

Minerals in south Asia

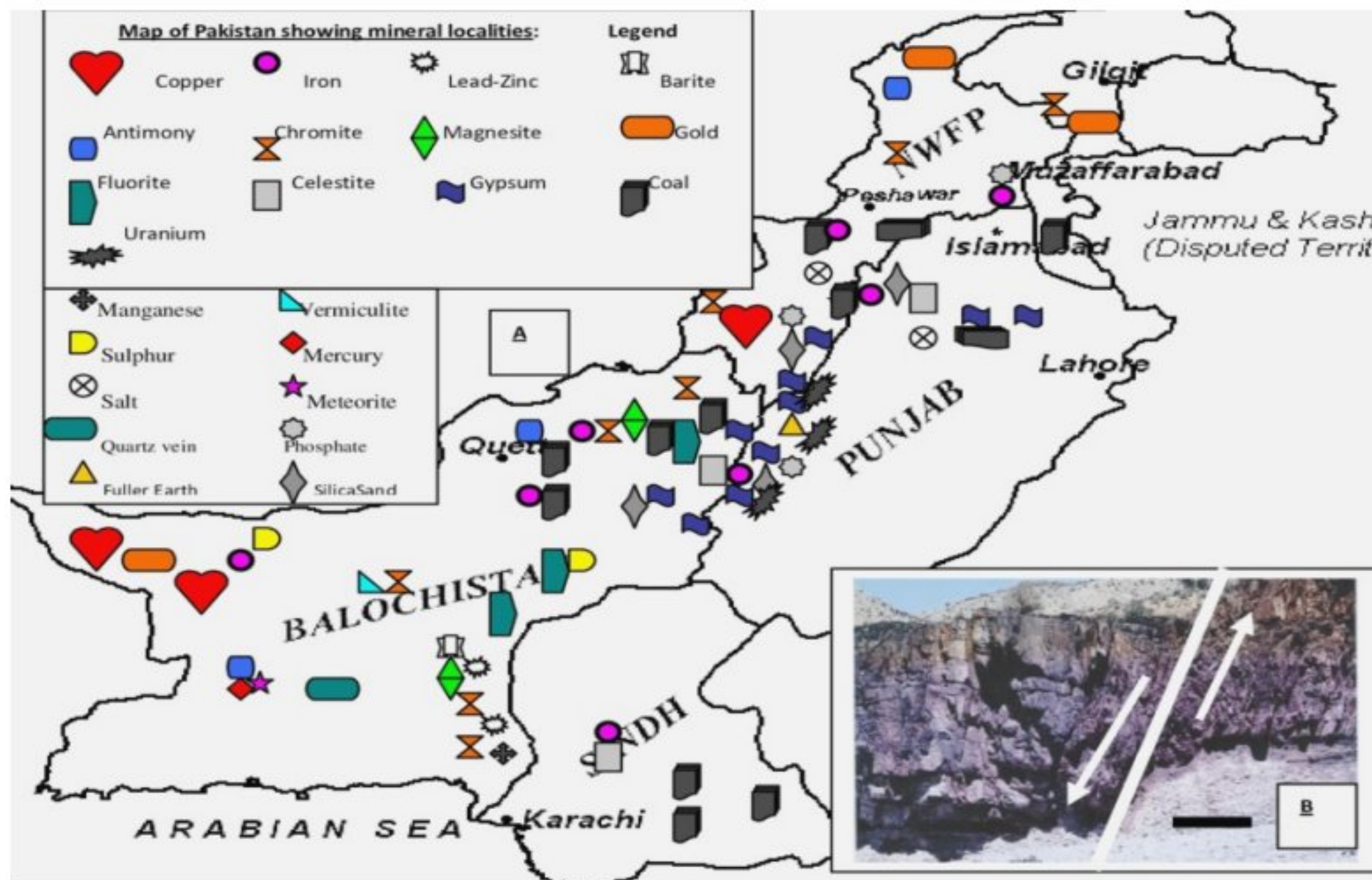


Minerals of Pakistan

Pakistan has immense reserves of a number of minerals and natural resources that include **coal, gold, copper, bauxite, mineral salt, chromite, iron ore**, and many others. Pakistan also mines a variety of precious and semi-precious minerals including ruby, topaz, and emerald.

MAIN METALLIC MINERALS OF PAKISTAN

- Aluminum
- Iron Ore
- Copper
- Chromite Ore
- Zinc/ Lead
- Calcium
- Magnesium
- Antimony
- Arsenic
- Gold
- Graphite
- Glass Sand
- Tungsten



Mineral salt:



Rock salt makes for some beautiful texture on the walls and the ceiling

Salt has been mined in the region since 320 BC. The Khewra Salt Mines are among the world's oldest and biggest salt mines. Salt is mined at Khewra in an underground area of about 110 square kilometres (42 sq mi). Khewra salt mine has an estimated total of 220 million tonnes of rock salt deposits. The current production from the mine is 325,000 tons of salt per annum.

Copper and Gold:

The Reko Diq mine is located near Reko Diq town in Chagai District, Baluchistan, Pakistan. It is one of the largest copper and gold mines in the world located in the south west part of Pakistan in Balochistan province.



In Reko Diq, Balochistan, deposits of copper and gold are present. Antofagasta, the company which possesses the Reko Diq field, is targeting an initial production of 170,000 metric tons of

copper and 300,000 ounces of gold a year. The project may produce more than 350,000 tons a year of copper and 900,000 ounces of gold. There are also copper deposits in Daht -e- Kuhn, Nokundi, Located in Chaghi district.



Iron ore:

Iron ore is used for the manufacturing of steel and iron. The largest deposits of iron ore are found in Kala Bagh. They are also found at Hazara district, Chitral, Khuzdar and Muslim Bagh.

Iron ore is found in various regions of Pakistan including Nokundi, Chiniot, Kalabagh the largest one (less than 42% quality), Haripur and other northern areas.



In February 2015, reserves were found in Chiniot, around 160 kilometres northwest of Lahore, by a Chinese group, the Metallurgical Cooperation of China. A senior provincial administrative

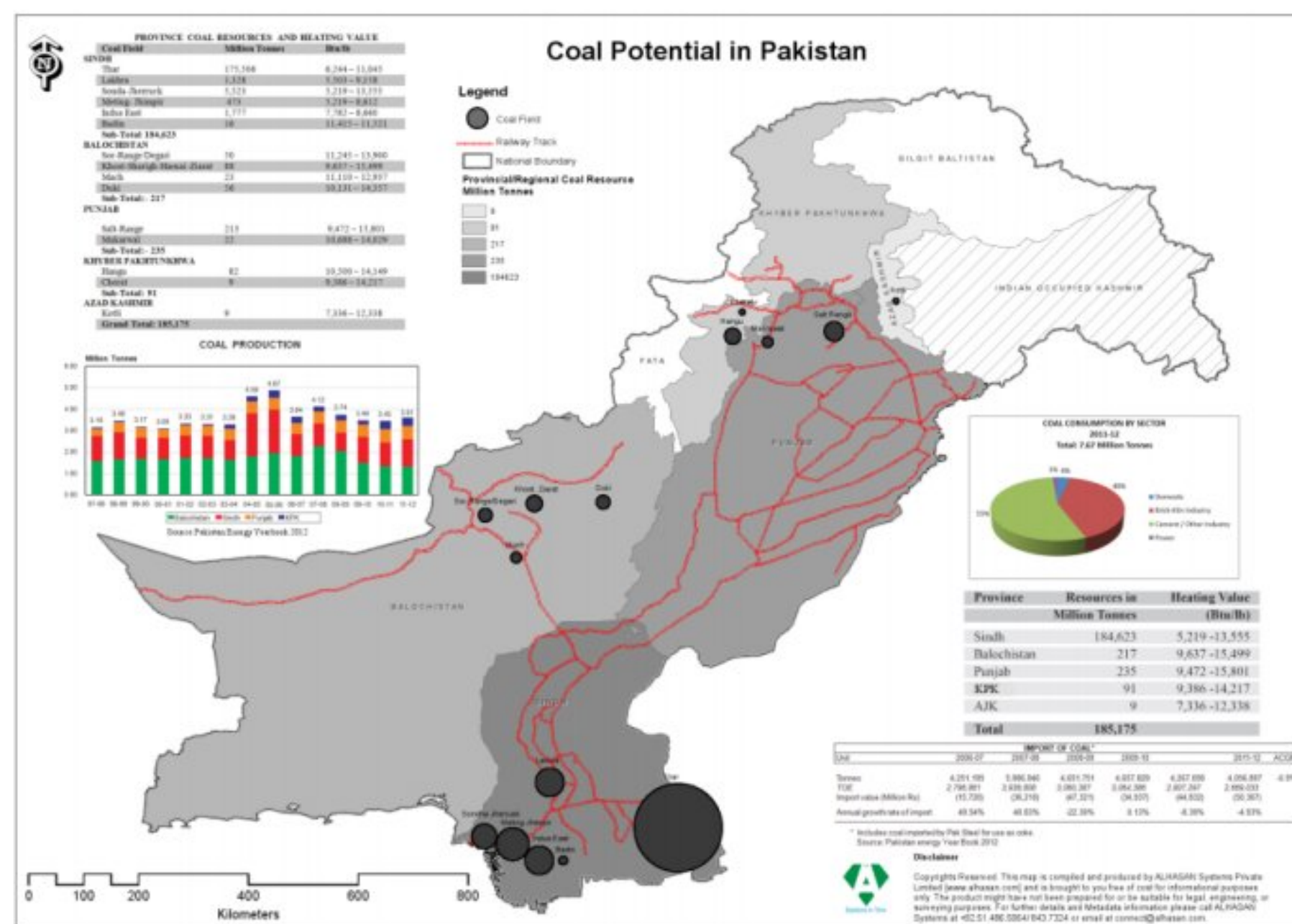
official told AFP that initial estimates indicated 500 million tonnes of iron ore had been discovered. The extracted iron had been tested in Swiss and Canadian laboratories, which were successful in finding 60-65 percent of it to be high grade.

Coal:

Pakistan's coal reserves meet only 11 per cent of its total requirement. In Punjab, coal mines are located at Dandot and Makkarwal. The country's biggest coal mines are present at Mianwali and Makkarwal. In Balochistan, coal mines are present at Sharag, Khost, Harnai and Mach, while in Sindh coal is found at Thatta and Larkana.

Pakistan holds **3,377 million tons (MMst) of proven coal reserves as of 2016**, ranking **20th** in the world and accounting for about 0% of the world's total coal reserves of 1,139,471 million tons (MMst).

Pakistan has proven reserves equivalent to **331.1 times its annual consumption**. This means it has about **331 years of Coal left** (at current consumption levels and excluding unproven reserves).



Coal Consumption in Pakistan:

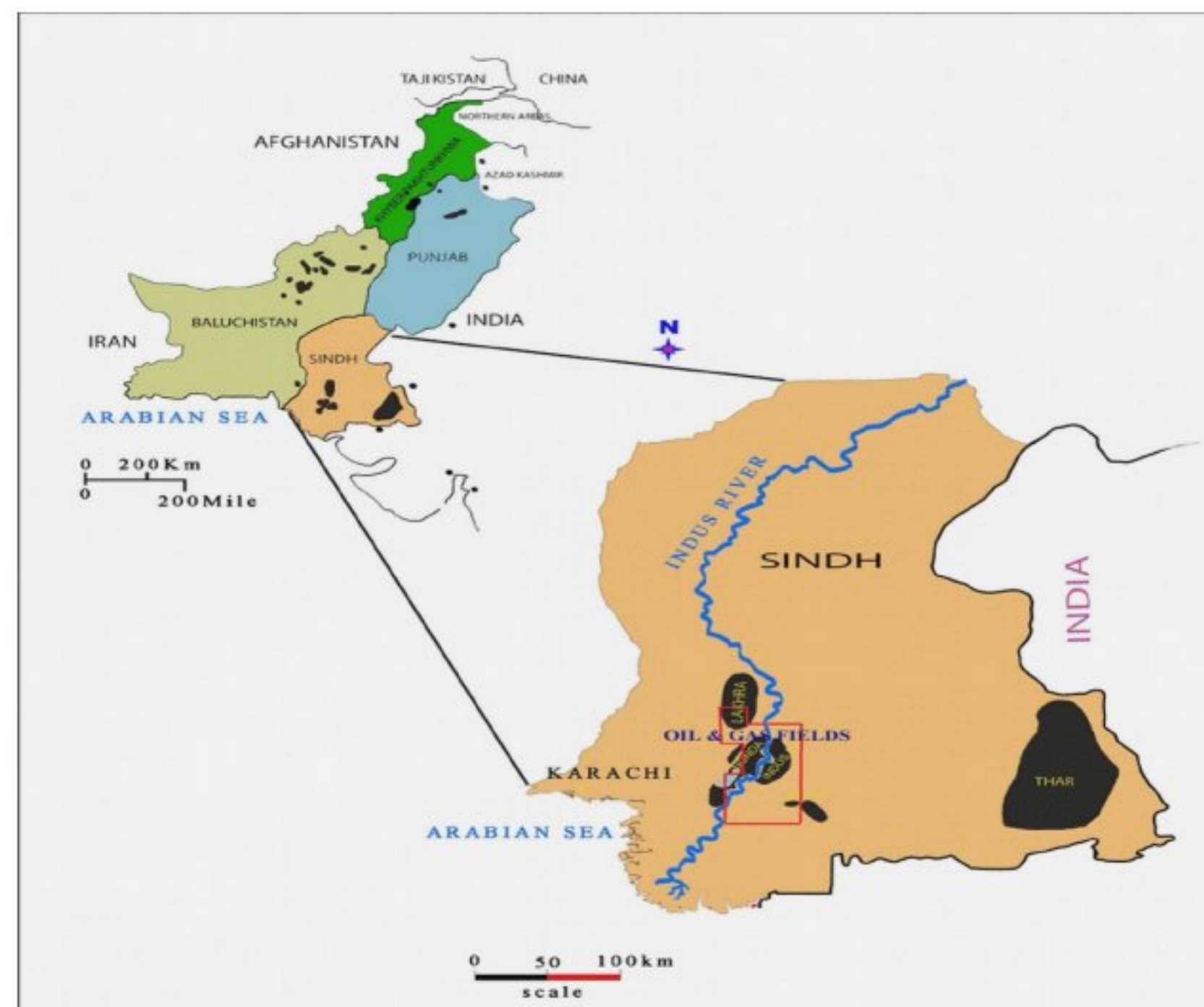
- Pakistan consumes **10,199,674 Tons** (short tons, "st") of Coal per year as of the year 2016.
- Pakistan ranks **38th** in the world for Coal consumption, accounting for about **0.9%** of the world's total consumption of 1,139,471,430 tons.
- Pakistan consumes **50,089 cubic feet of Coal per capita** every year (based on the 2016 population of 203,631,353 people), or **137 cubic feet per capita per day**.

