Minutes of the Coordination-cum-Empowered Committee (CCEC) meeting held on 6th April, 2016 at Indian Habitat Centre, Lodhi Road, New Delhi chaired by Union Secretary (Mines), Shri Balvinder Kumar

The meeting of Coordination-cum-Empowered Committee (CCEC) on Mineral Development and Regulation was held under the chairmanship of the Union Secretary (Mines) on 6th April, 2016 at 11:00 am in Indian Habitat Centre, Lodhi Road, New Delhi. The list of participants is given at Annexure-I.

2. Union Secretary (Mines) welcomed all the participants. At the outset, Union Secretary (Mines) emphasised that expediting e-auction of mineral blocks and constitution of DMF at district level are extremely imperative. He expressed his dissatisfaction in regard to only 6 mineral blocks having been auctioned successfully by 3 states till now, and called for greater effort on part of all State Governments.

[Action: State Governments]

3. Union Secretary (Mines) sought the representatives of the State Governments to give the status of their preparedness of phase I & phase II of auctions, setting up of DMF at district level and collection of funds in DMF and NMET. He also asked them to shed some light on the feedbacks received from stakeholders on blocks which need to be retendered. The summary of responses of the State Governments regarding e-auction, DMF and NMET is placed as Annexure-II.

[Action: State Governments, IBM, M-IV & M-VI, MoM]

4. Union Secretary (Mines) took up the agenda of identification of blocks from lapsed pending application. More than 65,000 mineral concession applications had lapsed with the amendment of the MMDR Act. State level committees have been constituted with officials from IBM, GSI, MECL & State Governments, to identify blocks out of the areas of the lapsed applications. It was informed that only two blocks have been identified by the committee for Madhya Pradesh. Rest committees also needs to be energised and they need to complete the identification within a month. CG,IBM requested State government representatives to collate data along with map to their regional committees.

[Action: State Governments, IBM, GSI, MECL, M-I, M-IV & M-VI, MoM]

5. The State Governments were asked to prepare a road map for auctioning the leases which are due to expire in 2020 and issues likely to come up in this regard. Additional Secretary (Mines) suggested that in order to prevent any gap in production after lapsing of merchant miner leases in the year 2020, the State Government should lease out other areas well in advance so that production slack can be met.
6. Additional Secretary (Mines) drew the attention of the participants to saved applications of Mining Lease under section 10 A (2) (c) which needs to be granted by 11th Jan, 2017. Representative of Jharkhand informed that 17 such applications are pending which lie in Saranda forest reserve and are awaiting final report from MoEFCC. Odhisha informed that 6 out of 45 old cases pertain to application saved under section 10 A (2) (c). Karnataka informed that 51 such applications are pending but are awaiting finalisation of R&R plans and have to be decided within the 30 MT cap in the State. Secretary (Mines) sensitised the State Governments that already more than a year has elapsed and state governments should expedite all such Mining Lease cases to get them executed and registered within the prescribed time.

7. Union Secretary (Mines) then asked for the status of extension of existing lease by the State Government for implementation of sub section (5) and (6) of section 8(A). State governments’ representative assured that all the extension shall be done soon. Additional Secretary (Mines) referred to follow the recent judgment of Supreme Court order dated 04.04.2016, in Common Cause vs. UoI & Ors, (2014), the extracts of which have been supplied to them in the meeting folder. The order is available on line at [http://judis.nic.in/supremecourt/imgs1.aspx?filename=43524](http://judis.nic.in/supremecourt/imgs1.aspx?filename=43524)

8. A presentation on ‘Mining Surveillance System’ (MSS) for major minerals was made by Senior Assistant Controller of Mines, Udaipur, which is being developed with the help of Bhaskaracharya Institute of Space Applications & Geo-Informatics (BISAG), Gujarat under DEITY, to curb the incidences of illegal mining with the use of space technology. This system has minimum human interference, accessible to remotest area and automatic detection. Union Secretary (Mines) advised the State Governments that the MSS may also be adopted for minor minerals where illegal mining cases are all the more rampant. It was requested the State Governments to provide the available digitised lease-wise information for all major mineral leases in their State for expediting the development of MSS, about the following-

   1. Mine wise Khasra / Cadastral plan either scanned in JPEG format or hard copy
   2. GPS coordinates of lease boundary pillars
   3. Mining lease data in format supplied in the meeting
   4. *The above information may also be provided for the minor minerals leases granted within 500m zone of major mineral leases.*
The above information when ready, may be arranged to be provided to Shri Darshan Deep Bhardwaj, Sr ACOM, IBM-Udaipur, who is the nodal officer for the development of the MSS through BISAG. His email address is darshandeep2011@gmail.com or he may be contacted on 09413418448.

[Action: State Governments, IBM & M-III, MoM]

9. Union Secretary (Mines) emphasised that restoration of mining land is critical which may be achieved through agroforestry intervention. A brief introduction about the initiatives taken in this field by International Centre for Research in Agroforestry (ICRAF) were highlighted by Ms. Rita Sharma, Member of ICRAF Board of Trustees and Former Secretary to Ministry of Rural Development. Presentation was made by representatives of ICRAF and copy of the same is placed as Annexure IV. Agroforestry was viewed as a promising approach to sustainably rehabilitate degraded mining lands. ICRAF proposed signing of a Memorandum of Understanding (MoU) to be signed among Ministry of Mines (MoM), World Agroforestry Centre (ICRAF) and Indian Council for Agricultural Research (ICAR) to work together to prepare a study document for adoption of agroforestry to support implementation of the Sustainable Development Framework. It is anticipated that this study could be completed in 6-9 months’ time and concurrently ICRAF and ICAR could take up 2-3 pilot projects for rehabilitation through agroforestry models. It was concluded that Shri Prithul Kumar, Director, MoM should work with ICRAF (Drs Rizvi and Dr Choudhary) and ICAR (Dr Dhyani and colleagues) to plan the way forward in order to rapidly make progress along the lines mentioned above.

[Action: State Governments, IBM & M-III, MoM]

10. A presentation on “Star Rating of Mines: A tool for implementation of sustainable development framework” was made by Shri. Subhash Chandra, Joint Secretary, Union Mines Ministry. The evaluation template for Star Rating will encompass managing impacts at mine level, addressing land resettlement and other social impacts, community engagement, final and progressive mine closure and adoption of international standards. Copy of the presentation is placed as Annexure V. Union Secretary (Mines) said that the lower star rating miners should be encouraged and should be given time for progression from lower star rating to higher star rating. This rating system may also be considered in obtaining faster clearances from various regulatory and environmental bodies.

[Action: State Governments, IBM & M-III, MoM]

11. Controller General, IBM made brief presentation on revised Rule 45 of MCDR, 1988. Copy of the presentation is placed as Annexure VI.

[Action: State Governments, IBM & M-VI, MoM]

12. Economic Advisor, Union Mines Ministry mooted two additional issues as AOB with the permission of the chair. He mentioned the proposals for seeking
general relaxation of area under the amended section 6(1) have not been received from most of the State Governments and requested them to send them at the earliest. He also informed that an Inter-Ministerial group - PAMCAF (Post-Auction Mining Clearances & Approvals Facilitator) has been constituted by the Union Mines Ministry (http://mines.nic.in/writereaddata/UploadFile/PAMCAF.pdf). As a key stakeholder in the decision making process regarding facilitation of clearances, the State Governments and all other central ministries and departments were again requested to nominate appropriate level officer to PAMCAF and intimate the Ministry.

[Action: State Governments, IBM, M-IV & M-VI, MoM]

13. The meeting ended with thanks to the Chair.

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List of Annexures

Annexure I: List of Participants
Annexure II: State-wise summary of Auction, DMF & NMET
Annexure III: Presentation on Mining Surveillance System by Shri DD Bhardwaj, Sr ACOM, IBM
Annexure IV: Presentation on agroforestry by Shri Dr. Ravi Prabhu, DDG, Department of ICRAF and Shri. Dr. Rajendra Choudhary, Scientist, Department of ICRAF
Annexure V: Presentation on Star Rating of Mines by Shri Subhash Chandra, Joint Secretary, Ministry of Mines
Annexure VI: Presentation on revised Rule 45 of MCDR, 1988 by Shri R K Sinha, Controller General, IBM

Total 6 Annexures
## Annexure I

### List of Participants

Annexed to Minutes of the Co-ordination Cum Empowered Committee (CCEC) meeting on 6th April 2016 at Silver Oak, India Habitat Centre, New Delhi chaired by Union Secretary (Mines), Shri. Balvinder Kumar.

