

## **THAR COAL RESOURCES IN THAR DESERT, SINDH– PAKISTAN**

### **1. Location and Accessibility:-**

The Thar coalfield is approximately located between Latitudes 24°15'N and 25°45'N and Longitudes 69° 45'E and 70° 45'E in the southern part of Sindh Province in the Survey of Pakistan topo-sheet Nos. 40 L/2,5 and 6. Based on available infrastructure and favourable geology, the Geological Survey of Pakistan selected four blocks near Islamkot for exploration and assessment of coal resources. The blocks with names, area and coordinates are given in Table-1:-

S.No.	Name/Blocks	Area (Sq.km)	Coordinates	
			Latitude	Longitude
1.	Sinhar Vikian Varvai, Block-I	122.00	24° 35'N to 24° 44'N	70° 12'E to 70° 18'E
2.	Singharo Bhitro, Block-II	55.00	24° 44'N to 24° 51'N	70° 15'E to 70° 25'E
3.	Saleh Jo Tar, Block – III	99.50	24° 49'N to 24° 58'N	70° 12'E to 70° 18'E
4.	Sonalba, Block – IV	82.50	24° 41'N to 24° 48'N	70° 12'E to 70° 20'E

The area is accessible by a 410 kilometers metalled road form Karachi up to Islamkot via Hyderabad-Mirpur Khas- Naukot and Thatta-Badin-Mithi-Islamkot. A road network connecting all the major towns with Thar Coalfield have been developed. The rail link from Hyderabad is up to Naukot, which is about 100 kilometers from Islamkot.

### **2. Relief, Topography and Climate**

Thar coalfield is a part of the Thar Desert of Pakistan and is the 9<sup>th</sup> largest desert of the world. It is bounded in the north, east and south by India, in the west by flood plains of the Indus River. The terrain is sandy and rough with sand dunes forming the topography. The relief in the area varies between near sea level to more than 150 meters AMSL.

The climate is essentially that of an aid to semi arid region with scorching hot summers and relatively cold winters. It is one of the most densely populated deserts of the world with over 91 thousand inhabitants. The livelihood of the population is dependent on agriculture and livestock.

### **3. Water Resources**

The area is a part of the desert where precipitation is very little with a high rate of evaporation. As such, limited water resources are of great significance.

**a. SURFACE WATER**

The water is scanty and found in a few small “tarais” and artificially dug depressions where rain water collects. These depressions generally consist of silty clay and caliche material.

**b. GROUNDWATER**

The hydro-geological studies and drill hole geology shows the presence of three possible aquifer zones at varying depths: (i) above the coal zone (ii) within the coal zone and (iii) below the coal zone.

Drilling data has indicated three aquifers (water-bearing Zones) at an average depth of 50 m, 120 m and more than 200 meters:

- One aquifer above the coal zone:  
Ranges between 52.70 and 93.27 meters depth.
- Second aquifer with the coal zone at 120 meters depth:  
Varying thickness up to 68.74 meters.
- Third aquifer below the coal zone at 200 metes depth:  
Varying thickness up to 47 meters.
  
- Water quality is brackish to saline

**4. Geology**

The Thar coalfield area is covered by dune sand that extends to an average depth of over 80 meters and rests upon a structural platform in the eastern part of the desert. The generalized stratigraphic sequence in the Thar coalfield area is shown in table. It comprises Basement Complex, coal bearing Bara Formation, alluvial deposits and dune sand.

**STRATIGRAPHIC SEQUENCE IN THE THAR COALFIELD**

<b>Formation</b>	<b>Age</b>	<b>Thickness</b>	<b>Lithology</b>
Dune Sand	Recent	14 m to 93 m	Sand, silt and clay
-----Unconformity-----			
Alluvial	Sub-Recent	11 m to 209 m	Sandstone, siltston

Deposits (variable) claystone, mottled.

-----Unconformity-----

Bara Formation Paleocent to +52 m Claystone, shale,  
Early Eocene (variable) sandstone, coal  
Carbonaceous claystone

-----Unconformity-----

Basement Complex Pre-Cambrian ----- Granite and quartz diorite.

## 5. Coal

The coal beds of variable thickness ranging from 0.20 – 22.81 meters are developed. The maximum number of coal seams found in some of the drill holes is 20. The cumulative thickness of the coal beds range from 0.2 to 36 meters. Claystone invariably forms the roof and the floor rock of the coal beds.

