environmental affairs
Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

energy
Department:
Energy
REPUBLIC OF SOUTH AFRICA

public enterprises
Department:
Public Enterprises
REPUBLIC OF SOUTH AFRICA

iGas

Eskom

TRANSNET

Development of a Strategic Environmental Assessment for the Identification of Energy Corridors, as well as Assessment and Management of a Gas Pipeline Network for South Africa

ERG and PSC Meeting

31 July 2018

SANBI
Biodiversity for Life
South African National Biodiversity Institute

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Meeting Agenda

TIME	ACTIVITY/PRESENTATION	PRESENTER
09:45 – 10:00	Tea and Registration	All
10:00 – 10:10	Welcome and Introductions	DEA
10:10 – 10:20	Background on the Phased Gas Pipeline Network and EGI Corridors	CSIR
10:20 – 11:00	Pinch Point Analysis	SANBI
11:00 – 11:30	Biodiversity Assessment (Terrestrial and Aquatic Ecology)	CSIR
11:30 - 11:45	Break	All
11:45 – 12:15	Biodiversity Assessment (Terrestrial and Aquatic Ecology)	CSIR
12:15 – 12:45	Discussion	All
12:45 – 13:15	Seismicity Assessment and Visual Impact Assessment	CSIR
13:15 – 13:30	Discussion, Way Forward and Closing	All
13.30 – 14.00	Lunch	All

BACKGROUND TO THE PGPN AND EGI EXPANSION SEA

CONTEXT – ENERGY INFRASTRUCTURE

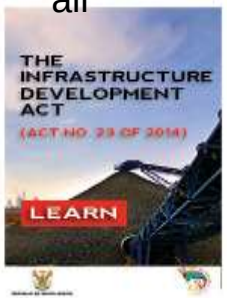
National Development Plan

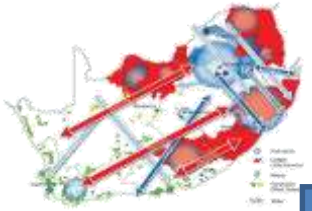
18 SIPs - unlock strategic development potential from project-level, municipal infrastructure to national scale projects - PICC

SIP 8 – Green Energy in support of the South African economy

SIP 9 – Electricity Generation

SIP 10 – Electricity Transmission and Distribution for all





Operation Phakisa

- Government initiative (2014) to fast track the implementation of solutions on critical development issues
- 3 Labs - Ocean Economy Lab
- 4 Critical Areas ----> Offshore Oil and Gas
- 11 Initiatives ----> A1 – Development of a Phased Gas Pipeline Network

OFFSHORE OIL AND GAS EXPLORATION LAB

August 2014

South Africa should …

… create an environment that ***promotes exploration*** …

… in order to ***drill 30 exploration wells*** in the next 10 years

… while simultaneously ***maximising the benefits for South Africa***

From an Environmental legislative perspective DEA is responding to planning requirements through Strategic Environmental Assessments (SEAs)

Phakisa A1 Phased Gas Pipeline Network

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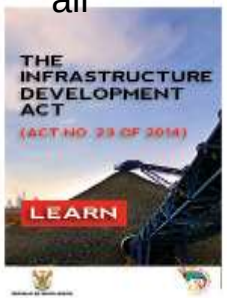

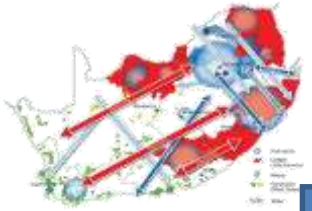

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From an Environmental legislative perspective DEA is responding to planning requirements through Strategic Environmental Assessments (SEAs)

Need for the SEA

- **Other Drivers**
  - PGPN driven by imported LNG (via the LNG to Power Program)
  - Shale Gas developments in the Karoo Region
  - Imported Gas from Mozambique

SEA for Phased Gas Pipeline Network

- The SEA is therefore needed in order to:
  - support objectives of Operation Phakisa Offshore Oil and Gas Lab and the NDP.
  - accelerate the gas to power programme.
  - to support the identification of gas as a contributor to the energy mix (IRP).
  - be proactive rather than reactive with regards to planning for infrastructure.
  - ensure that when required, environmental authorisations are not a cause for delay.

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SEA Project Team

Project Coordinator: DEA

Dee Fischer Project Coordinator	**Simon Moganetsi** Project Manager

Project Partners

DoE **iGas**	**DPE** **Transnet, Eskom**

Environmental Consultants: CSIR

Paul Lochner Project Advisor	**Annick Walsdorff** Project Leader	**Rohaida Abed** Project Manager	**Samukele Ngema** **Babalwa Mqokeli** Project Intern

Joint Service Provider: South African National Biodiversity Institute

Jeffrey Manuel Director Biodiversity Information and Planning	**Fahiema Daniels** Deputy Director: Biodiversity Planning	**Tsamaelo Malebu** GIS specialist

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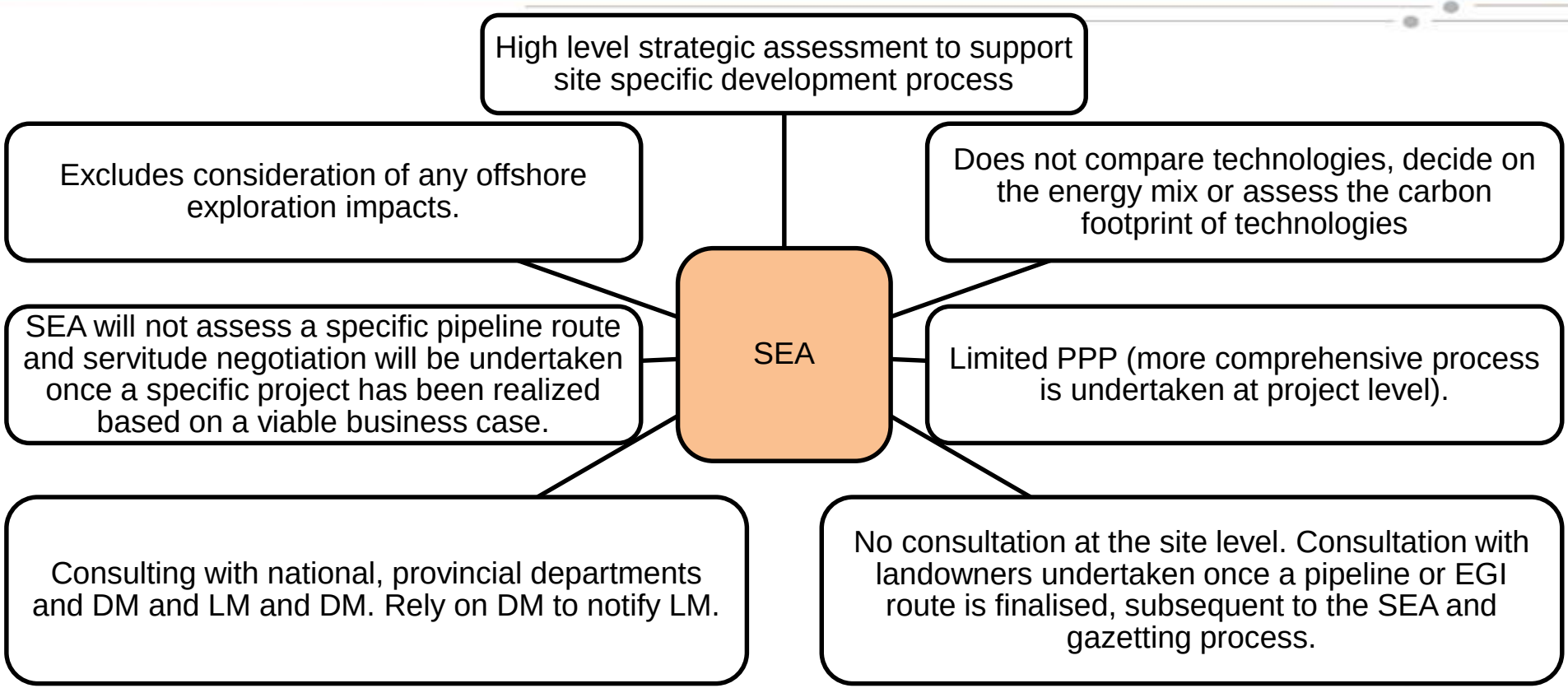
Considerations for the SEA Process



Vision of SEA: Development of a Strategic gas pipeline network and expansion of the gazetted EGI in an environmentally responsible and efficient manner that responds effectively to the country's economic and social development needs.

Effective

- Identify strategic energy corridors at a national scale based on future energy supply and demand requirements, environmental sensitivities as well as social and economic development priorities at a national, regional and localised level.

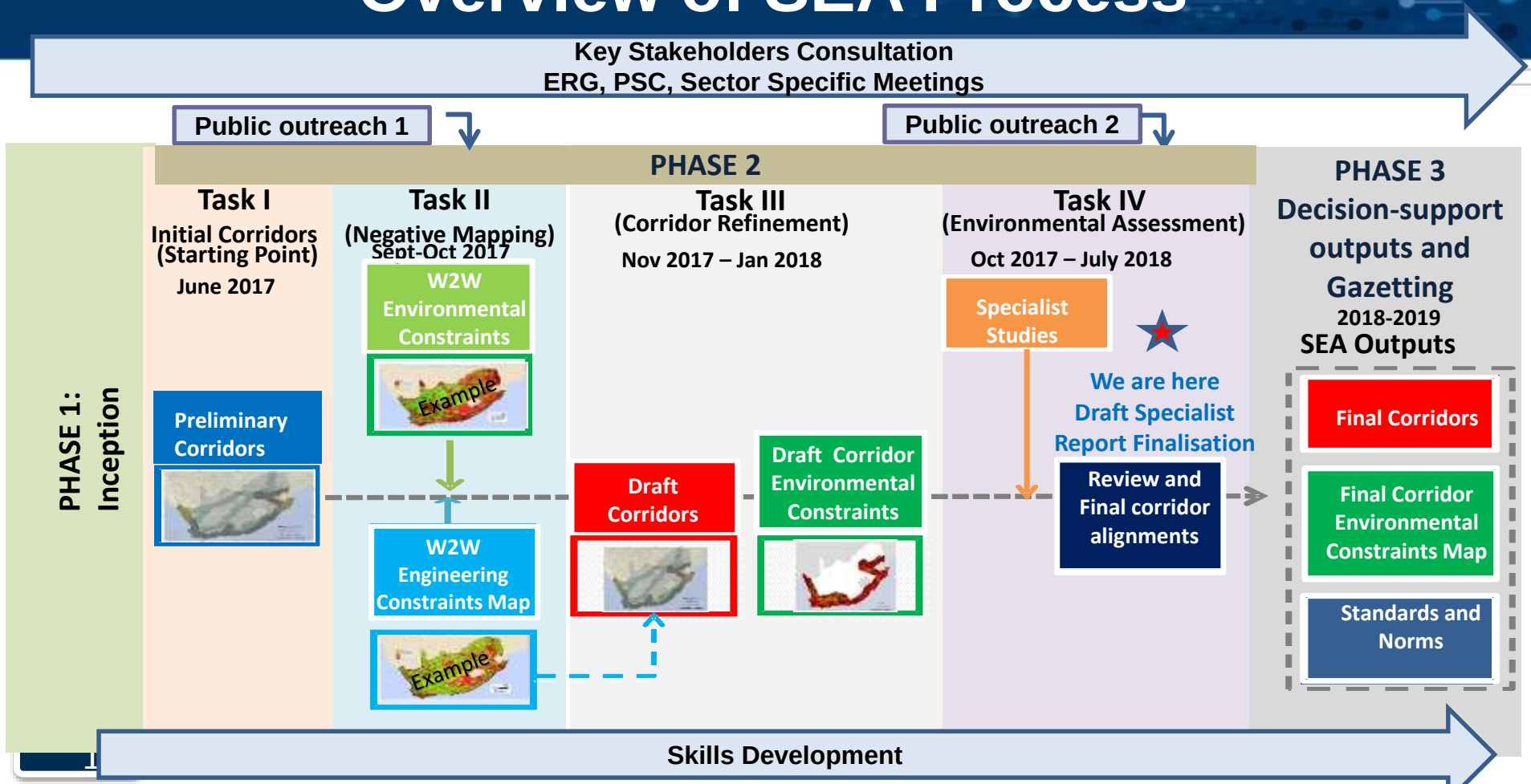
Efficient

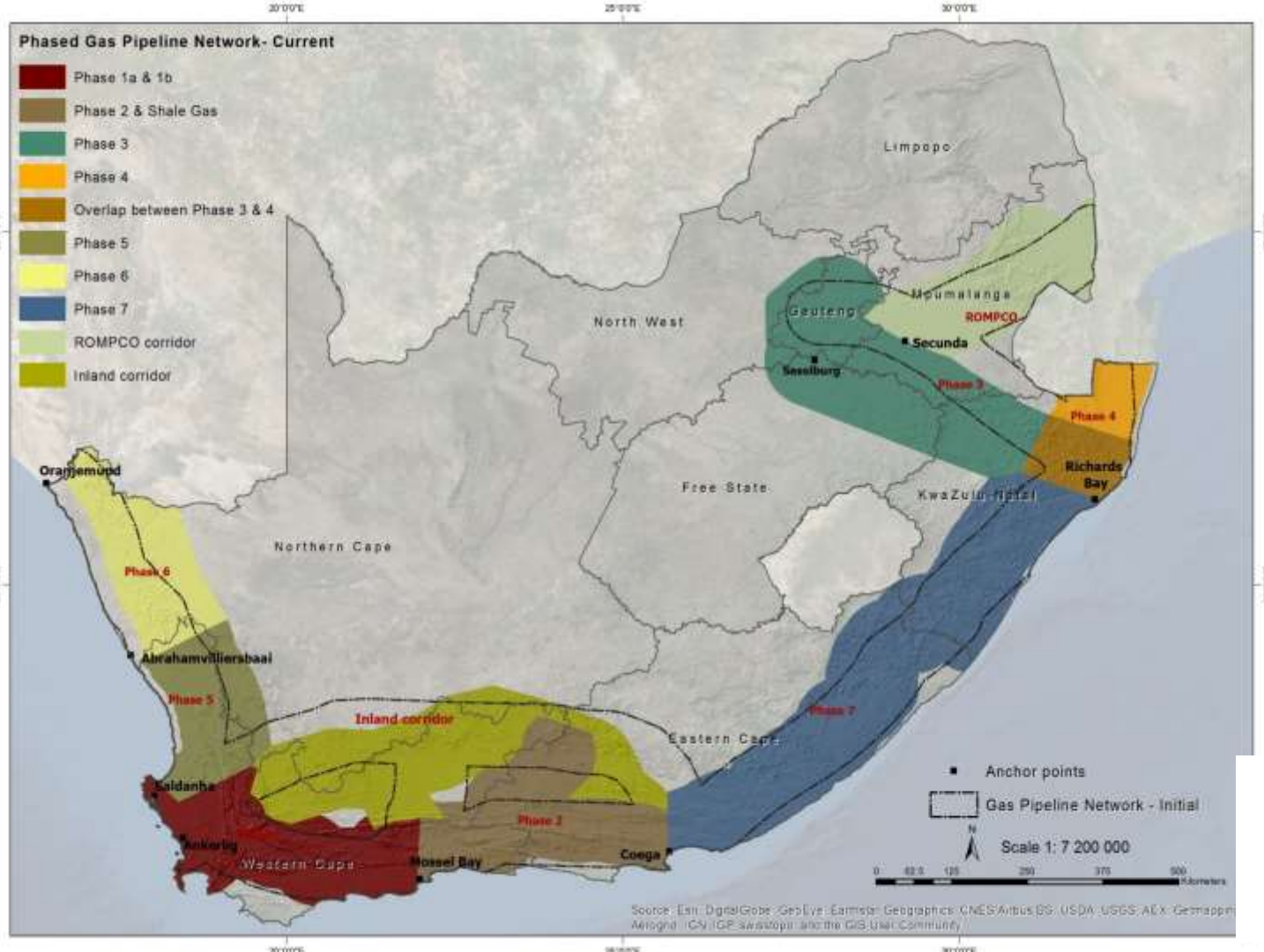
- Streamline the authorisation process by pre-assessing environmental sensitivities to avoid fatal flaws and focus on the site specific level of assessment required. **Exemption from EA Process within the pre-assessed corridors.**
- Enable developers greater flexibility in terms of route options within the assessed corridors (i.e. avoid land negotiation concerns).
- Promote collaborative governance between authorising authorities.

