

# TYPE, DISTRIBUTION AND USE OF COAL IN SOUTH AFRICA



mineral resources  
Department:  
Mineral Resources  
REPUBLIC OF SOUTH AFRICA



Council for Geoscience  
Applied Geoscience Solutions

# WHAT IS COAL

- Sedimentary rock
- Heterogeneous and carbonaceous fossil fuel/material



organic and inorganic



70% carbon content,  
30% oxygen and hydrogen



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# FORMATION OF SOUTHERN HEMISPHERE COAL

## Permian Period

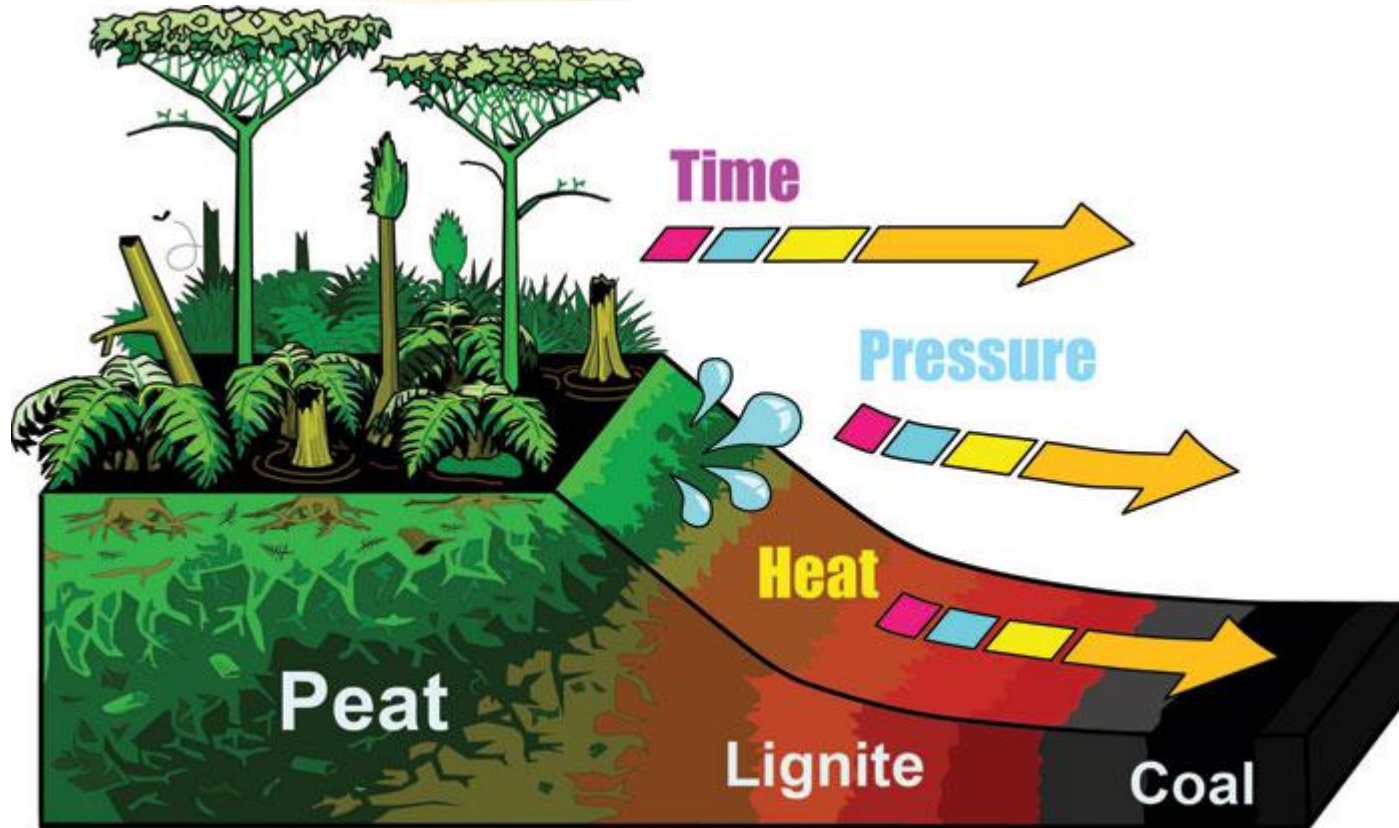


## Carboniferous Period





# COAL FORMATION



K&S

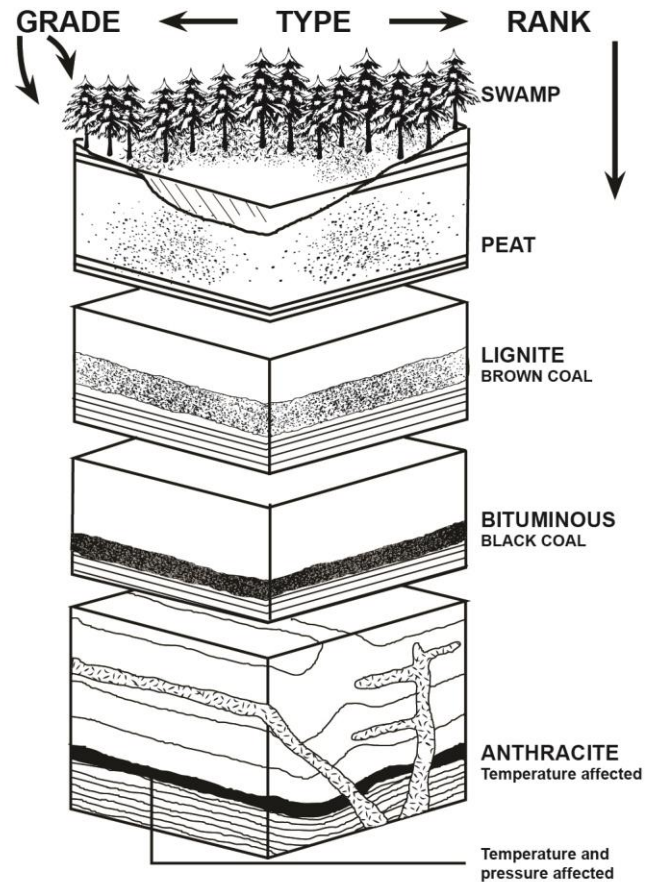


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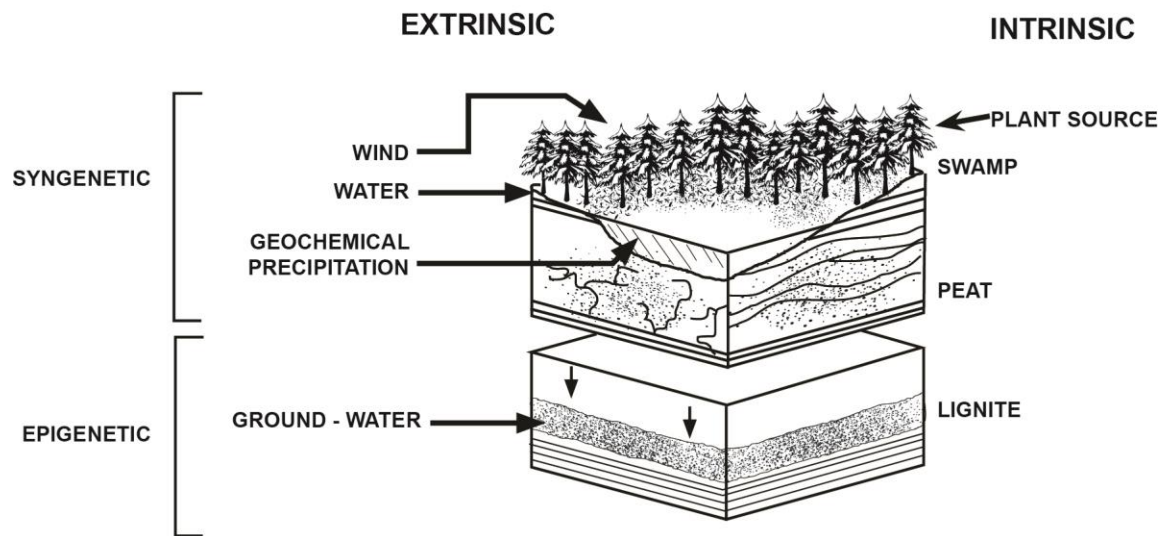


