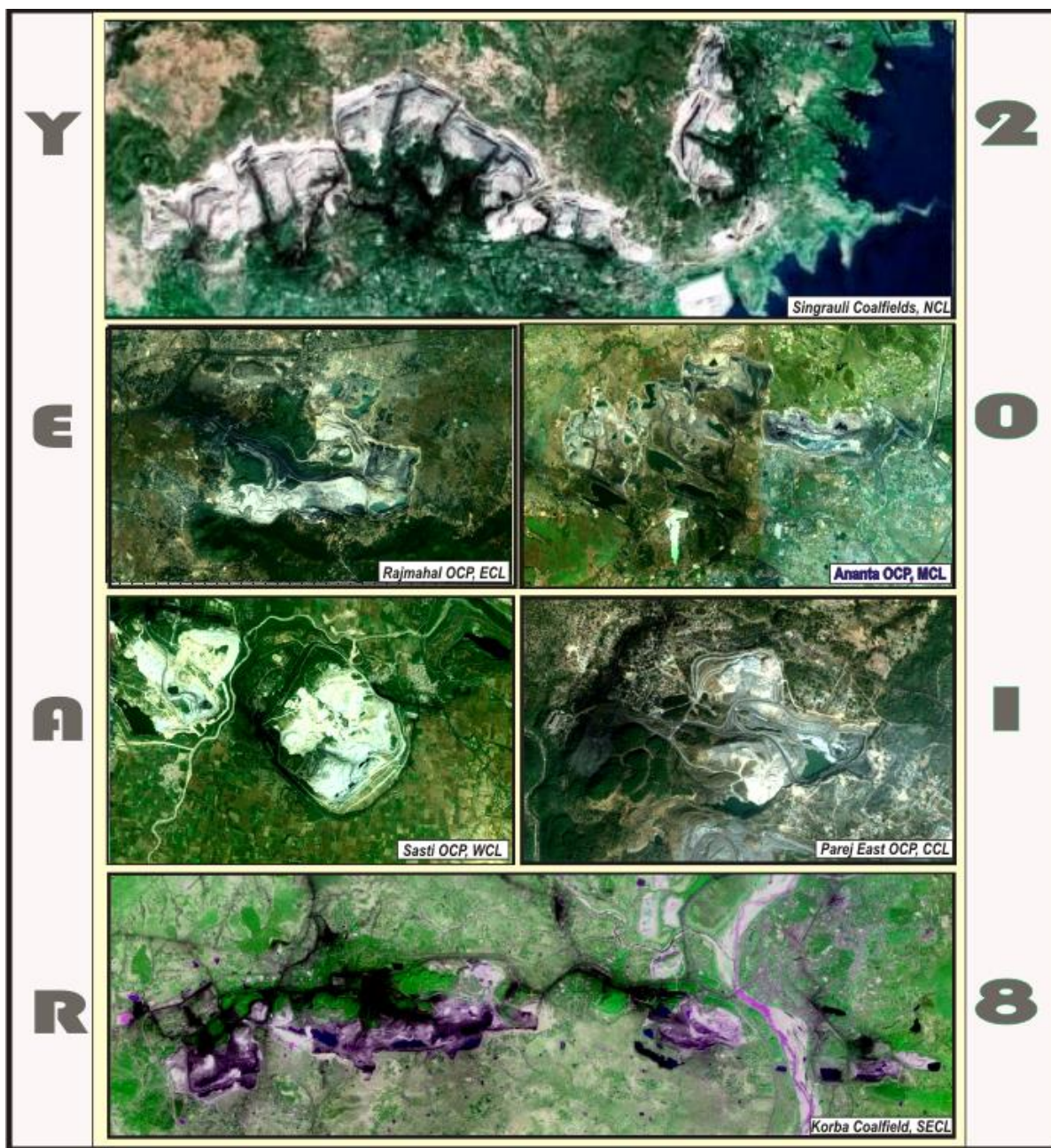


# Land Restoration / Reclamation Monitoring of 52 Opencast Coal Mines Projects of CIL producing more than 5 mcm (Coal+OB) Based on Satellite Data for the Year 2018



*cmpdi*  
A Mini-Ratna Company

**Land Restoration / Reclamation Monitoring of 52 Opencast  
Coal Mines Projects of CIL producing more than 5 mcm  
(Coal+OB) based on Satellite Data for the Year 2018**

**March- 2019**



**Remote Sensing Cell  
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## **Executive Summary**

- 1.0 Project** Land restoration / reclamation monitoring of 52 opencast coal mines in different subsidiaries of Coal India Ltd. (CIL) producing 5 million cu.m. and more (Coal+OB) per year based on satellite data on annual basis.
- 2.0 Objective** Objective of the land restoration / reclamation monitoring is to assess the area under backfilling, plantation, social forestry, active mining area, water bodies, distribution of wasteland, agricultural land and forest in the leasehold area of the projects. 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 671.44 Km<sup>2</sup> of the 52 OC projects considered for monitoring during 2018-19; total excavated area is 255.43 Km<sup>2</sup>; out of which 60.80 Km<sup>2</sup> area (23.80%) has been planted (Biologically Reclaimed), 99.99 Km<sup>2</sup> area (39.15%) is under backfilling (Technical Reclamation) and 94.64 Km<sup>2</sup> area (37.05%) is under active mining. It is evident from the analysis that 160.79 Km<sup>2</sup> (62.95%) area out of the total excavated area of the 52 OC projects is already under reclamation and balance 94.64 Km<sup>2</sup> (37.05%) area is under active mining. Company wise details are given in Table - 1 & Fig-1.
  - On comparing the status of land reclamation carried out in year 2018-19 with respect to years 2017-18 in the 52 Opencast projects of different CIL subsidiaries, it is evident from the analysis of the satellite data that area under land reclamation has increased from 152.63 Km<sup>2</sup> (Yr. 2017-18) to 160.79 Km<sup>2</sup> (Yr. 2018-19) which includes both plantation (Biological Reclamation) and areas under backfilling (Technical Reclamation). This increase of 8.16 Km<sup>2</sup> area of land reclamation in last one year is the result of the efforts made by CIL's subsidiary companies towards land reclamation. Year wise comparison in land reclamation in different subsidiaries is given in Fig.2.



- It has been observed that in WCL, SECL, NCL, CCL, BCCL & ECL area under biological reclamation has increased in comparison to previous year whereas in MCL area under biological reclamation has reduced marginally in the leasehold areas of the opencast projects selected for this study. It is important to note here that in case of MCL, leasehold areas of Projects like Ananta, Bharatpur, Jagganath, Hingula, Lakhanpur & Siarmal have been modified which has resulted in loss of planted areas.
- It has been observed that in all the subsidiaries of Coal India Limited (CIL) except for WCL, technical reclamation has shown an increasing trend. As compared to the analysis done in the year 2017, it has been found that there has been an overall increase 6.68 Km<sup>2</sup> area under technical reclamation commutatively in the year 2018 as compared to the year 2017. In case of WCL, the reduction in technical reclamation is resulting due to exclusion of two projects namely Ghughus and Pimpalgaon in this year monitoring schedule on request from WCL, as these two mines are in the process of final closure and now fall in less than 5 mcm (Caol+OB) category.
- It has been also observed that in subsidiaries like SECL, MCL, BCCL & ECL, total area under plantation (Green Cover) which includes plantation over backfill, plantation over overburden dumps and plantation done under social forestry etc. has increased as compared to previous year. It has been also observed that in subsidiaries viz WCL, NCL and CCL there has been decrease in area under green cover due to various reasons like modification of leasehold boundaries, mine advance, OB dumping on vegetated backfilled / OB Dump area due to constrain of dumping space etc. Overall 23.13% of the total leasehold area of all the subsidiaries of CIL commutatively is under Green Cover as per the satellite data of the year 2018.

Table-1

**Company wise Land Reclamation Status in OC projects of CIL based on Satellite Data of year 2018**  
(Projects producing more than 5 mcm of Coal+OB annually)

(Area in Sq. Kms.)

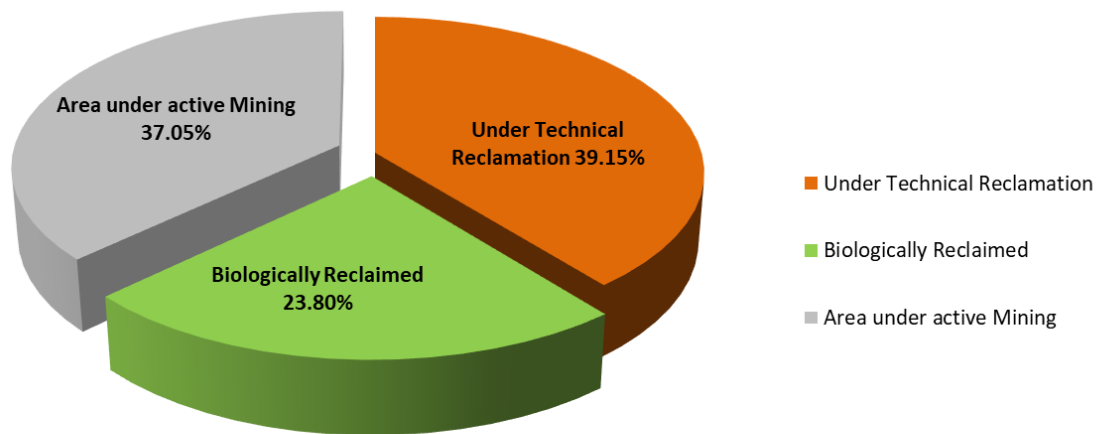
Sl. No.	Project (Nos.)	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
								Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	WCL (10)	94.38	101.59	7.92	6.24	3.18	3.23	15.34	12.55	9.82	8.54	19.13	18.82	30.23	28.29	28.34	24.32	11.10	9.47
				26.20%	22.06%	10.52%	11.42%					63.28%	66.53%			30.03%	23.94%	36.72%	33.47%
2	SECL (10)	157.20	157.20	23.38	25.63	24.96	25.62	10.89	10.46	8.47	8.53	18.56	19.52	66.90	70.77	44.32	44.61	48.34	51.25
				34.95%	36.22%	37.31%	36.20%					27.74%	27.58%			28.19%	28.38%	72.26%	72.42%
3	NCL (10)	174.28	174.28	23.92	26.65	14.81	15.37	11.07	11.41	27.81	26.19	30.71	29.66	69.44	71.68	53.69	52.97	38.73	42.02
				34.45%	37.18%	21.33%	21.44%					44.23%	41.38%			30.81%	30.39%	55.77%	58.62%
4	MCL (13)	111.44	130.01	19.26	21.29	8.22	8.17	3.06	3.20	3.25	3.24	15.87	16.31	43.35	45.77	14.53	14.61	27.48	29.46
				44.43%	46.52%	18.96%	17.85%					36.61%	35.63%			13.04%	11.24%	63.39%	64.37%
5	CCL (05)	48.47	51.35	7.86	8.70	5.38	5.51	4.01	3.70	3.73	3.71	3.89	3.94	17.13	18.15	13.12	12.92	13.24	14.21
				45.88%	47.93%	31.41%	30.36%					22.71%	21.71%			27.07%	25.16%	77.29%	78.29%
6	BCCL (02)	16.32	16.32	3.71	3.80	0.57	0.68	0.31	0.37	0.88	0.88	0.88	1.17	5.16	5.65	1.76	1.93	4.28	4.48
				71.90%	67.26%	11.05%	12.04%					17.05%	20.71%			10.78%	11.83%	82.95%	79.29%
7	ECL (02)	39.44	40.69	7.26	7.68	2.20	2.22	0.13	0.48	1.25	1.27	4.67	5.22	14.13	15.12	3.58	3.97	9.46	9.90
				51.38%	50.79%	15.57%	14.68%					33.05%	34.52%			9.08%	9.76%	66.95%	65.48%
	TOTAL (52)	641.53	671.44	93.31	99.99	59.32	60.80	44.81	42.17	55.21	52.36	93.71	94.64	246.34	255.43	159.34	155.33	152.63	160.79
				37.88%	39.15%	24.08%	23.80%					38.04%	37.05%			24.84%	23.13%	61.96%	62.95%

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

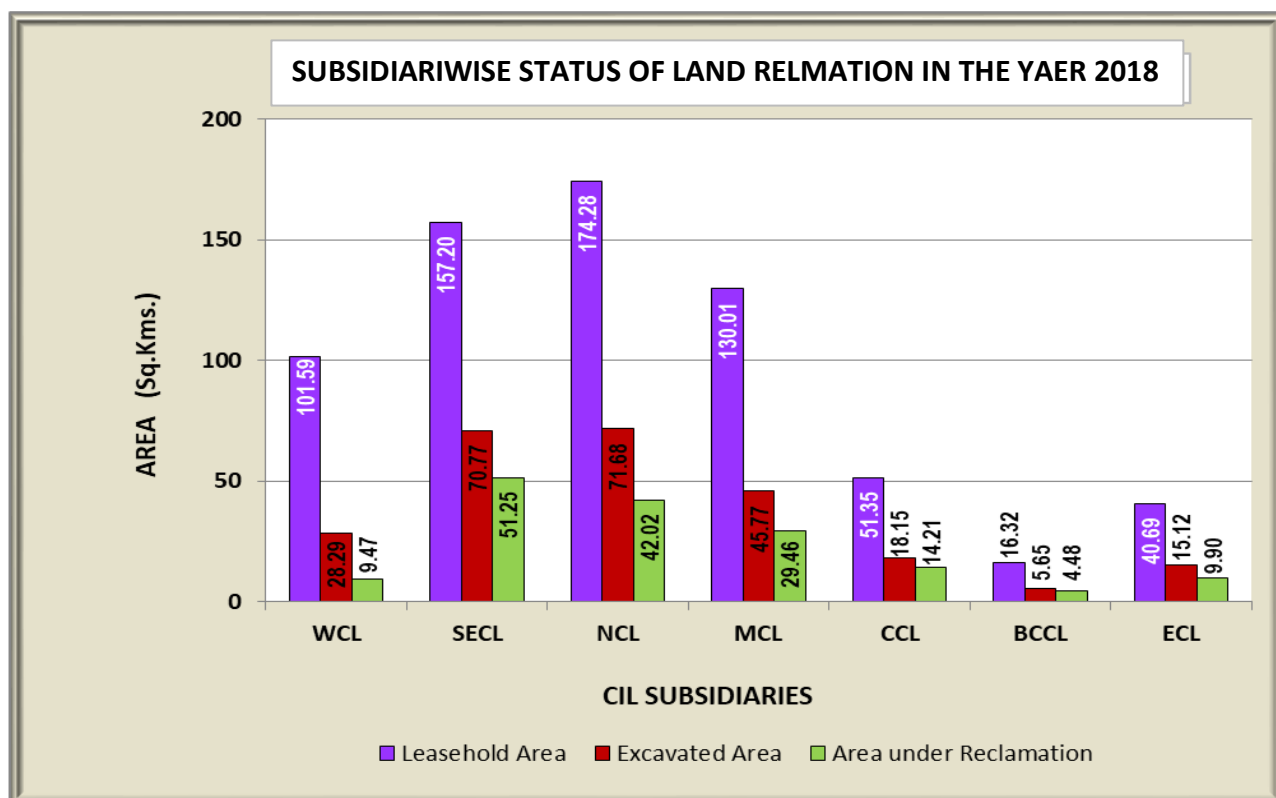
**Note:** In reference of the above Table, different parameters are classified as follows:

1. Area under Biological Reclamation includes areas under plantation done on backfilled area only.
2. Area under Technical Reclamation includes area under barren backfilled only
3. Area under Active mining includes coal quarry site, quarry filled with water etc.
4. Social Forestry and Plantation on external OB dump are not included in Biological Reclamation and are put under separate categories as shown in the table.
5. (%) calculated in the above table is in respect of total excavated area except for "Total area under plantation" where % is in terms of leasehold area.

**STATUS OF LAND RECLAMATION IN THE LEASEHOLD OF 52 OPENCAST MINES UNDER MONITORING IN 2018-19**  
*(Pie Chart indicated distribution of Total Excavated Area Only)*



**Fig.1 : Pie Chart showing Status of Land Reclamation in CIL Subsidiaries**



**Fig. 2 : Company wise Land Reclamation Status in the Year 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.

Keeping above in view, Coal India Ltd. (CIL) issued a work order vide letter no. CIL/WBP/Env/2009/2428 dated 29.12.2009 to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring land reclamation. status of all the opencast coal mines having production of more than 5 million m<sup>3</sup> per annum (coal + OB taken together per annum) based on remote sensing satellite data, regularly on annual basis for sustainable development of mining. 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 years. 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 and respective subsidiaries.

- 1.2** 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.
- 1.3** CMPDI undertook the above study and the present report is embodying the findings in nutshell carrying out for the 52 opencast projects of different subsidiaries producing 5 million cubic m. coal +OB or more in the year 2018-19. This study is being carried out in since year 2008 on annual basis and progressive changes in the status of land reclamation have been assessed.

## **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 3. Following steps are involved in land reclamation /restoration monitoring:

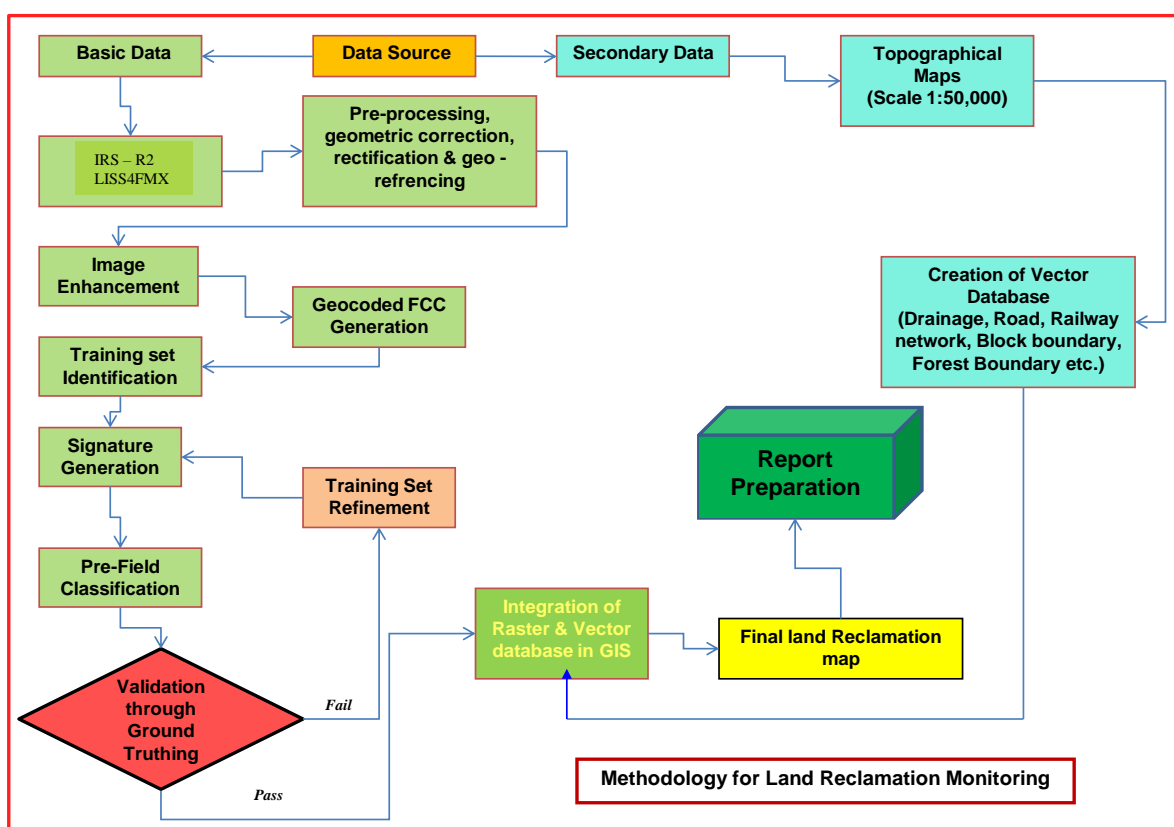


Fig.3 : Methodology for Land Reclamation Monitoring

**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 Professional v2014 s/w / PCI Geomatica digital image processing s/w. Methodology involves the following major steps:

- **Rectification & Geo-referencing:** 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 topo-sheet.

- **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 Professional v2014 s/w / PCI Geomatica digital image processing s/w and enhance the image quality for proper 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 Professional v2014/ PCI Geomatica digital image processing 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 52 opencast projects producing 5 million cubic m. and more (Coal + OB together) during the year 2018-19 were taken up for the study. 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. Baseline data on reclamation of these OC projects of CIL's subsidiaries have been generated and the same has been annually updated since year 2008.
- 4.2** Besides project wise land reclamation monitoring, coalfield wise vegetation cover monitoring on regional scale has also been planned for the major 19 coalfields of India at regular interval of three years using remote sensing satellite data to assess the regional impact of coal mining and associated industrialization on the land use and vegetation cover in the coalfield. Geo-environmental baseline data for Raniganj, Jharia , East Bokaro, West Bokaro, Karanpura, Singrauli (Moher Sub-basin), Korba, Bistrampur, Shoagpur, Mand-Raigarh, Talcher, Ib Valley , Wardha Valley, Bander , Kamptee, Umrer, Pench Kanhan and Makum coalfields based on the satellite data have been generated and will be monitored regularly at three years interval.
- 4.3** The list of subsidiary wise 52 opencast projects taken up for Land Reclamation Monitoring based on satellite data of year 2018 is given in table below :

<b>Subsidiary</b> <i>(No. of Projects)</i>	<b>Opencast Projects</b> <i>(5 million Cu.m. Coal +OB or more per annum)</i>
<b>WCL (10)</b>	Sasti, Padmapur, Durgapur, Mugoli, Umrer, Ukni, Niljai, New Majri, Makardhokra - III & Penganga
<b>SECL (10)</b>	Dipka, Gevra, Kusmunda, Manikpur, Dugga, Bishrampur, Chirimiri, Rajnagar, Dhanpuri & Jamuna
<b>NCL (10)</b>	Amlohri, Nigahi, Jayant, Dudhichua, Khadia, Krishnashila, Bina, Kakri, Jhingurdah, Block-B
<b>MCL (13)</b>	Ananta, Balram, Lingraj, Bharatpur, Bhubaneswari, Jagannath, Hingula, Belpahar, Lakhampur, Samleswari, Lajkura, Siarmal & Basundhara West Extension
<b>CCL (05)</b>	Ashoka, Piparwar, K.D. Hesalong, Rajrappa & Parej East
<b>BCCL (02)</b>	Block-II, Muraidih
<b>ECL (02)</b>	Sonpur-Bazari, Rajmahal
<b>TOTAL (52)</b>	

**4.4** Subsidiary wise land reclamation status of the above mentioned 52 OC projects derived from satellite data for the year 2018 are given in the following pages:

**WESTERN COALFIELDS LIMITED**

## **5.0 Land Reclamation Status in Western Coalfields Ltd.**

**5.1** Following 10 OC projects producing more than 5 million cubic m. (Coal + OB together) of Western Coalfields Ltd. have been taken up for land reclamation monitoring based on Satellite Data of the year 2018:

- Sasti
- Padmapur
- Durgapur
- Mugoli
- Umrer
- Ukni
- Niljai
- New Majri
- Makardhokra-III
- Penganga

**5.2** Project wise Land Reclamation status in WCL for the year 2018 is given in Table 5.1 and also shown graphically in Fig 5.1. 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 – 5.2. Land use maps derived from satellite data are shown in Plate 5.1-5.10. Land reclamation monitoring of the above projects except for Makardhokra-III and Penganga OCPs is being done since 2009 on annual basis. Year wise changes in the different land use classes based on satellite data are depicted in Bar Charts in Fig.5.2–5.11 for the last three years only.

**5.3** For the year 2018-19, Makardhokra-III and Penganga OCPs have been included in place of Pimpalgaon and Ghughus OCPs on request from WCL as Pimpalgaon and Ghughus OCPs are in process of final closure and now fall in less than 5 mcm (Coal+OB) category.



- 5.4** Study reveals that 33.47% of excavated area has been under reclamation in the above mentioned mines of WCL out of which 11.42% area has been revegetated and 22.06% area is under backfilling. There is an overall increase of 1.48 Km<sup>2</sup> in area under reclamation in WCL in the year 2018 with respect to the year 2017, out of which there is an increase of 0.41 Km<sup>2</sup> in area under biological reclamation (Plantation on Backfilled Areas) and an increase of 1.07 Km<sup>2</sup> in area under technical reclamation (Barren Backfilling). (Refer Total (A) in Table 5.1)
- 5.5** Analysis of satellite data also indicates that total area under plantation (Green Cover) has increased from 24.11 Km<sup>2</sup> (2017) to 24.32 Km<sup>2</sup> (2018). The increase of 0.21 Km<sup>2</sup> area under Green Cover areas may be attributed to continuous effort of WCL towards environmental protection.
- 5.6** After comparing the satellite data of year 2018 vs. 2017, it is evident that total area under plantation (Green Cover) in Sasti, Padmapur, Durgapur, Mugoli, Niljai & New Majri Opencast Projects has either increased or remained static whereas there is a marginal decrease in area under plantation / natural vegetation (Green Cover) in Umrer and Ukni opencast projects because of the OB dumping on vegetated backfilled / OB Dump area due to constrain of dumping space. It has been observed in some of the projects natural vegetation has also started growing on stabilized old backfilled areas and overburden dumps due to high soil fertility.
- 5.7** On comparing the status of land reclamation for the year 2018 with respect to the year 2017 in different projects, it is evident that the total area under reclamation has increased from 7.99 Km<sup>2</sup> (Yr. 2017) to 9.47 Km<sup>2</sup> (Yr. 2018).
- 5.8** Out of 10 projects of WCL, maximum area under reclamation is in Sasti Opencast Project (74.18%) followed by Umrer OC (73.36%) and Mugoli OC (25.74%).

**Table 5.1**  
**Project wise Land Reclamation Status in Opencast Projects of WCL**  
**(> 5 million Cu. M. of Coal+OB) based on Satellite Data of the Year 2018**

(Area in Sq. Kms.)

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, Avaneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Sasti	9.20	9.20	2.15	2.19	0.54	0.54	1.66	1.66	0.57	0.57	0.81	0.95	3.50	3.68	2.77	2.77	2.69	2.73
				61.43%	59.51%	15.43%	14.67%					23.14%	25.82%			30.11%	30.11%	76.86%	74.18%
2	Padmapur	8.29	8.29	0.13	0.18	0.15	0.17	1.70	1.60	0.53	0.71	1.59	1.54	1.87	1.89	2.38	2.48	0.28	0.35
				6.95%	9.52%	8.02%	8.99%					85.03%	81.48%			28.71%	29.92%	14.97%	18.52%
3	Durgapur	11.86	11.86	0.26	0.31	0.40	0.54	2.10	2.33	1.33	1.09	3.85	3.71	4.51	4.56	3.83	3.96	0.66	0.85
				5.76%	6.80%	8.87%	11.84%					85.37%	81.36%			32.29%	33.39%	14.63%	18.64%
4	Mugoli	7.88	7.88	0.24	0.58	0.24	0.12	1.14	1.36	0.26	0.26	2.16	2.02	2.64	2.72	1.64	1.74	0.48	0.70
				9.09%	21.32%	9.09%	4.41%					81.82%	74.26%			20.81%	22.08%	18.18%	25.74%
5	Umrer	9.45	9.45	2.08	1.88	1.39	1.59	1.27	1.32	2.77	2.42	1.07	1.26	4.54	4.73	5.43	5.33	3.47	3.47
				45.81%	39.75%	30.62%	33.62%					23.57%	26.64%			57.46%	56.40%	76.43%	73.36%
6	Ukni	9.94	9.74	0.00	0.00	0.00	0.00	2.10	1.42	0.18	0.68	2.16	2.25	2.16	2.25	2.28	2.10	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			22.94%	21.56%	0.00%	0.00%
7	Neeljai	15.30	13.63	0.00	0.48	0.10	0.10	1.16	1.19	1.33	1.31	3.47	3.02	3.57	3.60	2.59	2.60	0.10	0.58
				0.00%	13.33%	2.80%	2.78%					97.20%	83.89%			16.93%	19.08%	2.80%	16.11%
8	New Majri	7.74	7.74	0.31	0.62	0.00	0.17	1.84	1.67	1.35	1.35	3.01	2.85	3.32	3.64	3.19	3.19	0.31	0.79
				9.34%	17.03%	0.00%	4.67%					90.66%	78.30%			41.21%	41.21%	9.34%	21.70%
9	Makardhokra-III	-	16.37	-	0.00	-	0.00	-	0	-	0.02	-	0.65	-	0.65	-	0.02	-	0.00
				-	0.00%	-	0.00%					-	100.00%			-	0.12%	-	0.00%
10	Penganga	-	7.43	-	0.00	-	0.00	-	0	-	0.13	-	0.57	-	0.57	-	0.13	-	0.00
				-	0.00%	-	0.00%					-	100.00%			-	1.75%	-	0.00%
	TOTAL - A	79.66	101.59	5.17	6.24	2.82	3.23	12.97	12.55	8.32	8.54	18.12	18.82	26.11	28.29	24.11	24.32	7.99	9.47
				19.80%	22.06%	10.80%	11.42%					69.40%	66.53%			30.27%	23.94%	30.60%	33.47%
11	Pimpalgaon	4.52	-	0.00	-	0.00	-	1.02	-	0.88	-	0.58	-	0.58	-	1.90	-	0.00	-
				0.00%	-	0.00%	-					100.00%	-			42.04%	-	0.00%	-
12	Ghugus	10.2	-	2.75	-	0.36	-	1.35	-	0.62	-	0.43	-	3.54	-	2.33	-	3.11	-
				77.68%	-	10.17%	-					12.15%	-			22.84%	-	87.85%	-
	TOTAL - B	94.38	101.59	7.92	6.24	3.18	3.23	15.34	12.55	9.82	8.54	19.13	18.82	30.23	28.29	28.34	24.32	11.10	9.47
				26.20%	22.06%	10.52%	11.42%					63.28%	66.53%			30.03%	23.94%	36.72%	33.47%

Note 1: Penganga and Makardhokra-III OC with capacity > 5mcm (Coal+OB) has been included in this report to be monitored annually starting from 2018-19 in place of Pimpalgaon & Ghugus OC.

Note 2: 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 backfilled only
3. Area under Active mining includes coal quarry site, quarry filled with water. Area of Coal Dump has been excluded from Area under Active Mining in this table.
4. Social Forestry and Plantation on external OB dump are not included in Biological Reclamation and are put under separate categories as shown in the table.
5. (%) calculated in the above table is in respect of total excavated area except for "Total area under plantation" where % is in terms of leasehold area.

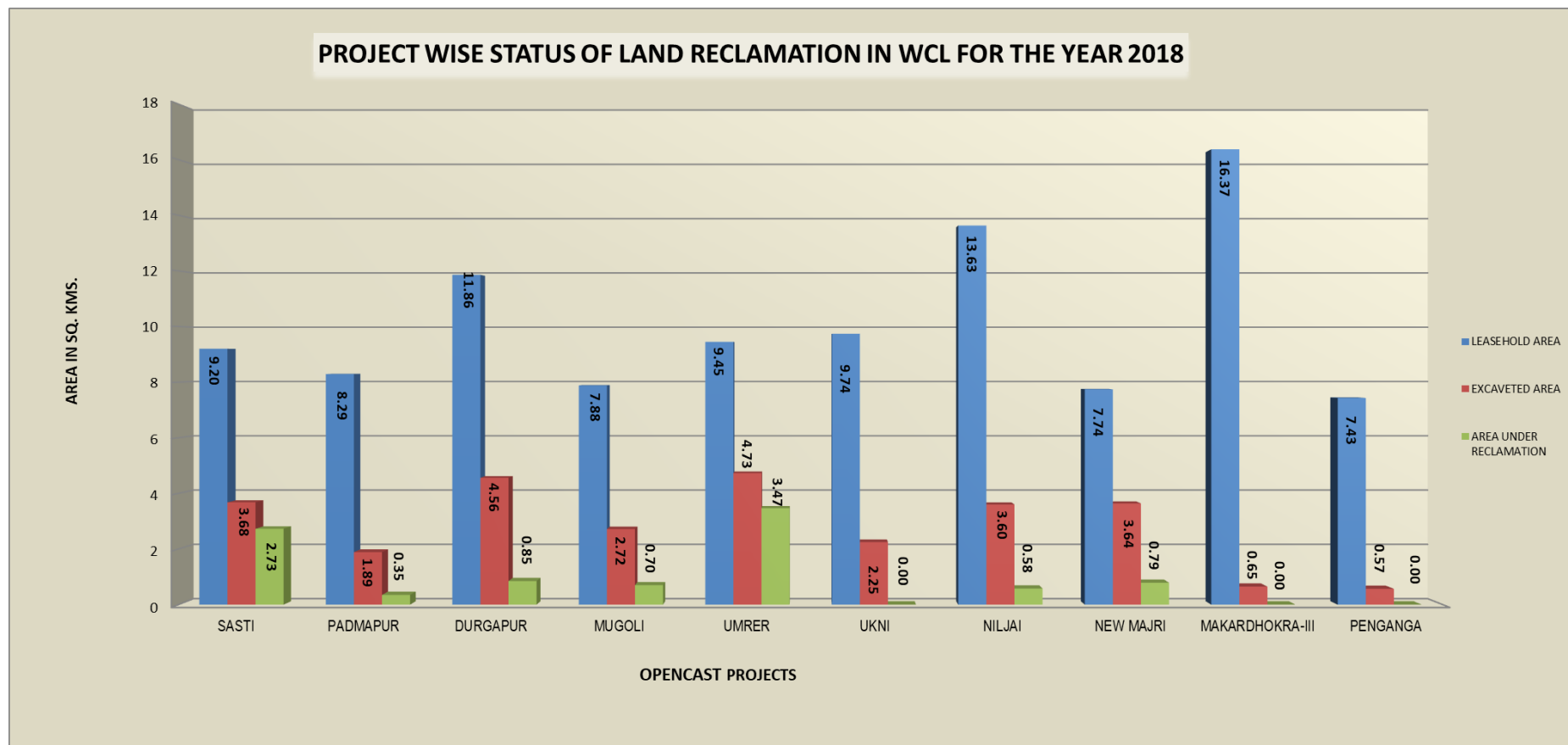
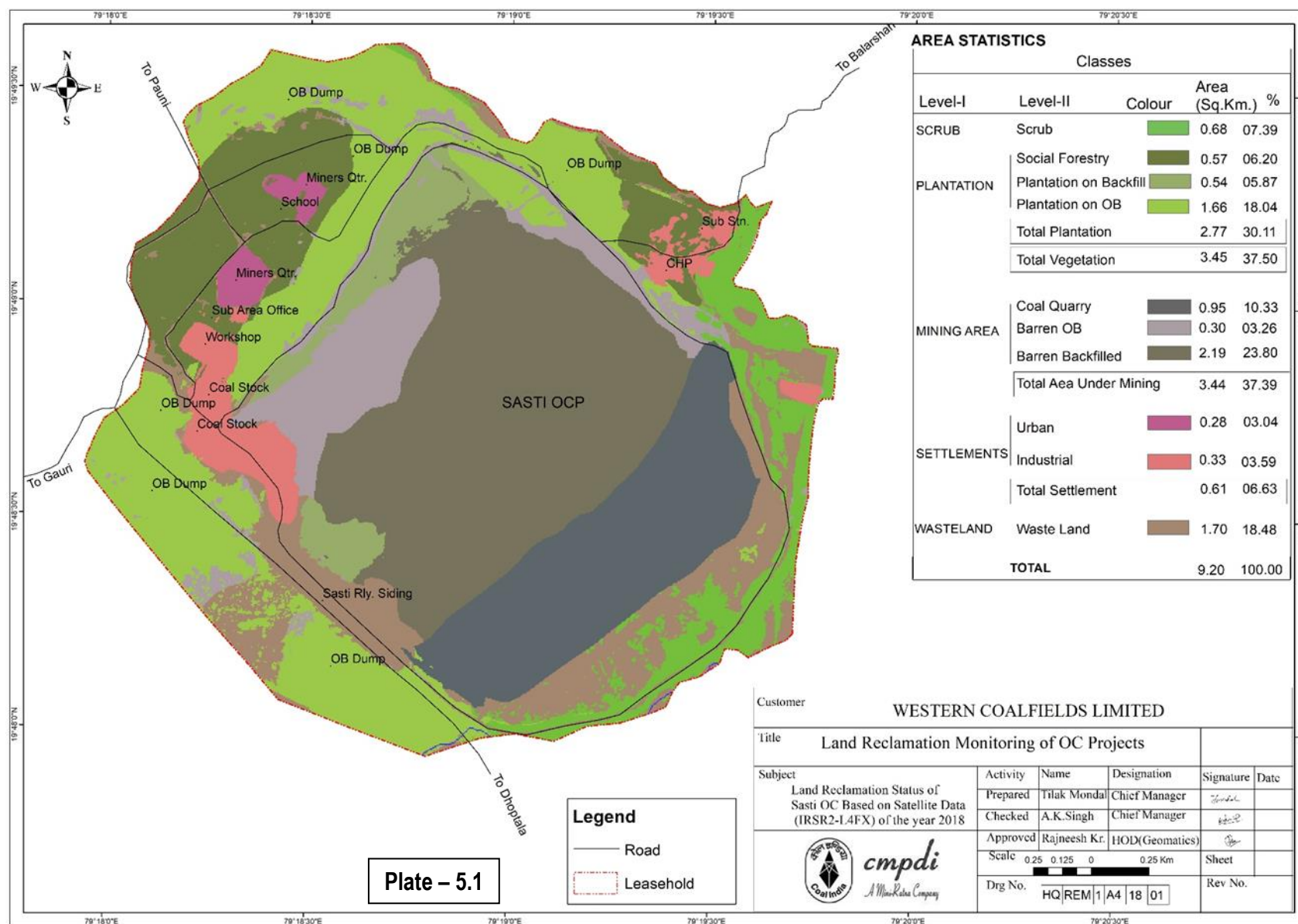


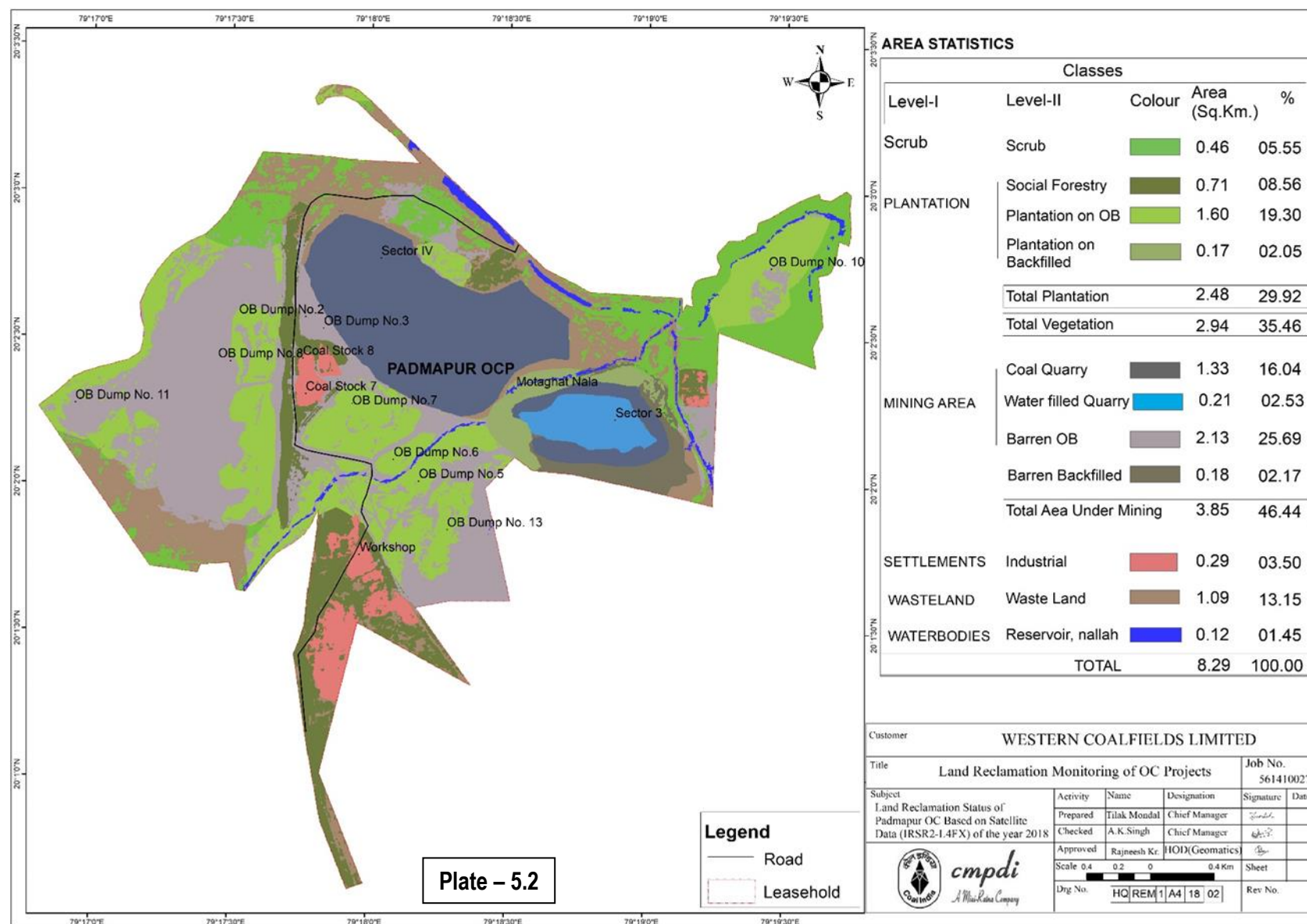
Figure : 5.1

Table 5.2

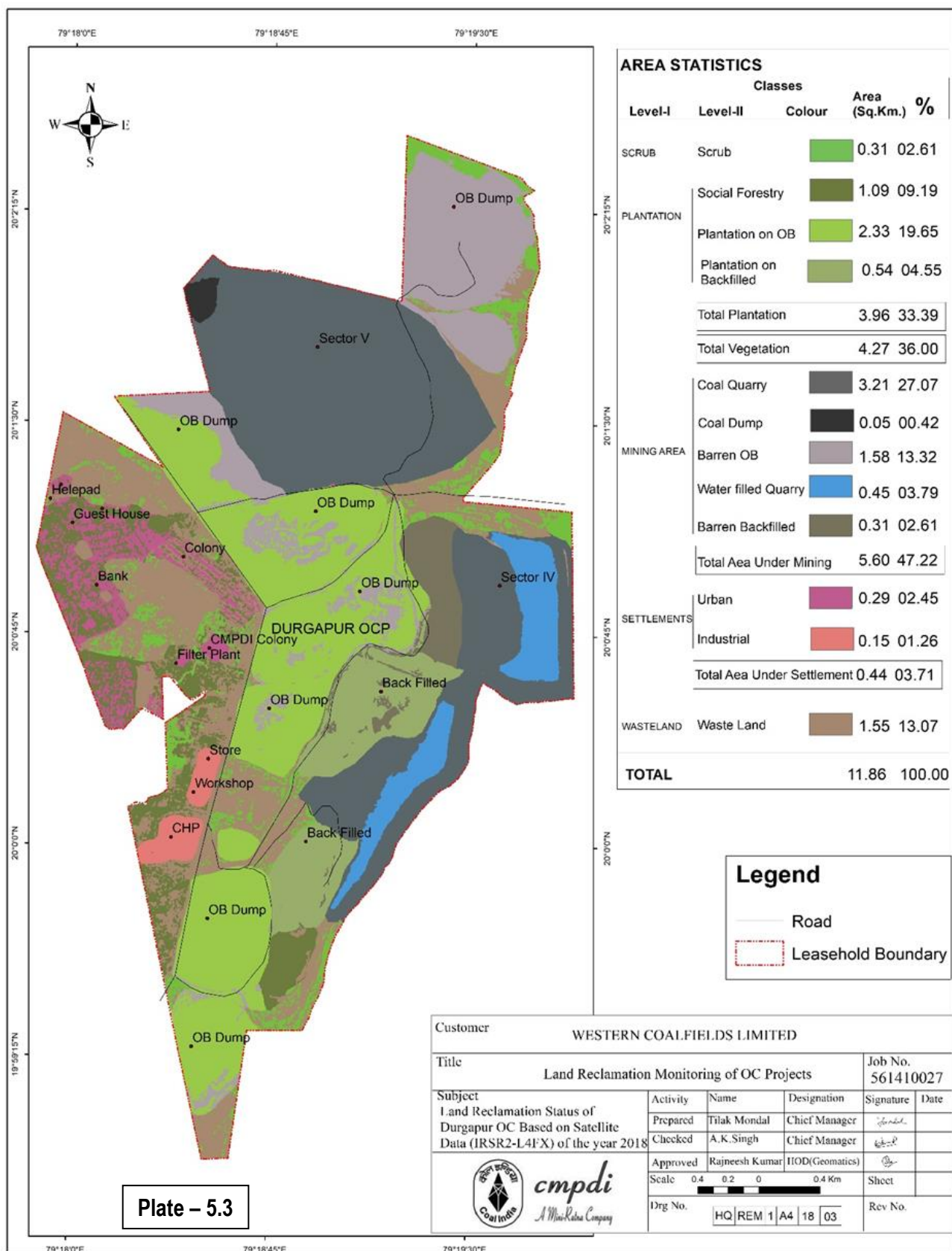
## Project wise Area Statistics of Land Use / Cover in OC Mines (&gt; 5 mcu.m.) of WCL based on Satellite data of the Year 2018

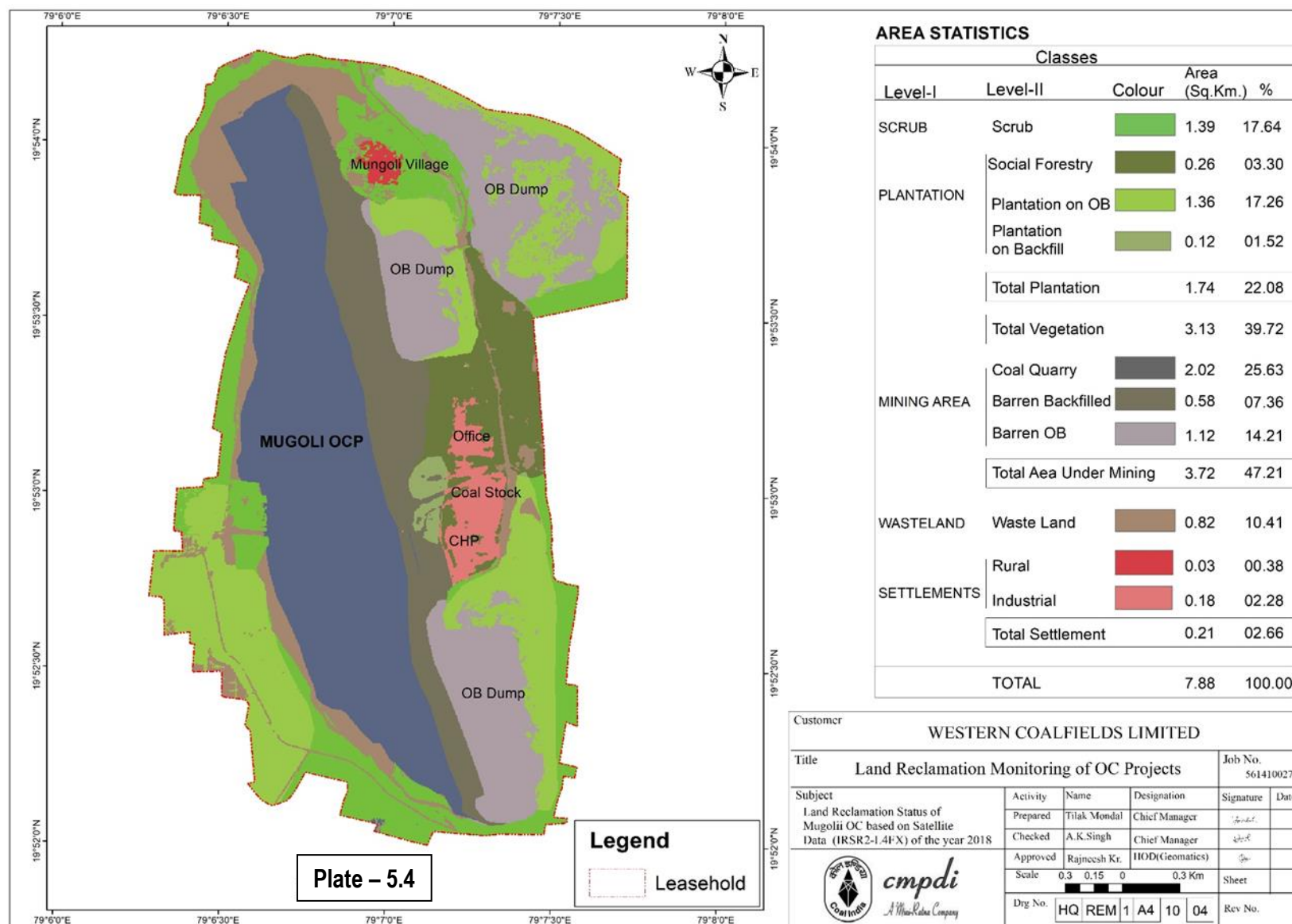
		SASTI		PADMAPUR		DURGAPUR		MUGOLI		UMRER		UKNI		NILJAI		NEW MAJRI		MAKARDHOKRA-III		PENGANGA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
SCRUBS	Scrubs	0.68	7.39	0.46	5.55	0.31	2.61	1.39	17.64	0.00	0.00	0.44	4.52	1.00	7.34	0.19	2.45	0.56	3.42	2.05	27.59	7.08	6.97
	Social Forestry	0.57	6.20	0.71	8.56	1.09	9.19	0.26	3.30	2.42	25.61	0.68	6.98	1.31	9.61	1.35	17.44	0.02	0.12	0.13	1.75	8.54	8.41
PLANTATION	Plantation on OB Dump	1.66	18.04	1.60	19.30	2.33	19.65	1.36	17.26	1.32	13.97	1.42	14.58	1.19	8.73	1.67	21.58	0.00	0.00	0.00	0.00	12.55	12.35
	Plantation on Backfill (Biological Reclamation)	0.54	5.87	0.17	2.05	0.54	4.55	0.12	1.52	1.59	16.83	0.00	0.00	0.10	0.73	0.17	2.20	0.00	0.00	0.00	0.00	3.23	3.18
	Total Plantation	2.77	30.11	2.48	29.92	3.96	33.39	1.74	22.08	5.33	56.40	2.10	21.56	2.60	19.08	3.19	41.21	0.02	0.12	0.13	1.75	24.32	23.94
	Total Vegetation	3.45	37.50	2.94	35.46	4.27	36.00	3.13	39.72	5.33	56.40	2.54	26.08	3.60	26.41	3.38	43.67	0.58	3.54	2.18	29.34	31.40	30.91
ACTIVE MINING	Coal Quarry	0.95	10.33	1.33	16.04	3.21	27.07	2.02	25.63	1.03	10.90	2.09	21.46	2.91	21.35	2.73	35.27	0.65	3.97	0.45	6.06	17.37	17.10
	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
	Quarry Filled With Water	0.00	0.00	0.21	2.53	0.45	3.79	0.00	0.00	0.11	1.16	0.06	0.62	0.00	0.00	0.12	1.55	0.00	0.00	0.00	0.00	0.95	0.94
	Coal Dump	0.00	0.00	0.00	0.00	0.05	0.42	0.00	0.00	0.12	1.27	0.10	1.03	0.11	0.81	0.00	0.00	0.00	0.00	0.12	1.62	0.50	0.49
	Total Area Under Active Mining	0.95	10.33	1.54	18.58	3.71	31.28	2.02	25.63	1.26	13.33	2.25	23.10	3.02	22.16	2.85	36.82	0.65	3.97	0.57	7.67	18.82	18.53
RECLAIMED	Area under Backfilling (Technical Reclamation)	2.19	23.80	0.18	2.17	0.31	2.61	0.58	7.36	1.88	19.89	0.00	0.00	0.48	3.52	0.62	8.01	0.00	0.00	0.00	0.00	6.24	6.14
	Barren OB Dump	0.30	3.26	2.13	25.69	1.58	13.32	1.12	14.21	0.45	4.76	2.95	30.29	2.91	21.35	0.08	1.03	0.88	5.38	0.66	8.88	13.06	12.86
	Total Area Under Mining Operation	3.44	37.39	3.85	46.44	5.60	47.22	3.72	47.21	3.59	37.99	5.20	53.39	6.41	47.03	3.55	45.87	1.53	9.35	1.23	16.55	38.12	37.52
WASTELANDS	Waste Lands	1.70	18.48	1.09	13.15	1.55	13.07	0.82	10.41	0.15	1.59	0.61	6.26	3.05	22.38	0.37	4.78	0.41	2.50	2.70	36.34	12.45	12.26
	Sand Body	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
	Total Wasteland	1.70	18.48	1.09	13.15	1.55	13.07	0.82	10.41	0.15	1.59	0.61	6.26	3.05	22.38	0.37	4.78	0.41	2.50	2.70	36.34	12.45	12.26
WATERBODIES	Reservoir, nallah, ponds	0.00	0.00	0.12	1.45	0.00	0.00	0.00	0.00	0.12	1.27	0.00	0.00	0.00	0.00	0.10	1.29	0.00	0.00	0.06	0.81	0.40	0.39
	Total Waterbodies	0.00	0.00	0.12	1.45	0.00	0.00	0.00	0.00	0.12	1.27	0.00	0.00	0.00	0.00	0.10	1.29	0.00	0.00	0.06	0.81	0.40	0.39
AGRICULTURE	Crop Lands	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	4.40	26.88	0.00	0.00	4.40	4.33
	Fallow Lands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	11.81	0.00	0.00	0.00	0.00	9.37	57.24	1.15	15.48	11.67	11.49
	Total Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.15	11.81	0.00	0.00	0.00	0.00	13.77	84.12	1.15	15.48	16.07	15.82
SETTLEMENTS	Urban Settlement	0.28	3.04	0.00	0.00	0.29	2.45	0.00	0.00	0.15	1.59	0.00	0.00	0.17	1.25	0.34	4.39	0.00	0.00	0.00	0.00	1.23	1.21
	Rural Settlement	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.38	0.00	0.00	0.08	0.82	0.00	0.00	0.00	0.00	0.08	0.49	0.03	0.40	0.22	0.22
	Industrial Settlement	0.33	3.59	0.29	3.50	0.15	1.26	0.18	2.28	0.11	1.16	0.16	1.64	0.40	2.93	0.00	0.00	0.00	0.00	0.08	1.08	1.70	1.67
	Total Settlement	0.61	6.63	0.29	3.50	0.44	3.71	0.21	2.66	0.26	2.75	0.24	2.46	0.57	4.18	0.34	4.39	0.08	0.49	0.11	1.48	3.15	3.10
Grand Total		9.20	100.0	8.29	100.0	11.86	100.0	7.88	100.0	9.45	100.0	9.74	100.0	13.63	100.0	7.74	100.0	16.37	100.0	7.43	100.0	101.59	100.00

