COAL GEOLOGY

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Gondwana Coalfields == exclusively found in the Peninsular plateau of India.

Gondwana Coalfields in Chhattisgarh.

Gondwana Coalfields in Jharkhand.

Gondwana Coalfields in Odisha.

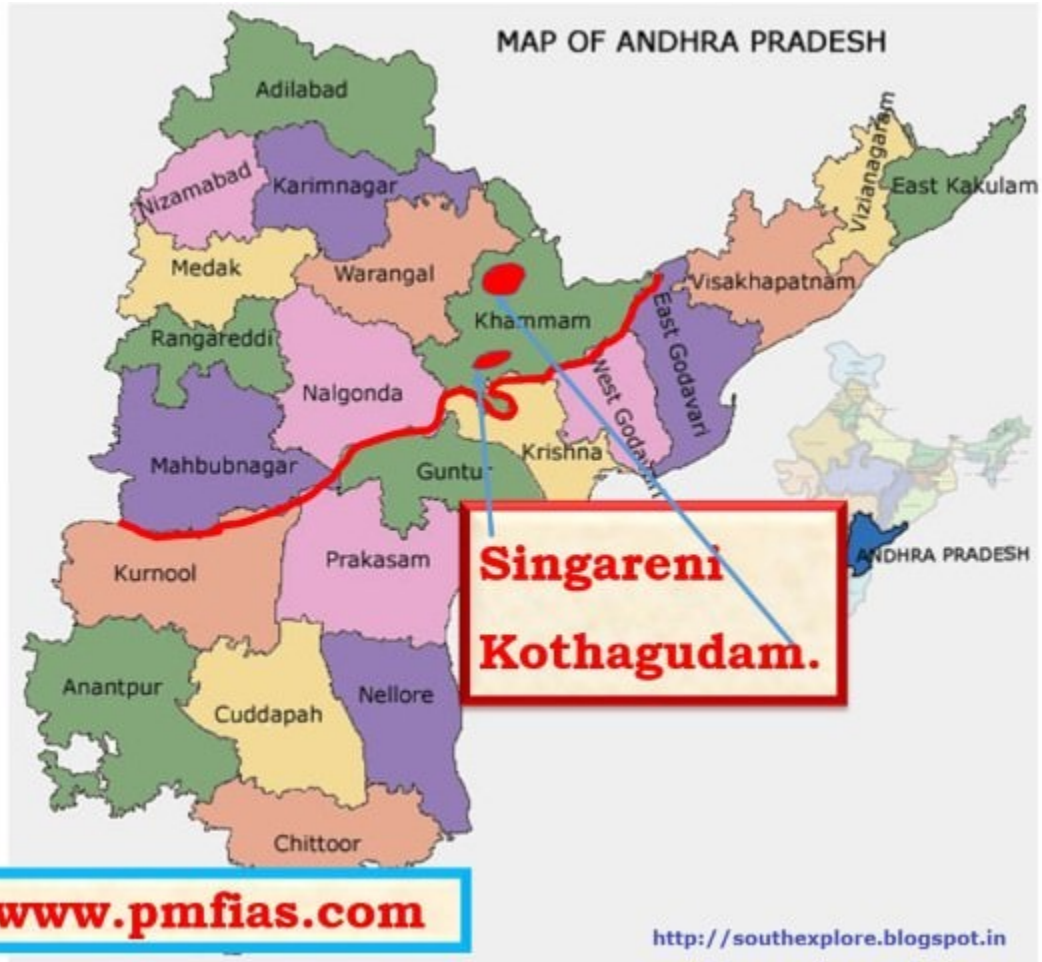
Gondwana Coalfields in Madhya Pradesh.

Gondwana Coalfields in Andhra Pradesh.

Gondwana Coalfields in Maharashtra.

Gondwana Coalfields in West Bengal.

- 6th in reserves [7.07 %]
- 5th in production [9.69 %]
- Most of the coal reserves are in the Godavari valley
- Adilabad, Karimnagar, Warangal, Khammam, East Godavari, and West Godavari.
- The actual workable collieries are situated at **Singareni** and **Kothagudam.**
- Almost the entire coal is of non-coking variety.
- These are the southern most coalfields of India and a source of coal supply to most of south India.



Who is the largest coal producer state in India?

Jharkhand: 38% of the total reserves of India are found in this state. ...

Orissa (Odisha): Orissa account for around 13.4% of the country's total production. ...

Chhattisgarh and Madhya Pradesh: Major coal fields are Korba, Umaria, Singrauli, Chirmiri and Sohagpu

Where is coal mainly found in India?

India has abundant domestic reserves of coal. Most of these are in the states of**Jharkhand**, **Odisha**, **West Bengal**, **Bihar**, **Chhattisgarh**, Telangana and **Madhya Pradesh**

What is Gondwana coal?

80 out of 113 Indian coalfields are located in the rock systems of the Damuda series [lower Gondwana Age]. Coking as well as **non-coking** and **bituminous** as well as sub-**bituminous** coal are obtained from Gondwana coal fields. Anthracite is generally not found in the Gondwana coal fields

Which type of coal is found in India?

Mostly **bituminous** to **lignite coal** is found in IndiaWhat is coal rank?

The four **ranks** are: Anthracite: The highest **rank** of **coal**. It is a hard, brittle, and black lustrous **coal**, often referred to as hard **coal**, containing a high percentage of fixed carbon and a low percentage of volatile matter. Bituminous: Bituminous **coal** is a middle **rank coal** between subbituminous and anthracite

What is the biggest coal mine in Australia?

In court, Adani said it expects the **mine** to produce 2.3 billion tonnes over 60 years. It would be the **largest coal mine in Australia** and one of the **largest** in the world. The **mine** would be the first of a number of large **mines** proposed for the Galilee Basin and would facilitate their development.

Where are the largest coal deposits in the world?

United States of America. The United States holds the world's biggest coal reserves. ...

Russia. The Russian Federation possesses the second biggest coal reserves. ...

China. China holds the third largest coal reserves in the world. ...

Australia. ...

India. ...

Germany. ...

Ukraine. ...

Kazakhstan.

What is the deepest coal mine in the world?

AngloGold Ashanti's **Mponeng gold mine**, located south-west of Johannesburg in**South Africa**, is currently the deepest mine in the world. The operating depth at**Mponeng** mine ranged from between 2.4km to more than 3.9km below the surface by the end of 2012

Which is the largest coal mine in India?

Jharkhand holds first position in coal production as well as coal reserves in India.

Jharia (the largest in India), Daltonganj, Bokaro, Giridih, North Karanpura, South Karanpura, Ramgarh.

Orissa holds second rank in coal reserves. ...

Madhya Pradesh: Singrauli, Umaria, Sohagpur, Satpura

Which country uses the most coal?

China is the largest coal consumer, accounting for 49% of the world's **total** coal. The next largest, the United States, consumed 11% of the world's **total**. China's coal consumption increased by more than 2.3 billion tons over the past 10 years, accounting for 83% of the global increase in coal consumption

How long will coal reserves in India last?

Clearly from the statistics says that our production is somewhere around 550-600 million tonnes a year on an average.Now the total reserves as per Ministry of coal in our country is 301.5 Billion tonnes(includes unproved reserves) according to which the coal would easily last for much more than **400 years**

What is the most valuable type of coal?

The ranks of coal (from most to least carbon content) are as follows: **anthracite**,**bituminous** coal, **subbitumi nous** coal, and lignite. The coal with the highest carbon content is the best and cleanest type of coal to use

How is coal formed in the earth?

Most of the **coal** we use now was **formed** about 300 million years ago, when much of the **earth** was covered by steamy swamps. As plants and trees died, their remains sank to the bottom of the swampy areas, making layers and layers of plant material and eventually **forming** a soggy, thick material called PEAT.

Is coal cheap?

Cheapest source of energy. It is by far **cheaper** than nuclear, natural gas, oil. ... Unlike other forms of energy (nuclear, natural gas, oil, hydroelectric), **coal** provides many jobs in removing **coal** from the earth, transporting it to the utility, burning it, and properly disposing of **coal** ash. **Coal** is American made

What is the formula for coal?

Coal is divided into four classes: anthracite, **bituminous**, **sub-bituminous**, and lignite. **Elemental** analysis gives empirical formulas such as $C_{137}H_{97}O_9NS$ for**bituminous** coal and $C_{240}H_{90}O_4NS$ for high-grade anthracite. Anthracite coal is a dense, hard rock with a jet-black color and a metallic luster

What are disadvantages of coal?

Disadvantages of using **coal** to produce electricity: ... The burning of **coal** is not environmental friendly because it produces harmful byproducts and gas emissions such as sulfur dioxide, carbon dioxide and nitrogen oxide that causes pollution to the environment including acid rain. **Coal** energy is nonrenewable energy

Who uses coal?

The most significant uses of coal are in electricity generation, steel production, cement manufacturing and as a liquid fuel. **Steam** coal - also known as thermal coal - is mainly used in power generation. Coking coal - also known as metallurgical coal - is mainly used in steel production

What are the negatives of coal?

Air pollution from coal-fired power plants includes sulfur dioxide, nitrogen oxides, particulate matter (PM), and heavy metals, leading to smog, **acid** rain, **toxins** in the environment, and numerous respiratory, cardiovascular, and cerebrovascular effects

What's coal ash?

Coal ash is the waste that is left after **coal** is combusted (burned). It includes fly **ash**(fine powdery particles that are carried up the smoke stack and captured by pollution control devices) as well as coarser materials that fall to the bottom of the furnace. Most **coal ash** comes from **coal**-fired electric power plants

Which type of coal has lowest calorific value?

Types of Coal Compared and Ranked

Rank	Type of Coal	Calorific Value (MJ/kg)
#1	Anthracite	30 millijoules per kilogram
#2	Bituminous	18.8–29.3 millijoules per kilogram
#3	Sub-bituminous	8.3–25 millijoules per kilogram
#4	Lignite (brown coal)	5.5–14.3 millijoules per kilogram

Is lignite A coal?

Lignite, often referred to as brown **coal**, is a soft, brown, combustible, sedimentary rock formed from naturally compressed peat. It is considered the lowest rank of **coal**due to its relatively low heat content. It has a carbon content around 60–70 percen

What is lignite coal used for?

The Lignite Energy Council reports that 79 percent of lignite is used to generate electricity, while 13 percent is used to generate **synthetic** natural gas and 7 percent is used to create fertilizer products like anhydrous ammonia and ammonium sulfate

Which is the largest coal field of India?

Raniganj Coalfield covers an area of 443.50 km^2 (171.24 **sq** mi) and has total coal reserves of 49.17 billion tonnes, spread across Indian states of West Bengal and Jharkhand. That makes it the second largest coalfield in the country (in terms of reserves).

What are the properties of coal?

