

# The role of a national geological survey in the development of a sustainable society, with special reference to Bangladesh

The National Geological Survey is a senior research-oriented scientific organization in the field of geosciences in many countries. It represents the geoscientific community of a country, and, as a result, its roles and responsibilities are vast in comparison to any other geoscientific organization. In Bangladesh, the National Geological Survey is named the Geological Survey of Bangladesh (GSB). It was established in 1972, with very limited facilities and manpower. In 1980, it became a full-fledged permanent department. The main responsibilities of this department are the exploration and exploitation of mineral resources, their evaluation and other detailed research work on various aspects of geosciences.

## Aims and Objectives

The Geological Survey of Bangladesh (GSB), under the Ministry of Energy and Mineral Resources of Government of the People's Republic of Bangladesh, has the following general aims and objectives:

- To carry out detailed geological mapping on a scale of 1:50,000 all over the country and to collect geoinformation in order to produce comprehensive reports and maps that guide geoscientists in the exploration, exploitation and development of mineral resources.
- To carry out geological, geophysical and drilling activities for mineral exploration, as well as to carry out feasibility studies and to determine the reserves of mineral deposits.
- To carry out laboratory analysis of geological findings—rocks, minerals, fuels and so on—to determine the mineralogical and chemical composition, and consequently the quality for use in development activities.
- To carry out research work on stratigraphy and biostratigraphy to determine the stratigraphic sequences of rock formations, their ages, paleoenvironment and condition of deposition, and to correlate them with each other locally, regionally and globally in the search for mineral resources.

- To provide valuable geoinformation to other organizations regarding environmental issues, water logging, salinity, purity of water, quality of construction materials, etc.
- To render advisory services to other governmental and non-governmental organizations regarding engineering works such as dams, bridges, roads and highways, industrialization, urbanization and all other aspects related to geoscientific activities.
- To carry out research work on the overall geo-infrastructure of the country, including the coastal areas.

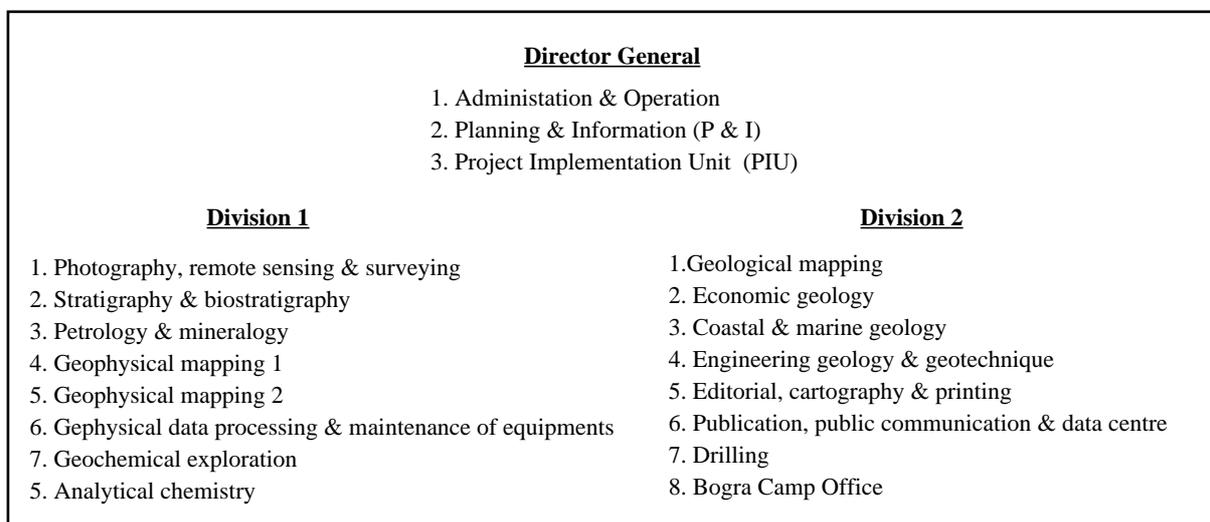
In addition, this department gives suggestions to and assists the government in defining and formulating policies regarding the conservation of natural resources and the environment.

