

**CLUSTER PROFILE**  
**Coal Cluster, Choa Sadan Shah,**  
**District Chakwal**



*Turn Potential into Profit*

**Small & Medium Enterprise Development Authority**  
Ministry of Industries, Production & Special Initiatives  
Government of Pakistan

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## **1 Description of Cluster**

The district of Chakwal covers an area of 6,524 and is subdivided into 4 tehsils - Chakwal, Talagang, Choa Saida Shah, and Kallar Kahar.

Choa Saida Shah and Kallar Kahar are Tehsils of District Chakwal. Choa Saida Shah is located 35 kilometers south of Chakwal on the Chakwal-Khewra Road, whereas Kallar Kahar is located 25 kilometers southwest of Chakwal along the motorway. Choa Saida Shah-Kallar Kahar area is full of natural resources. There are huge deposits of Coal and lime stone in this area. There are five cement industries naming DG Khan Cement Company, Pakistan Cement, Best way Cement, Dandot Cement and Gharibwal Cement located in this area that require continuous supply of lime stone and washed coal for their daily operations.

### **1.1 History & Background**

Historically, coal has been used as a major source of energy for hundreds of years. The industrial revolution and enhanced use of electricity was also due to coal. Until sixties, coal was the single largest source of primary energy. Large discoveries of oil and gas resulted in massive switchover from coal to furnace oil and gas. However, once again there is a shift back to use of coal as a major source of energy. Many developed and developing countries have already reverted back to coal. Clean Coal Technologies and availability of coal at competitive price are facilitating the transition.

Coal mining is one of the oldest industries of Pakistan. It assumed new heights in fifties when cement, fertilizer and other process industries became major users of coal. This led to an increase in production from 0.7 million tonnes/annum in 1959 to 1.4 million tonnes/annum in 1968. Until discovery of natural gas, coal was meeting 50 per cent of country's total energy requirement. The boom in construction activities in eighties provided new impetus and coal production touched 3.14 million tonnes in 1989-90. Since then annual coal production has remained stagnant between 3.2 to 3.5 million tonnes per annum.

The coal sector has a significant effect on the Pakistan economy as it generates incomes to the whole lot of stakeholders involved in the sector. The Punjab's coal fields comprise the eastern, central and western Salt Range between Khushab, Dandot and Khewra while Makerwal coal-field lies in Trans-Indus Range (Sanghar Range). The Salt Range coal-field covers an area of about 260 sq km, between Khushab, Dandot, Kallar Kahar and Khewra. The entire coal producing area is well connected with roads and railways.

### **1.2 Defining the Product**

Coal is naturally developed in hundreds and thousands of years and extracted from mines for human use. One of the most valuable content of coal is its carbon content which supplies most of its heating value. However, various other factors as moisture content, ash content and Sulphur are also important in determining the rank of a particular coal. The classification of coal is generally based on the content of volatiles. However, the exact classification varies between countries. The main types are given below:

- A. Anthracite, the highest rank; a harder, glossy, black coal used primarily for residential and commercial space heating. It may be divided further into metamorphically altered bituminous coal and petrified oil. Anthracite is top ranked coal, with highest carbon content that ranges between 86-98 per cent and has a heat value of nearly 15,000 BTUs (British thermal units) per pound.
- B. Bituminous coal, dense mineral, black but sometimes dark brown, often with well-defined bands of bright and dull material, used primarily as fuel in steam-electric power generation, with substantial quantities also used for heat and power applications in manufacturing and to make coke.
- C. Sub-bituminous coal properties range from those of lignite to those of bituminous coal and are used primarily as fuel for steam-electric power generation. Additionally, it is an important source of light aromatic hydrocarbons for the chemical synthesis industry.

HS Codes for Coal are given in the table:

Product	HS Code
Anthracite Coal	270-111
Bituminous Coal	270-112
Coal (other than Anthracite and Bituminous)	270-119

### 1.3 Geographical Location

Geographically this cluster is in widely spread area. It mainly includes the Salt Range Coal Field. The Salt Range coal field is spread in four districts: i.e Chakwal, Mianwali, Khushab, and Jhelum. Choa Sadan Shah is located 35 kilometers south of Chakwal on the Chakwal-Khewra Road. Mainly coal mines are present at Khajoola, Dulmail, Thoa, Dehri, Dalwal, Ara Basharat, Dindoot etc.

### 1.4 Core Cluster Actors

#### 1.4.1 Total Number of Mines

According to the estimates provided by industry sources, coal cluster is comprised of about 2000 coal mines. The Punjab Mineral Development Corporation and several private companies are operating the mines in the area.