Coal Production in Pakistan:

- Pakistan **produces 4,506,243.28 tons** (short tons, "st") of Coal per year (as of 2016) ranking **34th** in the world.

Coal Imports:

- Pakistan **imports 70% of its Coal consumption** (7,107,638 tons in 2016).



Chromites:

Chromite is a white-coloured metal used in the making of steel, dyes, photography items and airplanes. Pakistan has the world's largest reserves of chromite and this natural resource is found in Muslim Bagh, Chaghi, Kharan, Malakand and North Waziristan.

Pakistan has abundant chromite deposits located in both northern and **western parts of the Indus Suture Zone, Besham, Jijal, Chilas, Kohistan, Kot-Pranghar (Mohmand), Boya (Waziristan) Harichand, Sakhakot-Qila west of Tehsil Dargai, Bucha (Mohmand), and in ophiolite complexes of Baluchistan as Bela and Muslimbagh-Zhob.**

Production:

The leases operated by Pakistan Chrome Mines have produced an accumulated 1.5 million metric tons of High Grade Chromite and smaller quantities of Magnesite Ore.



Chromite Deposits in Pakistan:

Chromite is an oxide mineral containing Iron, Oxygen, and chromium $[(Fe, Mg, Al) Cr_2O_4]$. It occurs in mafic and ultramafic rocks deposits which are formed by masses of igneous rocks such as norite called stratiform deposit while the podiform deposits contain metamorphic rocks. Due to the weathering of laterite soil i.e. developed over peridotite and chromite-bearing rocks, chromite may also find in the beach sands. In Pakistan Chromite Deposits are located in Chilas

Complex, Sapat Complex, Jijal Complex, Shangle-Mingora, Malakand Agency-Sakhakot (Dargai), Waziristan, Zhob valley Igneous Complex, Bela and Muslimbagh.

Gypsum:

Gypsum reserves are situated at Mianwali, Dera Ghazi Khan, Kohat, Rohri, Quetta and Sibi. Iron ore is used for the manufacturing of steel and iron. The largest deposits of iron ore are found in Kala Bagh. They are also found at Hazara district, Chitral, Khuzdar and Muslim Bagh.



Gypsum is a white coloured shining stone used in the production of chemical fertilisers, cement, bleaching powder and plaster of Paris. Gypsum reserves are situated at Mianwali, Dera Ghazi Khan, Kohat, Rohri, Quetta and Sibi.

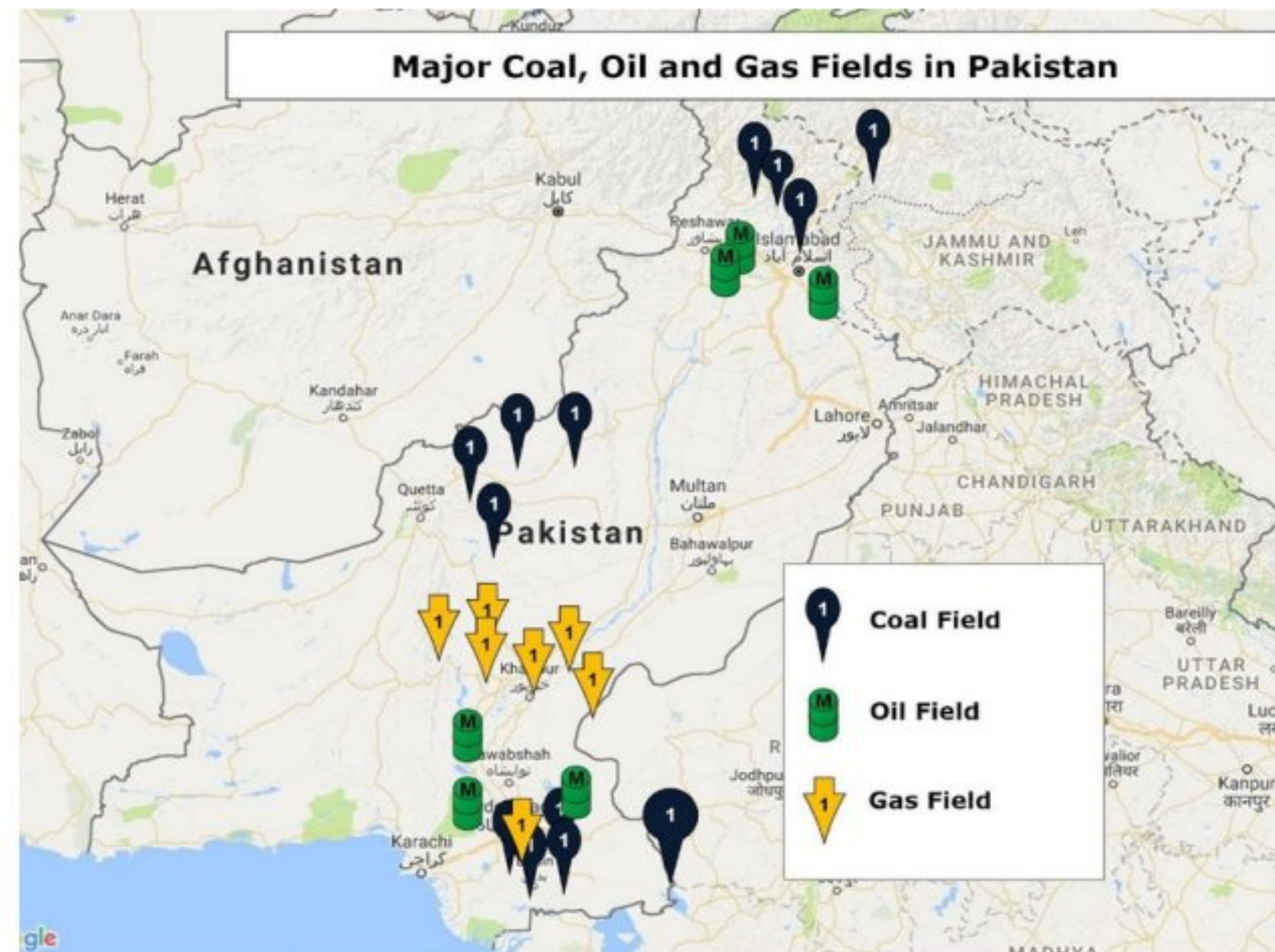
Mineral oil

Mineral oil is found in raw form and is purified in oil refineries. Only 15 per cent of the total mineral oil requirements of the country are produced in Pakistan, while the rest is imported. In Pakistan, the oil reserves are situated in Dhullian, Kot Mayyal, Attock, Chakwal, Dhodhak, Badin, Hyderabad, Dadu and Potwar Plateau.

Natural gas:

Natural gas is an essential element for industrial production, household purposes and vehicles. In Pakistan, natural gas was discovered in 1952 at Sui, Balochistan. In Sindh, it was found at Khairpur, Mazrani, Hundi, Kandhkot and Seri, while in Punjab natural gas is found at Dhodhak,

Pir Koh, Mayyal and Dhullian. It is brought from main reserves to places of need through a network of pipelines.



Copper:

Copper is needed for the manufacturing of electrical goods. Rich reserves of copper are found in Saindak and Chaghi district in Balochistan.

Salt:

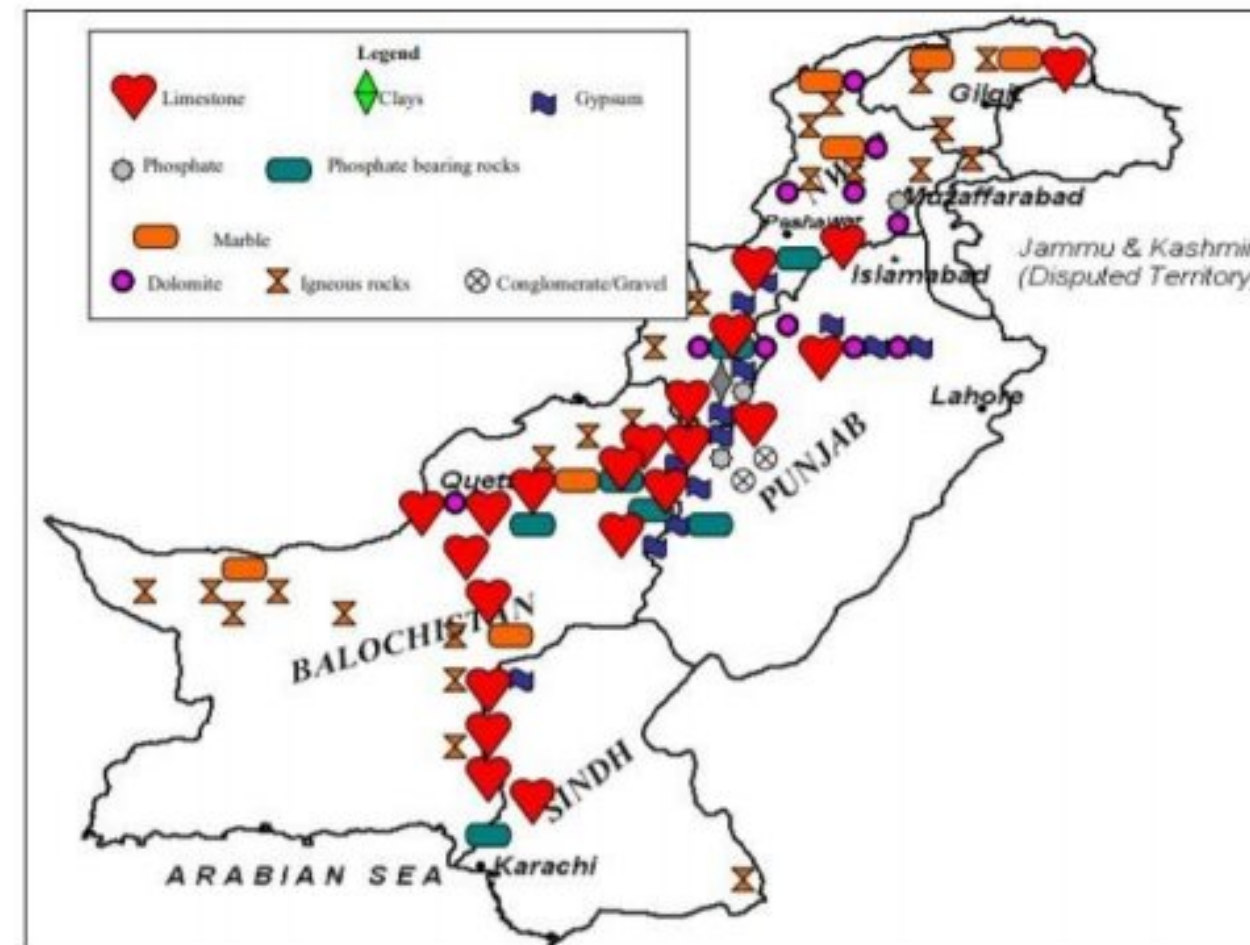
World's largest mineral salt reserves are found in Pakistan. This range is located at Potwar Plateau and the biggest salt mine is at Khewra in district Jhelum. Salt is also obtained from Warchha in Khushab district, Kala Bagh and Bahadur Khel and also from Mauripur, near Karachi.

Limestone:

This is used for making cement and is also used in paper, soap and glass industries. Limestone deposits are found in Jhelum, Dera Ghazi Khan, Moghul Kot, Hyderabad, Manghopir, Kot Diji and Ranipur.

Marble:

Marble is found in abundance in our country and is present in vast variety and colours. Its reserves are found in Chaghi, Mardan, Swat and Khyber Agency. The marble found in Pakistan is of highest quality because of its beauty, softness and colour. Black and white marble is found in the Kala Chitta Hills in Attock.



