

South Africa's Carbon Capture Utilisation and Storage Project

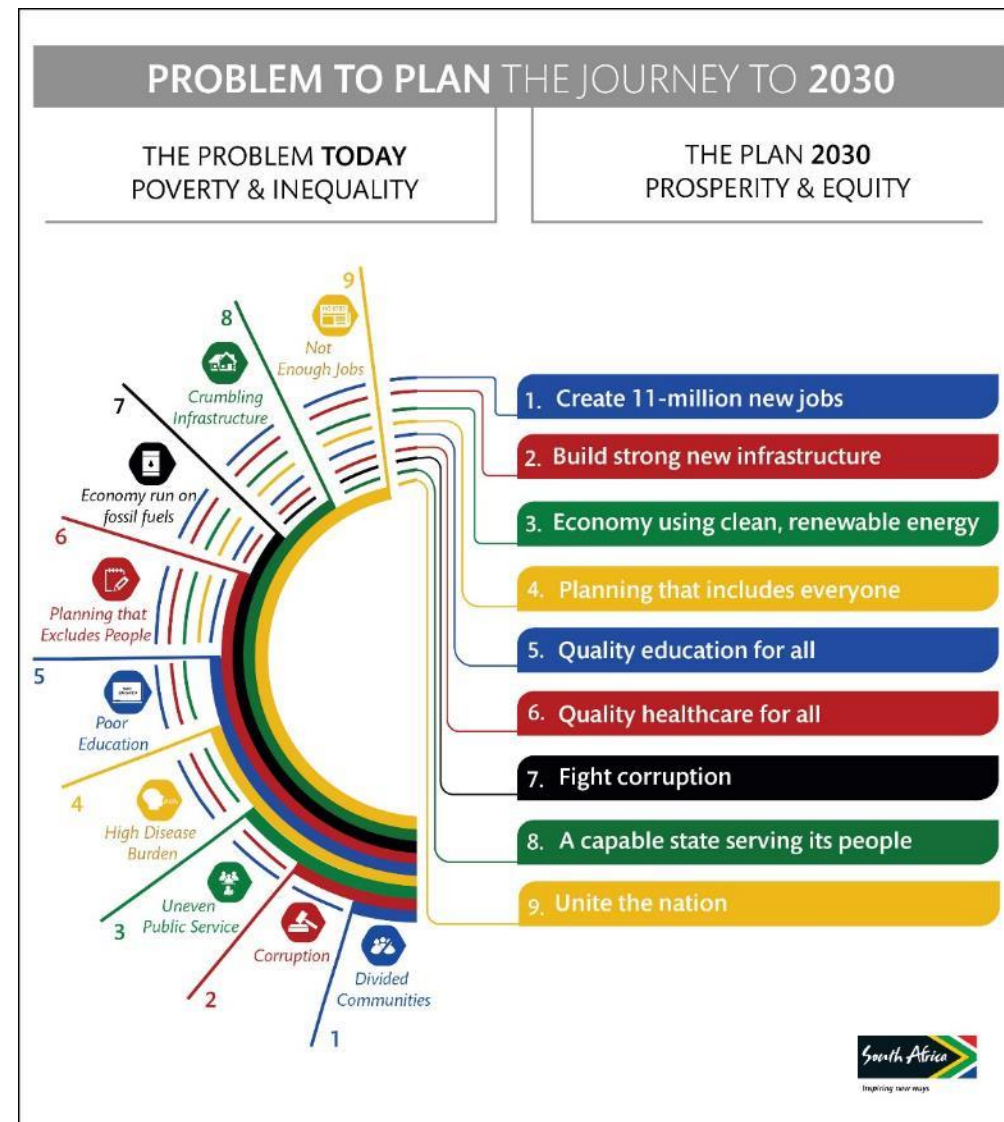
Council for Geoscience
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About the CGS – Principles

- The Council for Geoscience is established under the Geoscience Act, Act 100 of 1993, as amended, and is the mandated authority of all geoscientific data and information in South Africa;
- In addition, the Council for Geoscience is listed as a Schedule 3A Public Entity in terms of the Public Finance Management Act, Act 1 of 1999;
- The Council for Geoscience's operations are enshrined within the principles of the National Development Plan and the Strategic Development Goals;
- These are exclusively focussed toward the improvement of society through innovative geoscience solutions;

