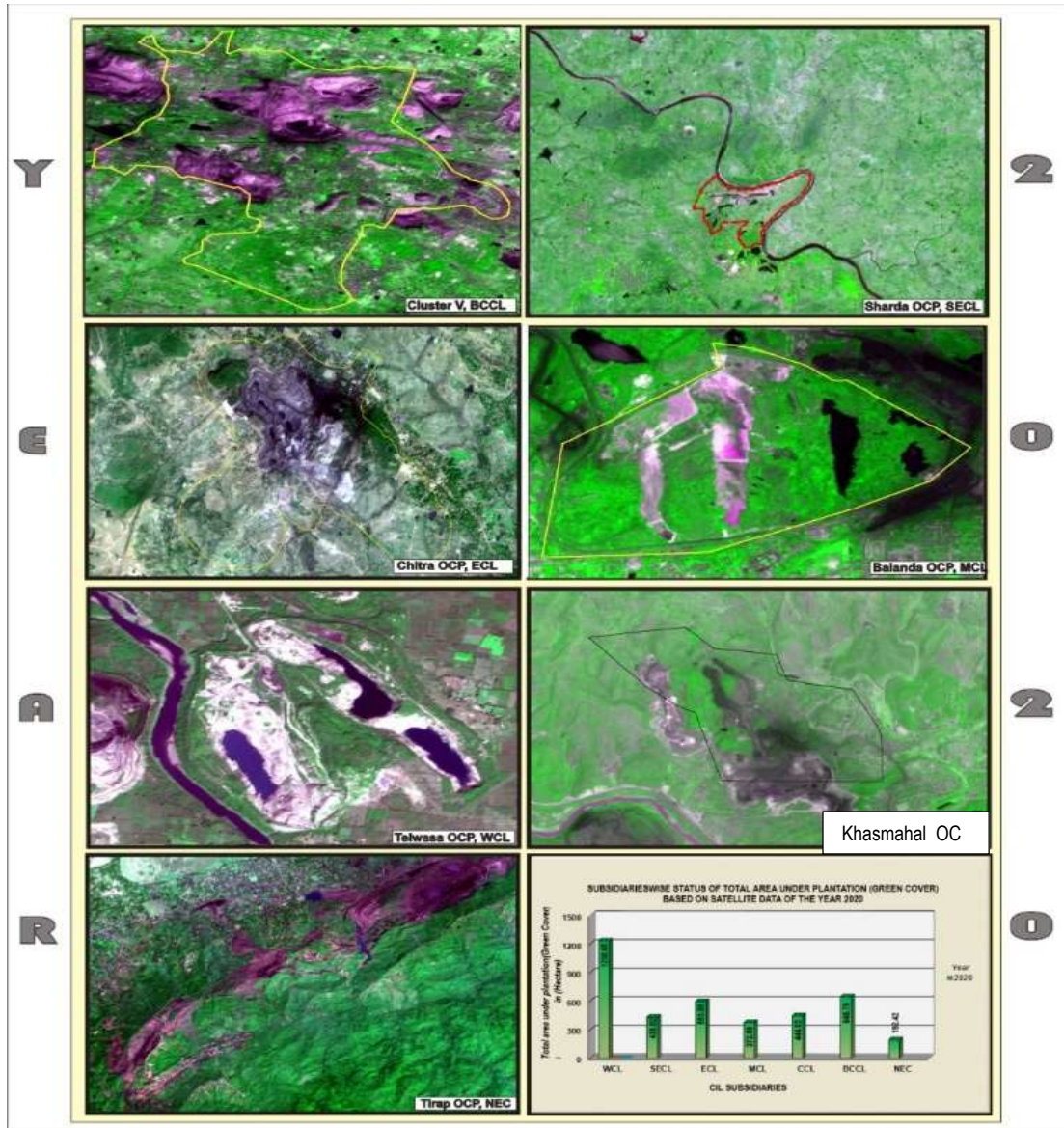


Land Restoration / Reclamation Monitoring of 46 Opencast projects, 09 Cluster of mines and 05 Underground mines of CIL producing less than 5 m.c.m. (Coal+OB) based on Satellite Data for the Year 2020



Submitted to
Coal India Limited



cmpdi
A Mini-Ratna Company

**Land Restoration / Reclamation Monitoring of 46 Opencast Projects, 09
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5 m.c.m. (Coal+OB) based on Satellite Data for the Year 2020**

March- 2021



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

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Executive Summary

- 1.0 Project** Land restoration/ reclamation monitoring of 60 projects consisting of 46 opencast coal mines, 9 clusters of (OC+UG) mines and 5 Underground mines of different subsidiaries of Coal India Ltd. (CIL) producing less than 5 million cubic meter (Coal+OB) annually, based on satellite data regularly at an interval of three years.
- 2.0 Objective** Objective of the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, green cover, water bodies, and distribution of wasteland, agricultural land and forest in the leasehold area of these 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 49743.76 Hectares of the 60 projects combine with 46 opencast coal mines, 9 cluster of (OC+UG) mines and 5 Underground mines producing less than 5 mcm (Coal +OB) considered for monitoring during 2020-21; total excavated area is only 7089.40 hectares out of which 925.11 hectares (13.05%) has been planted (*Biologically Reclaimed*), 2855.20 hectares (40.27%) area is been under backfilling (*Technically Reclaimed*) and 3309.09 hectares (46.68%) area is under active mining. It is evident from the analysis that 3780.31 hectares (53.32%) area of the 60 projects taken for study for the year 2020-21 is under reclamation and balance 3309.09 hectares (46.68%) area is under active mining. Company wise details are given in Table-1 & Fig-1.
- The Projects selected for land reclamation monitoring in the year 2020-21 are subdivided into three groups viz (A) 46 opencast projects belonging to WCL, SECL, CCL, ECL, MCL & NEC, (B) 09 Cluster of mines of BCCL & ECL and (C) 05 Underground mines of SECL & MCL.
- For 46 nos. of Opencast mines which is indicated as Group (A), in Table – 1, out of total mine leasehold area 24604.03 hectare of 46 OC projects of WCL, SECL, ECL, MCL, CCL & NEC producing less than 5 mcm (Coal+OB) annually considered for

monitoring during 2020-21; total excavated area is 5298.66 hectares, out of which 801.30 hectares (15.12%) area has been planted (Biologically Reclaimed), 2010.71 hectares (37.95%) area is under backfilling (Technical Reclamation) and balance 2486.65 hectares (46.93%) area is under active mining. Company wise details of land reclamation of above 46 projects is given in table - 1 (A) & Fig-1.

- Comparing the status of land reclamation for 46 no. of opencast projects in WCL, ECL, SECL, CCL, MCL & NEC monitored in the year 2020-21 with respect to previous cycle study done for the same set of OC mines in the year 2017-18 in these opencast projects of CIL's subsidiary coal companies, it is evident from the analysis that area under land reclamation has increased from 1681.39 Hectares (43.07%) (Yr. 2017) to 2812.01 Hectares (53.07%) (Yr. 2020-21) which includes both plantation (Biological Reclamation) and areas under backfilling (Technical Reclamation). This increase of 1130.62 Hectare area under land reclamation in a period of three years is due to addition of 03 OC projects of ECL and 02 OC projects of SECL and sincere efforts made by CIL's subsidiary companies towards land reclamation their mining area.
- It has been observed that in opencast projects in WCL, SECL, CCL, MCL, ECL & NEC technical and biological reclamation has either increased in the leasehold area of opencast projects in the year 2020-21 as compared to the year 2017-18.
- The 46 nos. of opencast projects in WCL, SECL, CCL, MCL, ECL & NEC taken for study of land reclamation monitoring in the year 2020-21: the area under green cover has gone up from 1764.03 Ha (9.79%) area in the year 2017-18 to 2561.48 Ha (10.41%) area in the year 2020-21.
- For 9 nos. of Clustered mines which is indicated as Group (B) in Table –1, out of total mine leasehold of 17047.22 Hectare for total nos of 09 clusters 05 nos in BCCL and 04 nos in ECL producing less than 5 million cu.m. (Coal+OB) annually considered for monitoring during the year 2020-21; total excavated area 1790.74 Ha, out of which 123.81 Ha (6.91%) area has been planted on backfill (Biologically Reclaimed), 844.49 Ha (47.16%) area is under backfilling (Technical Reclamation) and balance 822.44 Ha (45.93%) area is under active mining.

- In BCCL and ECL, cluster of mines consisting mostly opencast mine and few underground mines have been taken into consideration for land reclamation monitoring in the year 2020-21 on request of these subsidiaries.
- It is evident from Group (B) (refer table -1) that for 09 clusters taken for monitoring of land reclamation, plantation on backfill (Biologically Reclamation) has increased from 31.60 Ha (5.57%) in the year 2017 to 123.81 Ha (6.91%) in the year 2020 and Technical Reclamation has increased from 457.35 Ha (45.94%) in the year 2017 to 844.49 Ha (47.16%) in the year 2020.
- The area under green cover has gone up from 566.96 hectares (8.62%) in the year 2017 to 1179.75 hectares (6.92%) in the year 2020. The decrease of 1.70 % in percentage of green cover in the year 2020 as compared to the year 2017 is due to increase in area of leasehold boundary this year and percentage of green cover generated has been calculated with respect to area of leasehold boundary.
- Total area under reclamation in 09 nos of cluster of BCCL and ECL has gone up from 488.95 hectares (49.11%) in 2017 to 968.30 hectares (54.07%) in 2020-21.
- In Group (C), 02 nos of underground mines of SECL and 03 nos of Underground mines of MCL producing less than 5 million cu.m. (Coal+OB) annually are considered for the first time for land reclamation monitoring based on satellite data of the year 2020-21. Hence comparison has not been made this year however, data generated of these UG mine will be considered as base data for comparison of status of land reclamation for same set of mine during interval of three years.
- From Table 1; Group (A), (B) and (C) combined, it can be seen that total area of leasehold boundary in the 60 nos of project consisting of 46 nos of OC, 09 nos of Cluster of mines and 05 nos of Underground mines of WCL, SECL, ECL, MCL, BCCL, CCL & NEC is 49743.76 Ha; total excavated area is 7089.40 Ha only, out of which 925.11 Ha (13.05%) area has been planted on backfill (Biologically Reclaimed), 2855.20 Ha (40.27%) area is under backfilling (Technical Reclamation) and balance 3309.09 Ha (46.68%) area is under active mining.

- It has been observed that in all subsidiaries of CIL, biological reclamation as well as areas under technical reclamation has increased in the leasehold boundary from 486.48 Ha (9.93%) (Yr.2017) to 925.11 Ha (13.05%) and 1683.86 Ha (34.37%) to 2855.20 Ha (40.27%) respectively.
- Overall, the area under green cover has gone up from 2330.99 hectares (9.48%) in 2017-18 to 3847.14 hectares in 2020-21 as indicated in bar chart (fig-3).
- Total area under reclamation in all subsidiaries of CIL has gone up from 2170.34 hectares (44.30%) in 2017-18 to 3780.31 hectares (53.32%) in 2020-21.

Table-1
Company wise Land Reclamation Status in 46 OC, 09 Cluster of (UG+OC) mines and 05 underground mines producing
(Less than 5 million cu.m. Coal + OB) based on Satellite Data of year 2020

Sl. No.	Coal Company (No. of OC Projects, Cluster of mines & Underground mines)		Area in Hectare (% calculated in respect of total excavated area)																	
			Leasehold / All Right Boundary	Technical Reclamation		Plantation				Area under Active Mining	Total Excavated Area	Total Area under Plantation (% Green Cover generated in Leasehold)		Total Area under Reclamation						
						Biological Reclamation		Other Plantation												
					Area under Backfilling		Area under Plantation on backfill		Plantation on External OB Dumps		Socail Forestry, Avenue Plantation etc.									
1	2		3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11 (=4+5)	
	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
(A)	PROJECT WISE (OC)																			
1	WCL (14)	WCL (15)	7289.16	7759.95	337.31 26.45%	485.02 33.08%	60.35 4.73%	68.11 4.65%	526.46	760.04	406.54 68.82%	402.50 62.27%	877.63 13.63%	913.11 15.86%	1275.29 31.18%	1466.24 37.72%	993.35 15.86%	1230.65 31.18%	397.66 37.72%	553.13 37.72%
2	SECL (05)	SECL (07)	2058.00	4732.67	527.00 52.75%	592.32 47.33%	181.00 18.12%	249.48 19.94%	11.00	63.77	9.00 29.13%	55.95 32.73%	291.00 6.82%	409.55 10.21%	999.00 24.71%	1251.35 31.18%	201.00 9.77%	369.20 70.87%	708.00 70.87%	841.80 67.27%
3	-	ECL (03)	-	1824.91	-	53.81 35.98%	-	0.00 0.00%	-	25.90	-	33.99	-	95.74 64.02%	-	149.55	-	59.89 3.28%	-	53.81 35.98%
4	MCL (03)	MCL (05)	700.22	2322.58	48.62 24.12%	126.56 24.77%	31.18 15.47%	226.16 44.26%	22.22	26.69	4.09 60.40%	12.45 30.97%	121.74 6.40%	158.22 11.42%	201.54 39.60%	510.94 69.03%	57.49 8.21%	265.30 39.60%	79.80 69.03%	352.72 69.03%
5	CCL (13)	CCL (13)	6376.05	6376.05	276.25 22.81%	702.86 41.42%	170.20 14.05%	239.74 14.13%	122.86	123.71	81.39 63.13%	80.57 44.45%	764.54 6.87%	754.40 12.12%	1210.99 22.81%	1697.00 30.39%	374.45 5.87%	444.02 6.96%	446.45 36.87%	942.60 55.55%
6	NEC (03)	NEC (03)	1587.87	1587.87	37.33 17.21%	50.14 22.43%	12.15 5.60%	17.81 7.97%	77.84	121.33	47.75 61.61%	53.28 77.19%	167.41 69.61%	155.63 69.61%	216.89 12.12%	223.58 12.12%	137.74 8.67%	192.42 12.12%	49.48 22.81%	67.95 30.39%
TOTAL (A) (38)		TOTAL (A) (46)	18011.30	24604.03	1226.51 31.42%	2010.71 37.95%	454.88 11.65%	801.30 15.12%	760.38	1121.44	548.77 72.31%	638.74 84.33%	2222.32 56.93%	2486.65 46.93%	3903.71 21.56%	5298.66 21.56%	1764.03 9.79%	2561.48 10.41%	1681.39 43.07%	2812.01 53.07%
(B)	CLUSTER WISE																			
1	BCCL (04)	BCCL (05)	6576.22	7988.22	457.35 45.94%	657.49 50.55%	31.60 3.17%	27.81 2.14%	108.72	113.72	426.64 50.89%	504.23 47.31%	506.65 47.31%	615.44 47.31%	995.60 47.31%	1300.74 52.69%	566.96 8.62%	645.75 8.08%	488.95 49.11%	685.30 52.69%
2	-	ECL (04)	-	9059.00	-	187.00 38.16%	-	96.00 19.59%	-	194.00	-	244.00	-	207.00 42.24%	-	490.00	-	534.00 5.89%	-	283.00 57.76%
TOTAL (B) (04)		TOTAL (B) (09)	6576.22	17047.22	457.35 45.94%	844.49 47.16%	31.60 3.17%	123.81 6.91%	108.72	307.72	426.64 64.53%	748.23 82.24%	506.65 45.93%	822.44 45.93%	995.60 45.93%	1790.74	566.96 8.62%	1179.75 6.92%	488.95 49.11%	968.30 54.07%
(C)	PROJECT WISE (UG)																			
1	-	SECL (02)	-	4256.71	-	0.00 0.00%	-	0.00 0.00%	-	0.00	-	61.72	-	0.00 0.00%	-	0.00	-	61.72 1.45%	-	0.00 0.00%
2	-	MCL (03)	-	2600.12	-	0.00 0.00%	-	0.00 0.00%	-	0.00	-	44.19	-	0.00 0.00%	-	0.00	-	44.19 1.70%	-	0.00 0.00%
-		TOTAL (C) (05)	-	6856.83	-	0.00 0.00%	-	0.00 0.00%	-	0.00	-	105.91	-	0.00 0.00%	-	0.00	-	105.91 1.54%	-	0.00 0.00%
TOTAL CIL (A+B+C) (42) (Less than 5 MCM)		TOTAL CIL (A+B+C) (60)	24587.52	48508.08	1683.86 34.37%	2855.20 40.27%	486.48 9.93%	925.11 13.05%	869.10	1429.16	975.41 55.70%	1492.88 46.68%	2728.97 55.70%	3309.09 46.68%	4899.31 46.68%	7089.40	2330.99 9.48%	3847.14 7.93%	2170.34 44.30%	3780.31 53.32%

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

- Area under Biological Reclamation includes areas under plantation done on backfilled area only.
- Area under Technical Reclamation includes area under barren backfilled only
- 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.
- 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.
- (%) 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.
- The leasehold area shown for (3 UG mines of MCL) in the above Table is the net area of Orient 1 & 2 and Orient 3 Projects after deducting the common Leasehold area of Lajkura OCP as the leasehold boundaries of these mines are overlapping.
- The total leasehold area of the above mentioned 46 OC, 9 Clusters & 5 UG projects is 49743.76 Ha. without deducting the common leasehold area of Lajkura OC for 2 UG projects of MCL.

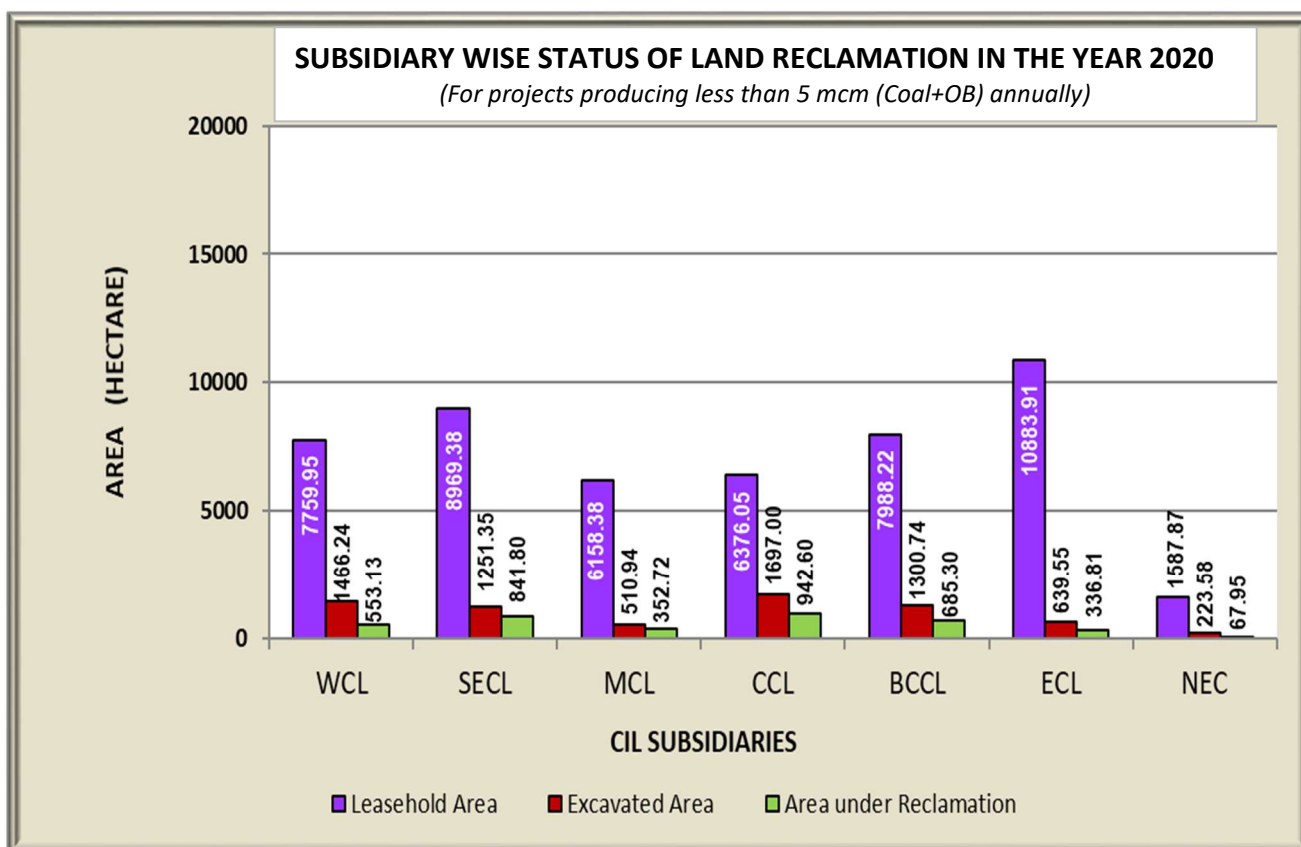


Fig. 1 : Company wise Land Reclamation Status in the Year 2020

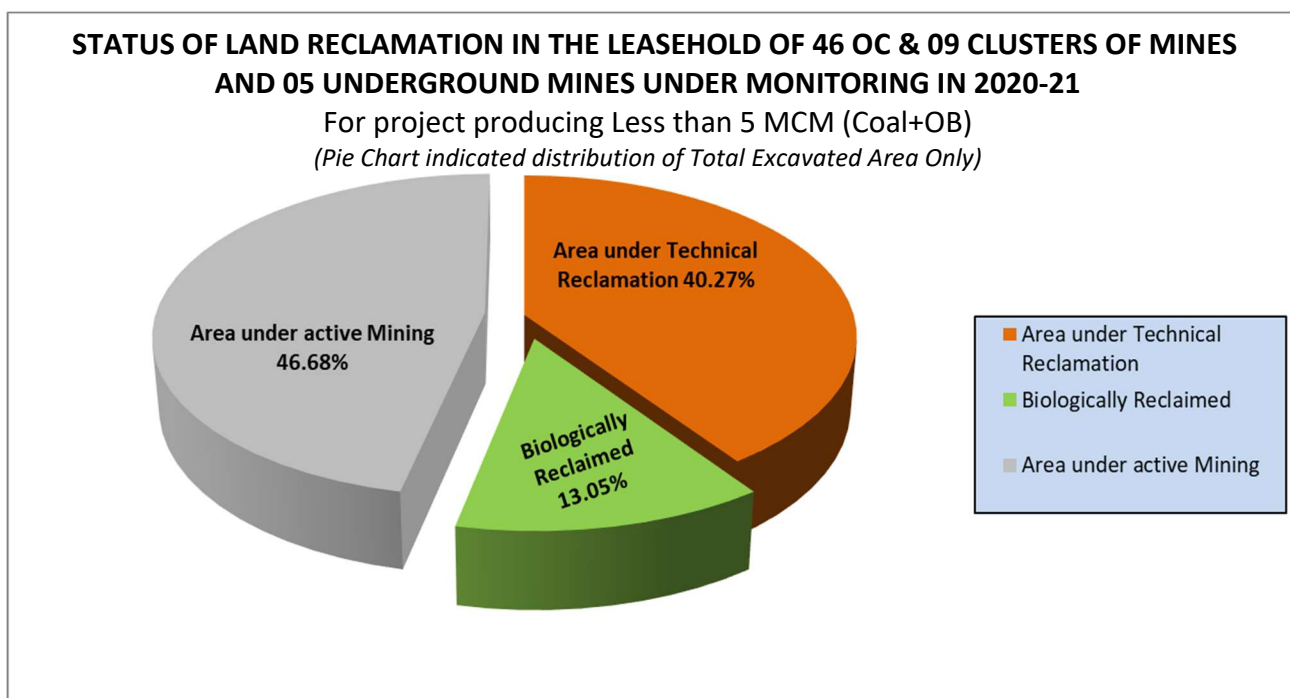


Fig. 2 : Pie Chart indicating Land Reclamation Status in the Year 2020-21

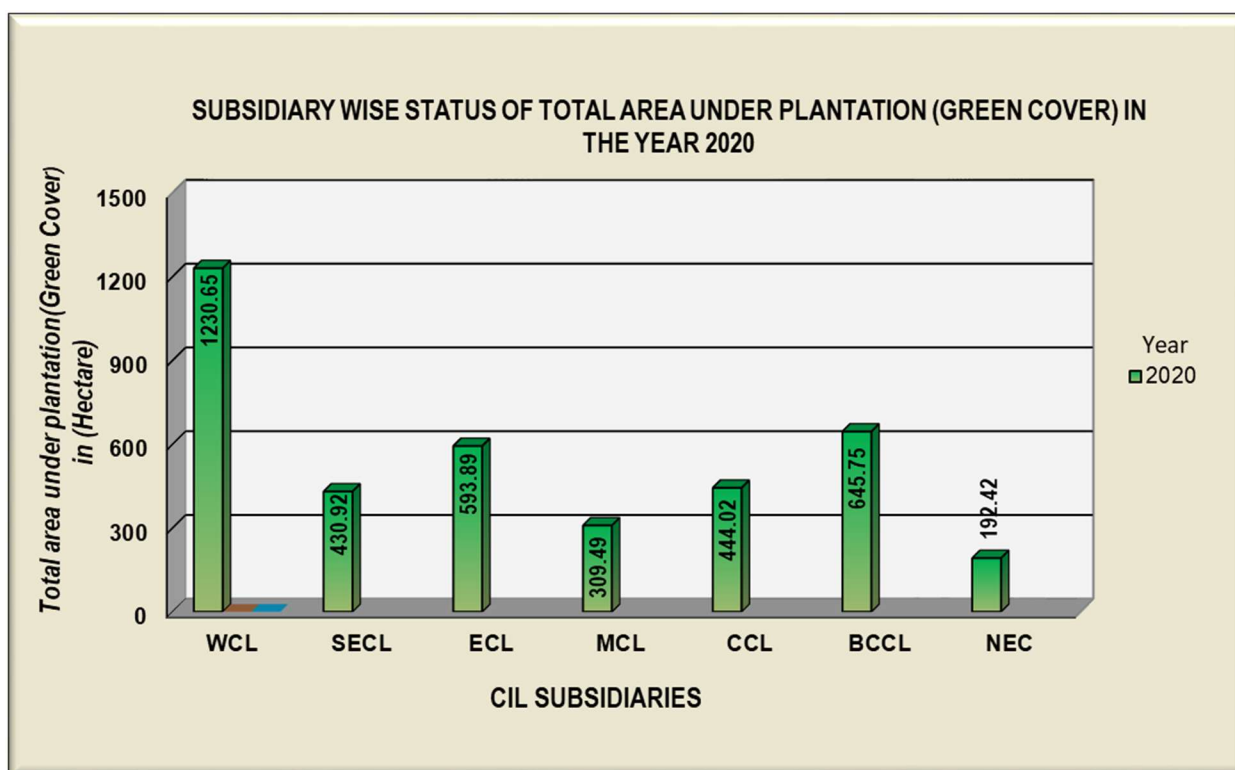


Figure- 3

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 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. Detailed 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**). 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 60 projects including 46 opencast mines, 09 cluster of (OC+UG) mines and 05 underground mines of different subsidiaries producing less than 5 million cubic m. (Coal +OB) in the year 2020-21 for baseline data generation / updation of these projects so that progressive changes in the status of land reclamation could be assessed in future.

2.0 Objective

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

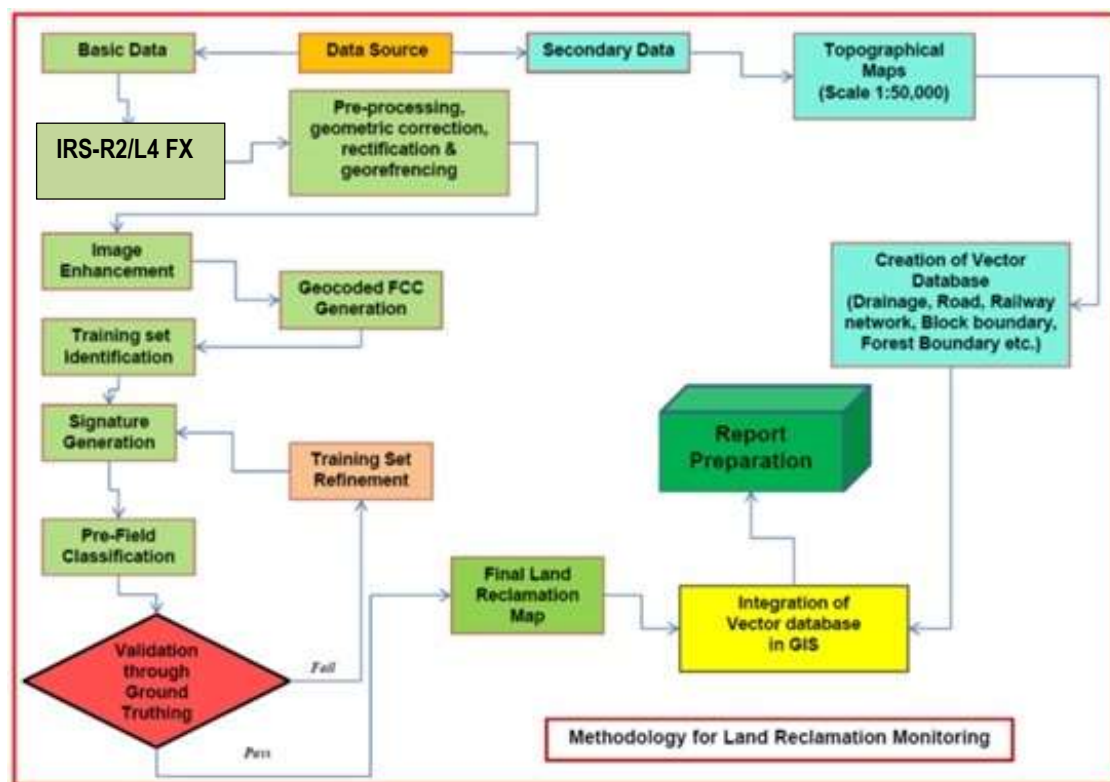


Fig.3: Methodology for Land Reclamation Monitoring

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:

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

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

- **Rectification & Georeferencing:** Inaccuracies in digital imagery may occur due to 'systematic errors' attributed to earth curvature and rotation as well as 'non-systematic errors' attributed to satellite receiving station itself. Raw digital images contain geometric distortions, which make them unusable as maps. Therefore, geo-referencing is required for correction of image data using ground control points (GCP) to make it compatible to Sol-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 v 2014 s/w and enhance the image quality for interpretation.
- **Training set selection**
Training set requires to be selected, so that software can classify the image data accurately. The image data are analysed based on the interpretation keys. These keys are evolved from certain fundamental image-elements such as tone/colour, size,

shape, texture, pattern, location, association and shadow. Based on the image-elements and other geo-technical elements like land form, drainage pattern and physiography; training sets were selected/identified for each land use/cover class. Field survey was carried out by taking selective traverses in order to collect the ground information (or reference data) so that training sets are selected accurately in the image. This was intended to serve as an aid for classification.

- **Classification and Accuracy assessment**

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

- **Area calculation**

The area of each land use class in the leasehold is determined using ERDAS IMAGINE v 2014 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 60 projects including 46 opencast coal mines, 9 cluster of (OC+UG) mines and 5 Underground mines producing less than 5 million cubic m. (Coal + OB together) were taken up for the study during the year 2020-21 based on the R-2, L4FX satellite data, land reclamation /mine closure monitoring was carried out using ERDAS IMAGINE 14.0 version digital image processing s/w and Arc-Info GIS.
- 4.2** The following are the total list of subsidiary wise 60 projects combine with 05 underground, 09 cluster of (UG+OC) mines and 46 opencast mines producing less than 5 mcm (coal and OB together) annually taken up for land reclamation monitoring based on satellite data of year 2020-21 is given in the Table below:

Subsidiary (No. of Projects)	Opencast ,UG and Cluster of mines producing (Less than 5 million Cu.m. Coal +OB per annum)
WCL (15)	Kolegaon, Bellora-Naigaon, Ghonsa, Ballarpur, Junad Extn, Urdhan, Telwasa, Gauri Expn (A), Bhatadi, Gondegaon, Kolarpimpri, Chhinda, Gauri Deep, Juna-Kunada and Adasa UG to OC.
SECL (09)	Sharda, Baroud, Chhal, Kanchan, Mahan-II, Rajgamar UG, Behraband UG, Saraipalli OC and Bijari OC
CCL (13)	Rohini, Purnadih, Tapin, Jharkhand, Topa, Urimari, North Urimari, New Giddi- C, Govindpur, Khasmahal, Amlo, Selected Dhor and Tarmi
BCCL (05)	Cluster III, Cluster V, Cluster VIII, Cluster IX and Cluster XVII
ECL (07)	Cluster I, Cluster II, Cluster III, Cluster IV, Chitra East, Mohanpur and Hurra –C Opencast projects.
MCL (08)	Lilari OC, Kulda OC, Oreint I & II UG, Orient-III UG, Balanda OC, Nandira UG, Chhendipada OC and Subhadra OC .
NEC (03)	Ledo, Tikak and Tirap OC.
TOTAL (60)	

Subsidiary wise land reclamation status of the above mentioned 60 projects derived from 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 15 opencast projects of WCL producing less than 5 million cubic m. (Coal+OB) annually were taken up for land reclamation monitoring during the year 2020:

- Kolegaon
- Naigaon
- Ghonsa
- Ballarpur
- Junad Extension
- Urdhan
- Telwasa
- Gauri I & II (Amalgamated)
- Bhatadi
- Gondegaon
- Kolarpimpri
- Chhinda
- Gauri Deep
- Juna-Kunada
- Adasa UG to OC

5.2 Area Statistics of different land use classes present in mine leasehold of the above projects for the year 2020 are shown in Table-2. Land use maps derived from satellite data are shown in plate 1-15 and change in different land use classes based on satellite data are depicted in Bar chart in fig 5.2 to 5.15.

5.3 Study reveals that out of the total mine leasehold area of 7289.16 Hectare of the 15 projects Viz. Kolegaon, Naigaon, Ghonsa, Ballarpur, Junad Extn, Urdhan, Telwasa, Gauri I & II, Bhatadi, Gondegaon, Kolarpimpri, Chhinda, Gauri deep and Juna kunada and Adasa UG to OC considered for monitoring during year-2020-21; total excavated area is 1466.24 Ha (18.89%), out of which 68.11 Ha (4.65%) area has been planted on backfill (*Biologically*

Reclaimed) and 485.02 Ha (33.08%) area is under Backfilling (*Technically Reclaimed*). and balance 913.11 Ha (62.27%) is under active mining. It is evident from the analysis that 553.13 Ha (37.72%) area of above projects is under reclamation (Biologically and Technically). Projects wise details area given in Table 1.

- 5.4** On comparing the status of land reclamation for the year 2020 with respect to the year 2017 in different projects taken for reclamation in the year 2020, it is evident from the analysis that area under land reclamation has increased from 397.66 Ha. (Yr. 2017) to 553.13 Ha (Yr. 2020). Overall percentage increase is 6.54%. during span of three year.
- 5.5** From analysis it is revealed that total vegetated area (Biological reclamation) has increased to 68.11 Ha (4.65%) in the year 2020 as compared to 60.35 Ha (4.73%) in the Year 2017 and area under technical reclamation (backfilling) has also increased from 337.31 Ha (26.45%) (Yr 2017) to 485.02 Ha (Yr 2020). This increase of 147.71 Ha area in technical reclamation during span of three year is due to major increase in area under backfilling from 44.61 Ha (Yr2017) to 101.67 Ha (2020) in Telwasa OC.
- 5.6** Total leasehold area of 15 project has increased from 7289.16 Ha (Yr 2017) to 7759.95 Ha (Yr 2020) due to major change in leasehold area of Bellora-Naigaon Ballarpur and Gondegaon OCPs and addition of Adasa UG to OC mine.
- 5.7** It is observed that overall marginal decrease of 0.08% in Biological reclamation in the year 2020 as compared to year 2017 is due to overall increase in excavated area from 1275.29 Ha (Yr.2017) to 1466.24Ha(Yr.2020) as such calculation for percentage of Biological reclamation has been carried out with respect to total excavated area.
- 5.8** Study indicates that overall the projects of WCL considered for this study indicate increase or static trend in biological reclamation (Plantation on backfill) as well as area under backfilling (Technical reclamation).

- 5.9** After analyzing the satellite data of year 2017 vs. 2020 it is evident that total area under plantation (Green cover) carried out on backfilled area, OB dumps as well as under social forestry in above OC mines of WCL has increased from 993.35 Hectare (Yr.2017) to 1230.65 Hectare (Yr.2020) in the span of three years. This increase of 237.30 Hectare area under total plantation in three year time is due to the sincere efforts made by WCL towards generation of green cover in leasehold area of 15 opencast projects considered for land reclamation in the year 2020-21.
- 5.10** Decrease in leasehold area of Ballarpur OCP from 549.64 Ha (Yr.2017) to 242.64 Ha (Yr.2020) has resulted in decrease of area under Social Forestry from 14.03 Ha (Yr.2017) to 9.74 Ha (Yr.2020) in Ballarpur OCP whereas area under Social Forestry has decreased from 84.03 Ha (Yr.2017) to 62.15 Ha (Yr.2020) in Gondagaon OCP. This decrease of 21.88 Hectare area under social forestry in Gondagaon OCP is due to increase in active mining area as well as change in shape of leasehold hold boundary.
- 5.11** Out of 15 projects of WCL, maximum land reclamation has been carried out in Telwasa OCP (89.42%) followed by Ballarpur OCP (84.58%), Gauri Expn (A) (58.68%) and Bellora – Naigaon OCP (41.81%).
- 5.12** Out of 15 OC projects, leasehold boundary of Kolgaon, Ballarpur Junad Extn, Bhatadi, Gondagaon and Kolar - Pimpri OC projects have been updated as per latest EC boundary. While Bellora - Naigaon and Gauri deep OC projects has been updated as per keyplan / shapfile sent by area.
- 5.13** Total 15 nos of OC projects has been considered for monitoring the status of land reclamation in the year 2020-21 as compared to 14 nos of OC projects in the year 2017-18. Adasa UG to OC project is included for land reclamation in the year 2020-21 on request of WCL and comparison of land reclamation status for this mine has not been made. However data generated for this mine in the year 2020 will be used as base data for comparing the status of land reclamation during cycle of three year.

- 5.14** It is observed that backfilling process in Kolgaon OC project as well as Gauri deep OC could not started till date due to its high gradient. At present Chhinda and Urdhan OC project are not in operation. Hence minor change in area of active mining is observed as indicated in Table-1.
- 5.15** This study will again be carried out at an interval of three years to assess the land reclamation status in the above projects.

TABLE:5.1
Project wise Land Reclamation Status in opencast Projects of WCL
Producing (Less than 5 million cu.m. of coal +OB) based on Satellite data of the year 2020

(Area in Ha)																			
Sl.No	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining	Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation		
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avanne Plantation Etc.									
1	2	3		4	5	6	7	8	9 (=4+5+8)	10 (=5+6+7)	11(=4+5)								
		2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020		
1	Kolegaon	349.00	397.52	0.00	0.00	0.00	0.00	37.41	72.83	22.23	25.63	39.26	48.03	39.26	48.03	59.64	98.46	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			17.09%	24.77%	0.00%	0.00%
2	Bellora-Naigaon	398.66	664.80	8.81	53.02	9.81	12.75	21.87	35.62	28.94	28.94	122.24	91.53	140.86	157.30	60.62	77.31	18.62	65.77
				6.25%	33.71%	6.96%	8.11%					86.78%	58.19%			15.21%	11.63%	13.22%	41.81%
3	Ghonsa	278.68	278.68	0.00	7.28	0.00	0.00	2.10	2.55	4.65	4.65	46.87	60.29	46.87	67.57	6.75	7.20	0.00	7.28
				0.00%	10.77%	0.00%	0.00%					100.00%	89.23%			2.42%	2.58%	0.00%	10.77%
4	Ballarpur	549.64	242.64	67.87	80.79	12.99	15.00	67.73	69.49	14.03	9.74	30.12	17.47	110.98	113.26	94.75	94.23	80.86	95.79
				61.16%	71.33%	11.70%	13.24%					27.14%	15.42%			17.24%	38.84%	72.86%	84.58%
5	Junad EXTN	420.97	449.63	34.51	34.51	2.45	2.46	36.14	65.57	26.86	28.81	56.54	61.54	93.50	98.51	65.45	96.84	36.96	36.97
				36.91%	35.03%	2.62%	2.50%					60.47%	62.47%			15.55%	21.54%	39.53%	37.53%
6	Urdhan	315.00	315.00	0.00	2.36	0.00	0.00	3.34	5.79	0.00	6.87	21.46	19.45	21.46	21.81	3.34	12.66	0.00	2.36
				0.00%	10.82%	0.00%	0.00%					100.00%	89.18%			1.06%	4.02%	0.00%	10.82%
7	Telwasa	271.91	271.91	44.61	101.67	4.68	4.68	34.20	50.71	23.62	23.62	69.64	12.58	118.93	118.93	62.50	79.01	49.29	106.35
				37.51%	85.49%	3.94%	3.94%					58.56%	10.58%			22.99%	29.06%	41.49	89.42%
8	Gouri Expn(A)	676.53	676.53	106.57	106.53	28.56	29.20	118.61	150.98	96.11	96.21	86.60	95.57	221.73	231.30	243.28	276.39	135.13	135.73
				48.06%	46.06%	12.88%	12.62%					39.06%	41.32%			35.96%	40.85%	60.94%	58.68%
9	Bhatadi	838.14	847.37	21.27	21.94	0.00	0.00	13.28	30.86	45.63	46.12	56.52	71.92	77.79	93.86	58.91	76.98	21.27	21.94
				27.34%	23.38%	0.00%	0.00%					72.66%	76.62%			7.03%	9.08%	27.34%	23.38%
10	Gondegaon	917.00	791.40	32.88	42.29	0.00	0.00	52.00	73.47	84.03	62.15	101.71	157.19	134.59	199.48	136.03	135.62	32.88	42.29
				24.43%	21.20%	0.00%	0.00%					75.57%	78.80%			14.83%	17.14%	24.43%	21.20%
11	Kolarpimpri	1484.97	1488.42	7.54	10.71	1.86	4.02	83.36	115.55	7.74	8.21	137.70	140.37	147.10	155.10	92.96	127.78	9.40	14.73
				5.13%	6.91%	1.26%	2.59%					93.61%	90.50%			6.26%	8.58%	6.39%	9.50%
12	Chhinda	106.68	106.68	0.00	0.00	0.00	0.00	20.44	20.44	2.80	2.87	22.78	23.29	22.78	23.29	23.24	23.31	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			21.78%	21.85%	0.00%	0.00%
13	Gouri deep	356.11	339.10	0.00	0.00	0.00	0.00	0.00	0.00	6.19	8.00	44.29	51.04	44.29	51.04	6.19	8.00	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			1.74%	2.36%	0.00%	0.00%
14	Juna-Kunada	325.87	325.87	13.25	23.92	0.00	0.00	35.98	66.18	43.71	42.20	41.90	62.84	55.15	86.76	79.69	108.38	13.25	23.92
				24.03%	27.57%	0.00%	0.00%					75.97%	72.43%			24.45%	33.26%	24.03%	27.57%
15	*Adasa UG to OC	—	564.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	8.48	0.00	0.00	0.00	0.00	0.00	8.48	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.00%	1.50%	0.00%	0.00%
	TOTAL	7289.16	7759.95	337.31	485.02	60.35	68.11	526.46	760.04	406.54	402.50	877.63	913.11	1275.29	1466.24	993.35	1230.65	397.66	553.13
				26.45%	33.08%	4.73%	4.65%					68.82%	62.27%	17.50%	18.89%	13.63%	15.86%	31.18%	37.72%
(% 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. 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.

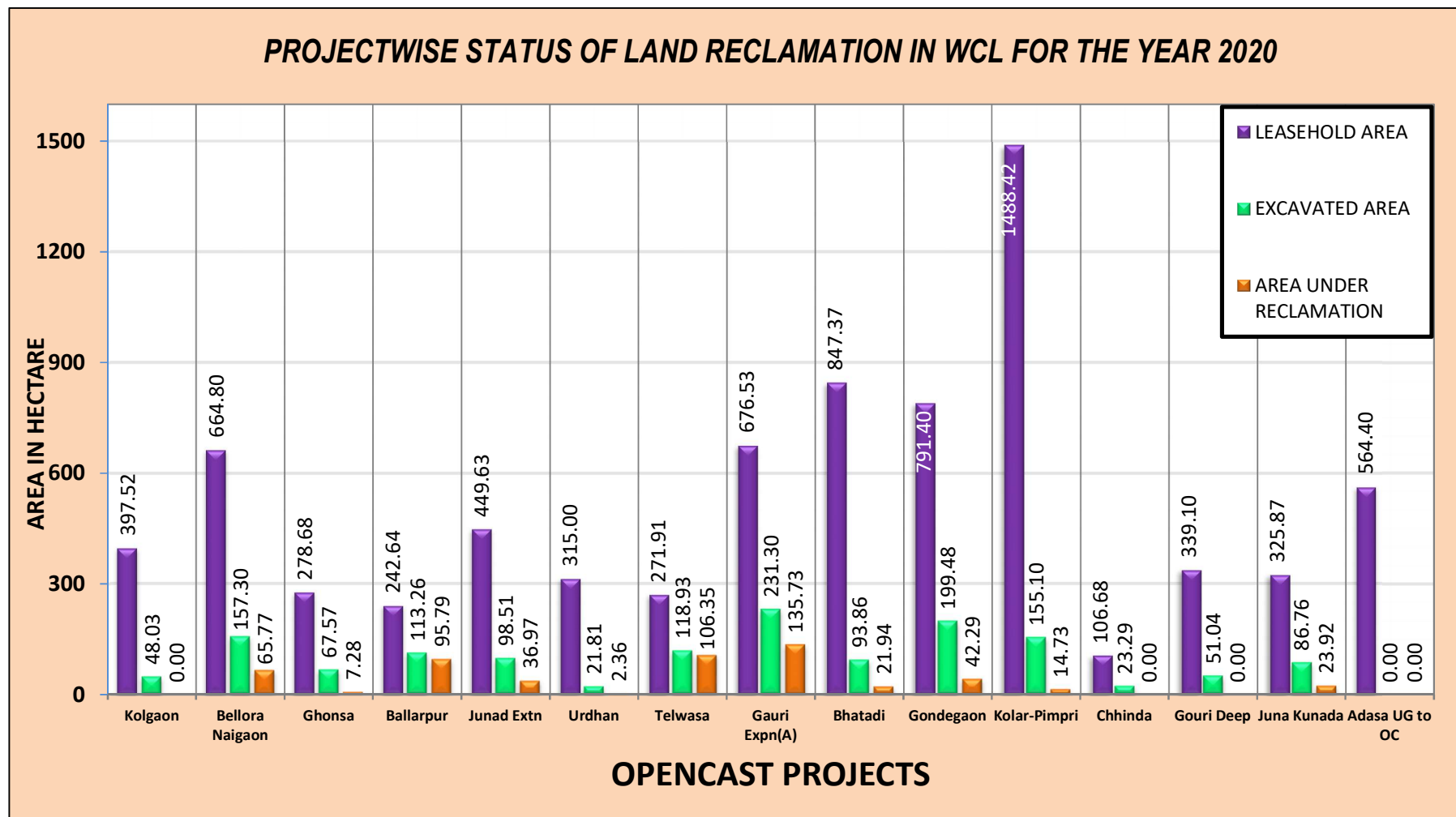
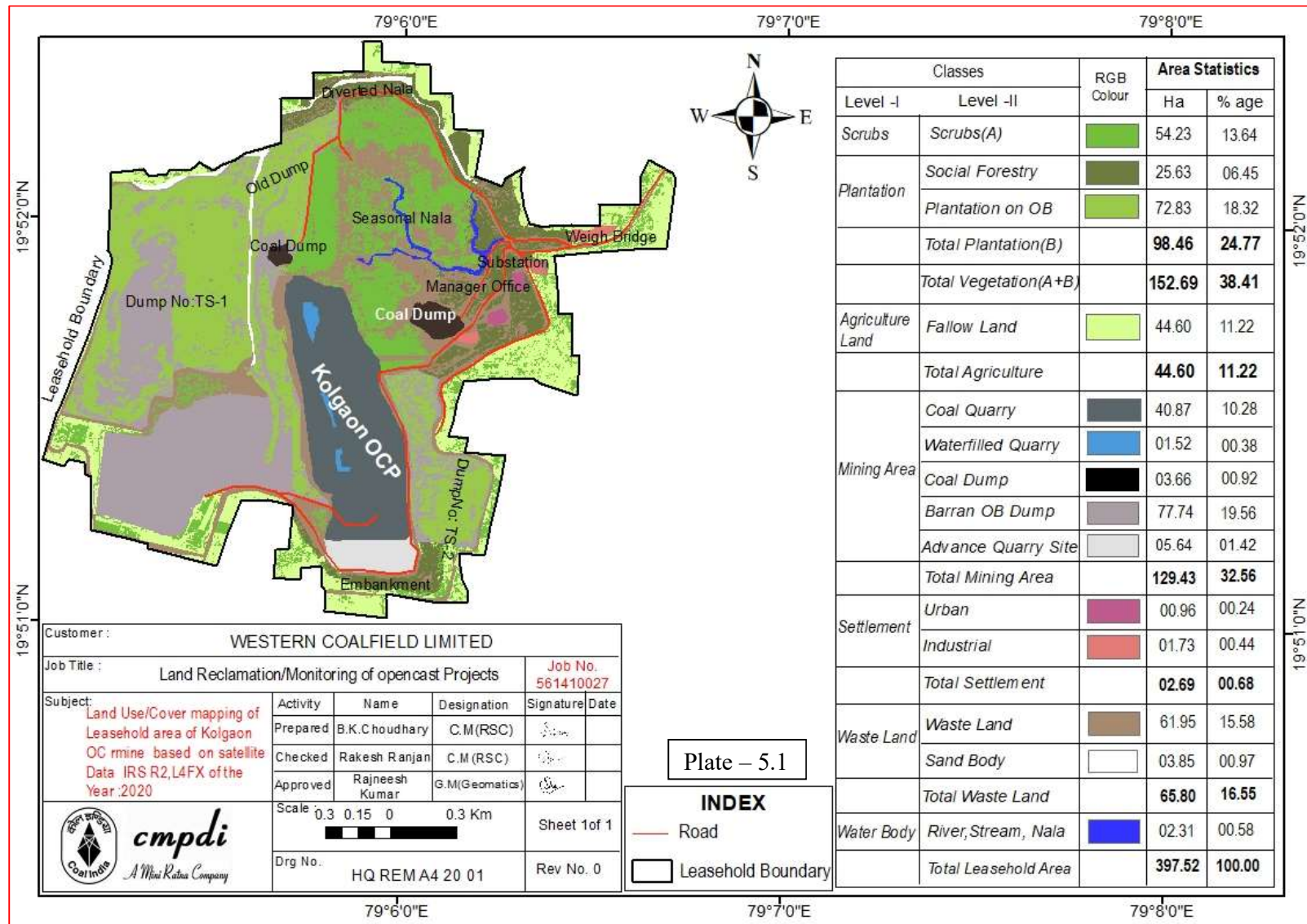


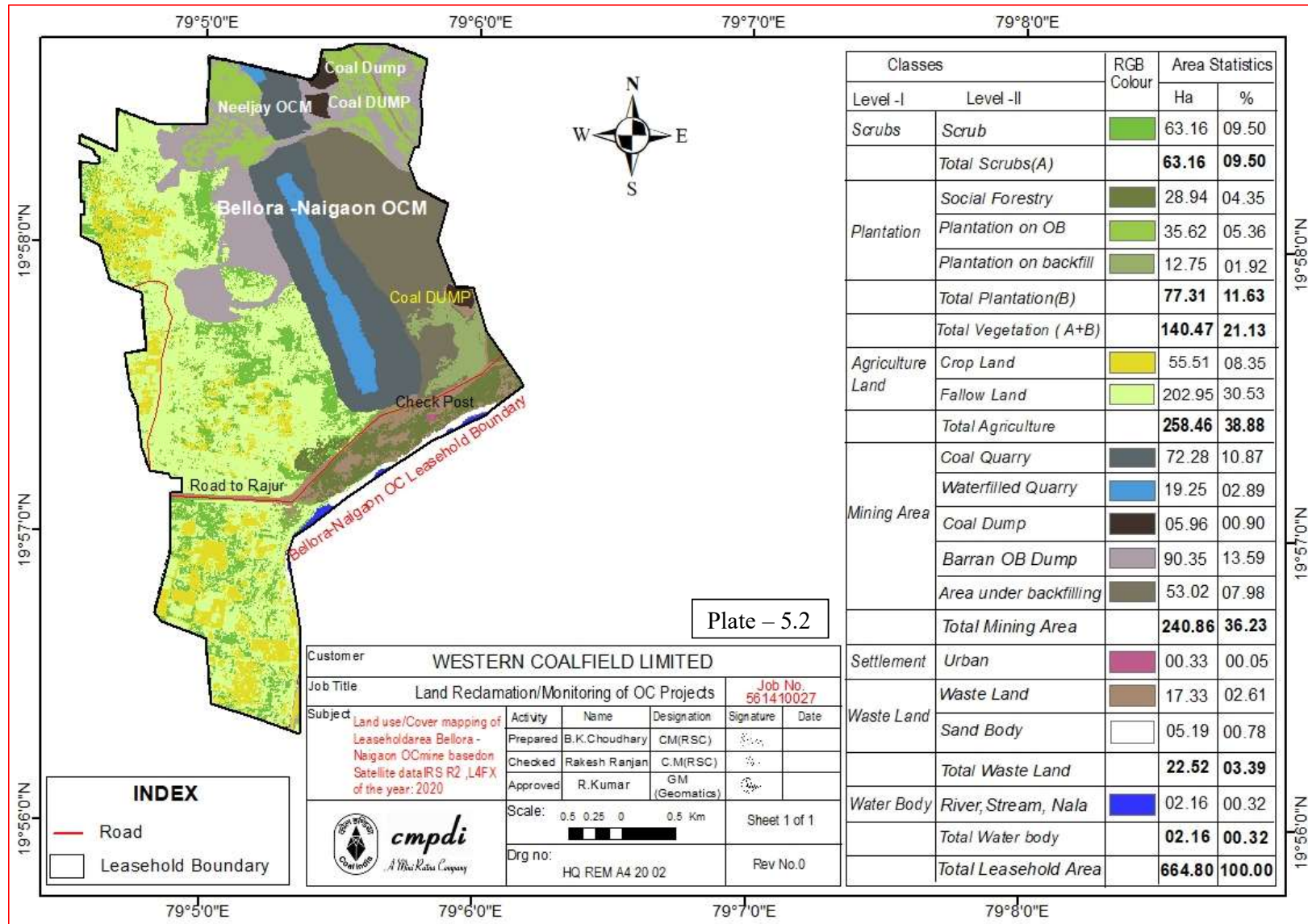
Fig 5.1: Land Reclamation Status in OC projects producing less than 5mcm (Coal +OB) of WCL in the Year 2020

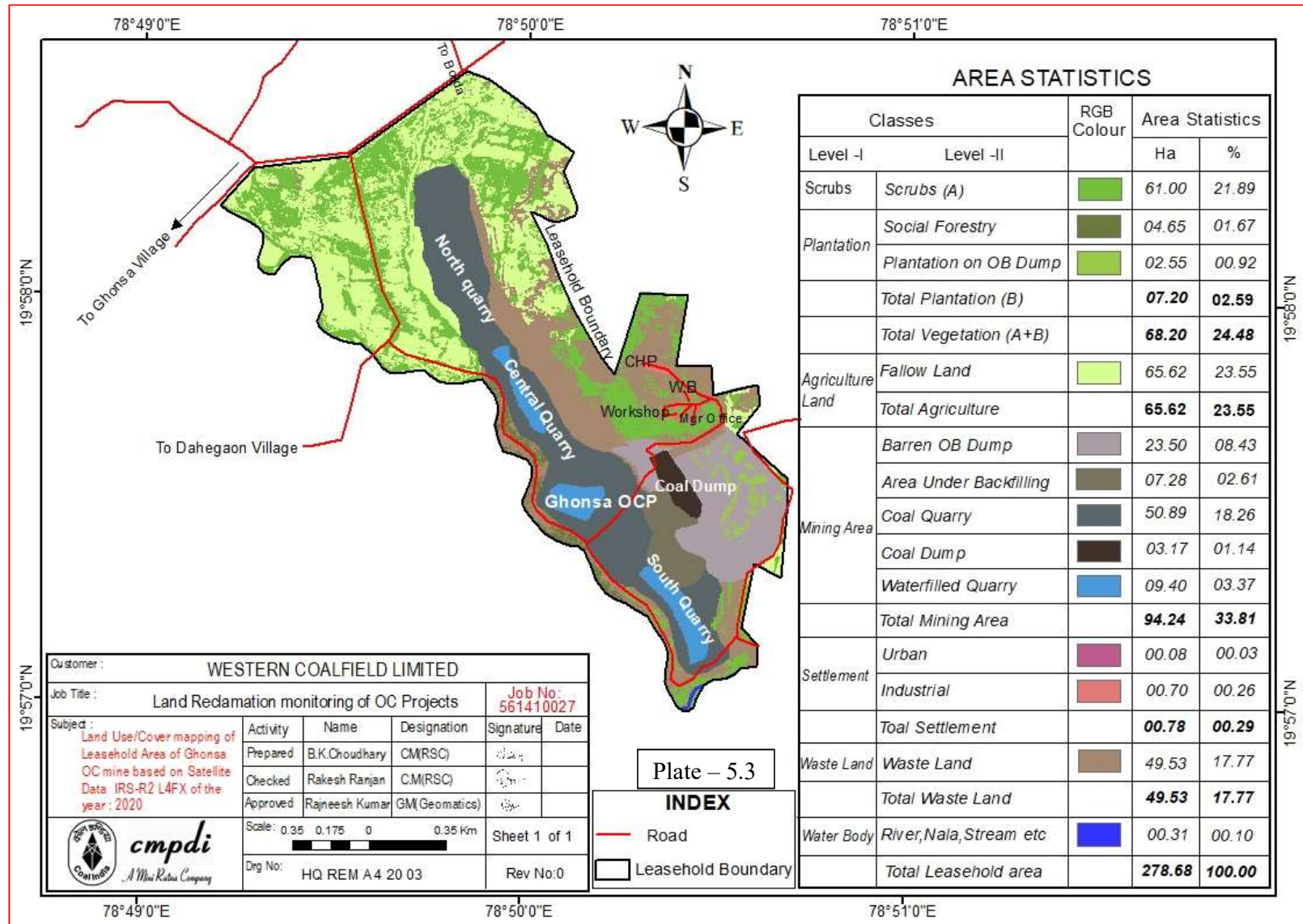
TABLE 5.2 : PROJECT WISE AREA STATISTICS OF LAND USE / COVER AND LAND RECLAMATION IN OC MINES PRODUCING (<5 MCU.M OF (COAL+OB)) OF WCL BASED ON SATELLITE DATA OF THE YEAR 2020

