STRATEGIC ENVIRONMENTAL ASSESSMENT

FOR THE PROPOSED BOEGOEBAAI PORT, SPECIAL ECONOMIC ZONE & BROADER NAMAKWA REGION

05 May 2026

Online Information Session

Work Package 2 Feedback

Welcome!

CSIR

Touching lives through innovation

Purpose of this session

Platform for I&APs to get involved and provide input on the SEA outputs.

- **Share** with stakeholders and Interested and Affected Parties (I&APs):
  - **What the SEA*** is, and the **progress** and **draft findings** of **Work Package 2 (WP2 – wider Namakwa region)**.
- **Receive feedback** from I&APs on the SEA findings.

- **Important!**
  - The Council for Scientific and Industrial Research (CSIR), as coordinator of the SEA, is **independent**.
  - The specialists who undertook respective specific investigations are **independent.**
  - The purpose of the SEA and this session is **not to promote development, provide yes/no answers or result in decisions.**
  - The purpose of the SEA and this session is to present the **possible risks and opportunities** that may result from the proposed development, based on best available **scientific evidence**.
  - The SEA aims to provide a **structured and inclusive foundation for decision-making** to ensure any future planning for the proposed Boegoebaai port, SEZ and broader Namakwa region **balances economic growth, environmental protection and community benefits.**
  - The SEA will **not reduce or replace the requirements of future project-level EIA processes.**

** SEA: Strategic Environmental Assessment; SEZ: Special Economic Zone; EIA: Environmental Impact Assessment*

What is green hydrogen and 'Power-to-X' products?

- Green hydrogen (GH_2) and 'Power-to-X' (PtX) products are **alternative fuels and chemicals** produced using **renewable electricity** (e.g. solar and wind power).
- Industries, vehicles, and equipment that are normally powered by petrol, diesel, coal, or other carbon-intensive inputs can instead **use GH_2 / PtX as environmentally and climate-friendly alternatives**.

Main components:

Water
•Desalinated sea / wastewater

Energy
•Renewable energy, powerlines, etc.

GH_2/PtX Production
•Through electrolysis: $H_2O \rightarrow H_2 + O_2$

GH_2/PtX Storage and Delivery
•Tanks, trucks, railways, pipelines, ships. etc.