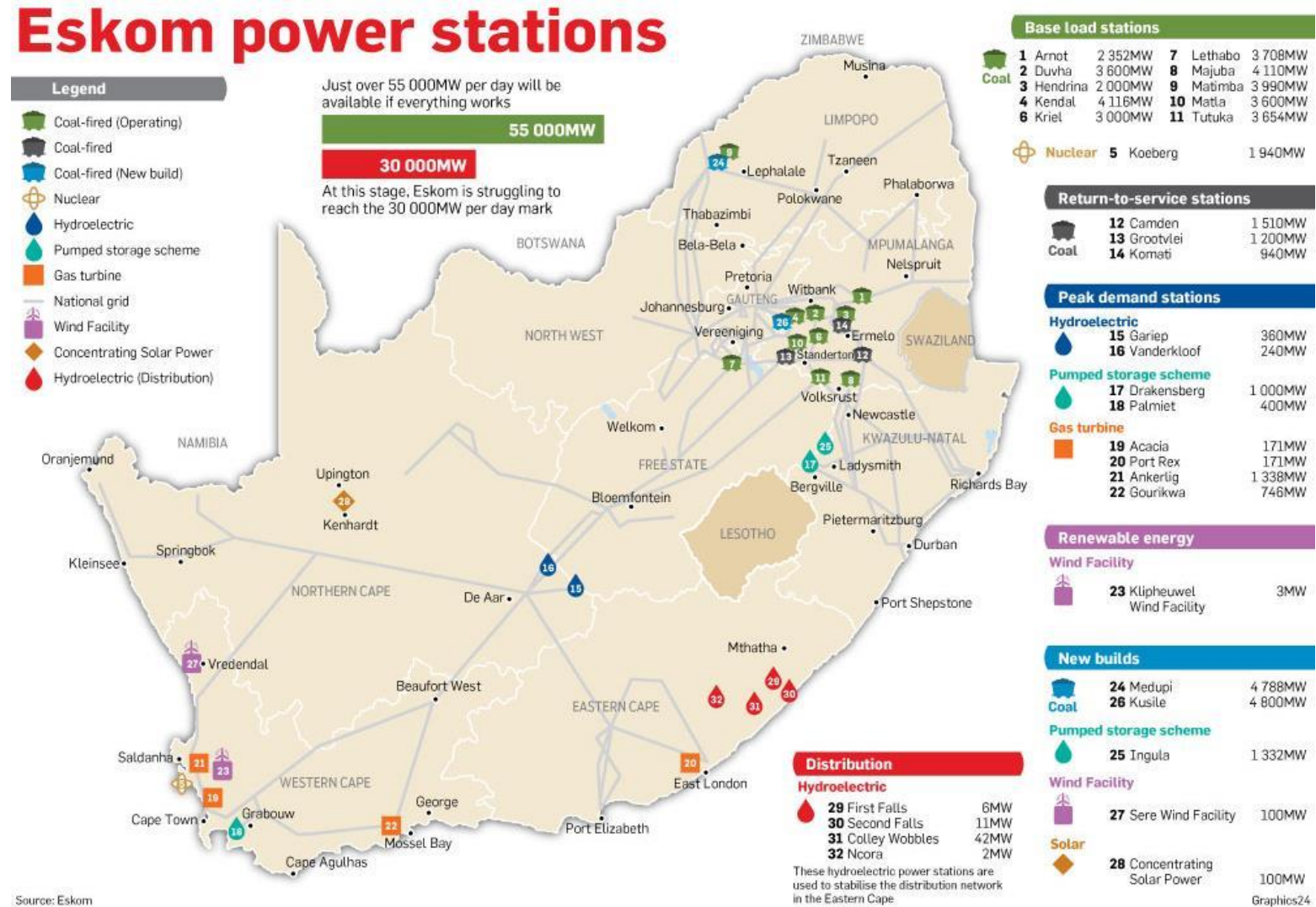


The South African energy landscape



The SA energy landscape – Energy generation

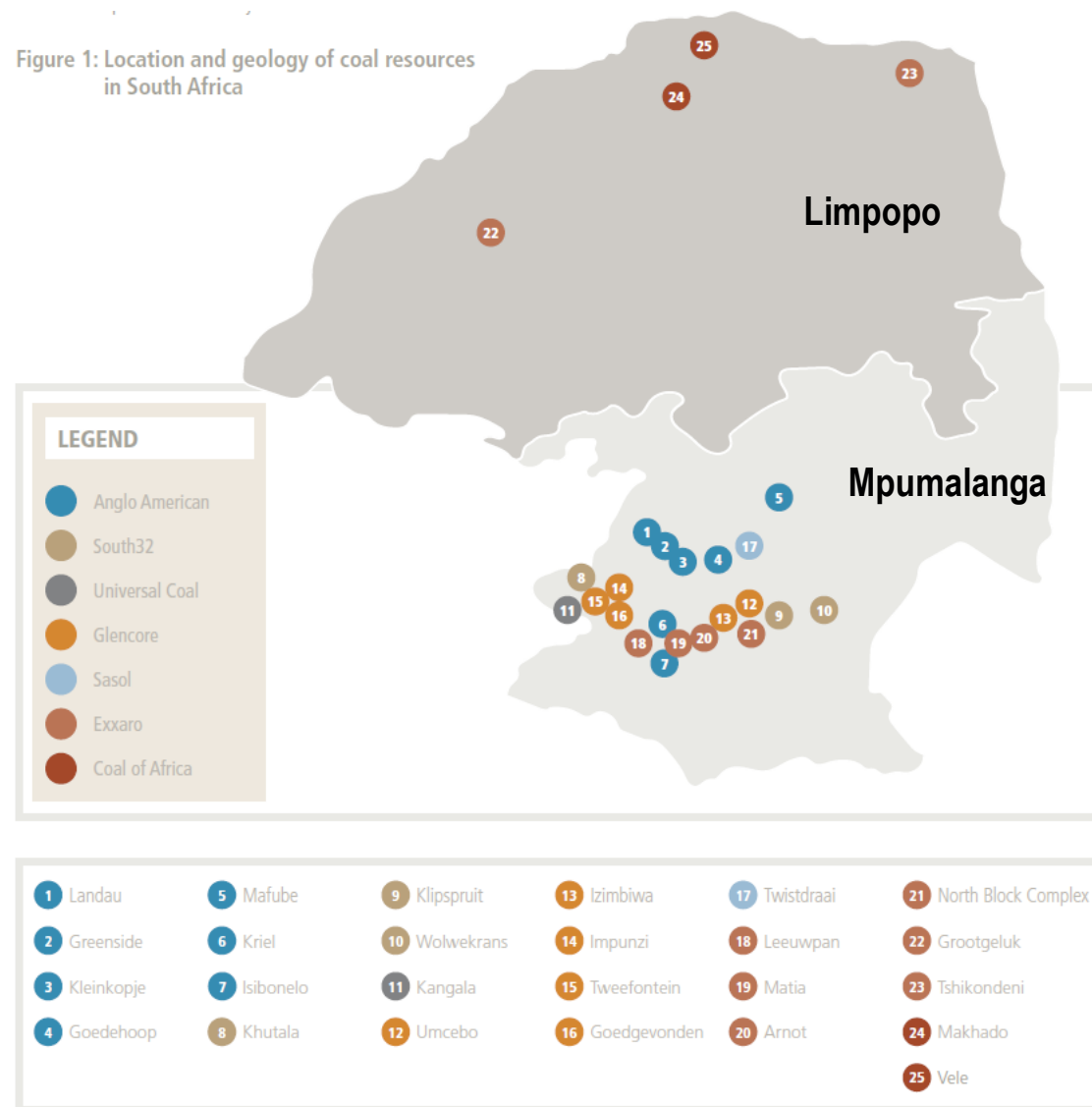
- South Africa is one of the largest energy-producers in Africa;
- More than two-thirds of energy generation capacity is developed from the country's vast coal resources;
- Most of the coal-fired energy generation is produced within the Mpumalanga Province;
- Many of these energy generation plants are planned for decommissioning in the next 5-10 years;



The SA energy landscape – Coal resources

- South Africa is one of the world's largest coal producers and still has significant coal resources;
- The vast majority of these coal resources are currently developed in the Mpumalanga and Limpopo Provinces, with the largest producer being the Mpumalanga Province;
- These coal resources and the associated downstream petrochemical industries form a key contributor toward the development imperatives;