The above-mentioned aims and objectives are implemented through 19 Branches along with 6 research-oriented laboratories under two Divisions. The organizational structure of this department is shown in Figure 1.

## Achievements

The Geological Survey of Bangladesh, since its inception to the present, has a proud record of achievements. So far, it has discovered valuable mineral resources such as limestone, white clay, glass sand, construction materials, peat, coal and hard rock in Bangladesh (Figure 2), the market value of which is US\$133296 million (MEMR/GSB). Major mineral resources discovered by the GSB, along with their locations, estimated reserves and values are shown in Table 1.

Discoveries of huge deposits of coal and hard rock at shallow depths are a blessing for the nation, because full-fledged mining of these mineral resources will open a new era for Bangladesh to enter the industrial world. The total reserves of coal at Barapukuria, Khalaspir and Jamalgonj is about 1496 million tons, the market value of which is about US\$89760 million. There are huge reserves of hard rock at Maddhyapara, and steps have been taken to extract 115 million tons, the estimated value of which is US\$2849 million (Table 1). These are great achievements for the nation, and proper utilization



**Figure 1** Organizational structure of the Geological Survey of Bangladesh.

tion of these resources will help to reshape the country's socio-economic infrastructure and lead to the development of a sustainable society.

The mining of coal and hard rock at Barapukuria and Maddhyapara, respectively, of Dinajpur District is now going on. It is expected that from 2001 full-fledged extraction of coal will start, and the target of extraction of coal per year is 1 million tons, the market price of which is US\$90 million. In addition, US\$45 million will be saved in foreign currency. The Barapukuria coal, which is of high-quality bituminous type having calorific value of 25.68 MJ/kg (11040 BTU/lb) with low sulfur content, is good for combustion to produce power.

Seventy percent of the coal will be used for power generation, and for this purpose a plan has been made to build a coal-fired power station having 250 MW capacity at Sherpur Village near the Barapukuria coal-field. As a result, the electrification problems of northern Bangladesh will be solved, and both industrial and agricultural sectors will benefit from these electrification facilities. The other 30% of the coal will be used for domestic, industrial and other purposes.

The target of initial extraction of hard rock from the Maddhyapara hard rock mine is 1.65 million tons per year. And as a result, foreign currency equivalent to US\$30 million will be saved per annum. This rock will be used as materials to construct roads and highways, bridges, dams, river dykes and embankments, commercial buildings and housing apartments. It will also be used for flood control, railway ballast and sleepers, decoration pieces, tiles, etc. The chemical composition of some of the hard rocks of the Pre-Cambrian basement complex of Dinajpur District shows the presence of a significantly high content of some valuable metals such as copper (120 ppm), lead (400 ppm) and zinc (530 ppm), as documented by Hussain & Curtin (1995). Proper recovery of these metals can make a significant contribution to the economic growth of the country.

Exploitation of coal from Jamalganj in Bogra District and Khalaspir in Rangpur District is not considered to be economically feasible, as the deposits are too deep. But, methane gas may be extracted from these coal fields, and for this purpose a pilot project has been undertaken to examine the possibility of extraction of gas from the Jamalganj coal field (Hussain, 2000). In 1995–1996, another potential coal field was discovered by the GSB at Dighipara (Nawabganj) in Dinajpur District, and the coal was reported to be at a depth of 327 m, the extraction of which is considered to be economically viable. Necessary steps have been taken by the GSB to determine the reserves of coal of this field.

Limestone in the Joypurhat area of NW Bangladesh discovered by the GSB is of good quality and suitable for cement production. As long ago as 1978 the mining of limestone was going on there, with

