Boegoebaai Port Development and Special Economic Zone (SEZ) Strategic Environmental Assessment (SEA)

Fisheries and Coastal Livelihoods Expert Group
Work Package 1

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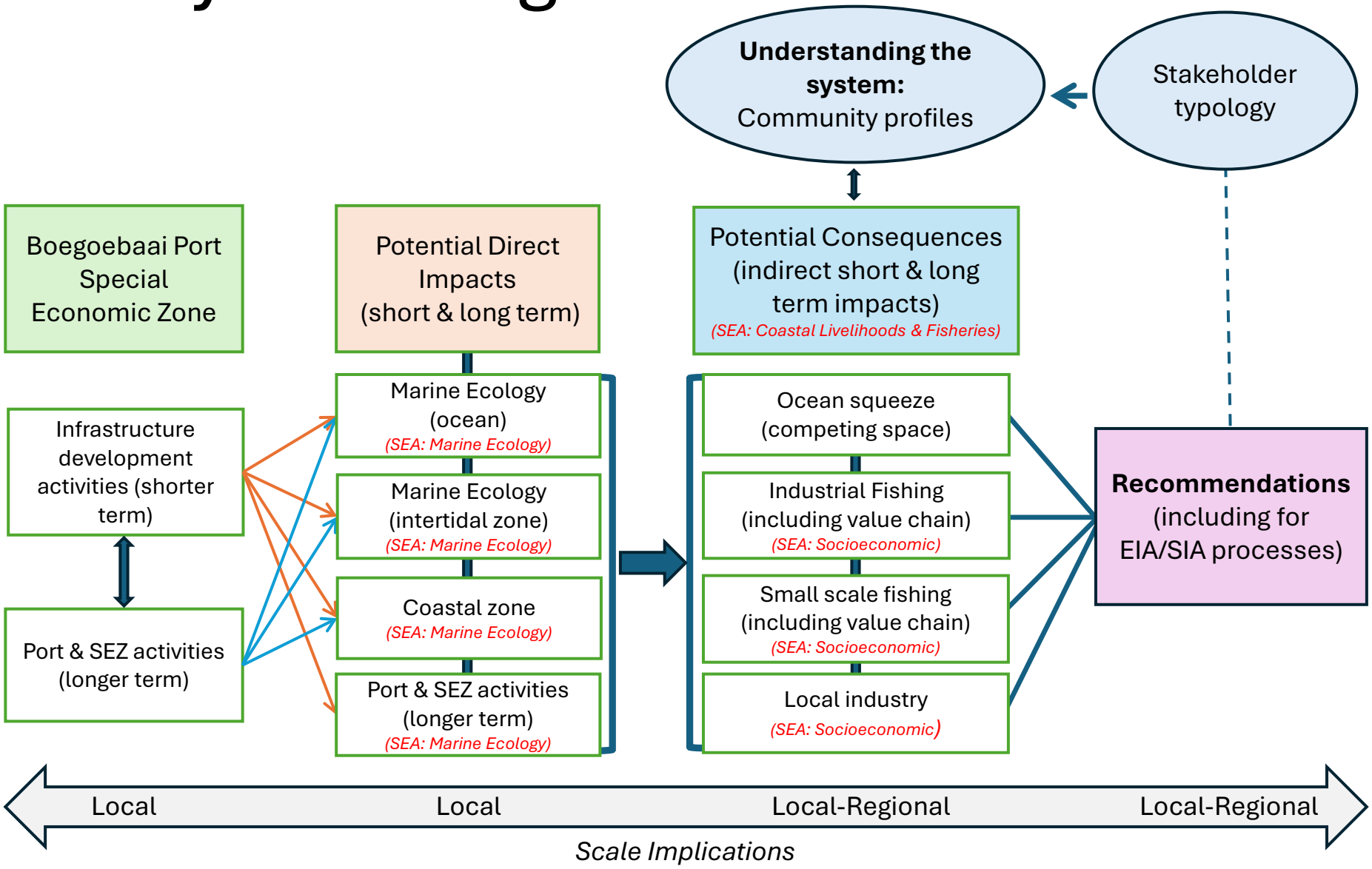
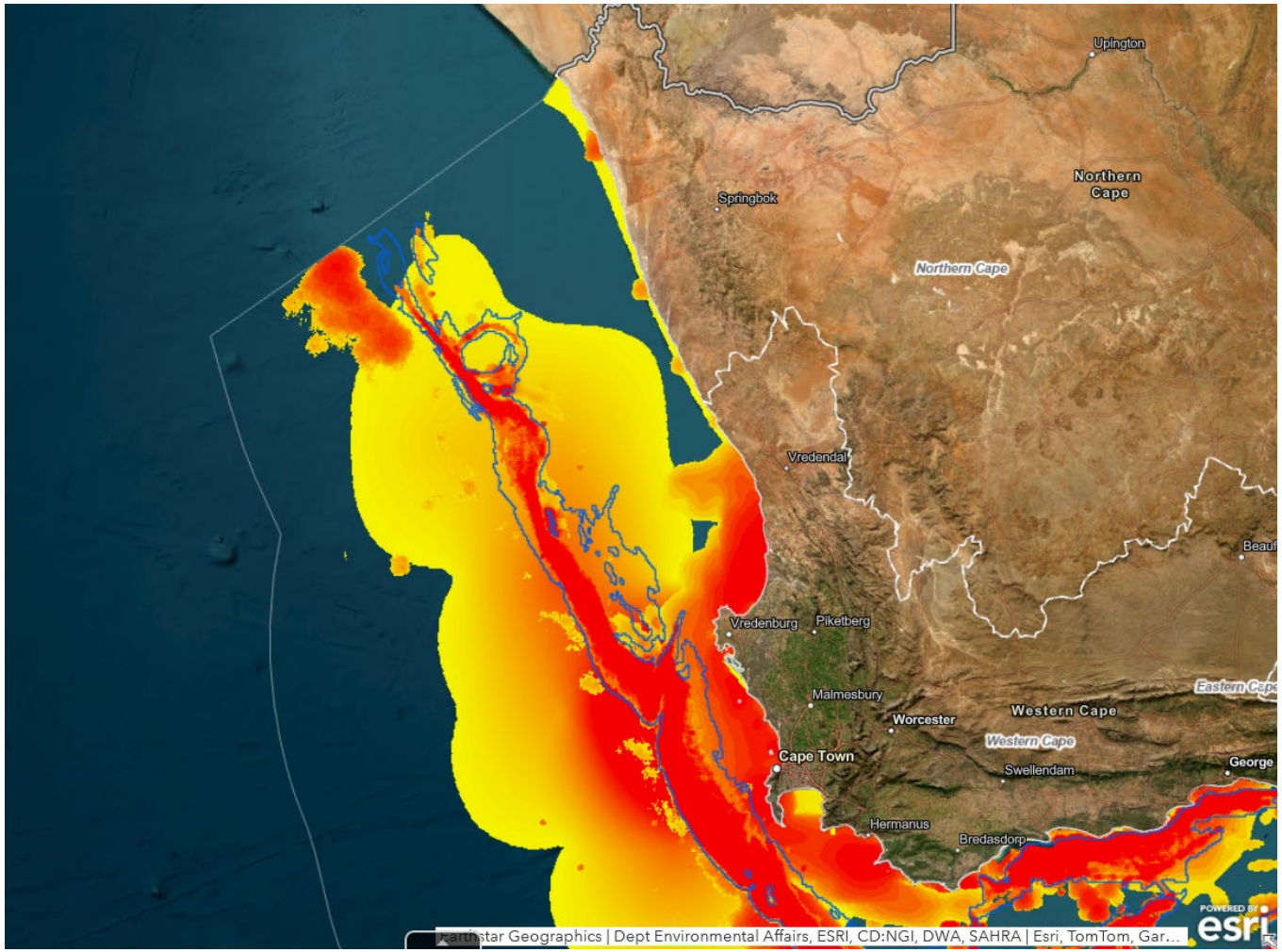
Theory of Change



Mixed Methods Approach

Method Step	Methods Used	Data Sources & Tools	Intended Outcome
Stakeholder Analysis Framework	Desktop review and research; expert validation through consultation	Published research & grey literature, inputs from various stakeholders	Holistic identification of interconnected stakeholders, Preliminary stakeholder landscape, draft stakeholder list, identification marginalised stakeholders
Stakeholder Categories	Desktop research	Master typology (Gammage & Strand 2021)	Clear differentiation of stakeholder groups by scale and type (government, NGO/NPO, civil society, private sector)
Stakeholder Relationships	Social network analysis	Third-party sources and expert inputs	Stakeholder interests and preferred engagement methods to inform potential impacts
Description of Fisheries	Desktop review; expert validation through consultation	Published research & grey literature; consultation of relevant subject matter experts	Overview of pertinent national fisheries in South Africa and fisheries in the Northern Cape Province
Community Profiles	Coastal livelihood typologies; desktop literature review; ground truthing through fieldwork and interviews	Typologies of coastal livelihoods for communities of interest were developed, Published research & grey literature, Fieldwork - semi-structured interviews; consultation of experts	In-depth understanding of community composition, diversity, and key livelihood activities (agriculture, conservation, fisheries, mining, tourism)
Aspects and Impacts	Desktop review; expert validation through consultation	Consolidation of findings from all steps.	Potential positive and negative impacts of the proposed development; high level evidence-based recommendations

Fisheries Overview



Fishing intensity of fisheries (trawl, hake longline, small pelagics, pelagic longline, tuna pole, linefish, net fish, kelp harvesting, West Coast Rock Lobster) with a focus on the west coast of South Africa (extracted from OCIMS Coastal Viewer; DFFE, 2024)

Community Profiles

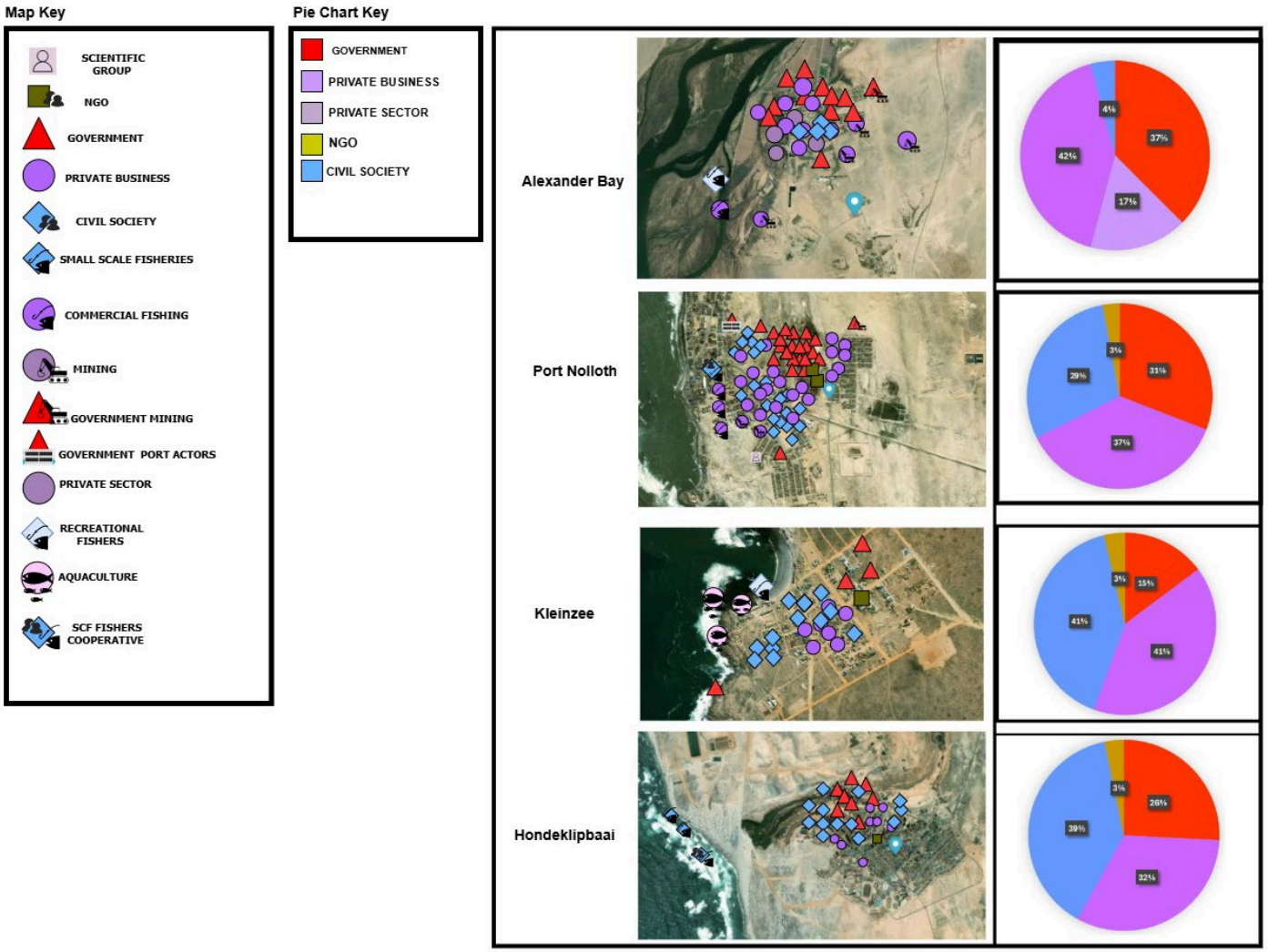
District Municipality	Local Municipality	Community of interest	Key coastal livelihood activities	
			Primary importance	**Secondary importance**
Namakwa	Richtersveld	Alexander Bay	Mining	Agriculture, tourism (including conservation)
		Port Nolloth	Fisheries, mining	Tourism (including conservation)
	Nama Khoi	Kleinzee	Fisheries (aquaculture)	Mining, tourism (including conservation)
	Kamiesberg	Hondeklipbaai	Fisheries	Tourism (including conservation)


Alexander Bay (outside)


Port Nolloth

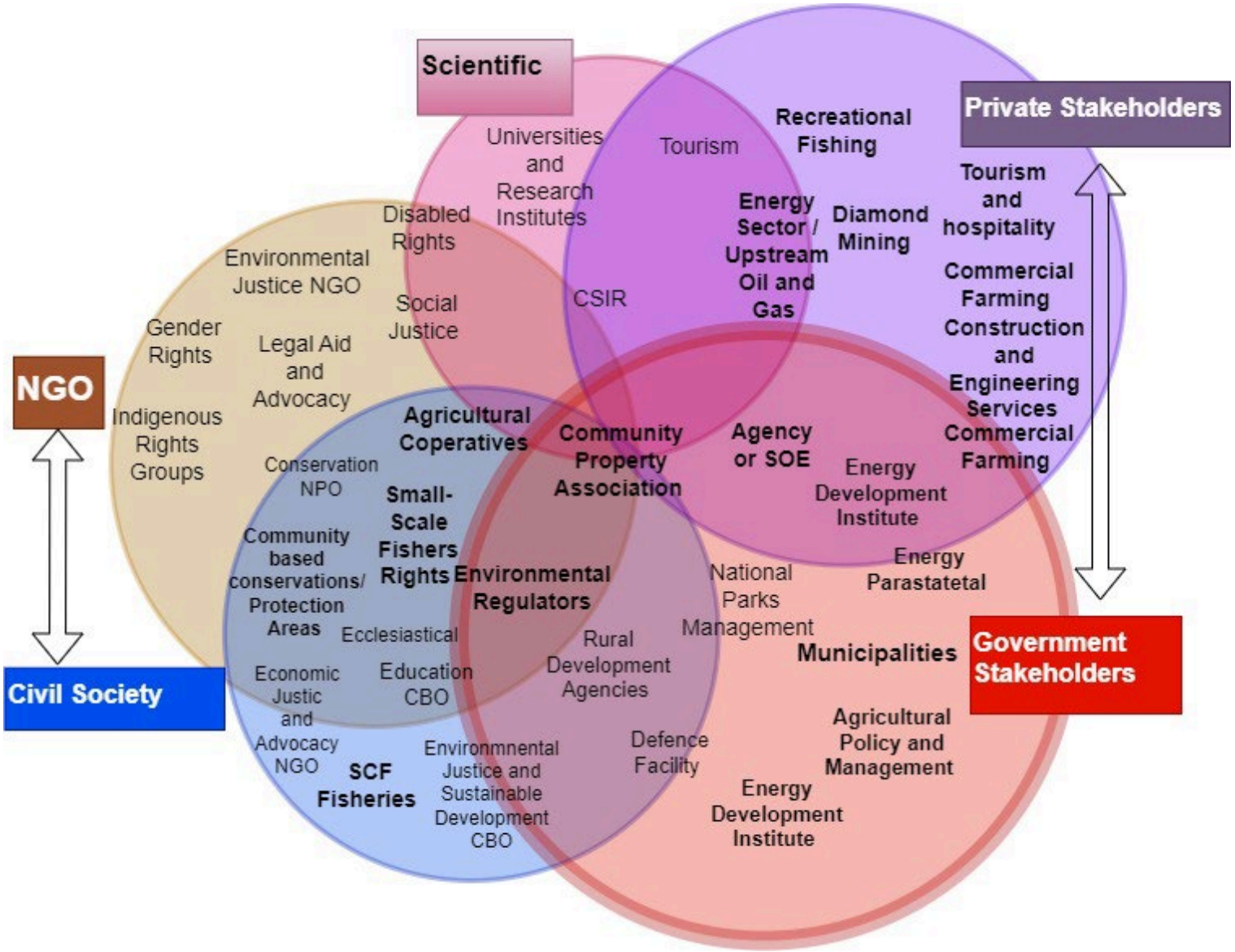
Hondeklipbaai

Stakeholder Mapping



An overview of the percentage distribution of stakeholders identified in the four communities of interest: Alexander Bay, Port Nolloth, Kleinzee and Hondeklipbaai

Stakeholder Categorisation



Impacts & Aspects

Focus Area	Recommendation
Alexander Bay	
Socio-Economic Opportunities	Ensure equitable access to port employment opportunities, particularly for marginalised groups.
	Transition skills and infrastructure from mining to industrial activities.
Environmental and Social Impacts	Evaluate cumulative environmental impacts of mining and port activities.
	Engage conservation organisations to monitor and mitigate degradation.
Stakeholder Engagement	Facilitate multi-stakeholder dialogues between residents, mining entities, and developers.
	Provide clear communication channels for community participation.
Port Nolloth	
Fisheries and Livelihoods	Protect small-scale fishing livelihoods from industrial disruptions.
	Strengthen marine resource management to prevent overfishing and displacement.
Infrastructure and Accessibility	Ensure port infrastructure does not restrict fishing grounds or harm marine habitats.
	Develop alternative income initiatives, such as eco-tourism.
Stakeholder Engagement	Collaborate with fishing co-operatives and conservation groups to design mitigation measures.
	Create transparent platforms for fishing rights decisions.
Kleinzee	
Aquaculture and Tourism	Integrate aquaculture into environmental planning to prevent water and habitat degradation.
	Promote conservation-aligned tourism opportunities.
Resilience and Diversification	Expand aquaculture through capacity-building initiatives and financial assistance.
	Foster synergies between tourism and aquaculture to diversify the economy.
Stakeholder Engagement	Strengthen collaboration with aquaculture enterprises and tourism operators.
	Involve local businesses in long-term planning and resource discussions.

Impacts & Aspects (cont.)

Focus Area	Recommendation
Hondeklipbaai	
Fisheries and Vulnerabilities	Maintain access to traditional fishing grounds for small-scale fishers.
	Offer skill-building for alternative livelihoods like eco-tourism and aquaculture.
Infrastructure Development	Minimise disruptions to livelihoods and cultural practices in infrastructure projects.
	Collaborate with NGOs to advocate for marginalised groups.
Stakeholder Engagement	Engage fishing communities in co-management frameworks.
	Ensure women's perspectives are included in consultations.
Cross-cutting Themes	
Inclusive Governance	Establish community advisory boards for ongoing decision participation.
	Strengthen co-management frameworks for resource management.
Environmental Stewardship	Prioritise marine spatial planning to protect habitats.
	Implement monitoring systems to track environmental and social impacts.
Capacity Building and Advocacy	Provide financial and technical support for adapting to socio-economic changes.
	Partner with NGOs for equitable resource allocation and decision-making.
Transparent Communication	Develop culturally appropriate communication strategies.
	Create mechanisms for feedback and grievance redressal.

Key Risks Identified

Marine ecosystem degradation of critical nursery grounds (sardine, hake, mullet).

Ocean squeeze: intensified spatial competition constraining small-scale fishers.

Pollution from construction, dredging & increased vessel traffic.

Gentrification & displacement pressures on adjacent communities.

Marginalisation of local stakeholders & fragmented, project-specific ESIAs.

Risk 1: Marine Ecosystem Degradation

Loss or damage to nursery habitat threatens west-coast commercial stocks.

Potential decline in fish populations → cascading economic impacts.

Risk 2: Ocean Squeeze

Competing industrial uses further restrict fishing space.

Erodes viability of traditional small-scale fisheries; exacerbated by climate change.

Risk 3: Pollution

Dredging & operations degrade water quality; underwater noise & spills.

Impacts kelp beds, recruit-dependent species and overall ecosystem health.

Risk 4: Gentrification & Displacement

Influx of workers & investors may raise living costs and displace residents.

Potential loss of cultural heritage and community cohesion.

Risk 5: Marginalised Stakeholders

Decision-making dominated by government & private sector interests.

Fragmented ESIAs overlook cumulative, cross-sector impacts.

Overarching Recommendations

- Commission expanded specialist fisheries impact study (cross-cutting & cumulative).
- Embed inclusive, SES-based stakeholder engagement from project inception.
- Invest in community-centric initiatives: skills, alternative livelihoods, affordable housing.
- Harmonise regulatory frameworks to manage cumulative impacts & scale mismatches.

Actions: Physical Environmental Impacts

- Conduct fisheries-specific EIAs; co-design mitigation with industry & communities.
- Create protected zones & integrate into marine spatial plans.
- Strict monitoring of water quality; rehabilitate impacted habitats.

Actions: Ocean Squeeze

- Implement co-managed marine spatial planning recognising traditional fisheries.
- Stakeholder dialogue platforms & GIS mapping to resolve space conflicts.
- Diversify livelihoods & adapt fishing practices; community-led monitoring.

Actions: Gentrification

- Protect sensitive ecological & cultural sites; promote sustainable tourism.
- Equitable housing policies to prevent displacement; prioritise local hiring.
- Design SEZ participation requirements favouring local businesses.

Actions:
Stakeholder Collaboration

- Establish community advisory councils & grievance mechanisms.
- Transparent multi-channel communication; pro bono legal support.
- Cultural impact assessments & integration of traditional decision processes.

Anticipated Benefits

Balanced economic growth with resilient marine ecosystems.

Sustainable fisheries securing food security & employment.

Empowered coastal communities with diversified livelihoods.

Enhanced trust & legitimacy through inclusive governance.

Sustainable Port Planning (Desktop)

Susan Taljaard & Steven Weerts
Coastal Systems and Earth Observations, Smart Places, CSIR

CSIR
Touching lives through innovation

24 April 2025

Approach

- Focus on structured **Practical** Guidance *re* Sustainable Port Planning (& Development)
- **Capitalize on R&D** already developed, within CSIR, also as part of UNEP studies for Western Indian Ocean region (through Nairobi Convention)
- **Facilitate alignment** with existing sustainable port performance approaches being explored within TNPA (Sustainability Performance Assessment pilot tested in Port of Ngqura (as part of UNEP project)

NOTE: The brief of this desktop study was NOT to perform a Sustainability Assessment on a proposed Port at Boegoebaai. It was to provide practical guidance on key criteria and best practice that need to be considered and adhered to during port planning, development and operations to claim sustainability

Report Content

1. **Introduction**
2. **Contextualising Sustainable Port Development**
   - Need for Sustainability
   - Policy and Legislative obligations
   - Embedding Sustainability in Port Development Cycle
   - Implementation Mechanisms and Funding Options
   - Sustainability Performance Assessment and Reporting
3. **Framework for Sustainable Port Planning & Development**
4. **Sustainability Planning for Proposed Port of Boegoebaai**
   - Key Sustainability Criteria
   - Useful Sources to Support Implementation (e.g. World Port Sustainability Programme & Nairobi Convention Toolkit for Sustainable Development)

Boegoebaai SEA

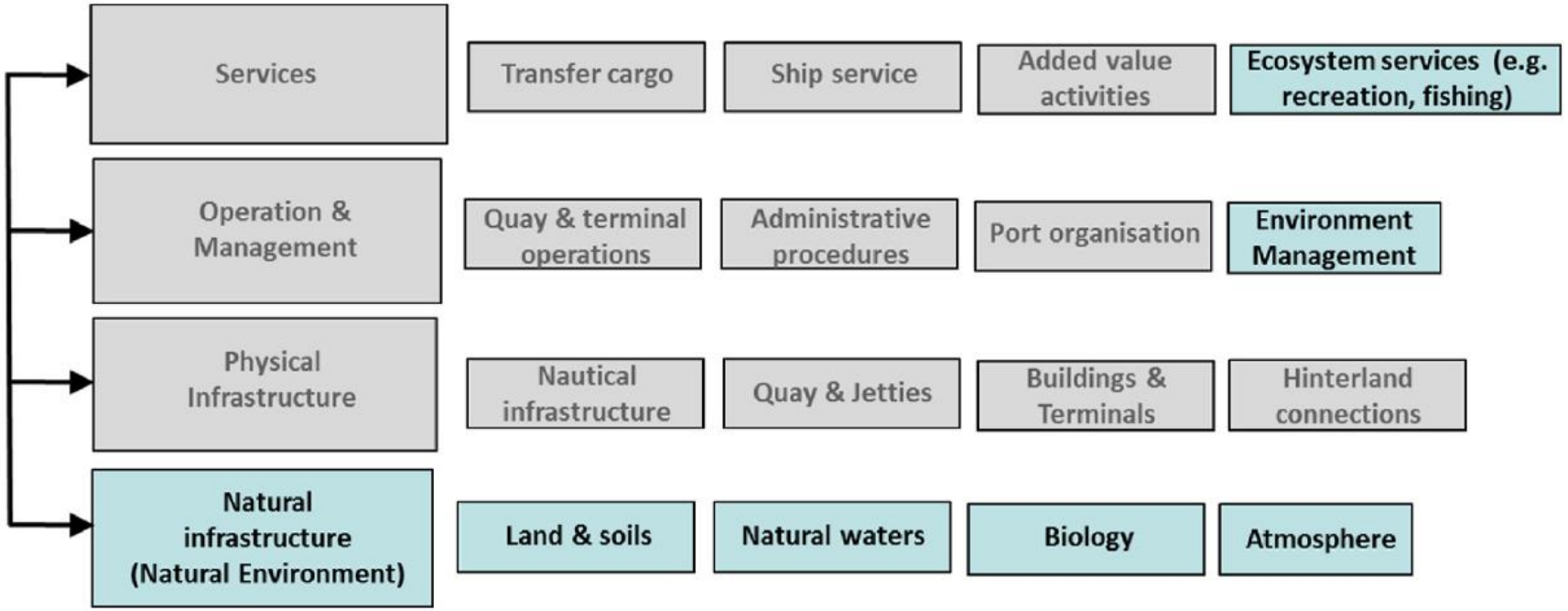
Informing Sustainability Planning for proposed Port of Boegoebaai

