

GREEN INITIATIVES - ENVIRONMENT FRIENDLY MINING

by

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Electric power consumption (kWh per capita) 2010-14

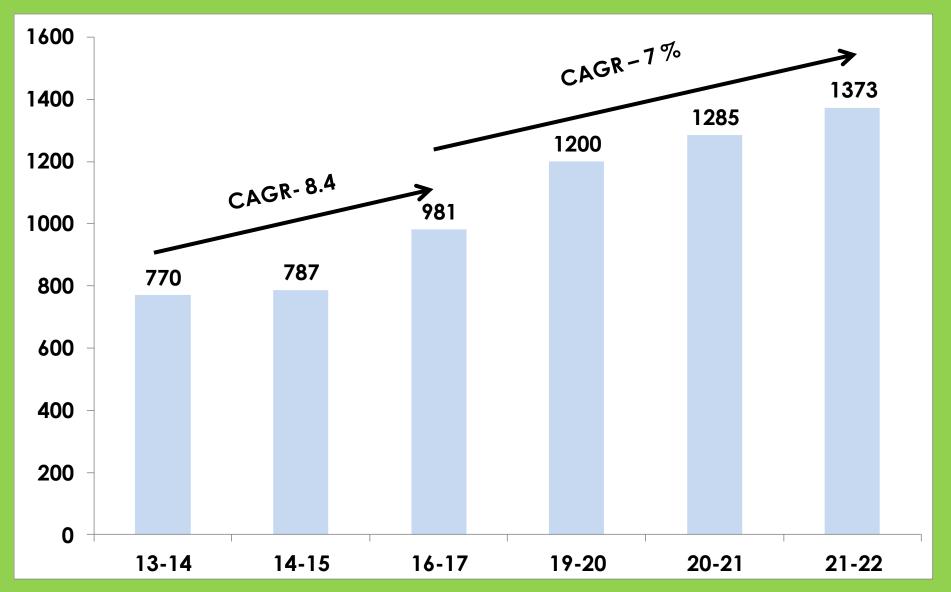
Country	kWh per capita
Australia	10,398
Bahrain	17,603
Canada	15,615
China	3,475
France	7,344
Germany	7,270
Iceland	53,203
India	957
Japan	7,752
Singapore	8690
Sweden	14,290
United Kingdom	5,452
United States	12,954

 1.4 billion people of the world who have no access to electricity in the world, India accounts for over 300 million.

All India Installed Capacity (MW) (As on 31/01/2015)

Owners hip / Sector	Thermal			Nuclear	Hydro (Renewa	RES	Total	
	Coal	Gas	Diesel	Total		ble)		
State	55890.5	6974.42	602.61	63467.53	0.00	27482.00	3803.67	94753.20
Private	53525.3	8568.00	597.14	62690.52	0.00	2694.00	27888.47	93272.99
Central	46775	7428.83	0.00	54203.84	5780.00	10691.43	0.00	70675.27
Total	156190.8	22971.2	1199.75	180361.89	5780.00	40867.43	31692.14	258701.45

Estimated All India Coal Demand



^{*} Working Group Estimated Demand in 16-17 & 21-22 981 Mt & 1373 Mt respectively Expected Coal demand for Power utility will be 938 Mt by Fy 2021-22

Power Generation in INDIA

Source	Power Generation (2014-15)					
	BU	%age				
HYDRO	129.11	12.31%				
THERMAL	878.32	83.78%				
NUCLEAR	35.97	3.43%				
Import(Bhutan)	5.00	0.48%				
TOTAL	1,048.40	100.00% 12				
Coal and lignite accounted for about 60% of India's total installed capacity.						

Coal Reserves (bt) of India (1-4-2015)

Type of Coal	Proved	Indicated	Inferred	Total	%age Share
Prime Coking	4.614	0.6987	0.00	5.313	1.73
Medium Coking	13.389	12.114	1.879	27.382	8.93
Semi-coking	0.482	1.004	0.222	1.707	0.56
Non-Coking	112.534	129.326	28.840	270.700	88.29
Tertiary Coal	0.594	0.099	0.799	1.493	0.49
Total	131.614	143.241	31.740	306.595	100

IN GLOBAL & INDIAN CONTEST - COAL IS A MAJOR ENERGY SOURCE

- Why Coal? Coal is a truly global industry it is mined commercially in over 50 countries and is used in over 70
 - "Coal Keeps Your Lights On"

increasingly clean affordable reliable plentiful safe

25% of world primary energy

40% of the world's electricity is produced using coal. Main fuel for electricity in USA, Germany, China, India, South Africa, Australia and much of central Europe



66% of the world's steel is produced using coal

▶ COAL INDA LTD IS COMMITTED FOR ENERGY SECURITY FOR OUR COUNTRY.

► COAL INDIA LIMITED PRODUCES 82% OF ENTIRE COAL PRODUCED IN INDIA.

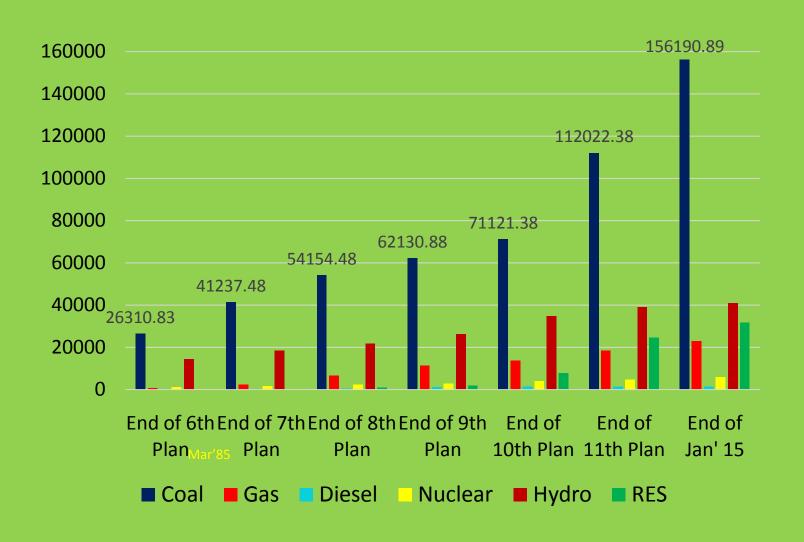
Estimated Nos. of Coal Mines

Country	Total Nos. of Mines	%age Underground	%age Opencast
CHINA	18,557	95%	5%
USA	1,458*	40%	60%
INDIA	562**	64%	36%
U.K.	46	28%	72%
Sub-Total	20,623	90%	10%
World (estimate)	24,000		