Chemical properties of coal

Moisture. Moisture is an important property of coal, as all coals are mined wet. ...

Volatile matter. ...

Ash. ...

Fixed carbon. ...

Relative density. ...

Particle size distribution. ...

Float-sink test. ...

Abrasion testing

What is the density of coal?

As the process continues, the coal becomes dark and hard and is classified as bituminous, which ignites easily and burns for a long time (density 42–**57 lb/ft3** or 673–**913 kg/m3**). Anthracite is the final maturation, a coal that's very hard and shiny (density 50–**58 lb/ft3** or 800–**929 kg/m3**).

How many types of coal are there?

How coal is classified?

Coal classification. **Coal classification**, any of various ways in which **coal** is grouped. Most classifications are based on the results of chemical analyses and physical tests, but some are more empirical in nature. ... In general, the calorific (heat) value of **coal** increases with rank from lignite through bituminous **coal**

What is Steam coal?

Thermal coal, also known as **steam coal** , is used for power and heat generation. In electricity generation, **thermal coal** is ground to a powder and fired into a boiler to produce heat, which in turn converts water into **steam**

Is coal a fossil fuel?

Fossil fuel is a general term for buried combustible geologic deposits of organic materials, formed from decayed plants and animals that have been converted to crude oil, **coal**, natural gas, or heavy oils by exposure to heat and pressure in the earth's crust over hundreds of millions of years

What are two advantages of coal?

Energy produced from coal fired plants is cheaper and more **affordable** than other**energy** sources. Since coal is **abundant**, it is definitely **cheap** to **produce power**using this fuel. Moreover, it is not **expensive** to extract and mine from coal deposits

Is coal clean?

Clean coal technology is a collection of technologies being developed to attempt to help lessen the environmental impact of **coal** energy generation and to mitigate worldwide climate change. ... As a result, **clean coal** technologies are being developed to remove or reduce pollutant emissions to the atmosphere

What are the elements in coal?

The organic compounds in coal are composed of the elements **carbon**, **hydrogen**,**oxygen**, **nitrogen**, **sulfur**, and trace amounts of a **variety** of other elements

Why is coal a fossil fuel?

The **fossil fuels** are **coal**, oil and natural gas. They are **fuels** because they release heat energy when they are burned. They are **fossil fuels** because they were formed from the remains of living organisms millions of years ago

How does using coal affect the environment?

Background Information-- **How does** burning **coal affect the environment**? ... Whenever it is burned, gases are given off and particles of ash, called "fly ash," are released. The sulfur in **coal** combines **with** oxygen to form sulfur dioxide, which can be a major source of air pollution if emitted in large enough quantities

Is charcoal a fossil fuel?

Charcoal is made from wood. Wood is not a **fossil fuel**, as the word '**fossil**' indicates that it has been sitting in the earth for some time. Petroleum, natural gas, and coal are examples of **fossil fuels**

How does coal affect the climate?

When **coal** is burned for energy, carbon dioxide is released into the atmosphere. Carbon dioxide, or CO2, is a greenhouse gas. The higher the concentration of greenhouse gases, the more energy trapped in the atmosphere. With more energy trapped, the planet warms, contributing to **climate** change

Why is charcoal good to burn?

However when wood is **burned** in an oven with the flow of air stopped, oxygen inside is soon used up and is not enough to oxidize the carbon in the wood. Thus the carbon is left to turn into **charcoal**. This is why when **charcoal** is **burned**, only carbon dioxide is released and there is neither smoke nor smell

Is coal more efficient than wood?

* Also, dry **wood** lights easily, but a **coal** fire requires much **more** kindling to get it going. Further, **wood** burns cleanly, while **coal** smoke is considered dirty. If you do use **coal**, anthracite is a relarively clean-burning fuel with a low sulfur content.

Does coal burn longer than wood?

As with **wood** stoves, **coal** must always be **burned** with a slightly open window in order to resupply oxygen that **coal** or **wood** fires consume. Secondary air intakes of modern stoves **burn** off carbon monoxide. * Burning rates. ... Being far denser **than wood**, **coal burns** more steadily and **longer**

Can you burn wood and coal together?

You probably think of firewood logs and **coal** as completely separate fuels. However, it is possible to **burn** them **together**. That's right: **you can burn coal** and logs in your fireplace simultaneously

Which coal is best for multi fuel stove?

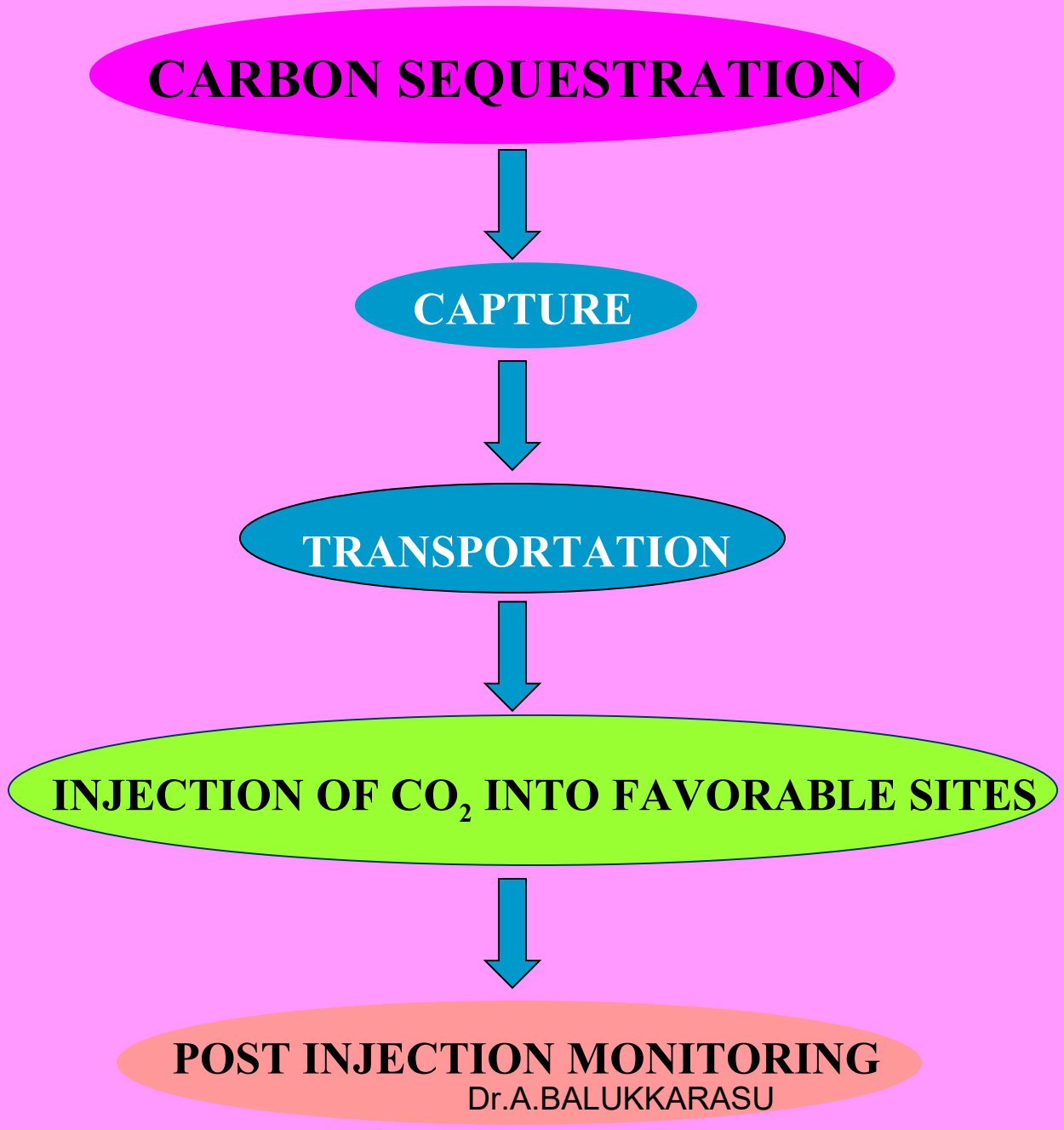
Wood. Our best performing **smokeless** coal which lasts up to 40% longer than**house coal** and has an excellent sustained heat output and a natural flame picture. A slow burning **smokeless** coal which packs together tightly in the grate to provide maximum heat output for as long as nine hours

What are 2 disadvantages of coal?

Disadvantages of Coal-Fired Power Plants. On the other hand, there are also some significant disadvantages of coal fired plants including Greenhouse Gas (GHG) Emissions, mining destruction, generation of millions of tons of **waste**, and emission of harmful substances. Greenhouse gas emissions

What is the biggest coal mine in the world?

The North Antelope Rochelle coal mine in the Powder River Basin of **Wyoming**, US, is currently the world's largest coal mine by reserve. The mine was estimated to contain more than 2.3 billion tonnes of recoverable coal as of December 2012



