Coal resource position in India

Geological Survey of India
Coal occurs in two stratigraphic horizons

Permian sediments (c. 290Ma) mostly deposited in Intracratonic Gondwana basins.

Early Tertiary (c. 60Ma) near-shore peri-cratonic basins and shelves.
Gondwana basins of Peninsular India disposed in four linear belts following several prominent lineaments in the Precambrian craton. In the extra-Peninsular region (Darjeeling and Arunachal Pradesh) Lower Gondwana sediments occur as thrust sheets overriding Siwalik sediments.
### Gondwana coal

**Occurrence** Eastern and central part of Peninsular India  
**Rank** Bituminous to sub-bituminous  
**Character** Moderate to High in Ash and Low in Sulphur

### Tertiary coal

**Occurrence** Northeastern India  
**Rank** Meta and Ortholignitous  
**Character** High in Sulphur; Strongly caking to non-caking

### Lignite

**Occurrence** Western and southern India  
**Character** High in Moisture and Volatile Matter
GONDWANA COAL

Coal bearing strata

**RANIGANJ/KAMTHI FORMATION** (Late Permian)—
ECONOMICALLY EXPLOITABLE IN RANIGANJ, JHARIA
EASTERN PART OF SINGRAULI BASIN AND
GODAVARI

**BARAKAR FORMATION** (Early Permian)—
MAJOR STOREHOUSE OF COAL IN ALL THE BASINS

**KARHARBARBI FORMATION** (Early Permian)—
RESTRICTED TO FEW COALFIELDS OF EASTERN INDIA
Oligocene sediments –
- Tikak Parbat Formation in Upper Assam, Nagaland and Arunachal Pradesh

Eocene sediments –
- Tura Sandstone, Lakadong Sandstone in Garo, Khasi and Jaintia hills of Meghalaya
- Sylhet Limestone in Mikir hills of Assam
- Lower Subathu Group in Jammu
Types of Indian coal

Coking

Prime – Low volatile bituminous coals, Coke type \( G_7 \) or better, \( R_o(\text{mean}) = 1.2 \). Upper Barakar seams in Jharia coalfield.

Medium - Low to high volatile bituminous coals, Coke type F-G\( _6 \), \( R_o(\text{mean}) = 1.1-1.4 \). Lower Barakar & Raniganj seams in Jharia, Barakar seams in Raniganj, Bokaro, parts of Ramgarh, Karanpura, Sohagpur and Pench- Kanhan coalfields

Semi – High volatile, Coke type D-F, \( R_o(\text{mean}) = 0.7 \). Lower Raniganj seams in Raniganj, Barakar seams in parts of Ramgarh and Sonhat coalfields

Non-coking

Superior – High volatile bituminous B-C coals. Mainly in Raniganj seams of Raniganj coalfield

Inferior – High volatile sub-bituminous coals. All coalfields

High Sulphur

Tertiary coalfields of Northeastern Region
Comparatively cleaner than Barakar coals
Low moisture, low ash and low to medium volatile
Generally non-coking except in parts of Giridih and North Karanpura
General characters of Barakar coal

- Moisture < 2% to 6%
- Volatile - <18 to 35%
- Carbon - 85 to 90% (on dmf basis)
- Ash - 15 to 30% (excluding dirt bands)
- Coking properties (eastern CFs of Damodar Valley basins)
- Coke type - D to G₆ or better
General characters of Raniganj coal

- High moisture
- High Volatile
- Coal seams thinner than those of Barakar
- Best developed in Raniganj coalfield
RESOURCE CLASSIFIED AS

**CATEGORY**

- **PROVED (>80%)**
  THROUGH DETAILED EXPLORATION
- **INDICATED (>50 to 80%)**
  THROUGH REGIONAL EXPLORATION
- **INFERRED (<50%)**

**DEPTH**

0-300 m, 300-600 m and 600-1200 m

**GRADE**

- Semi Coking: Grade-I and grade-II
- Non Coking: Superior (Gr.A – C) and Power grade (Gr.D-G)
Prevalent Quality classification system

