Strategic Environmental Assessment

for the Boegoebaai Port, Special economic Zone and Namakwa Region

Work Package Methodologies

Dr Greg Schreiner
CSIR

24 April 2025
Microsoft Teams, 09:00 – 12:30

CSIR role in the Strategic Environmental Assessment (SEA)

- CSIR asked to lead this SEA based on 30-year track record
- Designers, facilitators & integrators of the SEA
- CSIR has no financial/ideological interest in the development
- Mandate in the interest of South Africa stakeholders
- This is **NOT** a public relations or rubber stamp exercise!
- Credible, transparent and objective assessment process

SEA vs EIA

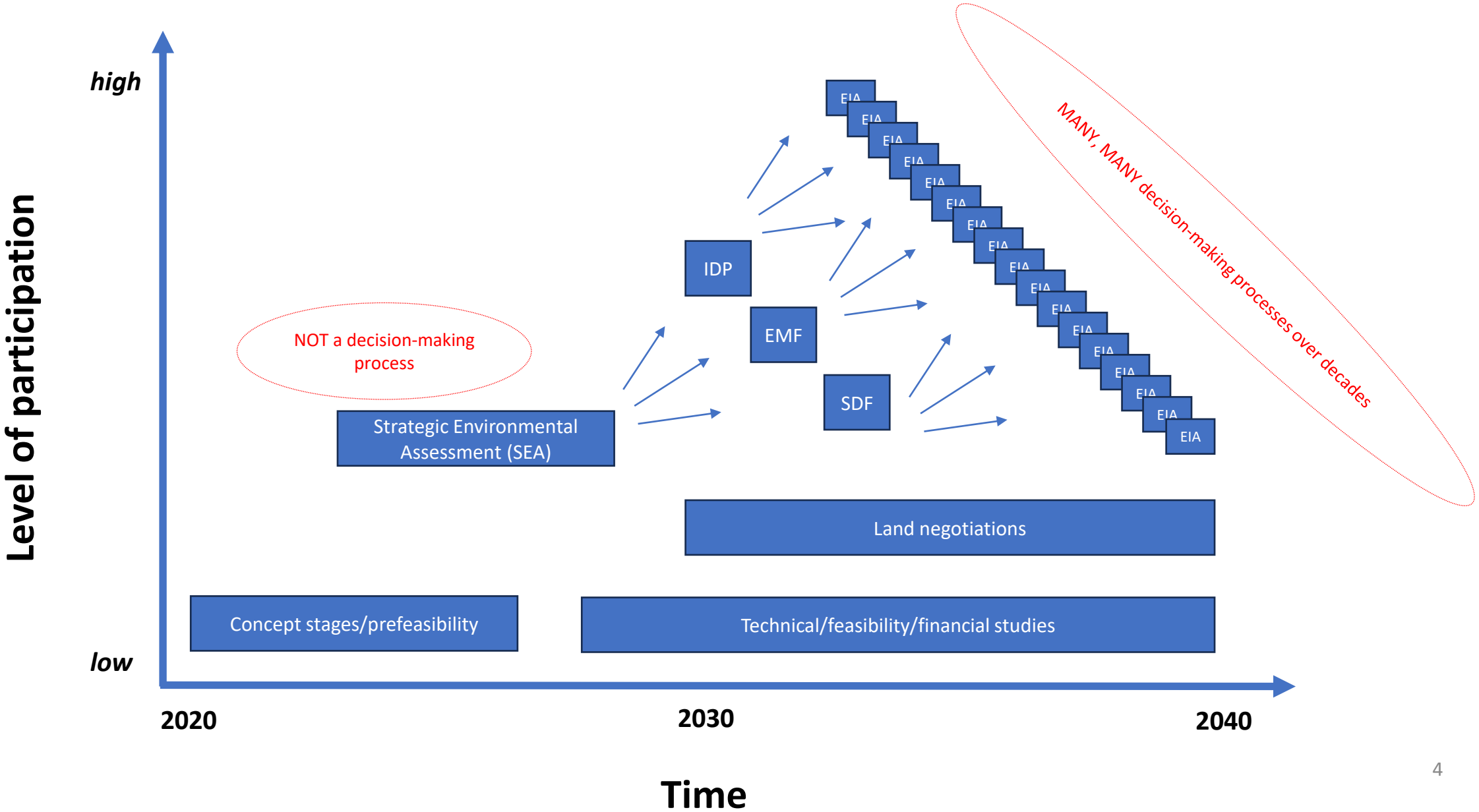
SEA is NOT a decision-making process

SEA: Unregulated knowledge-policy tool to guide sustainability planning at local, regional, national or international scale. Designed by the users.

EIA: Regulated knowledge-policy tool to guide specific (project scale) decision-making mandate, giving 'yes-no' answer, and if yes, under what conditions. Designed by regulators.

	EIA	SEA
Who pays?	Private sector	Usually donors & govt
Spatial scale	Project scale	Local, regional, national, inter
Time horizon	Short-medium (1-5 years)	Medium to long (scenarios)
Legislated	Yes, highly	No
Decision-level	Project (yes/no mandate)	Programme (guidance)
Cumulative impacts	No	Yes
Methods	Rote	Innovative, case specific
Participation	Standard PPP, town hall meetings	Coproduction, integrated governance

Where does this SEA fit in decision-making/planning?



Need for the SEA

1. Political backing for development, consisting of:

    i. A new breakwater port at Boegoebaai, dry and liquid bulk berths, and multi-purpose terminals

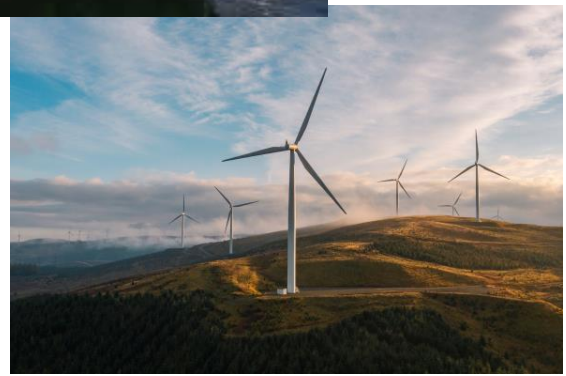
    ii. A mixed-use Special Economic Zone (SEZ) located in the region adjacent to the proposed Boegoebaai port.

    iii. An expansive regional renewable energy (wind and solar PV) generation and transmission infrastructure.

