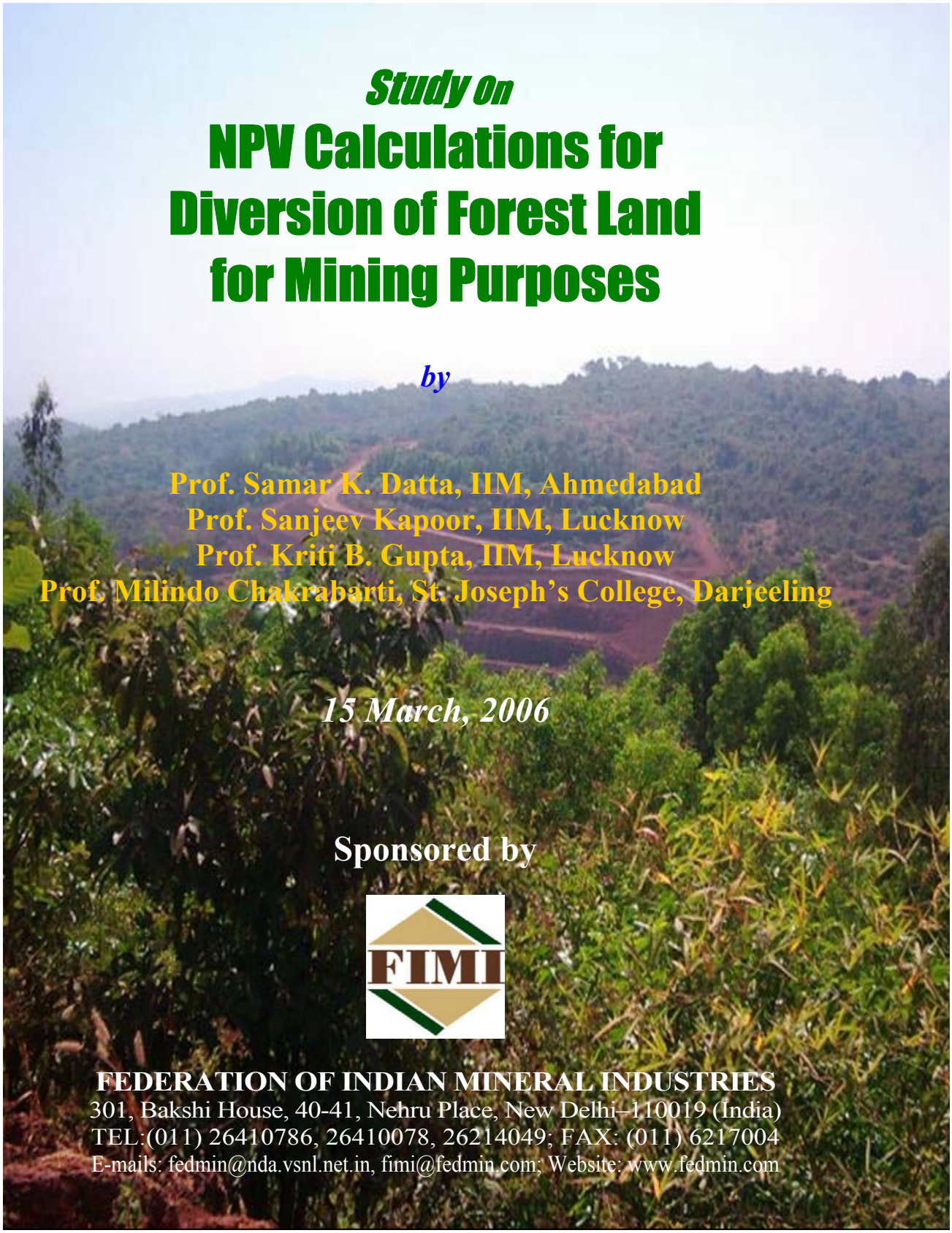

*Study on*

# NPV Calculations for Diversion of Forest Land for Mining Purposes

*by*


**Prof. Samar K. Datta, IIM, Ahmedabad**
**Prof. Sanjeev Kapoor, IIM, Lucknow**
**Prof. Kriti B. Gupta, IIM, Lucknow**
**Prof. Milindo Chakrabarti, St. Joseph's College, Darjeeling**


*15 March, 2006*

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**FEDERATION OF INDIAN MINERAL INDUSTRIES**
301, Bakshi House, 40-41, Nehru Place, New Delhi–110019 (India)
TEL:(011) 26410786, 26410078, 26214049; FAX: (011) 6217004
E-mails: fedmin@nda.vsnl.net.in, fimi@fedmin.com; Website: www.fedmin.com

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* Prof. Chakrabarti is also Director, CREATE (Centre for Studies in Rural Economy, Appropriate Technology and Environment), located at St. Joseph's College, Darjeeling.

## ***Abstract***

*The purpose of this report is to identify, based on economic principles, the parameters required for NPV calculation for diversion of forest land for mining purposes, while taking due consideration of cost and benefit factors, the methodological foundations, differences between mining and other non-forest uses of forest land, the prevailing statutory regulations for the mining industry to account for ecological cost mitigation etc.*

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# *PART I: MAIN REPORT*

# Chapter I

# The Context, the Concerns & the Methodology Followed

## I. The Context & the Purpose

1.1 Mining activities involve various phases such as exploration and development, extraction, processing, transportation and trans-shipment. Each of these phases involves specific activities that can adversely affect environment. The main types of process wastes during these phases are erosion due to removal of vegetation and top soil, huge volume of overburden, acid rock drainage, erosion of sediments, petroleum wastes from trucks etc. The possible air emissions are exhaust from construction, vehicles fugitive dust, dust blown to surrounding area due to non-coverage of the ore, and effluents released by vehicles. There are also possibilities of deforestation, loss of fertile soil cover and habitat loss from road and site construction.

1.2 The responsibility to manage mineral resources is vested with both Centre and State Governments as per the Constitution of India. While the Ministry of Mines at the Centre is in overall charge of formulating and implementing policies for exploration and development of all major minerals other than coal, natural gas, petroleum and atomic minerals, the state pollution control boards implement various environmental legislations in their respective states. Ministry of Environment and Forest (MoEF) is the nodal agency to provide environmental clearance to all mining projects with mining lease area beyond 5 hectares. It is also mandatory to get separate clearance from the MoEF in case forest lands are utilized for mining.

1.3 As in many other countries, India too has several legislations to regulate mining operations to minimize the adverse impact on environment. There are six main statutory Acts that regulate environmental impacts from mining activity as given below[1]:

- Mines and Mineral (Development and Regulations) Act, 1957
- The Water (Prevention and Control of Pollution) Act, 1974
- The Air (Prevention and Control of Pollution) Act, 1981
- The Environment (Protection) Act, 1986
- The Wildlife (Protection) Act, 1972, and
- The Forest (Conservation) Act, 1980.

[1] This part of this section is based on our understanding of the following documents: Handbook of Forest (Conservation) Act, 1980 (with Amendments made in 1988); Forest (Conservation) Rules, 2003 (with Amendments made in 2004); Guidelines & Clarifications (up to June, 2004), Government of India, Ministry of Environment & Forest, New Delhi; Mineral Conservation & Development Rules, 1988 (as amended up to 18th January, 2000) brought out by FIMI, New Delhi; Handbook of Environmental Procedures and guidelines (for Mining Industry) brought out by FIMI, New Delhi; the Gazette of India, Nos. 179 & 185, dated April 10, 2003 and April 17, 2003, respectively and Jain (2003).

1.4 Mines and Minerals (Development and Regulations) Act, 1957 stipulates certain restrictions on undertaking mining operations, and explains procedure for obtaining mining license and conservation of minerals. Under this Act, the Mineral Concession Rules outline the procedures for obtaining mining lease license. According to these Rules, a mining plan is mandatory before undertaking the mining activity, which should include likely impact of mining activity on forest and environment including air and water pollution, mechanism for restoration of the area by afforestation and adoption of suitable pollution control measures.

1.5 The Mineral Conservation and Development Rules, 1988 framed under Mines and Minerals (Development and Regulations) Act, 1957 provide the general steps and procedures to be followed by the mining industry during initiation, operation and closing the projects. As per these rules, the main precautions taken in this regard are as follows:

- Removal and utilization of top soil for rehabilitation of land.
- Storage of overburden and waste rock.
- Phased restoration, reclamation and rehabilitation of lands affected by mining operations.
- Other types of precautions for ground vibration, surface subsidence, discharge of toxic liquid, and precaution against noise.
- Taking immediate measures for planting in the same area or any other area selected by the Controller General or the authorized officer not less than twice the number of trees destroyed due to mining operation

1.6 The Water (Prevention and Control of Pollution) Act, 1974 and Air (Prevention and Control of Pollution) Act, 1981 prohibit any waste emission without written consent and payment of fees to the concerned State Pollution Control Board.

1.7 The Environment (Protection) Act, 1986 empowers the Government of India to take all measures required to protect and improve the quality of environment. The Act provides the necessary powers to the Government of India to take suitable actions for preventing, controlling and abetting environment pollution. Under this Act, the MoEF controls generation, correction, transport, storage and disposal of hazardous wastes. The Act also allows the Government of India to lay down standards for emissions and discharge of pollutants from all sources.

1.8 According to the Wildlife (Protection) Act, 1972, the government can declare any area to be sanctuary, national park or closed area for regulating hunting of wild animals. It may affect ongoing mining operations, if suddenly the mining area is declared as protected area under this Act.

1.9 The Forest Conservation Act 1980 clearly stipulates that mining including underground mining is a non-forestry activity. Therefore, enough provisions have been made in this Act either to minimize or compensate the adverse impact on environment when the forest land is to be diverted for non-forest purpose. We start with a briefing on

the various clauses and amendments of this Act, which are particularly related to diversion of forest land for mining purpose.

1.10 In case of open cast and underground methods, the mining process generates solid waste materials like over burden by removing the top soil of forest land. This overburden can create a lot of environmental hazards, if not dumped off properly. In order to make sure that the mining companies use this solid waste in a environmental friendly technique, the Act has made it mandatory for the mining companies to submit *"a mining plan (indicating the solid waste management and post-mining land use plan for reclamation of forest land) along with the proposal submitted for granting lease. The mining plan should be duly approved by Indian Bureau of Mines, Nagpur"*.

1.11 As every coin has two sides, each option of using forest land has its own gains and losses. For diversion of forest land for non-forest use, the Act takes into cognizance the ecological and environmental losses caused to the society, on the one hand, and the economic and social gains accrued, on the other.

1.12 Accordingly, to determine whether diversion of forest land to non-forest use is in the overall public interests or not, the Act makes it essential that *"a cost benefit analysis should be enclosed in all the proposals involving diversion of forest land of more than 20 hectares in plains and more than 5 hectares in hills"* (Annexure VI (a) of the Act).

1.13 The Act also lists the parameters for assessing the cost and benefits accruing due to diversion of forest land. While taking into account the environmental losses due to diversion of forest land, the Act specifies that "as a thumb rule, the environmental value of one hectare of fully stocked (density 1.0) forest would be taken as Rs. 126.74 lakhs to accrue over a period of 50 years. The value will reduce with the decrease in the density of forest" (Annexure VI (b) of the Act).

1.14 However, the methodology for calculation of such figures is not given in the Act, in the absence of which, one can debate over the validity of such figures, and every attempt to revise these figures upward with the passage of time will spark off a fresh controversy in the absence of sufficient clarity and transparency of the underlying formulae or methodology used.

1.15 In order to compensate for the loss of forest land due to diversion, compensatory afforestation (CA) is one of the most important conditions stipulated in the Act while approving proposals for diversion of forest land for non-forest uses. The Act says that *"it is mandatory to submit a comprehensive scheme for compensatory afforestation along with the proposal for diversion of forest land. The scheme will include the details of non-forest/degraded forest area identified for compensatory afforestation, year wise phased forestry operations, details of the species to be planted and the cost structure of various operations"* (Chapter 3).

1.16 This is based on asset replacement approach, where compensatory afforestation is required to be done over an equivalent area of non-forest land. The cost of land and

afforesation will be borne by the mining agency and the Forest Department will manage the newly planted area. Such area will subsequently be transferred to the ownership of the State Forest Department and declared as reserved/protected forests. When non-forest lands are not available, the Act states that compensatory afforestation may be carried out over the degraded forest twice in extent to the area being diverted.

1.17 Despite the existence of so many rules and regulations under which mining industry operates in India, mining is still perceived as contributing considerably towards the dwindling forest cover and deteriorating quality of environment. A Central Empowered Committee (CEC) was constituted by MoEF, considering the decline in effective forest coverage on the one hand and following the Learned Supreme Court's directives to formulate a scheme for compensatory afforestation by non-forest user agencies, on the other. CEC submitted its recommendations on 9.8.2002 elaborating on (i) the procedure for utilization of funds for compensatory afforestation, (ii) activities permissible under compensatory afforestation, (iii) adequate compensation for loss of forest land through recovery of net present value, (iv) funds for catchment treatment plan and (v) involvement of user agency for compensatory afforestation.[2]

1.18 The main recommendations of CEC are:

- In addition to funds for compensatory afforestation, net present value of the forest land diverted for non-forestry used shall also be recovered from the user agencies.
- Money deposited to Compensatory Forestation Fund (CAF) shall be used exclusively for protection and conservation activities
- Besides artificial regeneration, the funds shall also be used for natural regeneration, protection of forests and other related activities, as per site's specific plants prepared and implemented in a time bound manner.
- Public sector undertakings like Power Grid Corporation, NTPC, etc., which frequently require forest land for their projects should also be involved in undertaking, compensatory afforestation by establishing Special Purpose Vehicle (SPV).
- Plantations must use local and indigenous species since exotics have long term negative effects.
- An independent system of concurring, monitoring and evaluation shall be involved to ensure effective and proper use of funds.[3]
- The underlying principle for recovery of NPV (@ Rs.5.8-Rs. 9.2 lakh per Ha. of forest land depending upon quality and density of forest land diverted for non-forestry use) was that the plantations raised under the CAS could never adequately compensate for the loss of natural forests, as the plantations require more time to mature and even then they are a poor substitute to their natural forest. So, MoEF was of the view that in addition to funds released under CAS. The NPV of the forest land being diverted for non-forest use should also be recovered from the user agencies.[4]

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[2] p.4, paragraph 4 of Learned Apex Court's Judgment dated 26th September, 2005.

[3] *Ibid,* pp.4-5.

[4] *Ibid,* p. 6, para 1.

1.19 The Honorable Apex Court put down the following views on NPV:

- The basis for calculation of NPV should be the economic value spread over a period of 50 years, which would be the re-generational value for forest regeneration to be taken into account as opposed to restoration value, i.e. financial value.[5]
- The NPV is the present value of net cash flow from a project discounted by the cost of capital.
- Since ROI excludes time value of money as well as the gestation period of a project, the court favors the NPV method which discounts future cost and future benefits by use of an appropriate discount rate.
- The Court does not like the conventional method of accounting cost, which does not take into account social and economic cost of diversion of forest.
- The Court finds a flaw in the public sector undertakings' argument over application of lower discount rate for lowing gestation project in that the low rate of return is computed without including the value of intangibles of environmental benefits arising out of forests.
- On valuation of intangibles, the court suggests several methods – namely; opportunity cost, replacement cost, travel cost, contingent value method (CVM), and Social Benefit Cost Analysis (SBCA).
- The Court classifies the following categories of environmental outputs – flood control benefits, water production, soil conservation, outdoor recreation, biodiversity conservation, habitat, air purification, which can be evaluated using SBCA as there is no market for these public goods.
- Although the Apex Court recognizes variation in above stated outputs depending upon the valuation method used, it argues that CVM is useful for bio-diversity valuation, whereas SBCA is helpful in arriving at monitory value on carbon storage or air purification function of forests. The Court advises a body of experts to examine and suggest the best method depending on various factors to assess direct use values, indirect use values, option values and existence values of forests.[6]
- The Court stresses that the object of amount of NPV is to utilize the fund to conserve the ecology without any manner affecting proprietary rights of the state government over the land, timber or the minerals. So, it felt that the principles and parameters of the valuation of the damage ought to be evolved keeping in view the likely impact of activities on future generation.[7]

1.20 The main conclusions of September 26, 2005 Apex Court's Judgment are:

- Except for government non-commercial projects, all other projects would be subject to the NPV Regime, pending final decision by the Expert Committee;
- The payment to CAMPA is constitutional and valid;

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[5] *Ibid,* p.10, para 4.
[6] *Ibid,* pp. 10-12.
[7] *Ibid,* p. 29, para 6.

- The NPV amounts are required to be used for achieving ecological plans and for protecting the environment and for the regeneration of forest and maintenance of ecological plans and ecosystems;
- The fund has been created with regard to the principles of intergenerational justice and to undertake both short and long term measures;
- ***The NPV has to be worked out on economic principles***.[8]

1.21 In this situation, the Learned Apex Court directed constitution of an Expert Committee under chairmanship of Prof. Kanchan Chopra, a renowned authority on the subject, asking the Committee to examine the following issues:

- To identify and define parameters for calculation of NPV
- To formulate a practical methodology for different bio-geographical zones of India.
- To apply this methodology to obtain actual numerical values for different forest types.
- To determine who should pay the cost of restoration and/or compensation with respect to each category of forests.
- To suggest which projects deserve to be exempted from the NPV Regime.

1.22 At this juncture, the Federation of Indian Mineral Industries (FIMI) approached IIM, Ahmedabad to quickly come up with an interim report, whose objective is to identify, based on economic principles as emphasized by the Honorable Apex Court, the parameters required for NPV calculation for diversion of forest land for mining purposes, while taking due consideration of cost and benefit factors, the methodological foundations, differences between mining and other non-forest uses of forest land, the prevailing statutory regulations for the mining industry to account for ecological cost mitigation etc. The ultimate goal of this exercise is to sensitize the relevant quarters for evolving a suitable compensatory regime based on sound economic principles to guide diversion of forest land for mineral extraction.

## II. The Concerns

1.23 Given the Hon'ble Apex Court's wisdom to apply an NPV regime based on economic logic to determine the compensatory arrangements for diversion of forest land for mining use, one should also note that one hectare of leased in mined land yields an annual GDP contribution of Rs. 116536 compared to Rs. 2932.25 from one hectare through forestry and logging. The difference of Rs. 113604 per hectare has to be bridged through proper valuation of the forest services[9]. The study team based on its review of the relevant documents and literature, on the one hand, and several rounds of discussion with the mining industry as well as friends and colleagues from the forestry fraternity, on the other, identified the following concerns/issues underlying the problem with a view to resolving and accommodating them on a solid economic foundation:

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[8] *Ibid,* p.34, para 2. However, the emphasis added is ours.

[9] Input-Output Transaction Matrix published by CSO for 1998-99.

- What are the strengths and weaknesses of the NPV approach in the present context, and which types of institutional safeguards are needed to overcome the limitations of this approach?
- Whether inclusion of all indirect and intangible benefits of forests only in NPV calculation will be consistent with economic logic?
- Under what conditions will application of the NPV regime be the correct approach as per economic logic?
- Should the formulae for NPV calculation concentrate merely on the loss of forest benefits due to mining? If so, how? And if not, what else need to be considered? to take care of the following:
- Should NPV calculation also take into consideration the NPV from the alternative use of surface forest land during the mining operations? If yes, how? Should there be any adjustment in the final NPV calculation for the contributions of the mining sector towards forest and ecology regeneration?
- Should the funds contributed towards Compensatory Afforestation (CA) by the miner be suitably adjusted towards NPV calculation considering the facts that (a) forest land is not diverted to mining in perpetuity, except for a small fraction of the leased-in land; (b) the transferred forest land is broken progressively over time as per an approved plan and not all a time at the beginning of mining activities; (c) the miner faces (i) risks of bureaucratic delays in getting sanctions & approvals, and (ii) risk of being denied continuation of lease, leading to high order of asset-specificity risk in fixed investments, besides the usual input and output risks of an entrepreneur – namely, that he may be charged higher rates for the inputs, including mining lease, or that the international price of his mineral may go down?
- Should any other consideration like output, income and employment creation by the miner in interior villages, infrastructure and social development activities undertaken by the miner in remote mining areas, strong forward linkages of mining, which enter into strategic considerations like defense for a country, strong potential for starting of value-added activities in mined areas, which some of the progressive miners have started demonstrating, etc. enter into NPV calculation in the present context?

## III. The Methodology Followed

1.24 In order to find suitable answers to the above-stated questions, the study team during its deliberations over nearly the past three months concentrated on the following:

- Carefully going through the documents pertaining to the regulatory regime for temporary diversion of forestland from forestry towards mining;
- Critically examining a representative cross-section of the fast-growing literature on valuing forest benefits (so as to avoid possible errors due to complacency in the use of underlying methodologies);
- Interaction with a fairly good number of foresters, many of whom are directly or indirectly associated with the task of conceptualization and estimation of NPV for forests; and

- Interaction with FIMI officials as well as a representative cross-section of miners, followed by quick on the spot field visits to two regions (namely, Rajasthan and Goa) to capture their views and concerns to facilitate evolution of a conceptual framework towards calculation of NPV from the alternative use of forestland – namely, mining – whether one looks at the total activities of the miner (i.e., extraction of minerals as well as use of the land surface area), or merely on the use of the land surface area for forest regeneration, infrastructure and community development.

# Chapter II

# Observations & Findings of the Study

## I. Introduction

2.1 Given the Honorable Apex Court's directive that the NPV has to be worked out on economic principles, the present chapter attempts to deal with all relevant concerns as listed in the preceding chapter. This exercise is based on, on the one hand, a review of the available literature pertaining to the costs and benefits of forestry and mining activities, besides Acts, Rules and Regulations governing these matters, and on the other hand, analysis of two cases arising from field visits to a couple of selected mining sites, which could be undertaken subject to the short time available to the study team for preparing this interim report. The ultimate objective is to sensitize the relevant quarters against possible misuse and misinterpretation of the NPV methodology during its application in the current context, to help institute the necessary safeguards, and to facilitate, as far as possible, evolution of a rigorous NPV regime based on sound economic logic, as desired by the Honorable Apex Court.

