

# Technical Consultancy, Mining Research & Publication Division

## highlights

*The Technical Consultancy, Mining Research and Publication (TMP) Division was established in IBM with the objective of providing services to the Mining Sector in general and small mine operators in particular.*

*As the Manufacturing Sector of India grows, mining would occupy centre stage in the growth process. A lot of investment is expected to flow into the Mining Sector.*

## 7.7 TECHNICAL CONSULTANCY, MINING RESEARCH & PUBLICATION DIVISION (TMP)

### 7.7.1 Introduction

The Committee examined the relevance of technical consultancy services offered by IBM to the Mineral Industry in today's context. For the purpose, the background and the genesis of creation of TMP Division in IBM was analysed. In pursuance of the recommendations of the Mukherjee Committee (1966), the Government revised the functions of IBM by reorienting the emphasis on regulation and adding a new function to provide technical consultancy services to Mining Industry. This was in line with the views expressed by Mukherjee Committee which averred that after agriculture, it is mineral development and mineral exploitation that should receive prior attention of the Government and also the highest priority in matters of allocation of funds. For scientific development and exploitation of the mineral wealth of the country, establishment of a dynamic and well-organised Bureau of Mines was considered absolutely essential. IBM, therefore, had to shift its emphasis from routine bureaucratic administration to building up of important services, particularly, in areas, such as,

- a) Applied Research leading to technological improvement in all directions;
- b) A Consulting Engineering to provide technological assistance to the Mining Industry.

Accordingly, the Technical Consultancy, Mining Research and Publication (TMP) Division was established in IBM with the objective of providing services to the Mining Sector in general and small mine operators in particular.

### 7.7.2 Services Provided by TMP Division

Beginning from the preparation of geological appraisal of mineral deposits, the technical services have been diversified to undertake preparation of detailed feasibility reports of mining and ore dressing projects, financial analysis for loan requirements of mining projects based on detailed project reports prepared by other consultants, etc. The Technical Consultancy Cell offers services in survey, exploration, geology, mining feasibility studies, techno-economic evaluation and environment related issues. The Mining Research Cell undertakes research

investigations in geotechnical projects and environment whereas Publication Cell brings out Monographs and Bulletins on topical interest. The clientele for this service includes all kinds of lessees, such as, large, medium and small mine owners, State and Central public sectors, mining corporations, financial institutions, manufacturers of explosives, engineering consultants like Engineering Projects India Limited, MECON, etc.

An Indo-French collaborative project on "Development of Application Techniques in Relation to Environmental Management in Mines and Waste Resources" was carried out in Mining Research Cell in association with BRGM, France. The aim of this project was to enhance IBM's capabilities to assess existing potential impacts of mining operations and develop site-specific mining solutions, commensurate with acceptable level of environmental impacts and continual economic operational needs of technical, legislative and socio-economic conditions of India. The project took up the study in chromite mines at Sukinda valley and iron ore mines of North Goa. In both these areas, Regional Environmental Impact Assessment (EIA) and mitigation measures were studied. This involved transfer of state-of-the-art technology. The project also addressed development of process for waste utilisation and neutralisation of toxic mine waste of chromite mines of Sukinda valley, Odisha.

Mining Research Cell has also carried out research work on promotional basis. Recent examples of research work carried out by MR Cell are:

- S&T Project on Evaluation of Pollution Levels in Asbestos Mines and Processing Plants for lifting ban on Asbestos Mining.
- S&T Project on Attenuation of Hexavalent Chromium in Sukinda Chromite Belt by Bio-remediation Technology in collaboration with Utkal University, Bhubaneswar, Odisha.
- Regional Environmental Impact Assessment in the cluster of Limestone Mines at Mehgaon Nanhwarra Limestone Belt, Katni District, Madhya Pradesh.

### 7.7.3 Continuing Relevance of TMP Division

The Committee dwelt on the work done by TMP Division and felt that the objectives of providing technological assistance and technological improvement to Mining Industry which was recommended by the Mukherjee Committee and that which led to setting up of TMP Division, is still relevant.