Responsible

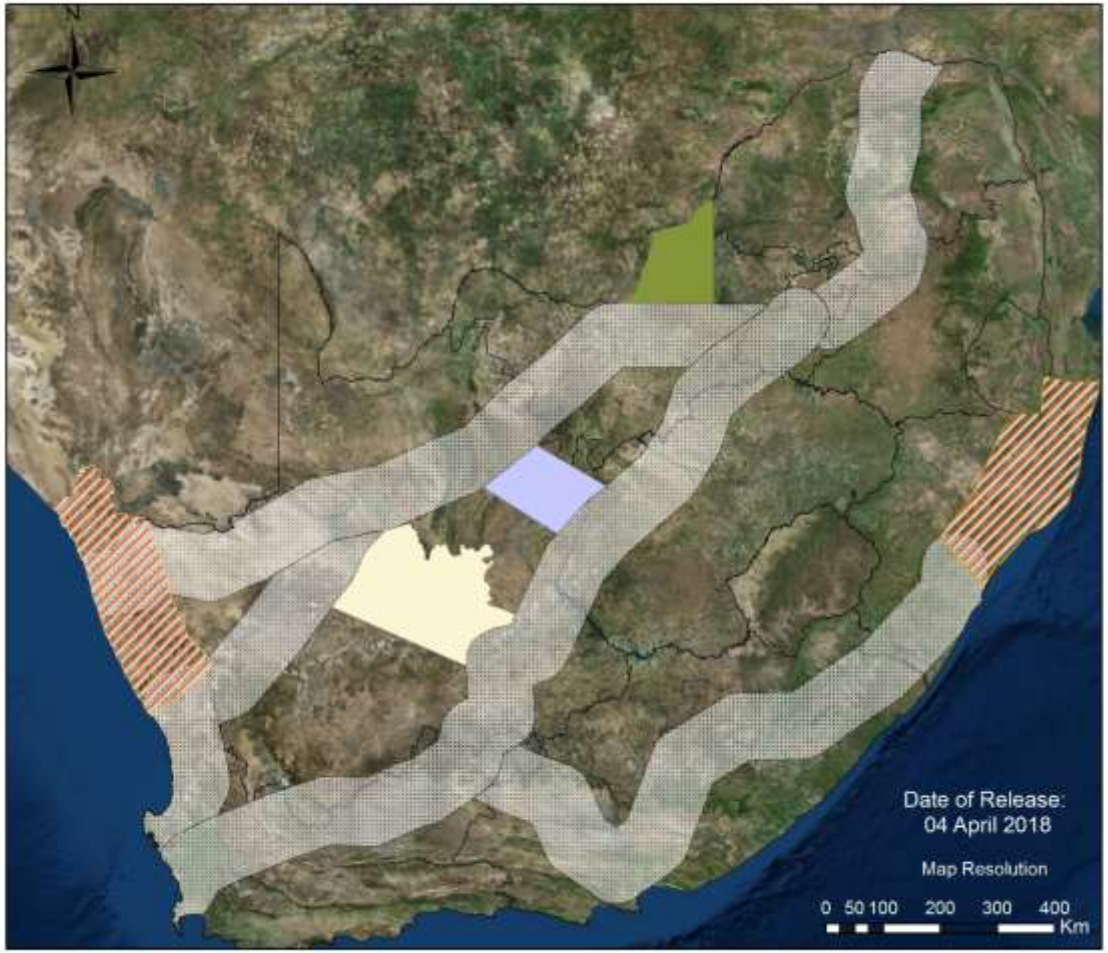
- Develop a generic EMPr, site specific development protocol, and norm or standards.

Overview of SEA Process




Phased Gas Pipeline Network- Current
Phase 1a & 1b
Phase 2 & Shale Gas
Phase 3
Phase 4
Overlap between Phase 3 & 4
Phase 5
Phase 6
Phase 7
ROMPCO corridor
Inland corridor
Limpopo
North West
Gauteng
Mpumalanga
ROMPCO
Secunda
Sasolburg
Phase 3
Phase 4
Richards Bay
Free State
KwaZulu-Natal
Northern Cape
Oranjemund
Phase 6
Phase 5
Inland corridor
Phase 7
Eastern Cape
Saldanha
Ankerlig
Western Cape
Mossel Bay
Phase 2
Coega
Anchor points
Gas Pipeline Network - Initial
Scale 1: 7 200 000

National Strategic Environmental Assessment for a Gas Pipeline Network and Electricity Grid Infrastructure in South Africa



Legend

- Additional EGI Corridor_C
- Additional EGI Corridor_D
- Additional EGI Corridor_E

Electricity Grid Infrastructure (EGI)

- Additional EGI Corridors
- Gazetted EGI Corridors

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energy
environmental affairs
public enterprises
SANParks
Eskom

Specialist Studies

Biodiversity and Ecological Impacts (Terrestrial and Aquatic Ecosystems, Flora and Fauna)	Socio-Economic and Planning Assessment	Seismicity
Integrating Author	**Integrating Author**	**Integrating Author**
Contributing Authors (Terrestrial): • Fynbos Biome • Savannah and Grassland Biomes • Indian Ocean Coastal Belt Biome • Albany Thicket Biome • Succulent and Nama Karoo Biomes **Contributing Authors (Aquatic):** • Estuaries • Rivers and Wetlands	**Contributing Authors:** *Gas Pipeline Network* • Benefits and Opportunities of Gas • Regional and Settlement Planning • Governance and Disaster Management *EGI Expansion* • Socio-Economic Impacts	**Contributing Author:** • Earthquakes and Faults
Bats	**Avifauna**	**Visual (EGI only)**

Note: A Soils and Agricultural specialist is also appointed to provide inputs to the sensitivity mapping, EMPr and Protocols for the agricultural land component.

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Pinch Point Analysis of Environmental and Engineering constraints for the design of the Phased Gas Pipeline and EGI corridors

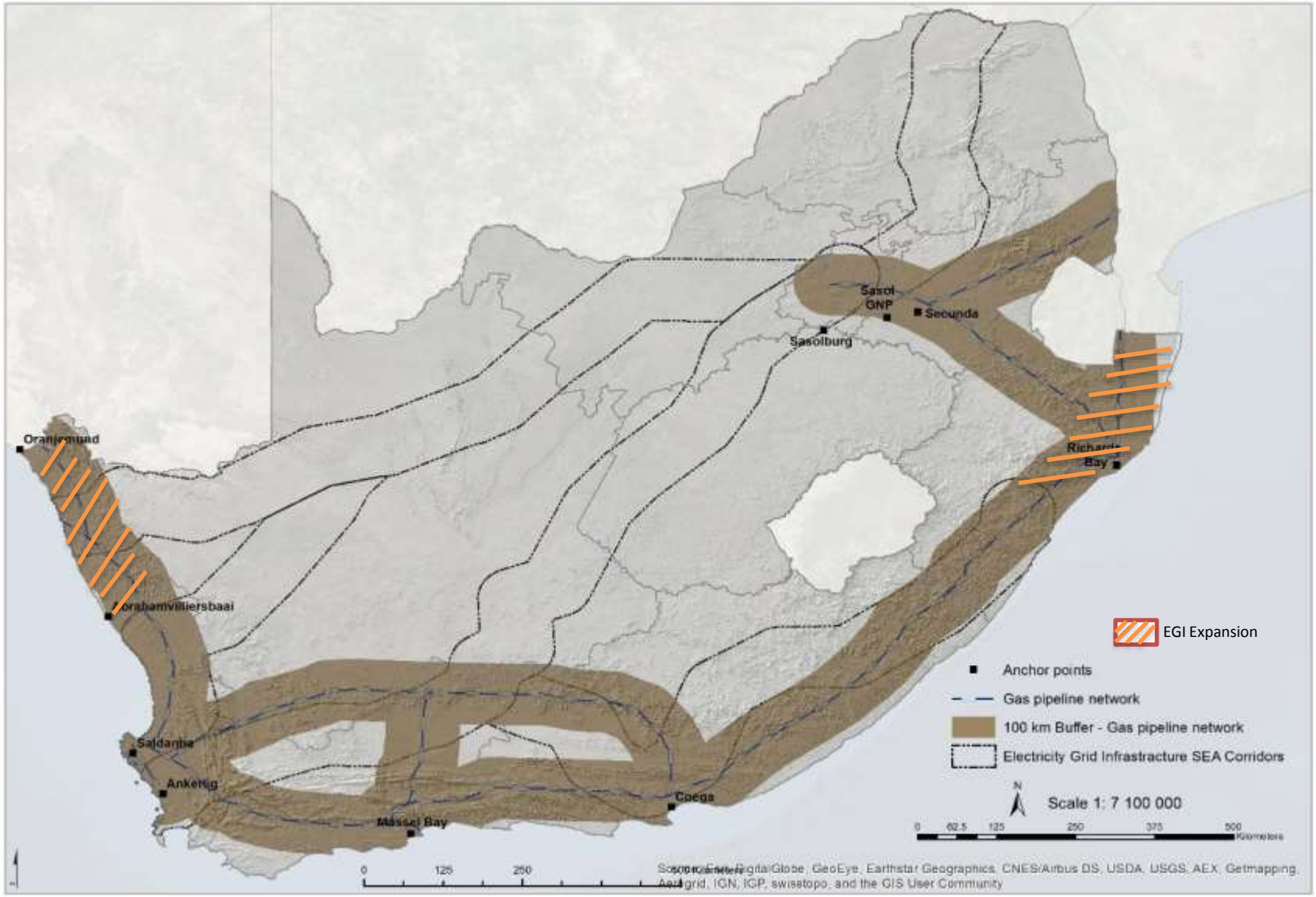
PSC and ERG Meeting

Ulwazi Auditorium, Knowledge Commons, CSIR
31 July 2018

Outline

- Initial corridors and rationale
- Sensitivity mapping
  - Environmental & Engineering constraints
- Process undertaken – Pinch point analysis
- Final outputs – Corridors
- Way forward

DRAFT Initial Corridors PGP & EGI



Rationale for the Pinch Point Analysis

- Initial corridors are based on **Operation Phakisa** outputs,
- **Environmental and engineering** constraints not considered,
- **Energy demand** not considered in designed,
- Corridors need to be **realigned** to consider existing Energy corridors/ focus areas.

Natural

Environmental Sensitivities

Protected Areas

- National Parks
- Provincial NRs
- Contract NRs
- Forest PAs
- Special NRs
- MCAs
- PEs
- PA expansion
- PA buffers

Terrestrial

- Natural Forest
- Thicket
- Threatened spp habitat
- CBAs
- Threatened Ecosystems

Degradation

- Eroded areas
- Soil erodibility

Freshwater

- All wetlands
- Rivers
- Dams
- Estuaries

Avifauna

- IBAs
- Colonies and roosts for large birds
- Bat roosts
- Bat ecoregions

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Environmental Sensitivities

Production Landscape

- Commercial Forestry
- Forestry expansion
- Deep rooted agriculture
- Irrigation pivots > 500m
- Other agriculture fields

Infrastructure and Industrial

- SKA and SALT
- Industrial areas
- Roads
- Railways
- Pipelines

Cultural Landscape

- Heritage Sites
- Landscape integrity

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Engineering Constraints

Industry

- SKA
- Forestry
- Urban settlement
- WULAs
- Mining

Natural Environment

- Rivers & wetlands
- Agriculture fields
- Thicket
- Dams & estuaries
- Slope

Specific EGI data

- High fire
- High wind
- High snow
- Pollution
- Flooding
- Eroded areas

Specific for Gas

- Geotechnical
- Pollution
- Fault lines and seismic data
- Water stressed catchments

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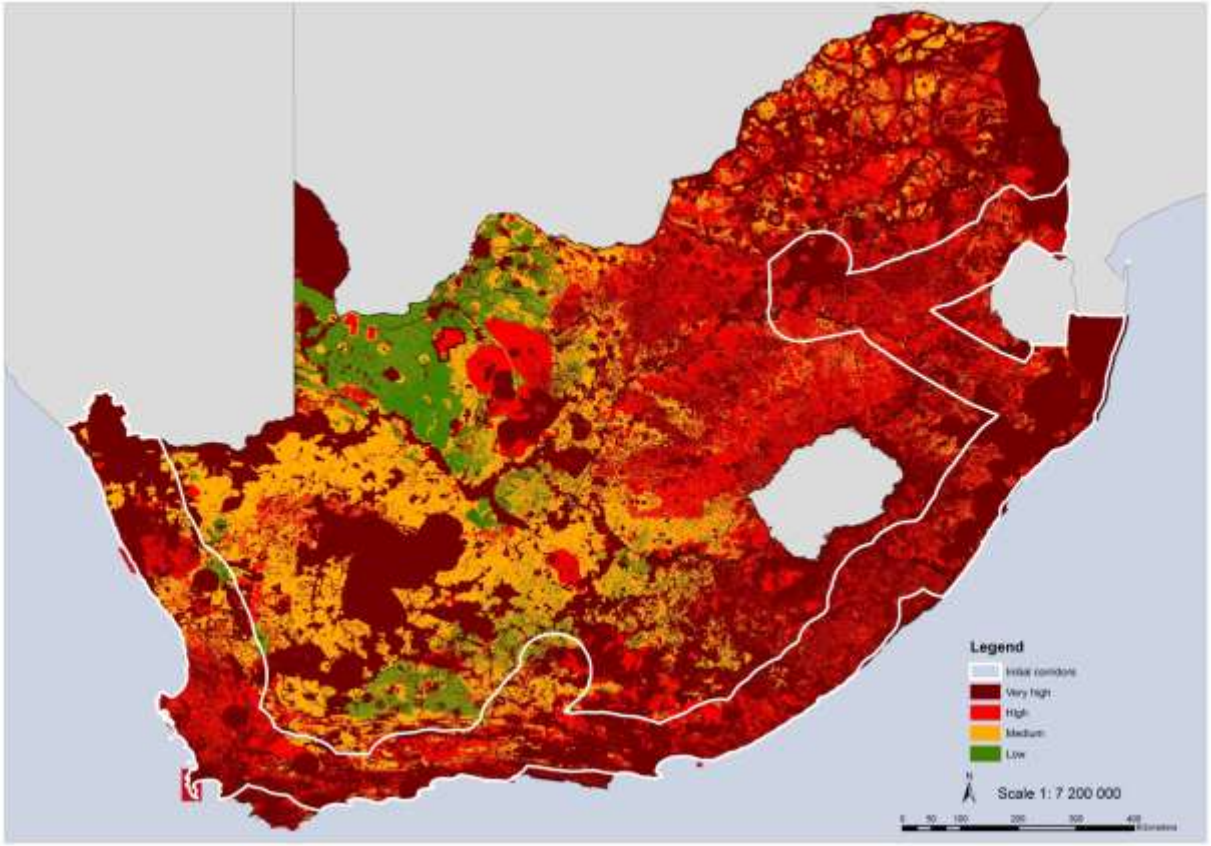
Sensitivity Categories