2.2 This chapter is organized as follows. The next section briefly describes the NPV methodology, besides bringing out its strengths and weaknesses. Section 3 calls for the need of an institutional mechanism, following the celebrated Coase Theorem, which can help operationalize the NPV regime in a multi-user context, as for example is the case of choice between forestry use of forestland by the Ministry of Environment and Forests (MOEF) vis-à-vis its use by mining purposes by an altogether different agency, while multiple stakeholders exposed to multifarious costs and benefits – both tangible and intangible – are involved on both sides. Section 4 attempts to articulate NPV calculations of forestland used as forests, while the next section attempts to arrive at NPV calculations, duly adjusted for payments toward Compensatory Afforestation Fund (CAF), of the same forest land for an alternative use – namely, for mining purposes. The final section deals with other considerations, which too seem to have a bearing on the issue of NPV calculation of forestland for forestry use vis-à-vis its use for mining purposes.

## II. Strengths & Weaknesses of the NPV Methodology

2.3 NPV calculation is a variant of cost-benefit analysis (CBA), which is used as a *"standard tool for evaluating economic merit of investment or development projects, and is widely used to assess forest land use options"* (IIED, 2003, p.24[10]). It involves calculation of net benefits (NB) of a given option as the sum of benefits (B) less the total costs (C), i.e., NB = B – C over an appropriate time horizon (say, n), as chosen

[10] International Institute for Environment and Development: *Valuing Forests – A Review of Methods and Applications in Developing Countries,* London, January, 2003

by the analyst. Using a suitable discount rate, r, the net benefits are combined into a single aggregate figure, called net present value, NPV, as

$NPV = \sum NB_t/(1+r)^t$, where t = 1,2,3…..,n.

Thus, between any two alternative forest use options, A and B, the net present value of A must exceed that of B, i.e., $NPV_A - NPV_B > 0$ if option A is to be preferred over B on purely economic grounds. It must be noted that while arriving at NPVs, the net benefits of any given land use option must comprise of both direct and indirect net benefits, while cost and benefit flows over time must be evaluated at current prices for deciding on management options. As *FAO Guidelines for Defining Financial, Economic, Environmental and Social Information* (section 2.2.3, reference: http://www.fao.org/docrep/w8212e/w8212e06.html) put it, *"..It assumes that the present is "knowable", and the future is not, so comparative valuation can be justified with the use of known data to compare alternatives as being more attractive and less attractive, not to derive their absolute value."* Moreover, as Bann (1997)[11] has clearly pointed out, *"Cost Benefit Analysis by defining a project's net worth (NPV) is a tool that can be used to determine if a project is viable or not; make comparisons between projects; and,* ***rank projects***[12]*. Ranking alternatives or choosing between mutually exclusive alternatives which all have a positive NPV, should be made on the basis of the highest NPV."*

2.4 The discount rate used to convert future streams of net benefit flows into present values in NPV calculation needs to be chosen carefully as the NPV calculations and the consequent ranking of investment alternatives are highly sensitive to this rate, especially when long streams of benefits and costs are involved. A prolific literature, which has grown over this subject[13], has uttered the following cautions with regard to choice of this discount rate:

- First, it reflects the cost of capital to the agency or stakeholder either directly choosing or involved in choosing among alternative investment options. Given unequal access of different agencies and stakeholders to the market for capital, on the one hand, and the usual imperfections of the capital market, especially in a developing country context, on the other, choice of this discount rate is not easy.
- Second, the fact that this discount rate reflects time preference of the agencies/stakeholders involved, adds to the complexity of this choice.
- Third, this rate needs to be suitably adjusted against the projected inflation rates in the future.
- Finally, as a number of future projections against uncertain outcomes are involved, the risk perceptions of concerned stakeholders too enter as factors determining this discount rate. For example, communities exposed to higher livelihood risks (e.g., unemployment, malnutrition, lack of basic infrastructure

[11] Bann, Camille, *The Economic Valuation of Tropical Forest Land Use Options – A Manual for Researchers,* EEPSEA Research Report, Section 10.5, p.48.

[12] Emphasis added.

[13] A classic text is Dasgupta, Partha; Sen, Amartya; and Marglin, Stephen (1972), *Guidelines for Project Evaluation,* United Nations.

and other amenities of life) and thus living dangerously at present are likely to heavily discount future prospects.

2.5 A few important features of the NPV methodology for purpose of comparison across investment alternatives, which are directly relevant for the purpose in hand, may now be pinpointed below.

2.6 First, although NPV is a good ordinal measure for decision-making over alternative investment options by a single user, it has questionable value as a cardinal measure of gains or losses (and hence of compensation) from one use over another in a multi-user context. This is precisely because different nodal user agencies (forester, miner etc) and their multiple stakeholders may perceive different parameters (e.g., the discount rate) underlying NPV calculations differently, thus making any calculation based on uniform parameter values across stakeholders simply misleading and prone to serious subjectivity error[14].

2.7 Second, it is difficult to rationalize the NPV regime for the purpose in hand using a supply-demand framework, which requires a demand curve (i.e., willingness to pay) as well as a supply curve (i.e., willingness to accept payments against supply) to determine the equilibrium price. Pricing of "natural forests" is difficult, because nature cannot reveal its "willingness to accept" for the intangible services it provides through "natural forests". The Supreme Court order of September, 2005 assigns to the society the role of charging the "producer fees" on behalf of the Nature. The Court then wants those willing to use natural forests for other purposes to pay for the costs involved in generating another patch of natural forest somewhere else to compensate for the loss. Obviously, the job is quite difficult, as the process and hence the cost involved in the production of a "natural forest" is not yet fully known to the mankind. The demand curve is also difficult to be derived for natural forests as most of us may not be revealing our willingness to pay as long as the forest cannot demand its pound of flesh for the services

[14] In a publication entitled 'Outlook studies - The global outlook for future wood supply from forest ... ' (section 3.3), which is claimed to have been extracted from one 1999 World Bank Report (source: FAO Corporate Document Repository), this point as well as other related concerns are expressed in the following manner; *"Usually, even when the calculations have all been done by a single agency, these analyses should be treated with caution. For example, in many instances it is unclear whether returns are cited in nominal (inclusive of inflation) or real (inflation-exclusive) terms or even whether returns are pre- or post- taxation. Similarly, questions arise as to how initial land-values are treated in the analysis, how complex taxation regimes have been applied and how different and variable government incentives have been taken into account. Added to these uncertainties, the usual questions relating to the quality of data used in the analysis, the quality of cost and price forecasting assumptions and the assumptions made about silvicultural, management and biological factors, can all conspire to make comparisons difficult. These difficulties are multiplied even further, when forest plantation investments are compared with investments in other sectors of the economy or with other financial instruments".* It seems the Honorable Apex Court in its judgment of September 26, 2005 has referred to the same document, when it has written that *"..We may however note that although in the application it was stated that the format issued by the World Bank for calculation for NPV for the projects shall be the basis of its calculation, the learned Solicitor General stated that he was not relying upon the said format..",* though the reasons for not following the World Bank format, nor the above-stated cautions (quoted in this footnote) are not cited.

it renders[15]. Moreover, the demand for forest land or any of the forestry services having a derived demand, it must be dependent on the income levels of the users, their preferences and future expectations, and the prices of the final goods where forestry services are being used, besides the prices of substitute and complements to forestry services. As NPV calculation is totally divorced from these considerations, it cannot properly reflect the demand side either.

2.8 Third, NPV may not be the right methodology except in marginal cases of slight alteration in investment portfolio in favor of one use or the other, where choice of one alternative against others does not affect the economy wide prices and thus influence the choice process itself. To be more precise, the NPV regime implicitly assumes a static and partial framework, and not even an equilibrium framework for the reasons elaborated in the preceding paragraph. It concentrates on only one option at a time, thus totally ignoring the fact that investment in one line may influence and may also be influenced by investments in alternative activities not only at a given point in time, but also over time[16].

2.9 Fourth, a point close to the earlier one (i.e., the need for an applied general equilibrium approach to the problem) is whether attempting total economic valuation (TEV) - i.e., inclusion of all indirect and intangible benefits calculation – which amounts to adopting a natural resource accounting system for forestry sector alone, will not be inconsistent and rather premature at this stage with the prevailing economic logic of national income accounting, on the one hand, and India's commitment, on the other hand, under WTO to follow global competitiveness criterion for our products against rival country products both at home and abroad (known as import-competitiveness and export-competitiveness, respectively) without going for excessive taxes or subsidies, unless we can extend the concept of green accounting for all trading nations and across the table – i.e., to all production activities, whether complementary and rival vis-à-vis forestry[17]. If

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[15] In other words, there is a 'free rider' or 'preference falsification' problem with respect to demand for a large part of forestry services, which are in the nature of public goods.

[16] Static general equilibrium models to handle the former type of problem and inter-temporal dynamic general equilibrium models to tackle the latter type of problem are now-a-days well-established traditions in the economics profession, though our textbooks and schools may be slow to establish their familiarity with these relatively newer fields and, what is probably more disturbing, little empirical work seems to have been done to guide policy action based on such general equilibrium considerations. This observed lacuna of traditional neo-classical analysis based on static partial equilibrium analysis probably prompted Raul Prebisch, an eminent Latin American economist to argue that this neoclassical tradition has neither any time horizon, nor any social horizon. IIED (2203, pp 28-29) has put this point succinctly as follows: *"The CBA framework is appropriate for making relatively small-scale decisions. The technique is generally based on the assumption that the project or initiative being considered is not so large so as to alter prices or the structure of the wider economy. Yet many decisions concerning forest land use are made on a much larger scale….Other evaluation methods can help resolve particular weaknesses or difficulties of CBA…"*

[17] In a study prepared by NCAER, New Delhi (2002) entitled 'Role of Mineral Ore Exports in the Economic Development of Goa – A Historical and Economic Enquiry', this issue is partly addressed, which is summed up as *"..The biggest challenge facing the mine owners of Goa today is how to internalize the social cost while maintaining international competitiveness. Will the Goan iron ore industry be able to stand competition from Australia and Brazil? Will it survive in the face of pressure groups, especially environmental groups?...The study concludes that according to most international industry perspectives, Goa is likely to maintain its niche as a supplier of quality ore which steel majors find useful for blending*

putting the forest land into non-forest use is considered a threat to our environment as it reduces the capacity of the nature to absorb the pollutants, we have been emitting, in the name of our quest for development, the same argument also holds good towards managing the other natural resources like water and air. Introduction of NPV regime in forests without totally overhauling our National Accounts Statistical System to conform to a green accounting norm may thus put undue pressure on some selected sectors of the economy, with other segments free riding on them. So, a number of experts, while pleading for doing justice to the valuation of forestry sector's contribution, have expressed caution over sudden (i.e., without adequate homework) switch-over towards a green accounting system for only one sector. The following two quotations are only indicative of the stage of preparedness for this task:

*Box 2.1*

*"Many people may be only dimly aware of the way in which economic growth is actually calculated. Economists use National Income Accounts for this purpose and rely on vast databases of statistics to tell us how much consumer expenditures, investment, government spending and the net value of exports has changed over a given time period (usually a year). Data used in the calculation of economic growth statistics are confined to transactions in markets, since data on economic activity outside of markets is scarce and, by definition, not easily measured. While the National Accounts consider the depreciation - that is, the 'using up' - of manufactured capital items, like logging and sawmill equipment, they do not treat 'natural capital', like a standing forest stock, in the same way. As a result, a country could exhaust its mineral resources, cut down its forests, erode its soils, pollute its aquifers, and hunt its wildlife and fisheries to extinction, but measured income would not be affected as these assets disappeared. Ironically, low-income countries, which are typically most dependent on natural resources for employment, revenues, and foreign exchange earnings are instructed to use a system for national accounting and macroeconomic analysis that almost completely ignores their principal assets.*

*To address this problem requires correction of the existing set of national accounts, or construction of a set of parallel accounts which take depletion of natural resources into consideration. In valuation terms, this necessitates total valuation of the standing forest stock to include all values associated with this resource. Some uses made of the forest are already recorded as transactions in markets (i.e., rattan sales); so care is required.*

*Although the researchers were not able to take into account the full range of values associated with standing forest, and the loss of these values as the timber is removed, the approach is instructive. We must first properly account for the extraction of obvious forest resources, such as timber, before we can begin to cast the net more widely to capture other less tangible values. A total valuation framework applied to correction of National Income Accounts is just one place to begin applying this line of thinking".* Source: Repetto et al. (1989), (Box 4.2: Towards Total Valuation of Forest Resources in Indonesia) as quoted in Duncan Knowler and Jon Lovett (May, 1996), Training Manual for Environmental Assessment in Forestry.

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*with Australian and Brazilian varieties. The efforts of Goa's mine owners at forging long-term alliances with international companies in new markets is part of the on-going strategy and augurs well for the industry. At the same time, the levy of additional cess by the state government could affect long-term viability of this sector…"* (the underlined sentence is highlighted to draw attention of the reader). Thus, selective imposition of excessive tax/fee burden on certain industries like mining following the green logic may lead to not only certain loss of competitive power of our mineral products even at home, but also erode the economic position of all mineral-based industries, when the rival countries are dragging their feet to implement the same green logic for their industries.

*Box 2.2*

Another FAO document, a paper entitled "Accounting for the Benefits of Forest Resources: Concepts and Experience" by Jeffrey R. Vincent and John M. Hartwick (1998)[1], while pointing out the limitations of the System of National Accounts (SNA) and the related System of Integrated Environmental and Economic Accounts (SEEA), and also identifying eight basic accounting adjustments related to economic aspects of forests, has also uttered the following note of caution:

*Empirical studies indicate that many of these adjustments are feasible, although they will be highly inaccurate if valuation techniques are not applied properly. Even when techniques are applied properly, the resulting estimates will often not be terribly precise. For this reason, we suggest that the adjustments proposed in this report be implemented as a satellite accounting system. Their implementation will most likely require a joint effort by national accountants and economists in planning or forestry agencies". (ibid, p.53)*

2.10 Another important lacuna of the NPV approach is that it is merely concerned with economic efficiency, not distributional equity, because financial transfers between individuals and groups as a result of any management activity, as they don't constitute any usage of economic resources, are totally ignored[18]. So, society's distributional considerations must be taken up explicitly and separately in the form of entitlements and property rights, while translating NPV calculations into action. Bann (2002) rightly argues that as the TEV of forests are enjoyed across the global canvas, the responsibility of paying for the loss should not be concentrated at regional or national levels. She argues in favour of an international compensatory mechanism to take care of the concerns arising out of diversion of forest land to non-forest uses[19]. Such an argument becomes far more meaningful in view of the fact that the estimates of TEV across tropical and temperate forests differ considerably[20]. An implication of this finding points towards a possible subsidization of the conversion of temperate forests by compensating for conversion of tropical forests at its TEV. Thus, a premature and selective use of "green accounting" may hurt India's interest. The prospects for carbon trading resulting out of the Kyoto Protocol calls for a harmonization between international compensatory mechanism and the domestic one. While we would like to take up some of these issues in the last section of this chapter, we present below the views of two well-known authors on this matter:

[18] Distributional considerations become even more complex when any particular investment has multiple goals with multiple streams of benefit-cost flows, which impact different stakeholders differently. As Dasgupta et al (1972) have argued throughout their book, such distributional norms must be explicitly taken into consideration, while implementing a project.

[19] Bann, C. (2002): The Economic Value of Tropical Forest in Verweij. P. (eds.): Understanding and Capturing the Multiple Values of Tropical Forests: Tropenbos International: Amsterdam: Pp 73-75

[20] Krieger, D.J (2001): The Economic Value of Forest Ecosystem Services: A Review: The Wilderness Society: Washington: Table 2 P8 (reproduced in Page 36 of the present document)

*Box 2.3*

*"Analysts must be aware of the distribution of the benefits and costs of forest management activities, and this may rely in part upon the underlying institutions such as property rights or rights of access to forest resources. CBA is instead concerned with the economic efficiency aspects of environmental changes stemming from some forest management activity. By this, economists mean that the results of an action can be measured by its net economic benefits, regardless of to whom these may accrue. A project showing a very high net economic benefit would be deemed highly desirable in economic efficiency terms, no matter that the beneficiaries may not be the ones who bear the burden of the costs arising from the action. In this context, financial transfers between individuals or groups, as a result of the management activity, are ignored in a CBA, since they do not constitute usage of economic resources. Thus, payment of subsidies or taxes, which may alter the distribution of benefits and costs from an action, are actually left out of a CBA. However, there is clearly a need to take account of this distribution, particularly as an aid to designing effective mitigation strategies.*

*Local forest communities may often fall into the category of losers from forest management activities, suffering a loss whether a forest is destructively logged or preserved as a pristine national park. In the latter situation, former subsistence hunting and gathering activities may no longer be permitted. In some cases, this problem may be recognized and addressed through the creation of special funds to compensate villagers for lost access to forest resources. Nonetheless, it is important that the distributional aspects of any proposed tropical forest project or policy be considered along with net return measurements, and that adequate transfers or other special provisions be enacted to deal with inequities. ……*

*Most important for economic analysis perhaps are property rights arrangements. Attempts to value tropical forest resources may run into difficulties if estimates are based on a simple observation of current use rates, without taking into consideration the property rights situation. This may be especially important if the property rights system is changing informally (as when indigenous common property systems are reasserted after a period of dormancy), or a change has been mandated as an element in a project or programme affecting a tropical forest area (as when land is suddenly privatized or nationalized). From an economic analysis standpoint, the benefits and costs associated with a management action will be influenced by the property rights regime in place. If a forest area is subject to open access, then measures to improve the physical management of the forest resources will produce few economic benefits unless the property rights situation is also addressed"* (Source: Duncan Knowler and Jon Lovett :*Training manual for environmental assessment in forestry.* May, 1996)

## Section III: An Attempt towards Rationalization of the NPV Regime

2.11 Notwithstanding the limitations of the NPV methodology to estimate the compensatory payments for shifting of forest land for mining purposes - especially the limited-type assumptions of a partial approach and absence of explicit distributional considerations - an attempt is being made in this section to rationalize this approach within the framework of a Coasian negotiation process, so as to come up with a cardinal price out of NPV exercise, assuming that the whole spectrum of net values realizable from alternative uses as forestland or mining land as per the laws of the land are realized by the forester and the miner, respectively. In other words, we would assume that, irrespective of the number and identity of stakeholders on either side, these two agencies are in a position to collect the net benefits from these two alternative uses and also to negotiate on behalf of their respective stakeholders. It is also assumed that both parties are agreeable to calculation of multifarious net benefits flowing to different stakeholders on either side by a neutral body, so that uniform evaluation standards (e.g., discount rate) can be applied by this neutral body to correctly assess the NPVs for either use. In this situation, a competitive negotiation process resulting in payment of NPV differences as compensation payment for use of forestland by miners, by virtue of the famous Coase Theorem, will lead to the most efficient solution, i.e., maximum value out of forestland in

its proposed use, provided institutional processes are there to satisfy the following three Coase conditions[21]:

- Presence of initial and unambiguous property rights system in favor of the two main negotiating parties (namely, the forester and the miner) on the multifarious costs and benefits arising out of their activities;
- Institutional checks and balances to ensure that no wealth effect due to unequal powers of the contracting parties can influence the negotiation process; and
- Establishment of institutional systems to ensure that transaction costs (i.e., costs of negotiation, writing and enforcement of contractual terms and conditions) are set at the minimum level so as not to jeopardize the negotiation process and reverse the profitability and sustainability of activities.

2.12 So, even if the partial equilibrium approach underlying the NPV methodology is accepted together with the presence of an independent and neutral body to authentically evaluate the NPVs from alternative uses of forestland, it remains to be seen whether and to what extent the three above-stated Coase conditions are fulfilled to ensure efficiency of the solution.

2.13 First, one needs to see whether as per the existing statutes, rules and regulations the costs and benefits of forestry and mining activities are fully internalized or leaked to/imposed on outsiders. Some of the points worth considering in this context are as follows:

- When an attempt is being made to estimate the total economic value of forests in NPV calculation for the purpose of determining the compensatory payments a miner would be required to pay, one can't lose sight of the fact that many of the benefits of forestry (inclusive of regenerated forestry on mined land) are in the nature of public goods not merely at the local and regional level, but also at the international level[22], and there are so far no institutional support system in domestic and international laws to demand payments from the beneficiaries for supply of these public goods. Two types of distortions are created as a result to damage the efficiency property of a Coasian negotiation process. In the first place, if these public good-type benefits nevertheless enter into the calculation of NPV for forestry, but left out in the calculation of NPV for mining, it would invariably mean charging the miner twice – first, while calculating NPV for forest use, and second, while undermining NPV for mining use of forestland – thus subsidizing the 'free-rider' beneficiaries, whether such beneficiaries are domestic or

[21] Chapter 9 of Paul Milgrom and John Roberts (1992), *Economics, Organization and Management,* Prentice Hall, provides a lucid exposition on Coase Theorem together with ownership and property rights.

[22] FAO Guidelines for defining financial, economic, environmental and social information (section 2.3.1, reference: http://www.fao.org/docrep/w8212e/w8212e06.html) has highlighted the relationship between forests and global climate in the following manner: *"Forest clearing and burning have led to increased amounts of "greenhouse" gases in the atmosphere, mainly carbon dioxide. At the same time worldwide losses of forests have reduced global capacity for atmospheric carbon dioxide to be sequestered from the air by growing trees. Balanced and sustainable forest management programmes in tropical forests for both wood production and for environmental conservation objectives can contribute towards atmospheric carbon dioxide sequestration".*

international communities. A second type of distortion with dynamic consequences[23] will arise if the compensatory funds collected from the miner for loss on public-good type forestry benefits due to mining, is not used timely through a participatory process to compensate the losers[24].

