protocol exploring the role of nurse plants (Yondela Norman).
- Detailed landscape carbon baselines have been completed for the intact and degraded thicket (roughly n = 200).
- Four of the 300 thicket wide plots for the Subtropical Thicket Restoration Programme are located in the Baviaanskloof (van der Vyver 2017).
- Detailed plant species biodiversity for 30 baselines have been completed for the Subtropical Thicket Restoration Programme (Lunderstedt n =30)
- Aboveground and litter biomass was calculated for 190 plots across the Baviaanskloof (Powell 2009).
- The GEF carbon assessments have assessed above-ground biomass and litter - limited to 30 plots on severely degraded thicket, 30 in moderately degraded thicket and 30 plots in intact thicket (on 2 farms)
- Plant species herbarium is being developed for the Baviaanskloof, which is used in development of a plant book for the area (D. Euston-Brown)
- Research into social-ecological systems has been done around the catchment, investigating landscape stewardship and its place in addressing sustainability issues (J. Cockburn).
- Change of land-use from ungulate farming (mainly goats) towards regenerative farming of essential oil-producing plants
- Landscape-scale work done on various agricultural aspects of the Baviaanskloof, with a focus on soil processes (F. Knight)
- Camera traps being used in the Baviaanskloof to monitor mammal activity and how their movements are impacted by anthropogenic influences (M. Beukes; PhD study).
- Baseline data generated through remote sensing is available for landscape degradation in the Baviaanskloof. This dataset provides a good baseline for future monitoring but needs to be validated through ground-truthing
- SAEON has a working database of hydrology, water quality, and weather changes in the Kouga and Baviaanskloof rivers
- AFIS fire data set (not complete)
- Soil carbon data (Dept of Environment, Fisheries and Forestry: Chief Directorate Natural Resource Management)
- Spekboom planting survival data (Gamtoos Irrigation Board % (Dept of Environment, Fisheries and Forestry: Chief Directorate Natural Resource Management).
- Germination on woody thicket spp. (Wilman 2014).
- Spekboom survival and growth in Thicket Wide Plots (van der Vyver 2017)
- Long-term vegetation monitoring plots (Euston-Brown 1995)

Kromme River Catchment - Existing data and studies done in the Kromme River catchment:

- River & groundwater physico-chemical properties have been measured by RU at sites in and upstream of Kompanjiesdrif wetland between 2016-2019 in the Kromme catchment
- River & groundwater stable isotopes have been measured by UWC at sites across the Kromme River catchment above the Kromme River Dam, 5 times per year 2017-2018 and by RU at sites in and upstream of Kompanjiesdrif wetland 2016-2019

- Data has been gathered upstream and downstream of wetlands in the Kromme River catchment which include pH, Conductivity, DO, Ca, K, Mg, Na, Cl, Fe, Cu, Zn, Al, Mn, DSi, SO₄²⁻, COD, Total P, Kj N, NH₄-N, NO₃-N, DOC (Rebelo 2017)
- SAEON, Nelson Mandela University, and Rhodes University have made successful arrangements with private landowners to install monitoring equipment on their properties in return for data sharing. Some of these sites have been active since 2015
- Channel, wetland, & floodplain topography has been observed by RU in a LiDAR survey of the upper Kromme floodplain; channel and wetland cross sections through and surrounding Kompanjiesdrif and Krugersland wetlands. The UWC has sets of surveyed channel and bank cross sections at 5 sites, Working for Wetlands undertook a cross sections survey prior to gabion weir installations (6 sites)
- SAEON undertook Saltmarsh topographic surveys in the Kromme Estuary conducted in 2004, 2009 and due in 2020
- Fish biodiversity survey above Kromme River Dam including invasive fish species and habitat modifications (Living Lands; Martin and Chakona, 2019)
- SAEON and NMU: 9 Salt marsh vegetation, fish, and invertebrate transects since 2009 (and ad hoc earlier) in the Kromme system
- RU, UWC, SAEON: Sampled soil for every piezometer location and core transects in transects across Kompanjiesdrif wetland in the Kromme system
- SAEON and NMU: Soil samples along 9 transects through the estuary salt marsh since 2009 (and earlier ad hoc)
- RU took soil depth to bedrock samples in transects across Kompanjiesdrif wetland
- Indigenous vegetation type ranges (pre-development) in the Kromme system - Euston-Brown 2006
- Historical land-cover mapping was undertaken by Rebelo 2012, 2015 where he mapped dominant cover types from georeferenced aerial photography from 1954, 1969, 1983, 2007 in the Kromme system
- Alien vegetation presence, density, clearing activity and expenditure by management blocks for Working for Water (DEA-NRM) in the Kromme system
- Crop types, irrigation types and water use estimates have been undertaken by DWS in the Kromme system
- Fire history data collection using helicopter and satellite products by ECPTA in the Kromme system
- Wetland vegetation cover and species composition surveys across multiple wetland basins upstream of the Kromme River Dam (Nsor, 2007 - published 2013, Rebelo 2014-2015, 2017 - published 2018, Barclay 2015-2016 - MSc 2016)
- Estuarine vegetation cover and species composition surveys. Conducted in 2004, 2006, 2009-2011 and due again in 2020 in the Kromme estuary

In addition, various government departments and programmes (e.g. local municipality, Department of Agriculture, DWS) collect data on human demographics, agricultural land and water use, and agricultural productivity in the Kromme River catchment.

- Living Lands: ongoing engagement of catchment stakeholders regarding information sharing and networks, IAP clearing and post-clearing rehabilitation, cultivation and sustainable wild harvesting of honeybush tea, and other sustainable farming and livelihood opportunities.
- RU: 3 year project funded by the South African National Biodiversity Institute (two years remaining) focused on improving understanding of Palmiet wetland drivers and appropriate restoration techniques based on these drivers.
- UWC: F.Jumbi PhD in progress: Characterization of flow paths to improve prediction of vegetation impacts on hydrological processes in semi-arid mountainous catchments of the Cape Fold Belt
- SAEON-Fynbos: ongoing climate, hydrometrics, and water physico-chemical properties monitoring to understand catchment function and detect change

- SAEON-Elwandle: Long-term observations of the Kromme Estuary (in situ continuous monitoring programme and Pelagic Ecosystem LTER programme)

Gouritz Cluster - The Gouritz Cluster Biosphere Reserve domain has been the site of numerous studies over the years, including, for example:

- CSIR work on the water resources of the Klein Karoo (e.g. Le Maitre et al 2009).
- Research by SANBI and the Klein Karoo Research Group (primarily bio-physical).
- Ongoing work by the Oudtshoorn Research Farm and the Klein Karoo Seed Marketing company.
- Archaeological research at Pinnacle Point and Blombos caves.
- The GCBR itself gathers data on carbon baselines, extent of restored areas, water quality and socio-economic parameters (through its donor-funded projects).

4.4. The availability of office facilities for staff and guest researchers

The Nelson Mandela University, George Campus is in a position to provide office space for four permanent staff and 5-10 visiting staff and/or students and other site operations. There is a hall, classrooms and a 200 seat theatre and conference room which can accommodate up to 40 people for presentations, teaching and learning activities for researchers, under graduate, post graduate and citizen science groups as well as community engagement events and workshops.



Figure 11. Two hundred seater lecture theatre on the Nelson Mandela University, George Campus.

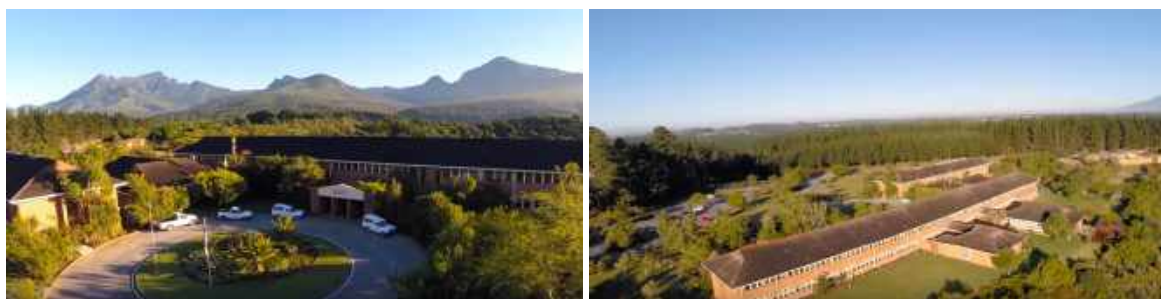


Figure 12. Administration and research building on the Nelson Mandela University, George Campus.



Figure 13. Lecture facilities and student residences on the Nelson Mandela University, George Campus.

There are also laboratory facilities available on the campus which consist of a lecture laboratory for teaching and learning and human capital development which can accommodate 35 people. There are another three labs ranging from 175sqm – 70sqm with the capacity to accommodate between 5-10 people. The laboratories have electricity and water services, are ventilated and fire protected and access controlled. There is cupboard and storage space within the laboratories. All the laboratories can be easily adapted for clean, wet and instrumented use.

