

Coal Assessment and Extraction in India: Issues and Prospects

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ETIP Seminar Series

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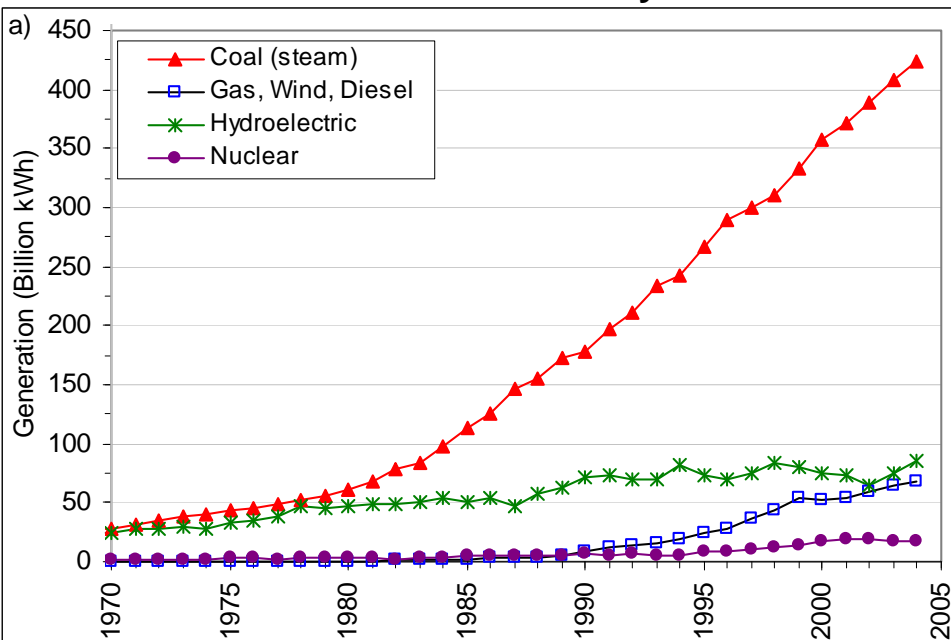
Outline

1. Importance of Coal in India
2. Challenges in the Coal Sector
3. Seminar Series on Key Coal Issues
4. Key Issues
 - a. Resource/Reserve Assessments
 - b. Technologies for coal extraction
 - c. Social and Environmental Issues
 - d. Human Resource and Capacity Building
 - e. Institutional and Pricing Reforms
5. Conclusions