- As argued by the Planning Commission (2001), it appears that the term 'forestland' is yet to be precisely defined through clarifications and notifications so as not to leave interpretation at the discretion of field officers[25]. There is further and acute need for more precisely defining quality of forests (including regenerated forests on mined land) in terms of suitable parameters and their relations to the flow of multifarious benefits, much beyond the traditional emphasis on timber alone, if the NPV regime has to be operationalized to determine compensation payments. Clarifications are needed on the title to woods to cut out forests on mined land if NPV calculations already include the value of lost woods. Similar clarifications are needed also on the title to the various products and services (including fish, horticultural produce, medicinal plants and herbs, and even recreational services) arising out of regenerated forests during a long period of mining operations, with suitable stipulations on how to adjust their values in NPV calculations, to avoid 'opportunistic' interpretations.
- It seems there are a lot of loopholes in our Acts, Rules and Regulations, and especially in the enforcement mechanisms, which gives rise to illegal mining. The extent of illegal mining is estimated at around 50% of the total production of minor minerals and about 30% of major minerals including coal[26]. FIMI has attributed illegal mining to several reasons: (i) Existence of mineral deposit, but non-grant of mining/quarry leases, particularly for minor minerals; (ii) Stoppage of a mine before full exhaustion of deposit or refusal of state to grant renewal;

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[23] *If CAMPA funds are not used efficiently and timely, shortages of tangible and intangible forest benefits will shoot up the prices of such benefits in the foreseeable future, thus forcing all non-forest-users to make larger quantum of NPV payments. Hence, NPV calculations to determine compensatory payments by the non-forest-users can't be independent of the systems and processes of use of CAMPA funds.*

[24] The Honorable Supreme Court has in the past already expressed wonder over and sought explanation from MEF why CAMPA funds were not spent on time to carry out afforestation. In its judgment of September 26, 2005 the Learned Apex Court directed MEF to include two more environmentalists – one with expertise in the field of forest and the other with expertise in the field of forest economy development, for inclusion in the executive body of CEC. Moreover, on distribution of CAMPA funds, the CEC stipulated that money would be released from CAMPA through State Level Management Committee as per Annual Plant of Operation (APO) finalized by the concerned state/union territory for use only in that particular state/union territory on site-specific schemes for natural assisted regeneration, forest management, protection infrastructure development, wild life protection and management, supply of wood and forest product produces saving devices, and other allied activities. However, it appears so far no formal mechanisms have been established for participation and monitoring of stakeholder communities in the use of CAMPA funds, nor to ensure proportionality between loss of specific communities on forest loss due to mining (say, within a Forest Division/Range/Beat) and their gains from afforestation and related schemes funded out of CAMPA funds. Appendix 2.1, based on data submitted before the Apex Court, displays some of the disturbing features of Compensatory Afforestation in this country.

[25] *Report of the Working Group on Mineral Exploration and Development (other than Coal and Lignite) for 10th Five Year Plan – Fiscal Measures, Infrastructure Development & Environment (Volume IV),* Planning Commission, Govt. of India, September, 2001, Section 6.4.1, p.69.

[26] Source: '*Note on Illegal Mining'* by Federation of Indian Mining Industries (FIMI), N. Delhi, p.2.

(iii) Denying of permission to mine in forest area (due to, say, declaration of operating mining area as wildlife sanctuaries) or arbitrary reduction in mining lease area at the time of renewal, resulting in many un-worked broken areas (like Jafarabad district of Gujarat, Kudappa district of Andhra Pradesh, Shivpuri district in Madhya Pradesh, Dholpur area, Kota and Alampur villages in Rajasthan, Dehradun region of Uttaranchal), which attract illegal mining; (iv) When state PSUs are granted extensive areas on mining lease, but surface rights on a smaller area, the residual area containing mineral deposits attract illegal mining, sometimes in connivance of state authorities; and (v) Almost endless chain of levies like royalty, welfare cess, NPV, compensatory afforestation (CA), various labor and environmental costs indirectly contributes to illegal mining with numerous hazards[27]. These factors are further reinforced in remote backward and tribal areas with high rates of unemployment. The ultimate result is bad (i.e., illegal) miners driving out good (i.e., law-abiding) miners, thus eroding effectiveness of the rule of the law[28].

- In the absence of a coordinated approach, the conditions for granting clearance to mining under the Forest Conservation Act (FCA) are often at variance with other Acts like MMRD Act, Mines Act, Labor Welfare Fund Act, and Environment (Protection) Act, 1986
- Unless section 2, clause 1.3 of FCA, 1980 are suitably amended, survey and mineral investigation (e.g., pitting, trenching and collection of surface samples) continue to attract the provisions of the Act, even though there is no cutting/clearing of forest, thus eroding the property rights on mining.
- As Planning Commission (2001, p.74) has pointed out, absence of elaboration and guidelines for preparation of EIA/EMP, standardized models for quantification of environmental impact of mining, competence of State Pollution Control Boards to conduct effective public hearing within a stipulated time frame seems to be eroding the rule of law with respect to mining.
- In the absence of clear definition and clarification of terms like “rare minerals”, “non-availability” etc. in Coastal Zone Regulation Notification dated 19/02/91 of the MOEF, mining in CRZ will continue to be affected even though reclamation and nourishment of mined-out coastal areas generally leads to better environmental conditions in the locality (Planning Commission, 2001, p.69).
- Failure to enforce collection of baseline information on micro-meteorological and environmental data during mining exploration activities, on the one hand, and to put together the secondary data available with agencies like the Central Ground Water Board, the State Ground Water Department, the Botanical Survey of India, the Zoological Survey of India, All India Land Use & Soil Survey etc., on the other, often leads to a failure to correctly assess performance of mining companies, resulting in such companies in general earning a bad name and seen in poor light.

[27] A detailed list of various levies and fees imposed on the mining industry is displayed in Appendix 2.2.
[28] This is akin to what the economists refer to as the ‘lemons problem, often leading to market failures.

2.14 The second important condition for Coase Theorem to hold is the absence of 'wealth effect', so that because of unequal power position no contractual party can unduly influence the terms and conditions of a contract. Unfortunately, this is far from the case whenever government or a government Department enters as one of the parties in a contract[29]. This is no exception in the present context, where the miner is required to bear all market risks in the input markets – inclusive of the impact of more stringent regulatory system (say, α), as well as in output markets (say, β), besides additional risks due to possible bureaucratic delays and mishandling (say, γ). As an entrepreneur, a miner is supposed to bear definitely the first two types of risk and also the third type of risk, depending upon efficiency of governance structure in a country. However, the presence of wealth effect can substantially increase these risks of the miners, thus tilting the results in favor of the forester away from the Coasian value-maximizing contract[30]. Listed below are some examples of this wealth effect affecting the mining industry:

- CEC submitted before the Learned Apex Court that the underlying principle for recovery of NPV @ Rs.5.8-Rs.9.2 lakh per hactre of forest land depending upon quality and density of forest land diverted for non-forestry use was that the plantations raised under the CAS could never adequately compensate for the loss of natural forests, as the plantations required more time to mature and even then they were a poor substitute for natural forests. The fact that the details of how and under what assumptions these quoted figures were arrived at were apparently not submitted before the Apex Court, nor deliberated upon during the court proceedings is probably enough indication of the wealth effect in favor of the Forest Department.
- The estimates of NPV assumes a direct relationship between canopy cover and TEV of forests, the latter increasing with increases in the former. One is not very sure if canopy cover alone can be taken as a unique indicator of the quality of forest services generated — more so if the forest in question is a planted one. For example, several species like Cryptomaria japonica and *Tectona grandis* are well known as suppressing growth of other species under them and thus inhibiting possibilities of high biodiversity.
- Given the fact that estimates of different forest services across the regions in the world vary wildly, one really is not sure if the existing methodologies for estimating their monetary values are efficient and sufficiently standardized for the purpose under review. The Honourable Supreme Court also cautioned against such possibilities in the judgment when they also realized that there being various techniques available for valuing bio-diversity, it is important to see the extent of convergence/divergence across value perspectives of different categories of stakeholders (p. 16). Thus an informed and empowered participation of local level stakeholders is a necessary condition for arriving at a reasonable estimation

[29] This is because a government Department can always camouflage its inefficiency by its superior access to the public exchequer, further covered up by bureaucratic arrogance and coercive power, unless civil society organizations can effectively curb these unequal powers.

[30] Much higher risk perception of the miner under conditions of wealth effect would prompt him to apply a higher discount rate than the Forest Department in arriving at present value calculations, which seems to have been lost sight of in NPV calculations so far.

of NPV[31]. Moreover, since many of the services are substitutes — for example logging and carbon sequestration —, one should be careful that no double counting happens while estimating the TEV of forests[32]. One should also consider the value of the forests created on mined land once the extraction activities are completed. Since mining is not taken up across the entire land leased in at any particular point of time — rather they are taken up in patches over years — the time dimension of the loss of forests is necessary to be considered as well.

- The payment of an uniform NPV for each class of forestland irrespective of the value of minerals being extracted and also irrespective of asset-specific investments in mining[33], which is likely to set in motion an incentive process of faster and more scientific mining of costlier minerals than cheaper and bulky minerals, is likely to create an allocative distortion effect, which the miner and the society has to bear unilaterally and gratuitously. This may provide an inadvertent boost up to illegal mining in cheaper and bulky minerals.
- Although mining diverts forestland only for a temporary period, unlike in most development projects like irrigation, housing, roads etc., compensatory afforestation charges are not staggered, nor collected annually for only the lease period, thus putting undue financial pressure on mining companies[34].
- Before rejecting any mining proposal, the user companies are not given an opportunity for justifying their proposal through submission of a revised proposal and without recognizing and rewarding mining units, which strictly adhere to compliance of stipulated mining rules and regulations[35].
- The impact of the wealth effect is probably the severest on the miner, when the latter is required to pass through an elaborate, complex and time-consuming process in seeking approval for Prospecting License Grant, Mining Lease Grant, Public Hearing / NOC from SPCB, Environmental Clearance Procedures, Grant of Reconnaissance Permit, Processing of Proposal for Acquisition of Forest Land (all shown in the form of flow charts in Appendix 2.2)[36].

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[31] Policy Recommendations by Tropenbos International/EFTRN Seminar , March 20-21, 2002 on Forest Valuation and Innovative Financial Mechanisms for the for the Sixth Meeting of the Conference of the Parties to the Convention on Biodiversity, reproduced in Verweij. P. (eds.): Understanding and Capturing the Multiple Values of Tropical Forests: Tropenbos International: Amsterdam: Pp 119-124. See recommendation 5 under Section 1.2.

[32] Pearce, D.W and Pearce, C.G.T (2001): The Value of Forest Ecosystems: CBD Technical Series No. 4: Table 17 P 41: (reproduced in Page 37 of the present document)

[33] It is also referred to as 'locking-in effect' in the contract literature.

[34] If non-marketed and intangible items are to be valued for the forestry sector, the same ought to be done for government non-commercial development projects (rather than granting them exemption from the NPV regime) to maintain consistency of economic logic. Else it would lead to loss of accountability for those projects and lesser CAF, resulting in lesser future production and higher prices of forestry services. The ultimate effect would be higher NPV calculation for non-forest users in the future.

[35] As highlighted by Planning Commission (2001, p.72), probably Forest Advisory Committee should have a representative of the Indian Bureau of Mines, and similarly Regional Advisory Committees should have representation from State Department of Mines and Geology and/or Regional Offices of Indian Bureau of Mines.

[36] Planning Commission (2001, pp70-75) has made several recommendations in this regard to cut down on the high transaction costs imposed on the miner: (i) At least 5 best practice environmental management

## Section IV: NPV Calculation on Forest Use

2.15 Given the expressed intention of the Learned Apex Court, it is important to begin this section by briefly elaborating on the concept of total economic value of forest, while pointing out the difficulties in making the concept operational in an objective manner[37]. A lucid presentation on the concept (also represented by Figure 2.1) together with a tabular presentation of the distribution of benefits among the stakeholders (Table 2.1), following Richards *et al*(2003)[38], is reproduced below:

*"Forest benefits or values are usually classified by economists as use values or non-use values. Use values arise from using the resource in some way, while non-use values do not depend on using the forest. Forest values or benefits are normally classified as follows.*

1. *Benefits received directly by forest users and other stakeholder groups are known as direct use values, and can be divided between:*

   - *extractive uses comprising mainly marketed or subsistence forest products*
   - *non-extractive uses like ecotourism, recreation and scientific studies, as well as the cultural or spiritual values to forest users.*

2. *Benefits that accrue indirectly both to forest users and people outside the forest, mainly as a result of environmental or ecological services, are known as indirect use values.*

3. *The value that various stakeholders place on keeping open the option of receiving future direct and indirect use values (as per 1 and 2), for example through undiscovered environmental, pharmaceutical or scientific values of forests, are known as option values. The commercial biodiversity potential of forests is sometimes called the quasi-option value.*

4. *Benefits that do not derive from the use of the forest, known as non-use values. These are comprised of existence and bequest values:*

   - *the value placed on the continued existence of forests, independent of their use values, is known as the existence value. It accrues mainly to people who do not use the forest, but who value the fact that it exists, for example for its biodiversity. Members of international environmental organizations express this existence value through subscription payments and other donations.*

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demonstration projects from different topographic and climatic regions of the country must be highlighted to improve compliance with environmental standards; (ii) Environmental clearance should be valid for the life of a mine, subject to review of environmental compliance at 5 year intervals; (iii) Procedure for obtaining forestry and environmental clearances must be simplified and streamlined subject to a maximum stipulated period of 120 days for decision-making; (iv) As the country is required to achieve 110 million hectares (i.e., 1/3rd of the country's total geographic area) of forest cover inclusive of 40 million existing good forest cover, it is necessary to demarcate about 35 million hectares of forest land with sparse or no green cover and another 35 million hectares of barren and waste lands and ravines etc. for priority afforestation, irrespective their locations across states, to relieve the mining companies of undue pressure to find out land for compensatory afforestation purpose.

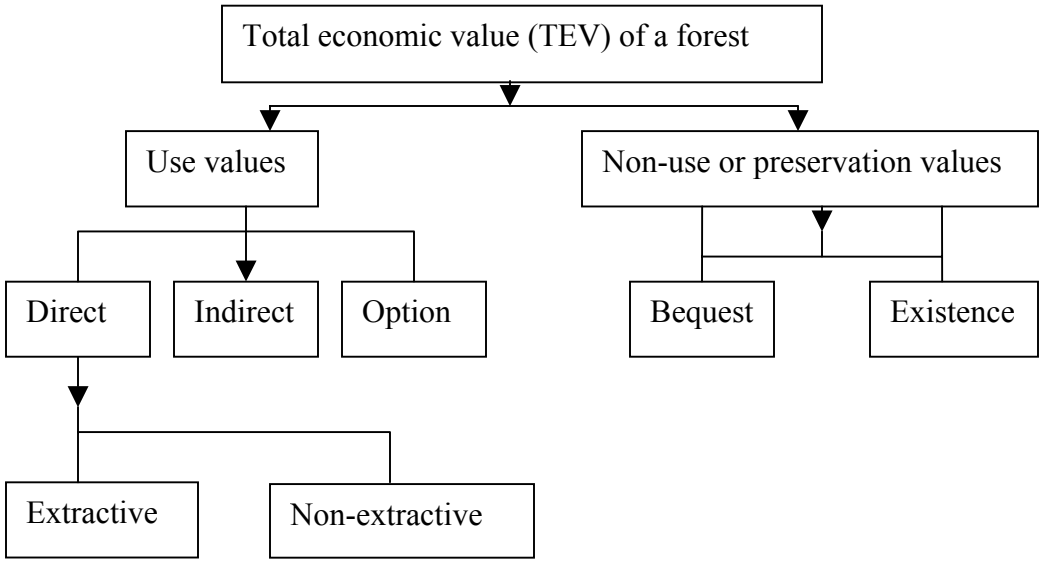
[37] David Pearce & Corin Pearce (February, 2001) have elaborated on these difficulties and resulting divergence in calculations of forest benefits in an important document entitled 'The Value of Forest Eco-systems – A Report to the Secretariat, Conservation of Bio-Diversity'. Appendix 2.3 provides a snap-shot view of the various valuation methods, which are combined to value forest benefits, together with the observed strengths and weaknesses of each methodology.

[38] Richards, Michael; Davies, Jonathan: and Yaron, Gil (2003): *Stakeholder Incentives in Participatory Forest Management – A Manual for Economic Analysis,* ITDG Publishing, p. 22.

- *A special case of option value is bequest value: it represents the value (to current users) of being able to pass on the forest in its present condition as an inheritance to future generations."*

2.16 However, as pointed out at the beginning of this chapter, NPV for forest use is not merely the total economic value on the positive side, but also the cost of forest management. Although it is not absolutely clear whether and how the NPV figures for forestland as furnished before the Learned Apex Court adjusted the costs of forest management, it is extremely important not to lose sight of this matter, and thus allow the issue of efficiency or inefficiency in forest management under the carpet. We would like to draw attention of the reader to the following important points:

**Figure 2.1**




- When total economic value of forests is considered, one can't choose only selected items on the cost side. In other words, the total cost of forest management, inclusive of explicit and implicit subsidies and grants from domestic as well as international sources must be considered. Thus, a non-forest user ought to be asked to pay only the net value created by the forester on forest use. If total economic value is 100 and the total cost is 40, then the net value added is 60. But if total cost rises to 60 due to inefficiency of forestry operations, the net value added to be paid as compensation becomes 40, not 60 any more. Asking for a compensation payment of 100 or 60 in this situation would mean subsidizing the inefficiency of forestry operations at the cost of (i.e., through taxes on) the non-forest user. Hence, in an era of global competition, the issue of efficiency/inefficiency in forestry operations can't be de-linked from the issue of calculation of compensatory payments using the NPV regime[39].

[39] It appears that the Forest Departments in almost all the states in India have recorded a steady generation of surplus over time till the late 1980s. However, this trend was reversed dramatically for most of the states barring a few like Madhya Pradesh and Andhra Pradesh. Such a reversal may be attributed to either a decline in the revenue generation capacity of Indian forests — due to loss in productivity, or a sudden

**Table 2.1: Distribution of total economic value among stakeholders**

| | Total economic value (TEV) | | | |
|---|---|---|---|---|
| ***Stakeholders*** | ***Extractive direct use values*** | ***Non-extractive direct use values*** | ***Indirect use values*** | ***Preservation values*** |
| Local forest users | Forest and agricultural products (sale, subsistence and inputs into the farming system, e.g. fodder, litter, etc.) | Cultural and spiritual values | Microclimate, hydrological, soil conservation and nutrient cycling | Preserving use values for descendants |
| Commercial interests | Timber, commercial NTEPs. Genetic material for pharmaceutical development | Tourism | Downstream irrigation/water benefits to commercial farmers, water and electricity companies, and other businesses | Undiscovered commercial potential of biodiversity |
| National and Forestry Department interests | Forest revenue and foreign exchange | Recreation, tourism, education, science | A range of watershed protection services | Future biodiversity values |
| Global society interests | Globally traded products | Science (especially medical), education | Global environmental services, e.g. carbon sinks | Existence values, future medicinal discoveries |

Source Adapted from Lampietti and Dixon, 1995 by Richards *et al*(2003), p.23

- Since most converted mined lands were natural rather than plantation forests, a question that naturally arises is how to demand cost of raising natural forests in the proposed NPV regime, when natural forests are not planted at all, nor any human intervention is permitted on such forests. Thus, if natural forests are not equivalent to planted forests even after the latter's full maturity, as argued before

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increase in costs of managing the forest resources of the country. The Judgment by the Honorable Supreme Court also agrees, " forests have become a net liability for the states rather than a source of revenue and maintenance of forest has become a problem due to financial constraints……". The 12th Finance Commission concurred with such submissions by the states rich in forests and granted Rs. 1000 crores spread over the award period 2005-2010 for maintenance and upkeep of forests. However, the reason put forward by the Forest Departments behind the forests turning into net liabilities — restrictions placed by the Supreme Court on exploitation of forest wealth — may not portray the whole truth and requires thorough investigations. The deficit may well be the result of an increased inefficiency of the Forest Departments both to generate potential revenue and reduce costs of forest management. An NPV regime should not be negligent of the possible sources of inefficiencies that might have crept into the forest departments of the states. Field level observation often reveals shoddy maintenance of plantation journals, considerable lack of biometric records of growth in the standing crops and NTFPs, low survival rate of plantations raised departmentally etc. The efficiency parameter of the forest department attracts further scrutiny in view of the fact that CAMPA funds are destined to be managed solely by the officials of the Forest Departments. The cost of running the Forest Departments should thus ideally be deducted from the calculated NPV proposed to be levied.

the Learned Apex Court, once the higher non-timber values of natural forests are admitted in NPV calculations, timber values need to be logically left out[40].

- Almost all biological processes are subject to a process of growth, peak and decay; forests as well as the multifarious benefits arising out of forests are therefore no exception. As all benefits from a natural process of forest growth are therefore subject to a bell-shaped distribution over the age of a forest (which are generally approximated by a normal or near-normal distribution), it is important to know the age at which a forestland is being diverted to mining, besides knowing the distribution of benefits. For example, in the context of a study by Nugent *et al* (2003) for CII, carbon sequestration capacity of a forest is found to follow the above-stated pattern[41]. This fact has two implications for NPV calculation in the present context. First, if a forestland is diverted to mining towards the end rather than at the beginning of its age distribution, lesser benefits of that forest ought to be counted as lost in NPV calculations. Second, given that all forestry benefits are subject to bell-shaped distributions, calculations based on an implicit presumption of an uniform distribution at the peak level of the true curve would lead to a clear over-estimation of the forestry benefits, which require correction in the present context[42].

