

# COALFIELDS OF SOUTHERN AND CENTRAL AFRICA: REMAINING RESOURCES AND OPPORTUNITIES



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**COALTRANS CONFERENCE**  
**18<sup>TH</sup> SEPTEMBER 2019**



2016

<http://52.172.159.94/index.php/epi/article/view/95785>



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# The Coalfields of South-Central Africa: A Current Perspective

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*Africa is host to coal deposits stretching from the far north to the far south and ranging in age from the Carboniferous through to the Miocene. Coal production in the north of the continent is however currently of a very limited nature compared to that in the south, where due mainly to its low cost and relative abundance, the commodity has long been the primary source of energy.*

hydroelectric. Zambia also relies heavily on hydropower, but currently some 300 MW of coal fired capacity is being built. Despite its huge coalfields (and various plans for coal-fired power stations) almost all of Mozambique's electricity generation is from hydropower. Although a number of coal fired units are being planned, Tanzania currently uses roughly equal amounts of hydro, natural gas and liquid fuel power plants. Coal is also used extensively in the metallurgical industry, with South Africa, Zimbabwe and Mozambique containing the largest and best resources.

# **PRESENTATION LAYOUT**

- **RESOURCES VS RESERVES**
- **GEOGRAPHICAL LOCATION**
- **GEOLOGICAL AND ECONOMIC SIGNIFICANCE OF THE KAROO AGED DEPOSITS**
  - **GENERAL STRATIGRAPHY**
  - **SOUTH AFRICA – MAIN COALFIELDS**
    - **REST OF SOUTH CENTRAL AFRICA**
  - **UNLOCKING THE VALUE OF SOUTHERN AFRICAN COAL RESOURCES**
- **OPPORTUNITIES FOR THE COAL INDUSTRY**

# RESOURCES AND RESERVES

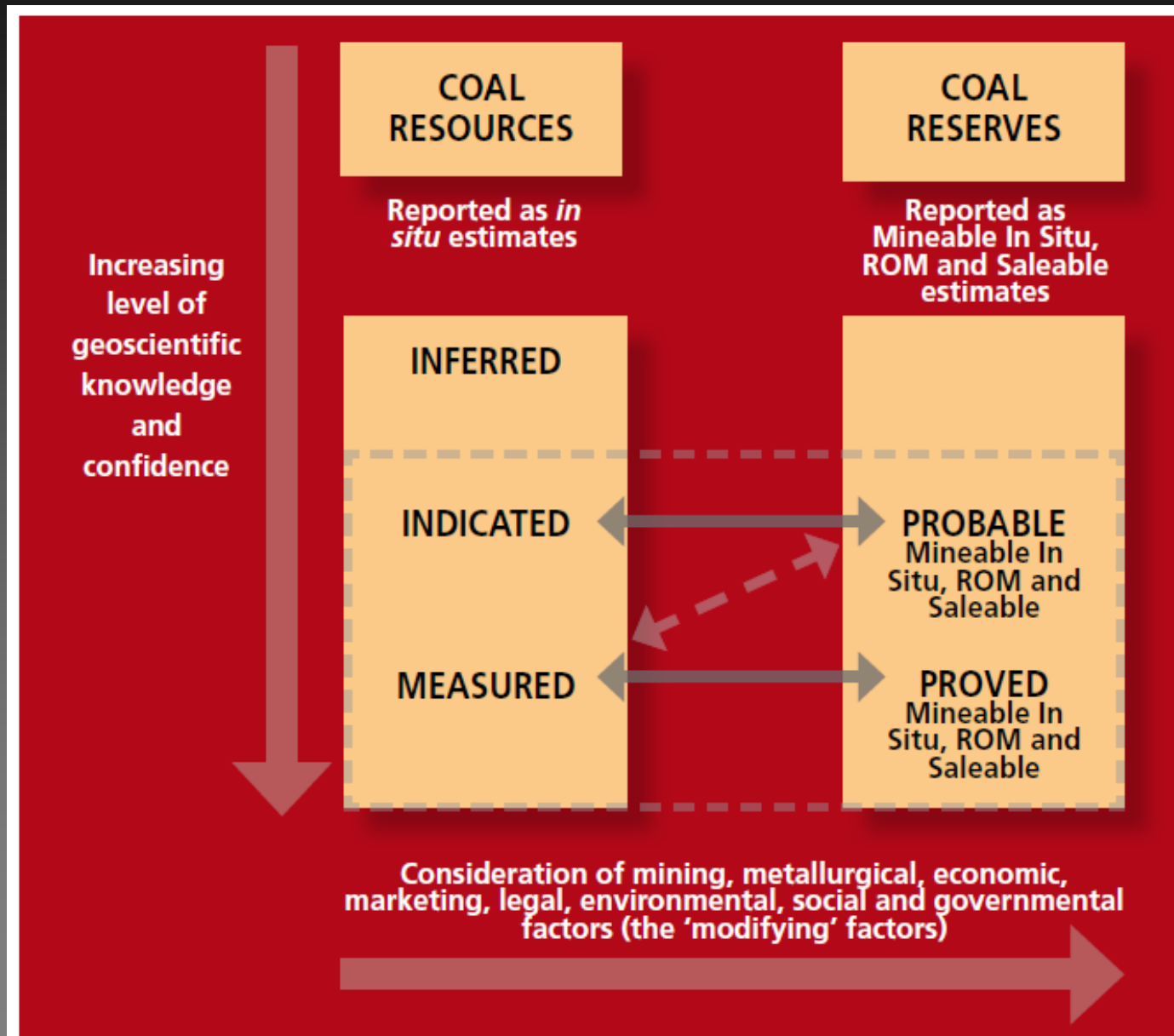
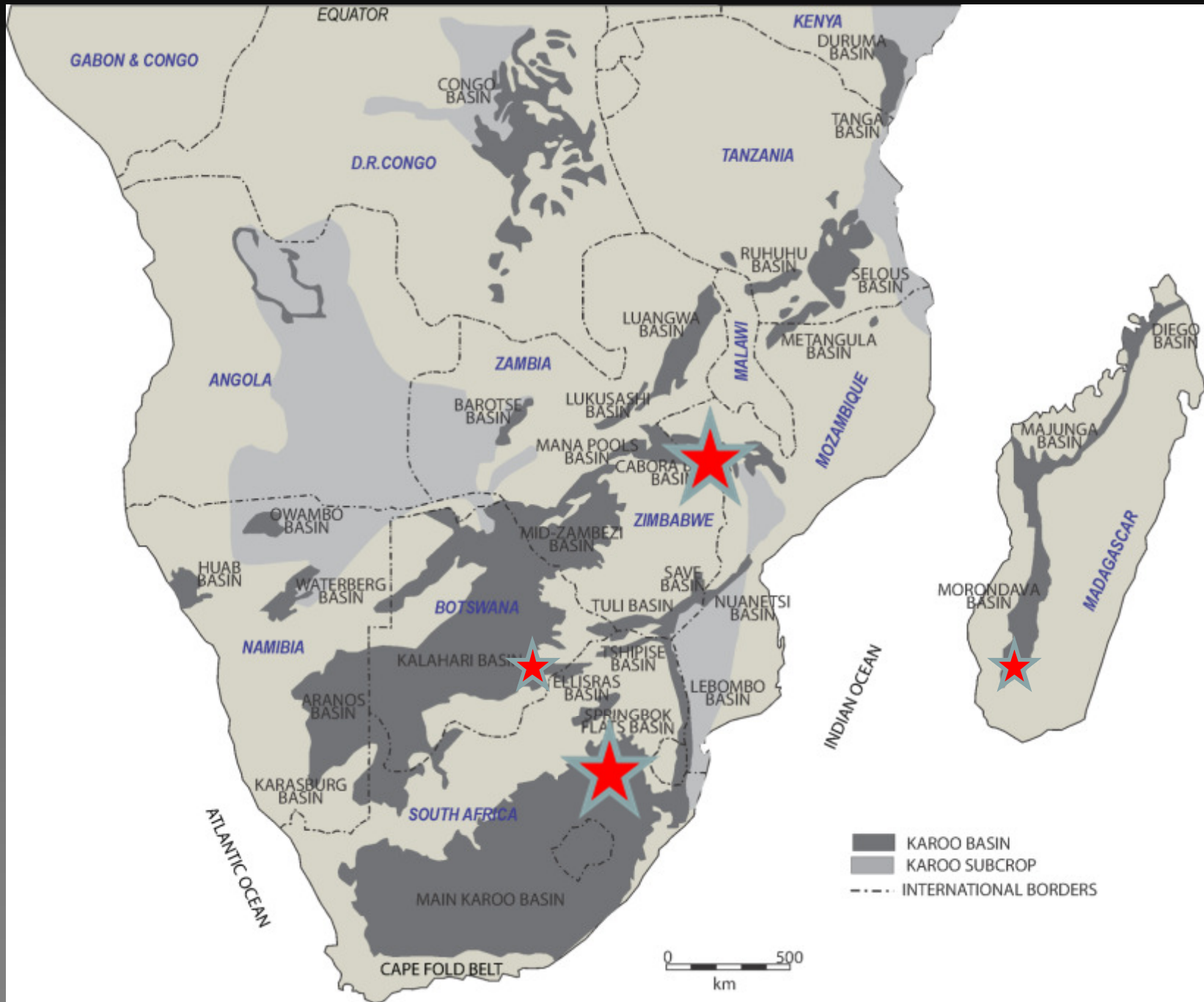


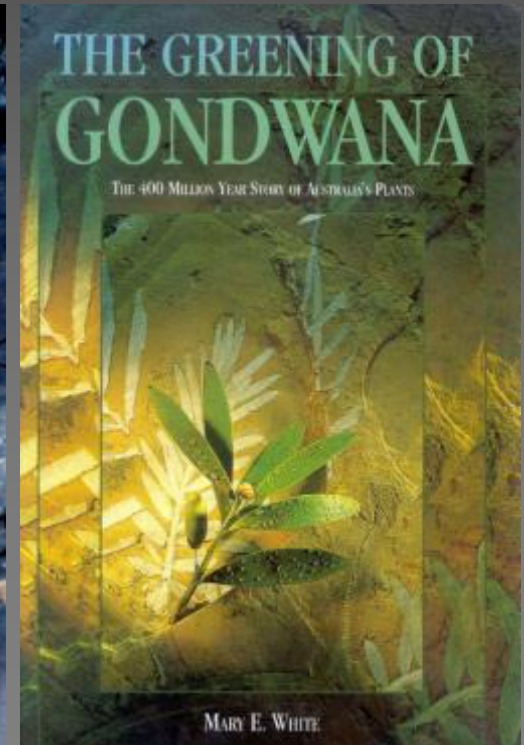
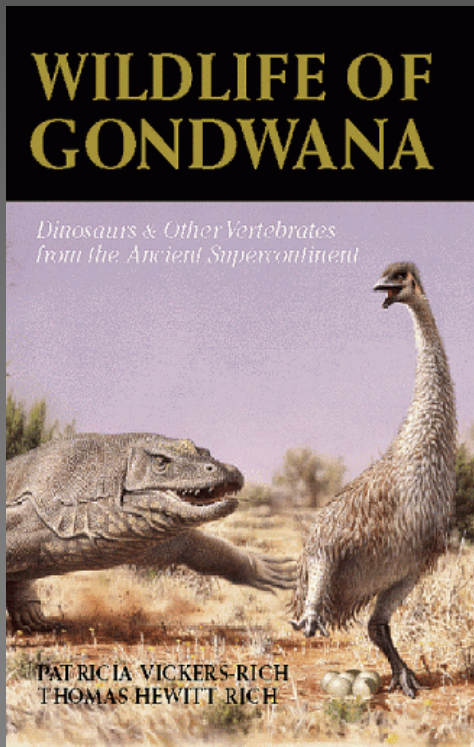
Figure 2: Relationship between Coal Resources and Coal Reserves

SAMREC (2016)



# GEOLOGICAL SIGNIFICANCE

- 120 MILLION YEAR HISTORY OF LIFE ON EARTH
- GONDWANA REACHED ITS MAXIMUM EXTENT
- SEDIMENTARY FILLS A PROXY FOR CLIMATE CHANGE