The Committee feels that to realise the goal of accelerated economic growth, the Manufacturing and Industrial Sectors should grow. Rapid growth of Manufacturing Sector is possible only if there is abundant supply of minerals and mineral-based products. Obviously, growth of the Mining Sector is then essential to accelerate the growth of the Manufacturing Sector. For the Manufacturing Sector of India to grow, mining should occupy the centre stage in the growth process. A lot of investment is expected to flow into the Mining Sector in view of the strong domestic demand in





infrastructure projects and climbing LME prices. Against such a backdrop, techno-economic valuation in mining assumes significance and needs to be reviewed at short intervals in view of the rapid changes in associated industry clusters.

In mining, each and every mineral deposit of a given commodity is a truly unique occurrence in relation to its particular geological controls, its inherent physical and chemical properties, the quality of mineral that it contains, its applicable extraction and processing methods and its geographic location with respect to markets for its products. The four main uses of mineral property valuations are:

- to highlight the value, viability and inherent uncertainty of a project;
- to provide economic, technical and operational guidelines for exploitation of the property;
- to form the basis for decisions relating to acquisitions, project financing, regulatory factors and taxation considerations; and
- to offer the management the flexibility to improve operating standards and control operating variances.

Mining operations have to necessarily undergo through the stages of exploration, project conceptualisation, development and exploitation coupled with progressive mine closure. In all these stages, techno-economic evaluations are important to keep mining operations at optimum and viable economic levels. Prospecting and exploration are progressive in nature. As exploration progresses and boundaries of mineralisation are known, its degree and measure of intrinsic economic value also needs to be ascertained as per UNFC norms during the advancing stages of geological assessment. In UNFC, apart from geological assessment, feasibility assessment studies leading to degree of economic viability (Economic and Potentially Economic) are important parameters for the categorisation of reserves and remaining resources. Such feasibility studies include viability of exploration, development, exploitation of minerals, beneficiation, environmental and mine closure and CSR proposals. The quantum of investment, therefore, needs to be estimated based on expected rate of return. In this context, techno-economic evaluation inter alia socio-economic concerns assume importance in any mining project. These are to be addressed under detailed feasibility studies as required at nascent, pre-production and running stages for sustainable development.

In today's era of mergers and acquisitions of mining property rights in view of liberalisation, privatisation and globalisation, techno-economic & feasibility studies have added importance. At the same time, techno-economic evaluation would also be useful for mining companies for registering with stock exchanges and for public issue. Together all this would mean high priority to techno-economic analysis of mining. Therefore, IBM should continue to render services in the capacity of independent technical advisor, for which it has to undertake pre-feasibility, detailed feasibility study and preparation of DPR. IBM can also undertake Resource Appraisal

and Analysis of mineral deposits for corporate and public sectors, multinational companies (MNCs) in domestic and other developing countries, to designate their mineral properties through various classification viz UNFC, JORC, CRISCO, CIM, SME, IGI, EFG, etc. on clientele basis. Such information constitutes an integral part in the presentation of the business profile of these organisations, especially in the media.

The Committee is also of the opinion that while the organised sector of the Mining Industry of the country has technical manpower and expertise at their disposal, they would still need independent technical advice of the nature as rendered by Technical Consultancy Cell. The small and medium sector Mining Industry also needs technical guidance for UNFC compliance with regard to resource evaluation and sensitisation to techno-economic parameters for sustainable development. The National Mineral Policy observes that the small-scale mining may lead to sub-optimal mining and ecological disturbance caused due to such mining need to be addressed. It therefore advocated efforts to promote small-scale mining of small deposits in a scientific and efficient manner while safeguarding vital environmental and ecological imperatives. IBM shall render technical consultancy to evolve method of cluster mining approach in contiguous small leases comprising of consortia or co-operative societies of miners to ensure optimum recoveries, instantaneous sub-grade disposal, market linkages, simultaneous reclamation plans. The National Mineral Policy also lays emphasis on research and development in Mineral Sector which it states should encompass the entire gamut of activities from geological survey, exploration, mining, beneficiation, concentration techniques of minerals to development of end-use materials. It stressed upon efforts for development of new technologies for conversion of existing mineral resources (of modest to potential economic value) into viable economic resources for sustainable mining.