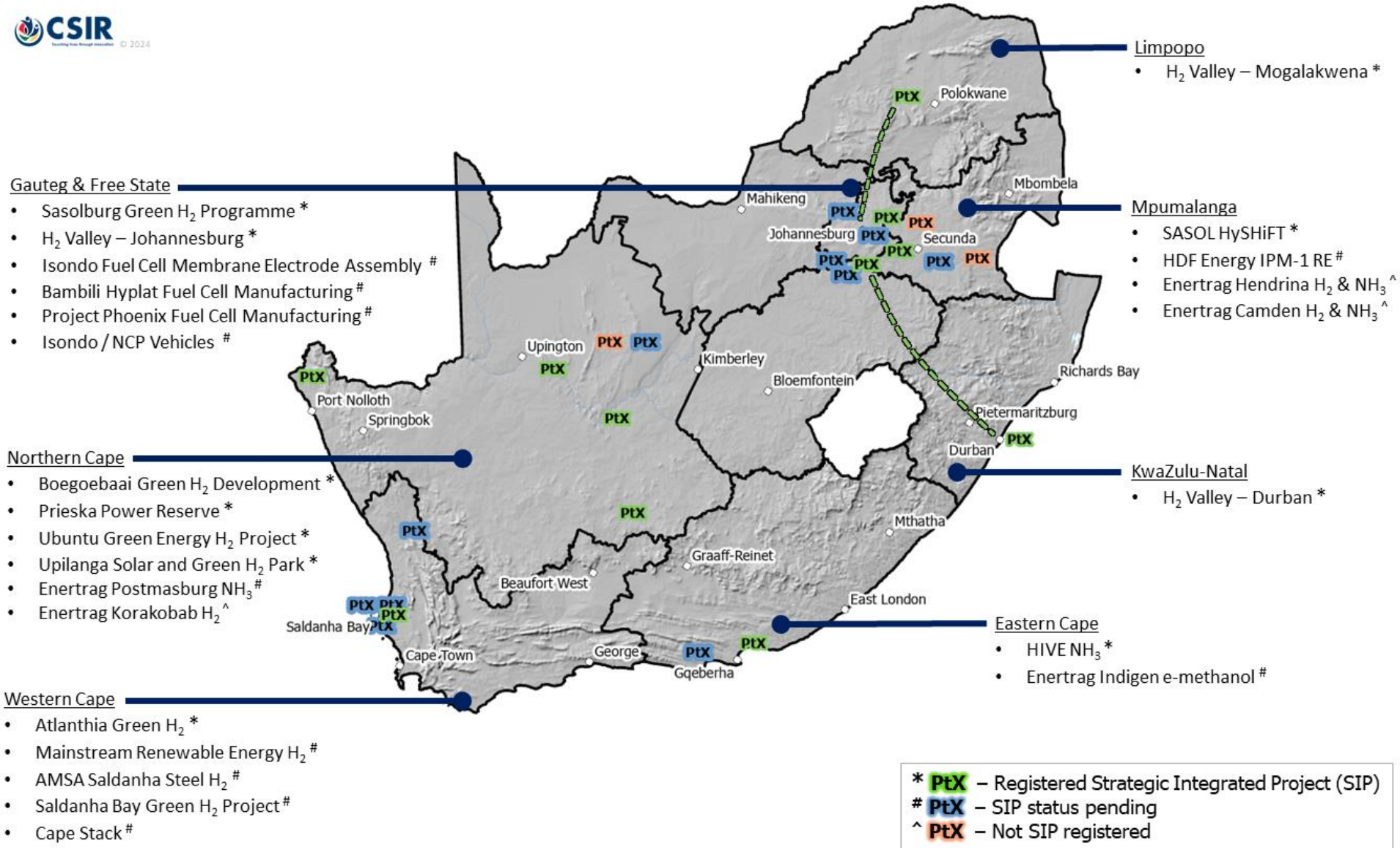
2. Substantial opportunity to decarbonize and diversify the South African energy economy, displace coal, generate new revenue, create jobs and skills

3. These are elegant, 'green', modern technologies but with large infrastructure footprints, occurring in a sparsely populated, but ecologically sensitive region.

4. Need for integrated, strategic planning and decision-making, conscious of cumulative impacts – guide future planning (not doing away with any decision-making process!)



Need for integrated, strategic planning and decision-making



SEA mission and objectives

Mission: To develop an **integrated decision-making framework to guide** the planning of the proposed Boegoebaai port, Special Economic Zone, and wider Namakwa region in a sustainable manner.

Objectives:

1. Assess the social and ecological sensitivity of local and regional receiving environments.

2. Classify spatial regions, based on multiple criteria, as being more, or less, suitable for future development.

3. Identify strategic-level constraints, opportunities, cumulative impacts, and management actions (mitigation/enhancement).

4. Provide an integrated decision-making framework and suite of tools, to guide project developers, practitioners, and policymakers.

NOT a decision-making process

One SEA process, 2 x Work Packages

Work Package 1: A local-scale, spatially focused SEA report identifying sensitivities around the proposed port and SEZ development covering ~33 500 ha ("Boegoebaai Port and SEZ SEA"). Site visits, data verification, higher resolution, higher confidence.

Focus = Sensitivity of the local receiving environment, informing Port & SEZ layouts

Work Package 2: A regional-scale, desktop SEA report covering the main sustainability issues associated with an expansive Northern Cape green hydrogen economy ("Namakwa Region SEA"). Extent defined by Municipal boundaries and covers an area of ~5.8 million ha. Desktop, scenarios-based, more strategic, lower resolution.