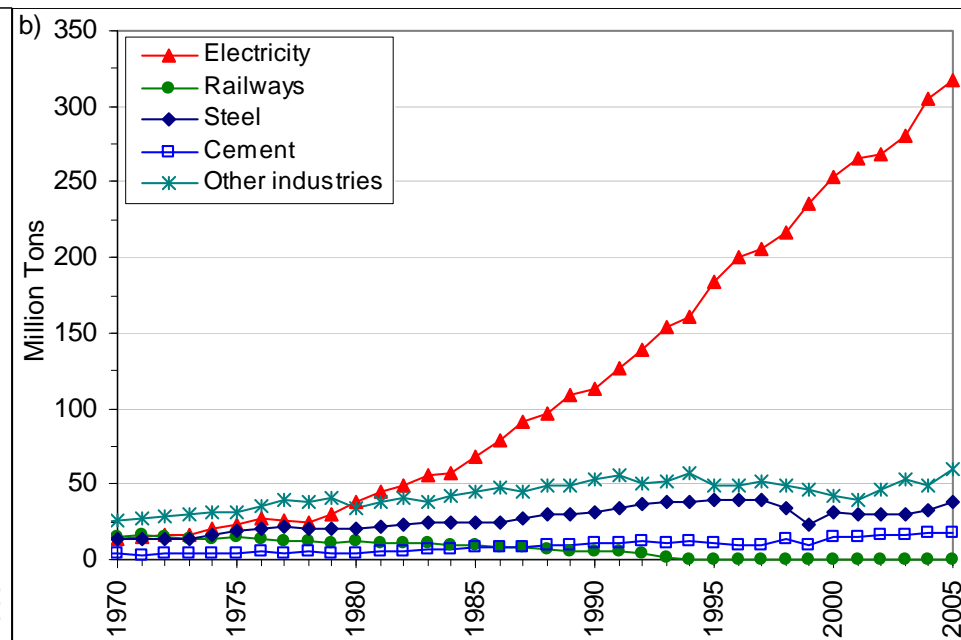
1.0 Electricity and Coal

- Electricity is a key modern energy source
- Electricity is unevenly distributed
 - 490 million people w/o electricity (mostly in rural areas)
- Coal dominates Indian electricity sector
 - Accounts for 53% of commercial energy; 71% of electricity generation
- 80% of domestic coal produced is used for electricity generation in India
- India has significant domestic coal resources – key for energy security

