

Land Restoration / Reclamation Monitoring of 51 Opencast Coal Mines Projects of CIL producing more than 5 mcm (Coal+OB) annually based on Satellite Data for the Year 2020



cmpdi
A Mini-Ratna Company

**Land Restoration / Reclamation Monitoring of 51 Opencast
Coal Mines Projects of CIL producing more than 5 mcm
(Coal+OB) annually based on Satellite Data for the Year 2020**

March- 2021



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

CONTENTS

	<i>Executive Summary</i>	3
1.0	Background	9
2.0	Objective	10
3.0	Methodology	10
4.0	Work plan	13
5.0	Land Reclamation in WCL	15
6.0	Land Reclamation in SECL	41
7.0	Land Reclamation in NCL	65
8.0	Land Reclamation in MCL	91
9.0	Land Reclamation in CCL	129
10.0	Land Reclamation in ECL	149

Executive Summary

- 1.0 Project** Land restoration / reclamation monitoring of 51 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 709.82 Km² of the 51 OC projects considered for monitoring during 2020-21; total excavated area is 254.04 Km²; out of which 111.99 Km² area (44.08%) is under backfilling (Technical Reclamation), 49.90 Km² area (19.64%) has been planted (Biologically Reclaimed) and 92.15 Km² area (36.27%) is under active mining. It is evident from the analysis that 161.89 Km² (63.73%) area out of the total excavated area of 254.04 Km² of the 51 OC projects is already under reclamation and balance 92.15 Km² (36.27%) area is under active mining. Company wise details are given in Table - 1 & Fig-1.
 - In the year 2020 amongst projects subsidiaries of Coal India Ltd. taken up for monitoring, BCCL is excluded for this report as projects of BCCL are monitored under less than 5 mcm category on cluster basis as per request from BCCL. In addition for the year 2020-21, CCL has included 2 more mines (Magadh & Amrapali), SECL has discarded 2 mines (Dugga & Bishrampur) and MCL has included 1 more mine (Garjanbahal) for monitoring from this year. Hence, 51 mines are chosen for monitoring instead of 52 mines of previous year.
 - On comparing the status of land reclamation carried out in year 2019-20 with respect to years 2020-21 in the 51 Opencast projects of different CIL subsidiaries, it is evident from the analysis of the

satellite data of the year 2020 that area under land reclamation has increased from 152.33 Km² (Yr. 2019-20) to 161.89 Km² (Yr. 2020-21) which includes both area under plantation (Biological Reclamation) and areas under backfilling (Technical Reclamation). This increase of 9.56 Km² 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 are given in Fig.2.

- It has been observed that in all the subsidiaries of Coal India Limited (CIL), technical reclamation has shown an increasing trend. As compared to the analysis done in the year 2019, it has been found that there has been an overall increase of 9.10 Km² in area under technical reclamation commutatively in the year 2020.
- It has been observed that in WCL, SECL, MCL, CCL & ECL area under biological reclamation has increased in comparison to previous year whereas in NCL area under biological reclamation has reduced in the leasehold areas of the opencast projects selected for this study (Refer Table – 1). In NCL all leasehold boundaries are updated with latest available EC boundaries which results change in position and area and overall impact on plantation and vegetation.
- It has been also observed that in subsidiaries like WCL, SECL, MCL, CCL & 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. However, in NCL, there has been decrease in area under green cover due to change in position and area after georeferencing of latest EC boundaries. Overall 20.46% of the total leasehold area of all the subsidiaries of CIL commutatively is under Green Cover as per the analysis of satellite data of the year 2020.
- Analysis of the results based on satellite data of the year 2020 also indicate that all subsidiaries of CIL except for NCL, whose projects were under monitoring indicate an increasing trend for area under reclamation. It has been observed that total area under reclamation has increased from 152.33 Km² (63.40%) in 2019 to 161.89 Km² (63.73%) in the year 2020.

Commutative Status of Land Reclamation monitoring based on satellite data of the year 2020 is indicated in the Pie Chart in the Fig. 1. Subsidiary wise status of Land Reclamation Monitoring of the projects monitored based on satellite data of the year 2020 is shown in form of Bar Chart at Fig 2. Comparison of Area under Reclamation in different subsidiaries of Coal India Limited between the years 2018 to 2020 has been shown in form of Bar- Chart in Fig 3.

Table-1

Company wise Land Reclamation Status in OC projects of CIL based on Satellite Data of year 2020
(Projects producing more than 5 mcm of Coal+OB annually)

(Area in Sq. Kms.)

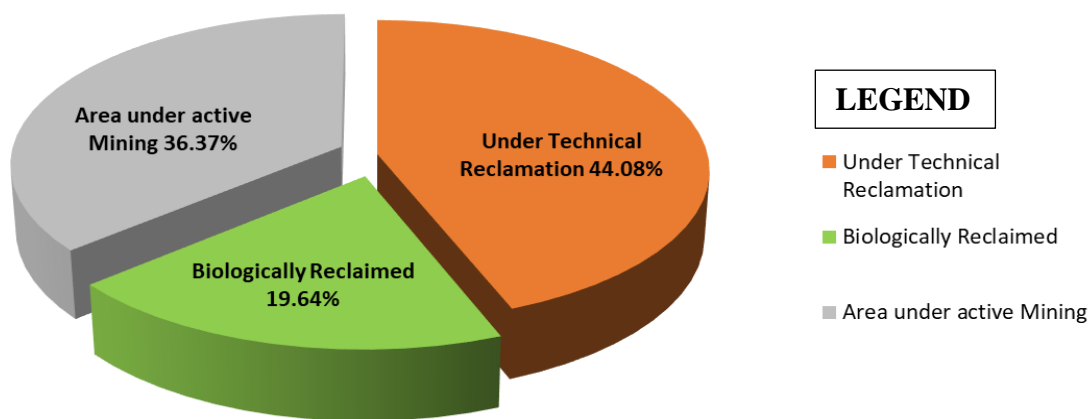
Sl. No.	Project (Nos.)	Total Leasehold Area		Reclamation Activities under Progress								Area under Active Mining	Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation		
				Technical Reclamation		Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Backfilled Areas		Plantation on External OB Dumps		Social Forestry, Avanneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	WCL (10)	117.19	110.05	8.19	9.00	2.98	3.39	13.35	13.82	8.88	8.81	18.10	18.35	29.27	30.74	25.21	26.02	11.17	12.39
				27.98%	29.28%	10.18%	11.03%					61.84%	59.69%			21.51%	23.64%	38.16%	40.31%
2	SECL (08)	135.24	134.17	22.29	23.80	15.52	17.23	10.88	10.82	8.05	7.34	17.00	17.00	54.81	58.03	34.45	35.39	37.81	41.03
				40.67%	41.01%	28.32%	29.69%					31.02%	29.30%			25.47%	26.38%	68.98%	70.70%
3	NCL (10)	174.28	187.91	31.88	33.91	14.78	12.46	10.99	15.21	26.14	22.82	27.18	28.73	73.84	75.10	51.91	50.49	46.66	46.37
				43.17%	45.15%	20.02%	16.59%					36.81%	38.26%			29.79%	26.87%	63.19%	61.74%
4	MCL (14)	151.56	161.76	22.74	24.56	8.26	8.37	3.18	3.18	3.43	3.89	16.91	18.04	47.91	50.97	14.87	15.44	31.00	32.93
				47.46%	48.19%	17.24%	16.42%					35.30%	35.39%			9.81%	9.55%	64.70%	64.61%
5	CCL (07)	51.35	75.24	9.43	11.89	5.58	5.78	3.63	3.67	3.77	3.79	3.62	5	18.63	22.67	12.98	13.24	15.01	17.67
				50.62%	52.45%	29.95%	25.50%					19.43%	22.06%			25.28%	17.60%	80.57%	77.94%
6	ECL (02)	40.69	40.69	8.36	8.83	2.32	2.67	0.48	0.50	1.42	1.48	5.11	5.03	15.79	16.53	4.22	4.65	10.68	11.50
				52.94%	53.42%	14.69%	16.15%					32.36%	30.43%			10.37%	11.43%	67.64%	69.57%
	TOTAL (51)	670.31	709.82	102.89	111.99	49.44	49.90	42.51	47.20	51.69	48.13	87.92	92.15	240.25	254.04	143.64	145.23	152.33	161.89
				42.83%	44.08%	20.58%	19.64%					36.60%	36.27%			21.43%	20.46%	63.40%	63.73%

(% 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 calculated in terms of leasehold area.

**STATUS OF LAND RECLAMATION IN THE LEASEHOLD OF 51 OPENCAST MINES
UNDER MONITORING BASED ON SATELLITE DATA OF THE YEAR 2020**
(Pie Chart indicated distribution of Total Excavated Area Only)



(As per Digital Image Processing of Satellite Data of the year 2020)

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

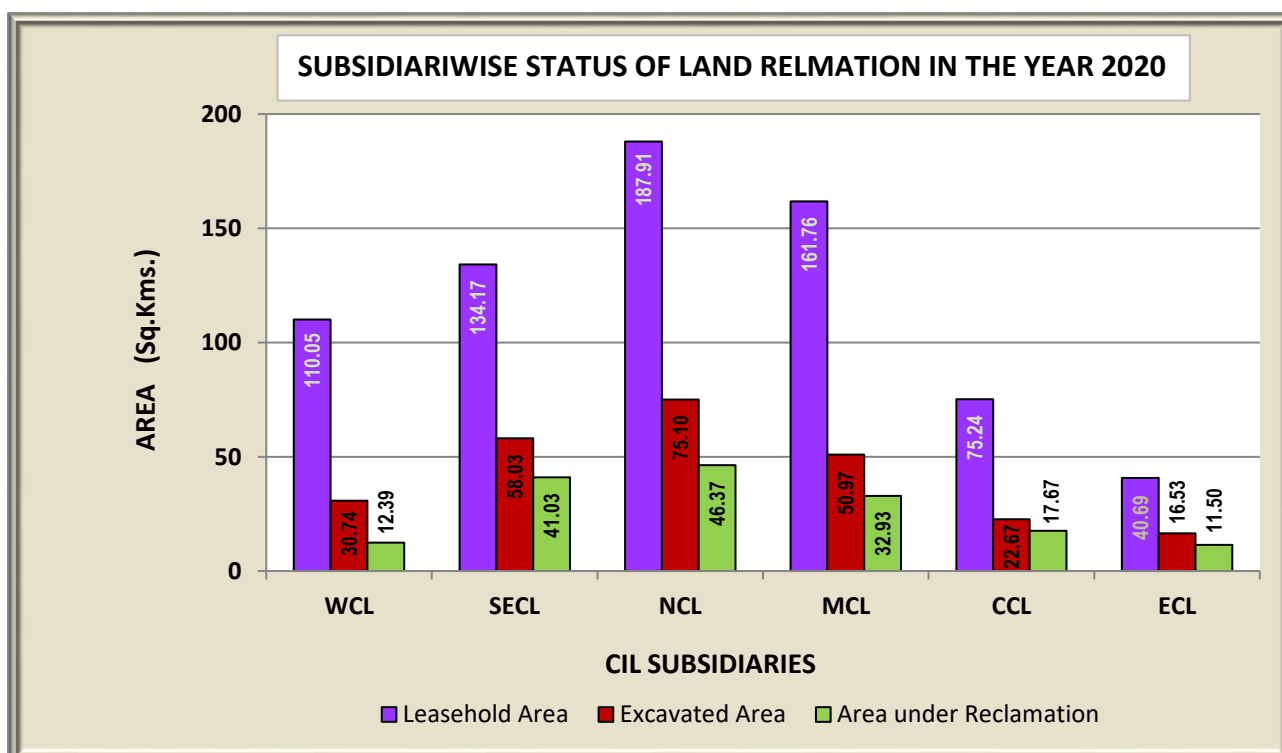


Fig. 2 : Company wise Land Reclamation Status in the Year 2020

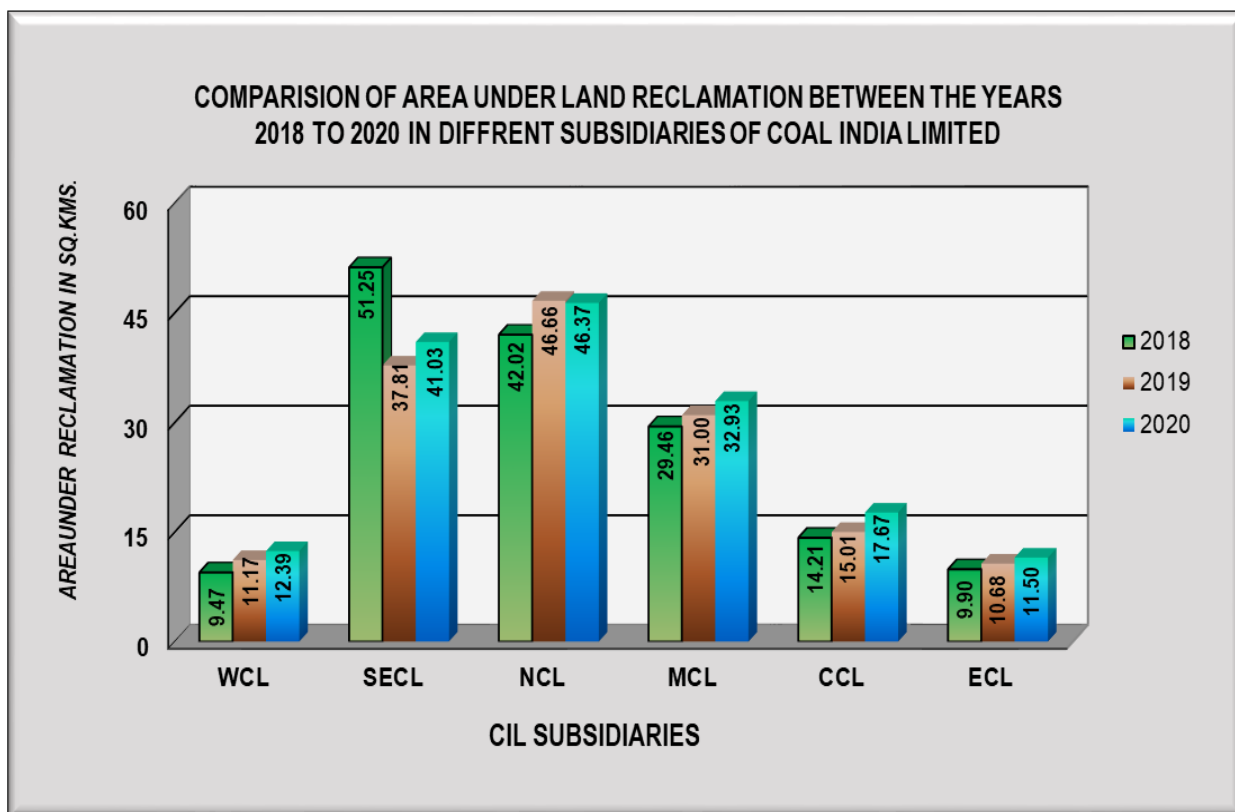


Fig. 4 : Comparison fo Area under Land Reclamation between 2018 to 2020

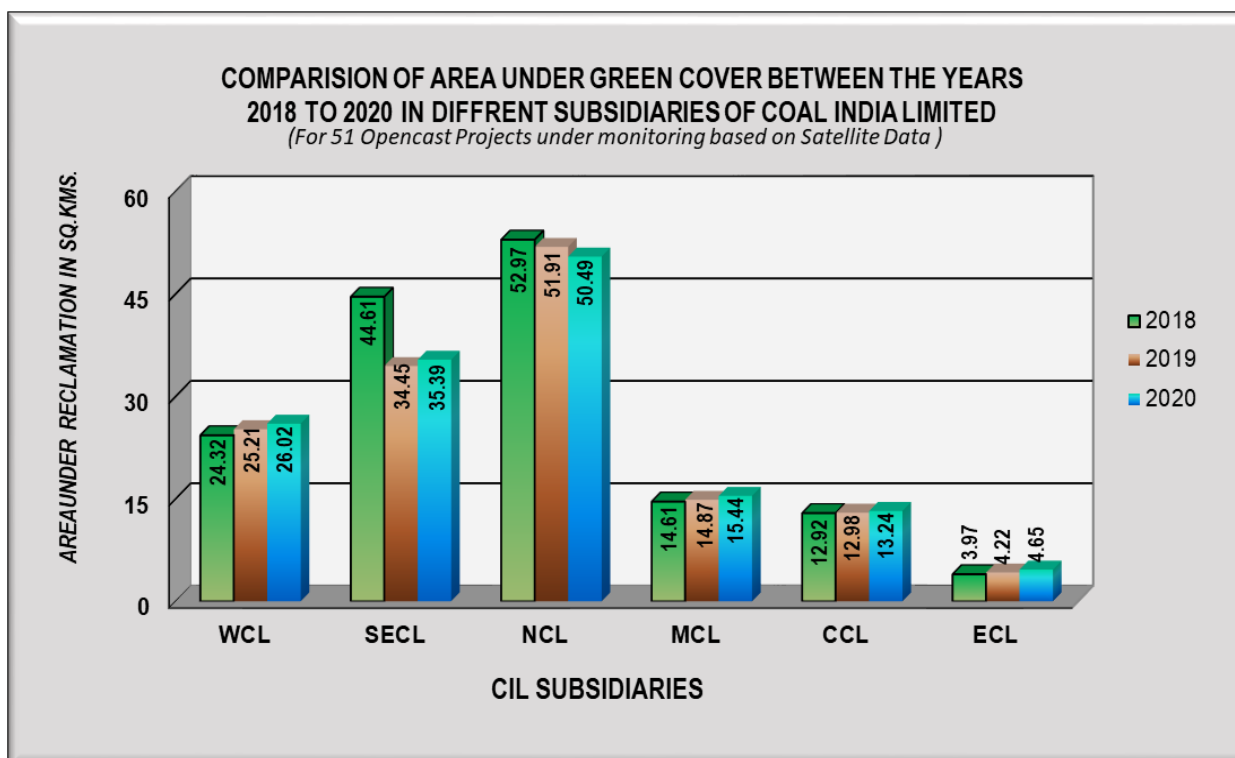


Fig. 5 : Comparison fo Area under Green Cover in subsidiaries between 2018 to 2020

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 m³ 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), CMPDI (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 & Climate Change (MoEF&CC), Govt. 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 51 opencast projects of different subsidiaries producing 5 million cubic m. coal +OB or more in the year 2020-21. 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. It is to be noted that BCCL has excluded this year for more than 5 Million Cubic m. (Coal+OB) monitoring category.

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:

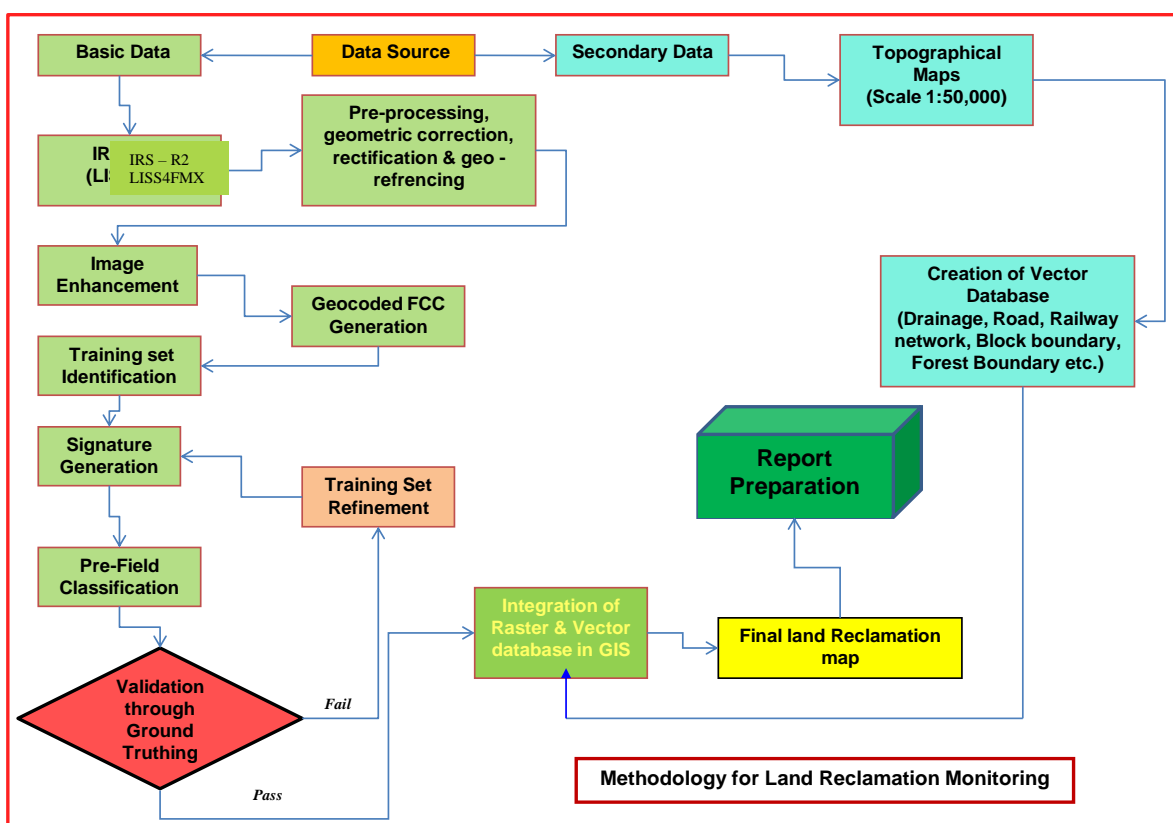


Fig.3 : Methodology for Land Reclamation Monitoring

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 51 opencast projects producing 5 million cubic m. and more (Coal + OB together) during the year 2020-21 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,

Bisrampur, 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 51 opencast projects taken up for Land Reclamation Monitoring based on satellite data of year 2020 is given in table below :

Subsidiary (No. of Projects)	Opencast Projects (5 million Cu.m. Coal +OB or more per annum)
WCL (10)	Sasti, Padmapur, Durgapur, Mugoli, Umrer, Ukni, Niljai, New Majri, Makardhokra - III & Penganga
SECL (08)	Dipka, Gevra, Kusmunda, Manikpur, Chirimiri, Rajnagar, Dhanpuri & Jamuna
NCL (10)	Amlohri, Nigahi, Jayant, Dudhichua, Khadia, Krishnashila, Bina, Kakri, Jhingurdah, Block-B
MCL (14)	Ananta, Balram, Lingraj, Bharatpur, Bhubaneswari, Jagannath, Hingula, Belpahar, Lakhanpur, Samleswari, Lajkura, Siarmal & Basundhara West Extension, Garjanbahal
CCL (07)	Ashoka, Piparwar, K.D. Hesalong, Rajrappa, Magadh, Amrapali & Parej East
ECL (02)	Sonepur-Bazari, Rajmahal
TOTAL (51)	

- 4.4** Subsidiary wise report on land reclamation status of the above mentioned 51 OC projects derived through Digital Image Processing of Satellite Data for the year 2020 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 2020:

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

5.2 Project wise Land Reclamation status in WCL for the year 2020 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 boundaries of the above projects for the year 2020 are shown in the Table - 5.2. It is important to mention here that leasehold boundary of Makardhokra - III has been modified as per latest EC. Land use maps derived from satellite data are shown in Plate 5.1-5.10. 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. Monitoring of land reclamation of Makardhokra-III and Penganga OCPs has been started from 2018 only on annual basis.

5.3 Study reveals that 12.39 Km² (40.31%) of excavated area has been under reclamation in the above mentioned mines of WCL out of which 9.00 Km² (29.28%) area is under backfilling (Technical Reclamation) and 3.39 Km² (11.03%) area has been revegetated (Biologically Reclaimed). There is an overall increase of 1.22 Km² in area under

reclamation in WCL in the year 2020 with respect to the year 2019, out of which there is an increase of 0.81 Km² in area under Technical Reclamation (Barren Backfilling) and increase of 0.41 Km² area under biological reclamation (Plantation on Backfilled Areas) (Refer Table 5.1).

- 5.4** Analysis of satellite data also indicates that total area under plantation (Green Cover) has increased from 25.21 Km² (2019) to 26.02 Km² (2020). The increase of 0.81 Km² area under Green Cover areas may be attributed to continuous effort of WCL towards environmental protection.
- 5.5** After comparing the satellite data of year 2020 vs. 2019, it is evident that total area under plantation (Green Cover) in all the projects of WCL under monitoring Sasti, Padmapur, Durgapur, Mugoli, Umrer, Ukni, Niljai, New Majri, Makardhokra-III and Penganga Opencast Projects has either increased or remained static. It has been also 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.
- 5.6** On comparing the status of land reclamation for the year 2020 with respect to the year 2019 in different projects, it is evident that the total area under reclamation has increased from 11.17 Km² (Yr. 2019) to 12.39 Km² (Yr. 2020).
- 5.7** Out of 10 projects of WCL, maximum area under reclamation is in Sasti Opencast Project (76.19%) followed by Umrer OC (64.30%) and Mugoli OC (40.53%).

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 2020

(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, Avauue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	Sasti	9.20	9.20	2.26	2.23	0.58	0.65	1.64	1.66	0.62	0.65	0.88	0.90	3.72	3.78	2.84	2.96	2.84	2.88
				60.75%	58.99%	15.59%	17.20%					23.66%	23.81%			30.87%	32.17%	76.34%	76.19%
2	Padmapur	8.29	8.29	0.48	0.53	0.18	0.18	1.80	1.83	0.76	0.78	1.27	1.29	1.93	2.00	2.74	2.79	0.66	0.71
				24.87%	26.50%	9.33%	9.00%					65.80%	64.50%			33.05%	33.66%	34.20%	35.50%
3	Durgapur	15.50	15.50	0.76	0.78	0.63	0.80	2.39	2.42	1.12	1.14	3.17	3.04	4.56	4.62	4.14	4.36	1.39	1.58
				16.67%	16.88%	13.82%	17.32%					69.52%	65.80%			26.71%	28.13%	30.48%	34.20%
4	Mugoli	12.55	12.55	0.86	1.10	0.12	0.12	1.52	1.62	0.32	0.38	1.74	1.79	2.72	3.01	1.96	2.12	0.98	1.22
				31.62%	36.54%	4.41%	3.99%					63.97%	59.47%			15.62%	16.89%	36.03%	40.53%
5	Umrer	9.45	9.45	1.78	1.75	1.20	1.33	1.44	1.54	2.42	2.31	1.75	1.71	4.73	4.79	5.06	5.18	2.98	3.08
				37.63%	36.53%	25.37%	27.77%					37.00%	35.70%			53.54%	54.81%	63.00%	64.30%
6	Ukni	12.85	12.85	0.21	0.30	0.00	0.00	1.52	1.56	0.65	0.68	2.13	2.07	2.34	2.37	2.17	2.24	0.21	0.30
				8.97%	12.66%	0.00%	0.00%					91.03%	87.34%			16.89%	17.43%	8.97%	12.66%
7	Niljai	17.61	17.61	0.79	1.04	0.10	0.10	1.37	1.51	1.29	1.17	2.98	3.00	3.87	4.14	2.76	2.78	0.89	1.14
				20.41%	25.12%	2.58%	2.42%					77.00%	72.46%			15.67%	15.79%	23.00%	27.54%
8	New Majri	7.74	7.74	0.98	1.05	0.17	0.21	1.67	1.68	1.35	1.35	2.54	2.43	3.69	3.69	3.19	3.24	1.15	1.26
				26.56%	28.46%	4.61%	5.69%					68.83%	65.85%			41.21%	41.86%	31.17%	34.15%
9	Makardhokra-III	16.37	9.23	0.07	0.07	0.00	0.00	0.00	0.00	0.05	0.05	0.75	1.10	0.82	1.17	0.05	0.05	0.07	0.07
				8.54%	5.98%	0.00%	0.00%					91.46%	94.02%			0.31%	0.54%	8.54%	5.98%
10	Penganga	7.63	7.63	0.00	0.15	0.00	0.00	0.00	0.00	0.30	0.30	0.89	1.02	0.89	1.17	0.30	0.30	0.00	0.15
				0.00%	12.82%	0.00%	0.00%					100.00%	87.18%			3.93%	3.93%	0.00%	12.82%
		117.19	110.05	8.19	9.00	2.98	3.39	13.35	13.82	8.88	8.81	18.10	18.35	29.27	30.74	25.21	26.02	11.17	12.39
				27.98%	29.28%	10.18%	11.03%					61.84%	59.69%			21.51%	23.64%	38.16%	40.31%

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. 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.
6. Leasehold Boundaries of Durgapur, Mugoli, Ukni and Niljai Opencast projects have been modified as per latest ECs.

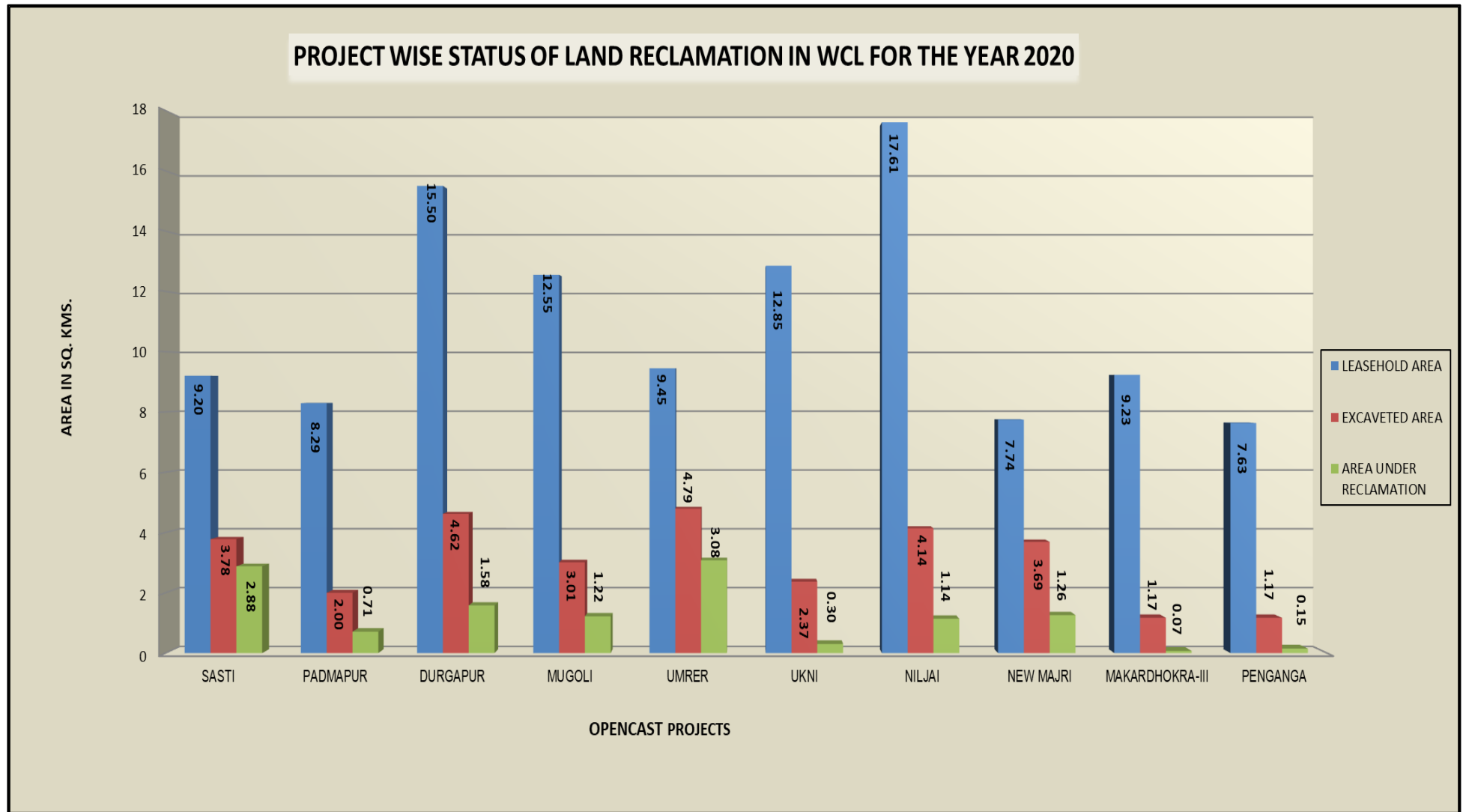
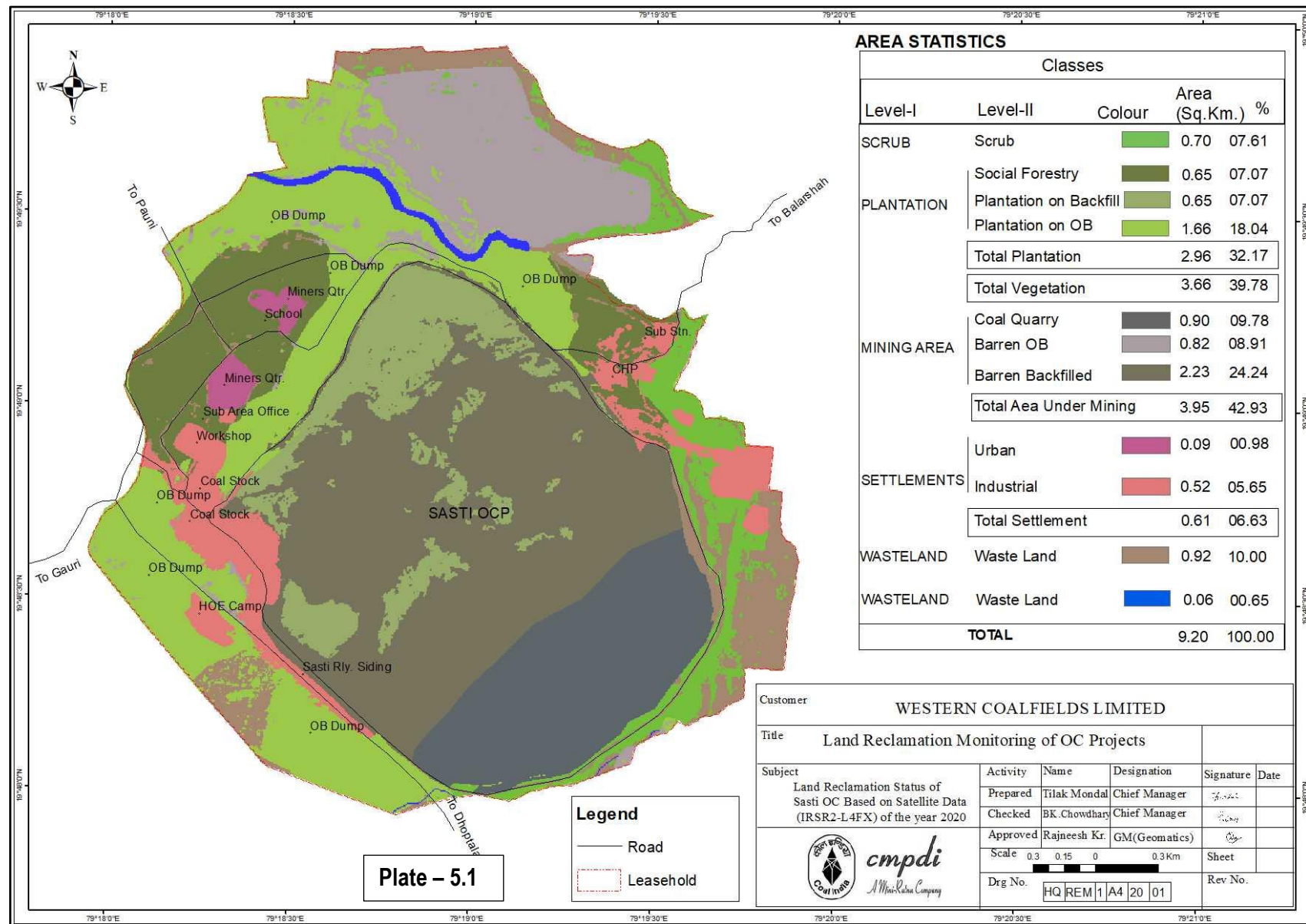


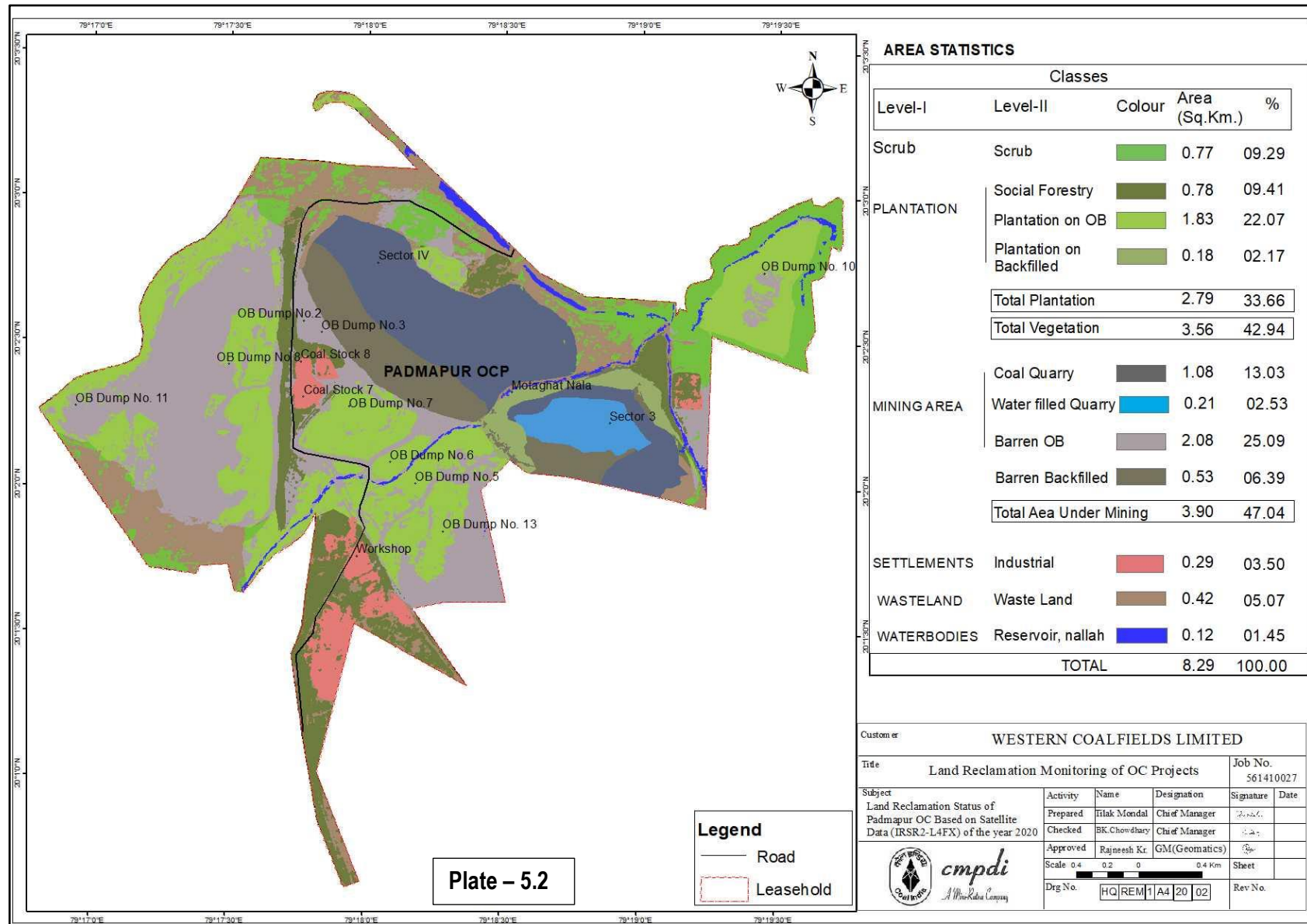
Figure : 5.1

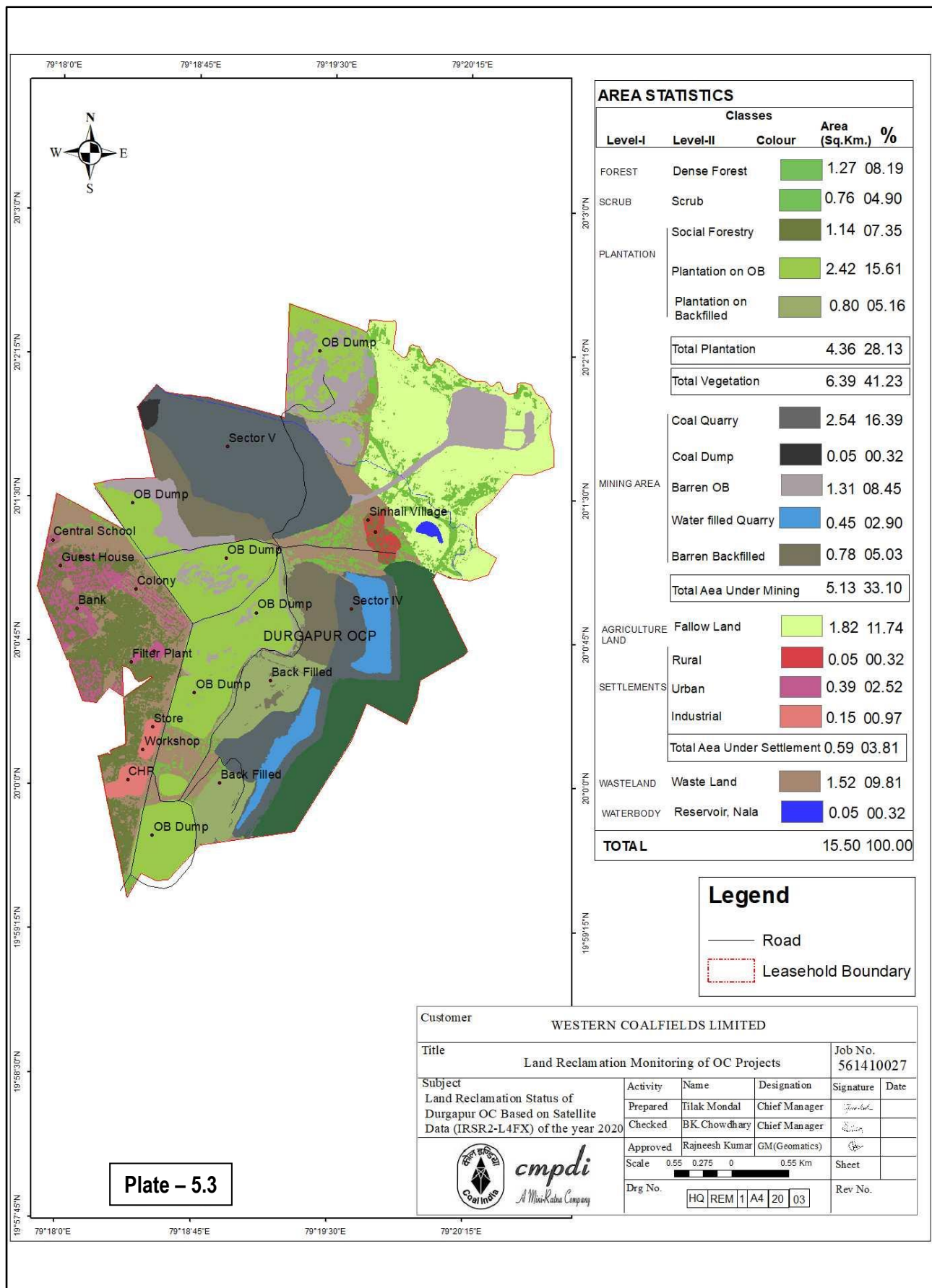
Table 5.2

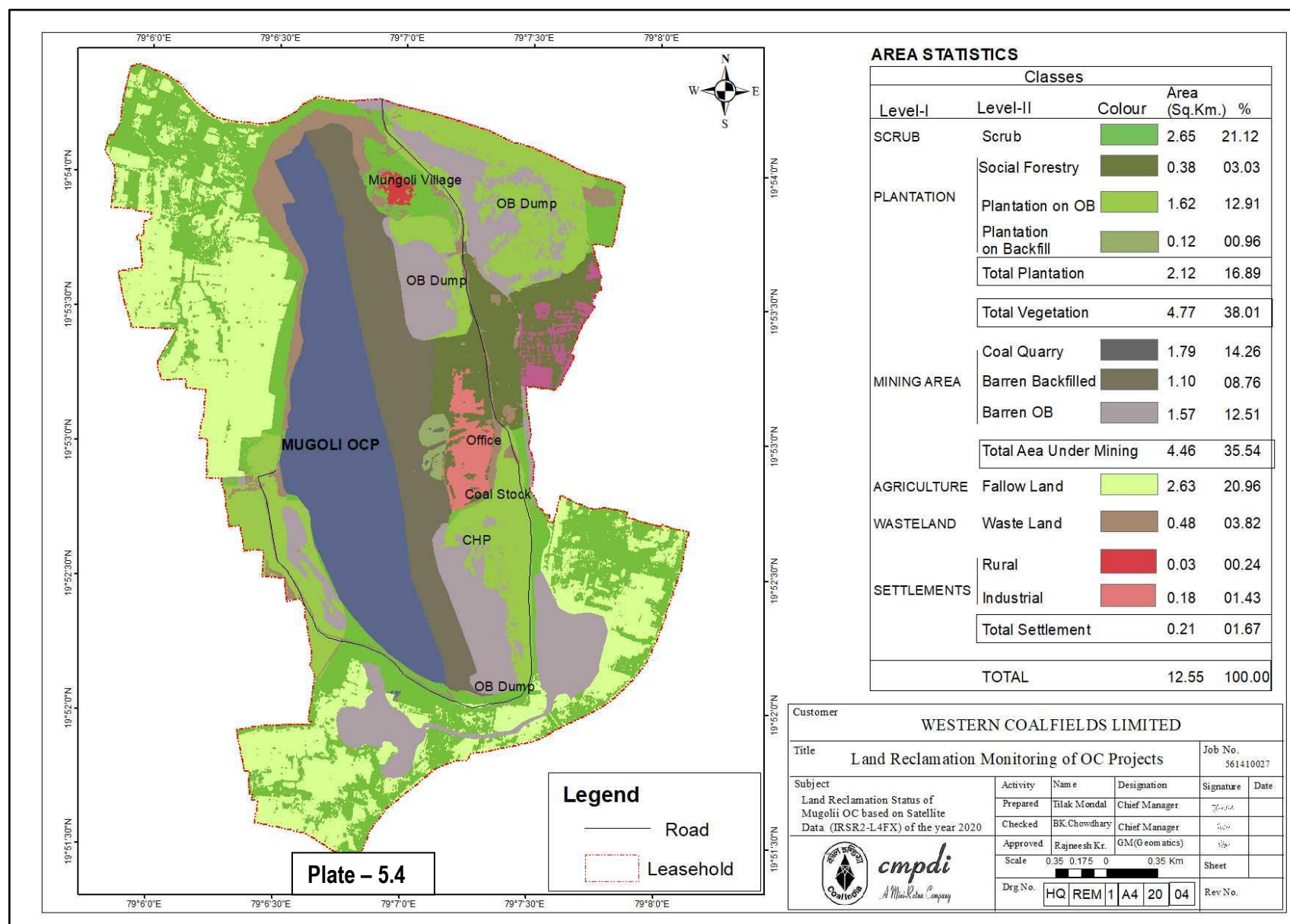
Project wise Area Statistics of Land Use / Cover in OC Mines (> 5 mcu.m.) of WCL based on Satellite data of the Year 2020

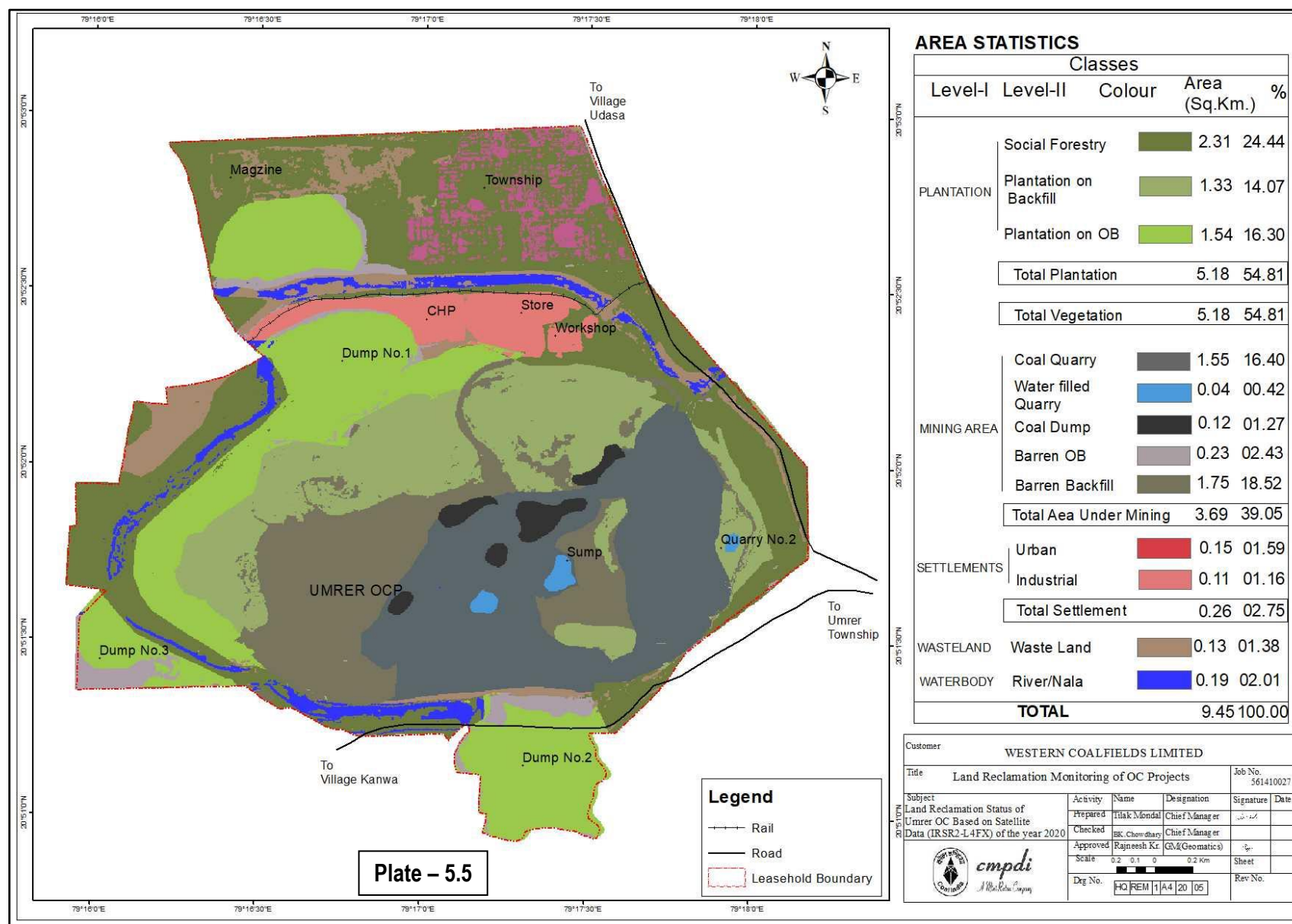
(Area in Sq Km)																							
		SASTI		PADMAPUR		DURGAPUR		MUGOLI		UMRER		UKNI		NILJAI		NEW MAJRI		MAKARDHOKRA-III		PENGANGA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	1.27	8.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.27	1.15
	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	0.00
	Total Forest	0.00	0.00	0.00	0.00	1.27	8.19	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	1.27	1.15
SCRUBS	Scrubs	0.70	7.61	0.77	9.29	0.76	4.90	2.65	21.12	0.00	0.00	2.19	17.04	1.98	11.24	0.13	1.68	0.53	5.74	1.72	22.54	11.43	10.39
	Social Forestry	0.65	7.07	0.78	9.41	1.14	7.35	0.38	3.03	2.31	24.44	0.68	5.29	1.17	6.64	1.35	17.44	0.05	0.54	0.30	3.93	8.81	8.01
	Plantation on OB Dump	1.66	18.04	1.83	22.07	2.42	15.61	1.62	12.91	1.54	16.30	1.56	12.14	1.51	8.57	1.68	21.71	0.00	0.00	0.00	0.00	13.82	12.56
PLANTATION	Plantation on Backfill (Biological Reclamation)	0.65	7.07	0.18	2.17	0.80	5.16	0.12	0.96	1.33	14.07	0.00	0.00	0.10	0.57	0.21	2.71	0.00	0.00	0.00	0.00	3.39	3.08
	Total Plantation	2.96	32.17	2.79	33.66	4.36	28.13	2.12	16.89	5.18	54.81	2.24	17.43	2.78	15.79	3.24	41.86	0.05	0.54	0.30	3.93	26.02	23.64
	Total Vegetation	3.66	39.78	3.56	42.94	6.39	41.23	4.77	38.01	5.18	54.81	4.43	34.47	4.76	27.03	3.37	43.54	0.58	6.28	2.02	26.47	38.72	35.18
ACTIVE MINING	Coal Quarry	0.90	9.78	1.08	13.03	2.54	16.39	1.79	14.26	1.55	16.40	1.91	14.86	2.89	16.41	2.31	29.84	1.10	11.92	0.68	8.91	16.75	15.22
	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	0.15	1.97	0.15	0.14
	Quarry Filled With Water	0.00	0.00	0.21	2.53	0.45	2.90	0.00	0.00	0.04	0.42	0.06	0.47	0.00	0.00	0.12	1.55	0.00	0.00	0.00	0.00	0.88	0.80
RECLAIMED	Coal Dump	0.00	0.00	0.00	0.00	0.05	0.32	0.00	0.00	0.12	1.27	0.10	0.78	0.11	0.62	0.00	0.00	0.00	0.00	0.19	2.49	0.57	0.52
	Total Area Under Active Mining	0.90	9.78	1.29	15.56	3.04	19.61	1.79	14.26	1.71	18.10	2.07	16.11	3.00	17.04	2.43	31.40	1.10	11.92	1.02	13.37	18.35	16.67
	Area under Backfilling (Technical Reclamation)	2.23	24.24	0.53	6.39	0.78	5.03	1.10	8.76	1.75	18.52	0.30	2.33	1.04	5.91	1.05	13.57	0.07	0.76	0.15	1.97	9.00	8.18
WASTELANDS	Barren OB Dump	0.82	8.91	2.08	25.09	1.31	8.45	1.57	12.51	0.23	2.43	3.03	23.58	3.40	19.31	0.16	2.07	2.21	23.94	1.32	17.30	16.13	14.66
	Total Area Under Mine Operation	3.95	42.93	3.90	47.04	5.13	33.10	4.46	35.54	3.69	39.05	5.40	42.02	7.44	42.25	3.64	47.03	3.38	36.62	2.49	32.63	43.48	39.51
	Waste Lands	0.92	10.00	0.42	5.07	1.52	9.81	0.48	3.82	0.13	1.38	1.04	8.09	1.93	10.96	0.31	4.01	0.29	3.14	1.80	23.59	8.84	8.03
WATERBODIES	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	0.92	10.00	0.42	5.07	1.52	9.81	0.48	3.82	0.13	1.38	1.04	8.09	1.93	10.96	0.31	4.01	0.29	3.14	1.80	23.59	8.84	8.03
	Reservoir, nallah, ponds	0.06	0.65	0.12	1.45	0.05	0.32	0.00	0.00	0.19	2.01	0.00	0.00	0.03	0.17	0.04	0.52	0.06	0.65	0.11	1.44	0.66	0.60
AGRICULTURE	Total Waterbodies	0.06	0.65	0.12	1.45	0.05	0.32	0.00	0.00	0.19	2.01	0.00	0.00	0.03	0.17	0.04	0.52	0.06	0.65	0.11	1.44	0.66	0.60
	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	1.09	11.81	0.00	0.00	1.09	0.99
	Fallow Lands	0.00	0.00	0.00	0.00	1.82	11.74	2.63	20.96	0.00	0.00	1.78	13.85	2.42	13.74	0.00	0.00	3.62	39.22	1.06	13.89	13.33	12.11
SETTLEMENTS	Total Agriculture	0.00	0.00	0.00	0.00	1.82	11.74	2.63	20.96	0.00	0.00	1.78	13.85	2.42	13.74	0.00	0.00	4.71	51.03	1.06	13.89	14.42	13.10
	Urban Settlement	0.09	0.98	0.00	0.00	0.39	2.52	0.00	0.00	0.15	1.59	0.00	0.00	0.34	1.93	0.34	4.39	0.00	0.00	0.00	0.00	1.31	1.19
	Rural Settlement	0.00	0.00	0.00	0.00	0.05	0.32	0.03	0.24	0.00	0.00	0.02	0.16	0.20	1.14	0.00	0.00	0.00	0.00	0.03	0.39	0.33	0.30
	Industrial Settlement	0.52	5.65	0.29	3.50	0.15	0.97	0.18	1.43	0.11	1.16	0.18	1.40	0.49	2.78	0.04	0.52	0.21	2.28	0.12	1.57	2.29	2.08
	Total Settlement	0.61	6.63	0.29	3.50	0.59	3.81	0.21	1.67	0.26	2.75	0.20	1.56	1.03	5.85	0.38	4.91	0.21	2.28	0.15	1.97	3.93	3.57
	Grand Total	9.20	100.0	8.29	100.0	15.50	100.0	12.55	100.0	9.45	100.0	12.85	100.0	17.61	100.0	7.74	100.0	9.23	100.0	7.63	100.0	110.05	100.00