Minerals in India

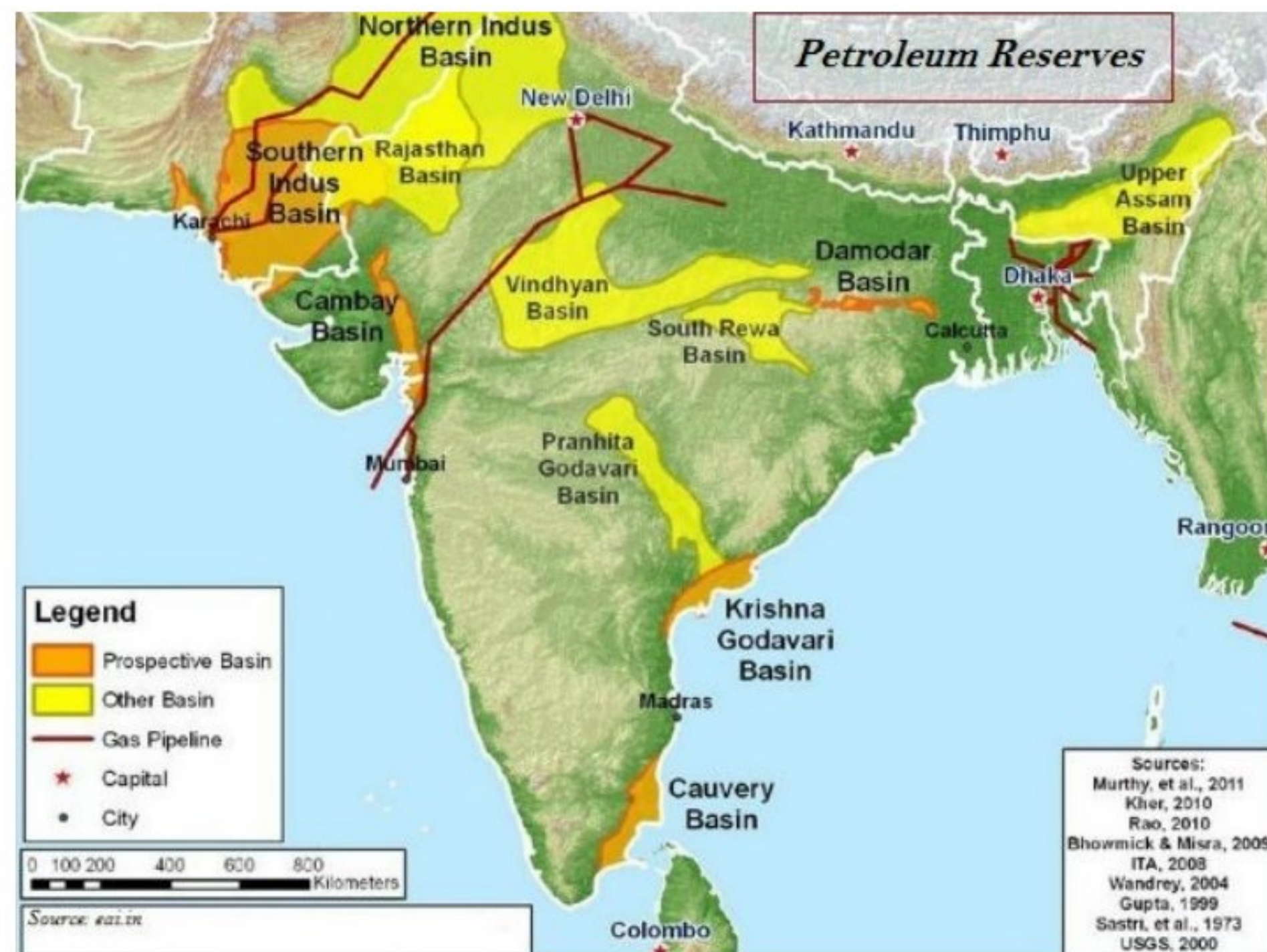
Introduction:

On the basis of chemical and physical properties, minerals are grouped as –

- **Metallic** minerals and
 - **Non-metallic** minerals.
- Major examples of metallic minerals are iron ore, copper, gold, etc.
 - Metallic minerals are further sub-divided as **ferrous** and **non-ferrous** metallic minerals.
 - The minerals containing iron is known as ferrous and without iron is known as non-ferrous (copper, bauxite, etc.).
 - Depending upon the origination, non-metallic minerals are either **organic** (such as fossil fuels also known as mineral fuels, which are derived from the buried animal and plant, e.g. such as coal and petroleum), or **inorganic** minerals, such as mica, limestone, graphite, etc.

Distribution of Minerals

- Minerals are unevenly distributed on the earth's surface.
- All minerals are exhaustible in nature, i.e., will exhaust after a certain time.
- However, these minerals take long time to form, but they cannot be replenished immediately at the time of need.
- More than 97% of **coal** reserves occur in the valleys of Damodar, Sone, Mahanadi, and Godavari rivers.
- **Petroleum** reserves in India are located in the sedimentary basins of Assam, Gujarat, and Mumbai High (i.e. off-shore region in the Arabian Sea – shown in the map given below).
- Some new petroleum reserves are also found in the Krishna-Godavari and Kaveri basins (shown in the image given above).



Mineral Belts in India

- Further, there are **three major mineral belts** in India namely –
 - The North-Eastern Plateau Region,

- The South-Western Plateau Region, and
- The North-Western Region.

North-Eastern Plateau Region

- The major areas of north-eastern plateau region are Chhotanagpur (Jharkhand), Odisha, West Bengal, and parts of Chhattisgarh.
- Iron ore, coal, manganese, bauxite, and mica are the major minerals of the north-eastern plateau region.

South-Western Plateau Region

- The south-western plateau region covers major parts of Karnataka, Goa, and contiguous Tamil Nadu uplands and Kerala.
- Major mineral resources of south-western plateau region are iron ore, manganese, and limestone.
- Kerala has deposits of monazite and thorium, and bauxite clay and Goa has deposits of iron ore.

North-Western Region

- The north-western region covers the areas of Aravalli in Rajasthan and parts of Gujarat.
- Major minerals of north-western regions are copper and zinc; other significant minerals include sandstone, granite, and marble, along with Gypsum and Fuller's earth deposits.
- In addition, Gujarat and Rajasthan, both have rich sources of salt.

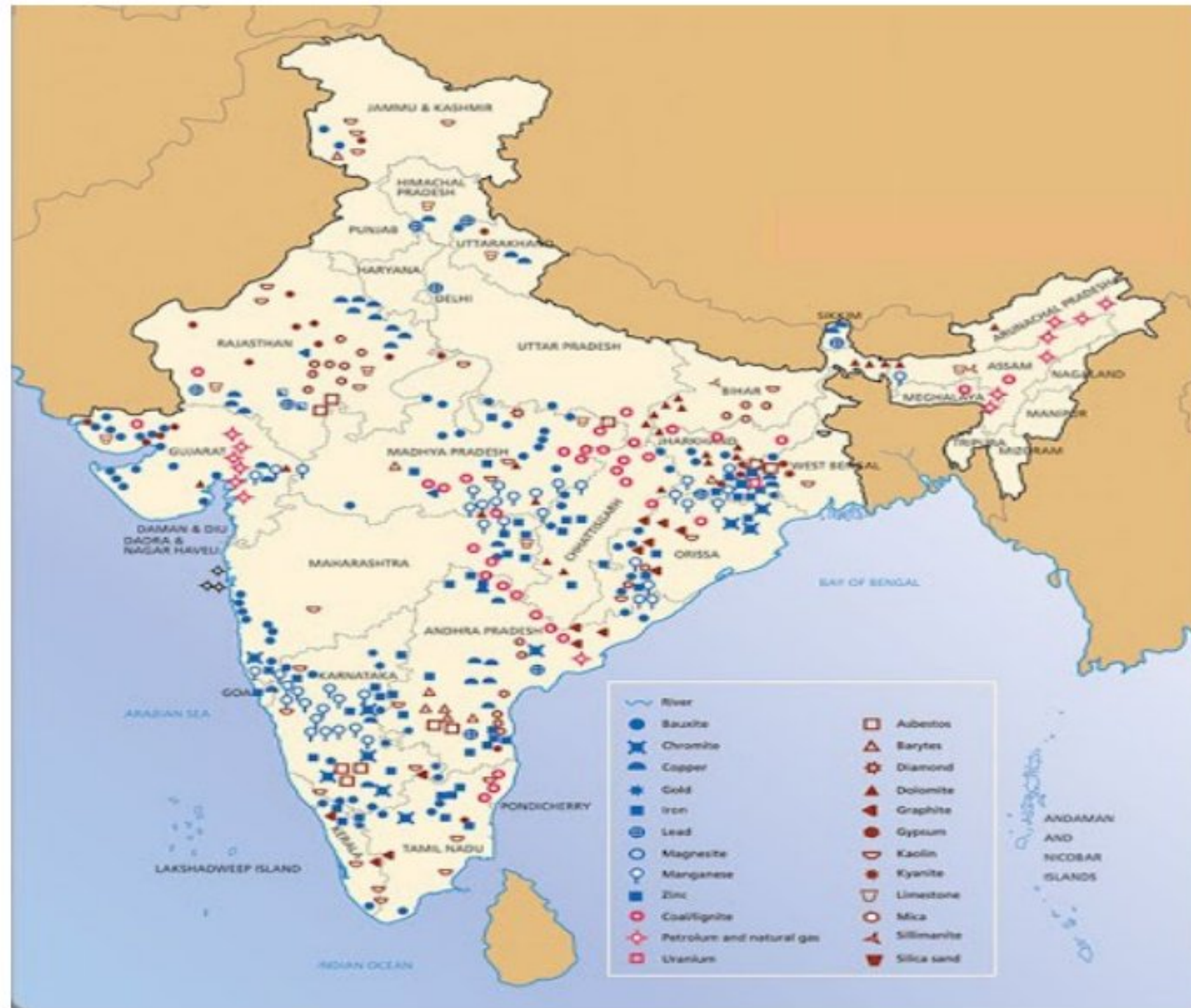
Mineral Belt	Location	Minerals found
North Eastern Peninsul	Chota Nagpur plateau and the Orissa plateau	Coal, iron ore, manganese, mica, bauxite, copper, kyanite, chromite, beryl, apatite etc. Khullar calls this region the <i>mineral heartland of India</i> and

ar Belt	covering the states of Jharkhand, West Bengal and Orissa.	further cites studies to state that: 'this region possesses India's 100 percent Kyanite, 93 percent iron ore, 84 percent coal, 70 percent chromite, 70 percent mica, 50 percent fire clay, 45 percent asbestos, 45 percent china clay, 20 percent limestone and 10 percent manganese.'
Central Belt	Chhattisgarh, Andhra Pradesh, Madhya Pradesh and Maharashtra.	Manganese, bauxite, uranium, limestone, marble, coal, gems, mica, graphite etc. exist in large quantities and the net extent of the minerals of the region is yet to be assessed. This is the second largest belt of minerals in the country.
Southern Belt	Karnataka plateau and Tamil Nadu.	Ferrous minerals and bauxite. Low diversity.
South Western Belt	Karnataka and Goa.	Iron ore, garnet and clay.
North Western Belt	Rajasthan and Gujarat along the Aravali Range.	Non-ferrous minerals, uranium, mica, beryllium, aquamarine, petroleum, gypsum and emerald.

- The **Himalayan belt** is also an important mineral belt, as it has rich deposits of copper, lead, zinc, cobalt, and tungsten.

Major Minerals:

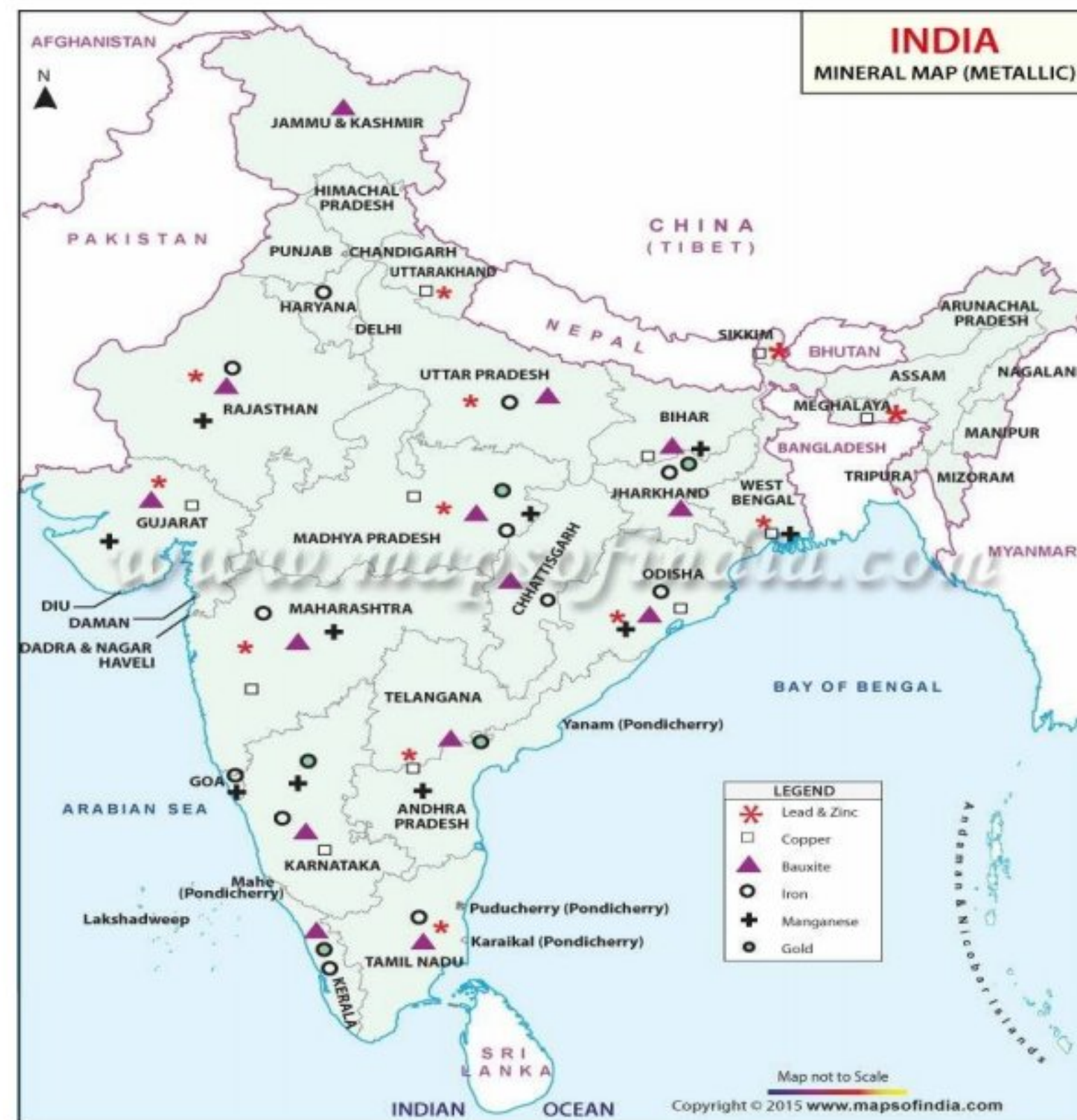
Following are the major minerals found in india –