Sources of Electricity



Coal Consumption by Sector

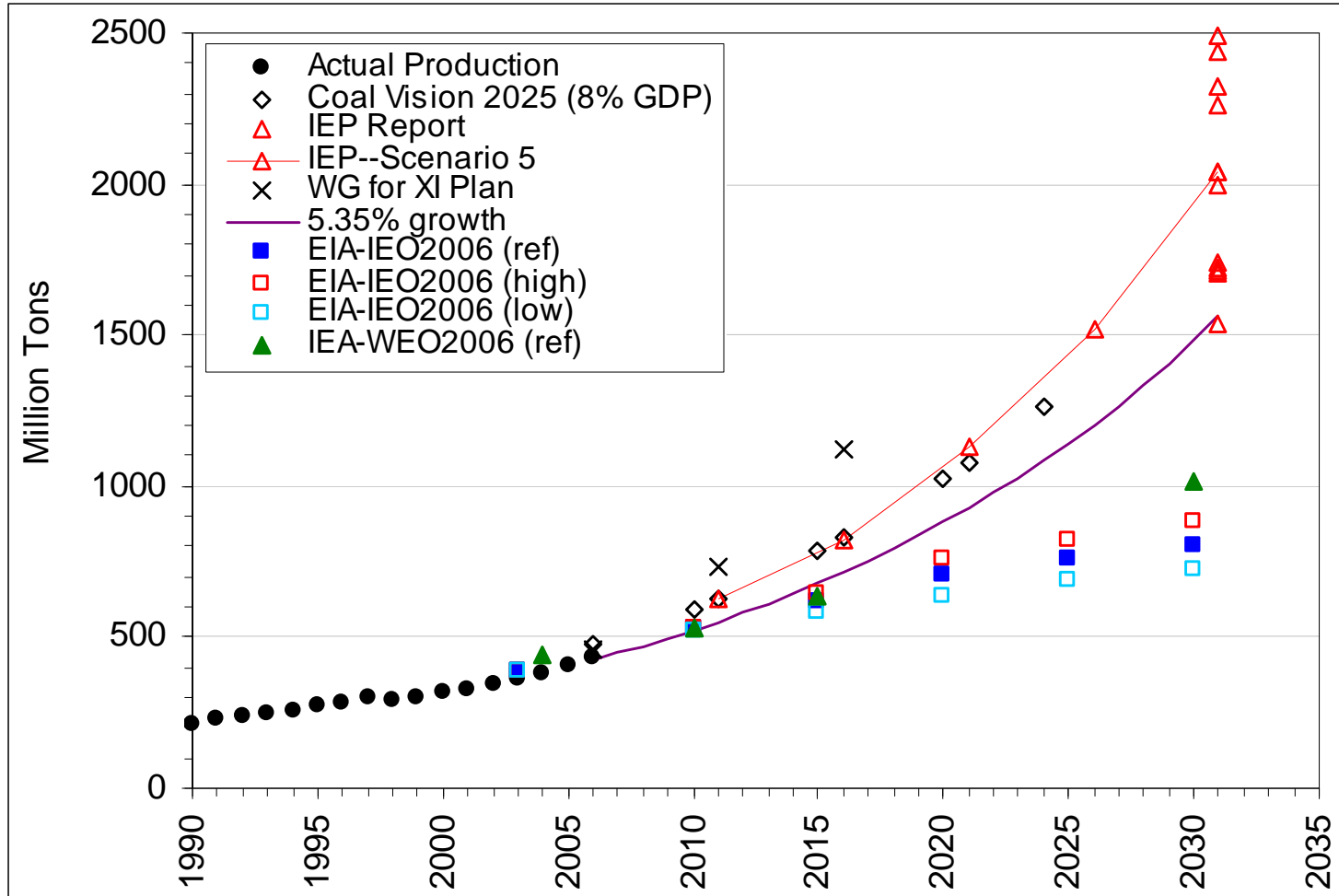


Source: MOSPI
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1.1 Growing demand for electricity

- Electricity generation expected to increase six-fold by 2030
 - 600 TWh in 2004-05 → 3600-4500 TWh by 2030
(China: 3250 TWh in 2007)
- Future growth of electricity in India is projected to rely heavily on coal
 - 10 GW of coal-power installed 2002-2007
(China: 90 GW in 2006)
 - 45 GW of coal-power planned for 2007-2012
- Domestic coal production might be unable to cope with demand → Rising imports