Final Draft

20 March 2025

Need for Sustainability

- Concept of Sustainable Ports – ports that remain **economically viable, but also are environmentally and socially responsible** (coastal environment in and around ports also offer value to others…)
- Increasingly, port authorities worldwide compelled to pursue greater sustainability to **safeguard their 'license to operate'** (competitiveness)



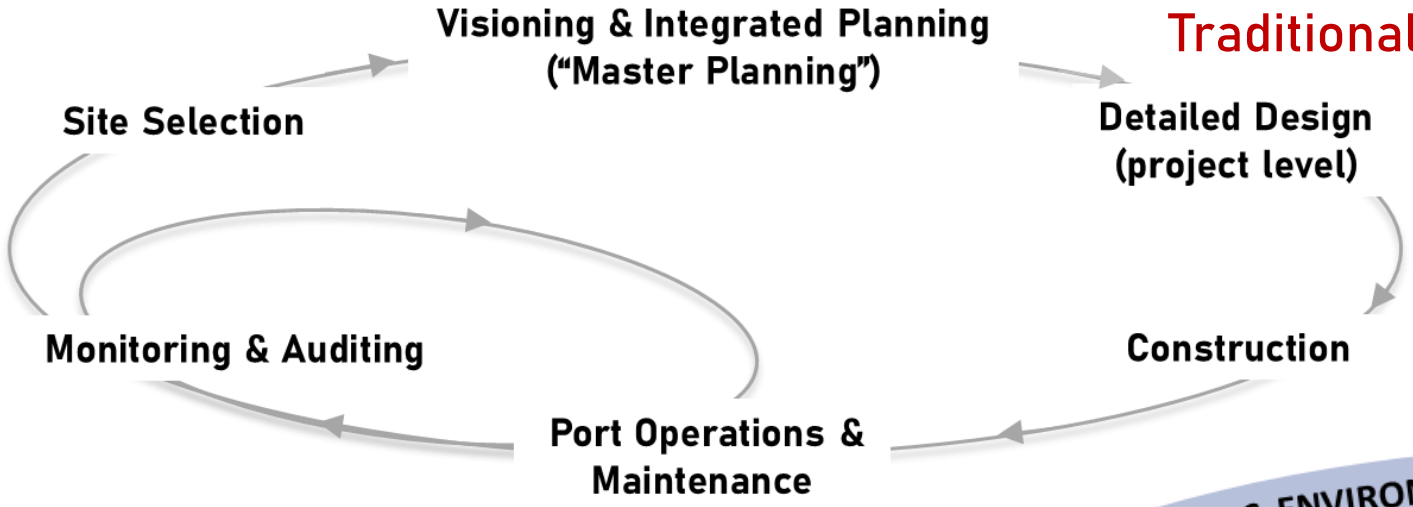
Policy & legislative obligations

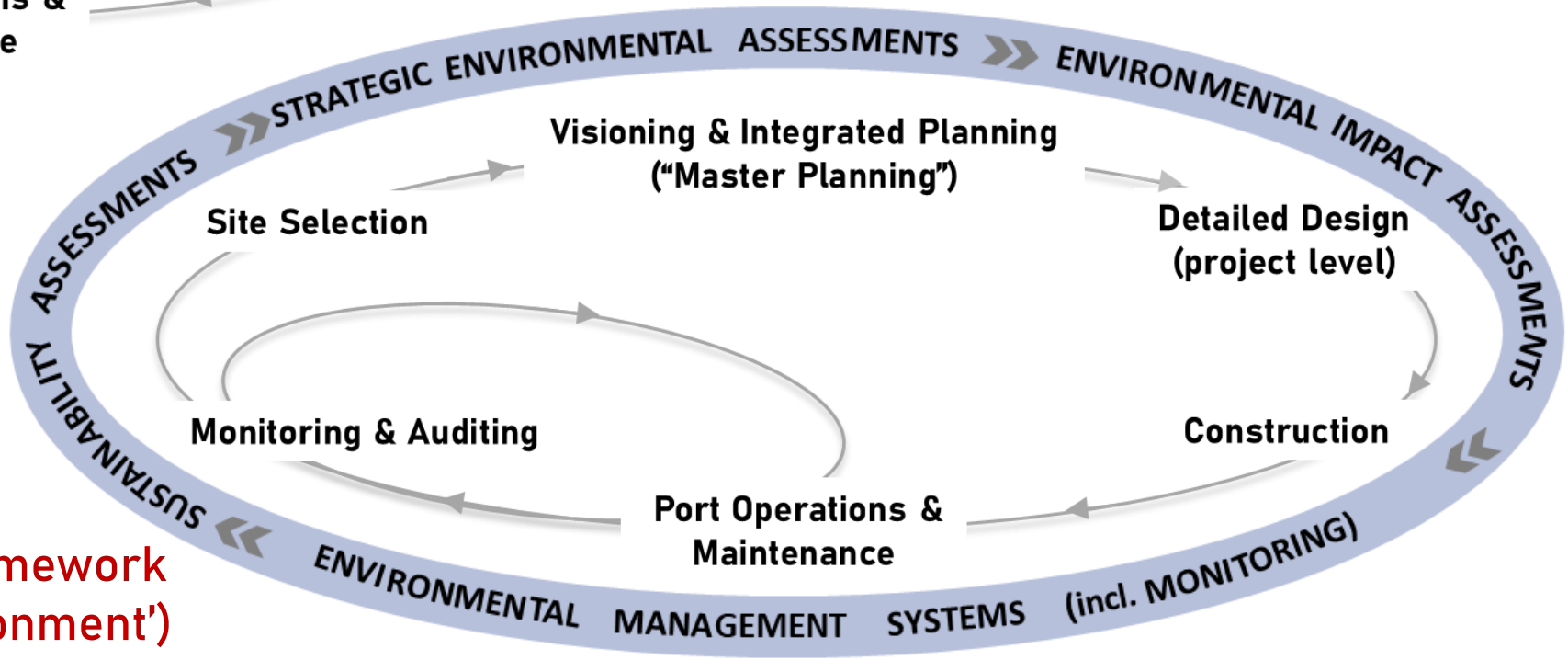
- South Africa signatory to **Agenda 2030** and its 17 Sustainability Development Goals
- **Agenda 2063**- *The Africa We Want*, Africa's blueprint for transforming continent into future global powerhouse
- South Africa has an array of legislation in **support of responsible and sustainable use** of its natural resources
- Numerous **national legislation applying to management in coastal and marine system** (Taljaard et al. 2019)
- **Priority pieces of legislation** in support sustainable port development (linked to related processes and activities)…

Port & Shipping	National Ports Act (No. 12 of 2005)
	South African Maritime Safety Authority Act (No. 5 of 1998)
Conservation	National Environmental Management: Biodiversity Act (Act 10 of 2004)
	National Environmental Management: Protected Areas Act (No. 57 of 2003)
Heritage	National Heritage Resources Act (No. 25 of 1999)
Water	National Water Act (No. 36 of 1998)
	Water Services Act (No. 108 of 1997)
Urban & spatial development	Climate Change Act (No. 22 of 2024)
	Disaster Management Act (No. 57 of 2002)
	Local Government: Municipal Systems Act (No. 32 of 2000)
	Spatial Planning and Land Use Management Act (No. 16 of 2013)
	National Environmental Management Act (No. 107 of 1998)
	Marine Spatial Planning Act (No. 16 of 2018)
	National Environmental Management: ICM Act (No. 24 of 2008)
Marine- and Land-based pollution	National Environmental Management: ICM Act (No. 24 of 2008)
	National Environmental Management: Waste Act (No. 59 of 2008)
	National Environmental Management: Air Quality Act (No. 39 of 2004)
	National Water Act (No. 36 of 1998)
	Hazardous Substances Act (No. 15 of 1973)
	Marine Pollution (Control and Civil Liability) Act (No. 6 of 1981)
	International Health Regulations Act (No. 28 of 1974)

Embedding Sustainability in Port Development Cycle

Traditional (engineering) Port Development Cycle





Integrated Port Management Framework
(aligning 'engineering' with 'environment')

Implementation Mechanisms & Funding Options

Implementation mechanisms, e.g.:

- Regulations and standards *(ultimate backstop for sustainability and technological implementation)*
- Incentives and disincentives including grants
- Voluntary and compulsory agreements
- Training and information sharing

Innovation in acquiring **additional financial resources** e.g.:

- Blended finance – strategically using development finance to mobilise additional finances towards sustainable port development in developing countries
- Investment from stakeholders – operators, municipalities or industries investing especially where there is added value
- Green Bonds – such as offered by development banks (e.g. World Bank, South African Development Bank)

Sustainability Performance Assessment & Reporting

Environmental Development 52 (2024) 101068

Contents lists available at ScienceDirect

Environmental Development

journal homepage: www.elsevier.com/locate/envdev

Circles of port sustainability: A novel method combining global comparability and local relatability in performance assessment

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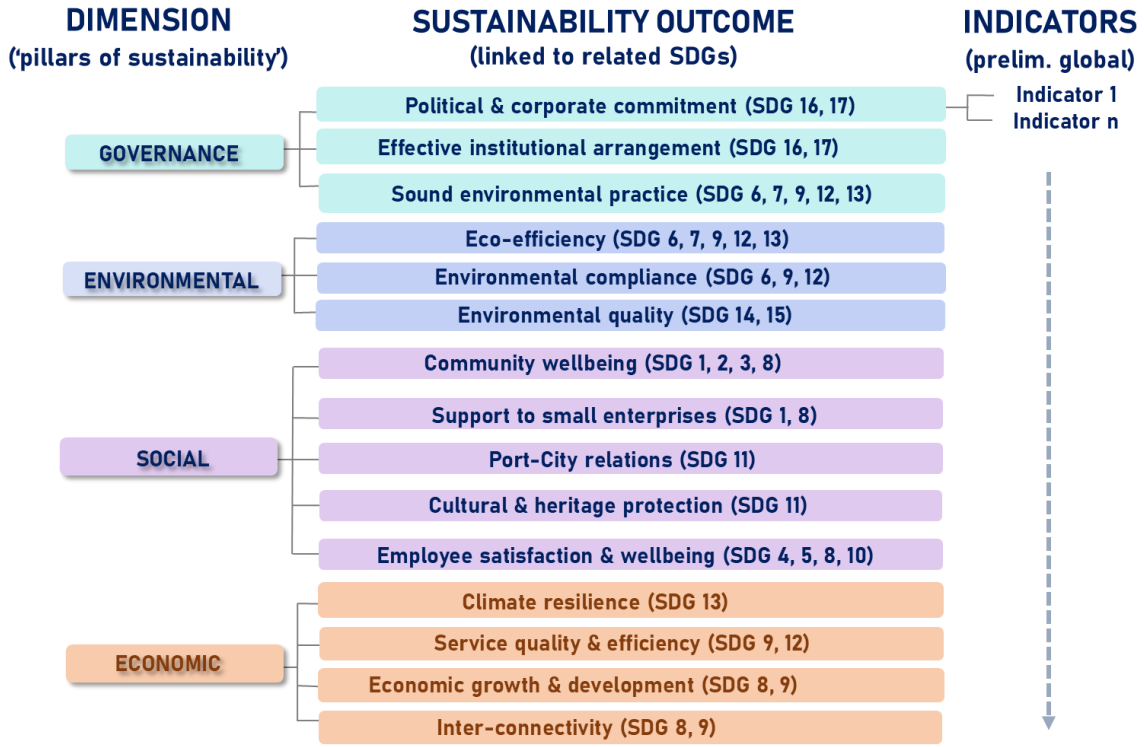
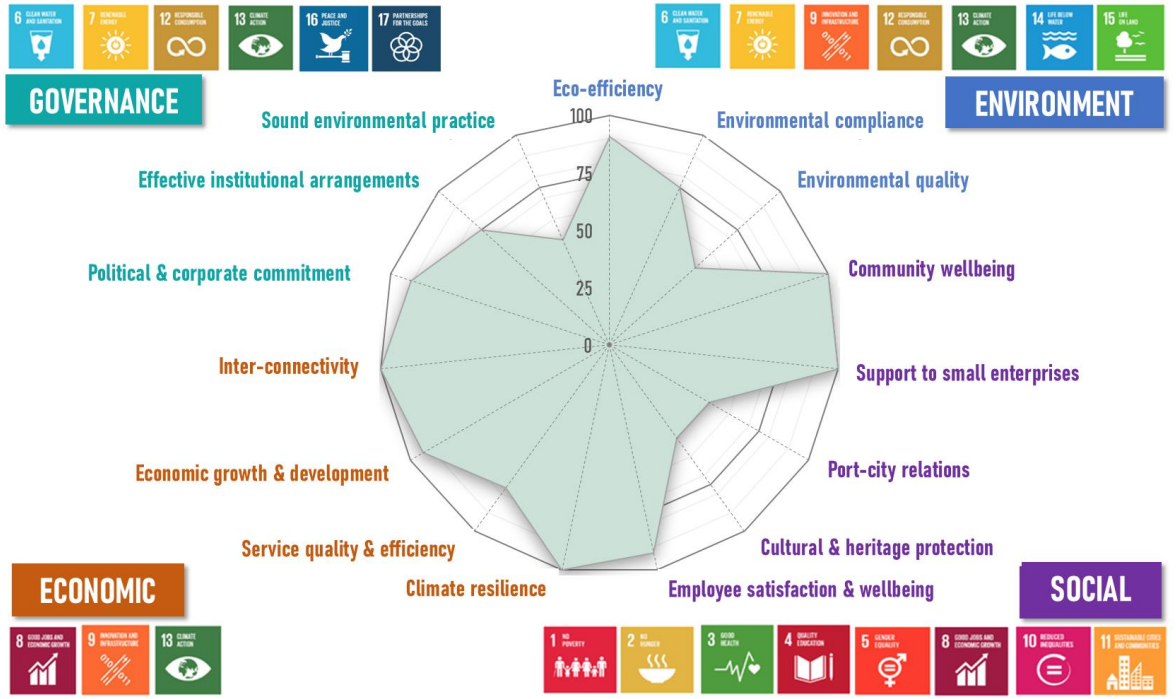
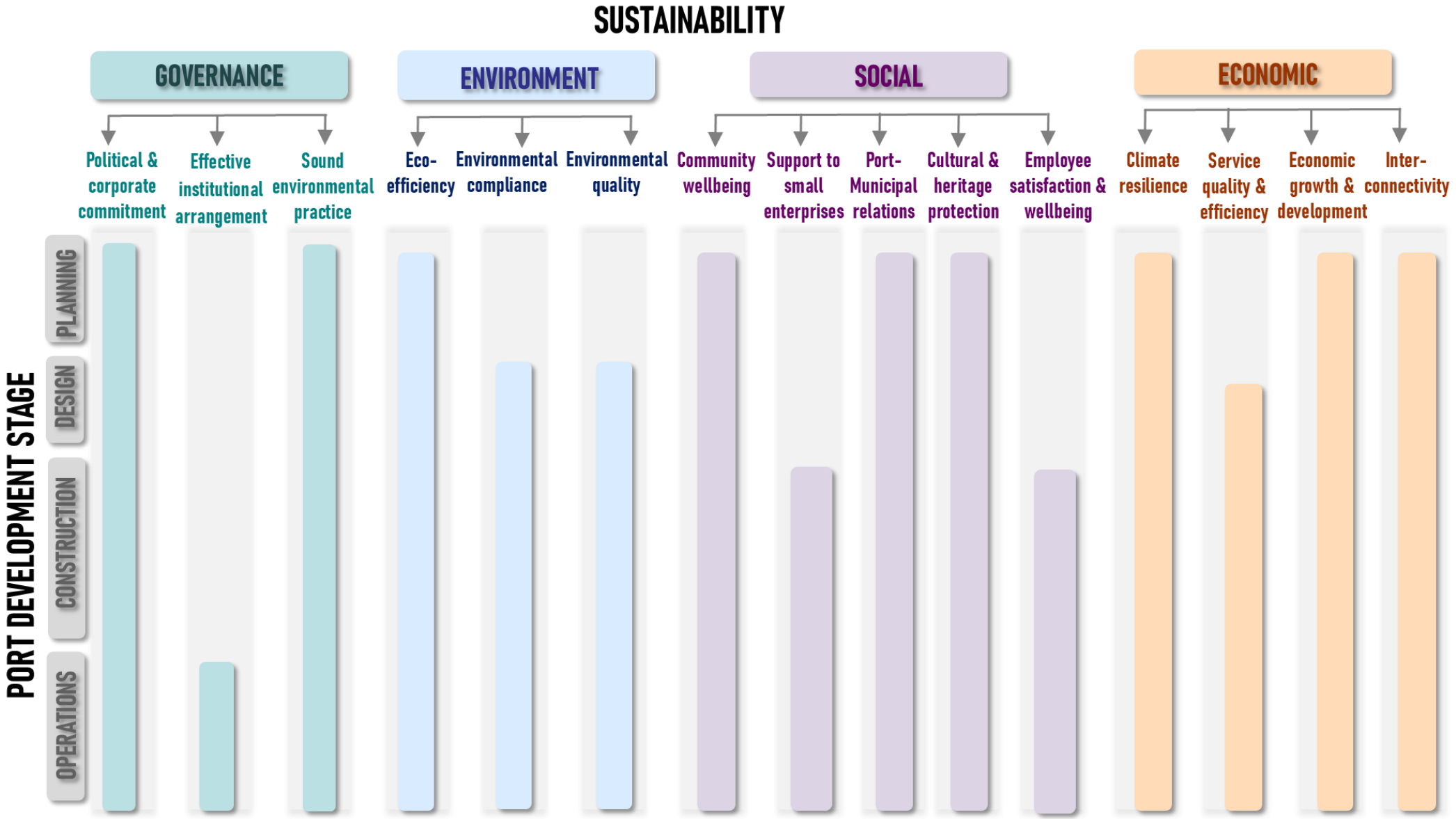


- Developed globally comparable, but locally relatable port sustainability performance index that uses local data
- Pilot tested in Port of Ngqura (TNPA in SA) and Port Victoria (Seychelles) – well-received by port authorities
- User-friendly visualisation of sustainability performance



Framework for Sustainable Port Planning & Development

- **Facilitate alignment** with existing Sustainable Port Performance Approaches….



Framework for Sustainable Port Planning & Development…

- Described selected Sustainability Outcomes (aligned with port sustainability performance index) organised within four key sustainability dimensions:
  - Governance
  - Environment
  - Social
  - Economic

DIMENSION	SUSTAINABILITY OUTCOME	DESCRIPTION
GOVERNANCE	Political & corporate commitment (SDG 16, 17)	Legislative framework and policies in place to enforce sustainability, with formal organizational commitment supported by dedicated resource allocations
	Effective institutional arrangement (SDG 16, 17)	Dedicated in-house institutions established to oversee sustainability matters, including engagement with port customers, related stakeholders outside port boundaries
	Sound environmental practice (SDG 6, 7, 9, 12, 13)	Formal environmental assessment processes are undertaken, with measures in place for effective implementation, such as management plans/ programmes, standard operating procedures, and contingency plans
ENVIRONMENT	Eco-efficiency (SDG 6, 7, 9, 12, 13)	Implementation of technologies supporting, for example efficient water use, mitigates climate change (e.g. emissions and fuel efficiency), using eco-friendly materials, minimizing/recycling waste, as well as greening and efficient land-use within ports
	Environmental compliance (SDG 6, 9, 12)	Effective compliance and enforcement to minimize potential environmental impact (e.g. through atmospheric emissions, waste and wastewater discharges, or spills) through sound environmental management systems and regular environmental audits
	Environmental quality (SDG 14, 15)	Good environmental health maintained, including air quality, water and groundwater quality, soil and sediment quality and habitat/biodiversity
SOCIAL	Community wellbeing (SDG 1, 2, 3, 8)	Wellbeing of affected communities are addressed (including access to support livelihoods, where appropriate), with open communication channels and community-based environmental education and awareness
	Support to small enterprises (SDG 1, 8)	Support to sustainability-related community and small business enterprises
	Port-Municipal relations (SDG 11)	Effective collaboration and communication across port-municipal nexus
	Cultural & heritage protection (SDG 11)	Protection of cultural heritage assets, including areas used for traditional practices
	Employee satisfaction & wellbeing (SDG 4, 5, 8, 10)	Wellbeing of employees are addressed in terms of health, safety, job security, and equity including open communication channels with adequate training, and education and awareness programmes
ECONOMIC	Climate resilience (SGD 13)	Climate change (CC) preparedness in terms of infrastructure and operations, as well as effective early warning climate systems
	Service quality & efficiency (SDG 9, 12)	Satisfied customers, achieved through good port infrastructure, technological efficiency, as well as sound port and cyber security
	Economic growth & development (SDG 8, 9)	Economically viable port, reflected in good revenue generation, growth opportunities and tax generation
	Interconnectivity (SDG 8, 9)	Well-connected port, both in terms of hinterland connectivity and international port connectivity (block chain), as well as regional infrastructure integration

Proposed Implementation Plan for Boegoebaai

- For each of Sustainability Outcomes within Sustainability Dimensions, **highlighted related SDGs** and **Key Criteria** to be addressed in the case of Boegoebaai to achieve outcomes….

GOVERNANCE

Sustainability Outcome	Related SDGs	Key Criteria
Political & corporate commitment	16: Peace, Justice and Strong Institutions 17: Partnerships for the Goals	• **Legislative fram** **operations in po** applying to port • **Organizational c** sustainability ou CSR values throu • **Dedicated budg** - Funding alloc - Funding alloc • **Public communi** communications and social matte
Effective institutional arrangements	16: Peace, Justice and Strong Institutions 17: Partnerships for the Goals	• **Formal in-house** - Dedicated de - TNPA Sustain • **Dedicated instit** through: - TNPA custom • **Dedicated instit** - Port consulta • **Dedicated colla** MoU or other fo
Sound management practice	6: Clean Water and Sanitation 7: Affordable and Clean Energy 9: Industry, Innovation and Infrastructure 12: Responsible Consumption and Production 13: Climate Action	• **Environmental a** - Strategic Envi planning and - Environmenta associated En operations ph - Environment Transnet Inte • **EMPs and/or St** monitoring) prep - Air quality - Marine envir - Soil/groundw - Biodiversity n - Wastewater - Solid Waste, i - Hazardous W - Hull cleaning - Ballast water - Dredging (Ca - SMME (small • **Contingency pl** - Oil/fuel spill r - Emergency pr

ENVIRONMENT

Sustainability Outcome	Related SDGs	Key Criteria
Eco-efficiency	6: Clean Water and Sanitation 7: Affordable and Clean Energy 9: Industry, Innovation and Infrastructure 12: Responsible Consumption and Production 13: Climate Action	• **Water use efficiency** through: - Integration of desalination planning into the port - Generation of water from alternative resources (e - Monitor and ensure water use efficiency by TNPA • **Energy efficiency** through: - Produce and/or source renewable energy sources - Monitoring and minimise of energy consumption - Encourage third parties to avoid or reduce use of • **Selection and procuring eco-friendly materials** thro use • **Waste management** (recycling of other waste) thro operations/services to avoid, recycle and/or minimi • **Recycle/minimize construction and building waste** • **Efficient and responsible land/sea use** (spatial plan occupation planning and consider sensitive ecosyste • **Climate mitigation** through: - Control greenhouse gas emissions by TNPA, tenan (CC mitigation) - Use of environmentally friendly fuels for tugs, veh ppm)
Environmental compliance	6: Clean Water and Sanitation 9: Industry, Innovation and Infrastructure 12: Responsible Consumption and Production	• **Environmental compliance monitored, reporting a** - Atmospheric emissions (port operations & visiting - Noise - Wastewater discharges - Solid/hazardous waste (e.g. NCR's and Audit findir to tenants by SHE Department as per related legis • **Environmental incidents** limited (e.g. spills) (Level 20; Level 3 and 4) • **Port environmental assurance audits** performed ar stakeholders • **Compliance to EMS,** specifically TNPA's internal TIM
Environmental quality	14: Life below Water 15: Life on Land	• **Environmental quality** effectively monitored and ev - Air quality - Noise (e.g. impact on marine mammals) - Marine water quality (e.g. using CSIR health index - Marine sediment quality (e.g. using CSIR health in - Shoreline erosion and accretion - Soil & groundwater quality, especially for fuel stor • **Status of habitat and biodiversity** such as: - Protect coastal and marine habitat and biodiversit (e.g. using CSIR health index for ports) - Support protection and recovery of disturbed terr areas effected by wind-blown sand). • **Control marine invasive species** (e.g. ballast water

SOCIAL

Sustainability Outcome	Related SDGs	Key Criteria
Community wellbeing	1: No Poverty 2: Zero Hunger 3: Good Health and Well-being 4: Quality Education and Learning Opportunities 8: Decent Work and Economic Growth	• **Corporate Social Initiat** - Support of cultural ac - Proactive community communities to stren - Cooperate with schoo - Internships and port • **Access rights for comm** community interests (e • **Community-based envi** programmes and event • **Support to sustainabili** - Providing opportuniti communities to suppo economic activities - Providing opportuniti associated developme • **RD&I investment** (studi - Creating synergies wi - Joint research and de industry and authoriti
Support to small enterprises	1: No Poverty 8: Decent Work and Economic Growth	• **Support to local/small** - Awarding contract to - Supporting local ente - Supporting supplier d
Port-municipal relations	8: Decent Work and Economic Growth 11: Sustainable Cities and Communities	• **Port-municipal collabo** programmes undertake • **Port municipal relation** with municipal/provinci
Cultural and heritage protection	11: Sustainable Cities and Communities	• **Protection of cultural a** - Identifying mapping p - Integrating port devel region (e.g. tourist ro
Employee satisfaction & wellbeing	4: Quality Education 5: Gender Equality 8: Decent Work and Economic Growth 10: Reduced Inequalities	• **Training (incl. educatio** - Cooperating with oth programs and centres - Offering training to po - Ensuring eligible emp - Monitoring and evalu - Ensuring eligible emp • **Employee engagemen** - Establishing and runn - Employee grievances/ recognition agreemer • **Employee grievance an** - Establishing grievance - Conducting employee - Logging legitimate em • **Employees recognition**