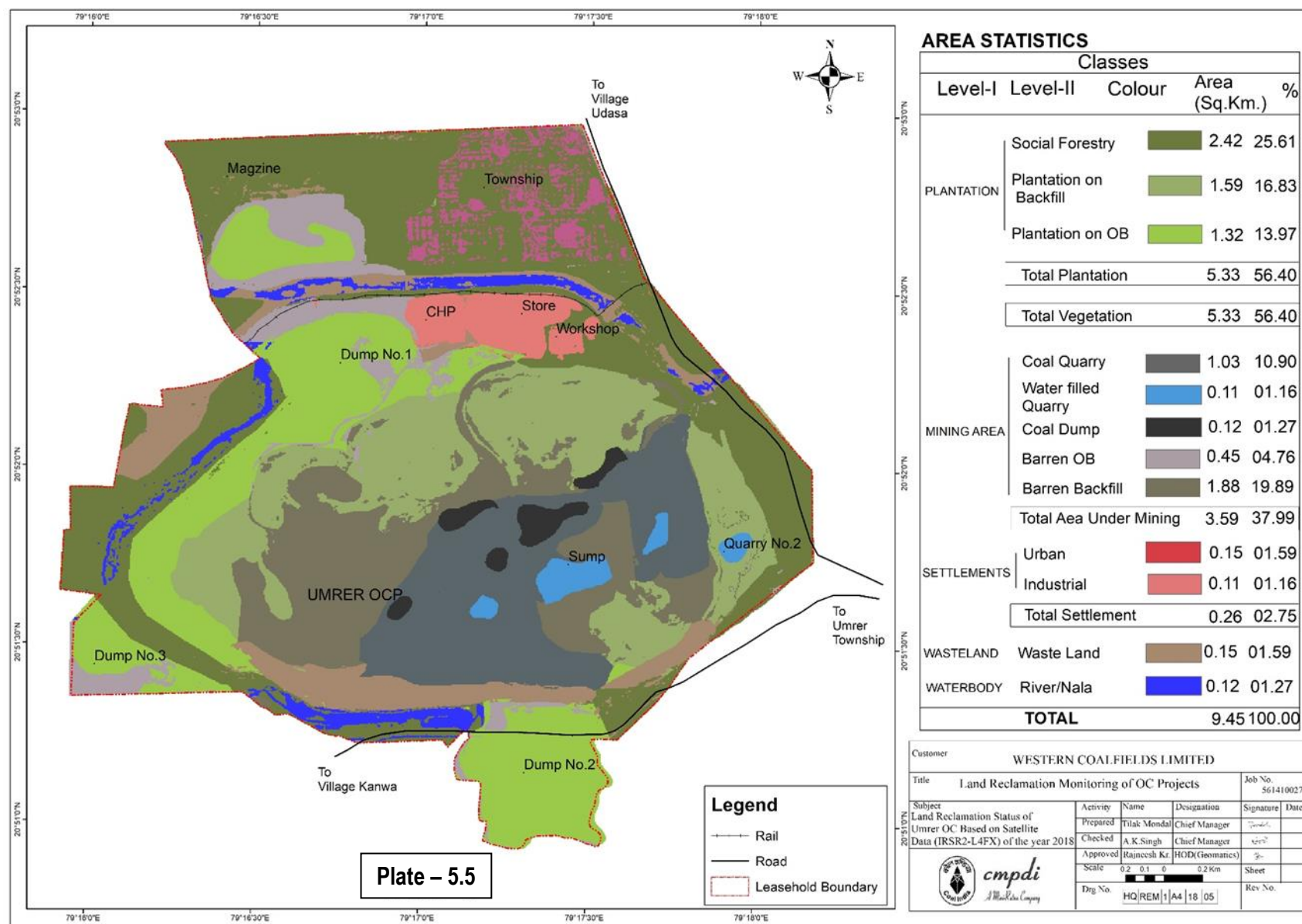




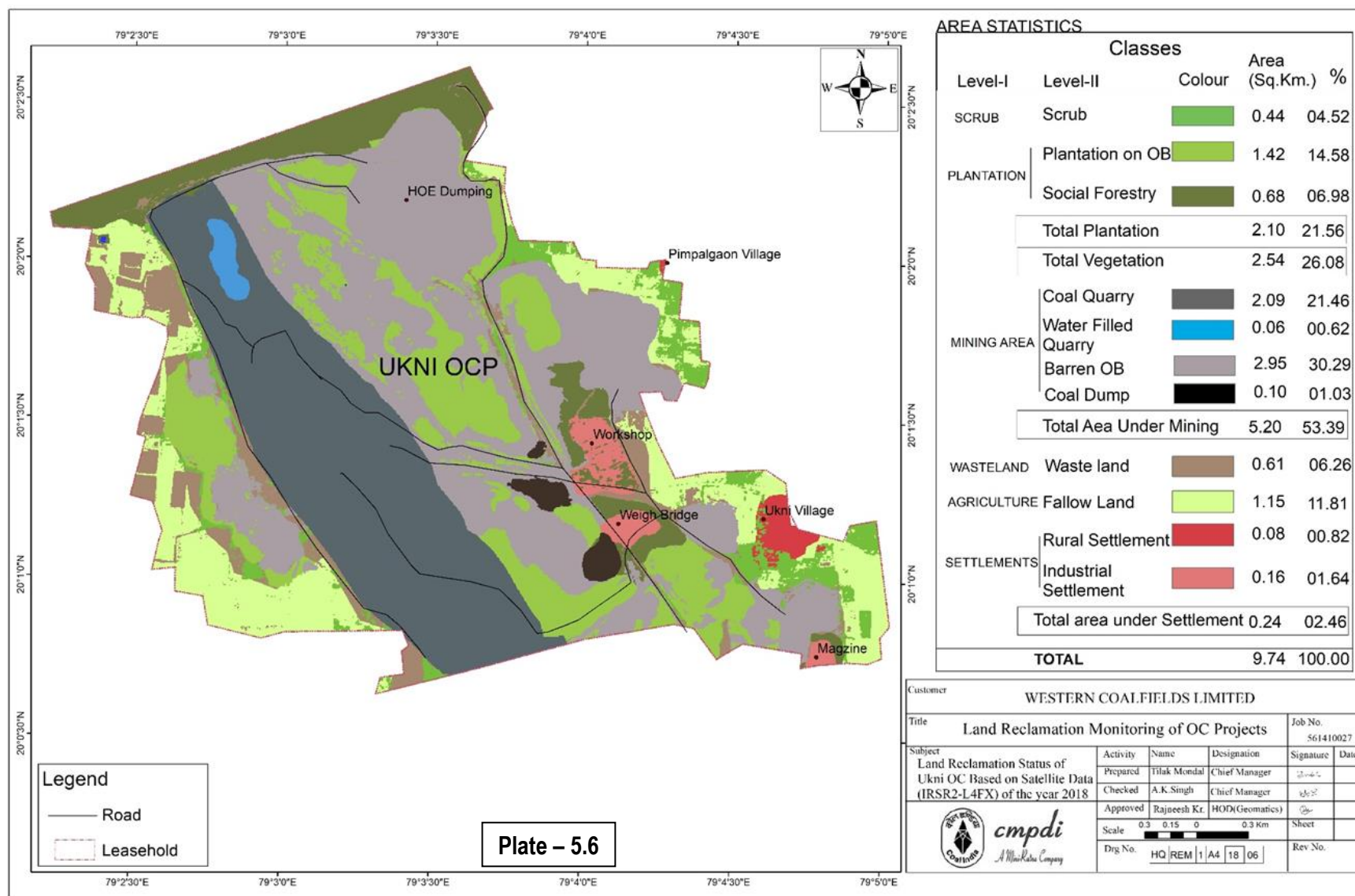


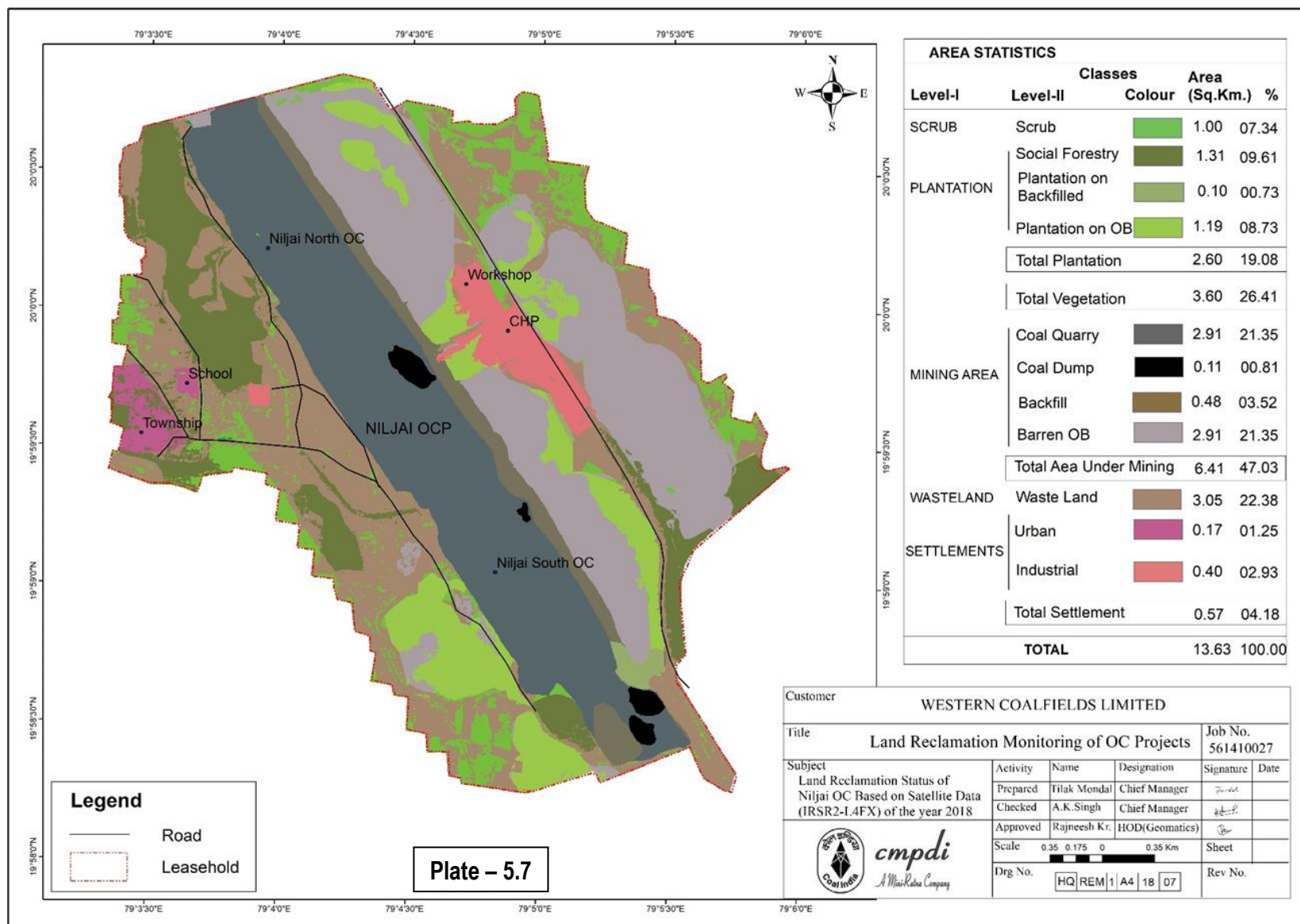






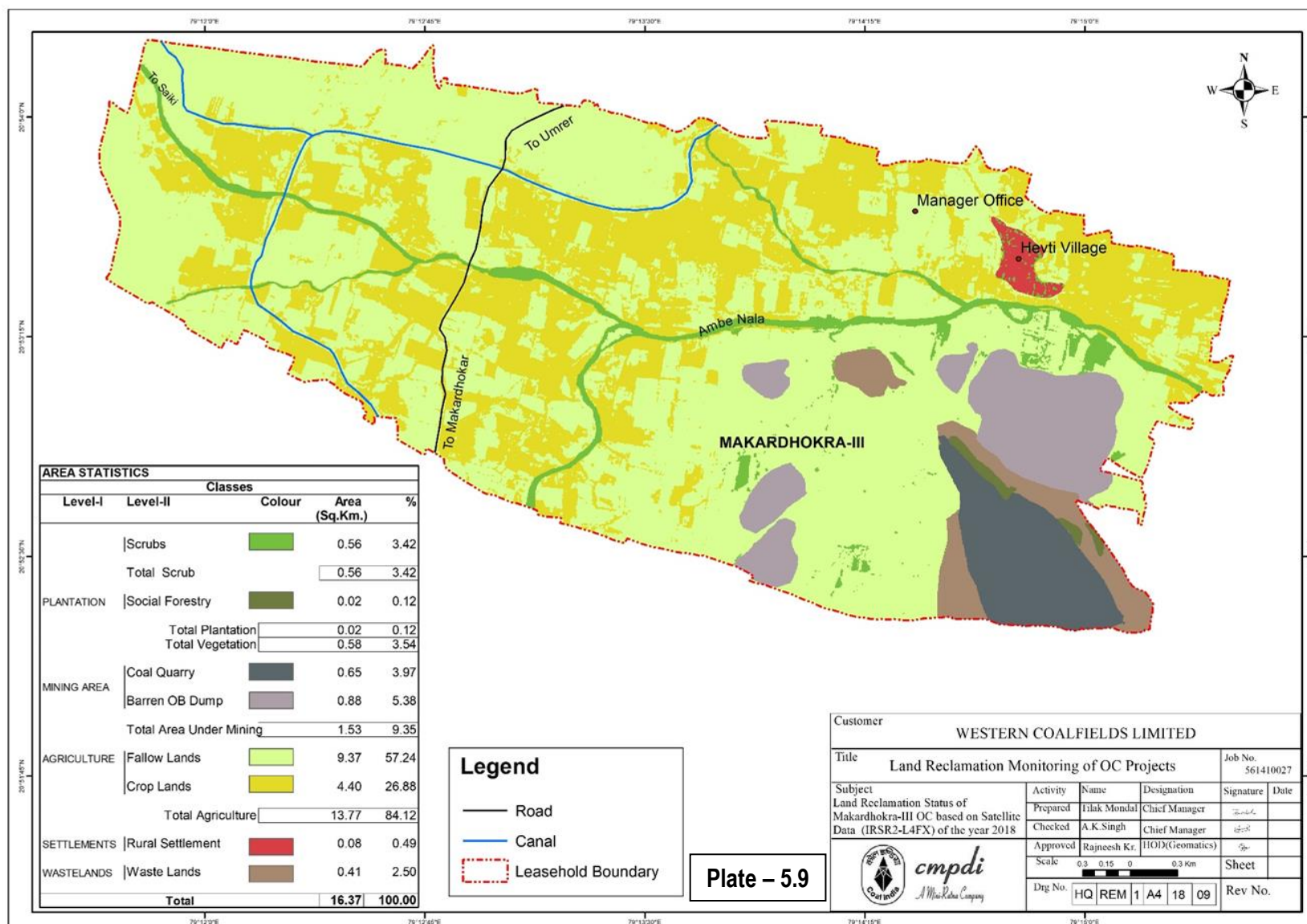


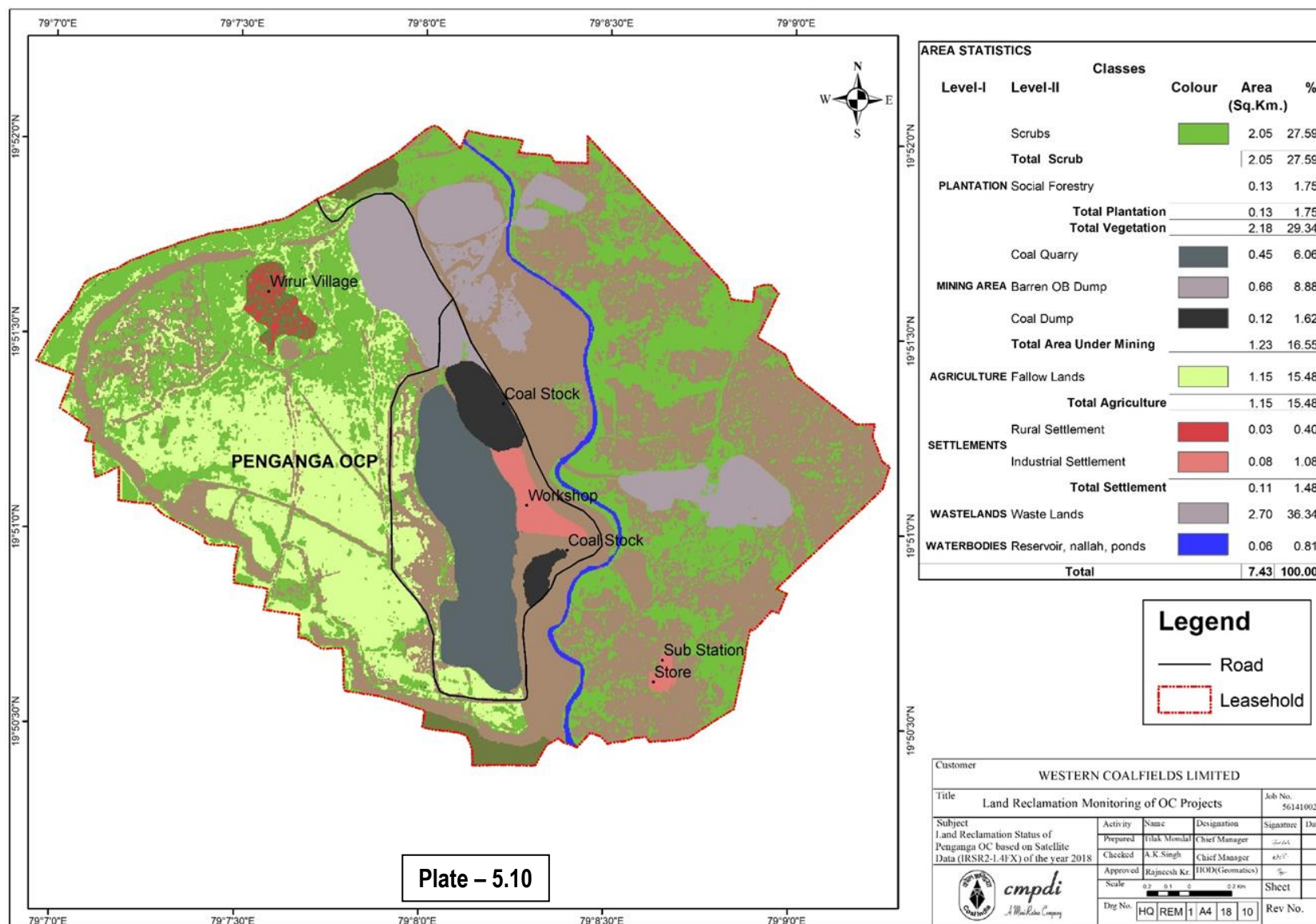












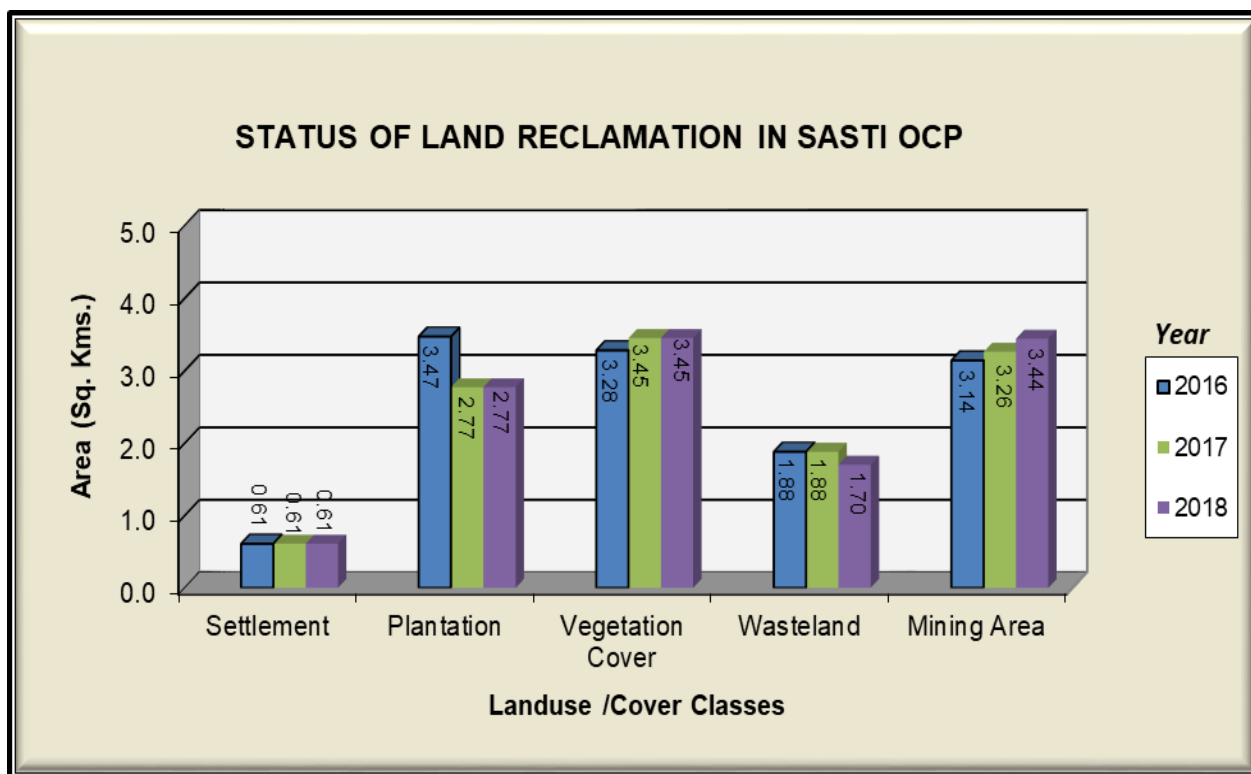


Figure - 5.2

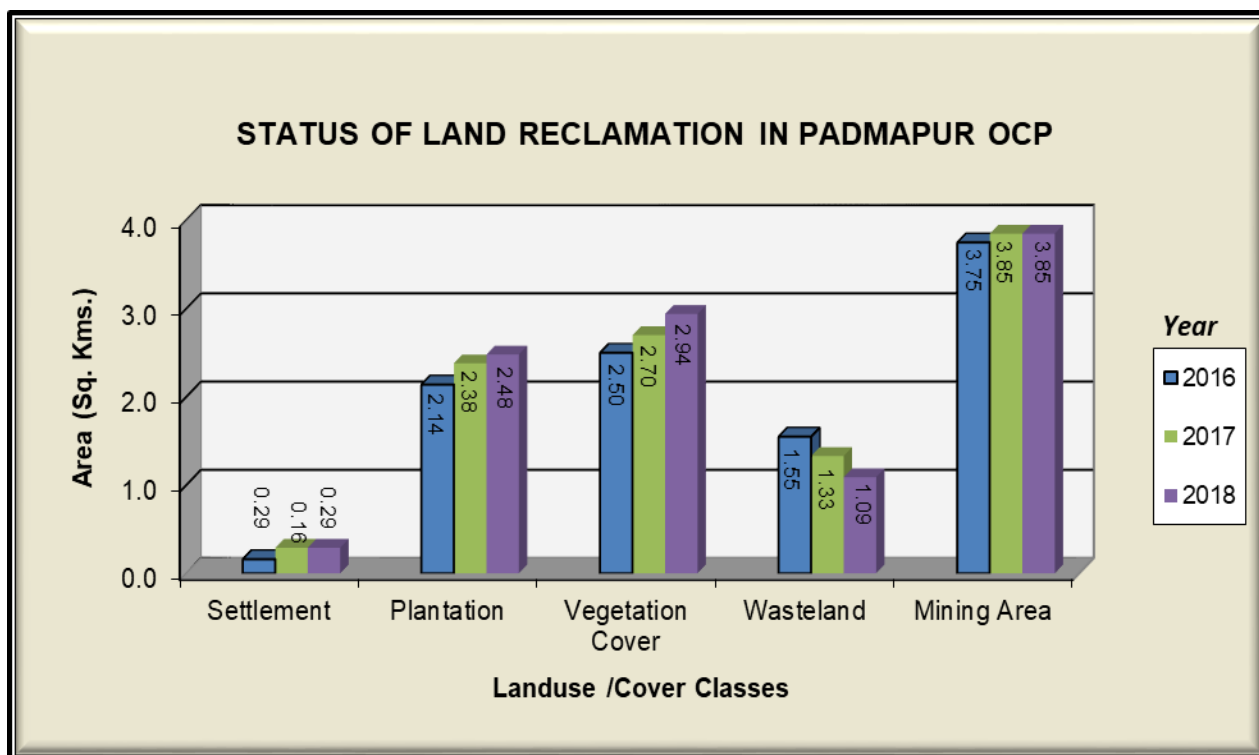


Figure - 5.3

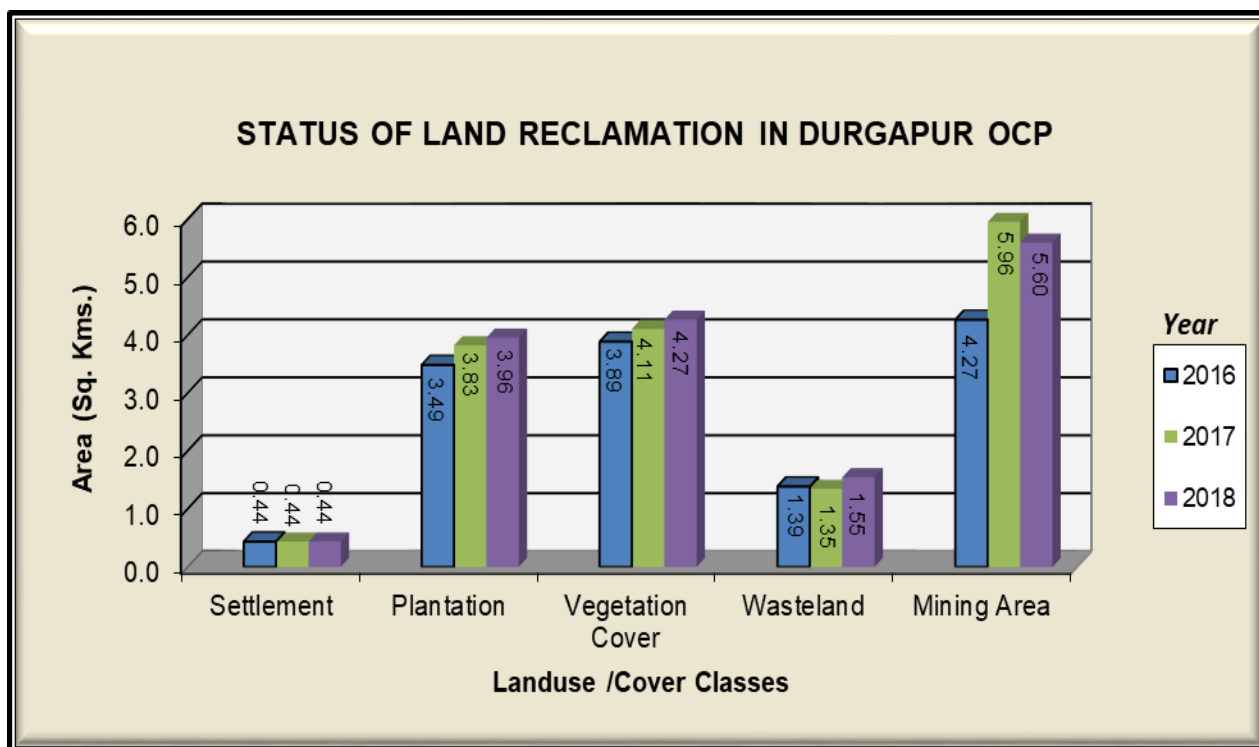


Figure - 5.4

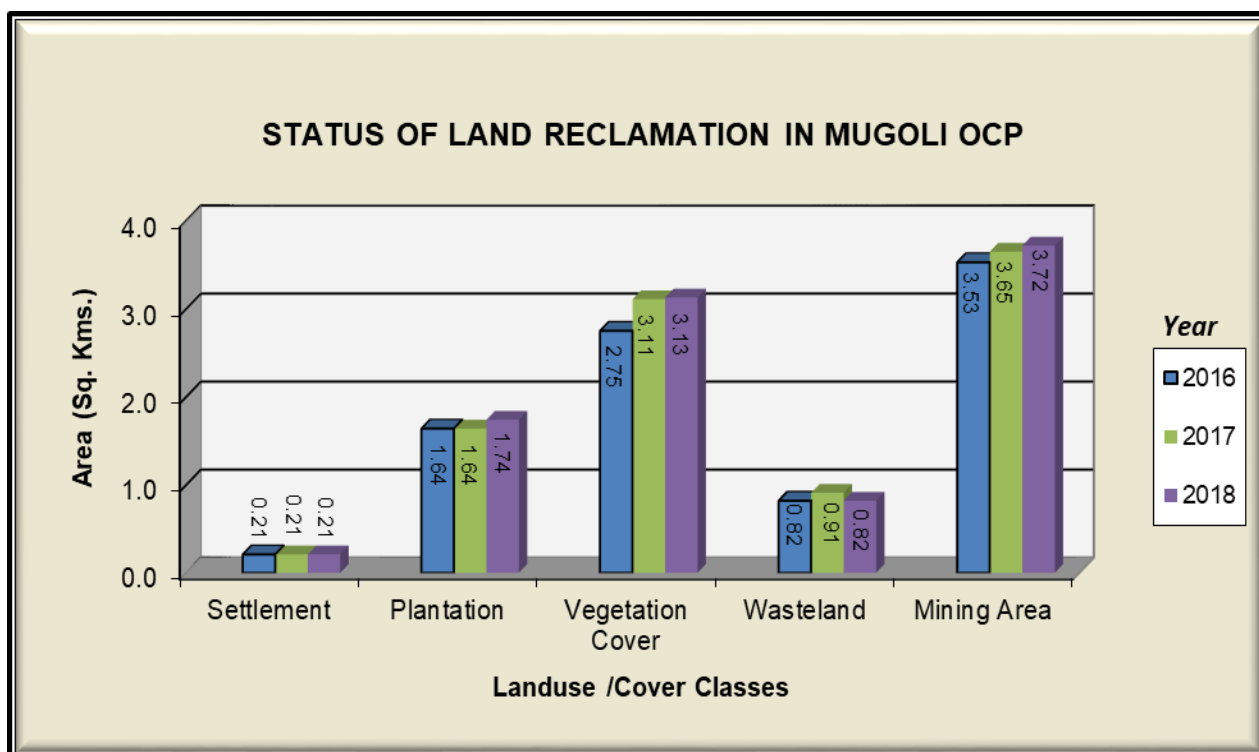


Figure - 5.5

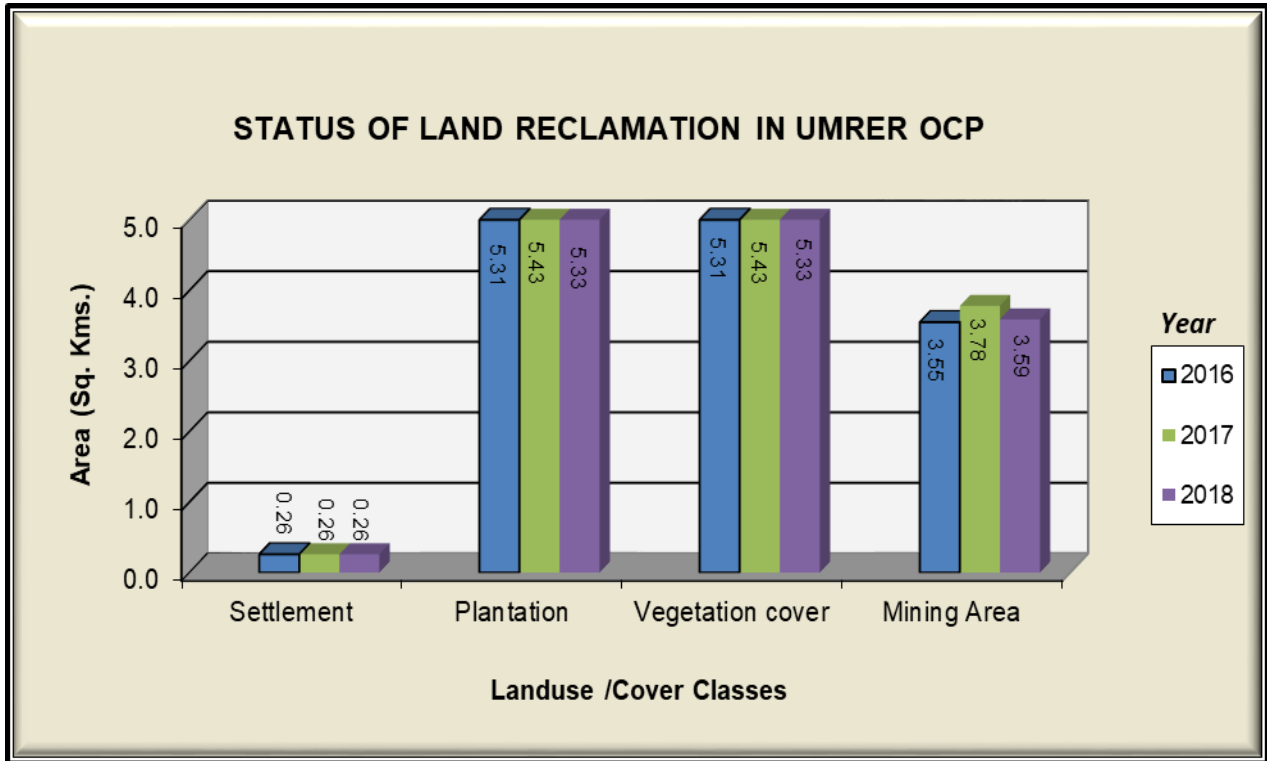


Figure - 5.6

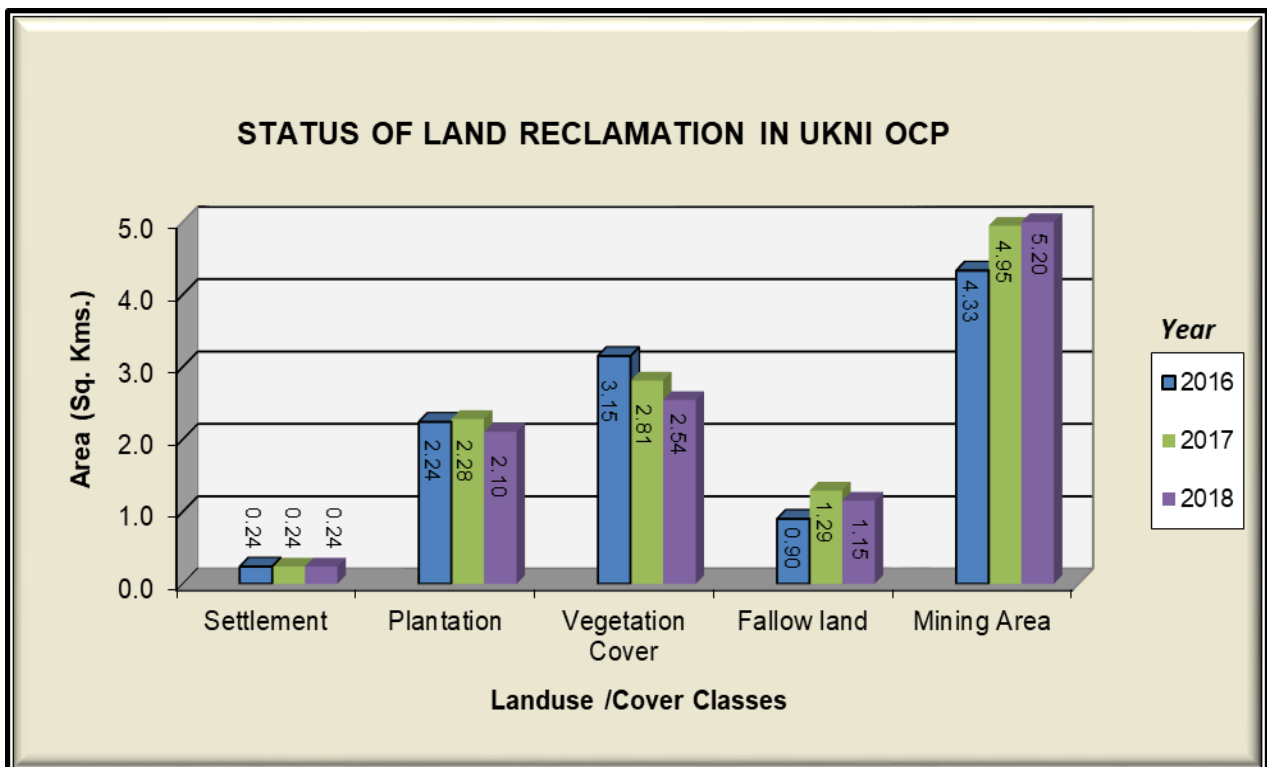


Figure - 5.7

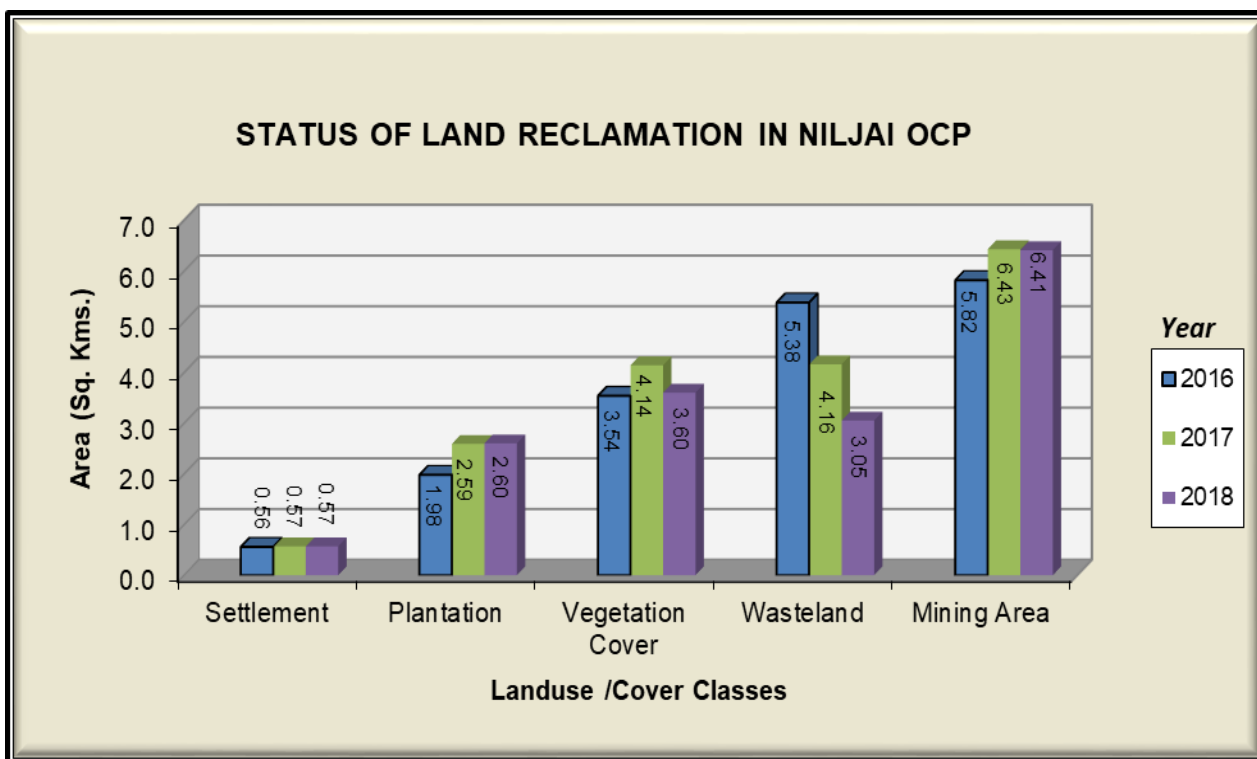


Figure - 5.8

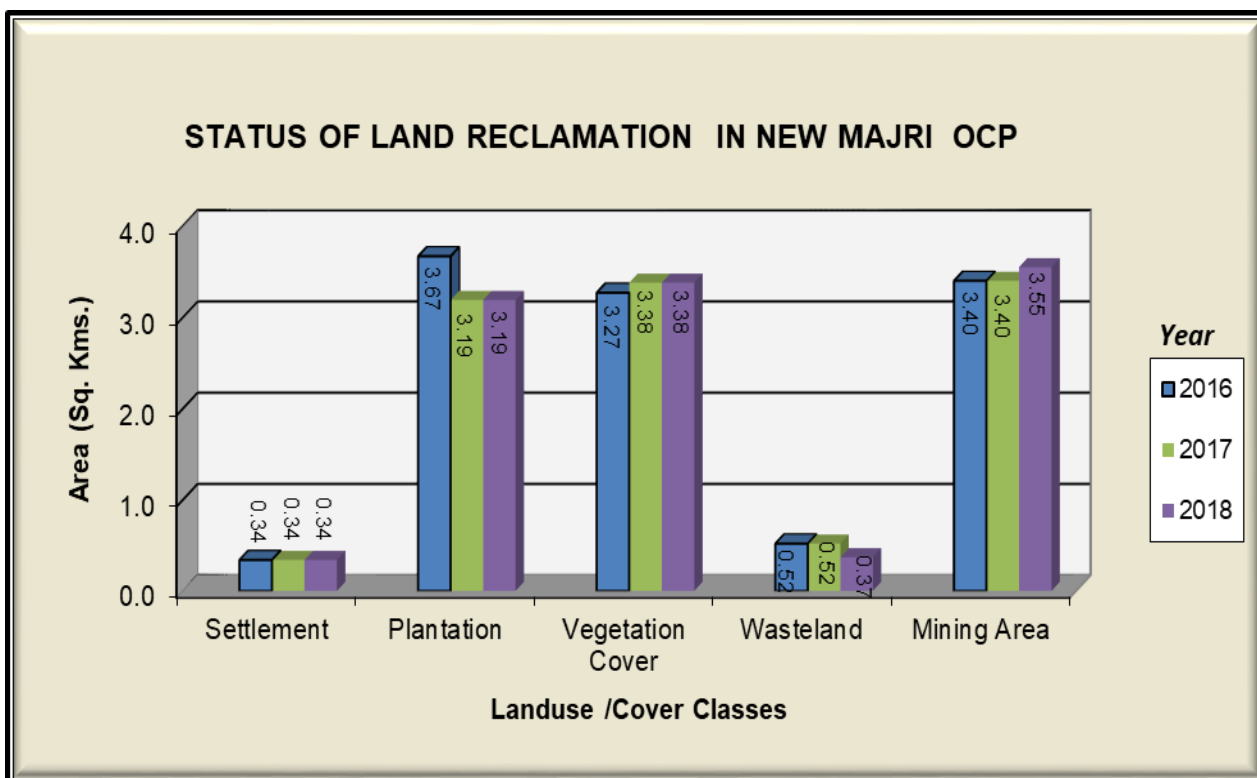


Figure - 5.9

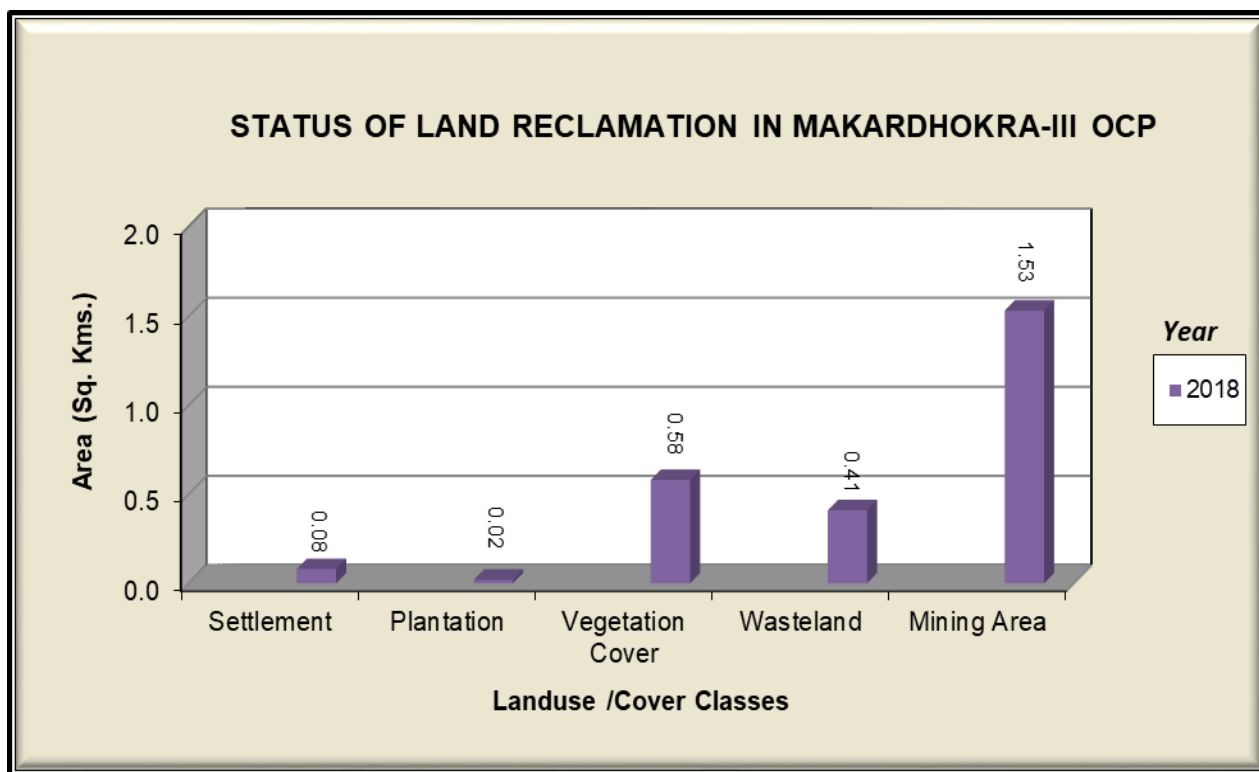


Figure – 5.10

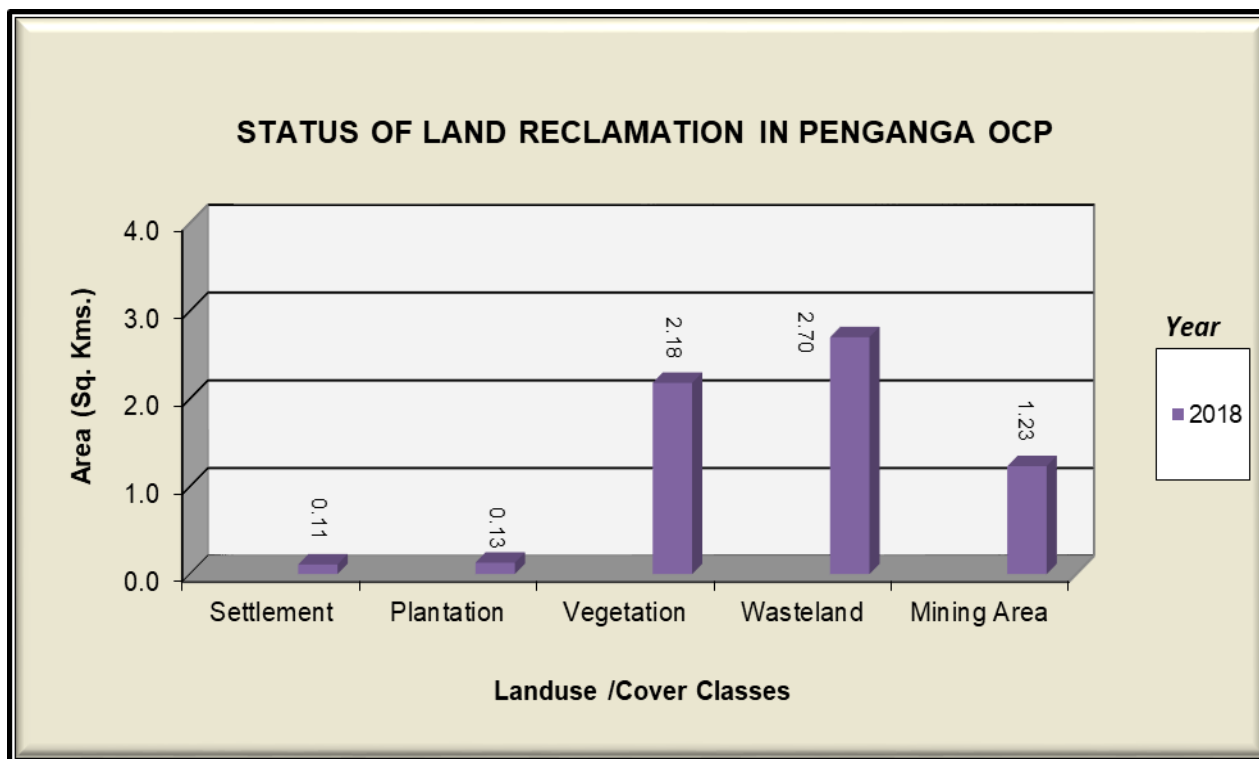
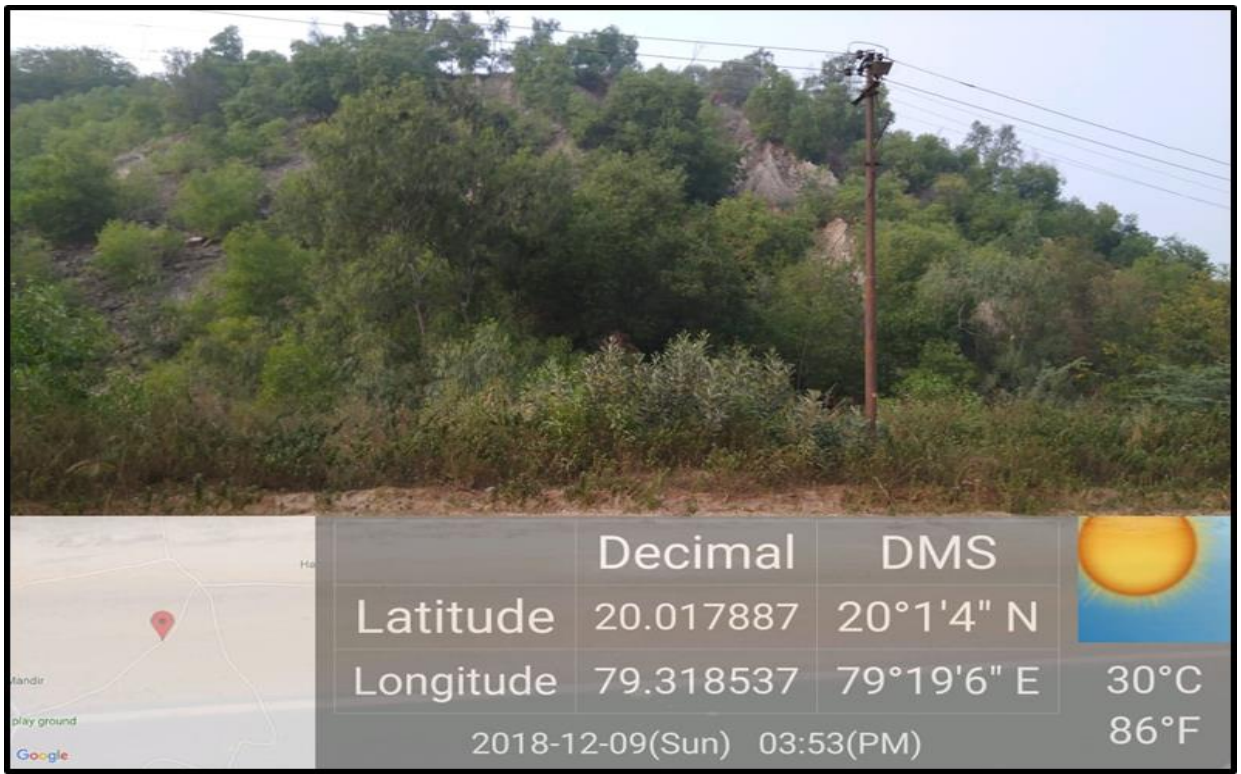


Figure - 5.11





Photograph -5.1: *Plantation on Backfill in Sasti OCP*

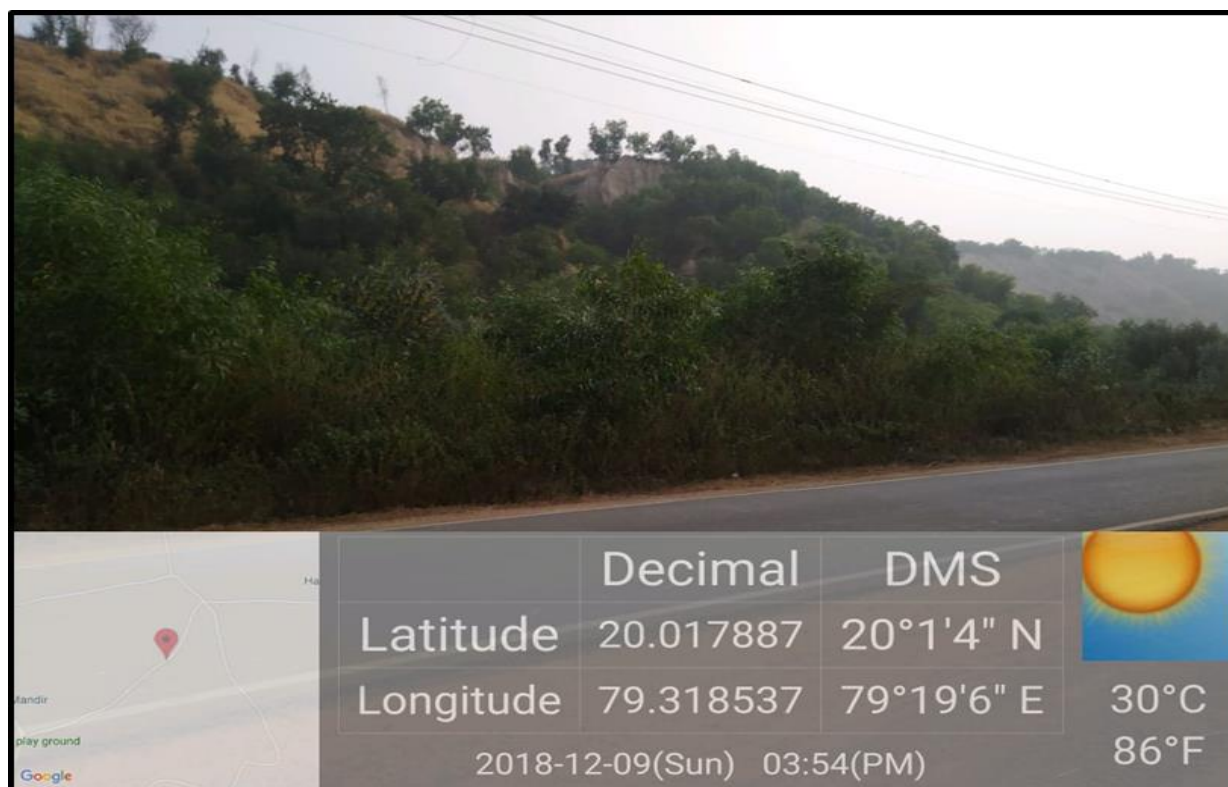


Photograph – 5.2: *Plantation on OB dump in Padmapur OCP*

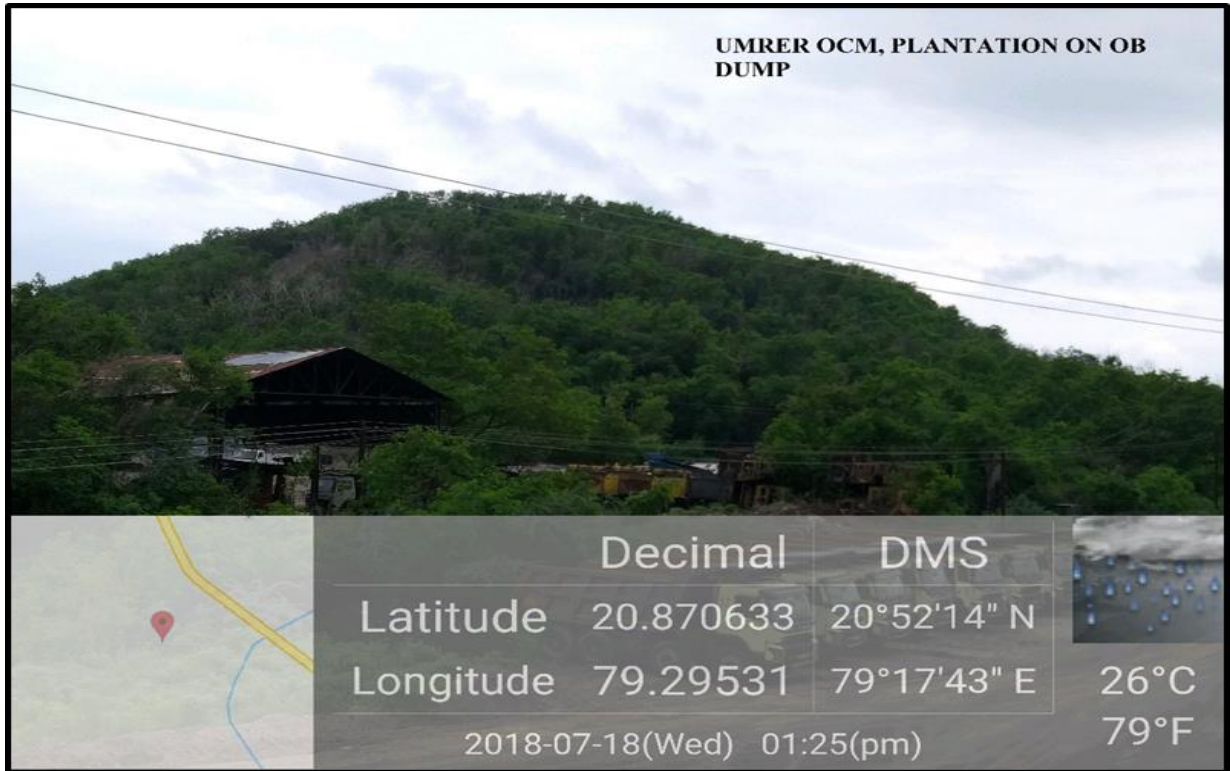




Photograph – 5.3: *Plantation on OB dump in Mugoli OCP*



Photograph – 5.4: *Plantation on OB dump in Durgapur OCP*



Photograph – 5.5: Plantation on External OB Dump in Umrer OCP



Photograph – 5.6: Plantation on External OB Dump in Ukni OCP





**Photograph – 5.7 : Plantation along road side in Niljai OCP**



**Photograph – 5.8 : Plantation along embankment in New Majri OCP**





Photograph – 5.9: Social Forestry in Makardhokra - III OCP



Photograph – 5.10: Avenue Plantation in Penganga OCP

**SOUTH EASTERN COALFIELDS LIMITED**

## **6.0 Land Reclamation Status in South Eastern Coalfields Limited**

**6.1** Following ten opencast projects of SECL producing 5 million cubic m. or more (Coal+OB) together were taken up for land reclamation monitoring during the year 2018-19:

- Dipka
- Gevra
- Kusmunda
- Manikpur
- Dugga
- Bishrampur
- Chirimiri
- Rajnagar
- Dhanpuri
- Jamuna

**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 cover / class present in the mine leasehold boundaries of the above projects for the year 2018 are shown in the Table –6.2. Land use / cover maps derived from satellite data are shown in Plate 6.1 - 6.10. Reports on land reclamation status of the above mentioned projects, were also prepared for the year 2008 to 2017 on annual basis. Year wise changes in the different land use / cover classes in last three years based on satellite data are depicted in Bar Charts in Fig. 6.2 - 6.11.

**6.3** Study reveals that in the projects of SECL as mentioned above, out of total 70.77 Km<sup>2</sup> excavated area; 51.25 Km<sup>2</sup> area (72.42%) is under reclamation, out of which 25.62 Km<sup>2</sup> (36.20%) area has already been biologically reclaimed and 25.63 Km<sup>2</sup> (36.22%) area is under technical reclamation.

- 6.4** After analyzing the satellite data of the year 2018, it is evident that area under land reclamation has increased from 48.34 Km<sup>2</sup> in the year 2017 to 51.25 Km<sup>2</sup> in the year 2018 in the above ten opencast projects of SECL in a period of one year. There is an increase of 2.91 Km<sup>2</sup> of area under reclamation in SECL with respect to the previous year 2017, out of which, there is an increase of 0.66 Km<sup>2</sup> in biological reclamation and 2.25 Km<sup>2</sup> area under technical reclamation (barren backfilling) respectively in the year 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) except for Manikpur, Bishrampur and Rajnagar opencast projects with respect to the year 2017. This may be due to OB dumping on vegetated backfilled area due to constrain of dumping space in these projects
- 6.6** There has been increase in area under technical reclamation (backfilling) overall but in projects like Kusmunda & Jamuna OCPs where area under technical reclamation has reduced marginally as compared to the year 2017, it seems that more backfilled areas have come under plantation (Biological Reclamation).
- 6.7** Study indicates that in Manikpur and Bishrampur opencast projects, total area under plantation (Green Cover) in the year 2018 has reduced marginally with respect to the year 2017 because of the OB dumping on vegetated backfilled / OB Dump area due to constrain of dumping space.
- 6.8** Out of 10 projects of SECL, Bishrampur (90.23%) ranks on top for land reclamation followed by Jamuna OCP (90.02) and Rajnagar (89.67%) in the year 2018-19.

Table – 6.1

**Project wise Land Reclamation Status in Opencast Projects of SECL  
(> 5 million Cu. M. of Coal+OB) based on Satellite Data of the Year 2018**

(Area in Sq. Kms.)

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)	
			2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Dipka	19.99	2.43	2.54	0.56	0.60	1.41	1.39	1.52	1.56	3.35	3.57	6.34	6.71	3.49	3.55	2.99	3.14
			38.33%	37.84%	8.83%	8.94%					52.84%	53.23%			17.47%	17.73%	47.16%	46.77%
2	Gevra	41.84	7.47	7.92	2.28	2.28	3.84	3.87	2.84	2.92	5.08	5.15	14.83	15.35	8.96	9.07	9.75	10.20
			50.36%	51.59%	15.39%	14.85%					34.25%	33.56%			21.42%	21.66%	65.75%	66.44%
3	Kusmunda	16.72	2.61	2.44	0.78	0.96	2.08	2.18	1.49	1.52	2.59	3.13	5.98	6.53	4.36	4.66	3.39	3.40
			43.63%	37.37%	13.07%	14.70%					43.30%	47.93%			26.05%	27.87%	56.70%	52.07%
4	Manikpur	19.44	1.10	1.13	0.88	0.70	1.24	1.30	0.67	0.47	2.52	2.23	4.50	4.06	2.79	2.47	1.98	1.83
			24.44%	27.83%	19.56%	17.24%					56.00%	54.93%			14.36%	12.70%	44.00%	45.07%
5	Dugga	5.41	1.32	1.55	1.86	1.87	0.14	0.14	0.00	0.00	0.48	0.48	3.66	3.90	1.99	2.01	3.18	3.42
			36.11%	39.74%	50.75%	47.95%					13.13%	12.31%			36.84%	37.15%	86.87%	87.69%
6	Bishrampur	15.23	3.69	3.99	8.16	8.11	0.00	0.00	0.22	0.22	1.36	1.31	13.21	13.41	8.38	8.33	11.85	12.10
			27.91%	29.75%	61.79%	60.48%					10.30%	9.77%			55.02%	54.69%	89.70%	90.23%
7	Chirimiri	6.51	1.32	1.44	1.04	1.06	0.00	0.00	0.83	0.83	0.43	0.33	2.79	2.83	1.87	1.89	2.36	2.50
			47.31%	50.88%	37.28%	37.46%					15.41%	11.66%			28.73%	29.03%	84.59%	88.34%
8	Rajnagar	8.61	2.07	2.12	3.64	3.61	0.00	0.00	0.60	0.71	0.72	0.66	6.42	6.39	4.24	4.32	5.70	5.73
			32.17%	33.18%	56.62%	56.49%					11.21%	10.33%			49.19%	50.17%	88.79%	89.67%
9	Dhanpuri	14.59	0.04	1.24	1.20	1.83	2.16	1.58	0.09	0.10	1.44	2.00	2.68	5.07	3.45	3.51	1.24	3.07
			1.49%	24.46%	44.78%	36.09%					53.73%	39.45%			23.65%	24.06%	46.27%	60.55%
10	Jamuna	8.85	1.34	1.26	4.57	4.60	0.01	0.00	0.21	0.21	0.59	0.65	6.50	6.51	4.79	4.81	5.91	5.86
			20.62%	19.35%	70.31%	70.66%					9.08%	9.98%			54.12%	54.35%	90.92%	90.02%
	TOTAL	157.20	23.38	25.63	24.96	25.62	10.89	10.46	8.47	8.53	18.56	19.52	66.90	70.77	44.32	44.61	48.34	51.25
			34.95%	36.22%	37.31%	36.20%					27.74%	27.58%			28.19%	28.38%	72.26%	72.42%

(% 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 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".