^{*} Includes 23 refuse recovery operations

^{**} Includes 33 mixed mines

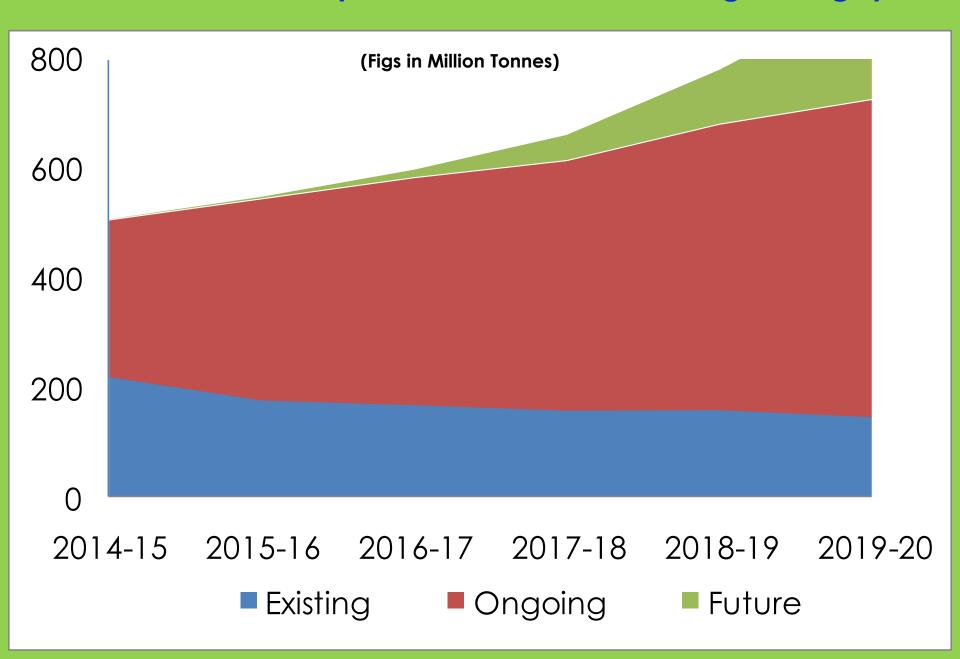
Growth of Coal Based Installed Capacity (MW)

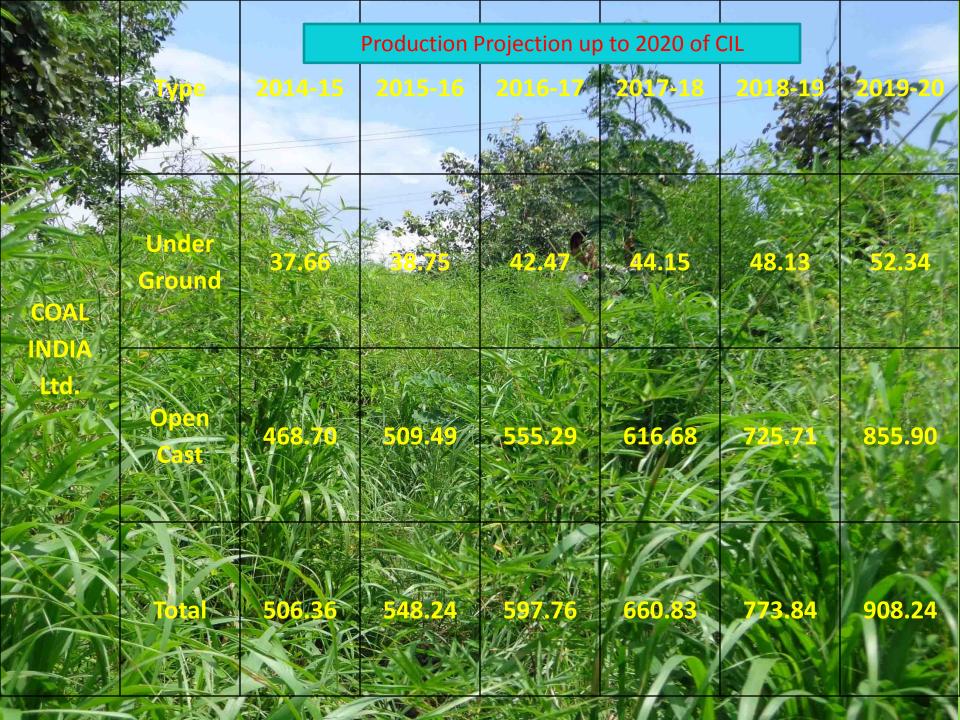


COAL PRODUCTION --past & future of CIL



Enhancement in production of CIL to bridge the gap





HIGHLIGHTS - Coal India's sustainable mining approach

2014-15

- Production of Coal -- 494.24MT.
- Off-take of Coal--489.38 MT.
- Sales --Rs.95434.76crs.
- Profit Before Tax--Rs21583.92crs.
- Profit after Tax--Rs.13726.70crs







- Coal India Ltd. is committed to take care of environmental concern
- Mine planning is carried out integrating environmental concerns by using MINEX software. The requirement of land for external OB dumps is kept bare minimum
- Requirement of forest land is also optimized
- Eco restoration, reclamation of mined out areas, gainful utilization of reclaimed land is a priority.