ECONOMICS

Sustainability Outcome	Related SDGs	Key Criteria
Climate resilience	13: Climate Action	• **Climate change (CC) preparedness** through: - Planning and design of infrastructure for enhanced climate resilience to be undertaken using the future climate change scenarios (e.g. in terms of changes in, temperatures, sea level rise and intense storms) as prepared by the Intergovernmental Panel on Climate Change (IPCC) scenarios. TNPA is currently undertaking a project on climate change adaptation including downscaling relevant IPCC climate scenarios for application at specific port planning and design scales along South Africa's coast. - Establishing CC cluster as per TNPA's systems - Establishing operational CC business continuity management (BCM) plan as per TNPA systems • **CC early warning systems** implemented (e.g., weather (waves, wind, flooding), seasonal forecasting, also addressing shorter term CC effects, plus local wind, waves in real time (e.g. IPOSS) to protect vessels and port infrastructure • CC incidents assessment through logging and addressing incidents, such as extreme sea-state, intense storms, and dry periods with strong winds and dust storms (Business Impact Analysis, Mission Critical Activities)
Service quality & efficiency	9: Industry, Innovation and Infrastructure 12: Responsible Consumption and Production	• **Technical capacity and efficiency** achieved as per TNPA targets for: - Ship turnaround times - Marine service delays - Anchorage - Cargo volumes handled • **Good quality potable water supplied** to tenants/ships • **Customer satisfaction** achieved through addressing issues arising through meetings of established institutional structures • **Port security** achieved by limiting criminal and security incidents • **Cyber security** achieved by preventing potential security incidents • **Digitalisation** of port systems • **Improvement of port infrastructure** through: - Maintaining at acceptable quality - Industrial innovation to ensure resilient and future-fit infrastructure
Economic growth & development	8: Decent Work and Economic Growth 9: Industry, Innovation and Infrastructure	• **Port revenue generation through formal port activities as** per targets set as per TNPA's financial system (e.g. Operation Ratios, Cash Interest Cover, Margin, Return on invested capital) • **Revenue generated through complementary sectors** (e.g. energy, transport services and tourist activities) • Business growth opportunities for others in port and wider region through: - Availability of a port to wider region: - Access to port facilities for private sector in the region (reduced travel distance to get export products to port) - Opportunities for Broad-Based Black Economic Empowerment • **Corporate Tax and VAT generation** through national and provincial revenue • **Employment opportunities** created through CAPEX employment opportunities as per TNPA target • **Economic contribution (gross value added)** created through CAPEX: Contribution to gross domestic product as per TNPA target • New business production through CAPEX creating new business opportunities as per TNPA target
Inter-connectivity	8: Decent Work and Economic Growth 9: Industry,	• **Effective hinterland connectivity** addressed and resolved (e.g. railway lines, road transport routes, potential gas pipeline) • **Effective international port connectivity** through addressing and resolving international

Proposed Implementation Plan for Boegoebaai …

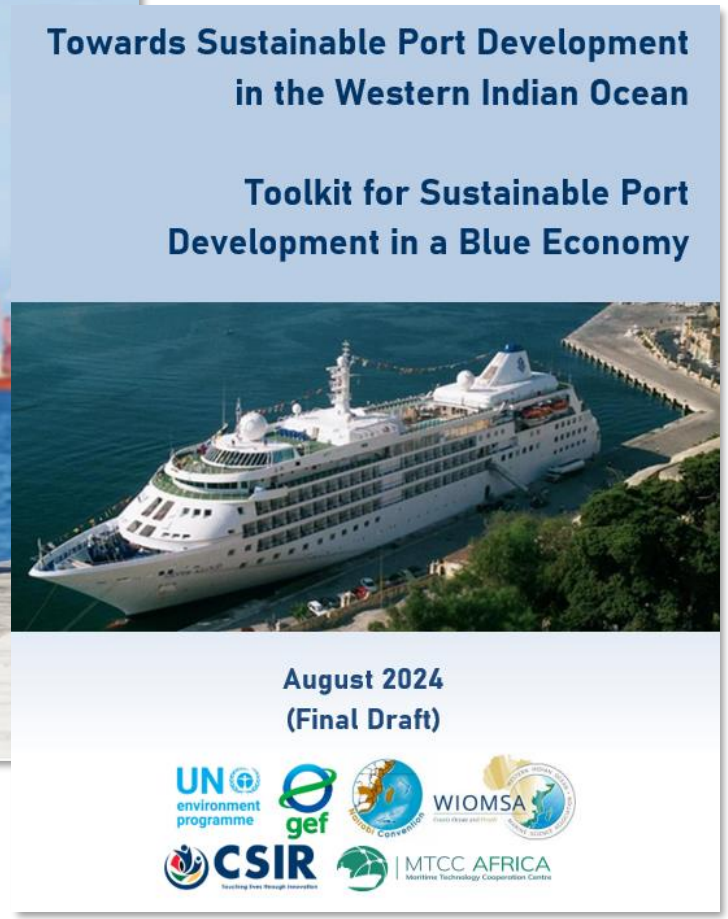
- All **Sustainability Outcomes** important, but reflecting on place-based circumstances, following likely to require specially attention:
  - **Ecoefficiency** (e.g. sustainable sources of water and energy)
  - **Community wellbeing** (e.g. local communities rely heavily on natural resources for their livelihood)
  - **Cultural & heritage protection** (e.g. areas support an array of cultural and heritage assets)
  - **Climate resilience** (e.g. west coast likely to be affected by climate change)
  - **Interconnectivity** (e.g. area is very remote with connectivity challenges)

- Considering potential future development around port (e.g. industrial, urban and suburban development) **effective spatial planning will be essential** to avoid future **port-city, and port-community conflict** and **interconnectivity** infrastructure
- Key requirement for effective response to **environmental issues & climate resilience** is **long-term data records** (e.g. climate, oceanic processes, environmental quality, and biodiversity), but given remoteness, data collection is likely to be a challenge that must be addressed and resolved soonest, should project go ahead

Guidance on Implementation

- **World Port Sustainability Programme, 2020**
  Report provides practical guidance on specific actions in support of SDGs (and related key criteria)

- **Nairobi Convention Toolkit for Sustainable Development**, provides practical tools for enhancing sustainability in port (collation of international best practice)




CSIR
Touching lives through innovation

Boegoebaai SEA:

Marine Ecology Specialist Study

Andrea Pulfrich **&** **Barry Clark**

PISCES ENVIRONMENTAL SERVICES (PTY) LTD

ANCHOR environmental

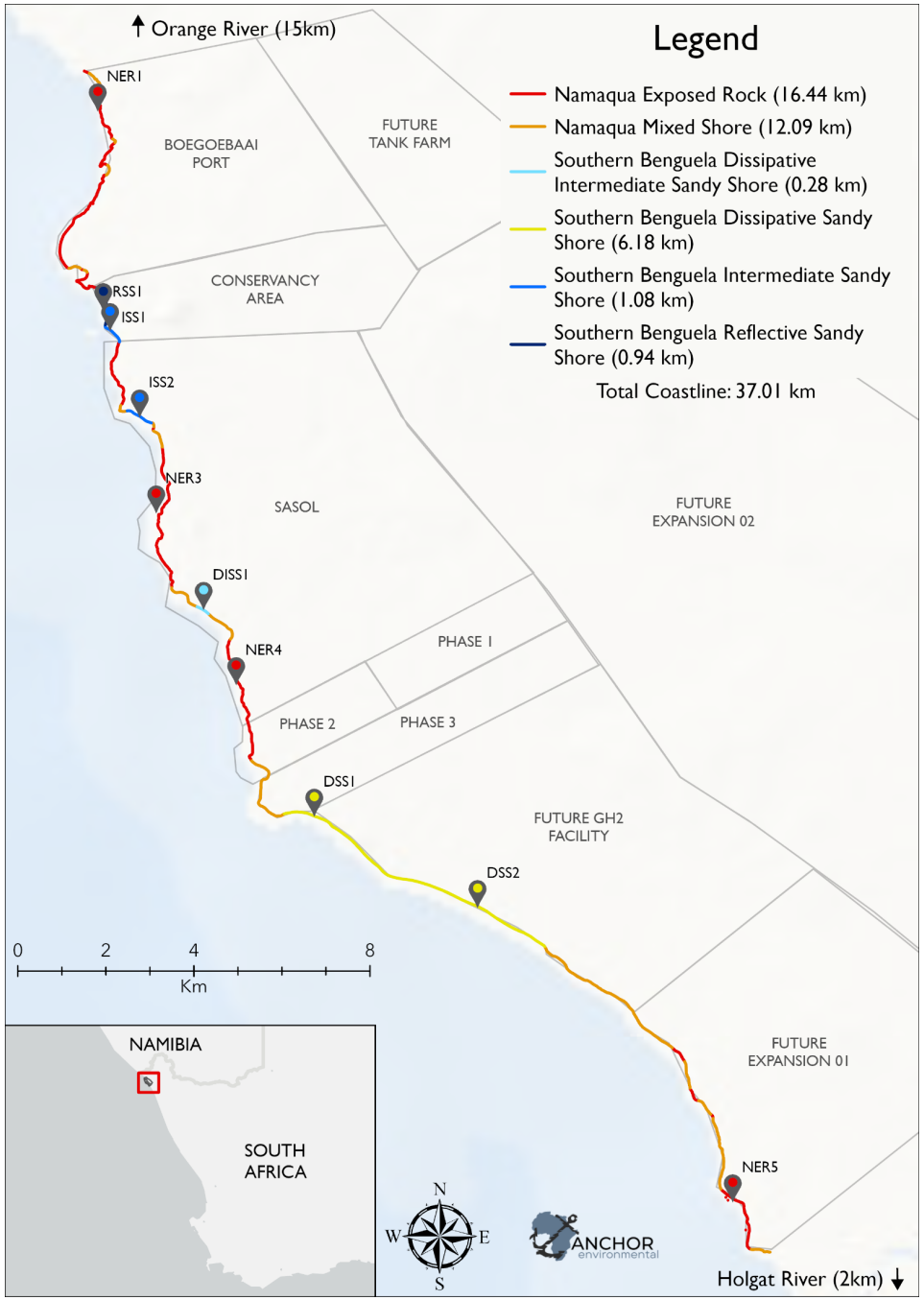
Part 1: Desktop assessment

- Description of the baseline marine ecology based on available information
  - Bathymetry and seabed topography
  - Waves and currents
  - Nutrients and water quality
  - Turbidity and organic inputs
  - Intertidal and subtidal macrofaunal communities
  - Pelagic communities
  - Marine mammals, turtles and seabirds
  - Extractive and non-extractive uses of the area

- Ecological risk assessment
  - Identify primary risks to the marine and coastal environment
  - Assess these risks in terms of probability of occurrences, degree of severity (magnitude), extent (scale), longevity (permanence), confidence of the analysis and potential for mitigation and monitoring
  - Highlight areas of uncertainty
  - Determine acceptability of risk profile (i.e. identify potential fatal flaws)

Part 2: Site verification and field surveys

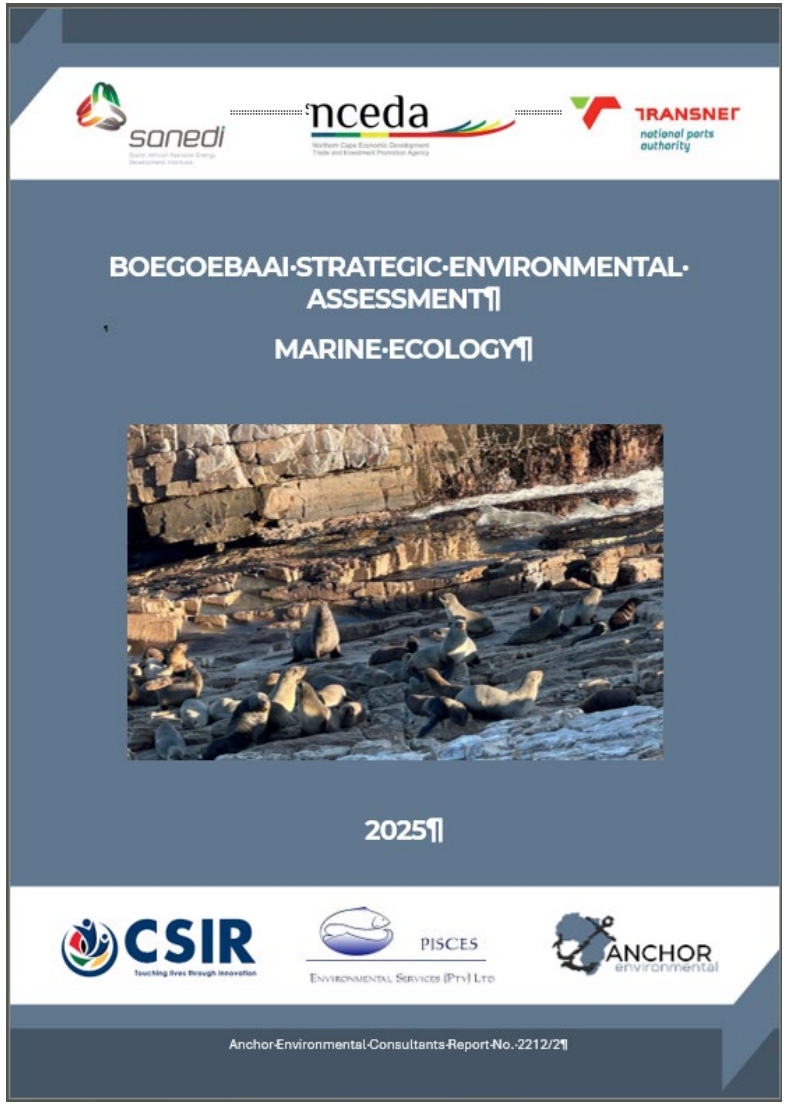
- 6 shoreline habitats that exist in the study area – rocky intertidal shore (1), mixed shore (1), sandy beach (4),
- Assume mixed shore biota comprises a “mix” of sandy and rocky shore species; biota present in each of the other habitat types will be sampled quantitative using standard sampling techniques
- Rocky intertidal
  - Invertebrate macrofauna
- Sandy Beaches
  - Invertebrate macrofauna
  - Surf zone fish
  - *Tylos granulatus* (red data species)

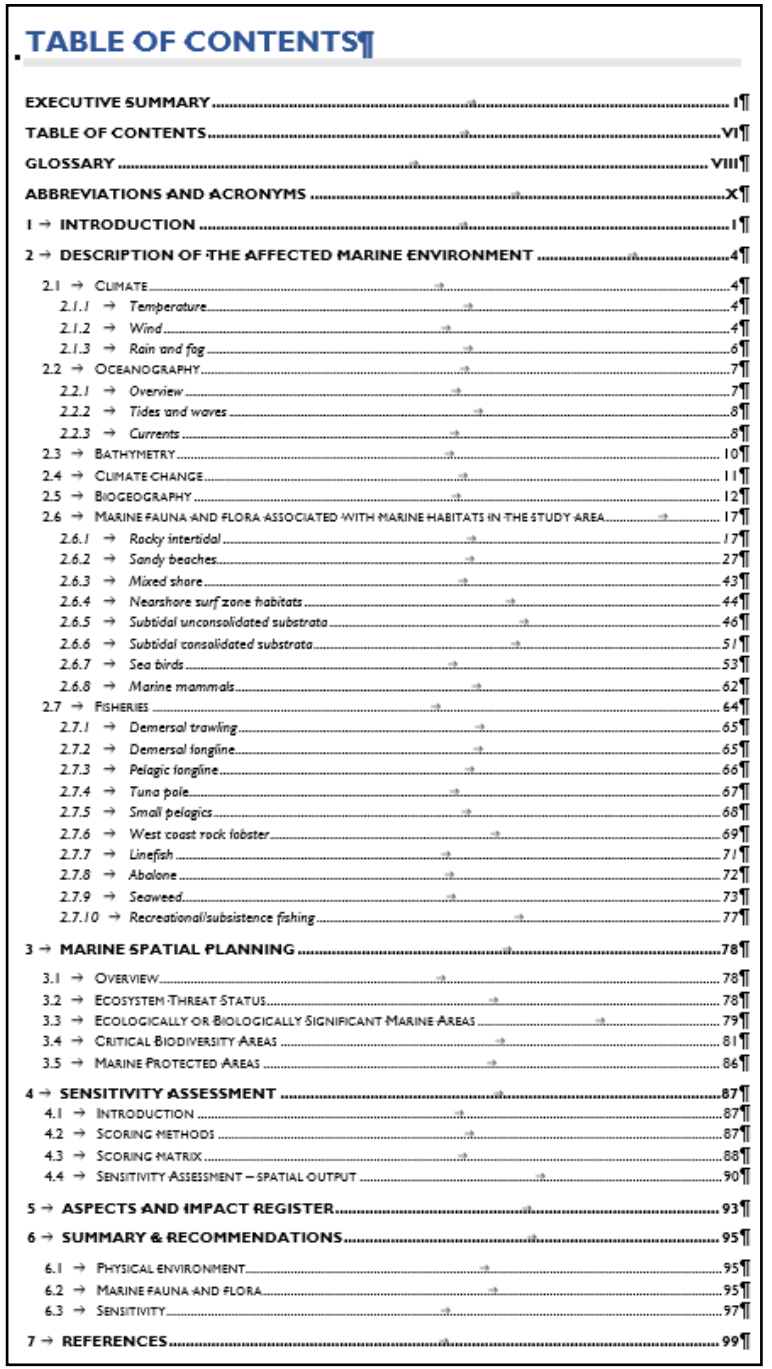


Part 3: Reporting

Timeline

- Draft report (129 p) submitted to CSIR: 6 Jan 2025
- Comments from reviewers received: 18 March 2025
- Final report to CSIR: 30 May 2025 (estimated)





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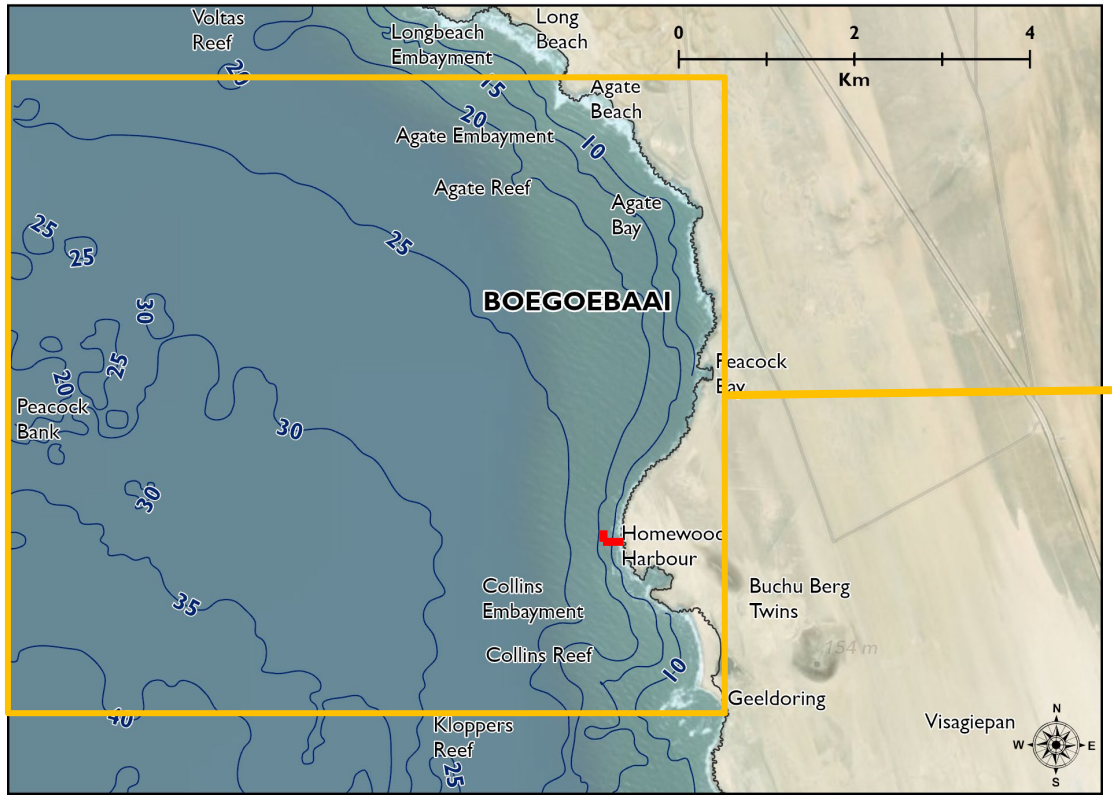
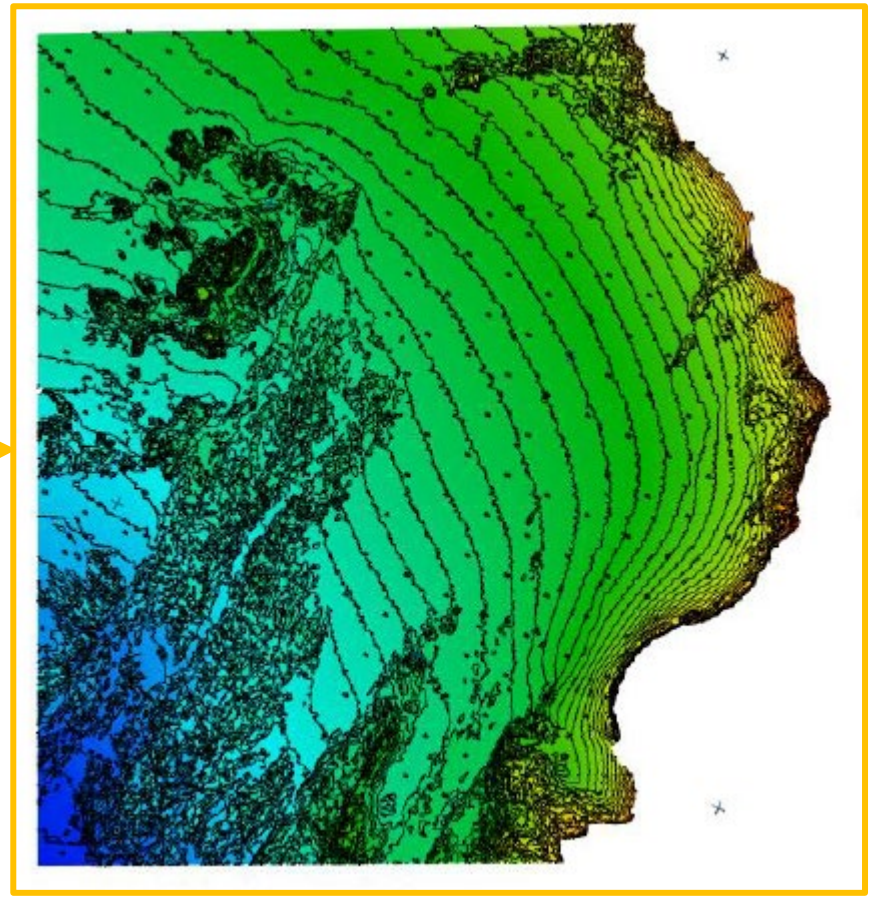
Key sensitivities/issues

1. Bathymetry



Source: Anchor Environmental (2025)



Source: Tritan Survey (2018)

2. Invertebrates

Tylos granularis Giant pill bug

Common on sandy beach in study area

IUCN Redlist: Endangered (recommended)

3. Sea birds

All seabirds are protected species i.t.o. Seals & Seabirds Act (1973)

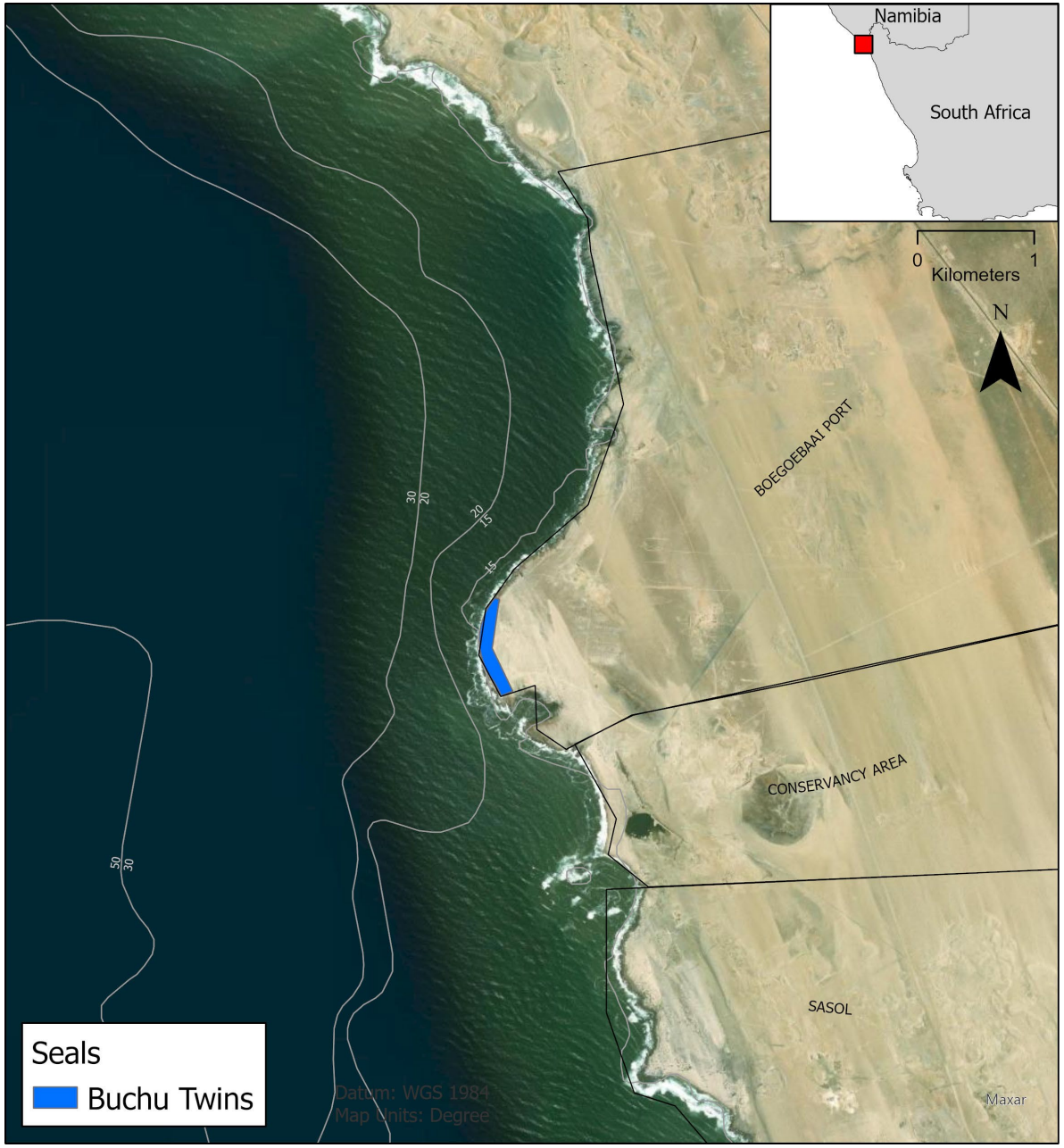
Cape gannet *Morus capensis* – "Vulnerable"
Uncommon in the study area

Cape Cormorant *Phalacrocorax capensis* – "Endangered" Moderately abundant

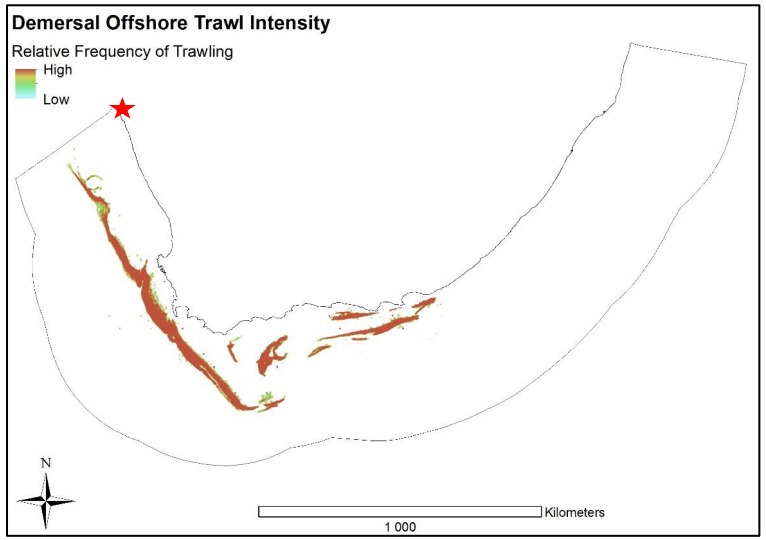
Bank Cormorant *Phalacrocorax neglectus* - "Endangered"
Moderately common, breeding colony at Boegoebaai Stack