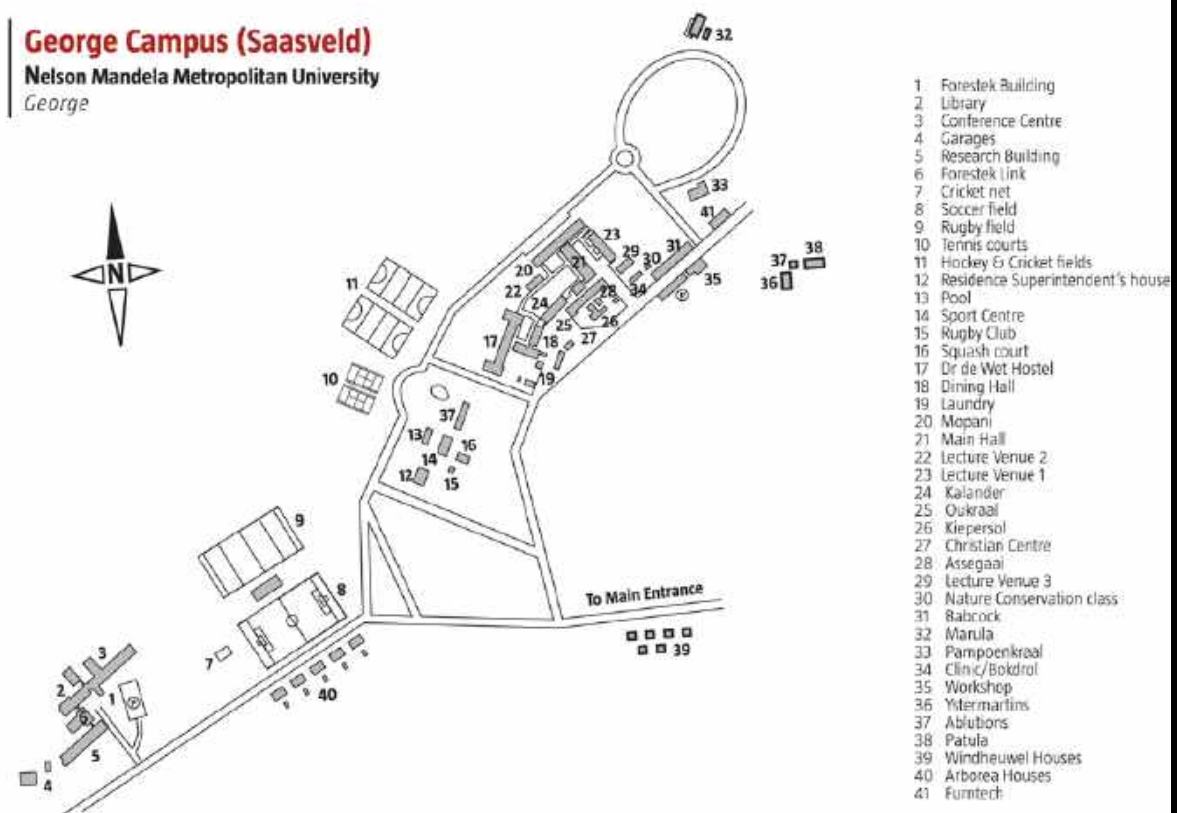


Figure 14. Map of infrastructure on the Nelson Mandela University, George Campus.

4.5. Accessibility of the landscape

The region has a well-maintained road networks with a national highway (N2) and secondary roads running through the landscape making the satellite sites easily accessible.

Garden Route - The George Campus core site is located on the outskirts of the town of George in the Western Cape Province which is exceptionally well endowed with infrastructure and services such as a local airport with 21 daily flights to Johannesburg and Cape Town. In January 2019, the Airports Company of South Africa announced a R100-million upgrade to George Airport over the next five years, including an expansion of the terminal as well as more parking and better traffic flow around the airport area. With upgrades to commence in 2020/21, this will increase passenger capacity from 800 000 people to 1.2 million (Wesgro Property Report 2019). A public bus service branded Go George was launched in 2014, the routes cover a significant portion of the city of George and free Wi-Fi has been installed in 27 wards of George by the Western Cape Government making it the second largest Wi-Fi hotspot cluster in the province (Wesgro Property Report 2019)

George Campus Core Site -The Nelson Mandela University, George Campus, provides a quiet retreat 5 Km from the urban fringe in a mountainous forest setting, In addition to public services the George Campus also has a well maintained emergency generator which automatically activates during power cuts and emergency water supplies. The campus also has fast and well maintained digital networks with many service providers; excellent water security and waste management facilities. The campus has well-functioning catering, laundry services and sports facilities including a 9-hole golf course, swimming pool, squash court, tennis courts, well-equipped gymnasium and trails for walking, running and mountain biking – some parts within Garden Route National Park. On-campus accommodation is also available during university recess periods.

The **Baviaanskloof satellite site** is remote. The nearest town is Willowmore (approximately 77km away) There is however guest accommodation on private farms in the area, and the Baviaanskloof Development Company (Devco) office has Wi-Fi and diesel. There is a police station at Zaaimanshoek (approx 15 km from the Devco) and a padstal which can provide basic needs. There is infrastructure at the Living Lands Studis office to facilitate research in the area.

The **Kromme satellite site** is accessible via a tarred main road (R62) through the centre line of the catchment. Dirt farm roads and hiking trails into many mountain areas (ECPTA or private owners), require a bakkie and in some cases 4x4 There is cell phone reception across most of the catchment area and mains electricity along main roads and most farm houses. There are surrounding small towns with groceries, hardware, pharmacies & clinics at Cape St Francis & St Francis Bay (downstream end of catchment), Kareedouw (near centre of catchment), Twee Riviere/Joubertina (7 km outside of catchment at upstream end). There is research infrastructure at the Living Lands offices at Joubertina and Langkloof office, Twee Riviere - located 7 km outside of the catchment on the upstream end. There are also Nelson Mandela Bay Metropole & DWS facilities at the Kromme River Dam and Woodlands Dairy Sustainability Programme, experimental farm property near the Impofu Dam. Kareedouw town and surrounding farm properties have unused warehouses and other building spaces that could be explored.

Gouritz Cluster - The GCBR domain includes towns such as Oudtshoorn, Mossel Bay, Riversdale and Stilbaai. These towns have excellent facilities hospitals, shopping centres, excellent road and communications networks. The GCBR NPC headquarters are in Riversdale and has modern facilities, including office space for visiting scientists and technicians. Riversdale is on the N2, 140 km from George (on the N2).

The biosphere reserve has satellite offices in Vanwyksdorp and Oudtshoorn with the capacity to absorb research associates in the Vanwyksdorp offices. Vanwyksdorp is 60 km from Riversdale on a gravel road. It has no medical facilities, but has comfortable accommodation, internet access and limited shopping facilities. Riversdale, Heidelberg and Prince Albert have a good, well maintained

road network, medical facilities, accommodations, and shopping facilities. Through their partners "on the ground" in Prince Albert, Mossel Bay and the above towns access to the other sites can be negotiated. Through Cape Nature, a strategic partner of the biosphere reserve, access to the nature reserves that form the core of the biosphere domain can be facilitated.

Wolwekraal Nature Reserve satellite site lies immediately adjacent to Prince Albert, 64 km from the N1 highway and has research facilities available in the landscape.

The **Duiwenhoks River satellite site** is crossed by the N2 highway and runs through the town of Heidelberg. The GCBR Riverdale offices can provide facilities for use by visiting researchers.

4.6. The availability of residential facilities for staff and guest researchers

Garden Route – In terms of healthcare facilities, the Garden Route District municipal area had 69 primary healthcare clinics (PHC) in 2018, which comprises of 32 fixed and 37 mobile clinics as well as seven community day centres. In addition, there are six district hospitals, one regional hospital, as well as 51 anti-retroviral treatment clinics/ treatment sites and 86 tuberculosis clinics/ treatment sites. Access to housing also includes access to services such as potable water, basic sanitation, safe energy sources and refuse removal services, to ensure that households enjoy a decent standard of living (Garden Route District Municipality IDP 2020/2021). The Garden Route District Municipal area has a total of 169 public ordinary schools and 28 in the Central Karoo District.

George is the major urban area of the Garden Route and is the second largest city in the Western Cape Province and is a popular holiday and conference centre and the administrative and commercial hub (with the recently built Garden Route Mall and Eden Meander shopping complex) in the region. The town of George offers accommodation, schools, hospitals and potential employment opportunities.

The George Municipality services 212 120 people in 62 722 households, and includes the City of George, the coastal areas of Kleinkrantz, Wilderness, Victoria Bay, Herolds Bay and Gwaing, and the rural areas of Herold, Uniondale Waboomskraal, Rondevlei, Haarlem, Geelhoutboom and Hansmoeskraal. Infrastructure is generally well-maintained with Good Governance Africa in 2016 having affirmed the city's position as the 18th best performing local municipality out of 234 in South Africa. The city has also recently achieved its sixth consecutive clean audit report. There are a total of 32 939 **homes** in George, with just over 14% of these located in security estates (mostly freehold). Overall, the vast majority (95%) of all homes in George are freehold. (Wesgro Property Report 2019).

Hospitals in George include the George Hospital, Mediclinic George, Mediclinic Geneva and Bergville Intercare. A new state-of the-art private hospital valued at more than R500m is also envisaged for Kraaibosch, north east of the Garden Route Mall, which will provide for the fast-growing demand for medical services in George and the Southern Cape. It will incorporate the Geneva Clinic, as well as a separate doctors' block. George has 51 public and private **schools** in all suburbs and townships in the area. Schools include the Afrikaans-medium George High School established in 1947 and Hoërskool Outeniqua established in 1923. The English medium school is York High School and there is also a double medium technical school named Eden Technical High School (formerly PW Botha College). Several independent schools have been established such as Glenwood House, an English medium co-ed school from Grade 000 to Grade 12.

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George municipality is the fourth most-important contributor in terms of **employment**. It has consistently recorded higher economic growth rates than the district, provincial or national economies over the past five years. The main economic sectors in the George municipal area are finance, insurance, real estate and business services. This is followed by transport, storage, manufacturing and communication services. Top insurance companies have branches here, as do all of the major banks as well as renowned investment and financial consultancies. Of the major business processing outsourcing (BPO) operations in the Western Cape (a major sector for the province), 11% are located in George, and include international companies such as Merchants, Solluco and Oakhurst Insurance. To promote growth in the BPO sector, the George municipality supports infrastructure required for high-speed internet connectivity. There is also a drive to encourage highly skilled and innovative IT technicians to consider George as a place in which to settle (Wesgro Property Report 2019).

The **George Campus** has on-campus accommodation and facilities available for workshops and meetings during university recess periods for guest researchers on the George Campus core site.



Figure 15. Diversity of accommodation facilities on the Nelson Mandela University, George Campus.

Gouritz – There are various levels and types of accommodation (B+B's, self-catering, hotels, flats, houses, camp sites) available in and surrounding Riversdale, Heidelberg, and Prince Albert. Limited accommodation (Self-catering, and 4-star hotel) is available in Vanwyksdorp.