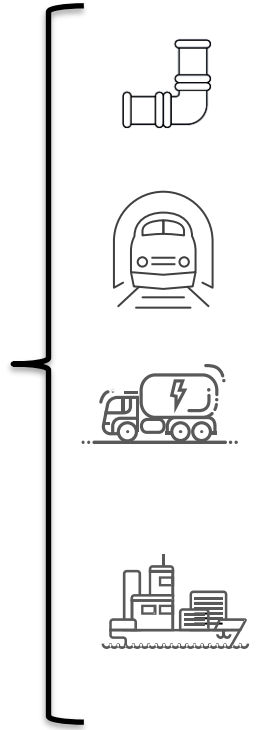








Green H_2
or ammonia / methanol / other chemicals



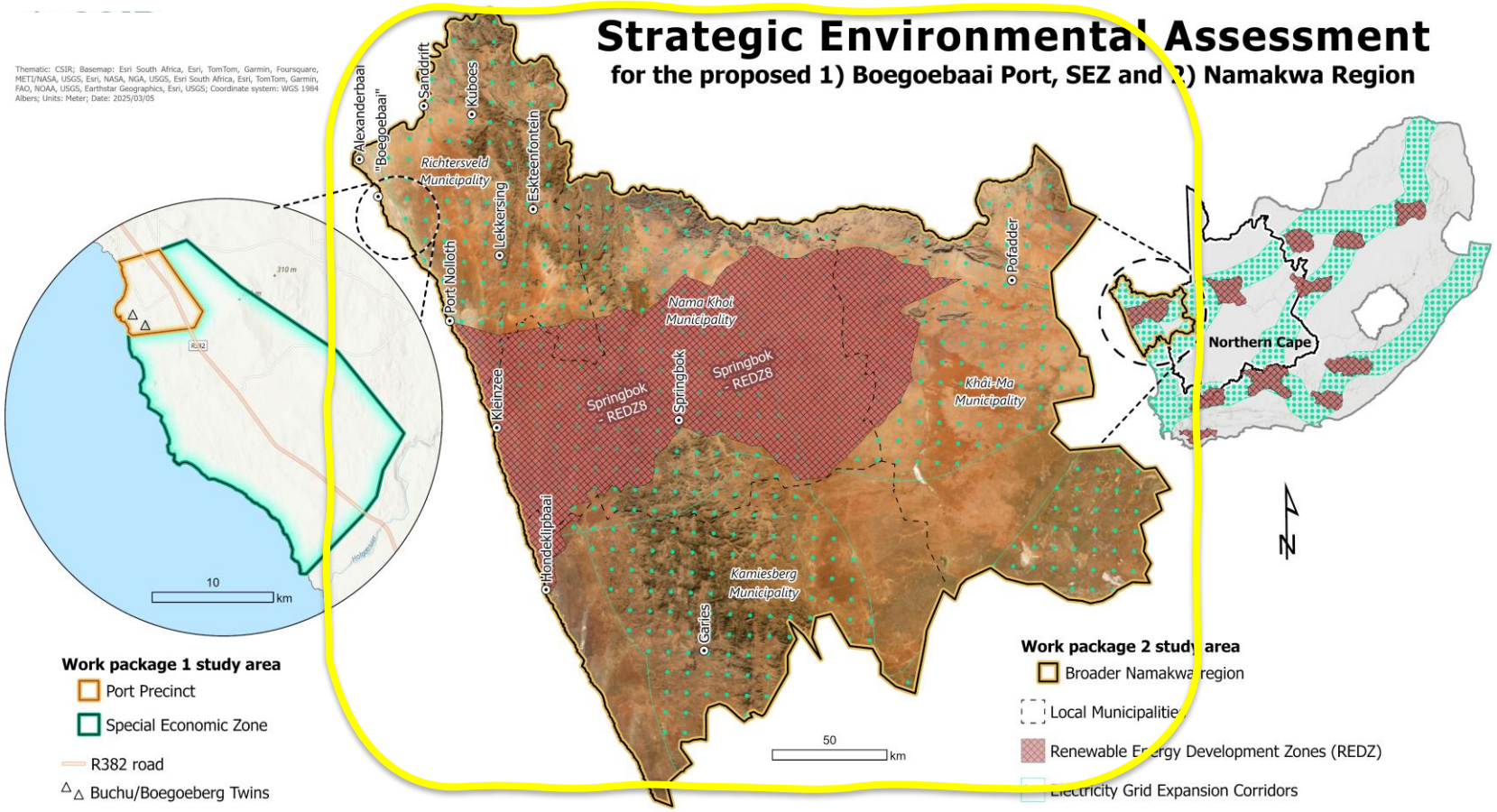
Power----------to----------X

Overview of the SEA

To guide the development of an integrated decision-making framework for planning the proposed Boegoebaai Port, SEZ, and the wider Namakwa region in a sustainable manner.

Why is a SEA required?

- Large-scale GH_2 production will have **many direct and indirect impacts, both positive and negative**.
- Development components, including their interconnected transport routes, will require **large areas of land surface and resource intensive inputs.**
- Although the region is sparsely populated, it is **ecologically and culturally sensitive** with many existing and potentially competing land uses, such as conservation, agriculture, fishing, tourism, mining, and other subsistence livelihoods.
- **Legally required** for new ports in terms of the "National Ports Act".



**WP2 – the focus of this round of information sessions, WP1 sessions concluded August 2025.*

WP1 Scale: strategic, but **local**; Outputs: Guidance for **project-level (port + SEZ)** development planning, layout planning, feasibility studies, environmental impact assessments, and decision-making.

WP2 Scale: strategic, scenario-based, **regional**; Outputs: Guidance for **broader Northern Cape GH_2 planning**, with a focus on cumulative opportunities and risks.

Characteristics and sensitivity of the region

Summary of draft results (WP2)

Ecology & Biodiversity:

- Global **biodiversity hotspot** (Succulent Karoo & Nama Karoo);
- **Key Biodiversity Areas** (KBAs); high endemism; but undergoing climate-driven "browning";
- **Coastal dunes, the Orange River corridor, and Kamiesberg** = irreplaceable systems;
- **Ecological processes** – pollinators in flower-rich shrublands; soil engineering by ants, termites and rodents; seasonal amphibians breeding in pans; hills are important for reptiles and small mammals.