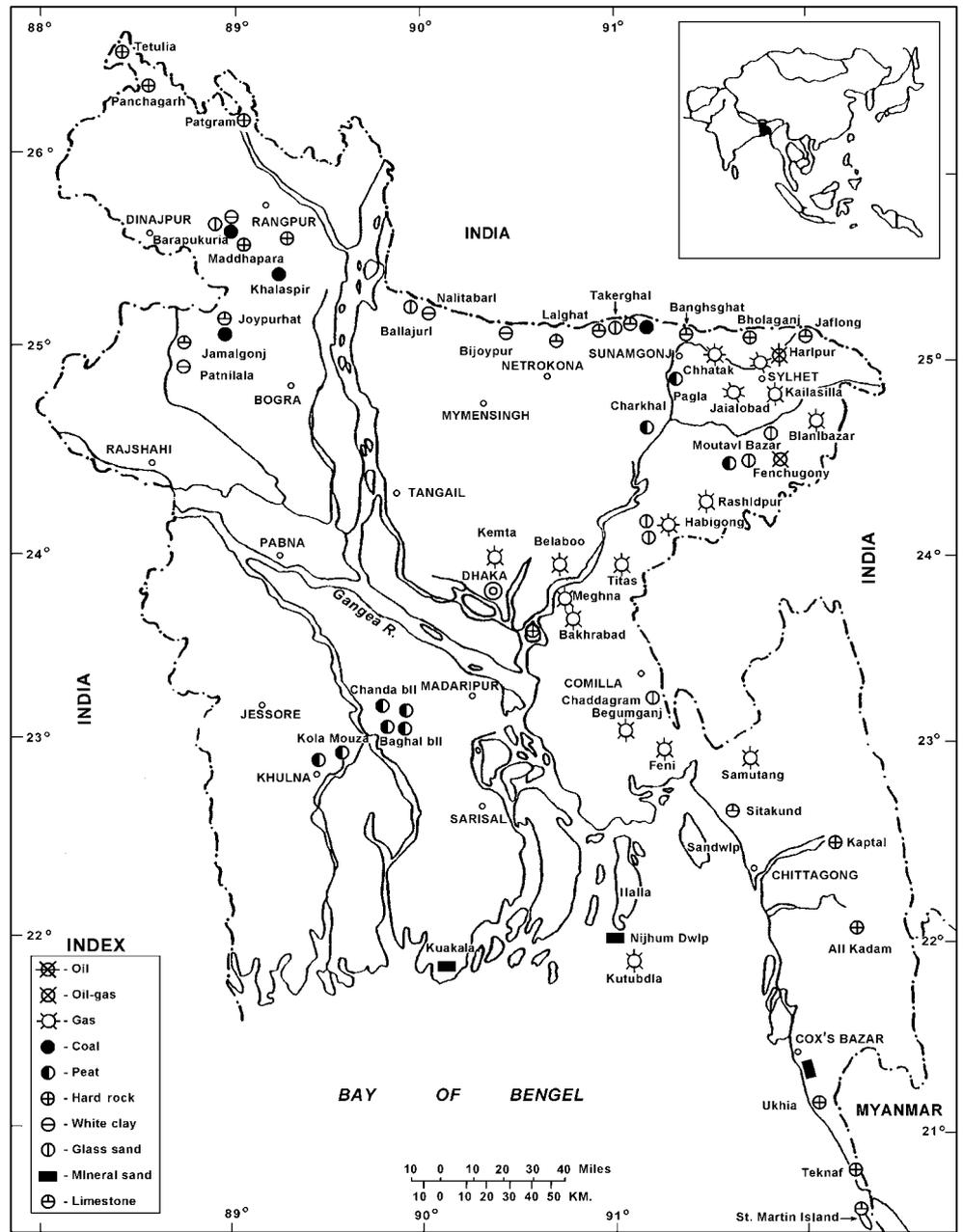


Figure 2 Mineral deposits of Bangladesh. (Source: Akhfar & Hasan, 1995)

the target of extraction of 1 million tons per year. But later on it was postponed considering the fact that the extraction of limestone and the use of that limestone to prepare clinker and then cement would not be feasible. Alternatively, the extraction of limestone is now under consideration and the possible target of extraction will be 2 million tons instead of 1 million tons (Hussain, 2000). The present cement demand of the country is 4 million tons per year, and the extraction of 2 million tons of limestone per year will bring substantial economic benefit to the country. Limestone detected from different parts of the country by the GSB can reduce the import cost, with proper planning.