# ECONOMIC SIGNIFICANCE

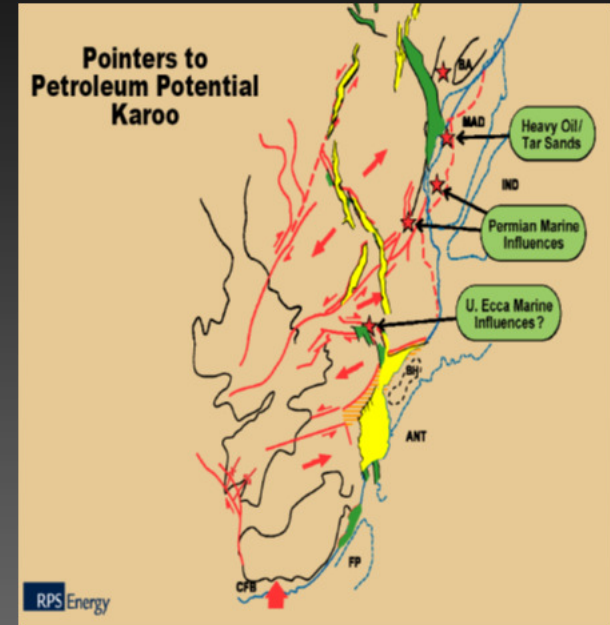


**URANIUM**

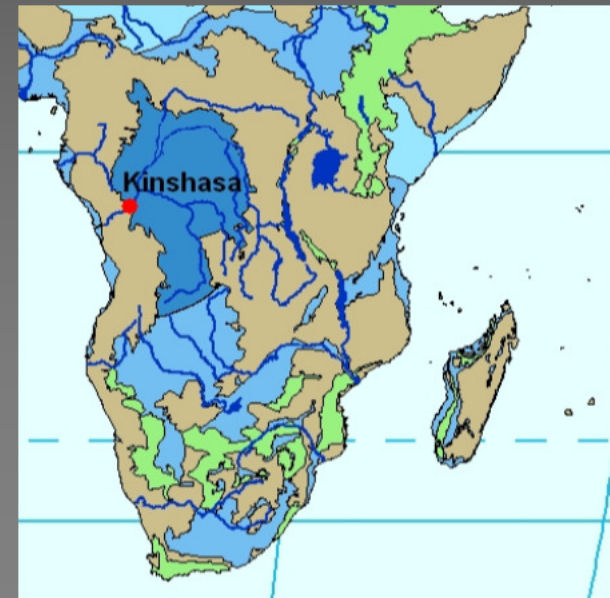
**COAL & CBM  
SHALE GAS**

**PETROLEUM**

**GROUND  
WATER**



**GEO THERMAL**



## The Karoo Basin of South Africa: type basin for the coal-bearing deposits of southern Africa

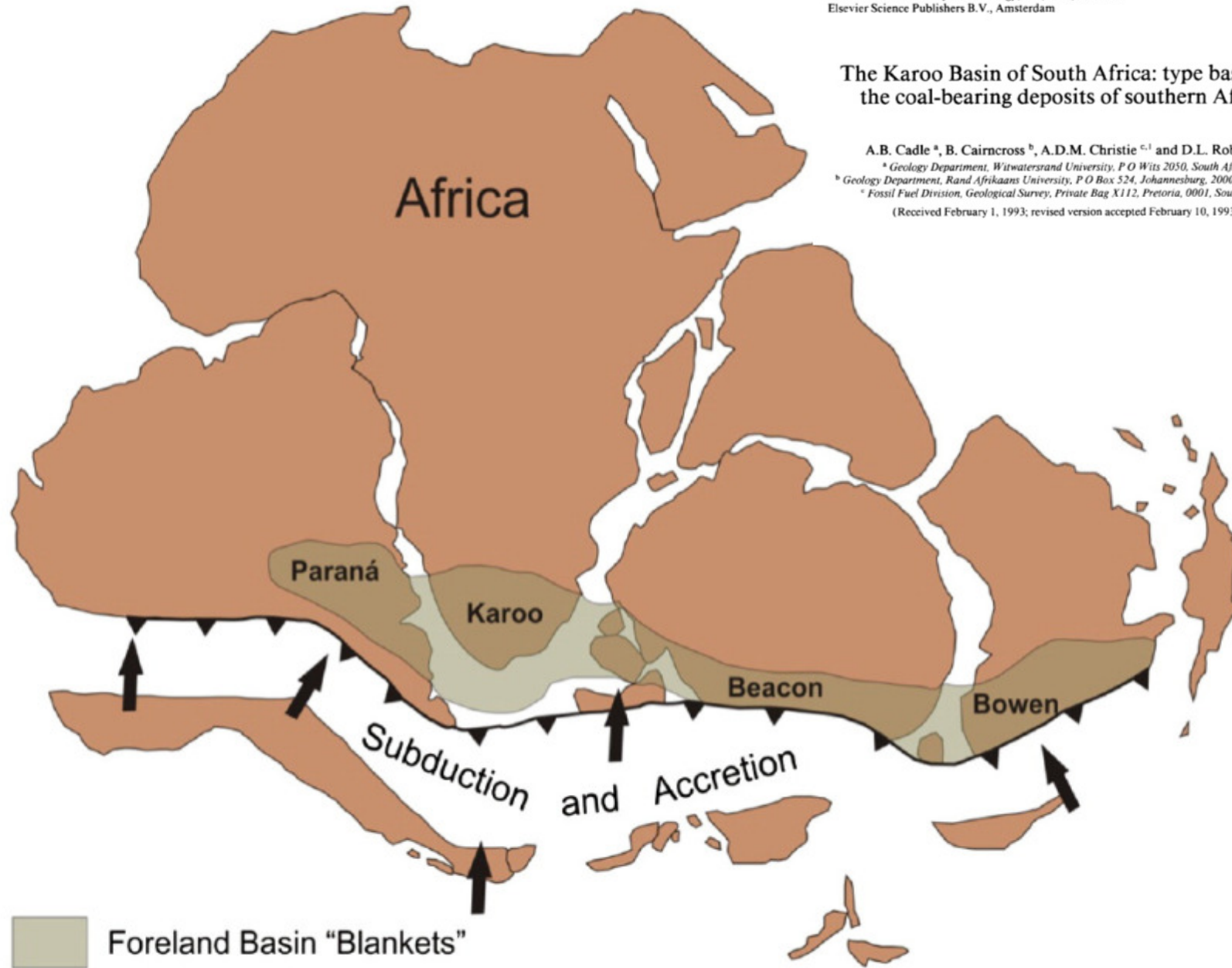
A.B. Cadle <sup>a</sup>, B. Cairncross <sup>b</sup>, A.D.M. Christie <sup>c,1</sup> and D.L. Roberts <sup>c</sup>

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<sup>b</sup> Geology Department, Rand Afrikaans University, P.O. Box 524, Johannesburg, 2000, South Africa

<sup>c</sup> Fossil Fuel Division, Geological Survey, Private Bag X112, Pretoria, 0001, South Africa

(Received February 1, 1993; revised version accepted February 10, 1993)

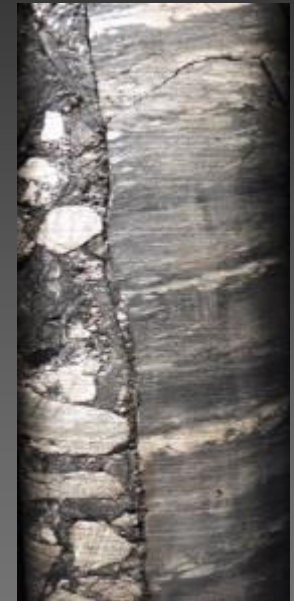




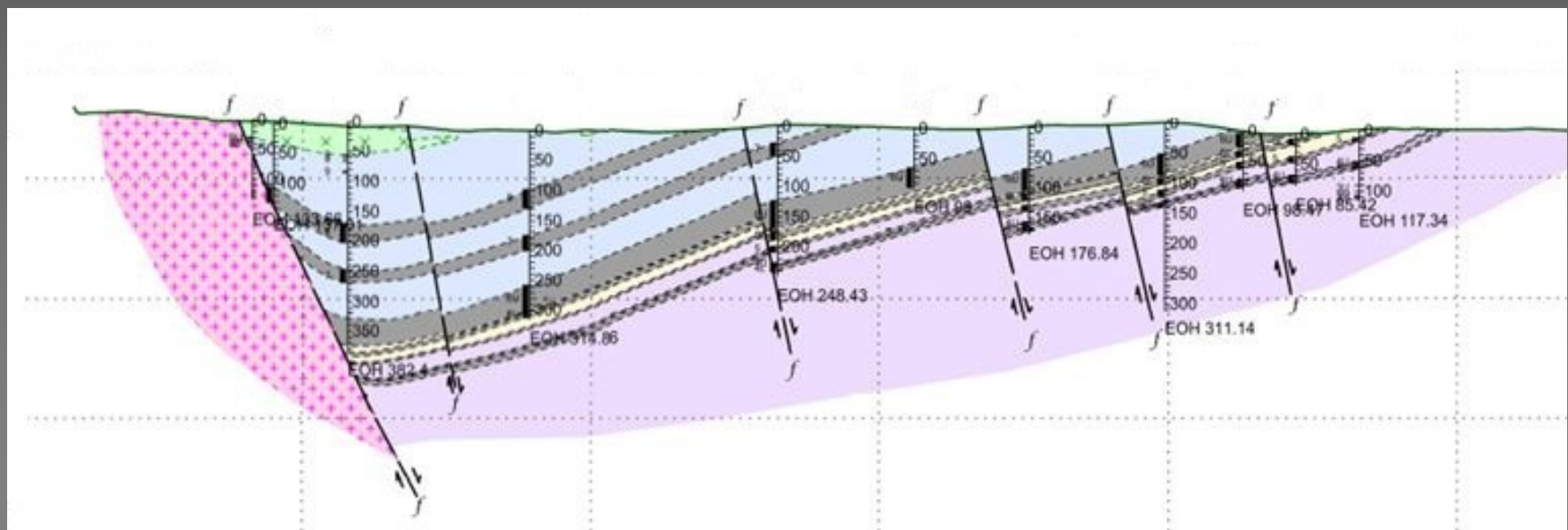
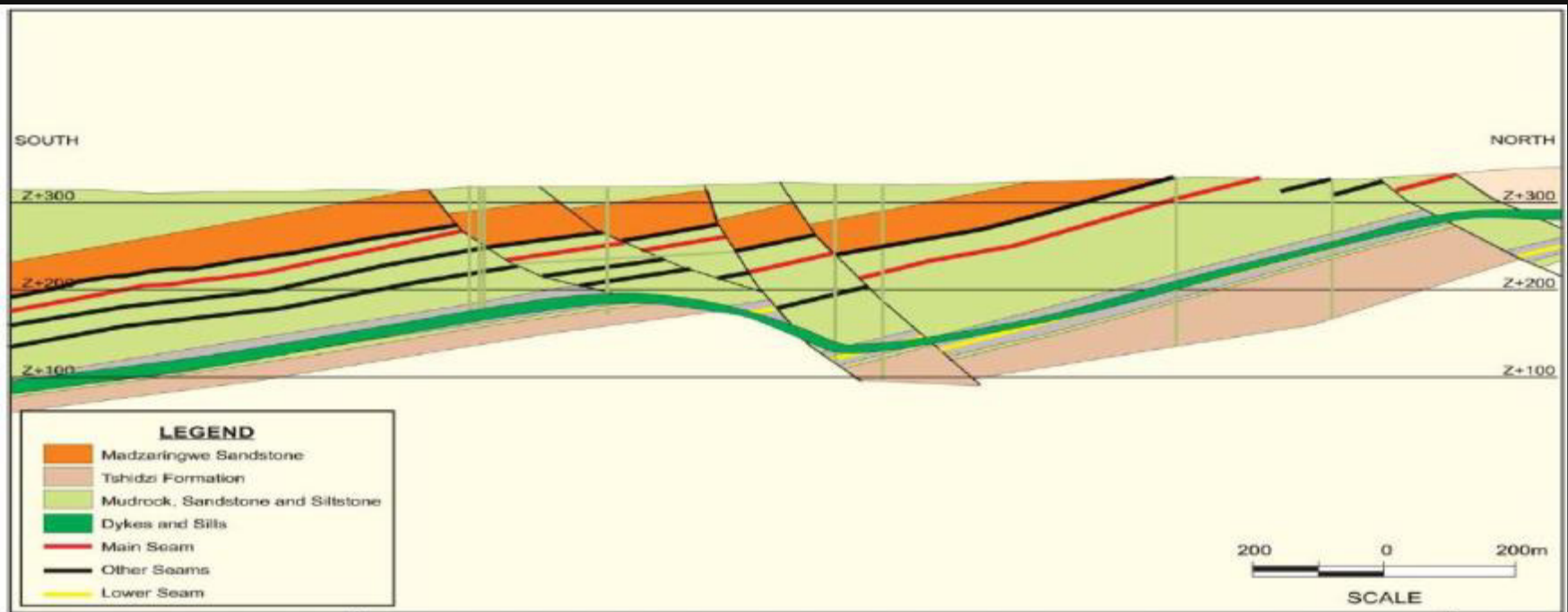
**ONLY THE MAIN KAROO BASIN  
IN SOUTH AFRICA IS A  
FORELAND BASIN**