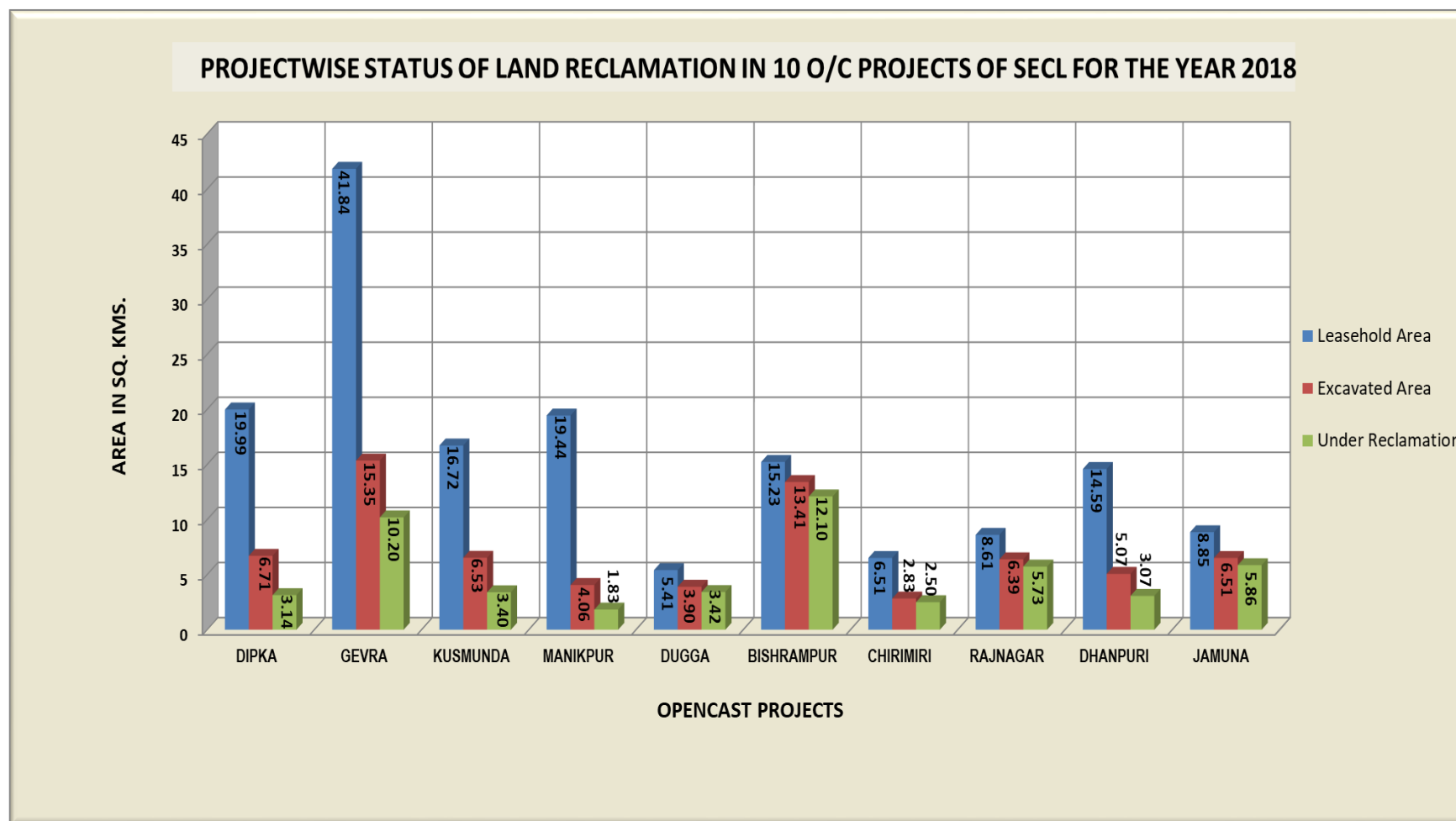


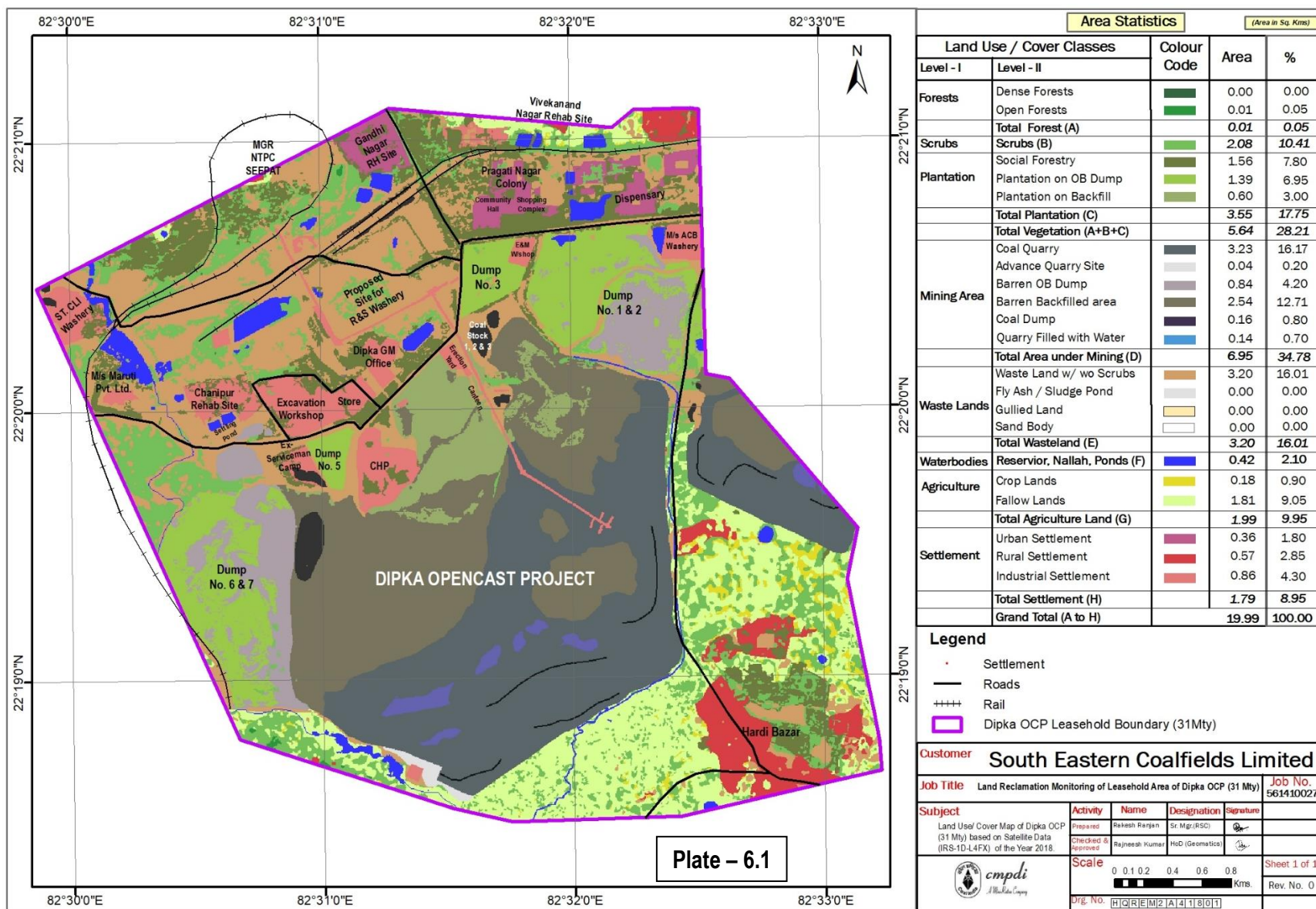
Fig.6.1: *Project wise Land reclamation status in OC projects of SECL in the year-2018*

Table 6.2

## Project wise Area Statistics of Land Use / Cover in OC Mines (&gt; 5 mcu.m.) of SECL based on Satellite data of the Year 2018

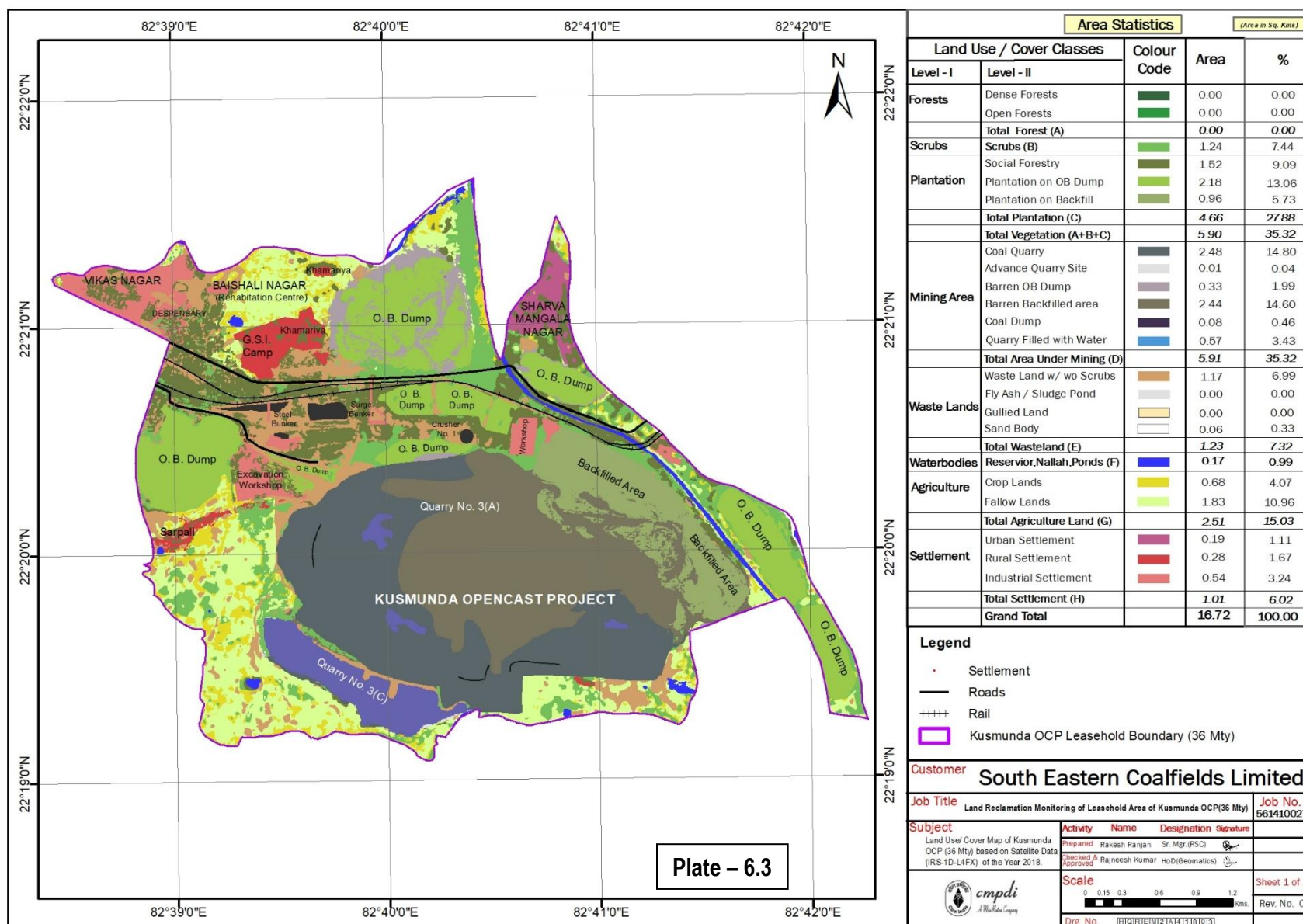
(Area in Km<sup>2</sup>)

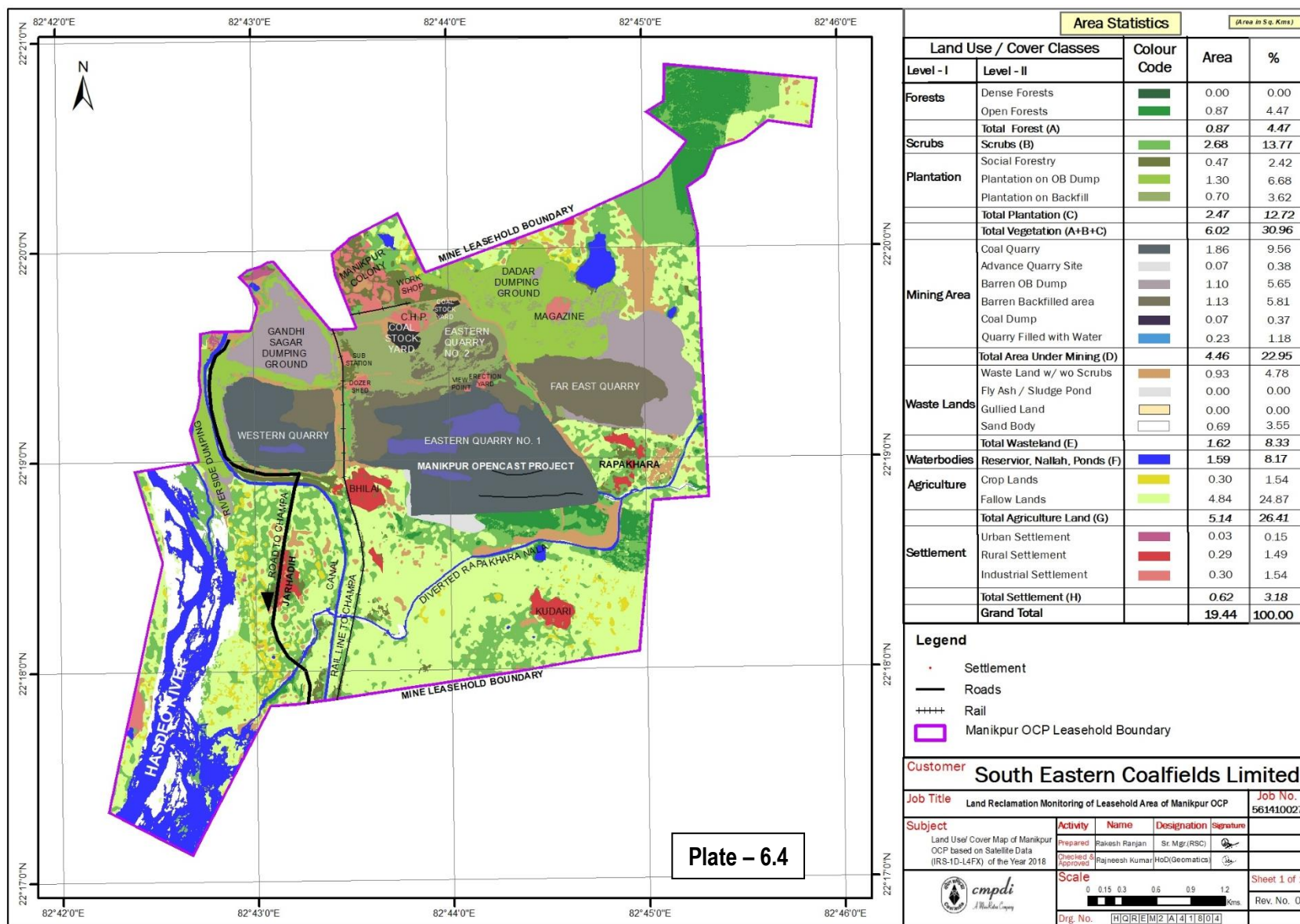
LAND USE / COVER CLASSES		COLOUR CODE	DIPKA		GEVRA		KUSMUNDA		MANIKPUR		DUGGA		BISHRAMPUR		CHIRIMIRI		RAJNAGAR		DHANPURI		JAMUNA		TOTAL	
FORESTS			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Dense Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest		0.01	0.05	0.00	0.00	0.00	0.00	0.87	4.47	0.00	0.00	0.00	0.00	0.60	9.23	0.01	0.12	1.07	7.31	0.00	0.00	2.56	1.63
	Total Forest (A)		0.01	0.05	0.00	0.00	0.00	0.00	0.87	4.47	0.00	0.00	0.00	0.00	0.60	9.23	0.01	0.12	1.07	7.31	0.00	0.00	2.56	1.63
PLANTATION	Scrubs (B)		2.08	10.41	4.01	9.59	1.24	7.44	2.68	13.77	0.19	3.52	0.35	2.30	1.44	22.18	0.28	3.25	2.71	18.59	0.21	2.37	15.20	9.67
	Social Forestry (C)		1.56	7.80	2.92	6.98	1.52	9.09	0.47	2.42	0.00	0.00	0.22	1.41	0.83	12.74	0.71	8.19	0.10	0.70	0.21	2.37	8.53	5.42
	Plantation on External OB Dump		1.39	6.95	3.87	9.25	2.18	13.06	1.30	6.68	0.14	2.58	0.00	0.00	0.00	0.00	0.00	0.00	1.58	10.83	0.00	0.00	10.46	6.65
	Plantation on Backfill / Excavated Area (Biological Reclamation)		0.60	3.00	2.28	5.45	0.96	5.73	0.70	3.62	1.87	34.60	8.11	53.24	1.06	16.27	3.61	41.92	1.83	12.54	4.60	51.96	25.62	16.30
AREA UNDER ACTIVE MINING	Total Area under Plantation (Green Cover) (D)		3.55	17.75	9.07	21.68	4.66	27.88	2.47	12.72	2.01	37.18	8.33	54.65	1.89	29.01	4.32	50.11	3.51	24.07	4.81	54.33	44.61	28.38
	Total Vegetation (A to D)		5.64	28.21	13.08	31.27	5.90	35.32	6.02	30.96	2.20	40.70	8.68	56.95	3.94	60.42	4.61	53.48	7.29	49.97	5.02	56.70	62.36	39.67
	Coal Quarry		3.23	16.17	4.13	9.87	2.48	14.80	1.86	9.56	0.00	0.00	0.03	0.20	0.25	3.84	0.29	3.37	1.53	10.48	0.00	0.00	13.80	8.78
	Coal Dump		0.16	0.80	0.29	0.69	0.08	0.46	0.07	0.37	0.00	0.00	0.08	0.53	0.04	0.61	0.03	0.39	0.09	0.62	0.00	0.00	0.84	0.54
TECHNICAL RECLAMATION	Advance Quarry Site		0.04	0.20	0.03	0.07	0.01	0.04	0.07	0.38	0.00	0.00	0.00	0.00	0.03	0.46	0.00	0.00	0.17	1.16	0.00	0.00	0.35	0.22
	Quarry Filled With Water		0.14	0.70	0.70	1.67	0.57	3.43	0.23	1.18	0.48	8.88	1.20	7.90	0.01	0.15	0.34	3.95	0.21	1.44	0.65	7.35	4.54	2.89
	Total Area under Active Mining (F)		3.57	17.87	5.15	12.30	3.13	18.73	2.23	11.49	0.48	8.88	1.31	8.63	0.33	5.06	0.66	7.71	2.00	13.70	0.65	7.35	19.52	12.42
	Barren OB Dump (G)		0.84	4.20	1.15	2.75	0.33	1.99	1.10	5.65	0.06	1.11	0.00	0.00	0.00	0.00	0.10	1.16	2.14	14.67	0.00	0.00	5.72	3.64
WASTELANDS	Area under Barren Backfilling (Technical Reclamation)		2.54	12.71	7.92	18.93	2.44	14.60	1.13	5.81	1.55	28.58	3.99	26.19	1.44	22.09	2.12	24.67	1.24	8.50	1.26	14.24	25.63	16.30
	Total Area under Technical Reclamation (H)		2.54	12.71	7.92	18.93	2.44	14.60	1.13	5.81	1.55	28.58	3.99	26.19	1.44	22.09	2.12	24.67	1.24	8.50	1.26	14.24	25.63	16.30
	Total Area under Mining Operations (F+G+H)		6.95	34.78	14.22	33.98	5.91	35.32	4.46	22.95	2.09	38.57	5.30	34.82	1.77	27.15	2.89	33.54	5.38	36.87	1.91	21.59	50.87	32.36
	Waste Lands		3.20	16.01	4.95	11.83	1.17	6.99	0.93	4.78	0.24	4.44	0.17	1.10	0.61	9.36	0.19	2.25	0.99	6.78	0.65	7.35	13.10	8.33
WATERBODIES	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.06	0.33	0.69	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.47	
	Total Wasteland (I)		3.20	16.01	4.95	11.83	1.23	7.32	1.62	8.33	0.24	4.44	0.17	1.10	0.61	9.36	0.19	2.25	0.99	6.78	0.65	7.35	13.85	8.81
	Reservoir, nallah, ponds		0.42	2.10	0.25	0.60	0.17	0.99	1.59	8.17	0.00	0.00	0.03	0.20	0.04	0.61	0.25	2.90	0.02	0.14	0.00	0.00	2.76	1.76
	Total Waterbodies (J)		0.42	2.10	0.25	0.60	0.17	0.99	1.59	8.17	0.00	0.00	0.03	0.20	0.04	0.61	0.25	2.90	0.02	0.14	0.00	0.00	2.76	1.76
AGRICULTURE	Crop Lands		0.18	0.90	0.83	1.98	0.68	4.07	0.30	1.54	0.00	0.00	0.05	0.33	0.00	0.00	0.02	0.23	0.00	0.00	0.00	0.00	2.06	1.31
	Fallow Lands		1.81	9.05	5.34	12.75	1.83	10.96	4.84	24.87	0.86	15.91	0.93	6.07	0.00	0.00	0.38	4.40	0.78	5.35	1.13	12.77	17.89	11.38
	Total Agriculture (K)		1.99	9.95	6.17	14.73	2.51	15.03	5.14	26.41	0.86	15.91	0.98	6.40	0.00	0.00	0.40	4.63	0.78	5.35	1.13	12.77	19.95	12.69
	Urban Settlement		0.36	1.80	0.81	1.94	0.19	1.11	0.03	0.15	0.00	0.00	0.00	0.00	0.13	2.00	0.21	2.38	0.00	0.00	0.00	0.00	1.72	1.09
SETTLEMENTS	Rural Settlement		0.57	2.85	1.09	2.61	0.28	1.67	0.29	1.49	0.00	0.00	0.03	0.20	0.00	0.00	0.06	0.70	0.09	0.62	0.09	1.02	2.50	1.59
	Industrial Settlement		0.86	4.30	1.27	3.04	0.54	3.24	0.30	1.54	0.02	0.38	0.05	0.33	0.03	0.46	0.01	0.12	0.04	0.27	0.05	0.57	3.17	2.02
	Total Settlement (L)		1.79	8.95	3.17	7.59	1.01	6.02	0.62	3.18	0.02	0.38	0.08	0.53	0.16	2.46	0.28	3.20	0.13	0.89	0.14	1.59	7.39	4.70
	Grand Total		19.99	100.00	41.84	100.00	16.72	100.00	19.44	100.00	5.41	100.00	15.23	100.00	6.51	100.00	8.61	100.00	14.59	100.00	8.85	100.00	157.20	100.00

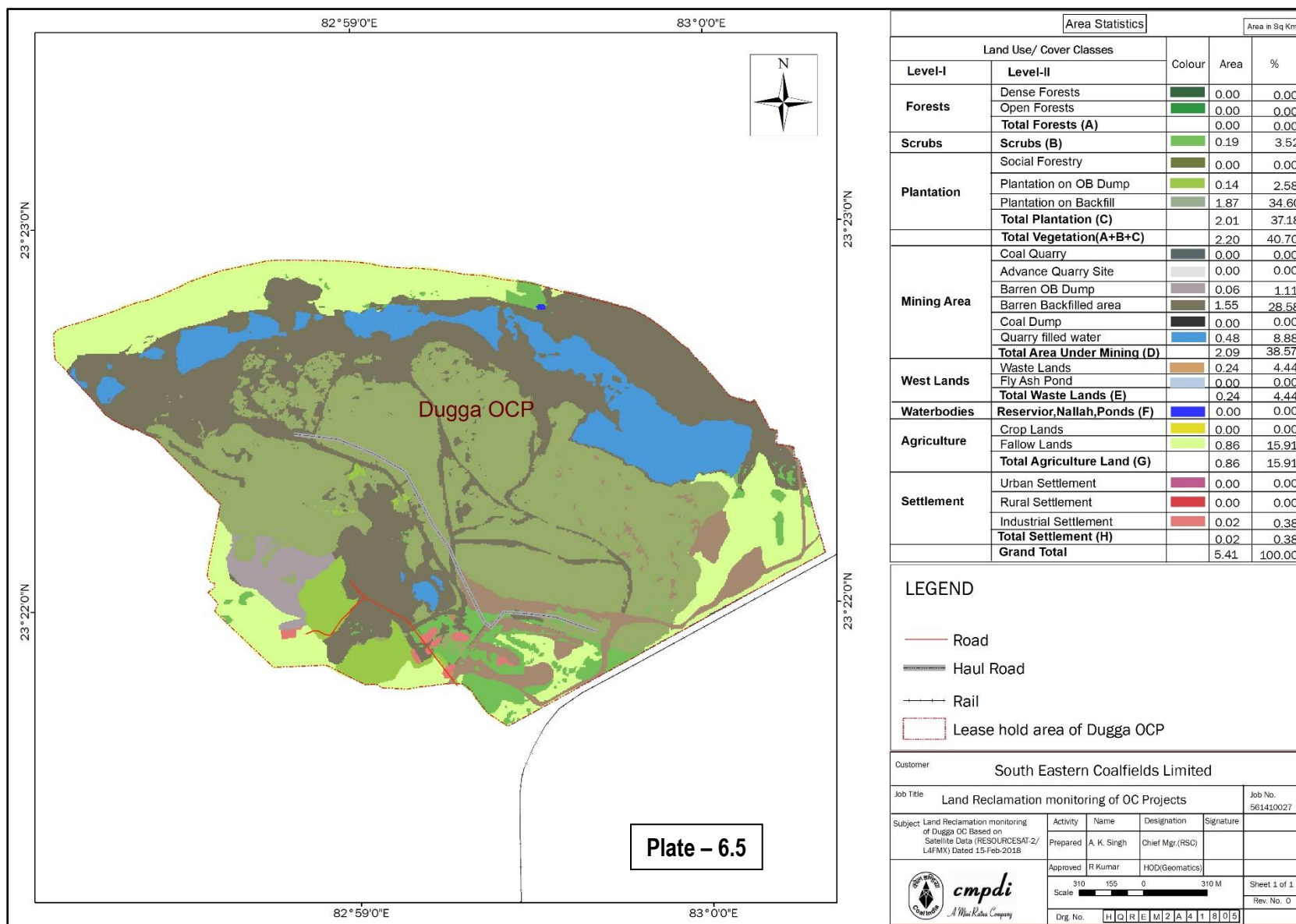




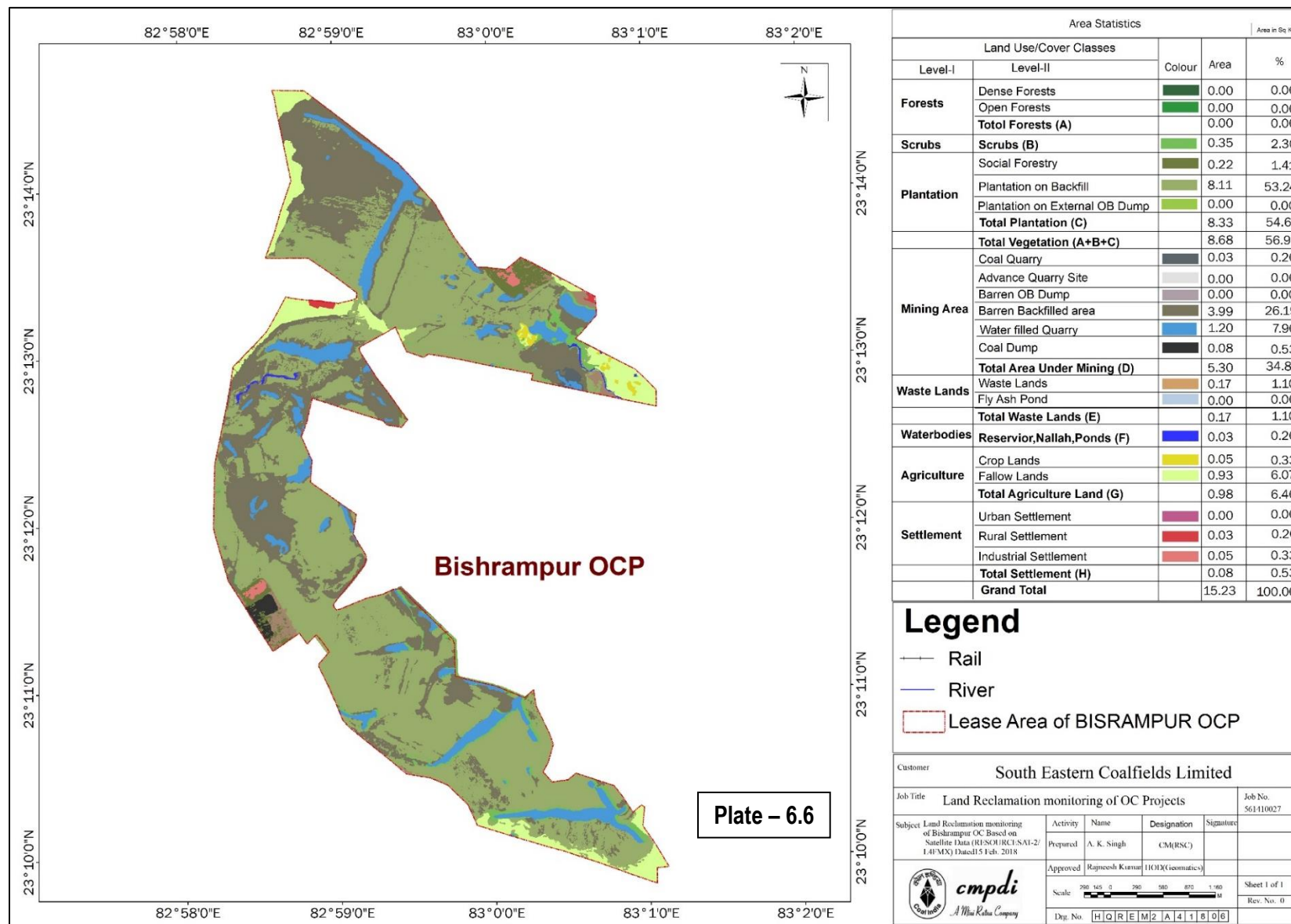




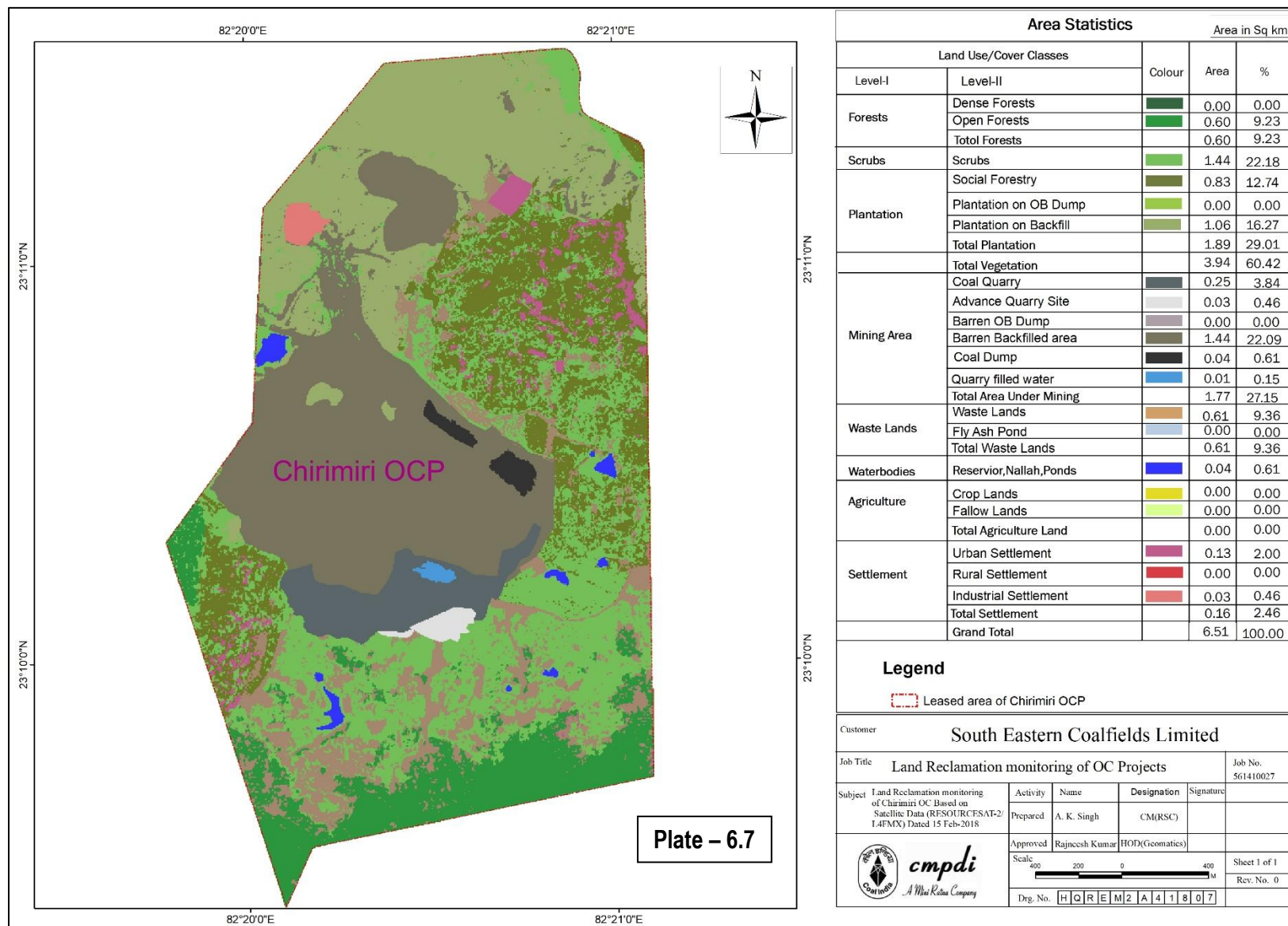




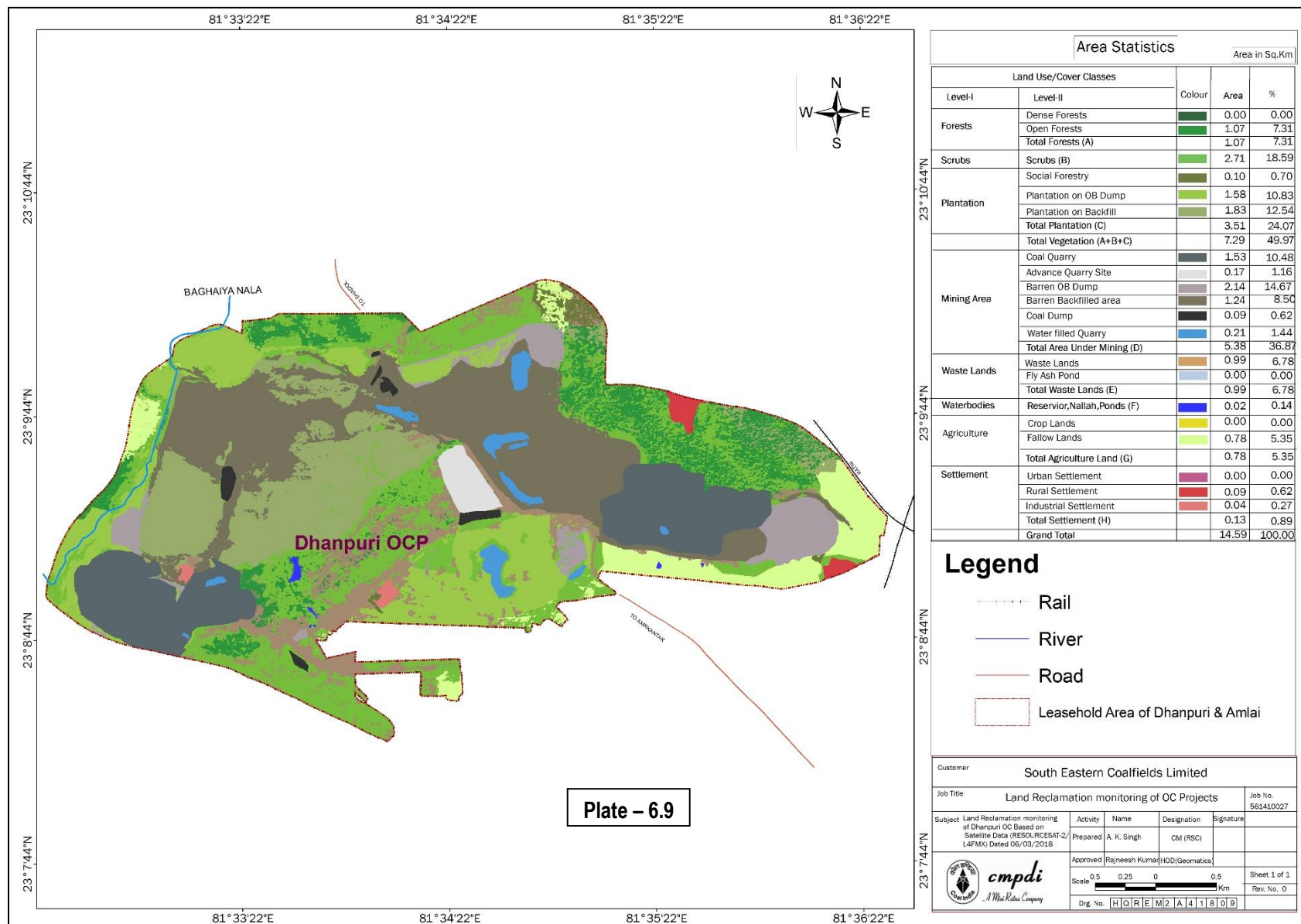
















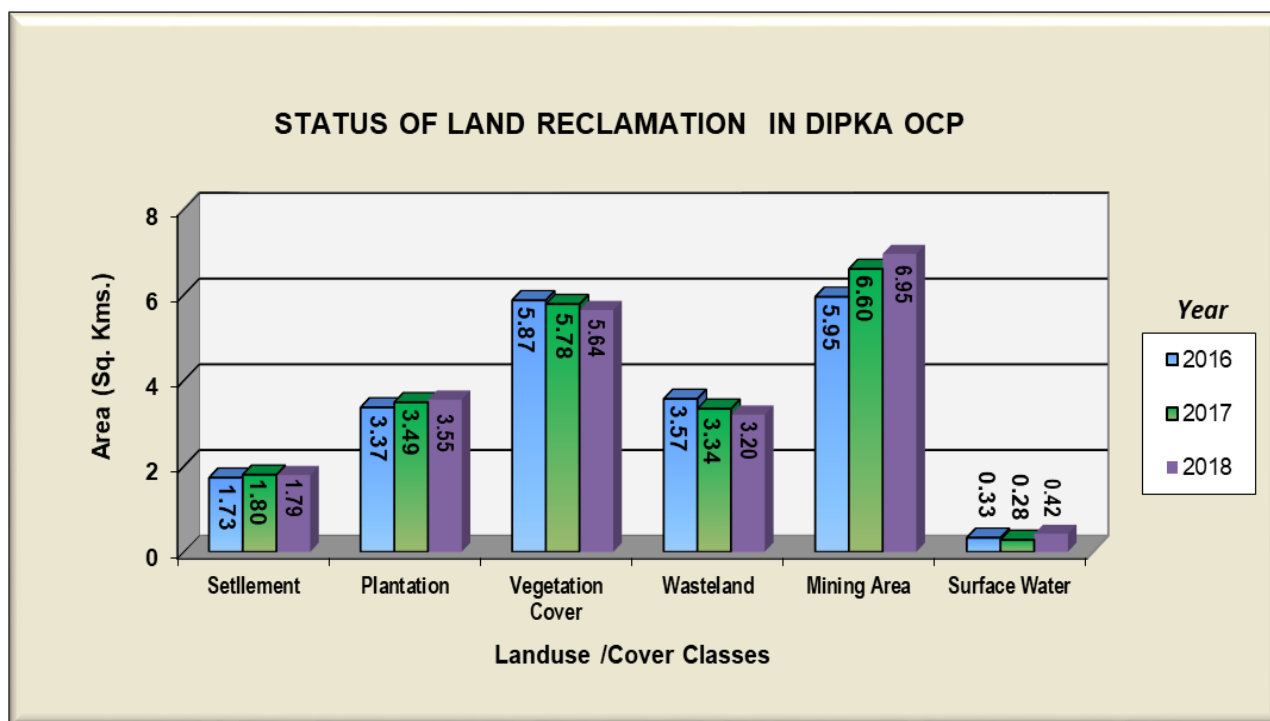


Figure 6.2

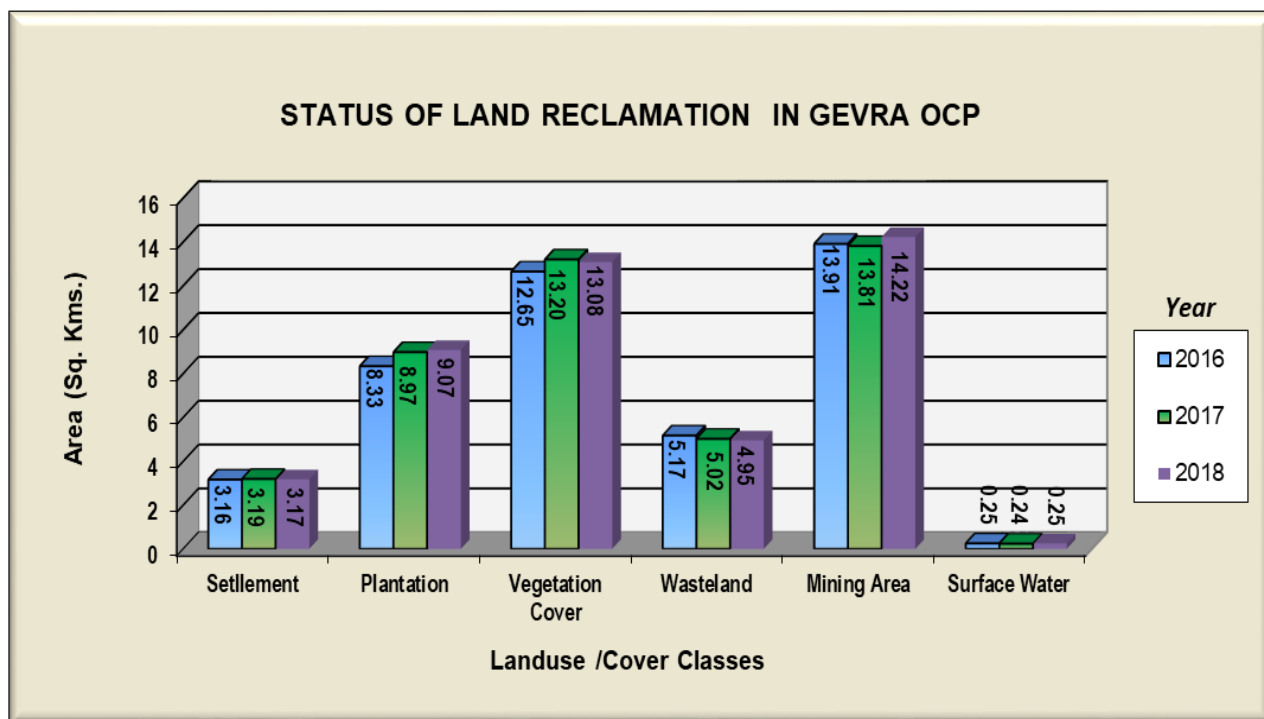


Figure 6.3

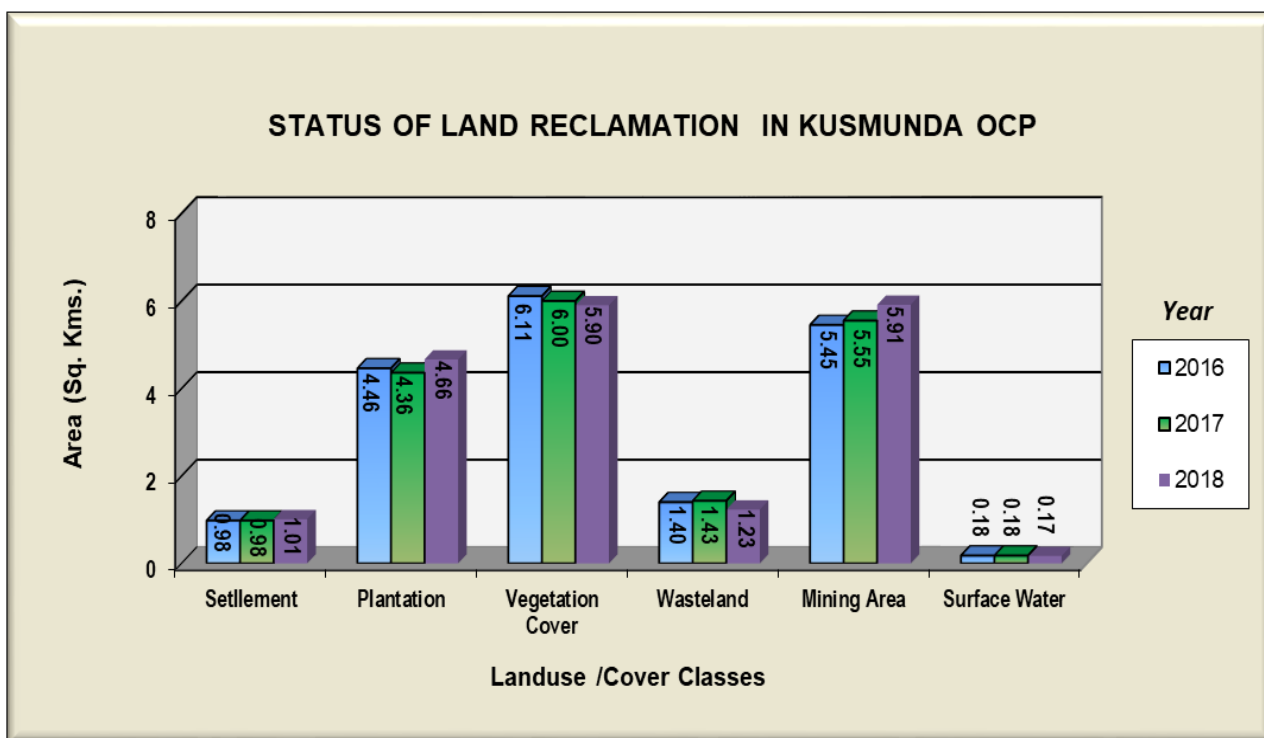


Figure 6.4

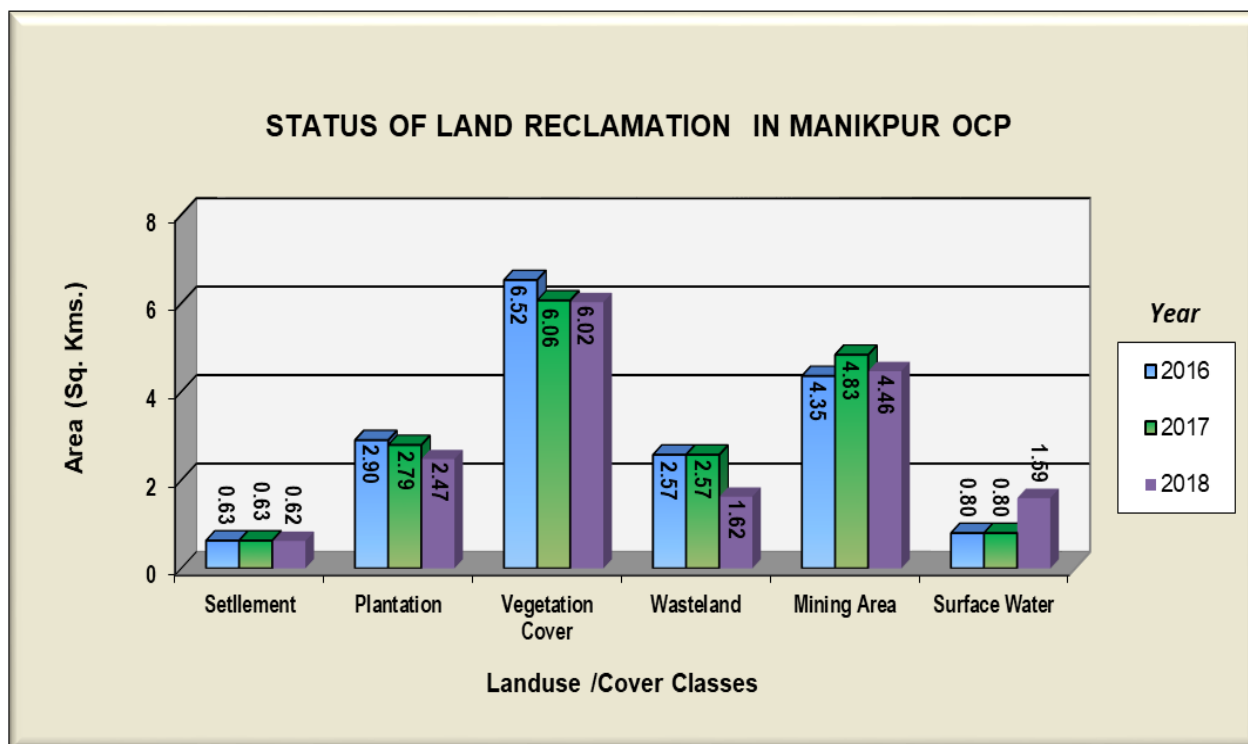


Figure 6.5

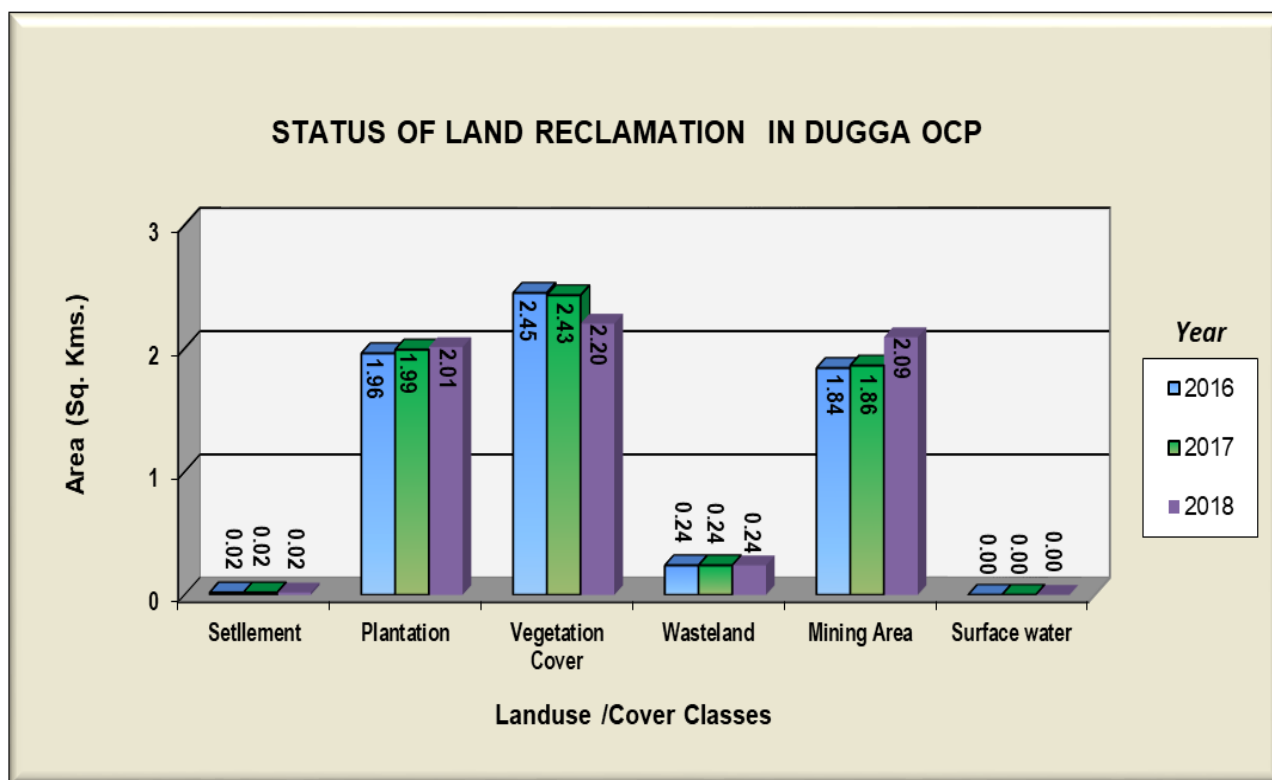


Figure 6.6

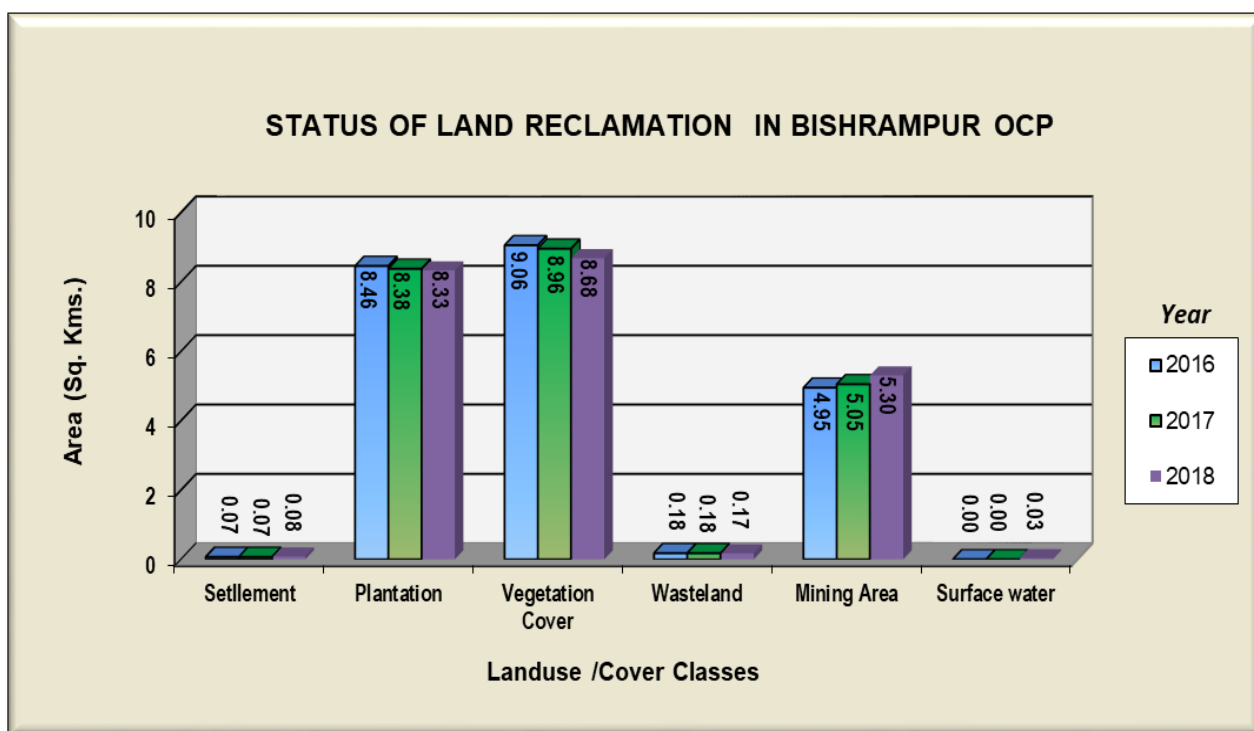


Figure 6.7



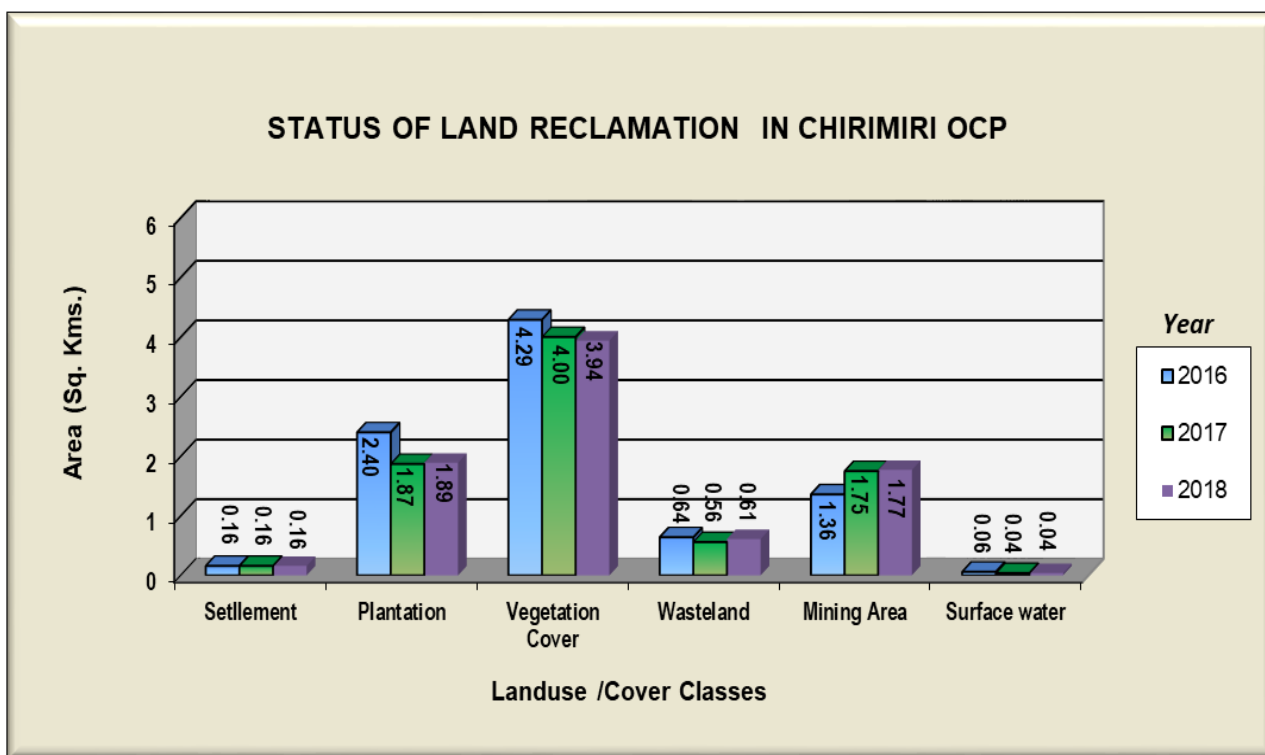


Figure 6.8

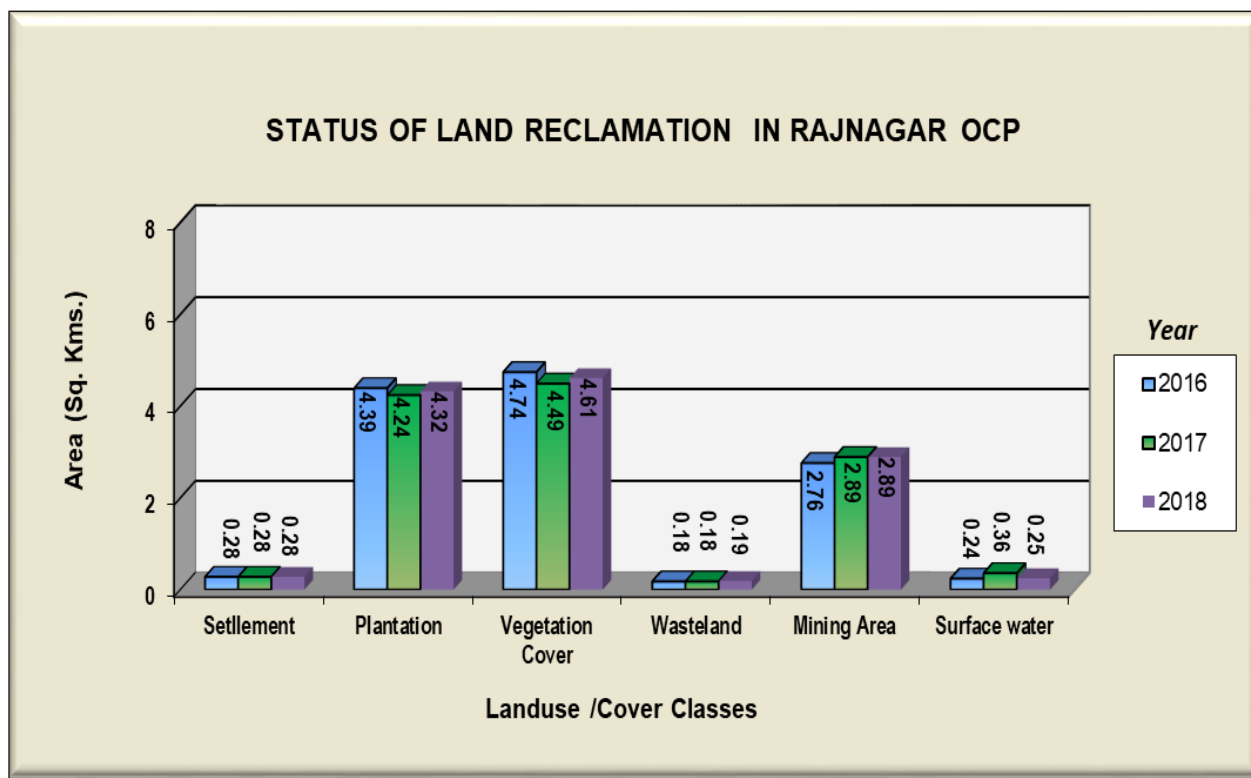


Figure 6.9

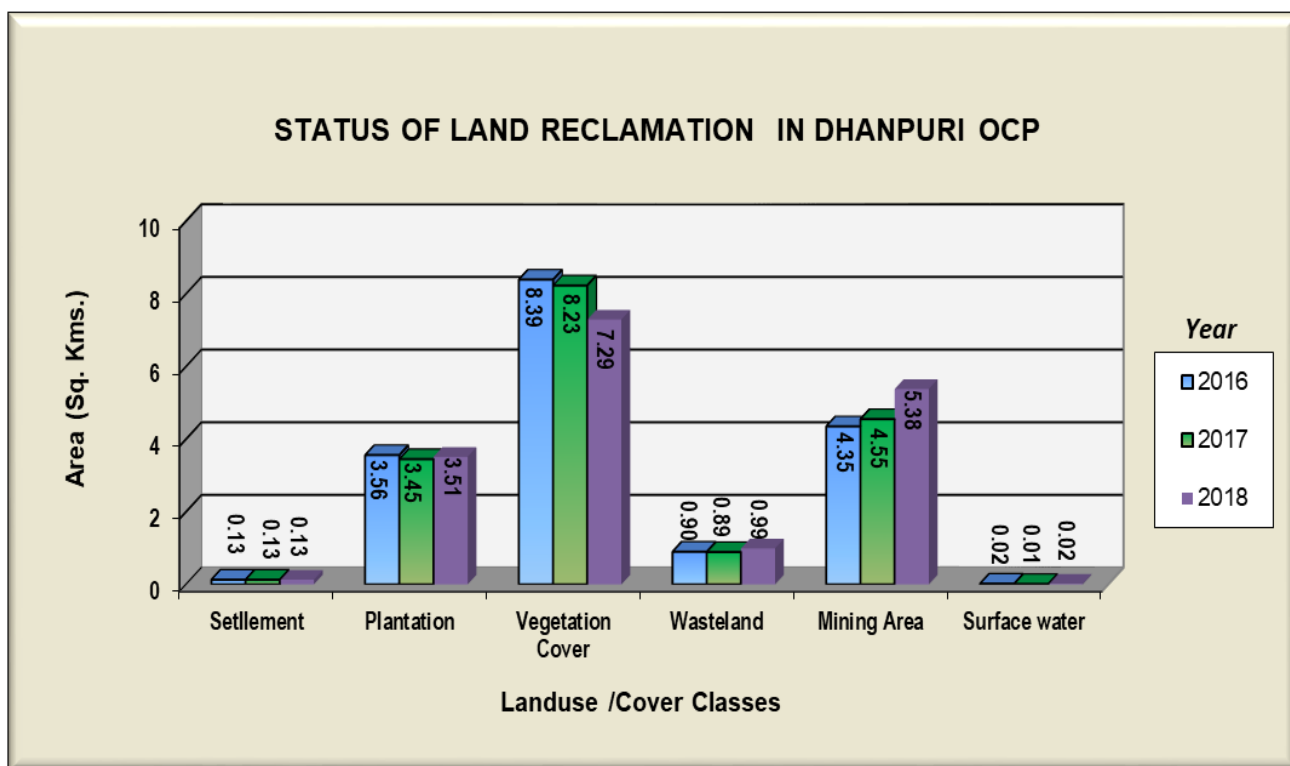


Figure 6.10

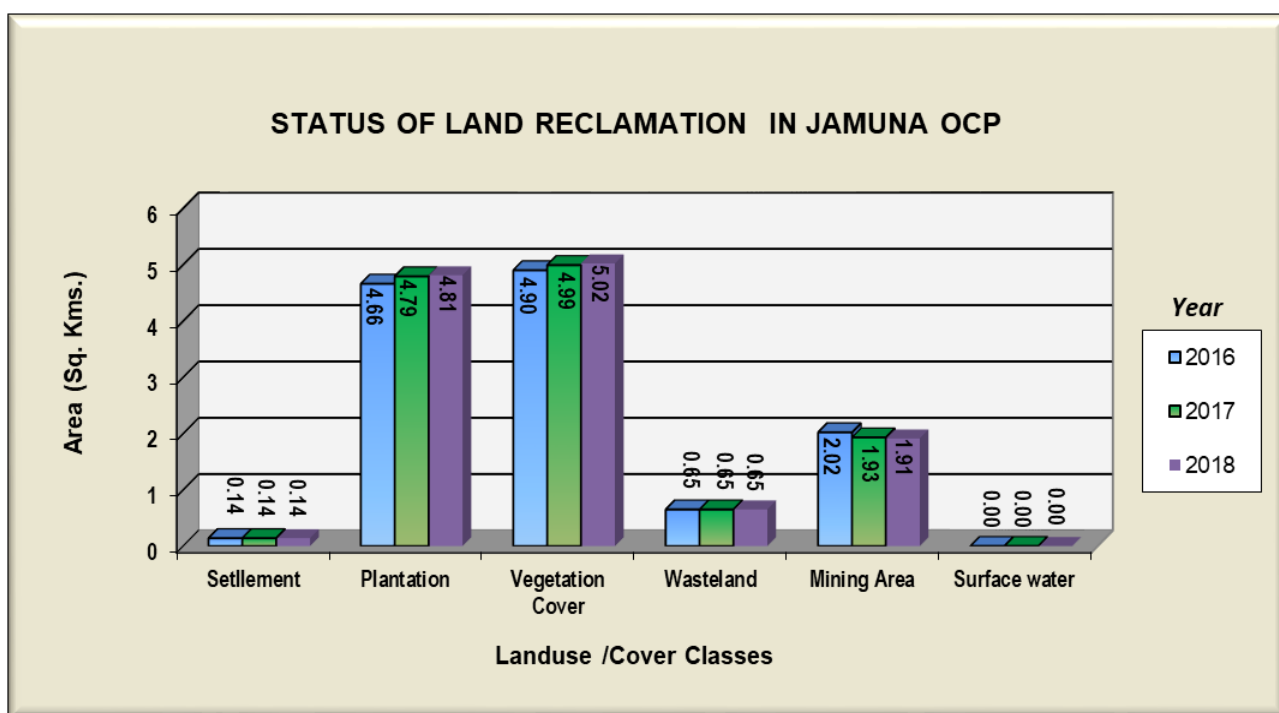


Figure 6.11



Photograph – 6.1: **Backfilling in Dipka Opencast Project**



Photograph – 6.2: **Plantation in Dipka Opencast Project**





Photograph – 6.3: ***Mining Activity in Gevra Opencast Project***



Photograph – 6.4: ***Plantation in Gevra Opencast Project***





Photograph – 6.5: ***Mining Operation in Kusmunda Opencast Project***



Photograph – 6.6: ***Plantation in Kusmunda Opencast Project***





Photograph – 6.7: **Backfilling Operation in Manikpur Opencast Project**



Photograph – 6.8: **Plantation in Manikpur Opencast Project**





Photograph – 6.9: *Plantation in Dugga Opencast Project*



Photograph – 6.10: *Plantation in Bishrampur Opencast Project*





Photograph – 6.11: *Plantation in Chirimiri Opencast Project*



Photograph – 6.12: *Plantation on OB Dump in Rajnagar Opencast Project*





Photograph – 6.13: *Plantation in Dhanpuri Opencast Project*



Photograph – 6.14: *Plantation in Jamuna Opencast Project*

**NORTHERN COALFIELDS LIMITED**



## 7.0 Land Reclamation Status in Northern Coalfields Ltd.

7.1 Following 10 OC projects producing more than 5 million cubic m. (Coal + OB together) of Northern Coalfields Ltd. have been taken up for land reclamation monitoring during the year 2018-19:

- Amlohri
- Nigahi
- Jayant
- Dudhichua
- Khadia
- Krishnashila
- Bina
- Kakri
- Jhingurdah
- Block-B

7.2 Project wise Land Reclamation status in NCL for the year 2018 is given in Table 7.1 and also shown graphically in Fig 7.1. Area statistics of different land use / cover classes present in the mine leasehold of the above projects for the year 2018 are shown in the Table – 7.2. Land use/cover maps derived from satellite data are shown in Plate 7.1 – 7.10. Land reclamation status of the above mentioned 10 projects were prepared regularly since 2008. Year wise changes in the different land use classes based on satellite data for the last three years are depicted in Bar Charts in Fig. 7.2 to 7.11.