(Department of Coal, Ministry of Energy, 1979)

Non-coking coal from Gondwana coalfields

<table>
<thead>
<tr>
<th>Grade</th>
<th>Useful Heat Value (k.cal/kg)</th>
<th>Sp.Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>&gt; 6200</td>
<td>1.42</td>
</tr>
<tr>
<td>B</td>
<td>5600 - 6200</td>
<td>1.45</td>
</tr>
<tr>
<td>C</td>
<td>4940 - 5600</td>
<td>1.50</td>
</tr>
<tr>
<td>D</td>
<td>4200 - 4940</td>
<td>1.55</td>
</tr>
<tr>
<td>E</td>
<td>3360 - 4200</td>
<td>1.60</td>
</tr>
<tr>
<td>F</td>
<td>2400 - 3360</td>
<td>1.68</td>
</tr>
<tr>
<td>G</td>
<td>1300 - 2400</td>
<td>1.76</td>
</tr>
</tbody>
</table>

Useful Heat Value = $8900 - 138(A+M)$

($A = Ash\%$, $M = Moisture\%$ at 60\% R.H & 40\degree C Temperature)
### Prevalent classification (contd.)

#### Coking coal

<table>
<thead>
<tr>
<th>Grade</th>
<th>Ash</th>
<th>Sp.Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel Grade -I</td>
<td>&lt; 15%</td>
<td>1.42</td>
</tr>
<tr>
<td>Steel Grade -II</td>
<td>15% - 18%</td>
<td>1.44</td>
</tr>
<tr>
<td>Washery Grade - I</td>
<td>18% - 21%</td>
<td>1.46</td>
</tr>
<tr>
<td>Washery Grade - II</td>
<td>21% - 24%</td>
<td>1.50</td>
</tr>
<tr>
<td>Washery Grade - III</td>
<td>24% - 28%</td>
<td>1.53</td>
</tr>
<tr>
<td>Washery Grade - IV</td>
<td>28% - 35%</td>
<td>1.58</td>
</tr>
</tbody>
</table>

#### Semi-coking & weakly coking coal

<table>
<thead>
<tr>
<th>Grade</th>
<th>Ash + Moisture</th>
<th>Sp.Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semi-Coking -I</td>
<td>&lt; 19%</td>
<td>1.44</td>
</tr>
<tr>
<td>Semi-Coking -II</td>
<td>19% - 24%</td>
<td>1.46</td>
</tr>
</tbody>
</table>
DEPTH-WISE AND CATEGORY-WISE RESOURCE OF INDIAN COAL
(As on 01-01-2006)

Total Resource: 253.3 b.t.

<table>
<thead>
<tr>
<th>Depth</th>
<th>Proved</th>
<th>Indicated</th>
<th>Inferred</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-300m</td>
<td>73.75</td>
<td>14.38</td>
<td>36.66</td>
</tr>
<tr>
<td>0-600m</td>
<td>66.63</td>
<td>13.71</td>
<td>11.23</td>
</tr>
<tr>
<td>300m-600m</td>
<td>0.50</td>
<td>6.74</td>
<td>5.76</td>
</tr>
<tr>
<td>600m-1200m</td>
<td>1.67</td>
<td>17.52</td>
<td>11.23</td>
</tr>
<tr>
<td>TOTAL</td>
<td>95.87</td>
<td>119.77</td>
<td>36.66</td>
</tr>
</tbody>
</table>

Total Resource: 154.8 b.t. (For Jharia Coalfield)
COALFIELD-WISE DISTRIBUTION OF COKING COAL
(As on 01.01.2006)
COALFIELD-WISE DISTRIBUTION OF NON-COKING COAL
(As on 01.01.2006)
Coal Resource base

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

- Proved: 95.87 b.t
- Indicated: 119.77 b.t
- Inferred: 37.67 b.t

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

Quality-wise break-up of Non-coking coal

- Coking: 32.09 b.t (12.7%)
- Non-Coking: 220.26 b.t (87%)
- High sulphur: 0.94 b.t

- Superior: 32.04 b.t
- Power grade: 153.03 b.t
- Ungraded: 35.19 b.t
Superior grade coal ('A' – 'C')
UHV:4940K - >6200Cal/Kg

Total resource: 32b.t.