It was also felt that with gradual depletion of surface and sub-surface high-grade mineral deposits and discovery of deep seated deposits, future thrust of mining would shift from opencast to underground in case of high value minerals, and also in the cases of minerals that are imported. Underground mining would need more technological solutions for safe, optimum and economic mining activities for which the services of TMP Division would be relevant. Therefore, the Committee recommends continuation of technical services by IBM and its further strengthening.

The term 'Economic' in sensu stricto encompasses technical, environmental, infrastructural, rehabilitation, legal, administrative and social concern for sustainable development in Mining and Mineral Sector. Apart from technical evaluation of mining projects, it is equally important to evaluate its economic viability not in suo motu but verification from other agencies at federal level with more transparency. Necessary knowledge in economic evaluation will equip IBM to prepare bankable schemes. Therefore, the Committee recommends that officers of TC Division should be deputed to undergo training at recognised centres in order to familiarise themselves with the principles and procedures for project appraisal and to study "Mineral Resource Management" themes designed in assistance with

## highlights

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*Underground mining would need more technological solutions for safe, optimum and economic mining activities — for which the services of TMP Division would be relevant.*



highlights

Institution of national or international reputed like IITs, IIMs, ISM etc. through long-term training course module — keeping in the view sustainable development and growing socio-economic concern.

**7.7.4 Applied Research in Mining**

The Committee observed that although Mining Research Cell is meant for carrying out research investigations, its working area is more on providing consultancy for mining environment and geotechnical investigations. Though a few research projects have been undertaken by Mining Research Cell in the past, its predominant work, however, was in the area of consultancy. The main thrust of mining research by IBM should be research oriented towards improvement of recoveries of minerals and efficiencies in operations, and finding solutions for special mining problems which have a bearing on conservation, systematic development of minerals and environmental problems in mining areas. The Committee feels that there are many emerging areas, such as, development of underground stoping methods for soft and friable minerals, development of mining method for deep-seated deposit, development of environmental performance indicators for mineral specific mining areas, development of industry specific mining software, etc. where IBM can render effective service to the Mining Industry.

The Committee observed that there are several instances where ecological and environmental concerns are raised due to mining and mineral processing activities. The environmental consequence of various mining and mineral processing operations, therefore, needs to be evaluated in scientific manner. In this context, the National Mineral Policy 2008 advocated designing of a framework for sustainable development (SDF). The SDF was therefore planned in a way that it takes into account the biggest issues facing the Sector in the context of existing laws and regulations and laid down principles that collectively, would lead the Sector towards sustainable development. It incorporated not only regulatory requirements, but also recommends practices and best-in-class aspects to address the challenges of sustainable development. It provides a path towards achieving sustainable development aided by guidance steps, measurable outcomes and reporting and assurance. The approach of the framework is flexible and allows for achievement of sustainable development objectives without being too prescriptive and formulaic. The Committee, therefore, recommends that the Mining Research Cell should also look into the capacity development for SDF implementations by undertaking studies in the areas of infrastructure related issues, HRD issues, regarding requirement of skilled manpower for the Mineral Industry, quality of engineering education, reclamation & rehabilitation of mined out areas, rehabilitation & resettlement of project-affected population, community development, public consultations, CSR activities, socio-economic impacts etc. Hence, the Committee envisages a greater role for Mining Research Cell in the area of mine environment and its development.

The Committee in cognisance of the averments made in the National Mineral Policy 2008 where it is stated that mining methods determine the safety, economy,

speed and the percentage of extraction of the ore reserves from a mine, advocates R&D especially in the areas of rock mechanics, ground control, mine design engineering, equipment deployment & maintenance, energy conservation, environmental protection, safety of operations and human engineering. Therefore, the Committee feels that the Mining Research Cell should also take up R&D projects in some of the thrust areas identified in NMP and act as a catalyst for advocacy of mechanisation, computerisation and automation by undertaking appropriate research investigations. The Committee further added that Regional Environmental Studies in various mining clusters for collective reclamation & rehabilitation, immediate restoration of ecologically fragile areas, evaluation of techniques for Zero-waste mining etc. also must be rendered the requisite thrust.