7.3 Study reveals that out of total excavated area of 71.68 Km<sup>2</sup>, 42.02 Km<sup>2</sup> (58.62%) of area is under reclamation out of which 15.37 km<sup>2</sup> (21.44%) area has been revegetated and 26.65 km<sup>2</sup> (37.18%) area is under backfilling. There is an increase of 3.29 Km<sup>2</sup> for area under reclamation in NCL in the year 2018 with respect to the year 2017. This increase is due to the efforts of NCL to protect environment.

- 7.4** After analyzing the satellite data of year 2018 vs. 2017, it is evident that area under plantation (biological reclamation) has increased from 14.81 km<sup>2</sup> in 2017 to 15.37 km<sup>2</sup> in 2018. All OCPs of NCL selected for monitoring except for Dudhichua OCP show static or increasing trend for Biological Reclamation.
- 7.5** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 23.92 km<sup>2</sup> in 2017 to 26.65 km<sup>2</sup> in 2018. All the 10 projects of NCL selected for monitoring are showing an increasing trend in technical reclamation except for Jhingurdah where the decrease in technical reclamation area may be due to new plantation done on backfilled areas.
- 7.6** It was also observed that total area under plantation (Green Cover) has decreased from 53.69 km<sup>2</sup> in 2017 to 52.97 km<sup>2</sup> in 2018 due to loss of some plantation as dump heights were increased owing to high overburden removal and no additional space being available for dumping of overburden material.
- 7.7** Out of 10 projects of NCL, maximum land reclamation has been carried out in Jhingurdah OCP (81.48%) followed by Jayant (68.66%) and Kakri (67.40%). It may be noted that in Jhingurdah OC Mine production from upper mineable seams is almost complete.

Table 7.1

## Summarised Land Reclamation Status in Opencast Projects of NCL based on Satellite Data of the year 2018

(Area in Sq. Kms.)

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		Other Plantations											
			Area under Backfilling	Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avaneue Plantation Etc.										
1	2	3	4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
			2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Amlohri	21.51	2.58	2.80	0.85	0.86	0.89	0.97	4.86	4.83	4.00	4.42	7.43	8.08	6.60	6.66	3.43	3.66
			34.72%	34.65%	11.44%	10.64%					53.84%	54.70%			30.68%	30.96%	46.16%	45.30%
2	Nigahi	30.16	3.42	4.13	2.42	2.50	2.61	2.93	5.08	5.08	4.20	3.58	10.04	10.21	10.11	10.51	5.84	6.63
			34.06%	40.45%	24.10%	24.49%					41.83%	35.06%			33.52%	34.85%	58.17%	64.94%
3	Jayant	29.11	5.20	5.47	4.54	4.87	2.11	2.26	3.53	3.61	5.51	4.72	15.25	15.06	10.18	10.74	9.74	10.34
			34.10%	36.32%	29.77%	32.34%					36.13%	31.34%			34.97%	36.89%	63.87%	68.66%
4	Dudhichua	14.00	3.00	3.32	1.67	1.26	1.16	0.85	0.67	0.32	4.43	5.43	9.10	10.01	3.50	2.43	4.67	4.58
			32.97%	33.17%	18.35%	12.59%					48.68%	54.25%			25.00%	17.36%	51.32%	45.75%
5	Khadia	14.91	2.83	3.20	0.50	0.54	0.19	0.24	3.20	2.66	3.18	3.05	6.51	6.79	3.89	3.44	3.33	3.74
			43.47%	47.13%	7.68%	7.95%					48.85%	44.92%			26.09%	23.07%	51.15%	55.08%
6	Krishnashila	5.94	0.67	0.84	0.10	0.14	0.03	0.08	1.04	1.04	1.16	1.09	1.93	2.07	1.17	1.26	0.77	0.98
			34.72%	40.58%	5.18%	6.76%					60.10%	52.66%			19.70%	21.21%	39.90%	47.34%
7	Bina	17.98	3.54	3.65	1.89	1.96	1.32	1.11	3.61	3.30	3.42	3.44	8.85	9.05	6.82	6.37	5.43	5.61
			40.00%	40.33%	21.36%	21.66%					38.64%	38.01%			37.93%	35.43%	61.36%	61.99%
8	Kakri	13.60	1.19	1.32	1.13	1.14	0.42	0.57	3.85	3.21	1.18	1.19	3.50	3.65	5.40	4.92	2.32	2.46
			34.00%	36.16%	32.29%	31.23%					33.71%	32.60%			39.71%	36.18%	66.29%	67.40%
9	Jhingurdah	12.43	0.64	0.59	1.58	1.61	2.22	2.23	1.80	1.90	0.77	0.50	2.99	2.70	5.60	5.74	2.22	2.20
			21.40%	21.85%	52.84%	59.63%					25.75%	18.52%			45.05%	46.18%	74.25%	81.48%
10	Block-B	14.64	0.85	1.33	0.13	0.49	0.12	0.17	0.17	0.24	2.86	2.24	3.84	4.06	0.42	0.90	0.98	1.82
			22.14%	32.76%	3.39%	12.07%					74.48%	55.17%			2.87%	6.15%	25.52%	44.83%
	TOTAL	174.28	23.92	26.65	14.81	15.37	11.07	11.41	27.81	26.19	30.71	29.66	69.44	71.68	53.69	52.97	38.73	42.02
			34.45%	37.18%	21.33%	21.44%					44.23%	41.38%			30.81%	30.39%	55.77%	58.62%
(% 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, 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..
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".

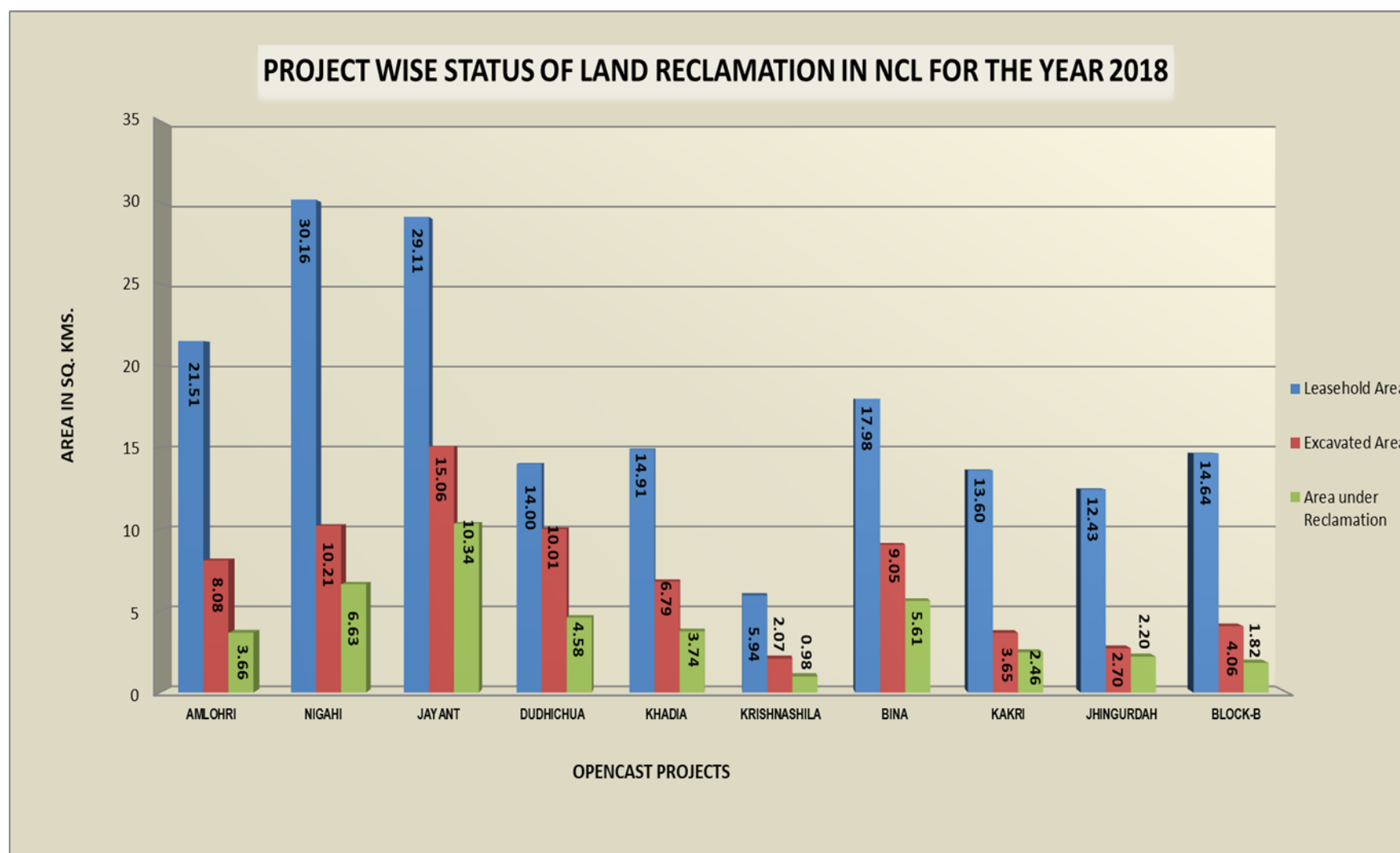


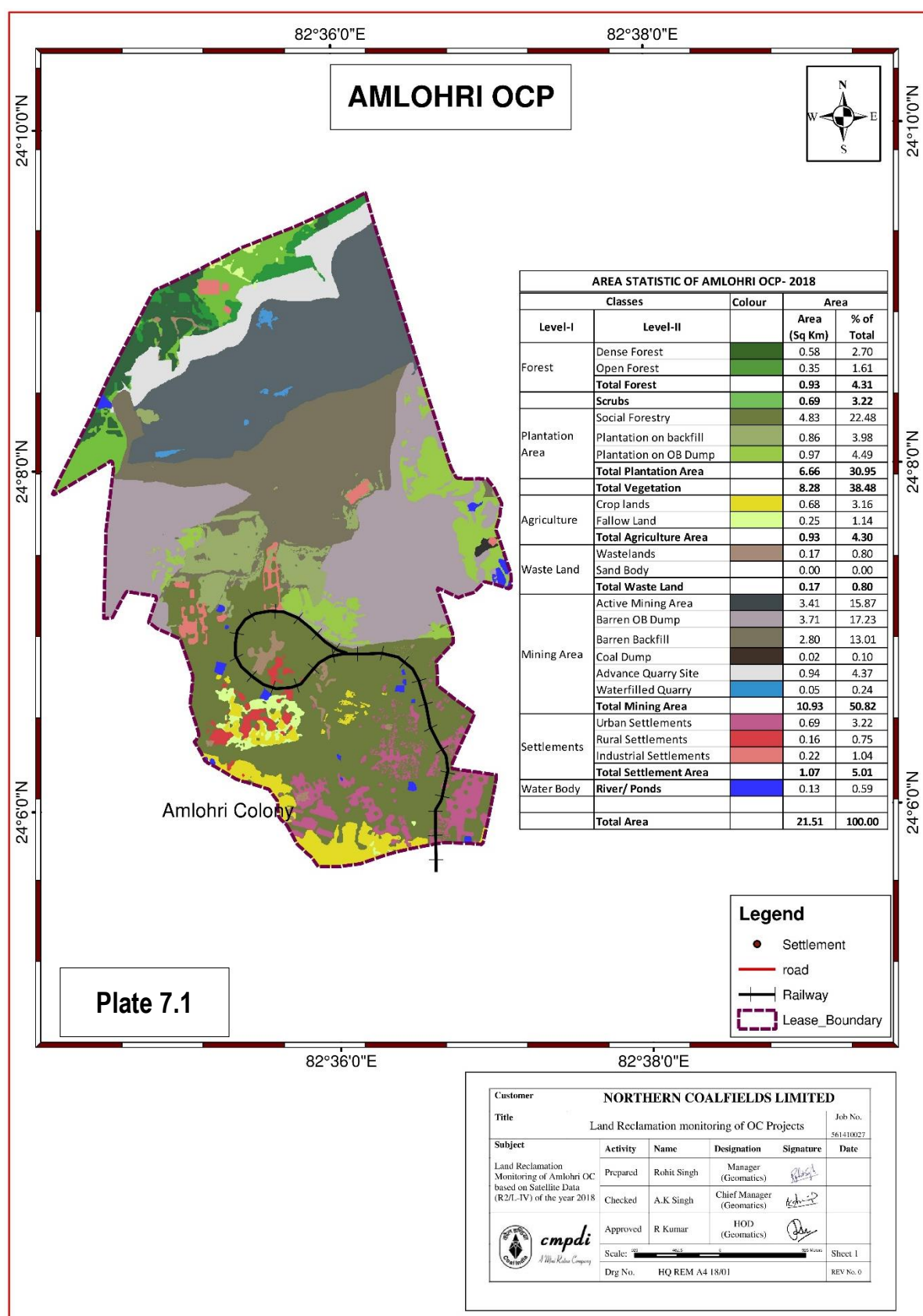
Fig.7.1: *Land reclamation status in Opencast Projects of NCL in the Year 2018*

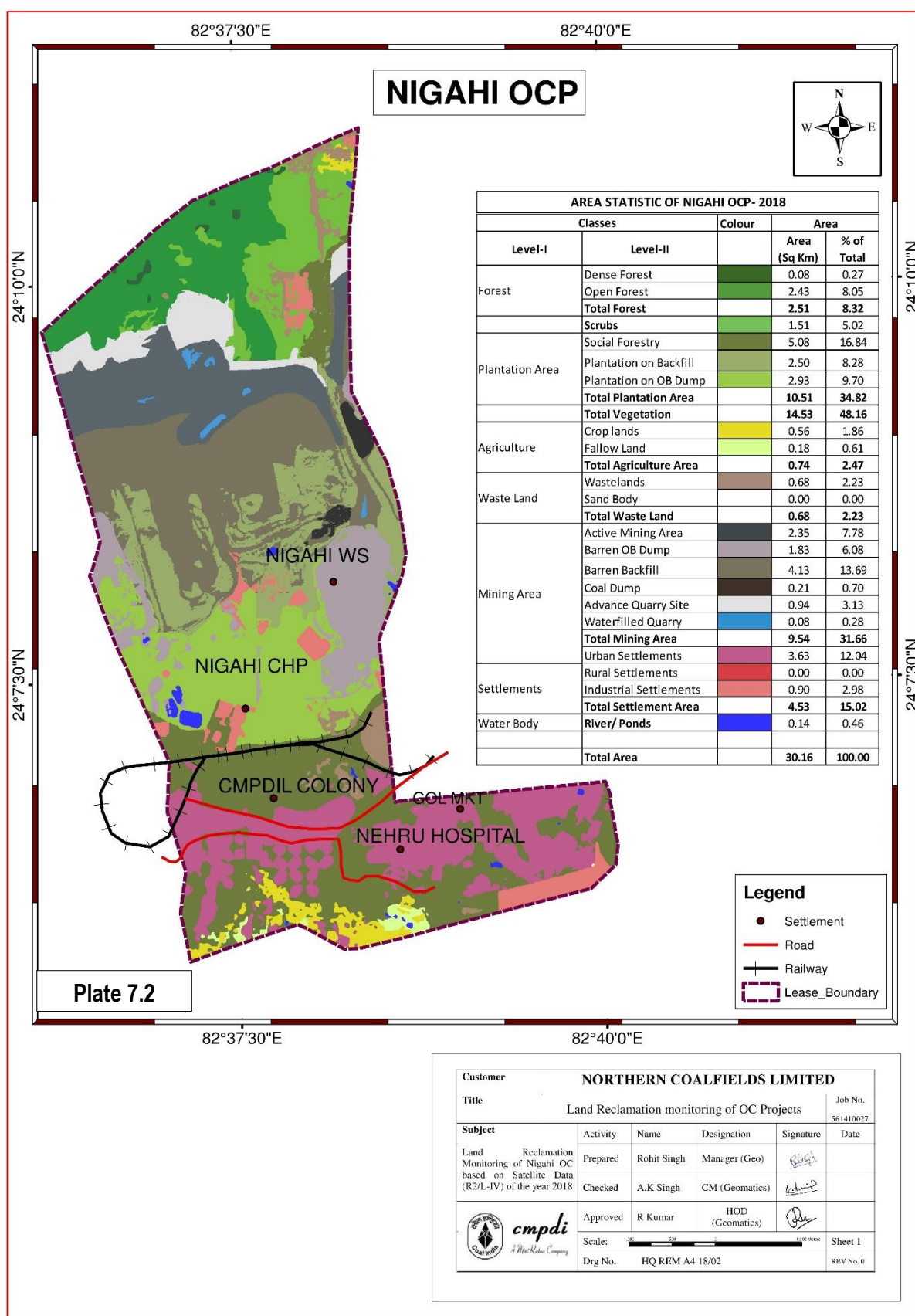
Table 7.2

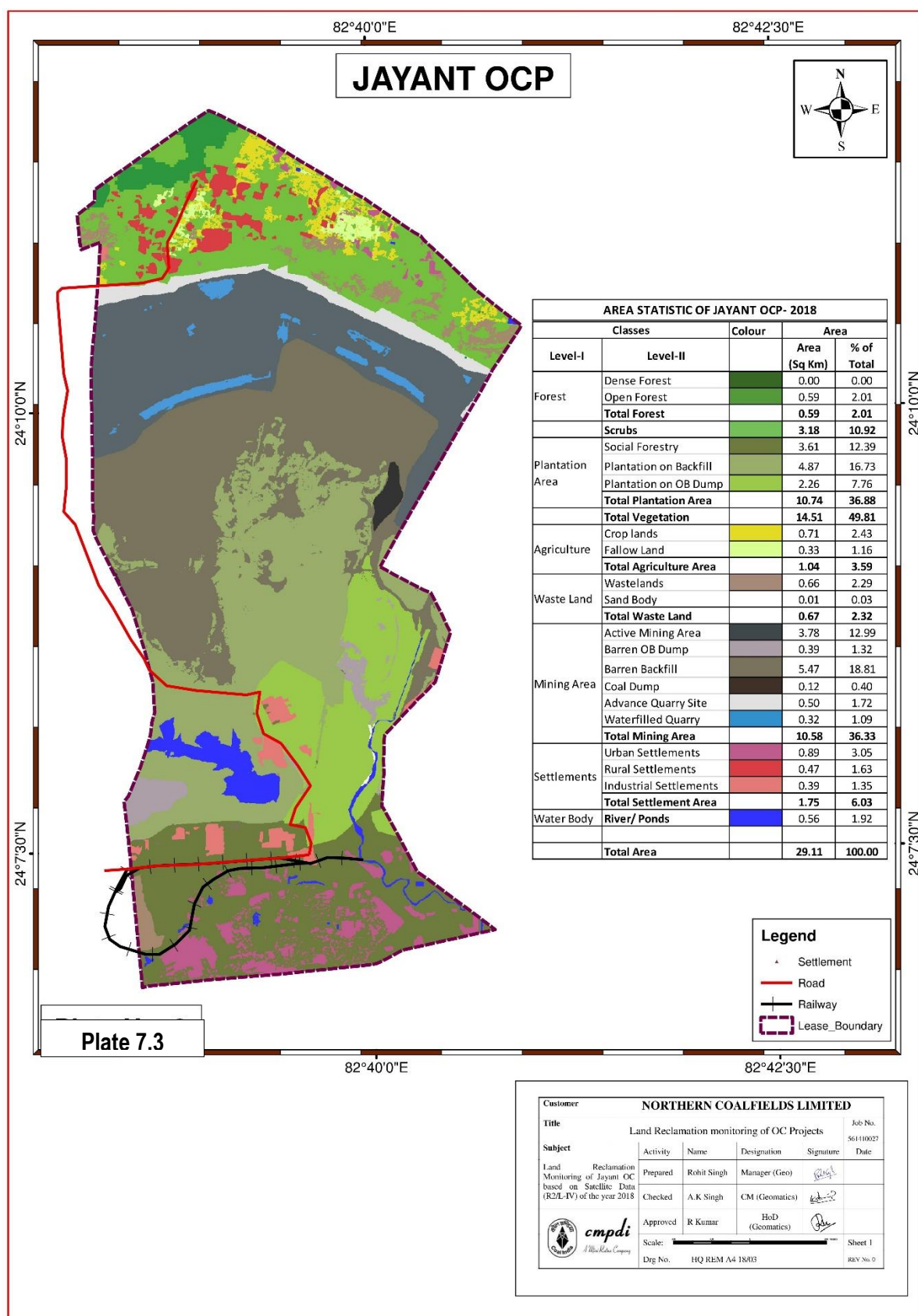
## Project wise Area Statistics of Land Use / Cover in OC Mines (&gt; 5 mcu.m.) of NCL based on Satellite data of the Year 2018

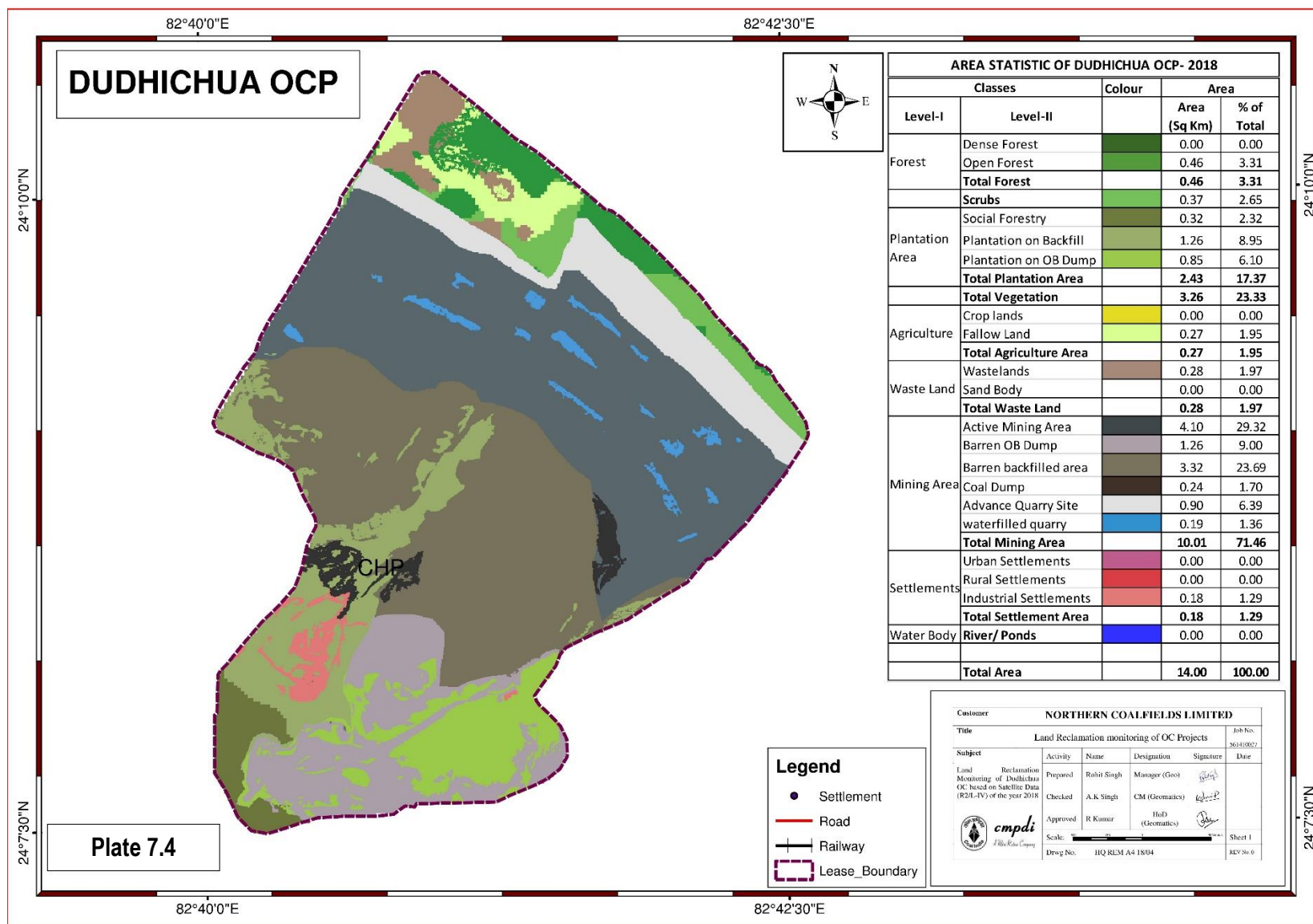
		(Area in Sq Km)																					
		AMLOHRI		NIGAHI		JAYANT		DUDHICHUA		KHADIA		KRISHNASHILA		BINA		KAKRI		JHINGURDAH		BLOCK-B		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.58	2.70	0.08	0.27	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.56	0.08	0.48	0.12	0.95	0.28	2.29	0.10	0.69	1.27	0.73
	Open Forest	0.35	1.61	2.43	8.05	0.59	2.01	0.46	3.31	1.28	8.60	0.92	15.49	1.44	8.05	1.84	13.59	0.53	4.25	0.86	5.85	10.70	6.14
	<b>Total Forest</b>	<b>0.93</b>	<b>4.31</b>	<b>2.51</b>	<b>8.32</b>	<b>0.59</b>	<b>2.01</b>	<b>0.46</b>	<b>3.31</b>	<b>1.28</b>	<b>8.61</b>	<b>0.95</b>	<b>16.05</b>	<b>1.52</b>	<b>8.53</b>	<b>1.96</b>	<b>14.54</b>	<b>0.81</b>	<b>6.54</b>	<b>0.96</b>	<b>6.54</b>	<b>11.97</b>	<b>6.87</b>
SCRUBS	Scrubs	0.69	3.22	1.51	5.02	3.18	10.92	0.37	2.65	1.12	7.49	0.65	10.88	1.11	6.15	1.52	11.16	3.10	24.91	2.31	15.76	15.56	8.93
SF	Social Forestry	4.83	22.48	5.08	16.84	3.61	12.39	0.32	2.32	2.66	17.85	1.04	17.44	3.30	18.33	3.21	23.59	1.90	15.26	0.24	1.66	26.19	15.03
PLANTATION	Plantation on External OB Dump	0.97	4.49	2.93	9.70	2.26	7.76	0.85	6.10	0.24	1.59	0.08	1.43	1.11	6.17	0.57	4.17	2.23	17.96	0.17	1.14	11.41	6.55
	Plantation on Backfill / Excavated Area (Biological Reclamation)	0.86	3.98	2.50	8.28	4.87	16.73	1.26	8.95	0.54	3.59	0.14	2.33	1.96	10.91	1.14	8.39	1.61	12.92	0.49	3.33	15.37	8.82
	<b>Total Area under Plantation (Green Cover)</b>	<b>6.66</b>	<b>30.95</b>	<b>10.51</b>	<b>34.82</b>	<b>10.74</b>	<b>36.88</b>	<b>2.43</b>	<b>17.37</b>	<b>3.44</b>	<b>23.03</b>	<b>1.26</b>	<b>21.20</b>	<b>6.37</b>	<b>35.41</b>	<b>4.92</b>	<b>36.15</b>	<b>5.74</b>	<b>46.14</b>	<b>0.90</b>	<b>6.13</b>	<b>52.97</b>	<b>30.39</b>
	<b>Total Vegetation</b>	<b>8.28</b>	<b>38.48</b>	<b>14.53</b>	<b>48.16</b>	<b>14.51</b>	<b>49.81</b>	<b>3.26</b>	<b>23.33</b>	<b>5.84</b>	<b>39.13</b>	<b>2.86</b>	<b>48.13</b>	<b>9.00</b>	<b>50.09</b>	<b>8.40</b>	<b>61.85</b>	<b>9.65</b>	<b>77.59</b>	<b>4.17</b>	<b>28.43</b>	<b>80.50</b>	<b>46.19</b>
AREA UNDER ACTIVE MINING	Coal Quarry	3.41	15.87	2.35	7.78	3.78	12.99	4.10	29.32	2.00	13.42	0.42	7.12	2.40	13.33	0.80	5.87	0.46	3.72	1.34	9.14	21.06	12.08
	Coal Dump	0.02	0.10	0.21	0.70	0.12	0.40	0.24	1.70	0.07	0.46	0.00	0.00	0.14	0.76	0.05	0.37	0.01	0.09	0.13	0.87	0.99	0.57
	Advance Quarry Site	0.94	4.37	0.94	3.13	0.50	1.72	0.90	6.39	0.85	5.72	0.64	10.76	0.77	4.28	0.28	2.06	0.00	0.00	0.32	2.20	6.14	3.52
	Quarry Filled With Water	0.05	0.24	0.08	0.28	0.32	1.09	0.19	1.36	0.13	0.90	0.03	0.47	0.13	0.74	0.06	0.45	0.03	0.24	0.45	3.10	1.47	0.84
	<b>Total Area under Active Mining</b>	<b>4.42</b>	<b>20.58</b>	<b>3.58</b>	<b>11.89</b>	<b>4.72</b>	<b>16.20</b>	<b>5.43</b>	<b>38.77</b>	<b>3.05</b>	<b>20.50</b>	<b>1.09</b>	<b>18.35</b>	<b>3.44</b>	<b>19.11</b>	<b>1.19</b>	<b>8.75</b>	<b>0.50</b>	<b>4.05</b>	<b>2.24</b>	<b>15.31</b>	<b>29.66</b>	<b>17.02</b>
TECHNICAL RECLAMATION	Barren OB Dump	3.71	17.23	1.83	6.08	0.39	1.32	1.26	9.00	1.40	9.38	0.42	7.12	0.45	2.51	0.60	4.43	0.58	4.64	2.64	18.01	13.28	7.62
	Area under Barren Backfilling (Technical Reclamation)	2.80	13.01	4.13	13.69	5.47	18.81	3.32	23.69	3.20	21.45	0.84	14.10	3.65	20.28	1.32	9.73	0.59	4.76	1.33	9.06	26.65	15.29
	<b>Total Area under Technical Reclamation</b>	<b>2.80</b>	<b>13.01</b>	<b>4.13</b>	<b>13.69</b>	<b>5.47</b>	<b>18.81</b>	<b>3.32</b>	<b>23.69</b>	<b>3.20</b>	<b>21.45</b>	<b>0.84</b>	<b>14.10</b>	<b>3.65</b>	<b>20.28</b>	<b>1.32</b>	<b>9.73</b>	<b>0.59</b>	<b>4.76</b>	<b>1.33</b>	<b>9.06</b>	<b>26.65</b>	<b>15.29</b>
	<b>Total Area under Mining Operations</b>	<b>10.93</b>	<b>50.82</b>	<b>9.54</b>	<b>31.66</b>	<b>10.58</b>	<b>36.33</b>	<b>10.01</b>	<b>71.46</b>	<b>7.65</b>	<b>51.33</b>	<b>2.35</b>	<b>39.57</b>	<b>7.54</b>	<b>41.90</b>	<b>3.11</b>	<b>22.91</b>	<b>1.67</b>	<b>13.45</b>	<b>6.21</b>	<b>42.38</b>	<b>69.59</b>	<b>39.93</b>
WASTELANDS	Waste Lands	0.17	0.80	0.68	2.23	0.66	2.29	0.28	1.97	0.01	0.08	0.08	1.33	0.21	1.17	0.22	1.61	0.41	3.33	2.03	13.89	4.75	2.73
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.01	0.03	0.00	0.00	0.00	0.00	0.07	1.18	0.00	0.00	0.01	0.04	0.00	0.00	0.00	0.00	0.09	0.05
	<b>Total Wasteland</b>	<b>0.17</b>	<b>0.80</b>	<b>0.68</b>	<b>2.23</b>	<b>0.67</b>	<b>2.32</b>	<b>0.28</b>	<b>1.97</b>	<b>0.01</b>	<b>0.08</b>	<b>0.15</b>	<b>2.51</b>	<b>0.21</b>	<b>1.17</b>	<b>0.23</b>	<b>1.65</b>	<b>0.41</b>	<b>3.33</b>	<b>2.03</b>	<b>13.89</b>	<b>4.84</b>	<b>2.78</b>
WATERBODIES	Reservoir, nallah, ponds	0.13	0.59	0.14	0.46	0.56	1.92	0.00	0.00	0.00	0.02	0.06	1.01	0.20	1.12	0.03	0.19	0.15	1.18	0.05	0.32	1.32	0.76
	<b>Total Waterbodies</b>	<b>0.13</b>	<b>0.59</b>	<b>0.14</b>	<b>0.46</b>	<b>0.56</b>	<b>1.92</b>	<b>0.00</b>	<b>0.00</b>	<b>0.00</b>	<b>0.02</b>	<b>0.06</b>	<b>1.01</b>	<b>0.20</b>	<b>1.12</b>	<b>0.03</b>	<b>0.19</b>	<b>0.15</b>	<b>1.18</b>	<b>0.05</b>	<b>0.32</b>	<b>1.32</b>	<b>0.76</b>
AGRICULTURE	Crop Lands	0.68	3.16	0.56	1.86	0.71	2.43	0.00	0.00	0.00	0.00	0.21	3.54	0.10	0.56	0.53	3.87	0.00	0.00	0.14	0.95	2.93	1.68
	Fallow Lands	0.25	1.14	0.18	0.61	0.33	1.16	0.27	1.95	0.00	0.00	0.24	4.01	0.09	0.49	0.13	0.94	0.28	2.23	1.60	10.96	3.37	1.93
	<b>Total Agriculture</b>	<b>0.93</b>	<b>4.30</b>	<b>0.74</b>	<b>2.47</b>	<b>1.04</b>	<b>3.59</b>	<b>0.27</b>	<b>1.95</b>	<b>0.00</b>	<b>0.00</b>	<b>0.45</b>	<b>7.55</b>	<b>0.19</b>	<b>1.05</b>	<b>0.66</b>	<b>4.81</b>	<b>0.28</b>	<b>2.23</b>	<b>1.74</b>	<b>11.91</b>	<b>6.30</b>	<b>3.61</b>
SETTLEMENTS	Urban Settlement	0.69	3.22	3.63	12.04	0.89	3.05	0.00	0.00	0.97	6.49	0.01	0.24	0.50	2.80	1.06	7.76	0.13	1.08	0.05	0.36	7.93	4.55
	Rural Settlement	0.16	0.75	0.00	0.00	0.47	1.63	0.00	0.00	0.00	0.00	0.02	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.65	0.37
	Industrial Settlement	0.22	1.04	0.90	2.98	0.39	1.35	0.18	1.29	0.44	2.95	0.04	0.64	0.34	1.87	0.11	0.83	0.14	1.14	0.39	2.69	3.15	1.81
	<b>Total Settlement</b>	<b>1.07</b>	<b>5.80</b>	<b>4.53</b>	<b>15.02</b>	<b>1.75</b>	<b>6.03</b>	<b>0.18</b>	<b>1.29</b>	<b>1.41</b>	<b>9.44</b>	<b>0.07</b>	<b>1.23</b>	<b>0.84</b>	<b>4.67</b>	<b>1.17</b>	<b>8.59</b>	<b>0.27</b>	<b>2.22</b>	<b>0.44</b>	<b>3.07</b>	<b>11.73</b>	<b>6.73</b>
	<b>Grand Total</b>	<b>21.51</b>	<b>100.00</b>	<b>30.16</b>	<b>100.00</b>	<b>29.11</b>	<b>100.00</b>	<b>14.00</b>	<b>100.00</b>	<b>14.91</b>	<b>100.00</b>	<b>5.94</b>	<b>100.00</b>	<b>17.98</b>	<b>100.00</b>	<b>13.60</b>	<b>100.00</b>	<b>12.43</b>	<b>100.00</b>	<b>14.64</b>	<b>100.00</b>	<b>174.28</b>	<b>100.00</b>