#### 1.4.2 Major Players

Major players of Coal Mine cluster are listed in table given below:

Sr.	Name	Address
1	Pir Waqar Ali Shah	Pehra, Chpoa Sadan Shah Kallar Kahar Road, Chakwal
2	Col Zahid Iqbal	Coal Washing Plant, Near Karoli Chowk, Kallar Kahar, Chakwal
3	Syed Aftab Shah	Saydan, Choa Sadan Shah, Chakwal
4	Mustafa Khan	Near ABAD Training Institute, Choa Sadan Shah, Chakwal

5	PUNJMIN	Khajoola, Choa Sadan Shah, Chakwal
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### 1.4.3 Total Production

The industry estimated annual wood consumption is around 360,000 ton. District Wise Annual Coal Production of Coal is given in below table.

Location	2006-07 (MT)	2007-08 (MT)
Jhelum	10,040	14,710
Chakwal	218,821	240,349
Khushab	199,375	213,544
Mianwali	88,480	84,580
Total	516,716	553,453

Estimated growth figure is around 10%. Chakwal cluster is producing almost 1000 tons per day. However, the production of coal is affected by rainy weather. When underground water level increases, the production from the mines decreases. As Coal mines are present in hilly areas of Cluster and most of the mines don't have proper roads to the mines. The mine owners develop the roads on self help basis. Non availability of proper infrastructure hampers the production capacity of the mines particularly in rainy season; i.e. July to September.

Currently the miners are facing shortage of blasting material, due to the prevailing law and order situation in the country, as the blasting material used in coal mines is not available resulting in low productivity.

### 1.4.4 Employment Generation

The industry is labor intensive generating almost 50,000 individuals ranging from 15-30 workers in one mine. These 50,000 individuals are involved with Coal Mining industry directly or indirectly. These persons can be divided into the categories of Mining Managers, Mine Engineers, surveyors, drillers, commercial agents, transporters and the general laborers. As far as the training of this work force is concerned, there are specialized training institutes for mining industry in the Cluster.

### 1.4.5 Capacity Utilization

Capacity utilization of the existing coal mines is not sufficient even to meet the demand of the local brick kiln market i.e. is below 50%. Sufficient demand-supply gap exists in the market and it is increasing day by day with the increase in the usage of coal in other areas like electricity generation and as fuel in cement industry etc.

## 1.5 Other Cluster Actors

### 1.5.1 Cement Industry

There are five cement industries naming DG Khan Cement Company, Pakistan Cement, Best way Cement, Dandot Cement and Gharibwal Cement located in this area that require continuous supply of lime stone and washed coal for their daily operations.

However currently more than 90% of demand of cement factories is being fulfilled through imports (from Indonesia, South Africa etc.), as the coal extracted from this region has high Sulphur (6~7%), Ash (30%) content along with other impurities and cannot be used in its raw extracted form/composition. Hence, the mine owners/ traders are limited to supply the coal to only Brick Kilns.

Cement factories can use the local coal after removing ash and reducing the value of Sulphur up to 2-3 %. Following table shows the Coal consumption capacity of Cement Factories of this area:

Name	Cement Production Capacity (Tons Per Day)	Coal Consumption (Tons Per Day)
DG Khan Cement	7,000	1,000
Best Way Cement	10,000	1,500
Pakistan Cement	6,000	1,000
Dandot Cement Factory	* <sup>1</sup>	1,000
Gharibwal Cement Factory	8,500	1,200

### 1.5.2 Brick Kiln Industry

The coal extracted from coal mines of this cluster have high value of Sulphur (ranging 6-7 %) which can only be used in brick furnaces. The mine owners supply coal to brick furnaces to nearby areas like Jhelum, Khariam, Chakwal, Rawalpindi etc.

Coal demand in the brick Kilns is seasonal. The high demand is observed in the Winter Season when production of bricks is on peak as same of Coal from the mines. On an average 1200 to 1300 ton per day is consumed by the Brick Kilns present in district. The brick kilns do not operate in rainy season.

### 1.5.3 Traders

As most of the coal extracted from the mines are used in Brick Furnaces and the mine owners are directly linked up with the owners of brick furnaces in other districts. There are also commercial agents working on the cluster who buy from the mines and sell it to different brick furnaces.

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<sup>1</sup> Industry Information: The Dandot Cement Factory is currently not working due to management issues with the labor.