Coal India Limited cares for Environment and also committed for the Energy Security of our Country







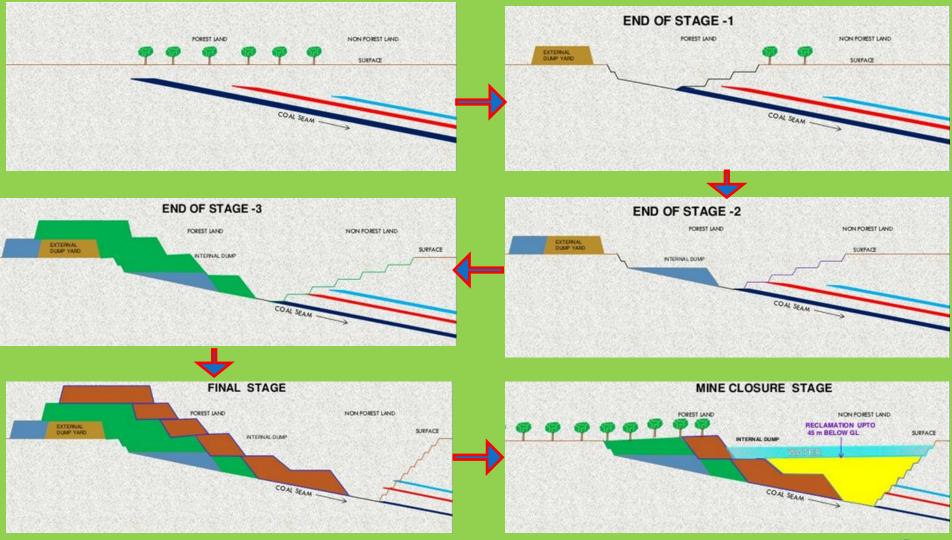




COAL: NATURE'S GIFT TO MANKIND



Stages of Opencast Mine





COAL EXTRACTION OB REMOVAL BY SHOVEL DUMPER







Mining activities involves

- **≻**Land Degradation
- **▶** Dust Generation.
- ➤ Noise & vibration
- ➤ Water pumping & discharge



LAND ACQUIRED AFTER NATIONALISATION TO 30-06-2015 (POST NATIONALISATION PERIOD)

						Area in Hecta	re		
Company	Tenano	Tenancy Land		Govt. Land		Forest Land		Total Land	
	Acquired	Possession	Acquired	Possession	Acquired	Possession	Acquired	Possession	
ECL	14207.440	11168.490	768.920	617.750	1110.450	298.340	16086.810	12084.580	
BCCL	4789.980	3819.840	346.030	297.670	86.410	86.410	5222.420	4203.920	
CCL	12876.870	6449.240	9406.340	3998.110	13572.350	7142.640	38876.630	17589.990	
NCL	5871.310	5532.440	3040.900	3040.900	8134.520	7063.000	17046.730	15636.340	
WCL	26182.679	17854.799	2361.470	1647.830	1572.481	826.671	30116.630	20329.300	
SECL	25452.353	13675.875	4932.826	2608.853	5722.703	5304.260	36107.882	21588.988	
MCL	14817.782	8064.095	8833.841	5175.598	6329.177	2537.309	29980.800	15777.002	
NEC	0.105	0.105	50.800	50.800	0.000	0.000	50.905	50.905	
TOTAL:	104198.519	66564.884	29741.127	17437.511	36528.091	23258.630	173488.807	107261.025	