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# COAL FORMATION



# ORIGIN OF MINERAL MATTER IN COAL



# BASIC COAL QUALITY ASSESSMENT: TYPE, GRADE AND RANK

## BENEFICIATION PROPERTIES

- Particle size distribution
- Grindability
- Float sink
- Hard Grove Index

## CHEMICAL PROPERTIES

- Ash
- Volatile Matter
- Moisture
- Calorific Value
- Fixed & Total Carbon
- Sulphur

**COAL**

## COAL PETROGRAPHY

- Vitrinite reflectance
- Maceral analysis

## MINERAL MATTER

- X-Ray Diffractometer
- X-Ray Fluorescence Spectroscopy

## SWELLING PROPERTIES

- Swelling Index
- Ash fusion Temperature

## PHYSICAL PROPERTIES

- Surface Area
- Porosity



# COAL TYPE

COAL TYPE	MOISTURE CONTENT (%)	CARBON CONTENT (%)	CALORIFIC VALUE (MJ/kg)
Peat	90%		
Lignite	35%	25-35%	9 - 21
Sub-bituminous	10%	35-45%	19-26
Bituminous	8-10%	45-85%	23-33
Anthracite	0-5%	85-95%	32-35



**lignite  
coal**



**sub-bituminous  
coal**



**bituminous  
coal**



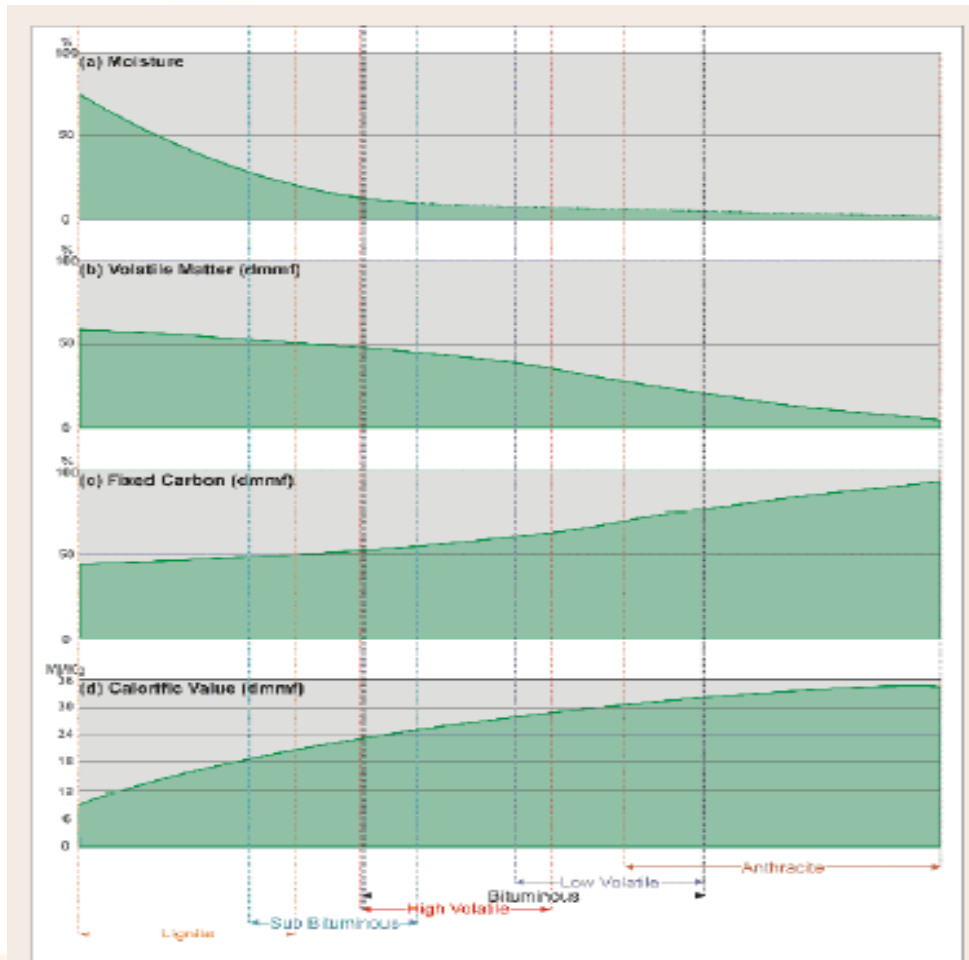
**anthracite  
coal**



**Typical coal found in South African Coalfield**

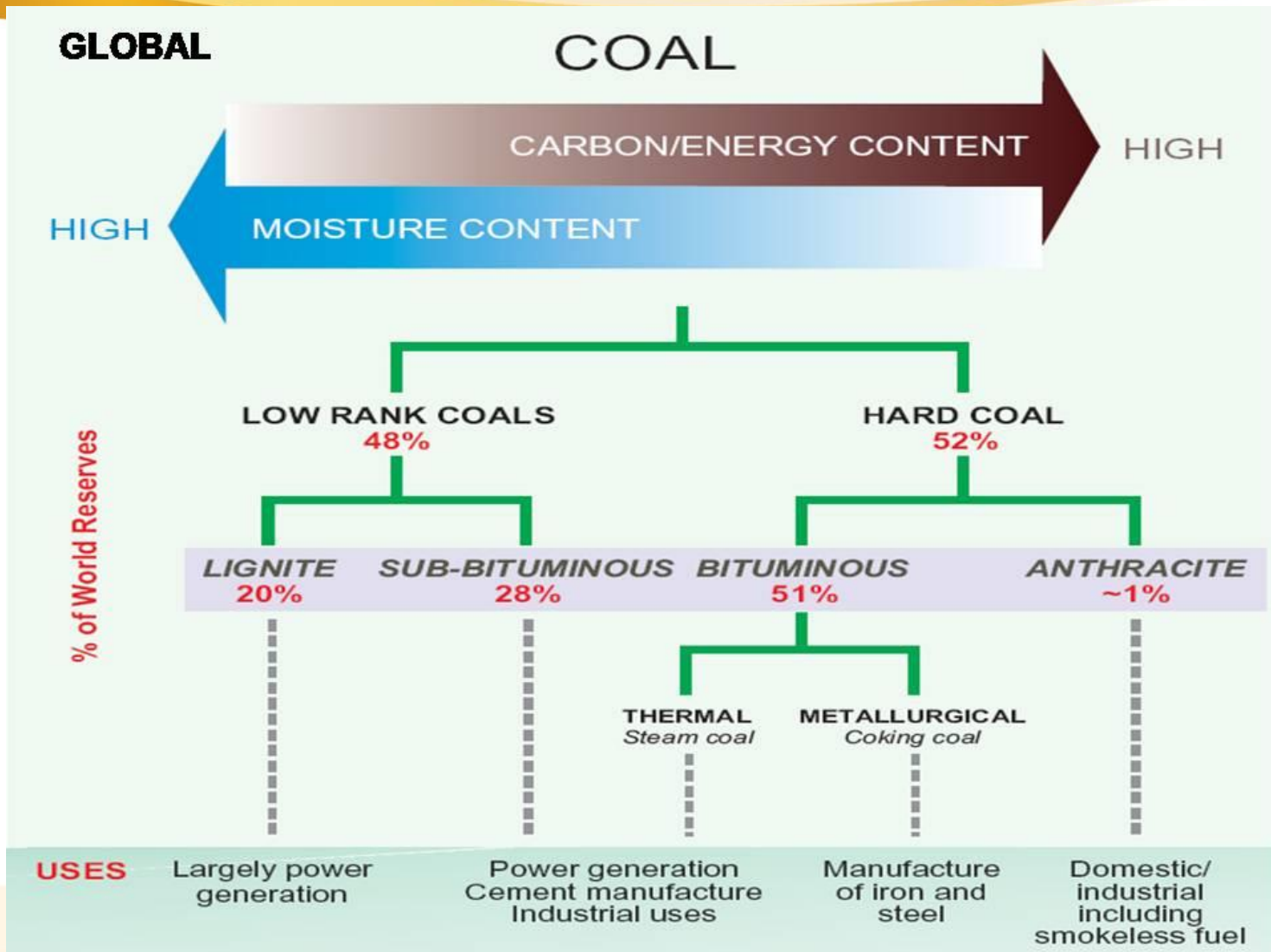


# VARIATION OF COAL PARAMETERS WITH RANK

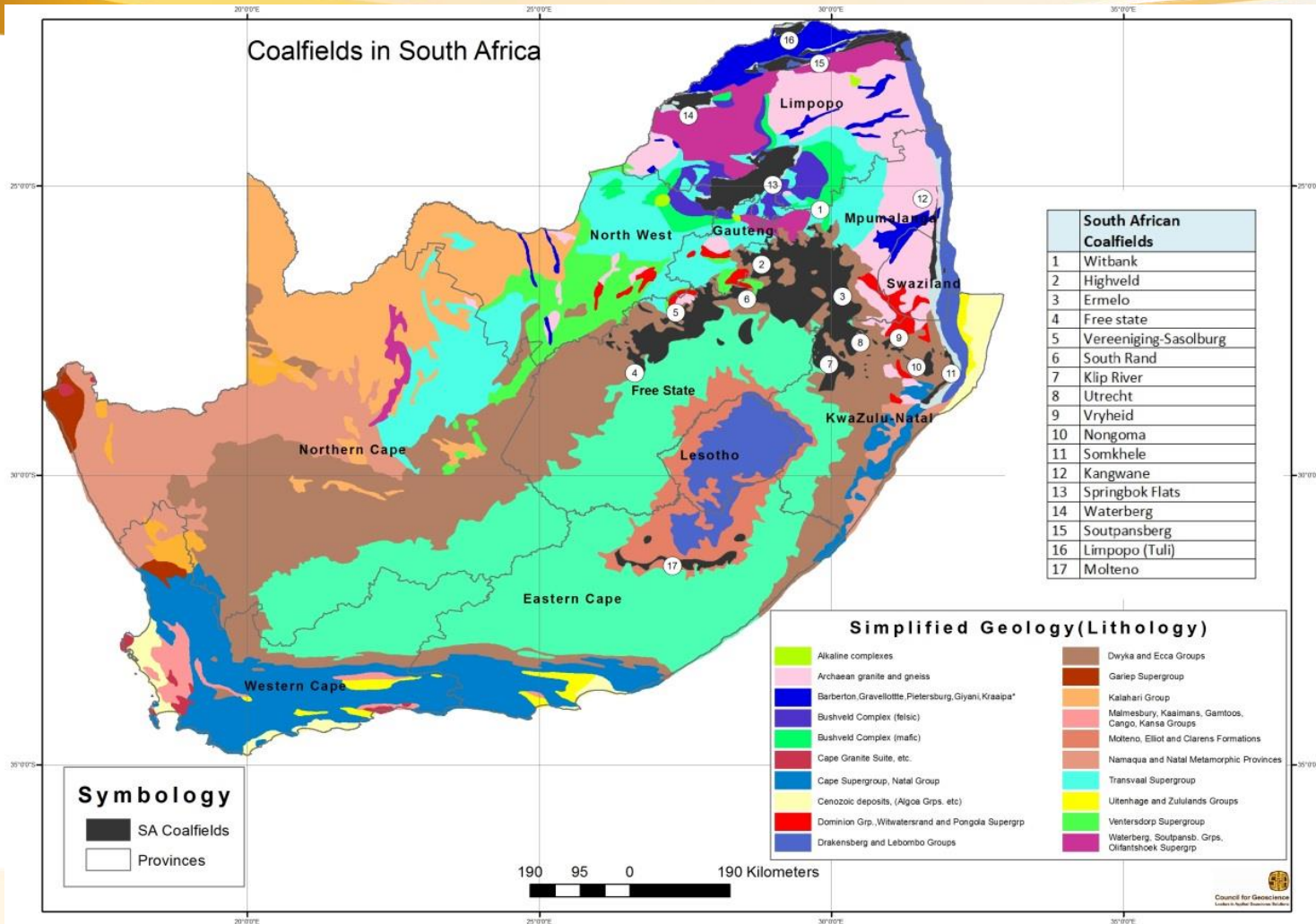


Source: Vinay

# COAL TYPE BY USE



# COAL DISTRIBUTION IN SOUTH AFRICA



# VARIATIONS OF MAJOR COAL SEAMS IN SOUTH AFRICA

## MAJOR SEAMS ACROSS THE KAROO BASIN, SOUTH AFRICA KWAZULU-NATAL, ERMELO, WITBANK TO FREE STATE *Different sequences of seams in each area*

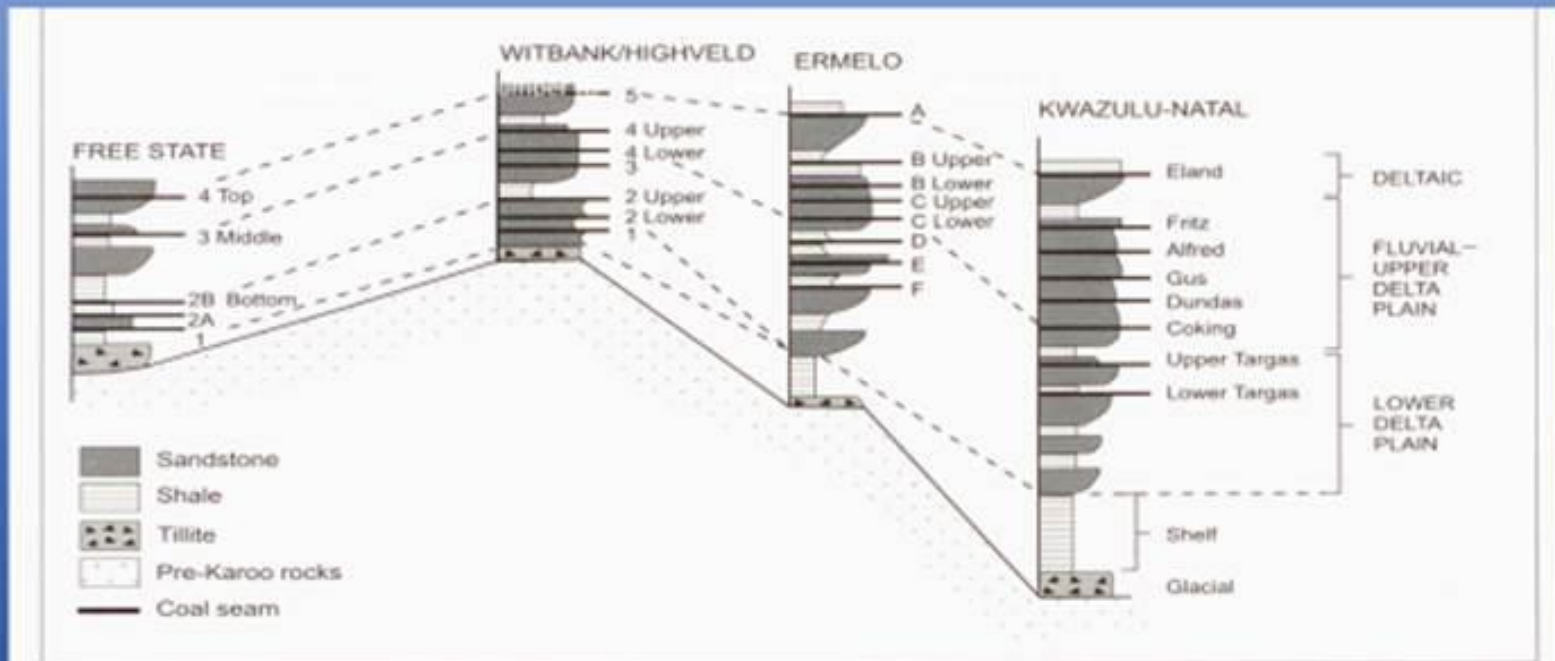


Fig. 5 - Tentative correlation of depositional sequences in the major coal fields within the main basin (after A.B. Cadle, quoted by Snyman and Barclay 1989).