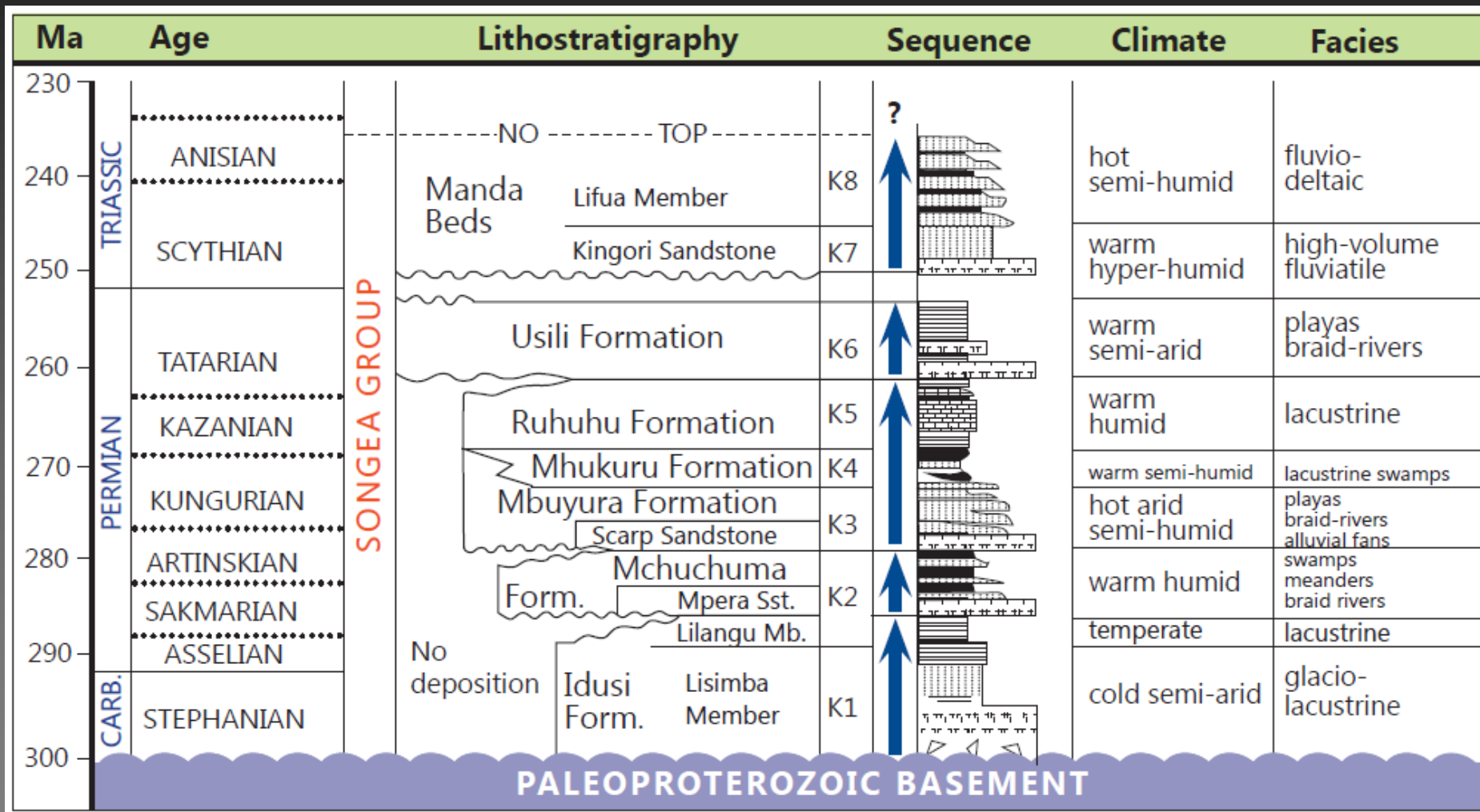


**ALL THE  
REMAINING BASINS  
ARE EXTENSIONAL  
RIFT RELATED BASINS**



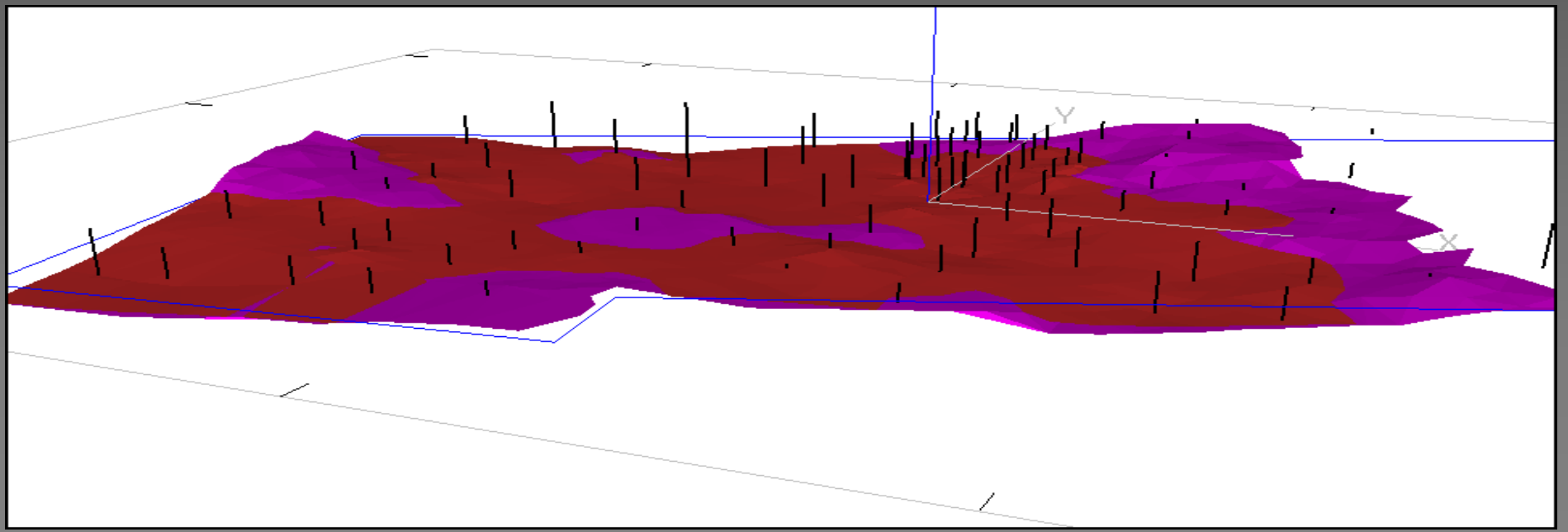
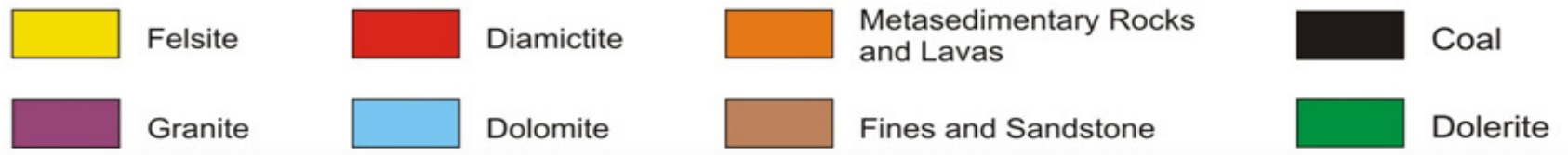
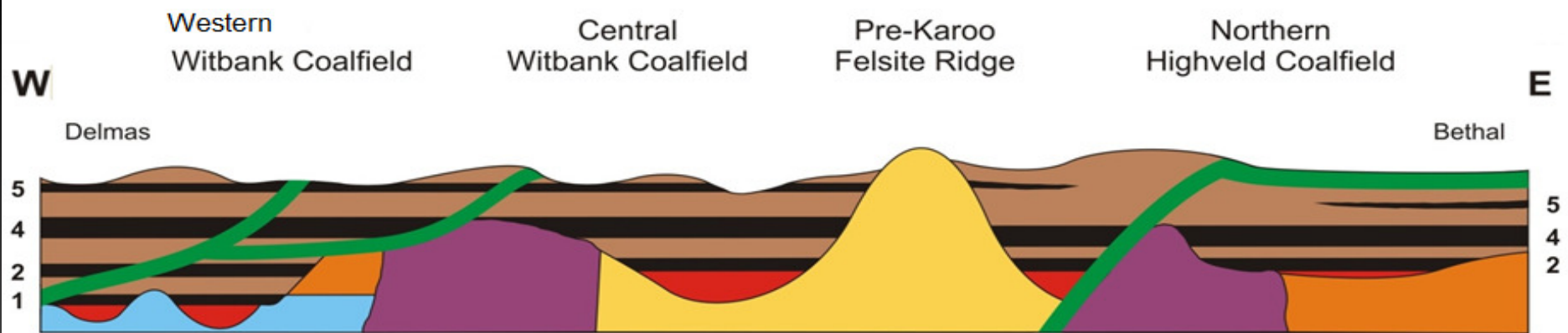
**(INTRA- OR INTERCRATONIC  
GRABENS OR HALF GRABENS)**