Focus = Cumulative opportunities and risks across the broader Namakwa region

Strategic Environmental Assessment

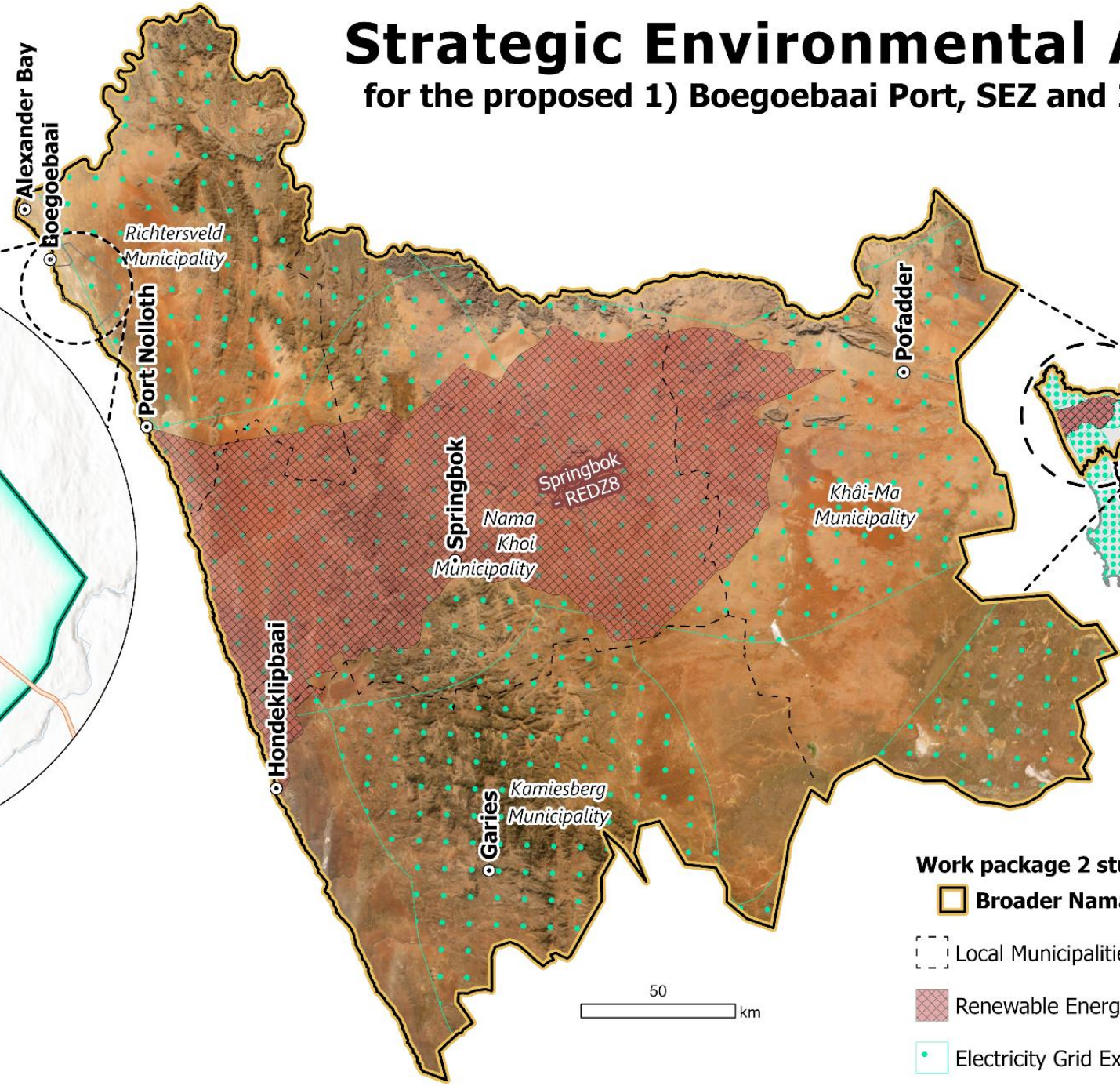
for the proposed 1) Boegoebaai Port, SEZ and 2) Namakwa Region

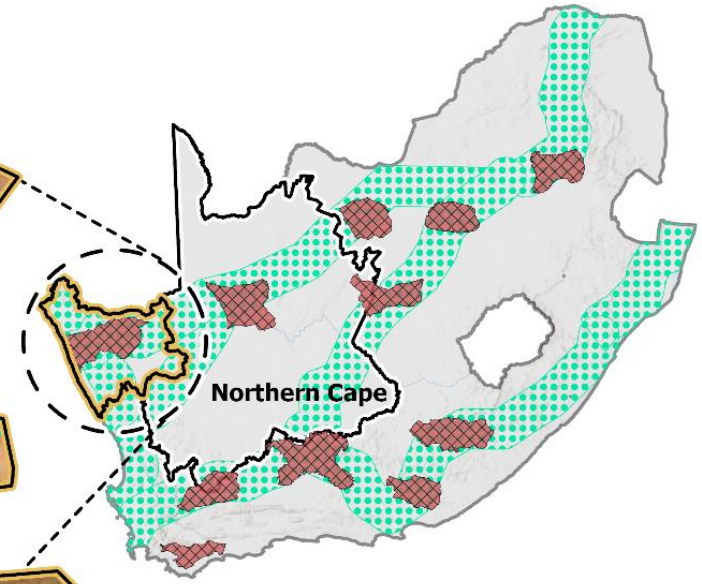
CSIR
Touching lives through innovation

Thematic: CSIR; Basemap: Esri South Africa, Esri, TomTom, Garmin, Foursquare, METI/NASA, USGS, Esri, NASA, NGA, USGS, Esri South Africa, Esri, TomTom, Garmin, FAO, NOAA, USGS, Earthstar Geographics, Esri, USGS; Coordinate system: WGS 1984 Albers; Units: Meter; Date: 2024/09/11