### **1.5.4 Coal Washing Plant**

Coal extracted from the Coal Mines present in the Coal Cluster is of low quality and cannot be directly used in the Cement Industry. However after processing through Washing and Purification, local Coal can be used in the Cement Industry.

There is only one plant of Coal Washing and Purification in the Cluster who is adding value and getting the higher prices in comparison to Coal supplied to brick furnaces. The washed and processed coal is then supplied to Cement industry present in Cluster. There is huge demand for Coal from Cement Industry. The daily capacity of coal processing of Coal washing and Purification plant is 65-70 tons per hour and this plant is working on 70% capacity.

## **1.6 Other Raw Material Used in Industry**

Following are the supportive actors of the cluster.

### **1.6.1 Sales Distribution Channels**

There are different sales distribution channels of coal cluster of Chakwal. As most of the coal extracted from the mines are used in Brick Furnaces and the mine owners are directly linked up with the owners of brick furnaces in other districts. There are commercial agents working on the cluster who buy from the mines and sell it to different brick furnaces.

Transportation of coal is very important factor. The coal extracted from the mines is stored in open places and then moved to the Brick Kilns through trucks. The loading capacity of the trucks varies from 8-35 tons per vehicle. There are almost one thousand individuals attached to this field only.

### **1.6.2 Explosives**

High explosives are used in the coal mines for blasting purpose. Explosive are not available in the market and mine owners purchase the explosive material from the black market due to non availability because of law and order situation in the country.

### **1.6.3 Machinery and Equipment**

The Machinery used in the Coal mines are water motors, engines for pulling carts from inside the mines, wood, iron tracks, electrical equipments and generators, and pipes. These equipments are local made and easily available in the local market.

## **1.7 Current Cluster Scenario**

There is a lot of demand for coal in the local market i.e. Cement factories, Brick Kilns etc. The Punjab Mineral Development Corporation and several private companies are operating the mines in the area. Anticipated reserve of the deposit is 235 million tons; whereas measured reserves are 79 million metric ton (based on actual mining and drilling)<sup>2</sup>

Location of Measured Coal Reserves is given in the table below:

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<sup>2</sup> Source: Punjab Mineral Development Corporation

Location	Reserves (Million Metric Ton)
Dalwal (Chakwal)	14.7
Padhrar (Khushab)	4.5
Pail(Khushab)	21.3
Makerwal (Mianwali)	21.7
Total	79

The top seam varies in thickness from 0.22 meter to 0.30 meter while the middle seam is up to 0.60 meter thick. The lower seam is up to one meter thick and is relatively of better quality and is being mined in Dandot, Choa-Saiden Shah and adjoining areas. The rank of the coal from the region is sub-bituminous A to high volatile bituminous.

Following table shows the Chemical Analysis of Coal in Punjab<sup>3</sup>:

Analysis	Salt Range	Makerwal
Fixed Carbon	29.8 - 44.8 %	36.7 – 44.9 %
Volatile Matter	26.3 – 33.8 %	42.4 – 48.1 %
Moisture	3.2 – 7.6 %	2.8 – 5.3 %
Ash	12.3 – 37.7 %	6.4 – 11.5 %
Sulphur	3.5 – 10.7 %	2.8- 6.8 %
Calorific Value	3,941 – 6, 161	6,328 – 6,769
BTU	7, 000 – 10,000	10,000 – 12,000

The coal extracted from coal mines of this cluster have high value of Sulphur (ranging 6-7 %) which can only be used in Brick Furnaces. The mine owners supply coal to brick furnaces to nearby areas like Jhelum, Khariam, Chakwal, Rawalpindi etc.

The mine owners receive no government support for their businesses.