Figure 1: Location and geology of coal resources in South Africa



The SA energy landscape – Energy society nexus

- The coal and associated petrochemical industry will still form a key component of South Africa’s medium to long-term developmental imperatives;
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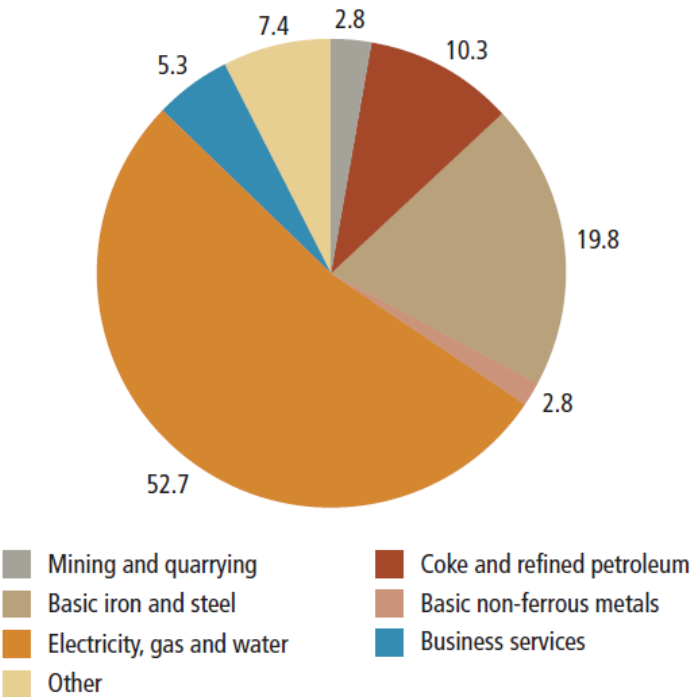
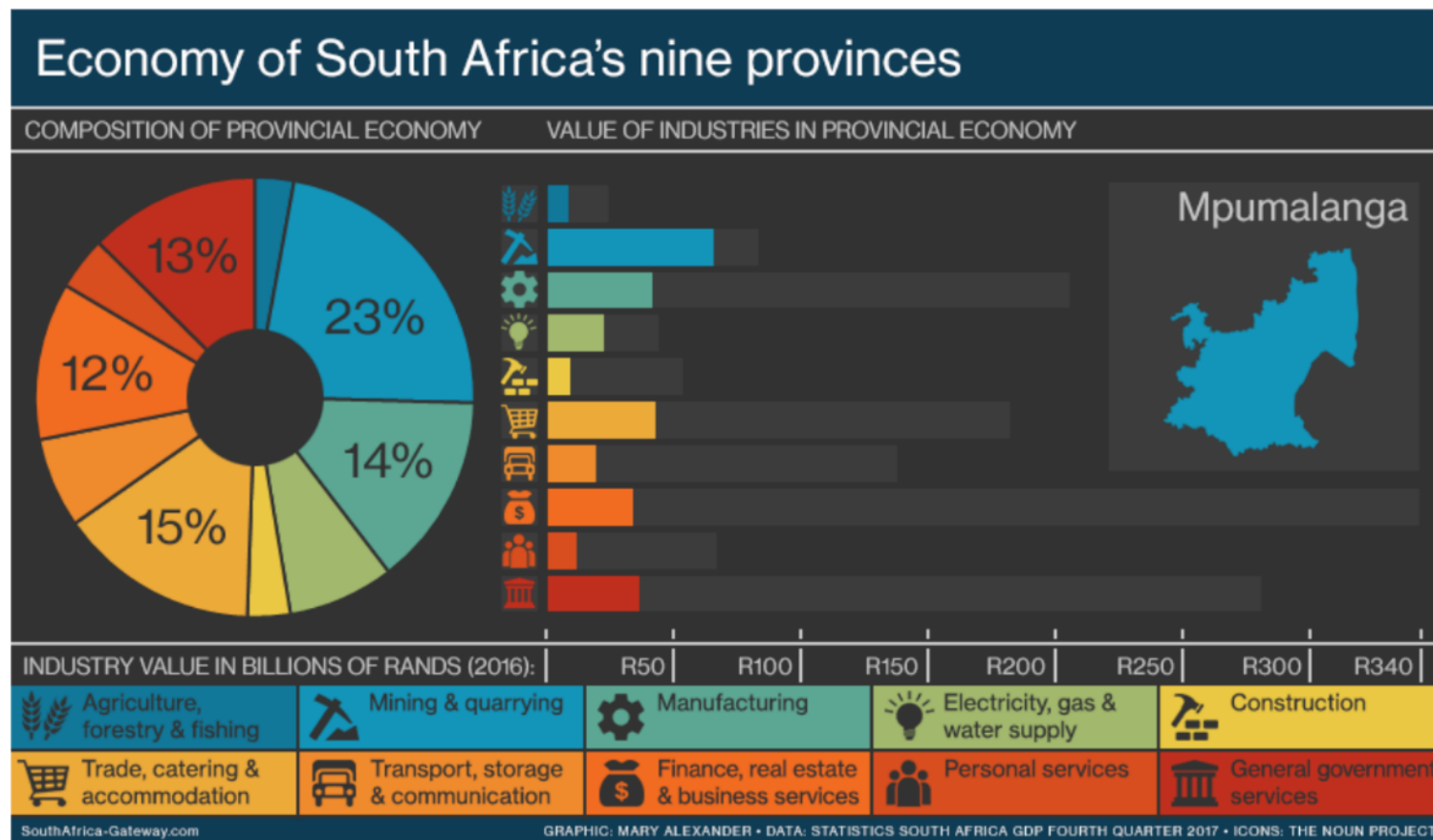


Table 9: Jobs created by the coal industry in the rest of the economy (2015)

Primary Industries	1,953
Agriculture, forestry and fisheries	181
Mining and quarrying	1,772
Secondary industries	48,779
Manufacturing	42,701
Petroleum, chemical, rubber, plastics	16,881
Electricity	5,073
Tertiary industries	154,064
Transport and storage	119,558
Other	34,506
Total	222,892
Less imported element	49,799
Net jobs created	173,093

