GOVERNMENT OF PAKISTAN
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AN OVERVIEW OF MINERAL RESOURCES OF PAKISTAN

BY

MUHAMMAD ALI MIRZA

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ABSTRACT

In 1947, when Pakistan came into existence only 6 mineral commodities were being mined on small scale and potential of finding minerals in the area which constituted Pakistan was not known. The Geological Survey of Pakistan (GSP), through its endeavours, has proved that Pakistan is geologically a unique country. Its landmass consists of rocks which were formed at oceanic centers, continental and oceanic island arcs, deep oceanic to shallow marine and even continental sediments. These rocks, as elsewhere in the world, have been proved by the GSP to contain a large variety of mineral deposits.

Chromite is the only metallic mineral which is being produced on small scale since before independence but large scale production of copper from Saindak porphyry copper deposit will be starting very soon and large scale mining of zinc/lead deposit of Duddar is not very far. Favourable areas of mineralization of aluminum, chromium, copper, lead-zinc, gold, silver, iron, platinum and tungstan have been identified and it is expected that soon Pakistan will emerge as an important country on the map of metal producing countries of the world.

It has now been proved that very large deposits of industrial minerals such as gypsum and anhydride, limestone and dolomite, building stones, rocks salt, silica sand, barite, fuller's earth, industrial clays and soap stone and medium sized resources of magnesite, china clay, and bentonite occur in the country.

Only a couple of years back Pakistan had no position on the global map showing countries having substantial coal resources but with the discovery of over 175 billion tonnes of good quality lignite in Thar Coal Field, Pakistan has achieved 11th position among the countries having large coal reserves. The coal is found suitable for power generation.

The prospect of making Pakistan an important mineral producing country are quite bright. Geological Survey of Pakistan is doing its best to explore the mineral potential and disseminate data, so as to make people interested in exploration and exploitation of mineral wealth of the country. A National Mineral Policy will be adopted during 1995 to attract local and foreign investment in the mineral sector.

STATUS OF METALLIC MINERALS

At the time of creation of Pakistan chromite was the only metallic mineral which was being mined on a small scale from Muslim Bagh area in Balochistan. Geological Survey of Pakistan, through its mapping and mineral exploration programme, has established that geological environments suitable for the localization of commercially exploitable deposits of important ores of metals such as antimony, aluminum, chromium, copper, lead, zinc, iron and precious metals like gold, silver and platinum exist over large areas of Pakistan. The Saindak copper deposit discovered by the GSP will soon start trial production and it is designed to produce 15810 tons of copper, 2.76 tons of silver and 1.47 tons of gold per annum. Duddar zinc-lead deposit is also being developed as a large metal mining venture. It will be seen from the following text that Pakistan has a potential to become important metal producing country of the world with proper attention given to the mineral sector.

Aluminum

Bauxite, which is generally used as an ore of aluminum, is found in the districts of Abbotabad, Kohat, Attock, Chitral, Ziarat, Kalat, Khushab and in Azad Jammu and Kashmir. Deposits of Kalat district and AJK are considered large.

Chromium

Host rocks favourable for the localization of chromite (chromium ore) are exposed in Lasbela, Khuzdar, Kharan, Muslim Bagh and Zhob districts of Balochistan, Malakand and Kohistan districts of N.W.F.P and Waziristan and Mohmand Agencies of FATA. Fairly large deposits of high to medium grade ore can be found with proper exploration activities.

Copper

Twenty two porphyry type copper prospects, which normally contain large tonnage of low grade ore, have been located by the GSP in Chagai district of Balochistan. One of these, at Saindak, has been proved to contain 412 million tons of ore averaging about 0.4% cu. Massive sulphide type copper deposits, with high grade but small tonnage, are expected to be found in Lasbela, Khuzdar and Chagai districts of Balochistan and Waziristan Agency of FATA.

Lead-Zinc

Thirty four carbonate hosted zinc-lead occurrences, with potential of commercial production, have been identified in Lasbela-Khuzdar region. Duddar has been proved to contain over 10 million tons of high grade ore with over 12% metal content and will soon be a producing mine. It is expected that the country will soon be an important producer of zinc-lead ore.

Gold

Porphyry copper deposits generally contain gold. Saindak deposit has been estimated to contain 0.75 million ounces of gold. Prospects similar to Saindak in Chagai district, when developed, will be large producers of this precious metal. Large areas with anomalous concentration of gold have also been identified in the northern mountain belt of the country and it is expected that quite a few commercially exploitable deposits will be found in the area.

Iron ore

The deposits located so far are either small in tonnage or low in grade. However, it is expected that large deposits of high grade ore of iron will be found in Chagai district of Balochistan and Chiniot area of Punjab. High grade iron ore has also been identified in Dammer Nesar, Chitral.

Northern mountain belt has been found to contain good potential for high value metals such as platinum, tungsten and lithium.

STATUS OF NON-METALLIC MINERALS

A wide variety and vast reserves of non-metallic minerals and rocks occur in almost all the provinces of Pakistan. Although these are being used in local industries and for other domestic purposes but the consumption is not commensurate with the available resources. As a matter of fact potential exists for export of certain industrial minerals.