1.2 Future Coal Demand

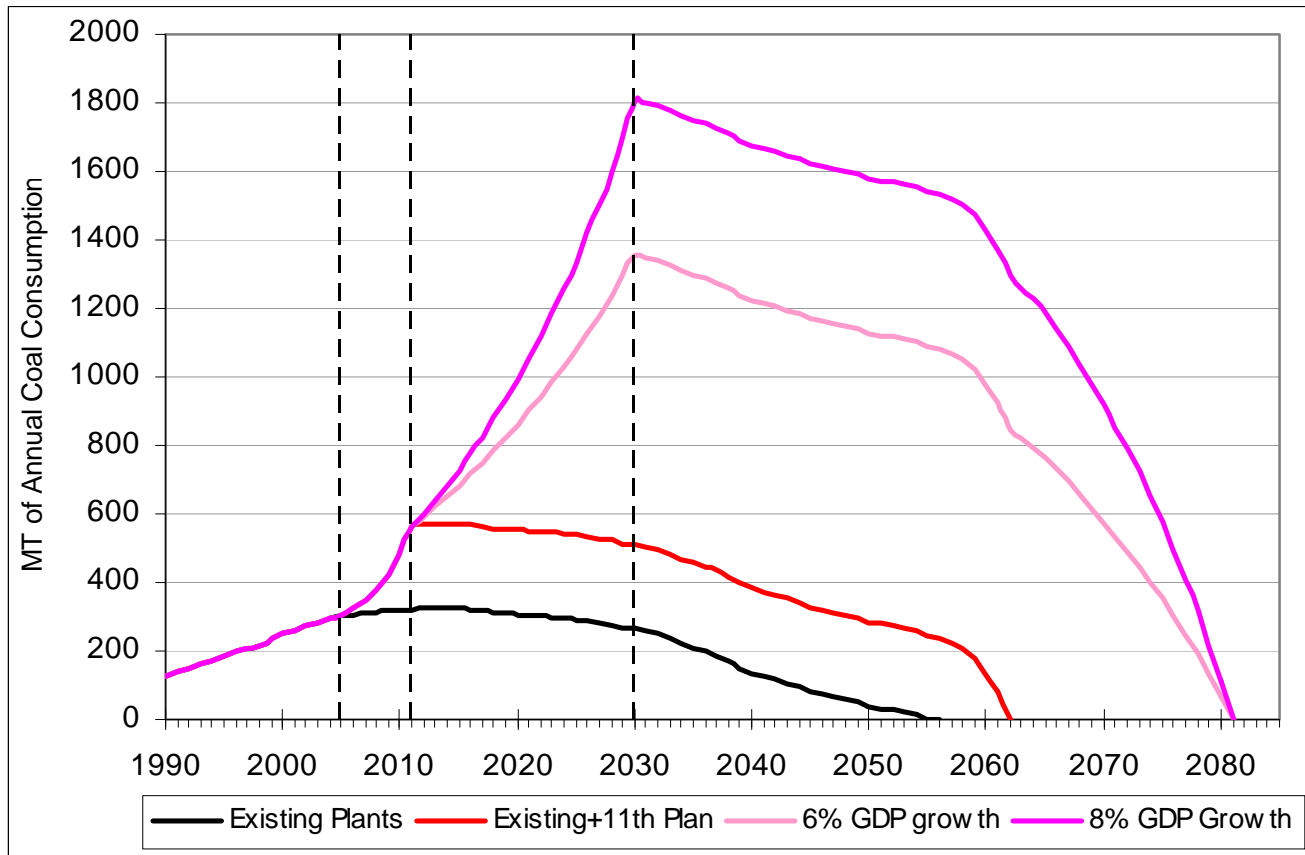


- Indian projections higher than IEA/EIA

More coal mining and coal use in India

1.3 Lifetime coal consumption (power plants)

BAU: Same plant-type distribution as 11th Plan (all using Indian coal)



	Existing Plants	11th Plan BAU	6% GDP	8% GDP
Electricity Growth		11%	4.8%	6.4%
Lifetime Coal consumption (BT)	12.2	24.7	68	91 ← Beyond existing reserve base
Peak coal consumption (MT)	327.3	573.6	1353	1805

Challenges in Coal Sector

2.0 Challenges in Coal Sector

- Need to meet the rising demand
 - Increasing pace of exploration
 - Upgrade technologies to access deeper coal reserves
- Reduce and manage social issues
 - Resettlement and rehabilitation
- Limit and manage environmental impacts
 - Balance between forests and mining
- Introduction of institutional and pricing reforms
- Human resources and capacity building

Indian Seminar Series

3.0 Joint Seminar Series

- Initial interactions with the Indian Planning Commission and ASCI on CCT roadmapping
 - Encouraging discussions with Kirit Parikh, Surya Sethi, & T.L. Sankar
- Initiated a stakeholder-based workshop series to jointly assess problems, policy gaps, and policy solutions in both the coal and the coal power sectors
 - Series to build on Integrated Energy Policy exercise and Sankar Committee work on coal-sector reforms
 - Direct engagement with policymakers and stakeholders
 - Facilitating open “off-the-record” discussions among a wide range of stakeholders
 - Two workshops on the coal sector already held in India
 - Two more planned: a) coal power; b) pricing, regulations, institutions

