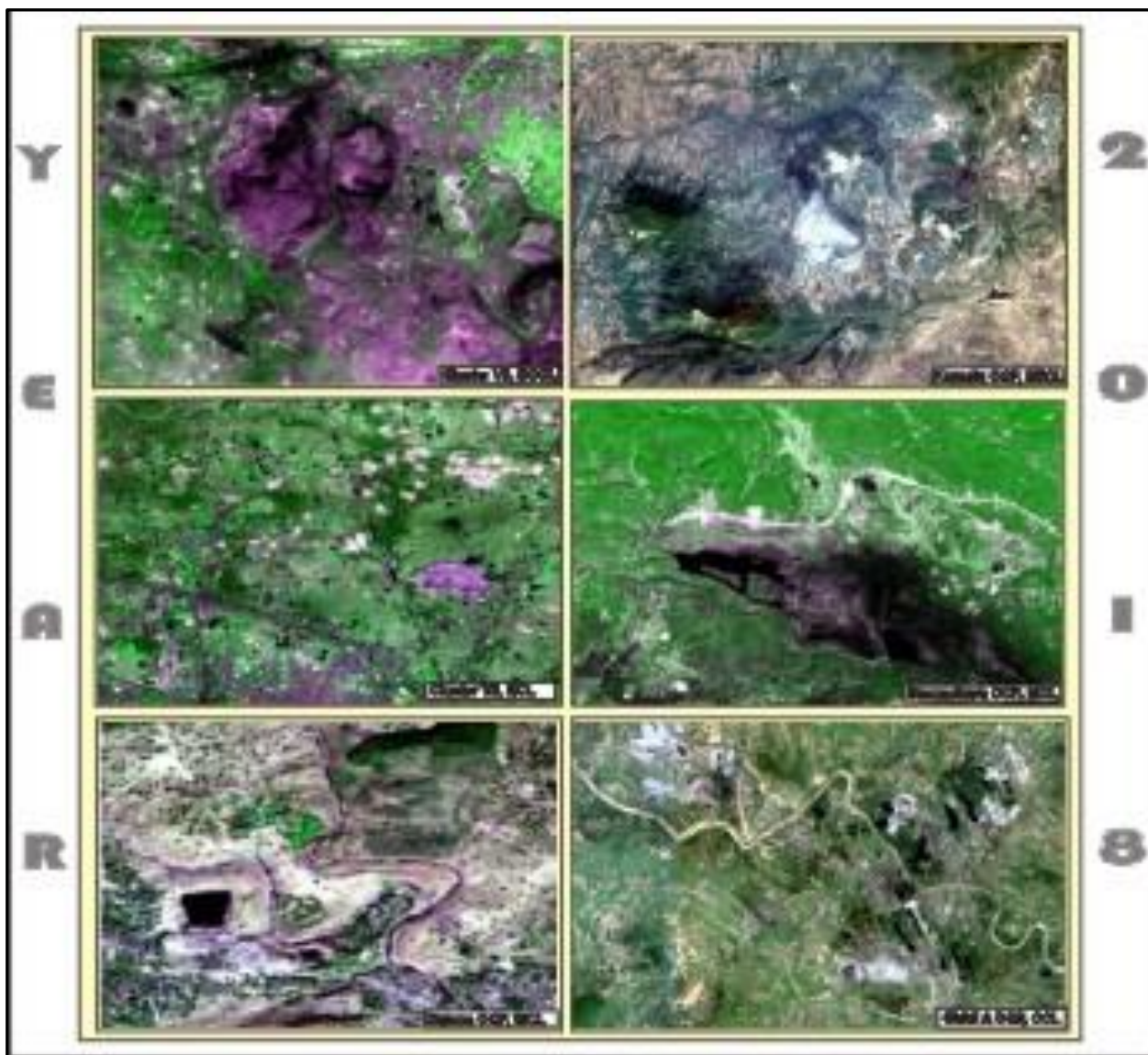


**Land Restoration / Reclamation Monitoring of 30 Opencast Coal  
Mines and 08 Clusters of CIL producing less than 5 mcm (Coal+OB)  
based on Satellite Data for the Year 2018-19**



Submitted to  
**Coal India Limited**



*cmpdi*  
A Mini-Ratna Company

**Land Restoration / Reclamation Monitoring of 30 Opencast  
Coal Mines and 08 Clusters of CIL producing less than 5  
mcm (Coal+OB) based on Satellite Data for the Year 2018-19**

**March- 2019**



**Remote Sensing Cell  
Geomatics Division  
CMPDI, Ranchi**

## **CONTENTS**

	<b><i>Executive Summary</i></b>	<b>2</b>
1.0	Background	7
2.0	Objective	8
3.0	Methodology	8
4.0	Work plan	11
5.0	Land Reclamation in WCL	13
6.0	Land Reclamation in SECL	42
7.0	Land Reclamation in MCL	54
8.0	Land Reclamation in CCL	67
9.0	Land Reclamation in BCCL	93
10.0	Land Reclamation in ECL	107

## Executive Summary

- 1.0 Project** Land restoration / reclamation monitoring of 30 opencast coal mines and 08 clusters of different subsidiaries of Coal India Ltd. (CIL) producing less than 5 million cu.m. (Coal+OB) per year based on satellite data regularly at an interval of three years.
- 2.0 Objective** Objective of the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and distribution of wasteland, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection.
- 3.0 Salient Findings** Out of the total mine leasehold area of 44441.56 Hectares of the 30 opencast projects & 08 clusters together of different subsidiaries of CIL producing less than 5 mcm (Coal +OB) annually considered for monitoring during 2018-19; total excavated area is 4162.63 hectares out of which 511.37 hectares (12.29%) has been planted (*Biologically Reclaimed*), 1963.64 hectares area (47.17%) is under backfilling (*Technical Reclamation*) and 1687.62 hectares (40.54%) is under active mining. It is evident from the analysis that 2475.01 hectares (59.46%) area of the 30 OCPs & 08 clusters taken for study for the year 2018-19 is under reclamation and balance 1687.62 hectares (40.54%) area is under active mining. Company wise details of land reclamation of the above OCPs & clusters is given in Table-1 & Fig-1.
- The projects selected for land reclamation monitoring in the year 2018-19 are subdivided into two groups viz (A) 30 opencast projects belonging to WCL, CCL, SECL & MCL and (B) 08 clusters of mines of ECL and BCCL.
- For Group A, out of the total mine leasehold area of 20218.60 Hectares of the 30 OC projects of WCL, SECL, MCL and CCL producing less than 5 mcm (Coal +OB) annually considered for monitoring during 2018-19; total excavated area is 3051.11 hectares out of which 437.45 hectares (14.34%) has been planted (*Biologically Reclaimed*), 1329.06 hectares area



(43.56%) is under backfilling (*Technical Reclamation*) and 1284.60 hectares (42.10%) is under active mining. It is evident from the analysis that 1766.51 hectares (57.90%) area of the 30 OC projects taken for study for the year 2018-19 is under reclamation and balance 1284.60 hectares (42.10%) area is under active mining. Company wise details of land reclamation of the above 30 projects is given in Table-1(A) & Fig-1.

- On comparing the status of land reclamation for 30 nos of opencast projects in WCL, SECL, MCL and CCL carried out in year 2018-19 with respect to previous cycle study done in the year 2015-16 in these opencast projects of CIL's subsidiary coal companies, it is evident from the analysis that area under land reclamation has increased from 1334.96 Hectares (Yr. 2015-16) to 1766.51 Hectares (Yr. 2018-19) which includes both plantation (Biological Reclamation) and areas under backfilling (Technical Reclamation). This increase of 431.55 hectares area of land reclamation in a period of three years is the result of the efforts made by CIL's subsidiary companies for environment protection.
- It has been observed that in opencast project in WCL, SECL, MCL and CCL, technical and biological reclamation has increased or remained static in the leasehold areas of opencast projects in the year 2018-19 as compared to the year 2015-16.
- The 30 nos. of opencast project in WCL, SECL, MCL and CCL taken for study of land reclamation monitoring in 2018-19; the area under green cover has gone up from 1784.83 Hectare (8.91%) area in the year 2015-16 to 1864.05 Hectare (9.22%) area in the year 2018-19.
- Total area under reclamation in 30 opencast projects of WCL, SECL, MCL and CCL has gone up from 1334.96 Ha (52.33%) in 2015-16 to 1766.51 Ha (57.90%) in 2018-19.
- For Group B, out of the total mine leasehold of 24222.96 Hectare for total no. of 08 cluster of mines ; 04 each in BCCL and ECL respectively producing less than 5 mcm (Coal +OB) annually considered for monitoring during the Year 2018-19: total excavated area is 1111.52 Hectare out of which 73.92 hectare (6.65%) has been planted on backfill (Biologically

Reclaimed), 634.58 hectare (57.09%) area is under backfilling (*Technical Reclamation*) and 403.02 hectare (36.26%) area is under active mining. It is also evident from Table -1(B) that 708.50 hectare (63.74%) area is under reclamation and balance 403.02 hectare (36.26%) area is under active mining.

- In BCCL and ECL, Cluster of mines consisting of mostly underground and few opencast mines have been taken into consideration for land reclamation monitoring in the year 2018-19 on request from these subsidiaries.
- It is evident from Table-1(B) that for 08 clusters taken for monitoring, total area under plantation (Green Cover) is 1779.19 (7.35%).
- It has also been observed from table -1(B) that biological reclamation for 08 cluster of mines in BCCL and ECL is 73.92 hectare (6.65%) in the year 2018-19.
- In BCCL and ECL total area under reclamation is 708.50 hectare (63.74%) in the year 2018.
- Concept of cluster of mines was not there for land reclamation study done in the year 2015-16. Hence comparison of status of land reclamation for the year 2018-19 with respect to year 2015-16 has not been made.
- From Table 1(A) and 1(B) combined, it can be seen that total reclamation in the 30 mines of WCL, CCL, MCL, SECL and 08 clusters of BCCL and ECL is 2475.01 Hectares out of which 511.37 hectares (12.29%) has been planted (*Biologically Reclaimed*), 1963.64 hectares area (47.17%) is under backfilling (*Technical Reclamation*) and 1687.62 hectares (40.54%) is under active mining.
- It is important to note that a new Table format has been designed by Coal India Ltd. with new parameters for Biological & Technical Reclamation. For comparative purpose the basic dataset for the year 2015-16 has been fed into new format so that it can be compared with the results of 2018-19 as per the new format.

**Table-1**

**Company wise Land Reclamation Status in OC projects & Clusters**  
**Producing (Less than 5 million cu.m. Coal + OB) based on Satellite Data of year 2018**

Sl. No.	Coal Company (No. of OC Projects / Clusters)	Area in Hectare (% calculated in respect of total excavated area)																	
		Leasehold / All Right Boundary	Technical Reclamation		Plantation						Area under Active Mining	Total Excavated Area	Total Area under Plantation (% Green Cover generated in Leasehol)		Total Area under Reclamation				
					Biological Reclamation		Other Plantation												
			Area under Backfilling / OB		Area under Plantation		Plantation on External OB Dumps		Socail Forestry, Avenue Plantation etc.										
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11 (=4+5)	
		2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
(A)	PROJECTWISE																		
1	WCL (12)	6515.74	6035.43	449.25 48.24	476.26 45.35	42.53 4.57	86.81 8.27	349.90	386.79	346.42	324.66	439.51 47.19	487.22 46.39	931.29	1050.29	738.85 11.34	798.26 13.23	491.78 52.81	563.07 53.61
2	SECL (03)	2425.43	3020.60	114.82 33.70	277.03 52.14	149.75 43.95	152.96 28.79	6.79	7.99	261.74	241.89	76.19 22.36	101.32 19.07	340.76	531.31	418.28 17.25	402.84 13.34	264.57 77.64	429.99 80.93
3	MCL (03)	2035.83	2035.83	83.74 30.18	164.06 45.39	1.13 0.41	1.13 0.31	14.30	14.30	27.86	27.86	192.60 69.41	196.29 54.30	277.47	361.48	43.29 2.13	43.29 2.13	84.87 30.59	165.19 45.70
4	CCL (12)	9045.86	9126.74	333.63 33.31	411.71 37.16	160.11 15.99	196.55 17.74	269.24	250.72	155.06	172.39	507.78 50.70	499.77 45.10	1001.52	1108.03	584.41 6.46	619.66 6.79	493.74 49.30	608.26 54.90
SUB TOTAL (A) (30)		20022.86	20218.60	981.44 38.47	1329.06 43.56	353.52 13.86	437.45 14.34	640.23	659.80	791.08	766.80	1216.08 47.67	1284.60 42.10	2551.04	3051.11	1784.83 8.91	1864.05 9.22	1334.96 52.33	1766.51 57.90
(B)	CLUSTERSWISE																		
5	BCCL (04)	-	5883.96	-	625.15 58.11	-	73.92 6.87	-	156.71	-	570.04	-	376.69 35.02	-	1075.76	-	800.66 13.61	-	699.07 64.98
6	ECL (04)	-	18339.00	-	9.43 26.37	-	0.00 0.00	-	0.00	-	978.53	-	26.33 73.63	-	35.76	-	978.53 5.34	-	9.43 26.37
SUB TOTAL (B) (08)		0.00	24222.96	-	634.58 57.09	-	73.92 6.65	-	156.71	-	1548.57	-	403.02 36.26	-	1111.52	-	1779.19 7.35	-	708.50 63.74
TOTAL CIL (A+B) (38) (Less than 5 MCM)		20022.86	44441.56	981.44 38.47	1963.64 47.17	353.52 13.86	511.37 12.29	640.23	816.51	791.08	2315.37	1216.08 47.67	1687.62 40.54	2551.04	4162.63	1784.83 8.91	3643.24 8.20	1334.96 52.33	2475.01 59.46

**Note :** Total Excavated Area (%) is calculated in respect to the Leasehold / All Right Boundary.

In reference of the above Table, different parameters are classified as follows:

1. Area under **Biological Reclamation** includes Areas under Plantation done on Backfilled Area Only.
2. Area under **Technical Reclamation** includes Area under Barren Backfilling only
3. Area under Active Mining Includes Coal Quarry, Advance Quarry Site, Quarry filled with water etc., if any.
4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the Table above.
5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

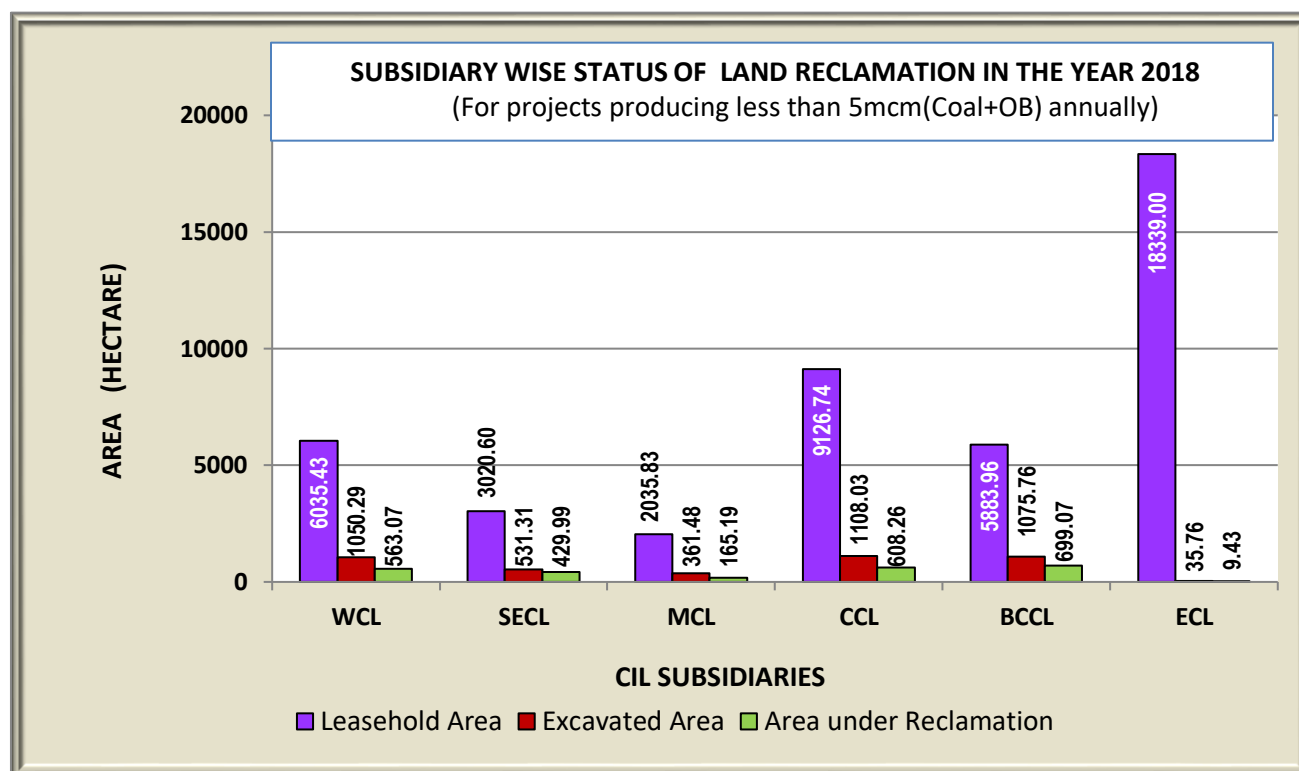


Fig. 1 : Company wise Land Reclamation Status in the Year 2018

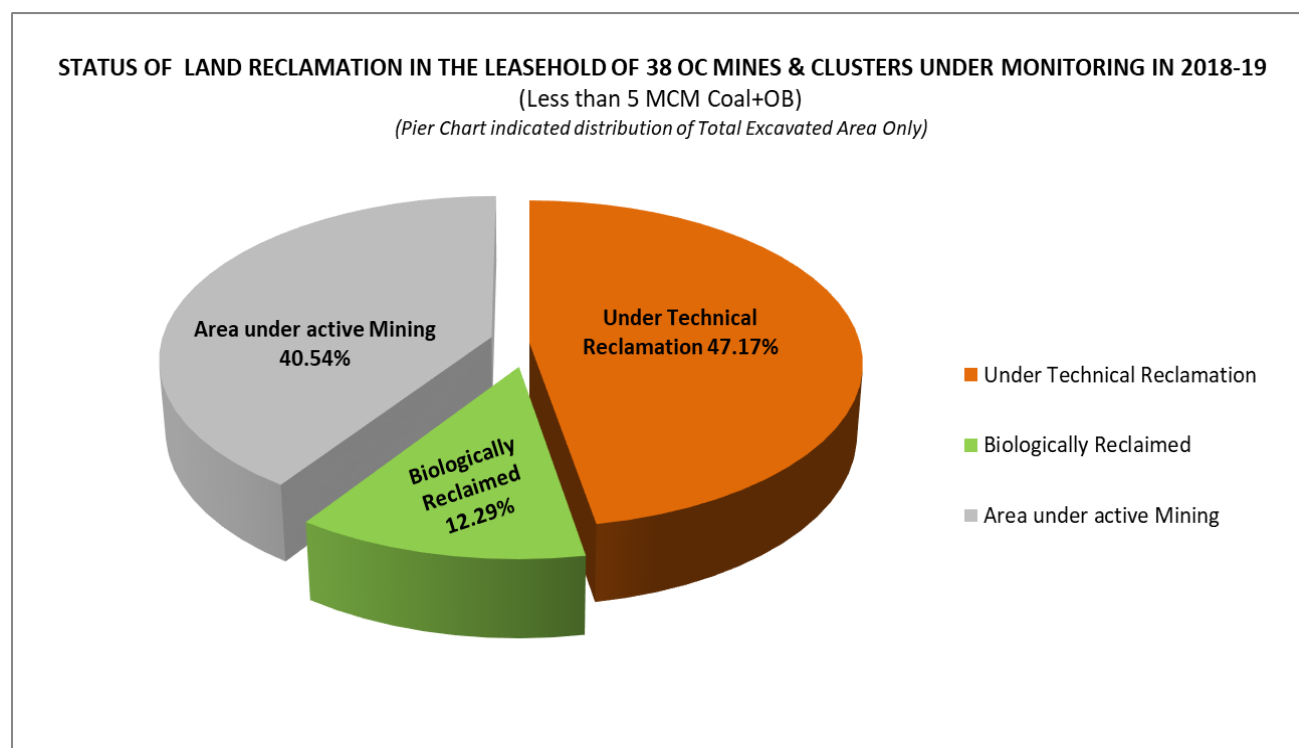


Fig2: Pie Chart indicating Land Reclamation Status in 2018

## **1.0 Background**

- 1.1** Land is the most important natural resource which embodies soil, water, flora, fauna and total ecosystem. All human activities are based on the land which is the most scarce natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do effect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.
- 1.2** Keeping above in view, a work order vide letter no. CIL/WBP/ENV./2011dated23/08/11 was issued by CIL for monitoring of less than 5 million m<sup>3</sup> per annum capacity (Coal +OB) projects from the year 2011 at interval of three years. Further, a revised work order was issued vide letter no. CIL/WBP/Env/2011/4706 dated 12.10.2012 from Coal India Limited for the period 2012-13 to 2016-17 which was subsequently followed by another work order vide letter no. CIL/WBP/Env/2017/DP/8477 dated 21.09.2017 from Coal India Limited for the period 2017-18 to 2021-22 for land reclamation monitoring of opencast projects and vegetation cover monitoring of 19 major coalfields.. According to this work order, all mines in CIL with output capacity of 5 million cu. m (coal +OB) shall be monitored every year and all mines below this capacity shall be monitored at an interval of 3 yrs. All coalfields in CIL shall also be monitored at an interval of 3 years as per a defined plan. The result of land reclamation status of all such mines to be put on the website of CIL, ([www.coalindia.in](http://www.coalindia.in)), CMPDI ([www.cmpdi.co.in](http://www.cmpdi.co.in)) and the concerned coal companies in public domain. Detail report to be submitted to Coal India Limited and respective subsidiaries.

- 1.3** Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment & Forest (MoEF). Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.
- 1.4** CMPDI undertook the above study and the present report is embodying the findings in nutshell carrying out for the 30 opencast projects of different subsidiaries and 08 clusters of BCCL and ECL producing less than 5 million cubic m. coal +OB annually in the year 2018-19 for baseline data generation and updation of database of these projects so that progressive changes in the status of land reclamation could be assessed in future.

## **2.0 Objective**

Objective of the land reclamation/restoration monitoring is to assess the area of backfilled, plantation, OB dumps, social forestry, active mining area, settlements and water bodies, distribution of wasteland, agricultural land and forest land in the leasehold area of the project. This is an important step taken up for assessing the progressive status of mined land reclamation and for taking up remedial measures, if any, required for environmental protection.

## **3.0 Methodology**

There are number of steps involved between raw satellite data procurement and preparation of final map. National Remote Sensing Centre (NRSC) Hyderabad, being the nodal agency for satellite data supply in India, provides only raw digital satellite data, which needs further digital image processing for extracting the information and map preparation before uploading the same in the website. Methodology for land reclamation monitoring is given in fig 4. Following steps are involved in land reclamation /restoration monitoring:

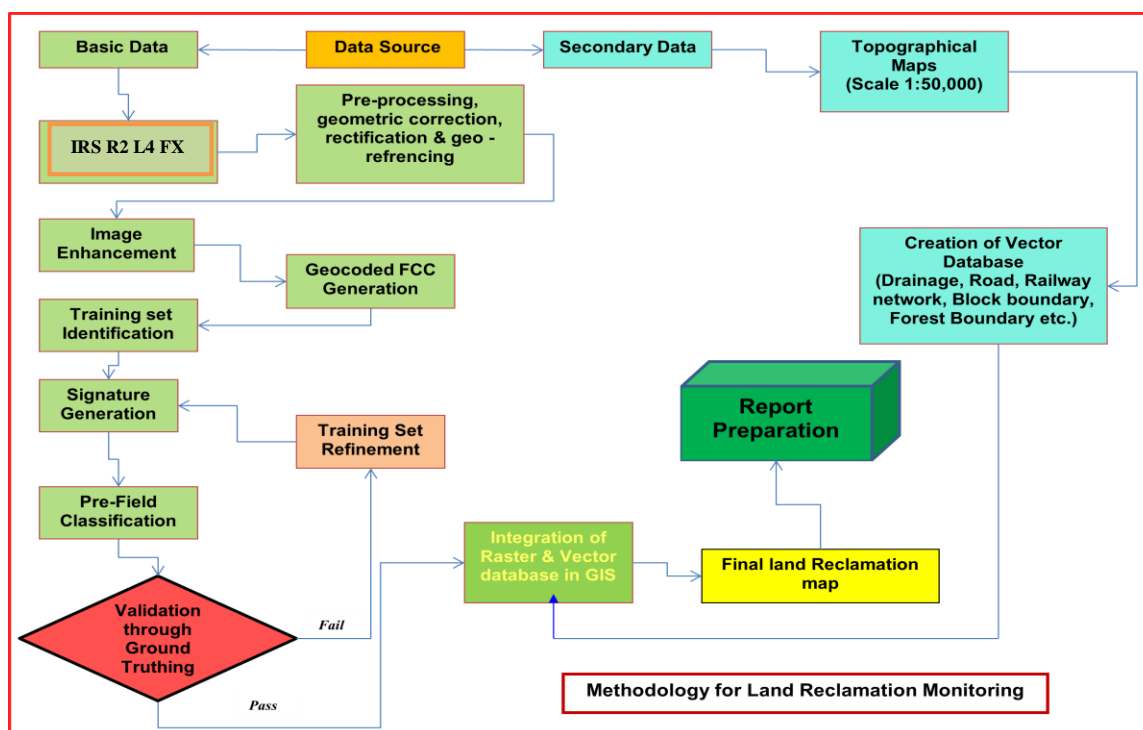


Fig.4 : Methodology for land reclamation monitoring

**3.1 Data Procurement:** After browsing the data quality and date of pass on internet, supply order for data is placed to NRSC. Secondary data like leasehold boundary, topo sheets are procured for creation of vector database.

**3.2 Satellite Data Processing:** Satellite data are processed using ERDAS IMAGINE v2014 s/w digital image processing s/w. Methodology involves the following major steps:

- Rectification & Georeferencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images contain geometric distortions, which make them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible to Sol toposheet.

- **Image enhancement:**

To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE v 2014 s/w and enhance the image quality for interpretation.

- **Training set selection**

Training set requires to be selected, so that software can classify the image data accurately. The image data are analysed based on the interpretation keys. These keys are evolved from certain fundamental image-elements such as tone/colour, size, shape, texture, pattern, location, association and shadow. Based on the image-elements and other geo-technical elements like land form, drainage pattern and physiography; training sets were selected/identified for each land use/cover class. Field survey was carried out by taking selective traverses in order to collect the ground information (or reference data) so that training sets are selected accurately in the image. This was intended to serve as an aid for classification.

- **Classification and Accuracy assessment**

Image classification is carried out using the maximum likelihood algorithm. The classification proceeds through the following steps: (a) calculation of statistics [i.e. signature generation] for the identified training areas, and (b) the decision boundary of maximum probability based on the mean vector, variance, covariance and correlation matrix of the pixels. After evaluating the statistical parameters of the training sets, reliability test of training sets is conducted by measuring the statistical separation between the classes that resulted from computing divergence matrix. The overall accuracy of the classification was finally assessed with reference to ground truth data.



- **Area calculation**

The area of each land use class in the leasehold is determined using ERDAS IMAGINE v2014 s/w.

- **Overlay of Vector data base**

Vector data base created based on secondary data. Vector layer like drainage, railway line, leasehold boundary, forest boundary etc. are superimposed on the image as vector layer in the Arc GIS database.

- **Pre-field map preparation**

Pre-field map is prepared for validation of the classification result

### **3.3 Ground Truthing:**

Selective ground verification of the land use classes are carried out in the field and necessary corrections if required, are incorporated before map finalization.

### **3.4 Land reclamation database on GIS:**

Land reclamation database is created on GIS platform to identify the temporal changes identified from satellite data of different cut-off dates.

## **4.0 Work Plan**

- 4.1** Total 30 opencast projects of different CIL subsidiaries and 08 clusters of BCCL & ECL producing less than 5 million cubic m. (Coal + OB together) were taken up for the study during the year 2018-19. Based on the RESOURCESAT-2 satellite data, land reclamation /mine closure monitoring was carried out using ERDAS IMAGINE digital image processing s/w and Arc-Info GIS.

- 4.2** The list of 30 opencast projects of different CIL subsidiaries and 08 clusters of BCCL & ECL producing less than 5 mcm (coal and OB together) annually taken up based on satellite data of year 2018 is given in table below :

<b>Subsidiary</b> <i>(No. of Projects)</i>	<b>Opencast Projects / Clusters</b> <i>(Less than 5 million Cu.m. Coal +OB per annum)</i>
<b>WCL (12)</b>	Inder UG to OC, Kamptee Deep OC, Navin Kunada, Shivpuri, Pauni Expn , HLOCM, Ghorawari, Dhorwasa, Damua, Barkuhi Makardhokra-I, Ambara.
<b>SECL (03)</b>	Amadand, Amera, Kurasia.
<b>MCL (03)</b>	Basundhara, Garjanbahal & Kaniha.
<b>CCL (12)</b>	Tetariakhar, Dakra, Magadh, Amrapali, Giddi – A, Pundi, Kedla, Jarangdih, Kathara, Konar, Karo, Karma.
<b>BCCL (04)</b>	Cluster -I, Cluster-IV, Cluster-VII, Cluster-X
<b>ECL (04)</b>	Cluster -V, Cluster-VI, Cluster-VII, Cluster-VIII
<b>TOTAL(38)</b>	

Subsidiary wise land reclamation status of the above mentioned 30 opencast projects of different CIL subsidiaries and 08 clusters of BCCL & ECL derived from satellite data for the year 2018-19 are given in the following pages:

**WESTERN COALFIELDS LIMITED**

## 5.0 Land Reclamation Status in Western Coalfields Ltd.

5.1 Following 12 opencast projects of WCL producing less than 5 million cubic m. (Coal+OB) annually were taken up for land reclamation monitoring during the year 2018-19:

- Inder UG to OC
- Kamptee Deep OC
- Navin Kunada
- Shivpuri
- Pauni Expn
- HLOCM
- Ghorawari
- Dhorwasa
- Damua
- Barkuhi
- Makardhokra-I
- Ambara

5.2 Land reclamation status of the above mentioned 12 opencast projects were also prepared for the year 2015. Project wise Land Reclamation status in WCL is given in Table 5.1 and also shown graphically in Fig 5.1. Area statistics of different land use /cover class present in the mine leasehold of the above projects for the year 2018 are shown in the Table – 5.2. Land use maps derived from satellite data are shown in Plate 5.1 - 5.12. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 5.2 - 5.13 for the years 2015 and 2018.

5.3 Study reveals that 563.07 Ha (53.61%) of mining area has already been under reclamation by WCL out of which 86.81 Ha (8.27%) area has been revegetated and 476.26 Ha (45.35%) area is under backfilling. There is an increase of 71.29 Hectare area under reclamation in WCL with respect to the year 2015, out of which 44.28 Hectare

increase in biological reclamation (plantation) and 27.01 Hectare increase in the technical reclamation (backfilling).

- 1.4** Study indicates that overall all the projects of WCL considered for this study indicate increase or static trend in biological reclamation (plantation on backfill) with respect to the year 2015.
- 5.5** There has been increase in area under technical reclamation (backfilling) in projects of WCL but in projects like Navin Kunda, HLOCM, Damua and Ambara OCPs where area under technical reclamation has reduced marginally as compared to the year 2015 as more backfilled areas have come under plantation (Biological Reclamation) in these projects.
- 5.6** After analyzing the satellite data of year 2015 vs. 2018 it is evident that total area under plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in all the mines of WCL has increased from 738.85 Hectare to 798.26 Hectare in span of last three year. This increase of 59.41 Hectare area of plantation (Green Cover) in three year time is due to the sincere efforts of WCL towards mine land reclamation.
- 5.7** The leasehold boundary of Ambara OCP has been updated this year which has resulted in significant change in shape and area of leasehold of Ambara OCP i.e 162.15 Ha in the year 2018 as compared to 775.52 Ha in the year 2015, due to which total area under plantation has decreased from 71.62 Ha (Yr. 2015) to 24.06 Ha (Yr. 2018). However percentage green cover generated in leasehold area has increased from 9.24% (Yr. 2015) to 14.84% (Yr. 2018) as percentage Green Cover generated is calculated with respect to leasehold area of respective mine.
- 5.8** Out of 12 projects of WCL, maximum land reclamation has been carried out in Damua OC project (76.04%) followed by Ambara (73.24%), HLOCM (66.39%) and Navin Kunada (64.82%).

Table – 5.1

**Project wise Land Reclamation Status in Opencast Project of WCL  
(Less than 5 million Cu. M. of Coal+OB) based on Satellite Data of the year 2018**

(Area in Ha)

Sl.No	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Awanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
1	Inder Ug to OC	617.84	617.84	57.29	57.29	0.00	0.00	27.64	29.79	37.60	37.96	80.78	80.66	138.07	137.95	65.24	67.75	57.29	57.29
				41.49%	41.53%	0.00%	0.00%					58.51%	58.47%			10.56%	10.97%	41.49%	41.53%
2	Kamptee Deep	462.63	471.44	48.92	51.23	2.95	8.11	61.09	61.39	28.48	37.88	69.47	61.99	121.34	121.33	92.52	107.38	51.87	59.34
				40.32%	42.22%	2.43%	6.68%					57.25%	51.09%			20.00%	22.78%	42.75%	48.91%
3	Navin Kunada	373.00	373.00	91.06	87.46	12.97	19.71	84.92	88.44	4.59	5.05	54.09	58.17	158.12	165.34	102.48	113.20	104.03	107.17
				57.59%	52.90%	8.20%	11.92%					34.21%	35.18%			27.47%	30.35%	65.79%	64.82%
4	Shivpuri	336.29	336.29	12.39	17.98	0.00	6.06	19.25	20.41	16.53	16.53	40.51	47.31	52.90	71.35	35.78	43.00	12.39	24.04
				23.42%	25.20%	0.00%	8.49%					76.58%	66.31%			10.64%	12.79%	23.42%	33.69%
5	PauniExpn OCP	255.00	255.00	26.54	47.37	2.24	3.83	32.36	36.64	10.00	9.94	37.43	43.76	66.21	94.96	44.60	50.41	28.78	51.20
				40.08%	49.88%	3.38%	4.03%					56.53%	46.08%			17.49%	19.77%	43.47%	53.92%
6	HLOCM	311.66	311.66	69.09	63.64	0.00	6.31	59.55	72.86	33.06	33.54	38.36	35.42	107.45	105.37	92.61	112.71	69.09	69.95
				64.30%	60.40%	0.00%	5.99%					35.70%	33.61%			29.72%	36.16%	64.30%	66.39%
7	Ghorawari	1175.11	1296.01	29.16	32.06	0.00	8.92	21.03	27.60	13.09	14.43	18.14	23.07	47.30	64.05	34.12	50.95	29.16	40.98
				61.65%	50.05%	0.00%	13.93%					38.35%	36.02%			2.90%	3.93%	61.65%	63.98%
8	Dhorwasa	229.56	232.91	57.08	51.07	4.88	11.85	35.69	39.69	10.76	11.47	37.64	36.12	99.60	99.04	51.33	63.01	61.96	62.92
				57.31%	51.57%	4.90%	11.96%					37.79%	36.47%			22.36%	27.05%	62.21%	63.53%
9	Damua	1080.92	1080.92	9.42	8.98	6.34	8.51	8.37	9.97	125.11	138.58	5.75	5.51	21.51	23.00	139.82	157.06	15.76	17.49
				43.79%	39.04%	29.47%	37.00%					26.73%	23.96%			12.94%	14.53%	73.27%	76.04%
10	Barkuhi	237.51	237.51	2.73	13.84	0.00	0.00	0.00	0.00	8.73	8.73	12.98	18.69	15.71	32.53	8.73	8.73	2.73	13.84
				17.38%	42.55%	0.00%	0.00%					82.62%	57.45%			3.68%	3.68%	17.38%	42.55%
11	Makardhokra-1	660.70	660.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	29.07	55.02	29.07	55.02	0.00	0.00	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.00%	0.00%	0.00%	0.00%
12	Ambara	775.52	162.15	45.57	45.34	13.15	13.51	0.00	0.00	58.47	10.55	15.29	21.50	74.01	80.35	71.62	24.06	58.72	58.85
				61.57%	56.43%	17.77%	16.81%					20.66%	26.76%			9.24%	14.84%	79.34%	73.24%
	TOTAL	6515.74	6035.43	449.25	476.26	42.53	86.81	349.90	386.79	346.42	324.66	439.51	487.22	931.29	1050.29	738.85	798.26	491.78	563.07
				48.24%	45.35%	4.57%	8.27%					47.19%	46.39%	14.29%	17.40%	11.34%	13.23%	52.81%	53.61%

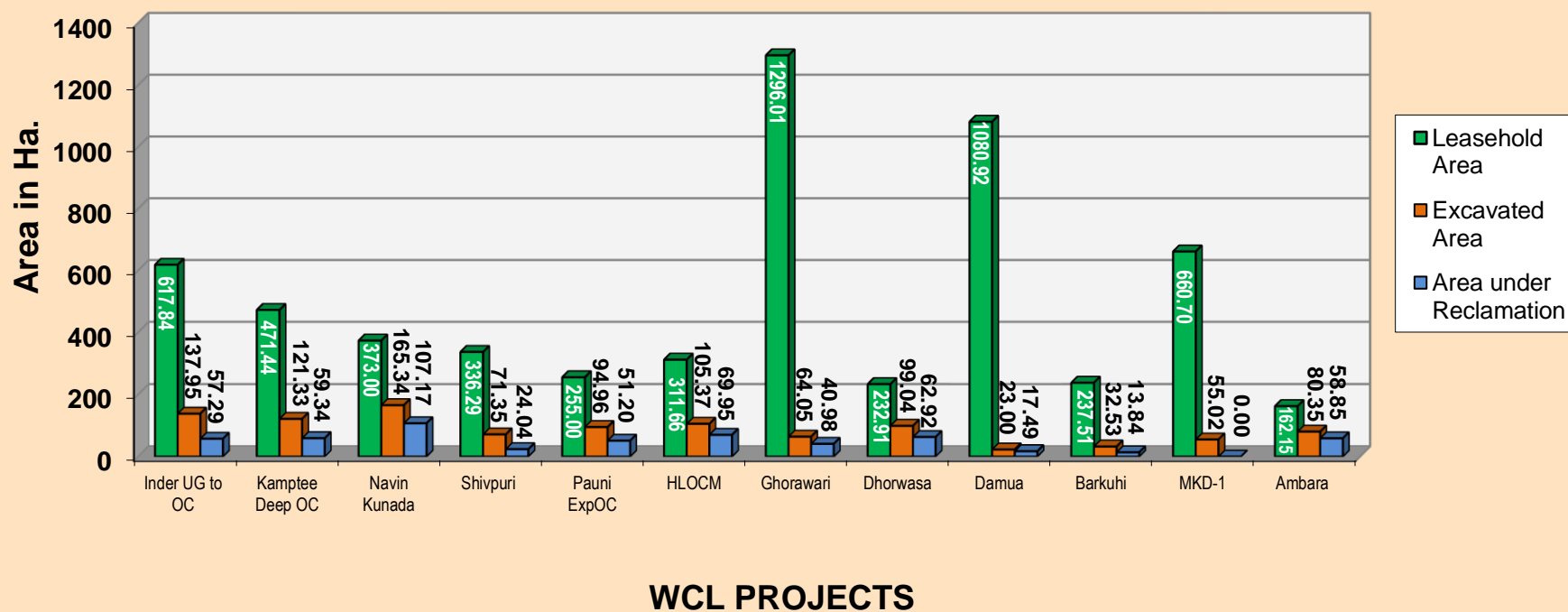
(% is calculated with respected to Excavated Area as applicable)

(% is calculated with respected to Excavated Area as applicable)

**Note : In reference of the above Table-1, different parameters are classified as follows**

- 1 Area under Biological Reclamation includes area under plantation done on backfilled area only.
- 2 Area under Technical Reclamation includes areas under barren backfill only.
- 3 Area under Active Mining includes coal quarry, advance quarry & quarry filled with water etc.
- 4 Social forestry and plantation on external OB dump are not included in biological reclamation and are put under other plantation.
- 5 % claculated in respect to total excavated area except for "Total area under plantation" where % has been calculated in terms of leasehold area.





