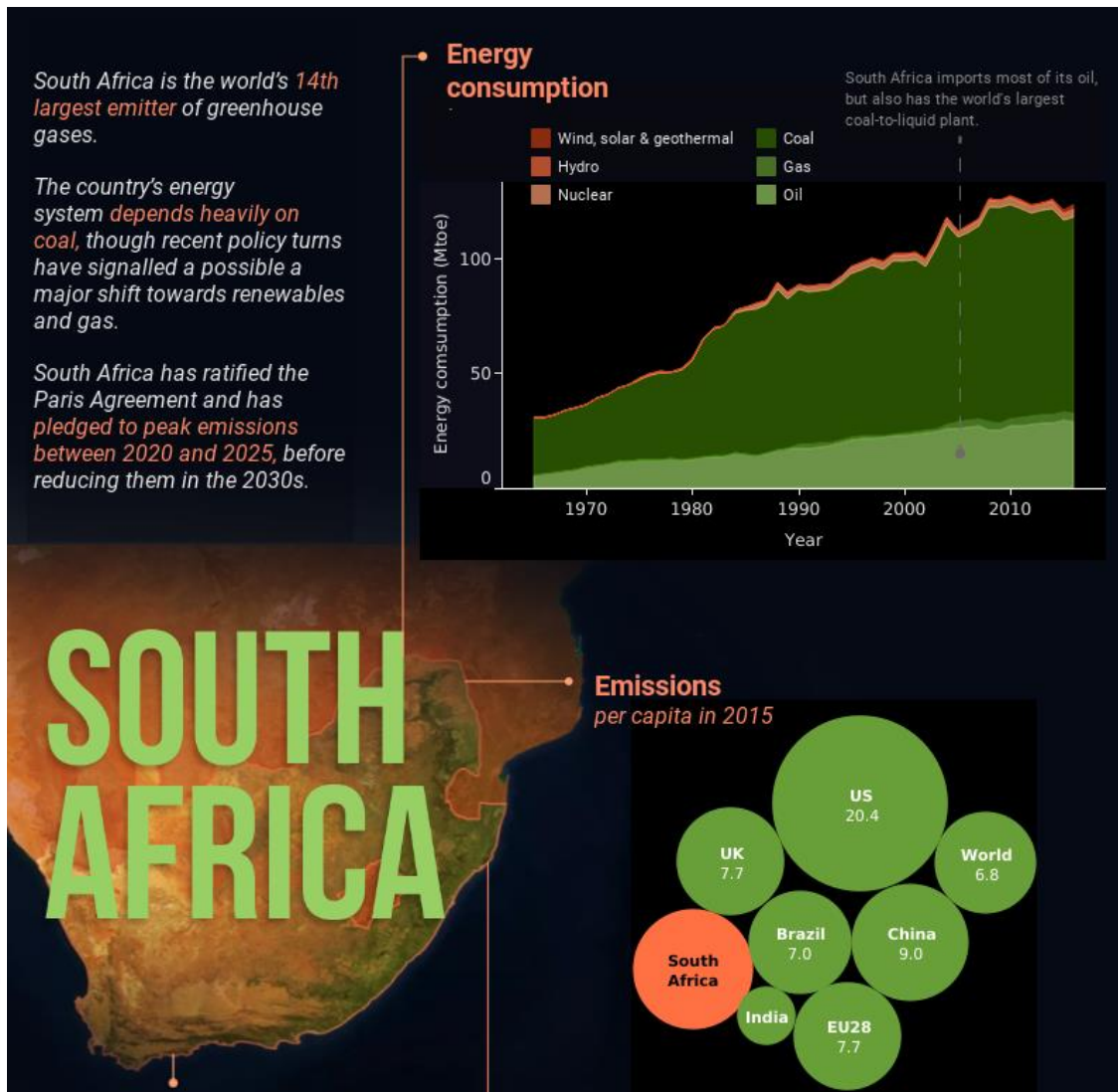
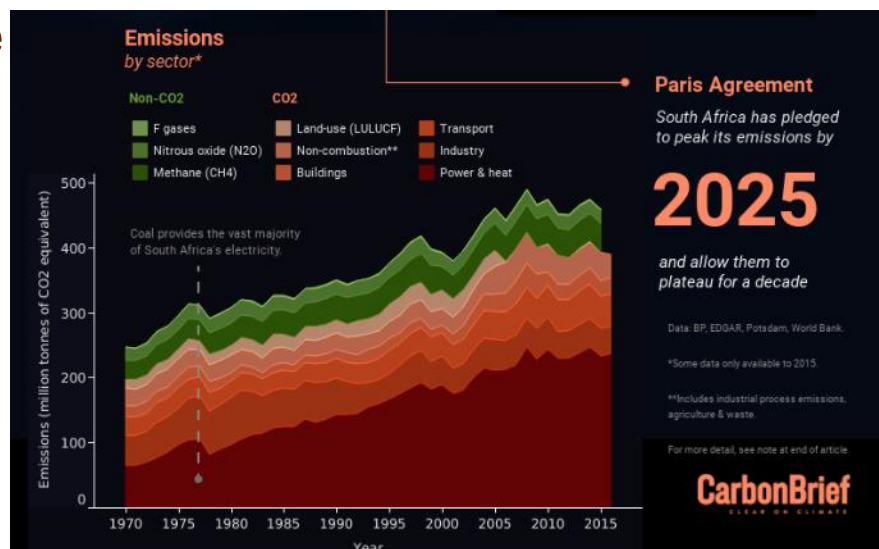
The SA energy landscape – Mpumalanga's economy

- Within Mpumalanga, the largest economic driver is the mining and manufacturing industries;
- These are largely linked to the coal and associated industries;
- There are however opportunities in other industries, e.g., agriculture;
- The balance is critical to maximise these opportunities;