Water Resources & Aquatic Ecology:

- **Hyper-arid** (±60–215 mm/year rainfall), highly dependent on groundwater;
- **Orange River** is the only permanent source;
- Many **wetlands, pans, and estuaries** are Critically Endangered.

Heritage:

- **Richtersveld Cultural and Botanical Landscape** (UNESCO World Heritage Site);
- **Communal grazing landscapes** (living heritage);
- **Scenic routes** (N7, N14, R382) and culturally significant mountains;
- Scattered, often unmarked, pre-colonial **graves**.

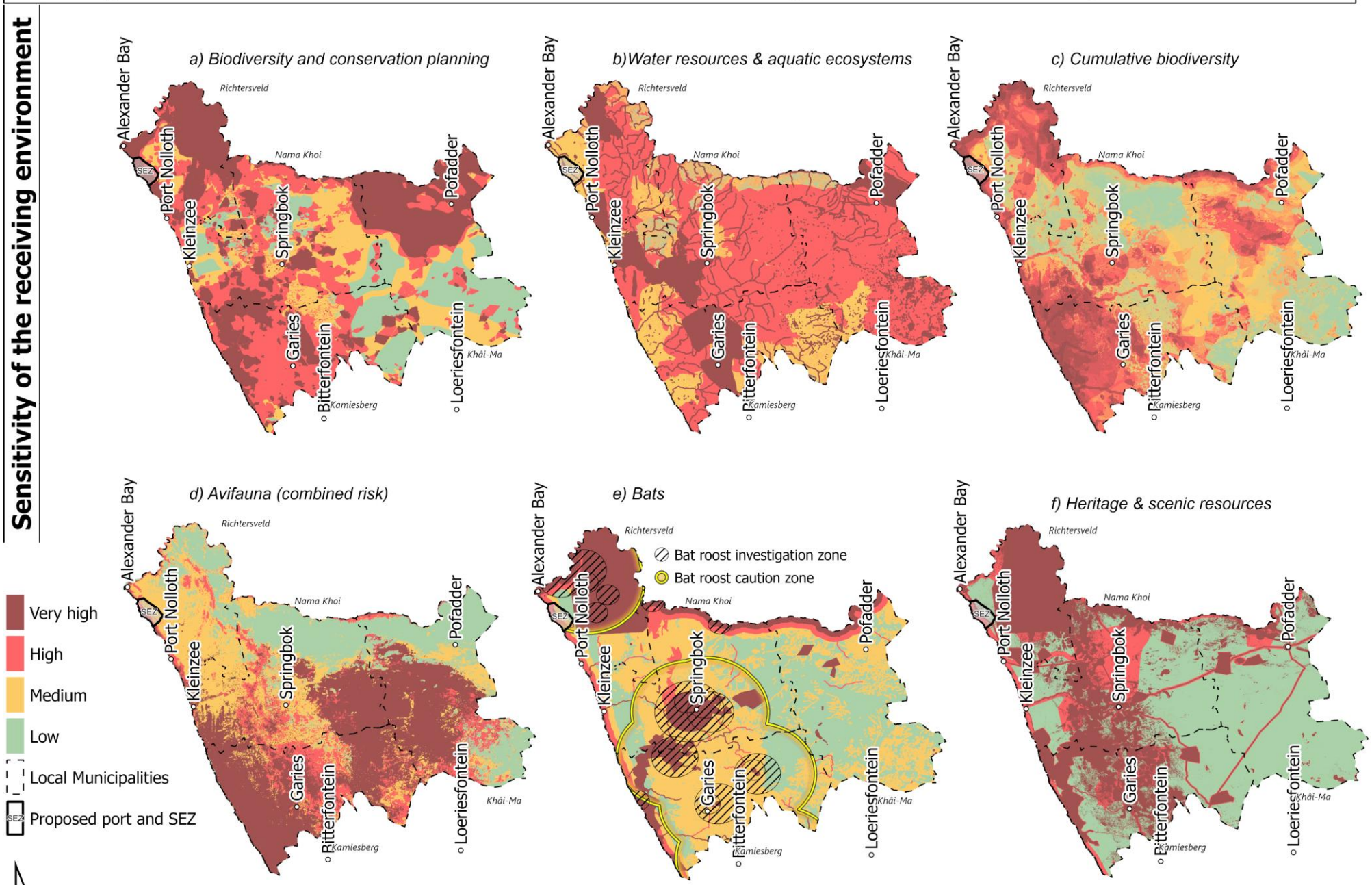
Socio-economics:

- Very **low population density** (~1 person/km²), **high unemployment, low household income**;
- Strong **mining** legacy; **tourism** and **agriculture** are highly sensitive to disturbance.

Infrastructure & Planning:

- Stressed **water and sanitation systems**, ageing **roads** (R382 critical), limited **electricity grid** capacity;
- Limited **municipal planning and institutional capacity**.

Strategic Environmental Assessment for the Namakwa region in relation to Boegoebaai Port & SEZ



Thematic: CSIR, 2025; Data: Van Rooyen et al., 2025; Clark et al., 2025; Orton et al., 2025; Gammage et al., 2025;
Coordinate system: GCS WGS 1984; Units: Degree; Scale: 1:3 300 000;
Date: 2026/03/11

- **Key principle →** "Lower sensitivity" ≠ low risk → all projects require site-specific verification

GH_2 development scenarios:

- Scenarios were used to envision and explore both the scale and implications (risks and opportunities) of GH_2 development in the region.
- What could a large GH_2 economy in the Northern Cape look like in terms of the nature, scale, and spatial footprint of infrastructure and development?
- What potential **cumulative positive and negative impacts** of GH_2 development can be expected, and what strategies can be implemented to **enhance benefits and reduce adverse effects**?

[Scenario 0] **Dynamic baseline** (up to ~2050) Assumes: **No GH_2, no port, no SEZ is developed.**	**[Scenario 1]** **"Small GH_2"** (shorter to medium term) Assumes: *In addition to impact trends under Sc0*	**[Scenario 2]** **"Large GH_2"** (longer term up to ~2050) Assumes: *In addition to impact trends under Sc0*

• Ongoing trends continue:
  • **Climate change;**
  • **Development activities and proposals** (e.g. mining, renewable energy);
  • **Biodiversity loss;**
  • **Water scarcity;**
  • **Unemployment;**
  • **Municipal capacity;**
  • **Market dynamics .**
	• **5 GW electrolysis** to produce ~ 1.4 mtpa GH_2 ;
	• **10 GW renewable energy** (~60% solar / 40% wind);
	• **Initial port and SEZ** development (including green ammonia);
	• **Initial linear infrastructure** – pipelines, railways and powerline connections.
		• **40 GW electrolysis** to produce ~ 4 mtpa GH_2;
		• **80 GW renewable energy** (~60% solar / 40% wind);
		• **Expanded port and SEZ** development;
		• **Expanded linear infrastructure –** pipelines, railways and powerline connections.

Impacts (positive & negative) and enhancement/mitigation measures

summary of draft results (WP2)

ECOLOGY AND BIODIVERSITY

Potential positive impacts / opportunities:	Potential negative impacts / risks:
[Scenario 0] Dynamic baseline "No port, no SEZ, no GH_2"	
Potential for ecosystem stabilisation through grazing reform and the expansion of protected areas	**Continued desertification, habitat degradation and biodiversity decline driven by climate change and unsustainable land use**
Enhance: Grazing management reform; expansion of protected areas and conservation agreements	*Mitigate: Improved grazing control; anti-poaching; restoration programmes*
[Scenario 1] "Small GH_2"	
Strategic biodiversity offsets and funded conservation programmes	**Local habitat loss, fragmentation and collision risk**
Enhance: Align offsets with protected area expansion priorities	*Mitigate: Avoid HIGH / VERY HIGH sensitivity areas; micrositing*
[Scenario 2] "Large GH_2"	
Landscape scale conservation through programmatic offsetting	**High risk of irreversible biodiversity loss if avoidance fails**
Enhance through: Combined offset bank and conservation agreements	*Mitigate through: Strict no-go zones; cumulative impact thresholds; offsetting as last resort*