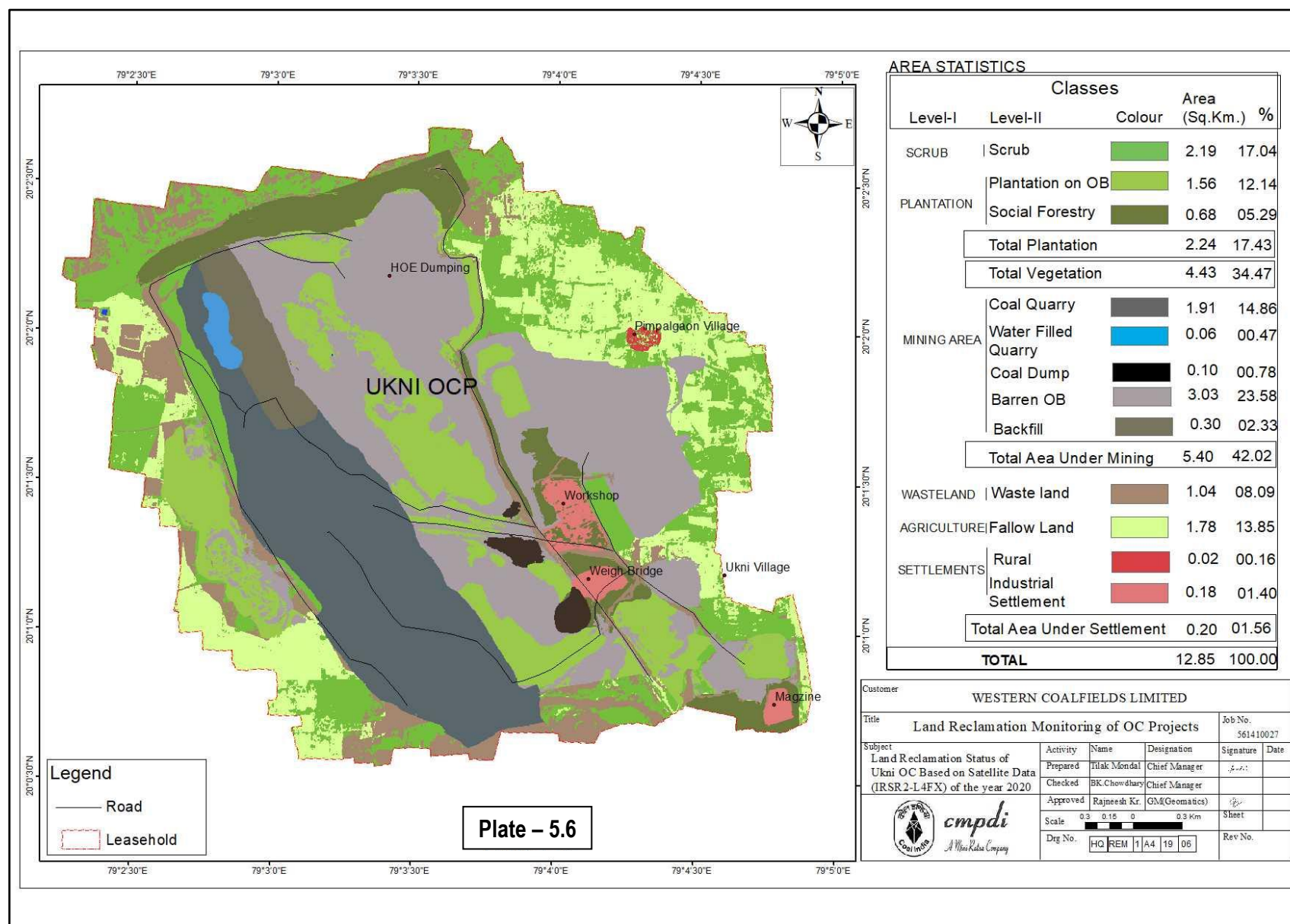


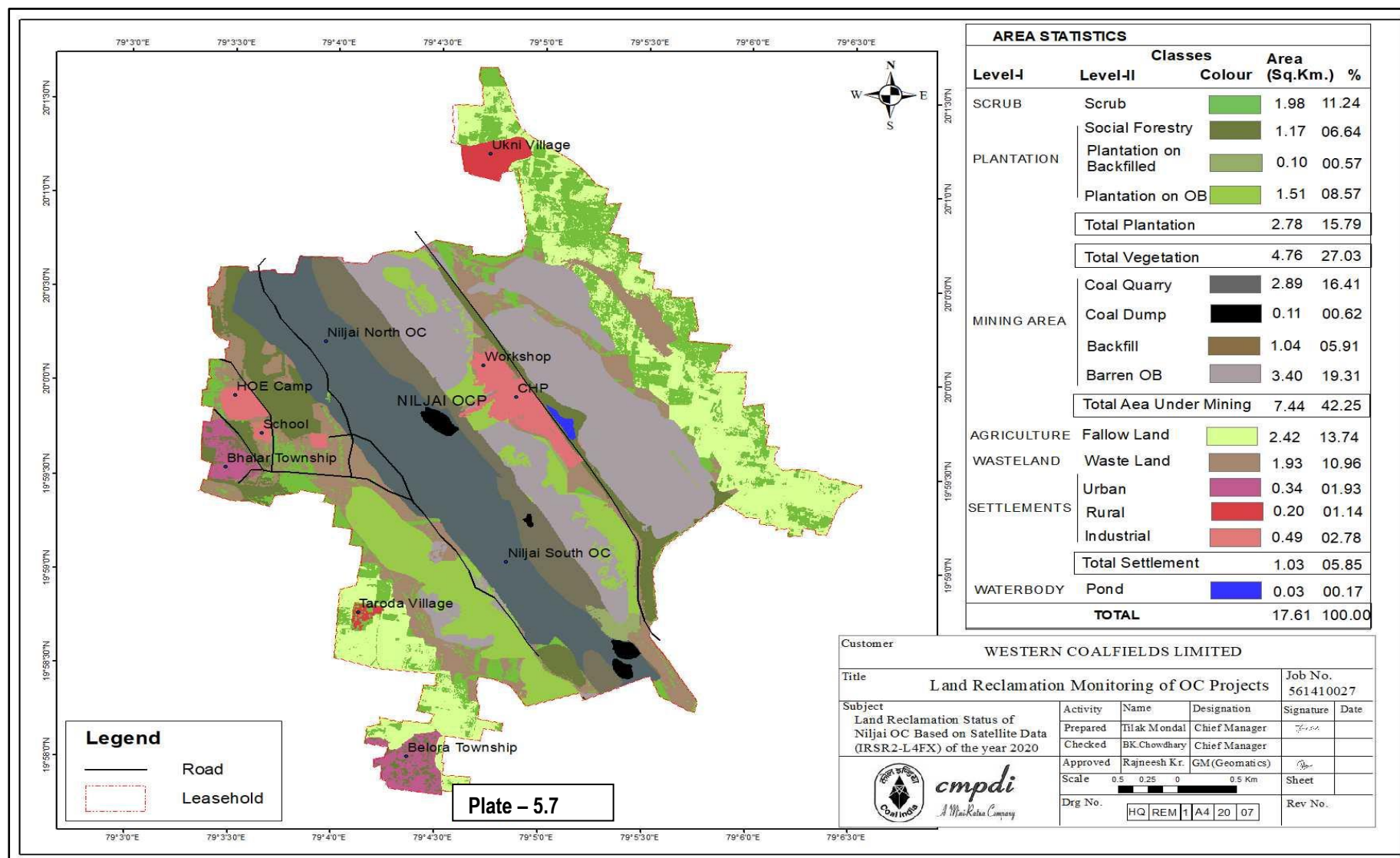




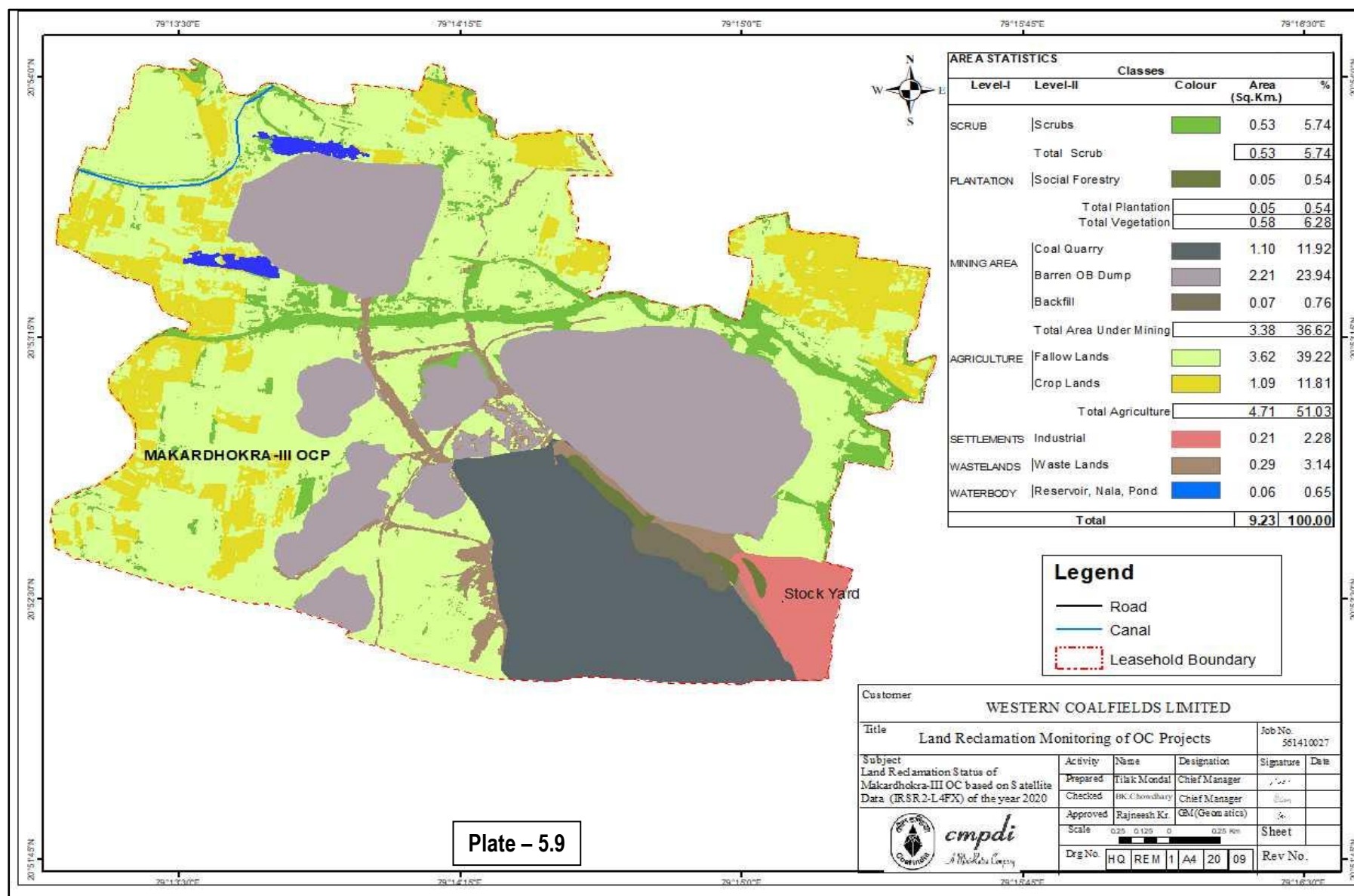


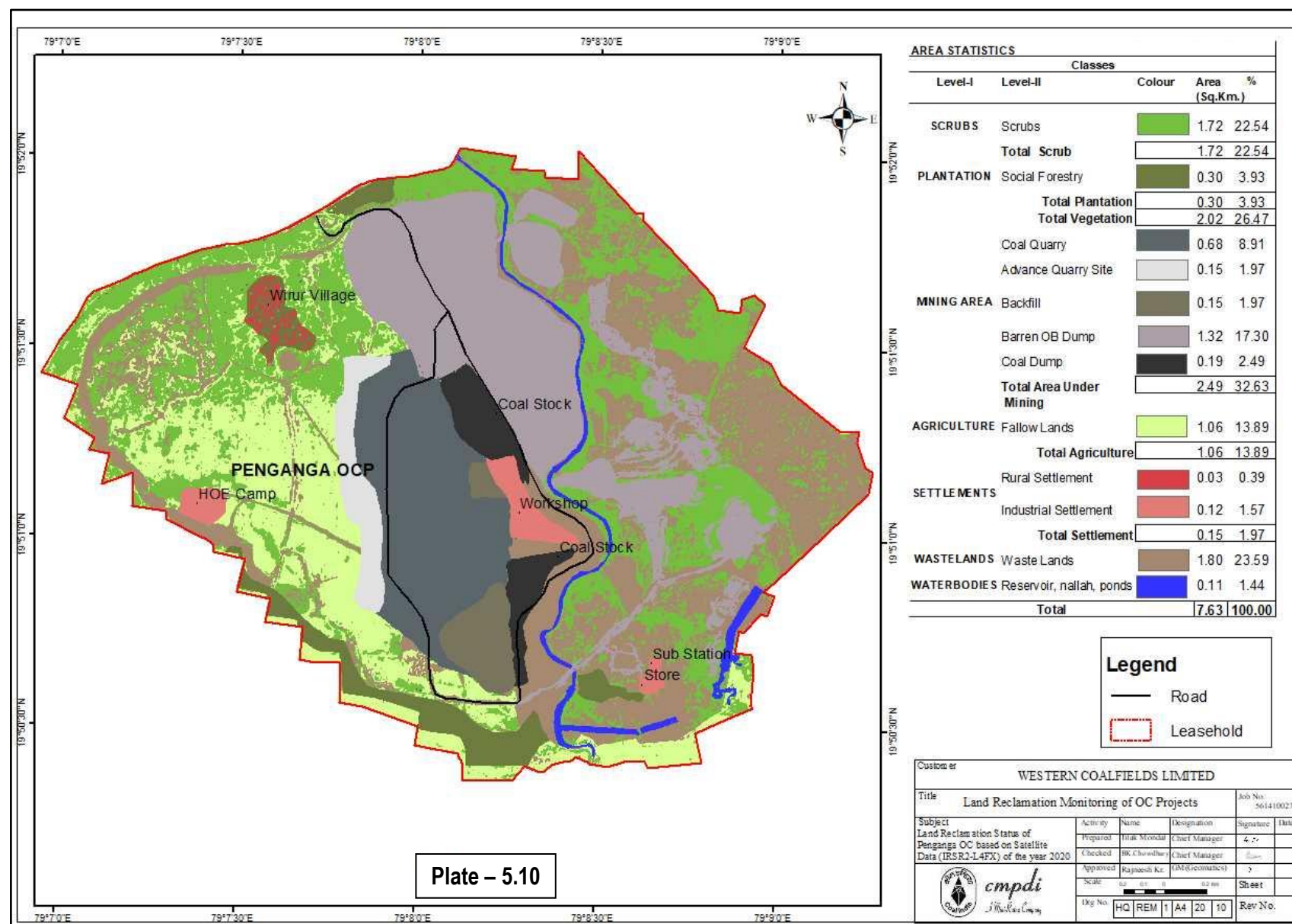












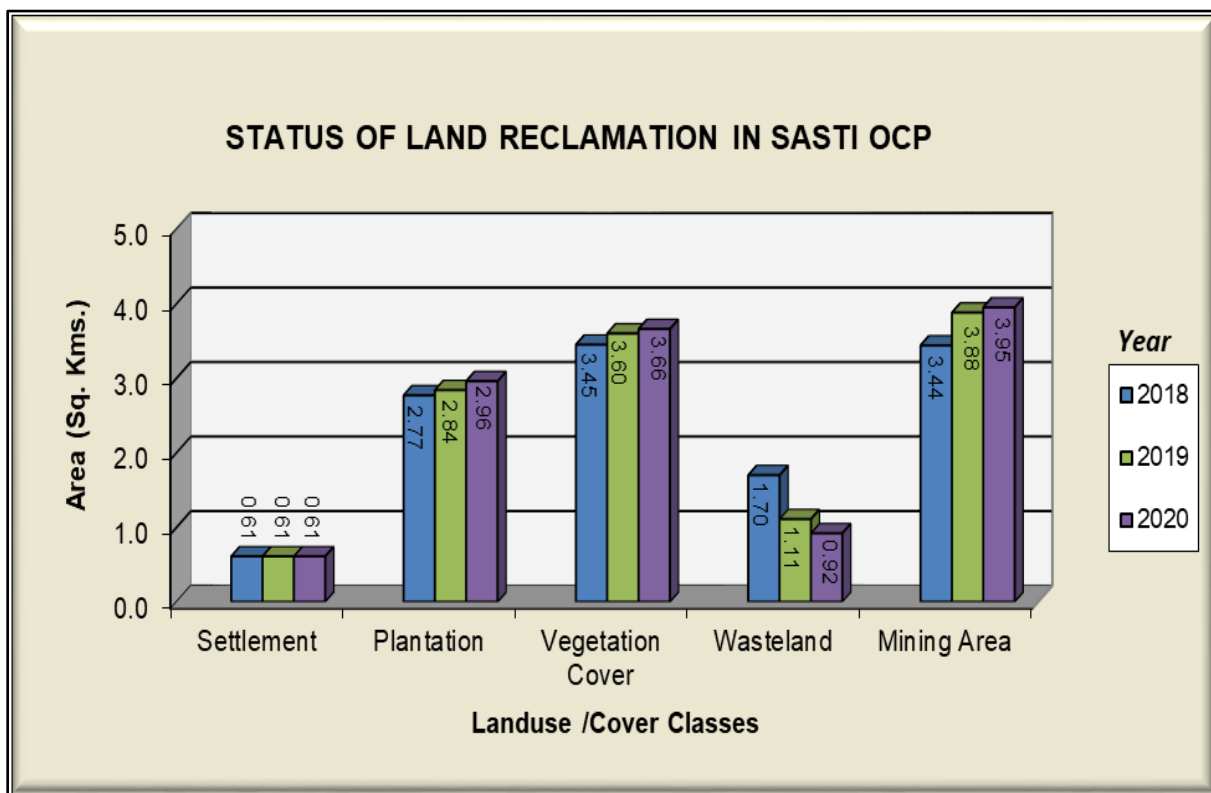


Figure - 5.2

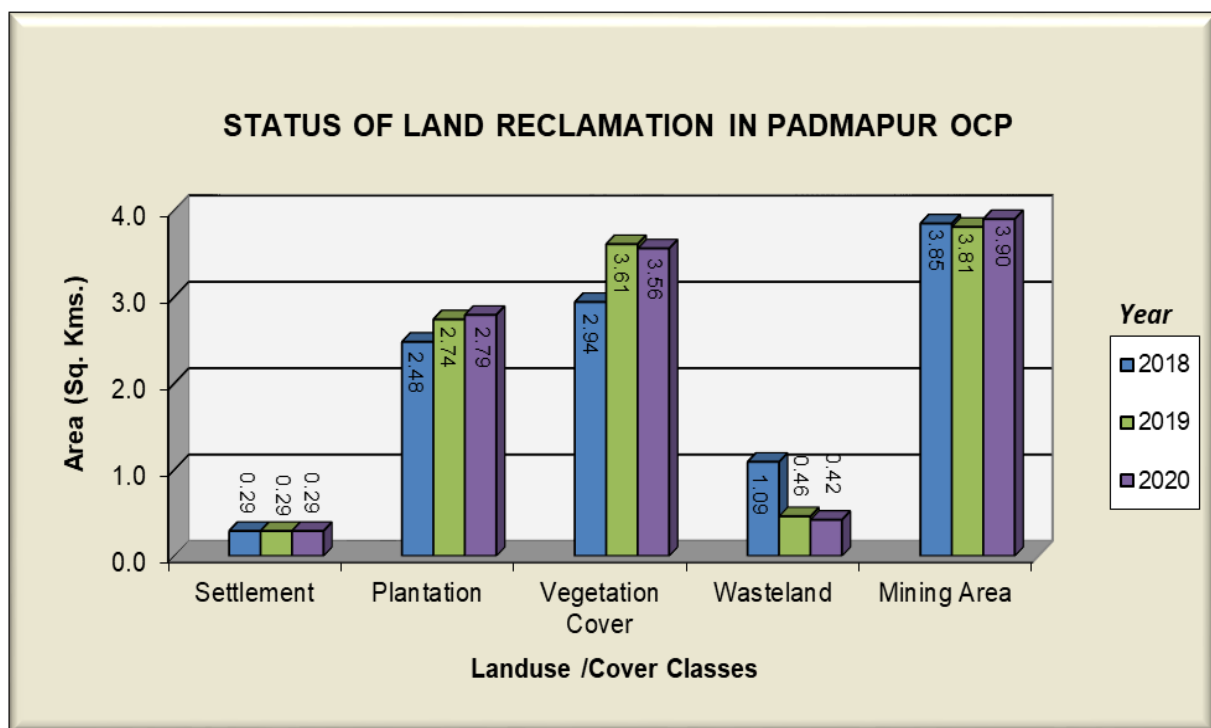


Figure - 5.3

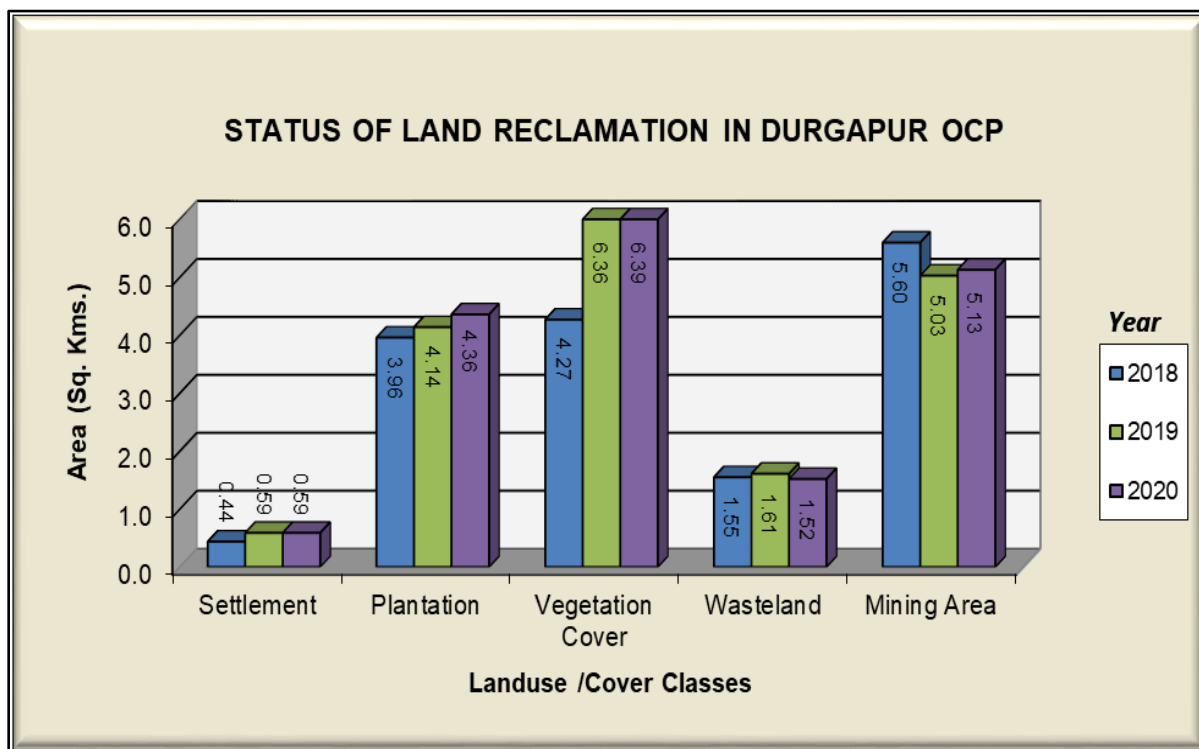


Figure - 5.4

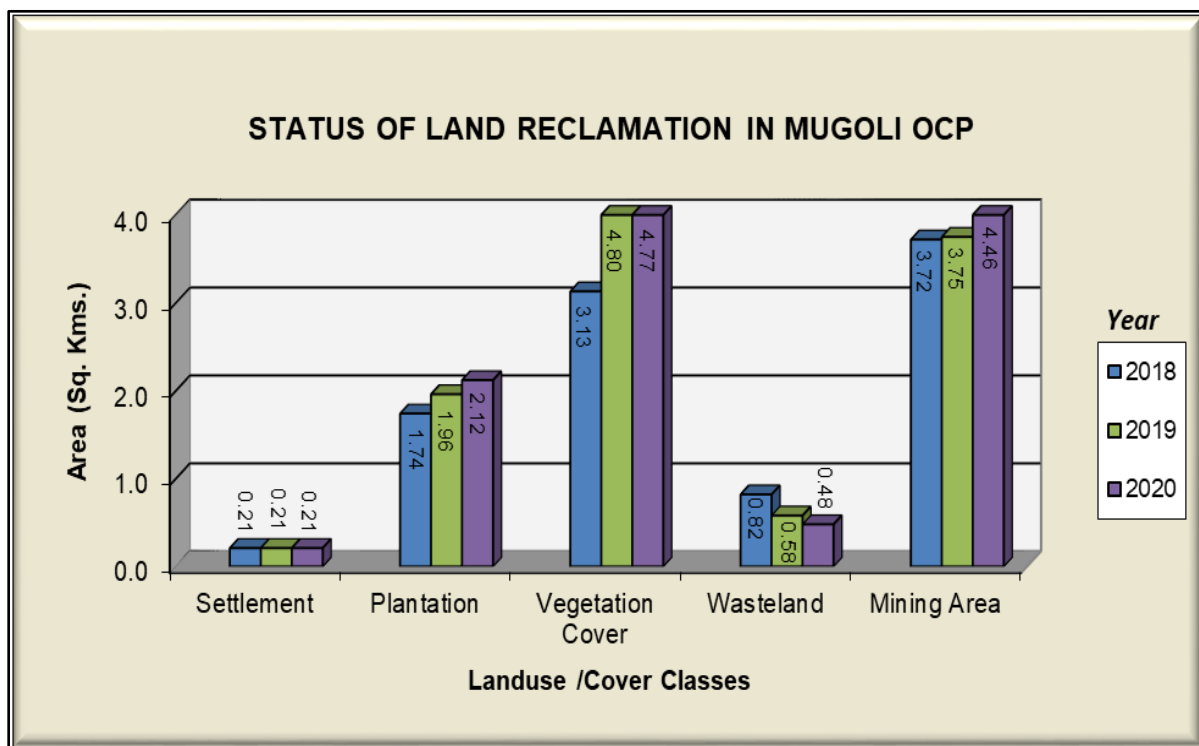


Figure - 5.5

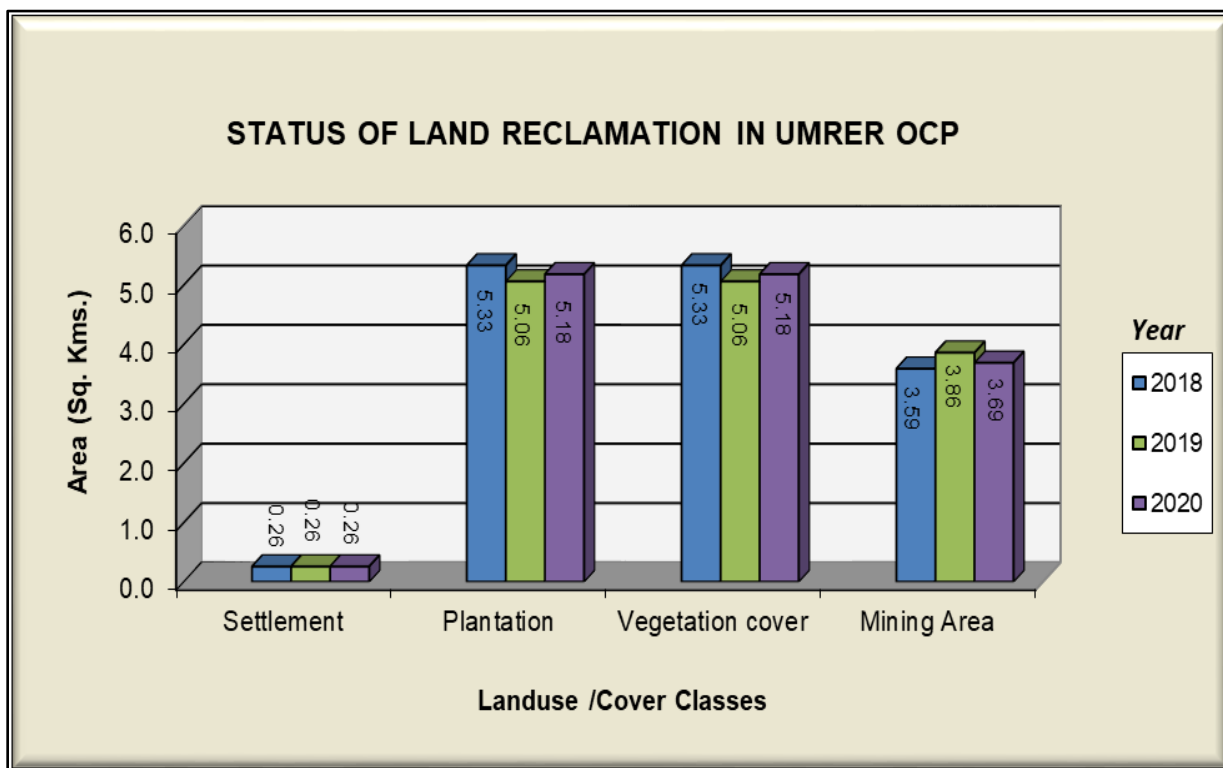


Figure - 5.6

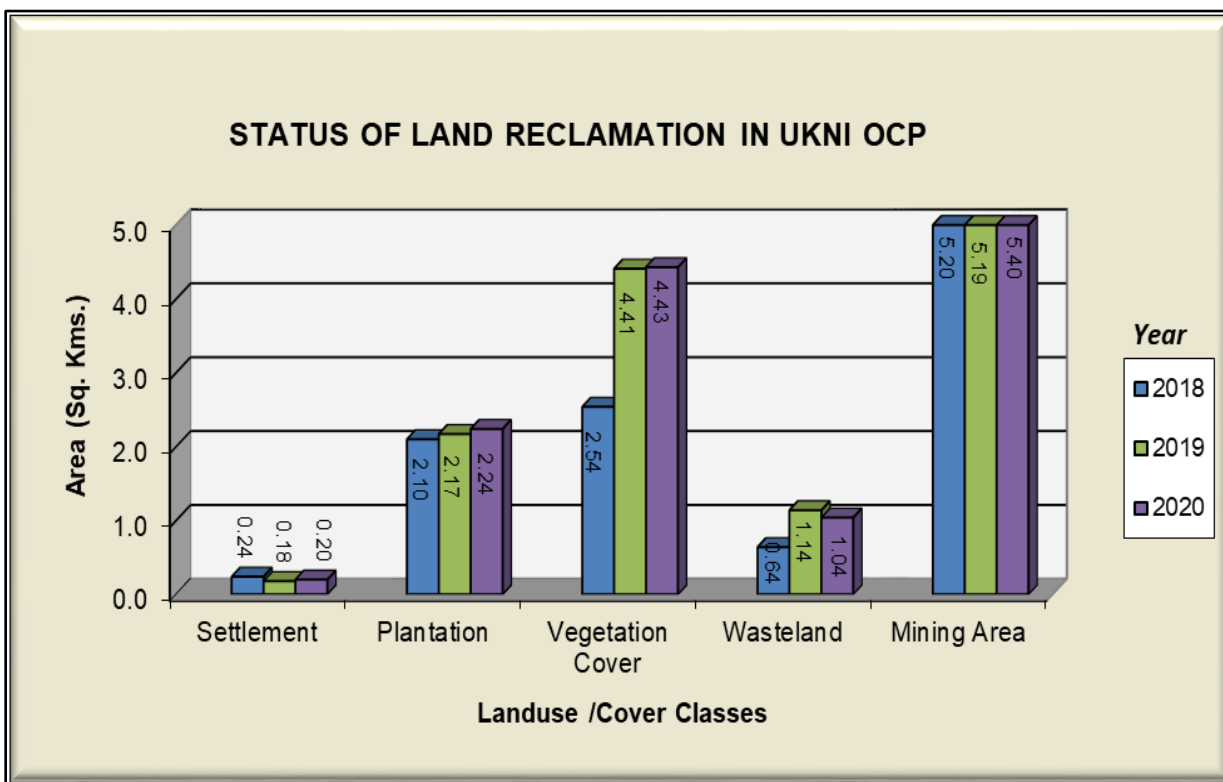


Figure - 5.7

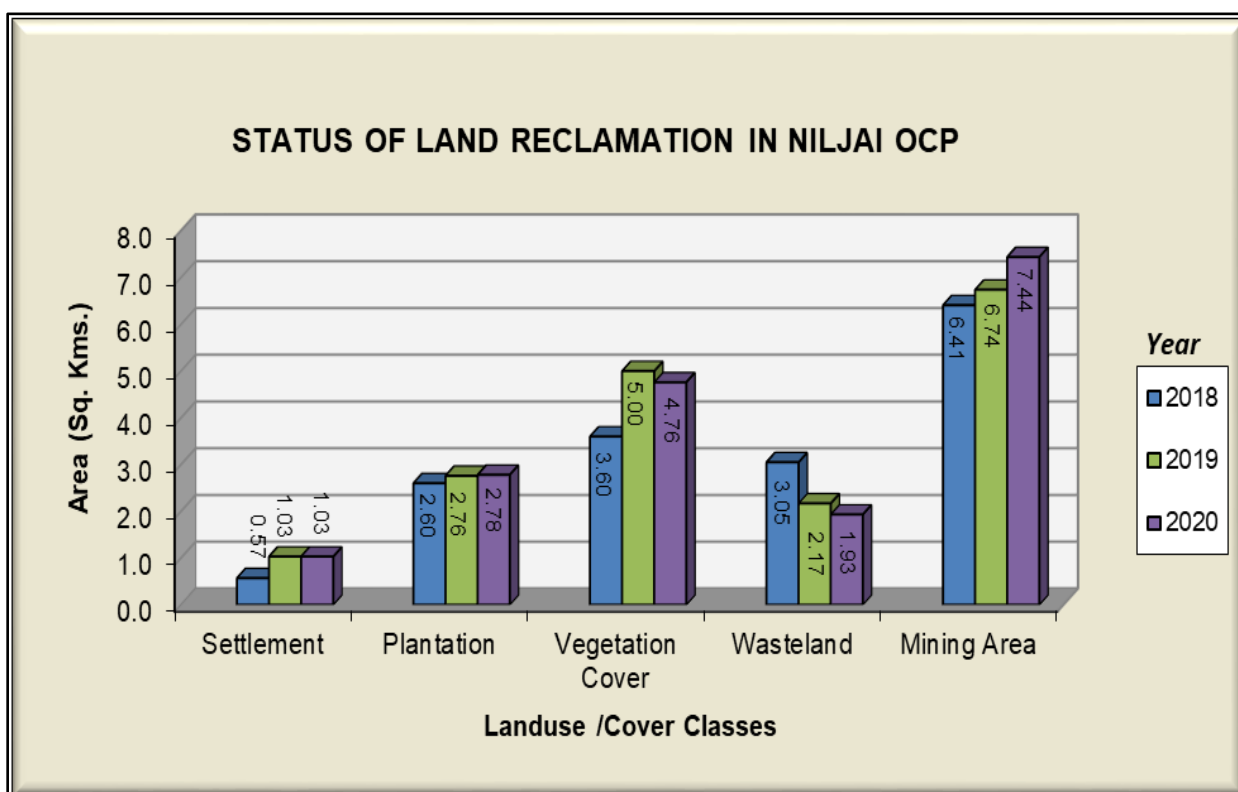


Figure - 5.8

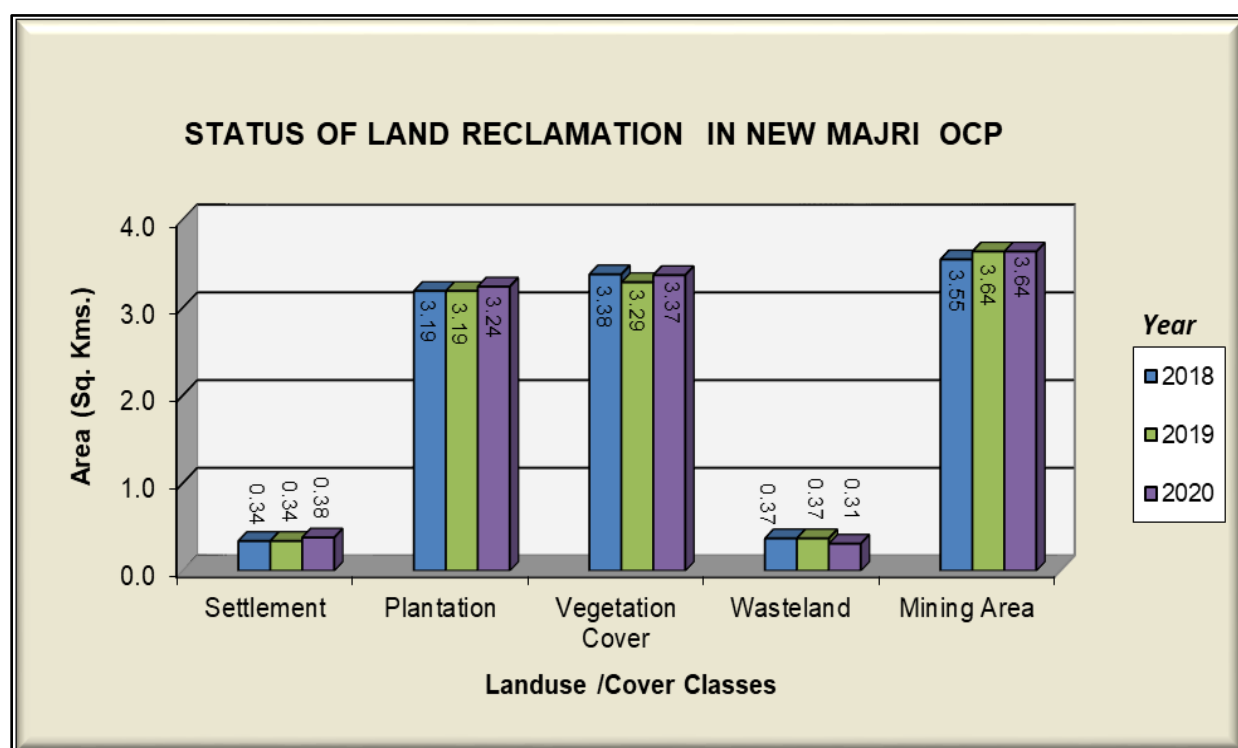


Figure - 5.9

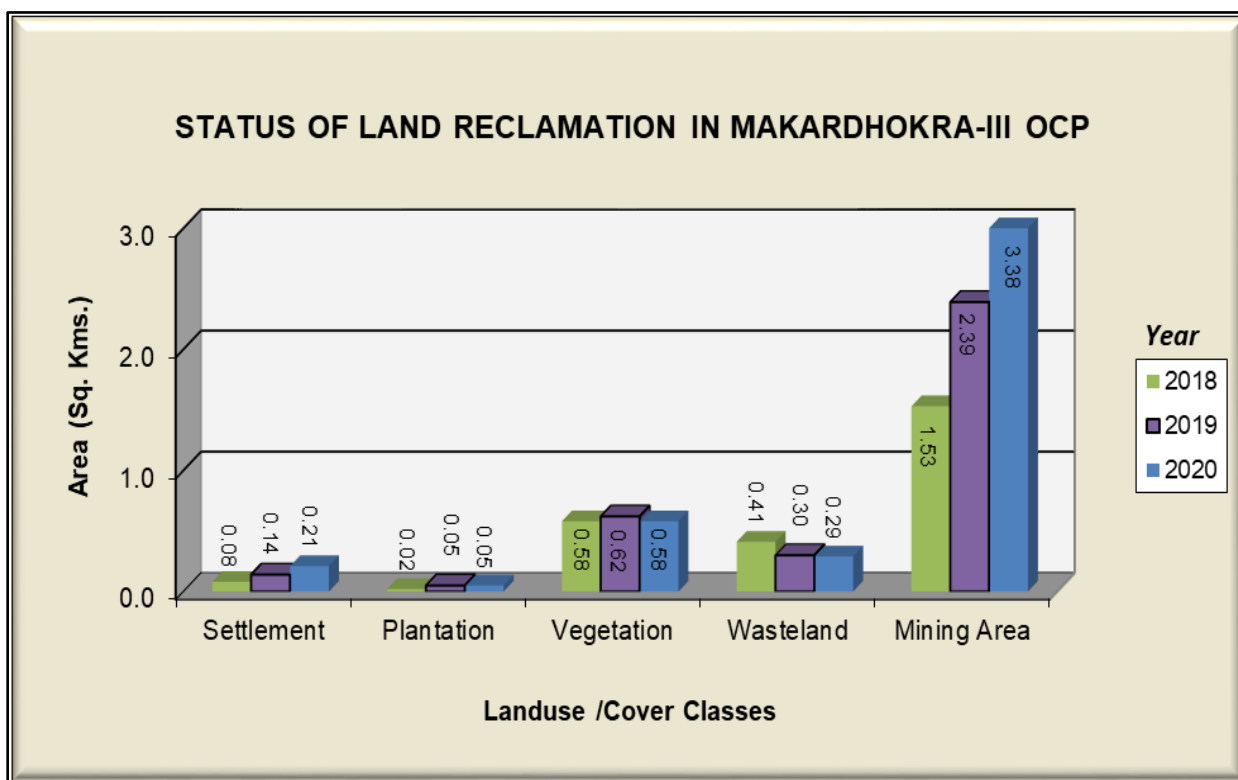


Figure – 5.10

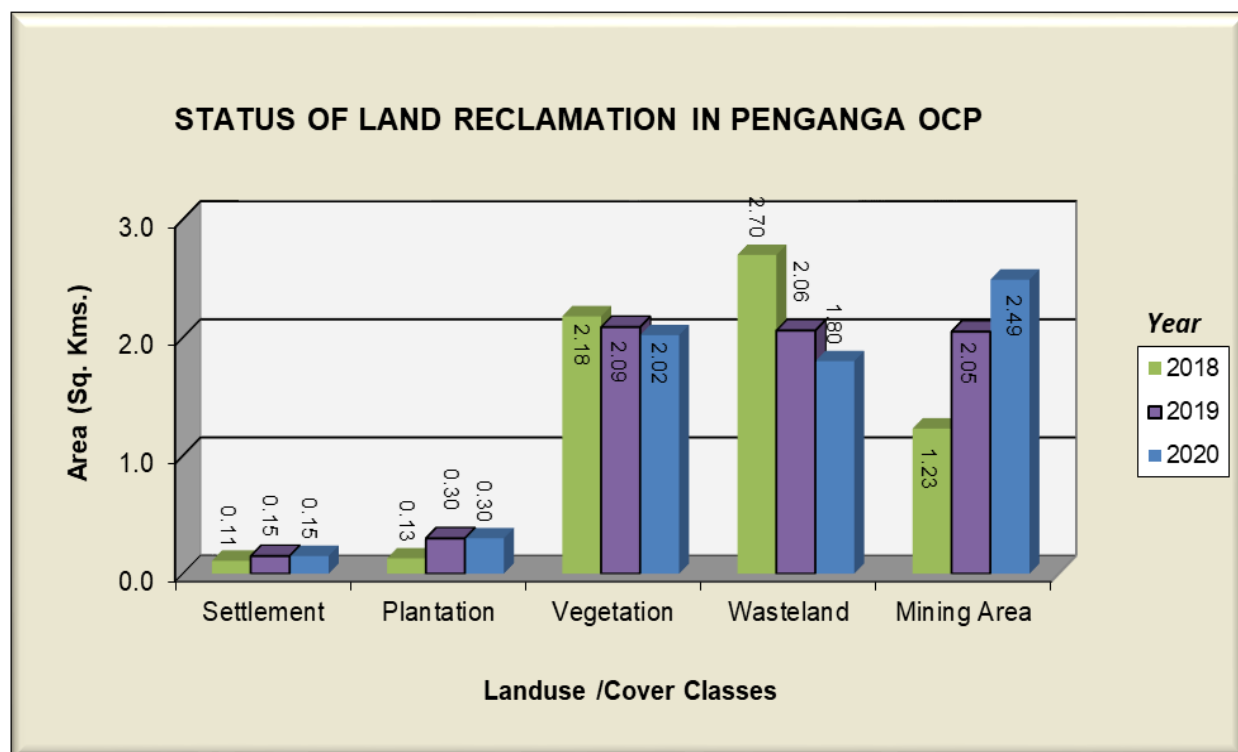


Figure - 5.11



Photograph -5.1: **Plantation on Internal OB/Backfill (Sasti OCP)**



Photograph – 5.2: **Plantation on External OB dump (Padmapur OCP)**



Photograph – 5.3: **Plantation on External OB dump of (Durgapur OCP)**



Photograph – 5.4: **Plantation on Embankment (Mugoli OCP)**



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



Photograph – 5.6: Social Forestry (Ukni OCP)



Photograph – 5.7: Social Forestry (Niljai OCP)



Photograph – 5.8 : Plantation on OB Dump in New Majri OCP



Photograph – 5.9: Avenue Plantation (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 eight opencast projects of SECL producing 5 million cubic m. or more (Coal+OB) together were taken up for land reclamation monitoring based on satellite data during the year 2020-21:

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

6.2 Project wise Land Reclamation status of the above mentioned projects 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 2020 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 monitoring of land reclamation in the above mentioned projects were also prepared for the year 2008 to 2019 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 58.03 Km² excavated area; 41.03 Km² area (70.70%) is under reclamation, out of which 23.80 Km² (41.01%) area is under technical reclamation and 17.23 Km² (29.69%) area has already been biologically reclaimed.

- 6.4** There has been substantial increase of 1.51 Km² for area under technical reclamation (backfilling) overall during the year 2020 but for projects like Rajnagar & Jamuna OCPs where area under technical reclamation has slightly gone down as compared to the previous year 2019 due to more areas coming under Biological Reclamation etc.
- 6.5** Study indicates that all the projects of SECL considered for this study show increased or static trend in biological reclamation (plantation on backfill) except for Chirimiri opencast projects with respect to the year 2019. This is due to OB dumping on vegetated backfilled area in view of constrain of dumping space in these projects and the leasehold area has been modified in view of new lease in compliance with EC which has resulted in loss of vegetated areas.
- 6.6** There is an increase of 3.22 Km² of area under reclamation in SECL with respect to the previous year 2019, out of which, there is an increase of 1.51 Km² area under technical reclamation (barren backfilling) and 1.71 Km² in biological reclamation respectively in the year 2020.
- 6.7** Study indicates that in all projects taken up for monitoring except for Kusmunda and Chirimiri opencast projects, total area under plantation (Green Cover) has increased from 34.45 Km² (25.47%) in year 2019 to 35.40 Km² (26.38%) in the year 2020 due to efforts of SECL towards environment protection.
- 6.8** Out of 8 projects of SECL, Jamuna OCP ranks on top for land reclamation (88.07%) followed by Rajnagar (85.13%) and Chirimiri (84.32%) in the year 2020-21.

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 2020**

(Area in Sq. Kms.)

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, Avanneu Plantation Etc.							
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	Dipka	19.99	19.99	2.87	2.94	0.66	0.77	1.60	1.60	1.59	1.59	3.25	3.30	6.78	7.01	3.85	3.96	3.53	3.71
				42.33%	41.94%	9.73%	10.98%					47.94%	47.08%			19.26%	19.78%	52.06%	52.92%
2	Gevra	41.84	41.84	7.87	8.80	2.57	2.60	4.08	4.15	2.95	2.94	5.81	5.29	16.25	16.69	9.60	9.69	10.44	11.40
				48.43%	52.73%	15.82%	15.58%					35.75%	31.70%			22.94%	23.16%	64.25%	68.30%
3	Kusmunda	16.72	16.72	2.96	3.28	1.20	1.32	2.13	1.94	1.60	1.60	2.78	2.56	6.94	7.16	4.93	4.86	4.16	4.60
				42.65%	45.81%	17.29%	18.44%					40.06%	35.75%			29.49%	29.07%	59.94%	64.25%
4	Manikpur	19.44	19.44	1.24	1.50	0.75	0.77	1.34	1.34	0.47	0.47	2.08	1.98	4.07	4.25	2.56	2.58	1.99	2.27
				30.47%	35.29%	18.43%	18.12%					51.11%	46.59%			13.17%	13.27%	48.89%	53.41%
5	Chirimiri	6.51	5.44	1.38	1.38	1.07	1.04	0.00	0.00	0.83	0.15	0.43	0.45	2.88	2.87	1.90	1.19	2.45	2.42
				47.92%	48.08%	37.15%	36.24%					14.93%	15.68%			34.93%	21.88%	85.07%	84.32%
6	Rajnagar	7.30	7.30	2.26	2.05	2.86	3.16	0.00	0.00	0.29	0.26	0.60	0.91	5.72	6.12	3.15	3.42	5.12	5.21
				39.51%	33.50%	50.00%	51.63%					10.49%	14.87%			43.15%	46.85%	89.51%	85.13%
7	Dhanpuri	14.59	14.59	2.50	3.15	1.75	2.44	1.73	1.80	0.11	0.18	1.37	1.72	5.62	7.31	3.59	4.42	4.25	5.59
				44.48%	43.09%	31.14%	33.38%					24.38%	23.53%			24.61%	30.29%	75.62%	76.47%
8	Jamuna	8.85	8.85	1.21	0.70	4.66	5.13	0.00	0.00	0.21	0.15	0.68	0.79	6.55	6.62	4.87	5.28	5.87	5.83
				18.47%	10.57%	71.15%	77.49%					10.38%	11.93%			55.03%	59.66%	89.62%	88.07%
	TOTAL (08)	135.24	134.17	22.29	23.80	15.52	17.23	10.88	10.83	8.05	7.34	17.00	17.00	54.81	58.03	34.45	35.40	37.81	41.03
				40.67%	41.01%	28.32%	29.69%					31.02%	29.30%			25.47%	26.38%	68.98%	70.70%

(%) 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".

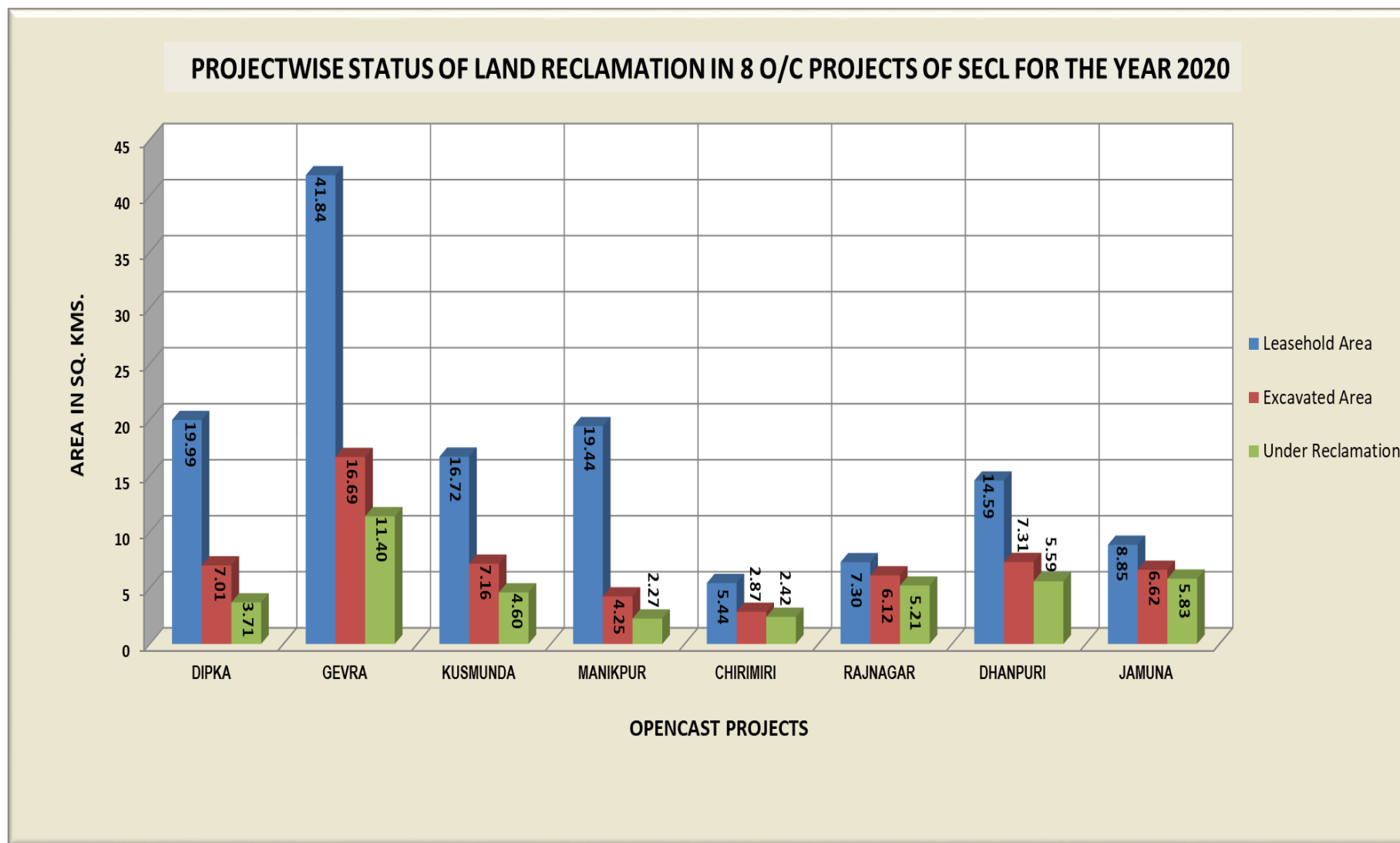


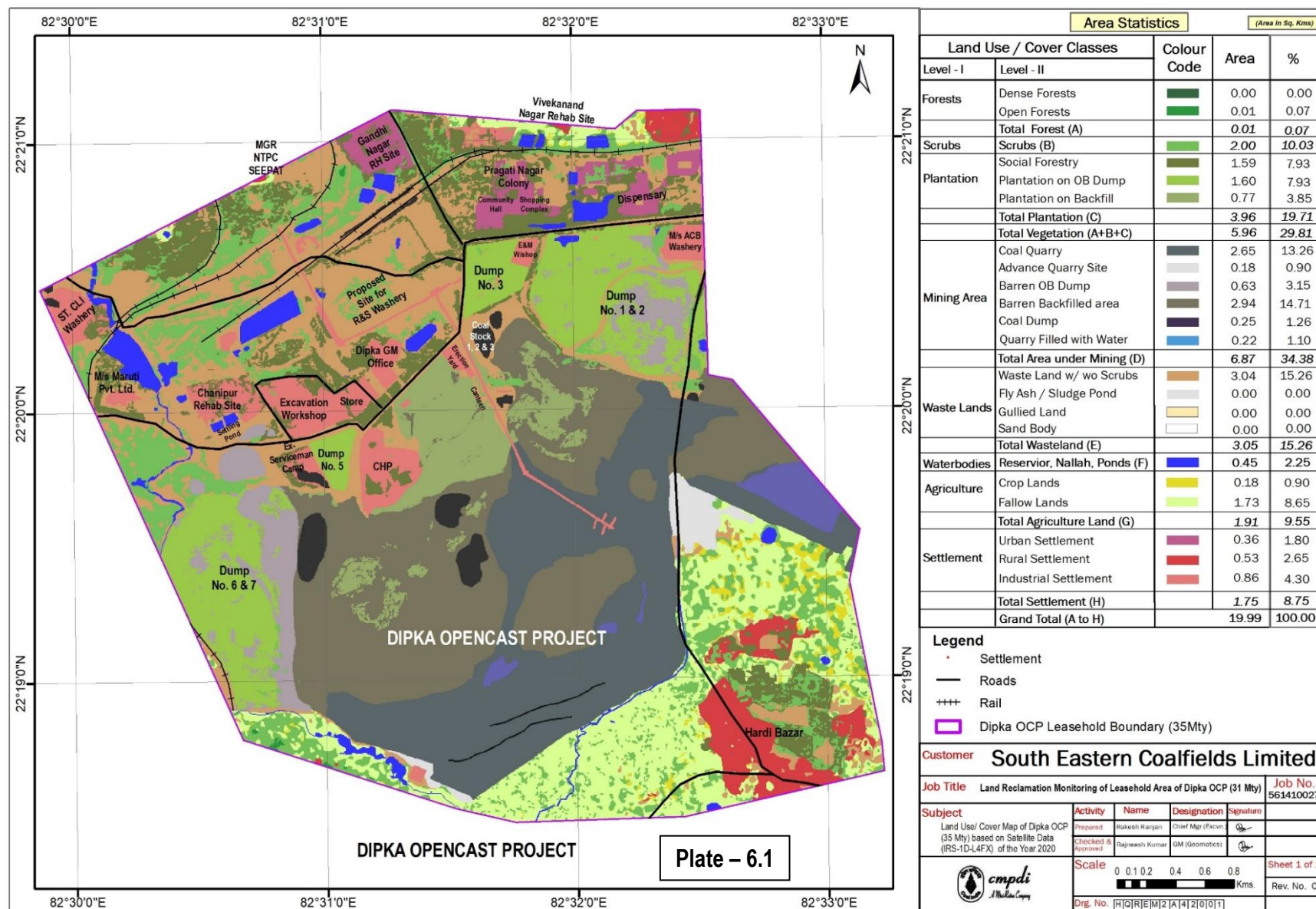
Fig.6.1: *Project wise Land reclamation status in OC projects of SECL in the year-2020*