**Section V: NPV Calculation on Mining**

2.17 As pointed out at the beginning of this chapter, NPV calculation for purpose of determining compensatory payment for diversion of forestland to mining must work out the difference in NPV calculations from both uses, i.e., $NPV_{comp} = NPV_F - NPV_M$, where $NPV_F$ and $NPV_M$ stand for NPVs from forest use and mining use of the forestland, respectively[43]. This section is concerned with calculation of $NPV_M$ following economic logic. Most probably, because of the common perception that mining has various damaging environmental effects, which the allegedly 'greedy' miner releases in an unconstrained fashion to the society at large for gratuitous absorption, no explicit measure of $NPV_M$ is attempted. In fact, this popular misconception seems to have created a biased mindset against mining so much so that hardly any claim is made for calculation of $NPV_M$ based on economic logic. True, use of forestland for mining purposes creates a number of environmental (negative) externalities during mining operations, but given modern technology as well as the regulatory regime governing mining activities, it is possible to minimize these negative environmental effects, as good miners have been

[40] If most natural forests have been converted into plantation forests due to poor management of the Forest Department (FD), thus raising the scarcity value of forestry benefits for all, one can legitimately ask the FD to pay for the NPV (i.e., the difference in net present value of natural and plantation forests).

[41] Nugent, J.B; Datta, Samar K; Chakrabarti, Milindo; Bhattacharyya, Debasis; Bhattacharyya, Ajoy; and Ali, Nursadh (2003): *Public-Private Partnership in Re-greening of Degraded Revenue / Private / Forest Land – A Cost-Benefit Analysis,* CII, N. Delhi, p.54.

[42] Year Book Australia 1997 (ABS catalogue # 1301.0) has considered this age distribution while assessing the benefits of native forests using the ABS approach.

[43] We assume that this difference in NPV figures, which determines the compensatory payment from the miner is positive. It must be pointed out in this context that unless one makes the assumption that $NPV_M$ has nothing to do with NPV from production of underground minerals, and the comparison is actually between use value of surface of a plot of land under forest use and mining use, this difference $NPV_T$ may easily turn out to be negative, belying the very purpose of this exercise.

doing, whereas reclamation and rehabilitation of mined land, which a miner is required to undertake as per the laws of the land, can generate a number of positive externality effects even during the stage of mining[44]. The two case studies based on the study team's field trip to two sets of mines in Western India (incorporated as Appendices 2.7 & 2.8) have attempted to bring out the unsung positive externality effects of mining. The following points demand special attention in the present context:

- Just like a forester incorporates value of all forestry benefits, so should the miner be allowed to incorporate total economic value of regenerated forests. Thus $NPV_m = NPV_{mm} + NPV_{mf}$ where $NPV_{mm}$ and $NPV_{mf}$ are NPV from mining and forest regeneration from the surface areas of mine land respectively.
- As per the definition of NPV, $NPV_M$ represents benefits minus costs in course of mining. So the costs incurred by the miner to minimize environmental damage in course of mining and to achieve reclamation and rehabilitation of the land surface as per the laws of the land, which may be looked upon as contractual obligations on the part of the miner, must be deducted from the total economic value of the forest land diverted to mining provides to the society at large (just like the tangible and intangible benefits of forests)[45].
- Mining doesn't involve transfer of forestland to non-forest use on perpetuity, as in the case of housing and other investment projects, though payments for compensatory afforestation (CA) are collected from the miner even before the mining starts on 100% basis. So, if payments through CA are already effected at the very beginning, it is necessary to re-adjust the value of CA against NPV calculations except for a small fraction of land (say, $\lambda$), which is lost due to mining for ever. Hence, only a fraction of CA, rather than 100% CA charges, ought to be charged to the miner. In other words, if CA charges are already collected in full, the miner should get credit for $(1- \lambda)$ fraction of forest land as and when it goes back to the forester in the form of regenerated forest.
- If a miner is granted permission to cut forests in successive installments, and the miner too starts afforestation of mined out land in phases in course of the mining operations, he too must be logically given due credit for all tangible and intangible benefits out of forests regenerated by him in phases in an NPV regime.
- If the miner pays for compensatory afforestation including cost of timber due to forest loss, he should logically be entitled to the value of cut out woods etc at the stage of mining. If it is not happening, the cost of timber collected by the Forest

[44] Appendix 2.4 reports afforestation in metalliferrous mines from 1989-90 to 2003-04 by important minerals. The Annual Report, 2004-05 of the Ministry of Mines, Govt. of India also notes on p.43, paragraph 5.35: *"After the enforcement of MCDR, 1988 extensive afforestation has been undertaken in the mines. During the year, about 3.2 million trees have been planted in and around mine areas covering about 1460 hects. Thus, so far 64.44 million trees have been planted over an area of about 29,000 hects. with a survival rate of 70 per cent."*

[45] If, in our over-enthusiasm to charge TEV of forestland to the miner, we ignore the TEV of regenerated forests out of mined land, the miner wouldn't have incentive to produce the best forests in difficult mining areas – the kind of forests we shall see in Appendices 2.7 & 2.8. Then the miner would have every incentive to shirk in its responsibilities, probably in connivance with the enforcers of law. The extent of afforestation undertaken by the mining industry is displayed in a table in Appendix 2.5.

Department during mining operations must be treated as a part of the compensatory payment to the government under the proposed NPV regime.

- If a miner gets x quantity of forestland of quality y on lease, he should be asked to pay for compensatory afforestation against the same package of (x, y) only. In the absence of correct assessment of the quality parameters of the forestland lost to mining, the miner is often asked to pay for higher quality of forests, say, z, where $z > y$[46].

**Section VI: Distributional, Strategic & Other Considerations**

2.18 The NPV regime, being at best a partial and isolated approach, cannot take care of distributional, strategic and other considerations, which influence daily decision making in an economy. At this stage, we would like to highlight only some of these points[47]:

- Mines are often located in interior and far-off places inhabited by backward and poor communities suffering from all kinds of odds in terms of socio-economic benefits. They suffer from poor infrastructure and poor employment and income opportunities. A miner is often required to undertake strong socio-economic development programs in the nearby villages to win over their support and cooperation. Although not enough comparative data is available on the socio-economic amenities of villagers living inside or in the vicinity of mining areas, enough anecdotal evidence is available on the socio-economic uplift of the people living within and around the mining areas vis-vis others. As the two present case studies show, mining may be a complementary instrument to promote good forestry, recreation parks and eco-tourism in this country, so much so that the miner and the forester along with their associated Departments and bodies must work hand in hand for realizing gains from value-added activities, rather than taking a static view of things and getting involved in a zero-sum game.
- There are immense potential for starting of value-added activities in mined areas (e.g., using the space for integrated natural resource management, eco-tourism, sports, public meetings, trainings, storage etc.), which some of the progressive miners have already started demonstrating (see Appendices 2.7 & 2.8).
- Mining is a strategic industry on which important activities including defense are highly dependent, and its survival can't therefore be ignored irrespective of NPV calculations.[48]
- Compared to the forestry sector, Indian mineral sector has much higher forward linkage effect, as shown in Appendix 2.6, which one shouldn't lose sight of in our over-enthusiasm to reward the budget-tight forester for his so far unappreciated multifarious services to the society out of the pockets of only the non-forest users of forestland like the miner.

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[46] As the issues related to the various risks and transaction costs the miners are already exposed to have been discussed earlier, we are not repeating the same at this stage.

[47] Examples are provided in the two case studies appended to this report.

[48] The Learned Supreme Court in its judgment dated December 12, 1996 has argued as follows: *...that the Railway Authorities are still using wooden sleepers for laying tracks. The Ministry of Railways will file an affidavit giving full particulars in this regard including the extent of wood consumed by them, the source of supply of wood, and the steps taken by them to the alternatives to the use of wood."*(*ibid,* p.6). In the absence of the mining industry (or imports), it would be extremely difficult to take care of such strategic needs.

# Chapter III

# A Summary of the Points Made

3.1 Given the Hon'ble Apex Court's wisdom to apply an NPV regime based on economic logic to determine the compensatory arrangements for diversion of forest land to mining, the study team based on its review of the relevant documents and literature, on the one hand, and several rounds of discussion with the mining industry as well as friends and colleagues from the forestry fraternity, on the other, identified the following concerns/issues underlying the problem with a view to resolving and accommodating them on a solid economic foundation:

- What are the strengths and weaknesses of the NPV approach in the present context, and which types of institutional safeguards are needed to overcome the limitations of this approach?
- Whether inclusion of all indirect and intangible benefits of forests only in NPV calculation will be consistent with economic logic?
- Under what conditions will application of the NPV regime be the correct approach as per economic logic?
- Should the formulae for NPV calculation concentrate merely on the loss of forest benefits due to mining? If so, how? And if not, what else need to be considered?
- Should NPV calculation also take into consideration the NPV from the alternative use of forest land during the mining operations? If yes, how? Should there be any adjustment in the final NPV calculation for the contributions of the mining sector towards forest and ecology regeneration?
- Should the funds contributed towards Compensatory Afforestation (CA) by the miner be suitably adjusted towards NPV calculation considering the facts that (a) forest land is not diverted to mining in perpetuity, except for a small fraction of the leased-in land; (b) the transferred forest land is broken progressively over time as per an approved plan and not all a time at the beginning of mining activities; (c) the miner faces (i) risks of bureaucratic delays in getting sanctions & approvals, and (ii) risk of being denied continuation of lease, leading to high order of asset-specificity risk in fixed investments, besides the usual input and output risks of an entrepreneur – namely, that he may be charged higher rates for the inputs, including mining lease, or that the international price of his mineral may go down?
- Should any other consideration like output, income and employment creation by the miner in interior villages, infrastructure and social development activities undertaken by the miner in remote mining areas, strong forward linkages of mining, which enter into strategic considerations like defense of a country, strong potential for starting of value-added activities on mined areas, which some of the progressive miners have started demonstrating, enter into NPV calculation in the present context?

3.2 In order to find suitable answers to the above-stated questions, the study team during its deliberations over nearly the past three months concentrated on the following:

- Carefully going through the documents pertaining to the regulatory regime for temporary diversion of forestland from forestry towards mining;
- Critically examining a representative cross-section of the fast-growing literature on valuing forest benefits (so as to avoid possible errors due to complacency in the use of underlying methodologies);
- Interaction with a fairly good number of foresters, many of whom are directly or indirectly associated with the task of conceptualization and estimation of NPV for forests; and
- Interaction with FIMI officials as well as a representative cross-section of miners, followed by quick on the spot field visits to two regions (namely, Rajasthan and Goa) to capture their views and concerns to facilitate evolution of a conceptual framework towards calculation of NPV from alternative uses of forestland – like, mining – whether one looks at the total activities of the miner (i.e., extraction of minerals as well as use of the land surface area), or merely on the use of the land surface area for forest regeneration, infrastructure and community development.

3.3 On the strengths and weaknesses of the NPV methodology for the purpose in hand, the study found the following:

- Although NPV is a good ordinal measure for decision-making over alternative investment options by a single user, it has questionable value as a cardinal measure of gains or losses (and hence of compensation) from one use over another in a multi-user context.
- It is difficult to rationalize the NPV regime for the purpose in hand using a supply-demand framework, which requires a demand curve (i.e., willingness to pay) as well as a supply curve (i.e., willingness to accept payments against supply) to determine the equilibrium price.
- NPV may not be the right methodology except in marginal cases of slight alteration in investment portfolio in favor of one use or the other, where choice of one alternative against others does not affect the economy wide prices and thus influence the choice process itself, because of the approach's implicit assumption of a static partial equilibrium framework.
- Attempting total economic valuation (TEV) - i.e., inclusion of all indirect and intangible benefits calculation – which amounts to adopting a natural resource accounting system for forestry sector alone, may be inconsistent and rather premature at this stage with the prevailing economic logic of national income accounting, on the one hand, and India's commitment, on the other hand, under WTO to follow global competitiveness criterion for our products against rival country products both at home and abroad (known as import-competitiveness and export-competitiveness, respectively) without going for excessive taxes or subsidies.
- The NPV approach is merely concerned with economic efficiency, not distributional equity, because financial transfers between individuals and groups as a result of any management activity, as they don't constitute any usage of economic resources, are totally ignored. Realization of NPV in the absence of a

global mechanism on compensatory principles may adversely affect India's interest internationally.

- Even if the partial equilibrium approach underlying the NPV methodology is accepted together with the presence of an independent and neutral body to authentically evaluate the NPVs from alternative uses of forestland, it is doubtful whether and to what extent the three important Coase conditions are fulfilled to ensure efficiency of the solution – namely, (i) presence of initial and unambiguous property rights system in favor of the two main negotiating parties (namely, the forester and the miner) on the multifarious costs and benefits arising out of their activities; (ii) institutional checks and balances to ensure that no wealth effect due to unequal powers of the contracting parties can influence the negotiation process; and (iii) establishment of institutional systems to ensure that transaction costs (i.e., costs of negotiation, writing and enforcement of contractual terms and conditions) are set at the minimum level so as not to jeopardize the negotiation process and reverse the profitability and sustainability of activities.

3.4 On the issue of objectively calculating NPV on forest use, the following findings deserve mention:

- While applying the concept of total economic value of forest, a number of international experts have pointed out the difficulties in making the concept operational in an objective manner and warned against possible divergent calculations of forest benefits. So, it may be quite premature to apply this methodology at this juncture in a standalone manner in the context of Indian forests.
- NPV for forest use is not merely the total economic value on the positive side, but also the cost of forest management. Although it is not absolutely clear whether and how the NPV figures for forestland as furnished before the Learned Apex Court adjusted the costs of forest management, it is extremely important not to lose sight of this matter, and thus allow the issue of efficiency or inefficiency in forest management under the carpet. In an era of global competition, the issue of efficiency/inefficiency in forestry operations can't be de-linked from the issue of calculation of compensatory payments using the NPV regime.
- Since most converted mined lands were natural rather than plantation forests, a question that naturally arises is how to demand cost of raising natural forests in the proposed NPV regime, when natural forests are not planted at all, nor any human intervention is permitted on such forests.
- As all benefits from a natural process of forest growth are therefore subject to a bell-shaped distribution over the age of a forest (which are generally approximated by a normal or near-normal distribution), it is important to know the age at which a forestland is being diverted to mining, because if a forestland is diverted to mining towards the end rather than at the beginning of its age distribution, lesser benefits of that forest ought to be counted as lost in NPV calculations. Moreover, given that all forestry benefits are subject to bell-shaped distributions, calculations based on an implicit presumption of a uniform

distribution at the peak level of the true curve would lead to a clear over-estimation of the forestry benefits.

3.5 NPV calculation for purpose of determining compensatory payment for diversion of forestland to mining must work out the difference in NPV calculations from both uses, i.e., $NPV_{comp} = NPV_F - NPV_M$, where $NPV_F$ and $NPV_M$ stand for NPVs from forest use and mining use of the surface of a forestland, respectively. If $NPV_M$ arising from surface land use as well as extraction of minerals exceeds $NPV_F$, $NPV_{comp}$ would most likely be negative, resulting in a total break-down of the NPV regime for the purpose in hand. The following points are made in the present context:

- Just like a forester incorporates value of all forestry benefits, so should the miner be allowed to incorporate total economic value of regenerated forests and infrastructure system.
- As per the definition of NPV, $NPV_M$ is benefits minus costs in use of forest land in course of mining. Thus, the costs incurred by the miner to minimize environmental damage in course of mining and to achieve reclamation and rehabilitation of the land surface as per the laws of the land which may be looked upon as contractual obligations on the part of the miner must be deducted from the TEV of mining land.
- Mining doesn't involve transfer of forestland to non-forest use on perpetuity, as in the case of housing and other investment projects, though payments for compensatory afforestation (CA) are collected from the miner even before the mining starts on 100% basis. So, if payments through CA are already effected at the very beginning, it is necessary to re-adjust the value of CA against NPV calculations except for a small fraction of land (say, $\lambda$), which is lost due to mining for ever.
- If a miner is granted permission to cut forests in successive installments, and the miner too starts afforestation of mined out land in phases in course of the mining operations, he too must be logically given due credit for all tangible and intangible benefits out of forests regenerated by him in phases in an NPV regime.
- If the miner pays for compensatory afforestation including cost of timber due to forest loss, he should logically be entitled to the value of cut out woods etc at the stage of mining.
- If a miner gets x quantity of forestland of quality y on lease, he should be asked to pay for compensatory afforestation against the same package of (x, y) only. In the absence of correct assessment of the quality parameters of the forestland lost to mining, the miner is often asked to pay for higher quality of forests, say, z, where $z > y$.

3.6 The NPV regime, being at best a partial and isolated approach, must separately take care of distributional, strategic and other considerations of the following types, which influence daily decision making in an economy:

- Although not enough comparative data is available on the socio-economic amenities of villagers living inside or in the vicinity of remote mining areas, enough anecdotal evidence is available on the socio-economic uplift of the people living within and around the mining areas vis-a-vis others. As the two present

case studies show, mining may be a complementary instrument to promote good forestry, recreation parks and eco-tourism in this country, so much so that the miner and the forester along with their associated Departments and bodies must work hand in hand for realizing gains from value-added activities, rather than taking a static view of things and getting involved in a zero-sum game.

- There are immense potential for starting of value-added activities in mined areas (e.g., using the space for integrated natural resource management, eco-tourism, sports, public meetings, trainings, storage etc.), which some of the progressive miners have already started demonstrating.
- Mining is a strategic industry on which important activities including defense are highly dependent, and its survival can't therefore be ignored irrespective of NPV calculations.
- Compared to the forestry sector, Indian mineral sector has much higher forward linkage effect, which one shouldn't lose sight of in our over-enthusiasm to reward the budget-tight forester for his so far unappreciated multifarious services to the society out of the pockets of only one non-forest users of forestland, the miner.

3.7 To conclude, it may be noted that

- The concerns for introducing innovative measures to raise resources for conservation of forests, given the steeply rising costs, cannot be overemphasized.
- However, the arguments for realizing NPV from selected non-forest users of forest land like the miners seem too hasty and too discriminatory in view of existing methodological deficiencies, absence of global institutional mechanisms to facilitate the intended compensatory framework and even lack of a domestic institutional support system.
- It is difficult to arrive at a reasonable estimate of NPV without adequately informed and empowered participation of the local stakeholders

3.8 Rather immediate attentions are needed to

- Take up measures to ensure efficient utilization of funds raised for compensatory afforestation;
- Ensure that no transparent and legally valid activity is exempted from the obligation to pay for compensatory afforestation as per economic logic, to avoid possible misuse of scarce resources by inefficient players[49];
- Design a scheme for taxing the final users of forest services — not the intermediate users in a selective and discriminatory fashion, subject to ensuring efficient utilization of the tax proceeds;
- Ensure a distinction in treatment between temporary and permanent users of forest land for non-forest purposes;
- Ensure adequate safeguard against possible damage to competitiveness of minerals and mineral-based industries and activities;

[49] If value of intangible forest services can be measured by experts, it is difficult to imagine that the sevices of various development projects like roads, schools and hospitals cannot be estimated. In the presence of mindless and large scale NPV exemptions on the one hand, and inefficient use of scarce CAMPA fund on the other, it is feared that the scarcity value of forest services will increase over time, thus progressively shifting the burden of NPV exemption on the non-exempt users.

- Provide adequate incentives for conversion of non-forest lands into forests; and
- Facilitate coordinated action by foresters, miners and the local communities to realize both developmental and environmental services from mined land.

## Estimates of forest eco-system values

| Ecosystem good or service | Market nature of service | Global values of forest type ($/acre) | | |
|---|---|---|---|---|
| | | All forests | Tropical | Temperate/Boreal |
| Climate regulation | NM | 57.1 | 90.2 | 35.6 |
| Disturbance regulation | NM | 0.8 | 2.0 | n.a. |
| Water regulation | NM | 0.8 | 2.4 | 0.0 |
| Water supply | M, NM | 1.2 | 3.2 | n.a. |
| Erosion control and sediment retention | NM | 38.8 | 99.1 | 0.0 |
| Soil formation | NM | 4.0 | 4.0 | 4.0 |
| Nutrient Cycling | NM | 146.1 | 373.1 | n.a. |
| Waste treatment | NM | 35.2 | 35.2 | 35.2 |
| Biological control | NM | 0.8 | n.a. | 1.6 |
| Food production | M | 17.4 | 12.9 | 20.2 |
| Raw materials | M | 55.8 | 127.5 | 10.1 |
| Genetic resources | M, NM | 6.5 | 16.6 | n.a. |
| Recreation | M, NM | 26.7 | 45.3 | 14.6 |
| Cultural | NM | 0.8 | 0.8 | 0.8 |
| Total | | 392.1 | 812.2 | 122.2 |

*NM: Good or service primary non-market in nature; M: Primarily market good or service; M, NM: Good or service that has significant market and non-market characteristics (Costanza, et. Al. (1997), quoted in Krieger (2001)*

## Summary of Forest Economic Values ($/ha/yr)

| Forest good or service | Tropical forests |
|---|---|
| Timber | |
| Conventional logging | 200-4400 (NPV) |
| Sustainable logging | 300-2660 (NPV) |
| Conventional logging | 20- 440 [1)] |
| Sustainable logging | 30- 266 [1)] |
| Fuelwood | 40 |
| NTFPs | 0- 100 |
| Genetic information [2)] | 0-3000 |
| Recreation | 2- 470 (general) |
| | 750 (forests near towns) |
| | 1000 (unique forests) |
| Watershed benefits | 15- 850 |
| Climate benefits | 360- 2200 (GPV) [3)] |
| (carbon sequestration and storage) | |
| Biodiversity, intrinsic value | ? |
| Amenity | - |
| Non-use values | |
| Option values | n.a. |
| Existence values | 2- 12 |
| | 4400 (unique areas) |

Source: Pearce & Pearce, 2001.

*Notes*: 1) Annuitised net present value (NPV) at 10% for illustration; 2) Bioprospecting values are hotly debated, see for example Simpson & Sedjo (1996); 3) Assumes that compensation for carbon is a one off payment in the initial period and hence is treated as a present value. It is a gross present value (GPV) since no costs are deducted.