4.7. Links to research or educational partner institutions

Garden Route - The NMU George Campus has a long history of forestry, conservation and agriculture training and research, dating back to 1939. The University hosts the School of Natural Resource Management, the Sustainability Research Unit which hosts the REHABS International Research Lab (with CNRS and University of Lyon) which also has strong ties with the Institute for Coastal and Marine Research and the African Centre for Coastal Paleoscience. This has led to the emergence of an internationally recognized hub of applied and practice-based, grounded social-ecological research in the Garden Route with strong synergies with EFTEON's objectives. The SRU has strong partnerships with the University of Lyon and CNRS. The SRU and SNRM have working relationships with numerous international research institutions such as Arizona State University, Clemson University, Penn State University

SANParks' Garden Route Research Unit consists of approximately 20 researchers and biotechnicians with offices in Knysna and near Sedgefield (on the shores of Rondevlei). Supporting research infrastructure includes visitor accommodation at Rondevlei, a herbarium in Knysna and basic wet and analytical labs in Rondevlei. SANParks is also the main host (in collaboration with Nelson Mandela University, the French CNRS, and the Southern African Programme on Ecosystem Science and Society) of the annual Garden Route Interface and Networking (GRIN) meeting. This symposium-style meeting was initiated in 2017 with the aim of advancing research and management for sustainable social-ecological systems. To date GRIN has attracted approximately 70 delegates per year (Roux et al. 2020).

The Garden Route District Municipality Disaster Management Centre would also be available for use. Furthermore the Knysna Basin Project headquarters in Knysna and the Natures Valley Trust, in Nature's Valley, the Garden Route Botanical Gardens and the Garden Route District Municipality Disaster Management Centre further complement the research infrastructure in and around the core site at the Nelson Mandela University George Campus. Both SANParks and Nelson Mandela University have facilities for visiting researchers at the core site.

Gouritz Cluster – The GCBR engages and partners with a range of research and educational institutions. Through the biosphere reserves Environmental Education Programme, close links with the Western Cape Department of Education (specifically primary schools in Vanwyksdorp, Herbertsdale, Albertina, Riversdale and Stilbaai) are in place. The GCBR also funds the Vanwyksdorp Development Institute, a campus that provides the environment and opportunity to learn skills and incubate entrepreneurial activities. The biosphere reserve share projects with the World Resource Institute in Washington DC and Crowther Labs, Zurich and engages with Wits University, and all Western and Eastern Cape Universities in South Africa, Leeds University in the UK, Zurich ETH, Switzerland. Furthermore they have links with Cape Nature Scientific Services (George, Oudtshoorn and Stellenbosch), Garden Route Botanical Gardens (George), African Centre for Paleoscience, and SapienCE (Bergen University, Norway).

5. Stakeholder analysis

Apart from the core collaborators in this nomination (see Annexure 1), the application involves the important role players and custodians of the landscape. These role players include conservation agencies such as South African National Parks, Eastern Cape Parks and Tourism and CapeNature. The role-players also include various research entities and institutes, government agencies, non-government organisations and community based organisations all operating in the landscape. For a full list of stakeholders please see the figure below and Annexure 2.

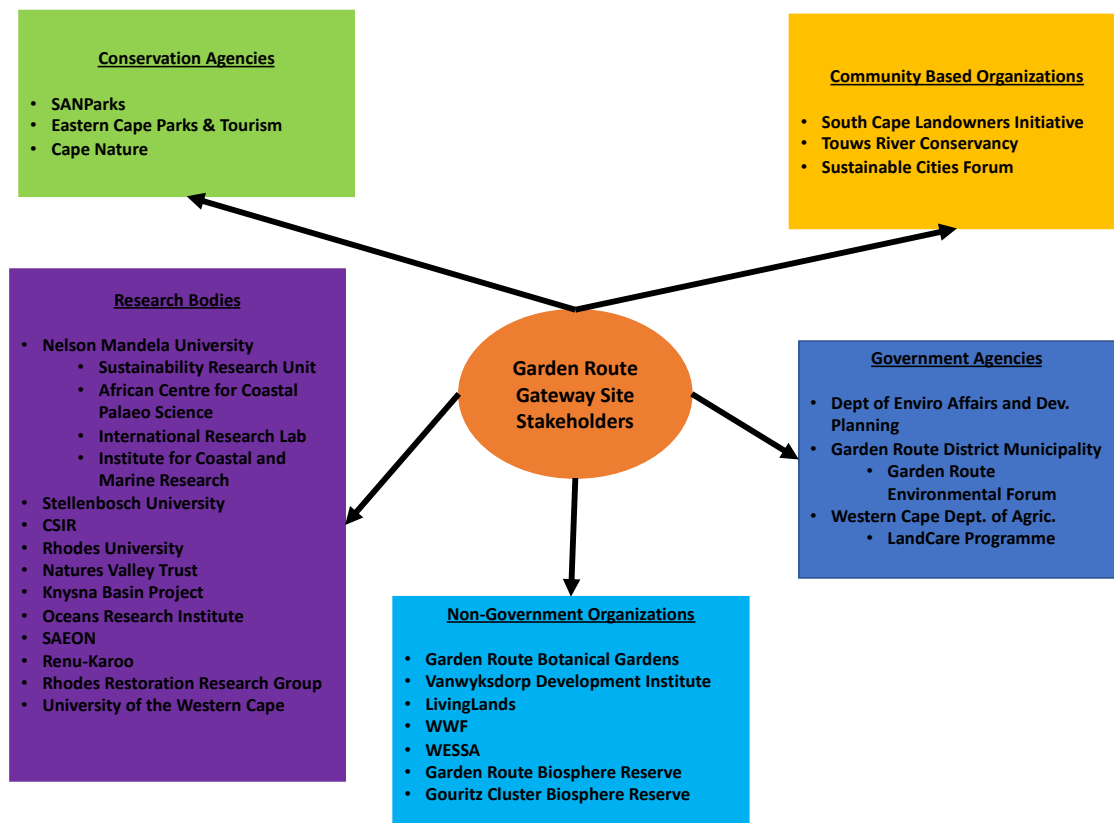


Figure 16. Stakeholder map of the Garden Route Gateway landscape nomination.

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The Nelson Mandela University is a comprehensive university offering professional and vocational training. The University has seven campuses – six in Port Elizabeth where the main administration is housed and one in George which houses the School of Natural Resource Management and school of business. The Sustainability Research Unit is also located on the George Campus. The university vision is to be a dynamic African university, recognised for its leadership in generating cutting edge knowledge for a sustainable future to offer a range of life changing education experiences for a better world.

Sustainability Research Unit - <https://sru.mandela.ac.za/>

The Sustainability Research Unit at the Nelson Mandela University was established in 2009 to promote research, community engagement and teaching and learning in the fields of sustainability science and social-ecological systems. The unit plays a role in generating scientific information through research collaborations, educating citizens and communities, and through participatory approaches, developing the capacity for sustainable management of natural resources. The unit has a salaried Director and Administrative Coordinator, and its members are further made up of 10 Research Associates 2 of which are adjunct professors and 1 emeritus professor, two post-doctoral fellows, 11 post-graduate students and 5 members from other faculties at the Nelson Mandela University.

The Garden Route Biosphere Reserve <https://gardenroutebiosphere.org.za/>

Dr Bianca Currie (Chair) – Bianca.Currie@mandela.ac.za

The Garden Route Biosphere Reserve NPO was formally established in 2018 and consists of a team of volunteer directors and thematic champions. The organisation has formal non-profit status (NPO registration number 209-625) with the South African Revenue Services, and is audited annually for compliance. The GRBR is currently provided an operation budget from the Western Cape Provincial Government and has recently secured funding from the Green Trust for landscape management co-ordination. A key focus of GRBR is facilitating demonstration projects, environmental education and sustainable development education and training, research and monitoring. While education, research, monitoring and capacity enhancement are seen as components of the logistic or knowledge-generation function of biosphere reserves, they are also integral to the conservation and development functions.

Garden Route National Park https://www.sanparks.org/parks/garden_route

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The Garden Route National Park is an unfenced park with some areas of controlled access but mostly open access for neighbouring communities and visitors. This park is best described as a complex of protected indigenous forests, mountain catchment areas, lakes, estuaries and marine ecosystems, all juxtaposed with semi-urban, commercial forestry and agricultural landscapes. The mission of Garden Route National Park, as co-created with stakeholders during 2018, is to be 'an innovative and accessible national park, spanning mountains to marine, conserving the natural and

cultural heritage of the Garden Route collaboratively for the benefit of people and the environment’.

Gouritz Cluster Biosphere Reserve - <https://gouritz.com/>

Steve du Toit – (Chief Executive) srdutoit777@gmail.com

The Gouritz Cluster Biosphere Reserve (GCBR) is a voluntary citizens’ initiative dedicated to the conservation of its region’s biodiversity, tied to the socio-economic development for the wellbeing of its peoples. Governed by members, it is a registered non-profit company with the tax status of a public benefit organisation. UNESCO has designated the region as a place of major biodiversity significance for the planet. The GCBR aims to be a catalyst for change towards solving one of sustainable development’s biggest issues: the disconnection between people and nature. It offers a full range of action-oriented initiatives across six themes – Land & Landscapes; Water Resources; Biodiversity; Economic Diversity & Livelihoods; Knowledge, Learning & Education; and Institutions – all aimed at securing the future of our beautiful region.

Landcare – <https://www.elsenburg.com/services-and-programmes/landcare-services>

Hannes Muller – (Program: Sustainable Resource Management) - hannesm@elsenburg.com

The LandCare programme is a community based and government supported approach to the sustainable management of the utilisation of agricultural natural resources and was conceptualised by the South African Government in 1997. The LandCare programme is being implemented in all nine (9) provinces of the Republic of South Africa (RSA). The overall vision of the LandCare programme is to optimise the productivity and sustainability of agricultural natural resources in order to achieve greater productivity, food security, job creation and a better quality of life for citizen of South Africa. The LandCare programme has an array of economic, social and environmental opportunities for citizens of RSA.

LivingLands

Dr Julia Glenday (Post-Doctoral Researcher SAEON) - julia@saeon.ac.za

Roderick Juba (Knowledge Broker Living Lands) – juba@livinglands.co.za

Living Lands is a not-for-profit organization for conserving and restoring living landscapes. (a variety of healthy ecosystems and land uses, and is home to ecological, agricultural, and social systems which are managed so as to function sustainably). Living Lands strives to ensures that natural and cultural resources are available for future generations and that the system is resilient for adaptation to climate change. Their vision is collaborations working on living landscapes where they aim to bring synergies and collective action to the landscape through knowledge creation for Living Landscapes; mobilising civil society; implementing landscape innovation and rehabilitation; enabling and facilitating social learning processes; fostering mutually beneficial partnerships and participatory networks.