The coal is brownish black, black and grayish black in colour. It is poorly to well cleared and compact. The quality of coal is better where percentage of clay is nominal.

### 5.1 Reserves

As a result of wide spread drilling over an area of 9000 km<sup>2</sup>, a total of 175 billion tons of coal resource potential has been assessed.

Detailed evaluation on four blocks has following results

S.No.	Name/Blocks	Area (Sq.km)	Reserves (Million Tonnes)			
			Measured	Indicated	Inferred	Total
1.	Sinhar Vikian Varvaj, Block-I	122.00	620	1,918	1,028	3,566
2.	Singharo Bhitro, Block-II	55.00	640	944	-	1,584
3.	Saleh Jo Tar, Block – III	99.50	413	1,337	258	2,008
4.	Sonalba, Block – IV	82.50	684	1,711	76	2,471
Total:		358.5	2,357	5,910	1,362	9,629

The overburden consists of three kinds of material; dune sand, alluvium and sedimentary sequence. The total overburden is around 150 to 230 meters. The roof and the floor rocks are claystone and loose sandstone beds.

## 5.2 Chemical Composition

The weighted average chemical analysis of the coal samples of the four blocks show variation and are as given below:

Moisture (%)	43.24 to	49.01
Ash (%)	5.18 to	6.56
Volatile Matter (%)	26.50 to	33.04
Fixed Carbon (%)	19.35 to	22.00
Sulphur (%)	0.92 to	1.34
Heating value (Btu/lb)		
As Received	5780 to	6398
Dry	10723 to	11353
DAF	11605 to	12613
MMM Free	6101 to	6841

## 6. Infrastructure at Thar coalfield.

**Electricity:** 11 kV feeder emanating from Islamkot Grid Station to Thar Coal Project with 200 watts transformer and energized.

**500 kV transmission line:** 500 kV transmission line has been laid by WAPDA up to mining site.

**Telephone:** Optical fiber cable lying/installation of system between Mirpurkhas to Mithi exchanges completed. 100' high guide tower (1" dia) is to be installed at Thar coal site with DRS equipment. Telephone facility is available up to Islamkot.

**Water supply:** Water supply line from Mithi to Islamkot and Islamkot to coal mines (Thario Halepoto) has been completed and water reservoir of 6 lac gallons is available at coal mine site. 03 lac gallons / day will be available at site (Block-II).

In addition, 2 reverse osmosis plant for desalination of water to provide potable water to investors and local people has been installed at Sobharo Shah and Islamkot (near Thar Coalfield)

**Construction of Airstrip:-** The scheme “Construction of Airstrip at Islamkot” costing Rs.120 million is under implementation.

**Railway line:** Pakistan Railway conducted feasibility study of railway line at Thar coalfield to facilitate transportation of coal equipment. The railway route has been approved by the Chief Minister, Sindh.

**Town Planning of Islamkot:** Town Planning of Islamkot” nearest town to coalfield has also been sponsored for rehabilitation/resettlement of the villages located within the coalfield vicinity.

Displaced population will be relocated by providing them all necessary facilities in the nearest township.

**Thar Lodge:** The scheme for construction of 20-bedded accommodation to facilitate foreign and local investors at Islamkot has been approved at an estimated cost of Rs. 40 978 million. Construction is in progress.

## 7. Mining Feasibility Study

Government of Sindh commissioned a mining feasibility study in July 2003 aiming at determining techno economic parameters for developing a coal mine having capacity of producing 6 million tons lignite annually. The feasibility study was carried out by Rheinbraun of Germany over an area of 40 Km<sup>2</sup> in block-1 in Thar desert, Sindh, Pakistan.

Following lignite reserves were delineated in the 40 Km<sup>2</sup> area according to USGS standards:

Measured reserves	588.035 tons
Indicated reserves	403.351 Mio tons
Inferred reserves	11.934 Mio tons
Total reserves	1003.320 Mio tons

The overall vertical stripping ration (m<sup>3</sup> waste : t lignite) is around 6.5:1. Cumulative lignite thickness in the average is about 27 meter and depth from top is about 150 meter.

Based on the selected excavation variant production schedules have been developed for each of the above mentioned equipment alternatives considering an annual lignite demand of the power station of 6 Mio t.