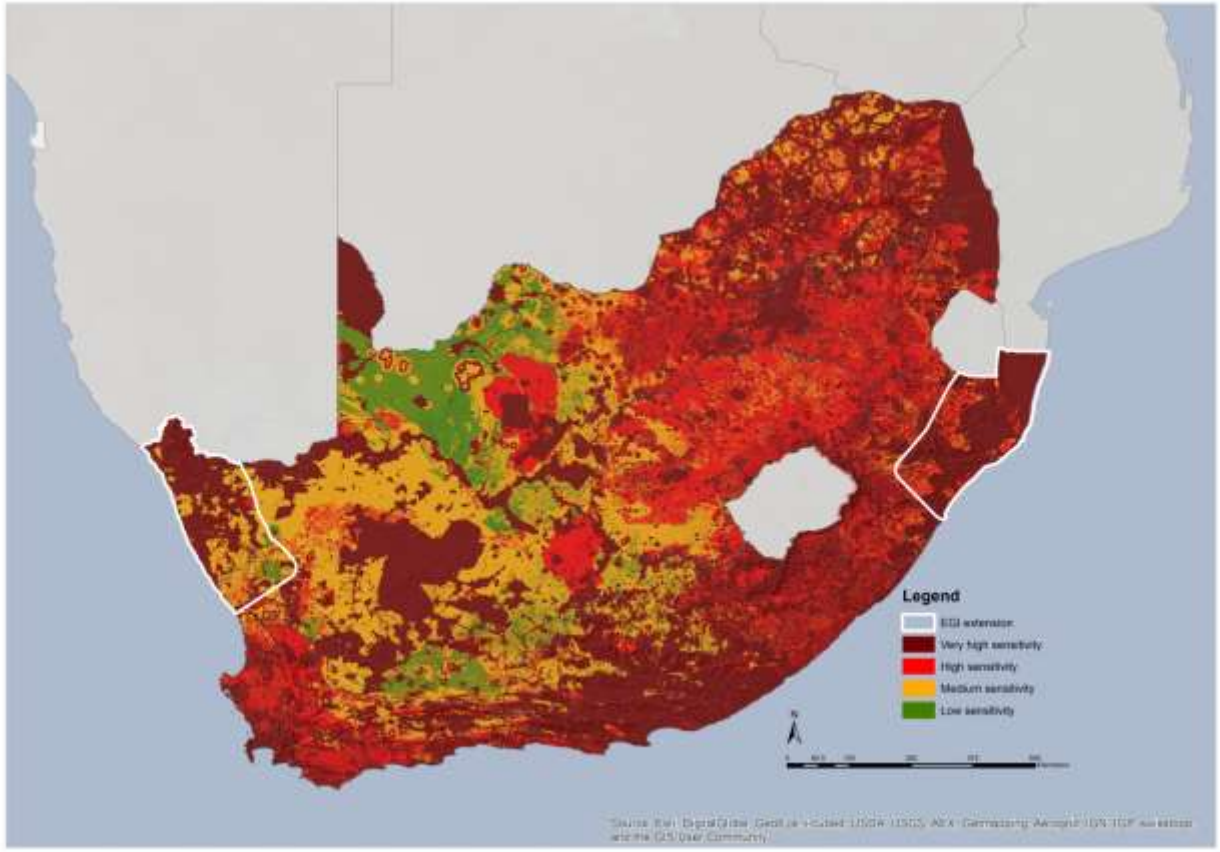
Constraint	Environmental
Very High	Area is rated as being extremely sensitivity to development. As a result the area will either have very high conservation or socio-economic value
High	Area is rated as being highly sensitivity to development. As a result the area will either have high conservation or socio-economic value
Medium	Area is rated as being of medium sensitivity to development. As a result the area will either have medium conservation or socio-economic value
Low	Areas considered to have low levels of sensitivity in the context of gas pipeline or EGI construction and maintenance

Environmental Sensitivities

Phased Gas Pipeline



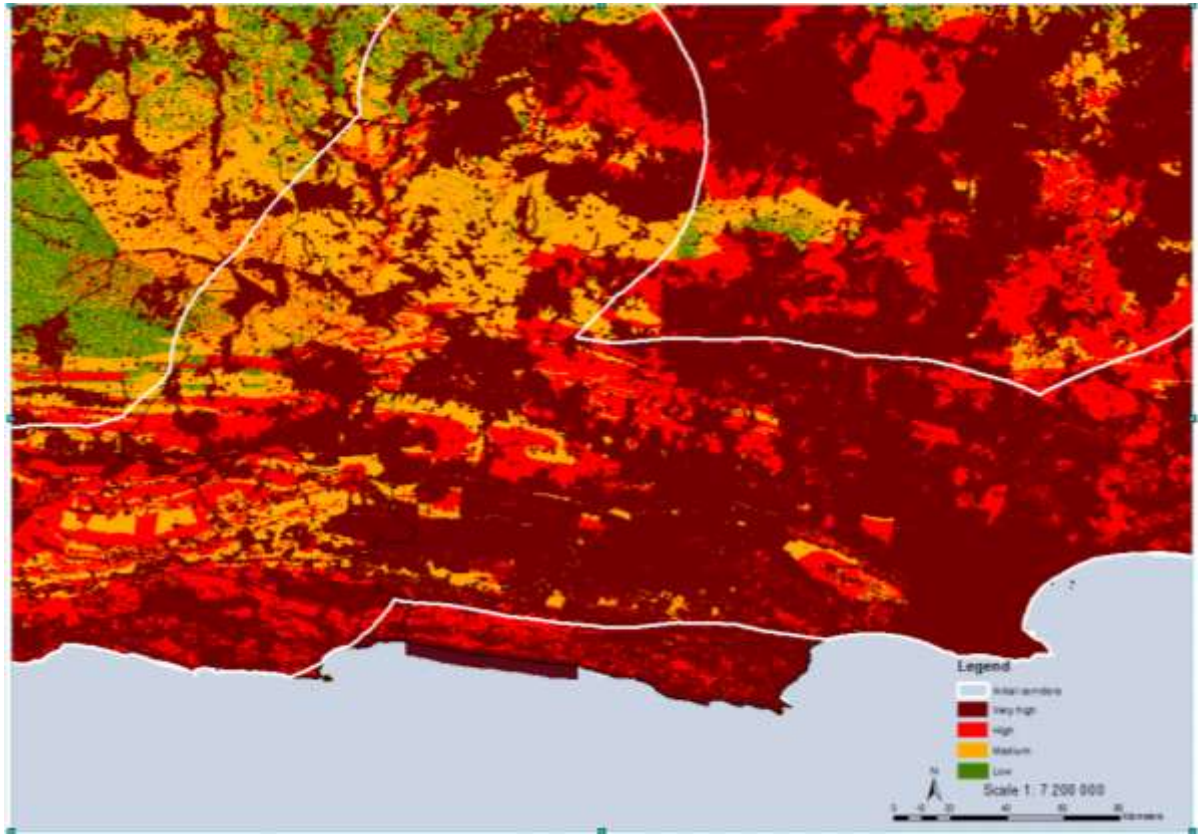
Electricity Grid Infrastructure (EGI)



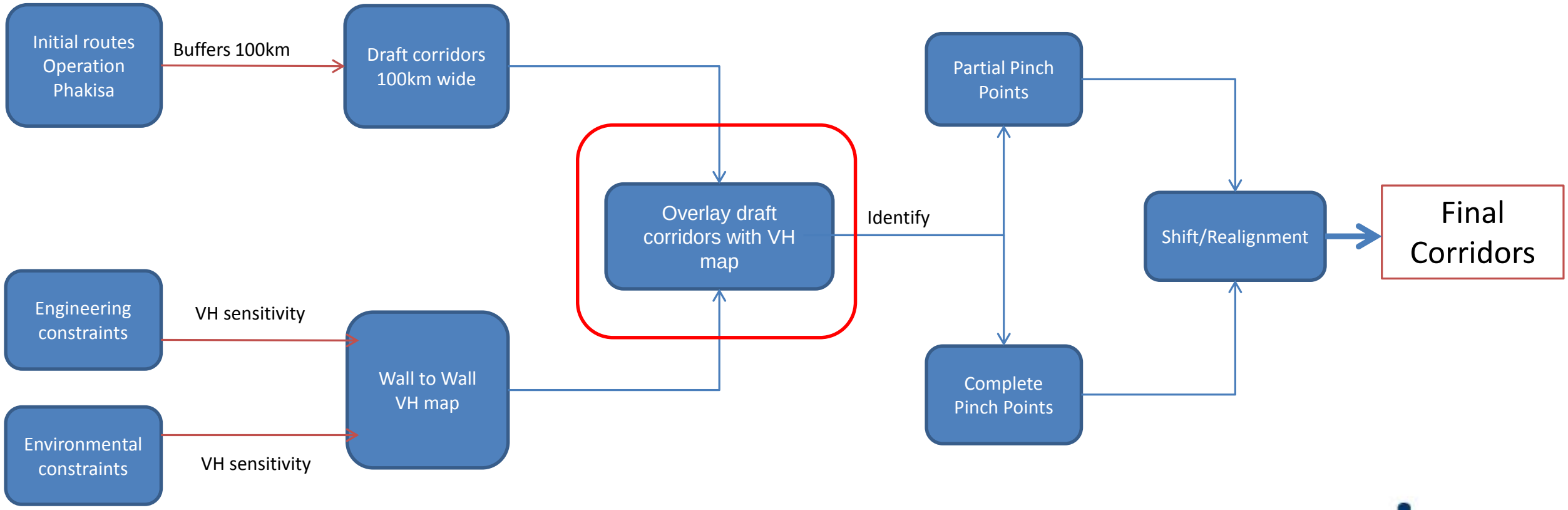
Zoomed Area

Indicate that although it is red (VH)

- there are some relief areas/points within the corridor.

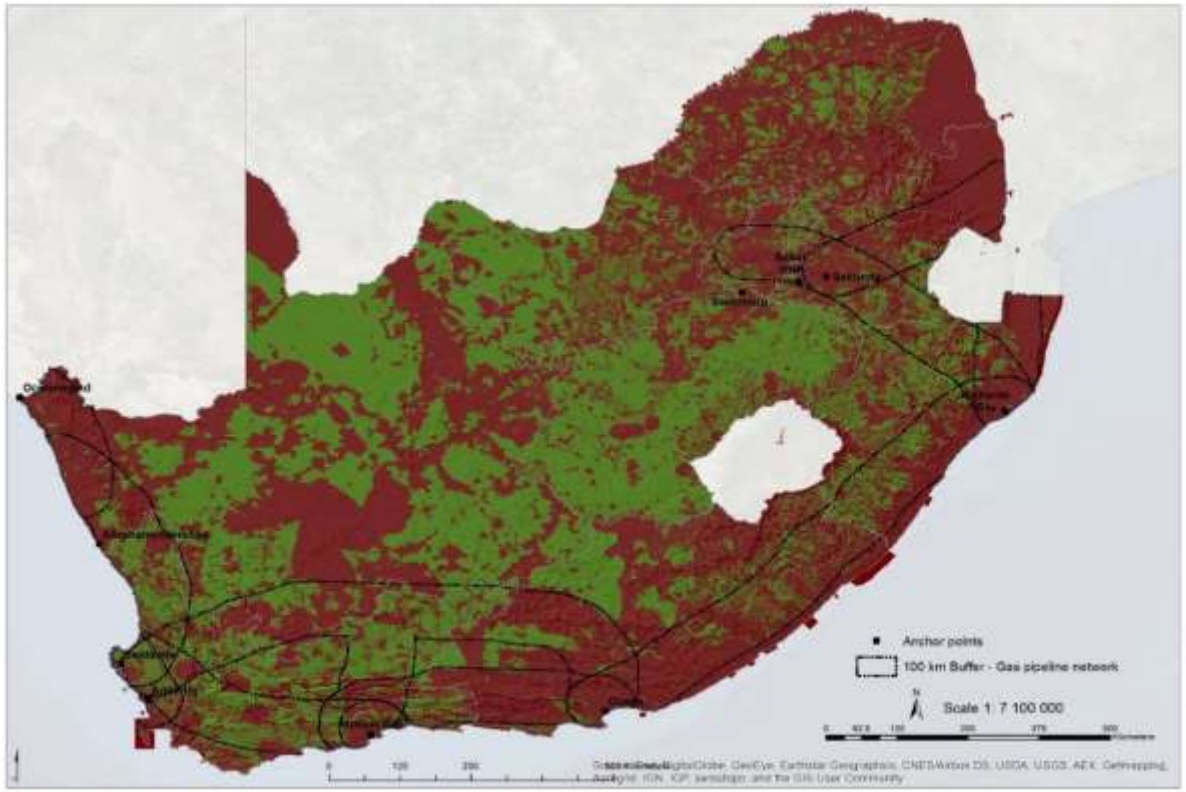


Pinch Point Analyses Process



Pinch Point Analyses Process

Phased Gas Pipeline



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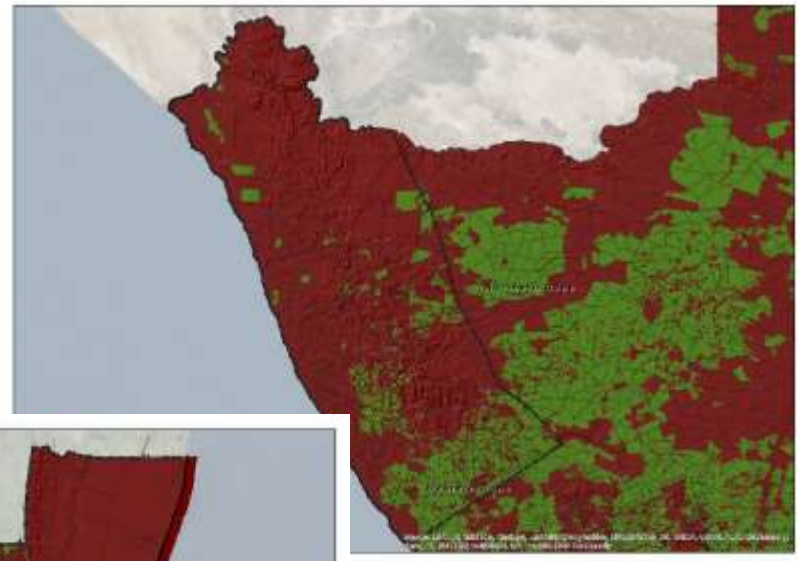
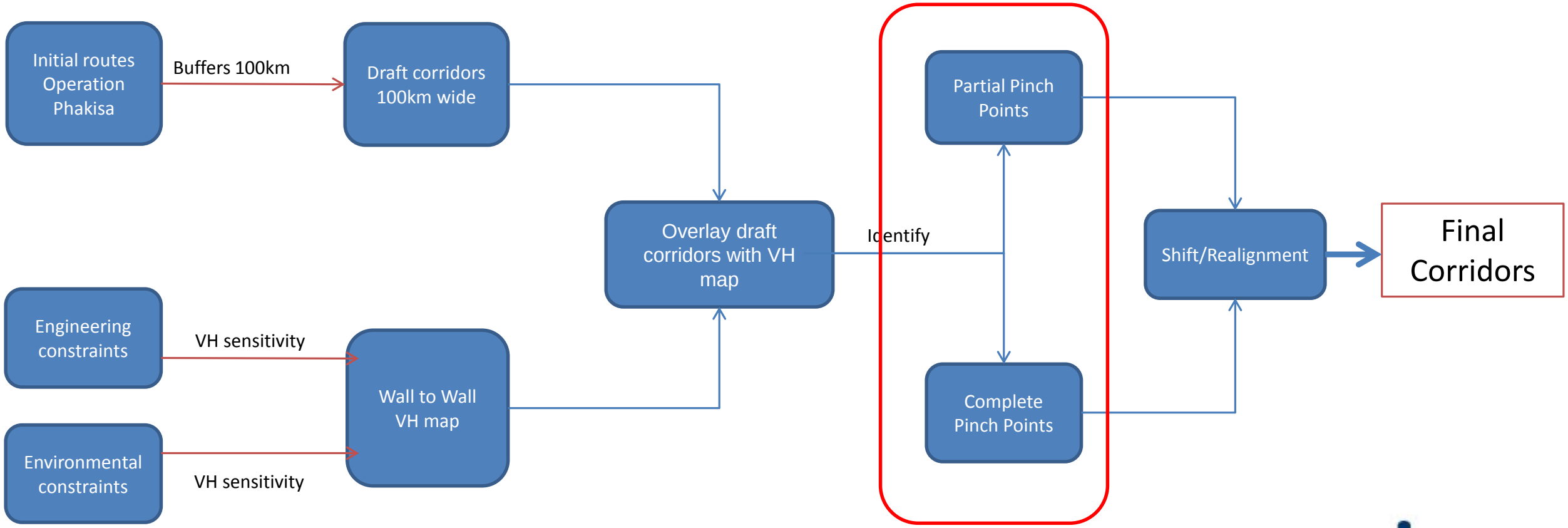


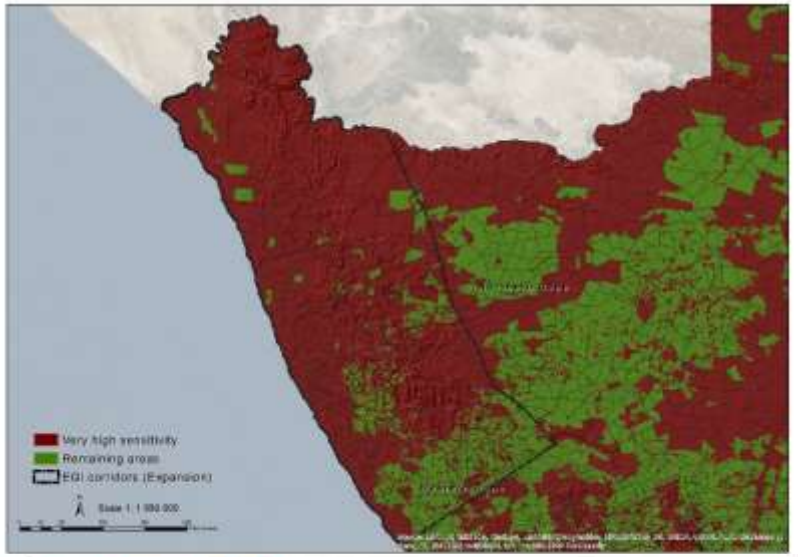
Pinch Point Analyses Process



Pinch Points

Phased Gas Pipeline

Electricity Grid Infrastructure (EGI)



