

# Introduction to Key Components of Monitoring and Evaluation in Extractive Industries with respect to Environment and Social Safeguards

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# Key Components of Monitoring and Evaluation

## **Basis for Monitoring and Evaluation**

- Laws and Regulations
- Standard/codes/local standard
- Comparison with National Best figure or international benchmark (within sector)
- Consistency with international conventions
- Existing environmental and social stress in the area
- Severity of the impacts (reversible or irreversible)
- Acceptability to local community or general public

# Key Components of Monitoring and Evaluation

At the same time, it is also essential to find out the answers to the following three questions:

- Are there any impacts?
- If yes, are these likely to be significant?
- If yes, are these significant effects likely to occur?
- Is their probability high, moderate or low?

# Stages of mine development

- **PROSPECTING** or search for deposits
- **EXPLORATION:** Once the deposit is assured, this is done to assess the size, shape, location and economic value of the deposit.
- **DEVELOPMENT** or the work of preparing access to the deposit so that the minerals can be extracted
- **EXPLOITATION** or the extraction of the minerals



# Mining Method

- Mineral excavation – both opencast and underground method is used
- Largely produced by open cast method
- Carried out by following method
  - Drilling and blasting (common conventional mining)
  - Surface mining/bucket wheel excavator/rock breaker

# View of coal mining project





# View of Gold mine





# View of Uranium mine





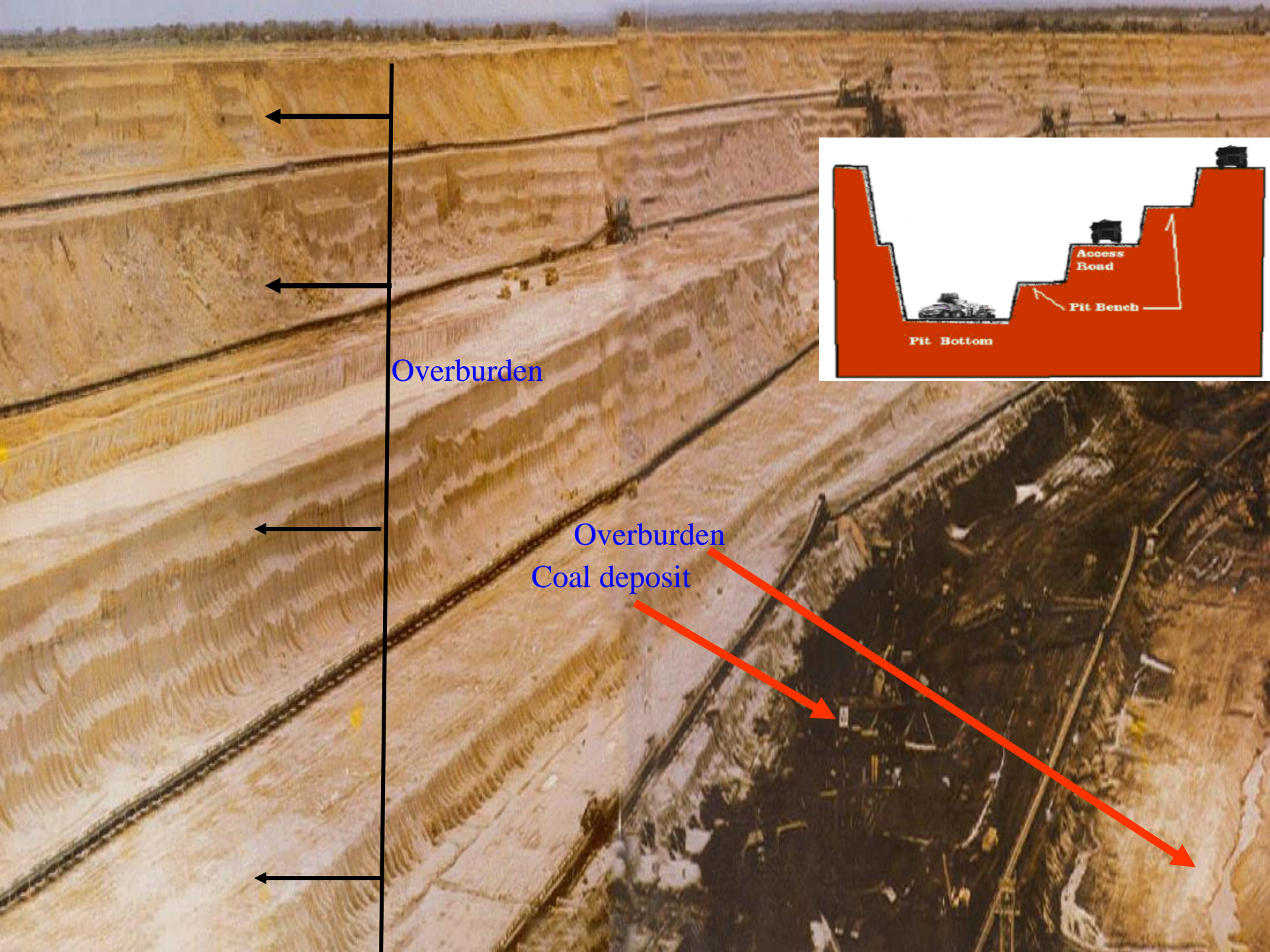
# Conventional Drilling and Blasting





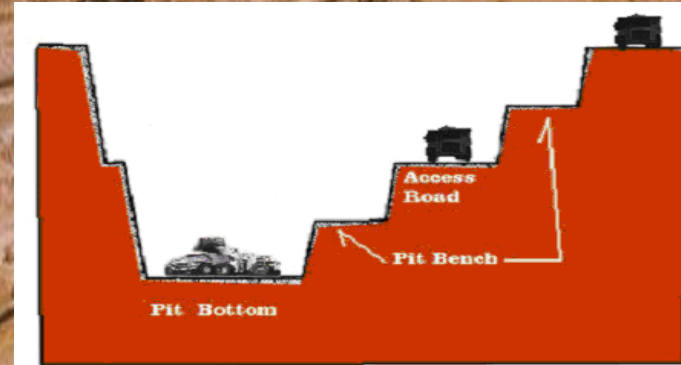
**View of blasting**





Overburden

Overburden  
Coal deposit







L&T 300

सब से बड़ा  
भारत का सबसे बड़ा  
खदान श्रेष्ठ  
प्रसिद्धि में एक एलसी सीरीज  
दो पावर वाहन  
पूर्ण-ऑटो  
केवल अनुमानित ग्राहक  
वाहन से अलग करें।





Direct Tipper Loading By Surface Miner







Bucket wheel excavator



# Rock breaker

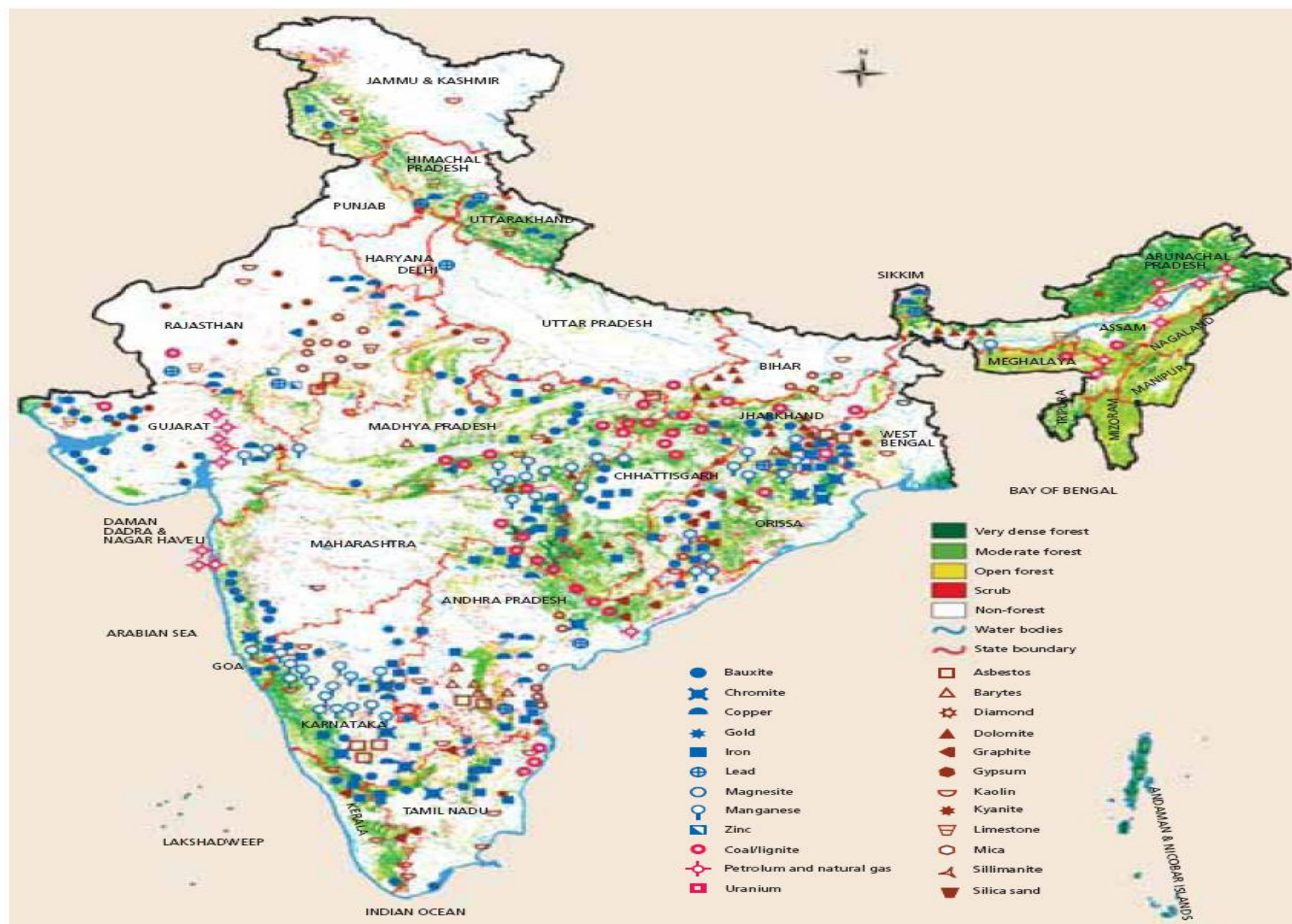


Rock breaker technology can be applied for breaking of rock/coal/ore even about 500 kg/sq.cm.