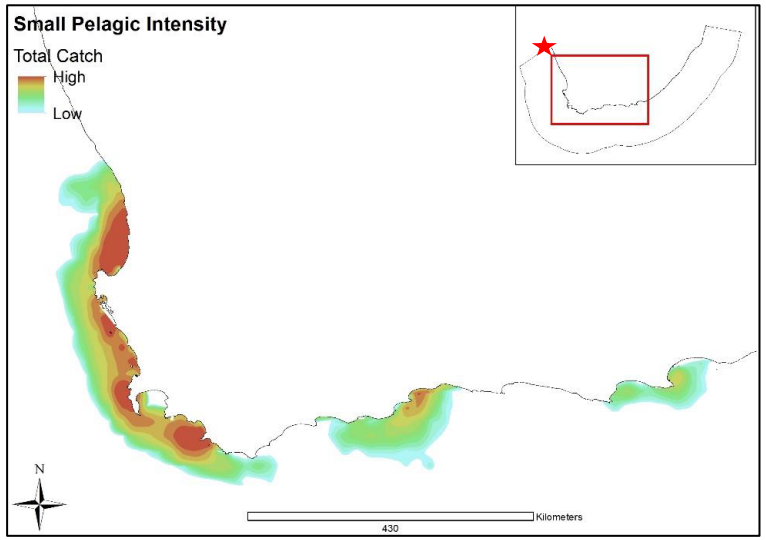
4. Marine mammals

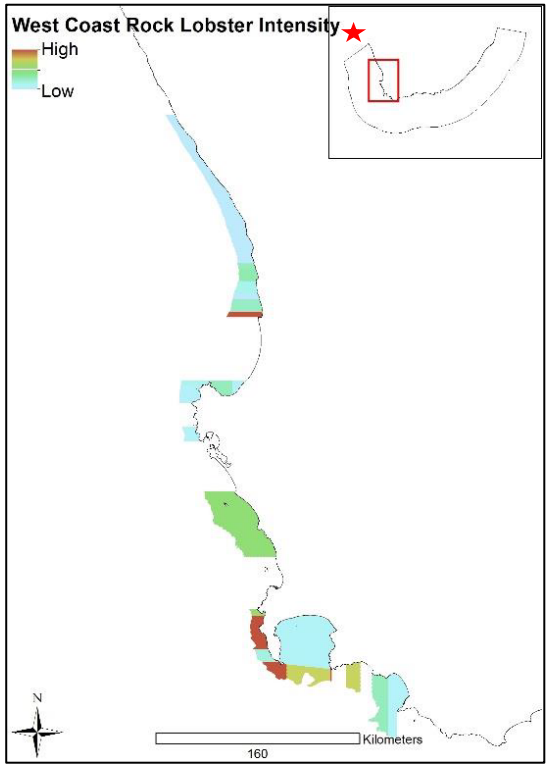
- 36 species of marine mammals likely present in the study area
    - Whales: humpback whales *Megaptera novaeangliae* and southern right whales *Eubalaena australis* (both least concern)
    - Dolphins: common dolphin *Delphinus delphis* (Least Concern), dusky dolphin *Lagenorhynchus obscurus* (Vulnerable), Heaviside's dolphin *Cephalorhynchus heavisidii* (Near Threatened)
- Cape fur seal, *Arctocephalus pusillus* (Least Concern)
    - protected species i.t.o. Seals & Seabirds Act (1973)
    - Breeding colony at Boegoebaai point (1 of 16 in SA)

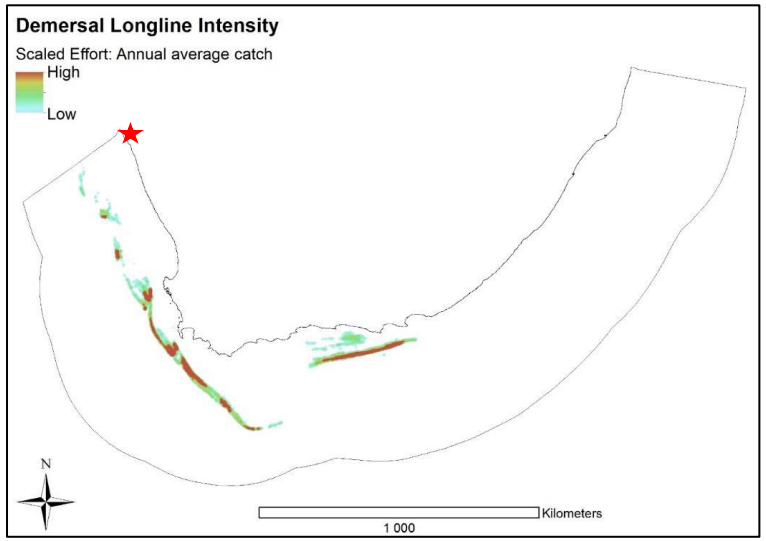


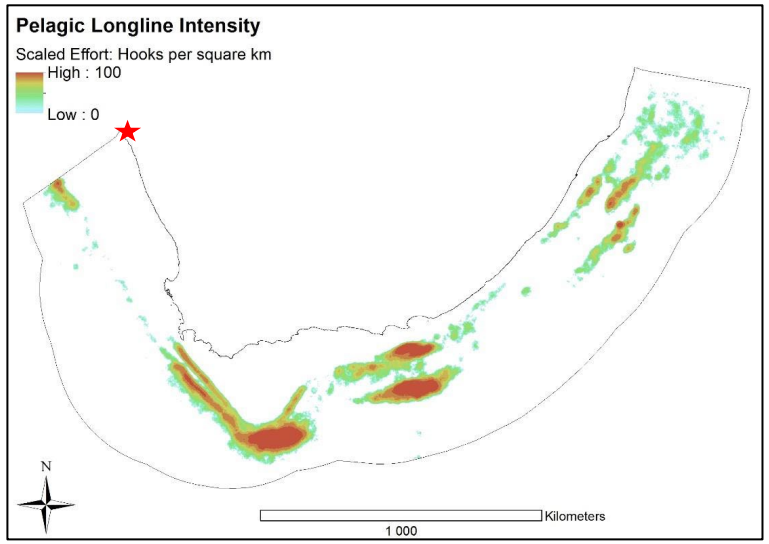
5. Fisheries


Demersal Offshore Trawl Intensity
Relative Frequency of Trawling
High
Low
N
Kilometers
1 000

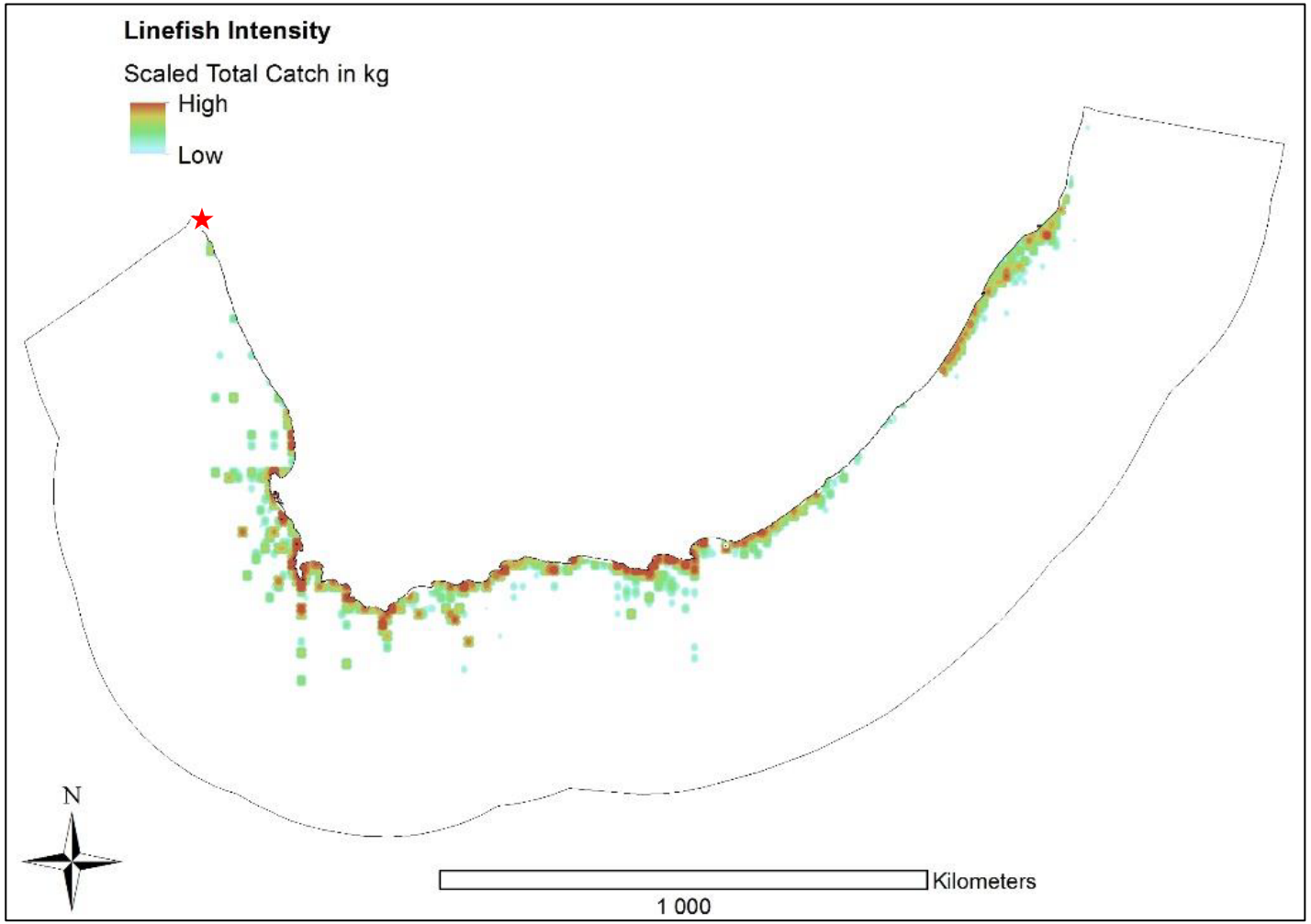

Small Pelagic Intensity
Total Catch
High
Low
N
Kilometers
430

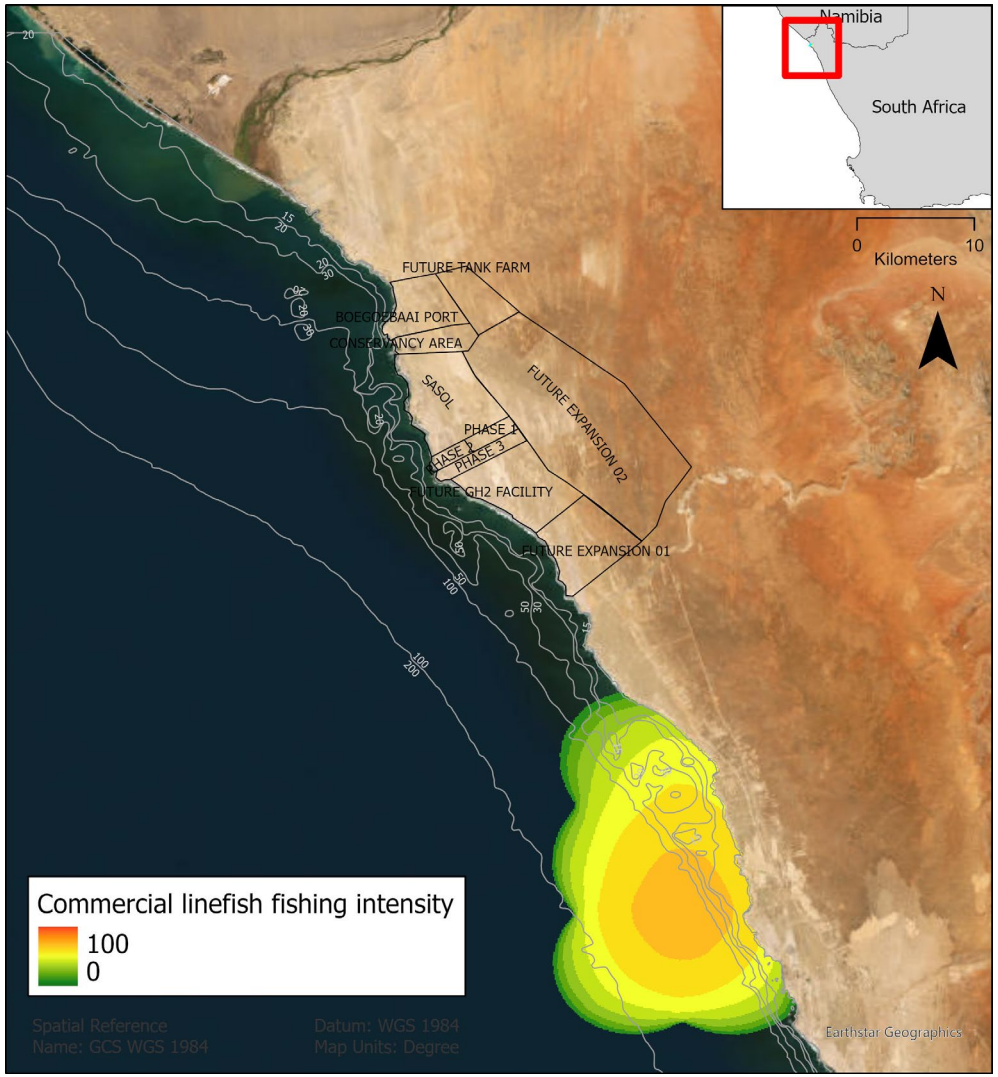

West Coast Rock Lobster Intensity
High
Low
N
Kilometers
160


Demersal Longline Intensity
Scaled Effort: Annual average catch
High
Low
N
Kilometers
1 000

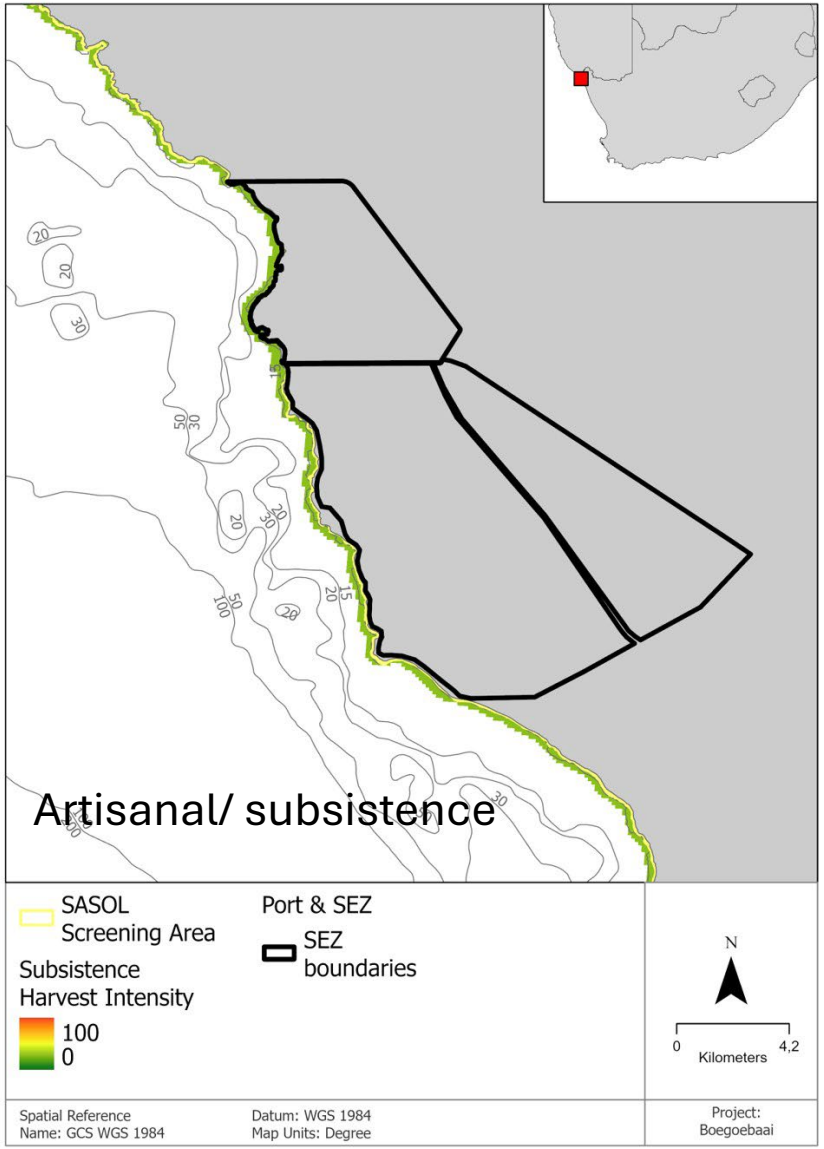

Pelagic Longline Intensity
Scaled Effort: Hooks per square km
High : 100
Low : 0
N
Kilometers
1 000

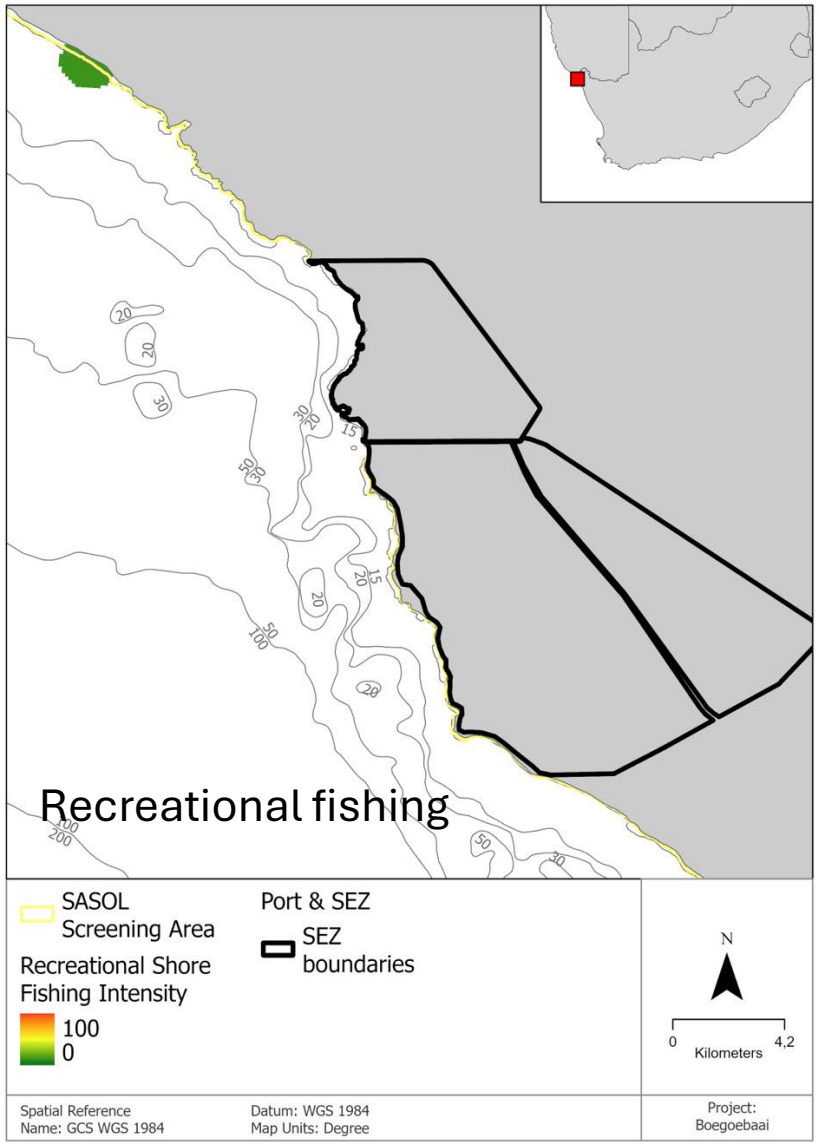
5. Fisheries (cont.)



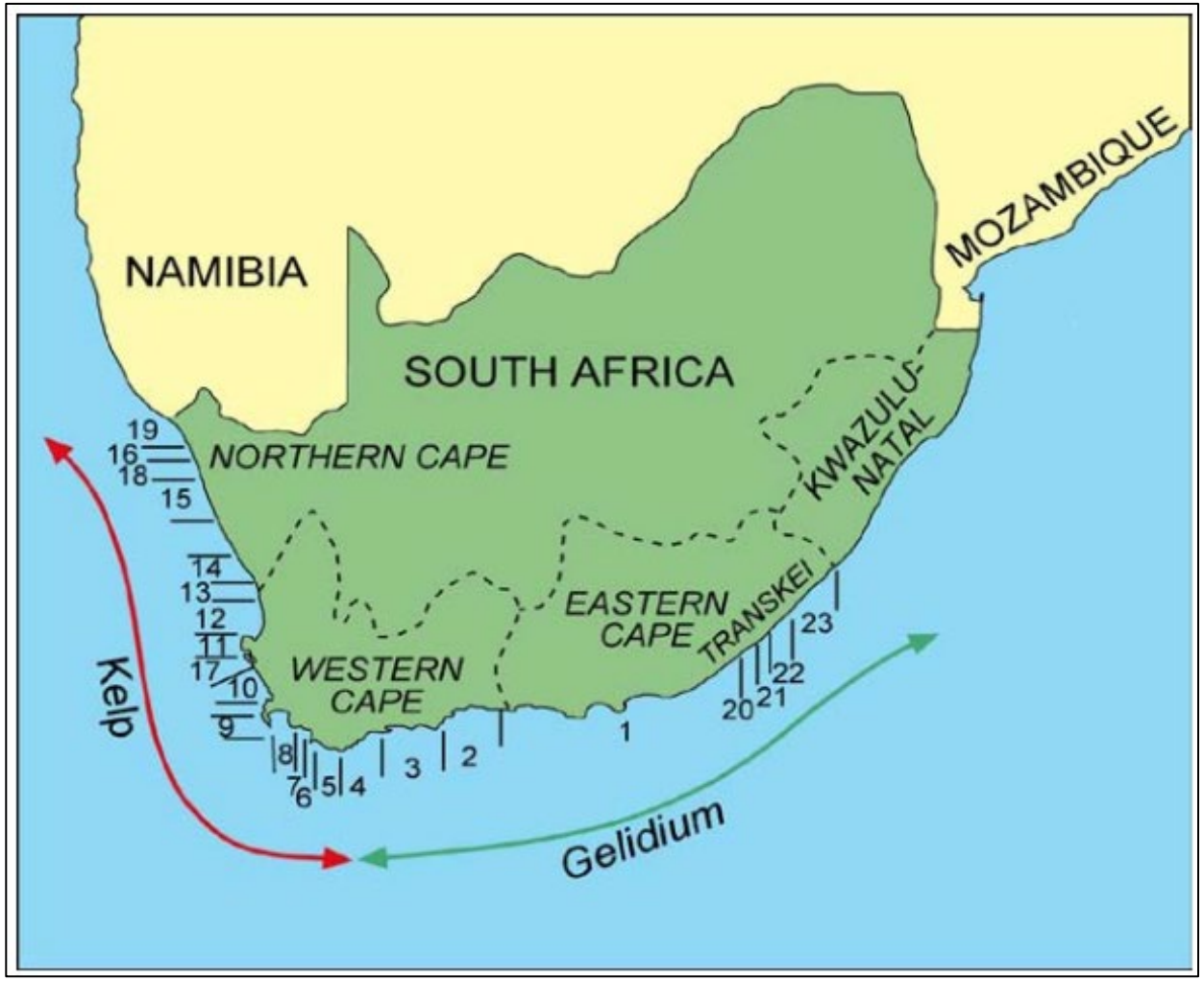


5. Fisheries (cont.)





5. Fisheries (cont.)



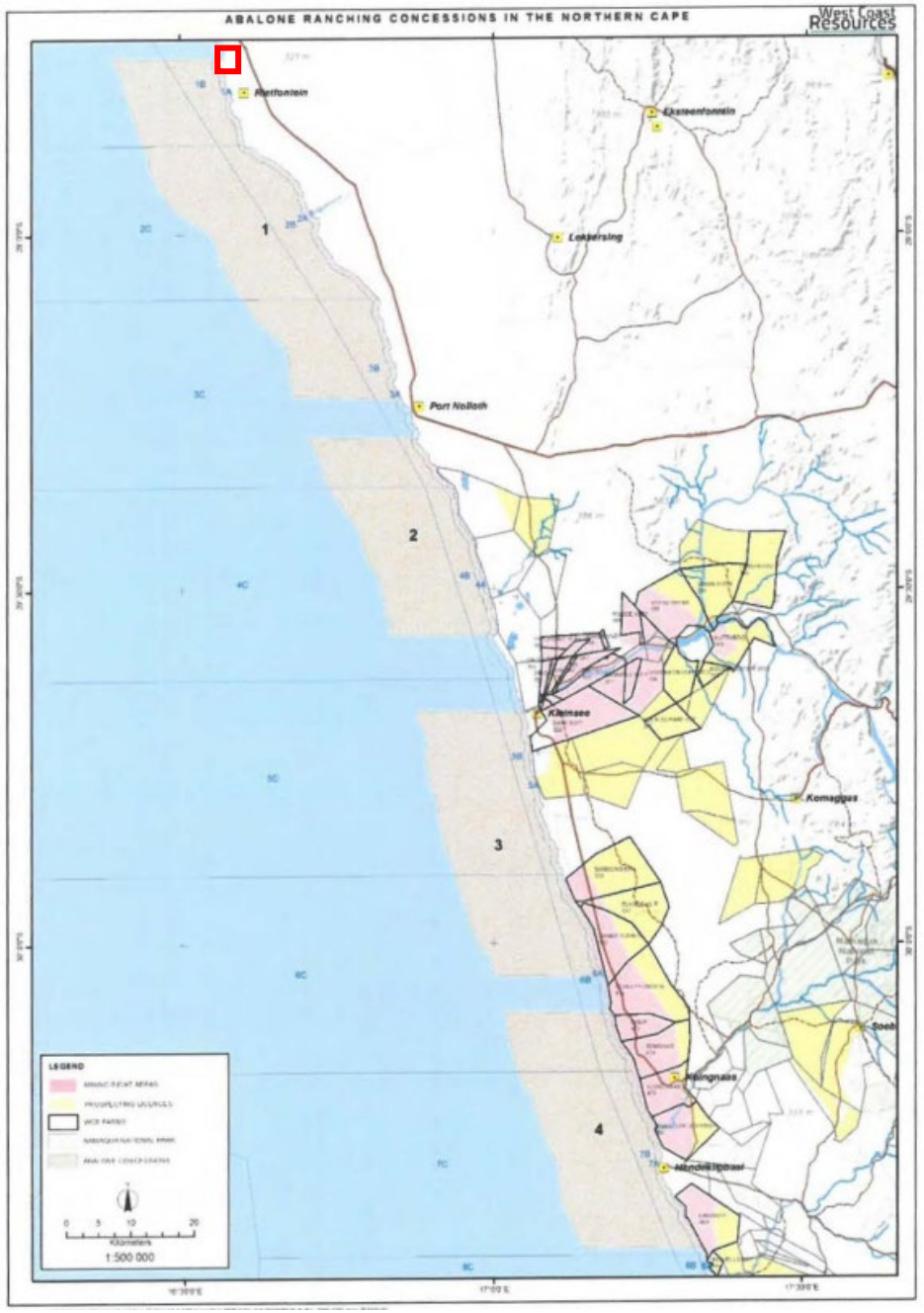
Seaweed harvesting concession areas

Beach cast kelp collection (kg/year)