No shift because of:

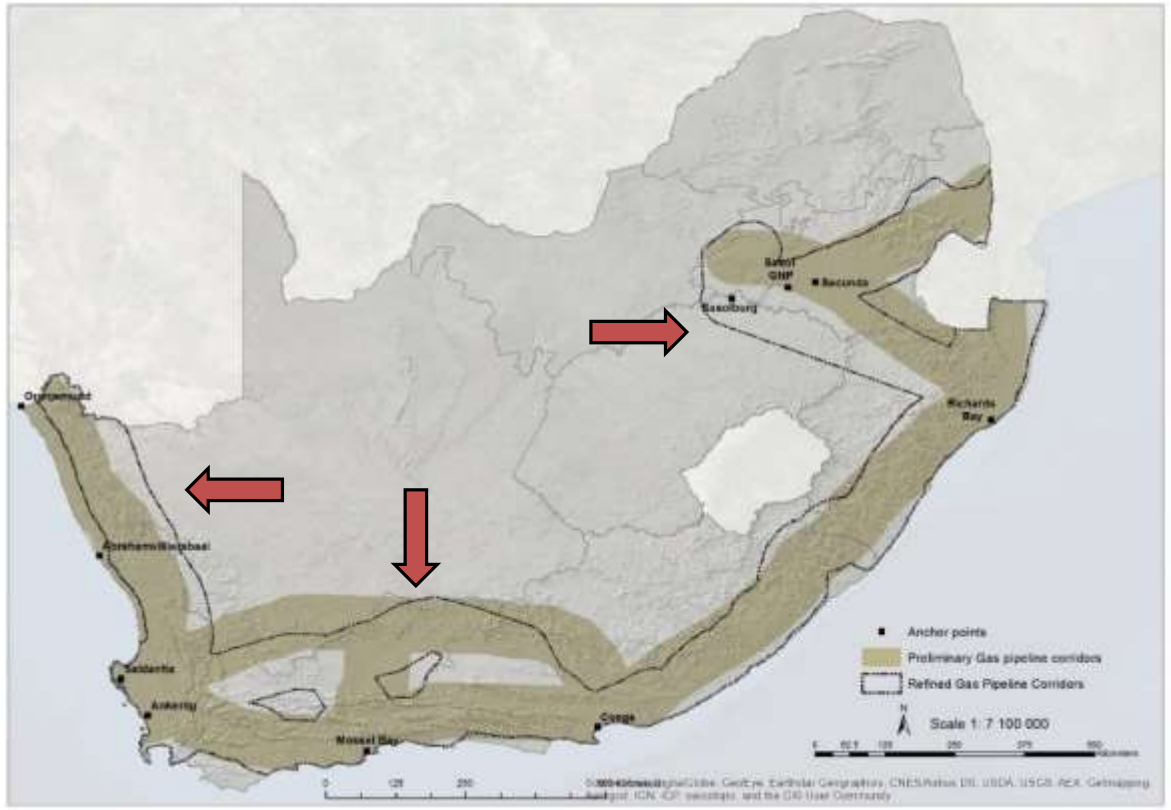
- **Orange river width inward**
- **Location of substation**
- **Location of transmission line**

No shift because of:

- **Swaziland border**

Realignment/Shift of Corridors

Phased Gas Pipeline



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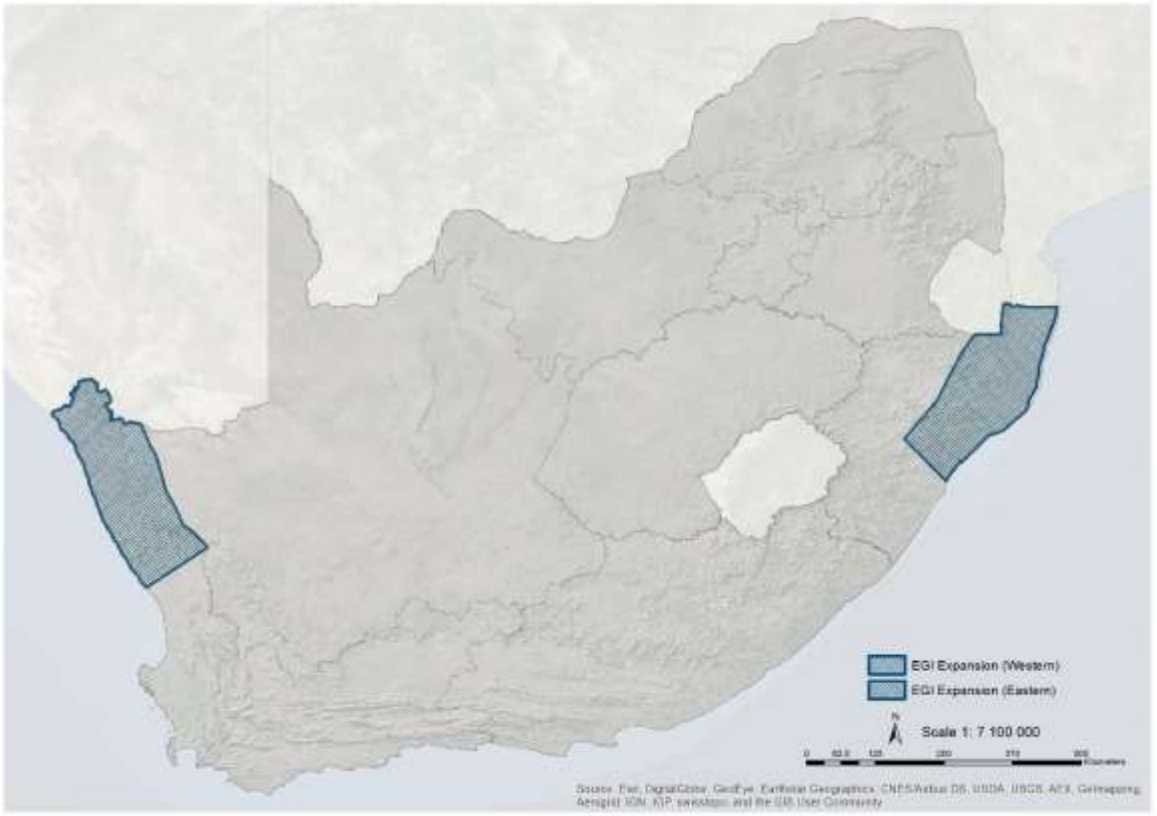
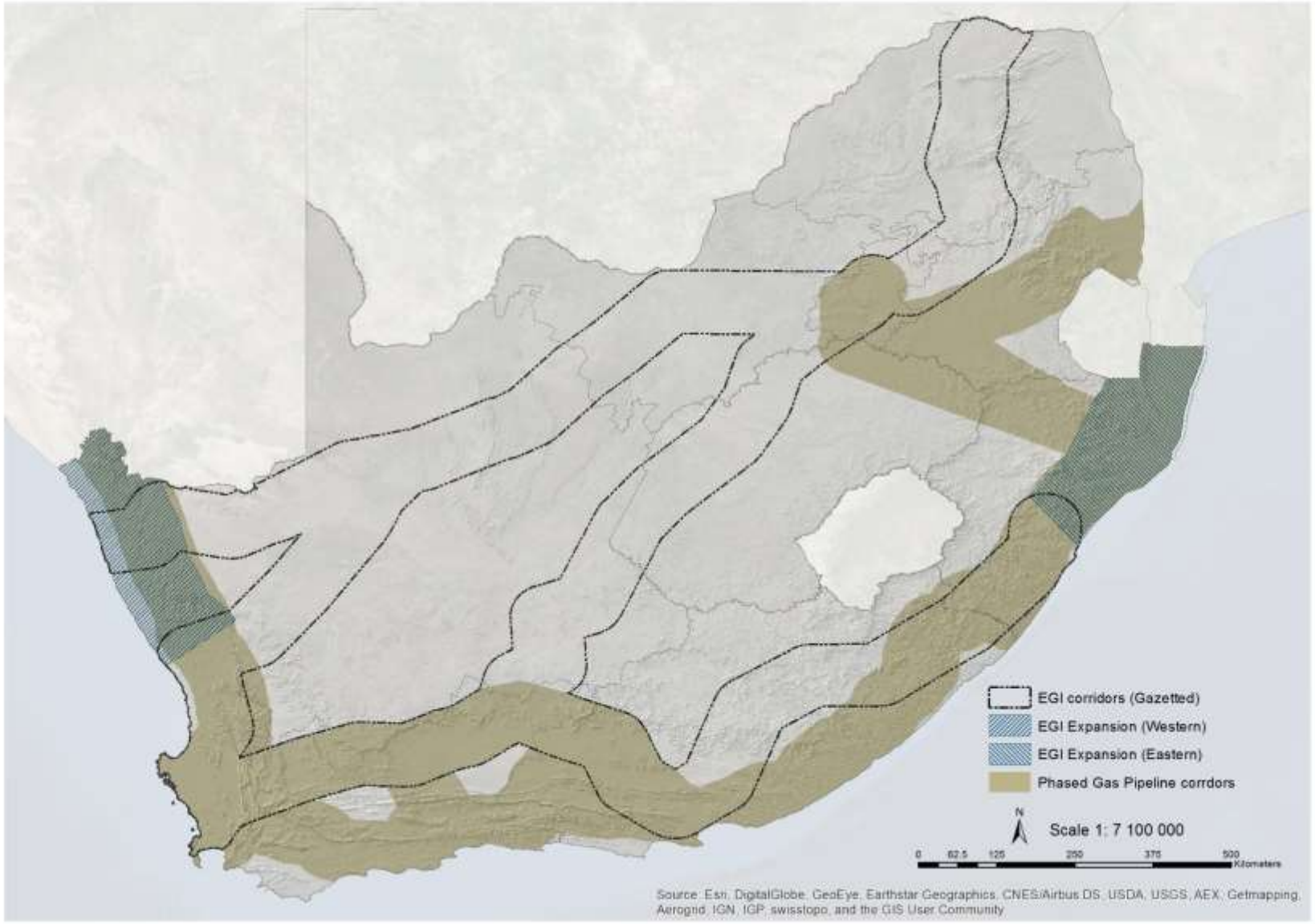
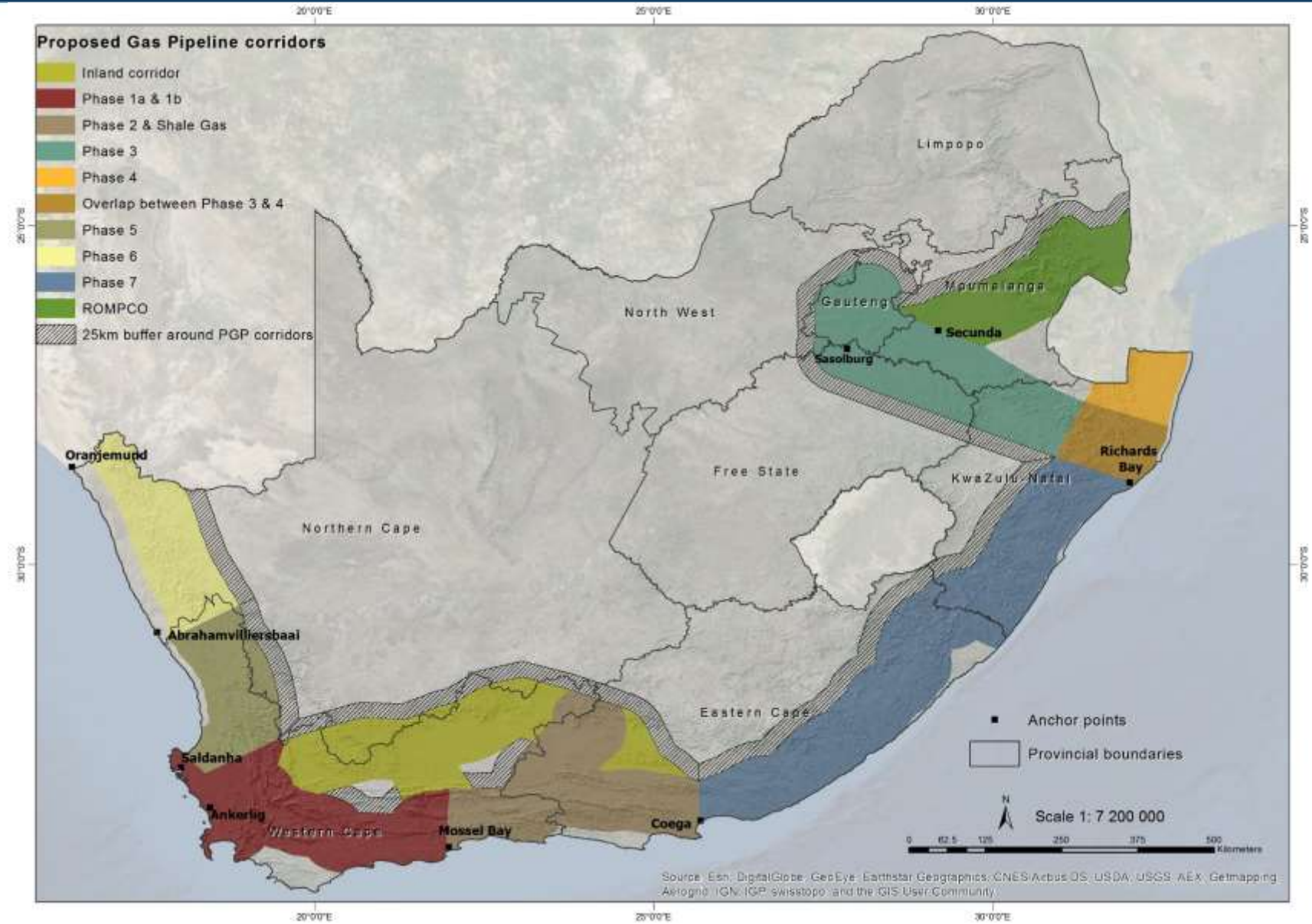


EGI expansion and PGP for assessment



Example of Corridors given to Specialist



Way Forward

- **Incorporate** Specialist report information into Wall to wall mapping,

- Finalise **demand mapping** (utilisation and generation) for EGI & PGP,

- **Refine** 125km corridor to 100km –wide corridor based on energy demand and environmental sensitivity,

- **Finalise corridors**

- **Least cost path** analyses:
    - *weighting exercise* for features used,
    - *Identify* network or potential least cost paths within the corridors

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Questions

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Gas Pipeline & Electricity Grid Expansion Strategic Environmental Assessment

Draft specialist assessment findings:

Biodiversity & Ecology

CSIR Knowledge Commons
Pretoria
31 July 2018

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Content

1. Specialist team and topics
2. Study area
3. Scientific assessment
4. Assessment report layout
5. Sensitivity analysis
6. Key findings from the draft v1 assessment
7. Way forward

1. Specialist team & topics

Fynbos Biome: David Le Maitre (CSIR)

Savannah and Grassland Biomes: Graham Von Maltitz (CSIR)

Indian Ocean Coastal Belt Biome: Alex Whitehead et al. (Sustainable Project Consulting)

Albany Thicket Biome: Derek Berliner (Eco-Logic Consulting)

Succulent- and Nama Karoo Biomes: Simon Todd (Three Foxes)

Estuaries: Steven Weerts et al. (CSIR)

Rivers and Wetlands: Gary de Winnaar et al. (Groundtruth)

