

COALFIELDS OF SUB-SAHARAN AFRICA WITH A FOCUS ON THE SMALLER BASINS



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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.

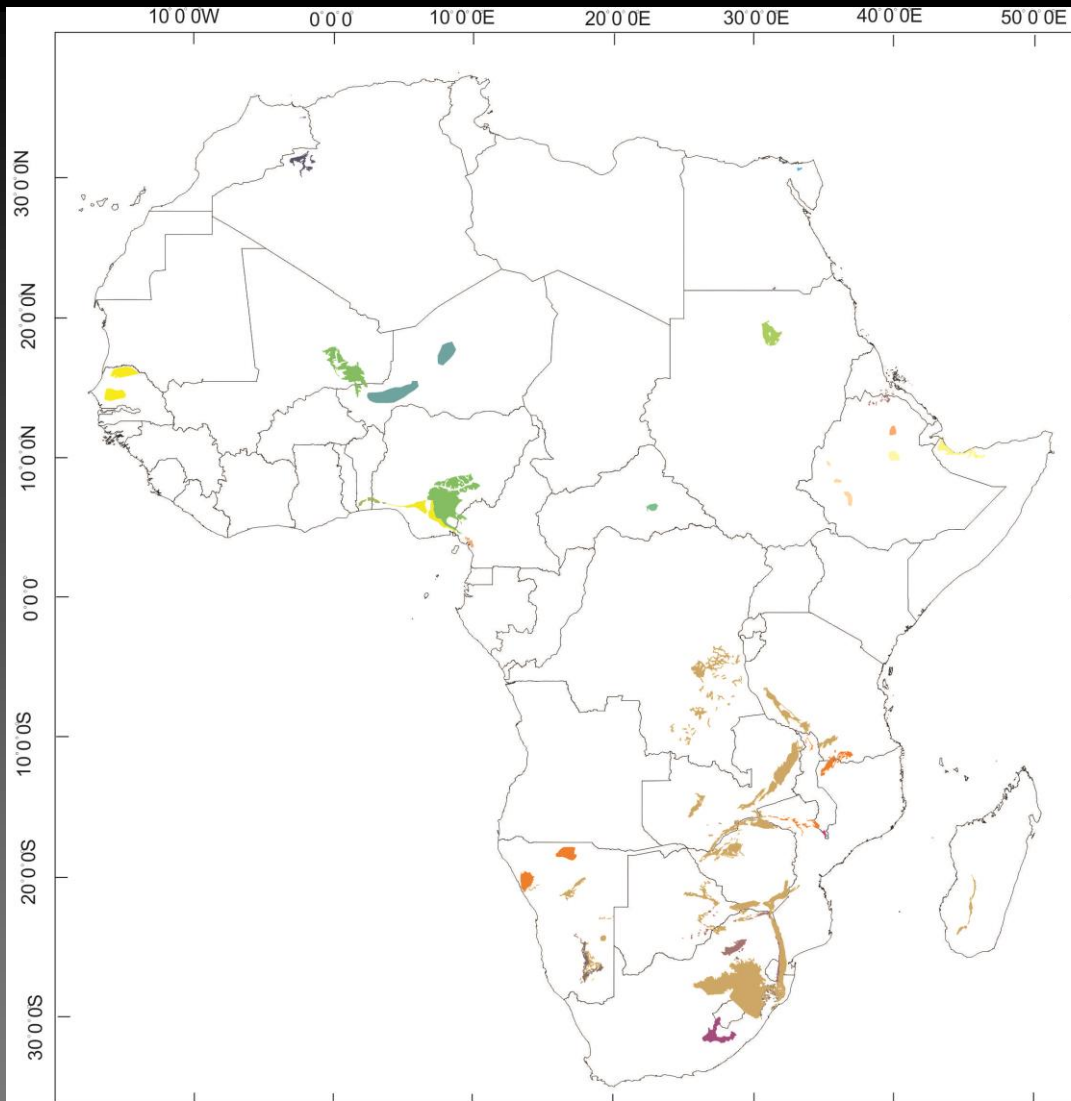
hydroelectric. Zambia also relies heavily on hydropower, but currently some 300 MW of coal fired capacity is being built. Despite its huge coalfields (and various plans for coal-fired power stations) almost all of Mozambique's electricity generation is from hydropower. Although a number of coal fired 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

- **Geographical Location of the coalfields of Sub-Saharan Africa**
- **Geological and Economic Significance of the Karoo aged deposits**
 - **The Main Karoo Basin (MKB)**
 - **Related extensional basins of SCA**
 - **Basin fills and controls**
- **Examples = Smaller East African basins (Tanzania and Malawi)**
 - **Take Home Points**




















BACK TO BASICS

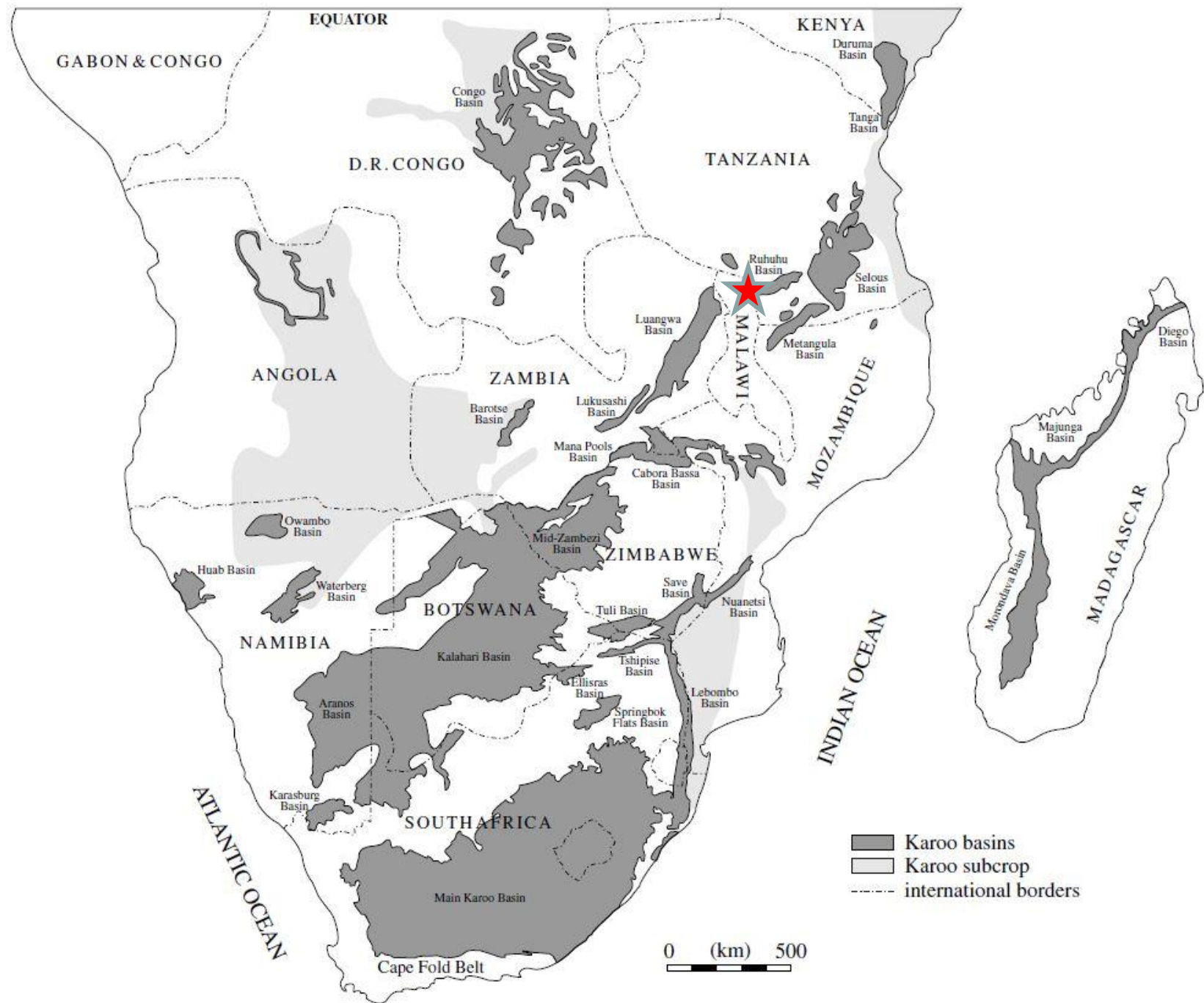
- Tectonic setting controls accommodation space (the space for sediment to accumulate) and sediment supply (depositional systems - **GRADE**).
- Climate overprints the sedimentary pile.
- Geological age dictates what plant types are available to form peat (and eventually coal - **TYPE**).
- Burial and heat overprints determines the **RANK**.
- Uplift and erosion determines what we have left.
- Any factor that affects the coal quality affects its processing.



EXPLANATION

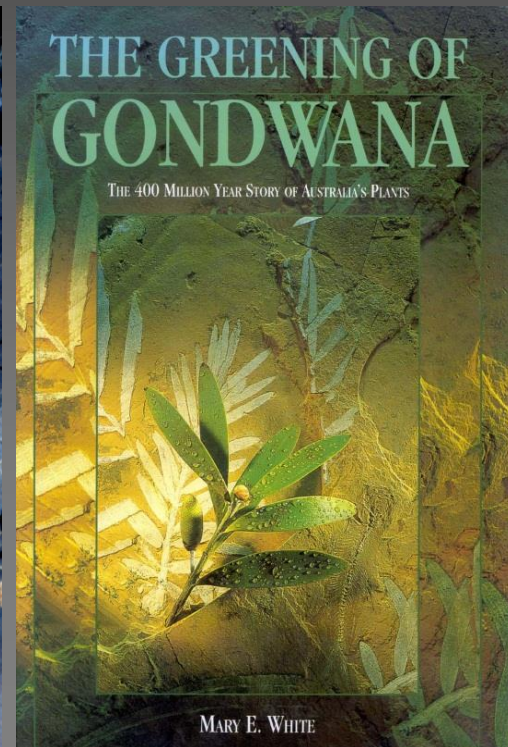
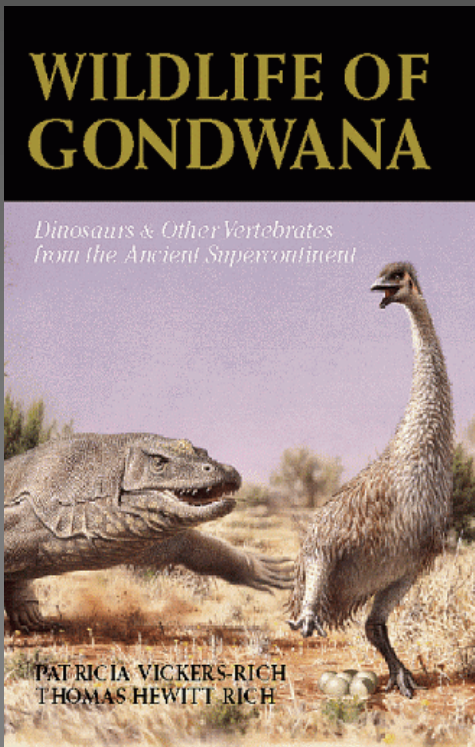
Coal age

 Pliocene	 Paleocene	 Jurassic	 Permian - Carboniferous
 Miocene	 Tertiary	 Triassic	 Upper Carboniferous
 Eocene-Miocene	 Cretaceous- Paleocene	 Triassic-Permian	 Carboniferous
 Middle Eocene-Oligocene	 Upper Cretaceous	 Upper Permian	
	 Cretaceous	 Permian	
	 Lower Cretaceous	 Lower Permian	