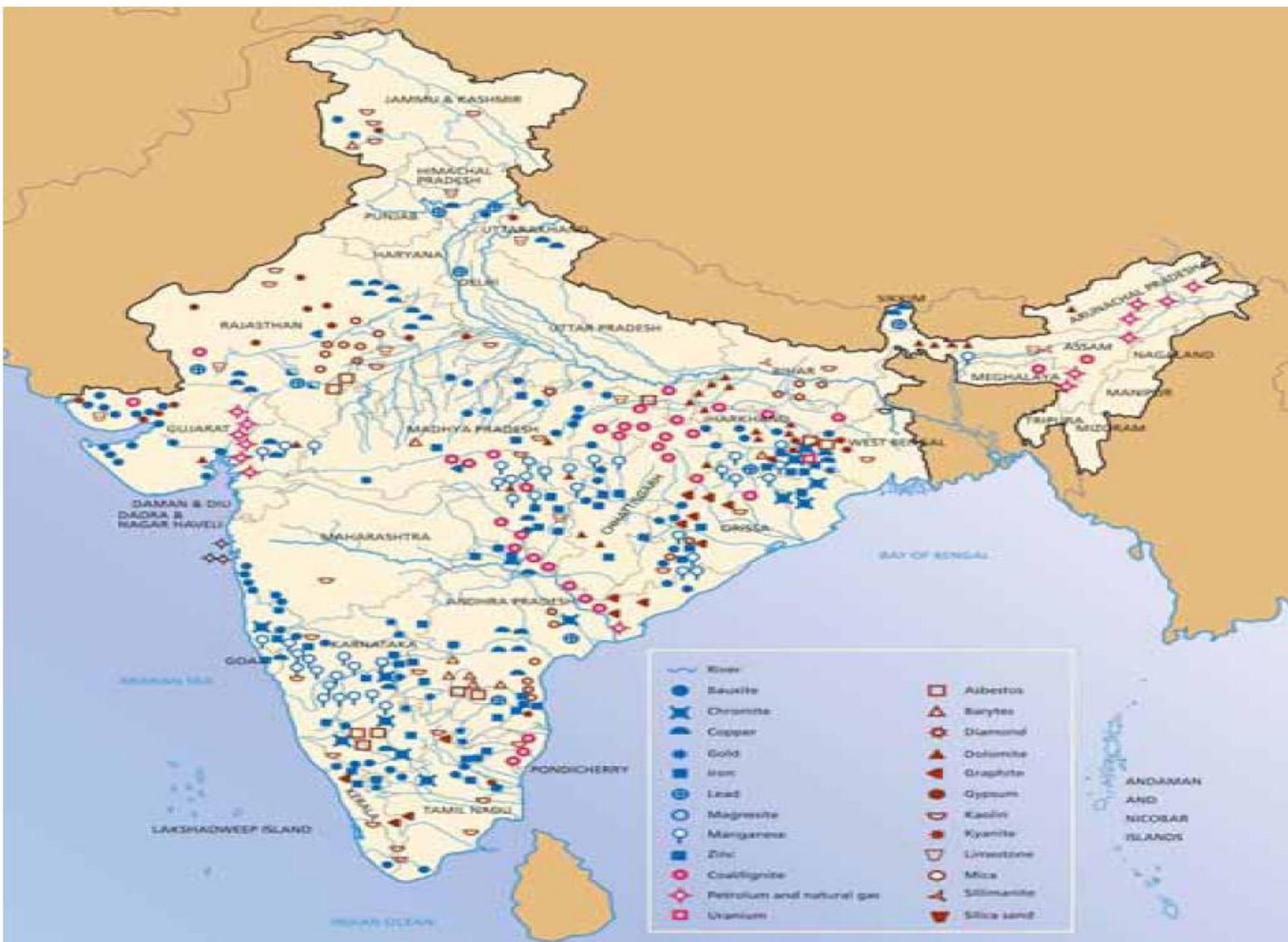
It can be used wherever it is not possible to go for blasting – near vicinity of structures and habitations.



**MAP 1.1: India – forests vs minerals**  
*India's mineral deposits are largely beneath its remaining forests*

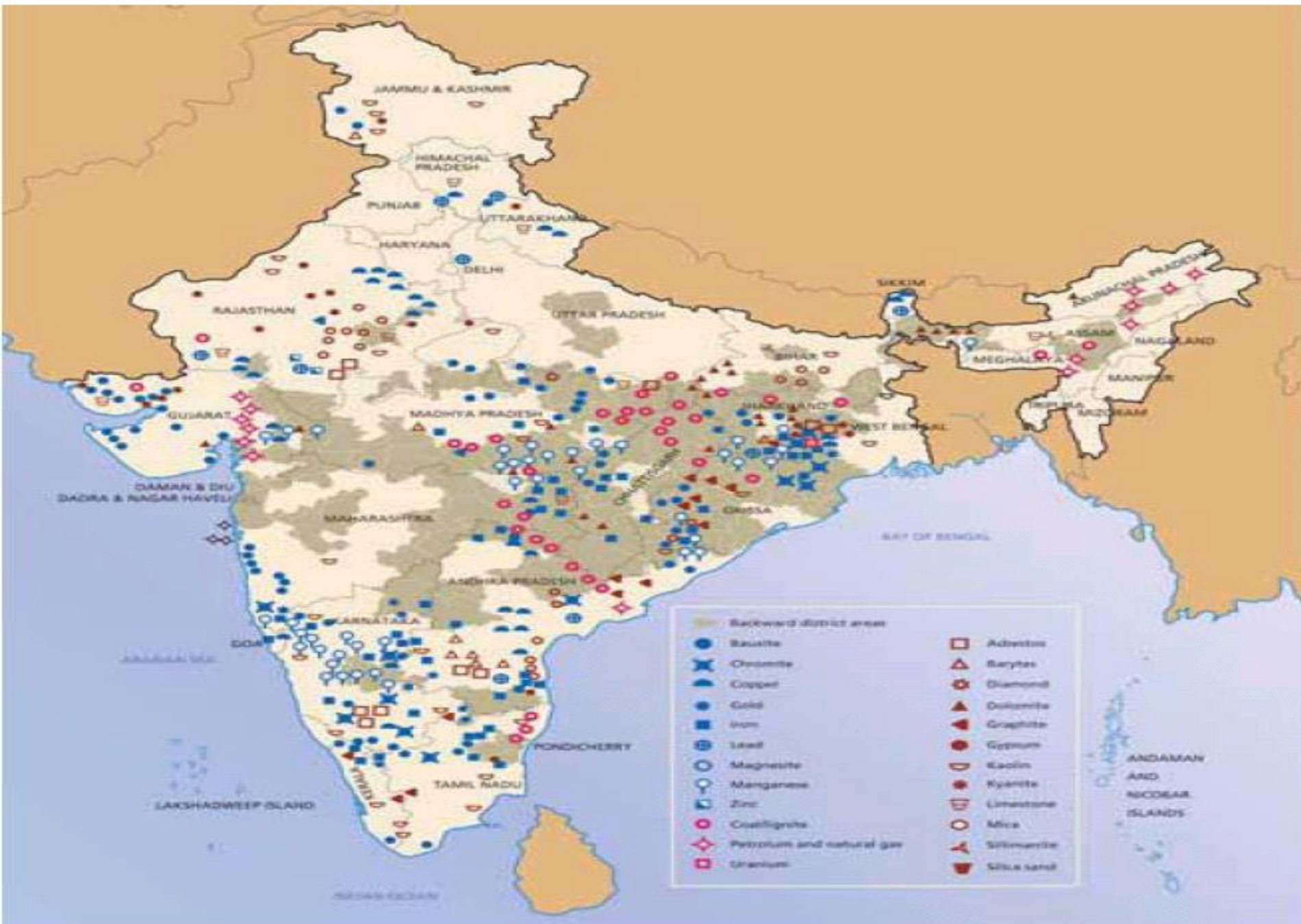


Most mineral reserves in India lie near the origin or in the catchments of rivers



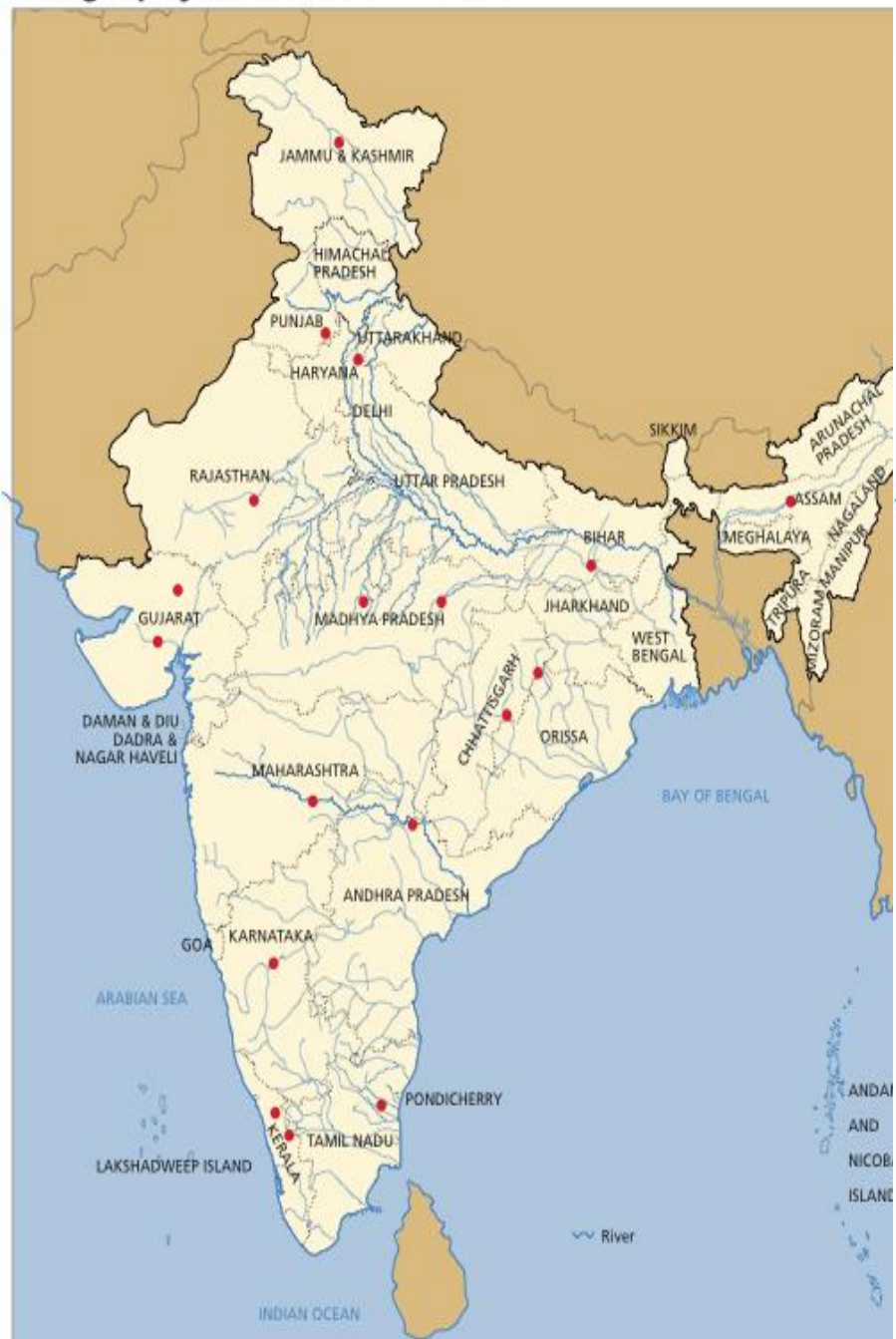


Mineral-bearing districts continue to be among the most backward districts of the country, in spite of the immense wealth they generate