# VALUE CHAIN OF COAL IN SOUTH AFRICA

Mining

## Coal Value

Exploration

Sampling &  
Characterization

Research &  
Development

Resources &  
Reserves

## Global Context

Coal Preparation

Transport

Coal Exports

## Regional Context

Electricity

Coal to Liquid

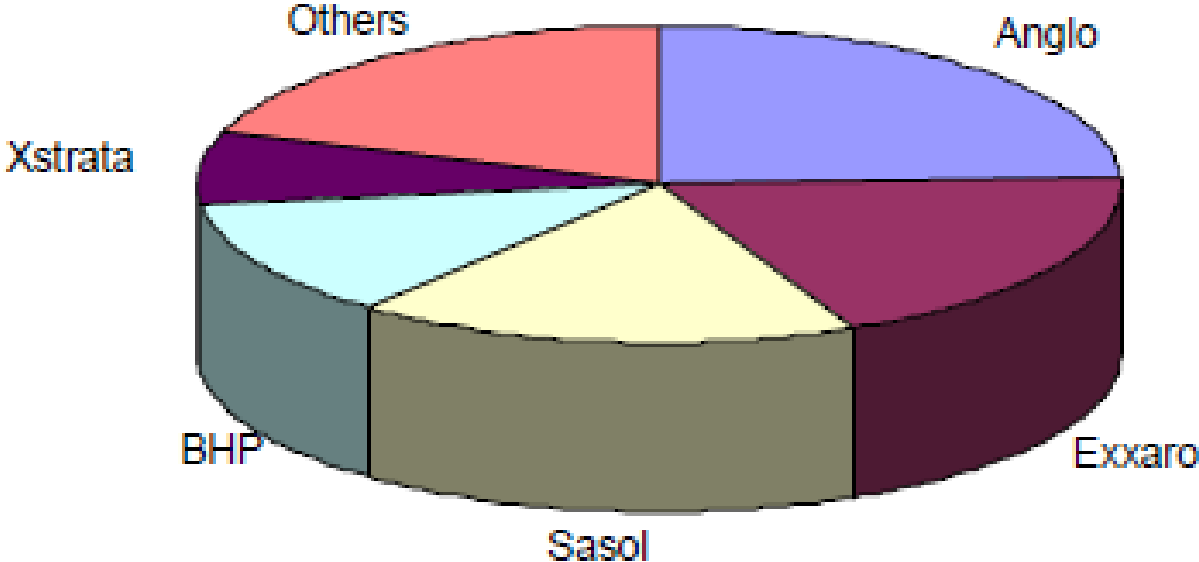
Metallurgical  
use

Industrial use

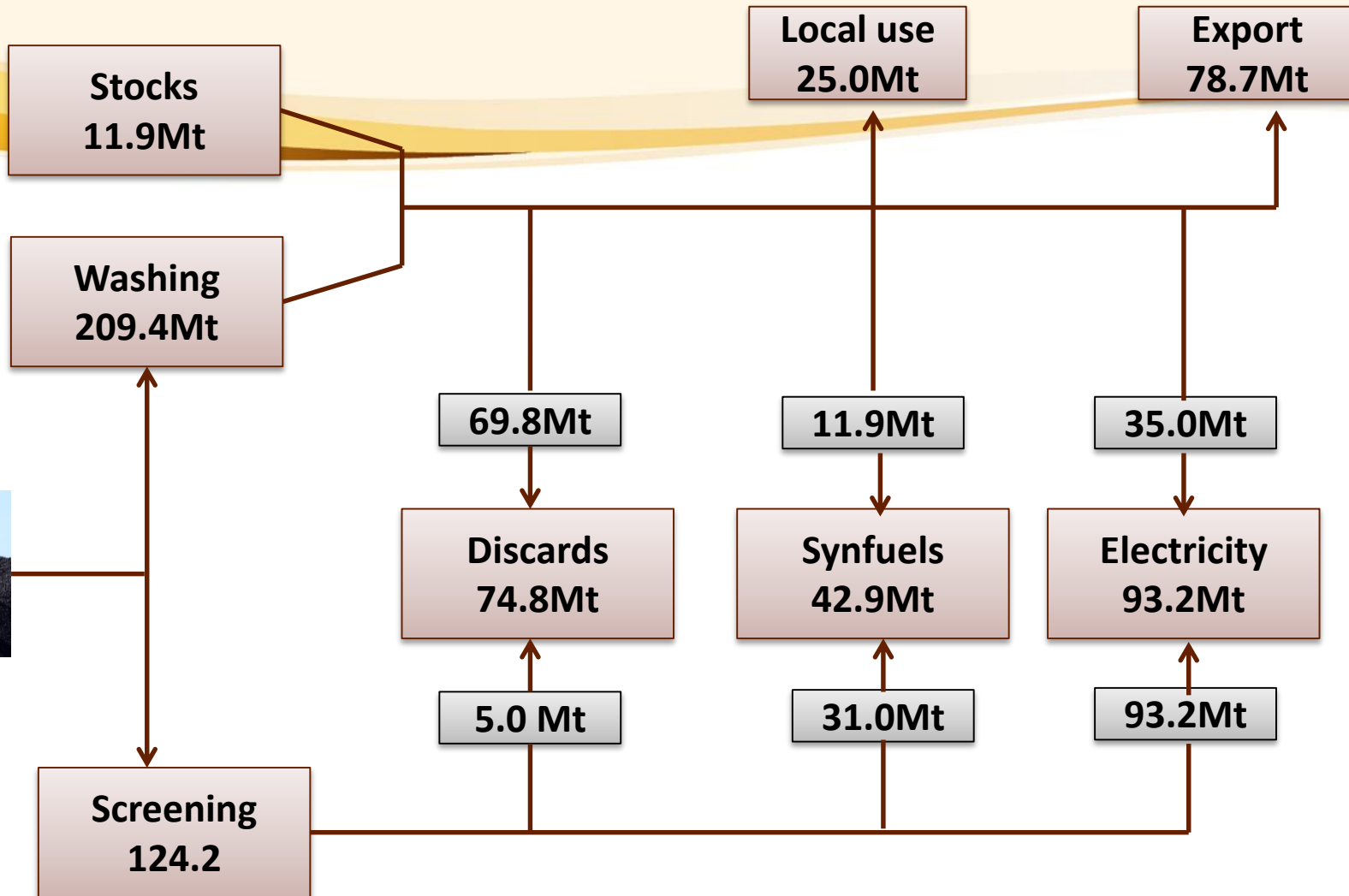
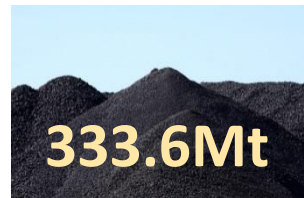
Residential use