### Project wise status of Land Reclamation in WCL for the Year 2018



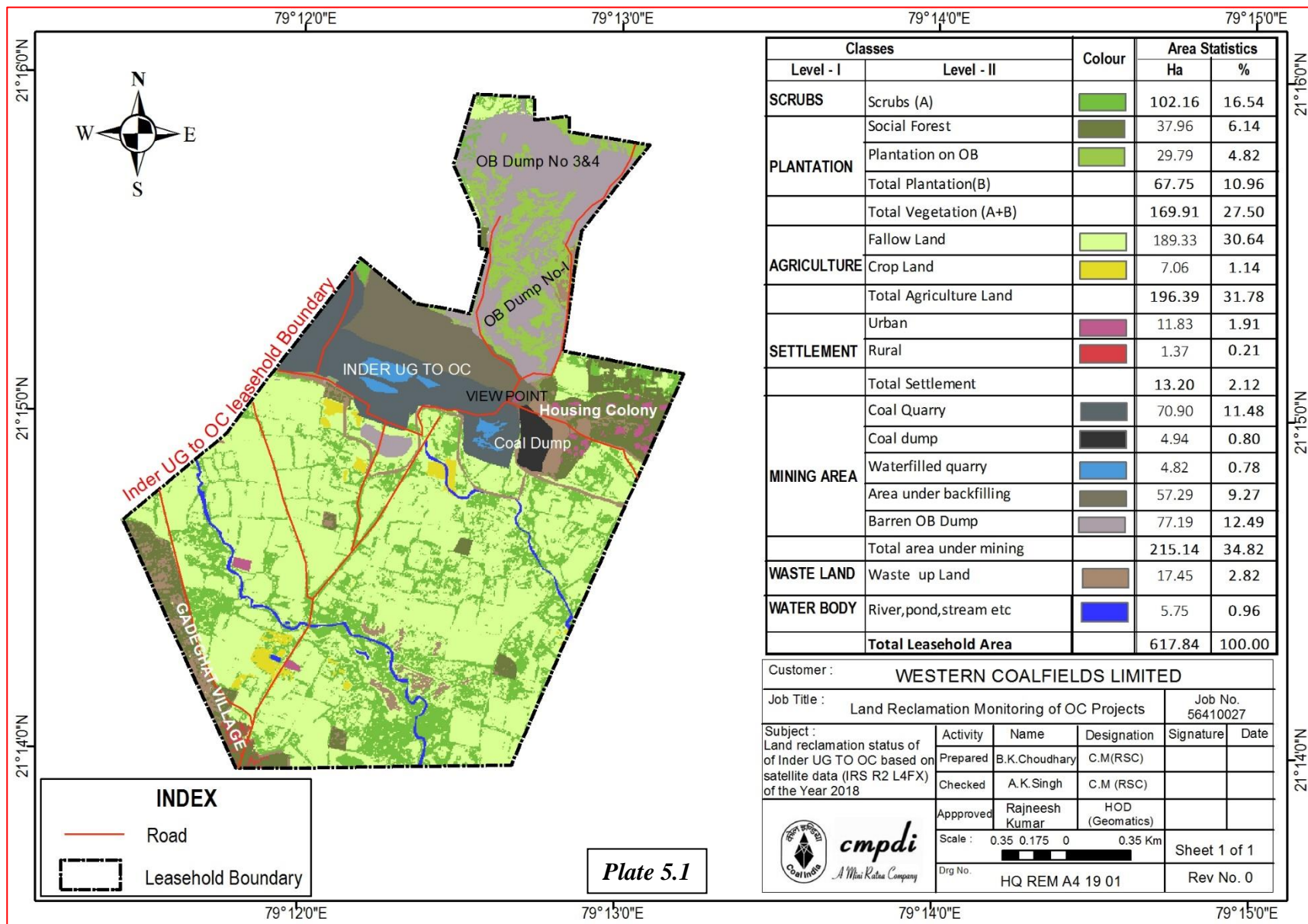
**Fig.5.1:** Land Reclamation Status in OC projects producing less than 5mcm (Coal+ OB) of WCL in the year-2018

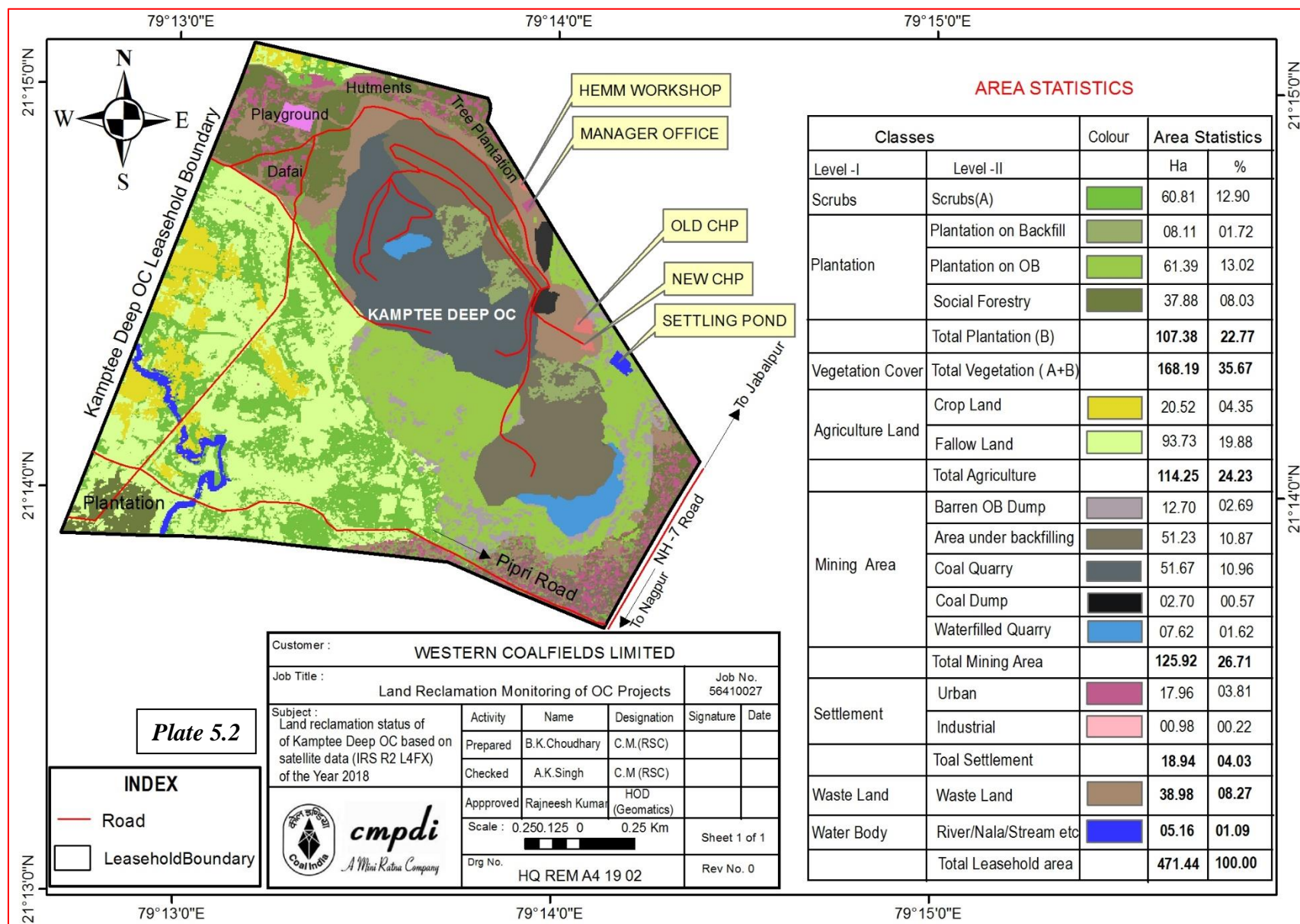
Table 5.1

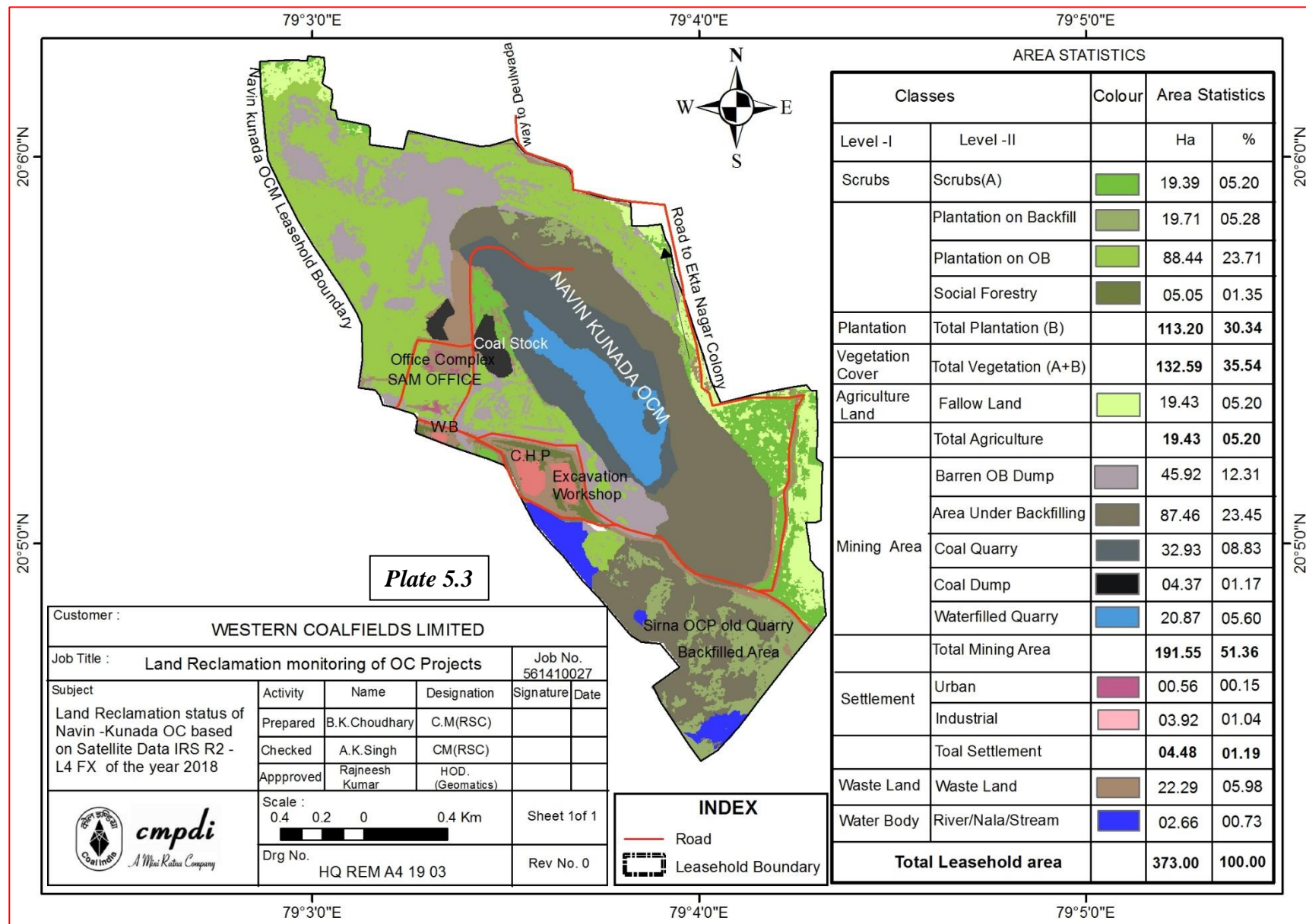
**Project wise area statistics of Land Use/Cover classes in Opencast Projects producing <5m.cm Coal+OB) of WCL based on satellite data of the year 2018**

(Area In Hectare)																												
			Inder UG to OC		Kamptee Deep		Navin Kunada		Shivpuri		Pauni Expn OC		HLOCM		Ghorawari		Dhorwasa		Damua		Barkui		Makardhokra-I		Ambara		Total	
FORESTS			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Dense Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140.68	10.85	0.00	0.00	62.19	5.75	0.00	0.00	0.00	0.00	0.00	0.00	202.87	3.36
	Total Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	140.68	10.85	0.00	0.00	62.19	5.75	0.00	0.00	0.00	0.00	0.00	0.00	202.87	3.36
SCRUBS	Scrubs		102.16	16.54	60.81	12.90	19.39	5.20	38.73	11.52	31.82	12.48	5.33	1.71	428.41	33.06	17.87	7.67	293.73	27.17	45.08	18.98	152.87	23.14	17.92	11.05	1214.12	20.12
	Social Forestry		37.96	6.14	37.88	8.03	5.05	1.35	16.53	4.92	9.94	3.90	33.54	10.76	14.43	1.11	11.47	4.92	138.58	12.82	8.73	3.68	0.00	0.00	10.55	6.51	324.66	5.38
PLANTATION	Plantation on OB Dump		29.79	4.82	61.39	13.02	88.44	23.71	20.41	6.07	36.64	14.37	72.86	23.38	27.60	2.13	39.69	17.04	9.97	0.92	0.00	0.00	0.00	0.00	0.00	0.00	386.79	6.41
	Plantation on Backfill		0.00	0.00	8.11	1.72	19.71	5.28	6.06	1.80	3.83	1.50	6.31	2.02	8.92	0.69	11.85	5.09	8.51	0.79	0.00	0.00	0.00	0.00	13.51	8.33	86.81	1.44
	Total Plantation on backfill		0.00	0.00	8.11	1.72	19.71	5.28	6.06	1.80	3.83	1.50	6.31	2.02	8.92	0.69	11.85	5.09	8.51	0.79	0.00	0.00	0.00	0.00	13.51	8.33	86.81	1.44
	Total Green Cover Generated		67.75	10.96	107.38	22.77	113.20	30.34	43.00	12.79	50.41	19.77	112.71	36.16	50.95	3.93	63.01	27.05	157.06	14.53	8.73	3.68	0.00	0.00	24.06	14.84	798.26	13.23
Total Vegetation Cover			169.91	27.50	168.19	35.67	132.59	35.54	81.73	24.31	82.23	32.25	118.04	37.87	620.04	47.84	80.88	34.72	512.98	47.45	53.81	22.66	152.87	23.14	41.98	25.89	2215.25	36.71
ACTIVE MINING	Coal Quarry		70.90	11.48	51.67	10.96	32.93	8.83	30.72	9.13	38.17	14.97	32.77	10.51	15.07	1.16	25.77	11.06	3.12	0.29	16.20	6.82	55.02	8.33	12.12	7.47	384.46	6.37
	Coal Dump		4.94	0.80	2.70	0.57	4.37	1.17	3.49	1.04	4.03	1.58	2.07	0.66	1.27	0.10	2.63	1.13	0.00	0.00	1.88	0.79	0.00	0.00	1.78	1.10	29.16	0.48
	Advance Quarry Site		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	Quarry Filled With Water		4.82	0.78	7.62	1.62	20.87	5.60	13.10	3.90	1.56	0.61	0.58	0.19	6.73	0.52	7.72	3.32	2.39	0.22	0.61	0.26	0.00	0.00	7.60	4.69	73.60	1.22
	Total Area under Active Mining		80.66	13.06	61.99	13.15	58.17	15.60	47.31	14.07	43.76	17.16	35.42	11.36	23.07	1.78	36.12	15.51	5.51	0.51	18.69	7.87	55.02	8.33	21.50	13.26	487.22	8.07
RECLAIMED	Barren OB Dump		77.19	12.49	12.70	2.69	45.92	12.31	60.54	18.00	35.61	13.96	47.74	15.32	34.40	2.65	35.08	15.06	20.13	1.86	16.24	6.82	15.13	2.29	0.00	0.00	400.68	6.64
	Barren Backfilled Area		57.29	9.27	51.23	10.87	87.46	23.45	17.98	5.35	47.37	18.58	63.64	20.42	32.06	2.47	51.07	21.93	8.98	0.83	13.84	5.83	0.00	0.00	45.34	27.96	476.26	7.89
	Total Area under Technical Reclamation		57.29	9.27	51.23	10.87	87.46	23.45	17.98	5.35	47.37	18.58	63.64	20.42	32.06	2.47	51.07	21.93	8.98	0.83	13.84	5.83	0.00	0.00	45.34	27.96	476.26	14.53
Waste land	Total Area Under Mine Operation		215.14	34.82	125.92	26.71	191.55	51.36	125.83	37.42	126.74	49.70	146.80	47.10	89.53	6.90	122.27	52.50	34.62	3.20	48.77	20.52	70.15	10.62	66.84	41.22	1364.16	22.60
	Waste Lands		17.45	2.82	38.98	8.27	22.29	5.98	17.40	5.17	24.07	9.44	23.95	7.68	253.11	19.53	11.60	4.98	185.27	17.16	3.78	1.59	25.44	3.85	24.36	15.02	647.70	10.73
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0	0	1.92	0.57	3.32	1.30	0.00	0.00	0.00	0.00	1.22	0.52	16.15	1.49	0.00	0.00	1.60	0.24	0.00	0.00	24.21	0.40
WATERBODIES	Total Wasteland		17.45	2.82	38.98	8.27	22.29	5.98	19.32	5.74	27.39	10.74	23.95	7.68	253.11	19.53	12.82	5.50	201.42	18.65	3.78	1.59	27.04	4.09	24.36	15.02	671.91	11.13
	Reservoir, nallah, ponds		5.75	0.96	5.16	1.09	2.66	0.73	0.44	0.13	1.14	0.45	6.52	2.09	5.74	0.45	8.94	3.84	9.98	0.93	5.40	2.28	6.47	0.98	0.00	0.00	58.20	0.98
	Total Waterbodies		5.75	0.96	5.16	1.09	2.66	0.73	0.44	0.13	1.14	0.45	6.52	2.09	5.74	0.45	8.94	3.84	9.98	0.93	5.40	2.28	6.47	0.98	0.00	0.00	58.20	0.98
AGRICULTURE	Crop Lands		7.06	1.14	20.52	4.35	0.00	0.00	8.36	2.48	0.00	0.00	0.00	0.00	3.52	0.27	0.00	0.00	0.00	0.00	59.00	24.84	26.77	4.05	14.67	9.05	139.90	2.32
	Fallow Lands		189.33	30.64	93.73	19.88	19.43	5.20	93.28	27.74	16.74	6.56	4.40	1.41	315.49	24.34	7.55	3.24	270.80	25.05	63.07	26.55	376.40	56.97	13.49	8.32	1463.71	24.25
	Total Agriculture		196.39	31.78	114.25	24.23	19.43	5.20	101.64	30.22	16.74	6.56	4.40	1.41	319.01	24.61	7.55	3.24	270.80	25.05	122.07	51.39	403.17	61.02	28.16	17.37	1603.61	26.57
SETTLEMENTS	Urban Settlement		11.83	1.91	17.96	3.81	0.56	0.15	3.20	0.95	0.44	0.17	10.16	3.28	6.26	0.48	0.32	0.14	50.09	4.63	3.37	1.42	0.00	0.00	0.81	0.50	105.00	1.72
	Rural Settlement		1.37	0.21	0.00	0.00	0	0	2.35	0.70	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.80	0.07	0.31	0.14	0.00	0.00	0.00	0.00	4.83	0.08
	Industrial Settlement		0.00	0.00	0.98	0.22	3.92	1.04	1.78	0.53	0.32	0.13	1.79	0.57	2.32	0.19	0.13	0.06	0.23	0.02	0.00	0.00	1.00	0.15	0.00	0.00	12.47	0.21
	Total Settlement		13.20	2.12	18.94	4.03	4.48	1.19	7.33	2.18	0.76	0.30	11.95	3.85	8.58	0.67	0.45	0.20	51.12	4.72	3.68	1.56	1.00	0.15	0.81	0.5	122.30	2.01
Grand Total			617.84	100.00	471.44	100.00	373.00	100.00	336.29	100.00	255.00	100.00	311.66	100.00	1296.01	100.00	232.91	100.00	1080.92	100.00	237.51	100.00	660.70	100.00	162.15	100.00	6035.43	100.00

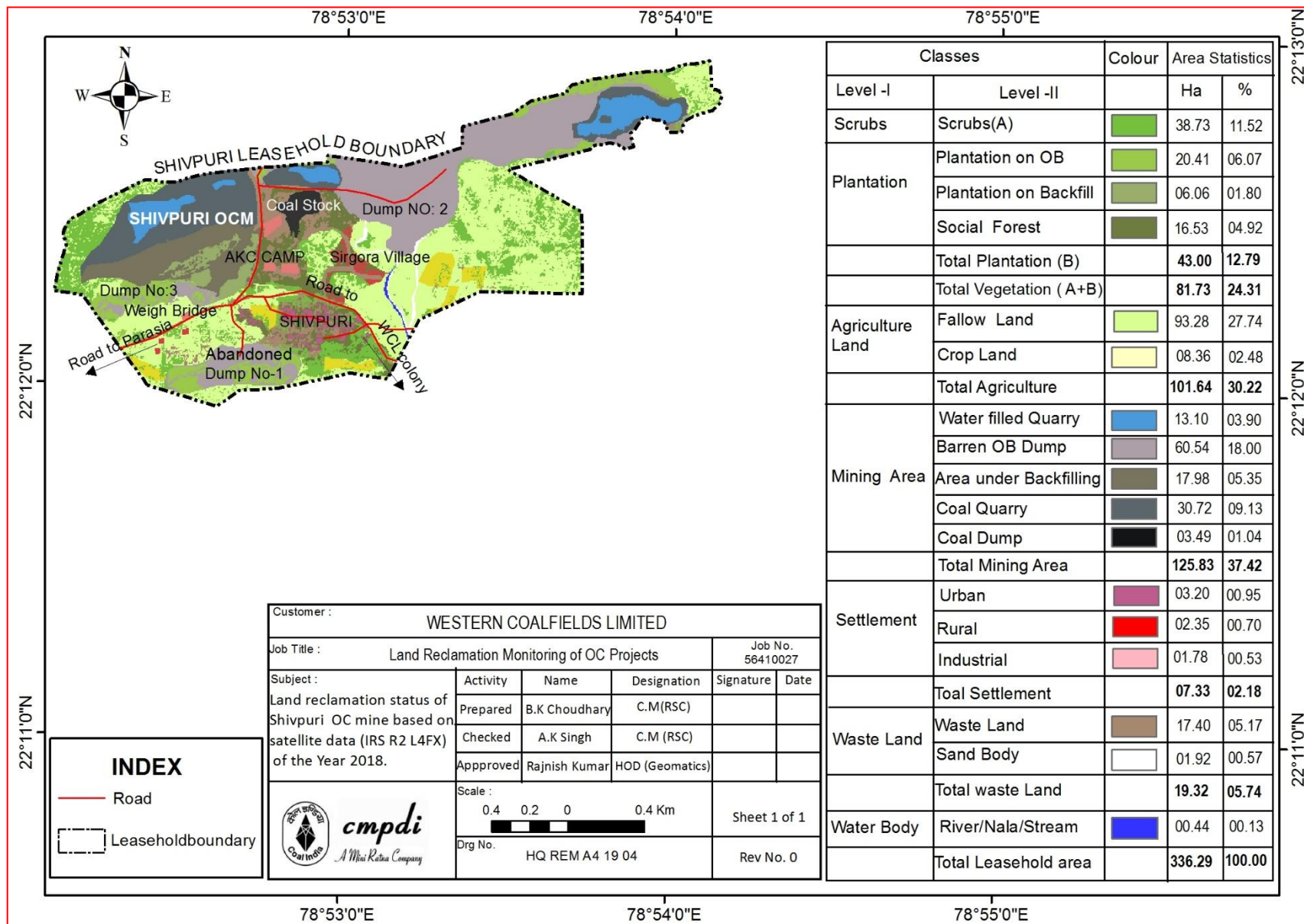


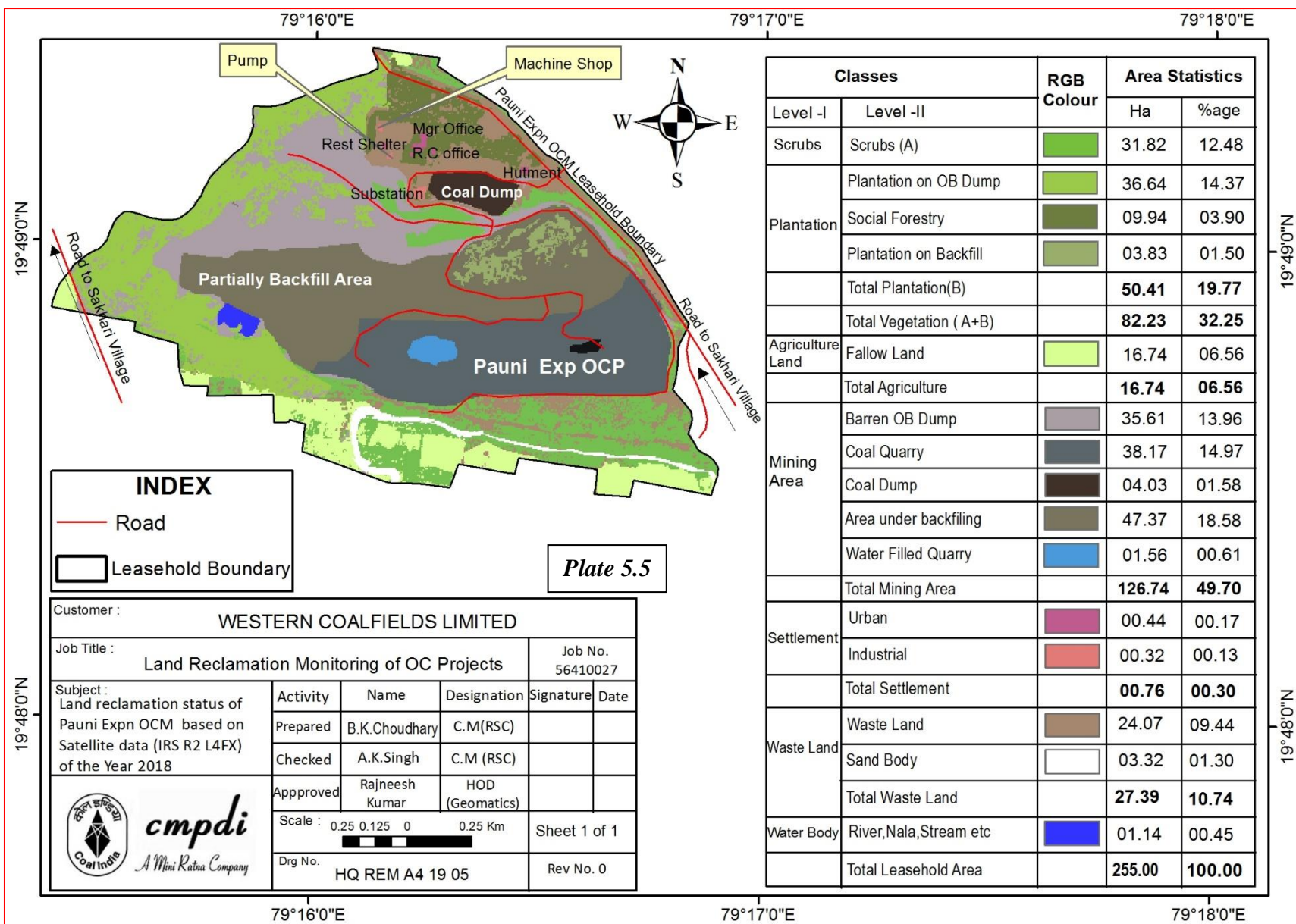




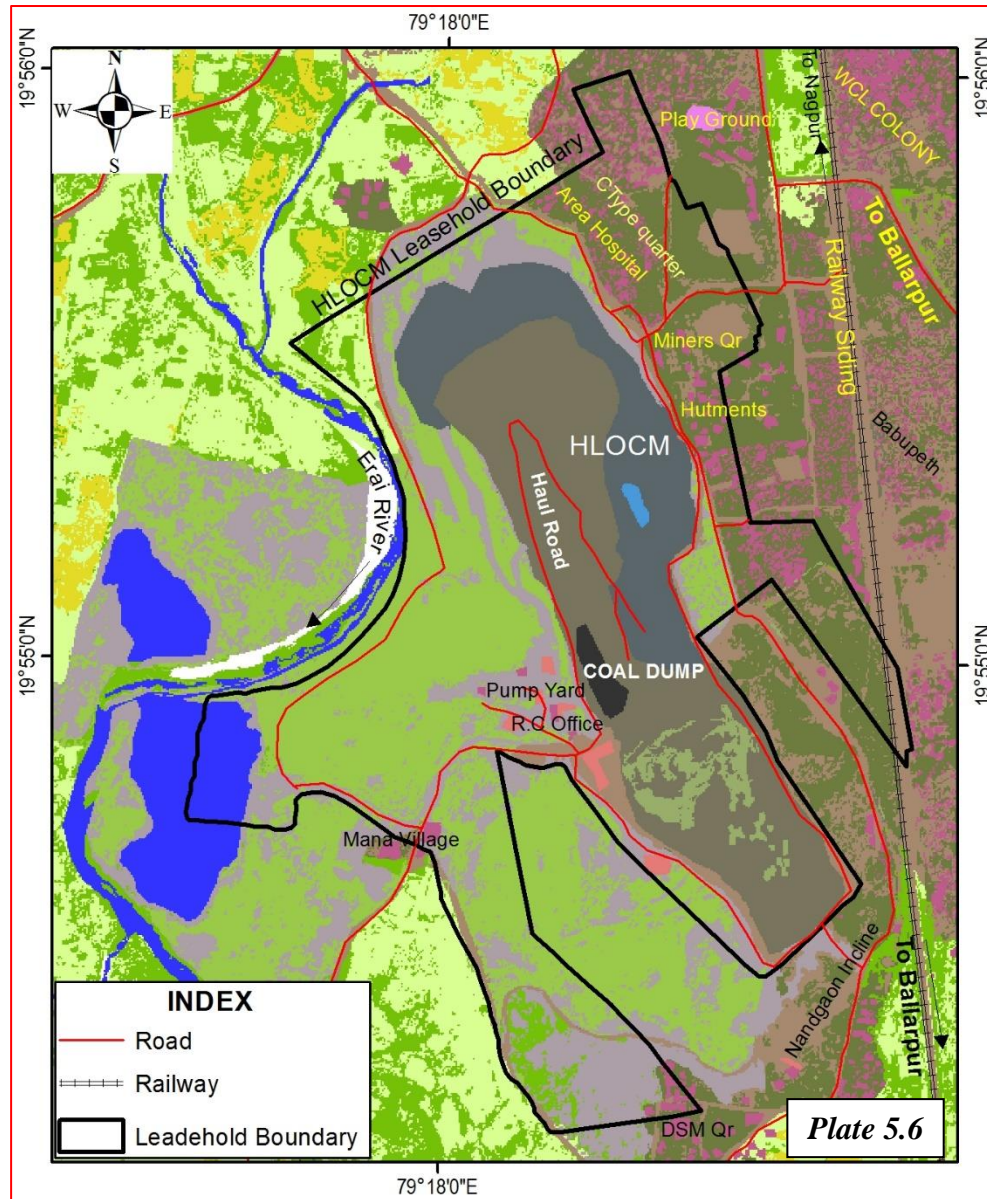












## AREA STATISTICS

Classes		Colour	Area Statistics	
Level -I	Level -II	R G B	Ha	% age
Scrub	Scrub(A)		05.33	01.71
Plantation	Plantation on Backfill		06.31	02.02
	Plantation on OB		72.86	23.38
	Social Forestry		33.54	10.76
	Total Plantation (B)		<b>112.71</b>	<b>36.16</b>
Vegetation Cover	Total Vegetation (A+B)		<b>118.04</b>	<b>37.87</b>
Agriculture Land	Fallow Land		04.40	01.41
	Total Agriculture Land		04.40	01.41
Mining Area	Barren OB Dump		47.74	15.32
	Area under backfilling		63.64	20.42
	Coal Quarry		32.77	10.51
	Coal Dump		02.07	00.66
	Waterfilled Quarry		00.58	00.19
	Total Mining Area		<b>146.80</b>	<b>47.10</b>
Settlement	Urban		10.16	03.28
	Industrial		01.79	00.57
	Total Settlement		<b>11.95</b>	<b>03.85</b>
Waste Land	Waste Land		23.95	07.68
Water Body	River/Nala/Stream		06.52	02.09
	Total Leasehold area		<b>311.66</b>	<b>100.00</b>

Customer :

WESTERN COALFIELDS LIMITED

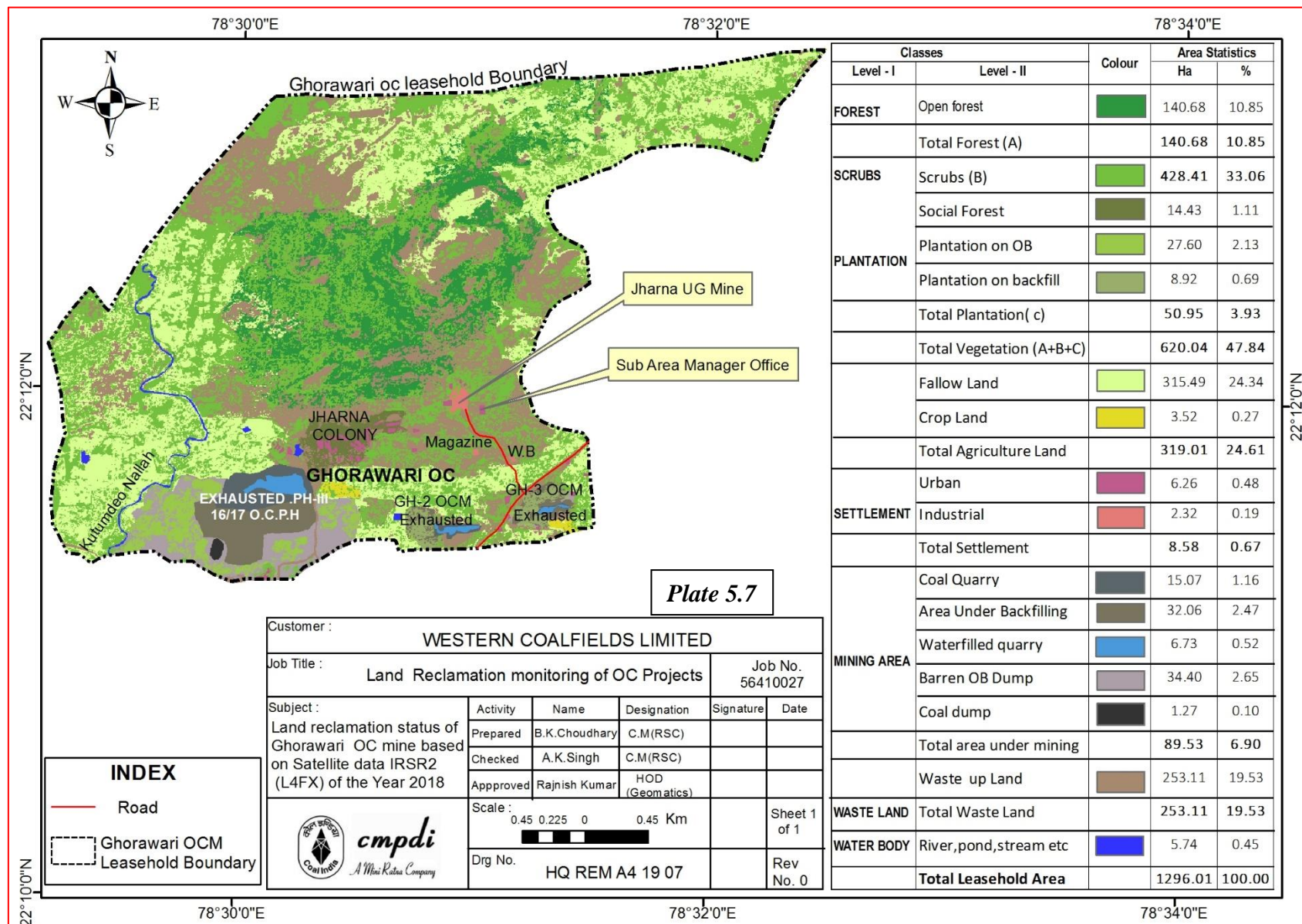
Job Title :

Land Reclamation Monitoring of OC Projects

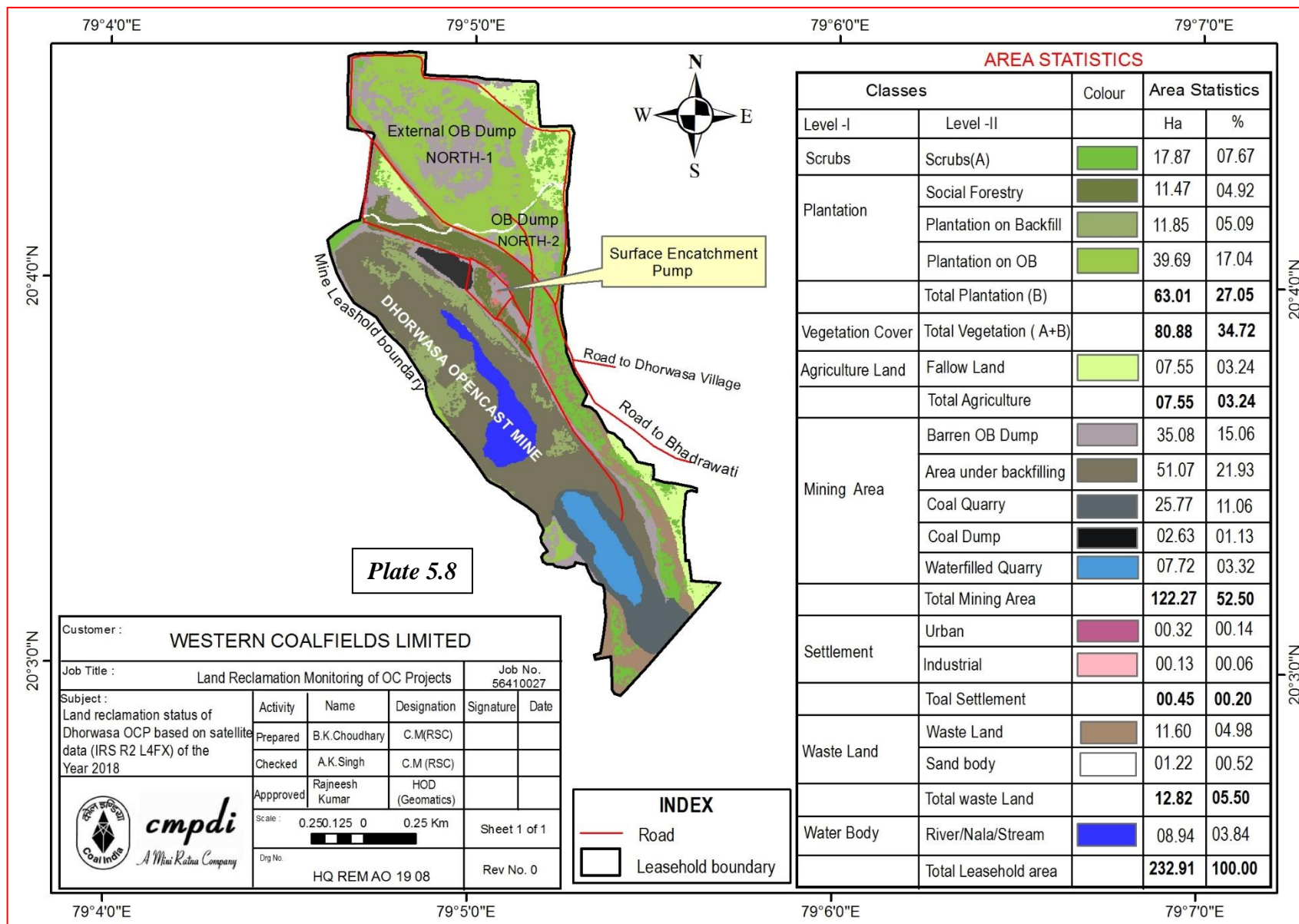
Job No.  
56410027Subject :  
Land reclamation status of  
of HLOCM based on satellite  
data (IRS R2 L4 FX) of the  
Year 2018

Activity	Name	Designation	Signature	Date
Prepared	B.K. Choudhary	C.M(RSC)		
Checked	A.K.Singh	C.M (RSC)		
Approved	Rajneesh Kumar	HOD (Geomatics)		
Scale : 0.25 0.125 0 0.25 Km			Sheet 1 of 1	
Drg No. HQ REM A4 19 06			Rev No. 0	