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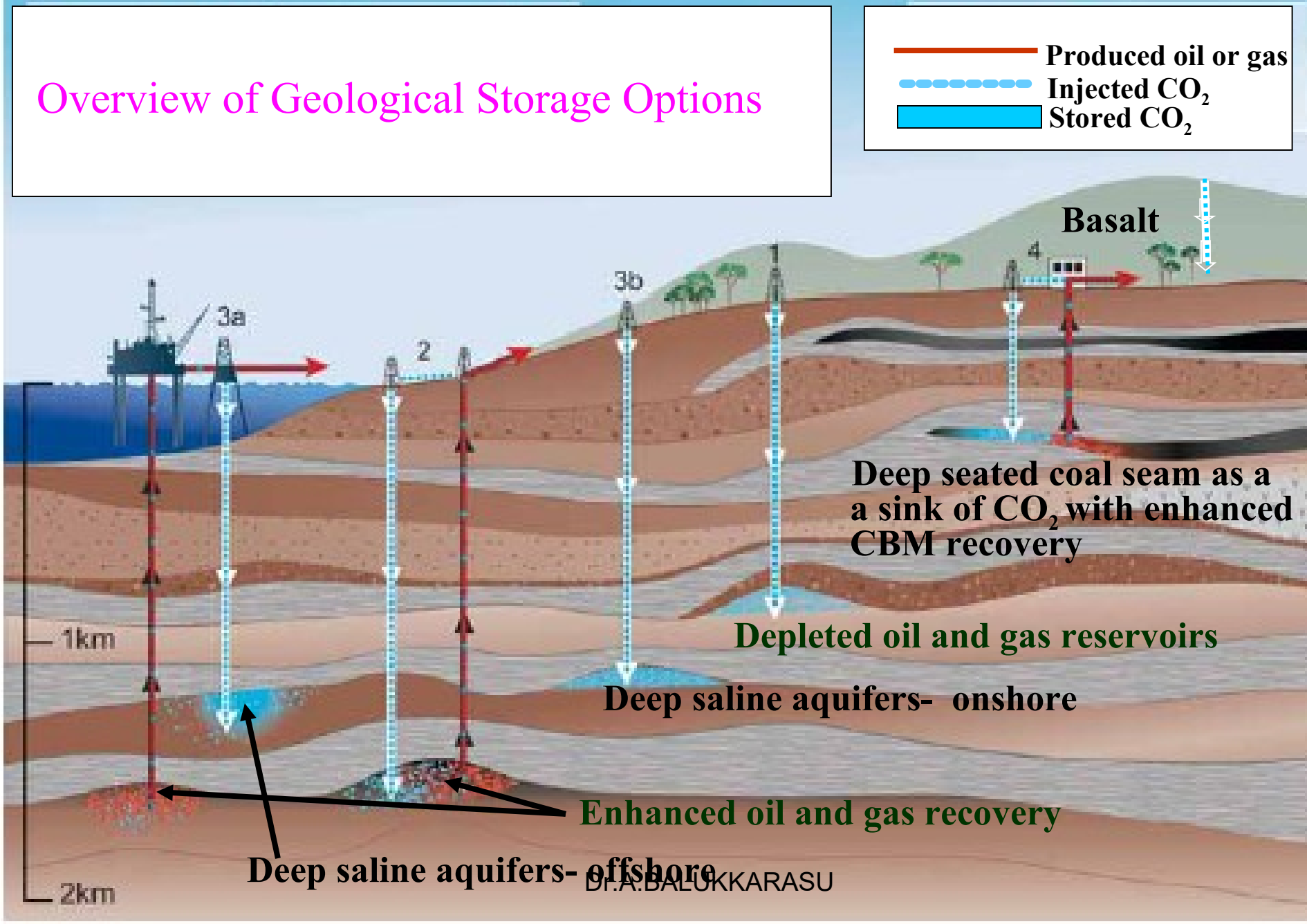
Overview of Geological Storage Options



FIELD EXPERIENCE- US

1. Allison CO2-ECBM Pilot
2. Location- San Juan basin
3. Producer well—16
4. Injector well—4
5. Average depth to top coal - 3100 feet
6. Permeability 100md
7. Initial pressure – 1650 psi
8. Temp. – 160^{o}F

OBSERVATION

1. CO_2 injection improved methane recovery from 77% to 95% of OGPI
2. Ratio of injected CO_2 to produced CH_4-3:1

FIELD EXPERIENCE- CANADA

1. Alberta Research Council
2. Location- Fenn BIG Valley, Alberta Province
3. Producer well—1
4. Injector well—1

OBSERVATION

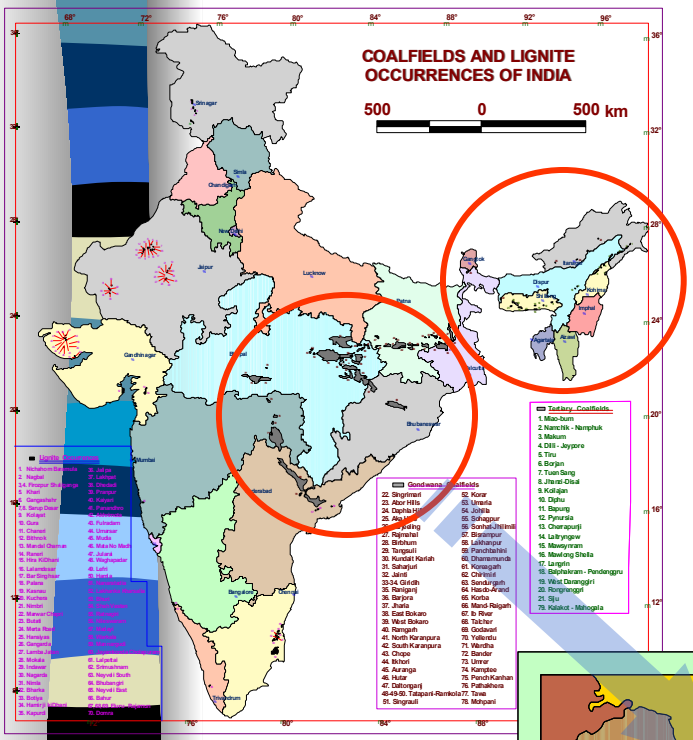
1. injectivity improves with continued CO_2 injection and methane production

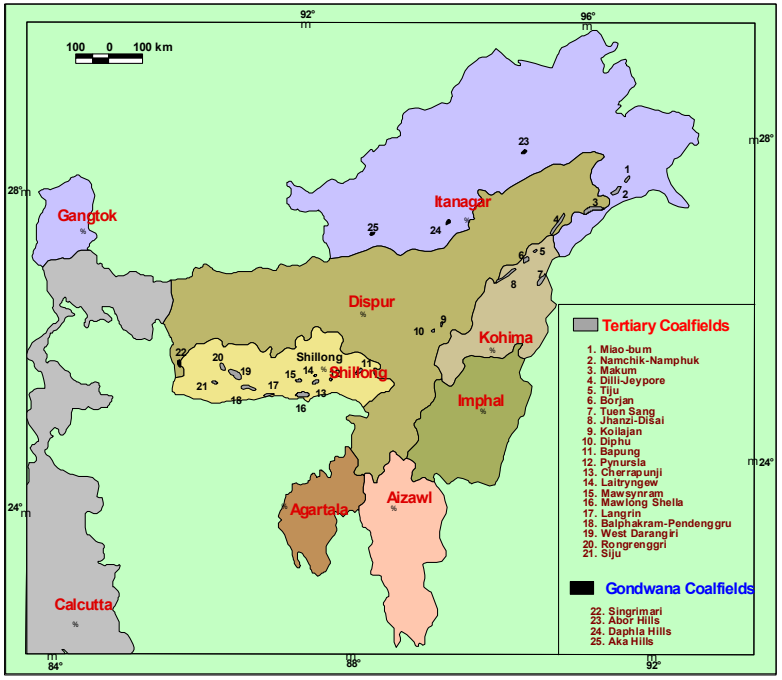
FIELD EXPERIENCE- JAPAN

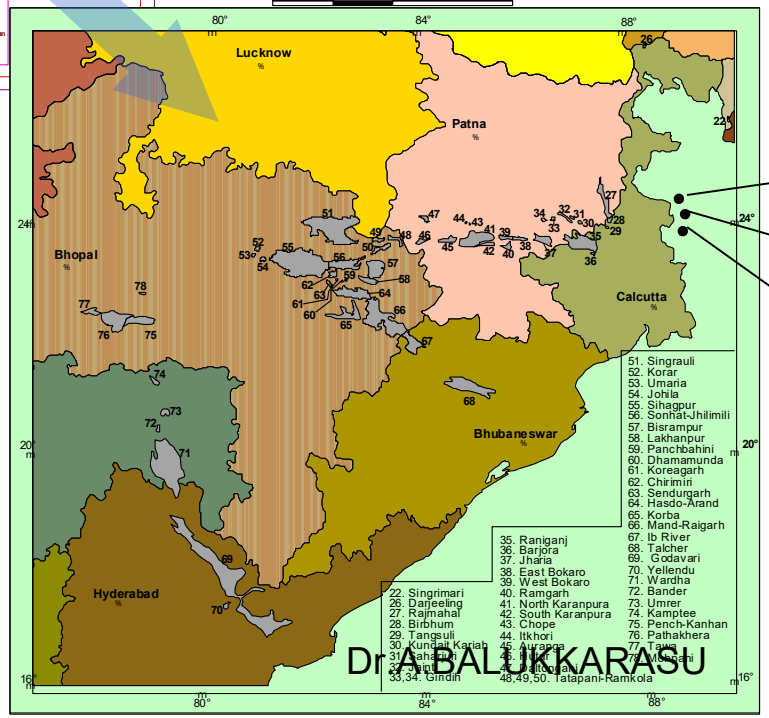
1. Operated by JCOAL
2. Location- Yubari site, Ishikari Coalfield
3. Producer well—1
4. Injector well—1

OBSERVATION

1. Gradual increase of injection rate –may be due to decrease in effective stress near injection well area.
2. 90% of injected CO2 stored in coal seams
3. Gas production increase with CO2 injection, and dropped after injection was stopped- indicating ECBM effect







Tertiary coalfields

Bangladesh

- Barapukuria
- Dighipara
- Jamalganj

Lower Gondwana Coalfields

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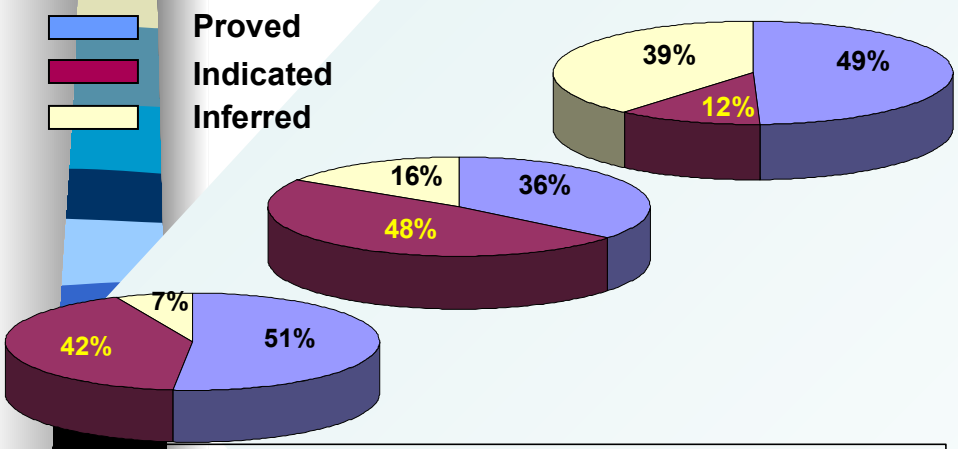
Coal Resource base