Annexure 2

Stakeholders and Partners in the landscape		
Name	Affiliation	Email
Prof. Herve Fritz	CNRS-Mandela University International Research Lab	Herve.fritz@mandela.ac.za
Prof. Christo Fabricius	World Wildlife Fund and Nelson Mandela University	Christo.fabricius@wwf.org
Nadia Sitas	Stellenbosch University	nadiasitas@sun.ac.za
Nina Viljoen	Garden Route District Municipality – Garden Route Environmental Forum (GREF)	Nina@garderoute.gov.za
Keith Spencer	Cape Nature	keith@capenature.co.za
Joyene Isaacs / Francis Steyn	Western Cape Dept of Agriculture	joyenei@elsenburg.com francesse@elsenburg.com
Albert Ackhurst and Marlene LaRoss	Dept of Environmental Affairs and Development Planning	Albert.Ackhurst@westerncape.gov.za Marlene.Laros@westerncape.gov.za
Duncan Hay	Nature's Valley Trust	dhay@inr.org.za
Corne Brink	Garden Route Botanical Garden	manager@botanicalgarden.org.za
Cobus Meiring	Southern Cape Landowners Initiative (SCLI)	cobus@naturabridge.co.za
Charles Breen	Knysna Basin Project	
Enrico Gennari	Oceans Research Institute, Mossel Bay	e.gennari@oceans-research.com
Joh Henschel	SAEON	henschel@saeon.ac.za
Andre Britz	Vanwyksdorp Development Institute	britzieaj@gmail.com
Sue Milton	Renu-Karoo and Wolwekraal Nature Reserve, Prince Albert	renukaroo@gmail.com
Myles Mander	FutureWorks, Knysna	myles@futureworks.co.za
Rita Botha	GCBR, Riversdale	goukoupmm@gouritz.com
Dr. Jan C. De Vynck	Nelson Mandela University, African Centre for Coastal Palaeo-science	Jan.devynck@mandela.ac.za
Otto Beukes	Living Lands	otto@livinglands.co.za
Kathleen Smart	Rhodes Restoration Research Group, Rhodes University	k.smart@ru.ac.za
Jasper Slingsby	SAEON	jasper@saeon.ac.za
Mike Powell	Rhodes Restoration Research Group, Rhodes University	m.powell@ru.ac.za
Tommy Bornman and Shaun Deyzel	SAEON Elwandle Node	tommy@saeon.ac.za shaun@saeon.ac.za
Fred Ellery	Rhodes University	f.ellery@ru.ac.za
Jane Tanner	Rhodes University	j.tanner@ru.ac.za
Alanna Rebelo	Stellenbosch University	ARebelo@sun.ac.za
Faith Jumbi	University of the Western Cape	3699749@myuwc.ac.za
Brian Reeves	ECPTA	Brian.Reeves@ecpta.co.za

Research Support and Management

PO Box 77000 • Nelson Mandela University
Port Elizabeth • 6031 • South Africa
Tel . +27 (0)41 504 2538
Kwezi.Mzilikazi@mandela.ac.za

5 October 2020

Dr Gregor Feig
EFTEON Manager
South African Environmental Observation Network

Landscape Nomination for EFTEON Garden Route Cluster Sites

As Director of Research Support and Management, and on behalf of the Deputy Vice-Chancellor for Research, Innovation and Internationalisation (DVC:RII) at the Nelson Mandela University, it gives me pleasure to endorse the application to host EFTEON landscape sites within the Garden Route cluster put forward by the Sustainable Research Unit at Nelson Mandela University, George Campus. We have a strong commitment to harnessing the University's knowledge resources to contribute to local, regional, national and international development. Hosting a new EFTEON site fits into the overall research strategy of the University and would put much needed resources toward important initiatives within the Garden Route Region.

The partnerships put forward are able to meet the objectives of the EFTEON and will enhance the NGO, private, public and international collaborations already in place in the region. The Garden Route region sites are an incredibly important socio-economic and ecological hub for the southern Cape region. The criteria set out for the hosting of an EFTEON are met by this region and proposal.

In terms of Institutional Support, within the Office of Research, Innovation and Internationalisation (RII) there are three departments that specifically provide research support: The Office of Research Development, Research Support and Management, and Innovation Office. Additionally, we have an Office of International Education that provides support for international collaboration and travel initiatives. We have contract and grant management systems as well as audit support through our finance department to enable us to administer projects from different funding agencies, both national and international. We provide proposal and budget development support when requested and act as Designated Authorities for different funding bodies.

We fully support SRUs application to host EFTEON sites, if funded. Institutional administrative support will be provided through the Office of the DVC:RII as this proposed initiative is seen as advancing the research for the faculty at Nelson Mandela University overall. The Office of the DVC: RII can assist in the development and maintenance of strategic partnerships that are proposed here. The University's Information Communication Technology Services is available to assist in establishing, maintaining, and support systems and platforms required. We have the necessary research management and

development support systems in place that would enable the SRU and University to meet the requirements outlined for EFTEON sites.

Yours sincerely

A handwritten signature in black ink, appearing to read 'N. Mzilikazi', with a horizontal line extending to the right.

Dr Nomakwezi Mzilikazi
Director: Research Support and Management

To develop, expand, manage and promote a system of sustainable national parks that represent biodiversity and heritage assets, through innovation and best practice for the just and equitable benefit of current and future generations.



Dr Gregor Feig
EFTEON Manager
SAEON
P.O. Box 2600
Pretoria 0001
South Africa

14 September 2020

Dear Dr Feig

Re: Letter of support for selecting the Garden Route Gateway site as an EFTEON landscape

South African National Parks (SANParks) is the largest conservation agency in South Africa, managing a system of 21 national parks including three World Heritage Sites and six Marine Protected Areas. These parks represent many bioregions of South Africa as well as a gradient of ecological intactness, from relatively pristine wilderness to open-access landscapes managed for recreational and cultural use.

The Garden Route National Park (GRNP) is a highly fragmented and unfenced park with some areas of controlled access but mostly open access for neighbouring communities and visitors. This park is best described as a complex of protected indigenous forests, mountain catchment areas, lakes, estuaries and marine ecosystems, all juxtaposed with semi-urban (including a gradient from exclusive properties of the affluent, to informal settlements with high rates of unemployment), commercial forestry and agricultural landscapes.

In SANParks, policy development and management decisions are guided and evaluated by science, undertaken either in-house or in conjunction with external collaborators. This is enabled through a group of embedded researchers and biotechnicians (known as Scientific Services) who implement monitoring programmes, undertake research and importantly act as knowledge conduits between the scientific knowledge base, policy and park management. Scientific Services is geographically distributed across four nodes, one being the Garden Route Research Unit with offices in Knysna and near Sedgefield (on the shores of Rondevlei). The Garden Route Research Unit consists of approximately 20 researchers and biotechnicians. Supporting infrastructure, including visitor accommodation at Rondevlei, a herbarium in Knysna and basic wet and analytical labs in Rondevlei, enhance research collaborations in the region, particularly supporting marine, estuarine, freshwater and vegetation research and monitoring efforts.

addo elephant
agulhas
augrabies
bontebok
camdeboo
golden gate highlands
karoo
kgalagadi transfrontier
knysna lake area
kruger
mapungubwe
marakele
mokala
mountain zebra
namaqua
table mountain
tankwa karoo
tsitsikamma
richtersveld
west coast
wilderness

The landscape focus of EFTEON aligns particularly well with the management challenges of Garden Route National Park, which are primarily of a social-ecological nature and typically span across multiple ecological and administrative boundaries. The mission of this park, as recently co-developed with stakeholders, is to be *“an innovative and accessible national park, spanning mountains to marine, conserving the natural and cultural heritage of the Garden Route collaboratively for the benefit of people and the environment”*. A successful EFTEON initiative in the Garden Route will greatly enhance existing collaboration between scholars and managers to achieve innovative social-ecological monitoring and management solutions for this park and its surrounding landscape. In return, as a collaborator the Garden Route National Park can contribute significant expertise, infrastructure and an outdoor laboratory with a mosaic of terrestrial, freshwater, estuarine and marine ecosystems.

On behalf of SANParks I express support for the EFTEON Garden Route Gateway proposal. The collaboration is important because it

- a) will be a catalyst for innovation through action research and social-ecological systems science;
- b) could contribute to the exploration of new development pathways in the Garden Route and South Africa, as described in South Africa’s National Development Plan;
- c) is well aligned to the Garden Route context where open-access conservation is juxtaposed within a multi-use landscape; and
- d) will contribute to the development of research capacity and build on the growing synergies between Nelson Mandela University, SANParks and civil society in the region.

Sincerely,



Dr Stefanie Freitag-Ronaldson
General Manager: Garden Route Research Unit
& Acting Head: Scientific Services
South African National Parks
Email: stef.freitag@sanparks.org
Mobile phone: +27 82 908 2678

Living Lands
Office 5
5 Noordhoek Main Road
Noordhoek

25 September 2020

RE: Support for the extension of the Garden Route Gateway site to the Kromme and Baviaanskloof catchments under the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) programme

To whom it may concern,

I am writing in my capacity as Managing Director of Living Lands to express my support for the extension of the Garden Route Gateway site to include the Kromme and Baviaanskloof catchment areas for long-term monitoring through the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) programme (<https://efteon.saeon.ac.za/>).

Living Lands is active in both these landscapes where we engage with local landowners and facilitate research and implementation, and work towards holistically and sustainably managed landscapes. The opportunity to have long-term, freely available environmental data collected in this landscape would be of particular interest to the organization, as it would provide an opportunity for significant improvement to the management of the area. This research platform would also allow for cross-catchment studies, and provide data along environmental gradients from the Garden Route to the Baviaanskloof.

If the Garden Route Gateway site is selected as an EFTEON landscape, I anticipate that our organization will be making use of the data collected and information produced.

Sincerely,

A handwritten signature in dark ink, appearing to read 'MJB', with a stylized flourish extending to the right.

Marijn Zwinkels
Managing Director
Living Lands



Wolwekraal Conservation and Research Organisation (WCRO)

PO Box 47 Prince Albert 6930

NPO Reg. Num 121-079 (15.05.2013)

Tel / Fax *27 (0) 23 5411828 (A/H)
Mobile (27) 082 7700206
e-mail WklConsResOrg@gmail.com

2020.08.07

Dr STEVE DU TOIT
Chief Executive
Gouritz Cluster Biosphere Reserve
email steve@gouritz.com |
Tel +27 (0)76 282 7799
2 Barry Street, Riversdale, South Africa, 6670
+27 (0)28 050 0577 | www.gouritz.com

Letter of support for GCBR and partners EFTEON landscape proposal

As owners of Wolwekraal nature Reserve we would like to support the EFTEON proposal of the Gouritz Landscape Cluster and partners.