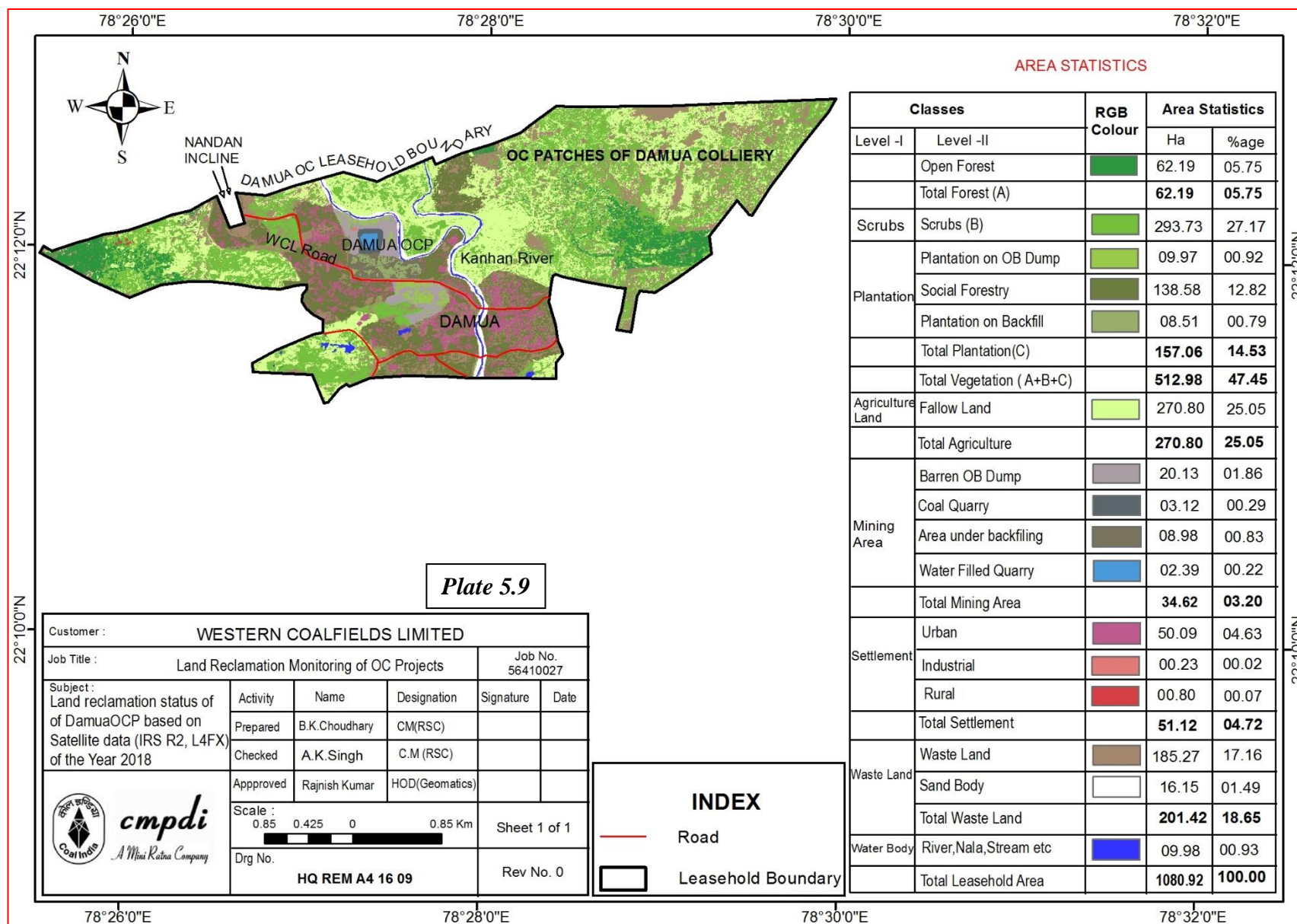


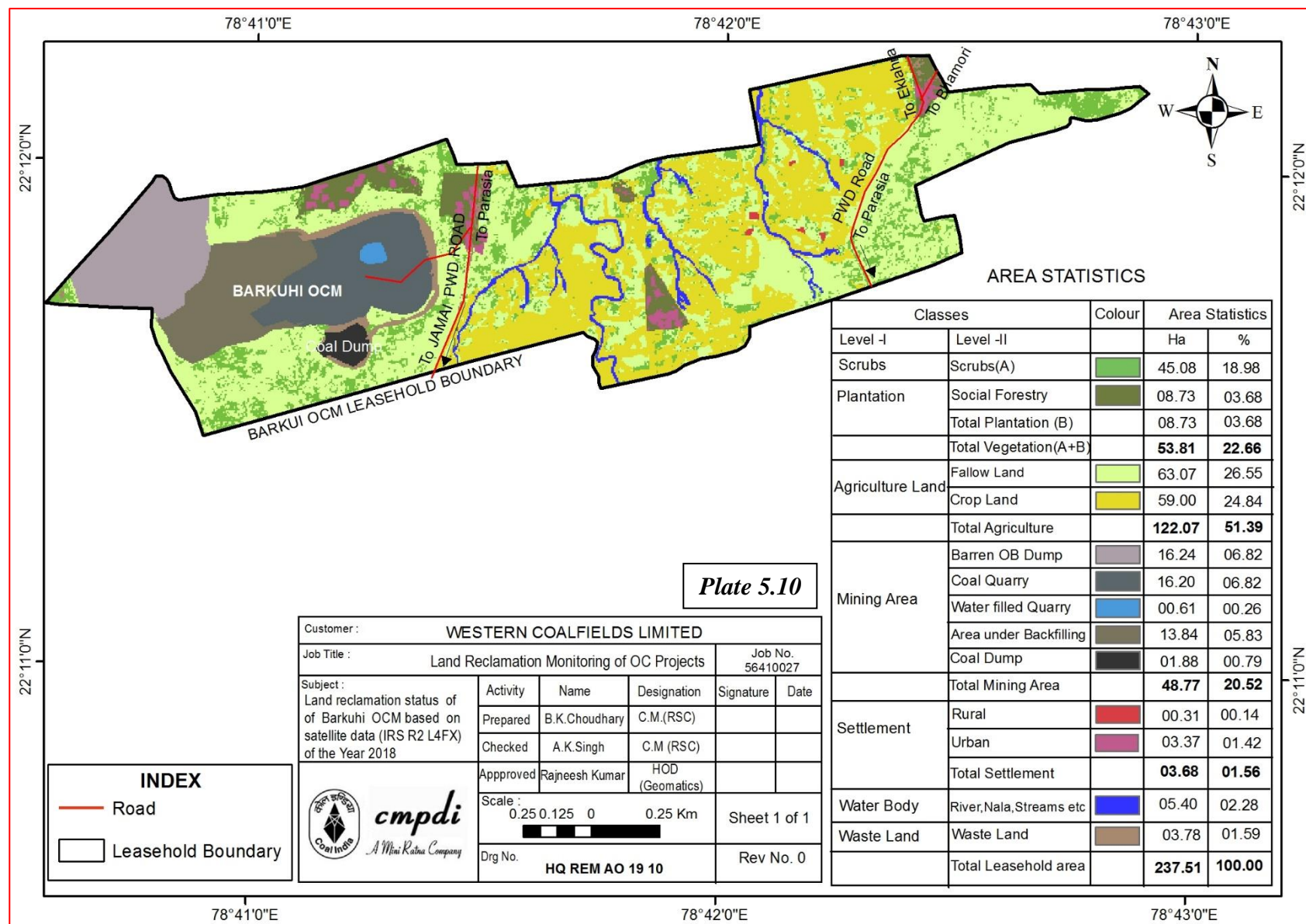


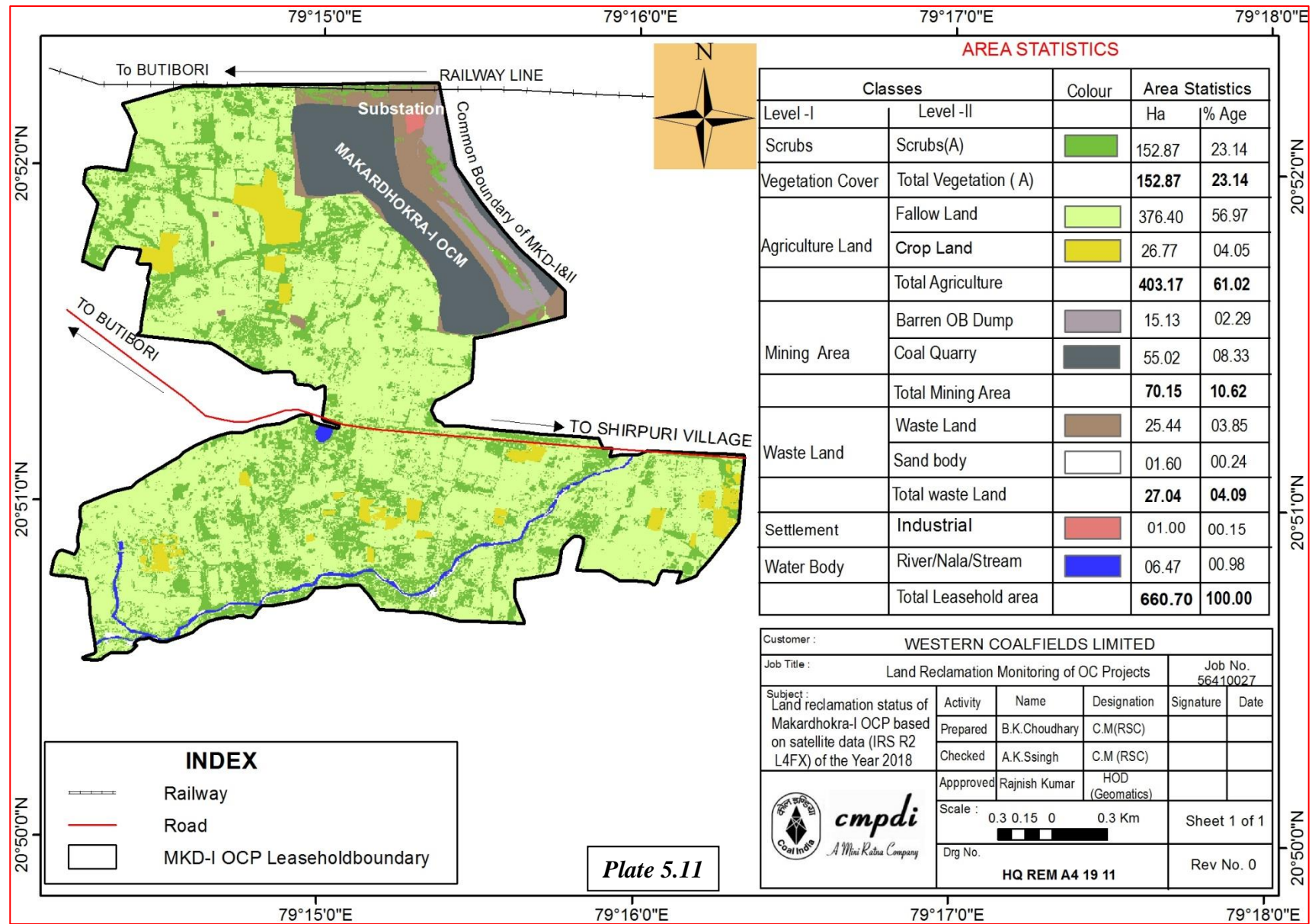




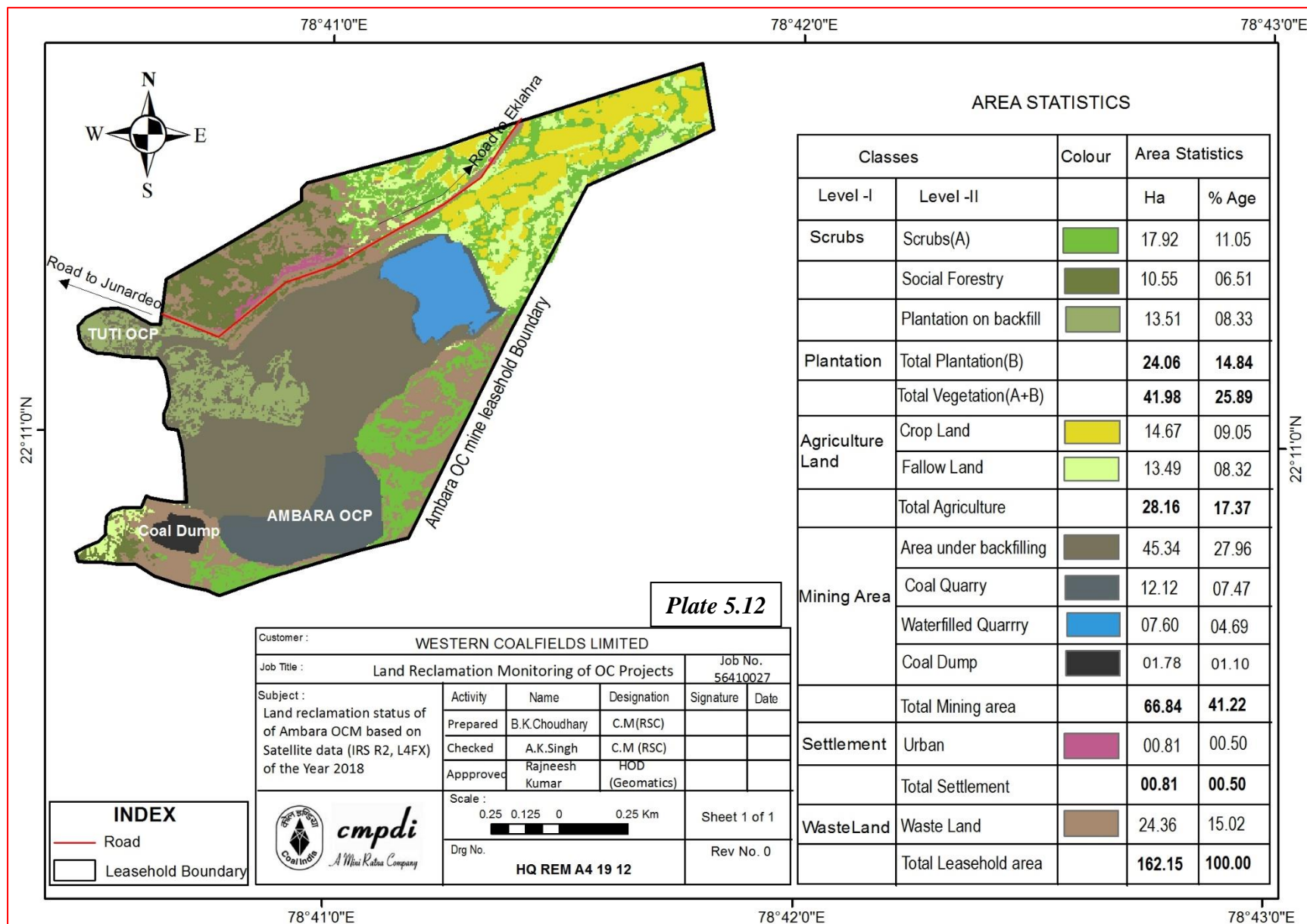


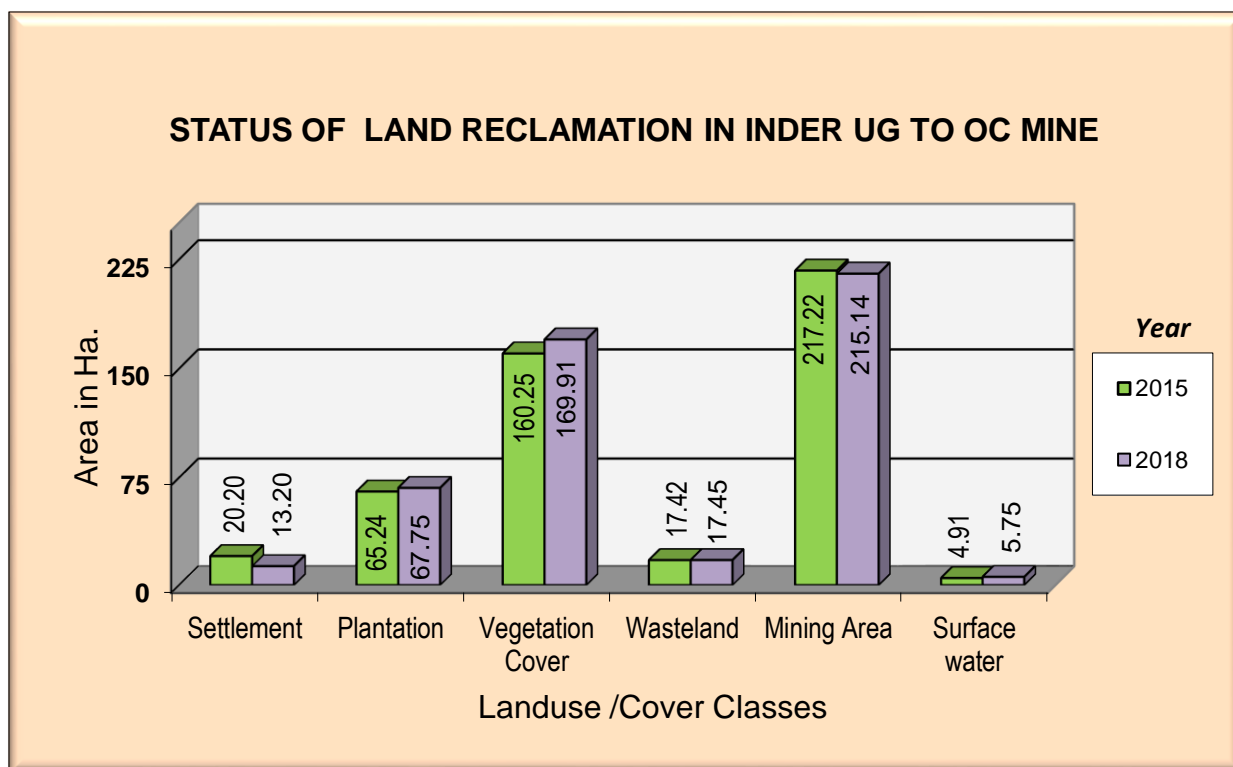
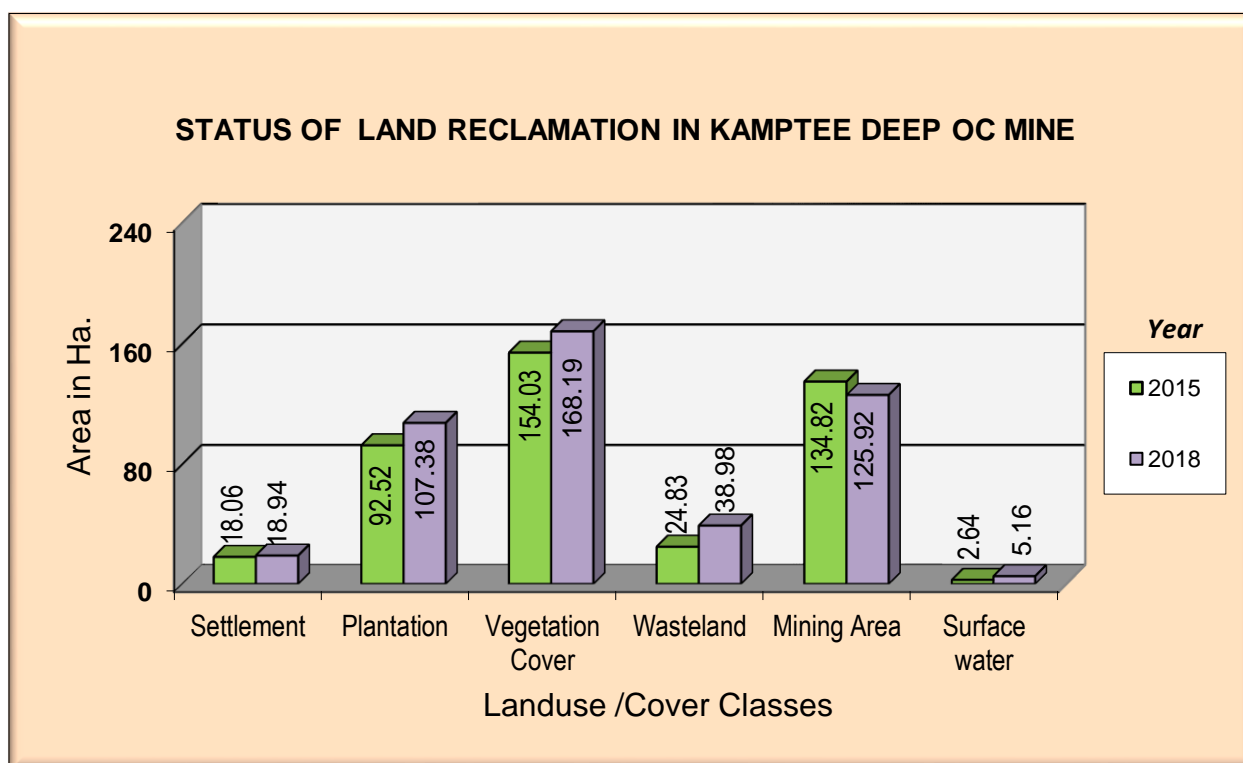


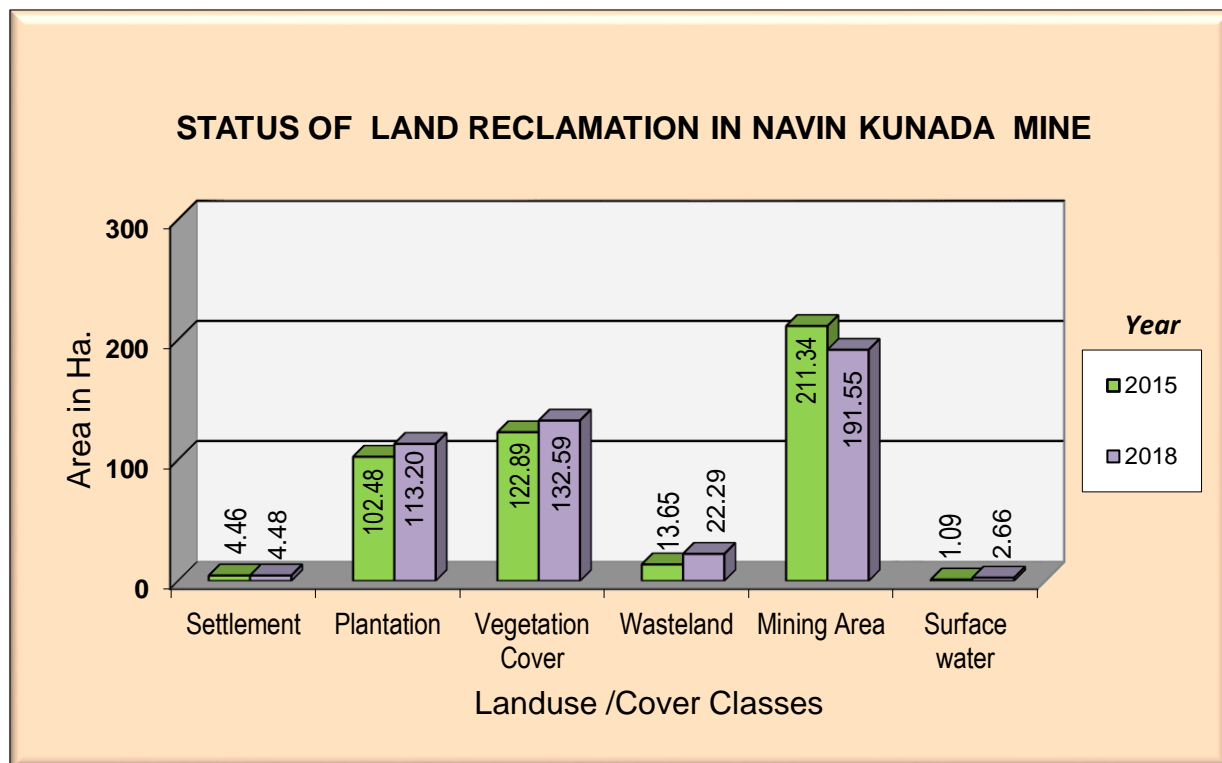
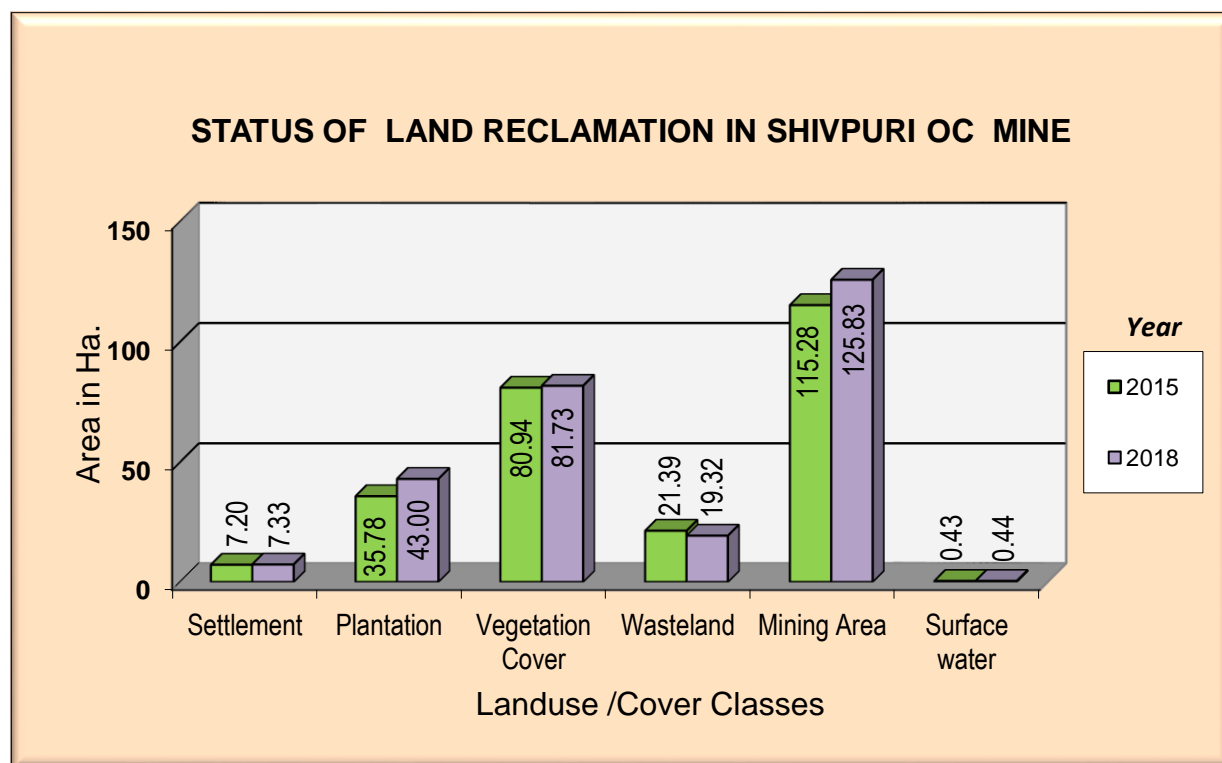








**Figure - 5.2****Figure - 5.3**

**Figure - 5.4****Figure - 5.5**

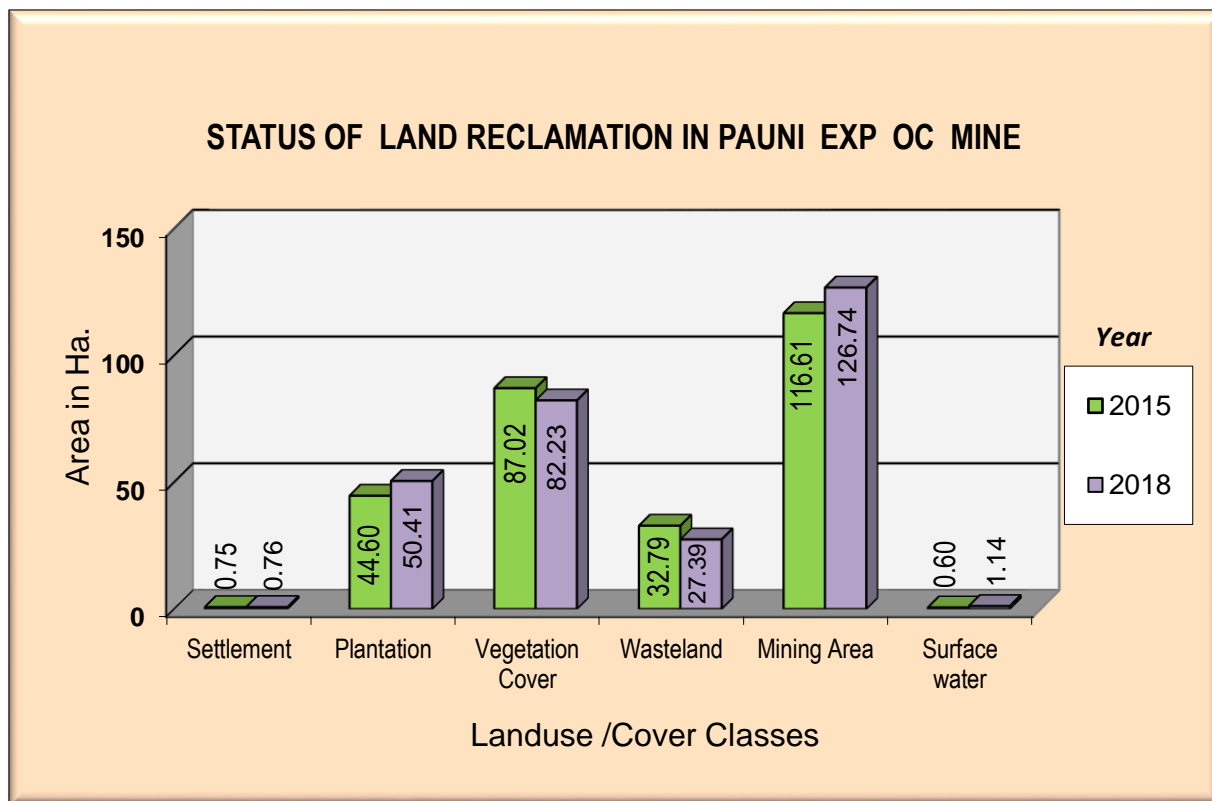


Figure - 5.6

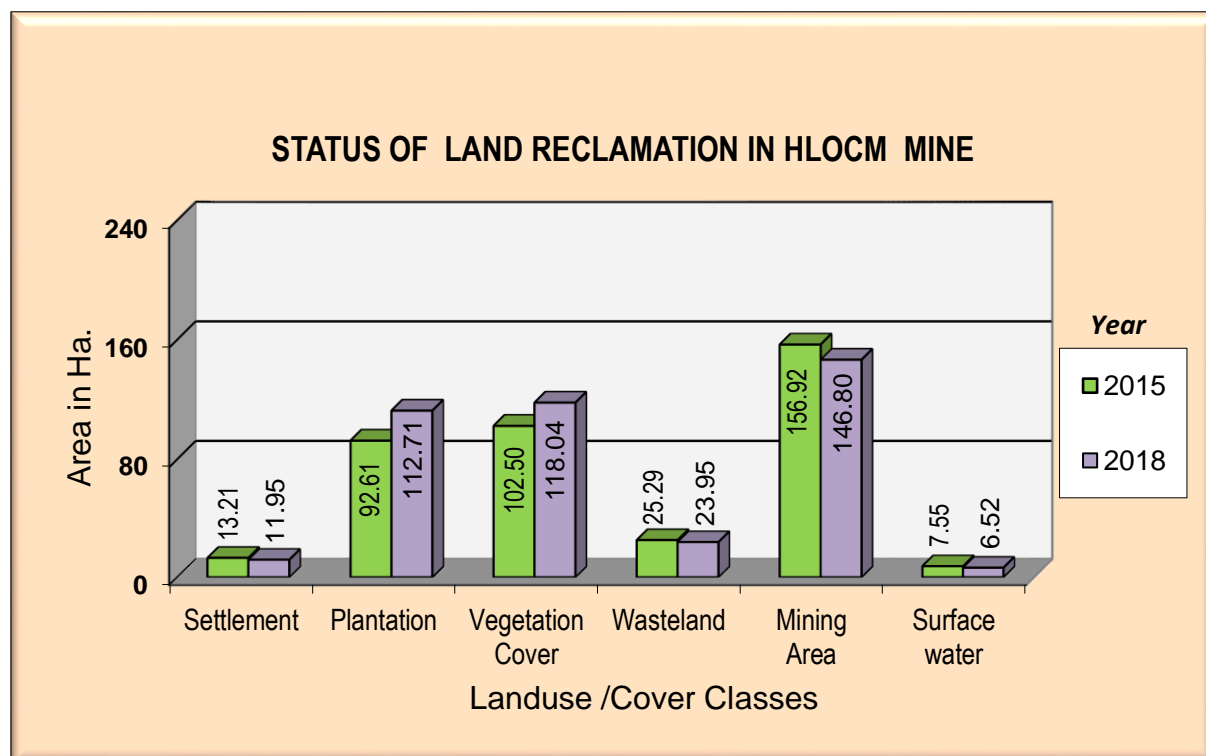


Figure - 5.7

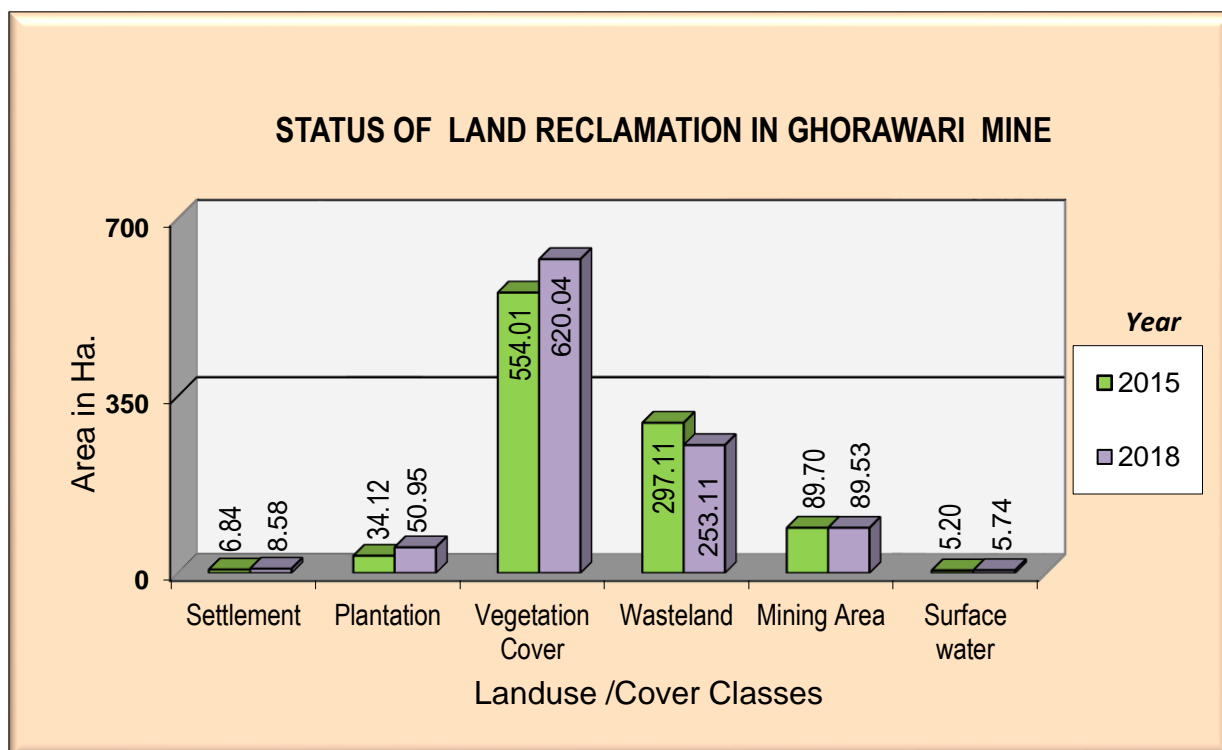


Figure - 5.8

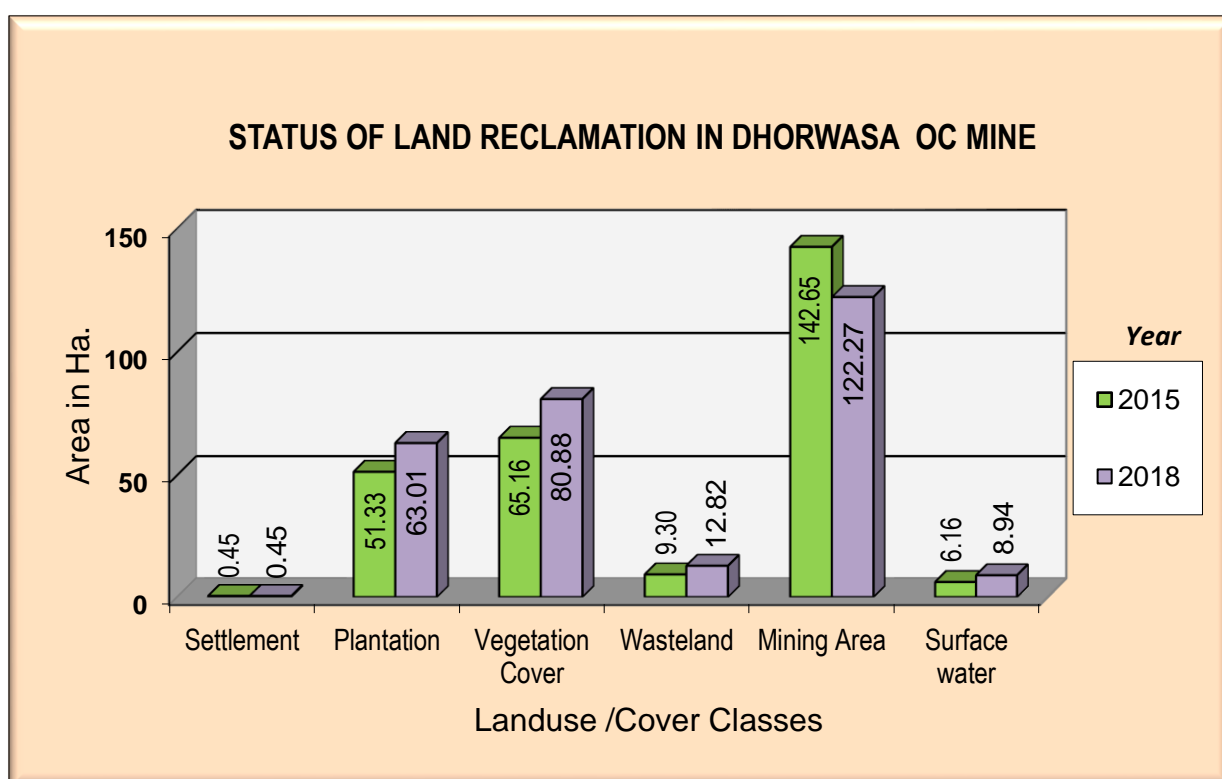


Figure - 5.9



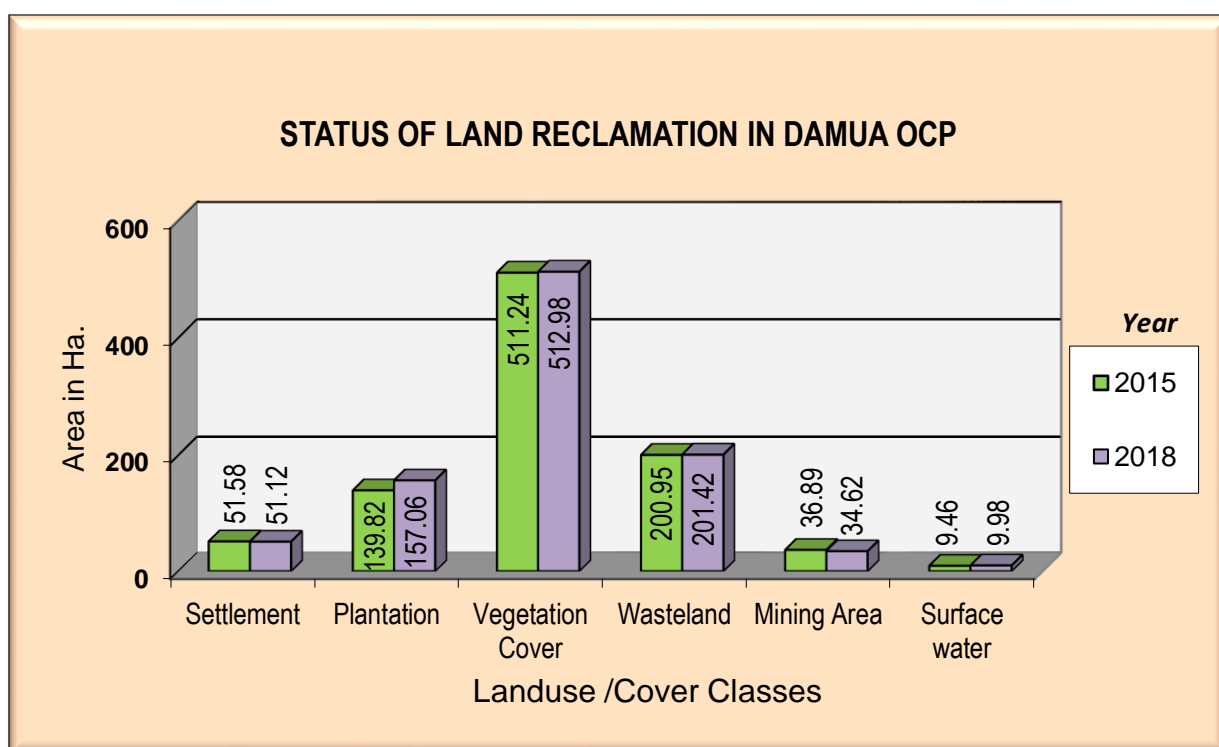


Figure - 5.10

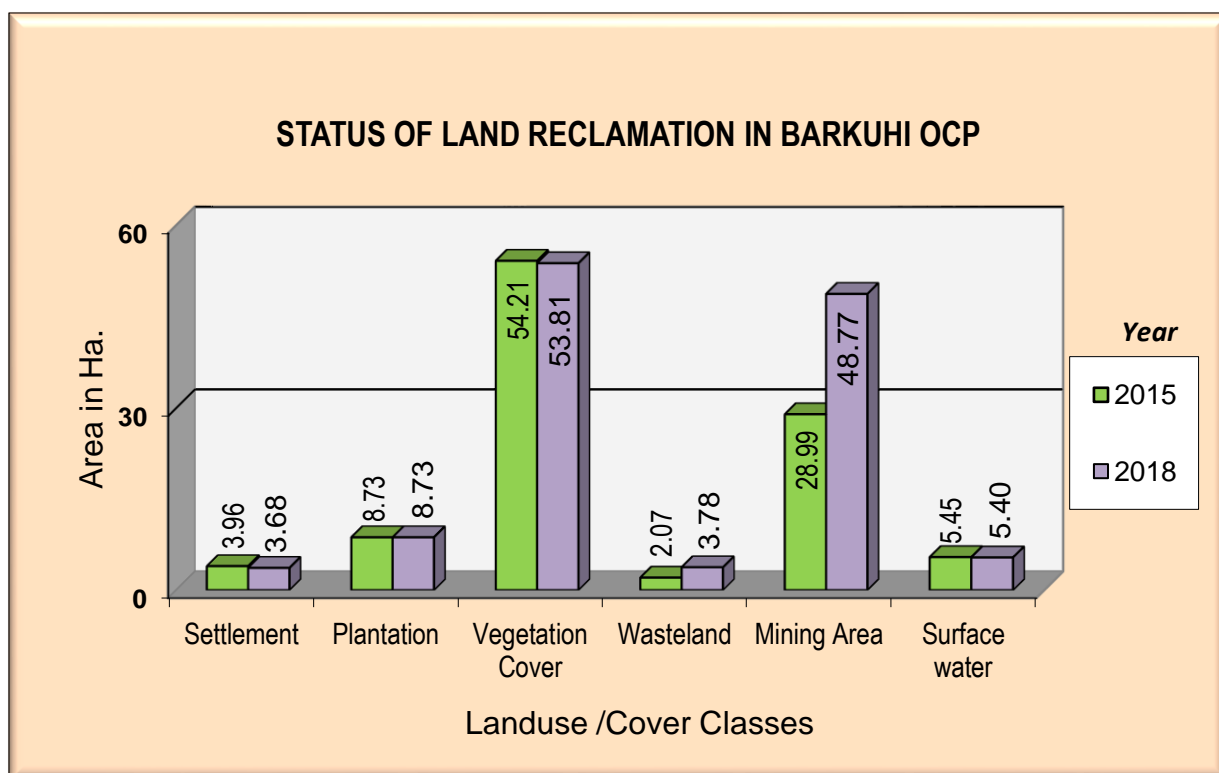


Figure - 5.11

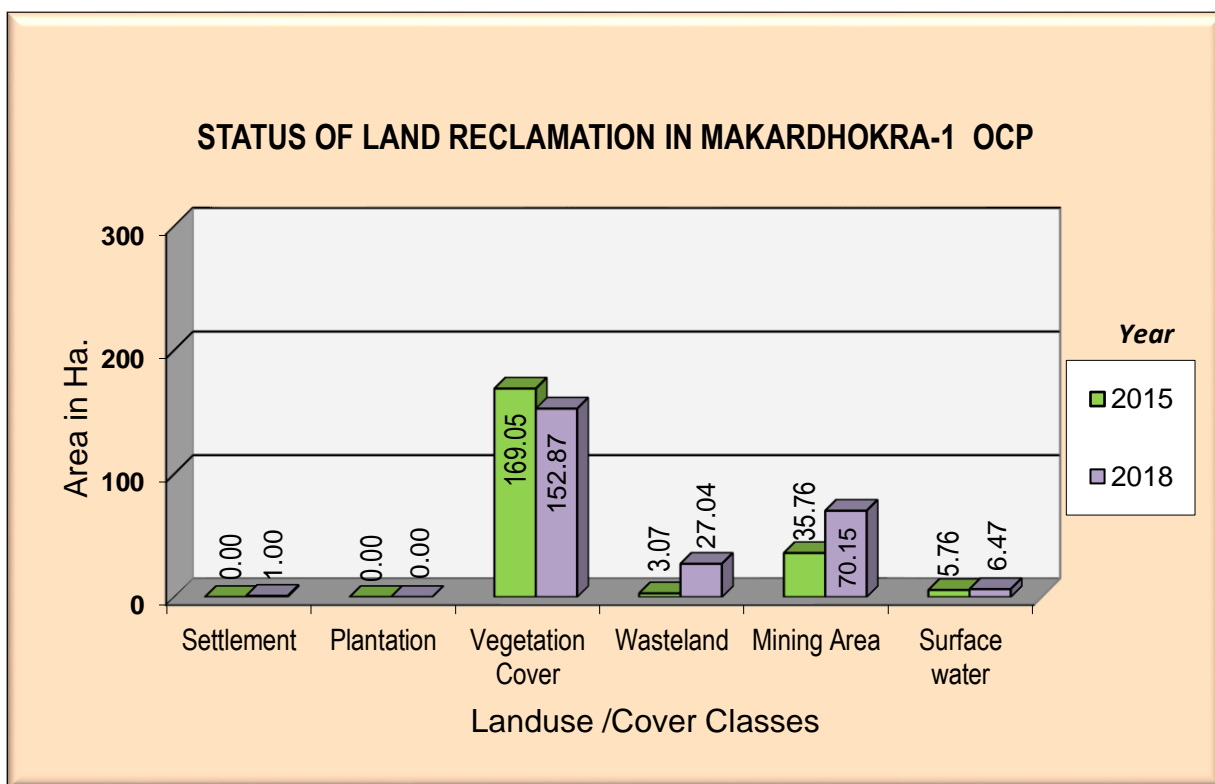


Figure - 5.12

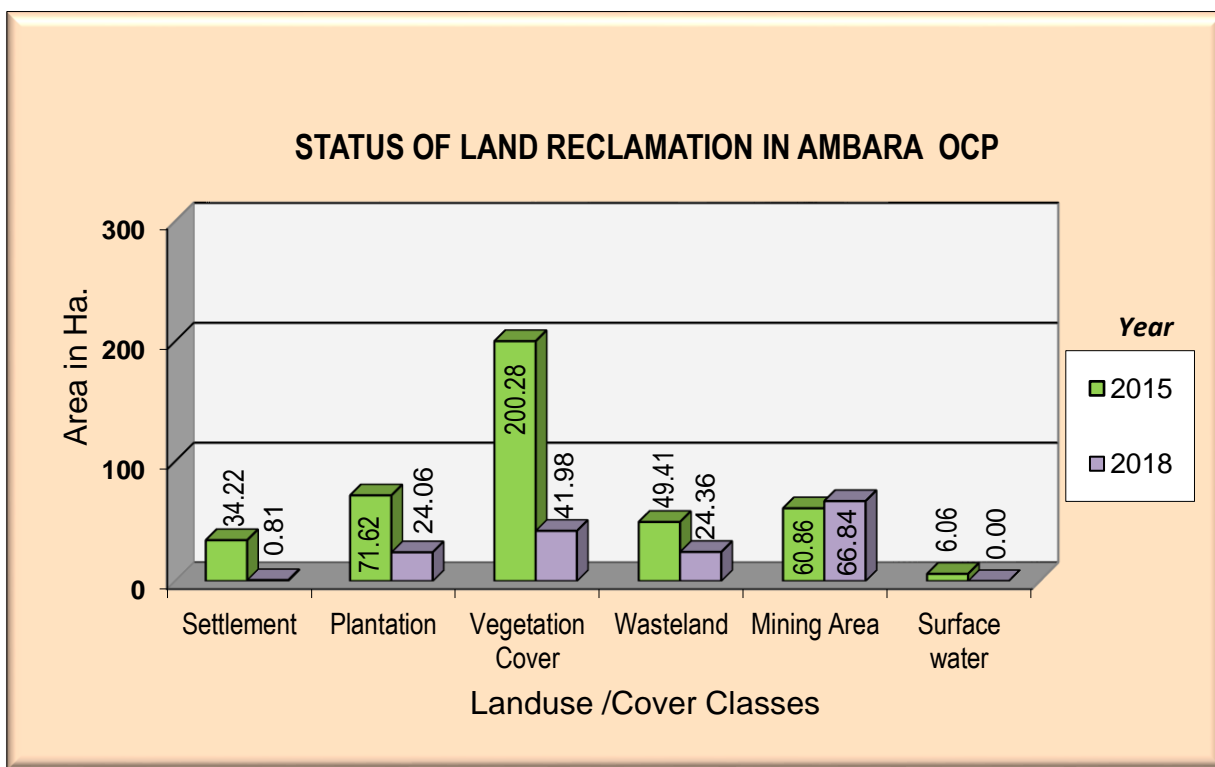


Figure - 5.13



**Photograph -5.1:** *Plantation under Social Forestry in Kamptee Deep Opencast Mine*



	Decimal	DMS
Latitude	19.82515	19°49'30" N
Longitude	79.256898	79°15'24" E

**Photograph -5.2:** *Plantation under Social Forestry in Pauni Expn. Opencast Mine*





**Photograph 5.3-** *Plantation on Barren OB Dump in Makardhokra -1 Open cast mine*

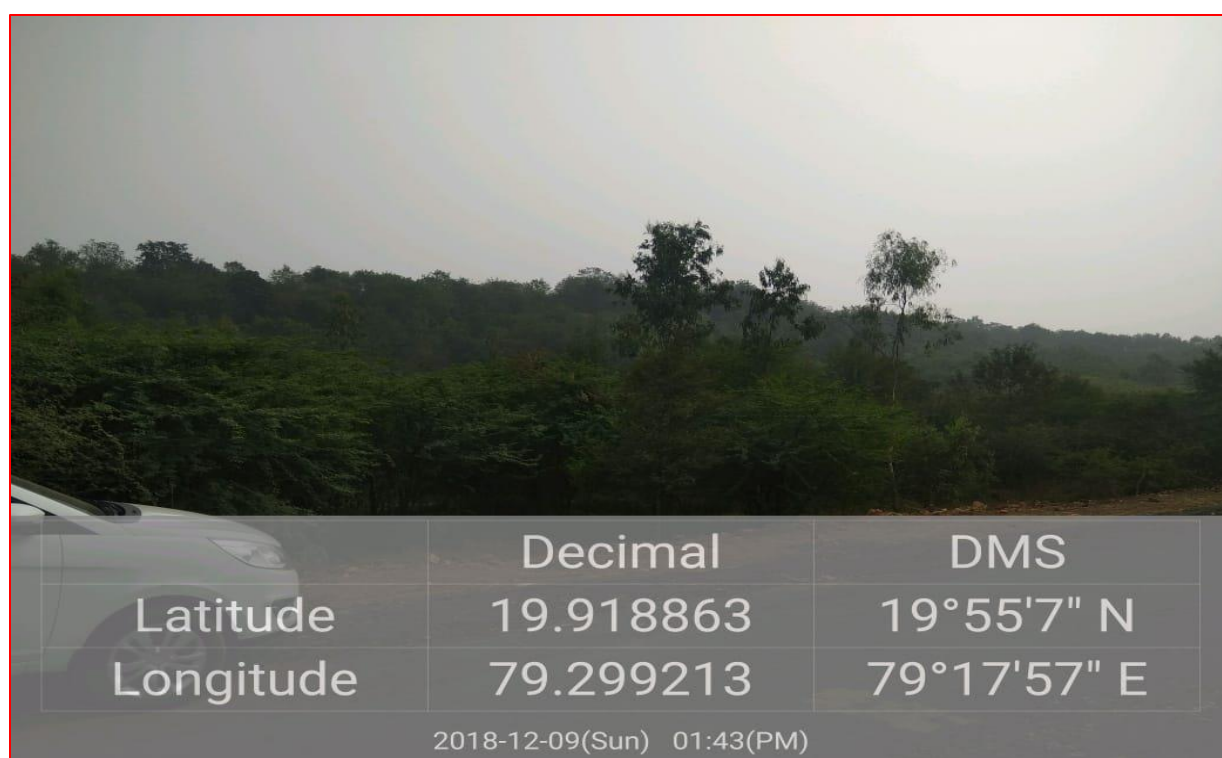


**Photograph 5. 4:** *Plantation on Barren OB Dump in Makardhokra-1 Opencast mine*





**Photograph- 5.5:** Plantation under Social Forestry in HLOCM



**Photograph- 5.6:** Plantation on Barren OB DUMP in HLOCM



**Photograph 5.7-** *Plantation on Barren OB Dump in Dhorwasa opencast mine*



**Photograph 5.8-** *Plantation under Social Forestry in Dhorwasa opencast mine*





**Photograph 5.9-** Tree plantation on OB Dump in Navin Kunada OCP



**Photograph 5.10-** Tree plantation around pit office in Navin Kunada OCP

**SOUTH EASTERN COALFIELDS LIMITED**



## 6.0 Land Reclamation Status in South Eastern Coalfields Limited

- 6.1 Following three opencast projects of SECL producing less than 5 million cubic m. (Coal+OB) together, were taken up for land reclamation monitoring during the year 2018-19:
- Amadand
  - Amera
  - Kurasia
- 6.2 Project wise Land Reclamation status in SECL is given in Table 6.1 and also shown graphically in Fig 6.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2018 are shown in the Table – 6.2. Land use maps derived from satellite data are shown in Plate 6.1 - 6.3. Different land use classes based on satellite data are depicted in Bar Charts in Fig.6.2 - 6.4.
- 6.3 Study reveals that out of total mine leasehold area of 3020.60 Hectares of the 03 OC projects of SECL mentioned above taken for this study in 2018-19; total excavated area is only 531.31 hectares out of which 152.96 Ha. (28.79%) has been planted (*Biologically Reclaimed*), 277.03 Ha. (52.14%) is under backfilling (*under Technical Reclamation*) and balance 101.32 hectares (19.07%) is under active mining.
- 6.4 On comparing the status of land reclamation for the year 2018 with respect to the year 2015 in the above projects, it is evident from the analysis that area of land reclamation has increased from 264.57 Ha. (Yr. 2015) to 429.99 Ha. (Yr.2018).
- 6.5 Study indicates that overall all the projects of SECL considered for this study indicate increase or static trend in biological reclamation (plantation on backfill) with respect to the year 2015 except for Kurasia OCP where area under biological reclamation has reduced marginally due to OB dumping on vegetated backfill.

- 6.6** There has been significant increase in area under technical reclamation (backfilling) in the above projects of SECL as compared to the year 2015.
- 6.7** After analyzing the satellite data of year 2015 vs. 2018 it is evident that total area under plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in all the mines of SECL has decreased from 418.28 Hectare to 402.84 Hectare in span of last three year. This may be due to more area coming under mining activity.
- 6.8** Out of 3 projects of SECL, Kurasia OCP ranks on top for land reclamation (99.51%) followed by Amera OCP (74.49%) and Amadand (57.62%).

TABLE: 6.1

**PROJECT WISE LAND RECLAMATION STATUS IN OPENCAST PROJECT OF SECL PRODUCING (< 5 MILLION CU. M. OF COAL+OB)  
BASED ON SATELLITE DATA OF THE YEAR 2018**

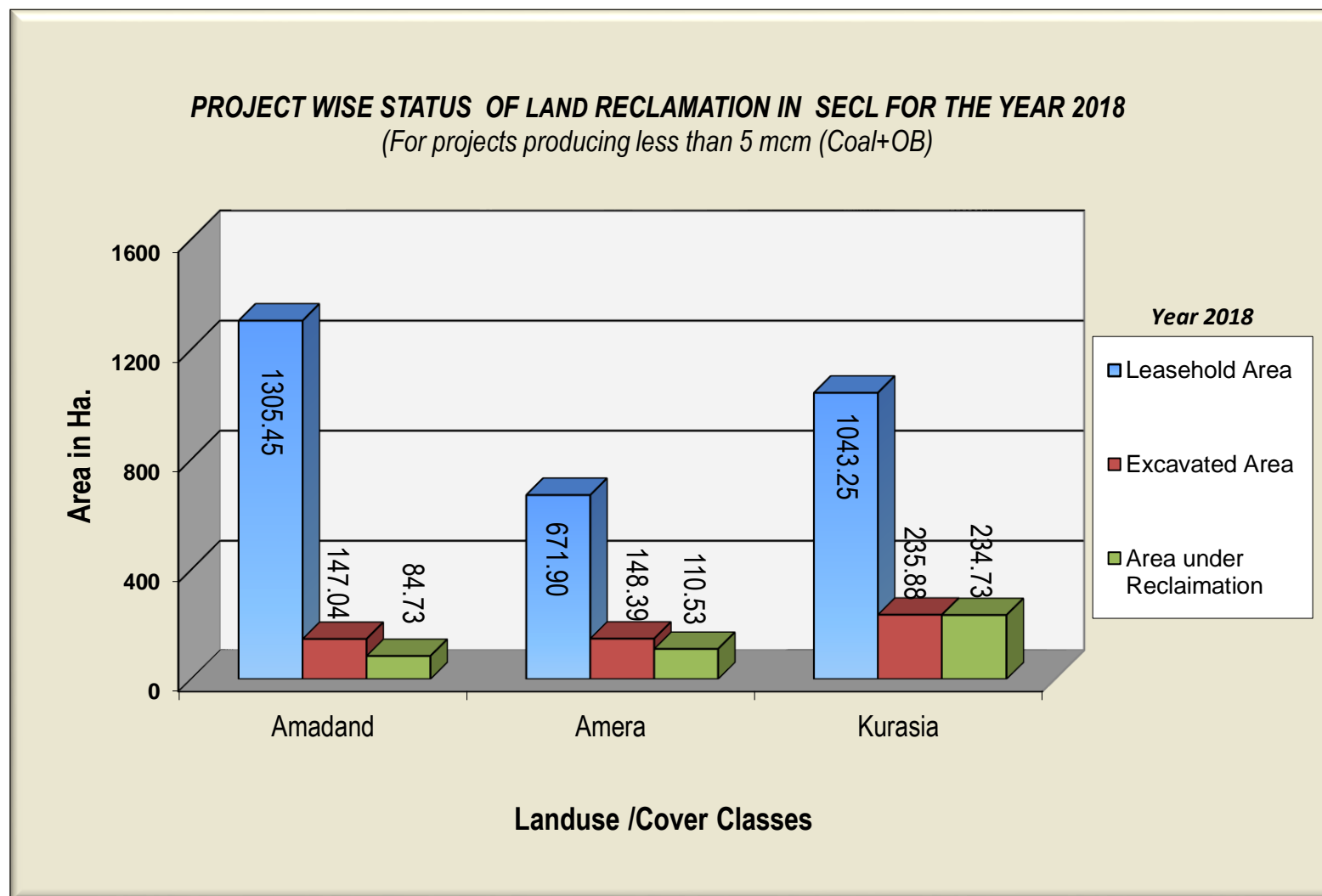
(Area in Hectare)

Sl.No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
1	Amadand OCP	710.28	1305.45	52.52	84.73	0.00	0.00	0.00	0.00	65.38	61.49	29.35	62.31	81.87	147.04	65.38	61.49	52.52	84.73
				64.15%	57.62%	0.00%	0.00%					35.85%	42.38%			9.20%	4.71%	64.15%	57.62%
2	Amera OCP	671.90	671.90	42.02	104.78	0.00	5.75	6.79	7.99	60.50	44.54	45.24	37.86	87.26	148.39	67.29	58.28	42.02	110.53
				48.15%	70.61%	0.00%	3.87%					51.85%	25.51%			10.01%	8.67%	48.15%	74.49%
3	Kurasia OCP	1043.25	1043.25	20.28	87.52	149.75	147.21	0.00	0.00	135.86	135.86	1.60	1.15	171.63	235.88	285.61	283.07	170.03	234.73
				11.82%	37.10%	87.25%	62.41%					0.93%	0.49%			27.38%	27.13%	99.07%	99.51%
	TOTAL	2425.43	3020.60	114.82	277.03	149.75	152.96	6.79	7.99	261.74	241.89	76.19	101.32	340.76	531.31	418.28	402.84	264.57	429.99
				33.70%	52.14%	43.95%	28.79%					22.36%	19.07%			17.25%	13.34%	77.64%	80.93%

( % is calculated with respected to Excavated Area as applicable)

**Note: In reference of the above Table-6.1, Different Parameter are classified as follows:**

1. Area under Biological Reclamation includes area under plantation done on backfilled area only.
2. Area under Technical Reclamation includes area under barren backfill only.
3. Area under Active Mining includes coal Quarry, Advance quarry site, Quarry filled with water etc.
4. Social Forestry and Plantation on External OB Dump area not included in Biological reclamation and are put under other plantation.
5. % calculated in respect of total excavated area except for "Total area under plantation" where % has been calculated in terms of leasehold area.