GEOLOGICAL SIGNIFICANCE

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

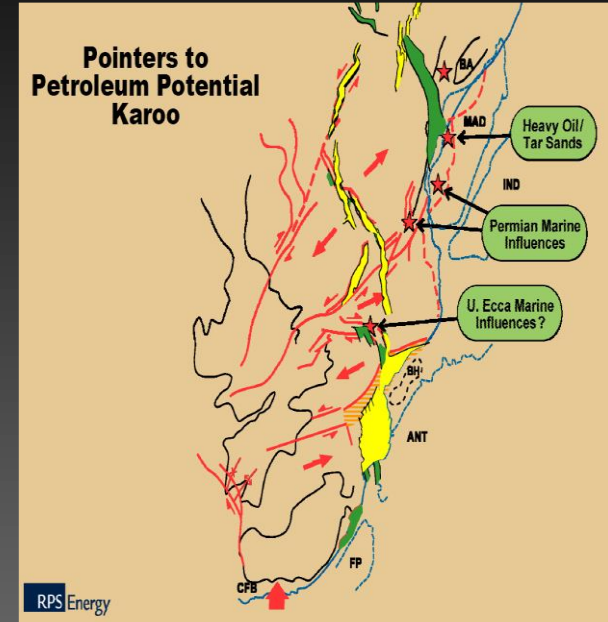


ECONOMIC SIGNIFICANCE

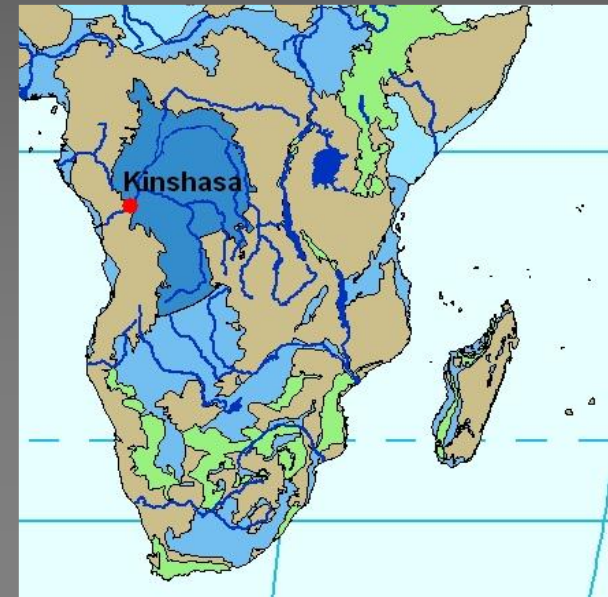


URANIUM

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

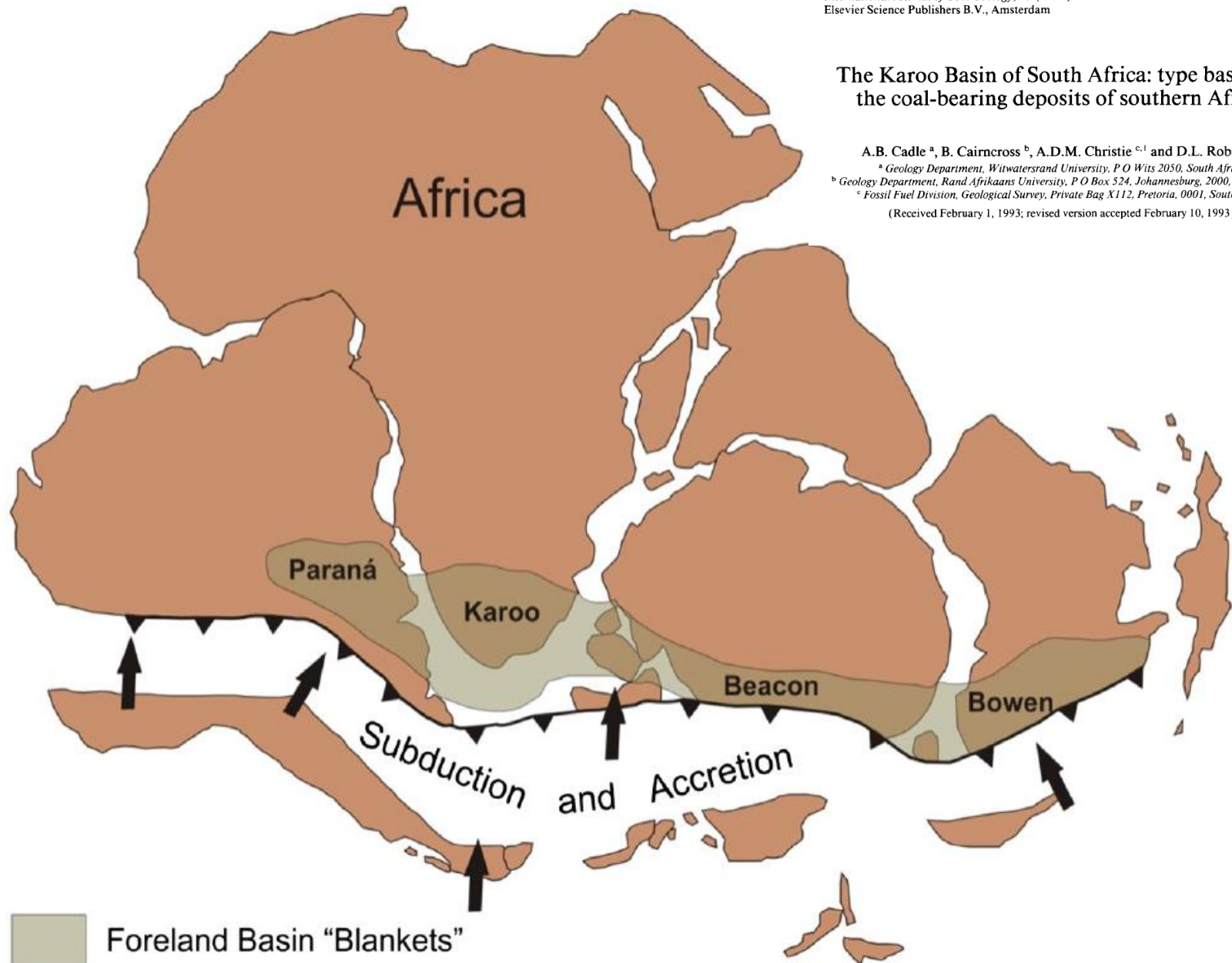
A.B. Cadle ^a, B. Cairncross ^b, A.D.M. Christie ^{c,1} and D.L. Roberts ^c

^a Geology Department, Witwatersrand University, P O Wits 2050, South Africa

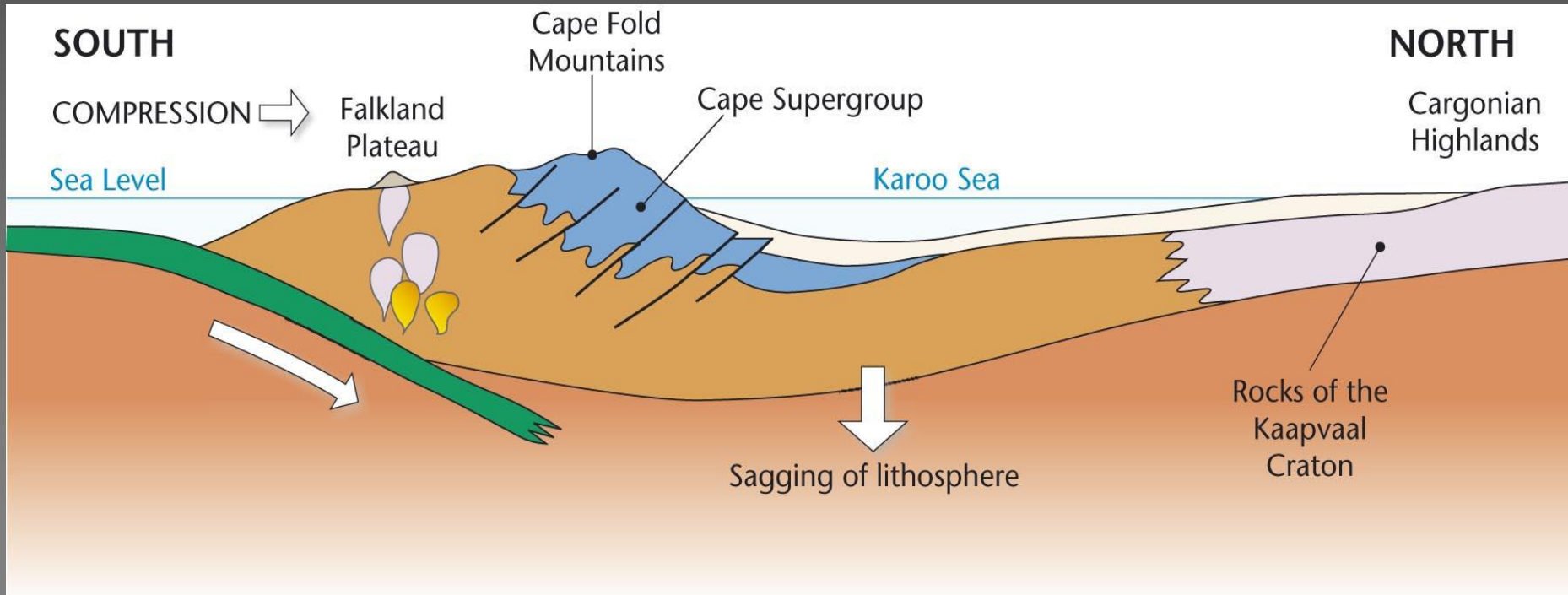
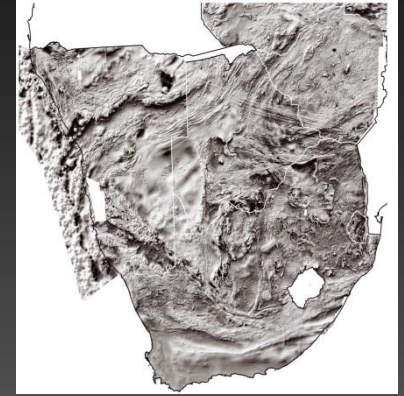
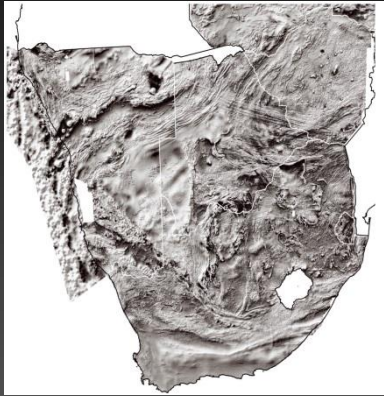
^b Geology Department, Rand Afrikaans University, P O Box 524, Johannesburg, 2000, South Africa

^c Fossil Fuel Division, Geological Survey, Private Bag X112, Pretoria, 0001, South Africa