Work package 1 study area

- Port Precinct
- Special Economic Zone
- Road R382





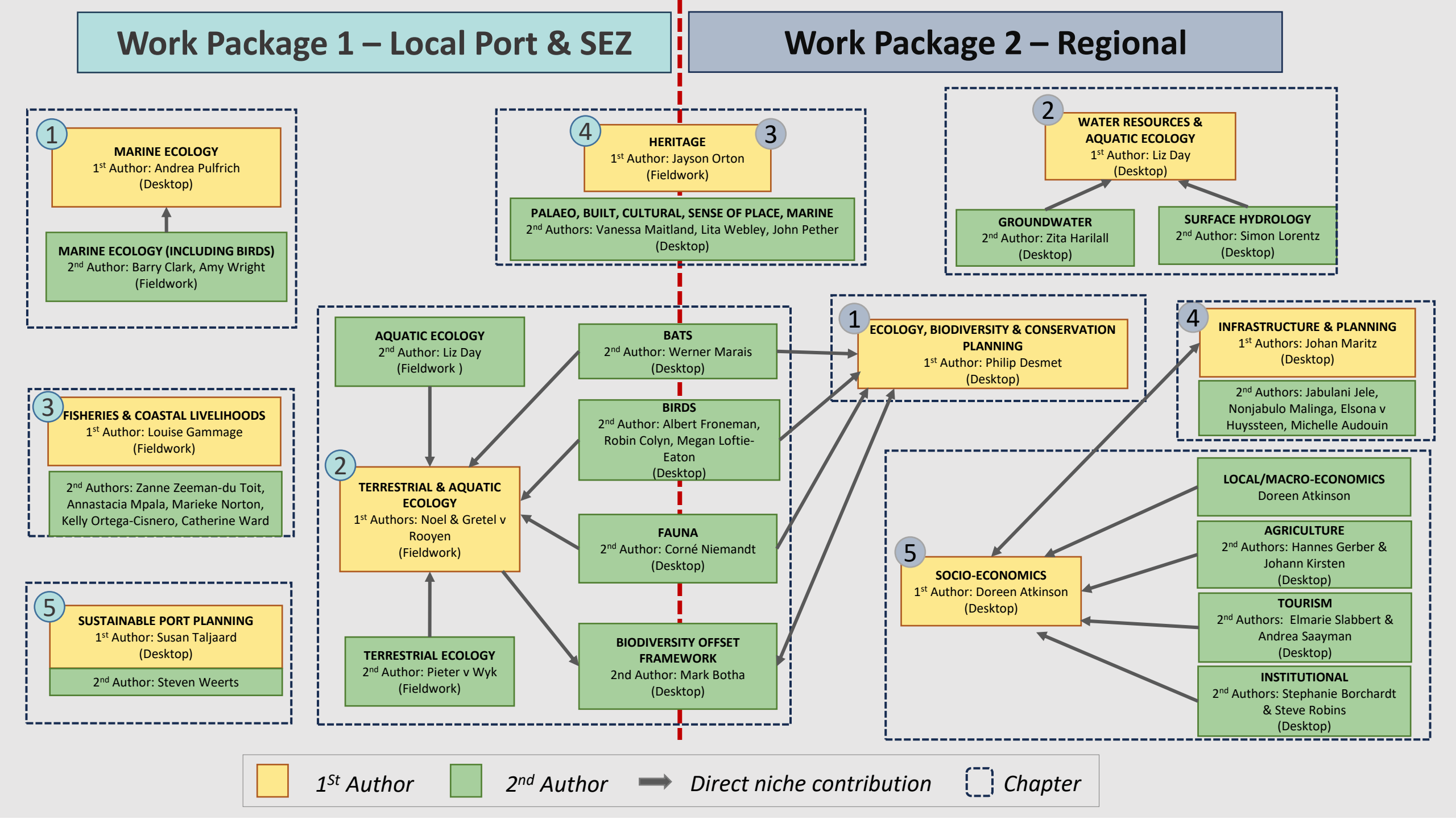
Work package 2 study area

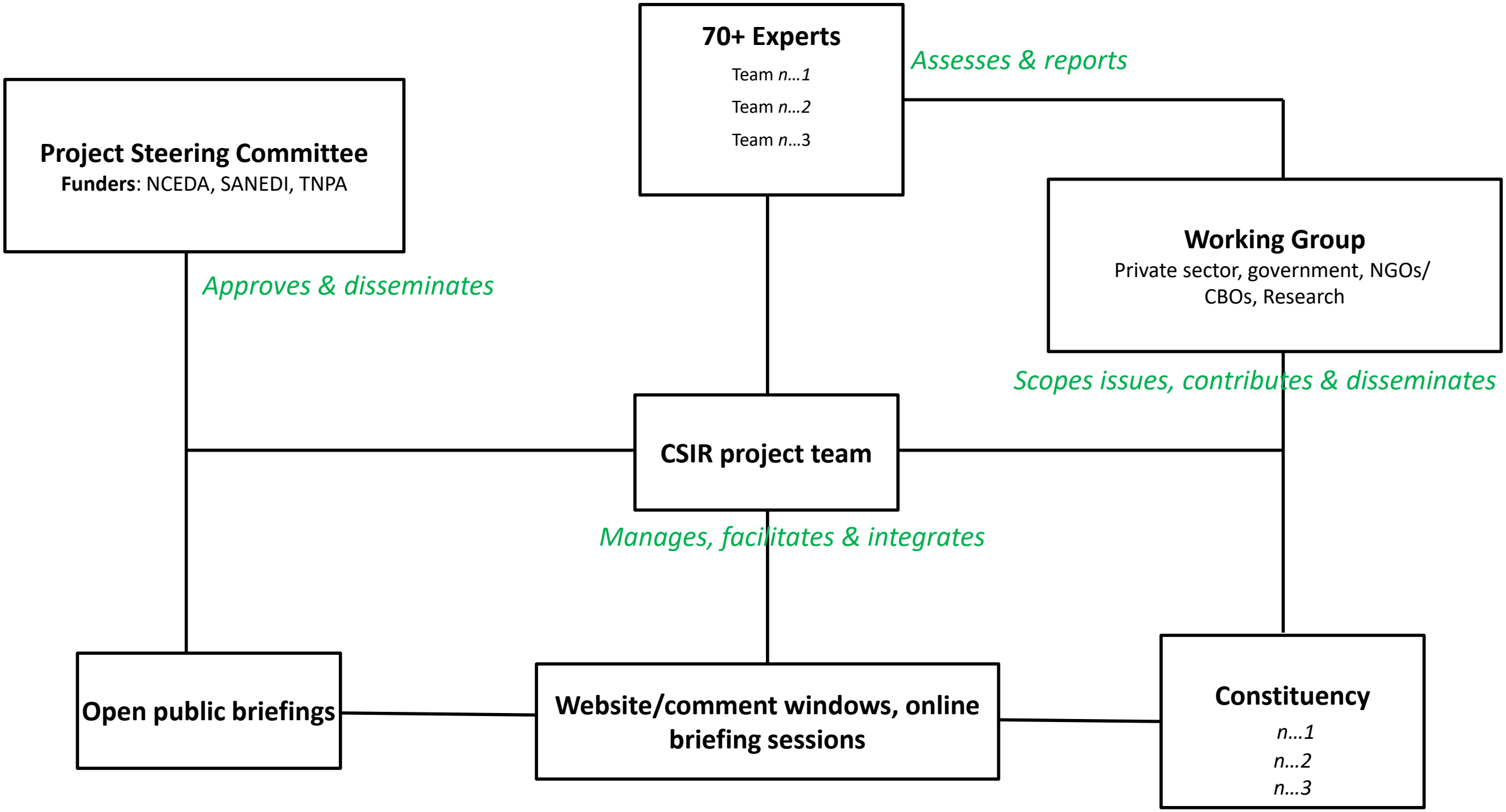
- **Broader Namakwa region**
- Local Municipalities
- Renewable Energy Development Zones (REDZ)
- Electricity Grid Expansion Corridors

Specialist research teams

Chapter	Lead author	Contributing authors	Nominated peer reviewers (tbd)
Marine ecology & biodiversity (including coastal birds)	Andrea Pulfrich	Barry Clark, Amy Wright	Prof George Branch & Dr Nina Steffani
Sustainable (green) port planning study	Susan Taljaard	Steven Weerts	Paul Lochner & Cebile Nzuza
Fisheries & coastal livelihoods			Dr Nina Rivers & Dr Hilkka Ndjaula
Terrestrial ecology (including faun			Prof Norbert Juergens
			Conrad Geldenhuys & Nick Helme
Biodiversity offset framework			Jeffrey Manuel & Susie Brownlie
Heritage			David Halkett & David Morris
Water / aquatic ecology (including			Dr Kevin Pietersen, Gary de Winnaar, Mark Graham & Russell Tate
Socio-economics (including local/macro-economics, agriculture, tourism & institutional capacity)	Doreen Atkinson	Elmarie Slabbert, Andrea Saayman, Hannes Gerber, Johann Kirsten, Steve Robins, Stephanie Borchardt	Prof Lucius Botes, Prof Lochner Marais, Dr Igshaan Samuels
Regional infrastructure & planning	Johan Maritz	Jabulani Jele, Nonjabulo Malinga, Elsona van Huyssteen, Michelle Audouin	Dr Antony Cooper & Prof Mark Oranje

