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REPORT OF WORKING GROUP

ON

MINERAL EXPLORATION AND
DEVELOPMENT
(OTHER THAN COAL & LIGNITE)

FOR THE XII FIVE YEAR PLAN (2012-17)

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REPORT OF THE WORKING GROUP ON MINERAL EXPLORATION AND DEVELOPMENT FOR THE XIIth PLAN

1. PREAMBLE

Minerals are a valuable natural resource being the vital raw material for infrastructure, capital goods and basic industries. As a major resource for development the extraction and management of minerals has to be integrated into the overall strategy of the country's economic development. The exploitation of minerals has to be guided by long-term national goals and perspectives. Just as these goals and perspectives are dynamic and responsive to the changing global economic scenario so also the national mineral policy and consequent strategies have to be dynamic taking into consideration the changing needs of industry in the context of the domestic and global economic environment. The National Mineral Policy, 2008 (NMP 2008), spells out the different elements of policy, including elements newly evolved, for the development of the mineral resources of the country. The Working Group has considered the issues arising from its Terms of Reference in the light of the NMP 2008 and has made its recommendations accordingly. The constitution and terms of reference of the Working Group are at Appendix to this Report.

2. BASIC FEATURES

2.1 The country is blessed with ample resources of a number of minerals and has the geological environment for many others. To exploit the country's geological potential for the sustainable development of the country, it is important that scientific and detailed prospecting is carried out in search of its mineral resources. It needs to be ensured that regional and detailed exploration is carried out systematically in the entire geologically conducive mineral bearing area of the country using state-of-the-art techniques in a time bound manner. Minerals being a valuable resource, the extraction of mineral resources located through exploration and prospecting has to be maximised through scientific methods of mining, beneficiation and economic utilisation. Zero-waste mining has to be the national goal and mining technology will need to be upgraded to ensure extraction and utilisation of the entire run-of-mines in the most efficient and sustainable manner.

2.2 To achieve both these goals of large scale prospecting and optimal mining, large investments will be required together with the latest technologies in prospecting and mining. The momentum initiated by the NMP 2008, which has seen a large number of legislative as well as non-legislative actions for sector reform and reorienting of priorities based on national interest needs to be taken advantage of by appropriately stepping up investments in key initiatives in the XIIth Plan. In particular, the regulatory environment is likely to be much improved as a result of the new MMDR Act (based on the MMDR Bill 2011) to make it more conducive to investment and technology flows. Transparency in allocation of concessions will hopefully be assured as a result, with better security of tenure to a holder of a concession. Enforcement of mining plans for adoption of proper mining methods and optimum utilisation of minerals will need to be ensured to ensure that there is no waste of resources. At the institutional level, the Geological Survey of India (GSI), the Indian Bureau of Mines (IBM) and the State Directorates of Mining & Geology will need to be strengthened with manpower, equipment and skillsets upgraded to the level of state of the art.

2.3 As the country develops and industry grows, assured availability and proximity of mineral resources will play an important role in giving a competitive edge to Indian

industry in general and manufacturing in particular. The multiplier effect of minerals processed into metals on downstream industrialisation cannot be over emphasised. Value addition must, therefore, be actively encouraged to the extent appropriate with the long term development of the mineral sector. However, such value addition will need to go hand in hand with the growth of the mineral sector as a standalone industrial activity. While appropriate linkages between exploitation of minerals and their end use including the development of industry based on the minerals should be established wherever feasible, a downward curve in an industrial sector using a particular mineral within the country need not be allowed to effect the growth of mining activity for that mineral. Hence employment and tertiary sector spinoffs from both value addition as well as from mining will need to be encouraged so as to maximise the contribution of the mineral sector to the country's gross domestic product. In particular emphasis needs to be given to co-production of by-product metals from base metal ores through process R&D so that the country's needs of so-called Technology Metals and Energy Critical Metals are effectively met, and provide raw material security on the one hand and competitive edge on the other, for the country's manufacturing sector. For the purpose, the Non-Ferrous Technology Development Centre (NFTDC), Hyderabad and Jawaharlal Nehru Aluminium Research Development and Design Centre (JNARDDC), Nagpur will need to be suitably reoriented so as to focus more on process R&D for Technology and Energy Critical Metals.

2.4 One of the major issues of a crosscutting nature which needs to be addressed is the creation of mining infrastructure, which requires a special thrust since the economic efficiency of evacuation of minerals from pit mouth to user point or port or rail head is closely linked to the end use value of the mineral and of the viability of the industry using the mineral. The NMP 2008 states that innovative structures will be devised for developing and financing the infrastructure needs of the mining sector and that assistance through viability gap funding will be extended where required. The policy also goes on to state that the principle of user charges and Private Public Participation (PPP) will be the basis on which mining infrastructure will be built. However to date, progress has been very poor and in the case of rail infrastructure, freight charges for ore (particularly for ore meant for export) is probably cross-funding rail infrastructure in non-mineral areas. The MMDR Bill 2011 provides for a revenue stream to District Mineral Foundation (DMF) for creation of local socio-economic infrastructure, and the XIIth Plan should be used to create PPP models for upgradation of local rail infrastructure with the assistance of the DMF.

2.5 To enable the use of state-of-the-art exploration techniques, scientific mining and optimal use of minerals through ore dressing and beneficiation technologies, it is necessary not only to promote research and development in minerals but to simultaneously establish appropriate educational and training facilities for human resources development to meet the manpower requirements of the mineral industry. The Skill Mapping Report commissioned for the Ministry of Mines by the Confederation of Indian Industry (CII) is a good starting point to address this crosscutting issue which has enormous long-term implications for the growth and development of the sector.

3. ROLE OF THE STATE IN MINERAL DEVELOPMENT

The role to be played by the Central and State Governments in regard to mineral development has been extensively dealt in the Mines and Minerals (Development and

Regulation) Bill, 2011, which attempts to harmonise the regulatory framework with the basic features of the new National Mineral Policy. Accordingly, in future the core functions of the State in mining will be facilitation and regulation of exploration and mining activities of investors and entrepreneurs, provision of infrastructure and royalty and tax collection. This needs strengthening of institutions under the Central and State Governments to enable them to discharge their functions effectively, which under the XIIth Plan needs to be taken up as part of a ‘Sector Reform’ initiative.

4. SURVEY AND EXPLORATION

4.1 The Geological Survey of India (GSI) is the principal agency for geological mapping and regional mineral resources assessment of the country. It is responsible for drawing up action oriented plans towards these ends in close cooperation with all other agencies engaged in this task. The GSI needs to ensure that its regional surveys cover all major geoscientific datasets, including geology, magnetics, gravity, geochemistry, etc. and that in line with best international practices, all pre-competitive data, including spatial data in GIS environment is put out to facilitate entrepreneurs to take investment decisions for exploration and make applications for mineral concessions. Many of these data sets, such as magnetics and geochemistry, though requiring high investment of funds and manpower, give very high returns through discovery of new mineral deposits.

4.2 Based on the new MMDR Bill 2011, mineral concessions are likely to be granted on the basis of bidding wherever the data is adequate for the purpose for the Prospecting stage or Mining stage, as the case may be. It is necessary to equip and position public agencies such as the Mineral Exploration Corporation Limited (MECL), Directorates of Mining and Geology of the State Governments and various Central and State Public Sector Organisations to conduct detailed exploration at State expense so as to enable the State Govts. to adopt the bidding route to a larger extent. In conducting exploration for minerals, special attention should be given by these government agencies to the development of strategic minerals through systematic investigation of potential sources which are difficult to otherwise access. This will require investments (either as grant or as equity) in these institutions to build up capacity to conduct detailed exploration and efficiently use modern technology to locate concealed mineral deposits. In particular, MECL will need to be repositioned to take up exploration for concealed deposits using the new HTREL concession mentioned in para 4.3 below.

4.3 While Government agencies will continue to perform the tasks assigned to them for exploration and survey, the private sector is now the main source of investment in reconnaissance and exploration. To expedite completion of reconnaissance work for the entire country as early as possible, an open sky policy of non-exclusivity for reconnaissance work is proposed to be adopted through the MMDR Bill, 2011, which will incentivize quicker reconnaissance. At the same time to attract large investments and high technology, a new instrument to be known as High Technology Reconnaissance and Exploration License (HTREL) is proposed to be introduced as part of the MMDR Bill 2011. Bulk minerals which do not need risk investment and high technology will not be eligible for HTREL. HTREL is likely to generate large volumes of high quality data, particularly geophysical data, and GSI and State Governments need to invest in IT systems to be able to authenticate, archive and integrate these data sets, including spatial data sets, so that in relinquished areas, constant data enrichment takes place, eventually leading to discovery of more and more mineral deposits.

4.4 Offshore, it is necessary to ensure that India's Exclusive Economic Zone (EEZ) is explored and exploited to the maximum possible extent. The Ministry of Earth Sciences (MoES) and its agencies are entrusted with the task of sea-bed exploration and mining. Cooperation between MoES and GSI needs to be institutionalised so as to achieve this objective within a time bound framework. The task of mapping out the Extended Economic Zone needs to be expedited and completed within the time prescribed by the International Sea Convention so that no area of sea bed mining is lost to the country. GSI is in the process of acquiring an Ocean Going Research Vessel (OGRV) to replace its current asset, and also needs to invest in another OGRV to meet the challenges of the coming decades when exploration of the seabed for polymetallic nodules, etc. will become more feasible.

4.5 Coordination of the regional exploration work by government agencies is at present being done by the Central Programming Board of the Geological Survey of India. The disaggregated projects are generally discussed in the State Level Committees and other technical forums before being incorporated into the annual programme. Following the recommendations of the NMP 2008, arrangements have been revamped to ensure that projects and programmes are prioritised in line with the national policy goals and are chalked out after taking into account the exploration work undertaken by the private sector. Particular attention will now be given to the survey and exploration of minerals in which the country has a poor resource-cum-reserve base despite having the geological potential for large resources. Minerals for which there is demand within the country either for use or for export after processing will also be prioritized and exploration for lower grade hematite, magnetite, base metals, noble metals, diamonds and high grade Ilmenite will be put on the fast track. To structure this process, budgeting procedures for State sponsored exploration should take into account the metals and minerals on which exploration activities are proposed to be focused. For long-term coordination of exploration effort, it is necessary that the Central Geological Programming Board (CGPB) which currently aims at only optimizing GSI's efforts, should be raised to the level of a National Geological Programming Board (NGPB) optimizing efforts at the sectoral level, including Central agencies such as AMD, CMPDIL, DGH, NIO, etc. as well as State Directorates of Geology and, of course, taking into account the private exploration efforts, particularly, the HTREL. This will enable better conducted survey programmes and improved data sharing. It can also lead to resource sharing of human resources and lab and other R&D facilities.

5. DATA BASE OF MINERAL RESOURCES

5.1 The national inventory of mineral resources will need to be based on a comprehensive and up-to-date review of exploration data which requires an efficient IT application to continuously integrate the interpreted exploration data with the existing data sets in accordance with internationally accepted standards such as UNFC and JORC (and its Canadian equivalent known as 43.101). Investments will need to be made in GSI, IBM and State Directorates for the purpose, and sector regulation at mining stage in particular, has to be made more robust so that data generated from detailed exploration at mining stage, including deeper drilling is adequately reflected in the data of reserves and resources. In line with best international practices a National Geophysical Data Repository and a National Drill Core Library must be created, preferably under or in close collaboration with GSI. In addition, systems will need to be

developed that integrate results of process R&D so that knowledge of techno-economic feasibility of extraction of by-product metals from polymetallic ores can be used in the national interest to produce Technology Metals and Energy Critical Metals, etc.

5.2 Similarly, data on concessions, including status of applications, relinquishment and renewal will need to be systematically maintained, incorporating a spatial data component. This Tenement Registry will give information of both Leasehold Areas as well as Freehold Areas in terms of green field, brown field and relinquished areas including areas given up by the GSI and RP/PL holders as not pursued. The data would be maintained online giving instant information to prospective investors on what is available for reconnaissance, prospecting and mining. Summaries of work done by public agencies will be kept in suitable form in the public domain subject to commercial considerations arising out of bidding processes, etc. As far as possible, pre-competitive data should be freely downloadable and, in fact, should be amenable to value addition at the user end. As already stated, data filing requirements will need to be rigorously applied and all concession holders must be subjected to detailed monitoring in this regard. The lock-in arrangements will need to be foolproof and released data must be integrated with the data generated by the state agencies and made available to other prospectors. The MMDR Bill 2011 already provides a legislative framework for the purpose, and IBM has initiated a pilot project. The project needs to be implemented in the XIIth Plan as a National Tenement Registry, through a Centrally funded initiative, and integrated with the cadastral maps being digitized under the National Land Records Computerization Scheme of the Deptt of Land Resources of Government of India.

6. STRATEGY OF MINERAL DEVELOPMENT

The strategy for development of any mineral should naturally keep in view its ultimate end uses in terms of demand and supply in the short, medium and long term. The guiding principle in the strategy of development of any mineral or mineral deposit at any location shall ordinarily be the economic cost of recovery i.e. extraction cost relative to market price and will hence be determined by the market. To maximise gains from the comparative advantage which the country enjoys, intra-se mineral development should be prioritised in terms of import substitution, value addition and export, in that order. However, a disaggregated approach in respect of each mineral will need to be adopted and a mineral specific strategy will need to be developed and while doing so, the need for appropriate investments in process R&D to be able to extract Technology Metals and Energy Critical Metals etc. for long term raw materials security for the manufacturing industry has to be supported with appropriate funding and incentives.

6.2 As advocated by NMP 2008, conservation of minerals cannot be construed in the restrictive sense of abstinence from consumption or preservation for use in the distant future but as a positive concept leading to augmentation of the reserve base through improvement in mining methods, beneficiation and utilisation of low grade ore and rejects and recovery of associated minerals. This is because the world over, experience has shown that as mining develops, the associated rise in exploration expenditure actually results in discovery of new deposits often far more than what was extracted. Over time, the grades may go down, and extraction costs may rise as accessibility becomes more expensive, but since the process occur in a globally networked context, preserving high grades for the future and denying oneself access to resources critical for current growth may be counter-productive particularly at moments when growth momentum needs to be built up to a level where it can become self-sustaining.

6.3 Side by side, there has to be a recognition of zero-waste mining as the ultimate goal and a commitment to prevent sub-optimal and unscientific mining. Mining Plans must ensure this, and non-adherence to the Mining Plan based on these parameters must carry repercussions for which regulatory agencies will need to be adequately equipped. Mineral sectoral value addition through latest techniques of beneficiation, calibration, blending, sizing, concentration, pelletisation, purification and general customization of product will also need to be encouraged. This is particularly important in iron ore mining as about 80% of the iron ore produced in the country is in the form of Fines and to promote such value addition, fiscal and non fiscal incentives will need to be provided through joint effort of the Ministry of Mines and Ministry of Steel. In particular technologies for agglomeration, pelletisation and direct use of fines to produce steel must be identified and taken up in Mission Mode to achieve the national goal of produce 200 million MT per annum of Steel by 2020.

7. MINING AS AN INDUSTRY WITH LINKAGES

7.1 Mining contributes to the generation of wealth and creation of employment independently and should therefore be treated as an economic activity in its own right and not merely as an ancillary activity of the manufacturing industry. Domestic and metal processing industry receives supplies of mineral resources produced by the mining industry at market prices prevailing from time to time. In order to be assured of uninterrupted supply of the mineral raw material from domestic sources, the user industry needs to be encouraged to develop long-term linkages with the mineral producing units including through a system of equity participation in such mining companies whether at home or abroad. The mineral processing unit should not only get an assured supply of the mineral raw material but should also have close links with the production and marketing agencies of the mineral based end products. Mining as a backward linkage and value addition as a forward linkage, therefore, needs to be encouraged. The new MMDR Bill provides for this in a variety of ways by allowing freer transfer of concessions, including mining leases, and by giving preference to value addition and end use while entertaining bids for mineral deposits. In addition, both the mineral industry and the metal industry need to be facilitated in accessing raw material assets abroad. Indigenous industry for manufacture of mining equipment and machinery also needs to be strengthened. Induction of foreign technology and use of equipment and machinery which improve the efficiency, productivity and economics of mining operations and safety and health of persons working in the mines and surrounding areas needs to be encouraged. Import of such equipment and machinery needs to be freely allowed. In order to improve the competitive edge of the national mining industry, emphasis needs to be laid on mechanisation, computerisation and automation of the existing and new mining units. To encourage this process at home and abroad, participation in international mining events and organizing mining events at home, where investment, technology, equipment and sectoral information dissemination can be the focus, needs to be facilitated by the Ministry of Mines, and given a thrust in the XIIth Plan as part of the strategy of improving raw materials security and technology access.

7.2 The quality and volume of our human resources, including knowledge and expertise at the frontiers of geoscience has already emerged as a bottleneck for the growth of the sector. Existing facilities for basic and specialised training needs to be urgently reviewed and upgraded to ensure that adequately trained manpower at all levels

is available for exploration and the development of mines and minerals. The manpower development programme needs to be suitably reoriented for the purpose. As the mining sector takes off, the country will need more and more mining engineers, geologists, geophysicists, geo-chemists and geo-informatists. A comprehensive review of the sector's manpower was undertaken through a study by CII and educational institutions need to be geared to meeting these needs in the medium and long-term.

8. INFRASTRUCTURE DEVELOPMENT

Mineral deposits generally occur in remote and backward areas with poor infrastructural facilities which often inhibit their optimum development. A major thrust needs to be given to development of infrastructural facilities in mineral bearing areas with special emphasis on Linking Infrastructure. Financial resources available with the District Mineral Foundation (DMF) created under MMDR Bill, 2011 needs to be leveraged to the extent possible through recourse to user charge based public-private-partnership arrangements by providing an institutional framework. The contribution of mineral development to regional and more specifically peripheral development, commensurate with the huge investment in large mining projects, is substantial. In so far as public funding of infrastructure is concerned a much greater thrust will be given to development of health, education, drinking water, road and other transportation related facilities and infrastructure in mineral bearing areas so that an integrated approach emerges, encompassing mineral development, regional development and the social and economic well being of the local, and particularly, tribal population. The provisions in this regard in the MMDR Bill, 2011 are adequate, and need to be put into execution at the earliest.

9. FINANCIAL SUPPORT FOR MINING

Mining is an eligible activity for obtaining financial support from financial institutions. However, at present only those mining projects which have a substantial component of mining machinery, equipment and buildings are being financed. Based on NMP 2008 recommendations and the learning from participation in international events such as PDAC in Toronto, initiatives have been taken to facilitate financing of mine development and also of exploration integral to the mining project. Prospecting being a high risk venture, access to "risk funds" from capital markets and venture funds will need to be facilitated. Early stage Exploration and Mining companies will need to be encouraged and differential listing requirements through segmented exchanges will need to be explored. Equity investment in joint ventures for exploration promoted by Indian Companies must be encouraged, and participation by 'Junior' exploration companies specializing in high technology and advanced geophysical methodologies will need to be facilitated. The HTREL licence included in the MMDR Bill 2011 needs to be supported by schemes such as 'flow-through' shares that manages risk in venture capital based activities in exploration and has proved very effective in Canada and Australia. Formulation of a suitable scheme in consultation with SEBI, RBI, CBDT and Indian Venture Capital Association (IVCA) must be completed within the first year of the XIIth Plan so as to take full advantage of the new HTREL instrument.

10. MINERAL DEVELOPMENT AND ENVIRONMENTAL PROTECTION

10.1 Small and isolated deposits of minerals are scattered all over the country. These often lend themselves to economic exploitation through small scale or artisanal mining.

With modest demand on capital expenditure and short lead-time, they provide employment opportunities for the local population. However, due to diseconomies of scale they can also lead to sub-optimal mining and ecological disturbance. Efforts need to be made to promote small scale mining of small deposits in a scientific and efficient manner while safeguarding vital environmental and ecological imperatives. Regulation of these conditionalities will also need to be tightened so as to control and prevent the growth of illegal mining. Where small deposits are not susceptible to viable mining, a cluster approach must be adopted by granting the deposits together as a single lease within a geographically defined boundary which is usable for purposes of environmental management.. Efforts should be made to grant such mineral concessions to consortia of small scale miners (such as cooperatives) so that such clusters of small deposits will enable them to reap the benefits of economies of scale. In grant of mineral concessions for small deposits in Scheduled Areas, preference should be given to Scheduled Tribes particularly Scheduled Tribe cooperatives. The MMDR Bill 2011 provides for such arrangements, but the IBM and State Directorates of Mining and Geology have to be strengthened to be able to manage the information relating to small deposits and also ensure proper regulation of concessions for efficient mining with less waste and to minimize environmental disturbance.

10.2 Extraction of minerals closely impacts other natural resources like land, water, air and forest. The areas in which minerals occur often have other resources, presenting a choice of utilisation of the resources. Some such areas are ecologically fragile and some are biologically rich. It is necessary to take a comprehensive view to facilitate the choice or order of land use keeping in view the needs of development as well as needs of protecting the forests, environment and ecology. Both aspects have to be properly coordinated to facilitate and ensure a sustainable development of mineral resources in harmony with the environment. Mining activity often leads to environmental problems like land degradation in opencast mining and land subsidence in underground mining, deforestation, atmospheric pollution, pollution of rivers and streams, soil erosion due disposal of solid wastes like overburden and so on, all affecting the ecological balance of the area. Open-cast mining in areas with actual forest cover leads to deforestation. Prevention and mitigation of adverse environmental effects due to mining of minerals and repairing and re-vegetation of the affected forest area and land covered by trees in accordance with the latest internationally acceptable norms and modern afforestation practices needs to form an integral part of mine development strategy in every instance. As advocated by NMP 2008, all mining must be undertaken within the parameters of a comprehensive Sustainable Development Framework which should be so devised as to take all these aspects into consideration. The ideal must be that a miner shall leave the mining area in better ecological shape than he found it. No mining lease can be granted to any party, private or public, without a proper mining plan including the environmental management plan approved and enforced by statutory authorities. The IBM must acquire the expertise to approve Environmental Management Plans (EMP) and conduct Environmental Impact Assessments (EIA), since environmental studies related to mining activities require deep and extensive knowledge from the mining domain side of the knowledge continuum. The intention is that IBM should be able to position itself as the internal environmental regulator as well as the official mining regulator for the sector. A High Powered Committee is already reviewing IBM's functions. The implementation of the recommendations of this Committee must be adequately funded as a priority under the XIIth Plan.

11. SUSTAINABLE DEVELOPMENT FRAMEWORK AND R&R

Mining operations sometimes involve acquisition of land held by individuals including those belonging to the weaker sections. In all such cases a social impact assessment is undertaken to ensure that suitable Relief and Rehabilitation packages are evolved, and the new LARL Bill provides a comprehensive approach to the entire process, which hopefully will go a long way to solve the underlying problem, with long-term implication for the mining sector as well. Appropriate compensation will form an important aspect of the Sustainable Development Framework mainly from point of view of ensuring that the various sectoral policies have their intended impacts. For the purpose, the SDF will be the instrument that will hopefully fill gaps and create synergy and also ensure that there is adequate and effective community engagement at all stages. In particular, in so far as indigenous (tribal) populations are concerned, the Framework will incorporate models of stakeholder interest for them in the mining operations, especially in situations where the weaker sections like the local tribal populations are likely to be deprived of their means of livelihood and life support as a result of the mining intervention with inadequate long-term compensation because their way of life is not fully reflected in the legal framework used for determining some R&R benefits. In areas in which minerals occur and which are inhabited by tribal communities and weaker sections it is imperative to recognize resettlement and rehabilitation issues as intrinsic to the development process of the affected zone. Thus all measures proposed to be taken will need to be formulated with the active participation of the affected persons and local communities, rather than externally imposed. A careful assessment of the economic, environmental and social impact on the affected persons will need to be made as part of the SDF. The SDF first level documentation has already been prepared by the Ministry of Mines. The second level documentation, for use at State level and a third document, as an operational manual for use at mine/lease level will need to be brought out quickly. The MMDR Bill provides that the National Mining Regulatory Authority and State Mining Regulatory Authority will advise the Central and State Govts. on implementing and monitoring the operation of the sustainable development framework, and the District Mineral Foundation is tasked with facilitating the implementation of the SDF. Completing the roll out of the SDF upto mine level must therefore be a high priority during the XIIth Plan.

12. MINE SAFETY

Mining operations are hazardous in nature. Accidents can happen and can result in the loss of life or limb of persons engaged in such hazardous work. Efforts must be directed towards the development and adoption of mining methods which would increase the safety of workers and reduce accidents. Steps need also to be taken to minimise the adverse impact of mining on the health of workers and the surrounding population. While many of these issues are dealt with under statutory provisions including the Mines Act, 1952, there is a need for a systematic approach to health and safety, which enables study of correct practices and can enable recommendations on improvements. Such studies may also need to be made at a Regional level, e.g., to study cumulative impacts over a period of time. The National Institute of Miners Health under the Ministry has a limited mandate in this sector and needs to be reoriented as a “National Institute of Mining Community Health”, so as to subserve a larger purpose, and become part of the SDF initiative. For these purposes, grants may need to be made to the Institute to upgrade its laboratory and field capabilities.

13. FOREIGN TRADE

Minerals continue to be an important source of foreign exchange earnings. The policy of export needs to keep in view the dynamics of mineral inventories as well as the short, medium and long term needs of the country. Efforts must be made to export minerals in value added form as far as possible. The indigenous mineral industry needs to be attuned to the international economic situation in order to derive maximum advantage from foreign trade by carefully anticipating technology and demand changes in the international market for minerals and mineral products. Long-term relationship with countries with complementary resource base (both materials and technology) needs in particular to be developed as part of a well thought out national strategy. Leading mining nations such as Australia and Canada have deep strength in mining and exploration technology and a strong legal and financial services sector based on mining related activities. In both these countries, substantial strength resides in the provincial level since the ownership of the resources as well as the legislative power is devolved there. It is necessary that relationships in the nature of MoU and specific cooperation agreements at G2G, B2B and academic levels are built on a clear recognition of this ground reality. The approach should be to make available mineral based materials to domestic users at reasonable prices as determined by market forces. A long term export policy would provide stability and prove to be an incentive for investing in large scale commercial mining activity. To develop mining as a modern stand alone industry substantial investment is required. Assurances on export of minerals are a key factor for investment decisions particularly on FDI in the sector. The Export Policy should be based on a clear long term strategy for export of minerals taking these aspects and the overall national interest into consideration.

14. FISCAL ASPECTS

As part of the larger process of bringing in investments and promoting efficiency, it will be necessary within the context of the Budget, to design fiscal measures conducive to the promotion of mineral exploration and development including beneficiation and other forms of product refinement. In the context of the changing mineral scenario and the economies of mineral development and products (both at the national and international level), fiscal changes will need to be made from time to time consistent with the general tax structure to incorporate concepts of 'pass through' and 'flow through' to promote venture capital investments in high risk activities such as green field exploration and process R&D. Mineral prices should reflect their value and the royalty structures will also need to be designed to ensure that the producer earns and the consumer pays the true value of the minerals produced and consumed. The fiscal dispensation must generally aim to ensure that adequate compensation is forthcoming to the State in return for the concessions it grants. The new MMDR Bill provides for moderation of royalty in support of certain initiatives, and for bidding processes to better realize a price through an open and transparent process, as also advocated by the Committee on allocation of Natural Resources (Chawla Committee). However, investments in exploration and in regulatory mechanisms are an essential prerequisite for these investments incentives to produce results.

15. RESEARCH AND DEVELOPMENT

15.1 Research and development in the mineral sector has to cover the entire gamut of activities from geoscientific survey, and exploration and mining to beneficiation and co-production of low-concentration strategic metals (particularly as by-products from base metal processing). Efforts will need to be directed towards the development of new technologies for improving the feasibility of conversion of existing mineral resources into viable economic resources. Appropriate technologies also need to be developed to enable indigenous industries to utilize the mineral resources with which the country is abundantly endowed and as substitutes for minerals whose reserves are poor. Indigenous technology has to be upgraded through research and appropriate absorption and adoption of technological innovations abroad. Research and development efforts need to be made to improve efficiency in process, operations and also the recovery of by-products.

15.2 Mining methods determine the safety, economy, speed and the percentage of extraction of the ore reserves from a mine. Research and development thrust needs to be directed specially in the areas of rock mechanics, ground control, mine design engineering, equipment deployment and maintenance, energy conservation, environmental protection, safety of operations and human engineering. While each of these issues is receiving the attention at the institutional level, there is urgent need for IBM (for metallic minerals) and CMPDIL (for coal minerals) to drive the process and incorporate progressively better practices into the domestic mining system. The High Powered Committee (HPC) set up in the Ministry of Mines on IBM is doubtless looking at these aspects and the institutional strengthening of IBM has to be a priority during the XIIth Plan.

15.3 As advocated by the NMP 2008, attention needs be given to beneficiation and agglomeration techniques to bring lower grades and finer particle size material into use. Research organisations, including the Mineral Processing Laboratories of the Indian Bureau of Mines will be strengthened for development of regional level processes for beneficiation and mineral and elemental analysis of ores and ore dressing products. The issue of promoting process R&D (including beneficiation) needs to be considered in depth. While at one level CSIR Labs and IBM can do 'public good' process R&D based on regional samples, deposit-specific process R&D needs to be done by the concessionaire on a commercial basis (though CSIR Labs and IBM can do such work for the concessionaire on a job basis). In intermediate R&D space, where the feasibility of the deposit is the question, process R&D to conduct feasibility studies constitutes a high-risk high-reward situation. IBM or CSIR Labs cannot take up this work and creation of a venture-capital funded process R&D setup (on the analogy perhaps, of the pharma industry and as obtained in advanced mining jurisdictions) is clearly required if the concept of zero waste mining is to be taken to its logical conclusion. Incentives, fiscal as well as non-fiscal, need to be structured based on a detailed study of how the system works in countries such as Australia and Canada, in particular Australia's CSIRO and CRC mechanisms.

15.4 Development of Automated Equipment

To meet the objective of safety and economic production, attention also needs to

be given to the development of robotics, automated equipment and system for mining, especially for deep mining and transportation to surface. The size of India's mines, where 56% of major metallic mineral mines are below 10 ha, has clearly been a major impediment, but the new MMDR Bill, once it becomes law, is likely to result in some rationalization of mine size driven by geological treaties and economic processes, facilitating more scientific mining and use of automation. Local manufacturers of earth moving and mining equipment need to be able to plan for the growth of the industry in the near future, and organize Mining Equipment Industry events, facilitated with Government support to help spread awareness.

15.5 Deep Sea Mining

India is a pioneer investor and has been allocated a mine site of 150,000 square kilometers in the Indian Ocean for exclusive survey and exploration. Deep ocean resources represent an exceptionally large and potentially important mineral resource. Integrated systems for exploration, exploitation, mining and processing of these resources need to be expedited with the development/acquisition of necessary technologies. Appropriate mechanism for coordinating the survey and exploration of Deep Sea Bed Area need to be established by the Ministry of Earth Sciences, and GSI needs to plan during the XIIth Plan period for acquisition of a second Ocean Going Research Vessel to be able to start operations from the XIIIth Plan period.

15.6 Production of Materials of High Purity

For the proper growth of the mineral and metal industry in the service of the nation, research also needs to be directed towards raw materials required for production of materials of high purity for use in advanced technology applications such as semi-conductors, electrical storage devices, magnets, photo-voltaics, lasers, special sensors, high temperature new ceramics, hard and high temperature materials, superconductors, insulators, very thin films, glasses and liquid crystals and metal and mineral fibres. The Non-Ferrous Technology Development Centre (NFTDC), Hyderabad, a non-grant R&D institution under the Ministry of Mines, which was set up by grants from PSUs under the Ministry has done excellent lab scale work on many materials including base metals. Similarly, JNARDDC has done R&D on high purity aluminium suitable for defence and aerospace applications. There are other agencies under Department of Science and Technology and DRDO doing similar similar work on development of high purity material and special alloys. There is clearly a need for an institutional mechanism comprising stakeholders interested in outcomes, to help direct lab scale research and then upscale it to pilot project level and enable commercialization. The mechanism may need to take the form of a not-for-profit company (Sec 25 Company) with adequate funding support, to be able to sponsor research, ensure upscaling and commercialization, and handle issues of IP.

15.7 Coordination of Research Organisations

Research and development activities in the mineral sector are carried out in the national laboratories, educational institutions and R&D units of public and private sector enterprises. Pooling of resources and expertise available in the various R&D Organisations is imperative to meet the challenges and to fulfil the tasks ahead in the mineral sector. Linkages and interaction between the various institutions (private as well

as public) engaged in R&D in the mineral sector need to be strengthened to derive the maximum benefit. Interchange of scientists between institutions needs to be encouraged to accelerate the pace of interaction, and to ensure that research findings are made available to users expeditiously. This has to be done in a holistic way so that inter-linkages are established to the advantage of each stakeholder. To this end the diverse research, development and training initiatives within the public domain need to be reorganised into a single and cohesive R & D and Training Institution of Excellence to be known as the 'National Institute of Mineral Development' which can be under the Indian School of Mines University umbrella, and funded by grant-in-aid during the XIIth Plan period.

16. OTHER ISSUES

16.1 While the main thrust of the deliberations of the Working Group and the Sub-Groups have quite rightly focused on mineral development related strategies, the fact that the Geological Survey of India (GSI) as an organization is within the administrative purview of the Ministry of Mines makes it necessary to bring out many emerging areas of geoscience with implications for science, society and the nation, which the Ministry of Mines as the administrative Ministry may have to take ownership and responsibility. These are discussed below.

16.2 The GSI is not merely a survey and exploration agency in support of the mineral sector, it is a vitally important provider and coordinator of information related to critical issues in the national interest. It must be positioned so as to enable its information to be used for the benefit of science, society and the nation by placing more emphasis on geospatial and multi-disciplinary work, in particular in areas that address the needs of diverse stakeholders in the fields of climate change, biogeochemistry and medical geology, paleo-studies, glaciology and polar studies, planetary studies, sub-surface hydrology, geomorphology, seismology, natural hazards, etc. An overarching mechanism to provide policy direction for geoscience is necessary to drive the process efficiently.

16.3 The future is a world more and more closely interconnected through markets, transportation, communication and interlinking technologies, commonly referred to as 'globalisation'. This has many implications for the national economy some of which are related to resources. On the one hand globalization requires addressing an increasing appetite for information which can be leveraged for a variety of purposes. On the other hand, growth in population and consumption will inevitably place greater stress on natural resources and the environment, forcing science and society to seek more sustainable responses. While no doubt the research agenda of the nation will seek to balance problem-specific research with core research, there an urgent need to set guiding principles to ensure that the balance is not overly weighted in favour of problem-specific research, and in particular, sustained and carefully calibrated funding of 'public good' multi-disciplinary research must be pursued as a national goal.

17. DETAILED RECOMMENDATIONS

The foregoing recommendations are based on the deliberation of the 4 subgroups

set up respectively for Mineral Exploration; Mineral Sector Strategy; Infrastructure and Financing; and R&D and HRD issues. Each of the subgroups have submitted detailed Reports which need to be gone into understand the issued in depth. The Executive Summaries are at Annexure 1 to 4. Based on these recommendations, an 'Implementation Agenda' for the XIIth Plan has been put together which brings out the various implementation elements of the broad strategy that has been carried out in this Working Group Report in Annexure 5. Needless to say, the Implementation Agenda comprises policy and legislative initiatives; cross cutting ideas requiring coordinating processes as well as funding proposals regulatory and governance issues. The devil as always, is in the detail. The Budgetary projection are given in Annexure 6.

18. CONCLUSIONS

Mineral wealth, though finite and non-renewable in the long term, is a major resource for development. The need for a well planned programme of survey and exploration, management of resources which have already been discovered and those which are in the process of discovery and their optimal, economical and timely use are matters of national importance requiring comprehensive planning, adequate funding and coordinated execution. The mechanisms and initiatives proposed by the Working Group for the XIIth Plan should hopefully address these issues to a considerable extent.

APPENDIX-I

I&M-3(24)/2010
Planning Commission
(Minerals Division)

Yojana Bhavan, Sansad Marg,
New Delhi-110001, Dated :23.02.2011

ORDER

Subject: Setting up of Working Group on Mineral Exploration and Development (other than coal and lignite) for Twelfth Five Year Plan (2012-17)

It has been decided to constitute a Working Group on Mineral Exploration and Development (other than coal and lignite) for the Twelfth Five Year Plan (2012-17).