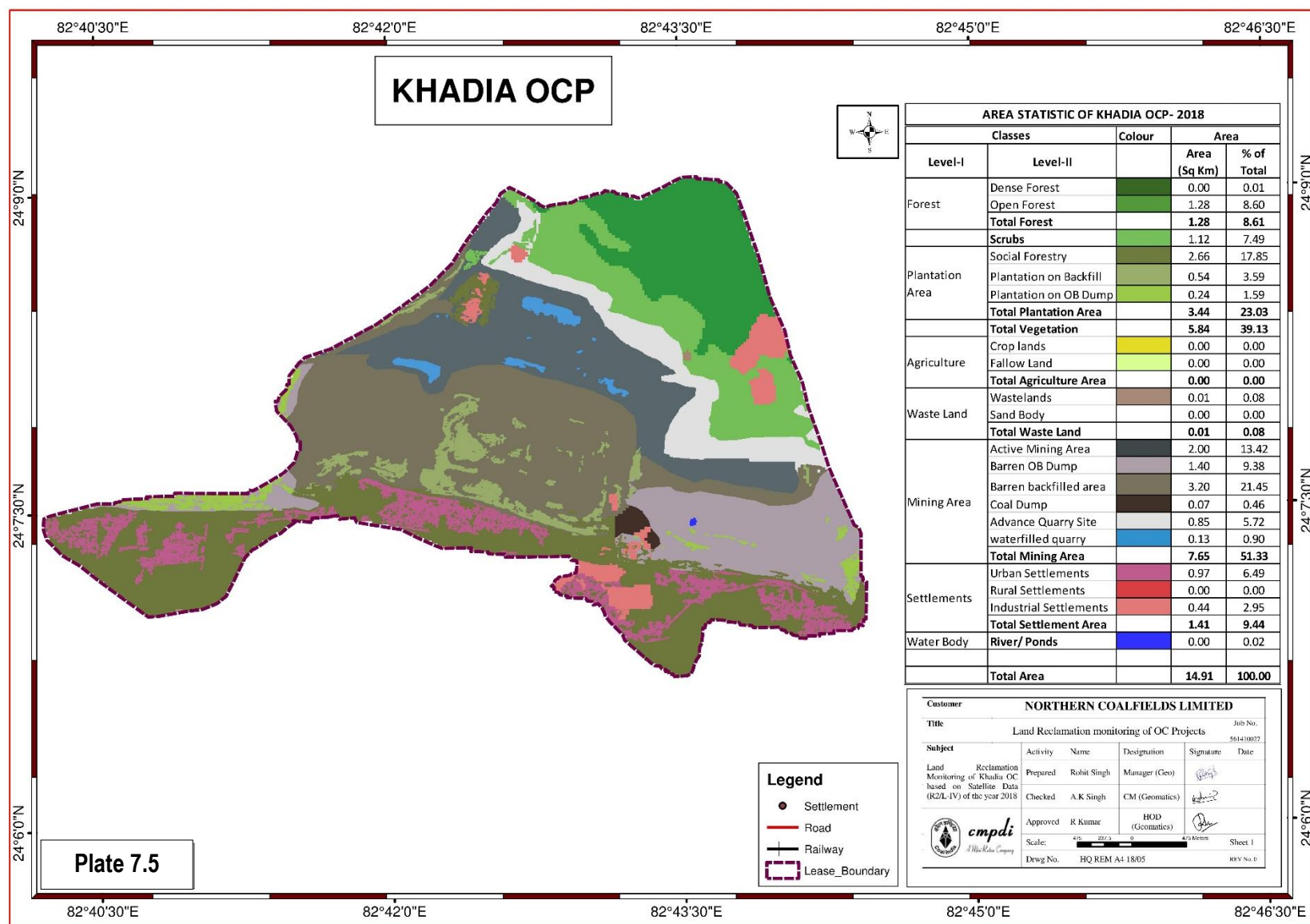




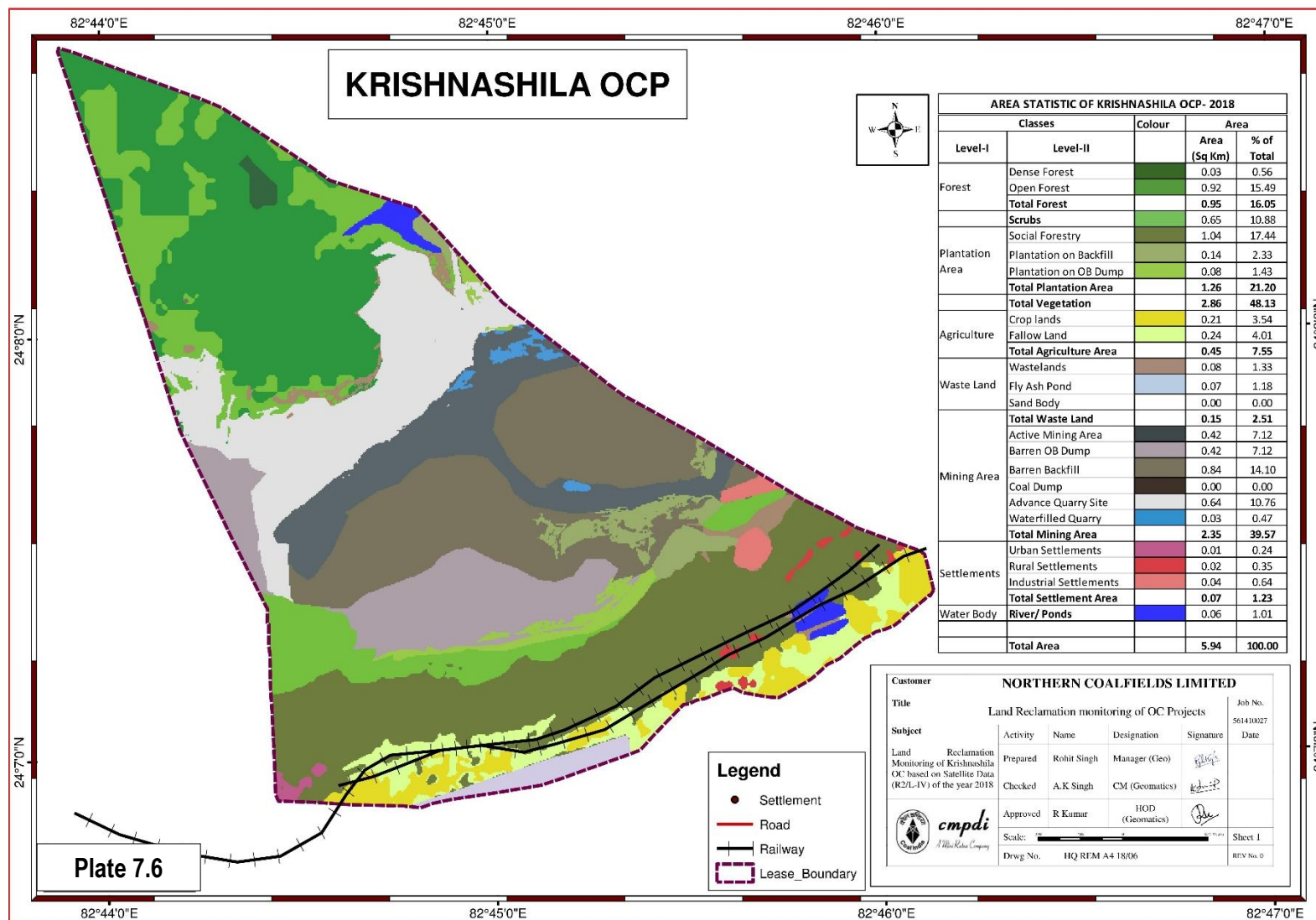


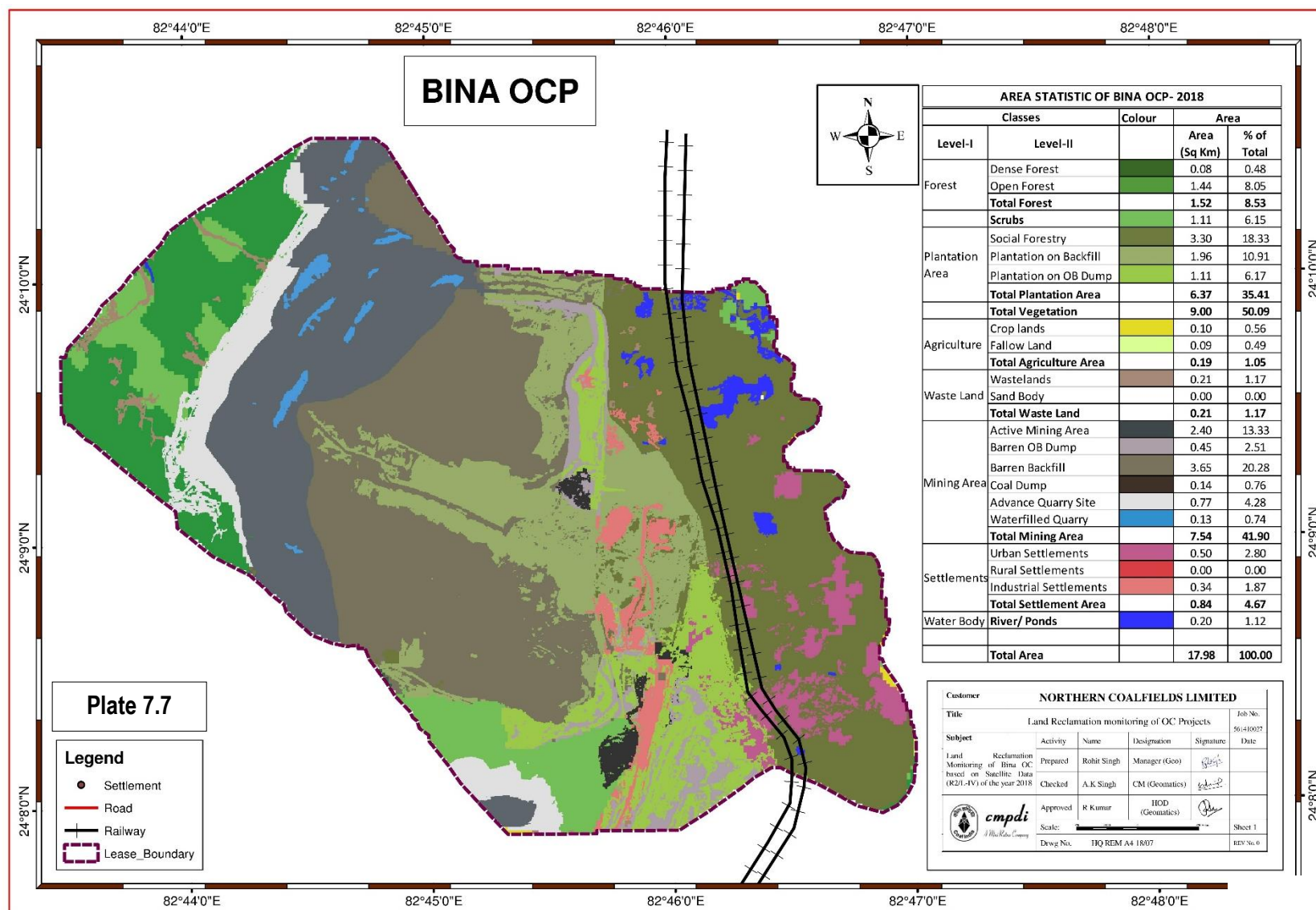


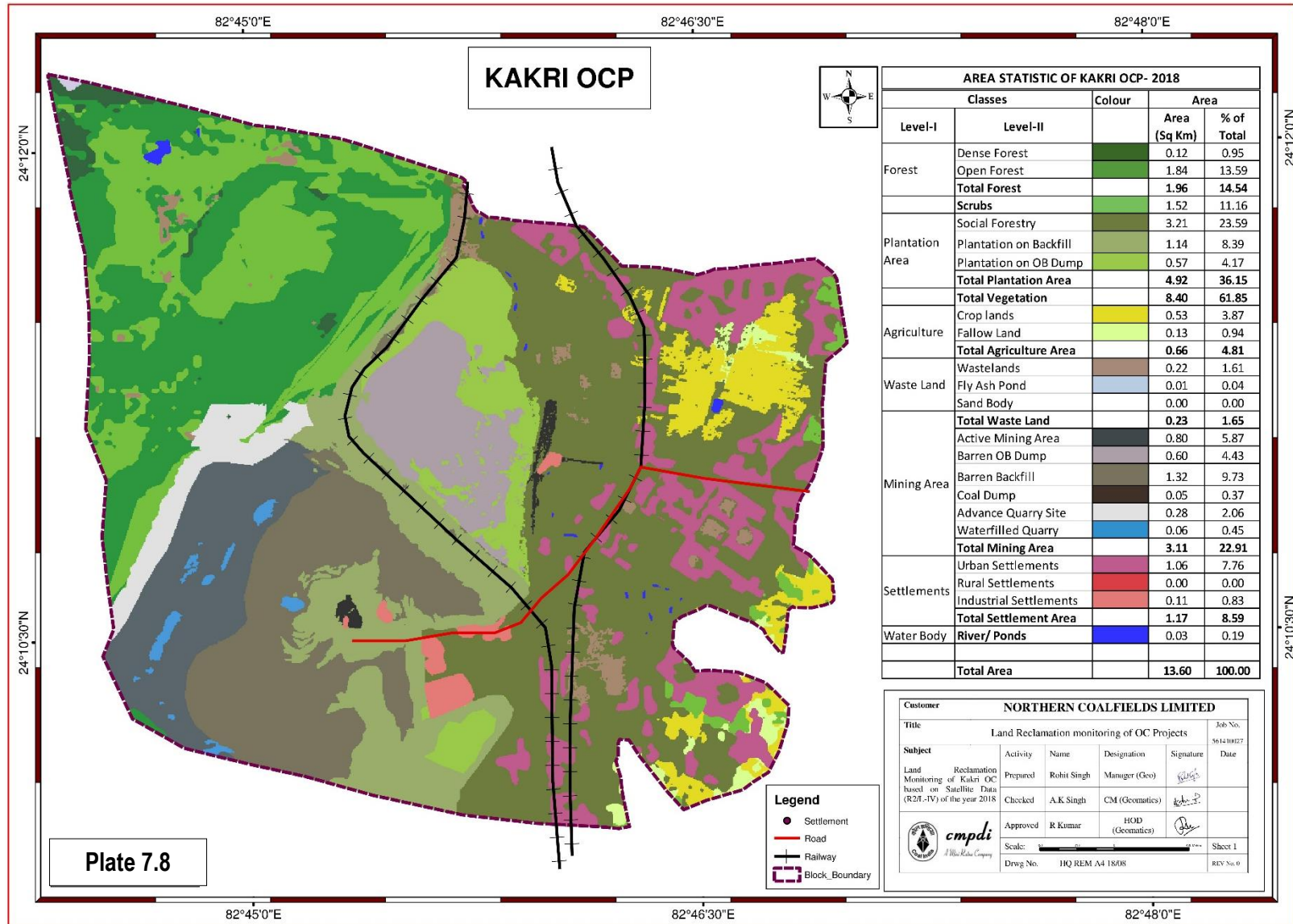




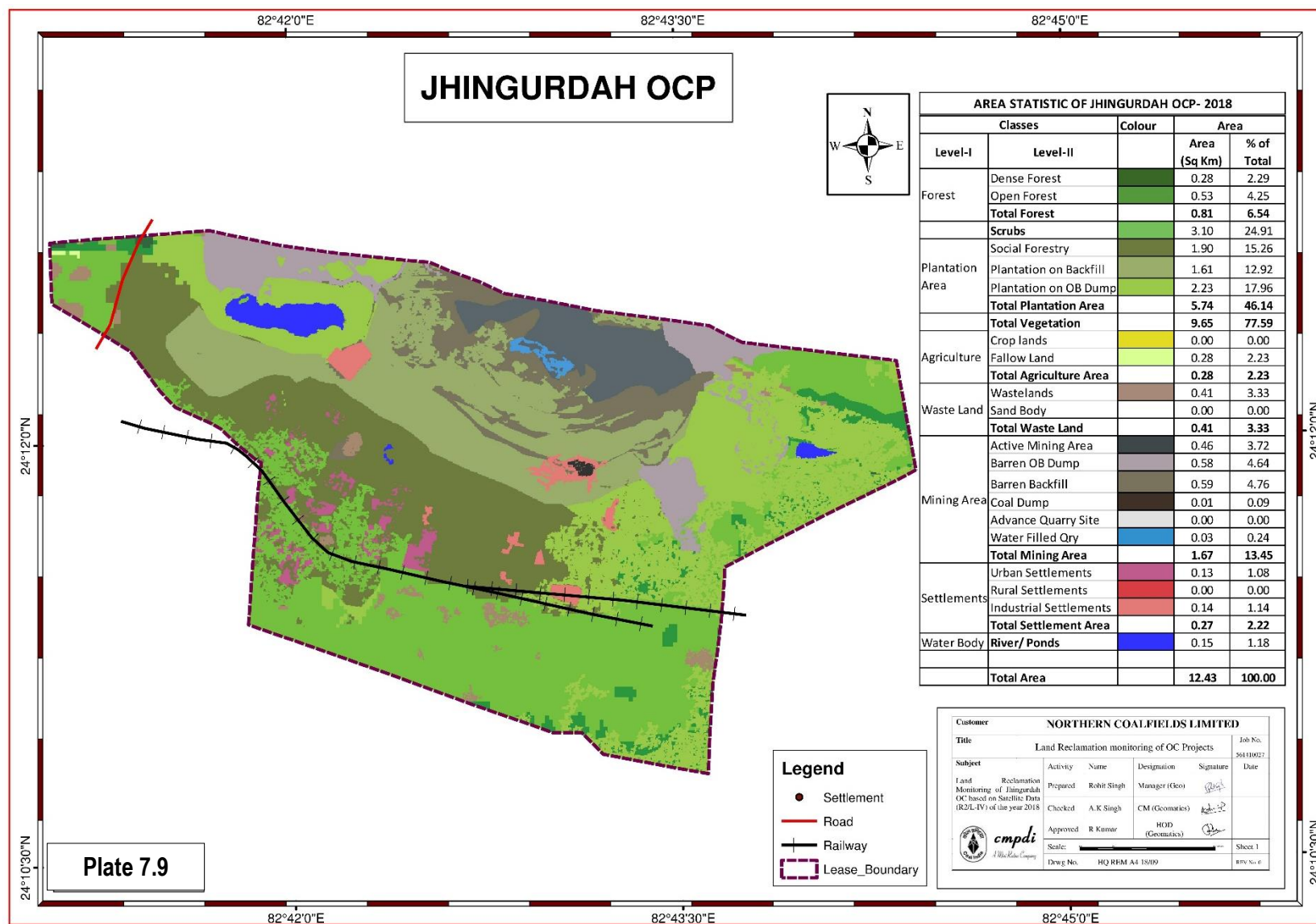


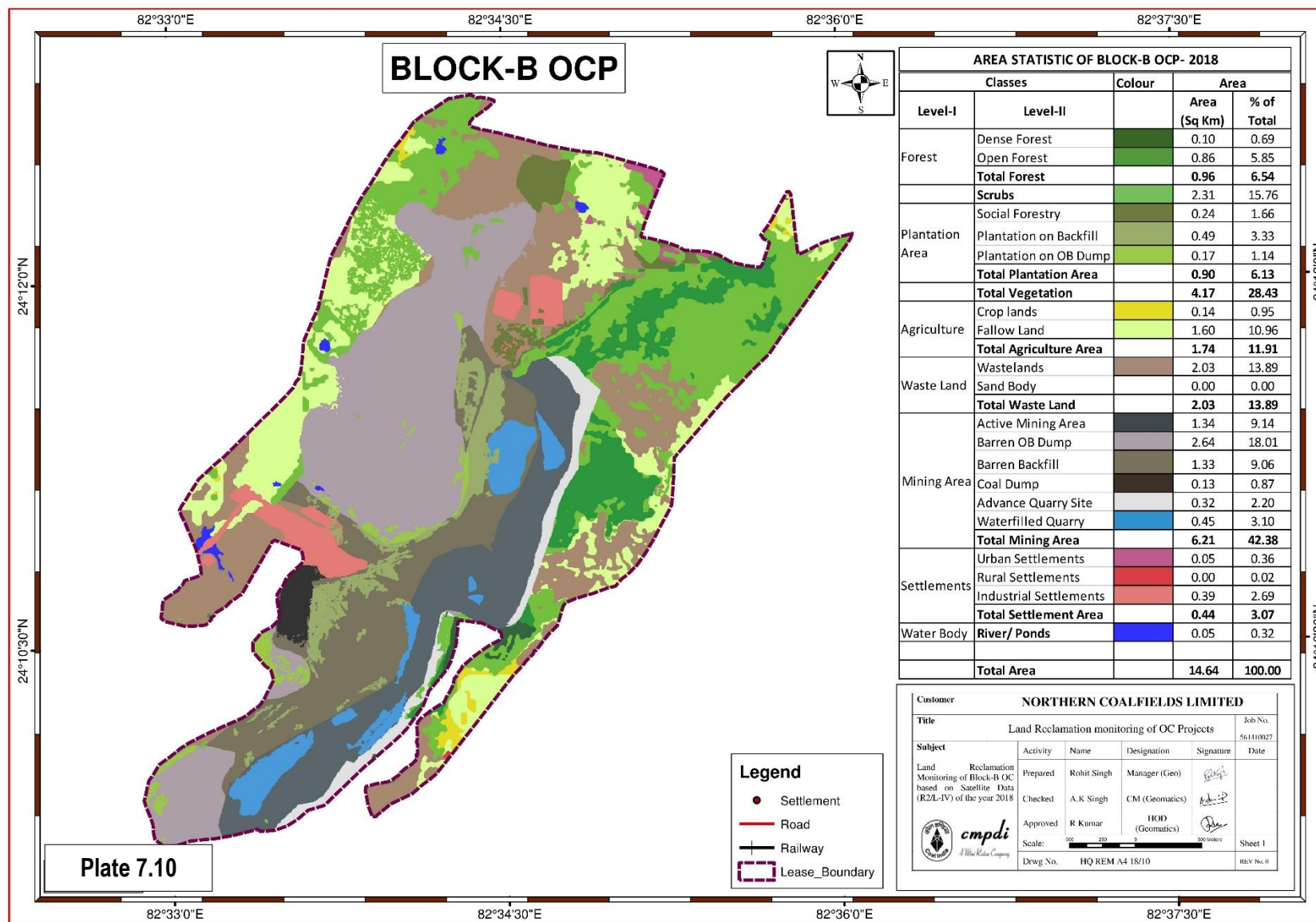














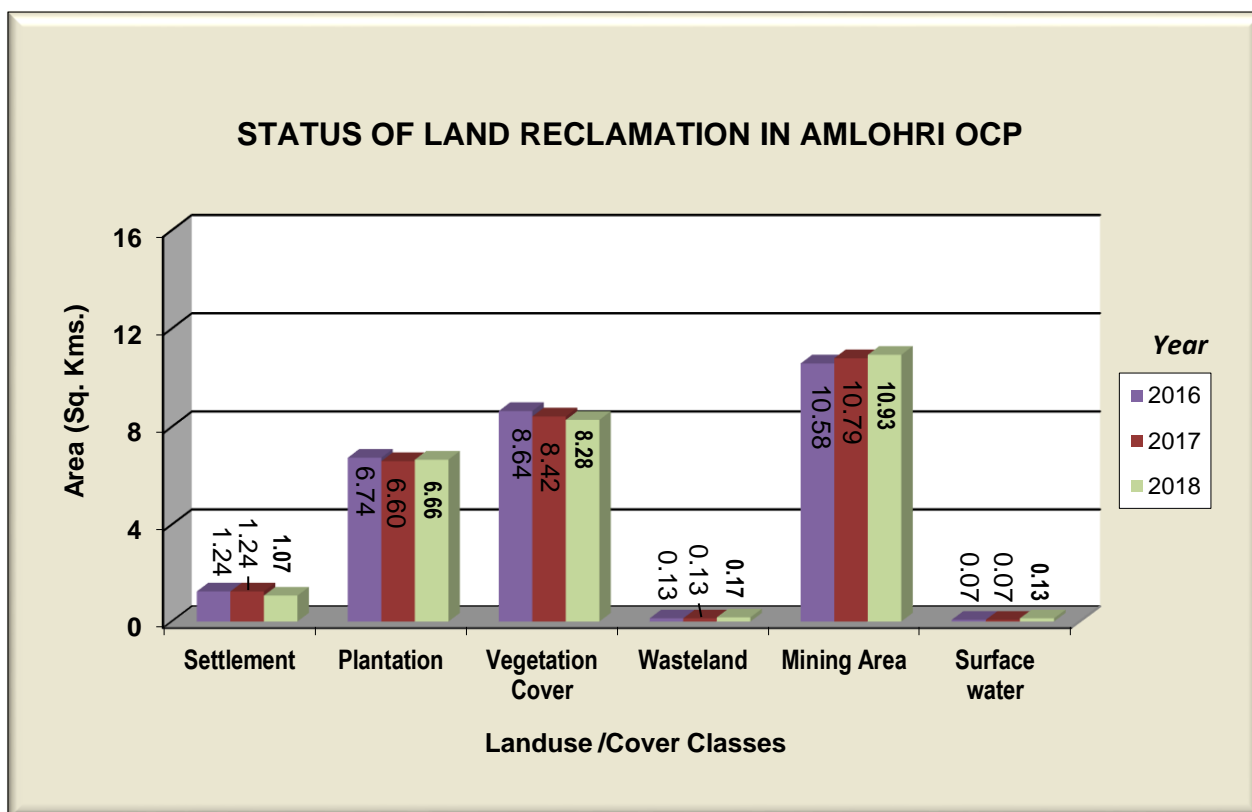


Figure 7.2

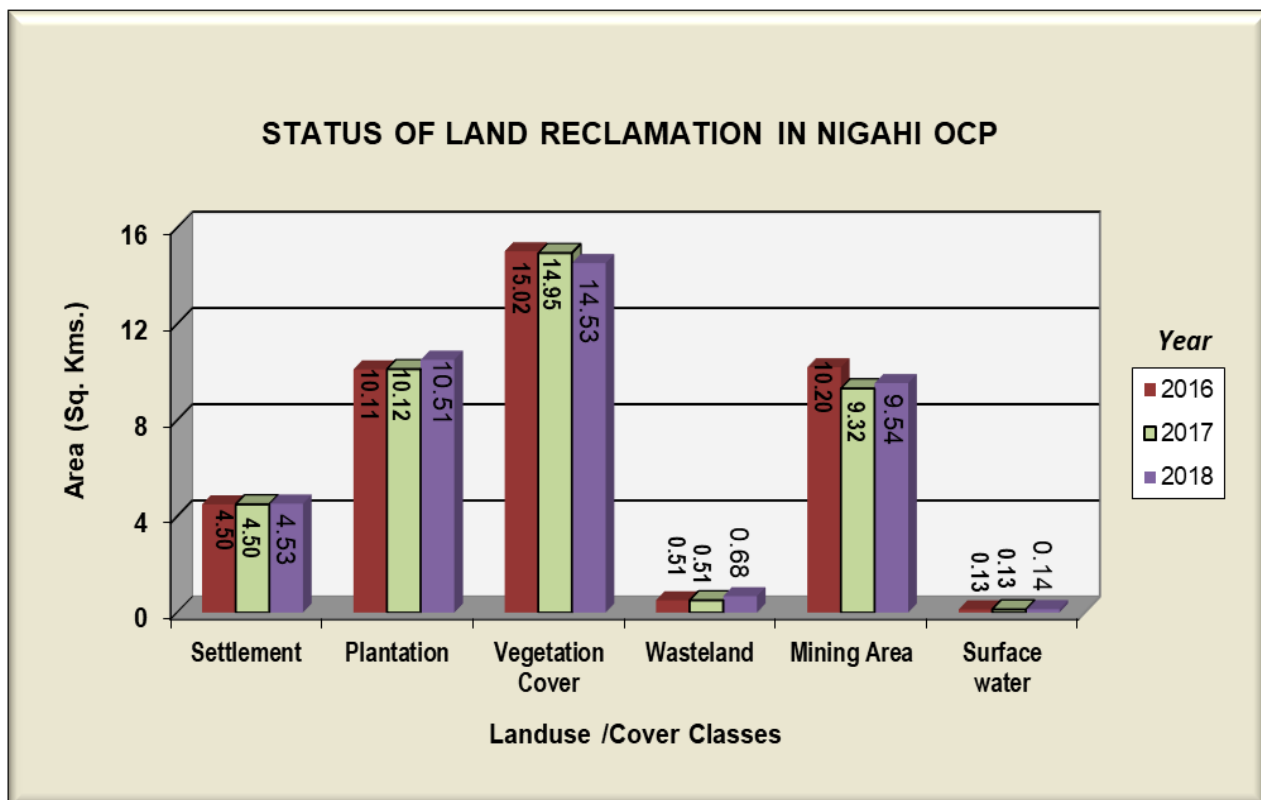


Figure 7.3

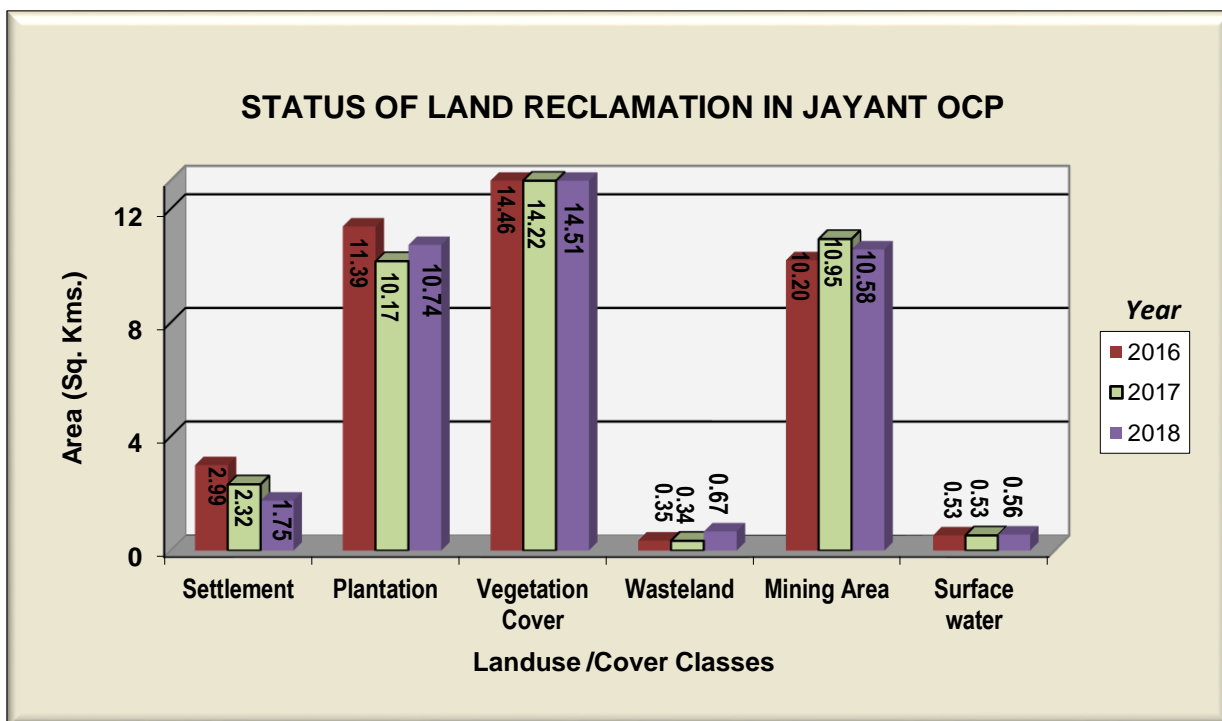


Figure 7.4

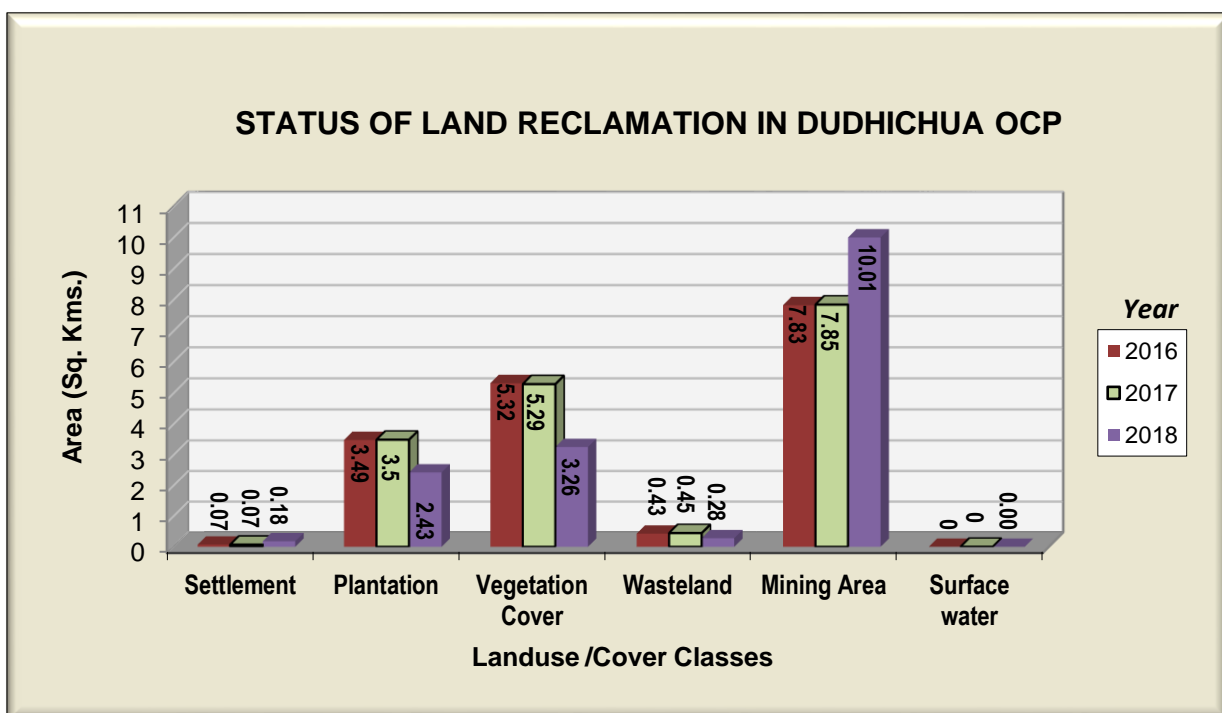


Figure 7.5

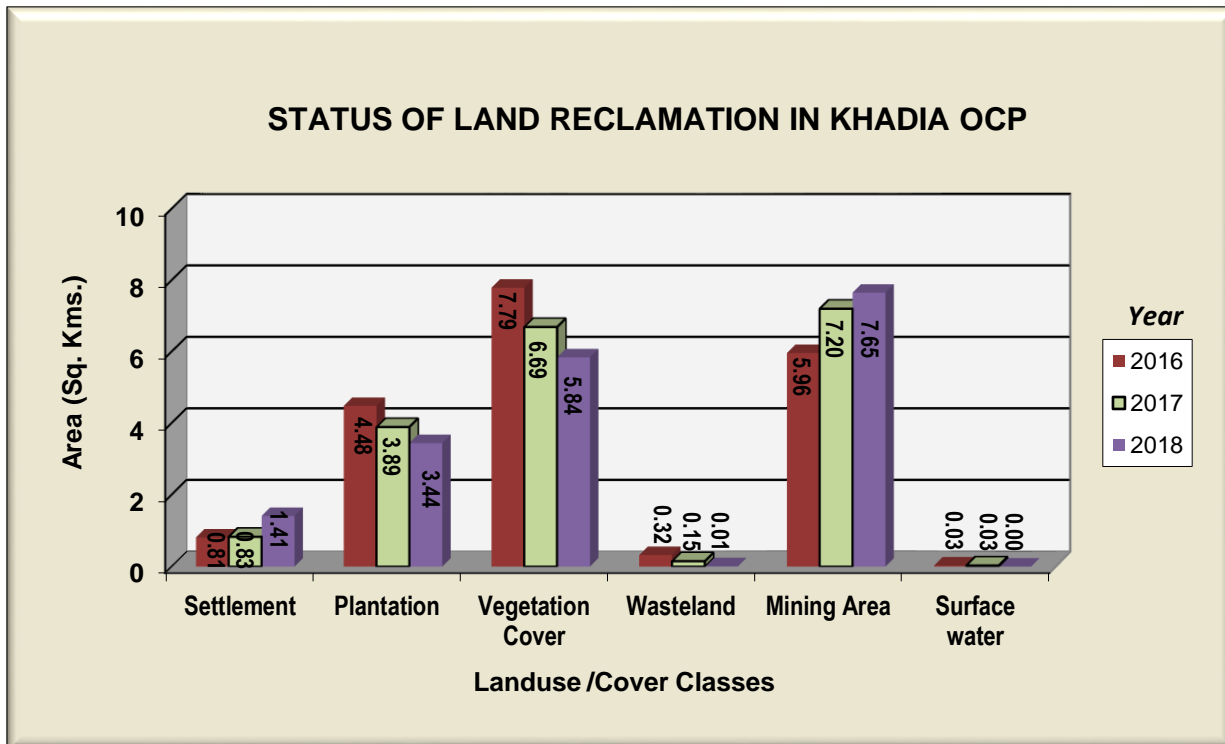


Figure 7.6

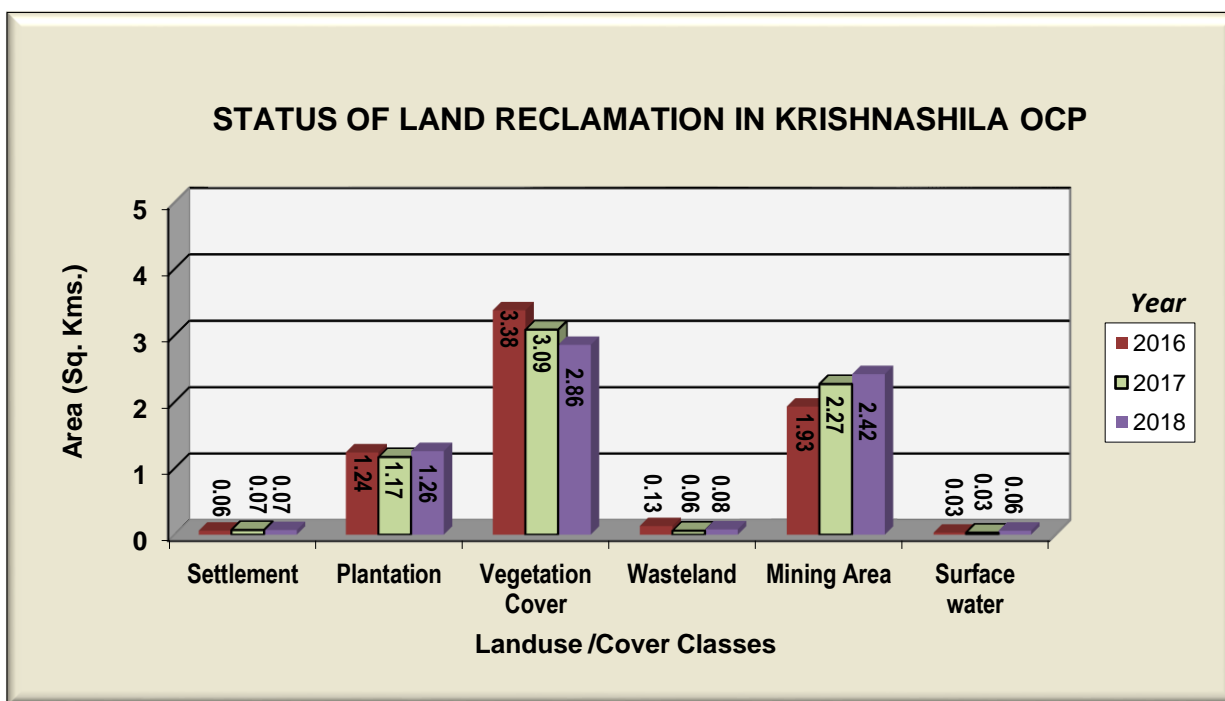


Figure 7.7

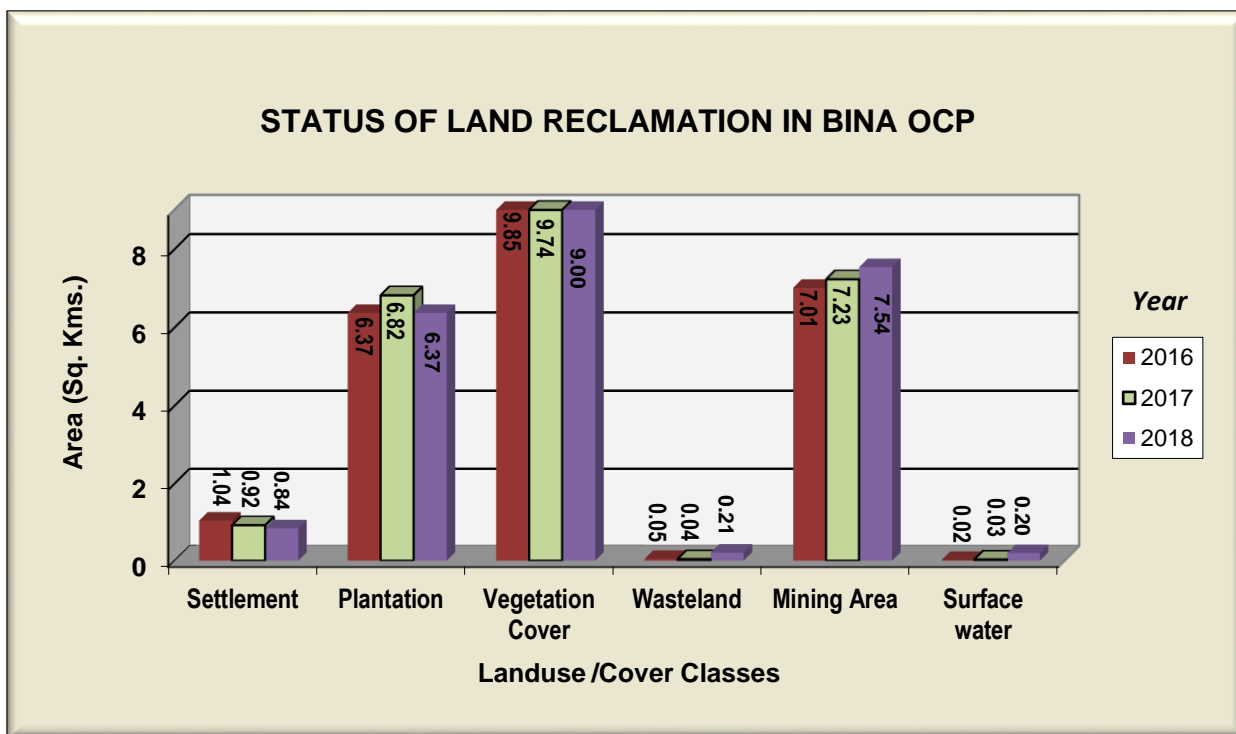


Figure 7.8

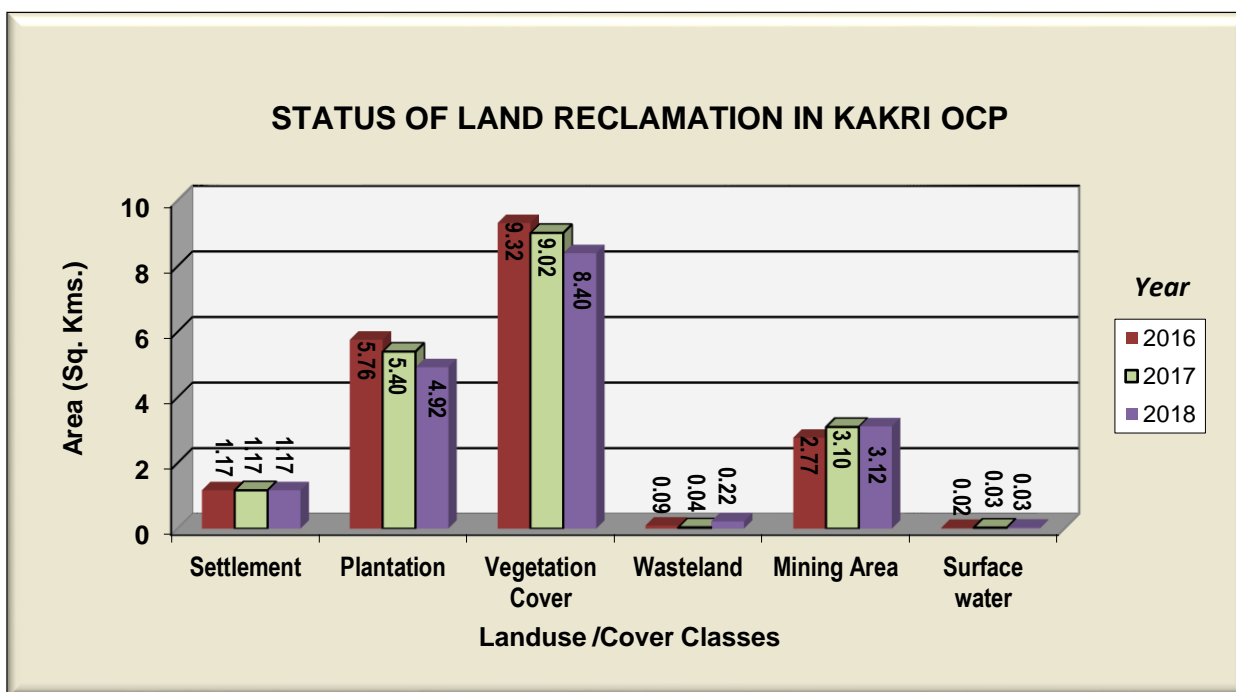


Figure 7.9

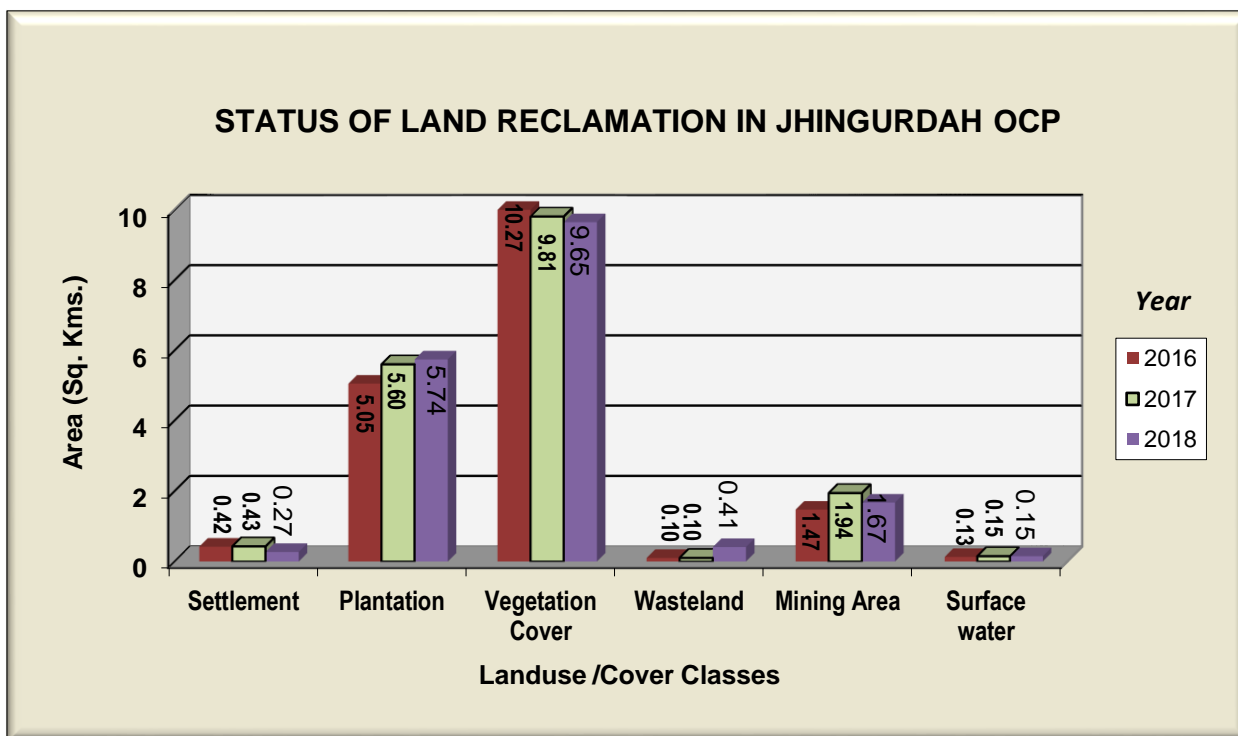


Figure 7.10

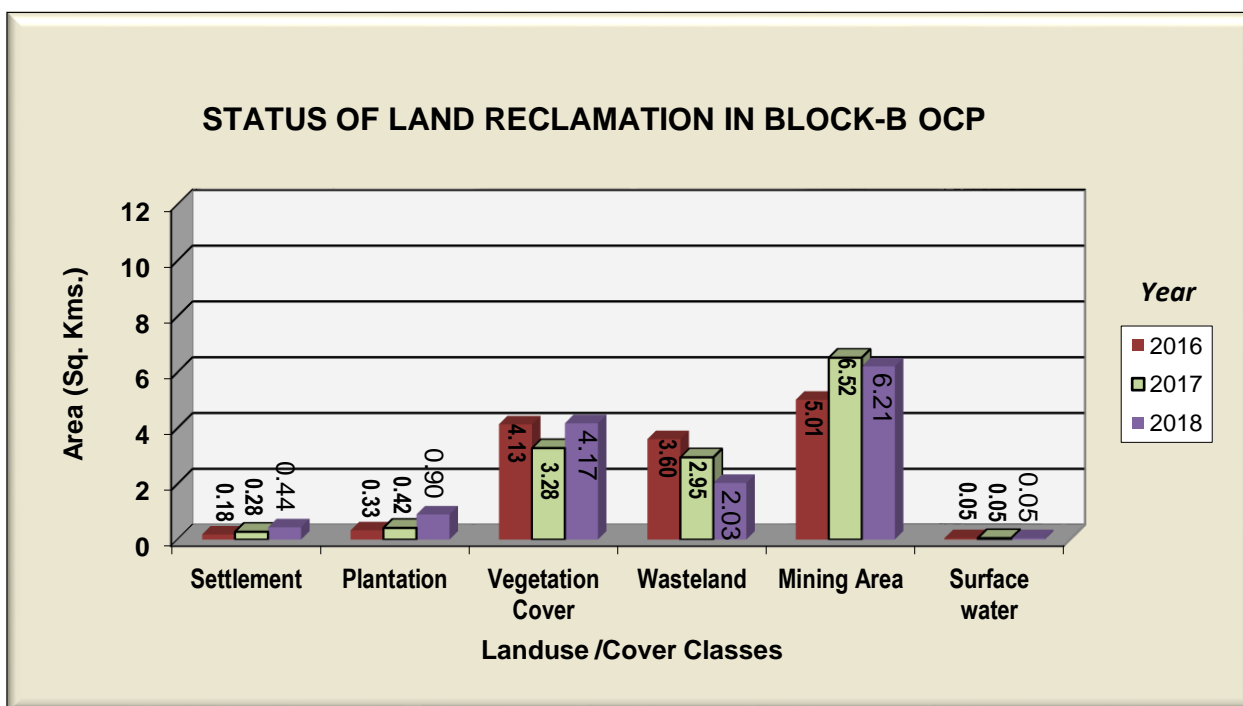
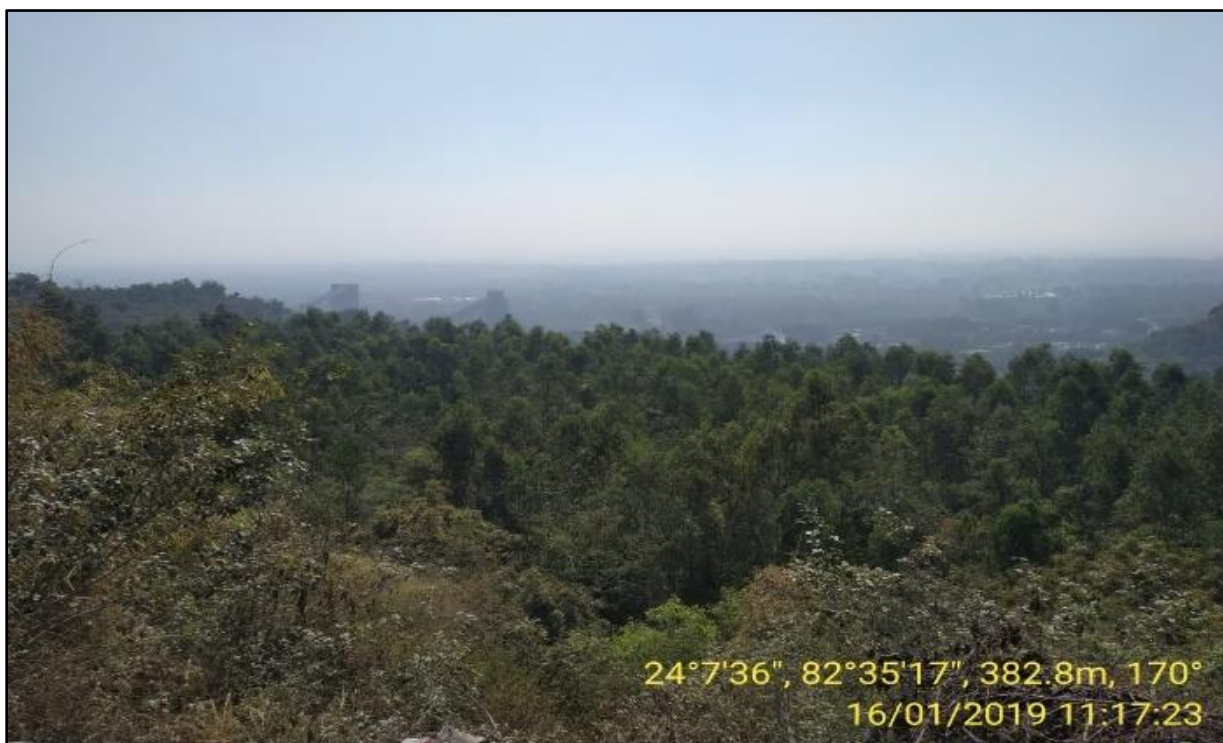


Figure 7.11





Photograph 7.1: **Amlohri OCP- Plantation growing on the slopes of OB**



Photograph 7.2: **Plantation on Slopes of OB Dump in Nigahi OCP**



Photograph 7.3 : **Plantation at Jayant OCP**



Photograph 7.4: **Plantation at Dudhichua OCP**





**Photograph 7.5: View of Plantation on OB at Krishnashila OCP**



**Photograph 7.6: Plantation atop OB Dumps at Bina OCP**



**Photograph 7.7: Plantation at Kakri OCP**



**Photograph 7.8: Plantation at Jhingurdah OCP**



**MAHANADI COALFIELDS LIMITED**

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

**8.1** Following 13 opencast projects of MCL producing more than 5 million cubic meter and more (Coal + OB) annually were taken up for land reclamation monitoring during year 2018-19 based on satellite data of the year 2018 :

- Ananta
- Balram
- Lingaraj
- Bharatpur
- Bhubaneswari
- Jagannath
- Hingula
- Belpahar
- Lakhanpur
- Samleswari
- Lajkura
- Siarmal
- Basundhara West Extension

**8.2** Project wise Land Reclamation status in MCL for the year 2018 is given in Table 8.1 and also shown graphically in Fig 8.1. Area statistics of different land use / cover classes present in the mine leasehold of the above projects for the year 2018-19 are shown in the Table -8.2. Land use maps derived from satellite data are shown in Plate 8.1 – 8.13. Land reclamation status of the above mentioned opencast projects were prepared regularly on annual basis since the year 2008. Year wise changes in the different land use classes based on satellite data are depicted in Bar Charts in Fig. 8.2–8.14 for the last two years only.

**8.3** Study reveals that out of total 45.77 Km<sup>2</sup> excavated area; 29.46 Km<sup>2</sup> area (64.37%) is under reclamation. Out of which 8.17 Km<sup>2</sup> (17.85%) area has been re-vegetated and 21.29 Km<sup>2</sup> (46.52%) area is under backfilling.

- 8.4** Analysis of satellite data indicates that area of plantation (Biological Reclamation) has decreased from 8.22 Km<sup>2</sup> (Yr. 2017) to 8.17 Km<sup>2</sup> (Yr. 2018). This decrease in Biological Reclamation is due to modification in leasehold boundaries in some projects.
- 8.5** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 19.26 km<sup>2</sup> in 2017 to 21.29 km<sup>2</sup> in 2018. All the 13 projects of MCL selected for monitoring are showing an increasing trend in technical reclamation except for Jagannath OCP, where the decrease in technical reclamation area may be due to modification in lease boundary..
- 8.6** It was also observed that overall total area under plantation (Green Cover) has increased from 14.53 km<sup>2</sup> in 2017 to 14.61 km<sup>2</sup> in 2018. Green Cover has reduced in some projects of MCL as there is reduction in social forestry in the leasehold areas of these projects due to mine advancement.
- 8.7** Study indicates that in Balram and Lingaraj OCPs area of plantation on OB dumps has reduced marginally with respect to the year 2017 because of OB dumping on vegetated OB Dump area due to constrain of spaces.
- 8.8** It has been observed that in Bharatpur OCP areas under biological reclamation, social forestry, active mining, excavated area, total area under plantation and total area under reclamation have reduced. This change is reflecting due to modification in boundaries.
- 8.9** On comparing the status of land reclamation for the year 2018 with respect to the year 2017 in different projects, it is evident that area of land reclamation has increased from 27.48 Km<sup>2</sup> (Yr. 2017) to 29.46 Km<sup>2</sup> (Yr.2018).
- 8.10** Out of 13 projects of MCL, Ananta OC ranks on top for land reclamation (80.29%) followed by Balram OC (77.18%) and Samleswari OC (75.32%).

Table – 8.1

## Project wise Land Reclamation Status in Opencast Projects of MCL based on Satellite Data of the year 2018

(Area in Sq. Kms.)

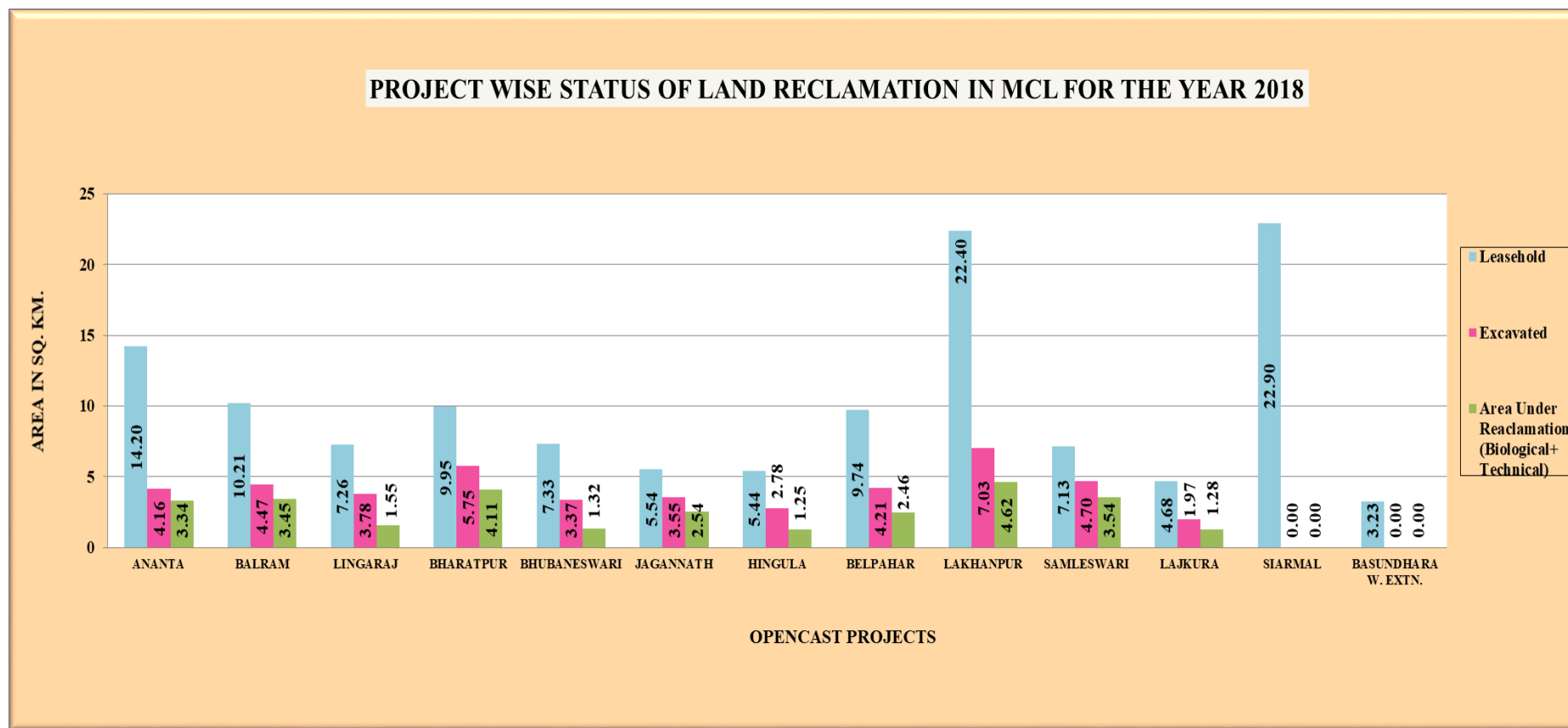
Sl. No.	Project	Total Leasehold Area 2017	Total Leasehold Area 2018	Technical Reclamation		Plantation						Area Under Active Mining	Total Excavated Area	Total Area Under Plantation (%Green Cover Generated in Leasehold)	Total Area Under Reclamation				
				Area under Backfilling		Biological Reclamation		Other Plantation											
						Plantation on Excavated/Backfilled Area		Plantation on External Over Burden Dump		Social Forestry, Avenue Plantation Etc.									
1	2	3	4	5		6		7		8		9		10(=5+6+9)		11(=6+7+8)		12(=5+6)	
				2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Ananta	4.56	14.20	2.01	2.33	0.87	1.01	0.11	0.11	0.09	0.23	0.62	0.82	3.50	4.16	1.07	1.35	2.88	3.34
				57.43%	56.01%	24.86%	24.28%					17.71%	19.71%			23.46%	9.51%	82.29%	80.29%
2	Balram	10.21	10.21	2.28	2.43	1.00	1.02	0.28	0.24	0.21	0.20	0.81	1.02	4.09	4.47	1.49	1.46	3.28	3.45
				55.75%	54.36%	24.45%	22.82%					19.80%	22.82%			14.59%	14.30%	80.20%	77.18%
3	Lingaraj	7.26	7.26	1.25	1.39	0.16	0.16	0.32	0.31	0.37	0.33	2.20	2.23	3.61	3.78	0.85	0.80	1.41	1.55
				34.63%	36.77%	4.43%	4.23%					60.94%	58.99%			11.71%	11.02%	39.06%	41.01%
4	Bharatpur	9.43	9.95	2.40	2.48	1.78	1.63	0.44	0.45	0.34	0.18	1.84	1.64	6.02	5.75	2.56	2.26	4.18	4.11
				39.87%	43.13%	29.57%	28.35%					30.56%	28.52%			27.15%	22.71%	69.44%	71.48%
5	Bhubaneswari	7.33	7.33	0.83	1.31	0.01	0.01	0.00	0.00	0.32	0.27	2.18	2.05	3.02	3.37	0.33	0.28	0.84	1.32
				27.48%	38.87%	0.33%	0.30%					72.19%	60.83%			4.50%	3.82%	27.81%	39.17%
6	Jagannath	4.99	5.54	0.89	0.75	2.05	1.79	0.00	0.00	0.14	0.17	0.91	1.01	3.85	3.55	2.19	1.96	2.94	2.54
				23.12%	21.13%	53.25%	50.42%					23.64%	28.45%			43.89%	35.38%	76.36%	71.55%
7	Hingula	4.83	5.44	1.08	1.18	0.07	0.07	0.21	0.21	0.22	0.21	1.41	1.53	2.56	2.78	0.50	0.49	1.15	1.25
				42.19%	42.45%	2.73%	2.52%					55.08%	55.04%			10.35%	9.01%	44.92%	44.96%
8	Belpahar	9.74	9.74	1.47	1.55	0.85	0.91	0.56	0.59	0.40	0.39	1.61	1.75	3.93	4.21	1.81	1.89	2.32	2.46
				37.40%	36.82%	21.63%	21.62%					40.97%	41.57%			18.58%	19.40%	59.03%	58.43%
9	Lakhanpur	16.20	22.40	3.36	3.90	0.60	0.72	0.44	0.59	0.41	0.46	2.46	2.41	6.42	7.03	1.45	1.77	3.96	4.62
				52.34%	55.48%	9.35%	10.24%					38.32%	34.28%			8.95%	7.90%	61.68%	65.72%
10	Samleswari	7.13	7.13	2.62	2.86	0.67	0.68	0.48	0.48	0.15	0.16	1.28	1.16	4.57	4.70	1.30	1.32	3.29	3.54
				57.33%	60.85%	14.66%	14.47%					28.01%	24.68%			18.23%	18.51%	71.99%	75.32%
11	Lajkura	4.68	4.68	1.07	1.11	0.16	0.17	0.22	0.22	0.07	0.07	0.55	0.69	1.78	1.97	0.45	0.46	1.23	1.28
				60.11%	56.35%	8.99%	8.63%					30.90%	35.03%			9.62%	9.83%	69.10%	64.97%
12	Siarnal	21.85	22.90	0.00	0.00	0.00	0.00	0.00	0.00	0.51	0.54	0.00	0.00	0.00	0.00	0.51	0.54	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			2.33%	2.36%	-	-
13	Basundhara W Extn.	3.23	3.23	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00	0.00	0.00	0.02	0.03	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.62%	0.93%	-	-
Total(MCL)		111.44	130.01	19.26	21.29	8.22	8.17	3.06	3.20	3.25	3.24	15.87	16.31	43.35	45.77	14.53	14.61	27.48	29.46
				44.43%	46.52%	18.96%	17.85%					36.61%	35.63%			13.04%	11.24%	63.39%	64.37%

(% is calculated with respect to excavated area as applicable)

**Note:** In reference to 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 Area under Barren Backfilling only.
3. Area under **Active Mining** includes Coal Quarry, Advance Quarry Site, Quarry Filled with Water, if any. Coal Dumps have been excluded from Active Mining Area.
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".

























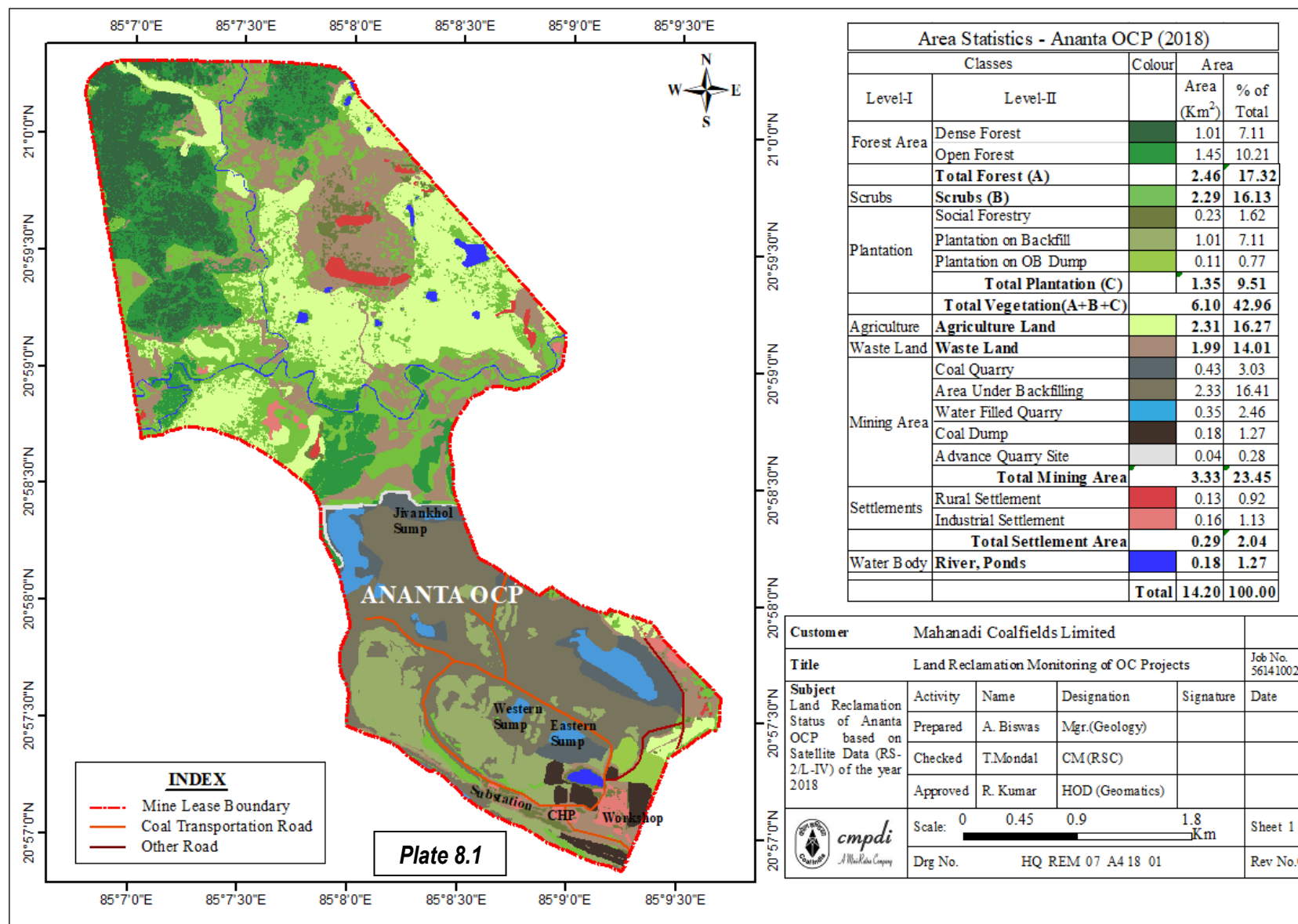
**Fig.8.1: Land reclamation status in OC projects of MCL in the year 2018**

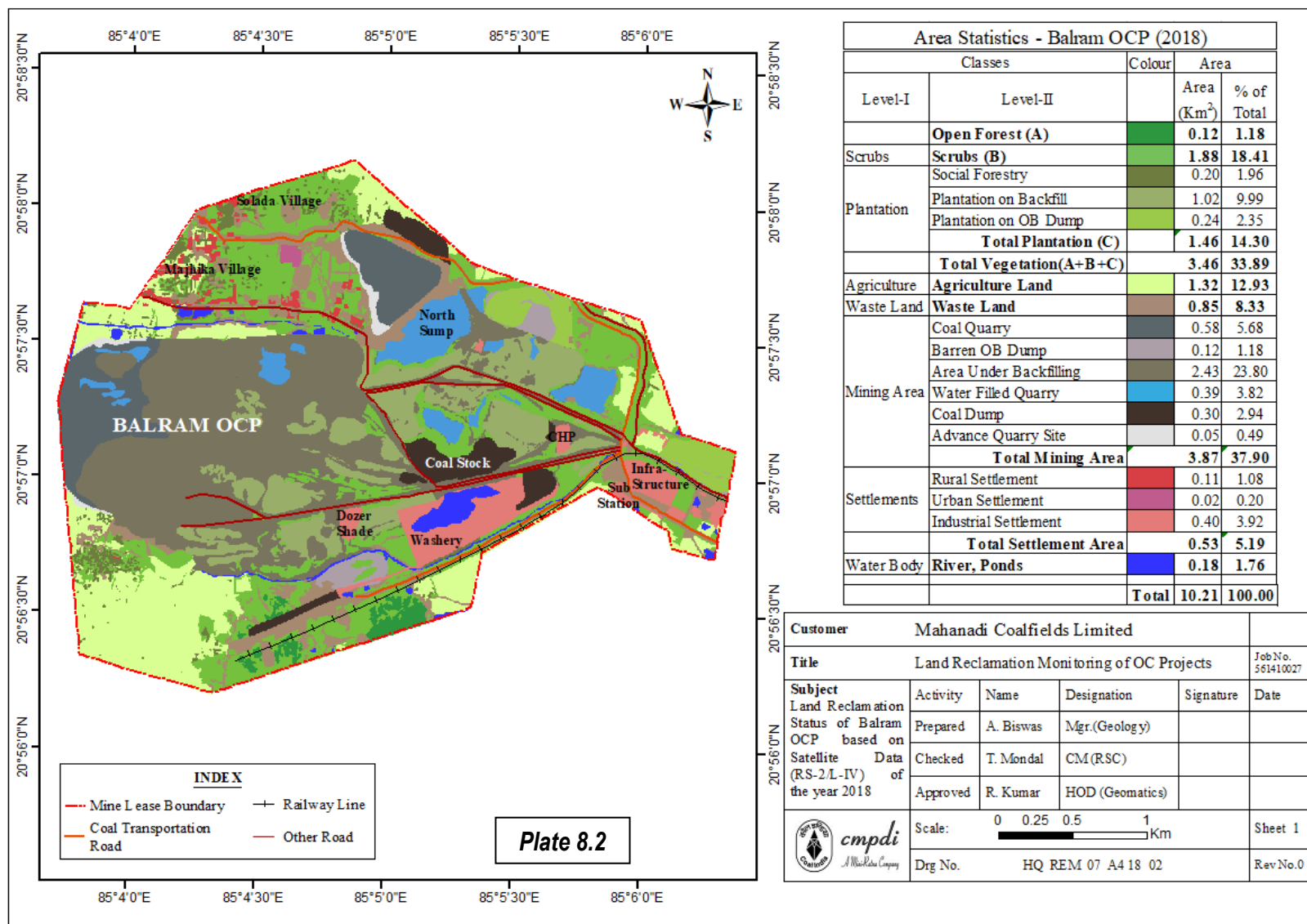
Table 8.2

## Project wise Area Statistics of Land Use / Cover in OC Mines (&gt; 5 mcu.m.) of MCL based on Satellite data of the Year 2018

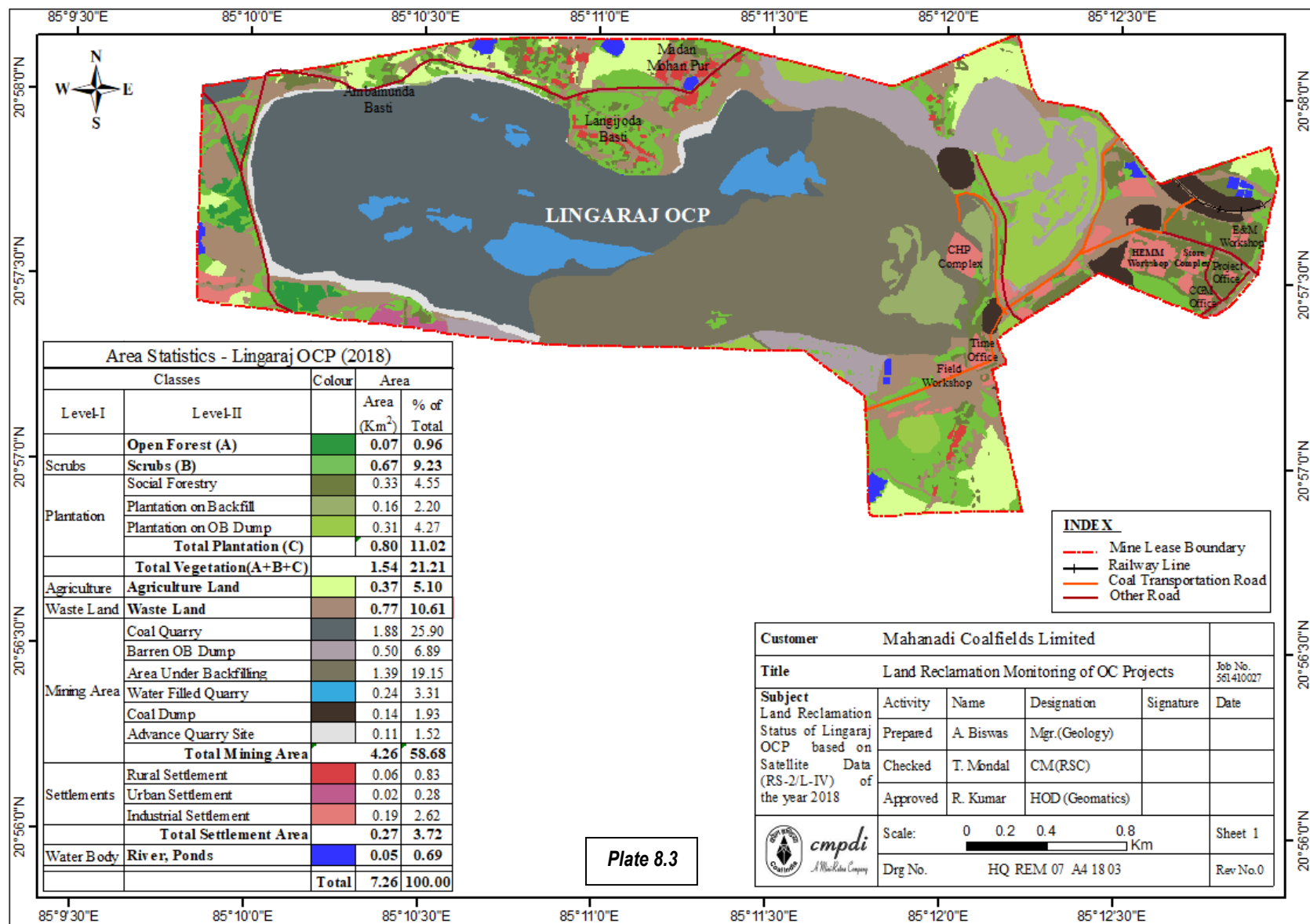
(Area in Km<sup>2</sup>)

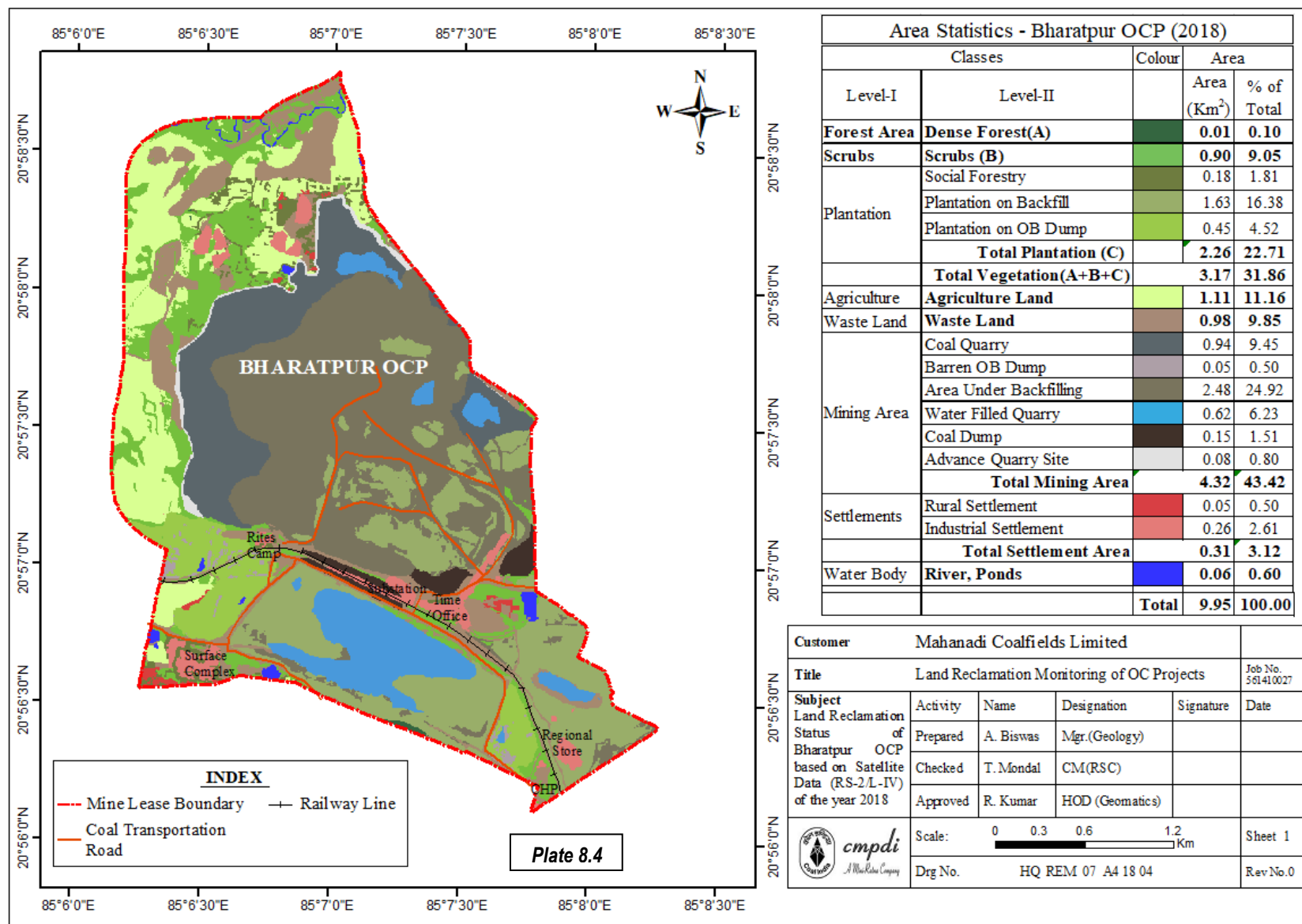
			ANANTA		BALRAM		LINGARAJ		BHARATPUR		BHUBANESHWARI		JAGANNATH		HINGULA		BELPAHAR		LAKHANPUR		SAMLESWARI		LAJKURA		SIARMAL		BASUNDHARA W EXTN		TOTAL		
FORESTS			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	
	Dense Forest		1.01	7.11	0.00	0.00	0.00	0.00	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.05	0.70	1.00	21.37	0.00	0.00	0.00	0.00	0.00	0.00	3.90	3.00
	Open Forest		1.45	10.21	0.12	1.18	0.07	0.96	0.00	0.00	0.68	9.28	0.05	0.90	0.05	0.92	0.00	0.00	3.02	13.48	0.10	1.40	0.47	10.04	0.82	3.58	0.79	24.46	7.62	5.86	
	Total Forest (A)		2.46	17.32	0.12	1.18	0.07	0.96	0.01	0.10	0.68	9.28	0.05	0.90	0.05	0.92	0.00	0.00	4.85	21.65	0.15	2.10	1.47	31.41	0.82	3.58	0.79	24.46	11.52	8.86	
SCRUBS	Scrubs (B)		2.29	16.13	1.88	18.41	0.67	9.23	0.90	9.05	0.51	6.96	0.37	6.68	0.41	7.54	1.92	19.71	2.96	13.21	0.43	6.03	0.29	6.20	7.31	31.92	1.36	42.11	21.30	16.38	
	Social Forestry		0.23	1.62	0.20	1.96	0.33	4.55	0.18	1.81	0.27	3.68	0.17	3.07	0.21	3.86	0.39	4.00	0.46	2.05	0.16	2.24	0.07	1.50	0.54	2.36	0.03	0.93	3.24	2.49	
PLANTATION	Plantation on External OB Dump		0.11	0.77	0.24	2.35	0.31	4.27	0.45	4.52	0.00	0.00	0.00	0.00	0.21	3.86	0.59	6.06	0.59	2.63	0.48	6.73	0.22	4.70	0.00	0.00	0.00	0.00	3.20	2.46	
	Plantation on Backfill/Excavated Area(Biological Reclamation)		1.01	7.11	1.02	9.99	0.16	2.20	1.63	16.38	0.01	0.14	1.79	32.31	0.07	1.29	0.91	9.34	0.72	3.21	0.68	9.54	0.17	3.63	0.00	0.00	0.00	0.00	8.17	6.28	
	Total Plantation (Green Cover) (C)		1.35	9.51	1.46	14.30	0.80	11.02	2.26	22.71	0.28	3.82	1.96	35.38	0.49	9.01	1.89	19.40	1.77	7.90	1.32	18.51	0.46	9.83	0.54	2.36	0.03	0.93	14.61	11.24	
	Total Vegetation (A+B+C)		6.10	42.96	3.46	33.89	1.54	21.21	3.17	31.86	1.47	20.05	2.38	42.96	0.95	17.46	3.81	39.12	9.58	42.77	1.90	26.65	2.22	47.44	8.67	37.85	2.18	67.49	47.43	36.48	
ACTIVE MINING	Coal Dump		0.18	1.27	0.30	2.94	0.14	1.93	0.15	1.51	0.10	1.36	0.09	1.62	0.35	6.43	0.10	1.03	0.14	0.63	0.07	0.98	0.04	0.85	0.00	0.00	0.00	0.00	1.66	1.28	
	Coal Quarry		0.43	3.03	0.58	5.68	1.88	25.90	0.94	9.45	1.67	22.78	0.35	6.32	0.73	13.42	1.31	13.45	1.84	8.21	0.96	13.46	0.57	12.18	0.00	0.00	0.00	0.00	11.26	8.66	
	Advance Quarry Site		0.04	0.28	0.05	0.49	0.11	1.52	0.08	0.80	0.20	2.73	0.03	0.54	0.03	0.55	0.23	2.36	0.38	1.70	0.16	2.24	0.08	1.71	0.00	0.00	0.00	0.00	1.39	1.07	
	Quarry Filled with Water		0.35	2.46	0.39	3.82	0.24	3.31	0.62	6.23	0.18	2.46	0.63	11.37	0.77	14.15	0.21	2.16	0.19	0.85	0.04	0.56	0.04	0.85	0.00	0.00	0.00	0.00	3.66	2.82	
	Total Area under Active Mining		0.82	5.77	1.02	9.99	2.23	30.72	1.64	16.48	2.05	27.97	1.01	18.23	1.53	28.13	1.75	17.97	2.41	10.76	1.16	16.27	0.69	14.74	0.00	0.00	0.00	0.00	16.31	12.54	
	Barren OB dump		0.00	0.00	0.12	1.18	0.50	6.89	0.05	0.50	0.78	10.64	0.00	0.00	0.02	0.37	0.12	1.23	0.02	0.09	0.07	0.98	0.03	0.64	0.00	0.00	0.00	0.00	1.71	1.32	
	Area Under Backfilling(Technical Reclamation)		2.33	16.41	2.43	23.80	1.39	19.15	2.48	24.92	1.31	17.87	0.75	13.54	1.18	21.69	1.55	15.91	3.90	17.41	2.86	40.11	1.11	23.72	0.00	0.00	0.00	0.00	21.29	16.38	
	Total Area under Mine Operation		3.33	23.45	3.87	37.90	4.26	58.68	4.32	43.42	4.24	57.84	1.85	33.39	3.08	56.62	3.52	36.14	6.47	28.88	4.16	58.35	1.87	39.96	0.00	0.00	0.00	0.00	40.97	31.51	
	Waste Lands		1.99	14.01	0.85	8.33	0.77	10.61	0.98	9.85	0.39	5.32	0.51	9.21	0.73	13.42	1.51	15.50	1.63	7.28	0.61	8.56	0.47	10.04	1.81	7.90	0.64	19.81	12.89	9.91	
WASTELANDS	Fly Ash Pond/Sand Body		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	1.99	0.06	1.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.13	
	Total Wastelands		1.99	14.01	0.85	8.33	0.77	10.61	0.98	9.85	0.39	5.32	0.62	11.19	0.79	14.52	1.51	15.50	1.63	7.28	0.61	8.56	0.47	10.04	1.81	7.90	0.64	19.81	13.06	10.05	
	Reservoir, nallah, ponds etc.		0.18	1.27	0.18	1.76	0.05	0.69	0.06	0.60	0.03	0.41	0.06	1.08	0.14	2.57	0.26	2.67	0.25	1.12	0.06	0.84	0.01	0.21	0.19	0.85	0.02	0.62	1.49	1.15	
WATER	Total Waterbodies		0.18	1.27	0.18	1.76	0.05	0.69	0.06	0.60	0.03	0.41	0.06	1.08	0.14	2.57	0.26	2.67	0.25	1.12	0.06	0.84	0.01	0.21	0.19	0.85	0.02	0.62	1.49	1.15	
	Crop Lands		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	2.16	9.43	0.00	0.00	2.16	1.66	
AGRICULTURE	Fallow Lands		2.31	16.27	1.32	12.93	0.37	5.10	1.11	11.16	1.09	14.87	0.47	8.48	0.41	7.54	0.32	3.29	4.21	18.79	0.21	2.95	0.04	0.85	9.35	40.82	0.37	11.46	21.58	16.60	
	Total Agriculture		2.31	16.27	1.32	12.93	0.37	5.10	1.11	11.16	1.09	14.87	0.47	8.48	0.41	7.54	0.32	3.29	4.21	18.79	0.21	2.95	0.04	0.85	11.51	50.25	0.37	11.46	23.74	18.26	
SETTLEMENTS	Urban Settlement		0.00	0.00	0.02	0.20	0.02	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.18	0.01	0.10	0.00	0.00	0.00	0.00	0.00	0.03	0.13	0.00	0.00	0.09	0.07		
	Rural Settlement		0.13	0.92	0.11	1.08	0.06	0.83	0.05	0.50	0.09	1.23	0.05	0.90	0.04	0.74	0.08	0.82	0.14	0.63	0.02	0.28	0.00	0.00	0.69	3.01	0.02	0.62	1.48	1.14	
	Industrial Settlement		0.16	1.13	0.40	3.92	0.19	2.62	0.26	2.61	0.02	0.27	0.11	1.99	0.02	0.37	0.23	2.36	0.12	0.54	0.17	2.38	0.07	1.50	0.00	0.00	0.00	0.00	1.75	1.35	
	Total Settlements		0.29	2.04	0.53	5.19	0.27	3.72	0.31	3.12	0.11	1.50	0.16	2.89	0.07	1.29	0.32	3.29	0.26	1.16	0.19	2.66	0.07	1.50	0.72	3.14	0.02	0.62	3.32	2.55	
GRAND TOTAL			14.20	100.00	10.21	100.00	7.26	100.00	9.95	100.00	7.33	100.00	5.54	100.00	5.44	100.00	9.74	100.00	22.40	100.00	7.13	100.00	4.68	100.00	22.90	100.00	3.23	100.00	130.01	100.00	