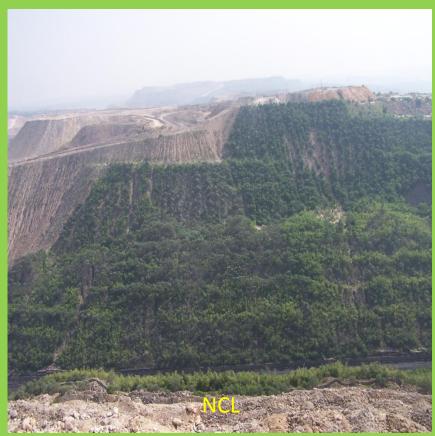
A VIEW OF OB DUMP YEARD IN DE-COALED AREA- ONE OF THE CIL MINES



Technical Reclamation in progress



Technical & Biological Reclamation on OB dumps in Steps/Stages



Stages of Reclamation of OB dumps in Singrauli



Stages of ecological restoration: BCCL





Homes to some insects and aquatic organism





TOP SOIL MANAGEMENT: CCL





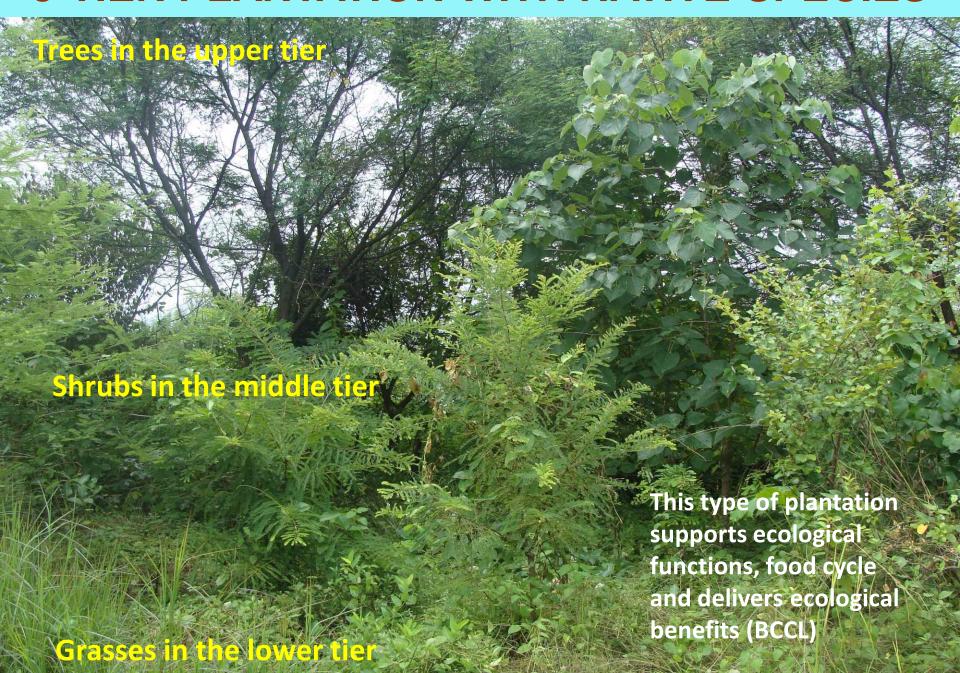
Stages of eco-restoration : CCL







3-TIER PLANTATION WITH NATIVE SPECIES



LARGE SCALE PLANTATION



Large Scale Plantation



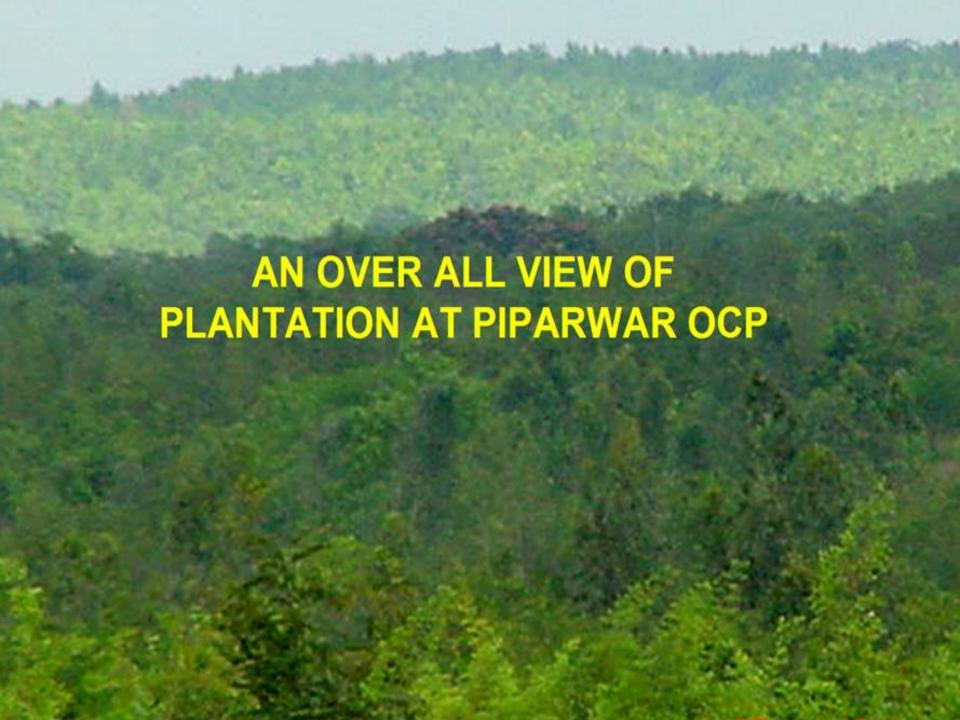




Plantation a source of Oxygen & CO2 sequestration

SINCE INCEPTION CIL HAS PLANTED **82676991** NUMBERS OF TREES IN AN AREA, COVERING **34944.63** HECTARES



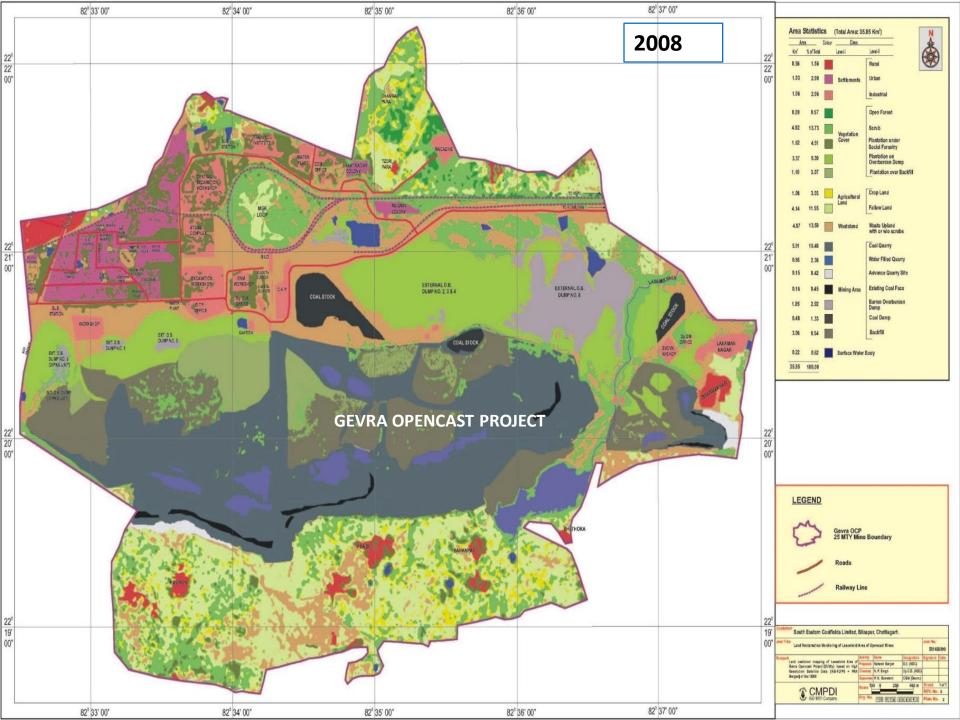


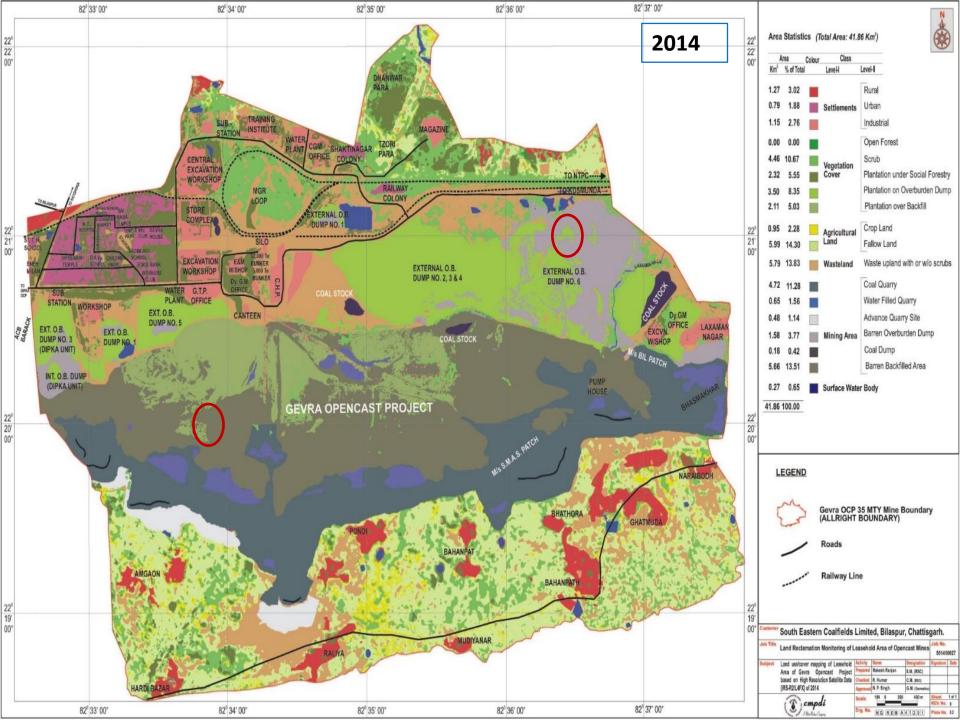
Amount of NPV and CA Charges Paid

Name of Subsidiary	Amount of NPV paid (Rs. in Crores)	Amount of compensatory afforestation paid (Rs. in Crores)
ECL	84.84	40.52
BCCL	2.90	16.85
CCL	501.28	82.3
SECL	665.37	286.88
NCL	98.02	47.92
MCL	298.18	87.57
Total	1650.59	562.04



Land Reclamation-Monitoring through Satellite Surveillance-Data from National Remote Sensing Centre- Hyderabad.