2. The composition and Terms of Reference of the Working Group would be as follows:

Composition

1	Secretary, Ministry of Mines, Shastri Bhavan, New Delhi	Chairman
2	Additional Secretary, Ministry of Mines, Shastri Bhavan, New Delhi	Vice-Chairman
3	Joint Secretary & FA, Ministry of Mines, Shastri Bhavan, New Delhi	Member
4	Consultant (Minerals), Planning Commission, New Delhi	Member
5	Joint Secretary, Ministry of Steel, Udyog Bhavan, New Delhi	Member
6	Joint Secretary, Department of Revenue, Ministry of Finance, North Block, New Delhi	Member
7	Joint Secretary, Department of Expenditure, Ministry of Finance, North Block, New Delhi	Member
8	Joint Secretary(Capital Markets), Department of Economic Affairs, North Block, New Delhi	Member
9	Joint Secretary, Ministry of Commerce, Udyog Bhawan, New Delhi	Member
10	Joint Secretary, Ministry of Shipping(Ports), Parivahan Bhavan, Sansad Marg, New Delhi	Member
11	Director, National Disaster Management Division, Ministry of Home Affairs, New Delhi	Member
12	Director, Ministry of Environment & Forests, New Delhi	Member
13	Adviser, Ministry of Earth Sciences, New Delhi	Member
14	Representative of Railway Board, Ministry of Railways, New Delhi	Member
15	Director, Atomic Minerals Division, Deptt. Of Atomic Energy Mumbai	Member
16	Director General, Geological Survey of India, Kolkata	Member
17	Controller General, Indian Bureau of Mines, Nagpur	Member
18	Deputy Adviser (Minerals), Planning Commission	Member

19	Chairman-cum-Managing Director, Mineral Exploration Corporation Ltd., Nagpur	Member
20	Principal Secretary, Industry & Mines, Govt. of Chhattisgarh, Raipur	Member
21	Secretary, Ministry of Mining & Geology, Govt. of Jharkhand, Ranchi	Member
22	Secretary, Deptt.of Mining & Geology, Govt. of Rajasthan, Jaipur	Member
23	Secretary, Ministry of Mining & Geology, Govt. of Karnataka, Bangalore	Member
24	Secretary, Ministry of Mining & Geology, Govt. of Andhra Pradesh, Hyderabad	Member
25	Secretary, Ministry of Steel & Mines, Govt. of Orissa, Bhubaneswar	Member
26	Director (Research), Association of Indian Universities, New Delhi	Member
27	Director, Indian School of Mines University (ISMU), Dhanbad	Member
28	Director, Non- Ferrous Materials Technology Development Centre (NFTDC),Hyderabad.	Member
29	Director (C.TEMPO), Ministry of Mines, C.G.O. Complex, Lodhi Road , New Delhi-110003	Member
30	Director, Defence Metallurgical Research Laboratory, New Delhi.	Member
31	Chairman-cum-Managing Director, National Mineral Development Corporation Ltd., Hyderabad	Member
32	Director, National Geophysical Research Institute, Hyderabad	Member
33	Director, Indian Lead-Zinc Information Centre, New Delhi	Member
34	Chief Technical Manager, India Copper Development Centre, Kolkata	Member
35	Secretary General, Aluminium Association of India, Bangalore	Member
36	Secretary General, Federation of Indian Mineral Industry, New Delhi.	Member
37	Representative of Confederation of Indian Industries, New Delhi	Member
38	TATA Iron and Steel company, Jeewan Bharati Building, Sansad Marg, New Delhi-110001	Member
39	CEO, Anglo-American, Services (India) Pvt. Ltd.,Unit No.12, IVth floor, Southern park, D-II, District Centre, Saket, New Delhi-110017	Member
40	Managing Director , Rio Tinto (India) Pvt. Ltd., IIIrd floor, The Capital Court, OLF, Palme Marg,Munirka, New Delhi-67	Member
41	Representative of DE BEERS India Private Ltd., No36/A, 2 nd phase Peenya Industrial Area, Bangalore-560058	Member

42	Joint Secretary, Ministry of Mines, New Delhi	Member Secretary
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3. Terms of Reference

Sub group I

- (i) To assess the reserves and resources of all ores/minerals (excluding fuel minerals) as per United Nations Framework Classification (UNFC) system.
- (ii) To review the National Mineral Inventory for identifying gap areas and to suggest corrective measures to improve the quality and standard of information and to assess the balance life of mineral inventory based on consumption pattern of various ores, minerals and evolving a strategy for development and conservation in a perspective of 10 to 15 years.
- (iii) To assess possibilities of zonation or prioritization of mineral resource bearing areas as 'mineral belts' for speedy exploitation of proven and economically viable mineral deposits.
- (iv) To identify technological gaps in mineral exploration (with special emphasis on deep seated deposit) and suggest measures for filling up the gaps and to draw up an exploration strategy for regional and detailed exploration of ores/minerals keeping in view the national priorities demand, (domestic and global), and availability of resources, particularly minerals of strategic importance.
- (v) To suggest strategies for facilitating private sector exploration through provision of easy access to pre-competitive geological and exploration data, including GIS based information and Mining Tenement information.
- (vi) To review the present role of various State and Central Institutions like GSI, IBM and State Directorates of Geology & Mining etc. and suggest enhancements in their role so that these institutions become more effective in facilitating growth of the mining industry in the country through geo scientific partnership.
- (vii) To suggest promotional role of both the Central and State Government agencies in the context of National Mineral Policy, 2008 for mineral exploration particularly for those minerals in which the resource base is poor and for the development of which private sector may be reluctant to invest.

- (viii) To suggest measures to encourage and facilitate offshore mining in the national interest and geo scientific activities.
- (ix) To assess and indicate investment that would be required to be made by the Central and State Governments for promotional exploration in the XII Plan , if deemed necessary to be carried out as a matter of national policy.

Sub group II

- (i) To review the present status of Indian mining industry (excluding fuel minerals) and principal mineral based industries in the country and to assess its international context.
- (ii) To assess demand for minerals/ores/metals and its likely growth during 12th Plan period and in perspective of 15 years at 8%, 9% and 10% per annum GDP growth rate(including demand for minerals for production of high purity material for use in electronics and other emerging technologies).
- (iii) To suggest priority for development of principal minerals in terms of import substitution, value addition and export, in that order, keeping in view the scope for generating employment in the sector.
- (iv) To suggest strategies for acquisition of raw material and technology assets abroad to improve competitiveness, ensure raw material security and help the growth of the Indian mineral based industry.

Sub group III

- (i) To examine the present investment, taxation, and trade policies for the mining sector and to review the actual realization of private investment (including FDI) and suggest structural changes in a way that enables high risk venture capital to flow into the sector along with state-of-the-art-technology, and project investment during the XIIth Five Year Plan and in the perspective of 10-15 years thereafter.
- (ii) To review the status of infrastructure such as roads, ports and railways both physical and financial for the mining sector and assess the requirement during the XIIth Plan period and in the perceptive of 10 to 15 years thereafter; to relate infrastructure creation and revenue generation, particularly for development of

PPP models and to suggest measures to fill up the existing gaps and building up of additional infrastructure; to define the roles of the Central Government, the State Government and the private sector in creating such infrastructure; and develop policies for best utilization of revenues from mineral wealth to be used for the long term development of the sector and the affected population.

- (iii) To assess constraints and problems encountered in exploration and exploitation of mineral resources in tribal, forest areas and to suggest measures in harmonizing mineral development with environment & forest regulation, PESA Act and Forest Rights Act and to suggest changes if any. To suggest measures that need to be taken to promote inclusive growth and at the same time safeguard the interests of the tribal in the areas of the country.
- (iv) To formulate a comprehensive framework for the most sustainable use of the country's mineral resources for national development keeping in view the interests of various stakeholders;
- (v) To assess the magnitude of rehabilitation and reclamation needed for abandoned or closed mines prior to the concept of mine closure plan and financial assurance came into being and to suggest appropriate plans for reclamation & rehabilitation for such mines to give eco-friendly image to mining industry.
- (vi) To examine and assess the socio-economic impact of mining on the life of local inhabitants and to suggest ways and means for improving their living standard.
- (vii) To suggest CSR initiatives and suggest ways of enabling corporate, including Central Public Sector Enterprises improve their corporate image in the mining sector through coordinated CSR efforts.

Sub group IV

- (i) To suggest ways of ensuring modernization, automation and computerization of the mining sector in the interest of scientific mining, safety and productivity.
- (ii) To review the present indigenous R&D set up in mining sector and to suggest strategy for exploiting and beneficiating low grade ores and to suggest measures for adoption of state- of- the- art-

technology in production and beneficiation to ensure zero waste mining in the country.

- (iii) To review the outcome of R&D and training and suggest ways for capacity building for organizations concerned in the mineral sector to meet the emerging geoscientific challenges.
- (iv) To suggest ways of developing centres of excellence in R&D, for both fundamental and multidisciplinary research.
- (v) To review the role of regulatory agencies namely Indian Bureau of Mines and the State Directorates of Geology and Mining and suggest measures for strengthening them through capacity building measures, and use of modern technologies including informatics.
- (vi) To suggest ways for making the governance system more effective in the mining sector; to review current mechanism of prevention and detection of illegal mining across States and suggest possible ways to develop capacities of concerned organizations for detecting, preventing illegal mining by using modern technologies and geo referencing of mining leases in the country.
- (vii) To create institutional mechanism for funding information, Education and Communications initiatives, including content development.
- (viii) To develop global reporting standards and ranking systems for mining companies in mining practices.
- (ix) To review the availability and requirement of human resource in mining sector during the XIIth Plan period and in perspective of 10 to 15 years and to suggest measures for capacity building by training and development of infrastructure for technical education and skill development . Also, to suggest strategy for modernization, updating of curriculum and technology to bring in the state of the art.
- (x) To make such other recommendations as may be considered appropriate.

4. The Chairman of the Working Group may co-opt other officials or non-officials as Members, if considered necessary.

5. The expenditure on TA/DA of official members in connection for attending meetings of the Working Group will be borne by the respective parent Department/Ministry to which they belong as per the rules applicable to them. Non-official members of the Group will be paid TA/DA by the Planning Commission as per SR 190(a) as admissible to Grade-I officers of the Government of India.

6. The Working Group will submit its report by 31st May ,2011.

7. The nodal officer in Planning Commission concerned with the Working Group is Shri L.P. Sonkar, Consultant (Minerals), Planning Commission ([Tel:23096547](tel:23096547)) and any further correspondence/query in this regard may please be made with him.

(G.Rajeev)

Under Secretary to the Govt.

of India

Copy forwarded to:

1. Chairman and all Members of the Working Group
2. PS to Deputy Chairman, Planning Commission
3. PS to MOS (Planning)
4. PS to all Members, Planning Commission
5. PS to Member-Secretary, Planning Commission
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7. Cabinet Secretariat, Rashtrapati Bhavan, New Delhi
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9. Chief Secretaries of All States/UTs
10. Ministry of Finance, Plan Finance Division, New Delhi
11. Accounts I Branch, Planning Commission
12. Information Officer, Planning Commission
13. On the Planning Commission Website.

(G. Rajeev)

Under Secretary to the Govt. of India

APPENDIX-II

Composition of Sub-Group-I relating to mineral exploration, technological gaps in exploration of deep seated deposits, private sector participation in exploration, Mining Tenement System, resource inventorisation, and development of offshore mining.

1	Additional Secretary, Ministry of Mines, Shastri Bhavan, New Delhi	Chairman
2	Director General, Geological Survey of India, Kolkata	Vice-Chairman
3	Director, Atomic Minerals Division, Deptt. Of Atomic Energy Mumbai	Member
4.	Adviser, Ministry of Earth Sciences, New Delhi	Member
5.	Secretary, Ministry of Mining & Geology, Govt. of Madhya Pradesh	Member
6.	Secretary, Deptt.of Mining & Geology, Govt. of Rajasthan, Jaipur	Member
7.	Anglo-American Services Pvt. Ltd.	Member
8.	Rio Tinto (India) (Pvt.) Ltd.	Member
9.	DeBeers India Pvt. Ltd.	Member
10.	Controller General, Indian Bureau of Mines	Member
11.	Chairman-cum-Managing Director, Mineral Exploration Corporation Ltd. (MECL)	Member
12.	Secretary General, Federation of Indian Mineral Industry, New Delhi.	Member
13.	Director (Technical), Ministry of Mines	Member-Secretary

Composition of Sub-Group-II relating to status of Indian mining industry, growth forecasts, import substitution, value addition and exports, strategies for raw material security and technological assets acquisition.

1	Joint Secretary (M&R), Ministry of Mines, Shastri Bhavan, New Delhi	Chairman
2	Consultant (Minerals), Planning Commission, New Delhi	Vice-Chairman
3	Joint Secretary, Ministry of Steel, Udyog Bhavan, New Delhi	Member
4.	Joint Secretary, Department of Expenditure, Ministry of Finance, North Block, New Delhi	Member
5.	Joint Secretary, Ministry of Commerce, Udyog Bhawan, New Delhi	Member
6.	Chairman-cum-Managing Director, Mineral Exploration Corporation Ltd. (MECL)	Member
7.	Chairman-cum-Managing Director, National Mineral Development Corporation Ltd., Hyderabad	Member
8.	TATA Iron and Steel company, Jeewan Bharati Building, Sansad Marg, New Delhi-110001	Member
9.	Director (C.TEMPO), Ministry of Mines, C.G.O. Complex, Lodhi Road , New Delhi-110003	Member
10.	Govt. of Jharkhand	Member
11.	Govt. of Orrisa	Member
12.	Director General of Foreign Trade	Member
13.	Rio Tinto (India) (Pvt.) Ltd.	Member
14.	Representative from IBM	Member
15.	Representative of Federation of Indian Mineral Industry, New Delhi.	Member
16.	Director, Indian Lead-Zinc Information Centre, New Delhi	Member
17.	Chief Technical Manager, India Copper Development Centre, Kolkata	Member
18.	Secretary General, Aluminium Association of India, Bangalore	Member
19.	IBM (Representative)	Member
20.	Director (BN), Ministry of Mines, Shastri Bhawan New Delhi	Member-Secretary

Composition of Sub-Group-III relating to review the present investment, taxation, trade policies and FDI. It has to come out with suggestions for structural changes to attract venture capital, project investment perspectives for 10-15 years, promoting inclusive growth, SDF, R&R policies and Mine closure issue alongwith socio-economic impact by CSR initiatives.

1	Joint Secretary & FA, Ministry of Mines, Shastri Bhavan, New Delhi	Chairman
2	Joint Secretary(Capital Markets), Department of Economic Affairs, North Block, New Delhi	Vice-Chairman
3	Joint Secretary, Department of Revenue, Ministry of Finance, North Block, New Delhi	Member
4.	Joint Secretary, Ministry of Shipping(Ports), Parivahan Bhavan, Sansad Marg, New Delhi	Member
5.	Representative of Railway Board, Ministry of Railways, New Delhi	Member
6.	Deputy Adviser (Minerals), Planning Commission	Member
7.	Secretary, Mining & Geology, Govt. of Chhattisgarh, Raipur	Member
8.	Secretary, Ministry of Mining & Geology, Govt. of Karnataka, Bangalore	Member
9.	Secretary, Mining & Geology, Govt. of Orissa, Bhubaneswar	Member
10.	Secretary, Deptt. of Mining & Geology, Govt. of Rajasthan	Member
11.	Director (C.TEMPO), Ministry of Mines, C.G.O. Complex, Lodhi Road , New Delhi-110003	Member
12.	Controller General, Indian Bureau of Mines, Nagpur	Member
13.	Director, Ministry of Environment & Forests, New Delhi	Member
14.	National Aluminium Company Limited (NALCO)	Member
15.	SBI Capital	Member
16.	Kotak Mahindra	Member
17.	UBS Securities India Pvt. Ltd.	Member
18.	Representative from Barclays	Member
19.	Secretary General, ASSOCHAM	Member
20.	Director (CS), Ministry of Mines, Shastri Bhawan, New Delhi	Member-Secretary

Composition of Sub-Group-IV relating to the policy measures for ensuring modernization, automation in mining sector, development of R&D, strengthening of regulatory agencies, State DGMs, IBM etc. Sub-Group-IV is also to review the availability of human resources, reporting standards, effective governance system

1	Joint Secretary (M), Ministry of Mines, Shastri Bhavan, New Delhi	Chairman
2	Secretary, Mining & Geology, Govt. of Andhra Pradesh	Member
3.	Secretary, Mining & Geology, Govt. of Jharkhand	Member
4.	Director, Non- Ferrous Materials Technology Development Centre (NFTDC),Hyderabad.	Member
5.	Director, Indian School of Mines University (ISMU), Dhanbad	Member
6.	Director (Research), Association of Indian Universities, New Delhi	Member
7.	Director, Defence Metallurgical Research Laboratory, New Delhi.	Member
8.	Director, Indian Lead-Zinc Information Centre, New Delhi	Member
9.	Chief Technical Manager, India Copper Development Centre, Kolkata	Member
10.	Director, National Geophysical Research Institute, Hyderabad	Member
11.	Secretary General, Aluminium Association of India, Bangalore	Member
12.	Secretary General, Confederation of Indian Industries, New Delhi	Member
13.	Deptt. of Science & Technology (DST)	Member
14.	Representative of GSI	Member
15.	Representative of Indian Bureau of Mines	Member
16.	Director (SK), Ministry of Mines, Shastri Bhawan, New Delhi.	Member-Secretary

EXECUTIVE SUMMARY

Sub Group I :- Mineral Exploration and Development

1. INTRODUCTION

- India's geology setup is similar in many ways to that of resource rich countries like Canada, Australia, Brazil, South Africa, Chile and Mexico etc. The share of the mining sector in the GDP of these countries in 2010 ranged from 15.1% to 2.3 %. However, in India mining sector accounts for just 2.2% of the GDP (source: Draft McKinsey Report, 2011).
- Global spending on exploration in 2010 was \$10.68 billion with major share of Canada (18%), Australia (11%), US (8%), Peru (7%), Mexico (6%). The exploration spending (including for oil and gas) in India is around \$ 15 /sq. km. compared to \$ 124/ sq. km. in Australia and \$ 118 / sq. km. in Canada (source: Draft McKinsey Report, 2011).
- Experience in other countries shows that reserves can increase significantly with additional exploration and beneficiation drives by state-of-the-art technology, e.g. Australia's known iron ore reserves increased hundred fold in 40 years from 400 million tonnes in 1966 to 40 billion tonnes in 2005, whereas India's resource base of Iron ore rose from 5000 million tonnes in 1955 to 25,249 million tonnes in 2005.
- National Mineral Policy, 2008 envisaged that the private sector would in future be the main source of investment in reconnaissance and exploration and government agencies will expend public funds primarily in areas where private investment are not forthcoming due to high uncertainties.
- The decline in the availability of non-bulk surficial deposits, on account of exploitation of all known deposits, which have sustained the human civilization over several millenniums, it has become imperative world over to look for deep seated mineral resources and also intensifying exploration in the obvious geological potential (OGP) areas in the country for meeting the ever growing need of the industry.
- Since independence, the value of mineral production increased from a level of Rs. 58 crores in 1947 to Rs.53,793 crores in 2008-09 (excluding fuel minerals) amounting to a growth of 927 times in about 62 years.

2. REVIEW OF ELEVENTH FIVE YEAR PLAN (2007- 2012)

- A. The chief two objectives of the 11th Plan were the following
- Intensification of exploration activities for,
 1. low volume – high value minerals such as gold, diamond, base-metals and PGE; and
 2. augmentation of existing resources in respect of ferrous and non-ferrous and industrial minerals
 - Encourage private sector investment in mineral exploration
- B. On review of the achievements of the Plan period the following areas of concern have been identified:

1. Investments in exploration are grossly inadequate and not commensurate to geological potential of the country.
2. GSI's modernization plan needs to be accelerated to meet emerging challenges.
3. There is an acute shortage of geoscientists in mining sector in general and GSI in particular
4. Impact of increased investment in R&D is not visible and has not resulted in significantly enhanced output

C. The following significant initiatives have been taken during the Plan period to achieve the targets set for the mining sector

1. National Mineral Policy 2008 has been approved by the Government of India on 13.03.2008
2. HPC Report on Functioning of the Geological Survey of India has been presented on 31.03.2009 and recommendations of the HPC are being implemented in a phased manner.
3. Draft MMDR Act has been approved by Cabinet and is to be introduced shortly in Parliament
4. Restructuring of IBM and the proposal of repositioning of MECL are being concretised
5. Modernisation programme of GSI as an offshoot of the HPC recommendations has been taken up
6. The usage of IT in general and Geoinformatics in particular has been vigorously pursued through the Portal Phase I & II of GSI. These have brought about a sea change in data storage, data analyses and data dissemination. The DPR for the Portal Phase III programme is to be finalized shortly.
7. The process of construction/ procurement has been initiated for a new Ocean Going Research Vessel for GSI for seabed survey and exploration for non-living resources etc., as a replacement of RV "Samudra Manthan"

D. Keeping in view the objectives of the Plan and the gap areas identified the following issues were identified for defining the path ahead:

- Need to improve management capacity at Central and State Government levels by:
 1. strengthening scientific and regulatory capabilities of concerned organizations;
 2. improving HRD in terms of trained manpower
 3. computerization in geo-spatial data collection, integration and analyses and also for processing and management of mineral concessions; and
 4. development of SDF
- Formulation of comprehensive framework for sustainable development of country's mineral resources, taking due notice of conflicting interests of various agencies

On the basis of the current status of mineral exploration in India vis-à-vis the global scenario and the review of the XI Plan, the ToRs of the Sub Group 1 have been deliberated and discussed and necessary recommendations presented in the different

chapters. The brief outline of the issues and recommendations of the different chapters are presented below.

3. NATIONAL MINERAL INVENTORY (NMI) (TOR No. ii)

- Preparation of mineral inventory was included in IBM's Charter in 1968 and the first NMI by IBM in 1971 covered 17 important minerals.
- NMI is being updated every five years commencing from 1985
- UNFC codification for NMI was adopted w.e.f. 01.04.2000
- The latest inventory (2005) included 65 minerals which have been grouped as :
 1. Metallic Minerals
 - a) Ferrous Group
 - b) Non-Ferrous Group
 1. Non- Metallic Minerals
 2. Precious & Semi-Precious Minerals
 3. Strategic Minerals
 4. Fertilizers Minerals
- NMI (2005) covers 17195 deposits distributed in:
 - a) 8824 freehold areas.
 - b) 653 public sector leases
 - c) 7641 private leases
 - d) 77 part leaseholders/others
- Provisional figures for 2010 available for 22 minerals.
- As per inventory, mineral commodities are classified as :
 - a) Abundant,
 - b) Adequate
 - c) Deficient and
 - d) Scarce
- Life indices are liable to change with changes in resource inventory, demand & supply position, production pattern, technology development and applications.
- Substantial portion of mineral reserves fall in unclassified, unknown, inferred and reconnaissance categories.

Recommendations / Future Strategy for upgrading the NMI

1. Mission approach needs to be initiated to enhance confidence levels of unclassified, unknown, inferred and reconnaissance categories
2. Special attention has to be paid for exploration and search for strategic, scarce and deficit minerals to reduce imports.
3. Resources are required to be augmented by
 - search for concealed deposits
 - lowering of threshold values
 - conservation of existing resources by (a) zero waste mining (b) improved beneficiation
4. Development in IT has to be leveraged for updating of NMI every two years.
5. JORC system of reporting besides UNFC has to be introduced

4. EXPEDITIOUS EXPLOITATION OF PROVEN AND ECONOMICALLY VIABLE MINERAL DEPOSITS (TOR No.iii)

- ‘Obvious Geological Mineral Potential’ (OGP) of area around 0.57 million sq. km has been divided into the following five major mineral belts
 1. N.E. Peninsular Belt/ Chota Nagpur and Orissa Plateau (Jharkhand, West Bengal and Orissa)
 2. Central Belt (Chhattisgarh, A.P., M.P. & Maharashtra)
 3. Southern Belt (Karnataka Plateau and Tamil Nadu)
 4. S.W. Belt (Karnataka and Goa)
 5. N.W. Belt / Aravalli Belt (Rajasthan and Gujarat)

- From the perspective of the proposed MMDR Act, government agencies may concentrate on these identified zones.

Suggested Road-map for Speedy Exploitation

1. IBM to update online database comprising Tenement Registry and Resource Inventory
2. Investment climate and fiscal regime needs to be improved through the new MMDR Act with special focus on augmentation of exploration activities in priority areas.
3. Fair, transparent and efficient concession granting procedures has to be ensured
4. Reduction and rationalization of clearance granting procedures (forest, environment)
5. Improvement of infrastructure in OGP areas
6. Improvement of monitoring and supervision through State DGMs
7. Utilisation of state-of-art contemporary technology in exploration, besides mining and beneficiation has to be facilitated

5. IDENTIFICATION OF TECHNOLOGICAL GAPS IN MINERAL EXPLORATION (WITH SPECIAL EMPHASIS ON DEEP SEATED / CONCEALED DEPOSITS) (TOR No.iv)

The following gaps in technological and geo-scientific inputs for implementing an accelerated mineral exploration programmes have been identified:

- Absence of detailed structural, geophysical (ground and aero-geophysical) and geochemical data
- Use of obsolete and time consuming drilling equipments and lack of advanced drilling techniques. Outsourcing for these needs to be explored.
- Lack of off-shore mineral exploration techniques
- Lack of application of advanced beneficiation technological know how
- Technical deficiency in application of multivariate statistical analyses, interpretation and multi-thematic / multidimensional modeling
- Leading edge mineral exploration technologies need to be applied. Some of these are:
 - (i) The hyperspectral remote sensing and Geomorphological - Lineament mapping for prognostication and identification of mineralized zones.

- (ii) 3-D seismic surveying which provides detailed geological and mineral mapping capability at both a regional and project scale facilitating improved selection of prospective terrain and an accelerated exploration cycle.
- Absence of data and interpretation of low-altitude multisensor airborne surveys with software support for data synthesis and interpretation aimed at anomaly location
- Lack of Application of geochemical surveys particularly of gas collection (nano -gas collection) for identification of sulphide deposits and energy resources
- Need for specific and high precision laboratory studies aimed at guiding and substantiating field studies pertaining to ore localization

Remedial Measures for bridging Technological Gaps

The remedial measures envisaged and planned for filling the geoscientific and technological gaps are as below:

1. Interpretation of integrated geological, geophysical and geochemical data
2. Software for prognostication of anomalies for search of deep-seated deposits
3. Acquisition, Integration and Interpretation of low-altitude multi-sensor airborne survey data through a National Aeromagnetic Survey Programme
4. State-of-the-art ground geophysical techniques e.g.
 - 3-D Seismic Surveying
 - Magnetotelluric Surveying
 - Borehole Resistivity and gravity surveying
 - Spectral IP Methodology
5. High Resolution Hyper-spectral airborne / satellite imageries
6. Advanced drilling techniques such as Reverse Circulation, Rotary Air Blast, Controlled Deflection, combined coring/non-coring
7. Off-shore exploration techniques applied at closer intervals
 - Multi-beam bathymetry
 - Multi-channel Seismic, magnetic and gravimetric
8. Develop Concept based models of mineral belts by integrating all the available geoscientific data of the mineral belts comprising
 - Systematic and Thematic Mapping at progressively larger scale
 - Geomorphological and structural studies
 - Geochemical surveys
 - Aeromagnetic survey
 - Ground geophysics
 - Hyperspectral studies
9. Detailed Geological Mapping , Drilling and 3 D geological modeling at larger scale
10. Ground Geophysics
 - 3D seismic surveying – useful for deposits such as VMS, SEDEX, MVT, IOCG, lode and porphyry copper-gold, kimberlite pipes and uranium in association with unconformities
 - Borehole Resistivity Tomography – for VMS, SEDEX and IOCG type deposit
 - Borehole Gravity for expanded search radius
 - Spectral IP Survey

Besides the issues listed above the identified necessary back-up and support in terms of capacity building and training required for enhancing exploration activities in the country are enumerated below.

1. Research-Development – Installation and operationalisation of advanced laboratory techniques
2. I.T. Delivering System : Database building and information sharing among exploration agencies
3. Human Resource Development in
 - Geospatial Surveying
 - Ore Deposit Modeling
 - Geostatistical Techniques and multivariate analysis
 - 3D/4D integration and interpretation of geological, geochemical and geophysical data for multi-thematic, multi-dimensional modeling for deep, concealed deposits
 - Acquisition, processing and interpretation of high resolution geophysical data

6. FACILITATING PRIVATE SECTOR INVESTMENT IN MINERAL EXPLORATION (TOR No.v)

- Legislative framework to be built so as to incentivise exploration activity
- Exploration companies to be encouraged through priority in grant of concessions, seamless transition and security of tenure and free transferability of concessions without the need of stage-wise approval
- Allow listing of exploration companies on stock exchange and introduce concept of flow-through shares
- Fiscal and taxation regime to be reviewed and rationalized to make it globally competitive.
- Concession granting procedures to be simplified and made transparent
- Increased application of e-governance for expeditious grant of concession.
- State agencies (GSI, IBM, DMG's) to be strengthened suitably for baseline data generation, exploration and monitoring and supervision of exploration activities when conducted by outsourcing.

7. REVIEW OF PRESENT AND SUGGESTED FUTURE ROLE OF STATE AGENCIES (TOR No.vi)

- GSI and DGM need to be strengthened so that they are able to concentrate on generation of basic geo-scientific data in a time bound manner and its ready dissemination to private investors to facilitate regional and detailed exploration as also for competitive bidding mechanism.
- Greater co-ordination to be achieved through the medium of CGPB/ SGPBs and it should be raised to the level of National Geological Programming Board (NGPB), for sectoral coordination of central and state agency programmes.
- Emphasis on detailed mineral exploration to shift from GSI and DGM's to private sector
- Educational and Research institutions to be encouraged to undertake enhanced interest in geo-scientific activities through collaborations or joint ventures.

8. PROMOTIONAL ROLE OF CENTRAL AND STATE GOVERNMENT AGENCIES (TOR No.vii)

- National Mineral Policy 2008 advocates linking role of state agencies to systematic investigation for development of resource base of:
 - scarce / deficient minerals;
 - strategic minerals; and
 - minerals where private sector is reluctant to invest
- Adequate funding should be provided to GSI and DMG's for development of these mineral resources to reduce dependence on imports

9. OFFSHORE GEO-SCIENTIFIC STUDIES AND MINING (TOR No.viii)

- MoES and GSI to conduct, on agreed sharing basis, Swath Bathymetric Survey in shallow and deep water regions of the EEZ
- Preparation of comprehensive Seabed Topographic and Sediment distribution Map
- Interpretation of geo-morphological features to decipher morpho-tectonic set-up
- Identify promising mineral zones and thereafter conduct regional and detailed mineral exploration
- GSI to concentrate on regional exploration of placer minerals, lime mud, phosphatic sediments, poly-metallic nodules, hydrothermal deposits etc.
- GSI to complete procurement of the replacement OGRV for RV Samudra Manthan and initiate procurement of the 2nd new OGRV to meet the challenges of the coming decades when exploration of the seabed for polymetallic nodules, etc will become feasible.
- MoES and NIO to concentrate on deep sea sector of Central Indian Ocean Basin for detailed exploration of poly-metallic nodules and sulphide minerals

10. INVESTMENT REQUIRED FOR MINERAL EXPLORATION (TOR No.ix)

The recommended organization wise break-up of investment required for the implementation of the envisaged 12th Plan targets are as follows:

• GSI (Promotional & Capital)	:	Rs. 4,596 crores
• MECL (Promotional & Capital)	:	Rs. 300 crores
• State Govt. and other agencies	:	Rs. 2,000 crores
• IBM	:	Rs. 50 crores
Total	:	Rs. 6,946 crores

EXECUTIVE SUMMARY

Sub Group II :- Mineral Sector Strategy

The country is endowed with huge resources of many metallic and non-metallic minerals. Mining sector is an important segment of the Indian economy. India produces as many as 87 minerals, which include fuel, metallic, non-metallic, atomic and minor minerals (including building and other materials).

The advance estimates of GDP (at current prices) for the year 2010-11 in respect of mining and quarrying sector accounted for about 2.51% of GDP. The contribution of mining and quarrying sector to GDP for the year 2010-11 is estimated at Rs. 182,278 crore which would indicate an increase of 18.2% over that in the previous year.

The development and management of mineral resources plays vital role in the growth of mineral based industries of a nation and its people at large. India's per capita mineral consumption is one of the lowest in the world. The growth in cement and energy sector has been faster than growth in the metallic sector. Minor minerals, particularly dimensional and decorative stones, have emerged as a major contributor to mineral output and exports.

In order to deal with the matter relating to status of Indian mining industry, growth forecasts, import substitution, value addition and exports, strategies for raw material security and technological assets, sub group II has been formed in Ministry of Mines as per planning commission order dated 23.02.2011 regarding setting up of Working Group on Mineral Exploration and Development (other than coal and lignite) for the Twelfth Five Year Plan (2012-17). The Terms of Reference of this sub group are:

- (i) To review the present status of Indian mining Industry (excluding fuel minerals) and principal mineral based industries in the country and to assess its international context.
- (ii) To assess demand for minerals/ ores/ metals and its likely growth during 12th Plan period and in perspective of 15 years at 8%, 9% and 10% per annum GDP growth rate (including demand for minerals for production of high purity material for use in electronics and other emerging technologies).
- (iii) To suggest priority for development of principal minerals in terms of import substitution, value addition and export, in that order, keeping in view the scope for generating employment in the sector.
- (iv) To suggest strategies for acquisition of raw material and technology assets abroad to improve competitiveness, ensure raw material security and help the growth of the Indian mineral based industry.

It was decided to cover the entire mineral industry for sub group II in individual group of minerals in order to go into specifics of each covering all the terms & references i.e. demand, supply reserves, exports and strategy for development. The individual group of minerals chosen are noted below:-

- 1) COPPER
- 2) LEAD AND ZINC

- 3) ALUMINIUM
- 4) CEMENT AND LIMESTONE
- 5) DIAMOND AND PRECIOUS STONES
- 6) GOLD AND PRECIOUS METALS
- 7) DIMENSIONAL AND DECORATIVE STONES
- 8) INDUSTRIAL/NON-METALLIC MINERALS
- 9) BEACH SAND MINERALS
- 10) STRATEGIC MINERALS
- 11) FERROUS MINERALS

The Ferrous minerals group was added in the XIIth Plan though it being dealt with in the Working Group of Ministry of Steel in view of current importance of development strategies of these minerals to support the domestic steel industry. New chapter titled “Strategic Minerals and Metals” was added to lay more emphasis on this group low volume high value strategic metals. Other new inclusions are additional information on Platinum Group of Elements along with Gold, new information on precious stones along with diamonds, greater emphasis on recycling particularly in case of metals and strong emphasis on domestic value addition as spelt out in the new manufacturing Policy.

The contents of the individual chapters and recommendations have been developed through interactive approach involving different industry stakeholders within individual core groups as well as sub groups and working group meetings facilitated by the Ministry and Planning Commission. The Implementation agenda lays down the Impact-Feasibility analysis and budgetary requirements while identifying the implementing agencies.

1. COPPER

Copper is a strategic metal essential for development of any country. Many countries preferred to build domestic production capability for refined copper to feed growing demand of copper by downstream industries for the actual end uses rather than depending on import of refined copper. To make this strategic metal indigenously available, two major refined copper production facilities based on imported concentrate were installed by M/s. Sterlite Copper (Vedanta Group) and M/s. Birla Copper (Hindalco Group). This was in addition to the integrated operation of Hindustan Copper Limited (HCL).

World Scenario

As far as copper ore is concerned, Chile has the largest reserve base, followed by Peru. Chile’s share in world copper reserve base is 24%. Total world reserves (contained copper) are estimated at 630, 000 thousand tones. Deep-sea nodules have been estimated to contain 700 million tonnes of copper. Nearly one-third of global mine production of copper comes from Chile (5520 thousand tones in the year 2010) followed by Peru (1285 thousand tones in the year 2010).

Indian Scenario(TOR No.ii)

As per the provisional data of Indian Bureau of Mines (IBM) as on 1.4.2010, there has been only minor change in the reserve position between 2005 and 2010. As on 1.4.2010, total reserves of copper are estimated (in metal terms) at 4.8 million tones and resources at 12.3 million tones.

Though India is abundant in copper resources, but the mined production of copper is quite low and stagnant since last five years. HCL is the lone producer of copper in India. It is producing 3.12 million tones of ore and around 30,000 tonnes of metal every year, which is less than 5% of the country's requirement of copper concentrate. Sterlite and Birla are the leading producers of refined copper in India. Jhagadia copper on the other hand is producing refined copper through secondary route i.e. by mostly using scrap as raw material. The total capacity of HCL for production of refined copper is 51,500 tones.HCL has applied for three RP's over an extent of 3039.70 ha also applied for three PL's over an extent of 65.64 ha.

Development of Indigenous Resources

This calls for intensive/ extensive exploration for copper to be taken up in India either by existing copper producers or by inviting independent junior exploration companies for green field exploration by granting RP and PL's.

Export and Import of Refined Copper

Major Copper concentrate Export countries are China, Japan, Korea, India and Germany. Major import countries are Chile, Peru, Australia, Canada and Argentina. India's share in the export of Copper concentrate is 10.3 %. India's exports were mainly to China and Germany.

Raw material security(TOR No.iv)

All over the world, major economies preferred to build domestic production capability for refined copper to feed growing demand of copper by intermediate and downstream product's manufacturers rather than depending upon import of refined copper itself. A case in point is of Japan, whose 100% of primary smelting capacities are based on imported feedstock. However, more than 70% of such imported concentrates comes from mines wherein Japanese entities have made investment (strategic or financial) – mostly with a proviso to supply proportionate concentrates to smelters in Japan.

China is gradually following a similar model to securitize feedstock as entire incremental smelting capacity shall have to be based on imported feedstock. In order to safeguard against supply risk and also to benefit from commodity cycles, China has been aggressively scouting for copper mining assets across the globe. It may be worth mentioning that by 2016, total supply by such overseas mining assets shall touch 1.5 million tonne copper i.e. almost 25% of total domestic demand, hence taking total raw material security of China from domestic and overseas mines to 50%.

The imperative for India is that it will have to compete with China on all fronts (mining assets to raw material supply to refined imports) often with Chinese state enterprises to ensure supply of copper to feed its growing demand.

Future Demand and Supply

India's refined copper consumption has increased at 10% per annum over last four years. Electrical, transport and consumer durable manufacturing sector are expecting to lead the growth in future copper demand. The future copper demand by 2015-16 is projected at GDP growth rate of 8% is 1.2 million tonnes. HCL, Birla, Sterlite have indicated expansion plans of production capacities in the coming five years to meet the concentrate requirement (in copper terms) of 1.38 million tonnes by producing 1.34 million tonnes at the end of 2015-16.