Equipment Alternative	Quantity of Lignite during project lifetime (Mio t)	Quantity of Waste during project lifetime (Mio m3)	Stripping Ration during project lifetime (m3:t)	Volume of Boxcut (Mio m3)	Required years for pre-strip
S&T	186.75	15.66.69	8.39:1	179.84	3
Reduced Reserve S&T	186.75	1,746.60	9.35:1	193.49	3

Capital cost of the project has been estimated to US\$ 747.201 million. The expenditure covers all investments, labour, parts, contractor services, energy and consumables. Duties and taxes, where applicable, are also included.

Following has been estimated as the cost of mined coal, starting from the first year of production and kept constant for the lifetime of the mine:

Coal Price Equipment variants	US \$/t	2004 Price Basis	US \$/GJ
S/T	37.10		3.40
S/T without SM	38.60		3.54

## 8. Incentives for Investors in Pakistan

To keep Pakistan competitive in international markets and support the viability of investments in the country the following incentives are available to both foreign and local investors:

### **TARIFF (On machinery not manufactured locally)**

S. No.	Description of Items	Custom Duty	Sales Tax	Conditions
1.	Machinery, equipment, material, specialized vehicles (4x4 non luxury), accessories, spares, chemicals and consumables meant for mine construction phase or extraction phase. Imports made for mine construction phase are also entitled for deferred payment of duty for a period of five years subject to 6% surcharge per annum.	5%	0%	<p>1. This concession is available to those Mineral Exploration and Extraction Companies or their authorized operators or contractors who hold permits, licences, leases and who enter into agreements with the Government of Pakistan or Provincial Government.</p> <p>2. The goods shall not be sold or otherwise disposed off without prior approval of the</p>

				CBR and payment of customs duties and taxes leviable at the time of import.
2.	<p>1. Machinery, equipment, coal mining equipment and spares (including construction machinery, equipment and specialized vehicles imported on temporary basis) meant for initial installation, balancing, modernization, replacement or expansion of projects for power generation through oil, gas, coal, wind and wave energy including under construction projects, which entered into an implementation agreement with the Government of Pakistan.</p> <p>2. Spares and maintenance parts required for the above project after commissioning.</p>	<p>5%</p> <p>10%</p>	<p>0%</p> <p>0%</p>	
3.	<p>1. Machinery, equipment, coal mining equipment and spares (including construction machinery, equipment and specialized vehicles imported on temporary basis) meant for initial installation, balancing, modernization, replacement or expansion of projects for power generation through gas, coal, hydel and oil including under construction projects.</p> <p>2. Spares and maintenance parts required for the above project after commissioning.</p>	<p>5%</p> <p>10%</p>	<p>0%</p> <p>0%</p>	

**FISCAL INCENTIVES:**

**A. Initial Depreciation Allowance:**

1. Initial Depreciation Allowance at the rate of 50% is permissible on an “eligible depreciable asset” placed into service in Pakistan for the first time in a tax year. For the purpose of such allowances, “eligible depreciable asset” means plant and machinery excluding the following:

a. Any road transport vehicle unless the vehicle is plying for hire

- b. Any furniture including fittings.
- c. Any plant or machinery that is acquired second hand or
- d. Any plant or machinery in relation to which a deduction has been allowed under another section of the Ordinance for the entire cost of the asset in the tax year in which the asset is acquired.

**B. Amortization:**

- 1. Amortization of pre-commencement expenses allowed at the rate of 20% annually.
- 2. Amortization of intangible assets allowed over a period of ten years.

**Normal Tax Rates (Financial Year 2004-05):**

1.	Public Companies	35%
2.	Private Companies	39%
3.	Banking Companies	41%

**FACILITATION**

**Exchange Control:**

Full repatriation of capital, capital gains, dividends and profits is allowed.

**Expatriate Facilitation Services:**

Foreign nationals (investors, executives, expatriate employees) having “CBR’s Pass Booklet” are allowed duty-free import of food stuffs and other consumable items equivalent to US \$ 1000 per year per person in Pakistan.

**Double Taxation Treaties:**

The Government of Pakistan has signed agreements on Avoidance of Double Taxation with 52 countries including China. Under these agreements proportionate tax relief is allowed to a person resident in Pakistan, on any income earned abroad (if such income has already been subjected to tax outside Pakistan), at the average rate of tax in Pakistan or abroad, whichever is lower.

**Protection to Investment:**

The economic policies and the existing legal cover for foreign and Pakistani investment will be extended to new areas and sectors. The benefits and incentives for investment provided by the Government shall continue enforce and will not be reduced or altered to the disadvantage of investors.