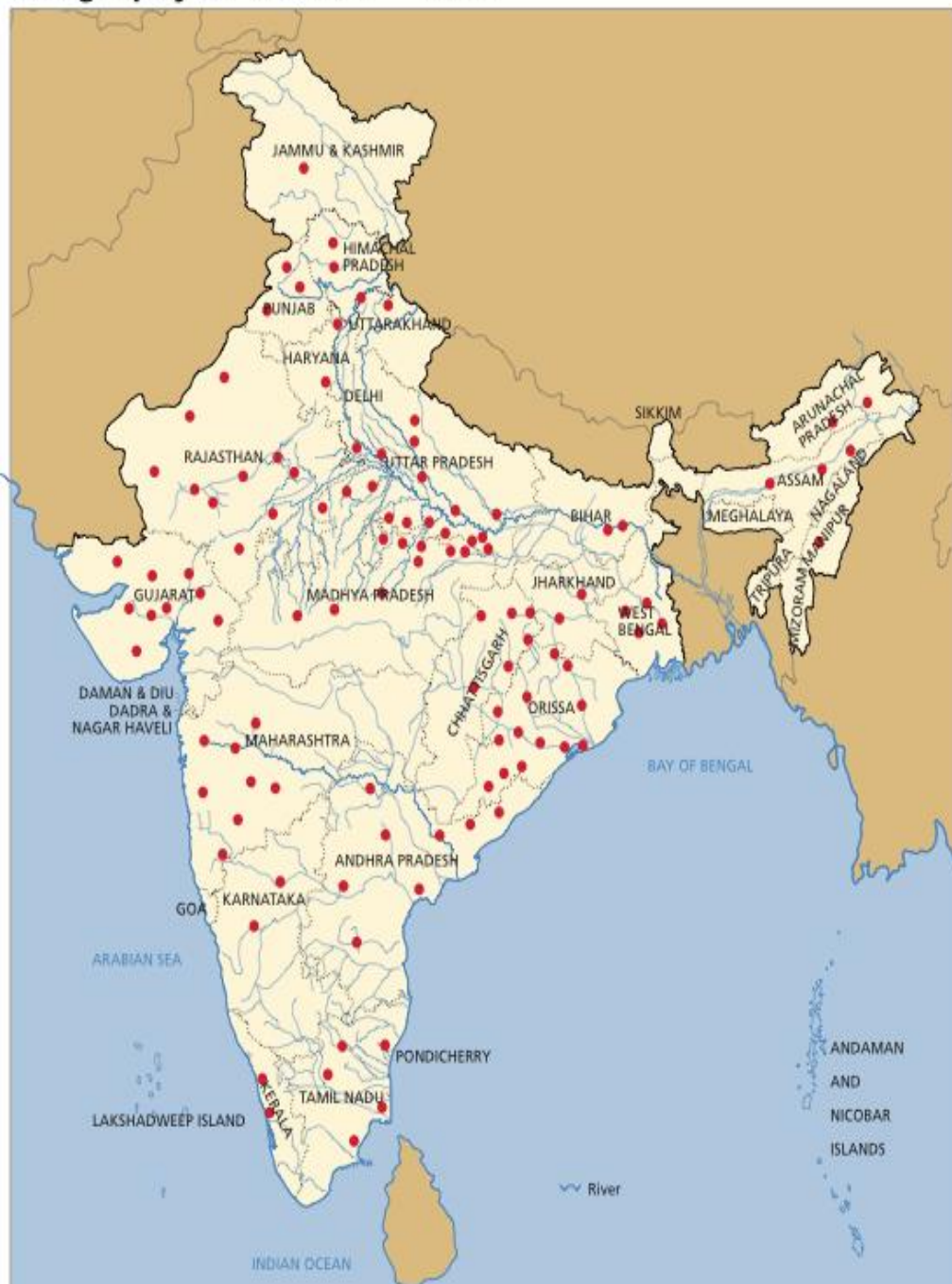


Source: Anon, 2003, 'Identification of districts for wage and self-employment programmes', *Report of the Task Force*, Planning Commission, New Delhi

Geography of conflict — 1991



Geography of conflict — 2011





# Minerals in India

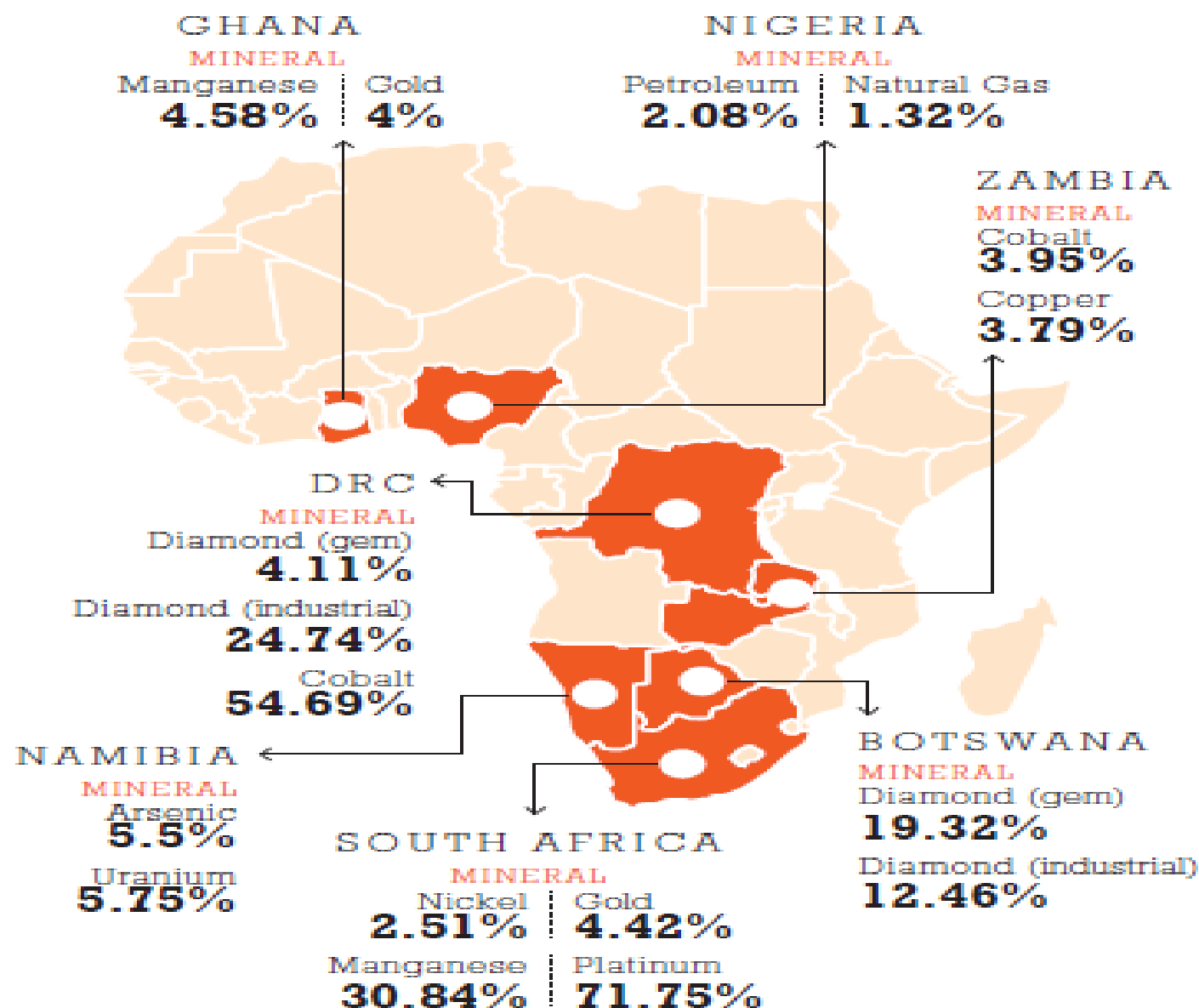
- India produces around 89 minerals
- Four fuels - *coal, lignite, oil and gas*
- 11 metallic - *iron ore, chromite, lead, zinc etc*
- 52 non-metallic - *limestone, dolomite, phosphorite, silica, etc.*
- 22 minor minerals - *stone, sand, marble, sandstone, etc.*

# India's Global Ranking

- 2<sup>nd</sup> largest producer of talc and barytes
- 3<sup>rd</sup> largest producer of chromite, coal and lignite
- 4<sup>th</sup> largest producer of iron ore
- 6<sup>th</sup> largest producer of bauxite and manganese ore

## AFRICA'S CONTRIBUTION TO GLOBAL MINERAL PRODUCTION

The continent of Africa has been bestowed with vast and valuable mineral wealth



# Africa : Mineral Production

- Africa is a resource-rich continent, accounts 30 per cent of the world's mineral reserves.
- Africa produces around 22 per cent of the world's gold
- Globally, the share of Botswana's diamond production is 19.32 per cent (gem)
- DRC provides 54.69 per cent of the world's cobalt.
- South Africa contributes 30.84 per cent and 71.75 per cent to the global manganese and platinum production respectively.
- Zambia's share in the world production of copper is 3.79 per cent.

# Monitoring and Evaluation

# Environmental And Social Risks - Mining Sector

Magnitude of impact of mining on land depends on a number of factors, like

- Existing land use pattern,
- Topography of the area,
- Climatic condition
- Stripping ratio,
- Quarry depth
- Mining Technology

# Environmental And Social Issues Related With Mining sector

## Air pollution

- Mainly in the form of FUGITIVE DUST.
- Most mining operations generate dust –
  - Drilling, blasting,
  - Vehicles movement on haul roads,
  - Collection, transportation and handling of coal
  - Screening, sizing and segregation and storage.