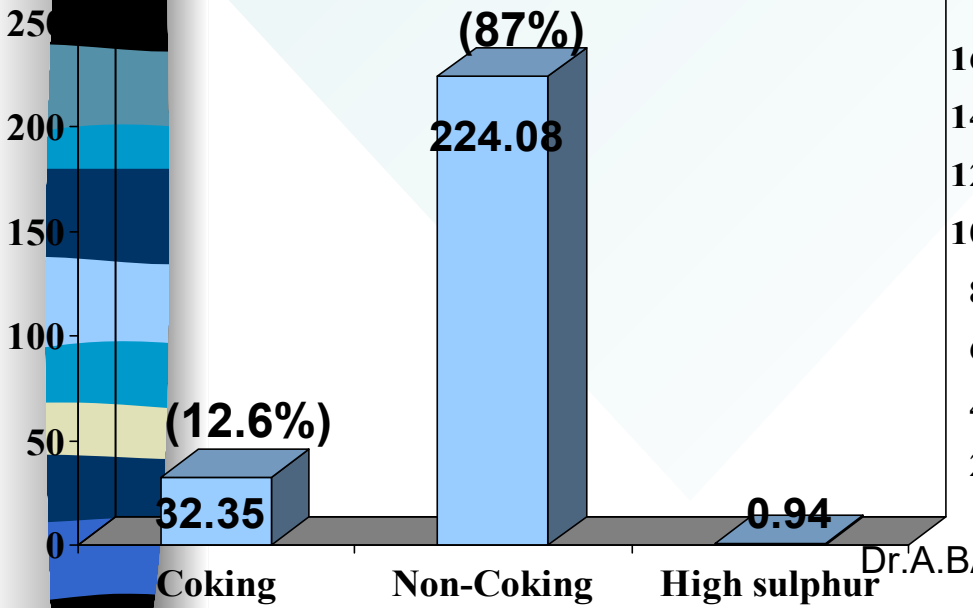
Proved	Indicated	Inferred
99.06 b.t	120.18 b.t	38.14 b.t

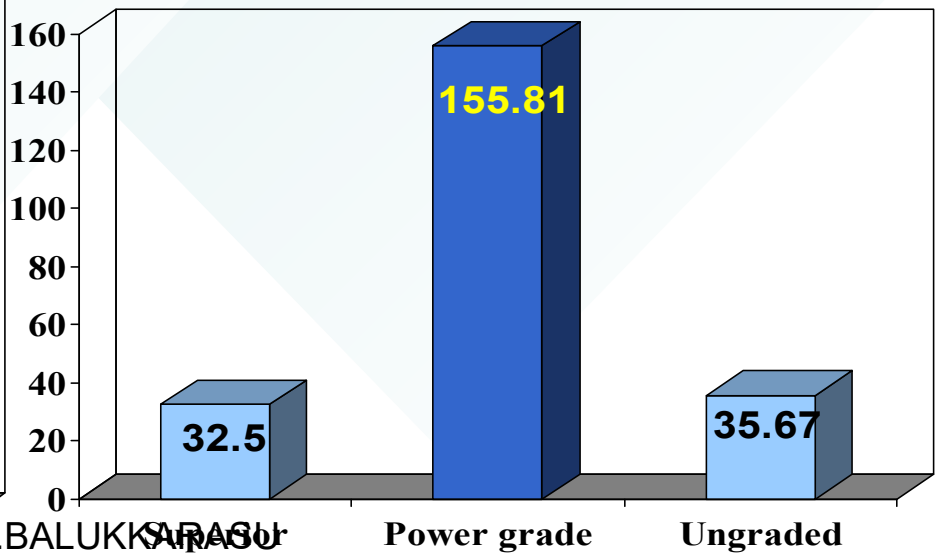
257b. t.
(up to 1200m depth)



Power grade coal:
155.8 b. t. (60%)
(up to 1200m depth)

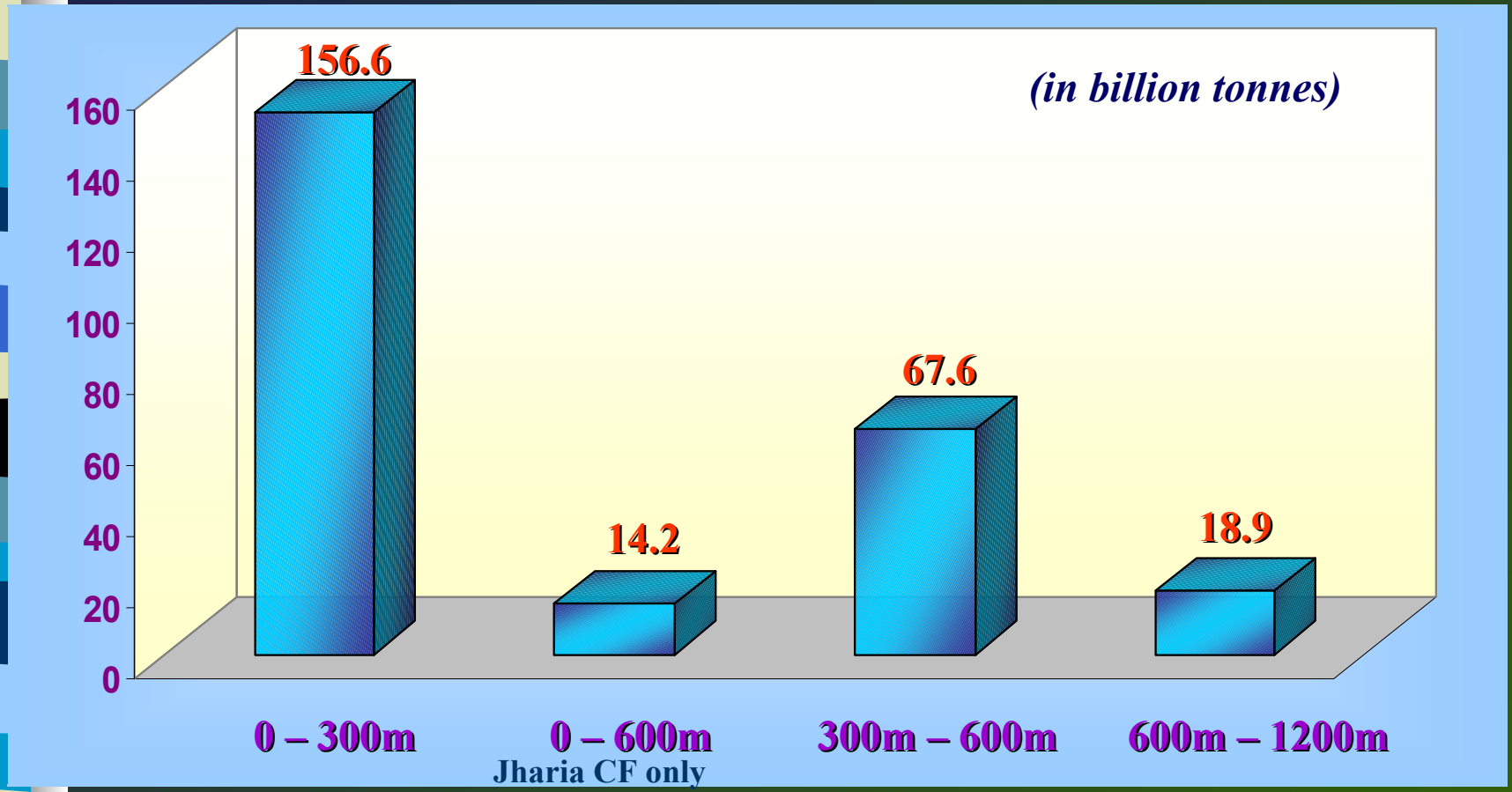
Quality-wise break-up of Non-coking coal



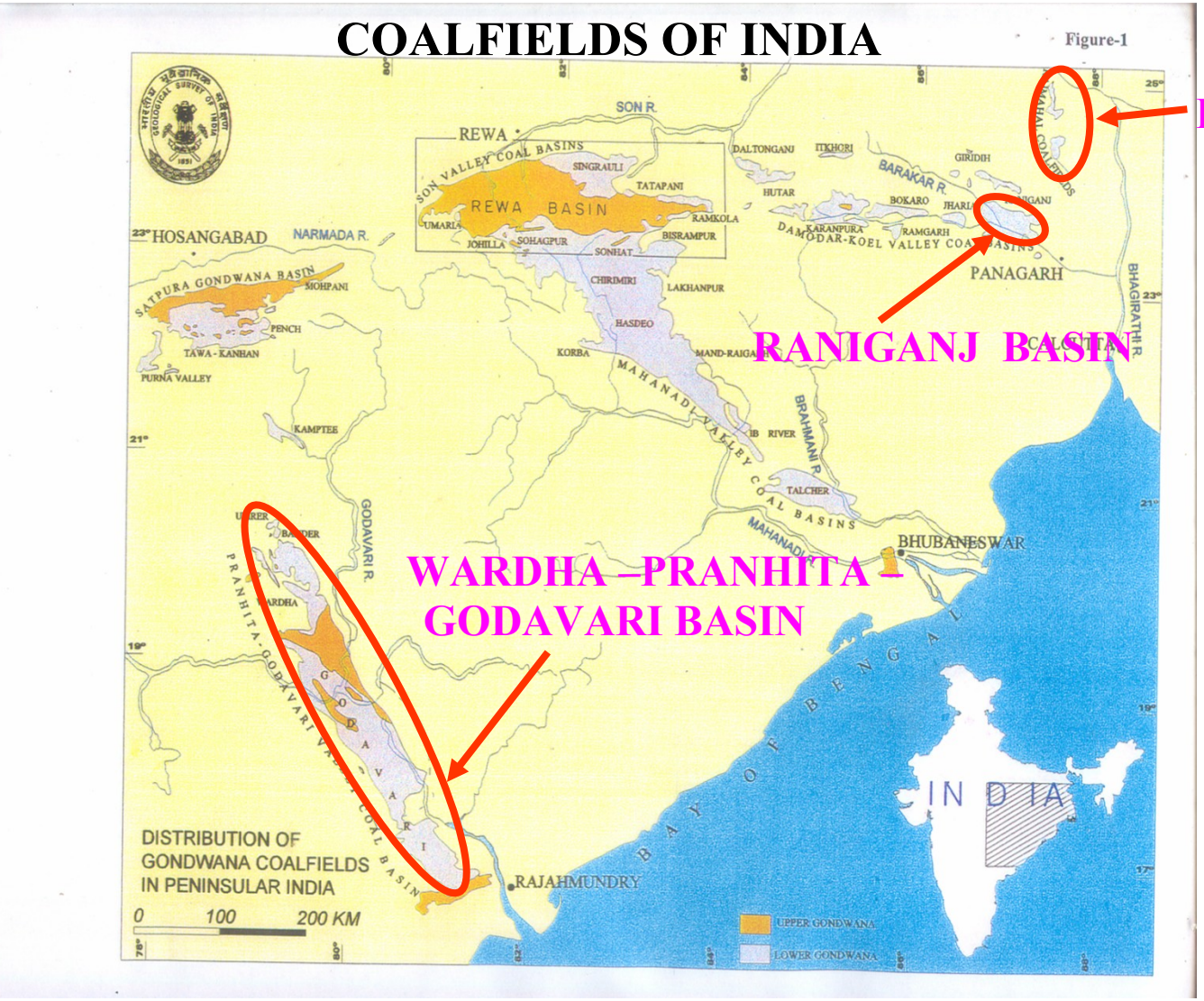


Indian coal resource is expressed in terms of :

Depth Range from surface



Resource up to 1200m depth considered for National Inventory.