Impacts (positive & negative) and enhancement/mitigation measures

summary of draft results (WP2)

WATER RESOURCES AND AQUATIC ECOLOGY

Potential positive impacts / opportunities:	Potential negative impacts / risks:
[Scenario 0] Dynamic baseline "No port, no SEZ, no GH_2"	
No noticeable opportunities	**Decline in ground- & surface water availability and quality, degradation of watercourses and biodiversity loss.**
Enhance: Imperative -protect groundwater recharge zones; improved water management and monitoring	*Mitigate: Upgrade wastewater treatment works; groundwater protection measures*
[Scenario 1] "Small GH_2"	
Desalination provides climate resilient water source	**Increasing water demand and pollution risk**
Enhance: Integrate desalinated water into municipal systems	*Mitigate: Strict siting away from Strategic Water Source Areas*
[Scenario 2] "Large GH_2"	
Large scale desalination improves long-term water security	**Severe groundwater depletion and estuary degradation**
Enhance: Regional level water planning and groundwater recharge management	*Mitigate: Protect ecological flows; desalination as primary supply source*

Impacts (positive & negative) and enhancement/mitigation measures

Summary of draft results (WP2)

HERITAGE RESOURCES

Potential Positive impacts / opportunities:	Potential negative impacts / risks:
[Scenario 0] Dynamic baseline "No port, no SEZ, no GH_2"	
No noticeable opportunities	**Undocumented loss of archaeological and living heritage**
N/A	*Mitigate: Early heritage screening, even without large scale development*
[Scenario 1] "Small GH_2"	
Improved heritage knowledge through surveys and monitoring	**Disturbance of coastal archaeology and unmarked graves**
Enhance: Heritage-driven tourism and adaptive reuse of structures	*Mitigate: Pre-construction surveys; chance find procedures*
[Scenario 2] "Large GH_2"	
Formal recognition and co-management of living heritage	**Cumulative loss of cultural landscapes**
Enhance: Benefit sharing agreements with communities (FPIC-based)	*Mitigate: Exclusion of World Heritage Sites and buffers; visual impact management*

Impacts (positive & negative) and enhancement/mitigation measures

Summary of draft results (WP2)

INFRASTRUCTURE AND PLANNING

Potential Positive impacts / opportunities:	Potential negative impacts / risks:
[Scenario 0] Dynamic baseline "No port, no SEZ, no GH_2"	
Modest settlement growth, improved services, limited economic and infrastructure development opportunities in key towns	**Continued infrastructure decay and low readiness**
Enhance: Prioritisation of maintenance planning and asset management	*Mitigate: Incremental rehabilitation of critical services*
[Scenario 1] "Small GH_2"	
Catalytic investment in roads, grid and water infrastructure	**Road damage and planning backlogs**
Enhance: Corridor-based and nodal infrastructure planning	*Mitigate: Early road upgrades and strengthened planning capacity*
[Scenario 2] "Large GH_2"	
Rail, grid and pipeline infrastructure repositions the region	**Institutional overload and land access delays**
Enhance: Phased rollout and national-provincial coordination	*Mitigate: Shared corridors; early land access frameworks*

Impacts (positive & negative) and enhancement/mitigation measures

Summary of draft results (WP2)