# BASAL GLACIAL UNITS (LPIA)





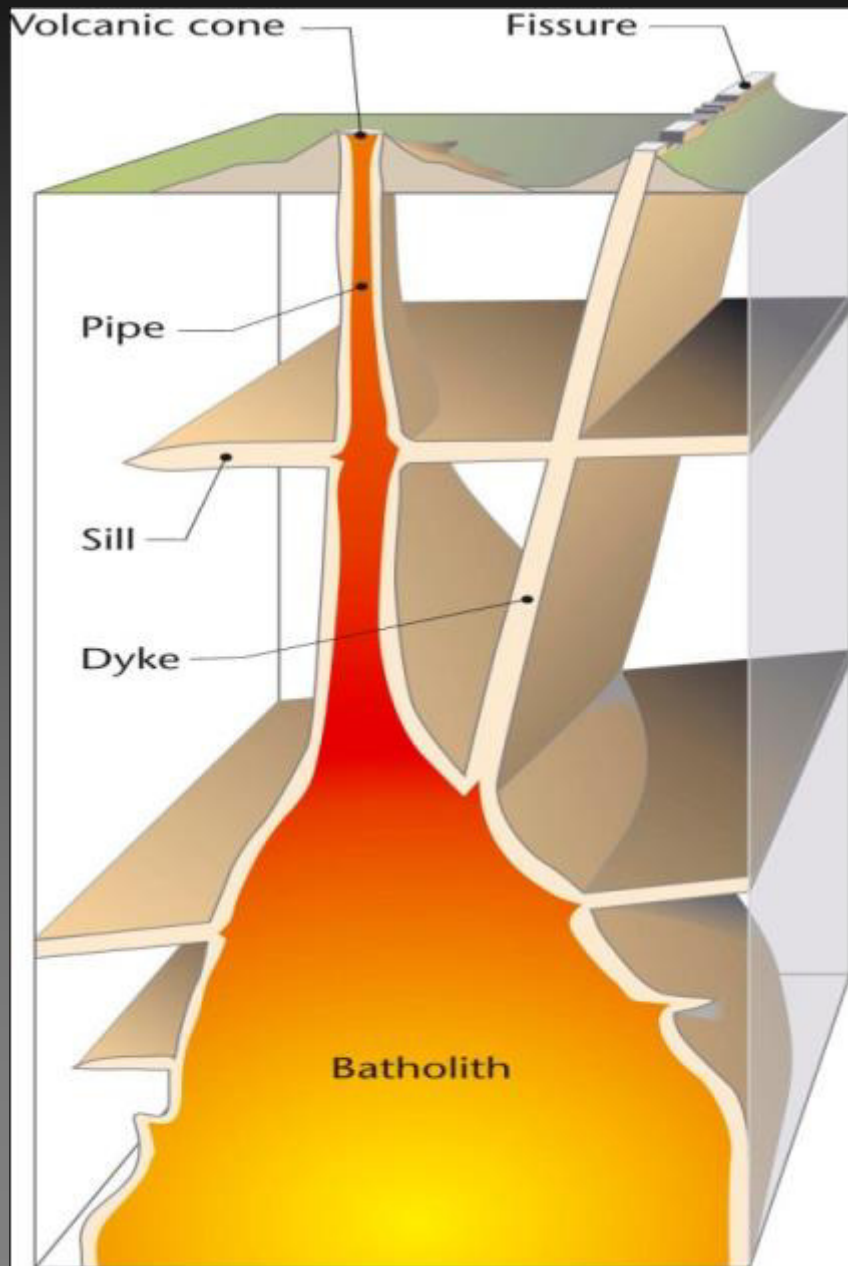
# LOWER COAL BEARING UNITS



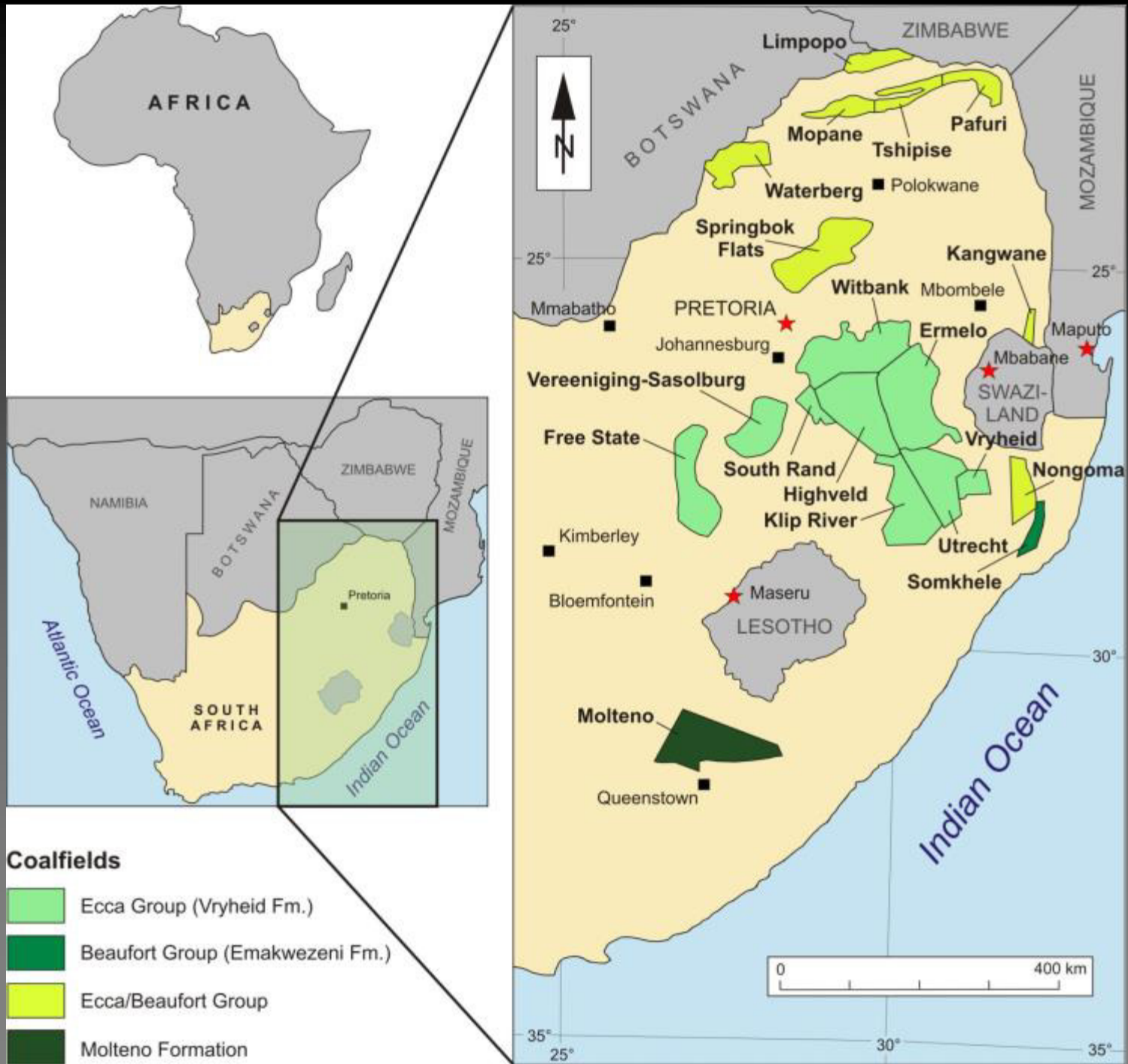
# UPPER COAL BEARING UNITS



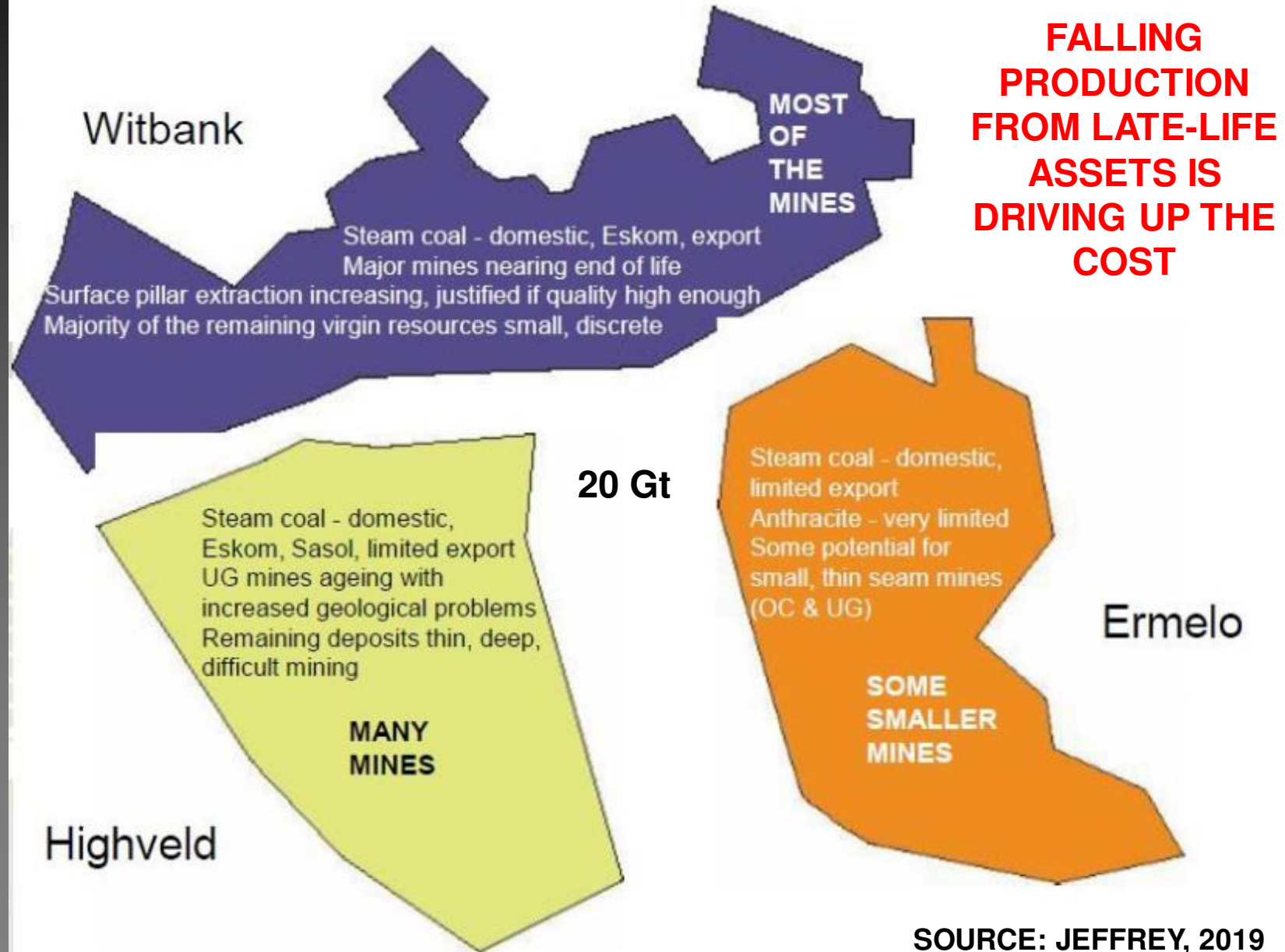
# BREAK-UP OF A SUPERCONTINENT



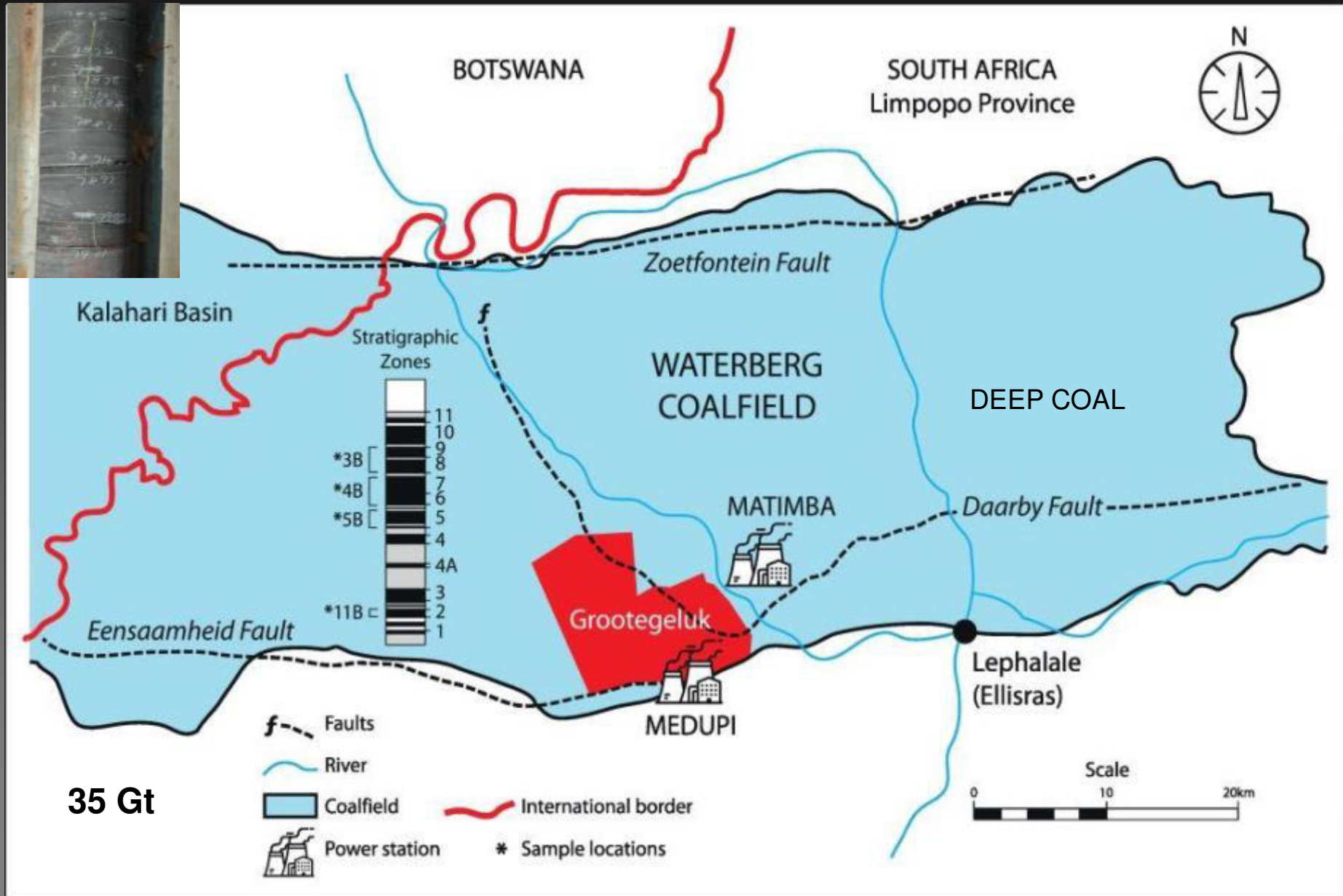




# Central Basin Coalfields

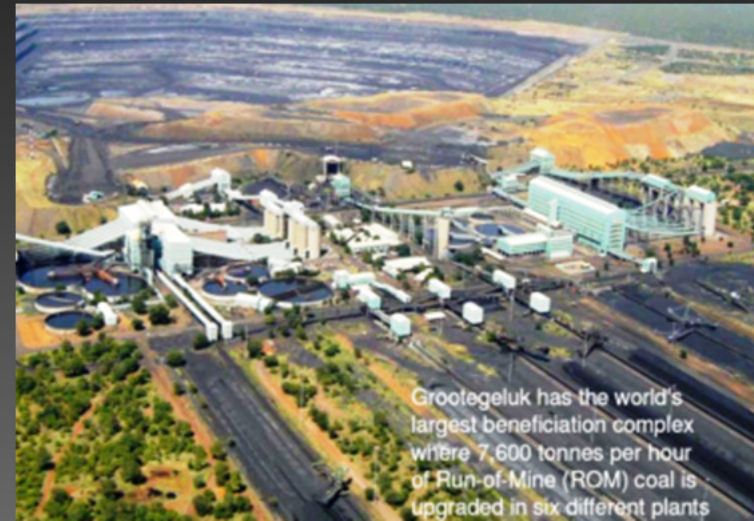


# THE WATERBERG COALFIELD



# WATERBERG COALFIELD

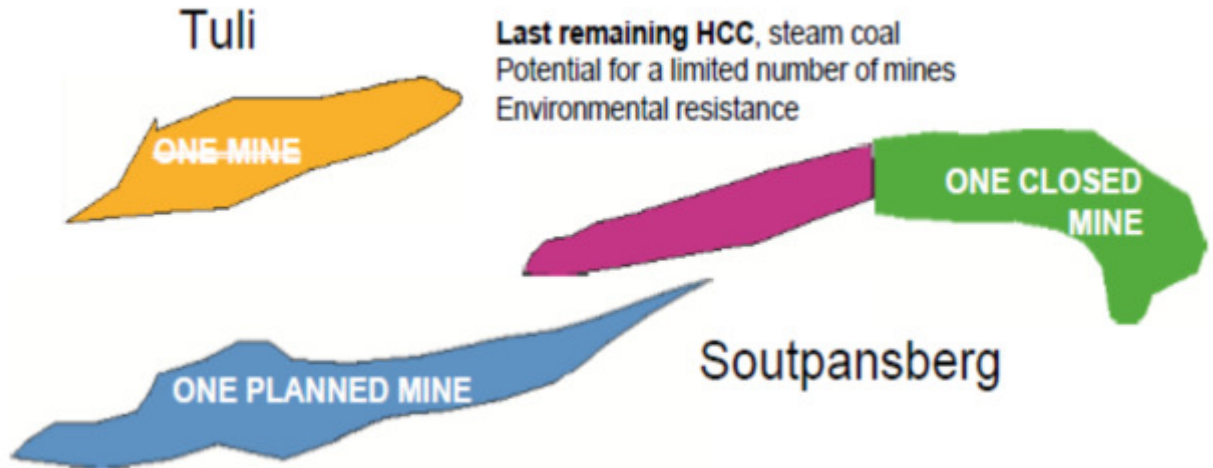
- **SHALLOW AND DEEP COAL**
- **VERY POOR YIELD (30% - 45%)**
- **LARGE WASHPLANTS REQUIRED**
- **HIGH CAPITAL (R4-R5 BILLION)**
- **FINANCIABILITY IS AN ISSUE**
- **WATER IS AN ISSUE**
- **TECHNICALLY CHALLENGING**
- **LOGISTICS IS EXPENSIVE (R300 - R350/TONNE TO GET COAL TO MARKET)**
- **INITIAL DEVELOPMENTS WERE NOT UNDER A FREE MARKET - ONLY SUBSIDISED PROJECTS ARE OPERATING (GROOTEGELUK)**



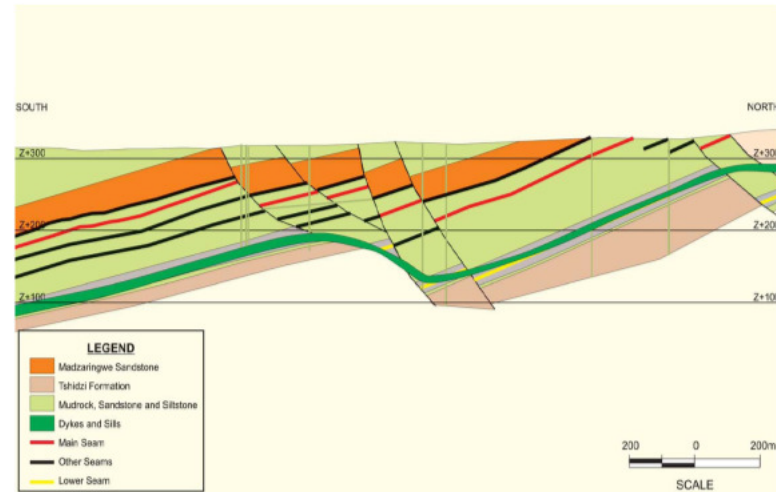
# SOUTPANSBERG & LIMPOPO COALFIELDS



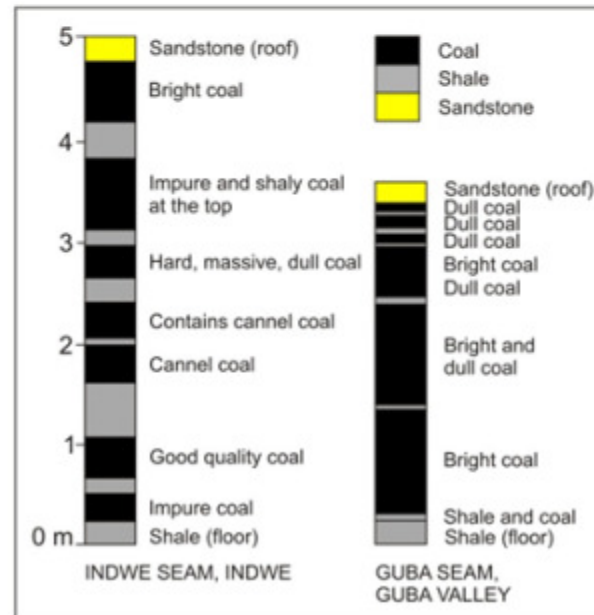
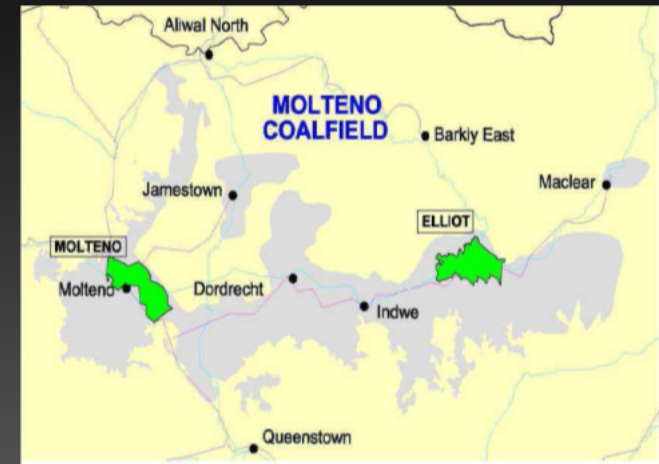
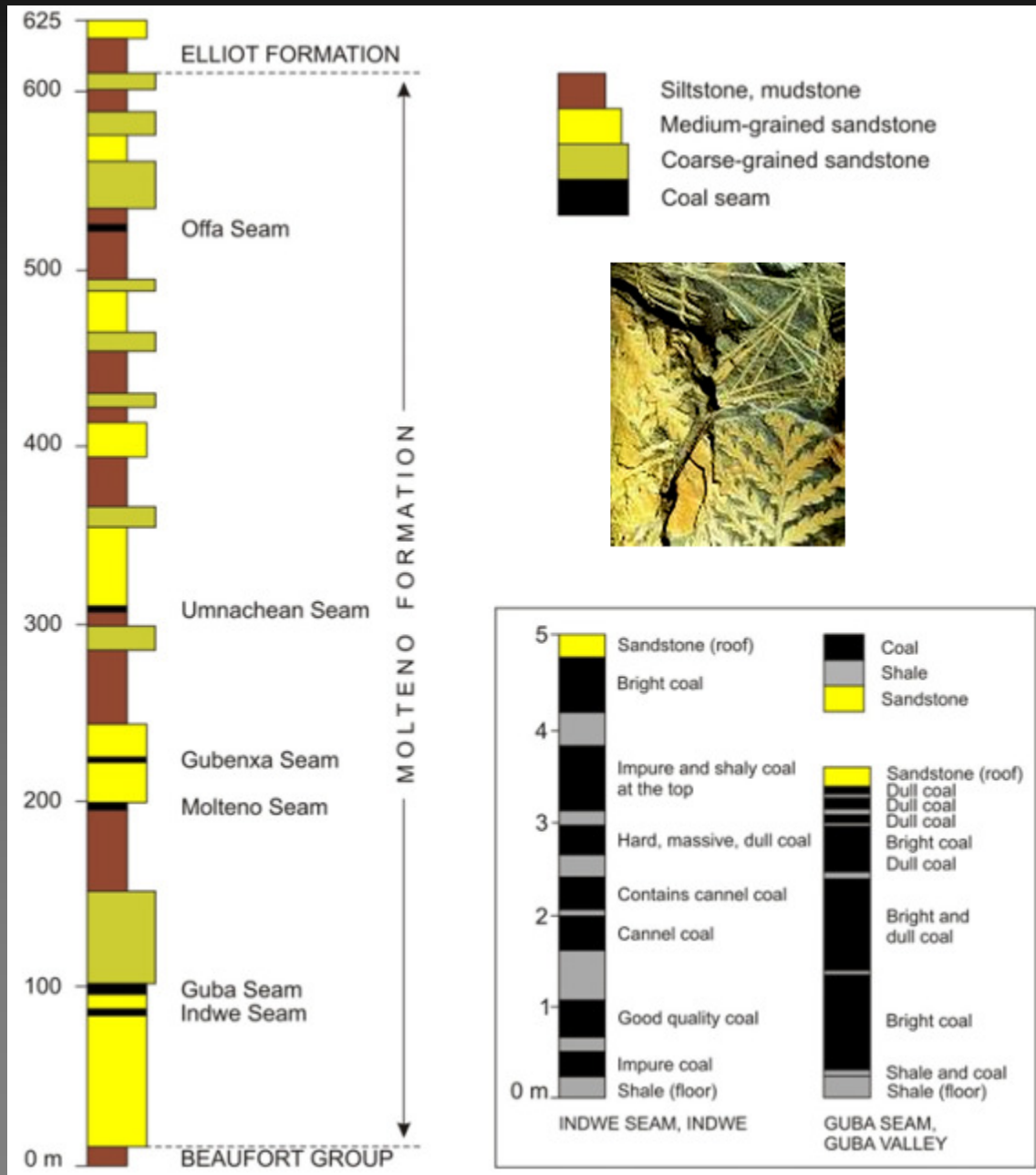
**Makhado**  
30-40,000 tpm - Arcellor