2. ZINC & LEAD

Zinc is the third most used non-ferrous metal after aluminium and copper. Globally, about 50% of zinc produced is used in galvanizing of steel products to protect them from corrosion. Lead is one of the most widely used metals and over 80% of all lead produced is used in making lead-acid batteries for the storage of energy.

World Scenario

Zinc

The world's zinc resources are estimated at some 480 million tonnes as against 460 million tonnes reported in the XI Five Year plan Report. This obviously means that some countries have expanded their resources for Zinc. Australia, China and USA together account for 60% of the world's zinc reserve base.

Lead

The world's lead resources are estimated at some 180 million tonnes as against 140 million tonnes reported in the 11th Five Year Plan Report, again indicating that countries have expanded their resources for Lead. Australia, China and USA together account for 63% of the world's lead reserve base.

Indian Scenario (TOR No.ii)

The IBM's lead-zinc reserve-resource inventory of India (as on 1st April 2005), based on United Nations Framework Classification (UNFC) criteria, is given below.

Lead Zinc Resources (UNFC) in India as on 1st April 2005

('000 tonnes)

State		Reserves	Remaining Resources	Total Resources
All India	Reserve/Resource	125,754	396,826	522,580
	Pb-metal	2,591	4,618	7,209
	Zn-metal	11,092	13,168	24,260
Rajasthan	Reserve/Resource	117,583	350,925	468,508
	Pb-metal	2,391	4,008	6,399
	Zn-metal	10,813	11,670	22,483

Source: Indian Bureau of Mines

Zinc Mine Production:

The major zinc mines are in China, Peru, Australia, USA, India & Canada with around 71% of the total world production. India is among the top 5 mining countries with a production share of around 6%.

Zinc Metal Production:

The leading zinc producers are China, Korea Republic, India, Canada, Japan, Spain & Australia with about 70% of the total world production. India is the third largest zinc producer with about 5.7% of the world production share.

Zinc Consumption

The global zinc metal consumption during 2010 was nearly 12.6 million tonnes. China, USA, Korea Republic, India, Japan and Germany are the leading consumers representing about 66% of the total world consumption. India's share in the world consumption is about 4.2%.

Exports and Imports

Global exim trade of zinc metal is around 3.5 million tonnes every year. The main zinc metal exporters are Canada, Australia, Netherlands, Spain and South Korea. India's exports during the last 4 years is 802 thousand tones. It is noteworthy that from being a net importer eight years ago, India has become a net exporter. India imported during the last four years 267 thousand tones of Zinc metal.

The major Lead mines are in China, Australia, USA, Peru, Mexico & India constituting 81% of the total world production. India is among the top six mining countries with a production share of around 2.3%. In 2010 India produced 97 thousand tones.

The global lead metal consumption in 2010 was 9.3 million tonnes. China, USA, Germany, India and Korea Republic are major consumers representing nearly 70% of the world consumption. India's share in the world lead metal consumption is around 3.3%.

Raw Material Security(TOR No.iv)

The raw material used by primary smelters is zinc concentrate and lead concentrate. With rapid expansions of smelter capacities, imports of zinc concentrate and lead concentrate are inevitable as domestic production (current as well as estimated) will be insufficient to meet the requirements. A supportive tariff regime (nil duty) is required on raw material namely zinc concentrate and lead concentrate to enable Indian zinc smelters and lead smelters to compete on a level playing field.

Future Demand and Supply

Zinc

Demand for zinc in India is expecting from 6,00,000 lakh tones in 2012-13 to 8,80,000 tonnes in 2016-17. Considering continuous supply of 20,000 tonnes from secondary route and 50,000 tonnes from imports in every year about 9 lakh tones production are projected with marginal increase from 2012-13 to 2015-16. This production projections are given in correlation with gradual reduction of exports with reference to domestic consumption.

The current zinc production capacity of HZL is 9,17,000 tones.

Zinc Demand-Supply Scenario

Based on the above data, the Zinc Demand Supply scenario during 12th Five Year Plan are:

<u>Year</u>	<u>Demand</u>	<u>India's Production (E)</u>	<u>Imports</u>	<u>Secondary Zinc</u>	<u>Exports</u>	<u>Supply</u>
2012-13	600000	916500	50000	20000	386500	600000
2013-14	660000	917000	50000	20000	327000	660000
2014-15	730000	959000	50000	20000	299000	730000
2015-16	800000	979000	50000	20000	249000	800000
2016-17	880000	979000	50000	20000	169000	880000

Lead

HZL is the lone producer of lead in India. Its current primary lead capacity is 85,000 tonnes per annum. In addition a lead smelter of 1 lakh metric tonnes per annum is expected to be operational in 2011-12. Lead demand in 2012-13 and 2016-17 is estimated at 4,33,000 tonnes and 5,68,000 tonnes respectively. Part of this projected demand is met through domestic primary lead supplies i.e. 1,85,000 tonnes per annum. Further, 50,000 tonnes per annum imports are projected to be continued. The remaining demand projected is to be met through secondary (organized sector) assuming 250,000 tonnes in

2012-13 and gradually increasing up to 350,000 tonnes by 2016-17, which is the terminal year for 12th five year plan.

The Lead Demand and Primary Lead Supply during the 12th Five Year Plan would be (tonnes):

Year	Lead Demand	Primary Lead Supply
2012-13	433000	185000
2013-14	464000	185000
2014-15	496000	185000
2015-16	531000	185000
2016-17	568000	185000

3. ALUMINIUM

Aluminium is one of the most common and widely used metals and the metal's production outstrips that of all other non-ferrous metals. Aluminium ranks second, next only to steel, in terms of volumes used, due to its versatility, which stems from its excellent properties. Bauxite is still the only ore used for commercial production of aluminium using the basic processes of Bayer Process for alumina refining and Hall-Heroult Process for aluminium smelting with improvements for better performance.

World Scenario:

The world production capacity of primary aluminium has increased from 36.7 million tonnes in 2005 to 52.7 million tonnes in 2010. The production of primary metal during the same period has correspondingly increased from 32.0 million tonnes to 42.0 million tonnes registering a CAGR of about 5.6%. World alumina refining capacity has increased from 68.4 million tonnes in 2005 to about 105.9 million tonnes in 2010. The world production of alumina has increased from 61 million tonnes in 2005 to about 81.6 million tonnes in 2010. China is the main producer of alumina in the world (35.7%) followed by Australia (24.1%). The total world bauxite resources (Measured, Indicated and Inferred) are estimated to be of the order of 55 to 75 billion tonnes while the reserves (Measured) are estimated to be at 28 billion tonnes. Except in Australia, the bauxite reserves are mostly available in countries with developing economy which account for nearly 70% of the total bauxite reserves. World Bauxite production range is varied between 193 to 211 million tonnes between 2006-2010. Major producers are Australia, China, Brazil, India and Guinea, and Jamaica. Australia alone accounts for 33% of the world production. Besides aluminium, which consumes bulk of the bauxite production, chemical, refractory and cement industries together consume bauxite to the tune of 10 – 12% of total production.

Indian Scenario

The total production capacity of aluminium in India has increased from 1.08 million tonnes in 2006-07 to 1.71 million tonnes in 2010-11. The production of primary aluminium in India was 1.63 million tonnes in 2010-11 whereas the consumption during 2010 was 1.59 million tonnes, representing a “Per Capita” consumption of about 1.3 kg which was in the range of 0.5 kg about a decade back. The installed capacity of alumina

refineries in India is currently stand at 4.60 million tones with break up of NALCO 2.1 Million tonne, Vedanta 1 Million tonne, and HINDALCO 1.5 Million tonnes. The production of alumina in 2010-11 in India is 3.6 million tones with breakup of Hindalco – 1.35 million tones, NALCO- 1.55 million tones and Vedanta – 0.70 million tones. The total resources of bauxite in India stand at 3290 Million tonnes out of which 900 million tones are of reserves category and balance 2390 million tones are of remaining resources. India occupies 6th place in the world with a share of 3.19% of world reserves. Odisha and Andhra Pradesh account for more than 90% of country's metallurgical grade resources. The production of bauxite in India has increased from 15.73 million tonnes in 2006-07 to 22.62 MT during 2007-08 and subsequently reduced to 15.55 million tonnes in 2008-09. The production of bauxite in India in 2008-09 represents about 7.3% of world production placing India in 5th position in the world in bauxite production. The temporary increase in bauxite production during 2007-08 was due to increase in export of bauxite from Gujurat state.

It is projected that aluminium production capacity in India at the end of the 12th Plan period would be about 4.7 Million Tonnes. This would require about 9.2 Million Tonnes of alumina. So, if all the announced alumina capacity additions fructify, India would be surplus in alumina and would be a significant player in alumina trade. To produce 13.3 Million Tonnes of alumina at the end of the 12th Plan period, the bauxite requirement would be about 40 Million Tonnes. All efforts should be directed towards ensuring bauxite availability to the alumina refineries.

State-wise Distribution of Bauxite Resources in India

SI No	State	Total Resources in Million Tonnes	% Share
1	Odisha	1808.27	54.97
2	Andhra Pradesh	615.27	18.70
3	Gujurat	188.34	5.72
4	Chhatisgarh	148.31	4.51
5	Madhya Pradesh	134.06	4.08
6	Jharkhand	117.55	3.57
7	Maharashtra	111.64	3.39
8	Goa	50.36	1.53
9	Karnataka	49.50	1.50
10	Tamilnadu	26.85	0.81
11	Uttar Pradesh	18.91	0.57
12	Kerala	14.09	0.45
13	Bihar	4.11	0.12
14	Jammu & Kashmir	2.02	0.06
15	Rajasthan	0.53	0.02
TOTAL		3289.81	100

[Source : IBM Mineral Year Book 2009]

A8: Production/Consumption of Bauxite by Primary Aluminium Producers in India

(All Figs in Thousand Tonnes)

Company	2006-07	2007-08	2008-09	2009-10	2010-11
BALCO	668.25	707.20	993.59	872.66	1278.90

HINDALCO*	3543.42	3498.19	3637.13	4003.97	4155.77
NALCO	4623.28	4684.68	4700.03	4787.89	4823.91
MALCO	341.71	343.04	263.87	613	Nil

*: Consumption [Source: Industry Data]

**Present Aluminium Capacity, Production during Last 5 Years, Plans for Expansion and Expected Capacity at the end of 12th Plan Period – Company-wise
(All Figs in Thousand Tonnes)**

Company	Present Capacity	Production					Proposed Capacity Addition during 12 th Plan	Capacity at the end of 12 th Plan
		2006-07	2007-08	2008-09	2009-10	2010-11		
NALCO	460	358.73	360.46	361.26	431.48	443.60	100	560
BALCO	250	313.19	358.67	356.78	262.76	253.14	650	900
MALCO	Nil	28.13	37.64	23.22	Nil	Nil	Nil	Nil
VEDANTA	500	Nil	Nil	82.03	264.32	385.36	1100	1600
HINDALCO	500	442.69	477.72	523.45	555.40	543.67	788	1276
ADITYA	Nil	Nil	Nil	Nil	Nil	Nil	359	359
TOTAL	1710	1142.74	1234.79	1346.74	1513.86	1625.77	2997	4695

4. CEMENT AND LIMESTONE

Limestone occupies the top position among non-fuel solid mineral deposits in the volume of annual extraction. Limestone is the primary and major constituent for the manufacture of cement.

Indian cement industry has been serving the nation's construction industry since 1914 and has now achieved a remarkable status with total installed capacity of about 313 million tonnes as on 31ST March 2011 and Cement Production of 231 million tonnes which is second largest in the world, being next to China.

World Scenario

India is only next to the largest producer of cement in the world, namely China. During the last one decade cement production in the world has gone up by more than 75%. The consumption level of Cement in the Asian countries continues to increase rapidly. The per capita consumption of cement is considered as an important index of the country's economic growth. Paradoxically, per capita cement consumption in India is still one of the lowest among major cement producing countries. Growth of cement industry is bound to spur a proportionate demand on limestone availability. The world cement production in the year 2010 is 3300 million tones.

Indian Scenario

National Council for Cement and Building Materials (NCB) and Indian Bureau of Mines (IBM), Government of India have been carrying out the compilation of the National Inventory of Cement Grade Limestone. The limestone resources are classified as per United Nations Framework Classification (UNFC) system. As per IBM the total cement grade limestone resources is 124,539.551 million tonnes, out of which the total cement grade limestone reserves is 8948.926 million tonnes UNFC code (111), (121) and (122), and the total remaining resources is 115,590.625 million tonnes. The production of the cement by India in the year 2011-12 is 246 million tones falling short by 22 million tones than the proposed target.

Cluster mining approach in order to utilize the small deposits for further industrialization of the mining area may be adopted in the sector which will improve the workability of small quarries.

Exports and imports

Indian cement industry has been exporting cement, the final product and also clinker, which is an intermediate product, to countries across the globe for the last one and a half decades. The projected export for the year 2011-12 is 3 million tones for both cement and clinker.

Availability of Limestone Reserves for Future Requirements

The total cement grade limestone resources as estimated by IBM, based on the UNFC classification system is at 124,539.551 million tonnes out of which the remaining resources is of 115,590.625 million tonnes as on 1st April 2010. However, 30% (approximate) of the reserves i.e. 34677.19 million tonnes fall under forest and other regulated areas which are not available for cement manufacture.

Future demand and supply

The Projections estimate the year-wise growth from 2012 to 2017 based on different assumptions of cement Demand, Export and GDP growth (low as 8%, average as 9%, and high as 10%). The total limestone requirement in the XII Plan (2012-2017) with the growth scenarios of cement @ 10%, 11% and 12% for the respective GDP growth of 8%, 9% and 10% and balance life of reserves is projected below:

Total Limestone Requirement in the XII Plan (2012-2017)

2012 – 2017	Scenario – I (10%)	Scenario –II (11%)	Scenario – III (12%)
Limestone Requirement during 12 th Plan projected for various growth Scenarios (Mn.t)	3162.96	3252.73	3344.87

5. DIAMOND AND PRECIOUS STONES

Diamond

The word diamond is a derivation of the Greek word, “Adamas”, which means “Invincible”. Diamonds have held human fascination for centuries. The first recorded history of diamonds dates back some 3,000 years, to India, where it is believed that diamonds were first recognized and mined. After India, alluvial diamonds were first discovered in Brazil in 1726 and then in 1867 in the Cape Colony, now a province in South Africa. Two years later, in 1869, the first primary sources of diamonds were discovered at Kimberley in South Africa.

World Scenario

The only authentic source for this data is from USGS. As per this the “Total Reserves” stand unchanged at 580 M.cts, while there is a minor addition in “Total Reserve Base” from 1250 M.ct to 1300 M.ct. As a result of the economic down-turn in 2008-09, world diamond production, which was 163 M cts, valued at USD 12.73 billion in 2008, fell sharply to 125 M cts, valued at USD 8.64 billion in 2009. However, with strong and increasing demand from India and China and partial recovery in demand from USA, production has increased to 140 M cts, valued at USD 11.75 billion in 2010-11. The major producing countries are Botswana, Russia, Canada, Australia, South Africa, DRC, Namibia and Angola.

Indian Scenario

According to IBM, India has Reserves + Resources of 4.6 M.ct. In addition, the Bunder Deposit of M/s Rio Tinto India has added a Reserve Base of 27 M.ct., which is expected to be in operation from 2016.

NMDC continues to be the only organized producer of diamonds in India, from its Majhgawan mine at Panna, Madhya Pradesh. This mine, which was closed for a couple of years, has recommenced production in August, 2009. The production during the year 2009-10 is 16,000 carats. The projected production during the year 2010-11 is around 11,000 carats.

Diamond Cutting and Polishing in India

With 800,000 strong workforce and deployment of the latest technology, India continues to be the dominant player in the world’s diamond cutting and polishing industry. In fact, according to India’s Gem & Jewellery Export Promotion Council (GJEPC), India has further strengthened its world dominance.

India has processed 60% of the world’s diamonds during eleventh plan by value vs 50% in tenth plan. In terms of caratage, India’s share was 85% in eleventh plan compared to 80% in the tenth plan. Similarly, India’s share was 92 % by number of diamonds processed during eleventh plan compared to 90% in tenth plan.

Exports and imports

India exported cut and polished diamonds worth US\$28.26 billion in the year ending March 31, 2011 (provisional figures), against rough diamond imports of US\$ 11.93 billion, with a significant value addition of US\$ 16.32 billion., according to GJEPC data. This reflects the strong recovery of the diamond industry from the global recession.

Future Growth of Indian Diamond Sector and Demand

The Indian cutting and polishing sector is facing growing competition from China and due to the fact that the producing African countries are demanding a greater share of processing of roughs within their countries. Thus, according to a KPMG analysis, by 2015, India's share in value terms will come down to 49.3% share (from the present 65%), of the world diamond roughs. In the same period China's share is expected to grow to 21.3%, with 7.1% to Russia, 5.5% to South Africa, 4.7% to Israel and 1.4% to the US.

Status of Diamond Exploration in India

Private companies like De Beers India and Rio Tinto India, based on the good geological database provided by GSI, were granted RPs for diamond exploration. The total area covered under RP's is 1,40,000 Sq.Km. The major focus was in the states of Andhra Pradesh, Chhattisgarh, Karnataka and Madhya Pradesh. Total expenditure in Diamond exploration in the last ten years by the two major private players, Rio Tinto and De Beers is almost US\$ 100 million, of which Rio's investment is US\$ 70 million.

PRECIOUS STONES

Coloured gemstones have been an integral part of the gems and jewellery industry at all times. Going by contemporary definition, any stone other than diamonds is labelled as a 'Coloured Gemstone'. Coloured gemstones may be precious or semi-precious. Important gemstones are Rubies, Emeralds, Sapphire.

Major producers of precious stone in world

Major producers of precious stones in world are: Columbia, Brazil, Sri Lanka, Australia, Myanmar, Madagascar, Zambia, Afghanistan and Pakistan.

Major producers of precious stone in India

Andhra Pradesh, Karnataka, Odisha, Meghalaya, Assam, Chattisgarh, Madhya Pradesh, Kerala, Jammu & Kashmir, Tamil Nadu.

India's Export and imports of Coloured Gemstones

The country is also a leading source of a spectrum of coloured gemstones, moving from its traditional concentration on emeralds, and later tanzanite, to today

offering the world a dazzling array of choice in terms of colour and quality. Exports of coloured gemstones were US\$ 315 million in 2010-11, the major importing countries being USA, Hongkong, Thailand, UAE and Japan. The total imports, on the other hand, amounted to USD 146 million, the major exporting countries being Hongkong, UAE, Brazil, Zambia, Thailand, USA and Tanzania .

Some important precious stones like emerald, ruby, sapphire, and other semi precious stones like tanzanite, topaz, opal have been discussed in detail in the main report with respect to their country wise production and cutting polishing industry.

6. GOLD AND PRECIOUS METALS

Gold has a high commercial status because it has always been in high demand for its fine jewellery characteristics; enjoys high value even for a very small volume; easily encashable; indestructible and non-corrosive hence lasts forever as a commodity. Because of these qualities gold is often treated as currency. It is important to note that stock of gold in a country's treasury and its annual accumulation lead to growth of a Nation's Gross Domestic Product (GDP).

World Scenario

The term Reserve-Base refers to both Resources and Reserves. The global geological reserves of gold have been placed at 51,000 tonnes out of which, about 14% is located in Australia, 12% in South Africa, 10% in Russia, 6% in USA , 6% in Indonesia, 3.9% in Peru, 3.7% in China and 3.3% in Uzbekistan.

The global Reserve-Base of 100,000 tonnes is spread over South Africa (31%), Russia (7%), China (4.1%), Australia (6%), Indonesia (6%), USA (5.5%), Canada (4.2%), Peru (2.3%) and other countries (33.9%).

The total Gold production from mines in the world during the year 2,553 tons. The major producers are China, South Africa, Australia and USA. The supply of Gold by way of recycling is 1,653 tons. Thus the total supply was 4,196 tons.

Indian Scenario

The total Reserve-Base in the country as on 1.4.2011 is 658 tonnes of gold metal. This tonnage is spread over 13 different States of the Country. Out of this tonnage 167 tonnes is categorized as Reserves in the sense they are economically mineable. The remaining about 491 tonnes of metallic gold is classified as resource of which 265 tonnes is the actual drilled resources and the remaining 226 tonnes is the projected potential resource which falls under 331/332 UNFC categories.

India's contribution to the world mine production is insignificant being 2.22 tonnes which continues to come from only one major producing mine and its two satellite mines viz. (i) Hira-Buddini and (ii) Uti, all belonging to Hutti Gold Mines Ltd. It is significant to note that a major portion of the country's production of gold comes as a by-product from anode slimes resulting from smelting of copper concentrates indigenously produced in Jharkhand State and copper concentrates imported by

Hindalco(Birla Group). The by-product gold in 2007-08 was 12.1 tonnes. In 2010-11 Hindalco produced 7 t of gold & 45t of silver. Together with the primary mine production the total production of gold in the country stood at 9.22 t during 2010-11.

India imported about 963 tons of gold during 2010. The projected imports at the growth rate of 11% from 2012-2017 are 9305 tons at an average of 1861 tons per year. As per world Gold council estimation, expected gold consumption India during the year 2011 1167 tons, against the 800 tons, projected in 11th plan for the year 2011-12. Considering the production expansions of HGML, BGML and RSMML and opening of new mines from private sector viz. MSPL, Geomysore, Deccan Gold and Manmohan Minerals during the 12th plan period from 2013-14, Gold production is projected at 28.00 tonnes from mines and 16 tonnes from by product totaled 44.00 tonnes by 2015-16.

Platinum Group of Elements

The Platinum Group of Elements (PGEs) covering platinum (Pt), palladium (Pd), rhodium (Rh), iridium (Ir), osmium (Os) and ruthenium (Ru) find applications in several important fields including automobile industry, medicine, jewellery, electrical and electronic sectors.

World scenario:

The largest reserves of PGE are located in the Bushveld Igneous Complex [BIC] of South Africa. The world reserve base of PGE is estimated to be 80,000 tonnes localised mostly in South Africa (87.5%), followed by Russia (8%) and USA (2.5%). Mine production (exclusively) by principal countries during the year 201 was 380(in tones of metal content).

Indian Scenario

In India, occurrences of PGE bearing minerals have been reported in the pre-cambrian mafic/ ultramafic complexes of Baula-Naushahi Ultramafic Complex (BNUC) in Orissa, Hanumalpur in Karnataka, and Sittampundi and Mettupalaiyam complexes in Tamil Nadu. However, GSI has estimated resources (11 tonnes @ 1.0 g/t cut-off) of PGEs only from BNUC as on 1.4.2010.

The major consumer of platinum is the jewellery sector. As the supply of all PGEs together is less than 600 tonnes with about 500 tonnes coming from mine production, the boom in the demand for platinum jewellery and also as an investment can be expected especially, with the projected yellow metal (gold) price of ~\$2000/ oz in the near future compounded by the uncertainty in many industrialized economies and the prevailing high inflation rate.

Platinum demand in India too is increasing steadily over the years (refer Table 6C.4 and Fig. 6C.6). India imports PGEs mainly from UAE (73%), South Africa (16%), UK (4%), Switzerland (3%), and Germany (2%).

Table for Imports of Metals and Alloys, 2006-07 to 2008-09 (values in Rs. '000)

Metals & alloys	Unit	2006-07		2007-08		2008-09	
		Qty ,kg	Value	Qty,kg	Value	Qty. kg	Value
Platinum, alloys and related metals: Total	Kg	6063	2528583	6468	6247752	53967	136803700
Platinum (powder, unwrought & others)	Kg	881	1368874	1985	4774955	50835	135124436
Other metals of platinum group	Kg	5182	1159709	4483	1472797	3132	1679264
Platinum-clad base/precious metals	Kg	41	7753	18	1478	361	905

Silver:

Silver is metal used both as precious metal for investment and Jewellery and has good industrial use also. India is the largest importer and largest consumer of silver in the world. The average domestic consumption of silver in the country on an average ~ 3000 tonnes per annum. The current pattern of utilization of silver in the country and bearing in mind the anticipated increase in the GDP, the future demand for silver in the country is likely to exceed 6000 tonnes per annum by 2017.

Distribution of global reserves

The total silver metal reserves of the world are 510,000 Tonnes. Out of this, the major silver reserves are situated at Peru (120,000 tonnes metal), Chile (70,000 Tonnes), Australia (69,000 tonnes), Poland (69,000 Tonnes), China (43,000 Tonnes), Mexico (37,000 Tonnes), USA (25,000 Tonnes) Canada (7000 Tonnes) while the rest of the countries together contained 50,000 Tonnes, as per the report of Mineral commodity summaries -2011.

The global production of silver is of the order of 1057 MOz (about 32,873 tonnes during 2010). Major portion of it is originating from lead, lead-zinc and copper mines as by product. Stand-alone silver mines are scarce and few mines are only in operation.

Out of the current production of silver in India [185 tonnes in 2010] around 139 tonnes is originating as byproduct of smelting of lead, zinc ores and a small quantity of 218 kg is being produced as a co-product of refining of gold from Hutti Gold Mines. The country has a resource base of 10,000 tonnes silver as of 1.4.2011. However, presence of an additional source of 10,000 tonnes is estimated in view of the reported 577 Million tonnes of lead-zinc ore resources by HZL.

7. DIMENSIONAL AND DECORATIVE STONES

India is the largest producer of 'Dimensional and Decorative Stones' viz. marble, granite, sandstone, slate, flaggy limestone etc. which form a major component of the construction sector. This sector accounts for 6-8% of the country's GDP and is the second highest employer after agriculture. The quality of Indian stones conforms to the highest International Standards and provides excellent uniformity and consistency.

World Scenario

The global stone production is over 126 million tonnes in the year 2009, with India followed by China, Turkey and Italy being the leading producers. As per the 'World Marble & Stones', 21st report by Carlo Montani, the major exporters of stones and stone products in the world are China (25.3%), Italy (13.5%), India (9.7%), Turkey (8.7%), Spain (6.8%), and Brazil (5.1%). On the other hand, the total world stone imports during 2009 amounted to US\$14081 million, with USA (14.6%), China (10.3%), South Korea (6.6%), Japan (6.2%), Germany (4.5%), France (3.7%), and Italy (3.5%) being the leading importing countries.

Indian Scenario

India possesses one of the best granite deposits in the world having excellent varieties comprising over 200 shades. India accounts for over 20% of the world resources in granite. The total Granite Reserves in India as per IBM are: 42,916 million cu. M.

The Indian stone production during the year 2009-10 is 35342 thousand tones, in value terms, the estimated turnover of the Indian Dimensional Stone market in 2009-10 was of the order of Rs.30,000 crores out of which the southern states accounted for Rs.18,000 crores, Rajasthan Rs.7000 crores, and the rest of India Rs.5000 crores. Granite alone accounts for 2/3rd of the value of production.

Dimensional stone exports from India

India is amongst the leading exporter countries of stones in the world. Indian Stone Exports comprise mainly Granite Cut Blocks, Slabs, Tiles, Marble (especially green marble), Slate, Sandstone, Monuments and Handicrafts. The major importers of Indian stones are USA, China, UK, Italy, Belgium, Germany, UAE, Hong Kong, Spain, Taiwan, Netherlands, Canada, Turkey, France, Russia and CIS countries. The value of exports for the year 2010-11 is 70180 Million rupees.

Projections for domestic consumption and exports

The growth is continuing and the demand for marble, granite, sandstone and other dimensional stones and stone products is anticipated to grow at around 15% CAGR. A similar rate of growth in exports can also be achieved with the help of suitable policy framework, infrastructure and other facilities which are expected to be provided to

the industry. There is a strong need for well-planned, concerted and dedicated efforts towards export promotion of Indian stones. The emphasis needs to be on popularization of Indian stones in both the traditional markets and exploration of new avenues by strengthening the activities of the Centre for Development of Stones (C-DOS) in Rajasthan by upgrading it into a national centre of excellence. Alternative option for exporting granite and marble in processed form to maximize export earnings is to develop and promote artifacts and special decorative and ornamental items of high value addition. There is tremendous skill in the country, which can be explored and supported with special incentives. This can certainly bring about substantial foreign exchange addition, as well as significant employment generation.

Projections for investment in Dimensional stone industry:

Present investment in dimensional stone industry in India is estimated at Rs.20,000 crores. It is expected that given the right policy support, the total turnover of the sector estimated to be around Rs. 30,000 crores (2009-10) will increase to over Rs. 40,000 crores by 2012-13, and thereafter double every five years considering an estimated growth rate of 15%. To sustain this growth, it is estimated that investment in this sector will have to go up to about Rs. 1,07,500 crores by 2022 – 23 (including foreign investment).

8. INDUSTRIAL / NON – METALLIC MINERALS

Under Industrial/Non-Metallic minerals, Fertilizer minerals, Flux & Construction minerals, Ceramic & Refractory minerals & Export Potential Minerals like Barytes, Bentonite, Mica & Steatite are dealt. These minerals have potential use in the down stream industries like glass, ceramic, fertilizer, refractory and chemical etc.

The Reserve/Resource status, production, current demand/supply and future projections etc have been discussed in detail in the relevant mineral wise chapter. Some of the important minerals from each industry mentioned above are summarized below:

Rock Phosphate:

Global Scenario

The rock phosphate or phosphorite is mainly fossiliferous calcareous sandstone exhibiting reddish-brown colour at places, being ferruginous. The total world reserves are 65,000 Million tonnes.

World production of marketable phosphate rock was 176 million tonnes in 2010, a 6% increase compared with that of 2009. The United States with 26 million tonnes, China with 65 million tonnes and Morocco and Western Sahara with 26 million tonnes were the leading producing countries, accounting for 67% of the production. India's production is a meager 1.55 million tonnes. As a result, India will continue to rely on imports to meet its demand.

Indian Scenario:

The total reserves as per IBM as on 1.4.2010 are 3,52,53,050 tonnes. Resources are 26,32,55,701 tonnes and total reserves/resources are 29,85,08,751 tonnes.

The total production of phosphorite at 1.55 million tonnes in 2009-10 decreased by about 14% from that in the previous year due to less lifting of ore at crushing plant of Jhamarkotra mine of RSMML, Rajasthan

Future demand and supply

The apparent demand of apatite and rock phosphate was 7.23 million tonnes in 2009-10. The apparent consumption of apatite and rock phosphate is estimated at 8.59 million tonnes by 2011-12 and at 13.22 million tonnes by 2016-17 at 9% growth rate.

Asbestos:

World Scenario:

The world has 200 million tonnes of identified resources. The important countries where resources of asbestos are available are United States, Brazil, Canada, China, Kazakistan and Russia.

The world production of asbestos was 2.0 million tonnes in 2010. The important producers were Russia (1000 thousand tonnes), China (350 thousand tonnes), Brazil (270 thousand tonnes) and Kazakistan (230 thousand tonnes). Canada and Zimbabwe are major producers of chrysotile variety. India's production was 233 tonnes only

Indian Scenario

As per United Nation's Framework Classification (UNFC) system, total resources (reserves and remaining resources) of asbestos in the country as on 1.4.2005 are placed at 21.74 million tonnes. Of these, 6.04 million tonnes are reserves and 15.70 million tonnes are remaining resources. Out of total resources of 21.74 million tonnes, Rajasthan accounts for 61% and Karnataka 38%.

The production of asbestos at 233 tonnes in 2009-10 decreased by about 26% from that in the previous year. The decrease in production was due to closure of mines. The entire production of asbestos was of chrysotile variety and was reported from Andhra Pradesh.

The internal consumption of asbestos was about 109 thousand tonnes per annum, almost entirely in asbestos-cement and asbestos-based products manufacturing.

The apparent consumption of asbestos during 2009-10 was about 331 thousand tonnes. The apparent demand of asbestos is estimated at 393 thousand tonnes by 2011-12 and at 605 thousand tonnes by 2016-17 at 9 % growth rate.

Exports of asbestos decreased to 918 tonnes in 2008-09 from 3,942 tonnes in previous year. Whereas imports decreased to 346,658 tonnes from 331,705 tonnes. There is a need to look in to the existing restrictions of the mining of Chrysotile Asbestos and start the mining with appropriate precautions in view of the improved capabilities to do the mining without any impact on the health of the workers.

FLUOROSPAR:

Fluorspar is an indispensable material to aluminium metallurgy. There are two primary grade of fluorspar which is defined based on the CaF_2 contents of the material: metallurgical grade fluorspar is any material containing $< 97\%$ CaF_2 whereas acid grade fluorspar is material containing $>97\%$ CaF_2 .

World scenario: The world reserves of fluorspar are **230,000(in thousand tonnes)**. World production of fluorspar was 5.4 million tonnes in 2010. China (3.0 million tonnes), Mexico (1.0 million tonnes), Mongolia (0.4 million tonnes), Russia (0.2 million tonnes and South Africa (0.10 million tonnes) were the principal producers. India's production is negligible in the world context

Indian Scenario

As per the UNFC, the total resources (reserves and remaining resources) of fluorite in the country as on 1.4.2005 were estimated at 20.16 million tonnes. Out of these, 9.21 million tonnes were placed under reserves category and 10.95 million tonnes under remaining resources category. The total production reported from the year 2005-06 to 2009-10 is 13,782 tonnes. Cluster mining approach in order to utilize the small deposits for further industrialization of the mining area may be adopted in the sector which will improve the workability of small quarries.

The average total consumption of fluorspar by all industries has been around 72,000 tonne per annum. The exports of fluorspar has decreased to around 203 tonnes in 2008-09 from 467 in 2007-08 whereas imports have considerably decreased to 153,749 tonnes in 2008-09 from 162,110 tonnes in 2007-08. The apparent domestic demand of fluorspar is estimated at 185 thousand tonnes by 2011-12 and at 285 thousand tonnes by 2016-17 at 9% growth rate

MAGNESITE

Magnesite(MgCO_3) is a very important mineral for the manufacture of basic refractories, which are largely used in the steel industry.

World Scenario

Resources: The world resources of magnesite are 2400 million tonnes. The world production of magnesite was 24.3 million tonnes in 2009, an decrease of about 5% compared with that of 2008. China was the principal producer, contributing about 62%, followed by Turkey (8%), Russia (11%), Korea RP(5%), Slovakia (2%) and Austria (2%). India's production was of the order of 286 thousand tonnes in 2009-10.

Indian Scenario

The total reserves/resources of magnesite as per UNFC system as on 1.4.2005 are about 338 million tonnes of which reserves and remaining resources are 76 million tonne and 262 million tonnes, respectively.

Production of magnesite in 2009-10 at 286,383 tonnes registered an increase of about 13% from that in the previous year. There were 8 reporting mines as against 16 in

the previous year. Five principal producers accounted for 94% output in 2009-10. About 60% production of magnesite was contributed by public sector. Tamil Nadu continued to be the major producing State, having a maximum share of 78% output, followed by Uttaranchal 20% and Karnataka 3%.

The consumption of magnesite in the organised sector increased to 282 thousand tonnes in 2009-10 because of higher consumption reported by refractory industry. The apparent domestic demand of magnesite is estimated at 403 thousand tonnes by 2011-12 and at 622 thousand tonnes by 2016-17 at 9% growth rate.

The exports of magnesite increased to 12,000 tonnes in 2008-09 from 8,697 tonnes in the previous year. The imports also increased to 51,422 tonnes in 2008-09 from 76,287 tonnes in the previous year. Out of the total imports, magnesite (calcined) were 12,992 tonnes only. The imports were mainly from People's Republic of China, Iceland, Australia, Nether land, Japan, and Slova Rep.

GRAPHITE

Graphite is used as a raw material in a large number of industries such as crucible, foundry facing, dry cell battery, lubricants, pencils, paints, etc.

World Scenario

Resources: The world reserves are of the order of 71 million tones. The world production of graphite was 1,100 thousand tonnes in 2010. China was the principal producer contributing about 73% of the total production, followed by India (12%), Brazil (7%) and Korea Dem. Peoples Rep. (3%).

Indian Scenario

As per the UNFC system, the total resources (reserve and remaining resources) of graphite in the country as on 1.4.2005 are placed at about 169 million tonnes, comprising 11 million tonnes in the reserves category and remaining 158 million tonnes under resources category.

The production of graphite at 109 thousand tonnes in 2009-10 decreased by 8% from the previous year. In 2008-09 about 83% production was accrued from seven mines, each producing more than 5,000 tonnes and Tamil Nadu was in the leading position contributing about 46% output followed by Orissa and Jharkhand.

Consumption of various grades of graphite in the organised sector was in the range of 14 thousand tonnes during the last three years. Out of total consumption, the refractory 45% and crucible industries 30% accounted for 75% and foundry industry 7%. The apparent domestic demand of graphite run of mine is estimated at 135 thousand tonnes by 2011-12 and at 208 thousand tonnes by 2016-17 at 9% growth rate.

The exports showed an increasing trend; the export being 1909 tonnes of natural graphite in 2008-09 as against 1420 tonnes in the previous year and the imports of 7309 tonnes from 11666 tonnes in 2007-08. However, exports and imports of graphite crucibles increased.

Barytes

Barytes, as a high specific gravity mineral (weighting agent) finds use largely in oil and gas well drilling. Next to oil drilling, the next important consumer of barytes is the chemical industry for manufacture of barium chemicals like carbonate, chloride, oxide, hydroxide, nitrate, peroxide and sulphate salts.