RAJMAHAL – BIRBHUM MASTER BASIN

Important geological locales for storage

1. large aerial extent.
2. Coal seams (> 50m) occur beyond 1.0 Km depth.
3. Thick Cap rock.
4. Close proximity with the thermal power stations and other industrial activities.

CBM blocks are allotted in these coalfields.

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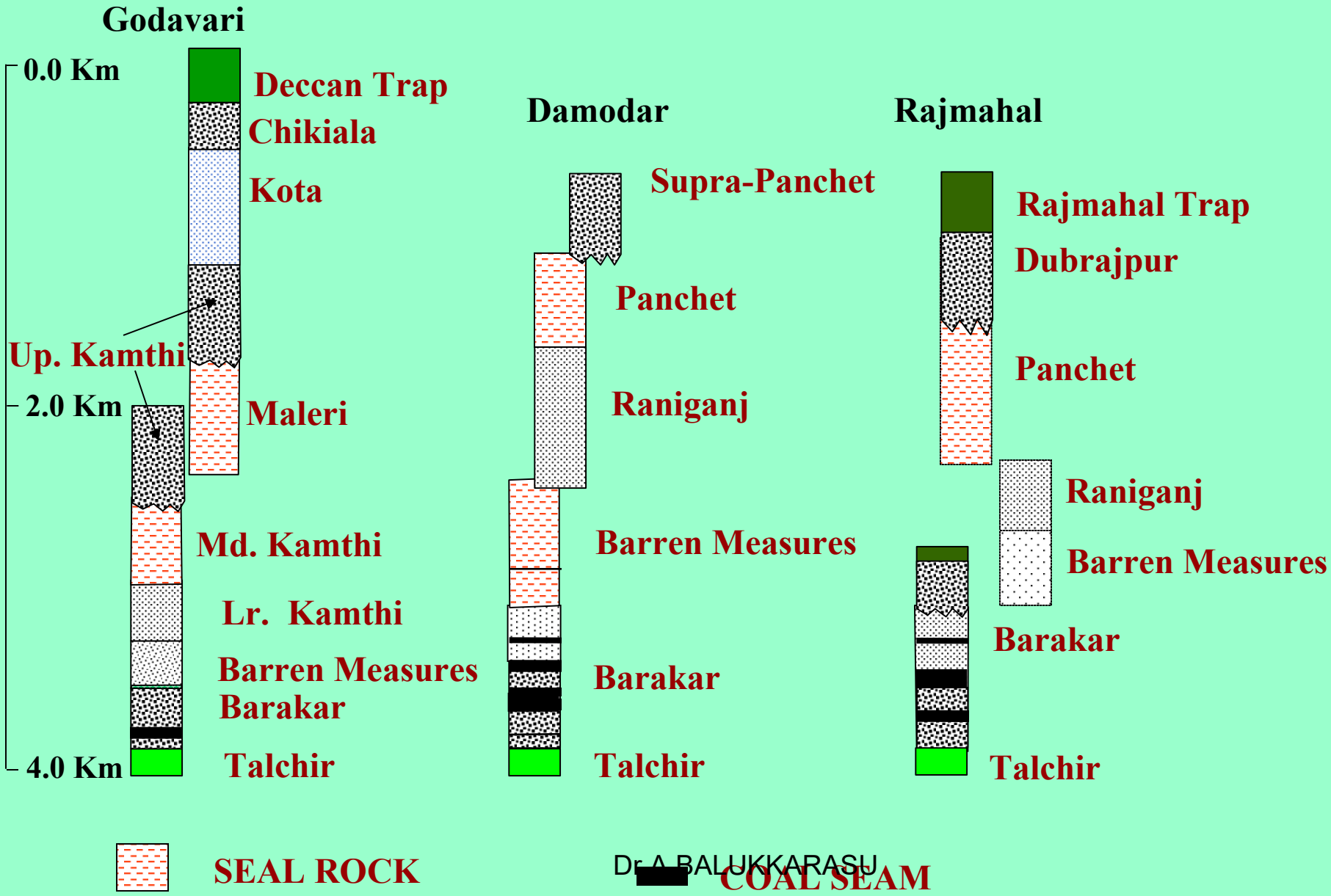
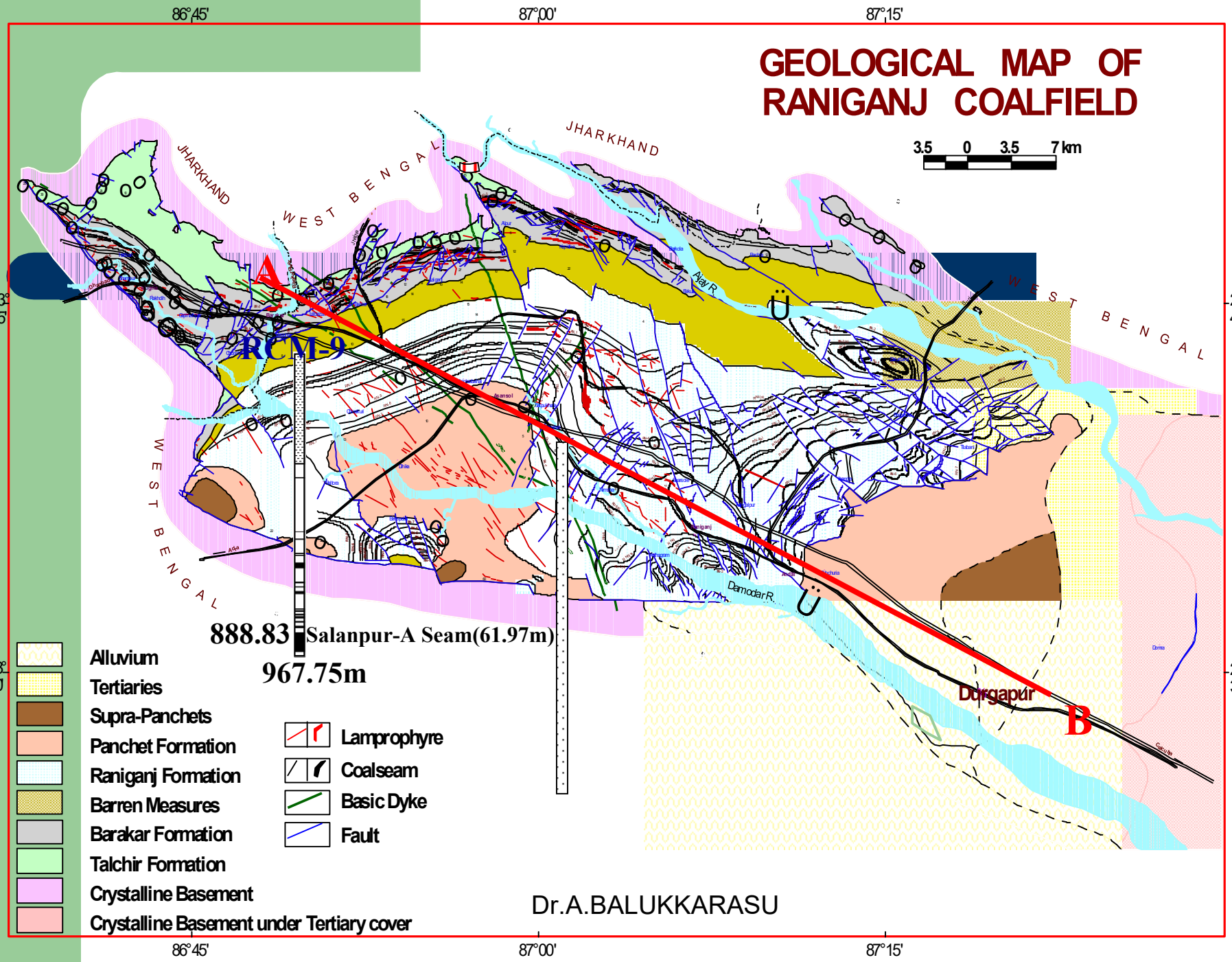
LITHOSTRATIGRAPHY OF SOME GONDWANA BASINS OF INDIA