Depth-wise distribution:

(0-300) 0.2
(600-1200) 2.2
(300-600) 9.8
(00--300) 19.7

(for Jharia)
Power grade coal
('D' – 'G')

UHV: 1300-4940 KCal/Kg

Total resource: 153b.t.

Depth-wise distribution

<table>
<thead>
<tr>
<th>Depth Range</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-600</td>
<td>5.9</td>
</tr>
<tr>
<td>600-1200</td>
<td>5.13</td>
</tr>
<tr>
<td>300-600</td>
<td>32.5</td>
</tr>
<tr>
<td>0-300</td>
<td>109.48</td>
</tr>
</tbody>
</table>
Lignite Occurrences

Total Resource: 38.3 b.t
CRITICAL ANALYSIS OF RESOURCE SCENARIO vis-à-vis UNDERGROUND COAL GASIFICATION
UNDERGROUND COAL GASIFICATION

CONCEPT ~ CONVERTING IN-SITU COAL SEAMS INTO A COMBUSTIBLE CLEAN GAS

UNIQUE FEATURE ~ EXPLOITATION OF UNMINEABLE DEEP SEATED COAL SEAMS

CONSTRAINT ~ DEVELOPMENT OF RELIABLE WORKING PROGRAMME WITH ECONOMIC VIABILITY
SUBSTANTIAL RESOURCE NOT MINEABLE ~
SURFACE CONSTRAINTS, SAFETY AND TECHNOLOGICAL REASONS

21% OF NET IN-SITU PROVED RESOURCE EXTRACTABLE WITHIN PRESENT MINING TECHNOLOGY
(SOURCE CMPDI)
Distribution of non-coking coal in major Coalfield within 0-300m

- Talcher: 30.3 billion tonne
- Ib-River: 14.3 billion tonne
- Raniganj: 14.3 billion tonne
- Rajmahal: 12.8 billion tonne
- N. karanpura: 10.52 billion tonne
- Singrauli: 9 billion tonne
- Godavari: 8.43 billion tonne
- Korba: 7.85 billion tonne
- Hasdeo: 7.7 billion tonne
- Wardha: 4.9 billion tonne
- S. Karanpura: 3.8 billion tonne
- Kamplee: 3.4 billion tonne
- Auranga: 1.8 billion tonne
- Pench-Kanhan: 1.6 billion tonne
- Tatapani: 1.2 billion tonne
- Sonhat: 1.1 billion tonne
- Sonhat: 1 billion tonne
<table>
<thead>
<tr>
<th>Coalfield</th>
<th>Distribution (in billion tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talcher</td>
<td>24.5</td>
</tr>
<tr>
<td>Ib-River</td>
<td>11.9</td>
</tr>
<tr>
<td>Mand-raigarh</td>
<td>11.8</td>
</tr>
<tr>
<td>Rajmahal</td>
<td>9.5</td>
</tr>
<tr>
<td>N. Karanpura</td>
<td>8.1</td>
</tr>
<tr>
<td>Korba</td>
<td>6.9</td>
</tr>
<tr>
<td>Raniganj</td>
<td>6.6</td>
</tr>
<tr>
<td>Godavari</td>
<td>5.8</td>
</tr>
<tr>
<td>Singrauli</td>
<td>5.6</td>
</tr>
<tr>
<td>Hasdeo</td>
<td>3.3</td>
</tr>
<tr>
<td>Wardha</td>
<td>3.2</td>
</tr>
<tr>
<td>S. Karanpura</td>
<td>2.3</td>
</tr>
<tr>
<td>Auranga</td>
<td>1.6</td>
</tr>
<tr>
<td>Kamptee</td>
<td>1.2</td>
</tr>
<tr>
<td>Sonhat</td>
<td>0.9</td>
</tr>
<tr>
<td>Pench-Kanhan</td>
<td>0.7</td>
</tr>
<tr>
<td>Tatapani</td>
<td>0.7</td>
</tr>
</tbody>
</table>
Distribution of Superior grade coal in major Coalfield within 0-300m
Distribution of non-coking coal in major Coalfield within 300-600m