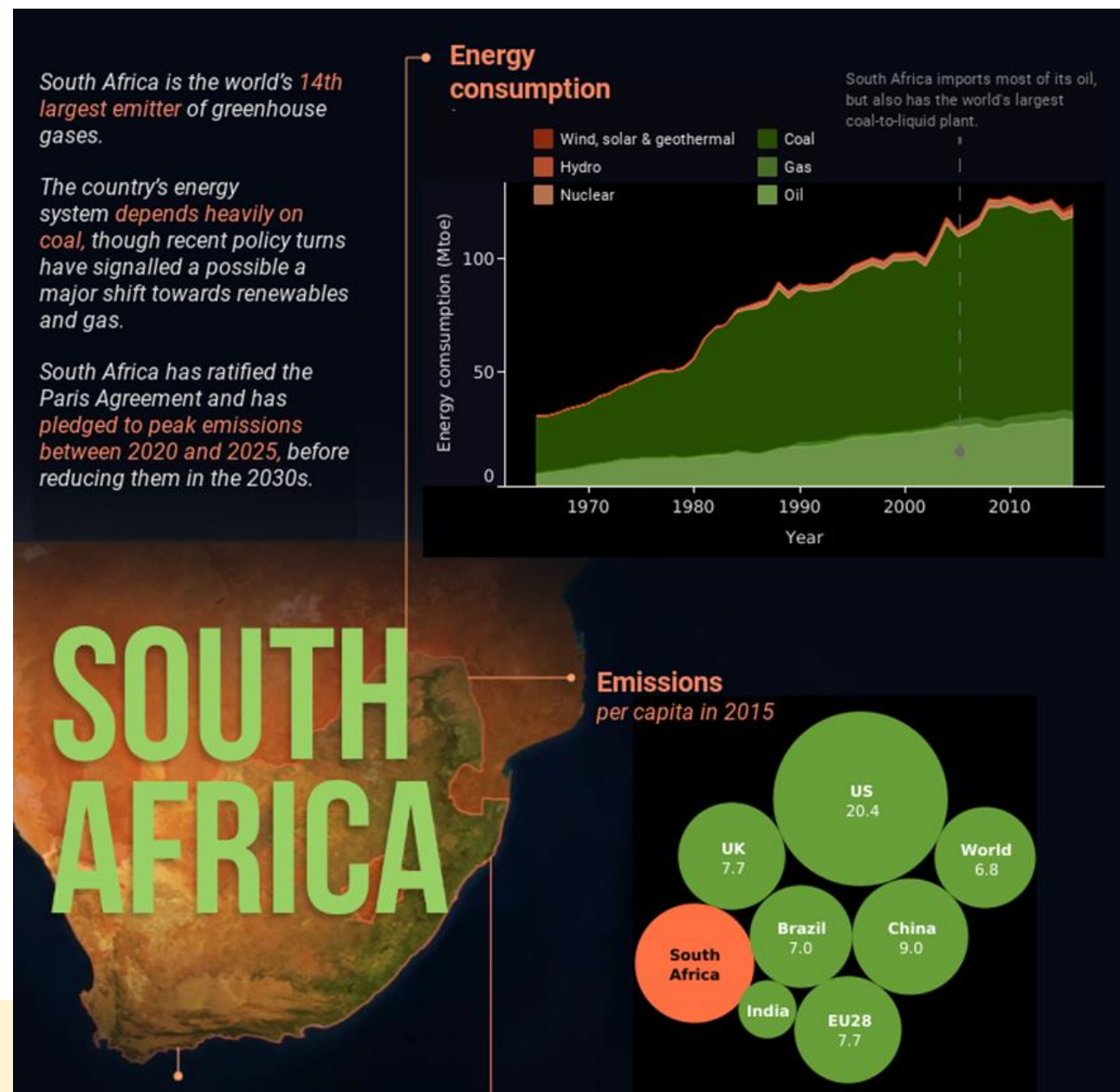
The SA energy landscape – CO₂ emissions

- Long-term usage of coal has made South Africa one of the largest rate of CO₂ emissions in the world;
- The South African Government has however committed to reducing CO₂ emissions by up to 50% in the next 10 years;
- However, there is a significant socioeconomic requirement on coal and therefore the reduction must take a sustainable approach;