Monitoring of land reclamation of OC mines through remote sensing

(Area in Sq. kms.)

No. of OC Mines	Year	Total excavated Area	Area under Green Cover	Area under Backfilling	Total Area under Reclamation	Area Under Active Mining
158	2014	492	212 (43%)	nsing 168 (34%)	379 (77%)	113 (23%)

At a time only 23% of the area being utilized for mining and on the rest, reclamation is undertaken

STATUS OF LAND RECLAMATION IN OC MINES OF CIL

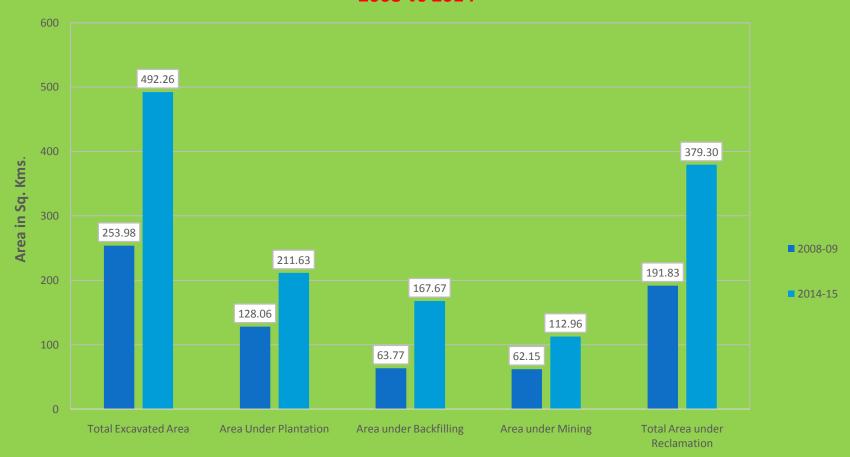
(% calculated in terms of total excavated area)
(Area in Sq. Kms.)

Particulars	No. of OC Mines	Year	Plantation (i)	Under Backfilling (ii)	Under Active Mining (iii)	Total Excavated Area (i+ii+iii)	Total Area under Reclamation (i+ii)
OCP > 5 mcm (Coal + OB)	50	2014	165 (46%)	116 (32%)	75 (21%)	356	281 (79%)
OCP < 5 mcm * (Coal + OB)	108	2012- 2014	46 (34%)	52 (38%)	38 (28%)	136	98 (72%)
Total	158	7764 E-97 H W 10 - 5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	212 (43%)	168 (34%)	113 (23%)	492	379 (77%)

* Land Reclamation Monitoring for OC mines producing less than 5 Mcm (Coal+OB) annually started in the year 2011 with a repeat cycle of three years.