The general quality of glass sand of Bangladesh is of medium grade, except for some which are comparatively free from impurities and good for making colorless glassware. Glass sand is being extracted in some areas and used as raw materials for the manufacture of glassware and glass sheets. White clay or china clay is also being exploited in different localities and used as raw materials in different ceramic industries of the country to produce ceramics, tiles,

**Table 1 Major mineral resources discovered by the Geological Survey of Bangladesh.**

<b>Mineral resources</b>	<b>Location</b>	<b>Reserves million tons</b>	<b>Market value million tons</b>	<b>Remarks</b>
Coal	Jamalganj	1053.00	89760	Mining development of coal in Barapukuria is going on.
	Barapukuria	300.00		
	Khalaspir	143.00		
	Dighipara	-		
Peat	Chanda-Baghia bill	150.00	5122	Extraction of peat is going on from Kola Mouja and is being used for various purposes.
	Koula Mouja	8.00		
	Chatal bill	6.21		
	Sunamgonj	3.50		
	Mauvi Bazar	3.00		
Limestone	Joypurhat	100.00	1819	Extracted mainly from Takerghat and is being used in the Chhatak Cement Factory.
	Bagalibazar	17.00		
	Takerghat and Laighat	12.90		
China clay	Barapukuria	25.00	6375	Extracted mainly from Bijoypur area and is being used in making ceramics, tiles, etc.
	Bijoypur	2.50		
	Maddhapara	15.00		
Glass sand	Barapukuria	90.00	13950	Glass sand is being extracted mainly from Chaddagram and used in glass-making industries.
	Maddhyapara	17.25		
	Noapara-Shahji-Bazar	8.00		
	Chaddagram	0.30		
	Balijuri	0.70		
Hard rock	Maddhyapara	Unlimited recoverable reserves: 115 million tons	2489	Mining development is going on.
Construction materials	Bholaganj	4.00	95	Construction materials are being used from these places, especially from Bholaganj area.
	Panchagarh-Tetulia	2.50		
	Patgram	0.88		
	Chittagong Hill Tracts	1.00		

(Source: MEMR & GSB)

etc. Good quality glass sand and white clay have also been recorded in Barapukuria and Maddhyapara in Dinajpur District, in NW Bangladesh, as revealed by a number of bore holes. The living standard of any nation is a measure of the productiveness of its hidden mineral resources, and the proper utilization of these resources is one of the key factors for the growth of the national economy. But the basic factor behind the exploration and exploitation of hidden mineral resources is sound economic condition, and that is the major drawback for developing countries like Bangladesh.

The Geological Survey of Bangladesh is mainly engaged in finding more and more solid mineral resources for the greater benefit of the nation. During the period 1997–2000, the GSB drilled and found the presence of limestone at Dhamurhat in Noaga District, and some metallic minerals (?) which need detailed examination before confirmation at Matharpur and Voktipur in Rangpur District. So far, the GSB has mapped an area of 56,000 km<sup>2</sup>, including a coastal area, out of the total land area of 148, 398 km<sup>2</sup> of the country on a scale of 1:50,000.

Besides its normal routine research work and publication of these findings, the GSB, in cooperation with the United States Geological Survey (USGS), has published three maps of Bangladesh on a scale of 1:1,000,000 under the project "Accelerated exploration for mineral resources and modernization of the Geological Survey of Bangladesh", financially supported by the Asian Development Bank in 1985–1990. These maps are: a) Geological Map of Bangladesh, b) Bouguer Gravity Anomaly Map of Bangladesh, and c) Aeromagnetic Map of Bangladesh. For its great contributions to the nation, especially for discovering shallow coal-fields and hard rock, the

GSB has been recognized as a leading scientific organization, and was honored with an Independent Award of Bangladesh.

## Conclusion

The development of a modern civilized industrial world is dependent mainly on the finding of more and more mineral resources and their proper utilization in all sectors of society. The Geological Survey of any country, in this respect, plays the most vital and dynamic role in exploration and exploitation of all sorts of mineral resources. Not only that, Geological Surveys also supply valuable geo-data to other organizations through producing comprehensive reports and maps. They also render advisory services to society regarding geohazards; natural resources and their proper conservation; and information about all kinds of environmental issues, waste disposal, urbanization, and so on. These types of contributions clearly demonstrate that geological survey is a unique organization that greatly helps to build up the sustainable society of a nation.

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