# *PART II: APPENDICES TO THE MAIN REPORT*

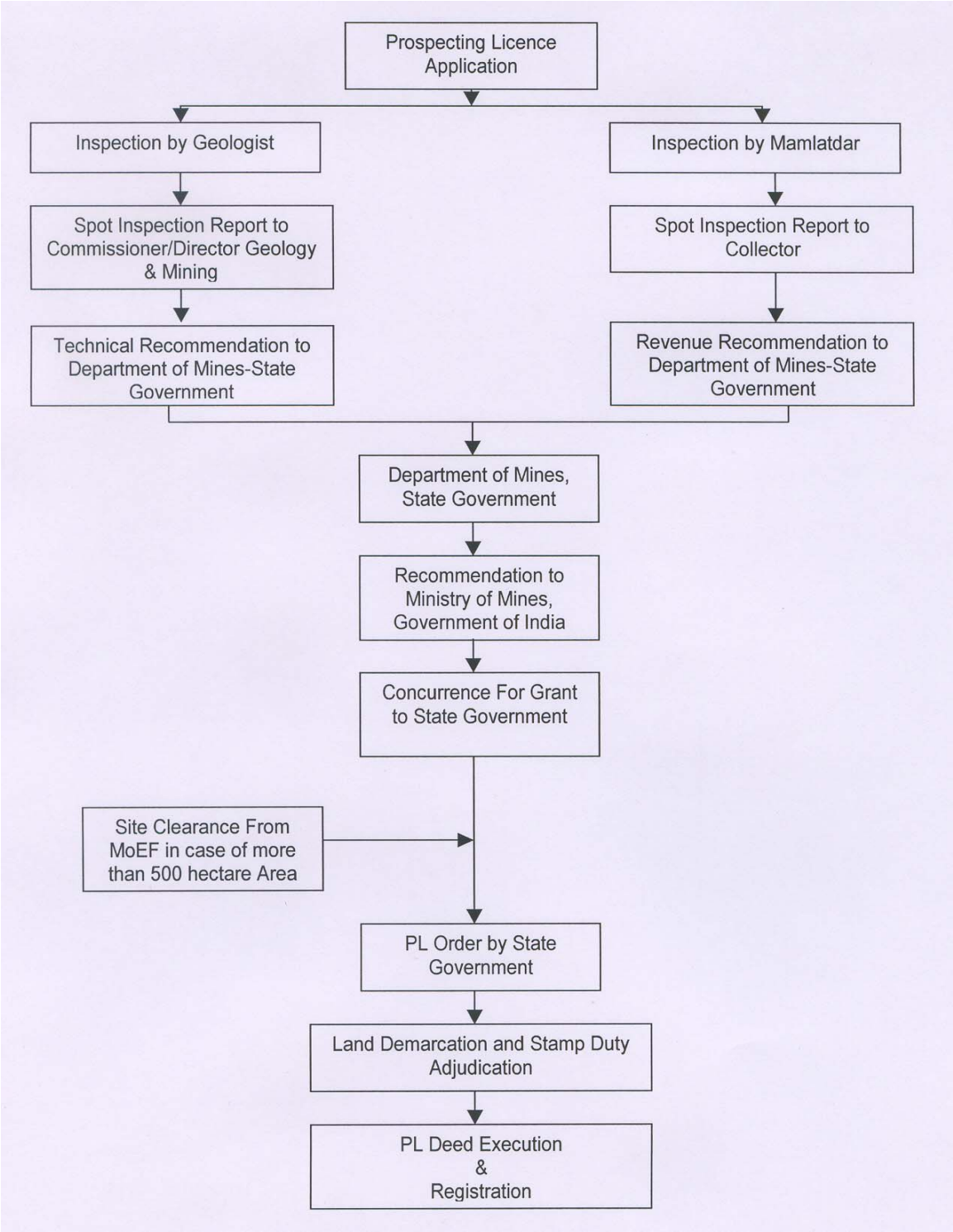
**Appendix 2.1 : Performance of Compensatory Afforestation (CA) across States as of 9th August, 2002**

| Name of State/U.T.s | Q.P.R. Received | % of total CA stipulated out of forest area approved | % CA done on stipulated area | % funds actually realized out of total to be realized | % of realized money spent |
|---|---|---|---|---|---|
| Andhra Pradesh | Jun – 01 | 104.13 | 62.56 | 100.00 | 48.87 |
| Arunachal Pradesh | Mar – 02 | 154.32 | 39.60 | 81.05 | 19.15 |
| Assam | Dec – 01 | 141.44 | 58.89 | 100.00 | 24.02 |
| Bihar | Mar – 00 | 63.87 | 1.88 | 21.71 | 7.89 |
| Chattisgarh | Jun – 02 | 208.95 | 97.47 | N.A. | 61.36 |
| Goa | Jun – 01 | 244.71 | 84.54 | 97.28 | 68.06 |
| Gujarat | Dec – 01 | 148.37 | 53.36 | 96.46 | 73.55 |
| Haryana | Jun – 02 | 99.18 | 89.10 | 88.71 | 30.16 |
| Himachal Pradesh | Dec – 01 | 229.70 | 51.46 | 98.32 | 55.78 |
| Jammu & Kashmir | Dec – 96 | 110.81 | 20.21 | 9.43 | 0.00 |
| Karnataka | Dec – 01 | 91.22 | 115.74 | 98.17 | 89.38 |
| Kerala | Jun – 01 | 190.39 | 70.98 | 52.28 | 87.00 |
| Madhya Pradesh | Dec – 01 | 111.07 | 50.73 | 96.91 | 55.68 |
| Maharashtra | Mar – 02 | 106.76 | 85.67 | 78.71 | 76.51 |
| Manipur | Mar – 01 | 0.40 | 0.00 | 100.00 | 0.00 |
| Meghalaya | Dec – 01 | 74.72 | 93.02 | 1.56 | 0.00 |
| Mizoram | Dec – 01 | 100.65 | 39.39 | 45.37 | 43.99 |
| Orissa | Sep – 01 | 118.83 | 58.53 | 91.46 | 35.38 |
| Punjab | Mar – 02 | 151.20 | 87.86 | 93.52 | 59.77 |
| Rajasthan | Dec – 01 | 111.19 | 60.05 | 87.96 | 37.61 |
| Sikkim | Dec – 01 | 313.48 | 94.52 | 100.00 | 55.88 |
| Tamilnadu | Dec – 01 | 52.80 | 42.57 | 91.46 | 21.16 |
| Tripura | Sep – 01 | 68.08 | 41.97 | 100.00 | 18.64 |
| Uttar Pradesh | Sep – 01 | 91.71 | 70.48 | 82.17 | 54.14 |
| Uttaranchal | Mar – 02 | 71.07 | 50.02 | 97.61 | 35.86 |
| West Bengal | Jun – 01 | 27.98 | 97.05 | 99.33 | 74.96 |
| A & N Islands | Sep – 01 | 92.71 | 89.56 | 93.33 | 17.85 |
| D & N Haveli | Mar – 00 | 155.95 | 101.52 | 86.44 | 0.00 |
| Total | | 117.14 | 60.64 | 92.39 | 60.80 |

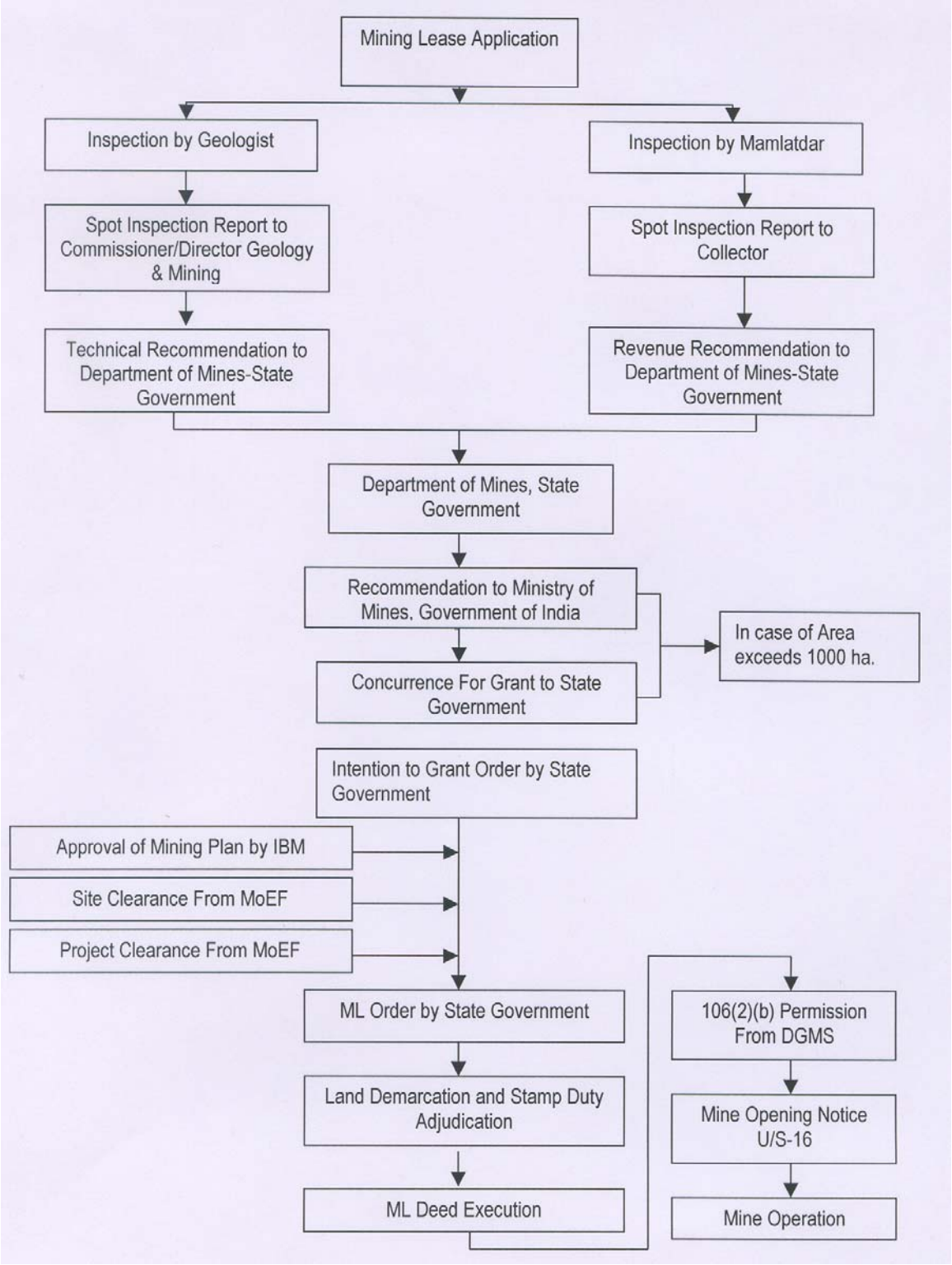
*Note: Figures exceeding 100 (marked in red) in the third column probably deserve some explanation from MOEF.*
*SOURCE: Reproduced & estimated from Annexure A, p.35 of the 'Recommendations of the Central Empowered Committee', I.A. NO. 566 OF 2000 IN WP(C) NO. 202 OF 1995; Affidavit on behalf of Union of India (Ministry of Environment and Forests) submitted to Supreme Court of India – Record of Proceedings*