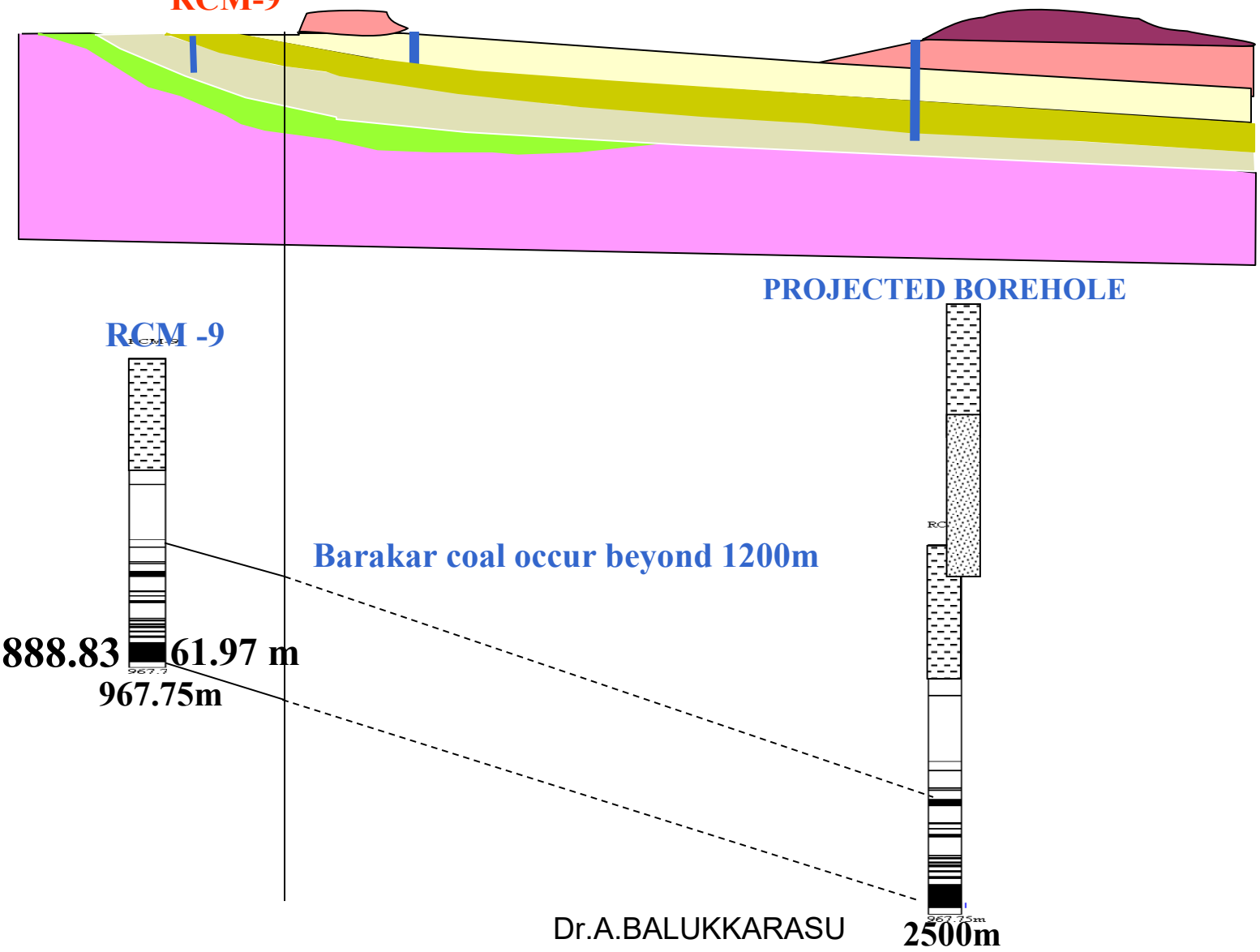


GEOLOGICAL MAP OF RANIGANJ COALFIELD



GEOLOGICAL SECTION ALONG A - B

Chalbalpur-Mahismura



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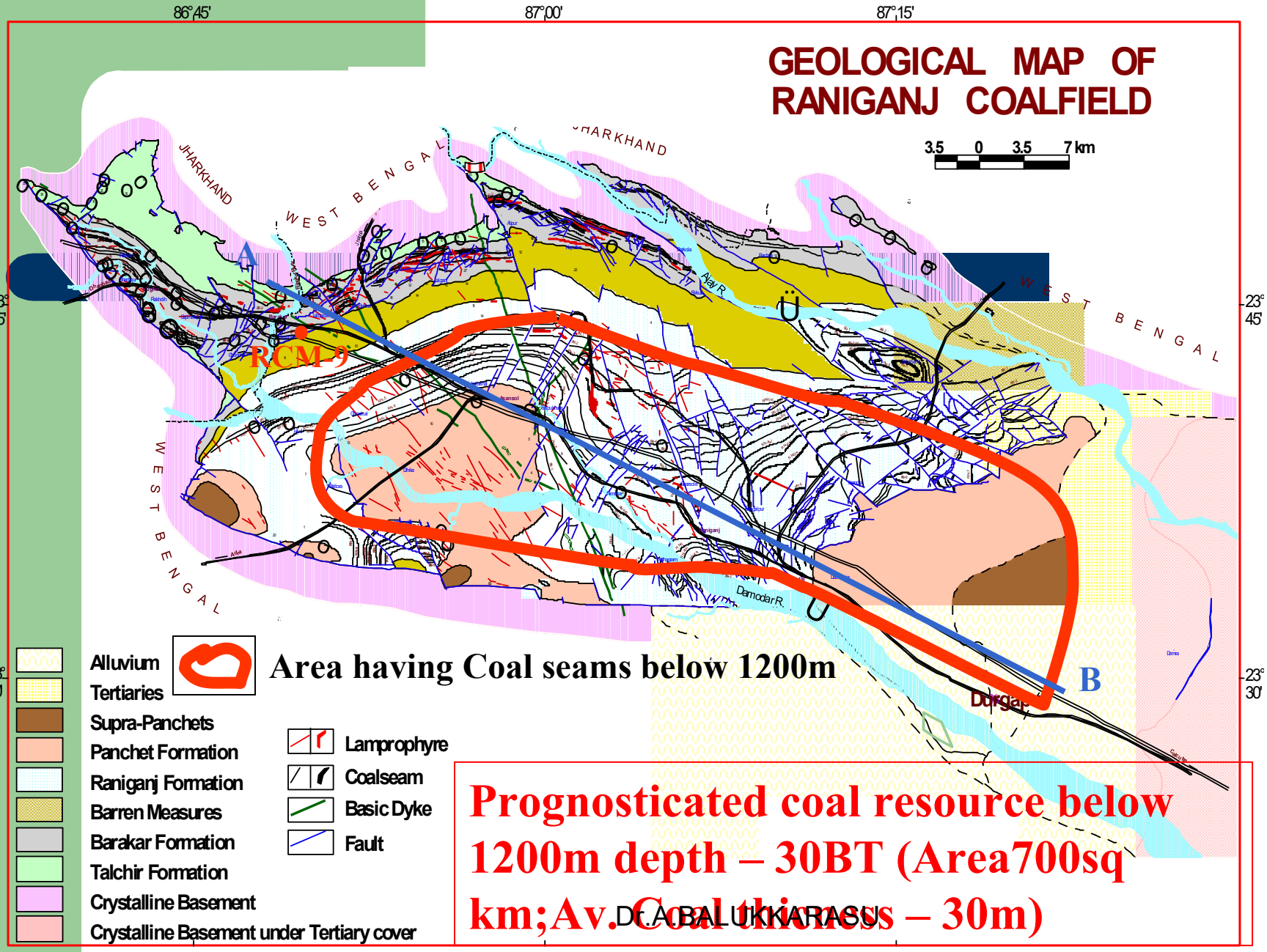
GEOLOGICAL MAP OF
RANIGANJ COALFIELD
86°45'
87°00'
87°15'
23° 45'
23° 30'
3.5 0 3.5 7 km
JHARKHAND
WEST BENGAL
A
B
RCM-9
Ajay R.
Damodar R.
Durgapur
Alluvium
Tertiaries
Supra-Panchets
Panchet Formation
Raniganj Formation
Barren Measures
Barakar Formation
Talchir Formation
Crystalline Basement
Crystalline Basement under Tertiary cover
Area having Coal seams below 1200m
Lamprophyre
Coalseam
Basic Dyke
Fault
Prognosticated coal resource below 1200m depth – 30BT (Area700sq km;Av.Coal thickness – 30m)
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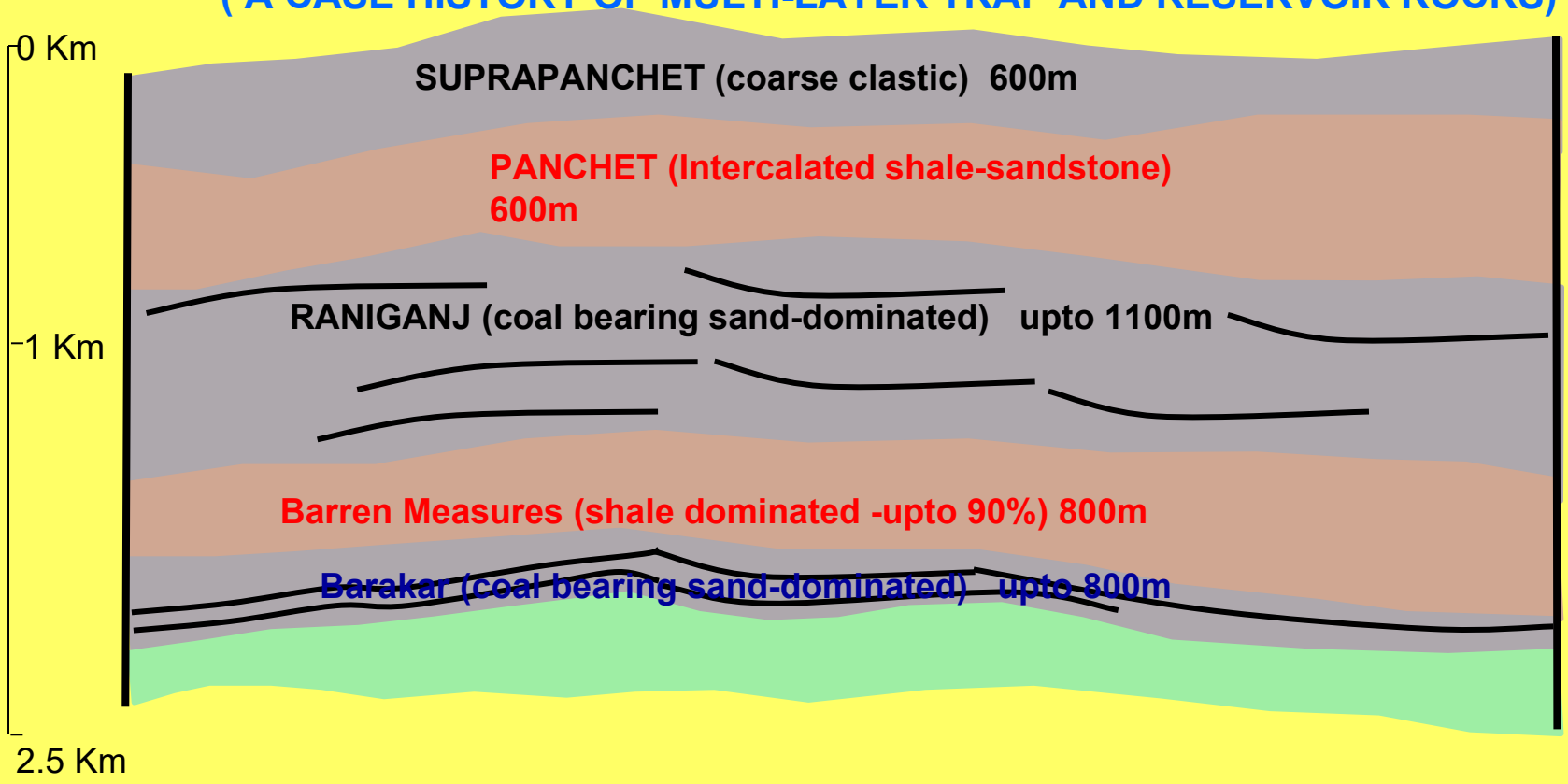
GENERALISED STRATIGRAPHIC SUCCESSION OF DEEPER PART OF RANIGANJ BASIN

(A CASE HISTORY OF MULTI-LAYER TRAP AND RESERVOIR ROCKS)