70+ expert appointed to produce SEA content and findings


Work Package 1 – Local Port & SEZ
Work Package 2 – Regional
1
MARINE ECOLOGY
1st Author: Andrea Pulfrich
(Desktop)
MARINE ECOLOGY (INCLUDING BIRDS)
2nd Author: Barry Clark, Amy Wright
(Fieldwork)
4
HERITAGE
1st Author: Jayson Orton
(Fieldwork)
3
PALAEO, BUILT, CULTURAL, SENSE OF PLACE, MARINE
2nd Authors: Vanessa Maitland, Lita Webley, John Pether
(Desktop)
2
WATER RESOURCES & AQUATIC ECOLOGY
1st Author: Liz Day
(Desktop)
GROUNDWATER
2nd Author: Zita Harilall
(Desktop)
SURFACE HYDROLOGY
2nd Author: Simon Lorentz
(Desktop)
3
FISHERIES & COASTAL LIVELIHOODS
1st Author: Louise Gammage
(Fieldwork)
2nd Authors: Zanne Zeeman-du Toit, Annastacia Mpala, Marieke Norton, Kelly Ortega-Cisnero, Catherine Ward
5
SUSTAINABLE PORT PLANNING
1st Author: Susan Taljaard
(Desktop)
2nd Author: Steven Weerts
AQUATIC ECOLOGY
2nd Author: Liz Day
(Fieldwork)
BATS
2nd Author: Werner Marais
(Desktop)
BIRDS
2nd Author: Albert Froneman, Robin Colyn, Megan Loftie-Eaton
(Desktop)
2
TERRESTRIAL & AQUATIC ECOLOGY
1st Authors: Noel & Gretel v Rooyen
(Fieldwork)
FAUNA
2nd Author: Corné Niemandt
(Desktop)
TERRESTRIAL ECOLOGY
2nd Author: Pieter v Wyk
(Fieldwork)
BIODIVERSITY OFFSET FRAMEWORK
2nd Author: Mark Botha
(Desktop)
1
ECOLOGY, BIODIVERSITY & CONSERVATION PLANNING
1st Author: Philip Desmet
(Desktop)
4
INFRASTRUCTURE & PLANNING
1st Authors: Johan Maritz
(Desktop)
2nd Authors: Jabulani Jele, Nonjabulo Malinga, Elsona v Huyssteen, Michelle Audouin
5
SOCIO-ECONOMICS
1st Author: Doreen Atkinson
(Desktop)
LOCAL/MACRO-ECONOMICS
Doreen Atkinson
AGRICULTURE
2nd Authors: Hannes Gerber & Johann Kirsten
(Desktop)
TOURISM
2nd Authors: Elmarie Slabbert & Andrea Saayman
(Desktop)
INSTITUTIONAL
2nd Authors: Stephanie Borchardt & Steve Robins
(Desktop)
1st Author
2nd Author
Direct niche contribution
Chapter


70+ Experts
Team n…1
Team n…2
Team n…3
Assesses & reports
Project Steering Committee
Funders: NCEDA, SANEDI, TNPA
Approves & disseminates
Working Group
Private sector, government, NGOs/ CBOs, Research
Scopes issues, contributes & disseminates
CSIR project team
Manages, facilitates & integrates
Open public briefings
Website/comment windows, online briefing sessions
Constituency
n…1
n…2
n…3

END

Survey of South African EAPs working in GH2 sector (Aug 2023)

Impact	Rank	Mean (SD)	Median

Opportunities:

GHG reduction, new jobs, skills, new revenues & supply chains, energy sector modernization, coal displacement

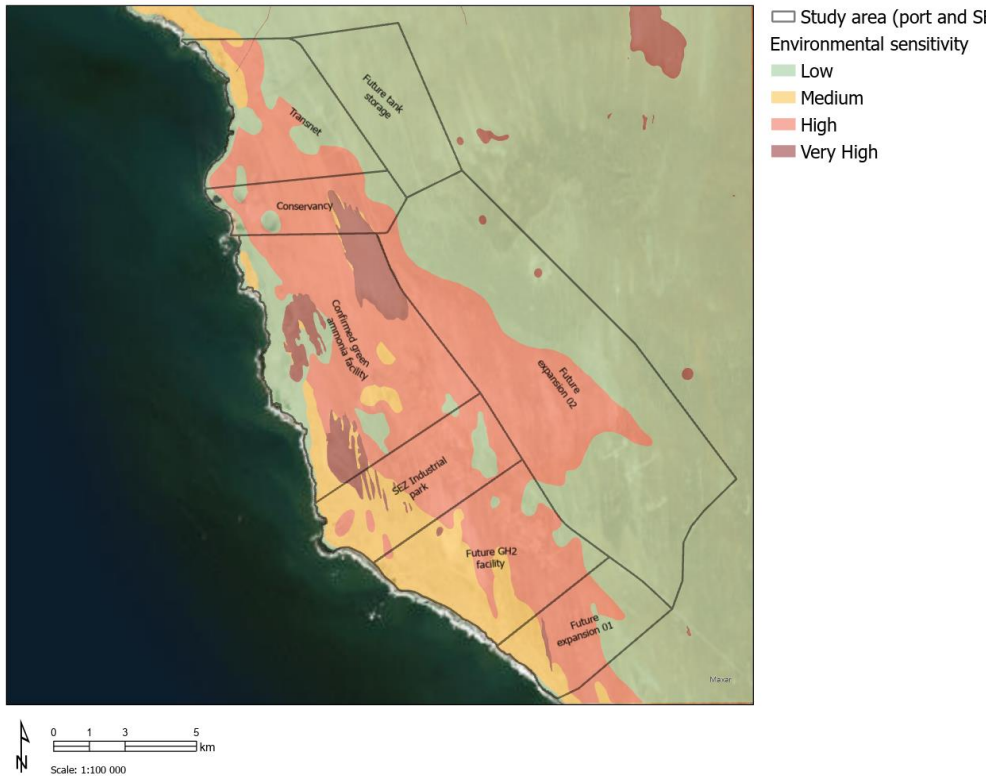
Concerns:

Biodiversity loss on land and at sea, land-use conflicts e.g., tourism, agriculture, conservation, burdens on small towns