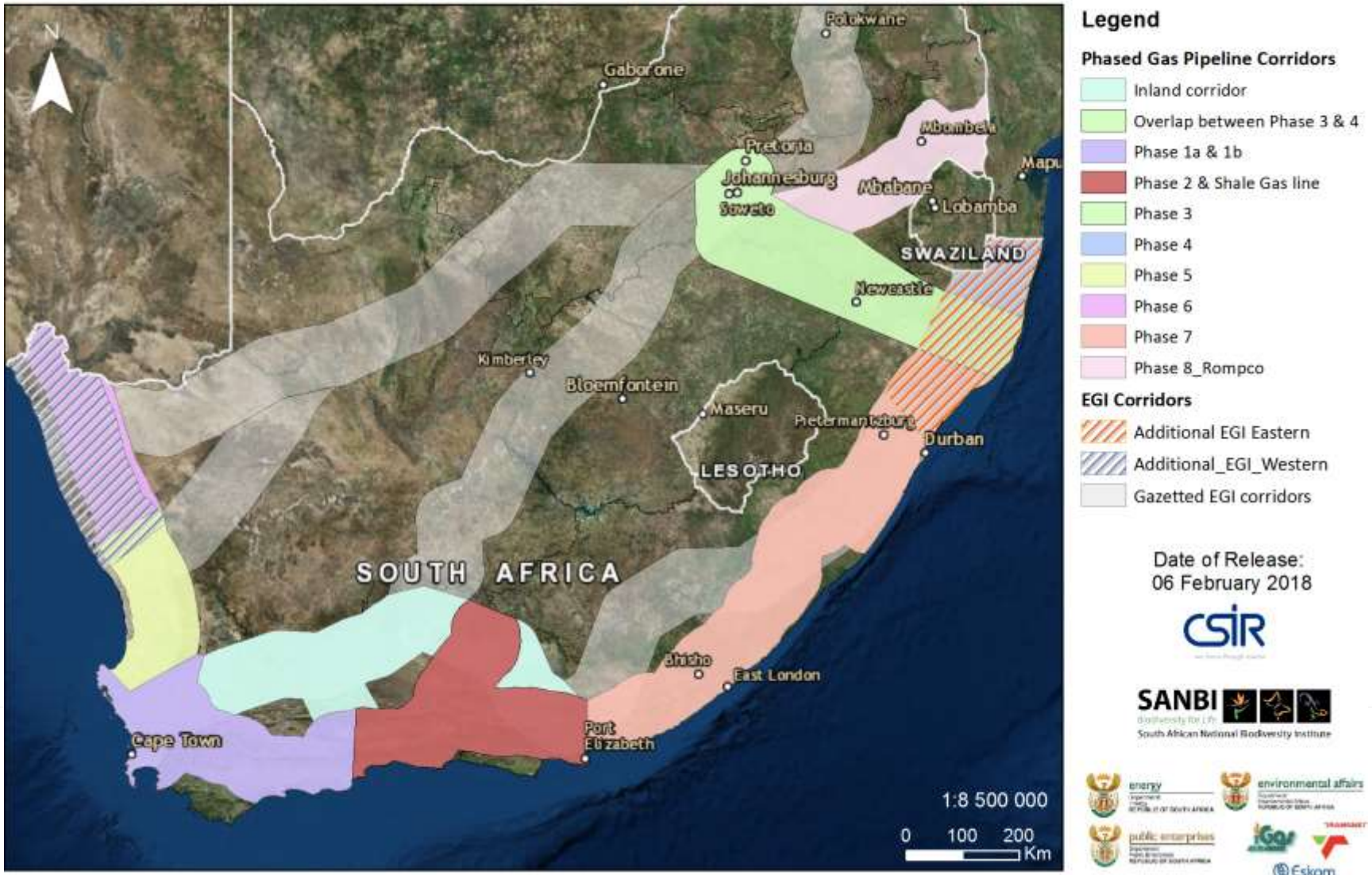
Bats (& terrestrial fauna review): Kate McEwan (Inkululeko Wildlife Services)

Avifauna: Chris van Rooyen et al. (Chris v Rooyen Consulting)

Integrating Author: Luanita Snyman-van der Walt (CSIR)

2. Study areas

National Strategic Environmental Assessment for a Gas network and EGI Expansion in South Africa



3. Scientific assessment

- **Scientific assessment = assimilation of existing knowledge**
- **Key questions the assessment aims to answer**
  - **Where are the most environmentally sensitive areas?**
  - **What are the impacts associated with the development?**
  - **What risks do the impacts associated with the development pose to the different sensitivity areas? *[Gas pipeline only]***
  - **How can the impacts be mitigated?**
  - **How does mitigation change the risk profile? *[Gas pipeline only]***
  - **What types of environmental assessment needs to be conducted in the sensitivity areas?**
    - **Which areas would be less / more onerous from an environmental assessment perspective for the developer?**
    - **Which areas, if proposed by developers, need additional / careful consideration to obtain Environmental Authorisation?**

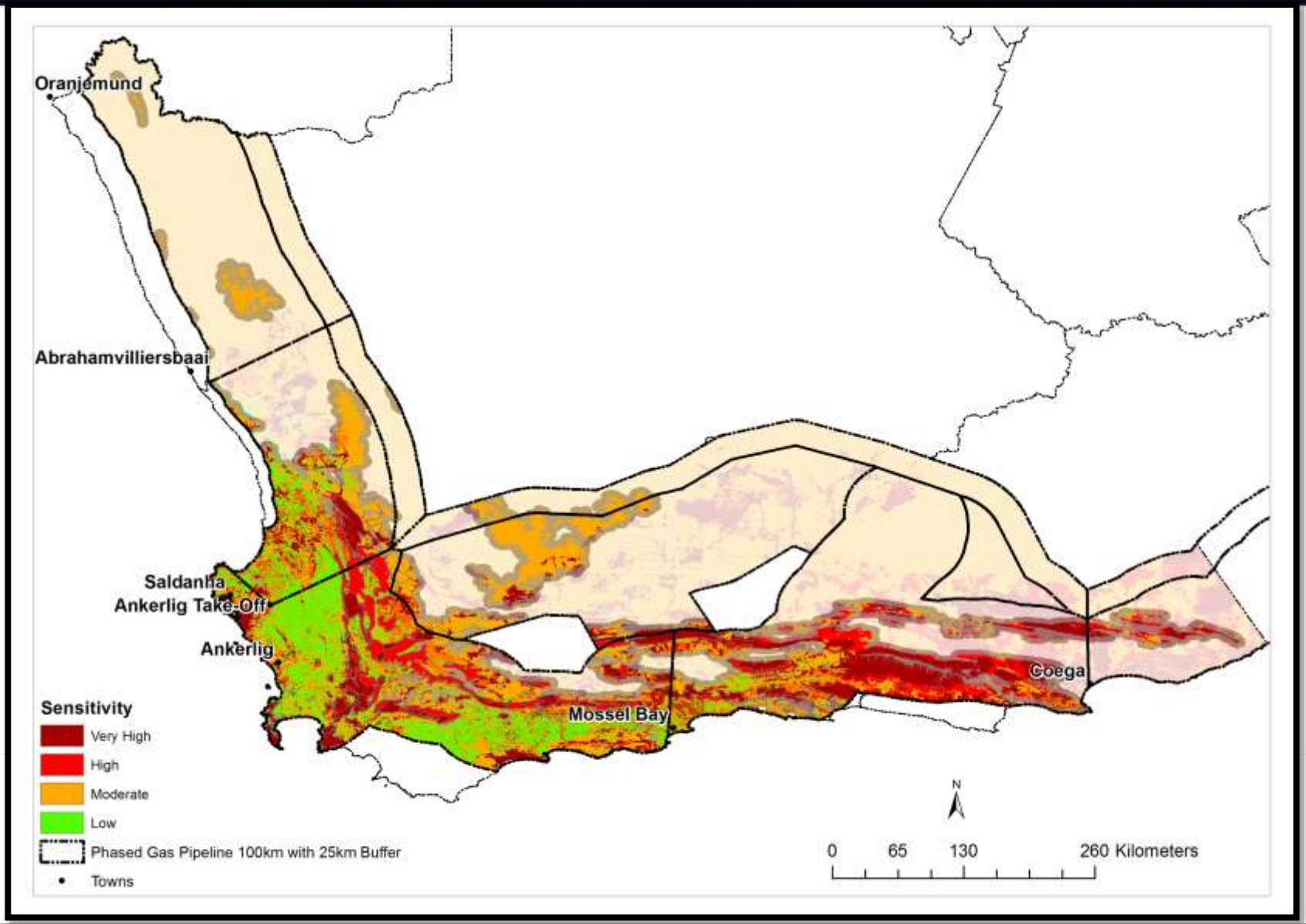
4. Assessment report layout

1. Introduction
2. Scope of the strategic issue
3. Approach and methodology (incl. data sources; assumptions & limitations
4. Key environmental attributes of the study area (incl. feature maps)
5. Sensitivity analysis (incl. sensitivity maps)
6. Key impacts and mitigation
7. Best practice guidelines and monitoring requirements
8. Risk assessment *[Gas Pipeline only]*
9. Gaps in knowledge

5. Sensitivity analysis

Sensitivity class	Features (Terrestrial)	Features (Aquatic)	Avifauna	Bats	Estuaries
Very high	National Protected Areas		Nest sites of Red Data species	Limestone & dolomite geology	Estuaries in NPAs
	Critical Biodiversity Area (CBA1)		Cape Vulture colonies and vulture restaurants	Bat roosts	Estuaries of biodiversity importance
	Threatened species			Indigenous forest habitat	Important nurseries
	-	Rivers & wetlands			
High	CBA2	-	Woodland & Grassland habitat	Arenite geology	Other estuaries
	Mountain Catchments	-		Plantation habitat	
Medium	NPA Expansion Focus Areas	-	Other avifauna habitat	Sedimentary & extrusive rock	-
	Ecological Support Area (ESA)			Thicket habitat	-
				Irrigated agriculture	-
Low	Least threatened vegetation	-	-	-	-
	Modified landscapes				

6. Key findings from the draft v1 assessment
FYNBOS BIOME

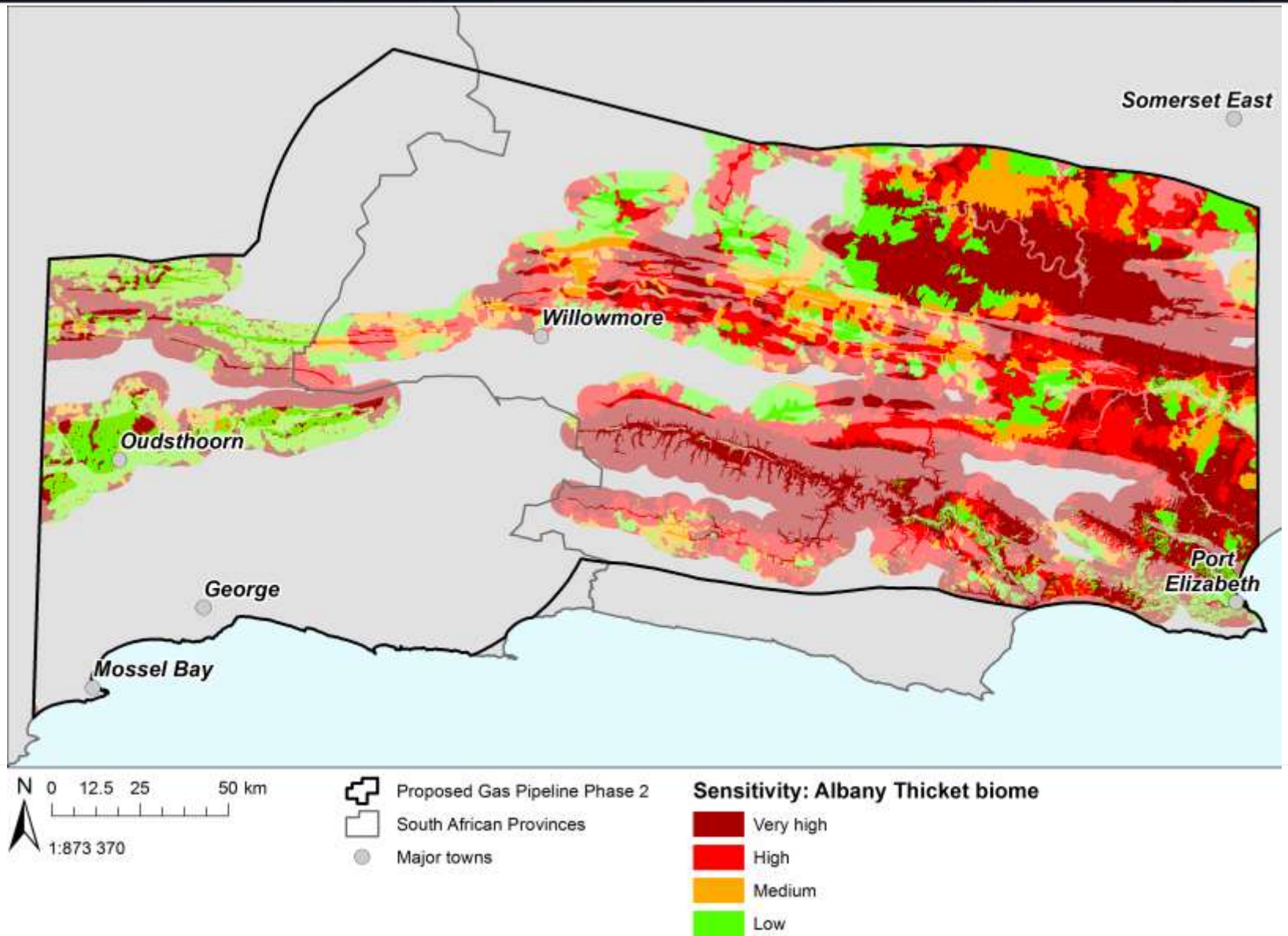


6. Key findings from the draft v1 assessment
FYNBOS BIOME

- **Environmental attributes**
  - Extremely diverse & high level of endemism
  - Fire-dependant ecosystem
  - Highly susceptible to alien invasion
  - Restoration is difficult, especially in low rainfall areas

- **Gaps in knowledge**
  - Limited info on fynbos root systems, some can be 2-3 m
  - Rehabilitation success in drier areas

6. Key findings from the draft v1 assessment
ALBANY THICKET BIOME

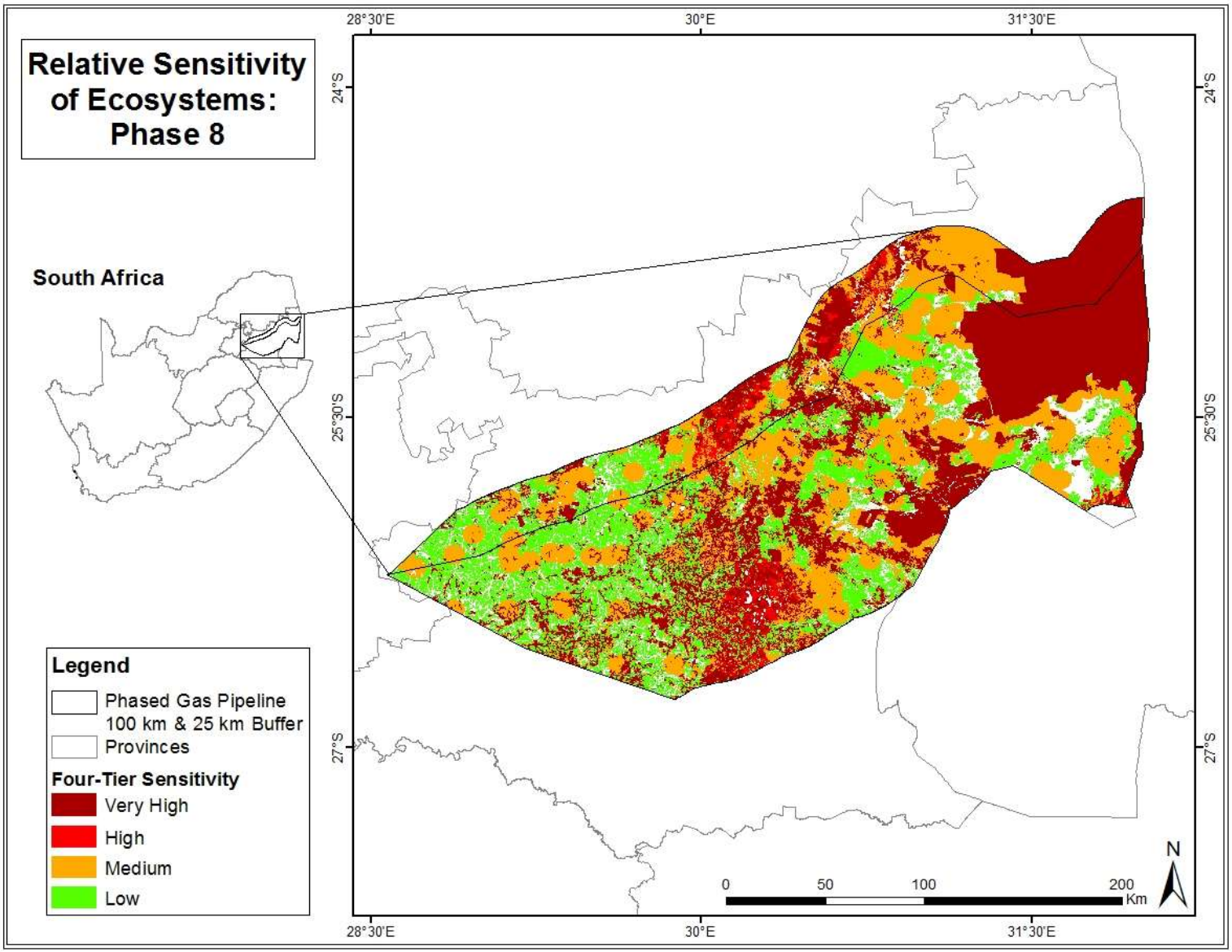


6. Key findings from the draft v1 assessment
ALBANY THICKET BIOME

- **Environmental attributes**
  - High diversity and endemism for succulents
  - Highly fragmented biome, nested in a mosaic of other biomes
  - Extensively degraded due to overgrazing (e.g. goats)
  - Invasion of non-thicket species (e.g. Grassland and Nama-Karoo elements)