Alternatives to  
coal

# SOUTH AFRICAN COAL PRODUCERS



# WHAT HAPPENS AFTER MINING



# QUALITY OF COAL CONSUMPTION BY INDUSTRIES

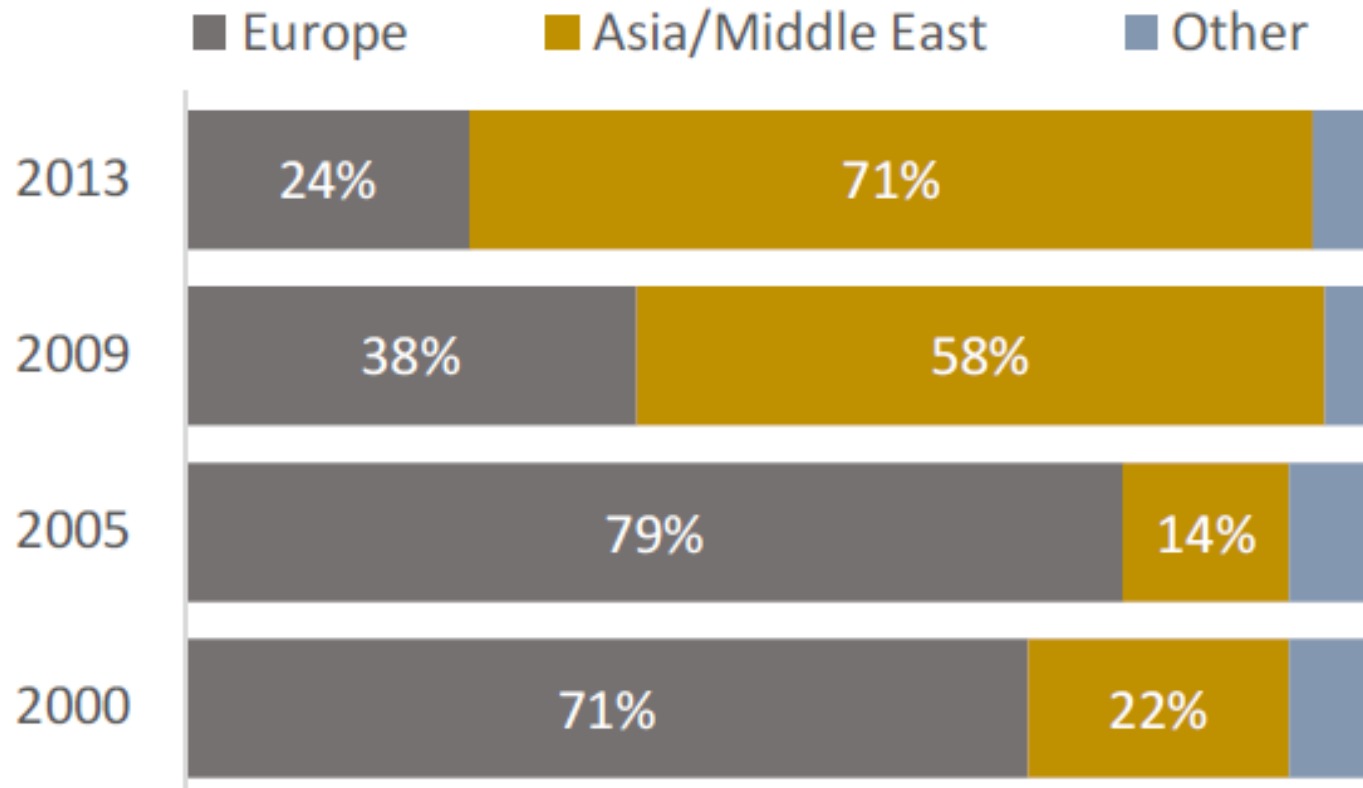
CONSUMPTION SECTORS	COAL TYPE	CV (MJ/kg)	GROSS CV (MJ/kg)	MOISTURE CONTENT (%)	ASH CONTENT (%)	VOLATILE MATTER (%)	FIXED CARBON (%)	TOTAL SULPHUR (%)
Power Stations	Bituminous	20.71	20.63	3.70	30.10	22.50	43.70	0.97
Petrochemical	Bituminous	21.34	21.25	4.80	25.80	22.30	47.10	0.97
Metallurgical Industries	Anthracite	32.08	31.99	2.30	7.70	5.50	84.50	0.74
	Bituminous	29.78	29.68	2.50	10.70	31.60	55.20	0.81
Domestic (Small industries and households)	Anthracite	29.40	29.31	2.60	15.20	7.00	75.20	0.98
	Bituminous	27.32	27.24	3.10	14.20	26.60	56.10	0.72
Exports	Anthracite	30.92	30.82	2.30	11.00	7.00	79.70	1.06
	Metallurgical Bituminous	31.04	30.99	2.60	7.50	31.70	58.20	0.57
	Steam Bituminous	27.71	27.83	3.00	13.30	26.60	57.10	0.61

\*All figures quoted in an air-dry basis.