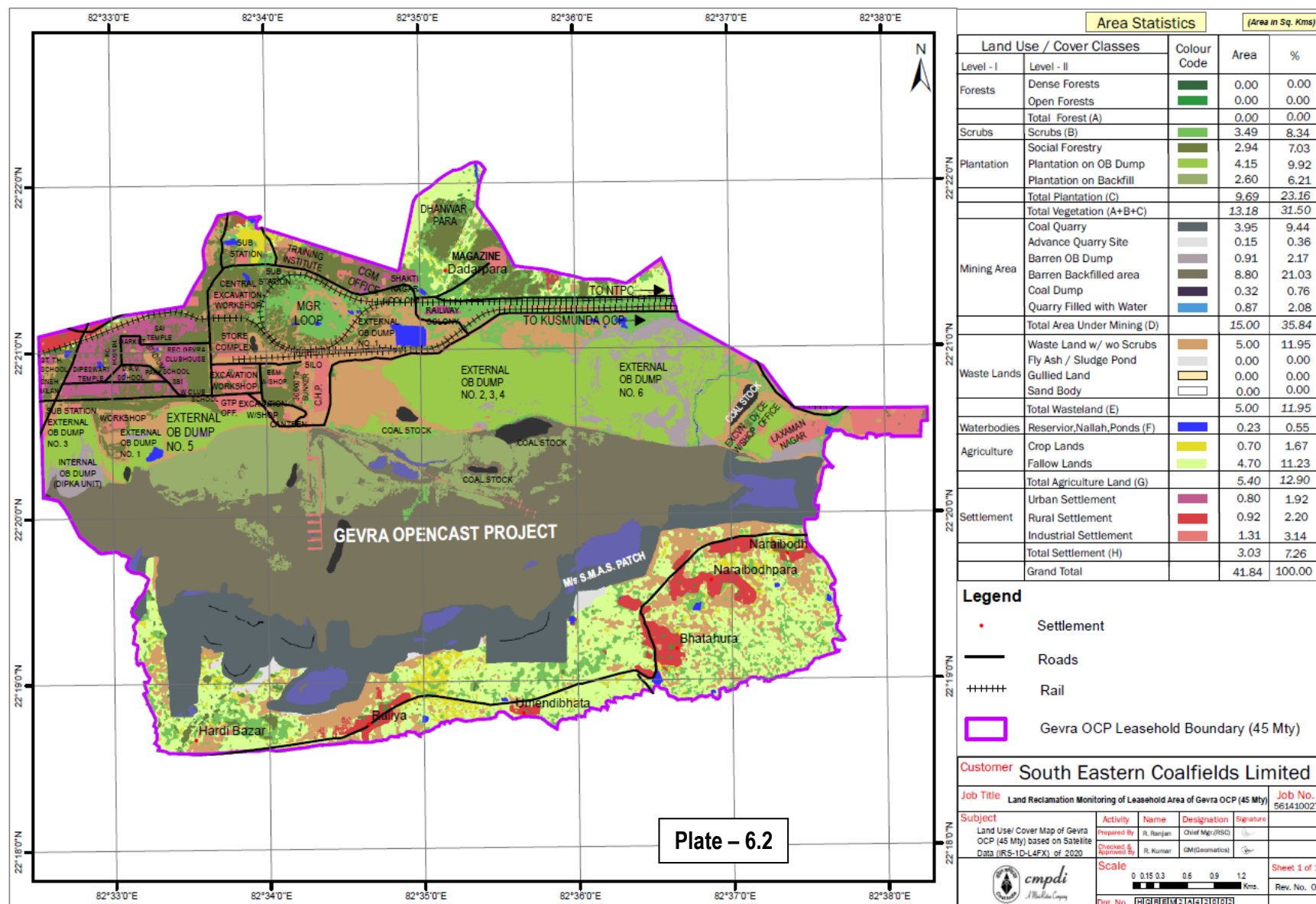
Table 6.2

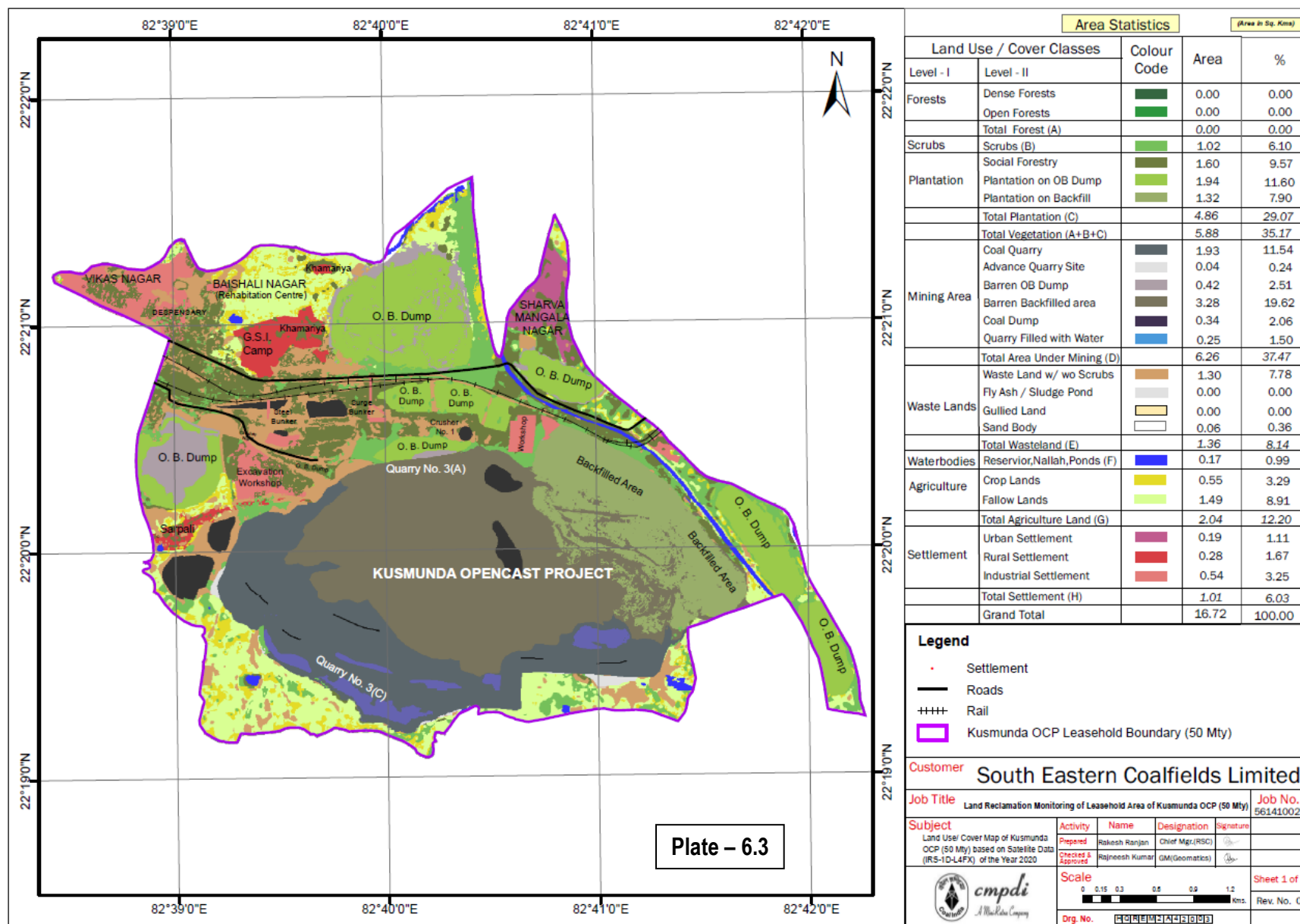
Project wise Area Statistics of Land Use / Cover in OC Mines (> 5 mcu.m.) of SECL based on Satellite data of the Year 2020

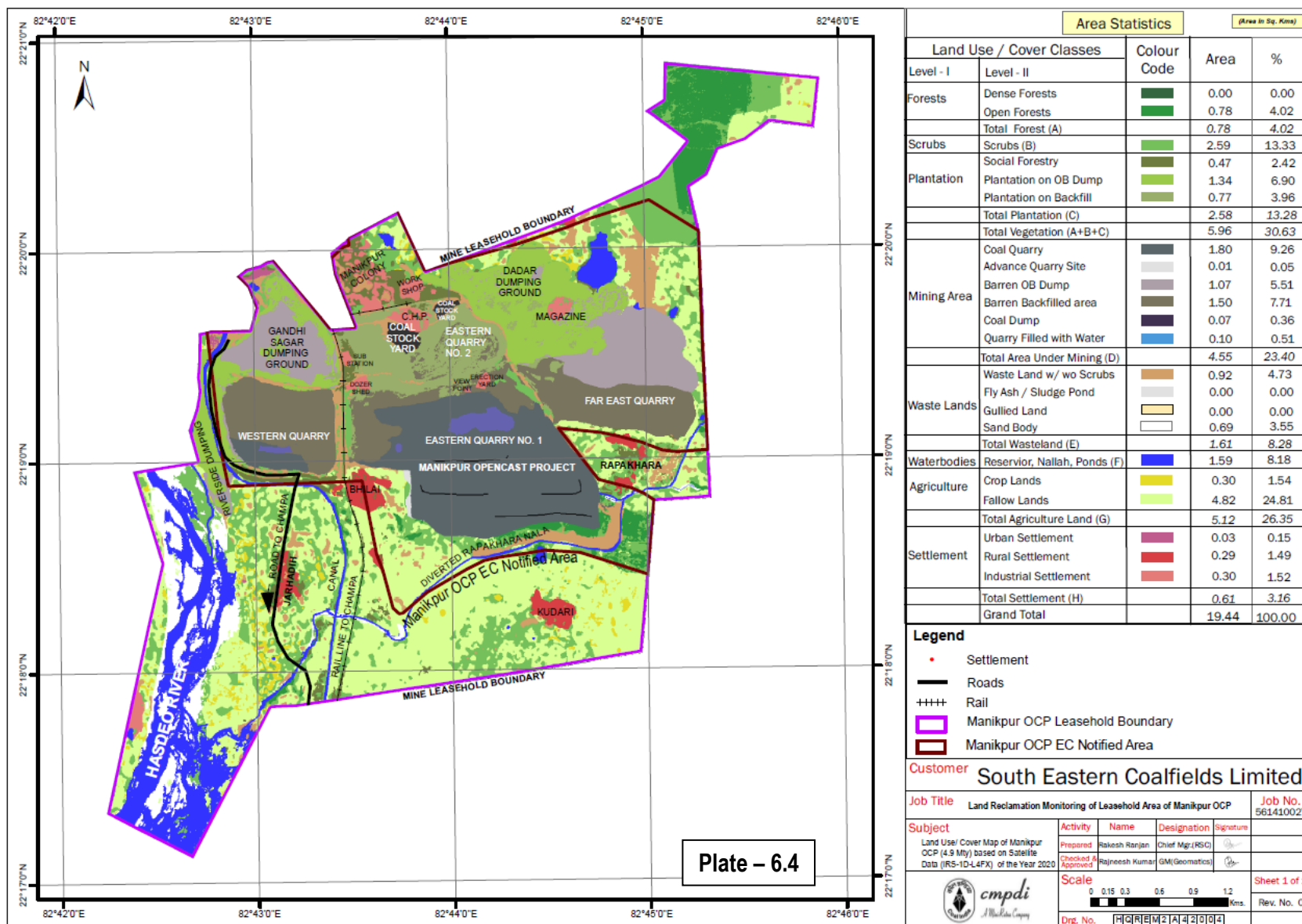
(Area in Km²)

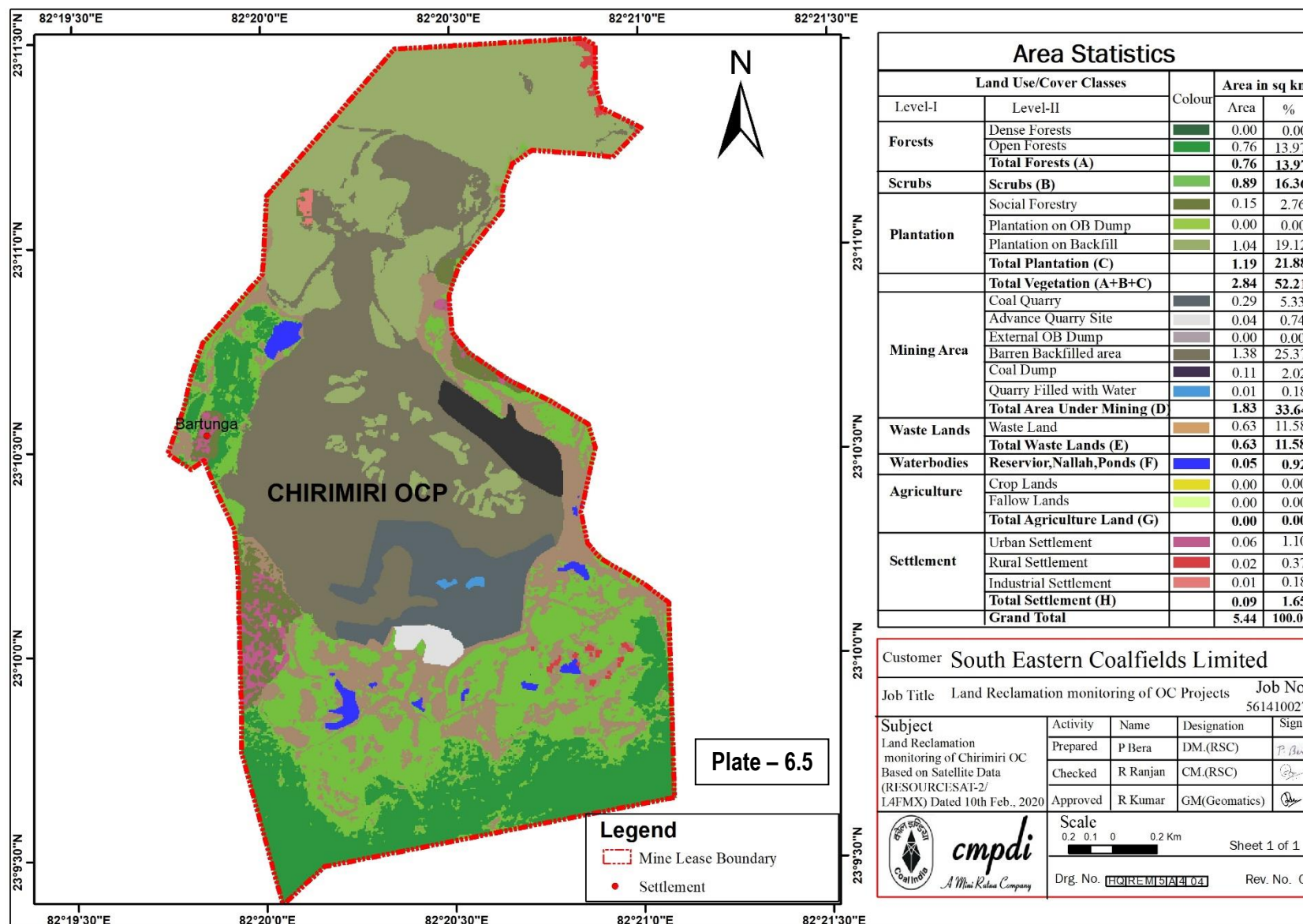
LAND USE / COVER CLASSES	COLOUR CODE	DIPKA		GEVRA		KUSMUNDA		MANIKPUR		CHIRIMIRI		RAJNAGAR		DHANPURI		JAMUNA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.01	0.07	0.00	0.00	0.00	0.00	0.78	4.02	0.76	13.97	0.00	0.00	0.78	5.35	0.00	0.00	2.34	1.74
	Total Forest (A)	0.01	0.07	0.00	0.00	0.00	0.00	0.78	4.02	0.76	13.97	0.00	0.00	0.78	5.35	0.00	0.00	2.34	1.74
SCUB	Scrubs (B)	2.00	10.03	3.49	8.34	1.02	6.10	2.59	13.33	0.89	16.36	0.30	4.11	2.17	14.87	0.53	5.99	13.00	9.69
	Social Forestry (C)	1.59	7.93	2.94	7.03	1.60	9.57	0.47	2.42	0.15	2.76	0.26	3.56	0.18	1.23	0.15	1.69	7.34	5.47
	Plantation on External OB Dump	1.60	7.98	4.15	9.92	1.94	11.60	1.34	6.90	0.00	0.00	0.00	0.00	1.80	12.34	0.00	0.00	10.83	8.07
PLANTATION	Plantation on Backfill / Excavated Area (Biological Reclamation)	0.77	3.85	2.60	6.21	1.32	7.90	0.77	3.96	1.04	19.12	3.16	43.26	2.44	16.72	5.13	57.97	17.23	12.84
	Total Area under Plantation (Green Cover) (D)	3.96	19.76	9.69	23.16	4.86	29.07	2.58	13.28	1.19	21.88	3.42	46.82	4.42	30.29	5.28	59.66	35.39	26.38
	Total Vegetation (A to D)	5.97	29.86	13.18	31.50	5.88	35.17	5.96	30.63	2.84	52.21	3.72	50.93	7.37	50.51	5.81	65.65	50.72	37.80
AREA UNDER ACTIVE MINING	Coal Quarry	2.65	13.26	3.95	9.44	1.93	11.54	1.80	9.26	0.29	5.33	0.34	4.66	0.73	5.00	0.00	0.00	11.69	8.71
	Coal Dump	0.25	1.26	0.32	0.76	0.34	2.06	0.07	0.36	0.11	2.02	0.00	0.00	0.15	1.03	0.00	0.00	1.25	0.93
	Advance Quarry Site	0.18	0.90	0.15	0.36	0.04	0.24	0.01	0.05	0.04	0.74	0.06	0.82	0.41	2.81	0.00	0.00	0.89	0.66
TECHNICAL RECLAMATION	Quarry Filled With Water	0.22	1.10	0.87	2.08	0.25	1.50	0.10	0.51	0.01	0.18	0.51	6.98	0.43	2.95	0.79	8.93	3.18	2.37
	Total Area under Active Mining (F)	3.30	16.52	5.29	12.64	2.56	15.34	1.98	10.18	0.45	8.27	0.91	12.46	1.72	11.79	0.79	8.93	17.01	12.67
	Barren OB Dump (G)	0.63	3.15	0.91	2.17	0.42	2.51	1.07	5.51	0.00	0.00	0.00	0.00	0.28	1.92	0.00	0.00	3.31	2.47
WASTELANDS	Area under Barren Backfilling (Technical Reclamation)	2.94	14.71	8.80	21.03	3.28	19.62	1.50	7.71	1.38	25.37	2.05	28.07	3.15	21.59	0.70	7.91	23.80	17.74
	Total Area under Technical Reclamation (H)	2.94	14.71	8.80	21.03	3.28	19.62	1.50	7.71	1.38	25.37	2.05	28.07	3.15	21.59	0.70	7.91	23.80	17.74
	Total Area under Mining Operations (F+G+H)	6.87	34.38	15.00	35.84	6.26	37.47	4.55	23.40	1.83	33.64	2.96	40.53	5.15	35.30	1.49	16.84	44.12	32.88
WATERBODIES	Waste Lands	3.04	15.21	5.00	11.95	1.30	7.78	0.92	4.73	0.63	11.58	0.44	6.02	1.00	6.85	0.47	5.31	12.80	9.54
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.06	0.36	0.69	3.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.75	0.56
	Total Wasteland (I)	3.04	15.21	5.00	11.95	1.36	8.14	1.61	8.28	0.63	11.58	0.44	6.02	1.00	6.85	0.47	5.31	13.55	10.10
AGRICULTURE	Reservoir, nallah, ponds	0.45	2.25	0.23	0.55	0.17	0.99	1.59	8.18	0.05	0.92	0.01	0.14	0.01	0.07	0.01	0.11	2.52	1.87
	Total Waterbodies (J)	0.45	2.25	0.23	0.55	0.17	0.99	1.59	8.18	0.05	0.92	0.01	0.14	0.01	0.07	0.01	0.11	2.52	1.87
	Crop Lands	0.18	0.90	0.70	1.67	0.55	3.29	0.30	1.54	0.00	0.00	0.01	0.14	0.27	1.85	0.00	0.00	2.01	1.50
SETTLEMENTS	Fallow Lands	1.73	8.65	4.70	11.23	1.49	8.91	4.82	24.81	0.00	0.00	0.06	0.82	0.64	4.39	0.93	10.51	14.37	10.71
	Total Agriculture (K)	1.91	9.55	5.40	12.90	2.04	12.20	5.12	26.35	0.00	0.00	0.07	0.96	0.91	6.24	0.93	10.51	16.38	12.21
	Urban Settlement	0.36	1.80	0.80	1.92	0.19	1.11	0.03	0.15	0.06	1.10	0.08	1.10	0.09	0.62	0.00	0.00	1.61	1.20
	Rural Settlement	0.53	2.65	0.92	2.20	0.28	1.67	0.29	1.49	0.02	0.37	0.004	0.05	0.00	0.00	0.09	1.02	2.13	1.59
	Industrial Settlement	0.86	4.30	1.31	3.14	0.54	3.25	0.30	1.52	0.01	0.18	0.02	0.27	0.06	0.41	0.05	0.56	3.15	2.35
	Total Settlement (L)	1.75	8.75	3.03	7.26	1.01	6.03	0.61	3.16	0.09	1.65	0.10	1.42	0.15	1.03	0.14	1.58	6.89	5.14
	Grand Total (A to L)	19.99	100.00	41.84	100.00	16.72	100.00	19.44	100.00	5.44	100.00	7.30	100.00	14.59	100.00	8.85	100.00	134.17	100.00

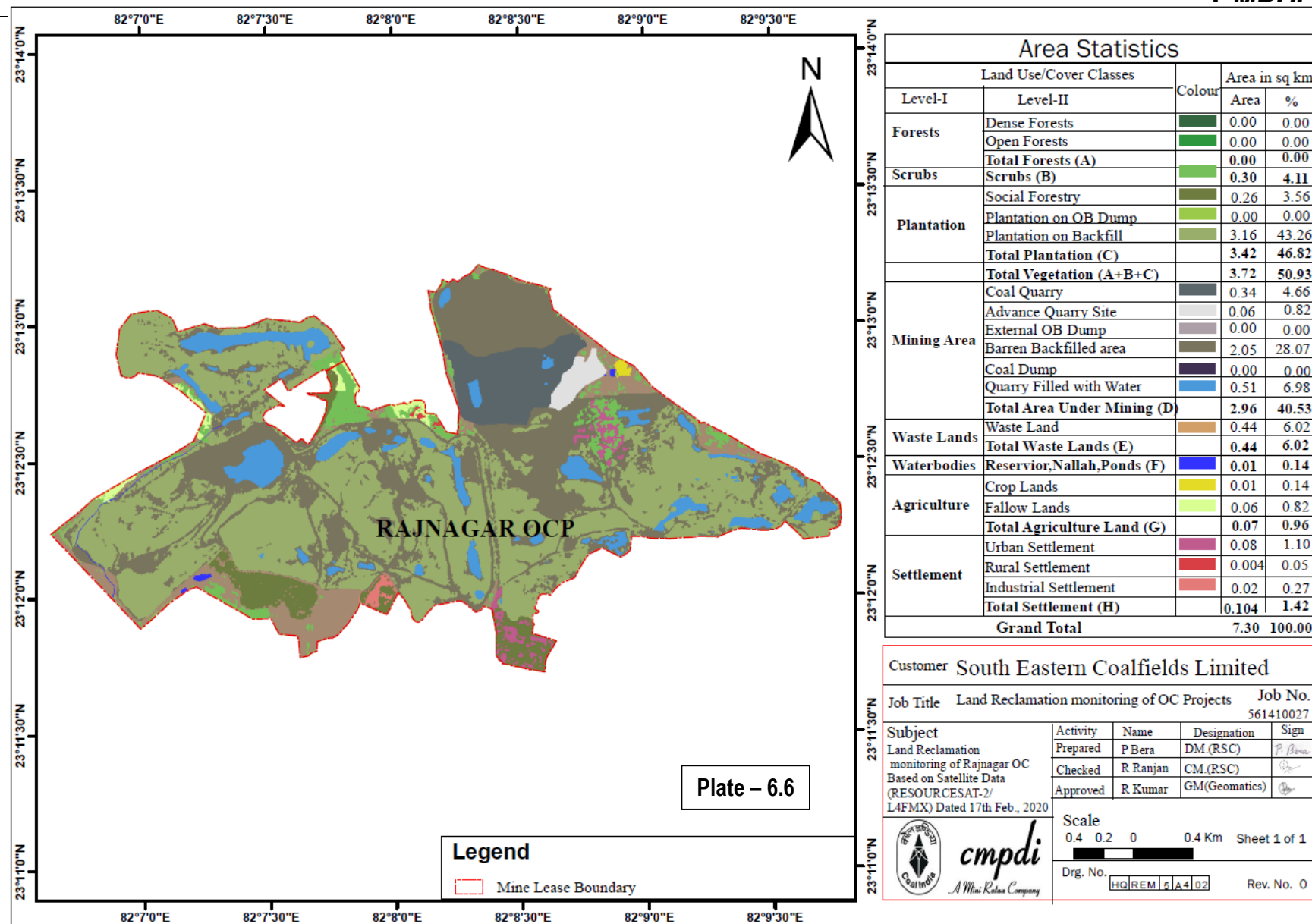


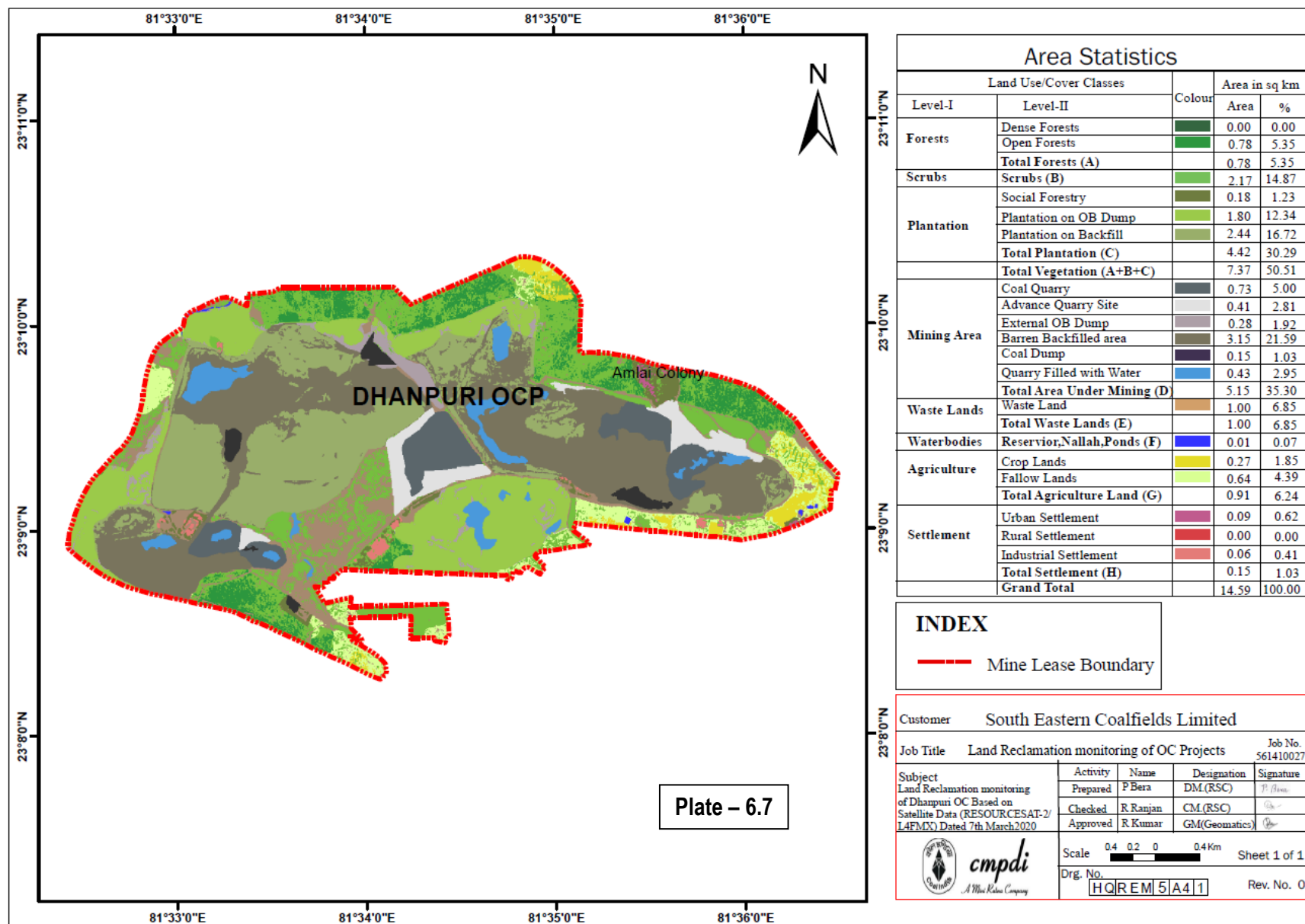


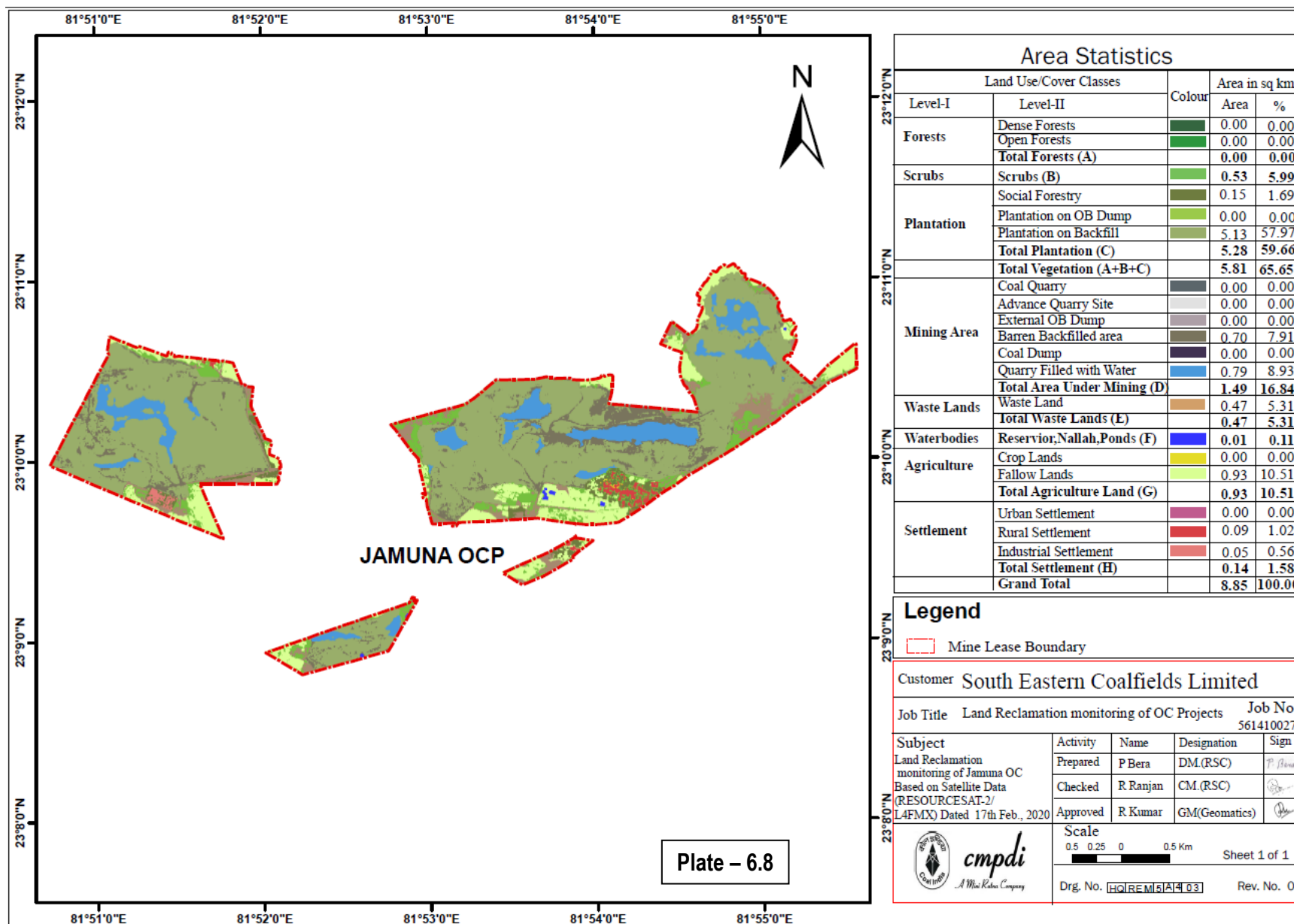












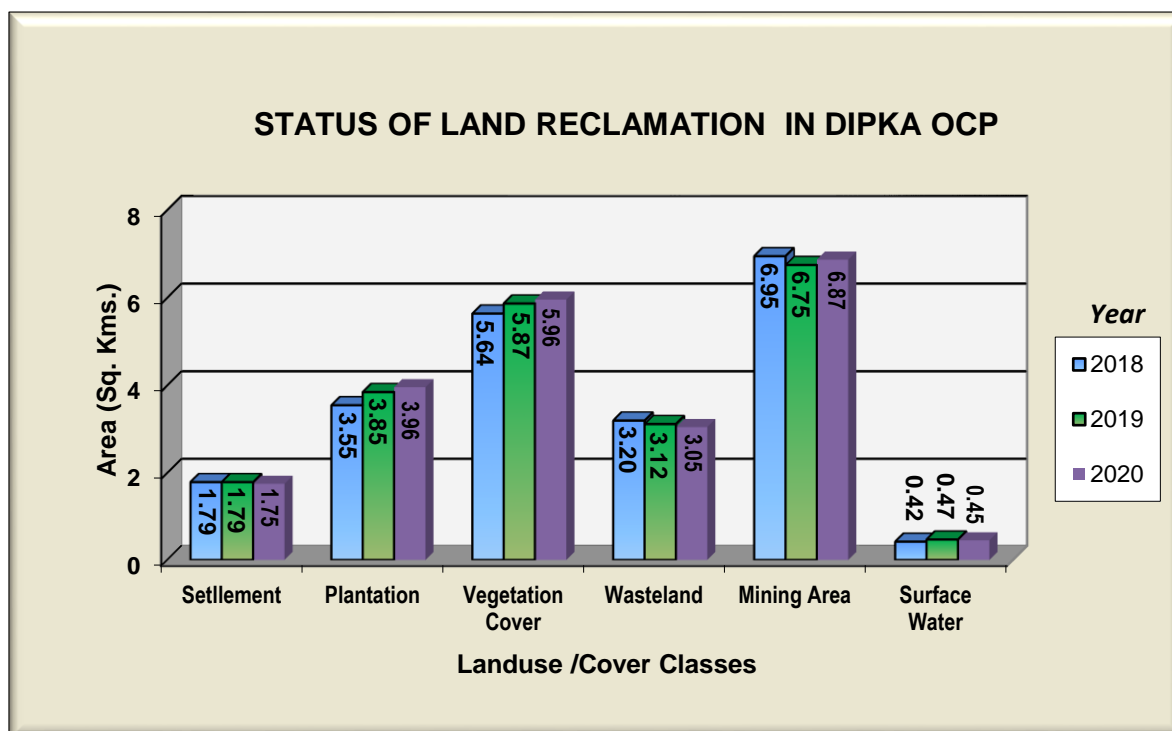


Figure 6.2

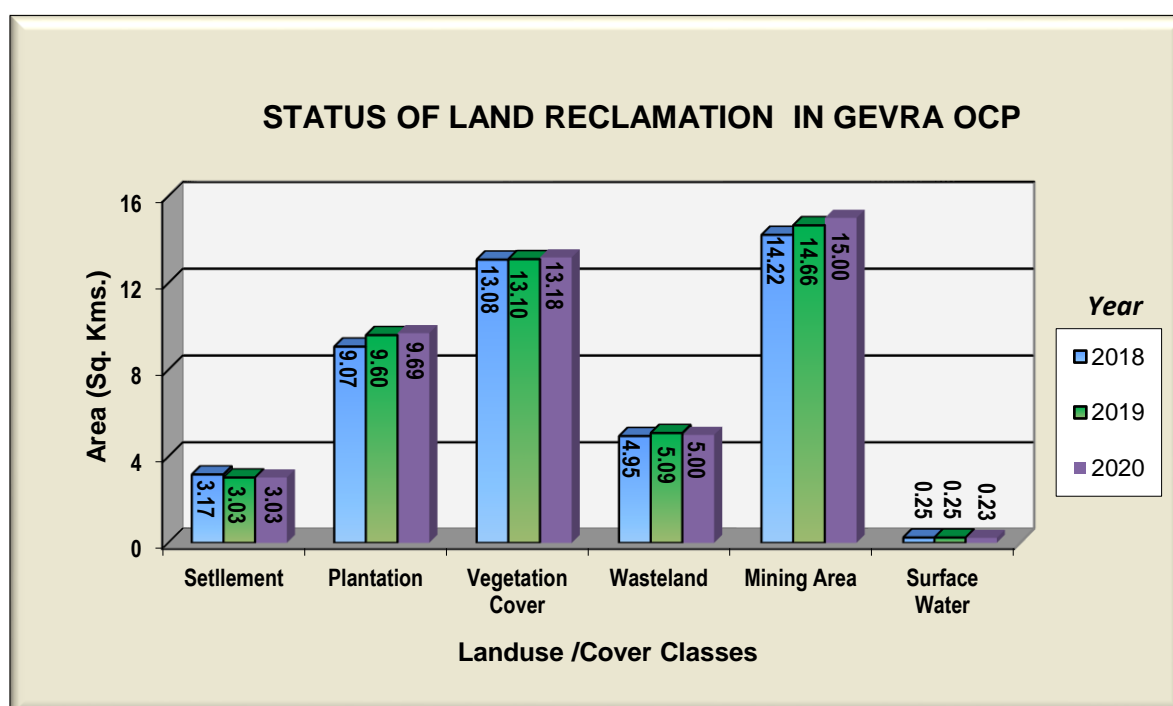


Figure 6.3

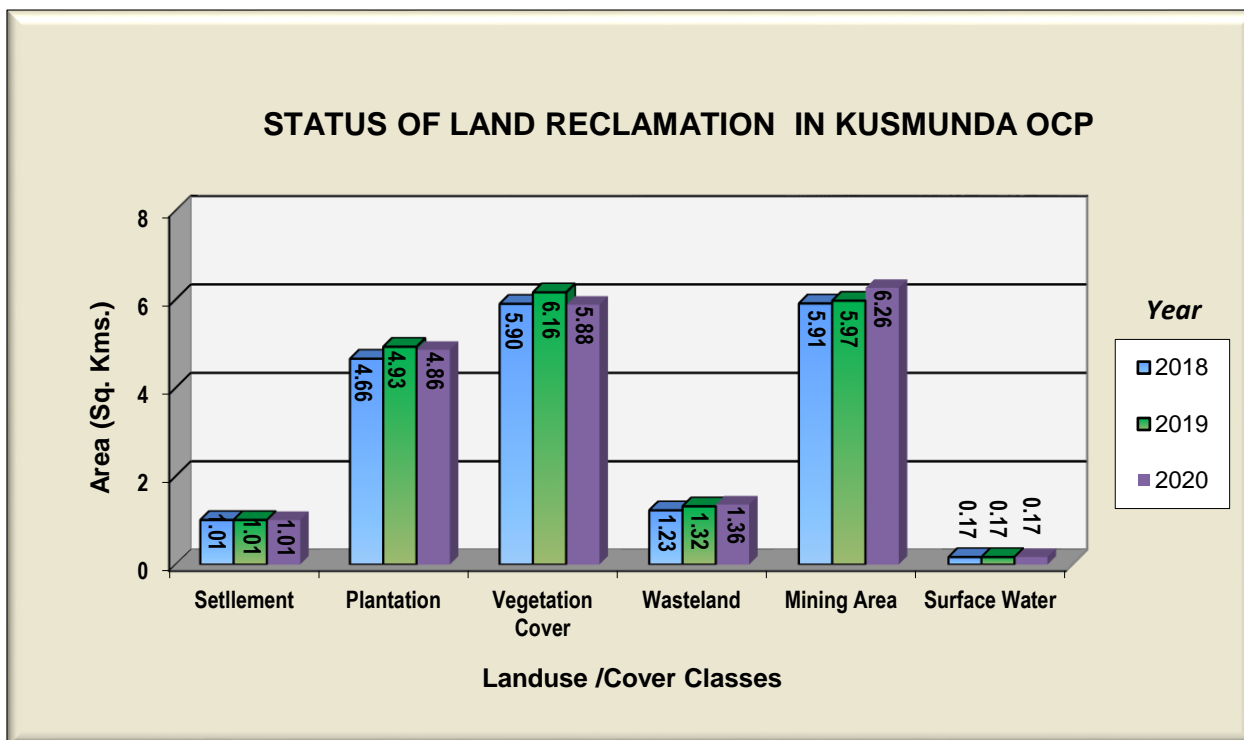


Figure 6.4

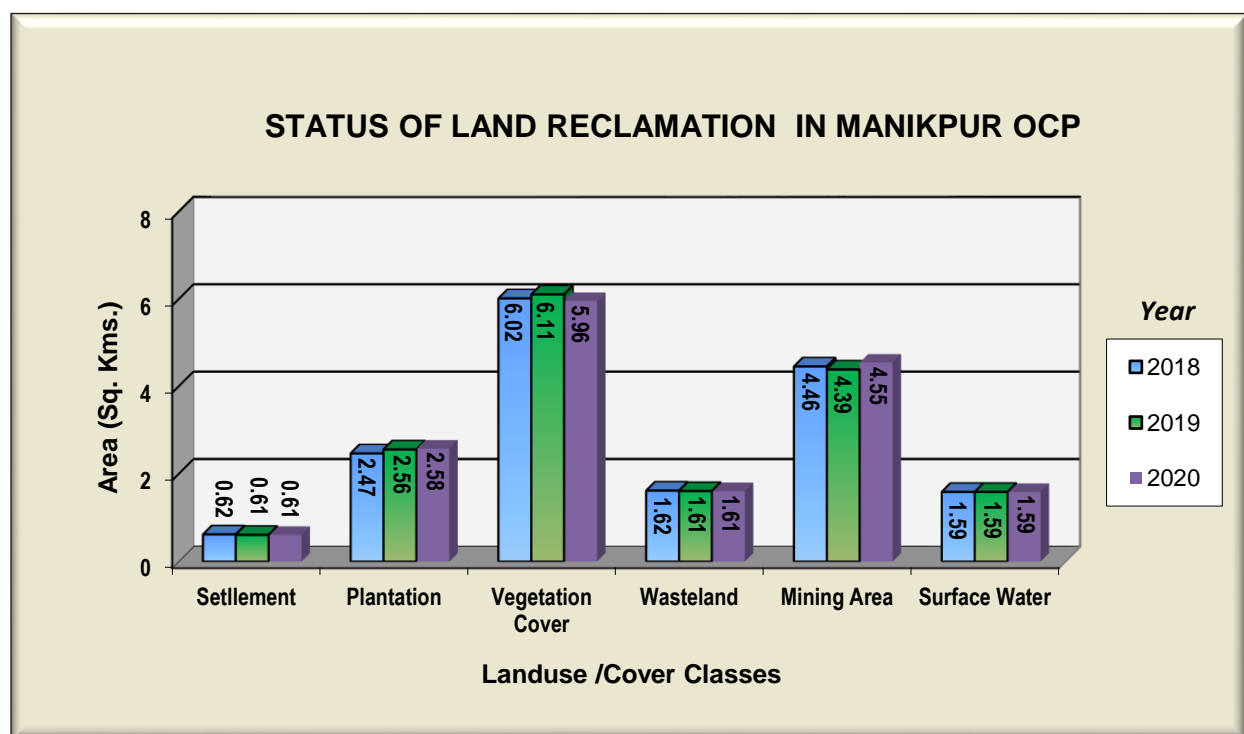


Figure 6.5

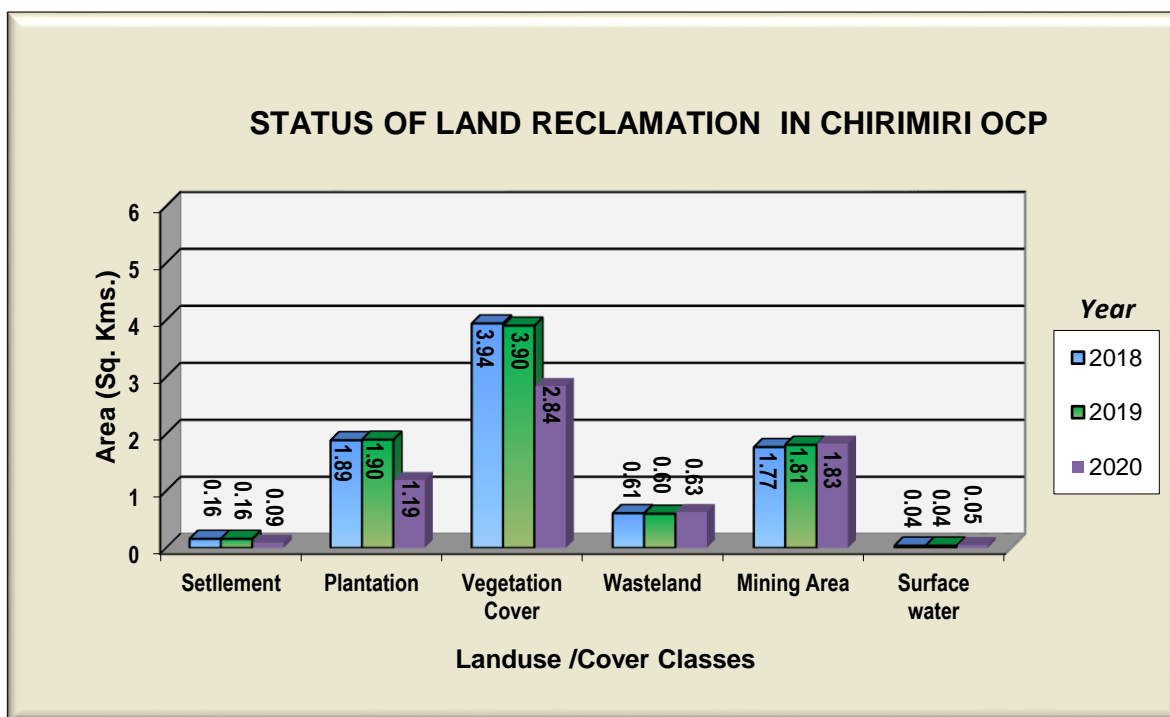


Figure 6.6

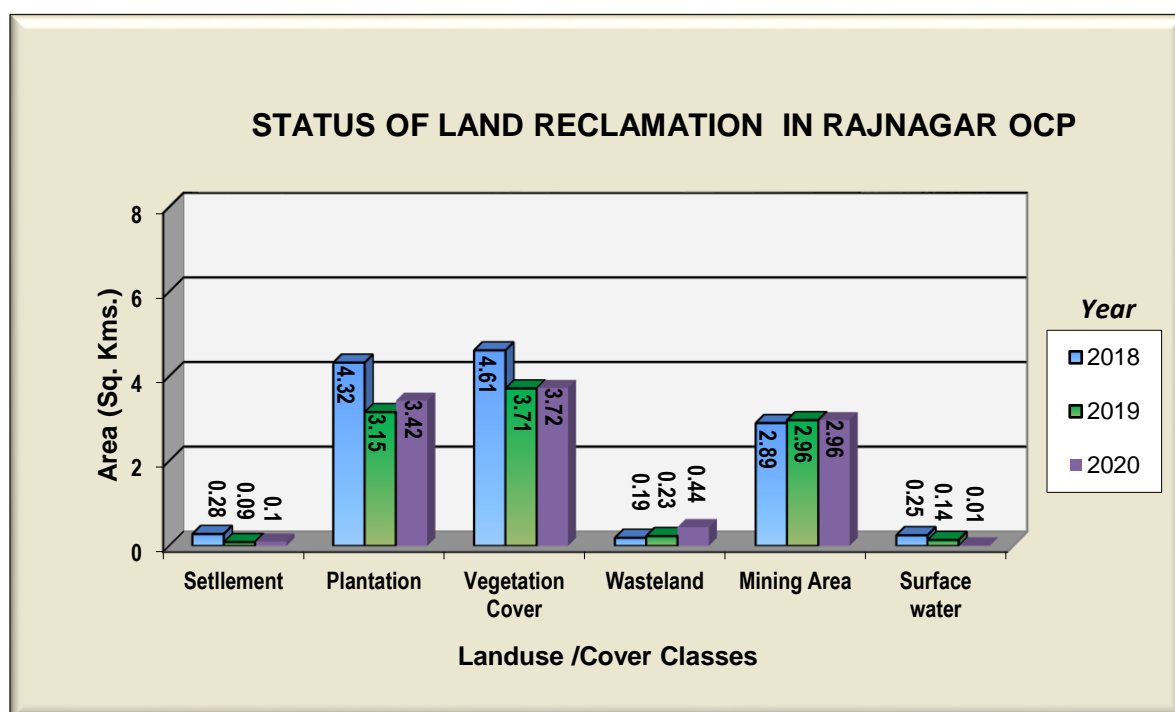


Figure 6.7

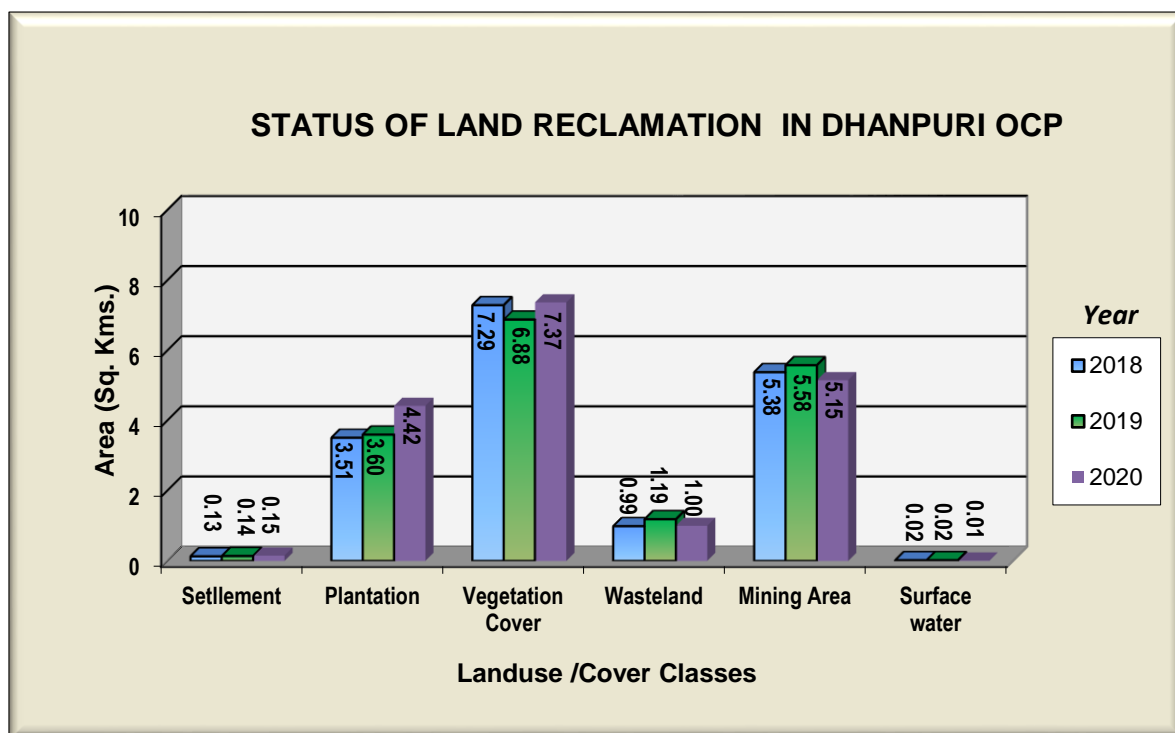


Figure 6.8

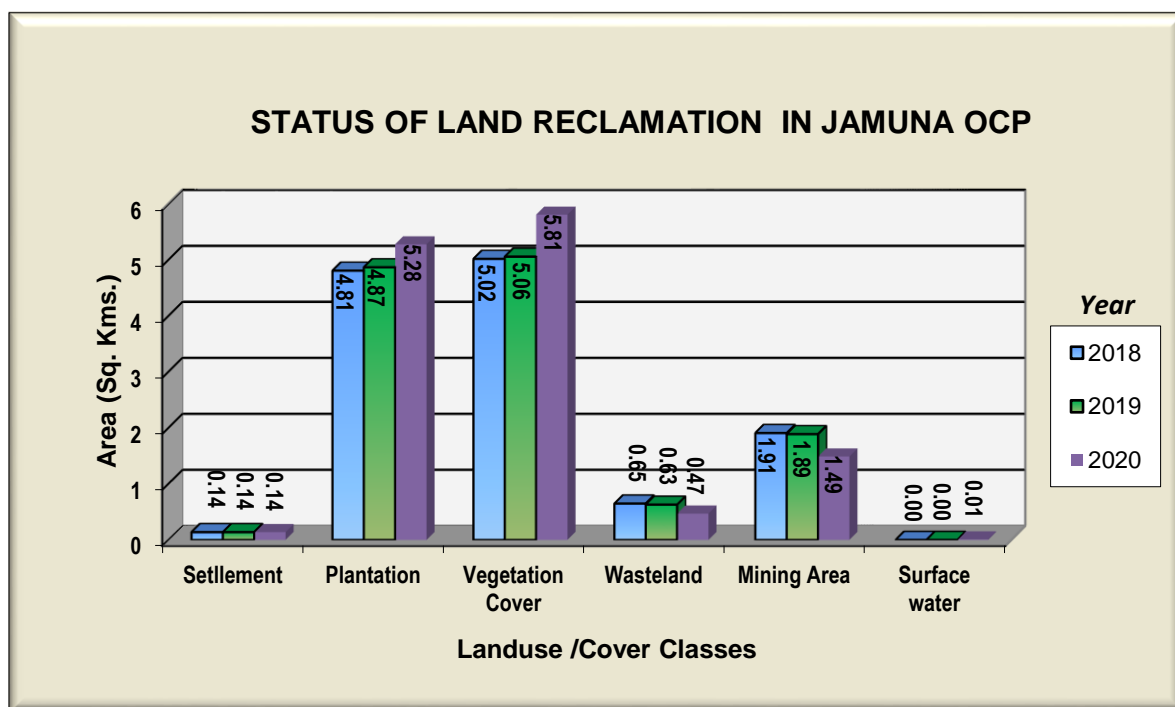


Figure 6.9



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



Photograph – 6.2: **Plantation around Dipka Guest House**



Photograph – 6.3: **Backfilling in Gevra Opencast Project**



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



Photograph – 6.5: ***Backfilling 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 Chirimiri Opencast Project***



Photograph – 6.10: ***Plantation in Rajnagar Opencast Project***



Photograph – 6.11: ***Plantation in Dhanpuri Opencast Project***



Photograph – 6.12: ***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 based on satellite data of the year 2020:

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

7.2 Project wise Land Reclamation status in NCL for the year 2020 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 2020 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 75.10 Km², 46.37 Km² (61.74%) of area is under reclamation out of which 33.91 Km² (45.15%) area is under backfilling (Technical Reclamation) and 12.46 Km² (16.59%) area has been revegetated (Biological Reclamation). There is a decrease of 0.29 Km² for area under reclamation in

NCL in the year 2020 with respect to the year 2019. This decrease is due to change in leasehold areas of the projects except Nigahi in NCL.

- 7.4** After analyzing the satellite data of year 2020 vs. 2019, it is evident that area under plantation (biological reclamation) has decreased from 14.78 Km² in 2019 to 12.46 Km² in 2020. This is due to change in leasehold area and orientation of leaseholds as mentioned above.
- 7.5** Study also reveal that area under barren backfilling (Technical Reclamation) has increased from 31.88 km² in 2019 to 33.91 km² in 2020. All the 10 projects of NCL selected for monitoring are showing an increasing trend in technical reclamation except for Bina, Kakri and Khadia due to change in leasehold area.
- 7.6** Study also reveal that area under Green Cover in the project under monitoring has marginally decreased from 51.91 Km² in 2019 to 50.49 Km² in 2020. In the projects of NCL selected for monitoring Jayant, Dudhichua, Khadia, Kakri, Jhingurdah and Block – B OCPs are showing an increasing trend in Green Cover in their leasehold.
- 7.7** Out of 10 projects of NCL, maximum land reclamation has been carried out in Jhingurdah OCP (85.22%) followed by Bina (70.00%) and Nigahi (65.10%). It may be noted that in Jhingurdah OC Mine production from upper mineable seams is almost complete.

Table 7.1

Summarized Land Reclamation Status in Opencast Projects of NCL based on Satellite Data of the year 2020

(Area in Sq. Kms.)																			
Sl. No.	Project	Total Leasehold Area(2019)	Total Leasehold Area(2020)	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		Social Forestry, Avaneue									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
				2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	Amlohri	21.51	23.20	3.66	3.77	0.85	0.80	1.14	0.93	4.60	4.40	3.90	3.51	8.41	8.08	6.59	6.13	4.51	4.57
				43.52%	46.66%	10.11%	9.90%					46.37%	43.44%			30.64%	26.42%	53.63%	56.56%
2	Nigahi	30.16	30.16	5.05	5.41	2.19	1.64	2.45	2.97	4.75	3.23	3.66	3.78	10.90	10.83	9.39	7.84	7.24	7.05
				46.33%	49.95%	20.09%	15.14%					33.58%	34.90%			31.13%	25.99%	66.42%	65.10%
3	Jayant	29.11	31.94	5.65	6.34	4.87	3.46	2.26	3.71	3.61	3.73	4.54	5.61	15.06	15.41	10.74	10.90	10.52	9.80
				37.52%	41.14%	32.34%	22.45%					30.15%	36.40%			36.89%	34.13%	69.85%	63.60%
4	Dudhichua	14.00	21.73	4.86	5.49	1.44	1.29	0.85	1.55	0.32	0.20	4.19	4.51	10.49	11.29	2.61	3.04	6.30	6.78
				46.33%	48.63%	13.73%	11.43%					39.94%	39.95%			18.64%	13.99%	60.06%	60.05%
5	Khadia	14.91	16.22	3.62	3.55	0.60	0.58	0.24	0.24	2.39	2.47	3.17	3.44	7.39	7.57	3.23	3.29	4.22	4.13
				48.99%	46.90%	8.12%	7.66%					42.90%	45.44%			21.66%	20.28%	57.10%	54.56%
6	Krishnashila	5.94	5.54	0.84	1.21	0.15	0.25	0.20	1.04	1.18	0.06	1.02	1.15	2.01	2.61	1.53	1.35	0.99	1.46
				41.79%	46.36%	7.46%	9.58%					50.75%	44.06%			25.76%	24.37%	49.25%	55.94%
7	Bina	17.98	15.97	4.33	4.31	1.79	1.62	0.77	0.78	3.83	3.20	3.02	2.54	9.14	8.47	6.39	5.60	6.12	5.93
				47.37%	50.88%	19.58%	19.12%					33.04%	30.00%			35.54%	35.07%	66.96%	70.00%
8	Kakri	13.60	15.33	1.66	1.37	0.89	0.59	0.83	1.40	3.09	3.01	1.08	1.60	3.63	3.56	4.81	5.00	2.55	1.96
				45.73%	38.48%	24.52%	16.57%					29.75%	44.94%			35.37%	32.62%	70.25%	55.06%
9	Jhingurdah	12.43	12.17	0.77	0.97	1.51	1.74	2.08	2.26	2.13	2.26	0.47	0.47	2.75	3.18	5.72	6.26	2.28	2.71
				28.00%	30.50%	54.91%	54.72%					17.09%	14.78%			46.02%	51.44%	82.91%	85.22%
10	Block-B	14.64	15.65	1.44	1.49	0.49	0.49	0.17	0.33	0.24	0.26	2.13	2.12	4.06	4.10	0.90	1.08	1.93	1.98
				35.47%	36.34%	12.07%	11.95%					52.46%	51.71%			6.15%	6.90%	47.54%	48.29%
	TOTAL	174.28	187.91	31.88	33.91	14.78	12.46	10.99	15.21	26.14	22.82	27.18	28.73	73.84	75.10	51.91	50.49	46.66	46.37
				43.17%	45.15%	20.02%	16.59%					36.81%	38.26%	42.37%	39.96%	30.39%	26.87%	63.19%	61.74%
(% 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".