Iron

- About 95% of total reserves of iron ore is found in the States of Odisha, Jharkhand, Chhattisgarh, Karnataka, Goa, Telangana, Andhra Pradesh, and Tamil Nadu.
- Sundergarh, Mayurbhanj, and Jhar are the major iron ore regions in Odisha and the important mines are Gurumahisani, Sulaipet, Badampahar (Mayurbhaj), Kiruburu (Kendujhar), and Bonai (Sundergarh).
- Noamundi (Poorbi Singhbhum) and Gua (Pashchimi Singhbhum) are important mines in Jharkhand.
- Dalli and Rajhara in Durg district are the important mines of Chhattisgarh.
- Sandur-Hospet area of Ballari district, Baba Budan hills, and Kudremukh in Chikkamagaluru district, and parts of Shivamogga are the important iron ore regions in Karnataka.
- The districts of Chandrapur, Bhandara, and Ratnagiri are the iron regions in Maharashtra.

- Other iron ore regions in India are Karimnagar and Warangal district of Telangana, Kurnool, Cuddapah, and Anantapur districts of Andhra Pradesh, and Salem and Nilgiris districts of Tamil Nadu.



Manganese

- Odisha is the leading producer of **Manganese**.
- Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi, and Bolangir are the major manganese regions in Odisha.
- Dharwar, Ballari, Belagavi, North Canara, Shivamogga, Chitradurg, Tumkur, and Chikkmagaluru are major manganese regions in Karnataka.
- Nagpur, Bhandara, and Ratnagiri districts are the major regions of manganese in Maharashtra.
- Balaghat-Chhindwara-Nimar-Mandla, and Jhabua districts are the important manganese regions of Madhya Pradesh.

Bauxite

- Odisha is the largest producer of Bauxite in India.
- Kalahandi, Sambalpur, Bolangir, and Koraput are the leading producers of bauxite in Odisha.
- Lohardaga (Jharkhand) is rich in bauxite deposits.
- Amarkantak plateau has rich deposits of bauxite in Chhattisgarh.
- Katni-Jabalpur area and Balaghat are the major regions of bauxite in Madhya Pradesh.
- Kolaba, Thane, Ratnagiri, Satara, Pune, and Kolhapur in Maharashtra are important bauxite producers.

Copper

- Copper deposits are largely concentrated in Singhbhum district of Jharkhand, Balaghat district of Madhya Pradesh, and Jhunjhunu and Alwar districts of Rajasthan.

Mica

- Hazaribagh plateau of Jharkhand and Nellore district of Andhra Pradesh have deposits of high grade mica.
- Jaipur to Bhilwara and areas around Udaipur are the major mica-bearing regions of Rajasthan.



- Other mica-bearing regions are Mysore and Hasan districts of Karnataka; Coimbatore, Tiruchirapalli, Madurai, and Kanniyakumari of Tamil Nadu; Alleppey of Kerala; Ratnagiri of Maharashtra; Purulia and Bankura of West Bengal.

Coal:

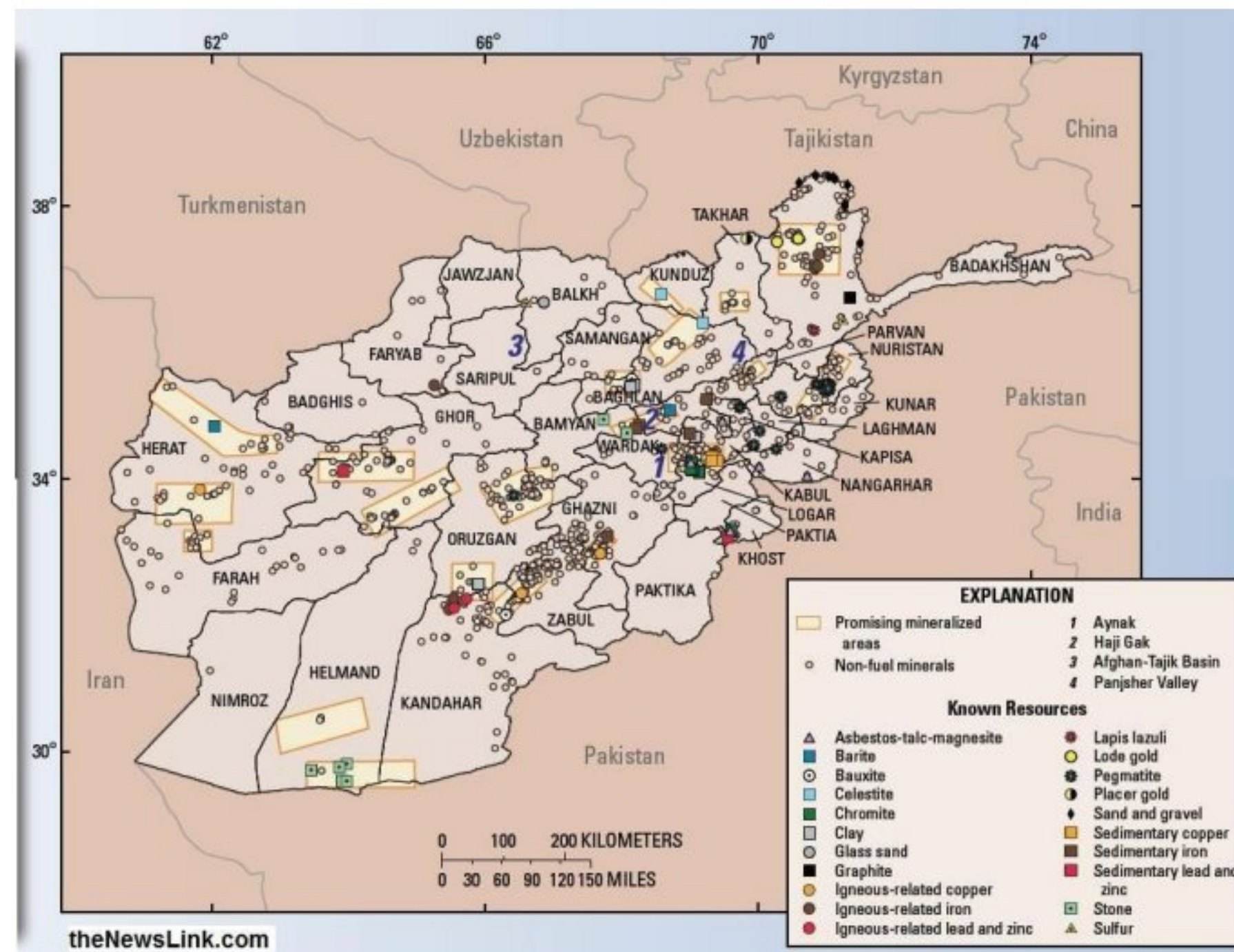
- Coal India Limited is an Indian public sector coal mining and refining company headquartered in Kolkata, West Bengal, India.
- It is the largest coal-producing company in the world and a Maharatna public sector undertaking.
- The company contributes around 82% to the total coal production in India.

Minerals in Afghanistan

Introduction:

Mining in Afghanistan is controlled by the Ministry of Mines and Petroleum, which is headquartered in Kabul with regional offices in other parts of the country. Afghanistan has over

1,400 mineral fields, containing barite, chromite, coal, copper, gold, iron ore, lead, natural gas, petroleum, precious and semi-precious stones, salt, sulfur, talc, and zinc, among many other minerals. Gemstones include high-quality emerald, lapis lazuli, red garnet and ruby. According to a joint study by The Pentagon and the United States Geological Survey, Afghanistan has an estimated US\$7 trillion of untapped minerals.



Location in Afghanistan:

- **Badakhshan Province:** Badakhshan Gold, gemstones, lapis lazuli.
- **Baghlan Province:** Baghlan clay and gypsum, Dudkash industrial minerals
- **Balkh Province:** oil.
- **Bamyan Province:** Hajigak Mine (iron oxide).
- **Daykundi Province:** tin and tungsten
- **Farah Province in the west:** copper, lithium;
- **Ghazni Province:** Dashti Nawar lithium salts;
- **Zarkashan Mine**(copper, gold);.
- **Ghor Province:** Karnak-Kanjar mercury, Nalbandon lead and zinc

- **Helmand Province:** Khanneshin carbonatite, gold, rare-earth elements, possible uranium reserves; Chagai Hills travertine, copper and gold.
- **Herat Province:** Shaيدا Copper Mine Dusar tin, Tourmaline tin, Herat barite and limestone
- **Jowzjan Province:** Oil and Gas
- **Kabul Province:** Jegdalek, Surobi District (gemstones).^[26]
- **Kandahar Province:** copper, cement
- **Kapisa Province:** copper
- **Kunduz Province:** Kunduz celestite
- **Logar Province:** copper (Mes Aynak).
- **Zabul Province:** Kundalyan gold and copper.

Commodities:

Afghanistan has abundant non-fuel mineral resources, including both known and potential deposits of a wide variety of minerals ranging from copper, iron, and sulfur to bauxite, lithium, and rare-earth elements. It was announced in 2010 that about \$1 trillion in untapped mineral deposits were identified in Afghanistan, enough to fundamentally alter the Afghan economy.

Copper:

"The survey provides credible information on mines in 28 different parts of Afghanistan," Wahidullah Shahrani told reporters.

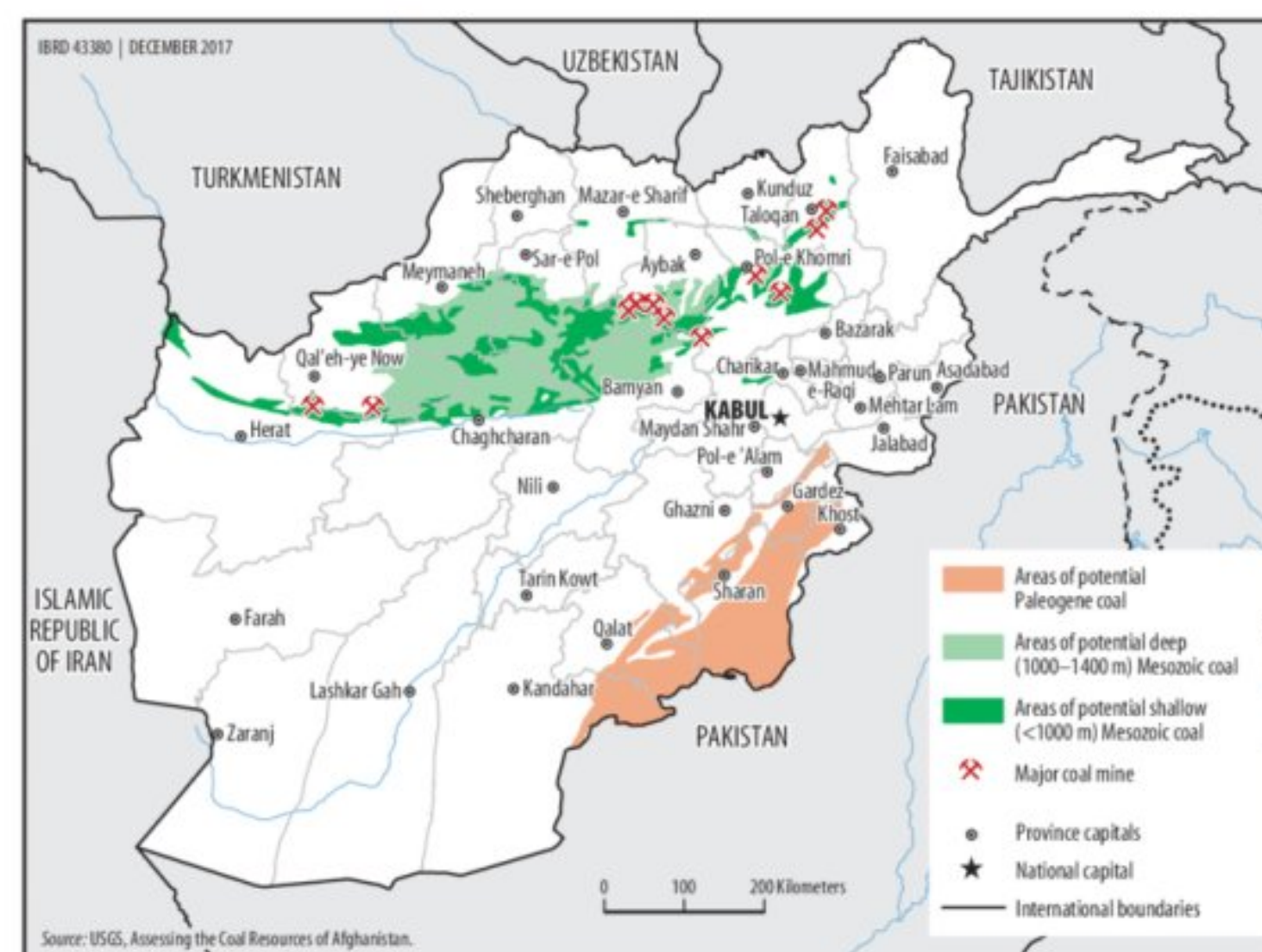
It showed the world's largest copper deposits existed in Balkhab district of Sar-e-Pol. The copper mine was discovered near a river, an area which might hold gold reserves as well. The government launched tenders in late 2011 for the Balkhab copper deposit, which had reserves of about 45 Mt of copper. Citing the report, an Afghan government minister said two new copper

mines in Logar Province and Herat Province provinces had been discovered. The value of the Logar pit, not the Ainak mine, is estimated at \$43 billion. Copper and gold mines worth of \$30 billion were discovered in the Zarkasho area of Ghazni and lithium pits of \$20 billion in Farah and Nimroz provinces, Shahwani said.