The following is the brief description of industrial minerals found in Pakistan:-

Abrasive Minerals

Many minerals and rocks are used in different industries as natural abrasives for grinding, cutting, boring, sharpening, buffing and polishing purposes. The minerals are used either in natural form or after shaping. The abrasive material includes garnet, quartzite, pumice, basalt and natural sand etc.

Garnet is found in Dir, Swat and Kohistan districts of N.W.F.P. Quartzite occurs in Cherat, Tarbela and quite a few other places in N.W.F.P and other provinces. Pumice and basalt are found in Chagai district of Balochistan and Northern Areas. Natural sand occurs in all the provinces.

Ceramic Minerals

Ceramic minerals include naturally occurring substances used in pottery, sanitary ware and various industries like oil, steel, paper and glass. Major ceramic minerals include china clay, fuller's earth, fire clay, barite, feldspar, fluorite and celestite.

China clay is found in Swat, N.W.F.P and Nagar Parker, Sindh. Fuller's earth occurs in Dadu and Khairpur districts, Sindh. Substantial reserves of fire clay occur in Salt Range and in D.G. Khan, Punjab. Abundent fire clay deposits are present in Mianwali, Sargodha and Attock districts of Punjab, Thatta and Dadu districts of Sindh and D. I. Khan district of N.W.F.P. Barite occurs in Lasbela and Khuzdar districts of Balochistan and Abbottabad district of N.W.F.P. Feldspar deposits are found in Swat and Chitral districts of N.W.F.P, Gilgit and Skardu districts of Northern Areas and Nagar Parker in Sindh. Fluorite is found in Kalat district of Balochistan. Small reserves of celestite deposits occur in Dadu district of Sindh.

Fertilizer and Industrial Minerals

Fertilizer material includes rock phosphate and apatite whereas industrial minerals are gypsum/anhydrite, rock salt, limestone/dolomite, silica sand/glass sand, magnesite, soapstone/talc ochres and sulphur.

Huge deposits of gypsum and anhydrite are found in Salt Range and D.G. Khan in Punjab and Kohat district of N.W.F.P. Medium sized deposits occur at various places in Balochistan and Sindh. Rock salt occurs in Salt Range in Punjab and N.W.F.P. Limestone and dolomite occur in huge quantities in all the provinces of Pakistan. Silica sand deposits are found in Mianwali district of Punjab, D.I. Khan and Abbottabad districts of N.W.F.P and Dadu district of Sindh. Magnesite occurs in Abbottabad district of N.W.F.P, Muslim Bagh area of Balochistan and in Malakand district of N.W.F.P. Soapstone is found in Kurram and Khyber agencies and Swat and Abbottabad districts of N.W.F.P. Ochres are found in Sargodha district in Punjab, Dadu and Thatta districts of Sindh and Ziarat district of Balochistan. Sulphur occurs only in Balochistan in Koh-i-Sultan and Sanni areas of Chagai district.

Building Materials

Building materials and decorative stones are found in abundence in Pakistan. These include marble, building stone, lightweight aggregate and sand, gravel and crushstone.

Marbles of excellent quality and in substantial quantities occur in Chagai district of Balochistan and Nowshehra district of N.W.F.P. Building stone of both igneous and sedimentary nature occur in large quantities in almost all the provinces of Pakistan. Lightweight aggregate material is likely to be found in Chagai district of Balochistan and the Northern Areas. Vermiculite occurs in Dalbandin area of Balochistan. Sand, gravel and crushstone occur in inexhaustible quantities in all the provinces of Pakistan.

STATUS OF COAL RESOURCES

Per capita power consumption is an indicator of the development stage of a country. The developed countries are using vast quantities of coal for power generation. In the USA 63 million tonnes, in East Germany 220 million tonnes and in Western Europe 182 million tonnes of coal is used for power production every year. Pakistan, unfortunately, has not been able to utilize its coal resources and the share of coal in the energy mix has declined from about 60% at the time of independence in 1947 to about 7% at present. Pakistan, at present, is using imported oil and natural gas for almost total thermal power generation. However, fast depleting gas resources, and sharp increase in already scarce foreign exchange bill for import of oil, are pressing hard to develop indigenous coal resources for generation of power.

GSP, from its own resources and aided by USAID and USGS, has continued its efforts to explore and establish coal resources of the country. The efforts of the department have resulted in the recent discovery of a large coal field in Thar, Sindh with coal quality suitable for power generation. The coal resources of the country are now projected at more than 183 billion tonnes. Out of these 734 million tonnes are measured, 3,569 million tonnes indicated 27,026 million tonnes inferred and 152,549 million tonnes hypothetical. Over 97% of these resources occur in Sindh province, not very far from Karachi, the biggest industrial centre of the country.

The Pakistani coals are lignite A to Hv sub B and generally high in sulphur. However, the latest discovered coal field of Thar desert contains low sulphur coal. With the erection of three power plants of 50 MW each, based on Lakhra coal, a beginning to utilize indigenous coal for

large scale power generation has been made. It is expected that the discovery of low sulphur coal in Thar will encourage investment on development of huge coal resources of the country for power generation. As a matter of fact a project of 1320 MW is on line which will use coal from Thar coalfield.