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

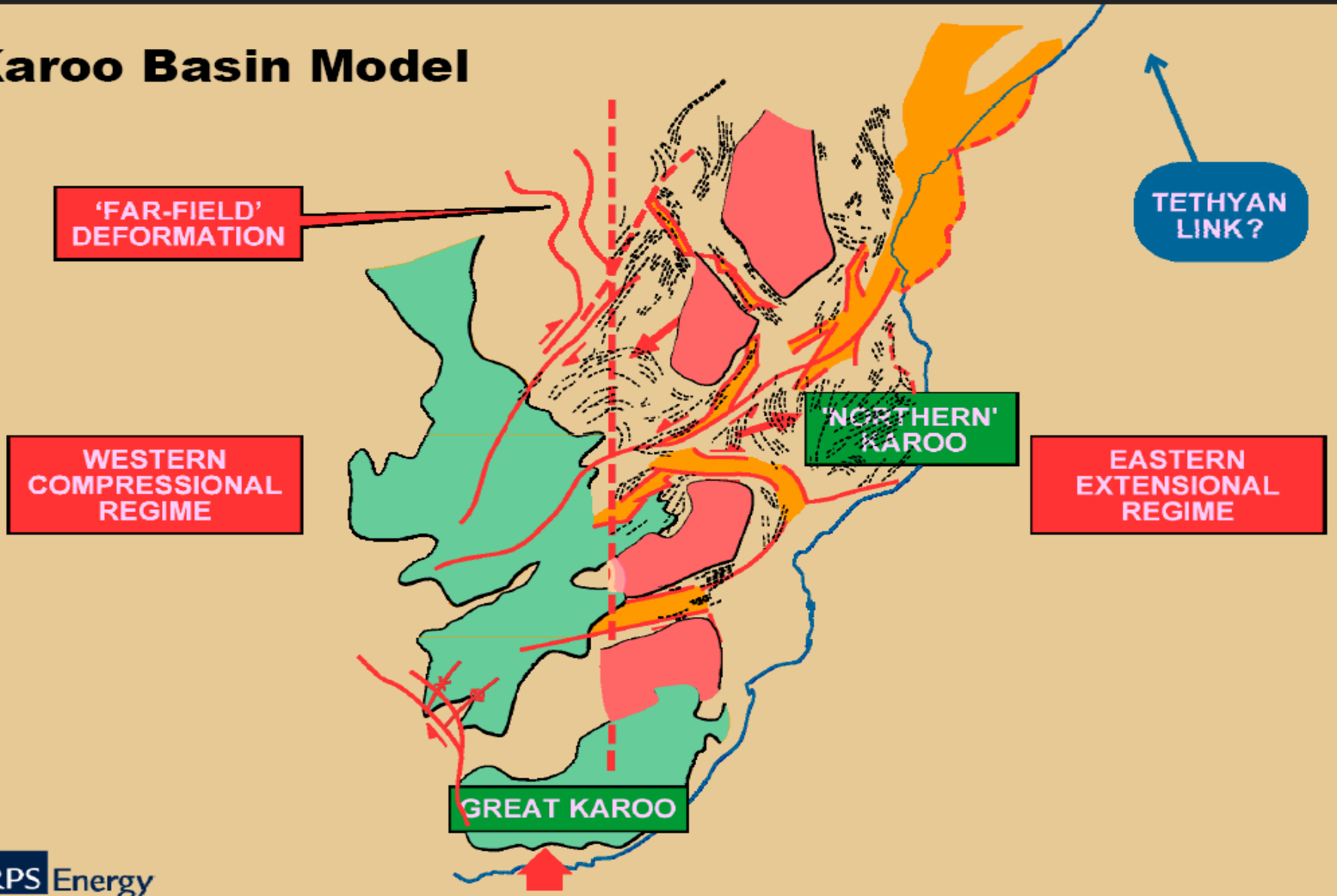


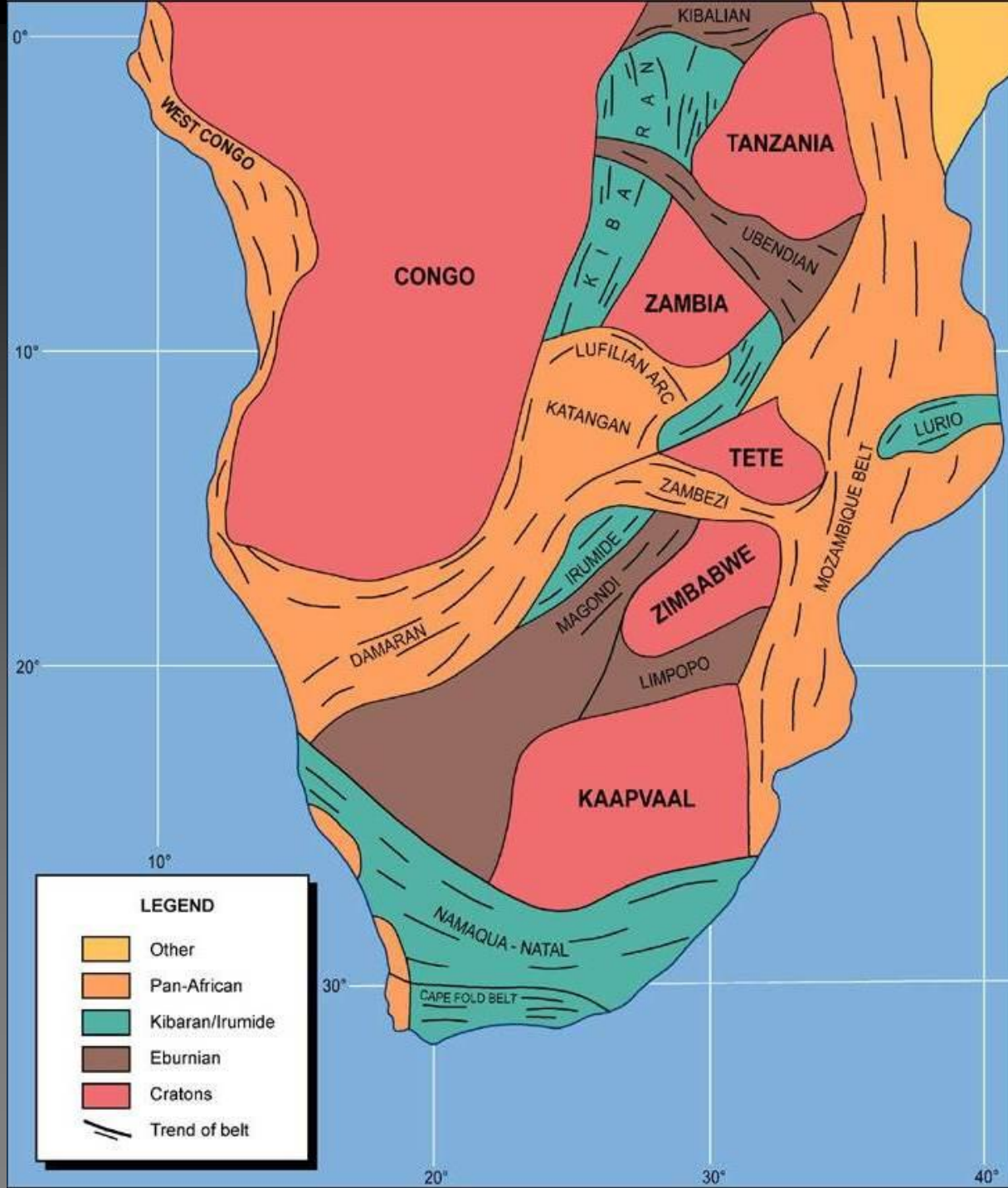
MAIN KAROO BASIN FORMED BY CRUSTAL SHORTENING WHICH CREATED THE CAPE FOLD BELT

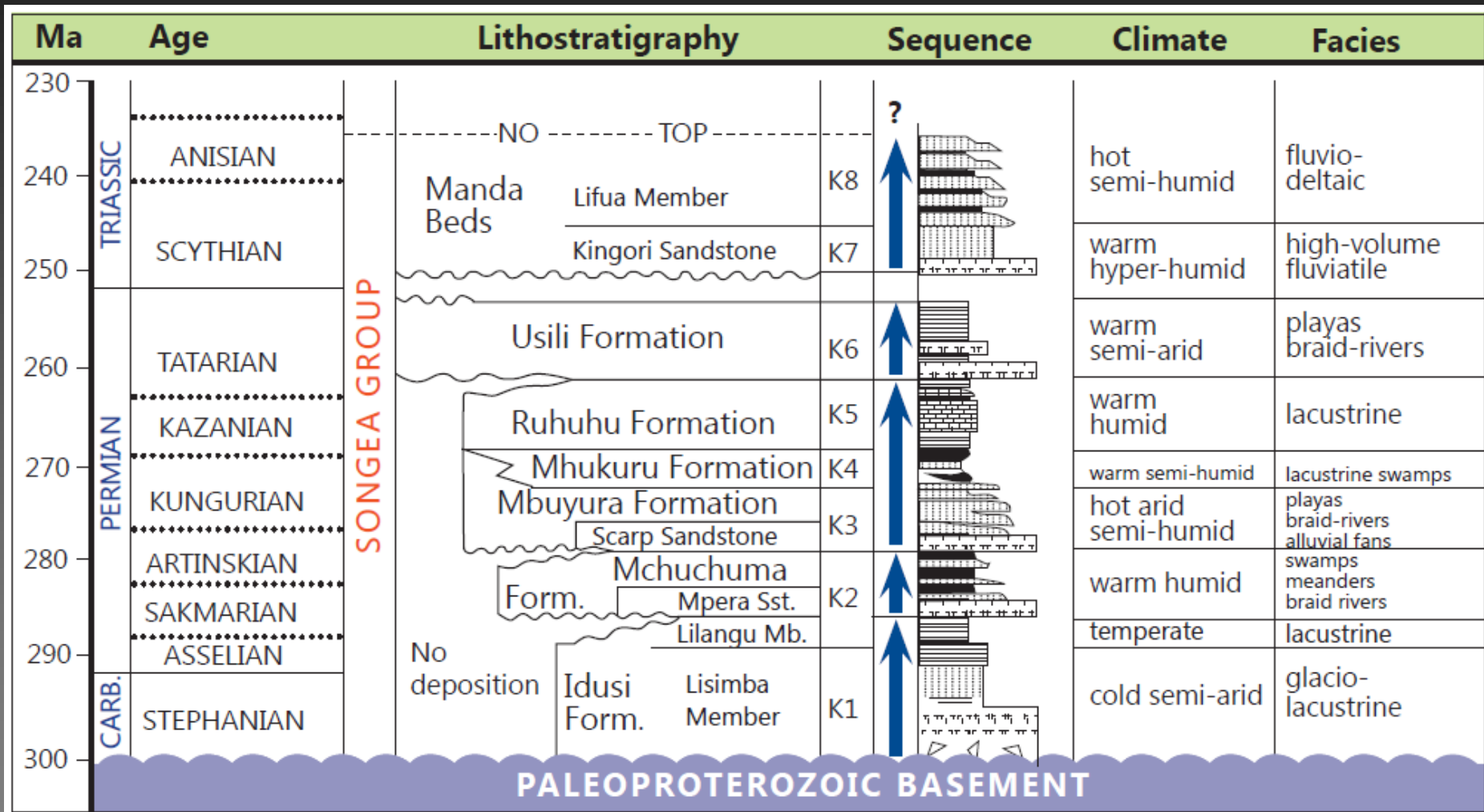


RELATED EXTENSIONAL BASINS OF SUB-SAHARAN AFRICA

Karoo Basin Model