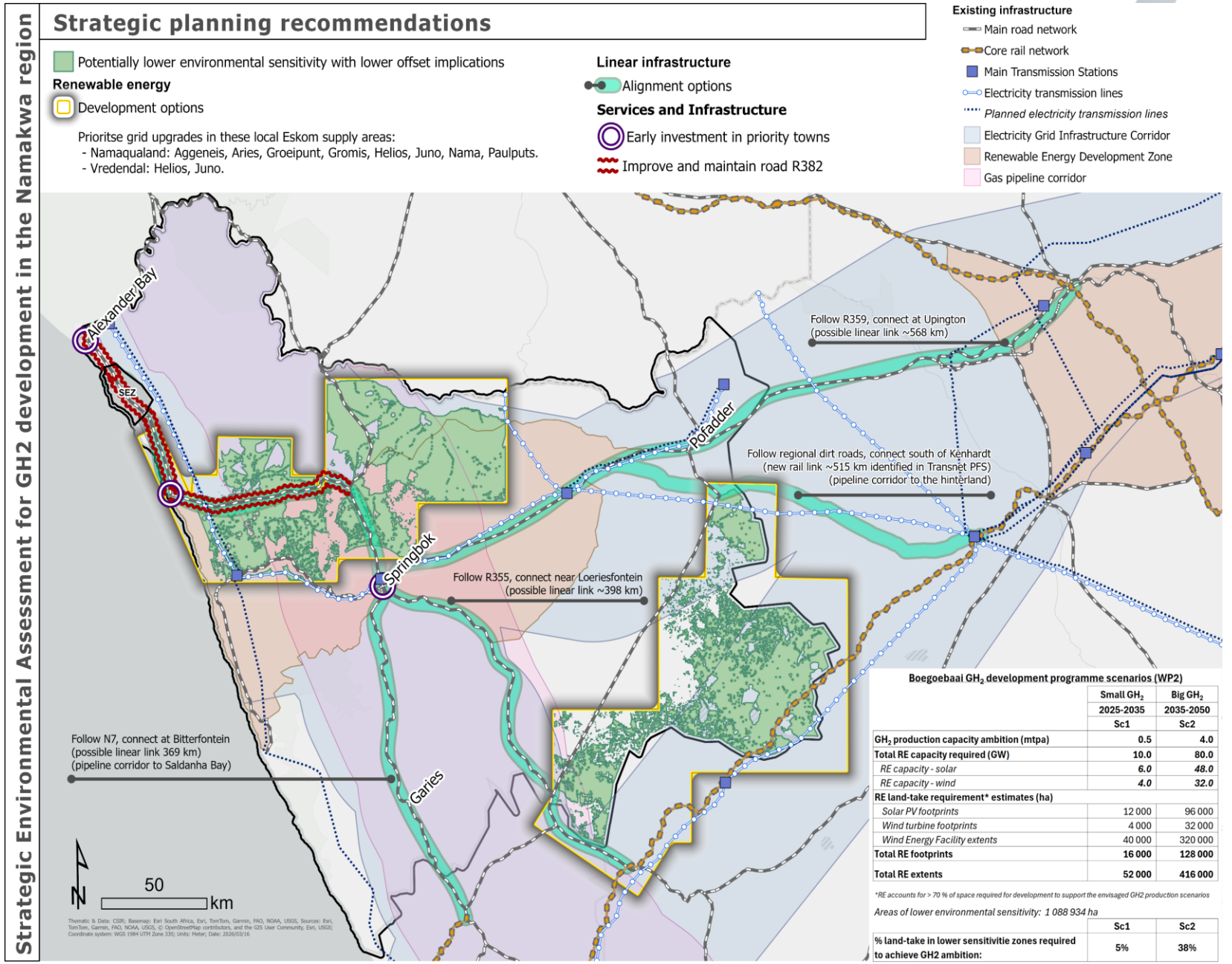
SOCIO-ECONOMIC SYSTEMS

Potential Positive impacts / opportunities:	Potential negative impacts / risks:
[Scenario 0] Dynamic baseline "No port, no SEZ, no GH_2"	
Tourism and agriculture can persist if landscapes remain intact	**Persistent unemployment and outmigration**
Enhance: Maintain landscape quality; support conservation-based tourism	*Mitigate: Local economic support programmes*
[Scenario 1] "Small GH_2"	
Job creation and skills development	**Housing pressure and "boomtown" dynamics**
Enhance: Local procurement and training initiatives	*Mitigate: Worker housing strategies; phased construction*
[Scenario 2] "Large GH_2"	
Sustained regional economic diversification; strengthened coordination, institutional capacity, and governance	**Increasing pressure on already constrained municipal capacity; high risk of inequality and social conflict**
Enhance: Long-term skills development and localisation strategies	*Mitigate: Governance strengthening; clear benefit sharing frameworks*

Recommendations – spatial planning:

Draft results (WP2)

- **Avoid sensitive areas→**
  - Richtersveld World Heritage Site and buffers;
  - Coastal dunes;
  - Orange River corridor;
  - Kamiesberge;
  - Strategic Water Source Areas;
  - Intact wetlands and pans;
  - And sensitive areas identified during project-specific EIA processes.
- **Target lower sensitivity areas for development →**
  - Disturbed coastal mining areas;
  - Inland arid plains (clustered PV, avoiding water and heritage features);
  - Plan shared infrastructure corridors (roads, rail, pipelines, power networks).