# Environmental Impacts - Air

Fugitive dust from blasting





# Environmental Impacts - Air

Fugitive dust from drilling



# Dust emission during loading operation





# Dust emission during transportation







CONTROL THE RISK AFTER HAZARD IDENTIFICATION  
DMIBITI HATARI BAADA YA KUTAMBUA VIHATARIISHI

309





# Dust emissions during unloading of ore



Dust emissions during unloading of ore





# NATIONAL AMBIENT AIR QUALITY STANDARDS

## CENTRAL POLLUTION CONTROL BOARD

### NOTIFICATION

New Delhi, the 18th November, 2009

No. B-29016/20/90/PCI-I—In exercise of the powers conferred by Sub-section (2) (h) of section 16 of the Air (Prevention and Control of Pollution) Act, 1981 (Act No.14 of 1981), and in supersession of the Notification No(s). S.O. 384(E), dated 11<sup>th</sup> April, 1994 and S.O. 935(E), dated 14<sup>th</sup> October, 1998, the Central Pollution Control Board hereby notify the National Ambient Air Quality Standards with immediate effect, namely:-

## NATIONAL AMBIENT AIR QUALITY STANDARDS

S. No.	Pollutant	Time Weighted Average	Concentration in Ambient Air		
			Industrial, Residential, Rural and Other Area	Ecologically Sensitive Area (notified by Central Government)	Methods of Measurement
(1)	(2)	(3)	(4)	(5)	(6)
1	Sulphur Dioxide (SO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	50 80	20 80	- Improved West and Gaeke -Ultraviolet fluorescence
2	Nitrogen Dioxide (NO <sub>2</sub> ), µg/m <sup>3</sup>	Annual* 24 hours**	40 80	30 80	- Modified Jacob & Hochheiser (Na-Arsenite) - Chemiluminescence
3	Particulate Matter (size less than 10µm) or PM <sub>10</sub> µg/m <sup>3</sup>	Annual* 24 hours**	60 100	60 100	- Gravimetric - TOEM - Beta attenuation
4	Particulate Matter (size less than 2.5µm) or PM <sub>2.5</sub> µg/m <sup>3</sup>	Annual* 24 hours**	40 60	40 60	- Gravimetric - TOEM - Beta attenuation
5	Ozone (O <sub>3</sub> ), µg/m <sup>3</sup>	8 hours* 1 hour**	100 180	100 180	- UV photometric - Chemiluminescence - Chemical Method
6	Lead (Pb) µg/m <sup>3</sup>	Annual* 24 hours**	0.50 1.0	0.50 1.0	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper - ED-XRF using Teflon filter
7	Carbon Monoxide (CO) mg/m <sup>3</sup>	8 hours** 1 hour**	02 04	02 04	- Non Dispersive Infra Red (NDIR) spectroscopy
8	Ammonia (NH <sub>3</sub> )	Annual*	100	100	-Chemiluminescence



(1)	(2)	(3)	(4)	(5)	(6)
9	Benzene (C <sub>6</sub> H <sub>6</sub> ) µg/m <sup>3</sup>	Annual*	05	05	- Gas chromatography based continuous analyzer - Adsorption and Desorption followed by GC analysis
10	Benzo(a)Pyrene (BaP) - particulate phase only, ng/m <sup>3</sup>	Annual*	01	01	- Solvent extraction followed by HPLC/GC analysis
11	Arsenic (As), ng/m <sup>3</sup>	Annual*	06	06	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper
12	Nickel (Ni), ng/m <sup>3</sup>	Annual*	20	20	- AAS /ICP method after sampling on EPM 2000 or equivalent filter paper

\* Annual arithmetic mean of minimum 104 measurements in a year at a particular site taken twice a week 24 hourly at uniform intervals.

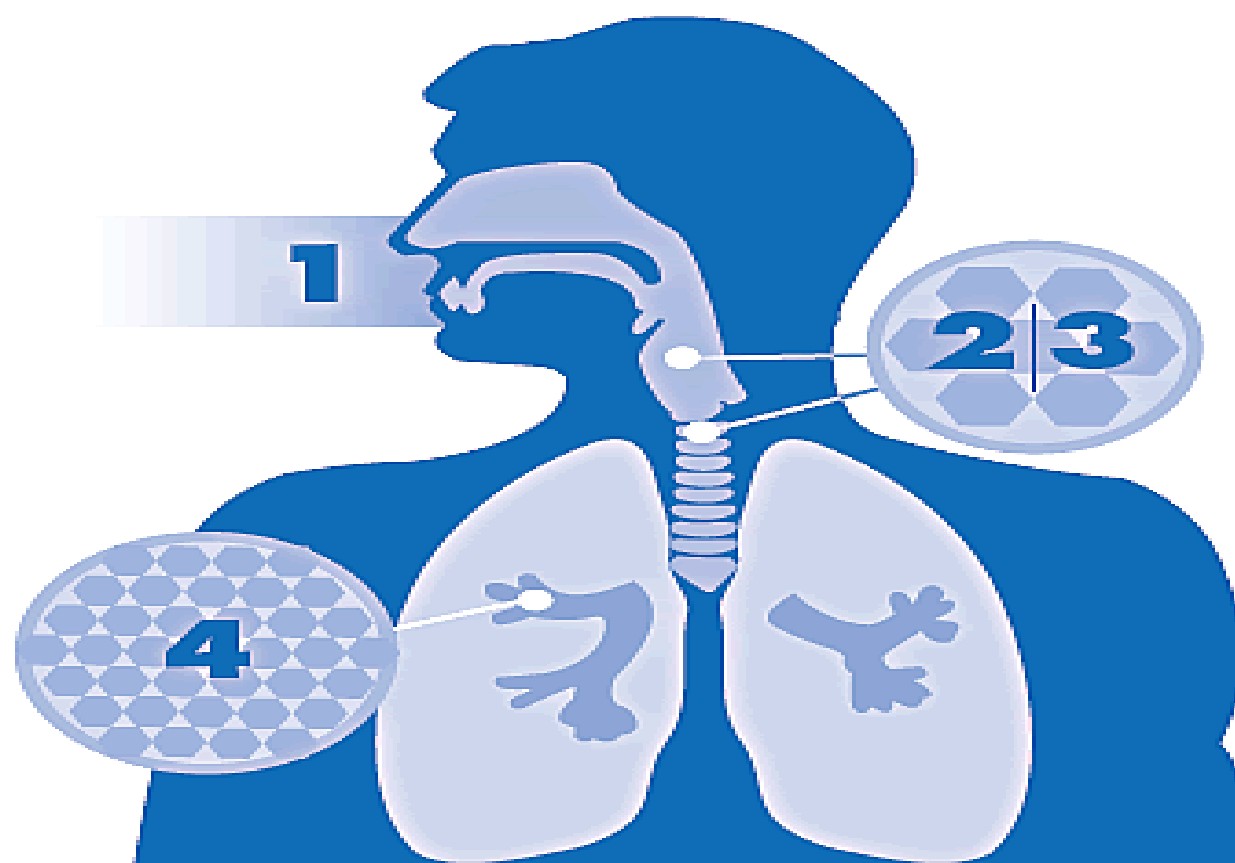
\*\* 24 hourly or 08 hourly or 01 hourly monitored values, as applicable, shall be complied with 98% of the time in a year. 2% of the time, they may exceed the limits but not on two consecutive days of monitoring.

Note. — Whenever and wherever monitoring results on two consecutive days of monitoring exceed the limits specified above for the respective category, it shall be considered adequate reason to institute regular or continuous monitoring and further investigation.

SANT PRASAD GAUTAM, Chairman  
[ADVT-III/4/184/09/Ext.]

**Note:** The notifications on National Ambient Air Quality Standards were published by the Central Pollution Control Board in the Gazette of India, Extraordinary vide notification No(s). S.O. 384(E), dated 11<sup>th</sup> April, 1994 and S.O. 935(E), dated 14<sup>th</sup> October, 1998.

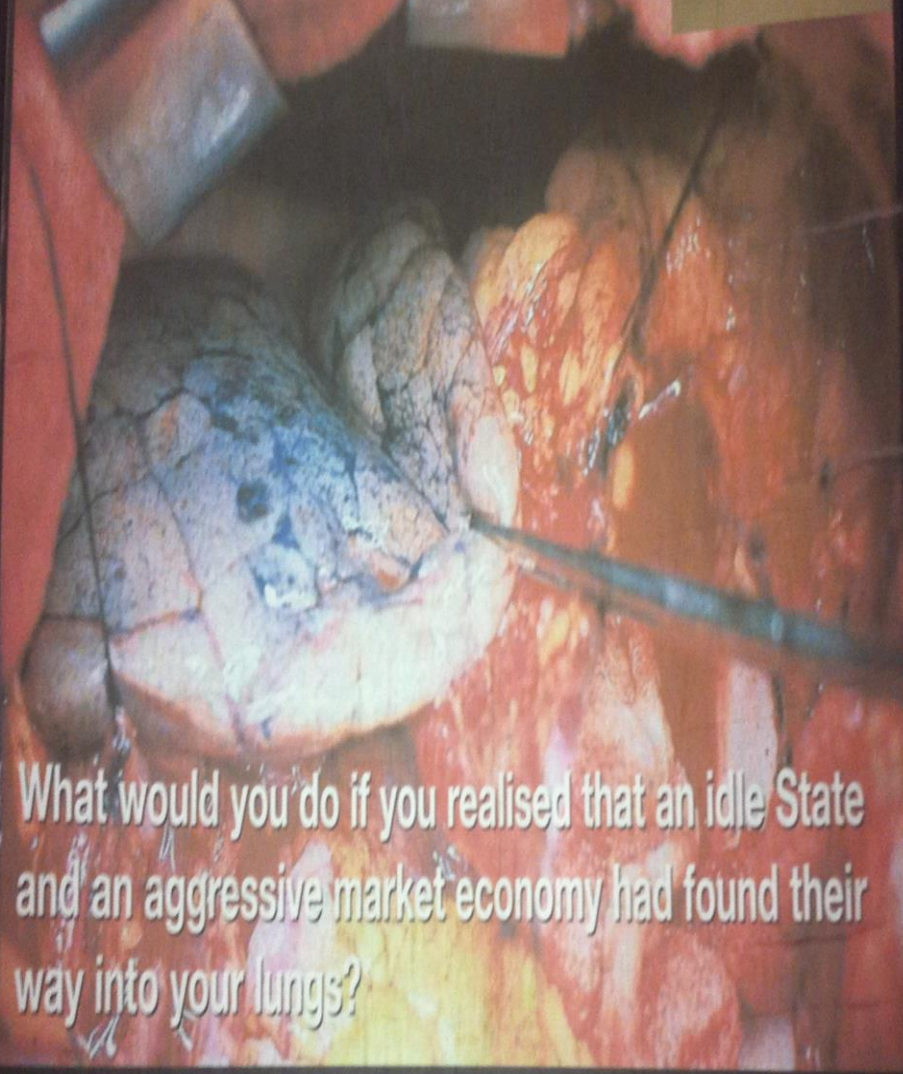
## How Particulate Matter Enters Our Body



- 1** Particulate matter enters our respiratory (lung) system through the nose and throat.
- 2 | 3** The larger particulate matter (PM<sub>10</sub>) is eliminated through coughing, sneezing and swallowing.
- 4** PM<sub>2.5</sub> can penetrate deep into the lungs. It can travel all the way to the alveoli, causing lung and heart problems, and delivering harmful chemicals to the blood system.