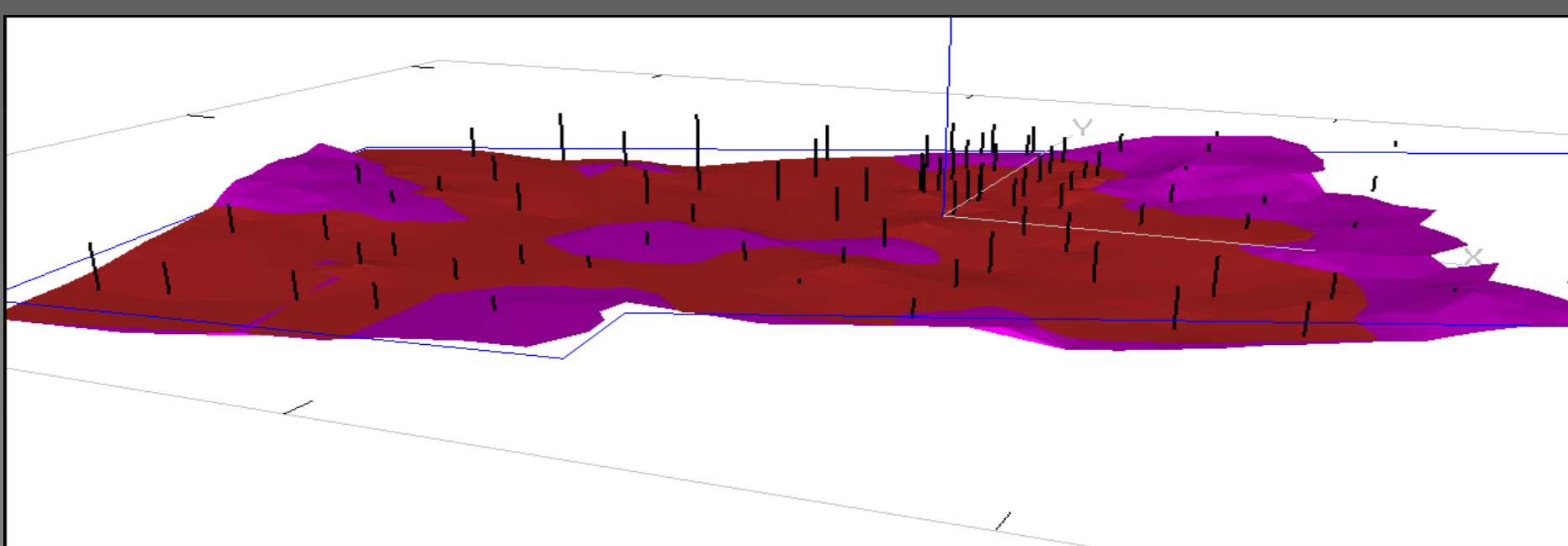
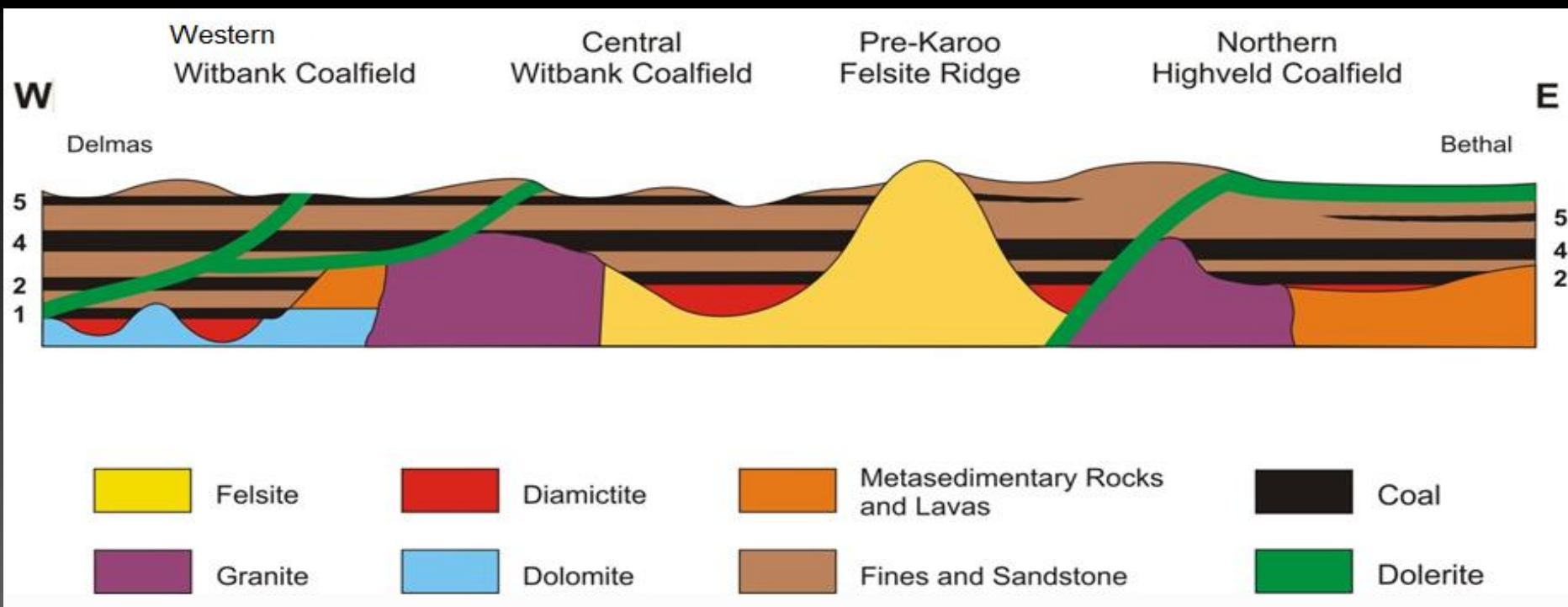






BASAL GLACIAL UNITS

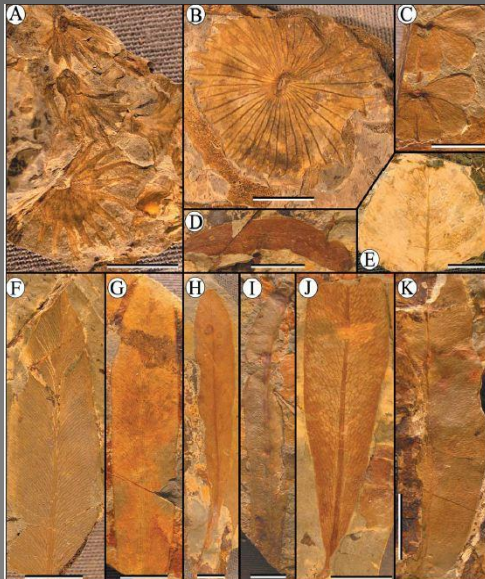




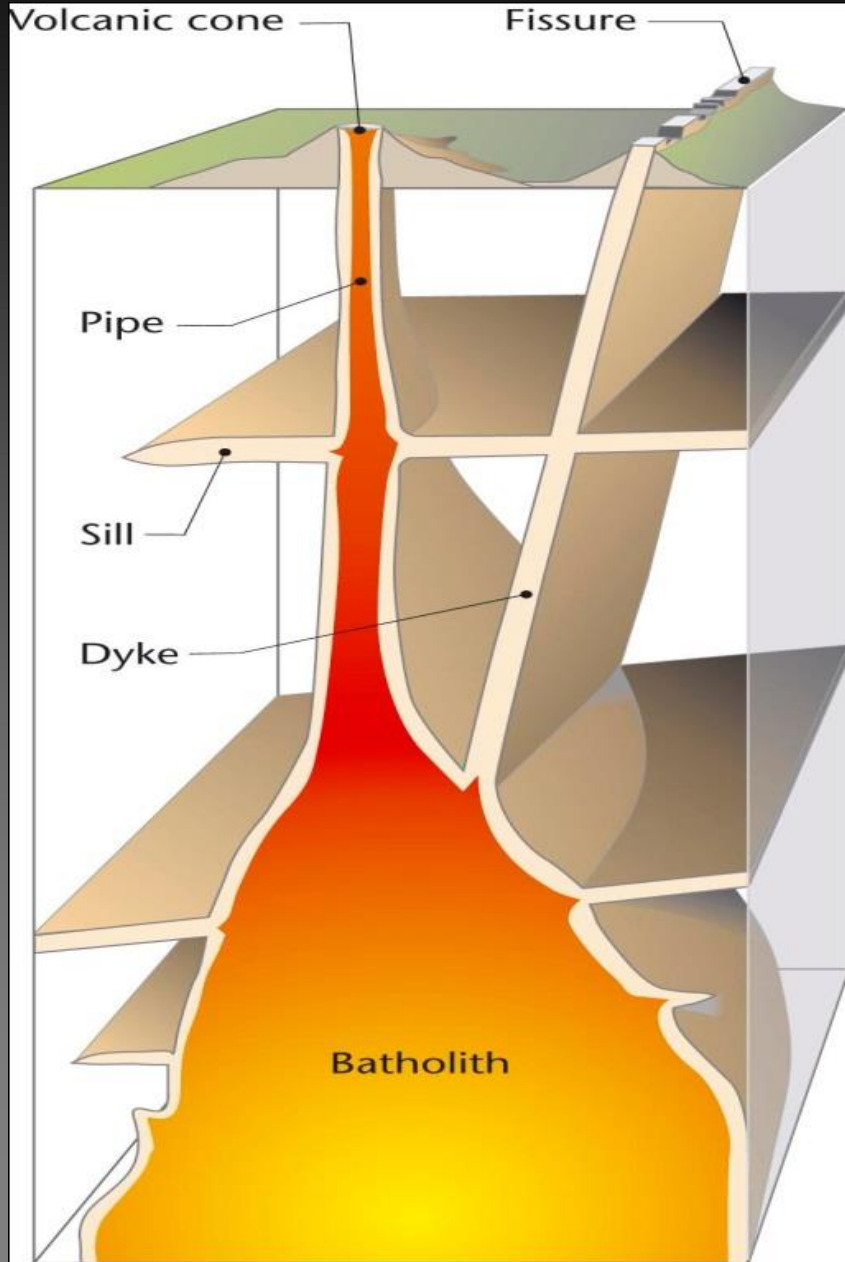
LOWER COAL BEARING UNITS



UPPER COAL BEARING UNITS



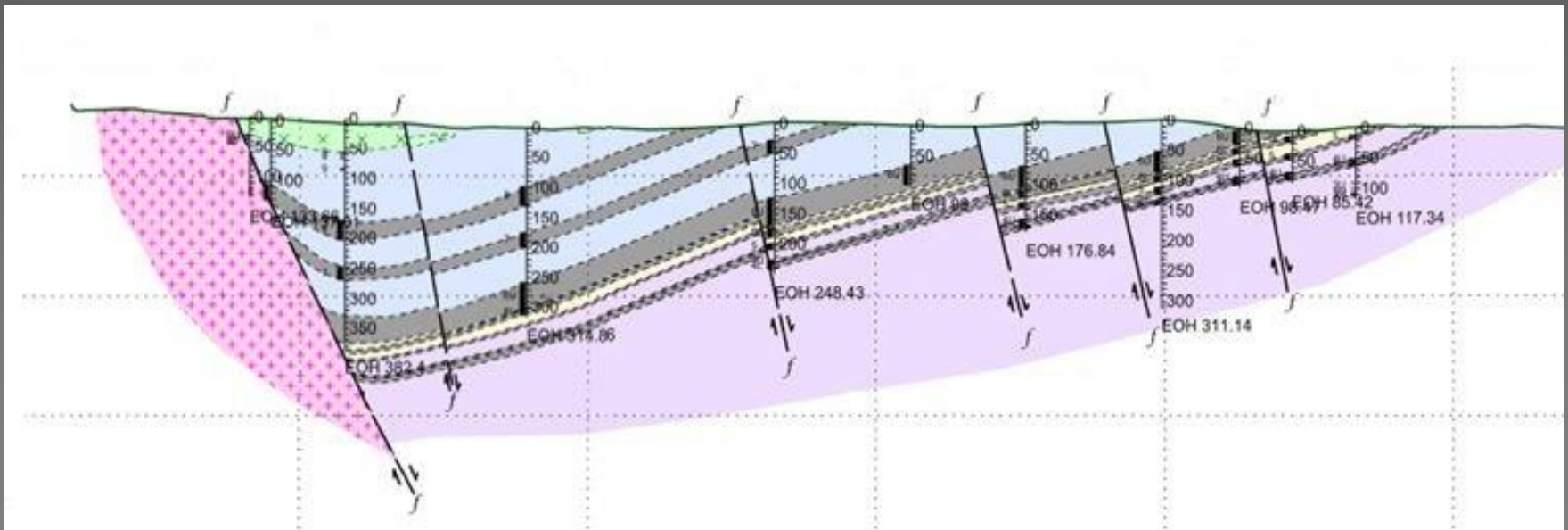
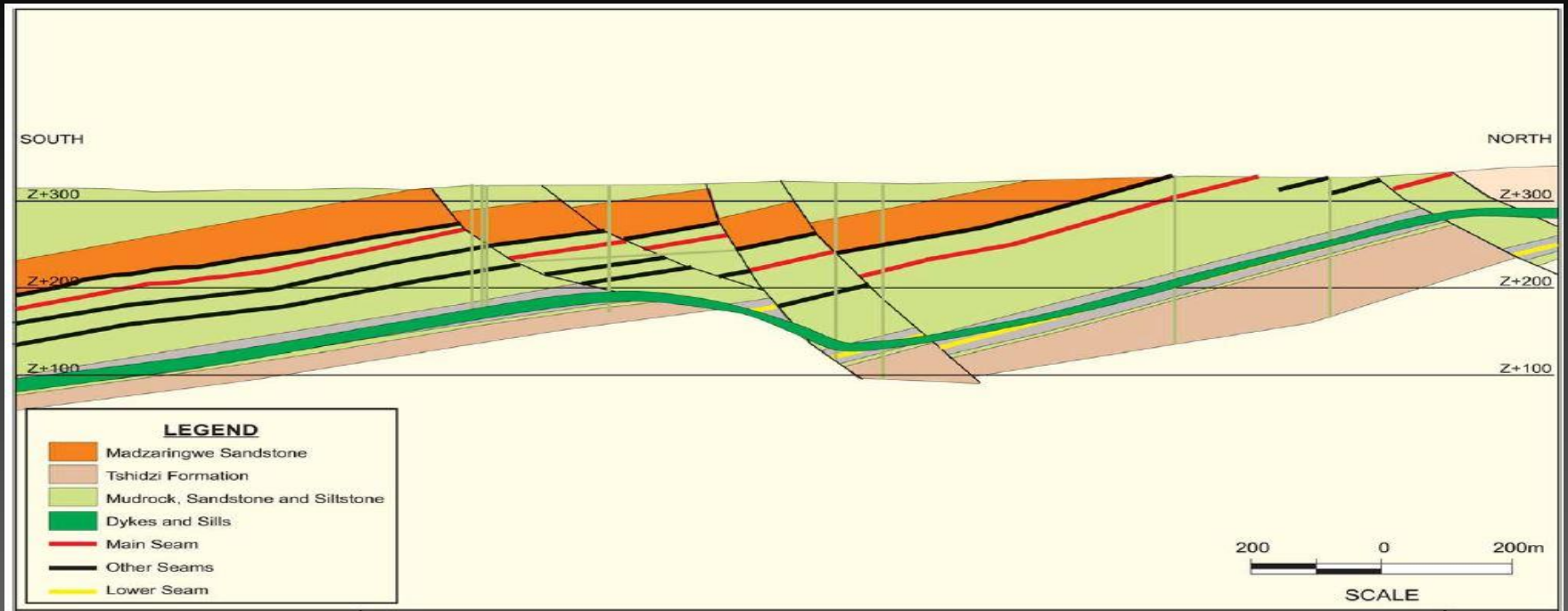
BREAK-UP OF A SUPERCONTINENT