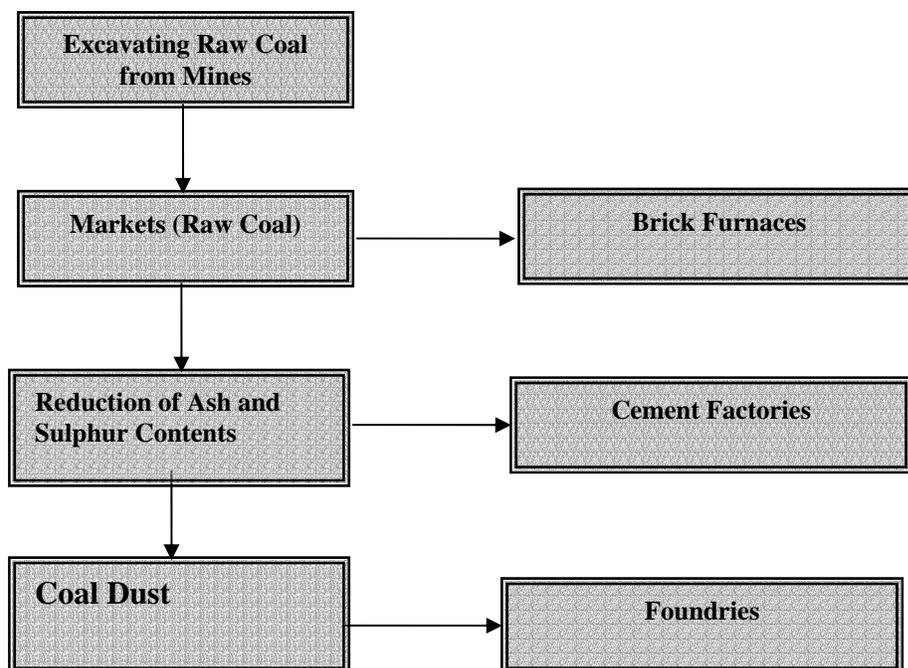
## 2 Analysis of Business Operations

According to the estimates provided by industry sources, coal extracted from this cluster is used in bricks furnaces. However a portion is also supplied to Cement Industry present in the cluster.

<sup>3</sup> Source: Punjab Mineral Development Corporation

## 2.1 Production Process

Coal Production value chain below is depicting the all the steps involved in the production and distribution of Coal from the mine and to the end user:



### 2.1.1 Coal Dust and Coking

A by-product of coal after coal washing and purification is Coal Dust which can be utilized in Foundry Industry.

There are also possibilities that the coal produced in the cluster can be used in Steel Industry after coking process. However no such activity is done yet in the Cluster.

## 2.2 Coal as Fuel in Brick Furnaces

Coal is used a brick furnaces present in the districts Chakwal, Rawalpindi, Jhelum. 90% of the coal extracted from the mines present in the cluster is used in Brick furnaces. These brick furnaces use coal as main heating energy sources for production of bricks.

## 2.3 Coal as Fuel in Cement Industry

It is reported that around 85 per cent of the cement industry has shifted on low-priced coal from relatively more expensive natural gas and furnace oil. The conversion has small impact on the local coal production because cement units are using high rank imported coal as the indigenous coal is of low quality. The estimates provided by industry, 175 Kg of coal is used to produce 1 ton of Clinker (Cement) compared to 95 Liters of furnace oil which is double then the price of Coal. Coal extracted from the Coal Mines is of low quality and cannot be directly used in the Cement Industry. However after processing through Washing and Purification, local Coal can be used in the Cement Industry

## 2.4 Technology Status

Technology status is at very low level in this cluster. The mine owner use traditional techniques to extract coal from the mines. Only few are using machine carts to extract coal from inside the mine. After blasting, the coal is dug out manually by labor.

## 2.5 Quality Assurance (Quality Standards and Certifications)

There is no concept of any quality standard in the cluster. Majority of the produce is sold off to the buyers without being washed or treated otherwise.

## 2.6 Market Mechanism

Coal is sold to brick furnaces or to the traders. Some of the mine owners have their own linkages with industry to supply coal.

## 2.7 Financing/ Banks and Financial Institutions

At present, none of the financial institution has developed any lending scheme for the development of coal sector. The financial products available in the market are not geared to cater the requirements of this sector. Access to equity and finance is the most malicious constraint to cluster growth and development, however commercial banks apply conservative policies while lending. High transaction costs, collateral requirement, no customized financial products incorporating cluster needs, along with high mark up rates discourage entrepreneurs to opt for formal financing. Entrepreneurs are bound to fulfill their financing needs from informal sector by paying exorbitant markup rates going as high as 30% annually.

## 2.8 Human Resources

### 2.8.1 Shortage of skilled manpower

As most of the establishments in Cluster are SMEs, therefore they are mostly hesitant to invest in human resource development. The workforce employed in Cluster is semi-skilled. Most of the workers acquire on-job training. The reasons for not investing in human resource development are; lack of awareness of importance of concept of human resource development and financial constraints.

### 2.8.2 Facilities of Vocational Training

The education level of workers/labor working in this cluster is very low, which is a major hindrance in learning and accepting new tools and techniques.