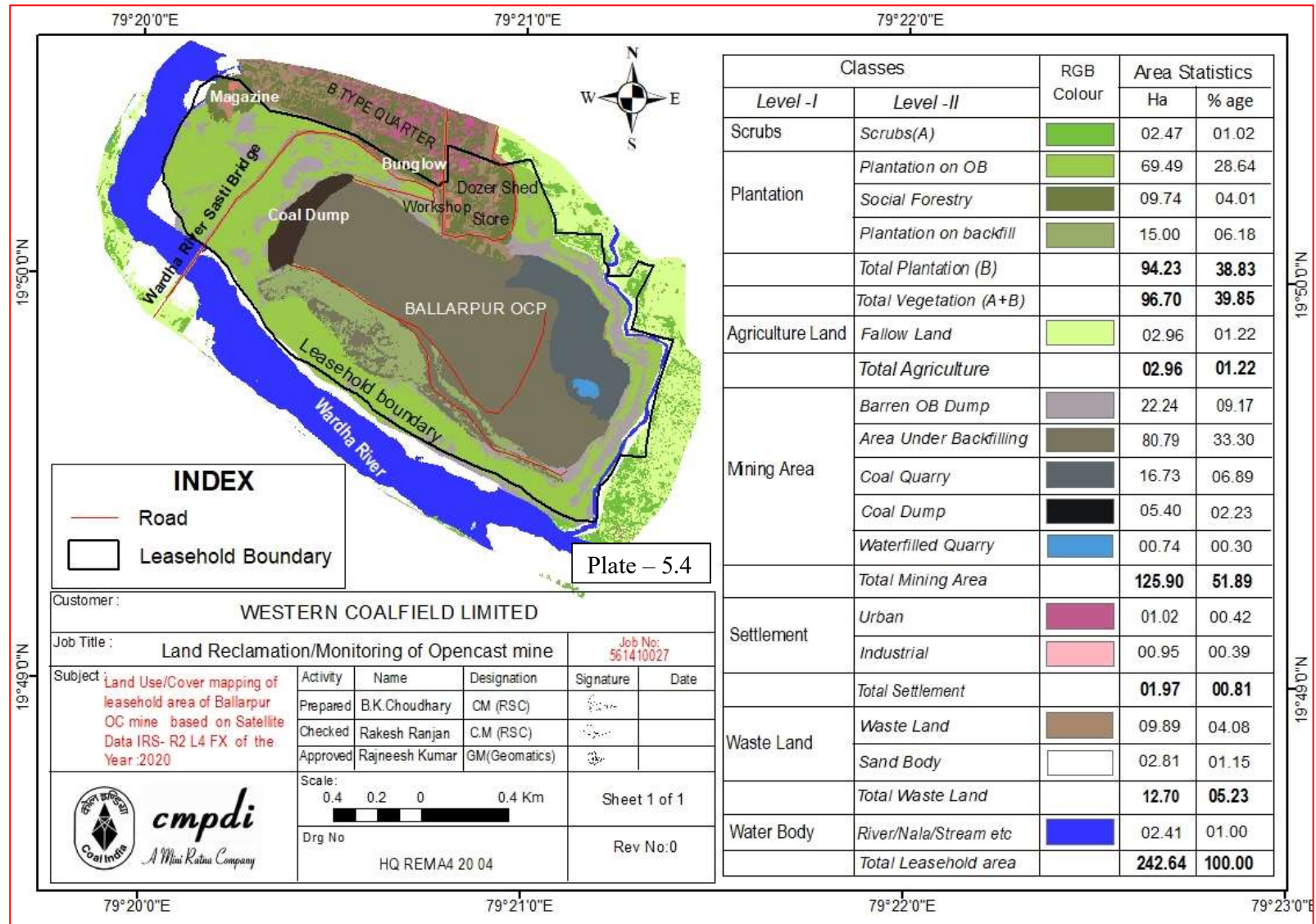
Area in Hectare

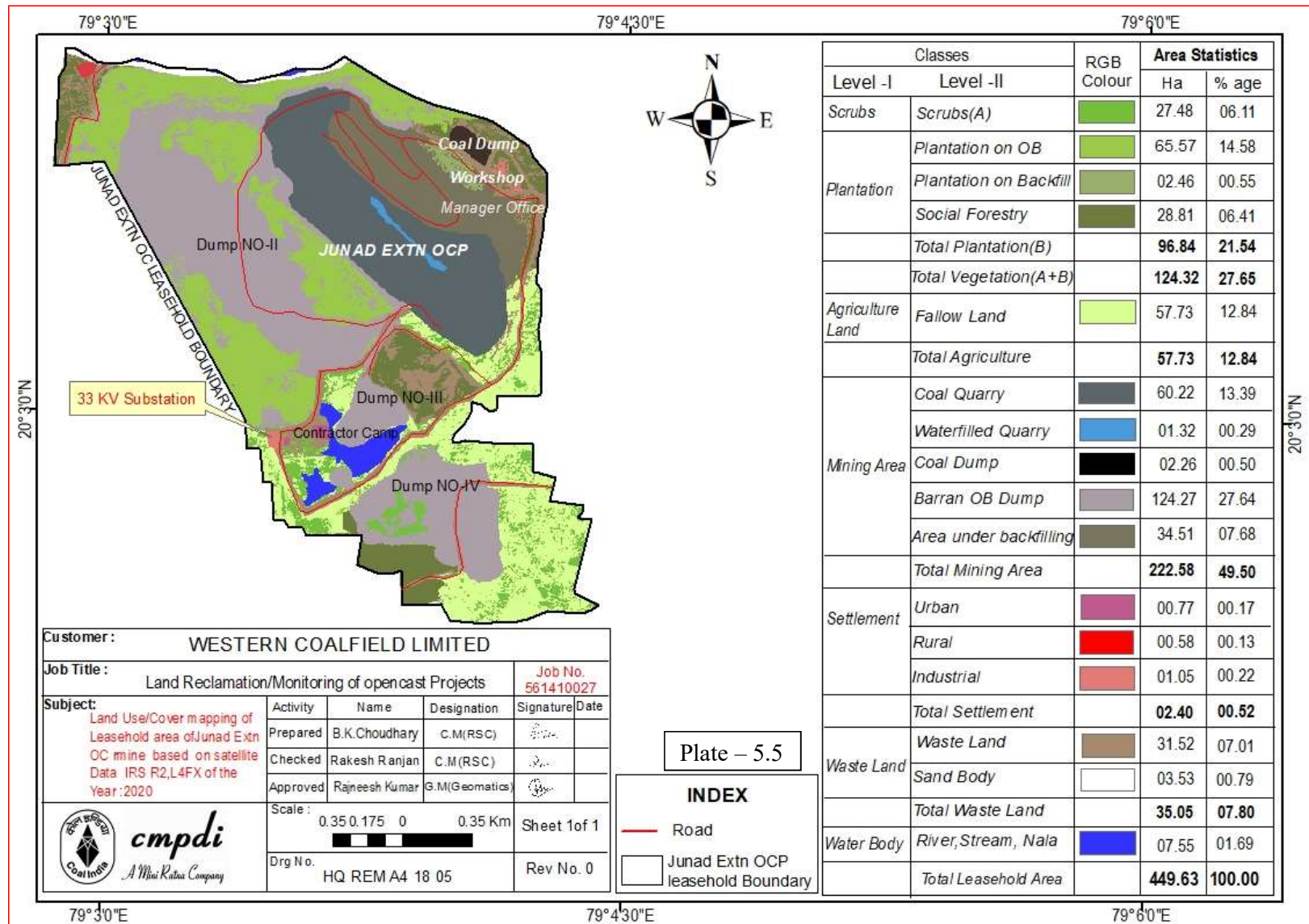
		Kolgaon		Bellora -Naigaon		Ghonsa		Ballarpur		Junad Extn		Urdhan		Telwasa		Gouri Expn(A)		Bhatadi		Gondegaon		Kolar-Pimpri		Chhinda		Gouri Deep		Juna Kunada		Adasa UG to OC		Total	
FORESTS		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Forest		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCRUBS	Scrubs	54.23	13.64	63.16	9.50	61.00	21.89	2.47	1.02	27.48	6.11	29.02	9.21	2.32	0.85	18.64	2.76	87.40	10.31	46.43	5.87	242.03	16.26	9.98	9.36	39.90	11.77	11.25	3.45	129.60	22.96	824.91	10.63
	Total Scrubs	54.23	13.64	63.16	9.50	61.00	21.89	2.47	1.02	27.48	6.11	29.02	9.21	2.32	0.85	18.64	2.76	87.40	10.31	46.43	5.87	242.03	16.26	9.98	9.36	39.90	11.77	11.25	3.45	129.60	22.96	824.91	10.63
PLANTATION	Social Forestry	25.63	6.45	28.94	4.35	4.65	1.67	9.74	4.01	28.81	6.41	6.87	2.18	23.62	8.69	96.21	14.22	46.12	5.44	62.15	7.85	8.21	0.55	2.87	2.69	8.00	2.36	42.20	12.95	8.48	1.50	402.50	5.19
	Total Social Forest	25.63	6.45	28.94	4.35	4.65	1.67	9.74	4.01	28.81	6.41	6.87	2.18	23.62	8.69	96.21	14.22	46.12	5.44	62.15	7.85	8.21	0.55	2.87	2.69	8.00	2.36	42.20	12.95	8.48	1.50	402.50	5.19
	Plantation on OB Dump	72.83	18.32	35.62	5.36	2.55	0.92	69.49	28.64	65.57	14.58	5.79	1.84	50.71	18.65	150.98	22.32	30.86	3.64	73.47	9.28	115.55	7.76	20.44	19.16	0.00	0.00	66.18	20.31	0.00	0.00	760.04	9.79
	Total Plantation on OB Dump	72.83	18.32	35.62	5.36	2.55	0.92	69.49	28.64	65.57	14.58	5.79	1.84	50.71	18.65	150.98	22.32	30.86	3.64	73.47	9.28	115.55	7.76	20.44	19.16	0.00	0.00	66.18	20.31	0.00	0.00	760.04	9.79
	Plantation on Backfill	0.00	0.00	12.75	1.92	0.00	0.00	15.00	6.18	2.46	0.55	0.00	0.00	4.68	1.72	29.20	4.32	0.00	0.00	0.00	0.00	4.02	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.11	0.88
	Total Plantation on backfill (Biological Reclamation)	0.00	0.00	12.75	1.92	0.00	0.00	15.00	6.18	2.46	0.55	0.00	0.00	4.68	1.72	29.20	4.32	0.00	0.00	0.00	0.00	4.02	0.27	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	68.11	0.88
	Total Green Cover generated	98.46	24.77	77.31	11.63	7.20	2.59	94.23	38.83	96.84	21.54	12.66	4.02	79.01	29.06	276.39	40.86	76.98	9.08	135.62	17.13	127.78	8.58	23.31	21.85	8.00	2.36	108.38	33.26	8.48	1.50	1230.65	15.86
ACTIVE MINING	Total Vegetation	152.69	38.41	140.47	21.13	68.20	24.48	96.70	39.85	124.32	27.65	41.68	13.23	81.33	29.91	295.03	43.62	164.38	19.39	182.05	23.00	369.81	24.84	33.29	31.21	47.90	14.13	119.63	36.71	138.08	24.46	2055.56	26.49
	Coal Quarry	40.87	10.28	72.28	10.87	50.89	18.26	16.73	6.89	60.22	13.39	12.12	3.85	1.84	0.68	75.01	11.09	71.40	8.43	150.76	19.05	100.35	6.74	16.28	15.26	43.62	12.86	51.12	15.69	0.00	0.00	763.49	9.84
	Advance Quarry Site	5.64	1.42	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	6.02	1.78	0.00	0.00	0.00	0.00	11.66	0.15	
	Quarry Filled With Water	1.52	0.38	19.25	2.89	9.40	3.37	0.74	0.30	1.32	0.29	7.33	2.33	10.74	3.95	20.56	3.04	0.52	0.06	6.43	0.81	40.02	2.69	7.01	6.57	1.40	0.41	11.72	3.60	0.00	0.00	137.96	1.78
	Coal Dump	3.66	0.92	5.96	0.90	3.17	1.14	5.40	2.23	2.26	0.50	5.10	1.62	2.57	0.95	1.33	0.20	6.87	0.81	5.14	0.65	3.68	0.25	0.31	0.29	3.90	1.15	2.70	0.83	0.00	0.00	52.05	0.67
	Total Area under Active Mining	51.69	13.00	97.49	14.66	63.46	22.77	22.87	9.42	63.80	14.18	24.55	7.80	15.15	5.58	96.90	14.33	78.79	9.30	162.33	20.51	144.05	9.68	23.60	22.12	54.94	16.20	65.54	20.12	0.00	0.00	965.16	12.44
	Barren OB Dump	77.74	19.56	90.35	13.59	23.50	8.43	22.24	9.17	124.27	27.64	64.91	20.61	51.09	18.79	98.71	14.59	159.34	18.80	179.07	22.63	263.42	17.70	22.50	21.09	96.76	28.53	77.51	23.79	0.00	0.00	1351.41	17.42
WASTELANDS	Barren Backfilled Area	0.00	0.00	53.02	7.98	7.28	2.61	80.79	33.30	34.51	7.68	2.36	0.75	101.67	37.39	106.53	15.75	21.94	2.59	42.29	5.34	10.71	0.72	0.00	0.00	0.00	0.00	23.92	7.34	0.00	0.00	485.02	6.25
	Total Area under backfill(Technical Reclamation)	0.00	0.00	53.02	7.98	7.28	2.61	80.79	33.30	34.51	7.68	2.36	0.75	101.67	37.39	106.53	15.75	21.94	2.59	42.29	5.34	10.71	0.72	0.00	0.00	0.00	0.00	23.92	7.34	0.00	0.00	485.02	6.25
	Total Area Under Mine Operation	129.43	32.56	240.86	36.23	94.24	33.81	125.90	51.89	222.58	49.50	91.82	29.16	167.91	61.76	302.14	44.67	260.07	30.69	383.69	48.48	418.18	28.10	46.10	43.21	151.70	44.73	166.97	51.25	0.00	0.00	2801.59	36.11
	Waste Lands	61.95	15.58	17.33	2.61	49.53	17.77	9.89	4.08	31.52	7.01	47.96	15.23	9.00	3.31	30.44	4.50	74.75	8.82	49.50	6.25	59.85	4.02	0.75	0.70	10.98	3.24	28.16	8.64	18.45	3.27	500.06	6.44
WATERBODIES	Fly Ash Pond / Sand Body	3.85	0.97	5.19	0.78	0.00	0.00	2.81	1.15	3.53	0.79	0.00	0.00	1.55	0.57	12.54	1.85	5.09	0.60	1.39	0.18	3.07	0.21	0.24	0.22	0.24	0.07	1.24	0.38	3.76	0.67	44.50	0.57
	Total Wasteland	65.80	16.55	22.52	3.39	49.53	17.77	12.70	5.23	35.05	7.80	47.96	15.23	10.55	3.88	42.98	6.35	79.84	9.42	50.89	6.43	62.92	4.23	0.99	0.92	11.22	3.31	29.40	9.02	22.21	3.94	544.56	7.01
	Reservoir, nallah, ponds	2.31	0.58	2.16	0.32	0.31	0.10	2.41	1.00	7.55	1.69	0.00	0.00	6.97	2.55	5.01	0.73	15.21	1.80	0.00	0.00	2.26	0.14	0.19	0.18	2.91	0.86	8.50	2.61	7.80	1.38	63.59	0.82
	Total Waterbodies	2.31	0.58	2.16	0.32	0.31	0.10	2.41	1.00	7.55	1.69	0.00	0.00	6.97	2.55	5.01	0.73	15.21	1.80	0.00	0.00	2.26	0.14	0.19	0.18	2.91	0.86	8.50	2.61	7.80	1.38	63.59	0.82
AGRICULTURE	Crop Lands	0.00	0.00	55.51	8.35	0.00	0.00	0.00	0.00	0.00	0.00	28.47	9.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	62.47	4.20	11.54	10.82	8.41	2.48	0.00	0.00	99.68	17.67	266.08	3.43
	Fallow Lands	44.60	11.22	202.95	30.53	65.62	23.55	2.96	1.22	57.73	12.84	101.93	32.36	3.61	1.33	28.81	4.26	321.09	37.89	168.87	21.34	557.02	37.42	13.54	12.70	115.77	34.14	0.00	0.00	289.45	51.28	1973.95	25.44
	Total Agriculture	44.60	11.22	258.46	38.88	65.62	23.55	2.96	1.22	57.73	12.84	130.40	41.40	3.61	1.33	28.81	4.26	321.09	37.89	168.87	21.34	619.49	41.62	25.08	23.52	124.18	36.62	0.00	0.00	389.13	68.95	2240.03	28.87
SETTLEMENTS	Urban Settlement	0.96	0.24	0.33	0.05	0.08	0.03	1.02	0.42	0.77	0.17	0.92	0.28	0.76	0.28	0.62	0.09	1.56	0.19	4.32	0.55	0.27	0.03	1.03	0.96	0.53	0.16	1.23	0.37	3.86	0.68	18.26	0.23
	Rural Settlement	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	0.13	1.67	0.53	0.00	0.00	0.00	0.00	3.71	0.44	0.00	0.00	6.01	0.40	0.00	0.00	0.00	0.00	0.00	0.00	2.81	0.50	14.78	0.19
	Industrial Settlement	1.73	0.44	0.00	0.00	0.70	0.26	0.95	0.39	1.05	0.22	0.55	0.17	0.78	0.29	1.94	0.28	1.51	0.18	1.58	0.20	9.48	0.64	0.00	0.00	0.66	0.19	0.14	0.04	0.51	0.09	21.58	0.28
	Total Settlement	2.69	0.68	0.33	0.05	0.78	0.29	1.97	0.81	2.40	0.52	3.14	0.98	1.54																			

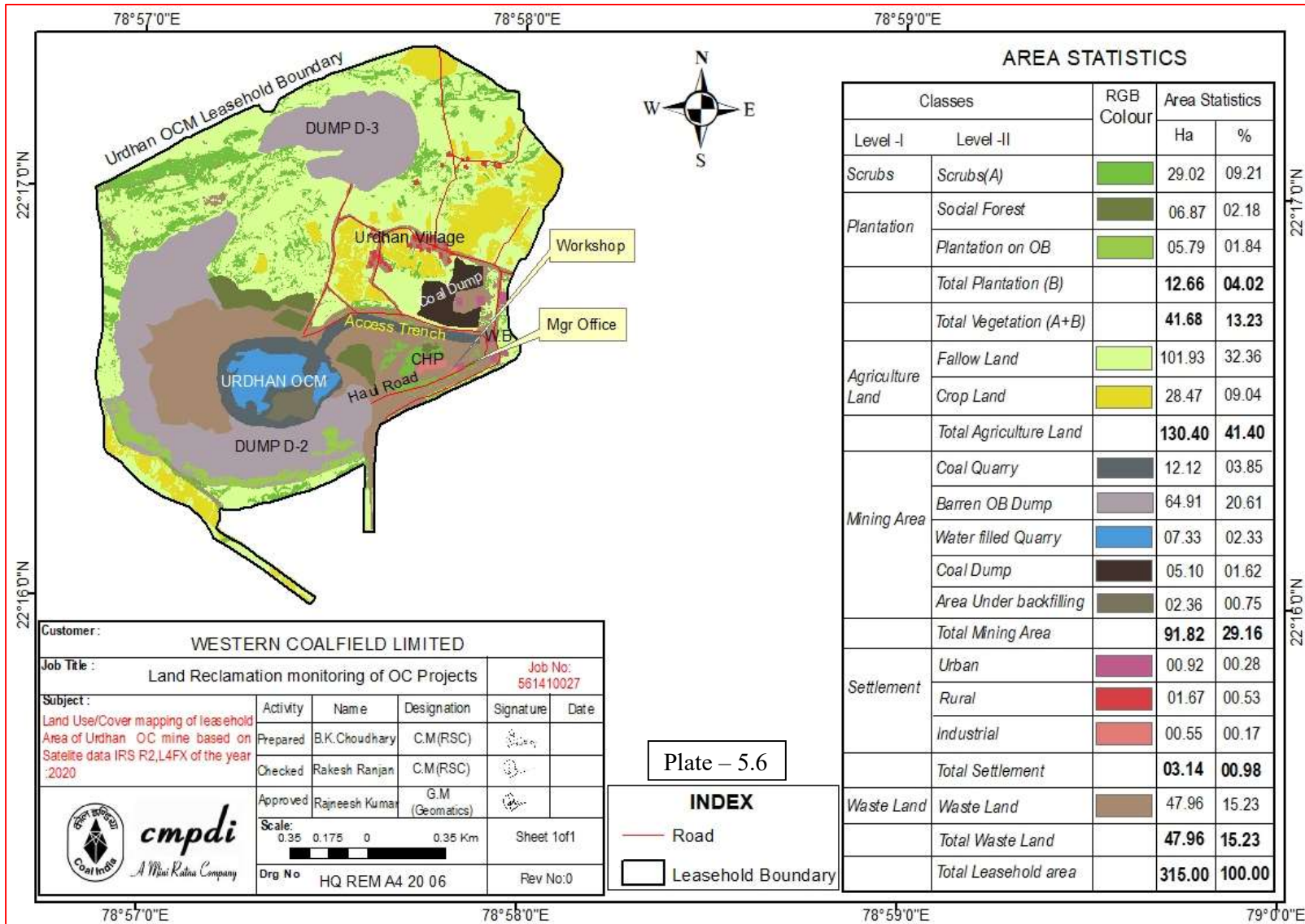


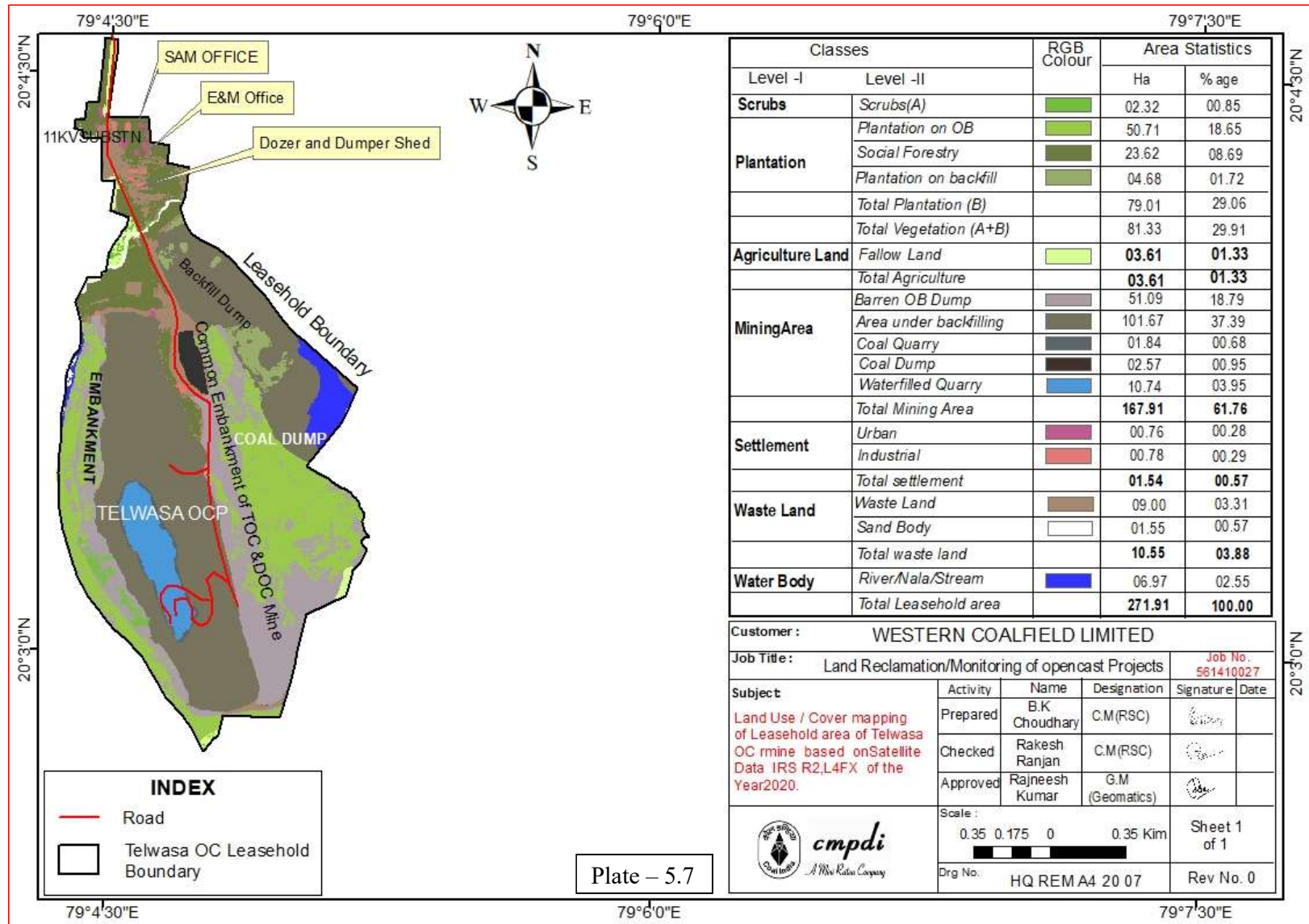


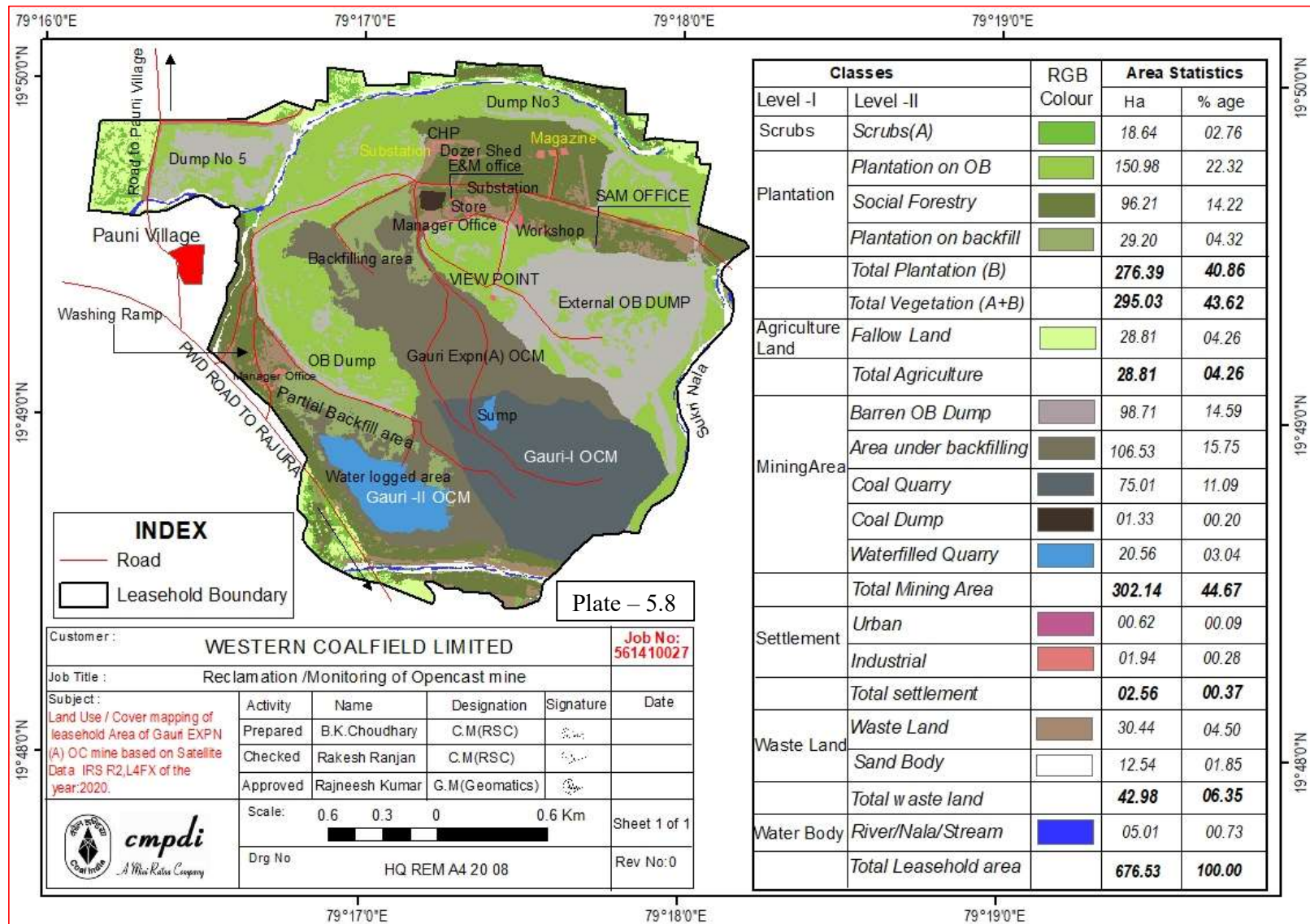


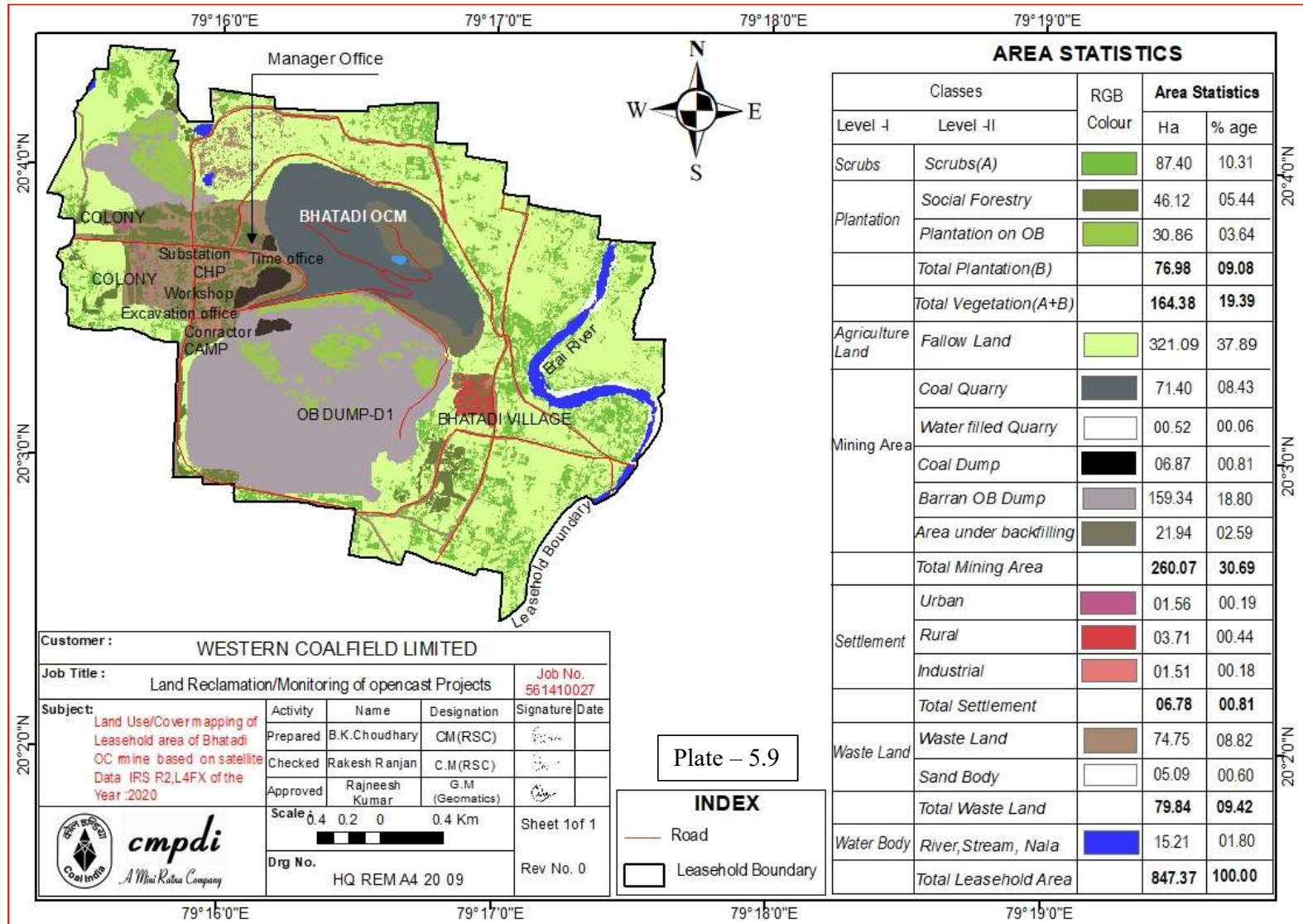


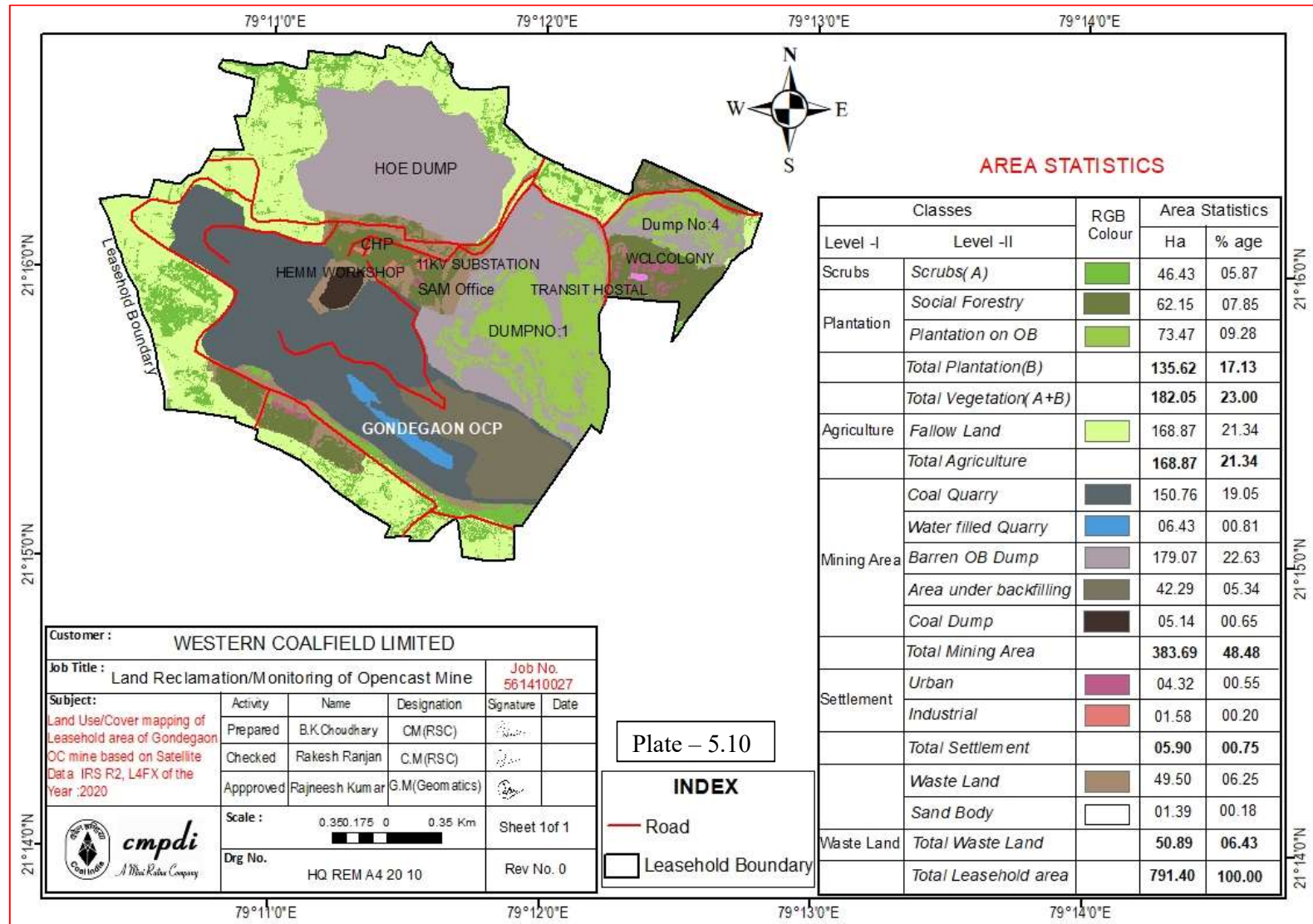


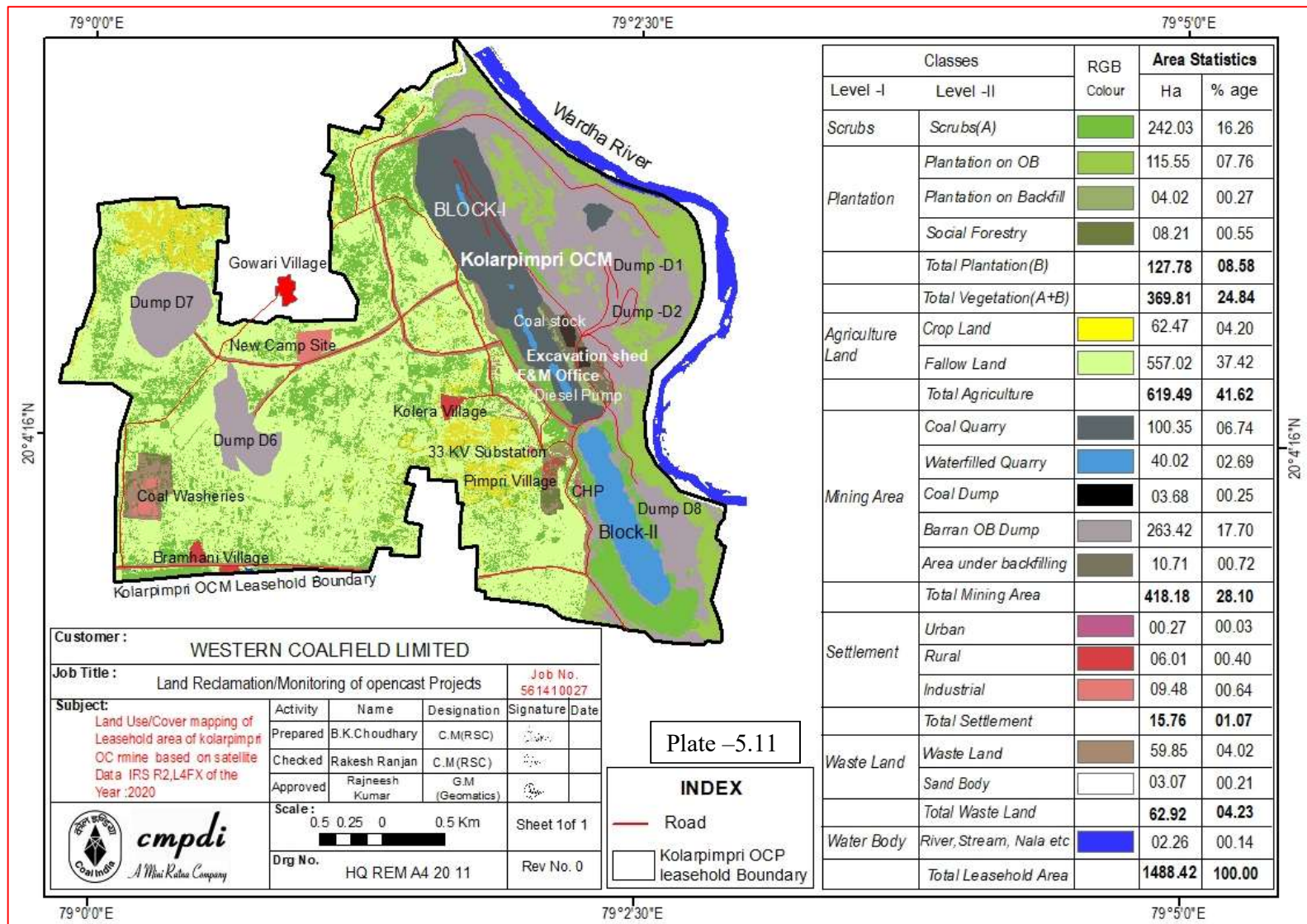


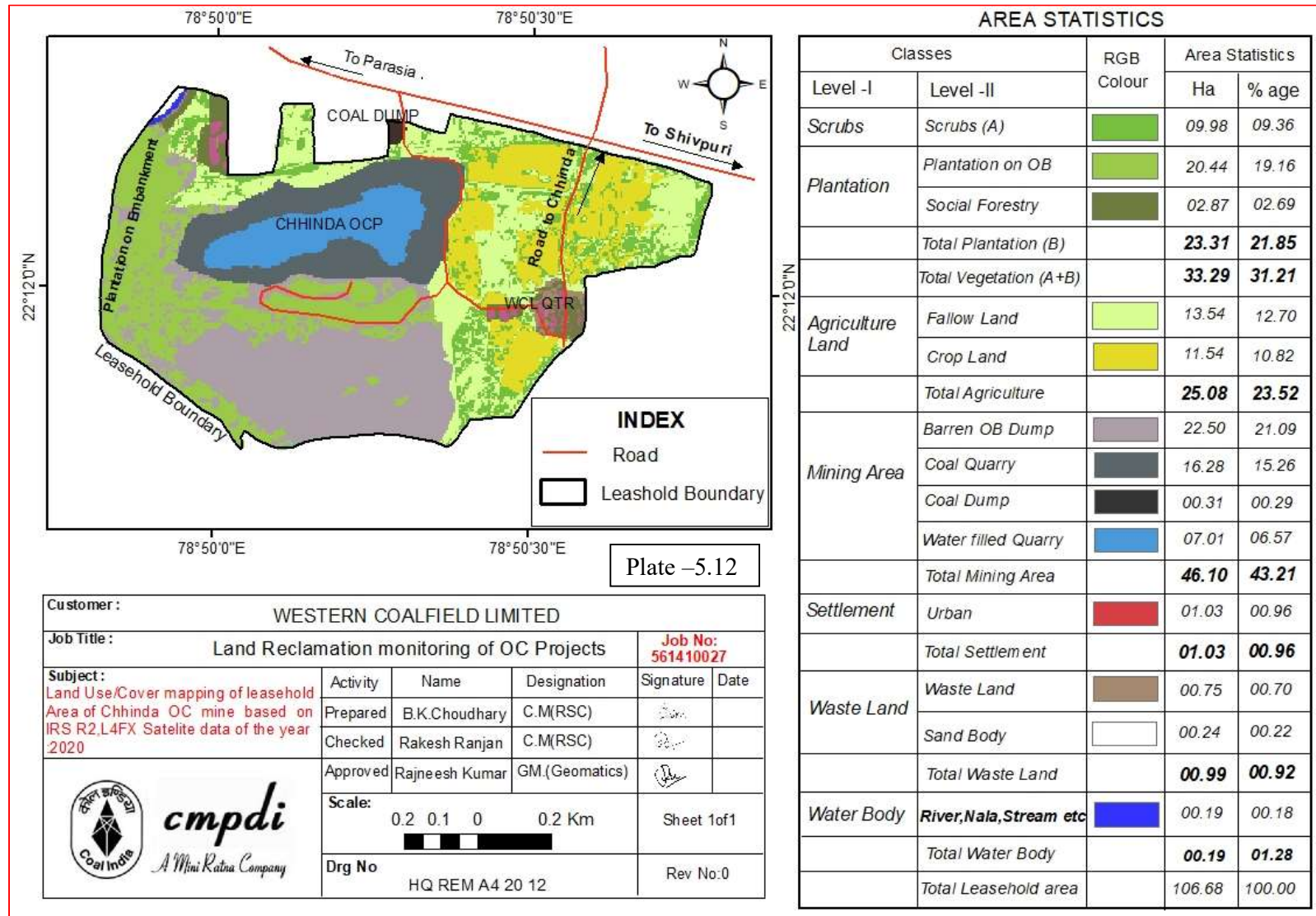


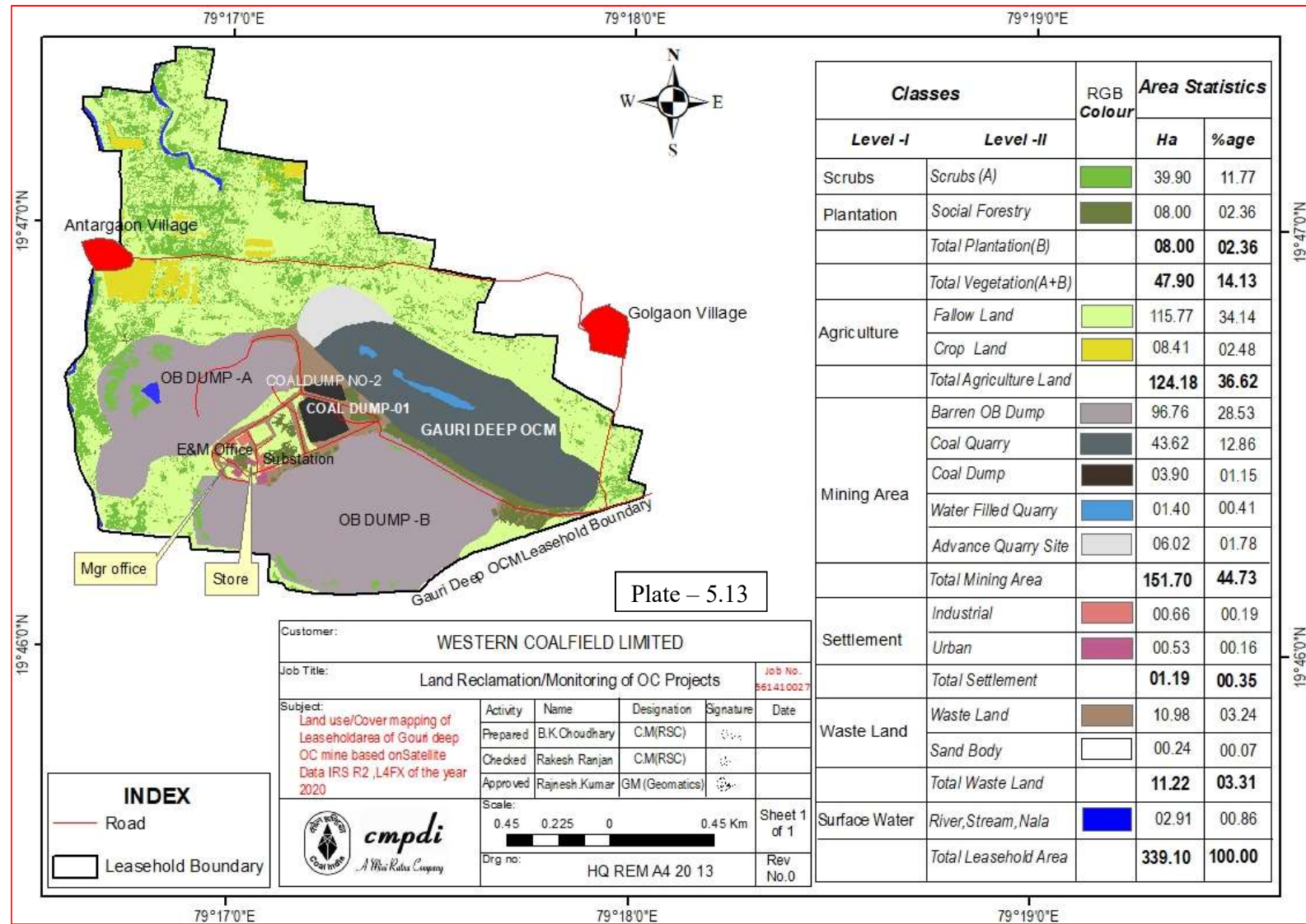


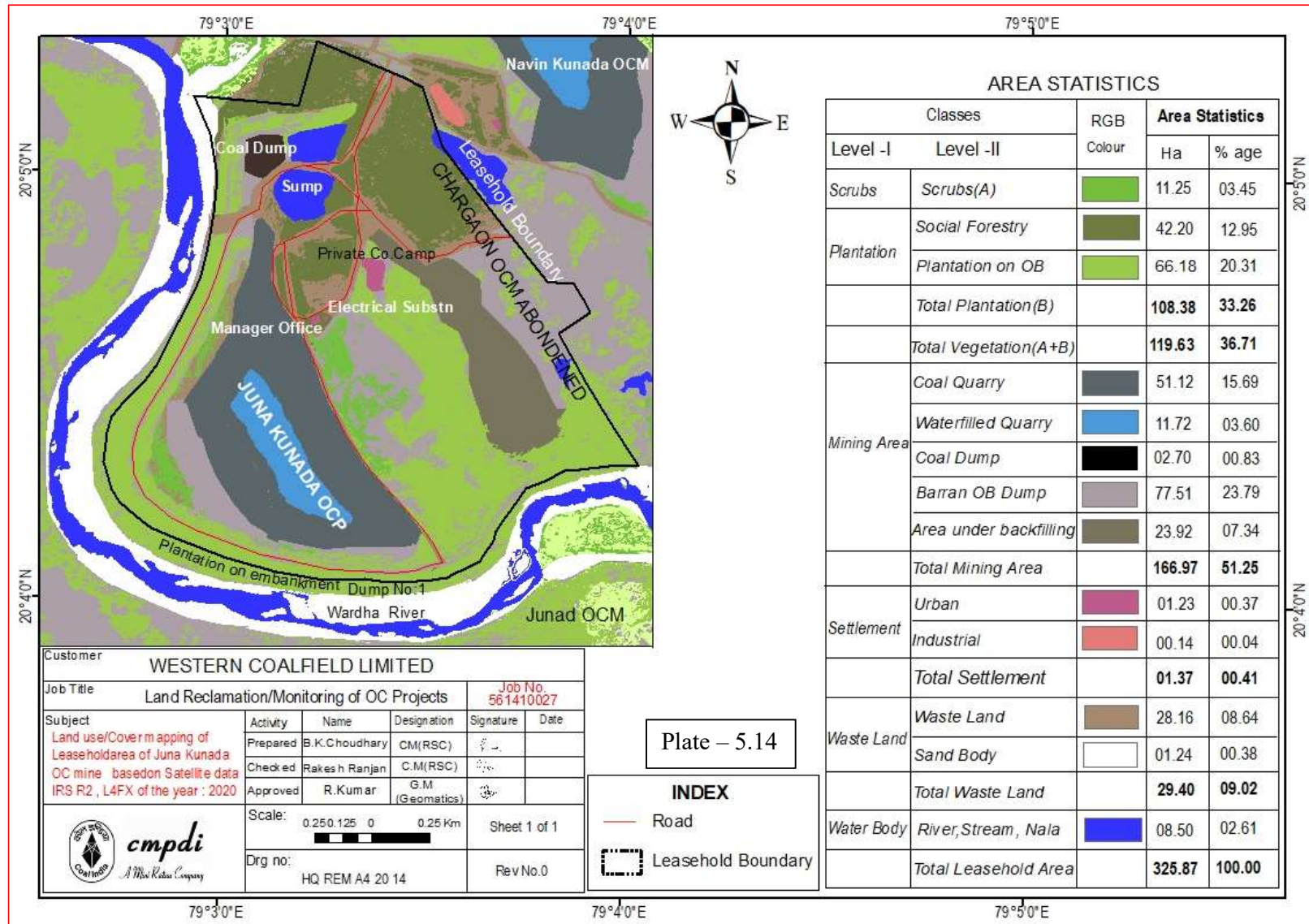


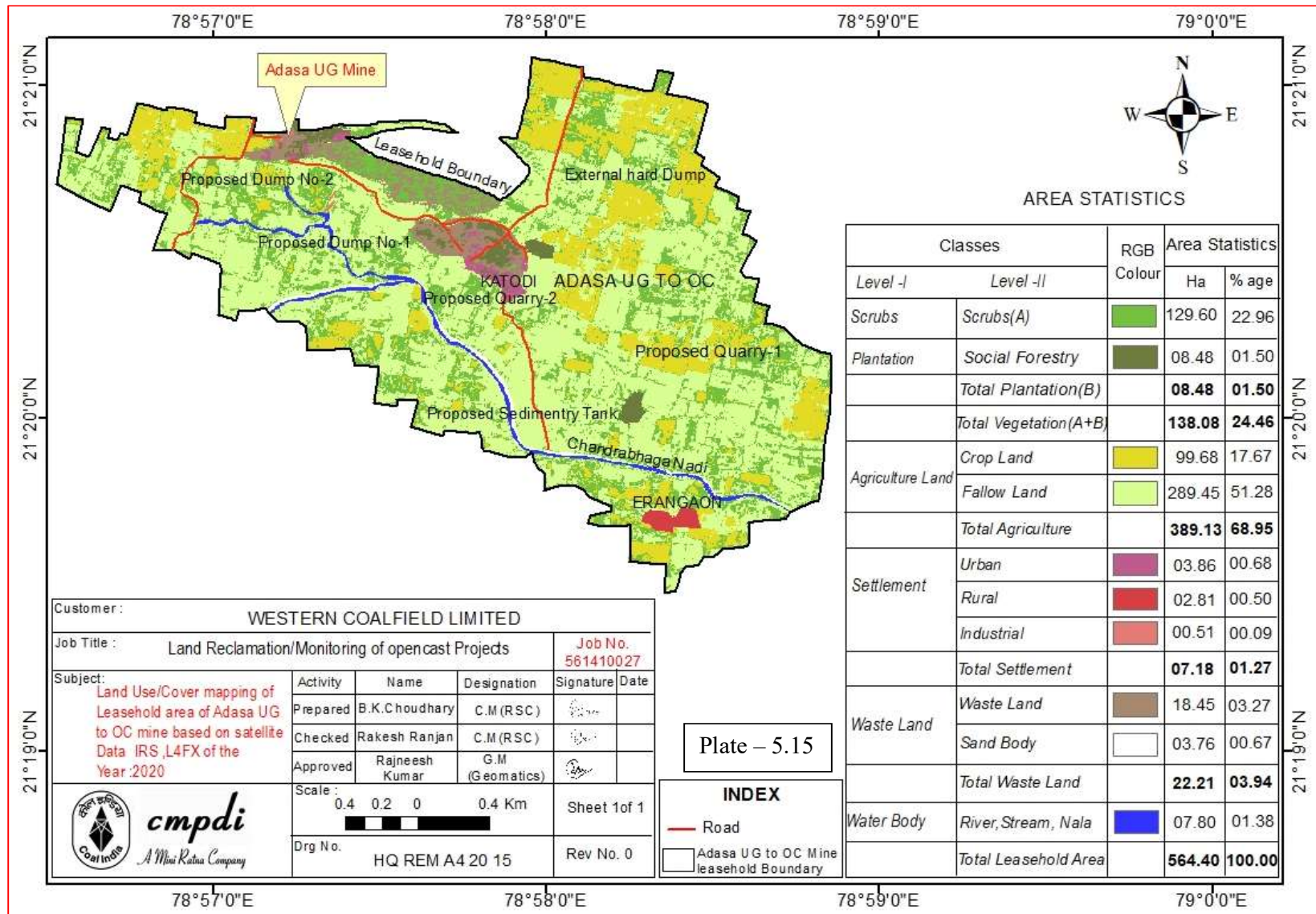












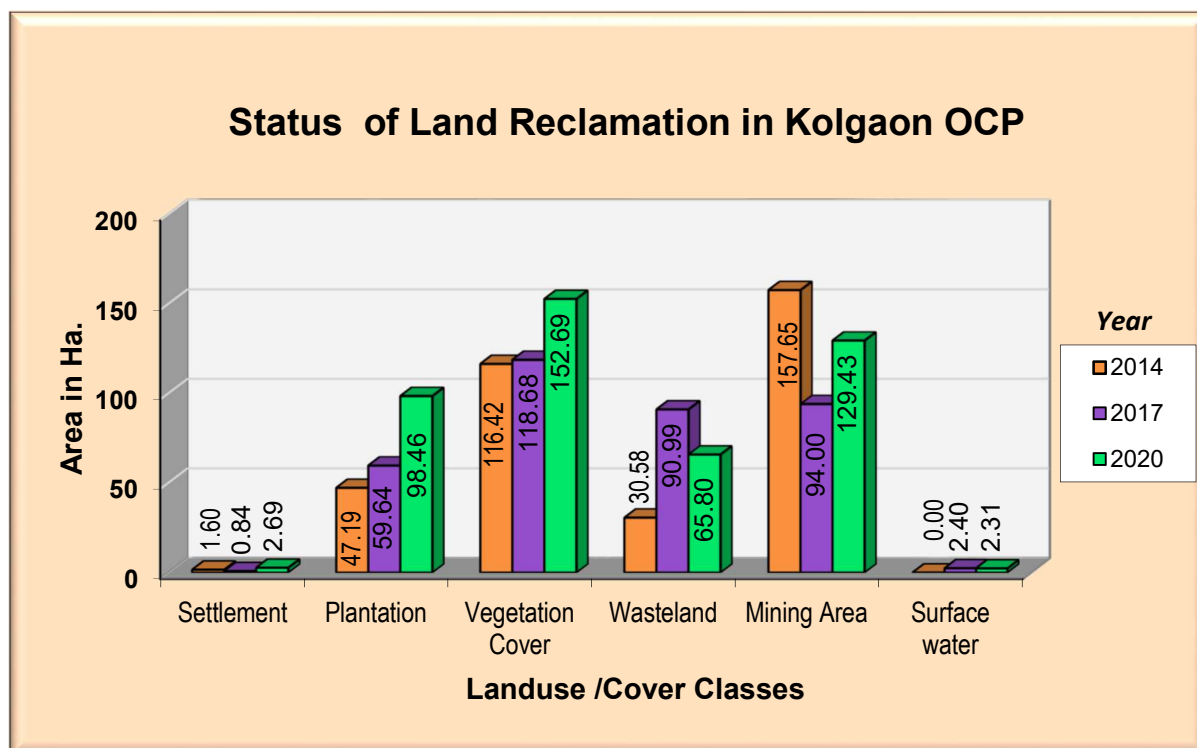


Figure-5.2

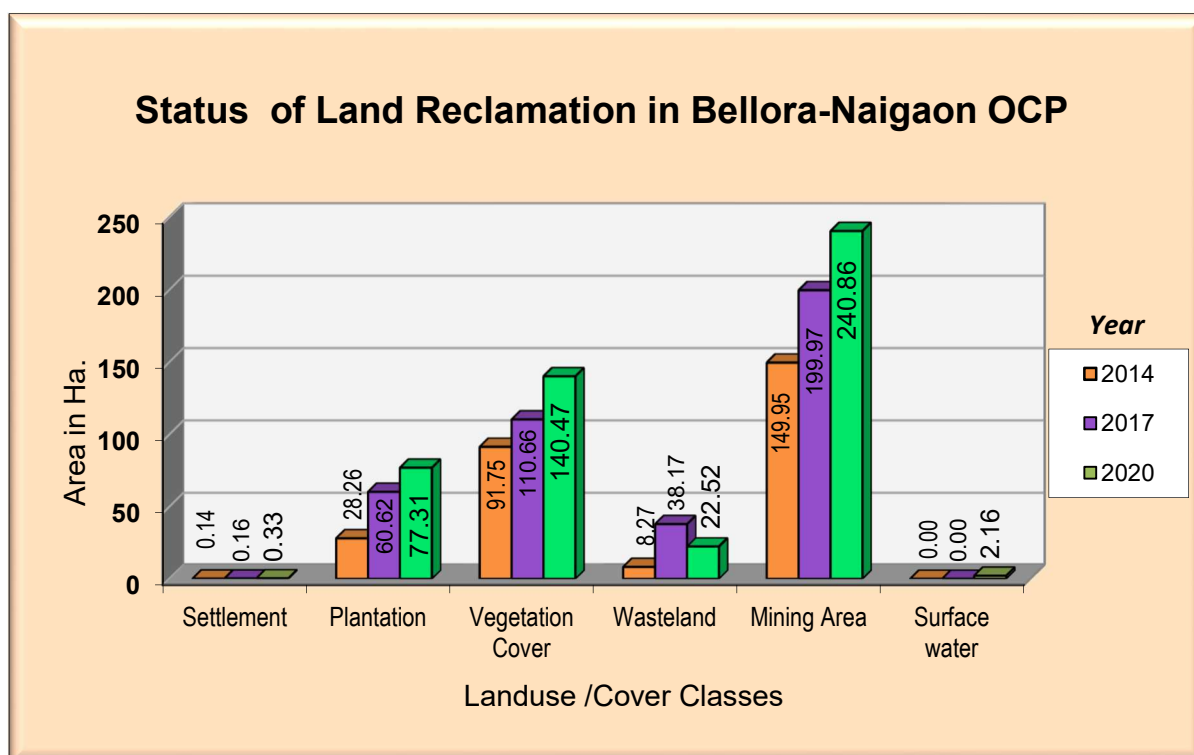


Figure-5.3

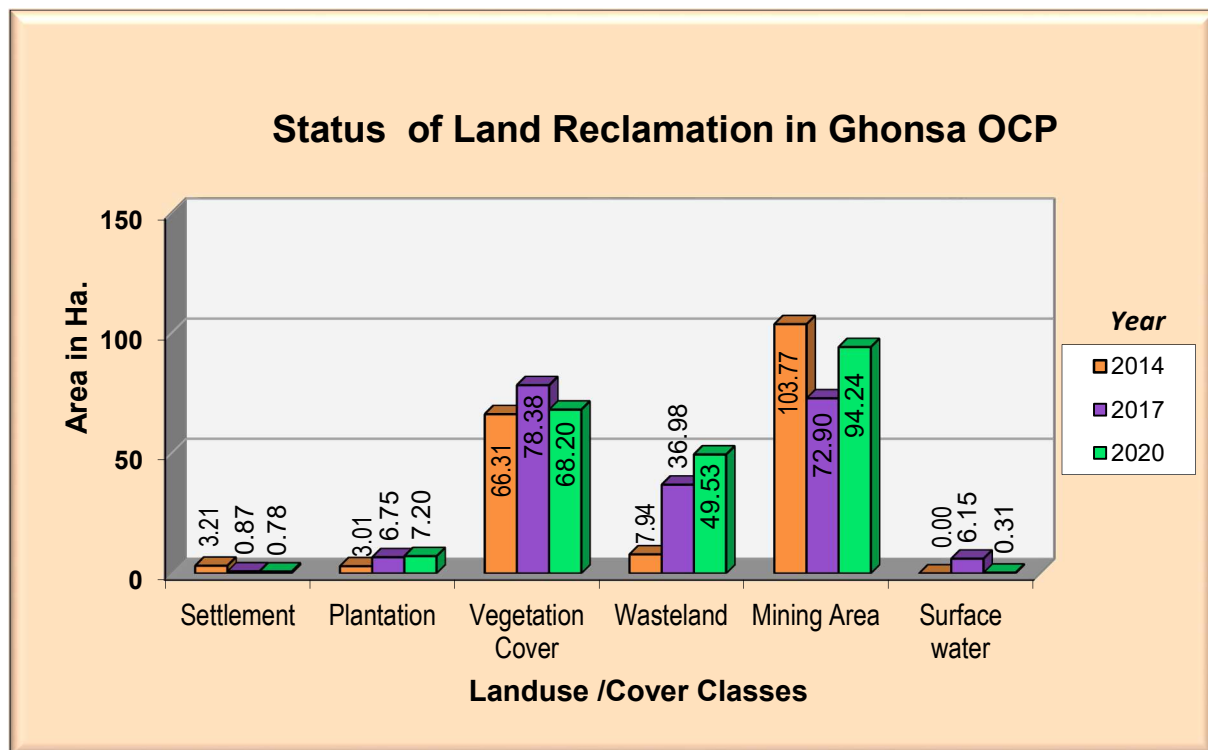


Figure - 5.4

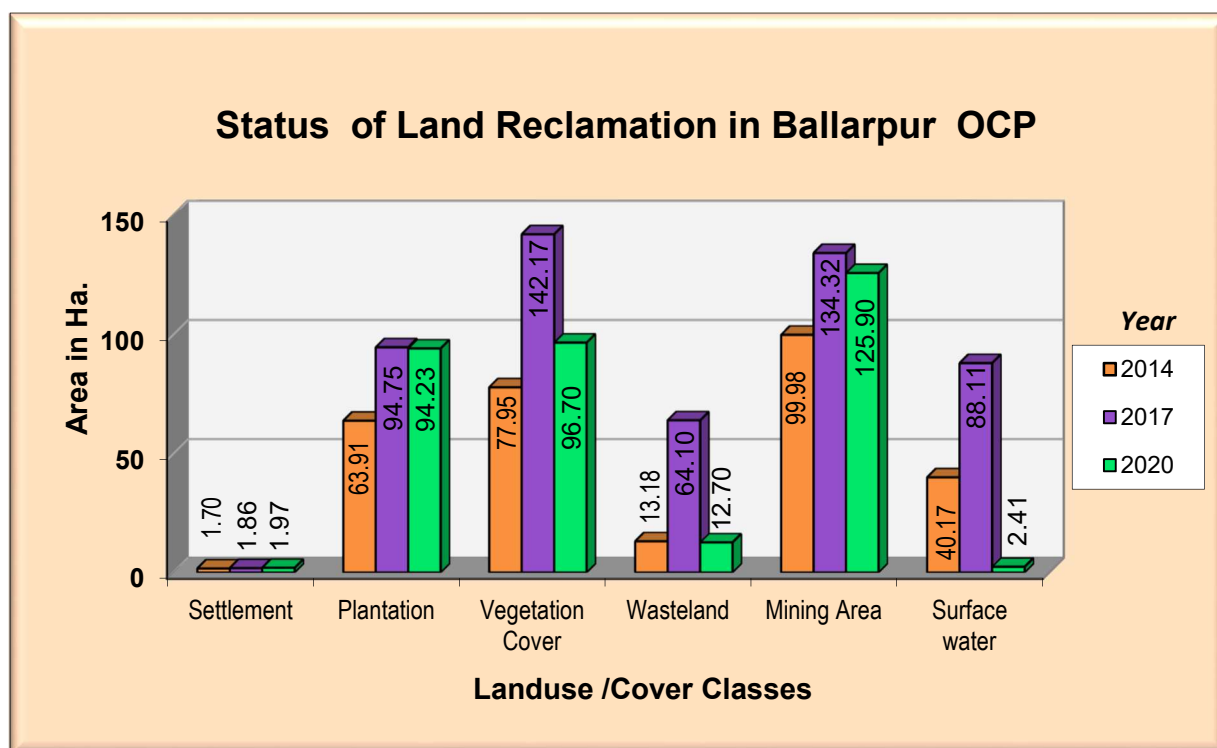


Figure - 5.5

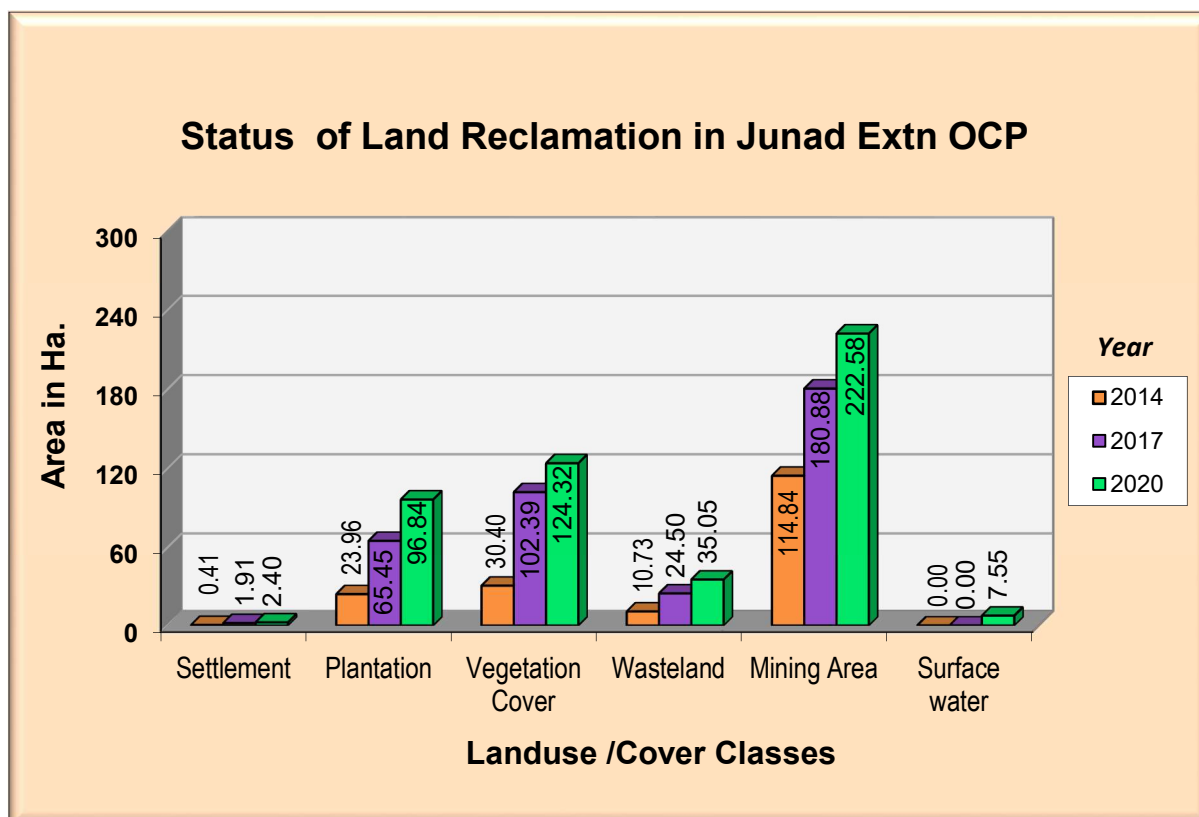


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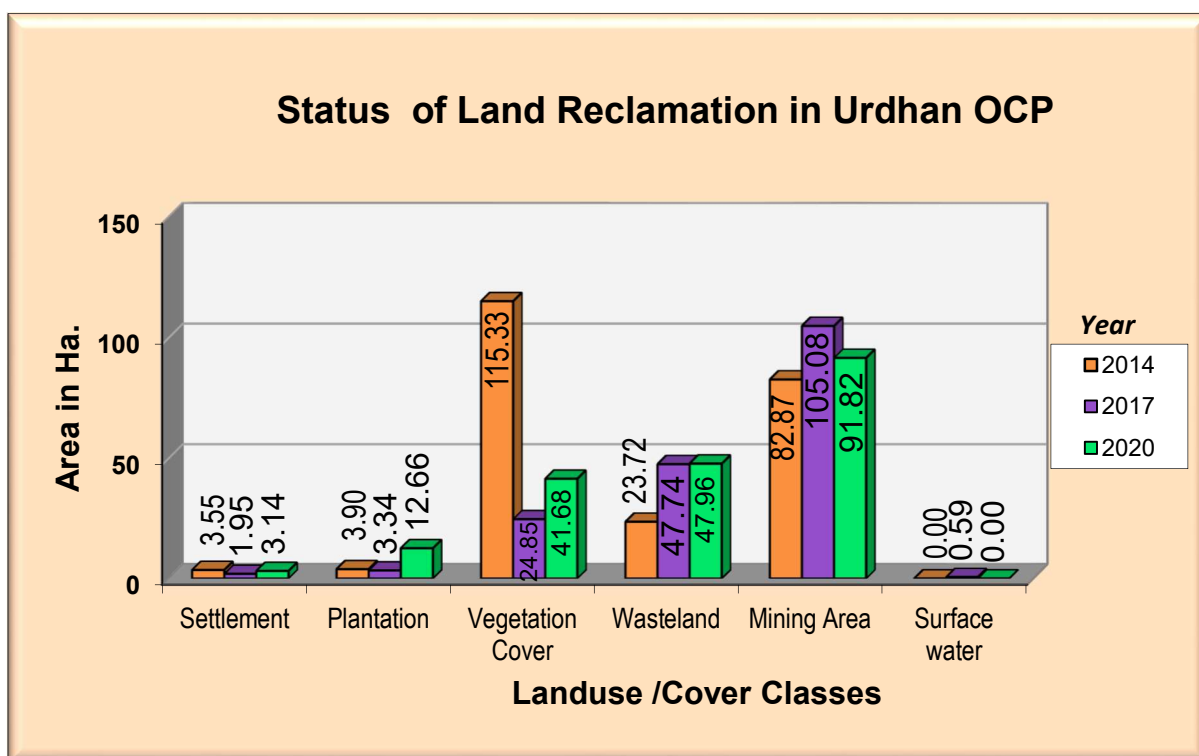