A deposit of beryllium, which is lighter than aluminum and stronger than steel used in airplanes, helicopters, ships, missiles, and space craft, has been found in the Khanashin district of southern Helmand province. The reserves are estimated at \$88 billion.

Coal:

Afghanistan has rich reserves of coking coal, coal is primarily located within a Jurassic belt from the northern provinces of Takhar and Badakhshan through the center of the country and towards the west in Herat, according to Afghan mines ministry.



Some sources suggest recent production of some 800,000 tons per year (figure A3.2),⁶⁸ oth-

In 2014 however, the U.S. Department of Labor has issued a List of Goods Produced by Child Labor or Forced Labor in which Afghanistan appeared to be one of the 74 countries with noticeable incidence of child labor in the coal mining field.

Gemstones:



Elbaite from Nangarhar Province

Afghanistan is known to have exploited its precious and semi-precious gemstone deposits. These deposits include aquamarine, emerald and other varieties of beryl, fluorite, garnet, kunzite, ruby, sapphire, lapis lazuli, topaz, tourmaline, and varieties of quartz. Corundum deposits (sapphire and ruby) in the country are largely exhausted, and very little gem quality material is found. The four main gemstone-producing areas are those of Badakhshan, Jegdalek, Nuristan, and the Panjshir Valley. Artisanal mining of gemstones in the country used primitive methods. Some gemstones were exported illicitly, mostly to India (which was the world's leading import market for colored gemstones and an outlet for higher quality gems) and to the domestic neighboring Pakistan market.

Gold:

The Afghan government signed a deal with Afghan Krystal natural Resources Co. (a local company) to invest up to \$50 million in the Qara Zaghan Mine in northern Baghlan Province. Qara Zaghan was the country's second gold mine, and production there was planned to begin by

2013. The mine's gold reserves were not yet known, but the company intended to spend the next 2 years exploring the site.



Investors from Indonesia, Turkey, the United Kingdom, and the United States were backing the project. The first gold mine was being developed by Westland general trading LLC of the United Arab Emirates at Nor Aaba near the border with Tajikistan in northern Takhar Province. The mine was expected to provide \$4 million to \$5 million per year in royalties to the government.

Iron ore:

The best known and largest iron oxide deposit in Afghanistan is located at Hajigak in Bamyan Province. The deposit itself stretches over 32 km and contains 16 separate zones, up to 5 km in length, 380 m wide and extending 550 m down dip, seven of which have been studied in detail. The ore occurs in both primary and oxidized states. The primary ore accounts for 80% of the deposit and consists of magnetite, pyrite and minor chalcopyrite. The remaining 20% is oxidized and consists of three hematitic ore types. The presence of coking coal nearby at Shabashak in the Dar-l-Suf District and large iron ore resources made the deposit viable for future development of an Afghan steel industry. Open pit mining and blast furnace smelting operations were envisioned

by an early feasibility study. The Hajigak also includes the unusual niobium, a soft metal used in the production of superconductors.

Lithium:

Lithium is a vital metal that is mostly used in the manufacture of rechargeable batteries for mobile phones, laptops and electric cars. It is believed that Afghanistan has plenty of lithium. The country's lithium deposits occur in dry lake beds in the form of lithium chloride; they are located in the western Province of Herat and Nimroz and in the central east Province of Ghazni.

^[47] The geologic setting is similar to those found in Bolivia and Chile. The deposits are also found in hard rock in the form of spodumene in pegmatites in the north-eastern Provinces of Badakhshan, Nangarhar, Nuristan, and Uruzgan. A pegmatite in the Hindu Kush Mountains in central Afghanistan was reported to contain 20% to 30% spodumene

Marble:

Afghanistan also has considerable amount of marble in different parts of the country. There are a number of marble factories in Herat. According to the U.S. Embassy in Kabul, current Afghan marble exports are estimated at \$15 million per year. With improved extraction, processing, infrastructure, and investment, the industry has the potential to grow into a \$450 million per year business.

Petroleum and natural gas:

Afghanistan has 3.8 billion barrels of oil between Balkh and Jawzjan Province in the north of the country.^{[50][51]} This is an enormous amount for a nation that only consumes 5,000 bbl/day. The United States Geological Survey and the Afghan Ministry of Mines and Industry jointly assessed the oil and natural gas resources in northern Afghanistan. In December 2011, Afghanistan signed

an oil exploration contract with China National Petroleum Corporation (CNPC) for the development of three oil fields along the Amu Darya river. Afghanistan will have its first oil refineries within the next three years, after which it will receive 70 percent of the profits from the sale of the oil and natural gas. CNPC began Afghan oil production in October 2012, extracting 1.5 million barrels of oil annually.

Rare-earth elements:

According to a September 2011 US Geological Survey estimate, the Khanashin carbonatites in southern Helmand Province have an estimated 1 million metric tonnes of rare-earth elements at a potentially useful concentration in the rock, but of unknown economic value. Regina Dubey, Acting Director for the Department of Defence Task Force for Business and Stability Operations (TFBSO) stated that "this is just one more piece of evidence that Afghanistan's mineral sector has a bright future."

Uranium:

The Helmand Province in southern Afghanistan is believed to possess uranium reserves, according to Afghan Ministry of Mines.

Minerals of Nepal

Introduction:

Nepal lies in the centre of the 2,500 km Himalayan belt, which has favourable geography for various minerals (metallic, non-metallic, and fuel). As many as 63 minerals have been identified in Nepal. In 2010/11, 80 mines and quarries for 12 different minerals were in operation. Of these, 29 are limestone quarries and 6 gem mines. In 2011, mines and mineral-based industries contributed 2.4% to Nepal's GDP.

Nepal has an abundance of minerals used in industrial and construction works including:

- Limestone (most abundant)
- Coal
- Talc
- Clay red
- Granite and marble (identified, but not extensively explored)
- Coal (with mines in Dang, Salyan, Rokpa and Palpa districts)
- Gold (alluvial gold was exploited in the past and there is potential for primary gold mining)
- Semi-precious and precious stones (tourmaline, aquamarine, ruby and sapphire)

Minerals Sector Division in Nepal:

- **Metallic minerals**, including iron, copper, zinc, lead, gold, platinum, silver and tin, are generally extracted from ore minerals. A numbers of metallic ore minerals are known to be found in various regions of Nepal.
- **Non-metallic minerals** such as magnesite, phosphorite, talc, limestone, dolomite, quartz, mica, clay, silica sand, gemstones, decorative and dimension stones, construction materials etc. are found throughout the country.
- **Fuel minerals** are naturally occurring carbon or hydrocarbon fuels such as petroleum, peat and natural gas formed by decomposition of organisms.
- **Gemstones** are pieces of minerals (or other rock or organic material) that can be converted to jewellery or other accessories. Certain gemstones such as tourmaline, Beryl/Aquamarine, Garnets, Kyanites and Rock crystals are available in Nepal.

- **Decorative and dimensions stones** are a variety of indigenous, metamorphic, and sedimentary rocks including Marbles, Granites and Quartzite that are available in Nepal.
- **Construction minerals** refers to Rocks, basalt, colored sandstone, phyllite, slates, flaggy quartzite and schist are used for roofing, paving and flooring.

Metallic Minerals:

Metallic minerals are the source of metals including iron, aluminum, copper, zinc, manganese, lead, chrome, platinum and others. Demand for new metals derived from ore deposits is increasing, largely due to reconstruction works. Some of metallic ore found in Nepal are discussed below:

Figure 1. Mines and Minerals sector division

Metallic Minerals	Non-Metallic Minerals	Fuels Minerals	Gemstones	Decorative and Dimension stones	Construction Minerals
<ul style="list-style-type: none"> • Iron • Copper • Zinc and Lead • Cobalt • Nickel • Gold • Silver • Tin 	<ul style="list-style-type: none"> • Limestone • Phosphorite • Magnesite 	<ul style="list-style-type: none"> • Coal • Petroleum • Natural Gas • Methane Gas • Hot Springs 	<ul style="list-style-type: none"> • Tourmaline • Beryl/ Aquamarine • Garnets • Kyanites • Rock crystals 	<ul style="list-style-type: none"> • Marbles • Granites • Quartzite's • Slate 	<ul style="list-style-type: none"> • Rocks • Basalt • Colored sandstone • Phyllite, Slates, Flaggy quartzite and schist

Iron:

Nepal is known to have 100.5 million tons of iron ore.

Table 1. Iron ores

S.N.	Headings	Information
1.	Main Iron Ore Deposits	Phulchoki (Lalitpur), Thoshe (Ramechhap), Labdi Khola (Tanahun), Jirbang (Chitwan), Phalam Khani (Parbat)
2.	Prospects availability	Baitadi, Bajhang, Jajarkot, Rolpa, Surkhet, Myagdi, Baglung, Parbat, Chitwan, Ramechhap, Taplejung
3.	Licensing Details	13 prospecting licenses and 3 mining licenses for iron to the private/ public companies in FY 2015/16.

Copper:

The demand for copper has increased greatly in recent years. Common copper ores found in Nepal include chalcopyrite, malachite, azurite, covellite, cuprite, bornite, and chalcocite. Copper ore occurrences/ prospects/ deposits are known from more than 107 localities in the country.

Table 2. Copper ores

S.N.	Headings	Information
1.	Main Copper Ore Deposits	Darchula, Bajhang, Bajura, Parbat, Baglung, Myagdi, Gulmi, Tanahun, Gorkha, Makwanpur, Kavre, Ramechhap, Okhaldhunga, Dhankuta, Solukhumbu, Ilam, Taplejung, Gyazi (Gorkha), Okharbot (Myagdi), Wapsa (Solukhumbu)
2.	Prospects availability	Kalitar (Makwanpur), Dhusa (Dhadhing), Wapsa (Solukhumbu), Bamangaon (Dadeldhura), Khandeshori/ Marma (Darchula), Kurule (Udayapur), Bhut Khola (Tanahun), Pandav Khani (Baglung), Baise Khani (Myagdi), Chhiring Khola (Bhojpur), Janter Khani (Okhaldhunga)
3.	Quantity and quality	Mines in Gyazi (Gorkha), Okharbot (Myagdi) and Wapsa (Solukhumbu), are able to produce 20 to 50 mt finished copper every year . ¹³
4.	Licensing Details	14 prospecting licenses for copper exploration have been issued by DMG until 2015/16 ¹⁴

Zinc and Lead:

Zinc and Lead deposits are found in more than 54 localities throughout Nepal. Ganesh Himal Zinc - Lead deposit (Lari and Suple) has proved to be an economic resource, and extraction works are currently under way.

Table 3. Zinc and Lead ores

S.N.	Headings	Information
1.	Main Zinc and Lead ore Deposits	Ganesh Himal area (Rasuwa), Phakuwa (Sankhuwasabha), Labang-Khairang (Makwanpur), Pangum (Solukhumbu), Salimar valley (Mugu/Humla), Daha Gulzar (Darchula), Phulchoki (Lalitpur), Sisha Khani and Kandevas (Baglung), Dhuwakot (Parbat), Barghare (Makwanpur) and Khola Khani (Taplejung).
2.	Quantity and quality	2.3 million tons of zinc and lead combined of commercial quality deposits are recorded (Chakrabarti 2003).
3.	Licensing Details	4 exploration licenses for lead and zinc have been issued by DMG ⁹

Uranium:

Recently a large deposit of uranium has been found in the Upper Mustang region of Nepal. The demand for Uranium is growing for abundant source of concentrated energy. Since extracting

uranium and assessing its quality is extremely costly and technically challenging, Nepal will require external support and technical knowhow for uranium extraction and proper use.

Table 4. Uranium

S.N.	Headings	Information
1.	Main uranium Deposits	Thumki, Jagat, Panchmane, Gagalphedi and Chunikhel in Shivapuri area in Kathmandu, Tinbhangale, Chandi Khola and Chiruwa Khola (Makwanpur); Buka Khola (Sindhuli); Mardar Khola and Panpa Khola (Chitwan); Jamari Gad, Bangabagar, Baggoth, Gorang (Baitadi); and traces in different section of Chamliya River (Darchula) and Mustang
2.	Quantity and quality	Uranium deposits about 10 km in length and 3 km in width in Lomanthang of very high quality. ¹⁰
3.	Licensing Details	No any Licenses issued yet by DMG

Other Metallic Minerals:

In addition to the above described metallic mines, several other metallic ores including Tungsten, Bismuth, Arsenic, Cadmium, Chromium, Mercury, and Titanium are also found in various parts of Nepal. Further investigations will be required in order to know their exact status and economic potential.