Work Package 1: Port & SEZ

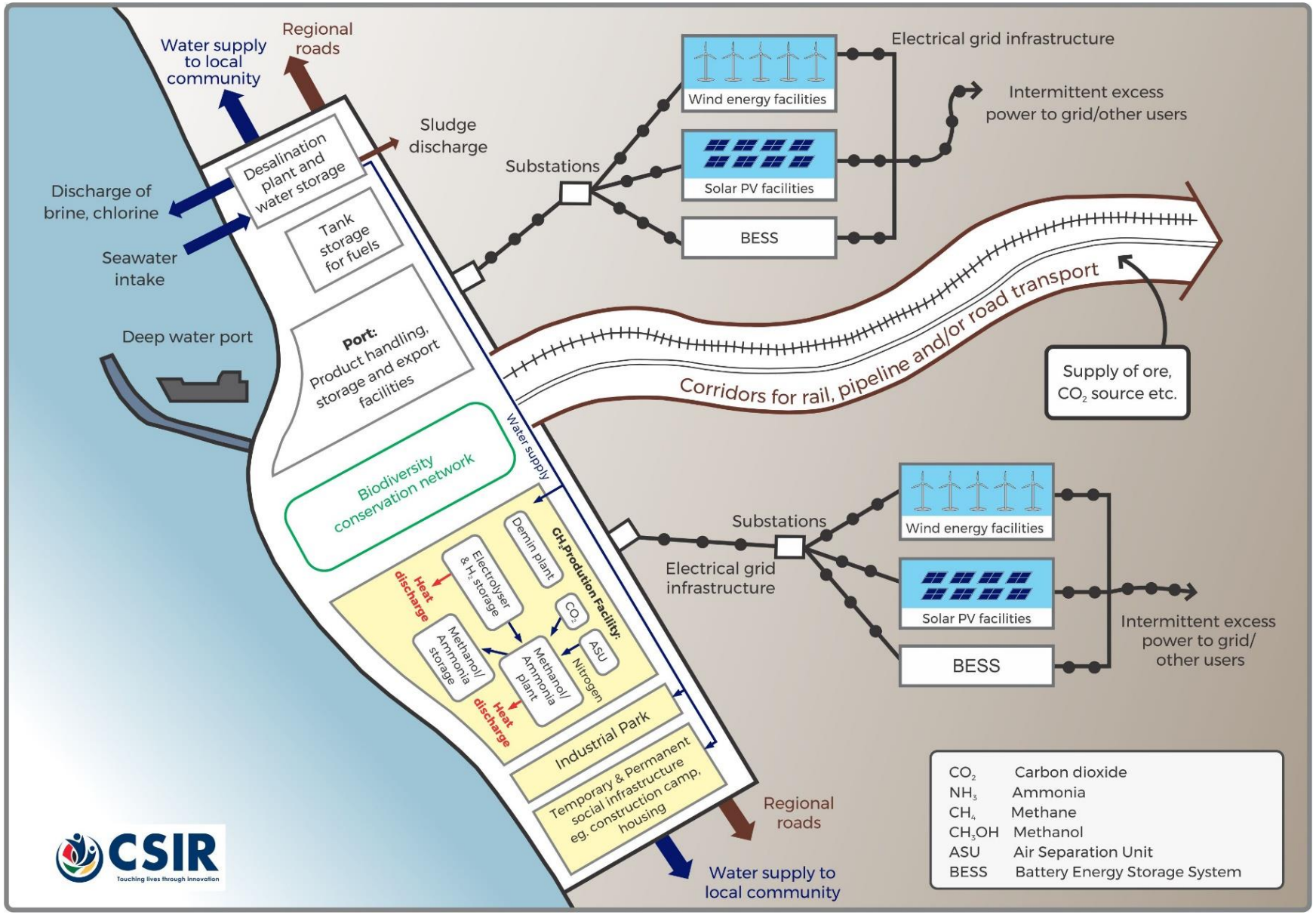
SEA reporting outputs

1. Executive Summary – 2 pages with headline findings/iconic images/ recommendations
2. Description of the receiving environment:
   - Social/ecological dynamics and change trends (baseline)
3. Sensitivity mapping (spatial classification e.g., tiered sensitivity map)
4. Aspects and Impacts register
   - Describe potential impacts associated with identified infrastructure/activity or SEZ subzone, citing main affected environment.
5. Recommended Strategic Management Actions:
   i. To enhance positive impact & reduce negative impacts
   ii. To guide future Port/SEZ planning and layouts
   iii. To guide future site & project specific EIAs within study area



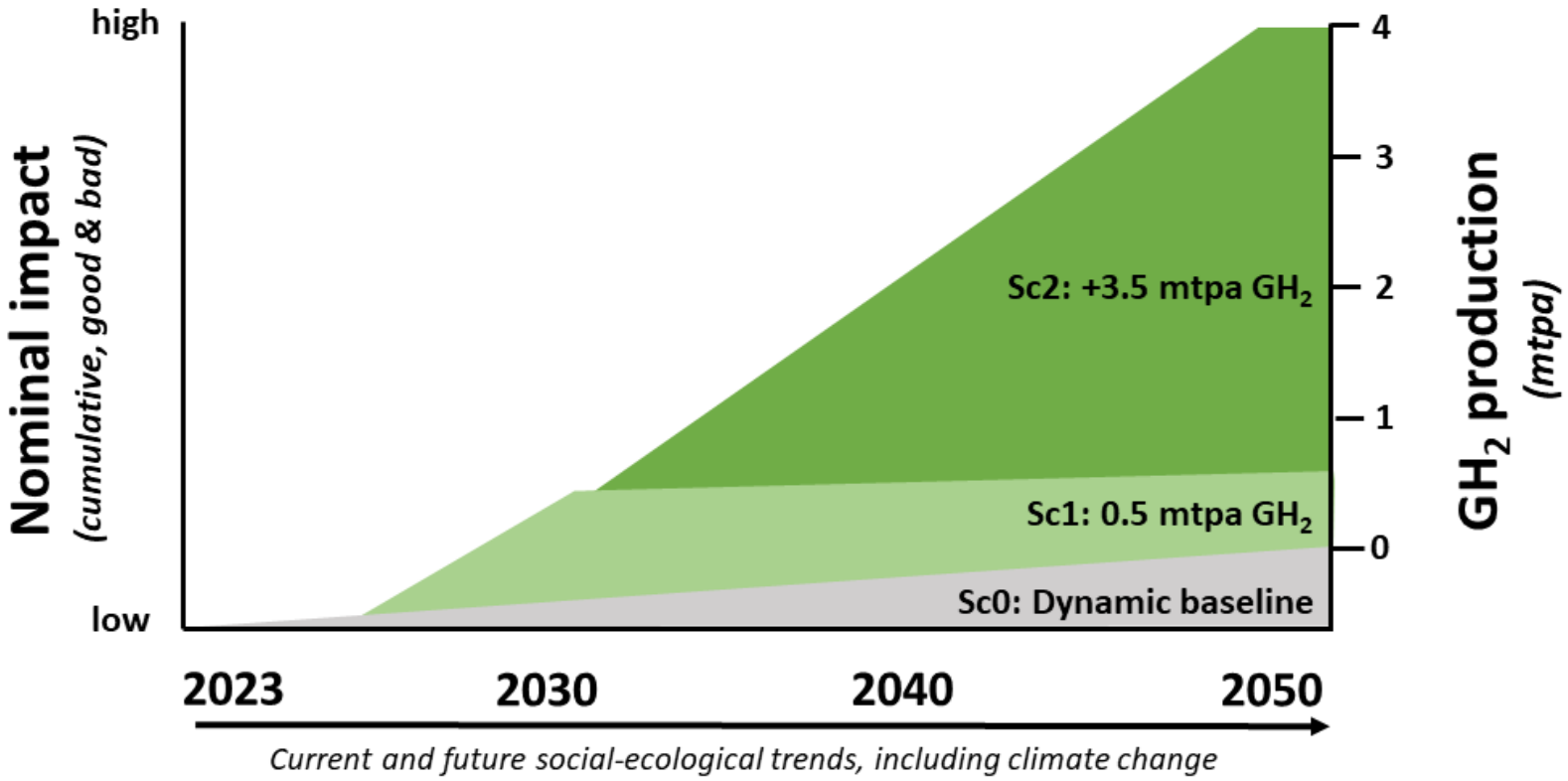
Port infrastructure aspect / SEZ subzone	Potential impact	Receiving environment of concern (spatially explicit)
Desalination plant located within the green ammonia facility subzone	Brine discharge from desalination plant causing increased salinity and loss of species	50m radius from diffuser points located along marine outfall
Expansion of development into Future expansion area 01	Vegetation clearance causing loss of biodiversity and species	Areas mapped Very high sensitivity for intact Richtersveld Coastal Duneveld habitat, as in **Error! Reference source not found.** (example)