<table>
<thead>
<tr>
<th>Coalfield</th>
<th>Tonne (in billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Talcher</td>
<td>8.1</td>
</tr>
<tr>
<td>Ib. River</td>
<td>8.1</td>
</tr>
<tr>
<td>Raniganj</td>
<td>7.3</td>
</tr>
<tr>
<td>Godavari</td>
<td>6.3</td>
</tr>
<tr>
<td>Mand-raigarh</td>
<td>4.7</td>
</tr>
<tr>
<td>Singrauli</td>
<td>4.4</td>
</tr>
<tr>
<td>Rajmahal</td>
<td>3.7</td>
</tr>
<tr>
<td>Birehun</td>
<td>3.3</td>
</tr>
<tr>
<td>N. Karanpura</td>
<td>2.8</td>
</tr>
<tr>
<td>Korba</td>
<td>2.3</td>
</tr>
<tr>
<td>S. Karanpura</td>
<td>1.6</td>
</tr>
<tr>
<td>Wardha</td>
<td>1.6</td>
</tr>
<tr>
<td>Auranga</td>
<td>1.3</td>
</tr>
<tr>
<td>Kamptee</td>
<td>0.9</td>
</tr>
<tr>
<td>Sonhat</td>
<td>0.8</td>
</tr>
<tr>
<td>Tatapani</td>
<td>0.6</td>
</tr>
<tr>
<td>Pench-Kanhani</td>
<td>0.5</td>
</tr>
</tbody>
</table>
Coalfield-wise distribution of Power grade coal within 300-600m depth
Coalfield-wise distribution of Superior grade coal within 300-600m depth
Distribution of non-coking coal in major Coalfield
within 600-1200m

(in billion tonne)
Distribution of Superior grade coal in major Coalfield within 600-1200m

(in billion tonne)

- Raniganj
- Godavari
- Birbhum
- Sonhat
- Talcher
Distribution of power grade coal in major Coalfield within 600-1200m
Out of total lignite resource (38.27 billion tonne) 9.4 billion tonne are of quarriable prospect.
EMERGING POSSIBILITIES OF EXPLOITING SOLID FOSSIL FUEL THROUGH UCG

requires

Characterisation of resource on chemical and petrographic parameters at exploration stage

for

Optimal utilisation of resource both at short and long term perspective
DESIRABLE COAL CHARACTERS

• COAL WITH HIGHER REACTIVITY ~ COAL WITH SIGNIFICANT AMOUNT OF EXINITE/LIPTINITE

• COAL WITH HIGH MOISTURE CONTENT ~ REACTION REQUIRES WATER

• COAL TYPE - LOW RANK COAL EASILY GASIFIED

• CAKING OR SWELLING SHOULD BE LESS
DESIRABLE COAL CHARACTERS (CONT'D.)

- MINERAL MATTER AND ASH FUSION TEMP. ARE IMP. FACTORS

- COAL NEED TO BE ADEQUATELY PERMEABLE

- FOR COAL HYDROGENATION DESIRABLE ELEMENTS
  VITRINITE REFLECTANCE < 0.8%
  VITRINITE + EXINITE > 60%
  VM > 35% ; H/C ATOMIC RATIO > 0.75%
## Generalised character of Coal / Lignite seams of some of the coal/lignite fields