Year	Concession Number					
	13	14	15	16	18	19
2005	65 898	165 179	10 300	35 920	0	0
2006	94 914	145 670	19 550	28 600	0	0
2007	122 095	79 771	0	84 445	0	0
2008	61 949	204 365	23 646	16 804	0	0
2009	102 925	117 136	0	0	0	0
2010	53 927	166 106	0	0	0	0
2011	40 511	72 829	0	0	0	0
2012	43 297	151 561	160 500	156 000	0	0
2013	20 485	97 283	36 380	24 000	0	0
2014	19 335	136 266	74 300	75 743	0	0
2015	52 827	158 184	0	0	0	0
2016	69 363	154 010	0	0	0	0
2017	0	168 268	0	0	43 700	0
2018	3 000	148 560	0	0	34 053	216 900
2019	93 514	91 906	0	0	29 510	132 955
2020	22 758	29 747	0	0	0	90 885
2021	4 633	109 080	0	0	0	37 600
2022	7 164	0	0	0	0	0
2023	0	0	0	0	0	128 820

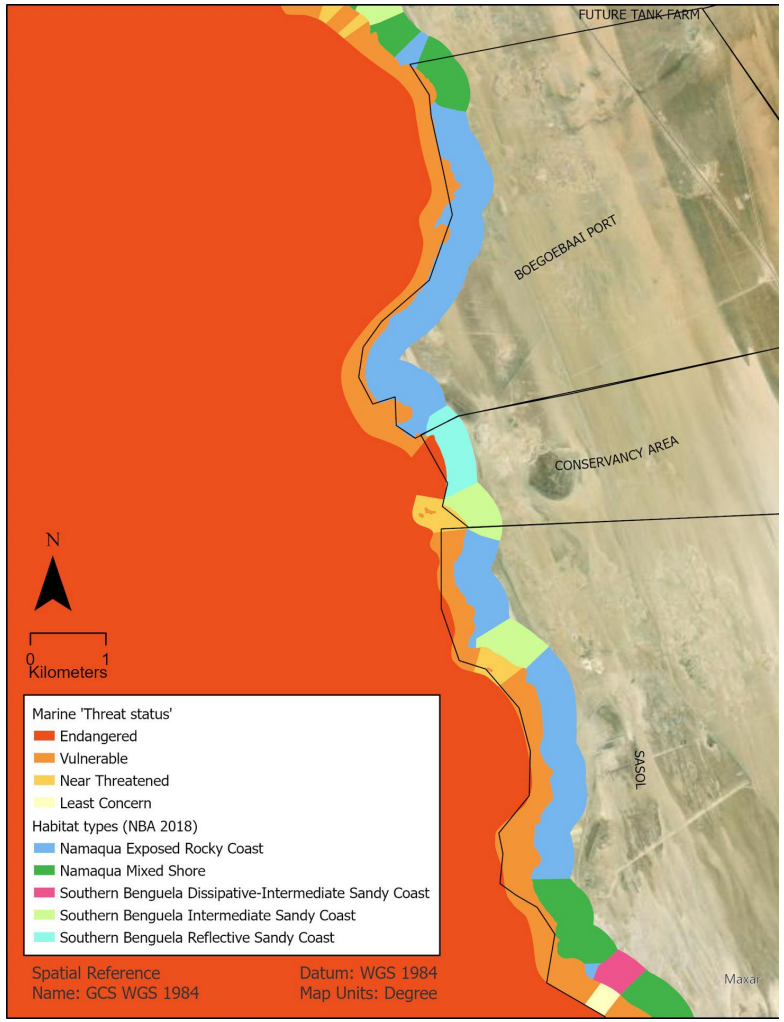
6. Aquaculture

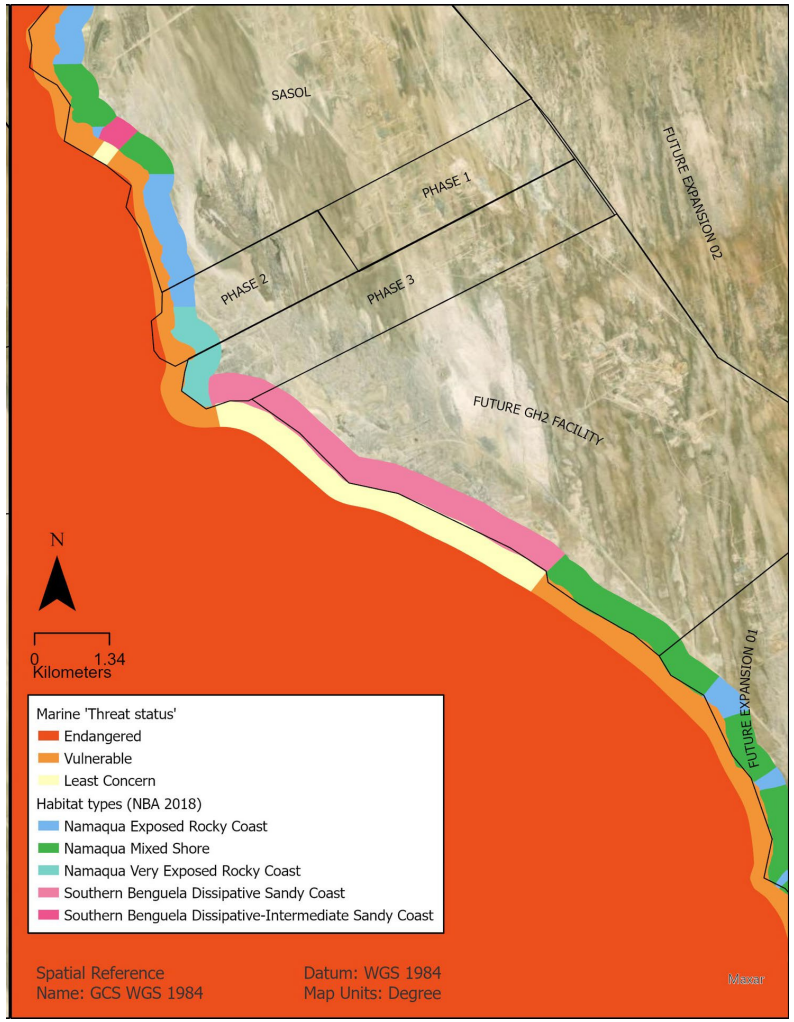
- Abalone ranching

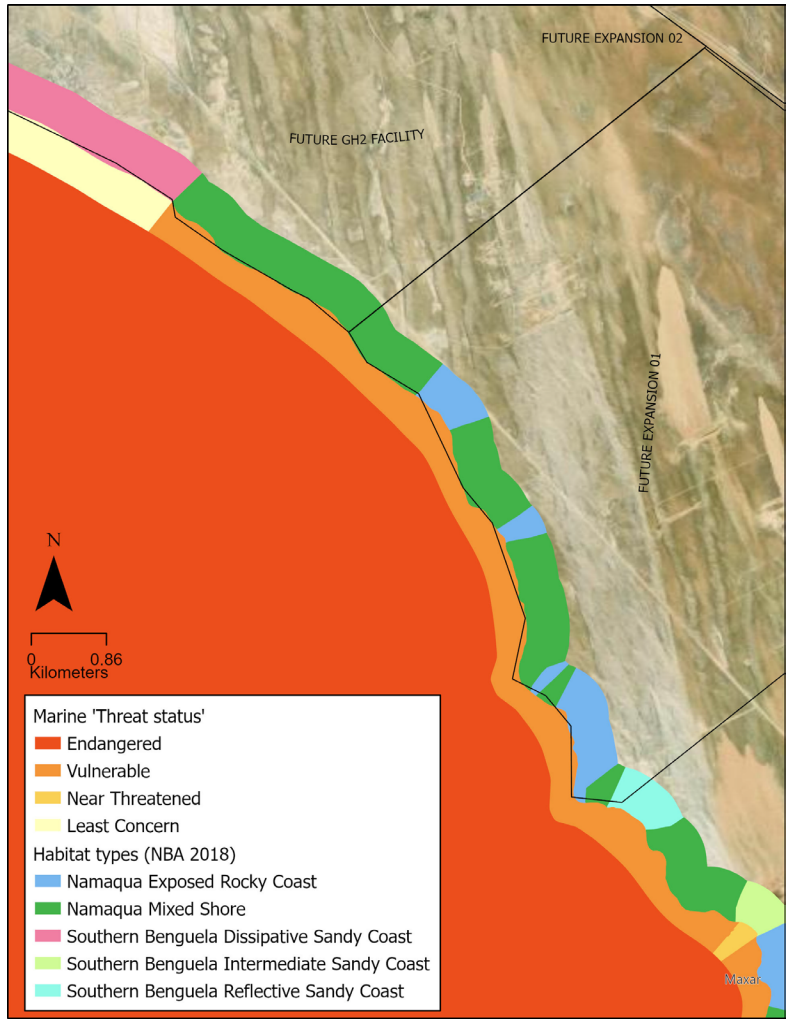


Northern Cape Area 1 held by Turnover Trading. No farming/seeding has commenced in the area as yet. DFFE are still awaiting the baseline assessment for the area as required in terms of permit conditions

6. Marine Spatial Planning: “Ecosystem Threat Status”

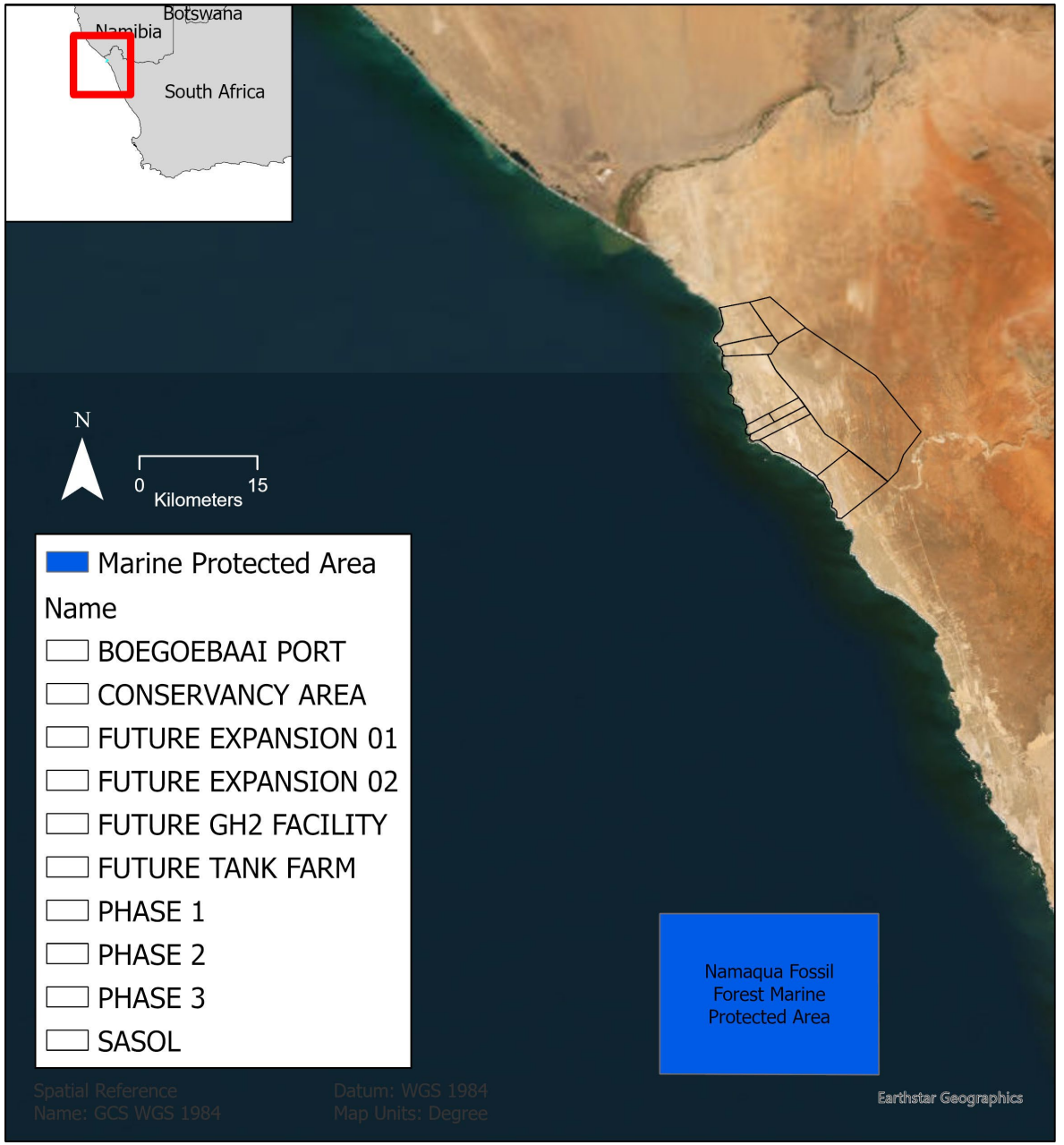






Source: National Biodiversity Assessment (SANBI 2018)

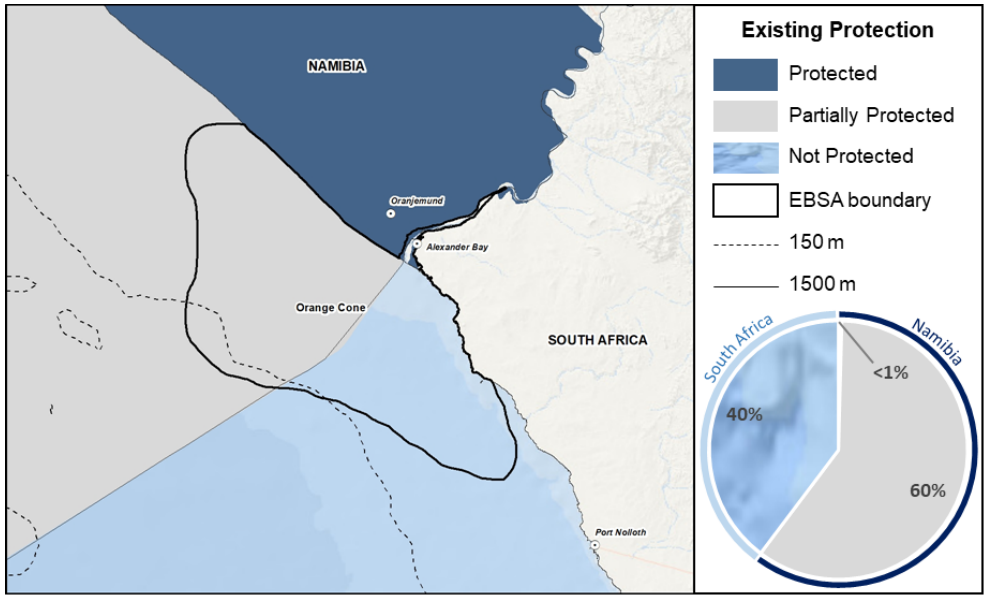
6. Marine Spatial Planning (Cont.): “Marine Protected Areas (MPAs)”

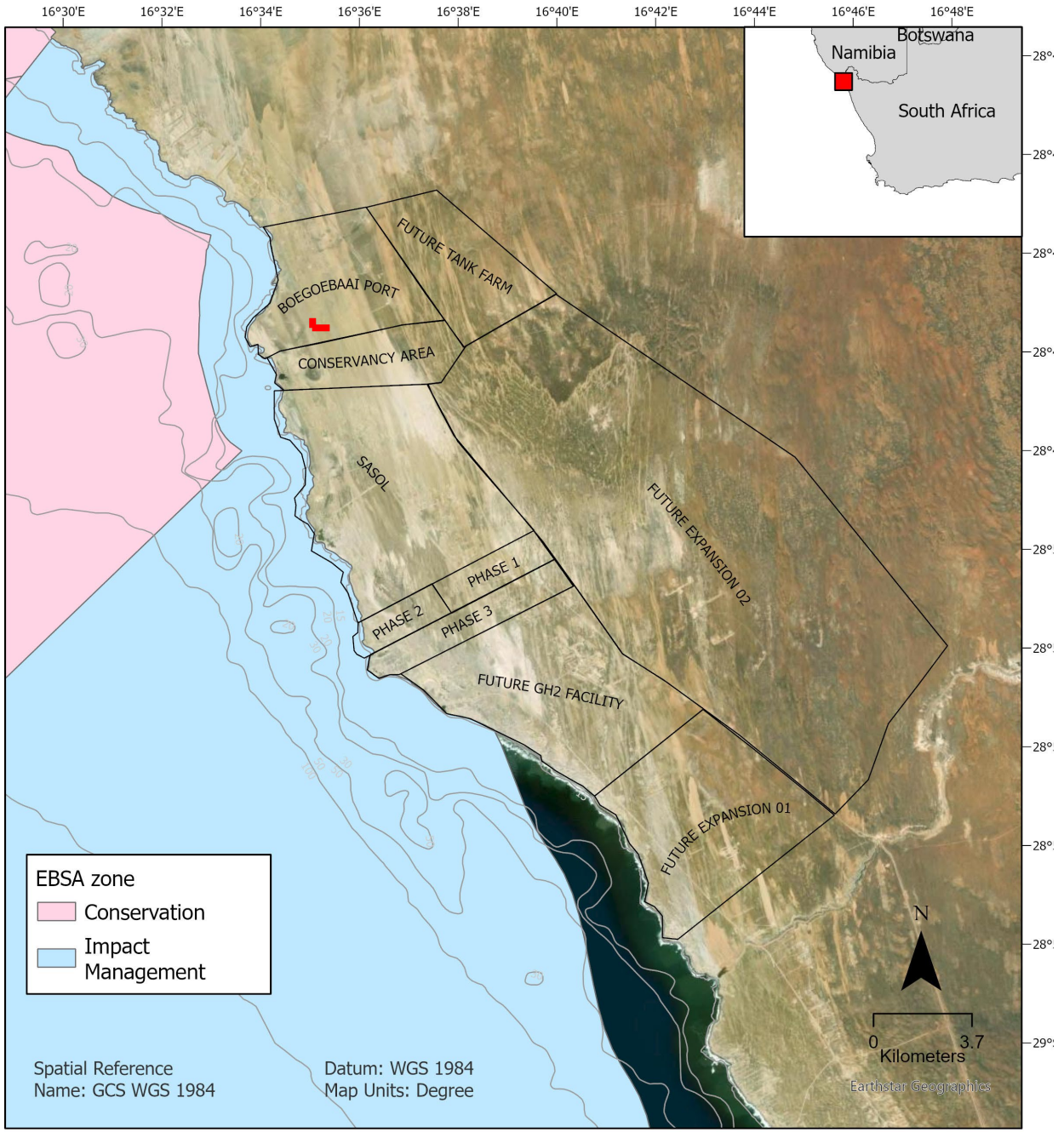


6. Marine Spatial Planning (Cont.): "Ecologically or Biologically Significant Marine Areas (EBSAs) "

Orange Cone EBSA

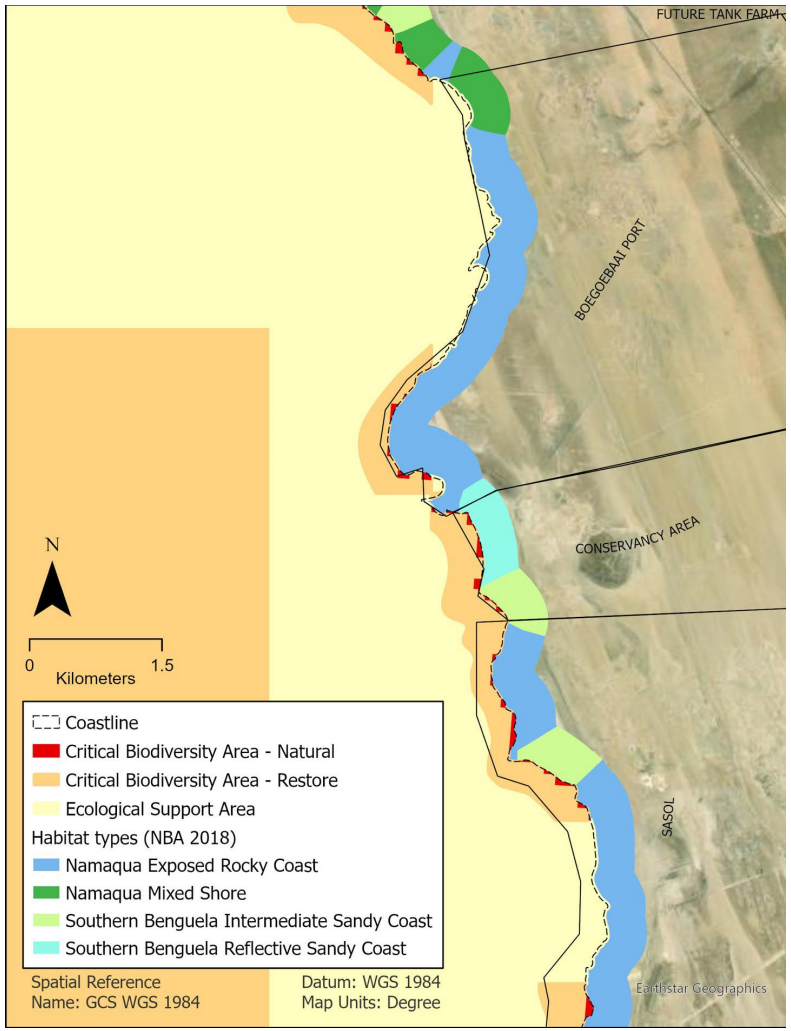
- Conservation zone
- Impact Management zone

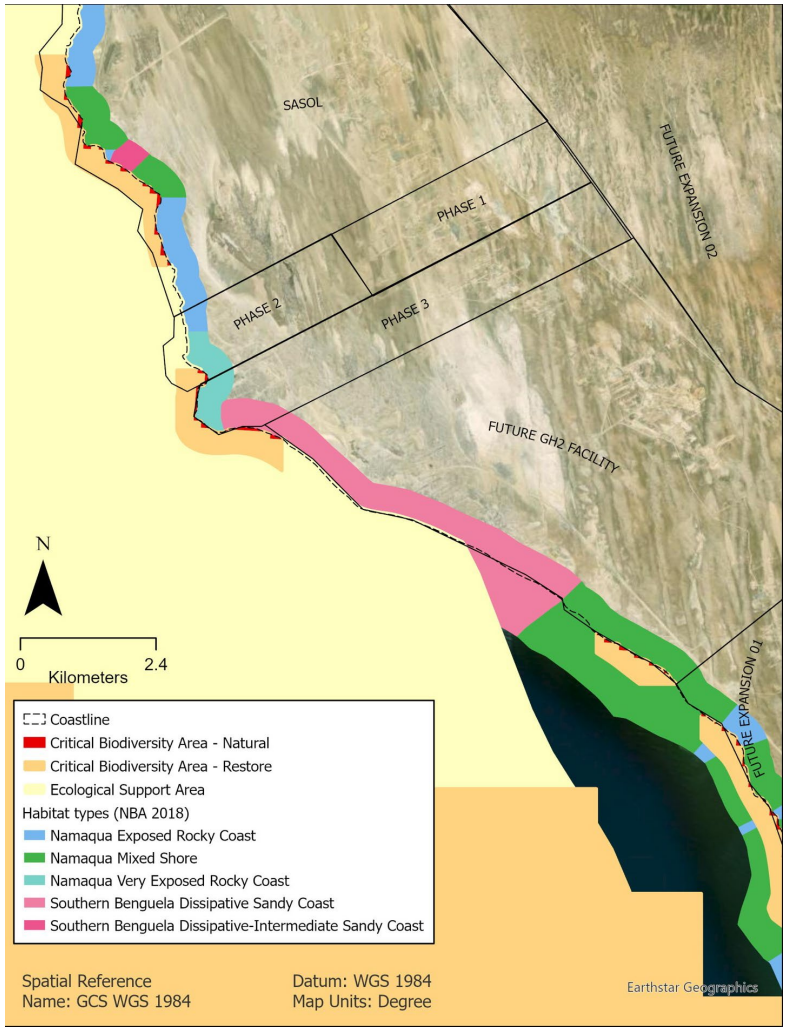


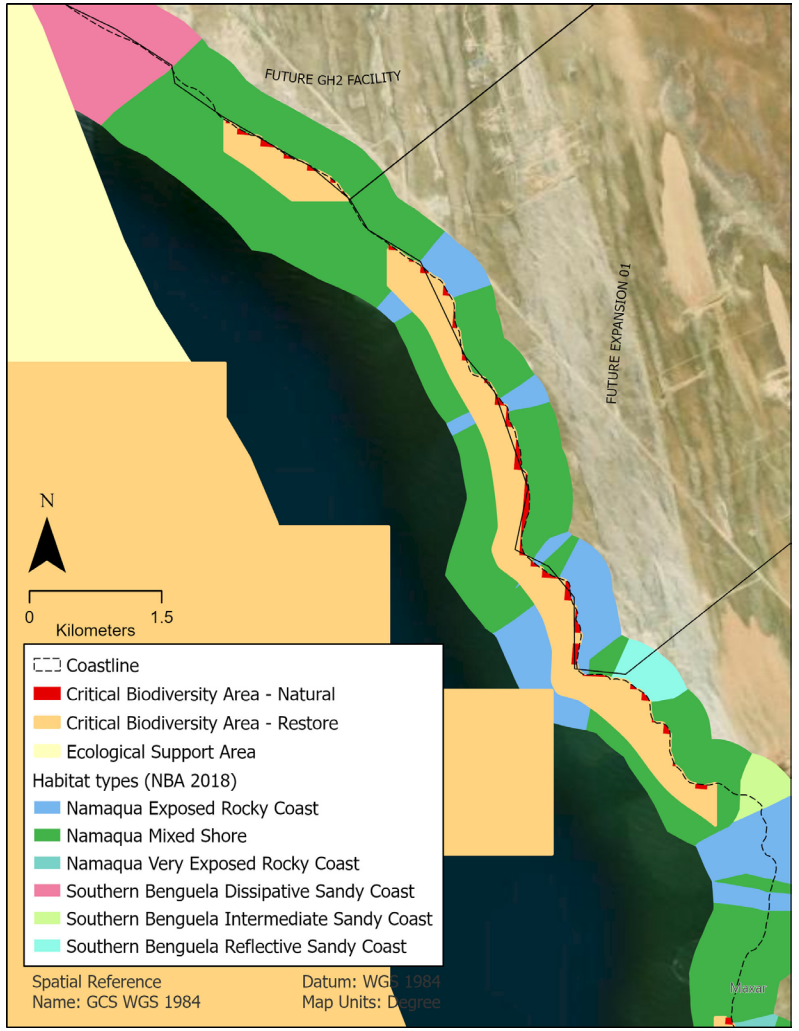


6. Marine Spatial Planning (Cont.): “Critical Biodiversity Areas (CBAs) Ecological Support Areas (ESAs)”

- CBA Natural
- CBA Restore
- ESA







6. Marine Spatial Planning (Cont.):

- Management recommendations for CBAs & ESAs

Type of activity	Critical Biodiversity Area (Natural) *Compatibility with the management objective: to keep the area in a natural / near-natural state*	Critical Biodiversity Area (Restore) *Compatibility with the management objective: to improve ecological condition and, in the long term, restore to a natural / near-natural state, or as near to that state as possible. As a minimum, avoid further deterioration in ecological condition and maintain options for future restoration.*	Ecological Support Areas *Compatibility with the management objective: to avoid further deterioration in ecological condition.*
Activities that could result in **Severe or Very Severe degradation** over **broad areas** (includes activities that have a high disaster risk)	**Not compatible**	**Not compatible**	**Restricted compatibility**
Activities that could result in **Severe or Very Severe degradation** of **localised sites** but do not result in degradation across broad areas	**Not compatible**	**Not compatible**	**Restricted compatibility**
Activities that could result in or contribute to **Moderate degradation** over **broad areas**	**Not compatible**	**Restricted compatibility**	**Compatible**
Activities that could result in or contribute to **Moderate degradation** over **localised sites**	**Restricted compatibility**	**Restricted compatibility**	**Compatible**
Activities that could result in **low to very low degradation** and/or are not managed by biodiversity zones	**Compatible**	**Compatible**	**Compatible**

Management recommendations:

- **Compatible:** Activities should be allowed and regulated by current general rules. Notwithstanding, there should still be duty of care, possibly requiring monitoring and evaluation programmes, to avoid unintended cumulative impacts to the biodiversity features for which this area is recognised.
- **Restricted compatibility:** A robust site-specific, context-specific assessment is required to determine the activity compatibility depending on the biodiversity features for which the site was selected. Particularly careful attention would need to be paid in areas containing irreplaceable to near-irreplaceable features where the activity may be more appropriately evaluated as not permitted. The ecosystem types in which the activities take place may also be a consideration as to whether or not the activity should be permitted, for example. Where it is permitted to take place, strict regulations and controls over and above the current general rules and legislation would be required to be put in place to avoid unacceptable impacts on biodiversity features. Examples of such regulations and controls include: exclusions of activities in portions of the zone; avoiding intensification or expansion of current impact footprints; additional gear restrictions; and temporal closures of activities during sensitive periods for biodiversity features.
- **Not compatible:** The activity should not be permitted to occur in this area because it is not compatible with the management objective. If it is considered to be permitted as part of compromises in MSP negotiations, it would require alternative CBAs and/or offsets to be identified. However, if this is not possible, it is recommended that the activity remains prohibited within the CBA.