CO_2 storage capacity – 600 MT

CAP ROCK

RESERVOIR ROCK

COAL SEAMS

TALCHIR FORMATION

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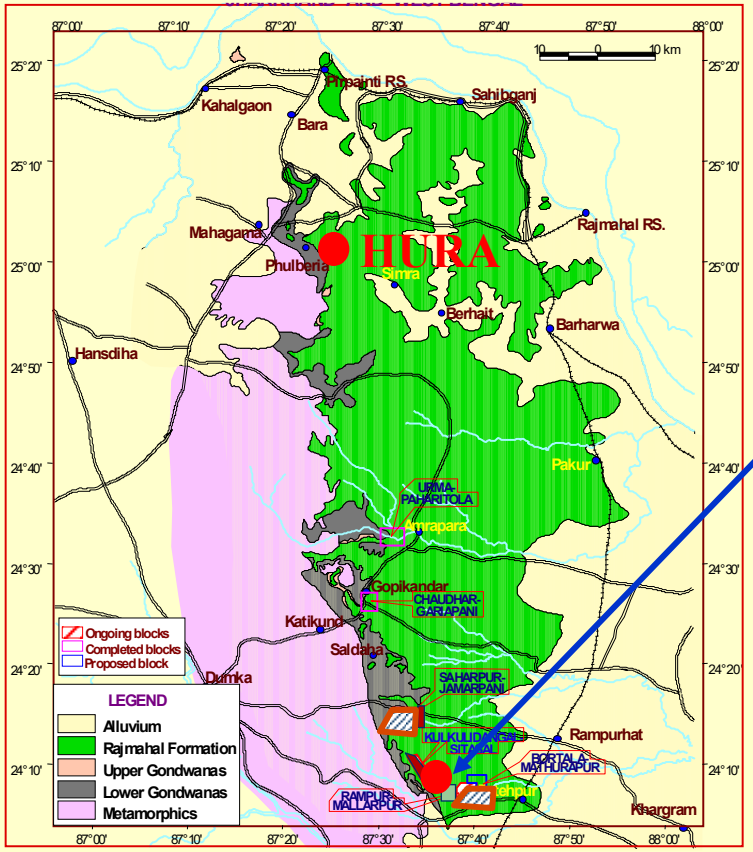
GEOLOGICAL MAP OF RAJMAHAL-BIRBHUM COALFIELDS



Trap thickness increases generally towards east

Maximum Trap thickness recorded –370m in southeastern part of the basin

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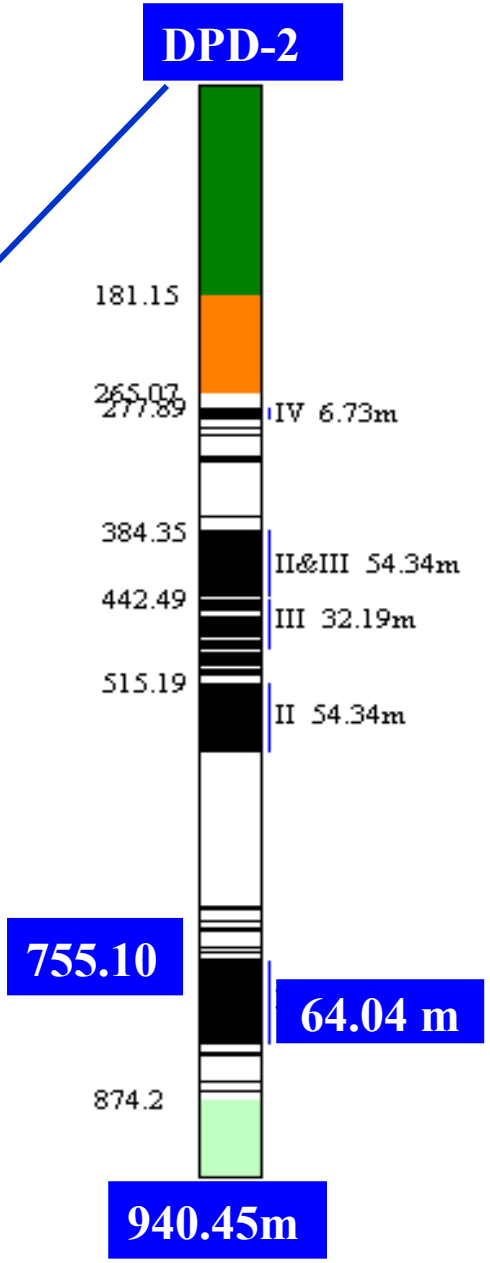
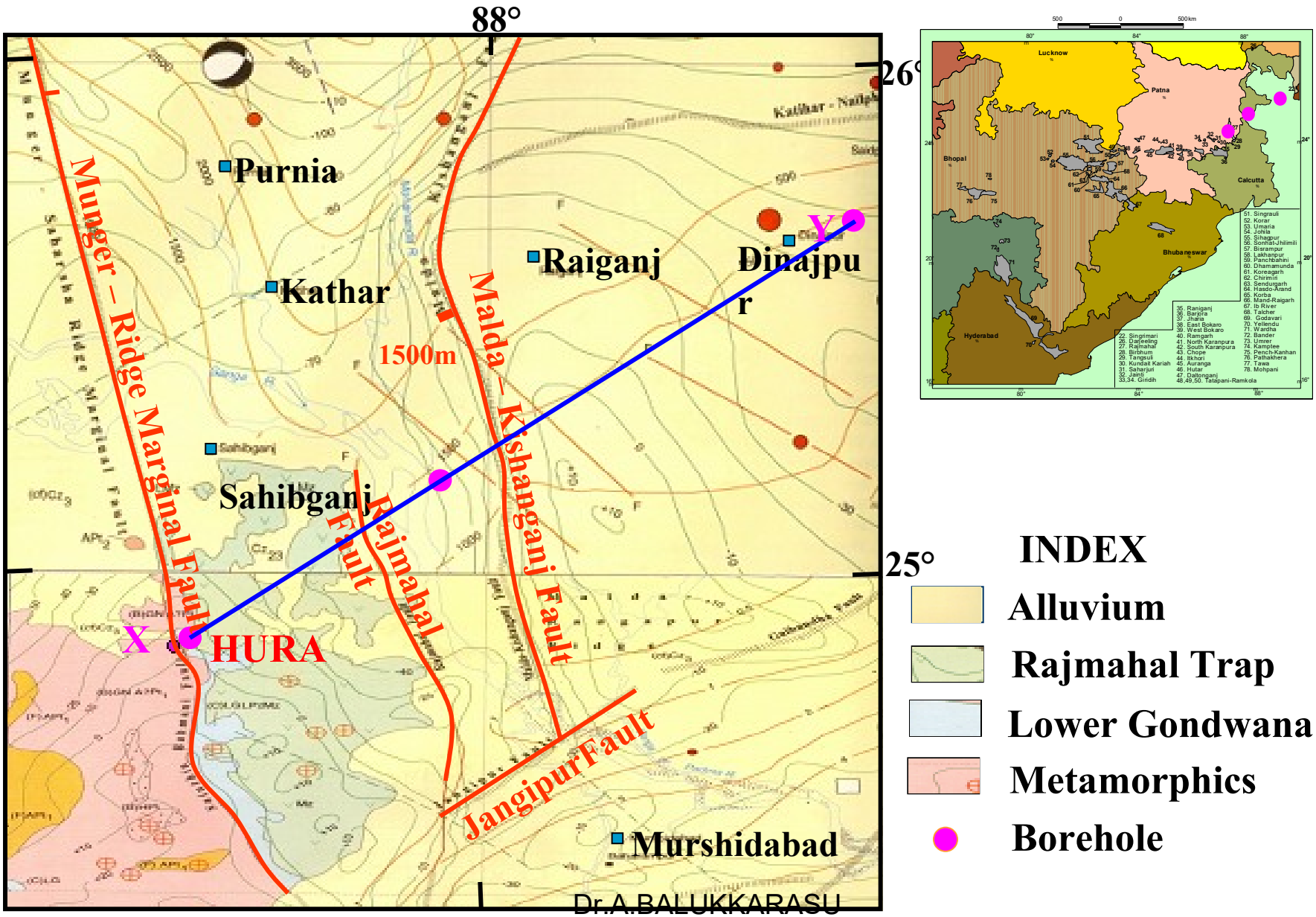
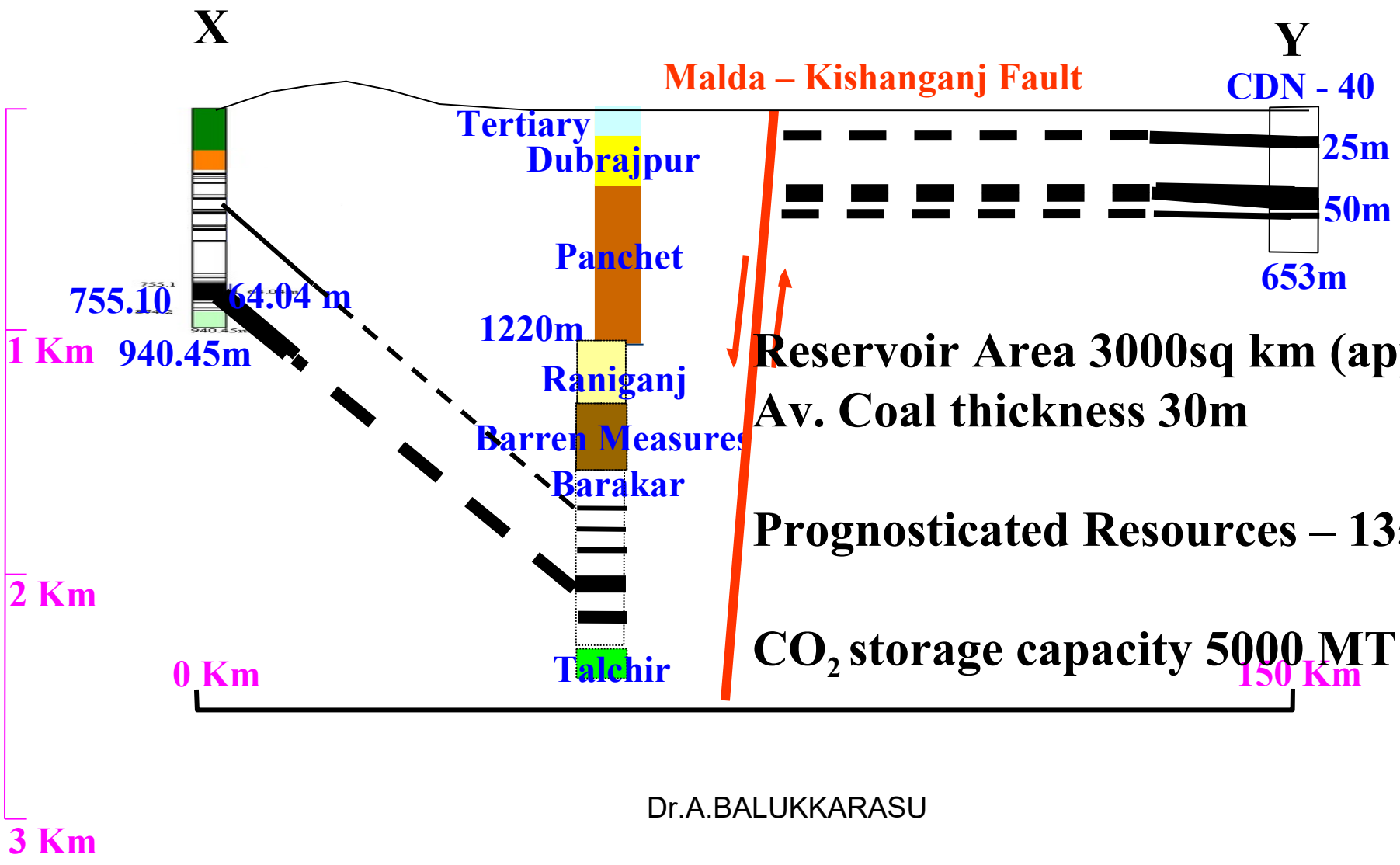
Pachami