<table>
<thead>
<tr>
<th>Ministry / Organization</th>
<th>Name</th>
<th>Designation</th>
<th>Email</th>
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<tbody>
<tr>
<td>Ministry of Mines</td>
<td>Shri Balvinder Kumar</td>
<td>Secretary</td>
<td><a href="mailto:secy-mines@nic.in">secy-mines@nic.in</a></td>
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<tr>
<td></td>
<td>Shri R. Sridharan</td>
<td>Additional Secretary</td>
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<td>Shri Sudhaker Shukla</td>
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<td>Dr. N.K. Singh</td>
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# Annexure II

**State-wise summary of Auction**

Annexed to Minutes of the Co-ordination Cum Empowered Committee (CCEC) meeting on 6\textsuperscript{th} April 2016 at Silver Oak, India Habitat Centre, New Delhi chaired by Union Secretary (Mines), Shri. Balvinder Kumar.

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<th>State</th>
<th>On Going (Phase I)</th>
<th>FY2016-17 (Phase II)</th>
<th>FY 2017-18</th>
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<tr>
<td>Andhra Pradesh</td>
<td>6</td>
<td>12</td>
<td>-</td>
<td>The date of initial bids for 6 limestone blocks has been extended to 30\textsuperscript{th} April. Out of the 6 blocks, only 3 blocks have received a total of 7 applicants – 3 each for 2 blocks and 1 for a block. Land ownership was informed to be one of the major impediments for applicants in coming forward. Exploration, survey and demarcation work by state agencies is going on for 12 other blocks. Union Secretary (Mines) advised to take prior action/consent for preventing cropping up of any land issues in future as it was informed that land is of fertile nature.</td>
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<tr>
<td>Chhattisgarh</td>
<td>3 blocks successfully auctioned</td>
<td>10 (June)</td>
<td>-</td>
<td>Geological Report updation and DGPS survey of area is going on for 10 blocks, 8 limestone and 2 bauxite, (G2 level explored) identified for second round of auction. Additional Secretary (Mines) enquired about any issues regarding the post action activities involving LOI/clearances for the preferred bidders.</td>
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<tr>
<td>Goa</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>There is no scope for blocks to put for auction. State requested MoM to approach Supreme Court for relaxing cap on production. The Union Secretary (Mines) suggested to prepare an infrastructure plan with the utilisation of DMF funds, along with production plan before going to the Supreme Court.</td>
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<tr>
<td>Gujarat</td>
<td>-</td>
<td>3 (April) 9 (July)</td>
<td>-</td>
<td>Reasons for lower participation by bidders in the first phase are due to large distance of limestone from the market/plant and restriction on use of limestone for captive purpose only. Additional 12 blocks (2 bauxite &amp; 10 limestone) are being prepared for phase II.</td>
</tr>
<tr>
<td>State</td>
<td>Blocks Auctioned/Retendered</td>
<td>Tendered Date</td>
<td>Other Details</td>
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<tr>
<td>Jharkhand</td>
<td>2 blocks successfully auctioned 1 to be retendered 3 more to be tendered (April)</td>
<td>6 (June)</td>
<td>-</td>
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<td></td>
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<td>3 other blocks of phase I shall be put for auction along with 1 annulled block by end of April. Subsequently, 6 mineral blocks (4 bauxite, 1 limestone &amp; 1 graphite) shall be put for auction by end of June this year.</td>
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<tr>
<td>Karnataka</td>
<td></td>
<td></td>
<td>On-going auction process has been extended due to issues regarding the stamp duty. Discussion of amendment of the Stamp Duty Act is going on. Hoping for favourable outcome soon.</td>
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<tr>
<td>Madhya Pradesh</td>
<td>4 blocks of phase I (3 blocks of limestone &amp; 1 of diamond). It was informed that though the limestone blocks were smaller but they had potential due to existing ement plants in the vicinity. 4 blocks for phase II are being prepared from limestone blocks which have been explored by DMG 8 blocks are being prepared for auctioning in 2017-18 – 1 iron ore, 5 limestone &amp; 2 base metels. It 3 blocks have been identified for exploration and work has been assigned to MECL</td>
<td></td>
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<tr>
<td>Maharashtra</td>
<td>4 to be retendered 6 to be tendered (April)</td>
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<td>The primary resons for lack of bids were due to some blocks being in Western Ghats which are ecosensitive zones.</td>
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<tr>
<td>State</td>
<td>Month</td>
<td>Date</td>
<td>Exploration Work</td>
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<tr>
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<td>-------</td>
<td>------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>Odisha</td>
<td>-</td>
<td>12 (Sep)</td>
<td>Exploration work of upgrading 13 blocks from G3 level to G2 level has been assigned to GSI(5), MECL(2) and DMG(5). State Government requested MoM to allow 7 blocks of G3 level for auction of CL. In regard to bauxite requirements of the existing Aluminium plants such as M/s Anarak etc., Odisha informed that 3 bauxite areas reserved for OMC are being operationalised, which may be considered for long term agreement for bauxite supply to the existing aluminium plants.</td>
<td></td>
</tr>
<tr>
<td>Rajasthan</td>
<td>7 (April)</td>
<td>17</td>
<td>It was informed that 7 blocks of limestone will be put up on auction this week. It was informed by Prl Secy, Rajasthan that in a short term calender 19 blocks are planned to be auctioned in 2016-17 and a long term calender is also being prepared. It was suggested that no differential royalty to be charged for SMS grade limestone and cement grade. Director-Tech,GSI, MoM suggested name of potential mineral blocks copper deposit near Dausa and Dhobion gold deposit that may be considered for auction</td>
<td></td>
</tr>
<tr>
<td>Tamil Nadu</td>
<td>-</td>
<td>1</td>
<td>11 blocks of iron ore are being explored by GSI. 8 blocks have been identified for exploration by MECL. Additional Secretary (Mines) suggested that 3 Molybdneum explored upto to G3 level by GSI may be considered for auction.</td>
<td></td>
</tr>
<tr>
<td>Telangana</td>
<td>-</td>
<td>-</td>
<td>MoU has been signed between state government and GSI for exploration from G4 level to G2 level of 11 mineral blocks. The Union Secretary (Mines) suggested to take up matter with GSI and expedite exploration work</td>
<td></td>
</tr>
</tbody>
</table>
**State-wise summary of DMF & NMET**

Annexed to Minutes of the Co-ordination Cum Empowered Committee (CCEC) meeting on 6th April 2016 at Silver Oak, India Habitat Centre, New Delhi chaired by Union Secretary (Mines), Shri. Balvinder Kumar.