# DELHI LUNG



What would you do if you realised that an idle State and an aggressive market economy had found their way into your lungs?

We fought for clean air

and inflicts fatal injuries is unknown to most of us. Surgeons who have the privilege of seeing inside us have a funny story to tell. They can tell, just by looking at the colour of the lungs, whether the person is from a dirty big city or not.

# HIMACHAL LUNG

Actually a shocking tale!

Look at the spotless lung below. The fortunate owner comes from a relatively cleaner place.



Nuisance to local public due to air pollution





## Air pollution - Visibility impact





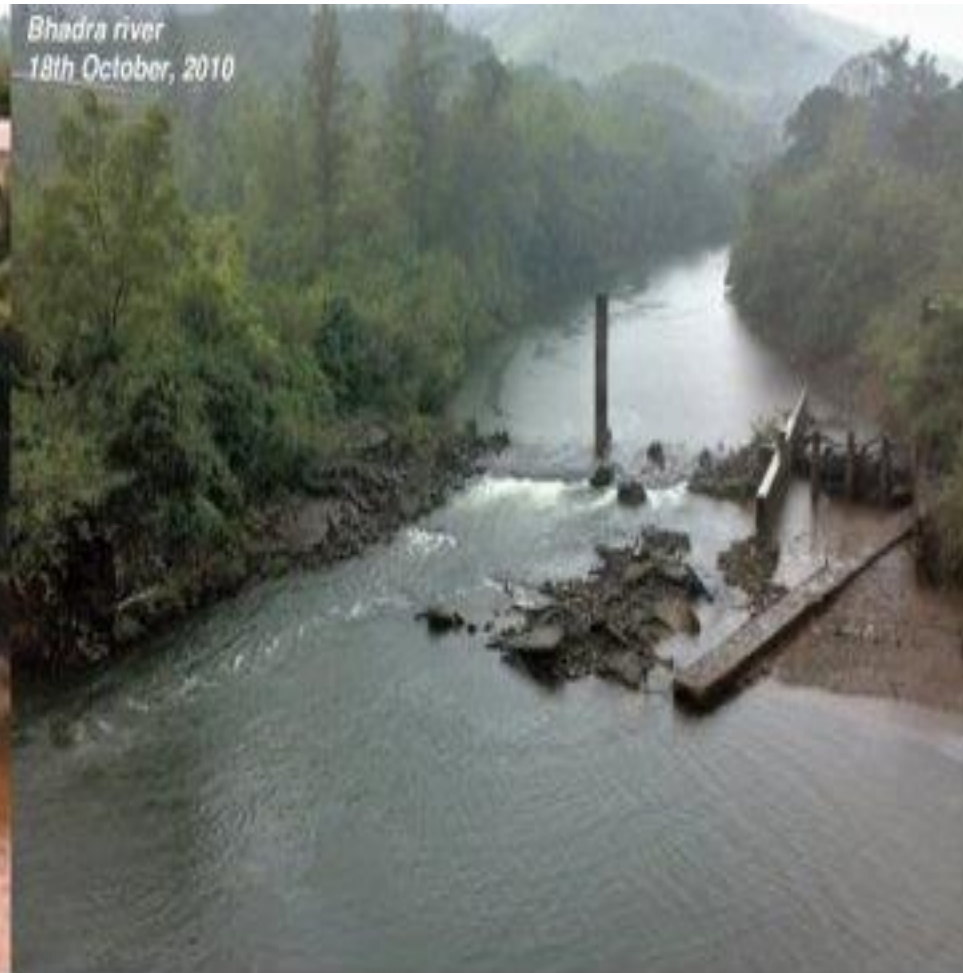
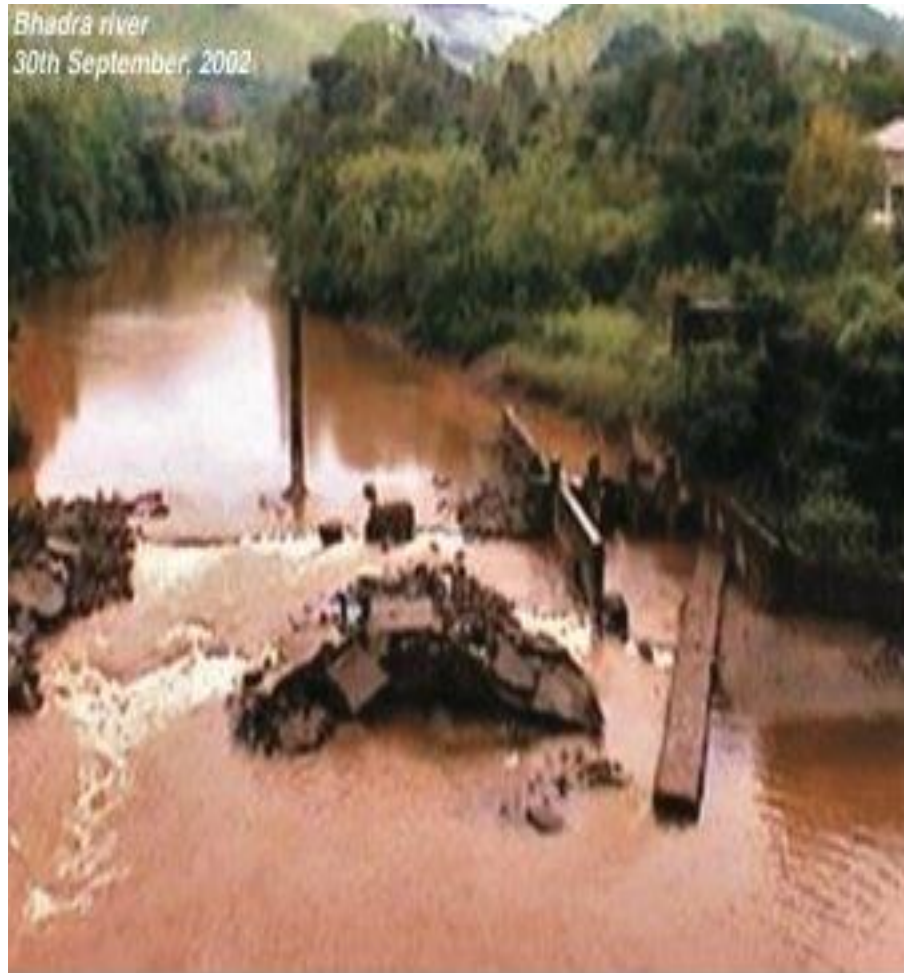


Runoff from the mine change the water quality





# Bhadra River: Supreme Court of India stopped the mining











Impact on river during monsoon











# Minerals and water: Close bond

Mine runoff not only alter water quality but also fills the river with the silt









# Road accident due to loaded truck



# Environmental Impact - Water

- Breaching of groundwater affects the local water availability.
- High risk to alter the water quality of areas e.g. low pH, increase in total solids, TDS and heavy metal concentration.























# Environmental Impact - Waste

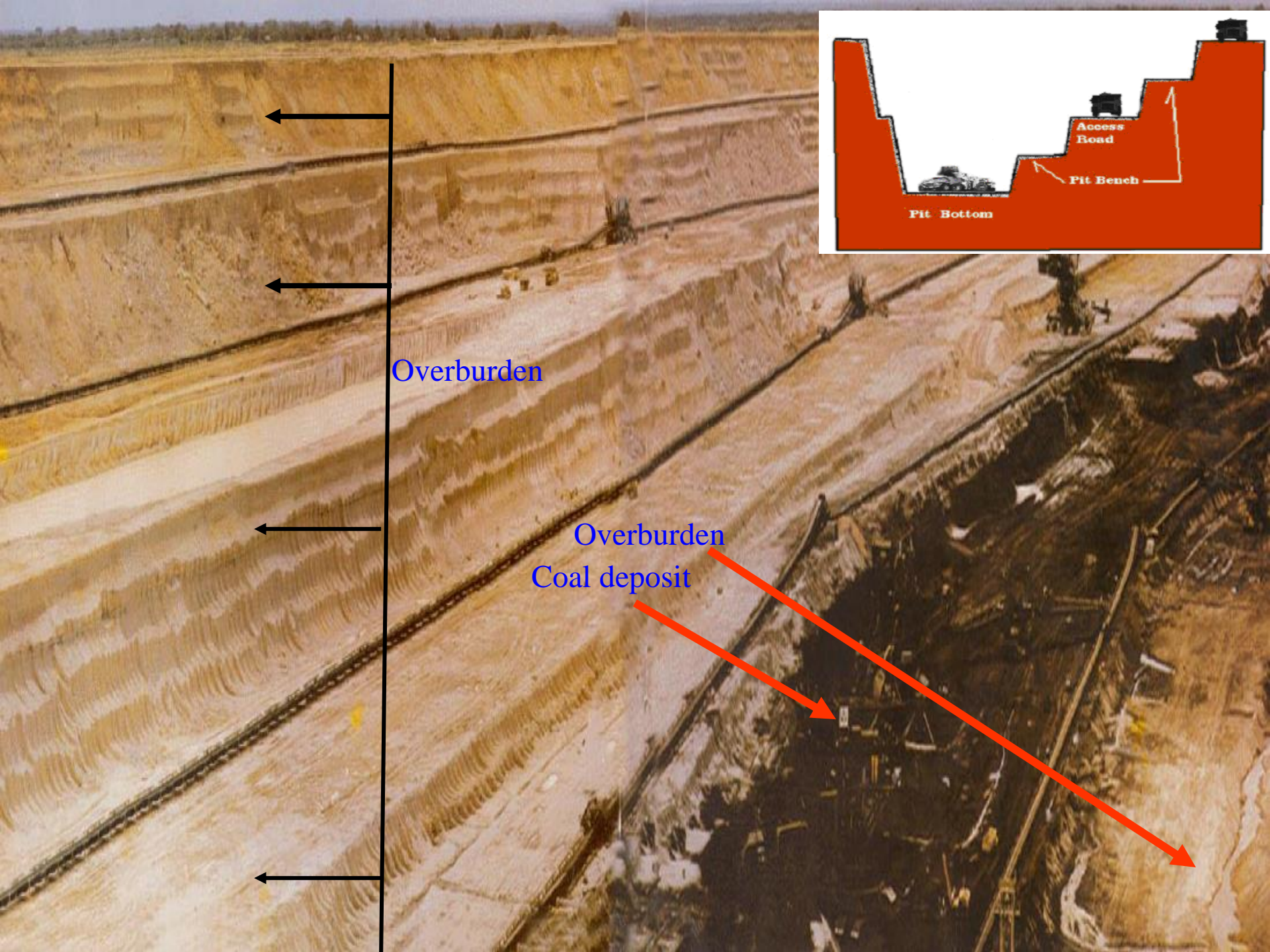
## Solid waste

- Overburden generation is denoted by stripping ratio.
- What is stripping ratio?