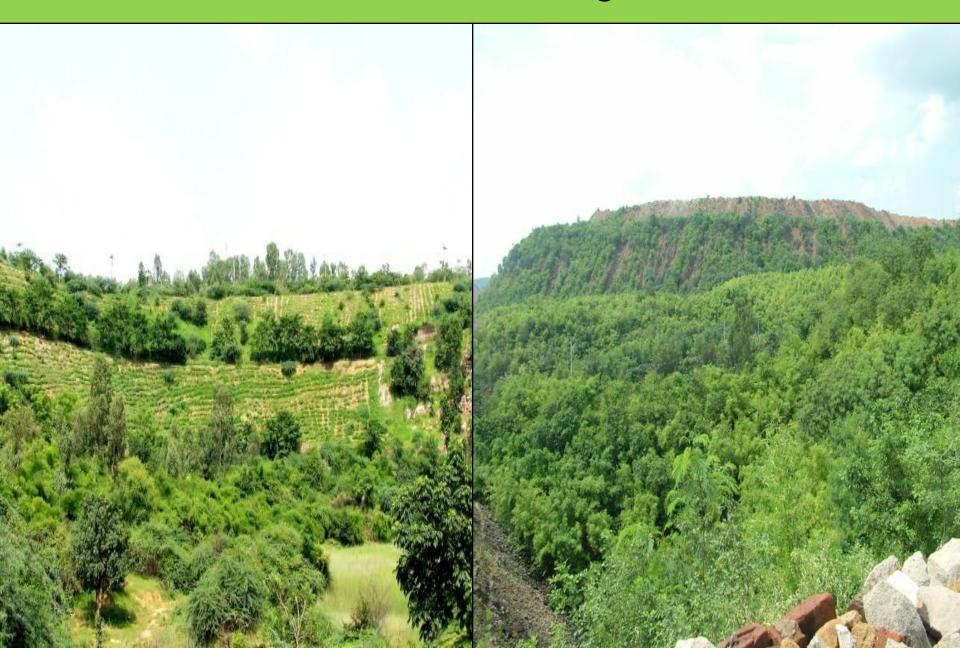
Land Reclamation Monitoring

STATUS OF LAND RECLAMATION IN 158 OC MINES OF CIL FOR THE YEAR 2008 Vs 2014



Reclamation Classes

Efforts towards minimizing land use





An Eco-Friendly Mine



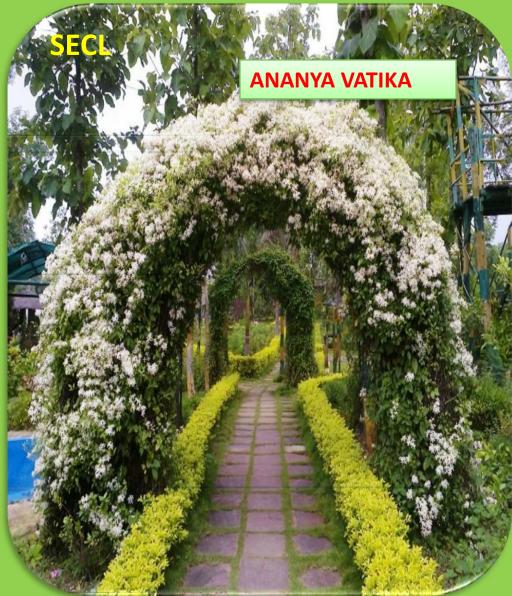
ECOLOGICAL RESTORATION: BCCL





Creation of park on reclaimed land







Introduction of Eco-friendly Technologies

Opencast Mines

- Deployed Surface Miner Technology avoiding usage of Explosives;
- ➤ In-pit crushing and conveying systems in Coal and Overburden to avoid truck transportation;

Underground Mines

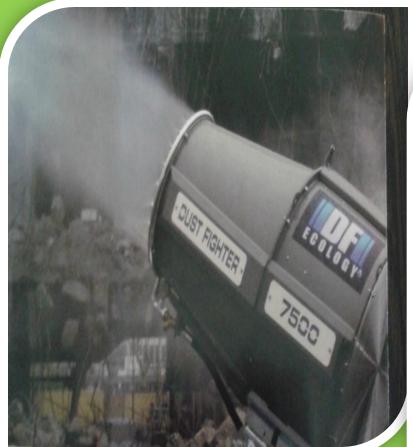
- Deployment of Continuous Miners avoiding usage of Explosives;
- Introduction of Long wall Technology avoiding usage of Explosives

Water sprinkling-A way for dust suppression-with a green belt – Practiced in- CIL MINES-





WATERS SPRINKLING SYSTEM HAVE BEEN PROVIDED TO CHECK FUGITIVE EMISSIONS FROM CRUSHING OPERATION



AUTOMATIC WATER SPRINKLER AT RECEIVING PIT



VIEW OF WATER SPRINKLER(FOG BASED) USED IN FEEDER BREAKER



VIEW OF WATER SPRINKLER(FOG BASED) USED IN FEEDER BREAKER



RAPID LOADING SYSTEM FOR COAL TRANSPORT



Continuous Miners-- Eliminate blasting and have in-built dust suppression arrangement to ensure dust control at source



- **Highwall Mining** has been successfully introduced at Sharda Mine.
- This method of mining ensures coal conservation and due to the use of coal cutting equipment dust levels at source are considerably reduced.



PRODUCTION OF COAL THROUGH SURFACE MINER (2014-15)

SURFACE MINER - A BLAST FREE TECHNOLOGY

SUBSIDIARY	No of mines using surface miners	No of surface miners deployed	Production through surface miners.	% OF COAL PRODUCED THROUGH SURFACE MINERS AGAINST TOTAL PRODUCTION BY CIL
ECL	1	2	3.094 MT	
CCL	3	3	9.142MT	
SECL	5	21	79.331MT	40%
MCL	14	38	106.821MT	
CIL	23	64	197.3888MT	





➤The immediate effect of the use of Surface Miner is of reducing fumes, dust and vibration produced during blasting as no blasting is required for this technology.

➤ Eliminations of Blasting in the use of surface miner does not lead to cracks in the coal benches.

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CIL's Approach for Environmental friendly Coal Dispatch-

Dispatch of coal and coal products by various modes for the years 2014-15 and 2013-14

(Figs. In million tonnes)								
Year	2014-15			2013-14	Growth over Last Year			
Mode	AAP Target	Despatch	% Satn.	Actual	Abs.	%		
Rail	297.587	266.499	89.6%	259.410	7.089	2.7%		
Road	116.066	122.099	105.2%	112.813	9.286	8.2%		
MGR	94.320	90.073	95.5%	88.750	1.323	1.5%		
Other Modes	10.820	11.311	104.5%	10.511	0.800	7.6%		
Overall	518.793	489.982	94.4%	471.484	18.498	3.9%		



COAL TRANSPORTATION FROM COAL MINE PIT TO RAILWAY SIDING BEING DONE BY IN-PIT CLOSED CONVEYOR AND FROM THERE BY RAIL/ MGR TO CONSUMERS.



Cleaner Transport of Coal

LONG DIASTANCE TUBE CONVEYER -a success story of environment friendly

coal transport to power plant.







TARPAULIN COVERED TRUCK-Dust free coal transportation







Various Activities Being Undertaken in the Field of Climate Change

- **Coal Mining Impacts Land Use Pattern and Involves Diversion of Forest Areas;**
- **▶**Best Mining Practices would address minimising these impacts through restoration and reclamation of mined out areas;
- > Deployment of advanced technologies for eco-friendly mining.
- ➤ Washing of Coal is another important action for reducing Ash Content in Coal which has direct impact on Co₂ emissions in the course of Power generation.
- ➤ Harnessing Methane Gas from Coal Seams through Extraction of Coal Bed Methane / Coal Mine Methane / Ventilation Air Methane in order to improve the safety of mining areas and also to avoid highly potential Green House Gas emissions;
- **➤ Development of Underground Coal Gasification.**
- **≻Water Management.**
- **Eco-restoration of mined out areas.**
- > Energy conservation and renewable energy initiatives.

COAL BED METHAME GAS BASED GENETRATORS OPERATING AT MOONIDIH BCCL

GOVERNMENT OF INDIA
CONVEYED PERMISSION FOR
EXPLORATION AND
EXPOITATION OF COAL BED
METHANE (CBM)FROM
AREAS UNDER COAL MINING
LEASE ALLOTED TO COAL
INDIA LTD.