World Scenario

The total world resources are 240 million tonnes. World production of barytes was 6.9 million tonnes in 2010. The important producers were China (3.6 million tonnes), India (1 million tonnes), USA (0.67 million tonnes), Morocco (0.46 million tonnes) and Mexico (0.4 million tonnes) were the principal producers. India occupies second position.

Indian Scenario

The total resources of barytes in India as on 1.4.2005 as per UNFC are placed at 74.2 million tonnes constituting 46% reserves and 54% remaining or additional resources. Andhra Pradesh alone accounted for more than 99% country's reserves as well as more than 94% country's remaining resources of barytes.

The production of barytes at about 2.14 million tonnes in 2009-10 increased by about 27% from that in the previous year. Andhra Pradesh continued to be the premier State accounting for almost the entire production .

The domestic consumption of barytes in the organised sector increased to 141,300 tonnes in 2008-09 from 126,000 tonnes in 2007-08. Oil and gas drilling industry, the main consumer of barytes in India, accounted for 70% consumption followed by chemical industry (24%). The apparent domestic demand of barytes is estimated at 1.36 million tonnes by 2011-12 and at 2.09 million tonnes by 2016-17 at 9 % growth rate.

The exports of barytes increased to 843,789 tonnes in 2008-09 as against 564,800 tonnes in the previous year. Venezuela was the main buyer followed by Saudi Arabia, USA and UAE.. Imports were 1674 tonnes mainly from China.

TALC, SOAPSTONE AND STEATITE

Talc is a hydrous magnesium silicate. In trade, talc often includes: (I) the mineral talc in the form of flakes and fibres; (ii) steatite, the massive compact cryptocrystalline variety of high-grade talc; and (iii) soapstone, the massive talcose rock containing variable talc (usually 50%), soft and soapy to feel.

World Scenario

The total world resources are 551,000(in thousand tones). World production of talc was about 7.45 million tonnes in 2010. Major producers were China, USA, Brazil, Finland and France

Indian Scenario

The total reserves/resources of talc/steatite/soapstone as on 1.4.2005 are assessed at 312 million tonnes of which reserves and remaining resources are 115million tonnes and 197 million tonnes, respectively. Substantial quantities of resources are established in Rajasthan (50%) and Uttaranchal (32%).

Production of steatite in 2009-10 at 835 thousand tonnes decreased by about 6% from the previous year. The entire production was from private sector mines. About 85% production was of grade other than insecticide and the remaining 15% was of insecticide/DDT grade. Rajasthan, the main producing state accounted for as much as 75% production followed by Uttaranchal (16%) and Andhra Pradesh(8%). The total consumption in the organised sector is around 270,000 tonnes per annum, of which 68% was in paper industry followed by pesticide (16%), paints (8%) and cosmetics (4%). The apparent domestic demand for talc-steatite is estimated at 879 thousand tonnes by 2011-12 and 1.35 million tonnes by 2016-17 at 9% growth rate.

The exports of steatite (total) is around 99,520 tonnes whereas imports were 5,218 tonnes in 2008-09.

9. BEACH SAND MINERALS & RARE EARTHS

Heavy mineral sands comprise of a group of seven minerals viz. ilmenite, leucoxene (brown Ilmenite), rutile, zircon, sillimanite, garnet (almandite) and monazite. Since these minerals are always found together in the beach sands of coastal stretches of peninsular India, they are classified as associate minerals and they are often synonymous with the term 'Beach sand mineral' as entire production of these minerals in India is from beach sands occurring on the coast.

World scenario:

The total world reserves for beach sand minerals are as follows (in million tonnes): Ilmenite- 650.05, Rutile-42.5, Zircon-55.4, Sillimanite-0.54,Garnet-12.5, RE minerals-113.7.

The total world beach sand production (in thousand tonnes) in 2009 was Ilmenite- 9305, Rutile- 598, Zircon-1056, Sillimanite- 35, Garnet-1410, Leucoxene – 85. The major producers are South Africa, Canada, Australia, China etc.

Indian Scenarion:

The total Indian mineral resources are 942.58 million tonnes as in August 2009 constituting 514.38 – Ilmenite, 154.26 - Garnet, 195.85 – Sillimanite, 32.28 – Zircon, 29.11 –Rutile and 10.70 monazite. Monazite contains Rare Earth Minerals also. These resources are predominantly located in the states of Andhra Pradesh, Orissa, Tamil Nadu and Kerala.

Future Demand and Supply

ILMENITE:

The major chunk of consumption of the ilmenite is for manufacture of Synthetic Rutile. The current demand is 3,50,000 TPA and the supply is around 8,00,000 TPA, excess mineral is exported. The demand of ilmenite as per the GDP growth rate of 8%,9% and 10% is 3.19,3.27 & 3.35 lakh tones.The projected production is around 8,00,000 tonnes per annum.

RUTILE:

The current demand is 36,000 TPA. The domestic production is 20,000 TPA. The rest of the demand is met by imports. Projected demand for the next five years is 44,000 TPA to 45,000 TPA as per the GDP growth rate of 8%,9% and 10%.The projected production is 30,000 TPA.

ZIRCON

The production for the last five years is 30,000 TPA. And the current demand is 65,000 TPA. The deficit supply is met by imports. Projected demand for the next five years is 86,000 TPA to 90,000 TPA as per the GDP growth rate of 8%,9% and 10%.The projected production is going to remain at the rate of 30-35,000 TPA. The rest is met by way of imports.

GARNET

The production for the last five years is 75,000 TPA. And the current demand is limited and the major chunk is exported. The domestic consumption is hardly a couple of thousand tonnes per annum and as such the change in GDP growth rate would make little impact on the same especially in the backdrop of very high production at present.

SILLIMANITE

The production for the last five years is 35,000 TPA. And the current demand is 32,000 TPA. Projected demand for the next five years is 35,000 TO 40,000 TPA as per the GDP growth rate of 8%,9% and 10%.The projected production is going to be doubled in the coming couple of years and the projected demand is met adequately.

RARE EARTH COMPOUNDS

Rare Earth Elements (REE) and Energy Critical Elements (ECE) are characterized by high density, high melting point, high conductivity and high thermal conductance. These unique properties make them indispensable for variety of emerging and critical technology applications relevant to India's energy security i.e. clean energy technology, defense and civilian application etc

In India, monazite is the principal source of rare earths, which is a prescribed substance as per the notification under the Atomic Energy Act, 1962. Indian Rare Earths Limited (IREL) has been the sole producer of Rare earth compounds in the country. The

recovery of Rare Earth Elements (REE) from Monazite has been restricted due to its thorium and uranium content.

The resource estimates of monazite in the beach and inland placer deposits stands at 10.21 million tonnes. The state wise resources are given below:

Resources of Monazite	(in Million Tonnes)
All India	10.21
Andhra Pradesh	3.73
Bihar	0.22
Kerala	1.37
Orissa	1.82
Tamil Nadu	1.85
West Bengal	1.22

Source: Department of Atomic Energy, Mumbai

Mining of Beach sands is being carried out at IREL and KMML. The installed capacity of Monazite separation plant of IREL at Manwalakuruchi is 6,000 TPY while that of KMML at Chavara is 240 TPY.

The Monazite obtained from Manwalakuruchi is chemically treated at Always plant of IREL to separate Rare Earths in its composite chloride form and Thorium as hydroxide upgrade.

IREL was forced to suspend operations of Monazite processing plant due to cheap imports from China in 2004. It is now in the process of setting up a Monazite processing plant (MOPP) at its OSCOM unit in Orissa. The plant with a capacity of 10,000 TPA of Monazite, 11,000 TPA of Rare Earth Chloride equivalent to 5000 TPA of rare earths oxide (REO) is expected to be in operation by 2012. Domestic market of Rare Earth Compounds is limited; IREL shall have to export the high pure rare earths that it tends to produce.

Globally, rare earths are produced from bastnaesite ore which is the fluoro-carbonate of rare earths. China currently caters to 60% of the global demand. China has reserves of both heavy rare earths as well as light rare earths in the form of ion exchange clay and bastnaesite respectively. It may be noted that rare earths from monazite source contribute a minor fraction of the global rare earths supply. However, monazite is the only mineral available in India from which rare earths could be obtained in a commercially viable manner.

Over the last year, the rare earths industry has been propelled from obscurity to the fore of international media, sparked by fears of a Chinese stranglehold on the supply of these strategic minerals.

Total rare earth oxide (REO) production was estimated at only 1,24,000 tonnes for 2008, dropping to 96,500 tonnes in 2009 as demand for hi-tech goods dived during the global recession.

However, demand is expected to reach 1,97,000 tonnes REO in 2015, surging ahead of production capacity, driven by growth in clean technology end markets such as wind turbines and electric vehicles.

Even with production exceeding demand by 2015, the supply of dysprosium, terbium and neodymium could still fall short, while europium, erbium and yttrium could also be tight.

Apart from Monazite sands, concentration of REE in hard rocks has been recorded in association with carbonatites, syenites, albities, granites, pegmatite, apatite and phosphorites and carbonaceous schists in India. There is a need for concerted efforts both by GSI and AMD to explore primary occurrences of Rare Earth Elements.

During XII Plan, GSI to examine all the data generated from the proterozoic and younger granites and Iron oxide-copper-gold (IOCG) type deposits and also their supergene / laterite profiles. Proper evaluation of existing data and data generated from National Geochemical Mapping Programme will also help in locating suitable target areas for further search of REE.

A study is required to be carried out to assess the demand for Rare Earths for meaningful production initiatives in this field.

Initiatives to Meet the Current and Future Demand Supply Gap

Indian reserves of the major beach sand mineral are approx 16% of the world reserves whereas the production accounts for only approx 6 – 7% of the world production.

It is essential to set up joint venture projects in association with state governments to enhance beach mineral production with further down stream applications where the reserves have been established and economic beneficiation can be looked into:

- Bramhagiri deposit of Orissa.
- Godavari, Krishna and Vishakapatnam districts of A.P.
- Allepey district in Kerala
- Villaithoppu-Rajakkamangalam in T.N.
- Puducherry U.T.

10. STRATEGIC MINERALS AND METALS

Metals/minerals considered are: 1.Tin 2. Cobalt 3.Lithium 4.Germanium 5.Gallium 6.Indium 7.Niobium 8.Beryllium 9.Tantalum 10.Tungsten 11. Bismuth 12.Selenium.

These minerals are considered as strategic because of the following main reasons:

1. Substitutes are limited or lead to a loss of properties and are often subject to the same constraints (e.g. production is concentrated in a few geographies).

2. As many of these can only be produced as a by-product of base metals extraction, potential for accelerating production / supply on standalone basis is very limited
3. Inconsistent mining regulations, legislative regimes and environmental risks for many of these minerals
4. Continued advances in technology development – there is a swift increase in demand for metal intensive technology such as LCD screens, hybrid cars, wind turbine magnets, hi-tech defense applications and various other applications in modern economy. Most of these scientific advances require key mineral inputs. These applications are critical to the end product.
5. Dependence on these technologies is increasing worldwide.

The Demand and supply and the important user industries are summarized in the table given below:

MINERAL	SOURCE	USER INDUSTRY / SECTORS	MAJOR PRODUCERS	INDIA'S PRODUCTION (TPY)	INDIA'S IMPORT (Tonnes)	GLOBAL DEMAND(2030 ESTIMATES) (TPY)
Tin	Cassiterite	Solder, Tin Plate, Chemicals	China, Indonesia, Peru	60	7,989 (Indian bureau of Mines, 2008-09)	NA
Cobalt	Produced as a by-product of Copper and Nickel mining	Defense, Chemicals, Paint and ceramic,	Congo, China, Zambia, Russia	1,560 (IBM)	9953 (IBM)	240,000 (Formationmet als.com)
Lithium	Electrolysis of a mixture of lithium Chloride and Potassium Chloride	Battery manufacturing industry, Paint, Grease, Aluminum production, Ceramics & glass	Chile, Australia, China,	NA	NA	340,000 (www.bnamericas.com0
Germanium	Sphalerite, zinc and copper smelting process	Solar cells, Defense, Optical fiber	China, USA, Russia	NA	NA	220 (European commission)
Gallium	By-product of Alumina Production process	LED's, Mobile Communication Industry, Integrated circuits	China, Germany, Japan, Kazakhstan, Ukraine	55kg(approx)	NA	603 (European Commission)

Indium	By-product of commercial extraction of Zinc, lead, copper and tin	Television Industry, Solder	China, Korea, Canada, Belgium, Japan	NA	NA	1,911 (European commission)
Niobium	Pyrochlore	Magnets, Steel and Aerospace	Brazil, Canada	NA	NA	NA
Beryllium	Electrolysis of a mixture of Beryllium Fluoride and Sodium Fluoride	Military, Space, Nuclear energy, Electronics	USA, China	NA	NA	NA
Tantalum	Tantalum oxide	Capacitors	Brazil, Australia, Mozambique, China, Rwanda	NA	NA	1,410 (European Commission)
Tungsten	Ammonium Paratungstate	Light bulbs, Defense, Drills	China, Russia, Canada, Bolivia, Austria	(IBM)	(IBM)	500,000 (www.bardinvestor.com)
Bismuth	By-product of extraction process of lead, tin, zinc	Pharmaceutical, Solder, Electronic circuits	China, Mexico, Peru	NA	NA	NA
Selenium	Sulphide deposits	Glass industry, Agriculture and Dairy, Manufacture of Alloys	Japan, Belgium, Canada, Germany	(IBM)	(IBM)	NA

Challenges for India

From the above table, it is clear that India is dependent on imports to a large extent and is thus vulnerable to supply/price fluctuations. These strategic minerals assume further importance due to the following additional reasons:

1. Growing industrialization of India would be increasingly dependent upon the use of technology.
2. India will move towards establishing and strengthening its own high-tech industry base.
3. Several important industries, critical to India's national security, renewable energy mission, electronics, consumer durables, clean technology etc. are dependent on subject minerals / metals.
4. The current understanding and knowledge of these minerals is limited and thereby India remains exposed to sub-optimal responses to the strategic risk.

5. Even if there be an opportunity for India in these strategic minerals, it cannot be leveraged to advantage in the absence of sufficient clarity on the strengths & weakness of this subject.

Thus keeping the above points in mind, it becomes imperative that India develops a comprehensive policy with regard to the exploration, production, consumption and other issues associated with these minerals.

Potential approach for India

India should develop its own policy response from amongst the following options and should craft an integrated roadmap for mining, production and usage of these minerals.

1. Access to raw materials in world markets: Entering into bilateral agreements with countries, to secure supply for both the short term and long term. Moreover, India can create a national body which is responsible for the national sourcing of raw materials similar to Japan Oil, Gas and Metals National Corporation (JOGMEC).
2. The right framework to foster sustainable supply of raw materials from Indian sources: Creating an environment where the domestic producers are encouraged to produce these metals. Most of these metals can be produced as a by-product of the base metal production process, but it appears that the current quantities are low. Thus India should work to incentivize the production of these metals through fiscal measures.
3. Increase resource efficiency and promoting recycling: Investing in research so that substitutes can be found. Recycling is another important way to fulfill a part of the demand of these metals.
4. Build a national stockpile: Evaluating the option of building a national stock pile for identified materials. This will not only help to meet supply in case of exigencies but also keep prices under control.

TIN

The world reserves are 5.2 million tones. China reserves stands at around 1.5 million tons which forms 29% of world reserves, the largest reserves of tin in the world for any single country. Indonesia, Brazil and Peru also have substantial quantity of tin reserves with 15%, 11% and 14% respectively.

The total world production in 2010 is 2,61,000 tonnes. The major producers are China, Indonesia, Peru and Bolivia producing about 80% of world production.

Tin reserves and resources in India as of 01.04.2005 are:

	Reserves	Resources	Total
Ore	249,497	86,302,812	86,552,309
Metal	134.1	101,103.02	101,237.1

India produced 59,776kgs of tin in FY09, all of which came from Dantewada district of Chhattisgarh. The primary consumers of the metal in India are the tin plate and solder industries.

COBALT

The world reserves are 7.3 million tones. Congo reserves stands at around 3.4 million tons which forms 50% of world reserves. Australia, Brazil, Canada and China are other major countries having substantial quantity of cobalt reserves.

The total world production in 2010 is 88,000 tonnes. The major producers are Congo, Australia, Zambia.

India has around 44.91 million ton of cobalt resource. Of this around 69% is in Orissa and the remaining 31% is in Nagaland (5 million tons) and Jharkhand (9 million tons). At present no production is done from the indigenous ores. Most of the cobalt refined in India is from imported ores. India produced 1001 tonnes of cobalt during the year 2010.

LITHIUM

The world reserves are 13 million tones. China reserves stands at around 7.5 million tons which forms more than 50% of world reserves. Chile is the second most abundant, with lithium reserves at 3.5 million tons. Together these two countries account for 85% of the total lithium reserves.

The total world production in 2010 is 25,300 tonnes. The major producers are China, Chile, Australia and Argentina.

GERMANIUM

Germanium is mined primarily from sphalerite, though it is also recovered from silver, lead, and copper ores. It is mostly produced as a by-product of zinc and copper-zinc smelting. The total world production is 1,20,000 tonnes in the year 2010. The major producers are USA, China and Russia. Around 30% of the total germanium consumed is produced from recycling scrap.

GALLIUM

Gallium is recovered from sodium aluminate liquors obtained in Bayer's alumina process during aluminum production. Traces of gallium are also found in zinc ores. Primary gallium production in terms of metal content was around 106 tons in 2010 and 79 tons in 2009. China, Germany, Kazakhstan and Ukraine were leading producers of gallium in 2010. Refined gallium production, which includes some scrap refining, was estimated to be about 161 tons in 2010. In 2010, the world primary gallium production capacity was around 184 tons, refinery capacity was 177 tons. world gallium recycling capacity is around 141 tons in 2010.

INDIUM

It is mainly produced as a by-product of the commercial extraction of zinc, lead, copper and tin. Major producers of Indium are China, Canada, and Korea etc. The total world production in the year 2010 is 574 tons.

NIOBIUM

The primary mineral from which Niobium is obtained is pyrochlore. The world's largest deposit is located in Araxa, Brazil and is owned by Companhia Brasileira de Metalurgia Mineracao (CBMM). Though, Niobium and Tantalum minerals often occur together but approximately 85%–90% of the niobium industry obtains its Niobium ores from sources other than those associated with the mining of tantalum containing ores. The total world production in the year 2009 is 61,700 tons. Major producers are Brazil and Canada.

BERYLLIUM

The proven reserves are there in USA which are around 15,000 tonnes. The major producer is USA which produced 170 tonnes during the year 2010.

India has substantial deposits of beryl ore and the processing technologies for treating the indigenous resource have been comprehensively developed and a pilot plant is being operated by the Department of Atomic Energy.

TANTALUM

The main resource base is from South America, Australia, China and Russia which account for 40%, 21%, 10%, 10% of the total resource base which is 698 Million pounds. The major producers are, Brazil, Australia, China. The total production during the year 2008 is 8,992 tons.

TUNGSTEN

The world reserves are 2.9 million tons. China reserves stands at around 60% of the total world reserves. Canada and Russia follow with 13% and 9% share. The total world production in 2010 is 25,300 tonnes. The major producers are China, Russia and Canada. The total world production in 2009 is 58,000 tonnes.

Tungsten reserves and resources in India as of 01.04.2005 are:

	Reserves	Resources	Total
Ore	0	87,387,464	87,387,464
Metal	0	142,094	142,094

BISMUTH

The world reserves are 320,000 tons. China reserves stands at 240,000 tons. Canada and Russia follow with 13% and 9% share. The total world production in 2010 is 7,600 tons. The major producers are China and Mexico.

SELENIUM

The world reserves are 88,000 tons. Chile reserves stands at 20,000 tons. The total world production in 2010 is 2,260 tons. The major producers are Japan and Germany. In India Selenium is produced by Hindalco. It reported an annual production of about 36.810 tons in 2008-09. Selenium was also produced by Hindustan Copper Ltd (HCL) at its Ghatsila copper smelter but no production has been reported in the recent years. India imported around 164 tons of Selenium in 2008-09.

11. Ferrous Minerals

Iron ore is the basic raw material mainly used in the making of pig iron, sponge iron, steel and alloy steel. Iron & steel industry is the major consumer of iron ore in the country. This industry uses iron ore in lumps as well as fines after pelletization, sintering or briquetting. Sponge iron is another major consumer of iron ore. Sponge iron is used as a substitute in place of scrap in electric arc furnaces and in mini-steel plants.

World Scenario

Iron ore deposits are distributed in different parts of the world. The world reserve base of crude iron ore is estimated to be around 160 billion tonnes and the reserves in iron content are estimated to be around 77 billion tonnes.

Among the leading producers of Iron ore in the world, China, Brazil, Australia, India & Russia are important from their level of production. Sweden is equally important for underground mining and its level of automation. In case of above major 5 countries, about 90% of iron ore comes from open cast mining method whereas in the case of Sweden, the entire production is from the underground mining.

In 2009, the world production of Iron Ore was 2,248 million tonnes as against 2214 million tonnes in the previous year. It is evident that, during the last 5 years, the production of Iron ore increased from 1567 million tonnes to 2248 million tonnes.

Indian Scenario

The total resources of iron ore, both Hematite and Magnetite, as on 1.4.2010 are estimated at 28526 Million tonnes (Provisional fig. provided by IBM). Of these, resources of Hematite, which is considered to be superior because of its high grade, are placed at 17882 (P) million tonnes with 8093 million tonnes (45.3%) under reserve category and the balance 9299 million tonnes (54.7%) under resources category.

India is the leading producer of iron ore in the world. Indian production of iron ore constitutes around 10% of the world iron ore output. The production of iron ore constituting lumps, fines and concentrates was estimated at 218.64 million tonnes in the

year 2009-10. During 2009-10, among the states, Orissa recorded the highest production of 79 million tonnes (36%), followed by Karnataka 43 million tonnes (20%), Goa 39 million tonnes (18%), Chhattisgarh 26 million tonnes (12%) , Jharkhand 23 million tonnes (11%). The remaining 3% production was reported from Andhra Pradesh, Madhya Pradesh, Maharashtra and Rajasthan. Grade wise analysis reveals that, out of total output of 218 million tonnes, iron ore lumps accounted for 91.7 million tonnes (41.9%), fines 126.2 million tonnes (57.7%) and concentrates 0.76 million tonnes(0.3%), respectively.

Exports and Imports

During 2000-01, India has exported 20.162 million tonnes which gradually increased to 101.531 million tonnes in 2009-10. Due to good export realization, import figures are not much. The imports in 2007-08 and 2008-09 comprised mostly (99%) iron ore pellets from Bahrain and very small amounts (<1%) of Pyrites from Finland and Germany. The total import of iron ore during 2009-10 was 8.97 lakh tonnes.

Sponge Iron

India is the largest producer of sponge iron in the world. The growth of sponge iron industry during the last few years in terms of capacity and production has been substantial. The installed capacity of sponge iron increased from 1.52 million tonnes per annum in 1990-91 to around 30.9 million tonnes in 2008-09. Production has increased from 0.9 million tonnes in 1990-91 to 21.09 million tonnes in 2008-09. There were 324 sponge iron units in the country. Out of these, 3 gas-based units had a capacity of about 8 million tonnes per annum and the rest were coal-based units.

Consumption, Demand and Supply

Consumption of iron ore in various industries like iron & steel, sponge iron, ferro-alloys, Alloy Steel, Coal washery and Cement during 2009-10 was about 90.6 million tonnes. Of the total domestic consumption, iron and steel and sponge iron industries account for about 98%. Cement industry is the second major consumer of iron ore.

As per National Steel Policy 2005 (NSP), the domestic finished steel production was projected at 110 million tonnes by 2019-2020. The projection was based on the projected Compounded Annual Growth Rate (CAGR) of 7.3% per annum in India which compares well with the projected national income growth rate of 7.8% per annum. As per the NSP, the projected demand of finished steel was 110 million tonnes. To meet the projected tonnage of the steel, the requirement of iron ore will be 190 million tonnes by 2020. For exports, additional 100 million tonnes of iron ore will be required. In all 290 million tonnes of iron ore will be required by 2020. The estimated production of iron ore would be about 255 million tonnes by 2011-12 and 374 million tonnes by 2016-17 at 8% growth rate. The apparent consumption is estimated at 138 million tonnes by 2011-12 and 218 million tonnes by 2016-17 at 8% growth rate.

MANGANESE ORE

Manganese ore is an indispensable raw material in manufacture of steel where it is used in the form of ferro-manganese and also as a direct feed to the blast furnace. . It has important application in ceramic and glass industry as colouring agent. About 90 to 95% world production of manganese ore is used in metallurgy of iron and steel.

World Scenario:

The total world reserves are approximately 5200 million tonnes in 2009. The land- based manganese resources are large but irregularly distributed. The largest manganese reserves are in South Africa which account for 77% of world reserves. 96% of global production of manganese today is from barely 7 countries viz. CIS, RSA, Brazil, Gabon, Australia, China and India in decreasing order of tonnages raised annually. The global resource base is close to 12 billion tonnes.

World production of manganese ore was 33.4 million tonnes in 2009, a 12.56% decrease as compared with that of 2008. China is the leading producer at 12 million tonnes, accounting for about 36% of the total world production. India's production was about 2.44 million tonnes in 2009-10.

Indian Scenario

The total resources of manganese ore in the country as per UNFC system as on 1.4.2005 are placed at 378.57 million tonnes. Out of these, 138.15 million tonnes are categorized as reserves and the balance 240.42 million tonnes are in the remaining resources category. Gradewise, ferro-manganese grade accounts for only 7%, medium grade 8%, BF grade 34% and the remaining 51% are of mixed, low, others, unclassified, and not known grades including 0.5 million tonnes of battery/chemical grade.

The production of Manganese ore in 2009-10 was 2.44 million tonnes as against 3.62 million tonnes in the previous year. Madhya Pradesh and Orissa were the leading producing states account for about 25% each of the total production in 2009-10. Next in the order of production were Maharashtra (24%), Karnataka (13%) and Andhra Pradesh 10%. The remaining 3% of total production was reported from Goa, Gujarat, Jharkhand, and Rajasthan..

Exports and Imports

During 2008-09, India Exported 2.05 lakh tonnes of Manganese ore. This quantity increased to 2.89 lakh tonnes during 2009-10(P). Exports were mainly to China, Bhutan & Japan. During the last five years i.e., 2005-06 to 2009-2010 the import of manganese ore increased from 3000 tonnes to 7.98 lakh tonnes. South Africa (42%), Australia (41%), Gabon (5%) and Ivory Coast (3%) were the main suppliers of manganese ore.

Consumption, Demand and Supply

The reported consumption of manganese in all industries during 2000-01 at 9.13 lakhs has increased over the years. In the year 2009-10 it has touched 30.25 lakhs.

Silico-manganese (62%) and ferro-alloys (31%) industries together accounted for about 93% consumption followed by iron & steel (5.2%).

The estimated production is about 4.56 million tonnes by 2011-12 and 6.700 million tonnes by 2016-17 at 8% growth rate. The apparent consumption is estimated at 4.98 million tonnes by 2011-12 and 7.31 million tonnes by 2016-17 at 8% growth rate.

CHROMITE

Chromite is an important commercial chromium bearing mineral. It has got its critical importance in the steel industry because it imparts unique qualities to the products to which it is added like production of stainless steel, high temperature alloys, ferro-chrome, charge-chrome, refractories etc. and have numerous industrial and defense applications.

World Scenario

World reserves of shipping-grade chromite are more than 350 Million tones, sufficient to meet conceivable demand for countries. About 88% of world's chromium resources are concentrated in Kazakhstan and South Africa, These two countries are the major sources for chromite ore globally. United States chromium resources are mostly in Stillwater complex in Montana.

The world production of chromite decreased to 18.7 million tonnes in 2009 from 23.6 million tonnes in 2008. South Africa was the leading producer, followed by India and Kazakhstan. Other significant producers were Turkey, Russia, Brazil, Finland and Zimbabwe.

Indian Scenario

As per UNFC system, total resources of chromite in the country as on 1.4.2010(P) are estimated at 203.3 million tonnes, comprising 53.9 million tonnes reserves (26.5%) and 149.4 million tonnes remaining resources (73.5%). More than 95% resources of chromite are located in Orissa, mostly in the Sukinda valley in Cuttack and Jajpur districts.

The production of chromite at 3.41 million tonnes during 2009-10 decreased by 16% as compared to the previous year owing to decrease in market condition and demand. Orissa continued to be the major producing state of chromite, accounting for almost entire production during 2009-10.

Export and Imports

During 2009-10, India Exported 6.89 lakh tonnes of Chromite ore and bulk share of about 82% was of chromite concentrate while chromite lumps and other Chromite together accounted for 18%. Exports were mainly to China (77%) and Japan (22%).

During 2009-10, India Imported 0.96 lakh tonnes of Chromite ore. Lumpy chromite accounted for 55% while concentrate and other forms accounted for remaining 45%. Imports were mainly from Oman (75%), UAE (9%), South Africa and Turkey (7% each).

Consumption, Demand and Supply

The estimated production of chromite is about 5.01 million tonnes by 2011-12 and 7.37 million tonnes by 2016-17 at 8% growth rate. The apparent consumption is estimated at 2.74 million tonnes by 2011-12 and 4.35 million tonnes by 2016-17 at 8% growth rate.

Status of Chromite exploration in India

Total potential area is approximately 2720 sq km which includes 2690 sq km in Peninsular India and 306 sq km in Extra Peninsular India. Total explored area is 604 sq km which includes 88.7 sq km lease hold areas. Free hold un-explored area is around 2116 sq km. Free hold explored area for reassessment is around 515.3 sq km.

RECOMMENDATIONS (Sub Group II)

1. As the major developed and developing countries are trying to acquire overseas mines by way of purchasing assets abroad or diplomatic support, the Indian Govt. needs to play a facilitative role to help by involving diplomatic support. It may also include Govt. to Govt. co-ordination, and formation of consortiums of public and private sector to work jointly to acquire the mining assets. Govt. may consider creating techno-economic analysis unit in Ministry under an Economic Advisor and associate stakeholders including NMCC, MEA, FIMI, CII etc. in the process. Strengthen ties with mineral rich countries and provinces with functional and specific MoUs and utilize IMG mechanism to align domestic stakeholders with MoUs.
 - *Implementing agencies – Ministry of Mines and Ministry of External Affairs, Deptt. of Atomic Energy, Ministry of Fertilizers, Ministry of Commerce.*

2. In case of acquisition of assets, an analysis was made on geological potential and the supply demand of various minerals. Depending upon the industrial growth and the demand projected the strategy for the raw material security for deficient and strategic minerals is to be worked out. There is a proposal to create the Sovereign Wealth Fund so as to acquire such resources wherever they are available. A sum of Rs. 1000 crores is also proposed for the same. The Ministry of Mines has formed a Inter Ministerial Committee for coordination relating to the areas of interest for the country to be taken up for bilateral discussions with other countries. The Inter Ministerial Committee will be having a representative from MEA, Atomic energy, Fertilisers, Commerce and Coal etc.
 - *Implementing agencies – Ministry of Mines and Ministry of External Affairs.*

3. In addition, the Ministry of Mines is having a Joint Working Group with the various countries like Australia, Canada, Chile, China, France, Columbia, Iran, Malawi, Afghanistan, Mongolia, Uzbekistan, , Namibia, Mozambique, , South Africa, Vietnam, Peru, Nigeria, Peru. It was noted that for effective and better results it is decided that Ministry will have direct MOU with provincial governments like Australia, Canada who actually are the owners of the minerals. There should be MOUs at provincial level to begin with for long term engagements with mines ministry as lead ministry and other concerned Ministries like Fertilizers, Deptt. of Atomic Energy etc. selected on the norms of potential for mineral in that province. Pro-active engagement with these provinces is also necessary to harness the mineral resources available in the countries to sustain India's growing needs in infrastructure and expanding manufacturing sectors.
 - *Implementing agencies – Ministry of Mines and Ministry of External Affairs.*

3. Mineral Sector development is hampered by the environmental and other clearances. Lot of time is needed to get mineral concessions through prescribed time limits as per the statute. Currently, RP applicant puts significant amount of time (8-12 or more months) in getting aerial survey permissions which involves obtaining 'No Objection Certificates' at various levels, security clearances from different Government department etc. Hence, simplification of Aerial survey procedures and approvals are required in order to increase the exploration range to find out more reserves.

- *Implementing agency – Ministry of Mines and Ministry of Civil Aviation.*

4. Cluster mining approach in order to utilize the small deposits for further industrialization of the mining area may be adopted in the sector which will improve the workability of small quarries.

- *Implementing agencies – State Governments, Industry associations*

5. To support development of suitable technology for various small deposits, there is a need for identification of a dedicated Centralized R&D institute/centre for process development of precious metals.

- *Implementing agencies – CSIR, Ministry of Mines*

6. To encourage efforts on exploration of low grade ores, initiatives are required to be taken by way of relaxation in taxation policy such as flow through options to offset risk in exploration. There is a need to create mechanism by which access venture capital is available to the mining companies on the lines of Toronto stock exchange (TSX)

- a. *Implementation agencies – Ministry of Mines and Ministry of Finance & SEBI*

1. COPPER

1.1 Intensive exploration of copper mineral for additional resources within the country using modern means and by involving private sector participation as well as inviting junior miners should be encouraged in XII plan because India's import dependency with respect to copper concentrate will be 90% of its requirement even if the current expansion plans of HCL are achieved.

- *Implementing agencies – GSI, ministry of Mines, state Governments, HCL.*
- *Fund requirement – 50 Crores for GSI in the 12th plan where metal specific focused exploration project to be formulated.*

1.2 All existing known resources / deposits of copper need to be brought into production through private or public sector investment. To increase range of down stream products so as to raise per capita copper consumption from 0.5 kg to 1.0 kg. by end of XIII plan.

- *Implementing agencies – HCL.*
- *Fund requirement – 2000 Crore for HCL through I&EBR.*

1.3 As the major developed and developing countries are trying to acquire overseas mines by way of purchasing assets abroad or diplomatic support, the Indian Government needs to play a facilitative role to help by involving diplomatic support. It may also include Government-to-Government co-ordination, and formation of consortiums of public and private sector to work jointly to acquire the mining assets. Government may consider creating techno-economic analysis unit in Ministry under an Economic Advisor and associate stakeholders including NMCC, MEA, FIMI, CII etc. in the process. Strengthen ties with mineral rich countries and provinces with functional and specific MoUs and Utilize IMG mechanism to align domestic stakeholders with MoUs. Japanese smelters have made investments in other countries for supply of raw material. Further, China often with government support acquired copper mining assets in other countries. Similar such approach by Indian government is needed by providing financial support by the government.

- *Implementing agencies – Ministry of Mines, DIPP and Ministry of External Affairs.*
- *Fund requirement – 10 Crore to set up a cell in Ministry of Mines*

1.4 To ensure recovery of by products during custom smelting model, it may be worthwhile to reduce the customs duty on copper concentrate from 2.5% at present to NIL, at least till CST is phased out. Further, in order to leverage these custom based smelters Government may by way of FTAs/ PTAs into India's access to copper concentrate. This needs intense negotiations in bilateral agreement with resource rich countries i.e. Australia, Peru and Chile.

- *Implementing agencies – Ministry of Commerce in consultation with Ministry of Mines, ministry of Finance and Ministry of External Affairs.*

1.5 It is necessary to encourage recycling of scrap with adoption of appropriate technology. Proper scrap collection and segregation mechanism needs to be established by creation of R & D institutions under an overarching framework for coordinated work.

- *Implementing agency – Ministry of Mines – providing grants to Indian Copper Development Centre.(ICDC)*
- *Fund requirement – 20 Crore to Ministry of Mines for assisting in developing appropriate technology for recycling and 5 crore by way of grants to R & D institutions as ICDC.*

1.6 The disincentive on gold production through copper route has been persisting. The following duty changes may be considered for encouraging smelters to recover Gold and Silver from slimes:

- Since there is no countervailing duty on finished gold imports, excise duty (Rs. 300 per 10 grams) on domestically produced gold vitiates the level playing field. Hence, excise duty on finished gold should be removed.
- Gold contained in copper concentrate should be exempted from the countervailing duty and additional customs duty, following the exemption from basic customs duty in the recent Budget. This step is necessary to remove the disincentive that exists currently with respect to production of gold for copper producers.
- *Implementing agency – Ministry of Mines and Ministry of Finance.*

2. LEAD AND ZINC

2.1 To encourage efforts on exploration of low grade ores, initiatives are required to be taken by way of relaxation in taxation policy such as flow through options to offset risk in exploration. There is a need to create mechanism by which access venture capital is available to the mining companies on the lines of Toronto stock exchange (TSX).

- *Implementation agencies – Ministry of Mines and Ministry of Finance & SEBI*

2.2 Duty structure needs to be reviewed suitably for procurement of geophysical and geochemical surveying instruments so that exploring agencies can undertake intensive exploration at low cost.

- *Implementation agencies – Ministry of Mines and Ministry of Finance.*

2.3 Currently, RP applicant puts significant amount of time (8-12 or more months) in getting aerial survey permissions which involves obtaining 'No Objection Certificates' at various levels, security clearances from different Government departments etc. Hence, simplification of Aerial survey procedures and approvals are required in order to increase the exploration range to find out more reserves.

- *Implementing agency – Ministry of Mines and Ministry of Civil Aviation.*

2.4 Nearly 50% of the estimated all India resource is low grade (<5% grade) and are currently not mined. To make these low grade deposits as economically viable mining projects, special relaxation in royalty and taxation need to be considered.