The SA energy landscape – Just Transition

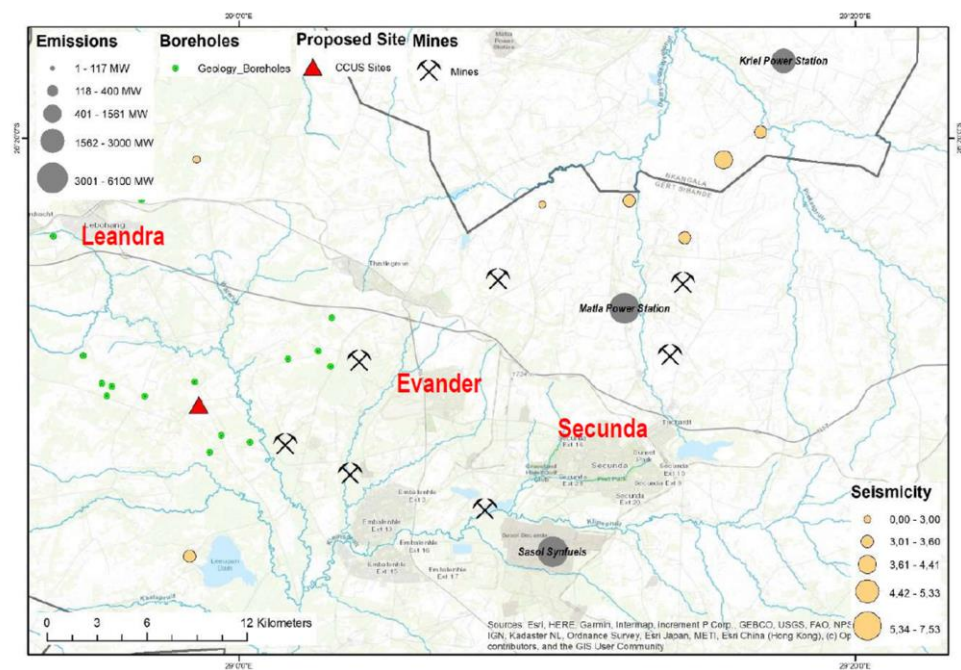
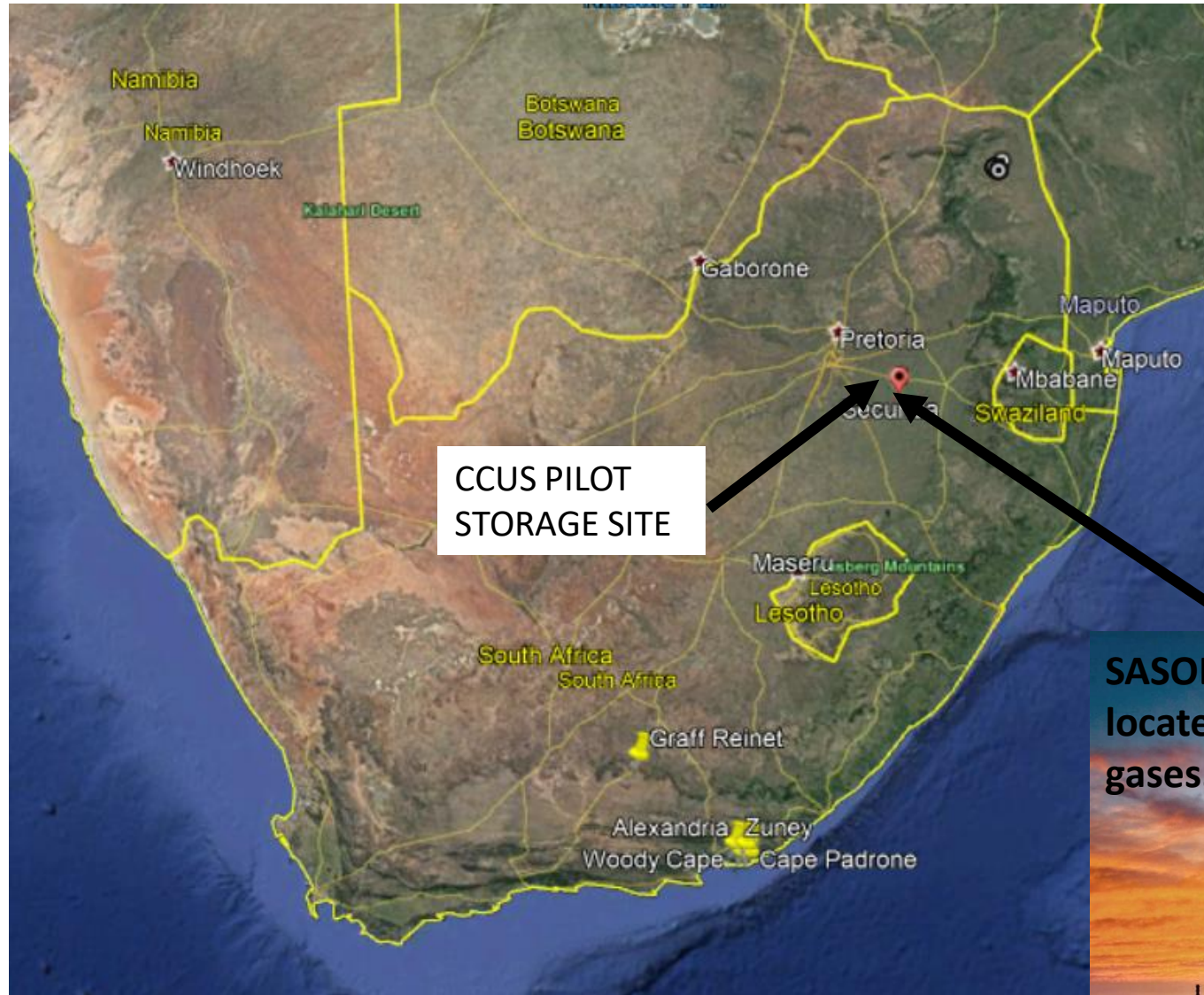
- South Africa will shift toward a low-carbon economy, however will need to do so in a sustainable manner;
- Social, economic and environmental considerations must be balanced to ensure a thorough Just Transition;
- Innovative solutions are needed to enable this sustainable transition;
- Carbon Capture, Utilisation and Storage provides such a possible solution. In particular, within areas with a large coal reliance, such as Mpumalanga;



Carbon Capture, Utilisation and Storage in South Africa



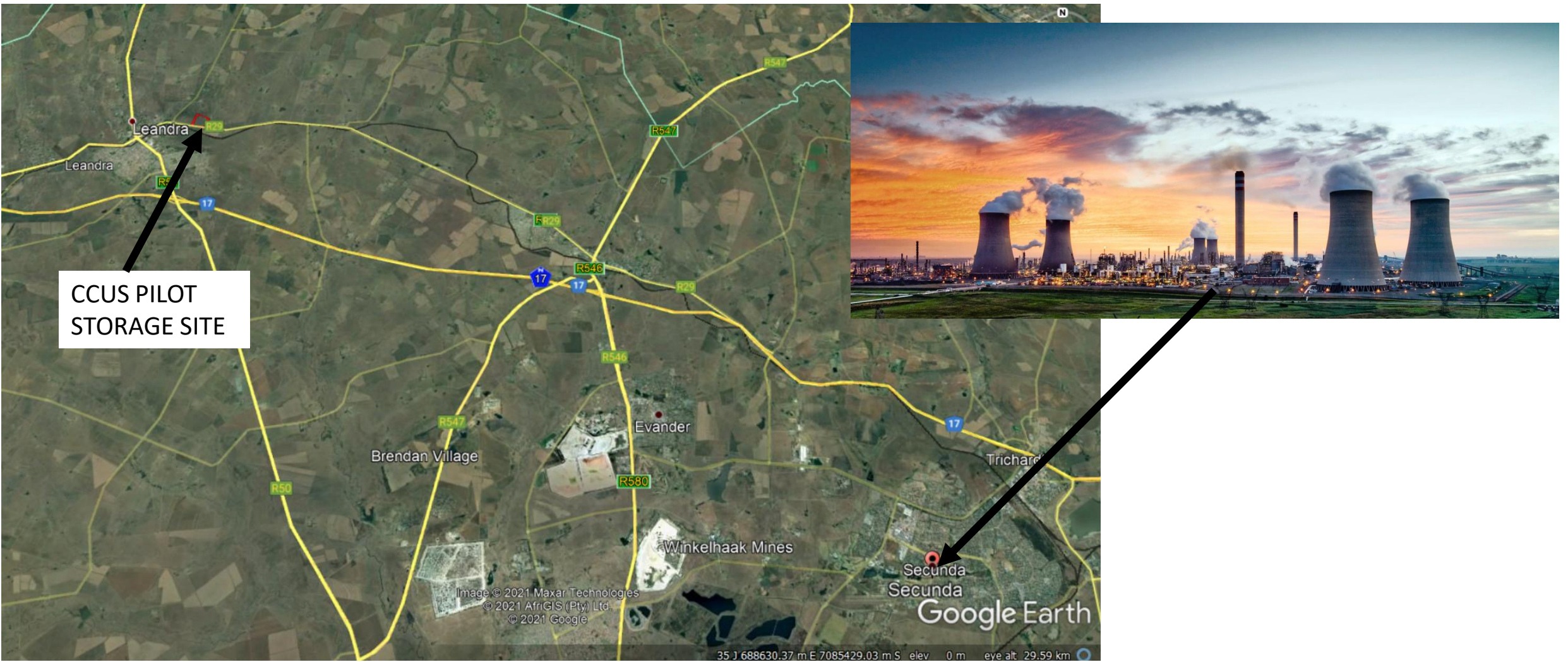
Carbon Capture, Utilisation and Storage in South Africa



SASOL Secunda is a vast coal-to-fuels and chemical plant located in South Africa. The facility issues 56.5 million tons of gases.