COAL BED METHANE



COAL WASHERY TO REDUCE THE ASH CONTENT OF COAL



Greenery with water sprinklers: Mahuda Washery (BCCL)



Crushing, Sizing and Washing of Coal

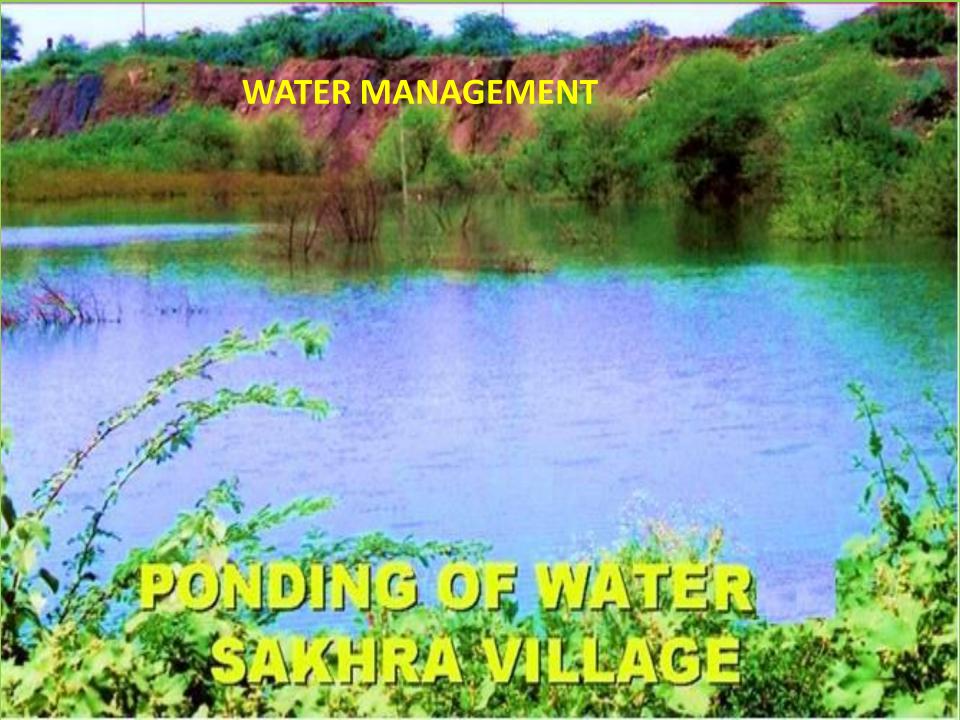
- ➤ Total installed capacity of washeries in the country is around 131.24 Million ton per year (MTY) as on 31.3.2014.
- > 52 washeries, both PSUs and Private, were operating in the country considering both Coking (29.69 MTY) and Non-Coking Coal (101.55 MTY).
 - ☐ 100 % Coal being supplied to Power Sector is crushed coal;
 - ☐ Existing 15 Washeries having 36.80 MTPA capacity

Existing Washeries of CIL

Sl.no.	Name of coal	Subsidiary	Capacity	State
	washery	company	(MTY)	
1	Dugda-ii	BCCL	2.00	Jharkhand
2	Bhojudih	BCCL	1.70	W.Bengal
3	Sudamdih	BCCL	1.60	Jharkhand
4	Moonidih	BCCL	1.60	Jharkhand
5	Mahuda	BCCL	0.63	Jharkhand
6	Madhuband	BCCL	2.50	Jharkhand
7	Kathara	CCL	3.00	Jharkhand
8	Swang	CCL	0.75	Jharkhand
9	Rajrappa	CCL	3.00	Jharkhand
10	Kedla	CCL	2.60	Jharkhand
11	Nandan	WCL	1.20	M.P
12	Gidi	CCL	2.50	Jharkhand
13	Piparwar	CCL	6.50	Jharkhand
14	Kargali	CCL	2.72	Jharkhand
15	Bina	NCL	4.50	U.P
	Total		36.80	

15 new washeries for a capacity of about 112.60 MTPA, which will be commissioned in next 3 years time by CIL;

Proposed				
Washeries Sl. No.	Name of washery	Subsidiary Company	Proposed Capacity (MTY)	State
1	Madhuband	BCCL	5.00	Jharkhand
2	Patherdih	BCCL	5.00	Jharkhand
3	Patherdih II	BCCL	2.50	Jharkhand
4	Dahibari	BCCL	1.60	Jharkhand
5	Dugda	BCCL	2.50	Jharkhand
6	Bhojudih	BCCL	2.00	Jharkhand
7	Ashoka	CCL	10.00	Jharkhand
8	Konar	CCL	7.00	Jharkhand
9	Karo	CCL	7.00	Jharkhand
10	Basundhara	MCL	10.00	Orissa
11	Jagannath	MCL	10.00	Orissa
12	Hingula	MCL	10.00	Orissa
13	Ib-Valley	MCL	10.00	Orissa
14	Kusmunda	SECL	25.00	Chattisgarh
15	Baroud	SECL	5.00	Chattisgarh
	Total		112.60	



Water Management-- Utilization of mine water in command area of CIL

	UTILISATION OF MINE WATER						
Subsidiary of CIL	Average Mine		Demand		Mine water	Balance mine	Mine water
	Discharge				supply	discharge(cum/day)	utilisation on
	(cum/day)						total demand
		Domestic	Industrial	Total			(%)
Eastern Coalfields Limited (ECL)	146045	71721	44180	115901	100458	45587	86.68
Bharat Coking Coal Limited (BCCL)	106050	82552	18746	101298	78425	27625	77.42
Central Coalfields Limited (CCL)	121140	41105	49371	90476	81511	39629	90.09
Western Coalfields Limited (WCL)	292030	67200	30509	97709	69403	222627	71.03
South Eastern Coalfields Limited (SECL)	411866	85226	54283	139509	97927	313939	70.19
Northern Coalfields Limited (NCL)	64800	15956	35576	51532	26797	38003	52.00
Mahanadi Coalfields Limited (MCL)	101185	16632	24641	41273	24721	76464	59.90
Overall	1243116	380392	257306	637698	479242	763874	75.15
Average Mine		Demand				D. G	
discharge (cusec)	Domestic (cusec)		dustrial cusec)	Total (cusec)	Mine water supply (cusec)	Mine w utilization total de	against
508	156		105	261	196	75.15	5%

[➤] More than **75**% water demand for industrial and domestic sector is catered through mine water discharge Debate arises to make our mines with zero discharge -??