<table>
<thead>
<tr>
<th>State</th>
<th>Whether DMF rules promulgated in line with PMKKKY</th>
<th>Whether DMF constituted at district level</th>
<th>If not, likely month</th>
<th>Collection of DMF Fund</th>
<th>Collection of NMET Fund</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andhra Pradesh</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
<td>Yes, Rs. 5.04 cr</td>
<td></td>
</tr>
<tr>
<td>Chhattisgarh</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, Rs. 251 cr</td>
<td>Yes, Rs 15 cr</td>
<td></td>
</tr>
<tr>
<td>Goa</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, Rs. 12 cr</td>
<td>Yes, Rs.3 lacs</td>
<td></td>
</tr>
<tr>
<td>Gujarat</td>
<td>Yes</td>
<td>Yes</td>
<td>1st April,16</td>
<td>No</td>
<td>No</td>
</tr>
<tr>
<td>Jharkhand</td>
<td>Yes (22.3.16)</td>
<td>Not constituted</td>
<td>No</td>
<td>Yes, Rs 6.82 cr</td>
<td></td>
</tr>
<tr>
<td>Karnataka</td>
<td>Yes (5.11.2015)</td>
<td>Yes (11.01.2016)</td>
<td>Yes</td>
<td>Yes, Rs 35 lacs</td>
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</tr>
<tr>
<td>Madhya Pradesh</td>
<td>Notification of DMF is in progress</td>
<td>Yes (all 55 dist)</td>
<td>Yes, Rs 32 cr</td>
<td>Yes, Rs 17 cr</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>out of 803 cr</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Maharashtra</td>
<td>Notification of DMF is in progress</td>
<td>Shall be constituted after notification of Rules</td>
<td>No</td>
<td>Yes, Rs 5.68 cr</td>
<td></td>
</tr>
<tr>
<td>Odisha</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes, Rs 274 cr</td>
<td>Yes, Rs 8.29 cr</td>
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<tr>
<td>Rajasthan</td>
<td>Notification of DMF is in progress</td>
<td>Shall be constituted after notification of Rules</td>
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<td>No</td>
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<tr>
<td>Tamil Nadu</td>
<td>Notification of DMF pending for EC clearance</td>
<td>Shall be constituted after notification of Rules</td>
<td>No</td>
<td>No</td>
<td></td>
</tr>
<tr>
<td>Telangana</td>
<td>Yes</td>
<td>Yet to be constituted</td>
<td>No</td>
<td>Yes, Rs 18 cr</td>
<td></td>
</tr>
</tbody>
</table>
USE OF SPACE TECHNOLOGY FOR CURBING ILLEGAL MINING

Mining Surveillance System (MSS) for Major Minerals

Indian Bureau of Mines, Ministry of Mines
and
Department of Electronics and Information Technology (DeitY)

Objectives:
• To develop a system for detection of incidence of illegal mining by use of space technology
• Surveillance of area up to 500m outside the lease boundary for incidences of mining

Simple - Transparent - Efficient - Low Cost
### Application of Geo-informatics in Mining Sector

#### Parameters

<table>
<thead>
<tr>
<th>Mine Details</th>
<th>Sources</th>
</tr>
</thead>
<tbody>
<tr>
<td>Location</td>
<td>➢ Revenue Map (Village)</td>
</tr>
<tr>
<td>Dimension</td>
<td>➢ State Govt.</td>
</tr>
<tr>
<td>Land Ownership</td>
<td>➢ Govt., Agri.(NA), Others</td>
</tr>
<tr>
<td>Land use</td>
<td>➢ Govt. Records, Satellite Image</td>
</tr>
</tbody>
</table>

#### Geo-informatics: Database Creation

Map Geo-referencing through Satellite Images

1. Collection of Khasra Map
2. Scanning of Khasra Map
3. Geo-referencing of Scanned Map to Satellite data
4. Digitization of Geo-referenced Khasra Map

A Starting Points
MSS for Major Minerals

1. Superimpose major mineral lease on satellite Image
2. Also plot minor mineral leases within 500m outside the lease boundary
3. Procure the temporal satellite imagery (particular scene) of whatever time it is required
4. Cartosat-1 data for a particular scene is normally available in time interval of 126 days (repetativity)
5. If required, satellite cameras can be tuned to give images in shorter interval (revisiting)

Simple - Transparent - Efficient - Low Cost

ADVANTAGES OF USE OF GIS APPLIACITION

1. Satellite based technology with minimum human Interference – thus more transparent and unbiased recording
2. Remote & inaccessible areas
3. Automatic detection of any mining activity in a temporal satellite image
4. Integration of information from multiple sources- satellite imagery, cadastral plan, etc.
5. Effective tool for monitoring of illegal mining- location, extent and trends
6. MIS report
7. The system will be deterrent for the possible illegal mining as it will

Simple - Transparent - Efficient - Low Cost
SCANNING OF KHASARA MAP MARKED WITH LEASE BOUNDARY

Village : Bhimdevla
S.No : 88
Mine code : 38GUJ08348

GEO-REFERENCING ON SATELLITE IMAGERY

Village : Bhimdevla
S.No : 88
Mine code38GUJ08348
Village : Bhimdevla
S.No : 88
Mine code : 38Guj08348

DIGITIZED MAP SUPERIMPOSED ON SATELLITE IMAGERY
AND DEMARCATION OF LEASE BOUNDARY

Village : Bhimdevla
S.No : 88
Mine code : 38Guj08348
Home Page

Drop Down Navigator Menu
Mine Information Tool

Case-1: Image -2005
Case-2: Mining Pit: Image 2005

Case-2: Mining Pit: Image 2015
### Mine Data Reports

**Mining Land Information System**

**Mining Report**

<table>
<thead>
<tr>
<th>State</th>
<th>District</th>
<th>Taluka</th>
<th>Village</th>
<th>Block</th>
<th>Mining Officer</th>
<th>Registration No.</th>
<th>Type of Material</th>
<th>Lease Area</th>
<th>Purpose of Mining</th>
<th>Lease Number</th>
<th>Address</th>
<th>Contact</th>
</tr>
</thead>
<tbody>
<tr>
<td>GUJARAT</td>
<td>Patanab</td>
<td>Patanab</td>
<td>Kutchkoli</td>
<td>Limesn</td>
<td>HOCHHAO [1111]</td>
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<td>10,117</td>
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<td>No Data</td>
</tr>
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<td>Kalaya</td>
<td>Bhand</td>
<td>Sand</td>
<td>Sand [446]</td>
<td>ISM/52/2011</td>
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<td>Sand [446]</td>
<td>ISM/52/2011</td>
<td>MAJOR</td>
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<td>No Data</td>
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<td>GUJARAT</td>
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<td>Kalaya</td>
<td>Bhand</td>
<td>Sand</td>
<td>Sand [446]</td>
<td>ISM/52/2011</td>
<td>MAJOR</td>
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<tr>
<td>GUJARAT</td>
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<td>Kalaya</td>
<td>Bhand</td>
<td>Sand</td>
<td>Sand [446]</td>
<td>ISM/52/2011</td>
<td>MAJOR</td>
<td>10,100</td>
<td>NON-CAPTIVE</td>
<td>3212975</td>
<td>No Data</td>
<td>No Data</td>
</tr>
</tbody>
</table>

**Query Builder**

**Query Builder**

**Filter**

- State: [Select State]
- District: [Select District]
- Taluka: [Select Taluka]
- Block: [Select Block]

**Value**

- Value: [Select Value]

**Search**

- Search: [Enter Search Query]

**Submit**

- Submit
Way Forward

1. Plot all major mineral leases on GIS system.

2. For plotting lease areas **khasra/cadastral or surface plan with GPS coordinates** of all major minerals are to be scanned, Geo-referenced, digitized and superimposed on satellite Images.

3. Also plot minor mineral leases within 500m outside the lease boundary

4. To check and complete the task of Geo-referencing of plan on satellite image - IBM Regional Office / State Government to depute one or two officers to BISAG, Gandhinagar

Simple - Transparent - Efficient - Low Cost

Thank You
Restoration of mining lands through Agroforestry interventions

Coordination-cum-Empowered Committee (CEC) meeting on Mineral Development and Regulation, under the chairmanship of Secretary (Mines)

6th April, 2016 at 11 AM at Silver Oak-II, Indian Habitat Centre, Lodhi Road, New Delhi

Ravi Prabhu et al., ICRAF
Structure of presentation

• Economic potential of restored mining lands
• Agroforestry as a tool for restoration of mined / degraded lands
  – Dr. Dhyani’s presentation refers as well)
• Options and technologies
  – (Dr. Dhyani’s presentation refers as well)
• Possible ways forward
  – (Presentations by Drs Choudhary and Pradhan refer as well)
Mining in India

• Significant ‘consumer’ of terrestrial land, estimated at > 17m ha
• Much of this remains in a degraded condition after mining ceases (exact data unavailable)
• We are here to discuss that a large part of this could and must be restored to economic productivity
• Costs of restoration can be high unless we engage communities’/farmers’ help
Regaining lost potential ...