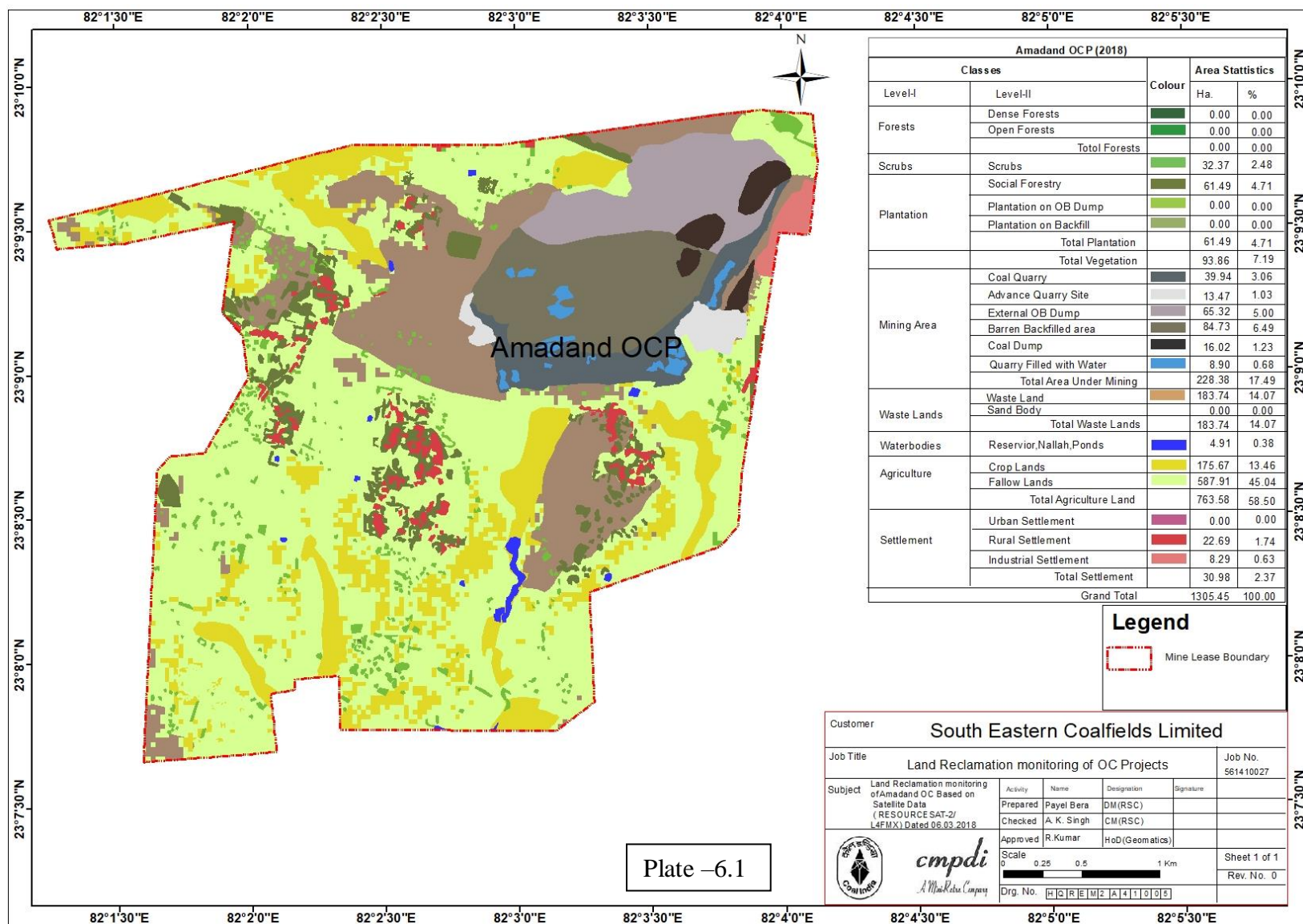
**Fig.6.1: Land Reclamation status in OC projects producing less than 5mcm (Coal+OB) of SECL in the year-2018**

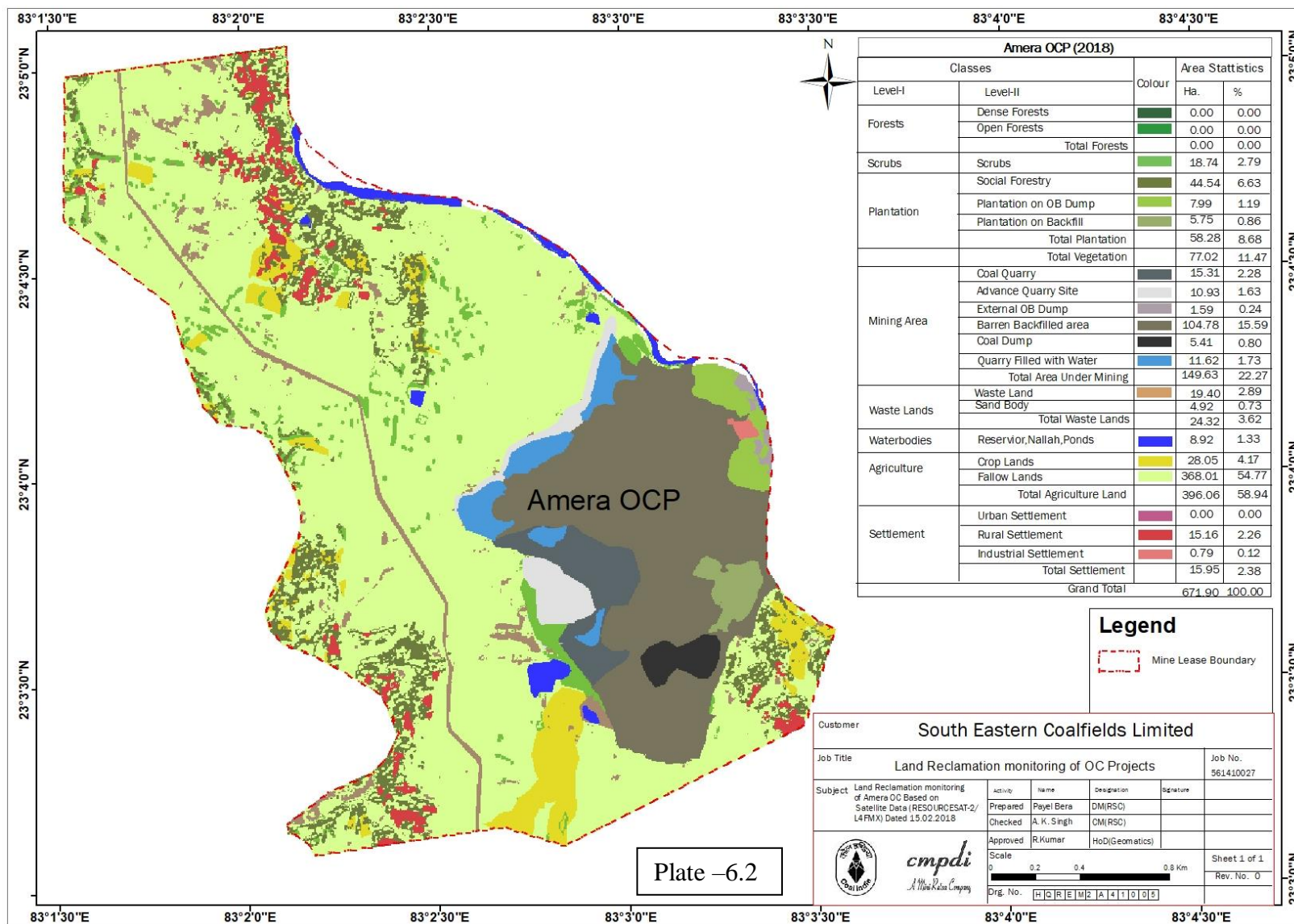
Table 6.2

**PROJECT WISE AREA STATISTICS OF LAND USE/COVER CLASSES IN OPENCAST PROJECTS PRODUCING  
<5 M.C.M OF (COAL+OB) OF SECL BASED ON SATELLITE DATA OF THE YEAR 2018**

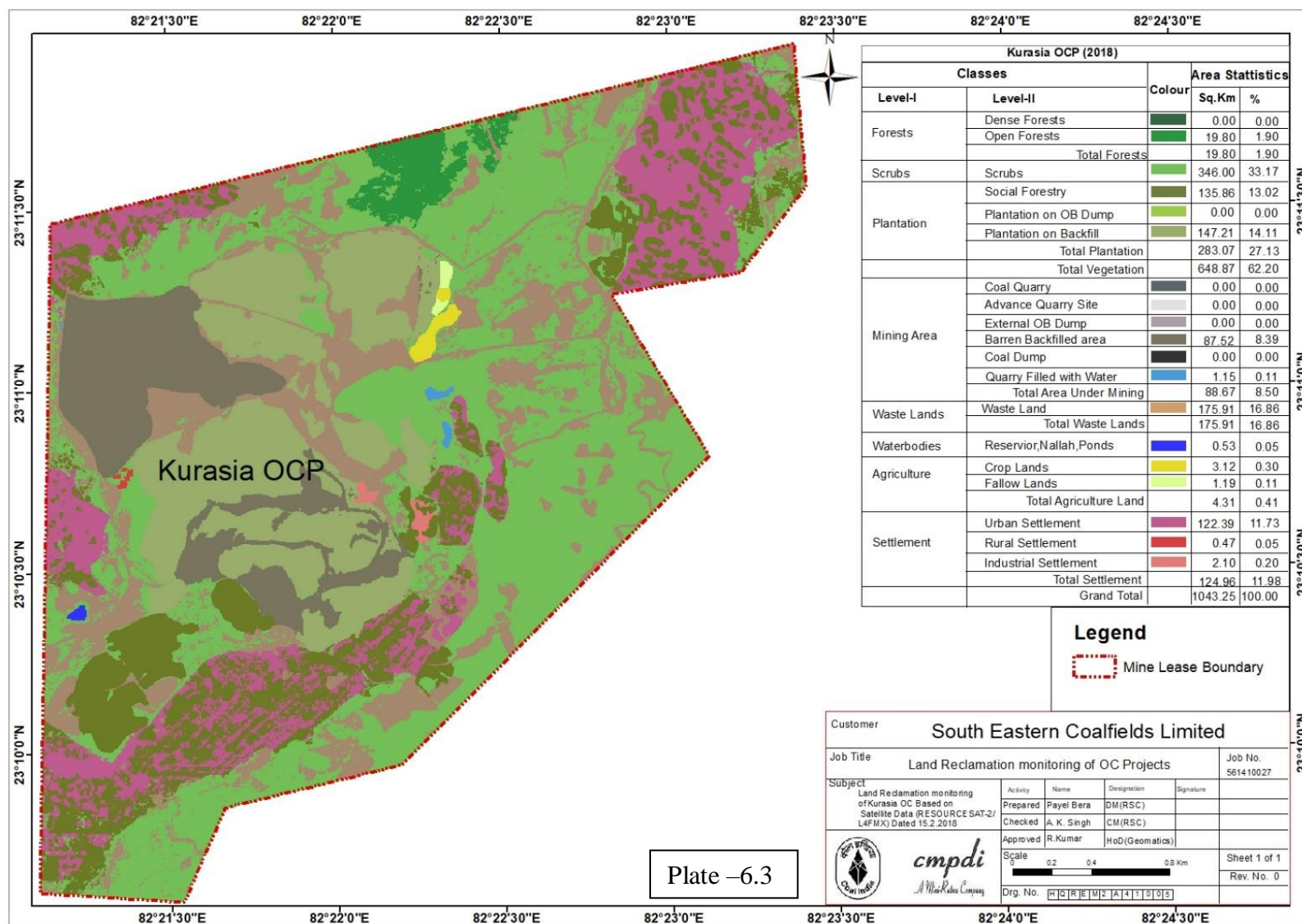
(Area in Hectare)

		Amadand OCP		Amera OCP		Kurasia OCP		TOTAL	
		Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest 	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest 	0.00	0.00	0.00	0.00	19.80	1.90	19.80	0.66
	<b>Total Forest</b>	0.00	0.00	0.00	0.00	19.80	1.90	19.80	0.66
SCRUBS	Scrubs 	32.37	2.48	18.74	2.79	346.00	33.17	397.11	13.15
PLANTATION	Social Forestry 	61.49	4.71	44.54	6.63	135.86	13.02	241.89	8.01
	Plantation on OB Dump 	0.00	0.00	7.99	1.19	0.00	0.00	7.99	0.26
	Plantation on Backfill (Biological Reclamation) 	0.00	0.00	5.75	0.86	147.21	14.11	152.96	5.06
	<b>Total Plantation</b>	61.49	4.71	58.28	8.68	283.07	27.13	402.84	13.34
	<b>Total Vegetation</b>	<b>93.86</b>	<b>7.19</b>	<b>77.02</b>	<b>11.47</b>	<b>648.87</b>	<b>62.20</b>	<b>819.75</b>	<b>27.14</b>
ACTIVE MINING	Coal Dump 	16.02	1.23	5.41	0.80	0.00	0.00	21.43	0.71
	Coal Quarry 	39.94	3.06	15.31	2.28	0.00	0.00	55.25	1.83
	Advance Quarry Site 	13.47	1.03	10.93	1.63	0.00	0.00	24.40	0.81
	Quarry Filled With Water 	8.90	0.68	11.62	1.73	1.15	0.11	21.67	0.72
	<b>Total Area under Active Mining</b>	<b>62.31</b>	<b>4.77</b>	<b>37.86</b>	<b>5.64</b>	<b>1.15</b>	<b>0.11</b>	<b>101.32</b>	<b>3.35</b>
	Barren OB Dump 	65.32	5.00	1.59	0.24	0.00	0.00	66.91	2.22
RECLAIMED	Area Under Backfilling (Technical Reclamation) 	84.73	6.49	104.78	15.59	87.52	8.39	277.03	9.17
	<b>Total Area under Technical Reclamation</b>	<b>84.73</b>	<b>6.49</b>	<b>104.78</b>	<b>15.59</b>	<b>87.52</b>	<b>8.39</b>	<b>277.03</b>	<b>9.17</b>
	<b>Total Area under Mine Operation</b>	<b>228.38</b>	<b>17.49</b>	<b>149.63</b>	<b>22.27</b>	<b>88.67</b>	<b>8.50</b>	<b>466.68</b>	<b>15.45</b>
WASTELAND	Waste Lands 	183.74	14.07	19.40	2.89	175.91	16.86	379.05	12.55
	Fly Ash Pond / Sand Body 	0.00	0.00	4.92	0.73	0.00	0.00	4.92	0.16
	<b>Total Wasteland</b>	<b>183.74</b>	<b>14.07</b>	<b>24.32</b>	<b>3.62</b>	<b>175.91</b>	<b>16.86</b>	<b>383.97</b>	<b>12.71</b>
WATERBODIES	Reservoir, nallah, ponds 	4.91	0.38	8.92	1.33	0.53	0.05	14.36	0.48
	<b>Total Waterbodies</b>	<b>4.91</b>	<b>0.38</b>	<b>8.92</b>	<b>1.33</b>	<b>0.53</b>	<b>0.05</b>	<b>14.36</b>	<b>0.48</b>
AGRICULTURE	Crop Lands 	175.67	13.46	28.05	4.17	3.12	0.30	206.84	6.85
	Fallow Lands 	587.91	45.04	368.01	54.77	1.19	0.11	957.11	31.69
	<b>Total Agriculture</b>	<b>763.58</b>	<b>58.50</b>	<b>396.06</b>	<b>58.94</b>	<b>4.31</b>	<b>0.41</b>	<b>1163.95</b>	<b>38.53</b>
SETTLEMENTS	Urban Settlement 	0.00	0.00	0.00	0.00	122.39	11.73	122.39	4.05
	Rural Settlement 	22.69	1.74	15.16	2.26	0.47	0.05	38.32	1.27
	Industrial Settlement 	8.29	0.63	0.79	0.12	2.10	0.20	11.18	0.37
	<b>Total Settlement</b>	<b>30.98</b>	<b>2.37</b>	<b>15.95</b>	<b>2.38</b>	<b>124.96</b>	<b>11.98</b>	<b>171.89</b>	<b>5.69</b>
	<b>Grand Total</b>	<b>1305.45</b>	<b>100.00</b>	<b>671.90</b>	<b>100.00</b>	<b>1043.25</b>	<b>100.00</b>	<b>3020.60</b>	<b>100.00</b>











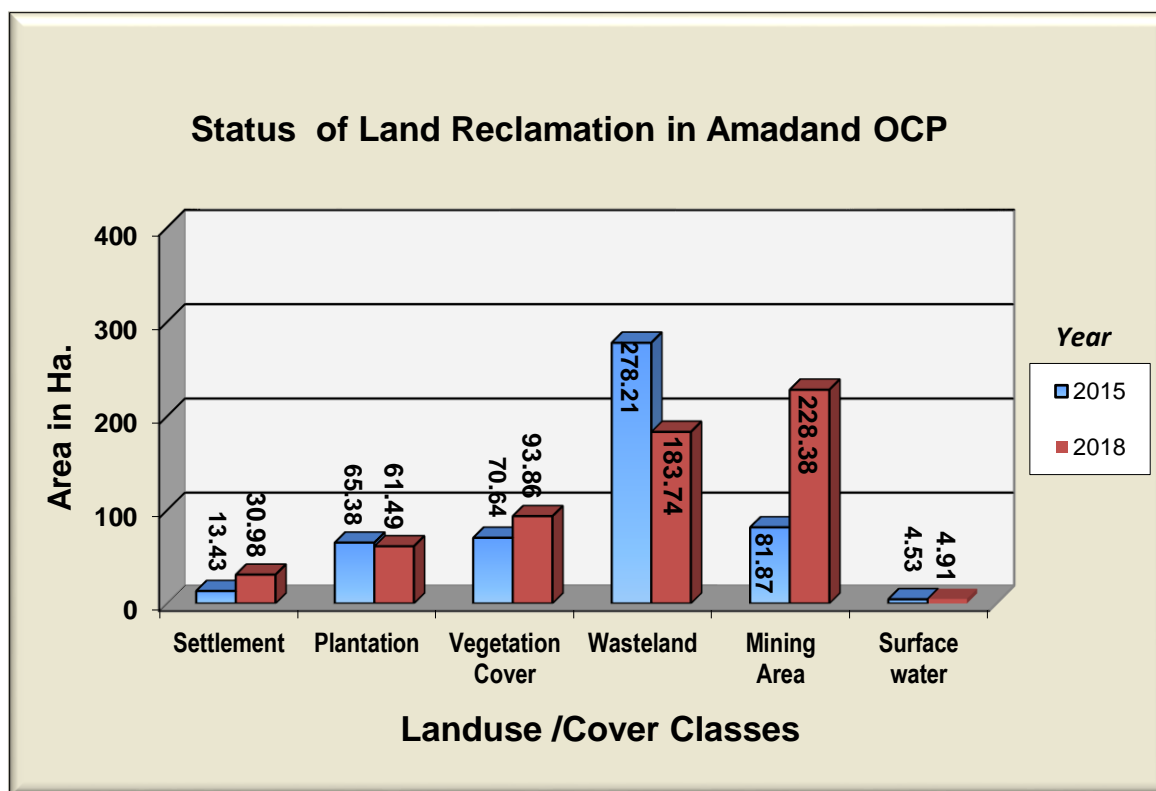


Figure 6.2

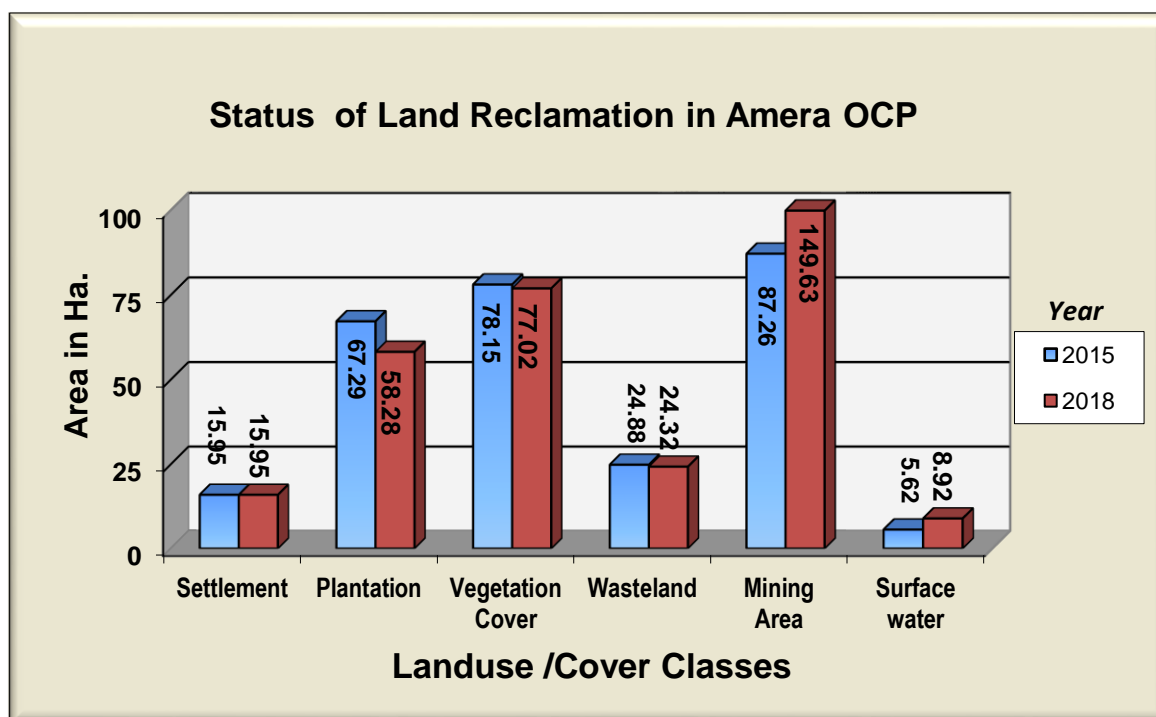


Figure-6.3

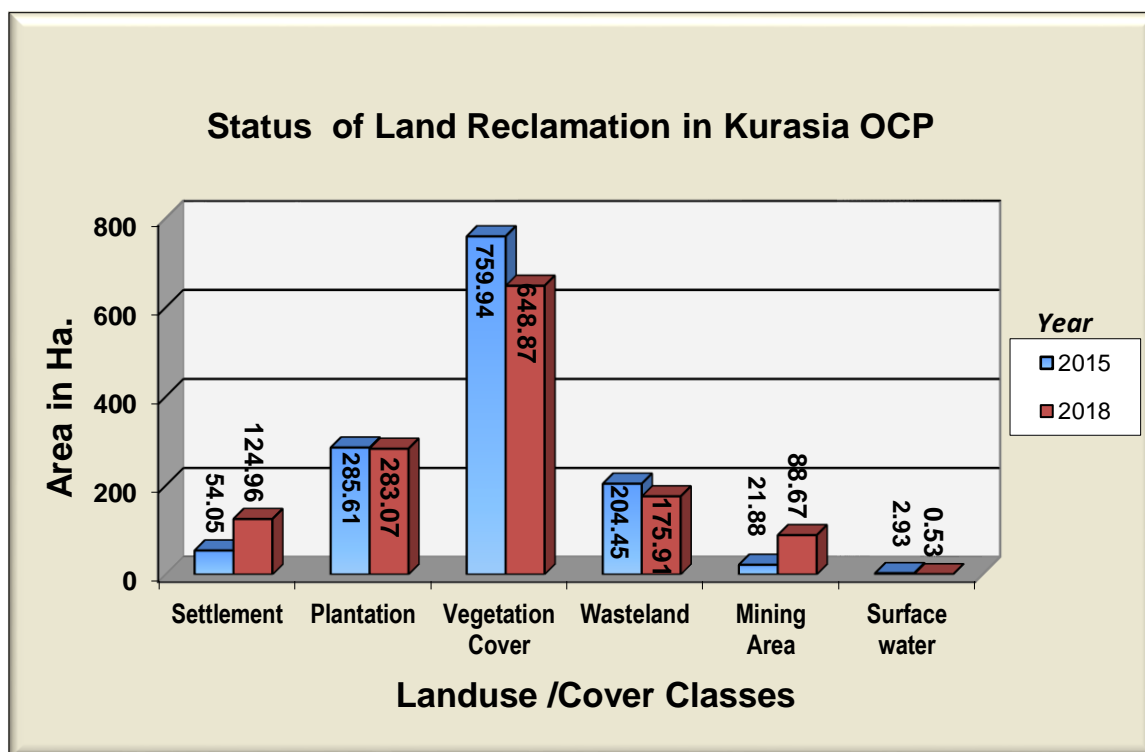


Figure: 6.4



***Photograph-6.1*** *Plantation on External OB Dump in Amera OCP*



***Photograph-6.2*** *Plantation on Backfill in Kurasia OCP*

**MAHANADI COALFIELDS LIMITED**

## 7.0 Land Reclamation Status in Mahanadi Coalfields Ltd.

- 7.1 Following 3 OC projects producing less than 5 million m<sup>3</sup>. (Coal + OB together) of Mahanadi Coalfields Ltd. have been taken up during the year 2018-19 for land reclamation monitoring:
- Basundhara
  - Garjanbahal
  - Kaniha
- 7.2 Project wise Land Reclamation status in the above mentioned projects of MCL is given in Table 7.1 and also shown graphically in Fig 7.1. Area statistics of different land use classes present in mine leasehold of above OC projects for the year 2018 is given in Table 7.2. Land use maps derived from the satellite data is given in Plate no. 7.1 to 7.3. Different land use status in form of Bar-Charts are shown in Fig. 7.2 – 7.4 Land reclamation status of the above mentioned opencast projects were also prepared for the year 2015.
- 7.3 Study reveals that out of total mine leasehold area of 2035.83 Hectares of the three OC projects of MCL mentioned above taken for this study in 2018-19; total excavated area is 361.48 hectares out of which 1.13 Ha. (0.31%) has been planted on backfill (*Biologically Reclaimed*), 164.06 Ha. (45.39%) is under backfilling (*Technical Reclamation*) and balance 196.29 hectares (54.30%) is under active mining.
- 7.4 On comparing the status of land reclamation for the year 2018 with respect to the year 2015 in different projects of MCL, it is evident from the analysis that area of land reclamation by MCL has increased from 84.87Ha (30.59%) area in (Yr. 2015) to 165.19 Ha.(45.70%) area in (Yr. 2018).
- 7.5 Study indicates that overall all the projects of MCL considered for this study indicate static trend in biologically reclamation and area under plantation (Green cover) with respect to the year 2015.

- 7.6** There has been increase in area under technical reclamation (backfilling) in all projects of MCL except for Garjanbahal OCP where there is no biological (plantation on backfill) and technical reclamation (backfilling) as this project is not in operation.
- 7.7** Out of 3 projects of MCL, Basundhara OCP has carried out maximum land reclamation with (61.41%) followed by Kaniha OCP (14.82%).



**TABLE: 7.1**  
**PROJECT WISE LAND RECLAMATION STATUS IN OPENCAST PROJECTS OF MCL PRODUCING < 5 M. CU. M. OF (COAL+OB)**  
**BASED ON SATELLITE DATA OF THE YEAR 2018**

(Area in Hectare)

Sl.N o.	Project	Total Leasehold Area	Technical Reclamation		Plantation						Area under Active Mining	Total Excavated Area	Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation			
					Biological Reclamation		Other Plantations											
			Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External OB Dumps		Social Forestry, Avenue Plantation Etc.									
1	2	3	4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
			2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
1	Basundhara	705.00	81.84	146.00	1.13	1.13	14.30	14.30	15.38	15.38	138.72	92.45	221.69	239.58	30.81	30.81	82.97	147.13
			36.92%	60.94%	0.51%	0.47%					62.57%	38.59%			4.37%	4.37%	37.43%	61.41%
2	Garjanbahal	653.83	0.00	0.00	0.00	0.00	0.00	0.00	1.95	1.95	0.00	0.00	0.00	0.00	1.95	1.95	0.00	0.00
			0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.30%	0.30%	0.00%	0.00%
3	Kaniha	677.00	1.90	18.06	0.00	0.00	0.00	0.00	10.53	10.53	53.88	103.84	55.78	121.90	10.53	10.53	1.90	18.06
			3.41%	14.82%	0.00%	0.00%					96.59%	85.18%			1.56%	1.56%	3.41%	14.82%
	TOTAL	2035.83	83.74	164.06	1.13	1.13	14.30	14.30	27.86	27.86	192.60	196.29	277.47	361.48	43.29	43.29	84.87	165.19
			30.18%	45.39%	0.41%	0.31%					69.41%	54.30%			2.13%	2.13%	30.59%	45.70%

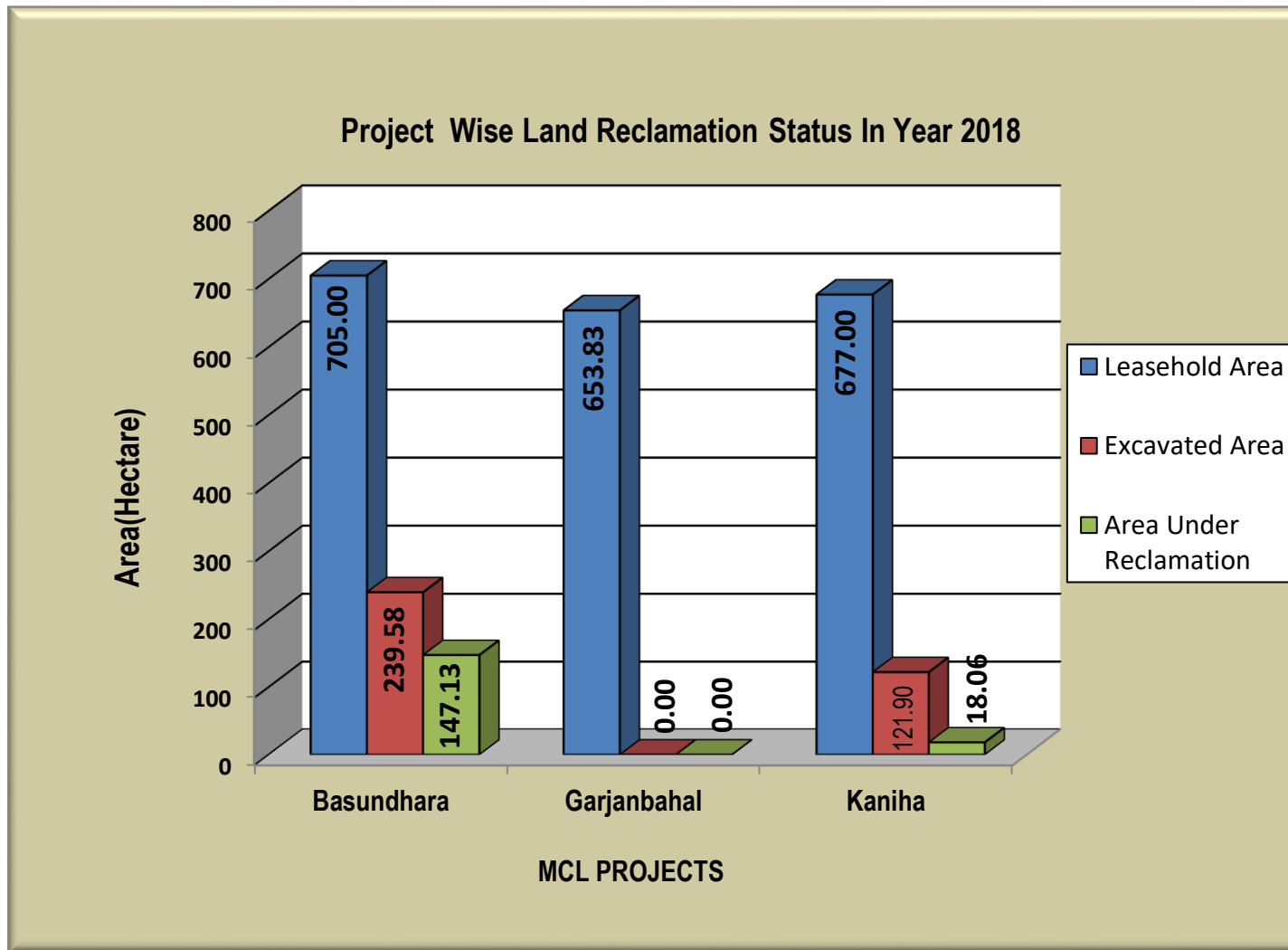
( % is calculated with respected to Excavated Area as applicable)

**Note: In reference of the above Table-7.1, different parameter are classified as follows:**

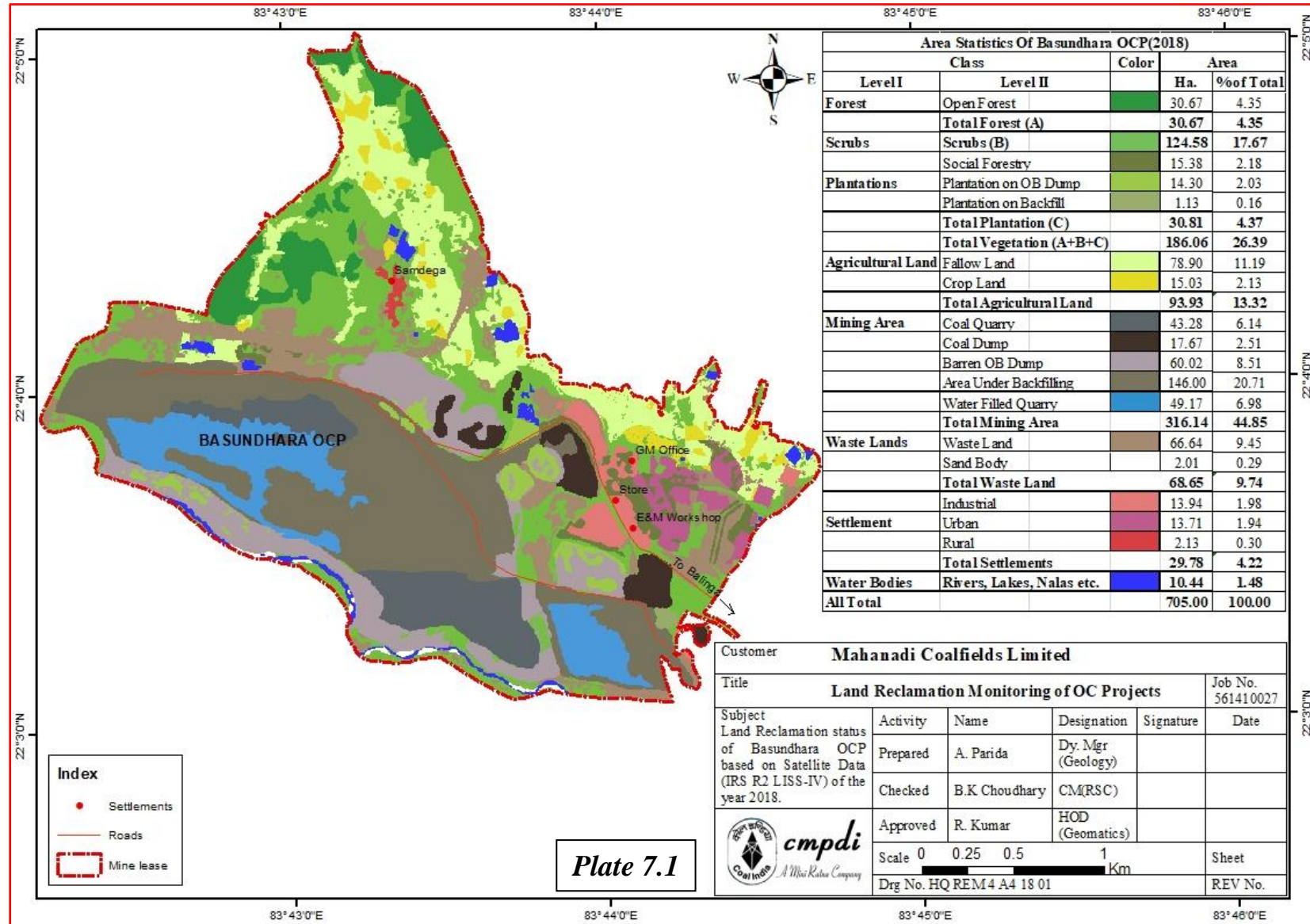
1. Area under Biological Reclamation includes area under plantation done on backfilled area only.
2. Area under Technical Reclamation includes area under barren backfill only.
3. Area under Active Mining includes coal Quarry, Advance quarry site, Quarry filled with water etc.
4. Social Forestry and Plantation on External OB Dump area not included in Biological reclamation and are put under other plantation.
5. % calculated in respect of total excavated area except for "Total area under plantation" where % has been calculated in terms of leasehold area.

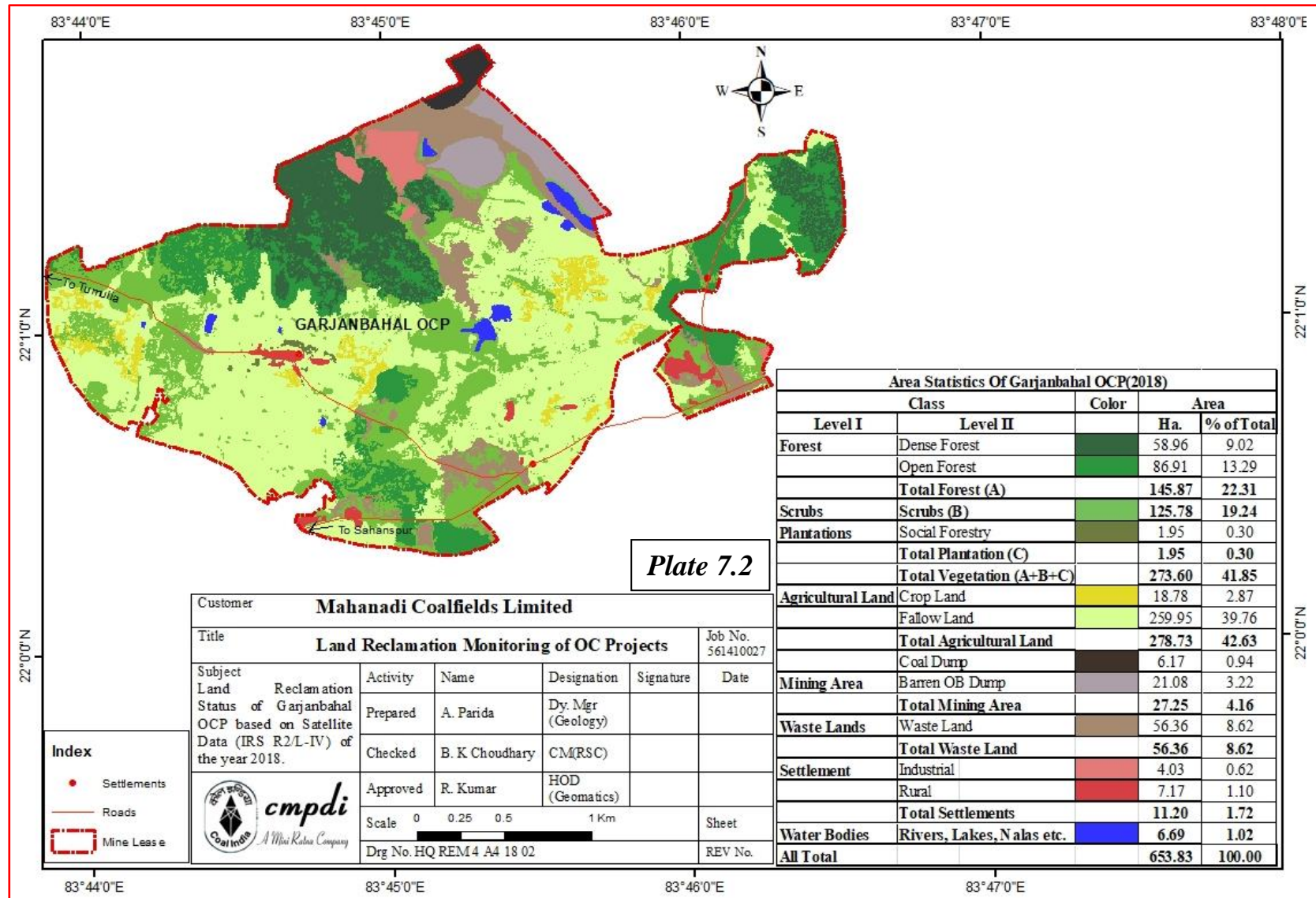
**Table 7.2**  
**PROJECT WISE AREA STATISTICS OF LAND USE/ COVER CLASSES IN OPENCAST PROJECTS**  
**PRODUCING (<5M.CM COAL+ OB) OF MCL BASED ON SATELLITE DATA OF THE YEAR 2018**

		(Area in Hectare)									
		BASUNDHARA		GARJANBAHAL		KANIHA		TOTAL			
		Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	58.96	9.02	0.00	0.00	58.96	2.90		
	Open Forest	30.67	4.35	86.91	13.29	0.00	0.00	117.58	5.78		
	<b>Total Forest</b>	30.67	4.35	145.87	22.31	0.00	0.00	176.54	8.67		
SCRUBS	Scrubs	124.58	17.67	125.78	19.24	46.55	6.87	296.91	14.58		
PLANTATION	Social Forestry	15.38	2.18	1.95	0.30	10.53	1.56	27.86	1.37		
	Plantation on OB Dump	14.30	2.03	0.00	0.00	0.00	0.00	14.30	0.70		
	Plantation on Backfill (Biological Reclamation)	1.13	0.16	0.00	0.00	0.00	0.00	1.13	0.06		
	<b>Total Plantation</b>	30.81	4.37	1.95	0.30	10.53	1.56	43.29	2.13		
	<b>Total Vegetation</b>	<b>186.06</b>	<b>26.39</b>	<b>273.60</b>	<b>41.85</b>	<b>57.08</b>	<b>8.43</b>	<b>516.74</b>	<b>25.38</b>		
ACTIVE MINING	Coal Dump	17.67	2.51	6.17	0.94	15.64	2.31	39.48	1.94		
	Coal Quarry	43.28	6.14	0.00	0.00	85.07	12.57	128.35	6.30		
	Advance Quarry Site	0.00	0.00	0.00	0.00	4.22	0.62	4.22	0.21		
	Quarry Filled With Water	49.17	6.98	0.00	0.00	14.55	2.15	63.72	3.13		
	<b>Total Area under Active Mining</b>	<b>92.45</b>	<b>13.12</b>	<b>0.00</b>	<b>0.00</b>	<b>103.84</b>	<b>15.34</b>	<b>196.29</b>	<b>9.64</b>		
RECLAIMED	Barren OB Dump	60.02	8.51	21.08	3.22	32.26	4.77	113.36	5.57		
	Area Under Backfilling (Technical Reclamation)	146.00	20.71	0.00	0.00	18.06	2.67	164.06	8.06		
	<b>Total Area under Technical Reclamation</b>	<b>146.00</b>	<b>20.71</b>	<b>0.00</b>	<b>0.00</b>	<b>18.06</b>	<b>2.67</b>	<b>164.06</b>	<b>8.06</b>		
	<b>Total Area under Mine Operation</b>	<b>316.14</b>	<b>44.85</b>	<b>27.25</b>	<b>4.16</b>	<b>169.80</b>	<b>25.09</b>	<b>513.19</b>	<b>25.21</b>		
WASTELAND	Waste Lands	66.64	9.45	56.36	8.62	125.72	18.57	248.72	12.22		
	Fly Ash Pond / Sand Body	2.01	0.29	0.00	0.00	0.00	0.00	2.01	0.10		
	<b>Total Wasteland</b>	<b>68.65</b>	<b>9.74</b>	<b>56.36</b>	<b>8.62</b>	<b>125.72</b>	<b>18.57</b>	<b>250.73</b>	<b>12.32</b>		
WATERBODIES	Reservoir, nallah, ponds	10.44	1.48	6.69	1.02	8.19	1.21	25.32	1.24		
	<b>Total Waterbodies</b>	<b>10.44</b>	<b>1.48</b>	<b>6.69</b>	<b>1.02</b>	<b>8.19</b>	<b>1.21</b>	<b>25.32</b>	<b>1.24</b>		
AGRICULTURE	Crop Lands	15.03	2.13	18.78	2.87	17.83	2.63	51.64	2.54		
	Fallow Lands	78.90	11.19	259.95	39.76	282.14	41.67	620.99	30.50		
	<b>Total Agriculture</b>	<b>93.93</b>	<b>13.32</b>	<b>278.73</b>	<b>42.63</b>	<b>299.97</b>	<b>44.30</b>	<b>672.63</b>	<b>33.04</b>		
SETTLEMENTS	Urban Settlement	13.71	1.94	0.00	0.00	0.00	0.00	13.71	0.67		
	Rural Settlement	2.13	0.30	7.17	1.10	13.38	1.98	22.68	1.11		
	Industrial Settlement	13.94	1.98	4.03	0.62	2.86	0.42	20.83	1.02		
	<b>Total Settlement</b>	<b>29.78</b>	<b>4.22</b>	<b>11.20</b>	<b>1.72</b>	<b>16.24</b>	<b>2.40</b>	<b>57.22</b>	<b>2.81</b>		
	<b>Grand Total</b>	<b>705.00</b>	<b>100.00</b>	<b>653.83</b>	<b>100.00</b>	<b>677.00</b>	<b>100.00</b>	<b>2035.83</b>	<b>100.00</b>		