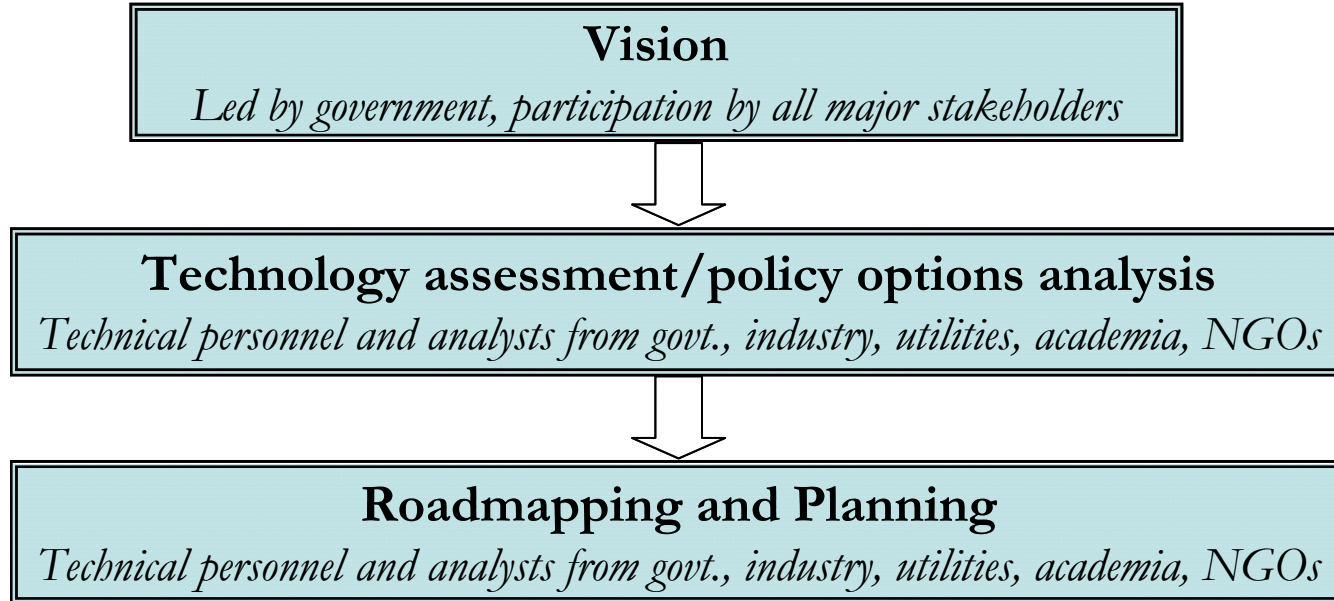
3.1 Goals of Seminar Series

- Assess the current state of knowledge and gaps
- Determine a plan of action for filling knowledge gaps
- Assess key processes and technologies for more efficient and cleaner coal extraction and power generation
- Set in a motion a process for discussions and resolution of conflicts among different stakeholders
- Help develop a coherent roadmap for the coal and coal-power sector for the coming two to three decades

3.2 Workshop Process

- ETIP team (Ananth Chikkatur & Ambuj Sagar)
 - Research and interviews with various stakeholders
 - Preparation of a “Background Paper,” highlighting key issues, to be handed out to participants before each workshop
 - Facilitate discussions during the workshops
 - Convert each Background Paper to a Final Paper (including discussions during the workshop) – to be published by Planning Commission
- Planning Commission/ASCI (Surya Sethi, Satyamurty, T.L. Sankar)
 - Organization and logistics of workshops
 - Review Background and Final Papers
 - Arrange for funding from local sources
- Funding from NTPC, CIL, and SCCL
 - Support for workshops and participants’ travel (if necessary)
 - Support for ETIP team’s travel and research activities (but not salaries)

3.3 Policy/Technology Roadmapping



Need for a Common Vision

- Common vision is necessary for development of better and consensus-based policies
- Different visions can lead to different approaches and policies
- Vision must address the challenges and constraints facing the sector
- Perspectives of different stakeholders (PSUs, private industry, NGOs, citizen groups...) must be taken into account

3.4 Visioning Exercise

- Facilitated a process (w/ gov't, industry and NGOs) to develop a common vision for the Indian coal sector:
 - **Vision in practice:** *“Produce the desired/requested quantum of production using the most economical means possible.”*
 - **Starting point:** *“Coal is a national asset that needs to be preserved, conserved, extracted, and utilized efficiently in a socially and environmentally sustainable manner to meet the nation’s energy needs.”*
- Lots of discussion – involving a whole range of stakeholders (Coal industry, NGOs, Ministries)
- New issues were raised
- Terms were defined
- Final Vision was accepted by all present

3.5 Common vision (coal sector)

Coal, a national asset, must be assessed, extracted and utilized in a scientific and viable manner with due responsibility for working conditions as well as ecological and social sustainability to meet the human and economic development needs in the country

- “assess” = explore, quantify, and categorize
- “scientific” = systematic, efficient, economic (conservation and preservation is implicit in “scientific”)
- “Viable” includes economic, social, and environmental costs
- “working conditions” includes safety, occupational hazards, living environment, health
- “sustainability” = maintain (or improve) performance of existing system for current and future generations