Simple economic restoration scenarios for 5 lakh ha

Scenario based on lowest mandi prices discounted @45%, does not include benefits of restoring ecosystem services
GLOSSARY OF TERMS

- **Reclamation**: Treatment of previously degraded and often contaminated land to achieve a useful purpose
- **Rehabilitation**: The return of disturbed land to a stable, productive and self–sustaining condition after taking into account beneficial uses of the site and surrounding land
- **Remediation**: To clean–up or mitigate contaminated soil or water
- **Restoration**: Return of disturbed land to a former condition or position
Soils are the key, especially SOC

– It is estimated that more than 6000 km² in Appalachia have been disturbed by coal mining since 1990.

• Zipper et al. (2011) reported that the productivity of these drastically disturbed lands can be restored to support forest vegetation by improving the soil’s physical and chemical quality.

Soil Organic Carbon in a sensitive ecosystem, Kenya

Vagen et al., 2014 – ICRAF GSL
Soil Organic Carbon in a sensitive ecosystem, Kenya

Vagen et al., 2014 – ICRAF GSL
SOIL REMEDIATION

• **Bioremediation** is a treatment that uses natural microorganisms to break contaminants into less toxic compounds
  – E.g. using the petrol pollutants as a source of carbon and energy to degrade the petroleum into carbon dioxide and water

• **Phytoremediation** entails the use of various plant species and their associated microorganisms to remove, degrade, and metabolize various contaminants
  – Advantages of phytoremediation include cost-effectiveness, the wide range of native plants available that are adapted to local conditions, and the ability to grow on site from seeds, which makes them easy to store and use.
SOIL REMEDIATION

• **Mycoremediation** involves using fungi to degrade contaminants including persistent and highly toxic pollutants like TNT and the nerve gases
  – Mushrooms were found to be effective and cost efficient in remediating soils contaminated with oil, chemicals, heavy metals, and radiation

• **Vermiremediation** is another method of remediation that uses earthworms to absorb and remove heavy metal and pesticide contamination from soil.
  – E.g. positive results of vermineEDIATION following tests in the state of Gujarat
So how do we go about this?

• Natural processes
  – very slow and highly dependent on nature of adjoining vegetation as well as condition of site

• Assisted natural processes –
  – E.g. ETF & Bhatti Mining areas
  – E.g Farmer/community assistance through agroforestry

• ‘Engineered’– Mechanical, biochemical, etc.
  – Will not be considered here
Ecological Task Forces

- An example of “purpose oriented teams” that can tackle difficult restoration problems
- Proven capacity to deliver
- So far, restoration to forest or conservation purposes
- 4 Battalions raised and active
- Challenges to deal with large scale degradation
- All costs to GoI; challenges of ‘social fencing’/sustainability
Bhatti Mining Land restoration by Ecological Task Force
Engaging communities & farmers

• Large numbers of landless farmers with knowledge of ecosystem and species
• Use of agroforestry techniques will allow them to:
  – Restore to *forest or conservation* areas via temporary agriculture (taungya system)
  – Restore to *long term agriculture* with tree cover so as to deliver multiple benefits
Agroforestry

A dynamic, ecologically based, natural resource management system that, through integration of trees, often with other plants and animals, in ‘production’ areas and landscapes, allows us to restore, diversify, enhance and sustain production and ecosystem services as well as providing a framework for important social institutions.
Bamboo agroforestry in Gujarat.
Left: Brick fields, Right: Restoration with Bamboo.
INBAR – Oliver Firth: http://www.slideshare.net/agroforestry/bioenergy-for-power-generation-oliver-frith-inbarbeijingcbdcop12
Agroforestry – possible ‘end points’

• If toxicity remains: Phytoremediation, no human direct consumption
  – Agroforestry for timber, energy (including biofuels), fibre

• Low or transitional toxicity: Direct human consumption
  – Agroforestry for food production: fruits, crops, livestock
  – Agroforestry for timber, energy, fibre or other cash crops
  – Agroforestry for conservation and ecosystem services
12 Years
**Results** Compared to control sites, disturbed soils exhibited significantly lower microbial diversity, bacterial biomass, soil organic carbon and nutrient concentrations. Recultivation with trees restored the soil microbial communities to a state similar to natural soils. Indigenous trees increased soil N concentration, and microbial biomass at a faster rate than the exotic *Eucalyptus* trees. Soil microbial diversity increased with plantation age.

**Conclusion** Soil communities can be used as soil health indicators in restoration monitoring. Additionally, soil microbial communities recovered fastest under indigenous compared to exotic trees, which further underlines the importance of tree species selection in restoration management.
Restoring soil fertility with trees

- Provision of **organic carbon** through a range of pathways resulting in favourable structure and water holding capacity, through organic matter maintenance and root action
- Effects of tree shading on **microclimate**
- **Hydraulic equilibration** by which deep-rooted trees allow deeper soil layers to buffer topsoil water content for other plants
- **Phytoremediation**: uptake and removal of heavy metals and organic pollutants from soil and groundwater
Restoring soil fertility with trees

- **Nitrogen fixation** by many leguminous trees and in few non-leguminous species (e.g. Alder and Casuarinas); ICRAF research has identified suitable indigenous trees, without risk of promoting invasive exotics.

- Improved **nutrient retrieval** by tree roots, including through mycorrhiza and from lower horizon,

- Providing **favourable conditions** for the input of nutrients from rainfall and dust,

- **Control of erosion** by combination of cover and barrier effect, especially the former
Through impacts on soil biota – trees increase abundance and productivity

Mean density of different soil biota and calculated response ratios

<table>
<thead>
<tr>
<th>Soil macrofauna</th>
<th>Agroforestry (indiv m⁻²)</th>
<th>Agriculture (indiv m⁻²)</th>
<th>RR</th>
</tr>
</thead>
<tbody>
<tr>
<td>Earthworms</td>
<td>54.4</td>
<td>17.6</td>
<td>3.1</td>
</tr>
<tr>
<td>Beetles</td>
<td>20.9</td>
<td>9.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Centipedes</td>
<td>2.7</td>
<td>0.5</td>
<td>5.6</td>
</tr>
<tr>
<td>Termites</td>
<td>90.7</td>
<td>81.0</td>
<td>1.1</td>
</tr>
<tr>
<td>Ants</td>
<td>23.2</td>
<td>8.6</td>
<td>2.7</td>
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</table>

<table>
<thead>
<tr>
<th>Soil mesofauna</th>
<th>(indiv m⁻²)</th>
<th>(indiv m⁻²)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Collembola</td>
<td>3890.1</td>
<td>2000.7</td>
<td>1.9</td>
</tr>
<tr>
<td>Mites</td>
<td>5100.7</td>
<td>1860.1</td>
<td>2.7</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Soil microfauna</th>
<th>(indiv liter⁻¹)</th>
<th>(indiv liter⁻¹)</th>
<th></th>
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</thead>
<tbody>
<tr>
<td>Non-parasitic nematodes</td>
<td>2922</td>
<td>1288</td>
<td>2.3</td>
</tr>
<tr>
<td>Parasitic nematodes</td>
<td>203.7</td>
<td>211.5</td>
<td>1.0</td>
</tr>
</tbody>
</table>
How trees help the restore soils – an example

Dry Season Dynamics

“Refugia”

Sustaining ecological functions

TREES ARE HOTSPOTS OF BIOLOGICAL ACTIVITY AND APPEAR TO PROMOTE PRODUCTIVITY & RESILIENCE

"Refugia"
Sustaining ecological functions

Wet Season Dynamics
### Table 3. Highest reported species and their shared agro-ecological properties