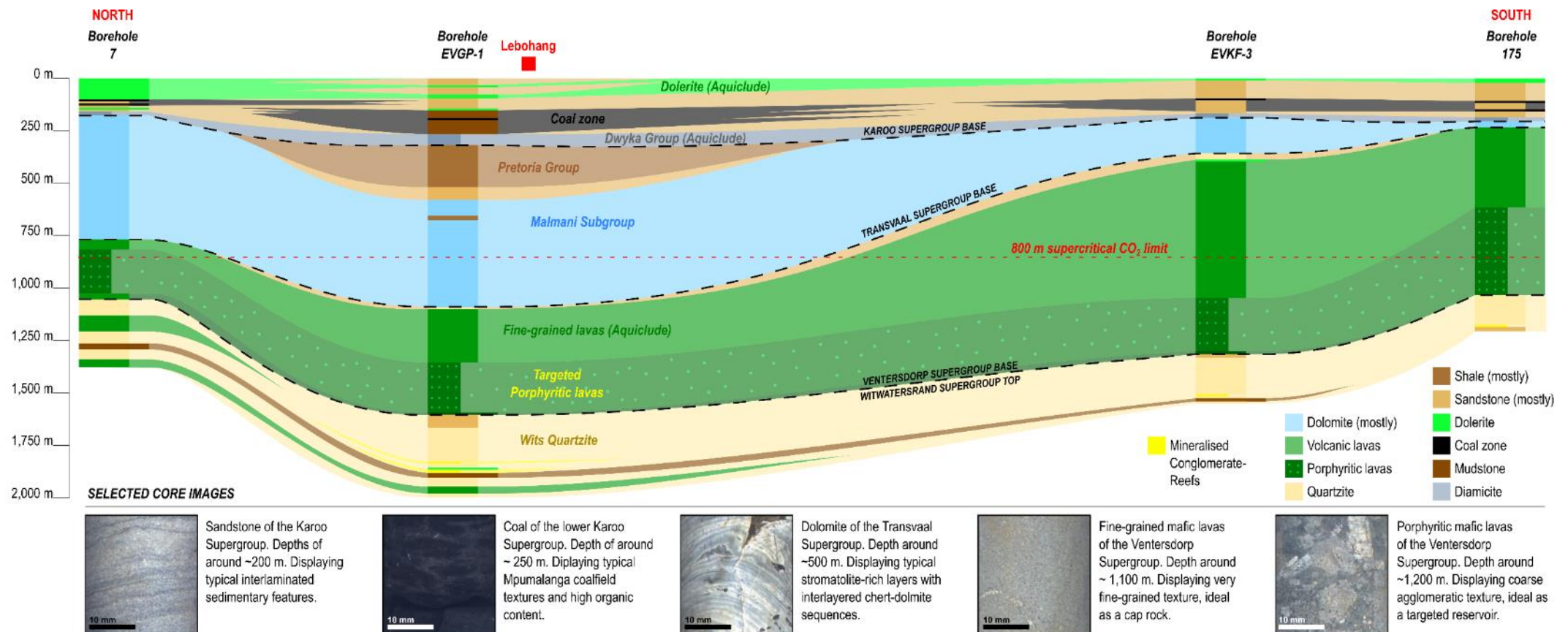


Carbon Capture, Utilisation and Storage in South Africa



Carbon Capture, Utilisation and Storage in South Africa

- An assessment of available geological data shows the availability of deep coal seams and potential CO₂ storage reservoirs can support CCUS development in the Mpumalanga Province;



Opportunities for Utilisation

- There are a number of possible industrial and chemical industries that can use the captured CO₂. These are largely linked to currently available industries and may influence additional economic development;
- Furthermore, captured CO₂ can be used of Carbon-Offsetting where Carbon credits may be used for additional economic development;
- Importantly, CO₂ can also be used to remediate the long-term negative effects of mining, including assisting in various agricultural needs;



Construction Materials

- Cement and concrete
- Asphalt
- Aggregate
- Timber/super hardwood



Fuel

- Synthetic (methanol, butanol, natural gas, syngas, etc.)
- Micro-algae fuel
- Macro-algae fuel



New materials

- Carbon fiber
- Carbon nanotubes and fullerenes
- Graphene



Chemicals

- Preservatives (formic acid)
- Medicinal
- Antifreeze (ethylene glycol)
- Carbon black
- Many more



Industrial gas & fluids

- Enhanced oil recovery
- Enhanced coal bed methane recovery
- Enhanced water recovery
- Semiconductor fabrication
- Power cycles



Polymers

- Polyurethane foams
- Polycarbonate (glass replacement)
- Acrylonitrile butadiene styrene
- Many more