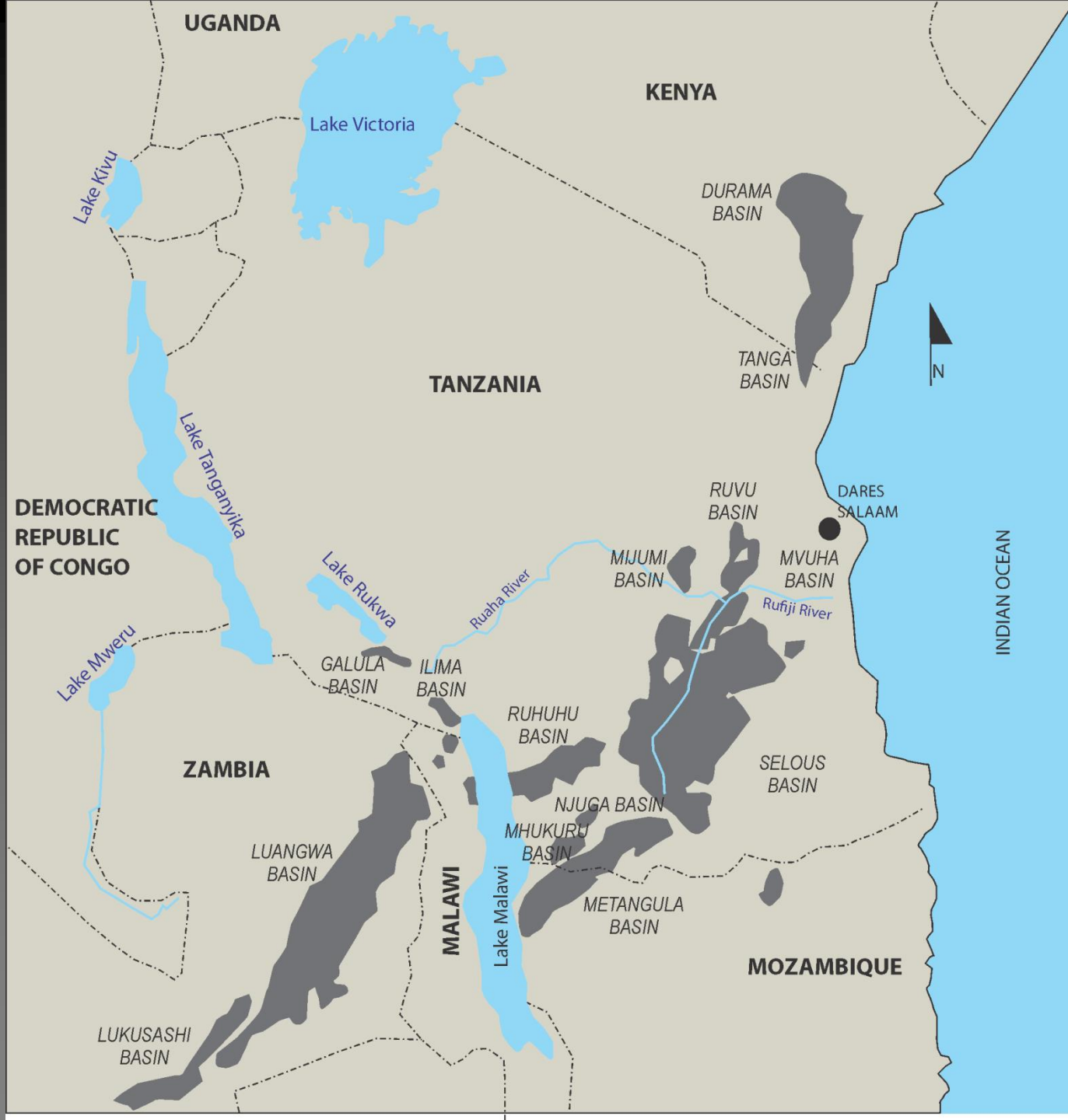


**ONLY THE MAIN KAROO BASIN
IN SOUTH AFRICA IS A
FORELAND BASIN**



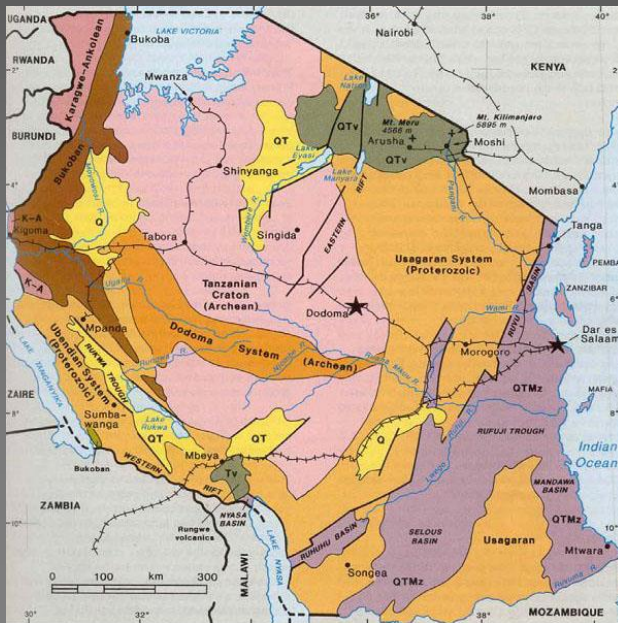
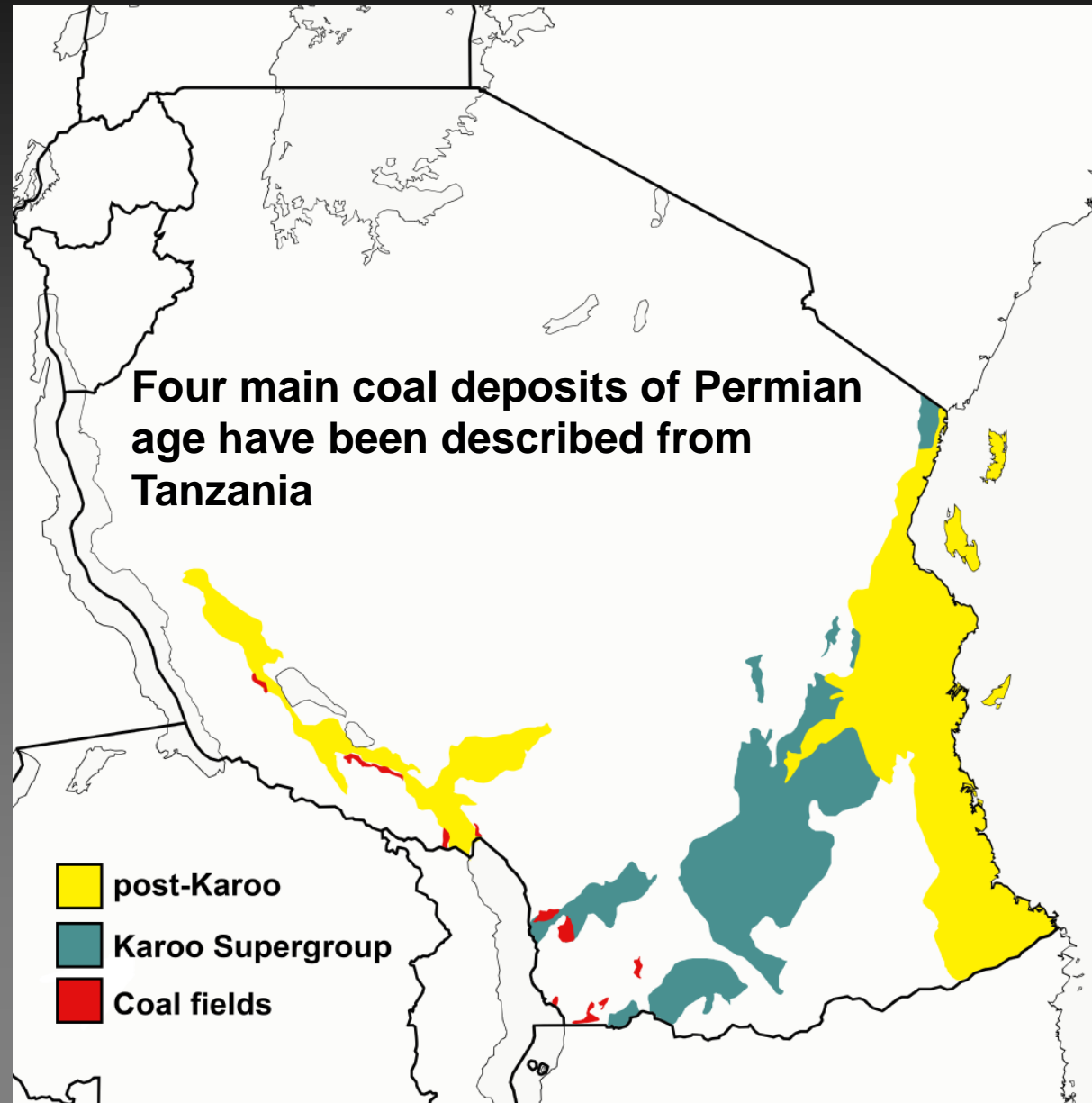
**ALL THE
REMAINING BASINS ARE
EXTENSIONAL RIFT RELATED
BASINS
(INTRA- OR INTERCRATONIC
GRABENS OR HALF GRABENS)**