Key Issues

4.0a Reserve/Resource Assessment

- Confusion among experts regarding “reserve” vs. “resources”
- Currently, only geological resources are assessed in India (not reserves)
 - Total: 253 billion tons (96 BT in “Proved” Category)
- Only tentative reserve estimation available
 - Basis for estimation is not reliable (nor publicly available)
 - IEP: 56-71 BT of extractable reserves
 - MoC/CMPDI: 52 BT
- Better estimates of reserves is critical for development of long-term electricity/energy policies
- Coal reserve estimates are poor in almost all countries (EWG report)

4.0b Coal exploration in India

- Key exploration agencies:
 - Geological Survey of India (GSI)
 - Coal Mine Planning and Design Institute (CMPDI)
 - Mineral Exploration Corporation (MECL)
 - Singareni Collieries Company Limited (SCCL)
- Funding: Ministry of Mines and Ministry of Coal
- Borehole Drilling is main technology in use for coal exploration
 - Limited number of drills; vintage and breakdowns
 - Need to use alternative technologies (seismic, geophysical techniques)
 - Insufficient investment in exploration technologies
 - Limited knowledge of international state-of-the-art technologies and practices

4.0c Exploration Constraints

- Knowledge gaps in various aspects of coal resources (magnitude and distribution of resources by area and by depth)
- Exploration overly guided by production considerations
 - There has been less emphasis on quality, and more on quantity, of geological reports
 - Overemphasis on exploration within 300 m depth
- Exploration pace limited by forest conservation laws and social issues
 - Problems getting forest clearances on time
 - People resisting exploration in their lands (worried about forced eviction)
- Domestic technological capacity is weak in the exploration sector, with little indigenous technological R&D inputs, and severe problems with human resources

4.0d Converting resource to reserves

- Lack of reconciliation and integration of data—data systems and databases: common repository; reconciliation; coordination; integration
- Significant uncertainty about confidence level of various data (quantity and quality)
 - Error assessment and statistical analysis is not being done regularly
- Significant confusion about extractable coal
 - Accuracy of reserve and resource assessments
 - Methodology for projecting extractability from resources
- Depleted reserves
 - No data exists on depleted reserves (only cumulative production)
 - Possible linkages with illegal mining
 - Crucial to assess mining efficiency and needs to be done regularly
- Need for better institutional coordination
 - Incorporation of feedback from past/field experiences
- Need for a joint exercise among exploration agencies to address these issues

4.1a Technologies for extraction

- Limited and evolving knowledge of technologies
 - Incomplete data and information on technology assessments in Indian context
 - Technology forecasts – cost and performance uncertainty
 - Evolving technological capacity in the country
- Need to look not just at extraction technologies, but overall technology systems (blasting, conveying, processing, etc.)
- Coal India Limited (CIL) is the dominant player in coal production
 - CIL effectively sets technology standards
- Contractors (with short-term contracts) are now engaged in coal extraction
 - Issue about legality; can be technology leaders
- Increasing role of the private sector (captive mining)

4.1b Opencast Technology

- Current dominance of opencast mining (OCM)
 - Low cost, ease of implementation, greater mechanization, faster production
 - Shovel-dumper, loader-dumper, and shovel-draglines
- Problems with OCM
 - High operating costs
 - Low capacity utilization
 - Large operation and maintenance workforce
 - Need to plan and build extensive road system for overburden removal and dumping
 - Extensive land degradation (social/env't concerns)
- OCM prices do not reflect many environmental and social costs (lack of level playing field for underground mining)
 - Methods for assessment of environmental and social costs
- Other options: = surface miners, crushing and conveying, bucket-wheel excavators, selective mining, highwall mining

4.1c Underground Mining (UGM)