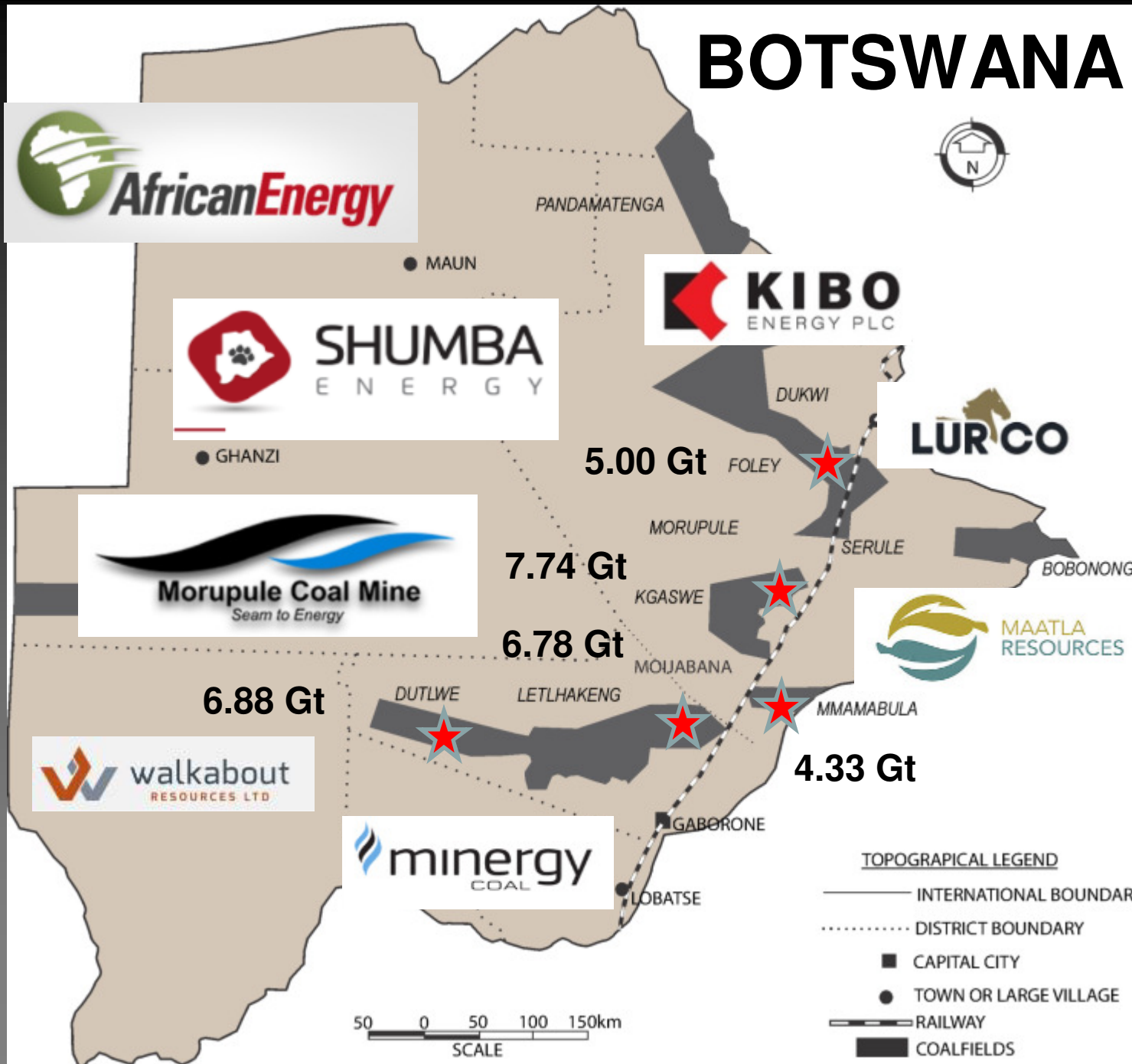
**6.3 Gt**



# MOLTENO COALFIELD

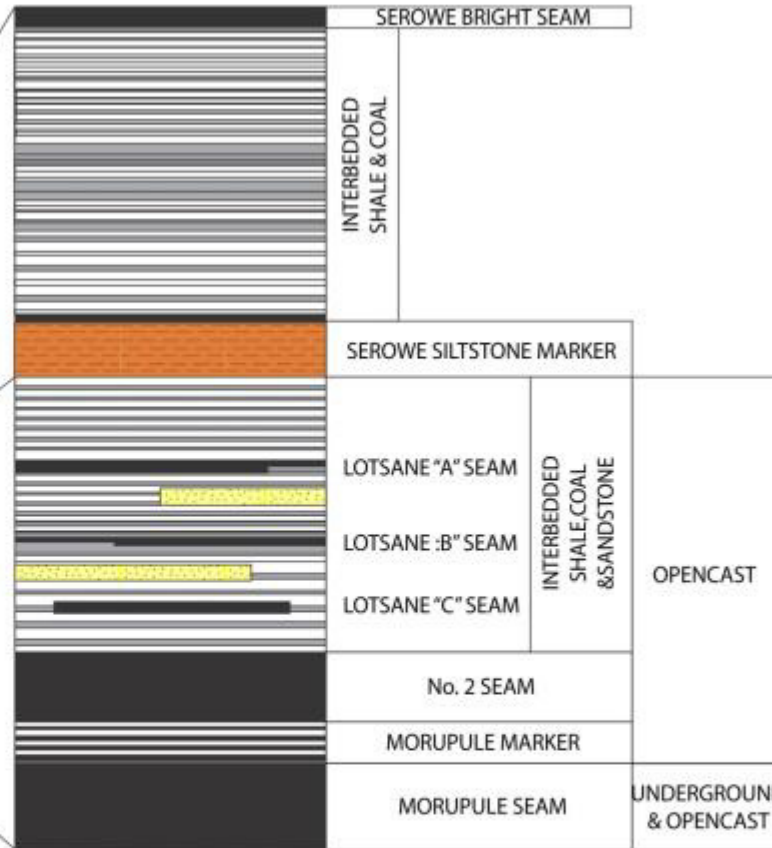
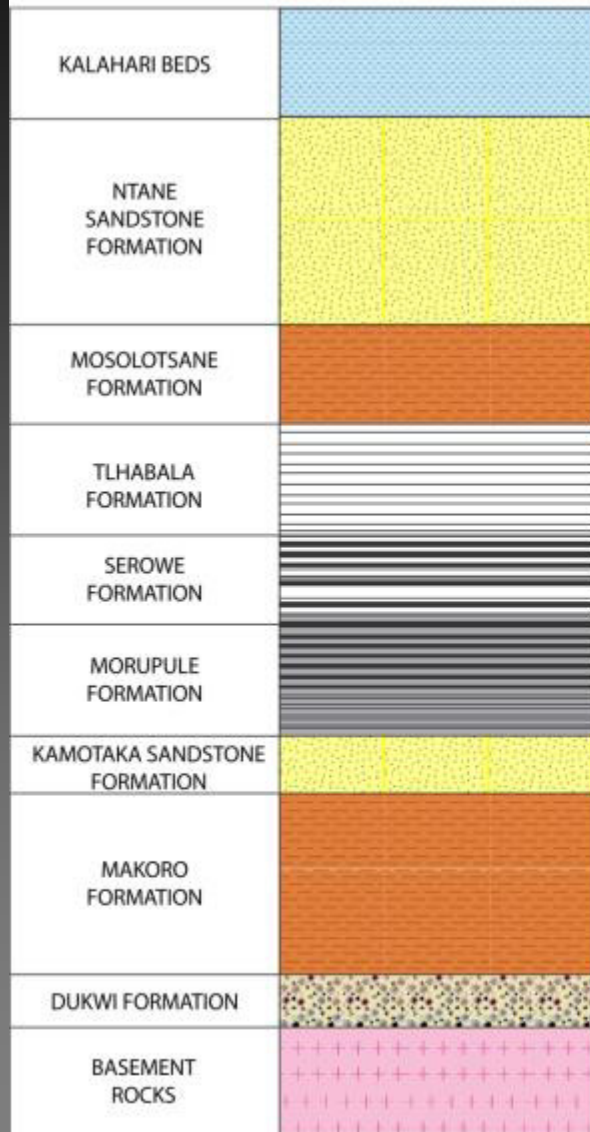