We understand that EFTEON is seeking landscapes suitable for long term Environmental and Social-Ecological Research. Wolwekraal Nature Reserve (120 ha) would offer a useful component as it lies on the northern and most arid extreme of the Gourtiz Cluster Biosphere reserve.

The site offers long-term data sets, a weather station owned and operated by SAEON and proximity to the village of Prince Albert. Moreover it is strongly influenced by the village in that it shares boundaries with the waste disposal and waste water treatment sites. Commercial farmland and a low density housing development abut the other two boundaries. The Dorps River that flows through the property is the major source of water for the town and is thus affected both by water extraction and pollution.

South African Revenue Service Tax Number 9541/939/16/2; NPO Reg. Num 121-079 (15.05.2013)
EXCO Members: Chairperson Dr WRJ Dean; Vice Chair Mr Chris Ball; Cape Nature representative Theresa vd Westhuizen; Additional Member Mr Hugh Forsyth; Secretary/Treasurer Dr Sue Milton-Dean
Contact details: e-mail WklConsResOrg@gmail.com; Tel 082 7700206
<http://www.wcro.co.za>

Since 2008 the owners of Wolwekraal Nature Reserve, assisted by student interns drawn from SAEON (ALN) and NMU (Nature Conservation, Saasveld Campus) and their lecturers, have contributed to collection and archiving of long-term data sets for the reserve. These include:

1. 75 vegetation plots which are mapped, GPS referenced and marked on the ground. Data for these plots is available for 2010, 2016 and 2018;
2. Two sets of ecological restoration trials;
3. Checklists of fauna and flora;
4. Demographic data for *Bijlia dilitata* (a rare endemic succulent), four common shrub species and *Tamarix ramossissima* that is an invasive alien plant in the river bed;
5. Mapped archaeological sites.

The Renu-Karoo Nursery lies within the Nature Reserve and could potentially offer facilities suitable for dirty lab work or plant propagation trials.



Sue and Richard Dean

For Wolwekraal Conservation and Research Organisation



Dr Gregor Feig
EFTEON Manager
SOUTH AFRICAN ENVIRONMENTAL OBSERVATION NETWORK

[Email: gregor@saeon.ac.za]

Dear Dr Feig and EFTEON Landscape Proposal Evaluation Panel

**SUPPORT FOR PROPOSAL TO ESTABLISH THE GARDEN ROUTE GATEWAY AS AN EXPANDED
FRESHWATER AND TERRESTRIAL ENVIRONMENTAL OBSERVATION NETWORK LANDSCAPE**

I write to express my full support for the establishment of an EFTEON Research Landscape in the Garden Route Region of the Western Cape Province.

As an organisation I believe our interests are well represented by the proposal and declare that members of our organisation will be interested to collaborate on projects that will benefit from the proposed infrastructure, and associated research endeavours within the proposed landscape. The proposal in question shows considerable overlap (and opportunity for co-benefit) with the following initiatives in which the Department is a key role player:

- The Western Cape Sustainable Water Management Plan;
- The Ecological Infrastructure Investment Framework;
- The Keurbooms / Karatara Payment for Ecosystem Services project;
- The Garden Route and Gouritz Cluster Biosphere Reserves; and
- The Mossel Bay Environmental Management Framework.

If needed, we are prepared to engage with EFTEON to develop the necessary documentation to reflect the required institutional arrangements to outline our respective expectations for interaction with and support for this project.

Yours sincerely

PIETER VAN ZYL
HEAD OF DEPARTMENT
ENVIRONMENTAL AFFAIRS AND DEVELOPMENT PLANNING
WESTERN CAPE GOVERNMENT
DATE: 30 September 2020



Western Cape
Government

Agriculture

Hannes Muller
Sustainable Resource Management: LandCare
Email: hannesm@elsenburg.com
tel: +27 44 803 3721 fax: +27 44 874 0241

Reference: NMU01/2020

To whom it may concern.

Letter of support – EFTEON proposal - Garden Route Gateway site.

This letter serves to state the support for the Garden Route Gateway EFTEON proposal by:
The Department of Agriculture WC – SRM LandCare.

We believe a severe lack of scientific research information exists to support the value of large investments being made in mainly Peat & Palmiet river and wetland systems. These investments aim to stabilise and ensure long term sustainability of the biological as well as agricultural systems, especially in the context of climatic changes and increase in frequency as well as severity of natural disasters.

Kind regards

Yours truly



.....
JJ Muller

District manager LandCare Eden

29 September 2020

Date

23 September 2020

**SUPPORT FOR THE PROPOSAL TO ESTABLISH AN EFTEON NODE IN THE GARDEN
ROUTE BIOSPHERE RESERVE**

To whom it may concern,

I hereby support the proposal to establish an Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) node in the Garden Route Biosphere Reserve, which extends into the Baviaanskloof World Heritage Site and Kromme River Catchment.

As the assigned management authority for provincial protected areas in the Eastern Cape, the Eastern Cape Parks and Tourism Agency (ECPTA) anticipates that the data collected through this initiative will stimulate and support research on ecosystem functioning and change, and that this will ultimately inform the ECPTA's adaptive management of protected areas.

The ECPTA is particularly interested in research on:

- The functioning of riverine systems and how these systems are impacted upon by anthropogenic factors (including climate change);
- The changing nature of fire in the landscape (especially increased frequency) and the impacts of this on ecosystem functioning and biodiversity;
- The spread of invasive alien organisms, impacts of these, and predictions for how this will be exacerbated with climate change;
- Drought and ecosystem response and resilience to this;
- Restoration and the benefits accrued through investment in this.

If the Garden Route Biosphere Reserve is selected as an EFTEON node, the ECPTA envisages that our engagement with the platform will be mutually beneficial.

Sincerely


Vuyani Dayimani
Chief Executive Officer





54 York Street,
George
Western Cape
6529

PO Box 12,
George,
Western Cape
6530

Tel: 044 803 1300
Fax: 086 555 6303
E-mail: info@gardenroute.gov.za
www.gardenroute.gov.za

OFFICE OF THE MUNICIPAL MANAGER

Enquiries: Dr. Nina Viljoen
Reference: 12/2/6/R
Date: 23 September 2020

Dr. Bianca Currie
Director: Sustainability Research Unit
Nelson Mandela University
Science Faculty
George Campus

Dear Dr. Currie

LETTER OF SUPPORT FOR THE NOMINATION: EXPANDED FRESHWATER AND TERRESTRIAL ENVIRONMENTAL OBSERVATION NETWORK (EFTEON) GARDEN ROUTE LANDSCAPE NOMINATION

The Garden Route District Municipality (GRDM) would like to confirm its full support of the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) landscape nomination for the Garden Route. The Garden Route District Municipality is committed to environmental sustainability, and research initiatives and related infrastructure such as that proposed by the EFTEON will work towards achieving this goal. The proposed nomination will enabled the GRDM to fulfil its strategic objectives as is stated in its Garden Route District Municipality Annual Report 2018/19 (2018), namely the Strategic Objective 6: "*Healthy and Socially Stable Communities*", and its Strategic Objective 7: "*Sustainable Environmental Management and Public Safety*". The proposal is also in line with the GRDM's Climate Change Adaptation Strategy (2020), which strongly recommends the implementation of environmental and climate change research, as well as the strengthening of the environmental and climate change datasets for the Garden Route district area. The proposed nomination is also linked to the Western Cape Provincial Biodiversity Economy Strategy (2016), namely its Core Objective 2:

"Recognise and value the economic contribution of ecological services", which is strongly supported by the GRDM.

Being a water stressed area, the Garden Route district will greatly benefit from the research initiatives and related infrastructure as a result of this nomination, which can provide dataset outcomes to assist and support the GRDM's land-use planning, its environmental strategic direction, as well as its decision-making towards collective efforts to support its Critical Biodiversity Areas and Ecological Support Areas. The increasingly severe drought conditions, such as is presently experienced over the Klein Karoo areas within the district, is having a disastrous impact on the agricultural sector, with increasing food security risks and related employment opportunities in the district. Indeed, the Garden Route District Municipality's Integrated Development Plan 2020/21 (2020) has noted that climate change impacts could have dire consequences for the agricultural sector in the Garden Route district area.

The Garden Route district area is incredibly special in terms of its biodiversity, pristine marine and coastal environment, unique fynbos and forest biomes, and recreational value, and has therefore gained international recognition as a prime tourism destination. Its value and natural environs are however threatened by unprecedented population growth, immigration, development, irresponsible land-use, as well as unpredictable climatic changes, amongst others. These factors are all threatening the natural processes and systems within the Garden Route district area, and therefore also causing severe risks to its environmental and ecosystem services' long-term sustainability.

The EFTEON initiative will enable the availability of comprehensive research infrastructure and consequent knowledge outputs on the biodiversity of the area, and will provide more technical information on the conservation planning process within the district. The potential information obtained through this initiative will assist the GRDM to set more focused and directed planning and management targets for underlying biodiversity features in specific areas of concern. It will also assist to shed more light on relevant research questions relating to the functioning of ecological processes (both currently, and in the face of climate change) within the Garden Route, which are required to ensure that its biodiversity features persist in the long-term.

This proposed research infrastructure will also assist with making available long-term datasets which can answer questions regarding direct climate change risk factors, as well as the risks and impacts on the Garden Route environs and services considering long-term climate change projections, which includes projections of a hotter and drier future for the area, with further increases in sea-level rise and more extreme events such as heat waves, droughts, floods and fires.

Considering the above, the EFTEON initiative will therefore provide the Garden Route District with the essential research infrastructure and strategic tools to enable dynamic environmental protection and management actions going into the future.

This valuable research experience and knowledge outcomes will assist in shaping future environmental management and sustainability paths within the district. Our support of this nomination will therefore be of great value for the entire Garden Route district area, and we wish you all the best with your research activities and related output achievements.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'M. Stratu', written over a horizontal line.

(pp) M. STRATU
MUNICIPAL MANAGER



science & innovation

Department:
Science and Innovation
REPUBLIC OF SOUTH AFRICA



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5th October 2020

Dr Bianca Currie
Nelson Mandela University
George
Western Cape

Dear Dr Currie

SUPPORT FOR THE GARDEN ROUTE GATEWAY LANDSCAPE PROPOSAL TO EFTEON

On behalf of the SAEON Arid Lands Node, I hereby confirm that our institution strongly supports the Garden Route Gateway nomination for an EFTEON Landscape Programme. Foremost, this support arises from the nature of the network of core collaborators in activities and approaches that align with the goals and mode of operation of EFTEON, which is a programme of SAEON.