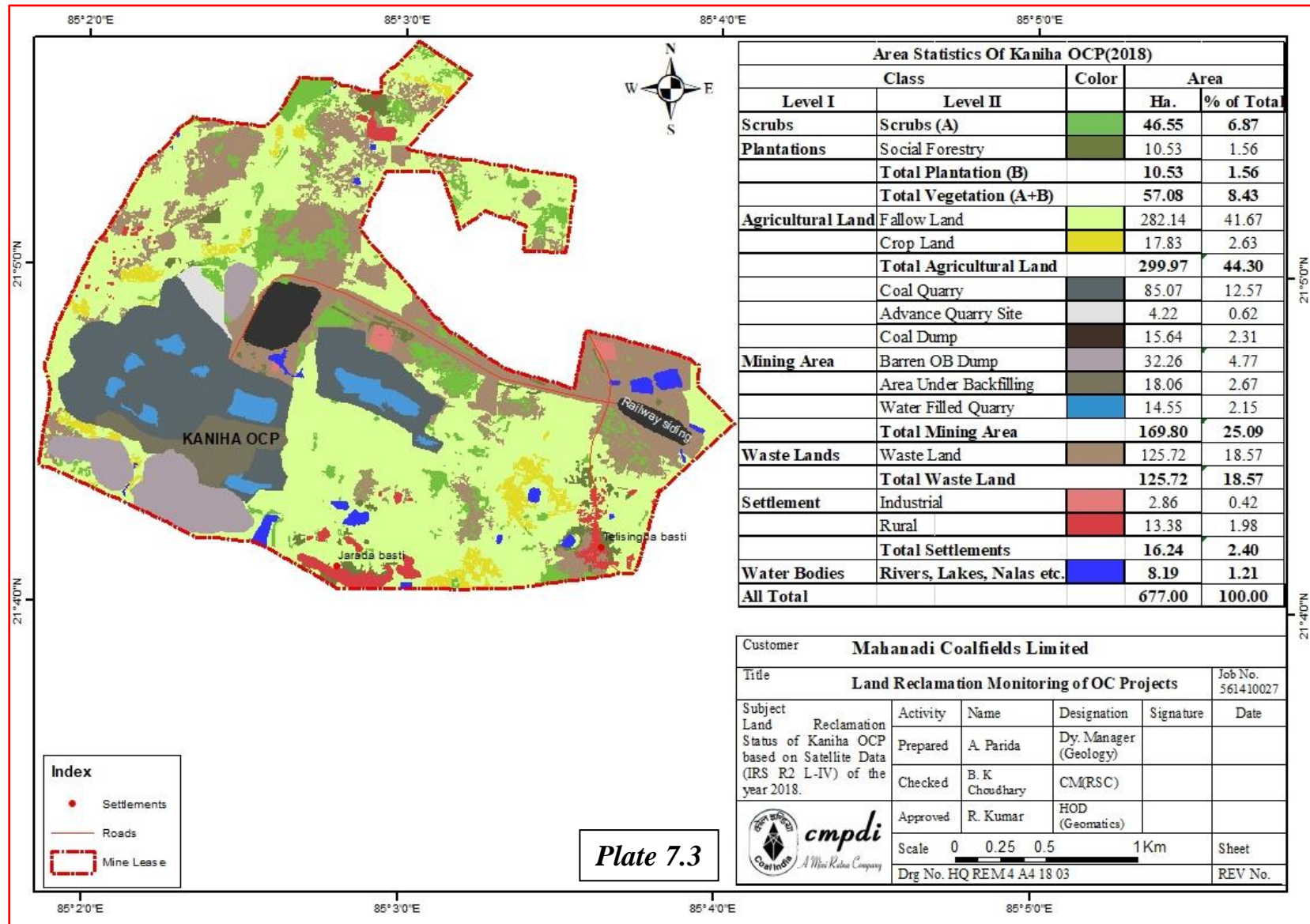


**Fig. 7.1 : Project wise Land Reclamation Status in MCL Projects for the Year 2018**











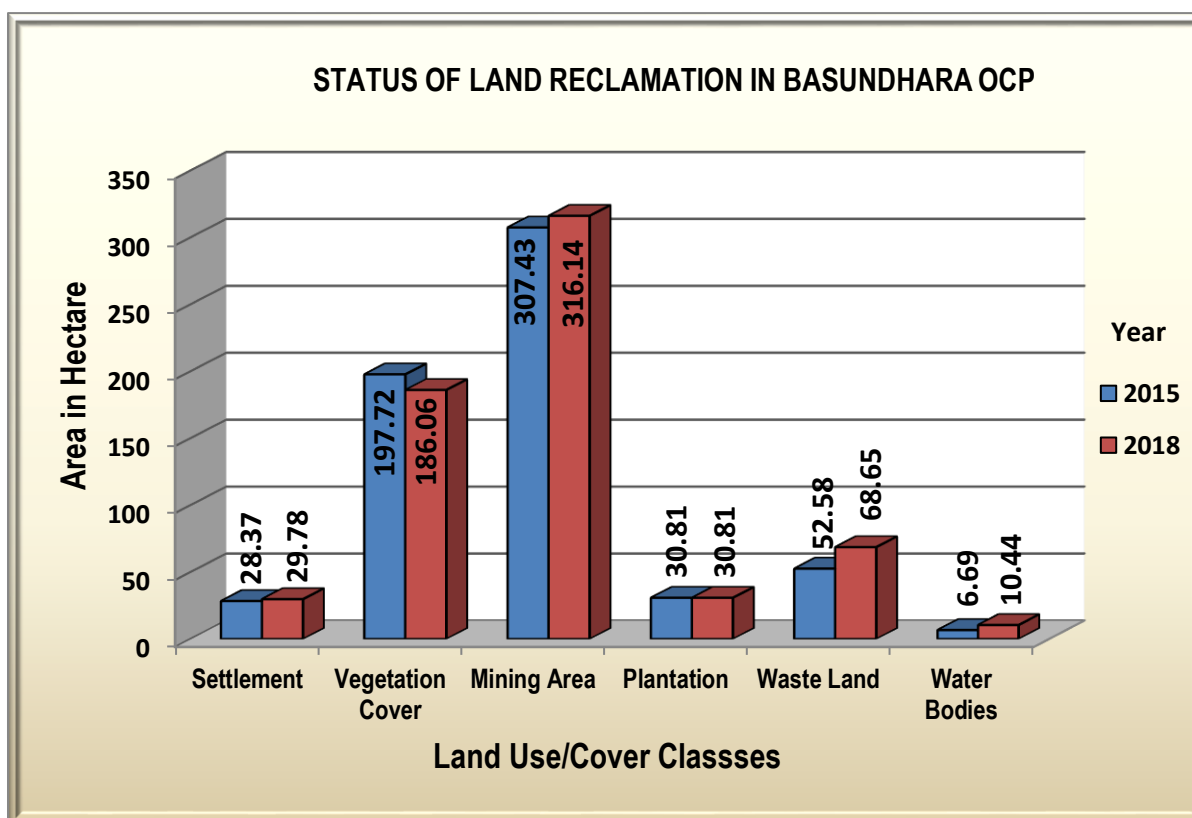


Figure – 7.2

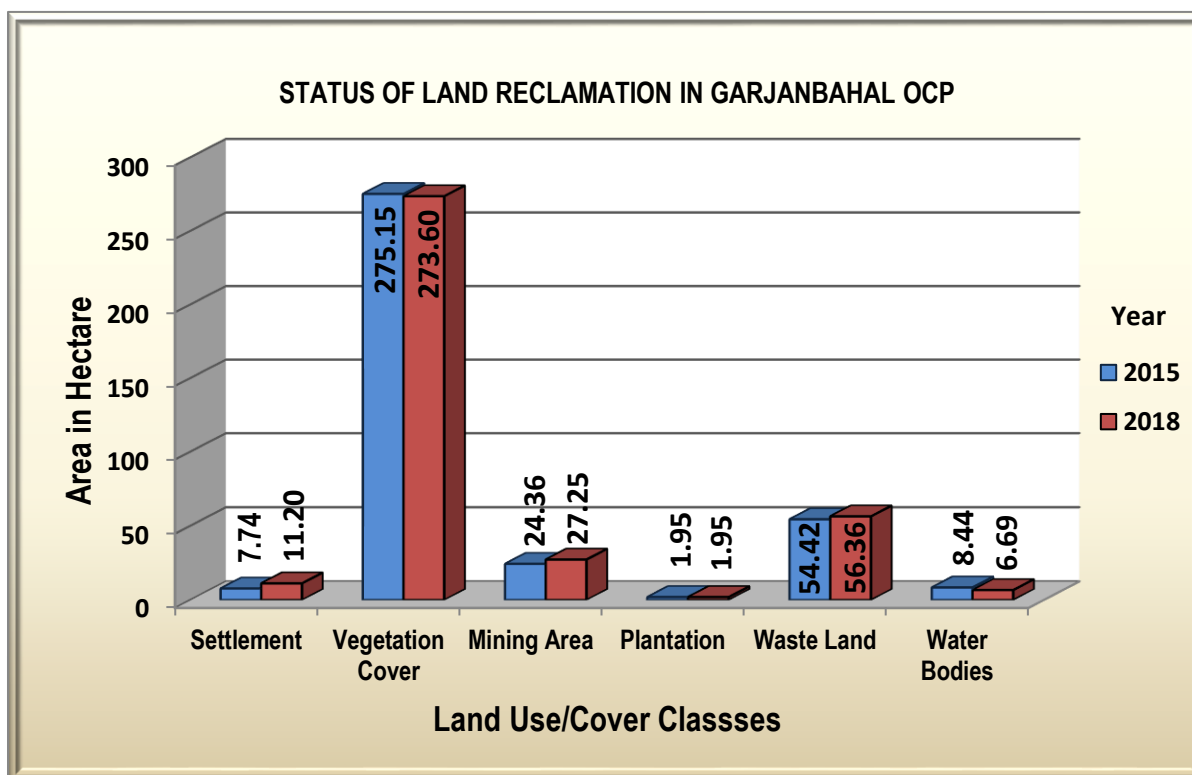
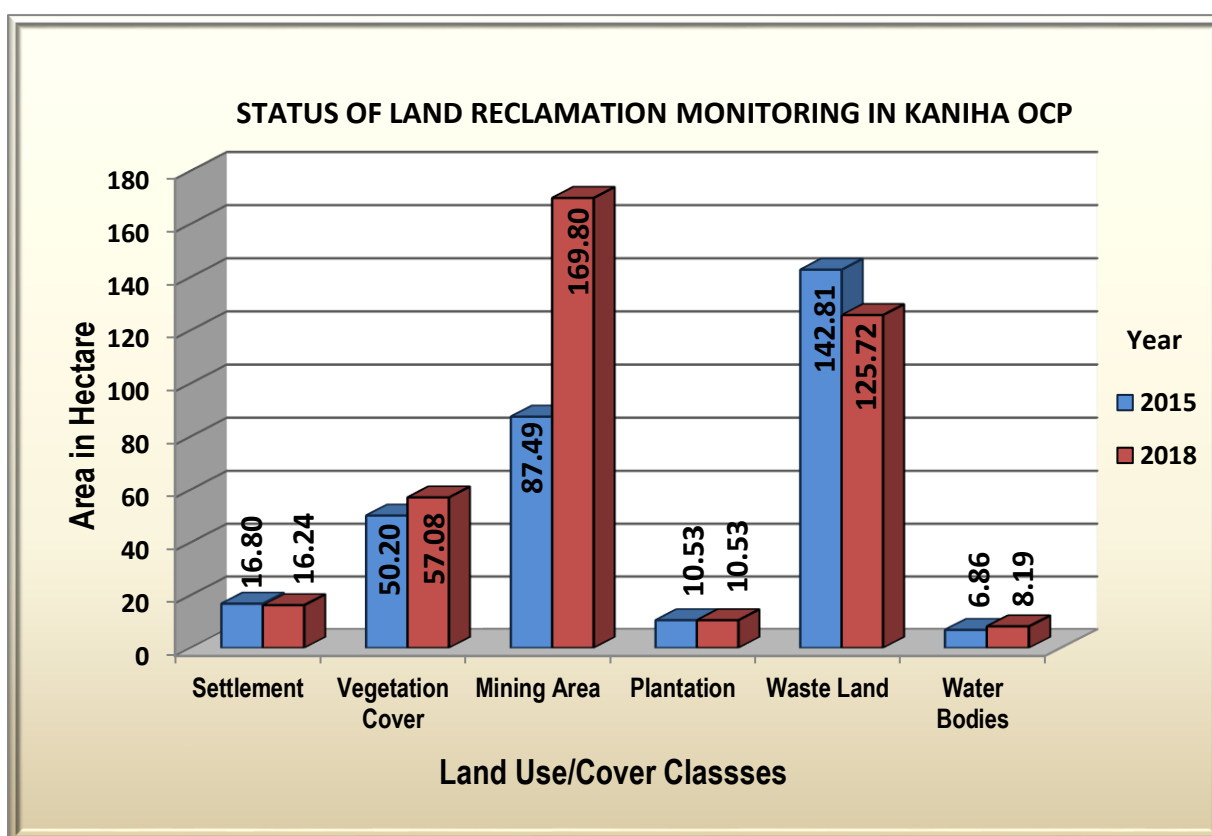


Figure – 7.3

**Figure-7.4**



**Photograph 7.1:** Plantation on External OB Dump in Basundhara OCP



**Photograph 7.2:** Plantation on Backfill in Basundhara OCP





**Photograph: 7.3** Plantation under Social Forestry in Kaniha OCP



**Photograph: 7.4** Plantation under Social Forestry in Kaniha OCP

**CENTRAL COALFIELDS LIMITED**

## **8.0 Land Reclamation Status in Central Coalfields Limited**

**8.1** Following 12 opencast projects of CCL producing less than 5 million cubic m. (Coal+OB) together annually were taken up for land reclamation monitoring during the year 2018-19 :

- Tetariakhar
- Dakra
- Magadh
- Amrapali
- Giddi-A
- Pundi
- Kedla
- Jarangdih
- Kathara
- Konar
- Karo
- Karma

**8.2** Project wise Land Reclamation status in CCL is given in Table 8.1 and also shown graphically in Fig 8.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2018 are shown in the Table - 8.2. Land use maps derived from satellite data are shown in Plate 8.1 – 8.12. Different land use classes based on satellite data are depicted in Bar Charts in Fig.8.2 - 8.13 for the year 2015 and 2018.

**8.3** Study reveals that 608.26 Ha (54.90%) of mining area has already been under reclamation by CCL out of which 196.55 Ha (17.74%) area has been revegetated and 411.71Ha (37.16%) area is under backfilling. There is an increase of 114.52 Hectare area under reclamation in CCL with respect to the year 2015, out of which 36.44 Hectare increase in biological reclamation (plantation) and 78.08 Hectare increase in the technical reclamation (backfilling).



- 8.4** Study indicates that overall all the projects of CCL considered for this study indicate increase or static trend in biological reclamation (plantation on backfill) with respect to the year 2015.
- 8.5** There has been increase in area under technical reclamation in all projects of CCL except in Dakra OCP where area under technical reclamation has reduced considerably as compared to the year 2015. This is because plantation on backfill (Biological reclamation) has gone up from 24.23 Hectare (28.49%) in 2015 to 45.79 Hectare (47.27%) in the year 2018.
- 8.6** After analyzing the satellite data of year 2015 vs. 2018 it is evident that total area under plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in all the mines of CCL has increased from 584.41 Hectare to 619.66 Hectare in span of last three year. This increase of 35.25 Hectare area of plantation (Green Cover) in three year time is due to the sincere efforts of CCL towards mine land reclamation and environment protection.
- 8.7** The leasehold boundaries of Magadh OCP has increased from 1704 Hectare in 2015 to 1769 Hectare in the year 2018 whereas leasehold boundary of Giddi"A" OCP has increased from 494.20 Hectare in the year 2015 to 510 Ha in the year 2018 as both the above mentioned OCP are under expansion.
- 8.8** In Kathara OCP, Area of plantation on OB has decreased due to dumping over plantation on OB hence total area under plantation (Green Cover) has decreased marginally from 228.88 Hectare (Yr 2015) to 224.67 Hectare (Yr2018).
- 8.9** Out of twelve projects of CCL, Maximum land reclamation has been carried out in Giddi"A" OCP (76.18%) followed by Dakra OCP(75.17%) and Jarangdih OCP (67.32%).
- 8.10** This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

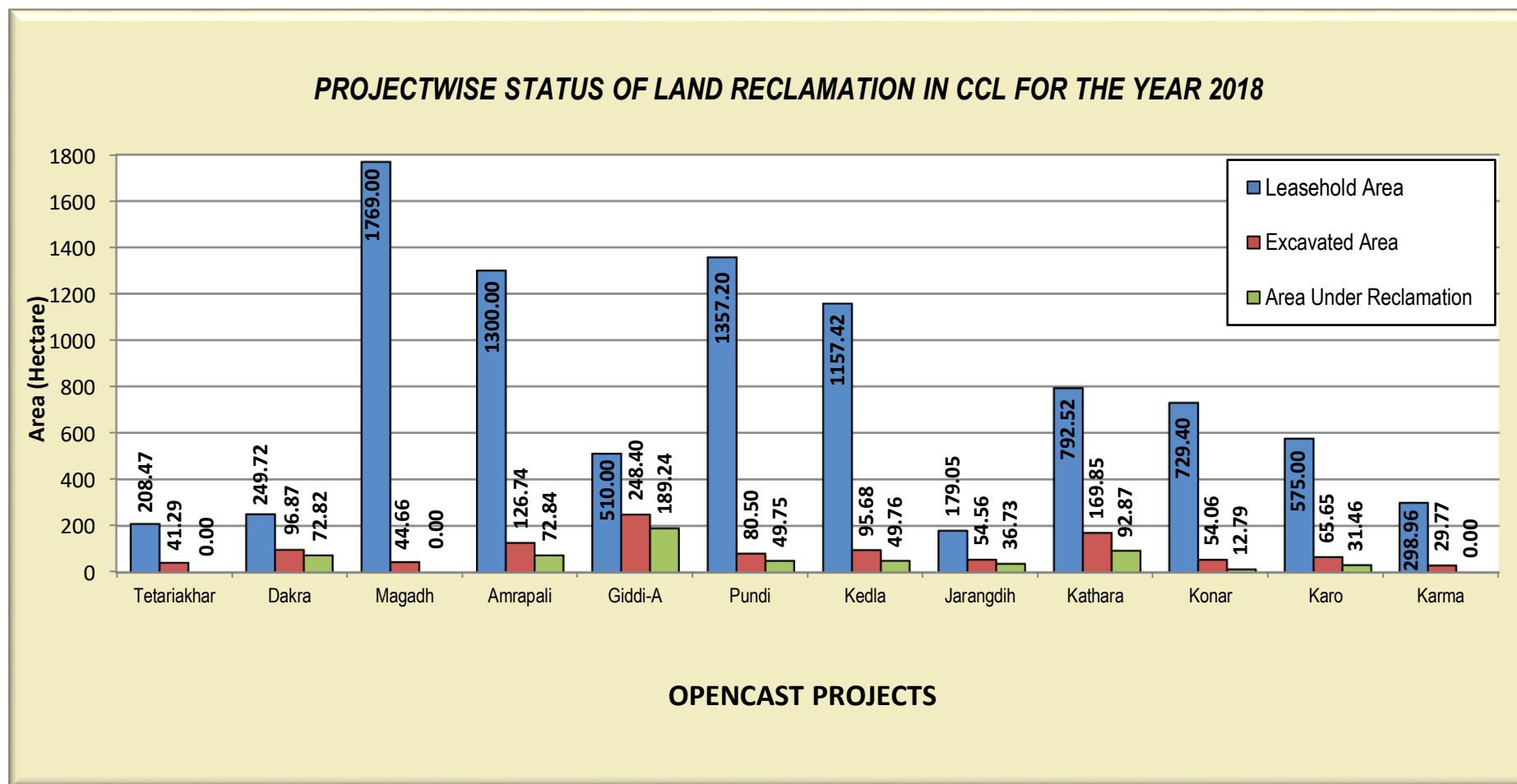
Table: 8.1

Project wise Land Reclamation Status in Opencast Project producing (<5 mcm of Coal+OB) of Central Coalfields Ltd based on the Satellite data of the Year 2018

(Area in Hectare)

Sl. No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Auanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018	2015	2018
1	Tetariakhar	205.59	208.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.45	22.38	41.29	22.38	41.29	0.00	1.45	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.00%	0.70%	0.00%	0.00%
2	Dakra	252.52	249.72	44.85	27.03	24.23	45.79	4.90	4.90	9.58	9.82	15.98	24.05	85.06	96.87	38.71	60.51	69.08	72.82
				52.73%	27.90%	28.49%	47.27%					18.79%	24.83%			15.33%	24.23%	81.21%	75.17%
3	Magadh	1704.00	1769.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.97	44.66	16.97	44.66	0.00	0.00	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			0.00%	0.00%	0.00%	0.00%
4	Amrapali	1300.00	1300.00	0.00	72.84	0.00	0.00	0.00	1.36	0.00	0.00	98.48	53.90	98.48	126.74	0.00	1.36	0.00	72.84
				0.00%	57.47%	0.00%	0.00%					100.00%	42.53%			0.00%	0.10%	0.00%	57.47%
5	Giddi-A	494.20	510.00	105.72	109.10	67.64	80.14	41.57	43.90	13.22	14.00	74.61	59.16	247.97	248.40	122.43	138.04	173.36	189.24
				42.63%	43.92%	27.28%	32.26%					30.09%	23.82%			24.77%	27.07%	69.91%	76.18%
6	Pundi	1357.20	1357.20	31.06	35.87	13.86	13.88	23.03	22.36	1.35	1.35	31.19	30.75	76.11	80.50	38.24	37.59	44.92	49.75
				40.81%	44.56%	18.21%	17.24%					40.98%	38.20%			2.82%	2.77%	59.02%	61.80%
7	Kedla	1157.42	1157.42	49.73	49.76	0.00	0.00	27.05	26.75	1.46	1.46	34.30	45.92	84.03	95.68	28.51	28.21	49.73	49.76
				59.18%	52.01%	0.00%	0.00%					40.82%	47.99%			2.46%	2.44%	59.18%	52.01%
8	Jarangdih	179.05	179.05	28.51	29.53	7.19	7.20	3.50	3.50	16.50	18.93	21.57	17.83	57.27	54.56	27.19	29.63	35.70	36.73
				49.78%	54.12%	12.55%	13.20%					37.66%	32.68%			15.19%	16.55%	62.34%	67.32%
9	Kathara	792.52	792.52	59.39	61.04	31.83	31.83	122.03	103.67	75.02	89.17	78.67	76.98	169.89	169.85	228.88	224.67	91.22	92.87
				34.96%	35.94%	18.74%	18.74%					46.31%	45.32%			28.88%	28.35%	53.69%	54.68%
10	Konar	729.40	729.40	0.26	9.31	3.48	3.48	27.10	24.18	20.69	19.16	51.98	41.27	55.72	54.06	51.27	46.82	3.74	12.79
				0.47%	17.22%	6.25%	6.44%					93.29%	76.34%			7.03%	6.42%	6.71%	23.66%
11	Karo	575.00	575.00	14.11	17.23	11.88	14.23	10.83	12.07	15.90	15.78	40.93	34.19	66.92	65.65	38.61	42.08	25.99	31.46
				21.08%	26.25%	17.75%	21.68%					61.16%	52.08%			6.71%	7.32%	38.84%	47.92%
12	Karma	298.96	298.96	0.00	0.00	0.00	0.00	9.23	8.03	1.34	1.27	20.72	29.77	20.72	29.77	10.57	9.30	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			3.54%	3.11%	0.00%	0.00%
	TOTAL	9045.86	9126.74	333.63	411.71	160.11	196.55	269.24	250.72	155.06	172.39	507.78	499.77	1001.52	1108.03	584.41	619.66	493.74	608.26
				33.31%	37.16%	15.99%	17.74%					50.70%	45.10%			6.40%	6.79%	49.30%	54.90%

(% is calculated with respected to Excavated Area as applicable)



**Figure. 8.1 : Land Reclamation Status in OC Projects producing Less than 5mcm(Coal+ OB) of CCL in the Year 2018**

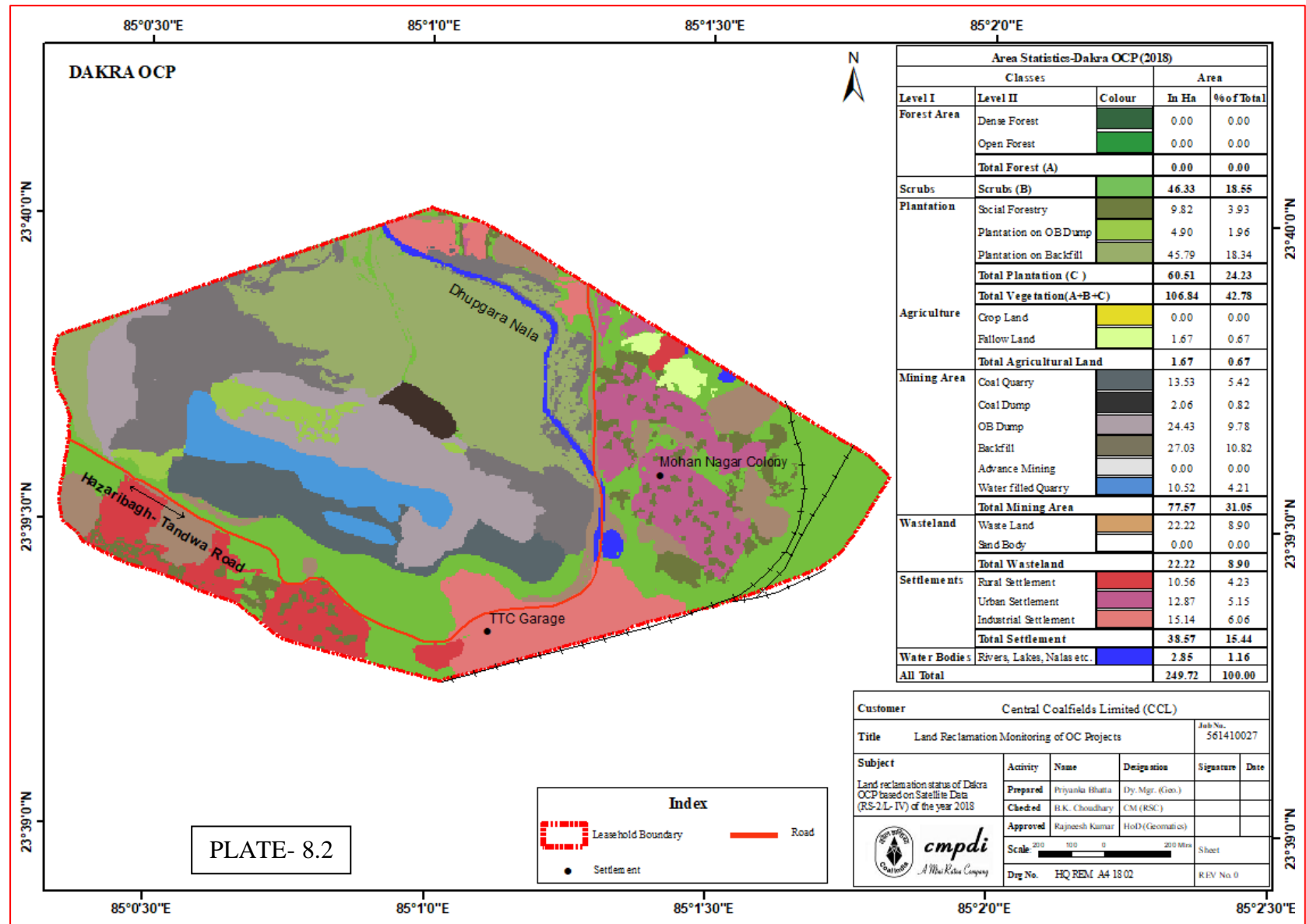
Table 8.2

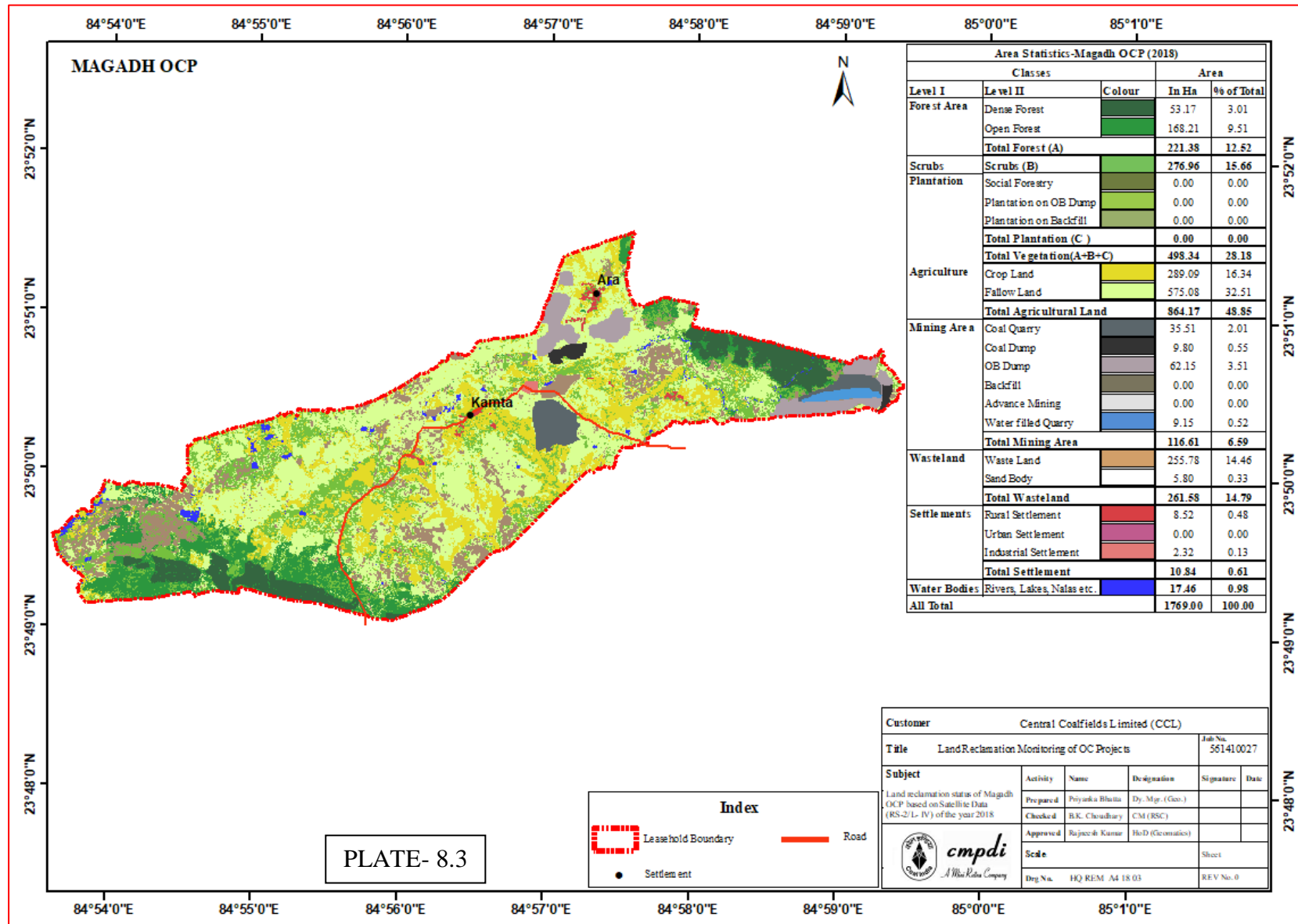
Project wise area statistics of land use/Cover classes in the OpenCast Project producing (<5m.cm Coal+OB) of CCL based on satellite data the year 2018

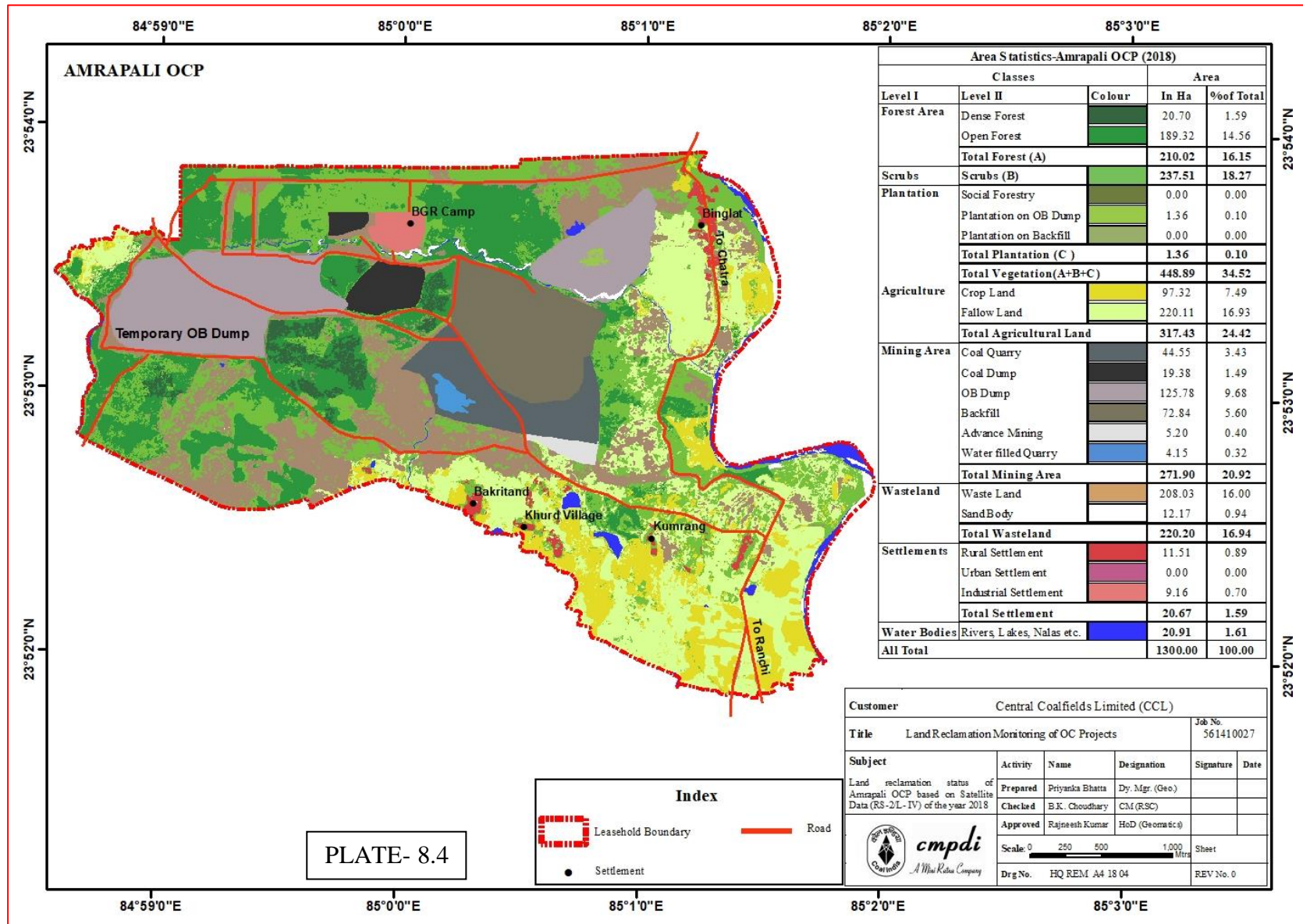
		(Area in Hectare)																									
		TETARIAKHAR		DAKRA		MAGADH		AMRAPALI		GIDDI-A		PUNDI		KEDLA		JARANGDIH		KATHARA		KONAR		KARO		KARMA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.02	0.01	0.00	0.00	53.17	3.01	20.70	1.59	0.00	0.00	181.58	13.38	0.04	0.00	0.00	0.00	0.00	0.00	76.78	10.53	66.61	11.58	0.00	0.00	398.90	4.37
	Open Forest	5.09	2.44	0.00	0.00	168.21	9.51	189.32	14.56	0.00	0.00	235.65	17.36	174.08	15.04	0.00	0.00	0.00	0.00	211.88	29.05	77.14	13.42	15.08	5.04	1076.45	11.79
	<b>Total Forest (A)</b>	5.11	2.45	0.00	0.00	221.38	12.52	210.02	16.15	0.00	0.00	417.23	30.74	174.12	15.04	0.00	0.00	0.00	0.00	288.66	39.58	143.75	25.00	15.08	5.04	1475.35	16.16
SCRUBS	Scrubs (B)	47.31	22.69	46.33	18.55	276.96	15.66	237.51	18.27	53.53	10.50	308.17	22.71	406.27	35.10	26.43	14.76	50.49	6.37	129.53	17.76	127.41	22.16	69.15	23.13	1779.09	19.49
	Social Forestry	1.45	0.70	9.82	3.93	0.00	0.00	0.00	0.00	14.00	2.75	1.35	0.10	1.46	0.13	18.93	10.57	89.17	11.25	19.16	2.63	15.78	2.74	1.27	0.42	172.39	1.89
	Plantation on External OB Dump	0.00	0.00	4.90	1.96	0.00	0.00	1.36	0.10	43.90	8.61	22.36	1.65	26.75	2.31	3.50	1.95	103.67	13.08	24.18	3.32	12.07	2.10	8.03	2.69	250.72	2.75
PLANTATION	Plantation on Backfill (Biological Reclamation)	0.00	0.00	45.79	18.34	0.00	0.00	0.00	0.00	80.14	15.71	13.88	1.02	0.00	0.00	7.20	4.02	31.83	4.02	3.48	0.48	14.23	2.47	0.00	0.00	196.55	2.15
	<b>Total Plantation (Green Cover) (C)</b>	1.45	0.70	60.51	24.23	0.00	0.00	1.36	0.10	138.04	27.07	37.59	2.77	28.21	2.44	29.63	16.54	224.67	28.35	46.82	6.43	42.08	7.31	9.30	3.11	619.66	6.79
	<b>Total Vegetation (A+B+C)</b>	53.87	25.84	106.84	42.78	498.34	28.18	448.89	34.52	191.57	37.57	762.99	56.22	608.60	52.58	56.06	31.30	275.16	34.72	465.01	63.77	313.24	54.47	93.53	31.28	3874.11	42.44
ACTIVE MINING	Coal Dump	20.08	9.63	2.06	0.82	9.80	0.55	19.38	1.49	5.52	1.08	4.87	0.36	5.76	0.50	4.39	2.45	15.90	2.01	9.33	1.28	7.91	1.38	6.52	2.18	111.52	1.23
	Coal Quarry	26.71	12.81	13.53	5.42	35.51	2.01	44.55	3.43	9.89	1.94	15.90	1.17	28.58	2.47	14.57	8.14	36.49	4.60	25.70	3.52	31.47	5.47	24.20	8.09	307.10	3.36
	Advance Quarry Site	0.00	0.00	0.00	0.00	0.00	0.00	5.20	0.40	0.00	0.00	0.65	0.05	0.34	0.03	1.47	0.82	0.00	0.00	12.99	1.78	0.00	0.00	1.42	0.47	22.07	0.24
ACTIVE MINING	Quarry Filled with Water	14.58	6.99	10.52	4.21	9.15	0.52	4.15	0.32	49.27	9.66	14.20	1.05	17.00	1.47	1.79	1.00	40.49	5.11	2.58	0.35	2.72	0.47	4.15	1.39	170.60	1.87
	<b>Total Area under Active Mining</b>	41.29	19.80	24.05	9.63	44.66	2.53	53.90	4.15	59.16	11.60	30.75	2.27	45.92	3.97	17.83	9.96	76.98	9.71	41.27	5.65	34.19	5.94	29.77	9.95	499.77	5.47
	Barren OB dump	29.32	14.06	24.43	9.78	62.15	3.51	125.78	9.78	0.57	0.11	36.35	2.68	88.70	7.66	12.52	6.99	144.47	18.23	64.65	8.86	39.15	6.81	48.58	16.25	676.67	7.41
WASTELANDS	Area Under Backfilling (Technical Reclamation)	0.00	0.00	27.03	10.82	0.00	0.00	72.84	5.60	109.10	21.39	35.87	2.64	49.76	4.30	29.53	16.49	61.04	7.70	9.31	1.28	17.23	3.00	0.00	0.00	411.71	4.51
	<b>Total Area under Mine Operation</b>	90.69	43.49	77.57	31.05	116.61	6.59	271.90	20.92	174.35	34.18	107.84	7.95	190.14	16.43	64.27	35.89	298.39	37.65	124.56	17.07	98.48	17.13	84.87	28.38	1699.67	17.39
	Waste Lands	18.63	8.94	22.22	8.9	255.78	14.46	208.03	16.00	35.84	7.03	128.16	9.44	74.01	6.39	19.77	11.04	43.92	5.54	28.89	3.96	72.45	12.60	31.98	10.70	939.68	10.30
WASTELANDS	Fly Ash Pond/Sand Body	0.00	0.00	0.00	0.00	5.80	0.33	12.17	0.94	5.98	1.17	3.02	0.22	0.66	0.06	0.97	0.54	9.87	1.25	0.00	0.00	0.00	0.00	9.75	3.26	48.22	0.53
	<b>Total Wastelands</b>	18.63	8.94	22.22	8.90	261.58	14.79	220.20	16.94	41.82	8.20	131.18	9.66	74.67	6.45	20.74	11.58	53.79	6.79	28.89	3.96	72.45	12.60	41.73	13.96	987.90	10.83
	Reservoir, nallah, ponds etc.	6.34	3.05	2.85	1.16	17.46	0.98	20.91	1.61	17.95	3.52	8.68	0.64	16.53	1.43	2.28	1.29	5.45	0.68	0.44	0.06	1.01	0.18	11.94	4.01	111.83	1.23
WASTELANDS	<b>Total Waterbodies</b>	6.34	3.05	2.85	1.16	17.46	0.98	20.91	1.61	17.95	3.52	8.68	0.64	16.53	1.43	2.28	1.29	5.45	0.68	0.44	0.06	1.01	0.18	11.94	4.01	111.83	1.23
	Crop Lands	0.00	0.00	0.00	0.00	289.09	16.34	97.32	7.49	0.00	0.00	127.37	9.38	1.48	0.13	0.62	0.35	20.12	2.54	6.88	0.94	0.09	0.02	0.00	0.00	542.97	5.95
AGRICULTURE	Fallow Lands	37.67	18.07	1.67	0.67	575.08	32.51	220.11	16.93	2.49	0.49	186.28	13.73	202.00	17.45	0.00	0.00	52.68	6.65	46.62	6.39	60.74	10.56	60.01	20.07	1445.35	15.84
	<b>Total Agriculture</b>	37.67	18.07	1.67	0.67	864.17	48.85	317.43	24.42	2.49	0.49	313.65	23.11	203.48	17.58	0.62	0.35	72.80	9.19	53.50	7.33	60.83	10.58	60.01	20.07	1988.32	21.79
	Urban Settlement	0.00	0.00	12.87	5.15	0.00	0.00	0.00	0.00	61.14	11.99	6.93	0.51	26.71	2.31	31.96	17.85	40.82	5.15	50.80	6.96	19.87	3.46	0.00	0.00	251.10	2.75
SETTLEMENTS	Rural Settlement	0.40	0.19	10.56	4.23	8.52	0.48	11.51	0.89	0.00	0.00	21.80	1.61	26.14	2.26	0.00	0.00	6.71	0.85	5.99	0.82	6.06	1.05	5.52	1.85	103.21	1.13
	Industrial Settlement	0.87	0.42	15.14	6.06	2.32	0.13	9.16	0.70	20.68	4.05	4.13	0.30	11.15	0.96	3.12	1.74	39.40	4.97	0.21	0.03	3.06	0.53	1.36	0.45	110.60	1.21
	<b>Total Settlements</b>	1.27	0.61	38.57	15.44	10.84	0.61	20.67	1.59	81.82	16.04	32.86	2.42	64.00	5.53	35.08	19.59	86.93	10.97	57.00	7.81	28.99	5.04	6.88	2.30	464.91	5.09
<b>GRAND TOTAL</b>		208.47	100.00	249.72	100.00	1769.00	100.00	1300.00	100.00	510.00	100.00	1357.20	100.00	1157.42	100.00	179.05	100.00	792.52	100.00	729.40	100.00	575.00	100.00	298.96	100.00	9126.74	100.00