- *Implementing agency – Ministry of Finance and Industrial associations*

2.5 Completion of feasibility studies on marginal grade deposits to establish their economic viability as new mining projects is required to augment the zinc-lead reserves of India in a time bound manner during this 12th plan period through R & D institutions under an overarching framework for coordinated work.

- *Implementing agency – Ministry of Mines.*
- *Fund requirement – 5 crore for engaging a consultant for developing feasibility studies for marginal grade deposits.*

2.6 With rapid expansions of smelter capacities, imports of zinc concentrate and lead concentrate are inevitable as domestic production (current as well as estimated) will be insufficient to meet the requirements. A supportive tariff regime (nil duty) is required on raw material namely zinc concentrate and lead concentrate to enable Indian zinc smelters and lead smelters to compete on a level playing field during FTAs.

- *Implementing agencies – Ministry of Commerce and Ministry of Finance.*

2.7 A considerable part of India's requirement of Zinc die cast alloys & Lead alloys are fulfilled by imports. Taxation and Technological transfer measures should be taken to develop indigenous downstream producers of these alloys so that India becomes self sufficient in value added products of zinc & lead as well.

- *Implementing agencies – Ministry of Mines and Ministry of Finance, C-TEMPO and Industry associations*

2.8 Various policy initiatives have been taken by the Ministry of Environment & Forests and Central Pollution Control Board, towards eco-friendly lead-zinc recycling sectors. Presently, the registration scheme for Recycling/Reprocessing of Hazardous Wastes comes under the purview of State Pollution Control Boards/Committees. Therefore, it is necessary that the state regulatory bodies will monitor the recycling sectors effectively by making suitable norms and rules so that sustainable approach can be taken place under proposed sustainable development framework (SDF) document.

- *Implementing agencies – Ministry of Environment and forests and State Governments.*

3. ALUMINIUM

3.1 Aluminium smelting being energy-intensive, allocation of captive coal blocks or linkages should be given at par with IPP's for primary aluminium smelters.

- *Implementing agency – Ministry of Coal, Ministry of Mines*

3.2 Many large Bauxite Greenfield mining projects such as Vedanta, Utkal Alumina and Anrak etc., are held up for want of Forest/ Environmental clearances. Also land acquisition became an issue. Holistic review to be taken to ensure faster clearances and land acquisition, particularly for weathered deposits like bauxite.

- *Implementing agencies – Ministry of Mines, Ministry of Environment and Forests, Ministry of Tribal Affairs, Ministry of Rural development and concerned State Governments.*

3.3 Value addition in Aluminium alloys and semis to be encouraged through removing inverted duty structures.

- *Implementing agency – Ministry of Commerce*

3.4 Induction and promotion of appropriate technologies indigenously or through Joint ventures required to be promoted by government funding and also suitably reorienting JNARDDC to focus more on process R&D for Technology.

- *Implementing agencies – Ministry of Mines, Ministry of Finance, Ministry of Commerce, JNARDDC.*
- *Fund requirement for technology development – Rs 5Crore for JNARDDC.*

3.5 It is necessary to encourage recycling of scrap with adoption of appropriate technology. Proper scrap collection and segregation mechanism needs to be established. This will help mineral and energy conservation.

- *Implementing agency – Ministry of Mines – providing grants to Aluminium Association of India for developing mechanism for scrap utilization and issues involved in segregation.*
- *Fund requirement – 25 Crore to Aluminium Association of India for developing appropriate recycling technology*

3.6 Development of appropriate technology through R & D for utilisation of Red Mud generated during Alumina production, including recovery of Gallium and Vanadium. Development downstream products to popularise aluminium as a metal in construction, automobile, packaging and other sectors and increase per capita consumption from 1.3 kg to 2.0 kg per capita by end of XIII plan

- *Implementing agency – JNARDDC*
- *Fund requirement – Rs 5 Crore to JNARDDC for developing the appropriate technology*

4. CEMENT AND LIMESTONE

4.1 The exploration for the cement grade limestone including special thematic mapping and geochemical mapping should intensify in the areas beyond known limestone belts by GSI. Search for occurrence in Himalayas and Indo Gangetic Plains and Indian deserts needs to be intensified. This will increase the conversion of resources

into reserves. Further, the limestone deposits are explored up to a depth of approximately 70 meters. There is a need to explore Limestone at greater depth.

- *Implementation agencies – GSI and State Governments.*

4.2 At present periodic assessment of the captive limestone mines is not taken up. The directives issued time to time for carrying out statutory exploration/ reassessment required to be monitored and reviewed to assess the availability of limestone reserves after assessing the current demand.

- *Implementation agency – IBM and State Governments*

4.3 Cluster mining approach in order to utilise the small deposits for further industrialization of the mining area may be adopted in the sector which will improve the workability of small quarries.

- *Implementing agencies – State Governments, Industry associations*

4.4 There are deposits existing in Northern and North eastern India which are of high value but with deficiency in infrastructure are not economical or accessible to exploit. Such deposits may be identified and seeing their potential, infrastructure should be developed which will lead to holistic development of that region.

- *Implementing agency – Ministry of Mines, DONEAR and State governments.*

4.5 Review of the provisions of the CRZ is essential to enable eco-friendly use of enormous reserves of cement grade limestone available along Gujarat coast and to provide raw material security to existing plants.

- *Implementation agency – National institute of Oceanography, Ministry of Mines, MOEF.*

4.6 Incentives on utilization of mineral beneficiation techniques with better recovery from low grade limestone and mine rejects may be provided in the form of appropriate royalty reliefs.

- *Implementation agency- Ministry of Mines*

4.7 Fiscal taxation measures to be adopted to encourage the utilization of low grade limestone. Further, utilisation of low grade limestone can be also encouraged by adopting the method of blending high grade imported limestone without compromising the quality of cement.

- *Implementing agencies – Ministry of Finance and Ministry of Commerce.*

4.8 To encourage higher use of fly ash and slag, suitable fiscal taxation measures to be adopted for optimal utilisation and conservation of available limestone resources. Special studies to be conducted on sand, sand resources, and sand substitutes including M-sand (crushed aggregates)

- *Implementation agencies – Ministry of Industries and Ministry of Finance. For study -C-TEMPO, NCCBM, State Governments.*

5. DIAMOND AND PRECIOUS STONES

5.1 India is the producer of some of the well known diamonds like Great Moghul, Koh-i-noor, Nizam, Hope and Daryia-i- noor etc., in the world. However, all the diamonds have been found in gravel or alluvium as the host rock has not been discovered. It needs investor friendly policies to offset the high expenditure and high risk in exploration to attract junior and other players in exploration to locate diamondiferous host rocks as kimberlite and lamproite.

- *Implementing agency – Ministry of Mines and Ministry of Finance and SEBI*

5.2 Airborne survey being crucial technique to locate kimberlites and lamproites needs simplification of procedures for approvals.

- *Implementing agency – Ministry of Civil Aviation*

5.3 The diamond exploration and exploitation being the capital intensive exercise needs support from the government by way of policy changes, incentives to attract venture capital, speedy approvals and assured right of transition from RP to ML.

- *Implementing agency – Ministry of Mines.*

5.4 For conducting regional surveys and technology upgradation for diamonds by GSI viz. regional airborne geophysical surveys, magneto-telluric survey, litho probe project and tele-seismic (seismic tomography) project etc., Government financial support may be extended. State government DMG exploration wings need to be strengthened.

- *Implementing agency – GSI*
- *Fund requirement – Rs. 200 crores for conducting exploratory surveys with focus on Diamonds.*

5.5 Commission exploration programmes and surveys to ascertain availability of coloured gemstones in mission mode by GSI. Appropriate budgetary support is necessary.

- *Implementing agency – GSI.*
- *Fund requirement – Rs. 20 Crores for mineral investigation scheme of GSI.*

5.6 Need for appropriate regulatory framework to prevent illegal mining of coloured gemstones.

- *Implementing agencies – State Government.*

5.7 To negotiate favourable trade regimes and agreements with countries which currently impose high tariffs on imports of coloured gemstones from India. (Eg. Brazil, Mexico and China).

- *Implementing agencies – Ministry of Commerce.*

5.8 With 800,000 strong workforce and deployment of the latest technology, India continues to be the dominant player in the world's diamond cutting and polishing industry. India is facing growing competition from China and due to the fact that producing countries in Africa want a share of processing within their countries. Thus, for India to retain its dominant position in cutting and polishing, the diamond industry needs to upgrade their equipment and skills for cutting and polishing of larger size diamonds and colored stones. Gem and Jewellery Export Promotion Council (GJEPC) may be identified as a nodal agency for this purpose.

- *Implementation agency- Ministry of Commerce, GJEPC, Hindustan Diamond Company Pvt. Ltd.*
- *Fund requirement – 100 crore for developing the skill of the work force by assisting GJEPC.*

6. GOLD AND PRECIOUS METALS

6.1 A central coordinating agency to be identified for taking a mission approach on gold and precious metals and achieving the objectives set out in this document.

- *Implementing agency – Ministry of Mines, GSI and C-TEMPO..*
- *Fund requirement – Rs 10 Crores for exploration of Gold deposits in the country.*

6.2 To accelerate the rate of exploration to tap the immense potential for Gold and precious metals in the country and to cover larger area through faster grants, seamless transition etc.

- *Implementing agencies – Ministry of Mines, GSI and State Governments and private sector*
- *Fund requirement – 50 crore for GSI*

6.3 To support exploitation of available resources by accelerating production from HGML, recovery from KGF tailings, reviving abandoned mines and faster approvals of other primary producers.

- *Implementing agencies – Ministry of Mines, Government of Karnataka, HGML.*

6.4 Encouraging copper smelters for recovery of gold and silver from anode slimes, measures like removal of excise duty on finished gold, exemption from the countervailing duty and exemption of additional customs duty for gold contained in copper concentrate, are required.

- *Implementing agency – Ministry of Finance*

6.5 To support development of suitable technology for various small deposits, there is a need for identification of a dedicated Centralised R&D institute/centre for process development of precious metals.

- *Implementing agencies – CSIR, Ministry of Mines, MECL*
- *Fund requirement Rs. 25 Crores*

6.6 Ensuring availability of skilled/ trained manpower in geology, mining, processing of precious metals as well as tradesman partnership between industry, academic institutions and research labs

- *Implementing agencies – Ministry of Mines and Ministry of HRD*
- *Fund requirement Rs. 25 Crore to CSIR and ISM*

6.7 Boula Nuasahi Ultra Maffic Complex (BNUC), Orissa having 15 tonnes of PGEs at 1 g/t of Pt+Pd should be accorded priority in developing it into economically viable deposit by identifying National Institutes to carry out detailed feasibility studies & to set up 2 t/annum PGE recovery plant by end of 12th Plan.

- *Implementing agencies – Government of Odisha, Orissa Mining Corporation, CSIR and Ministry of Mines*
- *Fund requirement – Rs 25 Crores to CSIR*

6.8 Feasibility studies on Sittampundi & Hanumalpara deposits to be initiated simultaneously

- *Implementing agencies- State Governments, Ministry of Mines*
- *Fund requirements – Rs 15 Crores to CSIR*

6.9 Detailed exploration in the 10-12 areas identified by GSI needs a major thrust during 12th plan to identify more resources.

- *Implementing agencies – Ministry of Mines and concerned State Governments*

6.10 Recovery of Gold from KGF tailings, reviving abandoned mines of BGML.

- *Implementing agencies – Ministry of Mines by engaging consultant.*
- *Fund requirement – 2 crore*

Investing into R&D and to encourage recycling through technology mission approach specific to PGEs by recycling the catalytic converters, E-waste and other PG bearing wastes and through project grants under S & T projects.

- *Implementing agency – Ministry of mines, DST, CSIR, BARC etc*
- *Fund requirement – Rs.100 Crores*

7. DIMENSION AND DECORATIVE STONES

7.1 Centre for Development of Stones (CDOS), Rajasthan, which is a state govt. agency to be upgraded and re-designated as a National agency for technology/ skill upgradation, market development support etc. for Marble. A separate national agency is required to be established in southern India for development of granite and other stones.

- *Implementing agency – Ministry of Mines and State Governments*
- *Fund requirement – Rs 100 Crore*

7.2 In order to promote the dimension stone industry by taking country as a whole there is a need to have a suitable rate of royalty in all the states.

- *Implementing agencies – Ministry of Mines, State Governments*

7.3 Initiatives to be taken in the form of fiscal measures as customs and excise duties to encourage import of dimension stones rather than finished products. This will encourage value addition and transfer of technology in the field of dimension stones in the country, which will contribute employment generation and foreign exchange earnings for GDP growth.

- *Implementing agencies – Ministry of Finance, Ministry of Commerce and Director General of Foreign Trade*

7.4 The dimensional stone sector should be given the status of industry so that it can qualify for the fiscal benefits like financial incentives, low cost loans etc.

- *Implementing agencies – Ministry of Finance and State Governments*

7.5 Necessary infrastructure facilities like water, power, road network in the mining areas of dimension stones which are generally located in remote areas may be provided by the State Governments.

- *Implementing agencies – State Governments*

7.6 Necessary clearances for the deposits located in the forest areas are required to be expedited by evolving a faster mechanism.

- *Implementation agencies – Ministry of Environment and Forests and State Governments*

8. INDUSTRIAL AND NON-METALLIC MINERALS

Detailed exploration for chemical and fertiliser grade rock phosphate is needed in order to convert the resources in to reserves. New deposits to be searched in Andhra Pradesh, Madhya Pradesh, and Rajasthan. Besides, beneficiation of low grade rock Phosphate should be promoted indigenously.

- *Implementing agencies – GSI and State Governments*

Private sector participation in rock phosphate and potash mining needs to be promoted in order to make available the above two minerals to reduce import dependence for promotion of fertilisers for agricultural sector.

- *Implementing agencies – Ministry of Fertilisers and State Governments*

The country is deficient in all fertiliser minerals hence, concentrated effort should be made by making consortium of public private companies to acquire assets abroad specifically in the countries like Uzbekistan, Jordan etc. Strengthen ties with mineral rich countries and provinces with functional and specific MoUs and Utilize IMG mechanism to align domestic stakeholders with MoUs

- *Implementing agencies – Techno-economic advisory unit Ministry of Mines*
- *Fund requirement - 1000 Crores through public private partnership to acquire mining assets abroad*

Country being deficient in Pyrites and Sulphur which are essential for fertiliser industry, thus taxation policy intervention to be introduced to recover the sulphur going as gaseous emissions in the refinery and petro-chemical industries.

- *Implementing agencies – Ministry of Petroleum and Natural Gas*

Restrictions of mining of Chrysotile variety of Asbestos used in flux and construction industries are required to be lifted in view of its increasing demand by framing necessary guidelines.

- *Implementing agency – Ministry of Mines*

Exploration of low silica dolomite which is used as flux to be initiated in the states of Andhra Pradesh and Orissa.

- *(Implementing agency – State Government).*

R & D for setting beneficiation facilities to utilize fluorspar from other parts of the country in the Chemical Industry.

- *Implementation agency – CSIR & IBM*

Mining technology upgradation by adopting State-of-the-art technology for the exploitation of deep-seated gypsum deposits in Rajasthan is required.

- *Implementation agency – Ministry of Mines*

There is an increasing demand for wollastonite in the international markets, especially in ceramic and plastic industries and in construction activities. Since, wollastonite is mined and exported by only a few countries in the world, there is a scope for increasing the exports of this mineral from India in value-added form as coated

powders. To augment the reserves of wollastonite further exploration is necessary in the States of Tamil Nadu and Gujarat.

- *Implementing agencies – Ministry of Commerce*

8.10 Demand for oil and gas remained strong and the oil price remained high, encouraging exploration lead to high demand for Barytes, since 85 % of the world's barytes is used in the petroleum industry. More exploration is necessary to locate new deposits in Rajasthan, Himachal Pradesh, etc.

- *Implementing agencies – State Governments*

8.11 Detailed exploration for deposits of high grade fireclay is necessary to meet the increasing demand from refractory industry.

- *Implementing agencies – State Governments*

8.12 Application of graphite in clay-bonded graphite crucibles has to be substituted by silicon carbide-graphite crucibles to improve upon the use of inferior grade ore with less quantity and at the same time ensuring longer life of crucible. Beneficiation of low grade ore having less than 10% Fixed Carbon is required to be given incentives.

- *Implementing agencies – Ministry of Mines*

9. BEACH SAND MINERALS AND RARE EARTHS

Out of 7,000 kms of Indian coastline, about 2,500 kms has been explored and operations are on over an extent of only 100 kms. No substantial progress in Exploration activities for Beach Minerals was witnessed during the XIth Plan. Substantive steps to develop the beach sand reserves of the Country to its full potential by adopting suitable exploration strategy with modern techniques.

- *Implementing agencies - Department of Atomic Energy.*

Grant of concessions and land acquisition to be simplified and facilitated in order to facilitate exploitation of all the minerals available in the Beach Sand Minerals, therefore strategy is need for full exploitation of all seven minerals.

- *Implementing agencies - Ministry of Mines, DAE, IBM, AMD and State Governments*

In order to have better synergy for promotion of beach sand minerals, mechanism for better coordination amongst AMD, IBM and State DGMs should be evolved, which may consists of specialists/ experts of institutions as well.

- *Implementing agency – AMD and IBM*

To promote technology for Titanium sponge, Rare earths production and usage, policy on value addition and technology transfer with appropriate guidelines in FDI need to be incorporated.

- *Implementing agency – Ministry of Mines, Ministry of Finance, DAE, State Governments*

Priority land use in the areas where beach sands exists should be insisted by the authorities before allotting land for other purposes in order to avoid wastage of precious minerals.

- *Implementation agency – State Governments*

Study to be conducted in order to have fair idea on the nature of replenishment of heavy minerals by tidal wave action all along the east coast from Andhra to Tamil Nadu will be helpful to check the trend of production pattern and thus check illegal mining/collection of such minerals.

- *Implementing agencies – National Institute of Oceanography and C-TEMPO*
- *Fund requirement – 1 Crore*

10. STRATEGIC MINERALS AND METALS

10.1 Creation of a national body and a corpus fund responsible for the national sourcing of strategic minerals and metals such as Tin, Cobalt, Lithium, Germanium, Gallium, Indium, Niobium, Beryllium, Tantalum, Tungsten, Bismuth and Selenium etc. and Rare Earths to be established.

- *Implementing agencies – Ministry of Mines – forming a national body consisting, Ministry of Commerce, Ministry of Industries, Ministry of Defence, FIMI, other Industries bodies and C - TEMPO*
- *Fund requirement – creation of corpus fund Rs. 500 Crores*

10.2 Bilateral agreements both for long and short term requirements for securing the supply of strategic minerals by strengthening ties with mineral rich countries and provinces with functional and specific MoUs and Utilize IMG mechanism to align domestic stakeholders with MoUs.

- *Implementing agencies – Ministry of Mines*

10.3 Encouraging domestic producers by incentivizing by-product recovery.

- *Implementing agency – Ministry of Mines*

10.4 Investing into R&D to find substitutes and to encourage recycling through technology mission approach specific to strategic minerals and through project grants under S & T projects. Further, Reorient JNARDDC into a National Mineral Research and Development Centre (NMRDC) to conduct and coordinate pre-competitive research on Technology metals, Energy Critical Metals and Rare Earth Metals with CSIR, DRDO and MOM institutions on Australian CRC pattern.

- *Implementing agency – Ministry of mines, DST, CSIR, BARC etc*
- *Fund requirement – Rs.100 Crores (includes 50 crores as grant for JNARDC)*

10.5 Strategy to address supply chain disruptions and ways to build a national stock pile, for strategically critical input materials, by identifying Non Ferrous Technology Development Centre as a coordinating agency with financial support and it also needs to be suitably reoriented so as to focus more on process R&D for Technology and Energy Critical Metals

- *Implementing agency – Ministry of mines and NFTDCc*
- *Fund requirement – Rs.1000 Crores*

10.5A comprehensive study to assess:

- Potential market size and demand; potential influence of substitution and price levels.
- Current exploration, production and availability of these minerals.
- Ways to incentivize Base Metal producers to produce these strategic metals
- Areas of competitive advantage India may have in sectors like Information technology and how best to leverage it for country's long term advantage
- Establishment of an Indian Competence Network on strategic minerals with all relevant stakeholders including recyclers, manufacturers, public authorities, government and researchers is essential for a successful implementation.

- *Implementing Agency – Ministry of Mines*
- *Fund requirement – Rs. 50 Lakhs*

11. FERROUS MINERALS

IRON ORE

11.1.1 To promote the domestic steel industry, assured Iron ore linkages need to be promoted.

- *Implementing agencies – Ministry of Mines, Ministry of Steel.*

11.1.2 Fiscal and non fiscal incentives will be needed to be provided through joint effort of the Ministry of Mines and Ministry of Steel. In particular technologies for agglomeration, pelletisation and direct use of fines to produce steel must be identified and taken up in Mission mode to achieve the national goal to produce 200 million MT of steel per annum by 2020.

- *Implementing agencies - Ministry of Finance, Ministry of Mines, Ministry of Steel.*

MANGANESE ORE

11.2.1 India is deficient in high-grade, low-phosphorous manganese ore reserves. As large consumers are directly importing, for small consumers necessary support through PSU's needs to be extended.

- *Implementing agencies - Ministry of Steel, Ministry of Commerce.*

11.2.2 In view of significant increase in demand for manganese ore by 12th Plan end, the production capacity needs significant augmentation and, correspondingly,

reserves and resources also need to be augmented. Investor-friendly atmosphere for exploration/exploitation of low-grade, low tonnage, scattered deposits and to discover high-grade deposits to be created.

- *Implementing agencies – Ministry of Steel, Ministry of Mines, State Governments*

11.2.3 India should acquire mines of high-grade Manganese deposits available in South Africa as a part of raw material security.

- *Implementing agencies – Ministry of Steel, MOIL*

CHROME ORE

11.3.1 The state of Odisha has more than 90% of chromite resources and reserves in the country, predominantly located in Sukhinda valley. The mines are going deeper and ore is becoming friable at lower levels. Exploration of deep seated ore bodies needs to be carried out on urgent basis.

- *Implementing agencies – OMC, Govt of Odisha*
- *Fund requirement – Rs 25 crores to Orissa mining corporation (State govt to allocate funds).*

11.3.2 Exploration efforts also need intensification to identify more deposits of chromite in the country. Underground mining technology needs to be promoted.

- *Implementing agencies – GSI*
- *Fund requirement – Rs 25 crores for GSI as a part of mineral exploration.*

11.3.3 Development of suitable technology for beneficiation of low-grade, friable chromite ore (30% Cr₂O₃) fines which are available in sizeable quantity in India.

- *Implementing agencies – Ministry of Mines, CSIR, NML*
- *(Fund requirement – Rs 5 crores to NML, CSIR & OMC)*

11.3.4 Further restrictions on exports of chromite ore/concentrates in view of the limited resources in India and increasing demand for steel industry.

- *Implementing agencies – Ministry of Mines, Ministry of Commerce, Ministry of Steel*

11.3.5 R & D is required for development of suitable technology for extraction of Nickel from the Chromite overburden from the Sukinda area of Odisha.

- *Implementing agencies – CSIR and Ministry of Mines*
- *Fund requirement – Rs.1 crore to CSIR*

11.3.6 Acquisition of technology assets abroad pertaining to application of low grade Iron ore and other technology for pig Iron, sponge iron and pelletisation. Further, for technology gathering participation in mining technology related events such as PDAC, China Mining Expo. etc. and organize mining technology related events in collaboration with CII and FIMI.

- *Implementing agencies - Ministry of Mines, C-TEMPO and Ministry of Steel*
- Fund requirement - 500.00 for acquisition of assets and 5 crores for participation in tech. related events.

EXECUTIVE SUMMARY

Sub Group III :- Infrastructure and Financing

India possesses great potential of mineral resources. However, there exists considerable scope for augmenting the resource position by further exploration of known deposits and discoveries of new deposits, adopting state-of-the-art technology and modern methods like aerial reconnaissance or geophysical surveys.

The geological and metallogenic history of India is similar to mineral rich Australia, South Africa, South America, and Antarctica, all of which formed a continuous landmass prior to the breaking up of Gondwanaland. It also has some features similar to the mineral rich Canadian shield of North America. Being aware of the vast potential of the sector, the Government of India has been consistently and in a pragmatic manner opening up the previously controlled regime to usher private investment in the sector and infuse funds, technology and managerial expertise. The opening up of the Indian mining sector has, therefore, generated considerable global interest. The Indian mining sector was opened to Foreign Direct Investment in 1993 after the announcement of the National Mineral Policy 1993.

Initially, all proposals were considered on a case to case basis by the Foreign Investment Promotion Board (FIPB). FDI policy in the mining sector was further liberalised in January 1997 which opened up an “automatic approval” route for investments involving foreign equity participation upto 50% in mining projects, and upto 74% in services incidental to mining.

The Foreign Direct Investment (FDI) policy in the mining sector has been gradually liberalized over the last few years. FDI cap for exploration and mining of diamonds and precious stones have been increased to 100% under the automatic route with effect from 10th February, 2006.

With this, the Foreign Direct Investment in the mining sector (exploration, mining, mineral processing and metallurgy) for all non-atomic and non- fuel minerals have now been fully opened upto 100% through the automatic route including diamonds and precious stones.

This report has been prepared by the Sub Group III taking into consideration the terms of reference of the Sub Group. The scheme of chapterisation of the Sub Group III report is as under;

Chapter 1: FISCAL MEASURES (TOR No.i)

In this Chapter the issue of present investment, taxation and trade policies has been addressed. Mineral exploration as a high risk venture has also been discussed. Review of investment in mining and exploration has also been brought out in this chapter. Global Practices in Taxation for Mining Sector also form part of this chapter. Access to capital in the global context stating Australian and Canada (Flow through shares) and institutional finance mechanism of New Africa Mining Fund of African

Development Bank are discussed in the Chapter. Tax incentives available in different countries for mining sector and incentives available for mining industry in India have been highlighted. Structural changes needed in Indian mineral sector and suggestions for encouraging investment in exploration and mining form the part of the chapter. Fiscal reforms/rationalization required in Indian mineral sector and incentives needed for the Indian Mineral sector form the corner stone of the chapter where the issue of inverted duty structure with respect to gold and silver content in copper industry has been dealt. Different incentives for beneficiation of low grade ores, private sector to set up R&D facilities for developing exploration related technologies, pelletisation for iron ore and recycling etc. have been addressed.

Suggested Measures

1. Amortization of all expenditure incurred prior to commercial production including the expenditure incurred on site and deposit acquisition over the minimum mining lease period of 20 years or a lesser period at the option of the lessee.
2. Earmarking a percentage of book profits each year to meet rehabilitation cost as per an approved Mine Closure Plan and set it aside as a special reserve in their books. Mine closure expenditure should be considered for tax benefits.
3. A policy framework needed to be developed by SEBI and Stock Exchanges so that investment in mining/mineral exploration is increased. For this a concept of Competent Person to certify the mineral resources as per UNFC system may be introduced so that investor is confident of getting returns and at the same time requirement of Stock Exchanges are adhered to as in the case of Toronto Stock Exchange.
4. “Flow-through–shares” mechanism in Indian mineral sector so that venture capital can flow in exploration activities under HTREL license proposed in MMDR Bill 2011 , which needs to be formulated in consultation with SEBI, RBI, CBDT and IVCA.
5. Exploration bonds on the lines of Infrastructure bonds may be introduced.
6. Removal of excise duty on finished gold and exemption from the countervailing duty and additional customs duty for gold contained in copper concentrate to encourage copper smelters for recovery of gold and silver from anode slime.
7. The excise duty on beneficiated low grade ores should be dispensed with in the interest of promoting and incentivizing beneficiation.
8. To promote creation of private R & D facilities in mineral based R&D processes incentives in the form of exemption in income tax/service tax should be considered.
9. Iron ore pelletisation industry needs incentives in the form of tax holidays.
10. Since extraction and recycling, particularly of energy critical metals, base metals, rare earth metal is costly; incentives in the form of tax holidays may be considered to encourage the activity.
11. Setting up of a Techno-Economic Cell in the Ministry of Mines for analysis of the issues related to taxes, tariff structure and trade policies in the mining sector.

Chapter 2: INFRASTRUCTURE DEVELOPMENT (TOR-II)

In this Chapter the issue of infrastructure development for mining, requirement of infrastructure for mineral sector ore-wise and region-wise has been identified. The initiative taken by different departments/ministries of Government of India for infrastructure development in the mining sector has been mentioned. Public Private Partnership (PPP) in all the three major infrastructure sectors namely, rail, road and ports has been highlighted.

Suggested Measures

1. State Governments should allot a certain amount out of their royalty collection for providing roads and other basic amenities like power, telecommunications, etc. at par with industrial estates.
2. The MMDR Bill 2011 provides revenue stream to District Mineral Foundation for creation of local socio-economic infrastructure. The 12th Plan should be used to create PPP modules for upgradation of rail infrastructure with assistance of the DMF. (Financial resources with the DMF needs to be leveraged to the extent possible through recourse to user charge based public-private-partnership arrangements by providing an institutional framework).
3. Enlarge the mandate of mineral development corporations and State Industrial Development and Investment Corporations to include planning, promotion and financing of mining infrastructure. These corporations should take up funding for the mining infrastructure projects by inter alia promoting and implementing entities in the form of JVs/SPVs.
4. Promotion of “cluster concept” so that trunk facilities are constructed with financial participation of all the mines-whether small or big, in a particular area in all the infrastructure development, be it railways, road network, water supply arrangements and power supply arrangements.
5. Railways till recently have permitted private mining industries to take connectivity only through private sidings, however considering the large amount of capital required for rail connectivity projects, PPP mode needs to be encouraged for private rail connectivity to mines. The new R2CI policy issued by Railways is a beginning in this direction. It would be helpful if a single window clearance is made available for such projects.
6. The capital cost of water and power projects (to access the main grid) for the SME sector may have to be borne by the State Government through outright grants from the Mineral Development Fund. Power supply grid system in the country needs to be strengthened, particularly that located in mining belts of India.
7. Development of dedicated freight corridors for transport of iron ore by railways from the mine-heads to various ports needs to be promoted along with private promoters.
8. Ports should invest in additional tippers to augment their receiving capacities.
9. Additional stockyard capacity at ports needs to be installed.
10. Considering high cost of construction of ports, dredging, etc. alternatives such as floating terminals, which will facilitate loading of larger ships outside the port, should be examined and implemented.
11. New ports coming up at Gopalpur and Dhamra in Orissa by a consortium of TATA Steel and L&T and another port coming up at Ennore, all on East Coast

should be expedited. These mega ports will hopefully have sophisticated mechanized handling plants and deep draft berths to handle super cargo.

12. Besides the issue of adding railway lines including new lines and doubling lines, another issue that needs focus is the issue of rolling stock. It is observed that during high demand rake availability becomes an issue. As we target larger volumes of mineral movement in future, railways need to ensure that adequate rakes are made available in the iron-ore circuits.
13. Apart from track and signaling improvements, rail freight tariffs to be rationalized to retain competitive edge of mineral based industry.
14. Accounting of mineral end-to-end requires implementation of Rule 45 by developing uniform ore accounting software with interface to Railways, Ports and Customs. The software for registration and concessions MIS should be developed preferably by NIC. A fund requirement of Rs. 50 crore for the purpose for its implementation during Twelfth Five Year Plan has been recommended.

Chapter 3: ENVIRONMENT, FOREST, RECLAMATION & REHABILITATION ISSUES(TOR No.iii)

The issue of environment, forest, reclamation and rehabilitation including Corporate Social Responsibility (CSR) as per the terms of reference of the Sub Group has been discussed. Further, the Chapter is subdivided into 5 more Sub-Chapters as 3.1, 3.2, 3.3, 3.4 and 3.4 as under.

Chapter 3.1: PROBLEMS & CONSTRAINTS IN EXPLORATION & EXPLOITATION OF MINERAL RESOURCES IN TRIBAL FOREST AREAS AND TO SUGGEST MEASURES IN HARMONISING MINERAL DEVELOPMENT WITH ENVIRONMENT AND FOREST REGULATION

The Sustainable Development Framework for mining sector and the principles spelt out in the draft SDF document prepared by the Consultant appointed by the Ministry of Mines for adaptation in Indian including likely outcome of SDF for mining sector form the part of the chapter. The constraints and problems encountered in exploration and exploitations of mineral resources in tribal and forest areas have been identified.

Suggested recommendations

1. Categorisation of mineral reserves and resources at the State levels, into high and low risk areas for purpose of investment in exploration based on environmental and social sensitivities.
2. Over a map of all the mining leases in the country, overlay environmental and social sensitivities using available databases. Through such an overlay, identify mine leases that fall into the high and low risk categories. Provide this categorisation, as well as its associated risks for each new lease area as well as those that are already in operation.
3. Classify as in-violable zones areas that are statutorily declared as prohibited or protected zones under various central, state and local government regulations

and international conventions. Exclude these in-violable areas from mining considerations.

4. Consultation and stakeholder engagement especially in Schedule V areas.
5. Benefit- sharing: The mining companies should share the benefit of mining with the mine affected people as proposed in the MMDR Bill 2011.
6. Frameworks for understanding more comprehensively, potential environmental impacts – safeguards, management, mitigation, indicators.
7. Strategic area-based approach to conserve natural resources and address pollution related issues.
8. Re-orient NIMH as National Institute of Mining Community Health. The re-oriented institute will be funded out of the Central Cess envisaged in the proposed draft MMDR Bill 2011 and become part of SDF initiatives.
9. Develop a sectoral regulator to comprehensively address social and environmental concerns through statutory interventions and approvals at mine as well as regional (watershed) level, with the intention that such regulator would function under the over arching supervision of the Environmental Regulator in the Ministry of Environment and Forest.

Chapter 3.2: COMPREHENSIVE FRAMEWORK FOR THE MOST SUSTAINABLE USE OF THE COUNTRY'S MINERAL RESOURCES FOR NATIONAL DEVELOPMENT KEEPING IN VIEW OF THE INTEREST OF VARIOUS STAKEHOLDERS

In this chapter for most sustainable use of country's mineral resources for national development keeping in view the interests of various stakeholders, the technological upgradation has been identified. IBM as regulator within SDF and capacity creation at State and District level and suggestions to formulate comprehensive framework for sustainable use of the mineral resources have been depicted.

Suggested Measures

1. Conduct detailed studies of the extent of mineral reserves and their reassessment in the light of revised threshold values.
2. The proportion of land already leased out, and within that, what proportion has been exploited, needs to be undertaken, to the degree possible (first level through remote sensing).
3. Consolidation of state database for the whole country, based on minerals, irrespective of go/ in-violable areas.
4. Sustainable use of minerals and re-use potential (Recycle). Cost benefits analysis on conservation strategies to reduce energy consumption as well as CO₂ emissions.

Chapter 3.3: RECLAMATION & REHABILITATION NEEDED FOR ABANDONED OR CLOSED MINES (TOR no.v)

This chapter discusses the key issues of Indian mining sectors, present statues and policies on reclamation and rehabilitation needed for the abandoned and closed mines. Present status of abandoned mines, measures and strategy for reclamation and rehabilitation of abandoned mines have also been brought out.

Suggested Measures

1. There are about 82 abandoned mining sites as per IBM's website, out of that sizable numbers of sites are of erstwhile PSU (33) and corporate sector(22). It is proposed that studies have to be taken up for their resource appraisal , environmental and socioeconomic impacts due abandoned mines along with concerned State Govt. and Pollution Control Boards, Ground Water agencies with assistance of respective Central or State PSU, Forest Dept.
2. Possibility of backfilling of fully exhausted voids shall be explored by utilization of waste within feasible distance from working mines in vicinity in consultation with forest department where it is necessary. Safety aspects of such reclamation should be studied in advance.
3. Accordingly, plan of rehabilitation in the form of Project document shall be worked out, so as to facilitate State Govt. to implement the plan of rehabilitation for enabling it to bring it to eco-friendly shape.
4. Further unlocking remnant mineral in such sites, notification for leases should be issued by State Govt. and after unlocking the residual values; the area should be reclaimed by the new holder of lease. Some relaxation on EC/FC for such sites for faster reclamation should be provided and such initiatives by the lessees should be incentivised. Those who have excellent track records in previous operations should be given preference in allocation of leases.
5. The financial implication of such small abandoned mines, where there are no takers, should be calculated and funding mechanism should be explored.
6. Escrow fund for mine closure should be done in case of current practice of financial assurances. Incentivise the good work of the lessee and penalize the defaulters.

Chapter 3.4: SOCIO-ECONOMIC IMPACT OF MINING ON THE LIFE OF LOCAL INHABITANTS AND TO SUGGEST WAYS AND MEANS FOR IMPROVING THEIR LIVING STANDARD (TOR No.vi)

In this chapter, socio-economic impact of mining on the life of local inhabitants have been addressed. In this context, the specific provisions of in scheduled areas and issues which need policy level clarification have been brought out. Institutional mechanism and funding have been pointed out.

Suggested Measures

1. For grant of Forest Clearance procedures should be made simplified and time-bound to avoid delays in grant of FC's.
2. Grant of environmental and forest clearances at the time of renewal of mining leases should not be insisted upon and should be made simple and faster. IMG approach should be adopted to make headway in clearance stuck since long and affected the sector in a big way.
3. Possibility of single window clearances for both FC and EC should be considered. Alternatively, the two should be processed parallel to avoid delays in grant of clearances.

4. Grant of ECs / FCs to clusters should be considered on the lines of Industrial Estates.
5. A study needs to be carried out on sensitivities and risks, demand and supply for granting the lease.
6. Policy on compensatory afforestation needs to be revisited considering the position of land banks available with the State for compensatory afforestation.