Figure - 5.7

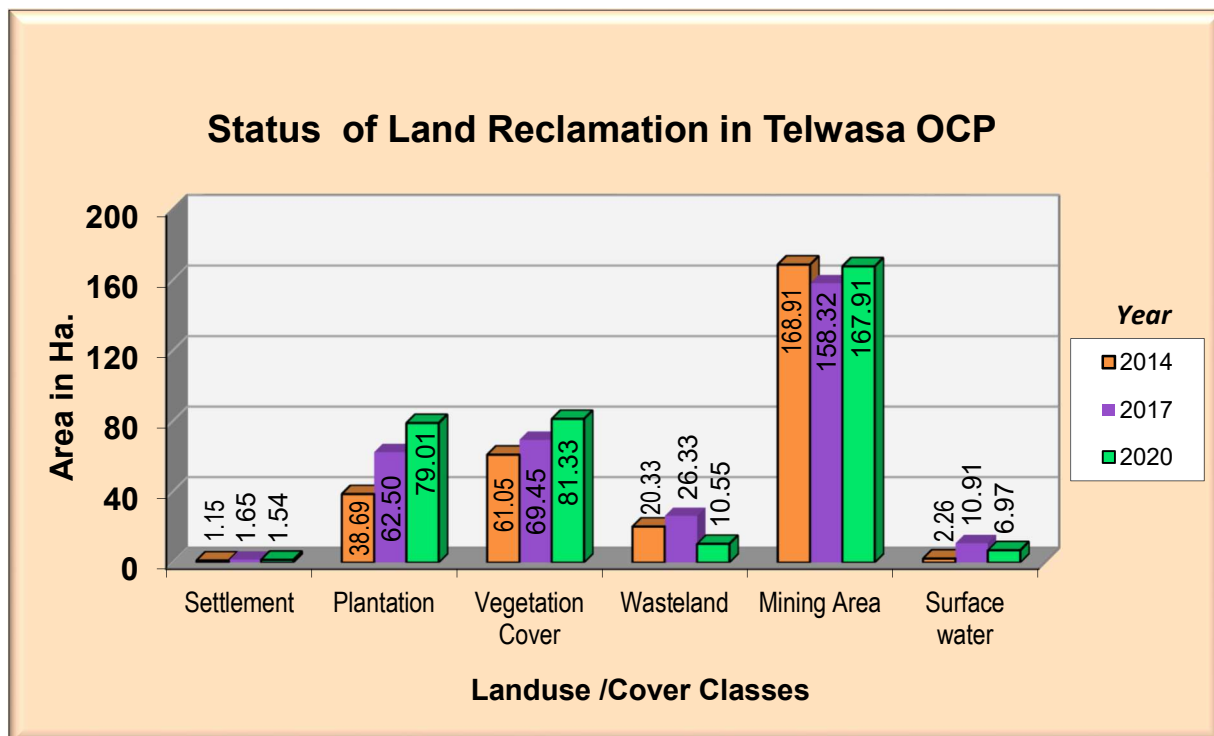


Figure - 5.8

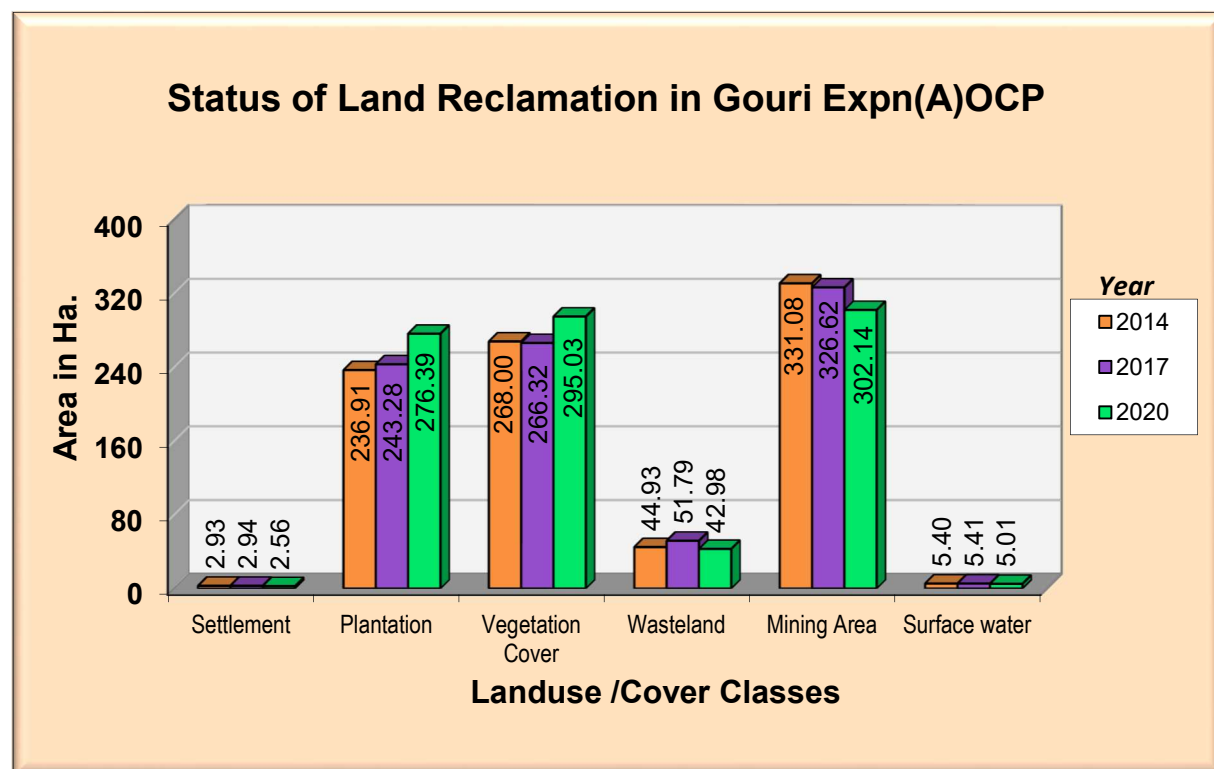


Figure-5.9

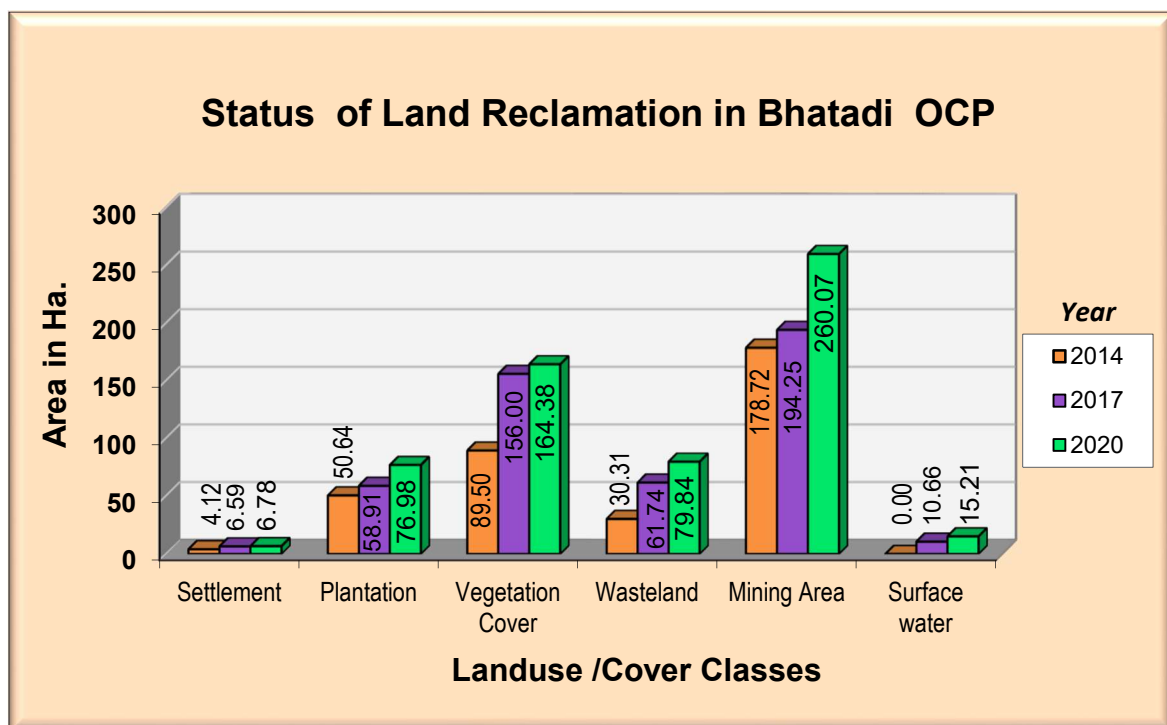


Figure-5.10

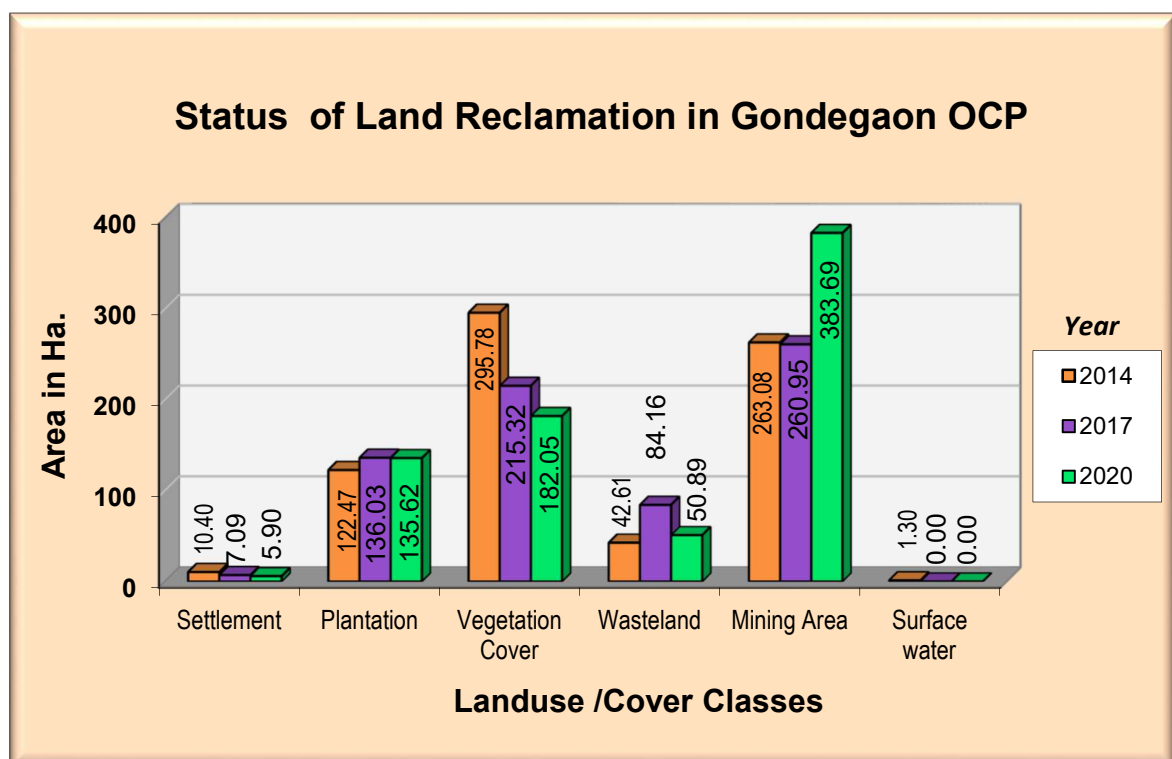


Figure-5.11

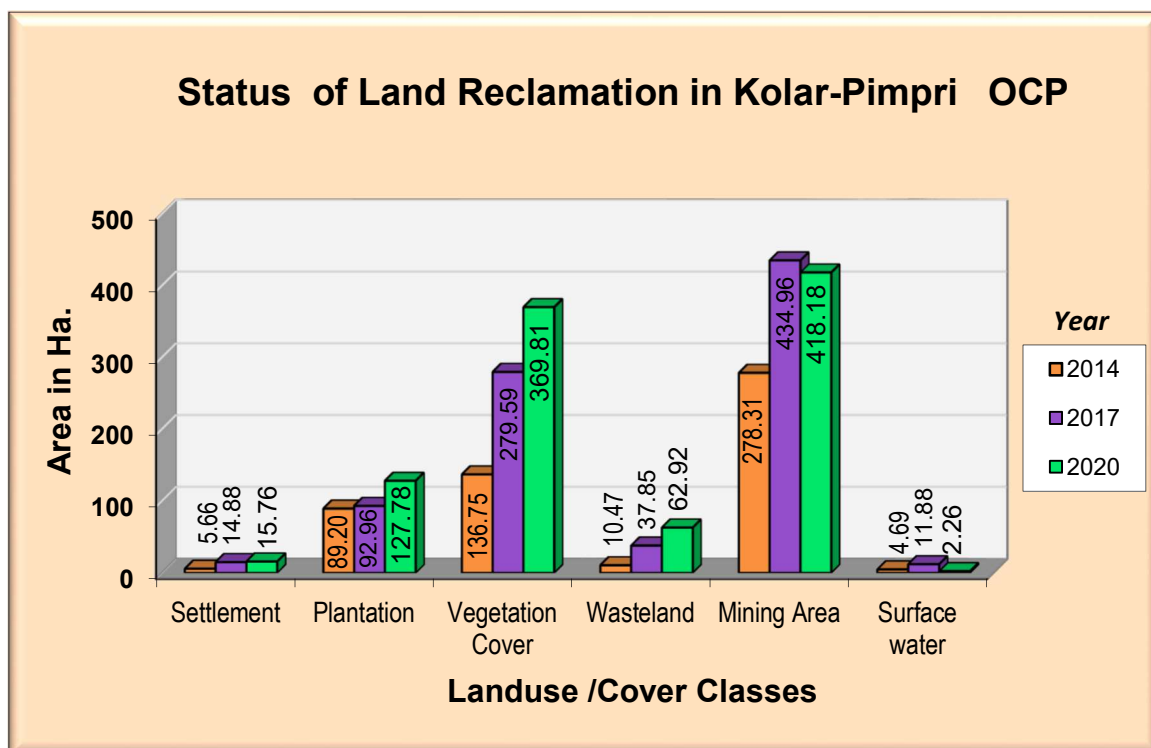


Figure-5.12

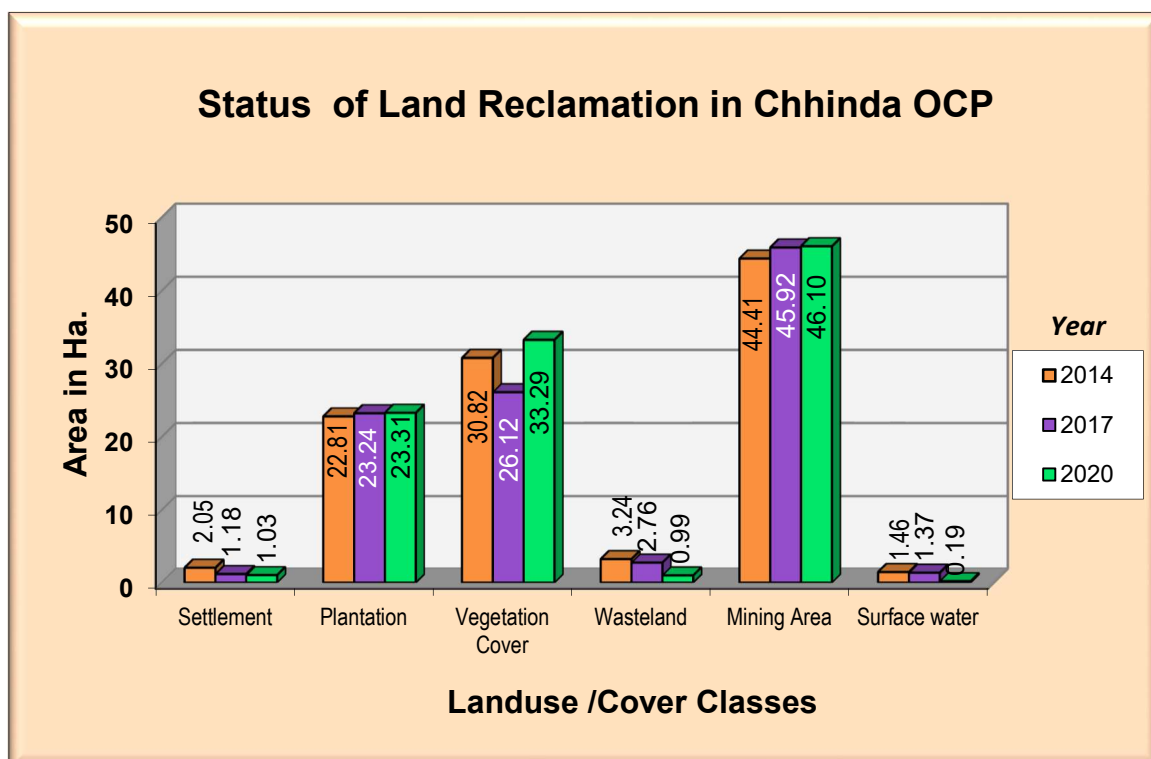


Figure-5.13

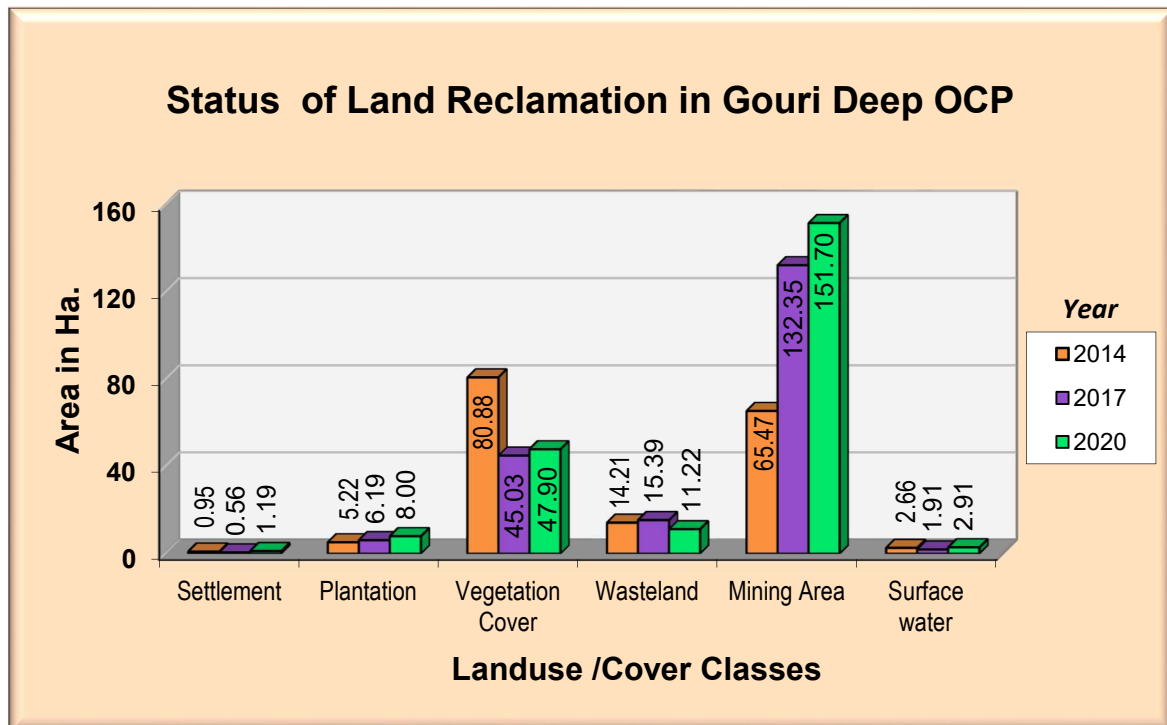


Figure-5.14

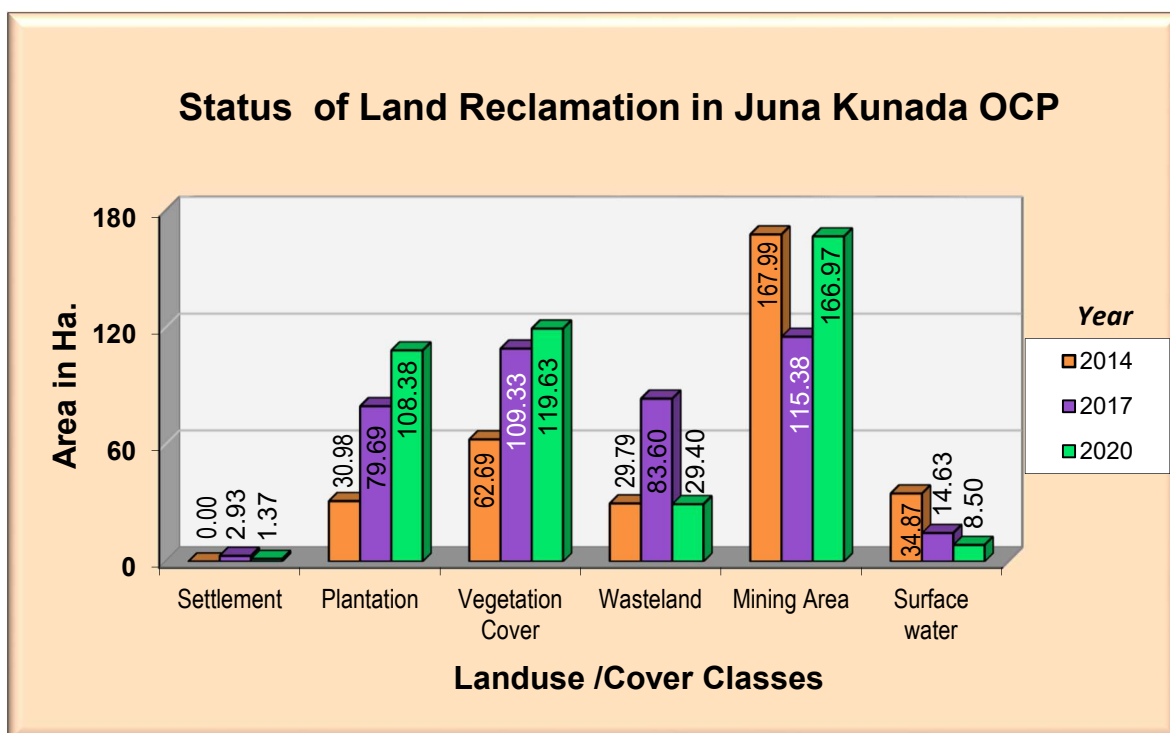


Figure-5.15

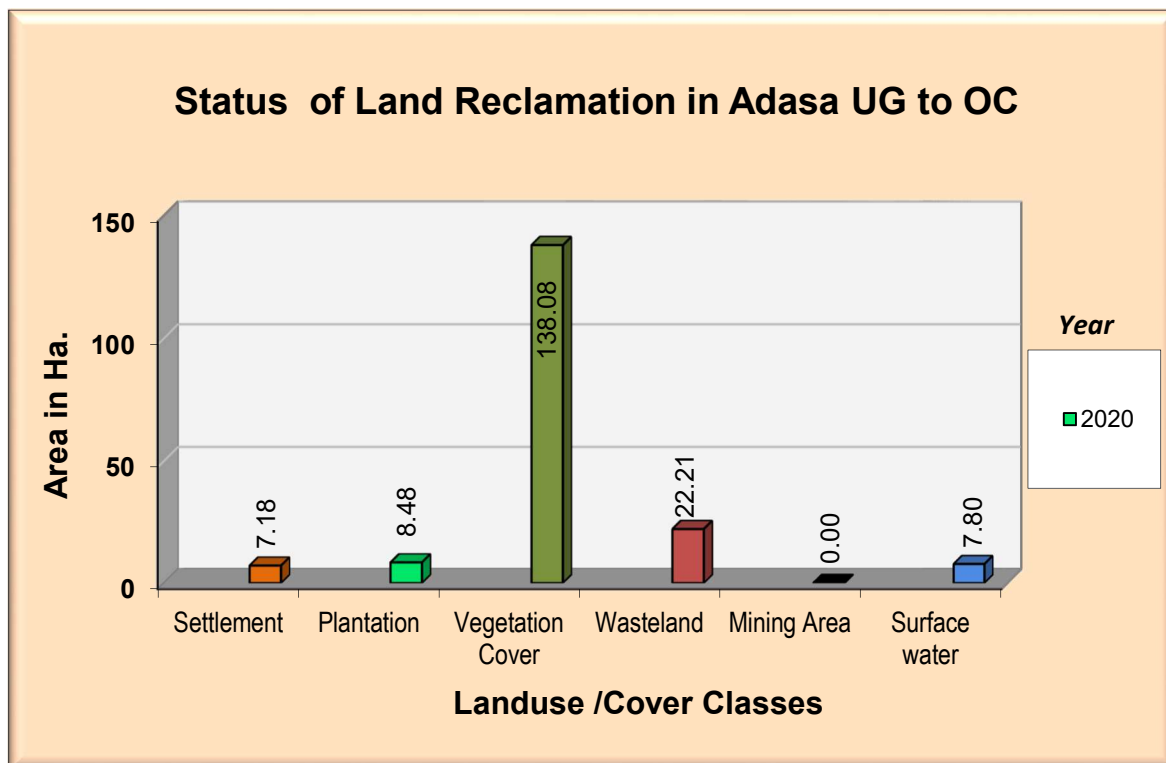


Figure-5.16



Photograph 5.1: Plantation on Barren OB in Gondegaon OCP



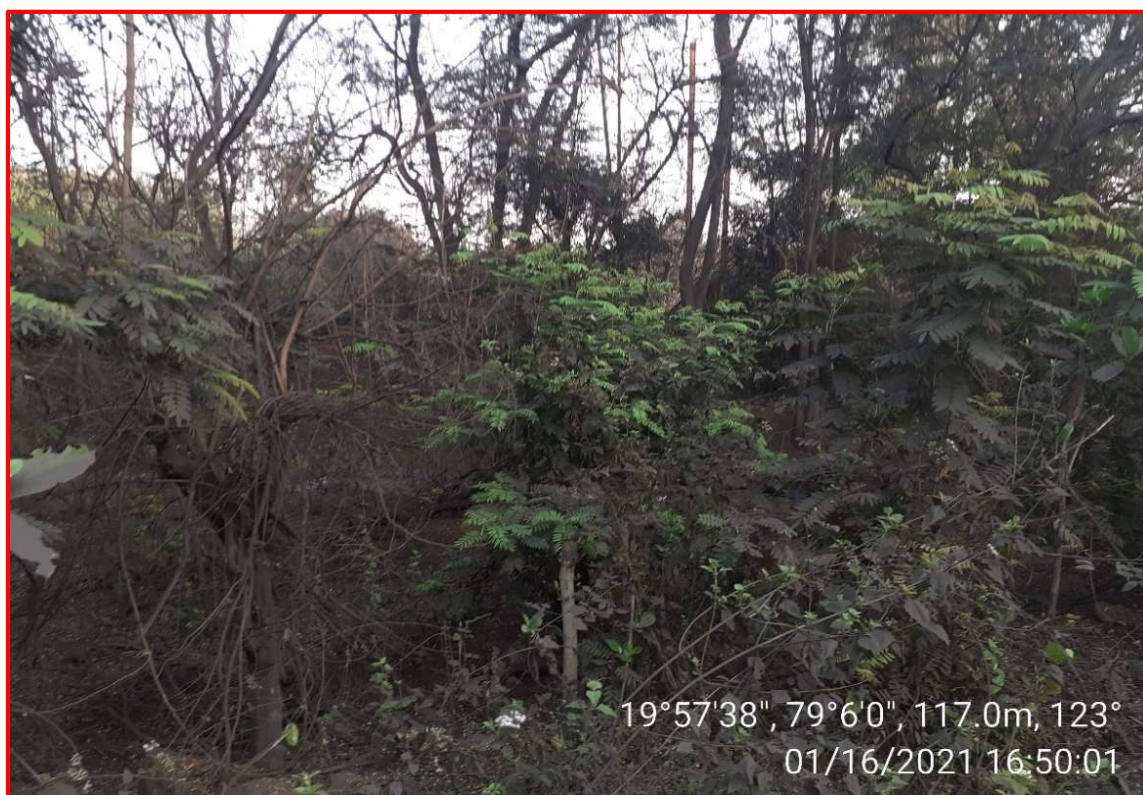
Photograph 5.2: Plantation on Barren OB in Junad Extn OCP



Photograph 5.3: Plantation on embankment in Kolgaon OCP



Photograph 5.4: Plantation on Barren OB dump in Kolgaon OC



Photograph 5.5: Plantation under social forestry in Bellora - Naigaon OCP



Photograph 5.6: Plantation on Barren OB Dump in Bellora - Naigaon OCP



Photograph 5.7: Plantation on embankment in Ballarpur OCP



Photograph 5.8: Plantation on backfill in Gauri Expn (A) OCP



Photograph 5.9: Plantation on embankment in Juna Kunada OCP



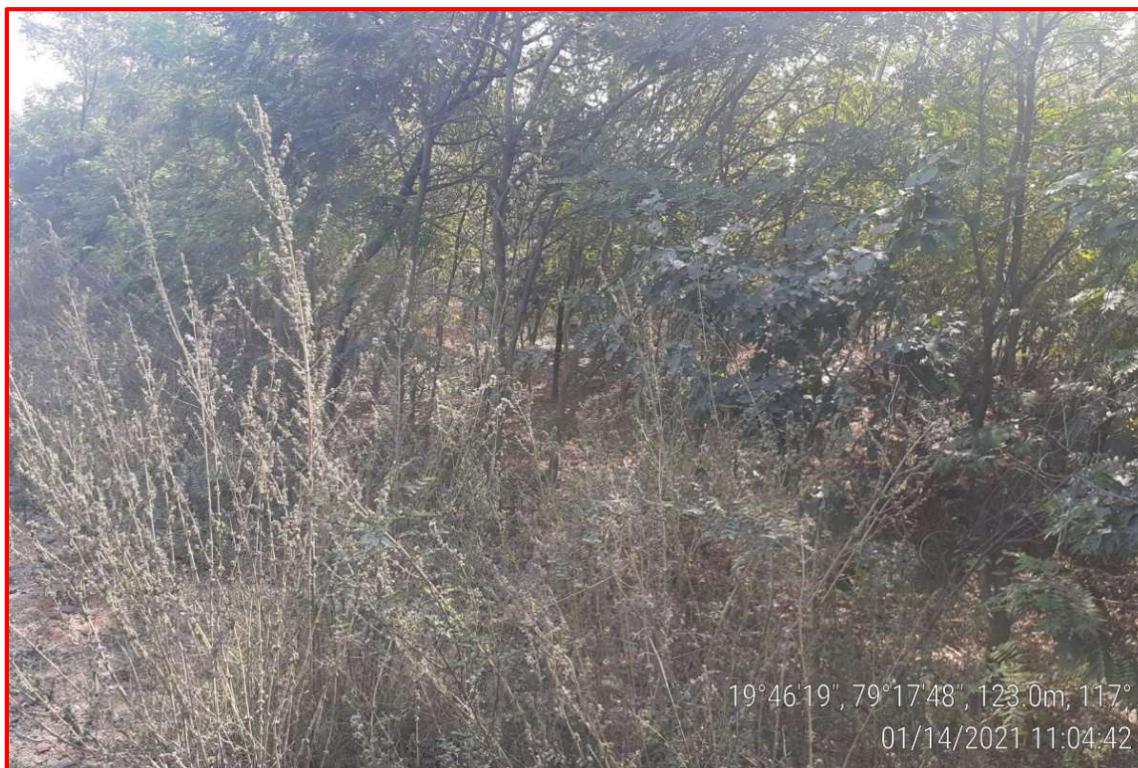
Photograph 5.10: Plantation on Barren OB dump in Junad Extn OCP



Photograph 5.11: Plantation on Barren OB in Telwasa OCP



Photograph 5.12: Plantation on embankment in Chhinda OCP



Photograph 5.13: Plantation under social forestry in Gauri Deep OCP



Photograph 5. 14: Plantation on Barren OB dump in Bhatadi OCP

SOUTH EASTERN COALFIELDS LIMITED

6.0 Land Reclamation Status in South Eastern Coalfields Limited

6.1 Following 07 opencast and 02 Underground mine of SECL producing less than 5 million cubic m. (Coal+OB) together, have been taken up for land reclamation monitoring during the year 2020-21 :

- Sharda OC
- Baroud OC
- Chhal OC
- Kanchan OC
- Mahan II OC
- Rajgamar UG
- Behraband UG
- Saraipali OC
- Bijari OC

6.2 Project wise Land Reclamation status in SECL is given in Table 6.1 and also shown graphically in Fig 6.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2020 are shown in the Table – 6.2. Land use maps derived from satellite data are shown in Plate 6.2 - 6.10. Different land use classes based on satellite data are depicted in Bar Charts in Fig.6.2 - 6.10.

6.3 Study reveals that out of total mine leasehold area of 8989.38 Hectares of the 07 OC and 02 UG mine of SECL mentioned above taken for this study in 2020-21; total excavated area is 1251.35 Ha., out of which 249.48 Ha. (19.94%) has been planted (*Biologically Reclaimed*), 592.32 Ha. (47.33%) is under backfilling (*Technically Reclaimed*) and balance 409.55 hectares (32.73%) is under active mining.

6.4 On comparing the status of land reclamation for the year 2020 with respect to the year 2017 in projects taken for land reclamation, it is evident that area of land reclamation has

increased from 708.00 Ha (Yr. 2017) to 841.80 Ha (Yr. 2020). This increase of 133.80 Ha area in land reclamation includes both plantation on Backfill (Biological Reclamation) and area under backfilling (Technical Reclamation) which are 68.48 Ha and 65.32 Ha respectively.

- 6.5 After analyzing the satellite data of year 2020, it is evident that plantation carried out on backfilled area, OB dumps as well as under social forestry in all the mines of SECL taken up for study has reached to 430.92 Ha(4.79%) area as compared to 201.00 Ha(9.77%) in the year 2017 within the entire leasehold area of 8989.38 Ha. Two projects (Rajgamar UG and Behraband UG) considered during the year 2020-21 are underground mines. Decrease of 3.6 in percentage of total area under plantation is due to increase in area of leasehold boundary this year as percentage of Green Cover is calculated with respect to area of leasehold boundary.
- 6.6 Leasehold area of Chhal OC has increased from 315 Ha (Yr 2017) to 1206.69 Ha (Yr 2020) due to expansion of the project resulting which area under social forestry has increased to 43.15 Ha in the year 2020 as compared to 6.00 Ha in the year 2017. Whereas total area under social forestry of all the above projects taken for land reclamation in the year 2020 has increased from 9.00 Ha to 117.67 Ha as 2 nos. each of underground and opencast projects have been added in the year 2020.
- 6.7 It is revealed that area under Technical reclamation in Baroud and Sharda OCP, has decreased from 239.00 Ha (Yr 2017) to 172.97 Ha (Yr 2020) and 84 Ha (yr 2017) to 62.00 Ha (yr 2020) respectively as more backfill area came under plantation on backfill.
- 6.8 Out of the 9 projects of SECL, Sharda OCP ranks on top for area under reclamation (74.58%) followed by Baroud OCP (71.56%) and Kanchan OCP (70.69%).

- 6.9** Out of the above 9 projects, 4 projects (Rajgamar UG, Behraband UG, Saraipali OC and Bijari OC) are additional projects which have been taken up for the first time for Land Reclamation monitoring in the year 2020-21. Updated leasehold boundary of Kanchan and Chhal, Sharda and Baroud and leasehold boundaries of the above mentioned additional projects were provided by SECL.

Table – 6.1
Project wise Land Reclamation Status in 07 Opencast Coal mines and 02 Underground mines of SECL
producing (< 5 million Cu. M. of Coal+OB) based on Satellite Data of the year 2020

(Area in Hectare)

Sl. No.	Project	Total Leasehold Area 2017	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 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)	
				2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
1	Sharda OC	884.00	871.21	84.00	62.00	102.00	124.00	11.00	34.20	1.00	3.39	41.00	63.38	227.00	249.38	114.00	161.59	186.00	186.00
				37.00%	24.86%	44.93%	49.72%					18.06%	25.42%			12.90%	18.55%	81.94%	74.58%
2	Baroud OC	361.00	1111.40	239.00	172.97	25.00	42.20	0.00	26.72	2.00	3.00	34.00	85.53	298.00	300.70	27.00	71.92	264.00	215.17
				80.20%	57.52%	8.39%	14.03%					11.41%	28.44%			7.48%	6.47%	88.59%	71.56%
3	Chhal OC	315.00	1206.69	111.00	184.14	5.00	12.00	0.00	0.00	6.00	43.15	95.00	92.13	211.00	288.27	11.00	55.15	116.00	196.14
				52.61%	63.88%	2.37%	4.16%					45.02%	31.96%			3.49%	4.57%	54.98%	68.04%
4	Kanchan OC	201.00	693.99	33.00	67.53	22.00	37.28	0.00	0.00	0.00	0.00	50.00	43.45	105.00	148.26	22.00	37.28	55.00	104.81
				31.43%	45.55%	20.95%	25.15%					47.62%	29.31%			10.95%	5.37%	52.38%	70.69%
5	Mahan II OC	297.00	297.00	60.00	105.68	27.00	34.00	0.00	2.85	0.00	2.72	71.00	70.12	158.00	209.80	27.00	39.57	87.00	139.68
				37.97%	50.37%	17.09%	16.21%					44.94%	33.42%			9.09%	13.32%	55.06%	66.58%
6	Rajgamar UG	-	3486.58	-	0.00	-	0.00	-	0.00	-	37.53	-	0.00	-	0.00	-	37.53	-	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.00%	1.08%	0.00%	0.00%
7	Behraband UG	-	770.13	-	0.00	-	0.00	-	0.00	-	24.19	-	0.00	-	0.00	-	24.19	-	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.00%	3.14%	0.00%	0.00%
8	Saraipali OC	-	279.00	-	0.00	-	0.00	-	0.00	-	0.00	-	19.50	-	19.50	-	0.00	-	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.00%	0.00%	0.00%	0.00%
9	Bijari OC	-	273.38	-	0.00	-	0.00	-	0.00	-	3.69	-	35.44	-	35.44	-	3.69	-	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.00%	1.35%	0.00%	0.00%
Total(SECL)		2058.00	8989.38	527.00	592.32	181.00	249.48	11.00	63.77	9.00	117.67	291.00	409.55	999.00	1251.35	201.00	430.92	708.00	841.80
				52.75%	47.33%	18.12%	19.94%					29.13%	32.73%			9.77%	4.79%	70.87%	67.27%

(% is calculated with respect 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. 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. Rajgamar UG, Behraband UG, Saraipalli OCP and Bijari OCP have been included for land reclamation monitoring in the year 2020 for the first time.

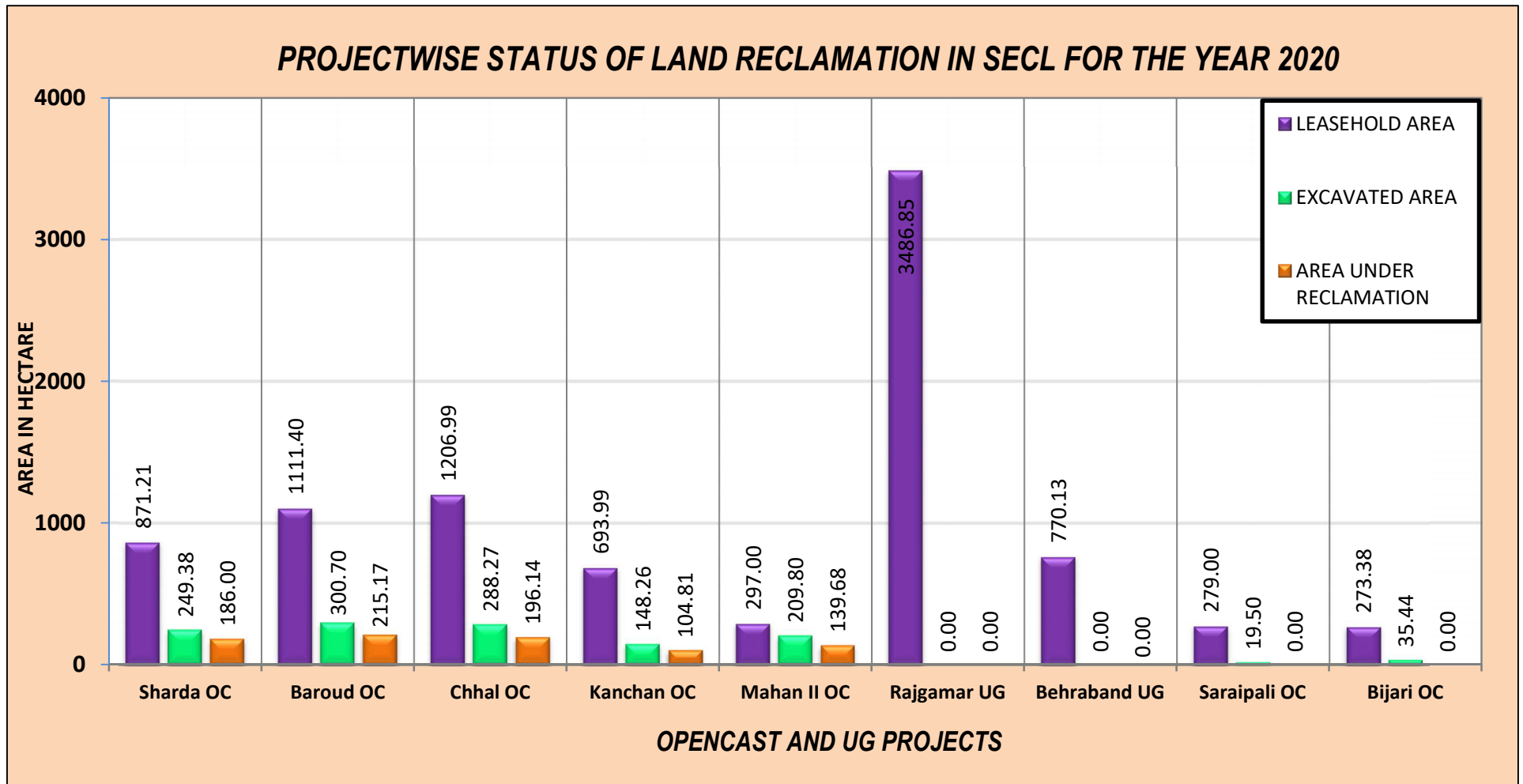
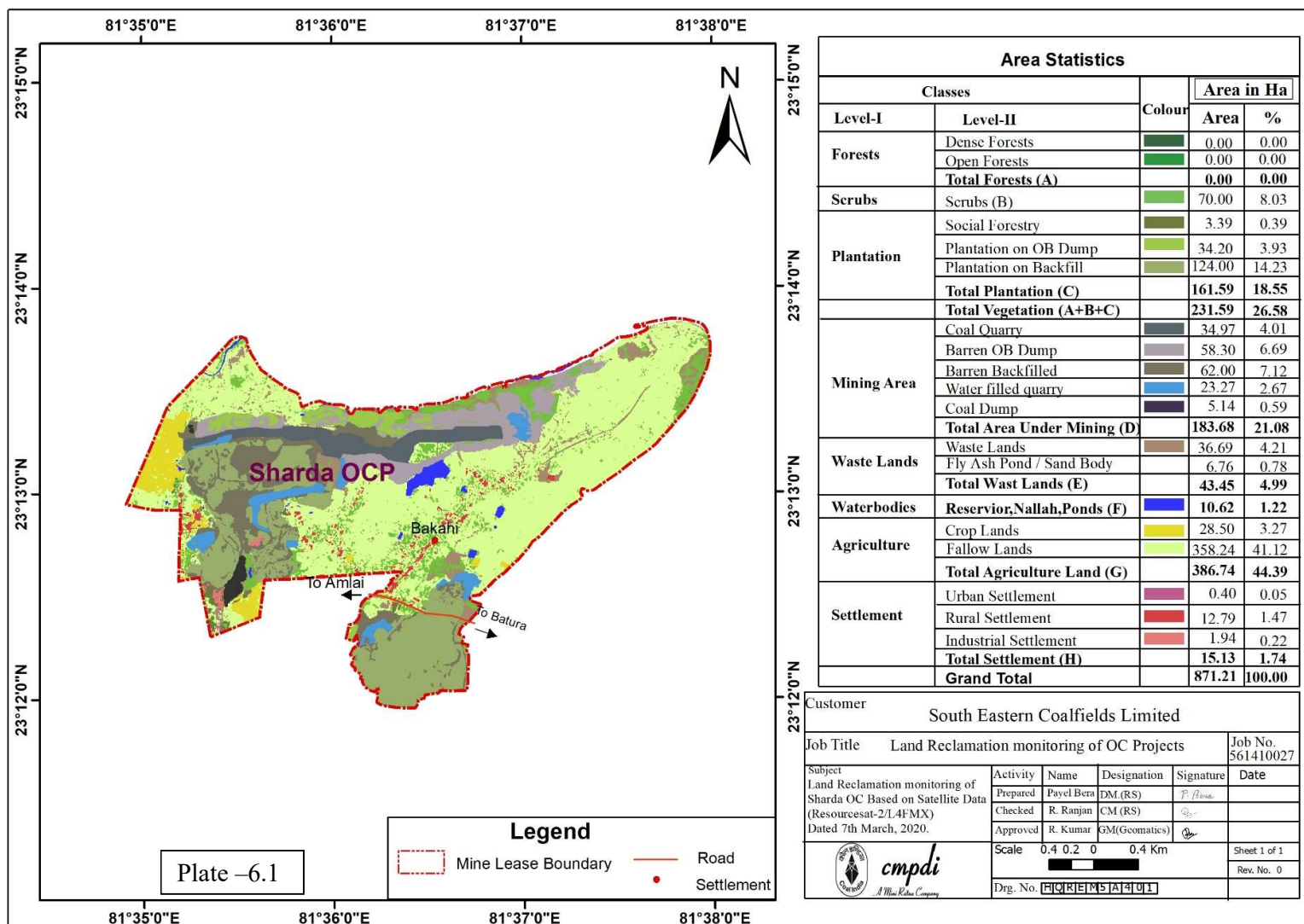
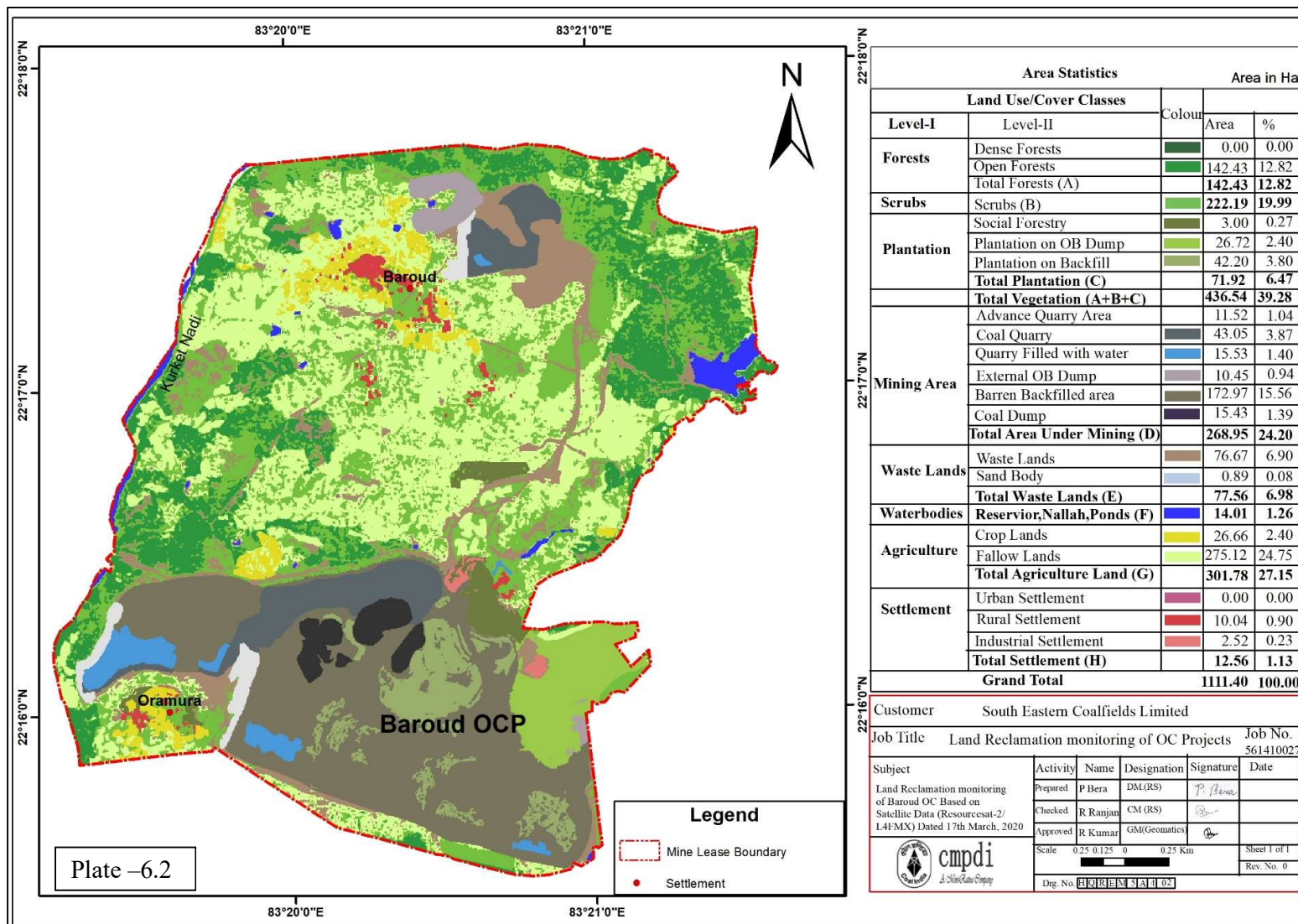


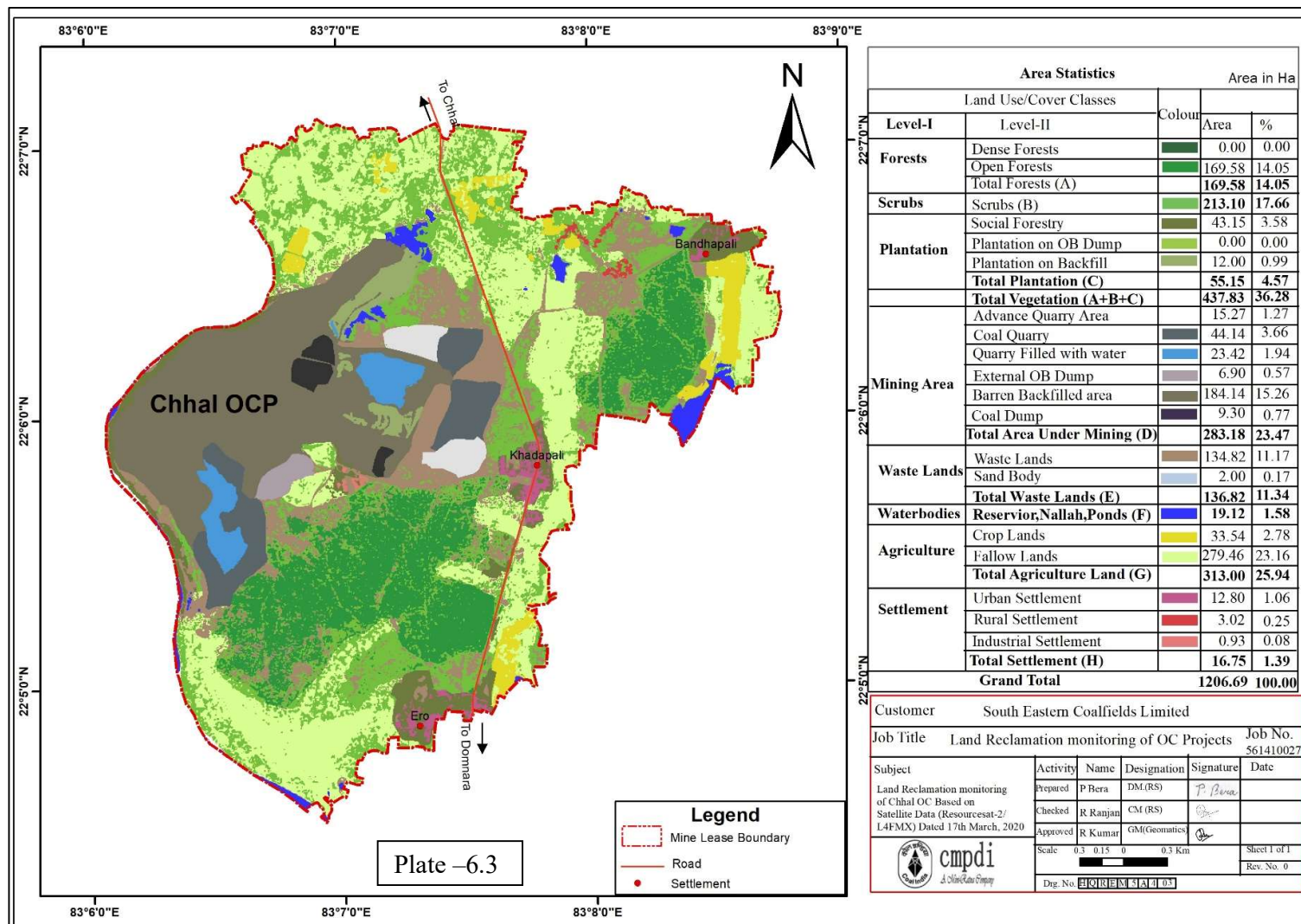
Fig.6.1: Land Reclamation status in 07 OC and 02 UG mines of SECL in the year-2020

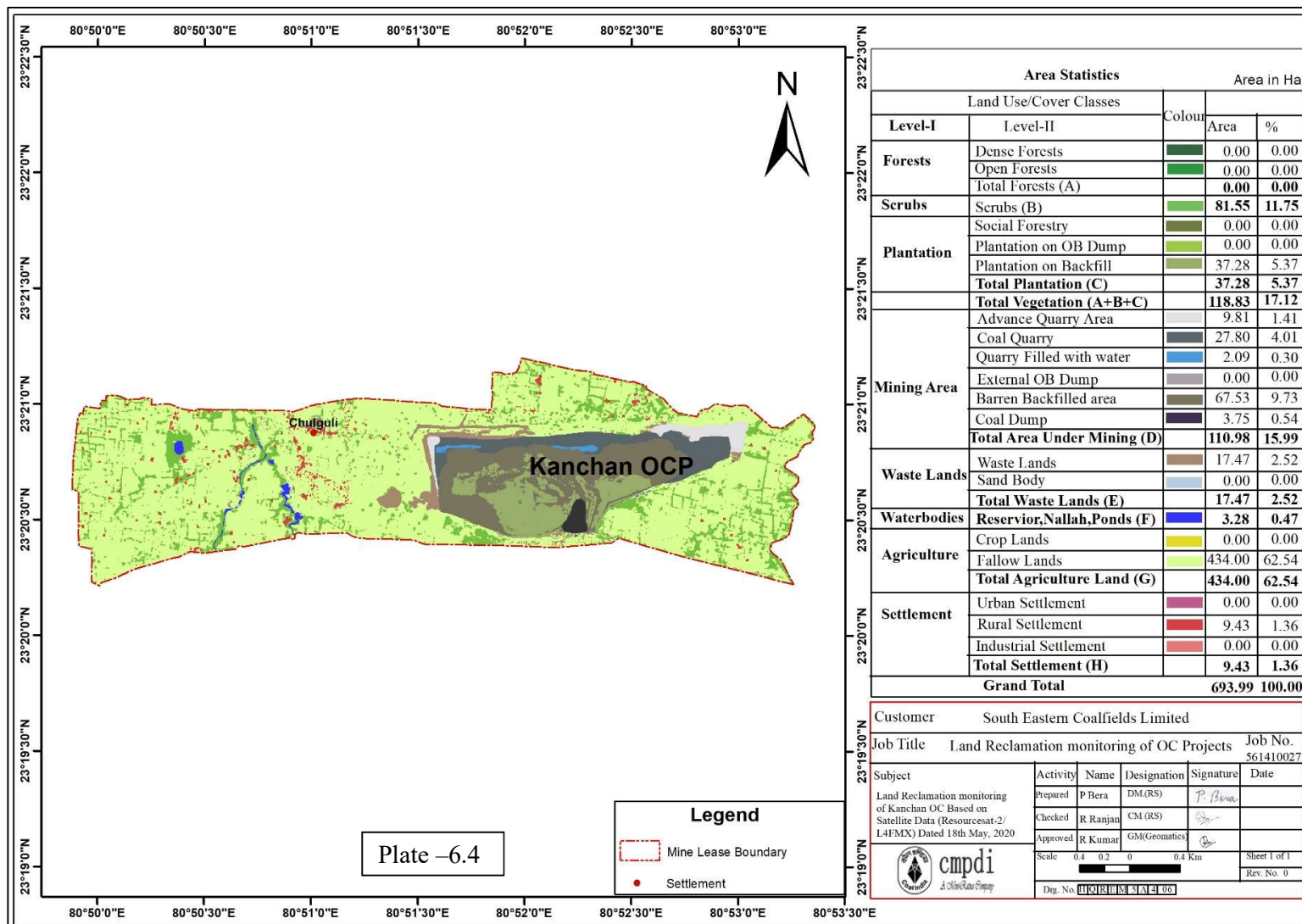
Table6.2 Project wise area statistics of Land use / Cover classes and land reclamation in opencast and UG Mines producing < 5 M.C.M of (Coal + OB) of. S.E.C.L based on Satellite data of the Year 2020

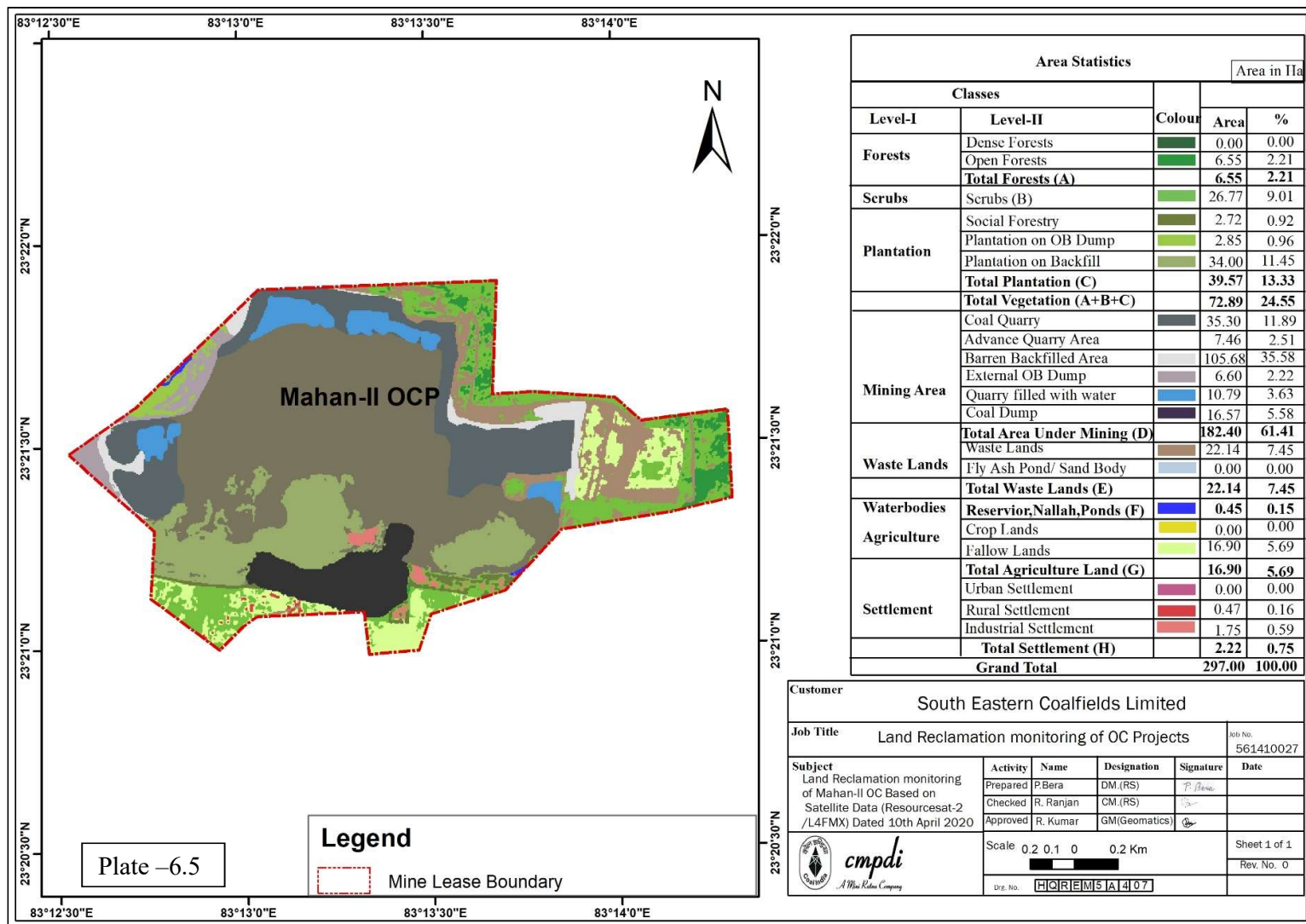
LAND USE / COVER CLASSES	COLOUR CODE	SHARDA		BAROUD		CHHAL		KANCHAN		MAHAN II		RAJGAMAR UG		BEHRABAND UG		SARAIPALI		BIJARI		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1057.26	30.32	0.00	0.00	0.00	0.00	0.00	0.00	1057.26	11.76
	Open Forest	0.00	0.00	142.43	12.82	169.58	14.05	0.00	0.00	6.55	2.21	892.78	25.61	0.00	0.00	0.00	0.00	0.00	0.00	1211.34	13.48
	Total Forest (A)	0.00	0.00	142.43	12.82	169.58	14.05	0.00	0.00	6.55	2.21	1950.04	55.93	0.00	0.00	0.00	0.00	0.00	0.00	2268.60	25.24
PLANTATION	Scrubs (B)	70.00	8.03	222.19	19.99	213.10	17.66	81.55	11.75	26.77	9.01	779.66	22.36	129.81	16.86	28.44	10.19	67.88	24.83	1619.40	18.01
	Social Forestry (C)	3.39	0.39	3.00	0.27	43.15	3.58	0.00	0.00	2.72	0.92	37.53	1.08	24.19	3.14	0.00	0.00	3.69	1.35	117.67	1.31
	Plantation on External OB Dump	34.20	3.93	26.72	2.40	0.00	0.00	0.00	0.00	2.85	0.96	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	63.77	0.71
	Plantation on Backfill / Excavated Area (Biological Reclamation)	124.00	14.23	42.20	3.80	12.00	0.99	37.28	5.37	34.00	11.45	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	249.48	2.78
	Total Area under Plantation (Green Cover) (D)	161.59	18.55	71.92	6.47	55.15	4.57	37.28	5.37	39.57	13.33	37.53	1.08	24.19	3.14	0.00	0.00	3.69	1.35	430.92	4.79
Total Vegetation (A to D)		231.59	26.58	436.54	39.28	437.83	36.28	118.83	17.12	72.89	24.55	2767.23	79.37	154.00	20.00	28.44	10.19	71.57	26.18	4318.92	48.04
AREA UNDER ACTIVE MINING	Coal Quarry	34.97	4.01	43.05	3.87	44.14	3.66	27.80	4.01	35.30	11.89	0.00	0.00	0.00	0.00	11.82	4.24	30.59	11.19	227.67	2.53
	Coal Dump	5.14	0.59	15.43	1.39	9.30	0.77	3.75	0.54	16.57	5.58	0.00	0.00	0.00	0.00	0.00	0.00	3.59	1.31	53.78	0.60
	Advance Quarry Site	0.00	0.00	11.52	1.04	15.27	1.27	9.81	1.41	7.46	2.51	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.31	44.90	0.50
	Quarry Filled With Water	23.27	2.67	15.53	1.40	23.42	1.94	2.09	0.30	10.79	3.63	0.00	0.00	0.00	0.00	7.68	2.75	0.42	0.15	83.20	0.93
	Total Area under Active Mining (F)	63.38	7.27	85.53	7.70	92.13	7.64	43.45	6.26	70.12	23.61	0.00	0.00	0.00	0.00	19.50	6.99	35.44	12.96	409.55	4.56
TECHNICAL RECLAMATION	Barren OB Dump (G)	58.30	6.69	10.45	0.94	6.90	0.57	0.00	0.00	6.60	2.22	0.00	0.00	0.00	0.00	20.82	7.46	3.46	1.27	106.53	1.19
	Area under Barren Backfilling	62.00	7.12	172.97	15.56	184.14	15.26	67.53	9.73	105.68	35.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	592.32	6.59
	Total Area under Technical Reclamation (H)	62.00	7.12	172.97	15.56	184.14	15.26	67.53	9.73	105.68	35.58	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	592.32	6.59
Total Area under Mining Operations (F+G+H)		183.68	21.08	268.95	24.20	283.17	23.47	110.98	15.99	182.40	61.41	0.00	0.00	0.00	0.00	40.32	14.45	38.90	14.23	1108.40	12.33
WASTELANDS	Waste Lands	36.69	4.21	76.67	6.90	134.82	11.17	17.47	2.52	22.14	7.45	259.79	7.45	126.38	16.41	26.30	9.43	22.09	8.08	722.35	8.04
	Fly Ash Pond / Sand Body	6.76	0.78	0.89	0.08	2.00	0.17	0.00	0.00	0.00	0.00	4.97	0.14	2.27	0.29	0.00	0.00	0.00	0.00	16.89	0.19
	Total Wasteland (I)	43.45	4.99	77.56	6.98	136.82	11.34	17.47	2.52	22.14	7.45	264.76	7.59	128.65	16.70	26.30	9.43	22.09	8.08	739.24	8.22
WATERBODIES	Reservoir, nallah, ponds	10.62	1.22	14.01	1.26	19.12	1.58	3.28	0.47	0.45	0.15	28.55	0.82	13.60	1.77	3.40	1.22	2.30	0.84	95.33	1.06
	Total Waterbodies (J)	10.62	1.22	14.01	1.26	19.12	1.58	3.28	0.47	0.45	0.15	28.55	0.82	13.60	1.77	3.40	1.22	2.30	0.84	95.33	1.06
AGRICULTURE	Crop Lands	28.50	3.27	26.66	2.40	33.54	2.78	0.00	0.00	0.00	0.00	41.25	1.18	53.93	7.00	25.01	8.96	10.18	3.72	219.07	2.44
	Fallow Lands	358.24	41.12	275.12	24.75	279.46	23.16	434.00	62.54	16.90	5.69	339.73	9.74	411.38	53.42	155.34	55.68	124.79	45.65	2394.96	26.64
	Total Agriculture (K)	386.74	44.39	301.78	27.15	313.00	25.94	434.00	62.54	16.90	5.69	380.98	10.92	465.31	60.42	180.35	64.64	134.97	49.37	2614.03	29.08
SETTLEMENTS	Urban Settlement	0.40	0.05	0.00	0.00	12.80	1.06	0.00	0.00	0.00	0.00	28.44	0.82	0.00	0.00	0.00	0.00	0.00	0.00	41.64	0.46
	Rural Settlement	12.79	1.47	10.04	0.90	3.02	0.25	9.43	1.36	0.47	0.16	14.93	0.43	8.57	1.11	0.00	0.00	3.55	1.30	62.80	0.70
	Industrial Settlement	1.94	0.22	2.52	0.23	0.93	0.08	0.00	0.00	1.75	0.59	1.69	0.05	0.00	0.00	0.19	0.07	0.00	0.00	9.02	0.10
	Total Settlement (L)	15.13	1.74	12.56	1.13	16.75	1.39	9.43	1.36	2.22	0.75	45.06	1.30	8.57	1.11	0.19	0.07	3.55	1.30	113.46	1.26
Grand Total (A to L)		871.21	100.00	1111.40	100.00	1206.69	100.00	693.99	100.00	297.00	100.00	3486.58	100.00	770.13	100.00	279.00	100.00	273.38	100.00	8989.38	100.00