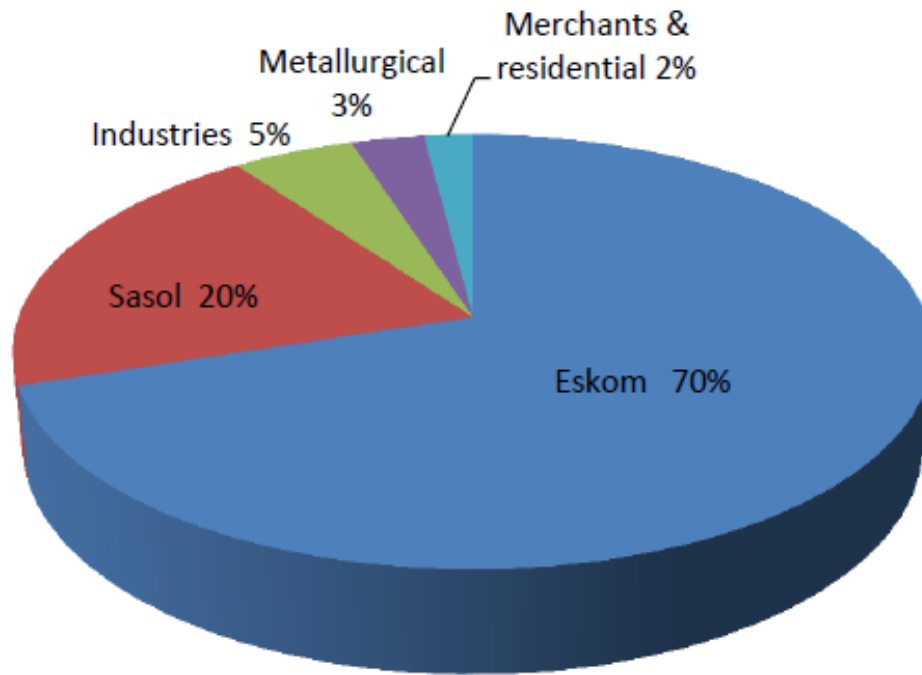
# COAL EXPORTS MARKET

SA Export coal exports by destination



*Taken from Chamber of Mines, 2014 estimates*

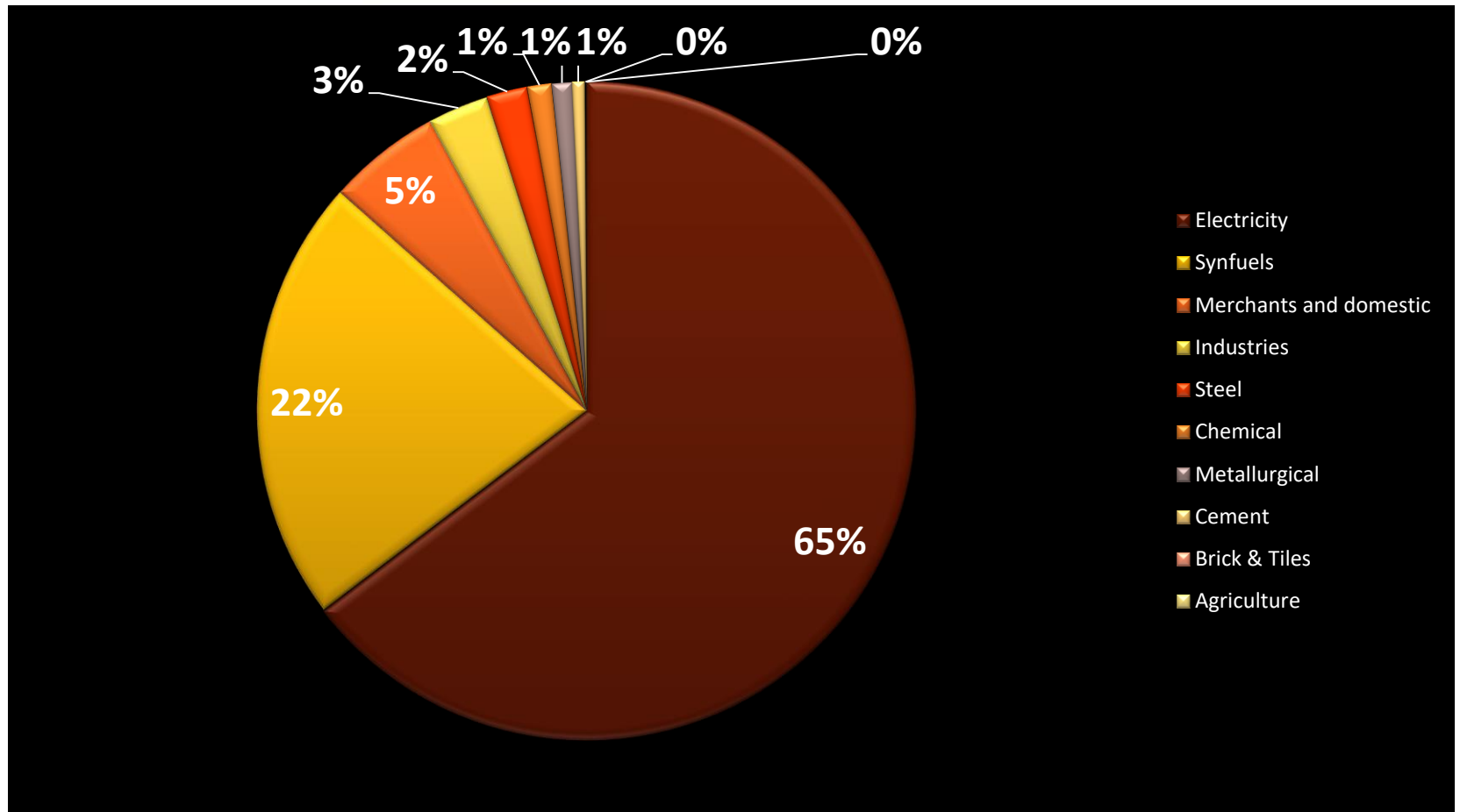
# COAL USE IN SOUTH AFRICA



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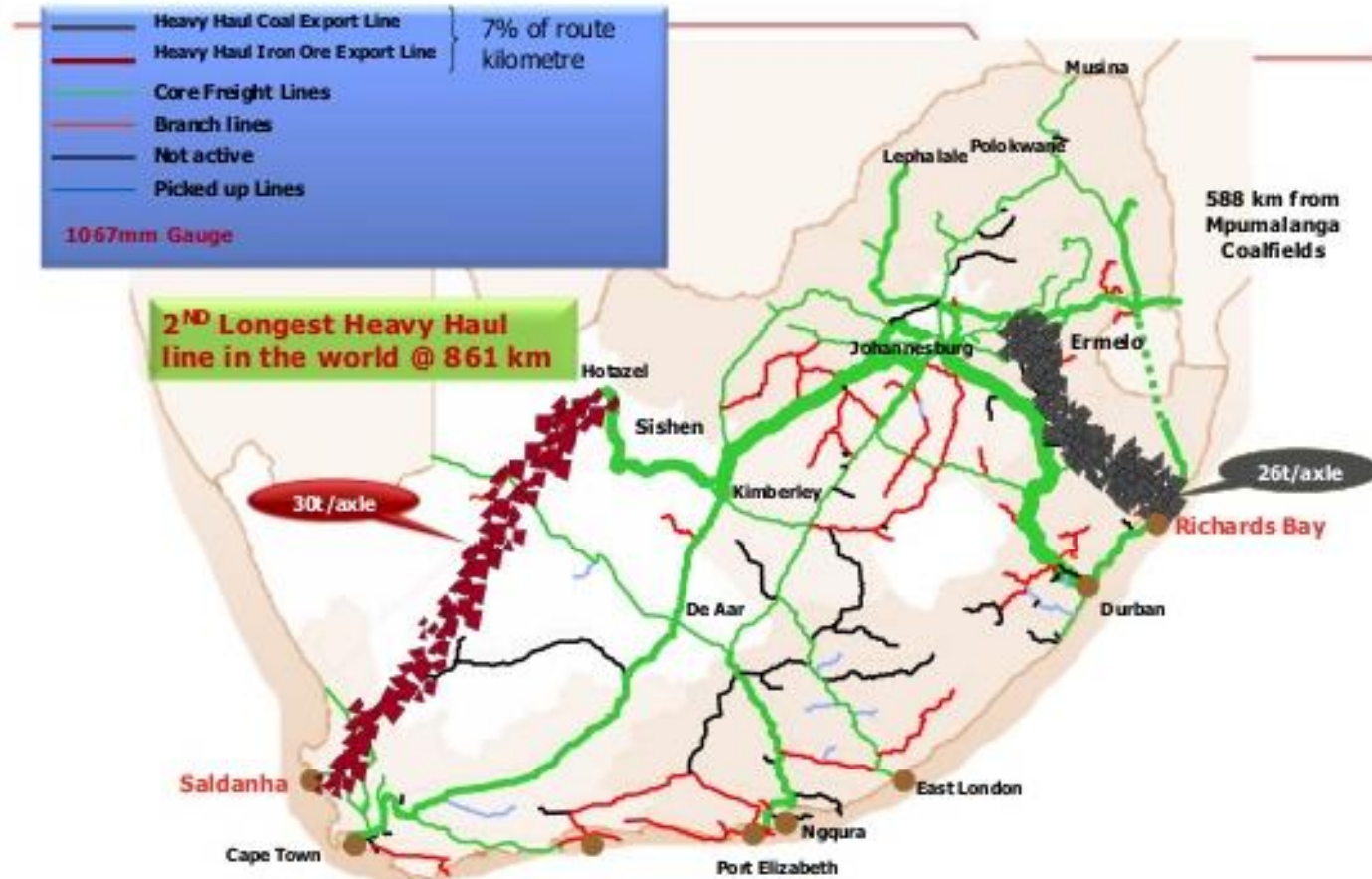
*Taken from Mintek reports, 2007 FIGURES*