Work Package 2: Regional



Work Package 2: Scenarios/risk-based approach

Year	Electrolyser	RE capacity	Key components footprint	GH2 product
2030	5 GW	10 GW	~21 000 ha	0.5 mtpa
2050	40 GW	80 GW	~142 000 ha	4 mpta

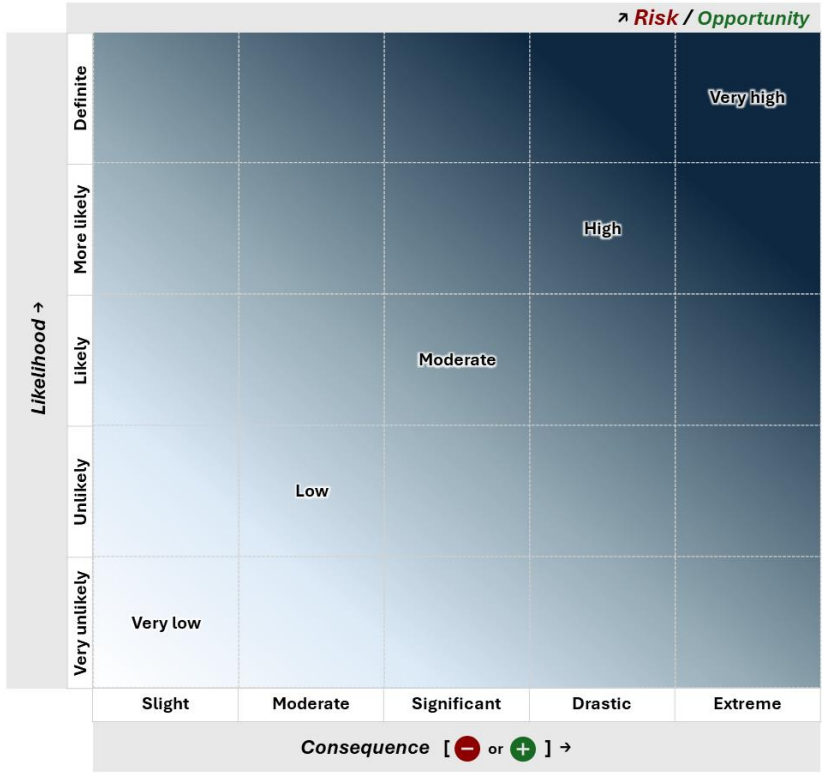


Scenario quantifications

	Aspect	Unit	Sc1: Small GH_2	Sc2: Big GH_2	*Assumptions*
SEZ	Electrolyser capacity	GW	5	40	Northern Cape Green Hydrogen Master Plan ambition
	Electrolyser footprint	ha	75	600	15 ha per 1 GW
	GH2 volume	mtpa	0,5	4,0	10 GW electrolyser = 1 mpta GH2
	GH2 storage footprint	ha	250	2 000	10 ha per 20 000 tpa (500 ha for 1 mpta)
	Ammonia volume	mtpa	2,8	22,7	1 mt H2 for 5,67 mt NH3 (1Mt of ammonia contains 176.5 kg (just 17.65%))
	Ammonia footprint	ha	57	454	1 ha per 50 000 tpa NH3 (e.g. Enertrag Hendrina) (20 ha for 1 mtpa)
	Ammonia storage footprint	ha	28	227	0,5 ha per 50 000 tpa NH3 (e.g. Enertrag Hendrina) (10 ha for 1 mpta)
	Desalination output volume	Ml/day	36	286	25 kg water per 1 kg GH2 (considering electrolysis and cooling). 1Mtpa GH2 output required 25 Mtpa (=25000 MLpa) water / 350 operational.
	Desalination footprint	ha	7	57	5 Ml/day output needs 1 ha
	Desalination discharge	Ml/day	48	387	Ratio of desalinated water to brine discharge water to be 42.5:57.5. (i.e 42.5% of intake sea water is converted to desalinated water and 57.5% is discharged as brine).
	Pipeline intake volume	Ml/day	84	672	Output + discharge
REGION	RE capacity total	GW	10	80	1 Mt/yr of H2 needs 10 GW electrolyser, that is powered by 20 GW
	RE capacity - solar	*GW*	*6*	*48*	60 % solar : 40 % wind
	RE footprint - solar	*ha*	*12 000*	*96 000*	0,5MW/ha
	RE extent - solar		*12 000*	*96 000*	Footprint = extent
	RE facilities - solar	*no of facilities*	*6*	*48*	Clusters of 1 GW facilities
	RE capacity - wind	*GW*	*4*	*32*	60 % solar : 40 % wind
	RE footprint - wind	*ha*	*4 000*	*32 000*	1 MW/ha
	RE extent - wind	*ha*	*40 000*	*320 000*	0,1 MW/ha
	RE facilities - wind	*no of facilities*	*3*	*21*	Clusters of 1,5 GW facilities
	Road length	km	300	600	New roads and upgrades same distances / routes as pipelines
	Road footprint	ha	1 200	2 400	40 m (Rural class 2 road 40-70 m. TRH26 Road Classification and Access Management)
	Rail length	km	550	550	Boegoebaai – Kenhardt. New rail direction south-east to connect to the existing Saldanha-Sishen route.
	Rail footprint	ha	1 600	1 650	30 m for rail and service track
	Pipeline length	km	300	600	Sc1: NAM<BB>SB (300km); Sc2: BB>Prieska (300km)
	Pipeline footprint	ha	600	600	20 m servitude
	Powerline length	km	260	1 387	Assume grid strengthening / shared infrastructure 30 km TX associated with each RE cluster.
	Powerline footprint	ha	1 300	6 933	50 m servitude (TRH 27 South African Manual for Permitting Services in Road Reserves)
	Main infrastructure components footprint	**ha**	**21 082**	**142 240**	