The SAEON Arid Lands Node has an office in Prince Albert and is involved in research projects at the Wolwekraal Nature Reserve, identified as one of the key sites. Another important site that is part of the proposed landscape is SAEON's Tierberg-LTER research facility in the Karoo, which has, to date, generated about 150 publications and continues to generate new knowledge. The development of the Garden Route Gateway EFTEON Landscape would serve to enhance and extend SAEON's programmes in this area.

The very high diversity of habitats in the proposed landscape, including areas ranging from arid, to semi-arid and mesic, with contrasting land uses, provides opportunities to compare processes that drive ecosystem functioning in different moisture conditions, especially in view of global change and changes in resource use across this area. For this reason, the development of the Garden Route Gateway Landscape will be valuable to SAEON, notably due to the appropriate range of perspectives, skills and interests of the network of collaborators that are part of this landscape programme.

I trust that this proposal will be evaluated favourably and enable this landscape to become a significant contributor to the goals of EFTEON.

Yours sincerely,

Dr Joh R. Henschel
Manager: SAEON Arid Lands Node

Prof. Hervé Fritz

Head of Unit

REHABS IRL, CNRS-UCBL-NMU

Research Building, George Campus

Nelson Mandela University, Madiba drive

6531 George, South Africa

Tel : +27 44 801 5059

E-mail: herve.fritz@cnr.fr / herve.fritz@mandela.ac.za

George, 28/09/2020

TO WHOM IT MAY CONCERN

Re: Support for the Garden Route Gateway Site proposal as an Expanded Freshwater and Terrestrial Environmental Observation Network Landscape.

I hereby express my full support for the establishment of an EFTEON Research Landscape in the Garden Route Gateway Site on behalf of the International Research Laboratory REHABS '*Reconciling Ecological and Human Adaptations for Biosphere Sustainability*'.

The IRL-REHABS is as a partner institute of the Sustainability Research Unit and a research entity at NMU, a joint initiative to create a collaborative framework elaborated between the French CNRS, Nelson Mandela University and University of Lyon, with the support of two associated institutions SANParks and University of Angers.

Promoting Long-Term Social-Ecological Research is one of the key objectives of the REHABS, as we believe it is essential in order to understand and tackle the challenges of the Anthropocene, explore ecosystem-based solutions and new adaptation pathways to global change, to improving human wellbeing while considering the sustainability of the biosphere. The REHABS can also act as a link between the French LTSE network (*Zones Ateliers*), to which it is formally connected, and the similar networks in South Africa.

The four themes structuring the research agenda of the REHABS are (1) Humans as hyper-keystone species: Understanding how responses of biodiversity and ecosystems to human practices form a dominant force in the functioning of the biosphere in the Anthropocene; (2) Nature's contribution to humans and humanity: reconciling perspectives on development, innovation, risk and well being with biosphere foundations and cultural pluralism; (3) Environmental governance and co-viability in multifunctional landscapes: conditions for active, stewardship of landscapes, seascapes and urbanscapes in the new context of the Anthropocene; (4) Methods and approaches for long-term social-ecological studies and

engaged research: Developing frameworks, co-designing protocols, analyses, co-learning and engagement.

Therefore, the interests of the REHABS are well represented by the Garden Route Gateway proposal, and the researchers involved with the REHABS will be interested to collaborate on projects that will benefit from the proposed EFTEON infrastructure, and associated research within the proposed landscape.

Yours sincerely,

A handwritten signature in black ink, appearing to be 'H. J. J.', is written on a light blue background.



SAEON
South African Environmental
Observation Network

SAEON Fynbos Node
Private Bag X7
Claremont 7735
South Africa
Tel: 021 799 8836
Int. Code: +27

www.saeon.ac.za
<http://www.saeon-fynbos.org/>

22/09/2020

RE: Support for the establishment of an environmental research platform in the Garden Route landscape cluster under the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) programme

To whom it may concern,

I am writing in my capacity as a post-doctoral researcher at the SAEON Fynbos node to express my support for the establishment of an environmental research platform in the Garden Route under the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) programme.

The opportunity to have long-term, freely available environmental data collected in this region would be of particular interest to me as a hydrology researcher with an interest in understanding and modelling catchment scale processes. I see this landscape as an appropriate site for research on important questions about the water use dynamics in understudied indigenous vegetation types, particularly thicket, Afro-montane forest, and karoo vegetation, as well as the impacts of anthropogenic land uses on catchment dynamics. This region also offers research opportunities across steep climate gradients and a transition between winter and summer rainfall regions. It would be exciting to have access to data from the sites across this cluster to better understand the drivers of their hydrological responses to change.

I have ongoing research interests in the Kromme and Baviaanskloof catchment areas, being proposed as satellite sites in this cluster, and manage hydrometric monitoring equipment in these catchments and the data produced. The support of the EFTEON programme in this, as well as additional data and research collaborations that would flow from having the platform established in this region, would be highly beneficial and ensure the longevity of observation in these critical catchments.

If the Garden Route landscape cluster were to be selected as an EFTEON landscape, I would be excited to engage with the platform and make use of the data collected in my future research.

Sincerely,

A handwritten signature in black ink, appearing to read 'J. Glenday', with a long horizontal line extending to the right.

Dr Julia Glenday
post-doctoral researcher, SAEON – Fynbos node

Department of Environmental Science

Tel: +27-(0)46-603-7010

Fax: +27-(0)46-622-9319

e-mail: j.gambiza@ru.ac.za

<http://www.ru.ac.za>

03 October 2020

To the EFTEON Selection Committee,

**Support for the Garden Route Cluster site nomination from the
Department of Environmental Science**

The landscapes included in the Garden Route cluster nomination, including the Gouritz and Garden Route Biosphere Reserves, represents an incredible diversity of ecosystems, land use, cultures and economic activities, spanning three biodiversity hotspots. It is also a highly dynamic system, subject to social-ecological change from local to global scales.

The Department of Environmental Science at Rhodes University has a longstanding relationship with many of the key partners represented in this nomination. In the last five years, staff and students from our department has regularly participated in the Garden Route interface meeting, a unique conference that serves as a knowledge interface between scientists and practitioners. We have collaborated with SANParks and the Garden Route Biosphere Reserve on several research projects, including research on the values and perceptions on water-based ecosystem services from the Soetkraal section, sense of place and ecotourism, and landscape indicators for monitoring the Garden Route Biosphere reserve. We have worked together with our SANParks and NMU colleagues on projects related to the Southern African Programme on Ecosystem Services and Society (SAPECS) and have also collaborated on conceptual work around relational values and protected areas.

Should EFTEON decide to award a site to the Garden Route gateway cluster, our department will be an important beneficiary, as well as a significant contributor to world-class global change research based on the EFTEON

distributed infrastructure. Although small, our department (like that of the sustainability research unit at NMU, with whom we share many values), is a powerful force in social-ecological research and education in Southern Africa and beyond. The Garden route cluster offers excellent and accessible opportunities for our honours students to learn about social-ecological systems, transdisciplinary research practices, and the value of long-term monitoring and evaluation. Some of the core research areas in our department include alien invasive clearing, ecosystem services, protected area resilience, biodiversity stewardship, people and protected areas, and sustainable land management. An EFTEON site in the Garden route cluster will provide important growth opportunities for these research areas, and the graduate students who develop and learn within them.

Our department thus fully supports the nomination of the Garden Route gateway cluster as an EFTEON landscape.

Yours sincerely

A handwritten signature in black ink, appearing to read 'Gambiza', with a stylized, flowing script.

Professor James Gambiza
Head of Department, Environmental Science



South Campus
Science Faculty
Tel . +27 (0)82 684 4461
Jan.DeVynck@mandela.ac.za

11 September, 2020

To Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON):

I would like to express my support for the nomination as a key stakeholder for EFTEON.

I am already an archaeological representative for GCBR and ACCP has built a formal collaboration with SanParks for both south Cape and east Cape re. a project on Pleistocene trace fossils.

The EFTEON study area incorporates both south Cape and east Cape areas and the adjacent inland areas. Our centre's focus is in the same area and I foresee a very productive collaboration growing from this.

Yours sincerely

Dr. Jan C. De Vynck
Director

Mossel Bay, 09 Aug 2020

To whom it may concerns,

I am the Director of Oceans Research Institute in Mossel Bay.

Oceans Research Institute has been operating in the area for about 14 years now. It collaborates with many South African and international universities on both research and training projects. Oceans Research carries out almost daily ecological and monitoring research in the area, from marine megafauna (sharks and marine mammals) to intertidal research, from BRUVs to estuary-related surveys. Oceans Research partners with the South African Institute for Aquatic Biodiversity in the maintenance of the Acoustic Tracking Array Platform (ATAP) of Mossel Bay.

The establishment of a research hub in the Gouritz-Garden Route area could have a very important impact for the already numerous research and conservation initiatives in the area. The area of interest is in the middle between Cape Town and Port Elizabeth but unfortunately, historically, has been having very little access to large research facilities.

However this coastal area is a biodiversity hotspot and conservation priority. It offers refuge to many conservation-priority species like the humpback dolphin, the white shark, many endemic catshark species, just to name a few. Because of the little access to its coastline, it also provides refuge for many intertidal and marine species.

The status of its estuaries is of growing concern. Even though the municipalities are doing what they can in collaboration with the general public, the area lacks good infrastructures and skilled manpower to support a regional environmental and ecological monitoring approach.

Oceans Research Institute therefore supports the Gouritz Cluster Biosphere Reserve led proposal for the creation of EFTEON site in this area, in collaboration with the Breede Gouritz Catchment and the Garden Route Biosphere Reserve group, and will be happy to support any research and conservation initiative especially in relation to the marine coastal environment.