Broad sea use	Associated MSP Zones	Associated sea-use activities	MPA	CBA-N	CBA-R	ESA
Transport	Maritime Transport Zone	Designated shipping lanes (including port approach zones)		R	R	Y
		Anchorage areas		R	R	Y
		Bunkering		N	N	R
		Ports and harbours (new)		N	N	R
		Dumping of dredged material		N	N	R
Infrastructure	Underwater Infrastructure Zone	Pipelines (excluding oil and gas)		N	R	Y
		Undersea cables (new installations)		N	R	Y
	Land-based Infrastructure Zone	Coastal development (new installations, including piers, breakwaters, and seawalls)[3]		N	N	R
Abstraction and Disposal	Disposal Zone	Waste-water (new installations)		N	R	Y
	Sea-water abstraction and disposal	Sea-water abstraction and disposal (e.g., desalination)		R	R	Y
		Sea-water abstraction and disposal (e.g., aquaculture disposal)		N	R	Y

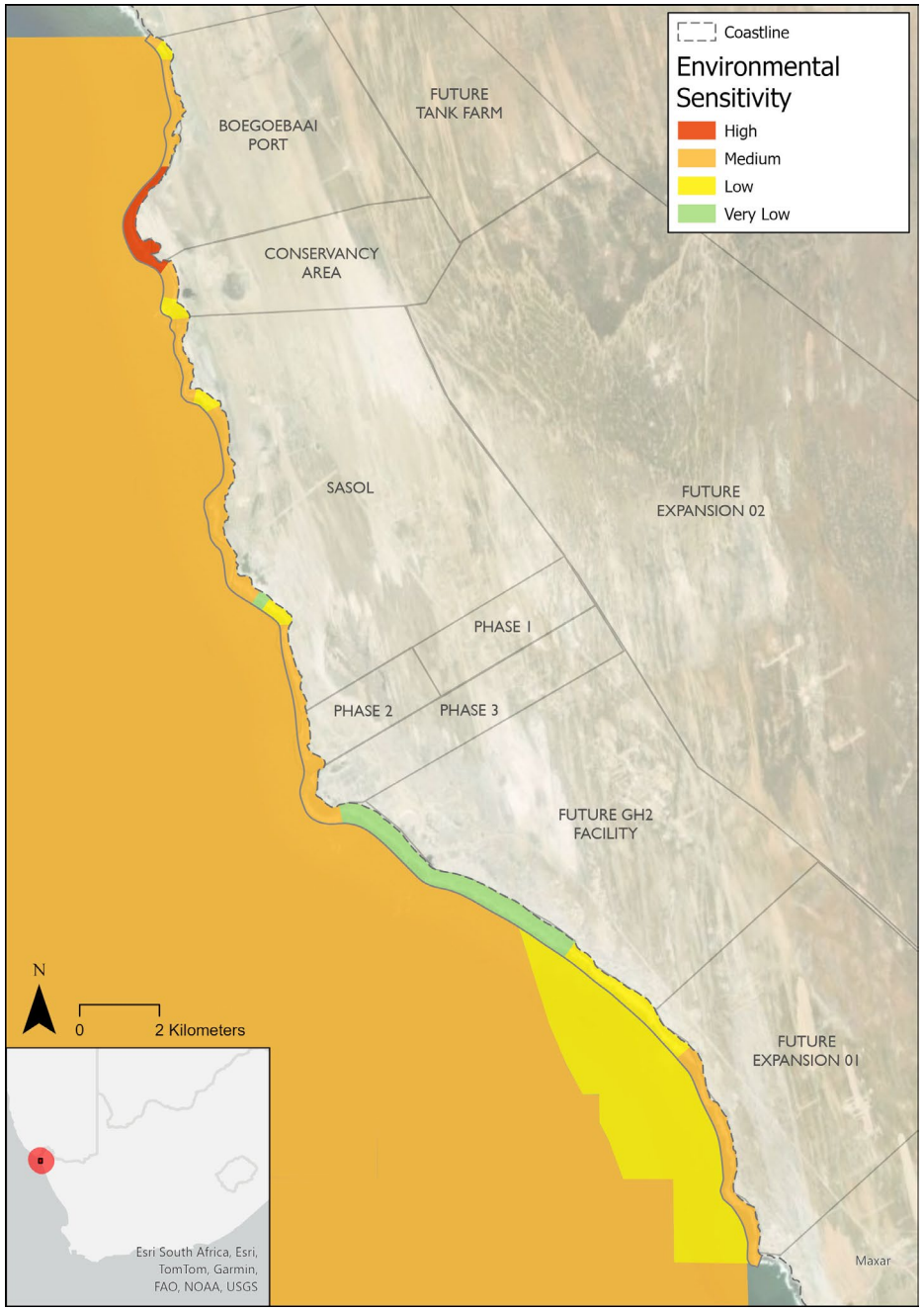
6. Environmental Sensitivity

Feature/constraint	Category	Assigned score
Marine Threat Status	Endangered	4
	Vulnerable	3
	Near Threatened	2
	Least Concern	1
Critical Biodiversity Area	Natural	3
	Restore	2
	Ecological Support Area	1
Species importance e.g. marine mammals	High	1
	Medium	0.5
	Low	0

Sum of feature/status scores

Regional importance

		ECOSYSTEM PROPORTIONALITY		
		Less than expected	*Equal*	*More than expected*
BIODIVERSITY STATUS	*< 4*	**VERY LOW**	**VERY LOW**	**LOW**
	4 - 5.9	**LOW**	**LOW**	**LOW**
	6 - 7.9	**LOW**	**MEDIUM**	**MEDIUM**
	8+	**MEDIUM**	**HIGH**	**HIGH**



6. Potential impacts

Activity Phase	Activity	Aspect	Potential Impact
1. Construction	Building of breakwater, jetties and quays	Increase in underwater noise levels (construction/blasting/pile driving)	Physiological and behavioural effects on marine fauna
		Permanent loss of habitat and associated communities under breakwater and alteration of substrate type and associated communities through introduction of non-native rock	Changes in benthic and associated demersal communities in CBA1restore and ESA areas
			Falls within EBSA Impact Management Zone
			Overlap with coastal habitats assigned a threat status of “vulnerable’ and nearshore habitats that are considered ‘endangered
		Increased turbidity	Physiological and behavioural effects on marine fauna
		Routine discharges to sea from construction vessels/machinery and local reduction in water quality	Physiological effect on marine fauna
		Hindrance of alongshore movement of juvenile and adult fish in the surf zone	Effects on recruitment
		Changes in wave patterns and/or currents causing sand accumulation or erosion	Changes in longshore currents affecting littoral drift
		Disturbance of seals and destruction of seal colony	Displacement or mortality
		Routine discharges to sea from construction vessels/machinery and local reduction in water quality	Physiological effect on marine fauna
	Capital dredging	Increased turbidity	Physiological and behavioural effect on marine fauna
		Remobilisation of contaminants in the sediments	Physiological effect on marine fauna and bioaccumulation risks
		Loss of unconsolidated habitat and associated communities	Disturbance and removal of benthic macrofauna in dredge footprint
			Disturbance and smothering of benthic fauna at spoils dump site
			Cascade effects on higher-order consumers
		Routine discharges to sea from construction vessels/machinery and local reduction in water quality	Physiological effect on marine fauna
	Installation of intake and discharge pipelines for RO Plant	Permanent loss of habitat under submerged intake and discharge pipelines	Loss of endangered Orange Cone Inner Shelf mud reef mosaic and vulnerable Namaqua exposed rocky shores ecosystem types
		Underwater noise levels (blasting)	Physiological and behavioural effects on marine fauna
	General housekeeping during construction	Accidental spills, litter, sewage, run-off	Physiological effect on marine fauna
			Degradation of coastal environment

6. Potential impacts (cont.)

Activity Phase	Activity	Aspect	Potential Impact
2. Operation Phase	Presence of vessels and operation of port	Increase in underwater noise levels	Physiological and behavioural effects on marine fauna
		Routine discharges to sea (e.g. deck and machinery space drainage, sewage and galley wastes) and local reduction in water quality	Physiological effect on marine fauna
	Lighting from port and vessels	Light emissions in marine environment	Disorientation and mortality of seabirds and marine mammals
			Attraction of plankton and increased risk to fish, turtles and cetaceans
	Increase in vessel traffic	Increase in underwater noise levels	Physiological and behavioural effects on marine fauna
		Increased risk of ship strikes	Injury or mortality of marine mammals/turtles
		Increased risk of vessel accidents and operational spills leading to reduction in water quality	Effects on faunal health (e.g. respiratory damage) or mortality (e.g. suffocation and poisoning)
			Physical damage to and mortality of benthic species / habitats
			Oiling of coastal habitats
	Maintenance dredging	Increased turbidity	Physiological and behavioural effect on marine fauna
		Remobilisation of contaminants in the sediments	Physiological effect on marine fauna and bioaccumulation risks
		Loss of unconsolidated habitat and associated communities	Disturbance and removal of benthic macrofauna in dredge footprint
			Disturbance and smothering of benthic fauna at spoils dump site
	Operation of RO Plant	Seawater intakes	Impingement and Entrainment
		Brine discharges	Physiological effect on marine fauna of RO Plant effluents
			Flow distortion around outlet
3. Unplanned Activities	Increase in vessel traffic	Increased risk of collision with marine fauna	Physiological and behavioural effects on marine fauna
	Accidental hydrocarbon spills / releases (e.g. vessel accident, bunkering and pipe rupture)	Loss of hydrocarbons to sea and reduction in water quality	Effects on faunal health (e.g. respiratory damage) or mortality (e.g. suffocation and poisoning)
			Physical damage to and mortality of benthic species / habitats
			Oiling of coastal habitats

Boegoebaai SEA: Aquatic & Terrestrial Ecology (WP1) – Main Findings

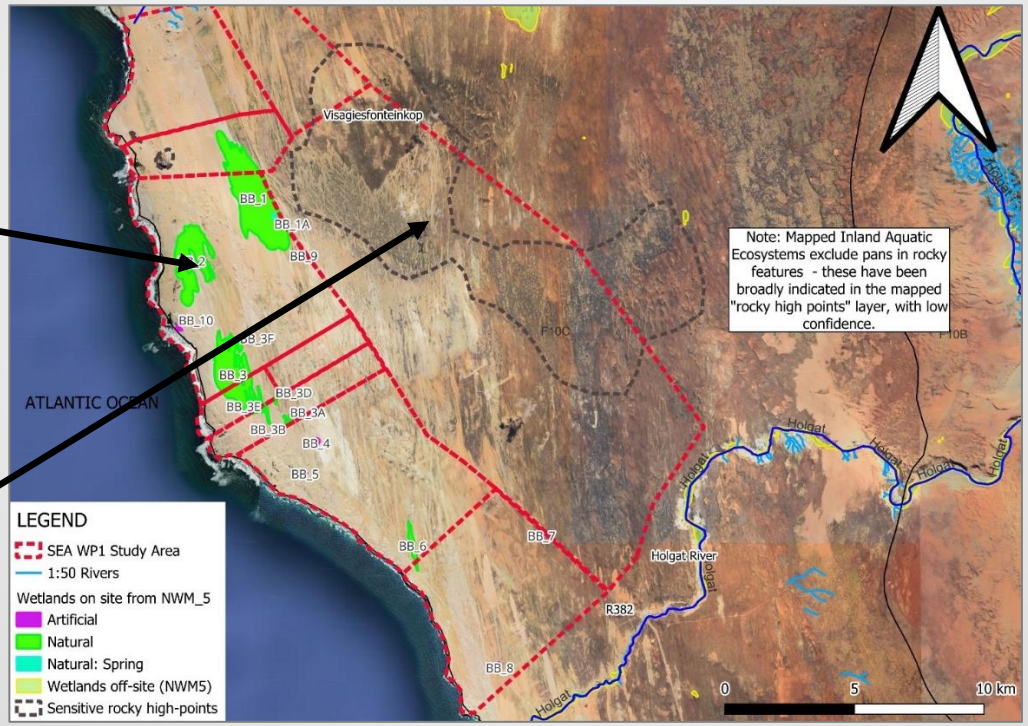
- **Aquatic ecology:** Liz Day
- **Fauna**
  - **Birds:** Albert Froneman, Robert Colyn, Marietjie Oosthuizen & Megan Loftie-Eaton
  - **Bats:** Werner Marais
  - **Mammals, Reptiles & Amphibians:** Corné Niemand
- **Vegetation & flora:** Noel & Gretel van Rooyen, Pieter van Wyk

Inland aquatic ecosystems & estuaries

Mainly desktop study with brief on-site visit

Large pans provide wetland/pan habitat, used by fauna for water and grazing and include macro-invertebrate habitat.

Ephemeral rock pools in rocky outcrops are likely to support (possibly endemic) invertebrate communities.



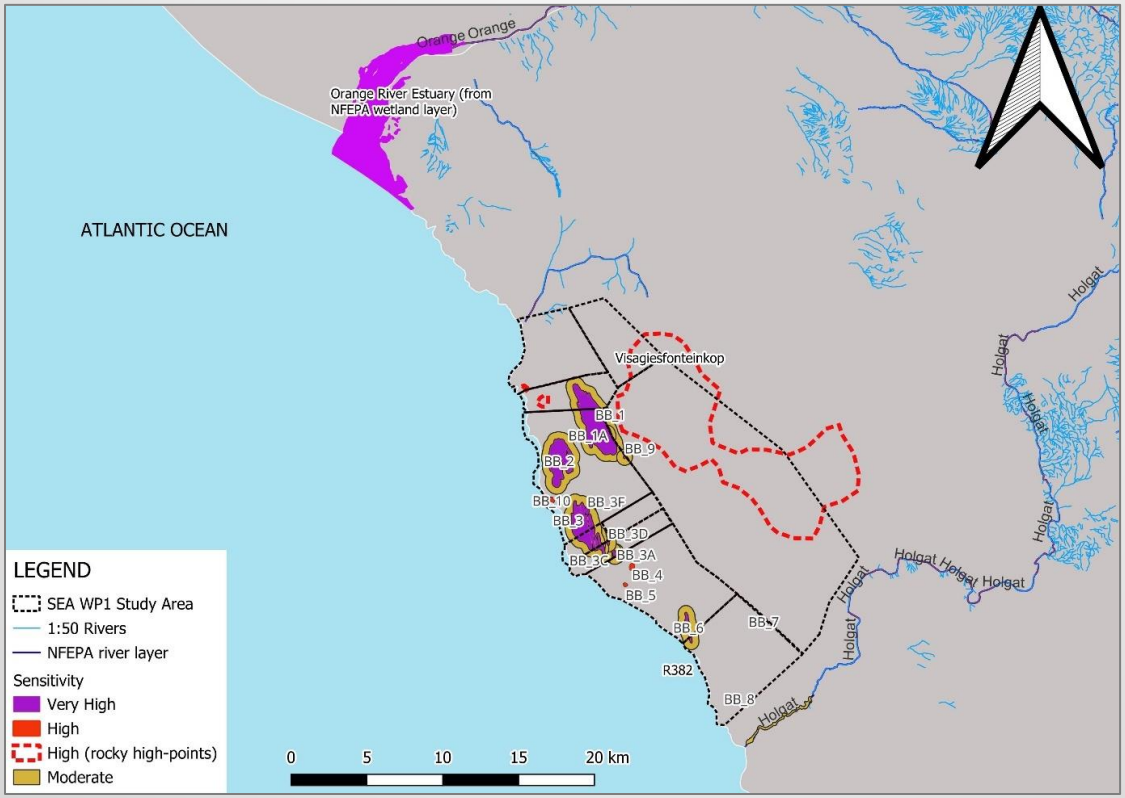
Inland watercourses in the study area, with extent based on NWM Ver 5. Rocky high points mapped at desktop level with low confidence.

National Wetland Map classified all mapped inland aquatic ecosystems as Depressions with a **Critically Endangered status**

No estuaries on site, but two in close proximity.
1. Orange River Estuary: **Ramsar Wetland status.**
2. Holgat River Estuary.

Inland aquatic ecosystems & estuaries

Site sensitivity



Inland and estuarine aquatic ecosystems sensitivity (assuming no mitigation measures) of the proposed Boegoebaai Port and SEZ study area. (Grey areas = Low sensitivity.)

Inland aquatic ecosystems & estuaries

Consequences & recommendations

Proposed development would potentially result in the **loss of all inland aquatic ecosystems.**

Negative impacts on the Orange River Estuary.

Recommen-dations:

1. Ensure layout avoids aquatic ecosystems;
2. Establish corridors linking terrestrial, coastal and inland aquatic areas across site.

Mitigation:

1. Human and financial resources at Orange River Estuary;
2. Upgrade solid waste management and wastewater treatment;
3. Address stormwater flows from roads.

Information gaps:

1.Surface/ groundwater linkages, especially in springs;
2. Rocky pool mapping refined;
3. Wet-season assessment of invertebrates.

Fauna: Avifauna

Desktop study with no on-site visit

87 bird species have been recorded in region (marine species excluded).

Of these **47 are priority species.**

Of these **13** were selected for further assessment.

The site provides suitable habitat and could potentially support:

1 CR species

3 EN species

4 VU species

2 NT species

Suitable habitat on site is present for:

1 Endemic species

1 Near-endemic species

Site is home to the **1 range-restricted** regional subsp. of the dune lark. Previously known as the Barlow's lark **NT**.

Mitigation:

1. Avoid nests and core habitat

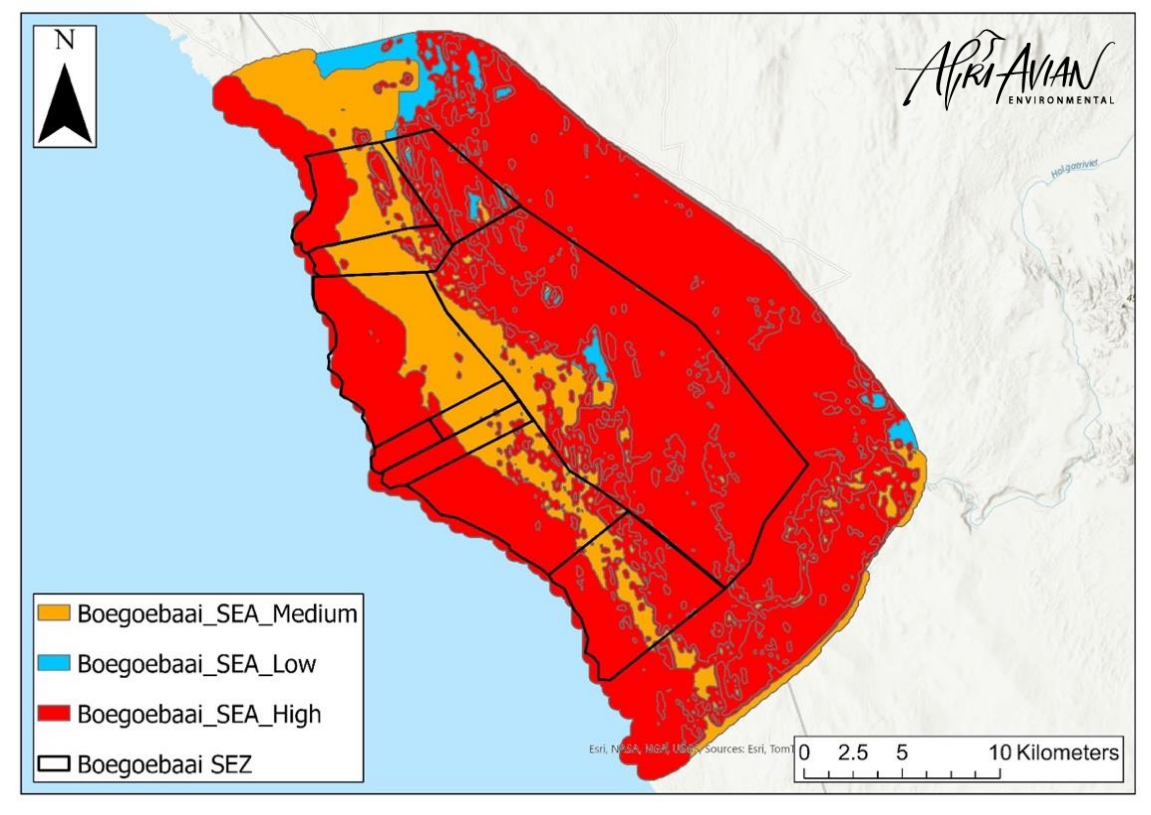
2. Bird flight diverters on powerlines

All developments require an **Avifaunal Specialist Study**

Fauna: Avifauna

Site sensitivity

- A weighted algorithm was applied allocating greater sensitivity to species that are more threatened, endemic or highly range-restricted in South Africa. It also evaluated data type (e.g. roost sites) and model type (distribution vs fine-scale breeding habitat suitability model).



The avian sensitivity map generated using an elegant analysis incorporating 13 avian SCCs.

Fauna: Bats

Mainly desktop study with brief on-site visit

According to literature sources **ten** bat species have either been recorded or may occur in the region.

One bat species with a regional **NT status** (2016).

Occurrence on site has not been confirmed.

Mitigation:

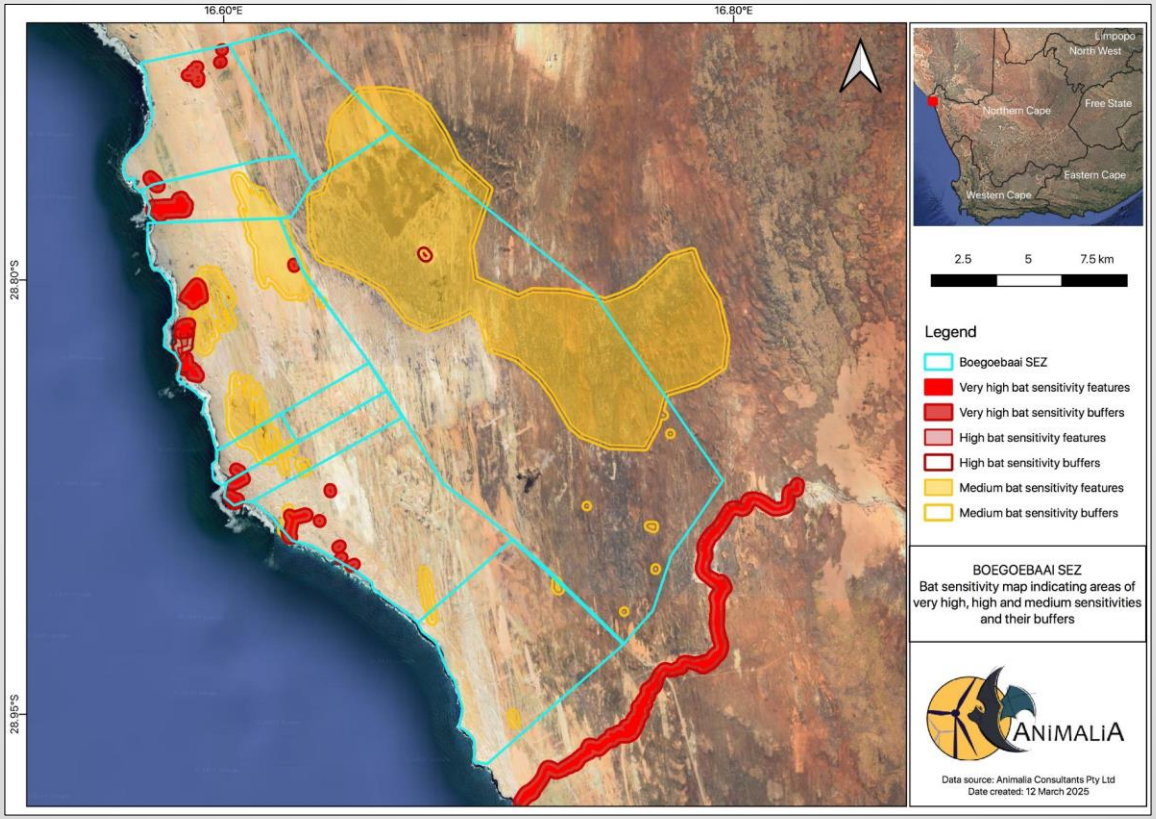
(i) Minimise artificial lighting;

(ii) Prevent bat mortalities at water-cooling tower blowdown;

(iii) Adhere to bat sensitivity map to avoid habitat destruction.