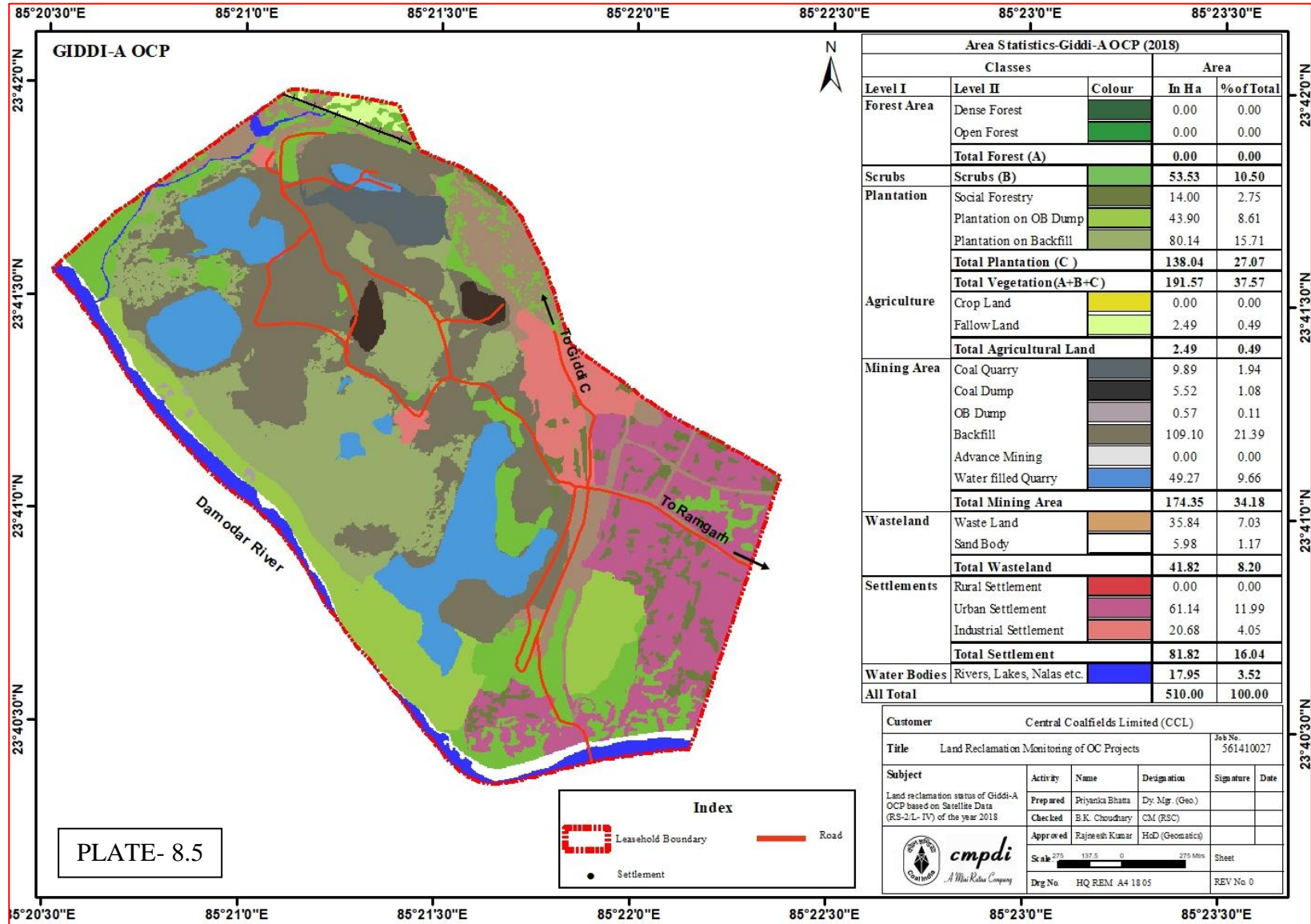




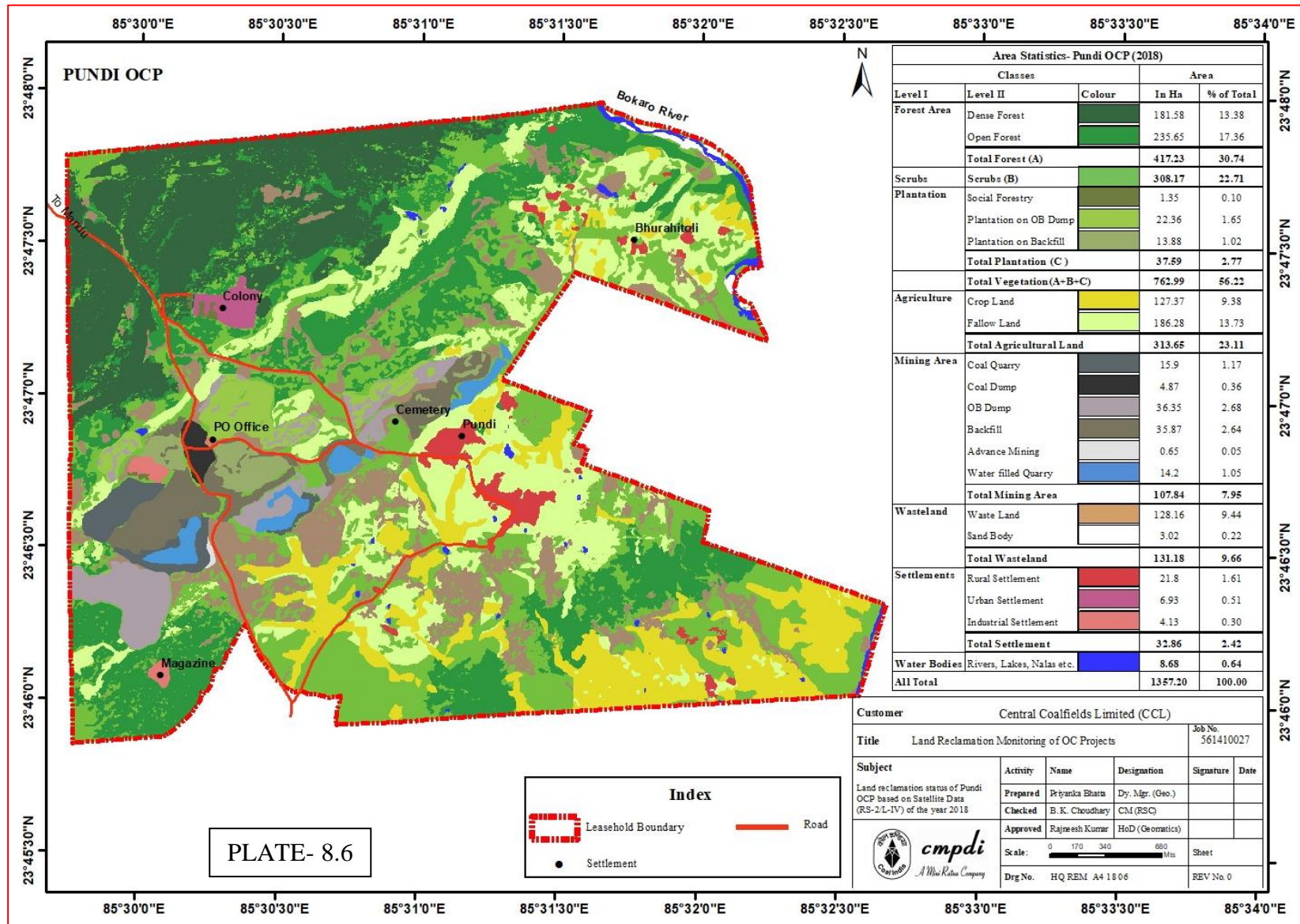




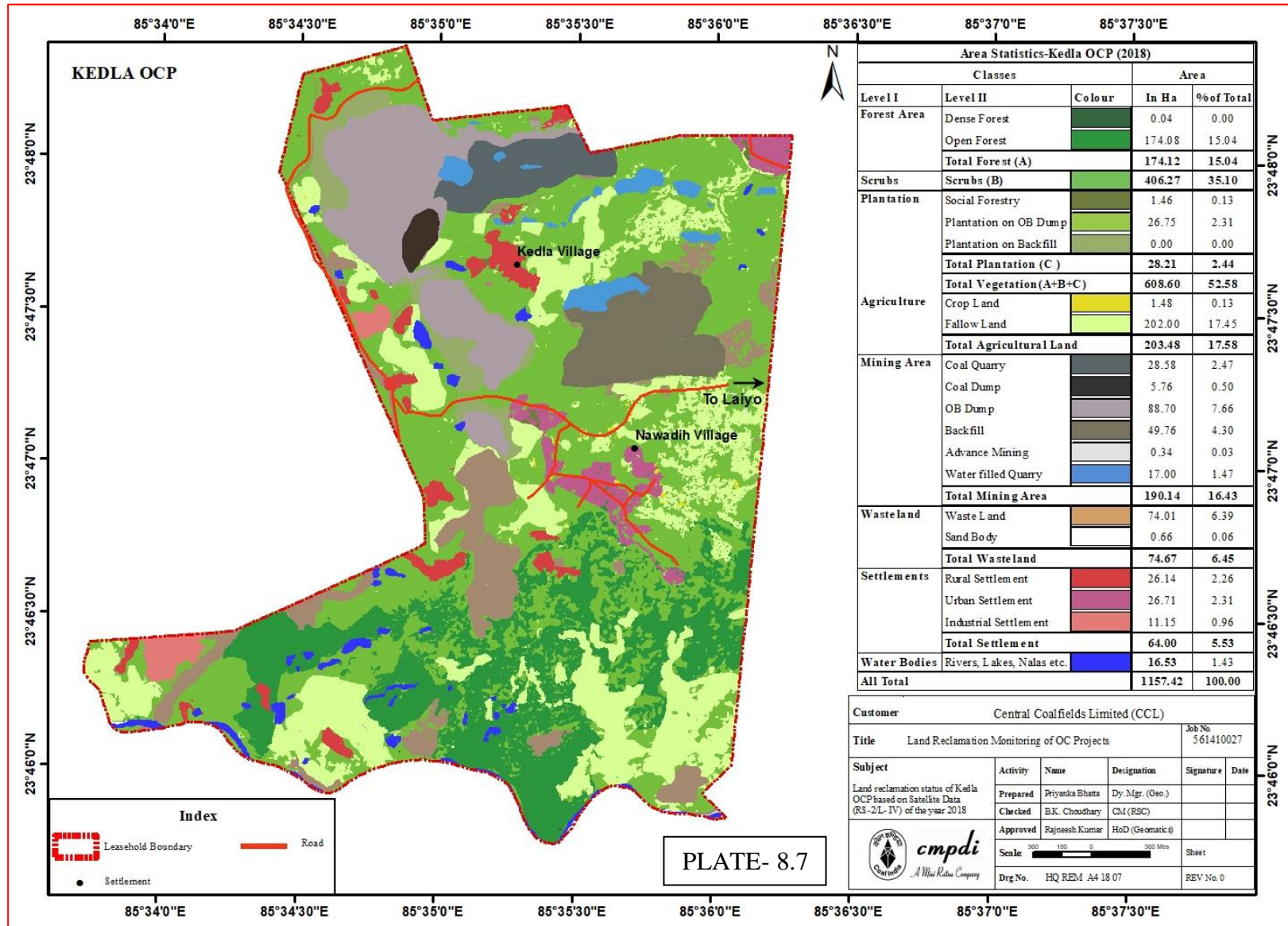


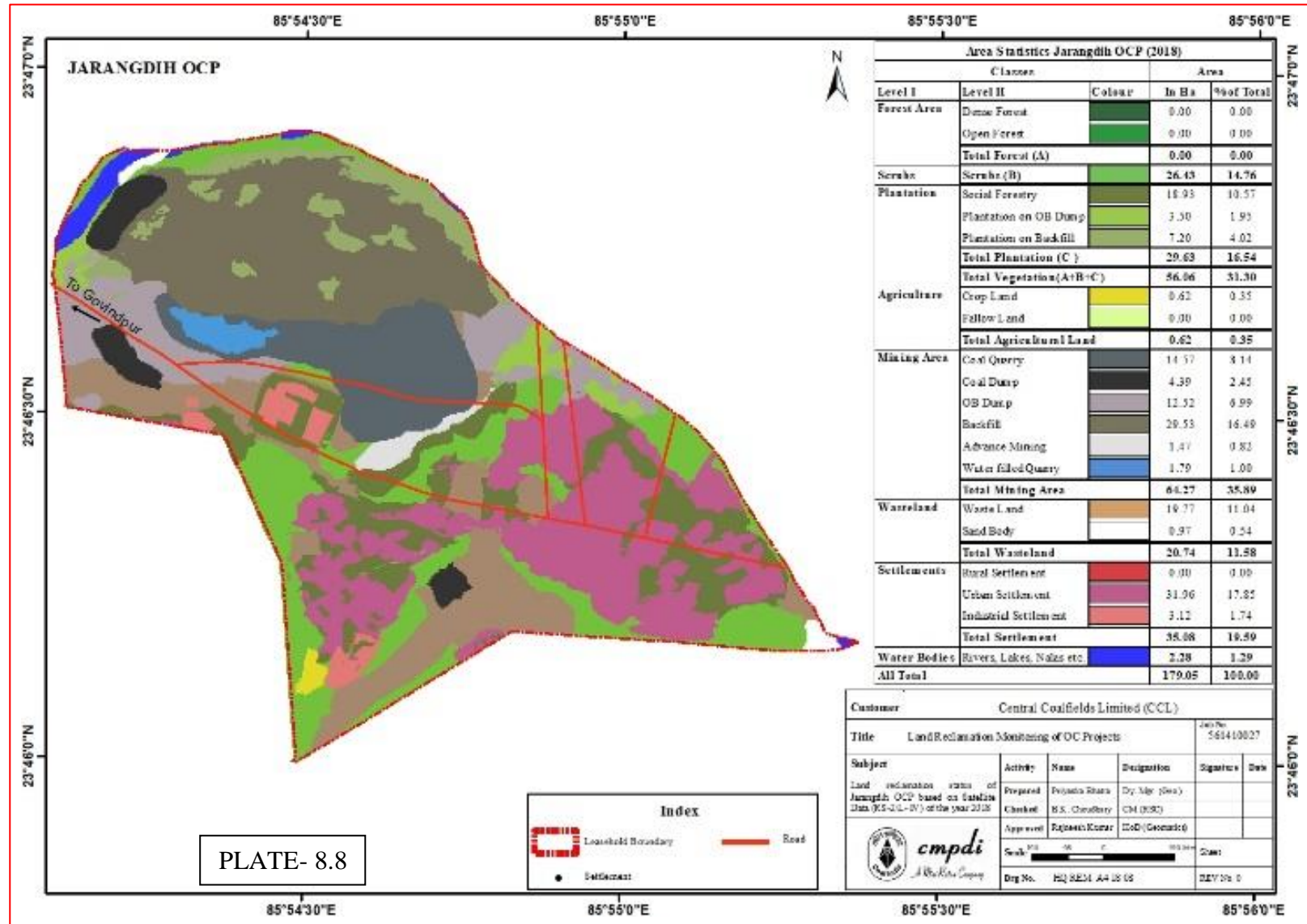


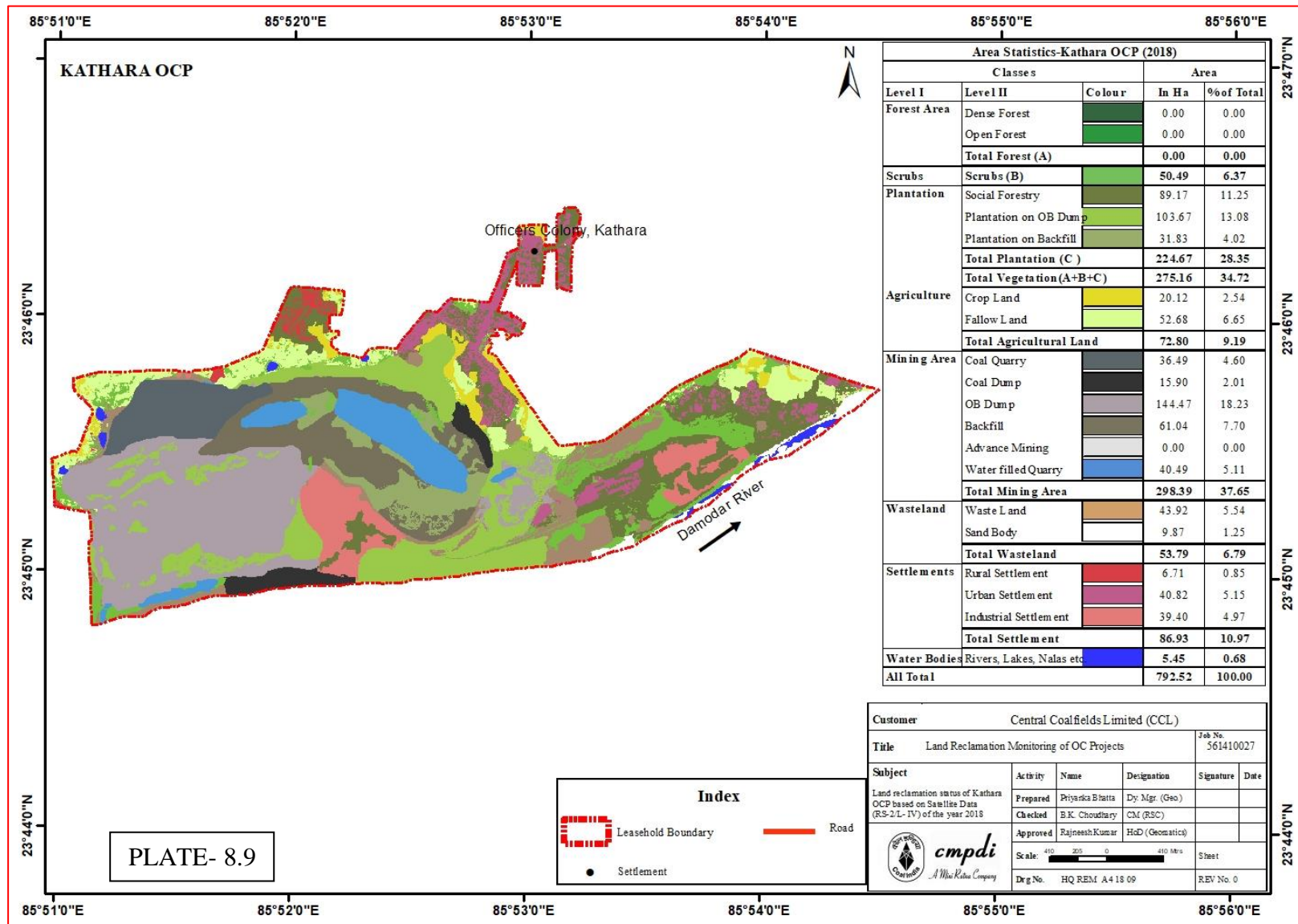




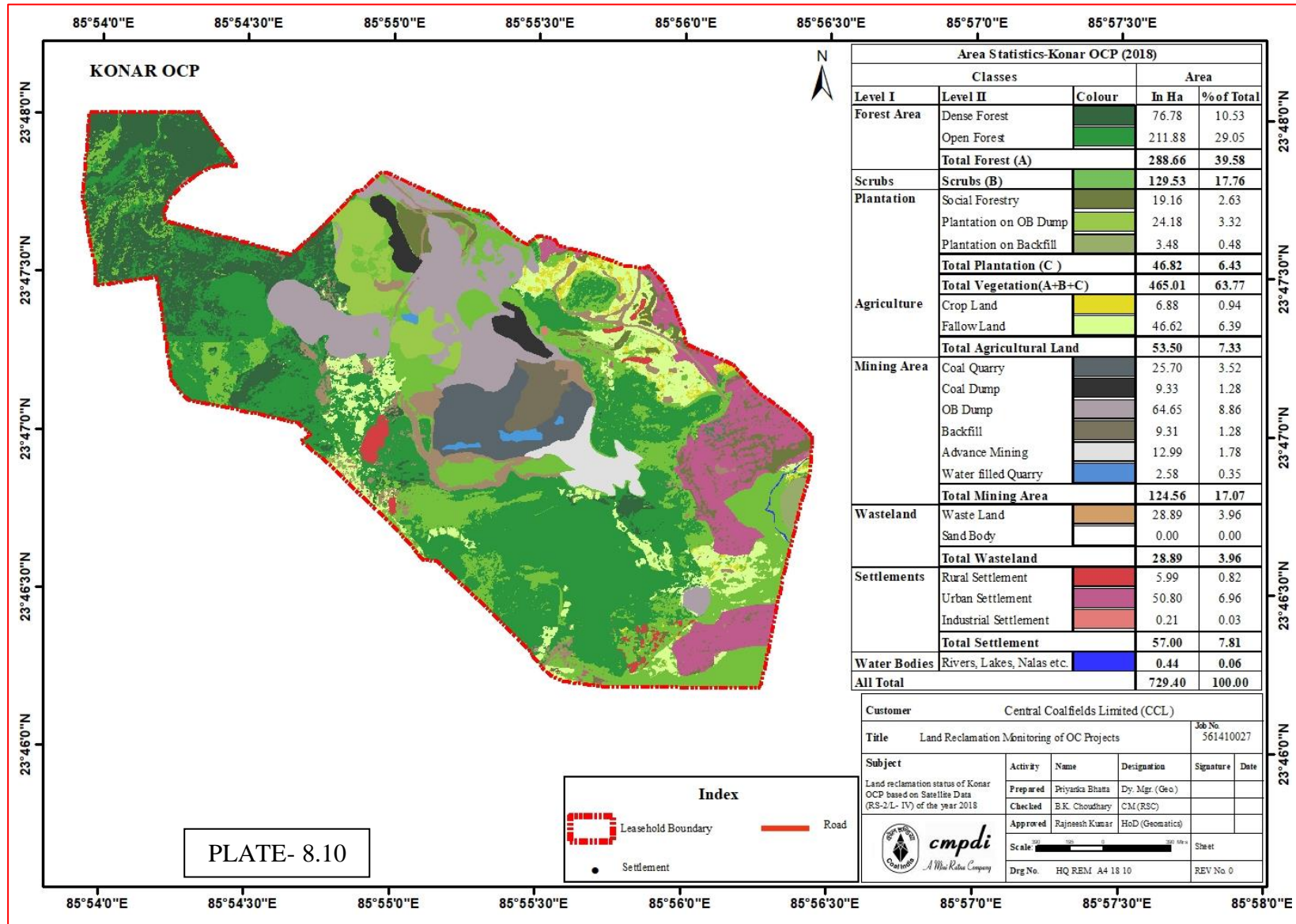


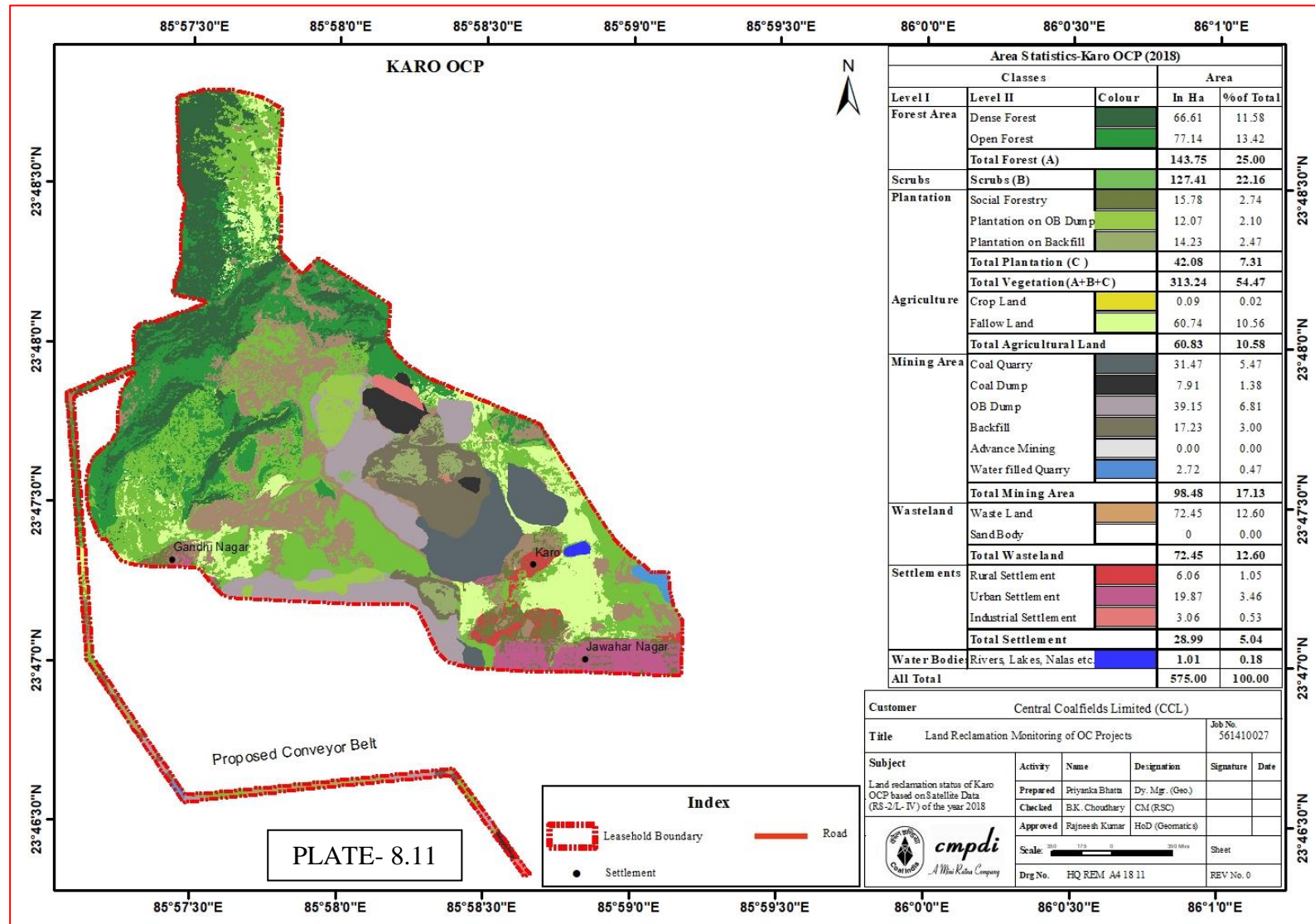




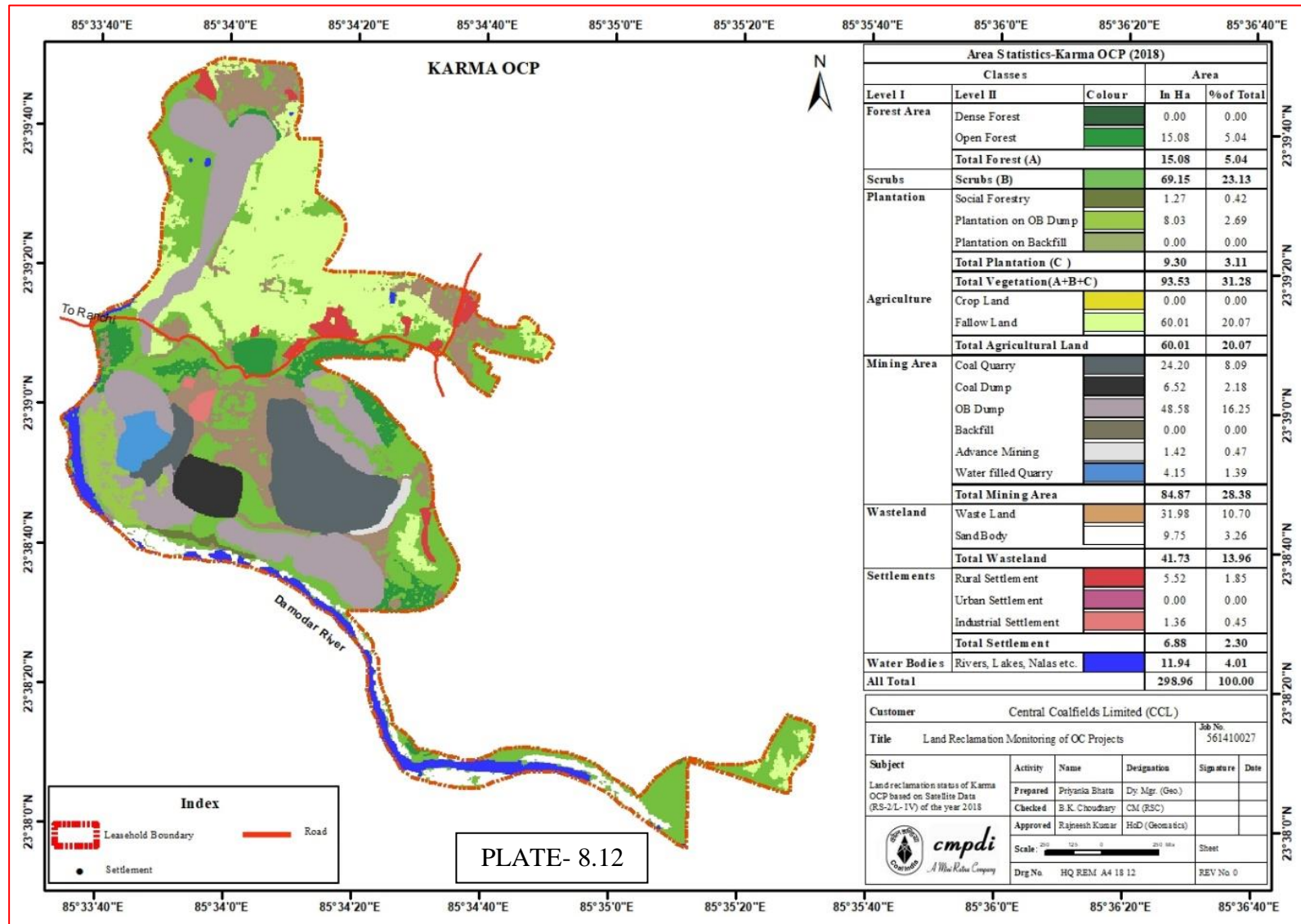












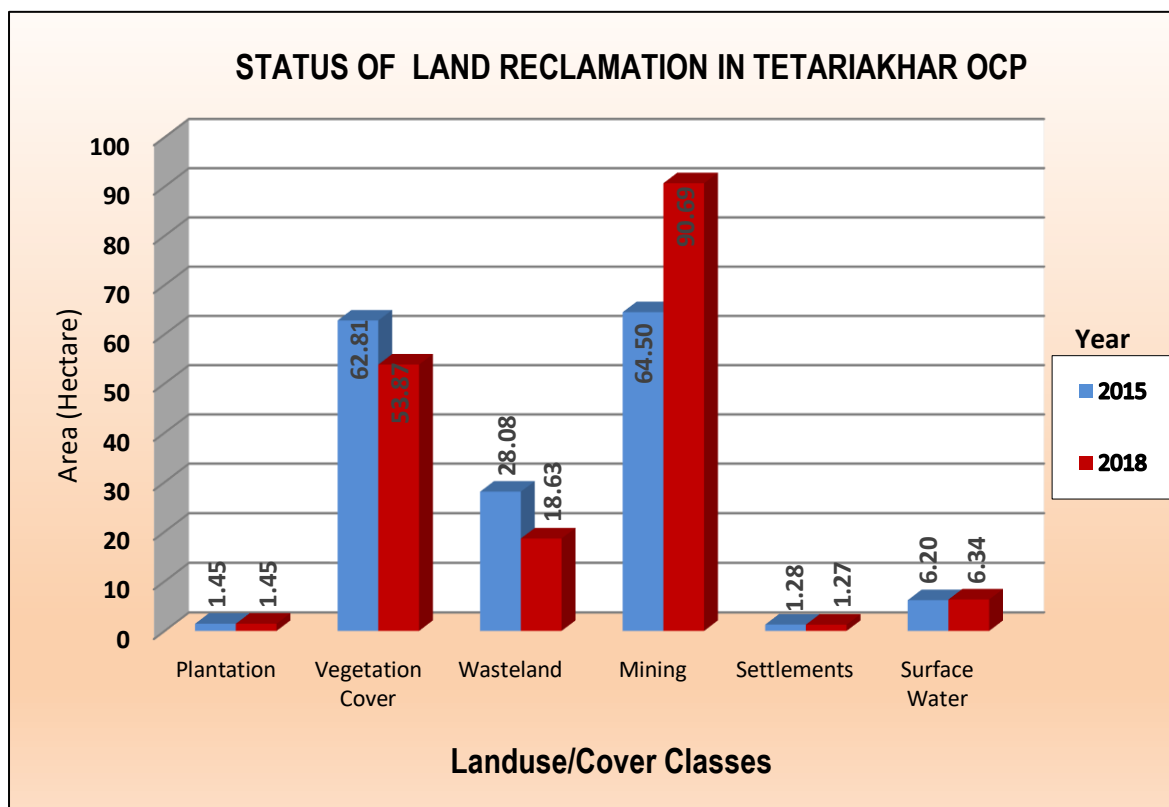


FIGURE – 8.2

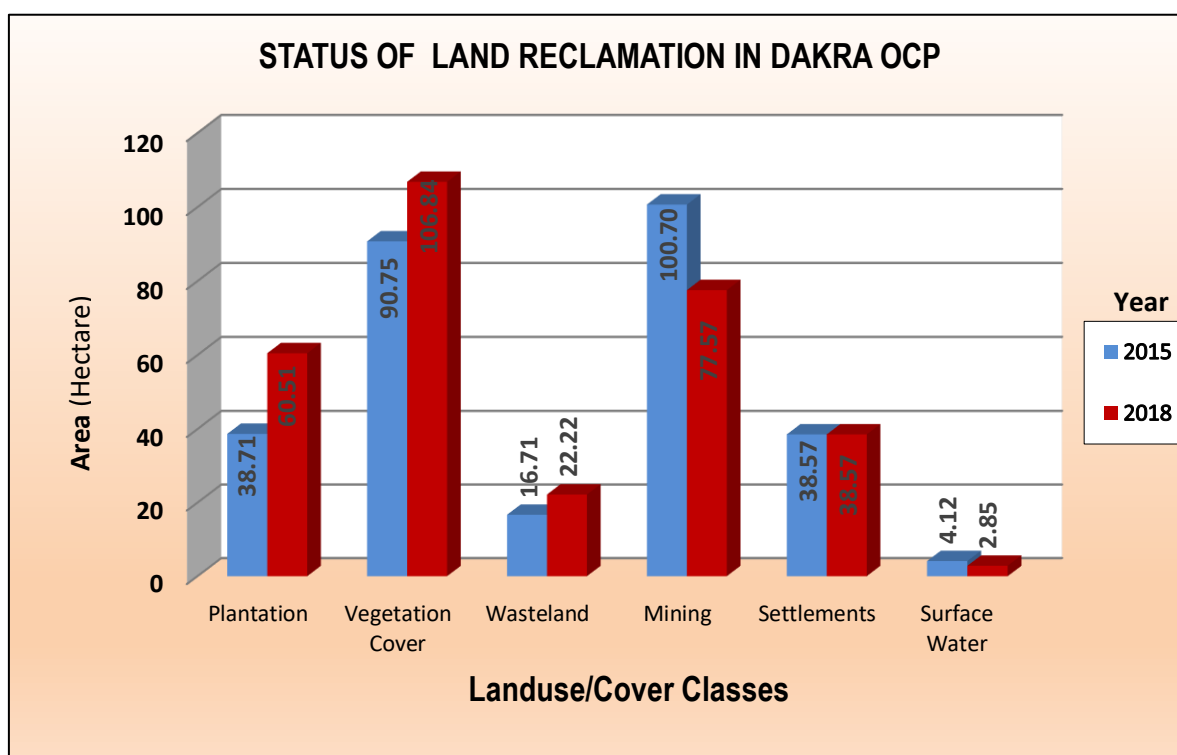


FIGURE – 8.3

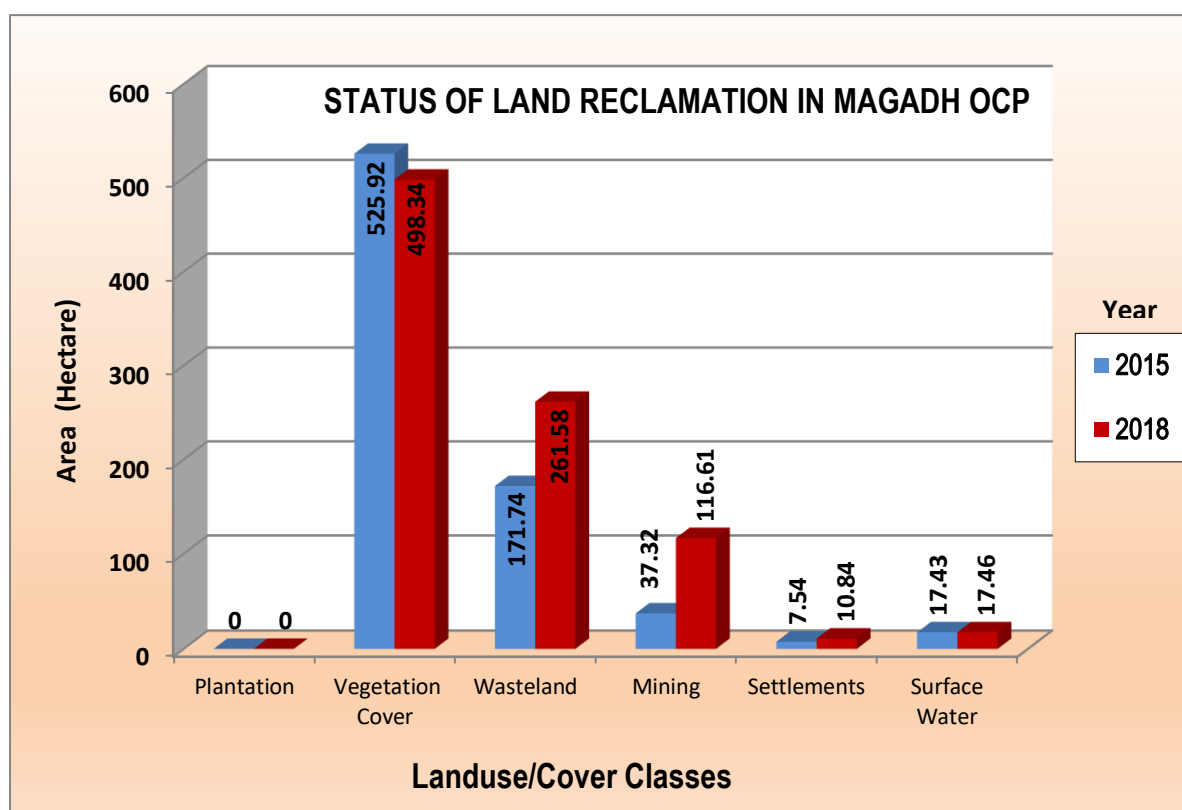


FIGURE – 8.4

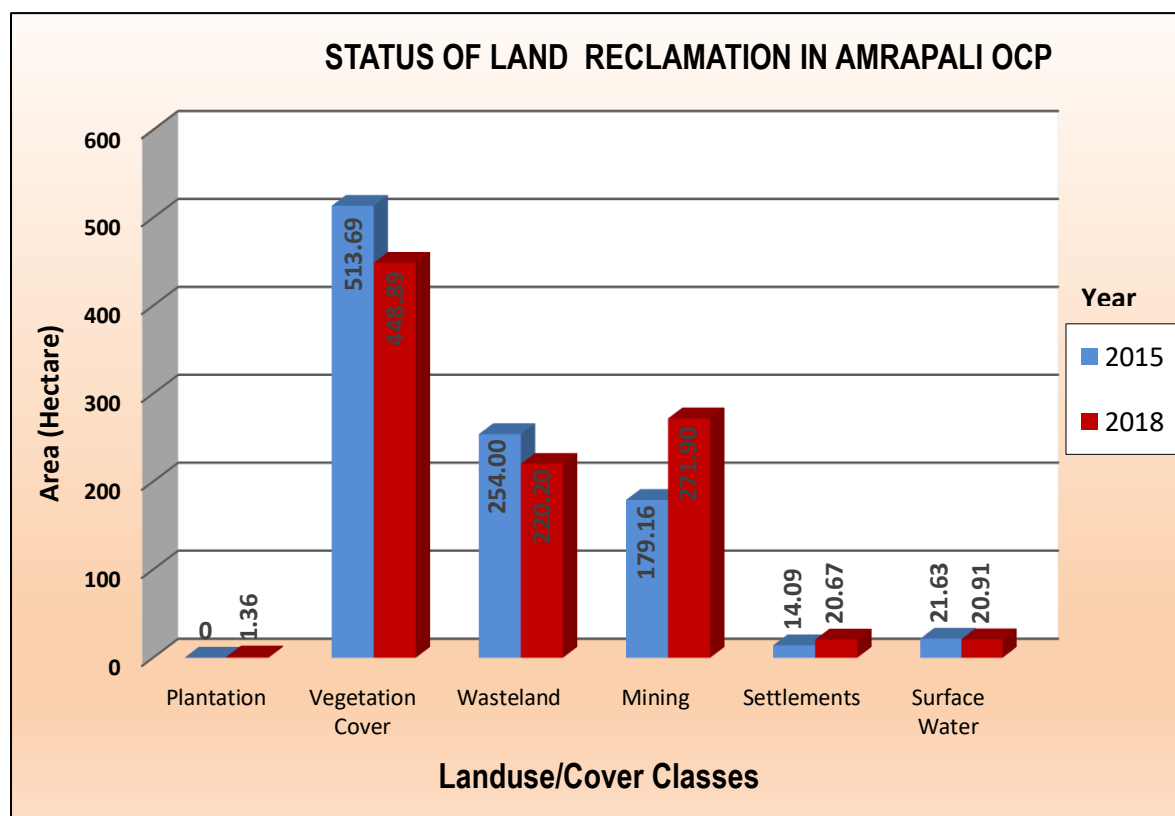


FIGURE – 8.5

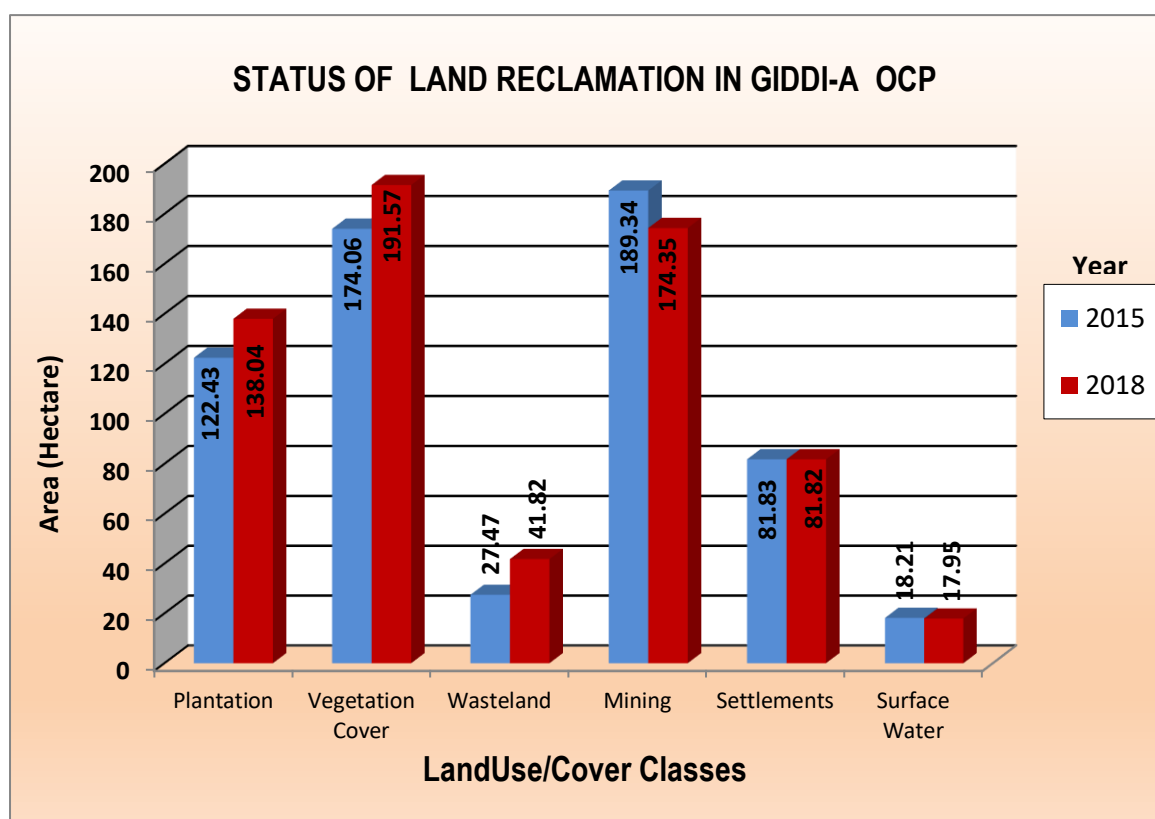


FIGURE – 8.6

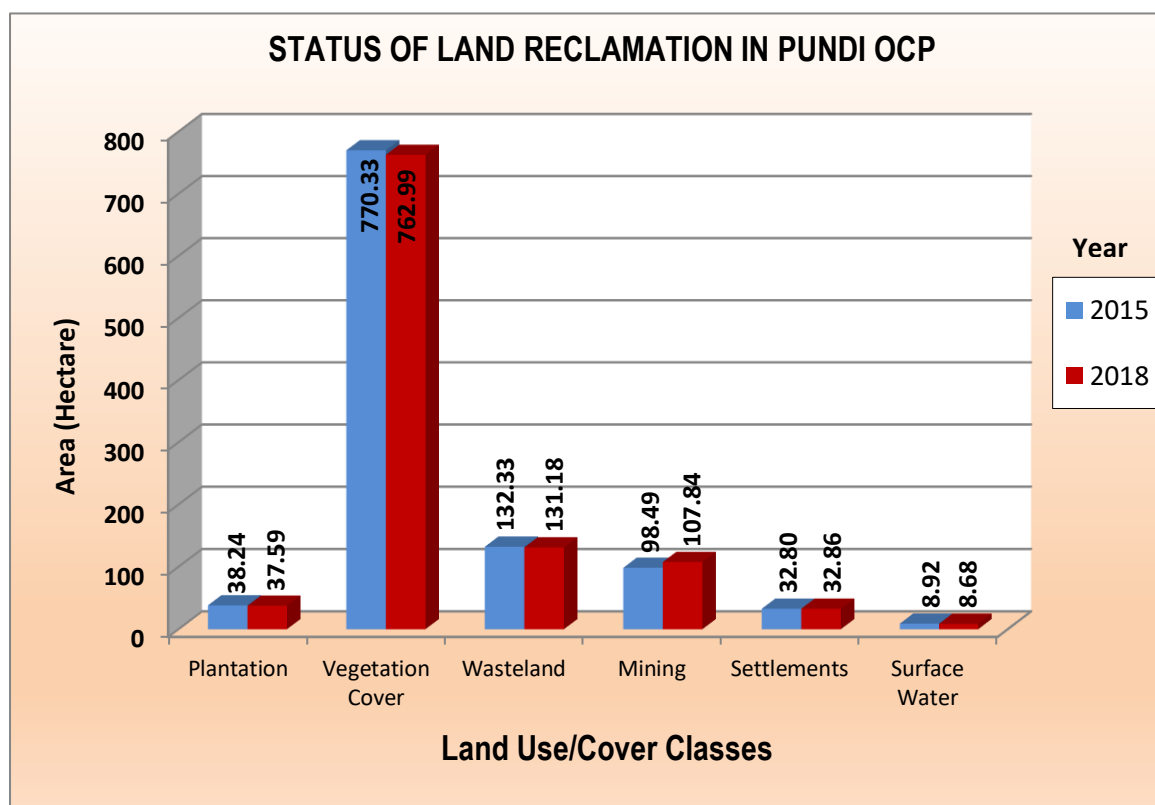


FIGURE – 8.7

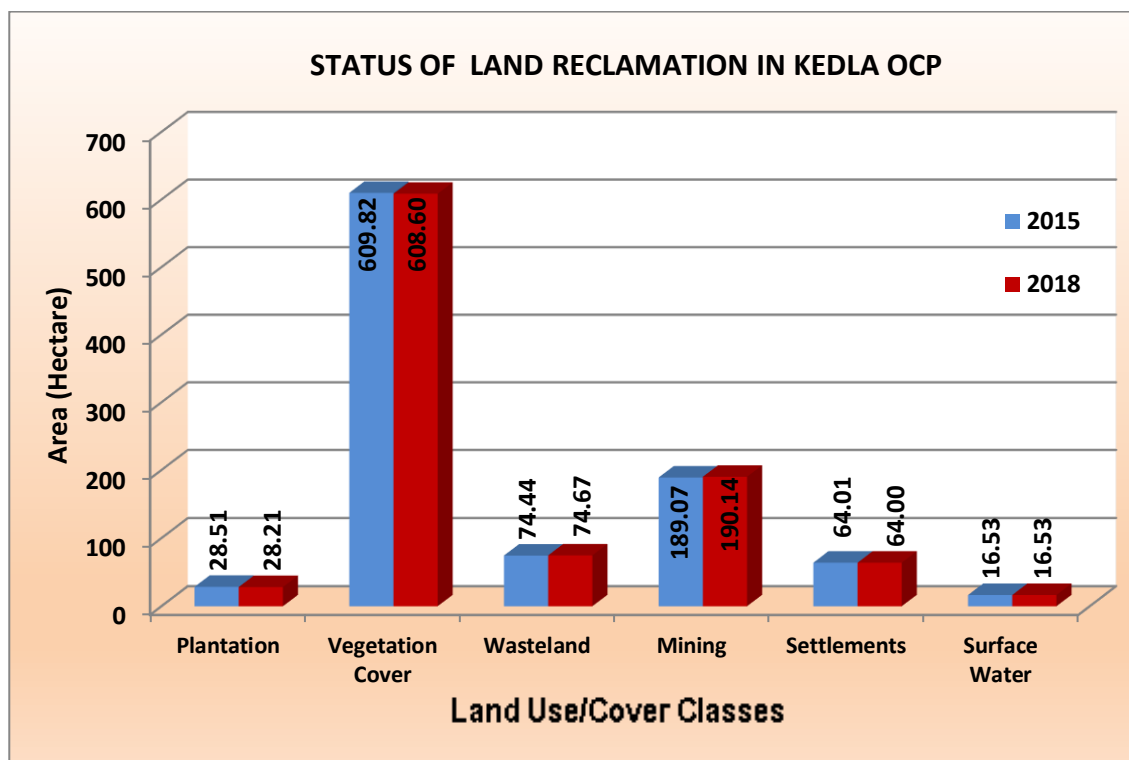


FIGURE – 8.9

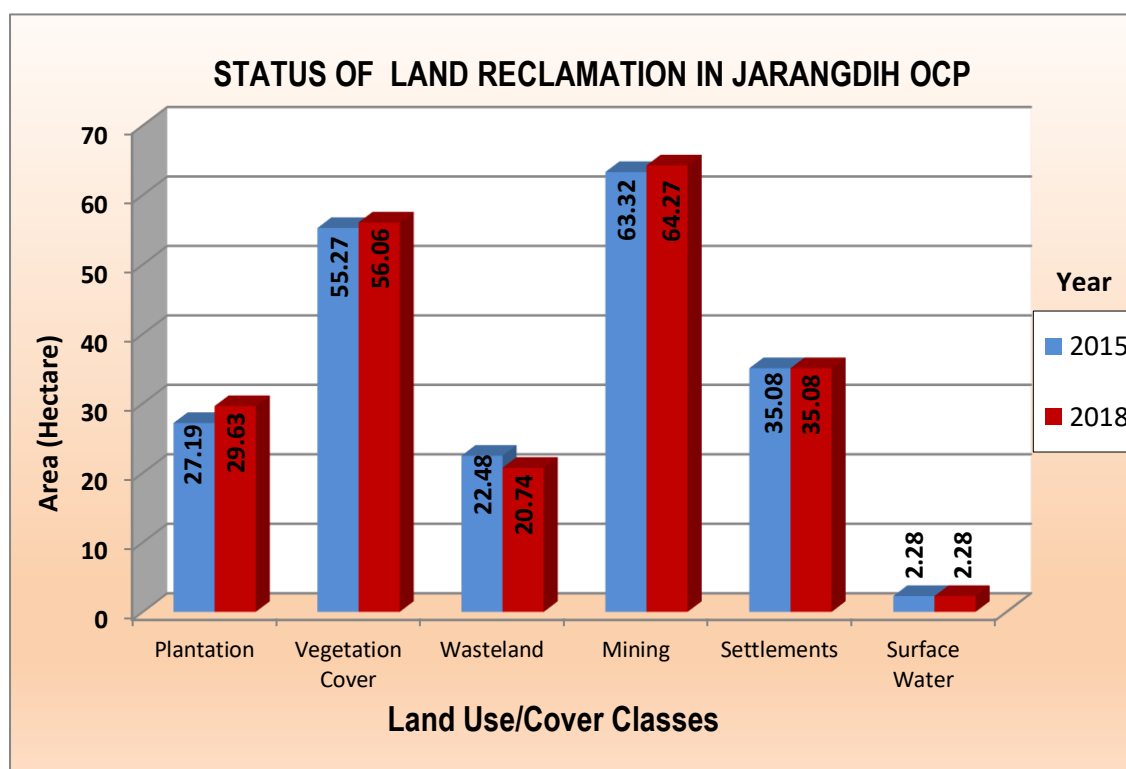


FIGURE – 8.10



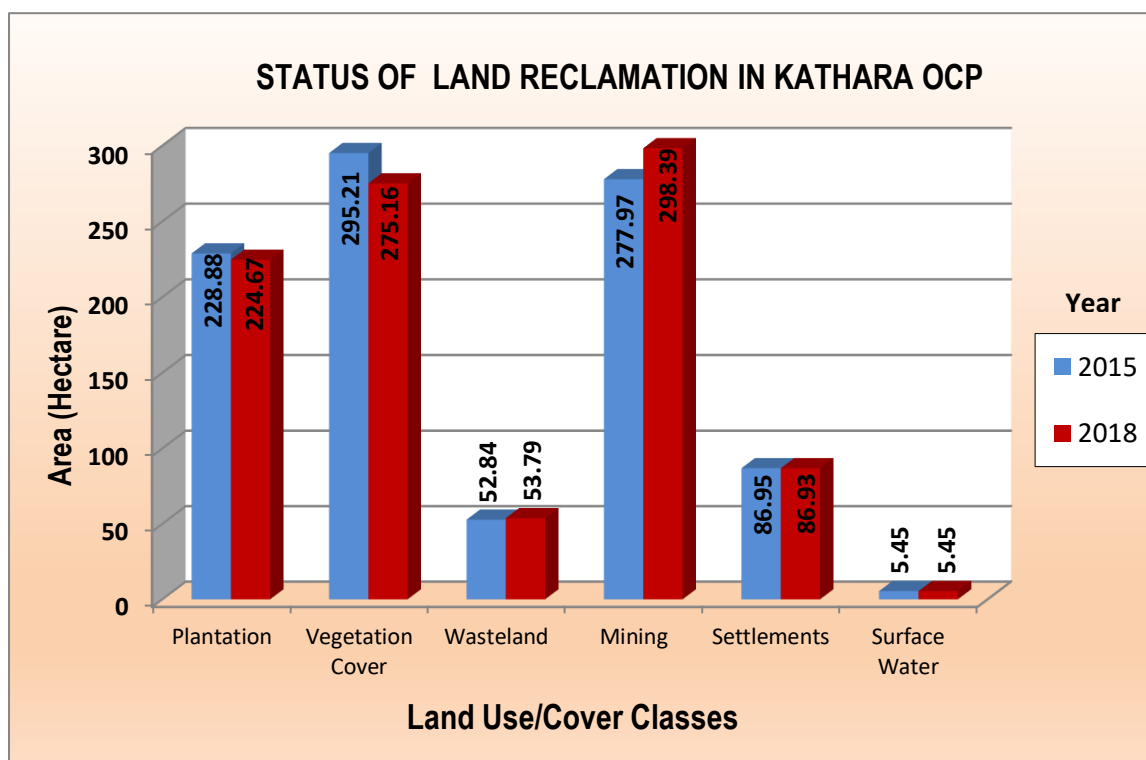


FIGURE – 8.11

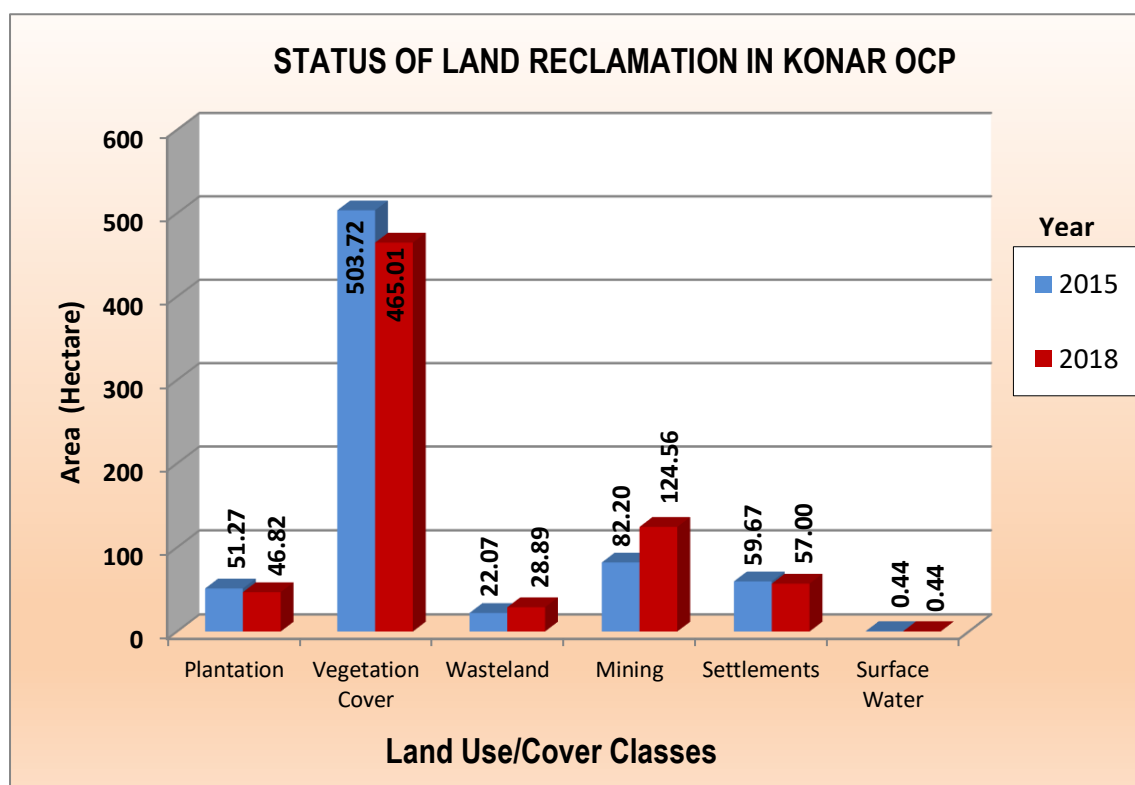


FIGURE – 8.12

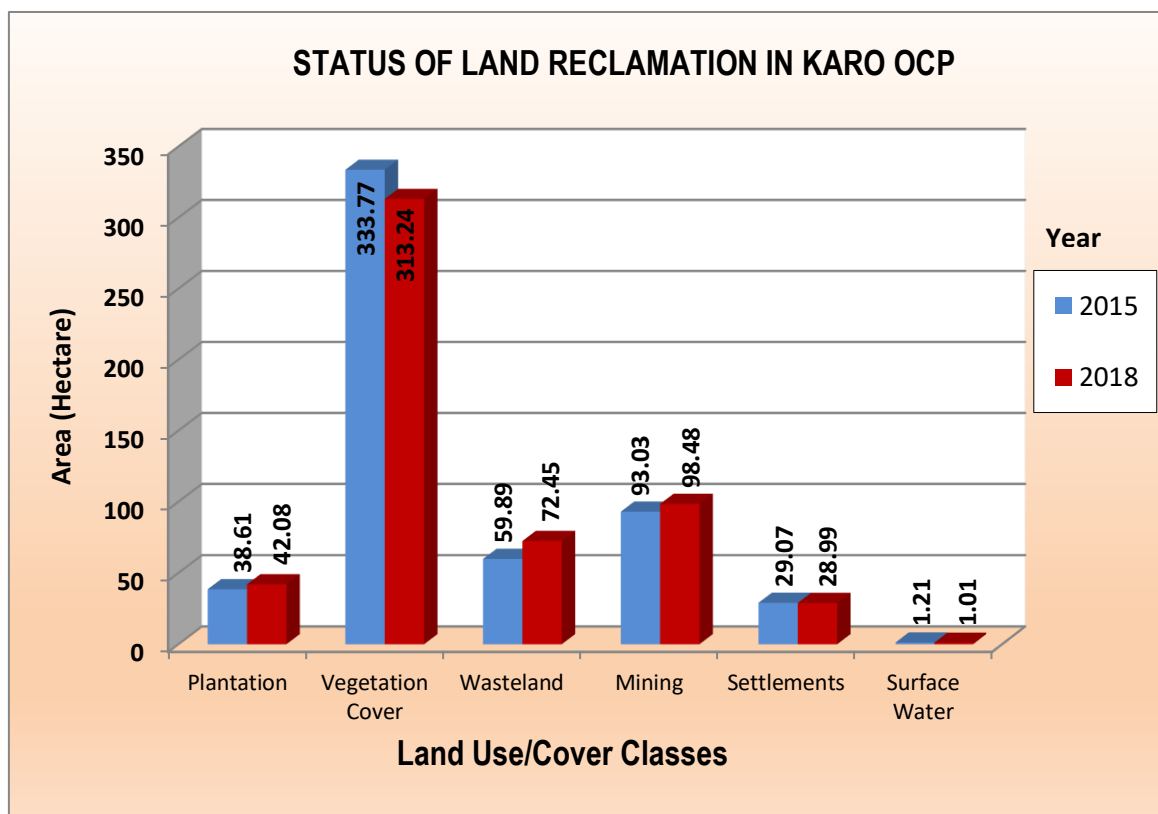


FIGURE-8.13

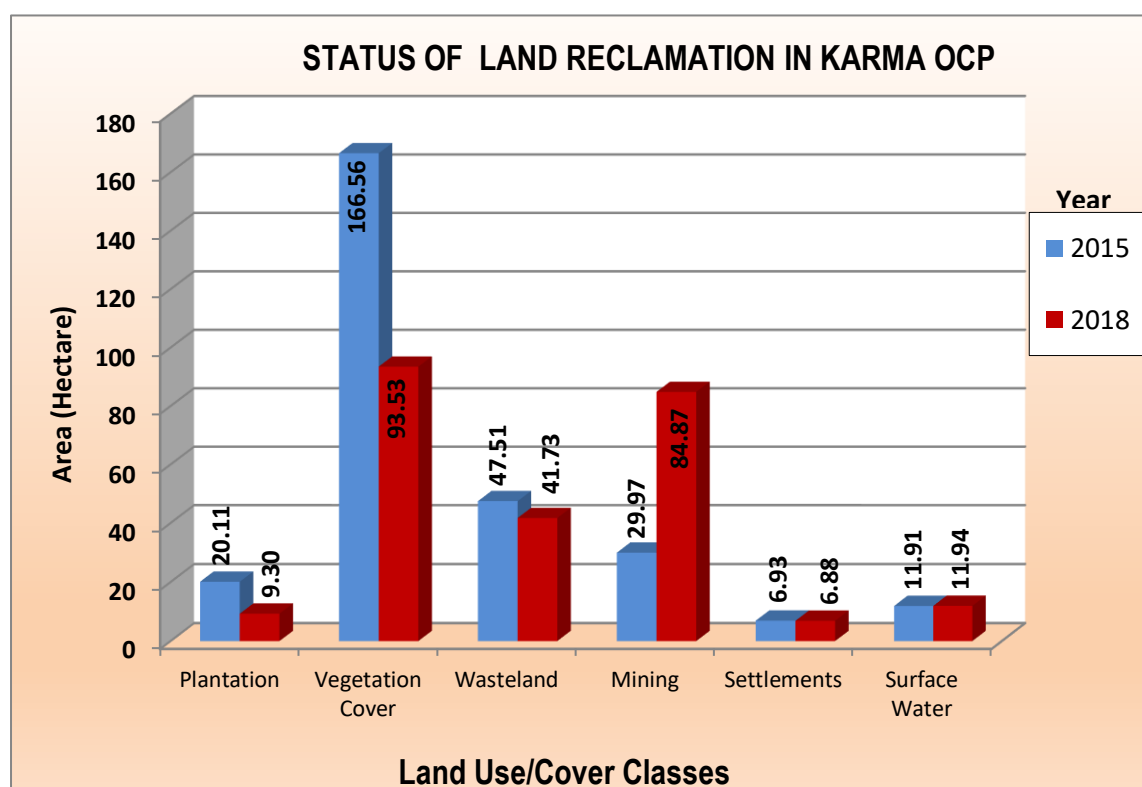


FIGURE – 8.14



**Photograph 8.1: Plantation on External OB Dump in Amrapali OCP**



**Photograph 8.2: Plantation on Backfill in Giddi "A" OCP**





**Photograph 8.3: Plantation on OB Dump in Dakra OCP**



**Photograph 8.3: Backfilling in Tetariakhar OCP**

**BHARAT COKING COAL LIMITED**



## 9.0 Land Reclamation Status in Bharat Coking Coal Limited

9.1 Following 4 Clusters of mines comprising both underground and OC Projects producing less than 5 million cubic meter (Coal + OB together) of Bharat Coking Coal Ltd. have been taken up during the year 2018-19 for land reclamation monitoring:

- **Cluster-I**      Damoda OCP
- **Cluster-IV**      Salanpur Colliery, Katras Choitudih Colliery, Gaslitand Colliery, Amalgamated Keshalpur West Mudidih Colliery, Angarpathra Colliery & Ramkanali Colliery.
- **Cluster VII**      Amalgamated East Bhuggatdih Simlabahal Colliery, Ena OC, Vishwakarma OCP, Kustore OCP)
- **Cluster- X**      Bhowrah North, Bhowrah South, Patherdih

9.2 Cluster wise Land Reclamation status of above mentioned clusters in BCCL is given in Table 9.1 and also shown graphically in Fig 9.1. Area statistics of different land use class present in the mine leasehold of the above clusters for the year 2018 are shown in the Table - 9.2. Land use maps derived from satellite data are shown in Plate 9.1 - 9.4. Different land use classes present in leasehold of above cluster based on satellite data are depicted in Bar Charts in Fig.9.2 - 9.5.

9.3 Study reveals that out of total mine leasehold area of 5883.96 Hectares of the above mentioned 04 clusters of BCCL taken up for the land reclamation monitoring during the year 2018-19; total excavated area is 1075.76 Hectare (18.28%) out of which 73.92 Hectare (6.87%) has been planted on backfill (*Biologically Reclaimed*), 625.15 Ha. (58.11%) is under backfilling (*Technical Reclamation*) and balance 376.69 hectares (35.02%) is under active mining.

- 9.4** Study indicates that overall all the clusters of BCCL considered for this study indicates that total area under plantation (Green Cover) is maximum in cluster VII, i.e 291.67 Hectare followed by cluster X with 236 Hectare, cluster IV with 192.20 Hectare and cluster I with 80.80 Hectare.
- 9.5** Out of 04 nos. of clusters, in BCCL, Cluster- VII tops with 76.09% reclamation followed by Cluster -X (71.00%) , Cluster -IV (46.90%) and Cluster- I (38.00%).
- 9.6** This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

Table 9.1

**Cluster wise Land Reclamation Status in Opencast Project of BCCL based on the Satellite data of the Year 2018  
(Clusters producing less than 5m.cm of Coal+OB annually)**

Sl.N o.	Cluster No.	Total Leasehold Area	Technical Reclamation	Plantation			Area under Active Mining	Total Excavated Area	Total Area under Plantation (% Green Cover Generated in Leasehold)	Total Area under Reclamation
			Area under Backfilling	Biological Reclamation	Other Plantations					
				Plantation on Excavated / Backfilled Area	Plantation on External Over Burden Dumps	Social Forestry, Avanue Plantation Etc.				
1	2	3	4	5	6	7	8	9 (=4+5+8)	10 (=5+6+7)	11(=4+5)
1	Cluster I	575.00	10.11	7.29	47.99	25.53	28.39	45.78	80.80	17.40