Units: GW = gigawatt; mtpa = million tonne per annum; ha = hectare; Ml/day = million litres per day; km = kilometre

Work Package 2: Risk/opportunity assessment



SEA reporting outputs

1. Executive Summary – 2 pages with headline findings/rec
2. Spatial classification of receiving environment across study area
3. Description of likely baseline receiving environment up to 2050
4. Description of potential impacts
5. Define/calibrate consequence terms
6. Describe best practices mitigation/enhancement
7. Assess the risk or opportunity of impacts
8. Recommended management actions

Positive impact	Scenario	Spatial receiving environment / receptor	Without management			With management		
			Consequence (+)	Likelihood	Opportunity	Consequence (+)	Likelihood	Opportunity
Job and skills creation	S0: BASELINE	Port and SEZ	SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S1: SMALL GH2		DRASTIC	LIKELY	HIGH	DRASTIC	NOT LIKELY	MODERATE
	S2: BIG GH2		EXTREME	VERY LIKELY	VERY HIGH	EXTREME	NOT LIKELY	MODERATE
	S0: BASELINE	XX Municipality	SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S1: SMALL GH2		SUBSTANTIAL	LIKELY	MODERATE	SUBSTANTIAL	NOT LIKELY	LOW
	S2: BIG GH2		DRASTIC	VERY LIKELY	HIGH	DRASTIC	NOT LIKELY	MODERATE
	S0: BASELINE	XX municipality + XX municipality	SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S1: SMALL GH2		SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S2: BIG GH2		MODERATE	VERY LIKELY	LOW	MODERATE	LIKELY	LOW
	S0: BASELINE	Northern Cape	SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S1: SMALL GH2		SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW
	S2: BIG GH2		SLIGHT	LIKELY	VERY LOW	SLIGHT	LIKELY	VERY LOW

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Cumulative impacts	No	Yes
Methods	Rote	Innovative, case specific
Participation	Standard PPP, town hall meetings	Coproduction, integrated governance

SEA cont…

- Can be any number of different approaches, methods and processes, it all depends on the specific issues in the specific context

- SEA needs to be:

    i. Sustainability-focused

    ii. Interdisciplinary

    iii. Credible

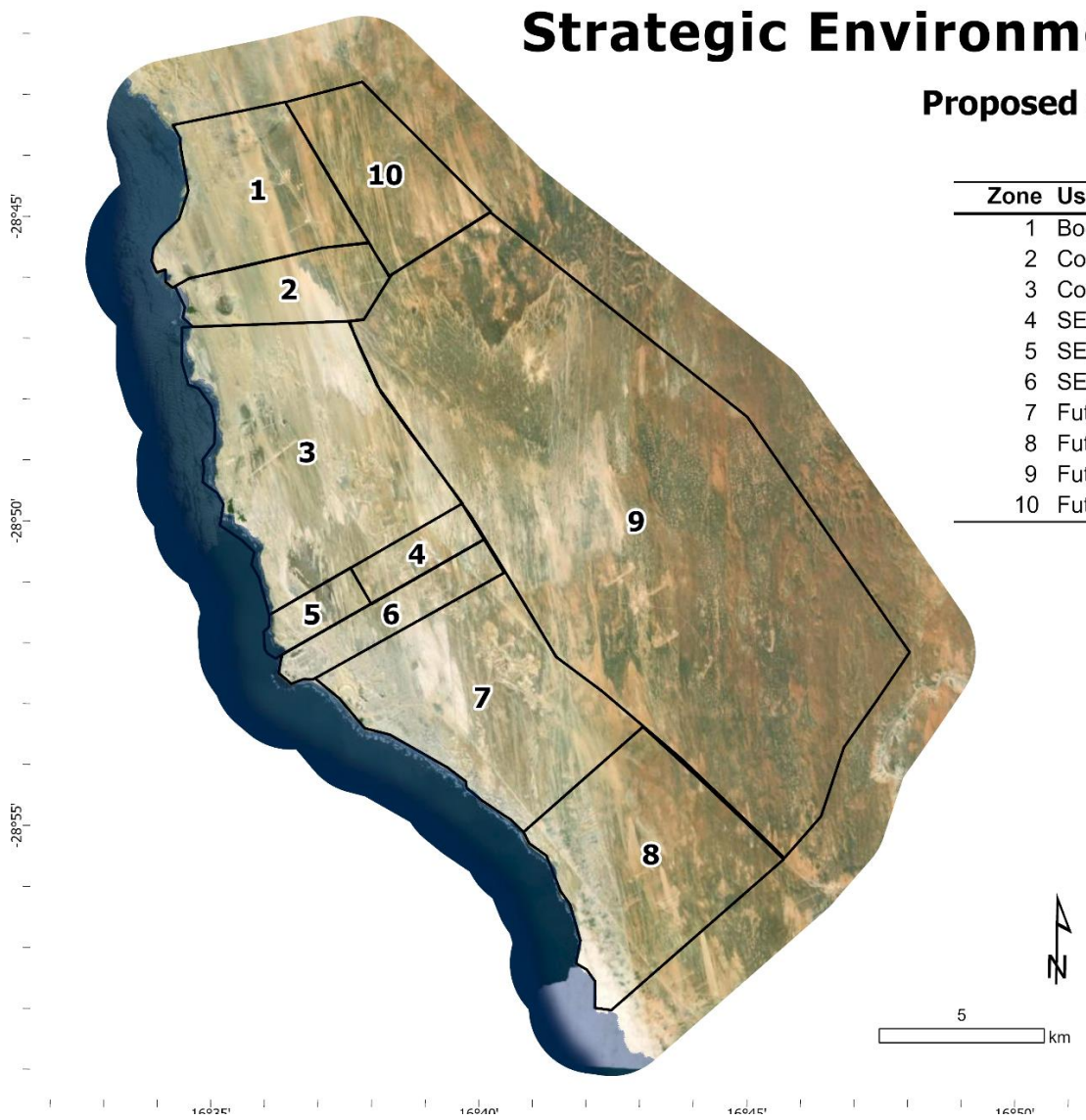
    iv. Useful for decision-making

    v. Coproduced

SEA is NOT…

- A mega Environmental Impact Assessment (EIA).
- A public relations exercise.
- A rubber stamp.

Project aspects and SEA Work Packages



Zone	Use	Approximate area
1	Boegoebaai port	2 187 ha
2	Conservancy area	1 170 ha
3	Confirmed green ammonia faci	4 508 ha
4	SEZ Phase 1	499 ha
5	SEZ Phase 2	411 ha
6	SEZ Phase 3	833 ha
7	Future green hydrogen facility	3 713 ha
8	Future expansion 01	3 408 ha
9	Future expansion 02	15 067 ha
10	Future tank farm	1 704 ha
		33 500 ha

Thematic: CSIR
Basemap: Earthstar Geographics
Coordinate system: WGS 1984 UTM Zone 33S
Units: MeterScale: 1:120 000
Date: 2024/09/05