**Appendix 2.2: Complex Processes for Seeking Approval on Various Items during Mining**

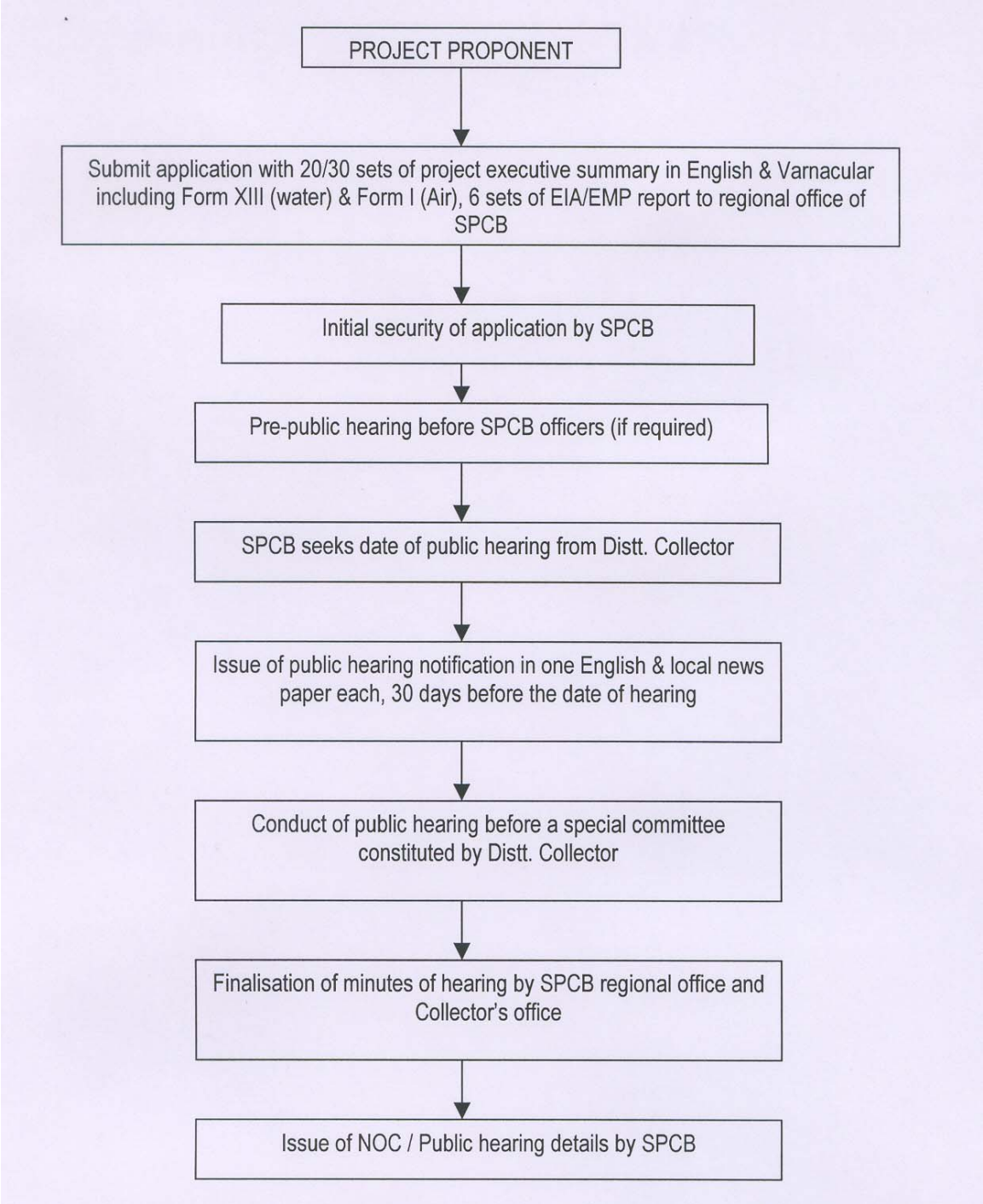
## A. FLOW CHART FOR PROSPECTING LICENCE GRANT



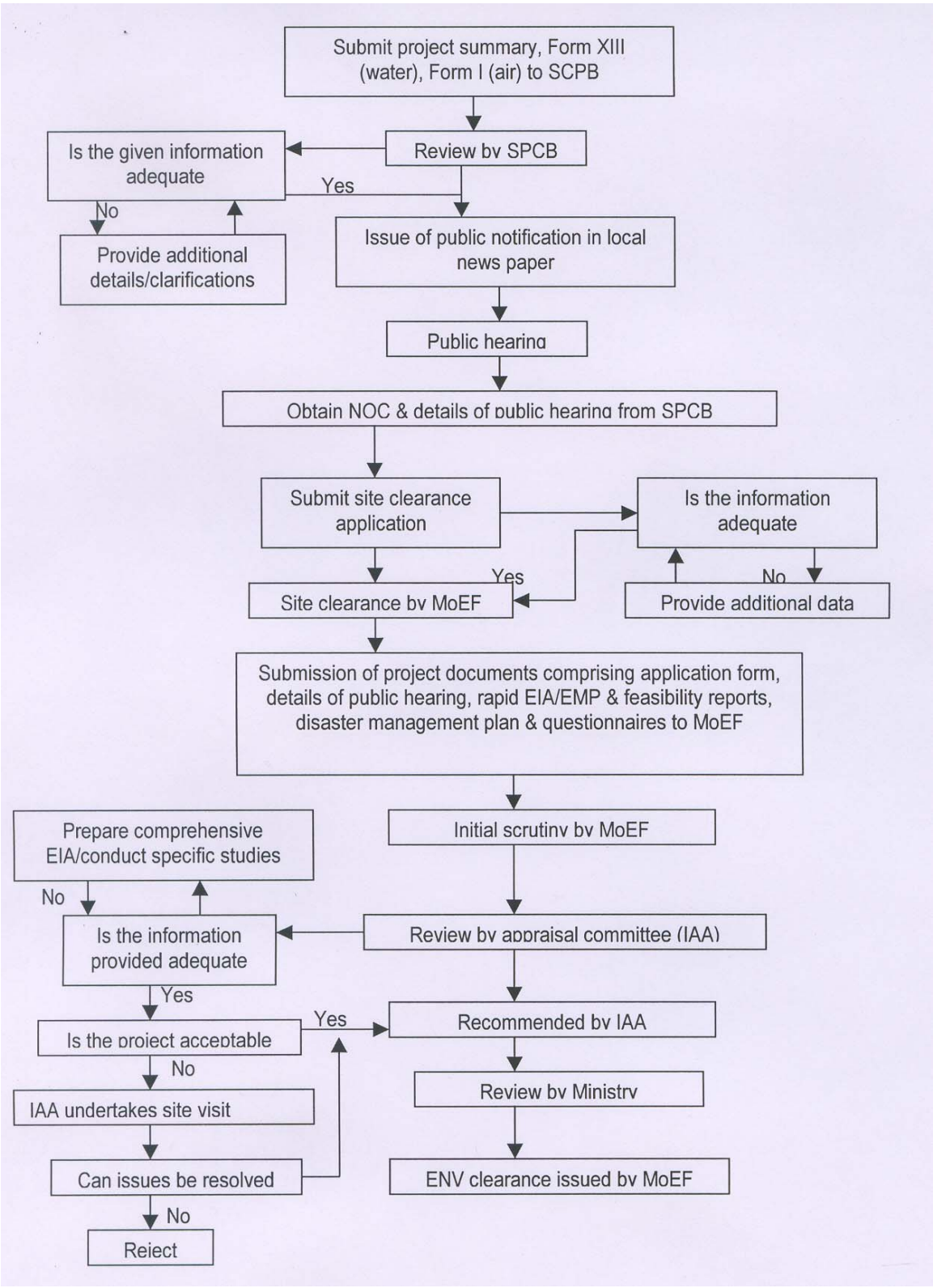
## B. FLOW CHART FOR MINING LEASE GRANT



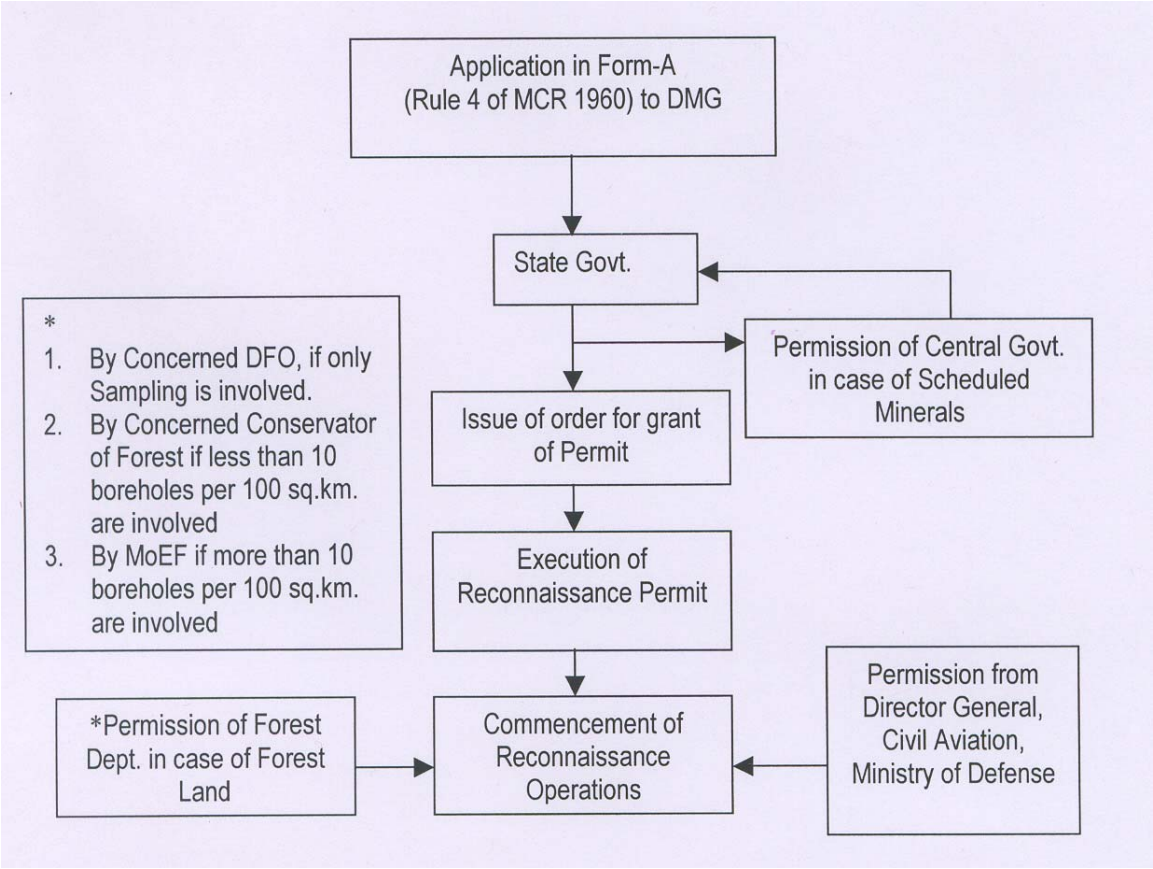
## C. FLOW CHART FOR PUBLIC HEARING / NOC FROM SPCB



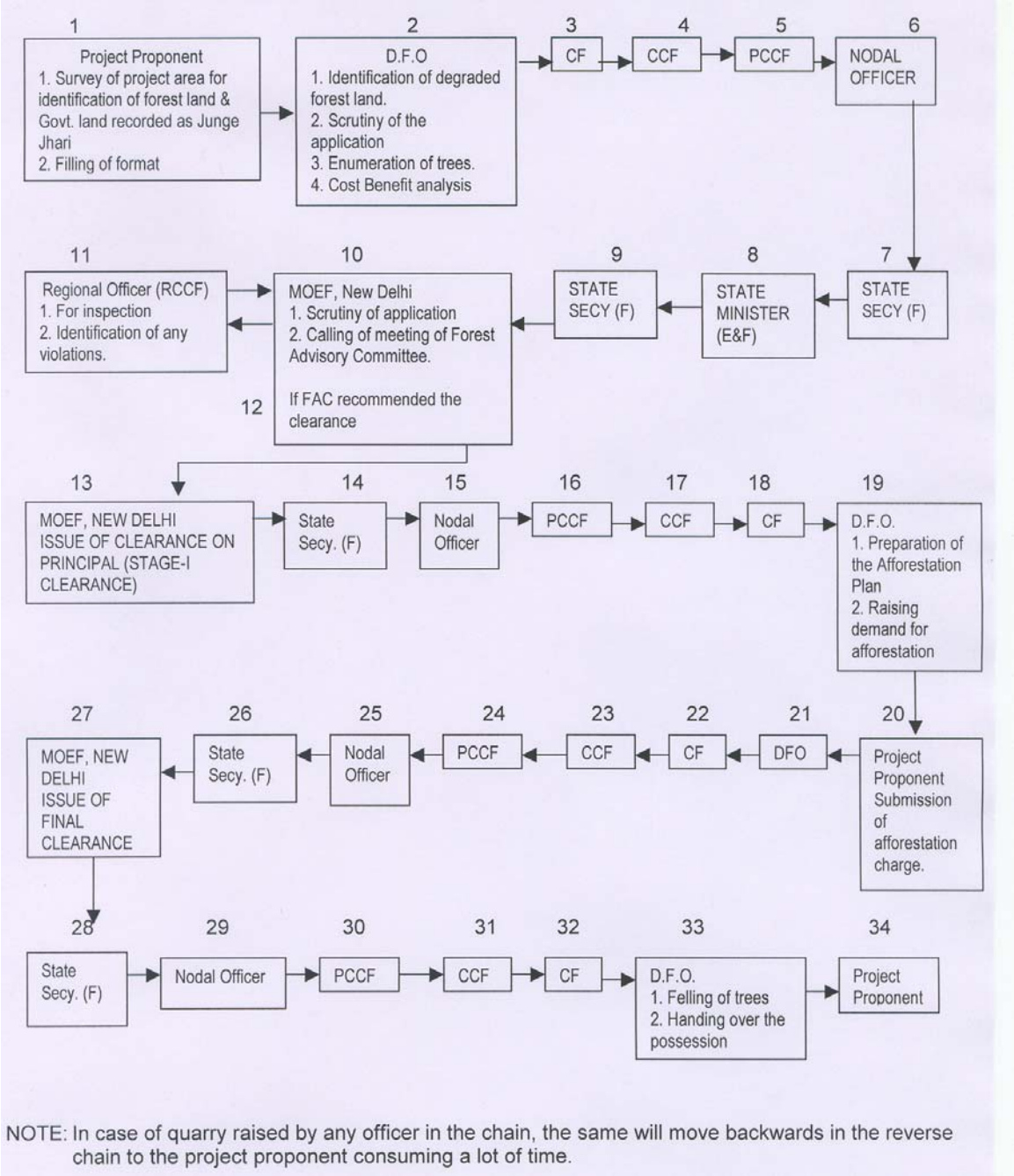
## D. FLOW CHART FOR ENVIRONMENTAL CLEARANCE PROCEDURES



## E. FLOW CHART SHOWING PROCEDURE FOR GRANT OF RECONNAISSANCE PERMIT



## F. PROCEDURE FOR PROCESSING OF PROPOSAL FOR ACQUISITION OF FOREST LAND




Source: FIMI, New Delhi

**Appendix 2.3: A Snap-shot View of Methods used for Valuing Forests, together with their Strengths & Weaknesses**

| Valuation method | Relevant forest benefits | Strengths and weaknesses |
|---|---|---|
| Market prices:<br><br>Use data from surveys of producers and consumers, adjusted if necessary to account for seasonal variation, value-added processing and/or public policy distortions. | Price-based valuation is commonly applied to non-timber forest products which are partly or informally traded, in order to estimate subsistence and/or unrecorded consumption. | Market prices clearly reflect consumer preferences but often need adjustment to account for public policy distortions or market failures. Aggregation or extrapolation of values based on potential production is not valid unless account is taken of likely price effects (elasticity of demand). |
| Surrogate markets:<br><br>Travel cost – use survey data on direct costs (e.g. fares, accommodation) and, in some cases, opportunity costs of time spent traveling to and from a site, evaluated at some fraction of the average wage rate.<br><br>Hedonic pricing – use statistical methods to correlate variation in the price of a marketed good to changes in the level of a related, non-marketed environmental amenity.<br><br>Substitute goods – use market prices of substitutes for non-marketed benefits. | Travel cost is often used to estimate demand for forest recreation at specific locations. Related methods used mainly in developing countries estimate the value of non-marketed, non-timber forest products in terms of the opportunity cost of time spent collecting and/or processing them.<br><br>Hedonic pricing is used to estimate the impact of proximity to forested land and/or logging on the prices of residential and commercial property.<br><br>Substitute goods approaches may be used wherever close market substitutes for non-timber benefits exist. | Provided the relation between the benefit being valued and the surrogate market is correctly specified, and prices in the surrogate market are not very distorted (e.g. by policy intervention), such methods are generally reliable.<br><br>Travel cost estimates may need to account for various objectives (benefits) in a single trip.<br><br>Hedonic pricing requires large data sets, in order to isolate the influence of a non-market benefit on market price, relative to other factors. |
| Production function:<br><br>Change in production method – uses data on the physical relation between level (or quality) of a non-market benefit and level (or quality) of output of a marketed good/service. | Change in production (or ‘”input-output” or ”dose-response”) methods are used to estimate both on-and-offsite impacts of land use change, e.g. the effect of logging on hunting, downstream water users, fisheries, climate. | Change in production methods requires good data on biophysical relationships (dose-response). |
| Stated preference<br><br>Contingent valuation method – use consumer surveys to elicit hypothetical individual willingness to pay for a benefit, or willingness to accept compensation for the loss of that benefit.<br><br>Contingent ranking / focus groups – use participatory techniques in group setting to elicit preferences for non-market benefits, either in relative terms (ranking) or in monetary terms. | Recreational values are often estimated using contingent valuation.<br><br>Stated preference methods such as CVM are the only generally accepted way to estimate non-use values, e.g. landscape or biodiversity values, for which price data do not exist and/or links to marketed goods cannot easily be established. Contingent ranking may be used where target groups are unfamiliar with cash valuation. | Contingent valuation estimates are generally considered reliable if strict procedural rules are followed.<br><br>Participatory techniques are more experimental and not widely used to estimate non-market forest benefits. They are good at eliciting qualities or “contextual” information, but there are doubts about their reliability for estimating willingness to pay. |
| Cost-based approaches:<br><br>Uses data on the costs of measures taken to secure, maintain and/or replace forest goods and services. | Cost-based approaches include replacement/relocation cost, defensive expenditure and opportunity cost analysis; may be used (with caution) to value any type of forest benefit. | Cost-based approaches are usually considered less reliable than other methods. One test of validity is evidence that people are prepared to incur costs to secure relevant benefits. |

*Source: “Valuing Forests”, A Review of Methods and Applications in Developing Countries, International Institute for Environment and Development, Environmental Economics Programme, January 2003, p. 23.*

**Appendix 2.4 : Afforestation in Metalliferrous Mines from 1989-90 to 2003-04 by Important Minerals**

| Mineral | Area Covered in ha | Trees Planted ('000) | Trees Surviving ('000) | Trees planted/ha ('000) | Survival Percentage | Survival ('000 trees /ha) |
|---|---|---|---|---|---|---|
| All Minerals | 29109 | 64446 | 44801 | 2.21 | 70 | 1.5 |
| Iron Ore | 9113 | 27902 | 19081 | 3.06 | 68 | 2.1 |
| Limestone | 9974 | 15467 | 11168 | 1.55 | 72 | 1.1 |
| Bauxite | 1822 | 5880 | 4426 | 3.23 | 75 | 2.4 |
| Manganese Ore | 2206 | 5617 | 3648 | 2.55 | 65 | 1.7 |
| Chromite | 422 | 1908 | 1216 | 4.52 | 64 | 2.9 |
| Copper Ore | 356 | 1334 | 845 | 3.75 | 63 | 2.4 |
| Gold | 434 | 922 | 646 | 2.12 | 70 | 1.5 |
| Lead & Zinc | 1369 | 705 | 630 | 0.51 | 89 | 0.5 |
| Iron & Manganese | 212 | 649 | 482 | 3.06 | 74 | 2.3 |
| Dolomite | 306 | 499 | 334 | 1.63 | 67 | 1.1 |
| Magnesite | 525 | 479 | 324 | 0.91 | 68 | 0.6 |
| Pyrites | 7 | 21 | 15 | 3.00 | 71 | 2.1 |
| Others | 2363 | 3063 | 1986 | 1.30 | 65 | 0.8 |

*Source: Indian Mineral Industry at a Glance, 2003-04, Indian Bureau of Mines, Nagpur*

# Appendix 2.5: Levies and Taxes on Minerals under Various Acts and Rules

**Part I – Various Charges/Levies under Mines and Minerals Development and Regulation (MMDR) Act, 1957**

| | |
|---|---|
| 1.a Permit fee | Applicable to reconnaissance permits @Rs. 5/- to 20/- per sq Km together with a non-refundable application fee @Rs. 5/- per sq Km. |
| 1.b Prospecting fee | Applicable to prospecting licenses @Re 0.50 to Re 5.00 per Ha. Application fee for a prospecting license is payable at Re 50 for first sq Km and @Re 10 for each additional sq Km |
| 1.c Fees in connection with mining lease | Application fee for a mining lease is Re 500. In addition a deposit of Re 1000 is required to be made to meet preliminary expenses in connection with the grant. |
| 1.d Surface rent | Payable at a rate not exceeding the land revenue, as may be specified by the State Government. For example it is Re 45 in West Bengal |
| 1.e Security deposit | Deposit for the observance of terms and conditions payable @Re 20 per sq Km for a reconnaissance permit and Re 500 per sq Km for a prospecting license and Re 10,000 for a mining lease |
| 1.f Dead rent | Rates are not specified. Varies from nil to Re 300 per Ha per annum depending on the area of the lease and the number of years. |
| 1.g Royalty | Rates of royalty on minerals are specified per units of production for 30 minerals (Re 2.50 to Re 726 per tonne) and at ad valorem rates on rest of the major minerals (varying from 0.7 to 11.0 per cent) |
| 1.h Mine Closure Charges | Promulgated by the Central Government. Every mining unit has to submit a progressive mine closure plan within 180 days from the date of commencement of such rules and final mine closure plan one year prior to the proposed closure of the mine.<br>Financial assurance has to be furnished by every lease holder for<br>i. A category mines : Re 25,000 per Ha and a minimum of Re 2 lakhs<br>ii. B category mines : Re 15,000 per Ha and a minimum of Re 1 lakhs<br>in one of the following forms to Regional Controller of Mines or the officer authorized by the State Government<br>i. letter of credit from any Scheduled Bank<br>ii. performance or surety bond<br>iii. trust fund built up through annual contributions from the revenue generated by mine and based on expected amount sum required for abandonment of mine<br>iv. any other form of security or guarantee acceptable to the authority |
| 1.i Stamp duty (or transaction fee) | For a period of 20 to 100 years for selected states are given in Table 2.3.1 at the end |

**Part II – Various Charges and Levies under Forest (Conservation) Act 1980/or Indian Forest Act**

| | |
|---|---|
| **2.a Forest produce tax and Forest passes/taxes** | Varies from state to state. Example: Re. 5 per trip and 8 to 12% of Royalty in Dandeli area of Karnataka |
| **2.b Compensatory taxes/levies** | Differ from state to state ranging from Re. 25,000 to Re. 60,000 per Ha of forest land. The rates vary with respect to mechanized, non-mechanized and underground mines ranging up to Re. 55 lakhs per Ha. Rates also differ on the basis of forest density ranging from Re. 6 lakhs to Re. 125 lakhs per Ha. Synopsis of Compensatory Afforestation and other charges in various states are given in Table 2.3.2 at the end. |
| **2.c Transit fees** | Re.18.68 per trip in Karnataka (other states also impose similar charges)<br>Re. 7 per tonne for transit pass to Forest Department (Madhya Pradesh) |
| **2.d Clearing of jungle** | Re. 100 per Ha |
| **2.e Land development work** | Re. 500 per Ha |
| **2.f Number of plants to be planted** | 400 per Ha (cost of each plant : Re 10) |
| **2.g Fire protection works** | Outer line Re. 250 per Km<br>Inner line Re. 100 per Km |
| **2.h Other miscellaneous charges** | Re. 300 per Km |
| **2.i Security guard charges for safety zone area** | Re. 2000 per guard for each 60 Ha of safety zone |
| **2.j Payment of extra-legal charges** | For diversion of land for mining purposes, State Governments insist on payment of many extra-legal charges (apart from Compensatory Afforestation charges) such as provision of jeep, petrol and salary of the driver etc. by the lessee for the period, for which forest clearance has been granted. |
| **2.k Net Present Value (NPV)** | As per Supreme Court Judgment of October 30, 2002 to be paid @ Rs.5.8-9.2/Ha depending upon quantity & density of forest land (subject to upward revision by MOEF in consultation with the CEC) – a matter, which is being discussed in details in this study. |

**Part III – Various Charges/Levies under Environment (Protection) Act, 1986: mainly (i) Water (Prevention And Control Of Pollution) Act, 1974, and (ii) Air (Prevention and Control of Pollution) Act, 1981**

| | |
|---|---|
| State Water/Air Pollution Consent Fee | Payable for obtaining consent to establish an industry. The fees are 'once off' costs and present minimal expenditure in terms of project costs. In Rajasthan Water Pollution Consent Fee is Re. 2,000 at prospecting stage and Re. 3,000 at mining stage on a project investment up to 65 lakhs. For projects of 200 crore or more, the rates increase to 50,000 and 75,000 respectively.<br>Similar rates are levied as Air Pollution Consent fee as well. To start operations, 50% of fees at prospecting stage are charged additionally. In Bihar/Jharkhand the rates of Water Pollution Consent Fees vary from Re. 1,500 to Re. 7500 and that of Air Pollution Consent Fees vary from Re. 1,000 to Re. 10,000 |

**Part IV – Cess under Labor Welfare Fund Act / Labor Welfare Cess Act**

| Mineral | Modes of Collection and Rates of Cess |
|---|---|
| **4.a Mica** | On all exports the Cess is prescribed as customs duty not exceeding 4.5%. At present, this rate has been fixed at 3.5% |
| **4.b Iron Ore** | For exports – duty of customs, for sold/deposed of to metallurgical industry – duty of excise from a mine not exceeding Re. 1 per tonne. Presently collected is Re. 1 per tonne. |
| **4.c Manganese** | For exports – duty of customs, for sold/deposed of to metallurgical industry – duty of excise from a mine not exceeding Re. 6 per tonne. Presently at Re. 2 per tonne. |
| **4.d Chromite** | For exports – duty of customs, for sold/deposed of to metallurgical industry – duty of excise from a mine not exceeding Re. 6 per tonne. Presently at Re. 4 per tonne. |
| **4.e Limestone & Dolmite** | Duty of excise (i) sold or disposed, (ii) used by the owner of the mine for any purpose at a rate not exceeding Re. 1 per tonne. At present collected at Re.0.50 per tonne |

**Part V – Direct/Indirect Taxes**

**A. Direct Taxes under Income Tax Act, 1961:** Applicable to industries in general and to mineral specific sectors

| | |
|---|---|
| **5.A.1 Corporate Tax** | i. Indian Company: 35% of taxable income plus a surcharge of 10% of the tax levied<br>ii. Foreign Company: 48% of taxable income. No surcharge payment |
| **5.A.2 Withholding Tax** | Rates agreed upon in the bilateral treaties prevail. Current rate 20% in respect of dividends and interest, while rate is 30% on fees and salaries paid to foreign consultants. |
| **5.A.3 Taxes on Capital Gains** | Long term capital gains attract concessional tax liabilities at a flat rate of 20% with indexation or 10% without indexation for Indian Companies and 10% for foreign companies |
| **5.A.4 Minimum Alternate Tax (MAT)** | If total taxable income of a company is less than 30% of its book profits, income tax payable @7.5% of its book profits. |
| **5.A.5 Service Tax** | Leviable on certain taxable services at 10.02% rate. |

**B. Indirect Taxes:**

| | |
|---|---|
| **5.B.1 Customs Duty** | Levied at 25% on most minerals, 5% on phosphate minerals, 35% on natural graphite, granite, marble and magnetite, 5% on most ores and concentrates of metals.<br>Special duty is levied at 5% of the value of goods and is presently exempted. Special additional duty is charged at 4% ad valorem. The surcharge is levied at 10% of the duty charged. Capital goods for mining attract a basic duty of 25%, 10% surcharge, 4% special additional duty and 16% countervailing duty |
| **5.B.2 Excise Duty** | Replaced with a single rate of Central Value Added Tax(CENVAT) of 16%ad valorem in addition to Special Excise Duty. For Marble slab and tiles – Re. 30 per sq m subject to a maximum of 16% ad valorem |
| **5.B.3 Sales Tax** | Goods covered by declaration in Form 'C' rate – 4%; in other cases – General Sales Tax varying from 5% to 16% with or without surcharge on sales tax, turnover tax, additional tax (Seven State Finance Ministers recently set out uniform minimum floor rate of 4% for minerals) |

**Part VI – Other Taxes**

| | |
|---|---|
| **6.a Municipal/Octroi/Toll Tax/Entry Tax** | Rates vary even within a state |
| **6.b Real Estate Tax** | Rates vary from state to state |
| **6.c Road Tax** | Rates vary from state to state. But generally Re. 5,000 per year per truck and Re. 35,000 for truck trailor of 35 tonne capacity |
| **6.d Village Panchayat Levies** | Rates vary widely |
| **6.e Taxes on change in land use** | Rates vary from state to state under surface rent |
| **6.f Water rate** | Specified by the State Government in the lease and varies from state to state |

**Part VII – Miscellaneous**

| | |
|---|---|
| **Corporate Social Responsibility Charges** | 5% turnover as levy (CSR) recently in Orissa for development of local areas. |
| **Supreme Court Judgement in the State of West Bengal vs. Kesoram Industries Ltd.** | Supreme Court's judgment of 15th January, 2004 has upheld levying of cess on coal and other minerals in addition to royalty – thus opening for other states to levy such taxes on the minerals |

**Table 2.5.1: Rates of Stamp Duty on Mining Leases in Selected States of India**

| State & Lease Period | Amount (Rs.) | Rate (%) |
|---|---|---|
| *Andhra Pradesh* (20-30) | First Rs. 1000<br>Next every Rs. 500 and part thereof | 5%<br>25% of amount considered or 3 times of the amount as average annual rent reserved |
| (30-100) | First 1000<br>Next every Rs. 500 and part thereof | 5%<br>25% of amount considered or 4 times of the amount as average annual rent reserved |
| *Bihar/Jhar-khand* (20-30) | Rs. 5000-Rs. 50,000<br>More than 50000 and part thereof | 5% of amount considered or 5 times of the amount as average annual rent received.<br>7% of amount considered or 5 times of the amount as average annual rent reserved |
| (30-100) | Rs. 5000–Rs. 50000<br>More than 50000 | 5% of amount considered or 8 times of the amount as average annual rent reserved.<br>7% of amount considered or 8 times of the amount as average annual rent reserved. |
| *Gujarat* (10-30)<br><br>In perpetuity | | 8% for Rs. 100 or part thereof of amount considered or two times of the amount as average annual rent reserved.<br>Same as above for $1/5^{th}$ of the whole amount of rents which would be paid or delivered in respect of the first 50 years of the lease |
| *Karnataka* (10-30) | First Rs. 1000<br>Next every Rs. 500 and part thereof. | 10%<br>Rs. 50 for every Rs. 500 or 3 times of the amount as average annual rent reserved. |
| Indefinite term | First Rs. 1000<br>Next every Rs. 500 and part thereof | 10%<br>Rs. 50 for every Rs. 500 or 3 times of the amount as average annual rent to be paid for the first 10 years of the lease. |
| *Madhya Pradesh/Chattis-garh* (20-30)<br>(30-100) | | 7.5% of amount considered or 5 times of the amount as average annual rent reserved.<br><br>7.5% of amount considered or 8 times of the amount as average annual rent reserved. |
| *(Rajasthan)*<br>Indefinite term | Rs. 1000 – Rs. 50,000<br><br>More than 50000 | 30% for Rs. 500 or part thereof amount considered or equal to the amount of every annual rent paid for the first 10 years.<br>50% of every 500 or part thereof of amount considered or $1/5^{th}$ of the whole amount of rent to be paid in respect of the first 50 years of the lease. |
| In perpetuity | Rs. 1000 – Rs. 50,000 | 30% for every Rs. 500 or part thereof amount considered or $1/5^{th}$ of the whole amount of rent to be paid in respect of the first 50 years of the lease. |
| | More than 50000 | 50% for every Rs. 500 or part thereof of amount considered or $1/5^{th}$ of the whole amount of rent to be paid in respect of the first 50 years of the lease. |
| *Uttar Pradesh* (20-30) | Rs. 900 – Rs. 1000<br>More than Rs. 1000 | 125%<br>62.5% of amount considered or 6 times of the amount as average annual rent reserved. |
| (30-100) | Rs. 900-Rs. 1000<br>More than Rs. 1000 | 125%<br>62.5% of amount considered or 10 times of the amount as average annual rent reserved. |

**Table 2.5.2: Compensatory Afforestation and Other Charges across States**

| State | Compensatory Afforestation Charges (Rs./per hectare) | Other charges | | |
|---|---|---|---|---|
| Orissa | 23,450/-<br>(in addition various extra-legal charges in the form of driver, jeep and petrol need to be provided by the lessee) | 36,255/- per km (Fencing over safety zone) | 13,170/- (Regeneration of safety zone) | 540/- (Protection of safety zone) |
| Jharkhand/Bihar | 19,790/- (the lessee has to make the land available for compensatory afforestation and the cost for availing such land has to be borne by the lessee) | 1,22,680/- per km (Fencing over safety zone) | 11,528/- (Regeneration of safety zone) | 510/- (Protection of safety zone) |
| Goa | 4,443/- | | | |
| Kanataka | 59,650/ + 1000/-<br>(Lease rentals) + 187.50<br>(Supervision charges) | 66,500/- per km (Fencing over safety zone) | 54,200/- (Regeneration of safety zone) | Protection charges for safety zone is one and half times that of regeneration charges |
| Rajasthan | 36,700/- | 26,000/- per hectare (penal charges) | | |
| Madhya Pradesh | 25,000/- | Cost of forest land in form of *"pratyasha shulk"* is being charged at the rate of Rs. 900,000/- to Rs. 1300,000/- | | |

Note: In other states the rate of Compensatory Afforestation Charges ranges between Rs. 35,000/- to Rs. 50,000/- per hectare for forest land diverted for mining.