- **Gaps in knowledge**
  - Rehabilitation techniques
  - Extent, stability and distribution of rare & threatened thicket fauna and flora

6. Key findings from the draft v1 assessment
SAVANNA BIOME

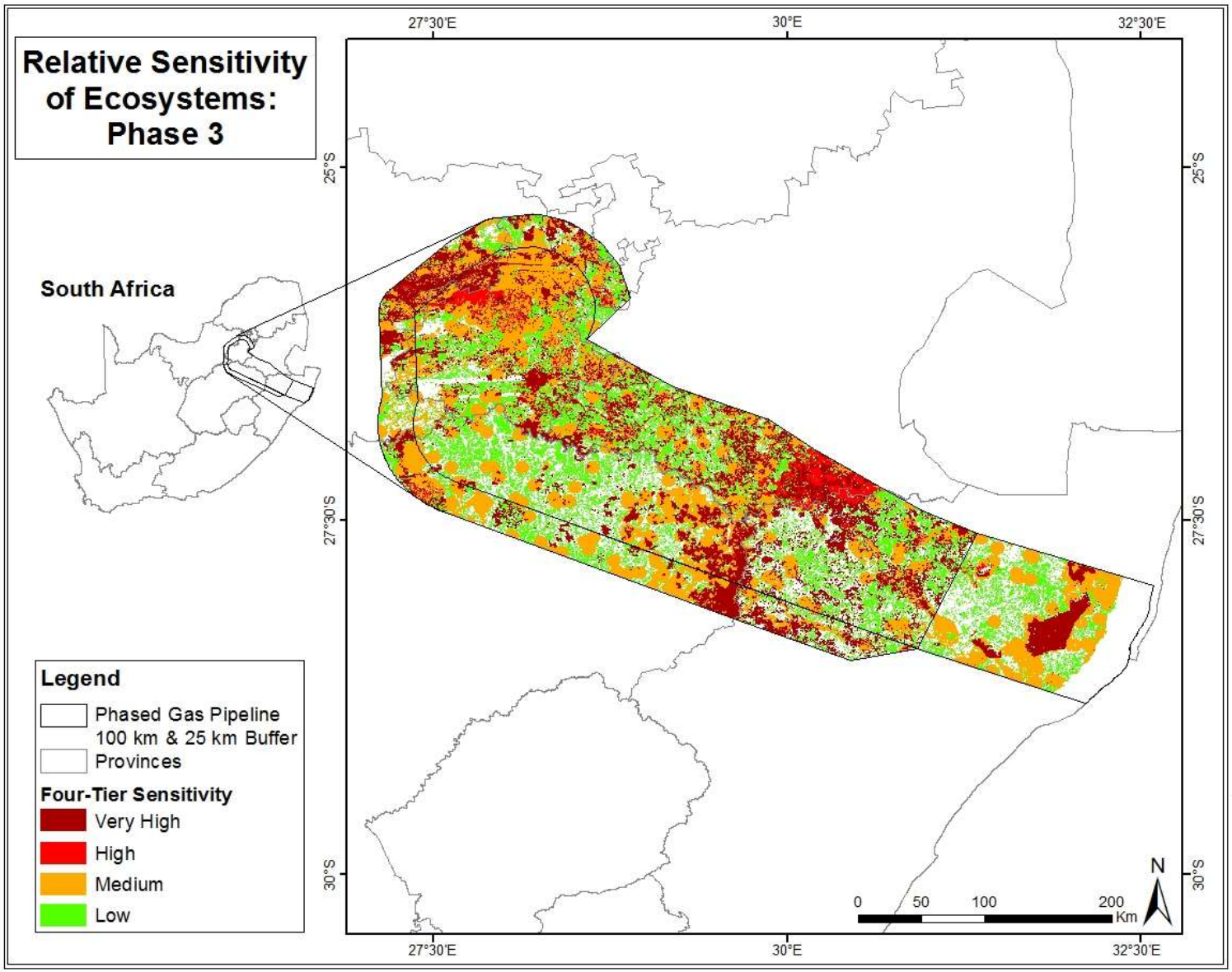


6. Key findings from the draft v1 assessment
SAVANNA BIOME

- **Environmental attributes**
  - Woody tree layer
  - Generally resilient to small-scale impacts
  - Fire-dependant ecosystem
  - Tree layer difficult to re-establish after complete clearance

- **Gaps in knowledge**
  - Location of specific sites with rare and threatened species

6. Key findings from the draft v1 assessment
GRASSLAND BIOME

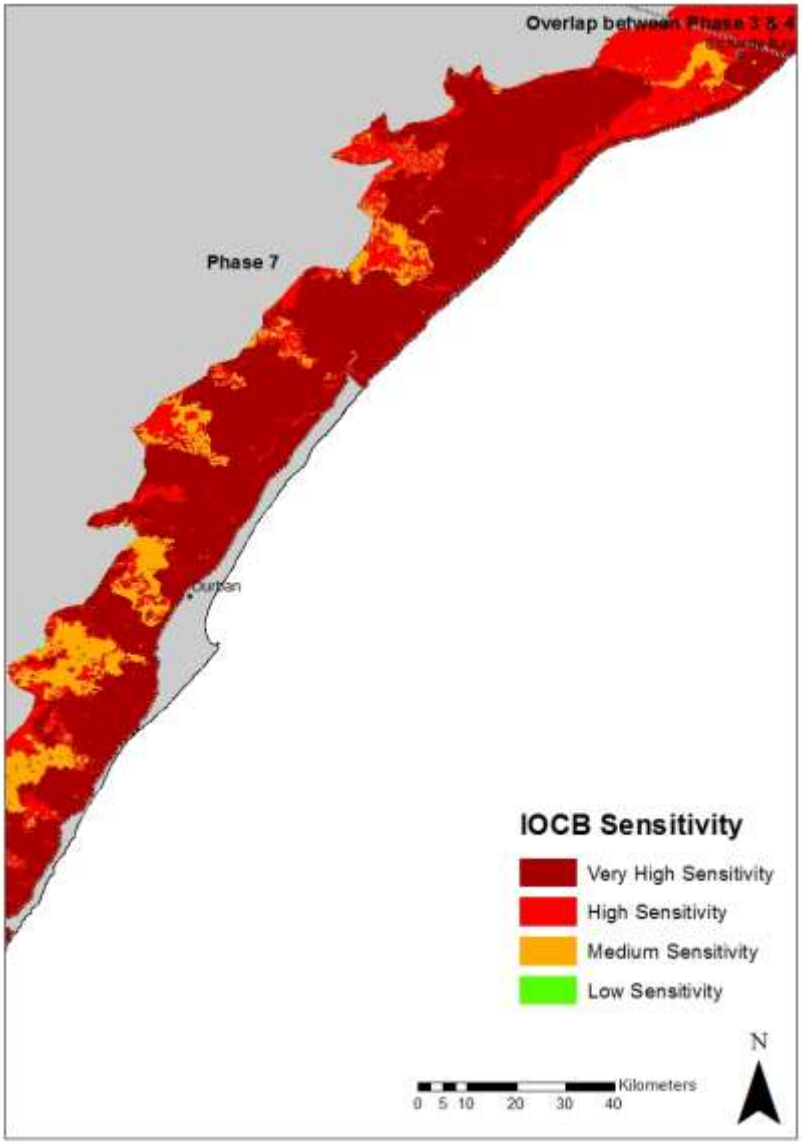


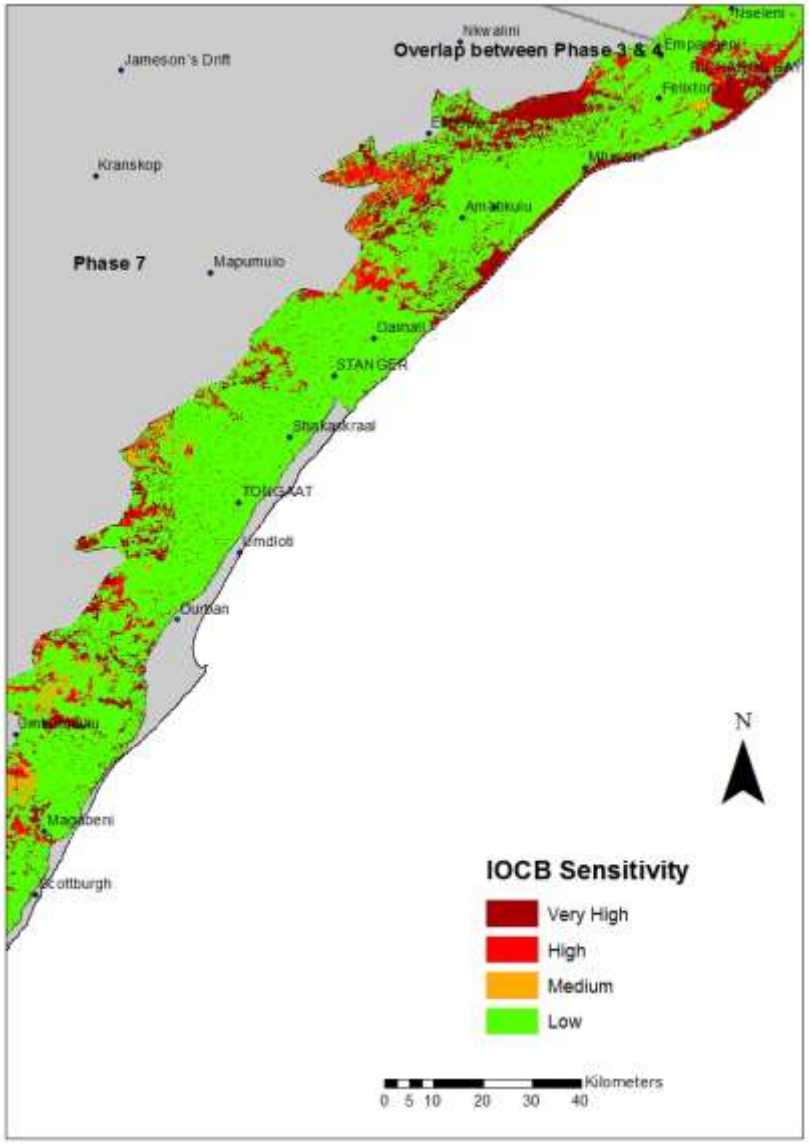
6. Key findings from the draft v1 assessment
GRASSLAND BIOME

- **Environmental attributes**
  - Dominant grass layer, but high diversity of rare non-grass herbaceous species.
  - Extensively transformed due to agriculture, mining and urban development
  - Not well conserved

- **Gaps in knowledge**
  - Location of specific sites with rare and threatened species

6. Key findings from the draft v1 assessment
INDIAN OCEAN COASTAL BELT BIOME





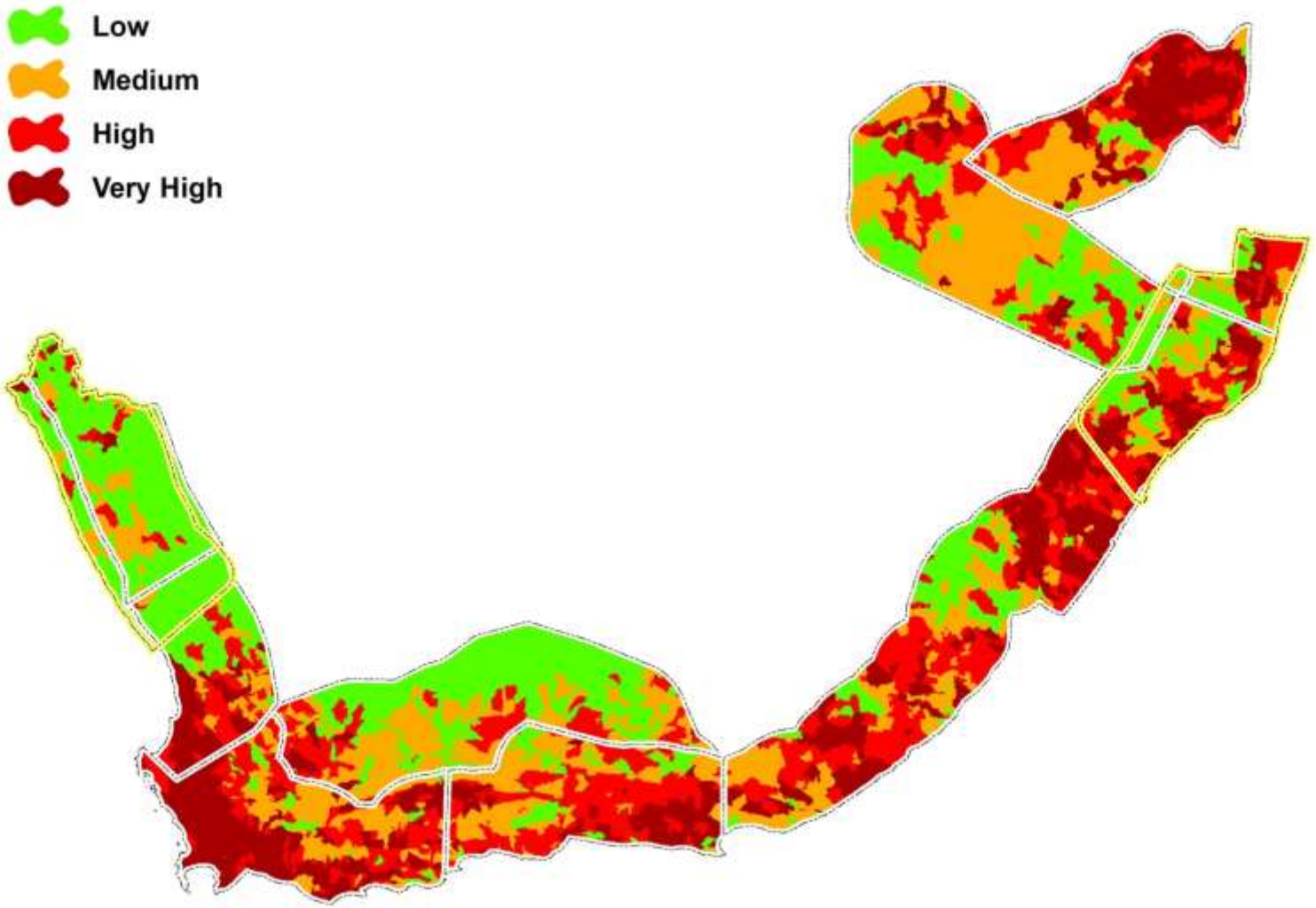
6. Key findings from the draft v1 assessment
INDIAN OCEAN COASTAL BELT BIOME

- **Environmental attributes**
  - Grassy coastal plains to undulating hills with shrubs, trees and forest
  - Extensively transformed outside of protected areas due to sugar cane cultivation, timber plantations and urban development
- **Gaps in knowledge**
  - Faunal records mainly limited conservation areas