TANZANIA



Tancoal Thermal Coal Mine – Ngaka sub-basin coalfield



ASX Release

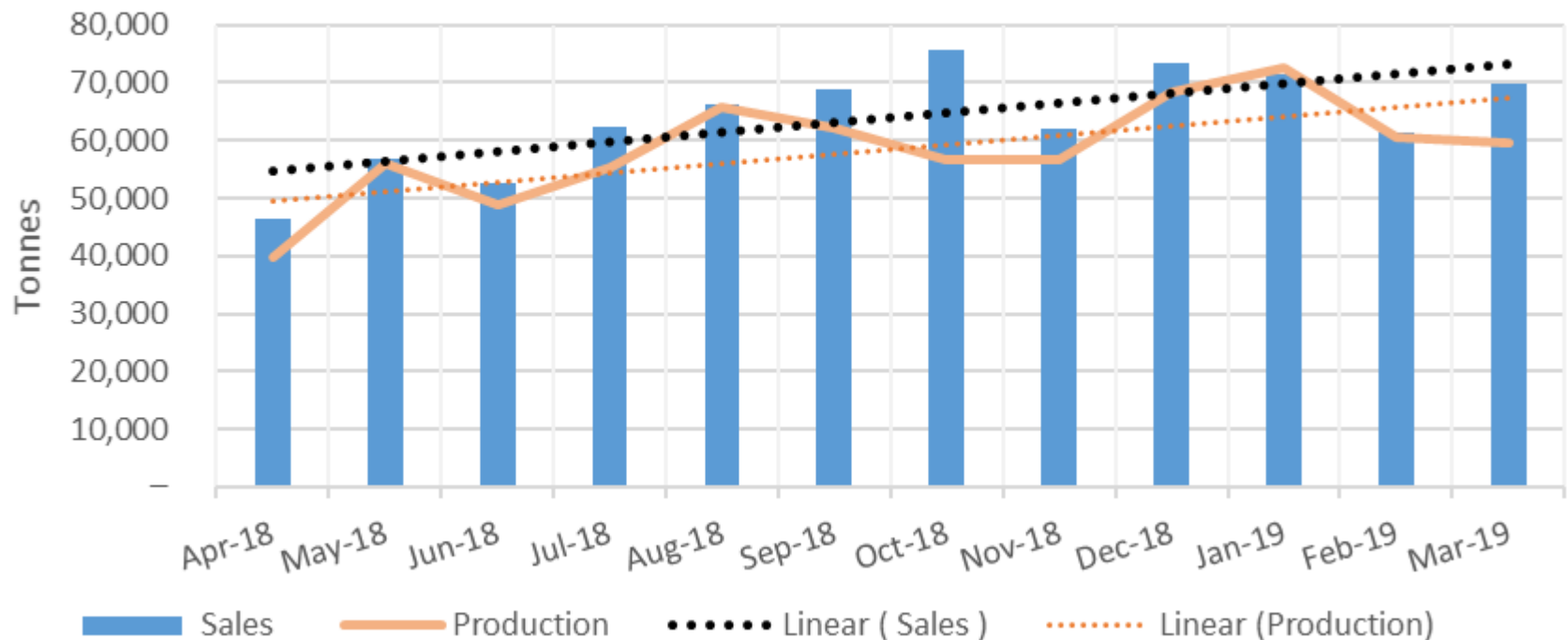
8 April 2019

IEC MARCH 2019 UPDATE

- **Sales 69,810 tonnes**
- **Production 59,643 tonnes**

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

Tancoal - Production and Sales



170 Mt Rukwa Thermal Coal Mine





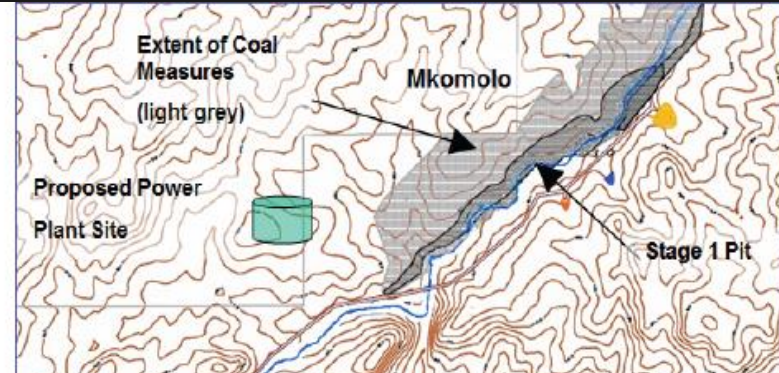
4,000 t per month



**Typical washed values 24.25 MJ/kg,
Ash 20%, Moisture 5-9%; TS 0.62%**

RUKWA COAL TO POWER PROJECT

- The Company's core asset is the Rukwa Coal-to-Power Project, located in western Tanzania, ~25km by road to the north-east of the major commercial centre of Sumbawanga.
- The Rukwa Coalfields are comprised of the Mkomolo, Namwele and Muze deposits – historical small scale mining having taken place
- Total in-situ JORC Resources across 3 deposits: 173Mt

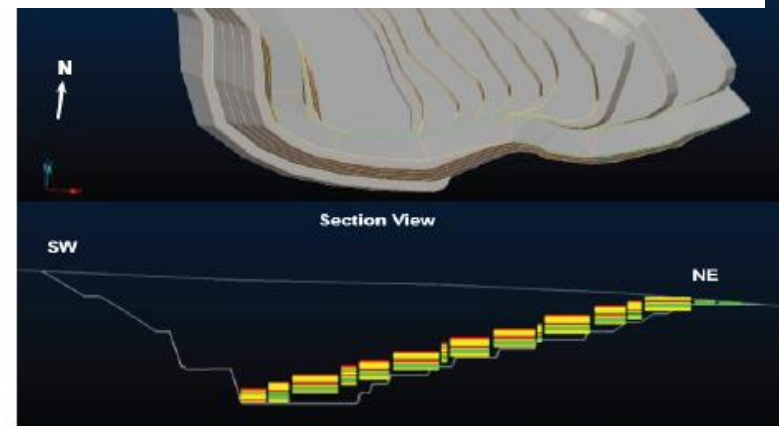


TanESCO Update

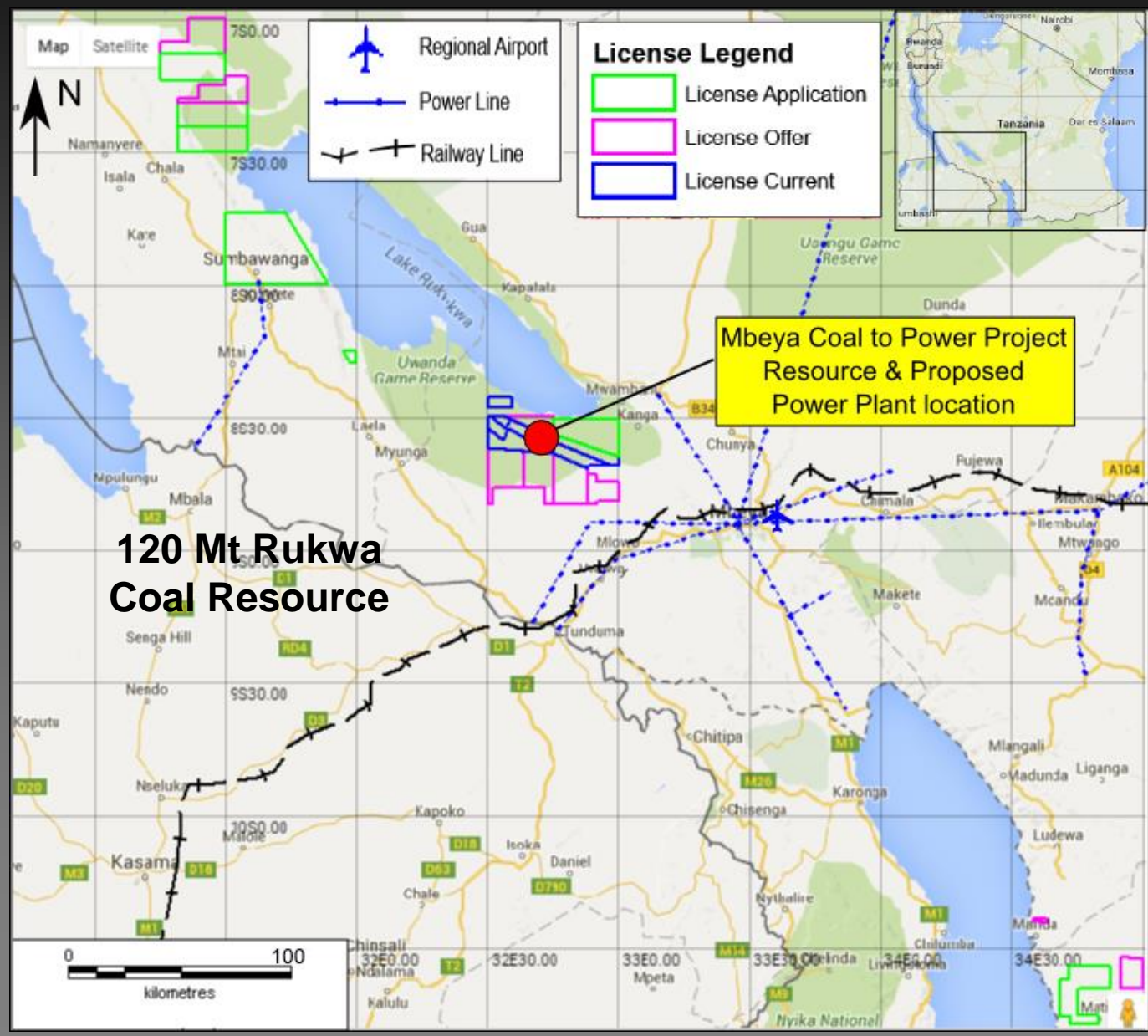
To date the Company has received no detailed explanation as to why Tanzania Electricity Supply Company ("TanESCO") did not move forward with the previously anticipated coal to power generation plans following the recent Request for Qualification (RFQ) submissions in October and December 2018. Subsequently the Company is concentrating on its commercial coal operations, whilst maintaining a dialogue with TanESCO, until the economic and political environment for coal to power generation in Tanzania is more clearly defined by the appropriate authorities.

- Ideally suited for coal fired power generation
- Edenville Energy plc own 100% of Edenville Power Tanzania Ltd established to develop the power plant

120-300 MW



Source: Edenville Energy



Kibo, Edenville's shares knocked by Tanesco bid rejection



Aim- and AltX-listed Kibo's share price on the LSE fell by 47.76% on the news, while its share price on the JSE fell by 31.58%.



Aim-listed Edenville's share price on the LSE, meanwhile, fell by 32.43%.



Kibo's drilling at the Mbeya coal-to-power project, in Tanzania



MALAWI



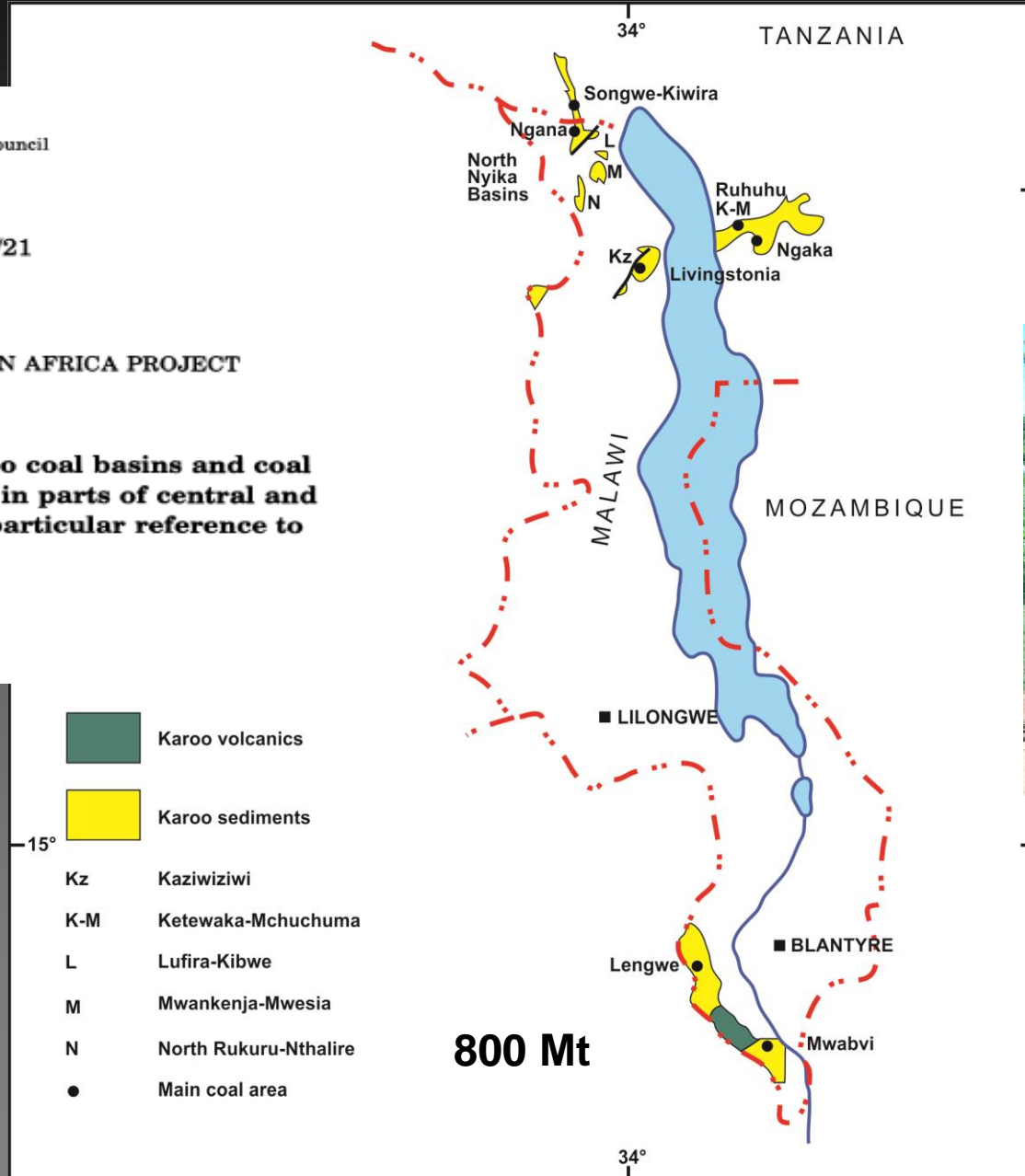
British Geological Survey
Natural Environment Research Council