<table>
<thead>
<tr>
<th>Family</th>
<th>Genus</th>
<th>Common Names</th>
<th>Agro-Ecologically Relevant Properties*</th>
<th>Reported Revegetation Outcomes† [References]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Meliaceae</td>
<td>Azadirachta</td>
<td>“Neem” “Sacred Tree”</td>
<td>(Relatively) Fast Growth;</td>
<td>Increased soil microbial activity resulting in nutrient mineralization [Rao and Tak (2001); Sharma et al. (2001); Rao and Tak (2002); Singh et al. (2004); Maiti (2007); Juwarkar et al. (2008); Tripathi and Singh (2008); Juwarkar et al. (2010)]</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Dalbergia</td>
<td>“Indian Rosewood” “Shisham”</td>
<td>Root architectural adaptations for drought tolerance;</td>
<td>Increased belowground biodiversity and (or) symbiotic mutualisms (e.g., mycorrhizal and bacterial associations) [Raman et al. (1993); Mehrotra (1998); Rao and Tak (2001)]</td>
</tr>
<tr>
<td></td>
<td>Albizia</td>
<td>“Lebbeck Tree” “Shirsh”</td>
<td>Economic development applications (timber cropping, landscaping);</td>
<td>Increased productivity and (or) site survivorship [Sharma et al. (1998); Chauya et al. (2000); De and Mitra (2002); Singh and Singh (2006); Hanief et al. (2007); Juwarkar et al. (2008); Chauhan and Silori (2010)]</td>
</tr>
<tr>
<td></td>
<td>Pongamia</td>
<td>“Indian Beech” “Karanj”</td>
<td>Ethnobotanical usages (e.g., anthelmintic, antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative); Promoter of nitrogen fixing interactions‡;</td>
<td>Increased nutrient deposition and soil carbon stock due to litter fall and (or) rhizospheric mineralization [Singh et al. (1999); Singh et al. (2004); Singh et al. (2006); Juwarkar et al. (2010); De and Mitra (2002)]</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Increased soil moisture retention and soil matrix stabilization [Sharma et al. (2001); Sharma et al. (2004); Maiti (2007); Juwarkar et al. (2010)]</td>
</tr>
</tbody>
</table>

*Based on: Koul et al. (1990); Scott et al. (2008); Tewari (1994); Lowry et al. (1994)
†In combination with other re-established species; ‡Characteristic of the Fabaceae only.
Figure 1. Taxon reporting frequency (n=245 reported sp.; N=37 studies).
Possible next steps

- **Diagnostics & Analytics**: Identify the potential areas for ecological and economic rehabilitation
  - Possible to use spectral and spatial techniques to progress targeting, investment and monitoring frameworks.

- **Carry out investment risk analysis and ‘action research’**: on restoration options across a representative subset of mining sites using a variety of possible funding/investment sources. This action research would include consideration of:
  - Biophysical aspects of restoration
  - Environmental and climate impacts assessment
  - Economic, social and agricultural assessments
Possible next steps

• **Develop options matrix**: Based on the above and trade-off analysis develop options paper

• **Stakeholder consultations** to discuss options matrix

• **Implement** agreed actions related to:
  – Policy guidance
  – Regulations
  – Investment framework including in capacity strengthening
  – Financing
  – Pilots at scale
  – Monitoring framework
The Right Tree for the Right Place

A. Trees for Products

fruit firewood medicine income sawnwood fodder

B. Trees for Services

soil fertility carbon sequestration soil erosion watershed protection shade biodiversity
Thank you very much for your kind attention!
Agricultural production and loss of... Diversity/environmental integrity

Global Ag & For production

Historical trajectory

‘Green revolution’

‘Environmental awareness’

Here and now

Futures we want

Futures we fear

SDG’s 1,2,5,7

We are paying the (high) price for greater production

Van Noordwijk; Forest Trees and Agroforestry CRP
PART I: A Case study on

Rehabilitation of Abandoned Mine Area in Foothills of Himalaya

S.K. DHYANI
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Background

- Mining in India is carried out in > 0.943 million ha area under 7365 mining leases.

- Area affected by mining and industrial waste is 16.72 million ha [0.19 million ha arable land and 16.53 million ha under open forest, ICAR, 2010].

- In Himalayan region 25000 ha area affected by mining.
Mussoorie-Sahastradhara limestone belt— one of the best quality (90% pure) lime-stone mines in India, which command ready market in steel, sugar, textiles, chemicals, glass and other related industries.

In a short stretch of 40 km of the Doon Valley, there were about 60 mines (27 in reserve forest, 3 in Municipal forest, 13 in Gram Samaj areas, and 16 in private lands) where intensive mining carried out and about 1,400 ha got disturbed by the ‘open cast’ mines from 1961-1983.

Also >200 lime kilns and crushing units, and a cement factory that spew out pollutants which form a persistent shroud over the valley.

This continued until the Supreme Court intervened in 1985 on the basis of a PIL and all the mining activities were stopped.
Unscientific mining and over-exploitation of limestone deposits in Doon valley following ruthless cutting of forest vegetation resulted in environmental problems rendering mined areas and their surroundings into barren land with stony/boulder debris.
- The area was denuded of the natural vegetation, pollution of air and water resources, blockade of roads, siltation of reservoirs, communication failures, spoilage of good agricultural lands and vanishing of aesthetics and perennial springs.

- The debris flow from these mines was as high as 550 t ha⁻¹ yr⁻¹
ICAR-CSWCRTI, Dehradun initiated a research project in a mined watershed of 64 ha near Shahastradhara for developing technologies for rehabilitation of minespoils.

- Biological measures (AF interventions) undertaken with/without mechanical measures.
- MPTS and other plant species were selected keeping in view the economical and ecological considerations.
- Selected species were native of the area, lime loving and leguminous with better soil binding characteristics (Dhyani et al., 1988).
### Package of practices for rehabilitation of degraded mined watershed (Sahastradhara, Doon valley)

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Problem area</th>
<th>Conservation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Mechanical</strong></td>
</tr>
<tr>
<td>1.</td>
<td>Main drainage channels (debris and boulder movement)</td>
<td>Gabion cross-barriers, silt detention basins, check dams, spurs, toe walls etc.</td>
</tr>
<tr>
<td>2.</td>
<td>a) Small drainage channels (sediment and runoff)</td>
<td>Loose stone checkdams, brush wood check dams.</td>
</tr>
<tr>
<td></td>
<td>b) Rills</td>
<td>Plugging by stems/rooted slips of <em>Salix</em>, <em>Woodfordia sp.</em>, <em>Ficus infectoria</em>, Hybrid Napier, <em>Eulaliopsis binata</em> etc</td>
</tr>
</tbody>
</table>
Wattling and mulching techniques for slope stabilization
<table>
<thead>
<tr>
<th>Sl. N.</th>
<th>Problem area</th>
<th>Conservation Measures</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>Mechanical</strong></td>
<td><strong>Vegetative</strong></td>
</tr>
<tr>
<td>3.</td>
<td>Minespoils/ Debris Dumps (Debris flow, poor fertility)</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(i) Less than 10% slope</td>
<td>Benches formed by easing slopes, continuous contour trenches.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trenches planted with Vitex negundo, Hybrid napier, Saccharum spontaneum, Acacia catechu etc.</td>
</tr>
<tr>
<td></td>
<td>(ii) More than 10% slope</td>
<td>Geojute (soil saver)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Grass mulch @ 2-3 t/ha spread, overlaid by Geojute, cuttings of Ipomoea carnea, Arundo donax, Hybrid Napier, Vitex negundo planted in holes.</td>
</tr>
<tr>
<td>4.</td>
<td>Mine haul roads, (gully development)</td>
<td>Gabion and loose stone checkdams, retaining walls</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stumps of Lannea coromandelica, Erythrina suberosa, Bombax ceiba, Ficus infectoria near check dams and rills, rooted slips of Bhabar, Kans, Gorda planted on the side of haul roads.</td>
</tr>
<tr>
<td>5.</td>
<td>Landslide area (unstable slopes)</td>
<td>Log wood crib structures</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Arundo donax, Hybrid napier (slips/rhizome); Ipomoea carnea, Vitex negundo (cuttings). Planting of Subabul, Toon, Bombax ceiba, Bauhinia retusa, B.purpurea and rooted slips of Bhabar, etc.</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Debris outflow, t ha⁻¹yr⁻¹</td>
<td>550</td>
<td>8</td>
</tr>
<tr>
<td>Monsoon runoff, %</td>
<td>57</td>
<td>37</td>
</tr>
<tr>
<td>Lean period flow, days</td>
<td>60</td>
<td>240</td>
</tr>
<tr>
<td>Vegetation cover, %</td>
<td>10</td>
<td>80</td>
</tr>
</tbody>
</table>