- Underground mining is declining
 - Opencast-able resources are limited
- UGM will be needed to meet the sharply rising future demand
 - Long-term perspective needed to put appropriate policies in place
- Main UGM technologies currently in use are:
 - Conventional Bord & Pillar system
 - Semi-mechanised Bord & Pillar system with Side Discharge Loaders (SDLs) /Load Haul Dumpers (LHDs)/ Universal Drilling Machines (UDMs)
 - Continuous Miners (CMs), Mechanised Longwall, and other special methods
- Problems with UGM
 - High cost of production (twice as expensive as OCM)
 - Low productivity
 - Challenges in increased mechanization
- Initial deployment of mechanized longwall had many problems
 - Inadequate exploration of the areas earmarked for longwall mining
 - Non-availability of long panels; sequencing of extraction from different seams
 - Lack of proper, trained manpower, and poor planning

4.1d Issues for technology deployment

- Need to carry out a mine-level study on man and machine productivity, and analyze reasons for variations
 - Will allow for benchmarking
 - Necessary for designing better incentive schemes for workers and management
 - Appropriate technology choices can only flow from such an exercise
- Long-term markets (with less uncertainty) are necessary to attract manufacturers
 - Long-term contracts are necessary for contractors to adopt advanced technologies
 - Legitimize contract mining
- Need to rationalize the pricing of coal grades to promote new technologies
 - Higher prices for higher grades
 - Coal is currently priced lower than other fossil fuels on energy basis
- Impact of greater private sector involvement?
- Procurement is an important issue
 - Can delay new technology acquisition/deployment

4.2a Displacement—Key Social Issue

- Displacement of people due to coal mining is inevitable and is of enormous magnitude
 - PAPs and secondary displacees (due to loss of agricultural land, environmental degradation, etc.)
 - Coal Vision 2025: 170,000 families or 850,000 displaced persons would have to be rehabilitated by 2025 when the requirement for land would double from current 147,000 ha to 292 500 ha
- Some data and socio-economic information on PAPs exist, and need to be publicly disseminated
 - Fernandes: about 5 million (DP and PAP) for all mining (mostly coal) (*disputed*)
 - 75% of displaced people's lives worsened due to displacement
- Detailed socio-economic data needs to be monitored, collected, and authenticated on a routine basis for all projects
- Different firms have different R&R policies, but they can always do better
 - Key is in implementation—poor record
 - Initial focus was employment, and now more cash-based
 - Company management need to have a long term social vision (change of mindset)

4.2b Better R&R

- Rehabilitation and Resettlement (R&R) should make sure that people are better off than before
 - People can become more positive towards coal mining projects, if they see it as being in their benefit
 - Those who are paying the price should be the beneficiaries
- PAPs must be part of the decision-making process
 - Different groups will have different needs (especially tribals)
 - R&R benefits impact different groups differently
- R&R should include creation of social assets (health, education, etc.) and benefit sharing
 - People need assets to enter the new economy and be aware of their options and opportunities
 - Both employment and lump-sum cash creates lots of social problems
 - Allow PAPs access to opportunities emerging from projects (e.g. township)
- Start development/training activities in areas well-before projects & operations commence
 - Need to create a baseline of socio-enviro-economic conditions (20-25 year timeframe)
- Need for a national “displacement roadmap/planning” to eliminate multiple displacement

4.2c Reclamation/Illegal Mining

- No proper data on number and area of non-working mines (abandoned, orphaned, closed, temporarily continued, etc.)
- “Closed” mines need to be reclaimed/rehabilitated and land be returned and reused
 - Post-mined land can be gifted to others—need for policies to make this happen
 - Legal issues regarding post-mining land use needs to be addressed
 - Leasing is not feasible in Indian legal conditions
- Progressive reclamation is being done, but final closure has issues
 - External overburden dumps, final height/contouring, etc.
 - Closure plans need to fully followed and certified by DGMS (liability issues)
- Money that is collected for closure/reclamation needs to be in a separate account and used only for this purpose
 - Reclamation bonds/bank guarantees need to be considered
- Illegal mining and illegal marketing (pilferage)
 - small shallow-dug “village mines” on private land
 - mining on re-opened abandoned or orphaned government mines
 - scavenging on the leasehold land of official operating mines
- No proper data on extent of illegal mining and illegal marketing
 - 70-80 MT?
- Illegal mining is linked to the question of ownership of mineral resources