Presently there are facilities of technical training for Coal industry. There is a training institute present in the Cluster which is providing technical training to students. The training institute is currently having short courses of Surveyors, Mining Supervisor, Electricians, and Mechanical. The training Institute also have also three years diploma in mining. However Mining Engineering degree is awarded in almost every engineering university of the country.

Training Mine Institute, Katas	Katas, Choa Sadan Shah, Chakwal
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## **2.9 Entrepreneurs Associations**

There is a Coal Mine Association present in the Cluster. This association has only virtual presence and is not effective/ active.

## **2.10 Govt./Semi Govt. Support / Educational Institutions**

There is no any Govt./Semi Govt. organization working for the uplift of this cluster. The Department of Mines and Mineral, Government of Punjab is only a lease awarding and royalty collection department and has not done any work for the uplift of Coal Mines Cluster.

### **2.10.1 Punjab Mineral Development Corporation (PMDC)**

Pakistan Mineral Development Corporation (PMDC) was established in July 1974 as a private limited company with authorized capital of Rs. 1000 million and paid up capital of Rs. 10 million subscribed by the Federal Government. The corporation is operating mineral projects for which mineral lease has been granted by respective provincial government under Mineral Concession Rules of respective provinces, broadly based on Pakistan Mining Concession Rules 1960, after incorporating amendments where deemed necessary by the provinces.

PMDC, as a lessee has signed Lease Deeds with provinces for various minerals for the area specified in the Lease Deed. Lease Deed, Inter alia, provides for and permits assignment of leasehold rights subject to prior consent of the lesser (Provincial Government). Under the policy of Government of Pakistan, the role of Government is policy making within strong regulatory framework and to pull out of business ventures, keeping the commercial activity as exclusive domain of the private sector. The Council of Common Interests (CCI) approved PMDC's privatization in May 1997. It is also engaged in the cluster and has leased out various mines.

### **2.10.2 SMEDA**

Small and Medium Enterprise Development Authority was formed in October 1998 with a sole purpose of developing SMEs in the country. It has a Regional business centers (RBCs) in various cities of Punjab including Rawalpindi. These RBCs provides following services to SMEs

- a) Identification of Investment Opportunities
- b) Facilitation in arranging finance from financial institutions
- c) Training programs
- d) Marketing advice.
- e) Technical advice.
- f) Legal Services
- g) Business plan development.
- h) Common facilities centers.

### **2.11 Private BDS Providers (Consultants)**

Cluster is unfortunate in this respect and there is no private BDS provider in the Cluster. There is an absence of BDS in productivity management, marketing and sales, HR development, software, etc.

## **3 SWOT Analysis**

### **3.1 Strengths**

- Large Source of Coal Deposits in the Cluster
- Cheap labor availability
- High Market Demand

### **3.2 Weaknesses**

- High cost of capital investment
- Low productivity
- Lacking in use of modern excavation techniques
- Lack of educated, certified and professionally trained work force
- No R&D facilities available
- Unawareness of social compliance and environmental issues
- Unawareness of any quality control and standards
- Lack of marketing skills
- Fluctuating prices of coal

### **3.3 Opportunities**

- Technical up-gradation
- Value addition opportunities in form of coal dust production, purification and washing
- Networking & linkages of cluster players/stakeholders (Cement Industry, Foundries etc)
- Development of consortiums with specified objectives

### **3.4 Threats**

- Import of low price and high quality coal from other countries

## **4 Investment Opportunities**

The need for following projects as potential investment opportunities in Ceramics Sanitary Ware Cluster Gujranwala has been identified on the basis of the key strengths of this cluster:

- i. Coal Washing and Purification Plant
- ii. Coal Mining

- iii. Transport Service
- iv. Coke oven batteries for coking

## 5 Industry Overview

### 5.1 Global Scenario

Coal plays an important role as a primary and an inexpensive source for power generation. In 2003, the USA produced 1,069 million short tons of coal and consumed during the same period 1,090 million short tons. The electric power sector accounted for over 90 per cent of the US coal consumption. In 2003, the USA generated 3,691 billion kwh of electricity from electric power sector, out of which coal-fired plants accounted for 53% of generation, nuclear 21%, natural gas 15%, hydroelectricity 7% and oil 3%. In many other developed countries coal is being used as the primary source for power generation.