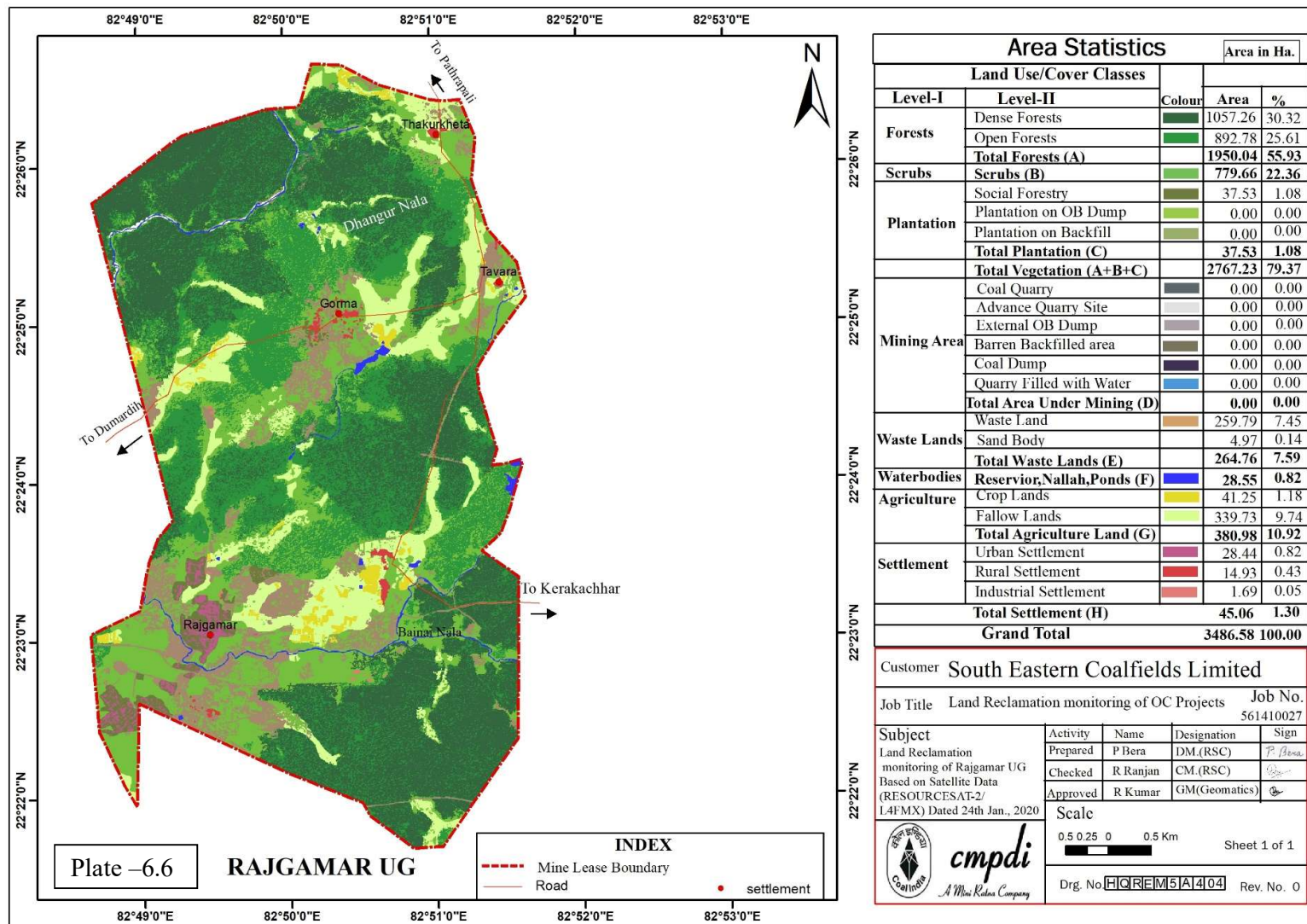


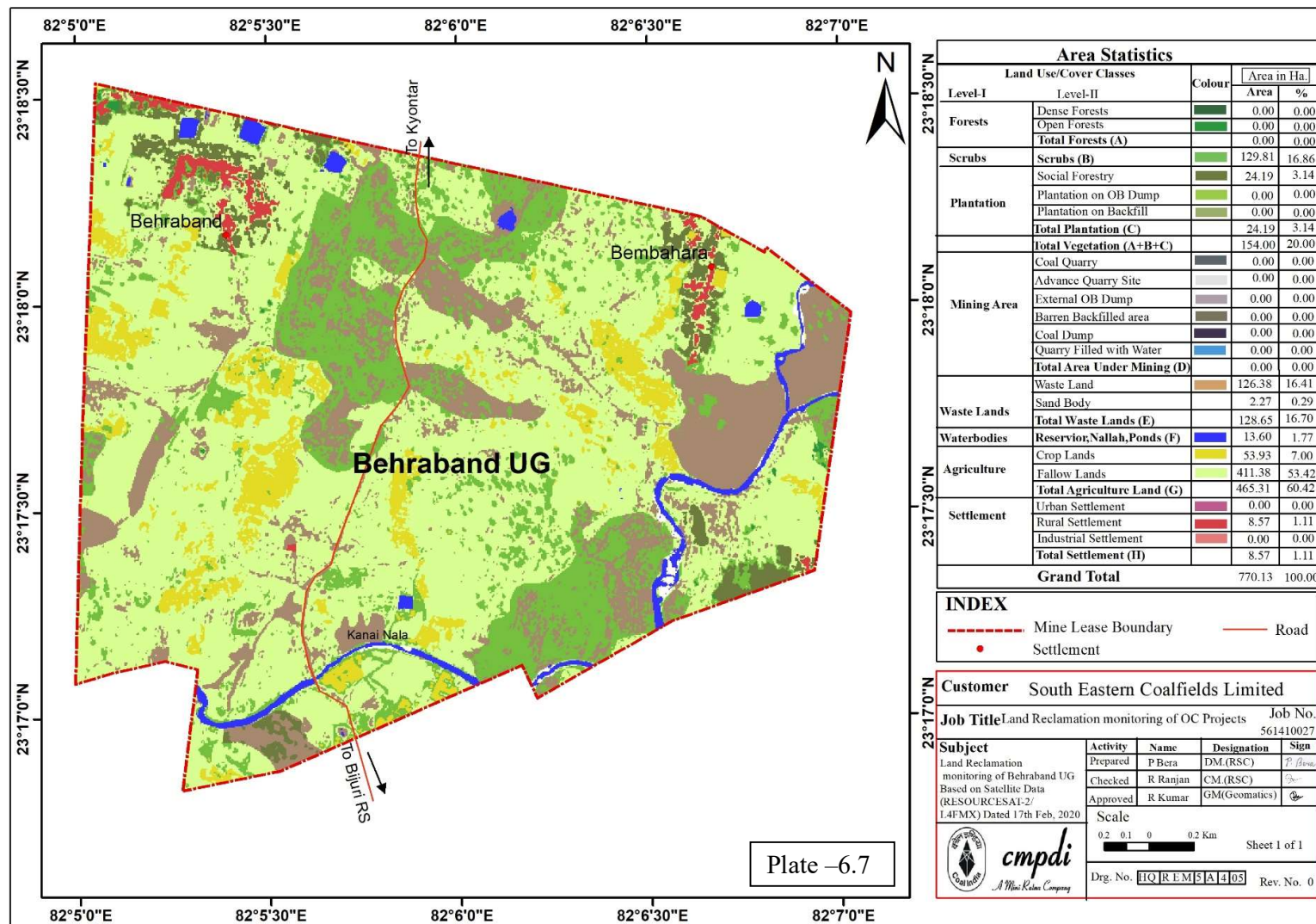


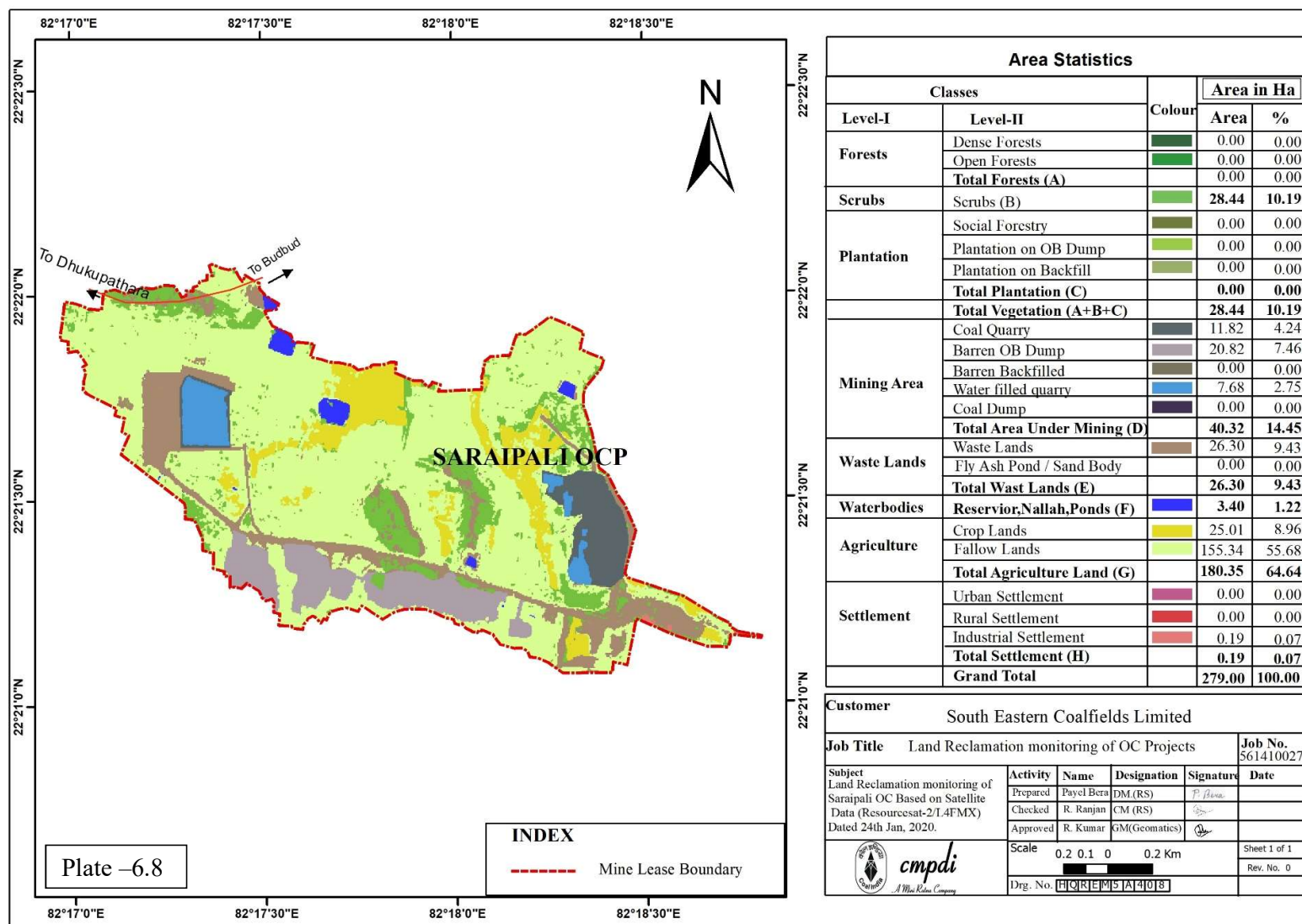


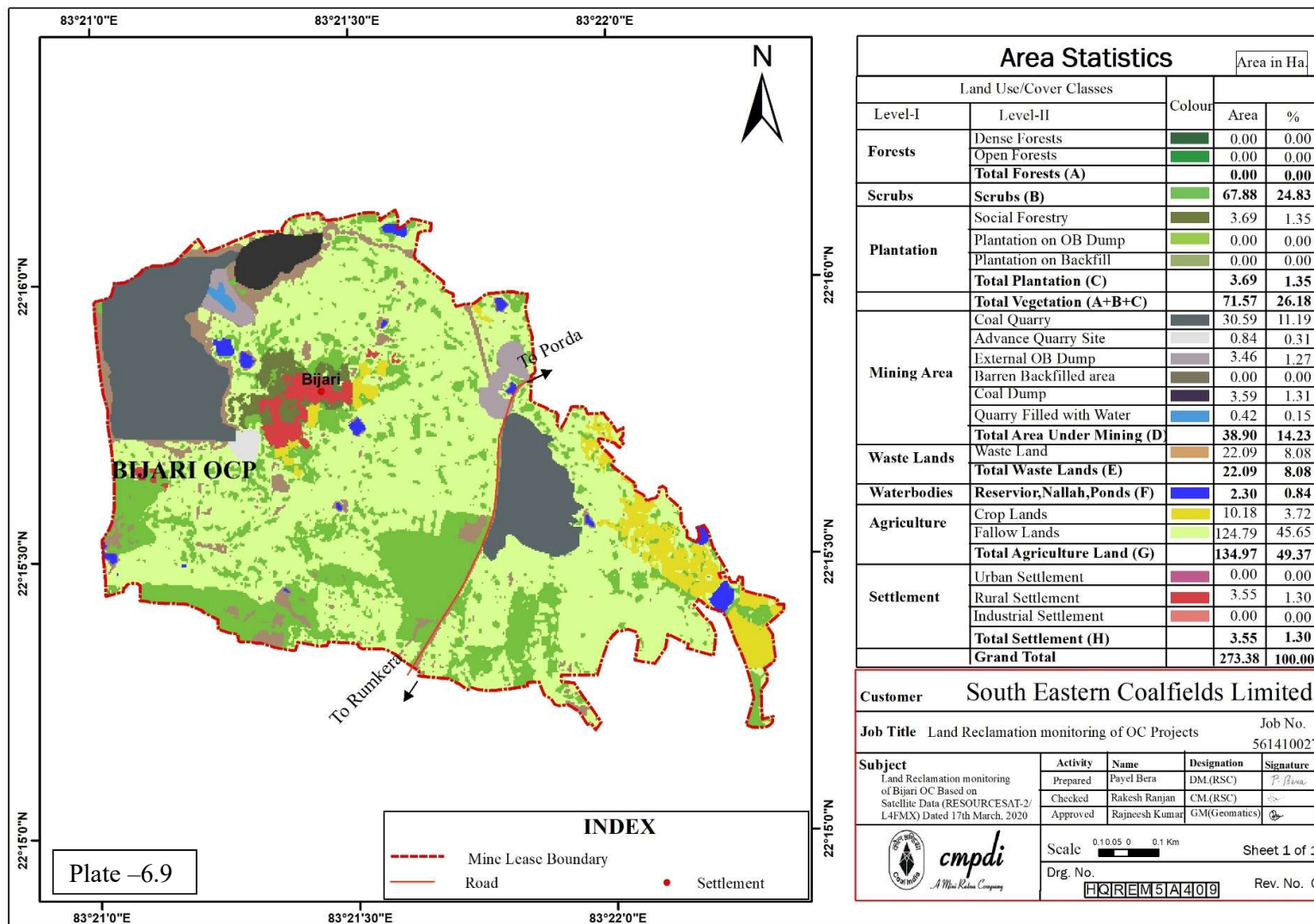












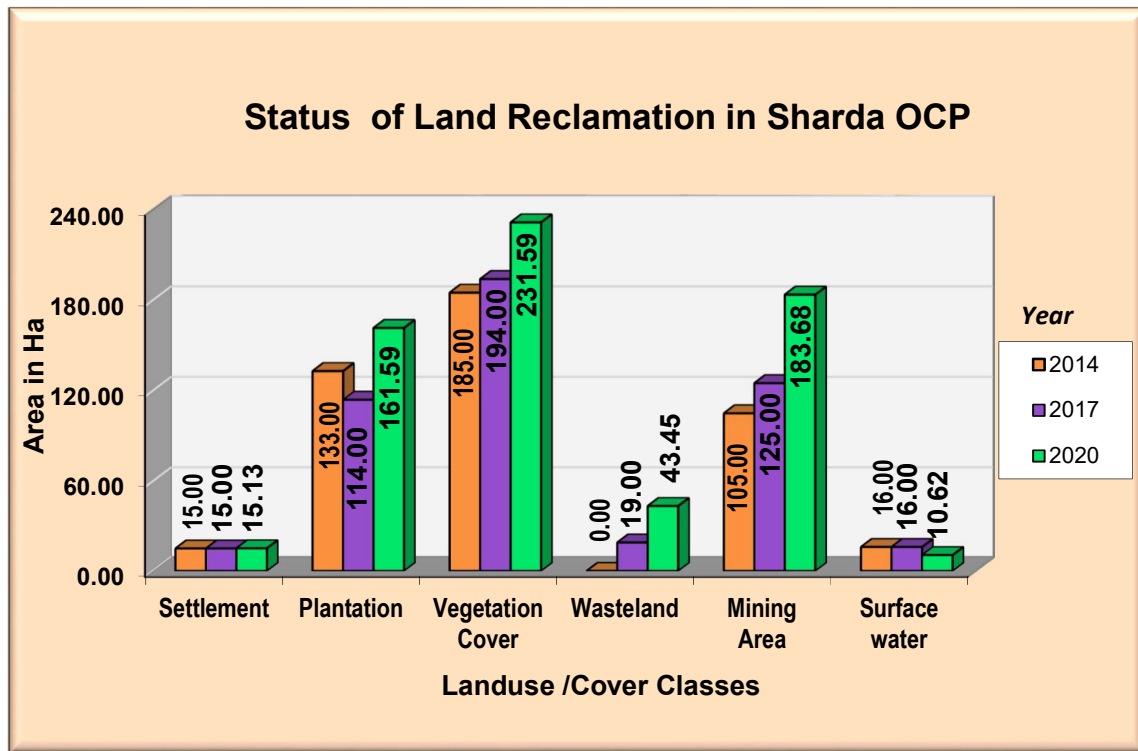


Fig: 6.2

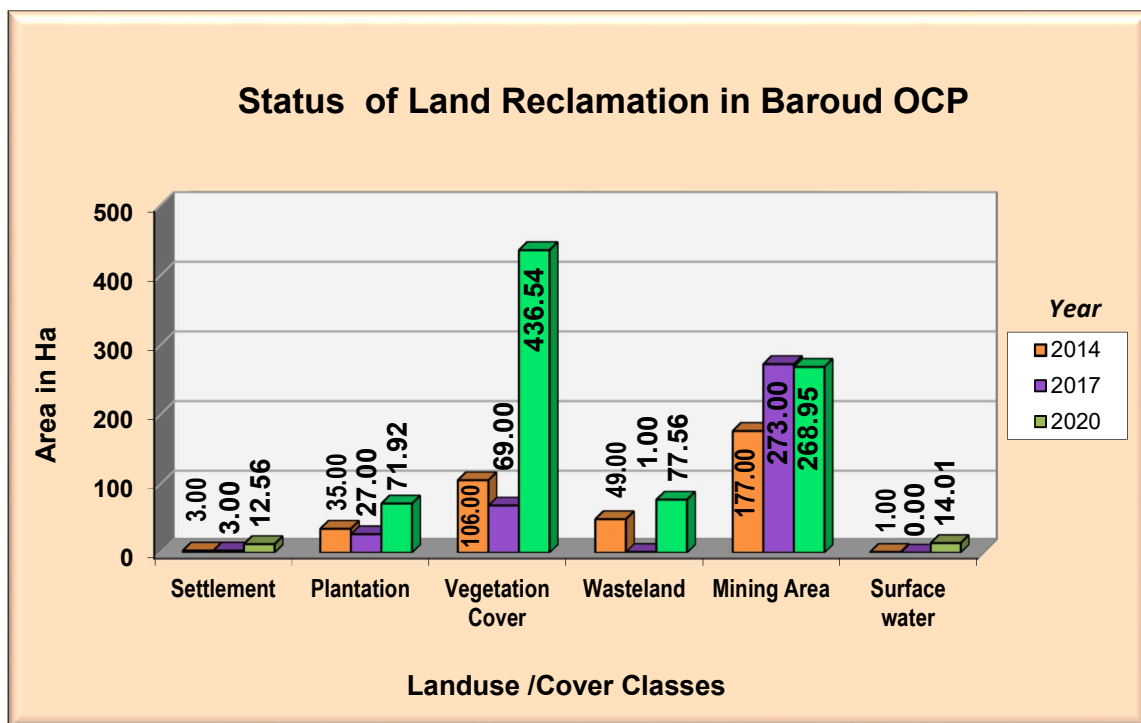


Fig: 6.3

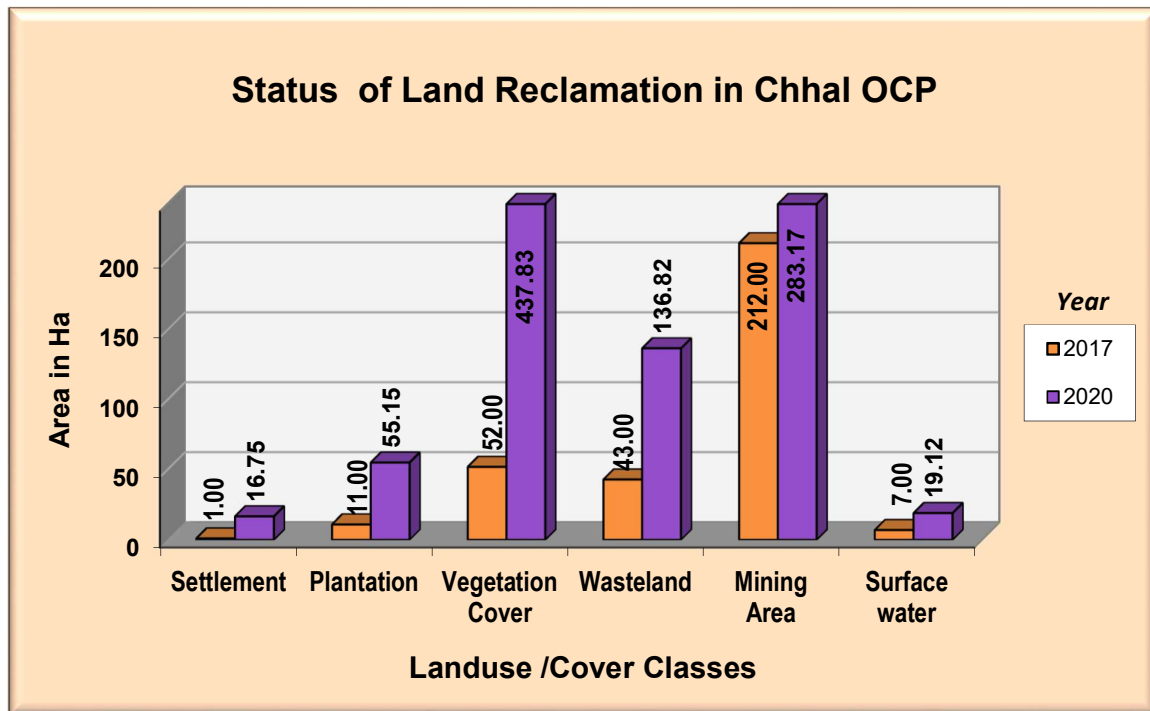


Fig: 6.4

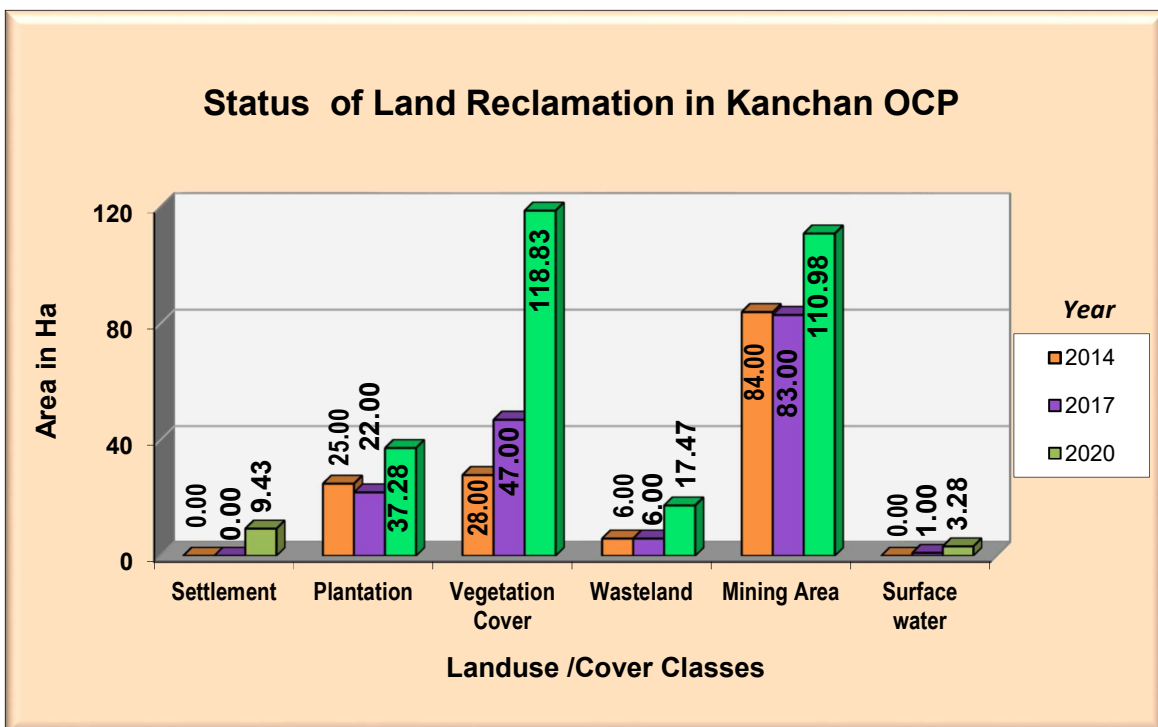


Fig: 6.5

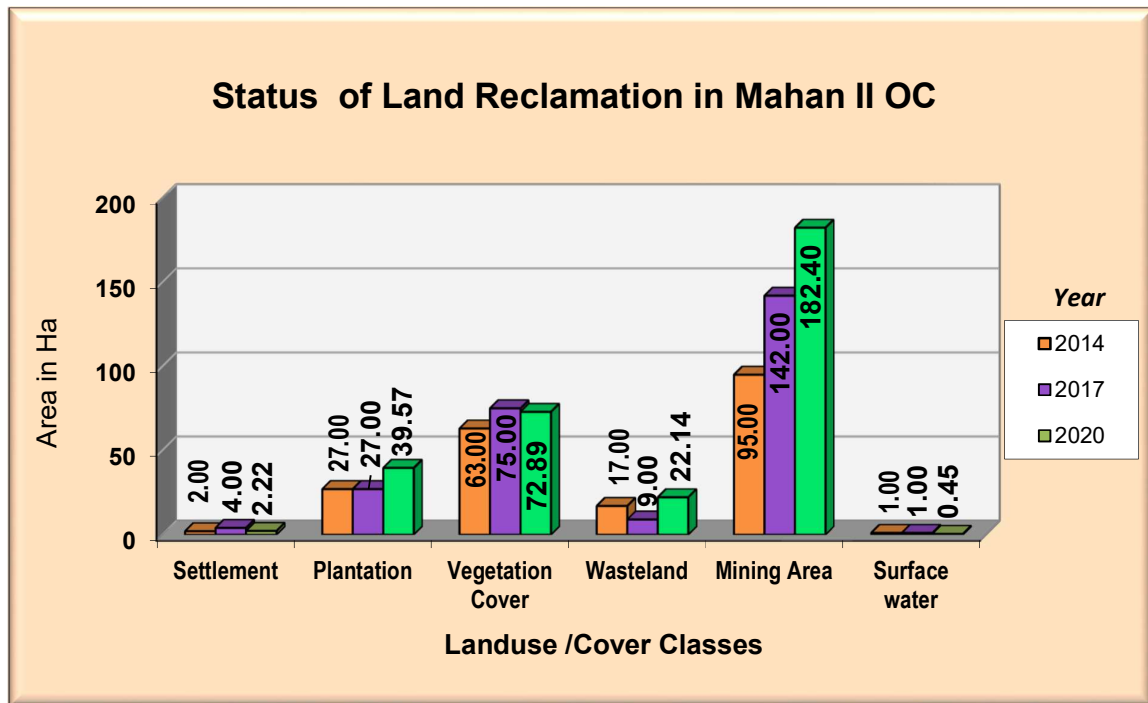


Fig: 6.6

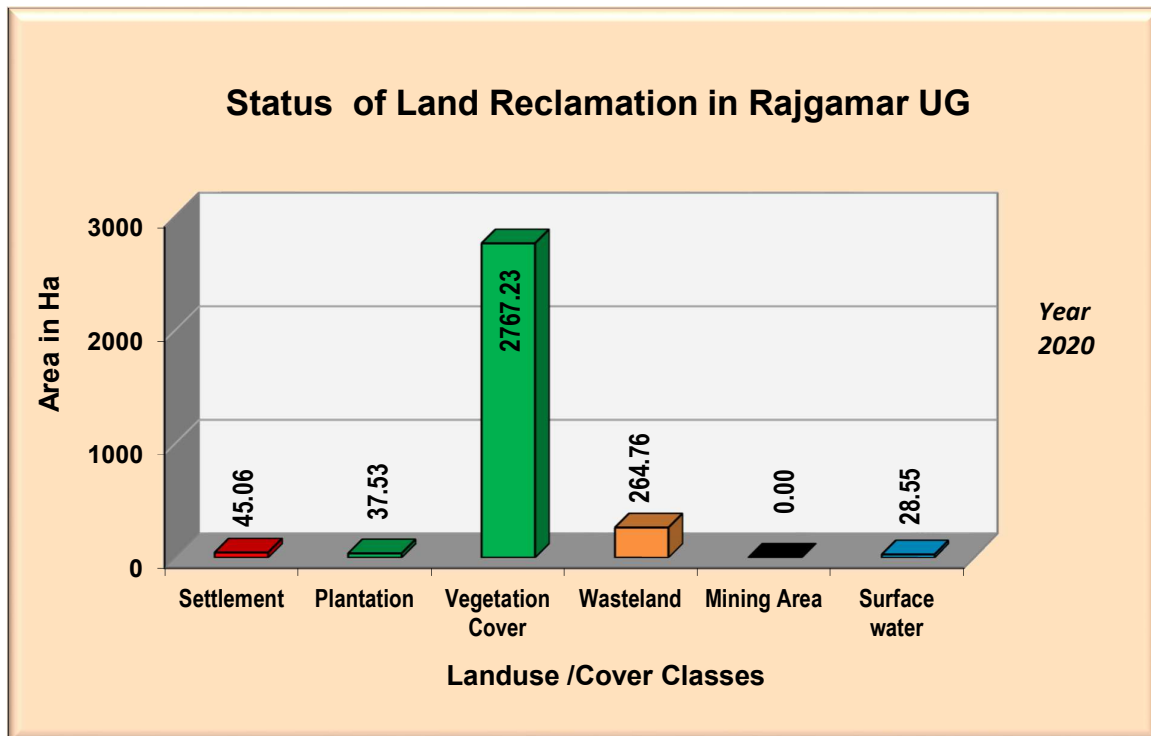


Fig: 6.7

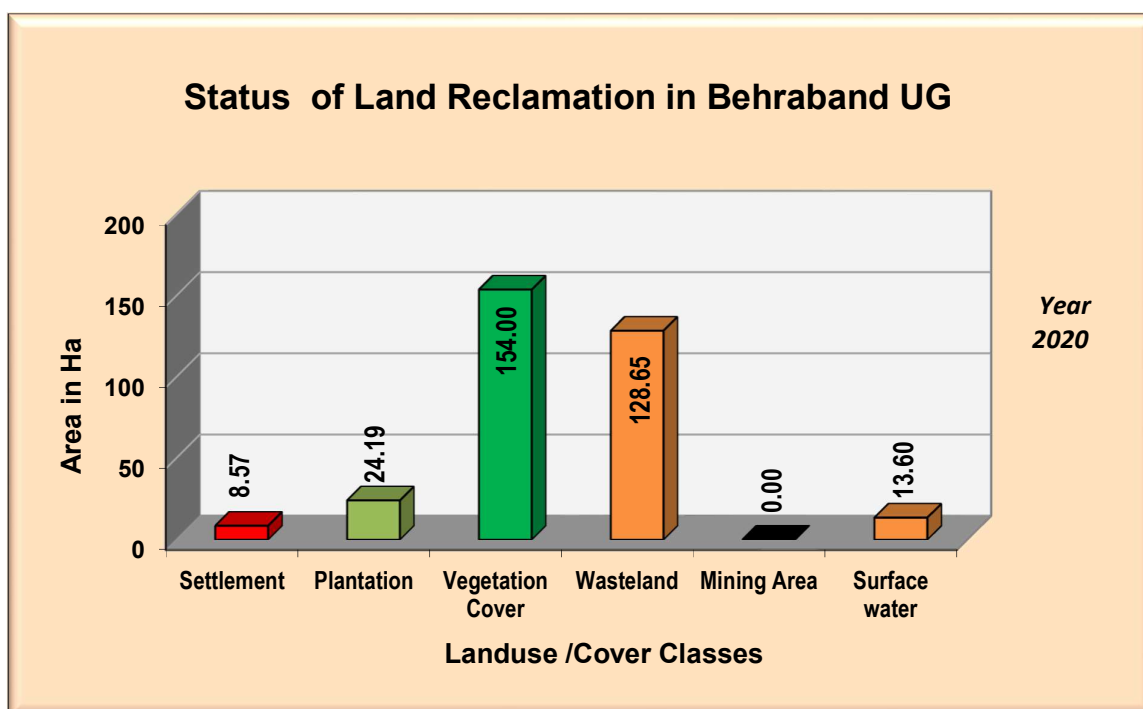


Fig: 6.8

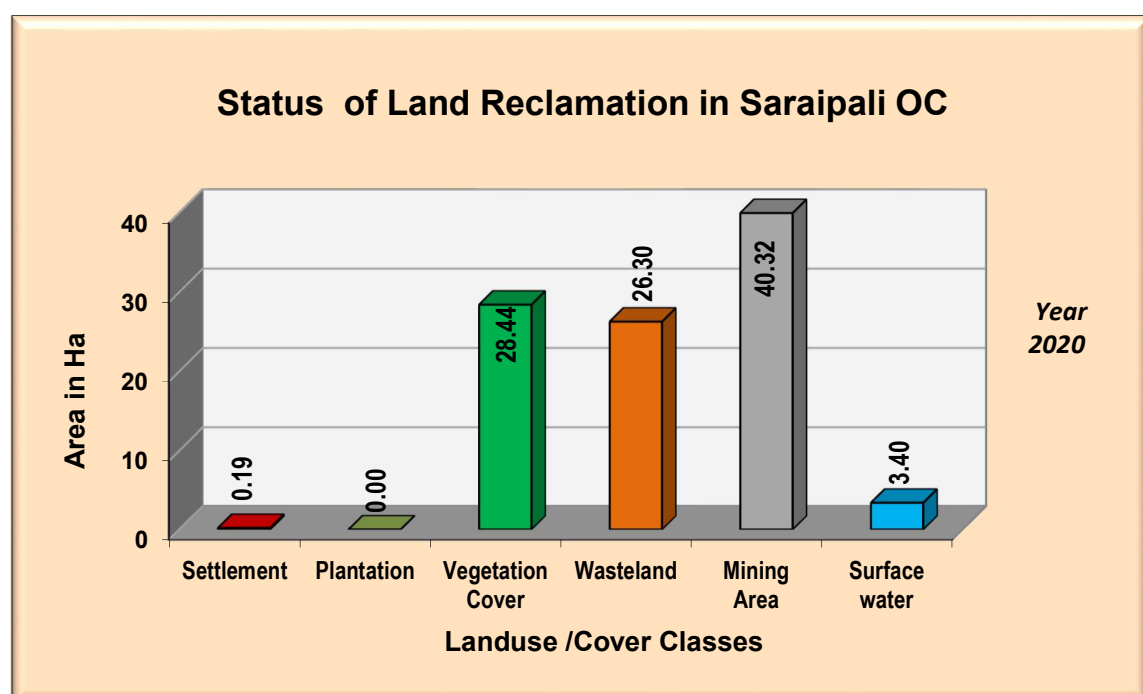


Fig: 6.9

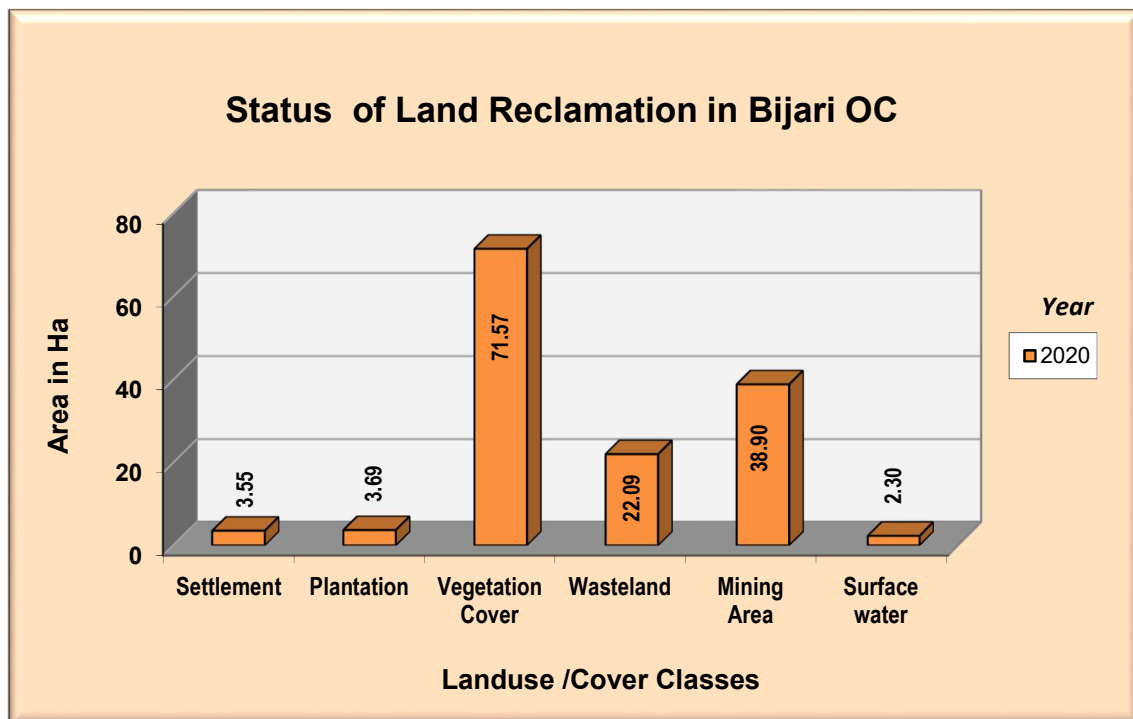


Fig: 6.10



Photo 6.1: Area under Backfilling in Baroud OCP



Photo 6.2: Plantation on Backfill in Baroud OCP



Photo 6.3: Plantation on Backfill in Baroud OCP



Photo 6.4: Plantation on Backfill in Sharda OCP



Photo 6.5: Plantation on Backfill in Kanchan OCP



Photo 6.7: OB Dump in Saraipali OCP



Photo6.8: Quarry of Saraipali OCP



Photo 6.9: plantation on Embankment in Chhal OCP



Photo 6.10: plantation on backfill in Chhal OCP

CENTRAL COALFIELDS LIMITED

7.0 Land Reclamation Status in Central Coalfields Limited

7.1 Following 13 opencast projects of CCL producing less than 5 million cubic m. (Coal+OB) together, have been taken up for land reclamation monitoring during the year 2020-21 :

- Rohini
- Purnadih
- Tapin
- Jharkhand
- Topa
- Urimari
- North Urimari
- New Giddi -C
- Govindpur
- Khasmahal
- Amlo
- Selected Dhor
- Tarmi

7.2 Project wise Land Reclamation status in CCL is given in Table 7.1 and also shown graphically in Fig 7.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2017 are shown in the Table - 7.2. Land use maps derived from satellite data are shown in Plate 7.1 – 7.13. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 7.2 - 7.14.

7.3 Study reveals that out of total mine leasehold area of 6376.05 Hectares of the 13 OC projects of CCL mentioned above taken for this study in 2020-21; total excavated area is 1697.00 Hectares, out of which 239.74 Ha. (14.13%) has been planted (*Biologically Reclaimed*), 702.86 Ha. (41.42%) area is under backfilling (*Technically Reclaimed*) and balance 754.40 hectares (44.45%) is under active mining.

- 7.4** Total area under Land Reclamation in all projects of CCL taken for this study during the year 2020 has increased from 446.45 Ha (36.87%) (Yr.2017) to 942.60 Ha (55.55%) (Yr. 2020). This increase of 496.15 Hectare in area under reclamation includes both 69.54 Ha increase in plantation on backfill (Biological Reclamation) and 426.61 Ha increase in area under backfilling (Technical reclamation).
- 7.5** After analyzing the satellite data of year 2020, it is evident that plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in all the 13 mines of CCL taken up for study, has reached to 444.02 Ha (6.96%) till now as compared to 374.45 Ha (5.87%) in the Year 2017.
- 7.6** Study indicates that overall all the projects of CCL considered for this study indicate increase or static trend in area under backfilling (Technical Reclamation) with respect to the year 2017, except in Amlo OC where area under technical reclamation has decreased from 49.50 hectare in the year 2017 to 39.51 Hectare in the year 2020 resulting which area under reclamation has decreased from 56.93 Ha to 54.09 Ha. Whereas plantation on backfill in above project has increased from 7.43 Ha (Yr.2017) to 14.58 Ha (Yr.2020) as more area under backfilling has come under plantation on backfill.
- 7.7** After analyzing the satellite data of the year 2017 and 2020, it is evident that total area under plantation (Green cover) carried out on backfill area, OB dumps as well as under social forestry in all the mines of CCL has increased from 374.45 Ha to 444.02 Ha during span of three years. This increase of 69.57 Hectare area of plantation (Green cover) in three year is due to sincere effort of CCL towards mine land reclamation and environment protection.
- 7.8** Decrease of 2.99 Hectare area under biological reclamation in Rohini OC, 3.63 Hectare in New Giddi-C OC, 0.36 Hectare in Govindpur OC and 1.93 Hectare in Khasmahal OC in the span of three year is due to expansion of mining area. Plantation on backfill (Biological Reclamation) in Tapin OC has not been started as yet. However,

Biological Reclamation has increased from 170.20 in the year 2017 to 239.74 Hectare in the year 2020.

- 7.9** In case of Rohini OCP, there is minor decrease in biological reclamation from 45.38 Ha (Yr.2017) to 42.39 Ha (Yr.2020) as backfilling process are being carried out over the planted site.
- 7.10** Out of 13 projects of CCL taken for this study, Khasmahal OCP ranks top for land reclamation (77.60%) followed by Jharkhand OCP (72.57%) and Rohini (71.08%).
- 7.11** This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

Table - 7.1

Project wise Land Reclamation Status in Opencast Projects of Central Coalfields Ltd. based on the Satellite data of the year 2020

(Area in Hectare)

Sl. No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avenue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
1	Rohini	258.17	258.17	65.76	122.03	45.38	42.39	1.55	0.11	5.44	0.00	53.02	66.89	164.16	231.31	52.37	42.50	111.14	164.42
				40.06%	52.76%	27.64%	18.33%					32.30%	28.92%			20.29%	16.46%	67.70%	71.08%
2	Purnadih	756.00	756.00	0.00	40.71	0.00	8.58	0.06	3.01	0.15	0.15	109.40	95.40	109.40	144.69	0.21	11.74	0.00	49.29
				0.00%	28.14%	0.00%	5.93%					100.00%	65.93%			0.03%	1.55%	0.00%	34.07%
3	Tapin	503.00	503.00	0.00	61.75	0.00	0.00	18.88	16.97	4.71	4.69	73.29	75.48	73.29	137.23	23.59	21.66	0.00	61.75
				0.00%	45.00%	0.00%	0.00%					100.00%	55.00%			4.69%	4.31%	0.00%	45.00%
4	Jharkhand	323.88	323.88	24.73	91.21	28.85	38.25	11.34	0.33	2.48	2.48	57.13	48.93	110.71	178.39	42.67	41.06	53.58	129.46
				22.34%	51.13%	26.06%	21.44%					51.60%	27.43%			13.17%	12.68%	48.40%	72.57%
5	Topa	520.91	520.91	0.00	20.89	0.00	3.75	25.88	43.81	14.24	14.22	67.18	55.71	67.18	80.35	40.12	61.78	0.00	24.64
				0.00%	26.00%	0.00%	4.67%					100.00%	69.33%			7.70%	11.86%	0.00%	30.67%
6	Urimari	1443.50	1443.50	24.16	91.58	25.03	48.80	7.56	0.06	37.59	42.67	81.97	63.74	131.16	204.12	70.18	91.53	49.19	140.38
				18.42%	44.87%	19.08%	23.91%					62.50%	31.23%			4.86%	6.34%	37.50%	68.77%
7	North Urimari	667.73	667.73	0.00	49.89	0.00	15.85	10.15	1.14	0.00	0.00	70.83	131.88	70.83	197.62	10.15	16.99	0.00	65.74
				0.00%	25.25%	0.00%	8.02%					100.00%	66.73%			1.52%	2.54%	0.00%	33.27%
8	New Giddi-C	210.32	210.32	17.97	31.22	13.97	10.34	2.69	3.02	6.47	5.83	26.72	26.78	58.66	68.34	23.13	19.19	31.94	41.56
				30.63%	45.68%	23.82%	15.13%					45.55%	39.19%			11.00%	9.12%	54.45%	60.81%
9	Govindpur	274.95	274.95	23.36	66.56	17.86	17.50	5.16	2.03	0.00	0.22	69.50	60.02	110.72	144.08	23.02	19.75	41.22	84.06
				21.10%	46.20%	16.13%	12.15%					62.77%	41.66%			8.37%	7.18%	37.23%	58.34%
10	Khasmahal	280.00	280.00	26.23	33.23	23.84	21.91	6.78	8.81	7.14	7.14	15.48	15.92	65.55	71.06	37.76	37.86	50.07	55.14
				40.02%	46.76%	36.37%	30.83%					23.62%	22.40%			13.49%	13.52%	76.38%	77.60%
11	Amlo	247.59	247.59	49.50	39.51	7.43	14.58	15.27	15.27	1.53	1.53	26.02	39.62	82.95	93.71	24.23	31.38	56.93	54.09
				59.67%	42.16%	8.96%	15.56%					31.37%	42.28%			9.79%	12.67%	68.63%	57.72%
12	Selected Dhor	300.00	300.00	22.01	31.22	0.00	5.94	4.92	16.53	0.11	0.11	92.38	48.92	114.39	86.08	5.03	22.58	22.01	37.16
				19.24%	36.27%	0.00%	6.90%					80.76%	56.83%			1.68%	7.53%	19.24%	43.17%
13	Tarmi	590.00	590.00	22.53	23.06	7.84	11.85	12.62	12.62	1.53	1.53	21.62	25.11	51.99	60.02	21.99	26.00	30.37	34.91
				43.34%	38.42%	15.08%	19.74%					41.58%	41.84%			3.73%	4.41%	58.42%	58.16%
	TOTAL	6376.05	6376.05	276.25	702.86	170.20	239.74	122.86	123.71	81.39	80.57	764.54	754.40	1210.99	1697.00	374.45	444.02	446.45	942.60
				22.81%	41.42%	14.05%	14.13%					63.13%	44.45%			5.87%	6.96%	36.87%	55.55%

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

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

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

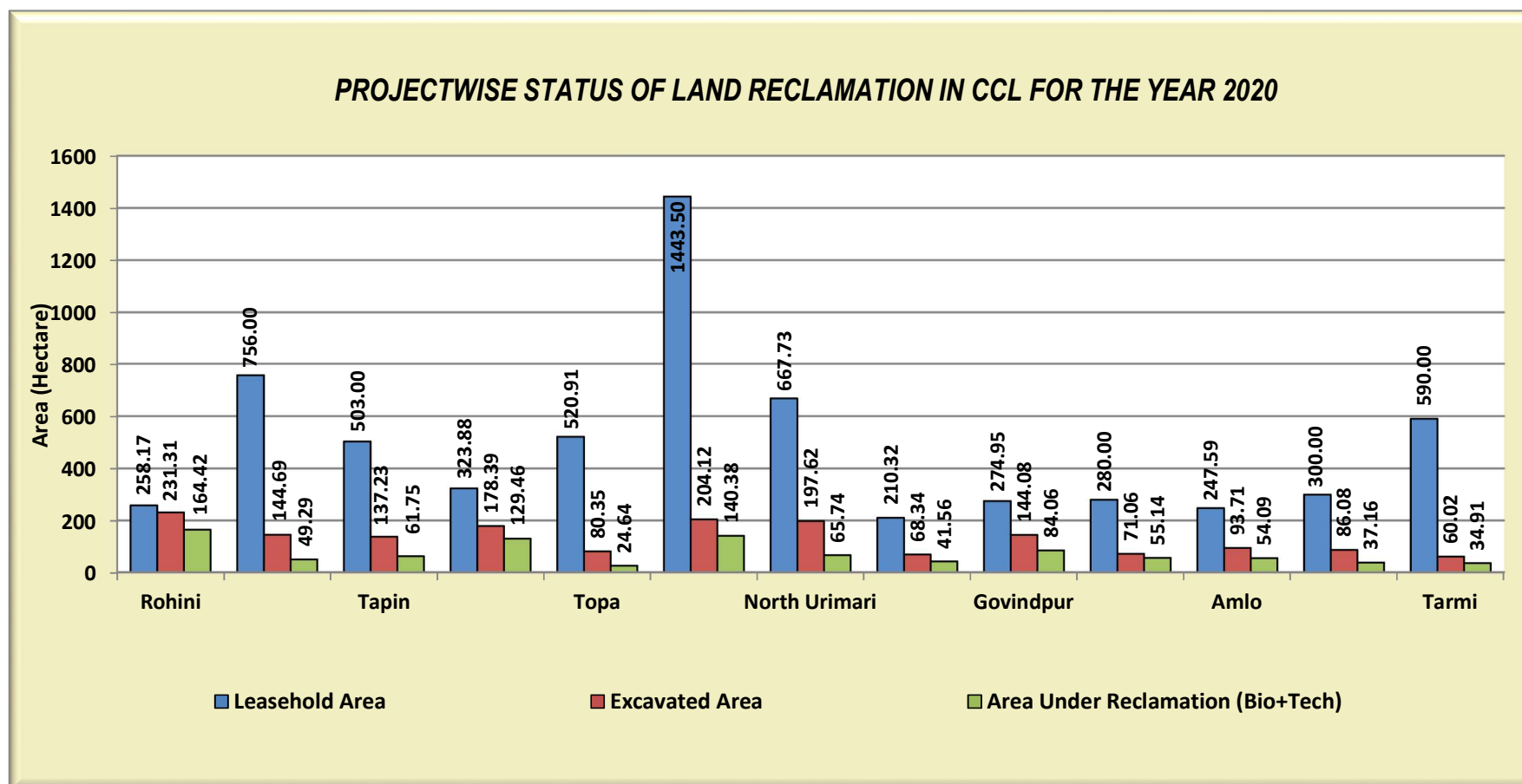
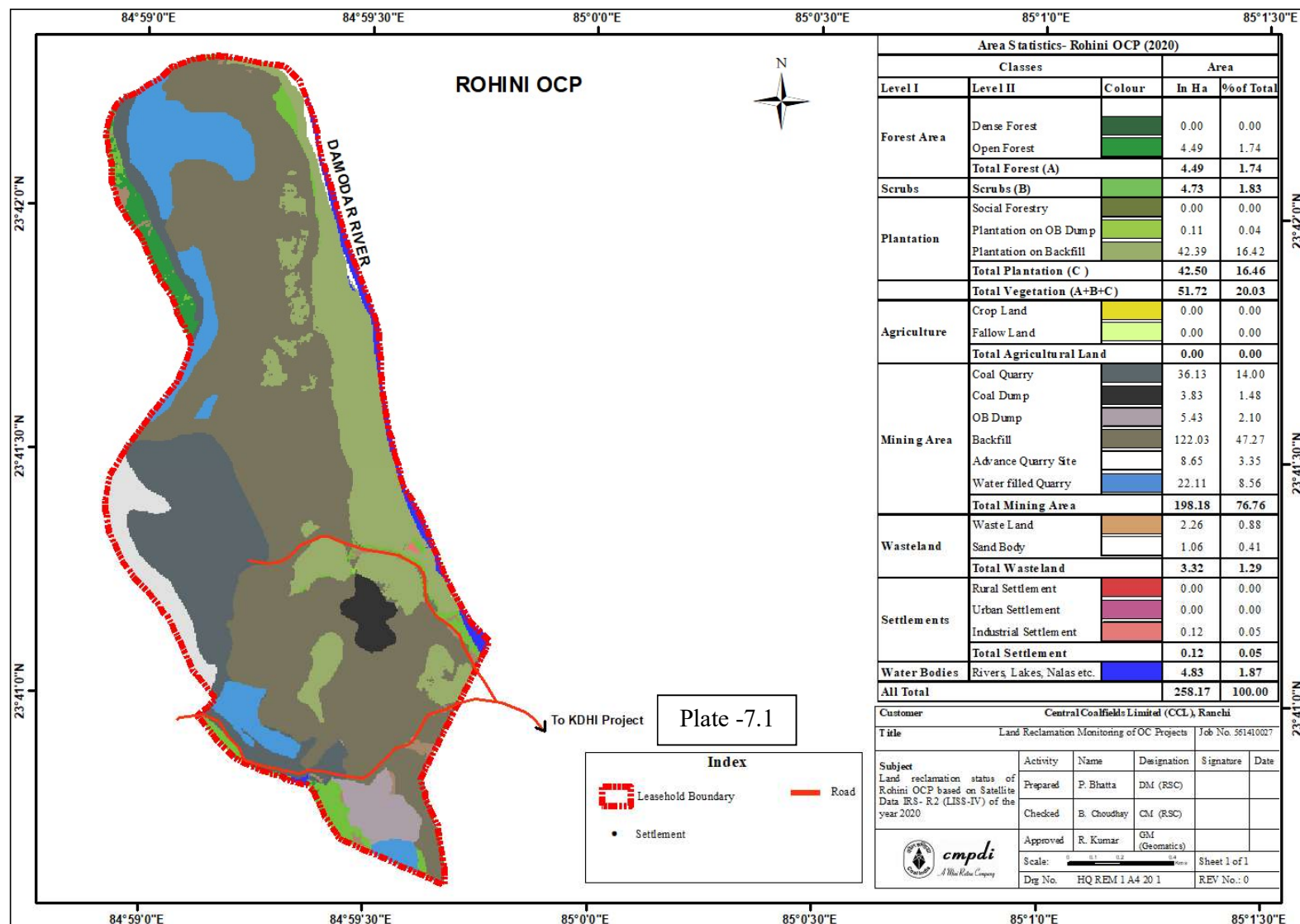


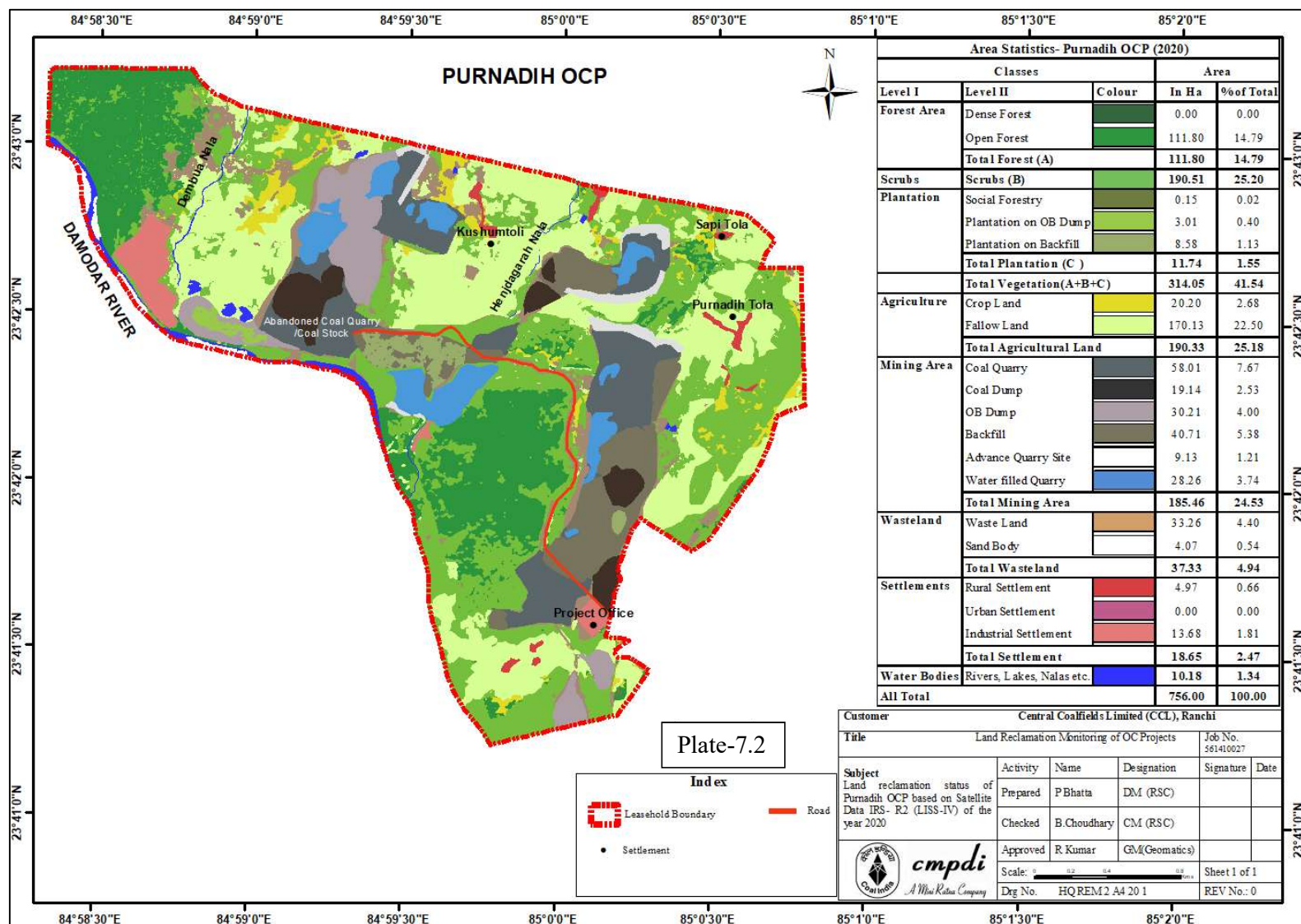
Figure 7.1: Land Reclamation status in OC Projects producing less than 5m.cm (Coal+OB) of CCL in the year 2020

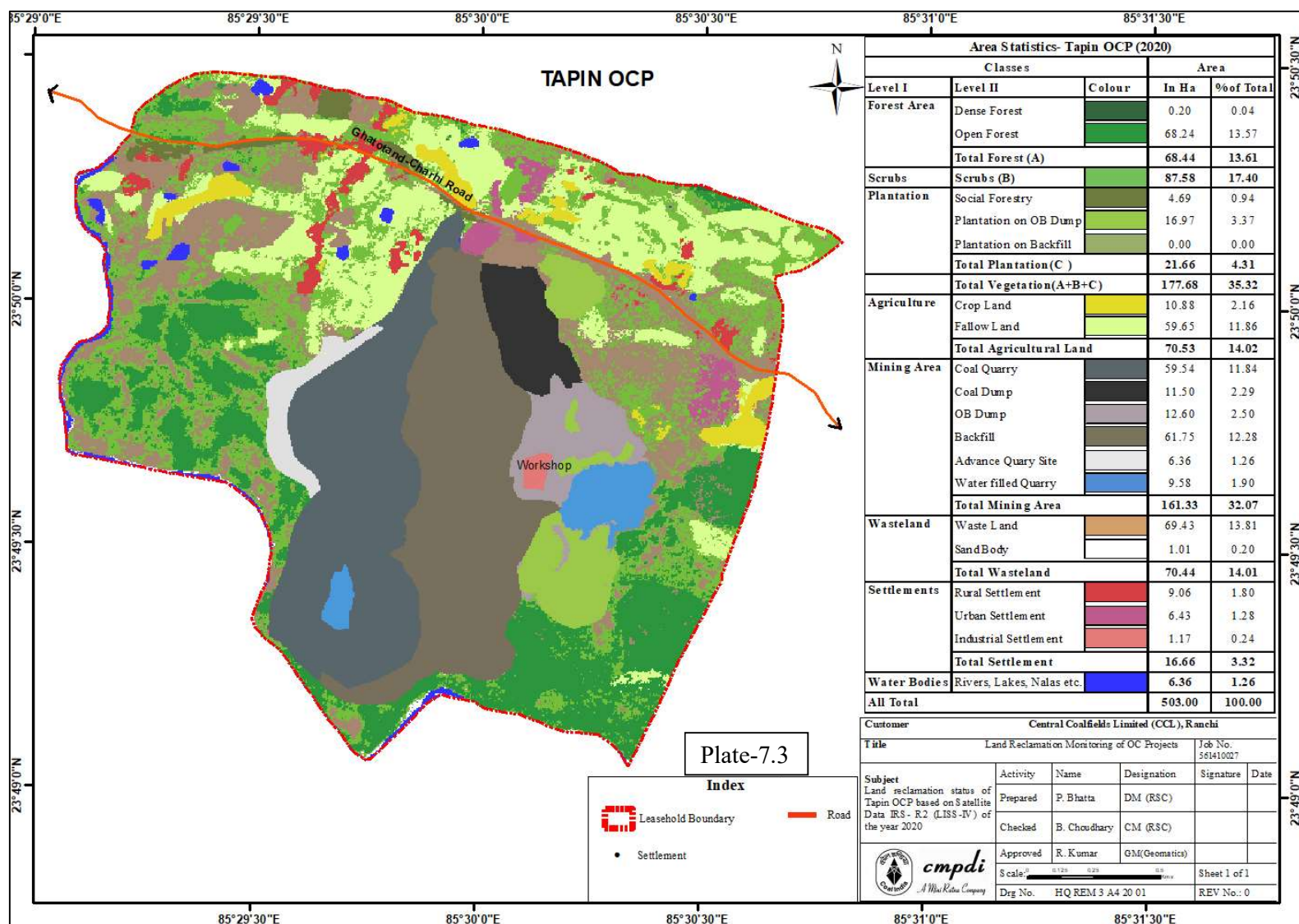
TABLE 7.2: PROJECTWISE AREA STATISTICS OF LAND USE /COVER CLASSES AND LAND RECLAMATION IN OCP PRODUCING (<5 M.C.M (COAL +OB)) OF CCL BASED ON SATELLITE DATA OF THE YEAR 2020