### Site

<table>
<thead>
<tr>
<th>Site</th>
<th>Ca</th>
<th>Mg</th>
<th>SO₄</th>
<th>HCO₃</th>
</tr>
</thead>
<tbody>
<tr>
<td>Treated oldmine</td>
<td>74</td>
<td>34</td>
<td>138</td>
<td>131</td>
</tr>
<tr>
<td>Untreated oldmine</td>
<td>188</td>
<td>39</td>
<td>240</td>
<td>98</td>
</tr>
<tr>
<td>Untreated fresh mine</td>
<td>389</td>
<td>120</td>
<td>756</td>
<td>77</td>
</tr>
<tr>
<td>Baldi river</td>
<td>80</td>
<td>34</td>
<td>142</td>
<td>152</td>
</tr>
<tr>
<td>Water quality standards</td>
<td>75</td>
<td>50</td>
<td>250</td>
<td>500</td>
</tr>
</tbody>
</table>

- Debris flow decreased from 550 t ha⁻¹yr⁻¹ before treatment to about 8 t ha⁻¹yr⁻¹.
- The quality of runoff improved considerably and was within permissible limits and the flow became perennial.
- Water quality (for drinking) of the treated mined area improved considerably.
Impact of rehabilitation measures

• Vegetal cover increased from 10% to >80% over a period of 14 years

• After 14 years of, pH of the minespoil came down by 0.6 units (8.1 to 7.5), OC increased from 0.13 to 0.42%, whereas CaCO$_3$ content decreased from 54.6 to 31.0% and bulk density from 1.63 to 1.47 Mg m$^{-3}$ which showed that planting of MPTS, shrubs and grasses helped in improvement of soil characteristics over a period of time.

• Also, there was considerable decrease in the equivalent slope of land from 38% to 19% and the resultant runoff and soil loss with adoption of mechanical and biological measures.
### PART II: Restoration of mining lands through Agroforestry Interventions in India—some more examples

<table>
<thead>
<tr>
<th>Mine Spoil Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bauxite mined area of MP</td>
<td>Bauxite-mined area in Madhya Pradesh</td>
</tr>
<tr>
<td>2. Coal mine spoils of Madhya Pradesh</td>
<td>Coal mine spoils in Madhya Pradesh</td>
</tr>
<tr>
<td>3. Rock - phosphate mine spoils of Mussoorie, Uttarakhand</td>
<td>Rock phosphate mine spoils in Mussoorie, Uttarakhand</td>
</tr>
<tr>
<td>4. Lignite mine spoils of Tamil Nadu</td>
<td>Lignite mine spoils in Tamil Nadu</td>
</tr>
<tr>
<td>5. Mica, Cu, tungsten, marble, dolomite, limestone, etc. minespoils of Rajasthan</td>
<td>Mica, Cu, tungsten, marble, dolomite, limestone, etc. minespoils in Rajasthan</td>
</tr>
<tr>
<td>6. Iron ore wastes of Odisha</td>
<td>Iron ore wastes in Odisha</td>
</tr>
<tr>
<td>7. Hematite/magnetite, Manganese spoils from Karnataka</td>
<td>Hematite/magnetite, Manganese spoils in Karnataka</td>
</tr>
<tr>
<td>8. Mined Areas of Megalahalli, Chitradurga, Karnataka</td>
<td>Mined areas in Megalahalli, Chitradurga, Karnataka</td>
</tr>
</tbody>
</table>
Rehabilitation of mine wastelands in Rajasthan

Specifications and salient technical features:

- The land is reshaped into terraces and slopes for rainwater harvesting and terraces for transplanting seedlings.
- Planting pits (60 cm³) at 3 m spacing in rows 9 m apart filled up with growing medium [mixture of fine sand /farm soil and FYM in 2:1 ratio].
- 8 species of trees and 7 of shrubs planted at 3 - 5 m in a row which could be 6 - 9 m apart.
- The interspaces grown with forage grasses, perennial medicinal plants and cucurbitaceous vegetables and cereals e.g. pearl millet.

Performance results: After 2-3 years of Rehabilitation

- Within 3 years, area rehabilitated.
- Trees and shrubs attain 2-4 m height and 1-4 m² canopy cover.
- Forage grasses, cereals and other intercrops grew successfully.
Rehabilitation of mine wastelands in Rajasthan Cont...

Technological interventions Impact:

Before Mining - on an av. farmer could produce about 1.50 q pearl millet & 3.50 q legume ha-1

After Mining - These lands remain barren and unproductive

After rehabilitation - It was possible to obtain about 5-7 tons of wood per ha

- Cultivation of crops between the 2 rows of trees could also produce about 150-200 kg ha-1 pearl millet.
- Additionally, *Cenchrus ciliaris* yielding about 1.5-2 tons ha-1 could also be produced from inter tree space
Rehabilitation of mine wastelands in Rajasthan

Social/environmental/other benefits:

- Arid ecosystem gets ecological stability on sustainable basis only with perennial plants.
- The technology provided a perennial plant cover of trees, shrubs and grasses, which has survived for the last 10 years.
- After land is acquired for mining, the land holder becomes landless. The compensation amount paid to the land owner gets exhausted due to poor fiscal control in villages.
- Consequently, these land owners later become labourers.
- By rehabilitation, lands become suitable for Agroforestry and silvipasture development providing much needed life support in the fragile arid ecosystem.
Development of Mined areas through Agroforestry

Afforestation Activities in Mined Areas

Regulation of Sliding in Mined Areas

Establishment of Plantations in Mined Areas of Megalahalli, Chitradurga, Karnataka
### Plant species suitable for revegetation of mine spoils

<table>
<thead>
<tr>
<th>Mine Spoil Category</th>
<th>Suitable Plant Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Bauxite mined area of MP</td>
<td><em>Grevillea pteridifolia</em>, <em>Eucalyptus camaldulensis</em>, <em>Pinus</em> spp., <em>Shorea robusta</em></td>
</tr>
<tr>
<td>2. Coal mine spoils of Madhya Pradesh</td>
<td><em>Eucalyptus hybrid</em>, <em>Eucalyptus camaldulensis</em>, <em>Acacia auriculiformis</em>, <em>Acacia nilotica</em>, <em>Dalbergia sissoo</em>, <em>Pongamia pinnata</em></td>
</tr>
<tr>
<td>3. Lime stone mine spoils of outer Himalayas, Uttarakhand</td>
<td><em>Salix tetrasperma</em>, <em>Leucaena leucocephala</em>, <em>Bauhinia retusa</em>, <em>Acacia catechu</em>, <em>Erythrina suberosa</em>, <em>Ipomea carnea</em>, <em>Agave</em>, <em>Eulaliopsis binata</em>, <em>Chrysopogon fulvus</em>, <em>Arundo donax</em>, <em>Pennisetum purpureum</em></td>
</tr>
<tr>
<td>4. Rock - phosphate mine spoils of Mussoorie, Uttarakhand</td>
<td><em>Pennisetum purpureum</em>, <em>Saccharum spontaneum</em>, <em>Vitex negundo</em>, <em>Rumex hastatus</em>, <em>Mimosa himalayana</em>, <em>Buddleja asiatica</em>, <em>Dalbergia sissoo</em>, <em>Acacia catechu</em>, <em>Leucaena leucocephala</em> and <em>Salix tetrasperma</em></td>
</tr>
<tr>
<td>5. Lignite mine spoils of Tamil Nadu</td>
<td><em>Ailanthus excelsa</em>, <em>Acacia holosericea</em>, <em>A. auriculiformis</em>, <em>Eucalyptus</em> spp., <em>Leucaena leucocephala</em> and <em>Agave</em></td>
</tr>
<tr>
<td>6. Mica, copper, tungsten, marble, dolomite, limestone, etc. minespoils of Rajasthan</td>
<td><em>Acacia tortilis</em>, <em>Prosopis juliflora</em>, <em>Acacia senegal</em>, <em>Salvadora oleoides</em>, <em>Tamarix, articulata</em>, <em>Zizyphus nummularia</em>, <em>Grewia tenax</em>, <em>Cenchrus setigerus</em>, <em>Cymbopogon</em>, <em>Cynodon dactylon</em>, <em>Sporobolus marginatus</em>, <em>D.annulatum</em>, tc.</td>
</tr>
<tr>
<td>7. Iron ore wastes of Odisha</td>
<td>Subabul, local plant species, etc.</td>
</tr>
<tr>
<td>8. Hematite/magnetite, Mangane spoils from Karnataka</td>
<td><em>Albizia lebbeck</em>, local plant species, etc.</td>
</tr>
</tbody>
</table>
Conclusion