Fauna: Bats

Site sensitivity



The bat sensitivity map for the proposed Boegoebaai Port and SEZ site.

Fauna: Mammals, reptiles & amphibians

Desktop study with no on-site visit

Diverse array of mammals, reptiles and amphibians, with **10 SCC** that could potentially occur on site:

4 mammal SCC

5 reptile SCC

1 amphibian SCC

Two golden mole species **one CR and one with a VU status** were recorded by eDNA samples on site.

Their presence must be established through on-site surveys. If recorded, they will likely represent a **fatal flaw to the Coastal Duneveld**.

The **CR (regional)** Namib web-footed gecko, has been recorded on site. It is abundant in Namibia.

Mitigation measures will be required in the breeding period during construction.

The **CR (regional)** leatherback sea turtle's distribution range overlaps the site, but it has not been identified as a nesting beach.

Insufficient data precautionary principle applies.

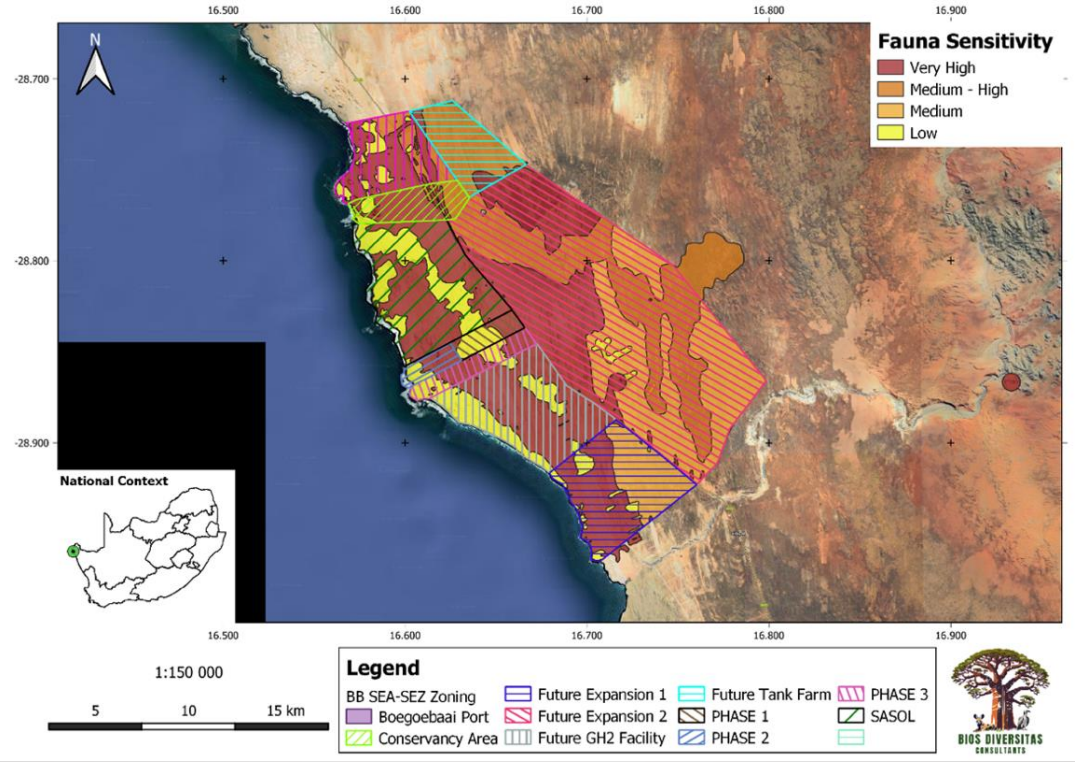
The **NT** desert rain frog occurs on site.

Recorded habitat must be preserved and appropriate mitigation measures applied.

Fauna: Mammals, Reptiles & Amphibians

Site sensitivity

Species-specific baseline assessments are required to verify and update the sensitivity map and delineate buffer zones.



Site sensitivity based on the faunal assessment of the mammals, reptiles and amphibians.

Fauna: Mammals, reptiles & amphibians

Recommendations

Development within areas of **Very High sensitivity must be avoided** due to the sensitive nature of these areas and potential negative impacts of the development on faunal SCC.

Mitigation:

Comment: Measures are often effective in theory but challenging to implement in practice.

Success of mitigation depends on sustained monitoring (seldom kept up) and adaptive management.

Information gaps:

(i) Ground-truthing by species-specific baseline surveys;

(ii) Comprehensive baseline biodiversity surveys for impacted SCC;

(iii) Under-representation of cryptic and nocturnal species;

Vegetation and Flora

Desktop review followed by a reconnaissance site visit

Priority habitat features:

(i) **2 CR ecosystems;**
(ii) **Irreplaceable & optimal CBAs**;
(iii) Inclusion in **NPAES (PA Expansion Strategy)**;
(iv) **Key Biodiversity Area**;
(v) habitat to **CR plant species**;
(vi) proximity of **CR Namib Lichen Fields.**

392 plant species confirmed on site from data by P. van Wyk; site visit in 2024; iNaturalist; and SANBI.

A total of **46 SCC:**
8 CR;
9 EN;
16 VU;
7 NT;
5 DD; and
1 Rare species.

From a botanical perspective the major source of impacts from the proposed development will result directly or indirectly from **vegetation clearance with the associated habitat loss and transformation** leading to the loss of the priority habitat features mentioned.

Previously-mined areas contain transformed vegetation. Additionally, mine-induced sand plumes cover large sections of land. These transformed habitats could be used for the proposed development **provided priority habitats are not negatively impacted.**

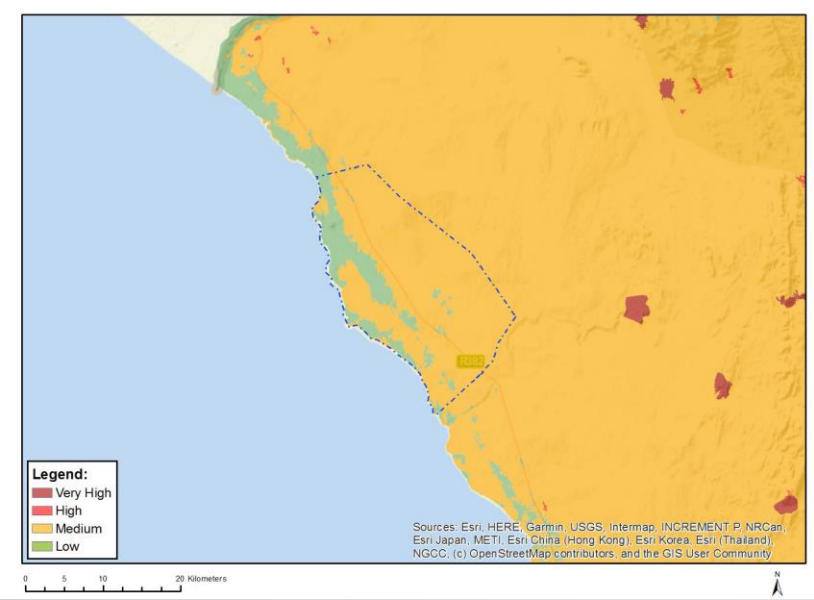
Information gaps:

1. The area has been under-sampled botanically – lack of point data on SCC.
2. In-depth, fine-scale survey of vegetation needed to refine coarse scale vegetation and sensitivity maps needed **for making far-reaching planning decisions.**

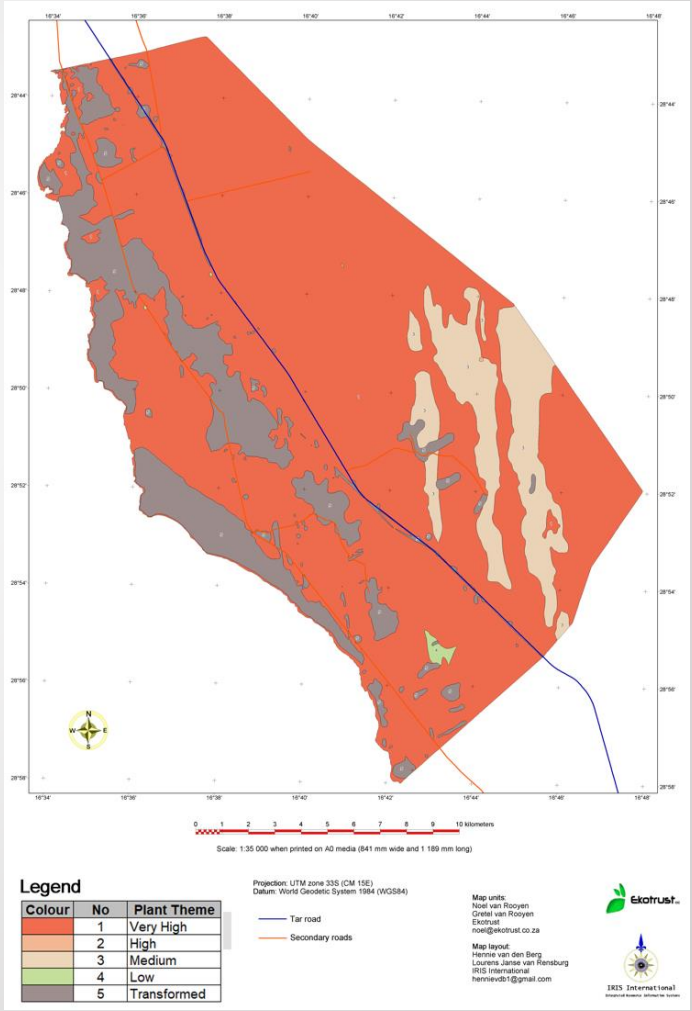
Vegetation and Flora

Site sensitivity: Plant Theme

Verify site sensitivity of **Screening Tool:**
Rated sensitivity as **Medium** listing **19 SCC** potentially on site.
SCC confirmed on site approx. **46 SCC.**
Recommended to upscale the sensitivity to Very High.
Transformed areas in grey.



Site sensitivity of the Plant Theme by Screening Tool.

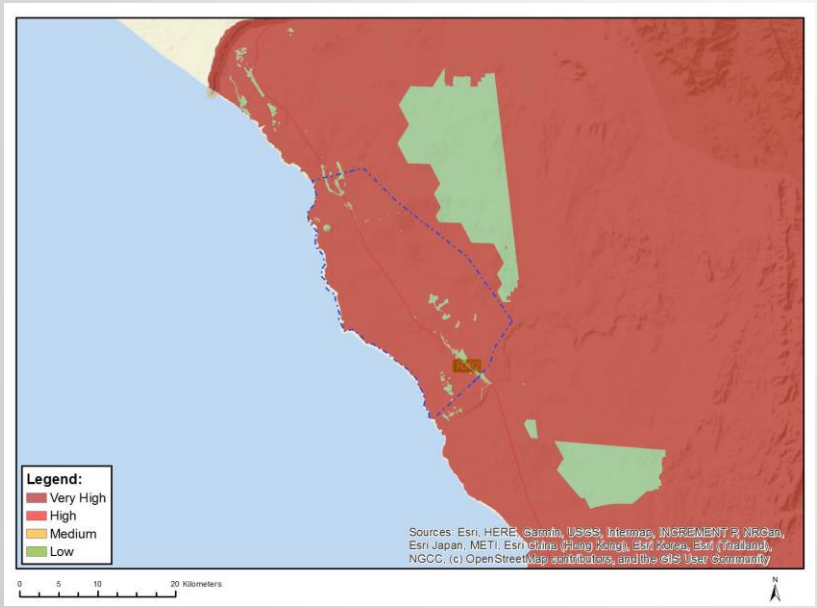


Site sensitivity of Plant Theme by current assessment.

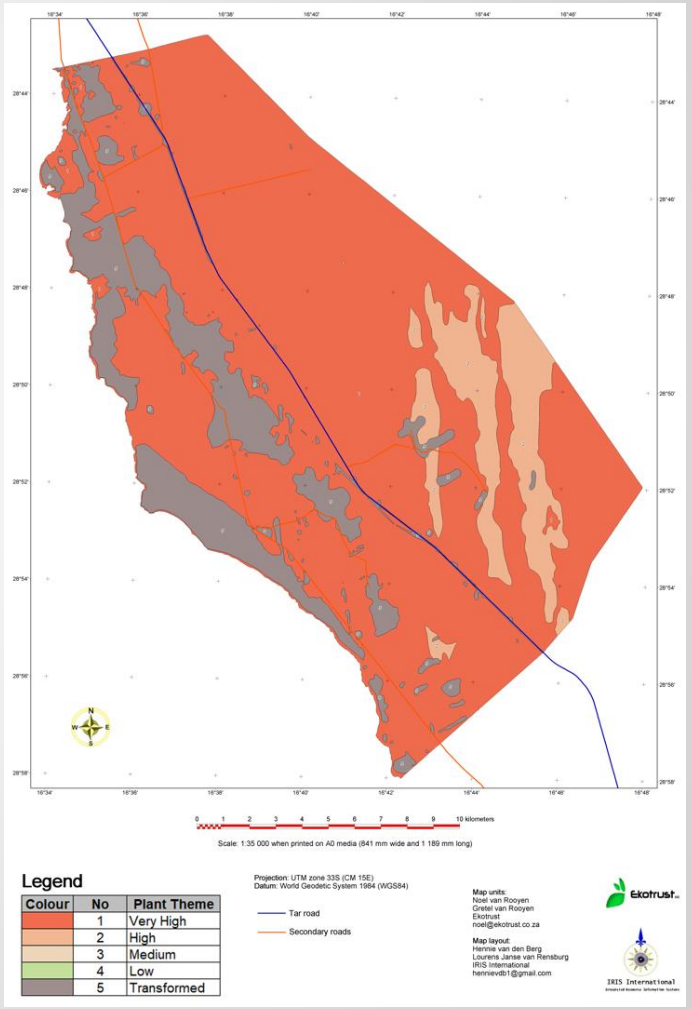
Vegetation and Flora

Site sensitivity: RelativeTerrestrial BiodiversityTheme

Screening Tool rated sensitivity as **Very High** based on CR vegetation types, CBAs, ESAs & NPAES (all rated Very High). **The current assessment supported the Very High rating. Transformed areas in grey.**



Site sensitivity of the RTB Theme by Screening Tool.



Site sensitivity of RTB Theme by current assessment.

Overall conclusions

- The potential benefits of the proposed development must be evaluated against the irreversible loss of biodiversity and ecosystem services.
- The aquatic assessment contended that the proposed development has no positive impacts and substantial negative impacts could accrue, unless addressed in layout (avoidance), design and management.
- The high-level evaluations of the plant and animal themes demonstrated **High to Very High** sensitivity. Areas of **Very High** sensitivity should be **avoided.**
- **Sand stabilisation** will be crucial to avoid negative impacts, due to strong winds, on threatened ecosystems on site and further north.
- There is a risk that **inadequate rehabilitation** during decommissioning could leave behind a degraded and vulnerable ecosystem because hyper-arid areas are very difficult to revegetate/rehabilitate successfully.

BB GH2 SEZ SEA

WP1 Biodiversity Offset framework for Port precinct and SEZ

Mark@ecological.co.za

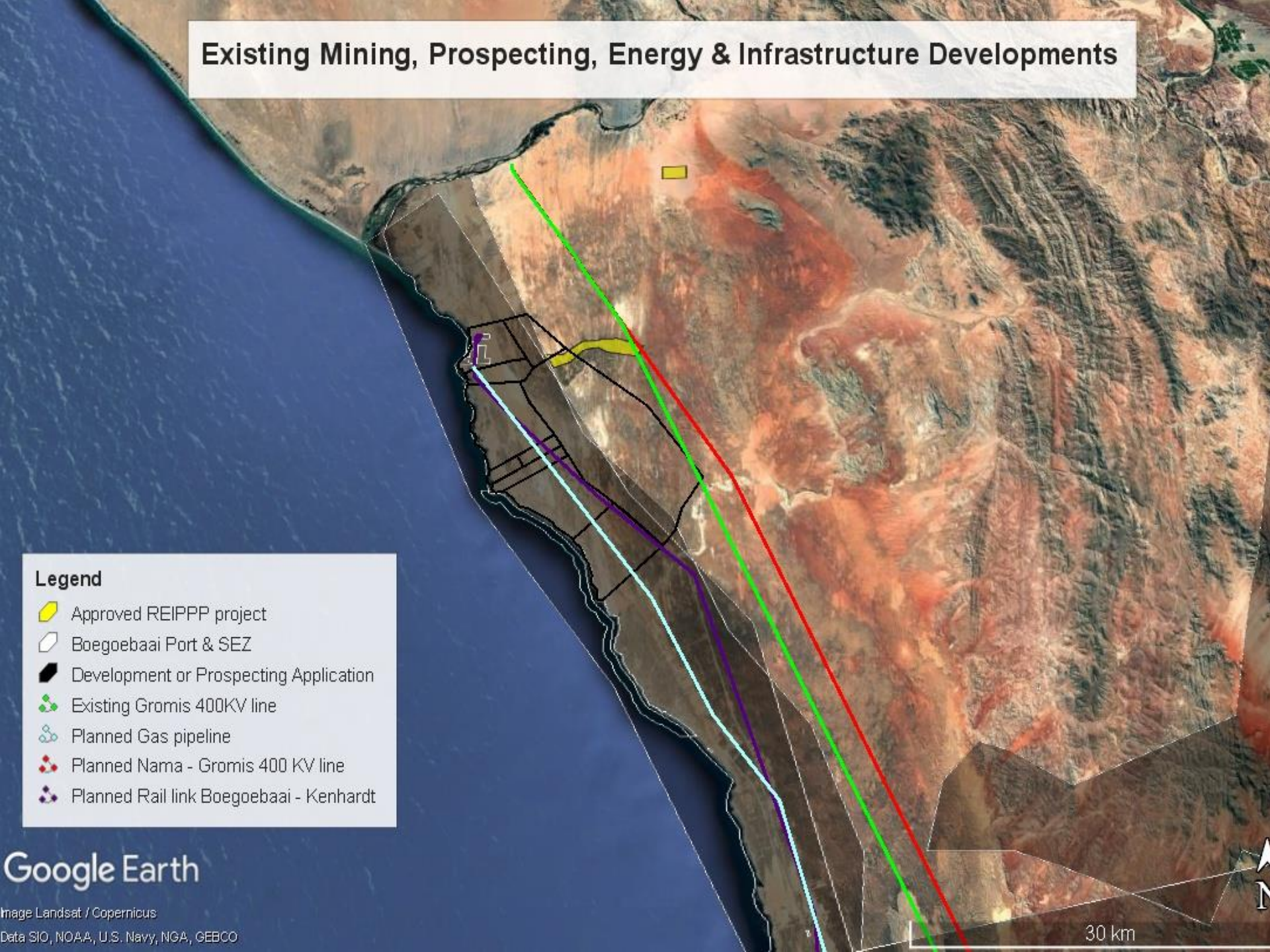
Offset Framework Requirements

1. Clarify impacts on pertinent biodiversity facets
   + Set out triggers, ratios for project level studies, no go areas
   + Indicate scale of required offsets
2. Understand land use constraints and opportunities
3. Collate intel on Offset Receiving Areas priorities
   + Biodiversity specialists & community priorities
   + State conservation institutions
4. Propose suitable offset modalities…
   + Site availability
   + implementers

Nota Bene…

- Excludes marine or coastal impacts
- Offsets vs Ecological Compensation…
- … after hierarchy/sequence exhausted
- Moveable feast of land use authorisations
  - Offsets will need to be Protected Areas
- Assumptions:
  - Mining rehabilitation
  - Recovery of sand plumes
- Key limiting factors = Implementers & sites
- Proactive Scheme/Bank best

Existing Mining, Prospecting, Energy & Infrastructure Developments



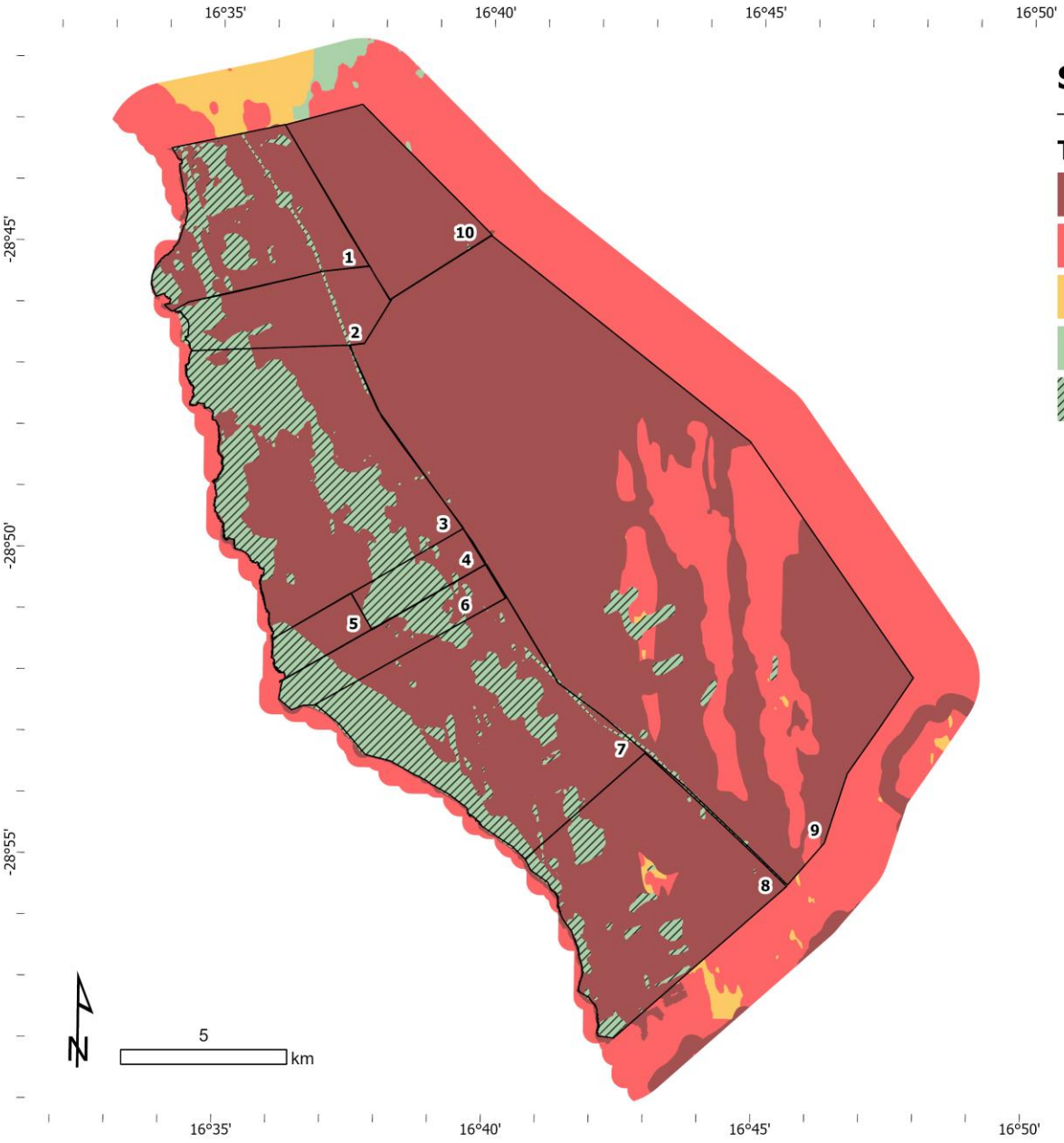
Likely impact scenarios

Small GH2

+ Modest ≈440 ha
+ Easy to fit into disturbed areas
+ Minor offset likely around SEZ
+ 21000 ha footprint in region

  = regional offset

+ Large GH2
+ ≈ 4000 ha in SEZ
+ Unlikely to fit in disturbed
+ Major offset certain, including CR features. Fatal flaw likely
+ Huge regional footprint of 140 000ha



Sensitivity of the receiving environment

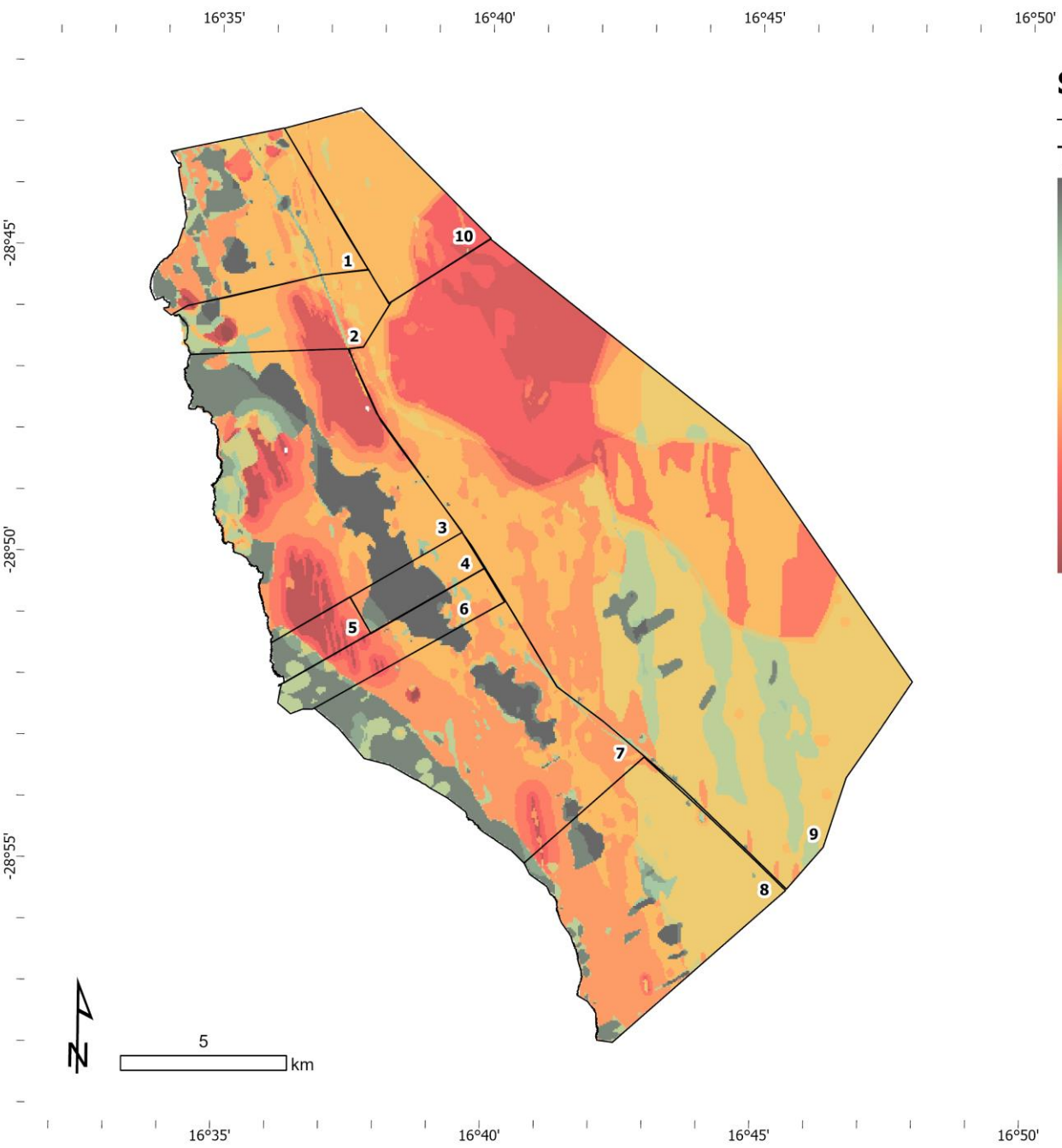
Terrestrial and aquatic ecology

- Very high
- High
- Moderate
- Low
- Transformed

Proposed SEZ layout

Zone	Use
1	Boegoebaai port
2	Conservancy area
3	Green ammonia facility
4	SEZ Phase 1
5	SEZ Phase 2
6	SEZ Phase 3
7	Future green hydrogen facility
8	Future expansion 1
9	Future expansion 2
10	Future tank farm