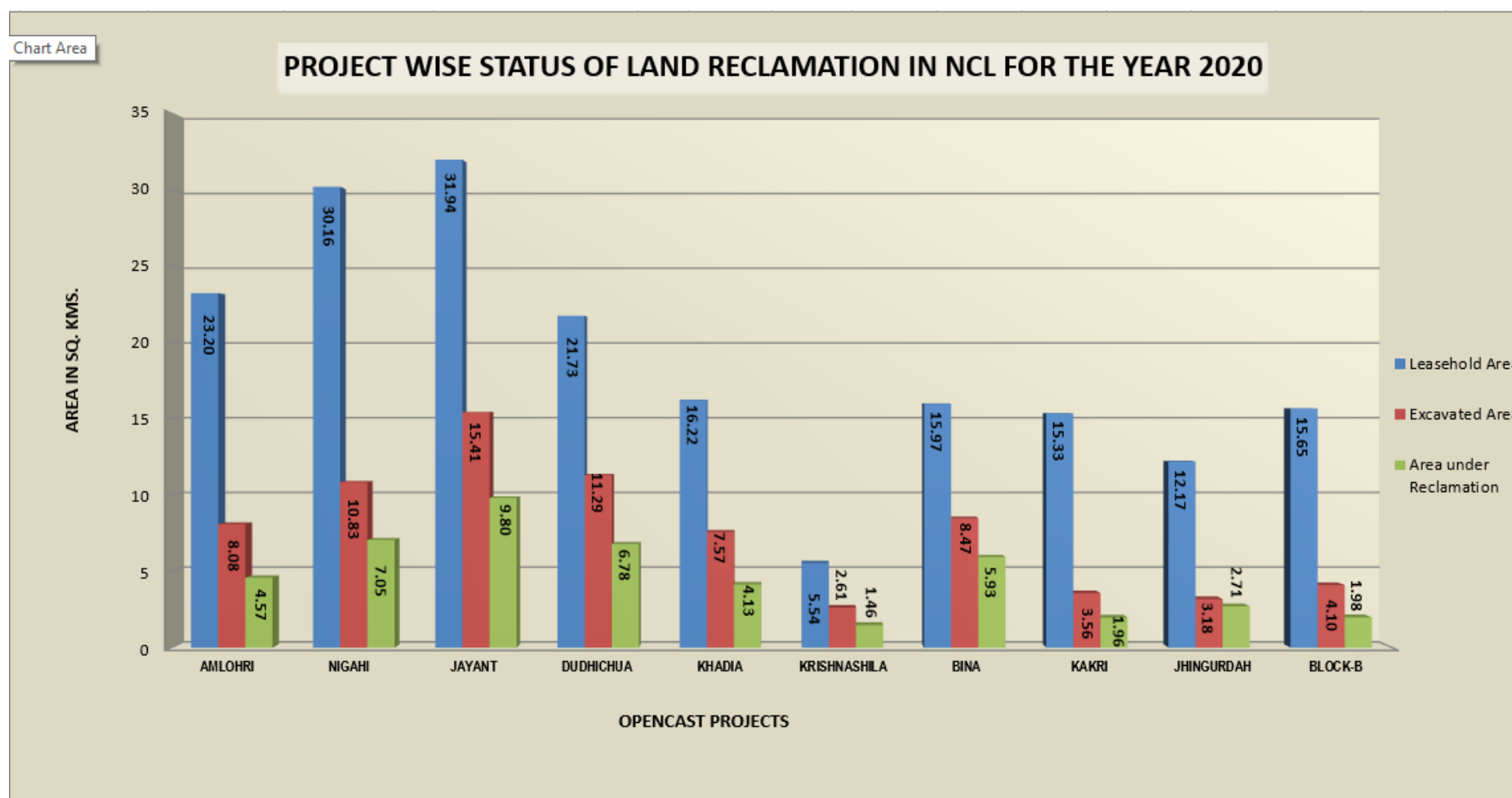
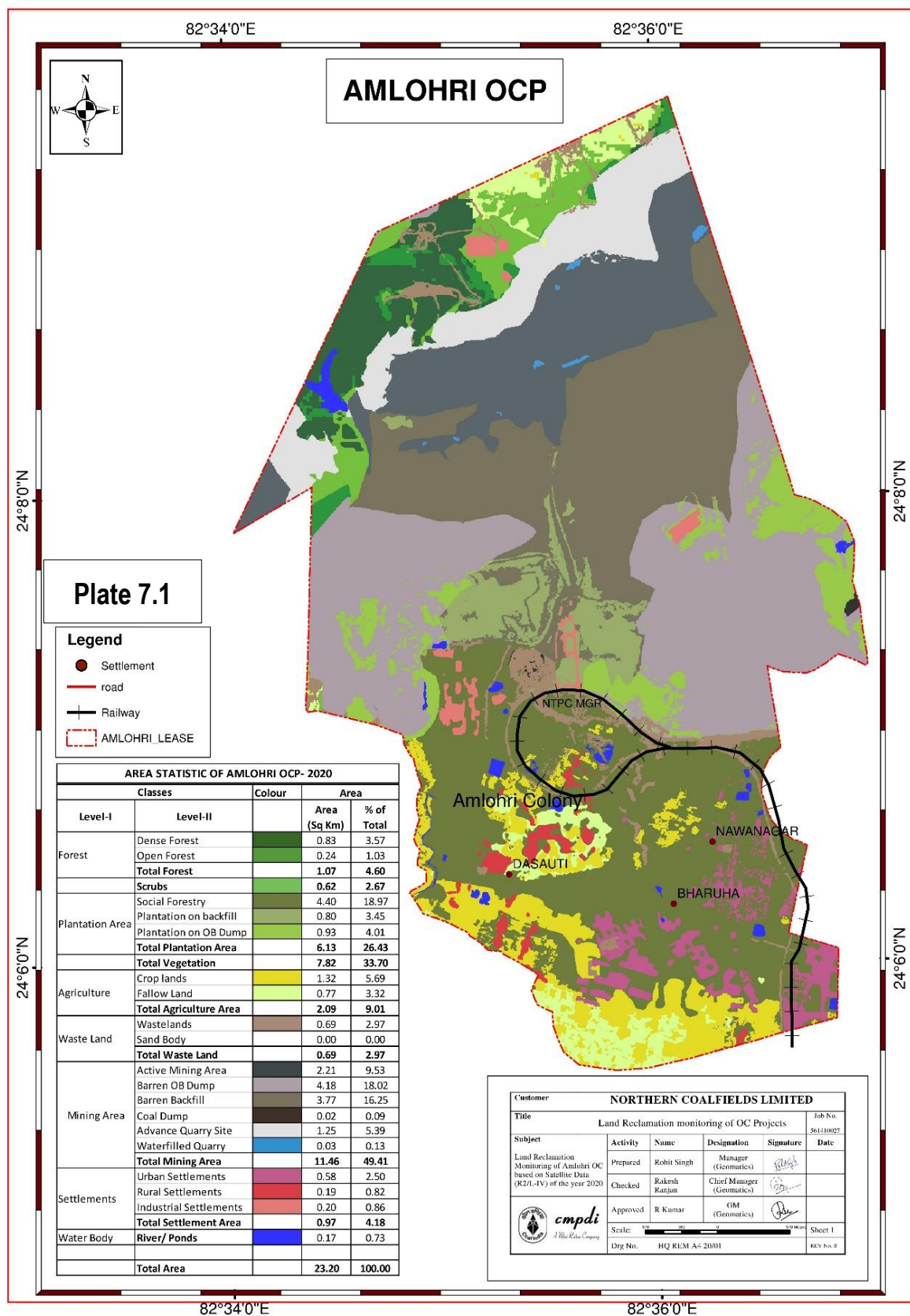


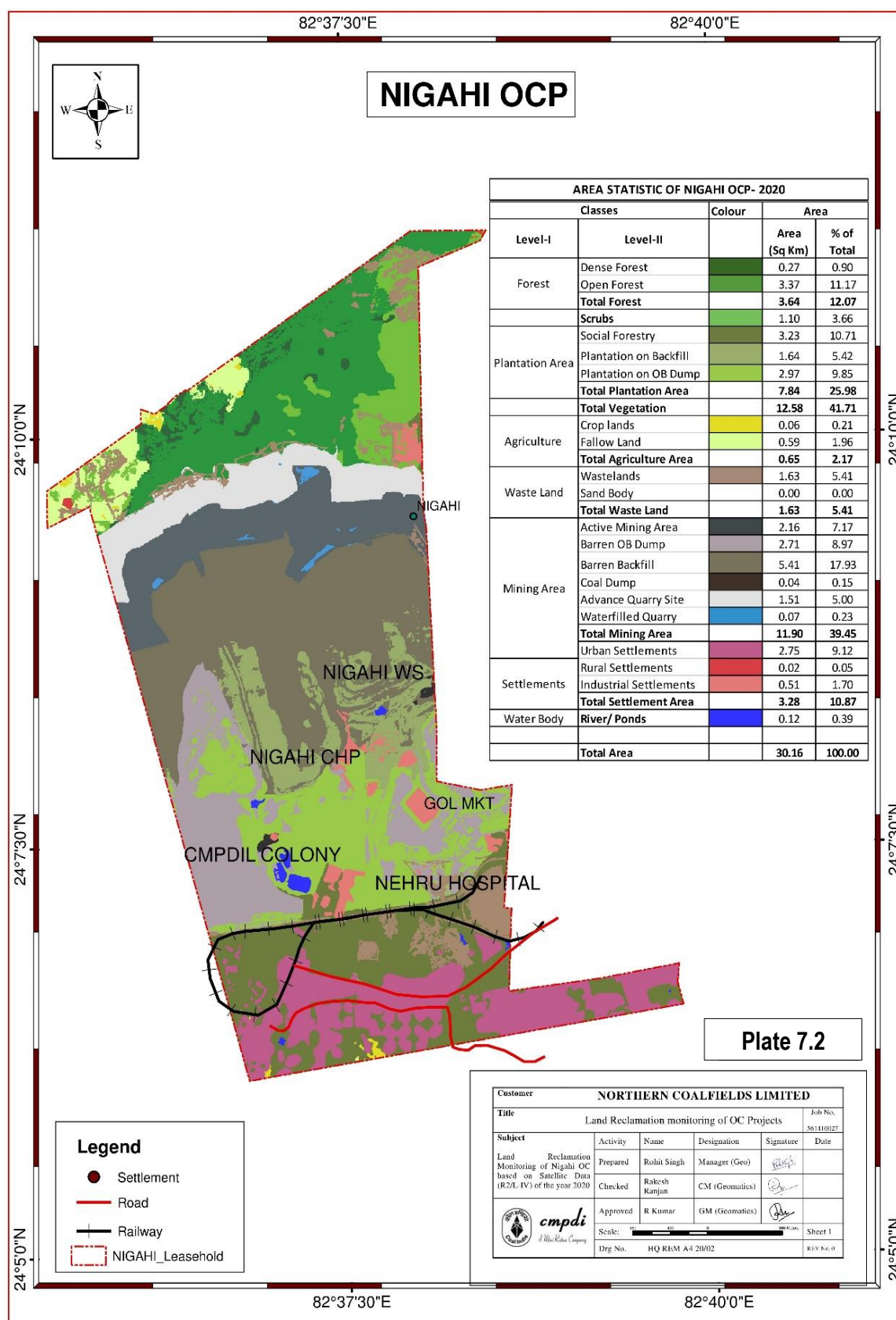
Fig.7.1: Land reclamation status in Opencast Projects of NCL in the Year 2020

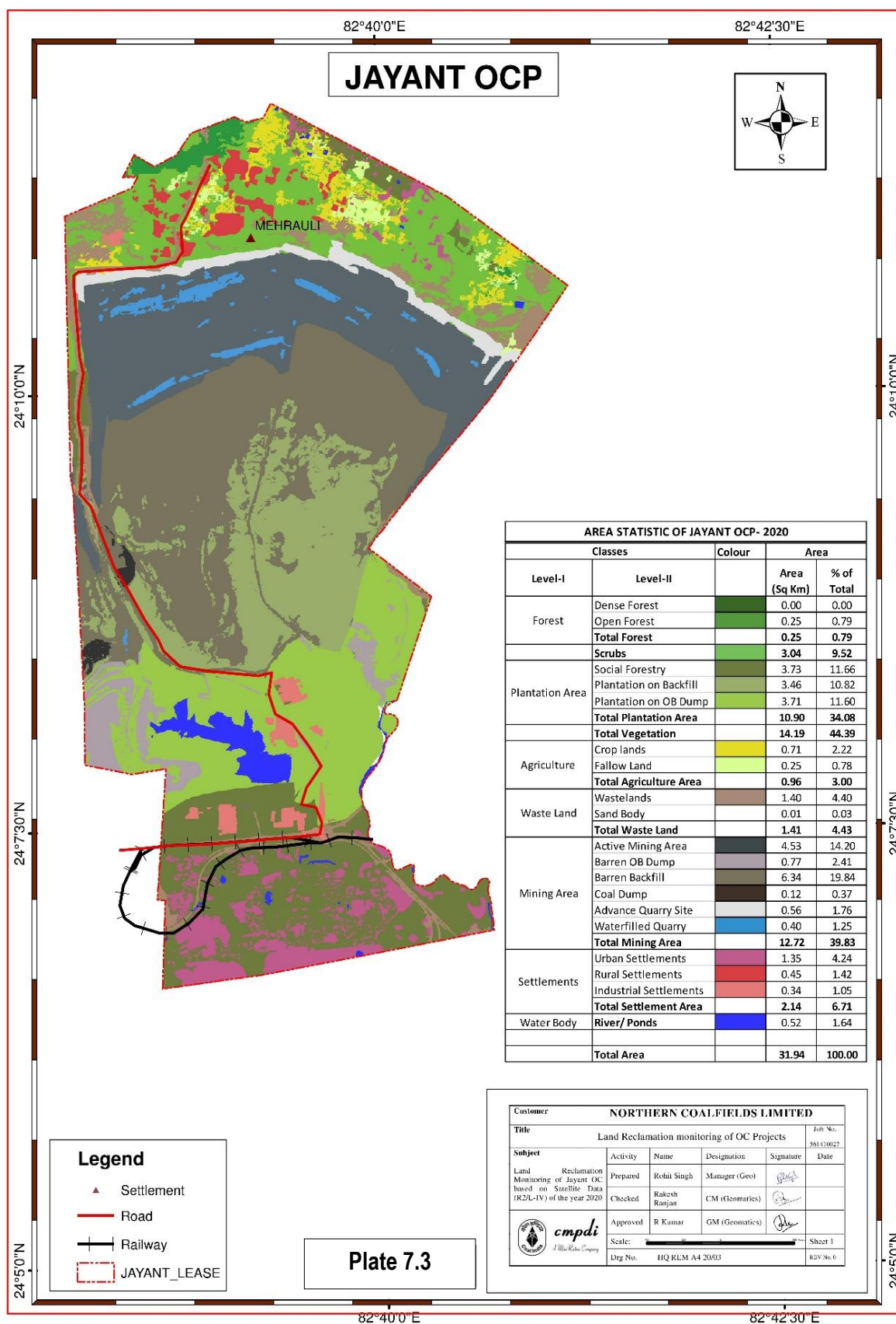
Table 7.2

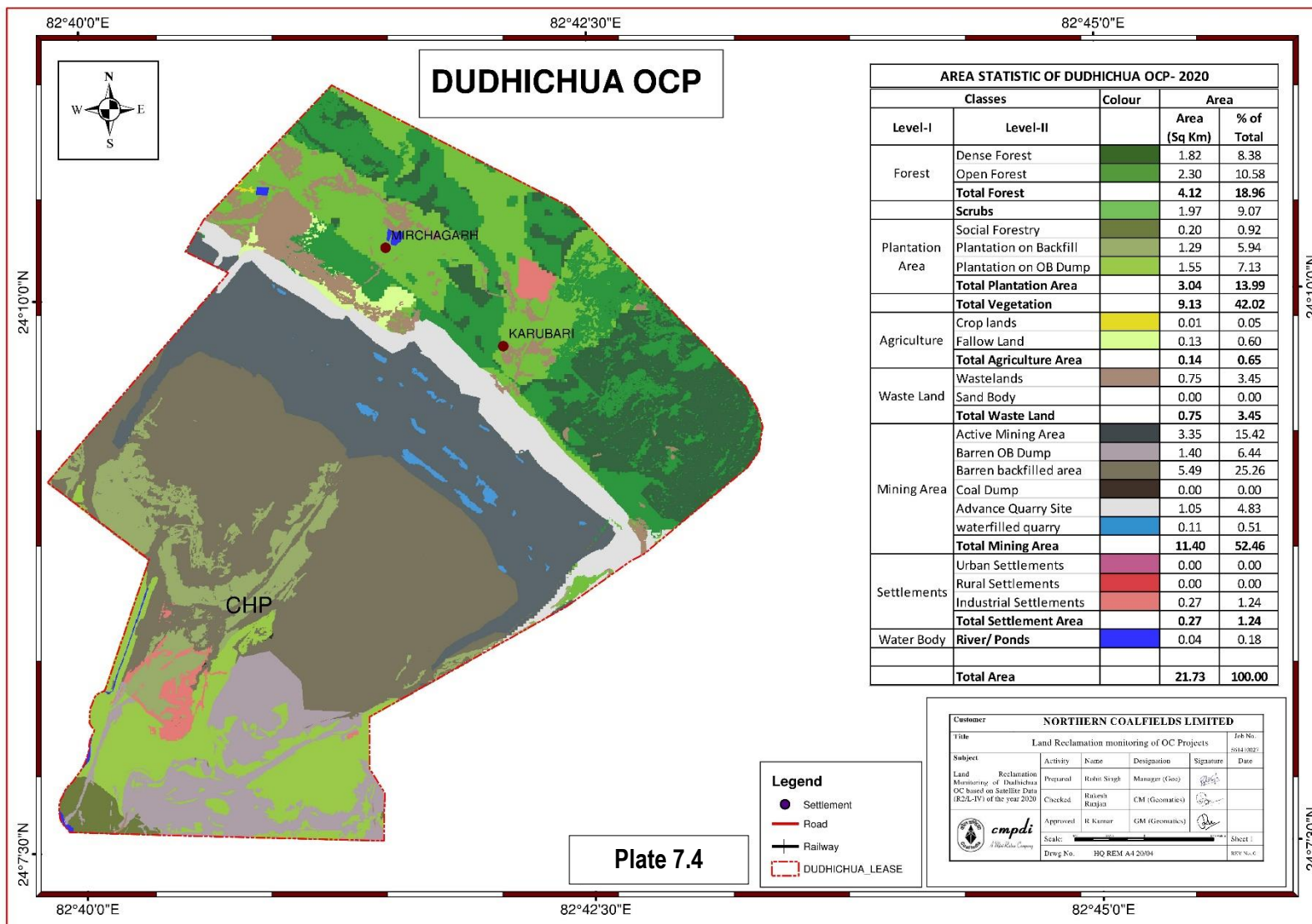
Project wise Area Statistics of Land Use / Cover in OC Mines (> 5 mcu.m.) of NCL based on Satellite data of the Year 2020

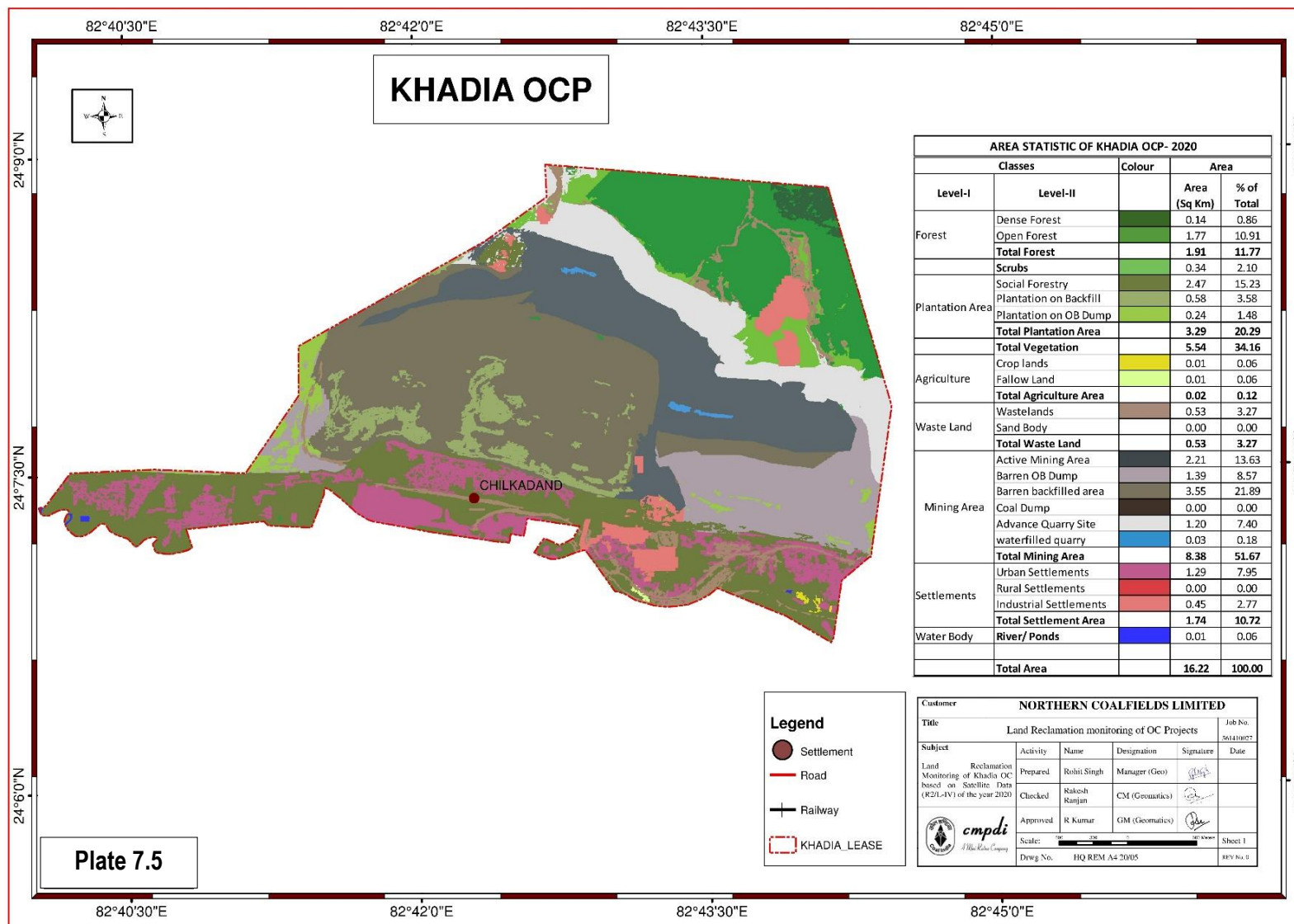
		AMLOHRI		NIGAH		JAYANT		DUDHICHUA		KHADIA		KRISHNASHILA		BINA		KAKRI		JHINGURDAH		BLOCK-B		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.83	3.57	0.27	0.90	0.00	0.00	1.82	8.38	0.14	0.86	0.03	0.55	0.35	2.19	0.34	2.22	0.08	0.65	0.07	0.44	3.93	2.09
	Open Forest	0.24	1.03	3.37	11.17	0.25	0.79	2.30	10.58	1.77	10.91	0.37	6.68	1.26	7.85	2.37	15.44	0.17	1.40	0.83	5.30	12.93	6.88
	Total Forest	1.07	4.60	3.64	12.07	0.25	0.79	4.12	18.96	1.91	11.77	0.40	7.23	1.61	10.04	2.71	17.66	0.25	2.05	0.90	5.74	16.86	8.97
SCRUB	Scrubs	0.62	2.67	1.10	3.66	3.04	9.52	1.97	9.07	0.34	2.10	0.34	6.14	0.45	2.85	1.14	7.44	1.78	14.63	2.37	15.14	13.15	7.00
SF	Social Forestry	4.40	18.97	3.23	10.71	3.73	11.66	0.20	0.92	2.47	15.23	0.06	1.08	3.20	20.05	3.01	19.63	2.26	18.57	0.26	1.66	22.82	12.15
PLANTATION	Plantation on External OB Dump	0.93	4.01	2.97	9.85	3.71	11.60	1.55	7.13	0.24	1.48	1.04	18.77	0.78	4.89	1.40	9.13	2.26	18.57	0.33	2.11	15.21	8.09
	Plantation on Backfill / Excavated Area (Biological Reclamation)	0.80	3.45	1.64	5.42	3.46	10.82	1.29	5.94	0.58	3.58	0.25	4.51	1.62	10.14	0.59	3.85	1.74	14.30	0.49	3.13	12.46	6.63
	Total Area under Plantation (Green Cover)	6.13	26.43	7.84	25.98	10.90	34.08	3.04	13.99	3.29	20.29	1.35	24.36	5.60	35.08	5.00	32.61	6.26	51.44	1.08	6.90	50.49	26.87
	Total Vegetation	7.82	33.70	12.58	41.71	14.19	44.39	9.13	42.02	5.54	34.16	2.09	37.73	7.67	47.97	8.85	57.71	8.29	68.12	4.35	27.78	80.51	42.84
AREA UNDER ACTIVE MINING	Coal Quarry	2.21	9.53	2.16	7.17	4.53	14.20	3.35	15.42	2.21	13.63	0.43	7.76	1.86	11.62	1.12	7.31	0.46	3.78	1.61	10.29	19.94	10.61
	Coal Dump	0.02	0.09	0.04	0.15	0.12	0.37	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.21	0.02	0.13	0.01	0.08	0.13	0.83	0.37	0.20
	Advance Quarry Site	1.25	5.39	1.51	5.00	0.56	1.76	1.05	4.83	1.20	7.40	0.71	12.82	0.55	3.47	0.40	2.61	0.00	0.00	0.23	1.47	7.46	3.97
	Quarry Filled With Water	0.03	0.13	0.07	0.23	0.40	1.25	0.11	0.51	0.03	0.18	0.01	0.18	0.10	0.61	0.06	0.39	0.00	0.00	0.15	0.96	0.96	0.51
	Total Area under Active Mining	3.51	15.14	3.78	12.55	5.61	17.58	4.51	20.76	3.44	21.21	1.15	20.76	2.54	15.91	1.60	10.44	0.47	3.86	2.12	13.55	28.73	15.29
TECHN. RECLAMATION	Barren OB Dump	4.18	18.02	2.71	8.97	0.77	2.41	1.40	6.44	1.39	8.57	0.58	10.47	0.26	1.63	0.65	4.24	1.25	10.27	2.71	17.32	15.90	8.46
	Area under Barren Backfilling (Technical Reclamation)	3.77	16.25	5.41	17.93	6.34	19.84	5.49	25.26	3.55	21.89	1.21	21.84	4.31	26.97	1.37	8.94	0.97	7.97	1.49	9.52	33.91	18.04
	Total Area under Technical Reclamation	3.77	16.25	5.41	17.93	6.34	19.84	5.49	25.26	3.55	21.89	1.21	21.84	4.31	26.97	1.37	8.94	0.97	7.97	1.49	9.52	33.91	18.04
	Total Area under Mining Operations	11.46	49.41	11.90	39.45	12.72	39.83	11.40	52.46	8.38	51.67	2.94	53.07	7.11	44.51	3.62	23.62	2.69	22.10	6.32	40.39	78.54	41.79
WASTELANDS	Waste Lands	0.69	2.97	1.63	5.41	1.40	4.40	0.75	3.45	0.53	3.27	0.21	3.79	0.31	1.91	0.87	5.68	0.54	4.44	2.22	14.19	9.15	4.87
	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	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01
	Total Wasteland	0.69	2.97	1.63	5.41	1.41	4.43	0.75	3.45	0.53	3.27	0.21	3.79	0.31	1.91	0.87	5.68	0.54	4.44	2.22	14.19	9.16	4.87
WATERBODIES	Reservoir, nallah, ponds	0.17	0.73	0.12	0.39	0.52	1.64	0.04	0.18	0.01	0.06	0.06	1.08	0.07	0.43	0.03	0.20	0.13	1.07	0.06	0.38	1.21	0.64
	Total Waterbodies	0.17	0.73	0.12	0.39	0.52	1.64	0.04	0.18	0.01	0.06	0.06	1.08	0.07	0.43	0.03	0.20	0.13	1.07	0.06	0.38	1.21	0.64
AGRICULTURE	Crop Lands	1.32	5.69	0.06	0.21	0.71	2.22	0.01	0.05	0.01	0.06	0.00	0.00	0.01	0.06	0.59	3.85	0.20	1.64	0.31	1.98	3.22	1.71
	Fallow Lands	0.77	3.32	0.59	1.96	0.25	0.78	0.13	0.60	0.01	0.06	0.00	0.00	0.00	0.00	0.10	0.65	0.03	0.25	1.94	12.40	3.82	2.03
	Total Agriculture	2.09	9.01	0.65	2.17	0.96	3.00	0.14	0.65	0.02	0.12	0.00	0.00	0.01	0.06	0.69	4.50	0.23	1.89	2.25	14.38	7.04	3.75
SETTLEMENTS	Urban Settlement	0.58	2.50	2.75	9.12	1.35	4.24	0.00	0.00	1.29	7.95	0.04	0.72	0.48	3.01	1.16	7.57	0.15	1.23	0.04	0.26	7.84	4.17
	Rural Settlement	0.19	0.82	0.02	0.05	0.45	1.42	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.36	0.00	0.00	0.00	0.00	0.01	0.06	0.73	0.39
	Industrial Settlement	0.20	0.86	0.51	1.70	0.34	1.05	0.27	1.24	0.45	2.77	0.20	3.61	0.28	1.75	0.11	0.72	0.14	1.15	0.40	2.56	2.90	1.54
	Total Settlement	0.97	5.80	3.28	10.87	2.14	6.71	0.27	1.24	1.74	10.72	0.24	4.33	0.82	5.12	1.27	8.29	0.29	2.38	0.45	2.88	11.47	6.10
	Grand Total	23.20	100.00	30.16	100.00	31.94	100.00	21.73	100.00	16.22	100.00	5.54	100.00	17.98	100.00	15.33	100.00	12.17	100.00	15.65	100.00	187.91	100.00