# COAL USAGE: 2014 FIGURES



FIGURES TAKEN FROM XMP CONSULTING

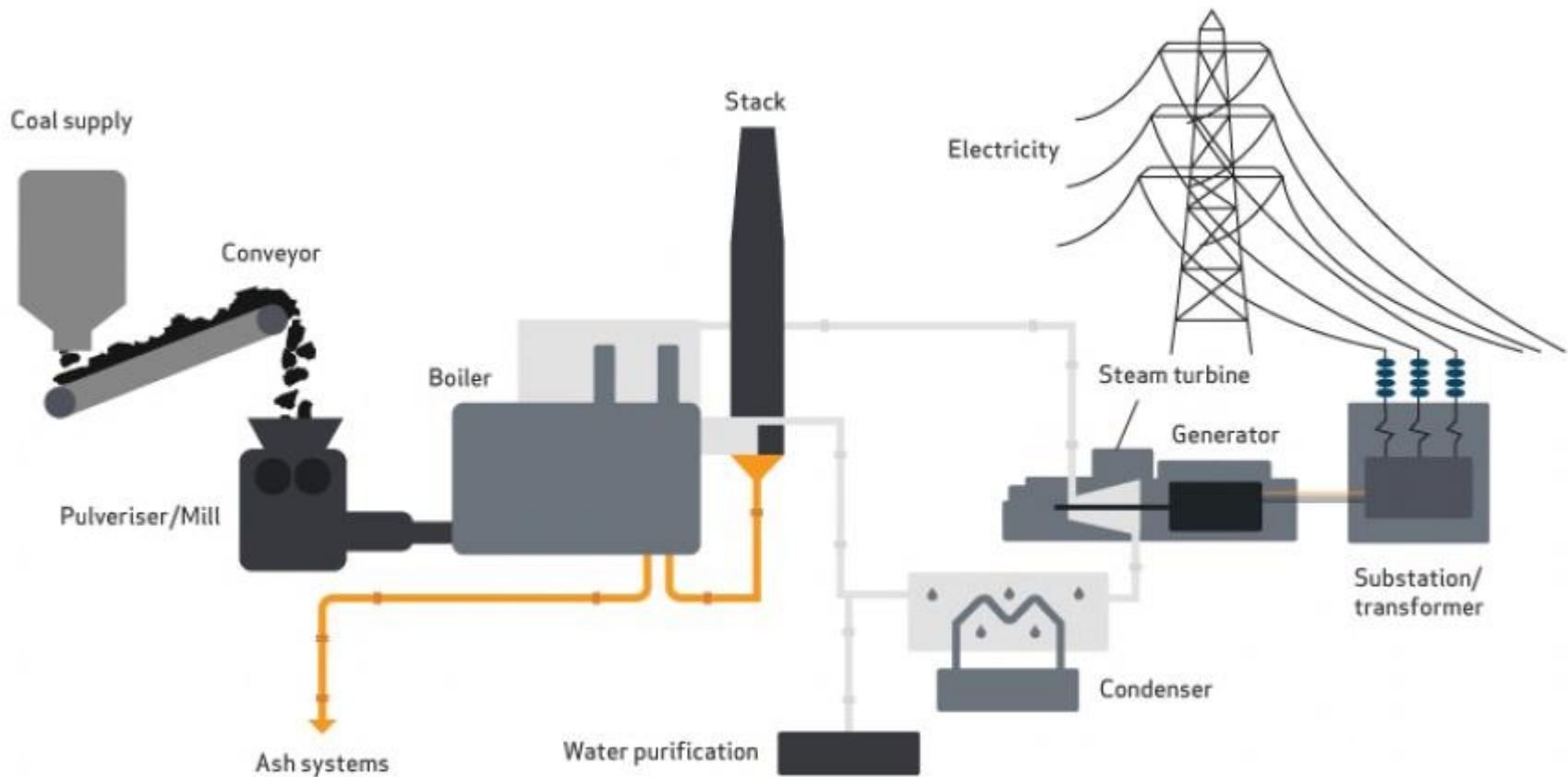
# EXPORT TERMINALS



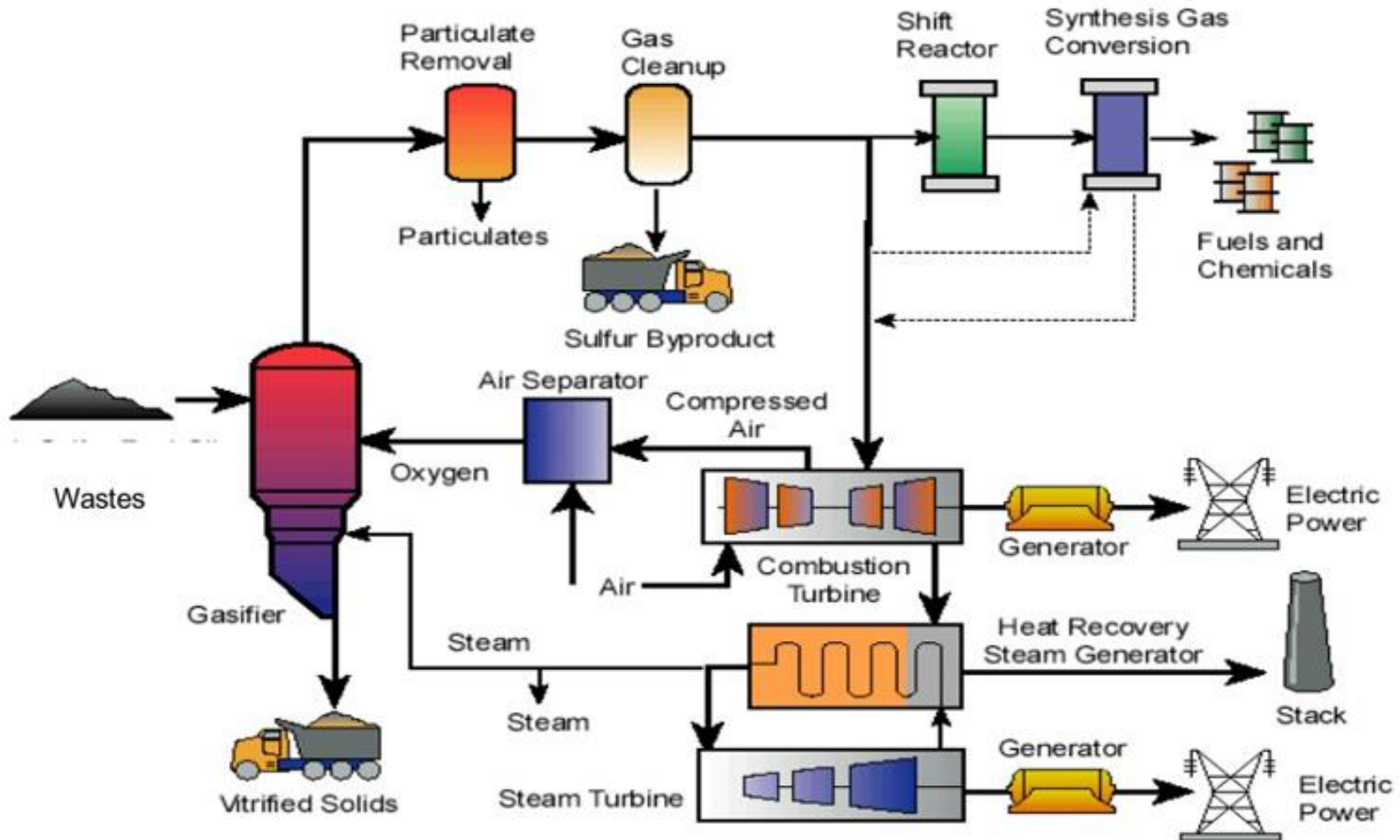


# COAL TO ELECTRICITY

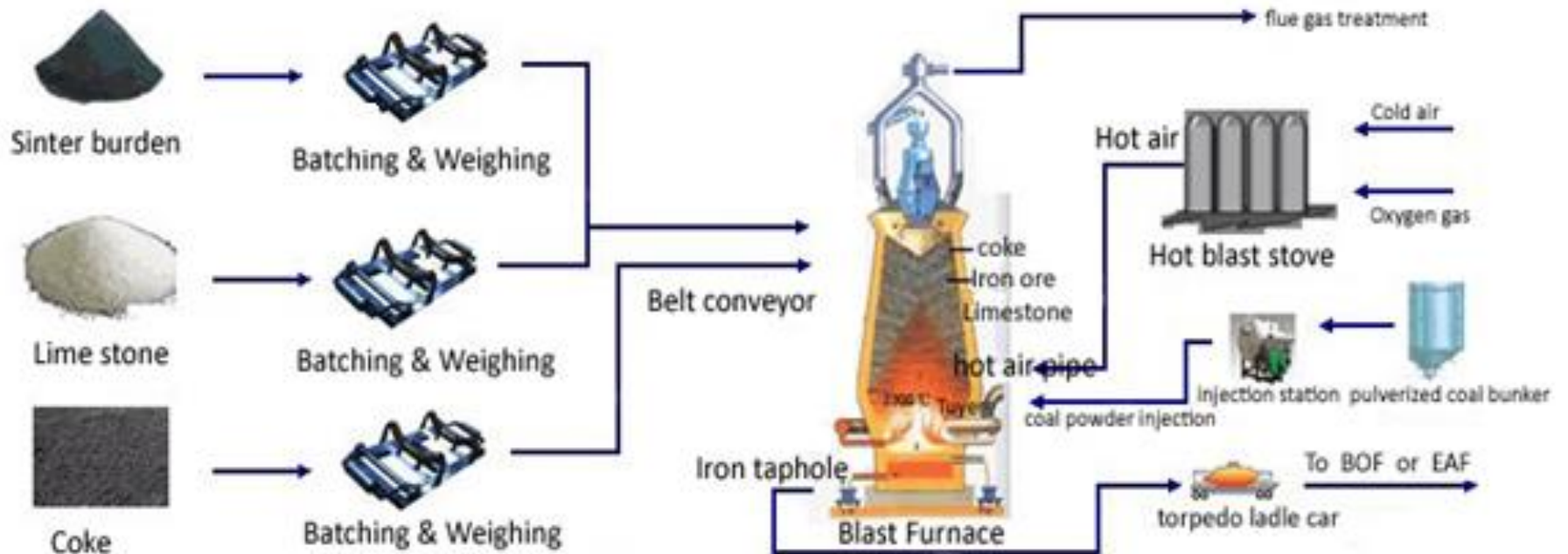
Coal converted into electricity



# COAL TO LIQUID PROCESS



# METALLURGICAL USE



# COAL POWER STATIONS IN SOUTH AFRICA

## LIMPOPO

- Medupi