*Source: Note prepared by FIMI on "Levies & Taxes Minerals under Various Acts & Rules"*

## Appendix 2.6: Input-Output Matrices for Indian Forestry & Mining Sectors

2.6.1 In the modern world, the quantity of a commodity produced is contingent upon an intricate web of interdependence across sectors producing a multitude of commodities. The output of a particular sector appears very much as an input in another. The extent of the output of a sector being used as inputs in other sectors is generally termed as its extent of forward linkage. The higher the extent of its use as inputs in other sectors, the greater is its forward linkage value. From a strategic perspective, it is imperative that sectors having higher forward linkage values are accorded some preferential treatments in the national policy matrix.

2.6.2 An attempt has been made here to estimate the forward linkage values of the forestry and mining sector using the Input-Output Transactions Table of 1998-99 for India produced by the Central Statistical Organization. Data used for constructing the Forward Linkage Coefficient (FLC) has been picked up from Matrix 1 mentioned as Input Flow (or Absorption Matrix as the *commodity x industry* matrix). There are 115 different sectors identified in the matrix. FLC has been constructed as
FLC = (IVAL-OVAL)/TVAL*100, where IVAL is the value of the output of the sector used as inputs in other sectors, OVAL is the value of the output of the sector used within the same sector and TVAL is the total value of output of a particular sector.

2.6.3 FLC thus captures the share of the total value of output of a sector utilized as inputs by sectors. Its value indicates the value of output used as inputs in other sectors out of every 100 Rs. worth of its output produced domestically. A higher value of FLC implies a higher extent of forward linkage. It is observed that all the sub-sectors in the mining sector, other than mica, enjoy a higher value of FLC than the forestry and logging sector.

**Table 2.6.1: Estimated values of forward linkage coefficients of some selected industries in India for 1998-99**

| COMMODITIES | COMM | *IVAL* | OVAL | FC | TVAL | FLC | RANK |
|---|---|---|---|---|---|---|---|
| FORESTRY AND LOGGING | 21 | 781297 | 7654 | 1200903 | 1982200 | 39.02951 | 56 |
| COAL AND LIGNITES | 23 | 2487973 | 6914 | -30202 | 2457771 | 100.9475 | 15 |
| CRUDE PETROLEUM NATURAL GAS | 24 | 3291370 | 2787 | -1972325 | 1319046 | 249.3153 | 3 |
| IRON ORE | 25 | 130523 | | 55073 | 185596 | 70.32641 | 35 |
| MANGANESE ORE | 26 | 16994 | | 389 | 17383 | 97.76218 | 22 |
| BAUXITE | 27 | 13172 | | -1004 | 12168 | 108.2512 | 11 |
| COPPER ORE | 28 | 90717 | | -56915 | 33802 | 268.3776 | 2 |
| OTHER METALLIC MINERALS | 29 | 127757 | | -27861 | 99896 | 127.89 | 7 |
| LIME STONE | 30 | 112273 | | 238 | 112512 | 99.78758 | 19 |
| MICA | 31 | 12 | | 220 | 232 | 5.172414 | 99 |
| OTHER NON-METALLIC MINERALS | 32 | 2035590 | | -1674656 | 360934 | 563.9785 | 1 |

Source: Estimated by the authors from the input-output tables, as provided by the Planning Commission, Govt. of India for 1998-99.
Note: Definitions used: COMM - Commodity code as per Input-Output Transactions Table 1998-99; IVAL- Value of commodity used as intermediate input; OVAL- Value of commodity used as intermediate input in the same industry; FC- Final Consumption net of imports; TVAL- Total value of output of the industry; FLC (Forward Linkage Coefficient)- (IVAL-OVAL)/TVAL*100; RANK- Rank in terms of FLC out of 115 industries. Higher the value of FLC, lower the rank.

# *Appendix 2.7*
# *Wolkem India Limited*

## 1. Introduction:

2.7.1 The purpose of this case study is two fold. First, it describes that the mining industry, under the multi-faceted regulatory regime as given in Section I of Chapter I, can minimize the adverse impact on environment by using various scientific techniques in its operations. Secondly, the case tries to explore the various contributions of mining sector in the national economy in terms of reclamation of mined areas through afforestation, foreign exchange earning, creation of local employment opportunities and improving the social infrastructure. The significance of these two issues in calculating the NPV of diverted forest land for mining purpose, has been discussed in detail in various places in our main report

2.7.2 Wolkem, one of the world's largest Wollastonite producers, and India's largest Calcite producer, was established in 1972. Wolkem started mining in the early seventies in one of the biggest tribal belts at Belka Pahar and Kheratarla Mines in Pali and Sirohi Districts, Rajasthan. Wolkem's mines are true repositories of the highest grade natural fibrous Wollastonite & Calcite in the world. The lithological formation of the area is basic rocks, granites, pegmatite, quartz-veins, cherty rocks, skarn with or without Wollastonite and bands of Calcite. The topography is hilly to undulating. The soil is shallow with pebbles and rocks.

2.7.3 The production of wollastonite during the last 5 years – i.e., from 2000-01 to 2004-05 was 754735 tonne at an average of 150946 MT per annum. It is envisaged to increase production to an average 250,000 MT per annum by 2009. The production of calcite, on the other hand, during the last 5 years (from 2000-01 to 2004-05) was 278,000 tonne at an average of 55,600 MT per annum, which the company is planning to increase up to 90000 MT per annum by 2009.

2.7.4 As discussed in paragraph 2.18, Section VI of Chapter 2 and as shown in Appendix 2.6 about the linkage effect of mining industry with the rest of the economy, the mineral products of Wolkem have strong forward linkages with other industries. The company markets over 60 grades and 12 brands of Calcite, Wollastonite and Talc for diverse applications in industries such as Paper, Polymer, Paint, Dental Care, Confectionery, Brake Lining, Building Materials, Ceramic Tiles, Adhesives, Insulating products etc., in domestic as well as in the global market.

2.7.5 Wolkem is an export house recognized by the Government of India, and a winner of India's Export Promotion Council's (CAPEXIL) special award for outstanding export performance for the last eight consecutive years. It exports on an average 15000 tons of wollastonite every year @ $ 100 per ton, thus bringing about $ 15 million of foreign exchange to country. This clearly demonstrate the foreign exchange earning potential of mining industry, which one must take care of while assessing the social benefits of this sector.

2.7.6 Wolkem pays great attention to the environment and regularly plants more than 15,000 trees every year, as a result, some of Wolkem's mining and processing plants are ISO 14001 certified. Its current plantations comprises mainly of Ficus Glomerata, Termanalia, Balerica, Boswellia, Serrata, Lannea Coromondelica, Diospyros Melanoxygon, Anogeissus Latifolia, Ougeinia Ogunesis, Embilica Officinalis, Wrightia Tinctoria etc.

2.7.7 The Company has won awards for scientific mining & development for the last eight consecutive years from:

- The President of India
- Indian Bureau of Mines
- Directorate General of Mines Safety

Wolkem has also won the *Vraksh Vardhak* (tree plantation) award from the Department of Forests, and several awards for afforestation and plantation, disposal of waste, water pollution etc from the Indian Bureau of Mines. These awards not only speaks the scientific mining practices being carried in Wolkem in order to minimize the negative externalities generated in mining operations, but also are clear testimony about the efforts of mining industry in afforestation of mined land. The same issue has been explicitly raised in paragraph 1.18, Section II of Chapter I, and subsequently in paragraph 2.17, Section V of Chapter II.

2.7.8 Wolkem conducts medical camps, provides drinking water, maintains hospitals and provides aid to schools in surrounding villages. Cattle water huts & anicuts / check dams have been built for water harvesting in nearby villages. Wolkem is the biggest employers of tribals in the districts of Pali, Sirohi and Udaipur, employing more than 2000 locals within 30 kms of the mining area, and thus significantly improving the quality of lives of thousands of families in the region of mining areas. As we have discussed earlier in Chapter II, these socio-economic benefits created in the form of employment to local youths, community development and creation of social infrastructure should be included in the calculation of NPV from mining sector.

2.7.9 Wolkem has vocational training centre at its Belka Pahar Mines, which is recognized by the Government of India. Wolkem organizes numerous training programs for the development of its employees numbering over 2000, of which 1500 are tribals including 500 tribal women.

## 2. Mining Operations at Belka Pahar Mines:

2.7.10 At this open cast mine, mining is carried out along the hill slopes by forming benches. The waste dump management practices are rigorously followed along slopes and valleys. The over burden is dumped by constructing retaining walls and making terraces (Plate 2.7.1).

2.7.11 Dumps are designed having terraces at a vertical interval of 8 to 10 meters. Retaining walls are provided on each terrace to strengthen its base. Water channels are provided to avoid erosion during rains. When dumps are matured, these are reclaimed by plantation on the levels and slopes of terraces (plate 2.7.2). Some of the nearby forest land, which is not under mining, is also getting green as there is natural plantation on these patches due to open pollinated varieties planted in mined land.

2.7.12 The total area taken on lease has not been utilized for mining so far. The details given in Table 2.7.1 bring out two important features:

(i) Out of the total leased in area of 46.21 hectares, the diversion of the forest area for mining and allied activities has been so far 41.6521 hectares.
(ii) Even this area has not been used at one stroke; but over the years in a staggered manner.

**Table 2.7.1: Details of forest area Diverted and Utilized for Mining and allied Activities at Belka Pahar Mines**

| SNo. | Details | Forest Area diverted | Cumm. Area Utilised upto (Ha) | | | |
|---|---|---|---|---|---|---|
| | | | 1994-95 | 1999-00 | 2004-05 | Till date 06 |
| 1 | Mining | 25.1970 | 20.3220 | 21.1850 | 22.1340 | 23.7000 |
| 2 | Storing of mineral & ore | 3.5000 | 3.5000 | 3.5000 | 3.5000 | 3.5000 |
| 3 | Dumping of O/B | 2.0200 | 2.0200 | 2.0200 | 2.0200 | 2.0200 |
| 4 | Storing of tools & m/c | 0.7825 | 0.7825 | 0.7825 | 0.7825 | 0.7825 |
| 5 | Construction of buildings | 3.5891 | 3.5891 | 3.5891 | 3.5891 | 3.5891 |
| 6 | Town ship | 2.5575 | 2.5575 | 2.5575 | 2.5575 | 2.5575 |
| 7 | Road support walls | 0.8480 | 0.8480 | 0.8480 | 0.8480 | 0.8480 |
| | **Sub Total :-** | **38.4941** | **33.6191** | **34.4821** | **35.4311** | **36.9971** |
| 8 | Road passing through the area to the hill top | 1.6270 | 1.6270 | 1.6270 | 1.6270 | 1.6270 |
| 9 | Road from Bhorlia near village Tani nearest forest entrance to mine | 1.4100 | 1.4100 | 1.4100 | 1.4100 | 1.4100 |
| 10 | Road from DG room to magazine | 0.1110 | 0.1110 | 0.1110 | 0.1110 | 0.1110 |
| 11 | Footpath from magazine to chowkidar room and ANFO shed | 0.0100 | 0.0100 | 0.0100 | 0.0100 | 0.0100 |
| | **Sub Total : -** | **3.1580** | **3.1580** | **3.1580** | **3.1580** | **3.1580** |
| | **Gr.Total** | **41.6521** | **36.7771** | **37.6401** | **38.5891** | **40.1551** |

2.7.13 The above scenario confirms our earlier concerns raised in Chapter I. We have argued that a minor should not be charged the full value of compensatory afforestation on complete leased-in area in advance; rather it should be in concurrence with the area

diverted for non-forestry purposes. The same logic applies while calculating the loss of benefits from complete leased-in forest land. The extent of loss would be different for different forest areas depending upon in which year that particular piece of area have been diverted for mining and other allied operations.

## 2. Ecological Contribution:

2.7.14 The wolkem is engaged in afforestation at the mining and its surrounding areas, which can be gauged from Table 2.7.2 below:

**Table 2.7.2: Details of Afforestation at Belka Pahar Mines**

| | Details | Cumulative Area Afforested (Ha) | | | |
|---|---|---|---|---|---|
| | | 1995-96 | 1999-00 | 2004-05 | Till date 06 |
| 1 | Mining | 0 | 0.7 | 4.4 | 7.4436 |
| 2 | Storing of mineral & ore | 1.2237 | 1.2237 | 1.2237 | 1.2237 |
| 3 | Dumping of O/B | 0 | 2.02 | 2.02 | 2.02 |
| 4 | Storing of tools & m/c | 0.7725 | 0.7725 | 0.7725 | 0.7725 |
| 5 | Construction of buildings | 1.2493 | 1.2493 | 1.2493 | 1.2493 |
| 6 | Town ship | 2.3945 | 2.3945 | 2.3945 | 2.3945 |
| 7 | Road support walls | 0.848 | 0.848 | 0.848 | 0.848 |
| 8 | Katcha road to hill top | 0.3 | 0.3 | 0.3 | 0.3 |
| 9 | Road from Bhorlia near village Tani nearest forest entrance to mine | 0 | 0 | 0 | 0 |
| 10 | Road from DG room to magazine | 0 | 0 | 0 | 0 |
| 11 | Foothpath from magazine to chowkidar room and ANFO shed | 0 | 0 | 0 | 0 |
| | **Total** | **6.788** | **9.508** | **13.208** | **16.2516** |

2.7.15 Indigenous species of fruits and flowers have been planted in more than 16 hectares in and around leased-in area, resulting in conversion of reclaimed area into a forest and increase in population of langoors and birds in the area (Plate 2.7.3). At the time of grant of mining lease in 1968, only 131 trees were standing in the area as counted by the Forest Department. Against this, more than 64 thousand plants have been planted, with 90 per cent survival rate. Because of mining, the local habitants got employment, and as a result, their dependence on forest has completely shifted. Consequently, the forest around the mining area has grown many folds (Plate 2.7.4).

2.7.16 The population near to mining areas still depends on water from local aquifers, streams and *nallahs* for drinking and agriculture purposes (Plate 2.7.5). This is due to conscious efforts of the company to sustain the indigenous sources of water. The company makes sure that these natural sources should not be disturbed due to mining operations; rather the company has constructed a lot of check dams to avoid siltation of water streams. This is against the general misconception that mining operations destroy the natural resources including forest and water.

2.7.17 Several measures have been adopted to abate the pollution and achieve conservation of natural resources. These measures are summarized in Table 2.7.3 below.

2.7.18 The efforts of the company to minimize the environmental losses have been well recognized by government officers during their visit to this area. Some of the quotes written by these officers in the visitors' book of the company have been reproduced below.

**Table 2.7.3: Strategies to contain the environmental Pollution by Wolkem Industry**

| Sl. | Nature of Pollution | Existing Strategies |
|---|---|---|
| 1 | Air | Wet drilling<br>Water spraying on roads<br>Water spraying/moistening of dumps<br>Green belt surrounding colonies and mining faces<br>Water spraying on plants and trees. |
| 2 | Water | Proper water drains on dumps, mining faces and roads<br>Construction of check dams and siltation tanks |
| 3 | Noise | Covered cabins/rooms<br>Green belts<br>Proper maintenance of machines |
| 4 | Solid Waste | Maintaining adequate moisture in over burden<br>Construction of retaining walls<br>Terracing<br>Afforestation<br>Proper water drains vertical and horizontal and water garlands on surface |

Mr. Abhijit Ghose, conservator of Forests, Jaipur, 27-09-1998

"It was my sudden inspection…… This area can be a demonstration site mines working in this region and else where in the state. Once again, I co Mr. Singh and his team for excellent work for the cause of environment".

Mr. Anand Singh, Assistant Commissioner, Ministry of Rural Areas & Employm of India, 21-07-1995

"I heard a lot of damage being done by mining operations in the country. E seen this area of mining operation shown by Shri Jain, I am fully confider situation is other way round; there is nothing to be scared about the mining o as the measures – protective, preservative or conservative are treated part activity as being done here. I am sure it can serve and become a replicable those engaged in similar ventures".

## 4. Community/Social Development

2.7.19 Community development has been the key of company's corporate strategy since its inception. A plethora of activities have been initiated in this direction (Plates 2.7.6 and 2.7.7), which are summarized in Table 2.7.4 below. Since inception, the company has incurred an expenditure of more than Rupees 2 crores on community development works.

**Table 2.7.4: Community Welfare Measures undertaken by Wolkem for the year 2004-05**

| | Welfare Measures | Description |
|---|---|---|
| 1 | Medical & Health checkup Camps | Conducted 23 no. of camps in 14 no. of villages 744 patients have been treated |
| 2 | Toilets for schools | Constructed 12 toilet in 4 of schools of nearby villages. Students & teachers are benefited by this sanitation facility. |
| 3 | Plantation in school campus | Planted 1500 of plants in Bhimana & Sarjuki bari school. This will create green environment in these school campuses. |
| 4 | Cemented water channels | Constructed 5 km length cemented water channels for irrigation from Nalla to various cultivated land. Villagers are irrigating the land through these channels. |
| 5 | Supply of fodder at the time of draught | Supplied fodder three times last year during draught. Some farmers got these fodders for their live stock. |
| 6 | Supply of drinking water at the time of draught | Sent water tanker to nearby villages during draught to provide drinking water to the villagers. |
| 7 | Renovation of school building, educational support etc. | Renovated school buildings of Sarjukibari, Thandiberi & Bhimana village schools. The company provided Darri, table, chairs, uniforms, etc., towards education support. |
| 8 | Donation for development | Company has donated Rs.12,000 to Sirohi Vikas Samiti through Collectorate. This |

| | Welfare Measures | Description |
|---|---|---|
| | | money was utilized for development of tribal villages. |
| 9 | Construction of bus stand, digging of tube well, etc., to improve public amenities / facilities | Constructed one bus stand near Khilla village. The company also dug two wells in Bekaria & Devla village. Deepening of wells of village Khilla, Khera & Luharcha was also done. |
| 10 | Construction of check dams, cattle water hut, etc. | Check dams were constructed for recharging of rain water. Cattle water huts were constructed for drinking water for live stock. |
| 11 | Camps on vermin culture, health, sanitation, water recharging, etc. | Large numbers of camps have been organized on these subjects to educate the tribal villagers. |
| 12 | Vermi compost | Vermi-compost units have been provided in nearby villages. Villagers are now acquainted in this culture. |

## 5. Lessons:

2.7.20 It is clear from the above case study that mining industries, with appropriate technologies, can minimize the negative externalities created in the process of their operations. Some of the innovative practices of Wolkem deserve special mention at this juncture:

- Steep slope mining with appropriate technological precautions to minimize land wastage;
- Dumping of overburden at terraces with retaining walls at the base;
- Reclamation of dumps by plantations on the levels and slopes of terraces;
- Reducing the dependency of local tribals on forests by providing them employment;
- Arranging transport for locally employed people between their homes and the factory, so that they don't need to leave their houses;
- Large scale afforestation in and around mining land;
- Construction of water diversion channels, check dams and siltation tanks to take care of water drainage system and providing suitable water harvesting and recharging in the area;
- Phased utilization and reclamation of the land damaged due to mining;
- Maintaining environmental lab to monitor the changes in the surrounding environment (Plate 2.7.8)

2.7.21 Mining industry, being located in remote and tribal areas of India, is generally perceived as exploitative of local community and environment. The present case however demonstrates that mining can contribute to poverty reduction by catalyzing improvement in physical infrastructure – a basis for initiating economic activity, and through investments that improve social services as well as social capital. In this way, a

symbiotic relationship between local community and the mining company can be developed.

2.7.22 The contribution of mining to foreign exchange earning, and towards promoting the other industries by supplying the raw material can't be overlooked. The need of the hour is promoting a partner ship web between government, mining company and local community, so that the national wealth of minerals can be exploited in a sustainable manner without causing too much harm to both micro and macro environment.

2.7.23 The recent attempt to levy NPV of diverted forest land on mining company can be interpreted as compensation package to be collected by Central Government. What we argue and which is strongly clear from the above case, is that compensation should include investment by the mining company in increased infrastructure and social services for community, so that the mining project leaves a positive legacy for affected communities. The role of the Government should be limited to on two fronts. First, the Government should reduce the various risk faced by the mining companies by establishing a conducive investment environment for mining through competitive tax regime and environmental protection regulations. Second, the Government can make sure that mining takes place in a socially and environmentally responsible manner with appropriate benefit sharing between Central Government, State Government and the community.