Technical Report WC/89/21
Overseas Geology Series

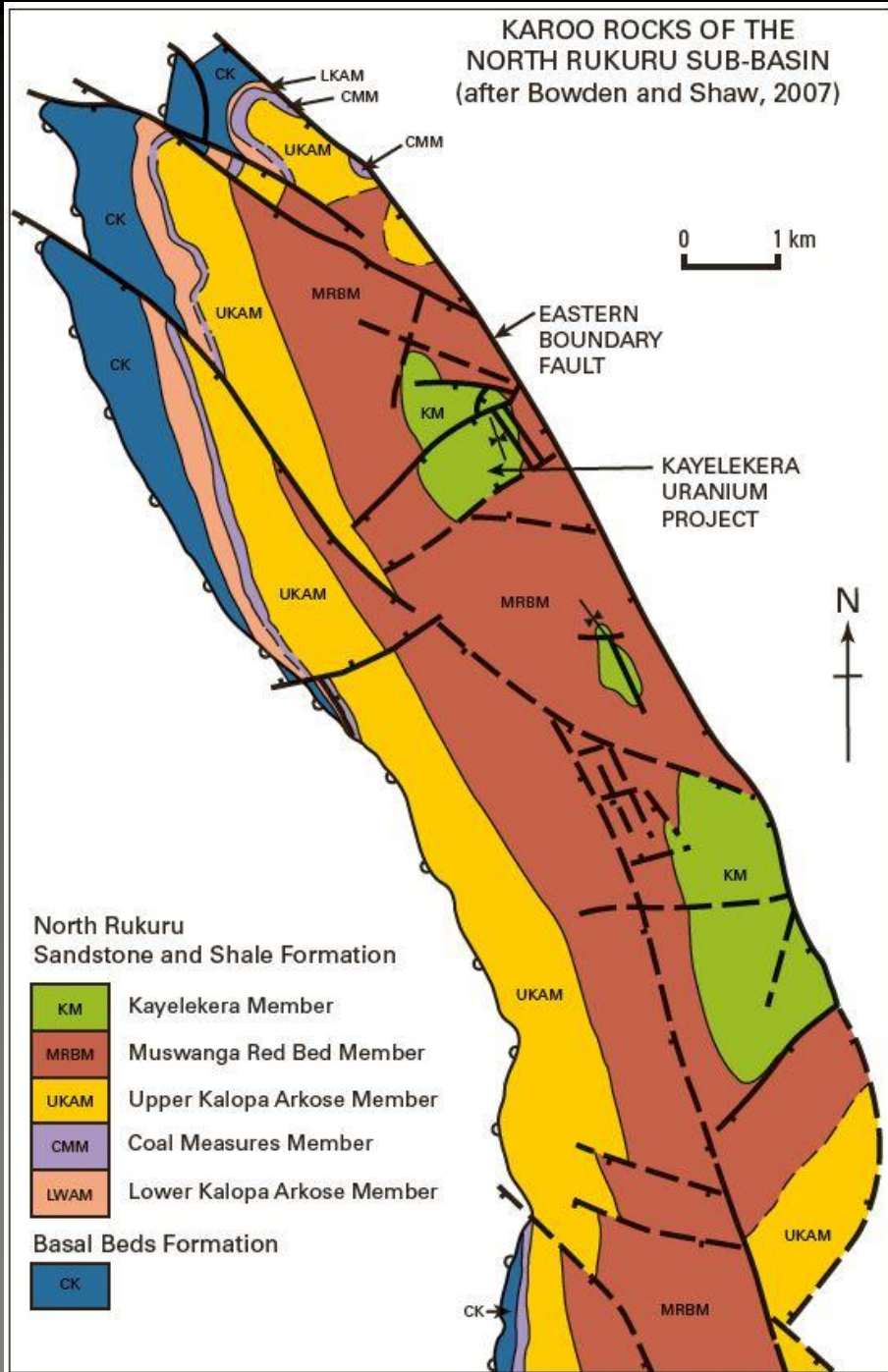
SMALLER COAL BASINS IN AFRICA PROJECT
Final Report

Review of Lower Karoo coal basins and coal resource development in parts of central and southern Africa with particular reference to northern Malawi

John D Bennett



KAROO ROCKS OF THE NORTH RUKURU SUB-BASIN
(after Bowden and Shaw, 2007)



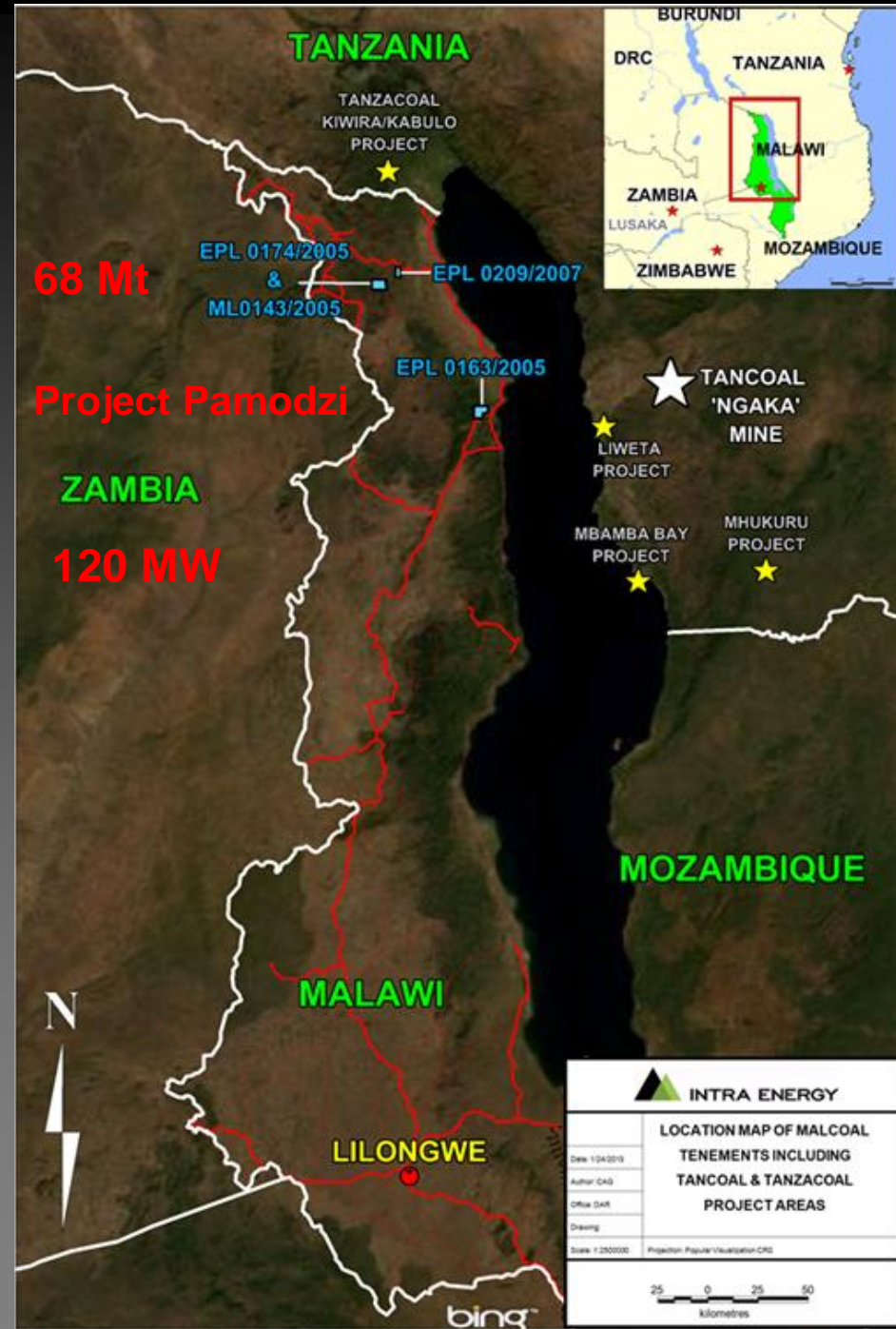
North Rukuru
Sandstone and Shale Formation

- KM Kayelekera Member
- MRBM Muswanga Red Bed Member
- UKAM Upper Kalopa Arkose Member
- CMM Coal Measures Member
- LWAM Lower Kalopa Arkose Member