# BOTSWANA

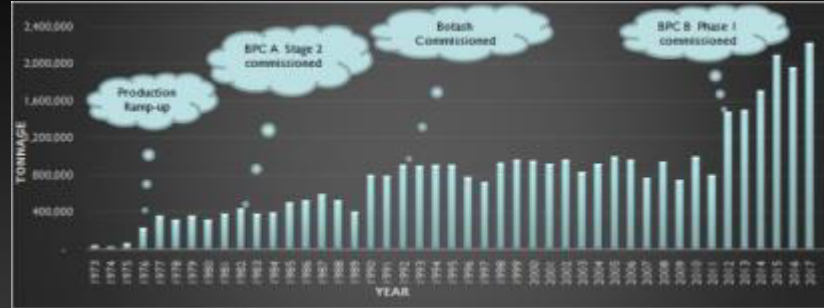


SOUTHEAST CENTRAL KALAHARI SUB BASIN

MORUPULE AREA

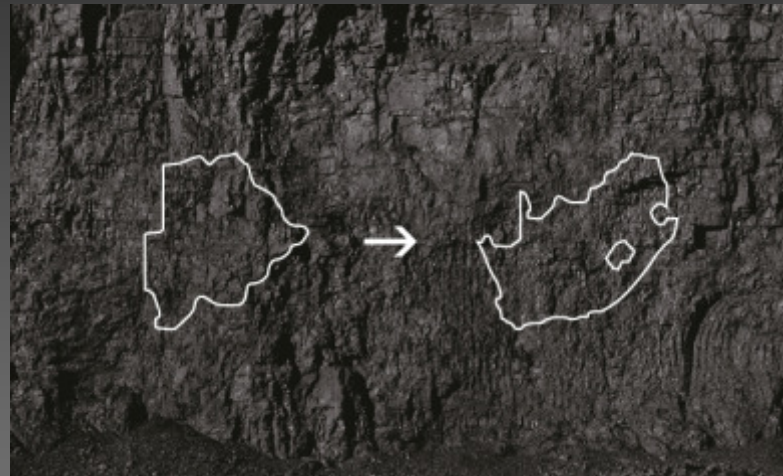








**340,000 tonnes  
in-pit coal  
exposed**

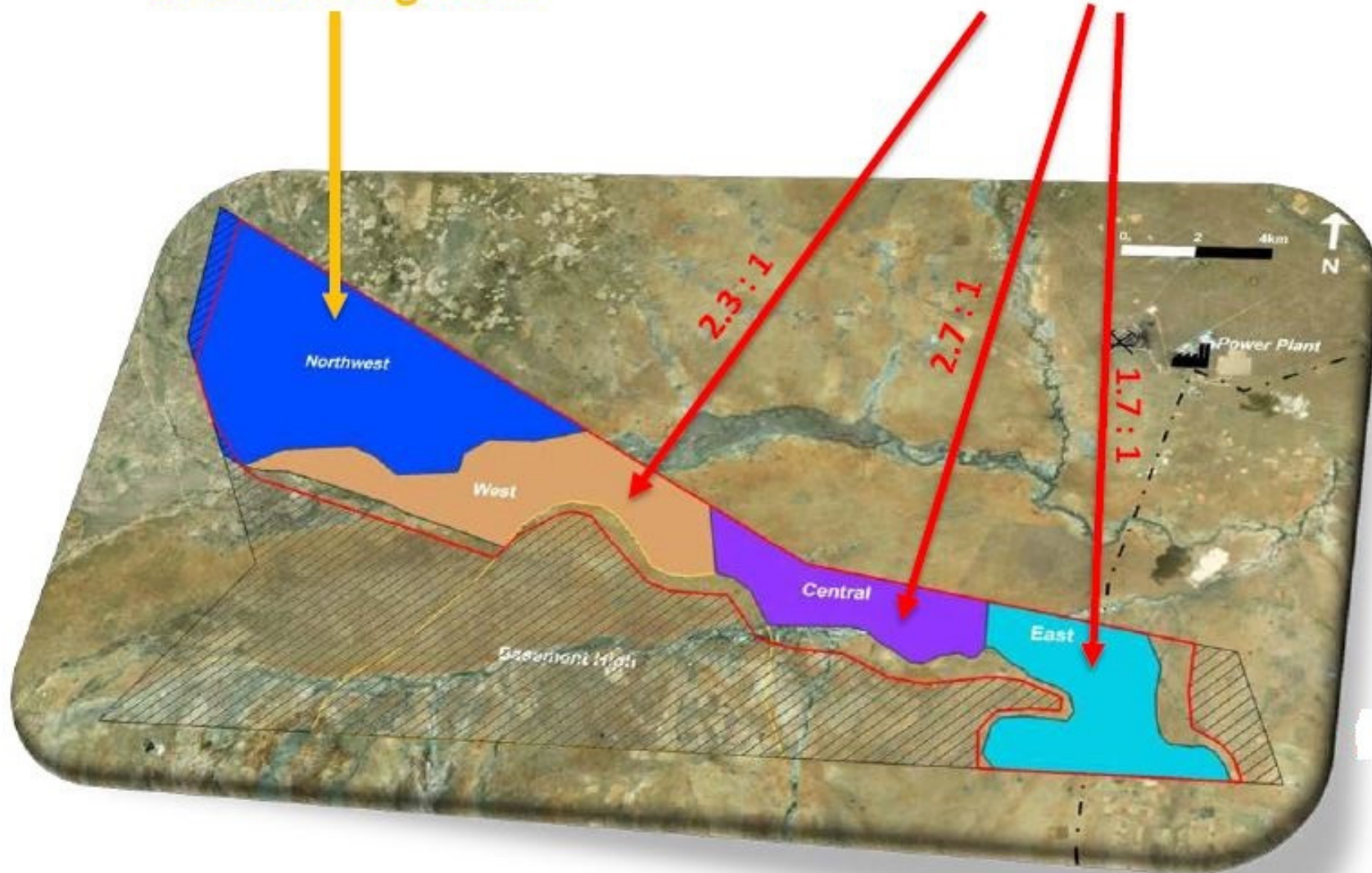


**First long-term  
contract signed for  
120,000 tonnes per  
annum**



1.1Bt Underground

1.2Bt Open cut

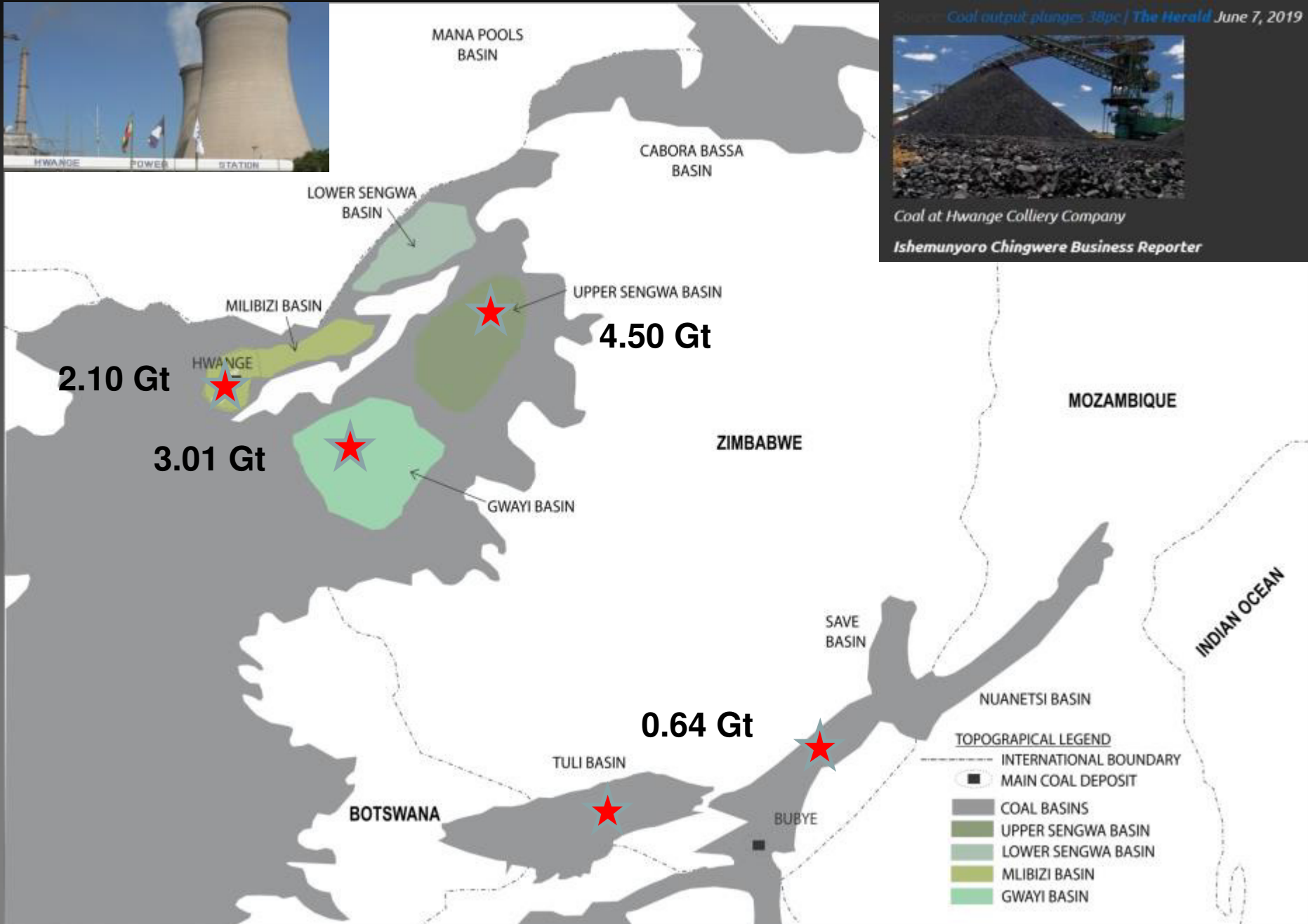




Coal output plunges 38pc | *The Herald* June 7, 2019



Coal at Hwange Colliery Company  
Ishemunyoro Chingwere Business Reporter



# HWANGE MAIN SEAM

INCREASE IN VOLATILE &  
SULPHUR CONTENT



**CARBONACEOUS MUDSTONE**

**HPS (Thermal Coal)**  
**MAX. 24% ASH**

**HCC (Coking Coal)**  
**MAX. 15% ASH**  
**MIN. 23.5% VOLATILES**

INCREASE IN ASH &  
PHOSPHORUS CONTENT

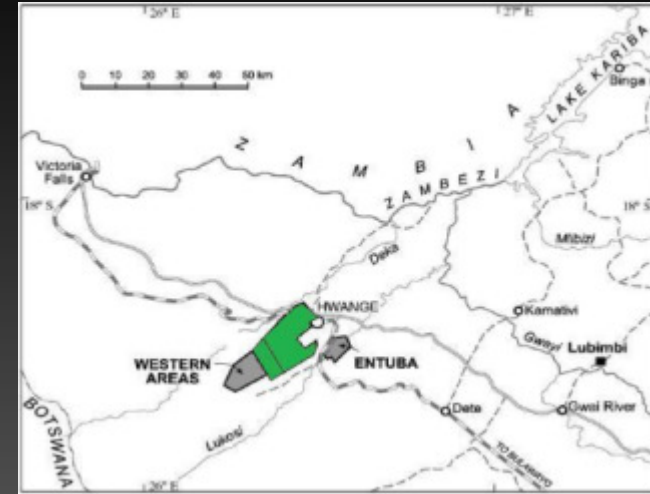


**FOOTWALL**

- The Main incline shaft of what became No.1 Colliery was completed in 1902.



150,000 tpm



**Hwange Colliery needs US\$50m fresh capital**



<http://hwangecolliery.co.zw/>

MAKOMO



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Coal Products

Coal Mining

Culture

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# Zimbabwe's Leader in Coal Production



<https://www.herald.co.zw/makomo-speaks-on-coal-sector-challenges/>

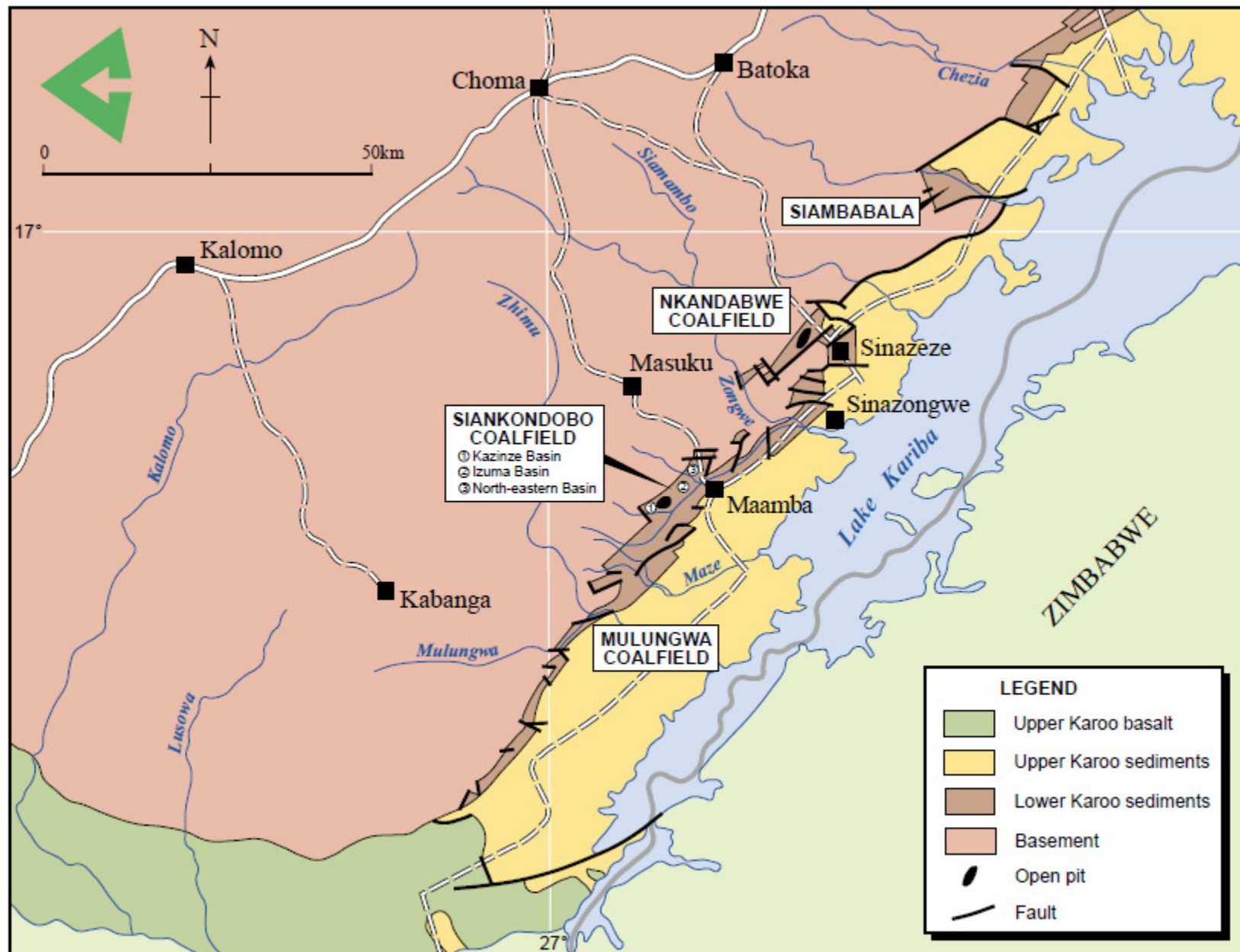


# ZAMBIA

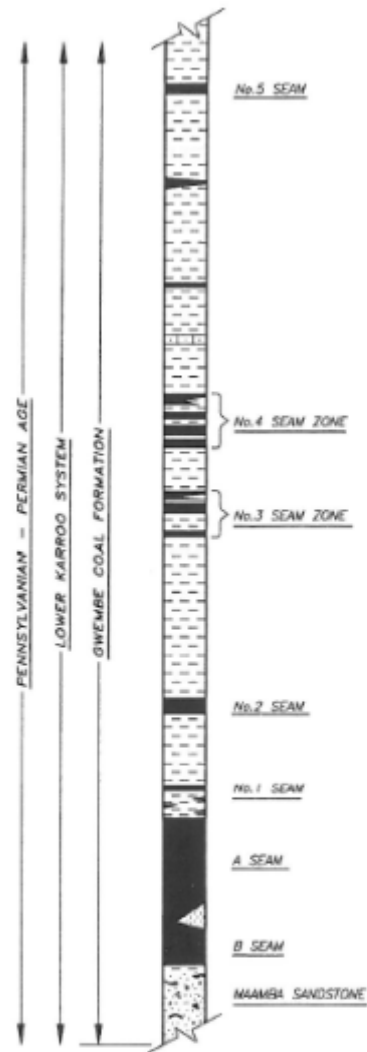


**MCL - 300 MW MINE-MOUTH POWER PLANT**





Coalfields of the Mid-Zambezi Valley <sup>9</sup>



FAULT NAME	AVERAGE DISPLACEMENT (m)
Fault A	15
Fault C	30
Fault D	29
Fault H	7
Fault I	18

GENERALISED STRATIGRAPHIC SECTION  
 IZUMA AND KANZINZE OPEN PITS  
 SIANKONDOBO COALFIELD  
 Southern Province, Zambia  
 Prepared For  
**MAAMBA COLLIERIES LIMITED**  
 Scale 1:400

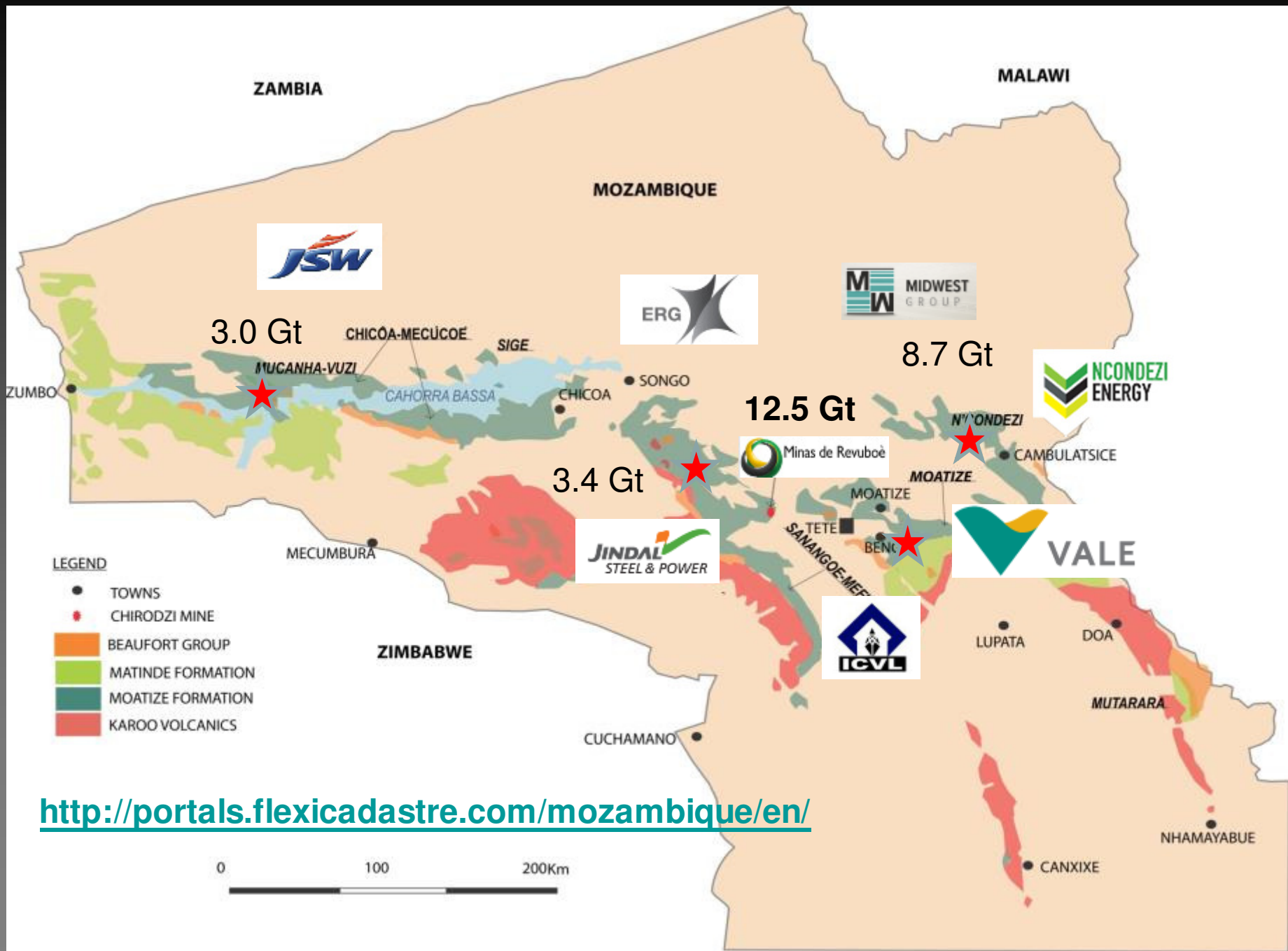
February 1993 John T. Boyd Company  
 Mining and Geological Engineers