**7.7.5 Modernisation of Equipment, Hardware & Software**

TC and MR Cell are equipped with various equipment, hardware and software (Table 7.10) for undertaking consultancy projects in the area of Surveying, Geology, Drilling & Blasting, Geo-technical investigations, Environment, etc. However, the Committee felt that many of these equipment, hardware and software are required to be updated in order to provide quality and reliable service to the Industry. Therefore, the Committee recommends modernisation of equipment of hardware and of software in the TMP Division viz feasibility studies and techno-economic evaluation software templates and their development, Electron microprobe for characterisation studies of solid waste, etc. The Committee also feels that apart from updating its own computer, software and IT knowledge base, IBM should also educate the Industry in usage of IT related applications.

**Table 7.10 : Important Equipment, Hardware and Software Available with TC & MR Cell**

**Environmental:** Electronic Weather Station, Wind Monitoring System, Sunshine Recorder, Ambient Air Analyzer, High Volume Air Sampler, Respirable Dust Sampler, Personal Sampler, Dust Fall Apparatus (DFA), Aerosol Lead & Free Silica Analyzer, Asbestos Fiber Collection Kits, Asbestos Mounting Apparatus (for Preparation of Asbestos slides), Auto Stream Sampler & Analyzer, Portable Water Analysis Kit, Bacteriological Tester, Water Current Meter, Soil Sampling Kit and Noise Level Meter with data logger, Blasting Seismograph.

**Rock Mechanics:** Equipment for estimating/testing strength properties of rocks, Borehole Extensometer, Tape Extensometer and Vibrating -Wire Piezometers, load Cells.

**Survey Equipment:**

- ❖ DGPS
- ❖ Total Station
- ❖ Auto Level and Manually operating instruments

*Although Mining Research Cell is meant to carry out research investigations, its working area is more on providing consultancy for mining environment and geotechnical investigations.*

*There are many emerging areas where IBM can render effective service. Development of underground stoping methods for soft and friable minerals, development of mining method for deep seated deposit, development of environmental performance indicators for mineral specific mining areas, development of industry specific mining software, etc. are few such areas.*



## Restructuring of IBM

(micro-optic theodolite, Dumpy Level, Prismatic Compass)

- ❖ EDM T2 Theodolite

### Computer Software:

- ❖ SURPAC 2000
- ❖ AutoCad-2007
- ❖ Pythagoras (for survey work)
- ❖ Power Topo
- ❖ Lica Survey Office
- ❖ Data Link
- ❖ SKI, SKI -Pro
- ❖ WM-250 for processing of meteorological data
- ❖ MAPINFO software & GPS software
- ❖ Blast ware for processing ground vibration data
- ❖ O1DB software for processing noise ware data
- ❖ "Galena" software for assessment of slope stability
- ❖ "Dips" software for stereonet analysis of joint data
- ❖ Scan air monitoring data collected through environmental van

### 7.7.6 Publication Cell

The work of preparation of monographs on investigations relating to Mining and Mineral Industry was initiated in IBM in 1967. A separate Cell was formed with officers drawn from the Mines Control & Conservation of Minerals Division. The Cell has since brought out monographs on a variety of minerals and a number of bulletins on various subjects. So far 20 monographs on minerals, such as, Iron Ore, Manganese, Bauxite, Limestone & Dolomite, Chromite, Asbestos, China Clay (Kaolin), Copper, Rock Phosphate, Graphite, Magnesite, Barytes, Kyanite & Sillimanite and Talc, Soapstone & Steatite, etc. have been prepared and published under the "Minerals Facts and Problems" series. These monographs have also been revised and updated at suitable intervals with latest information on resource position or changes in exploitation methods. Apart from the publications on mining and allied topics, IBM has also brought out publications on topical interest in the field of mineral beneficiation, chemical analysis and related topics. Some of the important publications and monographs which have been brought out by IBM and that which were well-received by the Mining Industry are listed below:

## highlights

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### Monographs Brought Out by IBM

- Barytes
- Bauxite
- China Clay (Kaolin)
- Copper
- Graphite
- Iron Ore
- Kyanite & Sillimanite
- Limestone & Dolomite
- Magnesite
- Manganese
- Rock Phosphate
- Talc, Soapstone & Steatite