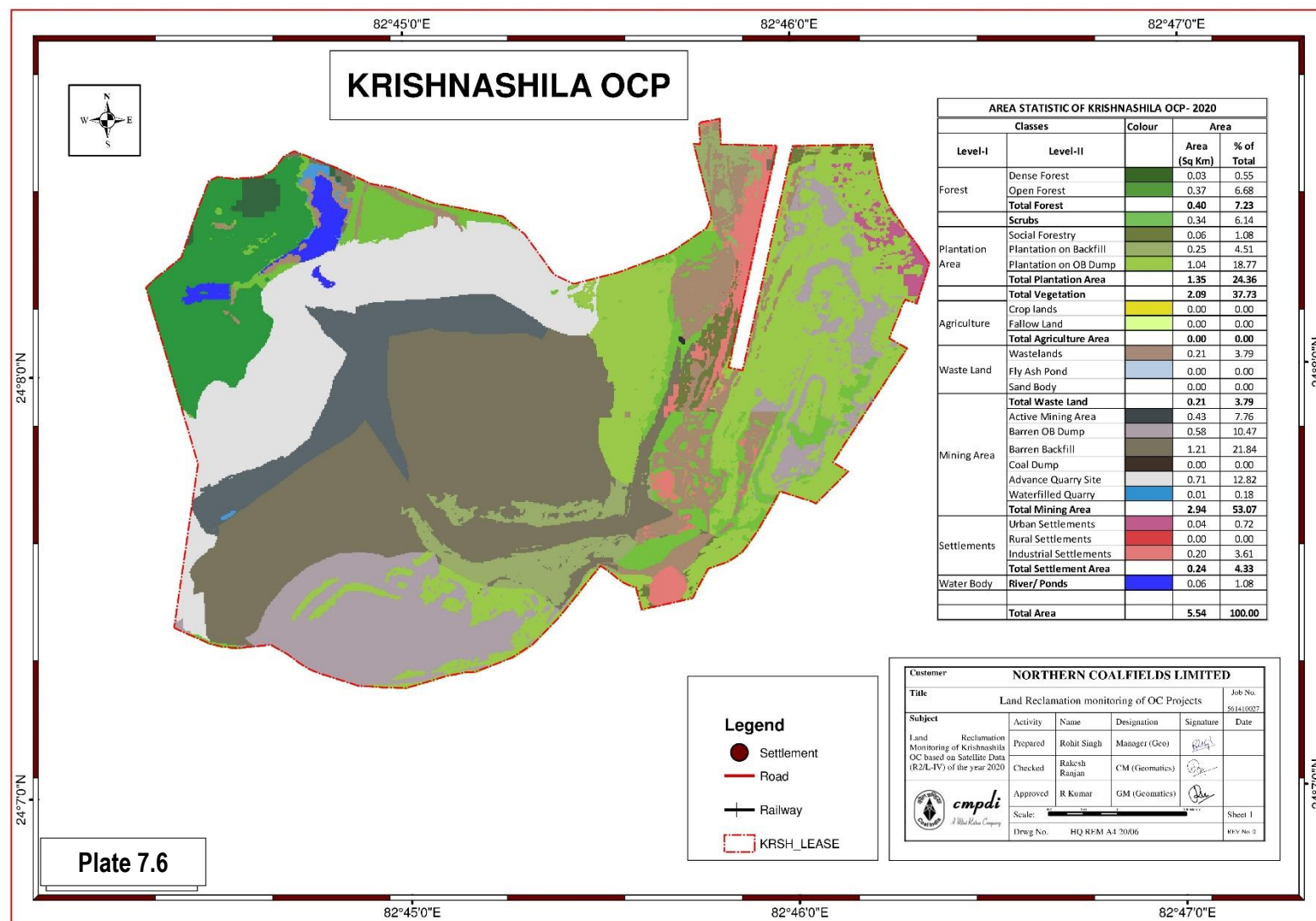


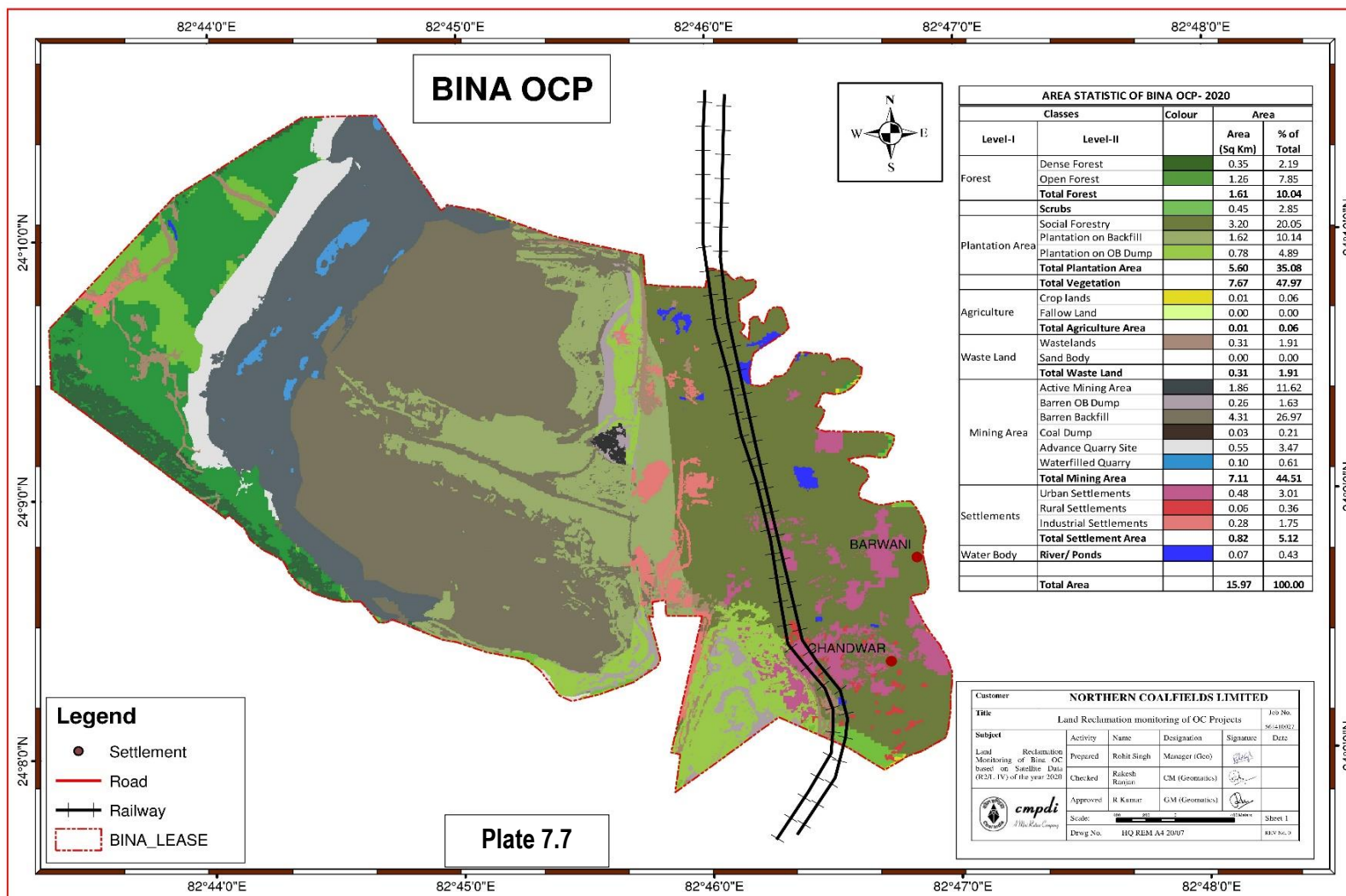


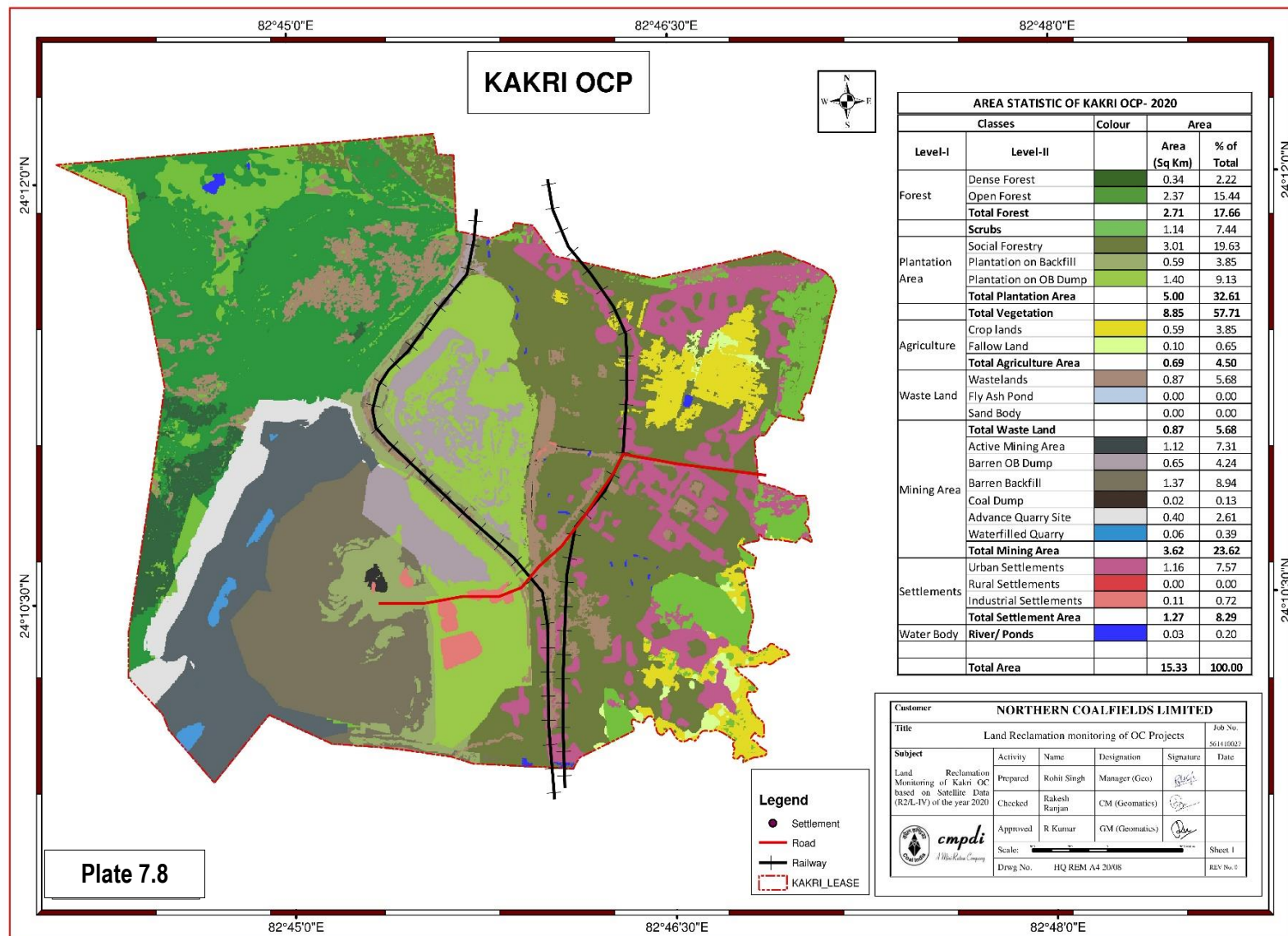


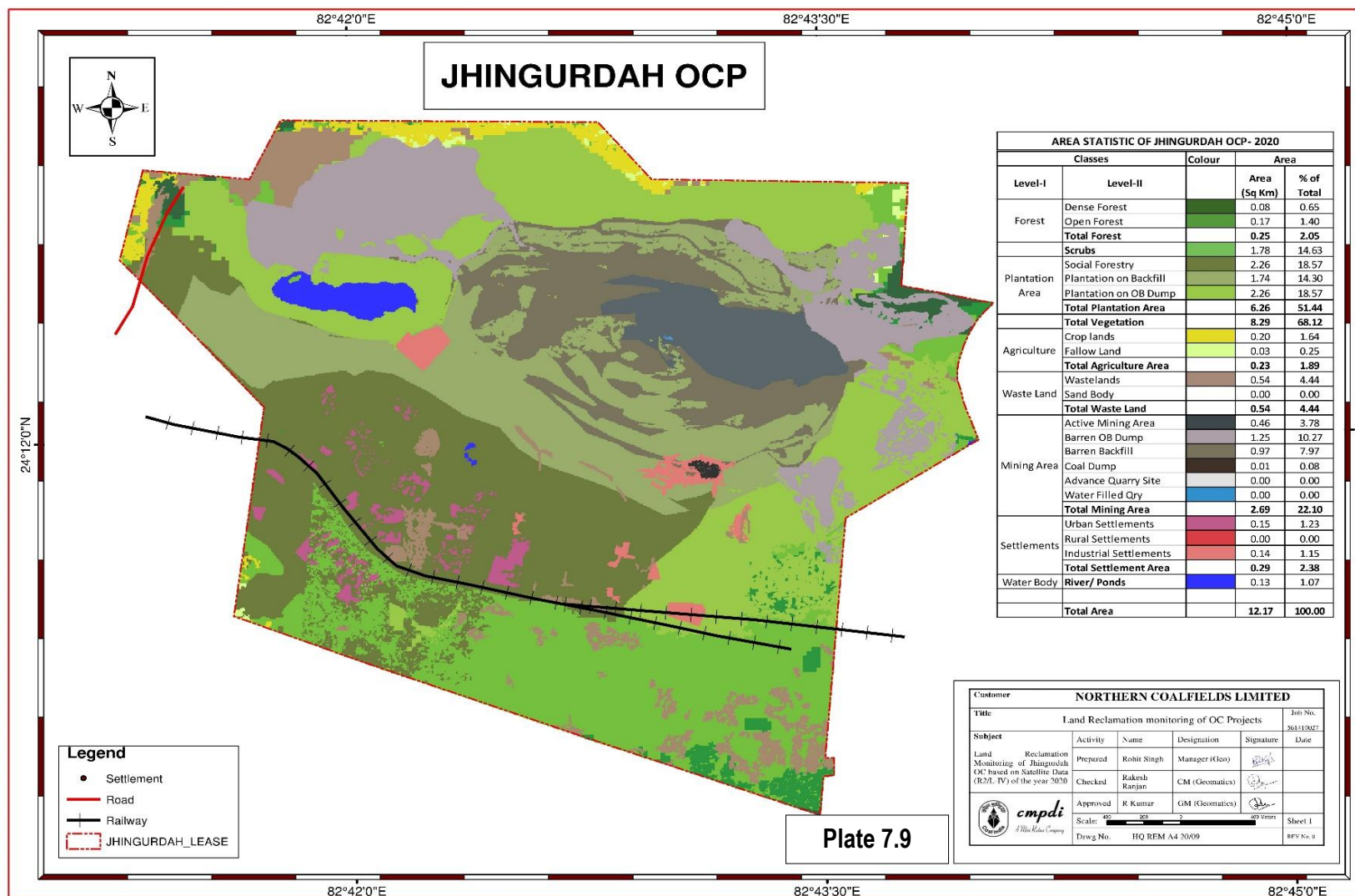


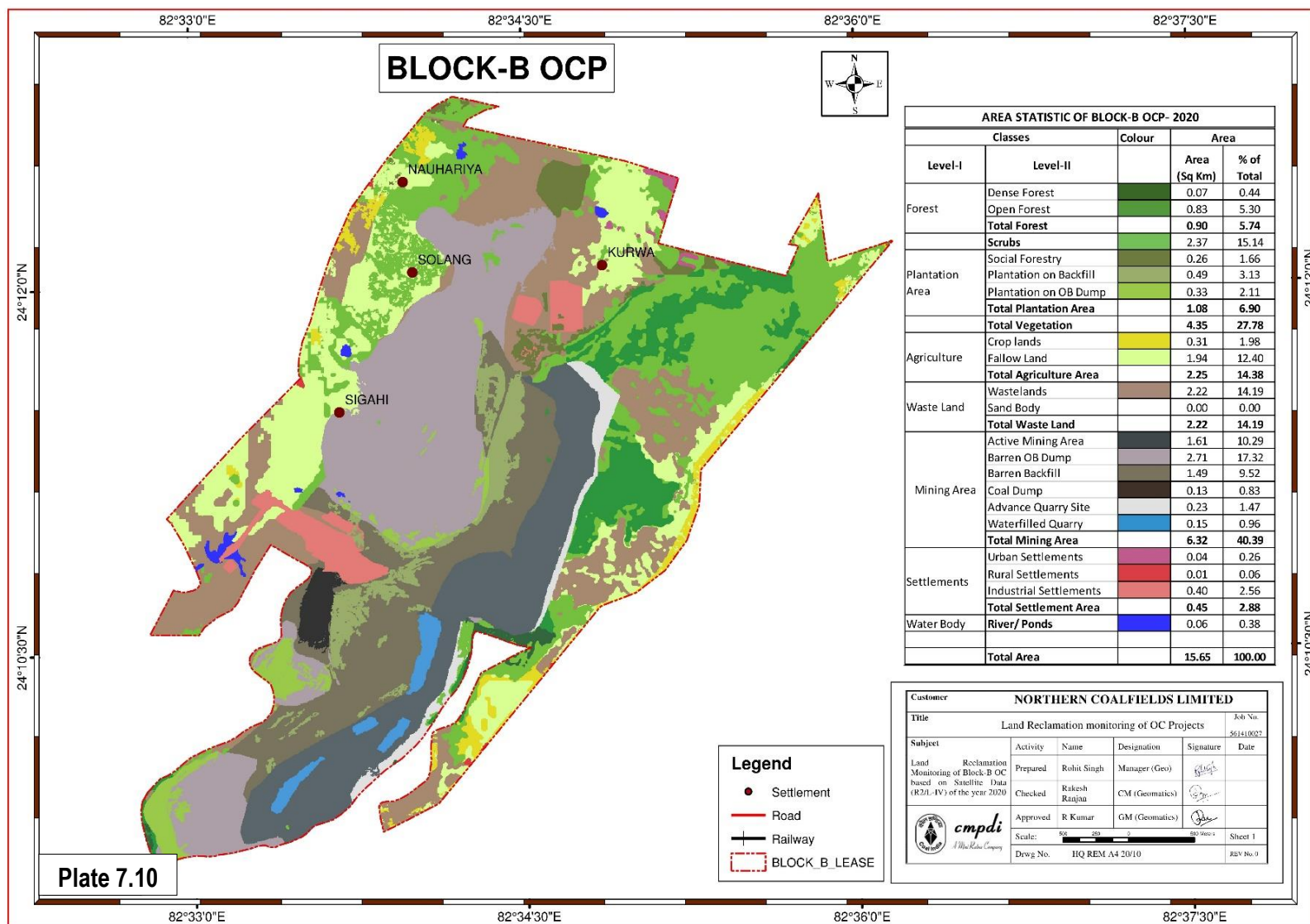












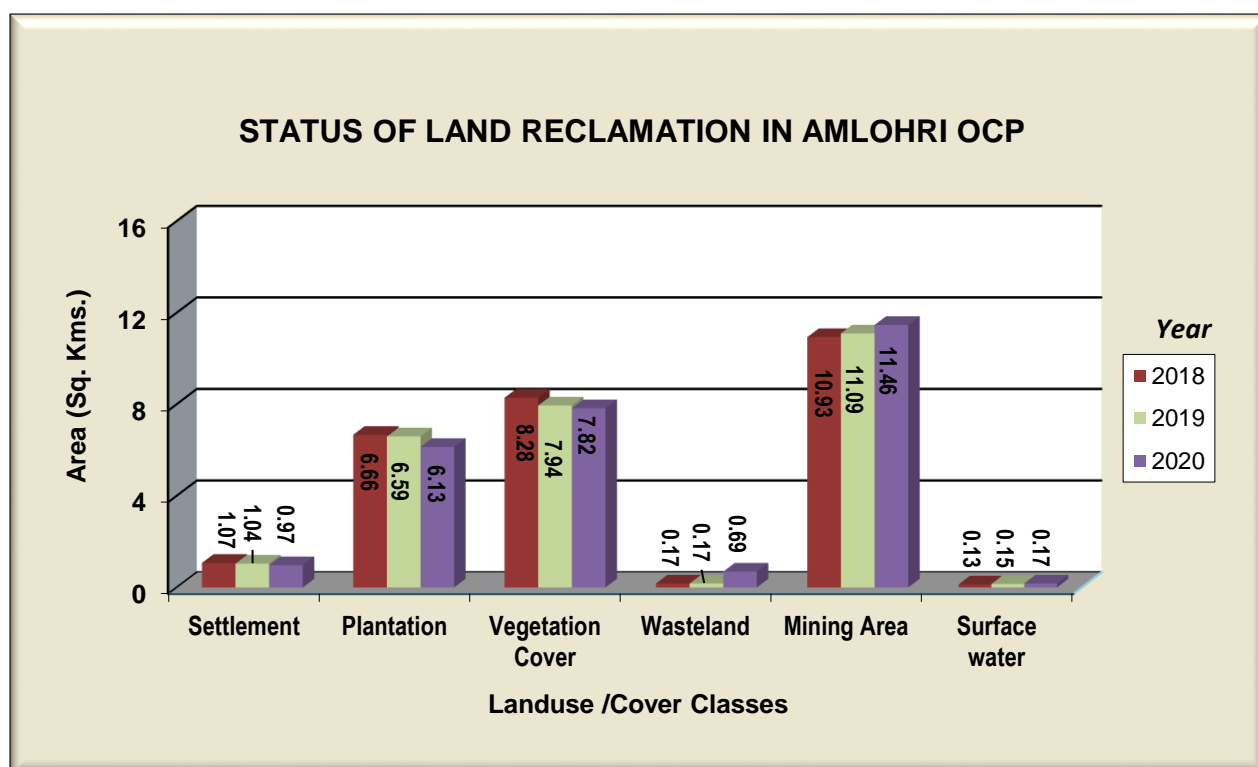


Figure 7.2

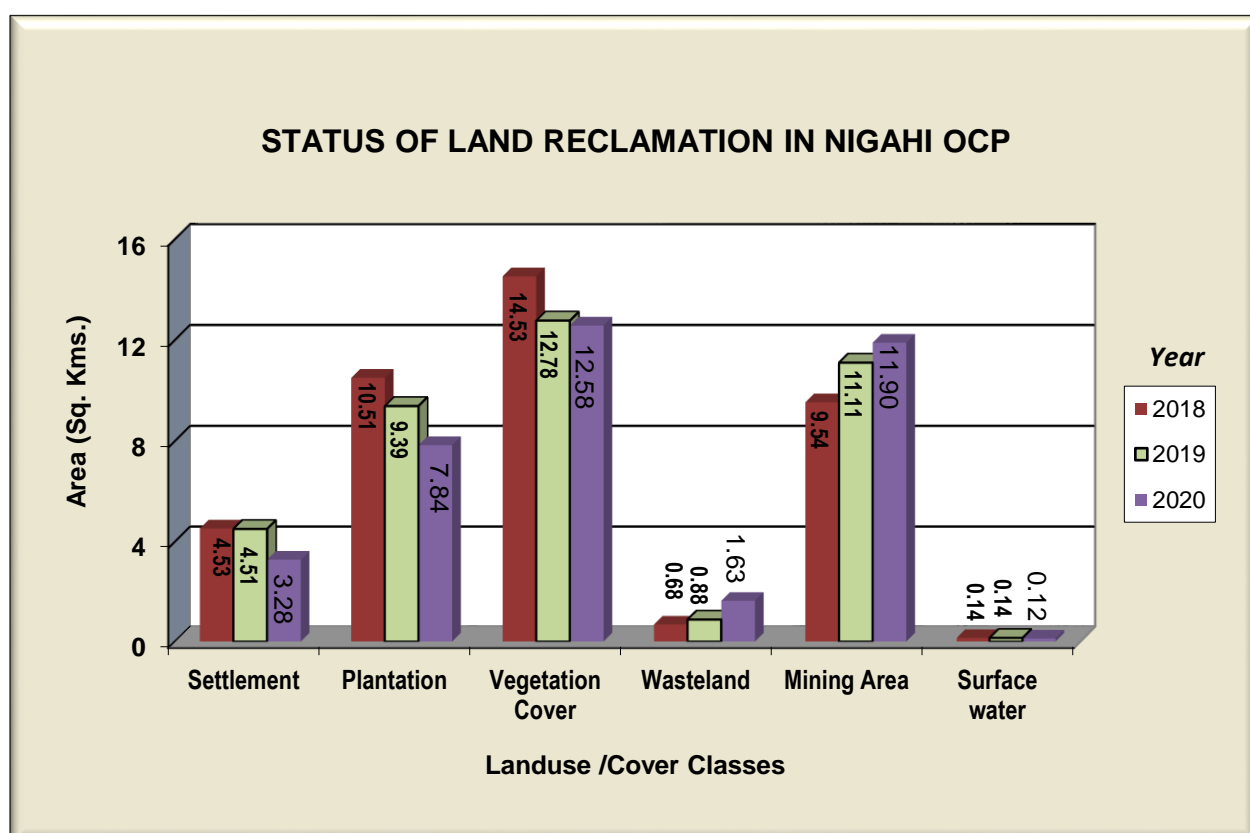


Figure 7.3

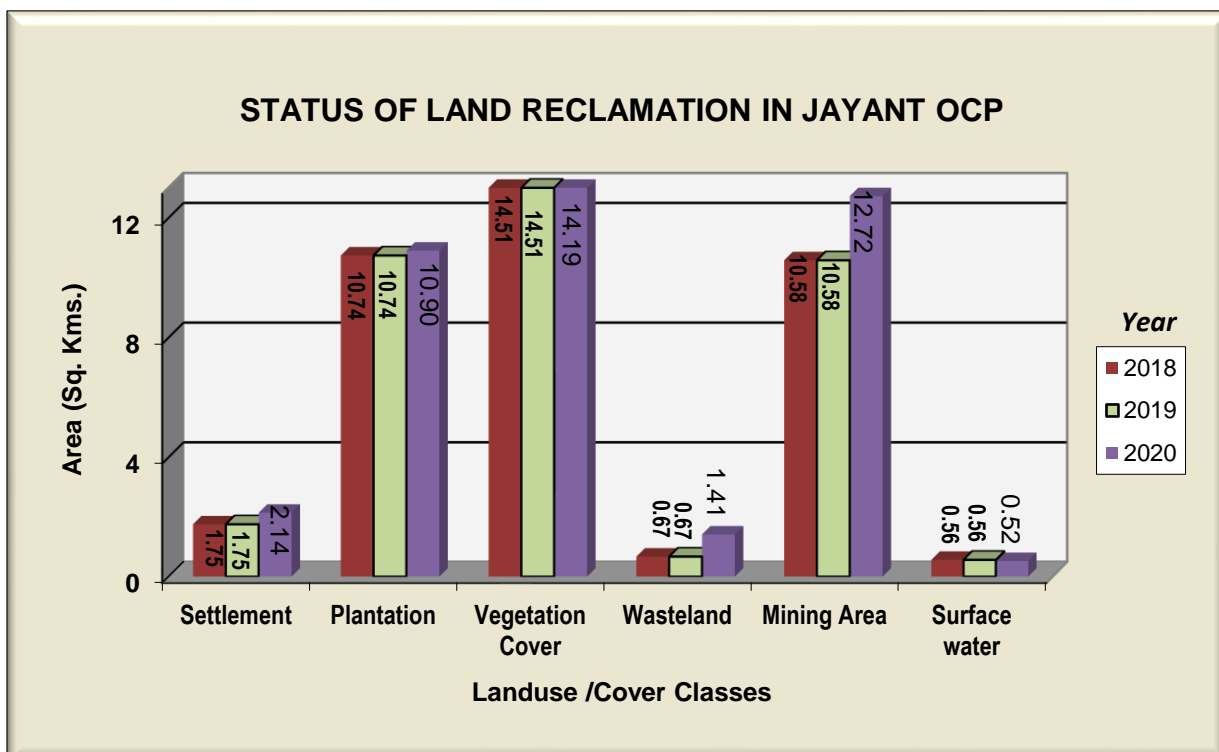


Figure 7.4

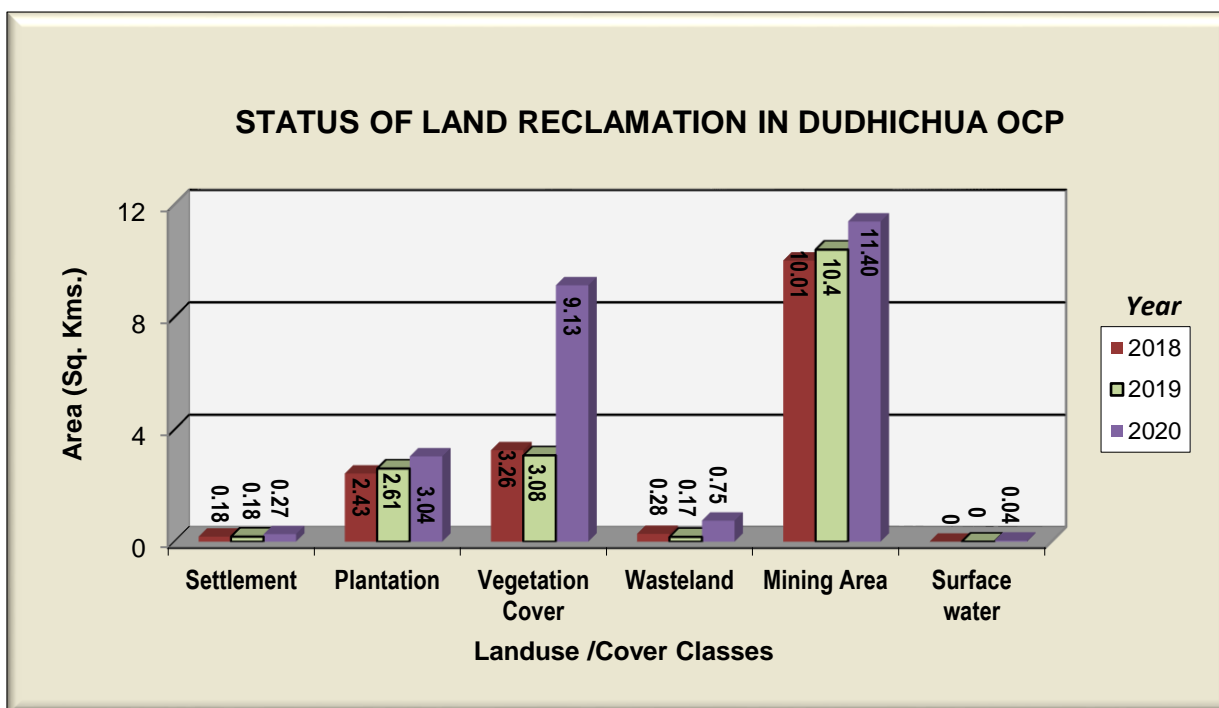


Figure 7.5

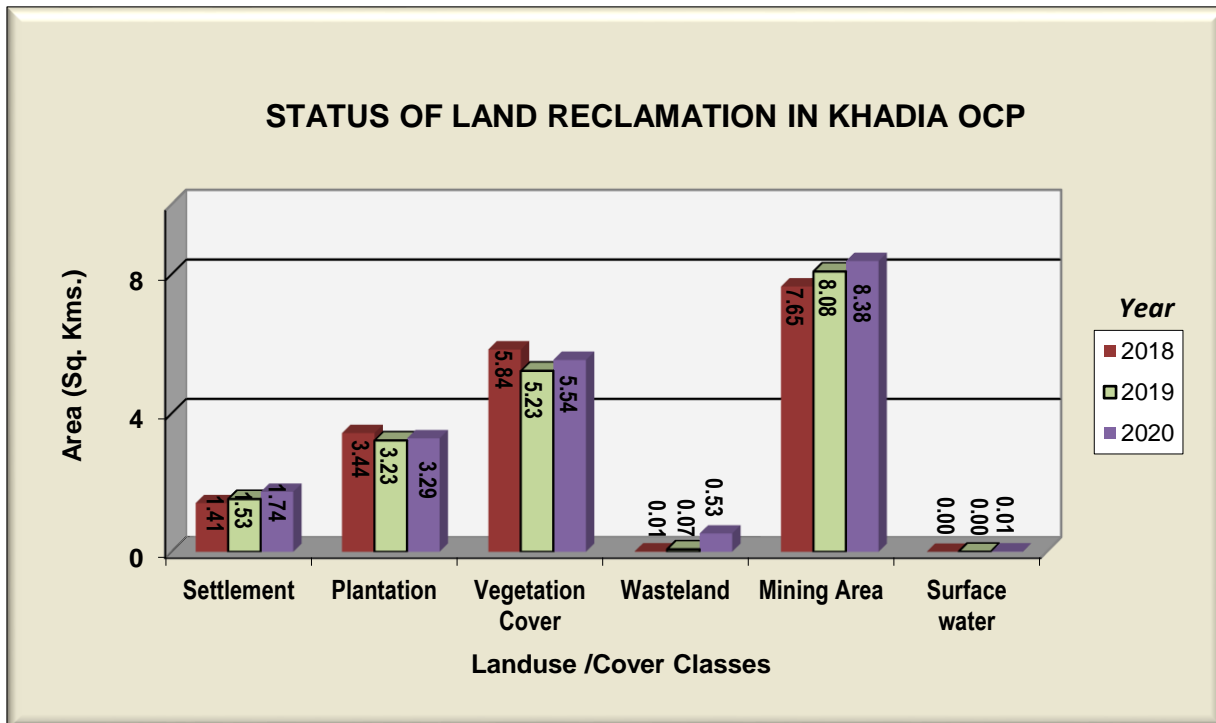


Figure 7.6

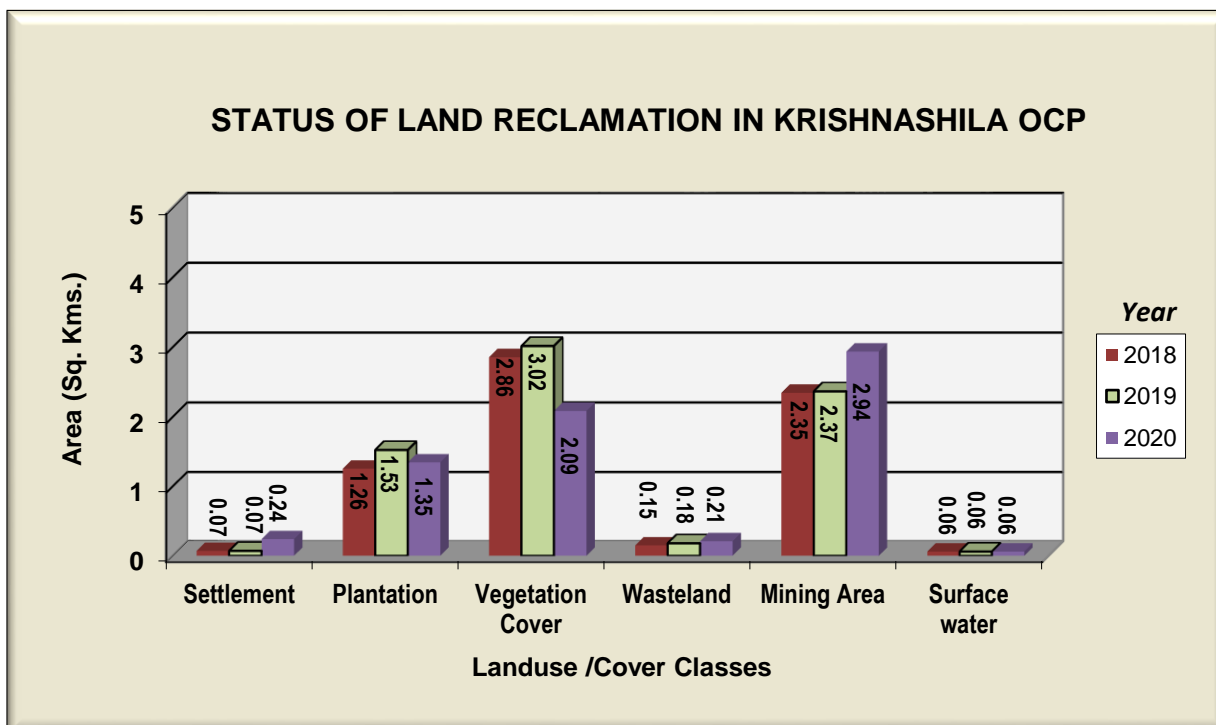


Figure 7.7

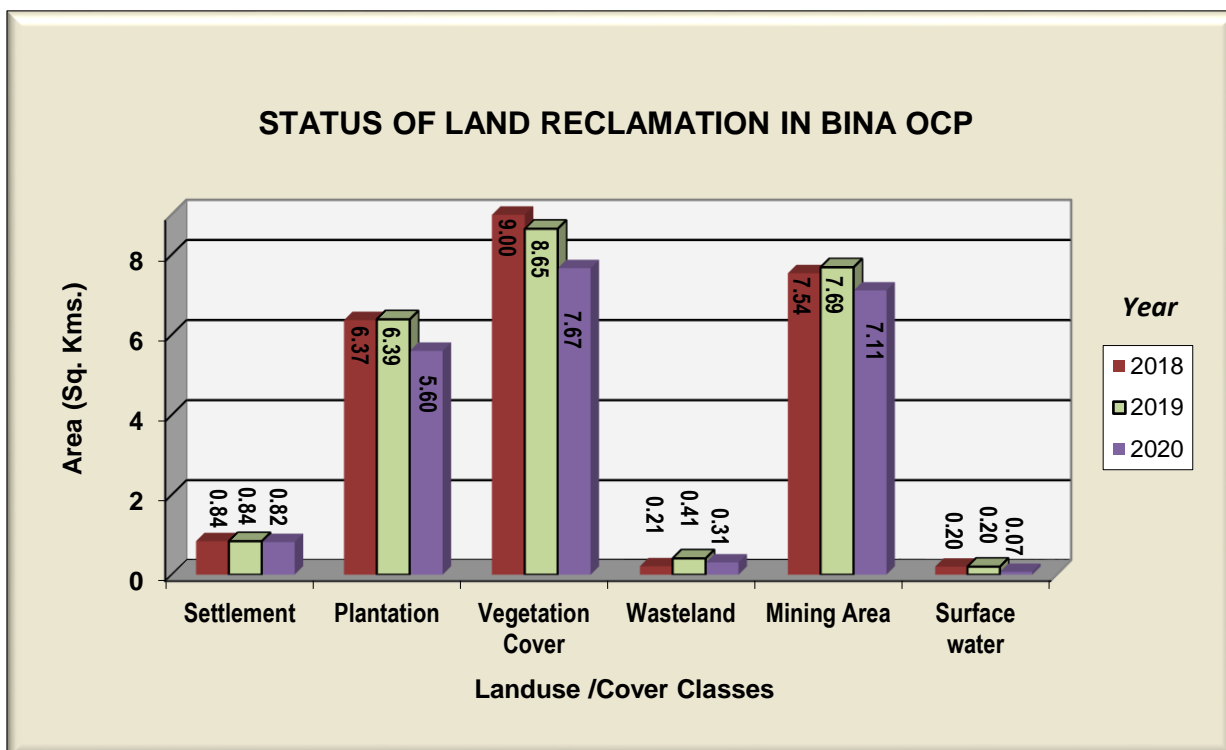


Figure 7.8

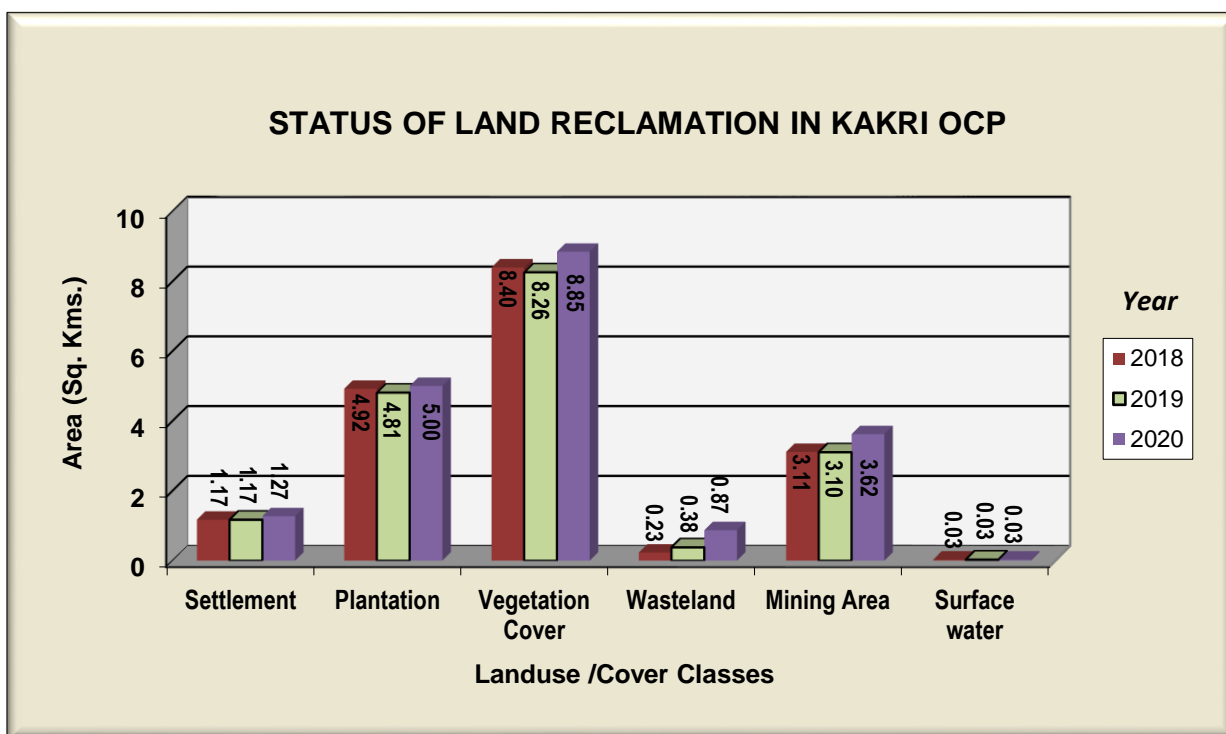


Figure 7.9

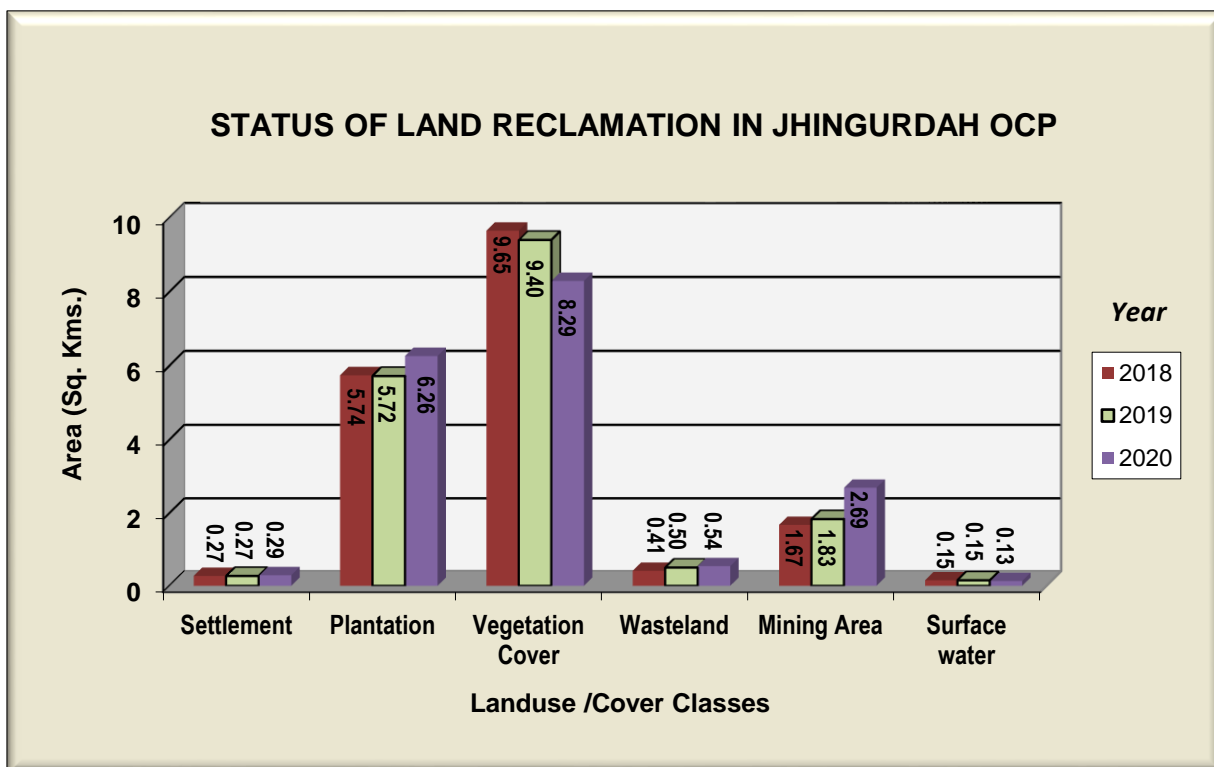


Figure 7.10

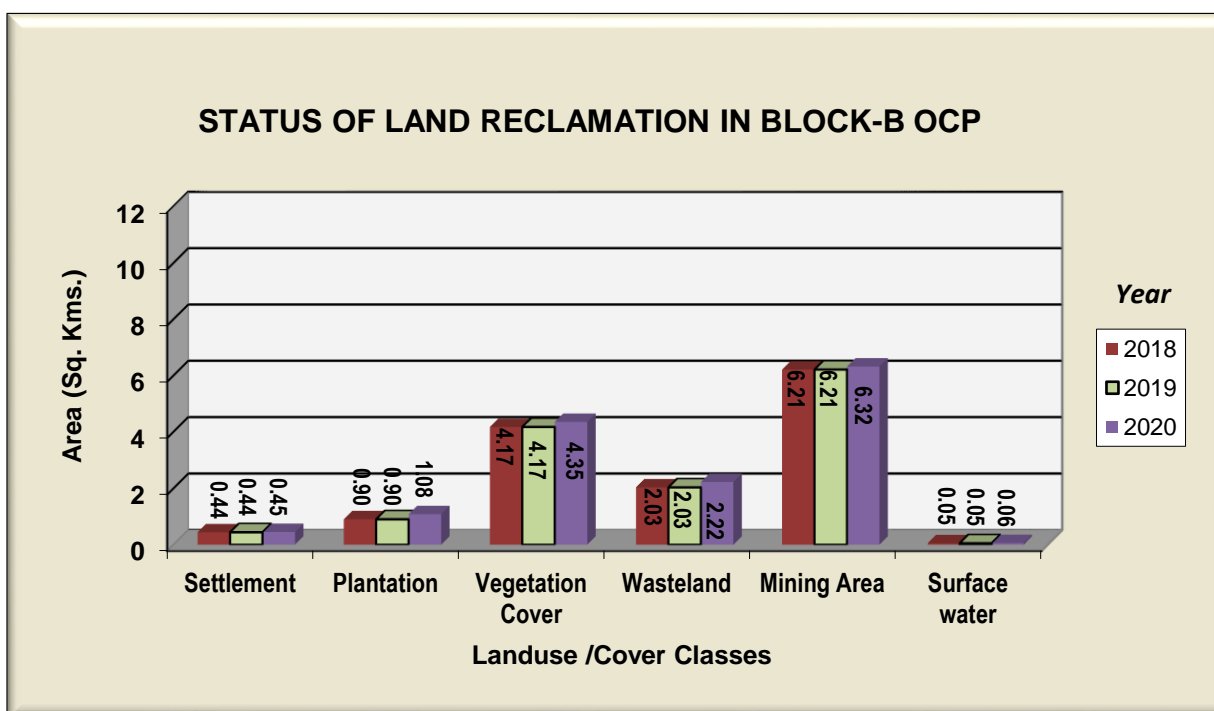


Figure 7.11



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



Photograph 7.2: Nigahi OCP- Plantation growing on the slopes of OB done



Photograph 7.3: Jayant OCP- Plantation done on Jayant OCP



Photograph 7.4: **Dudhichua OCP- Plantation done on Dudhichua OCP**



Photograph 7.5: **Khadia OCP- Plantation done on KHADIA OCP**



Photograph 7.6: **Krishnashila OCP- Plantation done on Krishnashila OCP**



Photograph 7.7: **Bina OCP- Plantation done on Bina OCP**



Photograph 7.8: **Kakri OCP- Plantation done on Kakri OCP**



Photograph 7.9: Plantation at Jhingurdah OCP



Photograph 7.10: Block-B OCP- Plantation done on Block-B OCP

MAHANADI COALFIELDS LIMITED

8.0 Land Reclamation Status in Mahanadi Coalfields Limited

8.1 Following fourteen opencast projects of MCL producing more than 5 million cubic meter and more (Coal + OB) were taken up for land reclamation monitoring based on satellite data of the year 2020 :

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

8.2 Project wise Land Reclamation status in MCL for the year 2020 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 2020-21 are shown in the Table -8.2 (in two parts). Land use maps derived from satellite data are shown in Plate 8.1 – 8.14. 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. 8.2–8.15 for the last three years only.

- 8.3** From the year 2020-2021 Garjanbahal OCP has been considered in more than 5mcm (Coal+OB) category and will be monitored each year. Previously it was in less than 5 mcm (Coal+OB) category and was monitored in an interval of 3 years. The leasehold boundaries of Balram, Bharatpur, Bhubaneswari, Samleswari and Lajkura project have been modified as per latest EC (Refer Table 8.1).
- 8.4** Study reveals that out of total 50.97 Km² excavated area; 32.93 Km² area (64.61%) is under reclamation. Out of which 8.37 Km² (16.42%) area has been re-vegetated (Biologically Reclaimed) and 24.56 Km² (48.19%) area is under backfilling (under Technical Reclamation).
- 8.5** Total Area under active mining has increased from 16.91 (Yr. 2019) to 18.04 (Yr. 2020). However, in some projects it has reduced due to increase in area under backfilling.
- 8.6** Analysis of satellite data indicates that area of plantation on backfill (Biological Reclamation) has increased from 8.26Km² (Yr.2019) to 8.37 Km² (Yr. 2020). This increase is due to the efforts of the Mahanadi Coalfields Ltd. taken up towards environmental protection. . Plantation on backfill has marginally reduced in Belpahar and Lajkura because of fresh backfilling on vegetated area.
- 8.7** Plantation on OB dump has marginally reduced in Ananta OCP due to construction of road and in Balram OCP due to updating of mine boundary. Area of Social forestry has reduced marginally in some projects due to mine advancement.
- 8.8** Study also reveals that area under barren backfilling (Technical Reclamation) has increased from 22.74 Km² in 2019 to 24.56 Km² in 2020. All the 14 projects of MCL selected for monitoring are showing an increasing trend in technical reclamation.
- 8.9** It was also observed that overall total area under plantation (Green Cover) has increased from 14.87 Km² in 2019 to 15.44 Km² in 2020 (Refer Total (B) in Table 8.1).

Green Cover has reduced in some projects of MCL due to change in mine boundary and reduction in social forestry in the leasehold areas resulting from mine advancement.

- 8.10** On comparing the status of land reclamation for the year 2020 with respect to the year 2019 in different projects, it is evident that area of land reclamation has increased from 31.00 Km² (Yr. 2019) to 32.93 Km² (Yr.2020).
- 8.11** Out of 14 projects of MCL, Balram OC ranks on top for land reclamation (78.94%) followed by Samleswari OC (74.13%) and Jagannath OC (73.06%).

Table – 8.1

Project wise Land Reclamation Status in Opencast Projects of MCL based on Satellite Data of the year 2020

				Technical Reclamation		Plantation						Area Under Active Mining		Total Excavated Area		Total Area Under Plantation (%Green Cover Generated in Leasehold)		Total Area Under Reclamation		(Area in Sq.km.)
Sl. No.	Project	Total Leasehold Area 2019	Total Leasehold Area 2020			Biological Reclamation		Other Plantation												
				Area under Backfilling		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)		
1	Ananta	14.20	14.20	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	
				2.35	2.40	1.02	1.05	0.11	0.10	0.23	0.22	1.18	1.45	4.55	4.90	1.36	1.37	3.37	3.45	
2	Balram	10.21	13.09	51.65%	48.98%	22.42%	21.43%					25.93%	29.59%			9.58%	9.65%	74.07%	70.41%	
				2.52	2.80	1.03	1.06	0.23	0.22	0.20	0.35	0.95	1.03	4.50	4.89	1.46	1.63	3.55	3.86	
3	Lingaraj	7.26	7.26	56.00%	57.26%	22.89%	21.68%					21.11%	21.06%			14.30%	12.45%	78.89%	78.94%	
				1.44	1.70	0.15	0.15	0.32	0.32	0.34	0.33	2.27	2.19	3.86	4.04	0.81	0.80	1.59	1.85	
4	Bharatpur	9.95	9.27	37.31%	42.08%	3.89%	3.71%					58.81%	54.21%			11.16%	11.02%	41.19%	45.79%	
				2.57	2.63	1.65	1.66	0.45	0.45	0.17	0.16	1.65	1.66	5.87	5.95	2.27	2.27	4.22	4.29	
5	Bhubaneswari	7.33	6.58	43.78%	44.20%	28.11%	27.90%					28.11%	27.90%			22.81%	24.49%	71.89%	72.10%	
				1.81	1.86	0.01	0.01	0.00	0.00	0.24	0.15	1.82	1.77	3.64	3.64	0.25	0.16	1.82	1.87	
6	Jagannath	5.54	5.54	49.73%	51.10%	0.27%	0.27%					50.00%	48.63%			3.41%	2.43%	50.00%	51.37%	
				0.76	0.84	1.79	1.79	0.00	0.00	0.17	0.17	1.01	0.97	3.56	3.60	1.96	1.96	2.55	2.63	
7	Hingula	15.75	15.75	21.35%	23.33%	50.28%	49.72%					28.37%	26.94%			35.38%	35.38%	71.63%	73.06%	
				1.33	1.48	0.06	0.07	0.21	0.21	0.28	0.28	1.75	2.02	3.14	3.57	0.55	0.56	1.39	1.55	
8	Belpahar	14.44	14.44	42.36%	41.46%	1.91%	1.96%					55.73%	56.58%			3.49%	3.56%	44.27%	43.42%	
				1.79	2.36	0.91	0.90	0.57	0.57	0.52	0.52	1.67	1.33	4.37	4.59	2.00	1.99	2.70	3.26	
9	Lakhanpur	22.40	22.40	40.96%	51.42%	20.82%	19.61%					38.22%	28.98%			13.85%	13.78%	61.78%	71.02%	
				4.12	4.32	0.80	0.83	0.59	0.59	0.45	0.44	2.51	2.99	7.43	8.14	1.84	1.86	4.92	5.15	
10	Samleswari	7.13	13.35	55.45%	53.07%	10.77%	10.20%					33.78%	36.73%			8.21%	8.30%	66.22%	63.27%	
				2.90	2.94	0.68	0.70	0.48	0.49	0.16	0.50	1.26	1.27	4.84	4.91	1.32	1.69	3.58	3.64	
11	Lajkura	4.68	7.21	59.92%	59.88%	14.05%	14.26%					26.03%	25.87%			18.51%	12.66%	73.97%	74.13%	
				1.15	1.20	0.16	0.15	0.22	0.23	0.06	0.16	0.84	0.89	2.15	2.24	0.44	0.54	1.31	1.35	
12	Siarmal	22.90	22.90	53.49%	53.57%	7.44%	6.70%					39.07%	39.73%			9.40%	7.49%	60.93%	60.27%	
				0.00	0.00	0.00	0.00	0.00	0.00	0.56	0.56	0.00	0.00	0.00	0.00	0.56	0.56	0.00	0.00	
13	Basundhara W Extn.	3.23	3.23	0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			2.45%	2.45%	-	-	
				0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	0.00	0.00	0.03	0.03	0.00	0.00	
	Total (A)	145.02	155.22	0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.93%	0.93%	-	-	
				47.46%	48.60%	17.24%	16.58%	3.18	3.18	3.41	3.87	16.91	17.57	47.91	50.47	14.85	15.42	31.00	32.90	
14	Garjanbahal	2018	2020	47.46%	48.60%	17.24%	16.58%					35.30%	34.81%			10.24%	9.93%	64.70%	65.19%	
				6.54	6.54	2018	2020	2018	2020	2018	2020	2018	2020	2018	2020	2018	2020	2018	2020	
	Total (B) (MCL)	151.56	161.76	0.00	0.03	0.00	0.00	0.00	0.00	0.02	0.02	0.00	0.47	0.00	0.50	0.02	0.02	0.00	0.03	
				0.00%	6.00%	0.00%	0.00%	3.18	3.18	3.43	3.89	16.91	18.04	47.91	50.97	0.31%	0.31%	0.00%	6.00%	
				47.46%	48.19%	17.24%	16.42%					35.30%	35.39%			9.81%	9.55%	64.70%	64.61%	

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".

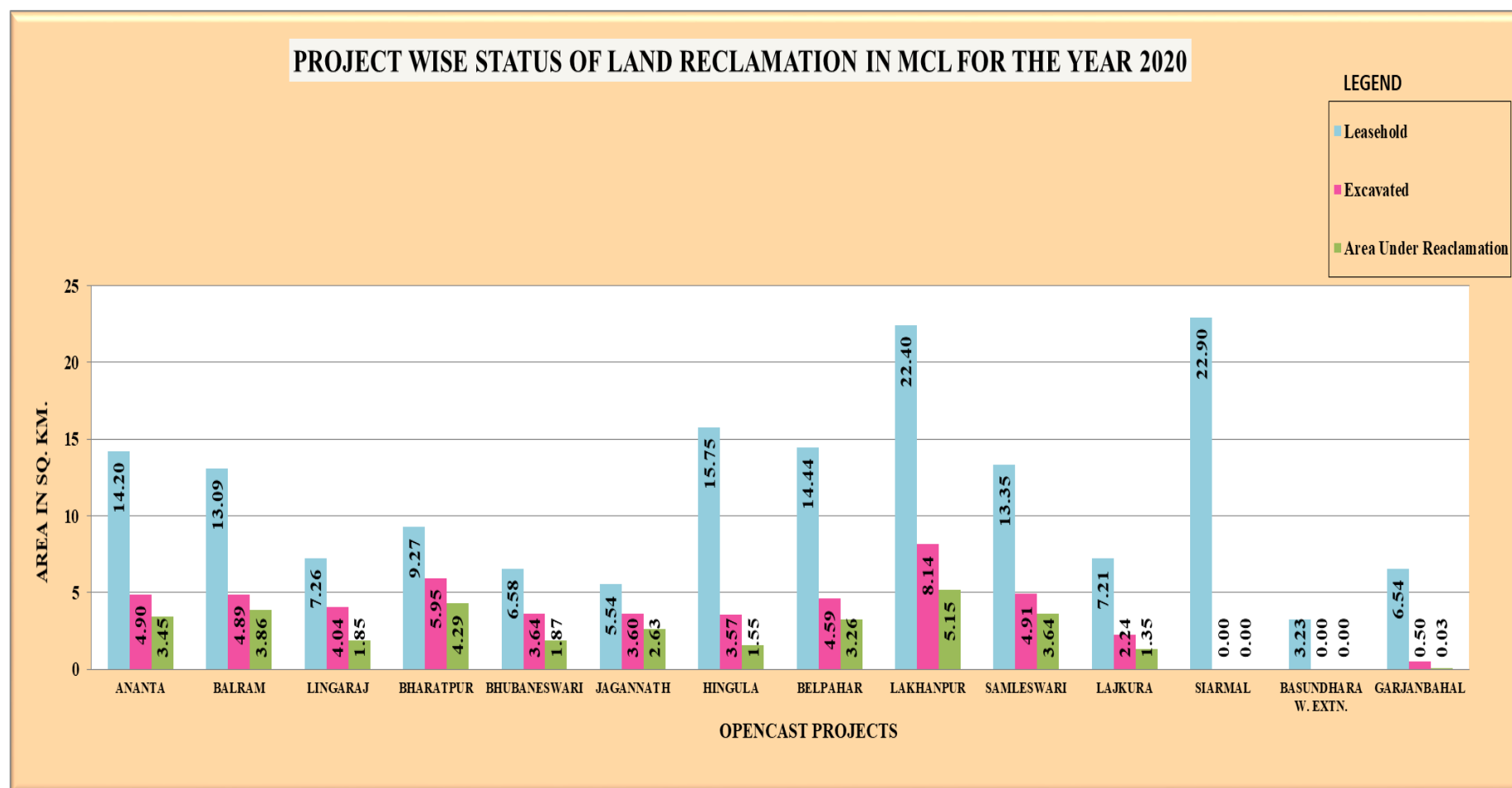


Fig.8.1: Land reclamation status in OC projects of MCL in the year 2020

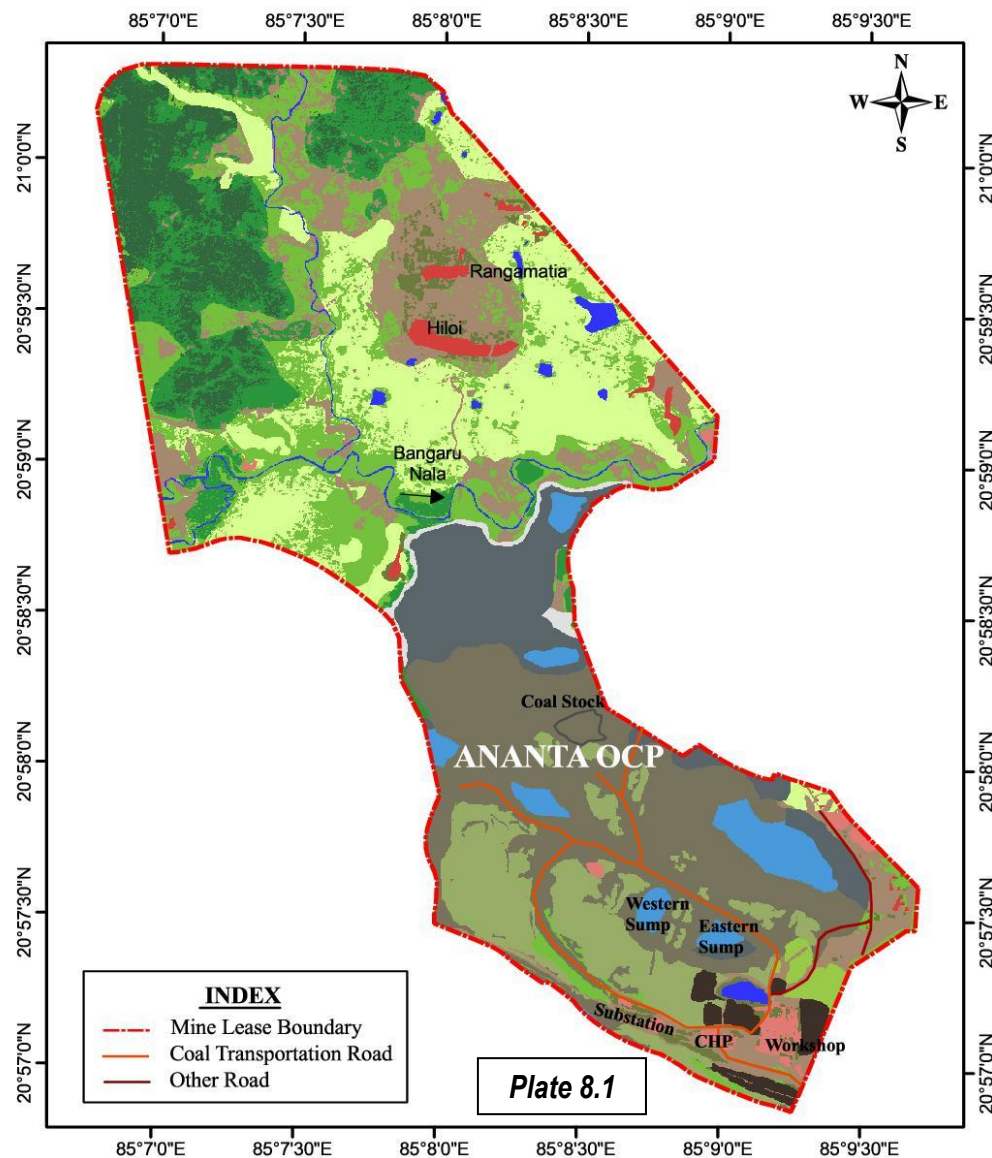
Table 8.2A

Project wise Area Statistics of Land Use / Cover in OC Mines (> 5 mcu.m.) of MCL based on Satellite data of the Year 2020

(Area in Sq. Kms.)																	
		ANANTA		BALRAM		LINGARAJ		BHARATPUR		BHUBANESHWARI		JAGANNATH		HINGULA		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	1.01	7.11	0.00	0.00	0.00	0.00	0.01	0.11	0.00	0.00	0.00	0.00	1.18	7.49	2.20	3.07
	Open Forest	1.21	8.52	0.57	4.35	0.03	0.41	0.00	0.00	0.37	5.62	0.04	0.72	1.63	10.35	3.85	5.37
	Total Forest (A)	2.22	15.63	0.57	4.35	0.03	0.41	0.01	0.11	0.37	5.62	0.04	0.72	2.81	17.84	6.05	8.44
SCRUBS	Scrubs (B)	2.07	14.58	2.44	18.64	0.56	7.71	0.53	5.72	0.65	9.88	0.32	5.78	3.38	21.46	9.95	13.88
PLANTATION	Social Forestry	0.22	1.55	0.35	2.67	0.33	4.55	0.16	1.73	0.15	2.28	0.17	3.07	0.28	1.78	1.66	2.32
	Plantation on External OB Dump	0.10	0.70	0.22	1.68	0.32	4.41	0.45	4.85	0.00	0.00	0.00	0.00	0.21	1.33	1.30	1.81
	Plantation on Backfill/Excavated Area(Biological Reclamation)	1.05	7.39	1.06	8.10	0.15	2.07	1.66	17.91	0.01	0.15	1.79	32.31	0.07	0.44	5.79	8.08
	Total Plantation (Green Cover) (C)	1.37	9.65	1.63	12.45	0.80	11.02	2.27	24.49	0.16	2.43	1.96	35.38	0.56	3.56	8.75	12.21
	Total Vegetation (A+B+C)	5.66	39.86	4.64	35.45	1.39	19.15	2.81	30.31	1.18	17.93	2.32	41.88	6.75	42.86	24.76	34.52
ACTIVE MINING	Coal Dump	0.18	1.27	0.24	1.83	0.11	1.52	0.15	1.62	0.00	0.00	0.09	1.62	0.37	2.35	1.14	1.59
	Coal Quarry	0.96	6.76	0.65	4.97	1.78	24.52	0.85	9.17	1.36	20.67	0.31	5.60	0.82	5.21	6.73	9.39
	Advance Quarry Site	0.09	0.63	0.03	0.23	0.20	2.75	0.11	1.19	0.24	3.65	0.05	0.90	0.19	1.21	0.91	1.27
	Quarry Filled with Water	0.40	2.82	0.35	2.67	0.21	2.89	0.70	7.55	0.17	2.58	0.61	11.01	1.01	6.41	3.45	4.81
	Total Area under Active Mining	1.45	10.21	1.03	7.87	2.19	30.17	1.66	17.91	1.77	26.90	0.97	17.51	2.02	12.83	11.09	15.47
	Barren OB dump	0.00	0.00	0.13	0.99	0.50	6.89	0.05	0.54	0.79	12.01	0.00	0.00	0.28	1.78	1.75	2.44
	Area Under Backfilling(Technical Reclamation)	2.40	16.90	2.80	21.39	1.70	23.42	2.63	28.37	1.86	28.27	0.84	15.16	1.48	9.40	13.71	19.12
	Total Area under Mine Operation	4.03	28.38	4.20	32.09	4.50	61.98	4.49	48.44	4.42	67.17	1.90	34.30	4.15	26.35	27.69	37.03
WASTELANDS	Waste Lands	1.81	12.75	1.13	8.63	0.70	9.64	0.83	8.95	0.44	6.69	0.49	8.84	1.83	11.62	7.23	10.09
	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	0.38	0.17	0.24
	Total Wastelands	1.81	12.75	1.13	8.63	0.70	9.64	0.83	8.95	0.44	6.69	0.60	10.83	1.89	12.00	7.40	10.32
WATER	Reservoir, nallah, ponds etc.	0.18	1.27	0.26	1.99	0.05	0.69	0.05	0.54	0.03	0.46	0.05	0.90	0.33	2.10	0.95	1.33
	Total Waterbodies	0.18	1.27	0.26	1.99	0.05	0.69	0.05	0.54	0.03	0.46	0.05	0.90	0.33	2.10	0.95	1.33
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
	Fallow Lands	2.25	15.85	2.13	16.27	0.36	4.96	0.82	8.85	0.43	6.53	0.51	9.21	2.38	15.11	8.88	12.39
	Total Agriculture	2.25	15.85	2.13	16.27	0.36	4.96	0.82	8.85	0.43	6.53	0.51	9.21	2.38	15.11	8.88	12.39
SETTLEMENTS	Urban Settlement	0.00	0.00	0.02	0.15	0.02	0.28	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.05	0.07
	Rural Settlement	0.13	0.92	0.31	2.37	0.05	0.69	0.04	0.43	0.06	0.91	0.05	0.90	0.22	1.40	0.86	1.20
	Industrial Settlement	0.14	0.99	0.40	3.06	0.19	2.62	0.23	2.48	0.02	0.30	0.11	1.99	0.02	0.13	1.11	1.55
	Total Settlements	0.27	1.90	0.73	5.58	0.26	3.58	0.27	2.91	0.08	1.22	0.16	2.89	0.25	1.59	2.02	2.82
GRAND TOTAL		14.20	100.00	13.09	100.00	7.26	100.00	9.27	100.00	6.58	100.00	5.54	100.00	15.75	100.00	71.69	100.00

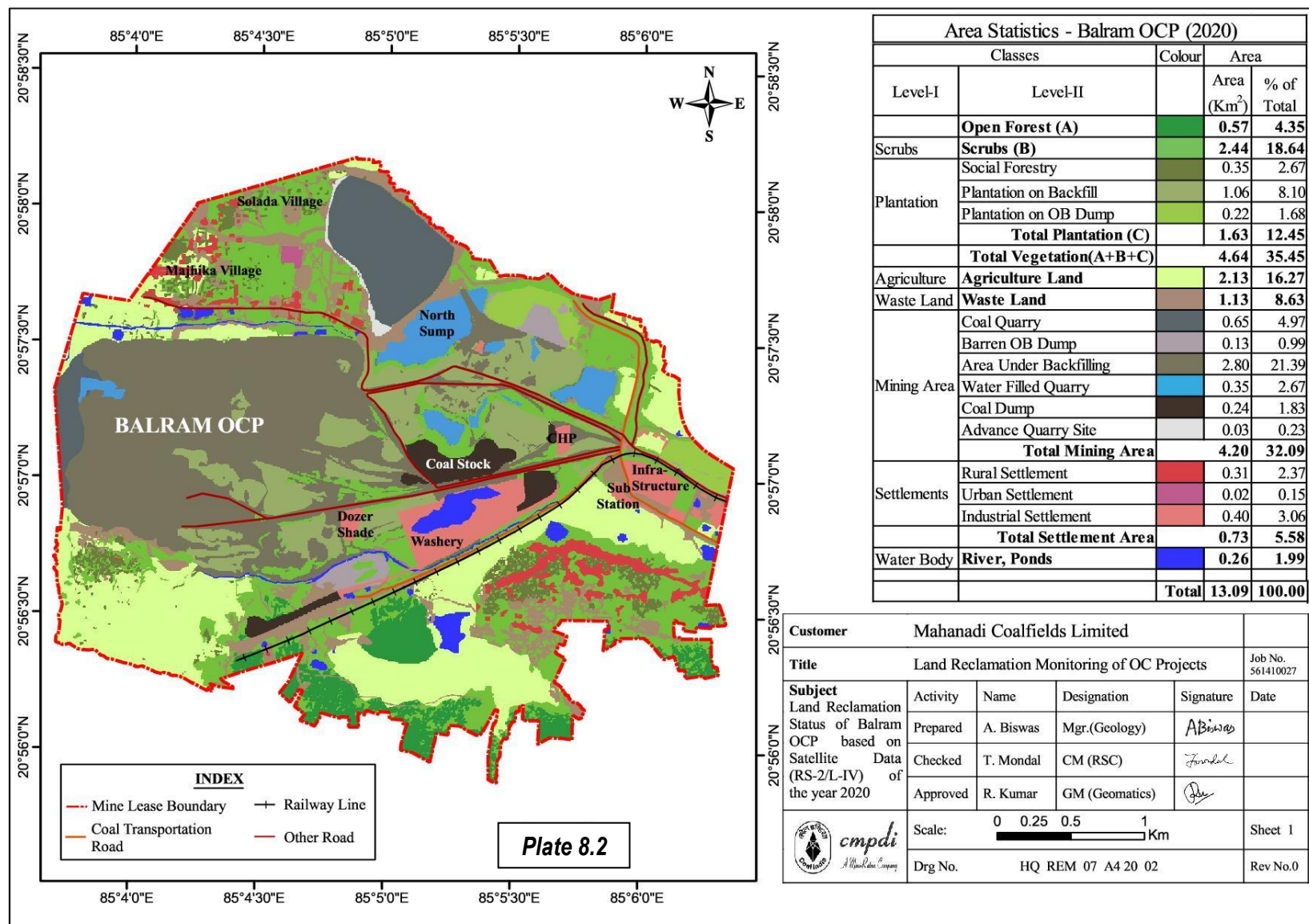
Table 8.2B

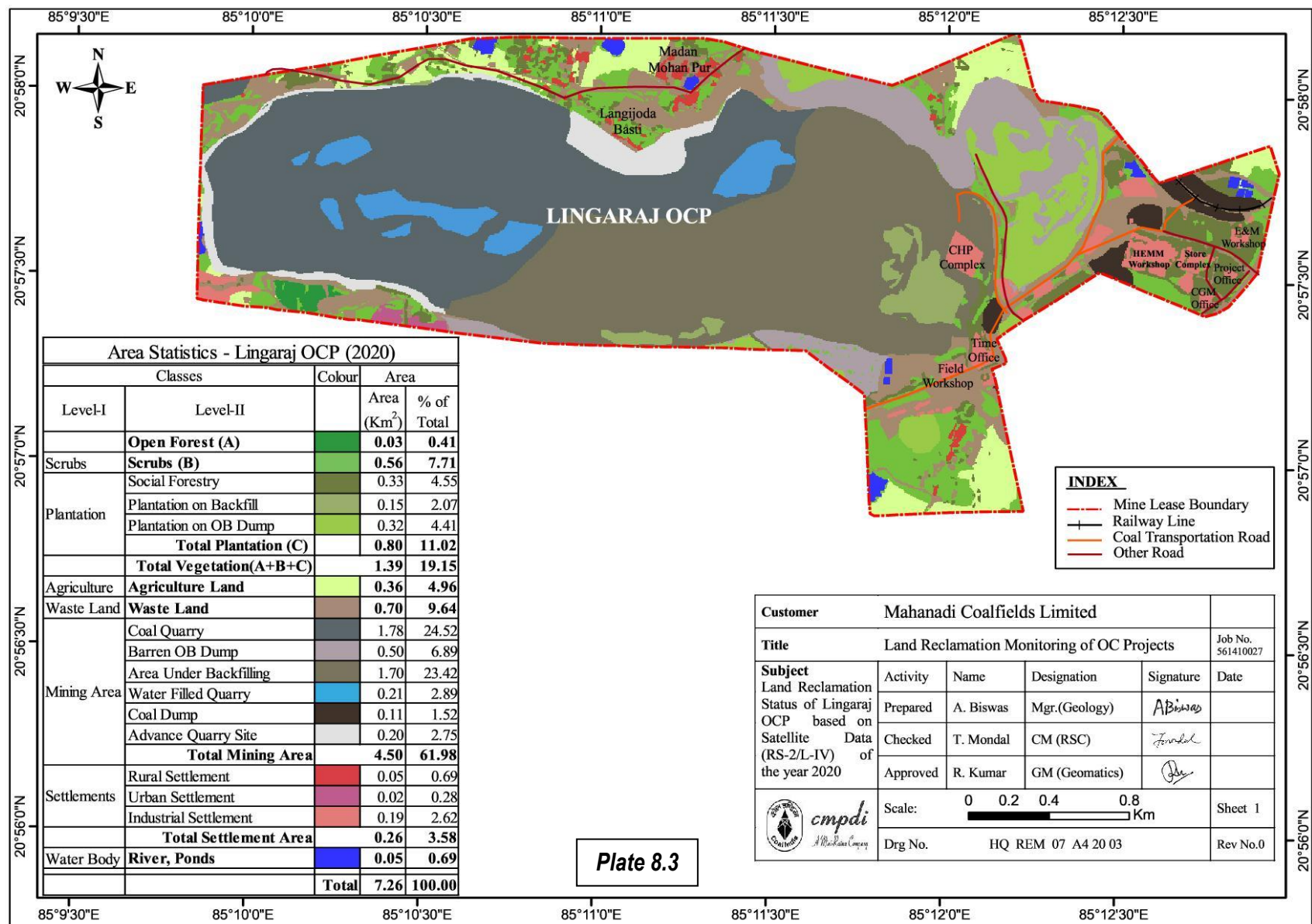
		(Area in Sq. Kms.)																	
		BELPAHAR		LAKHANPUR		SAMLESWARI		LAJKURA		SIARMAL		BASUNDHARA W EXTN		GARJANBAHAL		TOTAL		ALL TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	1.48	6.61	0.21	1.57	0.79	10.96	0.00	0.00	0.00	0.00	0.51	7.79	2.99	3.32	5.19	3.21
	Open Forest	0.91	6.30	2.45	10.94	0.56	4.19	0.74	10.26	0.85	3.71	0.79	24.46	0.75	11.46	7.05	7.83	10.90	6.74
	Total Forest (A)	0.91	6.30	3.93	17.54	0.77	5.77	1.53	21.22	0.85	3.71	0.79	24.46	1.26	19.25	10.04	11.15	16.09	9.95
SCRUBS	Scrubs (B)	3.46	23.96	2.78	12.41	2.61	19.55	1.05	14.56	7.27	31.75	1.36	42.11	1.18	18.03	19.71	21.88	29.66	18.34
PLANTATION	Social Forestry	0.52	3.60	0.44	1.96	0.50	3.74	0.16	2.22	0.56	2.45	0.03	0.93	0.02	0.31	2.23	2.48	3.89	2.40
	Plantation on External OB Dump	0.57	3.95	0.59	2.63	0.49	3.67	0.23	3.19	0.00	0.00	0.00	0.00	0.00	0.00	1.88	2.09	3.18	1.97
	Plantation on Backfill/Excavated Area(Biological Reclamation)	0.90	6.23	0.83	3.71	0.70	5.24	0.15	2.08	0.00	0.00	0.00	0.00	0.00	0.00	2.58	2.86	8.37	5.17
	Total Plantation (Green Cover) (C)	1.99	13.78	1.86	8.30	1.69	12.66	0.54	7.49	0.56	2.45	0.03	0.93	0.02	0.31	6.69	7.43	15.44	9.55
Total Vegetation (A+B+C)		6.36	44.04	8.57	38.26	5.07	37.97	3.12	43.27	8.68	37.90	2.18	67.49	2.46	37.59	36.44	40.45	61.20	37.83
ACTIVE MINING	Coal Dump	0.11	0.76	0.14	0.63	0.19	1.42	0.07	0.97	0.00	0.00	0.00	0.00	0.22	3.36	0.73	0.81	1.87	1.16
	Coal Quarry	0.99	6.86	2.32	10.36	0.81	6.07	0.75	10.40	0.00	0.00	0.00	0.00	0.36	5.50	5.23	5.81	11.96	7.39
	Advance Quarry Site	0.09	0.62	0.38	1.70	0.14	1.05	0.10	1.39	0.00	0.00	0.00	0.00	0.11	1.68	0.82	0.91	1.73	1.07
	Quarry Filled with Water	0.25	1.73	0.29	1.29	0.32	2.40	0.04	0.55	0.00	0.00	0.00	0.00	0.004	0.07	0.90	1.00	4.35	2.69
	Total Area under Active Mining	1.33	9.21	2.99	13.35	1.27	9.51	0.89	12.34	0.00	0.00	0.00	0.00	0.47	7.25	6.95	7.72	18.04	11.16
	Barren OB dump	0.13	0.90	0.02	0.09	0.07	0.52	0.13	1.80	0.00	0.00	0.00	0.00	0.30	4.58	0.65	0.72	2.40	1.48
	Area Under Backfilling(Technical Reclamation)	2.36	16.34	4.32	19.29	2.94	22.02	1.20	16.64	0.00	0.00	0.00	0.00	0.03	0.46	10.85	12.05	24.56	15.18
	Total Area under Mine Operation	3.93	27.22	7.47	33.35	4.47	33.48	2.29	31.76	0.00	0.00	0.00	0.00	1.02	15.65	19.18	20.49	46.87	28.98
WASTELANDS	Waste Lands	2.70	18.70	1.71	7.63	2.02	15.13	0.95	13.18	1.86	8.12	0.62	19.20	0.49	7.49	10.35	11.49	17.58	10.87
	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	0.00	0.00	0.00	0.00	0.00	0.00	0.17	0.11
	Total Wastelands	2.70	18.70	1.71	7.63	2.02	15.13	0.95	13.18	1.86	8.12	0.62	19.20	0.49	7.49	10.35	11.49	17.75	10.97
WATER	Reservoir, nallah, ponds etc.	0.25	1.73	0.28	1.25	0.17	1.27	0.07	0.97	0.22	0.96	0.03	0.93	0.06	0.92	1.08	1.20	2.03	1.25
	Total Waterbodies	0.25	1.73	0.28	1.25	0.17	1.27	0.07	0.97	0.22	0.96	0.03	0.93	0.06	0.92	1.08	1.2	2.03	1.25
AGRICULTURE	Crop Lands	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.91	8.34	0.00	0.00	0.00	0.00	1.91	2.12	1.91	1.18
	Fallow Lands	0.63	4.36	4.01	17.90	1.20	8.99	0.55	7.63	9.52	41.57	0.38	11.76	2.30	35.14	18.59	20.64	27.47	16.98
	Total Agriculture	0.63	4.36	4.01	17.90	1.20	8.99	0.55	7.63	11.43	49.91	0.38	11.76	2.30	35.14	20.50	22.76	29.38	18.16
SETTLEMENTS	Urban Settlement	0.02	0.14	0.00	0.00	0.003	0.02	0.08	1.11	0.02	0.09	0.00	0.00	0.00	0.00	0.12	0.14	0.17	0.11
	Rural Settlement	0.17	1.18	0.14	0.63	0.21	1.57	0.03	0.42	0.69	3.01	0.02	0.62	0.07	1.07	1.33	1.48	2.19	1.35
	Industrial Settlement	0.38	2.63	0.22	0.98	0.21	1.57	0.12	1.66	0.00	0.00	0.00	0.00	0.14	2.14	1.07	1.19	2.18	1.35
	Total Settlements	0.57	3.95	0.36	1.61	0.42	3.17	0.23	3.19	0.71	3.10	0.02	0.62	0.21	3.21	2.52	2.80	4.54	2.81
GRAND TOTAL		14.44	100.00	22.40	100.00	13.35	100.00	7.21	100.00	22.90	100.00	3.23	100.00	6.54	100.00	90.08	100.00	161.76	100.00