Basal Beds Formation

- CK

TANZANIA



68 Mt

Project Pamodzi

ZAMBIA

120 MW

MOZAMBIQUE

MALAWI

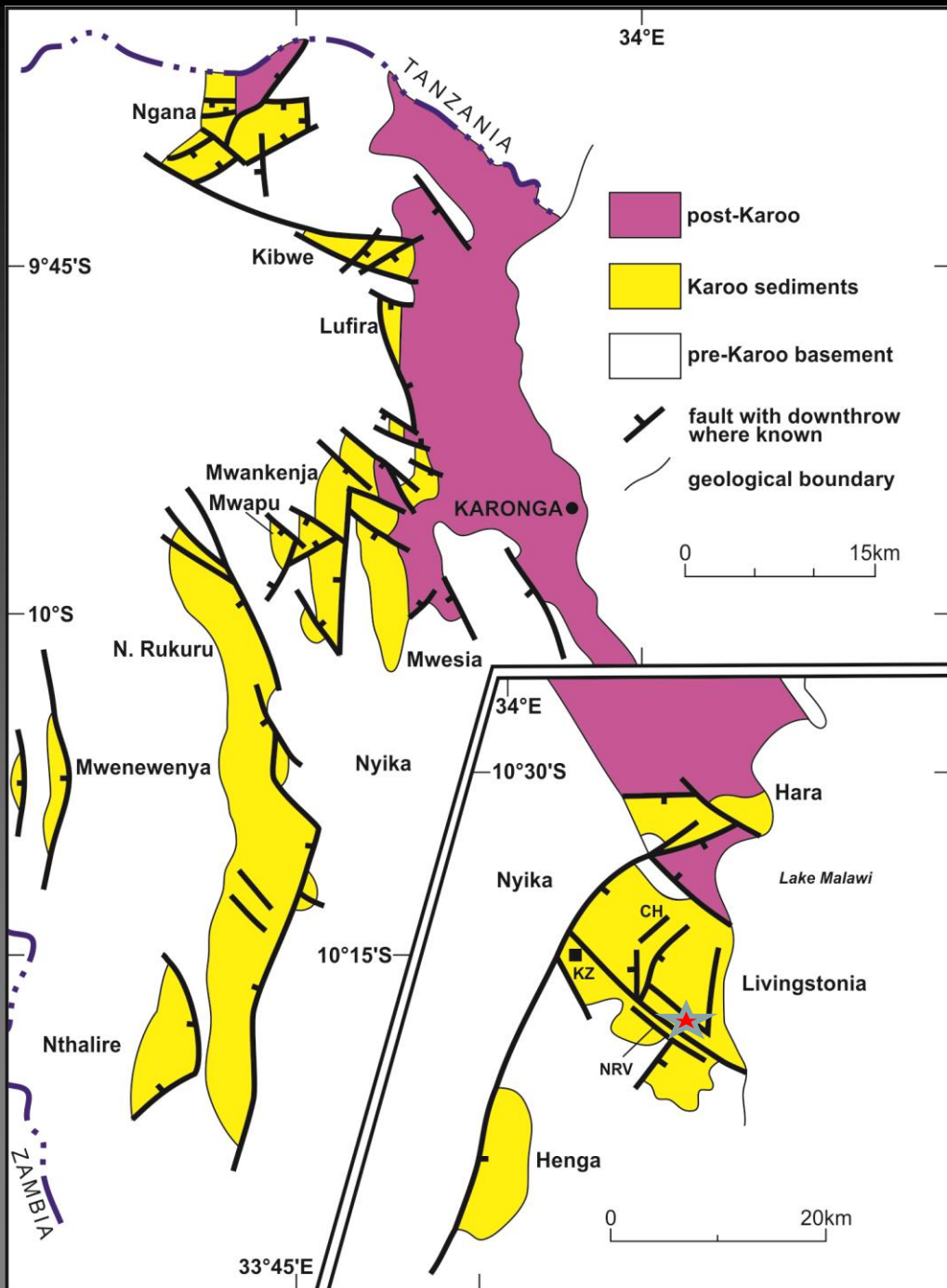
LILONGWE

INTRA ENERGY

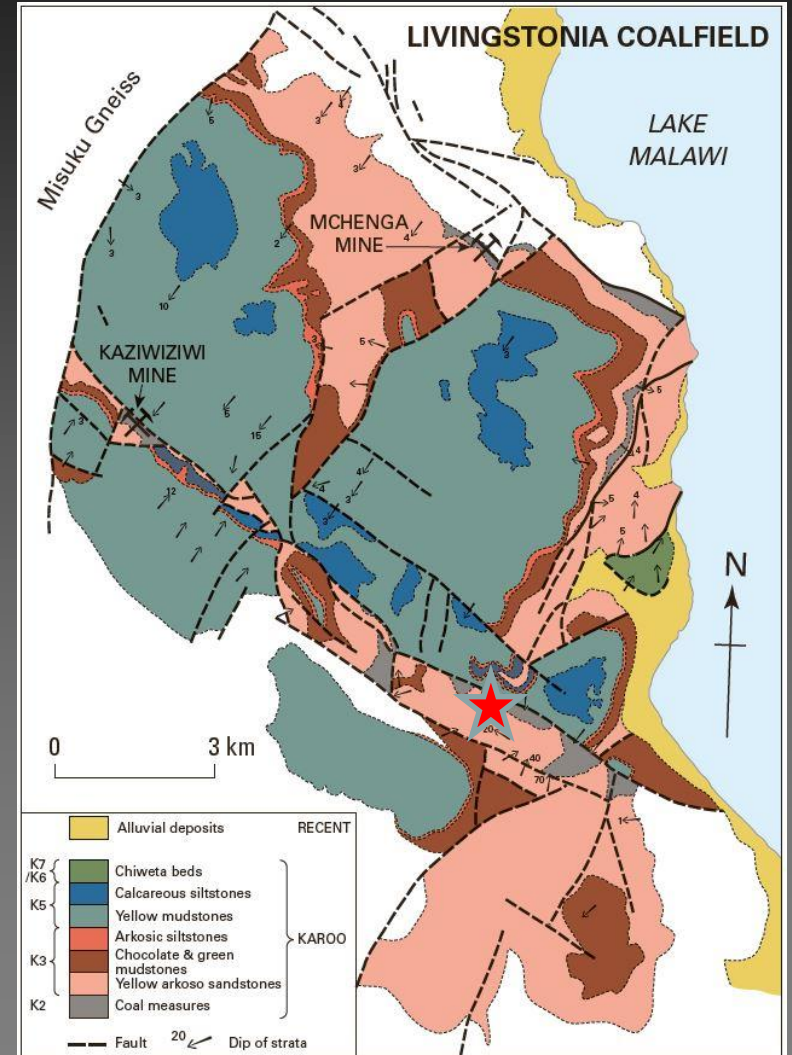
LOCATION MAP OF MALCOAL TENEMENTS INCLUDING TANCOAL & TANZACOAL PROJECT AREAS

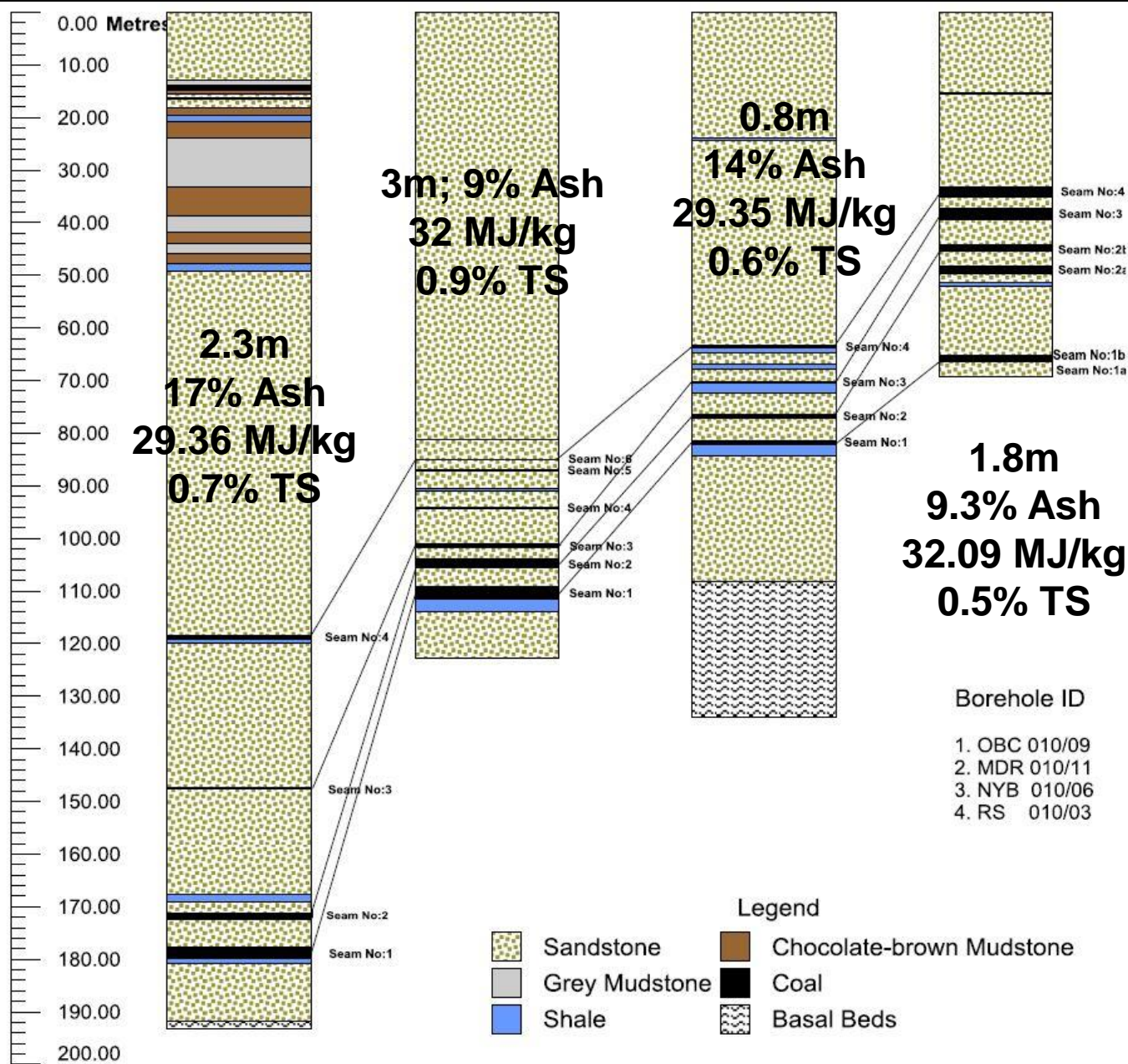
Date: 1/04/2010	Author: DAG
Office: SAR	Drawing:
Scale: 1:250000	Projection: Popular Visualization CRS

25 0 25 50
kilometres



Mchenga Coal Mine

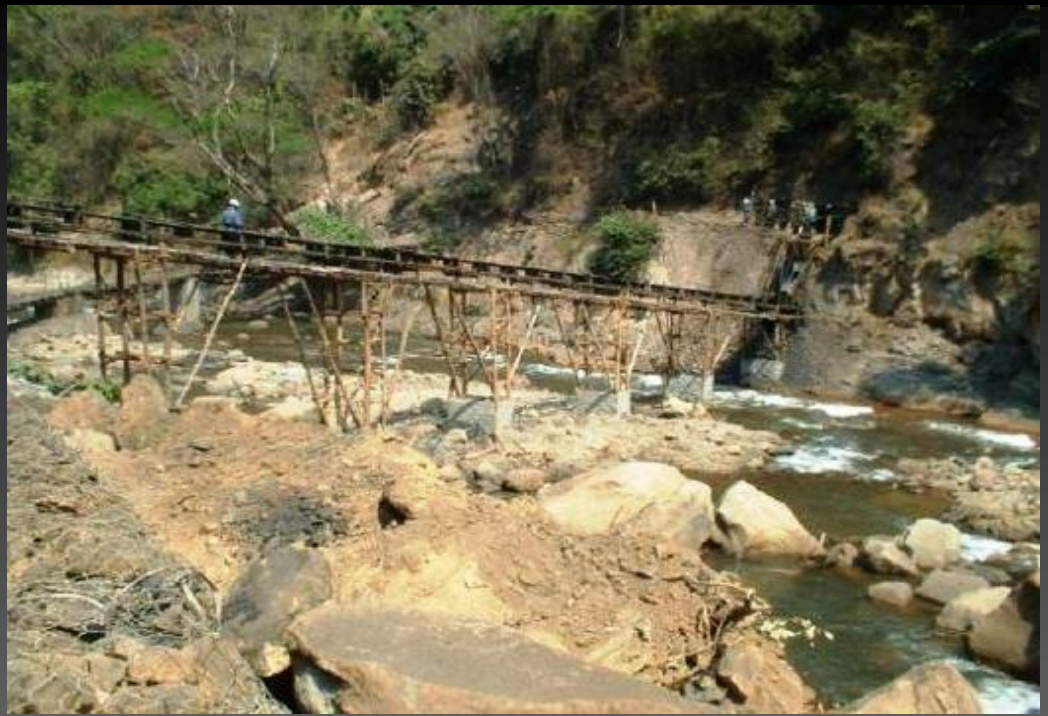




NW

Maneya (2012)_MSc.

SE



Carbonaceous shale

June 2017

You Guys are, all fired! We are closing shop because the Malawi market is saturated by imported coal

We are DOOMED!

Now that the Nacala Railway-line is operational, we'll be able to import coal from Mozambique using the 'COUNTER-BUY MALAWI INITIATIVE'... Oops! My Govt. is really doing all it can to protect local industry. We expect more investors to flock into the country. Hal Hal

By James Kazembe

New coal mine launched in Karonga

...“Kasikizi set to become Malawi’s largest coal producer” ...Consortium mulling over plans for 50MW power station



Dignitaries joined by Indian High Commissioner (2nd R) during launch



The resource curse in mwaulambo





MCL - 300 MW MINE-MOUTH POWER PLANT



TAKE HOME POINTS

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