			22.08%	15.91%			62.00%		14.05%	38.00%
2	Cluster IV	1123.79	147.22	0.00	27.11	165.09	166.67	313.88	192.20	147.22
			46.90%	0.00%			53.10%		17.10%	46.90%
3	Cluster VII	2127.70	351.54	37.47	15.52	238.67	122.23	511.24	291.67	389.01
			68.76%	7.33%			23.91%		13.71%	76.09%
4	Cluster X	2057.47	116.28	29.16	66.09	140.75	59.41	204.86	236.00	145.44
			56.76%	14.23%			29.00%		11.47%	71.00%
	TOTAL	5883.96	625.15	73.92	156.71	570.04	376.69	1075.76	800.66	699.07
			58.11%	6.87%			35.02%	18.28%	13.61%	64.98%

*(% is calculated with respected to Excavated Area as applicable)*

**Note:** In reference of the above Table, different parameters are classified as follows:

1. Area under Biological Reclamation includes Areas under Plantation done on Backfilled Area Only.
2. Area under Technical Reclamation includes Area under Backfilling only
3. Area under Active Mining Includes Coal Quarry, Advance Quarry Site and Quarry filled with water etc., if any.
4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the above Table.
5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

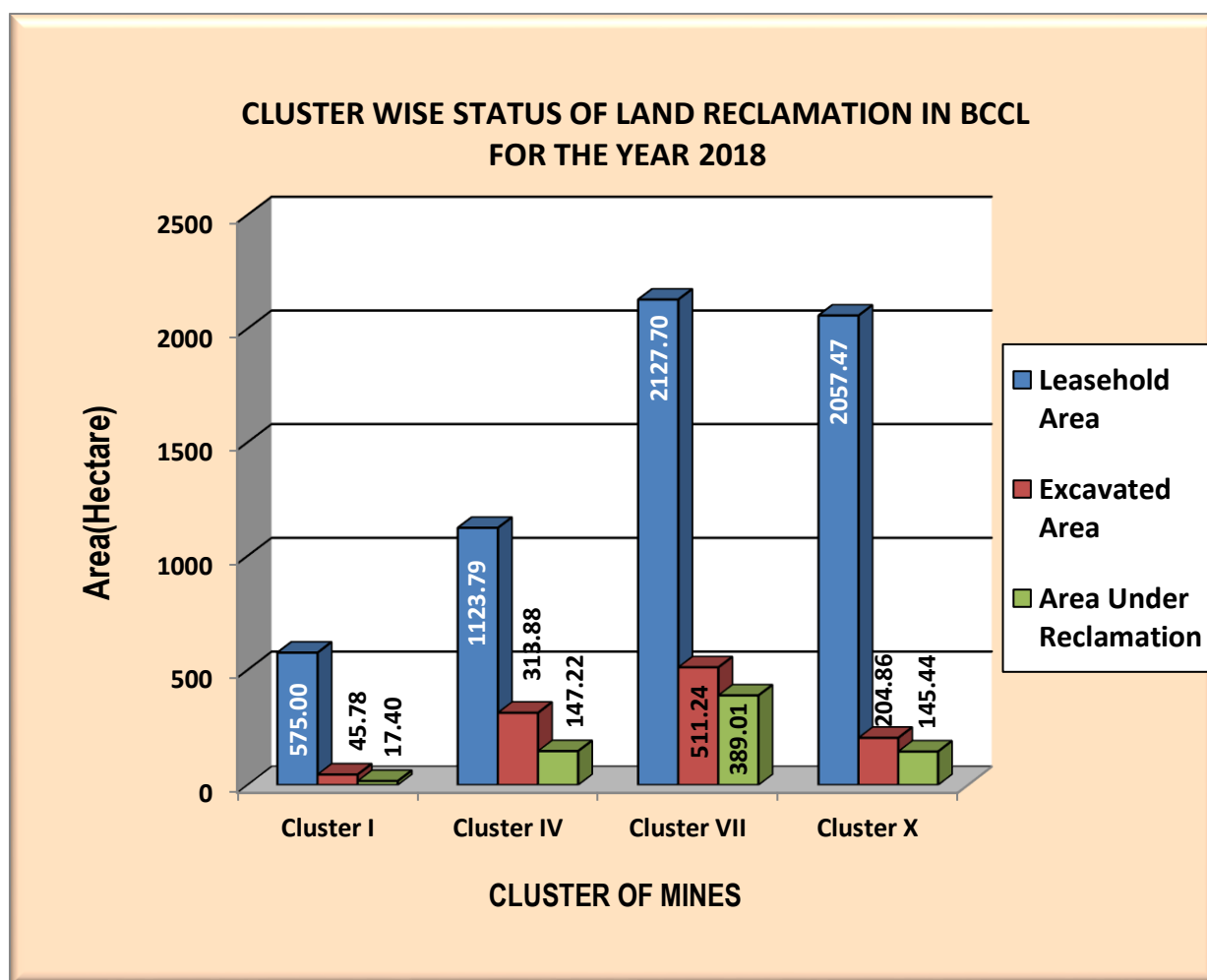


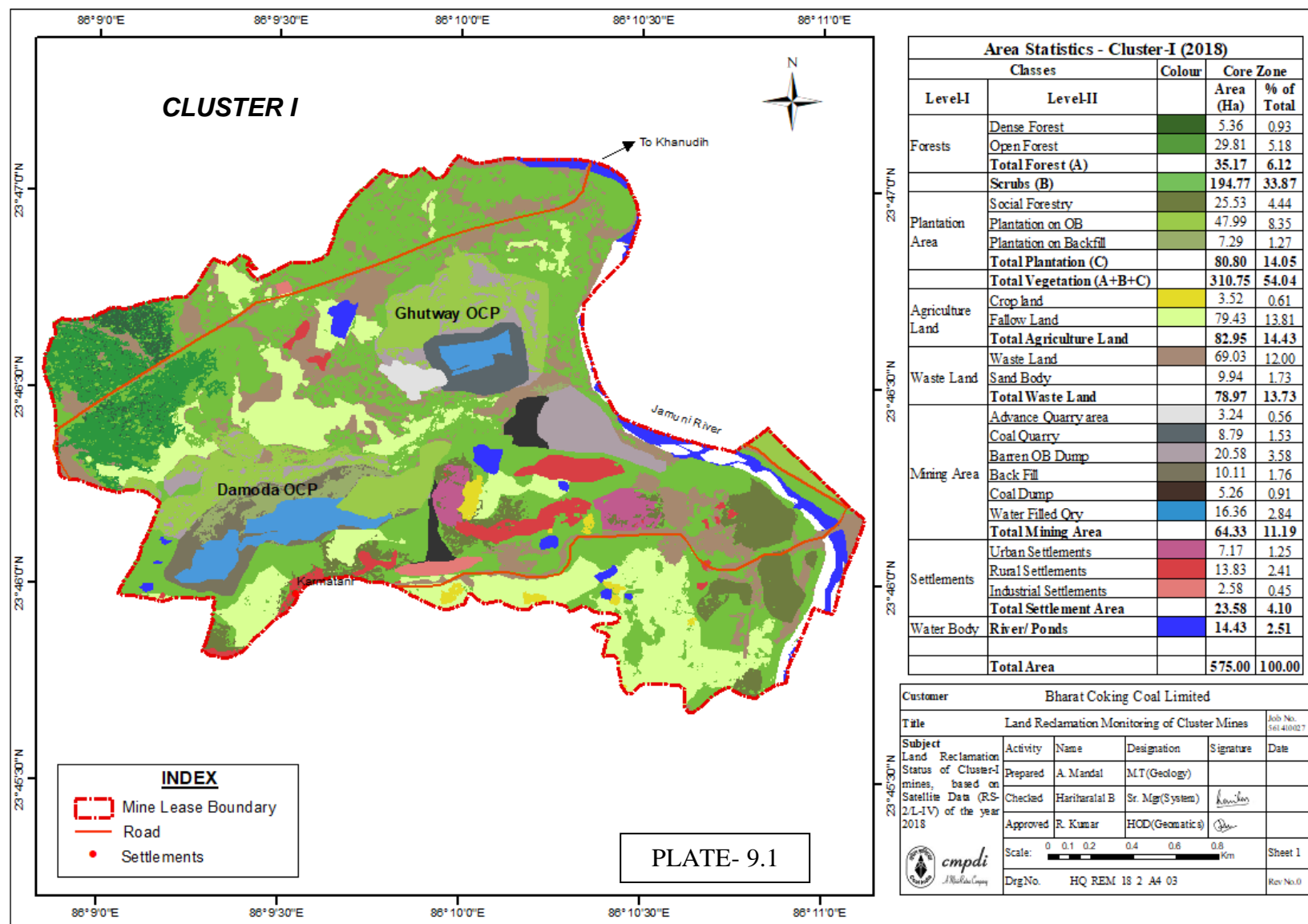
TABLE 9.2

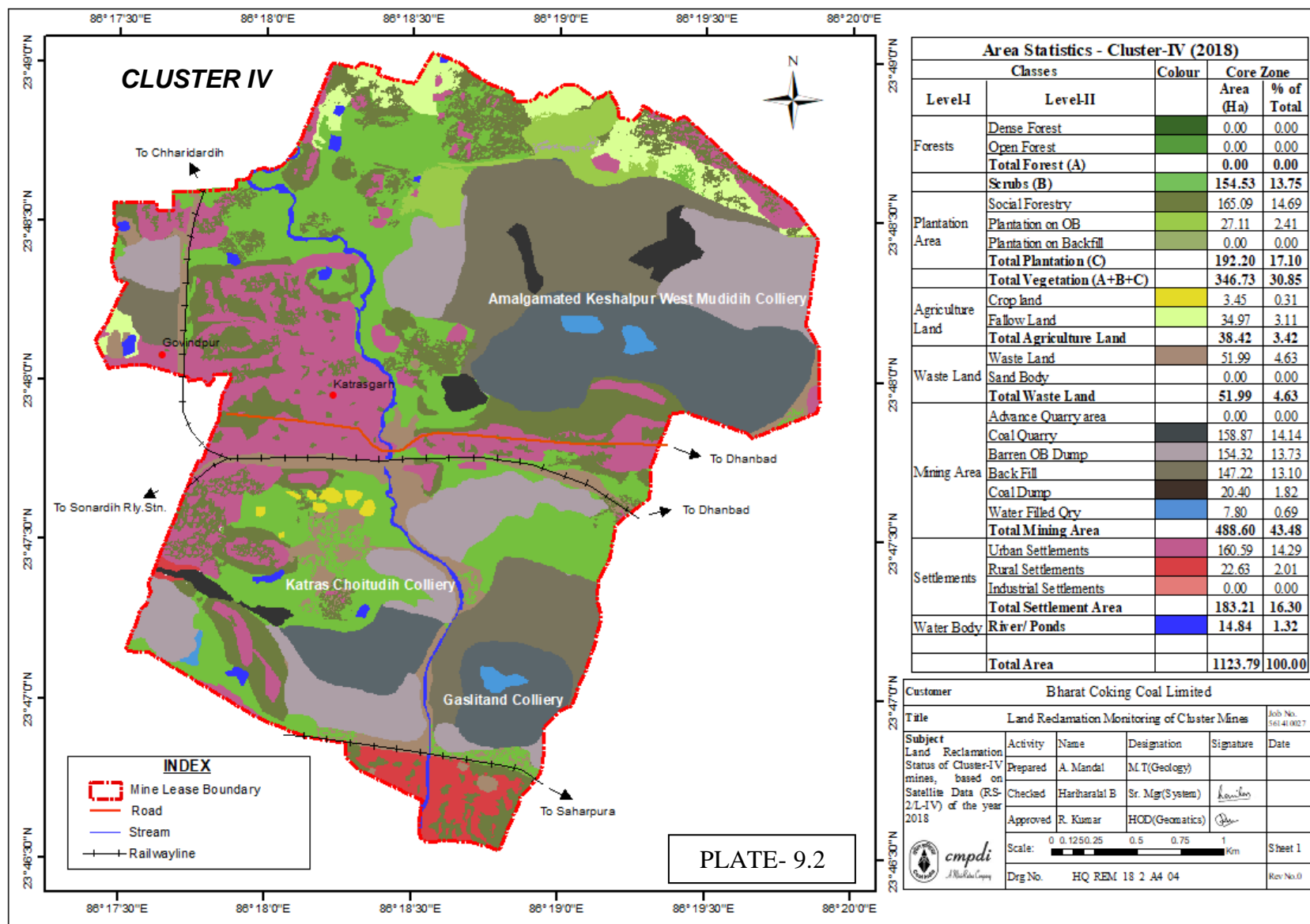
**CLUSTER WISE AREA STATISTICS OF LAND USE/COVER CLASSES IN CLUSTER OF MINES  
PRODUCING (<5M.CM OF COAL +OB) OF BCCL BASED ON SATELLITE DATA OF THE YEAR 2018**

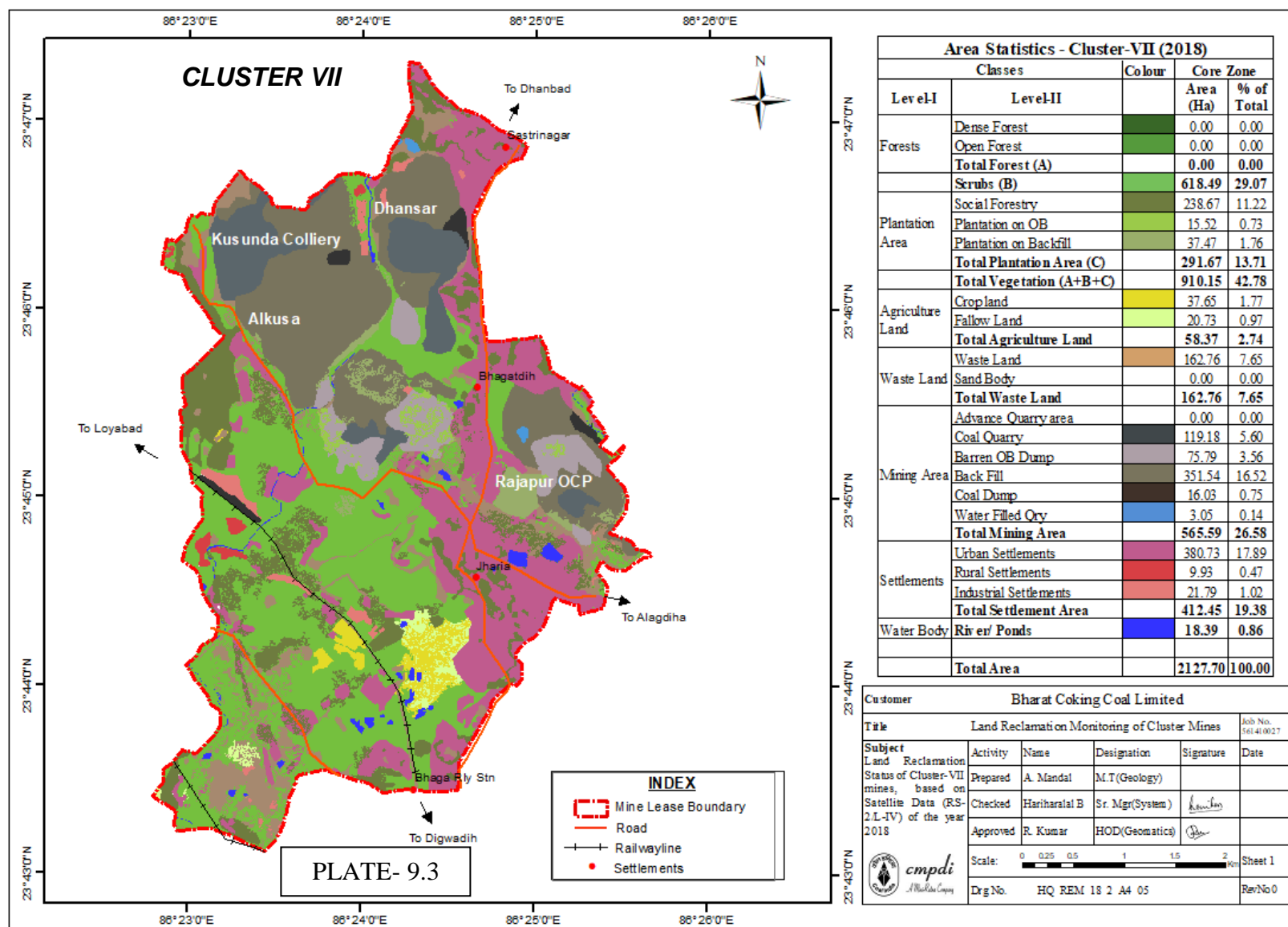
(Area in Hectares)

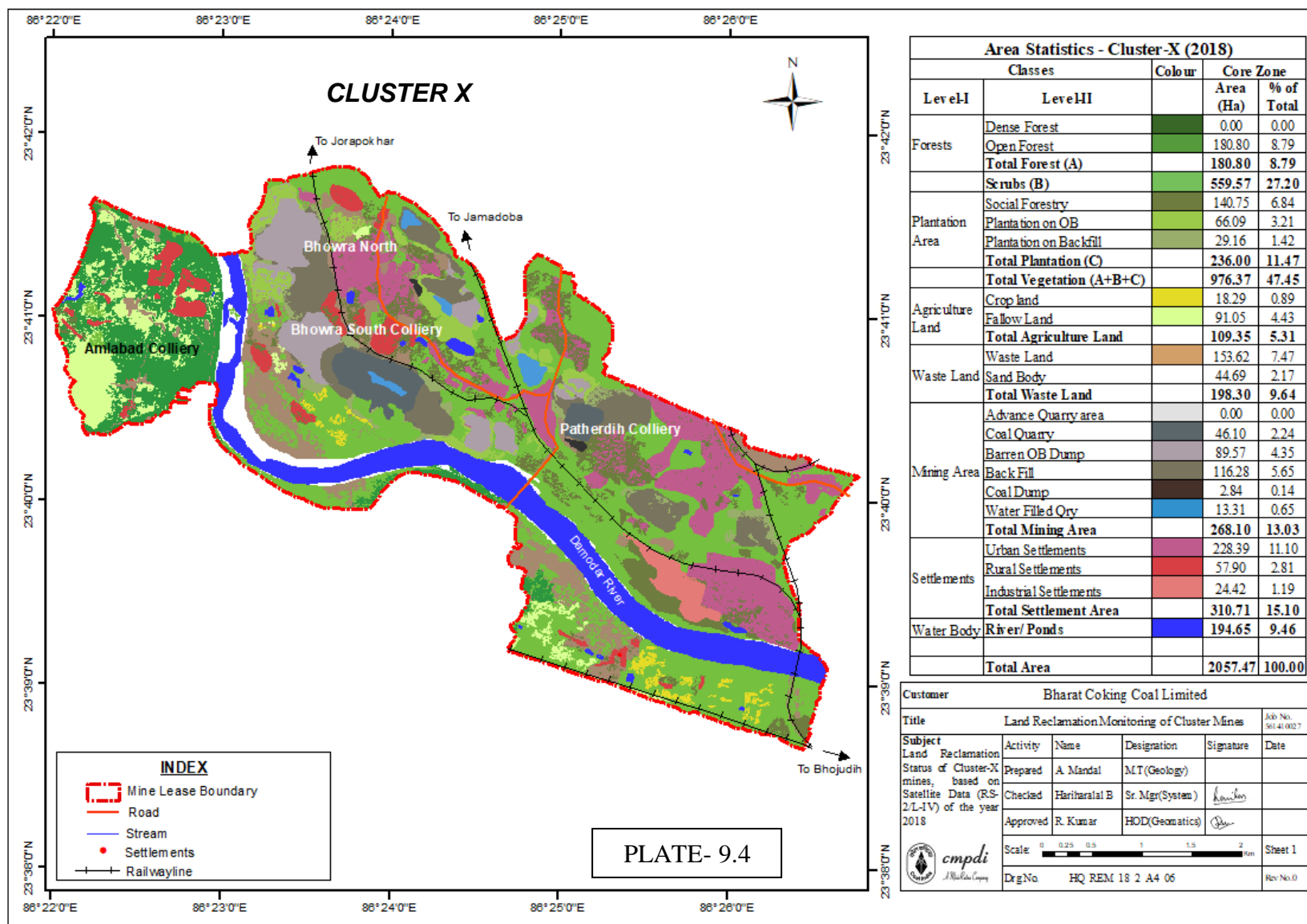
		CLUSTER I		CLUSTER IV		CLUSTER VII		CLUSTER X		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	5.36	0.93	0.00	0.00	0.00	0.00	0.00	0.00	5.36	0.09
	Open Forest	29.81	5.18	0.00	0.00	0.00	0.00	180.80	8.79	210.61	3.58
	<b>Total Forest</b>	35.17	6.12	0.00	0.00	0.00	0.00	180.80	8.79	215.97	3.67
SCRUBS	Scrubs	194.77	33.87	154.53	13.75	618.49	29.07	559.57	27.20	1527.35	25.96
PLANTATION	Social Forestry/Avenue Plantation	25.53	4.44	165.09	14.69	238.67	11.22	140.75	6.84	570.04	9.69
	Plantation on OB Dump	47.99	8.35	27.11	2.41	15.52	0.73	66.09	3.21	156.71	2.66
	Plantation on Backfill (Biological Reclamation)	7.29	1.27	0.00	0.00	37.47	1.76	29.16	1.42	73.92	1.26
	<b>Total Plantation</b>	80.80	14.05	192.20	17.10	291.67	13.71	236.00	11.47	800.66	13.61
	<b>Total Vegetation</b>	310.75	54.04	346.73	30.85	910.15	42.78	976.37	47.45	2543.99	43.24
ACTIVE MINING	Coal Dump	5.26	0.91	20.40	1.82	16.03	0.75	2.84	0.14	44.53	0.76
	Coal Quarry	8.79	1.53	158.87	14.14	119.18	5.60	46.10	2.24	332.94	5.66
	Advance Quarry Site	3.24	0.56	0.00	0.00	0.00	0.00	0.00	0.00	3.24	0.06
	Quarry Filled With Water	16.36	2.84	7.80	0.69	3.05	0.14	13.31	0.65	40.52	0.69
	<b>Total Area under Active Mining</b>	28.39	4.93	166.67	14.83	122.23	5.74	59.41	2.89	376.69	6.40
	Barren OB Dump	20.58	3.58	154.32	13.73	75.79	3.56	89.57	4.35	340.25	5.78
RECLAMED	Area Under Backfilling (Technical Reclamation)	10.11	1.76	147.22	13.10	351.54	16.52	116.28	5.65	625.15	10.62
	<b>Total Area under Technical Reclamation</b>	10.11	1.76	147.22	13.10	351.54	16.52	116.28	5.65	625.15	10.62
	<b>Total Area under Mine Operation</b>	64.33	11.19	488.60	43.48	565.59	26.58	268.10	13.03	1386.62	23.57
WASTELAND	Waste Lands	69.03	12.00	51.99	4.63	162.76	7.65	153.62	7.47	437.40	7.43
	Fly Ash Pond / Sand Body	9.94	1.73	0.00	0.00	0.00	0.00	44.69	2.17	54.63	0.93
	<b>Total Wasteland</b>	78.97	13.73	51.99	4.63	162.76	7.65	198.30	9.64	492.02	8.36
WATERBODIES	Reservoir, nallah, ponds	14.43	2.51	14.84	1.32	18.39	0.86	194.65	9.46	242.30	4.12
	<b>Total Waterbodies</b>	14.43	2.51	14.84	1.32	18.39	0.86	194.65	9.46	242.30	4.12
AGRICULTURE	Crop Lands	3.52	0.61	3.45	0.31	37.65	1.77	18.29	0.89	62.91	1.07
	Fallow Lands	79.43	13.81	34.97	3.11	20.73	0.97	91.05	4.43	226.18	3.84
	<b>Total Agriculture</b>	82.95	14.43	38.42	3.42	58.37	2.74	109.35	5.31	289.09	4.91
SETTLEMENTS	Urban Settlement	7.17	1.25	160.59	14.29	380.73	17.89	228.39	11.10	776.88	13.20
	Rural Settlement	13.83	2.41	22.63	2.01	9.93	0.47	57.90	2.81	104.29	1.77
	Industrial Settlement	2.58	0.45	0.00	0.00	21.79	1.02	24.42	1.19	48.80	0.83
	<b>Total Settlement</b>	23.58	4.10	183.21	16.30	412.45	19.38	310.71	15.10	929.96	15.80
	<b>Grand Total</b>	575.00	100.00	1123.79	100.00	2127.70	100.00	2057.47	100.00	5883.96	100.00