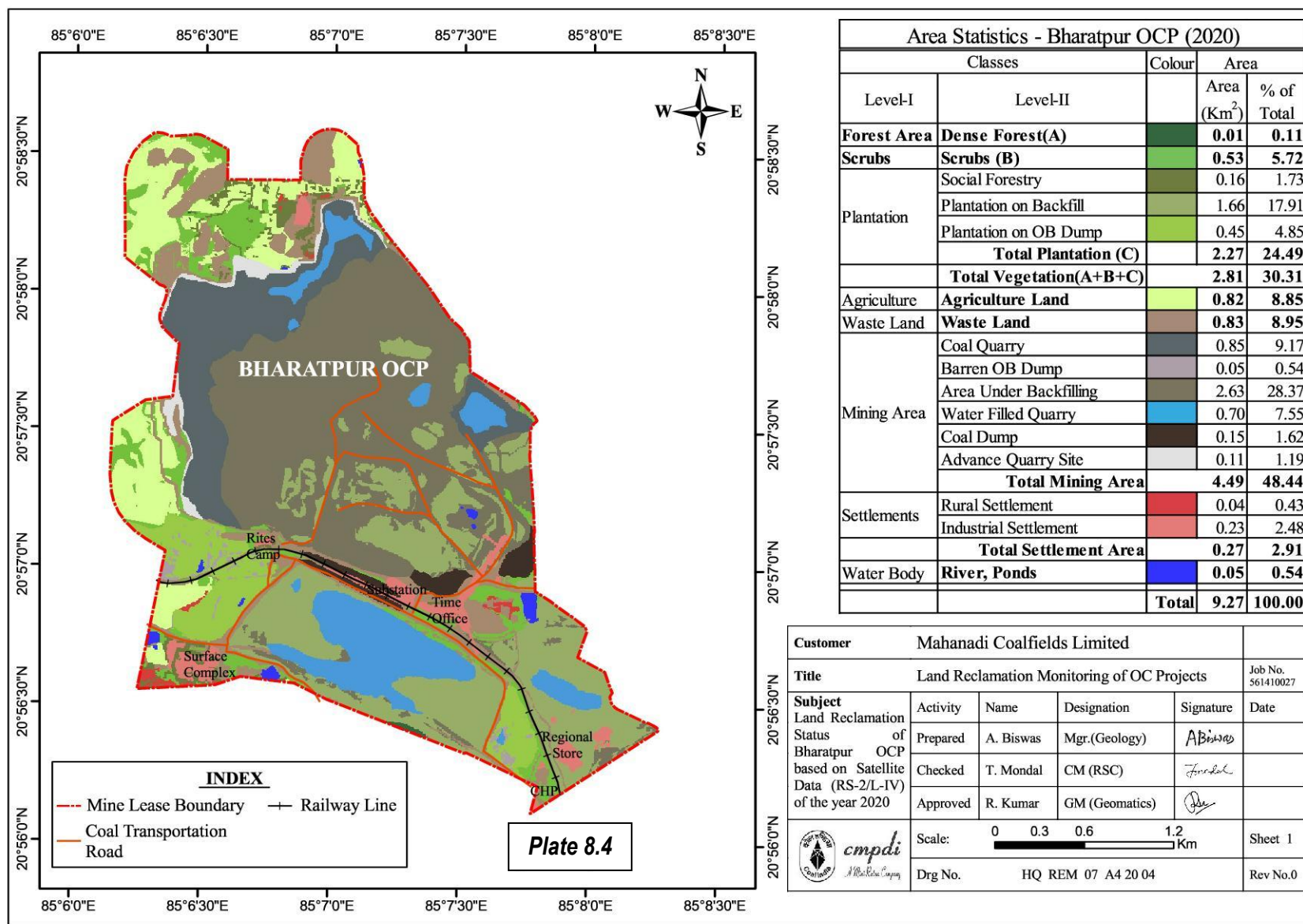


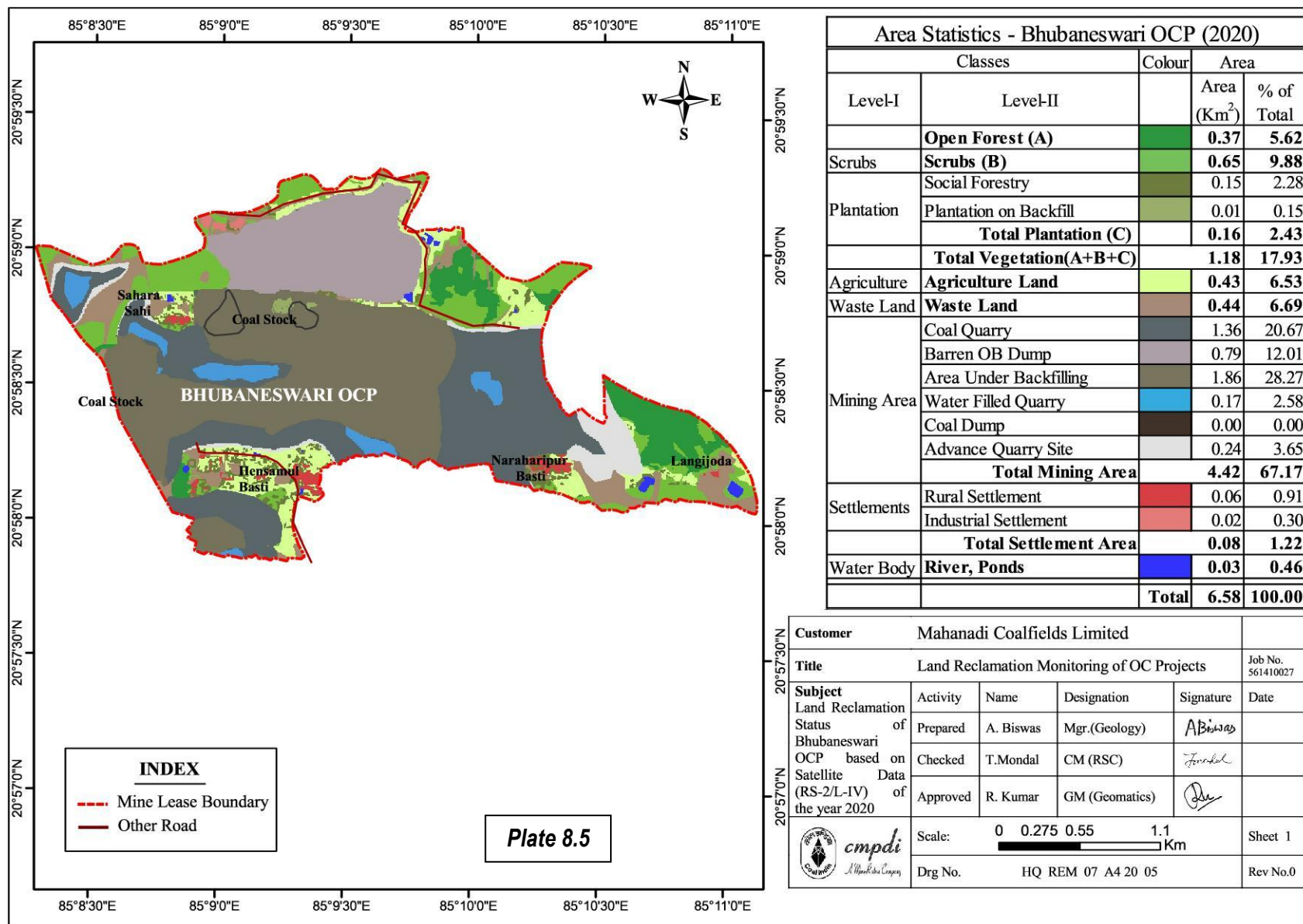
Area Statistics - Ananta OCP (2020)				
Classes		Colour	Area	
Level-I	Level-II		Area (Km ²)	% of Total
Forest Area	Dense Forest		1.01	7.11
	Open Forest		1.21	8.52
	Total Forest (A)		2.22	15.63
Scrubs	Scrubs (B)		2.07	14.58
Plantation	Social Forestry		0.22	1.55
	Plantation on Backfill		1.05	7.39
	Plantation on OB Dump		0.10	0.70
	Total Plantation (C)		1.37	9.65
	Total Vegetation(A+B+C)		5.66	39.86
Agriculture	Agriculture Land		2.25	15.85
Waste Land	Waste Land		1.81	12.75
Mining Area	Coal Quarry		0.96	6.76
	Area Under Backfilling		2.40	16.90
	Water Filled Quarry		0.40	2.82
	Coal Dump		0.18	1.27
	Advance Quarry Site		0.09	0.63
	Total Mining Area		4.03	28.38
Settlements	Rural Settlement		0.13	0.92
	Industrial Settlement		0.14	0.99
	Total Settlement Area		0.27	1.90
Water Body	River, Ponds		0.18	1.27
			Total	14.20
				100.00

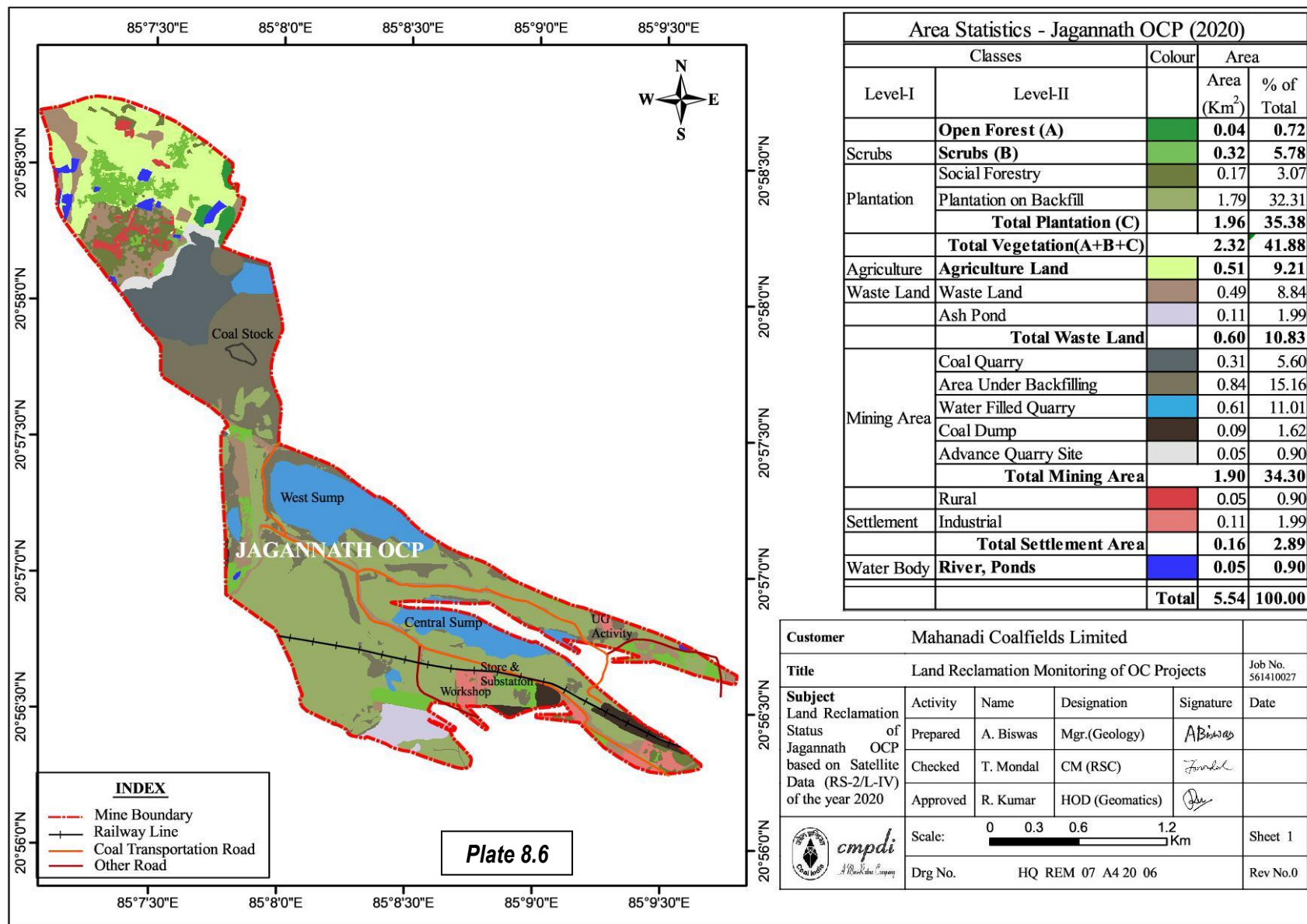
Customer					Mahanadi Coalfields Limited	
Title					Land Reclamation Monitoring of OC Projects	
Subject					Job No.	561410027
Land Reclamation Status of Ananta OCP based on Satellite Data (RS-2/L-IV) of the year 2020	Activity	Name	Designation	Signature	Date	
	Prepared	A. Biswas	Mgr.(Geology)	A. Biswas		
	Checked	T. Mondal	CM (RSC)	T. Mondal		
	Approved	R. Kumar	GM (Geomatics)	R. Kumar		
Scale:					0	0.45
					0.9	1.8
					Km	
Drg No.					HQ REM 07 A4 20 01	
Sheet					1	
Rev No.					0	

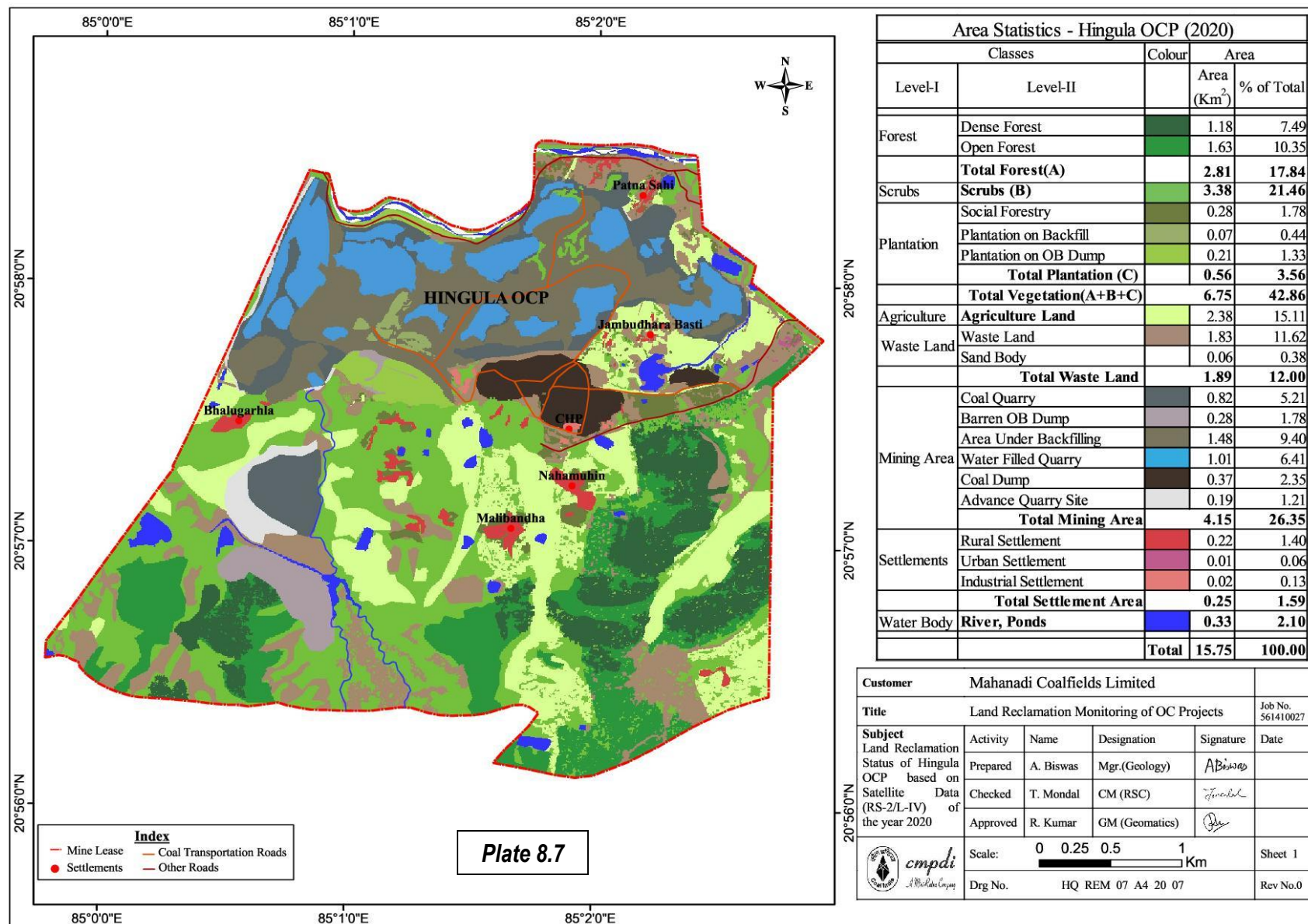




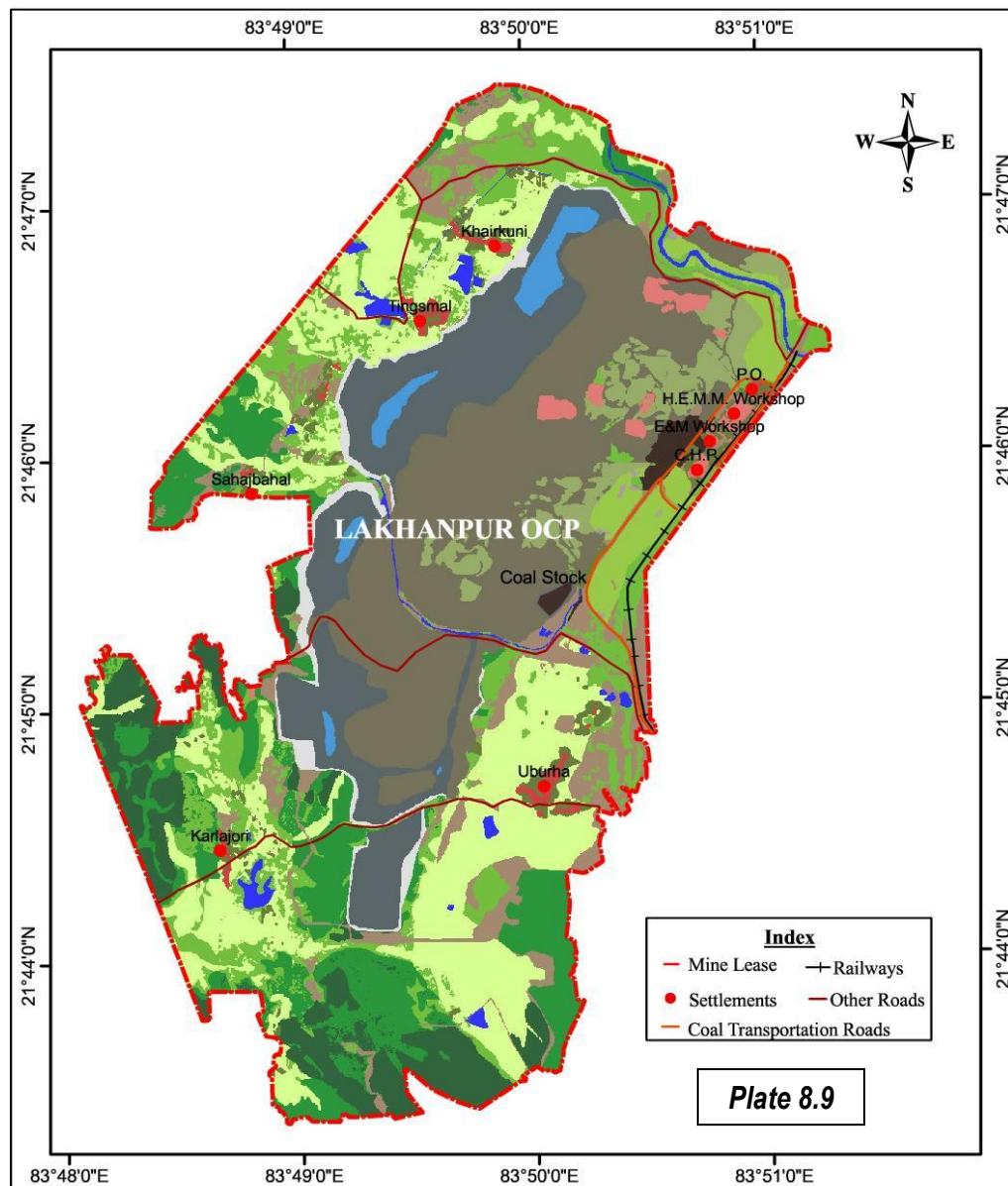






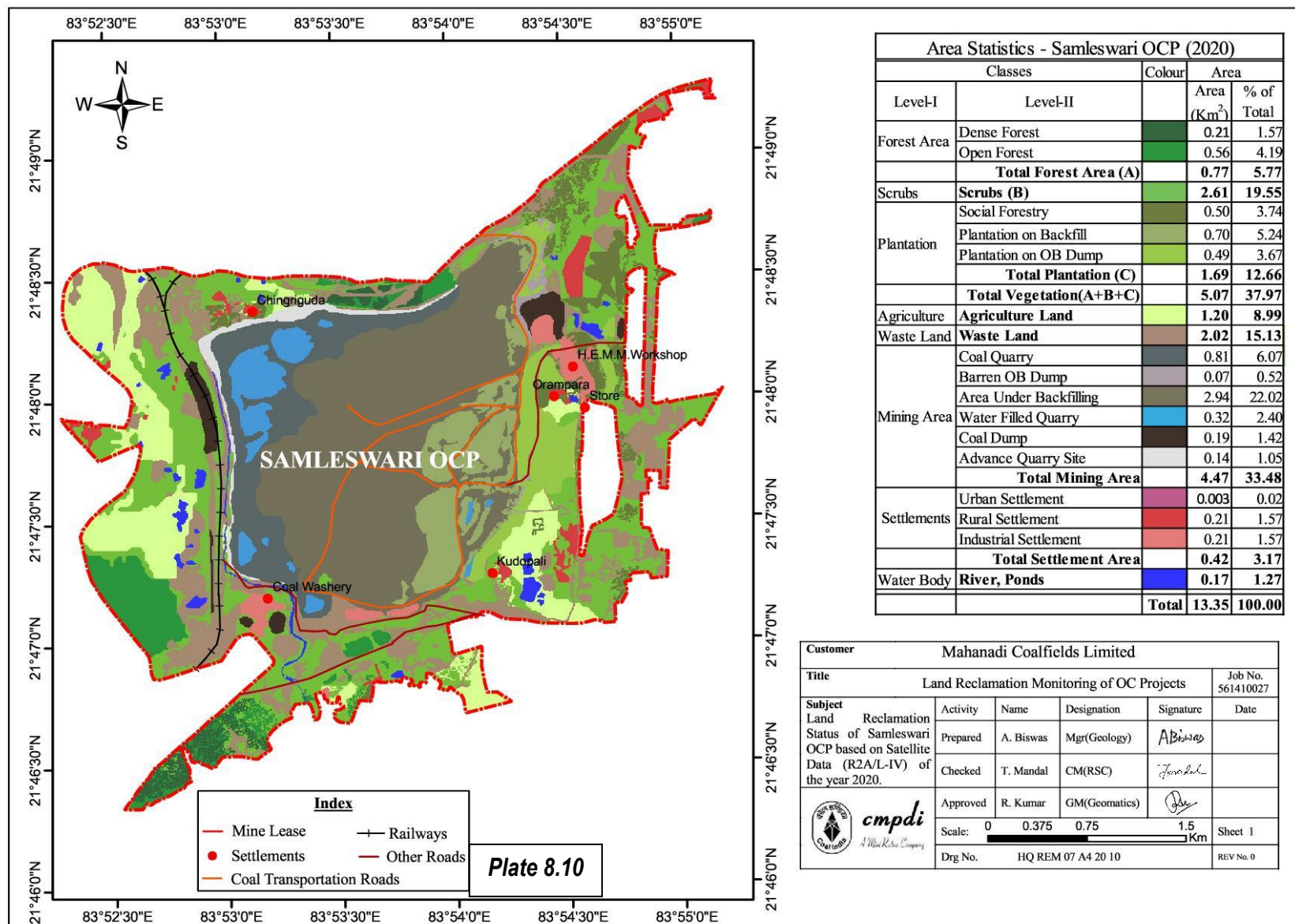


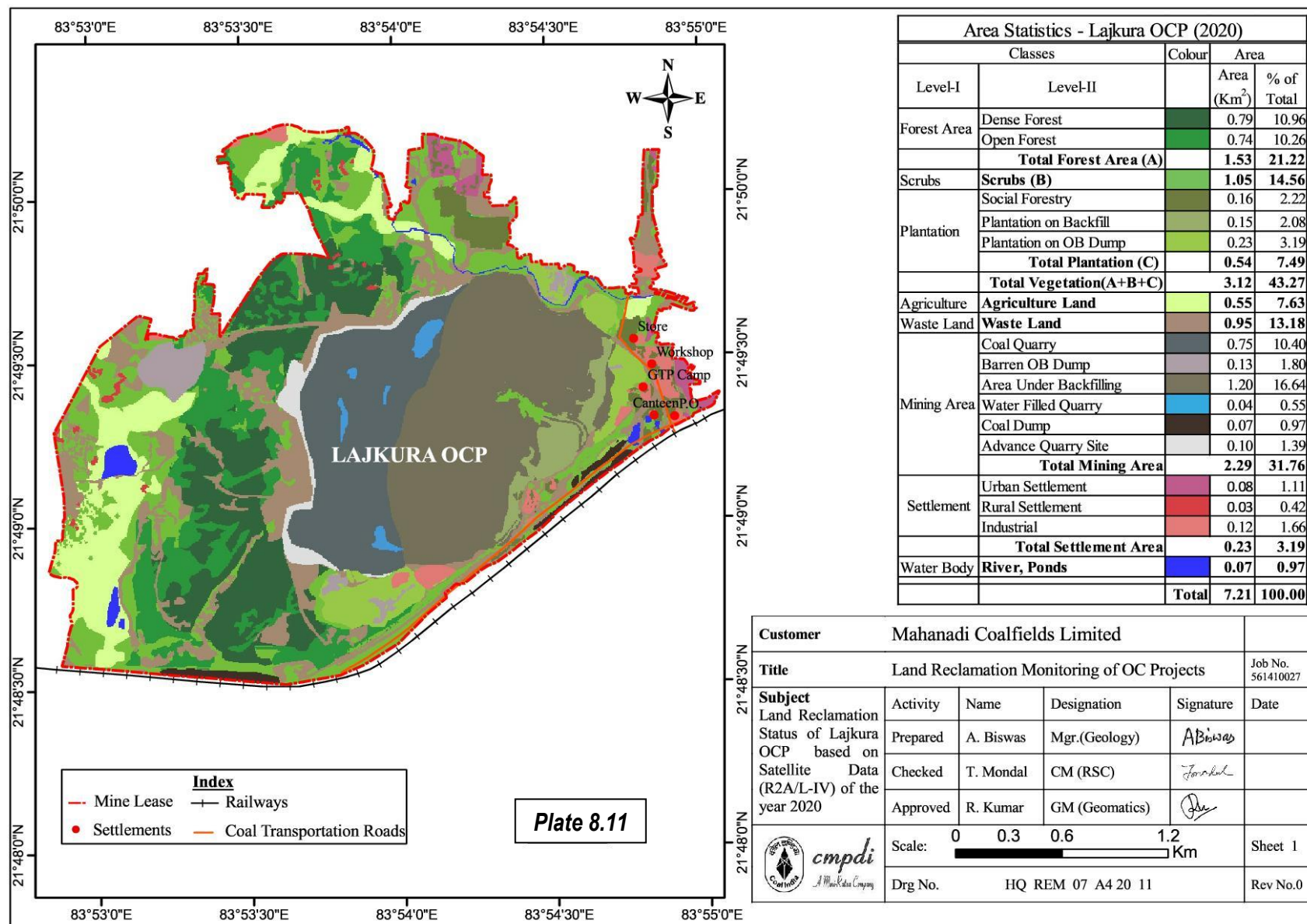


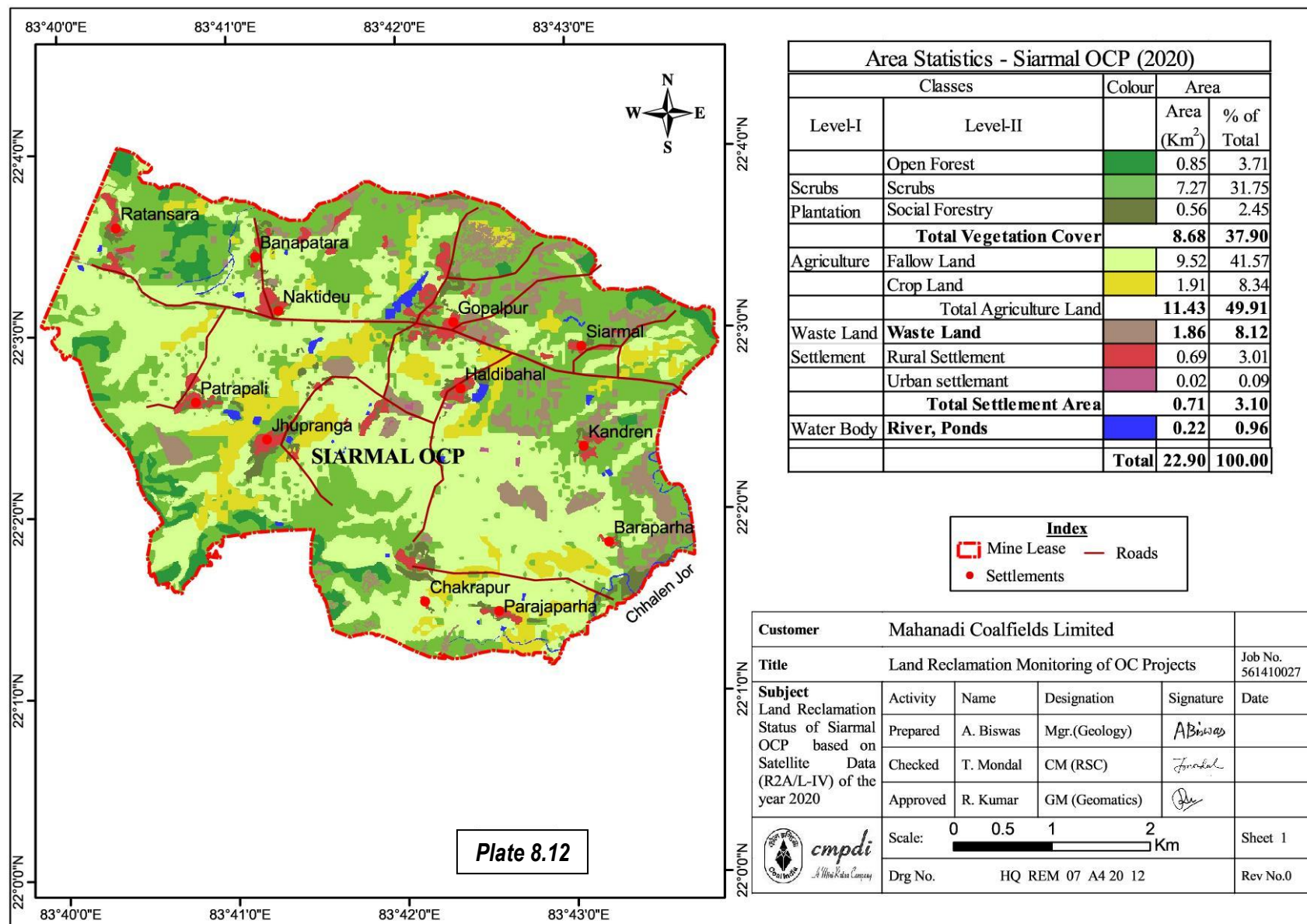


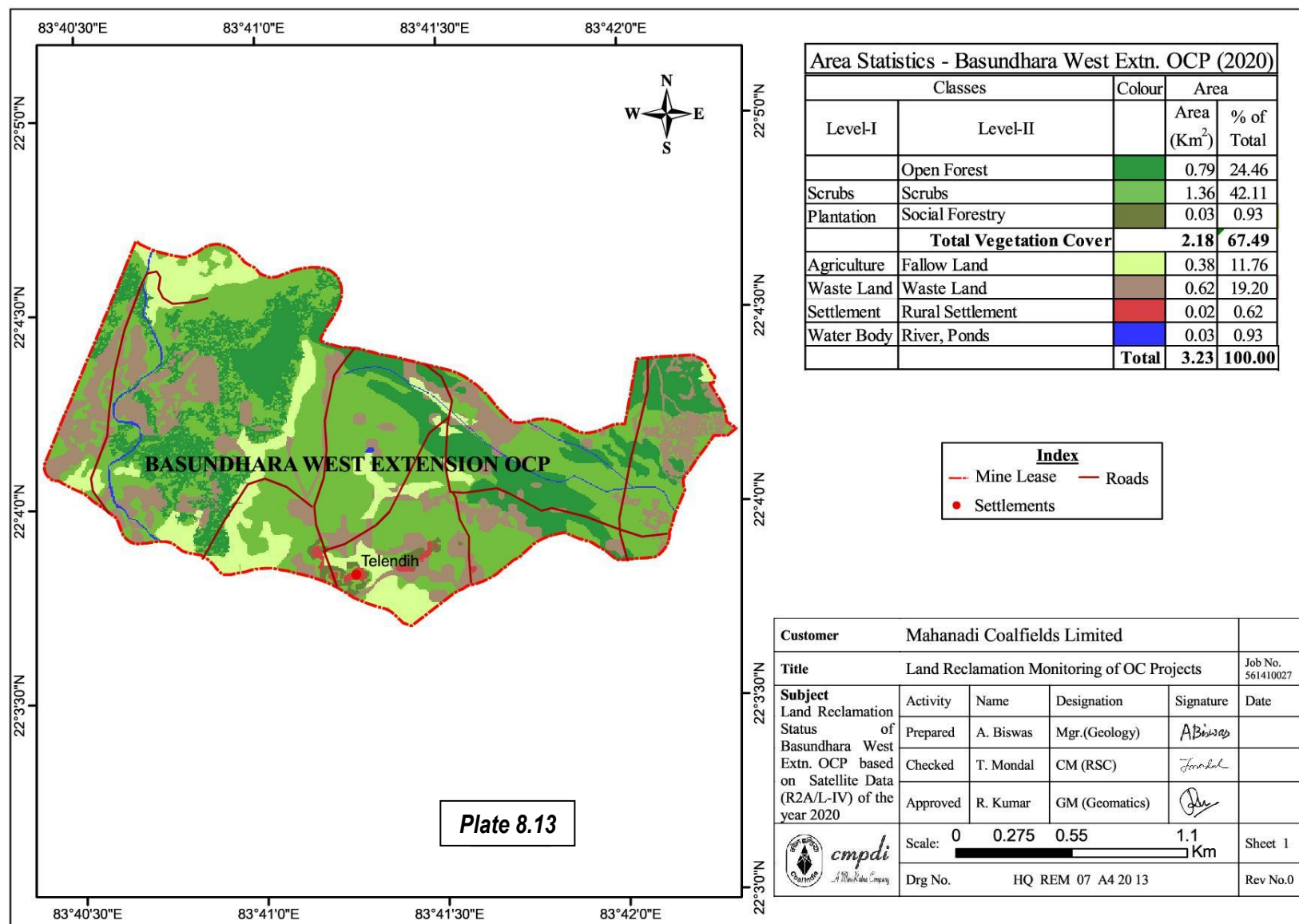
Area Statistics - Lakhanpur OCP (2020)				
Classes		Colour	Area	
Level-I	Level-II		Area (Km ²)	% of Total
Forest Area	Dense Forest		1.48	6.61
	Open Forest		2.45	10.94
	Total Forest Area (A)		3.93	17.54
Scrubs	Scrubs (B)		2.78	12.41
Plantation	Social Forestry		0.44	1.96
	Plantation on Backfill		0.83	3.71
	Plantation on OB Dump		0.59	2.63
	Total Plantation (C)		1.86	8.30
	Total Vegetation(A+B+C)		8.57	38.26
Agriculture	Agriculture Land		4.01	17.90
Waste Land	Waste Land		1.71	7.63
Mining Area	Coal Quarry		2.32	10.36
	Barren OB Dump		0.02	0.09
	Area Under Backfilling		4.32	19.29
	Water Filled Quarry		0.29	1.29
	Coal Dump		0.14	0.63
	Advance Quarry Site		0.38	1.70
	Total Mining Area		7.47	33.35
Settlements	Rural Settlement		0.14	0.63
	Industrial Settlement		0.22	0.98
	Total Settlement Area		0.36	1.61
Water Body	River, Ponds		0.28	1.25
	Total		22.40	100.00

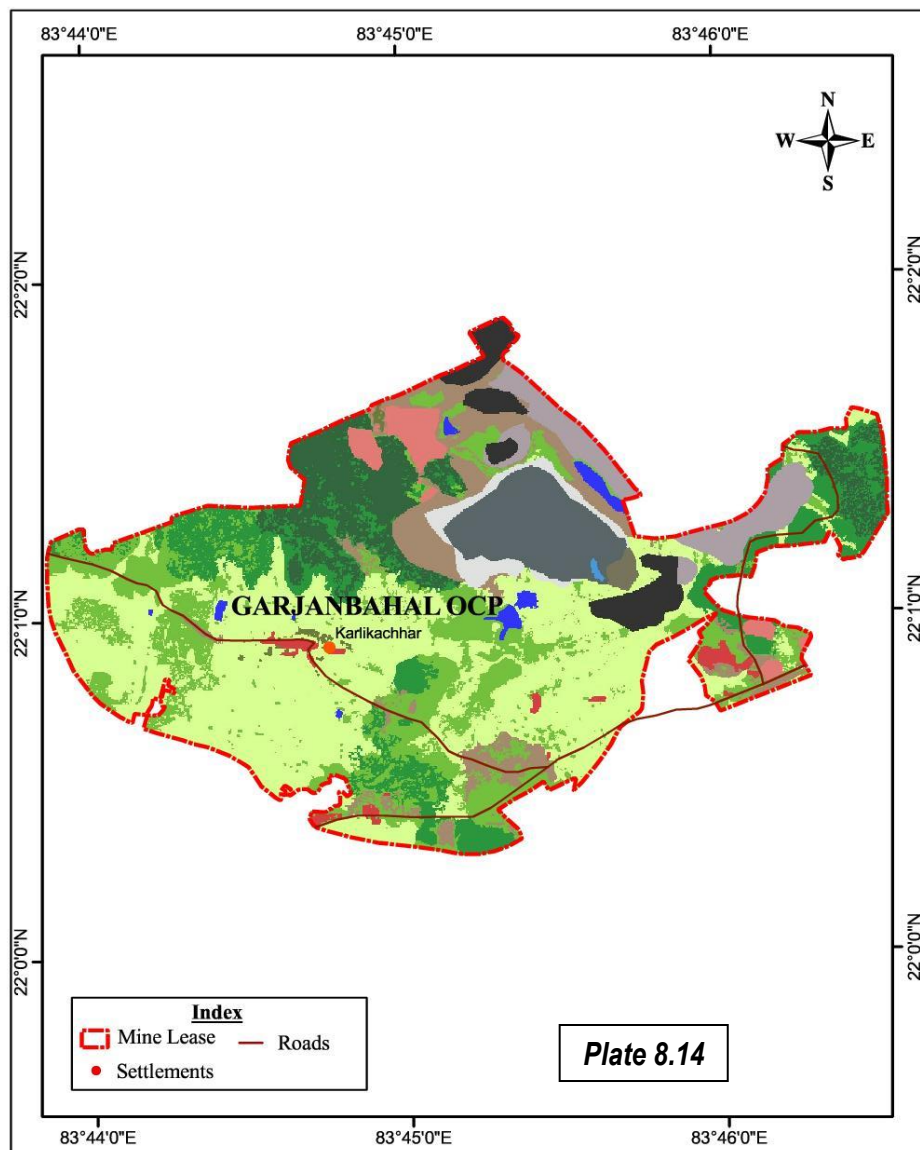
Customer		Mahanadi Coalfields Limited			
Title		Land Reclamation Monitoring of OC Projects			
Subject		Land Reclamation Status of Lakhanpur OCP based on Satellite Data (R2A/L-IV) of the year 2020			
Activity	Prepared	A. Biswas	Mgr.(Geology)	A. Biswas	
	Checked	T. Mondal	CM (RSC)	T. Mondal	
	Approved	R. Kumar	GM (Geomatics)	R. Kumar	
Scale:		0 0.375 0.75 1.5 Km			Sheet 1
Drg No.		HQ REM 07 A4 20 09			Rev No.0











Area Statistics - Garjanbahal OCP (2020)				
Classes		Colour	Area	
Level-I	Level-II		Area (Km ²)	% of Total
Forest Area	Dense Forest		0.51	7.79
	Open Forest		0.75	11.46
Total Forest Area (A)			1.26	19.25
Scrubs	Scrubs (B)		1.18	18.03
Plantation	Social Forestry		0.02	0.31
	Plantation on Backfill		0.00	0.00
	Plantation on OB Dump		0.00	0.00
Total Plantation (C)			0.02	0.31
Total Vegetation(A+B+C)			2.46	37.59
Agriculture	Agriculture Land		2.30	35.14
Waste Land	Waste Land		0.49	7.49
Mining Area	Coal Quarry		0.36	5.50
	Barren OB Dump		0.30	4.58
	Area Under Backfilling		0.03	0.46
	Water Filled Quarry		0.004	0.07
	Coal Dump		0.22	3.36
	Advance Quarry Site		0.11	1.68
Total Mining Area			1.02	15.65
Settlements	Rural Settlement		0.07	1.07
	Industrial Settlement		0.14	2.14
Total Settlement Area			0.21	3.21
Water Body	River, Ponds		0.06	0.92
Total			6.54	100.00

Customer		Mahanadi Coalfields Limited			
Title		Land Reclamation Monitoring of OC Projects			
Subject		Land Reclamation Status of Garjanbahal OCP based on Satellite Data (R2A/L-IV) of the year 2020			
Activity	Prepared	Name	Designation	Signature	Date
	Checked	T. Mondal	CM (RSC)	T. Mondal	
	Approved	R. Kumar	GM (Geomatics)	R. Kumar	
Scale:		0 0.375 0.75 1.5 Km			Sheet 1
Drg No.		HQ REM 07 A4 20 12			Rev No.0