- The efforts were successful in the development of cost effective, and site specific rehabilitation measures.
- The treated sites have now started generating additional reserves of water for irrigation, fuelwood, fodder, fibre and timber on sustainable basis.
- The techniques have restored the ecology of the area, ameliorated soil characteristics and improved the socio-economic conditions of the local people.
- Restoration of mining lands through Agroforestry Interventions in India for Sustainable Development Framework for the Mining Sector.

- Meeting INDC targets

**Post 2020 Climate Action Plan:** India commits to 35% cut in emission rate by 2030 from 2005 levels through creating additional C sink -2.5 to 3 billion t CO₂ by increasing forest & tree cover

**Thank You!**

*Winner of drawing competition Delhi WCA3: Km. V. Niharika from Pudur, Coimbatore, Tamil Nadu*
Presentation on Star Rating of Mines by Shri Subhash Chandra, Joint Secretary, MoM

Star Rating of Mines

Ministry of Mines, Government of India
New Delhi
April 6, 2016

Mining & Sustainability

- Challenges faced by the mining industry
- Environmental & Social Impacts
- Sustainable Development Framework (SDF)
- Balancing a productive mining industry and sustainable and vibrant communities
- Planning for sustainable communities
  - Managing the cumulative social, economic and environmental impacts
  - Managing cultural impacts
  - Managing risks
  - Collaborative approach
  - Corporate Social Responsibility
System for ‘Star Rating’

- Efforts and initiatives taken in implementation of a framework for sustainable development.

- One to five stars would be given to the mines. The best performing leases would be given 5 Stars.

- The mining leases would be rated in their category.

- Proposed to be instituted for the major mineral mines.

- The mining leases to be operational for more than 180 days.
Principles for Evaluation

- The management of impact by carrying out scientific and efficient mining.
- Addressing social impacts of our resettlement and rehabilitation requirements for taking up mining activities,
- Local community engagements and welfare programmes,
- Steps taken for progressive and final mine enclosure
- Adoption of international standards

Design of Evaluation Template

- Evaluation of the SDF implementation in the mining lease.
- The template will have to be filled by the lessee
- Attested by empanelled agencies/institutions viz. ISM Dhanbad, MMGI, IIT-Kharagpur IIT-BHU, IEI and mining departments of other national/regional engineering colleges.
- The certification may be done by the empanelled agencies on remuneration basis.
- A provisional ‘Star Rating’ would be awarded to the mining lease after their due submission of the attested template for star rating.
Design of Evaluation Template | (Contd.)

- Confirmation of star rating upon the due verification in the next inspection by IBM official.
- If any information given in the template is found grossly incorrect during the IBM inspection, the lessee, as well as the certifying institution/agency would be penalized.
- Draft evaluation template
- Widely circulated to various institutions and agencies
- Evaluation template finalised with the approval of the Minister
- Hosted on the website of the Ministry for comments & suggestions from stakeholders

Design of Evaluation Template | (Contd.)

- Should have objectivity and uniformity applicability across the leases of varying sizes
- The various modules and their activities included for evaluation
- The inter-se weightages and rating points should be balanced
- NISG to develop web portal for online template
- A stakeholder consultation workshop on 19th April, 2016 at FIMI House, New Delhi.
# Evaluation Template

| General Information | • Lease area details  
|                     | • Lease area utilisation  
|                     | • Royalty & other contributions:  
|                     | • Statutory compliances  
| Managing Impacts at the Mine Level | • Spending towards SDF  
|                                   | • Exploration Activity  
|                                   | • Zero Waste Mining  
|                                   | • Mineral Conservation  
|                                   | • Mining operation: Opencast & Underground  
|                                   | • Other facets of mining & environment compliances  
|                                   | • Ground water monitoring  
|                                   | • Water Usage  
|                                   | • Green Energy sourcing  

# Evaluation Template | (Contd.)

| Addressing Land, Resettlement and other Social Impacts | • Stakeholder participation  
|                                                        | • Grievance redressal  

| Community Engagement Benefit Sharing Contribution to Socio-economic Development | • Support to Health & Medical Services  
|                                                                                   | • Support to Skill development & Education  
|                                                                                   | • Social & Livelihood Support  
|                                                                                   | • Support to Transportation Services & Infrastructure  
|                                                                                   | • Sourcing of manpower amongst locals (from the district) in the mines  

Evaluation Template | (Contd.)

Final & Progressive Mine Closure

- Backfilling followed by agriculture and tree plantation
- Water Reservoir, ground water recharge, and pisciculture, if applicable
- Landscape restoration & rehabilitation of ecology & biodiversity
- Dump area stabilisation and development
- Construction of check dams or garland drains or retaining walls if applicable
- Environmental Monitoring (Core zone and buffer zone separately)
  - Ambient air quality-
  - Water quality
  - Noise level
  - Ground vibration

Adoption of International standards

- QMS (ISO_9001)
- EMS (ISO-14001)
- Social Accountability (8000)
- OHSAS (ISO-18001)
- Any other related standard

Overall performance & Star Rating

<table>
<thead>
<tr>
<th></th>
<th>Module-I</th>
<th>Module-II</th>
<th>Module-III</th>
<th>Module-IV</th>
<th>Module-V</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weightage in percentage</td>
<td>30</td>
<td>20</td>
<td>20</td>
<td>20</td>
<td>10</td>
<td>100</td>
</tr>
<tr>
<td>Maximum Marks</td>
<td>100</td>
<td>30</td>
<td>45</td>
<td>45</td>
<td>30</td>
<td></td>
</tr>
<tr>
<td>Applicable Marks</td>
<td>a</td>
<td>b</td>
<td>c</td>
<td>D</td>
<td>e</td>
<td></td>
</tr>
<tr>
<td>Marks Obtained</td>
<td>v</td>
<td>w</td>
<td>x</td>
<td>y</td>
<td>z</td>
<td></td>
</tr>
<tr>
<td>Weight % of Marks</td>
<td>( \frac{v \times 30 + (w \times 20) + (x \times 20) + (y \times 20) + (z \times 10)}{(a \times 30) + (b \times 20) + (c \times 20) + (d \times 20) + (e \times 10)} \times 100 )</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
### Criteria for Star Rating

<table>
<thead>
<tr>
<th>Weight % of Marks obtained</th>
<th>Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>90-100%</td>
<td>5 Star</td>
</tr>
<tr>
<td>Between 80-89%</td>
<td>4 Star</td>
</tr>
<tr>
<td>Between 60-79%</td>
<td>3 Star</td>
</tr>
<tr>
<td>Between 50-59%</td>
<td>2 Star</td>
</tr>
<tr>
<td>25-49%</td>
<td>1 Star</td>
</tr>
<tr>
<td>&lt; 25%</td>
<td>No rating</td>
</tr>
</tbody>
</table>

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Thank You
RULE 45 OF MINERAL CONSERVATION & DEVELOPMENT RULES, 1988

PRESENTED BY

R.K. SINHA
CONTROLLER GENERAL
INDIAN BUREAU OF MINES

BACKGROUND


- Accordingly, IBM constituted a committee to Review Forms/Returns/Notices, on 24.7.2014.

- IBM has reviewed all returns of MCDR, 1988.