### Bulletins Published by IBM

- Abrasives in India
- Applications of Computers and Information Technology in Indian Non-Coal Mines
- Cable Bolting Practices in Underground Mines
- Compendium of R & D Facilities for Processing of Ores & Minerals in India
- Drilling & Blasting in Metalliferous Mines
- Elements of Mineral Exploration
- Environmental Aspects of Mining Areas
- Explosives in Mining Industries — Some Recent Advances
- Export Potentiality of Selected Industrial Minerals
- Fluorite Mining in India
- Granite
- Gypsum
- Handbook of Indigenously Manufactured Machinery, Equipment and Explosives for Use in Mines
- India's Trade and Export Prospects in Minerals, Metals and Alloys
- Lead & Zinc Mining in Rajasthan
- Manual of Procedure for Chemical and Instrumental Analysis of Ores, Minerals, Ore Dressing Products and Environmental Samples
- Marble Mining in Italy — Scenario in India
- Mica in Andhra Pradesh



highlights

- Ochre
- Precious & Semi-precious Stones in India
- Quartz & Silica Minerals
- Reclamation/Restoration Techniques and Strategy for Mined out Areas
- Slurry Transportation in Indian Mines
- Status of Special Alloy Metals in India
- Tailing Dam Design

7.7.7 Publications on Topical Interest

The Committee observed that the publications of IBM have been well-received by the Industry, various Ministries of the Central Government, State Governments and Research & Scientific institutions. Further, there has been demands from the State Governments and the Industry that publication of monographs and bulletins should be continued by IBM with broader coverage of important minerals. Mechanism for updating of monographs at periodical intervals should be factored into the publication programme. Based on the responses received from the Industry to the questionnaire, more than 90% opined that in addition to monographs and bulletins, IBM should bring out audio-video versions of publications highlighting the efforts made by the Mining Industry in various fields like environmental protection measures, conservation of minerals, corporate social responsibility, community development, energy conservation, etc.

The Committee recommends that IBM should continue bringing out publications in the form of monographs & bulletins and also publications on topical interest, such as, Best practices adopted by Mining and Mineral Industry in the fields of scientific mining, environmental protection measures, conservation of minerals, corporate social responsibility, community development, energy conservation, mineral processing, etc. The Publication Cell should also make attempts to receive feedback from stakeholders regarding contents and quality of publications and to improve its publications in subsequent editions. The publications should not be restricted to print version but should also be brought out in audio and video versions as well. The publications should be made available on IBM's portal for a wider reach and broadening accessibility. It is also opined that under the "Education Theme" for general awareness of masses, particularly, for students, provisions in IBM portal in the form of FAQs, synchronizing various multidisciplinary aspects of geology, mining, beneficiation, mineral economics, environment, Socio-economic concern vis-a-vis explaining mode of functions being discharged by IBM must be provided. The Committee also recommends that IBM bring out a set of guidelines about various statutory requirements so that the Mineral Industry could be in a position for better compliance with the regulation.

7.7.8 National Awards for Mineral Conservation and Environment

The Committee also observed the responses on the questionnaire regarding national level awards in the field of mineral conservation and environment, etc. from the Industry. The general consensus of the Industry was that IBM should institute National Awards in various fields for the Mining Industry on similar lines as that of "National Geo-Science Award" (formerly National Mineral Award), "National Mines Safety Awards". The Committee, therefore, recommends that Publication Cell be entrusted with the responsibility of designing the modalities for inviting applications for National Awards in the fields of Mineral Conservation/ Environmental Protection/Corporate Social Responsibility/ Mine Closure etc. and processing of such applications.

7.7.9 Showcasing capability in National/International Exhibitions

International/national events, such as, Prospectors & Developers Association of Canada (PDAC), World Mining Congress (WMC), Industry Meets, Conferences, Symposia, etc. provide good opportunities to showcase the mineral potential of India and for improving the climate for attracting investment opportunities. The Committee feels that IBM should develop a team to participate in such international events for display and dissemination of knowledge and capability of the organisation.

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