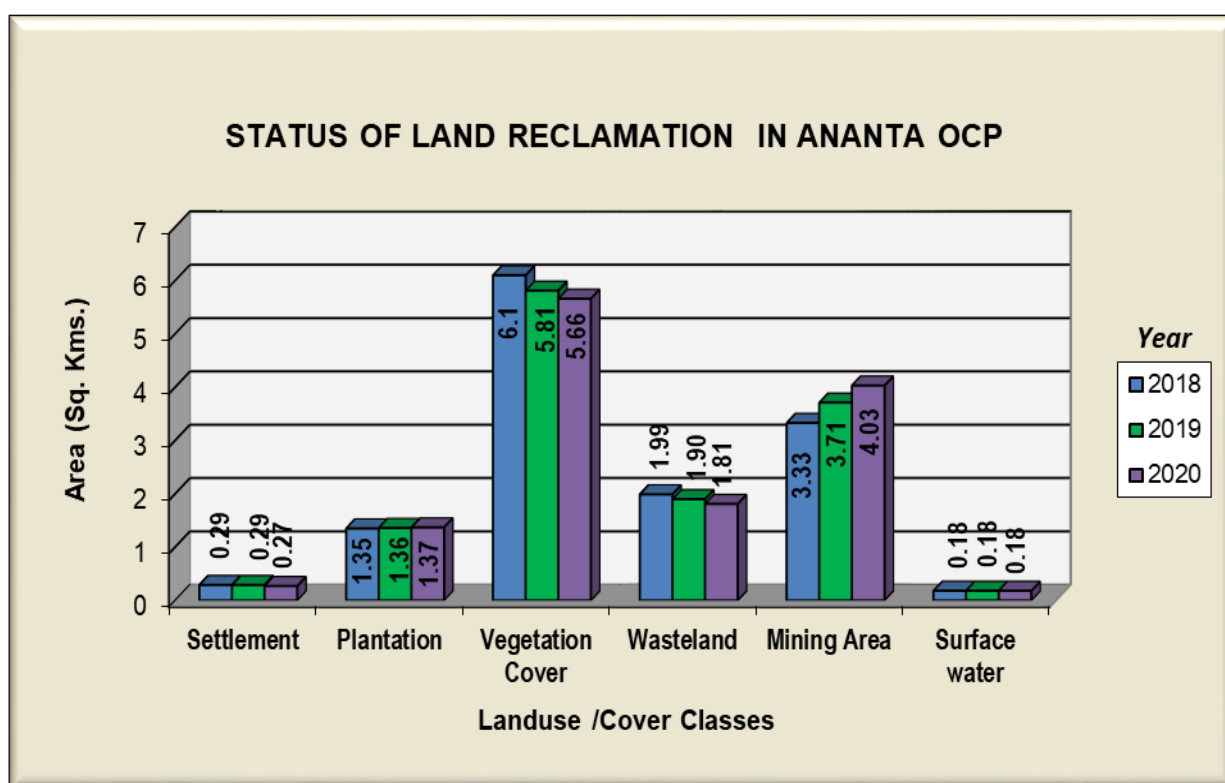


Figure 8.2

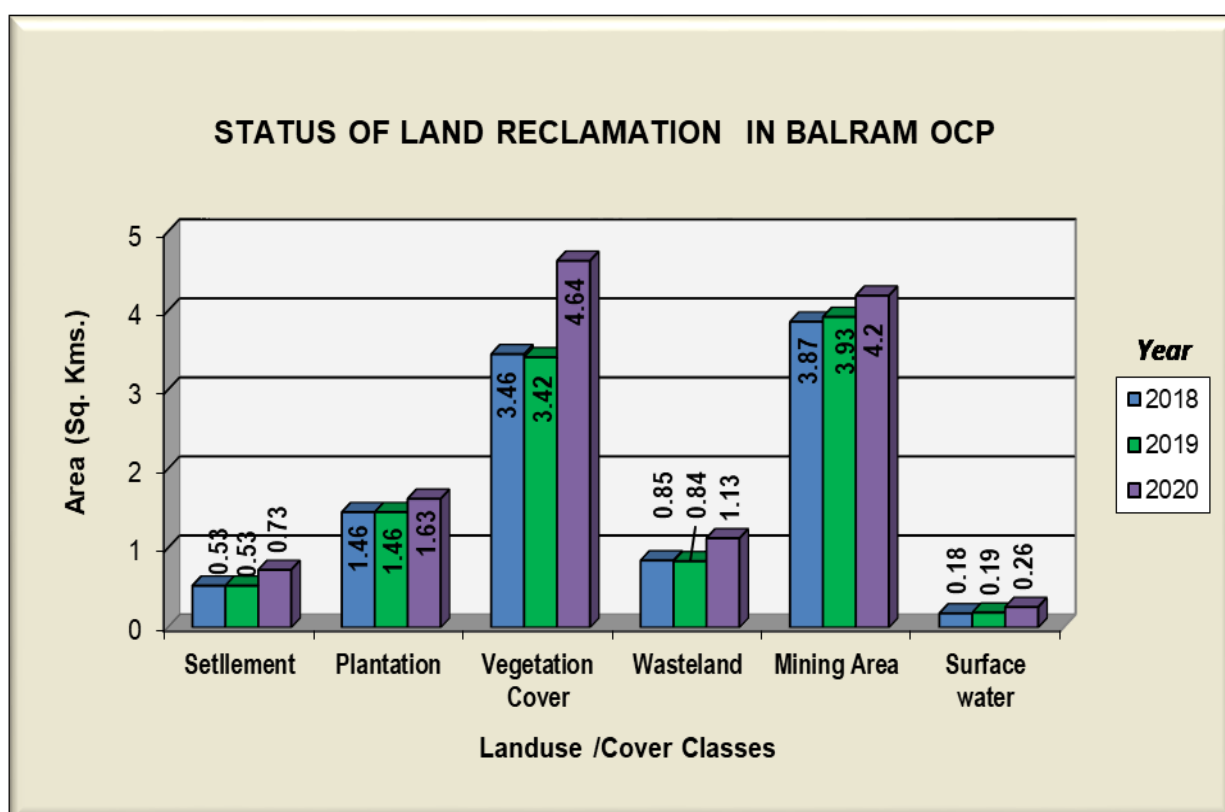


Figure 8.3

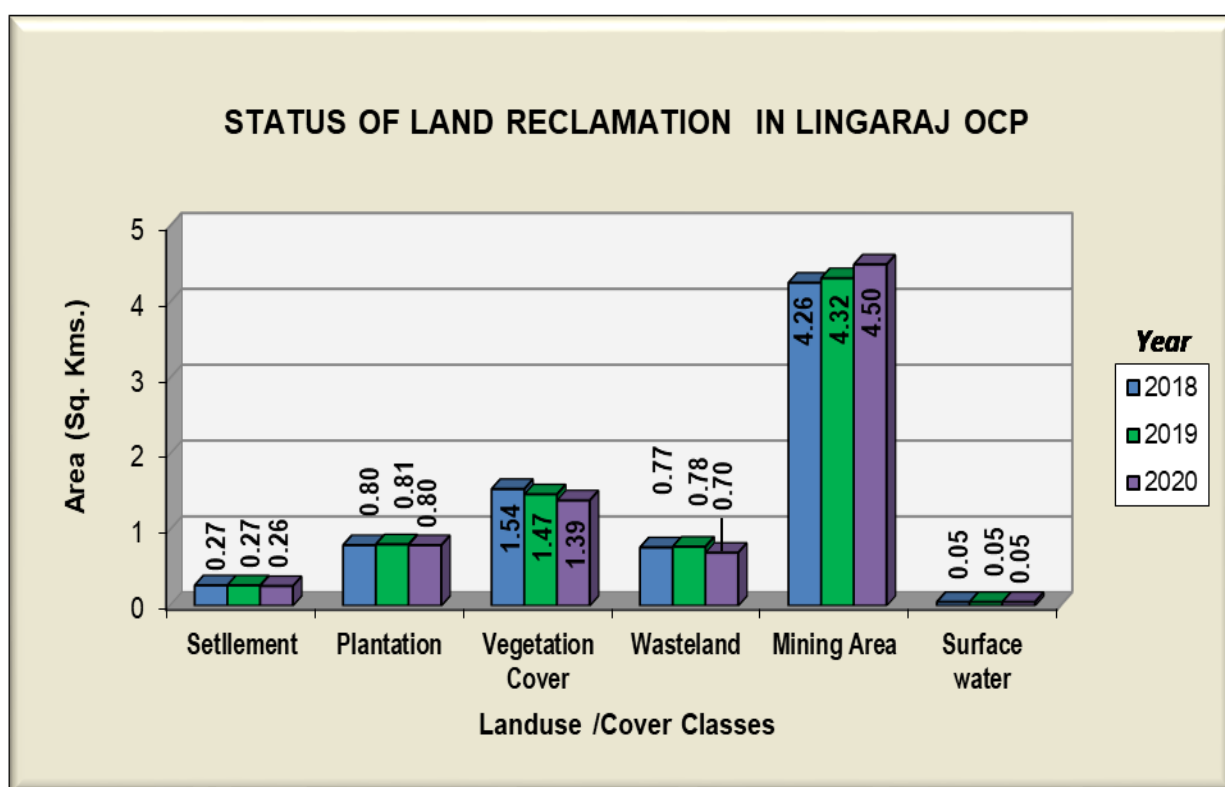


Figure 8.4

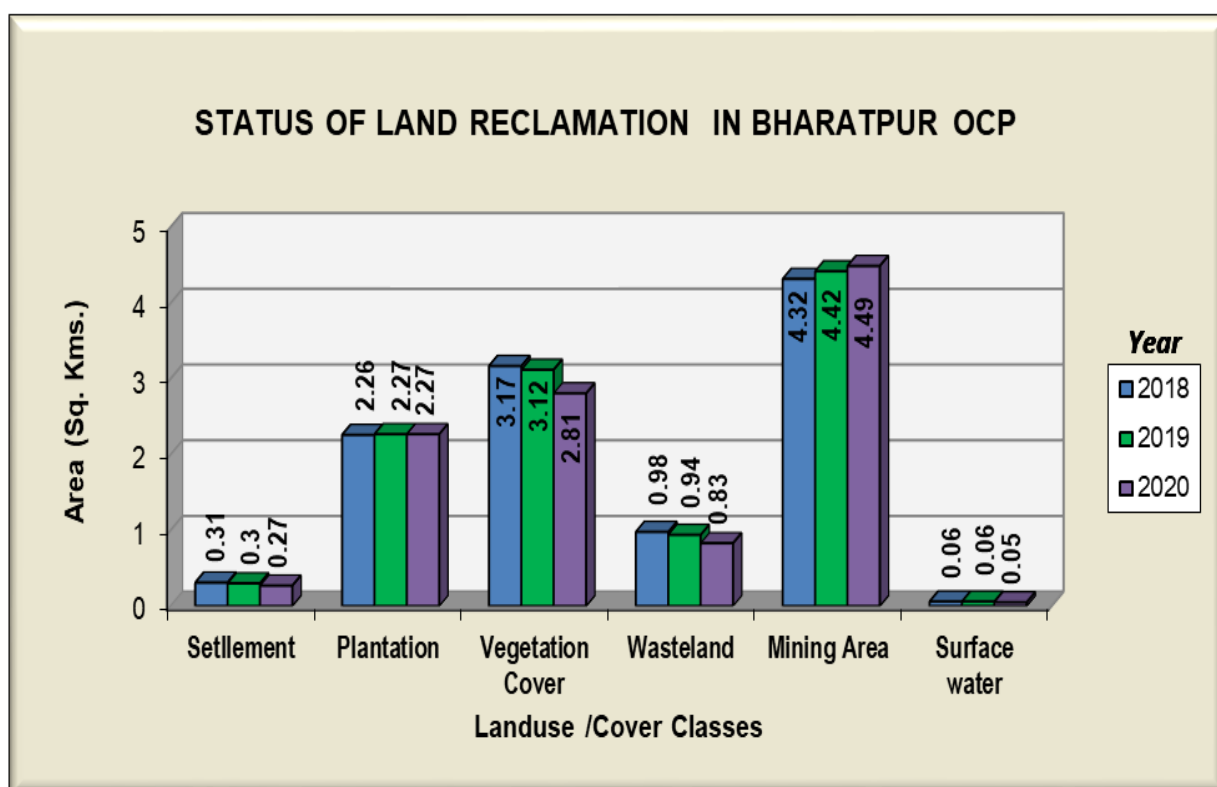


Figure 8.5

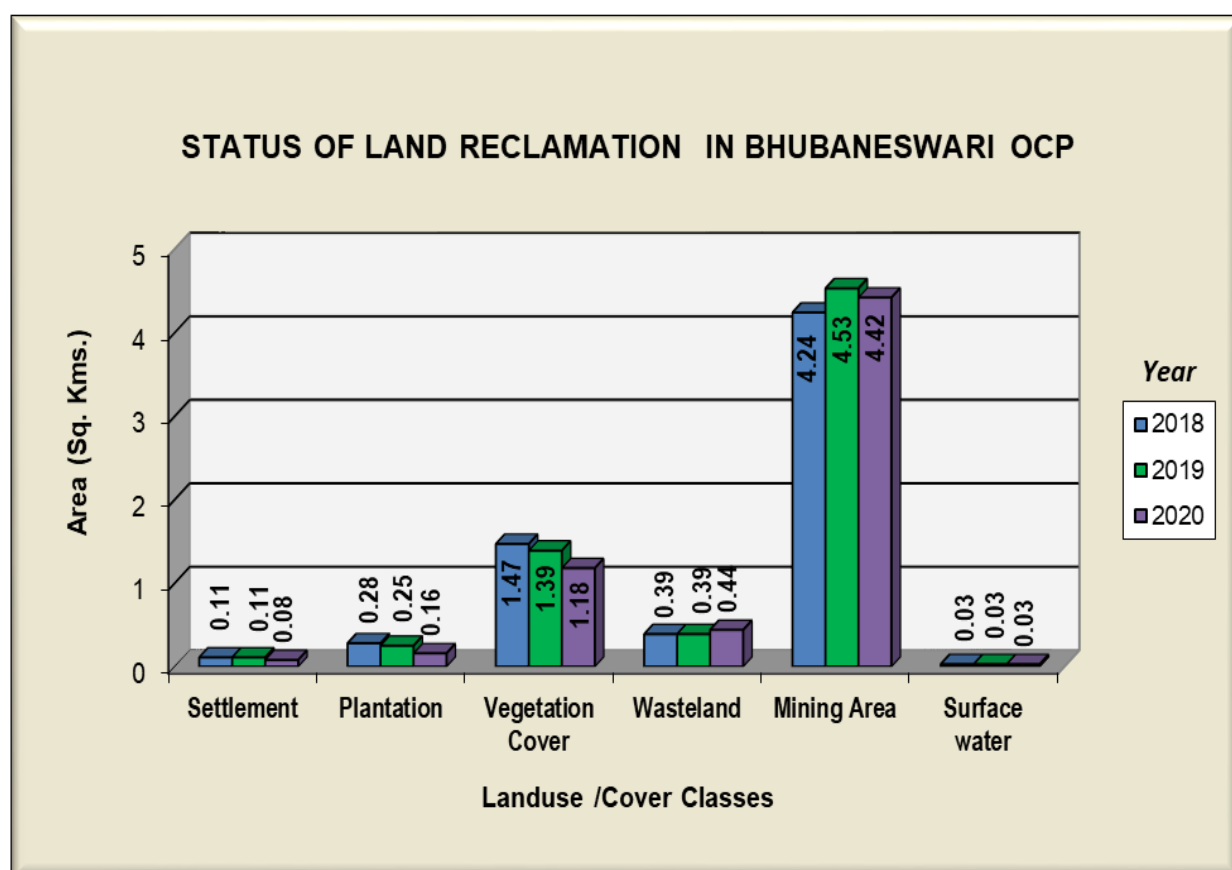


Figure 8.6

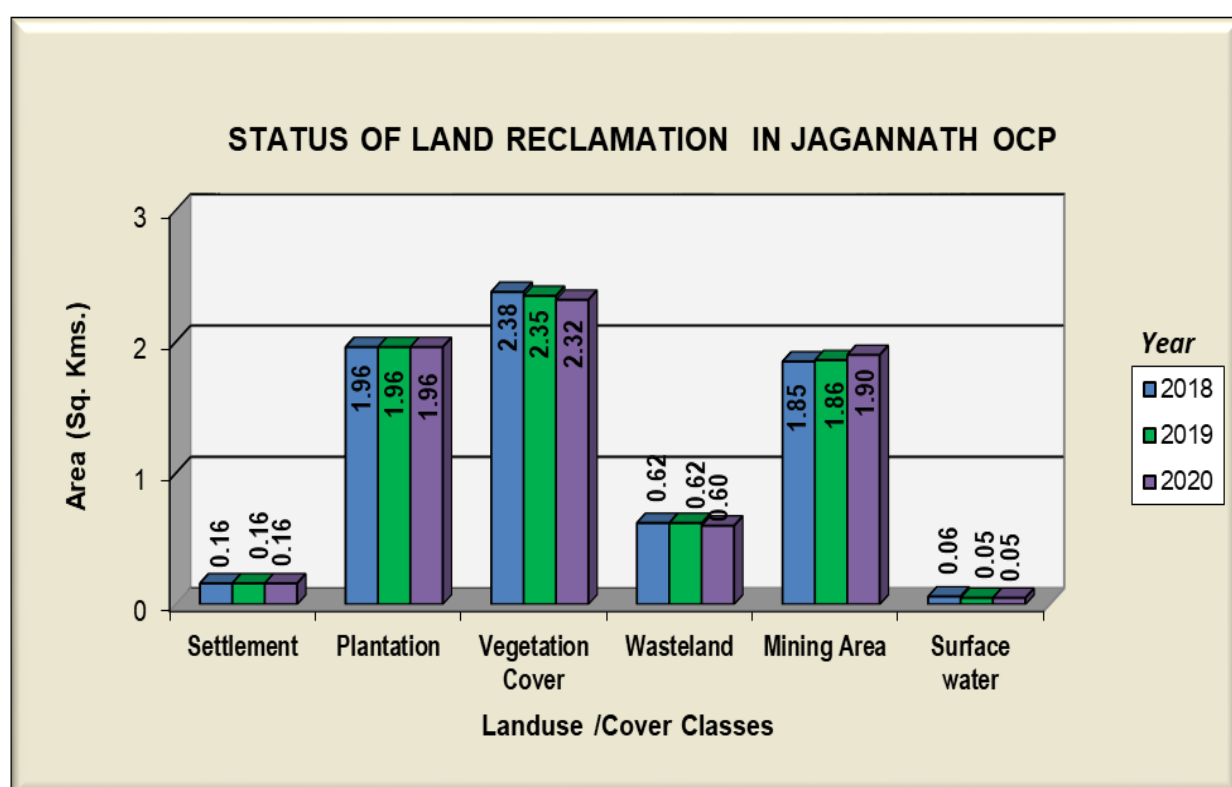


Figure 8.7

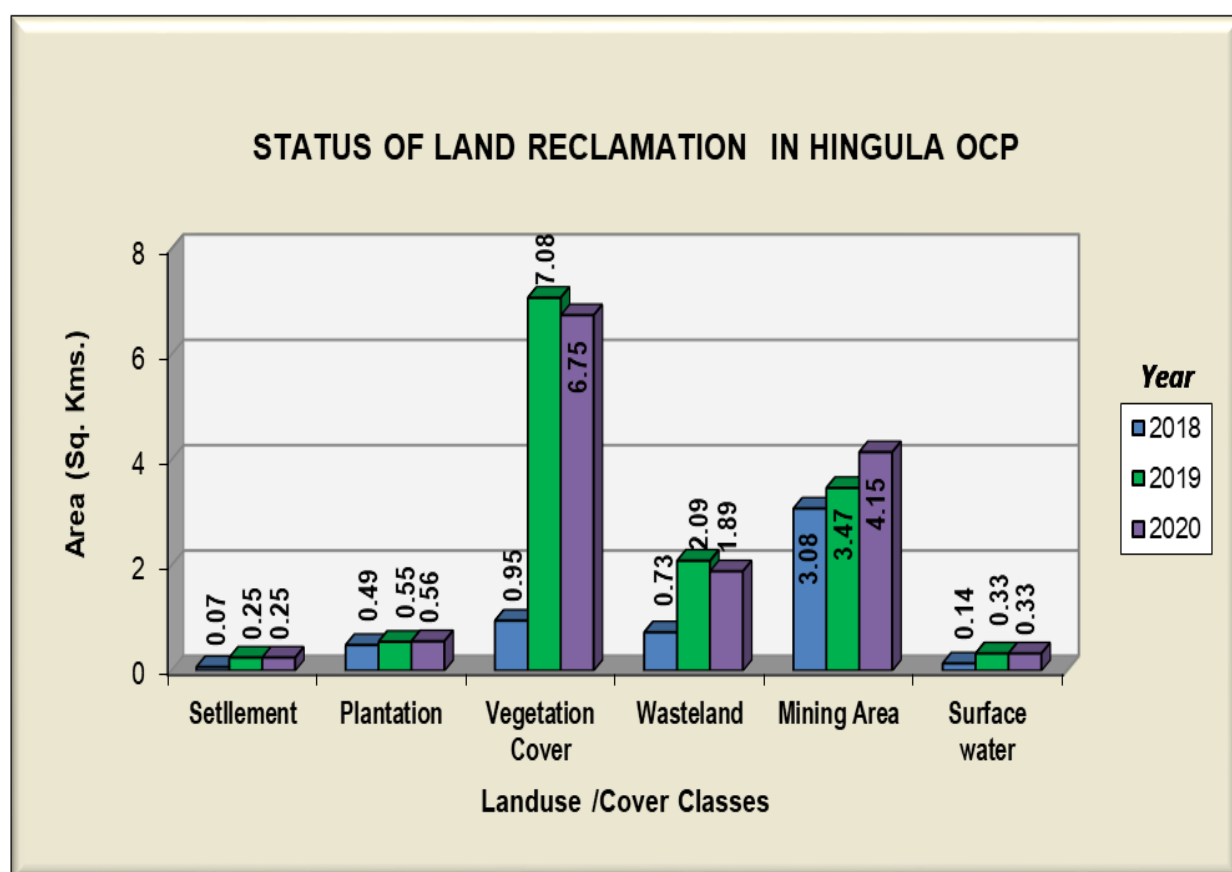


Figure 8.8

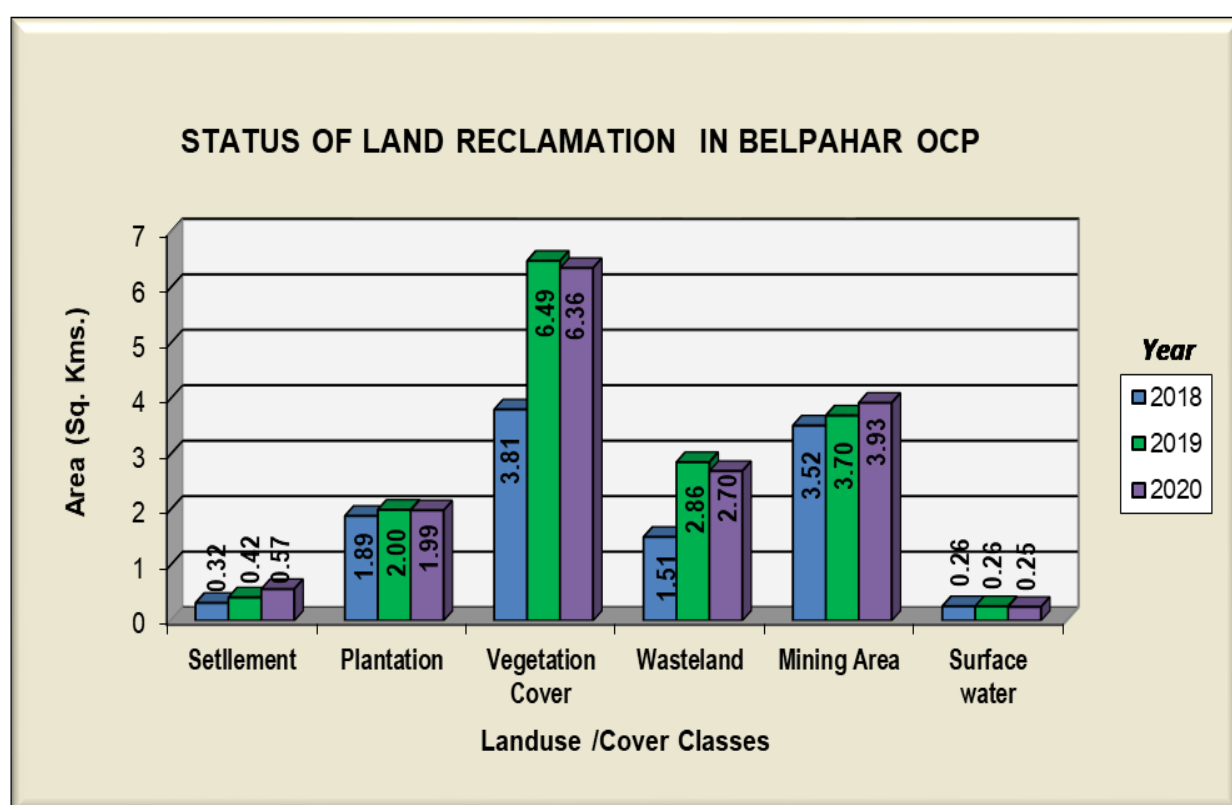


Figure 8.9

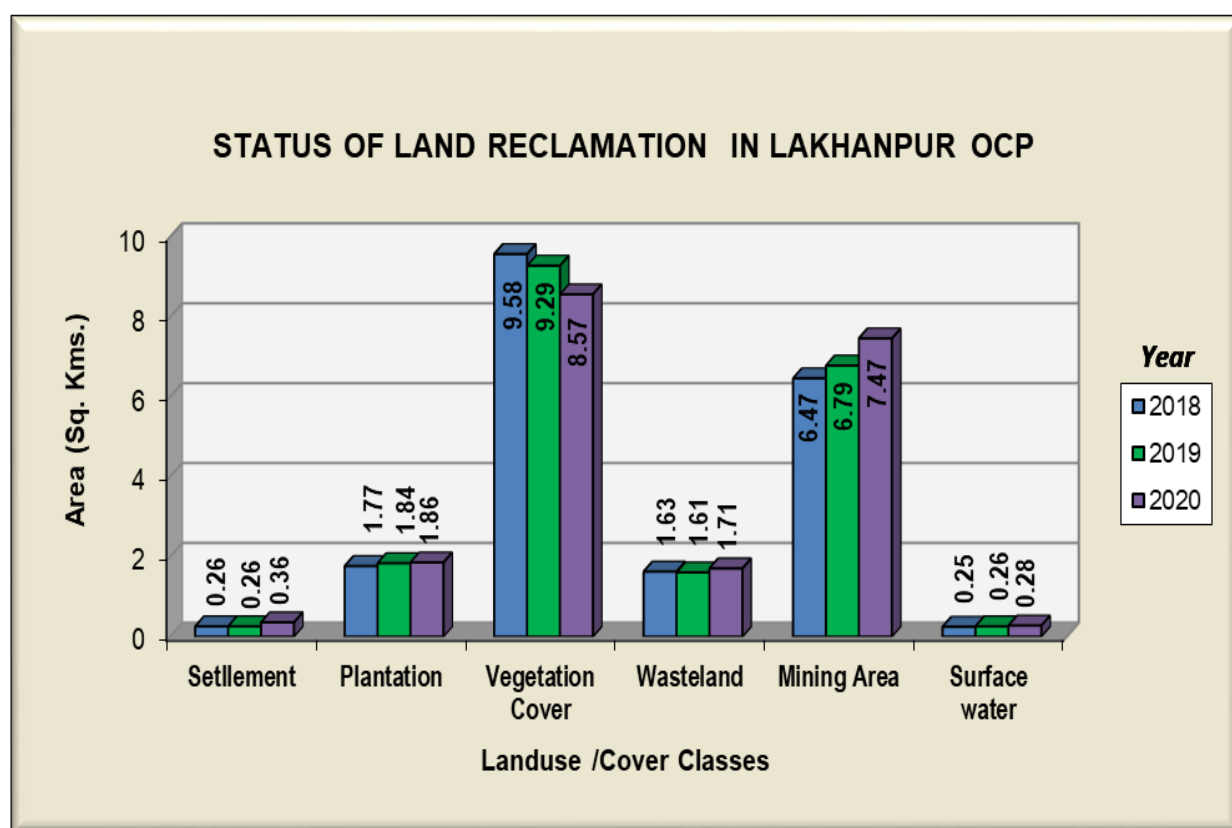


Figure 8.10

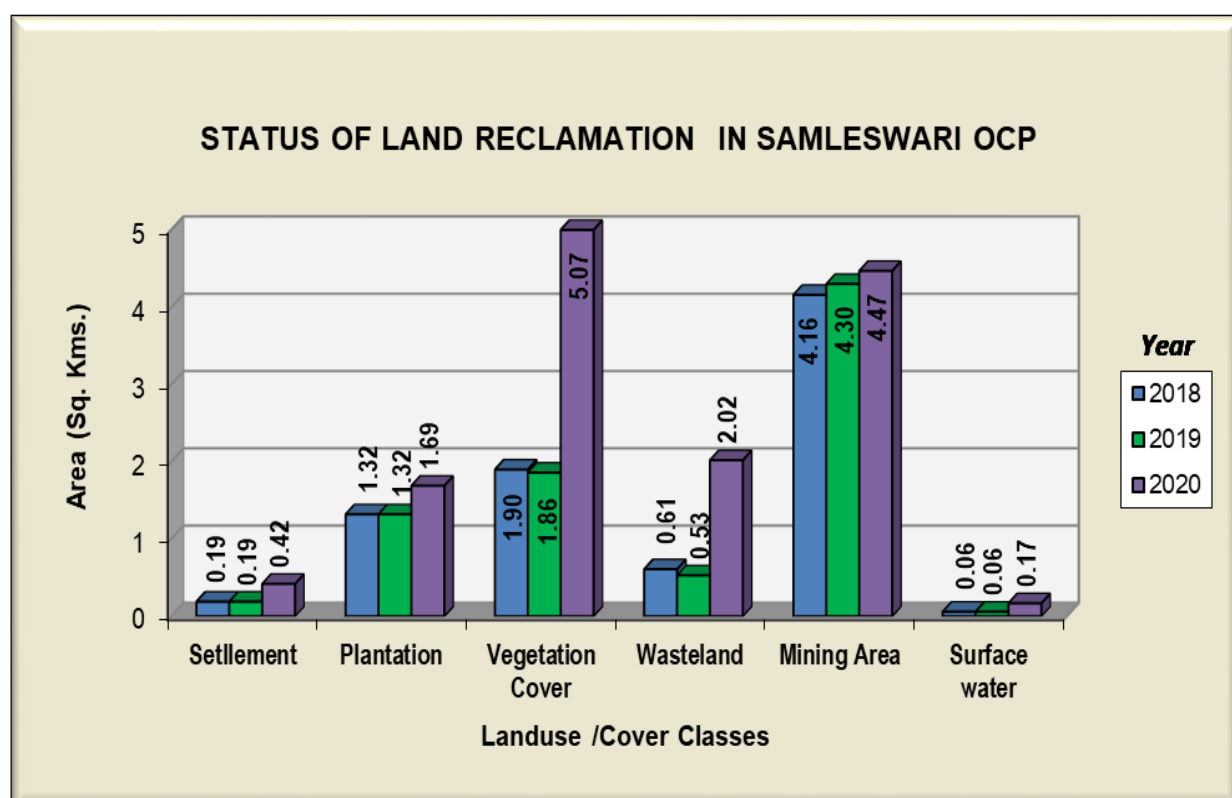


Figure 8.11

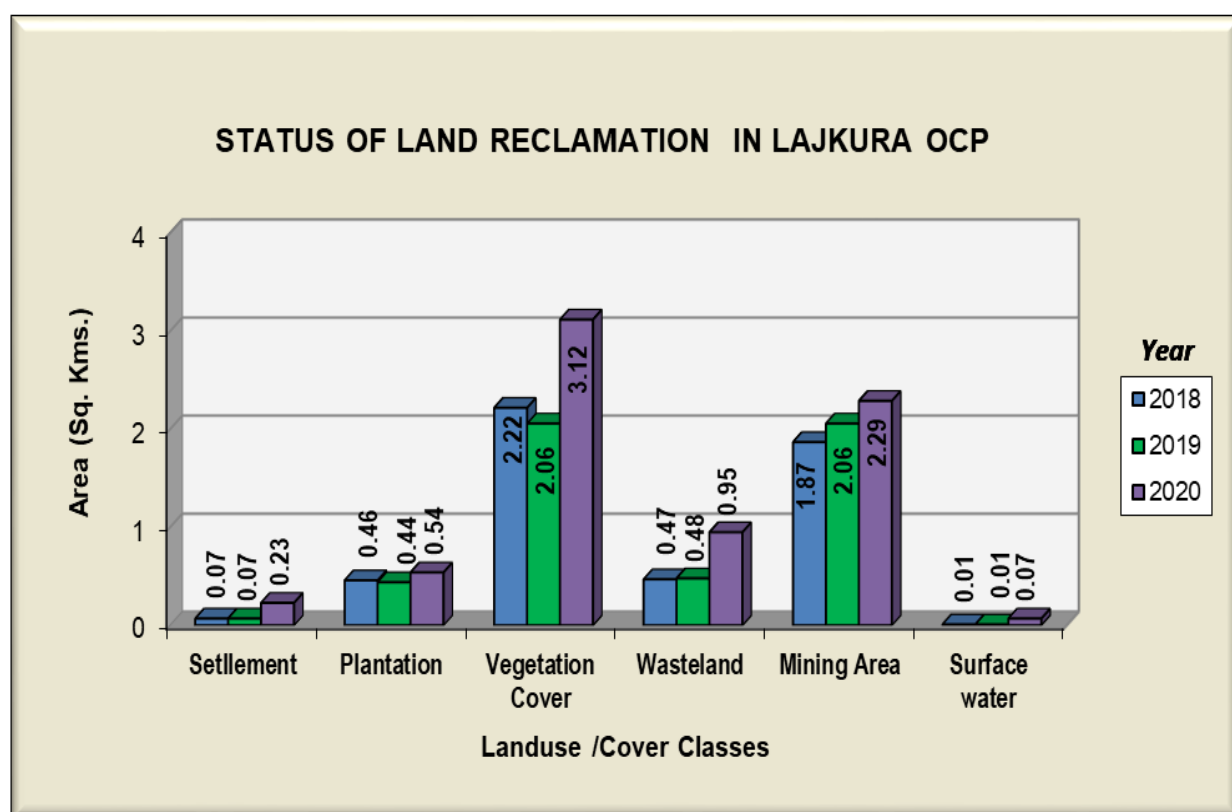


Figure 8.12

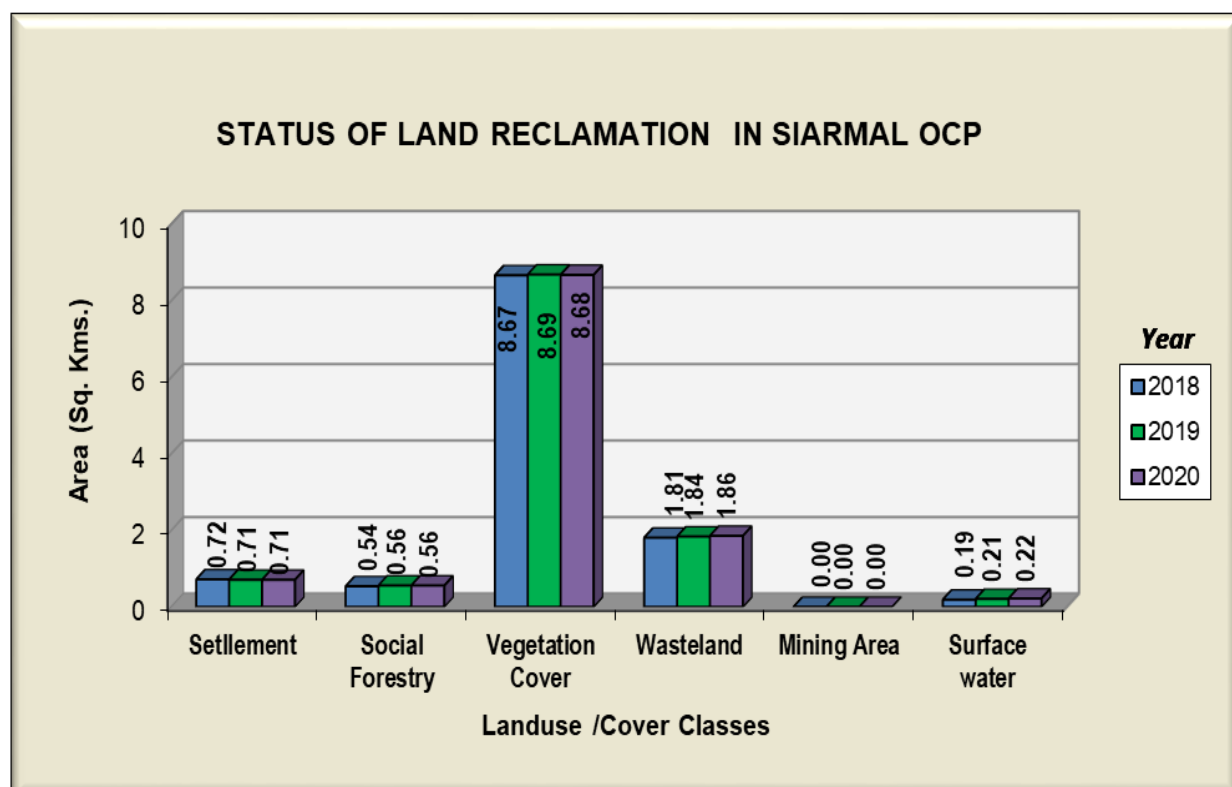


Figure 8.13

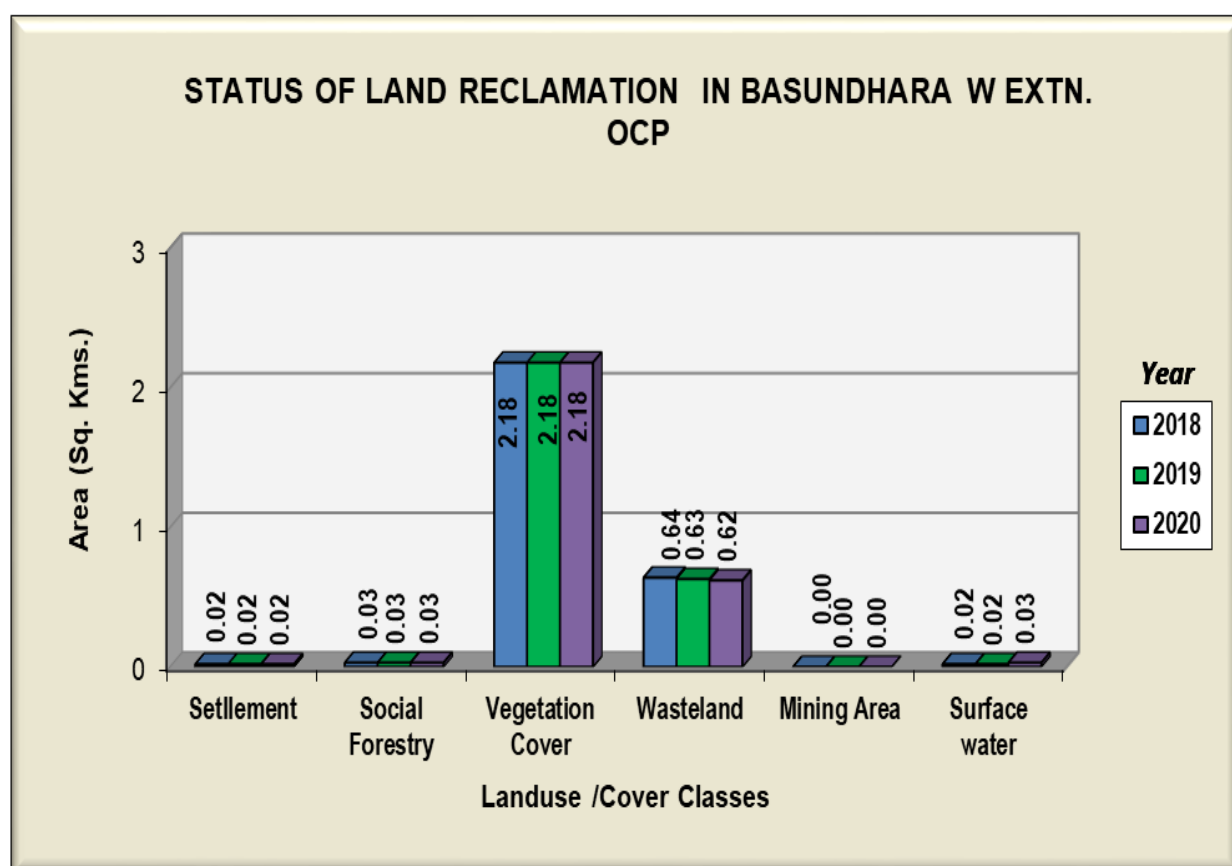


Figure 8.14

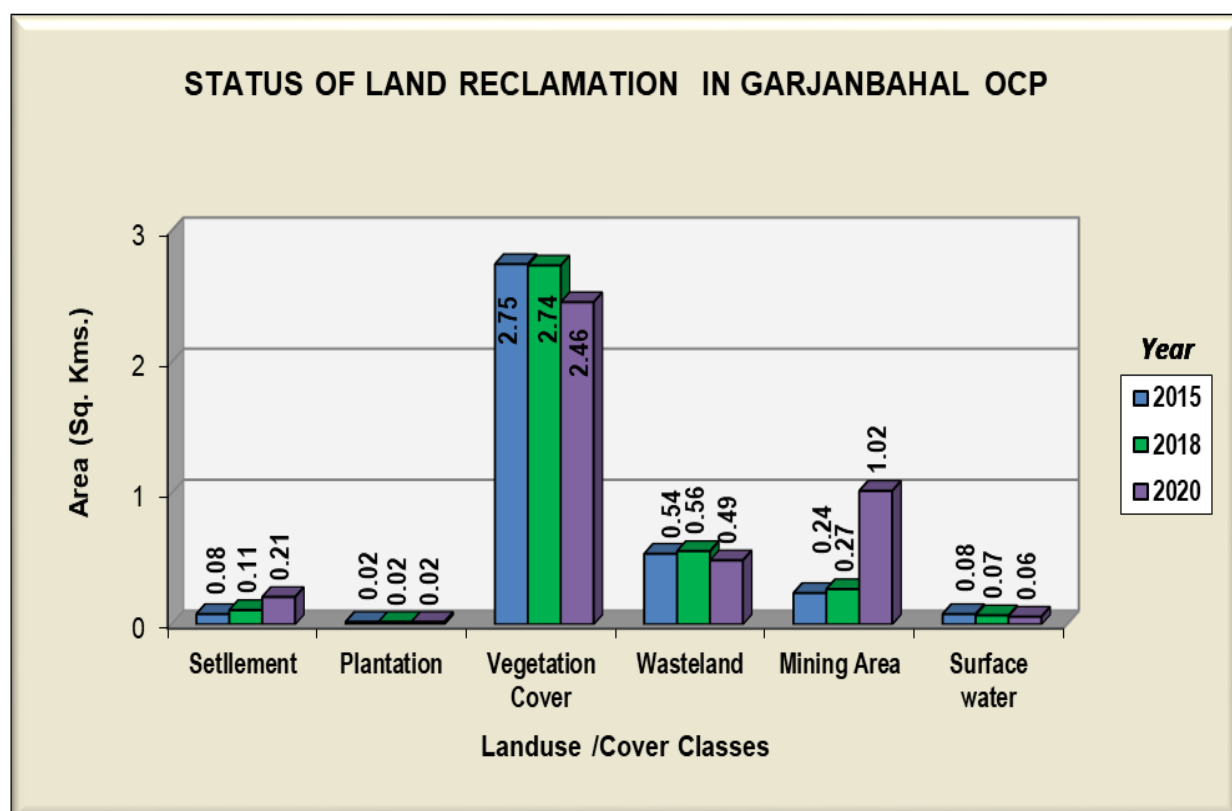


Figure 8.15



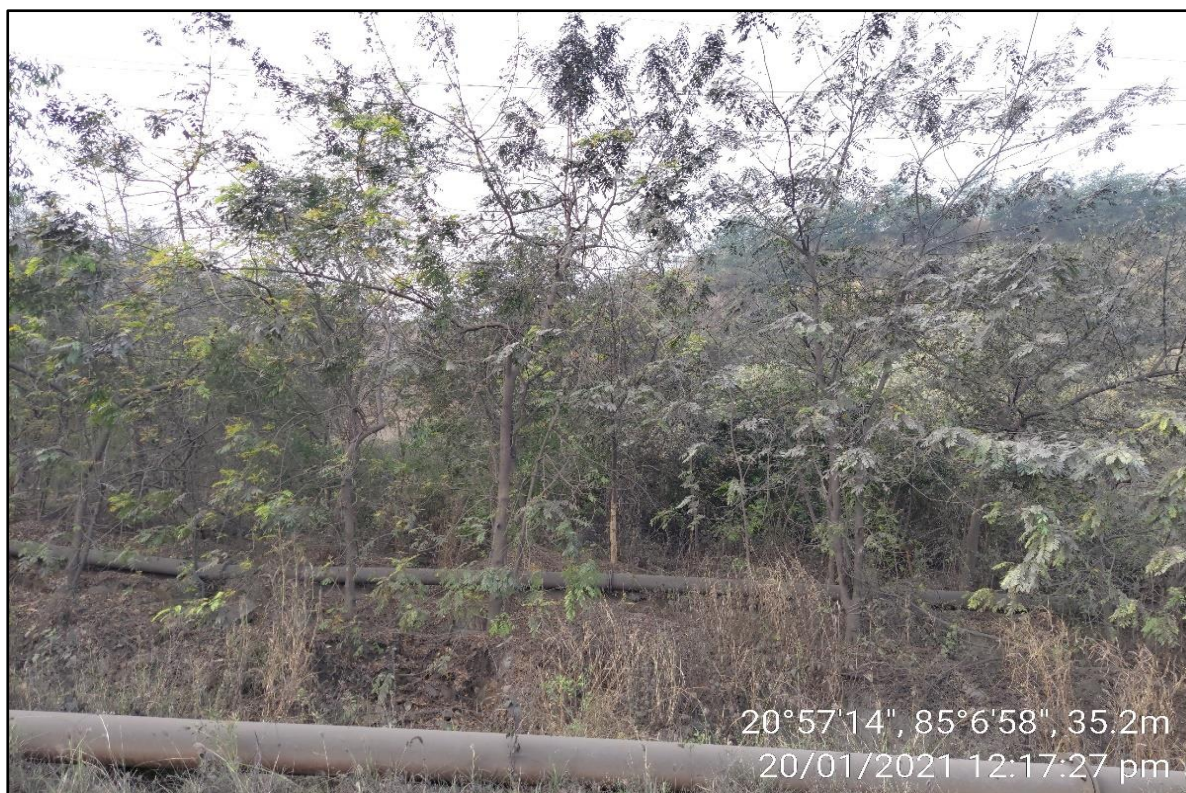
Photograph – 8.1: Plantation on Internal OB/Backfill (Ananta OC mine)



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/Backfill (Bhubaneswari OC Mine)**



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



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



Photograph – 8.8: **Plantation on Internal OB/Backfill (Belpahar OC Mine)**



Photograph-8.9: Plantation on Internal OB/Backfill (Lakhanpur OC Mine)



Photograph-8.10: Plantation on Internal OB/Backfill (Samleswari OC Mine)



Photograph-8.11: Plantation on Internal OB/Backfill (Lajkura OC Mine)



Photograph-8.12: Social Forestry Plantation (Garjanbahal OC Mine)

CENTRAL COALFIELDS LIMITED

9.0 Land Reclamation Status in Central Coalfields Ltd.

9.1 Following 7 OC projects producing more than 5 million m³ (Coal + OB) annually of Central Coalfields Ltd. have been taken up during the year 2020-21 for land reclamation monitoring based on satellite data of the year 2020:

- Ashok
- Piparwar
- KDH
- Amarpali
- Magadh
- Rajrappa
- Parej East

9.2 Project wise Land Reclamation status in CCL in the year 2020 is given in Table 9.1 and also shown graphically in Fig 9.1. It is to note that Land Reclamation Monitoring of Magadh & Amrapali has been taken up for the first time this year and the data generated will act as baseline data for future monitoring. Area statistics of different land use classes present in OC projects in the year 2020 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 Study based on Satellite data of the Year 2020 reveals that 17.67 Km² (77.94%) of excavated area has already come under reclamation in the above 7 OC projects of CCL, out of which 11.89 Km² (52.45%) area is under backfilling (Technical Reclamation) and 5.78 Km² (25.50%) area has been re-vegetated (Biological Reclamation).

- 9.4** Study reveals that the area under backfilling (Technical Reclamation) has increased from 9.43 Km² in 2019 to 11.89 Km² in 2020. Area of active mining has reduced in Piparwar, as the mine is on the course of being exhausted. Rehandling of old dump is being carried out in Rajrappa OCP for mining in the lower seams.
- 9.5** Analysis of satellite data also indicates that the area of plantation (Biological Reclamation) has increased from 5.58 Km² (Yr. 2019) to 5.78 Km² (Yr. 2020). This increase in Biological Reclamation reflects continuous efforts on part of CCL for environmental protection.
- 9.6** The area of total reclamation has reached 17.67 Km² (77.94%) of the total excavated area till the year 2020 as compared to 15.01 Km² (80.57%) in 2019. Percentage has reduced due to increase in total leasehold area of CCL projects under monitoring.
- 9.7** It has been observed that the total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps as well as Plantation on Social Forestry in all the 7 mines of CCL has increased by 0.26 Km² in the year 2020, as compared to the year 2019.
- 9.8** Piparwar area of CCL has developed an eco-restoration park called “**Kayakalp Vatika**” at Piparwar OCP over the reclaimed land.
- 9.10** Out of 7 projects of CCL, Parej East OC ranks on top for land reclamation (86.50%) followed by KDH (86.39%), Ashok OC (83.62%), Rajrappa OC (82.10%), and Piparwar OC (81.65%).

TABLE – 9.1
Project wise Land Reclamation Status in OC projects of CCL based on Satellite Data of the Year 2020
(Projects producing more than 5 mcm of Coal+OB annually)

(Area in Sq. Kms.)																			
Sl. No.	Project	Total/ Mine 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		Social Forestry, A vanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	Ashok	7.93	7.93	2.3	2.35	0.92	1.02	0.00	0.00	0.27	0.27	0.55	0.66	3.77	4.03	1.19	1.29	3.22	3.37
				61.01%	58.31%	24.40%	25.31%					14.59%	16.38%			15.01%	16.27%	85.41%	83.62%
2	Piparwar	11.20	11.20	2.56	2.91	1.34	1.45	0.48	0.42	1.17	1.18	1.39	0.98	5.29	5.34	2.99	3.05	3.90	4.36
				48.39%	54.49%	25.33%	27.15%					26.28%	18.35%			26.70%	27.23%	73.72%	81.65%
3	KDH	6.20	6.20	1.54	1.79	1.31	1.32	0.03	0.03	0.20	0.21	0.71	0.49	3.56	3.60	1.54	1.56	2.85	3.11
				43.26%	49.72%	36.80%	36.67%					19.94%	13.61%			24.84%	25.16%	80.06%	86.39%
4	Parej East	6.20	6.20	0.69	0.72	0.69	0.69	0.05	0.05	0.09	0.09	0.18	0.22	1.56	1.63	0.83	0.83	1.38	1.41
				44.23%	44.17%	44.23%	42.33%					11.54%	13.50%			13.39%	13.39%	88.46%	86.50%
5	Rajrappa	19.82	19.82	2.34	2.37	1.32	1.30	3.07	3.02	2.04	2.02	0.79	0.8	4.45	4.47	6.43	6.34	3.66	3.67
				52.58%	53.02%	29.66%	29.08%					17.75%	17.90%			32.44%	31.99%	82.25%	82.10%
6	Amrapali		6.20		1.20		0		0.05		0.02		1.07		2.27		0.07		1.20
					52.86%		0.00%						47.14%				1.13%		52.86%
7	Magadh		17.69		0.55		0.00		0.10		0.00		0.78		1.33		0.10		0.55
					41.35%		0.00%						58.65%				0.57%		41.35%
	TOTAL	51.35	75.24	9.43	11.89	5.58	5.78	3.63	3.67	3.77	3.79	3.62	5.00	18.63	22.67	12.98	13.24	15.01	17.67
				50.62%	52.45%	29.95%	25.50%					19.43%	22.06%			25.28%	17.60%	80.57%	77.94%

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. Magadh and Amrapali OCPs are taken up for monitoring from Year 2020.

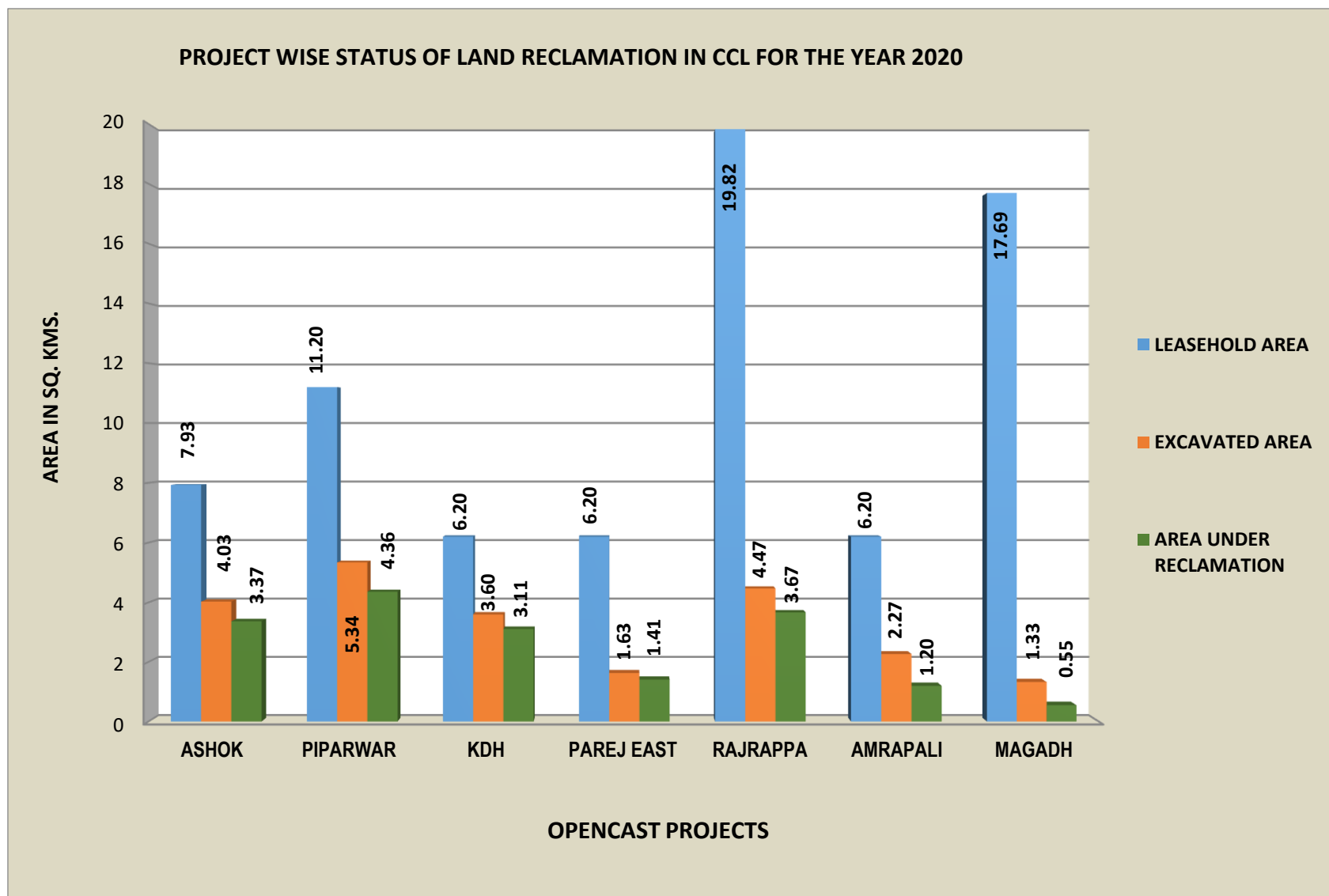






















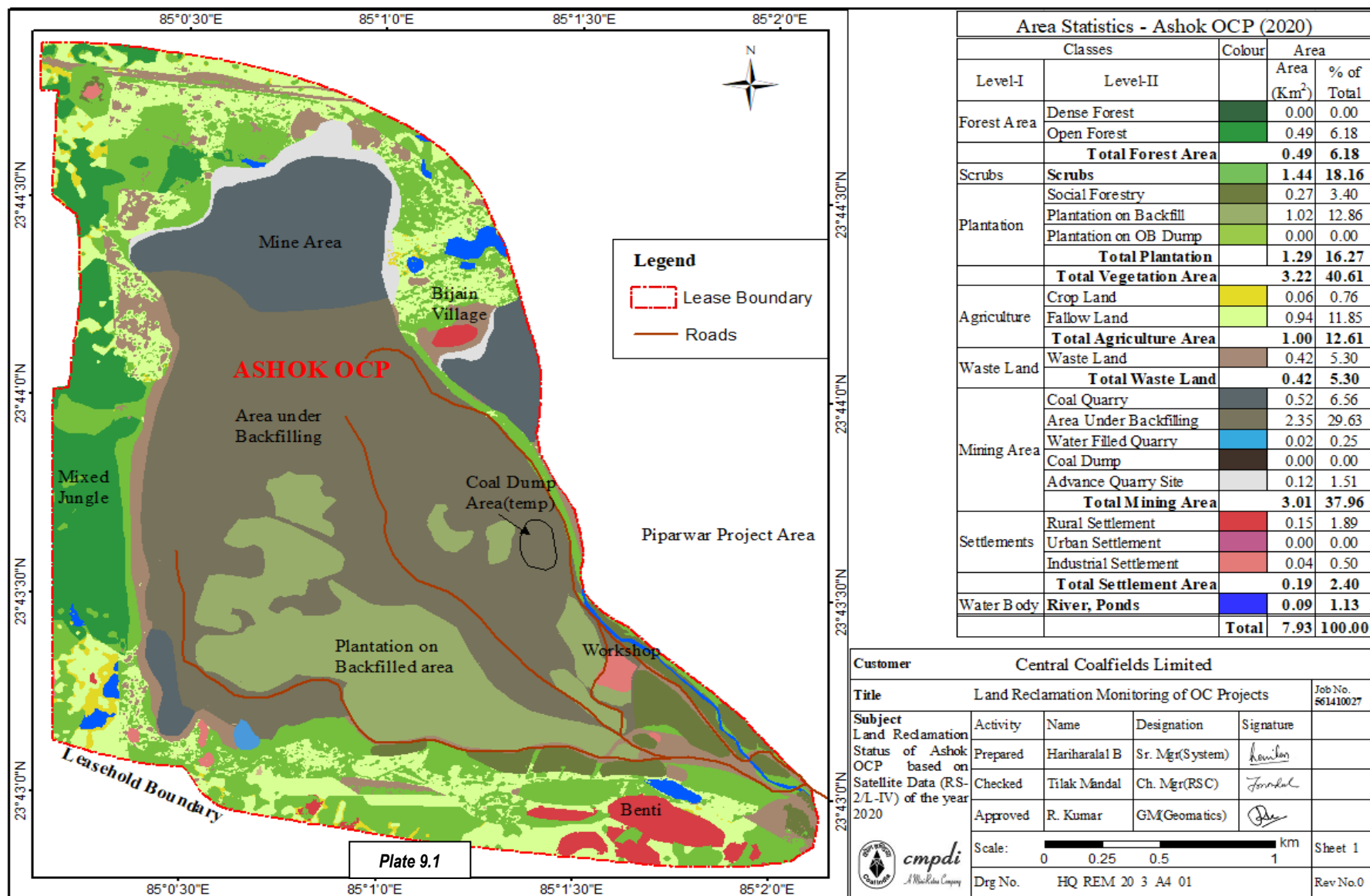
Fig. 9.1: Project wise Land Reclamation Status in Year 2020

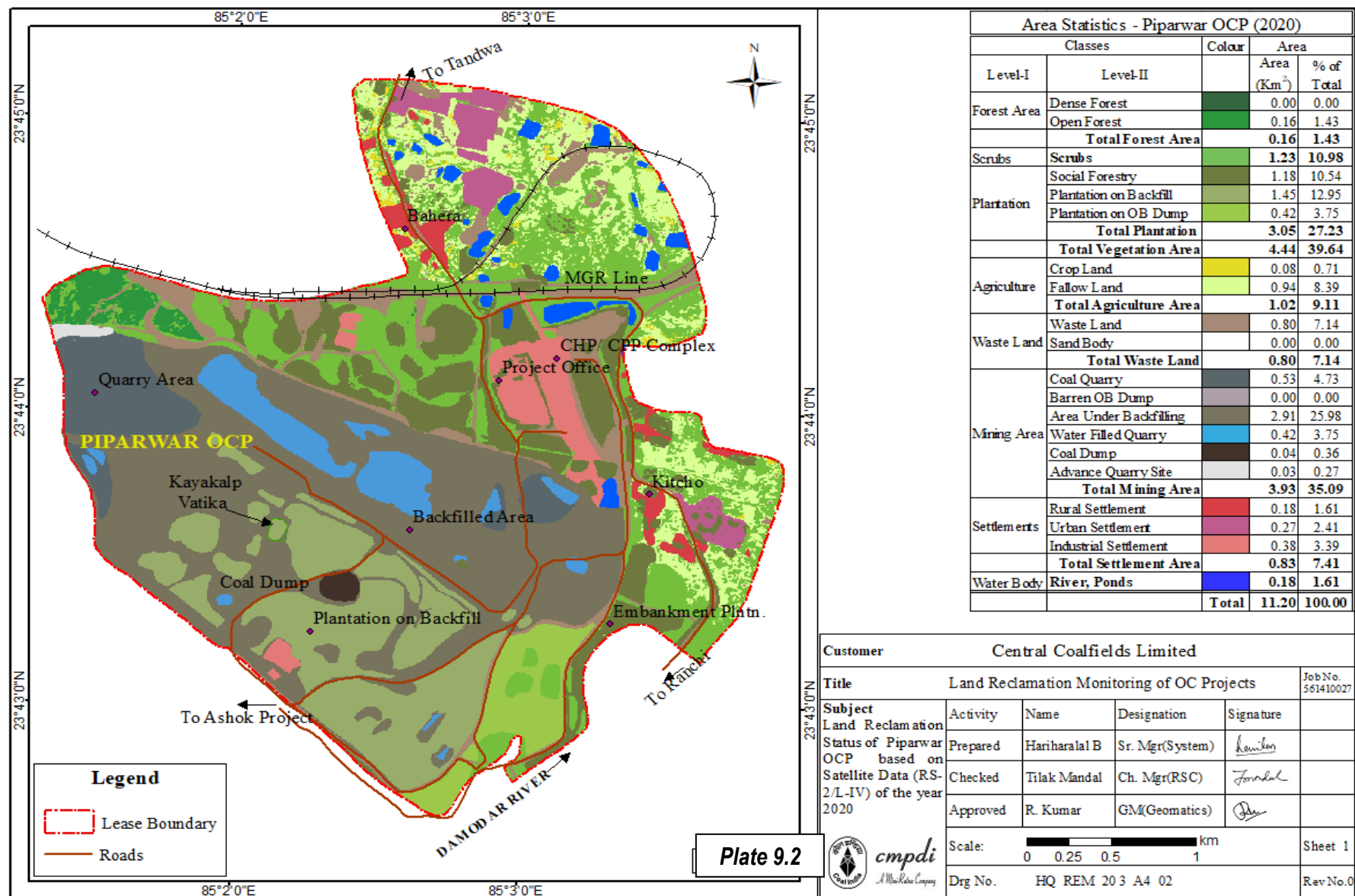
Table 9.2

**Project wise Area Statistics of Land Use / Cover in OC Mines
(> 5 mcu.m.) of CCL based on Satellite data of the Year 2020**

(Area in Km²)

			ASHOK		PIPARWAR		KDH		AMRAPALI		MAGADH		RAJRAPPA		PAREJ EAST		TOTAL	
			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
	Open Forest		0.49	6.18	0.16	1.43	0.20	3.23	0.14	2.26	2.65	14.98	1.48	7.47	1.31	21.13	6.43	8.55
	Total Forest (A)		0.49	6.18	0.16	1.43	0.20	3.23	0.14	2.26	2.65	14.98	1.48	7.47	1.31	21.13	6.43	8.55
PLANTATION	Scrubs(B)		1.44	18.16	1.23	10.98	0.78	12.58	0.85	13.71	2.85	16.11	4.60	23.21	1.85	29.84	13.60	18.08
	Social Forestry		0.27	3.40	1.18	10.54	0.21	3.39	0.02	0.32	0.00	0.00	2.02	10.19	0.09	1.45	3.79	5.04
	Plantation on OB Dump		0.00	0.00	0.42	3.75	0.03	0.48	0.05	0.81	0.10	0.57	3.02	15.24	0.05	0.81	3.67	4.88
	Plantation on Backfill (Biological Reclamation)		1.02	12.86	1.45	12.95	1.32	21.29	0.00	0.00	0.00	0.00	1.30	6.56	0.69	11.13	5.78	7.68
	Total Plantation(C)		1.29	16.27	3.05	27.23	1.56	25.16	0.07	1.13	0.10	0.57	6.34	31.99	0.83	13.39	13.24	17.60
	Total Vegetation(A+B+C)		3.22	40.61	4.44	39.64	2.54	40.97	1.06	17.10	5.60	31.66	12.42	62.66	3.99	64.35	33.27	44.22
ACTIVE MINING	Coal Quarry		0.52	6.56	0.53	4.73	0.15	2.42	0.94	15.16	0.60	3.39	0.40	2.02	0.13	2.10	3.27	4.35
	Advance Quarry Site		0.12	1.51	0.03	0.27	0.06	0.97	0.03	0.48	0.02	0.11	0.08	0.40	0.03	0.48	0.37	0.49
	Quarry Filled With Water		0.02	0.25	0.42	3.75	0.28	4.52	0.10	1.61	0.16	0.90	0.32	1.61	0.06	0.97	1.36	1.81
	Total Area under Active Mining(D)		0.66	8.32	0.98	8.75	0.49	7.91	1.07	17.25	0.78	4.40	0.80	4.03	0.22	3.55	5.00	6.65
E	Coal Dump		0.00	0.00	0.04	0.36	0.05	0.81	0.10	1.61	0.31	1.75	0.10	0.50	0.02	0.32	0.62	0.82
	Barren OB Dump		0.00	0.00	0.00	0.00	0.03	0.48	0.65	10.48	0.85	4.80	0.74	3.73	0.19	3.06	2.46	3.27
	Area Under Backfilling (Technical Reclamation)		2.35	29.63	2.91	25.98	1.79	28.87	1.20	19.35	0.55	3.11	2.37	11.96	0.72	11.61	11.89	15.80
	Total Area under Mine Operation(D+E)		3.01	37.95	3.93	35.09	2.36	38.07	3.02	48.71	2.49	14.08	4.01	20.23	1.15	18.54	19.97	26.54
WASTELANDS	Waste Lands		0.42	5.30	0.80	7.14	0.28	4.52	1.18	19.03	1.80	10.18	1.15	5.80	0.28	4.52	5.91	7.85
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.04	0.65	0.02	0.32	0.00	0.00	0.00	0.00	0.02	0.32	0.08	0.11
	Total Wasteland		0.42	5.30	0.80	7.14	0.32	5.16	1.20	19.35	1.80	10.18	1.15	5.80	0.30	4.84	5.99	7.96
WATERBODY	Reservoir, Nallah, Ponds		0.09	1.13	0.18	1.61	0.07	1.13	0.05	0.81	0.03	0.17	0.02	0.10	0.05	0.81	0.49	0.65
	Total Waterbodies		0.09	1.13	0.18	1.61	0.07	1.13	0.05	0.81	0.03	0.17	0.02	0.10	0.05	0.81	0.49	0.65
AGRICULTURE	Crop Lands		0.06	0.76	0.08	0.71	0.00	0.00	0.10	1.61	0.90	5.09	0.00	0.00	0.04	0.65	1.18	1.57
	Fallow Lands		0.94	11.85	0.94	8.39	0.60	9.68	0.60	9.68	6.54	36.97	1.10	5.55	0.31	5.00	11.03	14.66
	Total Agriculture		1.00	12.61	1.02	9.11	0.60	9.68	0.70	11.29	7.44	42.06	1.10	5.55	0.35	5.65	12.21	16.23
SETTLEMENTS	Urban Settlement		0.00	0.00	0.27	2.41	0.11	1.77	0.00	0.00	0.00	0.00	0.47	2.37	0.16	2.58	1.01	1.34
	Rural Settlement		0.15	1.89	0.18	1.61	0.02	0.32	0.05	0.81	0.30	1.70	0.32	1.61	0.16	2.58	1.18	1.57
	Industrial Settlement		0.04	0.50	0.38	3.39	0.18	2.90	0.12	1.94	0.03	0.17	0.33	1.66	0.04	0.65	1.12	1.49
	Total Settlement		0.19	2.40	0.83	7.41	0.31	5.00	0.17	2.74	0.33	1.87	1.12	5.65	0.36	5.81	3.31	4.40
	Grand Total		7.93	100.00	11.20	100.00	6.20	100.00	6.20	100.00	17.69	100.00	19.82	100.00	6.20	100.00	75.24	100.00





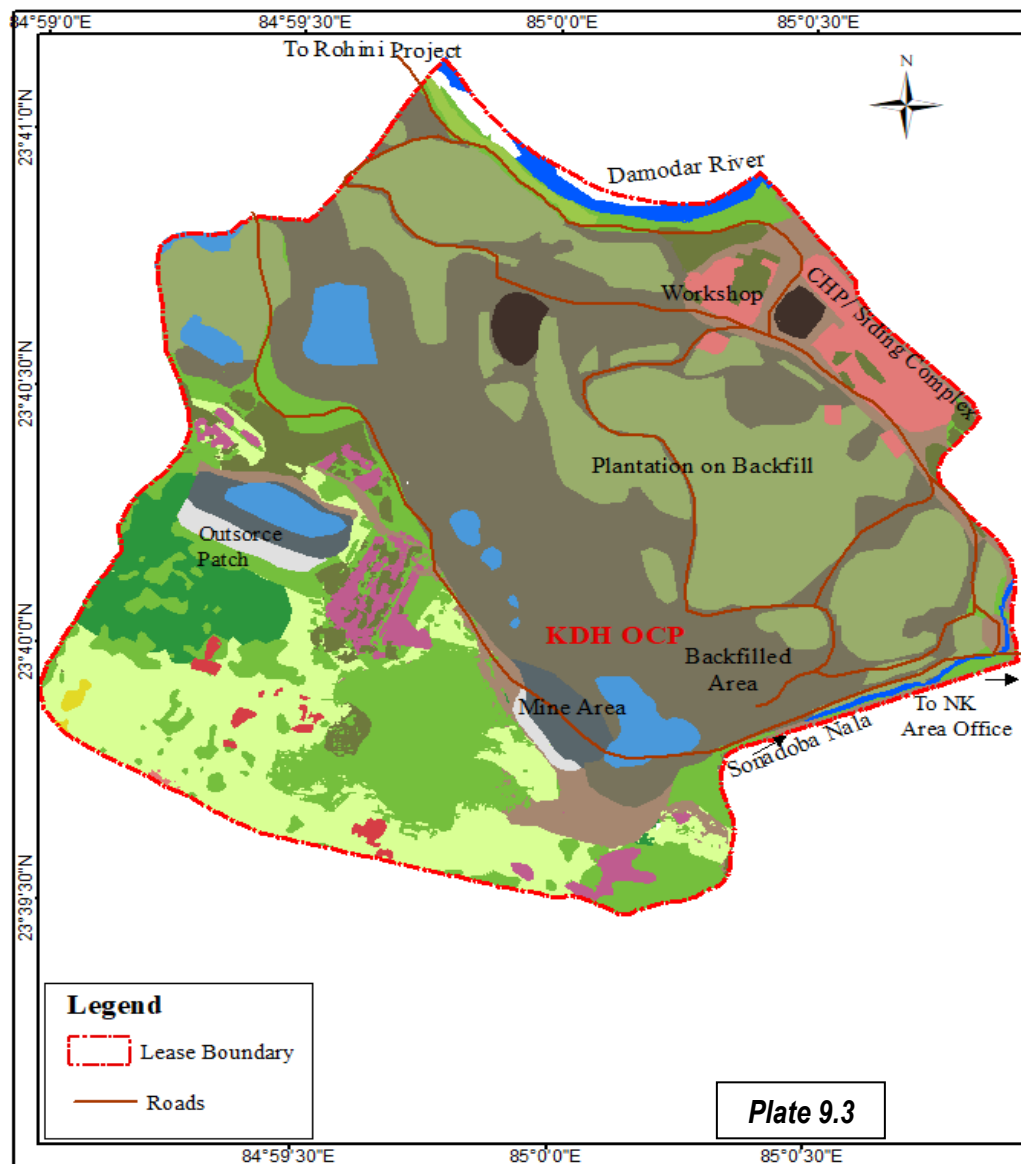
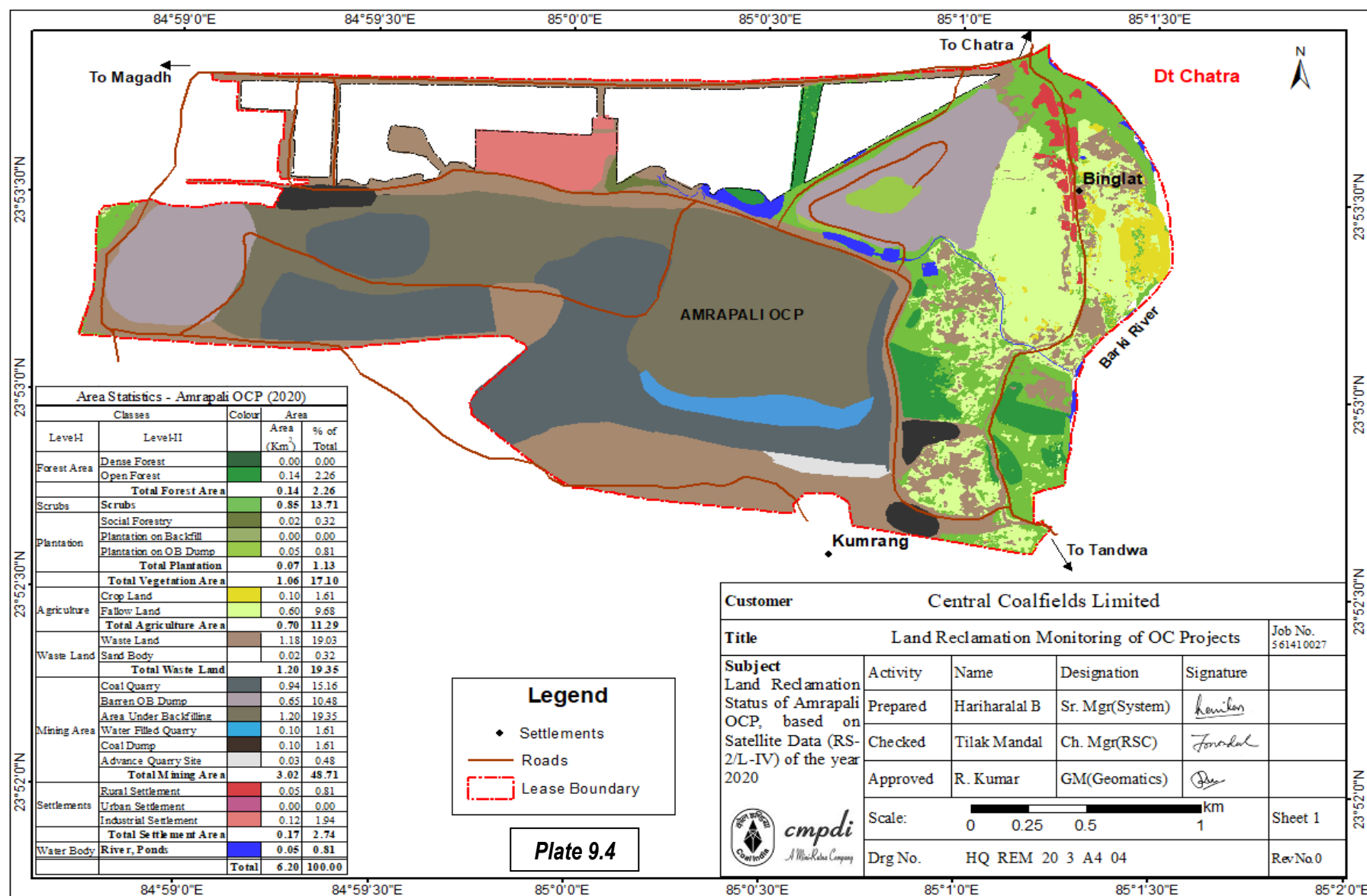
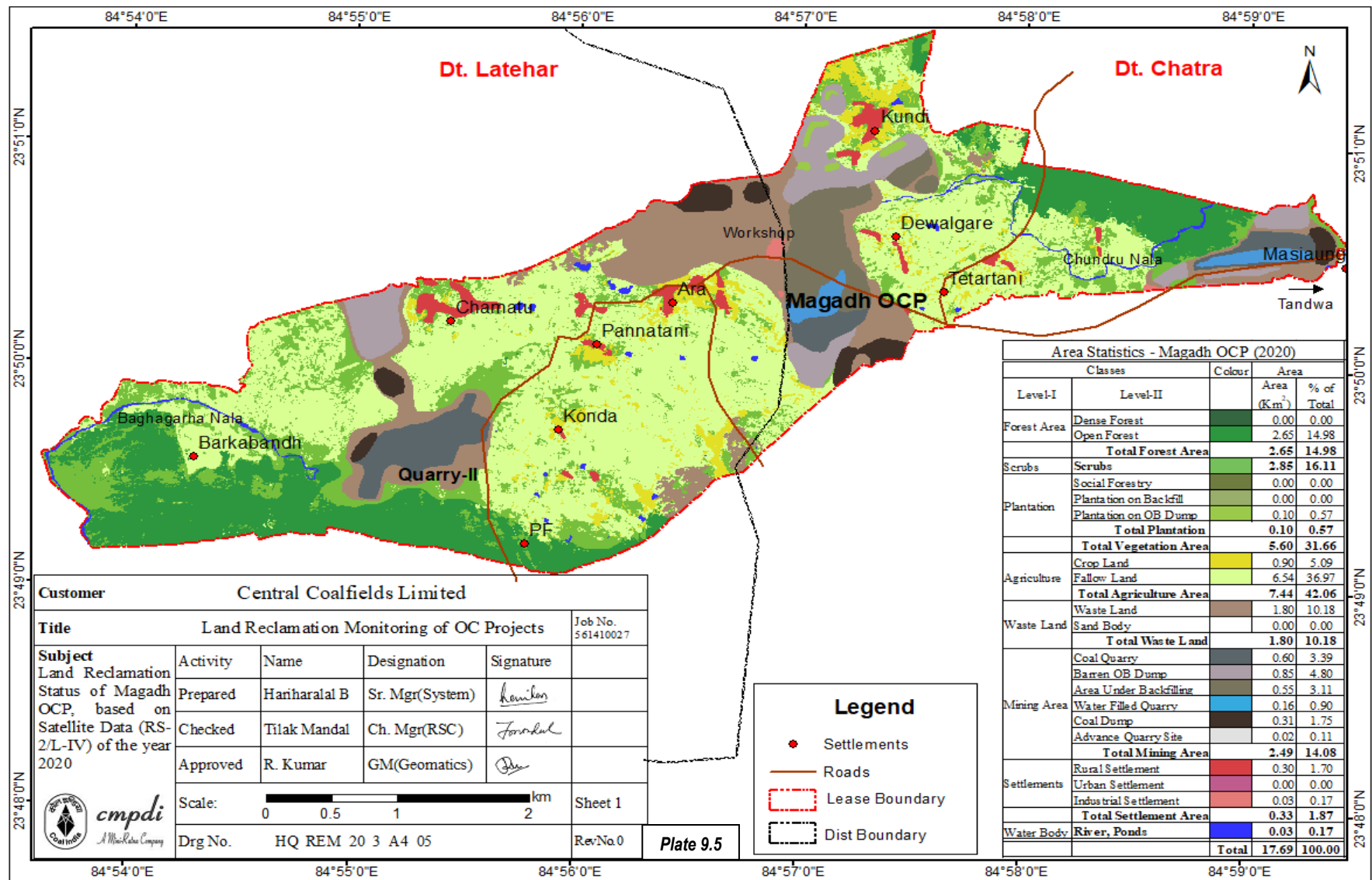