Boegoebaai GH_2 development programme scenarios (WP2)

	Small GH_2 2025-2035 Sc1	Big GH_2 2035-2050 Sc2
GH_2 production capacity ambition (mtpa)	**0.5**	**4.0**
Total RE capacity required (GW)	**10.0**	**80.0**
RE capacity - solar	***6.0***	***48.0***
RE capacity - wind	***4.0***	***32.0***
RE land-take requirement* estimates (ha)		
Solar PV footprints	12 000	96 000
Wind turbine footprints	4 000	32 000
Wind Energy Facility extents	40 000	320 000
Total RE footprints	**16 000**	**128 000**
Total RE extents	**52 000**	**416 000**

*RE accounts for > 70 % of space required for development to support the envisaged GH2 production scenarios

Areas of lower environmental sensitivity: 1 088 934 ha

	Sc1	Sc2
% land-take in lower sensitivitie zones required to achieve GH2 ambition:	**5%**	**38%**

Recommendations – strategic planning

Draft results (WP2)

- Strictly apply the **mitigation hierarchy**: **avoidance first, offsetting last.**
- **Concentrate development in degraded / lower-sensitivity landscapes.**
- **Bundle linear infrastructure** within shared corridors to limit fragmentation.
- Implement **regional-level biodiversity offsetting.**
- **Invest early in anchor towns** (Port Nolloth, Alexander Bay, Springbok).
- **Upgrade and maintain key transport routes**, especially the R382.
- **Strengthen the electricity network and capacity**.
- **Strengthen municipal governance capacity.**
- **Establish a multi-sphere Boegoebaai Intergovernmental Steering Committee** to, among other things, oversee responsible and meaningful consideration of SEA recommendations.
- **Incorporate FPIC and sustained engagement** as foundation for social legitimacy and strategic risk management.
- **Establish and implement a Community Negotiation Framework** supported by independent facilitation to build ongoing trust and a social license.

In conclusion Draft results (WP2)

- GH_2 development **can make a material contribution** to South Africa's energy transition and regional economic diversification, **but the receiving environment is sensitive** in terms of ecology, culture and socioeconomics.
- The Namakwa region is an extremely **water-constrained** landscape. GH_2 development can exacerbate **existing water scarcity and service delivery challenges**, but also **offers significant opportunities for water security** through seawater desalination.
- Socio-economically the region is vulnerable. GH_2 related infrastructure investment **can stimulate employment, infrastructure improvement and economic diversification**…but is strongly dependent on **effective governance**, **inclusive consultation processes**, **and careful management of in-migration, service delivery and local expectations**.

A future GH_2 economy in the Northern Cape is not constrained or driven by a single environmental or social factor, but by the cumulative interaction of ecological sensitivity, water scarcity, institutional capacity and spatial planning requirements.

How will the SEA outputs be used?

- **Information** source (state of knowledge at the time of assessment), to be enriched as further studies and fieldwork are conducted.
- **Point of departure for future investigation, planning and decisions** at strategic, local and project level.
- **Accountability** for future investigation, planning and decisions.

Next steps:

- **Please raise your hand to ask a question or write any comments / questions in the chat.**
- The full draft **SEA WP2 report is available for public review** for 45 days, approximately 18 March 2026 to 08 May 2026.
- The report, including instructions for submitting comments, is available online at→ https://www.csir.co.za/boegoebaai-port.
- After comments are received, the WP2 report will be updated (where appropriate), finalised and published on the website (approximately June 2026), marking the end of the SEA process.

- WP1 has been completed and the final report, including comments and responses, is available online at→ https://www.csir.co.za/boegoebaai-port.

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Thank you very much for your attention and input!

Contact:

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Project website:

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