Chapter 3.5: CSR INITIATIVES AND SUGGEST WAYS TO IMPROVE CORPORATE IMAGE IN THE MINING SECTOR (TOR No.vii)

The chapter highlighting the importance of Corporate Social Responsibility (CSR) stated that corporate social responsibility should not be construed as charity but the purpose of business should be understood for the community where it operates. Apart from describing the need for policy and planning at corporate/ intuitional level for CSR, the chapter talked about expenditure about CSR activities. In this context, it has been proposed in the chapter that each lessee should contribute at least Rs.5/- per ton for products dispatched for CSR activities outside the lease area for communities nearby. It is also further proposed that Lessees of smaller production in other States of India can take inspiration from Mineral Foundation of Goa (MFG) in this regard. Further, the chapter described the CSR Programme as part of SDF Mining Plan for which Accreditation Agencies to Prepare SDF. Institutional development and regulatory enforcement and strategy to build image of mining industry has been pointed out.

Suggested Measures

1. Each Lessee/public/corporate sector shall establish Sustainable Development Cell in the organization.
2. Each company shall publish document on CSR policy framework, fund flows and targeted achievement and quinquennial reviews to know efficacy and compatibility of implementation of proposals and address prospects and constraints demonstrated through socioeconomic parameters.
3. The baseline studies shall be commissioned in consultation with State DGMs /other agencies in mining areas to assess socio-economic impacts of mining and nature and extent of ameliorative measures.
4. CSR activities should be made component of terms in lease deed conditions for PL and ML. CSR activities should start from award of Prospecting Licence.
5. Introduce the separate part in Mining Plan document dealing with baseline data generation, Social Impact Assessment (SIA) and action plan for CSR activities linked production capacities for further implementation.
6. For institutional development, the lessee should make in house and outside faculty programmes for executive development for carrying out CSR activities.
7. Since R&R and CSR issues are integral part of Sustainable development in mineral districts, implementation of the proposal regarding monitoring of environmental parameters and community development as per approved document shall involve interaction and consultation if considered necessary.

8. IBM and State Directorates should develop capacity building in monitoring and suggesting proper CSR activities in the vicinity of mining area. IBM and State Directorate should establish “Sustainable Mineral Development Cell “ to plan, monitor and review R&R and CSR activities centrally with corporate and PSU sector and also work out guidelines, plan of action for mines in private sector particularly for small mining sector.
9. IBM and DGMs shall develop a system of reporting in regard to R&R and CSR activities, commissioned through proposed SDF at National and state level by introducing quarterly/annual return and made mandatory as per provision of proposed MMDR Bill 2011.
10. While reporting, it requires due verification of implementation from respective department/agencies. Corporate sectors are solely responsible for reporting it. IBM shall monitor R&R and CSR through regional offices in various mining belt by sample checkup or audits for physical verification.
11. Promotional campaign for environmental and social performance, recognition through a national award, display of showcases, articles in mass media on positive impacts and development with statistics, conducting mass media programme on sustainable mining and its outputs, achieving zero waste mining, value additions. Endorsement to Green Mining initiatives, awareness to curb illegal practices, participation of stakeholders in MEMC week celebrations should facilitate in improving the image of the mining industry

Executive Summary

Sub Group-IV:- Research and Development, HRD Issues in Mineral Sector

It is projected that mining sector in the country may grow in the next five years at the rate of 7-8 percent per year. The sustained growth of the sector is expected to meet the growing challenges like exploitation of deep deposits, poor grade ores, old tailing deposits by using the most modern technology in mining, adopting scientific mining methods and mineral processing together with meeting the challenges of socio-economic dimensions apart from environmental concerns. Greater Community involvement and sharing information and profits with them based on the New Mineral Policy-2008 and the proposed new MMDR Act are going to be in place during the 12th Plan period.

The Plan period is also going to emphasize curbing of the menace of the illegal mining practices by appropriate mechanisms and by use of technology for which existing infrastructure need to be strengthened in regulatory agencies and in States which are the first interface with miners. Also manpower availability at all levels right from exploration to mining to further processing and constant up-gradation of skill and adaption to best practices in the world will also be cause of concern during the Plan period.

Though India is endowed with very rich and variety of mineral resources (64 major minerals and 23 minor minerals) and skilled manpower and has network of R & D infrastructure yet contribution of the sector to GDP was only 2.3% in 2009-10. Sustained efforts for mineral exploration over past few decades have enhanced resources and reserves of many minerals, However, despite some major discoveries and noteworthy additions to the National Mineral Inventory, India continues to lack in several critical minerals like diamond, nickel, copper, gold, platinum group of elements, tin, tungsten, molybdenum, fertilizer minerals etc. The situation therefore calls for immediate attention and efforts to augment these resources. Though 100% FDI in the sector was allowed in NMP of 1993 and vibrant and forward looking NMP-2008 has come in place yet the investments in the sector have not matched to our expectations and needs.

The ten Terms of Reference (ToR) given to the Sub-Group were diverse and varied from modernization, automation, R&D to effective Governance including tackling illegal mining menace to global reporting and ranking practices to augmentation of human resources availability at all levels of the sector. With the exhaustive deliberation in several meetings and interaction the Sub-Group had come out with a unanimous report consisting of eight Chapters. Apart from Introductions the report has separate Chapters for Automation & Modernization of Mining Sector (ToR-1), Research & Development and Training (ToR-2,3 & 4), Role of Regulatory Agencies (ToR-5), Effective Governance In Mining Sector(ToR-6), Global Reporting Standards and Ranking System (ToR-8) and Human Resource Development in Mining Sector (ToR- 7 & 9). These are briefly described hereunder.

i) Automation & Modernization of Mining Sector(TOR No.i)

Sub-Group has suggested ways to use modern technology to achieve goals of a financially viable, socially responsible, environmentally, technically and scientifically sound mining with long term view of development which uses mineral resources optimally and ensures sustainable post-closure land uses. For these conditions of Mining Leases regarding size, shape, disposition with reference to geological boundaries and other mining conditions should be such as to favorably predispose the leased areas to systematic and complete extraction of minerals. Sub-Group suggests various scientific mining methods starting from optimal mining plans to mine closure and sustainable post-closure land uses to enhance safety, economy, speed and percentage of extraction of ore reserves from a mine. For this these methods and thrust must be directed specially in the area of rock mechanics, ground control, mine design engineering, equipment development & maintenance, energy conservation, environmental protection, safety operation and human engineering. Also this has to be done in a holistic way so that inter-linkages are established to the advantage of each segment. Sub-Group worked on the concept that safety and productivity are two sides of the same coin. Safe operations result in high production and accordingly some of the modern equipment that can be used for mining identified are

- Shaft boring machines for deep shaft sinking
- Faster mine development raise borer
- Faster mine development tunnel borer
- Jumbo Drill Machine, Load Haul Dumper (LHD) & Low Profile Dump Truck (LPDT).

Sub-Group also suggested that a consortium of Private/Public Sector companies should be set up for hire-lease of costly and sophisticated mining/exploration equipments like shaft/raise borers and tunneling machines for its optimum utilisation and to facilitate safe, scientific and sustainable mining. Sub-Group recommended that Import of such equipment & machinery and technology should be freely allowed. For this a mechanism in collaboration with Deptt. of Heavy Industries for production/indigenization of heavy mining and earth moving equipment may be formulated. Sub-Group taking cue from the NMP-2008 suggests taking steps to facilitate financing of mine development and also of exploration integral to the mining project, by creating suitable institutional structure capable of providing finance for the requisite time horizons. Accordingly Venture Capital structures and Long term Bond market development will be most suitable for the mining sector. Rs 5 Cr.[LFHI] may be put up for this through Ministry of Finance (MoF).

ii) Research & Development and Training(TOR No.ii)

Sub-Group observed that though the country has progressed well in several sectors during the previous Plan periods, but the sector did not seem to have fully taken advantage of the recent Research and Development in the Sector that has already become a hall mark in the mineral rich countries of the world like Canada, Australia, Brazil etc. Sub-Group took review of the existing indigenous R & D set up in mining sector noticed that there are already adequate number of institutions engaged in research and development in various aspects of mineral sector, but felt that there is an urgent need for coordination amongst them. Sub- Group taking a cue from the NMP 2008 has

suggested re-organization of research, development and training under a new National Institute of Mineral Development. At the same time the Sub-Group has suggested tax exemptions/ incentives/holidays for R&D activities and duty free imports of capital goods for R&D facilities to private sector to promote these activities and to attract large investments in mineral and metals sector. Sub-Group strongly recommended incentivizing all three segments of the process R&D structure with appropriate incentives.

- Public good R&D through promotional funding
- High risk R&D through venture capital [including flow through benefits] and
- Plant level R&D by tax concessions.

Rs 3 Cr.[HFHI] may be put up for this through MoF and Deptt. Of Commerce :-

Broadly R&D Recommendations are as under:-

- (i) Zero Waste Mining: Minerals are non-renewable and Zero Waste mining concept may not be seen only from environmental angles. Sub-Group felt that Technology and other Metals as are always found in trace in/with host main metal ores, once lost will be almost impossible to recover. Sub-Group has dealt in great details and has suggested emphasizing greater and urgent need of research in beneficiation technology and process technology so as to enable exploitation of Technology and other Metals by adopting end to end technology along with the main metal in the same process and has also focused on their Reuse, Reclaim and Recycle.

To achieve the goal of Zero Waste Mining, the Sub-Group has recommended that the low grade minerals and the less important minerals along with the main minerals which can not be extracted economically today should be stacked in a systematic manner so that it could be used for mineral extraction at a later date when these become economically viable. For this intensive R & D efforts should be made. An extensive R&D effort is needed to use the slime part of waste/tailing for some industrial purposes by mandating beneficiation studies. Rs 5 Cr.[HFHI] each may be put up for this to IBM and CSIR. If there are number of thin parallel lenses which can not individually be mined economically could be merged to make a thick ore body which could then be mined economically by a suitable mechanized method. However, this will reduce the overall grade which can be compensated by increase in production due to mechanization.

- ii) Steps to be taken to encourage exploitation of Beach Sand Minerals through a judicious mix of public private sector participation including foreign investment. Value addition, particularly to titanium bearing minerals should be strongly incentivized. DAE/ AMD/IREL may be implementing agency for this.
- iii) The Ministry of Earth Sciences (MoES) and its agencies which are entrusted with the task of sea-bed exploration and mining may with the coordination of GSI should expedite for development/ acquisition of necessary technology to

achieve deep mining activity and study of beach sand and placer deposits, polymetallic nodules and the concealed mineral deposits in the EEZ. And various objectives within a time bound framework.

- iv) R&D on mining methods, 'green mining' technologies to be incentivised and facilitated by undergo with advance mining network such as Canada and Australia. Rs 5 Cr.[HFHI] may be put up for this through IBM.
- v) At present the R&D setup in the industry is largely working as an internal department with emphasis on problem solving and applied research. In order to update technology, strengthen the R&D department/ organization, adequate budgetary support is necessary. National R & D Fund for Mineral Sector (of Rs. 50 Cr.LFHI in 12th Plan) to be established and re-structured.
- vi) Focus to be given on R & D efforts for co-production and joint production of associated metals and recovery of minor/trace metals. All mining plans to include beneficiation studies. Rs 5 Cr.[HFHI] may be put up for this through IBM and NFTDC under existing S&T Grant of the Ministry.
- vii) New improved mining methods to be developed for narrow vein mining for their economic exploitation. Rs 5 Cr.[HFHI] may be put up for this through IBM under existing S&T Grant.
- viii) Specific R&D projects may be formulated for exploration and mining (other than metallurgical projects). Rs 50 Cr.[HFHI] may be put up for this through Ministry of Mines under existing S&T Grant.
- ix) Considering thrust areas recommended, it is necessary to create projects involving (a) Streamlining of the execution by the existing institutional mechanisms and (b) to create Centres of Excellence on a mission mode to undertake interdisciplinary research. Rs 10 Cr.[HFHI] may be put up for this through GSI and IBM under existing S&T Grant.
- x) Considering strong need for active interface, networking and coordination among Science & Technology Department, R&D Institutions/ Centres, Academia and Entrepreneurs / Organisations in the mineral sector to be strengthened to derive the maximum benefit from mineral industry. Rs 5 Cr.[HFHI] may be put up for this through Ministry of Mines under existing S&T Grant.
- xi) Networking of scientists between institutions within the country and with institution of leading mining nations such as Australia and Canada to accelerate the pace of interaction, through MoUs and other collaborative arrangements. Rs 5 Cr.[HFHI] may be put up for this through Ministry of Mines and GSI under Techno Economic Support.
- xii) To ensure that the research findings are made available to users expeditiously, a web-based technical information management and dissemination centre to be created under C-TEMPO.

- xiii) Cooperation and coordination among all organizations/ institutions in the public and private sector engaged in the R & D tasks of mining/mineral sector.
- xiv) Basic R&D facilities/supports to be provided/ developed in the laboratories under the State Government to benefit the Small & Medium Enterprises. Rs 25 Cr.[HFHI] may be put up for this through State DGM from proposed Cess Fund. Private sector developing R&D facilities should be given benefits in terms of tax relief etc.
- xv) To undertake the R & D works/projects on various problems /issues related to Mining including deep mining activity and study of beach sand and placer deposits, poly-metallic nodules and the concealed mineral deposits in the EEZ. Rs 25 Cr.[LFHI] may be put up for this through GSI, Ministry of Earth Sciences and CSIR under existing S&T Grant.
- xvi) In order to meet the above requirement for R&D development in thrust areas identified for the XIIth plan, a National R&D Fund in the form of Grant-in-Aid under the domain of Ministry of Mines is proposed to be created for catering to requirement of above mentioned specific areas. Rs 25 Cr.[LFHI] may be put up for this through Ministry of Mines and CSIR under existing S&T Grant.
- xvii) Indian Bureau of Mines and State Directorates of Mining & Geology are responsible for regulations at each step, a comprehensive framework has to be formulated for the most sustainable use of the country's mineral resources for national development, taking due notice of the conflicts of interests of various agencies. .[HFHI]
- xviii) Indian Bureau of Mines and State Directorates of Mining & Geology to be strengthened with manpower, equipment, and skill sets upgraded to the level of state of the art. A Sector reform Project may be worked out for World Bank/ Multilateral assistance or support.
- xix) Most of the State Directorates of Mining & Geology lack adequate competence and laboratory backup for ore testing and beneficiation studies, for granting approval of Mining plans, Rs 60 Cr.[HFHI] may be put up for this through IBM, GSI and State DGM from proposed Cess Fund.
- xx) The issue of promoting process R&D(including beneficiation) needs to be considered in depth.While at onle level CSIR labs and IBM can do'Public Good" process R&D based on reginal samples.Fiscal and non fiscal incentives need to be structured based on detailed study of how the system works in countries such as Australia and Canada, in particular Australia's CSIRO and CRC mechanisms.
- xxi) Import of such equipment & machinery and technology to be freely allowed. For the same mechanism in collaboration with Deptt. of Heavy Industries for production/indigenization of heavy mining and earth moving equipment may be formulated. Local manufactures of earth moving mining equipment need to be able to plan for the growth of industry in the near future by

organization of mining equipment industry events facilitated with Govt. support.

iii) Effective Governance In Mining Sector(TOR No.iii)

Mining activities, including exploration, development, production, and disposal of minerals generally affect the environment and ecology of the mined areas. Environmental and social concerns must be addressed sensitively, for which effective governance systems are required to ensure mining in a sustainable manner under a sustainable development framework. The same has to be tackled. These can be effected through regulatory agencies i.e. IBM and State Directorates of Mining & Geology which is first interface with mining community. Sub-Group observed that most of the State Directorates of Mining & Geology lack adequate/basic competence, infrastructure facilities, manpower and laboratory backup for doing the basic functions and supplement GSI in exploration and other Geo-Science activities. A new Cess has been proposed in the new MMDR Act which can be leveraged to fund the strengthening of State Directorates of Mining & Geology. Apart from recommendations made above the State may be

- i) Checking of illegal/unscientific mining, awareness about sustainable mining practices and GIS based mining tenements and mineral concession data-base etc.
- ii) The State Directorates of Mining & Geology need to be strengthened through a management and technology oriented intervention of IBM and GSI, leveraging on a Sector reform agenda. Rs 10 Cr.[HFHI] each may be put up for this through State DGM, IBM and GSI for above two activities.
- iii) Mining activities, including exploration, development, production, and disposal of minerals generally affect the environment and ecology of the mined areas. Environmental and social concerns must be addressed sensitively, for which effective governance systems are required to ensure mining in a sustainable manner under a sustainable development framework. Rs 25 Cr.[HFHI] may be put up for this through IBM and State DGM.

iv) Illegal mining(TOR No.vi):

Illegal mining is rampant and this amounts to stealing of public property; it is also an environmental hazard. Strong action is required to be taken by State Governments to prevent and detect such illegal activities. Rs 20 Cr.[HFHI] may be put up for this through IBM. Rs 50 Cr.[HFHI] may also be put up for this through State DGM from Cess Fund.

The following ways are suggested to detect the Illegal Mining

- Regular inspection and survey of mining lease areas by Regulating Authorities and by the Special Task Force set up for the purpose.
- Regular co-ordination between the State Governments having common borders, and sharing transit corridors (like ports etc).
- Twenty four hours vigilance on transit of minerals by establishing check posts in the mining areas and especially in the suspected areas.
- Use of satellite imageries for tracking of mining activities.
- Computerisation of Weigh Bridges at mine sites and transportation systems.

-Proper maintenance of Reports should be compulsory for the mining companies which should be open to inspection.

Further following technology inputs may be used to curb the Illegal Mining

-Survey of the lease boundaries using DGPS and establishing permanent boundary pillars on the ground.

-Digitisation of land records as well as sketches of mineral concessions granted.

-The State Government should develop capacities for using satellite imageries for curbing illegal mining which can be used to identify illegal mining activities

-In order to curb illegal mining, close co-ordination and interaction among State Land Revenue Department, Mines and Geology Department, State Forest Department, Regional Remote Sensing Centres and IBM is essential.

-Registration of all producers, traders and end-users with IBM/DGM and computerized ore-accounting system.

v) Global Reporting Standards (TOR No.vii)

Mining activities have a significant environmental impact which needs to be tackled through effective environmental management system, effective mine closure planning, restoration of ecological balance, and observance of best mining practices to ensure maintenance of critical natural capital. Loss of biodiversity is loss of natural capital and the process is irreversible. Environmental Impact Assessments, as part of environmental management system should integrate environmental responsibilities into everyday management practices through changes in organizational structure, procedures and processes. Now socio-economic factors have also a new dimension and mining community per se is not limited to the local displaced but also includes those which are some way or other affected any mining activities.

Sub-Group observed that though there is no standard or ideal Global System, many companies observe the same voluntarily in some or other way. The Sub-Group outlines following key issues on which ranking system of mining companies should be done based on their performance in various aspects of mining sustainability:

- Biodiversity/Ecosystem services and general environment
- Financial (KPIs): Fundamentals, Profit Margins, Growth Rates, Financial Strength, Analyst Estimates
- Environmental Performance Indicators (EPIs): Solid Industrial Waste including Mass Mining Waste (Tailings, Slag, Waste Rock, Low Grade Ores, Leached Ore Residues) Energy, Waste-Water/Effluents, Emissions (green house gas emissions associated to energy consumption), Smelter emissions, Risk Mitigation
- Labour, Social Performance Indicators (SPIs): Product Responsibility, Community development, Human Rights, Diversity & Opportunity, Employment Quality, Living conditions, Welfare amenities provided by the company

- Health and Safety Management at work; Occupational diseases; disabilities due to occupational diseases or work related accidents
- Artisanal and small-scale mining
- Rehabilitation and Resettlement
- Closure planning / mine closure plan
- Governance Performance Indicators (GPIs): Board Functions, Board Structure, Compensation, Vision & Strategy, Shareholder Rights
- Productivity and production with safety, efficiency, economy with due regard to the conservation and the environment.

Sub-Group made following recommendations:

- The mining companies should be encouraged to voluntarily use the World's most widely used Global Reporting Initiative (GRI) and GRI Mining and Metals Sector Supplement for sustainability reporting or may develop their own system. Rs 2 Cr.[HFHI] may be put up for this through IBM, State DGM, C-Tempo and CSIR .
- Ranking system of mining companies should be done based on their performance in various aspects of mining sustainability. The key issues are: Biodiversity/ Ecosystem services and general environment etc. Rs 2 Cr.[LFHI] may be put up for this through IBM, State DGM, C-Tempo and CSIR.

vi) Human Resource Development in Mining Sector(TOR No.ix)

The Sub-Group observed that most important asset of the mining sector is its Human Resource base. The shortage of Mining Engineers, Mines Managers, Mine Surveyors, Mine Foremen, Mining Mates, Blasters, Operators, Skilled Workmen and other professional skills is pressing concern for the growing mining sector. The National Mineral Policy -2008 aims at attracting private investment both domestic and foreign direct investment along with the state-of-the-art technology for exploration and mining. The policy also envisages level playing field for public and private sector. The increasing investment will also need more skilled manpower in this sector. The rapid expansion with the increasing investment in mining sector will also need more skilled human resource. In order to ensure the modernization process successful and sustainable development of mining sector, it is necessary to strengthen the infrastructure for Human Resource Development and Training. As per the report prepared jointly by Ministry of Mines & Confederation of Indian Industry the projected figure of employment in mining sector by the year 2017 will be more than 10.60 lakhs. Similarly by the year 2025 the figure will be more than 12.10 lakhs. The Sub-Group made following recommendations:-

- Mining Industry in India is one of the largest employers. The rapid expansion with increasing investment in mining sector and to ensure the modernization process successful and sustainable development, it is necessary to strengthen the infrastructure of Human Resource Development and Training. Rs 10 Cr.[HFHI]

may be put up for this through HRD from technological upgradation and modernization scheme of IBM.

- ii) In the study made by CII about skilling, skill gaps in Planning, Operation, Maintenance and Safety in Mining Industry are observed. To bridge the gap between demand and supply of the human resource and also to update the knowledge in tune with the advancement in technology, the following initiatives are required for capacity building of infra-structure. Rs 10 Cr.[HFHI] may be put up for this through HRD & ISM, Dhanbad from technological upgradation and modernization scheme of IBM.
- iii) **Skill Development Measures:** Mining industry is currently facing huge shortage of trained manpower such as blaster, shot firer, drillers, heavy machine operators, surveyor, etc. To address this issue is through introduction of relevant courses in the existing ITI/ITC and imparting refresher courses at places located close to the mining centres. Rs 5 Cr.[HFHI] may be put up for this through State Govt. and Ministry of Labour from S&T grant of the Ministry.
- iv) Participation in events abroad for exposure and showcasing and promoting Indian Interests. Rs 10 Cr.[HFHI] may be put up for this through Ministry of Mines from S&T grant of the Ministry.
- v) Modernisation and updating of curriculum and technology. Rs. 10 Cr.[HFHI] may be put up for this through HRD from S&T grant of the Ministry.

Sub-Group has endeavored to provide a way forward and has proposed many far reaching recommendations. Important being creation of Mineral Development Fund in each mineral rich district and National R &D Fund, strengthening of mining and geology departments in State Governments, national and other regulatory agencies to curb illegal mining, forming of consortium of public-private sector for hire-lease of costly and sophisticated mining/ exploration equipments and to facilitate scientific and sustainable mining.

The Sub-Group in all has made 33 recommendations and has also estimated that Rs. 494 Crore will be required during 12th Plan period. The recommendations are in conformity with, in framework of and in furtherance to path laid down by the NMP-2008 and the proposed new MMDR Act and in tune with recommendations made by other Sub-Groups especially w.r.t. Regulatory Agencies and State DGMS, Offshore Exploration, Centres of Excellence, Geo-science Advisory Council and National Institute of Mineral Development, Mineral Development Fund in each mineral rich district etc.

Feasibility/Impact analysis has also been shown which reflect high feasibility and high impact in most of the recommendations.

SUB GROUP –I ON MINERAL EXPLORATION AND DEVELOPMENT

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores]	Impact-Feasibility Assessment
1.	10.3.1.1	GSI to complete geophysical and geochemical mapping expeditiously, with the assistance of outsourcing and service contracts, if necessary so as to develop potential areas for prospecting which can be competitively awarded for further detailed exploration and utilization of proved mineral resources.	Survey & Mapping (Mission-I)	GSI, DGM with assistance of outsourcing and service contract	12 th Plan for OGP area of the country.	760.0 (160 + 600)	HFHI
2.	10.3.1.2	The Geomorphological and Lineament Mapping (GMM) on 1:50,000 scale by end of 2012-13.	Survey & Mapping (Mission-I)	GSI & NRSC	2012-13	2.0	HFHI
3.	10.3.1.3	Complete National Geochemical mapping (NGCM) of the Obvious Geological Potential (OGP) areas by end of 12 th Plan and rest of country of 13 th Plan.	Survey & Mapping (Mission-I)	GSI, DGM with assistance of outsourcing and service contract	12 th Plan for OGP area of the country	[600.0 - included at SI.No.1]	HFHI
<p>HF - HIGH FEASIBILITY LF - LOW FEASIBILITY HI - HIGH IMPACT LI - LOW IMPACT</p>							

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
4.	10.3.1.4	Hyper Spectral Mapping (HSM) in OGP areas on 1:50,000 scale by end of 12 th Plan.	Survey & Mapping (Mission-I)	GSI & NRSC	XII Plan	50.0	HFHI
5.	10.3.1.5	National Aeromagnetic Surveys by the GSI in a comprehensive and systematic manner for OGP by end of 12 th Plan and rest of the country (including off-shore) by end of 13 th Plan.	Survey & Mapping (Mission-I)	GSI & outsourcing	XII & XIII Plan	700.0 during XII plan and Rs.4000 cr.for entire project.	HFHI
6.	10.3.1.6	Conducting High –risk exploration for deep-seated and concealed mineral deposits through modern technology infusion. Private sector will be facilitated to carry out exploration in LAPL for basemetal, gold and PGE, whereas GSI and MECL will also be strengthened to carry out investigations/promotional exploration for PGE, technology metals, etc. with special attention needed for exploration and search for strategic, scarce and deficit minerals to reduce imports.	Mineral Exploration (Mission-II)	GSI, MECL & outsourcing State DGMs	XII & XIII Plan	+ 385.0 [260 GSI + 125.00 MECL] + State DGMs (for XII plan period only).	HFHI
7.	10.3.1.7	Develop and roll out a country wide Mining Tenement Registry and link-up with State Land Records Database for integration with digitized cadastral maps. IBM and 10 mineral rich States need to be enabled to upgrade their Hardware, Connectivity and Software for executing this project.		IBM & State DGMs	XII Plan onwards	50.0	HFHI

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
8.	10.3.1.8	Prepare and implement a project to enable 1:50,000 scale geological, geophysical, and geochemical maps to be served on internet in GIS platform in line with international practice.	Information Dissemination (Mission III)	GSI	XII Plan	230.0	HFHI
9.	10.3.1.9	Concession framework to be made more investor friendly through new legislation.		IBM, MOM	XII Plan onwards	Not Available [N.A.]	HFHI
10.	10.3.1.10	Provide for independent Regulation of concessions and appropriate Legislation on Transferability of the mineral concessions.		IBM, MOM	XII Plan	N.A.	HFHI
11.	10.3.1.12	Create a National Geophysical Data Repository and a National Drill Core Repository to facilitate entrepreneurs to take-up exploration.	Survey & Mapping (Mission-I) and Mineral Exploration (Mission-II)	GSI	XII Plan	35.0 (10.0 + 25.0)	HFHI

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
12.	10.3.1.13	State Directorates of Mining and Geology to be developed to create facilities for concession system, mine plan and closure, sustainable mining practices (SDF) and stakeholder protection and royalty system.		State DGMs & IBM	XII Plan	2000.0 [to be sourced from proposed Mineral Cess]	HFHI
13.	10.3.1.14	Repositioning of MECL in promotional role for deep seated and concealed mineral deposit exploration using HTREL (LAPL) under new MMDR Act.		MECL & MOM	XII Plan	Cross reference [Cf.] S.No.6	HFHI
14.	10.3.1.15	Facilitate capacity development of State Mineral Development Corporations and promote joint ventures in exploration with MECL and central PSUs and private sector.		State DGM, MECL	XII Plan	Cf. S.No.12	HFHI
15.	10.3.1.16	Adoption of Globally acceptable reporting systems such as UNFC, JORC etc. for assessing mineral reserves/resources.		IBM & MECL	XII Plan	Cf. & to include provision of S.No.32	HFHI
16.	10.3.1.17	Incentivize the private sector to create R&D institutions and labs for process development, both through venture capital route for high risk commercial R&D and business plan for mine level R&D solutions.		Pvt. Sec/ FIMIL	XII Plan onwards	N.A. Scheme of incentives (fiscal & non fiscal) to be rked	LFHI

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	out. Funds requirement (Crores)	Impact - Feasibility Assessment
17.	10.3.1.18	Develop beneficiation techniques for zero waste mining through R&D institutions.		Central and State PSUs, IBM & Pvt. Sec.	XII Plan onwards	Cf. S.No. 16	HFHI
18.	10.3.1.19	GSI to purchase a Coastal Launch for offshore and coastal geoscience work.	Modernisation and Replacement (STSS)	GSI	XII & XIII Plan	100.0	HFHI
19.	10.3.1.20	Create and enhance capacity of GSI and States for offshore / Coastal geoscience including Coastal geomorphology and beach sand / Tidal deposit resources.	Survey & Mapping (Mission-I)	GSI & State DGMs	XII Plan onwards	330.0	HFHI
20.	10.3.2.1	Keeping in view the approach in National Mineral Policy 2008, a concept needs to be build up leading to augmentation of reserves/resources base through improvement in mining methods, beneficiation, utilization of low grade ores and rejects and recovery of associated minerals to achieve the national goal of zero waste mining. Accordingly, due emphasis may be given on low volume high value minerals like gold, diamond, base metals, platinum group of minerals and rare earth elements.		GSI, IBM, MECL	XII Plan	Cf.S.No.6	HFHI

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
21.	10.3.2.2	In view of the lack of new discoveries of non-bulk surficial deposits it has become necessary to have multi-disciplinary approach for locating concealed mineral deposits. MECL has to be repositioned to take up promotional exploration for concealed deposits.		MECL	XII Plan	Cf.S.No.6 and S.No. 13	HFHI
22.	10.3.2.3	Emphasis may be given to mine small deposits having low grade with high tonnage adopting a concept of cluster mining. The beneficiation technique needs to be developed at par with the international standard state of the art techniques for extraction for high value and strategic minerals. Process R&D on business lines to prepare flow sheets for clients on commercial basis - key to ensure that low grade ores are explorable. IBM should not do promotional R&D at mine level (which is presently being done and at subsidized rates, preventing private sector competition) but take up only pre-competitive and regional R&D required for general understanding of scope of the problem.		IBM & State DGMS	XII Plan	Cf.S.No.17	HFHI
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
23.	10.3.2.7	Many industries do not opt for low grade ore extraction and concentrate in the creamy portion of the deposit. Unless GSI identifies new areas of iron ore with 45%	Mineral Exploration	GSI, MECL & State	XII Plan onwards	Cf. S.No. 17	HFHI

		Fe and above, no other agency will venture for assessment of such occurrences. Hence in the freehold areas, GSI through regional exploration programme will identify new areas of iron ore with + 45% Fe. The State Govt will also take up the job for speedy completion. After regional evaluation, wherever needed, MECL will carry out detailed exploration for conversion of resources to reserves. Exploration will be put on the fast track. In leasehold areas the job will rest with the lessee as per directions issued by State Govt. under Rule 27 (3) MCR. IBM will monitor and take active role in the leasehold areas for proper inventory of iron ore. Government agencies can be entrusted with the job of detailed exploration keeping in view the conservation aspect.	(Mission-II)	DGMs			
24.	10.3.2.8	To achieve the optimal utilization of iron ore in any deposit the threshold grade to be lowered and grade wise inventory of ores have to be made. Scheduling of deposit is essential through optimization to prevent sub-optimal unscientific mining. Mineral sectoral value addition through latest techniques of beneficiation, calibration, blending, sizing, concentration, pelletisation, purification and general sustenance is the need of the hour for sustainable development.		IBM, State DGMs and Pvt. Sec.	XII Plan onwards	As indicated at Sr.No.6, 17and 23.	HFHI
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact - Feasibility Assessment
25.	10.3.2.9	Other important mineral commodities (chromite,	Mineral	GSI, IBM,	XII Plan	+385.0	HFHI

		manganese ore, bauxite) for which threshold values have been lowered have to be explored by regional research (reconnaissance /prospecting). GSI and State Government departments will take up the job in free hold areas. Detailed Exploration as a follow up will be the responsibility of MECL in promising areas. IBM to ensure that Lessees report these resources in lease areas as part of Mining Scheme.	Exploration (Mission-II)	MECL, State DGMS	onwards	[260 GSI + 125.00 MECL + State DGMS] indeterminate as indicated at S.No.6	
26.	10.3.3.2	The strategy to accelerate the exploitation of mineral resources or to increase production of metals should include the following:		MECL, Central and State PSUs, IBM	XII plan onwards	+2175 [MECL 125 + 2000 States] indicated also at S.No.6 and 13.	HFHI
		<ul style="list-style-type: none"> • To identify, assess and exploit discovered mineral deposits, particularly of deficit and scarce category. • To exploit the resources of marginal grades and tonnage by introducing modern technology and adequate fund flow. • To speedily increase of the reserve base of iron ore through re-assessing the proven deposits with changed threshold value. • To increase domestic production of manganese, viable alternatives to be worked out for exploitation of small scale deposits. • To bring large investment for exploitation of copper, lead and zinc to maximize the extraction of mineral resources. This can be done through technological upgradation for exhaustive mining, bringing in advance beneficiation techniques to bring down the cut off grade of mining, and use of unutilized already generated waste at the mine/pit heads. This will ensure utilization of the entire run of mines and zero wastage mining as envisaged in the NMP, 2008. • To make efforts to establish industries based on mineral near to the proven deposit wherever feasible, for speedy exploitation • To intensify R & D activity for exploiting the marginal grade ores, rejects and recovery of associated minerals through advance scientific mining, ore dressing and beneficiation technologies 					

		<ul style="list-style-type: none">• To facilitate cluster mining of small deposits, grant lease to the clusters as a single deposit for effective implementation of mining plan, closure and SDF.• To strengthen the information delivery system for providing instant information to prospective investors on viability of proven deposits with likely increase in production through technological upgradation in mining and beneficiation.• To ease tax laws wherever possible and by enabling the forest clearance process• State Governments to immediately develop the capability of State Minerals Development Corporations for analyzing the generated data after exploration / prospecting and offering suitable prospects for competitive award. This is since the State mining departments convert the resources into reserves by undertaking feasibility and economic viability studies of the discovered mineral deposits through joint ventures with MECL and Central PSUs and Private Sector.• To give incentive for using the equipment and machinery thereby improving the efficiency of mines• To undertake mitigation measures by adopting proper environmental management in the operative mines and quarries and impact assessment programmes.• Encourage State Governments to prepare Action Plans for their State Directorates so as to enable them to take-up large scale mapping promotional exploration through State Mineral Development and promote joint ventures with MECL and Central PSUs and Private Sector including development of Mining Plan, closure and SDF
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S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores]	Impact-Feasibility Assessment
27.	10.3.5.1	GSI needs to collaborate and train the DGMs for baseline data generation, so that it may concentrate its resources for the upcoming challenges of locating deep and concealed deposits and sophisticated and upgraded baseline data. It needs to also concentrate on geological, geophysical and drilling capacity upgradation. GSI need also to explore the possibility of expeditious baseline data generation with the assistance of outsourcing and service contracts if necessary. Greater co-ordination to be achieved through the medium of CGPB/ SGPBs and it should be raised to the level of National Geological Programming Board (NGPB), for sectoral coordination of central and state programmes	HRD (Mission V)	GSI, State DGMs	XII Plan	Cf. S.No.1 and 28	HFHI
28.	10.3.5.4	HPC has envisaged that the GSI Training Institute [GSI-TI] at Hyderabad should be developed into a 'Centre of Excellence' for providing high quality cutting edge training/ knowledge delivery with state-of-the-art facilities. Thus GSI-TI has embarked upon elaborate programme of capacity building based on wide range of Training Needs Assessment to raise the technical ability of departmental candidates, officers of various	HRD (Mission V)	GSI	XII Plan	32.0 (also see S.No.3 1)	HFHI