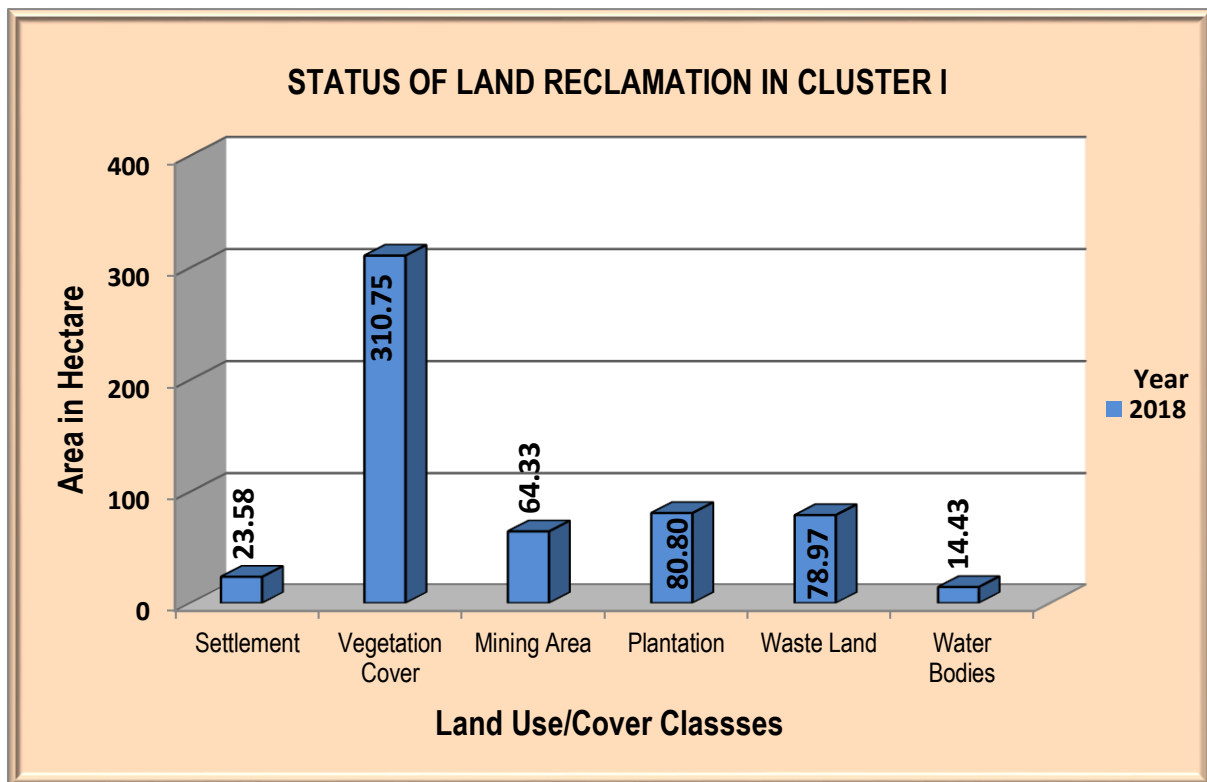


Figure-9.2

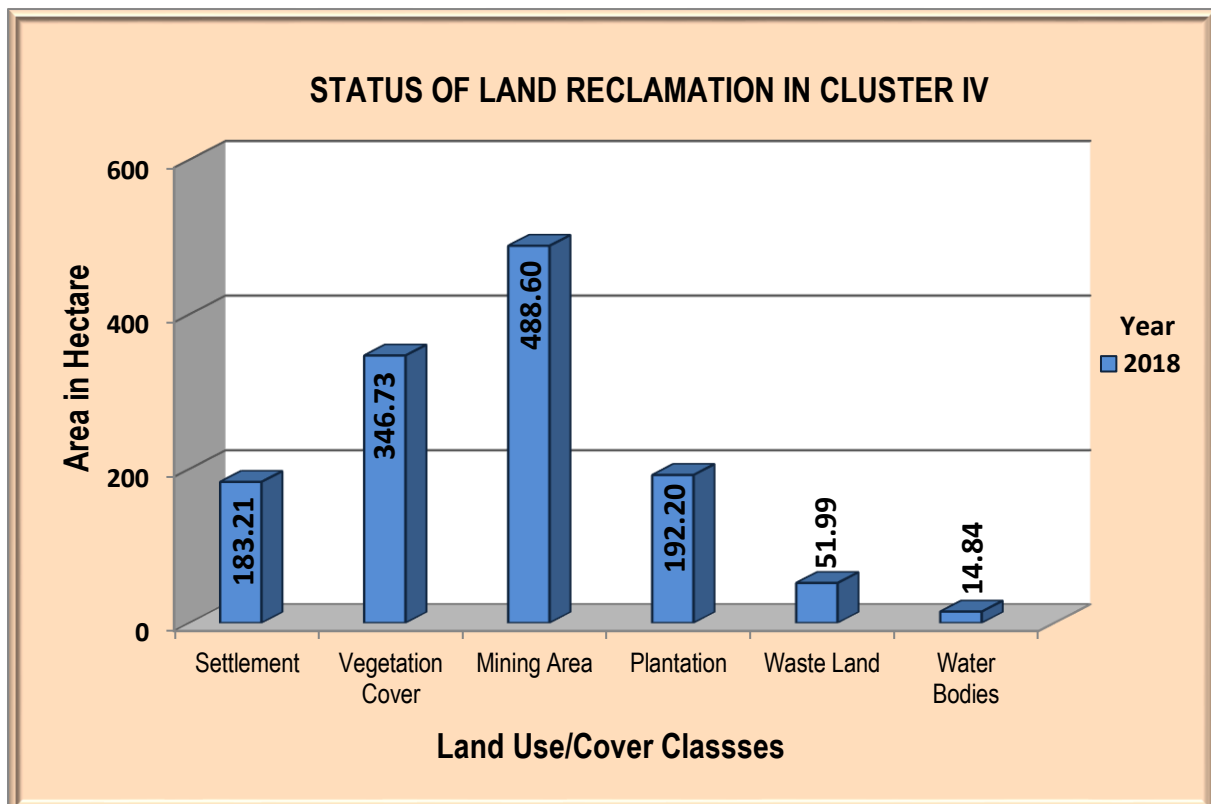


Figure-9.3



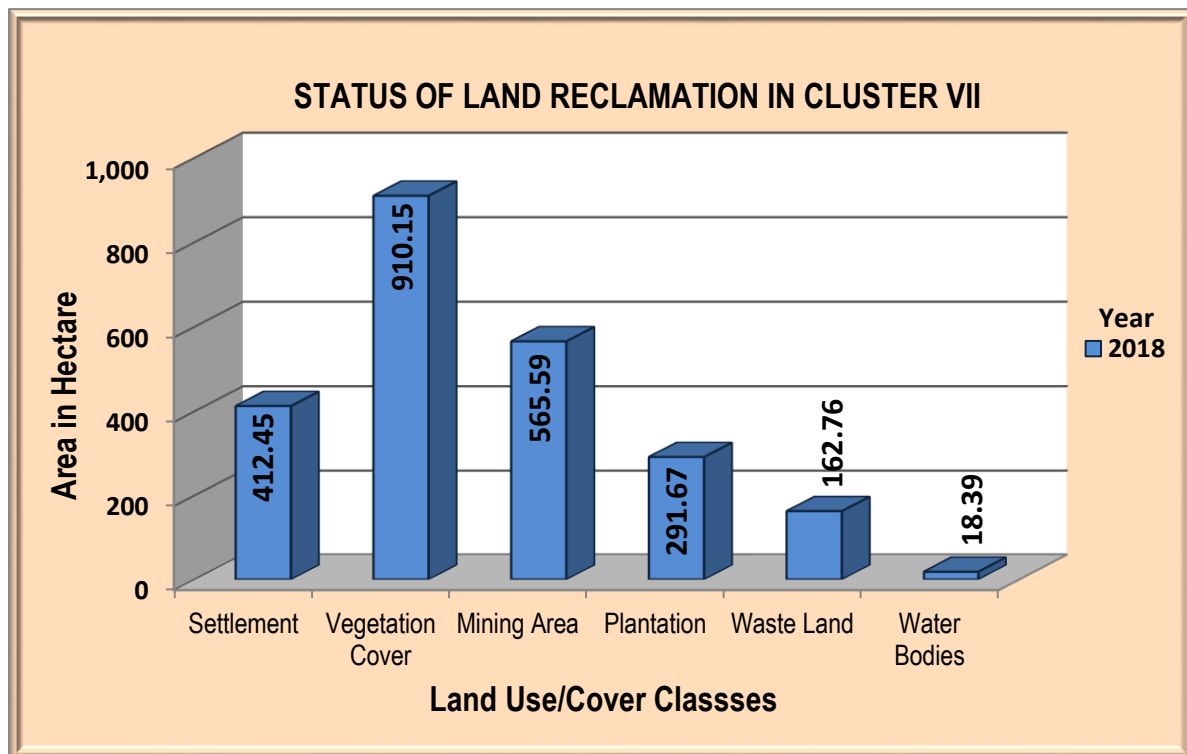


Figure 9.4

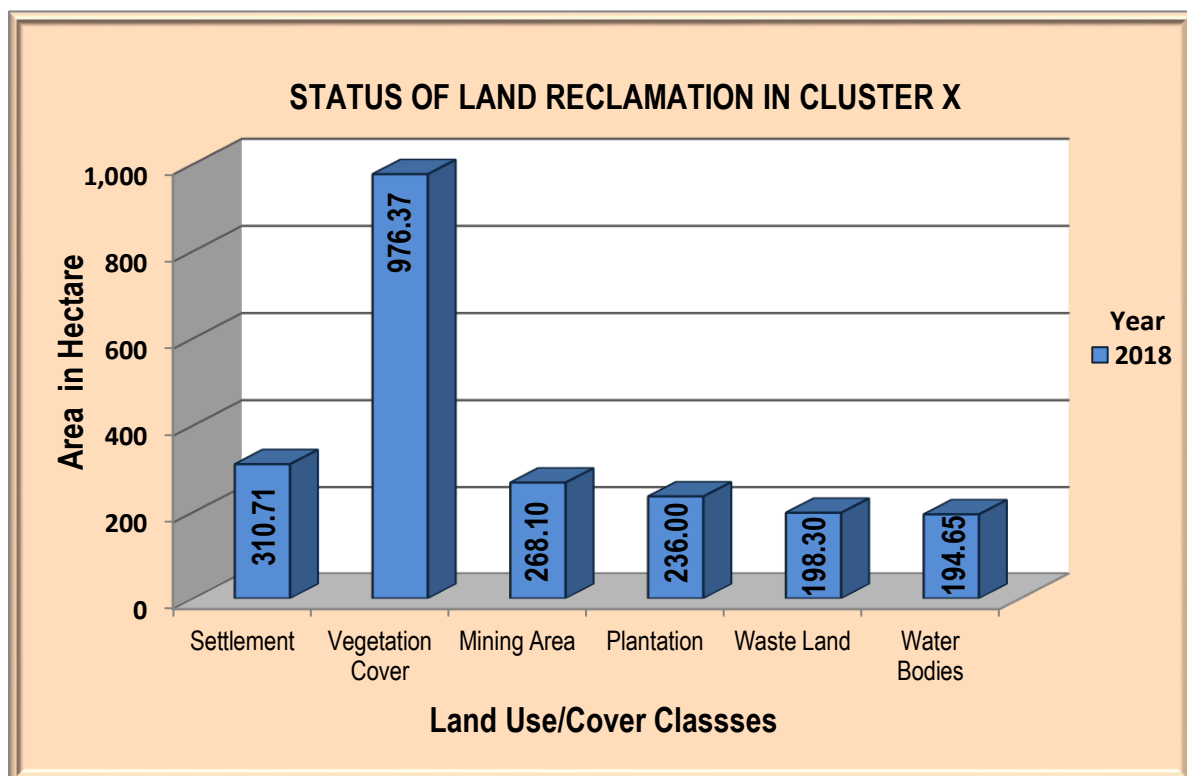


Figure-9.5



Photograph 9.1 Ecological Restoration site in Damoda Colliery, Cluster-I



Photograph 9.2 Ecological Restoration site in Cluster-IV





Photograph 9.3: Ecological Restoration site in Cluster VII



Photograph 9.4: Plantation on External OB Dump in Cluster X

**EASTERN COALFIELDS LIMITED**

## 10.0 Land Reclamation Status in Eastern Coalfields Limited

**10.1** Following 04 Cluster comprising Opencast and Underground mines producing less than 5 million m<sup>3</sup>. (Coal + OB together) of Eastern Coalfields Ltd. have been taken up during the year 2018-19 for land reclamation monitoring:

- Cluster V** Parbelia UG & OC, Dubeshwari UG& OC
- Cluster VI** Dhemomain UG, Sodepur UG & OC, Narsamuda UG, Patmohana UG & OC Patch, Chinakuri I UG and Chinakuri III UG & OC Patch, Bejidih UG, Methani UG & OC Patch, Sheetalpur UG.
- Cluster VII** Barmondia UG, Chakballavpur UG, Manoharbahal UG, Bhanora West UG & OCP
- Cluster VIII** Bhanora UG, Girmint /KDI UG, Sirpur UG, Sirpur Seam Incline UG, Ningah UG, Mithapur West UG & Mithapur West OC Patch, Satgram UG.

**10.2** Cluster wise Land Reclamation status of above mentioned projects in ECL is given in Table 10.1 and also shown graphically in Fig 10.1. Area statistics of different land use class present in the leasehold of the above clusters for the year 2018 are shown in the Table - 10.2. Land use maps derived from satellite data are shown in Plate 10.1 – 10.4. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 10.2 – 10.5.

**10.3** Study reveals that majority of the mines under clusters considered for monitoring are of underground mine type with few opencast patches. Out of total mine leasehold area of 18339.00 Hectares of the above mentioned 04 clusters of mines in ECL taken up for this study in 2018-19; total excavated area is 35.76 hectares



out of which 9.43 Ha. (26.37%) is under backfilling (*Technical Reclamation*) and balance 26.33 hectares (73.63%) is under active mining. As such these clusters mostly consists of Underground mines and few OC mines and patches. It is also evident from Table-10.1 that Technical reclamation is found only in cluster VII whereas no Biological reclamation is observed in all cluster i.e V,VI,VIII and VIII. Total area under plantation (green cover) is 978.53 Ha (5.34%).

- 10.4** Out of four clusters of mines i.e Cluster V, VI, VII, VIII in ECL, 9.43 Ha (28.05%) technical reclamation is observed for Cluster VII only in the year 2018.
- 10.5** This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

Table: 10.1

**Cluster wise Land Reclamation Status in Opencast Projects of ECL  
based on the Satellite data of the year 2018**  
(For projects/Clusters producing Less than 5 mcm Coal+OB)

Sl. No.	Cluster No.	Total Leasehold Area	Technical Reclamation	Plantation			Area under Active Mining	Total Excavated Area	Total Area under Plantation (%Green Cover Generated in Leasehold)	Total Area under Reclamation
				Biological Reclamation	Other Plantations					
			Area under Backfilling	Plantation on Excavated / Backfilled Area	Plantation on External Over Burden Dumps	Social Forestry, Avenue Plantation				
1	2	3	4	5	6	7	8	9 (=4+5+8)	10 (=5+6+7)	11(=4+5)
			2018	2018	2018	2018	2018	2018	2018	2018
1	Cluster V	2970.00	0.00	0.00	0.00	119.94	0	0.00	119.94	0.00
			0.00%	0.00%			0.00%		4.04%	0.00%
2	Cluster VI	4775.00	0.00	0.00	0.00	519.02	2.14	2.14	519.02	0.00
			0.00%	0.00%			100.00%		10.87%	0.00%
3	Cluster VII	2313.00	9.43	0.00	0.00	143.21	24.19	33.62	143.21	9.43
			28.05%	0.00%			71.95%		6.19%	28.05%
3	Cluster VIII	8281.00	0.00	0.00	0.00	196.36	0.00	0.00	196.36	0.00
			0.00%	0.00%			0.00%		2.37%	0.00%
	TOTAL	18339.00	9.43	0.00	0.00	978.53	26.33	35.76	978.53	9.43
			26.37%	0.00%			73.63%		5.34%	26.37%

Note: In reference of the above Table, different parameters are classified as follows:

1. Area under Biological Reclamation includes Areas under Plantation done on Backfilled Area Only.
2. Area under Technical Reclamation includes Area under Backfilling only
3. Area under Active Mining Includes Coal Quarry, Advance Quarry Site and Quarry filled with water etc., if any.
4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the above Table.
5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

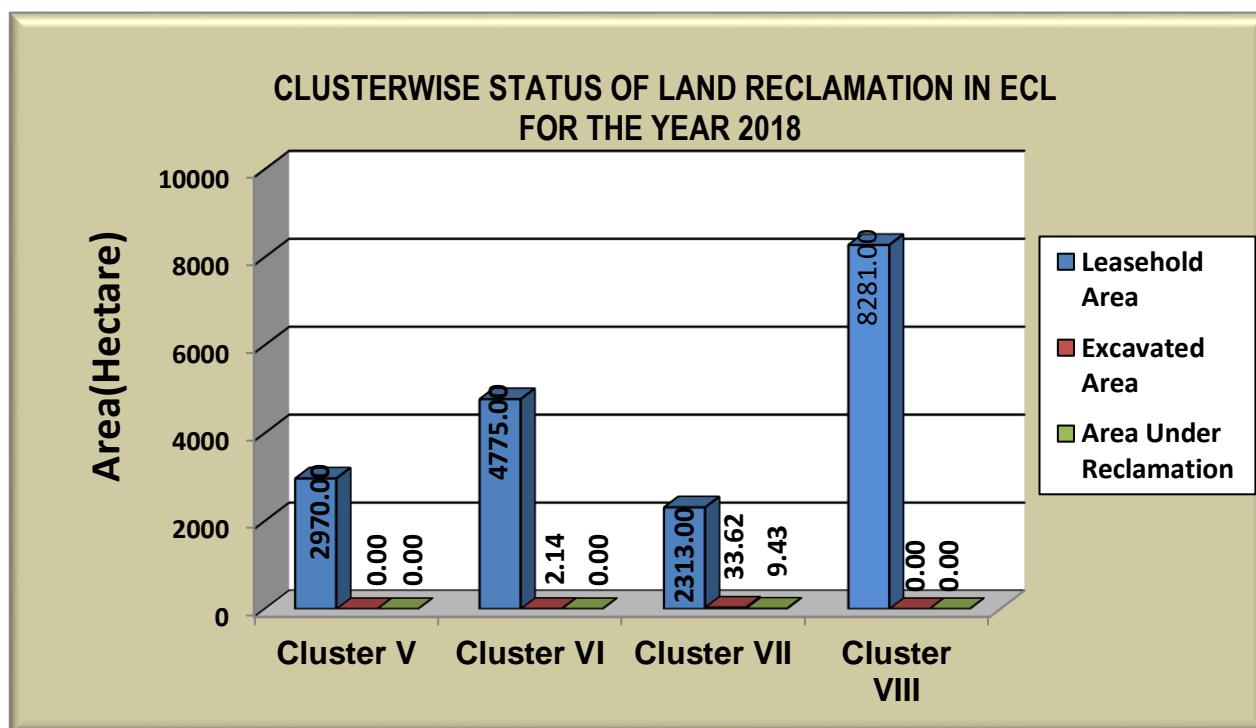
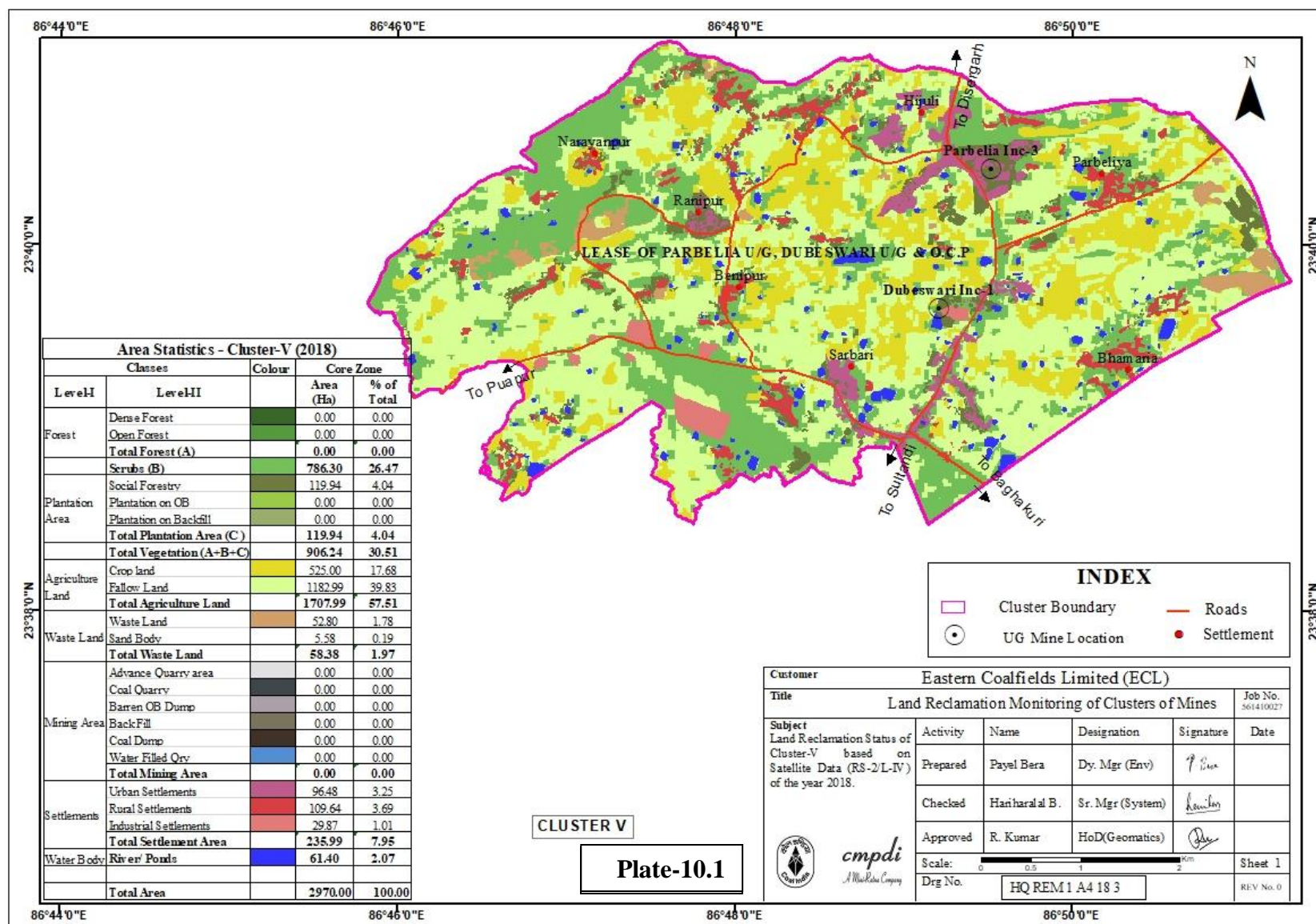


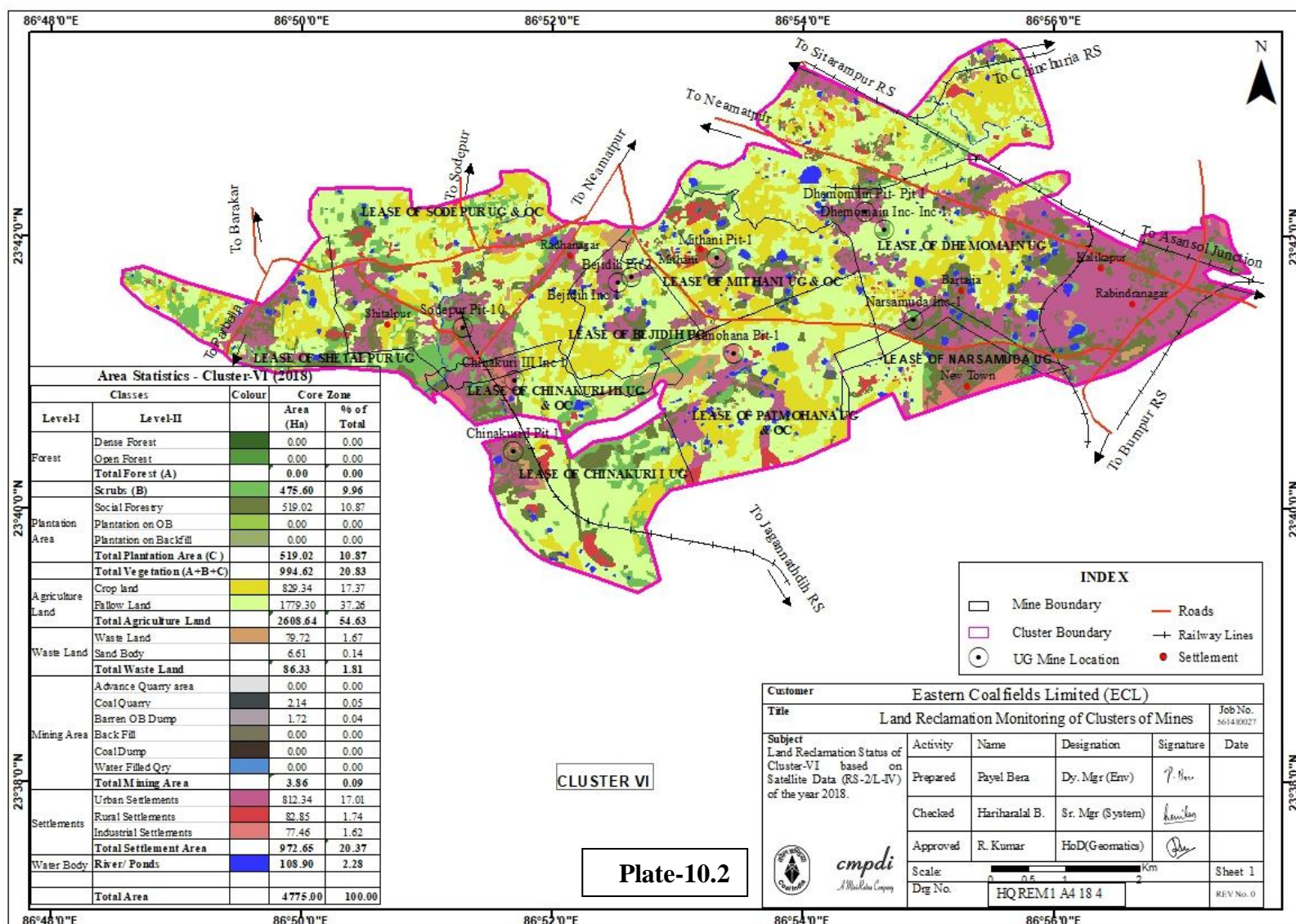
Figure-10.1 Cluster wise Land Reclamation Status -2018 (ECL)

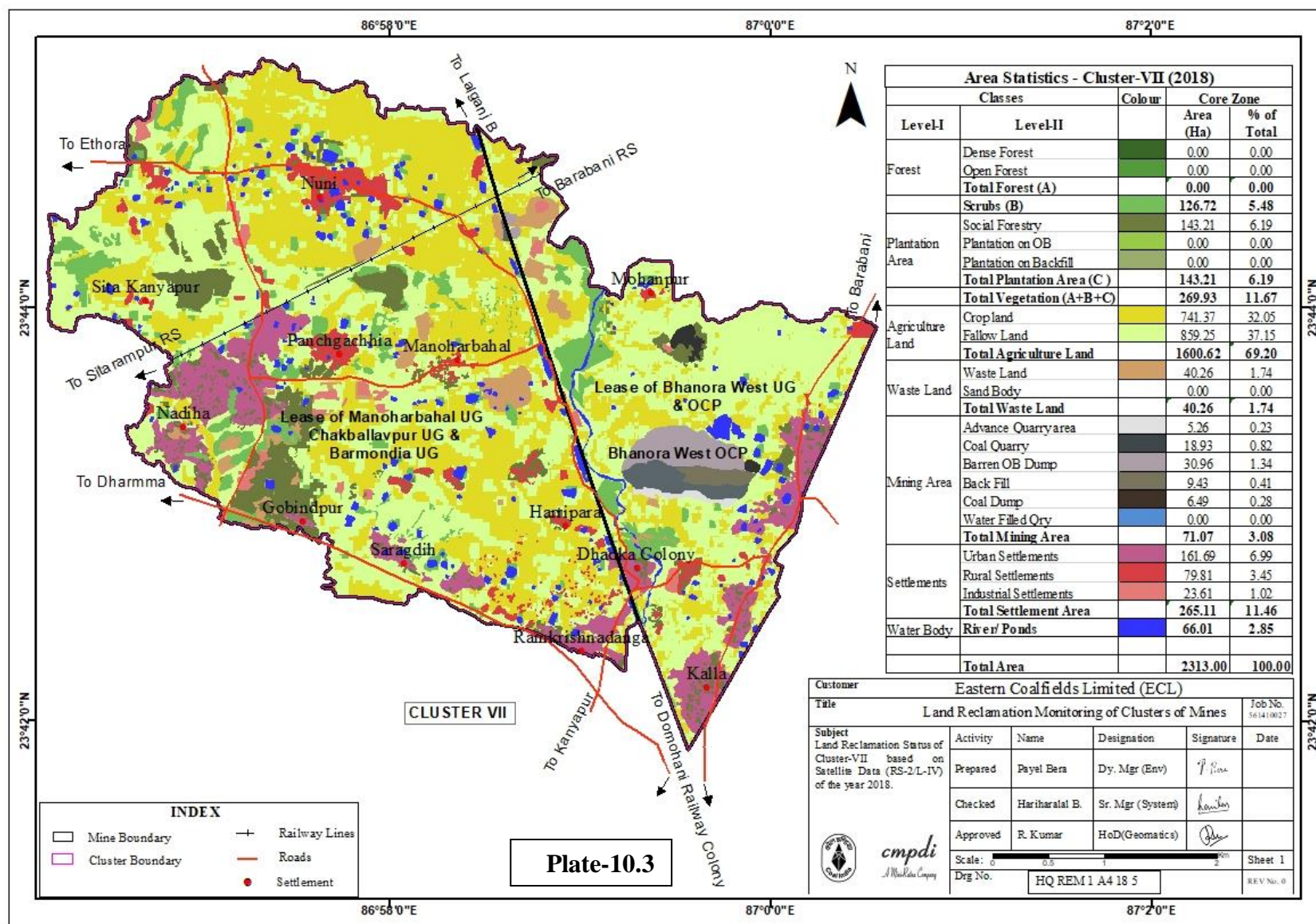
**Table: 10.2**  
**Cluster wise area statistics of Land use/Cover classes in cluster of mines producing**  
**<5m.cm of (Coal +OB) of ECL based on Satellite data of the year 2018**

		CLUSTER V		CLUSTER VI		CLUSTER VII		CLUSTER VIII		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<b>Total Forest</b>	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCRUBS	Scrubs	786.30	26.47	475.60	9.96	126.72	5.48	502.38	6.07	1891.00	10.31
	Social Forestry	119.94	4.04	519.02	10.87	143.21	6.19	196.36	2.37	978.53	5.34
	Plantation on OB Dump	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
PLANTATION	Plantation on Backfill (Biological Reclamation)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<b>Total Plantation</b>	119.94	4.04	519.02	10.87	143.21	6.19	196.36	2.37	978.53	5.34
	<b>Total Vegetation</b>	906.24	30.51	994.62	20.83	269.93	11.67	698.74	8.44	2869.53	15.65
ACTIVE MINING	Coal Dump	0.00	0.00	0.00	0.00	6.49	0.28	0.00	0.00	6.49	0.04
	Coal Quarry	0.00	0.00	2.14	0.05	18.93	0.82	0.00	0.00	21.07	0.11
	Advance Quarry Site	0.00	0.00	0.00	0.00	5.26	0.23	0.00	0.00	5.26	0.03
	Quarry Filled With Water	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	<b>Total Area under Active Mining</b>	0.00	0.00	2.14	0.05	24.19	1.05	0.00	0.00	26.33	0.14
RECLAMED	Barren OB Dump	0.00	0.00	1.72	0.04	30.96	1.34	0.00	0.00	32.68	0.18
	Area Under Backfilling (Technical Reclamation)	0.00	0.00	0.00	0.00	9.43	0.41	0.00	0.00	9.43	0.05
	<b>Total Area under Technical Reclamation</b>	0.00	0.00	0.00	0.00	9.43	0.41	0.00	0.00	9.43	0.05
WASTELAND	<b>Total Area under Mine Operation</b>	0.00	0.00	3.86	0.09	71.07	3.08	0.00	0.00	74.93	0.41
	Waste Lands	52.80	1.78	79.72	1.67	40.26	1.74	412.61	4.98	585.39	3.19
	Fly Ash Pond / Sand Body	5.58	0.19	6.61	0.14	0.00	0.00	0.00	0.00	12.19	0.07
WATERBODIES	<b>Total Wasteland</b>	58.38	1.97	86.33	1.81	40.26	1.74	412.61	4.98	597.58	3.26
	Reservoir, nallah, ponds	61.40	2.07	108.90	2.28	66.01	2.85	320.05	3.87	556.36	3.03
	<b>Total Waterbodies</b>	61.40	2.07	108.90	2.28	66.01	2.85	320.05	3.87	556.36	3.03
AGRICULTURE	Crop Lands	525.00	17.68	829.34	17.37	741.37	32.05	2407.89	29.08	4503.60	24.56
	Fallow Lands	1182.99	39.83	1779.30	37.26	859.25	37.15	3498.69	42.25	7320.23	39.92
	<b>Total Agriculture</b>	1707.99	57.51	2608.64	54.63	1600.62	69.20	5906.58	71.33	11823.83	64.47
SETTLEMENTS	Urban Settlement	96.48	3.25	812.34	17.01	161.69	6.99	690.18	8.33	1760.69	9.60
	Rural Settlement	109.64	3.69	82.85	1.74	79.81	3.45	189.79	2.29	462.09	2.52
	Industrial Settlement	29.87	1.01	77.46	1.62	23.61	1.02	63.05	0.76	193.99	1.06
	<b>Total Settlement</b>	235.99	7.95	972.65	20.37	265.11	11.46	943.02	11.38	2416.77	13.18
<b>Grand Total</b>		2970.00	100.00	4775.00	100.00	2313.00	100.00	8281.00	100.00	18339.00	100.00

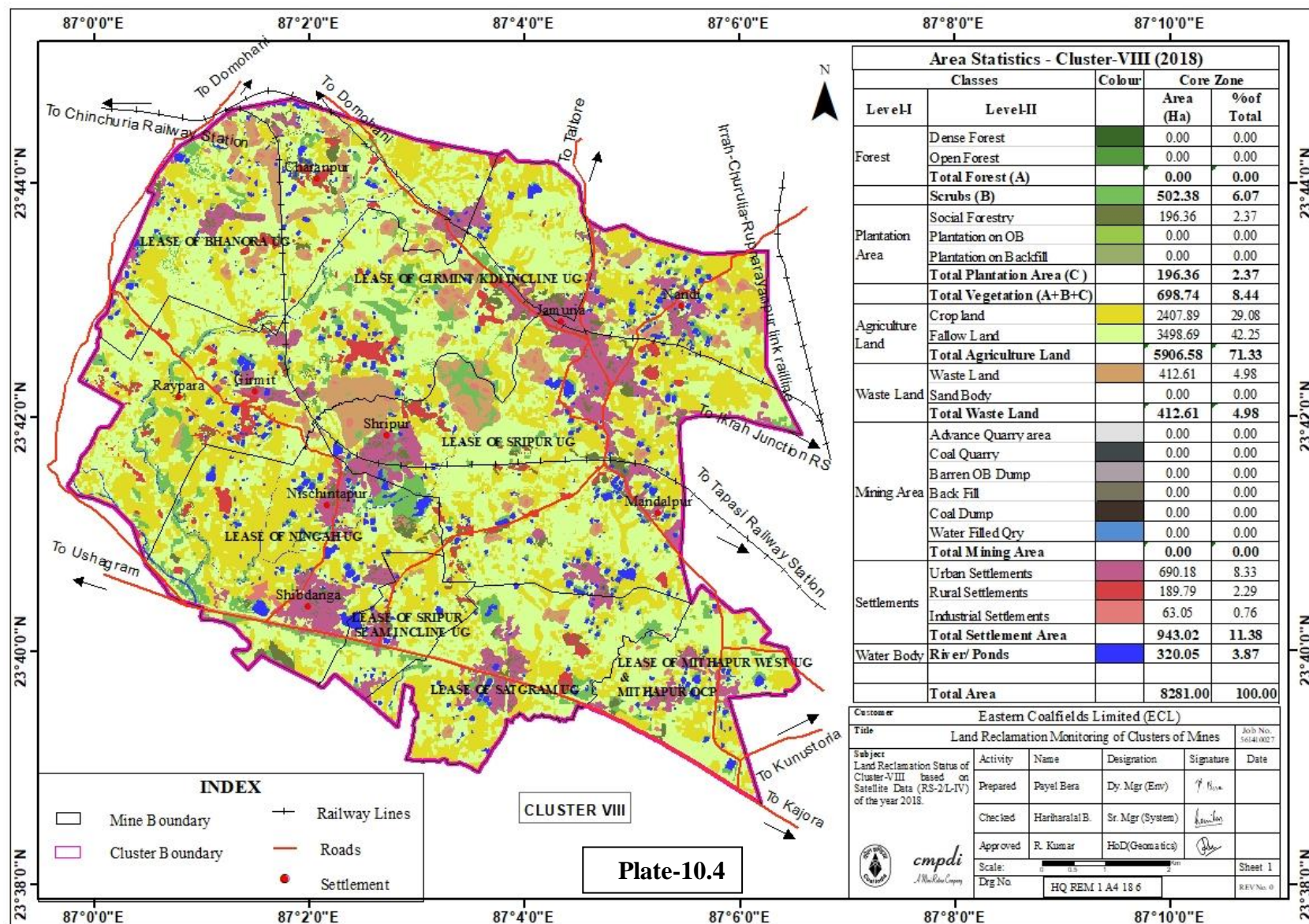












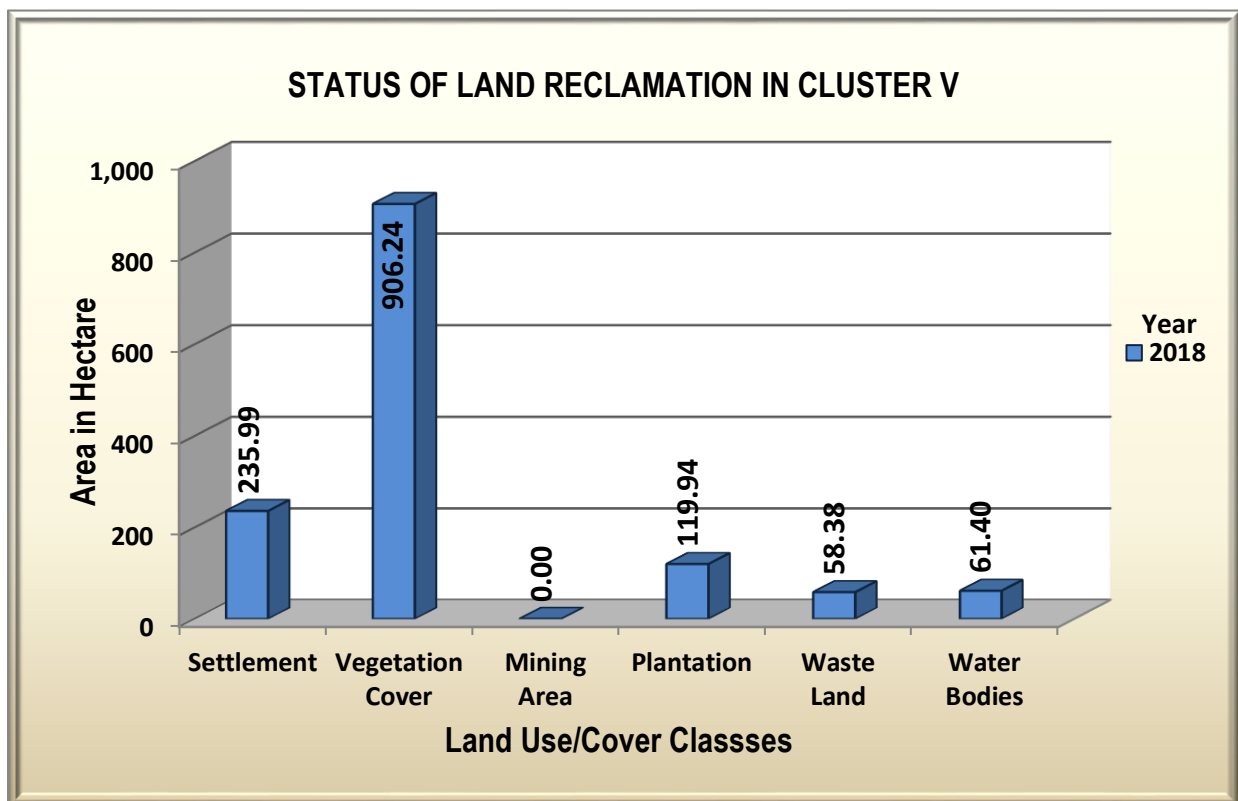


Figure-10.2

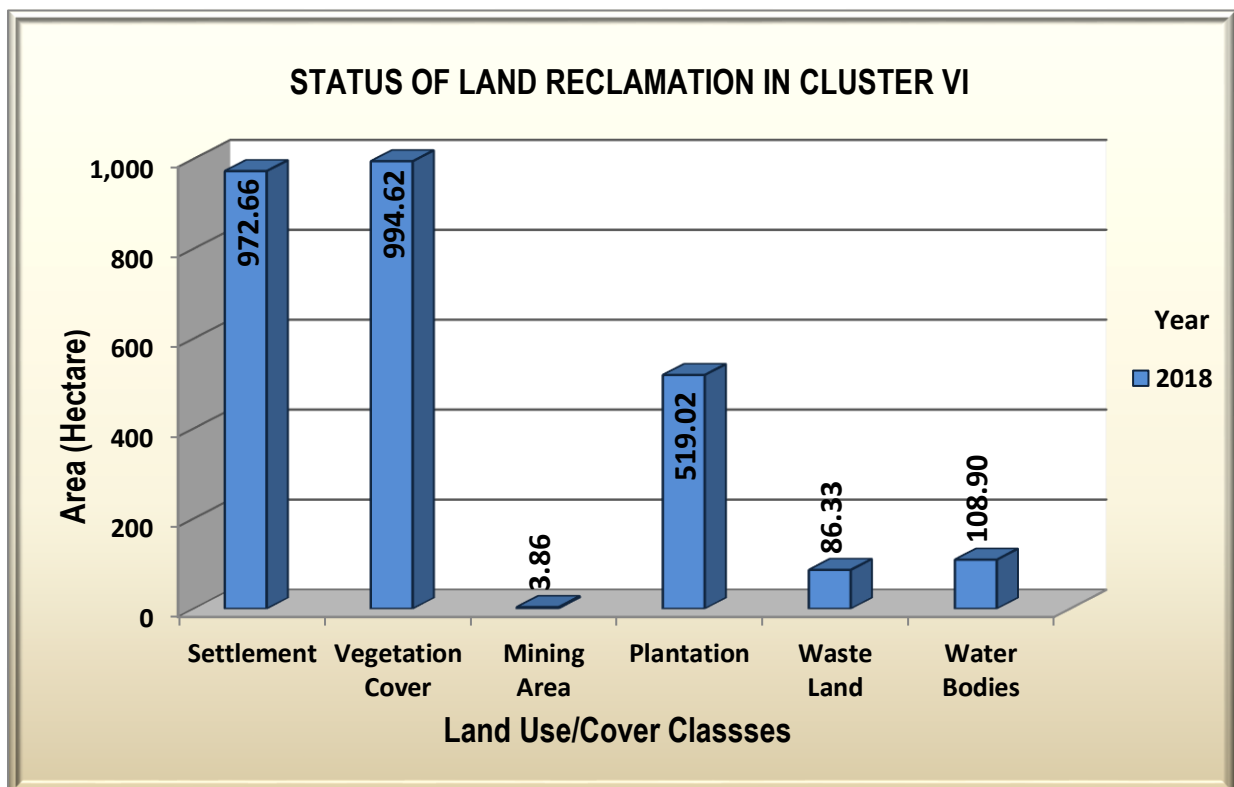


Figure-10.3

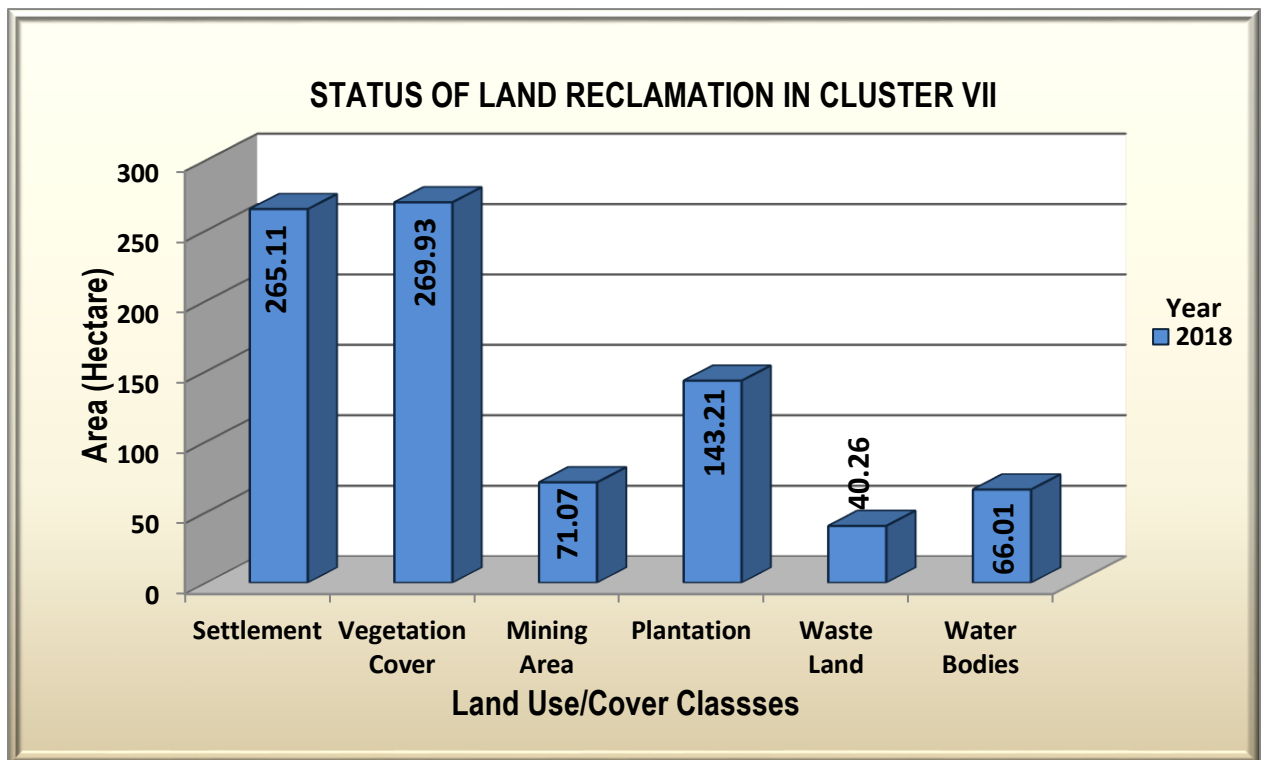


Figure-10.3

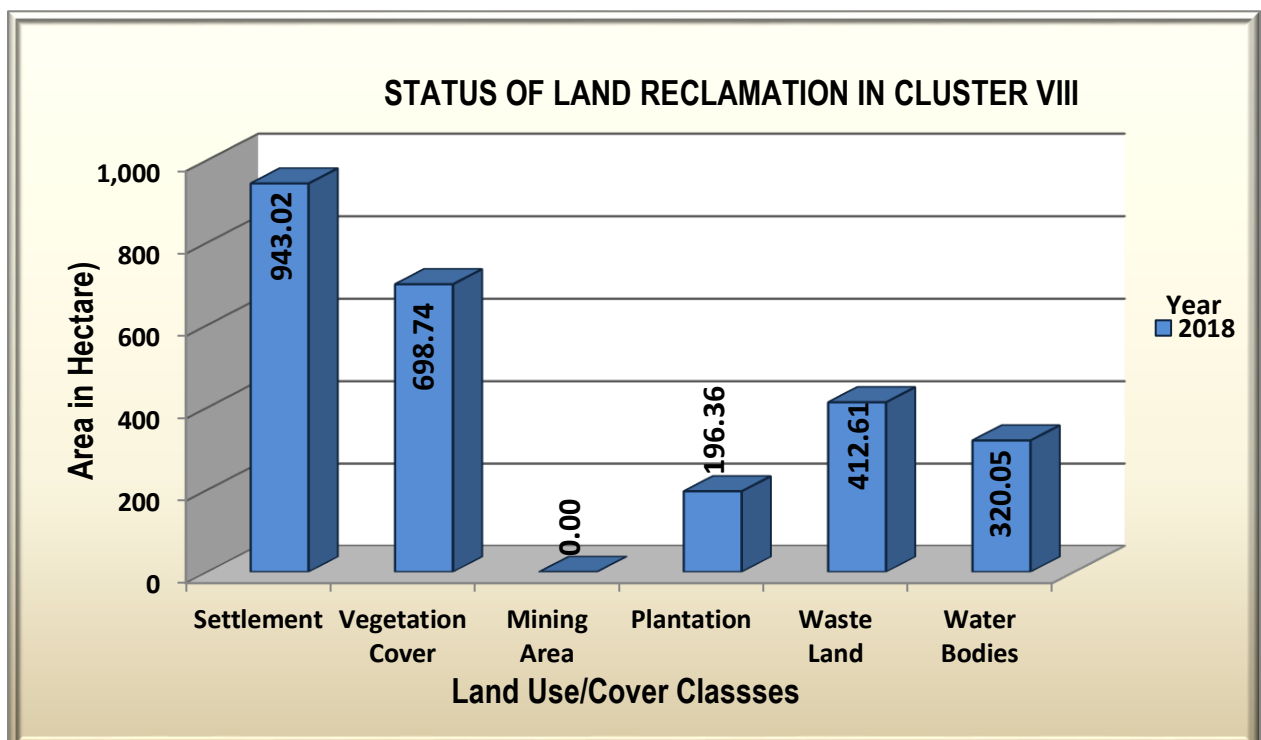


Figure-10.4





**Photograph 10.1: Bhanora West OCP, Cluster VII, ECL**



**Photograph10.2: Social Forestry Plantation in Cluster VI, ECL**



**cmpdi**  
*A Mini Ratna Company*

## Central Mine Planning & Design Institute Ltd.

(A Subsidiary of Coal India Ltd.)

Gondwana Place, Kanke Road, Ranchi 834031, Jharkhand

Phone : (+91) 651 2230001, 2230002, 2230483, FAX (+91) 651 2231447, 2231851

Website : [www.cmpdi.co.in](http://www.cmpdi.co.in), Email : [cmpdihq@cmpdi.co.in](mailto:cmpdihq@cmpdi.co.in)