*The ratio of overburden that needs to be removed to the amount of ore removed.*

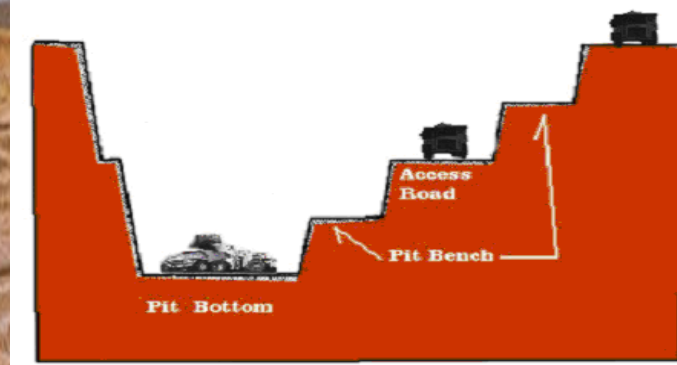
- Major cause of air and water pollution in Indian mines





Overburden

Overburden  
Coal deposit





# View of overburden dump





# View of overburden dump



Change in Water Quality, if OB dumps stacked near river's catchment

OB Dump



pH- 4-5

27 1:59PM





# Tailing pond of Uranium mine





# Tailing pond of Copper mine





# Facts - Waste

- A weak area. Topsoil mostly dumped with overburden with no reuse.



# Environmental Impacts – Noise & Vibration

## Noise

- Cumulative effect of mining activities produces considerable noise.
- Some sources of noise – blasting, drilling, crushing, material handling and movement of vehicles

## Vibrations

- Blasting results in ground vibrations and if there are human habitation nearby, it can destroy property and houses







**RELATED KEYWORDS:** [Rajesh-Karan-Lamba](#) | [Friends](#) | [Chikkajala-Police](#) | [Arun-Chandra-Shetty-Khem-Patalim-Nanda](#)

## Five Bengaluru students drown in abandoned quarry

TNN | Apr 24, 2015, 02:22AM IST

**BENGALURU:** Five engineering students drowned at an abandoned quarry at Chikkajala, off Ballari Road, on Thursday afternoon. The students were part of an eight-member group - all fourth-semester students of electrical and communication at Revana Siddeshwara Engineering College, Chikkajala - who had gone for a swim at the prohibited quarry [f](#) [t](#) .

The students were fascinated by photographs on social media. On Thursday, the group walked to the quarry, just 3 km from their college, and reached the place around 12.30pm.

By Thursday evening, police recovered the bodies of Arun Chandra Shetty, Khem Patalim, Nanda Kumar KR and Rajesh Karan Lamba, all 19. The body of



Five engineering students drowned at an abandoned quarry at Chikkajala, off Ballari Road, on Thursday afternoon.





Police recovering body of students from quarry









Spontaneous  
combustion of coal  
in open cast mine









Learning from good practices

# Best practices in OB stabilization: Jayant Project of North coal field Limited





# Best practices in OB stabilization





# Best practices in OB stabilization



BIOLOGICAL STABILIZATION

















# BEAUTIFUL LANDSCAPE DEVELOPED AT WASTE DUMP





# Toe Wall and Water channels for erosion control





# Garland drain along the boundary







**Toe Wall and Garland drains for erosion control**



# Innovative strategies for restoration of mine dumps

















# A Case Study of Mine Land Reclamation by using geo-textile membrane



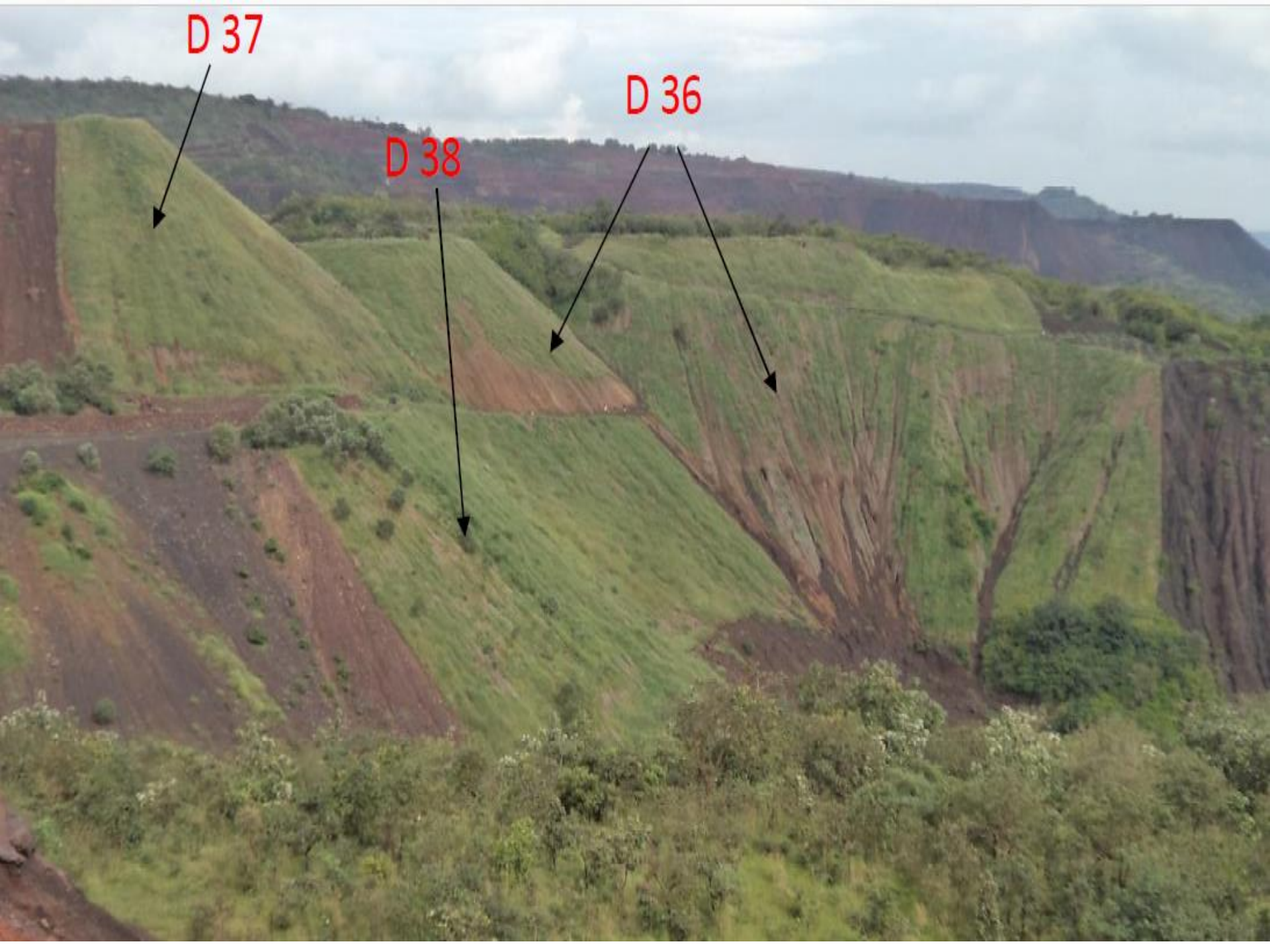




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**BIOLOGICAL ENGINEERING IN OB DUMPS AT PK OC.IV, MANUGURU, KHAMMAM DISTRICT**



**VIEW OF KHAMMAM OPENCAST PROJECT & MALLAMPET**























# Soil conservation and management

- ☐ To store the topsoil for reuse is a good practice
- ☐ Scrap the topsoil prior to drilling and blasting
- ☐ Immediately used for plantation work
- ☐ If topsoil is not used immediately, then it should be staked at a designated area
- ☐ Embankment to prevent erosion and its height should not exceed more than six meter