		State Govts., students and research scholars and faculty from University and geoscientists from private sector. Six Regional Training Institutes and ten Field Training Centres (FTC) are being established at different locations in India for providing specific Regional Training Modules, and infrastructure needs to be created /upgraded for the purpose. Wherever possible, FTC will be upgraded in PPP mode.					
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores]	Impact-Feasibility Assessment
29.	10.3.5.2	In line with national geoscientific priorities and GSI's Vision, a Geoscience Advisory Council [GAC] has been constituted to advise Ministry of Mines on geoscientific policy matters in general and the role and direction of GSI in particular to meet emerging challenges in the field of geosciences. GAC will be headed by Hon'ble Minister of Mines and consist of representatives from Ministry of Earth Sciences, Ministry of Science and Technology, Ministry of Environment and Forests, Department of Atomic Energy, Planning Commission, etc. GAC will set the future geo-science policy direction for the sector and will conduct studies etc through consultancies.	HRD (Mission V)	GSI	XII Plan	5.0 [approx .]	HFHI
30.	10.3.5.3	To foster geosciences partnership and encourage applications of geosciences for sustainable development amongst other objectives, the Ministry of Mines has taken the lead to establish an Indian Geosciences Congress [IGC] as a registered body of professionals at GSI (DGCO), New Delhi. The IGC will	HRD (Mission V) (a new head – Grant-in-	GSI	XII Plan	14.0	HFHI

		help to enlarge scope for geoscientific intervention for sustainable development in different spheres of society in general and mining sector in particular where application of geosciences is required or possible and function as a non-profit body devoted to the cause of geosciences for interchange of geoscientific knowledge outside the official structures.	Aid to be opened)				
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores]	Impact-Feasibility Assessment
31.	10.3.5.5	<p>GSI needs exposure to best international geoscientific practices and to emerging trends in geoscience, including geoscientific policy formulation in a multi-disciplinary environment. Funding under World Bank. Technical Assistance # during XII Plan is proposed to be around Rs.112.5 crores; particularly for knowledge upgradation for GSI and State DGM personnel in the areas covered under Missions 1 to 4.</p> <p># TA (from World Bank) is mainly to comprise following:-</p> <p>a. Capacity Building through GSITI etc. 70.50 crores b. Modernisation of GSI TI Centres 42.00 crores ----- Total : 112.50 crores. ----- (~ 25 Million US Dollars @ Rs. 45 Rs. per dollar)</p>	Proposed under World Bank TA	GSI	XII Plan	112.50 # [TA from World Bank] (also see S.No.28)	HFHI

S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores]	Impact-Feasibility Assessment
32.	5.6.2	GSI needs international expertise for technology upgradation and technology assimilation. To achieve that goal, GSI has proposed a centralized facility that would be developed as a centre of Excellence the CHQ, Kolkata and to be named as Integrated Research & Development Centre for Geosciences [IRDCG](refer to the Report of the Committee on Modernisation in GSI – available on GSI’s Portal]. IRDCG will incorporate all existing high-quality instrumentation available in the CHQ and upgrade them, besides procuring some more and build up a resource sharing network. It would spearhead high-quality research in diverse fields of geology utilizing state of the art instrumentation and through formation of several experts’ research groups. IRDCG would be	R&D Mission IV	GSI	XII Plan	172.0	HFHI

		supplemented by two satellite centres at Faridabad and Bangalore with facilities that can be developed independently.					
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact-Feasibility Assessment
33.	10.3.5.6	IBM should evolve as a robust Mineral Intelligence Centre and policy thinker for addressing the varied issues of mineral security and create a mechanism for development of Models to identify the Demand and Supply of minerals keeping in mind both present and future needs.		IBM	XII Plan	NA	HFHI
34.	10.3.5.7	DGMs need to give a greater thrust on exploration; co-ordination with GSI on baseline data generation through CGPB; and collaboration with Pvt. Ventures in prospecting and exploration. The resource base of the DGMs needs to be strengthened for taking up these activities on a more extensive scale. The upgradation in man power, equipment and skill is especially important with the requirement of reassessment of reserves with the reduction in the threshold grade of 22 minerals. Capacity upgradation of the DGMs are also required for reducing the time taken for processing of mineral concession applications.	HRD (Mission V)	GSI, State DGMs	XII Plan onwards	Cf. S.No.24 and 27	HFHI
35.	10.3.5.8	A percentage of the royalty/ cess collected by the States, as contained in the draft MMDR Act, needs to be dedicated for capacity development of the DGMs for an enhanced role in mineral exploration and mineral administration.		State DGMs	XII Plan onwards	Cf. S.No.12	HFHI
36.	10.3.5.9	State Governments must be encouraged and facilitated		State	XII Plan	Cf.S.No	HFHI

		to prepare Action Plans funded by their own resources for their State Directorates, so as to enable them to take up large-scale mapping, promotional exploration, concession management including mining plan, closure and SDF; promotional R&D; and laboratory facilities.		DGMs, IBM	onwards	.12	
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact-Feasibility Assessment
37.	10.3.6.5	Reservation of areas for government agencies to be stopped completely, except in exigencies of conservation of minerals in national interest.	New MMDR Act	MoM, State DGMs	XII Plan	N.A.	HFHI
38.	10.3.6.6	Security of tenure should be guaranteed, and free transferability of concessions allowed (other than leases).	New MMDR Act	MoM, State DGMs, IBM	XII Plan	N.A.	HFHI
39.	10.3.6.7	Concessions should be granted in a transparent manner in fixed time frame.	New MMDR Act	MOM, IBM	XII Plan	N.A.	HFHI
40.	10.3.6.8	Review and rationalization of taxes, levies, royalties, duties to make the industry globally competitive.		MoM, IBM	XII Plan	N.A.	HFHI
41.	10.3.6.9	Indian Bureau of Mines (IBM) to be suitably modernized along scientific lines and strengthened to serve as single authority in all matters concerning mining (approvals, inspection and developmental) and SDF. IBM must also acquire the expertise to approve EMP and EIA since environmental studies related to mining activities require deep and extensive knowledge		MoM, IBM	XII Plan	N.A.	HFHI

		from mining domain side. A High Power Committee is already reviewing IBM's Functions. The implementation of the recommendation of this Committee must be adequately funded on priority under 12 th Plan.					
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact-Feasibility Assessment
42.	10.3.6.10	Suitable mechanism needs to be created for independent regulation of mineral concessions such as National and State Mineral Regulatory Authorities and Mining Tribunals Special Courts need to be set up suitably funded out of cess to enforce regulatory provision.	New MMDR Act	MoM, IBM, State DGMS	XII Plan	N.A.	HFHI
43.	10.3.7.1	To carryout close grid seabed mapping (geological, geophysical and geochemical) along with multibeam bathymetry, multi-channel seismic, magnetic, gravimetric, side scan, deep core sampling, dredge, heat probe etc. within EEZ (present as well as areas likely to be gained on delineation of outer limit of Legal Continental Shelf).	Survey & Mapping (Mission-I)	GSI	XII Plan	Cf.S.No .18 & 19.	HFHI
	10.3.7.2	<ul style="list-style-type: none"> To carry out comprehensive topographic and sedimentation map under the proposed MoU with MoES in a time-bound manner. 					
	10.3.7.3	<ul style="list-style-type: none"> Identify mineral rich zones along with the seabed mapping in the shallow water sector for placer minerals/ lime mud / phosphatic sediments etc and in deep water sector for Polymetallic nodules and hydrothermal deposits / gas hydrates / OTEC. 					

10.3.7.4		<ul style="list-style-type: none"> To continue mapping of seabed in near shore and offshore region, collection of parametric data on different themes, search for mineral and energy resources, environmental investigations in connection with coastal hazards like coastal and bank erosion. 					
10.3.7.5		<ul style="list-style-type: none"> In pursuance of NMP, 2008 the programmes with inter institute collaboration have to be strengthened further and the modality of sharing of offshore data. 					
10.3.7.6		<ul style="list-style-type: none"> To search for phosphate rich sediments, lime mud deposits in addition identification of potential areas for gas-hydrate accumulation. 					
10.3.7.7		<ul style="list-style-type: none"> Search for hydrothermal sulphide mineralization, ferromanganese and cobalt rich encrustation, polymetallic nodules in selected sectors of Indian Ocean. 					
10.3.7.8		<ul style="list-style-type: none"> GSI to closely monitor the process of acquisition (already underway) of a new multidisciplinary research vessel which is fitted with state-of-the-art scientific equipment as replacement of R.V. Samudra Manthan and initiate procurement of the 2nd new OGRV to meet the challenges of the coming decades when exploration of the seabed for polymetallic nodules, etc will become feasible 					
10.3.7.9		<ul style="list-style-type: none"> To pursue procurement of a new coastal launch for survey in shallow waters and near coastal 					

	10.3.7.10	lagoons, estuaries is in the initial stage. To adhere to the Modernization Plan of GSI for procurement of various advanced equipment for the laboratories and research vessels.															
S. No.	Recom. No.	Main Recommendations	Mission/ Scheme of GSI	Implementing Agency	Time period [years]	Funds requirement (Crores)	Impact-Feasibility Assessment										
44.	10.3.7.11	GSI to prepare plans for acquisition of another geotechnical vessel and a second multidisciplinary ocean going research vessel which is fitted with state-of-the-art scientific equipment for deep sea survey and exploration.	Modernisation and Replacement (STSS)	GSI	To be completed in XIII Plan	Cf.S.No .18, 19 (no funds in XII plan)	HFHI										
45.	10.3.8.1	The overall expenditure estimated for the XIIth Five Year Plan for mineral exploration and related activities (other than coal and lignite).		-	-	-	-										
		<table border="1"> <tr> <td>Agency</td> <td>Estimates</td> </tr> <tr> <td>GSI (Promotional & Capital)</td> <td>Rs. 4596 crores</td> </tr> <tr> <td>IBM</td> <td>Rs. 50 crores</td> </tr> <tr> <td>MECL (Promotional & Capital)</td> <td>Rs. 175 crores</td> </tr> <tr> <td>State Govt. and other agencies</td> <td>Rs. 2000 crores [States to get sourcing from proposed Mineral Cess]</td> </tr> </table>	Agency	Estimates	GSI (Promotional & Capital)	Rs. 4596 crores	IBM	Rs. 50 crores	MECL (Promotional & Capital)	Rs. 175 crores	State Govt. and other agencies	Rs. 2000 crores [States to get sourcing from proposed Mineral Cess]					
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S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
		COPPER					
1	1.1	Intensive exploration of copper mineral for additional resources within the country using modern means.	Geological Survey of India, State Government and HCL	5+ next plan	Mineral Exploration (GSI)	50.00	HFHI
2	1.2	All existing known resources / deposits of copper need to be brought into production through private or public sector investment. To increase range of down stream products so as to raise per capita copper consumption from 0.5 kg to 1.0 kg. by end of XIII plan.	Hindustan Copper Ltd.	3	Renewal & Replacement, HCL(Green field projects)	2000.00	HFHI
3.	1.3	Government support for overseas mines acquisition which include Government-to-Government co-ordination, and formation of consortiums of public and private sector to work jointly to acquire the mining assets in the lines of Japanese and Chinese models.	To set up cell in Ministry of Mines in consultation of DIPP, MEA	2	Techno economic support(MOM)** (New proposed scheme)	10.00	HFHI
4	1.4	To ensure viability of custom smelting model, appropriate negotiations for bilateral agreement with resource rich countries i.e. Australia, Peru and Chile.	Ministry of Finance, Ministry of Commerce, Ministry of Mines, MEA	1	Techno economic support(MOM)*	NA	LFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
5	1.5	To encourage recycling of copper scrap with adoption of appropriate technology. Proper scrap collection and segregation mechanism needs to be established.	20 crore to Ministry of Mines for assisting in developing technologies and 5 crore to other such as Indian Copper Development Centre	2	Techno economic support(MOM)*	25.00	HFHI
6	1.6	Encouraging copper smelters for recovery of gold and silver from anode slimes, measures like removal of excise duty on finished gold and exemption from the countervailing and additional customs duties for gold contained in copper concentrate need to be in place.	Ministry of Mines and Ministry of Finance	2	Science &Technology Grants (MOM)*	NA	HFHI
		LEAD AND ZINC					
7	2.1	To encourage efforts on exploration of low grade ores, initiatives to be taken by way of relaxation in taxation policy such as flow through options to offset risk in exploration	Ministry of Mines Ministry of Finance and SEBI	1	Science & Technology Grants(MOM)*	NA	HF-HI
8	2.2	Duty structure needs to be reviewed suitably for procurement of geophysical/geochemical surveying instruments.	Ministry of Mines Ministry of Finance	1	Techno economic support(MOM)*	NA	HF- HI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
9	2.3	Simplification of Aerial survey procedures/ approvals is required in order to increase the exploration range to find out more reserves.	Ministry of Mines Ministry of civil Aviation	2	Science &Technology Grants(MOM)	NA	HF - HI
10	2.4	To make low grade deposits as economically viable mining projects, special relaxation in royalty and taxation need to be considered	Ministry of Finance Industry associations	2	Science &Technology Grants(MOM)	NA	LF - HI
11	2.5	Completion of feasibility studies on marginal grade deposits to establish their economic viability as new mining projects is required, to augment the zinc-lead reserves of India in a time bound manner	Ministry of Mines by engaging consultant	2	Science &Technology Grants(MOM)	5.00	LFHI
12	2.6	A supportive tariff regime (nil duty) is required on raw material namely zinc concentrate and lead concentrate to enable Indian zinc smelters and lead smelters to compete on a level playing field during FTAs.	Ministry of Commerce Ministry of Finance	2	Techno economic support(MOM)*	NA	LFHI
13	2.7	Taxation and Technological transfer measures should be taken to develop indigenous downstream producers of Lead and Zinc alloys so that India becomes self sufficient in value added products of zinc & lead	Ministry of Mines Ministry of Finance and C-TEMPO	2	Techno economic support(MOM)*	NA	LFHI
14	2.8	Various policy initiatives towards eco-friendly lead-zinc recycling sectors and their monitoring	Ministry of Environment and Forests State Governments	2	Techno economic support(MOM)*	NA	HFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
		ALUMINIUM					
15	3.1	Aluminium smelting being energy- intensive, allocation of captive coal blocks or linkages should be given at par with IPPs for primary aluminium smelters	Ministry of Coal Ministry of Mines	2	Techno economic support(MOM)*	NA	LFHI
16	3.2	Many large Bauxite Greenfield mining projects such as Vedanta, Utkal Alumina and Anrak etc., are held up for want of Forest/ Environmental clearances. Also land acquisition became an issue. Holistic review to be taken to ensure faster clearances and land acquisition, particularly for weathered deposits like bauxite.	Ministry of Mines, Ministry of Environment and Forests, Ministry of Tribal Affairs, Ministry of Rural development and concerned State Governments	2	Techno economic studies(MOM)	NA	HFHI
17	3.3	Value addition in Aluminium alloys and semis to be encouraged through removing inverted duty structures	Ministry of Commerce	-	Techno economic support(MOM)*	NA	HFHI
18	3.4	Induction and promotion of appropriate technologies indigenously or through Joint ventures required to be promoted by government funding for preparation of Aluminium alloys and high purity metal for new uses. Also suitably reorienting JNARDDC to focus more on process R&D for technology.	Ministry of Mines, Ministry of Finance, Ministry of Commerce, JNARDDC	2	Science & Technology Grants(MOM)	5.00	HFHI
19	3.5	Encourage recycling of scrap with adoption of appropriate technology. Proper scrap collection and segregation mechanism needs to be established	Ministry of Mines – providing grants to Aluminium Association of India etc.	3	Science & Technology Grants(MOM)	25.00	LFHI

S. No.	Reco m. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
20	3.6	Development of appropriate technology through R & D for utilisation of Red Mud Development downstream products to popularise aluminium as a metal in construction, automobile, packaging and other sectors and increase per capita consumption from 1.3 kg to 2.0 kg per capita by end of XIII plan.	Council of Scientific and Industrial Research	5	Science & Technology Grants(MOM)	5.00	LFHI
		CEMENT AND LIMESTONE					
21	4.1	The exploration for the cement grade limestone including special thematic mapping and geochemical mapping should intensify in the areas beyond known limestone belts by GSI. Search for occurrence in Himalayas and Indo Gangetic Plains and Indian deserts needs to be intensified.	Ministry of Mines and State Government	3	Science & Technology Grants(MOM)	NA	HFHI
22	4.2	The directives issued time to time for carrying out statutory exploration/ reassessment required to be monitored and reviewed to assess the future availability of limestone reserves	IBM , State Government	2	MCDR inspections (IBM)	NA	HFHI
23	4.3	Cluster mining approach in order to utilise the small deposits for further industrialization of the mining area may be adopted in the sector which will improve the workability of small quarries.	State Governments and Industry associations	3	Science & Technology Grants(MOM)	NA	LFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
24	4.4	There are deposits existing in Northern and North eastern India which are of high value but with deficiency in infrastructure are not economical or accessible to exploit. Such deposits may be identified and infrastructure development dovetailed.	Ministry of Mines, DONER State governments	3	Science & Technology Grants(MOM)	NA	LFLI
25	4.5	Careful review of the provisions of the CRZ is essential to enable use of enormous reserves of cement grade limestone available along Gujarat coast and provide raw material security for existing plants. Adequate environmental safeguards to be developed in collaboration with MoEF.	National Institute of Oceanography Ministry of Mines and MOEF	3	Techno economic support(MOM)*	NA	LFHI
26	4.6	Incentives on utilization of mineral beneficiation techniques with better recovery from low grade limestone and mine rejects may be provided in the form of appropriate royalty reliefs.	Ministry of Commerce	2	Techno economic support(MOM)*	NA	HFHI
27	4.7	Fiscal taxation measures to be adopted to encourage the utilization of low grade limestone.	Ministry of Finance Ministry of Commerce	2	Techno economic support(MOM)*	NA	HFLI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
28	4.8	To encourage higher use of fly ash and slag suitable fiscal taxation measures to be adopted for optimum utilization and mineral conservation. Special studies to be conducted on sand, sand resources, and sand substitutes including M-sand (crushed aggregates)	Ministry of Industries Ministry of Finance C-TEMPO, NCCBM, S.G.	2	Techno economic support(MOM)*	NA	HFHI
		DIAMOND AND PRECIOUS STONES					
29	5.1	Needs investor friendly policies such as flow through options to off set risk in exploration to attract junior and other players in exploration to locate more reserves	Ministry of Mines Ministry of Finance	1	Techno economic support(MOM)*	NA	HFHI
30	5.2	Airborne survey being crucial technique to locate Kimberlites and Lamproites needs simplification of procedures for approvals	Ministry of Civil Aviation	2	Techno economic support(MOM)*	NA	HF HI
31	5.3	The diamond exploration and exploitation being the capital intensive exercise needs support from the Government by way of policy changes for speedy approval, assured guidelines for transmission from RP to ML.	Ministry of Mines	2	Science & Technology Grants(MOM)	NA	LFHI

S. No	Reco m. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
32	5.4	Regional surveys and technology upgradation for diamonds by GSI viz. regional airborne geophysical surveys, magneto-telluric survey, litho probe project and tele-seismic (seismic tomography) project etc	Geological Survey of India	3	Mineral Investigation(GSI)	200.00	HFHI
33	5.5	Commission exploration programmes and surveys to ascertain availability of coloured gemstones in mission mode by GSI with appropriate budgetary support.	Geological Survey of India	3	Mineral Investigation(GSI)	20.00	HFHI
34	5.6	Need for appropriate regulatory framework to prevent illegal mining of coloured gemstones	State Governments	2	Techno economic support(MOM)*	NA	HFHI
35	5.7	To negotiate favourable trade regimes and agreements with countries which currently impose high tariffs on imports of coloured gemstones from India.	Ministry of Commerce	1	Techno economic support(MOM)*	NA	HFHI
36	5.8	For India to retain its dominant position in cutting and polishing of diamonds, it needs to upgrade their equipment and skills for cutting and polishing of larger size diamonds.	Ministry of Commerce, Gem & Jewellery promotion Export Council, Hindustan Diamond Company Pvt. Ltd.	2	Funds for other Ministries(Proposed new scheme in 12 th plan)	100.00	HFHI

GOLD AND PRECIOUS METALS							
S. No	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
37	6.1	A central coordinating agency to be identified for taking a mission approach on gold and precious metals and achieving the objectives set out in this document	Ministry of Mines, GSI and C-TEMPO	2	Techno economic support(MOM)*	10.00	HFHI
38	6.2	To accelerate the rate of exploration to tap the immense potential for Gold and precious metals in the country and to cover larger area through faster grants, seamless transition etc	Ministry of Mines, Geological Survey of India and State Governments and Private sector	2	Promotional Exploration(MECL)	50.00	LFHI
39	6.3	To support exploitation of available resources by accelerating production from HGML, recovery from KGF tailings, reviving abandoned mines and faster approvals of other primary producers.	Ministry of Mines, Government of Karnataka, Hutti Gold Mines Ltd.	3	Techno economic support(MOM)*	NA	LFHI
40	6.4	Encouraging copper smelters for recovery of gold and silver from anode slimes, measures like removal of excise duty on finished gold and exemption from the countervailing duty and additional customs duty for gold contained in copper concentrate.	Ministry of Finance	1	Techno economic support(MOM)*	NA	HFHI
41	6.5	To support development of suitable technology for various small deposits, there is a need for identification of a dedicated Centralised R&D institute/centre for process development of precious metals.	Council of Scientific and Industrial Research, Ministry of Mines, MECL	2	Techno economic support(MOM)*	25.00	HFHI

S. No .	Reco m. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
42	6.6	Ensuring availability of skilled/ trained manpower in geology, mining, processing of precious metals as well as tradesman partnership between industry, academic institutions and research labs.	Ministry of Mines and Ministry of HRD for funding academic institutions.	2	Techno economic support(MOM)*	25.00	HFHI
43	6.7	Boula Nuasahi Ultra Maffic Complex (BNUC), Orissa having 15 tonnes of PGEs at 1 g/t of Pt+Pd should be accorded priority in developing it into economically viable deposit by identifying National Institutes to carry out detailed feasibility studies & to set up 2 t/annum PGE recovery plant by end of 12th Plan	Government of Odisha, Orissa Mining Corporation, Council of Scientific and Industrial Research and Ministry of Mines	2	Science & Technology Grants(MOM)	25.00	HFHI
44	6.8	Feasibility studies on Sittampundi & Hanumalpara deposits to be initiated simultaneously	State Governments, Ministry of Mines	2	Promotional Exploration(MECL)	15.00	HFLI
45	6.9	Detailed exploration in the 10- 12 areas identified by GSI needs a major thrust during 12th plan to identify more resources.	Ministry of Mines and concerned State Governments	2	Science & Technology Grants(MOM)	NA	HFHI
46	6.10	Recovery of Gold from KGF tailings.	Ministry of Mines by engaging consultant	5	Disposal of Gold tailings assets of BGML(Proposed new scheme in 12 th plan)	2.00	LFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
47	6.11	Investing into R&D and to encourage recycling through technology mission approach specific to PGEs by recycling the catalytic converters, E- waste and other PG bearing wastes and through project grants under S & T projects.	Ministry of mines, Department of Science and Technology, Council of Scientific and Industrial Research, Baba Atomic Research Centre	2	Science & Technology Grants(MOM)	100.00	HFHI
		DIMENSION AND DECORATIVE STONES					
48	7.1	Centre for Development of Stones (CDOS), Rajasthan to be upgraded and re-designated as a National agency for technology/ skill upgradation, market development support etc. in Marble. A separate national agency is required to be established in southern India for development of granite and other stones on similar lines.	Ministry of Mines State Governments	2	Fund for State governments(Proposed new scheme in 12 th plan)	100.00	HFHI
49	7.2	In order to promote the dimension stone industry, there is a need to have a suitable uniform rate of royalty in all the states.	State Governments Ministry of Mines	2	Techno economic support(MOM)*	NA	HFHI
50	7.3	Initiatives to be taken in the form of fiscal measures as customs and excise duties to encourage import of dimension stones rather than finished products which will contribute to foreign exchange earnings for GDP growth	Ministry of Finance, Ministry of Commerce Director General of Foreign Trade	2	Techno economic support(MOM)*	NA	HFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
51	7.4	In order to promote dimensional stone sector it should be given the status of industry so that it can qualify for the fiscal benefits like financial incentives, low cost loans etc.	Ministry of Finance State Governments Ministry of Mines	2	Techno economic support(MOM)*	NA	HFHI
52	7.5	Necessary infrastructure facilities like water, power, road network in the mining areas of dimension stones which are generally located in remote areas may be provided.	State Governments	3	Techno economic support(MOM)*	NA	LFHI
53	7.6	Necessary clearances for the deposits located in the forest areas are required to be expedited by evolving a faster mechanism	Ministry of Environment Forests State Governments	3	Techno economic support(MOM)*	NA	LFHI
		INDUSTRIAL AND NON-METALLIC MINERALS					
54	8.1	Detailed exploration for chemical and fertiliser grade rock phosphate is needed in order to convert the resources in to reserves.	GSI State Governments	5	Mineral Investigation(GSI)	NA	HFHI
55	8.2	Private sector participation in rock phosphate and potash mining needs to be promoted.	Ministry of Fertilisers State Governments	-		NA	LFHI
56	8.3	Concentrated effort should be made by making consortium of public private companies to acquire assets abroad specifically in the countries like Uzbekistan, Jordan etc	Techno-economic advisory unit Ministry of Mines and C-TEMPO	4	Funds for other Ministries(Proposed new scheme in 12 th plan)	1000.00	HFHI

S. No	Reco m. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
57	8.4	Taxation policy intervention to be introduced to recover the sulphur going as gaseous emissions in the refinery and petro-chemical industries	Ministry of Petroleum and Natural Gas	2	Techno economic support(MOM)*	NA	LFHI
58	8.5	Restrictions of mining of Chrysotile variety of Asbestos are required to be lifted in view of its increasing demand by framing necessary guidelines.	Ministry of Mines	2	Techno economic support(MOM)*	NA	LFHI
59	8.6	Exploration of low silica dolomite in the states of Andhra Pradesh and Orissa may be initiated	State Government	3	Techno economic support(MOM)*	NA	LFHI
60	8.7	R & D for setting beneficiation facilities to utilize fluorspar from other parts of the country in the Chemical Industry	CSIR & IBM	3	Science & Technology Grants	NA	HFLI
61	8.8	Mining technology upgradation by adopting State-of-the-art technology for the exploitation of deep-seated gypsum deposit is required	Ministry of Mines	3	Techno economic support(MOM)*	NA	LFHI
62	8.9	Increasing the exports of Wollastanite mineral from India in value-added form as coated powders	Ministry of Commerce	2	Techno economic support(MOM)*	NA	HFLI
63	8.10	Enhanced exploration efforts are necessary to locate new deposits of Barytes	State Government	3	Techno economic support(MOM)*	NA	HFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
64	8.11	Detailed exploration for deposits of high grade fireclay is necessary to meet the increasing demand from refractory industry	State Government	3	Techno economic support(MOM)*	NA	LFLI
65	8.12	Beneficiation of low grade Graphite ore having less than 10% Fixed Carbon is required to be given incentives	Ministry of Mines& IBM	2	Science & Technology Grants	NA	LFHI
		BEACH SAND MINERALS					
66	9.1	Substantive steps to develop the beach sand reserves of the Country to its full potential by adopting suitable exploration strategy with modern techniques.	Department of Atomic Energy	2	Science & Technology Grants	NA	HFHI
67	9.2	Grant of concessions and land acquisition to be simplified and facilitated in order to facilitate exploitation of all the minerals available in the Beach Sand Minerals	Ministry of Mines, Department of Atomic Energy, IBM, Atomic Mineral Division and State Governments	2	Techno economic support(MOM)*	NA	HFHI
68	9.3	To have better synergy for promotion of beach sand minerals, mechanism for better coordination amongst AMD, IBM and State DGMs should be evolved.	Atomic Mineral Division Indian Bureau of Mines	2	Technological upgradation(IBM)	NA	HFHI
69	9.4	To promote technology for Titanium sponge, Rare earths production and usage; policy on value addition in FDI needs review	Ministry of Mines, Department of Atomic Energy, State Governments	2	Techno economic support(MOM)*	NA	LFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
70	9.5	Priority land use in the areas where beach sands exists should be insisted by the authorities before allotting land for other purposes in order to avoid wastage of precious minerals.	State Governments		Techno economic support(MOM)*	NA	HFLI
71	9.6	Study to be conducted in order to have fair idea on the nature of replenishment of heavy minerals by tidal wave action all along the east coast from Andhra to Tamilnadu will be helpful to check the trend of production pattern and thus avoid illegal mining	National Institute of Oceanography State Governments and C-TEMPO	2	Techno economic support(MOM)*	1.00	HFHI
		STRATEGIC MINERALS AND METALS					
72	10.1	Creation of a national body and a corpus fund responsible for the national sourcing of strategic minerals and metals such as Tin, Cobalt, Lithium, Germanium, Gallium, Indium, Niobium, Beryllium, Tantalum, Tungsten, Bismuth and Selenium etc.	Ministry of Mines – forming a national body consisting, Ministry of Commerce, Ministry of Industries, Ministry of Defence, FIMI and other Industries Bodies and C-TEMPO	2	Creation of corpus fund(Proposed new scheme in 12 th plan)	500.00	LFHI
73	10.2	Bilateral agreements both for long and short term requirements for securing the supply of strategic minerals by strengthening ties with mineral rich countries with functional and specific MOU's and utilize IMG mechanism to align domestic stake holders with MoU's	Ministry of Mines		Techno economic studies(MOM)	NA	HFHI
74	10.3	Encouraging domestic producers by incentivizing by-product recovery	Ministry of Mines	2	Techno economic studies(MOM)	NA	LFHI

S. No	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
75	10.4	Investing into R&D to find substitutes and to encourage recycling through technology mission approach specific to strategic minerals and through project grants under S & T projects. Further, Reorient JNARDDC into a National Mineral Research and Development Centre (NMRDC) to conduct and coordinate pre-competitive research on Technology metals, Energy Critical Metals and Rare Earth Metals with CSIR, DRDO and MOM institutions on Australian CRC pattern.	Ministry of mines, Department of Science & Technology, Council of Scientific and Industrial Research, Bhaba Atomic Research Centre	2	Science & Technology Grants(MOM)	100.00 (includes 50 crores as grant for JNARDC)	HFHI
76	10.5	Strategy to address supply chain disruptions and ways to build a national stock pile, for strategically critical input materials by identifying Non Ferrous Technology Development Centre as a coordinating agency with financial support and it also needs to be suitably reoriented so as to focus more on process R&D for Technology and Energy Critical Metals	Ministry of Mines and Non Ferrous Materials Technology Development Centre, Hyderabad(NFTDC)		Creation of corpus fund(Proposed new scheme in 12 th plan)	1000.00	HFHI
77	10.6	A comprehensive study to assess: Potential market size and demand, Current exploration, Areas of competitive advantage India may have, Establishment of an Indian Competence Network on strategic minerals with all relevant stakeholders including recyclers, manufacturers, public authorities, government and researchers.	Ministry of Mines, CSIR	2	Science & Technology Grants	0.50	HFHI

FERROUS MINERALS							
IRON ORE							
S. No	Reco m. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
78	11.1.1	To promote the domestic steel industry, assured Iron ore linkages need to be promoted by PSUs	Ministry of Mines, Ministry of Steel	3	Techno economic support(MOM)*	NA	HFHI
79	11.1.2	Fiscal and non fiscal incentives will be needed to be provided through joint effort of the Ministry of Mines and Ministry of Steel. In particular technologies for agglomeration, pellatisation and direct use of fines to produce steel must be identified and taken up in Mission mode to achieve the national goal to produce 200 million MT of steel per annum by 2020.	Ministry of Finance, Ministry of Mines, Ministry of Steel.	-	Techno economic support(MOM)*	NA	HFHI
MANGANESE ORE							
80	11.2.1	India is deficient in high-grade, low-phosphorous manganese ore reserves. As large consumers are directly importing, for small consumers necessary support through PSU's needs to be extended	Ministry of Steel, Ministry of Commerce	-	Science & Technology Grants	NA	HFHI
81	11.2.2	In view of significant increase in demand for manganese ore by 12 th Plan end, the production capacity needs significant augmentation and, correspondingly, reserves and resources also need to be augmented. Investor-friendly atmosphere for exploration/exploitation of low-grade, low tonnage, scattered deposits and to discover high-grade deposits to be created	Ministry of Steel, Ministry of Mines, State Governments	-	Techno economic support(MOM)*	NA	HFHI

S. No	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
82	11.2.3	India should acquire mines of high-grade Manganese deposits available in South Africa as a part of raw material security.	Ministry of Steel, MOIL	-	Techno economic support(MOM)*	NA	HFHI
		CHROME ORE					
83	11.3.1	The State of Odisha has more than 90% of chromite resources and reserves in the country, predominantly located in Sukhinda valley.The mines are going deeper and ore is becoming friable at lower levels. Exploration of deep seated ore bodies needs to be carried out on urgent basis	OMC, Govt of Odisha	4	Fund for State governments(Proposed new scheme in 12 th plan)	25.00	HFHI
84	11.3.2	Exploration efforts also need intensification to identify more deposits of chromite in the country. Underground mining technology needs to be promoted	GSI	-	Mineral Investigation(GSI)	25.00	LFHI
85	11.3.3	Development of suitable technology for beneficiation of low-grade, friable chromite ore (30% Cr ₂ O ₃) fines which are available in sizeable quantity in India	Ministry of Mines, CSIR, NML, OMC	3	Science & Technology Grants(MOM)	5.00	HFHI
86	11.3.4	Further restrictions on exports of chromite ore/concentrates in view of the limited resources in India and increasing demand for steel industry	Ministry of Mines, Ministry of Commerce, Ministry of Steel	-	Techno economic studies(MOM)	NA	LFHI

S. No.	Recom. No.	Mineral wise Recommendation	Implementing Agency	Time period (Years)	Name of Scheme	Fund requirement (in Crores)	Impact-Feasibility assessment
87	11.3.5	R & D is required for development of suitable technology for extraction of Nickel from the Chromite overburden from the Sukinda area of Odisha	CSIR and Ministry of Mines	2	Science & Technology Grants(MOM)	1.00	HFHI
88	11.3.6	Acquisition of technology assets abroad pertaining to application of low grade Iron ore and other technology for pig Iron, sponge iron and pelletisation. Further, for technology gathering participation in mining technology related events such as PDAC, China Mining Expo. etc. and organize mining technology related events in collaboration with CII and FIMI	Ministry of Mines, C-TEMPO and Ministry of Steel	3	Creation of Corpus of fund* * new scheme	500.00 for acquisition of assets and 5 crores for participation in tech. related events.	HFHI

* Techno economic support (MoM) - New proposed scheme, coordinated through C-TEMPO, a registered society needs Ministry of Mines, task with techno-economic studies