2.7.24 The partnership approach as outlined above, would provide a win-win situation for all concerned parties in the following manner:

- Mining company – a profitable long run investment with minimum risks
- Government – taxes and economic growth
- Community – employment, income, improved infrastructure, social services and opportunity to initiate other spin-off businesses.

**Plate 2.7.1: Scientific Dumping of Over Burden**

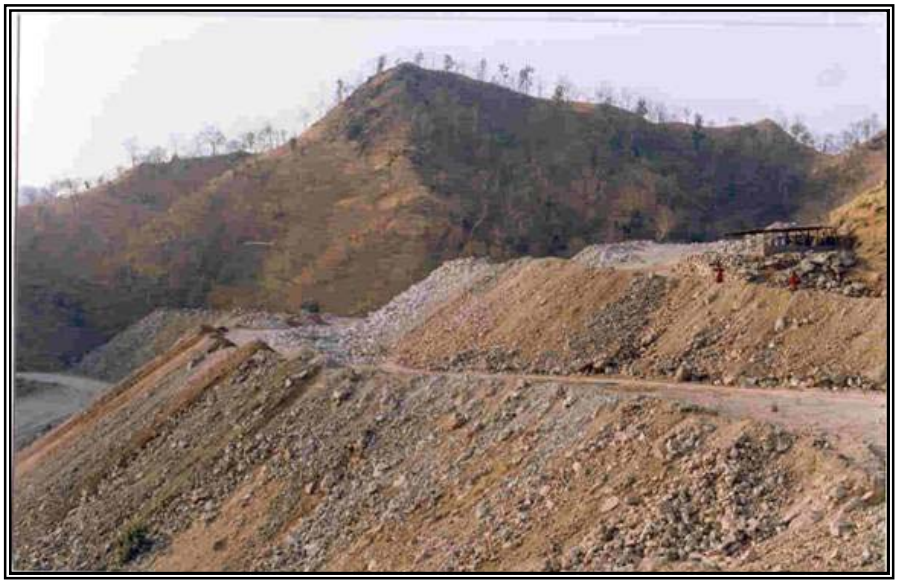


**Plate 2.7.2: Reclamation of Dumps Through Plantations on the Slope of Terrace**

**Plate 2.7.3: Development of Forest in the Reclaimed Area**

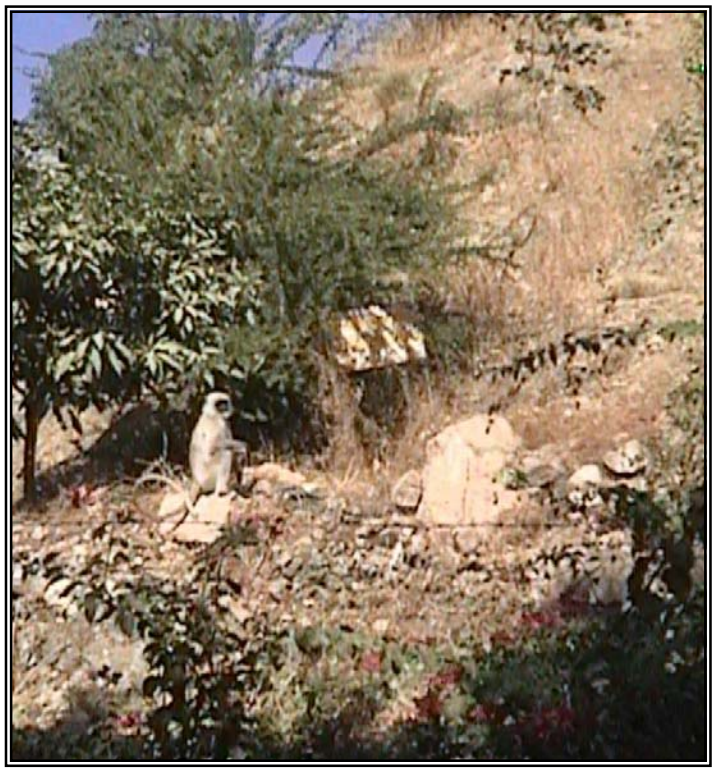


**Plate 2.7.4: Glimpse of Forest in and Around Mining Area**

**Plate 2.7.5: Maintenance of Streams and Nallas for Agriculture and Drinking Purpose**

**Plate 2.7.6: Construction of Water Tank by Wolkem Industries**

**Plate 2.7.7: Plantation in School Camps by Wolkem Industries**


Plate 2.7.8: Instrument to Monitor the Surrounding Environment at Belka Pahar Mines

# *Appendix 2.8*
# Iron Ore Mining in Goa

## 1. Introduction

2.8.1 The state of Goa is well endowed with industrial minerals like iron ore, manganese ore, bauxite, limestone, dolomite etc. The mining districts of Goa cover 30,400 hectares, constituting about 8.2 per cent of Goa's total geographical area.

Iron ore, being the most explored mineral in the state, has played a vital role in Goa's economic growth, and remains the biggest contributor to Goa's foreign exchange earnings exceeding even tourism. Although the production of iron ore in Goa is about 20 per cent of the national production, its share (including small part of iron ores from Karnataka) in total export is about 40 percent of the total exports of iron ore from India. Goa is predominantly a low grade supplier of iron ore and its entire production is exported in international markets. The major export destinations for Goan iron ore are China (53 %), Japan (27 %) and Europe (12 %). According to one NCAER Study[50], the output multiplier effect for the Goan iron-ore industry is 1.62 units based on input-output model. The same study estimated the employment multiplier effect as 1.73 persons per lakh rupees worth of output at 1993-94 prices. The *net social benefit* of iron ore mining in Goa has been estimated between Rs 183 per tonne (for small mines) to Rs 202 per tonne (for large mines), amounting to Rs 300 crore per annum social profits on 16 million tones of iron ore exports from Goa.

2.8.2 Most of the mines in Goa are open cast mines and mining operations strictly adhere to the rules framed by the regulatory authorities for safety, namely, Department of Mines Safety and India Bureau of Mines. Mining activities involve various phases like exploration, extraction, processing, transportation and trans-shipment. To study the impact of mining on the local natural and social environment, an in-depth study of two of the mining sites was undertaken in Goa.

## 2. Case 1: Bicholim Iron Ore Mine under Operation

2.8.3 M/s. Dempo Mining Corporation Pvt. Ltd. started mining in Bicholim area in 1941. The company has got 5 contiguous leases of Vagachiper (99.96 Ha), Lamgao (89.92 Ha), Gaotoor (90.14 Ha), Totichomor Dongar (99.73 Ha) and Mandoorbaga (99.55 Ha), together constituting an area of 479.30 ha. Production of iron ore in this mine is of the order of 16.50 lakh ton per annum, which is primarily export-driven with long term marketing tie ups with Nippon Steel of Japan, Jinan Steel of China and others. In 2003-04, Dempo earned USD 44.60 million of valuable foreign exchange for the Country. Although, this mining area is primarily under non-forest, a close look at the various initiatives undertaken by the company shows that the mining activities are not always detrimental to the sustainability of environment and if properly managed, can be

[50] NCAER, 2002. "Role of Mineral Ore Exports in the Economic Development of Goa: A History and Economic Enquiry".

very much helpful to the development of not only the local area and local people but also for the entire country as well.

## 3. Innovative Steps undertaken at Bicholim Mine Site for Sustainability of Environment:

2.8.4 In the Bicholim mine, mining and reclamation activities are continuous in all the five leased areas (as per the government guidelines under Mineral Development Policy Statement, 1993). While one plot is getting mined, the extracted topsoil and overburden are being used to reclaim some other previously mined area. Some of the *innovative steps* undertaken by the company to preserve the environment and major achievements are listed below.

- Expenses on Environment Management have increased from Rs 176.01 lakh on core zone and 12.10 lakh on peripheral development in 1993-94 to 216.80 lakh and 54.60 lakh respectively during 2003-04.
- Drilling-blasting has been completely eliminated by adopting Ripping-dozing method in 1992. This has reduced problem of dust generation, ground vibration, air blast and fly rock. Excavators like CAT 375 LME, CAT 5080 LME have been deployed for excavation process which have significantly reduced the noise level, increased fuel efficiency and reduced the carbon emission (Plate 2.8.1). Emissions from exhaust of heavy earth moving equipment are checked periodically and proper preventive maintenance of hauling units are carried out to minimize the emission levels.
- To take care of mine run-off, 101 filter beds, 21 settling ponds have been created all along the leased-in area.
- Since 1986, more than ten different studies have been conducted especially relating to environment with the help of several national level organizations such as MoEF, CMRI, TERI, NEERI, Caterpillar, NIRM etc.
- The major categories of items on which expenditure were incurred during 2003-04 for environment management were: monitoring and evaluation (5 lakh), afforestation (5.00 lakh), dump management (26 lakh), slime dam (100 lakh), rain water harvesting (2.00 lakh), environment awareness (1 lakh), dust suppression operation and maintenance (51 lakh), reclamation (26 lakh), and peripheral development (54.60 lakh).
- Projects for dump stabilization through effective micro-organism (EM) technology for stabilization and soil conservation, plantation on degraded/ dumped land in collaboration with TERI for soil conservation have been undertaken (Plate 2.8.2).
- Ministry of Environment and Forests, New Delhi, and World Bank aided "Environment Management Capacity Building Technical Assistance" project is under operation at Bicholim Mine since January 2002 under the guidance of CMRI, Dhanbad. Critical factors were identified and a design of dump was proposed by CMRI, which is being implemented at 4-Top area of Bicholim Mine. (Plate 2.8.3 and Plate 2.8.4)

- In this mine area, 176.09 ha of land have already been reclaimed and 32.82 ha are under the process of reclamation (Plate 2.8.5). The details of areas fully reclaimed and still under reclamation are shown in Table 2.8.1.

| **Table 2.8.1: Area Reclamed or under Reclamation at Bicholim Mine Site** | |
|---|---|
| Fully Reclaimed | 176.09 |
| 1. Back fill & reclaimed in mined out area | 129.18 |
| 2. Rain harvest & reclaimed in mined out area | 5.10 |
| 3. Rain harvest & reclaimed in virgin area | 0.75 |
| 4. Slime dam reclaimed area | 1.10 |
| 5. Waste dump reclaimed area | 38.56 |
| 6. Afforestation in unutilised area | 1.40 |
| Reclamation underway | 32.82 |
| 1. Back fill area active | 12.00 |
| 2. Rain harvest area active | 0.80 |
| 3. De-silt waste dump active | 10.52 |
| 4. Afforestation in mined out area | 6.90 |
| 5. Afforestation in unutilised area | 2.60 |
| *Source: Dempo Mining Corporation, Goa* | |

- Afforestation campaign is in full swing by the management despite the fact that the area under mine was not under forest prior to mining. During the period 1993-94 to 2003-04, an area of 98.68 ha of land has been afforested where 578823 plants have been planted so far (Plate 2.8.6).
- Systematic afforestation of mixed plant species (i.e., both local and exotic) and grasses is being implemented to initiate quicker regeneration of flora and fauna resulting in a richer biodiversity of species in the project area (Plate 2.8.7). Some of the plants used for afforestation with their number being planted during the above period are as following: Cashew (1,80,367), Anola (13,948), Khair (8,320), Gulmohur (36,236), Acacia (8,85,367), Kokum (6,150), Phanas (6,000), Shivan (26,250), Suru (2,36,000), Subabul (4,500), Saton (32,000), Mango (17,560), Rain tree (23,626), Jamun (17,012), Apto (33,560), Teak (11,500), Nilgiri (1,92,947), Sisam (27,500), Sanwar (43,000) and others (1,98,616). There is a plan to develop the project area as a major tourist attraction by providing park and other recreational facilities (Plate 2.8.8).
- Mine water is treated with lime and flocculants like Alum, Magnasol, etc., which has enhanced the setting of suspended solids process and then clean water is either re-utilized for beneficiation process or allowed to flow out for irrigation purpose.
- Carbon Tetra Chloride (CTC), a CFC compound (which depletes Ozone layer) used for cleaning of battery terminals has been replaced with eco-friendly products like Batpro and Corroclean of Stanvac Inc. U.K
- Collection and proper disposal of burnt oil and cotton waste is done for its re-use after processing.

- Roads are cleaned at junctions to eliminate the generation of dust. This cleaning helps to remove the spillage on the roads (Plate 2.8.9).
- The mock rehearsals on emergency preparedness on different impacts are conducted twice in a year as preventive measures and possible corrective actions against emergencies.
- Training programme and counseling sessions regarding implementation of Environment Management Programme and other details of ISO 14001 are regularly arranged by Central Mining Research Institute, Dhanbad.
- This mine has got FIMI–Baldota national award for outstanding contribution to the national goal of sustainable development through environmental conservation and rational utilization of natural resources. It has also bagged a number of environment and safety awards.

## 4. Social Development Work

2.8.5 The management of Bicholim mine has also undertaken several development works, which would not have been possible in the absence of mining activities in this area.

- About Rs 30-34 Lakhs every year is being provided to Mineral Foundation of Goa[51] for socio-environment development projects across the State of Goa.
- Within the buffer zone of Bicholim, works done through the Mineral Foundation of Goa include: park at Bicholim, upgradation of lakes at Mulgao, Lamgao and Manasbagh, upgradation of schools and construction of libraries, medical camps conducted twice every year and educational facilities for needy students.
- Some other works done by company include development of traffic island, providing ambulance, garbage collection van, providing invertors to primary health centers, construction of Mandap, Scholarships, providing water connections, etc.
- It is also promoting locals for self employment and sustenance through own your truck scheme wherein it has given 350 trucks so far.
- Utilization of organic waste from municipal garbage at Mapusa town and treated at mines for rehabilitation of dumps.
- Construction of Mulgao Lake (earlier it was a small pond) for facilitating irrigation for coconut and palm garden and paddy fields with a cost of Rs 4 crores. This work was carried out in 1990-91 (Plate 2.8.10 and Plate 2.8.11).
- The company measures the quality of life (QOL) to assess the status of socio-economic environment of the region. QOL in the core and buffer zones of Bicholim iron ore mines, which is a function of important socio-economic indicators like food, clothing, shelter, sanitation, security, environmental pollution etc. It has been reported that in Bicholim area people enjoy almost all the basic facilities.

[51] The Mineral Foundation of Goa was set up by the mining industry and was registered on 12th December, 2000 as cooperative venture for the promotion of environmental and social development programmes. It is a non-profit organization and is wholly funded by annual subscriptions from the mining industry.

- Government water supply pipe line connections have been provided for needy families at company's cost.
- Company has excavated and constructed two lakes in its mining area, which caters to the needs of whole of the villages of Lamgao and Mulgao for agricultural activity.
- On the employment front, company adopts 'son of the soil' criteria by employing 95% of the work force from local areas, which has resulted in higher living standards of the locals.
- The Company at its own cost has provided a well-equipped ambulance to the Municipality of Bicholim.
- The Company has provided street light, electrical fixtures to the neighboring village *panchayats*.
- Books and uniforms are provided to the school children and *vanamahotsava* programme are arranged in schools neighboring to the mines in association with Goa Mineral Foundation. Company has beautified the Kadamba Bus stand at Bicholim town and constructed bus stop at Mayem village.
- For the employees, the company has established a co-operative consumer society and a co-operative credit society which caters to the consumer items and financial needs of the employees.
- The company encourages local youth in sporting arena/ cultural programmes by aiding their clubs and organizations wherever necessary.

## 5. Case 2: Sanquelim Mine Land Reclamation

2.8.6 The Sanquelim iron ore mine is situated at Sanquelim, North Goa and covers over an area of 200 Ha. The mining operations started in 1960 by Sesa Goa and it got exhausted in 1988. At present no mining activity is in operation in this area. This site has been completely reclaimed by now. Prior to reclamation, "pot culture" experiments were conducted with objective of identifying plant species suitable for mine site reclamation having growth potential without artificial aids such as fertilizers and irrigation. It was found out that local flora can grow on mine rejects in a water deficient environment if the soil is supplemented with organic matter in the form of neem cake and organic manure. These findings were used to design a plantation programme for introducing local flora and thus enhancing the biodiversity of reclaimed area. In a study conducted by Botany Department of Goa University[52], in the year 1994 a total of 164 species belonging to 138 genera distributed among 55 families existed in the reclaimed mine site area (Plate 2.8.12). They comprised grasses, legumes, climbers, shrubs and trees. More than 5 lakh saplings have been grown at the Sanquelim mine site so far, covering a total area of more than 300 Ha (Plate 2.8.13).

## 6. Agro-horticultural Approach:

[52] Rodrigues, B.F. (1994). "Survey of Vegetation of Iron Ore Mine Waste Lands at Sanquelim (Goa) of SESA Goa Ltd.", Department of Botany, Goa University, Goa

2.8.7 For using mine overburden for a productive purpose, agri-horticultural approach was trialed and adopted at the Sanquelim mine. Under this approach dump is initially stabilized by planting acacias at a close spacing, which acts as nitrogen fixer and generally not grazed by cattle. The dump soil finally becomes rich in humus due to foliage of acacia, which initiates microbial activity and helps in further plant growth. Leguminous creeper was also used, which acts as mulch for water conservation and prevention of soil erosion apart from acting as nitrogen fixer encouraging microbial activity. After stabilizing and reclaiming the area through agro-horticultural approach, several horticultural crops like cashew, jackfruit, coconut, banana and mango were introduced in the area (Plate 2.8.14). Some of the other species found suitable through experiment for land reclamation are congo grass, stylo grass, kudzu and vettiver szenoides, saton, shisum, awla, khair, shivan, karanj-gulmohar, rain tree, amaltus etc.

## 7. Pisciculture

2.8.8 Initially, an experiment was conducted at the Sanquelim mine to investigate the possibility of pisciculture but the pit water was not suitable for pisciculture. With the addition of lime for reducing acidity level of water and organic and inorganic fertilizers to improve the nutrient contents of water the pit water was made suitable for fish farming. With the release of several varieties of fish and ducks an effort has been made to create self-sustaining ecosystem (Plate 2.8.15).

## 8. Social Development Work

2.8.9 Apart from developing the mined out land, the company is using the developed mine infrastructure for various social development works after the closure of mine. It has established a technical training school in selected engineering trades for local youths in deserted-mine offices with an initial capital investment of Rs 50 lakh and is equipped with tools and equipment previously used in mine maintenance activities. It has an annual budget of Rs 20 lakhs. The company has also established a Football Academy where local youths get football training while pursuing their academic career in local schools fully supported and funded by Sesa Community Development Foundation. The initial capital investment for the football academy was Rs 80 lakh and it has an annual budget of Rs 30 lakhs. The football field has been established on a reclaimed overburden site.

## 9. Learning from the Two Case Studies in Goa

2.8.10 It is clear from the above cases, economically mining sector is the backbone of the economy of Goa and contributes a major share in the national export earning from the export of iron ore. Literacy rate in Goa is quite high and people in general, are conscious of their rights and demanding in terms of higher quality of life. Although there is a legal requirement for the mining firms to contribute to the compensatory afforestation fund if the mining area falls under forest land (as discussed in Section 1 of Chapter 1), the studied firms mining even in non-forest areas have also taken several proactive steps themselves to preserve and improve the environment and local fauna and flora during and after the mining processes are over. Some of these places have great potential to be

developed as tourist spots after the mining and their reclamation are over. Even when the mining activity is in operation very close to the village areas, the improved technology of mining with the superior excavators, and sprinkling of water on the road and iron ore while transporting have resulted in lower level of air, water and noise pollution.

2.8.11 Apart from individual effort by different mining companies, mining industry in Goa through its Mineral Foundation, has achieved several milestones during the small span of the last five years such as establishment of Self Help Groups for women empowerment, providing financial support to the deserving and needy students from the mining belt in nine different professional institutes in Goa, book bank programme, promotion of nature club for promoting awareness about nature and environment amongst students community, several first aid camp, astronomy outreach programme, health care facilities (e.g., health camps in schools on regular interval, mobile medicare unit, participation in Project Drushti for free cataract surgery, and national tuberculosis eradication programme), programme for institutional and community infrastructure development, participatory initiative for sustainable development of watershed, revival and improvement of water harvesting and storage structures and upgradation of haulage road.

2.8.12 It is true that not all the mining firms in Goa may be equally active in the development of natural environment and local community but there are large number of mining firms in Goa whose presence has directly (or indirectly through Mineral Foundation of Goa) resulted in improvement in the quality of life of the local people in terms of better road network, school, colleges, sports facility, irrigation facility from pit water, bio-diversity etc. as observed in the two cases earlier. The NCAER study has also found out that the social cost (in form of pollution etc.) is only one-fifth of the value of externalities and the iron ore exports add about Rs 300 crore social profit, which the country may not afford to lose.

**Plate 2.8.1: Environment Friendly Excavation**

**Plate 2.8.2: Project Site for Effective Microorganism**

**Plate 2.8.3: Settlement of Dump with Boulders and Plantation**

**Plate 2.8.4: Waste Dump Stabilization Plant**

**Plate 2.8.5: Land under the Process of Reclamation**

**Plate 2.8.6: Mined Area after Afforestation**

**Plate 2.8.7: Systematic Afforestation of Local and Exotic Plants**

**Plate 2.8.8: Development of Mined Site for Possible Recreational Facilities**

**Plate 2.8.9: Stabilization of Dust on Road and Mining Sites**


**Plate 2.8.10: Development of Lake at the Mined Pit for Irrigation**

**Plate 2.8.11: Irrigation Channel at Mulgao Lake**

**Plate 2.8.12: Experimentation for the Development of Flora at the Sanquelim Site**

**Plate 2.8.13: Varieties of Plant Species Developed at Sanquelim Mined Site**

**Plate 2.8.14: Development of Agro-Horticultural Crops at the Reclaimed Site**

**Plate 2.8.15: Self-Sustaining Ecosystem with Pisciculture at Sanquelim Mine**