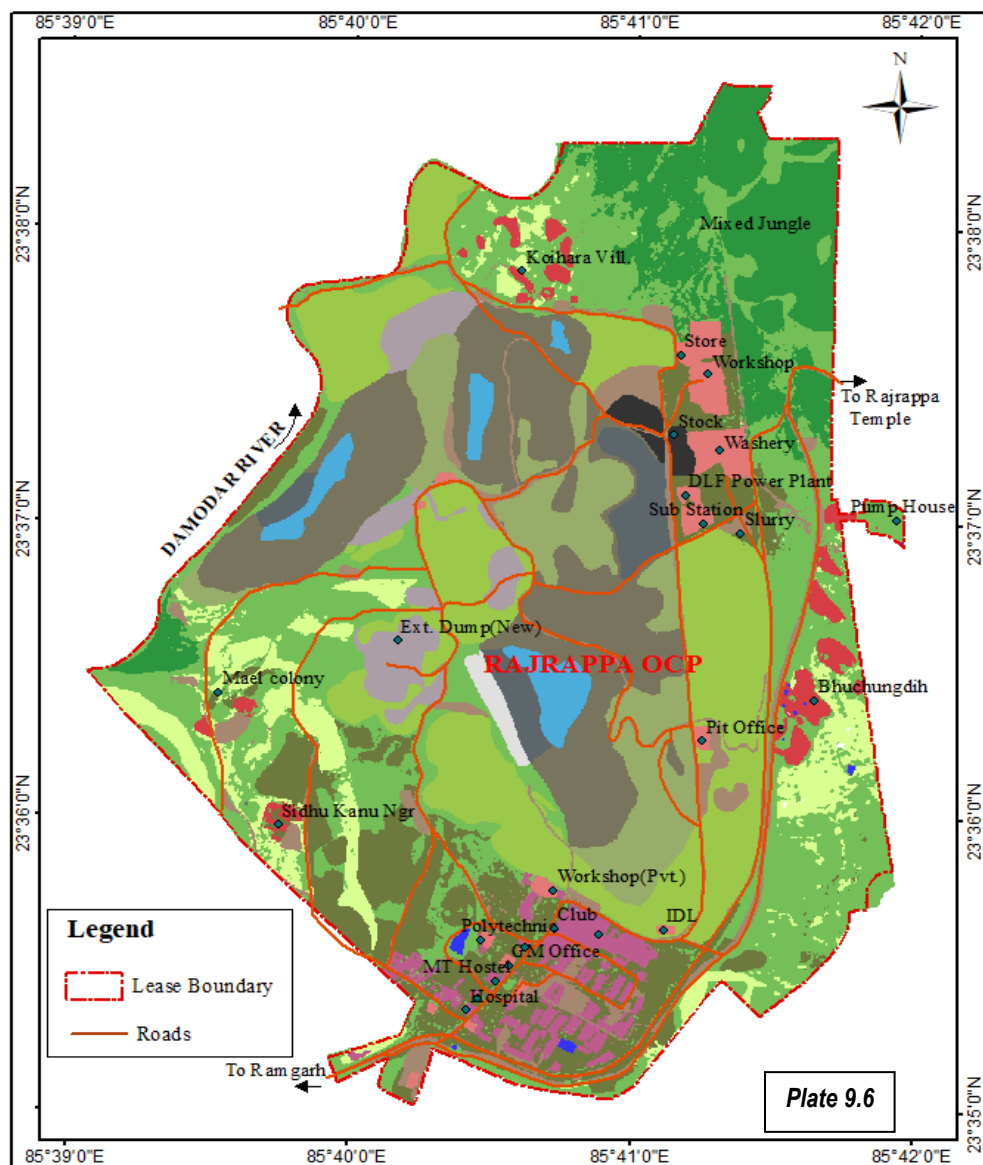
Plate 9.3

Area Statistics - KDH OCP (2020)				
Classes		Colour	Area	
Level-I	Level-II		(Km ²)	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		0.20	3.23
	Total Forest Area		0.20	3.23
Scrubs	Scrubs		0.78	12.58
	Social Forestry		0.21	3.39
	Total Scrub Area		0.99	15.97
Plantation	Plantation on Backfill		1.32	21.29
	Plantation on OB Dump		0.03	0.48
	Total Plantation		1.56	25.16
	Total Vegetation Area		2.54	40.97
Agriculture	Crop Land		0.00	0.00
	Fallow Land		0.60	9.68
	Total Agriculture Area		0.60	9.68
Waste Land	Waste Land		0.28	4.52
	Sand Body		0.04	0.65
	Total Waste Land		0.32	5.16
Mining Area	Coal Quarry		0.15	2.42
	Barren OB Dump		0.03	0.48
	Area Under Backfilling		1.79	28.87
	Water Filled Quarry		0.28	4.52
	Coal Dump		0.05	0.81
	Advance Quarry Site		0.06	0.97
	Total Mining Area		2.36	38.06
Settlements	Rural Settlement		0.02	0.32
	Urban Settlement		0.11	1.77
	Industrial Settlement		0.18	2.90
	Total Settlement Area		0.31	5.00
Water Body	River, Ponds		0.07	1.13
	Total		6.20	100.00

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 2020	Activity	Name	Designation	Signature	
	Prepared	Hariharalal B	Sr. Mgr(System)	<i>hamban</i>	
	Checked	Tilak Mandal	Ch. Mgr(RSC)	<i>Tilak</i>	
	Approved	R. Kumar	GM(Geomatics)	<i>R. Kumar</i>	
Scale:		0 0.25 0.5 1 km			Sheet 1
Drg No.		HQ REM 20 3 A4 03			Rev No.0

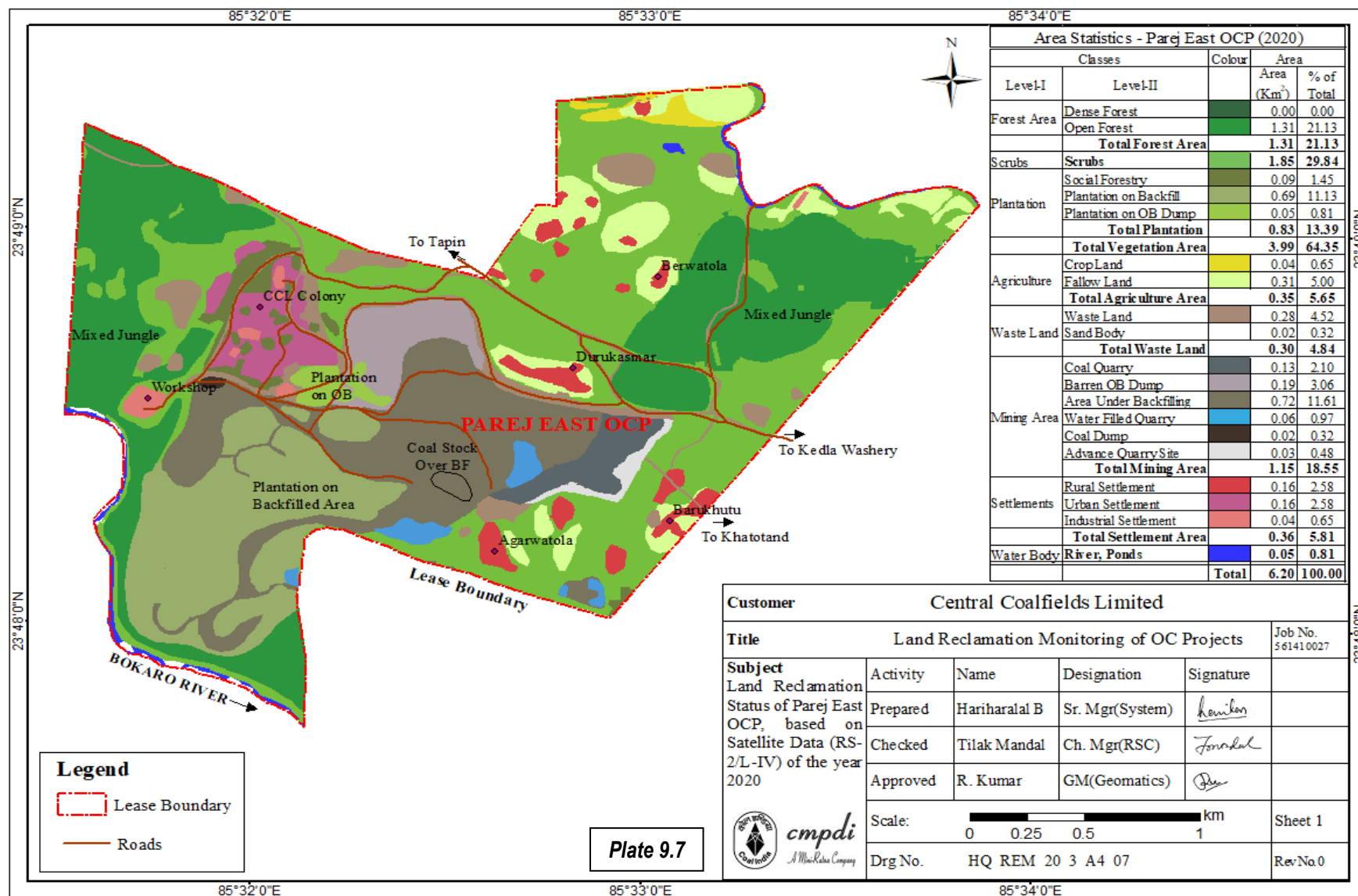






Area Statistics - Rajrappa OCP (2020)				
Level-I	Classes	Colour	Area (Km ²)	% of Total
Forest Area	Dense Forest		0.00	0.00
	Open Forest		1.48	7.47
	Total Forest Area		1.48	7.47
Scrub	Scrub		4.60	23.21
	Social Forestry		2.02	10.19
	Plantation on Backfill		1.30	6.56
Plantation	Plantation on OB Dump		3.02	15.24
	Total Plantation		6.34	31.99
	Total Vegetation Area		12.42	62.66
Agriculture	Crop Land		0.00	0.00
	Fallow Land		1.10	5.55
	Total Agriculture Area		1.10	5.55
Waste Land	Waste Land		1.15	5.80
	Total Waste Land		1.15	5.80
Mining Area	Coal Quarry		0.40	2.02
	Barren OB Dump		0.74	3.73
	Area Under Backfilling		2.37	11.96
	Water Filled Quarry		0.32	1.61
	Coal Dump		0.10	0.50
	Advance Quarry Site		0.08	0.40
	Total Mining Area		4.01	20.23
Settlements	Rural Settlement		0.32	1.61
	Urban Settlement		0.47	2.37
	Industrial Settlement		0.33	1.66
	Total Settlement Area		1.12	5.65
Water Body	River, Ponds		0.02	0.10
Total			19.82	100.00

Customer		Central Coalfields Limited			
Title		Land Reclamation Monitoring of Rajrappa OCP			Job No. 561410027
Subject Land Reclamation Monitoring Status of Rajrappa OCP, based on Satellite Data (RS-2/L-IV) of the year 2020	Activity	Name	Designation	Signature	
	Prepared	Hariharalal B	Sr. Mgr(System)	<i>hariharalal</i>	
	Checked	Tilak Mandal	Ch Mgr(RSC)	<i>Tilak Mandal</i>	
	Approved	R. Kumar	GM(Geomatics)	<i>R. Kumar</i>	
Scale:		0 0.5 1 2 km			Sheet 1
DrgNo.		HQ REM 20 3 A4 06			Rev.No.0



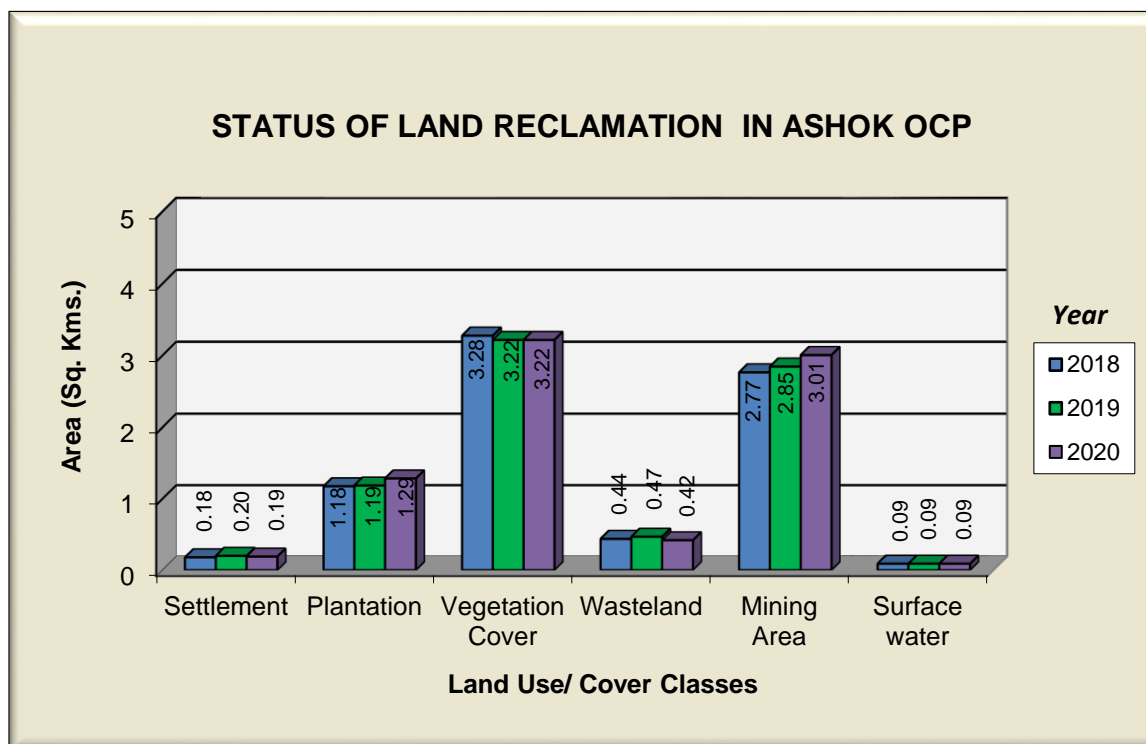


Figure 9.2

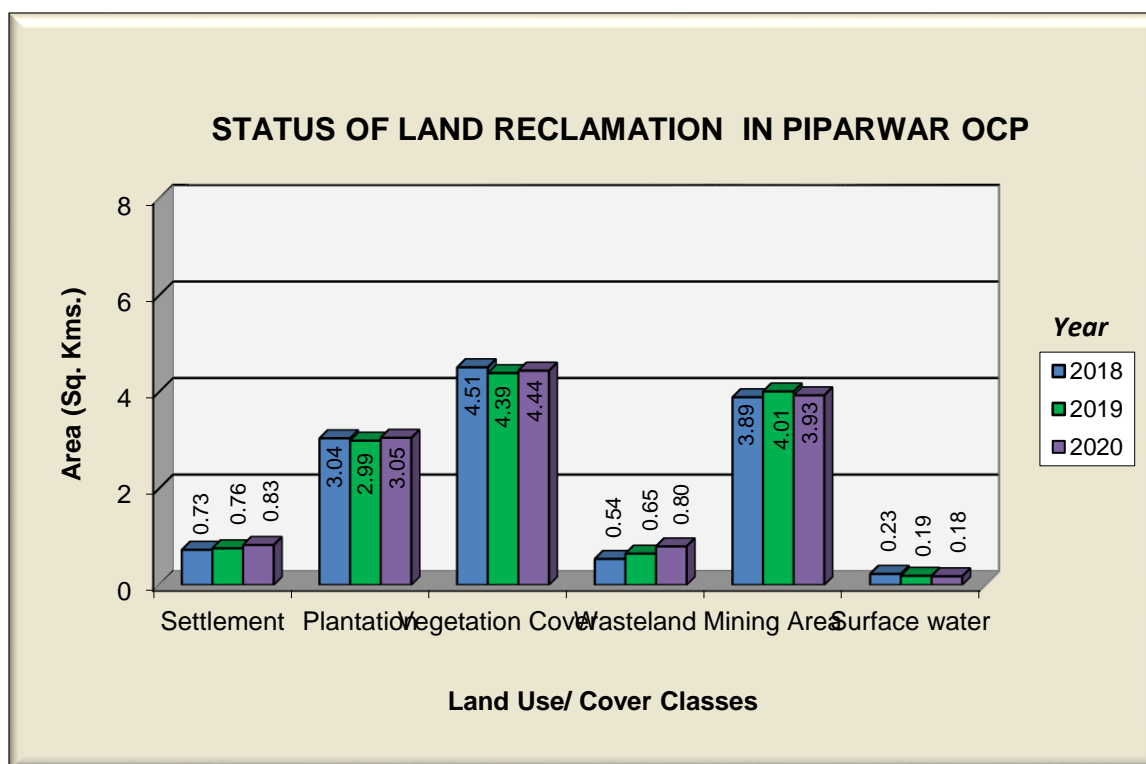


Figure 9.3

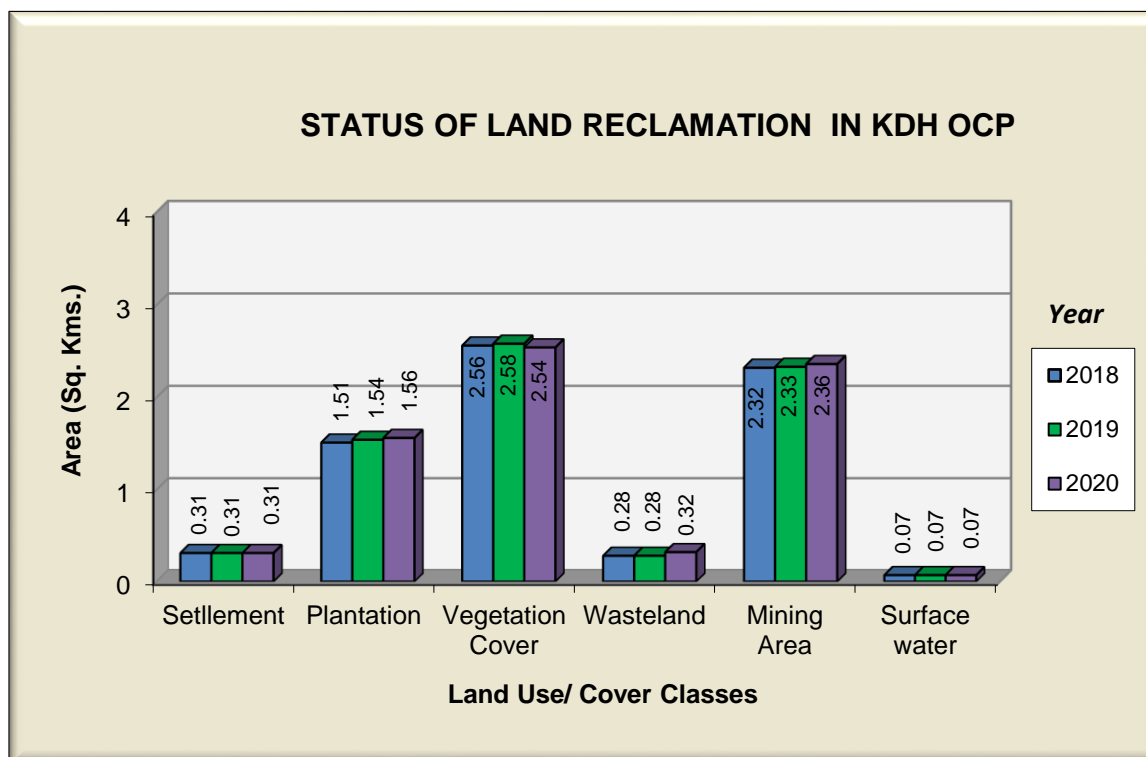


Figure 9.4

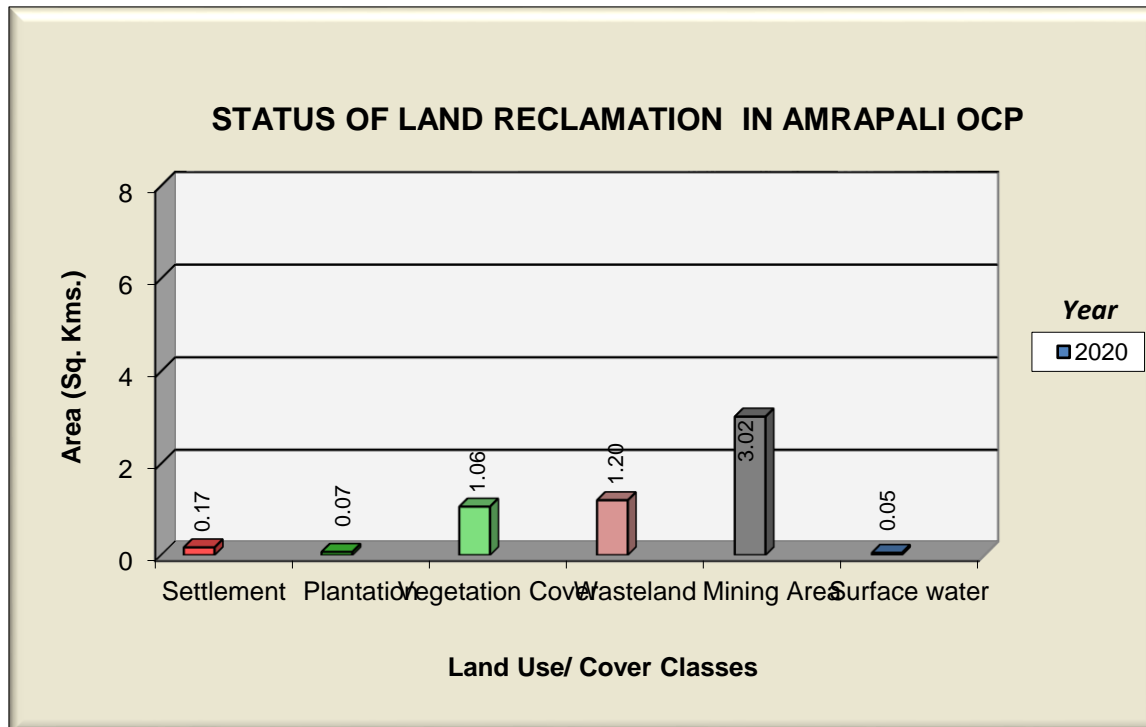


Figure 9.5

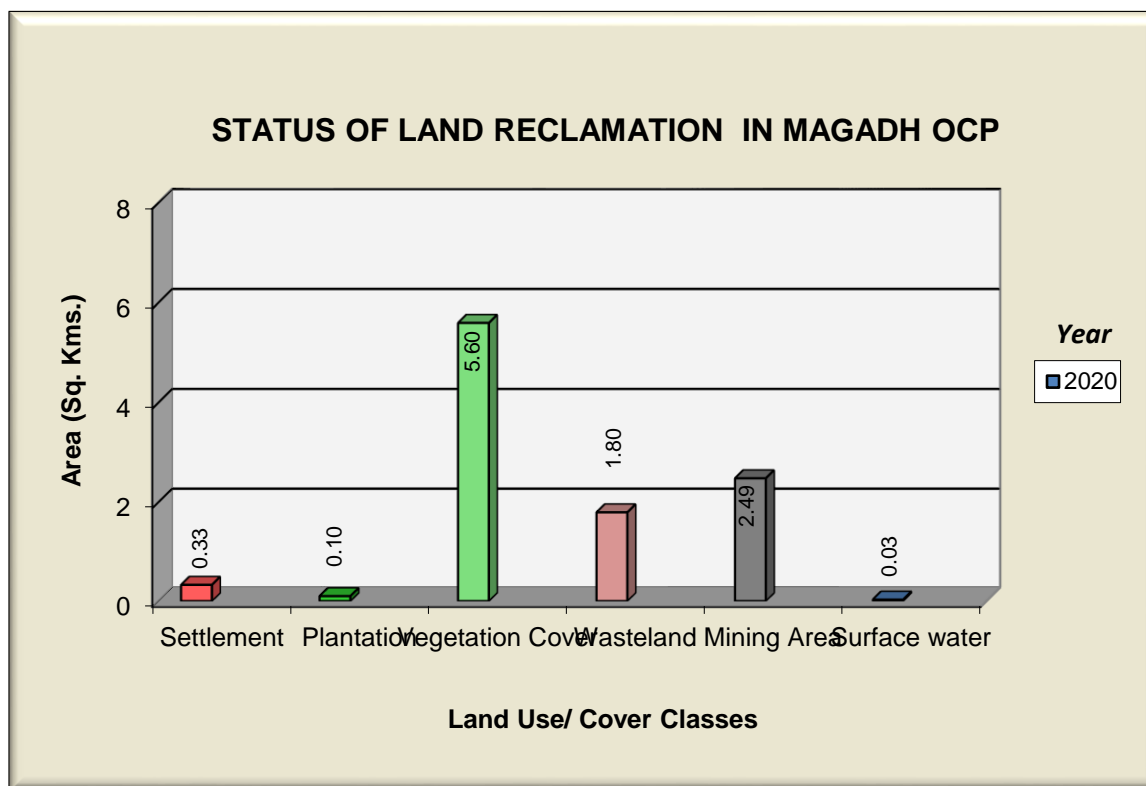


Figure 9.6

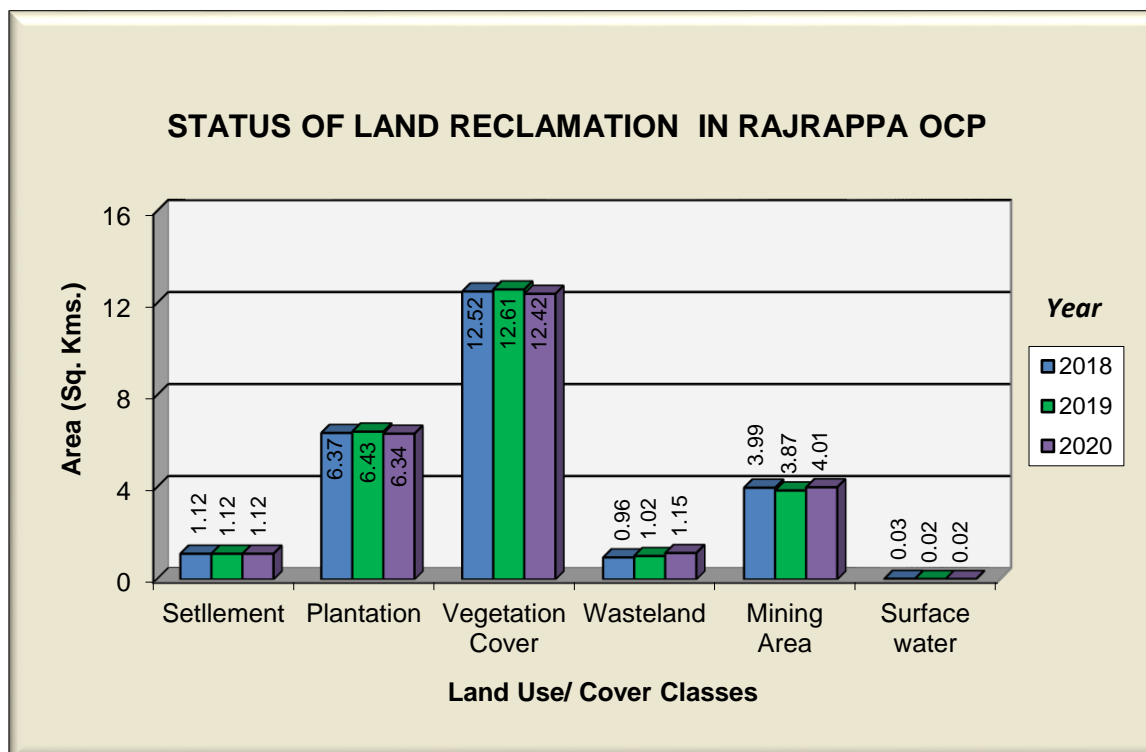
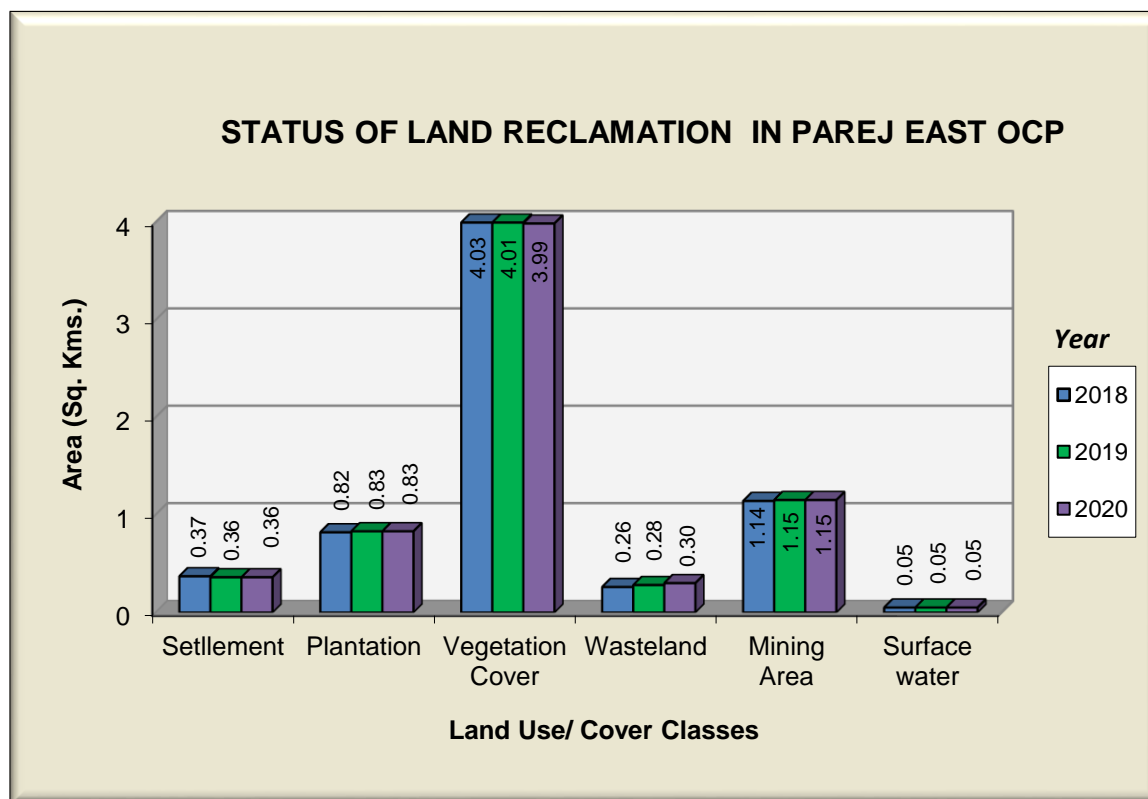


Figure 9.7

**Figure 9.8**



Photograph 9.1: **Plantation on Backfilled area - Piparwar OCP**



Photograph 9.2: **Kayakalp Vatika, Eco Restoration Park Piparwar OCP**



Photograph 9.3: Plantation on Backfilled Area - Ashok OCP



Photograph 9.4: Plantation on OB Dump Area - Amarpali OCP



Photograph 9.5: Plantation on OB Dump Area- Parej East OCP



Photograph 9.6: Plantation on Backfill in Rajrappa OCP

EASTERN COALFIELDS LIMITED

10.0 Land Reclamation Status in Eastern Coalfields Ltd.

10.1 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 based on Satellite Data of the year 2020

- Rajmahal
- Sonepur Bazari

10.2 Both the projects have also been mapped earlier also during the period 2010 to 2019 on annual basis for assessing the progress of land reclamation. Total mine leasehold area of both the projects combined is **40.69** km² in **2020**, confirming to the EC parameters and boundary.

10.3 Project wise Land Reclamation status in ECL based on satellite data for the year 2020 is given in Table 10.1 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 2020 is given in Table 10.2. Land use maps derived from the satellite data are 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 11.50 Km² (69.57%) of excavated area is under reclamation by ECL, out of which 8.83 Km² (53.42%) area is under backfilling (Technical Reclamation) and 2.67 Km² (16.15%) area has been revegetated (Biological Reclamation).

10.5 Area under active mining in Rajmahal OCP reduced by 0.01 Km² only, as the progress of mine advancement is limited due to non-availability of land.

- 10.6** On comparing the status of land reclamation for the year 2020 with respect to the year 2019, it is evident from the analysis that the total area of land reclamation has increased from 10.68 Km² (Yr. 2019) to 11.50 Km² (Yr. 2020).
- 10.7** After analyzing the data of the year 2020, it is seen that the total area under plantation (Green Cover) which includes plantation carried out on backfilled area, OB dumps and plantation under social forestry/ avenue plantation in the two mines of ECL has increased from 4.22 Km² (Yr. 2019) to 4.65 Km² (Yr. 2020).
- 10.8** Of the two projects in ECL, Rajmahal OCP tops with 82.18% reclamation followed by Sonepur Bazari OCP with 57.83 % reclamation.

Table-10.1

Project wise Land Reclamation Status in Opencast Projects of ECL based on Satellite Data for the Year 2020

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

(Area in Sq. Kms.)																			
Sl. No.	Project	Total/ Mine Lease hold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold Area)		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)	
		2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
1	Rajmahal	17.75	17.75	4.44	4.75	1.74	1.80	0.06	0.06	0.54	0.60	1.52	1.42	7.70	7.97	2.34	2.46	6.18	6.55
				57.66%	59.60%	22.60%	22.58%					19.74%	17.82%			13.18%	13.86%	80.26%	82.18%
2	Sonepur Bazari	22.94	22.94	3.92	4.08	0.58	0.87	0.42	0.44	0.88	0.88	3.59	3.61	8.09	8.56	1.88	2.19	4.50	4.95
				48.45%	47.66%	7.17%	10.16%					44.38%	42.17%			8.20%	9.55%	55.62%	57.83%
	TOTAL	40.69	40.69	8.36	8.83	2.32	2.67	0.48	0.50	1.42	1.48	5.11	5.03	15.79	16.53	4.22	4.65	10.68	11.50
				52.94%	53.42%	14.69%	16.15%					32.36%	30.43%			10.37%	11.43%	67.64%	69.57%
(% is calculated with respected to Total 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".

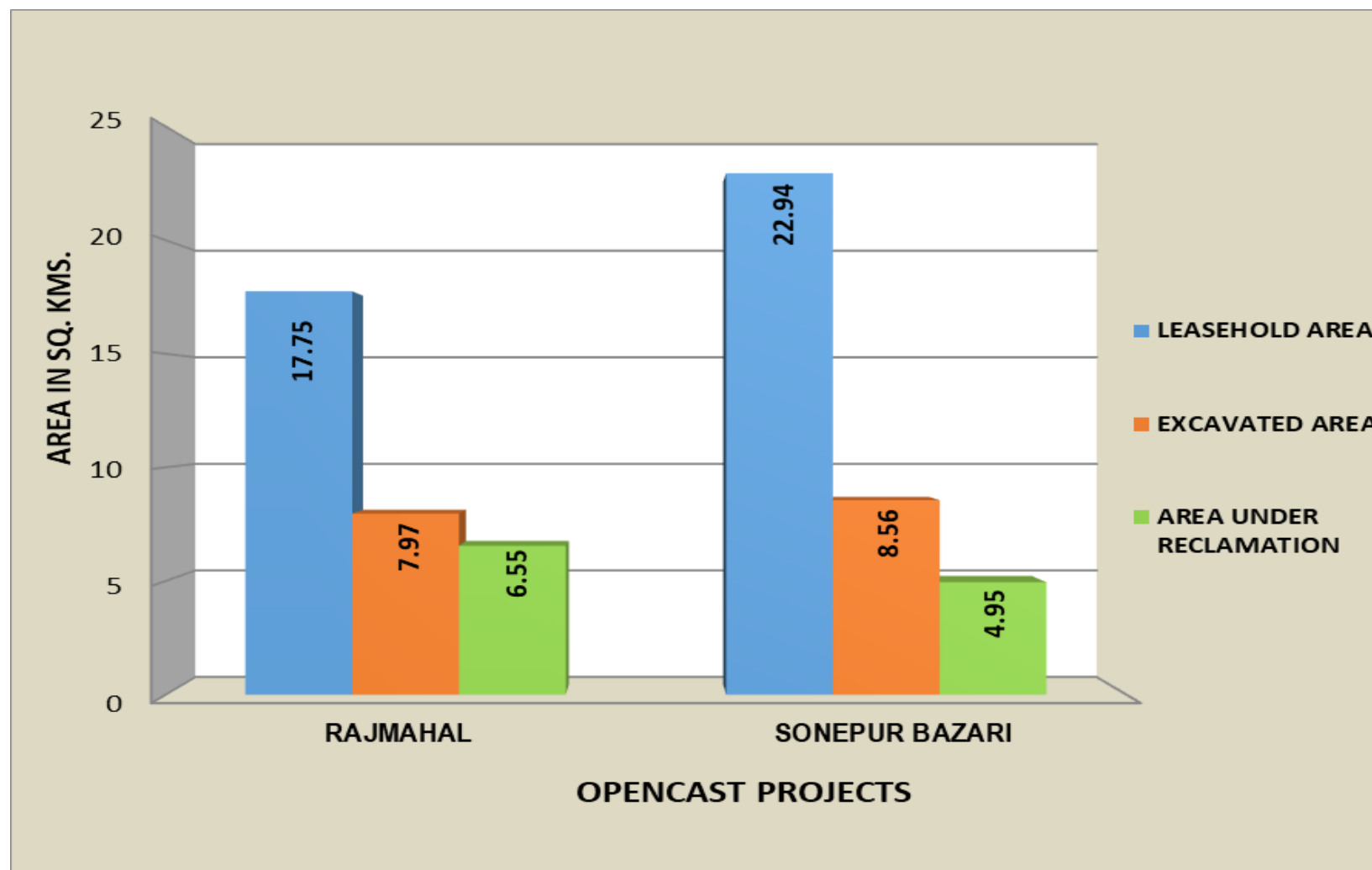






















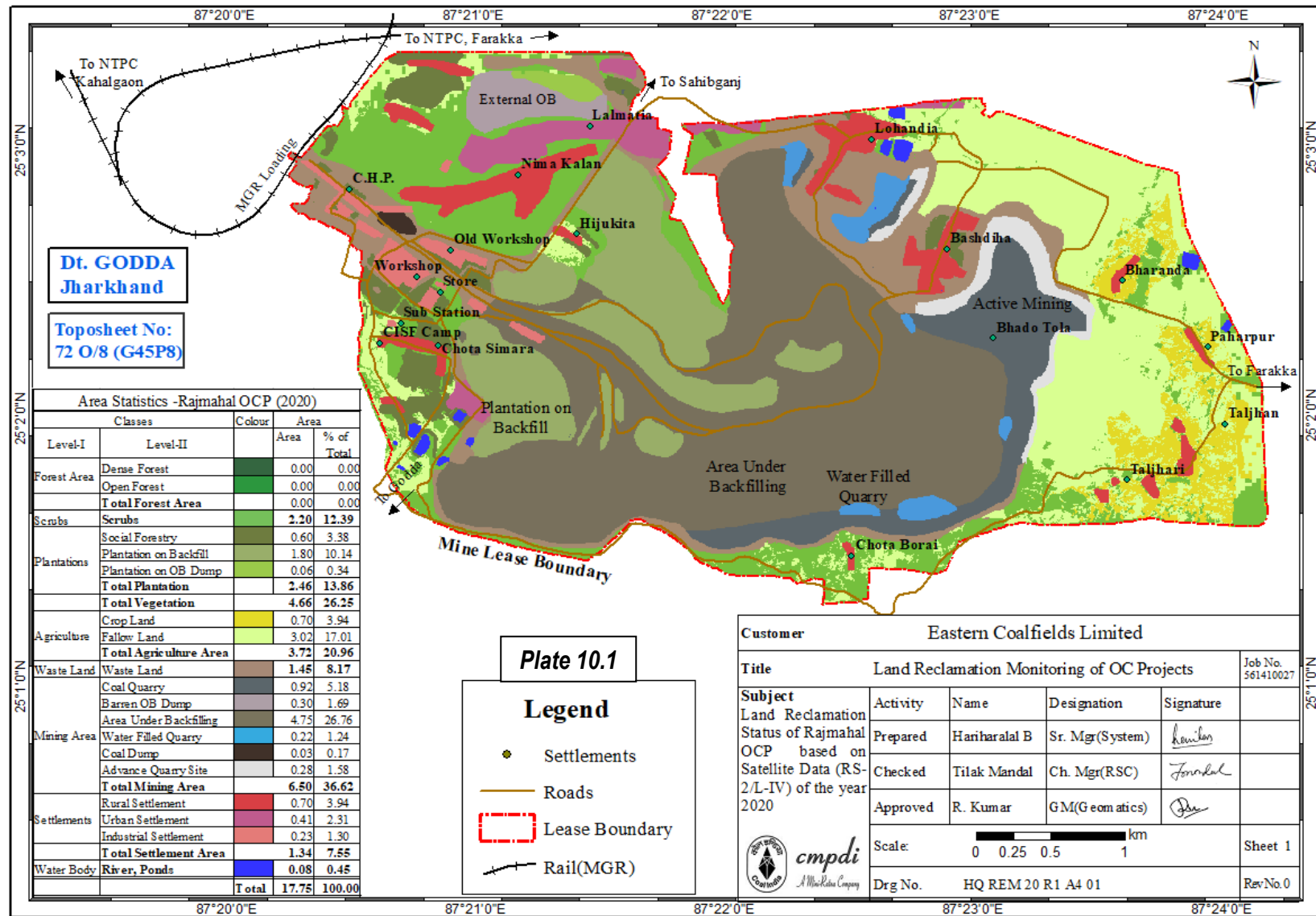
Fig. 10.1: Project wise Land Reclamation Status in ECL in the year 2020

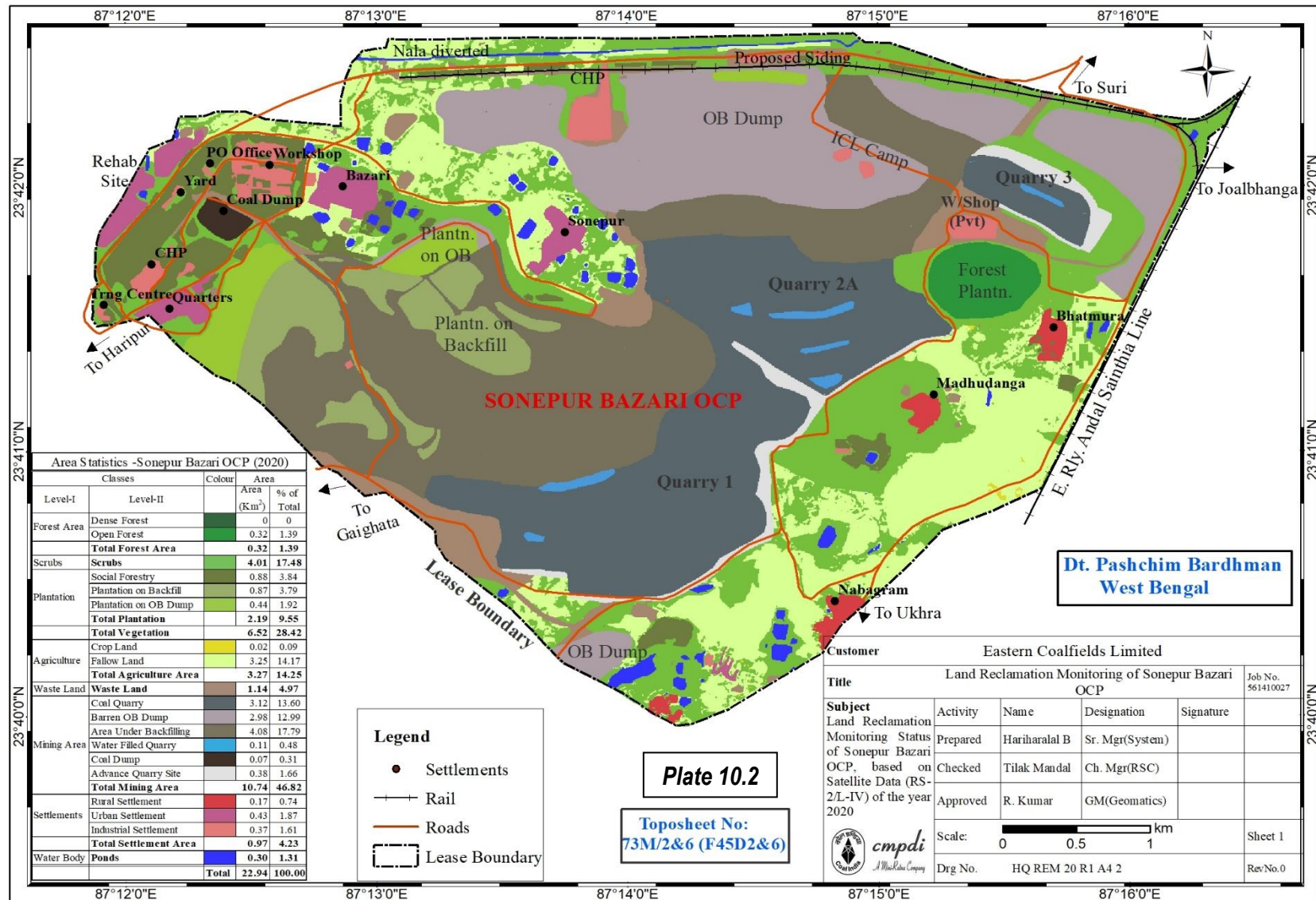
Table 10.2

**Project wise Area Statistics of Land Use / Cover in OC Mines
(> 5 mcu.m.) of ECL based on Satellite data of the Year 2020**

(Area in Km²)

			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
	Total Forest(A)		0.00	0.00	0.32	1.39	0.32	0.79
	Scrubs(B)		2.20	12.39	4.01	17.48	6.21	15.26
PLANTATION	Social Forestry		0.6	3.38	0.88	3.84	1.48	3.64
	Plantation on OB Dump		0.06	0.34	0.44	1.92	0.50	1.23
	Plantation on Backfill(Biological Reclamation)		1.80	10.14	0.87	3.79	2.67	6.56
	Total Plantation (C)		2.46	13.86	2.19	9.55	4.65	11.43
	Total Vegetation (A+B+C)		4.66	25.25	6.52	28.42	11.18	27.48
ACTIVE MINING	Coal Quarry		0.92	5.18	3.12	13.6	4.04	9.93
	Advance Quarry Site		0.28	1.58	0.38	1.66	0.66	1.62
	Quarry Filled With Water		0.22	1.24	0.11	0.48	0.33	0.81
	Area under Active Mining (D)		1.42	8.00	3.61	15.74	5.03	12.36
E	Coal Dump		0.03	0.17	0.07	0.31	0.10	0.25
	Barren OB Dump		0.30	1.69	2.98	12.99	3.28	8.06
	Area Under Backfilling(Technical Reclamation)		4.75	26.76	4.08	17.79	8.83	21.70
	Total Area under Mining Operation (D+E)		6.50	36.62	10.74	46.82	17.24	42.37
WASTELANDS	Waste Lands		1.45	8.17	1.14	4.97	2.59	6.37
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.00	0.00
	Total Wasteland		1.45	8.17	1.14	4.97	2.59	6.37
WATERBODIES	Reservoir, Nallah, Ponds		0.08	0.45	0.30	1.31	0.38	0.93
	Total Waterbodies		0.08	0.45	0.30	1.31	0.38	0.93
AGRICULTURE	Crop Lands		0.7	3.94	0.02	0.09	0.72	1.77
	Fallow Lands		3.02	17.01	3.25	14.17	6.27	15.41
	Total Agriculture		3.72	20.96	3.27	14.25	6.99	17.18
SETTLEMENTS	Urban Settlement		0.41	2.31	0.43	1.87	0.84	2.06
	Rural Settlement		0.7	3.94	0.17	0.74	0.87	2.14
	Industrial Settlement		0.23	1.3	0.37	1.61	0.60	1.47
	Total Settlement		1.34	7.55	0.97	4.23	2.31	5.68
	Grand Total		17.75	100.00	22.94	100.00	40.69	100.00





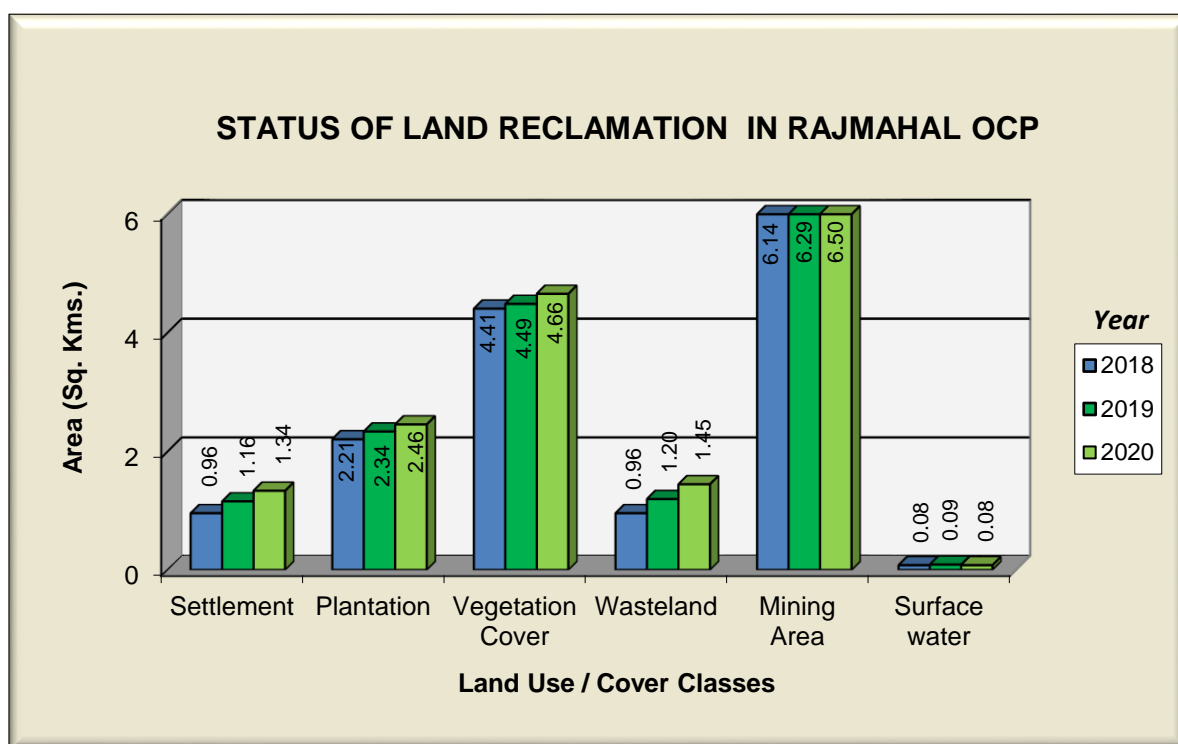


Figure 10.2

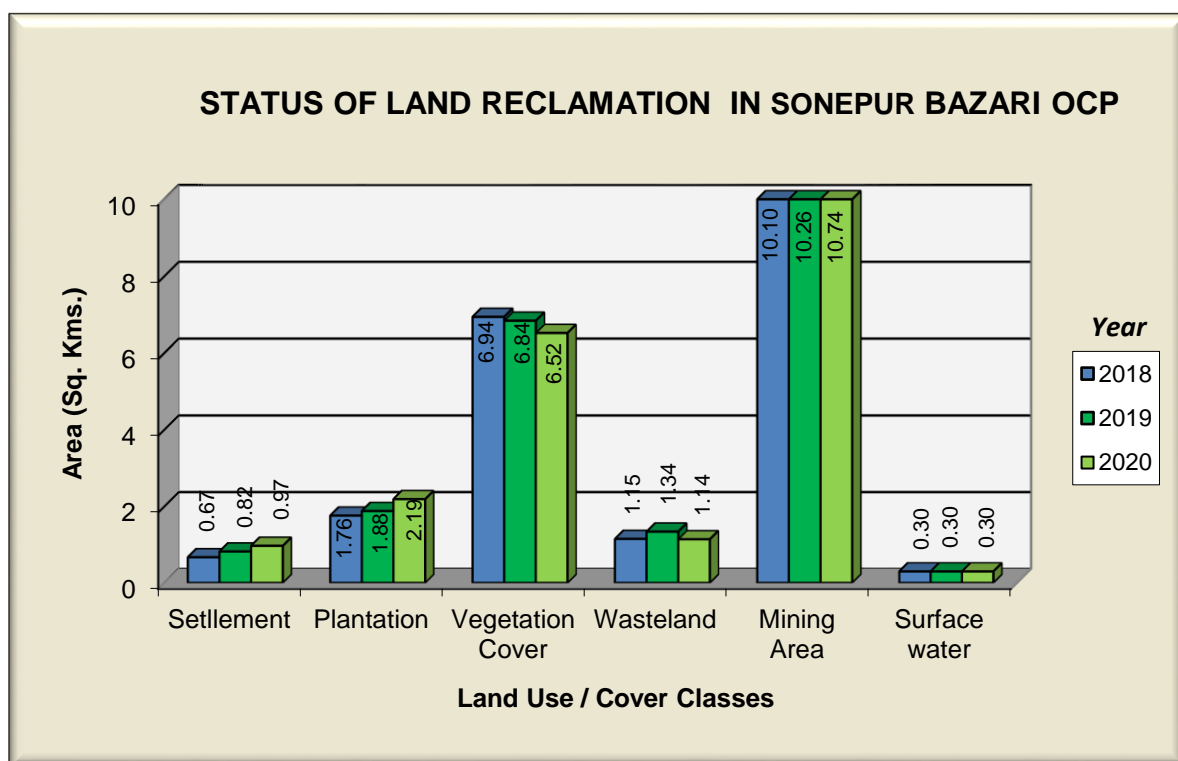


Figure 10.3



Photograph 10.1: Plantation on Backfill in Rajmahal OCP, ECL



Photograph 10.2: Plantation on Backfilled Area in Sonapur Bazari OCP, ECL



cmpdi
A Mini-Ratna Company

Central Mine Planning & Design Institute Ltd.

(A Subsidiary of Coal India Ltd.)

Gondwana Place, Kanke Road, Ranchi 834031, Jharkhand

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

Website : www.cmpdi.co.in, Email : cmpdihq@cmpdi.co.in