Present status of coal resources in Pakistan is as follows;

Balochistan Province

The known producing coal fields include Duki, Khost-Sharig-Harnai, Pir Ismail Ziarat, Mach-Abe-Gum, Sor Range-Daghari and Chamalong-Bahlol. The over-all resource potential exceeds 194 million tonnes with measured reserves of 52.5 million tonnes. The seam thickness ranges from 0.5 to 1.75 m, averaging 0.75 m. The quality ranges from high volatile sub C to high volatile sub B. New possible coal bearing areas are available which have not yet been explored and may have large coal potential. Average annual production exceeds one million tonnes.

N.W.F.P

Hangu is the only producing coal field in N.W.F.P. Some sporadic mining is also reported from Cherat. The resource potential is over 44 million tonnes, with measured reserves of only 0.5 million ton. The production is insignificant.

Punjab Province

Substantial coal resources have been outlined in the Eastern and Central Salt Range and in Makerwal area of the Surghar Range. A coal resource potential of 234 million tonnes has been projected with drill-proved reserves of 43 million tonnes. Although several coal seams are developed, only one seam is being mined throughout the province. The thickness of the coal seam varies from 0.3 to 2.13 meters with an average of 0.43 meter. In Makerwal the average thickness is about one meter.

The quality of coal ranges from Hv sub C to Hv sub B. The average reported annual production is 450,000 tonnes.

Sindh Province

A very large coal resource potential exists in the Sindh province. Coal resource potential in excess of 13 billion tonnes has been outlined in Lakhra, Sonda-Jherruck, Indus East, Thar and

Badin coalfields. Measured reserves are over 734 million tonnes. Average seam thickness in Jherruck, Ongar, Sonda, Indus East and Lakhra area is 3.25, 1.25, 0.90, 1.55 and 1.65 meter respectively. Coal being produced is high in sulphur. Average annual production is about a million tonnes. The known coal fields from where mining is reported include Lakhra and Meting-Jhimpir. Over 175 billion tonnes of coal have been estimated for the recently discovered Thar coalfield. It is low in sulphur and ash. Coal seams range in thickness from 1.42 to 27.00 meters.

SCOPE OF LARGE SCALE MINING IN PAKISTAN

Pakistan has a very good potential for copper mining, particularly in the Chagai arc in Balochistan and Kohistan arc in the northern part of the country where environment for both porphyry and massive type copper mineralization exists. Exploration for Cyprus type massive sulphide copper is being done by FATADC in Waziristan Agency and there is a strong possibility of finding commercially exploitable deposits in the area. Indications of massive sulphide copper mineralization exist in Lasbela-Khuzdar belt in Balochistan. About 22 prospects have been identified by the GSP in Chagai District alone.

Carbonate hosted lead-zinc mineralizationis is an active target for exploration in Lasbela-Khuzdar belt. About 34 prospects have been located by the GSP out of which 3 have been investigated in some detail and are likely to prove economic deposits. Similar environments exist in NWFP where possibility of finding commercial deposits is quite strong.

Geological environment favourable for localization of gold/silver exists in Chagai district of Balochistan and northern mountain belt and there are reasonable chances of finding such deposits in these areas. A number of anomalous zones of gold mineralization have recently been located in the Northern Areas of Pakistan.

Exploration activities are also likely to lead to proving of economic viability of a number of occurrences of bauxite, chromite, lithium ore and platinum group elements, particularly in Balochistan and the northern part of the country.

Pakistan is bestowed with enormous resources of industrial minerals and rocks and their development can meet the domestic requirement and can also fetch a lot of foreign exchange by export.

Inexhaustible reserves of limestone, sandstone and dolomite are found in almost all the provinces of Pakistan. Limestone, suitable both for chemical and industrial use is being mined from various parts of the country. Considerable scope exists for enhancing production and for export to other countries where limestone resources are scarce.

Rock salt, gypsum and anhydrite are also available in very large quantities for domestic use as well as for export. Varieties of excellent quality marbles and other building stones are being mined and marketed both for domestic consumption and for export. Industrial clays and barite resources are also available in large quantities. Their optimum utilization has not been made so far. Reasonable resources of fertilizer minerals, magnesite, talc, silica sand and fluorite are present in the country and there is a lot of scope for their development and utilization in various industries.

Reserves and thickness of coal seams in the coal fields of Balochistan, Punjab and N.W.F.P don't warrant large scale mining because of, (i) thin coal seams (normally less than a meter), (ii) steep dip of the seams (more than 40°), (iii) present depth of most of the mines (1500 to 2500 feet) and (iv) limited reserves. However, the coalfields of the Sind province have a good promise for large scale mining due to shallow over burden, low dips and sizable coal seam thickness.

Recently discovered Thar coalfield has a very large resource potential (about 175 billion tonnes) and almost flatlying and quite thick coal seams (upto 27 meters). These deposits will be able to support very large open cast mines needed for large thermal power generating units.

A National Mineral Policy will soon be adopted to attract local and foreign investment in the mineral sector.

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