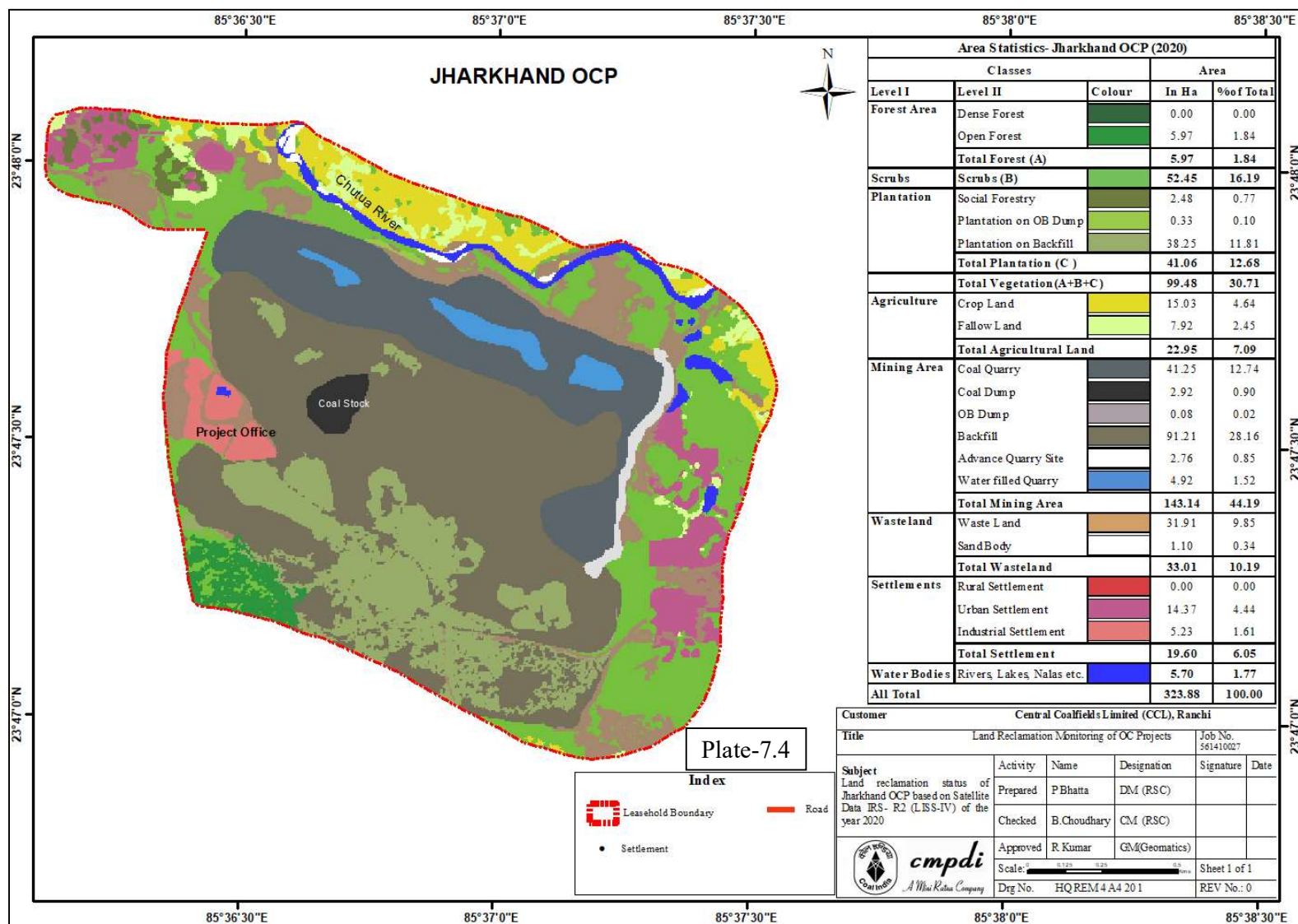
(Area in Ha)

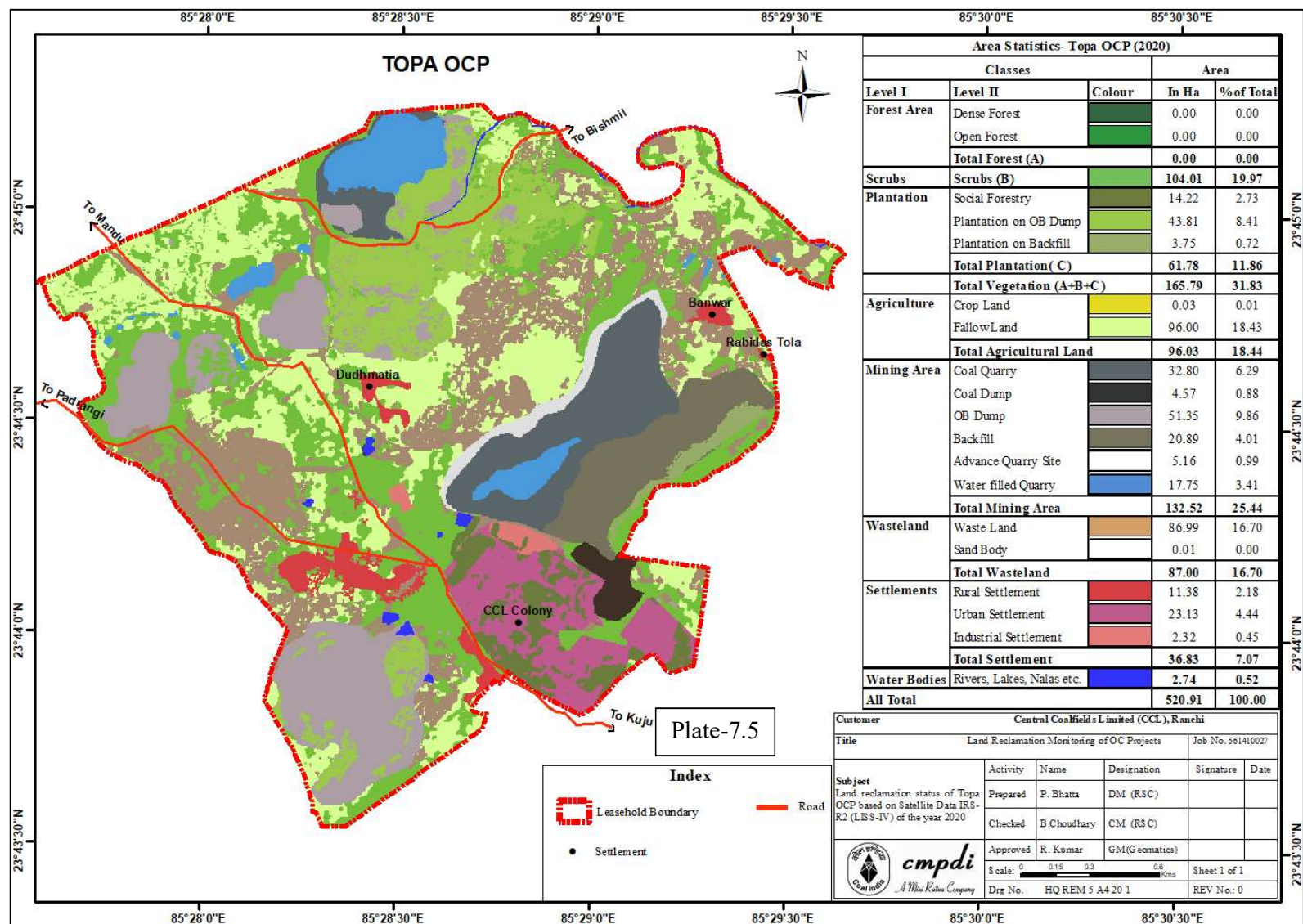
		ROHINI		PURNADIH		TAPIN		JHARKHAND		TOPA		URIMARI		NORTH URIMARI		NEW GIDDL-C		GOVINDPUR		KHAMSAHAL		AMLO		SELECTED DHORI		TARMII		TOTAL	
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.20	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.61	0.25	0.02	0.00	0.03	0.01	0.86	0.01
	Open Forest	4.49	1.74	111.80	14.79	68.24	13.57	5.97	1.84	0.00	0.00	182.21	12.62	20.94	3.14	0.00	0.00	0.00	0.00	52.41	18.72	19.49	7.87	3.80	1.27	57.76	9.79	527.11	8.27
	Total Forest (A)	4.49	1.74	111.80	14.79	68.44	13.61	5.97	1.84	0.00	0.00	182.21	12.62	20.94	3.14	0.00	0.00	0.00	0.00	52.41	18.72	20.10	8.12	3.82	1.27	57.79	9.80	527.97	8.28
SCRUBS	Scrubs (B)	4.73	1.83	190.51	25.20	87.58	17.40	52.45	16.19	104.01	19.97	330.90	22.92	104.69	15.68	60.98	28.99	94.19	34.26	37.63	13.43	37.61	15.19	26.20	8.73	158.50	26.86	1289.98	20.23
	Social Forestry	0.00	0.00	0.15	0.02	4.69	0.94	2.48	0.77	14.22	2.73	42.67	2.96	0.00	0.00	5.83	2.77	0.22	0.08	7.14	2.55	1.53	0.62	0.11	0.04	1.53	0.26	80.57	1.26
PLANTATION	Plantation on OB Dump	0.11	0.04	3.01	0.40	16.97	3.37	0.33	0.10	43.81	8.41	0.06	0.00	1.14	0.17	3.02	1.44	2.03	0.74	8.81	3.15	15.27	6.17	16.53	5.51	12.62	2.14	123.71	1.94
	Plantation on Backfill	42.39	16.42	8.58	1.13	0.00	0.00	38.25	11.81	3.750	0.72	48.80	3.38	15.85	2.37	10.34	4.92	17.50	6.36	21.91	7.83	14.58	5.89	5.94	1.98	11.85	2.01	239.74	3.76
	Total Plantation(Biological Reclamation C)	42.50	16.46	11.74	1.55	21.66	4.31	41.06	12.68	61.78	11.86	91.53	6.34	16.99	2.54	19.19	9.13	19.75	7.18	37.86	13.53	31.38	12.68	22.58	7.53	26.00	4.41	444.02	6.96
Total Vegetation (A+B+C)		51.72	20.03	314.05	41.54	177.68	35.32	99.48	30.71	165.79	31.83	604.64	41.88	142.62	21.36	80.17	38.12	113.94	41.44	127.90	45.68	89.09	35.99	52.60	17.53	242.29	41.07	2261.97	35.48
ACTIVE MINING	Coal Quarry	36.13	14.00	58.01	7.67	59.54	11.84	41.25	12.74	32.80	6.29	43.90	3.04	103.26	15.46	11.94	5.68	50.08	18.20	15.50	5.54	33.90	13.69	29.38	9.79	18.75	3.18	534.44	8.38
	Coal Dump	3.83	1.48	19.14	2.53	11.50	2.29	2.92	0.90	4.57	0.88	3.27	0.23	12.66	1.90	2.64	1.26	3.21	1.17	11.74	4.19	5.08	2.05	8.88	2.96	5.88	1.00	95.32	1.49
	Advance Quarry Site	8.65	3.35	9.13	1.21	6.36	1.26	2.76	0.85	5.16	0.99	2.40	0.17	26.37	3.95	3.63	1.73	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	64.46	1.01
	Quarry Filled with Water	22.11	8.56	28.26	3.74	9.58	1.90	4.92	1.52	17.75	3.41	17.44	1.21	2.25	0.34	11.21	5.33	9.94	3.62	0.42	0.15	5.72	2.31	19.54	6.51	6.36	1.08	155.50	2.44
	Total Area under Active Mining	70.72	27.39	114.54	15.15	86.98	17.29	51.85	16.01	60.28	11.57	67.01	4.65	144.54	21.65	29.42	14.00	63.23	22.99	27.66	9.88	44.70	18.05	57.80	19.26	30.99	5.26	849.72	13.32
RECLAIMED	Barren OB dump	5.43	2.10	30.21	4.00	12.60	2.50	0.08	0.02	51.35	9.86	5.44	0.38	61.11	9.15	19.81	9.42	0.00	0.00	40.18	14.35	15.28	6.17	83.93	27.98	14.06	2.38	339.48	5.32
	Area Under Backfilling	122.03	47.27	40.71	5.38	61.75	12.28	91.21	28.16	20.89	4.01	91.58	6.34	49.89	7.47	31.22	14.84	66.56	24.21	33.23	11.87	39.51	15.96	31.22	10.41	23.06	3.91	702.86	11.02
	Total Area under Technical Reclamation	127.46	49.37	70.92	9.38	74.35	14.78	91.29	28.18	72.24	13.87	97.02	6.72	111.00	16.62	51.03	24.26	66.56	24.21	73.41	26.22	54.79	22.13	115.15	38.39	37.12	6.29	1042.34	16.34
	Total Area under Mine Operation	198.18	76.76	185.46	24.53	161.33	32.07	143.14	44.19	132.52	25.44	164.03	11.37	255.54	38.27	80.45	38.26	129.79	47.20	101.07	36.10	99.49	40.18	172.95	57.65	68.11	11.55	1892.06	29.67
WASTELANDS	Waste Lands	2.26	0.88	33.26	4.4	69.43	13.81	31.91	9.85	86.99	16.70	321.94	22.30	52.78	7.90	9.73	4.62	14.65	5.33	13.15	4.69	45.64	18.42	27.80	9.27	89.20	15.12	798.74	12.50
	Fly Ash Pond/Sand Body	1.06	0.41	4.07	0.54	1.01	0.20	1.10	0.34	0.01	0.00	32.12	2.23	0.00	0.00	0.00	0.00	0.08	0.03	0.00	0.00	0.00	0.00	9.31	3.10	16.17	2.74	64.93	1.02
	Total Wastelands	3.32	1.29	37.33	4.94	70.44	14.01	33.01	10.19	87.00	16.70	354.06	24.53	52.78	7.90	9.73	4.62	14.73	5.36	13.15	4.69	45.64	18.42	37.11	12.37	105.37	17.86	863.67	13.55
WATER	Reservoir, nallah, ponds etc.	4.83	1.87	10.18	1.35	6.36	1.26	5.70	1.77	2.74	0.52	52.59	3.64	5.29	0.80	0.01	0.00	0.26	0.09	0.97	0.34	0.94	0.38	5.85	1.95	10.37	1.75	106.09	1.66
	Total Waterbodies	4.83	1.87	10.18	1.34	6.36	1.26	5.70	1.77	2.74	0.52	52.59	3.64	5.29	0.80	0.01	0.00	0.26	0.09	0.97	0.34	0.94	0.38	5.85	1.95	10.37	1.75	106.09	1.66
AGRICULTURE	Crop Lands	0.00	0.00	20.20	2.68	10.88	2.16	15.03	4.64	0.03	0.01	0.00	0.00	35.80	5.36	22.61	10.75	5.35	1.95	2.48	0.89	0.00	0.00	0.24	0.08	6.69	1.13	119.31	1.87
	Fallow Lands	0.00	0.00	170.13	22.50	59.65	11.86	7.92	2.45	96.00	18.43	218.26	15.12	152.86	22.89	11.74	5.58	9.39	3.42	23.37	8.35	1.46	0.59	22.89	7.63	129.51	21.95	903.18	14.17
	Total Agriculture	0.00	0.00	190.33	25.18	70.53	14.02	22.95	7.09	96.03	18.44	218.26	15.12	188.66	28.25	34.35	16.33	14.74	5.37	25.85	9.24	1.46	0.59	23.13	7.71	136.20	23.08	1022.49	16.04
SETTLEMENTS	Urban Settlement	0.00	0.00	0.00	0.00	6.43	1.28	14.37	4.44	23.13	4.44	18.43	1.28	0.00	0.00	2.50	1.19	0.00	0.00	7.85	2.80	2.32	0.94	6.47	2.16	14.16	2.40	95.66	1.50
	Rural Settlement	0.00	0.00	4.97	0.66	9.06	1.80	0.00	0.00	11.38	2.18	23.56	1.63	20.79	3.11	3.11	1.48	0.77	0.28	1.39	0.50	4.03	1.63	0.48	0.16	8.45	1.43	87.99	1.38
	Industrial Settlement	0.12	0.05	13.68	1.81	1.17	0.24	5.23	1.61	2.32	0.45	7.93	0.55	2.05	0.31	0.00	0.00	0.72	0.26	1.82	0.65	4.62	1.87	1.41	0.47	5.05	0.86	46.12	0.72
	Total Settlements	0.12	0.05	18.65	2.47	16.66	3.32	19.60	6.05	36.83	7.07	49.92	3.46	22.84	3.42	5.61	2.67	1.49	0.54	11.06	3.95	10.97	4.44	8.36	2.79	27.66	4.69	229.77	3.60
GRAND TOTAL		258.17	100.00	756.00	100.00	503.00	100.00	323.88	100.00	520.91	100.00	1443.50	100.00	667.73	100.00	210.32	100.00	274.95	100.00	280.00	100.00	247.59	100.00	300.00	100.00	590.00	100.00	6376.05	100.00