Other Metallic Minerals

Table 5. Metallic Ores

S.N.	Headings	Information
1.	Cobalt	Cobalt ores are located in Netadarling & Tamghas (Gulmi), Samarbhamar (Arghakhanchi), Lamadanda (Dhadhing), Nangre (Kavre), Bhorle (Ramechhap) and Bauli Gad (Bajhang).
2.	Nickel	Nickel deposits are found in Bamangaon (Dadeldhura), Bering Khola (Ilam), Bauligad (Bajhang), Khopre Khani (Sindhuli) and old workings from Nangre, Nigre and Bhorle (Ramechhap) area.
3.	Gold	Gold can be found in river gravel/ sediments deposited by the rivers including Mahakali, Chameliya, Jamari Gad, Seti, Karnali, Bheri, Rapti, Lungri Khola & Phagum Khola (Rolpa), Kaligandaki, Myagdi Khola, Modi, Madi, Marsyangdi, Trishuli, Budhigandaki, and Sunkoshi. DMG has issued 45 prospecting licenses for gold till date . ¹¹
4.	Silver	Silver availability is recorded in Ganesh Himal (Rasuwa), Baraghare (Makwanpur), and Bering Khola (Ilam). It is mainly used to make ornaments, jewelry, coins, handicrafts, utensils, dental appliances, and in many other purposes.
5.	Tin	Tin is found in Meddi and Ganera (Dadeldhura) and Mandu Khola area (Makwanpur). It is used in making brass and bronze alloys, coating, lining, plating the food containers, in chemicals etc.

Non-Metallic minerals:

A number of non-metallic minerals like magnesite, phosphorite, talc, limestone, dolomite, quartz, mica, clay, silica sand, gemstones, decorative and dimension stones, construction materials etc.

are known to exist in their natural forms in Nepal. Some of the explored non-metallic ores are discussed below:

Limestone:

Due to Nepal's vast quantities of limestone, a number of cement companies employ Nepali as inputs. Other cement plants are under construction and yet others are in the pipeline. The demand for cement, driven by infrastructure development works and reconstruction is ever increasing in Nepal.

Table 6. Limestone ores

S.N.	Headings	Information
1.	Main Limestone Ore Deposits:	Udaypur, Dhankuta, Sindhuli, Makwanpur, Lalitpur, Dhanding, Syangja, Arghakhanchi, Surkhet, Dang, Salyan, Baitadi and Palpa.
2.	Quantity and quality	1.25 billion metric tons of best cement grade limestone deposits. 540 million tons of limestone deposits has been proven, while that of 110 million tons has been semi-proven, and there are possibilities of having an additional 420 million tons ¹²
3.	Licensing Details:	According to DMG record (FY 2015/16) 44 mining licenses and 172 prospecting licenses of limestone have been issued to the private sector. ¹³

Other Non-Metallic Ores:

Occurrences of other non-metallic ores such as Talc, Mica, Ceramic clay/ Red clay, Silica sand, Salt: Brine water, Barites, Calcite and Diatomite have also been reported from different parts of Nepal.

Other Non-Metallic Ores

Table 7. Non-Metallic Ores

S.N.	Headings	Information
1.	Dolomite	From geological mapping over 5 billion tons (possible) of dolomite occur mainly in Dhankuta, Khotang, Udayapur, Sindhuli, Dolakha, Kavre, Kathmandu, Makwanpur, Dhading, Syangja, Palpa, Baglung, Gulmi, Arghakhanchi, Dang, Pyuthan, Salyan, Rolpa, Rukum, Jajarkot, Surkhet, Dailekh, Jumla, Achham, Doti, Bajhang, Bajura, Baitadi and Darchula districts . It is yet to be explored in detail thus their grade and quality are still unknown. DMG has issued 10 prospecting licenses for dolomite ¹⁴
2.	Phosphorite	Its availability mainly recorded in Dhik Gad, Junkuna, Morgaon, Sanagaon and Dhaubisaune areas in Baitadi while also in Tarugad, Juilgad, Goichan - Kandechar area in Bajhang and further east to Bajura.
3.	Magnesite	180 million tons (66 million tons of high grade, MgO content 88 to 96% loss free basis) of magnesite deposit in Kharidhunga (one of the biggest and best quality magnesite in south Asia), Dolakha; 20 million tons of mediums to low-grade magnesite deposit in Kampughat in Udayapur district; and few small size magnesite occurrences from Palpa, Baitadi and Dolakha have been identified. ¹⁵ DMG has issued 1 mining licenses for magnesite. ¹⁶

Fuel Minerals

A number of fuel minerals are believed to exist in different parts of Nepal, only the important ones are briefly described.

Petroleum and Natural Gas

The GoN has identified exploration for petroleum products as a priority. Western Nepal has witnessed gas and oil seepage, confirming the presence of oil and natural gas in Nepal. DMG/ Petroleum Exploration Promotion Project (PEPP) has identified 10 prospective blocks in the southern parts of the country.

Table 8. Petroleum and Gas ores

S.N.	Headings	Information
1.	Main Petroleum and Gas Deposits	In a stretch of 14km in Padukasthan, Sirsathan and Navisthan area in Dailekh and Muktinath (Mustang).
2.	Quantity and quality	Not available
3.	Extraction Period	35 years
4.	Licensing Details	Global tender
5.	Exploration Period	4 years

Methane Gas

For many years the Kathmandu valley has been known to have methane gas deposits. DMG has invited potential investors to develop gas wells. Feasibility studies have confirmed that the gas can be used for industrial and household purpose and the reserve is sufficient to supply gas to 21,000 families for about 30 years.

Table 9. Methane gas ores

S.N.	Headings	Information
1.	Main Methane Gas Deposits	26 km ² area in Kathmandu valley by exploration drilling of over 14 drill holes up to 570 m depth
2.	Quantity and quality	316 million cubic meter methane gas deposit. Its average calorific value is 7200 kcal/m ³
3.	Licensing Details	Not available
4.	Licensing Details	Global tender
5.	Exploration Period	4 years

Gem Stones

Tourmaline

Tourmaline is a semi-precious mineral stone that is well known for its ability to detoxify the human body. It is one of only a handful of minerals that have the ability to emit negative ions and far-infrared rays. Five distinct types of tourmaline are available in Hyakule and Phakuwa (Sankhuwasabha). Small-scale mines of aquamarine, beryl, tourmalines are in operation in those places. Two tourmaline mines are in operation in Daha area in Jajarkot and six mines are under development. 15 prospecting licenses and 13 mining licenses for tourmaline have been issued by DMG .

Quartz Crystal (Rock Crystal)

Quartz is one of the most common stones available in Nepal. It is the component of variety of rocks and comes in an extensive range of colors and varieties. Two small-scale quartz crystals mines are in operation from pegmatites in Khejemi/ Sirku (Taplejung) and Raluka (Nuwakot). Quartz crystals are also known from different parts of Jajarkot, Dailekh, Dhadhing, Rasuwa,

Nuwakot, Sakhwasabha, Ilam and Taplejung districts. Two mining licenses and 15 prospecting licenses have been issued by DMG.

Decorative and Dimension Stones:

A number of decorative and dimension stones including marble, granite, quartzite's and slate are known to exist in various parts of the country. Some of the important ones which have already been explored described below.

Table 10. Decorative and Dimension Stones

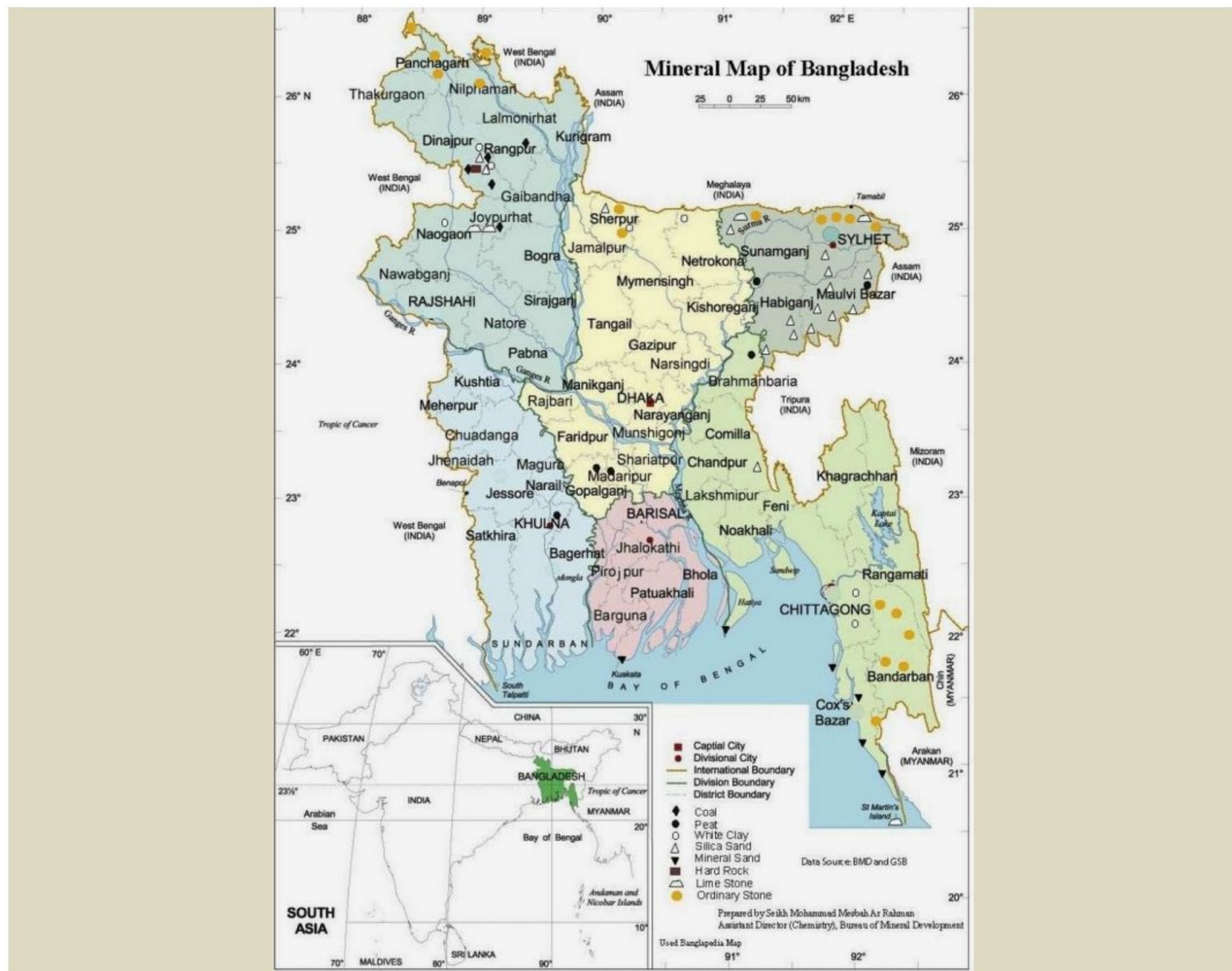
S.N.	Headings	Information
1	Marble	Its availability has been recorded in Lalitpur, Dhadhing, and Makwanpur. To date, three mining licenses and three prospecting licenses have been issued by DMG for marble. Godavari Marbles, one of the major marble industries whose annual production capacity is approximately 80,000m ² produces polished marble slabs and aggregate as bi-products. ¹⁹
2	Granite	Various types of granite exist in Makwanpur (Palung and Ipa), Sindhuli, Udaypur, Dadeldhura in the Lesser Himalaya. DMG has done some evaluation work of Palung granite. Only 2 prospecting licenses for granite have been issued by DMG. ²⁰
3	Quartzite	Quartzite is found in Taplejung, Ilam, Dhankuta, Ramechhap, Sindhupalchok, Makwanpur, Dhadhing, Tanahun, Kaski, some other districts. It is mainly used for dimension stones, flagstones for paving purposes, and in construction. 34 prospecting licenses and 7 mining license have issued by DMG to date. ²¹
4	Slate	Slate is extensively mined in different parts of Dhankuta, Sindhupalchok, Ramechhap, Nuwakot, Sindhupalchok, Dhadhing, Tanahun, Baglung, Syangja, Palpa, Parbat, Jajarkot, Achham, Doti, Dadeldhura, Baitadi, Bajhang, Bajura and many other districts. It is mainly used as roofing and pavement material.
5.	Exploration Period	4 years

Minerals of Bangladesh

Introduction:

Because of a different geological environment, important mineral deposits of Bangladesh are NATURAL GAS, COAL, LIMESTONE, HARDROCK, GRAVEL, BOULDER, GLASS SAND, construction sand, WHITE CLAY, BRICK CLAY, PEAT, and beach sand heavy minerals. Tertiary Barail shales occurring within the oil and gas windows have generated natural gas and oil found in Bangladesh. After generation, gas and oil have migrated upward through multi-kilometre rock

layers above, to reach and accumulate in suitable SANDSTONE reservoirs in the Neogene Bhuban and Bokabil rock units. Gravel, glass sand, construction sand, peat, and beach sand are found in the Holocene sediments, and white clay (kaolin) is found in the late Pleistocene sediments in the small hills mainly in the northern part of the country. White clay and glass sand deposits have also been discovered in the north-western part below the surface.