## Designated soil stacking





# Technical Reclamation: laying of top soil layer over backfilled material







Safe stacking of topsoil



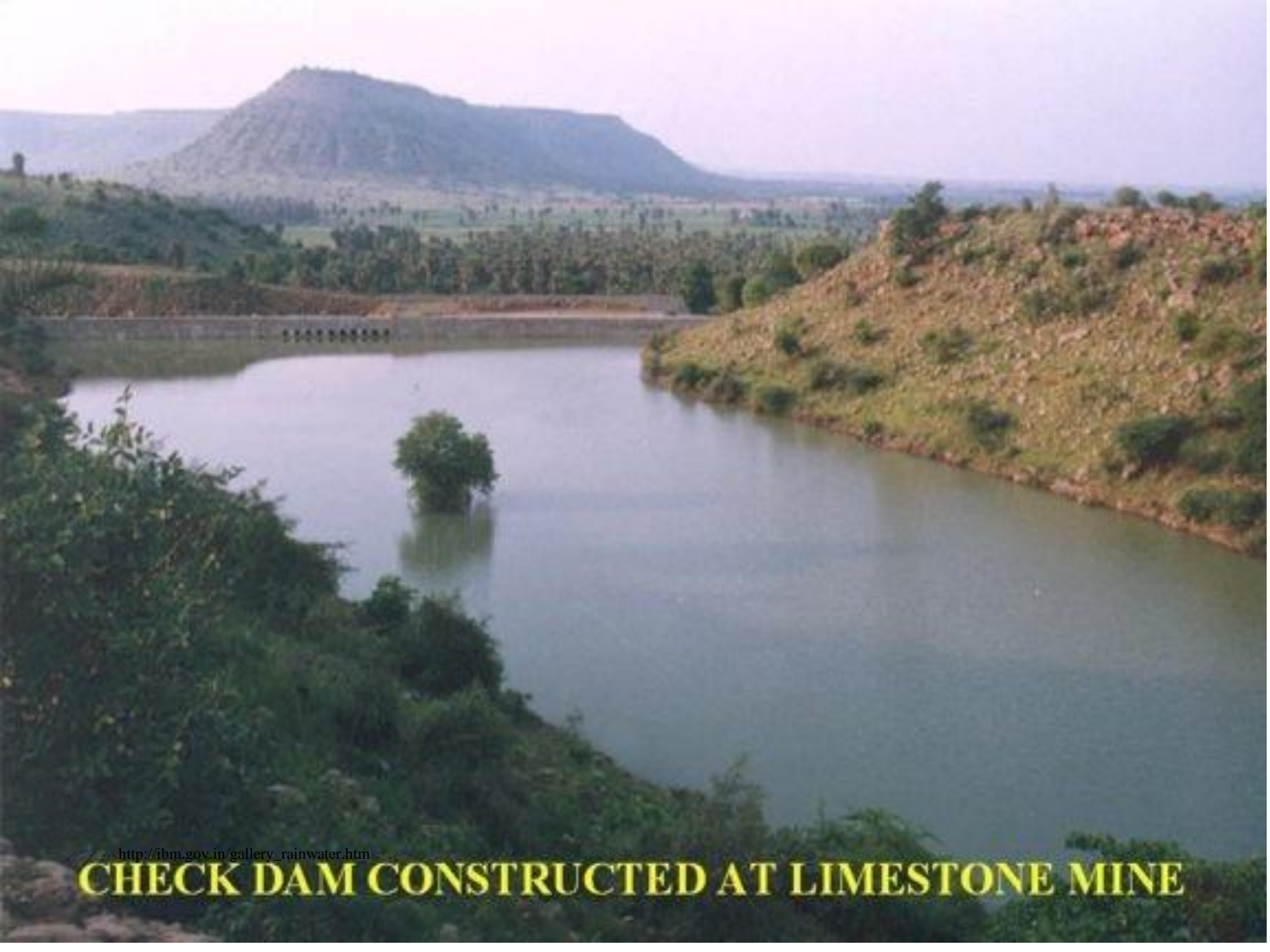












[http://ibm.gov.in/gallery\\_rainwater.htm](http://ibm.gov.in/gallery_rainwater.htm)

**CHECK DAM CONSTRUCTED AT LIMESTONE MINE**



# Restoration of seasonal natural drain – with water of underground mine

































**Water Spraying Arrangements at Feeder Breaker of BPA OC II Extn. BPA Area**







Fixed sprinkler – railway siding



















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KUSMUNDA CHD  
TANAKPUR DISTRICT  
N/S/SK. SAMANTA & CO. P. LIMITED  
731041 800 KOLKATA 730001.

TRANSFER HOUSE-1

CONVEYOR 35-36











# Ambient Air Quality Monitoring

1	Total No. of ambient air quality monitoring stations & frequency of monitoring	04 Nos.; Fortnightly Monitoring
2	Ambient Air Quality Monitoring Stations Locations	1. Near Substation- NGOA-1 2. Near GhatRohna -NGOA-2 3. Gondegaon Village-NGOA-3 4. Guest House/Filter Plant- NGOA-4
3	Ambient air quality status for the parameters prescribed by state pollution control board. (Average 95% time weighted value)	All parameters are within permissible limits.



Sewage Treatment Plant in Srirampur Area

















# Water Quality Monitoring

1	No. of Water quality monitoring stations & frequency of monitoring	02 nos.; Fortnightly Monitoring
2	Monitoring stations	1. Mine water Discharge-NGOW-1 2. Workshop water (treated) discharge-NGOW-2
3	Average concentrations of major pollutants prescribed by State Pollution Control Board	All parameters are within permissible limit.
4	Quantity of effluent discharge to Local Water source	After primary settling in the central quarry, the Mine water discharge is passed through 2 nos. of sedimentation tank for further settling / sedimentation of the discharged water.





















**GROUND NUT CULTIVATION ON RECLAIMED AREA**









**PEER ORCHARD DEVELOPED OVER RECLAIMED AREA**



View of abandoned mine converted into agriculture land





# REHABILITATION AT JAMUL MINES





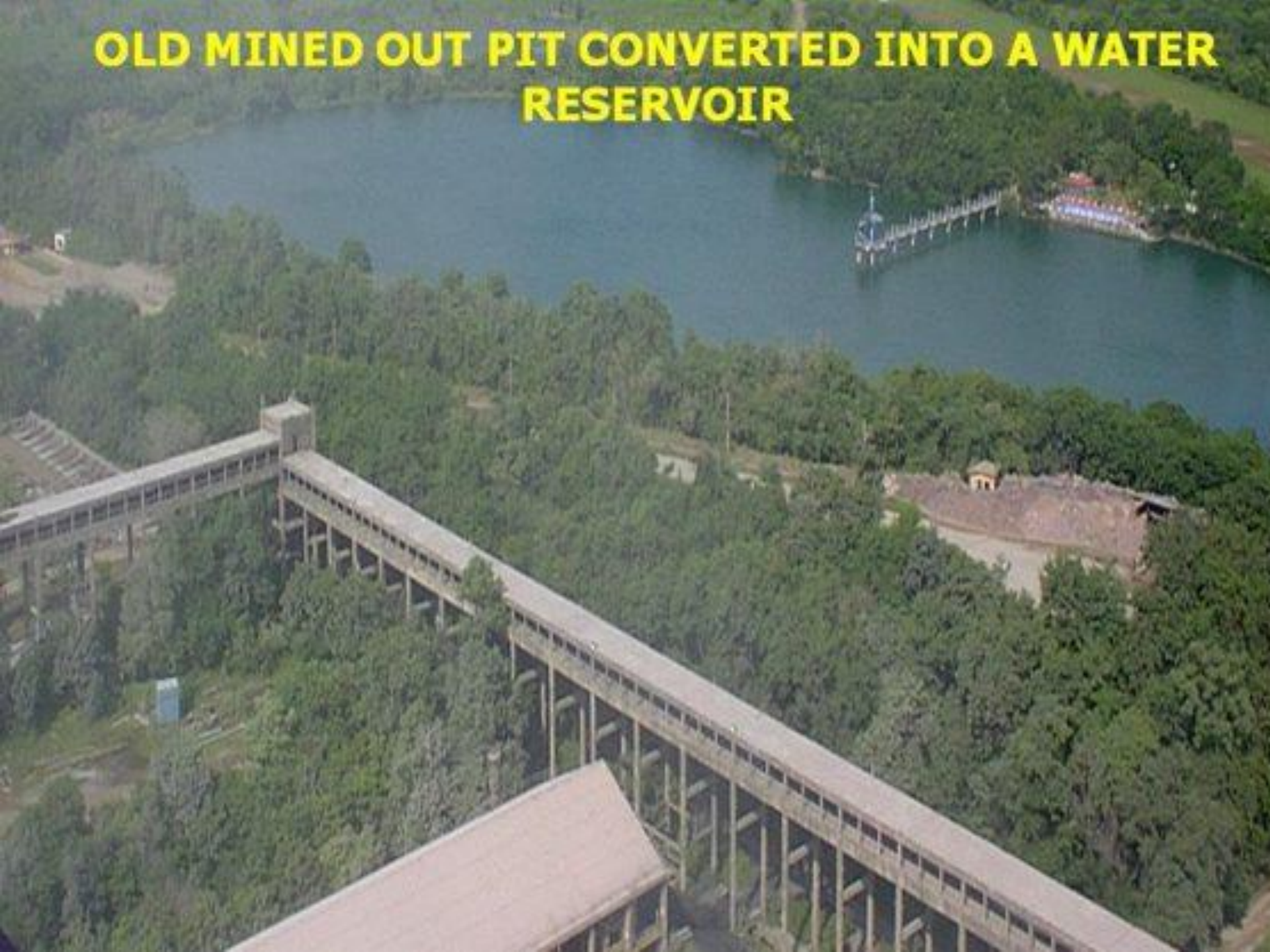


# Plantation of horticultural species on restored overburden dumps





# OLD MINED OUT PIT CONVERTED INTO A WATER RESERVOIR





# Piparwar mine - View of reclaimed voids

Water body developed in reclaimed voids



Migratory birds in the reclaimed voids







In water scarce area - convert abandoned mine into water reservoir



ACC  
TRUST



# SUSTAINABLE DEVELOPMENT GOALS



1 NO POVERTY



2 ZERO HUNGER



3 GOOD HEALTH AND WELL-BEING



4 QUALITY EDUCATION



5 GENDER EQUALITY



6 CLEAN WATER AND SANITATION



7 AFFORDABLE AND CLEAN ENERGY



8 DECENT WORK AND ECONOMIC GROWTH



9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



10 REDUCED INEQUALITIES



11 SUSTAINABLE CITIES AND COMMUNITIES



12 RESPONSIBLE CONSUMPTION AND PRODUCTION



13 CLIMATE ACTION



14 LIFE BELOW WATER



15 LIFE ON LAND



16 PEACE, JUSTICE AND STRONG INSTITUTIONS



17 PARTNERSHIPS FOR THE GOALS



SUSTAINABLE DEVELOPMENT GOALS





# Flambeau Copper Mine

- Flambeau Mine orebody contained copper with trace amounts of gold.
- Mine operated for four year - 1993 - 1997.
- Open pit was backfilled and the site returned to its original contours.
- At the request of local governments, 32 acres of reclaimed land were leased for industrial development cooperation





Before.