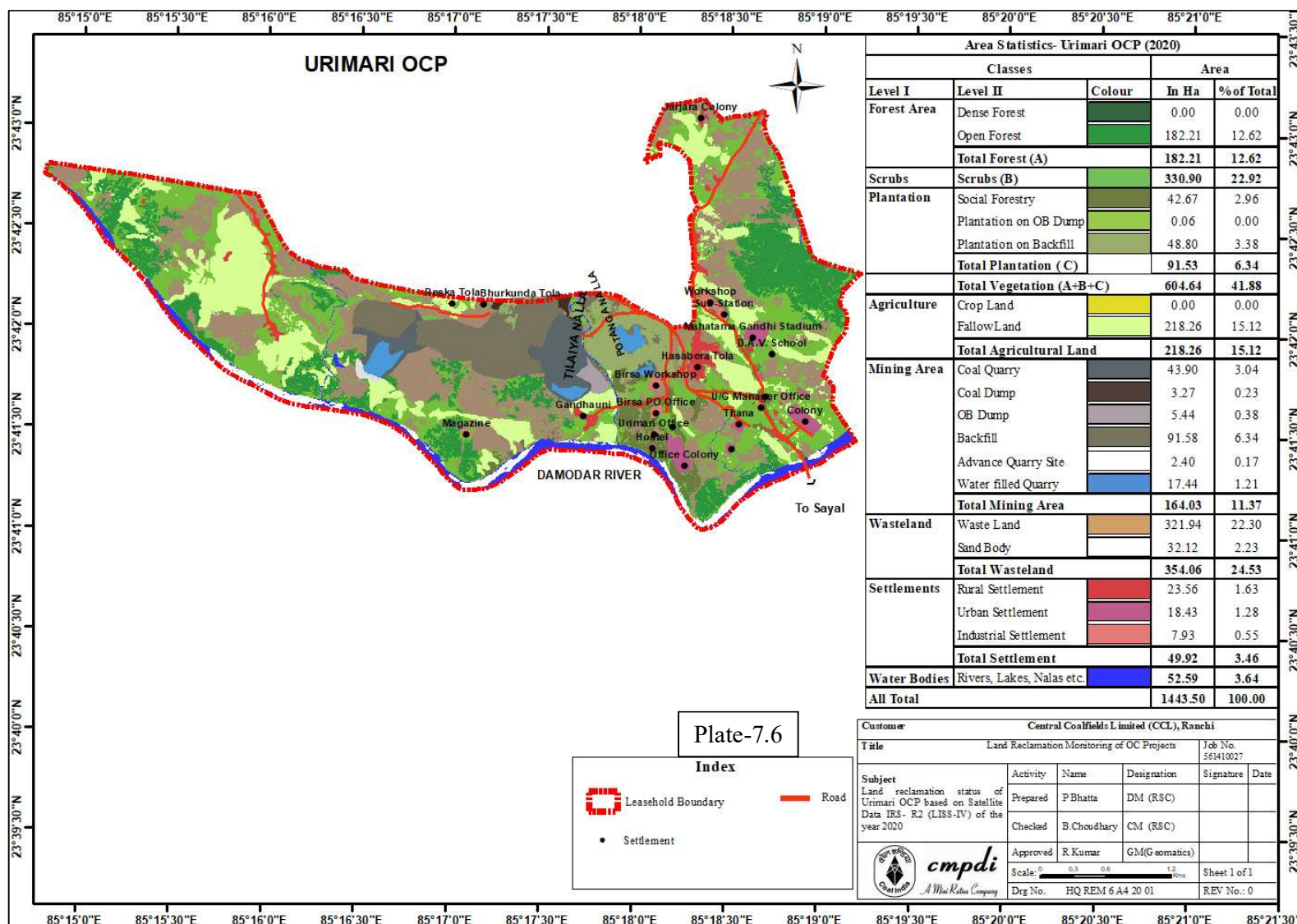


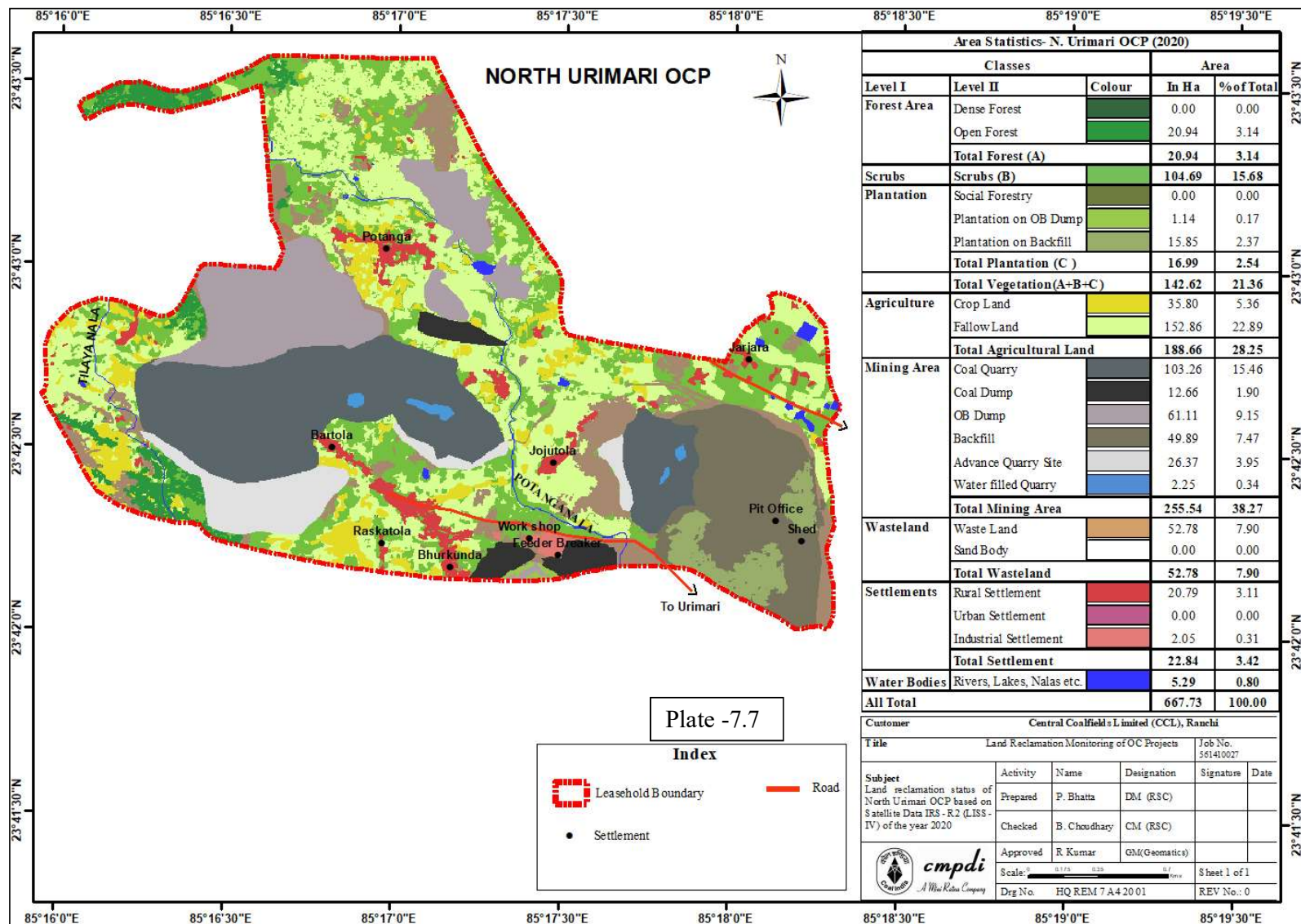


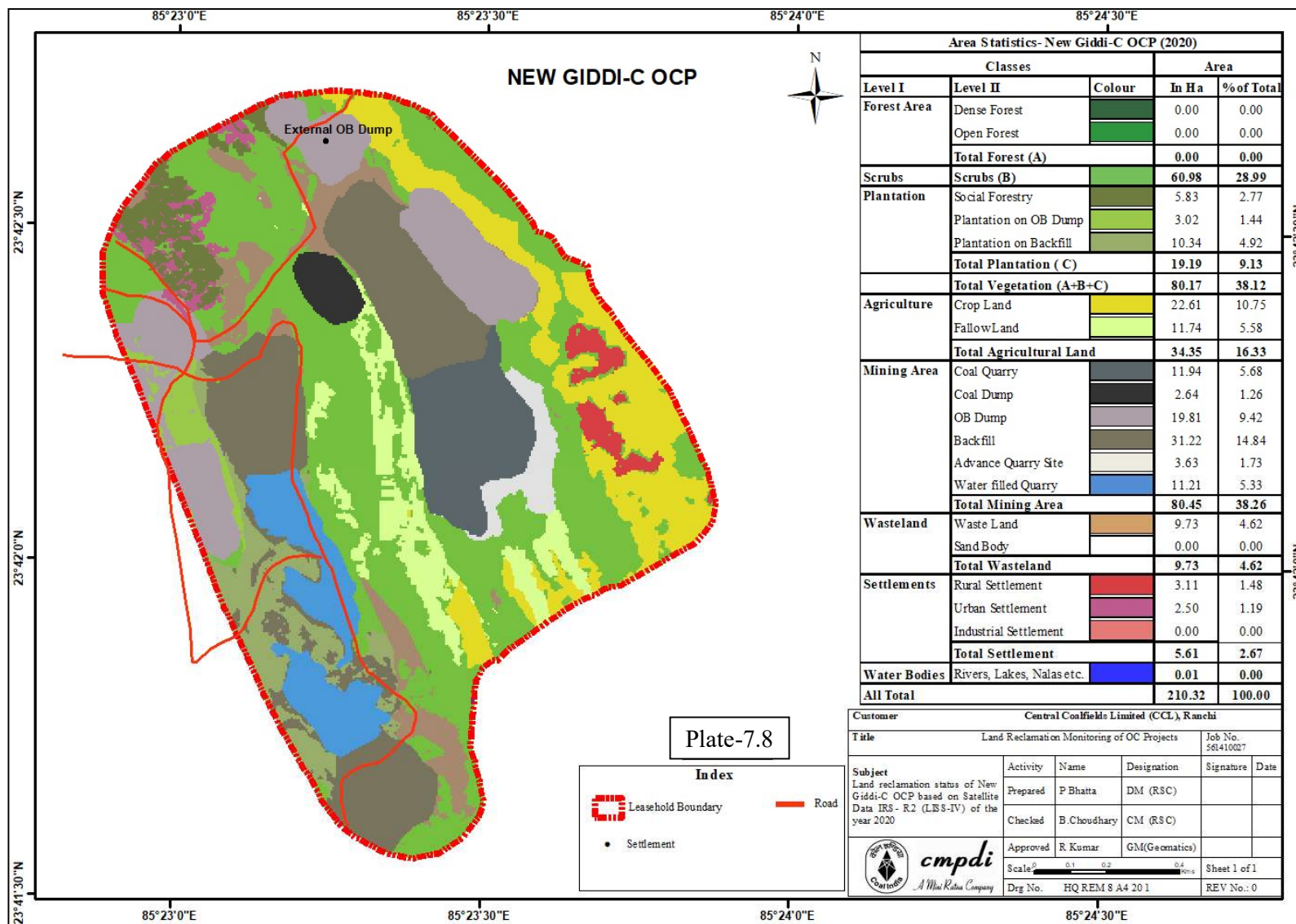


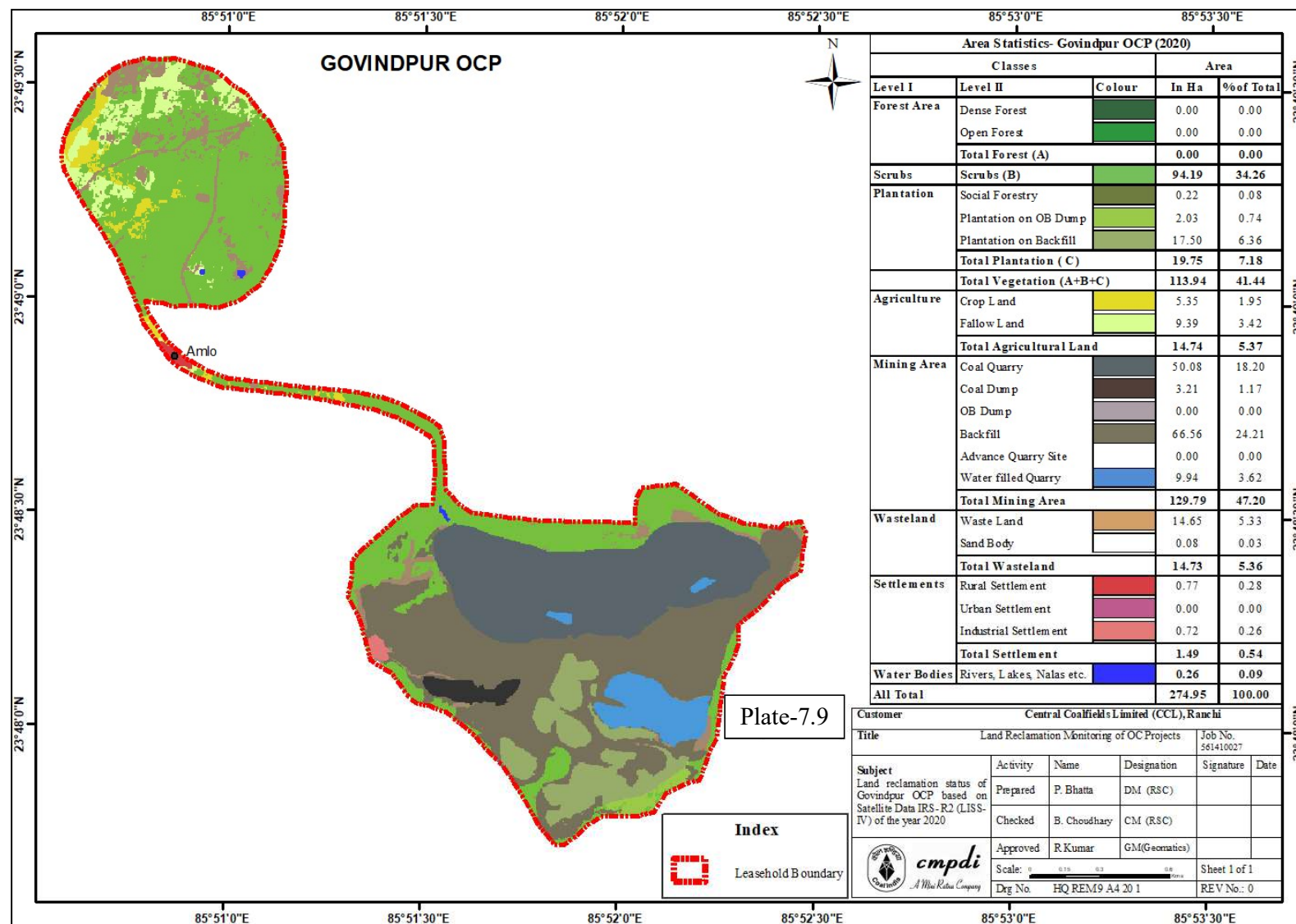


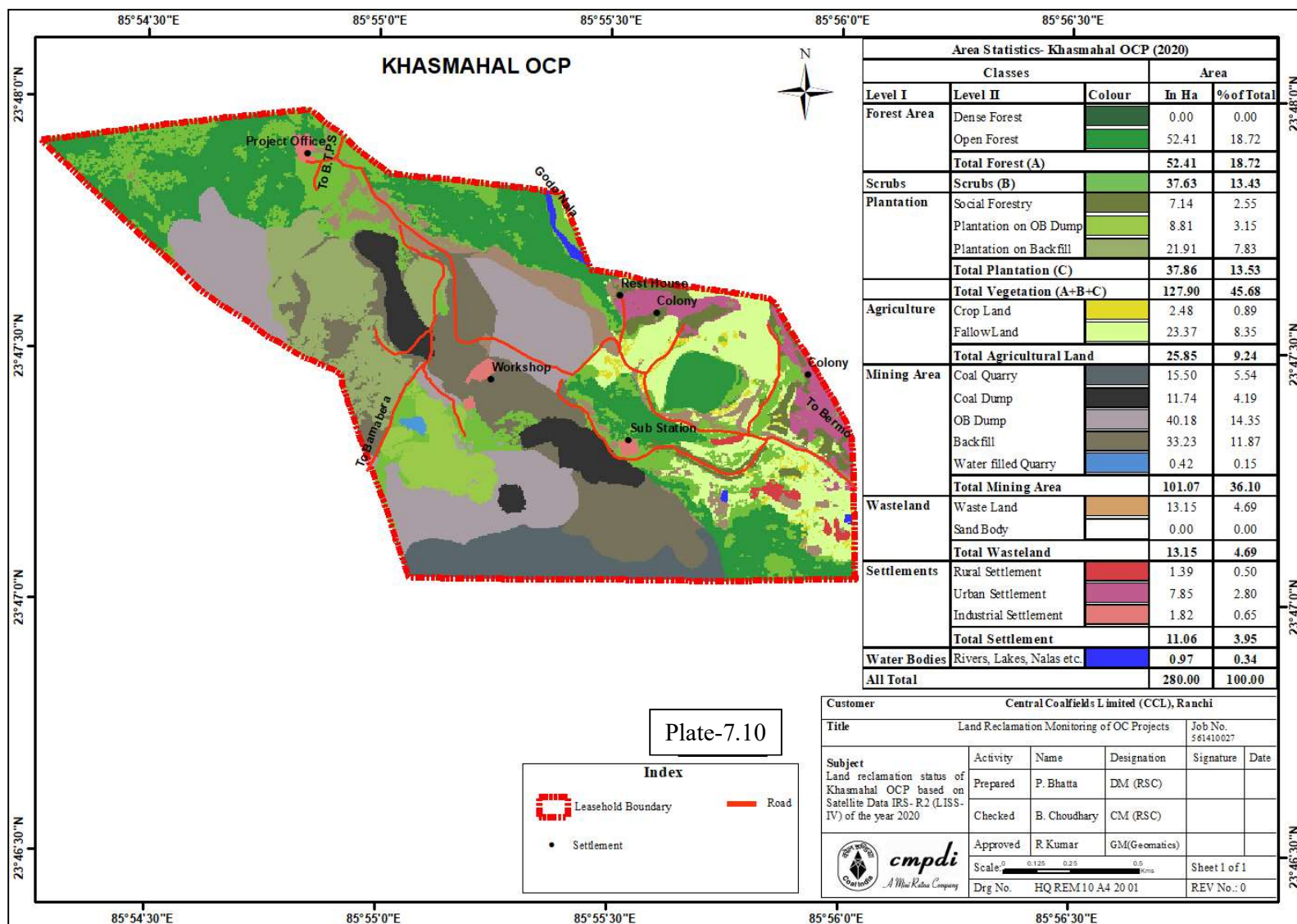


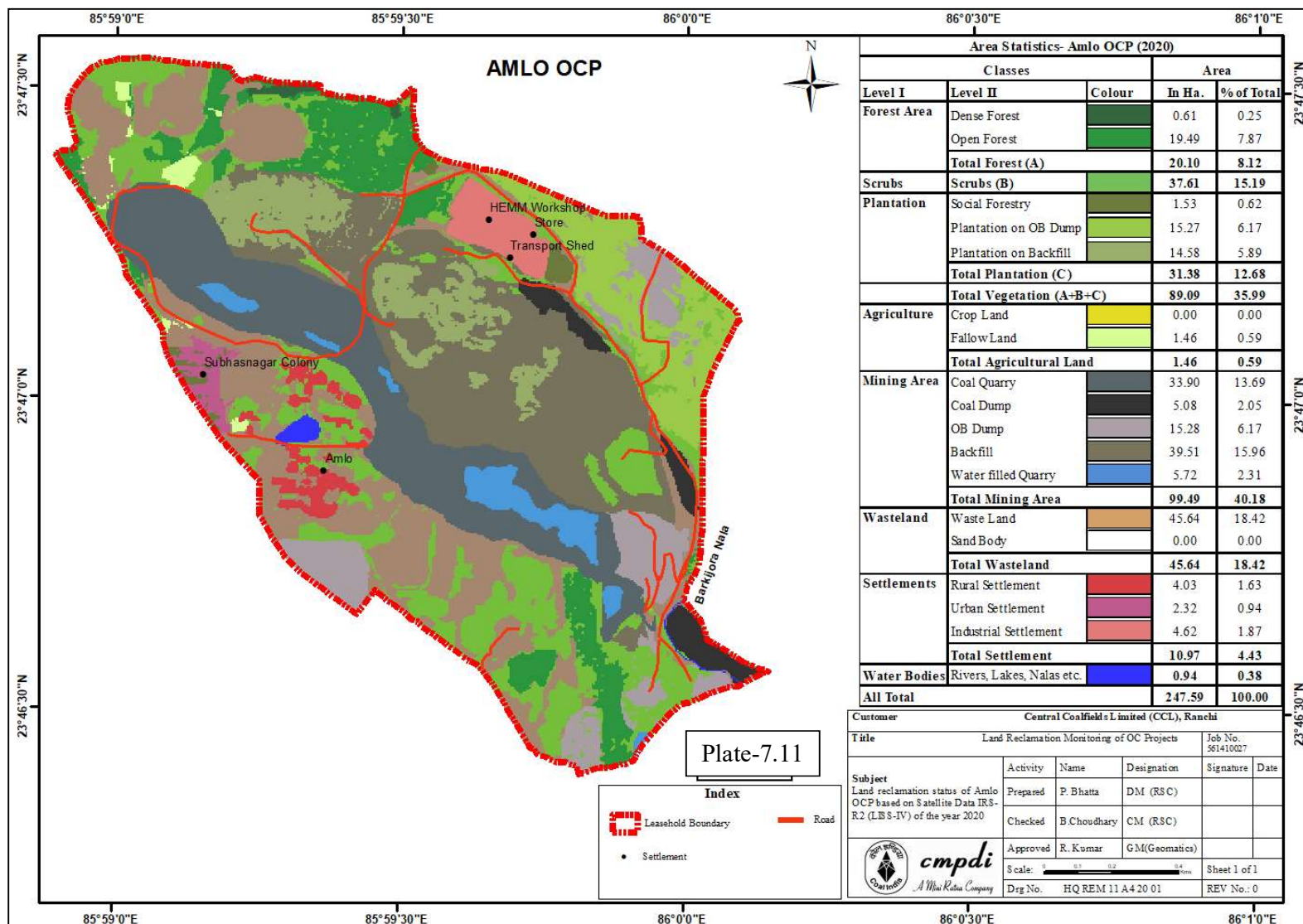


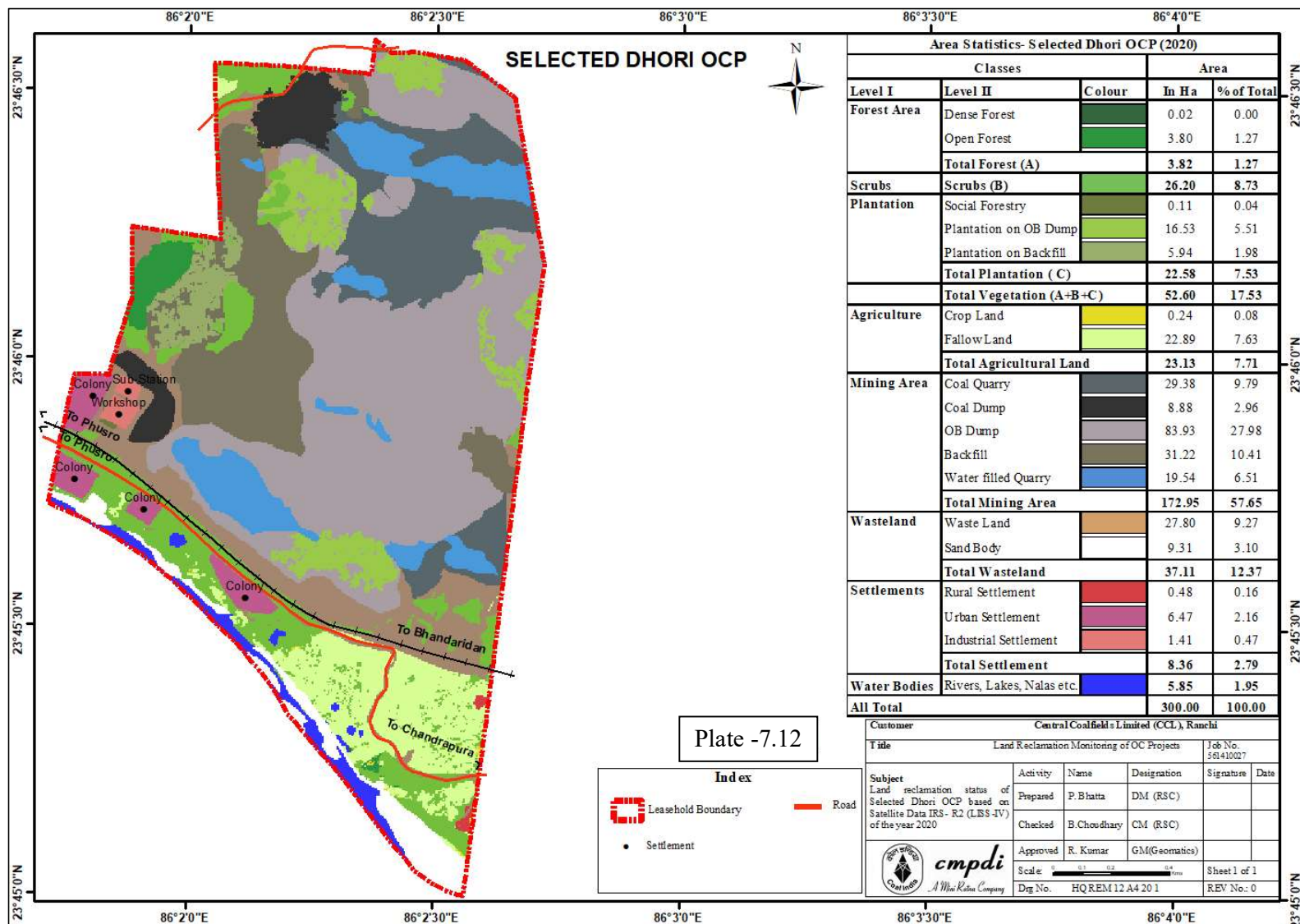


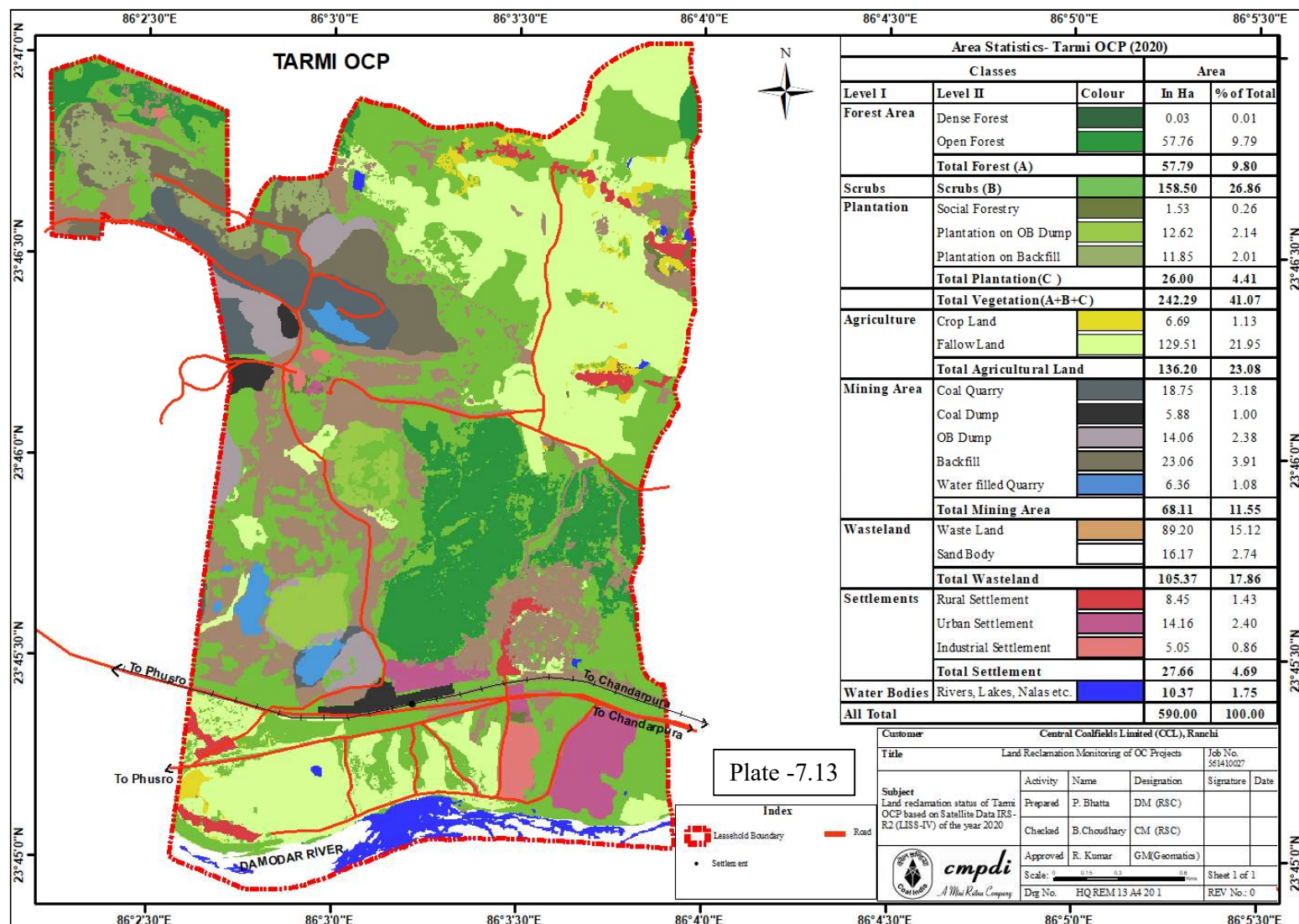












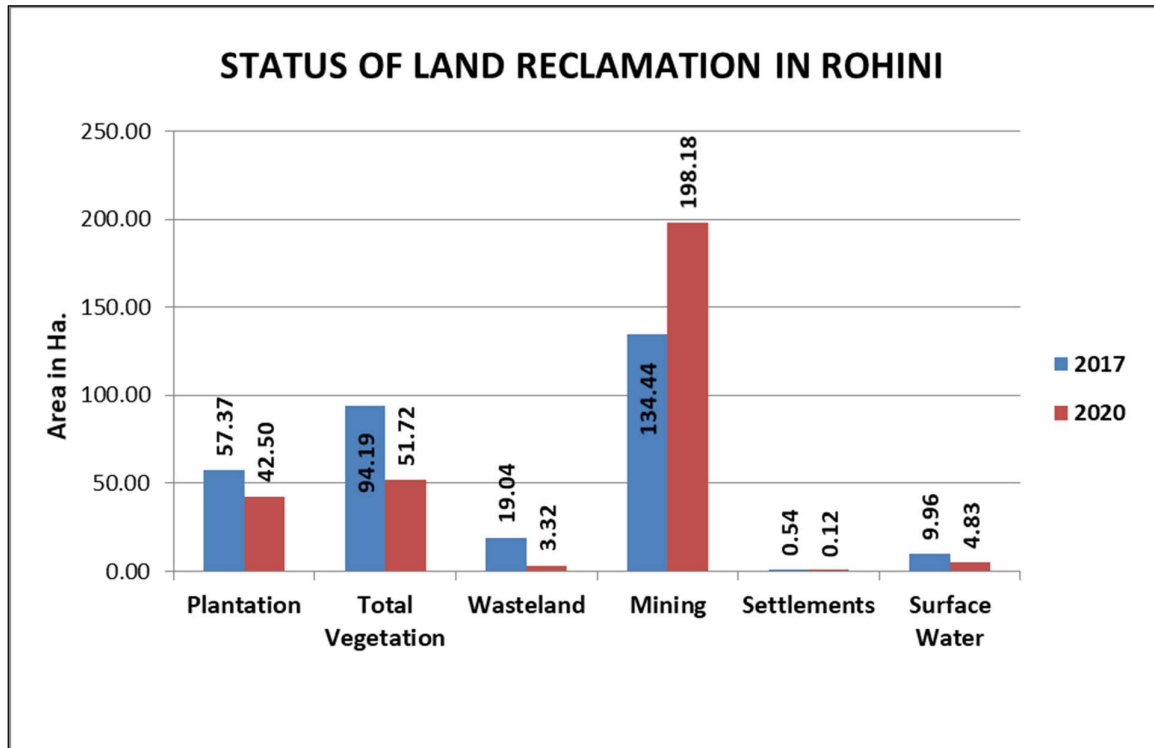


FIGURE – 7.2

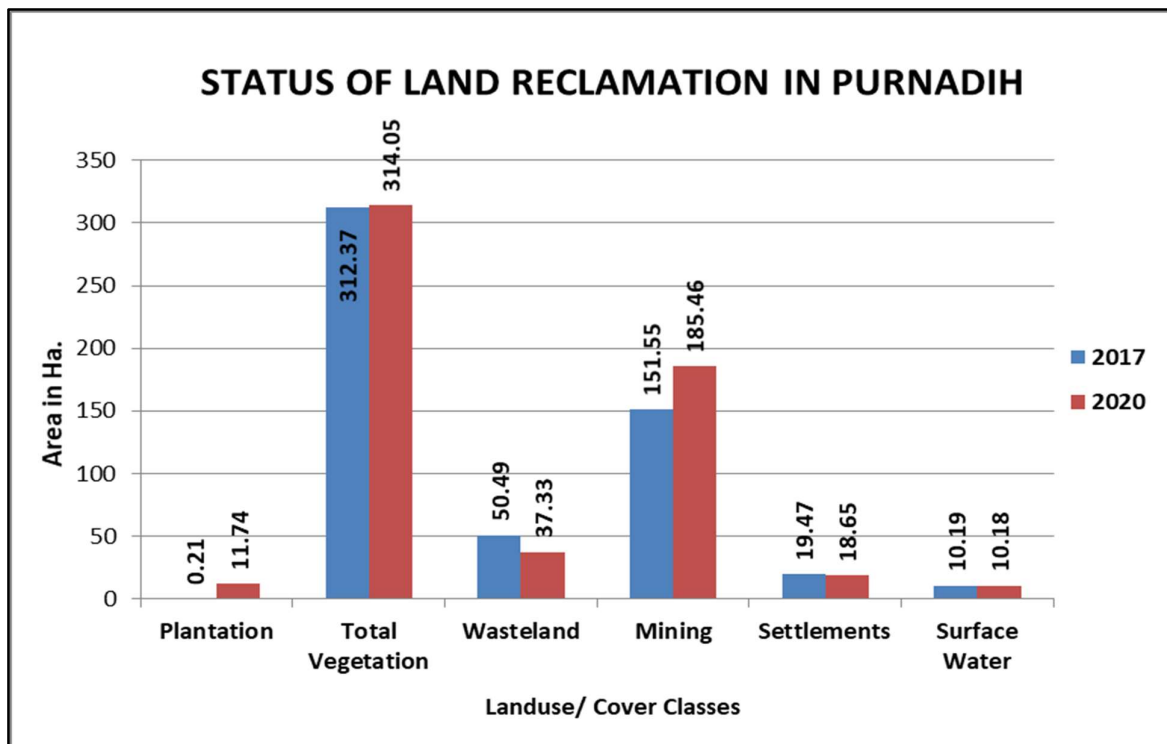


FIGURE – 7.3

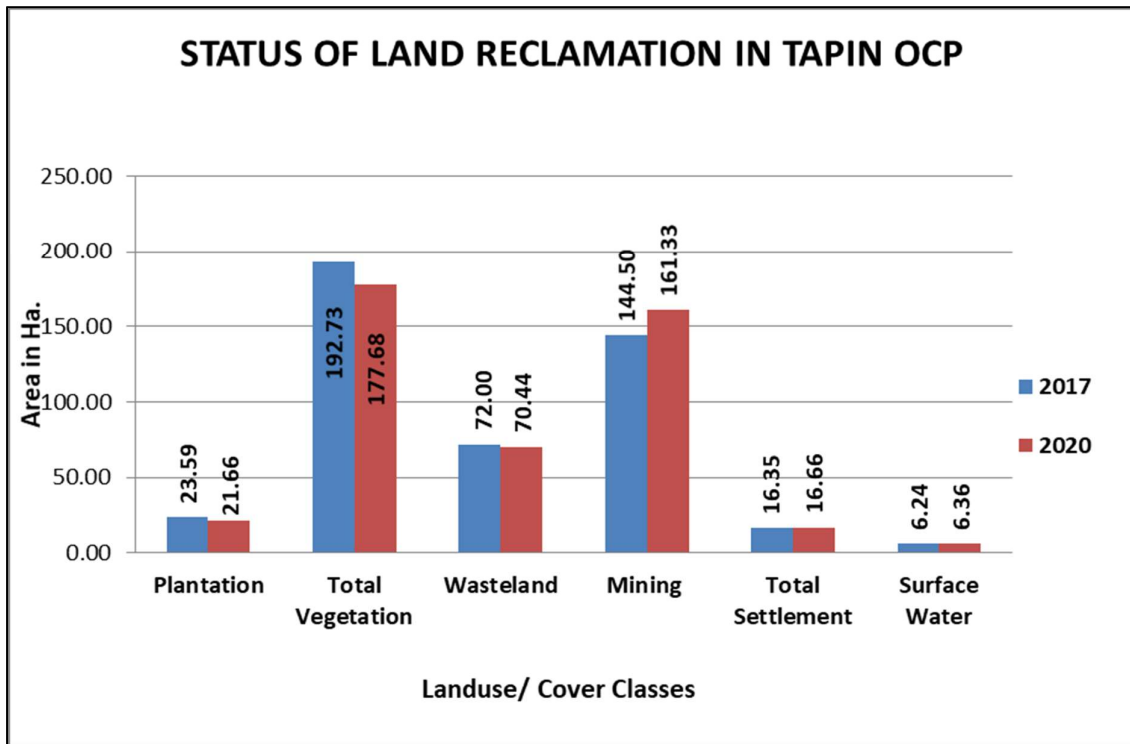


FIGURE – 7.4

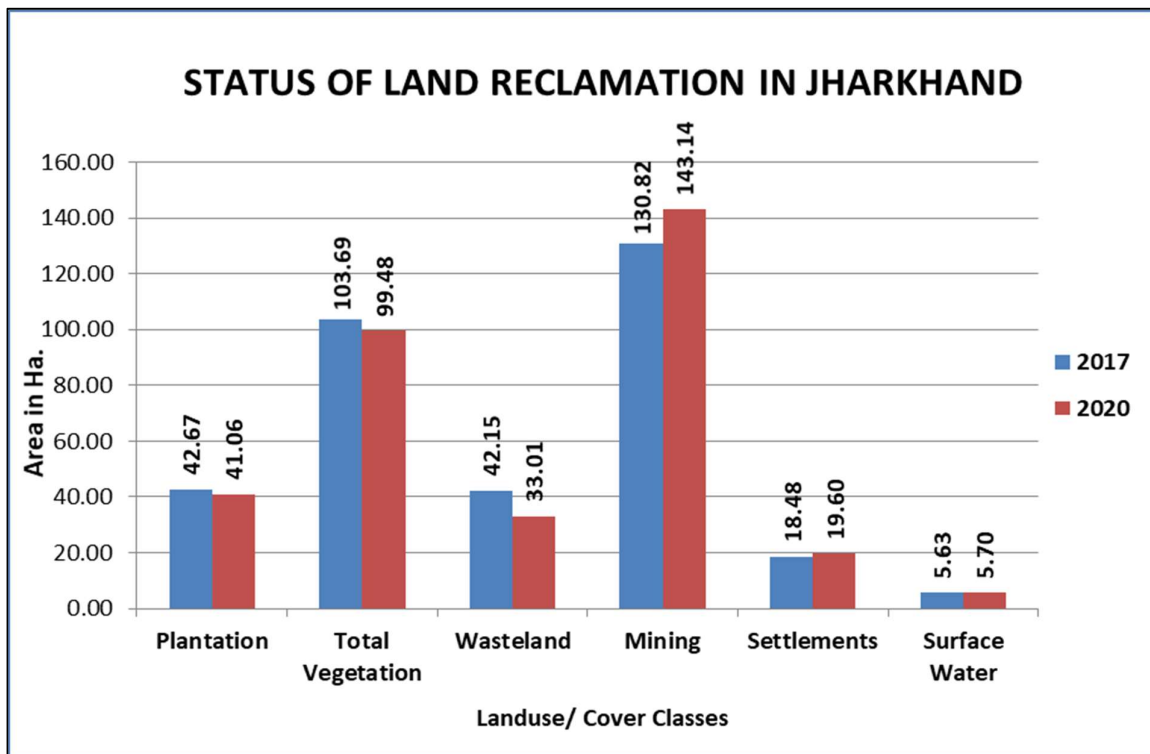


FIGURE – 7.5

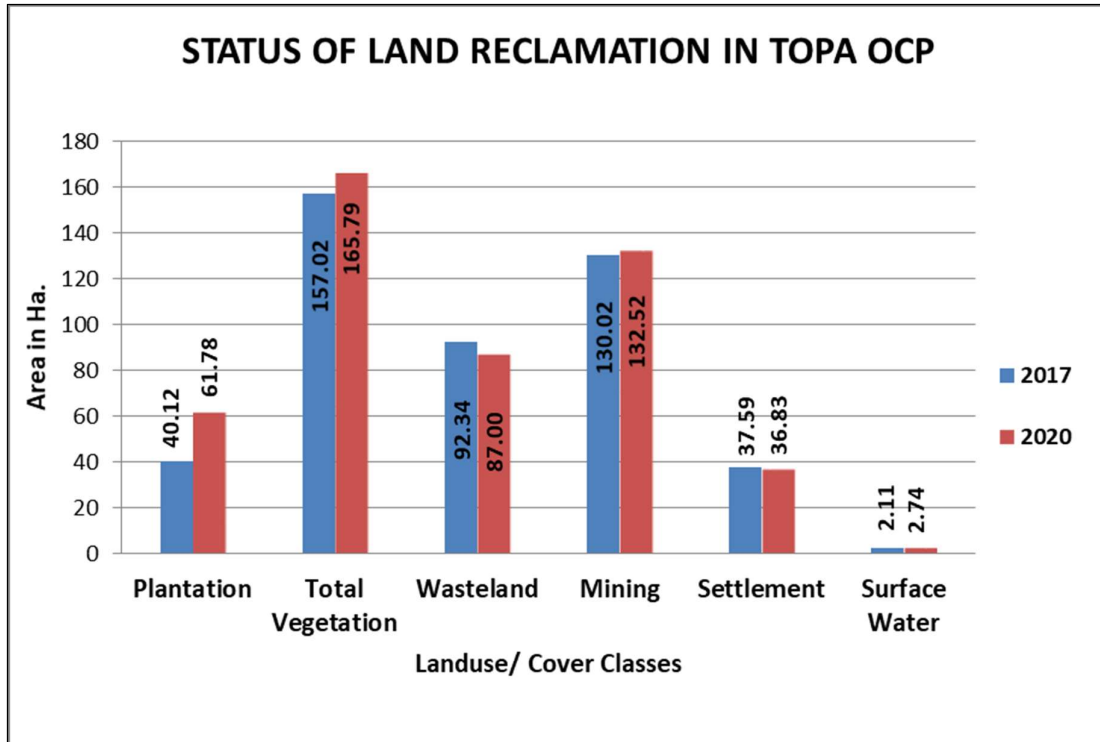


FIGURE – 7.6

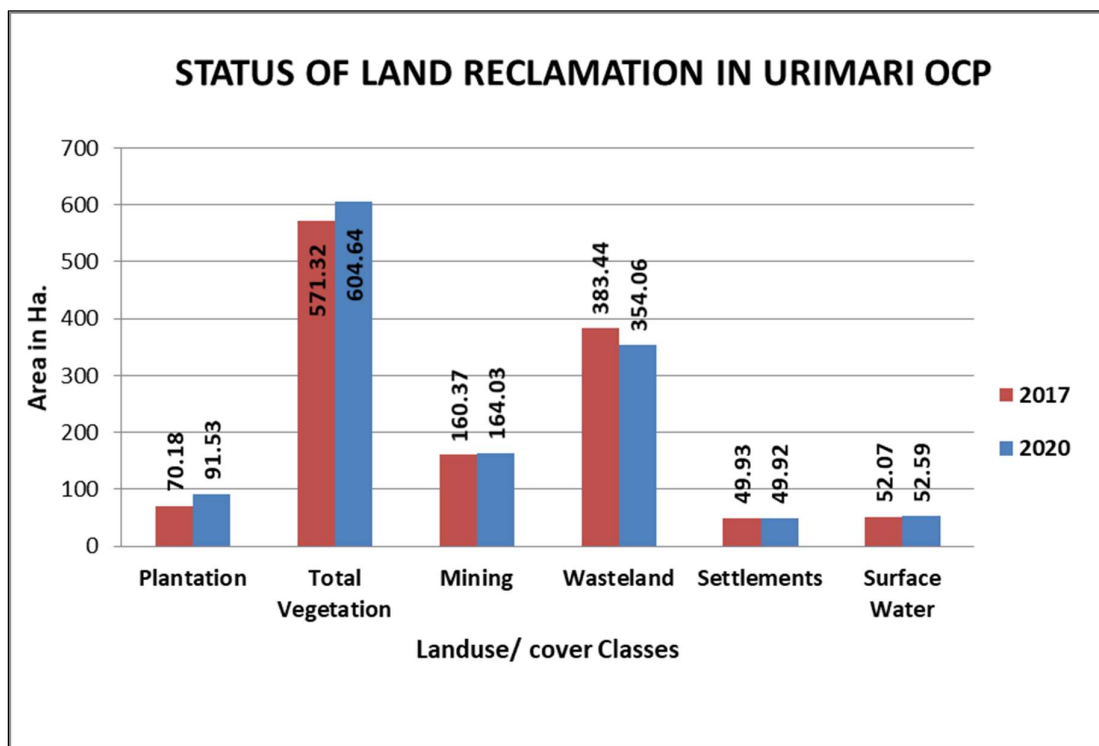


FIGURE – 7.7

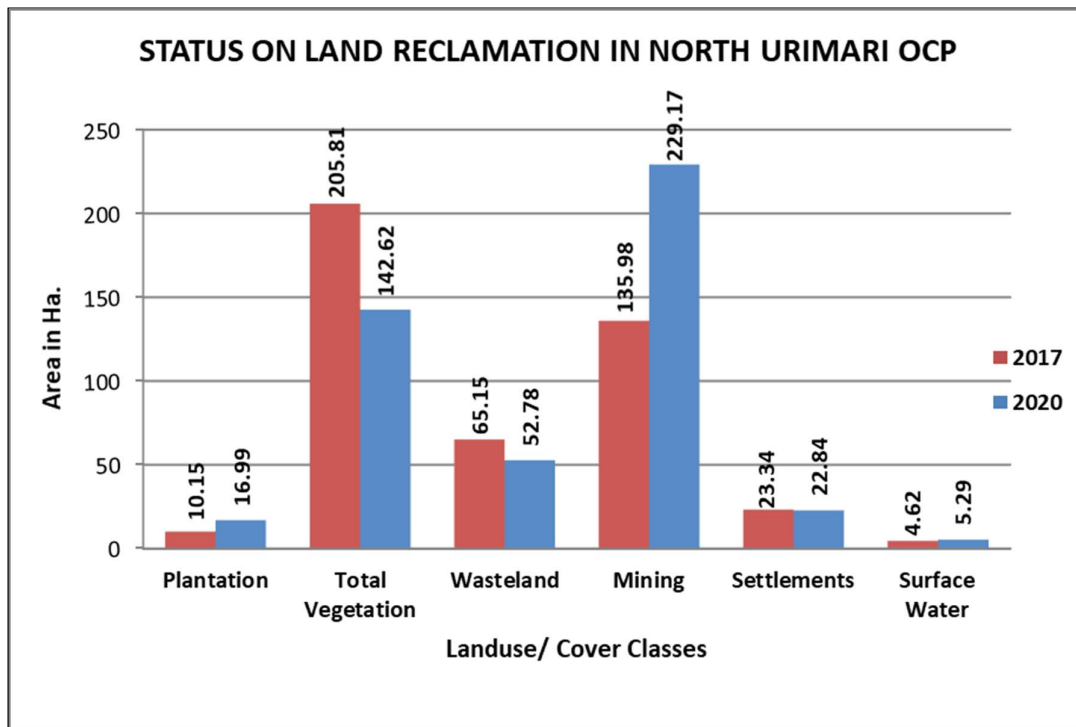


FIGURE – 7.8

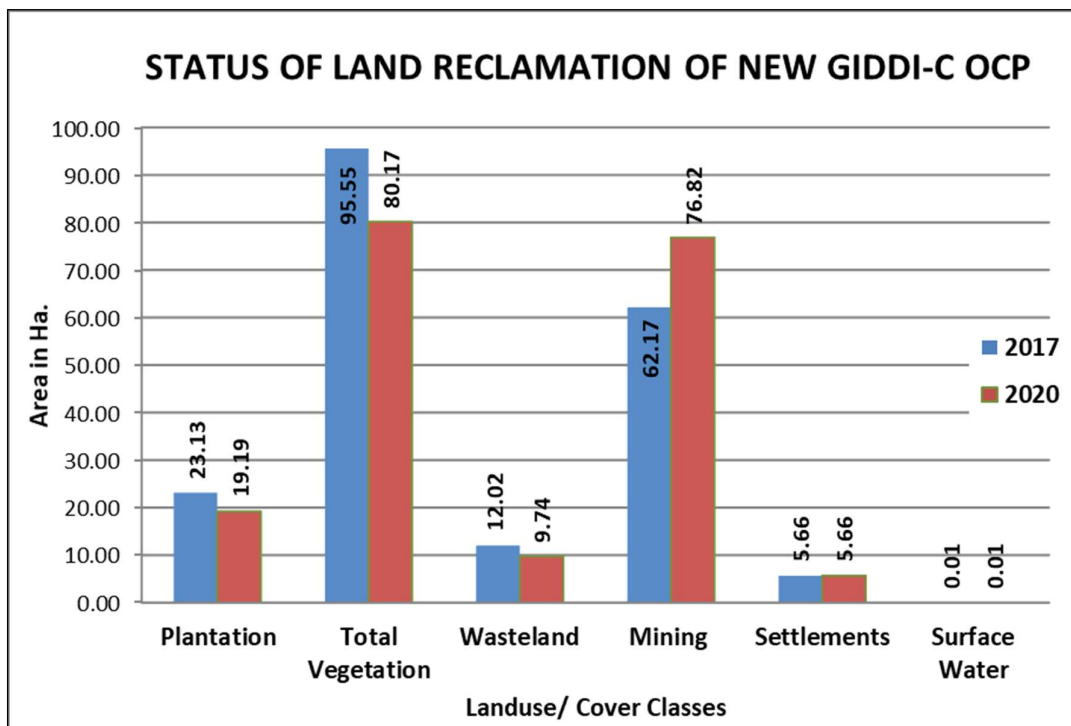


FIGURE – 7.9

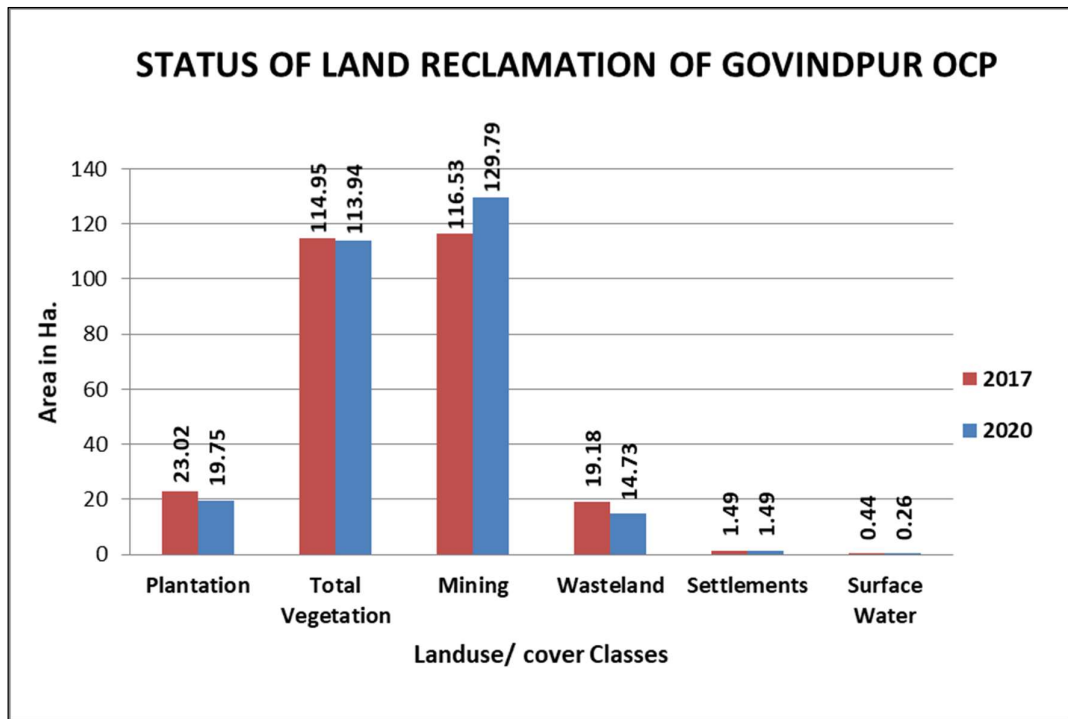


FIGURE – 7.10

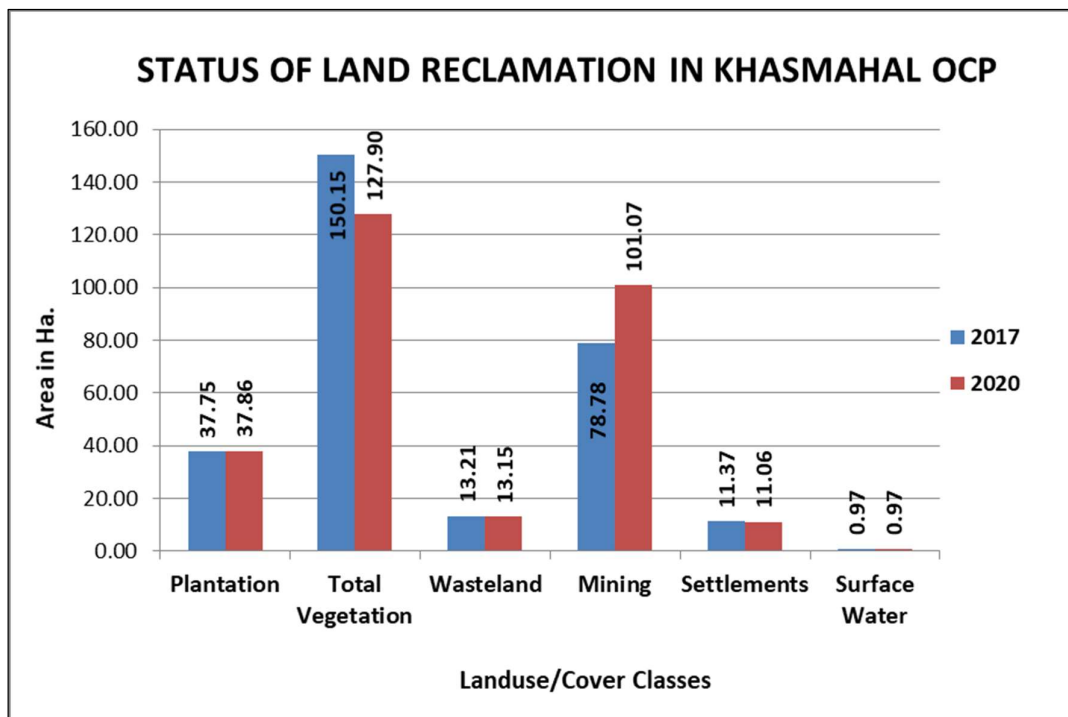


FIGURE – 7.11

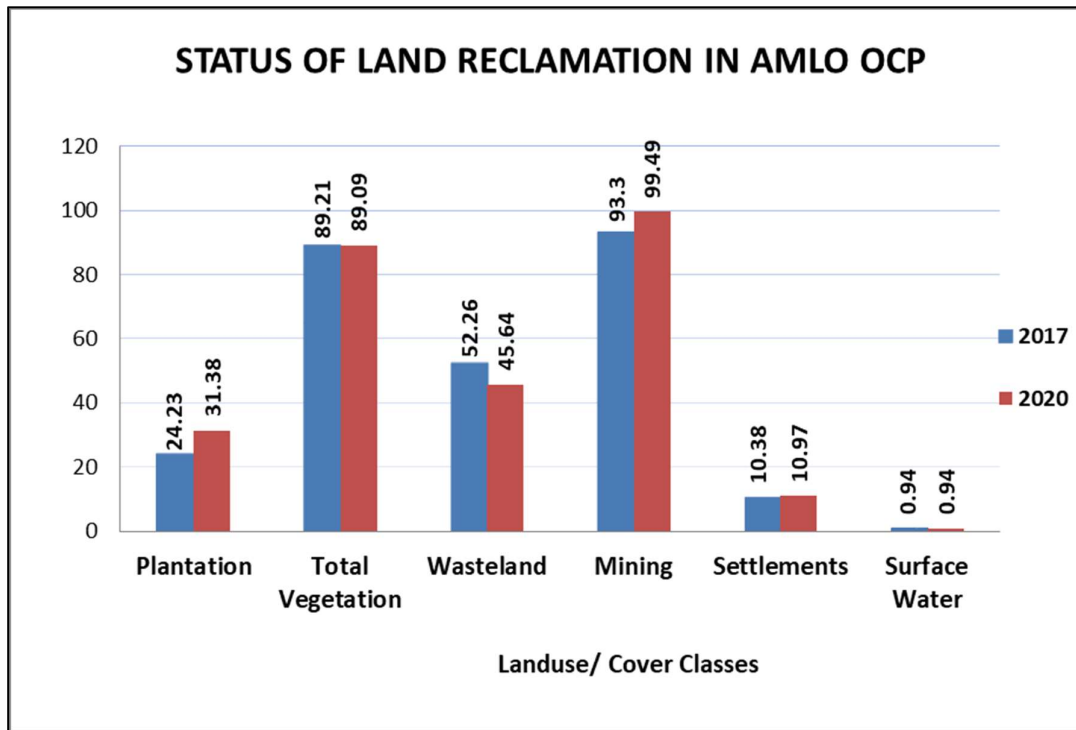


FIGURE – 7.12

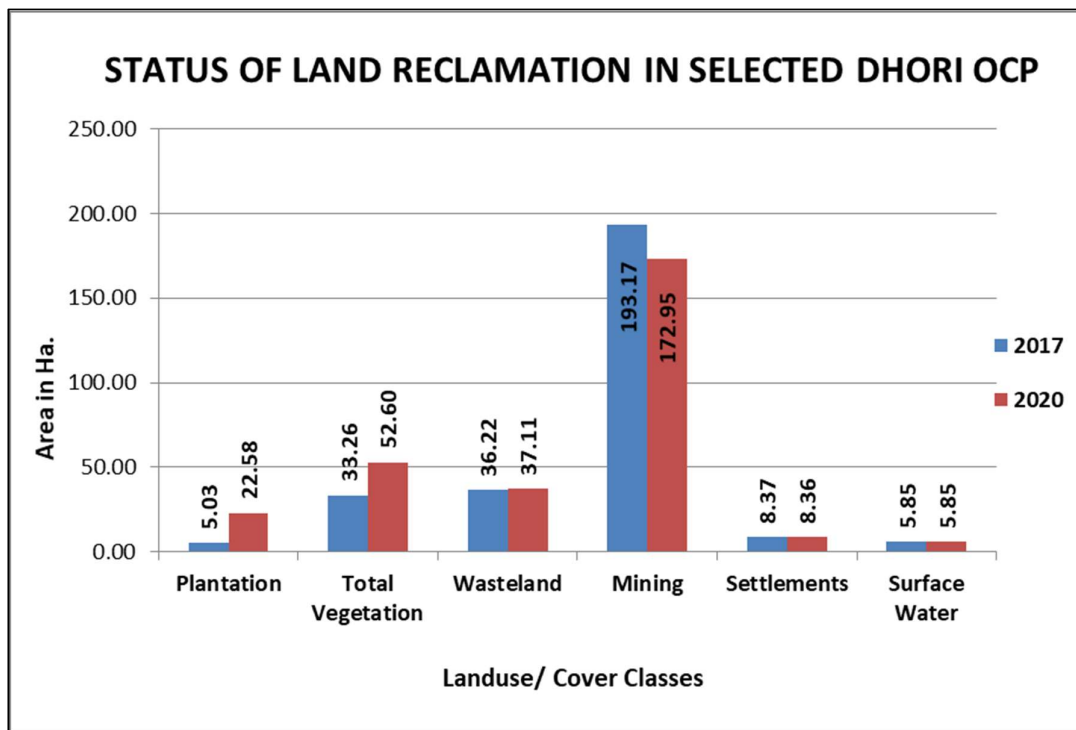


FIGURE – 7.13

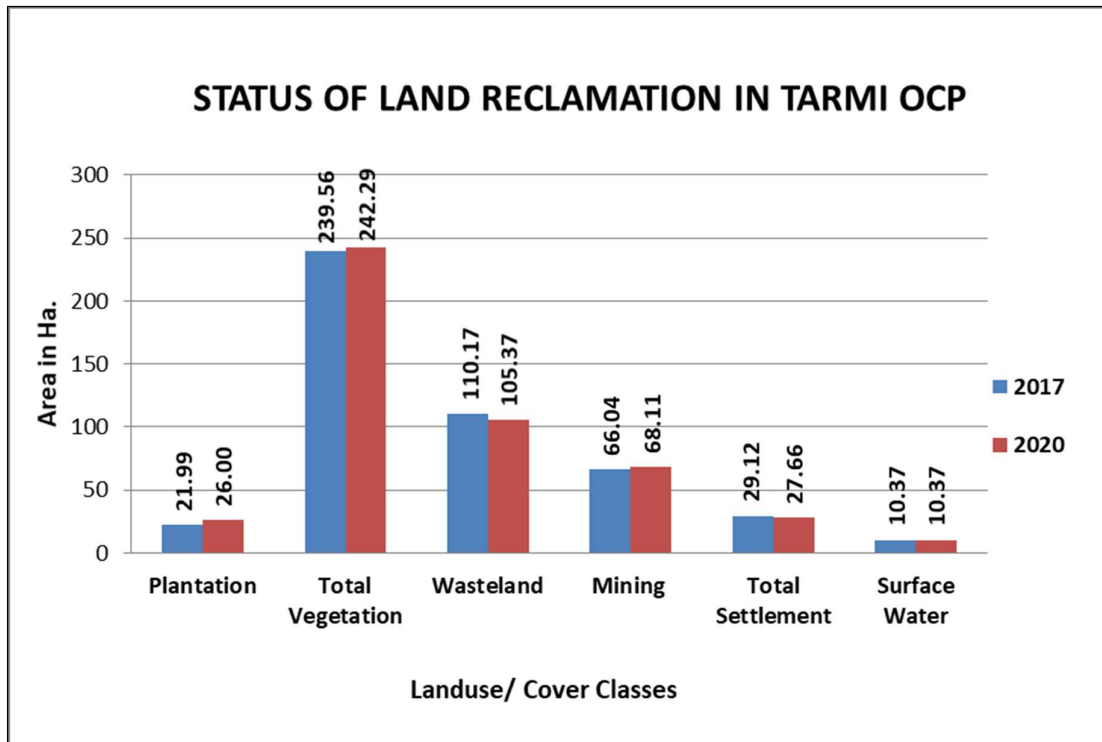


FIGURE – 7.14



Photo 7.1: Plantation on Backfill Dump in Rohini OCP



Photo7.2: Plantation on Backfill Dump in Purnadih OCP



Photo7.3: Plantation on Backfill Dump in Jharkhand OCP



Photo7.4: Plantation on OB Dump in Topa OCP



Photo7.5: Growing Plantation using Seed Ball Technique on Backfill in Urimari OCP



Photo7. 6: Plantation on Backfill Dump in Urimari OCP



Photo7.7: Plantation on External OB Dump in North Urimari OCP



Photo7.8: Plantation on Backfill Dump in North Urimari OCP



Photo7.9: Plantation under social forestry in Govindpur OCP



Photo7.10: Plantation on Backfill Dump in Khasmahal OCP

BHARAT COKING COAL LIMITED

8.0 Land Reclamation Status in Bharat Coking Coal Limited

8.1 Following 5 Clusters of Opencast Projects producing less than 5 million m³. (Coal + OB together) of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring: during the year 2020-21:

- Cluster -III
- Cluster -V
- Cluster -VIII
- Cluster-IX
- Cluster-XVII

8.2 Cluster wise Land Reclamation status of above mentioned projects in BCCL is given in Table 8.1 and also shown graphically in Fig 8.1. Area statistics of different land use class present in the mine leasehold of the above clusters for the year 2020 are shown in Table - 8.2. Land use maps derived from satellite data are shown in Plate 8.1 - 8.5. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 8.2 - 8.6.

8.3 Study reveals that out of total mine leasehold area of 7988.22 Hectares of the 05 Cluster of (UG+OC) mines of BCCL mentioned above taken for this study in 2020-21; total excavated area is 1300.74 hectares out of which 27.81 Ha. (2.14%) has been planted (*Biologically Reclaimed*), 657.49Ha. (50.55%) is under backfilling (*Technically Reclaimed*) and balance 615.44 hectares (47.31%) is under active mining.

8.4 Land Reclamation monitoring of cluster XVII of BCCL has been taken up for the first time in the year 2020-21. Hence comparison of this cluster of mines in the year 2020 with respect to year 2017 has not been made. The data thus generated in the year 2020 will

be considered as base data for comparison of land reclamation of this cluster of mines at the interval of every three years.

- 8.5** Study reveals that out of 5 cluster of mines of BCCL taken for land reclamation in the year 2020, the area under total plantation (Green cover) is maximum in Cluster IX i.e 217.17 Ha followed by cluster III with 187.33 Ha, Cluster V with 136.33 Ha, cluster VIII with 56.60 Ha, cluster XVII with 48.32 Ha.
- 8.6** Out of 5 cluster of mines considered for land reclamation monitoring based on satellite data of the year 2020; cluster XVII tops with 65.67% reclamation followed by cluster V with 65.30%, cluster VIII with 63.53%, cluster III with 38.01% and cluster IX with 27.96%.
- 8.7** On comparing the status of land reclamation based on satellite data of the year 2017 and 2020 for above cluster of mines, it is revealed that total area under plantation on backfill has decreased from 31.60 Ha (Yr.2017) to 27.81 Ha (Yr.2020). This decrease of 3.79 Ha area in biological reclamation during span of three years is due to rehandling of backfill.
- 8.8** Area under backfilling (Technical Reclamation) has increased from 457.35 Ha in the year 2017 to 657.49 Ha in the year 2020. This increase of 200.14 Ha area under backfilling is mainly due to Cluster XVII which has been added in the year 2020.
- 8.9** After analyzing the satellite data of year 2017 and 2020, it is evident that plantation carried out on backfilled area, OB dumps as well as under social forestry in all the mines of BCCL taken up for study has reached to 645.75 Ha (8.08%) area as compared to 566.96 Ha (8.62%) in the year 2017 within the entire leasehold area of 7988.22 Ha. Decrease of 0.54% in percentage of total area under plantation is due

to increase in area of leasehold boundary as percentage of Green Cover is calculated with respect to area of leasehold boundary.

- 8.10** Study indicates that overall all the projects except cluster XVII (which has been added in the year 2020) of BCCL considered for study indicate increase or static trend in technical reclamation (Area under backfilling) with respect to the year 2017.
- 8.11** In Cluster V, active mining area has decreased from 112.24 Ha in the year 2017 to 103.52 Ha in the year 2020 as more active mining area of above cluster V has come under backfilling area.
- 8.12** This study will again will be carried out after an interval of three years to assess the land reclamation status in the above projects.

TABLE 8.1
CLUSTER WISE LAND RECLAMATION STATUS IN BCCL BASED ON SATELLITE DATA OF THE YEAR 2020

(Area in Hectare)																			
Sl. No.	Cluster No.	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External OB Dumps		Social Forestry, Avaneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
1	Cluster III	1552.53	1552.53	55.87	60.37	3.89	3.89	21.11	21.11	128.07	162.33	101.50	104.79	161.26	169.05	153.07	187.33	59.76	64.26
				34.65%	35.71%	2.41%	2.30%					62.94%	61.99%			9.86%	12.07%	37.06%	38.01%
2	Cluster V	1724.52	1724.52	162.09	187.59	7.19	7.19	23.85	23.85	105.29	105.29	112.24	103.52	281.52	298.30	136.33	136.33	169.28	194.78
				57.58%	62.89%	2.55%	2.41%					39.87%	34.70%			7.91%	7.91%	60.13%	65.30%
3	Cluster VIII	1331.95	1331.95	161.86	206.91	13.72	9.93	21.97	21.97	24.70	24.70	111.06	124.49	286.64	341.33	60.39	56.60	175.58	216.84
				56.47%	60.62%	4.79%	2.91%					38.75%	36.47%			4.53%	4.25%	61.25%	63.53%
4	Cluster IX	1967.22	1967.22	77.53	77.53	6.80	6.80	41.79	41.79	168.58	168.58	181.85	217.24	266.18	301.57	217.17	217.17	84.33	84.33
				29.13%	25.71%	2.55%	2.25%					68.32%	72.04%			11.04%	11.04%	31.68%	27.96%
5	Cluster XVII	-	1412.00	-	125.09	-	0.00	-	5.00	-	43.33	-	65.40	-	190.49	-	48.32	-	125.09
					65.67%		0.00%						34.33%				3.42%		65.67%
	TOTAL	6576.22	7988.22	457.35	657.49	31.60	27.81	108.72	113.72	426.64	504.23	506.65	615.44	995.60	1300.74	566.96	645.75	488.95	685.30
				45.94%	50.55%	3.17%	2.14%					50.89%	47.31%			8.62%	8.08%	49.11%	52.69%
(% is calculated with respect to Excavated Area as applicable)																			

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

Cluster XVII as indicated in Table-8.2 has been considered for land reclamation monitoring for the first time in the year 2020.

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

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

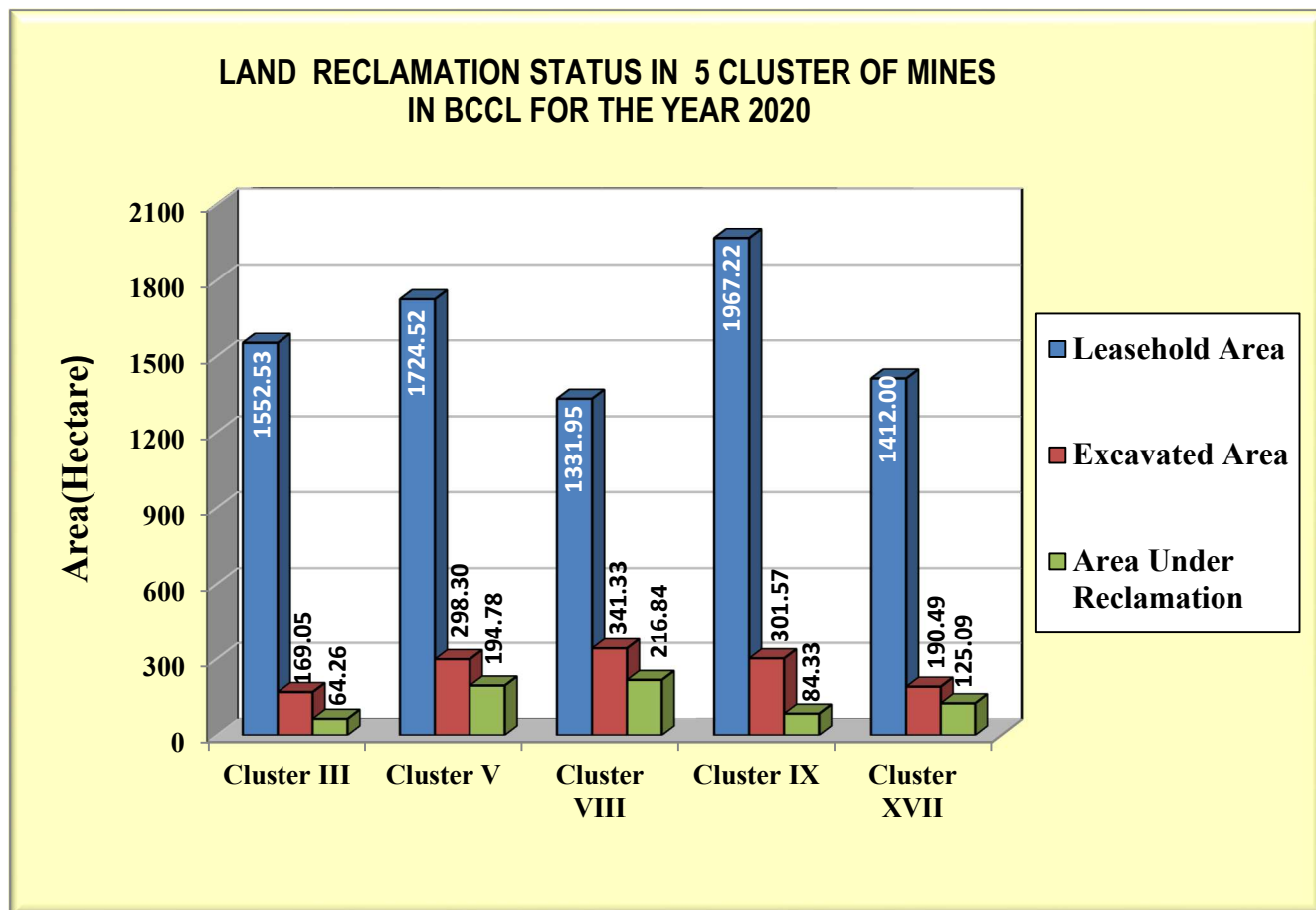
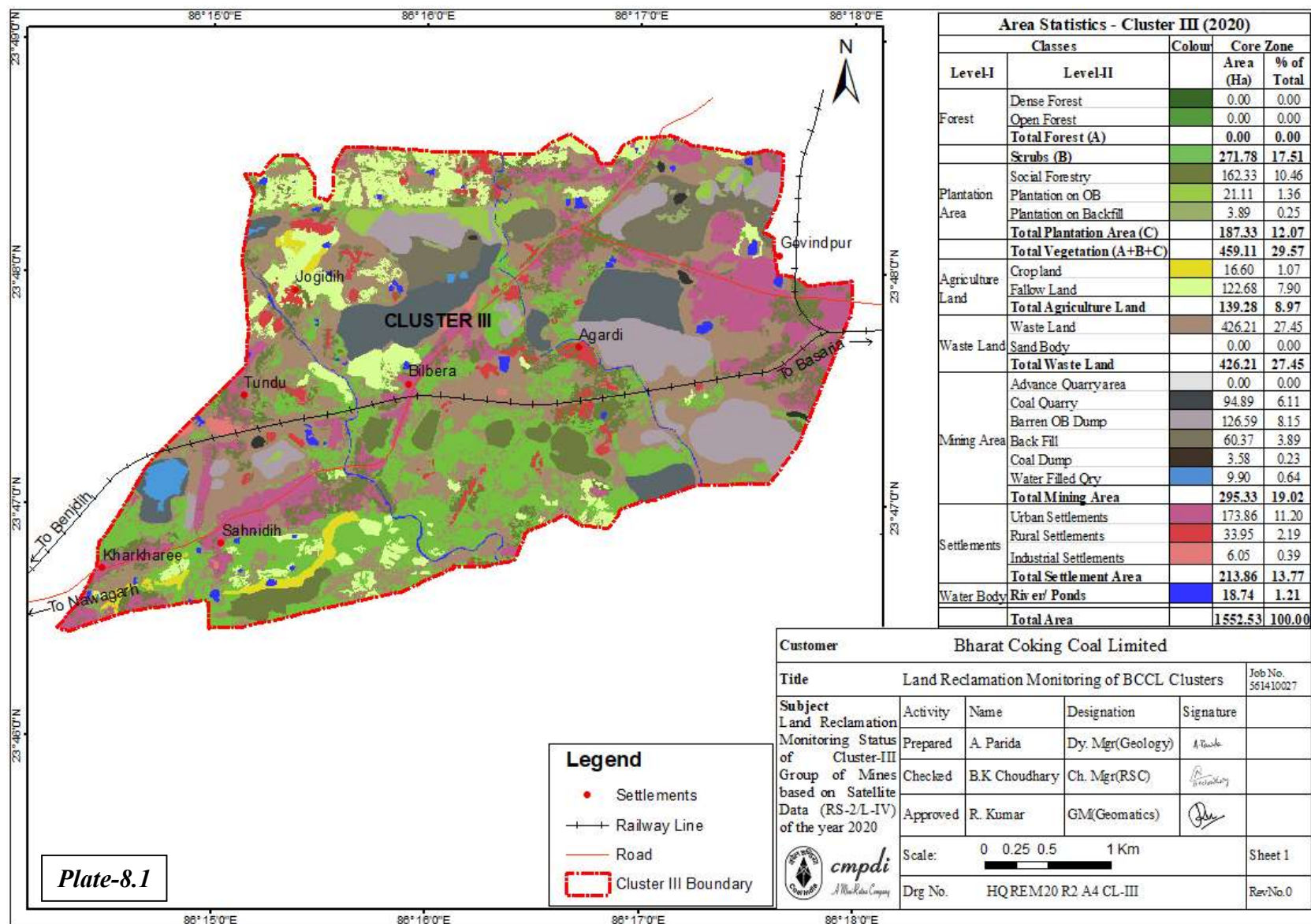
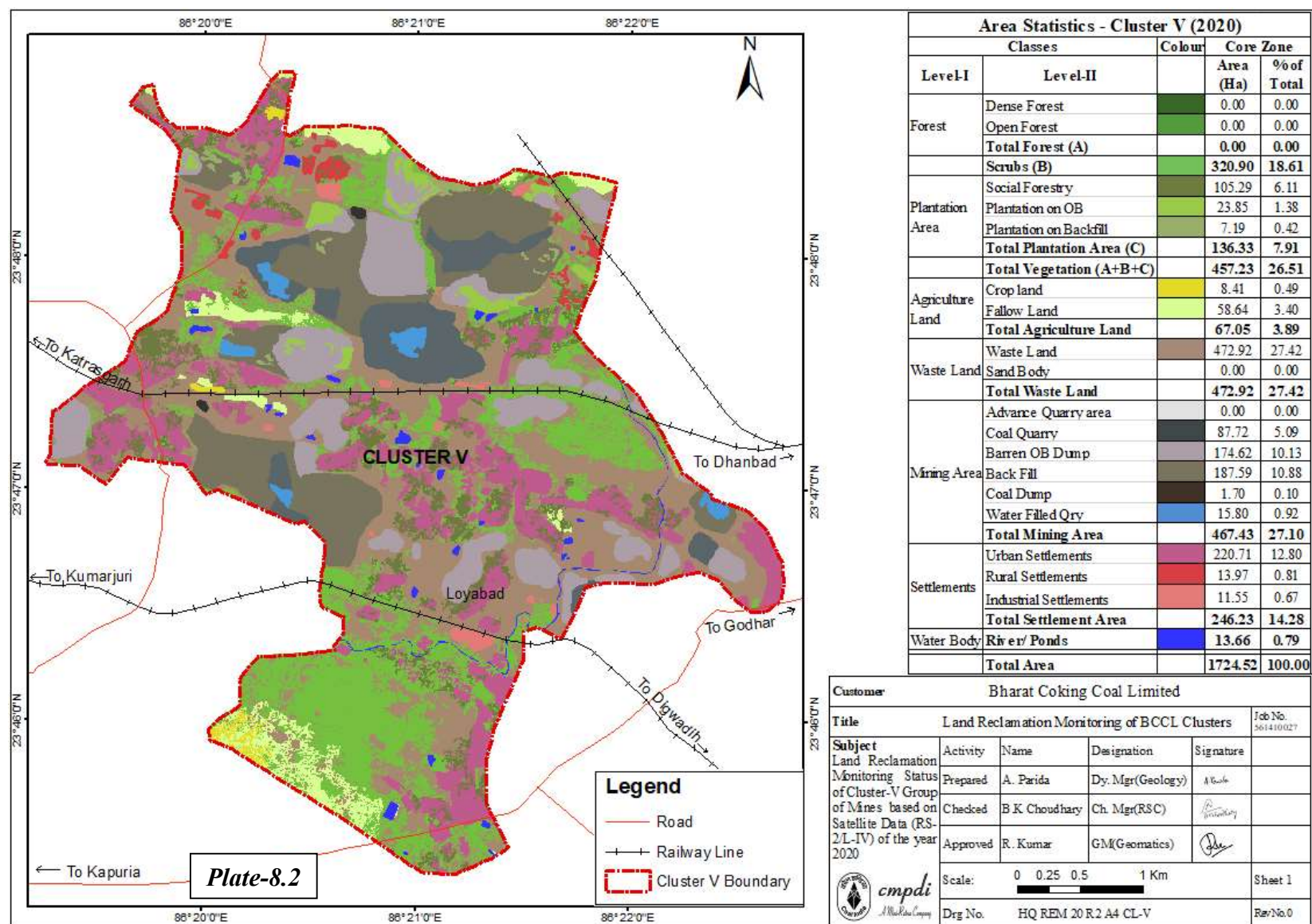


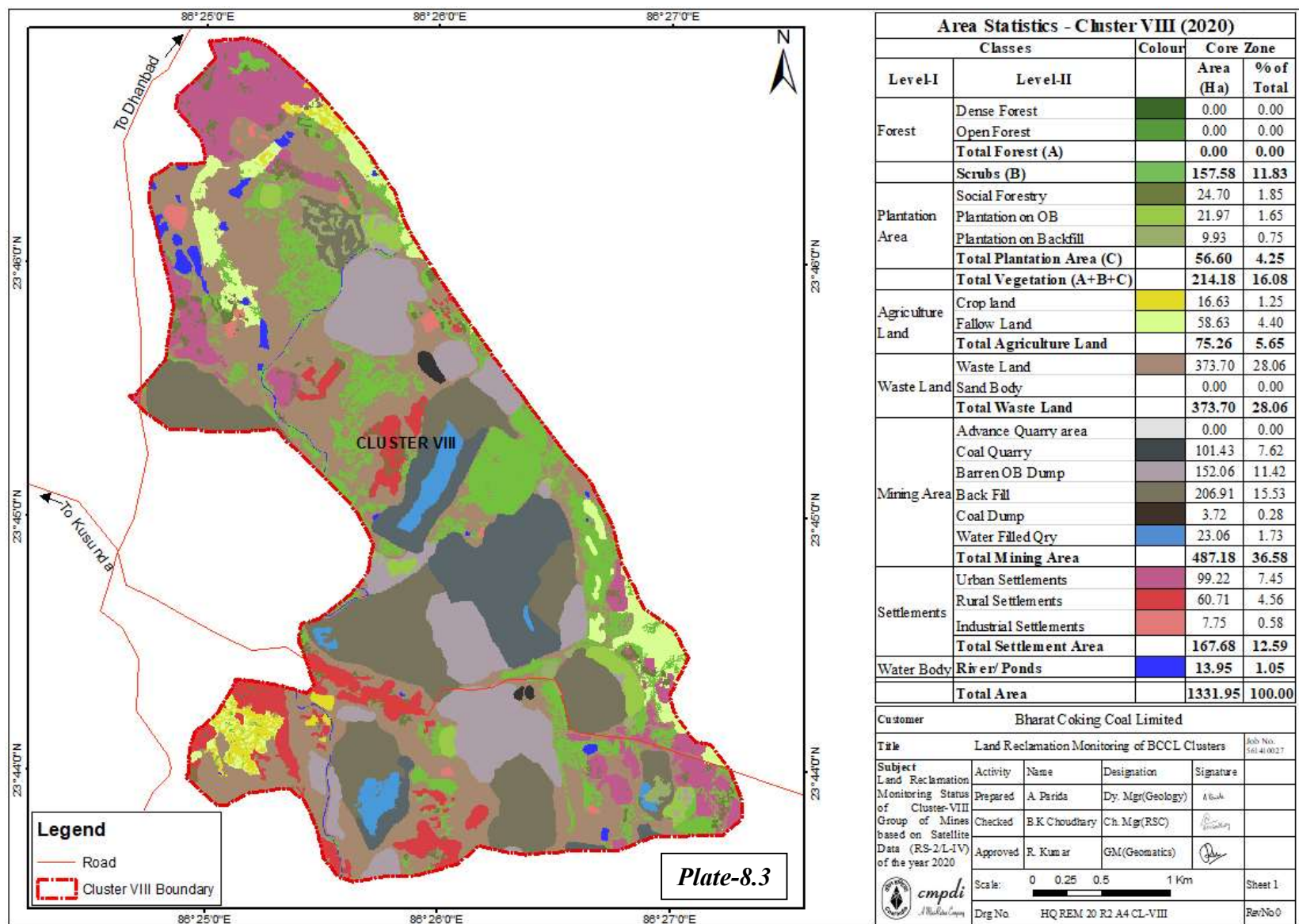
Figure -8.1

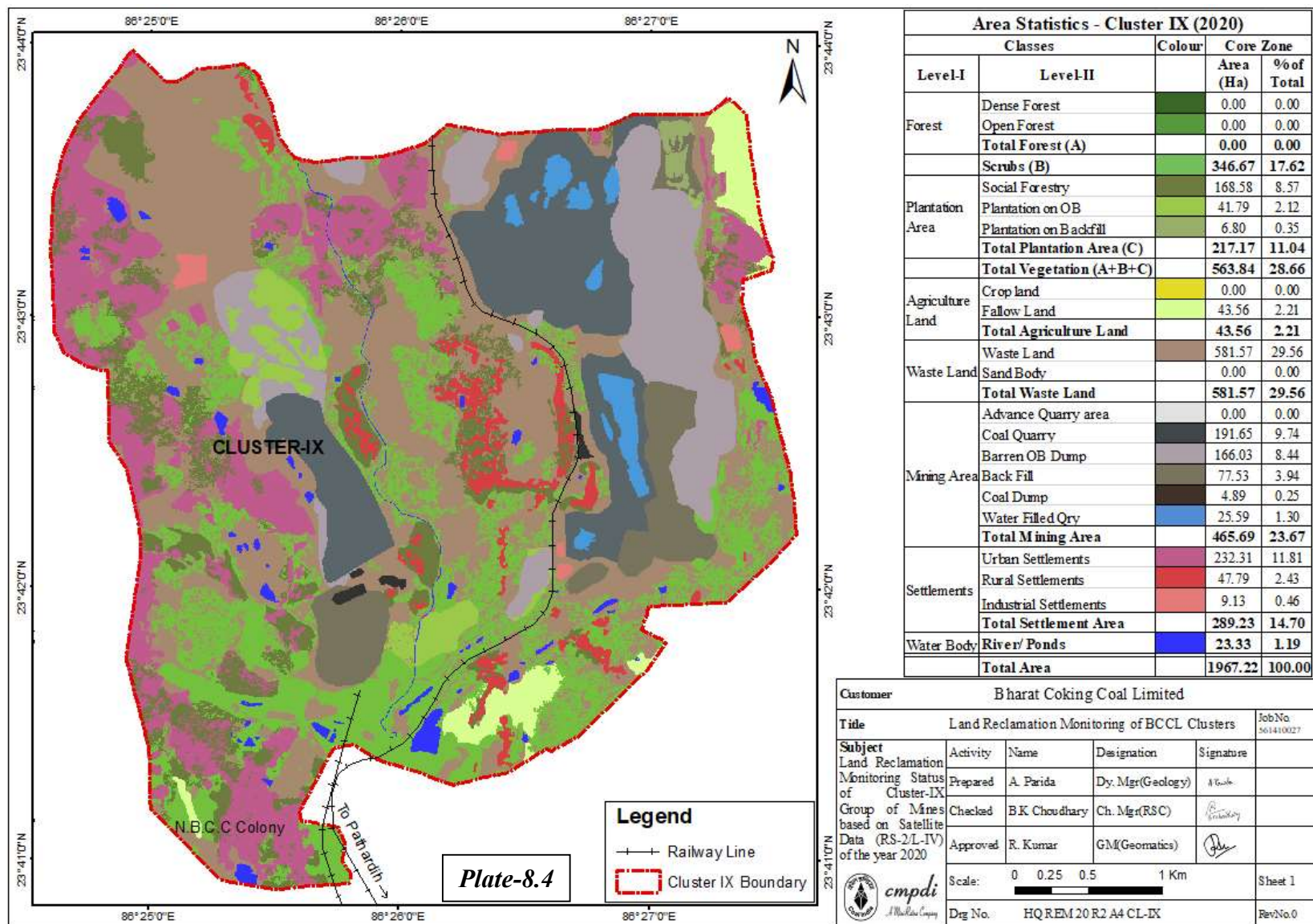
TABLE 8.2
STATUS OF LAND USE / COVER AND LAND RECLAMATION OF CLUSTER OF MINE IN BCCL BASED ON SATELLITE DATA OF THE YEAR 2020

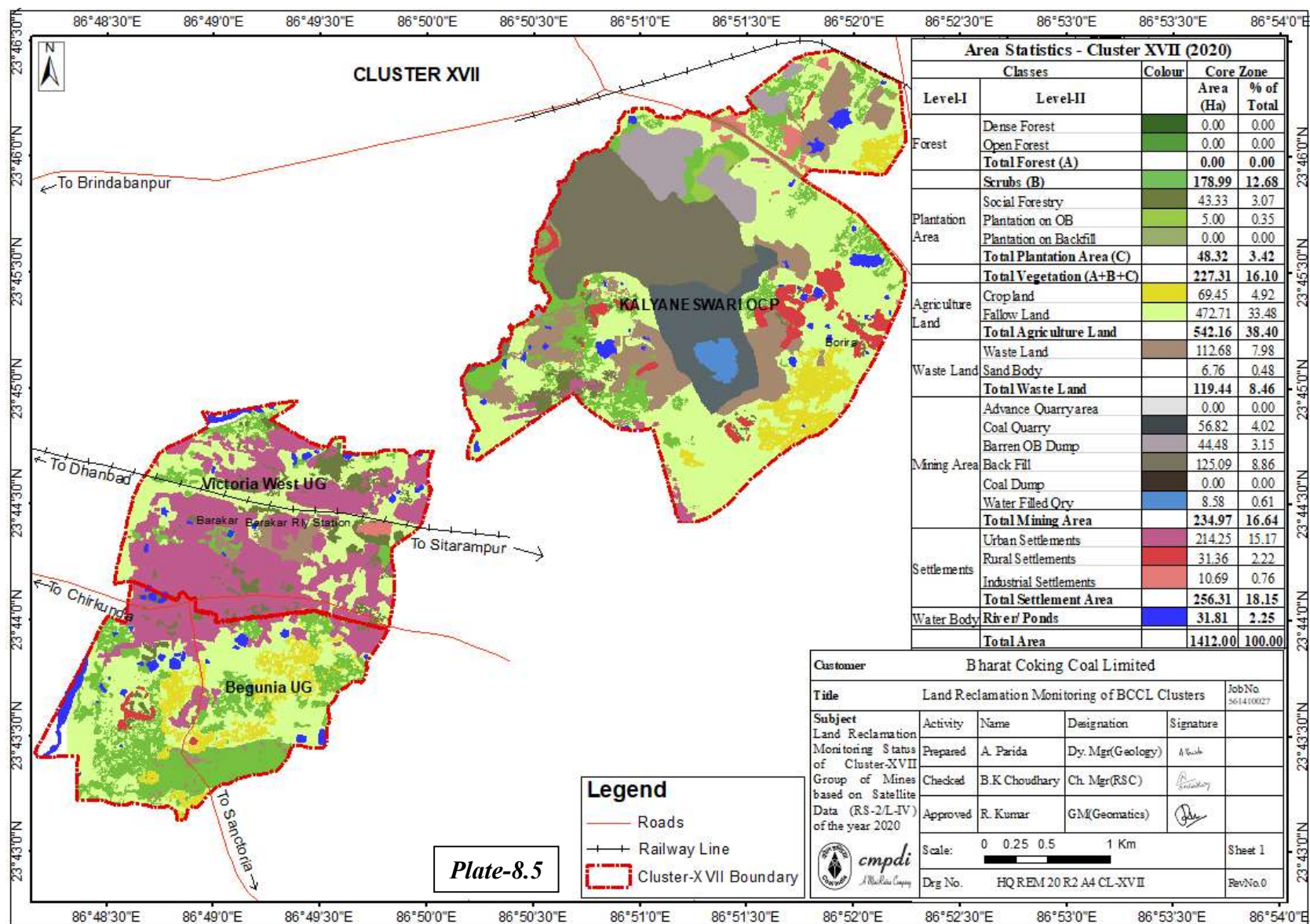
Status of Land Reclamation in 5 Clusters of (UG+OC) mines of Bharat Coking Coal Ltd. based on Satellite data of the Year 2020													
(Area in Hectare)													
		CLUSTER III		CLUSTER V		CLUSTER VIII		CLUSTER IX		CLUSTER XVII		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Open Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Forest (A)	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SCRUBS	Scrubs (B)	271.78	17.51	320.90	18.61	157.58	11.83	346.67	17.62	178.99	12.68	1275.92	15.97
PLANTATION	Social Forestry/Avenue Plantation	162.33	10.46	105.29	6.11	24.70	1.85	168.58	8.57	43.33	3.07	504.23	6.31
	Plantation on OB Dump	21.11	1.36	23.85	1.38	21.97	1.65	41.79	2.12	5.00	0.35	113.72	1.42
	Plantation on Backfill (Biological Reclamation)	3.89	0.25	7.19	0.42	9.93	0.75	6.80	0.35	0.00	0.00	27.81	0.35
	Total Plantation (C)	187.33	12.07	136.33	7.91	56.60	4.25	217.17	11.04	48.32	3.42	645.75	8.08
Total Vegetation (A+B+C)		459.11	29.57	457.23	26.51	214.18	16.08	563.84	28.66	227.31	16.10	1921.67	24.06
	Coal Dump	3.58	0.23	1.70	0.10	3.72	0.28	4.89	0.25	0.00	0.00	13.89	0.17
ACTIVE MINING	Coal Quarry	94.89	6.11	87.72	5.09	101.43	7.62	191.65	9.74	56.82	4.02	532.51	6.67
	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
	Quarry Filled With Water	9.90	0.64	15.80	0.92	23.06	1.73	25.59	1.30	8.58	0.61	82.93	1.04
	Total Area under Active Mining	104.79	6.75	103.52	6.00	124.49	9.35	217.24	11.04	65.40	4.63	615.44	7.70
	Barren OB Dump	126.59	8.15	174.62	10.13	152.06	11.42	166.03	8.44	44.48	3.15	663.78	8.31
RECLAIMED	Area Under Backfilling (Technical Reclamation)	60.37	3.89	187.59	10.88	206.91	15.53	77.53	3.94	125.09	8.86	657.49	8.23
	Total Area under Mine Operation	295.33	19.02	467.43	27.10	487.18	36.58	465.69	23.67	234.97	16.64	1950.60	24.42
WASTELAND	Waste Lands	426.21	27.45	472.92	27.42	373.70	28.06	581.57	29.56	112.68	7.98	1967.08	24.62
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.76	0.48	6.76	0.08
	Total Wasteland	426.21	27.45	472.92	27.42	373.70	28.06	581.57	29.56	119.44	8.46	1973.84	24.71
WATERBODIES	Reservoir, Nallah, Ponds	18.74	1.21	13.66	0.79	13.95	1.05	23.33	1.19	31.81	2.25	101.49	1.27
	Total Waterbodies	18.74	1.21	13.66	0.79	13.95	1.05	23.33	1.19	31.81	2.25	101.49	1.27
AGRICULTURE	Crop Lands	16.60	1.07	8.41	0.49	16.63	1.25	0.00	0.00	69.45	4.92	111.09	1.39
	Fallow Lands	122.68	7.90	58.64	3.40	58.63	4.40	43.56	2.21	472.71	33.48	756.22	9.47
	Total Agriculture	139.28	8.97	67.05	3.89	75.26	5.65	43.56	2.21	542.16	38.40	867.31	10.86
SETTLEMENTS	Urban Settlement	173.86	11.20	220.71	12.80	99.22	7.45	232.31	11.81	214.25	15.17	940.35	11.77
	Rural Settlement	33.95	2.19	13.97	0.81	60.71	4.56	47.79	2.43	31.36	2.22	187.78	2.35
	Industrial Settlement	6.05	0.39	11.55	0.67	7.75	0.58	9.13	0.46	10.69	0.76	45.17	0.57
	Total Settlements	213.86	13.77	246.23	14.28	167.68	12.59	289.23	14.70	256.31	18.15	1173.31	14.69
Grand Total		1552.53	100.00	1724.52	100.00	1331.95	100.00	1967.22	100.00	1412.00	100.00	7988.22	100.00











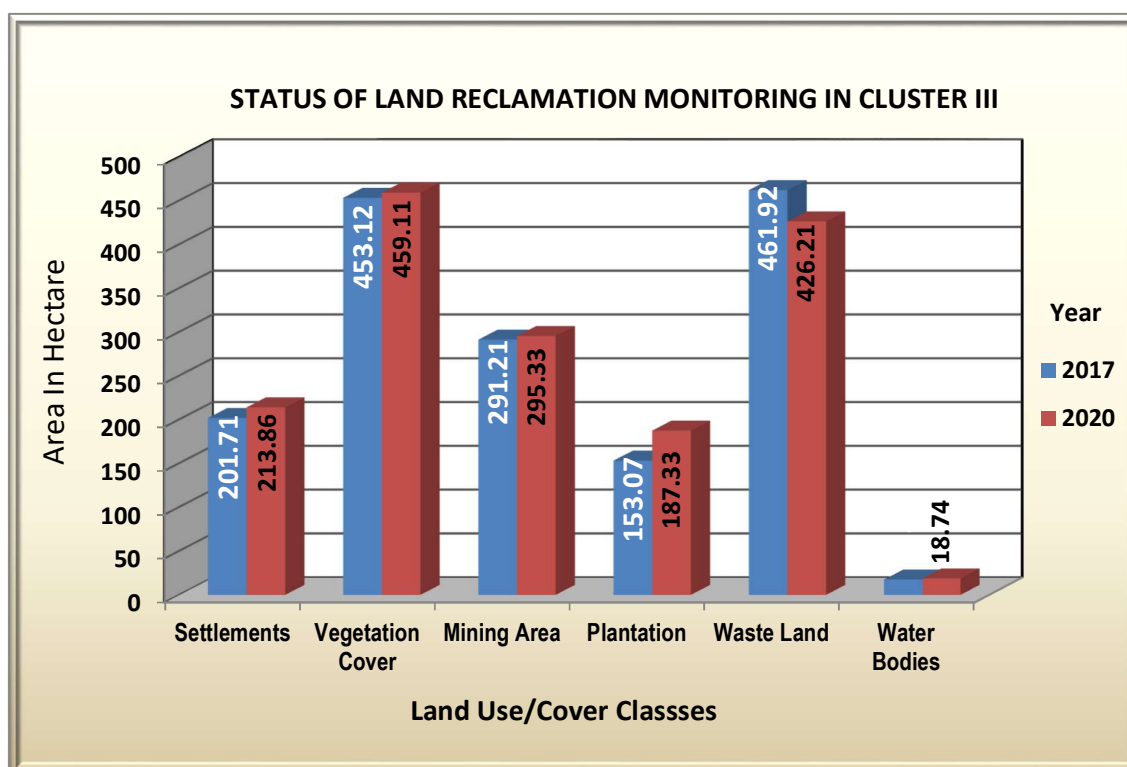


Figure 8.2

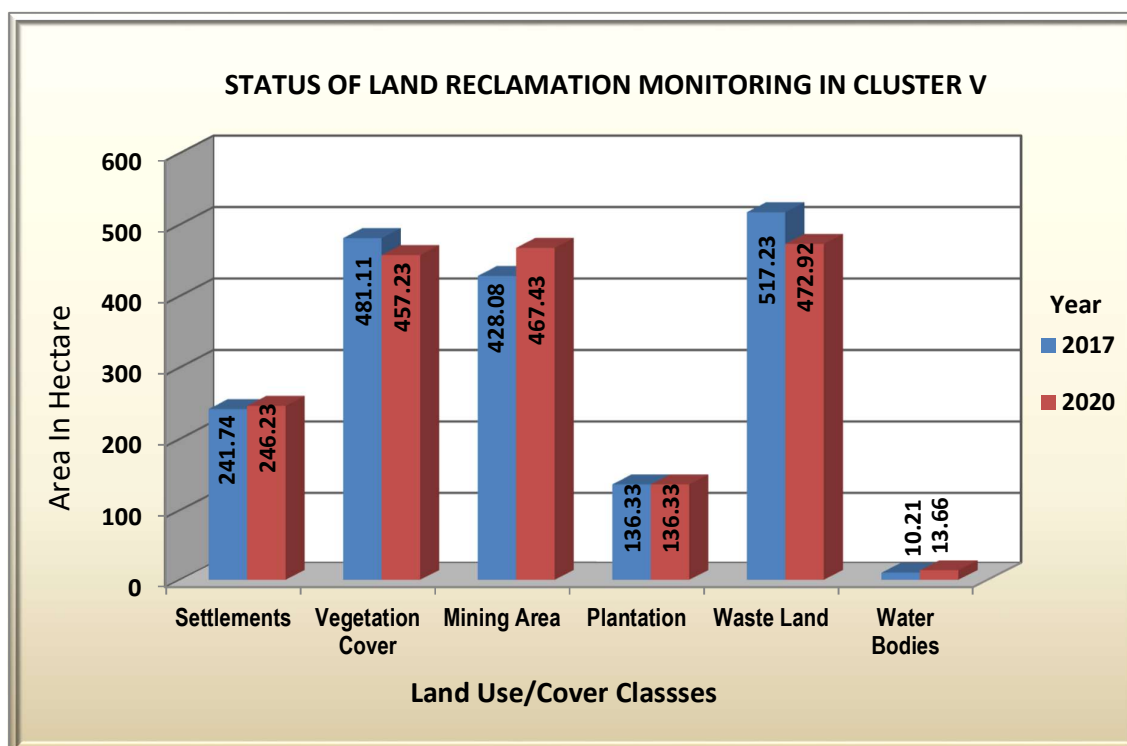


Figure 8.3

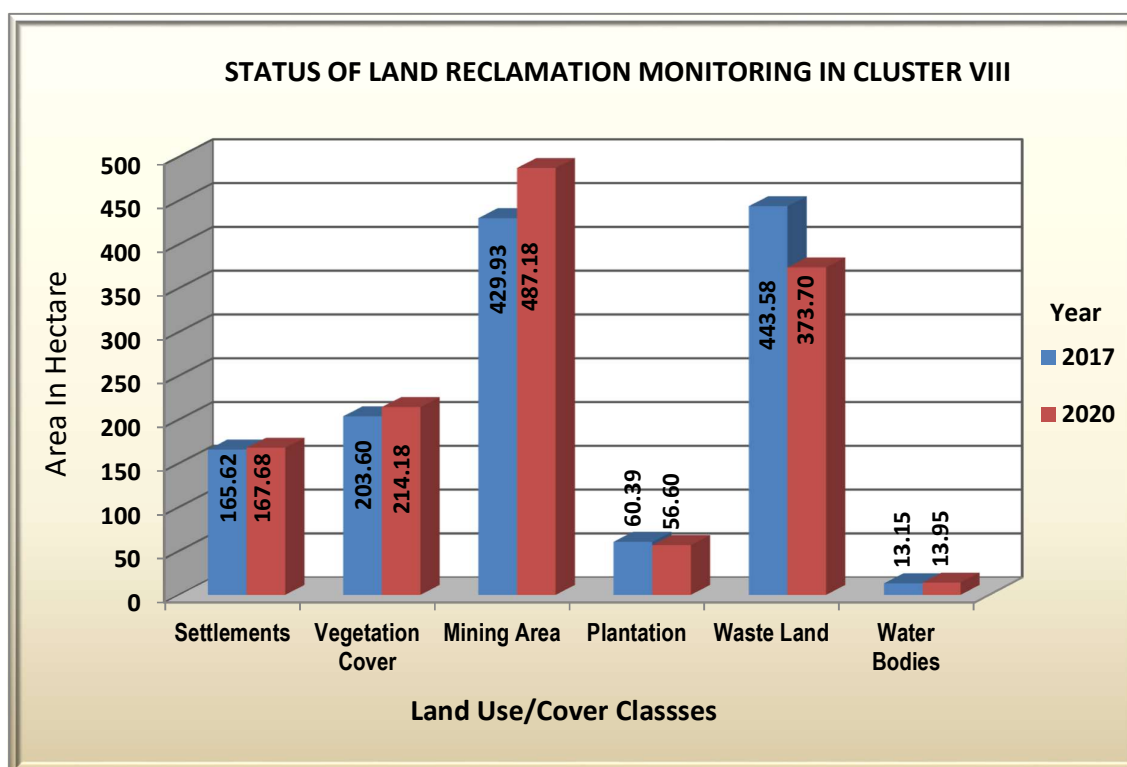


Figure 8.4

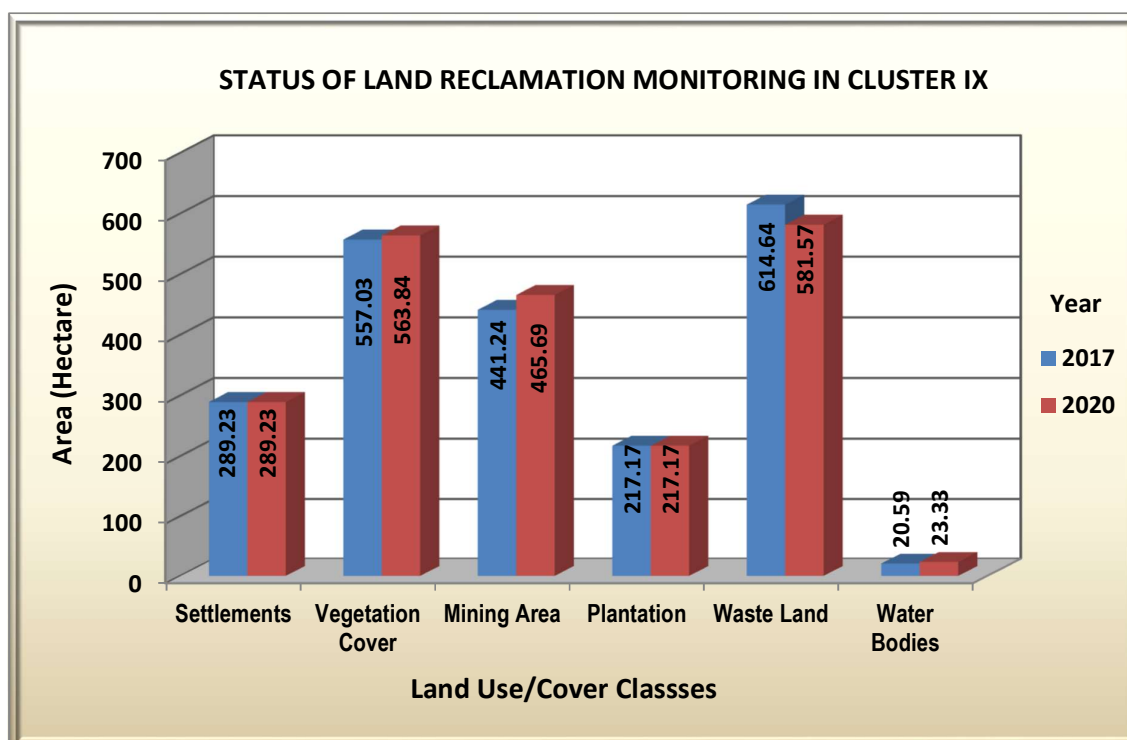


Figure 8.5

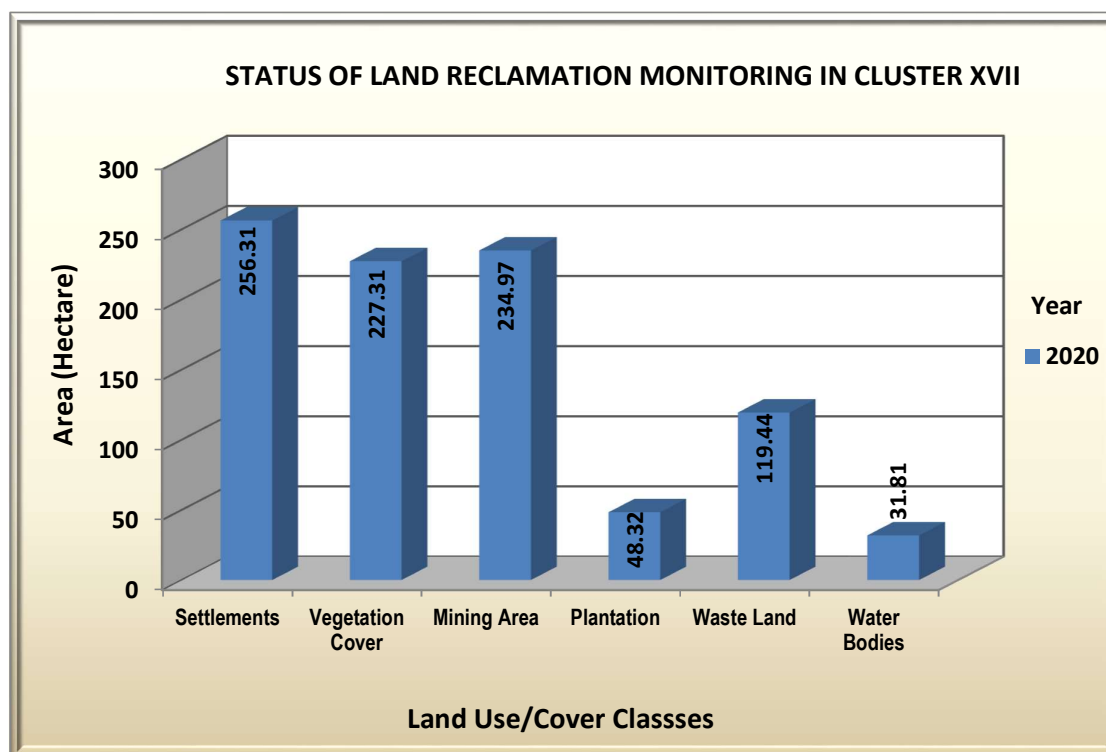


Figure 8.6



Photo8.1: Plantation on OB dump in Cluster III



Photo 8.2: Eco Restoration site in Cluster V



Photo 8.3: Plantation on OB Dump in Cluster V



Photo8.4: Plantation on OB Dump in Cluster VIII



Photo8.5: Gokul Eco Cultural Park in cluster IX



Photo 8.6: Plantation under social forestry in Cluster XVII

EASTERN COALFIELDS LIMITED

9.0 Land Reclamation Status in Eastern Coalfields Limited

9.1 In ECL, there are a total of twelve clusters of mines. Out of which four clusters of mines (comprising both UG and OC projects) and three OCPs (Chitra East, Mohanpur and Hurra-C) have been taken up for land reclamation monitoring during the year 2020-21

1. Cluster - I (Chapapur OC, Nirsa OC, Khudiya OC and Kapasara OC)
2. Cluster - II (Rajpura OC, Kumardhubi UG & Barmuri OC)
3. Cluster - III (Bonjehamari, Sangramgarh & Dabour - all UG & OC)
4. Cluster - IV (Itapara OC, Gaurangdih & Begunia OC)
5. Chitra-East OC
- 6 .Mohanpur OC
7. Hurra-C OC

9.2 Project wise Land Reclamation status of four clusters of mines (UG+OC) and three OC in ECL is given in Table 9.1 and also shown graphically in Fig 9.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2020 are shown in the Table - 9.2. Land use maps derived from satellite data are shown in Plate 9.1 - 9.7. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 9.2 - 9.8

9.3 Study reveals that out of total mine leasehold area of 10883.91 Hectares of the above mentioned four clusters of mines (UG+OC) and 03 OC projects of ECL taken up for this study in 2020-21; total excavated area is 639.55 hectares (5.88%) out of which 96.00Ha (15.01%) area has been planted (Biologically Reclaimed), 240.81 Ha (37.65%) area is under backfilling (Technically Reclaimed) and balance 302.74 Ha (47.34%) area is under active mining.

- 9.4** Land reclamation monitoring for four clusters of mines (UG+OC) and three OC in ECL have been taken up for the first time in the year 2020 -21. The data thus generated in the year 2020-21 will be considered as base data for comparison of status of land reclamation for the same set of projects at the interval of three year .
- 9.5** Study reveals that out of four clusters of mines (UG+OC) and three OC in ECL considered for land reclamation monitoring in the year 2020-21, area under backfilling (Technical reclamation), plantation on backfill (Biological Reclamation), total area under plantation (Green Cover) and total area under land reclamation is maximum in Cluster I i.e 90 Ha (40.18%), 60.00 Ha (26.79%), 295.00 Ha (7.99%) and 150.00 Ha (66.96%) respectively.
- 9.6** Since the clusters have many underground mines too, surface land has not been affected much due to mining activities in majority of the areas, except where opencast mines are present. Whereas, the land affected in the OC mines area has been taken up for reclamation/ restoration activities.
- 9.7** It is evident from the analysis that out of four clusters of mines (UG+OC) and three OC in ECL considered for land reclamation monitoring based on satellite data of the year 2020, cluster-II tops with 74.11% land reclamation followed by cluster-I with 66.96% and Mohanpur OC with 55.00%.
- 9.8** The study will again be carried out to assess the status of land reclamation monitoring for the same set of above mentioned four cluster of mines and 3 opencast projects after an interval of three year.

Table 9.1
Project wise Land Reclamation Status in Opencast Projects of ECL
based on the Satellite data of the year 2020

Status of Land Reclamation in 4 Clusters and 3 OCPs of ECL based on Satellite Data of the Year 2020										
(Area in Hectare)										
Sl. No.	Cluster / Mine	Total Leasehold Area	Technical Reclamation Area under Backfilling	Plantation			Area under Active Mining	Total Excavated Area	Total Area under Plantation (% Green Cover Generated in Leasehold)	Total Area under Reclamation
				Biological Reclamation Plantation on Excavated / Backfilled Area	Other Plantations Plantation on External OB 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)
1	Cluster I	3692.00	90.00	60.00	148.00	87.00	74.00	224.00	295.00	150.00
			40.18%	26.79%			33.04%		7.99%	66.96%
2	Cluster II	1018.00	48.00	35.00	17.00	37.00	29.00	112.00	89.00	83.00
			42.86%	31.25%			25.89%		8.74%	74.11%
3	Cluster III	1628.00	48.00	0.00	6.00	90.00	49.00	97.00	96.00	48.00
			49.48%	0.00%			50.52%		5.90%	49.48%
4	Cluster IV	2721.00	1.00	1.00	23.00	30.00	55.00	57.00	54.00	2.00
			1.75%	1.75%			96.49%		1.98%	3.51%
5	Chitra East	714.00	31.81	0.00	14.90	27.99	77.74	109.55	42.89	31.81
			29.04%	0.00%			70.96%		6.01%	29.04%
6	Mohanpur	164.91	22.00	0.00	11.00	6.00	18.00	40.00	17.00	22.00
			55.00%	0.00%			45.00%		10.31%	55.00%
7	Hurra-C	946.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	TOTAL	10883.91	240.81	96.00	219.90	277.99	302.74	639.55	593.89	336.81
			37.65%	15.01%			47.34%	5.88%	5.46%	52.66%
(% is calculated with respect 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
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.