6. Key findings from the draft v1 assessment
TERRESTRIAL IMPACTS AND MITIGATION

- **Key impacts**
  - Introduction and establishment of alien species
  - Loss of rare / endemic species
  - Changes in habitat structure and function
  - Erosion and nuisance (e.g. dust, noise)
  - Movement of terrestrial fauna
- **Management & mitigation**
  - Avoid high sensitivity areas (e.g. NPAs, CBAs)
  - Limit activity footprint
  - Monitor species composition and invasion of alien species
  - Monitor soil erosion
  - Seasonal considerations for disturbance and rehabilitation

6. Key findings from the draft v1 assessment
FRESHWATER



6. Key findings from the draft v1 assessment
FRESHWATER

- **Key impacts**
  - Aquatic habitat loss and fragmentation
  - Hydrological alteration
  - Erosion and sedimentation
  - Water quality deterioration

- **Management & mitigation**
  - Avoid wetland, river & riparian habitat
  - Reduce time of open & exposed trenches/excavations

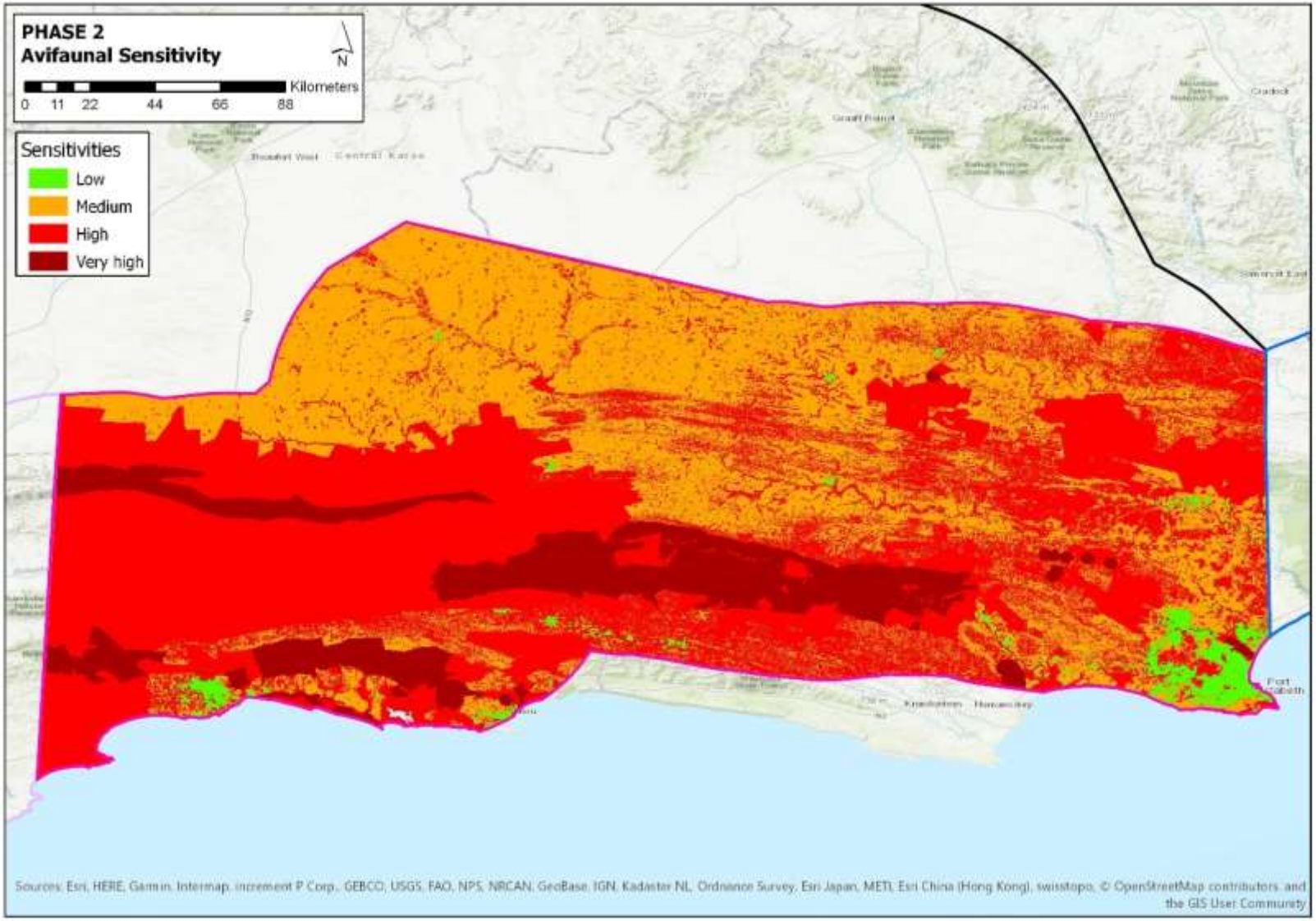
- **Gaps in knowledge**
  - Occurrence of threatened aquatic species is not extensively known

6. Key findings from the draft v1 assessment
ESTUARIES

6. Key findings from the draft v1 assessment
ESTUARIES

- **Environmental attributes**
  - Highly dynamic & sensitive systems
- **Key impacts**
  - Habitat destruction
  - Altered dynamics
  - Water quality deterioration
  - Loss of upper catchment-marine connectivity
  - In-stream pipeline crossing trapping sediment and increasing flood risk
- **Management & mitigation**
  - Avoid estuaries as far as possible
  - Limit trenching, opt for HDD / pipe-jacking
- **Gaps in knowledge**
  - Lack of data on physical processes e.g. Sedimentary dynamics, geology & hydrology (flooding potential)

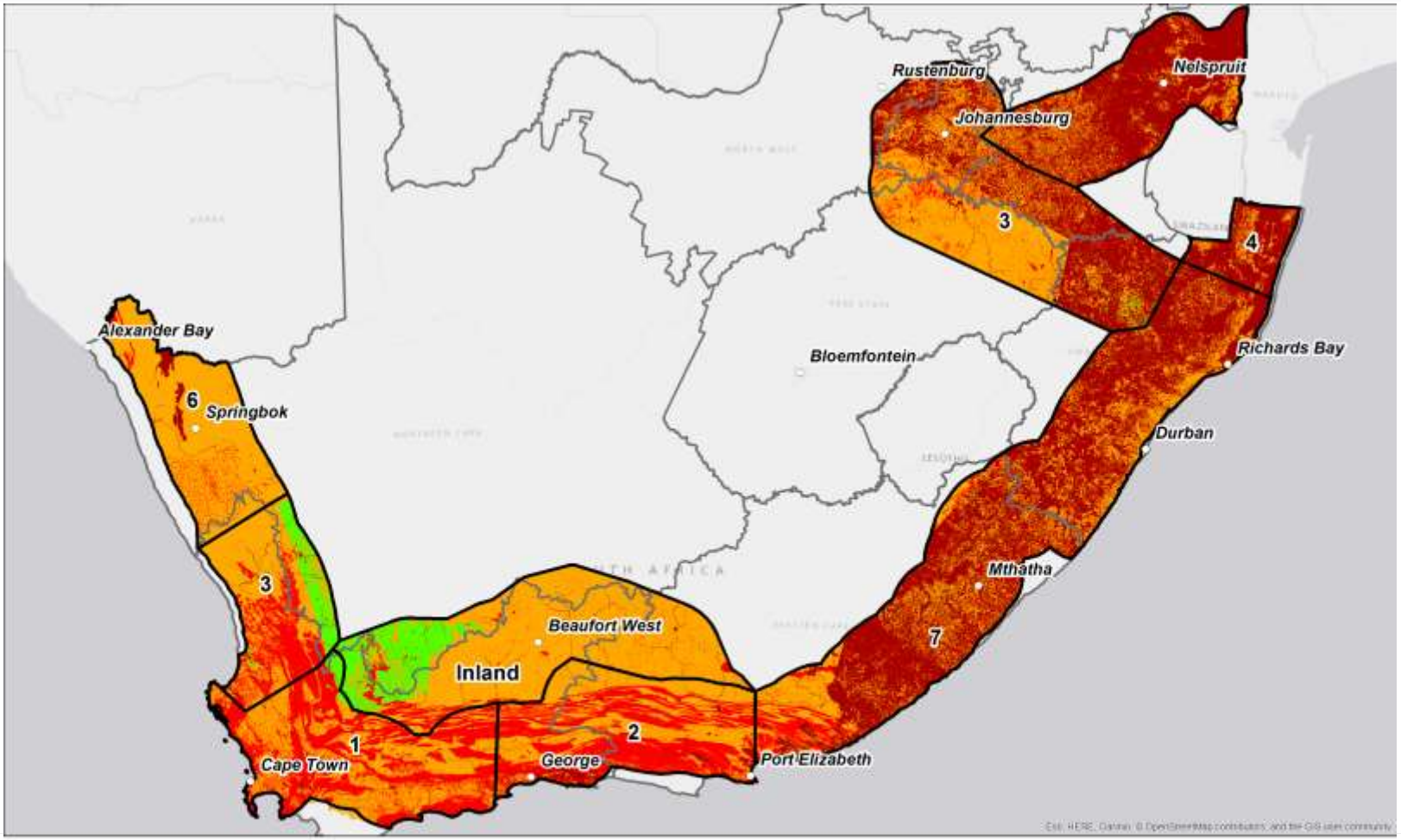
6. Key findings from the draft v1 assessment
AVIFAUNA



6. Key findings from the draft v1 assessment
AVIFAUNA

- **Key impacts**
  - Electrocution *[EGI only]*
  - Collision *[EGI only]*
  - Displacement due to disturbance & habitat transformation.
- **Management & mitigation**
  - Avoid known sensitive bird habitat and flight paths
  - Bird-friendly powerline design (incl. Bird Flight Diverters)
- **Gaps in knowledge**
  - Population sizes of many Red Data species are not well known

6. Key findings from the draft v1 assessment
BATS



6. Key findings from the draft v1 assessment
BATS

- **Key impacts**
  - Electrocution *[EGI only]*
  - Electromagnetic interference *[EGI only]*
  - Displacement due to disturbance & habitat transformation
- **Management & mitigation**
  - Avoid key bat roosts or foraging habitat
  - Avoid construction in certain seasons
  - Minimise development footprint
  - Prevent dust and sedimentation of water bodies
- **Gaps in knowledge**
  - Effects of electromagnetic radiation on flying bats & the echolocation of insectivorous bats during foraging is unknown

7. Way forward

- **Expert / peer review by acknowledged experts (~mid-June – August 2018)**
  - Fynbos – Prof. Brian van Wilgen (Private)
  - ✓Savannah and Grassland – Prof. Bob Scholes (Wits)
  - Karoo and ✓Thicket – Dr Sue Dean (Renu Karoo)
  - Indian Ocean Coastal Belt – Duncan Hay (INR)
  - Estuaries – Prof. Janine Adams (NMMU)
  - ✓Avifauna – Jonathan Booth (Birdlife)
  - Terrestrial fauna – Kate McEwan (Inkululeko Wildlife Services)
  - Freshwater – Leo Quayle (INR) and Nancy Job (SANBI)

- **Incorporate expert review → integrate all inputs → public review**

Gaps in knowledge

1. Limited info on root systems
- Fynbos biome

2. Rehabilitation success
- Fynbos (drier areas) and Albany Thicket

3. Extent and distribution of species of special concern
- Albany Thicket, Savanna, Grassland, IOCB (faunal records)
- Freshwater systems

4. Population sizes of many Red Data species (birds)

5. Lack of data on physical processes (Estuaries)

6. Electromagnetic radiation flying bats; echolocation

Thank you

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DRAFT FINDINGS

- SEISMICITY ASSESSMENT
- VISUAL ASSESSMENT
- SOCIAL, PLANNING AND DISASTER MANAGEMENT

Seismicity Assessment – EGI and Gas Pipelines

Terms of Reference/Research Question	Report Finding
What affect or impact could EGI and Gas Pipelines have on earthquakes and related phenomena?	Earthquakes driven by geological forces (e.g. motion of tectonic plates, isostatic response to erosion, volcanism) or certain human activities (e.g. mining, impoundment of reservoirs, fluid injection or extraction). **EGI and Gas Pipelines do not affect seismicity in any known way.**

Seismic hazard in South Africa is generally low by world standards. Eight damaging earthquakes (5.0<M<6.3) have occurred in South Africa during the last 120 years.

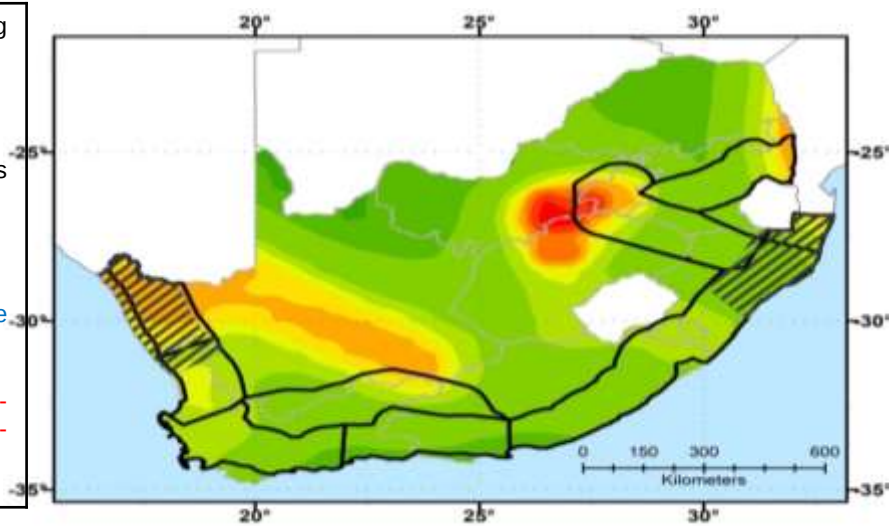
Larger tectonic earthquakes (say 6.5<M<7.5) are rare and could take place anywhere.

Local conditions that might increase the hazard posed by secondary effects of earthquakes should be taken into account when siting and constructing GPNs. For example:

- Steep slopes that are prone to landslides.
- Thick soils and alluvium that may amplify ground motions and/or liquefy when shaken.

Typical of MMI 6 = shaking is strong enough to cause alarm but only cause minor damage to buildings and well below the damage thresholds of modern EGI.

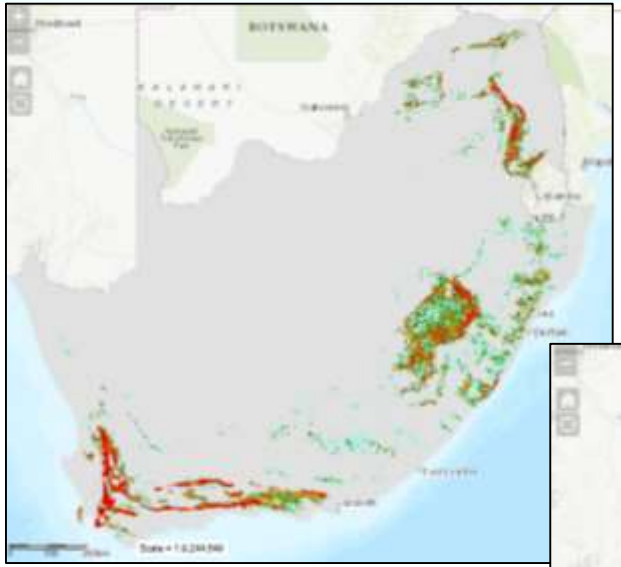
Typical of MMI 8 = shaking is strong enough to cause slight damage to earthquake-resistant structures, considerable damage to solid buildings, and great damage to poorly-built buildings.