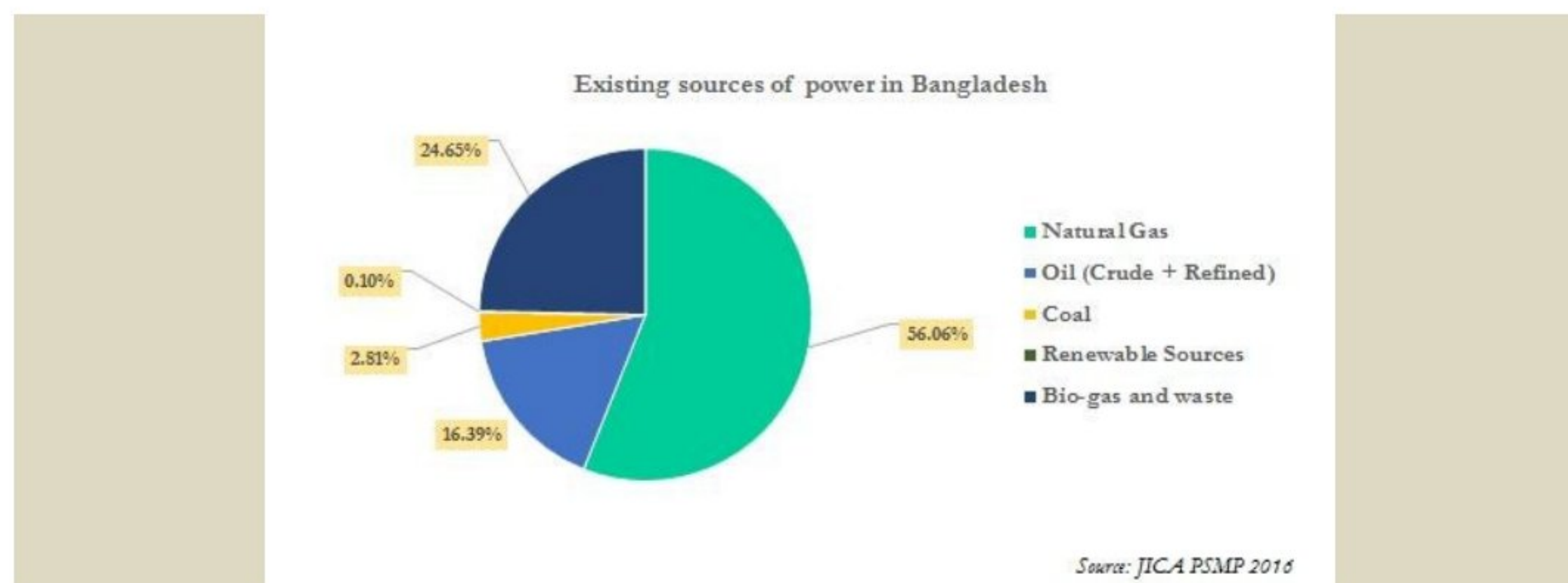


Oil and gas:

There are 23 discovered gas fields in Bangladesh of various sizes. The estimated recoverable proved and probable (P1+ P2) reserve of the 23 gas fields is 21.05 TCF. Gas in most of the fields is dry, in a few fields it is wet, with considerable amounts of CONDENSATE, eg at Beanibazar (16

bbl/mmcfg), Jalalabad (15 bbl/mmcfg), and Kailashtila (13 bbl/mmcfg). Currently, natural gas accounts for more than 75% of the total commercial energy consumption and the major part of the future energy demand would be met from it.

Power sector ranks the highest (52%); fertiliser sector ranks the second (28%); and industry, domestic, commercial and other sectors together rank third (20%) in gas consumption. Currently 17 gas fields under public and private sectors are in production with gas supply between 2000 mmcfcg per day.



Coal:

The first discovered in the country by Geological Survey of Pakistan (GSP) in 1959 was at great depth. GEOLOGICAL SURVEY OF BANGLADESH (GSB) continued its efforts for exploration that resulted in the discovery of 4 coalfields. BHP Minerals, a US-Australian company, discovered a field in 1997 totalling 5 coalfields. All the discovered fields lie in the north-western part of the country. Details of the coalfields and quality of the coal are shown below.

Coal field	Depth (m)	Thic kness (m)	Reserve (m ton)	Fixed carbon (%)	Volatile matter (%)	Ash content (%)	Sulphur content (%)	Calorific value content (%)
Jamalganj	640-	64	1053	47 (av)	38 (av)	22 (av)	0.62 (av)	11000

	1158							(av)
Barapukuri	129-	51	300	45.5-	2.28-	11.79-	0.43-	10547-
a	506			54.7	3.60	23.71	1.33	12529
Khalaspir	257-	50	143	32.0-	2.93-	7.6-	0.24-	7388-
	483			80.8	30.47	50.51	3.15	13880
Dighipara	328-	61	Not	51.3-	25.29-	2.64-	0.51-	10200-
	407		determined	65.6	38.23	20.05	1.02	14775
Phulbari	151	---	386	---	---	---	---	---

Limestone:

In the early 1960s, a quarry of limestone of Eocene age with a small reserve at Takerghat in the north eastern part of the country started supplying raw materials to a cement factory.

This was the first mine in the country which was actually a quarry. In the 1960s GSB discovered another limestone deposit in Joypurhat at a depth of about 515-541m below the surface with a total reserve of 100 million ton. GSB continued its effort to find out limestone deposits at shallow depth. In the mid 1990s GSB discovered limestone deposit at a depth of 493-508 and 531-548m below the surface at Jahanpur and Paranagar of Naogaon respectively. Thickness of these deposits is 16.76m and 14.32m respectively.

Hard Rock:

Bangladesh has dearth of construction materials. A large deposit of granodiorite, quartz diorite, gneiss of Precambrian age has been discovered by GSB at depths ranging from 132 to 160m below surface at Maddhyapara, Dinajpur.

Hardrock has been extracted upto April 2007 a sum of total of 459,283.98 metric ton 392030.78 M. Ton of hardrock have already been sold to different organisations. These rocks are used as construction materials for housing apartments, commercial buildings, roads and highways,

bridges, dams, river dykes, embankments, flood control, railway ballast and sleepers, decoration pieces, tiles etc.

Peat:

In Bangladesh peat deposits occur in the marshy areas of the north-eastern, middle and south western parts with a total reserve of more than 170 million ton. Calorific value of peat ranges from 6000 to 7000 BTU/lb. Peat can be used as fuel for domestic purposes, brick manufacturing, boilers etc. However, their exploitation has not yet been started. Details of the peat deposits are given in the following table.

Metallic minerals:

GSB has carried out investigation for mineral deposits and succeeded in locating a few potential zones. Relatively high content of metallic minerals like chalcopyrite, bornite, chalcocite, covellite, galena, sphalerite etc have been found in the core samples from the north-western region of the country.

Construction sand:

It is very much available in the riverbeds throughout the country. Sand consists mostly of quartz of medium to coarse grains. It is extensively used as construction material for buildings, bridges, roads etc all over the country.

Gravel:

Deposits of gravel are found along the piedmont areas of the HIMALAYAS in the northern boundaries of Bangladesh. These river borne gravels come from the upstream during the rainy

season. Total reserve of the gravel deposits is about 10 million cu m. Gravel deposits are being exploited and used in the country.

Glass sand:

Important deposits of glass sand of the country are at Balijuri (0.64 million ton), Shahjibazar (1.41 million ton) and Chauddagam (0.285 million ton) at or near the surface, Maddhyapara (17.25 million ton) and Barapukuria (90.0 million ton) below the surface. Glass sands consist of fine to medium, yellow to grey quartz.

White Clay:

There are surface to near surface deposits of white clay in Bijoypur and Gopalpur area of Netrokona district, Nalitabari of Sherpur district, Haidgaon of Chittagong district and Baitul Izzat of Satkania upazila, Chittagong district. Besides there are subsurface deposits of white clay' in Maddhyapara, Barapukuria, Dighipara of Dinajpur district and Patnitala of Naogaon district. The exposed white clay is not good in quality. It is used in the ceramic factories of Bangladesh after mixing with high quality imported clay.

Beach sand:

Deposits of beach sand have been identified in the coastal belt and in the coastal islands of Bangladesh. Different heavy minerals and their reserves (in ton) are: Zircon (158,117), Rutile (70,274), Ilmenite (1,025,558), Leucoxene (96,709), Kyanite (90,745), Garnet (222,761), Magnetite (80,599) and Monazite (17,352). An Australian company has applied for the permission to carry out the feasibility study for exploitation.

Brick Clay:

In Bangladesh the mineralogical, chemical and engineering properties of Pleistocene and Holocene brick clays of Dhaka, Narayanganj and Narsingdi districts are well documented. The bulk chemistry and engineering properties of the Holocene and Pleistocene samples have been found satisfactory for manufacturing good quality bricks. These are being exploited and widely used in the country. [AKM Khorshed Alam and Sifatul Quader Chowdhury]

Mines:

Mining process of extracting coal, ores, precious stones, hardrock etc from mines. In 1774, mining was first started in undivided Bengal at Raniganj coalfield of West Bengal in India. Then Jharia, Bokrao and Karanpura coalfields of India also came under mining. From 1857 to 1957 a number of geologists expressed with the hope that coalmines would be found under the green cropped land in Bangladesh. In spite of this the then East Pakistan (now Bangladesh) was neglected for the exploration works for mineral resources. But the hopes of the geologists were vindicated when in course of searching for oil in 1959 STANVAC drilled a hole in Bogra district, where Gondwana coal was encountered at a depth of 2381m from surface. In 1985 coalfield was discovered at Barapukuria in Dinajpur district. More coalfields were discovered at Khalaspir (Rangpur district) in 1989, at Dighipara (Dinajpur district) in 1995 and at Phulbari of the same district in 1997. A large deposit of granodiorite, quartz diorite, gneiss of Precambrian age has been discovered at depth ranging from 132 to 160m below surface at Maddhyapara, Dinajpur in 1974-75.

Mine hazard:

Irrespective of the choice of mining methods some disturbances to the mine site and its surrounding environment are inevitable. Issues of safety and environmental concerns for mines under construction in Bangladesh are WATER POLLUTION and control of mine drainage,

sedimentation in water courses, NOISE POLLUTION, ground vibration, AIR POLLUTION, socio-economic disturbances, loss of agricultural land, danger of land subsidence, hazards of mine fire, problems of dust and human discomfort.

History of large-scale mining of minerals using modern technology and management in Bangladesh is not old. Although there are technical requirements for mine planning and hazard assessment but in small-scale sand, beach sand, glass sand, white clay, gravel, and soil mining hardly follow any standard regulations both from mine safety and environmental protection point of view.

Minerals of Bhutan

Introduction:

The mineral resources of Bhutan include **beryl**, **coal**, copper, **dolomite**, graphite, **gypsum**, iron, lead, **limestone**, marble, mica, precious stones, pyrite, **quartzite**, silver, slate, talc, tin, tungsten, and zinc.

Production

In 2015, Bhutan's primary mineral commodity output was industrial mineral products, which included cement, clay, dolomite, granite, gypsum, limestone, marble, quartzite, stone (unspecified), and talc. Additionally, coal, ferrosilicon, and iron ore were produced. The largest reported increases in production were for iron ore (which increased by 127%), marble (58%), stone (unspecified, 49%), and dolomite (31%). The largest reported production decreases were for talc (54%), coal (30%), limestone (24%), and granite (11%). Data on mineral production are in table 1.

Cement.

In 2015, Dungsam Cement, which was wholly owned by Druk Holding & Investments Ltd. (DHI), produced 469,302 metric tons (t) of cement, of which 62% was sold to the domestic market and 38% was exported. Of the cement sold domestically, 50% was for use in the construction of hydropower projects and other infrastructure construction projects in the country. The company also produced 375,870 t of clinker (Druk Holding & Investments Ltd., 2015, p. 50–5).

Stone, Dolomite.—

In 2014, DHI, through its wholly owned subsidiary State Mining Corp. Ltd. (SMCL), announced that it had invested in a dolomite-manufacturing project that would produce dolomite refractory bricks, high-alumina-content refractory products in bricks, and castables to be used by the ferrous-metal and industrial manufacturing sectors. In 2014, the company completed a feasibility study for the plant, which would be located in Gomtu and managed by OCL India Pvt. Ltd. of India. In addition, DHI acquired an environmental clearance from the Government for the development of a dolomite mine to be located in Samtse District in the southwestern part of the country.

Coal.—

In 2015, SMCL made progress with its Habrang coal project by completing a topographical survey, a geologic study, a final mine feasibility study, and an environmental impact assessment for a mine. The Habrang coal mine is located in Bhangtar, Samdrup Jongkhar Dzongkhag District in southeastern Bhutan. Additionally, SMCL obtained the clearance to start work for the

revitalization of the Tshophangma coal mine (also known as the Samrang coal mine), which is located in Bhangtar District.

Renewable Energy.—

According to the National Statistics Bureau of Bhutan, in 2015, the total installed electricity generation capacity of the country was 1,614 megawatts (MW), which was an increase of about 8% compared with that of 2014. Most of the electricity was generated in the following hydropower facilities—Basochu I, Basochu II, Chhukha, Dagachhu, Kurichu, and the Tala Hydropower Project Authority (National Statistics Bureau of the Royal Government of Bhutan, 2016b, p. 130).