- Matimba

## MPUMALANGA

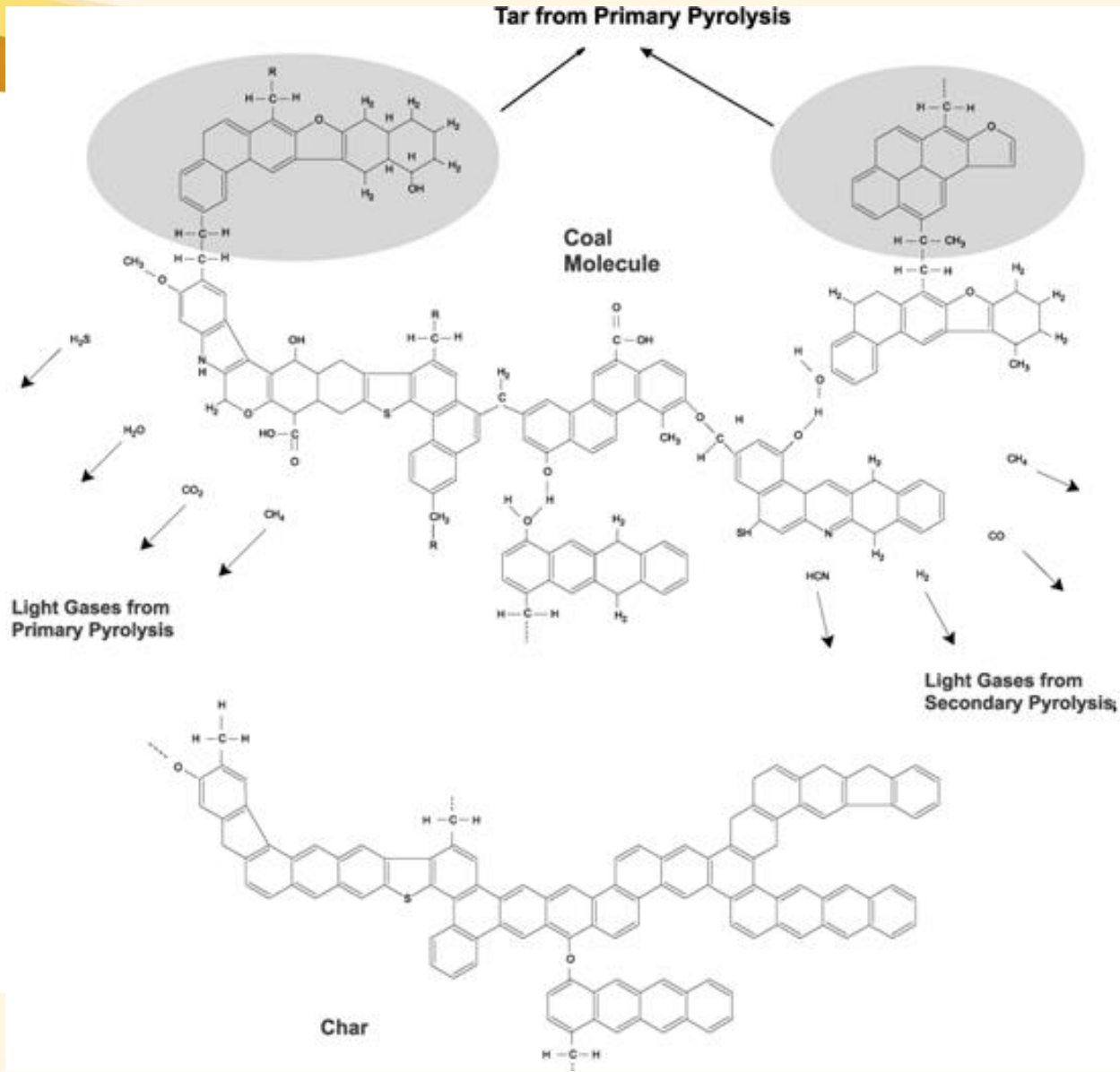
- Majuba
- Kendal
- Duvha
- Matla
- Tutuka
- Kriel
- Arnot
- Hendrina
- Camden
- Grootvlei
- Komati

## FREE STATE

- Lethabo

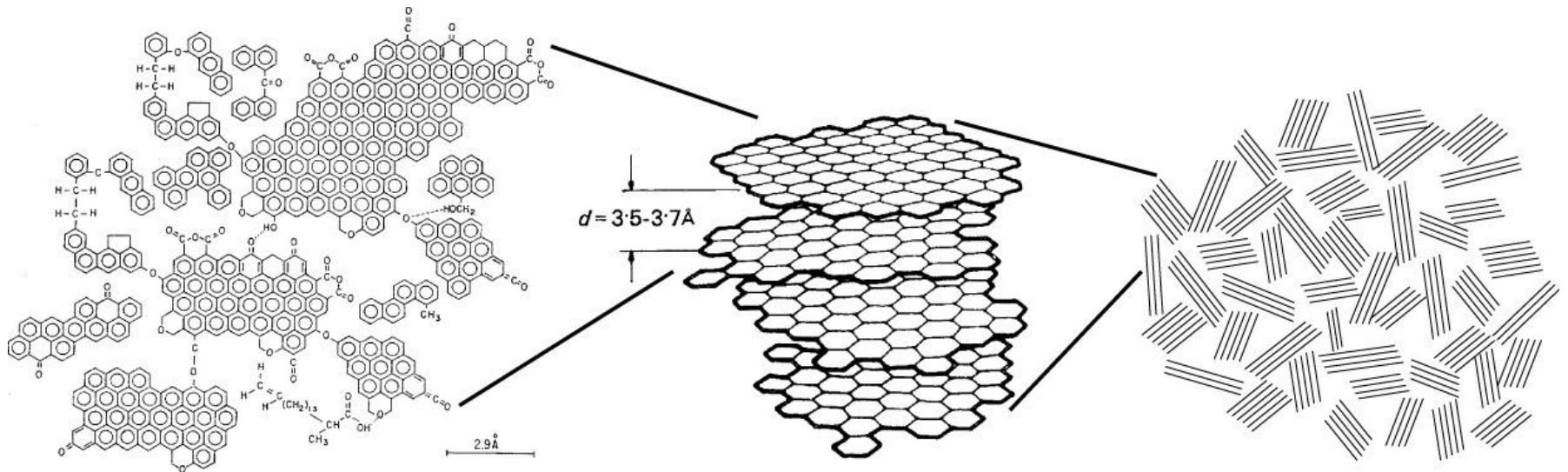


# COAL STRUCTURAL CONVERSION PROCESS





# COAL CHAR TO GRAPHITE





# THANK YOU