<table>
<thead>
<tr>
<th>Coal</th>
<th>Vitrinite%</th>
<th>Inertinite%</th>
<th>Exinite%</th>
<th>VM%</th>
<th>C%</th>
<th>H%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mand-Raigarh</td>
<td>43–60</td>
<td>22–43</td>
<td>15–25</td>
<td>_</td>
<td>78 – 81</td>
<td>5.0– 5.3</td>
</tr>
<tr>
<td>Tatapani-Ramkola</td>
<td>8–16</td>
<td>41–51</td>
<td>16–18</td>
<td>_</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bisrampur</td>
<td>25–30</td>
<td>55–60</td>
<td>10-15</td>
<td>35-38</td>
<td>78 – 85</td>
<td>4.2–4.8</td>
</tr>
<tr>
<td>Godavari</td>
<td>35–45</td>
<td>40–60</td>
<td>5–15</td>
<td>35 - 42</td>
<td>78 - 85</td>
<td>4.2–5.4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lignite</th>
<th>Vitrinite%</th>
<th>Inertinite%</th>
<th>Exinite%</th>
<th>VM%</th>
<th>C%</th>
<th>H%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ramnad</td>
<td>60 – 80</td>
<td>5 – 6</td>
<td>10 – 20</td>
<td>_</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mannargudi</td>
<td>80</td>
<td>5</td>
<td>12</td>
<td>_</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
RANGE OF VARIATION OF VITRINITE REFLECTANCE (Ro%) IN DIFFERENT COALFIELDS
MAJOR COALFIELDS (Resource > 300m)

(COAL SEAMS >3M THICK OF BARAKAR AND RANIGANJ/KAMTHI FMS.)

- RAJMAHAL-BIRBHUM CF
- RANIGANJ CF
- JHARIA, N KARANPURA, S KARANPURA, AURANGA
- TALCHER AND IB
- MAND RAIGARH, KORBA
- GODAVARI VALLEY
- SINGRAULI

Around 29 b. t. of lignite resource >150m (mainly in Tamil Nadu)

Huge deposit of lignito-bituminous coal and lignite of Cambay basin and Sanchor basin within 700-1700m
INDIAN COAL RESOURCES SUITABLE FOR UCG

• UNMINEABLE PART OF THE SHALLOW LEVEL RESOURCE

• SUBSTANTIAL SHARE (36%) OF TOTAL RESOURCE (253 BT) CONTAINED IN DEPTH LEVEL BEYOND 300M
POSSIBLE AREAS FOR SHALLOW LEVEL COAL RESOURCE

- Eastern part of Hasdo-Arand Coalfiled
- Southwestern part of Sohagpur Coalfield
- Central part of Talcher Coalfield
- Southcentral part of Singrauli Coalfield
- Western part of Rajmahal Coalfield
LITHOLOGICAL MAP OF SOHAGPUR COALFIELD

Shallow level

Shahdol

Sohagpur

Legend:
- Basic intrusive
- Lameta Beds
- Parsora Formation
- Pali Formation
- Raniganj Formation
- Barren Measures
- Barakar Formation
- Talchir Formation
- Precambrians
POSSIBLE AREAS FOR DEEPER (>300M) LEVEL COAL RESOURCE

- Eastern part of Raniganj Coalfield
- Western part of Ib-River & Talcher Coalfield
- Westcentral part of Mand-Raigarh Coalfield
- Central part of main basin, Singrauli Coalfield
- Eastern part of Birbhum-Rajmahal Coalfield
- Eastern part of Pench-Kanhan Coalfield
- Central part of north Godavari Coalfield
Cumulative coal thickness (42.27m) and development of thicker seams (9.77m)
Coal seams: 9 (regionally persistent)
Controll points: > 40 (spacing < 1km – 1km apart)
Depth of overburden: Max. 350m
Ind. Seam thickness: 1m - > 80m
Cum. Coal thickness: 80m – 160m
Quality: M% - 4% to 7%, A% - 20% - 40%
Vitrinite (55%) / Inertinite (30%) / Exinite (15%)
Ro.(max): 0.45% to 0.61%
Coal seam Zones: Six
Zone thickness: 1.50m – 54m
Depth range: 31.50m – 521.50m
Grade: D - G
Intermediate to deeper level
SINGRAULI

Coal seams: 7-8
Controll points: > 30 (spacing >1km apart)
Depth of overburden: Raniganj: >150m
Barren Measure: 250-300m

Ind. Seam thickness: <1m – 18m
Cum. coal thickness: 25m – 30m
Quality: M% : 4 - 10% A% : 10.3% - 45%