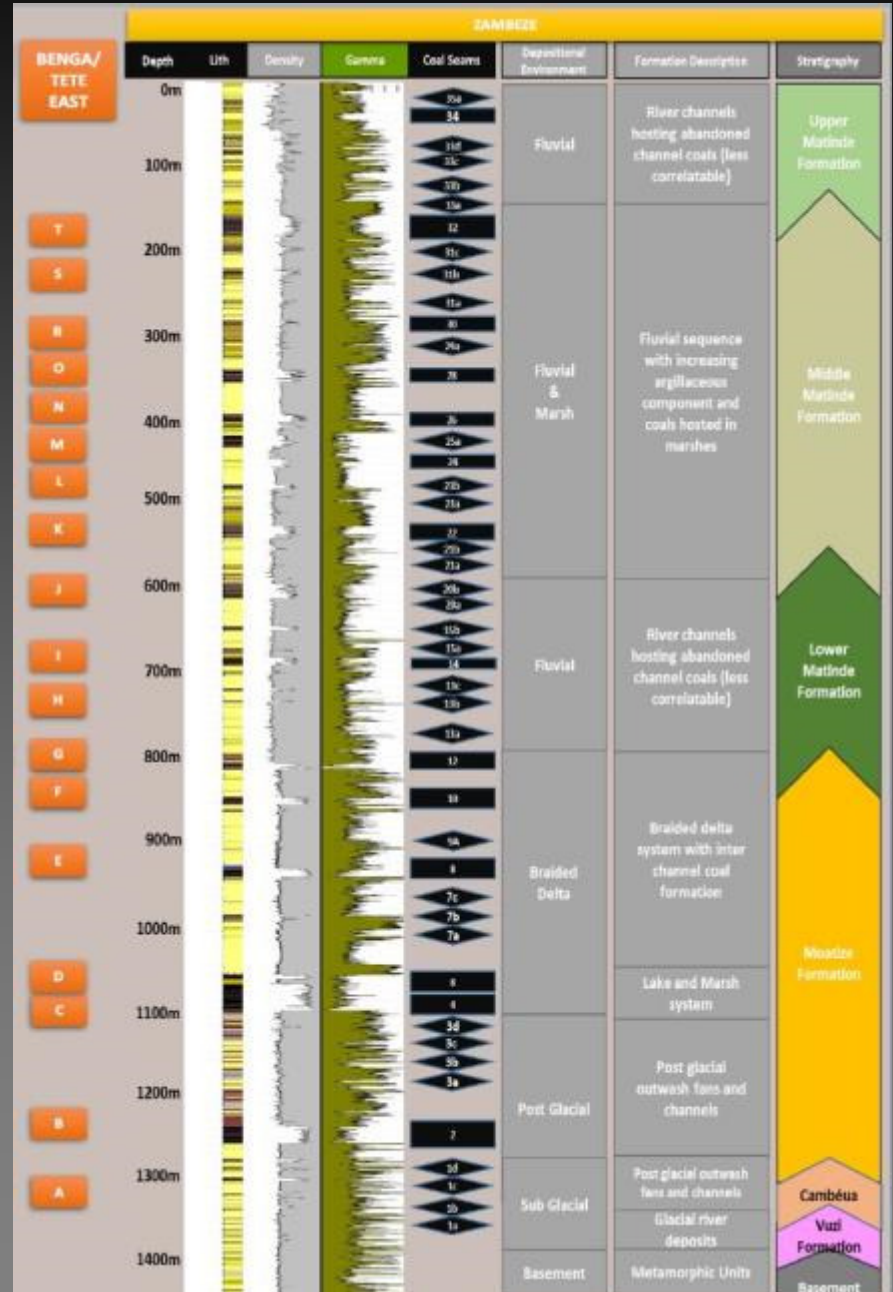
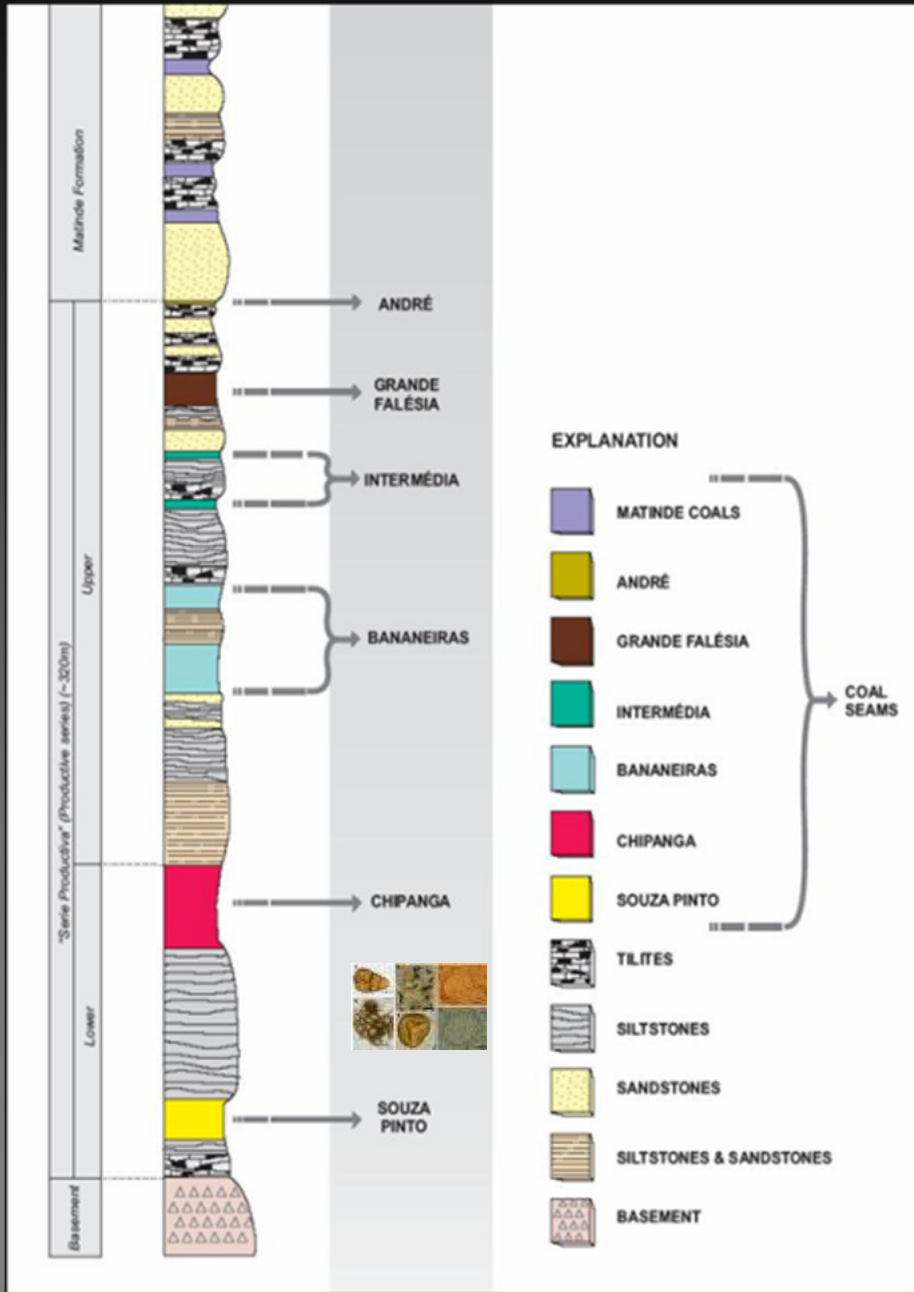
FIGURE 3.2



# MOZAMBIQUE





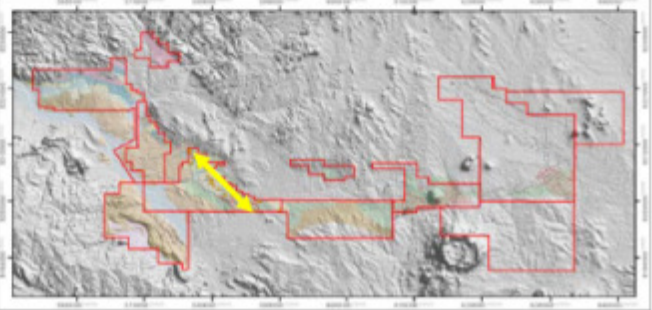
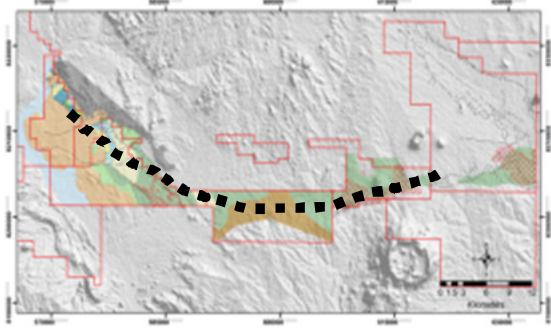
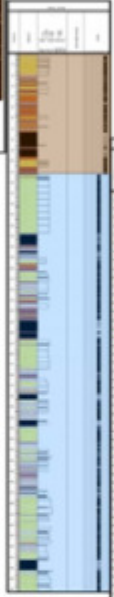
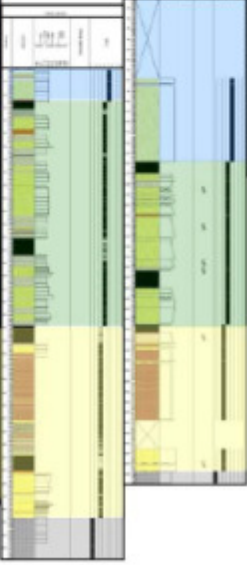
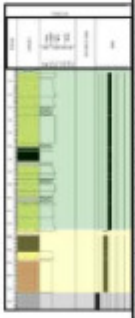