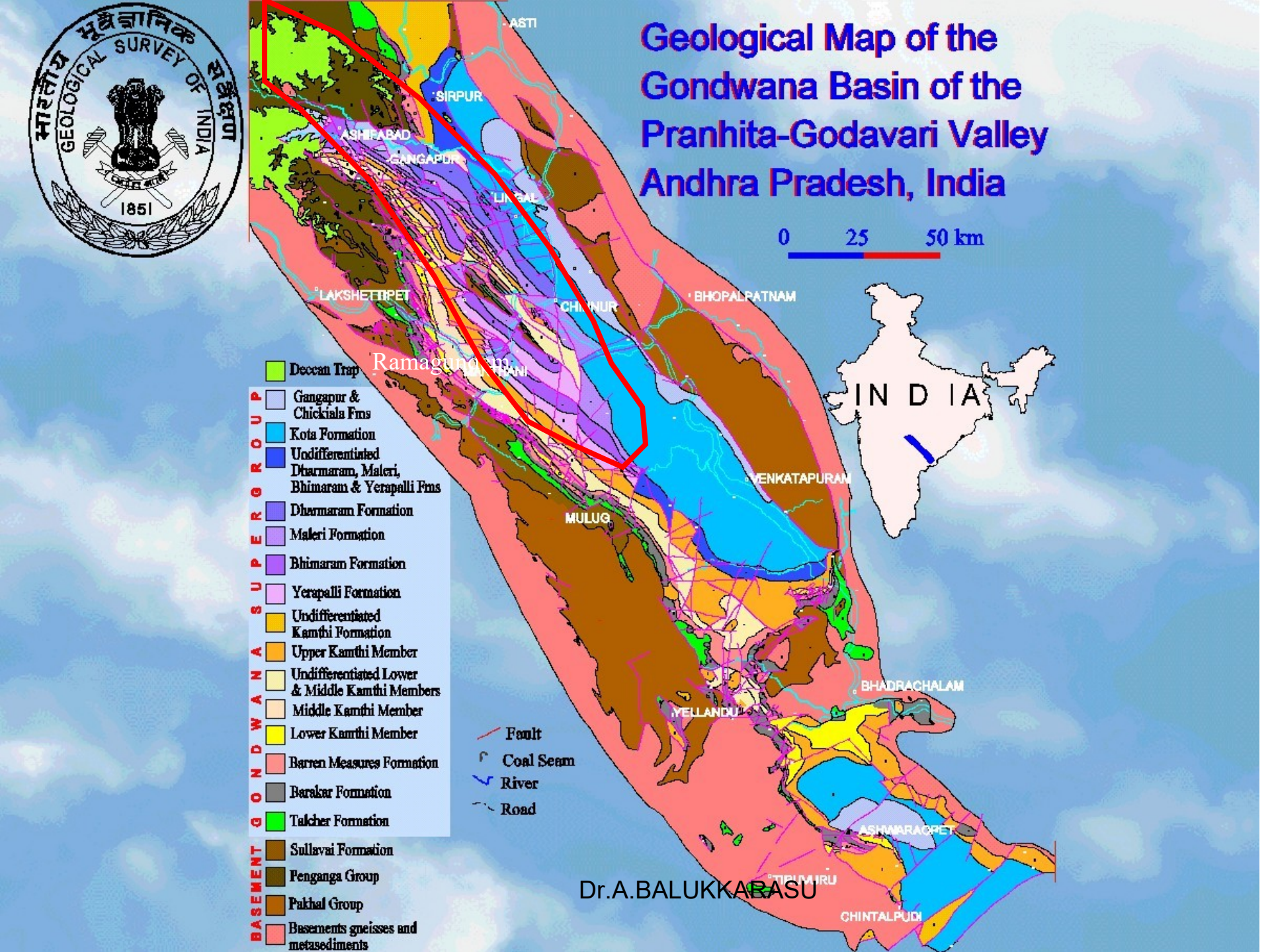


TECTONIC MAP OF RAJMAHAL BASIN (EASTERN PART)



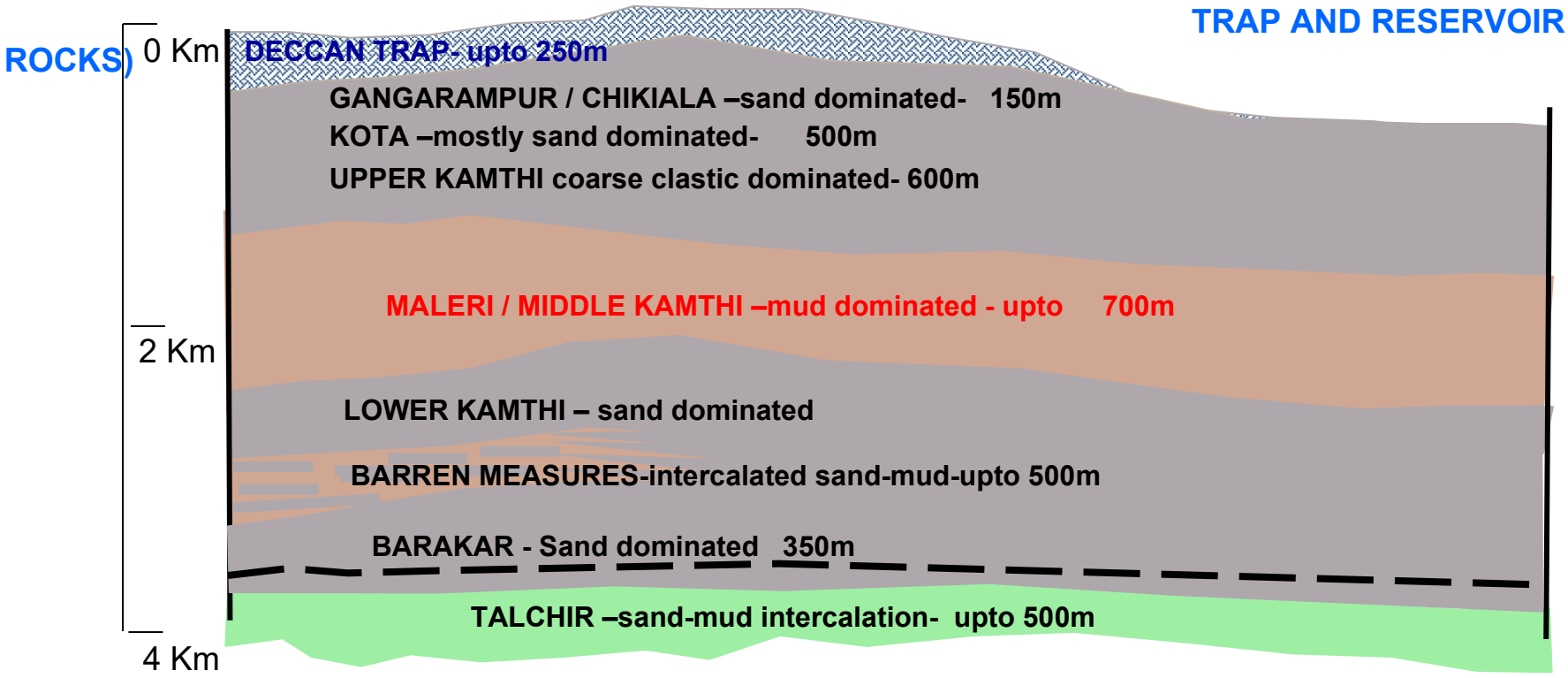
GEOLOGICAL SECTION ALONG X – Y IN RAJMAHAL BASIN





GENERALISED STRATIGRAPHIC SUCCESSION OF GODAVARI BASIN

(A CASE HISTORY OF DOUBLE-LAYER TRAP AND RESERVOIR

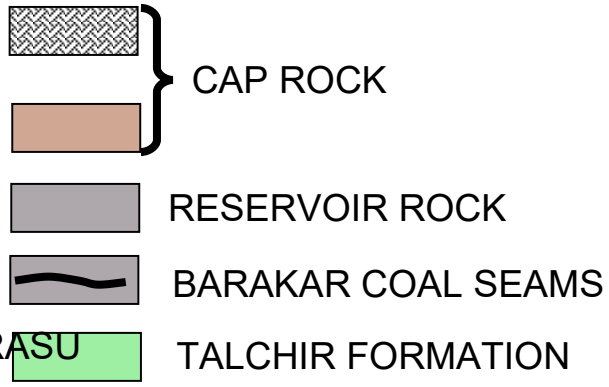


Area 300sq km

Av. Coal thickness 5m

Prog. Resource 20 BT

CO_2 storage capacity 800MT



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Coal basin	Reservoir area(sq km)	Av. Coal (m)	Resource (BT)	Capacity (MT)
Raniganj	700	30	30	600
Rajmahal	3000	30	135	5000
Godavari	3000	5	20	800
Total	**6700**		**185**	**6400**

COAL WING OF GSI

WITH ITS RICH AND ROBUST GEOSCIENTIFIC DATABASE (SURFACE AND SUBSURFACE)

ON ALL COAL BASINS OF INDIA

AND HAVING ADEQUATE EXPERTISE IN FIELD AND LABORATORY STUDIES

IS CAPABLE TO

DELINEATE THE SUITABLE SITES FOR CO_2 STORAGE

IN DEEP SEATED UNMINABLE COAL SEAMS AND ASSOCIATED PERMEABLE AND IMPERMEABLE ROCKS

CONSIDERING ALL GEOLOGICAL FACTORS

Dr.A.BALUKKARASU

Collaborative work to be performed by coal wing, GSI; CMFRI and Foreign Agencies/Institutions

NATURE OF WORKS

- **DELINEATION OF BASIN WISE AREAS WITH COAL RESOURCE OCCURING BELOW 1200m DEPTH**
- **DETAILED STUDY OF FAULT AND FRACTURE PATTERN**
- **COAL PETROGRAPHY INCLUDING DETAILED STUDY OF CLEAT PATTERN**
- **PHYSICOCHEMICAL CHARACTER OF ROCKS**
- **PHYSICO-MECHANICAL PROPERTIES OF COAL**
- **DESORPTION OF CH_4 AND SORPTION OF CO_2 CHARACTER OF COAL**