- This presentation is mainly concentrated on the returns under Rule 45 of MCDR, 1988.
CURRENT STATUTE

- As per Rule 45(1) & 45(2)
  - the owner, agent, mining engineer or manager of every mine
  - or any person or company engaged in trading or storage or end-use or export of the mineral mined in the country,
  - shall register himself through Form M with Indian Bureau of Mines.
  - the registration number to be used for all purposes of reporting and correspondence connected therewith.
  - registration to be applied within one month from the date of commencement of these rules [9.2.2011]
  - electronic registration not necessary

CURRENT STATUTE

- Total number of registration granted to the mining lessees so far by IBM is 8797 (up to February, 2016).

- Total registration granted to the person or company engaged in trading or storage or end-use or export of the mineral mined in the country, is 10539 (up to February, 2016).

- Almost all existing mining companies dealing in MCDR minerals are registered
PROPOSED AMENDMENT IN RULE 45

The Rule 45(2), to be read as below:
➢ For the purpose of registration under sub-rule (1), the owner, agent, mining engineer or manager of every mine,
➢ or any person or company engaged in trading or storage or end-use or export of minerals,
➢ shall apply for registration, in electronic form,
➢ within one month from the date of registration of lease deed
➢ or before the commencement of trading operation or storage or end-use or export of minerals, as the case may be.

CURRENT STATUTE

➢ As per Rule 45(5) the owner, agent, mining engineer or manager of every mine, to submit monthly and annual returns in the prescribed format to the Regional Controller of Mines in the Indian Bureau of Mines or any other authorized official of the IBM.
PROPOSED AMENDMENT IN RULE 45

- The Rule 45(5), to be read as below,

  - The owner, agent, mining engineer or manager of every mine, shall submit

  - **online** returns in respect of each mine to the Regional Controller of Mines in the Indian Bureau of Mines or any other authorised official of the Indian Bureau of Mines.

CURRENT STATUTE

- As per Rule 45(5) the owner, agent, mining engineer or manager of every mine, to submit monthly and annual returns in the prescribed format to the Regional Controller of Mines in the Indian Bureau of Mines or any other authorized official of the IBM.
CURRENT STATUTE

- As per Rule 45(5)(a), the Monthly Return shall be submitted to Regional Controller of Mines or the authorized officer of IBM before the 10th of every month in respect of preceding month in the Form as indicated below:
  
  (i) for iron ore in Form F-1;
  (ii) for manganese ore in Form F-2;
  (iii) for bauxite and laterite in Form F-3;
  (iv) for chromite in Form F-4;
  (v) for copper, lead, zinc, pyrite, gold, tin and tungsten in Form F-5;
  (vi) for mica in Form F-6 (now declared as minor mineral)
  (vii) for precious and semi-precious stones in Form F-7 and
  (viii) for all other minerals in Form F-8.

PROPOSED AMENDMENT IN RULE 45

- Under Rule 45(5)(aa), only three monthly returns are prescribed as below:
  
  (i) For all minerals except copper, gold, lead, pyrite, tin, tungsten, zinc, precious and semi-precious stones in the Form F-1;
  (ii) For copper, gold, lead, pyrite, tin, tungsten, zinc, in the Form F-2 and
  (iii) For precious and semi-precious stones in the Form F-3.
CURRENT STATUTE

As per Rule 45(5)(b), the Annual return shall be submitted to Regional Controller of Mines or the authorized officer of IBM before the 1st July every year in respect of preceding financial year in the Form as indicated below:

(i) for iron ore in Form H-1;
(ii) for manganese ore in Form H-2;
(iii) for bauxite and laterite in Form H-3;
(iv) for chromite in Form H-4;
(v) for copper, lead, zinc, pyrite, gold, tin and tungsten in Form H-5;
(vi) for mica in Form H-6; (now declared as minor mineral)
(vii) for precious and semi-precious stones in Form H-7 and
(viii) for all other minerals in Form H-8.

PROPOSED AMENDMENT IN RULE 45

Under Rule 45(5)(b), only three Annual Returns are prescribed as below:

(i) For all minerals except copper, lead, zinc, pyrite, gold, tin, tungsten, precious and semi-precious stones in the Form H-1;
(ii) For copper, lead, zinc, pyrite, gold, tin, tungsten, in the Form H-2;
(iii) For precious and semi-precious stones in the Form H-3.
CURRENT STATUTE

- As per Rule 45(6), any person or company engaged in trading or storage or end-use or export of mineral shall submit monthly return in the Form N and Annual Return in the Form O to Indian Bureau of Mines and concerned State Government.

- Monthly return to be submitted before the 10th of every month in respect of preceding month in Form N;

- Annual return to be submitted before the 1st July each year for the preceding financial year in the Form O.

PROPOSED AMENDMENT IN RULE 45

- The new sub-rule 45(5)(a) is introduced which states that a daily return shall be submitted through mobile app of IBM latest by 1800 hour of the following day.

- The daily return comprises of daily grade-wise production, dispatch, sale value and ex-mine price.

- It shall be submitted by mine owner through mobile app of IBM.

- This will be help in knowing the daily production, daily dispatch and ex-mine price of a particular mineral for the particular State Government.
PROPOSED AMENDMENT IN RULE 45

Keeping in view of Royalty issue for beneficiation of low grade iron ore, following additional grades were introduced in the return for iron ore.

Lump
(a) below 51% Fe
(b) 51% to below 55% Fe

Fines
(a) below 51% Fe
(b) 51% to below 55% Fe

PROPOSED AMENDMENT IN RULE 45

- CLO has been introduced as a separate grade to be reported in the return.
- CLO quantity is further bifurcated (grade wise and size wise) as,

  a) Below 62% Fe (any size)
  b) 62% to below 65% Fe (5-18 mm size CLO)
  c) 62% to below 65% Fe (10-40 mm size CLO)
  d) 62% to below 65% Fe (CLO others)
  e) 65% and above Fe (5-18 mm size CLO)
  f) 65% and above Fe (10-40 mm size CLO)
  g) 65% and above Fe (CLO others)
PROPOSED AMENDMENT IN RULE 45

- Run of Mine (ROM) production to be reported without grade wise bifurcation
- Dispatches of ROM to be reported as per their grades in the returns.
- This is applicable for Iron ore and Chromite ore only
- Grade wise Ex-Mine price of ROM ore dispatched, is to be furnished
- Grade wise category of ROM for Iron ore is as,
  a) Below 51% Fe ROM
  b) 51% to below 55% Fe ROM
  c) 55% to below 58% Fe ROM
  d) 58% to below 60% Fe ROM
  e) 60% to below 62% Fe ROM
  f) 62% to below 65% Fe ROM
  g) 65% and above Fe ROM

PROPOSED AMENDMENT IN RULE 45

- Grade wise category of ROM for Chromite ore is as,
  a) Below 40% Cr2O3 ROM
  b) 40% to below 52 % Cr2O3 ROM
  c) 52% and above Cr2O3 ROM
PROPOSED AMENDMENT IN RULE 45

- There is no change in online Form M, N and O.
- The **submission** of returns through **on-line** will be mandatory.
- Print copy of on-line returns is not required to be submitted if the return is submitted with **digital signature**.
- In other case print copy of on-line return is also to be submitted.

PROPOSED AMENDMENT IN RULE 45

- In case of furnishing incomplete or wrong or false information, where mineral is exported, then :
  - Directorate General of Foreign Trade (DGFT) shall order suspension of permits for carrying out such exports of minerals of such person or company engaged in export of minerals,
  - DGFT may revoke the order of suspension only after ensuring proper compliance".
PROPOSED AMENDMENT IN RULE 45

- Concept of sale value is introduced in rule 45(8)
- Sale value is,
  - the gross amount payable by the purchaser as indicated in the sale invoice, where the sale transaction is on an arms’ length basis and the price is the sole consideration for the sale, excluding taxes, if any
  - For the purpose of computing sale value, no deduction from the gross amount shall be made in respect of royalty, payments to the District Mineral Foundation and payments to the National Mineral Exploration Trust

THANKS