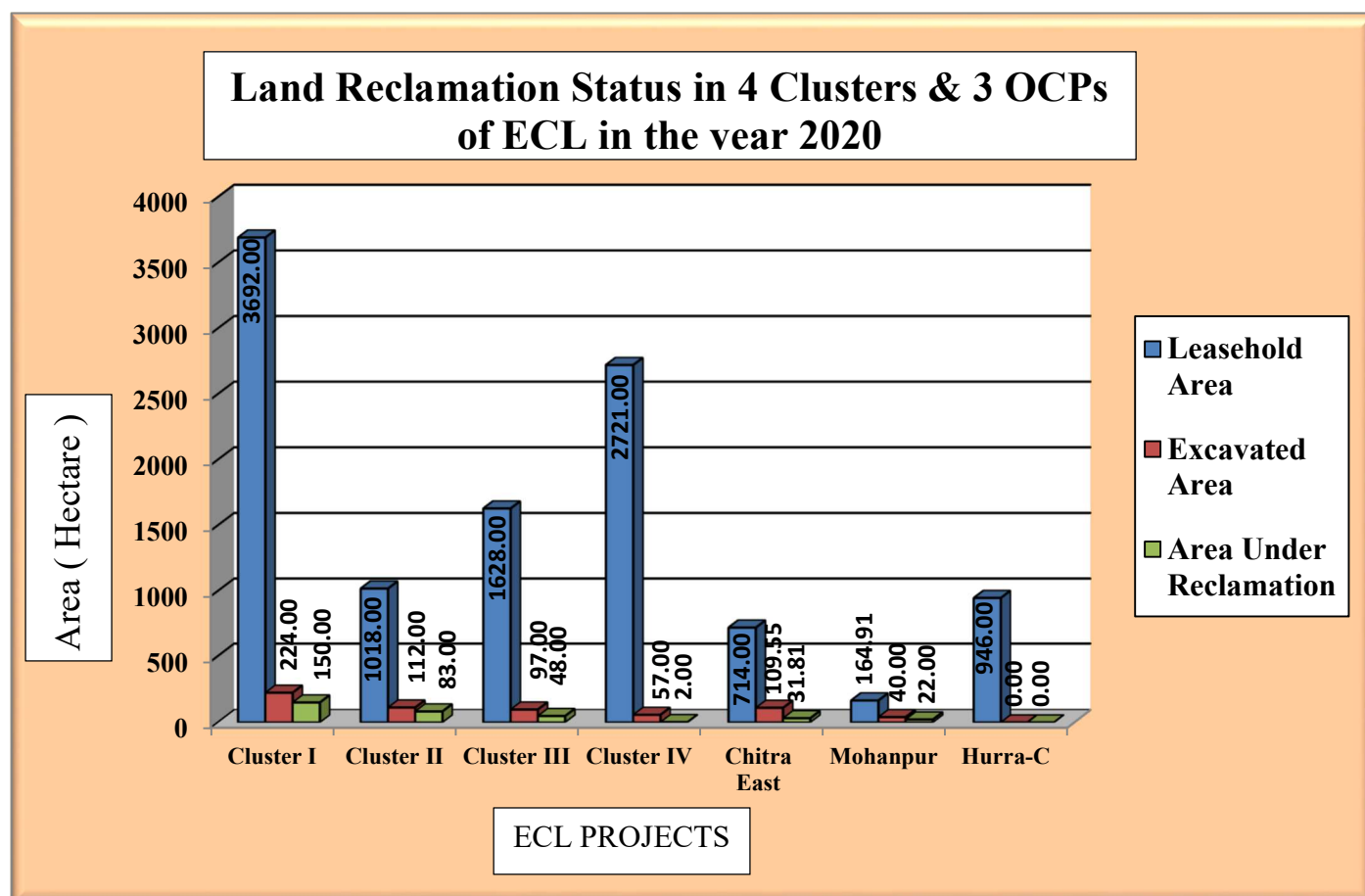
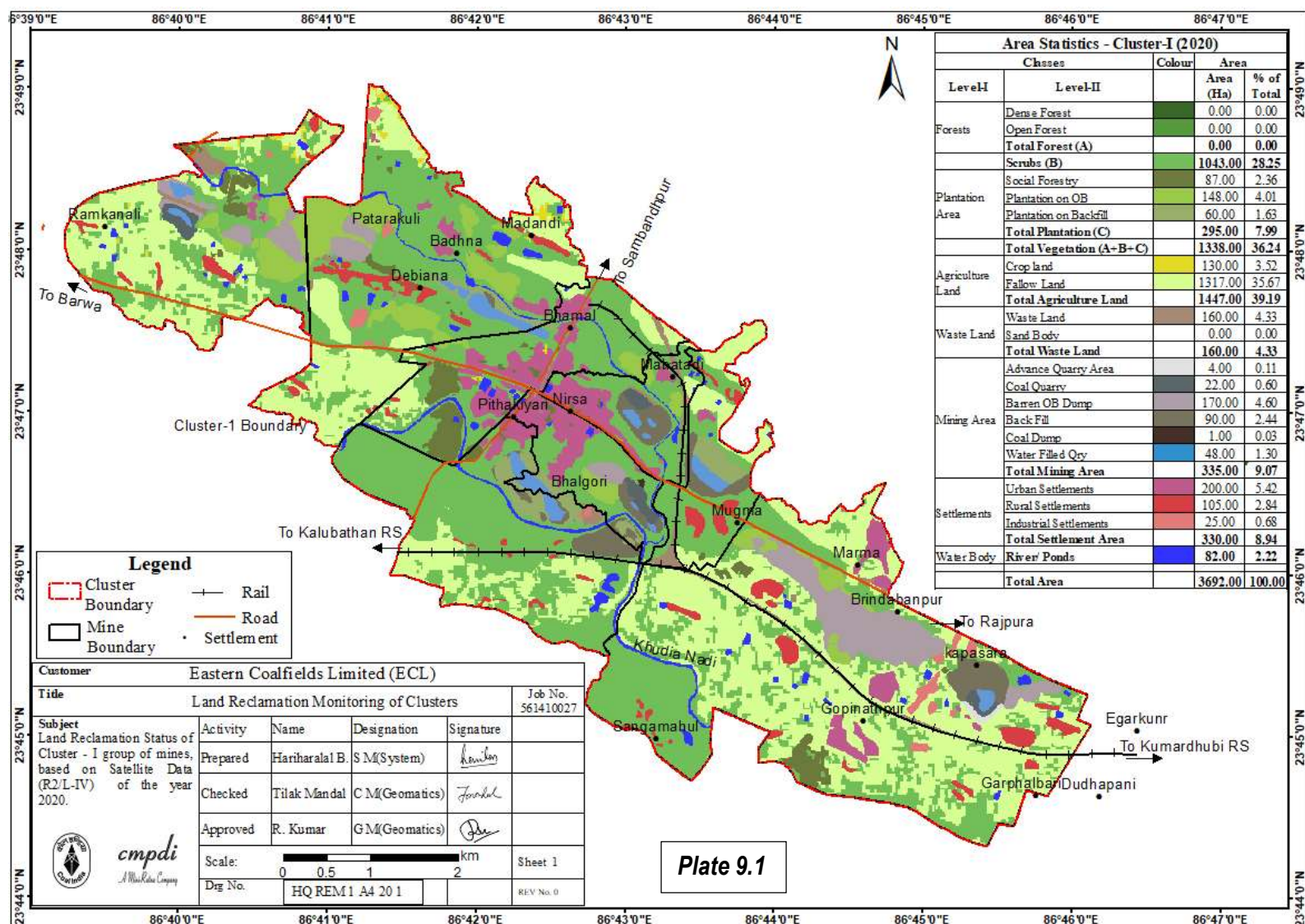
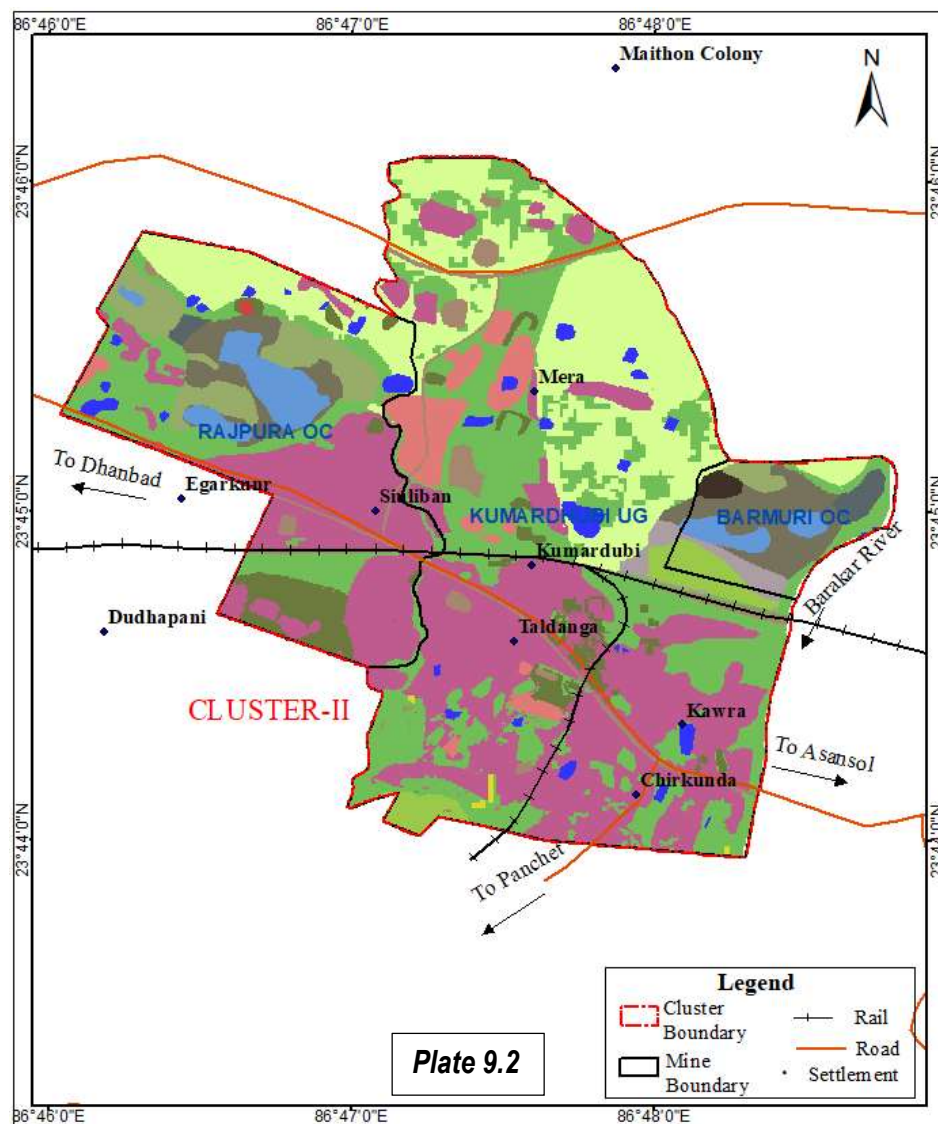


Fig. 9.1: Project wise Land Reclamation Status in year 2020 for ECL

Table 9.2

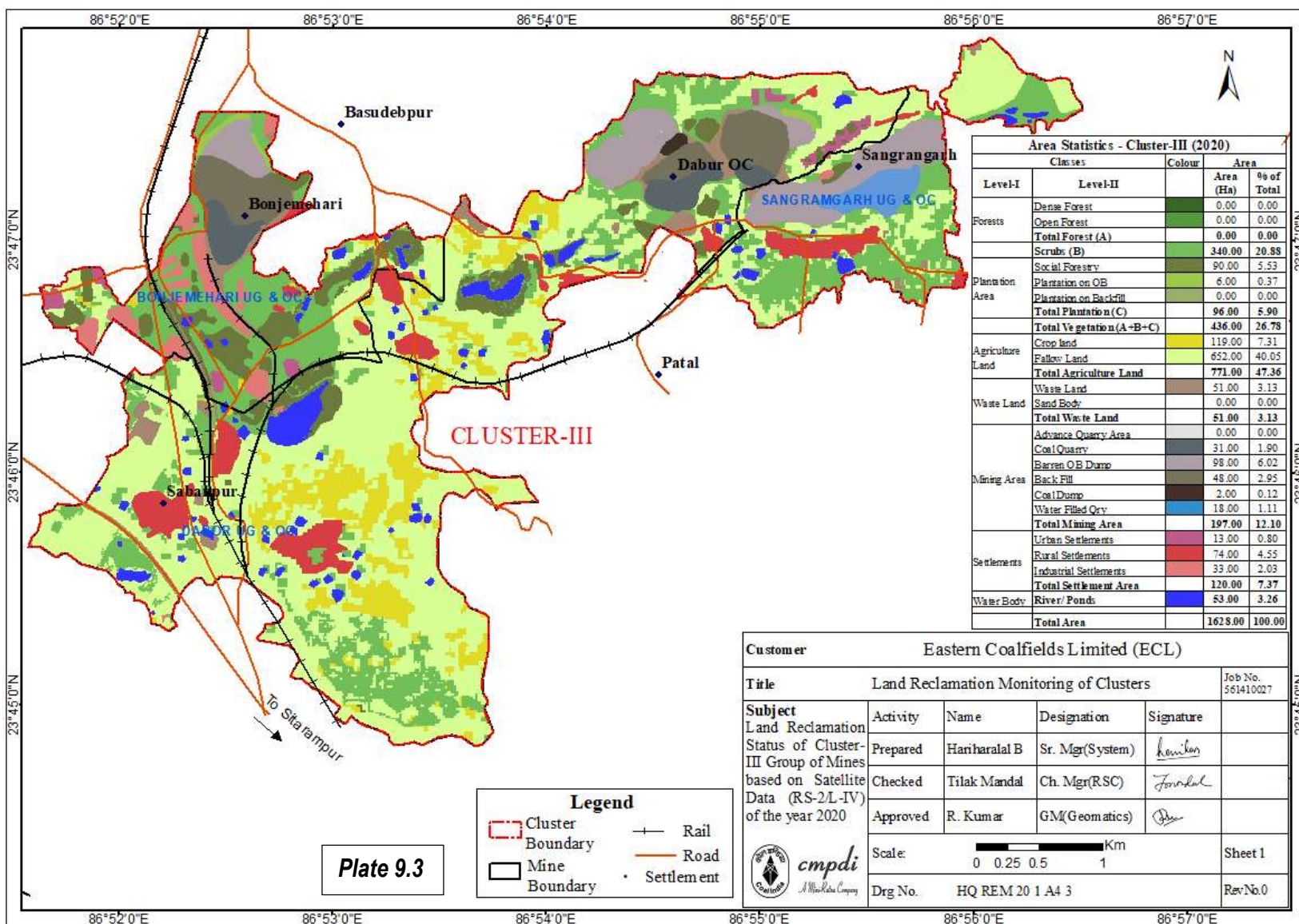
Cluster/ Project wise Area Statistics of Land Use/ Cover in 4 Clusters of (UG+OC) mines and 3 OCPs of ECL based on Satellite data of the Year 2020																	
(Area in Hectare)																	
		CLUSTER I		CLUSTER II		CLUSTER III		CLUSTER IV		CHITRA-EAST		MOHANPUR		HURRA-C		TOTAL	
		Area	%	Area	%	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	45.00	4.76	45.00	0.41
	Open Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.96	2.38	0.00	0.00	350.00	37.00	366.96	3.37
	Total Forest	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	16.96	2.38	0.00	0.00	395.00	41.75	411.96	3.79
SCRUBS	Scrubs	1043.00	28.25	275.00	27.01	340.00	20.88	440.00	16.17	128.70	18.03	39.91	24.20	205.00	21.67	2471.61	22.71
PLANTATION	Social Forestry/Avenue Plantation	87.00	2.36	37.00	3.63	90.00	5.53	30.00	1.10	27.99	3.92	6.00	3.64	0.00	0.00	277.99	2.55
	Plantation on OB Dump	148.00	4.01	17.00	1.67	6.00	0.37	23.00	0.85	14.90	2.09	11.00	6.67	0.00	0.00	219.90	2.02
	Plantation on Backfill (Biological Reclamation)	60.00	1.63	35.00	3.44	0.00	0.00	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	96.00	0.88
	Total Plantation	295.00	7.99	89.00	8.74	96.00	5.90	54.00	1.98	42.89	6.01	17.00	10.31	0.00	0.00	593.89	5.46
	Total Vegetation	1338.00	36.24	364.00	35.76	436.00	26.78	494.00	18.16	188.55	26.41	56.91	34.51	600.00	63.42	3477.46	31.95
ACTIVE MINING	Coal Dump	1.00	0.03	3.00	0.29	2.00	0.12	4.00	0.15	5.98	0.84	1.00	0.61	0.00	0.00	16.98	0.16
	Coal Quarry	22.00	0.60	7.00	0.69	31.00	1.90	42.00	1.54	74.68	10.46	13.00	7.88	0.00	0.00	189.68	1.74
	Advance Quarry Site	4.00	0.11	0.00	0.00	0.00	0.00	3.00	0.11	0.00	0.00	3.00	1.82	0.00	0.00	10.00	0.09
	Quarry Filled With Water	48.00	1.30	22.00	2.16	18.00	1.11	10.00	0.37	3.06	0.43	2.00	1.21	0.00	0.00	103.06	0.95
	Total Area under Active Mining	74.00	2.00	29.00	2.85	49.00	3.01	55.00	2.02	77.74	10.89	18.00	10.92	0.00	0.00	302.74	2.78
	Barren OB Dump	170.00	4.60	10.00	0.98	98.00	6.02	60.00	2.21	47.54	6.66	33.00	20.01	0.00	0.00	418.54	3.85
RECLAIMED	Area Under Backfilling (Technical Reclamation)	90.00	2.44	48.00	4.72	48.00	2.95	1.00	0.04	31.81	4.46	22.00	13.34	0.00	0.00	240.81	2.21
	Total Area under Technical Reclamation	90.00	2.44	48.00	4.72	48.00	2.95	1.00	0.04	31.81	4.46	22.00	13.34	0.00	0.00	240.81	2.21
	Total Area under Mine Operation	335.00	9.07	90.00	8.84	197.00	12.10	120.00	4.41	163.07	22.84	74.00	44.87	0.00	0.00	979.07	9.00
WASTELAND	Waste Lands	160.00	4.33	33.00	3.24	51.00	3.13	47.00	1.73	90.39	12.66	13.00	7.88	52.00	5.50	446.39	4.10
	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
	Total Wasteland	160.00	4.33	33.00	3.24	51.00	3.13	47.00	1.73	90.39	12.66	13.00	7.88	52.00	5.50	446.39	4.10
WATERBODIES	Reservoir, Nallah, Ponds	82.00	2.22	17.00	1.67	53.00	3.26	65.00	2.39	5.26	0.74	1.00	0.61	1.00	0.11	224.26	2.06
	Total Waterbodies	82.00	2.22	17.00	1.67	53.00	3.26	65.00	2.39	5.26	0.74	1.00	0.61	1.00	0.11	224.26	2.06
AGRICULTURE	Crop Lands	130.00	3.52	2.00	0.20	119.00	7.31	245.00	9.00	3.45	0.48	0.00	0.00	11.00	1.16	510.45	4.69
	Fallow Lands	1317.00	35.67	185.00	18.17	652.00	40.05	1616.00	59.39	238.51	33.40	12.00	7.28	275.00	29.07	4295.51	39.47
	Total Agriculture	1447.00	39.19	187.00	18.37	771.00	47.36	1861.00	68.39	241.96	33.89	12.00	7.28	286.00	30.23	4805.96	44.16
SETTLEMENTS	Urban Settlement	200.00	5.42	290.00	28.49	13.00	0.80	10.00	0.37	12.46	1.75	0.00	0.00	0.00	0.00	525.46	4.83
	Rural Settlement	105.00	2.84	4.00	0.39	74.00	4.55	120.00	4.41	7.72	1.08	7.00	4.24	7.00	0.74	324.72	2.98
	Industrial Settlement	25.00	0.68	33.00	3.24	33.00	2.03	4.00	0.15	4.59	0.64	1.00	0.61	0.00	0.00	100.59	0.92
	Total Settlements	330.00	8.94	327.00	32.12	120.00	7.37	134.00	4.92	24.77	3.47	8.00	4.85	7.00	0.74	950.77	8.74
	Grand Total	3692.00	100.00	1018.00	100.00	1628.00	100.00	2721.00	100.00	714.00	100.00	164.91	100.00	946.00	100.00	10883.91	100.00

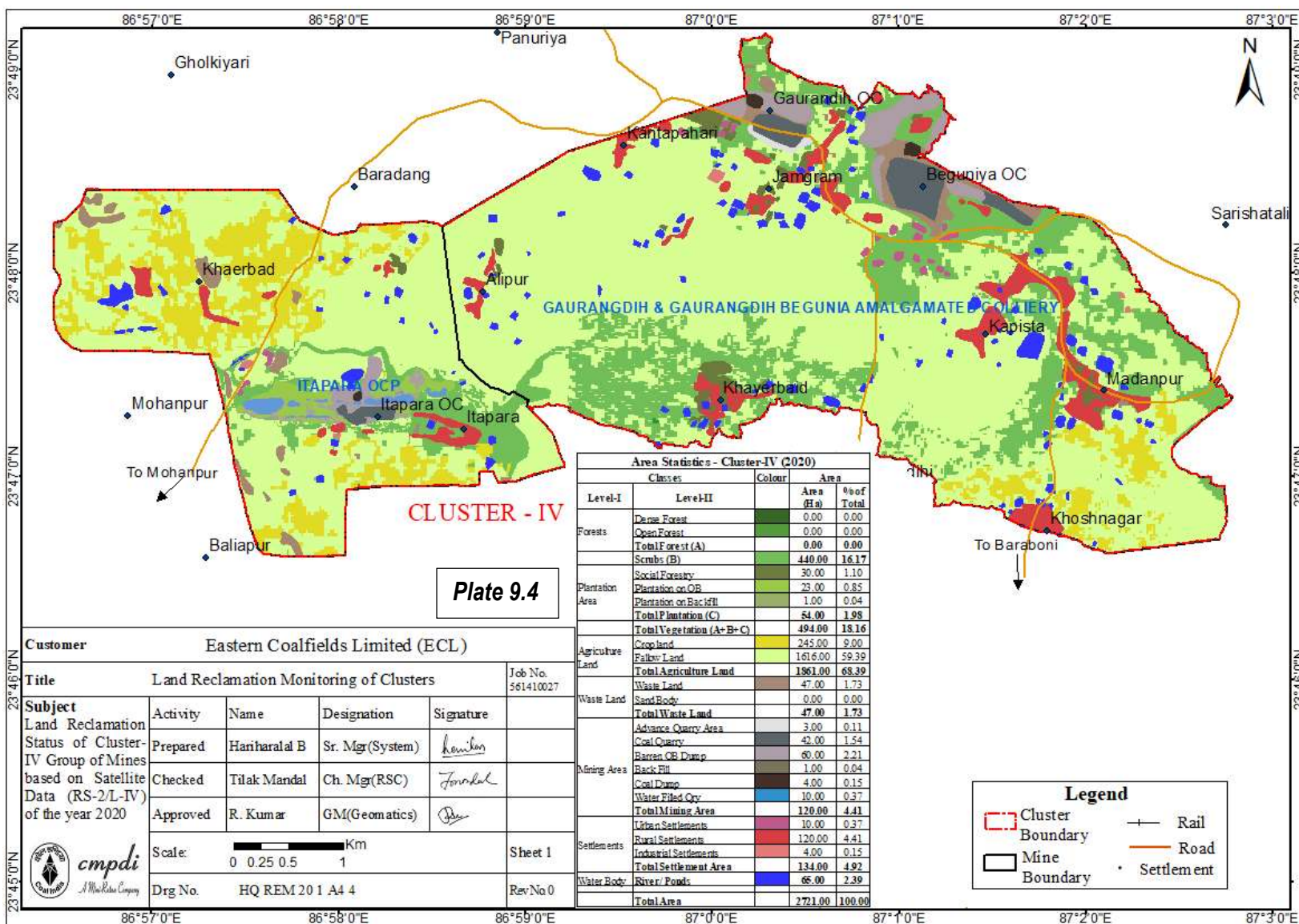


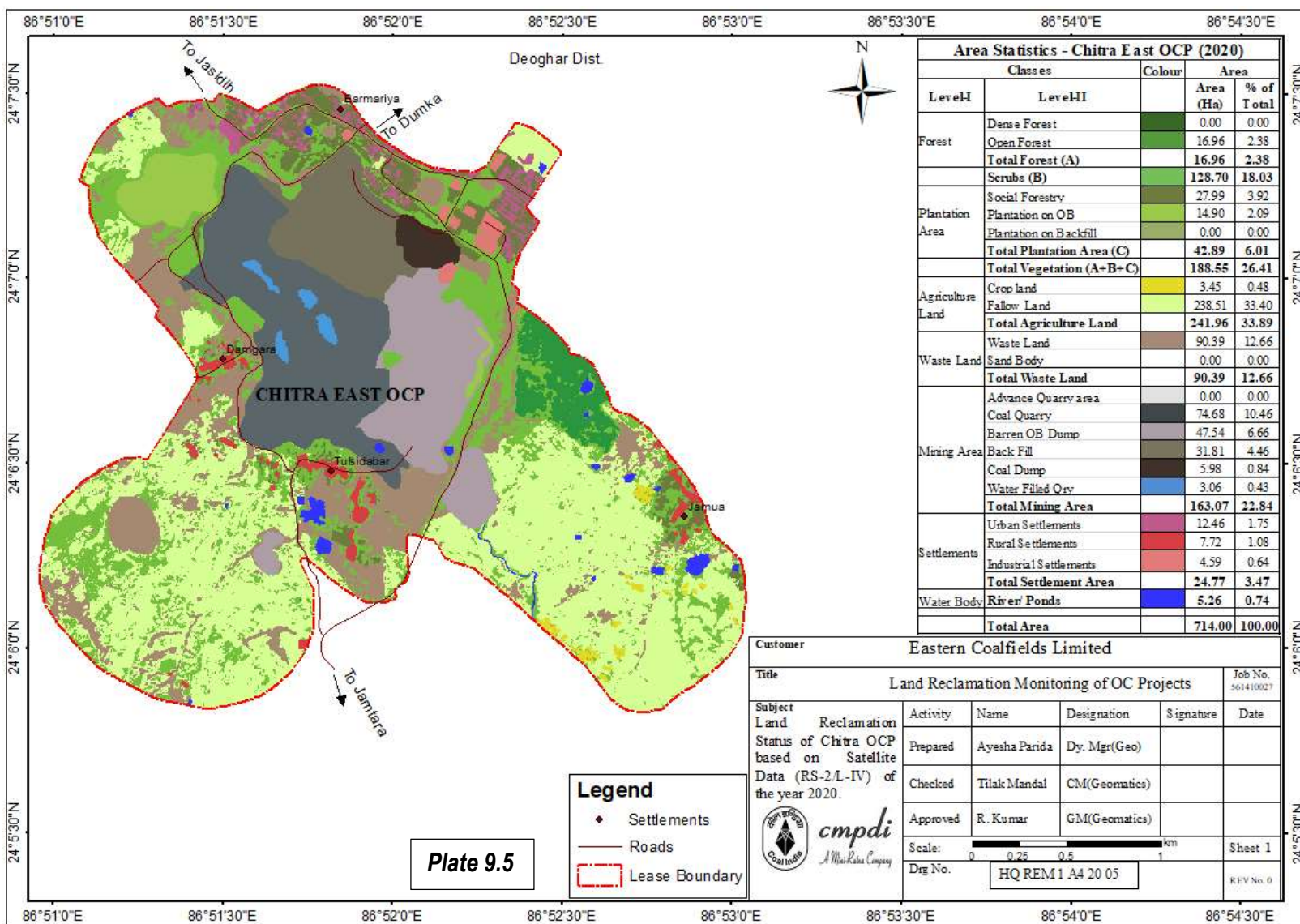


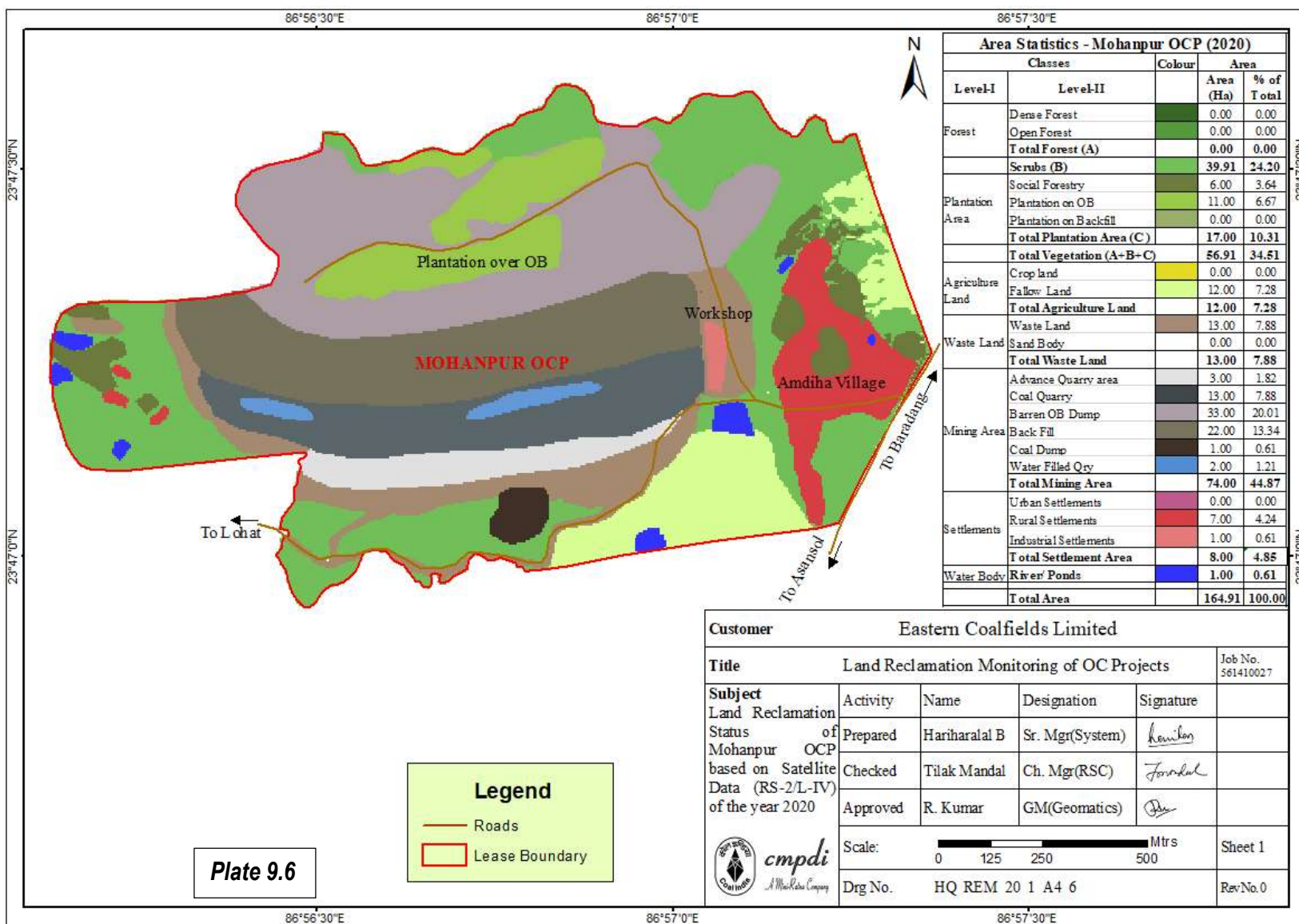
Area Statistics - Cluster-II (2020)				
Classes		Colour	Area	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		0.00	0.00
	Scrubs (B)		275.00	27.01
Plantation Area	Social Forestry		37.00	3.63
	Plantation on OB		17.00	1.67
	Plantation on Backfill		35.00	3.44
	Total Plantation (C)		89.00	8.74
	Total Vegetation (A+B+C)		364.00	35.76
Agriculture Land	Crop land		2.00	0.20
	Fallow Land		185.00	18.17
	Total Agriculture Land		187.00	18.37
Waste Land	Waste Land		33.00	3.24
	Sand Body		0.00	0.00
	Total Waste Land		33.00	3.24
Mining Area	Advance Quarry Area		0.00	0.00
	Coal Quarry		7.00	0.69
	Barren OB Dump		10.00	0.98
	Back Fill		48.00	4.72
	Coal Dump		3.00	0.29
	Water Filled Qry		22.00	2.16
	Total Mining Area		90.00	8.84
	Urban Settlements		290.00	28.49
Settlements	Rural Settlements		4.00	0.39
	Industrial Settlements		33.00	3.24
	Total Settlement Area		327.00	32.12
Water Body	River/Ponds		17.00	1.67
	Total Area		1018.00	100.00

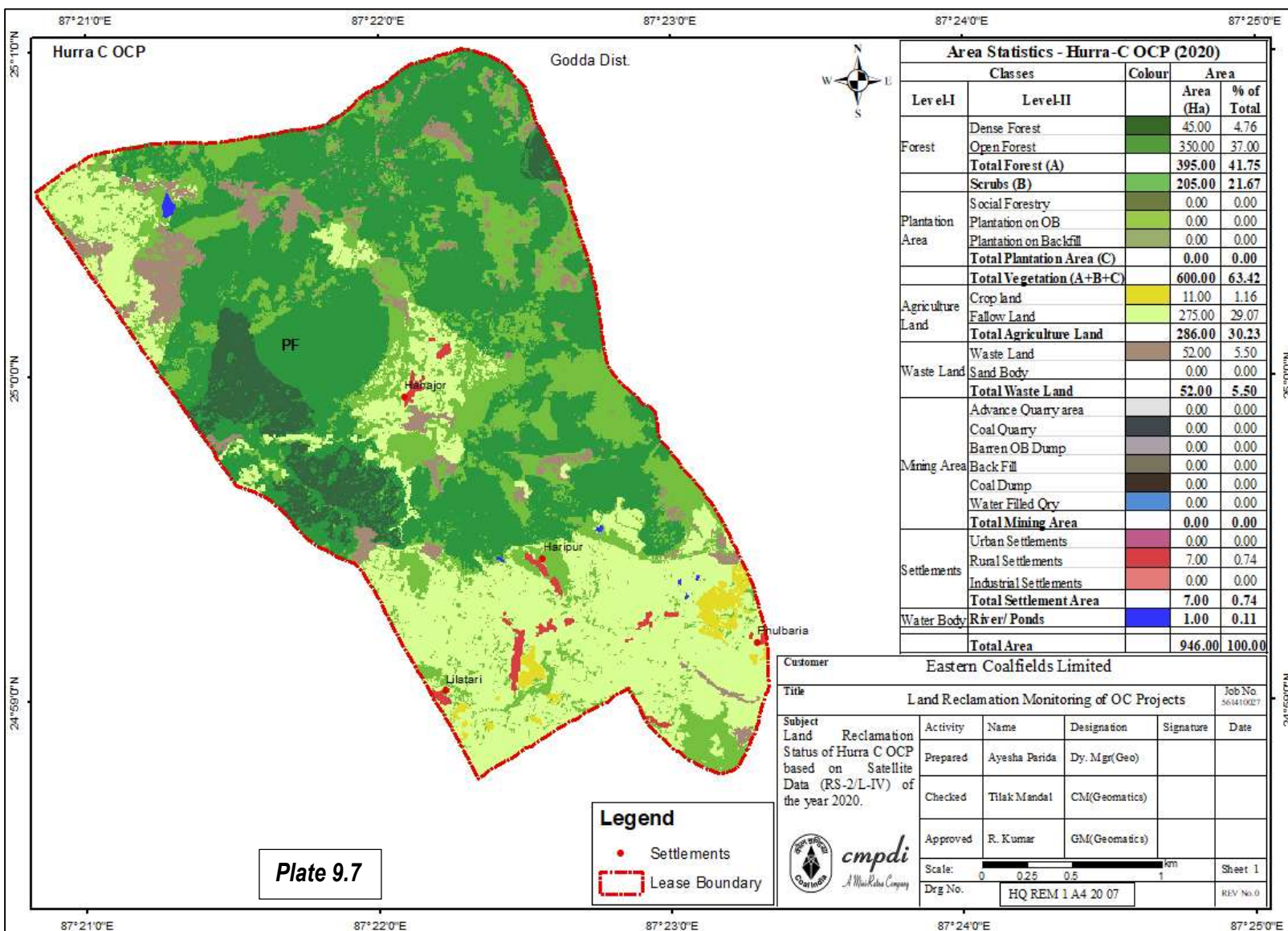
Customer Eastern Coalfields Limited (ECL)				
Title Land Reclamation Monitoring of Clusters				Job No. 561410027
Subject Land Reclamation Status of Cluster-II Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2020	Activity	Name	Designation	Signature
	Prepared	Hariharalal B	Sr. Mgr(System)	<i>Hariharalal B</i>
	Checked	Tilak Mandal	Ch. Mgr(RSC)	<i>Tilak Mandal</i>
	Approved	R. Kumar	GM(Geomatics)	<i>R. Kumar</i>
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Drg No. HQ REM 20 1 A4 3		Rev.No.0		











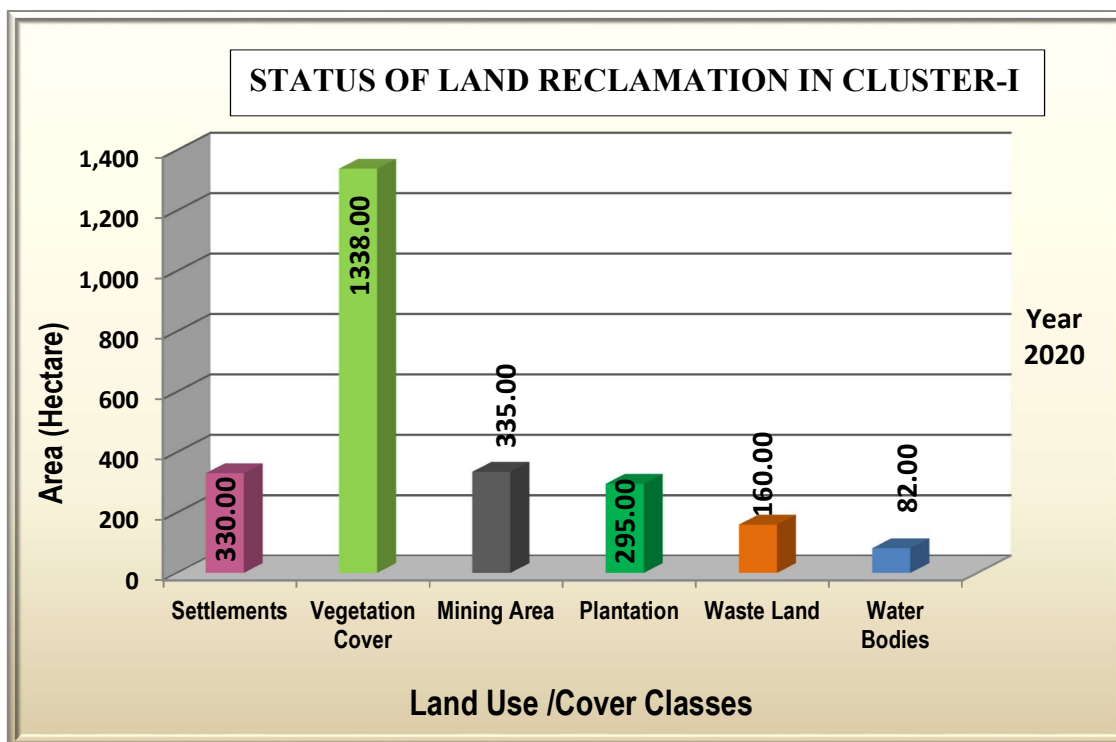


Figure-9.2

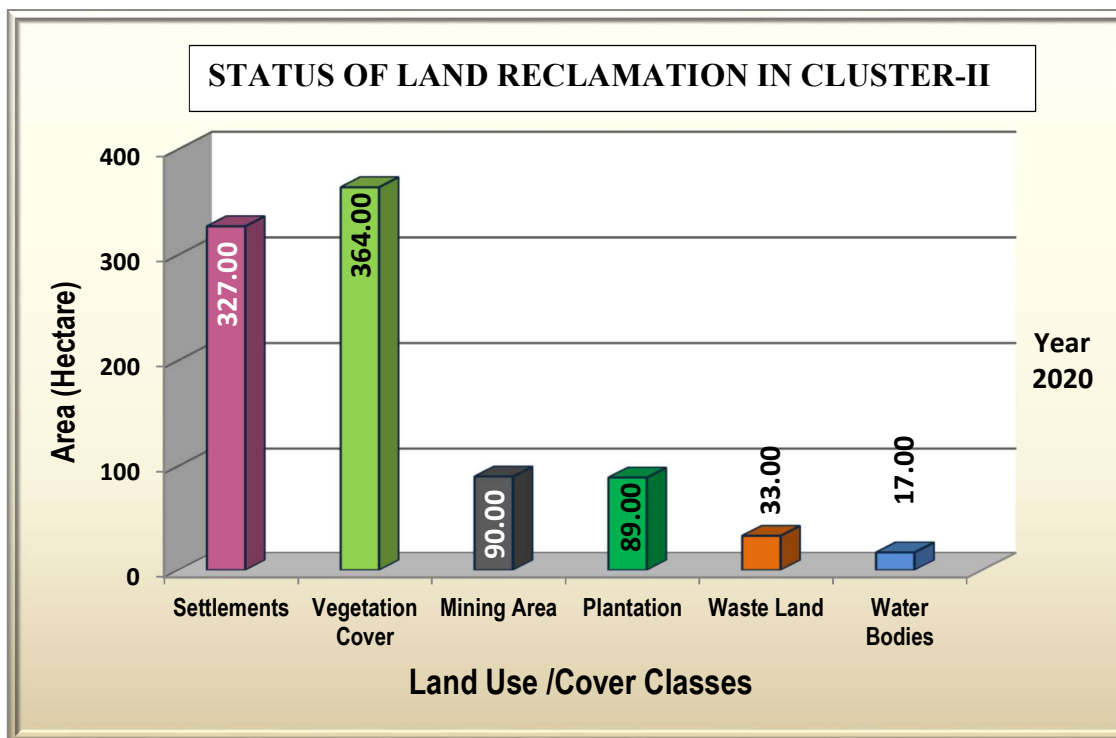


Figure-9.3

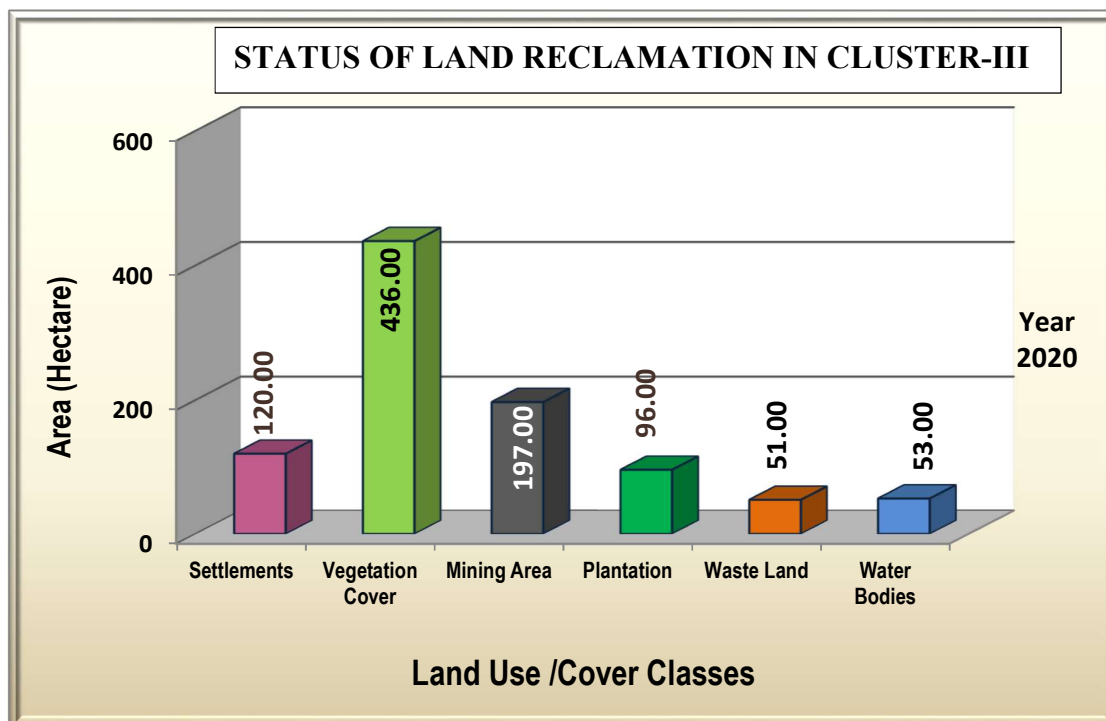


Figure-9.4

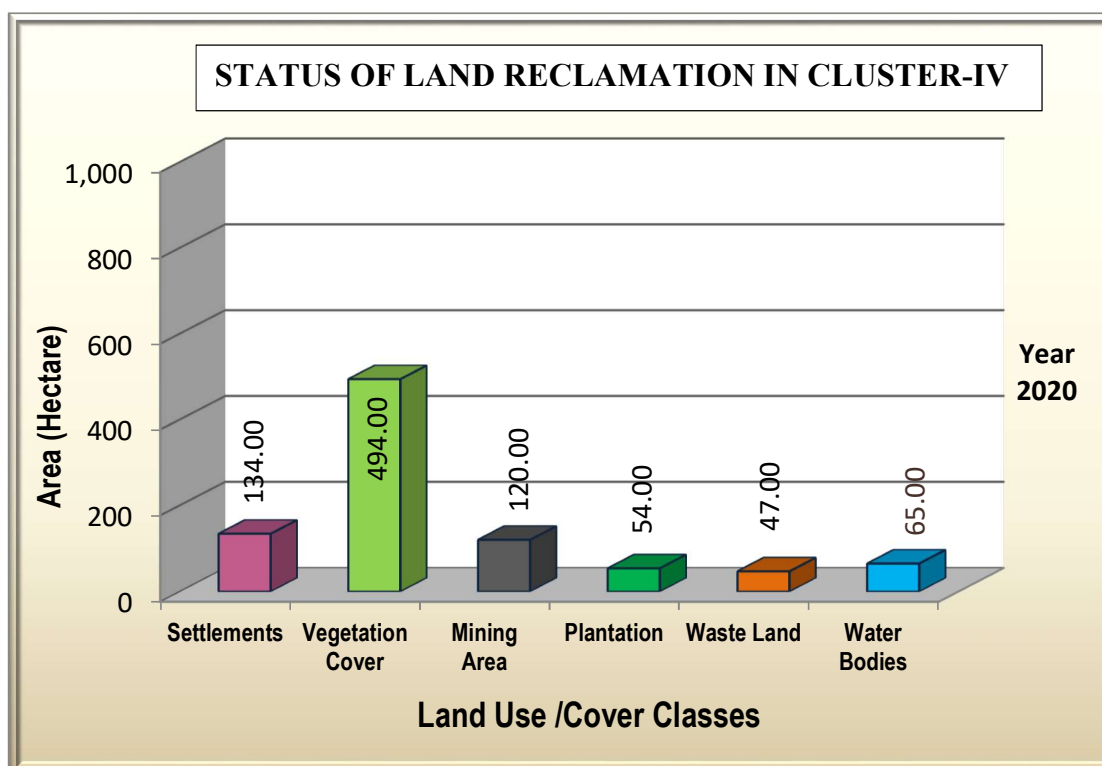


Figure-9.5

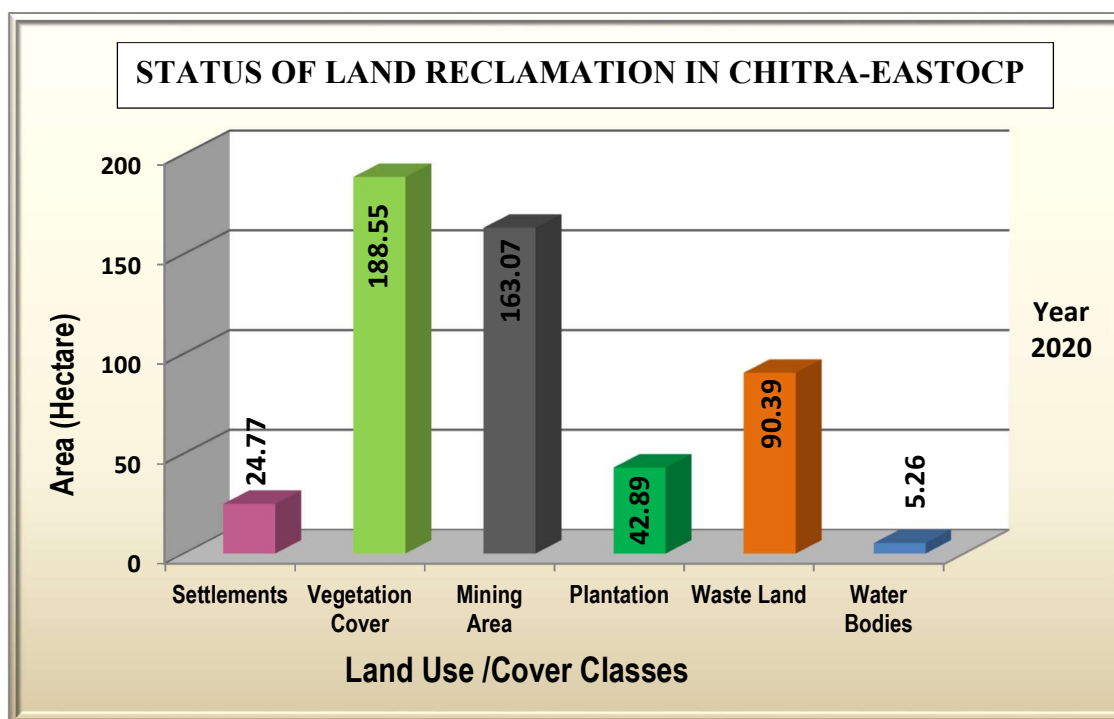


Figure-9.6

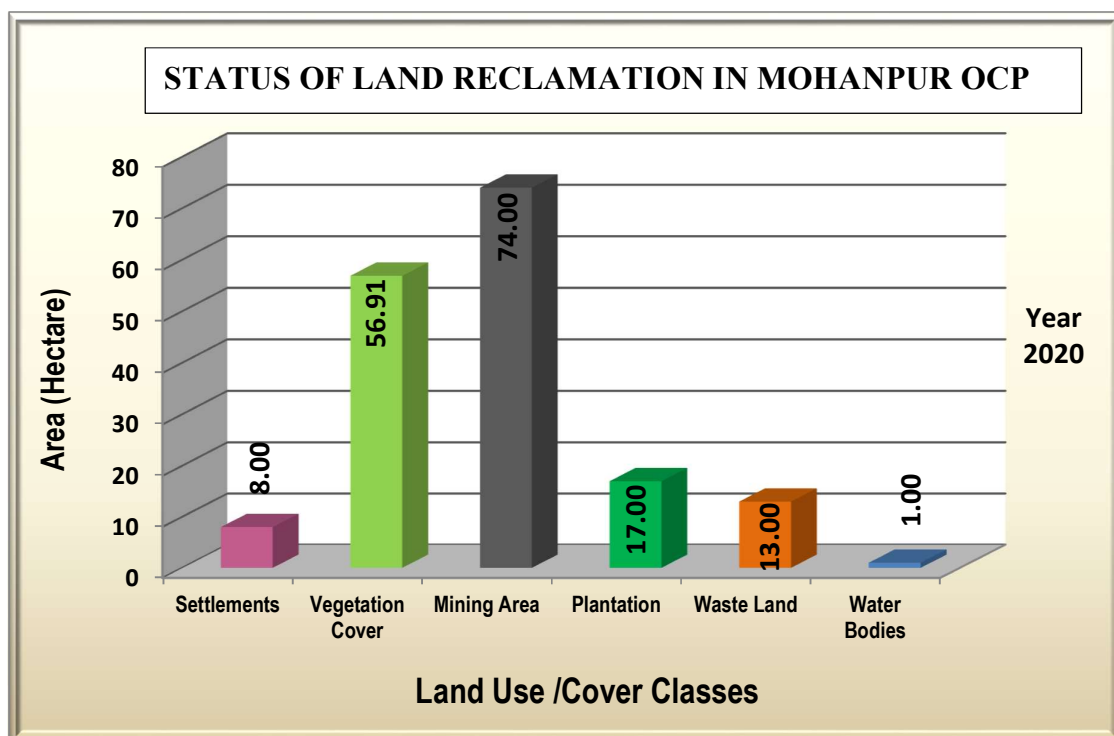


Figure-9.7

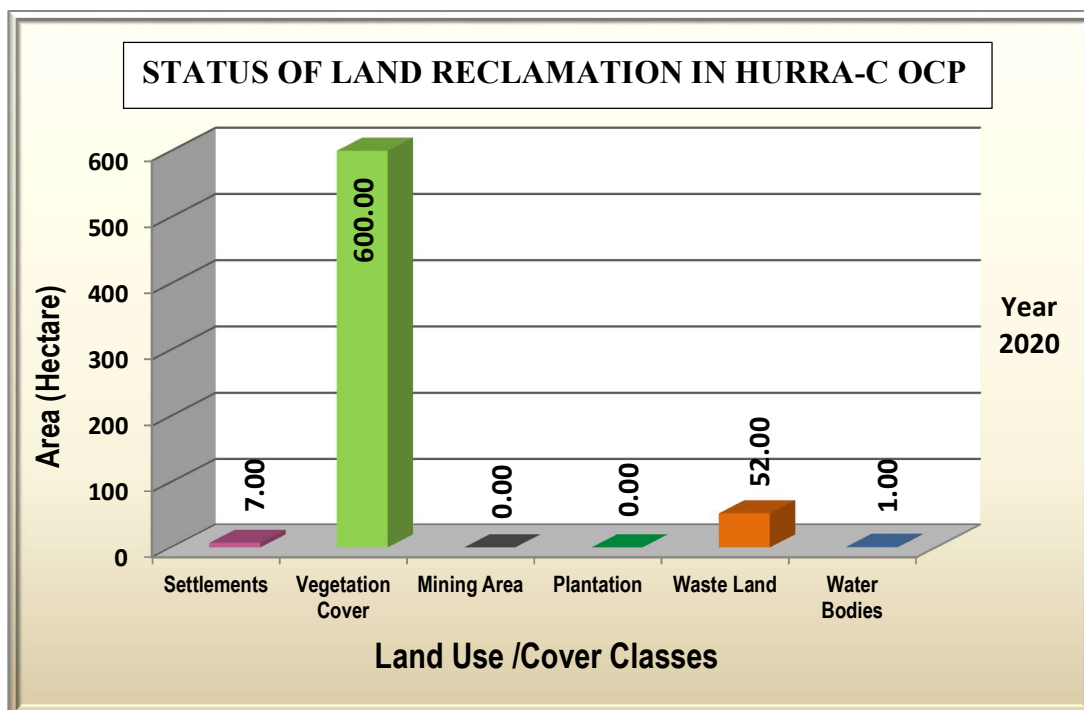


Figure-9.8



Photo -9. 1 Plantation on OB Dump area in Dabor OCP, Cluster-III



Photo -9.2 Plantation on OB Dump area in Chapapur OCP, Cluster-I



Photo 9. 3 Plantation on OB Dump area in Nirsa OCP Cluster II



Photo 9. 4 Plantation on OB Dump in Chitra East OCP



Photo -9.5 Plantation on OB Dump in Mohanpur OCP

MAHANADI COALFIELD LIMITED

10.0 Land Reclamation Status in Mahanadi Coalfields Limited

10.1 Following 8 projects (UG+OC) mines producing less than 5 million m³. (Coal + OB together) of Mahanadi Coalfields Ltd. have been taken up for land reclamation monitoring during the year 2020-21:

- Lilari OCP
- Kulda OCP
- Orient 1 & 2 UG
- Orient 3 UG
- Balanda OCP
- Nandira UG
- Chhendipada OCP
- Subhadra OCP

10.2 Project wise Land Reclamation status of above mentioned projects in MCL is given in Table 10.1 and also shown graphically in Fig 10.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2020 are shown in the Table - 10.2. Land use maps derived from satellite data are shown in Plate 10.1 - 10.8. Different land use classes based on satellite data are depicted in Bar Charts in Fig. 10.2 – 10.9

10.3 Study reveals that out of total mine leasehold area of 6158.38 Hectares of the above mentioned 05 OC and 03 UG mines of MCL taken up for this study in 2020-21; total excavated area is 510.94 hectares, out of which 226.16 hectares (44.26%) has been planted (*Biologically Reclaimed*), 126.56 Hectare area (24.77%) is under Backfilling (*Technically Reclaimed*) and balance 158.22 Hectare (30.97%) is under active mining. It is also evident from analysis that 352.72 Ha (69.03%) area of the 8 nos. of UG and OC mines together is under total reclamation (Biological and Technical).

- 10.4** After analyzing the satellite data of year 2017 vs. 2020 it is evident that total area under plantation (Green Cover) carried out on backfilled area, OB dumps as well as under social forestry in above (OC+UG) mines of MCL has increased from 57.49 Hectare (Yr 2017) to 309.49 Hectare (Yr 2020). This increase of 252.00 Ha in plantation area in the year 2020 is due to addition of 3 UG and 2 OC projects in the year 2020.
- 10.5** It is revealed that excavated area and area under plantation on backfill (Biological Reclamation) in Lilari OCP have decreased from 71.02 Ha (Yr 2017) to 66.29 Ha (Yr 2020) and 30 Ha in the year 2017 to 24.80 Ha in the year 2020 respectively. Whereas area under social forestry has increased from 1.80 Ha (Yr 2017) to 2.53 Ha (Yr 2020). The decrease of 4.73 Ha in excavated area and 5.20 Ha area under plantation on backfill is due to change in shape and area of leasehold boundary of the above project.
- 10.6** On comparing the status of land reclamation for the year 2017 with respect to the year 2020 in different projects. It is evident from analysis that area of land reclamation has increased from 79.80 Ha (Yr 2017) to 352.72 Ha (Yr 2020). This increase of 272.92 Ha area under reclamation is mainly due to increase in area under land reclamation in Lilari and Kulda OCPs and also due to addition of Balanda and Subhadra OC projects in the year 2020-21.
- 10.7** In Chhendipada OCP, total area under plantation increased from 4.40 Ha. (Yr 2017) to 9.37 Ha. (Yr 2020) which indicate that MCL is committed for reclamation of mined land for maintaining the ecological balance in the region.
- 10.8** It is important to mention here that leasehold boundary of Orient 1 & 2 UG overlaps with the leasehold boundary of Lajkura OCP and Orient 3 UG. Therefore, to avoid data duplicity in terms surface features/classes pertaining to Lajkura OCP reflecting in the Area Statistics of Orient 1&2 UG and Orient 3 UG, the overlapping leasehold area of Lajkura OCP has been deducted as per request from MCL. (Refer MCL Letter No. MCL/GM/OA/ENVT/2021/675 dtd. 31.05.2021). Furthermore, the leasehold boundaries of Orient 1&2 and Orient 3 UG mines were also found to be overlapping. Moreover, it

may be noted that Land Reclamation monitoring of Lajkura OC based on Satellite Data of year 2020 has been carried out under more than 5 mcm category.

10.9 Out of the above mentioned projects taken up for monitoring, Subhadra OC is an upcoming project and the current status can be used as base data for comparing the status of land reclamation monitoring during cycle of three years.

10.10 Out of the 8 projects of MCL, Balanda OCP ranks on top for land reclamation (92.60%) followed by Lilari OCP (91.67%), Chhendipada OCP (74.04%) in the year 2020.

Table 10.1

Project wise Land Reclamation Status in 5 OC and 3 UG mines of Mahanadi Coalfields Ltd based on Satellite data of the year 2020

SL No.	Project	Total Leasehold Area		Plantation								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 Excavated / Backfilled Area		Plantation on External OB Dumps		Social Forestry, Avanne Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
1	Lilari OC	141.81	201.00	25.22	35.97	30.00	24.80	20.10	23.85	1.80	2.53	15.80	5.52	71.02	66.29	51.90	51.18	55.22	60.77
				35.51%	54.26%	42.24%	37.41%					22.25%	8.33%			36.60%	25.46%	77.75%	91.67%
2	Kulda OC	538.10	634.21	13.26	52.62	0.00	0.00	0.00	0.00	1.19	1.19	102.68	130.52	115.94	183.14	1.19	1.19	13.26	52.62
				11.44%	28.73%	0.00%	0.00%					88.56%	71.27%			0.22%	0.19%	11.44%	28.73%
3	Balanda OC	-	351.22	-	31.11	-	196.90	-	0.00	-	6.66	-	18.21	-	246.22	-	203.56	-	228.01
					12.64%		79.97%						7.40%				57.96%		92.60%
4	Chhendipada OC	20.31	24.30	10.14	6.86	1.18	4.46	2.12	2.84	1.10	2.07	3.26	3.97	14.58	15.29	4.40	9.37	11.32	11.32
				69.55%	44.87%	8.09%	29.17%					22.36%	25.96%			21.66%	38.56%	77.64%	74.04%
5	Subhadra OC	-	1111.85	-	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%
6	Orient 1&2 UG	-	1144.28	-	0.00	-	0.00	-	0.00	-	21.73	-	0.00	-	0.00	-	21.73	-	0.00
					0.00%		0.00%						0.00%				1.90%		0.00%
7	Orient 3 UG	-	981.84	-	0.00	-	0.00	-	0.00	-	18.31	-	0.00	-	0.00	-	18.31	-	0.00
					0.00%		0.00%						0.00%				1.86%		0.00%
8	Nandira UG	-	474.00	-	0.00	-	0.00	-	0.00	-	4.15	-	0.00	-	0.00	-	4.15	-	0.00
					0.00%		0.00%						0.00%				0.88%		0.00%
	TOTAL	700.22	4922.70	48.62	126.56	31.18	226.16	22.22	26.69	4.09	56.64	121.74	158.22	201.54	510.94	57.49	309.49	79.80	352.72
				24.12%	24.77%	15.47%	44.26%					60.40%	30.97%			8.21%	6.29%	39.60%	69.03%

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, and Quarry filled with water etc., if any.
4. Social Forestry and Plantation on External OB Dumps are not included in Biological Reclamation and are put under separate categories as shown in the 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. Out of 8 projects taken for Land Reclamation Monitoring in the year 2020-21, comparison has been made for only three projects like Lilari OCP, Kulda OCP and Chhendipada OCP as other 5 projects are taken up for monitoring for the first time in the year 2020.
7. The leasehold areas of Lilari OC, Kulda OC, Orient 1&2 UG, Orient 3 UG, Nandira UG and Chhendipada OC projects are modified as per EC while Leasehold area of Balanda OC and Subhadra OC are as per map provided by area.
8. The leasehold area shown in (Sl. 6 & 7) in the above Table is the net area of these Projects after deducting the common Leasehold area of Lajkura OCP as the leasehold boundaries of these mines are overlapping.
9. The total leasehold area of the above mentioned 8 OC & UG projects without deducting the common leasehold area of Lajkura OC is 6158.38 Ha.