Dr Enrico Gennari

Director



Institute for Coastal and Marine Research (CMR)
Ocean Sciences Campus
Tel . +27 (0)41 504 4278
Bernadette.Snow@mandela.ac.za

28 September 2020

To whom it may concern:

Institute for Coastal and Marine Research: Letter of Support to the Sustainability Research Unit (SRU) application for the 2nd Phase for the EFTEON

The Institute for Coastal and Marine Research (CMR) is a research entity of the Nelson Mandela University, based at its Ocean Sciences Campus in Port Elizabeth, South Africa. The CMR reports directly to the Deputy Vice-Chancellor: Research, Innovation and Internationalisation. The Institute spans across all seven University Faculties, and it includes members from external research entities and stakeholder groups (nationally and internationally). Established in the 1980s, the CMR aims to be a leading ocean and coastal sciences institute. The Institute conducts cutting-edge research, builds capacity, and advances our understanding of the coastal and marine environment to serve the needs of South Africa, the African continent and beyond, in a sustainable manner. The CMR strives for excellence in transdisciplinary research and training related to the ocean and coastal environments. This advances scientific knowledge, provides a basis for management strategies that optimise the maintenance of biodiversity and sustainable use of our resources, and contributes to the education of the community at large in all matters pertaining to the ocean and coast. The CMR's activities are broadly classified as Research, Training and Consultation.

Two Units fall directly under the CMR, namely, the Marine Apex Predator Research Unit (MAPRU – specialising in all aspects of marine apex predator research), and the Research Diving Unit (RDU – supporting marine research and related academic programmes). The Institute is proud to host four South African Research Chairs at the Ocean Sciences Campus: Law of the Sea and Development in Africa; Marine Spatial Planning; Ocean Science and Marine Food Security; and Shallow Water Ecosystems. The CMR also collaborates with the Research Chair for Identities and Social Cohesion in Africa and is involved in the development of a new Research Chair for Cultural Heritage.

The CMR prides itself on its diverse, transdisciplinary and multidisciplinary core team of dedicated researchers (including established researchers and early-career researchers), collaborators, and stakeholders. We continually challenge ourselves to grow and develop this expertise to enable us to address the global issues that the ocean and coastal environments are facing, whilst taking into consideration the needs and requirements of local communities who rely on these environments for their subsistence. The CMR has strong collaborative links with many national research entities and works closely with many Governmental groups and environmental management authorities. Much emphasis is placed on developing and maintaining international partnerships. Our efforts in research and engagement have resulted in our pool of expertise being the widest in the region.

The Garden Route is an area of ecological importance, which offers pristine natural environments as well as heavily impacted areas as a result of human activities. This landscape includes numerous biomes, and changes can be observed across a variety of gradients. This region also includes coastal catchments and opportunities to study carbon storage and sequestration – a research field of the Shallow Water Ecosystems Research Chair. The developing Research Chair in Cultural Heritage seeks opportunities for collaboration, which may present itself through the Garden Route National Park and Nelson Cave in the Robberg Nature Reserve. The Knysna Heads, Tsitsikamma coast and Klasies River locations are of cultural and palaeo importance. The CMR has attempted to expand its reach into this Garden Route region. This has been successful through serving on GRIN (Garden Route Interface Network); through the SARChI Marine Spatial Planning's established activities linked to the Plettenberg Bay Research, Monitoring and Diving Hub; as well as through collaboration with the Nature's Valley Trust, CapeNature and SANParks in this area.

A further important stakeholder and collaborator for the CMR in the Garden Route area, is the Nelson Mandela University's Sustainability Research Unit (SRU), based at the Mandela University's George Campus. As stated in the SRU Strategic Plan from 2016-2020, the SRU focuses on the sustainability of complex ecological systems in the Garden Route. The SRU was established as the first dedicated interdisciplinary research group focusing on environmental and social sustainability research in this critical biodiversity area. This is in line with the CMR's Vision and Mission and speaks to all three CMR Research Themes: *Living Resources and Marine Food Security; Biodiversity, Conservation and Management; and Global Change*. Several SRU researchers and their post-graduate students form part of the CMR's membership. The CMR especially values the relationships built with Dr Bianca Currie (SRU Director and Vice Director for the IRL REHABS Project), and Professor Hervé Fritz (Head of the CNRS and IRL REHABS Project). A visit by researchers that formed part of the ACCLIMATE II vessel mission, saw Professor Fritz and one of his Doctoral candidates present on their research at a two-day workshop hosted by the CMR at the Ocean Sciences Campus. This interaction highlighted the need for a stronger collaboration between the CMR and the SRU for work done along the Garden Route, and a number of collaborative research opportunities were discussed.

In addition, CMR will be hosting a French Liaison at Nelson Mandela University in support of students, emerging researchers, funding opportunities and future research.

The CMR works closely with SAEON colleagues based at the Elwandle and Egagasini nodes. The CMR fully understands the importance of SAEON's long-term environmental observation and monitoring programmes and is excited about the prospect of a second phase for the SAEON Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) in this critical Garden Route biodiversity area. The CMR recognises the leading role that the SRU played in this network during the first phase in the Garden Route landscape and views it as a noteworthy accomplishment of the SRU. Although the EFTEON's focus is largely freshwater and terrestrial in comparison to the CMR's focus is on coastal environments, it is acknowledged that healthy, well-managed and well-maintained terrestrial and freshwater environments have a significant effect on healthy coastal ecosystems. The Garden Route area comprises of both marine and terrestrial landscapes, forming an ideal site to focus on for the EFTEON and for further CMR research collaborations.

With the SRU's position at the Nelson Mandela University's George Campus, the CMR is confident that the SRU will fulfil all the requirements for the second EFTEON phase, with the Garden Route landscape as its study area:

- **Environmental Research Platform:** Study sites are ample, secure and accessible – with a gateway site at the Mandela University George Campus. The Garden Route National Park and Gouritz Cluster are easily accessible. The George Campus and SRU host the significant research infrastructure and facilities in the research landscape. With the George Campus' long history in research and education, it provides the SRU with excellent facilities: office spaces, laboratories, storage units (for samples, equipment and instrumentation), and accommodation for visiting researchers. The SRU possesses the range of hydrological, meteorological and micrometeorological environmental monitoring, observation and sampling measurement equipment, instrumentation, and consumables. A team of researchers and students to perform this research, is available (including SRU members and members of the CMR).
- **Spatial Diversity Coverage:** As mentioned, the Garden Route landscape is representative of a number of vegetation types and biomes in South Africa – and it includes coastal catchments. The land has also been altered for a variety of uses, ranging from tourism and conservation, to urban residential

and urban/rural public infrastructure development, agriculture and forestry. This area affords researchers the opportunity to study the transitions between biomes and land uses, linking these to climate change observations with efforts into alleviating adverse effects on critical social components such as food production and general water shortages. These aspects are already being considered by SRU researchers.

- Datasets: The Garden Route area's landscape has been studied since the 1970s, contributing to a large historical and experimental dataset. The Garden Route National Park particularly offers security for decadal research and monitoring. The SRU works closely with SANParks colleagues and additional Garden Route stakeholders on this monitoring and contribution towards the dataset.
- Experimentation: Climate change and disturbances as a result of alien invasive species, land degradation and land transformation, have affected the Garden Route landscape. This area offers opportunities to SRU researchers to develop experiments in an attempt to understand processes and ecosystem changes. The SRU will employ a system approach to identify essential variables and monitoring priorities. Integrated monitoring will be implemented to capture information on biodiversity changes. Knowledge on the dynamics of ecological processes and their effects on human well-being, will be noted.

The details provided in this letter clearly indicate the significant importance of the Garden Route landscape and the need for long-term environmental observation and monitoring here. It is also demonstrated that the SRU possesses of the necessary qualities to continue leading EFTEON research along the Garden Route. As the Director for the Institute for Coastal and Marine Research (CMR), I hereby confirm the CMR's support for the SRU to lead the EFTEON along the Garden Route. The SRU is fully capable and equipped to continue this task. This will be a prestigious achievement for the SRU at Nelson Mandela University and will provide additional collaborative opportunities for the CMR – thereby strengthening the CMR's research along the Garden Route.

Sincerely,



Dr Bernadette Snow

*Director: Institute for Coastal and Marine Research
Nelson Mandela University
South Africa*



28 May 2020

**Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) Call
for Landscape Nominations**

**Nomination of the Garden Route Gateway as a landscape for installation of long-term
ecological research infrastructure**

Dear Bianca

Thank you and the Sustainability Research Unit for taking the lead in this important initiative. You are assured of our support and willingness to collaborate in ensuring success.

Best wishes

Charles Breen

Chairman Board of Trustees

Email breenc39@gmail.com Cell +27 (0)82 454 1386

28 September 2020

Dr Bianca Currie
Director: Sustainability Research Unit
Vice Director: IRL REHABS
Lecturer: School of Natural Resource Management
Chair: UNESCO Garden Route Biosphere Reserve
Nelson Mandela University
Science Faculty, George Campus

Dear Bianca

SUPPORT FOR EFTEON GARDEN ROUTE BID

This serves to confirm that the Nature's Valley Trust (NVT), a conservation NGO located in the Bitou Municipality is entirely supportive of this bid.

NVT is involved in environmental and conservation research in the inshore marine, shoreline, estuaries, catchments and fynbos systems. It also leads environmental education programmes in the municipality. We work in partnership with SANParks, Capenature, several academic institutions, Bitou, civil society and other non-government organisations, and the private sector.

As such we would make significant use of all EFTEON's offerings, particularly as it relates to:

- Biodiversity
- Productivity
- Ecosystem condition
- Ecosystem service provision and use
- Remotely sensed imagery
- Socio-ecological survey data

Best of luck with the bid.

Yours sincerely,



Duncan Hay
Director

Incorporating the
Garden Route Botanical Garden
&
The Southern Cape Herbarium

Trust No IT 2704-97 / NPO 009-676
/ PBO ito sections 18A & 30 of the Income Tax Act, 1962
49 Caledon Street, George, 6529, South Africa
Tel: 044-8741558 / Fax: 0866279445

Dear Dr. Bianca Currie,

The Garden Route Botanical Garden is excited to hear about the EFTEON Landscape nomination for the Garden Route, and we support this project fully.

The Garden Route Botanical Garden is a NPO that aims to conserve and display the rare and endangered flora endemic to the Southern Cape through Ex-situ and In-situ conservation practices.

The information provided by the EFTEON infrastructure would be an invaluable asset to small conservation organisations such as ourselves who rely heavily upon available open source data and citizen science led programmes that provide data on Biodiversity, Ecosystem conditions and Socio-economic and Socio-ecological conditions and much more.

The Garden Route Botanical Garden uses this data for ; Location of rare and endangered plant species, location , population dynamics and threats to restricted plant populations, for monitoring of restricted populations, as well as for the collection and propagation of these species for conservation purposes.