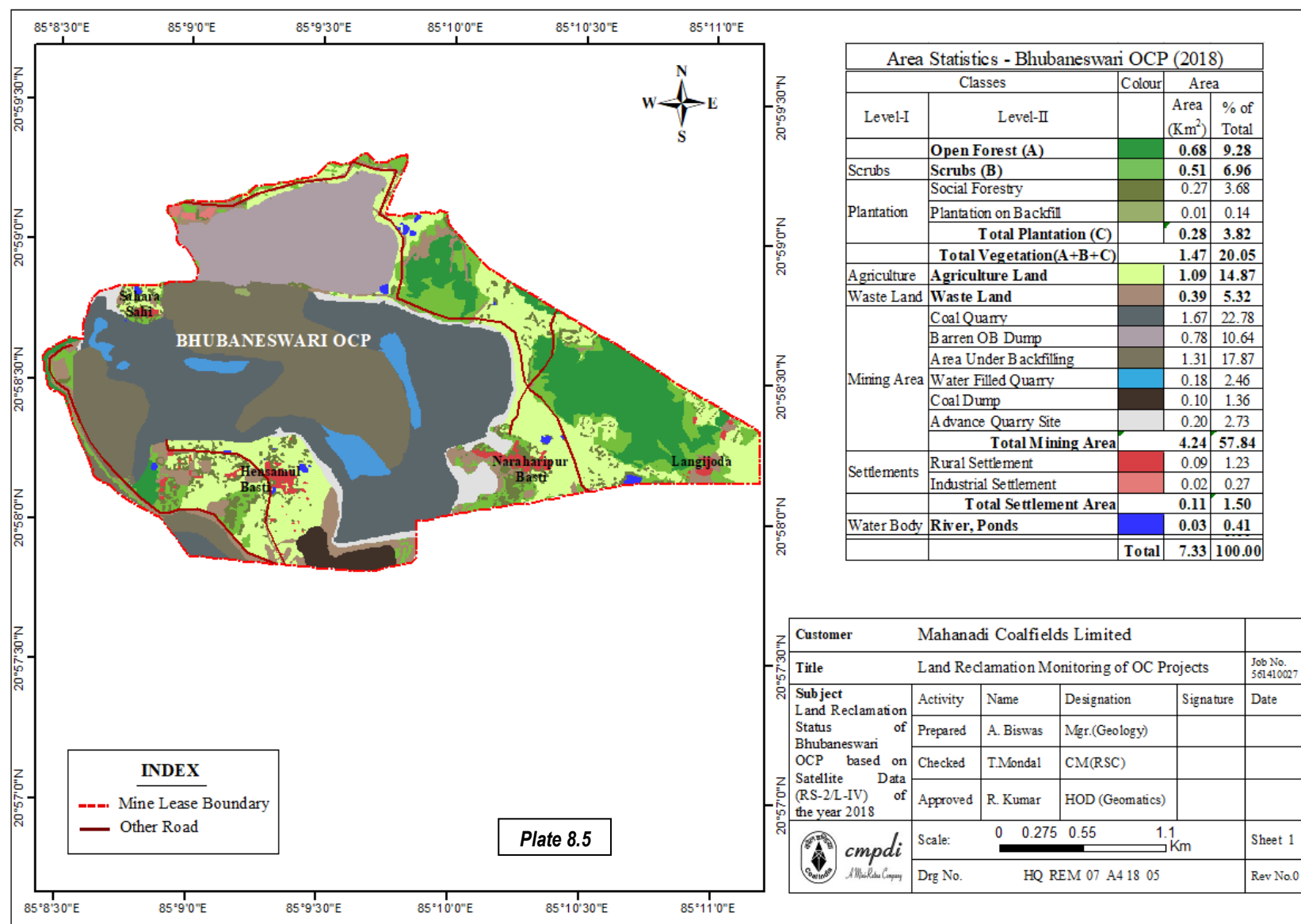


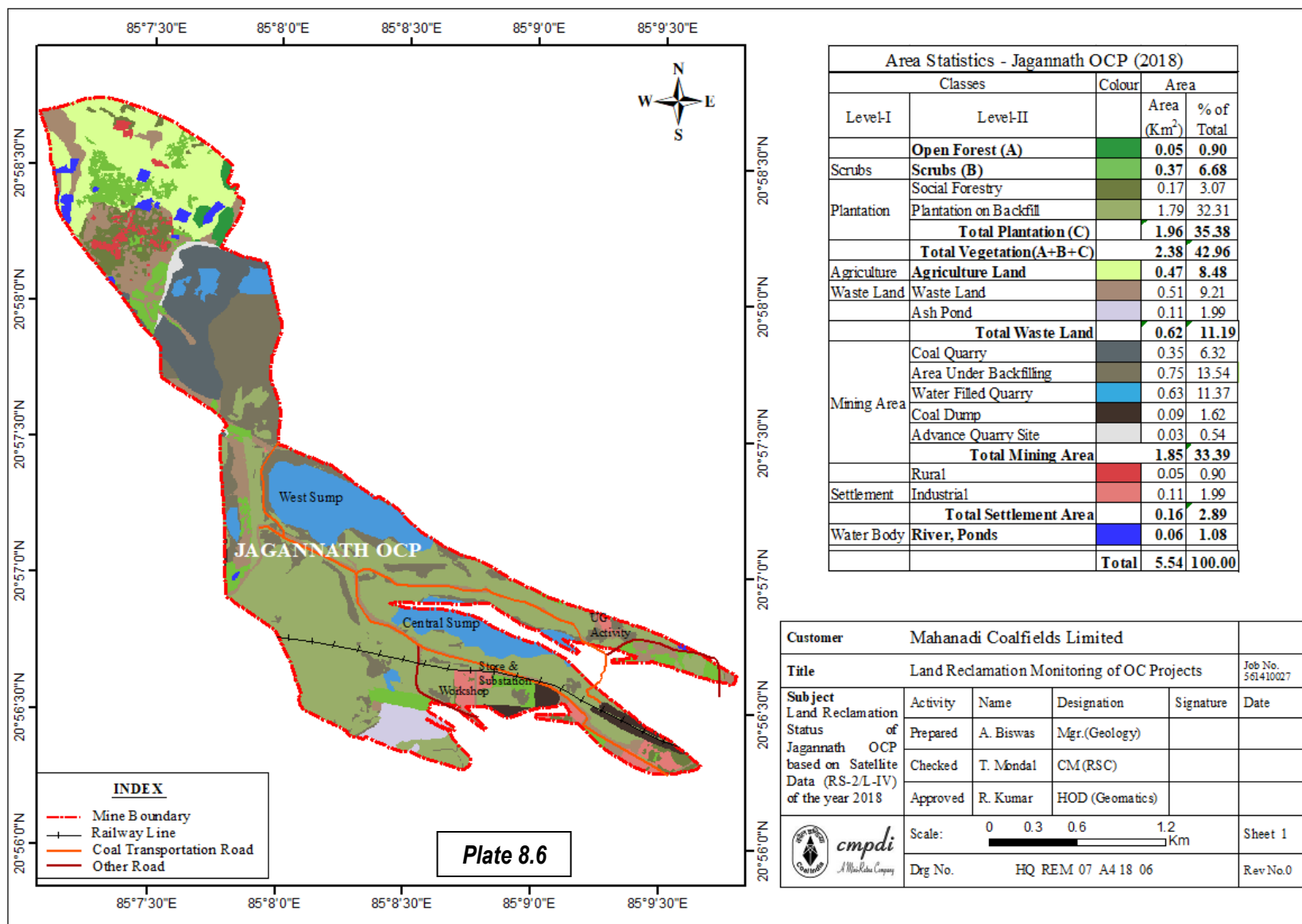




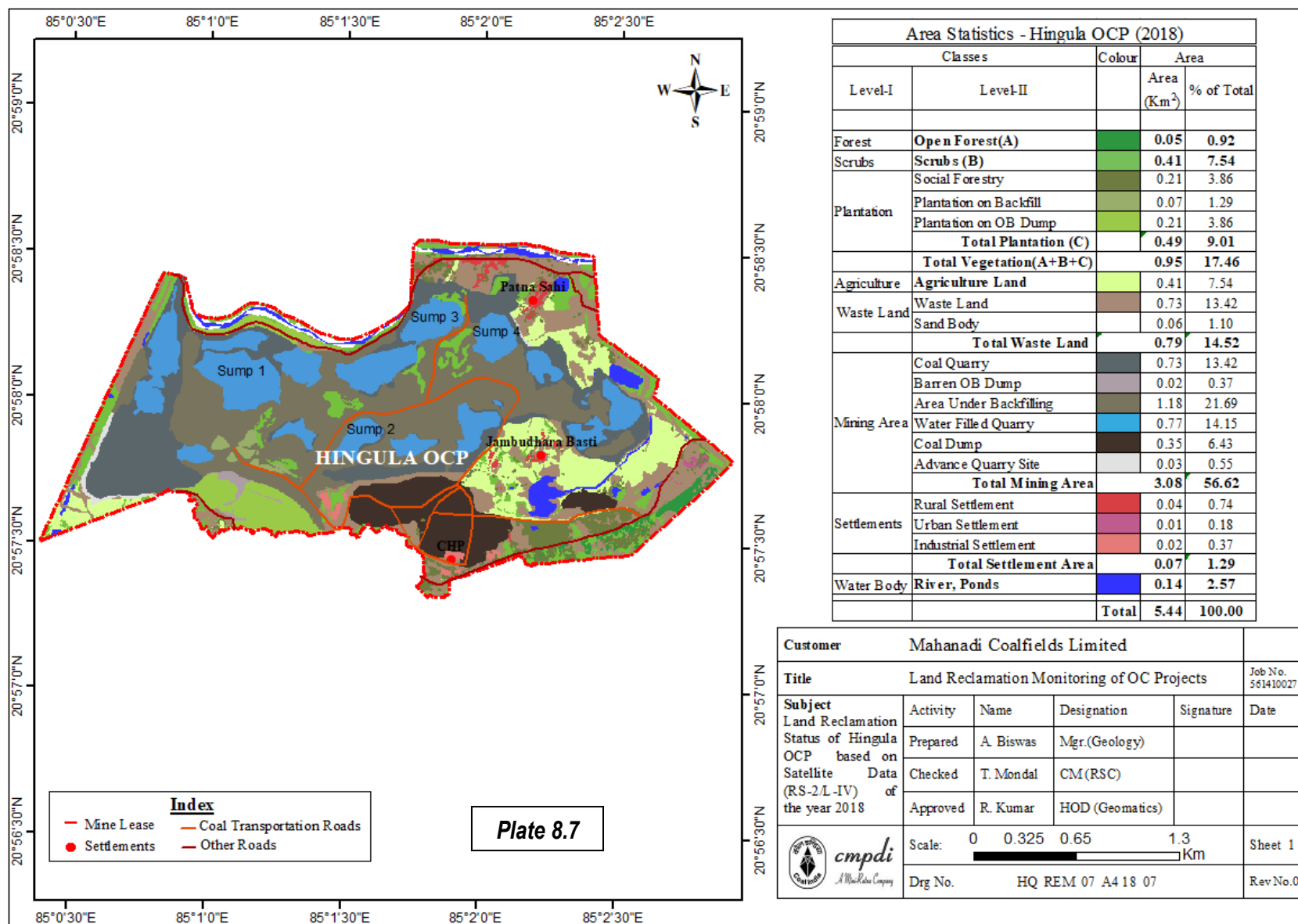


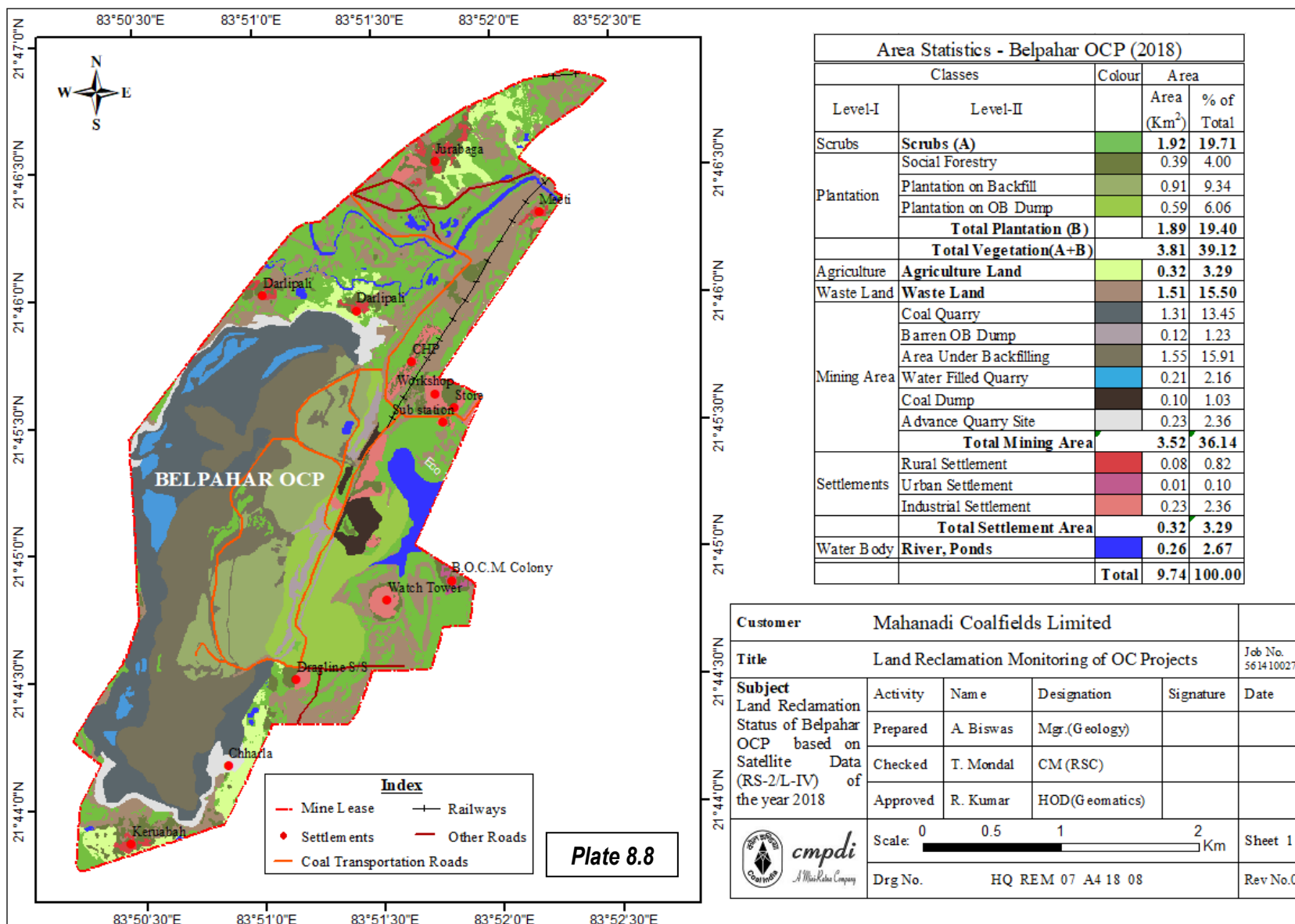


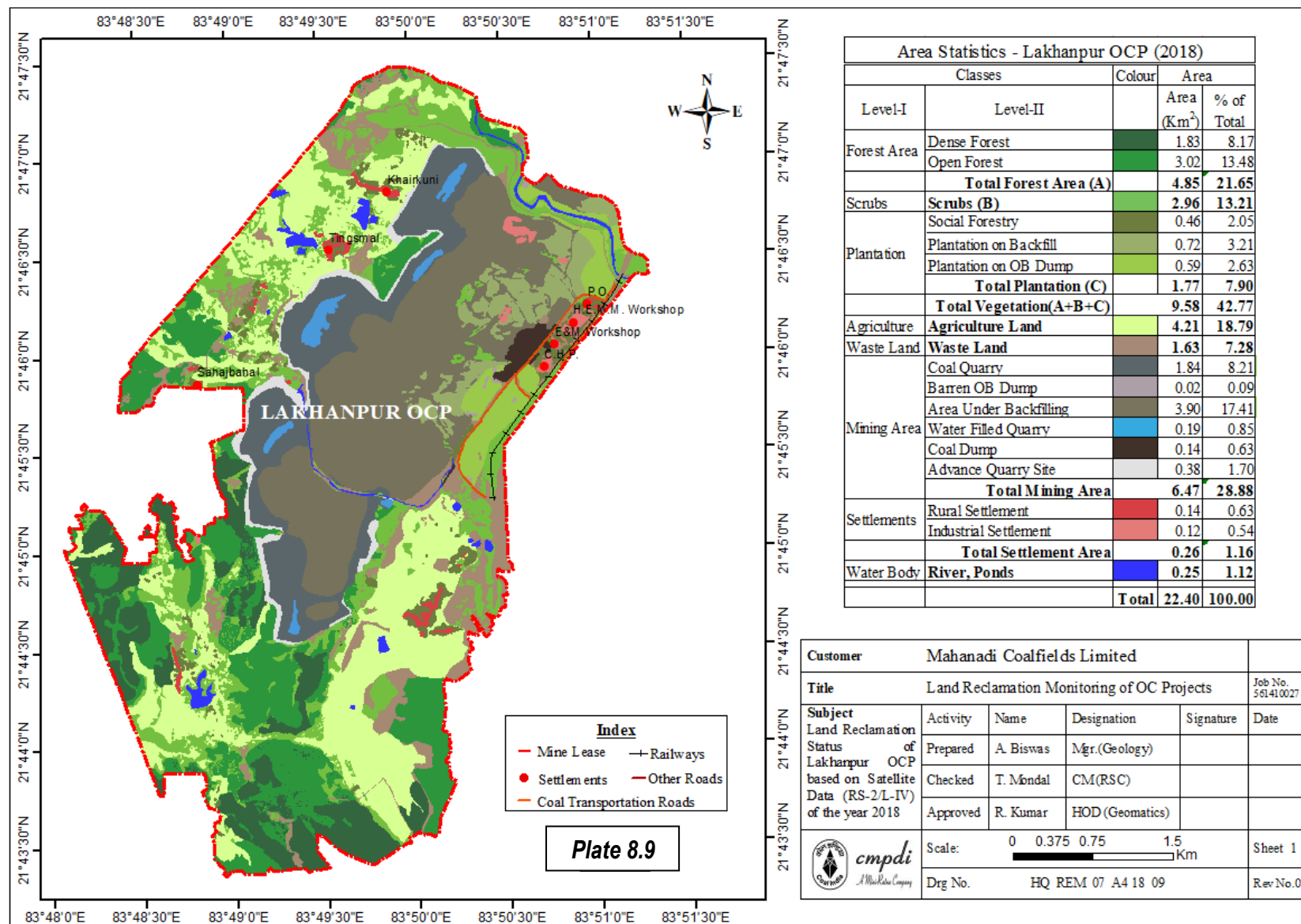


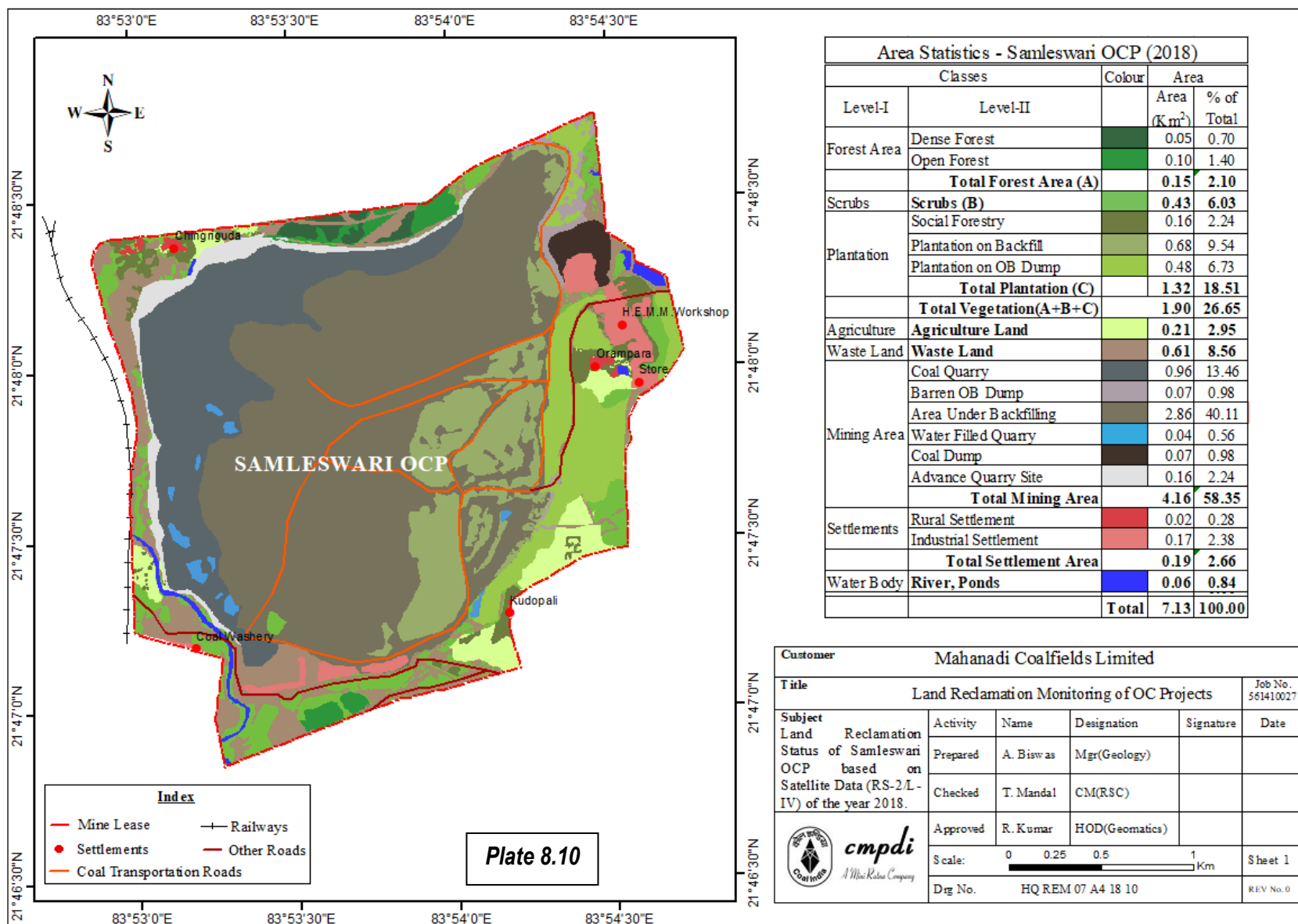




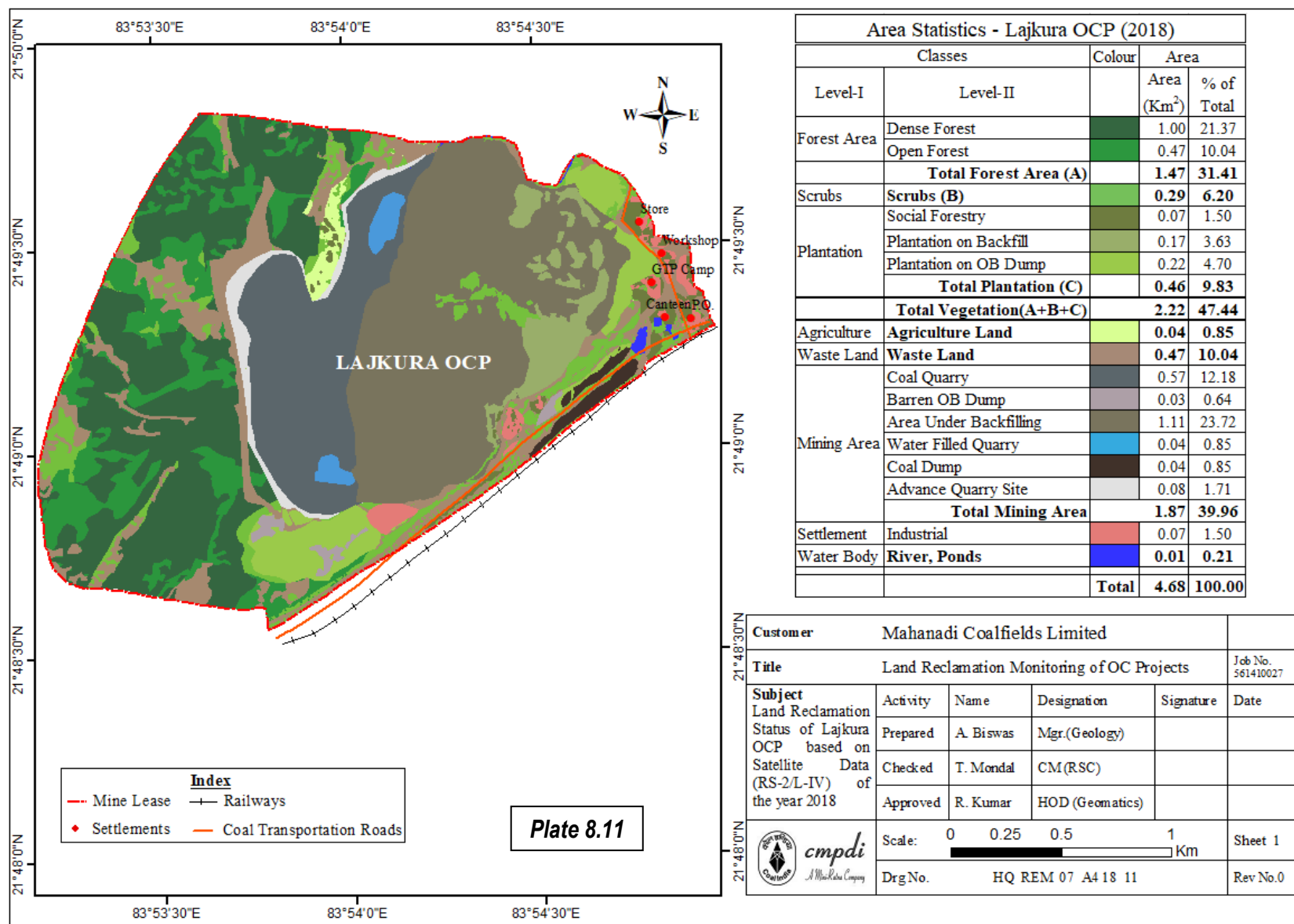


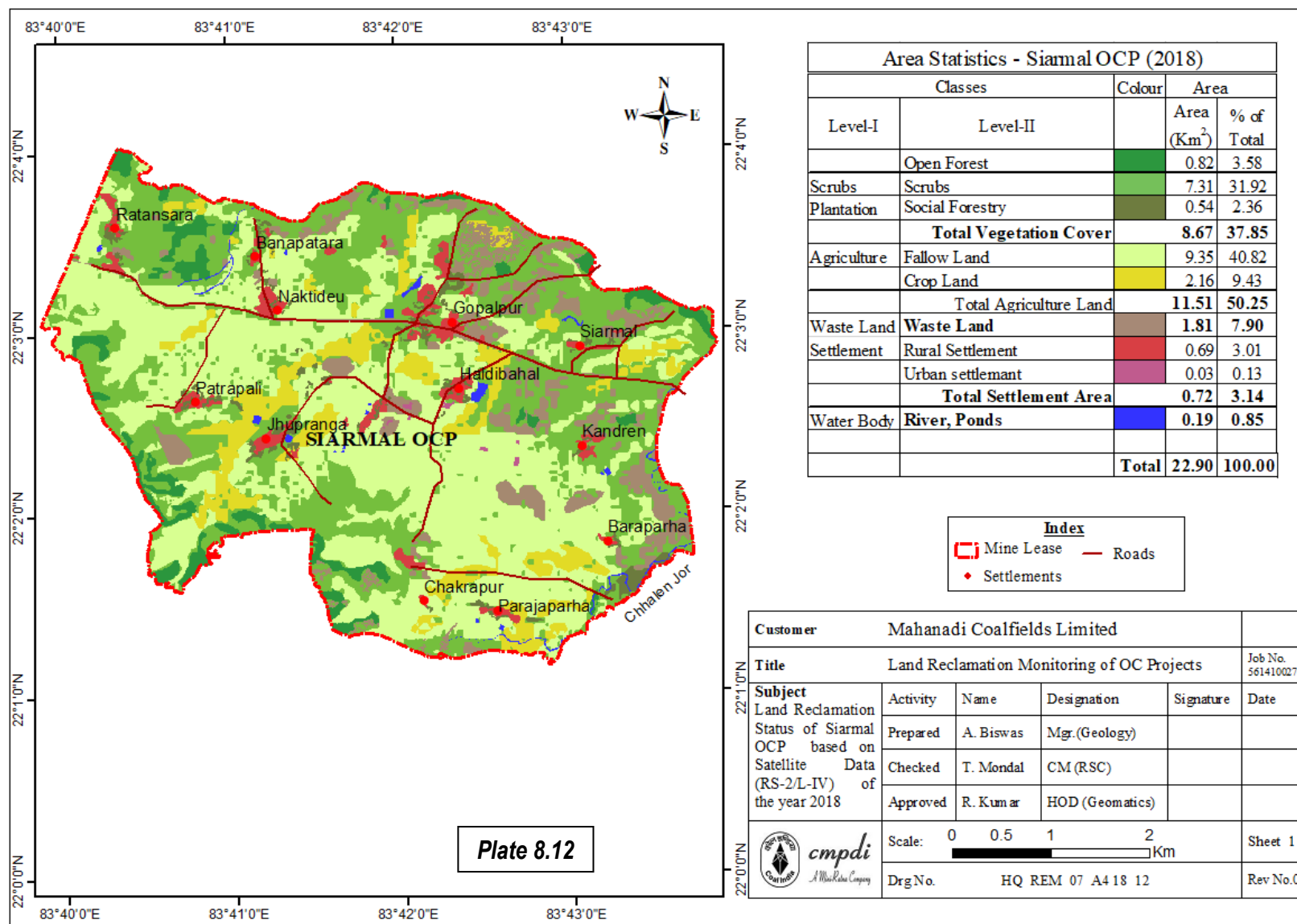


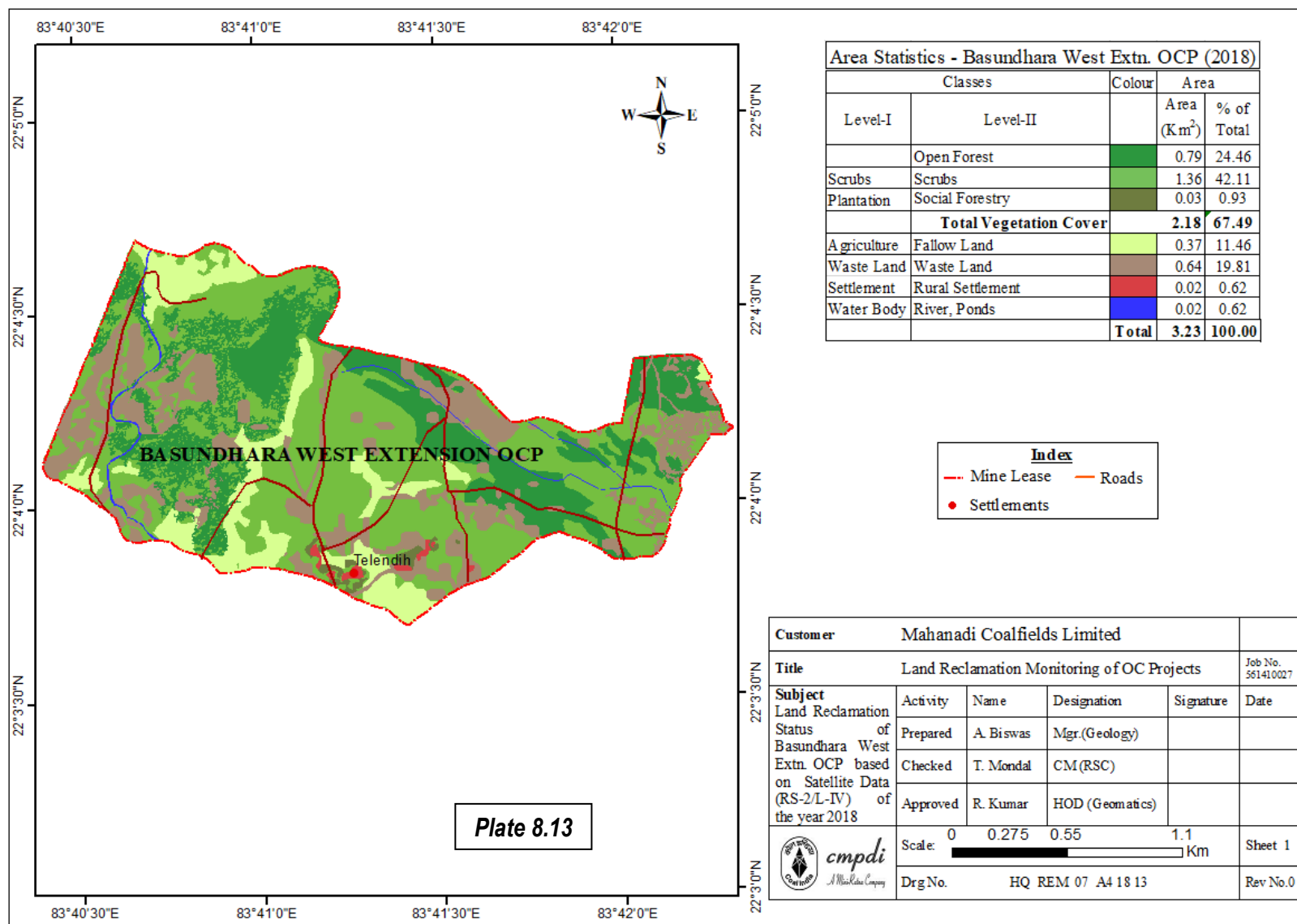












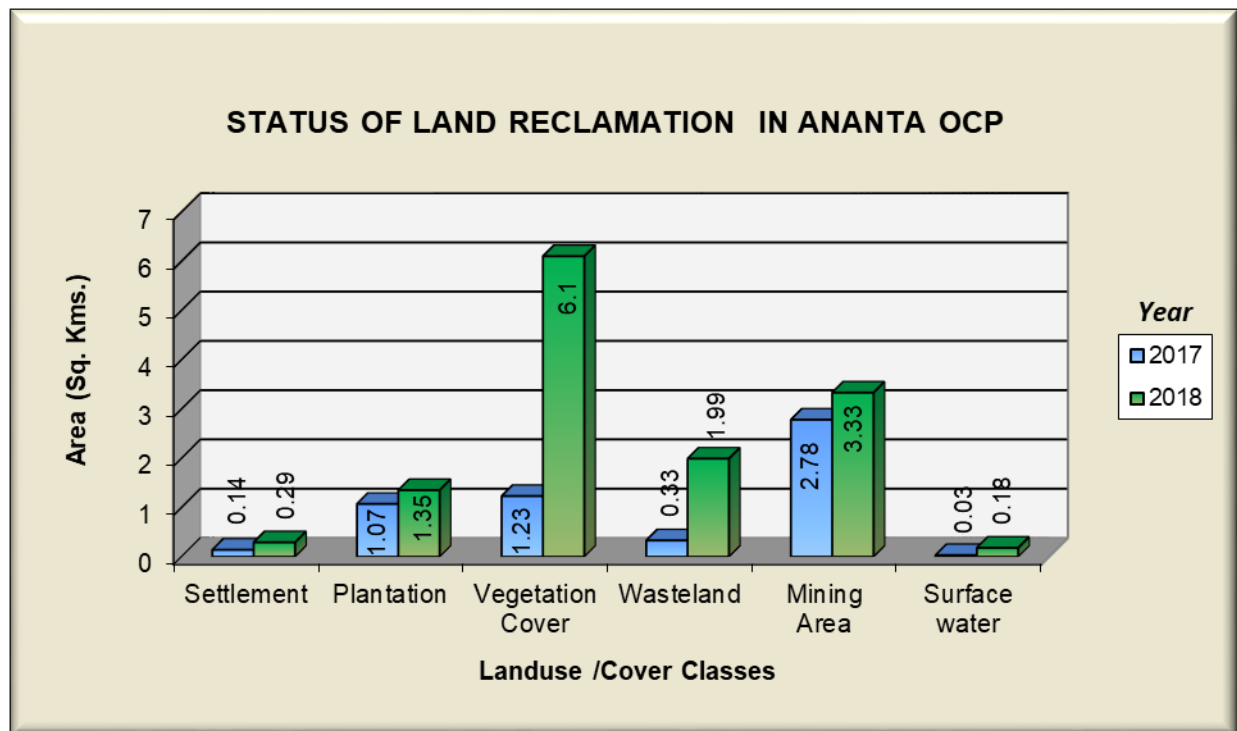


Figure 8.2

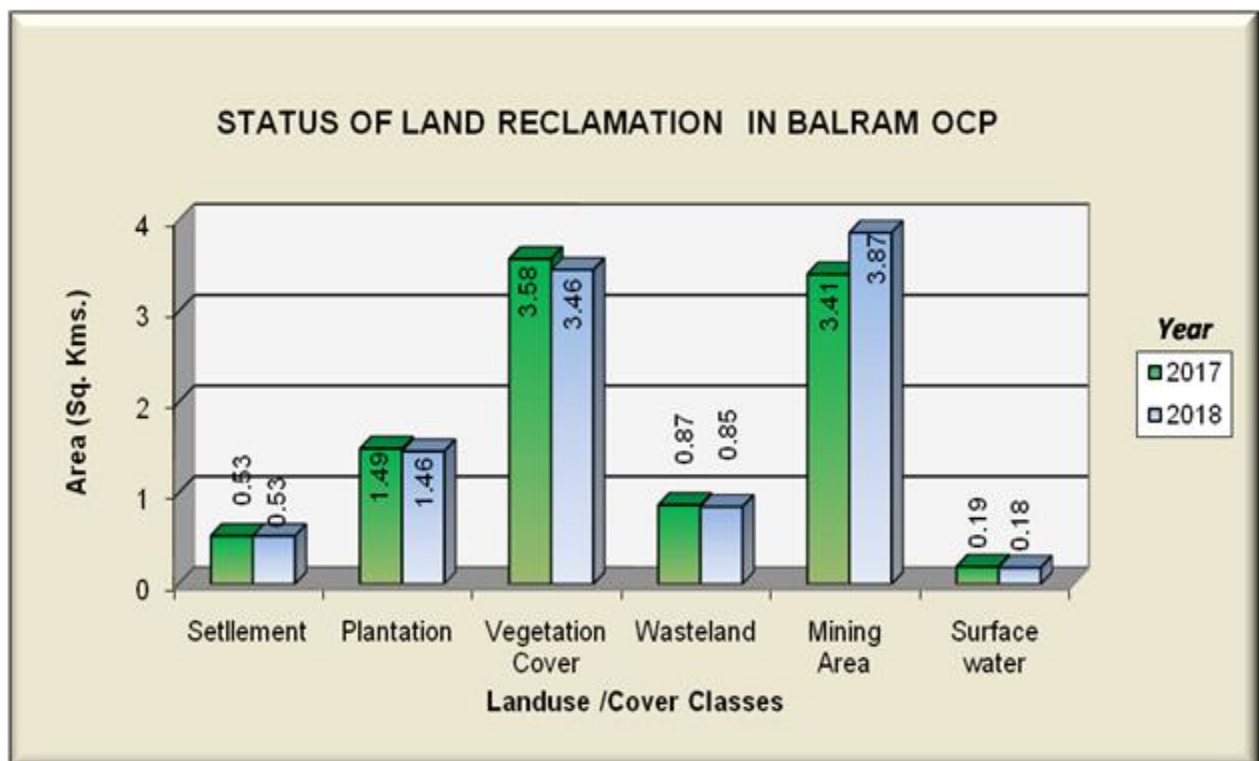


Figure 8.3



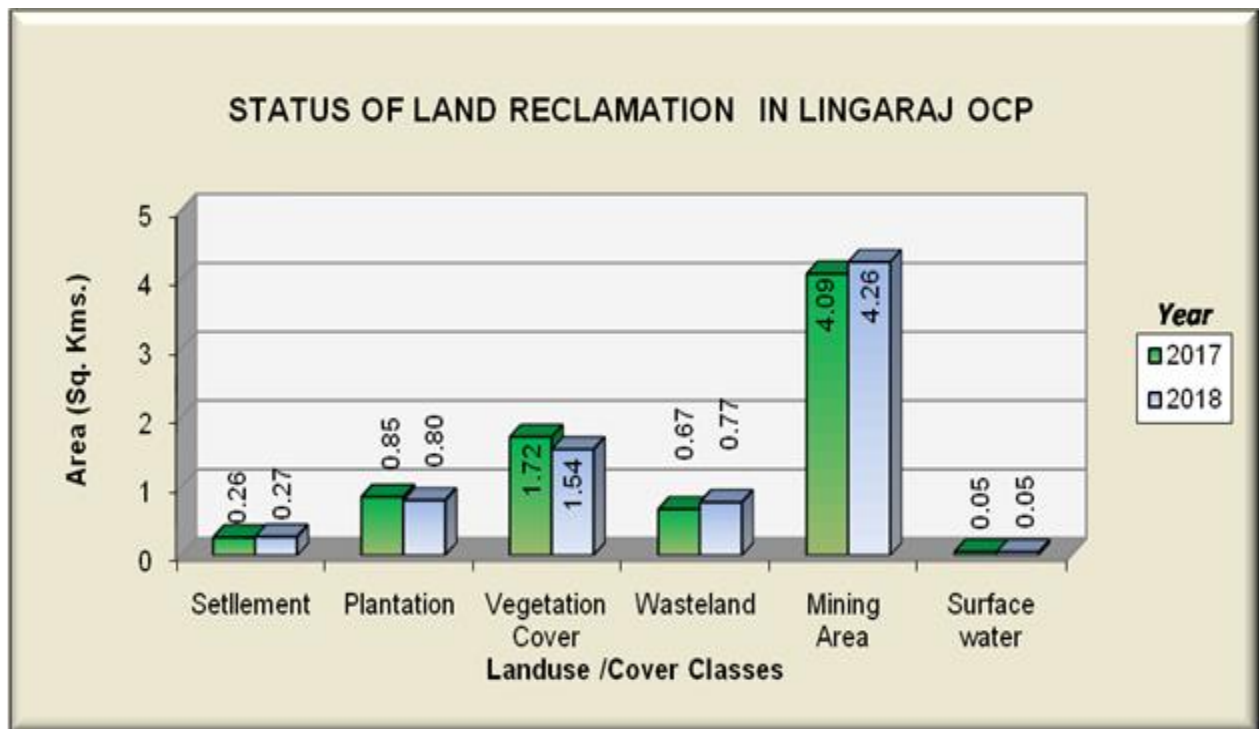


Figure 8.4

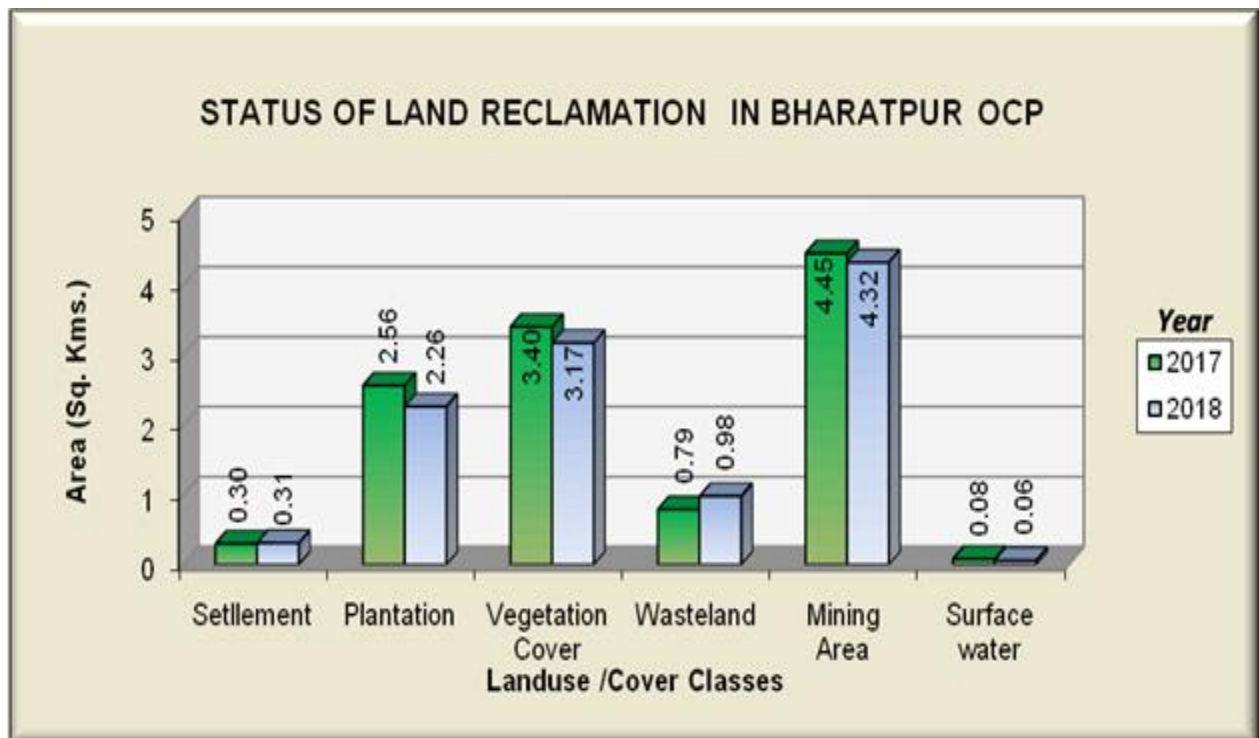


Figure 8.5

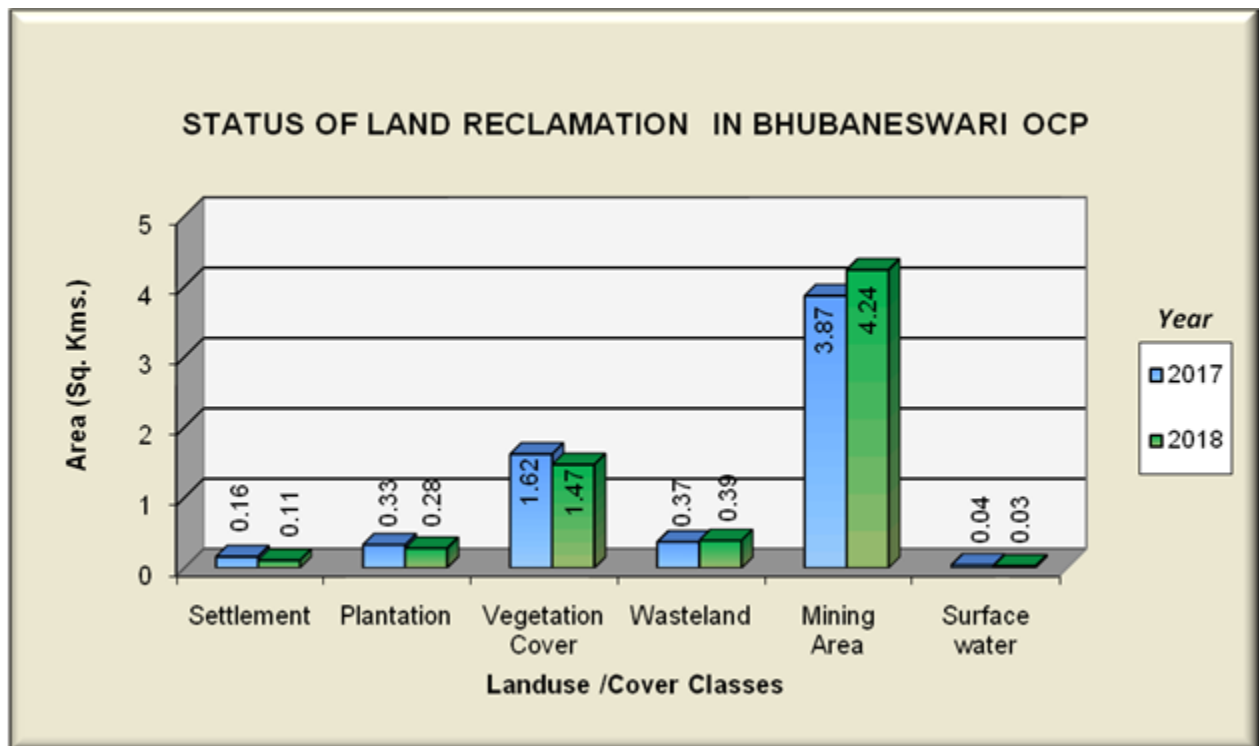


Figure 8.6

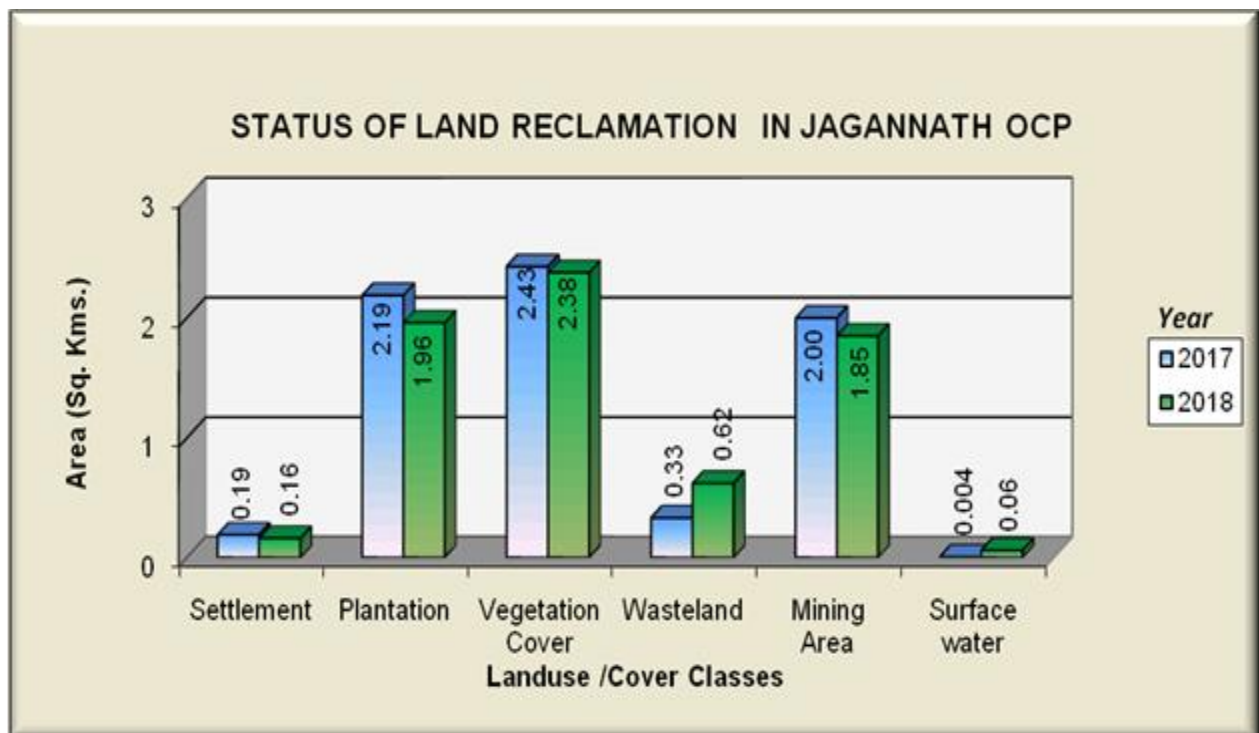


Figure 8.7

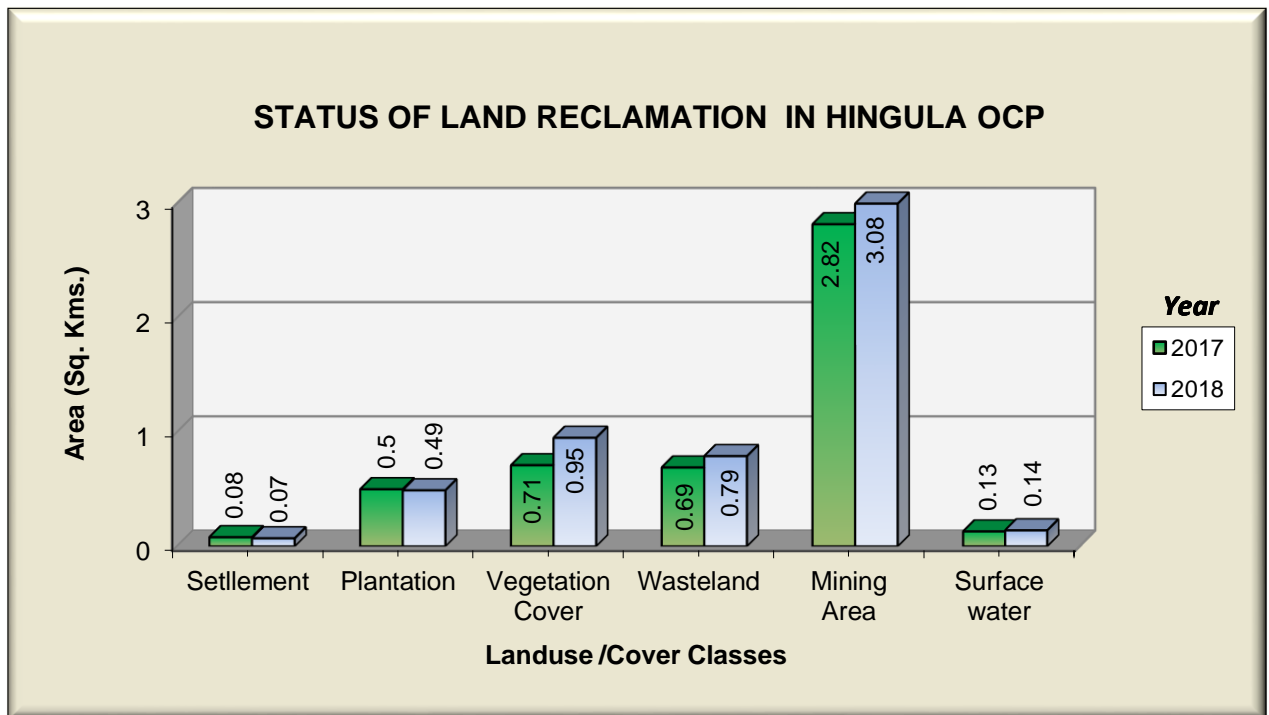


Figure 8.8

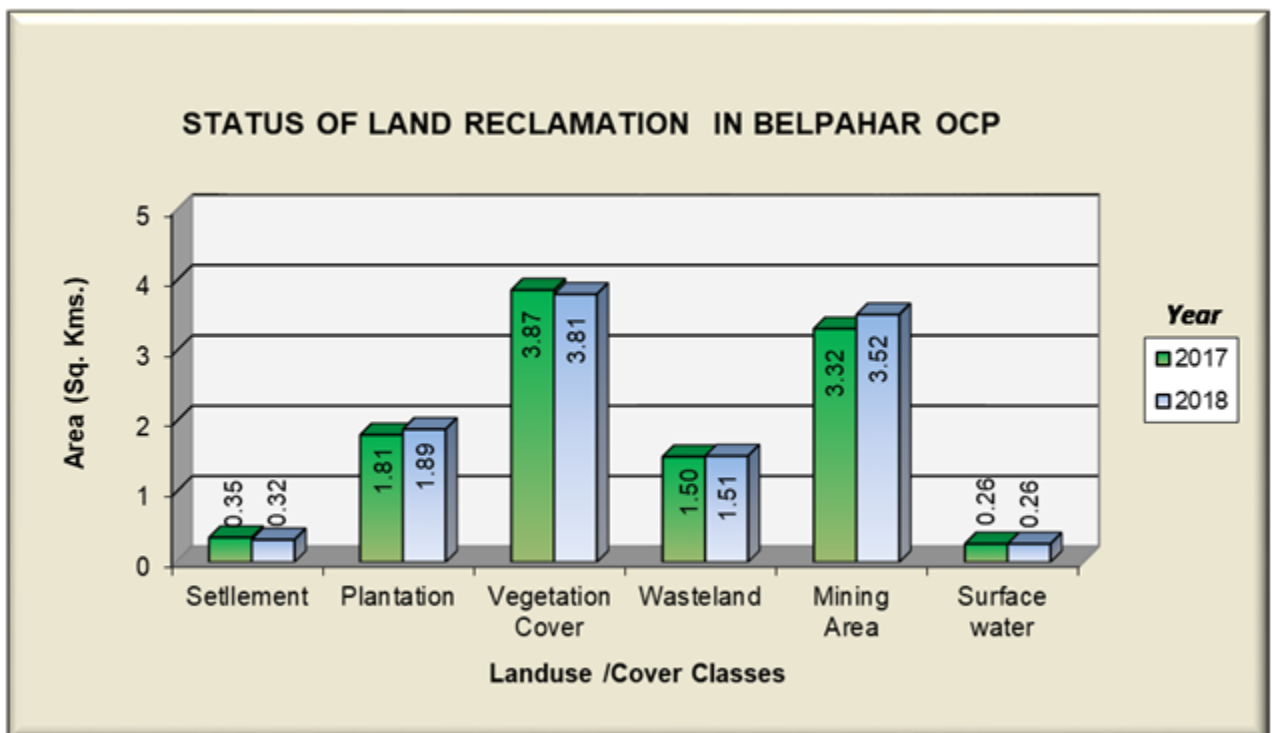


Figure 8.9

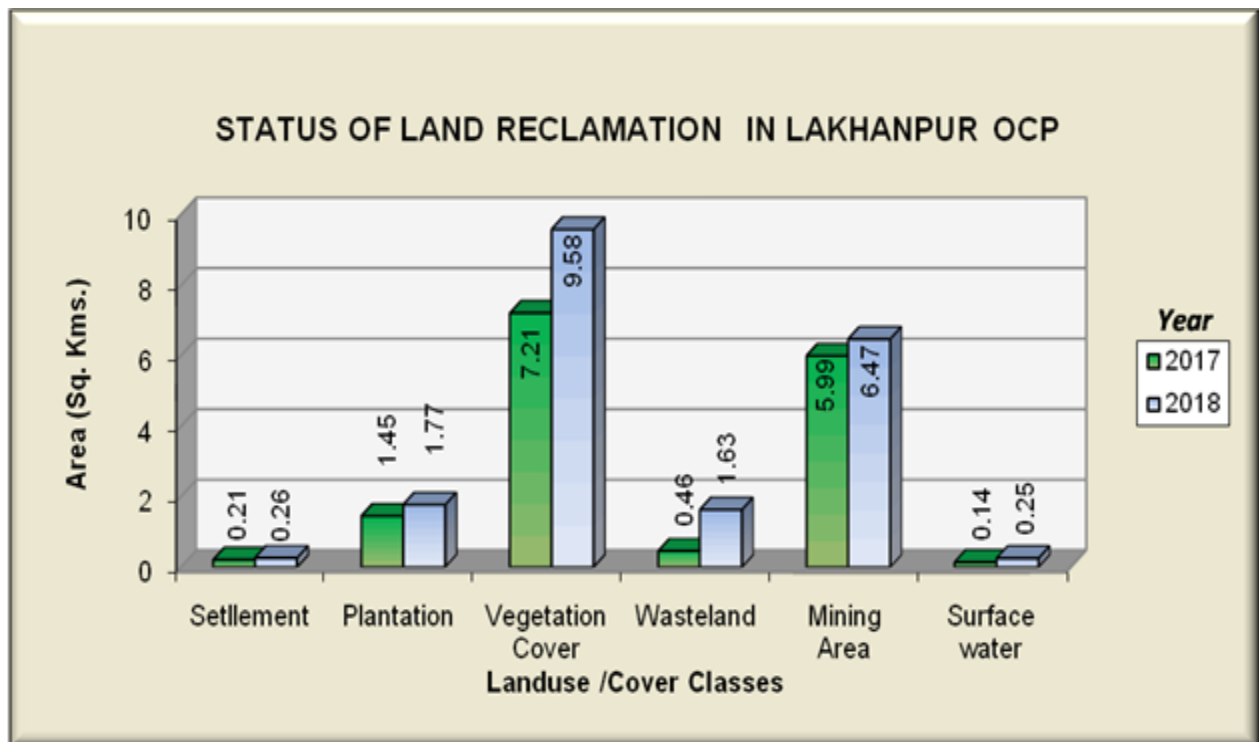


Figure 8.10

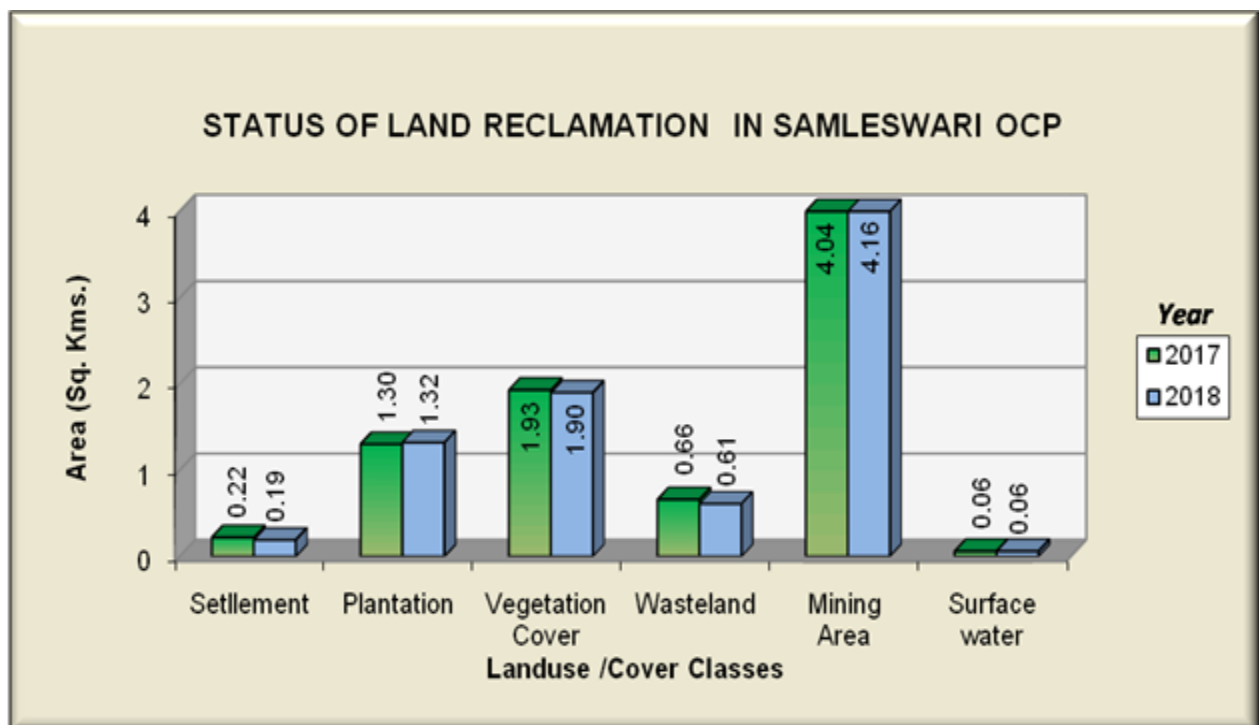


Figure 8.11

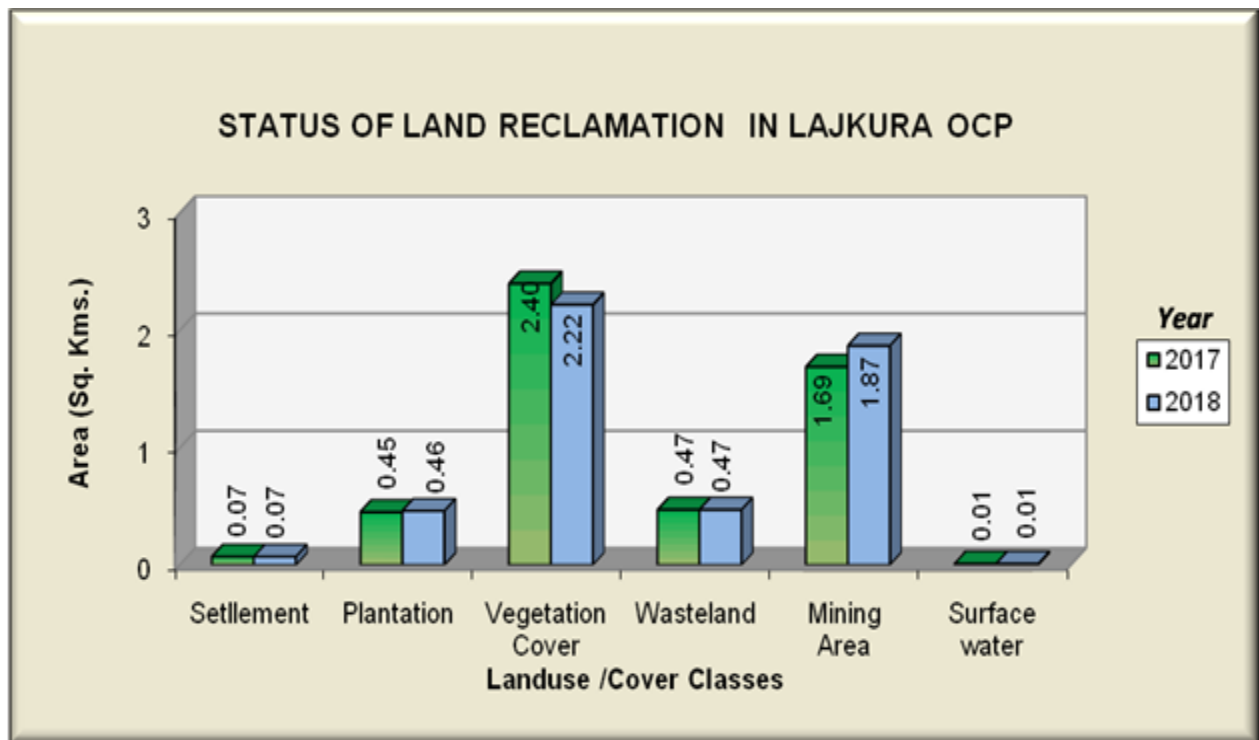


Figure 8.12

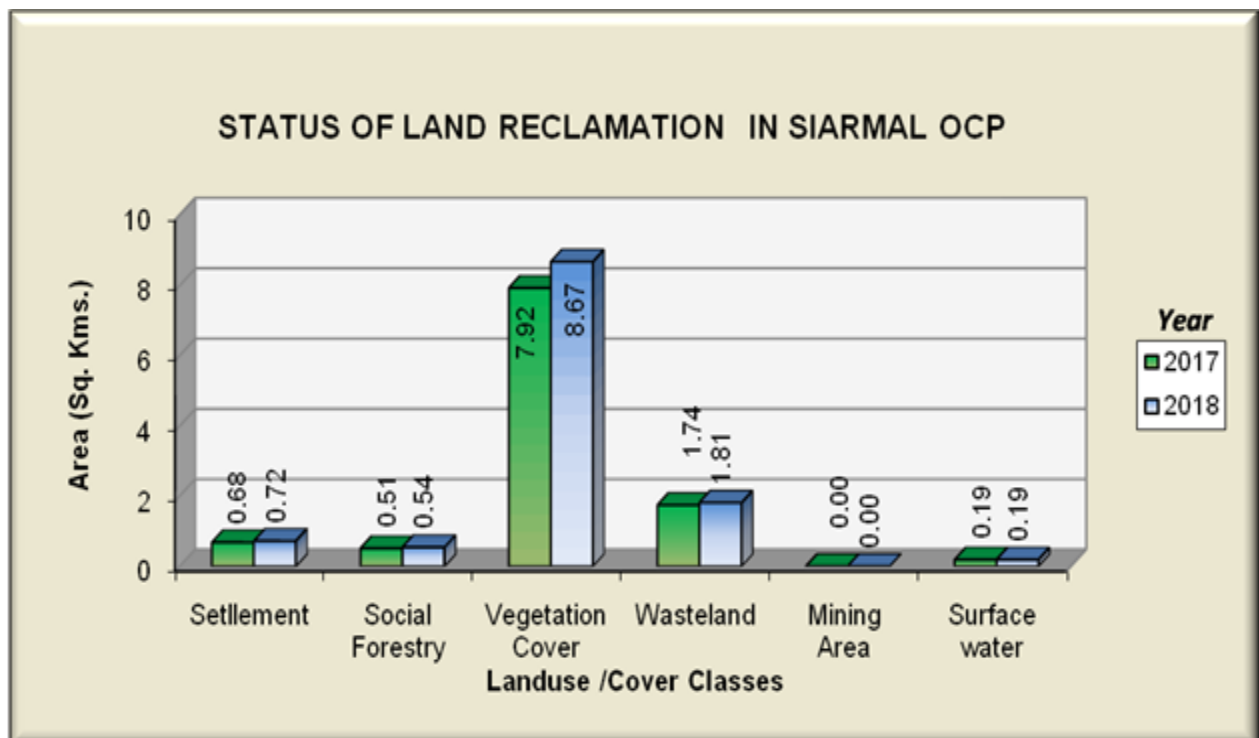
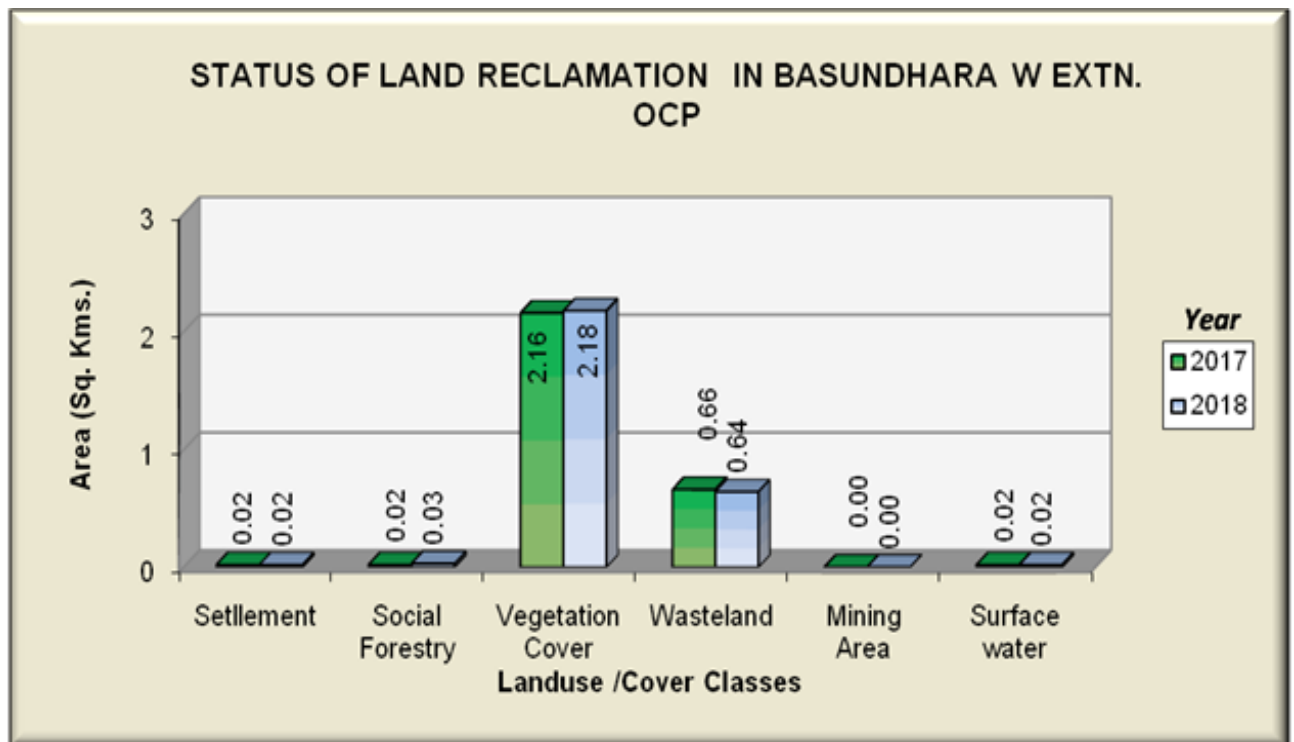


Figure 8.13





**Figure 8.14**



Photograph – 8.1: **Plantation on Internal OB/Backfill (Ananta OC mine)**



Photograph – 8.2: **Plantation on Internal OB (Balram OC Mine)**





**Photograph – 8.3: Plantation on Internal OB/Backfill (Lingaraj OC Mine)**



**Photograph – 8.4: Plantation on Internal OB/Backfill (Bharatpur OC Mine)**





**Photograph – 8.5 : Plantation on Internal OB (Jagannath OC Mine)**



**Photograph – 8.6: Plantation on Internal OB/Backfill (Hingula OC Mine)**





Photograph – 8.7: **Plantation on Internal OB/Backfill (Belpahar OC Mine)**



Photograph – 8.8: **Plantation on Internal OB/Backfill at Lakhanpur OC**





Photograph-8.9: **Plantation on Internal ob/Backfill at Samleswari OC**



Photograph-8.10: **Plantation at Lajkura Opencast Project**

# **CENTRAL COALFIELDS LIMITED**

## **9.0 Land Reclamation Status in Central Coalfields Ltd.**

**9.1** Following 5 OC projects producing more than 5 million m<sup>3</sup>. (Coal + OB) annually of Central Coalfields Ltd. have been taken up during the year 2018-19 for land reclamation monitoring based on satellite data of the year 2018:

- Ashok
- Piparwar
- KD Hesalong
- Rajrappa
- Parej East

**9.2** Project wise Land Reclamation status in CCL in the year 2018 is given in Table 9.1 and also shown graphically in Fig 9.1. Area statistics of different land use classes present in OC projects in the year 2018 is given in Table 9.2. Land use maps derived from the satellite data is given in Plate no. 9.1 to 9.5. Changes in land use status are shown in Fig. 9.2 – 9.6 and field photographs showing plantation and backfilled area in mining projects in photo 9.1-9.5.

**9.3** Total leasehold area has been modified from 48.47 Km<sup>2</sup> to **51.35 km<sup>2</sup>** in **2018**, (Ashok from 6.75 Km<sup>2</sup> to **7.93 Km<sup>2</sup>** & KDH from 4.50 Km<sup>2</sup> to **6.20 Km<sup>2</sup>**) as per EC.

**9.4** Study reveals that 14.21 Km<sup>2</sup> (78.29%) of excavated area has already come under reclamation in the above 5 OC projects of CCL, out of which 5.51 Km<sup>2</sup> (30.36%) area has been re-vegetated (Biological Reclamation) and 8.70 Km<sup>2</sup> (47.93%) area is under backfilling (Technical Reclamation).

- 9.5** Analysis of satellite data indicates that area of plantation (Biological Reclamation) has increased from 5.38 Km<sup>2</sup> (Yr. 2017) to 5.51 Km<sup>2</sup> (Yr. 2018). This increase in Biological Reclamation reflects constant effort on part of CCL for environment protection.
- 9.6** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 7.86 km<sup>2</sup> in 2017 to 8.70 km<sup>2</sup> in 2018. All the 5 projects of CCL selected for monitoring for the year 2018-19 are showing an increasing or static trend in technical reclamation.
- 9.7** After analyzing the satellite data of year 2018, it is seen that total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps as well as Plantation under social forestry in all the 5 mines of CCL has decreased by 0.20 km<sup>2</sup> in the year 2018 as compared to the year 2017. This decrease in Green Cover is mainly attributed to decrease in Plantation on OB Dumps in Piparwar OC project as well reduction in social forestry in both Ashoka and Piparwar OCPs due to mine advancement..
- 9.8** It may be seen from the Table.9.1 that area of total reclamation has reached 78.29% of the total excavated area till the year 2018 as compared to 77.29% in 2017.
- 9.9** Out of 5 projects of CCL, Parej East OC ranks on top for land reclamation (88.00%) followed by Ashok OC (83.33%), KDH (80.00%), Rajrappa OC (78.70%) and Piparwar OC (70.41%).

**TABLE – 9.1**  
**Project wise Land Reclamation Status in OC projects of CCL based on Satellite Data of the Year 2018**  
*(Projects producing more than 5 mcm of Coal+OB annually)*

*(Area in Sq. Kms.)*

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, Avaneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Ashok	6.75	7.93	1.78	2.14	0.88	0.91	0.00	0.00	0.34	0.27	0.93	0.61	3.59	3.66	1.22	1.18	2.66	3.05
				49.58%	58.47%	24.51%	24.86%					25.91%	16.67%			18.07%	14.88%	74.09%	83.33%
2	Piparwar	11.20	11.20	2.02	2.30	1.35	1.34	0.62	0.52	1.30	1.18	1.46	1.53	4.83	5.17	3.27	3.04	3.37	3.64
				41.82%	44.49%	27.95%	25.92%					30.23%	29.59%			29.20%	27.14%	69.77%	70.41%
3	KDH	4.50	6.20	1.52	1.52	1.26	1.28	0.03	0.03	0.12	0.20	0.38	0.70	3.16	3.50	1.41	1.51	2.78	2.80
				48.10%	43.43%	39.87%	36.57%					12.03%	20.00%			31.33%	24.35%	87.97%	80.00%
4	Parej East	6.20	6.20	0.52	0.64	0.64	0.68	0.05	0.05	0.09	0.09	0.27	0.18	1.43	1.50	0.78	0.82	1.16	1.32
				36.36%	42.67%	44.76%	45.33%					18.88%	12.00%			12.58%	13.23%	81.12%	88.00%
5	Rajrappa	19.82	19.82	2.02	2.10	1.25	1.30	3.31	3.10	1.88	1.97	0.85	0.92	4.12	4.32	6.44	6.37	3.27	3.40
				49.03%	48.61%	30.34%	30.09%					20.63%	21.30%			32.49%	32.14%	79.37%	78.70%
	TOTAL	48.47	51.35	7.86	8.70	5.38	5.51	4.01	3.70	3.73	3.71	3.89	3.94	17.13	18.15	13.12	12.92	13.24	14.21
				45.88%	47.93%	31.41%	30.36%					22.71%	21.71%			27.07%	25.16%	77.29%	78.29%

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

**Note:** In reference to 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 Area under Barren Backfilling only.
3. Area under **Active Mining** includes Coal Quarry, Advance Quarry Site, Quarry Filled with Water, if any. Area of Coal Dump has been excluded from Area under Active Mining in this table.
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".
6. Leasehold area of Ashoka and KDH OCPs modified as per the EC Boundary



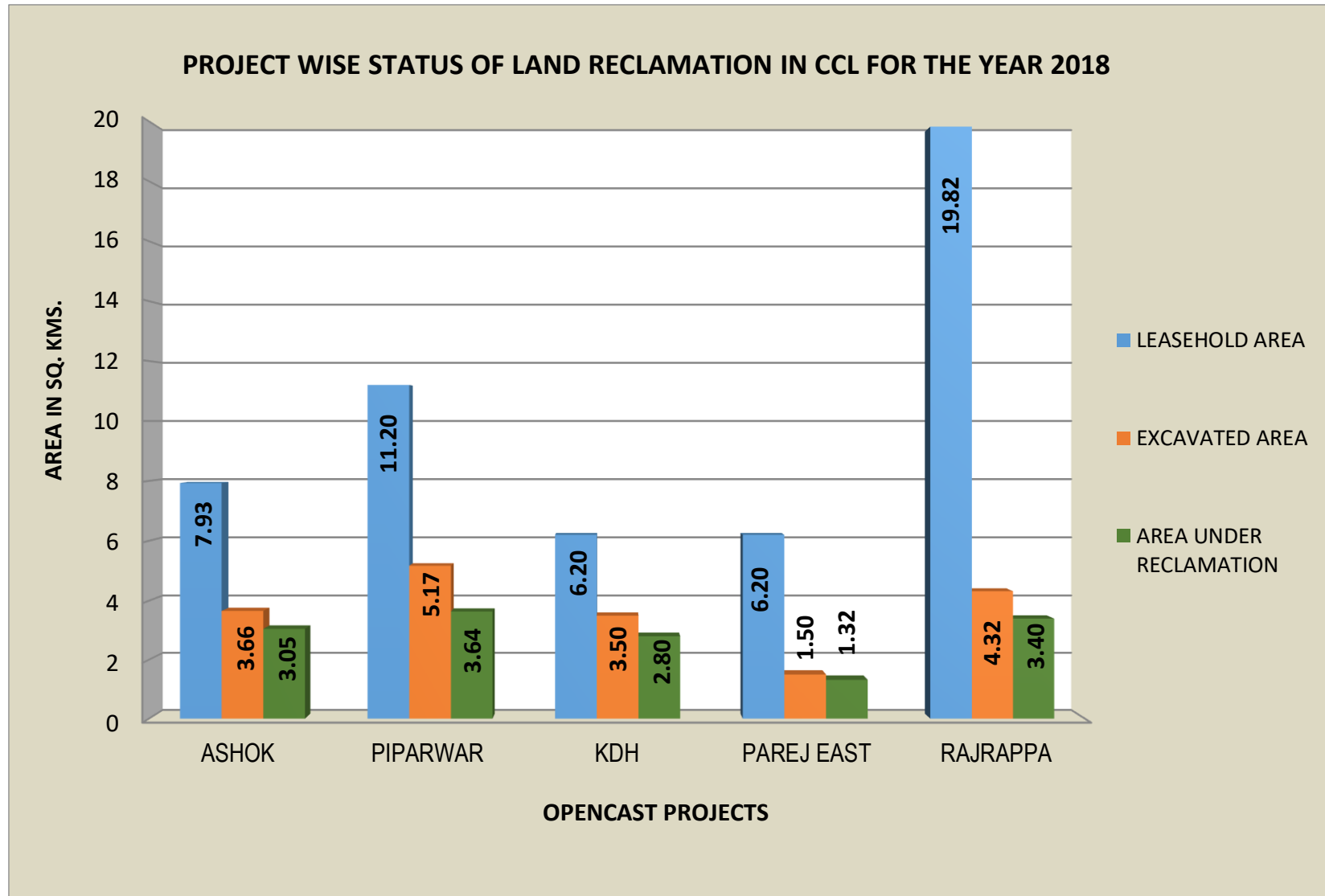


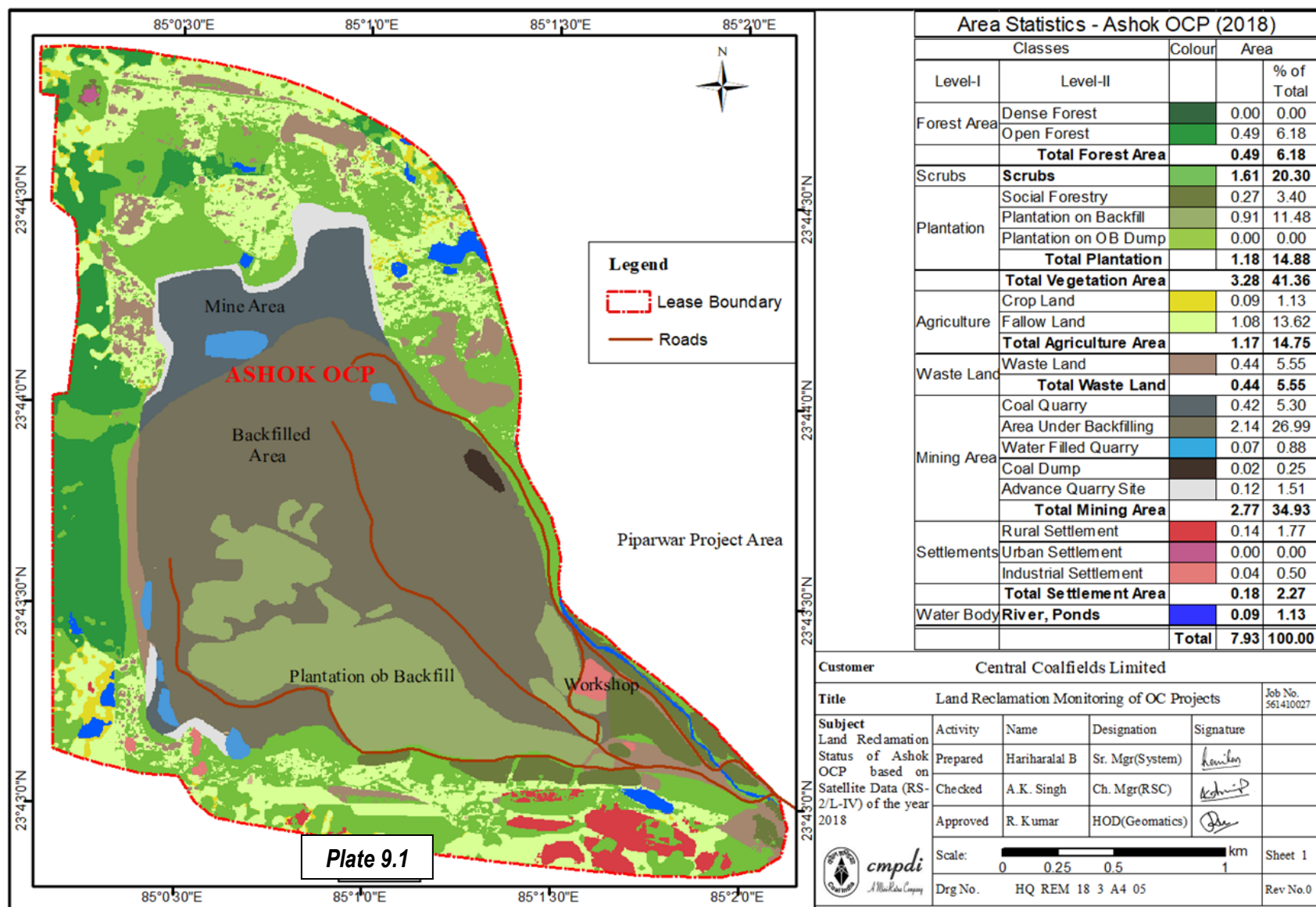
Fig. 9.1 : Project wise Land Reclamation Status in Year 2018

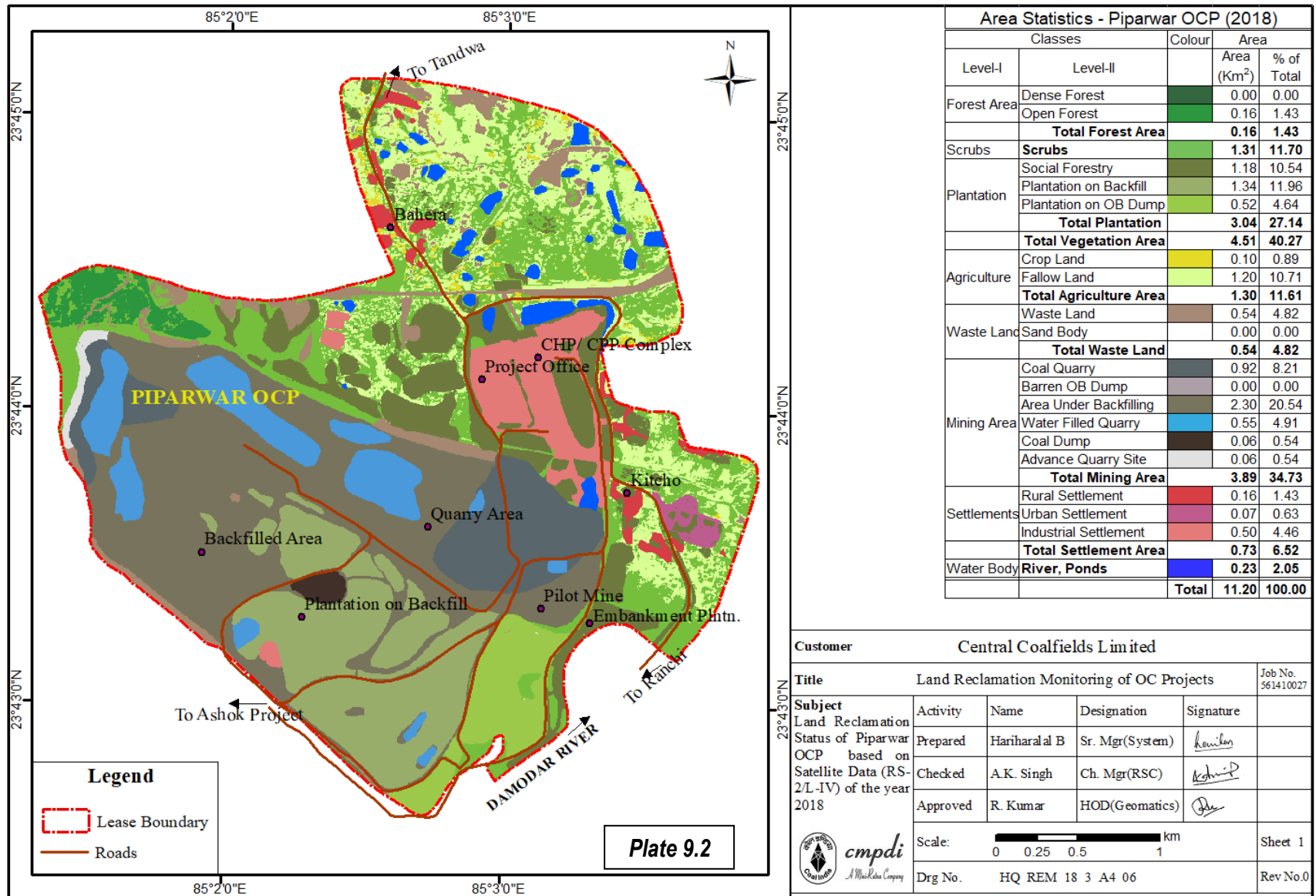
Table 9.2

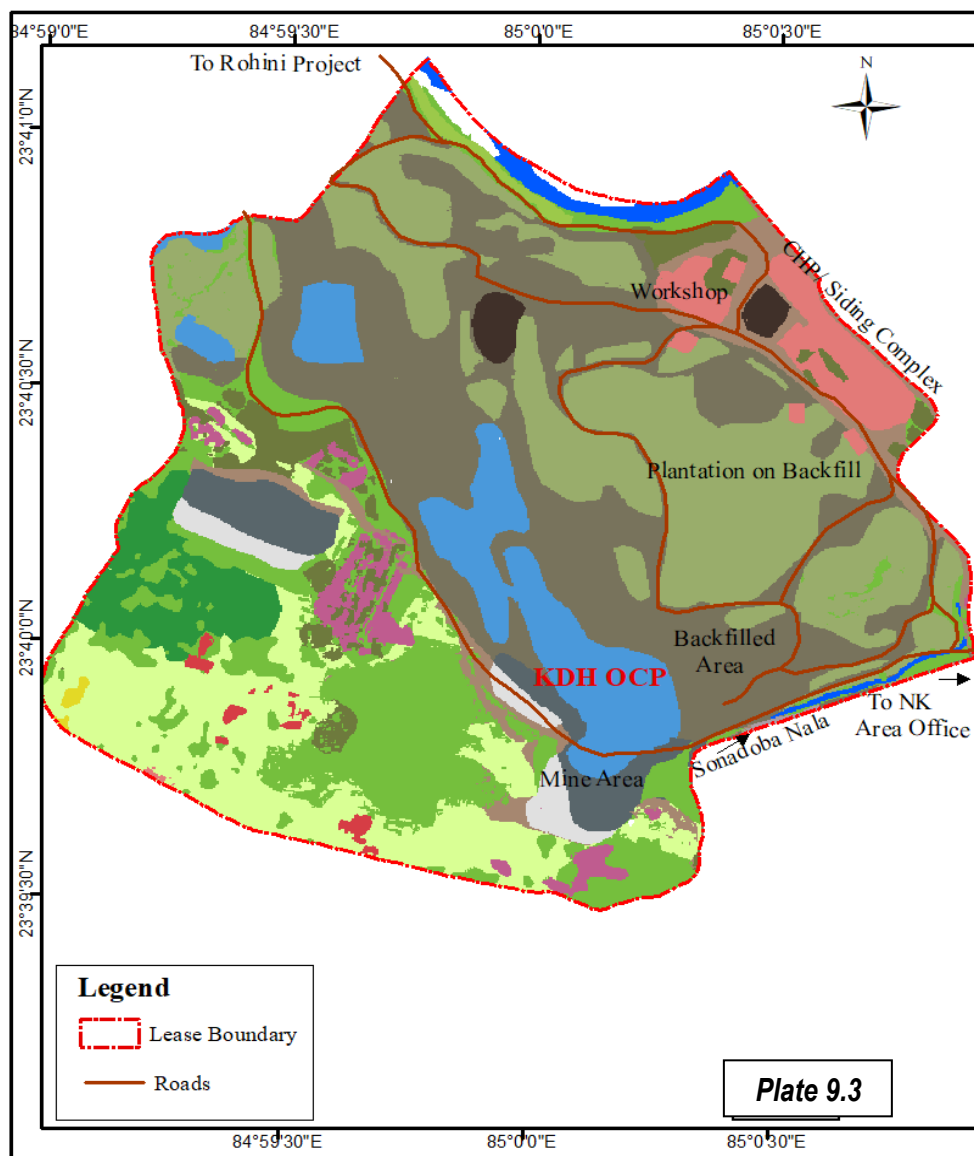
**Project wise Area Statistics of Land Use / Cover in OC Mines  
(> 5 mcu.m.) of CCL based on Satellite data of the Year 2018**

(Area in Km<sup>2</sup>)

		ASHOK		PIPARWAR		KDH		RAJRAPPA		PAREJ EAST		TOTAL	
		Area	%	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	0.00	0.00