Vuzi

Moatize

Lower Matinde

Upper Matinde



# SEDIMENTARY VARIABILITY



TYPE I



TYPE II

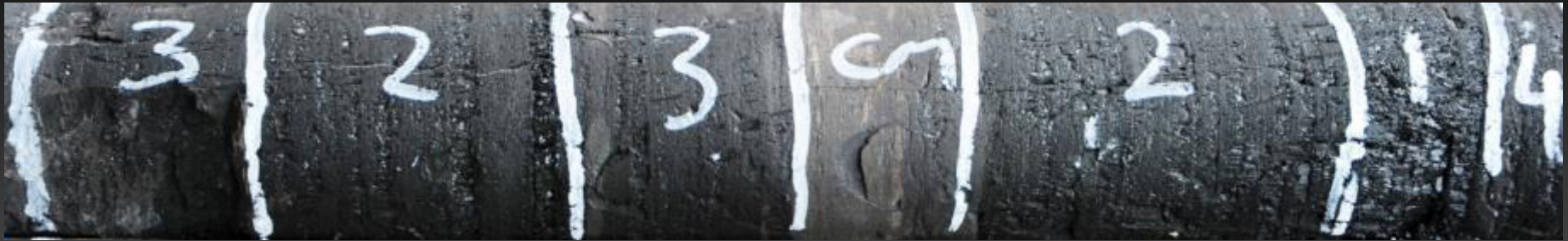


TYPE III



TYPE IV

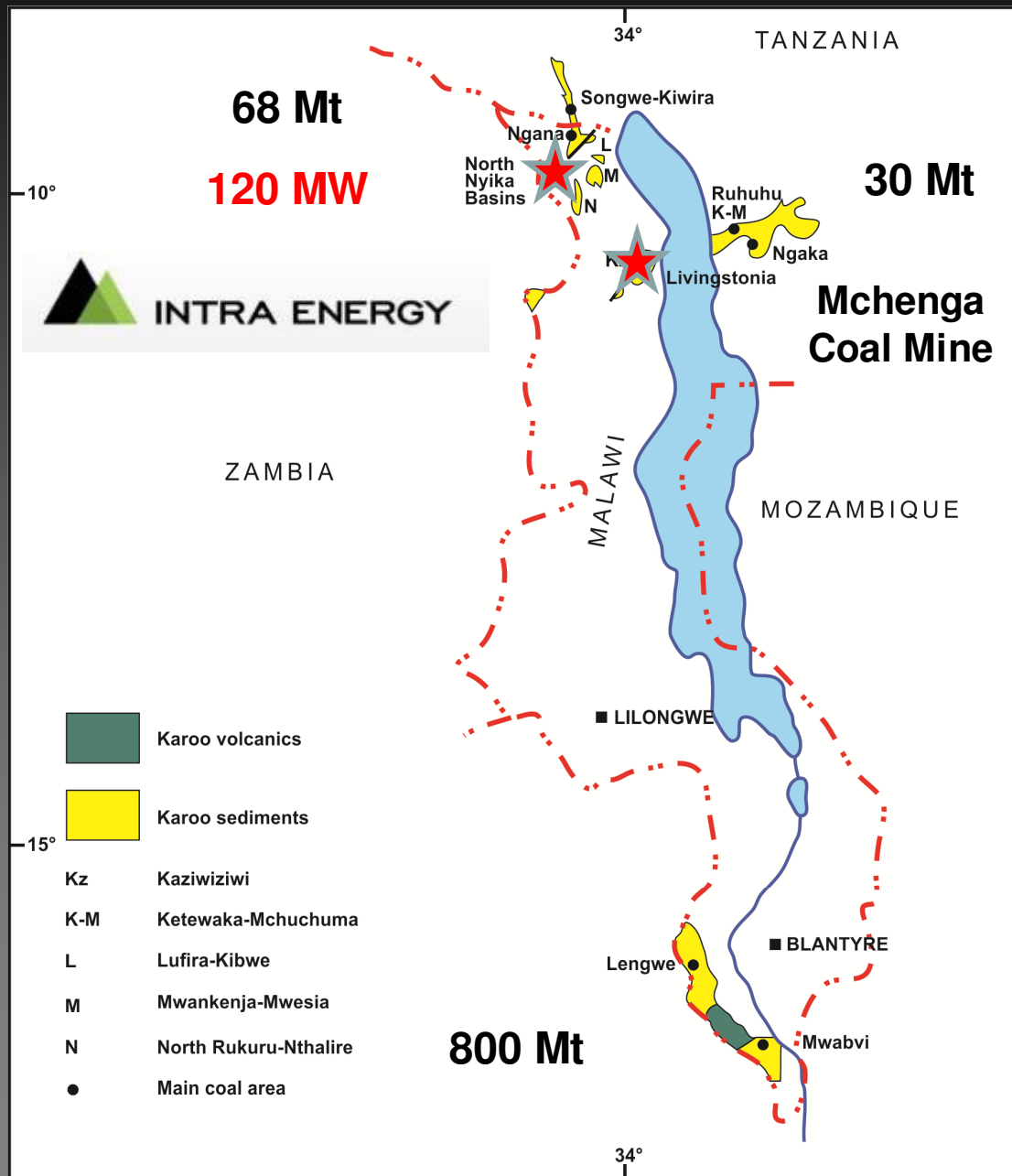
# COAL SEAMS

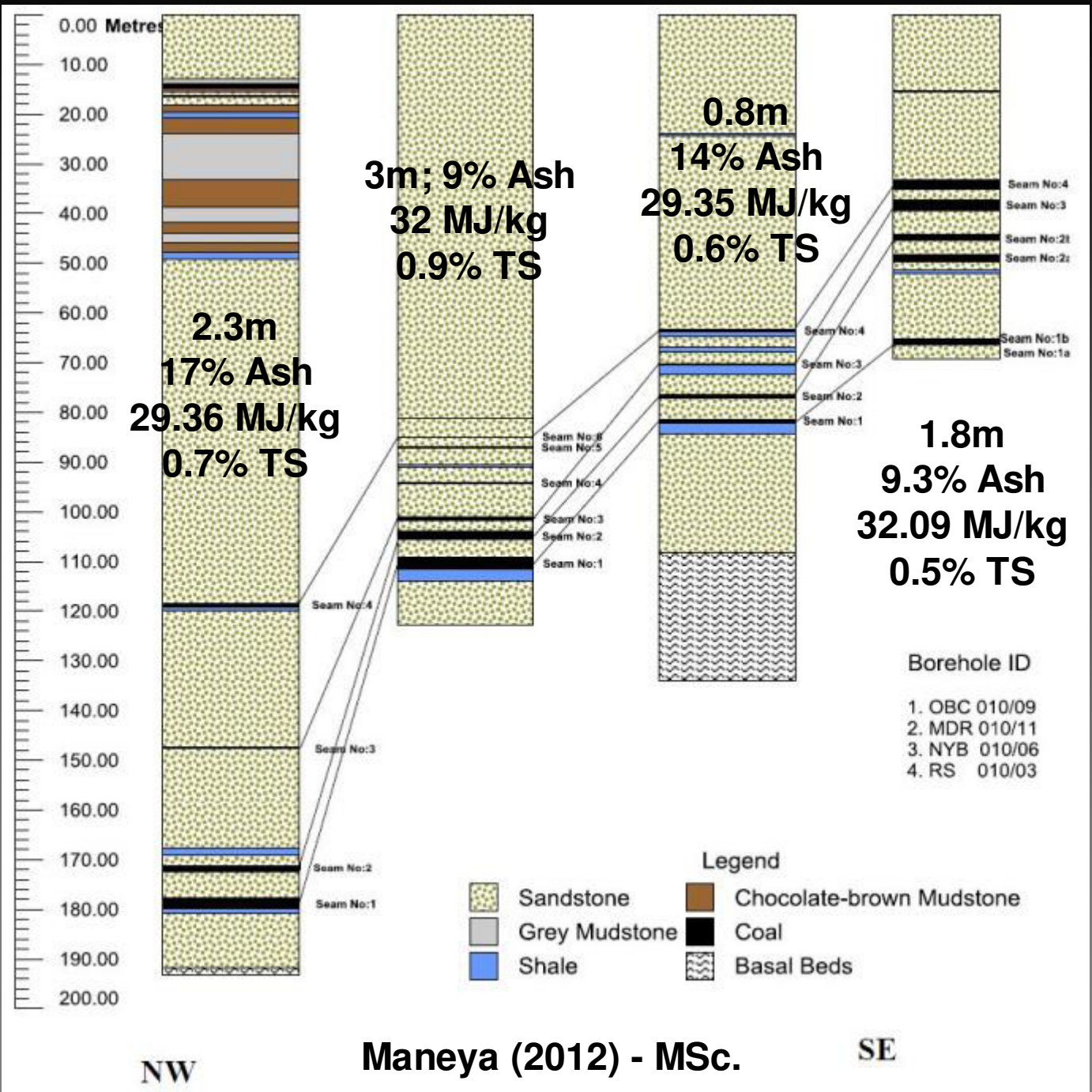






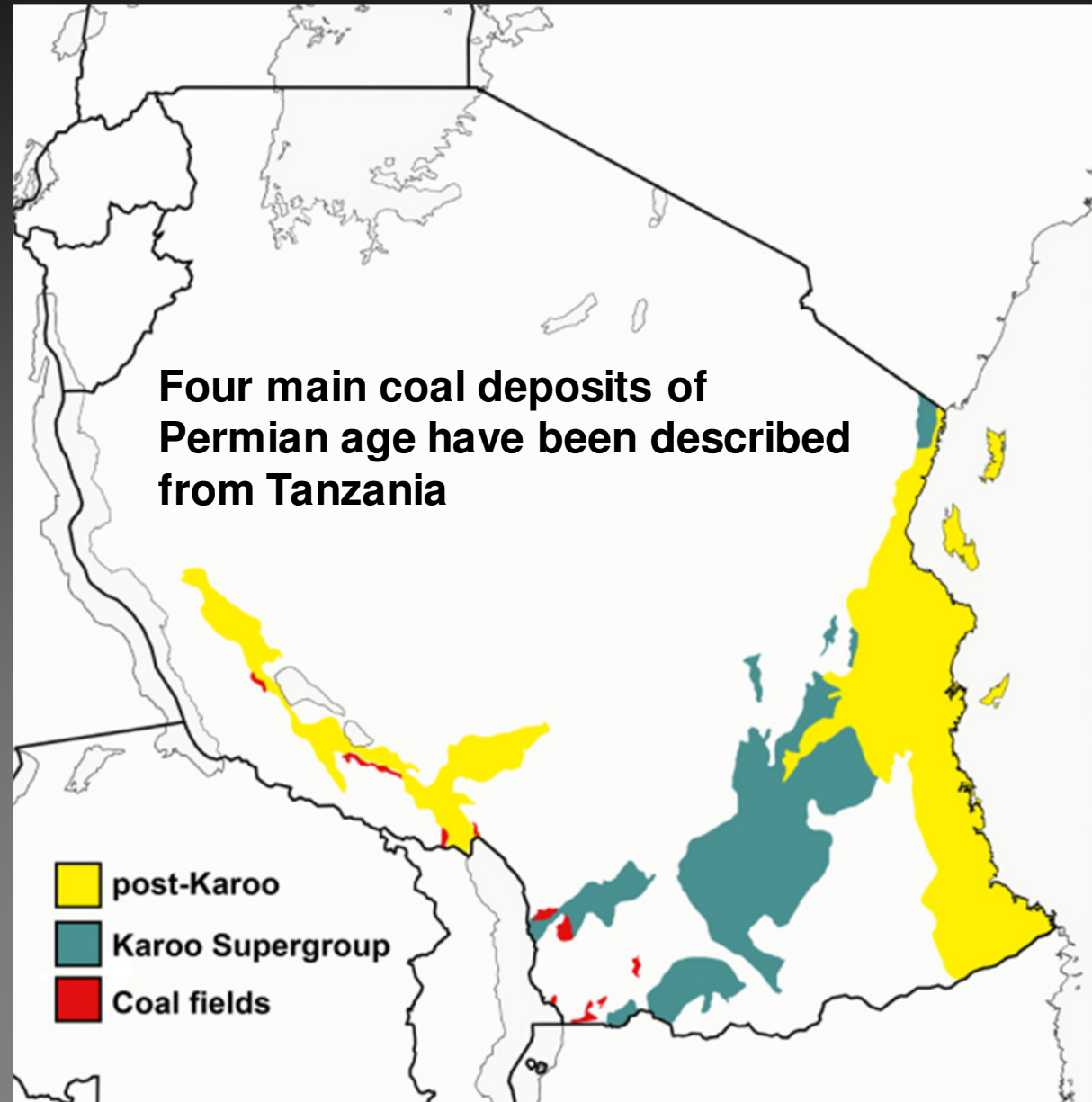
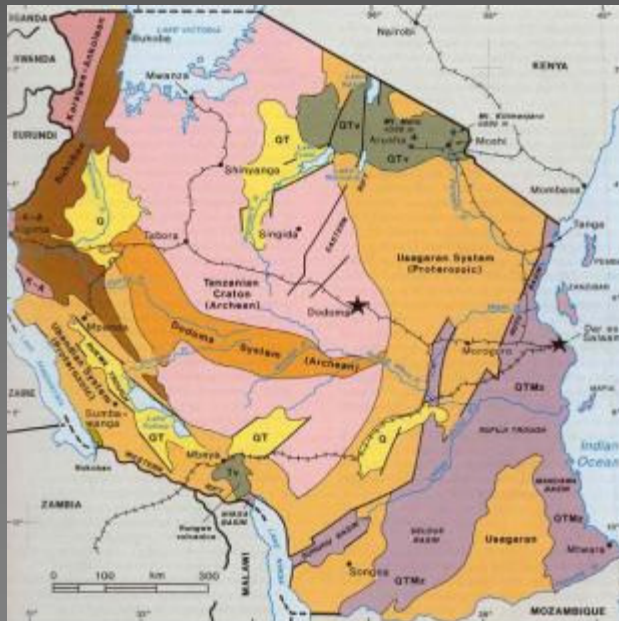
# MALAWI







# TANZANIA





# INTRA ENERGY

# TANCOAL

## Tancoal Thermal Coal Mine – Ngaka sub-basin coalfield



## ASX Release

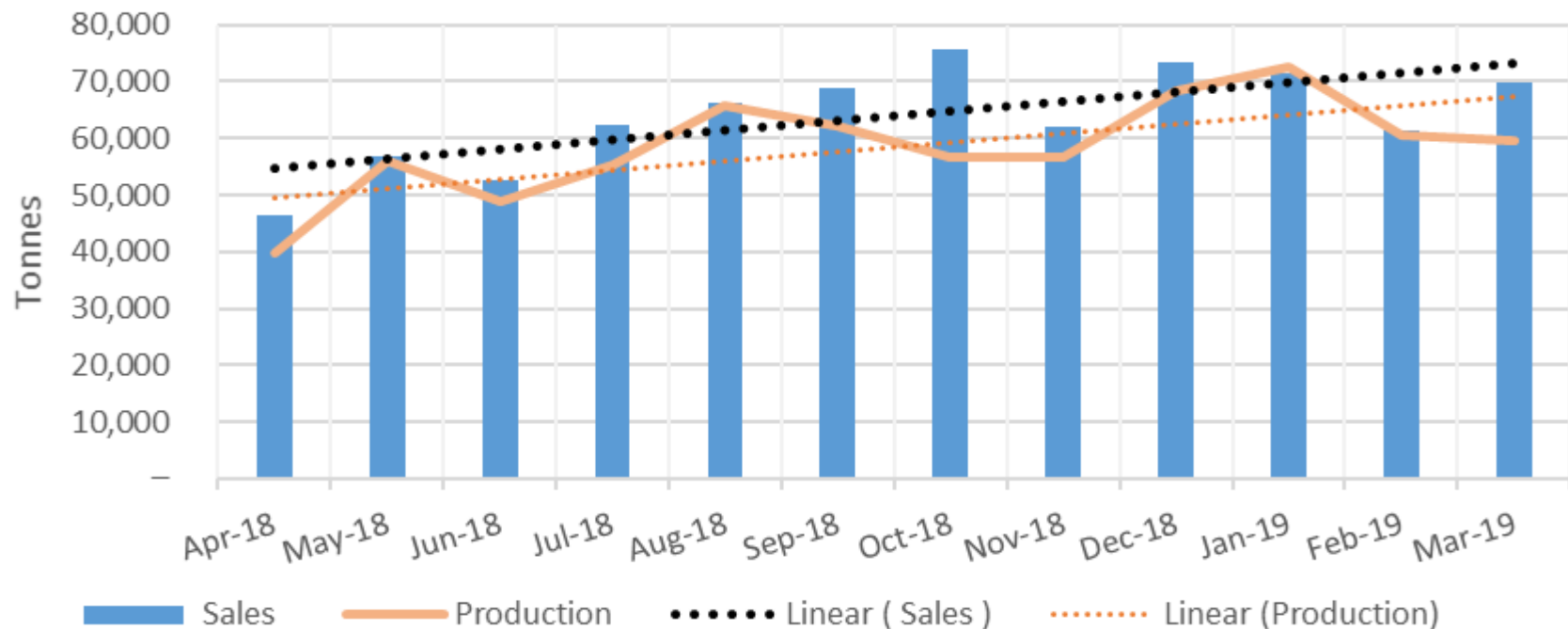
14 August 2019

## IEC JULY 2019 UPDATE

- Sales 58,377 tonnes in July
- Production 61,355 tonnes in July

Sub-20% Ash; 26.5 MJ/kg,  
26.6% VM; 1.3% TS

### Tancoal - Production and Sales

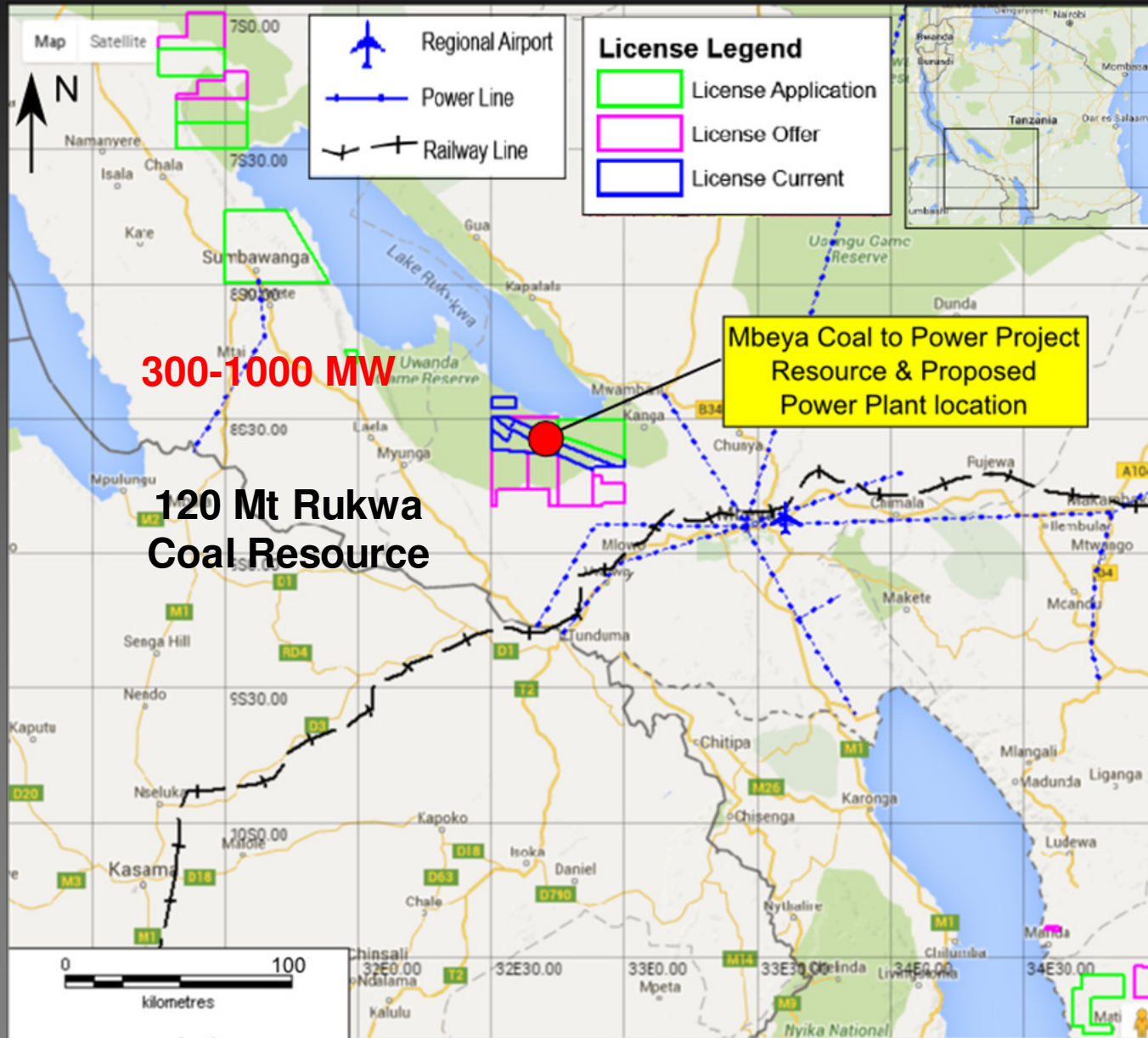


## 170 Mt Rukwa Thermal Coal Mine

120-300 MW

4,000 tonnes per month





# UNLOCKING THE VALUE

- **NEED TO UNDERSTAND THE GEOLOGY AND THE COAL QUALITIES**
- **DIFFERENT TECTONIC REGIMES (COMPRESSIONAL AND EXTENSIONAL)**
- **ALL THE COALS ARE ASSOCIATED WITH NON-MARINE TO MARGINAL MARINE TERRESTRIAL, KAROO SEQUENCES – OVERALL SIMILAR FILLS**
  - **MOST SSA COAL SEAMS FORMED DURING TWO PERIODS:**
    - THE EARLY PERMIAN (CISURALIAN) & THE LATE PERMIAN (LOPINGIAN)**
  - **EARLY PERMIAN COALS ARE MOST COMMONLY SANDSTONE-HOSTED.**
  - **LATE PERMIAN COALS TYPICALLY OCCUR INTERBEDDED WITH MUDSTONES.**



# OPPORTUNITIES FOR THE COAL INDUSTRY

- **LARGE COAL RESOURCES**

- **SOUTH AFRICA – POTENTIALLY >60 Gt**

- **BOTSWANA 213 – 60 -50 – 31 Gt**

- **ZIMBABWE – 11 Gt**

- **MOZAMBIQUE – 30 Gt**

**= 132 Gt**

- **COAL IS A BULK COMMODITY – UNLOCKING ITS VALUE IS A GEOLOGICAL AND LOGISTICAL CHALLENGE**

- **OPPORTUNITIES UCG – CTL AND CTF  
POWER GENERATION – INLAND MARKETS**

- **CHALLENGES**

- **SOCIAL LICENCE**

- **FUNDING**