Maceral
Vitrinite (45%- 78%)
Exinite (7%- 8%)
Inertinite (8% - 45%)

Ro.(max): 0.4% to 0.6%
LITHOLOGICAL MAP OF SOHAGPUR COALFIELD

Intermediate & Deeper level

Shahdol

Legend:
- Basic intrusive
- Laneta Beds
- Parsora Formation
- Pail Formation
- Raniganj Formation
- Barren Measures
- Barakar Formation
- Talchir Formation
- Precambrians
GEOLOGICAL MAP OF RAJMAHAL - BIRBHUM COALFIELDS

Dighi-Dharampur area
(Northern Extn. Hura)

Total 10-15 seams
7–8 coal seams
of 6–15m thick

Brahmani-Birbhum basin –
southeastern part

Total > 15 seams
2–4 coal seams
of 5–7m thick

Resource (300-600m)
7B.T. (Approx)
Lignite seams: 4-5
Controll points: > - 20 (spacing >1km apart)
Depth of overburden: 250 - 350m
Ind. Seam thickness: <1m – 28m
Cum. lignite thickness: 15m – 40m
Quality: M% : 30% - 40%, A% : 7% - 17%

Maceral
Huminite (52%-86)
Exinite (0.9%-5.6%)
Inertinite (1.2%-8.7%)
Ro.(max): 0.3% to 0.5%
Lignite seams: 1 - 4
Controll points: > - 17 (spacing >1km apart)
Depth of overburden: 300 - 350m
Ind. Seam thickness: <1m – 12m
Cum. lignite thickness: 6m – 18m
Quality: M% : 35% - 45%, A% : 5% - 18%

Maceral
- Huminite (48%-80)
- Exinite (0.9%-5.6%)
- Inertinite (3% - 9%)
Ro.(max): 0.3% to 0.5%
Thank you
Thank you
**JHARIA COALFIELD**

**Salient features**

<table>
<thead>
<tr>
<th>FORMATION</th>
<th>THICKNESS</th>
<th>COAL SEAMS</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intrusives</td>
<td></td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Raniganj</td>
<td>725m</td>
<td>22</td>
<td>(0.1m-4.7m)</td>
</tr>
<tr>
<td>Barren Measures</td>
<td>850m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barakar</td>
<td>1130m</td>
<td>46</td>
<td>(0.3m-33.0m)</td>
</tr>
<tr>
<td>Talchir</td>
<td>225m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**COAL RESOURCE**

- 0-600m -- 14.2 bt
- 600m-1200m -- 5.2 bt
- 0 – 1200m – 19.4 bt

Deeper level
EAST BOKARO COALFIELD

Salient features

<table>
<thead>
<tr>
<th>FORMATION</th>
<th>THICKNESS</th>
<th>COAL SEAMS</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahadeva</td>
<td>500m</td>
<td>No</td>
<td>(0.4m-3.0m)</td>
</tr>
<tr>
<td>Panchet</td>
<td>600m</td>
<td>7</td>
<td>(0.4m-3.0m)</td>
</tr>
<tr>
<td>Raniganj</td>
<td>600m</td>
<td>7</td>
<td>(0.4m-3.0m)</td>
</tr>
<tr>
<td>Barren Measures</td>
<td>500m</td>
<td>26</td>
<td>(0.4m-63.9m)</td>
</tr>
<tr>
<td>Barakar</td>
<td>1000m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Talchir</td>
<td>80m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COAL RESOURCE

- 0-300m -- 3.2 bt
- 300m-600m -- 1.5 bt
- 600m-1200m -- 2.3 bt
- 0 – 1200m -- 7.0 bt
NORTH KARANPURA COALFIELD