After



Krughütte Solar Park in Germany, constructed on the site of a former copper mine in Saxony-Anhalt. (image: Parabel





# Social Initiative under CSR





















यो.को.एल.समग्र परियोजना  
के CSR-2015-16 के तहत ज्यु  
भूमिगत में छेक डैम का  
निर्माण किया गया।







Evaluation policies/regulations at each stage  
in the value chain by taking case of India,  
Tanzania and Namibia



# Why we do Evaluation policies/regulations

- To build understanding for Audit/inspection/compliance
- Gap assessment and give recommendation to government
- Amendment in existing laws/policy intervention



Example - Evaluation of policies/regulations  
(India, Tanzania, and Namibia)



Indicators	India	Tanzania	Namibia
Classification of mines	<p>Categorization based on: Types of minerals, namely metallic, non-metallic, fuel minerals and atomic minerals</p> <p>Basis of mechanization— Category A (mechanized mines), and Category B (non-mechanized mine)</p> <p>For conducting environmental impact assessment (EIA), the mines are categorized on the basis of size (category A and category B)</p>	<p>Categorization is based on investment: Large-, medium- and small-scale mines</p>	<p>Categorization is based on the size</p> <p>Small-scale mines and minerals deposits are only available to the Namibian citizens. An individual or company can have a maximum of 10 claims (size of claims 600 x 300 m)</p>



Indicators	India	Tanzania	Namibia
Permit system	<p>Well-defined, specified time-limit, and disqualification and penalty in case of violation</p> <p>Both state and Central governments are empowered to issue exploration and exploitation licenses</p> <p>Online Auctioning of mine lease has been introduced to promote transparency and accountability</p>	<p>Commission issues all exploration and exploitation licences</p> <p>No process of online auctioning</p>	<p>Minister of Mines and Energy issues all the licences</p> <p>No process of online auctioning</p>

Indicators	India	Tanzania	Namibia
Mine Safety and hygiene	Rules and regulations are properly laid down with proper benchmarks	Safety and hygiene are adequately addressed under acts and regulations	Safety and hygiene are adequately addressed under acts and regulations
Child labour	Child Labour Act prohibits the employment of children	Prohibited under the law; however, child labour is still prevalent, particularly in small-scale mines	Prohibited under the law
Groundwater	In case of groundwater intersection, a no objection certificate needs to be obtained from the concerned authority (Central Groundwater Board). Clearance is given subject to use of mine seepage	No such provision for effective use of mine seepage water	Prohibition on wastage of groundwater in boreholes, wells, shafts, mines or other excavations. A requirement of a licence to dispose of groundwater



Indicators	India	Tanzania	Namibia
Groundwater	<p>In case of groundwater intersection, no objection certificate needs to be obtained from the concerned authority (Central Groundwater Board).</p> <p>Clearance is given subject to use of mine seepage water for agriculture and other public purposes</p>	No such provision for effective use of mine seepage water	<p>Prohibition on wastage of groundwater in boreholes, wells, shafts, mines or other excavations.</p> <p>License requirement to dispose groundwater extracted from a mine or during any underground work</p>

Indicators	India	Tanzania	Namibia
Land acquisition	People's consent is mandatory	No consent is required	People's consent is mandatory in case of private land
	Social impact assessment is mandatory	No such provision	No such provision
	No irrigated multi-crop area can be acquired for mining unless as a last resort	No such provision	No such provision
	Both title and non-title holders are eligible for compensation	Only titleholder are compensated	Only titleholder are compensated
	Method of compensation and R&R package is mentioned in act	Compensation is calculated as per market value	Compensation depends on negotiation  No rehabilitation and resettlement is mandated by law



Indicators	India	Tanzania	Namibia
Land acquisition	In tribal areas - five-year plan for socio-economic development	No such provision	No such provision
	No declaration of land acquisition is made unless the developer or project proponent deposits the cost of acquisition with the government	No such provision	No such provision
	Construction of resettlement colonies having defined amenities in case of relocation	Provisions exist, but require strengthening	No such provision

Indicators	India	Tanzania	Namibia
CSR	CSR is mandatory and capped at 2 per cent profit (i.e., net profit before taxes for CSR corpus)	CSR is mandatory, but no financial provision defined on annual CSR expenditure	Voluntarily done by large mine only
	It is mandatory for companies to file annual return on CSR expenditure	No such provision	--
Benefit-sharing	<p>Mining Act mandates the formation of District Mineral Foundations.</p> <p>Funds are to be used for socio-economic development of the area around the mine.</p>	No such provision	No such provision



Country	Policy measures
Botswana	<ul style="list-style-type: none"> <li>Establishment of <b>Tribal Land Boards</b></li> </ul>
Democratic Republic of Congo	<ul style="list-style-type: none"> <li>10 per cent of the total royalty to the <b>Mining Fund for future generations</b></li> <li>Establishment of an entity or committee which includes representatives from local communities—0.3 per cent of the total turnover allocated to the entity for development of affected communities</li> <li>Mining rights holder to develop a concrete framework of social responsibility towards affected communities</li> </ul>
Ghana	<ul style="list-style-type: none"> <li><b>Mineral Development Fund:</b> Provisioning of 20 per cent of mineral royalty in the fund to provide financial resources for the benefit of a mining community</li> <li>Establishment of the <b>Mining Development Scheme</b> for each mining community</li> <li>Establishment of <b>local management committees</b> with representation of traditional community members, representatives from women's group and youth groups</li> </ul>

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Botswana	<ul style="list-style-type: none"> <li>Establishment of <b>Tribal Land Boards</b></li> </ul>
Democratic Republic of Congo	<ul style="list-style-type: none"> <li>10 per cent of the total royalty to the <b>Mining Fund for future generations</b></li> <li>Establishment of an entity or committee which includes representatives from local communities—0.3 per cent of the total turnover allocated to the entity for development of affected communities</li> <li>Mining rights holder to develop a concrete framework of social responsibility towards affected communities</li> </ul>
Ghana	<ul style="list-style-type: none"> <li><b>Mineral Development Fund:</b> Provisioning of 20 per cent of mineral royalty in the fund to provide financial resources for the benefit of a mining community</li> <li>Establishment of the <b>Mining Development Scheme</b> for each mining community</li> <li>Establishment of <b>local management committees</b> with representation of traditional community members, representatives from women's group and youth groups</li> </ul>



South Africa	<ul style="list-style-type: none"> <li>• <b>Affirmative action:</b> At least 26 per cent of the units of production of prospecting or mining projects should be held by historically disadvantaged South Africans</li> <li>• Existence of a <b>Mining Charter</b> (2018, draft) under the act for entrance of historically disadvantaged South Africans in the minerals and mining industry (amended in 2010)</li> </ul>
Uganda	<ul style="list-style-type: none"> <li>• 3 per cent royalty to lawful occupiers of land</li> </ul>

Indicators	India	Tanzania	Namibia
Environmental clearance	EIA is mandatory	EIA is mandatory	EIA is mandatory
	Cluster approach is used for small-scale mines and EIA is done for clusters.	No such provision	No such provision
	Accreditation of consultants	Registration of consultants, not exhaustive	Registration of consultants, not exhaustive



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	Cluster approach is used for small-scale mines and EIA is done for clusters.	No such provision	No such provision
	Accreditation of consultants	Registration of consultants, not exhaustive	Registration of consultants, not exhaustive
	Bank do but not stipulated in act	Environment clearance is pre-requisite for project financing, stipulated in act	No legal mandate

Indicators	India	Tanzania	Namibia
Insurance against damage	Covered in Land Act	Insurance coverage against losses, injuries, and damage to environment, communities, individual and properties due to mining operations	No such provisions
Mineral conservation	Mandatory for every lease holder to complete the exploration of the whole area at G1 level within a period of five years from the start of the lease period	No such provision	The Mining Act has provided for mineral conservation, but it doesn't have any legal mandate for G1 level exploration
	Online daily record on production	No such online system for filing daily production	No such online system for filing daily production



Indicators	India	Tanzania	Namibia
	<p>Mineral Exploration Trust</p> <p>Fund is generated by levying a cess of 2 per cent on the royalty.</p> <p>This is in addition to mineral royalty paid to the government</p>	No such provision	No such provision
	Clean energy cess - \$7 per tonne of coal for development of renewable energy	No such provision	No such provision

Indicators	India	Tanzania	Namibia
Acid mine drainage	No specific provision for controlling acid mine drainage. It is covered separately under water pollution laws	Mining regulations clearly define the procedure for placing the overburden dump so as to reduce chances of acid mine drainage	No specific provisions for acid mine drainage and heavy metals
Performance security	For mines granted lease through auction, performance security is 0.5 per cent estimated value of the reserve deposited in the bank. The security is required against any non-compliance of environmental, social, mine closure and other provisions	Rehabilitation bonds for mine closure	No such provisions



Indicators	India	Tanzania	Namibia
Mine closure	<p>Rehabilitation cost</p> <p>Coal</p> <p>Open cast - 9 lakh/ha (12328 USD/ha)</p> <p>Underground - 1.5 lakh/ha (2054 USD/ha)</p> <p>Non-Coal</p> <p>US \$4,800 per hectare in case of mechanized mines, and US \$3,200 per hectare in case of manual mines.</p>	<p>Rehabilitation bonds is deposited in banks for mine closure.</p> <p>Value of the bond is calculated by a mine closure committee</p>	<p>Section 128 (3) of the Mining Act stipulates that failure to rehabilitate a mined area properly is an offence carrying a penalty of N\$100,000 (US \$8,400) or five years imprisonment</p>
	<p>Mining companies have to submit progressive (submitted after every five year) and final closure plans</p>	<p>No such provision</p>	<p>No such provision</p>

Indicators	India	Tanzania	Namibia
Compliance and monitoring	Mandated under Mining and Environment Act	Commission and NEMC is the nodal agencies to ensure mine compliance.	Ministry of Mines and Energy and Ministry of Environment and Tourism is the nodal agencies for compliance and monitoring.
	Adequate framework/guidelines for compliance assurance, mandated under different acts	Lack of guidelines	Lack of guidelines



Indicators	India	Tanzania	Namibia
Separate judiciary	Separate environmental courts called National Green Tribunal look into environment-related complaints	No such provision	No such provision
	The Mining Act also establishes special courts for dealing with non-compliance with provisions of the Mining Act	No such provision	No such provision
	Separate courts to address grievances related to land acquisition, compensation and R&R package	No such provision	Land Tribunal has been constituted to deal with matters related to compensation and R&R issues

Indicators	India	Tanzania	Namibia
Audits	Every year, companies have to disclose production and environmental compliance in the form of an environmental statement.	Environmental control audits are done every five years. Provision for conducting self-audit, every year.  An audit petition is made whenever the public complains about the project	Audit is done annually under EMA Act 2007 (section 26)
	Six monthly compliance report under EIA notification 2006		
	Star rating (non-coal mine) - The rating is based on an assessment of four area - mine management, Env & social impacts, mine closure,  Mandatory to achieve four-star rating, otherwise their licence might be cancelled	No such rating exercise	No such rating exercise



Indicators	India	Tanzania	Namibia
Local content plan	No such provision	The Act provides for local content to boost the Tanzanian economy and provide training and employment to the host communities	Mining Act provides for the employment and training of the host communities. But broader concept of local content plan is missing.