SUB GROUP-III ON INFRASTRUCTURE & FINANCING

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
Investment, taxation, trade policies of Mining sector							
1	1.12.1	All expenditure incurred prior to commercial production should be eligible for amortization over the minimum mining lease period of 20 years or a lesser period at the option of the lessee	M/o Finance	1 yr.	NA	NA	LFHI
2	1.12.2	For reclamation, the mining companies may be allowed to earmark a percentage of book profits each year to meet rehabilitation cost as per an approved Mine Closure Plan and set it aside as a special reserve in their books. Mine closure expenditure should be considered for tax benefits.	NA	1 yr.	NA	NA	HFHI
3	1.12.3	A concept of Competent Person to certify the mineral resources as per UNFC system may be introduced so that investor is confident of getting returns and at the same time requirement of Stock Exchanges are adhered to as in the case of Toronto Stock Exchange	SEBI/Stock Exchanges to bring a Policy Framework	2 yr.	NA	NA	HFHI
4	1.12.4	“Flow-through–shares” mechanism in Indian mineral sector so that venture capital can flow in exploration activities under HTREL license proposed in MMDR Bill 2011 , which needs to be formulated in consultation with SEBI, RBI, CBDT and Indian Venture Capital Association(IVCA).	Mechanism to be created by SEBI/ Stock Exchange	2 yrs	NA	NA	HFHI
5	1.12.5	Exploration bonds in the lines of Infrastructure bonds	Mechanism to be created by SEBI/ Stock Exchange	2 yrs	NA	NA	HFHI
6	1.12.6	Encouraging copper smelters for recovery of gold and silver from anode slimes, measures like removal of excise duty on finished gold and exemption from the countervailing duty and additional customs duty for gold contained in copper concentrate.	M/o Finance	During 12 th Five Year Plan	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	LFHI Impact Feasibility Assessment
7	1.12.7	The excise duty on beneficiated low grade ores should be dispensed with in the interest of promoting and incentivizing beneficiation.	M/o Finance	1 yr.	NA	NA	LFHI
9	1.12.9	Iron ore pelletisation industry needs incentives in the form of tax holidays.	M/o Finance	2 yr.	NA	NA	LFHI
10	1.12.10	Since extraction and recycling, of metal is costly, incentives in the form of tax holidays may be considered.	M/o Finance	2 yr.	NA	NA	LFLI
11	1.12.11	Creation of Techno-Economic Cell in the Ministry of Mines.	Ministry of Mines	During 12 th Five Year Plan	Rs. 10 crore With 10 officers/ staff to be headed by a Joint Secretary	Techno-economic Policy Studies (New)	LFHI
Infrastructure Development							
12	2.4.1	Allocation of fund by State Governments of certain amount of their royalty collection for infrastructure development.	State Governments	During XIIth Five Year Plan period	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
13	2.4.2	Mineral Development Foundation (MDF) should be set up in each State along with a District Mineral Foundation (DMF) having stake in major mining activity and the MMDR Bill 2011 provides revenue stream to District Mineral Foundation for creation of local socio-economic infrastructure. The 12 th Plan should be used to create PPP modules for upgradation of rail infrastructure with assistance of the DMF. (Financial resources with the DMF needs to be leveraged to the extent possible through recourse to user charge based public-private-partnership arrangements by providing an institutional framework).	State Governments	During XIIth Five Year Plan period	NA	NA	HFHI
14	2.4.3.	Enlarge the scope of Mineral Development Corporation (MDC) and State Industrial Development and Investment Corporations (SIDIC) in major mining States.	Existing institutional mechanism to be enlarged by the State Governments	During XIIth Five Year Plan period	NA	NA	LFHI
15	2.4.4	Funding of mining infrastructure by MDC and SIDIC	M/o Finance or Mineral Development Fund	During XIIth Five Year Plan period	NA	NA	LFHI
6	2.4.5	Cluster concept to finance mine-linking infrastructure by mine owners	Mine owners	During XIIth Five Year Plan period	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
17	2.4.6	National Highways and the port projects within the existing schemes. The Government of India should encourage more and more projects in Public Private Partnership (PPP) mode in all the above three sectors of infrastructure.	M/o Railway, M/o Road Transport and Highways and M/o Shipping	During XIIth Five Year Plan period	NA	NA	HFHI
18	2.4.7	Procedural delay in giving approval of railway projects on PPP may be reduced. Railways till recently have permitted private mining industries to take connectivity only through private sidings, however considering the large amount of capital required for rail connectivity projects, PPP mode needs to be encouraged for private rail connectivity to mines. The new R2CI policy issued by Railways is a beginning in this direction. It would be helpful if a single window clearance is made available for such projects.	M/o Railway	During XIIth Five Year Plan period	NA	NA	LFHI
19	2.4.8	The siding policy of railway needs to be liberalized. Expedition of new sidings which can result in increase in iron ore volumes. It is also important to note that due to a large basket of projects and paucity of funds railway projects take time to complete, of late various stake holders including state governments have started funding capacity augmentation projects as capacity needs to be increased all along the rail network for carrying additional traffic which would come on the network from the large number of new sidings projected.	M/o Railway	During XIIth Five Year Plan period	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
20	2.4.9	The capital cost of water and power projects for the SME sector may have to be borne by the State Government through grant from Mineral Development Fund. Alternatively, the Rural Water Supply Scheme of the Central Government could be extended to the mining areas and State Government to make electricity available to the mine sites for SME sector.	M/o Water Resources, M/o Power, State Governments	During XIIth Five Year Plan period	NA	NA	LFHI
21	2.4.10	Strengthen of power grid in mining belts	M/o Power	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
22	2.4.12	Development of dedicated freight corridors for transport of iron ore by railways from the mine-heads to various ports needs to be promoted along with private promoters.	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
23	2.4.13	Ports should develop additional trippers to augment their receiving capacities.	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
24	2.4.14	Additional Stockyards capacity at ports needs to be installed.	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
25	2.4.15	The options of floating terminal should be examined and implemented.	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFLI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs.cr.)	Scheme	Impact Feasibility Assessment
26	2.4.16	New Ports coming up at Gopalpur and Dhamra by consortium of TATA Steel and L&T and another port coming at Ennore should be expedited.	M/o Shipping	During XIIth Five Year Plan	NA	NA	LFHI
27	2.4.17	Rolling Stock during high demand rake availability becomes an issue.	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFHI
28	2.4.18	Apart from track and signaling improvements, rail freight to be rationalized to retain competitive edge of mineral based industry.	M/o Railway	1 yr.	NA	NA	LFHI
29	2.4.18.1.1	As the iron ore from Bellary-Hospect sector moves to ports namely Chennai, Krishnapatnam, Goa, Karwar, Belekeri and New Mangalore, it is necessary to strengthen and improve railway carrying capacities to all these ports. This can be achieved by doubling of tracks, electrification of routes wherever necessary in addition to ensuring timely availability of wagons However, the existing infrastructure in this sector is underutilized due to the sudden drop in iron-ore rakes based on iron-ore export policy. Further rail efficiency is badly affected due to poor unloading and loading facilities at terminals and poor wagon tipping facility where ever provided. The terminal facilities wherever minerals are unloaded or loaded needs to be upgraded to match the arrival of rakes as often rakes take inordinately long time for releases which affect the efficiency of the system and the wagon tipping facility.	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
30	2.4.18.1.2	<p>In Bellary-Hospet sector, it is recommended that the new port at Ennore which is being developed; efforts be made for speedy development of iron ore berth, mechanical ore loading facility, adequate capacity of stockpile and dredging to accommodate large cape size vessels.</p> <p>The private sector port at Krishnapatnam in Andhra Pradesh and iron ore handling facilities at New Mangalore port on the West Coast should be gradually improved to load additional iron ore expected to move to this port from Bellary-Hospet and other regions in Karnataka</p> <p>Efforts to develop an all –weather port at Tadri or Belekeri with a draft of 18 meters as a long-term solution.</p> <p>Efforts should be made to deepen draft at Mormugao (Goa Port) upto 16.5 m and mechanical handling facilities be installed for rail borne iron ore traffic from Bellary-Hospet sector to Goa Port.</p>	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
31	2.4.18.2.1	<p>In Bailadila-Vaizag sector, to ensure and sustain the movement of increased tonnage by railway, it is necessary to strengthen the existing railway facilities.</p> <p>The load carrying capacity of railways for ore transport is to be enhanced keeping in view the movement of bauxite envisaged from Andhra Pradesh quarries.</p> <p>Construction of new rail line to link Bailadila sectors (Jagdapur) to Raipur & Gua-Barbil-Badajamda sector needs to be taken up on priority. This will support SAIL, NMDC's and others mining operations.</p>	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
32	2.4.18.2.2.	In Bailadila-Vaizag secto, as NMDC and MMTTC are the major suppliers of iron ore from Vizag port, it is necessary to augment the stockpile capacity of this port. Vizag port is facing congestion making the vessel wait sometimes upto 7 days to berth. The port has taken up some berth including General Cargo berth for renovation because of which iron ore which is handled at General Cargo berth does not get berth as other berths are dedicated only for handling coal. The situation is likely to improve once the renovation works are completed	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
33	2.4.18.3.1	In Orissa-Jharkhand sector, iron ore is transported by railways to steel plants and to the ports of Haldia and Paradip. In order to increase the capacity, several new railway projects have been undertaken in this region viz. Banspani – Daitari, Haridaspur – Paradip, Angul – Sukinda Road, Jharsuguda – Sambalpur, etc. While Banspani-Daitari project has been completed the work has been started in Haridaspur – Paradip, Angul – Sukinda Road. It is, therefore, recommended that these projects be expedited to be completed as soon as possible. A study should be commissioned by M/o Railway giving data on iron ore loading and unloading in Orissa. Ministry of Railways should develop product dedicated freight corridors jointly with rail users – MNCs / private companies / or / PSUs. However this project has been progressing slowly, primarily due to land acquisition and compensation related issues.	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFHI

SI No	Reco m. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
34	2.4.18.3.2	The road projects in the Orissa- Jharkhand sector undertaken in the mining area namely Rajamunda-Barbil (NH215) - 60 kms, Barbil-Panikoili (NH215) -189 kms, Chandikhole – Paradip (NH5A) - 77 kms, Jamshedpur – Haldia (NH 33, NH6, NH41) – 200 kms, Jaintgarh – Chaibasa – Haldia(NH 75E) -100 kms should be completed as soon as possible.	M/o Road Transport and Highways	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
35	2.4.18.3.3	<p>In Orissa- Jharkand sector, the port facilities needs improvement. In case of Haldia Port high sea loading through barges is strongly recommended.</p> <p>Paradip Port is a very congested port. The draft needs to be increase for berthing bigger vessels. With the completion of construction project which includes a berth handling ships up to 1,25,000 DWT by PPP mode at Paradip Port, the draft limitation will be removed.</p> <p>Several new port projects namely Dhamara and POSCO's captive port are under consideration for quite some time. It is recommended that support should be given by way of separate allotment of rakes for Dhamara port from Eastern India. Also, it is recommended that these projects should be implemented expeditiously to handle additional iron ore from the region in order to reduce freight costs from India to iron ore importing countries.</p> <p>POSCO's own port proposed at Jatadhari near Paradip should be developed expeditiously.</p>	M/o Road Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
36	2.4.18.4.1	In Goa sector, railway capacity from Bellary-Hospet to Goa should be suitably increased to meet the growing movement of iron ore. The early completion of doubling of Hospet-Vasco line which has been recently sanctioned will help the iron ore industry in Karnataka and Goa.	M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
37	2.4.19.4.2	The main infrastructure at Mormugao port barges, mechanical ore loading facility and transhippers, which should be maintained, replaced and suitably enhanced to take care of growing export demand. The minor port of Panjim handles about 8-9 million tonnes of iron ore annually, mainly through barge loading, and therefore, availability of adequate barges should be ensured.	M/o Shipping	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
38	2.4.19	<p>Handling facilities at major ports viz. Chennai, Tuticorin, Cochin, Mangalore, Kaswa, Kandla, Mumbai, JNPT and Vizag need to be improved for the export of dimensional stones.</p> <p>Road network should also be extended to rural mining belts including decorative & dimensional stone producing centers, thereby providing linkages to highways / expressways.</p> <p>It is recommended that railway stockyards at various places should be created with Inland Container Service System (ICD) in operation. The railway stockyards with potential of handling stones should be equipped with crane facilities of minimum 50 tonnes. From these points, open wagons shall move to important ports and other destinations where the stone processing units are located.</p> <p>The Indian dimension stone industry is totally dependent on road transport with practically no support from the railways. Most of the competing countries have vast network of rail transportation supporting their stone industry through which they are able to offer any quantity in any size at very competitive prices in International market. Thus, it is necessary for the Indian stone industry to have proper rail links nearest to the quarrying areas.</p>	M/o Shipping, M/o Road Transport and Highways, M/o Railway	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
39	2.4.20	<p>The Greenfield alumina plants and bauxite mining would require strengthening of infrastructure development of road and rail network. The bauxite mining belts of Chattisgarh and Jharkhand also need improvement in road infrastructure for the brownfield expansion of existing plants. In Andhra Pradesh bauxite deposits would require extension of railway line up to deposits.</p>	M/o Road Transport and Highways, M/o Railway.	During XIIth Five Year Plan period and in the perspective	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
40	2.4.21	Bulk handling of limestone and rock phosphate both for domestic consumption, exports and imports is made by rail and road network. Road network is a serious bottleneck in northeastern states where limestone is exported through road network to neighbouring counties. Therefore, efforts should be made to strengthen the existing road and rail network connecting mines to the consuming centres.	M/o Road Transport and Highways, M/o Railway.	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI
41	2.4.22	Rule 45 of the MCDR, 1988 has been notified on 9.2.11 with a view to allow end-to-end accounting of the minerals. Rule 45 largely covered the area of accounting of mineral production and movement of minerals legally mined. With the implementation of the provisions of Rule 45, increasing the efficiency in accounting minerals, State Government may find it easy to isolate and monitor areas of illegal mining effectively. This requires implementation of Rule 45 by developing uniform ore accounting software with interface to Railways, Ports and Customs. The software for registration and concessions MIS should be developed preferably by NIC. With the association of Customs, align mineral code used for different grades of ore by IBM with that of HS code of eight digit used by Customs.	IBM, Ministry of Mines	During Twelfth Five Year Plan	Rs. 50 crore	Capacity Building of State Government (New)	HFHI

Environment, Forest, Reclamation & Rehabilitation issues							
Problems & Constraints in Exploration & Exploitation of Mineral Resources in Tribal Forest Areas and to suggest measures in Harmonizing Mineral Development with Environment and Forest regulation							
SI No	Reco m. No.	Main Recommendations	Implementin g Agency	Time period	Fund requirem ents (Rs. Cr.)	Schem e	Impact Feasibilit y Assess ment
42	3.1.5.1	Categorisation of mineral reserves and resources at the State levels, into high and low risk groups based on environmental and social sensitivities.	State Governments	During XIIth Five Year Plan period	NA	NA	LFHI
43	3.1.5.2	Over a map of all the mining leases in the country, overlay environmental and social sensitivities using available databases covering at least subjects like protected area (PAs), dense forests, and schedule areas to begin with Through such an overlay, identify mine leases that fall into the high and low risk categories. Provide this categorisation, as well as its associated risks for each new lease area as well as those that are already in operation.	State Governments	During XIIth Five Year Plan period	NA	NA	LFHI
44	3.1.5.3	Initially, for operational mining leases, the categorisation would be more focussed on impacts rather than risks, and would include elements like pollution levels, water quality, health indicators in the area etc which would indicate potential and ongoing impacts of the mining activity	State Government	During XIIth Five Year Plan period	NA	NA	LFHI
45	3.1.5.4	Classify as in-violable zones areas that are statutorily declared as prohibited or protected zones under various central, state and local government regulations and international conventions. Exclude these in-violable areas from mining considerations	Central Government, State and Local Government	During XIIth Five Year Plan period	NA	NA	HFHI

SI No	Reco m. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
46	3.1.5.5	Consultation and stakeholder engagement especially in Schedule V areas. This will address some of the issues of ensuring local stake in control, use and management of such areas and resources.	State Government	During XIIth Five Year Plan period	NA	NA	LFHI
47	3.1.5.6	Benefit- sharing: The mining companies should share the benefit of mining with the mine affected people as proposed in the MMDR Bill 2011. Consultation and stakeholder engagement together with benefit sharing would address issues of consent of the indigenous communities on project impacts on common resources, cultural practices, economic opportunities and adequate compensation	State Government, Mining Companies	During XIIth Five Year Plan period	NA	NA	HFHI
48	3.1.5.7	Frameworks for understanding more comprehensively, potential environmental impacts – safeguards, management, mitigation, indicators.	Central Government, State Government, Mining Companies	During XIIth Five Year Plan period	NA	NA	LFHI
49	3.1.5.8	Strategic area-based approach to conserve natural resources and address pollution related issues	Central Government, State Government,	During XIIth Five Year Plan period	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
50	3.1.5.9	Re-orient NIMH as National Institute of Mining Community Health. The re-orient institute with state of art infrastructure facilities will conduct applied research and provide technical support services on mining community health issues and sustainable development of Indian mining community. The re-oriented institute will be funded out of the Central Cess envisaged in the proposed draft MMDR Bill 2011.	M/o Mines	During XIIth Five Year Plan period	Central Cess envisaged in the proposed draft MMDR Bill 2011	NA	HFHI
51	3.1.5.10	Put in place institutional structures and mechanisms at central, state and district levels to address different issues concerning consultation and stakeholder engagement, benefit sharing, environmental impact and conservation of natural resources	Central Government, State Government,	During XIIth Five Year Plan period	NA	NA	LFHI
52	3.1.5.11	Develop a sectoral regulator to comprehensively address social and environmental concerns through statutory interventions and approvals at mine as well as regional (watershed) levels, with the intention that such regulator would function under the over arching supervision of the Environmental Regulator in the Ministry of Environment and Forest.	IBM, Ministry of Mines	During XIIth Five Year Plan period		NA	HFHI
Comprehensive Framework for the Most Sustainable Use of the Country's Mineral Resources for National Development Keeping in View of the Interest of Various Stakeholders							
53	3.2.5.1	Conduct detailed studies of the extent of mineral reserves and their reassessment in the light of revised threshold values.	IBM, Ministry of Mines	During XIIth Five Year	NA	NA	LFLI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Plan period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
54	3.2.5.2	The proportion of land already leased out, and within that, what proportion has been exploited, needs to be undertaken, to the degree possible (first level through remote sensing).	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	HFHI
55	3.2.5.3	Consolidation of state databases for the whole country, based on minerals, irrespective of go/in-violable areas.	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	LFHI
56	3.2.5.4	Sustainable use of minerals and re-use potential (Recycle). Cost benefits analysis on conservation strategies to reduce energy consumption as well as CO2 emissions.	Scientific Organizations dealing with Minerals	During XIIth Five Year Plan period and in the perspective of 10-15 years	NA	NA	LFHI

Reclamation & Rehabilitation Needed for Abandoned or Closed Mines							
SI No	Reco m. No.	Main Recommendations	Implementin g Agency	Time period	Fund requirem ents (Rs. Cr.)	Schem e	Impact Feasibilit y Assess ment
57	3.3.4.1	There are about 82 abandoned mining sites as per IBM, out of that sizable numbers of sites are of erstwhile PSU (33) and corporate sector (22). It is proposed that studies have to be taken up for their resource appraisal, environmental and socioeconomic impacts due abandoned mines along with concerned State Government and Pollution Control Boards, Ground Water agencies with assistance of respective Central or State PSU, Forest Dept.	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	LFHI
58	3.3.4.2	Possibility of backfilling of fully exhausted voids shall be explored by utilisation of waste within feasible distance from working mines in vicinity in consultation with forest department where it is necessary. Safety aspects of such reclamation should be studied in advance	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	LFLI
59	3.3.4.3	Accordingly, plan of rehabilitation in the form of Project document shall be worked out, so as to facilitate State Government to implement the plan of rehabilitation for enabling it to bring it to eco-friendly shape.	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	LFHI
60	3.3.4.4	Further unlocking remnant mineral in such sites, notification for leases should be issued by State Government and after unlocking the residual values; the area should be reclaimed by the new holder of lease. Some relaxation on EC/FC for such sites for faster reclamation should be provided and such initiatives by the lessees should be incentivised. Those who have excellent track records in previous operations should be given preference in allocation of leases	State Governments	During XIIth Five Year Plan period	NA	NA	LFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
61	3.3.4.5	The financial implication of such small abandoned mines, where there are no takers, should be calculated and funding mechanism should be explored.	IBM, Ministry of Mines	During XIIth Five Year Plan period	Funding mechanism should be explored through Planning Commission in due course.	NA	LFHI
62	3.3.4.6	Escrow fund for mine closure should be done in case of current practice of financial assurances. Incentivise the good work of the lessee and penalize the defaulters	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	HFHI
Socio-Economic Impact of Mining on the Life of Local Inhabitants and to Suggest Ways and Means for Improving their Living Standard							
63	3.4.5.1	For grant of Forest Clearance procedures should be made simplified and time-bound to avoid delays in grant of FCs.	Ministry of Environment and Forest	During XIIth Five Year Plan	NA	NA	HFHI

SI No	Reco m. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
64	3.4.5.2	Grant of environmental and forest clearances at the time of renewal of mining leases should not be insisted upon and should be made simple and faster. IMG approach should be adopted to make headway in clearance stuck since long and affected the sector in a big way.	Ministry of Environment and Forest	During XIIth Five Year Plan	NA	NA	HFHI
65	3.4.5.3	Possibility of single window clearances for both FC and EC should be considered. Alternatively, the two should be processed parallel to avoid delays in grant of clearances.	Ministry of Environment and Forest	During XIIth Five Year Plan	NA	NA	LFHI
66	3.4.5.4	Grant of ECs / FCs to clusters should be considered on the lines of Industrial Estates.	Ministry of Environment and Forest	During XIIth Five Year Plan	NA	NA	LFHI
67	3.4.5.5	A study needs to be carried out on sensitivities and risks, demand and supply for granting the lease.	State Governments	2 Years	NA	NA	HFHI
68	3.4.5.6	Policy on compensatory afforestation needs to be revisited considering the position of land banks available with the State for compensatory afforestation.	State Governments	During XIIth Five Year Plan period	NA	NA	LFHI

SI No	Reco m. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
CSR Initiatives and Suggest Ways to Improve Corporate Image in the Mining Sector							
69	3.5.8.1	Each Lessee/public/corporate sector shall establish Sustainable Development Cell in the organisation for conceptualisation, planning, monitoring of sustainable development with mineral resource management. Accordingly, lessee shall carry out detailed appraisals region-wise/sector wise to work out long term and short-term strategies for Corporate Social Responsibility (CSR). These strategies shall include preparatory action for conceptualisation of mining activity, impacts on socioeconomic structure and action plan for improving the quality of life of the communities nearby.	State Government Lessee, Public Corporate Sector /	During XIIth Five Year Plan period	NA	NA	LFLI
70	3.5.8.2	Each company shall publish document on CSR policy framework, fund flows and targeted achievement and quinquennial reviews should be submitted by five years to know efficacy and compatibility of implementation of proposals and address prospects and constraints demonstrated through socioeconomic parameters.	Mining Companies	During XIIth Five Year Plan period	NA	NA	LFHI
71	3.5.8.3	The base line studies shall be commissioned in consultation with State DGMS /other agencies in mining areas to assess socio-economic impacts of mining and nature and extent of ameliorative measures. The project report shall be prepared by District Mineral Foundation (DMF) in terms of SDF for local area development, and ensure execution. DMF shall execute such programmers/projects. Necessary Funds utilization shall be made as per proposed MMDR.	State DGMS and other agencies	During XIIth Five Year Plan period	NA	NA	HFHI
72	3.5.8.4	CSR activities should be made component of terms in lease deed conditions for PL and ML. CSR activities should start from award of Prospecting Licence	Mining Companies	During XIIth Five Year	NA	NA	HFLI

SI No	Reco m. No.	Main Recommendations	Implementing Agency	Plan period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
73	3.5.8.5	The present state of Mining Plan document is comprehensive, multidisciplinary covers also Conceptual plan, Environment Management plan, Progressive closure plan, outlines of socioeconomic aspects of region. It is proposed to introduce the separate part in document dealing with base line data generation, Social Impact Assessment (SIA) and action plan for CSR activities linked production capacities for further implementation. .	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	HFLI
74	3.5.8.6	For institutional development, the lessee should make in house and outside faculty programmes for executive development for carrying out CSR activities.	Lessee	During XIIth Five Year Plan period	NA	NA	LFHI
75	3.5.8.7	Since RR and CSR issues are integral part of Sustainable development in mineral districts, implementation of the proposal regarding monitoring of environmental parameters and community development as per approved document shall involve interaction and consultation if considered necessary.	Indigenous Communities, State Government, Central Government	During XIIth Five Year Plan period	NA	NA	LFHI
76	3.5.8.8	IBM and State Directorates should develop capacity building in monitoring and suggesting proper CSR activities in the vicinity of mining area. IBM and State Directorate should establish "Sustainable Mineral Development Cell" to plan, monitor and review RR and CSR activities centrally with corporate and PSU sector and also work out guidelines, plan of action for mines in private sector particularly for small mining sector.	IBM and State DGM	During XIIth Five Year Plan period	NA	NA	HFHI

SI No	Recom. No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Scheme	Impact Feasibility Assessment
77	3.5.8.9	IBM and DGM shall develop a system of reporting in regard to RR and CSR activities, commissioned through proposed SDF at National and state level by introducing quarterly/annual return and made mandatory as per provision of draft new MMDR Bill 2011.	IBM and State DGM	During XIIth Five Year Plan period	NA	NA	LFHI
78	3.5.8.10	While reporting, it requires due verification of implementation from respective department/agencies. Corporate sectors are solely responsible for reporting it. IBM shall monitor R&R and CSR through regional offices in various mining belt by sample checkup or audits for physical verification.	IBM, Ministry of Mines	During XIIth Five Year Plan period	NA	NA	HFHI
79	3.5.8.11	Each Corporate sector, should submit the survey report by five years to know efficacy and compatibility of implementation proposals and address prospects and constraints demonstrated through socioeconomic parameters.	Corporate Sector	During XIIth Five Year Plan period	NA	NA	HFHI
80	3.5.8.12	Initiatives for Improving the Image of Mining Industry: Promotional campaign for environmental and social performance, recognition through a national awards, display of showcases, articles in mass media on positive impacts and development with statistics, conducting mass media programme on sustainable mining and its outputs, achieving zero waste mining, value additions. Endorsement to Green Mining initiatives, awareness to curb illegal practices, participation of stakeholders in MEMC week celebrations.	Central Government, State Government, Mining Companies, Public Corporate Sector	During XIIth Five Year Plan period	NA	NA	HFHI

SUB GROUP-IV ON RESEARCH & DEVELOPMENT, HRD ISSUES IN MINERAL SECTOR

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
1.	8.2.1	Mineral Development Fund should be set up in each District having stake in major mining activity by creating a revenue stream of royalty-like payments.	Part of MMDR Bill 2011				HFHI
2.	8.2.2	National Mineral Policy-2008: Suggests to take steps to facilitate financing of mine development and also of exploration integral to the mining project, by creating suitable institutional structure capable of providing finance for the requisite time horizons. Venture Capital structures and Long term Bond market development will be most suitable for the mining sector.	MoF	5			LFHI
3	8.2.3	To attract large investments in metals sector by introducing tax concessions for R&D activities, allowing duty free imports of capital goods for R&D facilities, and also incentivizing all three segments of the process R&D structure with appropriate incentives:- <ul style="list-style-type: none"> - Public good R&D through promotional funding - High risk R&D through venture capital [including flow through benefits] and - Plant level R&D by tax concessions. 	Deptt. of Commerce & MoF	3			HFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
4	8.3.2	<p>Use of modern mining equipment & machinery and latest available technology which improve the efficiency, productivity and economics of mining operations, safety & health of persons working in the mines and surrounding areas to be encouraged.</p> <p>Help organize mining equipment industry events to support local manufacturers of earth moving machinery and mining equipment.</p>	<p>State Govt.</p> <p>Deptt. of Commerce & Deptt. of HI.</p>				HFHI
5	8.3.3	Mining technology needs to be upgraded through modernization, automation, computerization to ensure extraction & utilization of the entire Run of Mine (ROM) taking care of all safety measures.	MoM	5	50.00	S&T grants	HFHI
6	8.3.4	<p>To achieve the goal of Zero Waste Mining, the following points have been recommended.</p> <ul style="list-style-type: none"> Intensive R&D efforts to be made for low grade minerals particularly iron ore and base metals. The low grade minerals and the less important minerals along with the main 	IBM	3	5.00	Mineral beneficiation studies IBM	HFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
		<p>minerals which can not be extracted economically today should be stacked in a systematic manner so that it could be used for mineral extraction at a later date when these become economically viable. For this intensive R & D efforts should be made.</p> <ul style="list-style-type: none"> An extensive R&D effort is needed to use the slime part of waste/tailing for some industrial purposes by mandating beneficiation studies. If there are number of thin parallel lenses which can not individually be mined economically could be merged to make a thick ore body which could then be mined economically by a suitable mechanised method. However, this will reduce the overall grade which can be compensated by increase in production due to mechanization. The issue of promoting process R&D(including beneficiation) needs to be considered in depth.While at one level CSIR labs and IBM can do'Public Good" process R&D based on regional samples.Fiscal and non fiscal incentives need to be structured based 	<p>CSIR</p> <p>State DGM</p>	2	5.00	<p>Mineral beneficiation studies IBM</p>	<p>HFHI</p> <p>HFHI</p>

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		on detailed study of how the system works in countries such as Australia and Canada, in particular Australia's CSIRO and CRC mechanisms.					
7	8.3.6	Steps to be taken to encourage exploitation of Beach Sand Minerals through a judicious mix of public private sector participation including foreign investment. Value addition, particularly to titanium bearing minerals should be strongly incentivized.	AMD /DAE/ IREL				
8	8.3.9	The Ministry of Earth Sciences (MoES) and its agencies are entrusted with the task of sea-bed exploration and mining. MoES with the coordination of GSI should expedite for development/ acquisition of necessary technology to achieve this objective within a time bound framework.	MoES				
9	8.3.10	R&D on mining methods, 'green mining' technologies to be incentivised and facilitated by undergo with advance mining network such as Canada and Australia	IBM	5	5.00		HFHI
10	8.4.1	At present the R&D setup in the industry is largely working as an internal department with emphasis on problem solving and applied research. In order to update technology, strengthen the R&D department/ organization, adequate budgetary support is necessary. National R & D Fund for Mineral Sector to be established and re-structured. An	MoM to take up with cabinet to consider amending MMDR Act	5	50.00		HFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
		Institution of excellence to be known as 'National Institute of Mineral Development' which can be under the Indian School of Mines University, umbrella, funded by grant in aid during the 12 th Plan period.					
11	8.4.2	Focus to be given on R & D efforts for co-production and joint production of associated metals and recovery of minor/trace metals. All mining plans to include beneficiation studies.	NFTDC Hyderabad/ IBM	2	5.00	S&T grants	HFHI
12	8.4.3	New improved mining methods to be developed for narrow vein mining for their economic exploitation.	IBM	5	5.00	S&T grants	HFHI
13	8.4.4	Specific R&D projects may be formulated for exploration and mining (other than metallurgical projects).	MoM	5	50.00	S&T grants	HFHI
14	8.4.5	Considering thrust areas recommended, it is necessary to create projects involving (a) Streamlining of the execution by the existing institutional mechanisms and (b) to create Centres of Excellence on a mission mode to undertake interdisciplinary research.	IBM and GSI	5	10.00	S&T grants	HFHI
15	8.4.6	Considering strong need for active interface, networking and coordination among Science & Technology Department, R&D Institutions/ Centres, Academia and Entrepreneurs / Organisations in the mineral sector to be strengthened to derive the maximum benefit from mineral industry.	MoM	3	5.00	S&T grants	HFHI

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16	8.4.7	Networking of scientists between institutions within the country and with institution of leading mining nations such as Australia and Canada to accelerate the pace of interaction, through MoUs and other collaborative arrangements.	GSI & MoM	3	5.00	Techno economic support	HFHI
17	8.4.8	To ensure that the research findings are made available to users expeditiously, a web-based technical information management and dissemination centre to be created under C-TEMPO.	GSI, MoM & C-TEMPO				
18	8.4.9	Cooperation and coordination among all organizations/ institutions in the public and private sector engaged in the R & D tasks of mining/mineral sector	MoM				
19	8.4.10	Basic R&D facilities/supports to be provided/ developed in the laboratories under the State Government to benefit the Small & Medium Enterprises.	DGM	5	25.00	Through Cess fund	HFHI
20	8.4.11	Private sector developing R & D facilities should be given benefits in terms of tax relief, etc.	MoF				
21	8.4.12	To undertake the R & D works/projects on various problems /issues related to Mining including deep mining activity and study of beach sand and placer deposits, poly-metallic nodules and the concealed mineral deposits in the EEZ	GSI, MoES & CSIR	3	25.00	S&T grants	LFHI
22	8.4.13	In order to meet the above requirement for R&D development in thrust areas identified	MoM & CSIR	5	25.00	S&T grants	LFHI

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		for the XIIth plan, a National R&D Fund in the form of Grant-in-Aid under the domain of Ministry of Mines is proposed to be created for catering to requirement of above mentioned specific areas.					
23	8.5.1	Indian Bureau of Mines and State Directorates of Mining & Geology are responsible for regulations at each step, a comprehensive framework has to be formulated for the most sustainable use of the country's mineral resources for national development, taking due notice of the conflicts of interests of various agencies.	IBM & State DGM	3			HFHI
24	8.5.2	Indian Bureau of Mines and State Directorates of Mining & Geology to be strengthened with manpower, equipment, and skill sets upgraded to the level of state of the art. A Sector reform Project may be worked out for World Bank/ Multilateral assistance or support.	IBM & State DGM, MoM				
25	8.5.4	Most of the State Directorates of Mining & Geology lack adequate competence and laboratory backup for ore testing and beneficiation studies, for granting approval of Mining plans, Checking of illegal / unscientific mining, awareness about sustain-able mining practices and GIS based mining tenements and mineral concession data-	IBM, GSI & State DGM IBM, GSI & State DGM	5 5	60.00 (Through Cess fund) 10.00	Techno-logical upgradation & Moderni-	HFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
		base etc. The State Directorates of Mining & Geology need to be strengthened through a management and technology oriented intervention of IBM and GSI, leveraging on a Sector reform agenda.	IBM, GSI & State DGM	5	10.00 (Through Cess fund)	zation. IBM	
26	8.6.1	Mining activities, including exploration, development, production, and disposal of minerals generally affect the environment and ecology of the mined areas. Environmental and social concerns must be addressed sensitively, for which effective governance systems are required to ensure mining in a sustainable manner under a sustainable development framework.	IBM & State DGM	5	25.00		HFHI
27	8.6.2	Illegal mining is rampant in many states. This amounts to stealing of public property; it is also an environmental hazard. Strong action is required to be taken by State Governments to prevent and detect such illegal activities	IBM	5	20.00		HFHI
28	8.6.3	The following ways are suggested to detect the Illegal Mining: • Regular inspection and survey of	IBM & State DGM	5	50.00	Through Cess fund	HFHI

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		<p>mining lease areas by Regulating Authorities and by the Special Task Force set up for the purpose.</p> <ul style="list-style-type: none"> • Regular co-ordination between the State Governments having common borders, and sharing transit corridors (like ports etc). • Twenty four hours vigilance on transit of minerals by establishing check posts in the mining areas and especially in the suspected areas. • Use of satellite imageries for tracking of mining activities. • Computerisation of Weigh Bridges at mine sites and transportation systems. • Proper maintenance of Reports should be compulsory for the mining companies which should be open to inspection. 					
29	8.6.4	<p>The following ways are suggested to curb the Illegal Mining</p> <ul style="list-style-type: none"> • Survey of the lease boundaries using DGPS and establishing permanent boundary pillars on the ground. 	-- do --	-- do --	Included in Rs. 50 above	-- do --	HFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
		<ul style="list-style-type: none"> Digitisation of land records as well as sketches of mineral concessions granted The State Government should develop capacities for using satellite imageries for curbing illegal mining which can be used to identify illegal mining activities In order to curb illegal mining, close co-ordination and interaction among State Land Revenue Department, Mines and Geology Department, State Forest Department, Regional Remote Sensing Centres and IBM is essential. Registration of all producers, traders and end-users with IBM/DGM and computerized ore-accounting system. 	State DGM, IBM				
30	8.7.1	<p><u>Global Reporting Standards</u> The mining companies should be encouraged to voluntarily use the World's most widely used Global Reporting Initiative (GRI) and GRI Mining and Metals Sector Supplement for sustainability reporting or may develop their own system.</p>	IBM, State DGM, C-Tempo & CSIR	2	2.00		HFHI
31	8.7.2	Ranking system of mining companies	IBM, State	2	2.00		LFHI

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		should be done based on their performance in various aspects of mining sustainability. The key issues are: Biodiversity/ Ecosystem services and general environment etc.	DGM, C-Tempo & CSIR				
32	8.8.1	Mining Industry in India is one of the largest employers. The rapid expansion with increasing investment in mining sector and to ensure the modernization process successful and sustainable development, it is necessary to strengthen the infrastructure of Human Resource Development and Training.	HRD	3	10.00	Technological up-gradation & Modernization on IBM	HFHI
33	8.8.2	In the study made by CII about skilling, skill gaps in Planning, Operation, Maintenance and Safety in Mining Industry are observed. To bridge the gap between demand and supply of the human resource and also to update the knowledge in tune with the advancement in technology, the following initiatives are required for capacity building of infra-structure <u>Skill Development Measures:</u> Mining industry is currently facing huge shortage of trained manpower such as blaster, shot firer, drillers, heavy machine operators, surveyor, etc. To address this issue is through introduction of relevant courses in the existing ITI/ITC and imparting refresher courses at places	HRD, ISM	3	10.00	Technological up-gradation & Modernization on IBM	HFHI
			State Govt. MoL	2	5.00	S&T grant	LFHI

SI No	Recommendation No.	Main Recommendations	Implementing Agency	Time period	Fund requirements (Rs. Cr.)	Existing / Proposed Scheme	Impact Feasibility Assessment
		located close to the mining centres. Participation in events abroad for exposure and showcasing and promoting Indian Interests.	MoM	5	10.00	S&T grant	HFHI
		Modernisation and updating of curriculum and technology:	HRD	5	10.00	S&T grant	HFHI
		Total			494.00 *		
*145 through State Cess and remaining through Budgetary Support							

FUND REQUIREMENT IN XII FIVE YEAR PLAN(2012-17)

S.N	Organization	Name of Scheme	Fund Requirement (Rupees in crores)
S.N	Organization	Name of Scheme	Fund Requirement (Rupees in crores)
o.			
1.	Geological Survey of India (GSI)	i) Survey & Mapping	2017.00 *
		ii) Mineral Exploration	348.00
		iii) Specialised Investigation	29.00
		iv) Research & Development and Other Exploration	173.30
		v) Inf. Dissemination	253.15
		vi) Human Resource Development	48.00
		vii) Modernisation and Replacement (S&T Support System).	1464.55 **
		viii) Construction	263.00
		Total:	4596.00
2.	Mineral Exploration Corporation Limited (MECL)	i) Promotional	190.00
		ii) Capital	110.00 ***
		Total:	300.00
* Includes Rs. 700 crores for Aeromagnetic Programme			
** Includes Rs. 100 crores for acquisition of Ocean Going Research Vessels.			
*** Includes Rs. 110 crores for Equity linked to repositioning for deep exploration.			

3.	Indian Bureau of Mines (IBM)	<p>i) Inspection of mines for scientific and systematic mining, mineral conservation and mines environment. 50.00</p> <p>ii) Mineral Beneficiation Regional Studies- utilization of low grade and sub grade ores and analysis of environmental samples. 50.00</p> <p>iii) Technological upgradation & Modernization. 55.00</p> <p>iv) Collection, processing dissemination of data on mines and minerals through various publications. 40.00</p> <p>v) Scheme on Computerized Online Register on Mining Tenement System. 50.00</p> <p>vi) Capacity Building of State Governments - Development & implementation of ore accounting software by NIC. * 50.00</p> <p>VII) Construction * New Scheme 5.00</p> <p style="text-align: right;">Total: 300.00</p>	
4.	Bharat Gold Mines Ltd. (BGML) For meeting expenses on maintenance of essential services.	New Scheme for study to be conducted for disposal of BGML gold tailing assets.	2.00
5.	Hindustan Copper Limited (HCL)	<p>i) Replacement & Renewals</p> <p>ii) Mine Development Expenditure/new projects in line with new Corporate Plan (on account of expansion of mines at MCP, KCC etc.)</p> <p style="text-align: right;">Total: 1500.00 2000.00 * * from I&EBR</p>	
6.	National Aluminum Company Ltd. (NALCO)	<p>i) Spill over projects</p> <p>ii) New projects, in line with Nalco's vision and Corporate Plan 2020</p> <p style="text-align: right;">Total: 711.00 13522.00 14233.00 * * from I&EBR</p>	