4.2d Environmental Issues

- There is now some convergence of views between coal companies and MoEF
- Need to have longer perspective plans and avoid ex-post facto clearance
- MoEF to provide better guidelines on preparation of Environmental Impact Assessment (EIA)
 - water/air modeling, quantifying damage costs, etc.
 - Regional conditions/impacts/other projects
 - New technologies, washeries
- Mitigation is often addressed in EIA, but cost of damage to environment is not assessed
 - Methods for quantification of damages needs to be developed
- Implementing options that protect environment without corresponding production/profit benefits are contentious issues
- Need to separate environment and R&R costs in DPRs
- EIA-EMP should not be administered or directly funded by project proponent
 - EIA should be prepared by independent accredited agencies (blacklist bad agencies)
 - EIA agencies should report to MoEF, rather than project proponent directly
- Need to involve local people in preparation of EIAs, as they have intimate knowledge of flora and fauna

4.2e Go-NoGo Zones

- Key concern is reduction of time taken for clearances
- Creation of Go-NoGo zones for forest areas
 - Accepted in principle
 - Need for demarcating and mapping areas
 - Enforcement
- Create Go-NoGo areas for infrastructure development (demarcate and exclude coal bearing areas)
 - There are tradeoffs between forests and habitation – need for balance
 - Need to make a master plan for all coal bearing areas (CIL, captive, etc.)
 - Certification needs to be provided
- Green credits for afforestation can also be considered

4.3 Human Resource/Tech. Capacity

- Lack of appropriately trained manpower is becoming a critical problem
 - Geologists in exploration and mining
 - Graying workforce as hiring has been restricted
 - Experienced people are retiring with loss of expertise and institutional memory
 - Loss of experts through migration to private sector and captive mining
- Retraining of workers is critical to promote increasing mechanization
- Working conditions in mines
 - More data and information is needed to ascertain state of affairs in mines
- Retention of young people and experienced people
 - Salaries, benefits, and attractive career paths
- Strengthening technological capacity
 - CMPDI and SCCL should learn about international practices and take up training programs with international experts
 - JV and acquisitions can increase indigenous capacity

4.4a Institutional Reforms

- Government dominates the coal industry – Ministry of Coal, CIL, SCCL
- Better coordination and cooperation among different ministries (coal, railways, env't/forests, mining, power) is needed
 - Need to exchange information on practices, management methods, etc.
- Need clarity on institutional functions
 - Conflict of interest in agencies doing multiple tasks
 - Funding problems
- Need for greater competition
 - Captive coal mining and private sector entrants are being encouraged with allotment of coal blocks
 - Can help improve technologies and management practices
- Important to assess how increasing private sector involvement in coal will affect current institutions and practices
- Need for an independent coal regulator to regulate aspects of the extraction and transport of coal, and set appropriate prices for large consumers

4.4b Pricing Reforms

- Coal prices deregulated since 2000, but prices are still “guided” by Ministry of Coal, which controls the main coal producer (CIL)
- Current grading scheme has poor incentives for quality
 - Coal should be priced according to its heat value
 - Number of grades can be increased
 - Already in process
- Need for FSTAs between large consumers and suppliers
 - Can reduce illegal mining
 - Already in process
- Need to include social and environmental costs in coal price
 - Need for assess methodologies in Indian context

5.1 Conclusions/Outlook

- Need for better data and analysis all around
 - Lots of data gaps
 - resources, reserves, technology suitability, abandoned mines, displacement, socio-economic data, environmental impacts, reforms, etc.
- Need for better planning process
 - Lack of coordination among different agencies
 - Lack of common vision
 - Retrospective analysis (critical examination of the past)
 - Long term perspectives and planning
- Need to involve a wider range of stakeholders
 - Critical in ensuring successful implementation of policies
- Seminar series is helping on all of these fronts

Acknowledgements

Indian Seminar Series

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