Coal major export countries are given in table below:

Exports of Coal by Country and year (million short tons)								
Countries	2003	2004	2005	2006	2007	2008	2009	Share
Australia	238.1	247.6	255	255	268.5	278	288.5	26.50%
Indonesia	107.8	131.4	142	192.2	221.9	228.2	261.4	24.00%
Russia	41	55.7	98.6	103.4	112.2	115.4	130.9	12.00%
Colombia	50.4	56.4	59.2	68.3	74.5	74.7	75.7	6.90%
South Africa	78.7	74.9	78.8	75.8	72.6	68.2	73.8	6.80%
USA	43	48	51.7	51.2	60.6	83.5	60.4	5.50%
China	103.4	95.5	93.1	85.6	75.4	68.8	38.4	3.50%
Canada	27.7	28.8	31.2	31.2	33.4	36.5	31.9	2.90%
Vietnam	6.9	11.7	19.8	23.5	35.1	21.3	28.2	2.60%
Kazakhstan	30.3	27.4	28.3	30.5	32.8	47.6	25.7	2.40%
Poland	28	27.5	26.5	25.4	20.1	16.1	14.6	1.30%
<b>Total</b>	<b>713.9</b>	<b>764</b>	<b>936</b>	<b>1,000.60</b>	<b>1,073.40</b>	<b>1,087.30</b>	<b>1,090.80</b>	<b>100%</b>

Major Coal importing countries are given below:

Exports of Coal by Country and year (million short tons)								
Country	2003	2004	2005	2006	2007	2008	2009	Share
Australia	238.1	247.6	255	255	268.5	278	288.5	26.50%
Indonesia	107.8	131.4	142	192.2	221.9	228.2	261.4	24.00%
Russia	41	55.7	98.6	103.4	112.2	115.4	130.9	12.00%
Colombia	50.4	56.4	59.2	68.3	74.5	74.7	75.7	6.90%
South Africa	78.7	74.9	78.8	75.8	72.6	68.2	73.8	6.80%
USA	43	48	51.7	51.2	60.6	83.5	60.4	5.50%
China	103.4	95.5	93.1	85.6	75.4	68.8	38.4	3.50%
Canada	27.7	28.8	31.2	31.2	33.4	36.5	31.9	2.90%

Vietnam	6.9	11.7	19.8	23.5	35.1	21.3	28.2	2.60%
Kazakhstan	30.3	27.4	28.3	30.5	32.8	47.6	25.7	2.40%
Poland	28	27.5	26.5	25.4	20.1	16.1	14.6	1.30%
<b>Total</b>	<b>713.9</b>	<b>764</b>	<b>936</b>	<b>1,000.60</b>	<b>1,073.40</b>	<b>1,087.30</b>	<b>1,090.80</b>	<b>100%</b>

## 5.2 Local Scenario

Though coal mining is undertaken at all the four provinces, Pakistan has not been able to exploit the real benefit of huge reserves of the commodity. One of the reasons for this is poor demand for coal. The mining sector in each province is faced with peculiar set of issues ranging from higher cost of production to lack of infrastructure. The cost of mining per tonne not only varies from province to province but also varies within each province. Main reasons are different mining methods, level of application of technology and variations in working depths of mines. Despite the fact that coal found in Baluchistan is superior in quality, it is expensive due to mines being deeper and steeper.

In Pakistan, coal currently makes up merely 1% of the electric power generation. The coal consumption shares of brick kilns and power sectors decreased by 2.4 % and 35.8 % respectively during July March 2009-10 against the same period last year. Due to price differential between coal and furnace oil, almost the whole cement industry has been switched over to coal from furnace oil. Operational coal mines decreased production by 15% from 4.12 million tons in 2007-08 to 3.49 million tons in 2008-09.

Pakistan's Import and Production of Coal<sup>4</sup> estimates are given below:

<b>Year</b>	<b>Imports (000 tons)</b>	<b>Local Production (000 tons)</b>	<b>Total (000 tons)</b>
2009-10 (e)(July-March)	3600	1704	5304
2008-09	4652	3738	8390
2007-08	5987	4124	10111
2006-07	4251	3643	7894
2005-06	3307	4587	7894

Cement Industry has huge demand of the coal which is currently imported from South Africa, Malaysia. Pakistan is at present importing around four million tons of coal from major coal-producing countries such as Indonesia, China, South Africa, and Australia. It is expected that in the coming year the imports would be about five million tons. Most of the coal is consumed by the cement industry while the brick kiln makers also use imported coal, moreover, the average load of coal per ship is over 40,000 metric tons and every year about 81-85 ships discharge coal at the two Ports.

<sup>4</sup> Source: Economic Survey of Pakistan

## **6 Contact**

For any further information/clarification please contact Regional Business Center at following address:

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