The Garden Route Botanical Garden also houses the Southern Cape Herbarium and Environmental Education Centre, research collected regarding impacts of Climate Change on biodiversity in the Garden Route will benefit these two entities greatly by directing research and education programmes to areas of most concern.

We look forward to the establishment of this infrastructure and future collaborations with NMU, SRU and the Department of Science and Innovation.

Kind Regards,



Corne Brink
Manager and Curator



Southern African Programme for Ecosystem Change and Society (SAPECS)
Hosted at Centre for Complex Systems in Transition
School of Public Leadership
Stellenbosch University
23 September 2020

Dear Dr Feig and the EFTEON Landscape Proposal Evaluation Panel

Re: support for the Garden Route Gateway Site proposal as an Expanded Freshwater and Terrestrial Environmental Observation Network Landscape.

I hereby express my full support for the establishment of an EFTEON Research Landscape in the Garden Route Gateway Site on behalf of the Southern African Programme for Ecosystem Change and Society (SAPECS www.sapecs.org).

The Southern African Program on Ecosystem Change and Society (SAPECS) is a transdisciplinary, international research program that aims to advance stewardship of social-ecological systems and ecosystem services in southern Africa. It is linked to the international Program on Ecosystem Change and Society (www.pecs-science.org), a 10-year research initiative within the ICSU global change programs.

SAPECS consists of a network of researchers, both from within the region and abroad, actively engaged in researching social-ecological systems in a range of case studies at various scales in the southern African region. This research is conducted within a shared conceptual framework and focuses on a common set of core themes. As a network of researchers and practitioners working on issues related to social-ecological resilience and sustainability, we believe our interests are well represented by the proposal, and declare that members of our network will be interested to collaborate on projects that will benefit from the proposed infrastructure, and associated research endeavours within the proposed landscape.

If needed, we are prepared to engage with EFTEON to develop a memorandum of understanding or data sharing agreement to outline our respective expectations for interaction with and support for this project. A representative from the SAPECS is also keen to engage with and/or serve on the landscape committee if needed.

Sincerely,

Professor R (Oonsie) Biggs
SAPECS Coordinator
www.sapecs.org

Contact person: Cornelia Jacobs; Research Coordinator, CST; +27 823740088
corneliajacobs@sun.ac.za



LETTER OF SUPPORT

For the NMU-SRU as the leading entity for the Expanded Freshwater and Terrestrial Environmental Observation Network (EFTEON) landscape nomination for the Garden Route

25 September 2020

EFTEON

Mandated by the Garden Route District Municipality, the Garden Route Environmental Forum (GREF) is a regional forum for collaboration in conservation, environmental adaptation and community interaction. The GREF represents the full spectrum of both governmental and non-governmental stakeholders and key environmental management entities in the Southern Cape.

As such, GREF recognises the relevance and importance of the EFTEON Second Phase proposal, all it encompasses, and the multiple long-term benefit it holds for all the key environmental stakeholders both in the region and beyond.

The Garden Route District Municipality in particular, as well as the Western Cape Government, stands to gain substantially from the outcomes as outlined and proposed by EFTEON Phase Two, and therefore strongly supports the Nomination.

We wish NMU-SRU and its partners well with the due process.

Yours sincerely

**Mrs Marti Kirstein on behalf Mr Cobus Meiring, Chairperson of the
GARDEN ROUTE ENVIRONMENTAL FORUM (GREF) SECRETARIAT**

Email: cobus@naturalbridge.co.za

Mobile: 083 626 7619



55 Sands Road Wilderness, 6560
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Email: cobus@naturalbridge.co.za
Website: www.scli.org.za

25 September 2020

For Att: Dr. Bianca Currie
Director: Sustainability Research Unit
Vice Director: IRL REHABS
Lecturer: School of Natural Resource Management
Chair: UNESCO Garden Route Biosphere Reserve
Nelson Mandela University, Science Faculty, George Campus
www.sru@mandela.ac.za
<https://gardenroutebiosphere.org.za/>

SCLI letter of support: EFTEON Garden Route Landscape Nomination

Established in 2010, the Southern Cape Landowners Initiative (SCLI), is the premier regional public platform for landowners and land managers dealing with the eradication and control of invasive alien plants in the Garden Route, and strongly supports the EFTEON Garden Route Landscape Nomination.

The favourable Southern Cape climate makes it vulnerable for prolific invasive alien plant growth, and the effects thereof on the ecological integrity of the region, documented over well more than a century, has been devastating.

The collective of entities represented by SCLI, and their effort in working towards creating more wild spaces, free of invasive alien plants, urgently requires what is encompassed in the objectives as set out by EFTEON in order to scientifically substantiate our long-term drive to create a healthier environment.

SCLI wishes you well with the nomination.

Kindest regards

COBUS MEIRING | Stakeholder Management

Founder and Chairperson of the Southern Cape Landowners Initiative (SCLI)

12 August 2020

Dr Steve Du Toit

Gouritz Cluster Biosphere Reserve
Riversdale

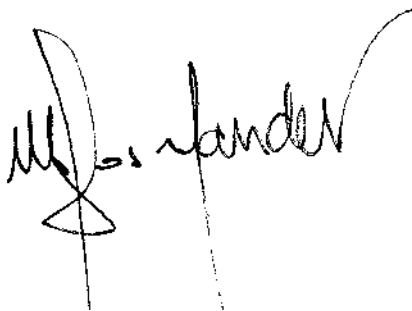
Dear Steve

RE: EFTEON Proposal

Futureworks supports the GCBR EFTEON bid given the need to monitor and analyze climate trends in the Garden Route and Gouritz Cluster biosphere reserves. The economic and social dependence on the regional rivers, being either drought prone or particularly short catchments, implies a critical need to be aware of changes to the climate, both in the short to medium term.

Timeous and credible analysis of climate trends will foster greater resilience in the Southern Cape communities and having a facility in the region will support informed decision making.

Thanks



Myles Mander

Director



Dr Gregor Feig

Manager

EFTEON - Expanded Freshwater and Terrestrial Environmental Observation Network

Dear Dr Feig

Support for the Nomination of the Garden Route Gateway as a landscape for installation of long-term ecological research infrastructure

The Sustainable City Forum (SCF) wishes to offer its support for the above nomination. In offering our support, we briefly indicate the nature of SCF and the way in which this innovative and strategic infrastructure conceptualisation will be of value to our work.

The Sustainable City Forum (SCF)

SCF was registered as an NPC on the 28th October 2019. It was established as a joint venture between the George Chamber of Business (GCB) and the Sustainability Research Unit (SRU), Nelson Mandela University, George Campus, but as its own legal entity.

The mission of SCF is to champion long-term social and ecological well-being in the Garden Route by promoting sustainability and action based on research and partnerships with communities. Against this commitment, our vision involves:

- Encouraging proactive planning for urban densification, social integration, and sustainable land management;
- Increasing awareness of and action for climate change risks about wildfire, water shortages and food security;
- Generating and circulating information about an economy that produces goods and services sustainably, while limiting consumption of raw material and waste production;
- Advocating for transparent and accountable governance, so that sound policy and planning moves from theory or promise, to practice and implementation; and
- Identifying and implementing innovative projects at a local level that further these goals.

How can the installation of long-term ecological research infrastructure will be of value to SCF and its network of partners?

SCF has been focusing its research and action around strategies to address the impact of rapid urbanisation in the Garden Route as well as concerns about food security, an issue made more apparent with the onset of the COVID-19 pandemic, with the concomitant rise in unemployment,

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Board of Directors: Ms D Erasmus, Prof R. Fincham (Chairperson), Ms J Mashele, Mr S Stead (Acting CEO)

Non-Profit Company Registration No: 2019/524632/08

the glaring reality of human poverty, and the on-going impact of climate change on agricultural production. Amongst the questions we have been raising in a research context and through engagement with the local and district municipalities as well as relevant interest groups are: *How can we more effectively engage with local government and affected communities around rapid, unplanned informal urbanisation and its impact on the human/nature interface? How can we create a more food secure Garden Route, where agricultural production is not only for commercial gain, but also about food production for local consumption and is climate smart?*

We applaud the social and ecological systems (SES) articulation of the proposal presented to EFTEON as the systemic human and nature concerns made abundant in this framing are exemplified in our work. As the proposal states and we concur, the Garden Route is a sensitive ecological entity and human expansion and poor policy enactment in the future will destroy its inherent attraction and employment as a tourist destination. The envisaged infrastructure will contribute to a stronger policy environment with the resources on offer.

It is against these comments that the Sustainable City Forum gives its full support to this proposal.



Professor RJ Fincham

Chairperson

30th September 2020



Stephen Stead

Chief Executive Officer

28 September, 2020

LETTER OF SUPPORT: EFTEON Call for landscape nominations- Nelson Mandela Garden Route Gateway Application

To whom it may concern,

The Touw River Conservancy is a small but passionate community group based in the Touw River Catchment in the Garden Route of South Africa. Our vision is:

To instil in all our members, partners and visitors a deep sense of pride in, stewardship of and responsibility for our unique natural heritage and a realization of its intrinsic and environmental value.

Our mission is:

To conserve the natural assets of the area, in partnership with all its people, for the benefit and enjoyment of present and future generations.

We believe that in order to achieve our mission and vision it's critical that we engage with the best possible science around the state of our environment and the impact climate change, human development and agriculture is having on our landscape. We see many opportunities for better engagement with scientific evidence to deepen our understanding of our landscape and our impacts on it and believe that the unique combination of flora, fauna, geology and social conditions of the Garden Route generally makes this region a massively valuable and fascinating region to study in depth. Furthermore, the fact that we have well established networks in the region from a research, activism and community perspective means that much of the architecture required to deliver high impact, relevant and important research outcomes are already in place.

At the same time, increasingly rapid changes in the region lend a sense of urgency to our actions in this special part of the world. Urban development, agricultural development, invasive alien vegetation, governance issues and climate change are all threatening the landscape we love in varied, complex and interconnected ways. We hope that the additional capacity to understand our landscape, should the application be approved, will improve our ability to motivate for better landscape management and engagement to ensure a sustainable future for us and the incredible ecosystems that we share this part of the world with.

Many thanks for your consideration of this application.

Yours,

Matthew Koehorst
Touw River Conservancy Chairperson

Email: immatthewkoehorst@gmail.com
Cell: 076 6189 722