Minerals of Sri-lanka

Introduction:

The natural resources of Sri Lanka include **graphite, mineral sands, limestone, phosphates, and gems**. The mining sector does not play a significant role in the country's economy. Sri Lanka is well-endowed with industrial minerals including **Graphite**, Ilmenite, Rutile, Zircon, Quartz, Feldspar, Clay, Kaolin, **Apatite (Phosphate Rock)**, Silica Sand, Garnet sand, Mica, Calcite and Dolomite. Pulmoddai beach sand deposit is the most important non-ferrous mineral reserve in Sri Lanka to date.



Metals

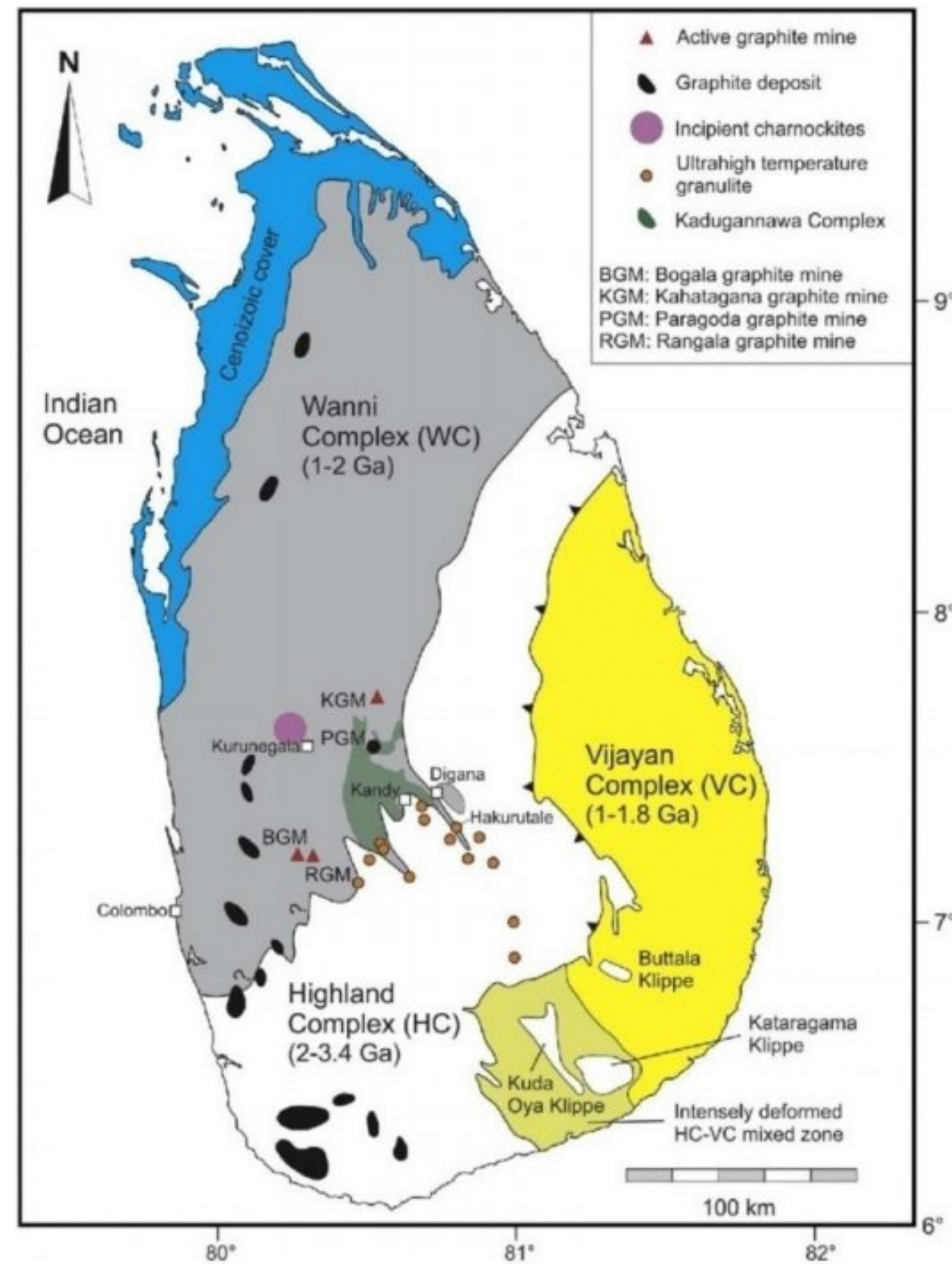
In 2011, Ceylon Steel Corp. completed its three-year expansion project at Oruwela, thereby enabling the iron mill's production capacity to expand to 250,000 Mt/yr from 100,000 t/yr.

Experts state that the black mineral sands of Pulmoddai beach contain heavy mineral concentrates amounting to about 12.5 million Mt. of which 65% is ilmenite, 10% is zircon, 10% is rutile, and small quantities of garnet and monazite.

- **Pulmoddai beach** sand deposit is the most important non-ferrous mineral reserve in Sri Lanka to date. This deposit contains minerals including one of the most expensive and sought after metals in the world - titanium.

- **Ilmanite** (FeTiO₂) and rutile (TiO₂) are found in enormous concentrations in the Pulmoddai beach sand deposit area. Several other beach mineral-sand deposits of Monazite, Zircon, garnet and Ilmanite are found in various parts of the island and are now being exported.
- The use of **graphite in Sri Lanka** has a long history, that dates back to 1675. Sri Lankan graphite has gained popularity all over the world for its high purity and offers many processing applications in graphite lubricants, flake graphite, carbon brushes, refractory bricks and midget electrodes and nano-technology.
- Three main types of **clay - kaolinite, ball clay and brick clay** - are used for **export industries**. Yellow, red and blue colour ball clay is found in Sri Lanka's hill country. These are used to make casts and as refractory material because of their attributes of strength and high plasticity. Brick clay is found in most of the river valleys and is commonly used in the production of bricks and tiles.
- **Quartz, ball clay, silica and feldspar** are utilized in **the ceramics and glass industries** with great success; **the country's porcelain** is ranked among the best in the world.
- **Fossil Fuels:**
- In 2011, Cairn Lanka Ltd., a subsidiary of Cairn India Ltd., discovered potential gas reserve in a well on one of the blocks in the Mannar Basin in Sri Lanka. The Mannar

Basin is divided into eight blocks. The combined capacity of the eight blocks is estimated to be more than 1 billion bbl of oil. Around \$2 billion/yr is spent on petroleum imports.



Titanium:

Lanka Mineral Sands Ltd., which was under the SRED, was engaged in extracting mineral sands along Pulmoddai beach north of Trincomalee. The mineral sands contained garnet, ilmenite, monazite, rutile, and zircon. The mineral sands deposit was estimated to have a resource of about 12.5 million metric tons (Mt), and ilmenite accounted for 60% of the deposit.

Lanka Mineral Sands planned to construct a new mineral sands processing plant at Kokkilai in northern Sri Lanka. The black mineral sands of Pulmoddai beach have heavy-mineral

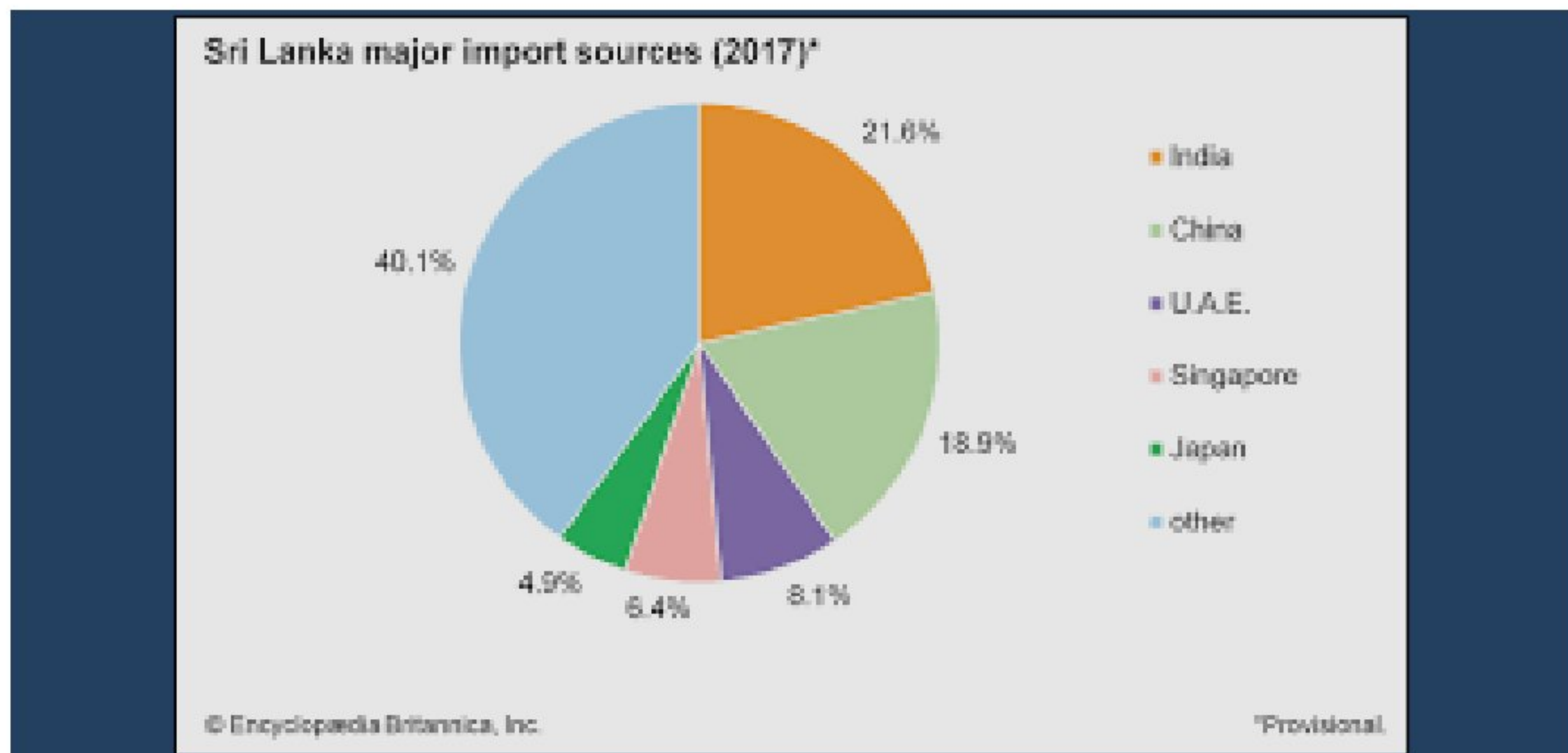
concentrations of 50% to 60% and were considered to be some of the richest mineral sands in the world. The company also planned to increase mine production of ilmenite and zircon.

Graphite:

Sri Lanka's vein graphite is the highest quality form of natural graphite in the world; it contains more than 90% carbon content. Graphite is used in such traditional industries as refractories and steelmaking, and it is also in demand for use in such emerging technologies as lithium-ion batteries. State-owned Kahatagaha Graphite Lanka Ltd. planned to increase its production of vein graphite by 50% in 2012. The company, which operated one of the three graphite mines in the country, intended to increase its processing capacity of vein graphite to 150 metric tons per month (t/mo) from 100 t/mo to meet market demand.

Phosphate Rock.—

Lanka Phosphate Ltd., which was also under the SRED, operated the Eppawala phosphate project, which covered an area of approximately 324 hectares in the Anuradhapura District, North Central Province. The resources of the deposit were estimated to be 60 Mt containing 33% to 40% phosphorus pentoxide. The company produced two types of phosphate rock—Eppawala and high-grade Eppawala. The company planned to manufacture single superphosphate (SSP) to substitute for triple superphosphate (TSP), which was currently imported.



Minerals in Maldives

The **natural resources** include oil, **natural** gas, coal, minerals, and the forest.

Mineral and Rock Specimens in Maldives:

- Mineral and Rock Specimens in Maldives.
- High-end Collector Mineral Specimens.
- General Mineral Specimens.
- Rare Mineral Species.
- **Fluorescent Minerals.**
- **Gold** and **Silver** Specimens.
- Gem Mineral Crystals.
- Micromounts and Microminerals.

Maldives: Income from natural resources, percent of GDP:

For that indicator, we provide data for the Maldives from 1980 to 2018. The average value for the Maldives during that period was 0.02 percent with a minimum of 0 percent in 2004 and a maximum of 0.11 percent in 1982. The latest value from 2018 is 0 percent. For comparison, the world average in 2018 based on 186 countries is 6.54 percent. See the global rankings for that indicator or use the country comparator to compare trends over time.

Gas Consumption in Maldives:

Maldives consumes million cubic feet (MMcf) of **natural gas** per year as of **the** year 2017. **Maldives** ranks 114th in **the** world for **natural gas** consumption, accounting for about 0.000% of **the** world's total consumption of 132,290,211 MMcf.

Maldives: Oil reserves, billion barrels:

For that indicator, we provide data for the Maldives from 1980 to 2020. The average value for the Maldives during that period was 0 billion barrels with a minimum of 0 billion barrels in 1980 and a maximum of 0 billion barrels in 1980. The latest value from 2020 is 0 billion barrels. For comparison, the world average in 2020 based on 186 countries is 8.67 billion barrels. See the global rankings for that indicator or use the country comparator to compare trends over time.

Maldives: Coal reserves, million short tons:

For that indicator, we provide data for the Maldives from 2008 to 2017. The average value for the Maldives during that period was 0 million short tons with a minimum of 0 million short tons in 2008 and a maximum of 0 million short tons in 2008. The latest value from 2017 is 0 million short tons. For comparison, the world average in 2017 based on 190 countries is 6012.16 million

short tons. See the global rankings for that indicator or use the country comparator to compare trends over time.