INTERMEDIATE SUMP OF AREA 1 Ha AT TRIJUNCTION



DESILTATION ARRANGEMENT



Effluent treatment Plant-An approach to waste water management in CIL



ETP FOR TREATMENT OF EFFLUENTS FROM CHP & LIGHT

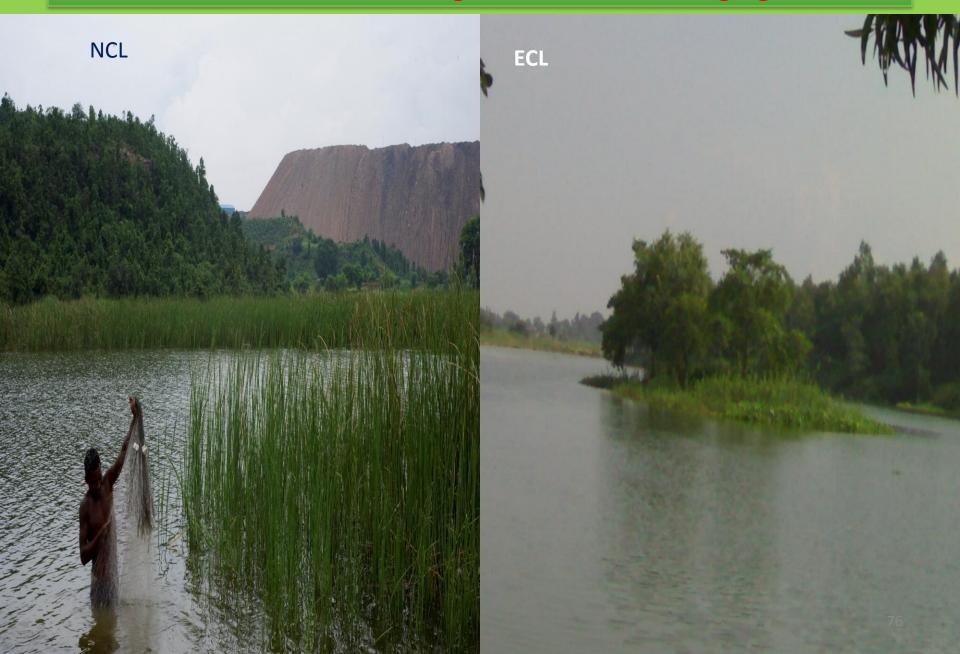








Mine voids used for ground water recharging



Check dams for irrigation & water recharge





Sustainability



- Welfare of the employees and local community through community development
- Proper R&R to project affected persons
- √ 57809 employment to land losers.
- ✓ Compensation paid during last 3 years—16063.63 Lakhs
- Undertaken various educational, health, recreational and other measures

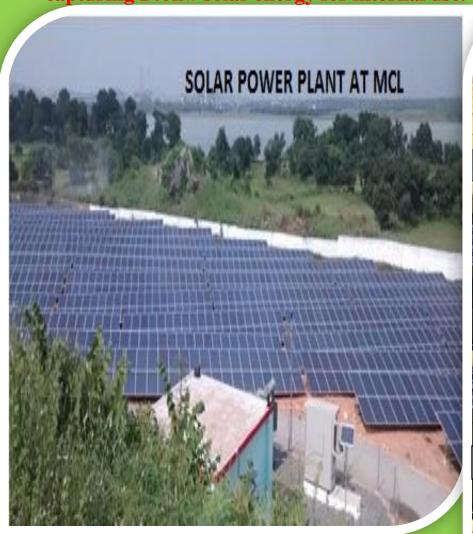
- CSR expenditure by CIL in 2014-15- Rs. 298.10 crores.
- MoU has been signed with HIDCO & CIL to operate three electrical operated Buses and one electrical service car at a cost of 15 crores as a Green Kolkata initiative.
- > 51115 toilets in schools have been constructed under the Swachh Bharat Abhiyan

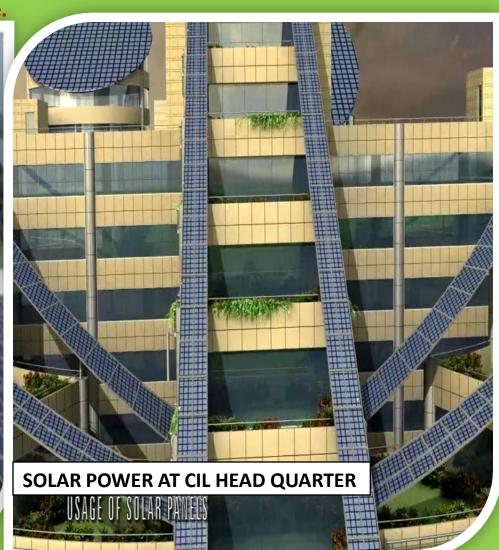


✓ CIL is committed for harnessing green and clean renewable energy sources for environment benefits; mitigate global warming/climate change and energy security.

✓CIL has already established 2 MW solar power plant at MCL and 0.20 MW solar plant at CMPDIL. Corporate office of CIL at Rajarhat , is a energy efficient building with a provision of

capturing 140kw solar energy for internal use.





Third Party-- Evaluation by expert bodies.

- ✓ Forest Research Institute (FRI) ,Derhadun
- ✓ National Environmental Engineering Research Institute (NEERI).
- ✓ National Remote Sensing Centre (ISRO) for conducting Coal Mine fire survey in Jharia Coalfields.
- ✓ Monitoring reclamation activities through satellite surveillance in 50 major OCPs in every year and other OCPs once in three years-Data from NRSC.

Research & Development Efforts for Sustainable Mining & Mine Closure

- "Sustainable livelihood activities on reclaimed open cast coal mines:
 ----- TERI
- * "Assessment of mine water environment -- -- Birsa Agriculture University (BAU), Kanke, Ranchi
- Innovation efforts in association ----- FRI DEHRADUN for ecological restoration.
- **Rs. 3005.32** crores deposited by CIL in Escrow account for under taking mine closer activities.

ONE BILLION TONNES COAL-2020

- > Railways for infrastructure.
- > State forest department's expertise.
- State administration- A major role to play
- ➤ Support from MoEF
- ➤ Our share holders for sustaining confidence on CIL.