Seismicity Assessment – EGI and Gas Pipelines

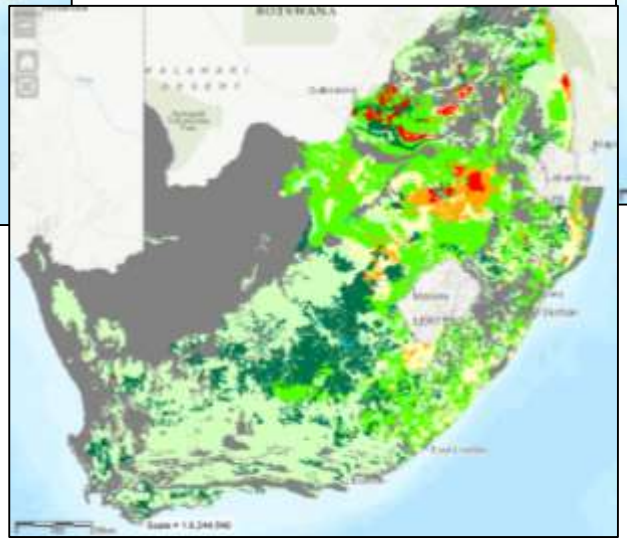
Terms of Reference/Research Question	Report Finding – Direct Impacts
What damage could earthquake-related phenomena (e.g. strong ground motion, surface displacement as the result of fault rupture, landslides triggered by strong ground motion, tsunami) cause to EGI and Gas Pipelines? What impact would the damage to EGI and Gas Pipelines have on the environment and people?	The earthquake causes: • the ground, EGI and Gas Pipelines to shake to such an extent that damage occurs; or • displacement between opposite sides of the fault that is large enough to damage structures or break cables and pipelines. Regions where the risk is relatively high (but still quite low) are the mining districts in Gauteng, North West and Free State Provinces, where gold mining at depths approaching 4 km had induced three shallow earthquakes with M>5 that caused damage to surface structures. These regions are far removed from the EGI corridors. But they intersect with Gas Corridor 3 (from Richards Bay to Gauteng).

Factors/hazards have been used to identify regions within the proposed corridors where GPNs may be sensitive to the effects of earthquakes:



Landslides susceptibility

Swelling clays



Collapsing soils

Seismicity Assessment – EGI and Gas Pipelines

Terms of Reference/Research Question	Report Finding – Indirect Impacts
What damage could earthquake-related phenomena (e.g. strong ground motion, surface displacement as the result of fault rupture, landslides triggered by strong ground motion, tsunami) cause to EGI? What impact would the damage to EGI have on the environment and people?	Earthquake shaking may: • trigger landslides and rockfalls; • cause soils to liquefy; • or dams to fail. All these phenomena may lead to damage and loss. Earthquake-related phenomena could cause damage to EGI and Gas Pipelines that might disrupt the supply of electricity and gas. In worst cases, the damage could trigger a cascade of other hazardous phenomena such as fires, explosions, asphyxiation, electrocution, and the release of toxic and radioactive substances. EGI (such as pylons and sub-stations) and Gas Pipelines that are built according to international standards are generally resilient to moderate levels of ground shaking. Landslide susceptibility is low for most of the area covered by the EGI and Gas Pipeline corridors, although significant sections of rugged terrain are traversed by corridors 1, 2, 5, 7 and 8.

Seismicity Assessment – EGI and Gas Pipelines

- Sensitivity maps have not been produced because of the **poor resolution of probabilistic seismic hazard assessments, large uncertainties, and the lack of detailed information regarding currently active faults and near-surface geology**.
- The mapping of active faults involves difficult palaeoseismic studies and detailed and sensitive seismic mapping.
- The mapping of areas that may be prone to local site effects such as amplification, liquefaction and landslide requires **detailed geological, geotechnical and geophysical mapping** (these are usually done for **nuclear power station and waste disposal sites**).

Seismicity Assessment – EGI and Gas Pipelines

Best Practice Measures:

Planning Phase:

- Map the regions within the EGI and Gas Pipeline corridors that have:
  - Historical or instrumental records of M>5 earthquakes,
  - Palaeoseismic evidence of M>6 earthquakes (age<100,000 years), or
  - Seismically-active faults.

- Within the corridors, map sub-regions that have either (these are designated as sensitive):
  - Steep topography prone to seismically-triggered landslides,
  - Thick near-surface low-seismic-velocity layers that could cause site amplification, or
  - Saturated/problem soils (swelling/expansive clays and collapsible soils) and sands that could liquefy when shaken.

Seismicity Assessment – EGI and Gas Pipelines

Construction Phase:

- Conduct geological and geophysical investigations in “sensitive” regions to quantify the hazard of landslides, strong ground motion or liquefaction.
- Should these surveys indicate that there is a significant probability that EGI and Gas Pipeline damage thresholds will be exceeded, the EGI and Gas Pipeline should either be relocated, reinforced or protected (e.g. landslide nets).
- Install sensors and monitor both weak and strong ground motion to “sensitive” regions to improve hazard assessments.

Conclusion:

- Both the Expanded Eastern and Western EGI corridors and all the Gas Pipeline corridors are **deemed suitable** for development. Attention should be given to local conditions that increase the earthquake hazard. For example:
  - Steep slopes that are prone to landslides; and
  - Thick soils and alluvium that may amplify ground motions and/or liquefy when shaken.
- These sites should be avoided, or the Gas Pipelines and EGI reinforced appropriately, or ground improvement measures implemented.

Visual Impact Assessment – EGI

Scope: Identification of features of visual or scenic value, as well as sensitive receptors within the two expanded EGI corridors.

Purpose: To determine overall visual sensitivity within the corridors in the context of EGI.

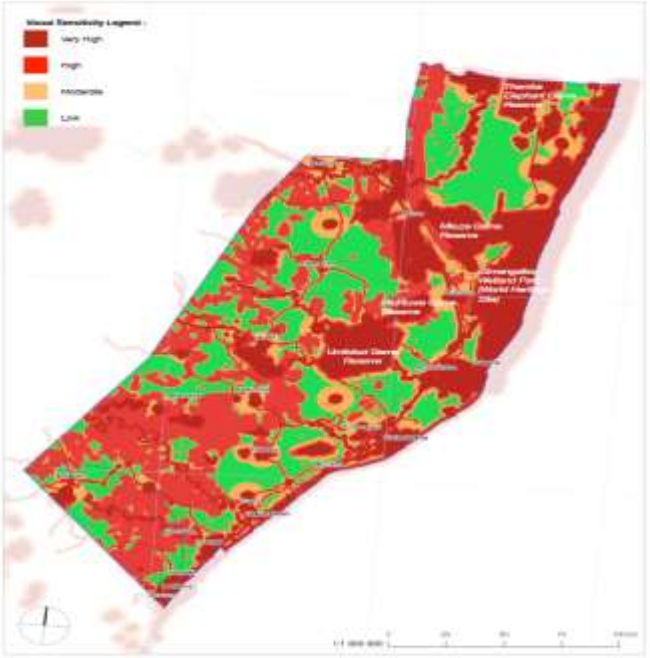
Recommended buffer distances between EGI development and sensitive features / receptors

Feature Type	Very High Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Topographic features including steep slopes	0 m	500 m	1 km	-
Major rivers	500 m	1 km	2 km	-
Water bodies, dams, wetlands, pans	500 m	1 km	2 km	-
Ramsar Sites	1 km	2 km	3 km	-
Coastal zone	1 km	2 km	3 km	-
National Parks, World Heritage Sites	2 km	3 km *	4 km *	-
Protected Areas - Nature Reserves	1 km	2 km *	4 km *	-
Private reserves and game farms	n/a	1 km *	2 km *	-
Cultural landscapes	0 m	500 m *	1 km *	-
Heritage sites	0 m	500 m *	1 km *	-
Towns / villages / settlements	500 m	1 km	2 km	-
National roads	500 m	1 km *	2 km *	-
Provincial routes	250 m	500 m *	1 km *	-
Scenic routes	1 km	2 km *	3 km *	-
Passenger rail lines	250 m	500 m *	1 km *	-
Airfields	3 km	-	8 km	-

*Viewsheds to be taken into account at the project scale. Buffers could be reduced if proposed transmission infrastructure is outside the viewshed

Visual Impact Assessment – EGI

Map W8 • Expanded Western Corridor : Visual Sensitivity



Map E8 • Expanded Eastern Corridor : Visual Sensitivity

Western Expanded Corridor

- Moderate to good potential, in visual terms.
- Main pinch points - Namaqua National Park and Orange River

Eastern Expanded Corridor

- Moderate potential in visual terms.
- Main pinch points – Complex topography, game reserves, Umfolozi World Heritage Site

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Visual Impact Assessment – EGI

Key Impacts on Expanded Western Corridor	Mitigation
Potential visual intrusion on scenic mountain ranges, escarpment and granite outcrops. *E.g. Kamiesberg Mountains in the south, mountain peaks around Springbok.*	Avoid development on visually sensitive mountain peaks, ridge skylines and steep slopes.
Potential visual impact on national parks, nature reserves, and their related wilderness experience. *E.g. Namaqua National Park and related wild flower reserve, Richtersveld Transfrontier Park and World Heritage Site*	Avoid development within viewshed of protected landscapes. Screen substations from view by means of earth berms or tree planting.
Potential visual impact on private reserves, game farms and tourism facilities.	Avoid development where scenic resources or tourism facilities would be compromised.
Potential visual impact on river corridors, which often form green oases in the arid landscape. *E.g. Orange River (Gariep R.), Groen River.*	Although river crossings are inevitable, avoid scenic gorges or ravines. Avoid transmission lines running along river valleys.
Potential visual impact on mission settlements, historical towns and other heritage sites. *E.g. Steinkopf, Rietpoort mission settlements, historical mining towns (Nababeep, Okiep, Concordia) and other historical settlements / sites.*	Avoid powerlines and substations intruding on historical settlements and sites. Maintain recommended visual buffers.
Potential visual impact on national / arterial and scenic routes / mountain passes. Also historical rail lines. *E.g. N7, particularly between Kamieskroon and Springbok*	Avoid powerlines crossing or running adjacent to scenic routes / passes. Locate substations away from routes and screen where necessary.

Visual Impact Assessment – EGI

Key Impacts on Expanded Eastern Corridor	Mitigation
Potential visual intrusion on scenic mountain ranges, ridgelines, scarp edges, dolerite koppies and high coastal dunes *E.g. Lebombo and Ubombo Mountains in the north, High dunes along the coast.*	Avoid development on visually sensitive mountain ridge skylines, scarp edges, dolerite koppies, dunes and steep slopes.
Potential visual impact on game reserves, nature reserves, wilderness areas and tourism facilities, including their wilderness experience. *E.g. Mkuze Game Reserve in the north. Hluhluwe/ Umfolozi Game Reserves further south. St Lucia Game Reserve and World heritage Site at the coast.*	Avoid development within viewshed of protected landscapes. Screen substations from view by means of earth berms or tree planting.
Potential visual impact on river valleys, gorges, ravines, waterfalls, estuaries and wetlands. *E.g. Primarily the St Lucia wetland system. Lake Sibayi and Kosi Lake to the north. The large Jozini Dam (Pongolopoort Dam). The Tugela River Valley and tributaries.*	Although river crossings are inevitable, avoid scenic ravines and estuaries. Avoid transmission lines running along river valleys.
Potential visual impact on historic towns and settlements, and heritage sites including battle sites and gravesites. *E.g. Numerous traditional settlements. Towns, villages and heritage sites.*	Avoid powerlines intruding on historic settlements and battle sites. Maintain recommended visual buffers.
Potential visual impact on national, arterial and scenic routes, and passenger rail lines. *E.g. The N2, particularly along the coast and across estuaries. The Pongola poort to Jozini. Numerous scenic routes and passes in rural areas.*	Avoid powerlines crossing or running adjacent to scenic routes / passes. Locate substations away from routes and screen where necessary.

Visual Impact Assessment – EGI

Conclusion:

- Opportunities do exist in both of the expanded corridors for the alignment of transmission lines, although a number of pinch-points need to be negotiated.
- The varied nature of the landscape in the two expanded EGI corridors, and widespread occurrence of scenic and heritage resources, will require careful micro-siting of powerlines and substations at the project level.

Social, Planning, Disaster Management – Gas Pipelines

Purpose:

- To identify key settlement planning and development considerations
- To identify key impacts associated with the construction and operation of a gas pipeline on the communities livelihoods
- To outline the various agencies that have to be involved in disaster management as part of the pipeline operations.

Approach: Sensitivity mapping with respect to 3 key components:

- population density
- development intensity and extent
- land-use management and tenure

Key Social, Planning, Disaster Management – Gas Pipelines

Corridor	Settlement Planning
West Coast Corridors (Phase 5 and 6)	Suitable - limited settlement and sensitivities. Fewer towns, and is sparsely populated. Largest extent is commercial farmland.
Southern Coast Corridor (Phase 1 and 2)	Suitable - highest levels of sensitivity within the vicinity of the greater Cape Town City Region area and around the coastal cities
Inland Corridor	Suitable and limited development sensitivities. Mostly low sensitivity related to settlement planning and development.
Eastern Cape and KZN Coast (Phase 3, 4, 7)	High levels of sensitivity around the bigger eThekwini - Pietermaritzburg City Region areas, Richards Bay urban complex . Densely settled rural areas which are mainly traditional authority areas.
Northern and Gauteng Corridor (Phase 3 and 8)	High levels of sensitivity around the bigger Gauteng City Region areas, major urban complexes, large towns and densely settled rural areas due to greater scale of people and area impacted by planning and construction.

Key potential impacts

- Land-use management implications (land negotiations, servitude proclamation)
- Risks to the local population due to the influx of job seekers
- Impact on the location options of new developments (extent and direction) due to the presence of the gas pipeline
- Disruptive impact on businesses contributing to the local economy during construction – high density areas
- Disruptive impact on population and service delivery during construction
- Impacts on local population due to the Presence of project workers/workforce
- Resettlement and relocation/ displacement impacts – high density areas
- Health Risks associated with a gas pipeline leak or fire
- Inability to effectively respond to gas pipeline leak or fire

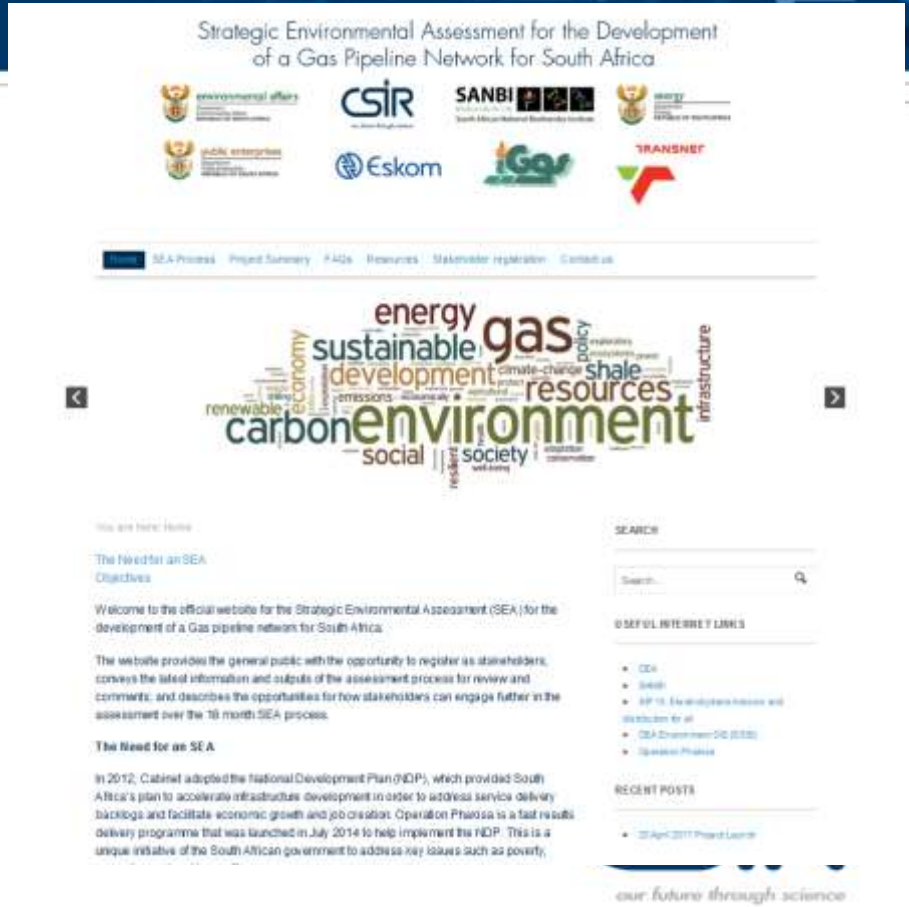
Project Way Forward

- Finalise Expert Peer Review process
- Second public outreach to be held (mid-September 2018) and public review.
- Finalisation of specialist studies
- SDF/IDP review and municipality feedback exercise – energy intensive activities that may motivate a re-alignment of the corridor
- Final pinch point → final refined corridors.
- Inputs from ERG/PSC members in terms of weighing of the various features when looking at an overall sensitivity for the least cost path analysis
- SEA Report and outputs to be finalised.

Project Website

Project Email Address:
gasnetwork@csir.co.za

Project Website:
https://gasnetwork.csir.co.za/



Thank you

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