Salient features

<table>
<thead>
<tr>
<th>FORMATION</th>
<th>THICKNESS</th>
<th>COAL SEAMS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mahadeva</td>
<td>165m</td>
<td>No Thickness</td>
</tr>
<tr>
<td>Panchet</td>
<td>225m</td>
<td>thin bands</td>
</tr>
<tr>
<td>Raniganj</td>
<td>400m</td>
<td>5 (0.5m-35.2m)</td>
</tr>
<tr>
<td>Barren Measures</td>
<td>385m</td>
<td></td>
</tr>
<tr>
<td>Barakar</td>
<td>500m</td>
<td>1 (0.5m-10.5m)</td>
</tr>
<tr>
<td>Karharbari</td>
<td>200m</td>
<td></td>
</tr>
<tr>
<td>Talchir</td>
<td>180m</td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>--</td>
<td></td>
</tr>
</tbody>
</table>

COAL RESOURCE

- 0-300m -- 10.3 bt
- 300m-600m -- 4.3 bt
- 0 – 1200m – 14.6 bt
SOUTH KARANPURA COALFIELD

COAL SEAMS

<table>
<thead>
<tr>
<th>Location</th>
<th>Thickness</th>
<th>No</th>
<th>Thickness Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raniganj</td>
<td>360m</td>
<td>7</td>
<td>(0.8m-3.3m)</td>
</tr>
<tr>
<td>Barren Measures</td>
<td>385m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Barakar</td>
<td>1050m</td>
<td>42</td>
<td>(0.5m-54.2m)</td>
</tr>
<tr>
<td>Talchir</td>
<td>180m</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Basement</td>
<td>--</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

COAL RESOURCE

- 0-300m -- 3.3 bt
- 300m-600m -- 1.8 bt
- 600m-1200m -- 0.9 bt
- 0 – 1200m – 6.0 bt

Salient features

Deeper level
Distribution of substantial resource under ‘Proved’ category within 0-300m depth level

Resource >1 b.t.

Mand-Raigarh 1.2
S.Karanpura 1.8
Rajmahal 2
Wardha 2.5
Singrauli 4.1
Godavari 4.1
Raniganj 4.3
Korba 4.5
lb-River 5.1
N.Karanpura 6.9
Talcher 11.3

(in billion tonne)
Distribution of substantial resource under ‘Indicated’ category within 0-300m depth level

<table>
<thead>
<tr>
<th>Location</th>
<th>Resource (in billion tonne)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Raniganj</td>
<td>1.2</td>
</tr>
<tr>
<td>N.Karanpura</td>
<td>1.2</td>
</tr>
<tr>
<td>Auranga</td>
<td>1.5</td>
</tr>
<tr>
<td>Godavari</td>
<td>1.7</td>
</tr>
<tr>
<td>Hasdo</td>
<td>2.2</td>
</tr>
<tr>
<td>Singrauli</td>
<td>2.2</td>
</tr>
<tr>
<td>Korba</td>
<td>2.4</td>
</tr>
<tr>
<td>Ib-River</td>
<td>6.9</td>
</tr>
<tr>
<td>Rajmahal</td>
<td>7.4</td>
</tr>
<tr>
<td>Mand-Raigarh</td>
<td>10.6</td>
</tr>
<tr>
<td>Talcher</td>
<td>13.1</td>
</tr>
</tbody>
</table>

Resource >1 b.t.
Status of shallow level (<150m) resource needs to be upgraded in different lignite basins
PETROGRAPHICAL CHARACTER OF GONDWANA COAL IN DIFFERENT COALFIELDS

STUDIES CARRIED OUT BY GSI

VITRINITE%

EXINITE

INERTINITE

SHALE+MINERAL MATTER

Talcher
Tatapani-Ramkola
Singrauli
Saharjuri
Wardha
Sohagpur
Bokaro
Jharia
Satpura
Raniganj

TALCHER
RAMKOLA-TATAPANI
SINGRAULI
SAHARJURI
WARDHA
SOHAGPUR
BOKARO
JHARIA
SATPURA
RANIGANJ

Talcher
Tatapani-Ramkola
Singrauli
Saharjuri
Wardha
Sohagpur
Bokaro
Jharia
Satpura
Raniganj

Talcher
Tatapani-Ramkola
Singrauli
Saharjuri
Wardha
Sohagpur
Bokaro
Jharia
Satpura
Raniganj