	Open Forest	0.49	6.18	0.16	1.43	0.20	3.23	1.48	7.47	1.31	21.13	3.64	7.09
	<b>Total Forest</b>	<b>0.49</b>	<b>6.18</b>	<b>0.16</b>	<b>1.43</b>	<b>0.20</b>	<b>3.23</b>	<b>1.48</b>	<b>7.47</b>	<b>1.31</b>	<b>21.13</b>	<b>3.64</b>	<b>7.09</b>
PLANTATION	Scrubs	1.61	20.30	1.31	11.70	0.85	13.71	4.67	23.56	1.90	30.65	10.34	20.14
	Social Forestry	0.27	3.40	1.18	10.54	0.20	3.23	1.97	9.94	0.09	1.45	3.71	7.22
	Plantation on OB Dump	0.00	0.00	0.52	4.64	0.03	0.48	3.10	15.64	0.05	0.81	3.70	7.21
	Plantation on Backfill (Biological Reclamation)	0.91	11.48	1.34	11.96	1.28	20.65	1.30	6.56	0.68	10.97	5.51	10.73
	<b>Total Plantation</b>	<b>1.18</b>	<b>14.88</b>	<b>3.04</b>	<b>27.14</b>	<b>1.51</b>	<b>24.35</b>	<b>6.37</b>	<b>32.14</b>	<b>0.82</b>	<b>13.23</b>	<b>12.92</b>	<b>25.16</b>
<b>Total Vegetation</b>		<b>3.28</b>	<b>41.36</b>	<b>4.51</b>	<b>40.27</b>	<b>2.56</b>	<b>41.29</b>	<b>12.52</b>	<b>63.17</b>	<b>4.03</b>	<b>65.00</b>	<b>26.90</b>	<b>52.39</b>
ACTIVE MINING	Coal Quarry	0.42	5.30	0.92	8.21	0.18	2.90	0.45	2.27	0.11	1.77	2.08	4.05
	Advance Quarry Site	0.12	1.51	0.06	0.54	0.09	1.45	0.12	0.61	0.02	0.32	0.41	0.80
	Quarry Filled With Water	0.07	0.88	0.55	4.91	0.43	6.94	0.35	1.77	0.05	0.81	1.45	2.82
	<b>Total Area under Active Mining</b>	<b>0.61</b>	<b>7.69</b>	<b>1.53</b>	<b>13.66</b>	<b>0.70</b>	<b>11.29</b>	<b>0.92</b>	<b>4.65</b>	<b>0.18</b>	<b>2.90</b>	<b>3.94</b>	<b>7.67</b>
	Coal Dump	0.02	0.25	0.06	0.54	0.05	0.81	0.09	0.45	0.10	1.61	0.32	0.62
	Barren OB Dump	0.00	0.00	0.00	0.00	0.05	0.81	0.88	4.44	0.22	3.55	1.15	2.24
	Area Under Backfilling (Technical Reclamation)	2.14	26.99	2.30	20.54	1.52	24.52	2.10	10.60	0.64	10.32	8.70	16.94
	<b>Total Area under Mine Operation</b>	<b>2.77</b>	<b>34.93</b>	<b>3.89</b>	<b>34.73</b>	<b>2.32</b>	<b>37.42</b>	<b>3.99</b>	<b>20.13</b>	<b>1.14</b>	<b>18.39</b>	<b>14.11</b>	<b>27.48</b>
WASTELAND	Waste Lands	0.44	5.55	0.54	4.82	0.25	4.03	0.96	4.84	0.24	3.87	2.43	4.73
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.03	0.48	0.00	0.00	0.02	0.32	0.05	0.10
	<b>Total Wasteland</b>	<b>0.44</b>	<b>5.55</b>	<b>0.54</b>	<b>4.82</b>	<b>0.28</b>	<b>4.52</b>	<b>0.96</b>	<b>4.84</b>	<b>0.26</b>	<b>4.19</b>	<b>2.48</b>	<b>4.83</b>
WATERBODIES	Reservoir, Nallah, Ponds	0.09	1.13	0.23	2.05	0.07	1.13	0.03	0.15	0.05	0.81	0.47	0.92
	<b>Total Waterbodies</b>	<b>0.09</b>	<b>1.13</b>	<b>0.23</b>	<b>2.05</b>	<b>0.07</b>	<b>1.13</b>	<b>0.03</b>	<b>0.15</b>	<b>0.05</b>	<b>0.81</b>	<b>0.47</b>	<b>0.92</b>
AGRICULTURE	Crop Lands	0.09	1.13	0.10	0.89	0.00	0.00	0.06	0.30	0.04	0.65	0.29	0.56
	Fallow Lands	1.08	13.62	1.20	10.71	0.66	10.65	1.14	5.75	0.31	5.00	4.39	8.55
	<b>Total Agriculture</b>	<b>1.17</b>	<b>14.75</b>	<b>1.30</b>	<b>11.61</b>	<b>0.66</b>	<b>10.65</b>	<b>1.20</b>	<b>6.05</b>	<b>0.35</b>	<b>5.65</b>	<b>4.68</b>	<b>9.11</b>
SETTLEMENTS	Urban Settlement	0.00	0.00	0.07	0.63	0.11	1.77	0.47	2.37	0.16	2.58	0.81	1.58
	Rural Settlement	0.14	1.77	0.16	1.43	0.02	0.32	0.30	1.51	0.17	2.74	0.79	1.54
	Industrial Settlement	0.04	0.50	0.50	4.46	0.18	2.90	0.35	1.77	0.04	0.65	1.11	2.16
	<b>Total Settlement</b>	<b>0.18</b>	<b>2.27</b>	<b>0.73</b>	<b>6.52</b>	<b>0.31</b>	<b>5.00</b>	<b>1.12</b>	<b>5.65</b>	<b>0.37</b>	<b>5.97</b>	<b>2.71</b>	<b>5.28</b>
<b>Grand Total</b>		<b>7.93</b>	<b>100.00</b>	<b>11.20</b>	<b>100.00</b>	<b>6.20</b>	<b>100.00</b>	<b>19.82</b>	<b>100.00</b>	<b>6.20</b>	<b>100.00</b>	<b>51.35</b>	<b>100.00</b>







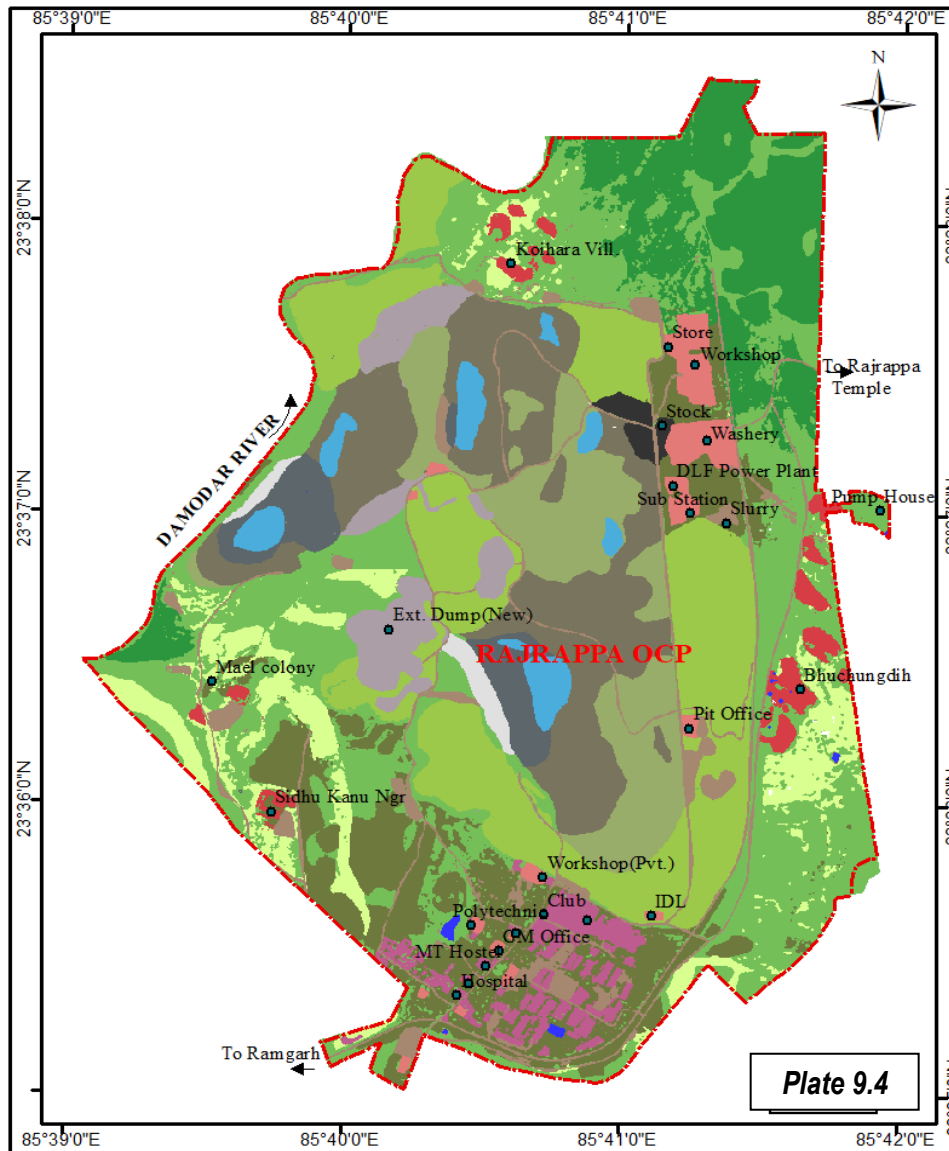
Area Statistics - KDH OCP (2018)				
Classes		Colour	Area	
Level-I	Level-II		Area (Km <sup>2</sup> )	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		0.20	3.23
	<b>Total Forest Area</b>		<b>0.20</b>	<b>3.23</b>
Scrubbs	Scrubbs		<b>0.85</b>	<b>13.71</b>
	Social Forestry		0.20	3.23
	Plantation on Backfill		1.28	20.65
Plantation	Plantation on OB Dump		0.03	0.48
	<b>Total Plantation</b>		<b>1.51</b>	<b>24.35</b>
	<b>Total Vegetation Area</b>		<b>2.56</b>	<b>41.29</b>
Agriculture	Crop Land		0.00	0.00
	Fallow Land		0.66	10.65
	<b>Total Agriculture Area</b>		<b>0.66</b>	<b>10.65</b>
Waste Land	Waste Land		0.25	4.03
	Sand Body		0.03	0.48
	<b>Total Waste Land</b>		<b>0.28</b>	<b>4.52</b>
Mining Area	Coal Quarry		0.18	2.90
	Barren OB Dump		0.05	0.81
	Area Under Backfilling		1.52	24.52
	Water Filled Quarry		0.43	6.94
	Coal Dump		0.05	0.81
	Advance Quarry Site		0.09	1.45
	<b>Total Mining Area</b>		<b>2.32</b>	<b>37.42</b>
Settlements	Rural Settlement		0.02	0.32
	Urban Settlement		0.11	1.77
	Industrial Settlement		0.18	2.90
	<b>Total Settlement Area</b>		<b>0.31</b>	<b>5.00</b>
Water Body	River, Ponds		0.07	1.13
<b>Total</b>			<b>6.20</b>	<b>100.00</b>

Customer Central Coalfields Limited

Title Land Reclamation Monitoring of OC Projects					Job No. 561410027
Subject Land Reclamation Status of KDH OCP based on Satellite Data (RS- 2/L-IV) of the year 2018	Activity	Name	Designation	Signature	
	Prepared	Hariharalal B	Sr. Mgr(System)	<i>hanlon</i>	
	Checked	A.K. Singh	Ch. Mgr(RSC)	<i>kevinid</i>	
	Approved	R. Kumar	HOD(Geomatics)	<i>Dan</i>	
Scale: 0 0.25 0.5 1 km					Sheet 1
Drg No. HQ REM 18 3 A4 07					Rev No.0







Area Statistics - Rajrappa OCP (2018)

Classes		Colour	Area	
Level-I	Level-II		Area (Km <sup>2</sup> )	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		1.48	7.47
	<b>Total Forest Area</b>		<b>1.48</b>	<b>7.47</b>
Scrubs	<b>Scrubs</b>		<b>4.67</b>	<b>23.56</b>
Plantation	Social Forestry		1.97	9.94
	Plantation on Backfill		1.30	6.56
	Plantation on OB Dump		3.10	15.64
	<b>Total Plantation</b>		<b>6.37</b>	<b>32.14</b>
	<b>Total Vegetation Area</b>		<b>12.52</b>	<b>63.17</b>
Agriculture	Crop Land		0.06	0.30
	Fallow Land		1.14	5.75
	<b>Total Agriculture Area</b>		<b>1.20</b>	<b>6.05</b>
Waste Land	Waste Land		0.96	4.84
	<b>Total Waste Land</b>		<b>0.96</b>	<b>4.84</b>
Mining Area	Coal Quarry		0.45	2.27
	Barren OB Dump		0.88	4.44
	Area Under Backfilling		2.10	10.60
	Water Filled Quarry		0.35	1.77
	Coal Dump		0.09	0.45
	Advance Quarry Site		0.12	0.61
	<b>Total Mining Area</b>		<b>3.99</b>	<b>20.13</b>
Settlements	Rural Settlement		0.30	1.51
	Urban Settlement		0.47	2.37
	Industrial Settlement		0.35	1.77
	<b>Total Settlement Area</b>		<b>1.12</b>	<b>5.65</b>
Water Body	<b>River, Ponds</b>		<b>0.03</b>	<b>0.15</b>
	<b>Total</b>		<b>19.82</b>	<b>100.00</b>

## Legend

- Lease Boundary
- Roads

Customer Central Coalfields Limited

Title Land Reclamation Monitoring of OC Projects

Job No. 561410027

**Subject**  
Land Reclamation  
Status of Rajrappa  
OCP based on  
Satellite Data (RS-  
2/L-IV) of the year  
2018

Activity	Name	Designation	Signature	
Prepared	Hariharalal B	Sr. Mgr(System)	<i>Harikan</i>	
Checked	A.K. Singh	Ch. Mgr(RSC)	<i>A.K. Singh</i>	
Approved	R. Kumar	HOD(Geomatics)	<i>R. Kumar</i>	

Scale: 0 0.5 1 2 km

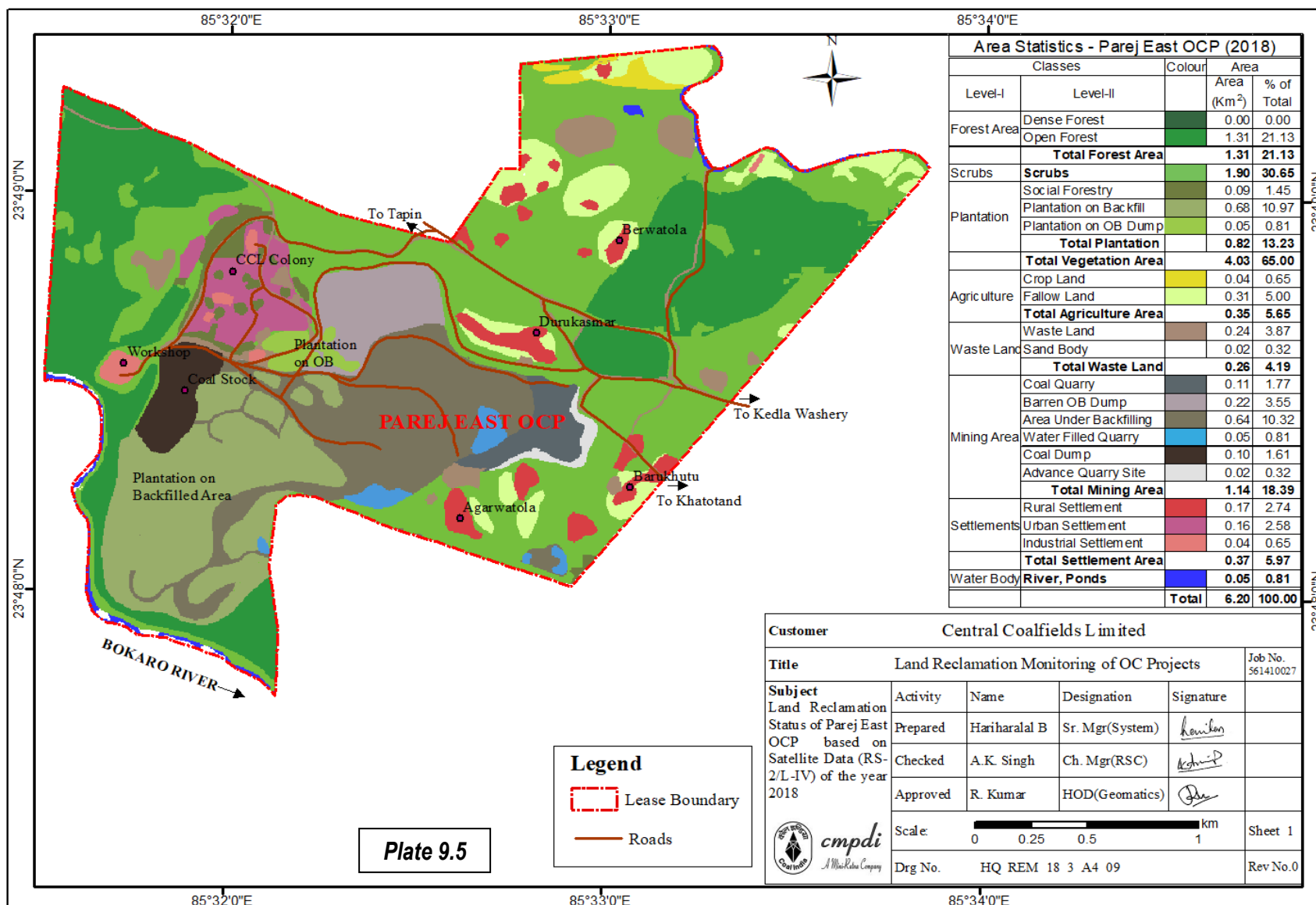
Sheet 1

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Rev No.0



**cmpdi**  
A Min-Roha Company



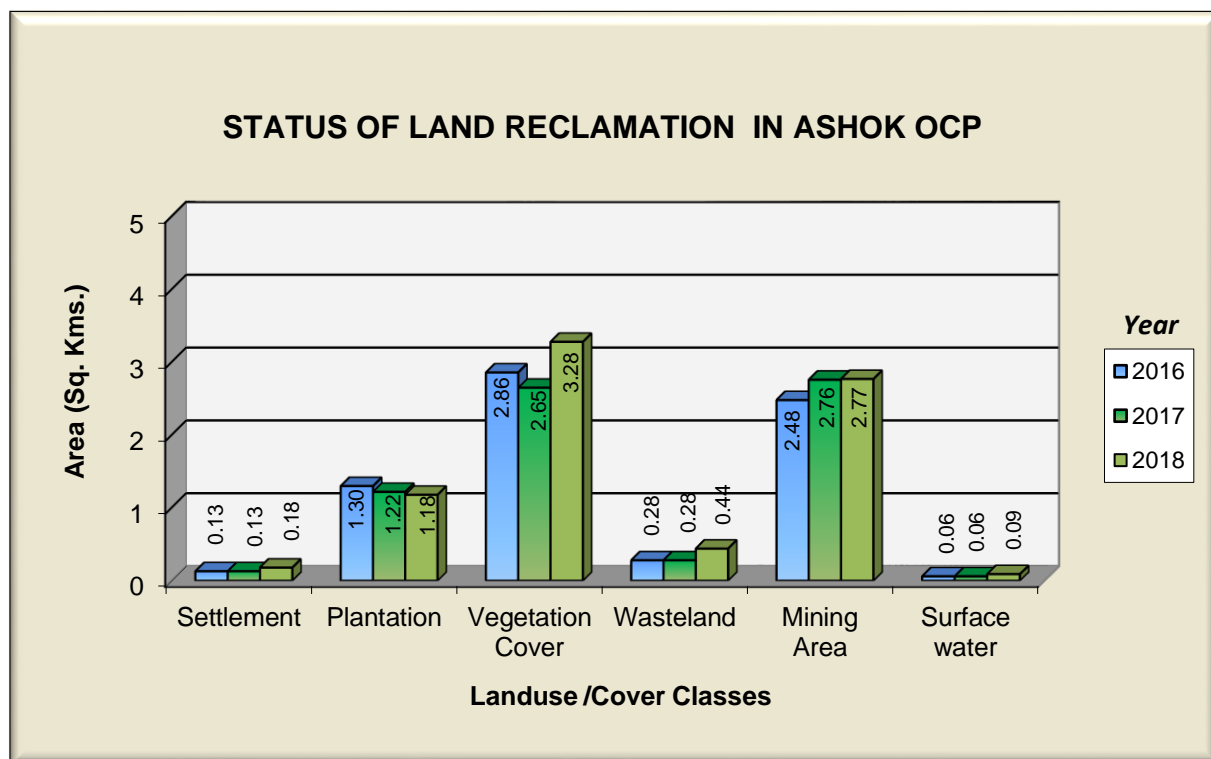


Figure 9.2

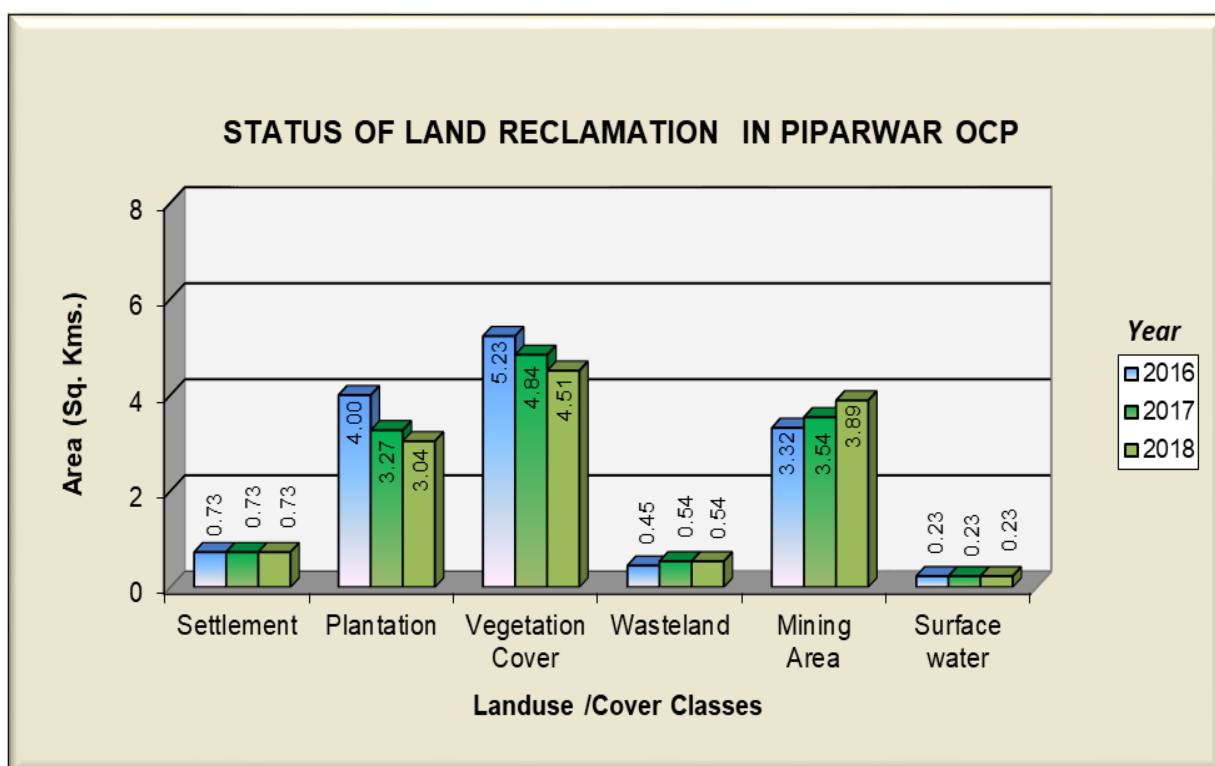


Figure 9.3

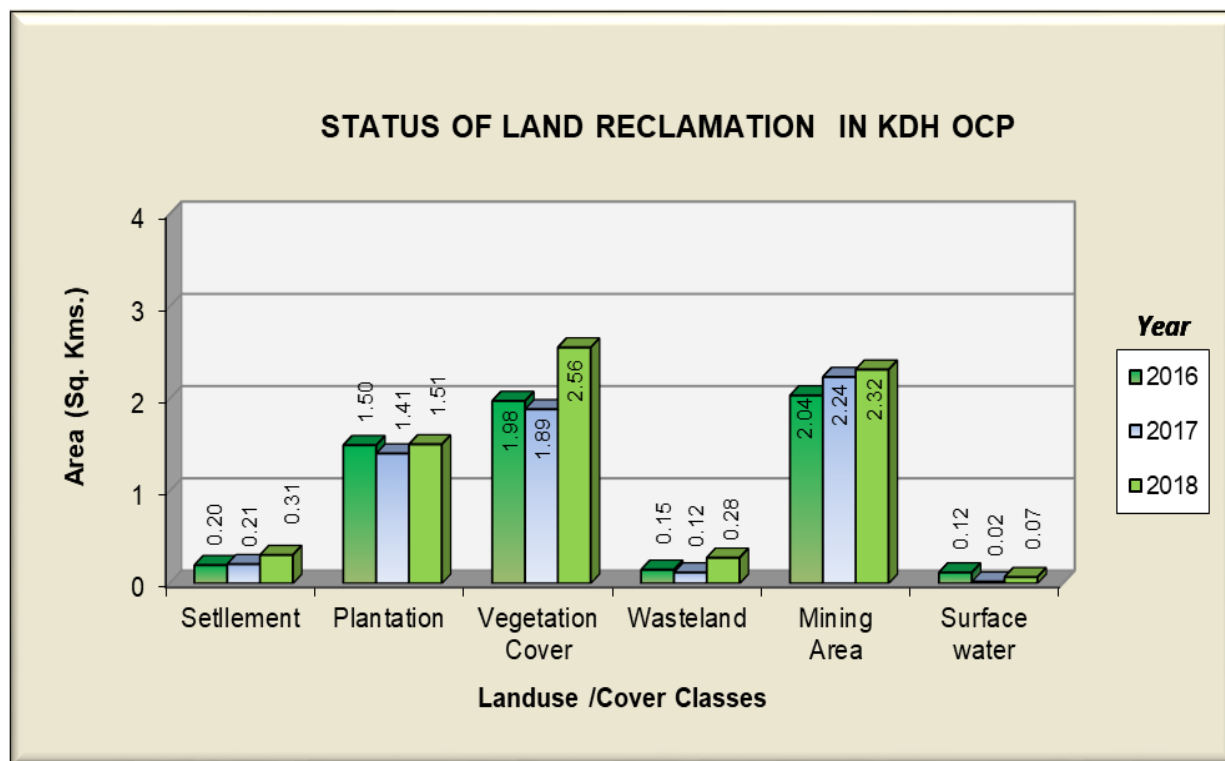


Figure 9.4

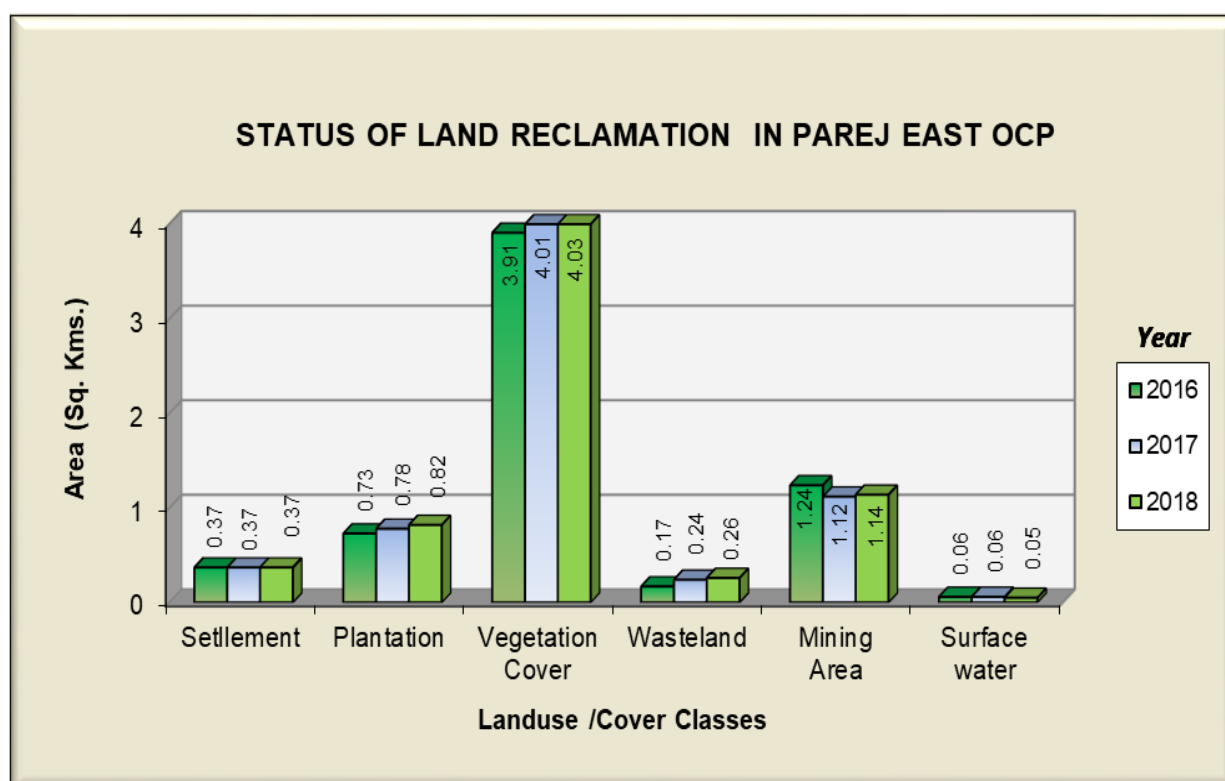
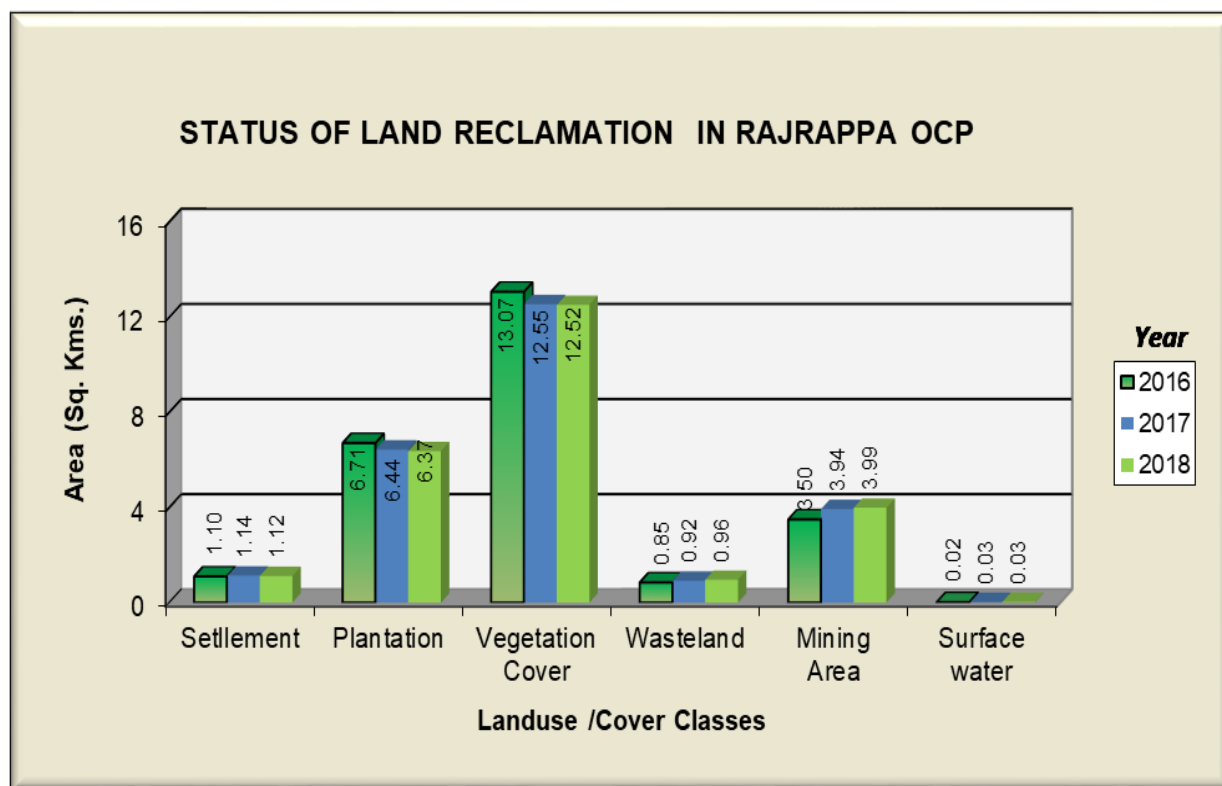