Thematic: CSIR, 2025; Data: Van Rooyen et al., 2025;
Coordinate system: WGS 1984 UTM Zone 33S; Units: Meter; Scale: 1:125 000;
Date: 2025/04/14



Sensitivity of the receiving environn

TEST ecological sensitivity hotspots

Transformed	No Offset
Low	1:1
Moderate	3-5:1
High	10-15:1
Very high	30:1

Proposed SEZ layout

Zone	Use
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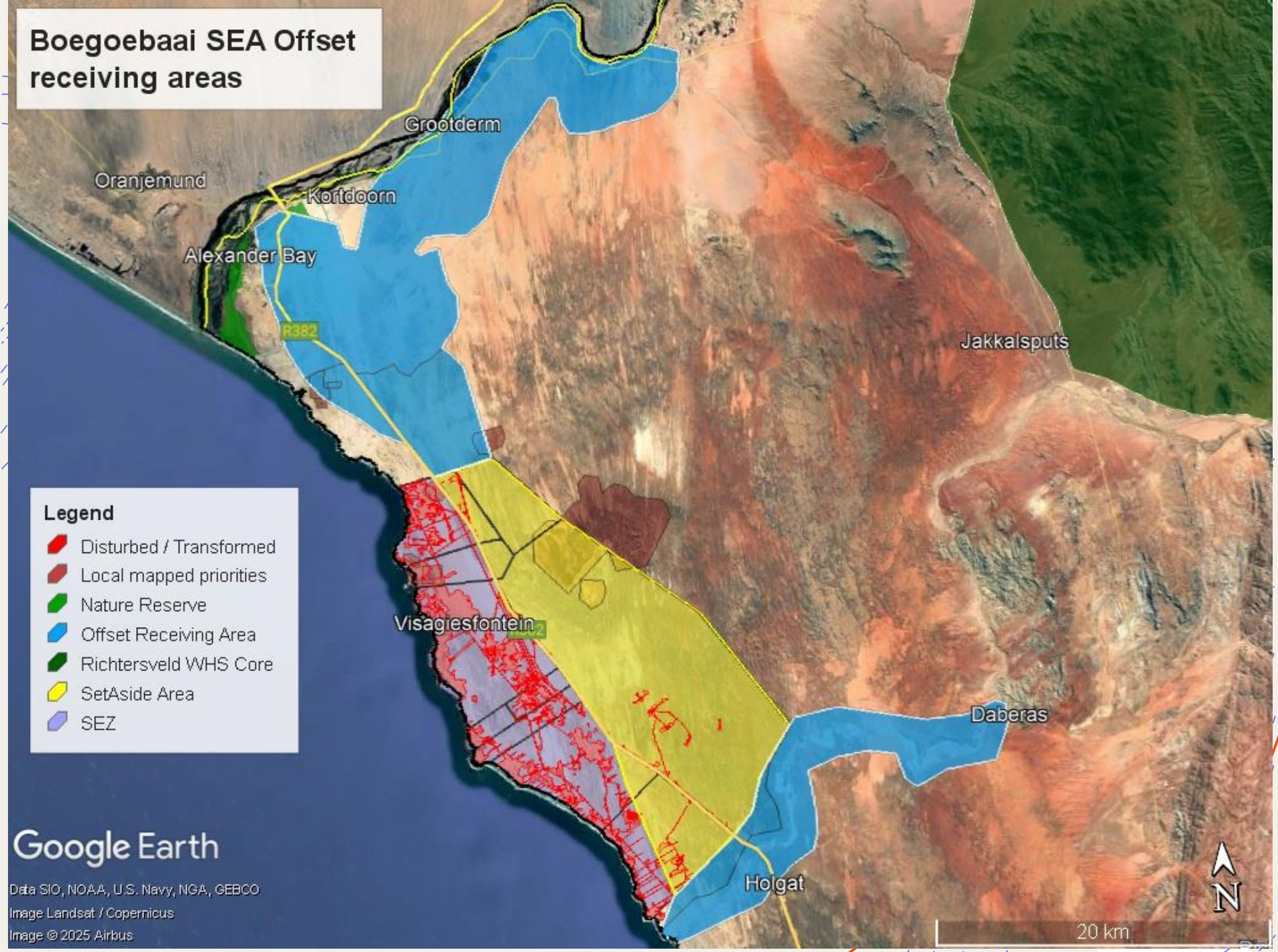
Thematic: CSIR, 2025; Data: Van Rooyen et
Coordinate system: WGS 1984 UTM Zone 33S; Units: Meter; Scale: 1
Date: 2


Boegoebaai SEA Offset receiving areas
Grootderm
Oranjemund
Kortdoorn
Alexander Bay
R382
Jakkalsputs
Visagiesfontein
Daberas
Holgat
Legend
Disturbed / Transformed
Local mapped priorities
Nature Reserve
Offset Receiving Area
Richtersveld WHS Core
SetAside Area
SEZ
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image Landsat / Copernicus
Image © 2025 Airbus
N
20 km

Offset Framework

+Clear constraints for project planners

+Offset implications calculated upfront

+Project scale EIAs focus on where & how

+Require land use consent, Management, $

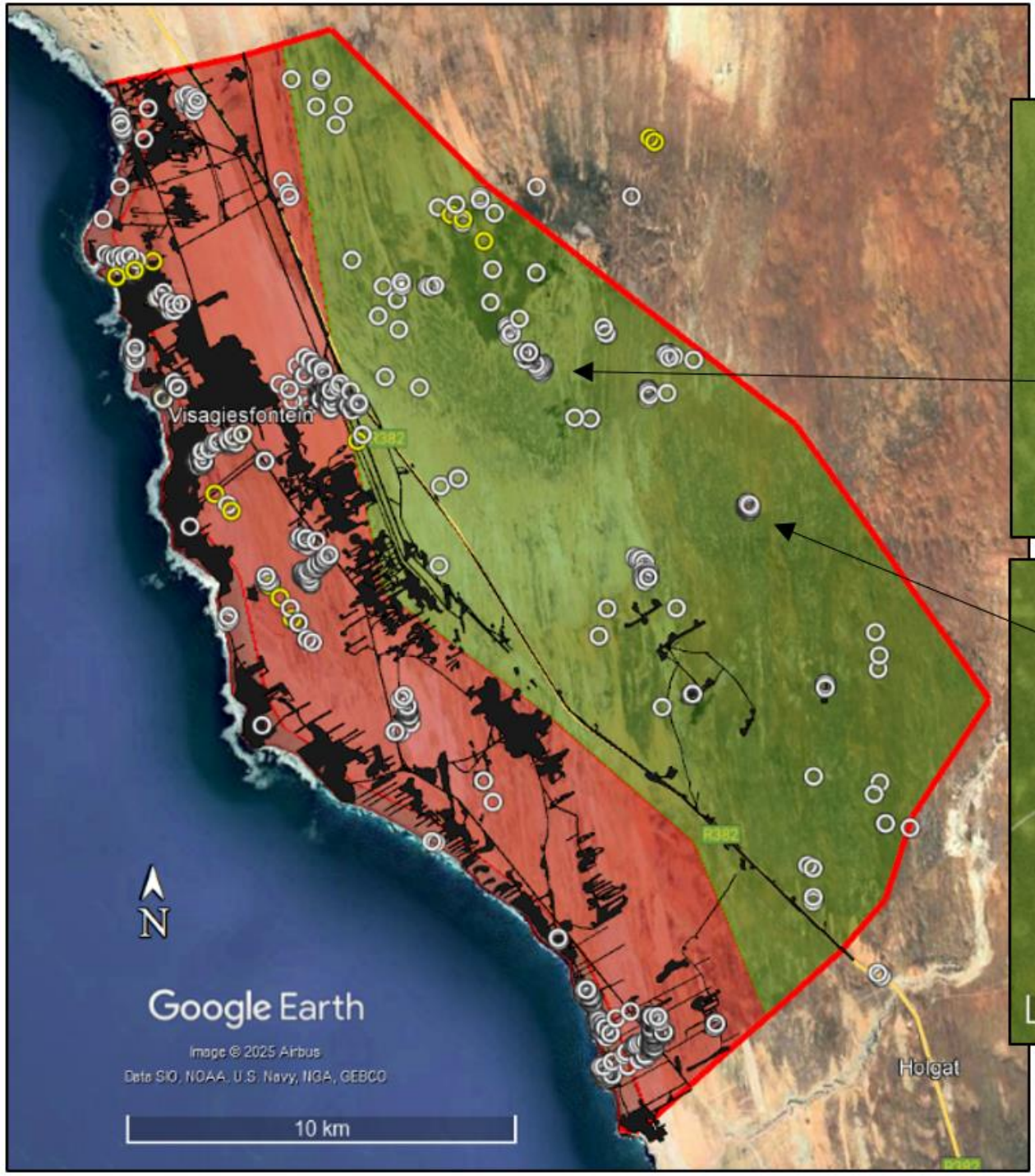
➢Establish a Proactive Offset Scheme upfront for entire SEZ, sell credits to project developers

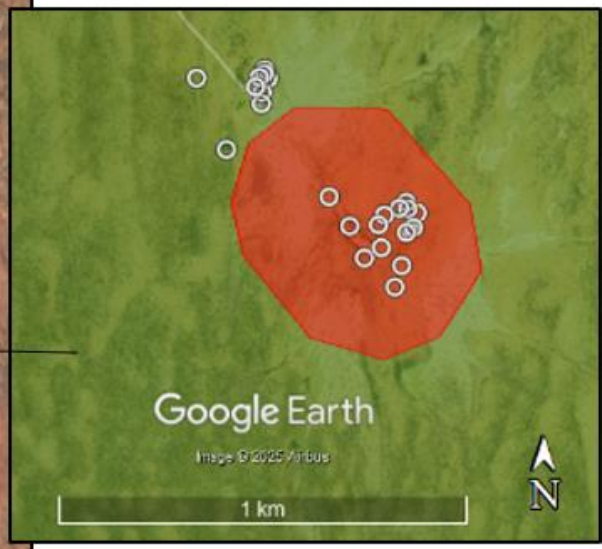
WP1: HERITAGE

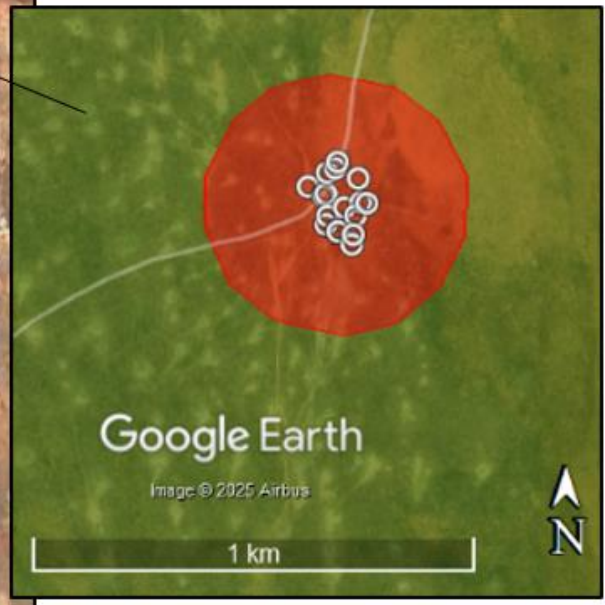
Name	Role
Jayson Orton	- Team leader - Lead author - Specialist author: archaeology
Lita Webley	- Lead author - Specialist author: archaeology - Specialist author: living heritage
John Pether	- Specialist author: palaeontology
Vanessa Maitland	- Specialist author: maritime heritage

PALAEONTOLOGY

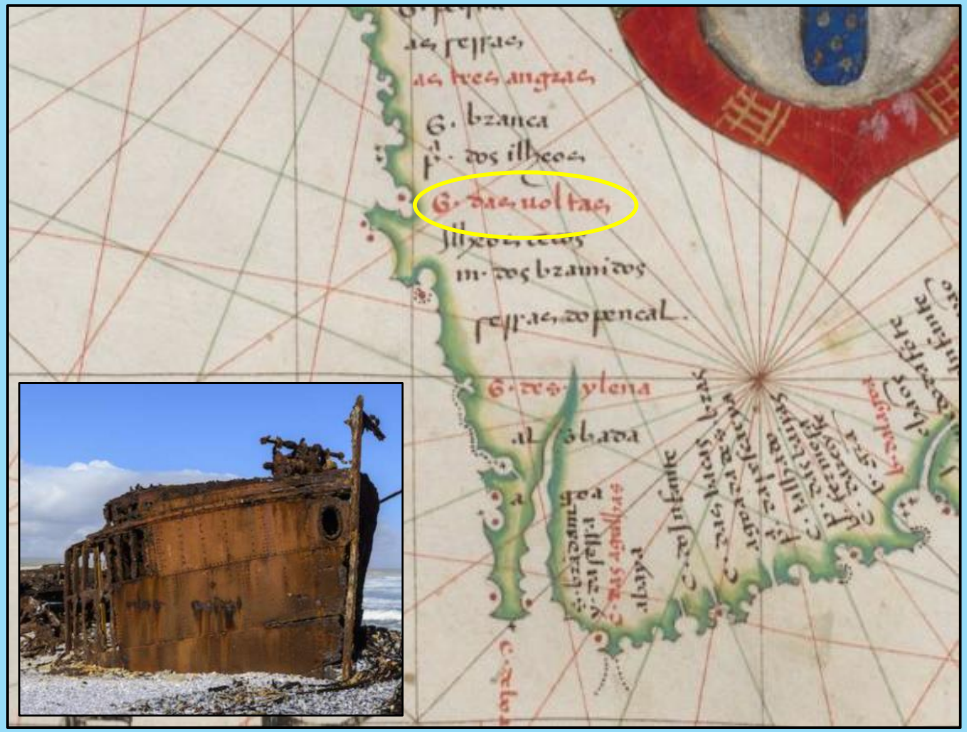
ARCHAE-OLOGY





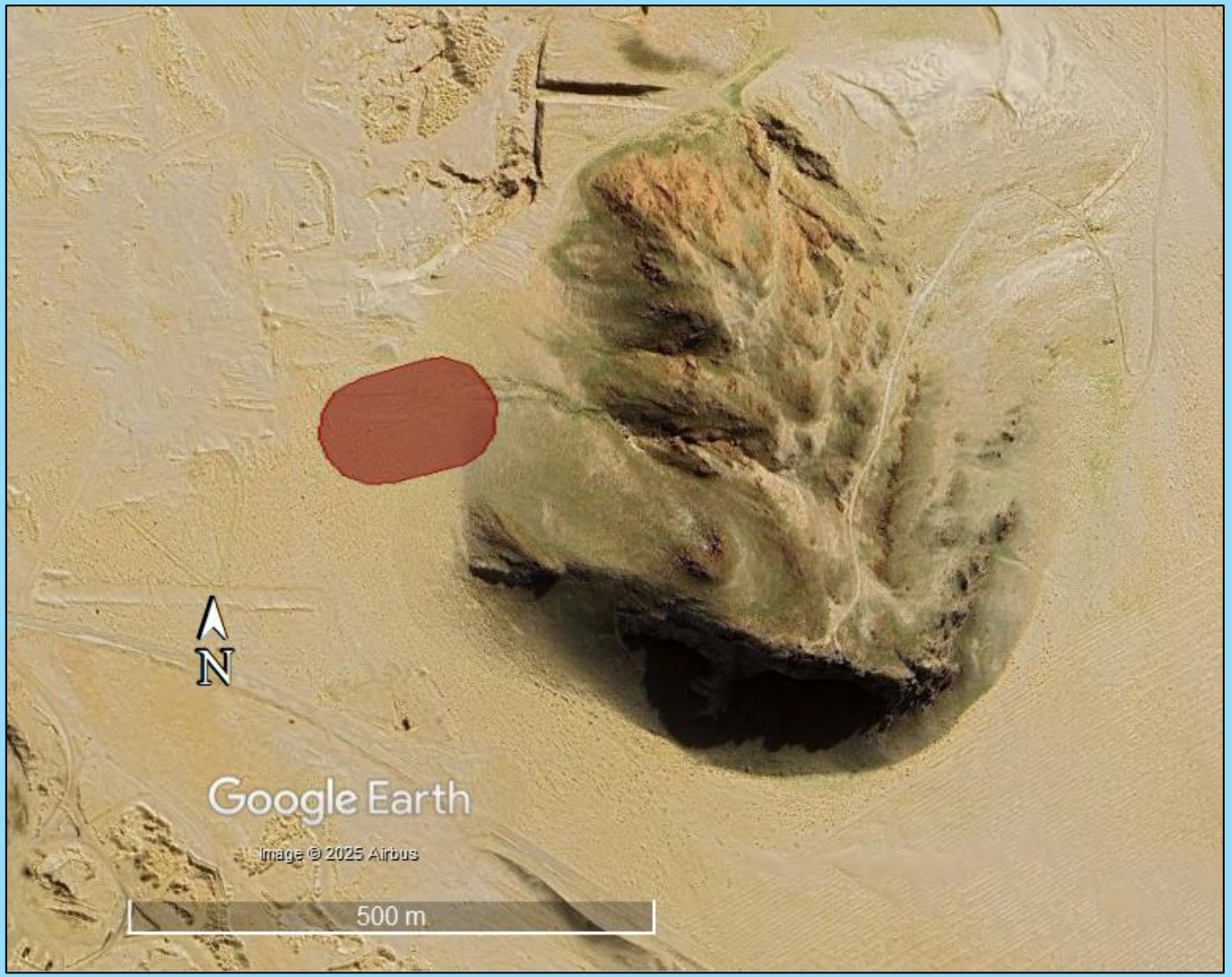


MARITIME ARCHAEOLOGY

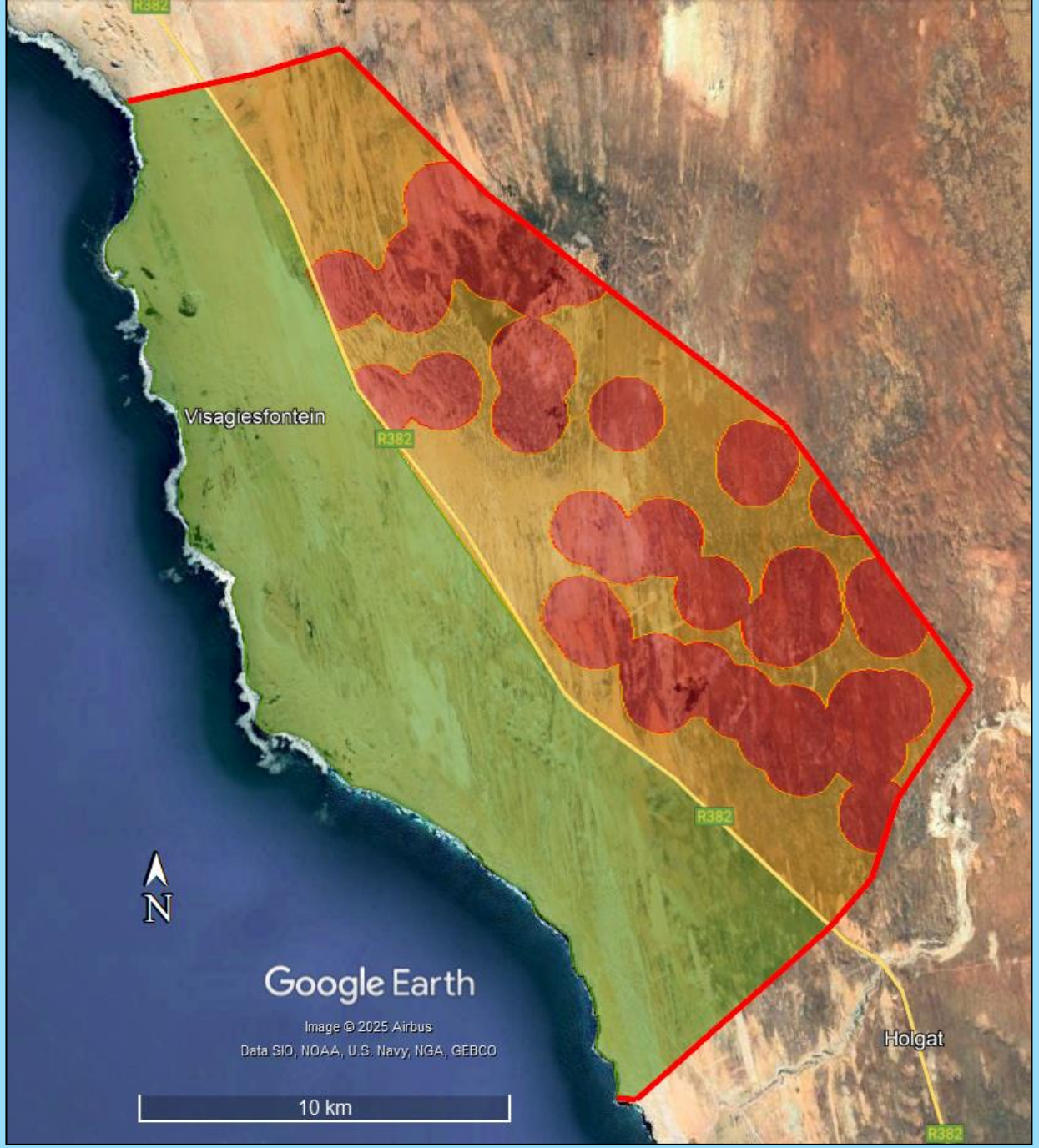


Cape Voltas
Cape Voltas
R382
1
2
10
Visagiesfontein
3
R382
9
4
5
6
Wreck Point
7
Soco Reefs
R382
8
Holgat
Google Earth
Data SIO, NOAA, U.S. Navy, NGA, GEBCO
Image © 2025 Airbus
10 km
N

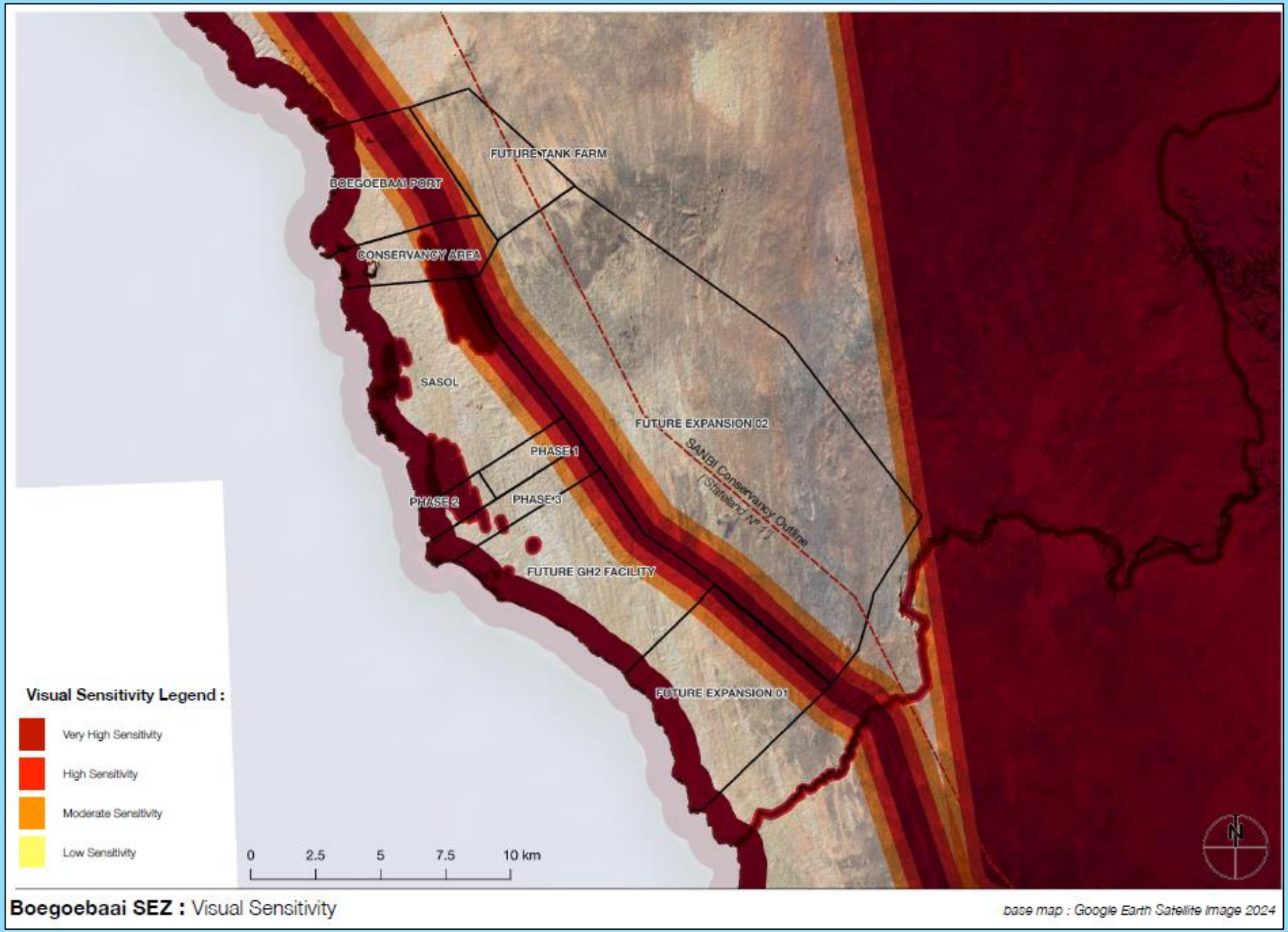
GRAVES



LIVING HERITAGE



VISUAL SENSITIVITY



CULTURAL LANDSCAPES

SUMMARY

<u>MAIN MITIGTIONS</u>

PALAEONTOLOGY

- Will require monitoring of excavations

ARCHAEOLOGY

- Looks scarier than it is!
- Mitigation very feasible, but will be extensive

MARITIME HERITAGE

- Possible magnetometer surveys

GRAVES

- None. Chance finds procedure

LIVING HERITAGE

- Negotiate with herder community

CULTURAL LANDSCAPES

- Follow visual recommendations