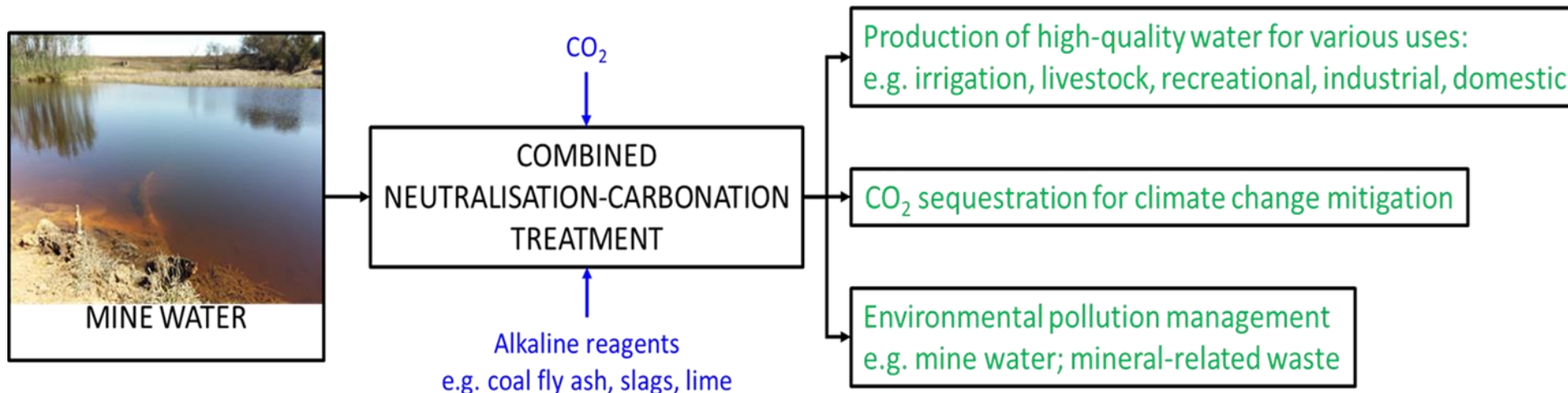


Agriculture & food

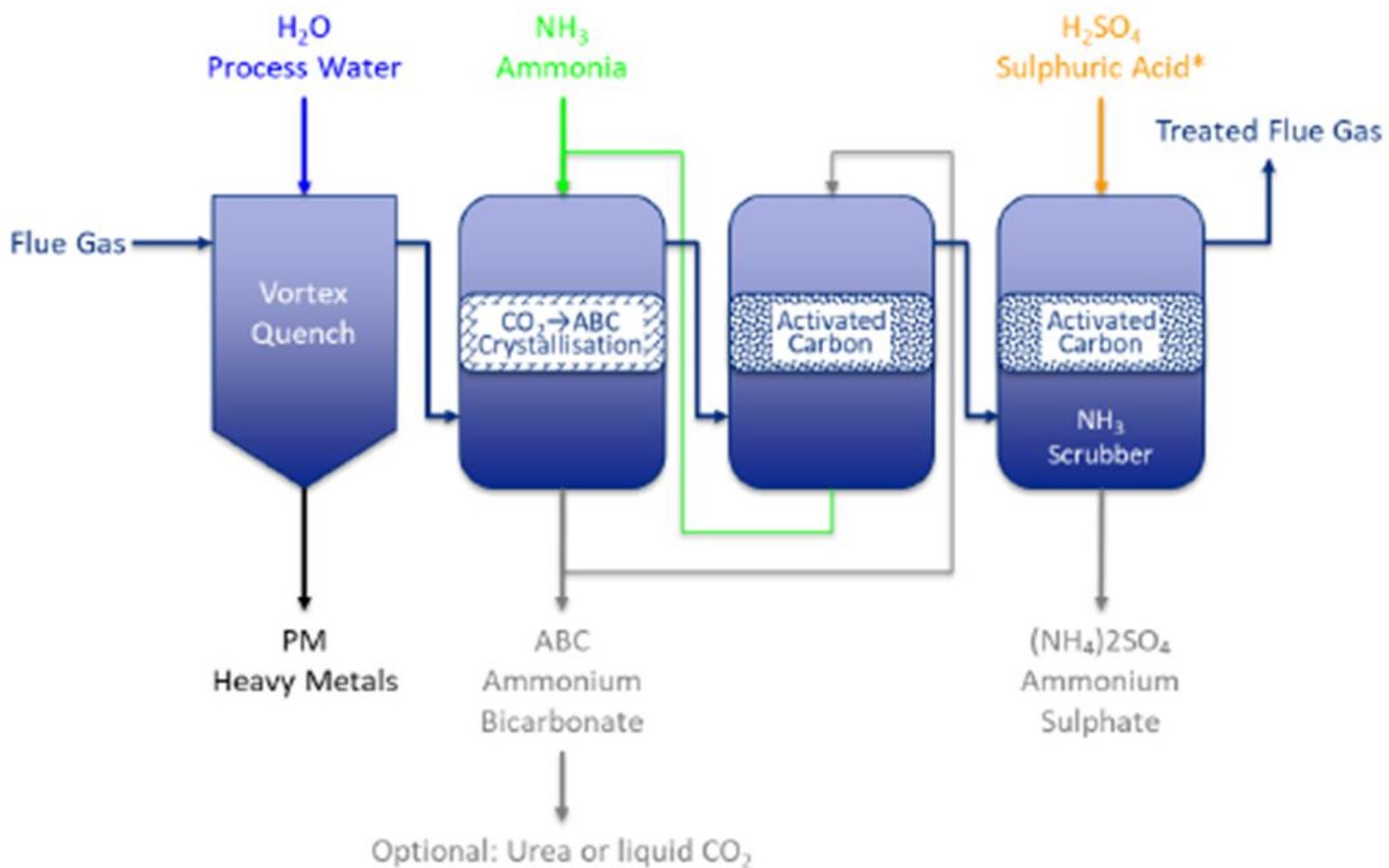
- Algae-based food or animal feed
- Microbial fertilizer
- Biochar, bio-pesticides, bio-cosmetics

Opportunities for Utilisation- Acid Mine Drainage

- Application CO₂ mineralisation to treat acid mine drainage. Mineral carbonation could be applied strategically in the ex situ treatment of mine water in South Africa, with the four-fold holistic purpose of :
 - Sequestering CO₂ for climate change mitigation,
 - Treating mine water for environmental pollution management,
 - Producing high-quality water from mine water for various uses (e.g. irrigation, livestock, recreational, industrial, or even domestic uses) and long-term water resource sustainability, and
 - Reducing the volumes of mineral waste residues for reduced residue management cost, reduced environmental pollution risks, and possible land reclamation.



Opportunities for Utilisation- Fertilizer production



Location: Cimalux site at Rumelange (Luxembourg)

Take-home message

1. Hydrocarbons are important for current and future socioeconomic development;
2. South Africa will use it's natural resources for continued development;
3. Mpumalanga relies heavily on the hydrocarbon sector;
4. South Africa will reduce CO2 emissions and focus on environmental sustainability;
5. CCUS provides a solution for this Just Transition;
6. The CGS will work toward implementing this technology;
7. The CGS aims to develop a pilot CCUS site in Leandra;
8. All focus is toward social, economic and environmental sustainability;



THANK YOU



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