Figure 9.5



**Figure 9.6**





Photograph 9.1: **Plantation on Backfilled Area in Ashok OCP**



Photograph 9.2 : **Eco Park developed on Reclaimed Area - Piparwar OCP**



**Photograph 9.3: Plantation on Reclaimed Area in Piparwar OCP**



**Photograph 9.4 : Plantation on Backfilled Area in KDH OCP**





**Photograph 9.5 : Plantation on Backfilled Area- Parej East OCP**



**Photograph 9.6 : Plantation on OB- Rajrappa OCP**

**BHARAT COKING COAL LTD.**



## **10.0 Land Reclamation Status in Bharat Coking Coal Ltd.**

**10.1** Following two OC projects producing 5 million cubic m. or more (Coal + OB together) annually of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring for the year 2018-19:

- **Block-II**
- **Muraidih**

**10.2** Both the projects, Block-II OC and Muraidih has been mapped earlier also during the year 2009 to 2017 on annual basis.

**10.3** Project wise Land Reclamation status in BCCL for the year 2018 is given in Table 10.1 and also shown graphically in Fig 10.1. Area statistics of different land use classes present in OC projects in the year 2018 is given in Table 10.2. Land use maps derived from the satellite data is given in Plate no. 10.1 & 10.2. Changes in land use status are shown in Fig. 10.2 & 10.3.

**10.4** Study reveals that 4.48 Km<sup>2</sup> (79.29%) excavated area is under reclamation out of which 0.68 Km<sup>2</sup> (12.04%) area has been revegetated (Biologically Reclaimed) and 3.80 Km<sup>2</sup> (67.26%) area is under backfilling (Technical Reclamation).

**10.5** Analysis of satellite data indicates that area of plantation (Biological Reclamation) has increased from 0.57 Km<sup>2</sup> (Yr. 2017) to 0.68 Km<sup>2</sup> (Yr. 2018). This increase in Biological Reclamation reflects constant effort on part of BCCL for land reclamation and environment protection.

**10.6** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 3.71 km<sup>2</sup> in 2017 to 3.80 km<sup>2</sup> in 2018. Both the projects of BCCL

selected for monitoring for the year 2018-19 are showing an increasing trend in technical reclamation.

- 10.7** After analyzing the satellite data of year 2018, it is seen that total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps as well as Plantation under social forestry in the two mines of BCCL has increased by 0.17 km<sup>2</sup> in the year 2018 as compared to the year 2017. This increase of 0.17 Km<sup>2</sup> area in Green Cover, underlines the efforts taken up by the coal company (BCCL) towards plantation activities for land reclamation and environmental protection.
- 10.8** An eco-restoration site of 3.6 ha has been developed by the company in Block-II from 2015-16. Another eco restoration area, of 3.2 ha is also developed by the company over OB dump behind the coal stock yard.
- 10.9** In collaboration with The Energy and Resources Institute (**TERI**) School of Advanced Studies, an area of 6.5 ha has also been developed by the company for bio-diversity through forest landscape restoration, over backfilled area of Muraidih OCP. The plants are of good health, maintained well and is a commendable job.
- 10.10** It may be seen from the Table.10.1 that area of total reclamation has reached 4.48 Km<sup>2</sup> in the year 2018 as compared to 4.28 Km<sup>2</sup> 2017.
- 10.11** Among the two projects of BCCL, Muraidih OC ranks on top for land reclamation (86.64%) followed by Block II OC (73.58%).

Table-10.1

## Status of Land Reclamation in Bharat Coking Coal Limited based on Satellite Data for the Year 2018

(Projects producing more than 5 mcm of Coal+OB annually)

(Area in Sq. Kms.)

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, Avaneue Plantation Etc.										
1	2	3	4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
			2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Block-II	9.07	2.15	2.18	0.13	0.16	0.04	0.10	0.57	0.57	0.50	0.84	2.78	3.18	0.74	0.83	2.28	2.34
			77.34%	68.55%	4.68%	5.03%					17.99%	26.42%			8.16%	9.15%	82.01%	73.58%
2	Muraidih	7.25	1.56	1.62	0.44	0.52	0.27	0.27	0.31	0.31	0.38	0.33	2.38	2.47	1.02	1.10	2.00	2.14
			65.55%	65.59%	18.49%	21.05%					15.97%	13.36%			14.07%	15.17%	84.03%	86.64%
	TOTAL	16.32	3.71	3.80	0.57	0.68	0.31	0.37	0.88	0.88	0.88	1.17	5.16	5.65	1.76	1.93	4.28	4.48
			71.90%	67.26%	11.05%	12.04%					17.05%	20.71%			10.78%	11.83%	82.95%	79.29%

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

**Note:** In reference to 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 Area under Barren Backfilling only.
3. Area under **Active Mining** includes Coal Quarry, Advance Quarry Site, Quarry Filled with Water, if any. Coal dump has been excluded from Active mining area in this table.
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".

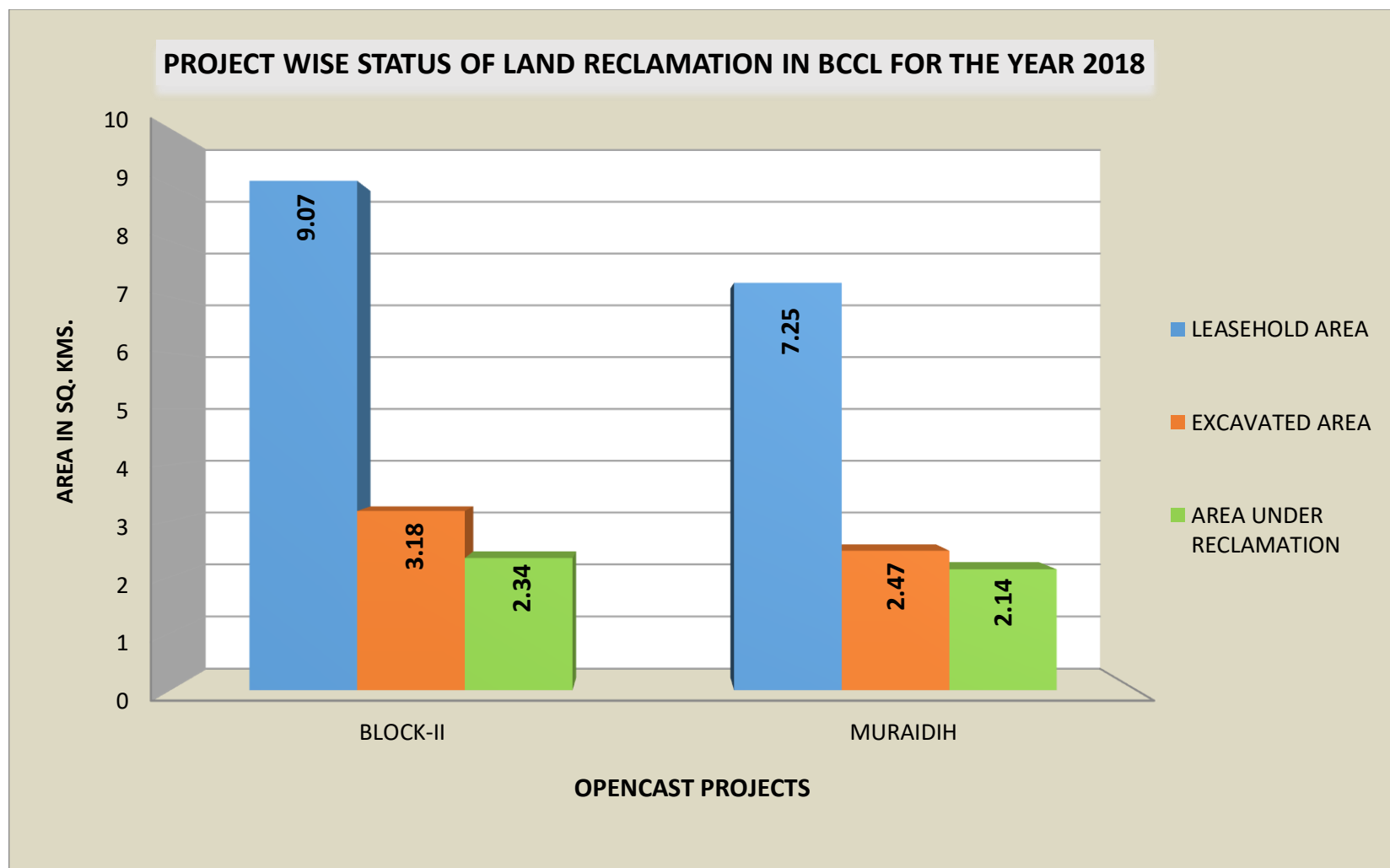




















Fig. 10.1 : Project wise Land Reclamation Status in BCCL for the Year 2018

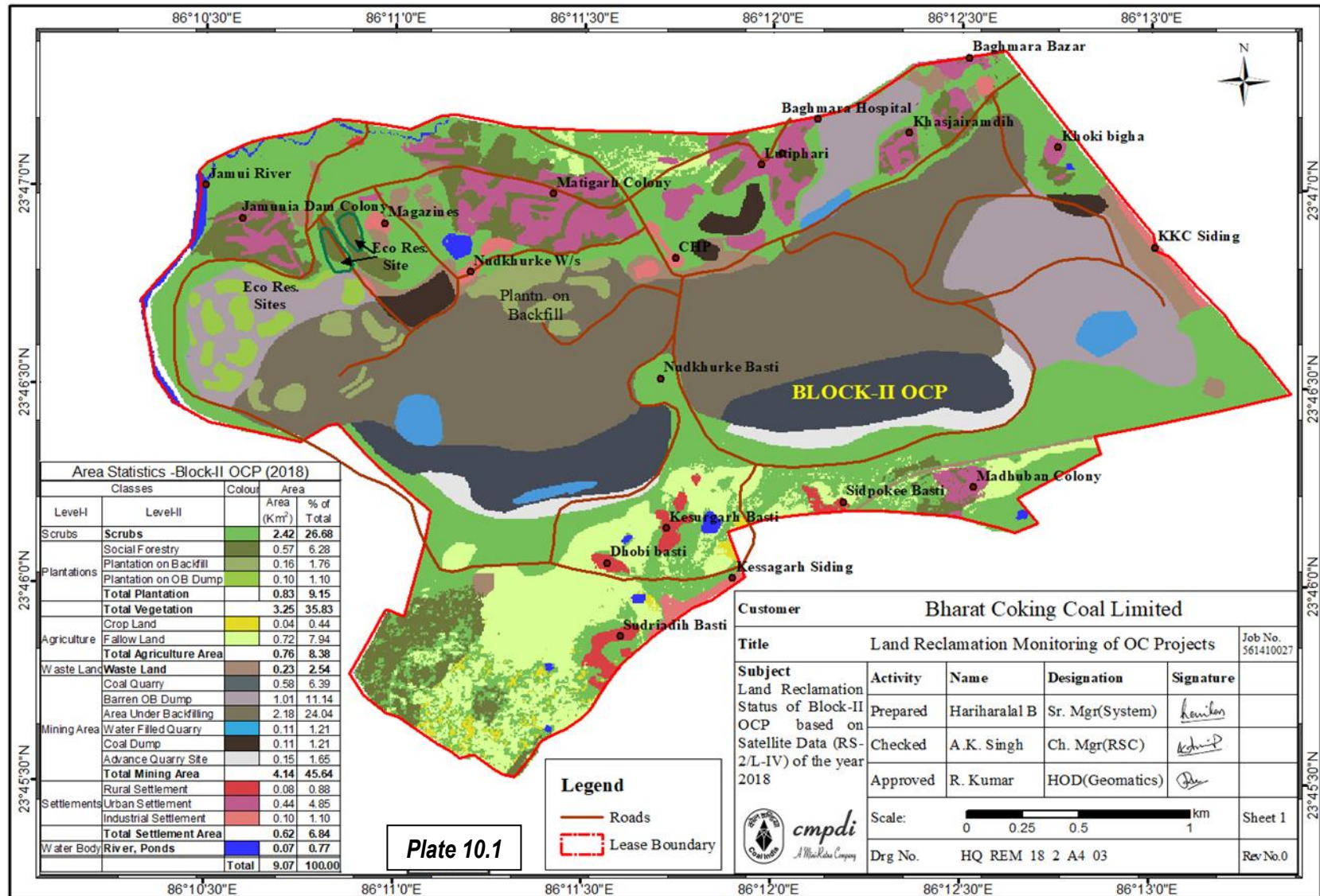


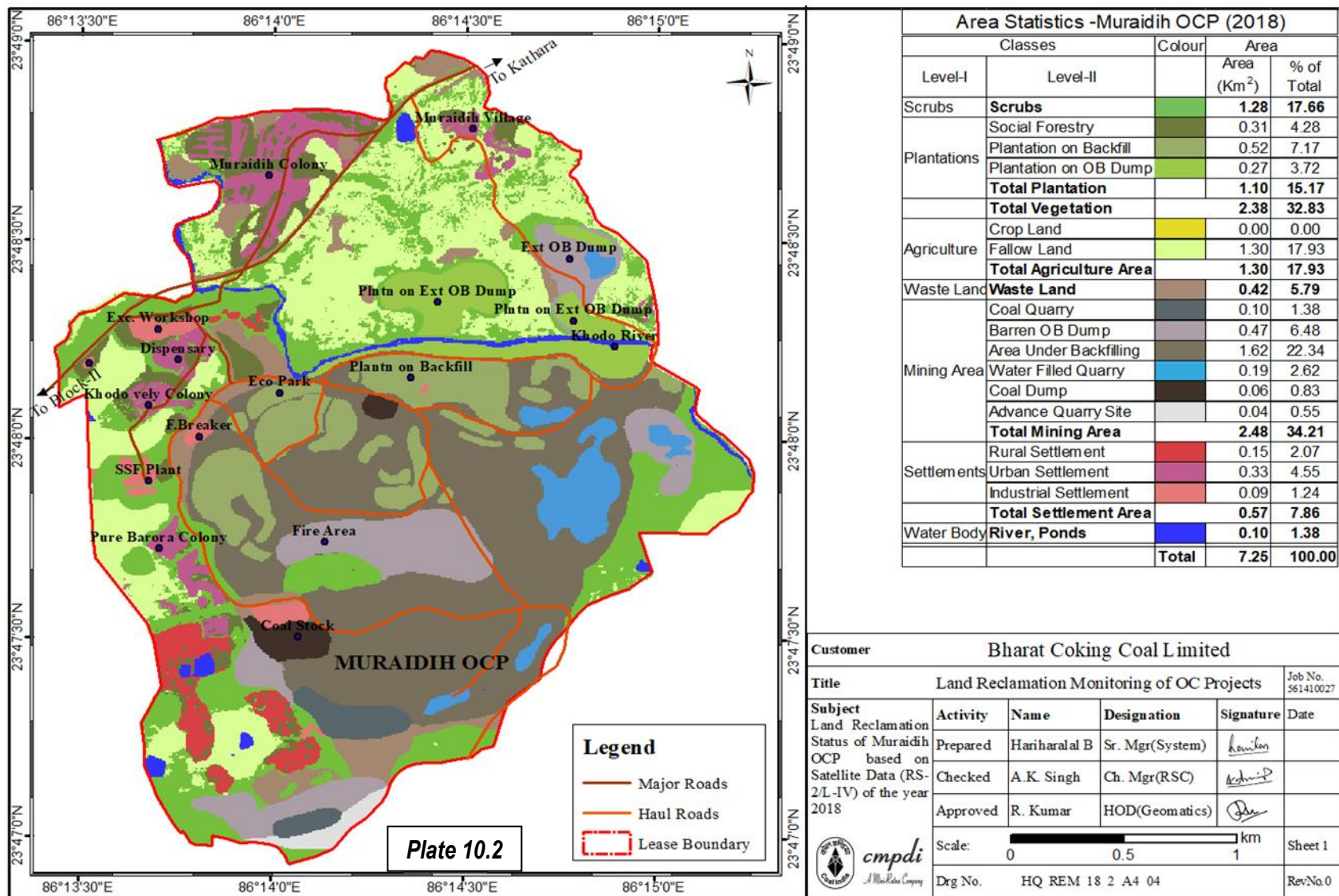
Table 10.2

**Project wise Area Statistics of Land Use / Cover in OC Mines  
(> 5 mcu.m.) of BCCL based on Satellite data of the Year 2018**

(Area in Km<sup>2</sup>)

			BLOCK-II		MURAIIDIH		TOTAL	
			Area	%	Area	%	Area	%
PLANTATION	Scrubs (A)		2.42	26.68	1.28	17.66	3.70	22.67
	Social Forestry		0.57	6.28	0.31	4.28	0.88	5.39
	Plantation on OB Dump		0.10	1.10	0.27	3.72	0.37	2.27
	Plantation on Backfill(Biological Reclamation)		0.16	1.76	0.52	7.17	0.68	4.17
	<b>Total Plantation ( B )</b>		<b>0.83</b>	<b>9.15</b>	<b>1.10</b>	<b>15.17</b>	<b>1.93</b>	<b>11.83</b>
<b>Total Vegetation (A+B)</b>			<b>3.25</b>	<b>35.83</b>	<b>2.38</b>	<b>32.83</b>	<b>5.63</b>	<b>34.50</b>
ACTIVE MINING	Coal Quarry		0.58	6.39	0.10	1.38	0.68	4.17
	Advance Quarry Site		0.15	1.65	0.04	0.55	0.19	1.16
	Quarry Filled With Water		0.11	1.21	0.19	2.62	0.30	1.84
	<b>Area under Active Mining (D)</b>		<b>0.84</b>	<b>9.25</b>	<b>0.33</b>	<b>4.55</b>	<b>1.17</b>	<b>7.17</b>
E	Coal Dump		0.11	1.21	0.06	0.83	0.17	1.04
	Barren OB Dump		1.01	11.14	0.47	6.48	1.48	9.07
	Area Under Backfilling(Technical Reclamation)		2.18	24.04	1.62	22.34	3.80	23.28
<b>Total Area under Mining Operation (D+E)</b>			<b>4.14</b>	<b>45.64</b>	<b>2.48</b>	<b>34.21</b>	<b>6.62</b>	<b>40.56</b>
WASTELAND	Waste Lands		0.23	2.54	0.42	5.79	0.65	3.98
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.00	0.00
<b>Total Wasteland</b>			<b>0.23</b>	<b>2.54</b>	<b>0.42</b>	<b>5.79</b>	<b>0.65</b>	<b>3.98</b>
WATERBODIES	Reservoir, Nallah, Ponds		0.07	0.77	0.10	1.38	0.17	1.04
	<b>Total Waterbodies</b>		<b>0.07</b>	<b>0.77</b>	<b>0.10</b>	<b>1.38</b>	<b>0.17</b>	<b>1.04</b>
AGRICULTURE	Crop Lands		0.04	0.44	0.00	0.00	0.04	0.25
	Fallow Lands		0.72	7.94	1.30	17.93	2.02	12.38
	<b>Total Agriculture</b>		<b>0.76</b>	<b>8.38</b>	<b>1.30</b>	<b>17.93</b>	<b>2.06</b>	<b>12.62</b>
SETTLEMENTS	Urban Settlement		0.44	4.85	0.33	4.55	0.77	4.72
	Rural Settlement		0.08	0.88	0.15	2.07	0.23	1.41
	Industrial Settlement		0.10	1.10	0.09	1.24	0.19	1.16
	<b>Total Settlement</b>		<b>0.62</b>	<b>6.83</b>	<b>0.57</b>	<b>7.86</b>	<b>1.19</b>	<b>7.29</b>
<b>Grand Total</b>			<b>9.07</b>	<b>100.00</b>	<b>7.25</b>	<b>100.00</b>	<b>16.32</b>	<b>100.00</b>







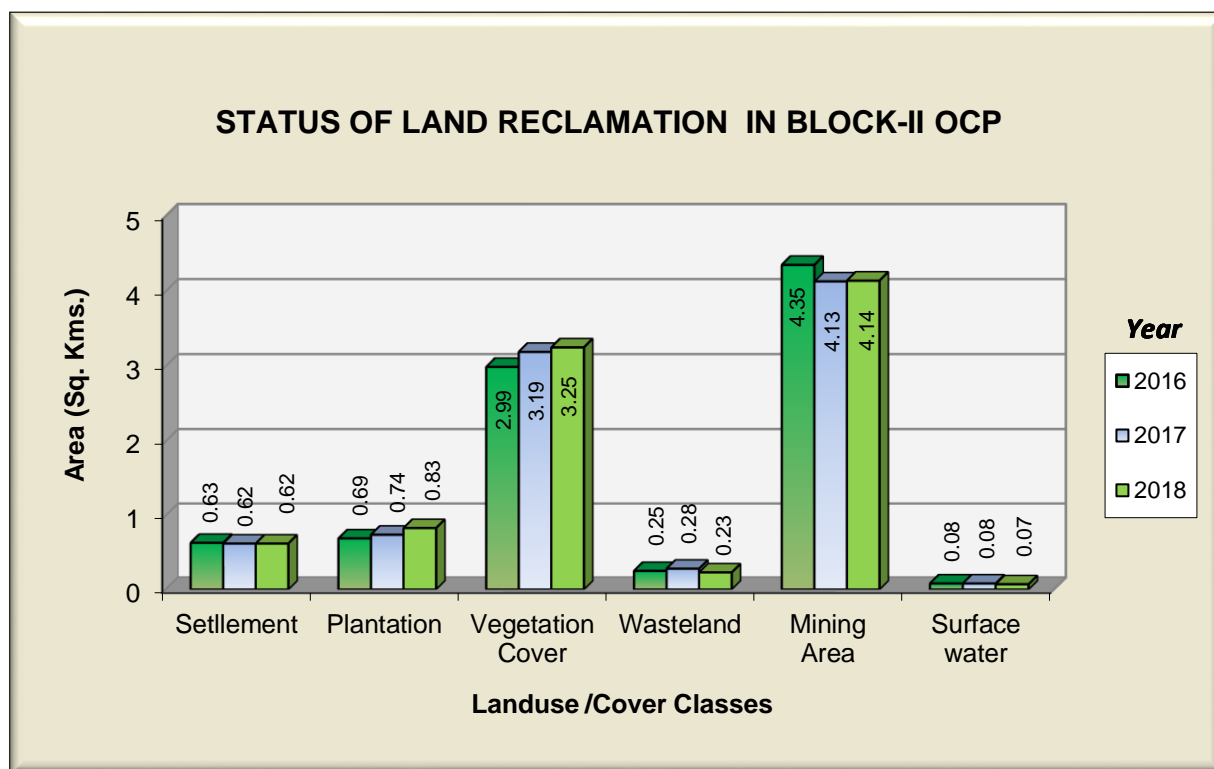


Figure 10.2

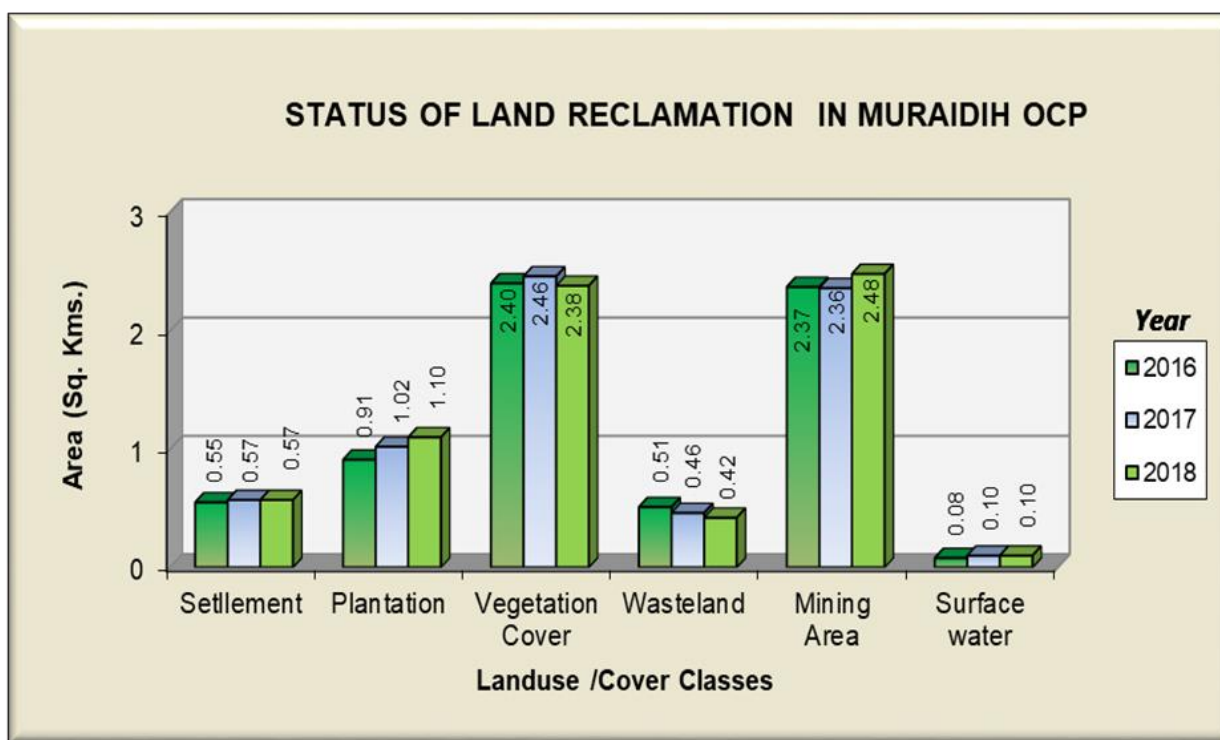
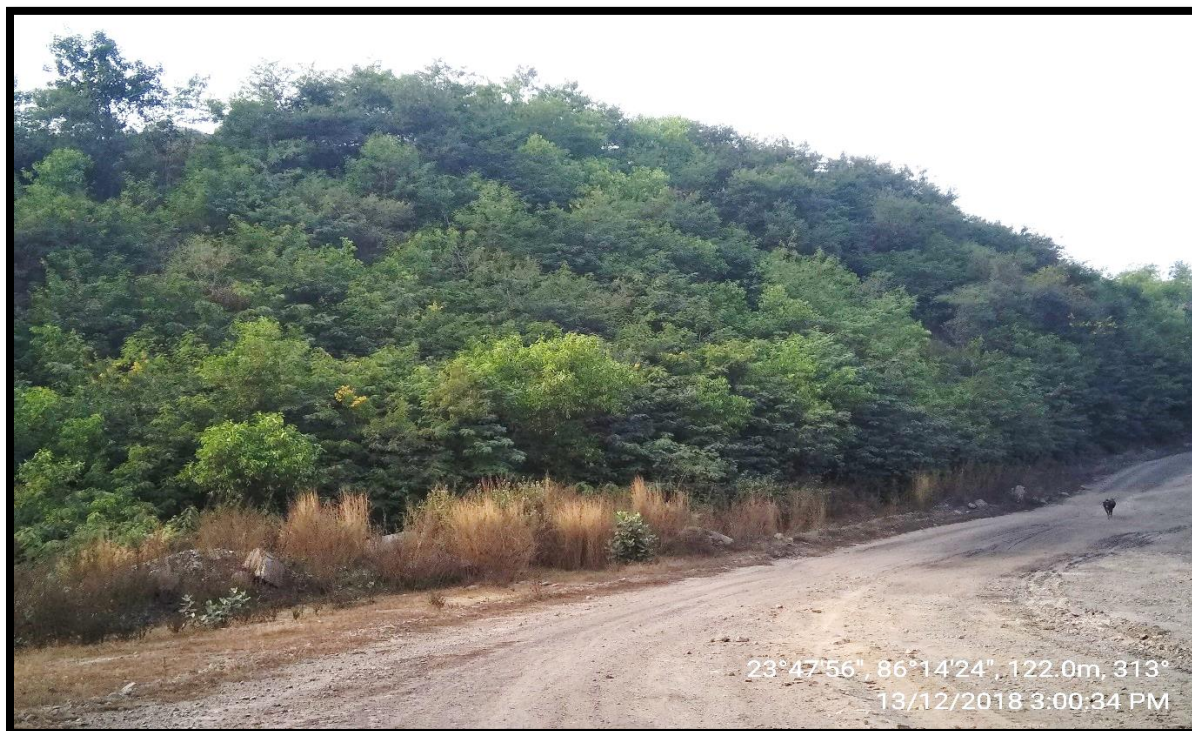


Figure 10.3





**Photograph 10.1: Eco restoration Park (3.2 Ha) in Block-II OCP, BCCL**



**Photograph 10.2: Plantation in Backfilled Area in Muraidih OCP, BCCL**

**EASTERN COALFIELDS LIMITED**

## **11.0 Land Reclamation Status in Eastern Coalfields Ltd.**

**11.1** Following two OC projects producing 5 million cubic m. or more (Coal + OB) annually of Eastern Coalfields Ltd. have been taken up for land reclamation monitoring for the year 2018 - 19:

- Rajmahal
- Sonepur Bazari

**11.2** Both the projects have also been mapped earlier also during the period 2010 to 2017 on annual basis for assessing the progress of land reclamation.

**11.3** It is important to note here that Total mine leasehold area has been modified from 39.44 to **40.69** km<sup>2</sup> from **2018**, considering the boundary as per EC.

**11.4** Project wise Land Reclamation status in ECL for the year 2018 is given in Table 11.1 and also shown graphically in Fig 11.1. Area statistics of different land use classes present in the leasehold boundaries of the OC projects for the year 2018 is given in Table 11.2. Land use maps derived from the satellite data are given in Plate no. 11.1 & 11.2. Changes in land use status are shown in Fig. 11.2 & 11.3.

**11.5** Study reveals that 9.90 Km<sup>2</sup> (65.48%) of excavated area is already under reclamation by ECL out of which 2.22 Km<sup>2</sup> (14.68%) area has been revegetated (Biological Reclamation) and 7.68 Km<sup>2</sup> (50.79%) area are under backfilling (Technical Reclamation).

**11.6** Analysis of satellite data indicates that area of plantation (Biological Reclamation) has increased from 2.20 Km<sup>2</sup> (Yr. 2017) to 2.22 Km<sup>2</sup> (Yr. 2018). This increase in

Biological Reclamation reflects constant effort on part of ECL for environment protection.

- 11.7** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 7.26 km<sup>2</sup> in 2017 to 7.68 km<sup>2</sup> in 2018. Both the projects of ECL selected for monitoring for the year 2018-19 are showing an increasing trend in technical reclamation.
- 11.8** After analyzing the satellite data of year 2018, it is seen that total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps as well as Plantation under social forestry in the two mines of ECL has increased from 3.58 km<sup>2</sup> in the year 2017 to 3.97 Km<sup>2</sup> the year 2018.
- 11.9** On comparing the status of land reclamation for the year 2018 with respect to the year 2017, it is evident from the analysis that the total area of land reclamation has increased from 9.46 km<sup>2</sup> (Yr. 2017) to 9.90 Km<sup>2</sup> (Yr. 2018).
- 11.10** Out of two projects in ECL, Rajmahal OCP tops with 77.64% reclamation followed by Sonepur Bazari OCP with 53.59 % reclamation.



Table-11.1

**Project wise Land Reclamation Status in Opencast Projects of ECL based on Satellite Data for the Year 2018**

*(Projects producing more than 5 mcm of Coal+OB annually)*

*(Area in Sq. Kms.)*

Sl. No.	Project	Total Lease hold 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, Avaneue Plantation Etc									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018	2017	2018
1	Rajmahal	16.38	17.75	3.72	4.10	1.70	1.70	0.00	0.06	0.41	0.45	1.36	1.67	6.78	7.47	2.11	2.21	5.42	5.80
				54.87%	54.89%	25.07%	22.76%					20.06%	22.36%			12.88%	12.45%	79.94%	77.64%
2	Sonepur Bazari	23.06	22.94	3.54	3.58	0.50	0.52	0.13	0.42	0.84	0.82	3.31	3.55	7.35	7.65	1.47	1.76	4.04	4.10
				48.16%	46.80%	6.80%	6.80%					45.03%	46.41%			6.37%	7.67%	54.97%	53.59%
	TOTAL	39.44	40.69	7.26	7.68	2.20	2.22	0.13	0.48	1.25	1.27	4.67	5.22	14.13	15.12	3.58	3.97	9.46	9.90
				51.38%	50.79%	15.57%	14.68%					33.05%	34.52%			9.08%	9.76%	66.95%	65.48%

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

**Note:** In reference to 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 Area under Barren Backfilling only.
3. Area under **Active Mining** includes Coal Quarry, Advance Quarry Site, Quarry Filled with Water, if any. Coal Dump is excluded from Active Mining Area.
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".

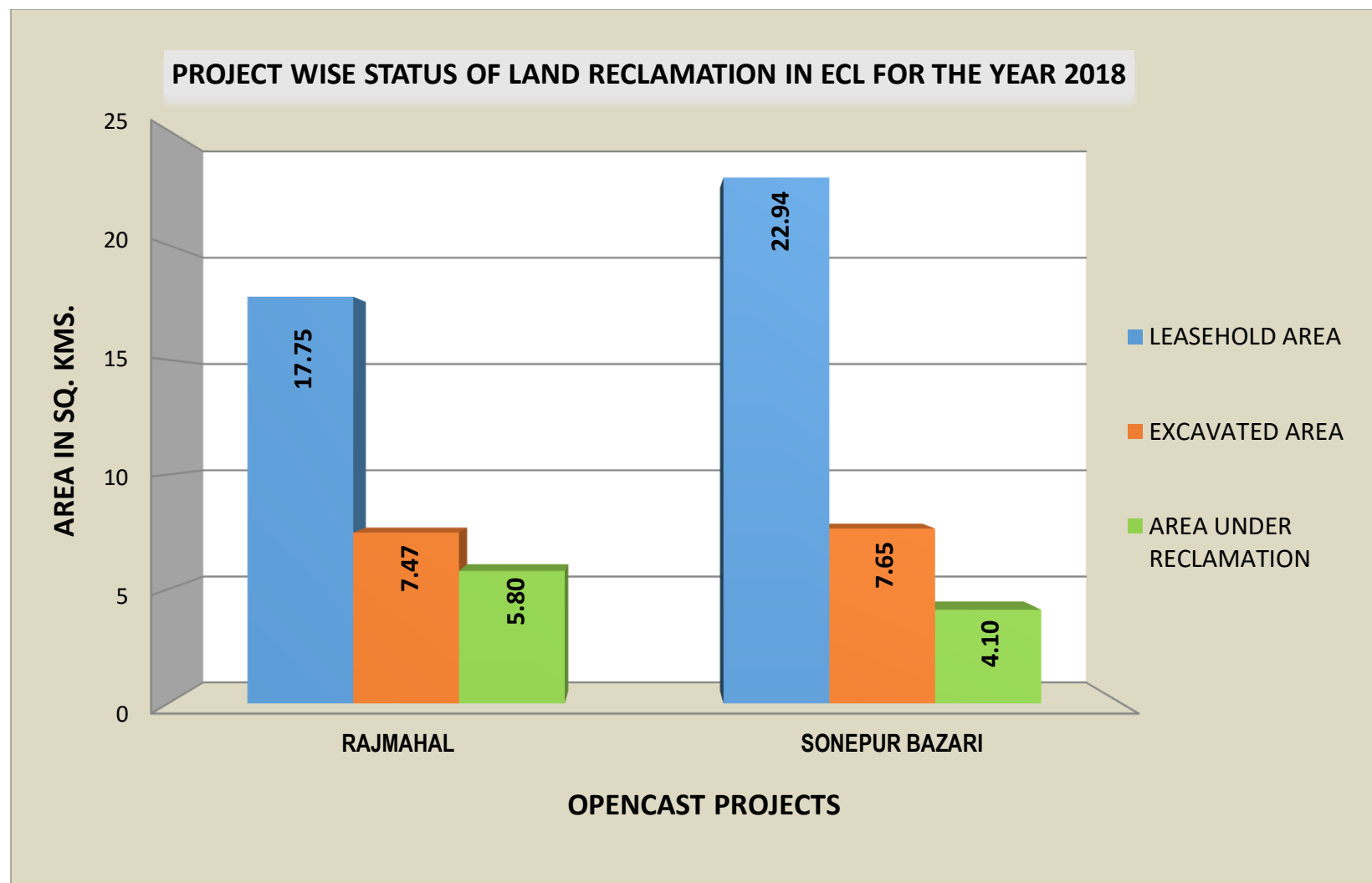






















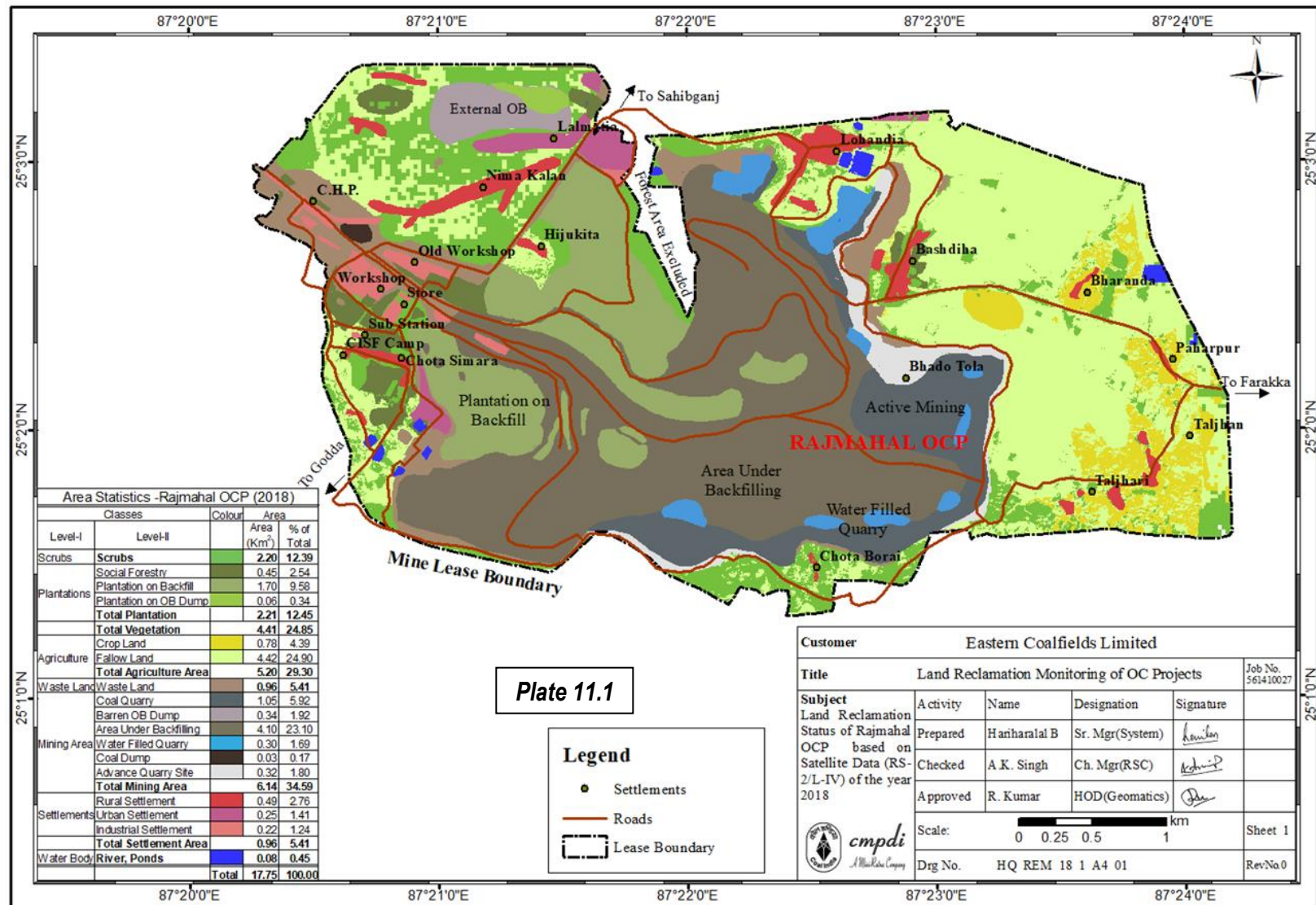
Fig. 11.1: Project wise Land Reclamation Status in ECL in the year 2018

Table 11.2

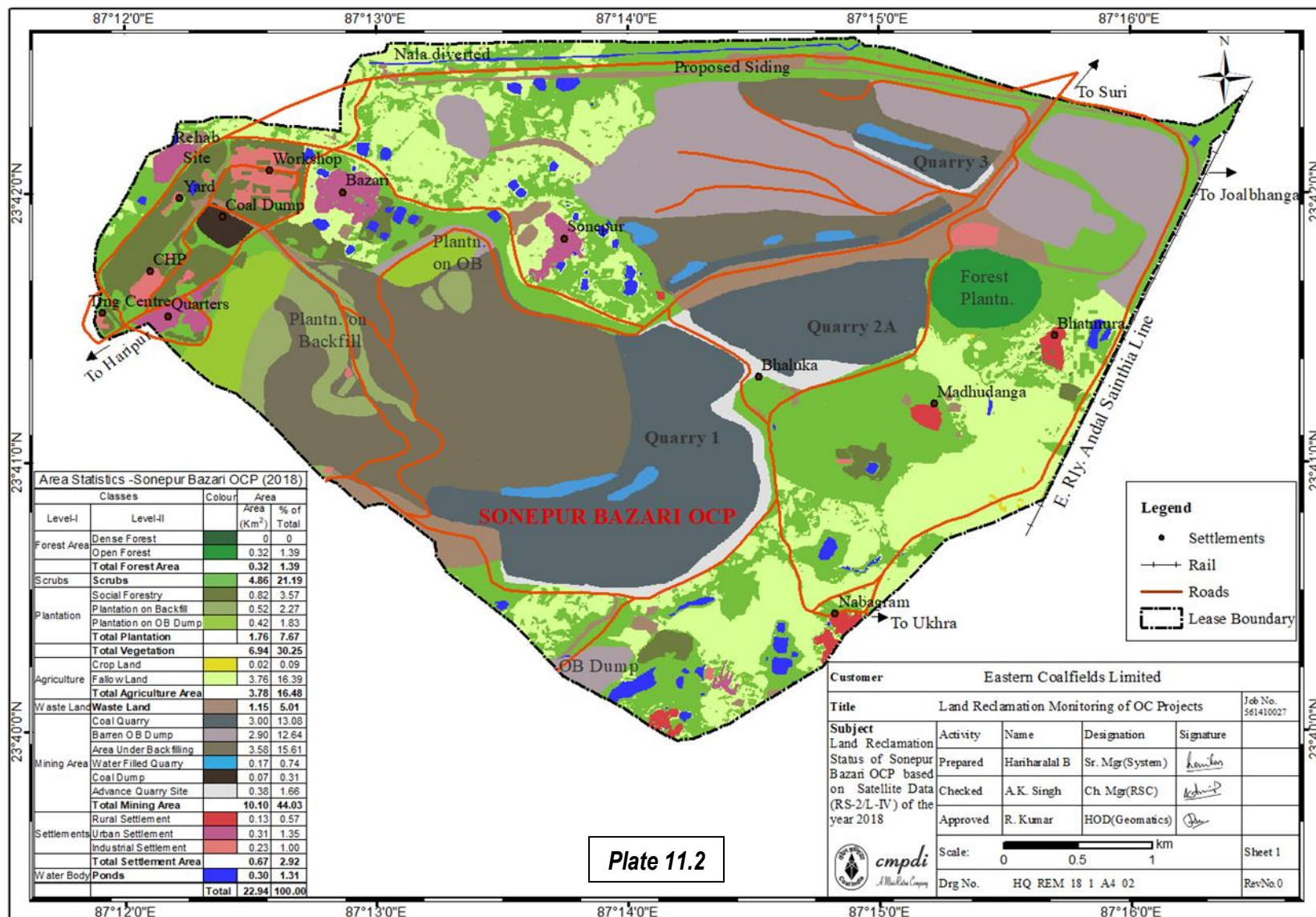
**Project wise Area Statistics of Land Use / Cover in OC Mines  
( > 5 mcu.m.) of ECL based on Satellite data of the Year 2018**

(Area in Km<sup>2</sup>)

			RAJMAHAL		SONEPUR BAZARI		TOTAL	
			Area	%	Area	%	Area	%
FORESTS	Dense Forest		0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest		0.00	0.00	0.32	1.39	0.32	0.79
	<b>Total Forest(A)</b>		0.00	0.00	0.32	1.39	0.32	0.79
	<b>Scrubs(B)</b>		2.20	12.39	4.86	21.19	7.06	17.35
PLANTATION	Social Forestry		0.45	2.54	0.82	3.57	1.27	3.12
	Plantation on OB Dump		0.06	0.34	0.42	1.83	0.48	1.18
	Plantation on Backfill(Biological Reclamation)		1.70	9.58	0.52	2.27	2.22	5.46
	<b>Total Plantation ( C )</b>		2.21	12.45	1.76	7.67	3.97	9.76
	<b>Total Vegetation (A+B+C)</b>		<b>4.41</b>	<b>24.85</b>	<b>6.94</b>	<b>30.25</b>	<b>11.35</b>	<b>27.89</b>
ACTIVE MINING	Coal Quarry		1.05	5.92	3.00	13.08	4.05	9.95
	Advance Quarry Site		0.32	1.80	0.38	1.66	0.70	1.72
	Quarry Filled With Water		0.30	1.69	0.17	0.74	0.47	1.16
	<b>Area under Active Mining (D)</b>		<b>1.67</b>	<b>9.41</b>	<b>3.55</b>	<b>15.48</b>	<b>5.22</b>	<b>12.83</b>
E	Coal Dump		0.03	0.17	0.07	0.31	0.10	0.25
	Barren OB Dump		0.34	1.92	2.90	12.64	3.24	7.96
	Area Under Backfilling(Technical Reclamation)		4.10	23.1	3.58	15.61	7.68	18.87
	<b>Total Area under Mining Operation (D+E)</b>		<b>6.14</b>	<b>34.59</b>	<b>10.10</b>	<b>44.03</b>	<b>16.24</b>	<b>39.91</b>
WASTELANDS	Waste Lands		0.96	5.41	1.15	5.01	2.11	5.19
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.00	0.00
	<b>Total Wasteland</b>		<b>0.96</b>	<b>5.41</b>	<b>1.15</b>	<b>5.01</b>	<b>2.11</b>	<b>5.19</b>
WATERBODIES	Reservoir, Nallah, Ponds		0.08	0.45	0.30	1.31	0.38	0.93
	<b>Total Waterbodies</b>		<b>0.08</b>	<b>0.45</b>	<b>0.30</b>	<b>1.31</b>	<b>0.38</b>	<b>0.93</b>
AGRICULTURE	Crop Lands		0.78	4.39	0.02	0.09	0.80	1.97
	Fallow Lands		4.42	24.9	3.76	16.39	8.18	20.10
	<b>Total Agriculture</b>		<b>5.2</b>	<b>29.30</b>	<b>3.78</b>	<b>16.48</b>	<b>8.98</b>	<b>22.07</b>
SETTLEMENTS	Urban Settlement		0.25	1.41	0.31	1.35	0.56	1.38
	Rural Settlement		0.49	2.76	0.13	0.57	0.62	1.52
	Industrial Settlement		0.22	1.24	0.23	1.00	0.45	1.11
	<b>Total Settlement</b>		<b>0.96</b>	<b>5.41</b>	<b>0.67</b>	<b>2.92</b>	<b>1.63</b>	<b>4.01</b>
	<b>Grand Total</b>		<b>17.75</b>	<b>100.00</b>	<b>22.94</b>	<b>100.00</b>	<b>40.69</b>	<b>100.00</b>







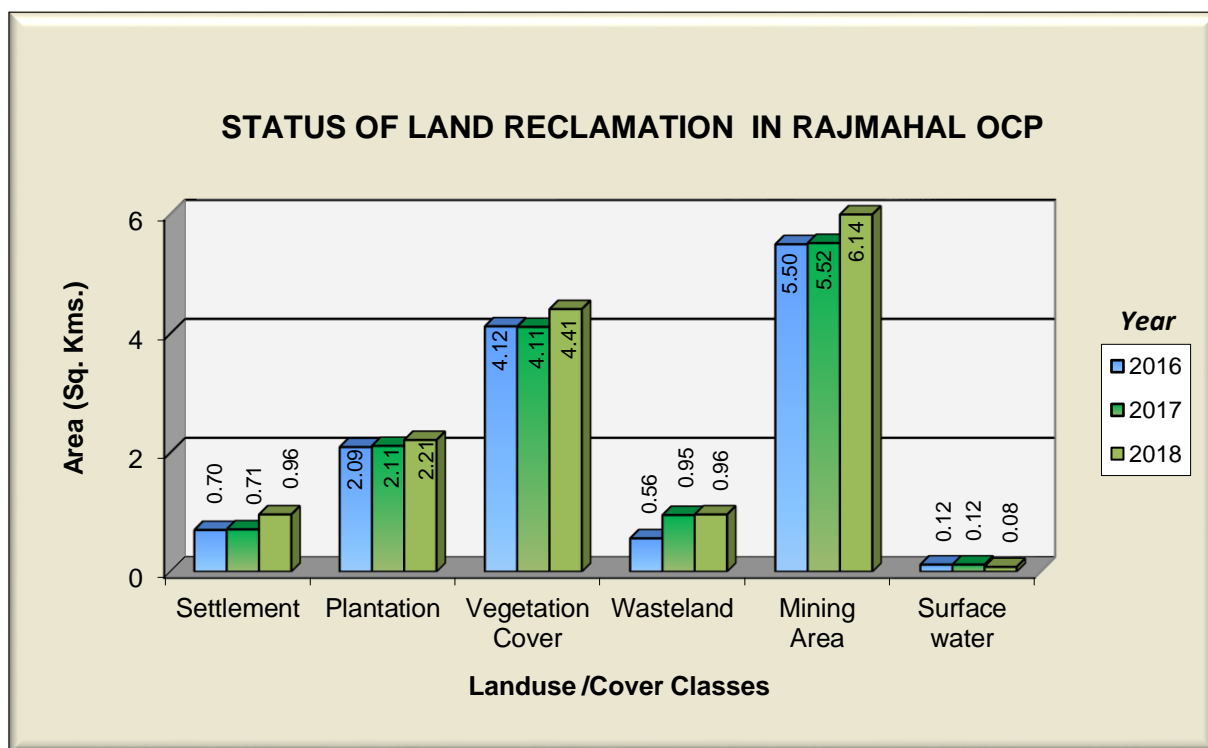


Figure 11.2

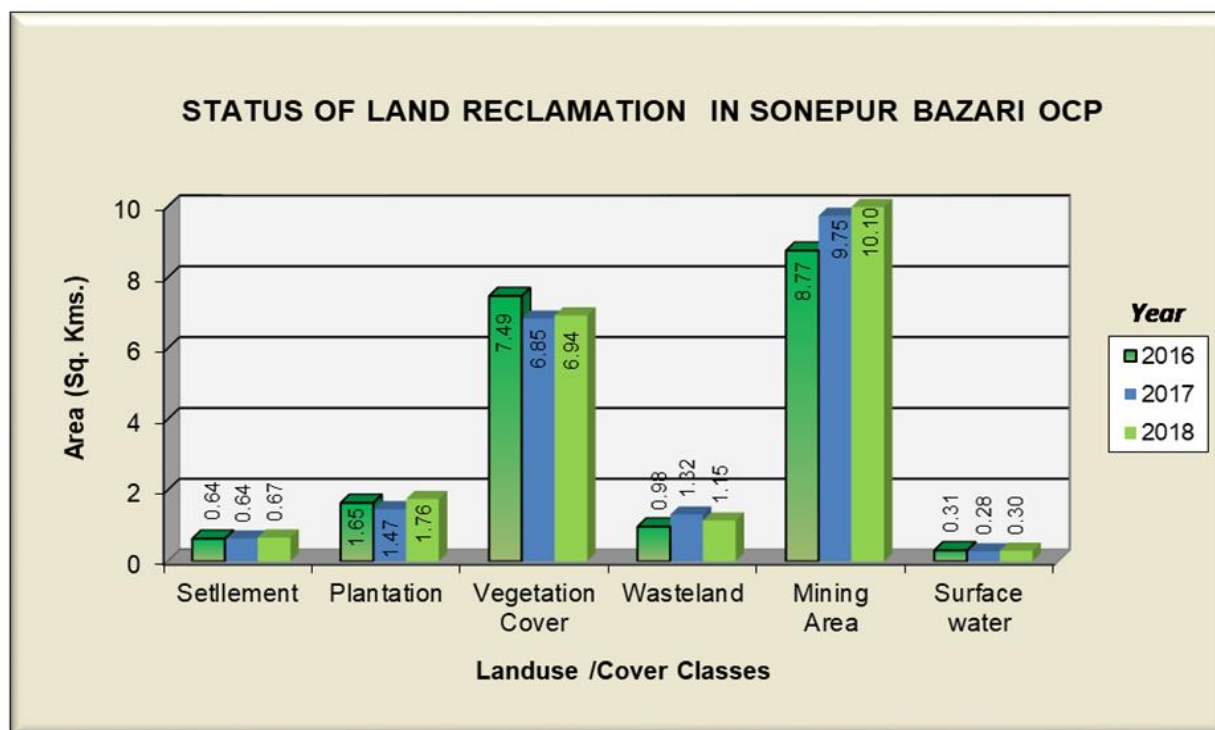


Figure 11.3





**Photograph 11.1 : Plantation on Backfill in Sonepur Bazari OCP, ECL**



**Photograph 11.2 : Plantation on Backfilled Area in Rajmahal OCP, ECL**



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