Fig 1: Project Wise Land Reclamation Status of MCL in Year 2020

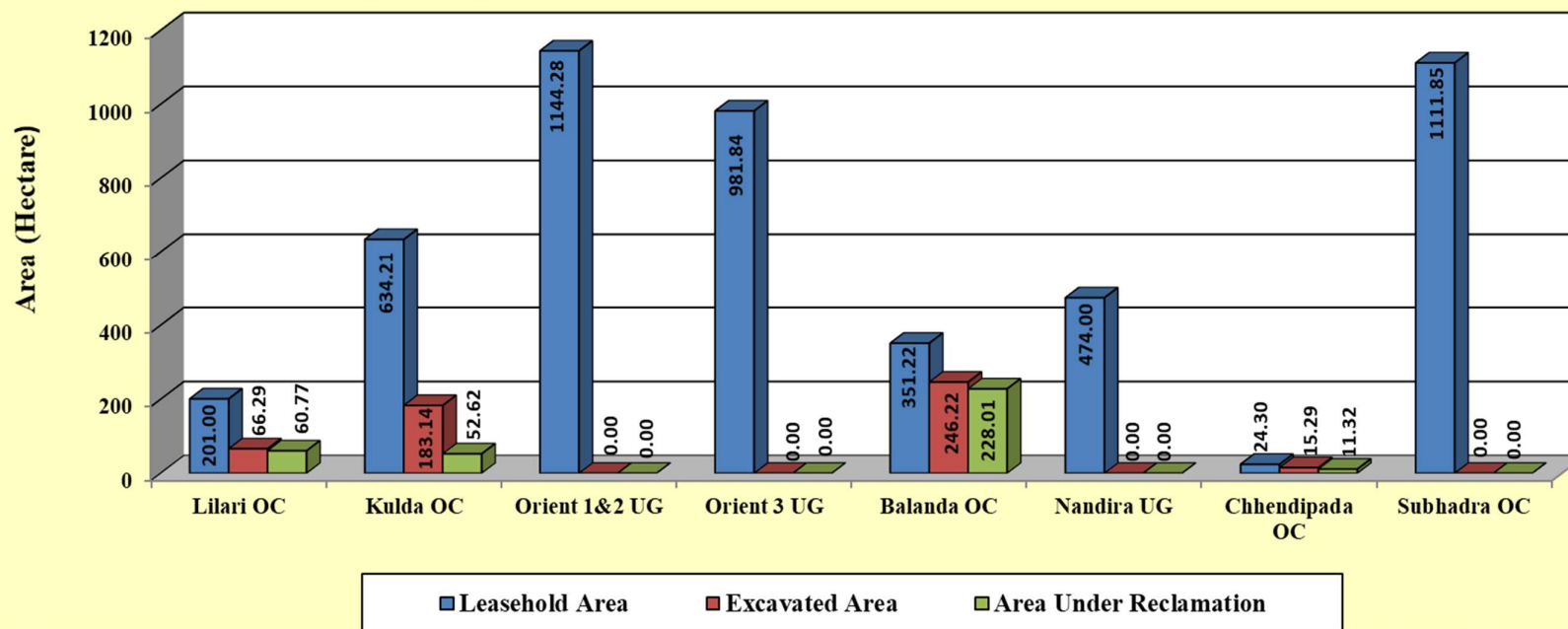
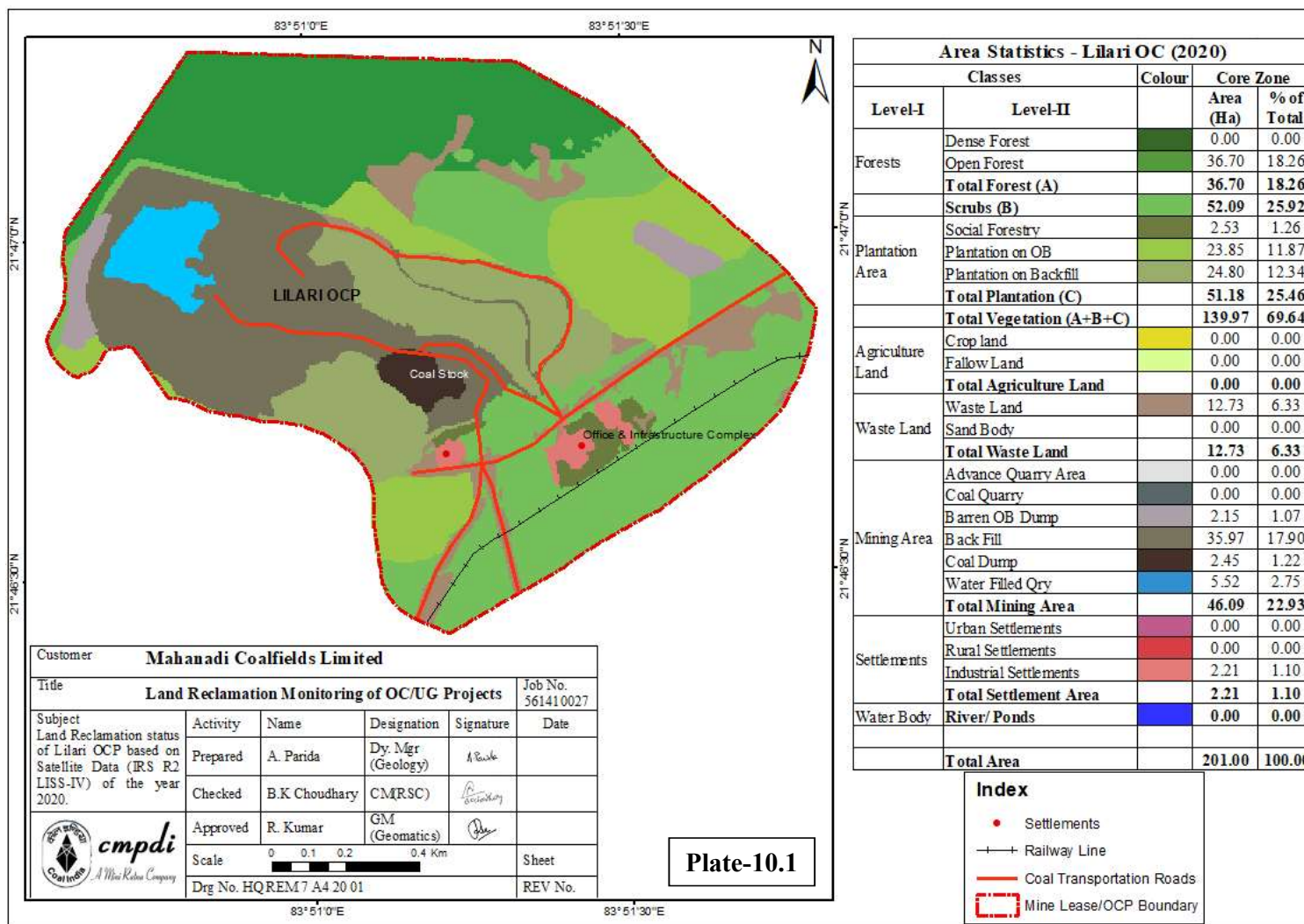
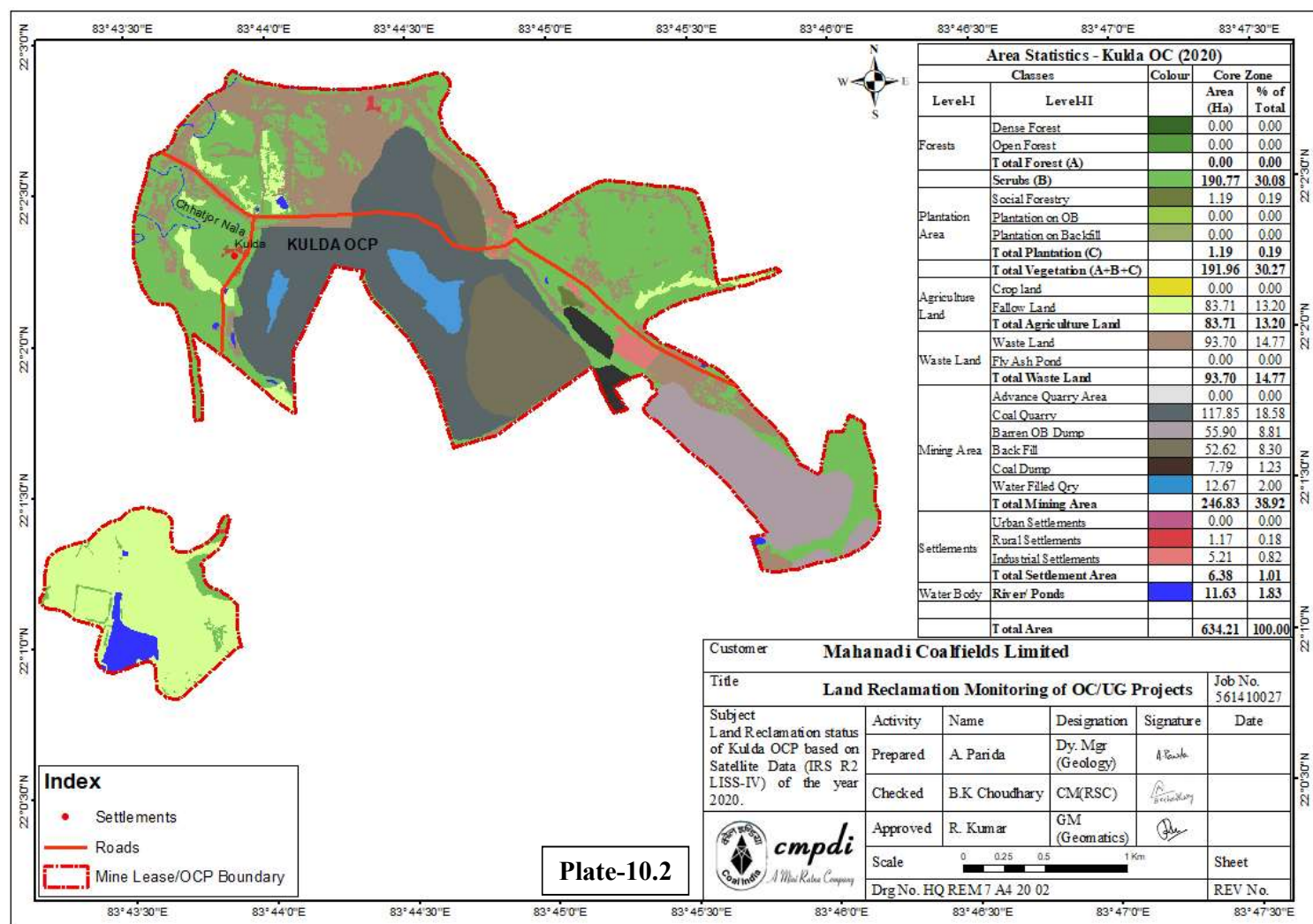


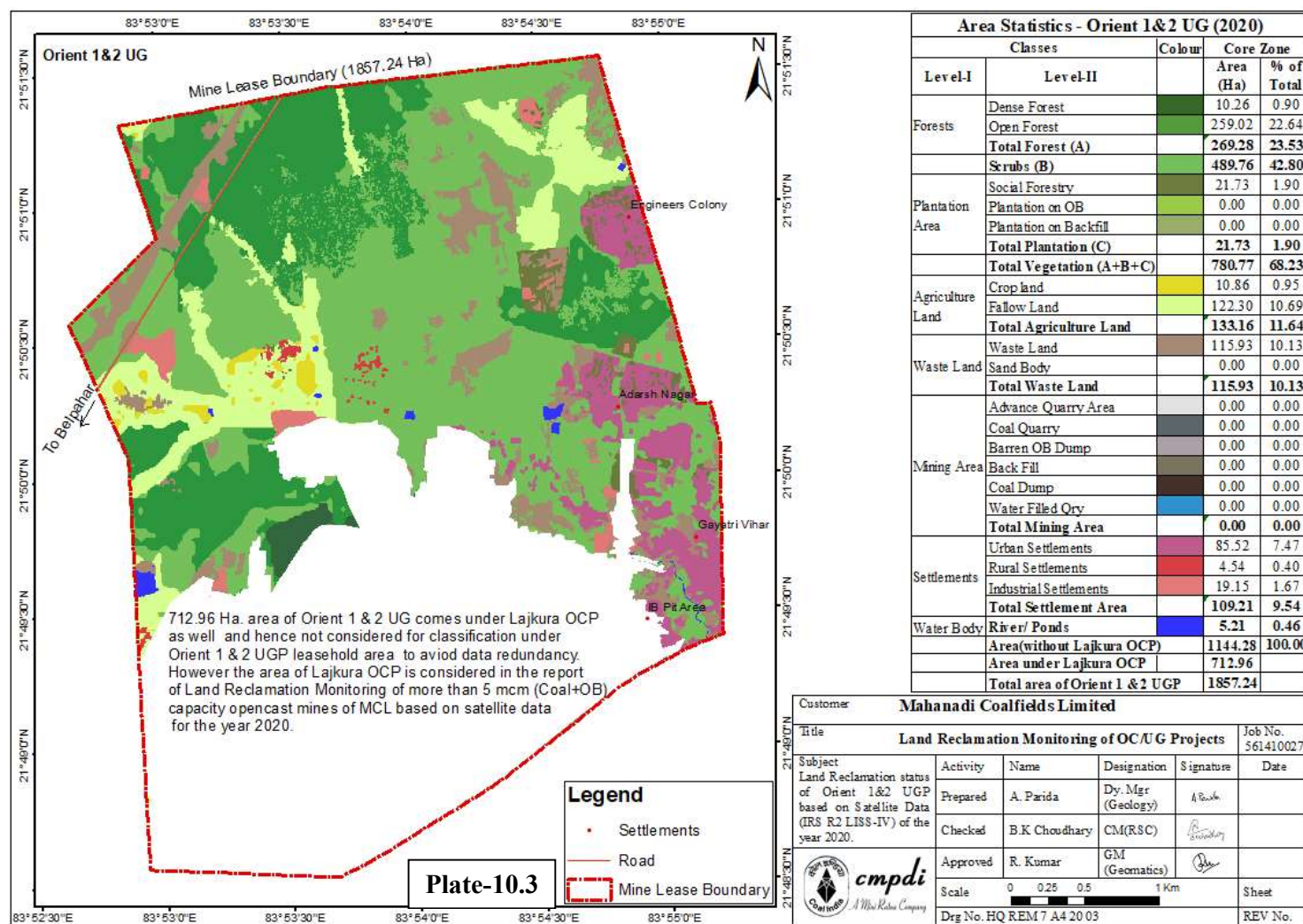
TABLE-10.2
STATUS OF LAND USE/COVER CLASSES/LAND RECLAMATION IN UG & OC MINE PRODUCING (<5 M.C.M OF COAL+OB) OF MCL BASED ON SATELLITE DATA OF THE YEAR 2020

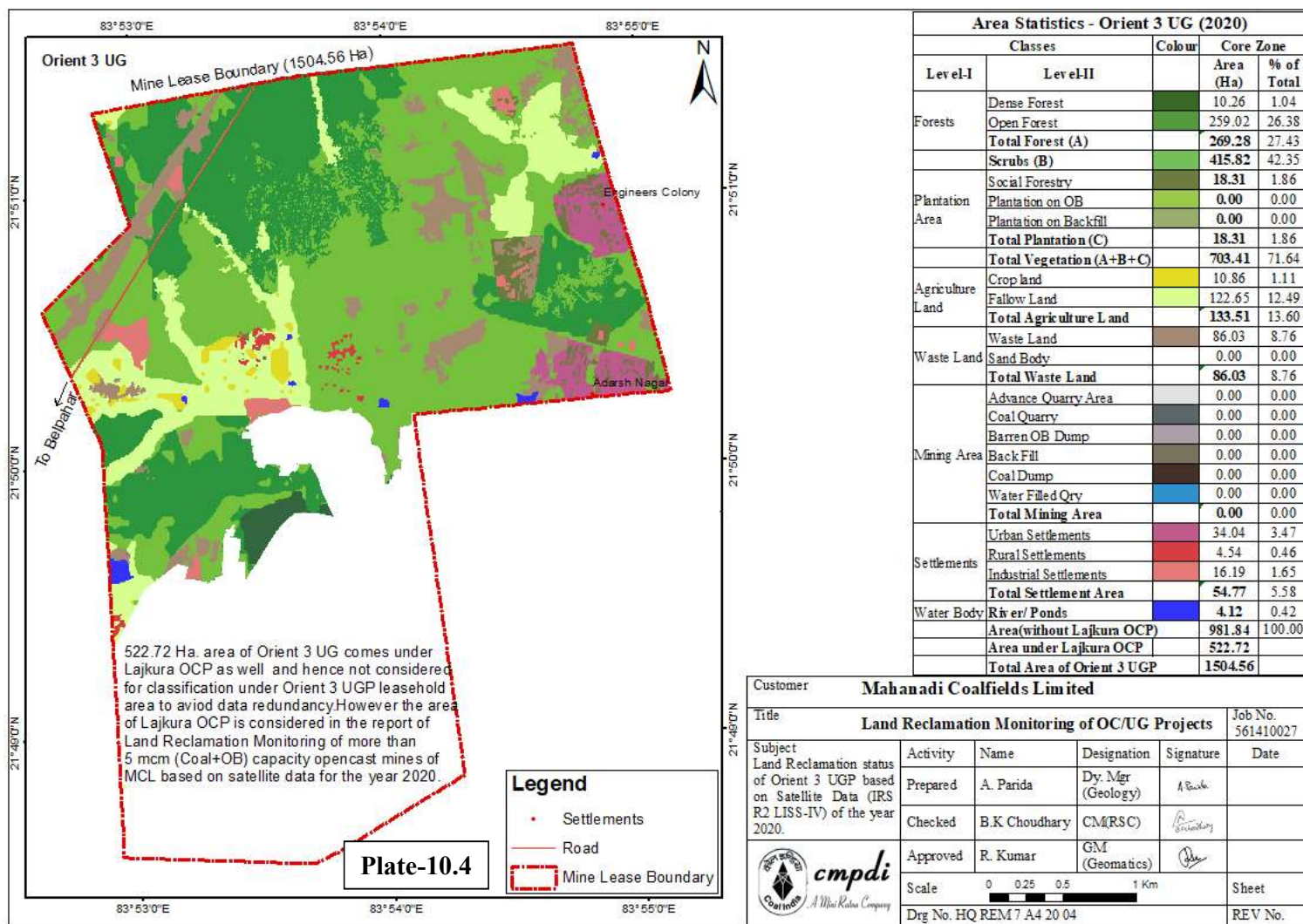
		Lilari OC		Kulda OC		Orient 1&2 UG		Orient 1&2 UG without Lajkura OCP common area*		Orient 3 UG		Orient 3 UG without Lajkura OCP common area**		Balanda OC		Nandira UG		Chhendipada OC		Subhadra OC		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	91.05	4.90	10.26	0.90	91.05	6.05	10.26	1.04	0.00	0.00	195.10	41.16	1.57	6.46	0.00	0.00	378.77	6.15
	Open Forest	36.70	18.26	0.00	0.00	339.75	18.29	259.02	22.64	339.75	22.58	259.02	26.38	0.00	0.00	196.84	41.53	0.00	0.00	62.31	5.60	975.35	15.84
	Total Forest	36.70	18.26	0.00	0.00	430.80	23.20	269.28	23.53	430.80	28.63	269.28	27.43	0.00	0.00	391.94	82.69	1.57	6.46	62.31	5.60	1354.12	21.99
SCRUBS	Scrubs	52.09	25.92	190.77	30.08	586.84	31.60	489.76	42.80	487.09	32.37	415.82	42.35	9.12	2.60	32.11	6.77	1.14	4.69	607.12	54.60	1966.28	31.93
	Social Forestry/Avenue Plantation	2.53	1.26	1.19	0.19	36.69	1.98	21.73	1.90	18.55	1.23	18.31	1.86	6.66	1.90	4.15	0.88	2.07	8.52	0.00	0.00	71.84	1.17
	Plantation on OB Dump	23.85	11.87	0.00	0.00	23.00	1.24	0.00	0.00	11.48	0.76	0.00	0.00	0.00	0.00	0.00	0.00	2.84	11.69	0.00	0.00	61.17	0.99
PLANTATION	Plantation on Backfill (Biological Reclamation)	24.80	12.34	0.00	0.00	13.72	0.74	0.00	0.00	0.00	0.00	0.00	0.00	196.90	56.06	0.00	0.00	4.46	18.35	0.00	0.00	239.88	3.90
	Total Plantation	51.18	25.46	1.19	0.19	73.41	3.95	21.73	1.90	30.03	2.00	18.31	1.86	203.56	57.96	4.15	0.88	9.37	38.56	0.00	0.00	372.89	6.06
	Total Vegetation	139.97	69.64	191.96	30.27	1091.05	58.75	780.77	68.23	947.92	63.00	703.41	71.64	212.68	60.55	428.20	90.34	12.08	49.71	669.43	60.21	3693.29	59.97
ACTIVE MINING	Coal Dump	2.45	1.22	7.79	1.23	4.59	0.25	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	14.83	0.24
	Coal Quarry	0.00	0.00	117.85	18.58	75.26	4.05	0.00	0.00	74.87	4.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	267.98	4.35
	Advance Quarry Site	0.00	0.00	0.00	0.00	10.16	0.55	0.00	0.00	10.03	0.67	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	20.19	0.33
RECLAMATION	Quarry Filled With Water	5.52	2.75	12.67	2.00	4.41	0.24	0.00	0.00	4.41	0.29	0.00	0.00	18.21	5.18	0.00	0.00	3.97	16.34	0.00	0.00	49.19	0.80
	Total Area under Active Mining	5.52	2.75	130.52	20.58	89.83	4.84	0.00	0.00	89.31	5.94	0.00	0.00	18.21	5.18	0.00	0.00	3.97	16.34	0.00	0.00	337.36	5.48
	Barren OB Dump	2.15	1.07	55.90	8.81	12.71	0.68	0.00	0.00	10.84	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	81.60	1.33
WASTE LAND	Area Under Backfilling (Technical Reclamation)	35.97	17.90	52.62	8.30	123.11	6.63	0.00	0.00	46.96	3.12	0.00	0.00	31.11	8.86	0.00	0.00	6.86	28.23	0.00	0.00	296.63	4.82
	Total Area under Technical Reclamation	35.97	17.90	52.62	8.30	123.11	6.63	0.00	0.00	46.96	3.12	0.00	0.00	31.11	8.86	0.00	0.00	6.86	28.23	0.00	0.00	296.63	4.82
	Total Area under Mine Operation	46.09	22.93	246.83	38.92	230.24	12.40	0.00	0.00	147.11	9.78	0.00	0.00	49.32	14.04	0.00	0.00	10.83	44.57	0.00	0.00	730.42	11.86
WATERBODIES	Waste Lands	12.73	6.33	93.70	14.77	205.17	11.05	115.93	10.13	153.63	10.21	86.03	8.76	13.41	3.82	22.91	4.83	1.39	5.72	26.82	2.41	529.76	8.60
	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	74.98	21.35	0.00	0.00	0.00	0.00	3.84	0.35	78.82	1.28
	Total Wasteland	12.73	6.33	93.70	14.77	205.17	11.05	115.93	10.13	153.63	10.21	86.03	8.76	88.39	25.17	22.91	4.83	1.39	5.72	30.66	2.76	608.58	9.88
AGRICULTURE	Reservoir, Nallah, Ponds	0.00	0.00	11.63	1.83	12.37	0.67	5.21	0.46	9.10	0.60	4.12	0.42	0.14	0.04	0.36	0.08	0.00	0.00	22.61	2.03	56.21	0.91
	Total Waterbodies	0.00	0.00	11.63	1.83	12.37	0.67	5.21	0.46	9.10	0.60	4.12	0.42	0.14	0.04	0.36	0.08	0.00	0.00	22.61	2.03	56.21	0.91
	Crop Lands	0.00	0.00	0.00	0.00	10.87	0.59	10.86	0.95	10.87	0.72	10.86	1.11	0.00	0.00	4.25	0.90	0.00	0.00	0.00	0.00	25.99	0.42
SETTLEMENTS	Fallow Lands	0.00	0.00	83.71	13.20	175.74	9.46	122.30	10.69	175.31	11.65	122.65	12.49	0.00	0.00	11.00	2.32	0.00	0.00	383.06	34.45	828.82	13.46
	Total Agriculture	0.00	0.00	83.71	13.20	186.61	10.05	133.16	11.64	186.18	12.37	133.51	13.60	0.00	0.00	15.25	3.22	0.00	0.00	383.06	34.45	854.81	13.88
	Urban Settlement	0.00	0.00	0.00	0.00	94.10	5.07	85.52	7.47	34.04	2.26	34.04	3.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	128.14	2.08
WATER BODIES	Rural Settlement	0.00	0.00	1.17	0.18	5.91	0.32	4.54	0.40	5.90	0.39	4.54	0.46	0.00	0.00	2.50	0.53	0.00	0.00	6.09	0.55	21.57	0.35
	Industrial Settlement	2.21	1.10	5.21	0.82	31.79	1.71	19.15	1.67	20.68	1.37	16.19	1.65	0.69	0.20	4.78	1.01	0.00	0.00	0.00	0.00	65.36	1.06
	Total Settlements	2.21	1.10	6.38	1.01	131.80	7.10	109.21	9.54	60.62	4.03	54.77	5.58	0.69	0.20	7.28	1.54	0.00	0.00	6.09	0.55	215.07	3.49
Grand Total		201.00	100.00	634.21	100.00	1857.24	100.00	1144.28	100.00	1504.56	100.00	981.84	100.00	351.22	100.00	474.00	100.00	24.30	100.00	1111.85	100.00	6158.38	100.00

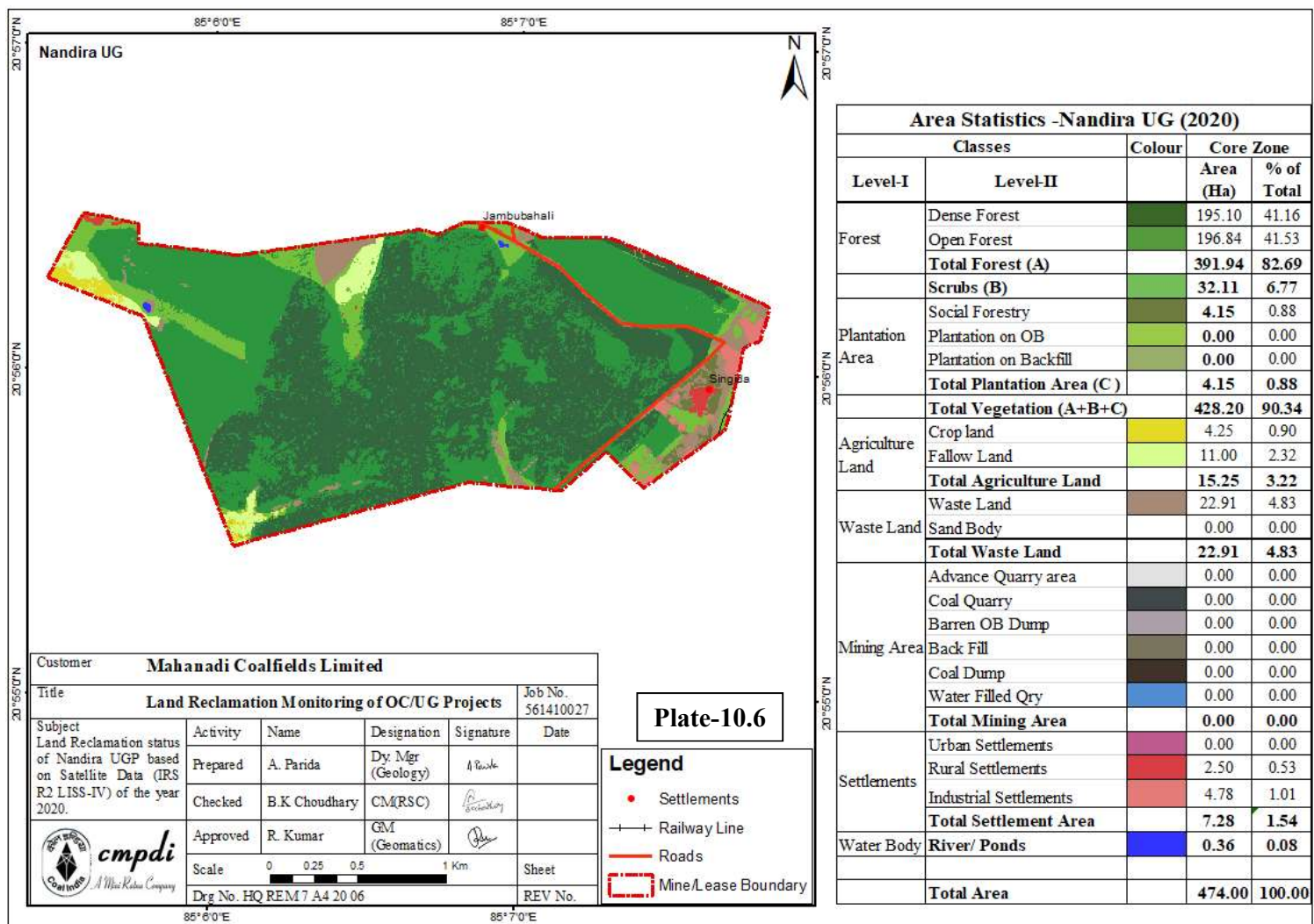
Note: The Area of Orient 1&2* and Orient 3** indicated here is excluding the common area of Lajkura OC as the leasehold areas of Orient 1 & 2, Orient 3 UG Mines and Lajkura OC overlap with each other. Moreover, it may be noted that monitoring of Lajkura OC based on Satellite Data of 2020 has been carried out under more than 5 mcm category.

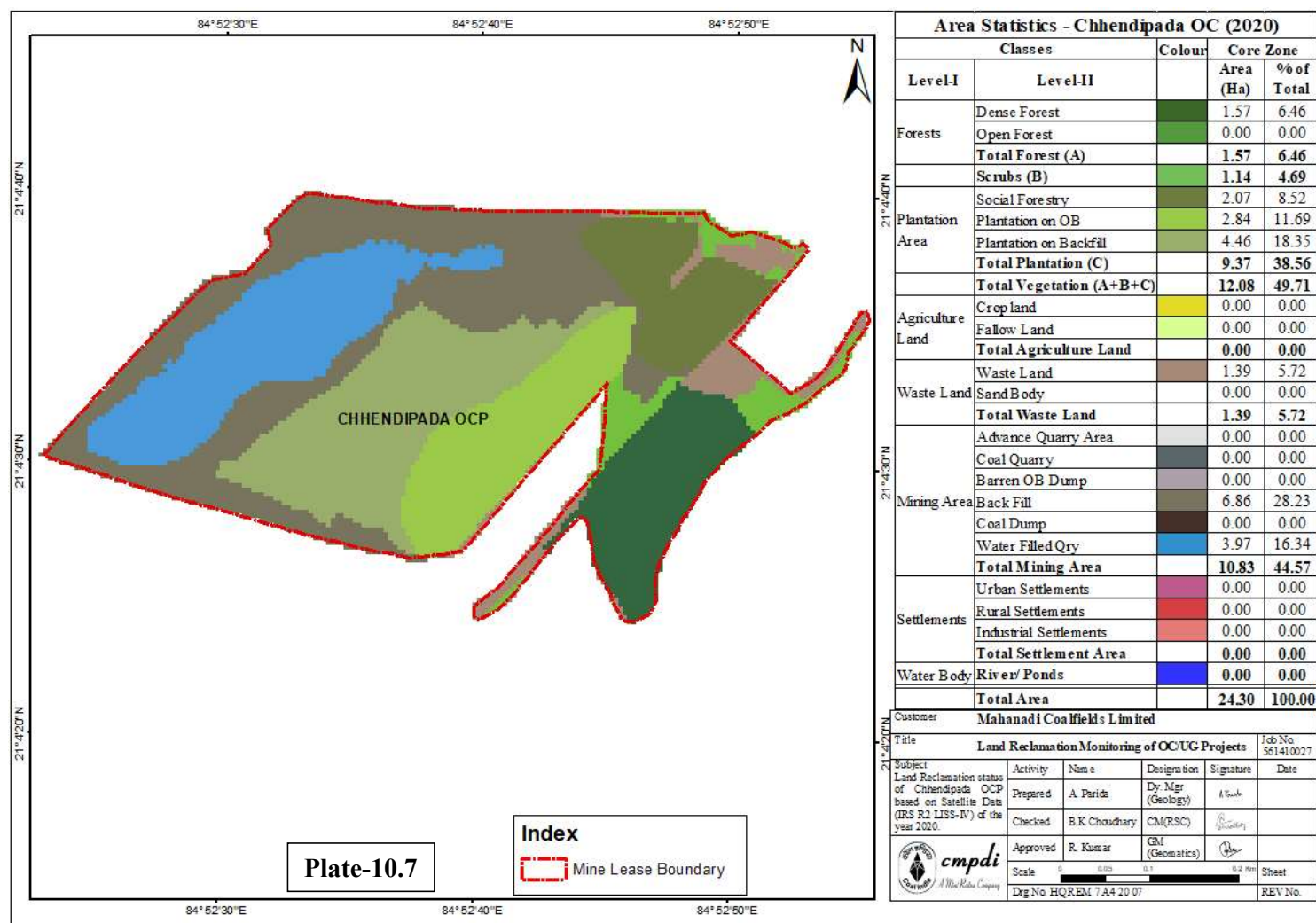


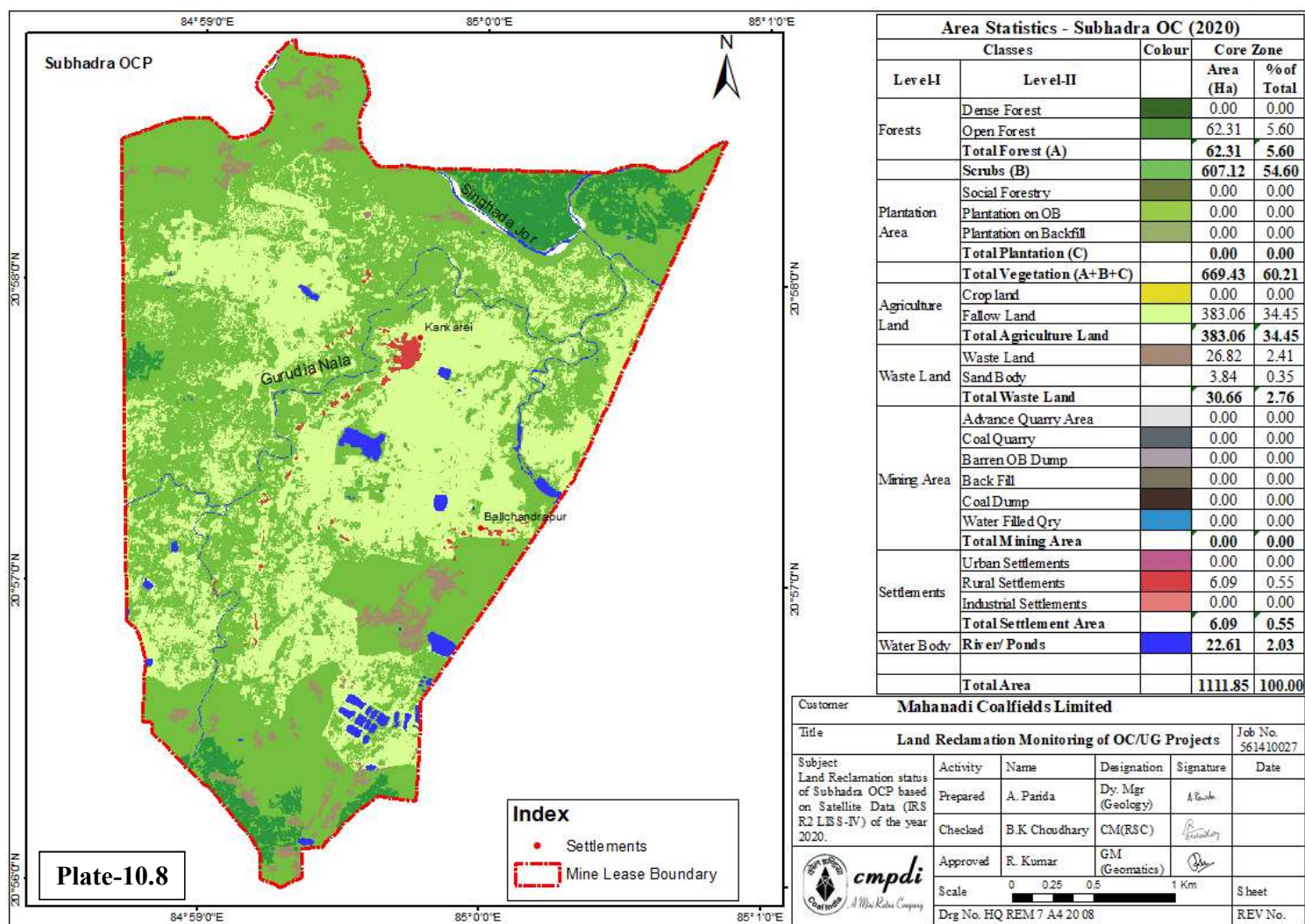












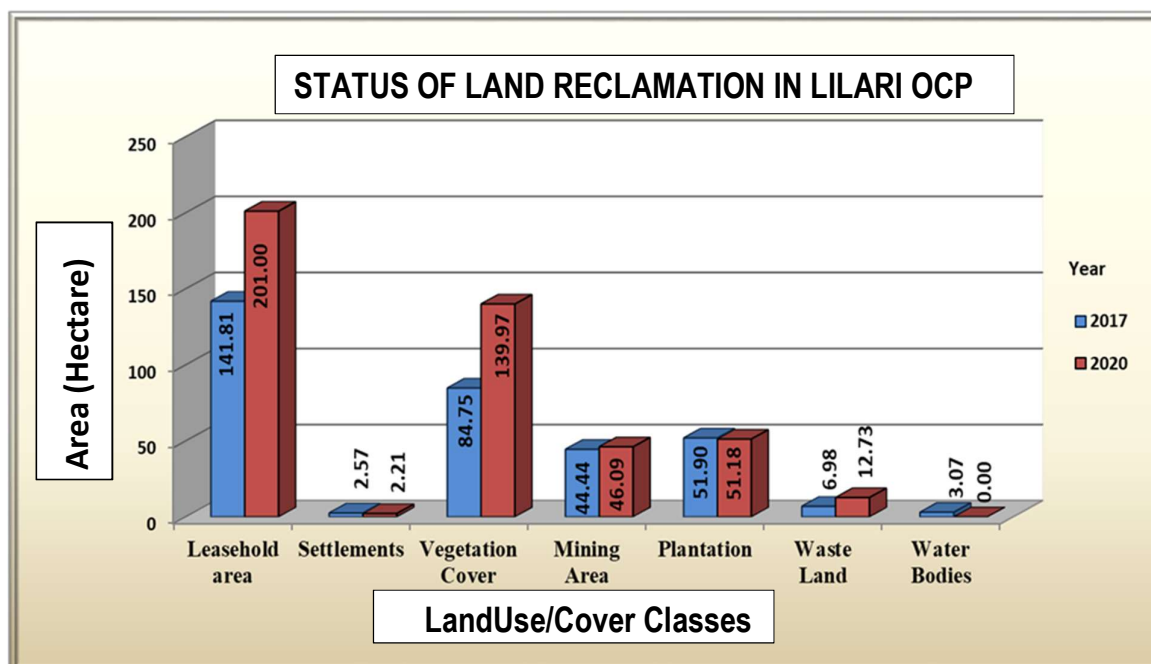


Figure – 10.2

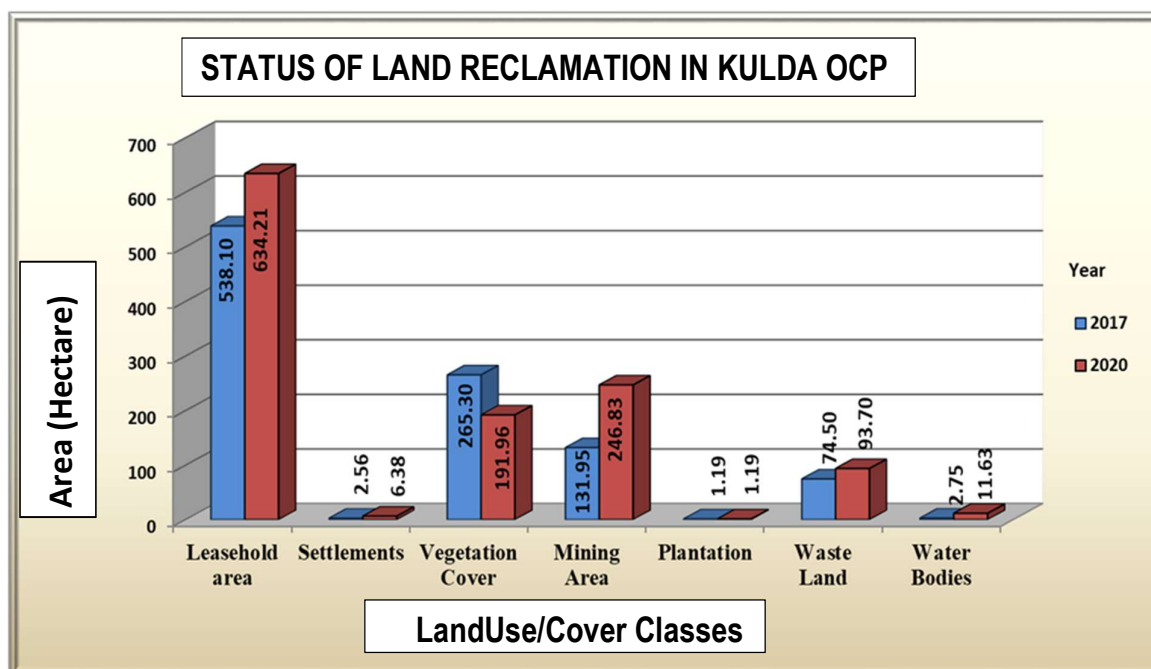


Figure -10.3

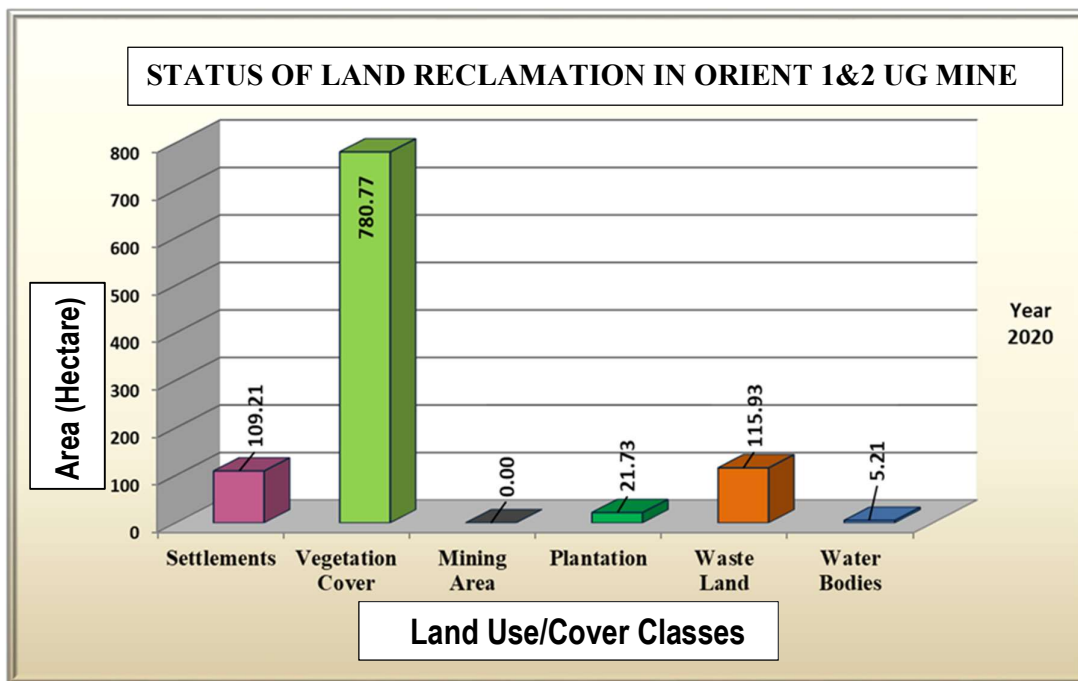


Figure -10.4

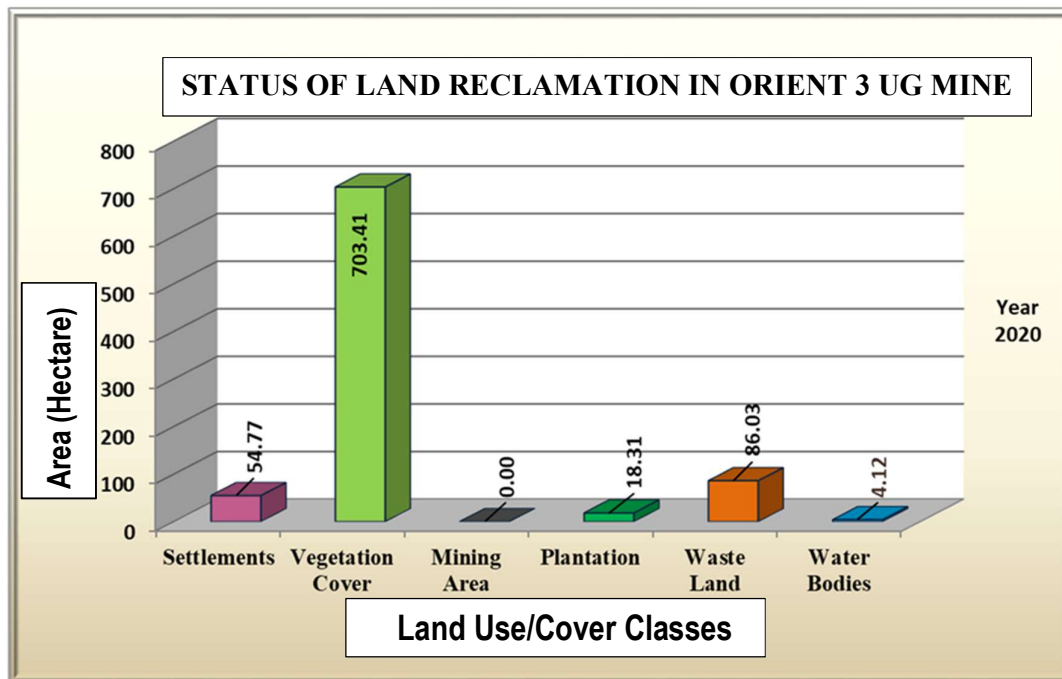


Figure -10.5

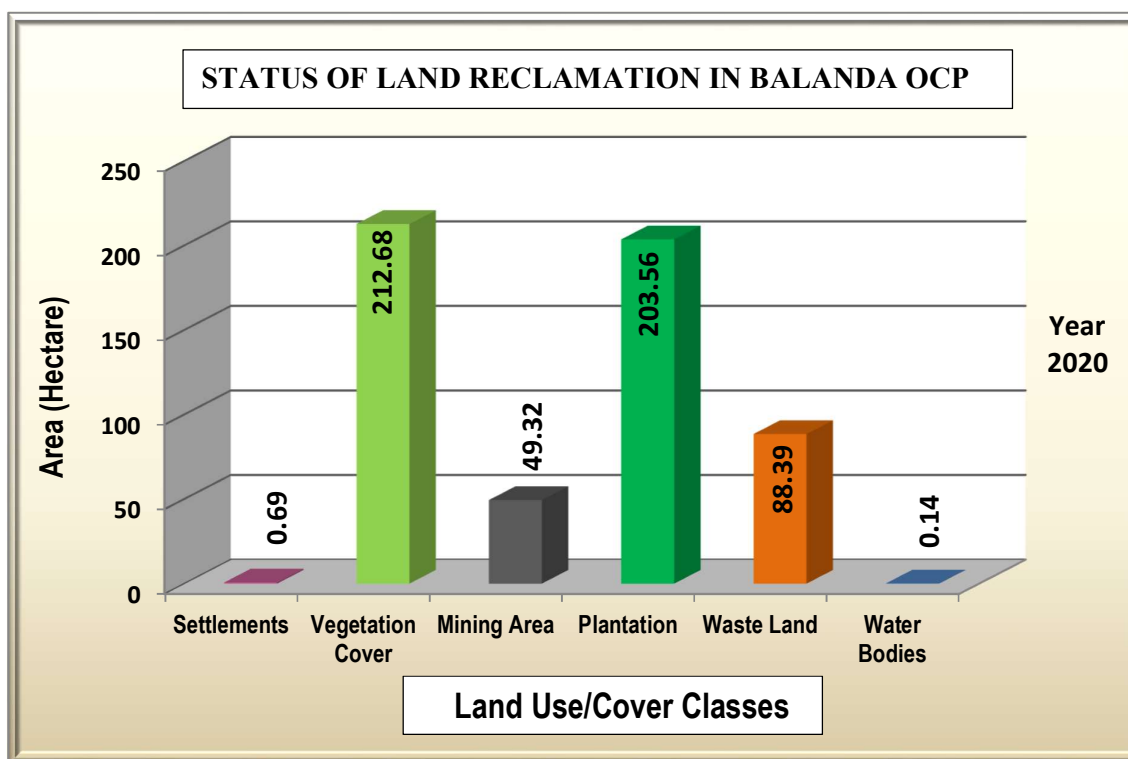


Figure -10.6

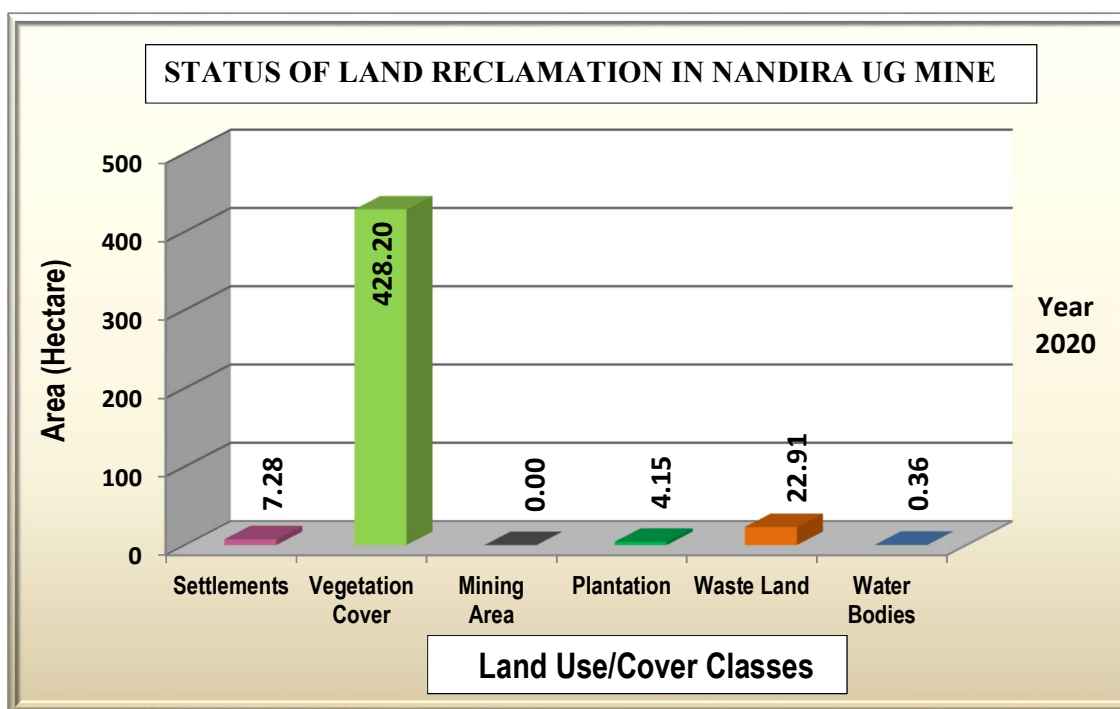


Figure -10.7

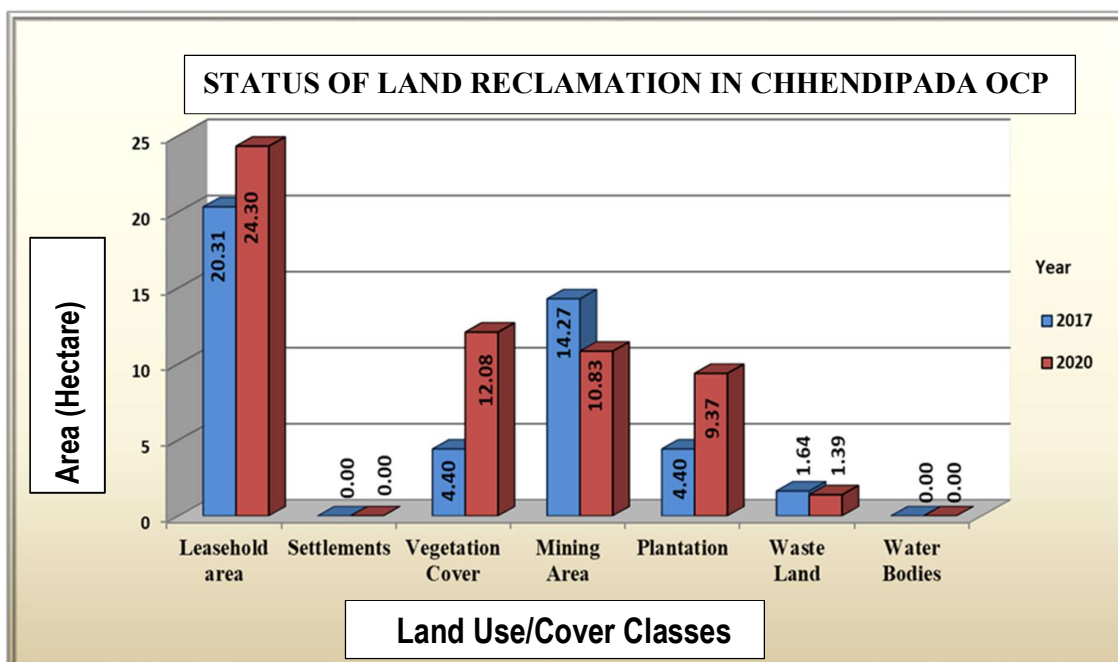


Figure -10.8

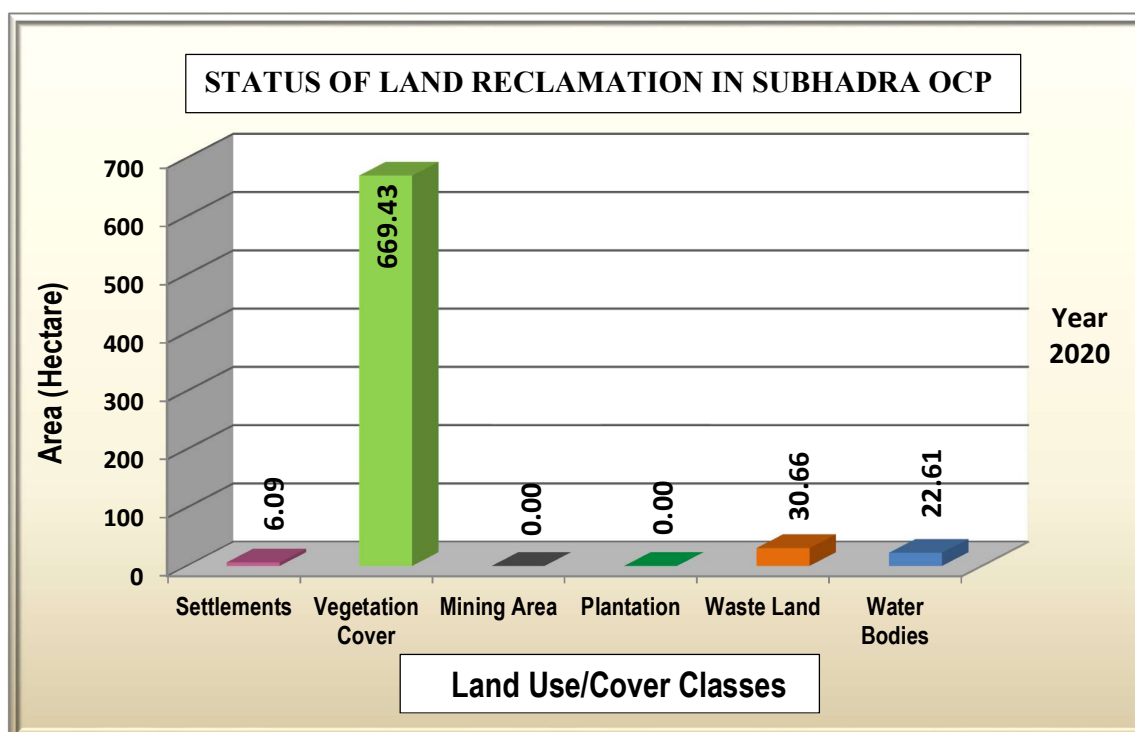


Figure -10.9



Photograph10.1: Plantation on backfill in Lilari OCP



Photo10.2: Plantation on internal dump in Kulda OCP



Photo 10.3: Plantation on backfill in Balanda OCP



Photo 10.4: Plantation on backfill in Chhendipada OCP

NORTH EASTERN COALFIELDS

11.0 Land Reclamation Status in North Eastern Coalfields

- 11.1 Following three OC projects producing less than 5 million m³ (Coal + OB together) of North Eastern Coalfields Ltd. have been taken up for land reclamation monitoring based on satellite data of the the year 2020-21 .
- Lido OCP
 - Tikak OCP
 - Tirap OCP
- 11.2 Project wise Land Reclamation status of above mentioned projects in NEC is given in Table 11.1 and also shown graphically in Fig 11.1. Area statistics of different land use class present in the mine leasehold of the above projects for the year 2020 are shown in the Table - 11.2. Land use maps derived from satellite data are shown in Plate 11.1 -11.3 Different land use classes based on satellite data are depicted in Bar Charts in Fig. 11.2 to 11.4.
- 11.3 Study reveals that out of total mine leasehold area of 1587.87 Hectares of the above mentioned 03 OC projects of NEC taken up for this study in 2020-21; total excavated area is 223.58 hectares (14.08%), out of which 17.81 Hectare (7.97%) has been planted (Biologically Reclaimed), 50.14 Hectare (22.43%) is under backfilling (Technically Reclamation) and balance 155.63 Hectare (69.61%) is under active mining.
- 11.4 On comparing the status of land reclamation for the year 2017 with respect to the year 2020 in different projects. It is evident from analysis that area of land reclamation has increased from 49.48 Ha (22.81%) in the year Year 2017 to 67.95 Ha (30.39%) in the Year 2020.
- 11.5 After analyzing the satellite data of the year 2017 vs 2020 it is evident that total plantation carried out on backfill area, OB Dumps as well as social Forestry in all the three mines of NEC has increased from 137.74 Hectare (8.67%) (Year 2017) to 192.42 (12.12%) Hectare (Year 2020) in the span of last three years. This increase of 54.68 Hectare area of total plantation in three years is due to sincere effort made by NEC towards land reclamation.

- 11.6** Out of three projects in NEC, Ledo OCP tops with 22.54 Hectare (82.41%) reclamation followed by Tirap OCP with 45.41 Hectare (33.90%) as evident from Table -11.1.
- 11.7** This study will be carried out again after an interval of three years to assess the land reclamation status in the above projects.

Table-11.1
Projects wise Land Reclamation Status in opencast projects of NEC based on the satellite data of the year 2020

(Area in Hectare)

(Area in Hectare)

Sl. No.	Project	Total Leasehold Area		Technical Reclamation		Plantation						Area under Active Mining		Total Excavated Area		Total Area under Plantation (% Green Cover Generated in Leasehold)		Total Area under Reclamation	
						Biological Reclamation		Other Plantations											
				Area under Backfilling		Plantation on Excavated / Backfilled Area		Plantation on External Over Burden Dumps		Social Forestry, Avaneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020	2017	2020
1	Ledo	101.00	101.00	0.00	14.35	5.82	8.19	1.31	8.05	29.21	29.99	21.51	4.81	27.33	27.35	36.34	46.23	5.82	22.54
				0.00%	52.47%	21.30%	29.95%					78.70%	17.59%			35.98%	45.77%	21.30%	82.41%
2	Tikak	1191.80	1191.80	0.00	0.00	0.00	0.00	71.26	100.81	18.54	23.29	62.00	62.29	62.00	62.29	89.80	124.10	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			7.53%	10.41%	0.00%	0.00%
3	Tirap	295.07	295.07	37.33	35.79	6.33	9.62	5.27	12.47	0.00	0.00	83.90	88.53	127.56	133.94	11.60	22.09	43.66	45.41
				29.26%	26.72%	4.96%	7.18%					65.77%	66.10%			3.93%	7.49%	34.23%	33.90%
	TOTAL	1587.87	1587.87	37.33	50.14	12.15	17.81	77.84	121.33	47.75	53.28	167.41	155.63	216.89	223.58	137.74	192.42	49.48	67.95
				17.21%	22.43%	5.60%	7.97%					77.19%	69.61%			8.67%	12.12%	22.81%	30.39%

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

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

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

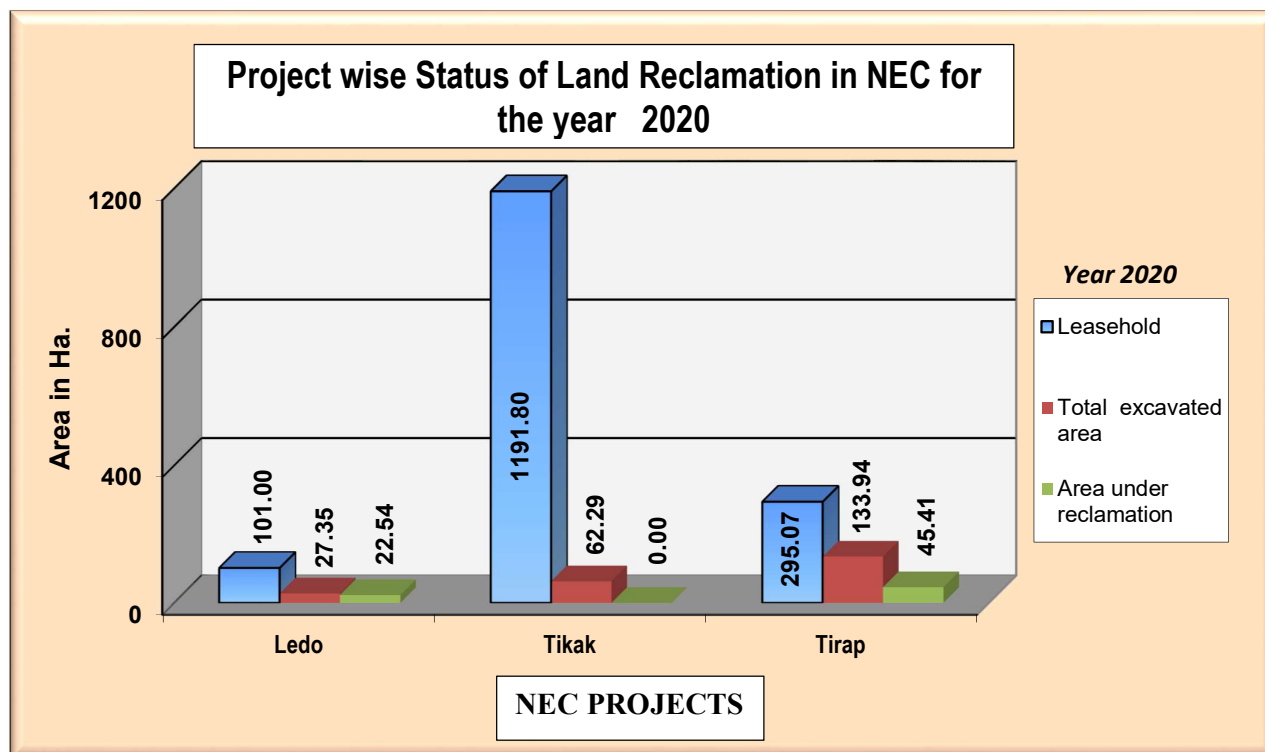




















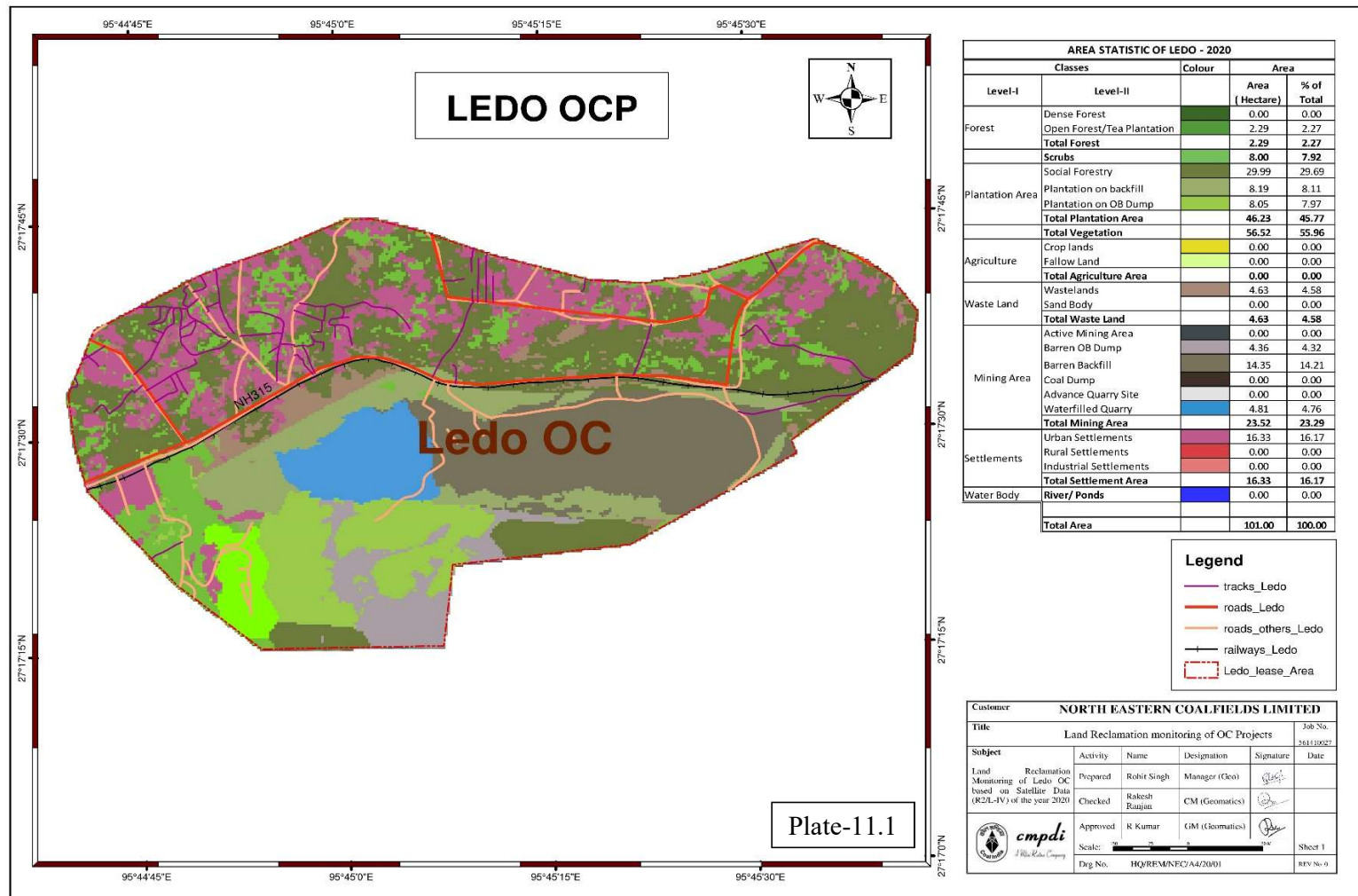


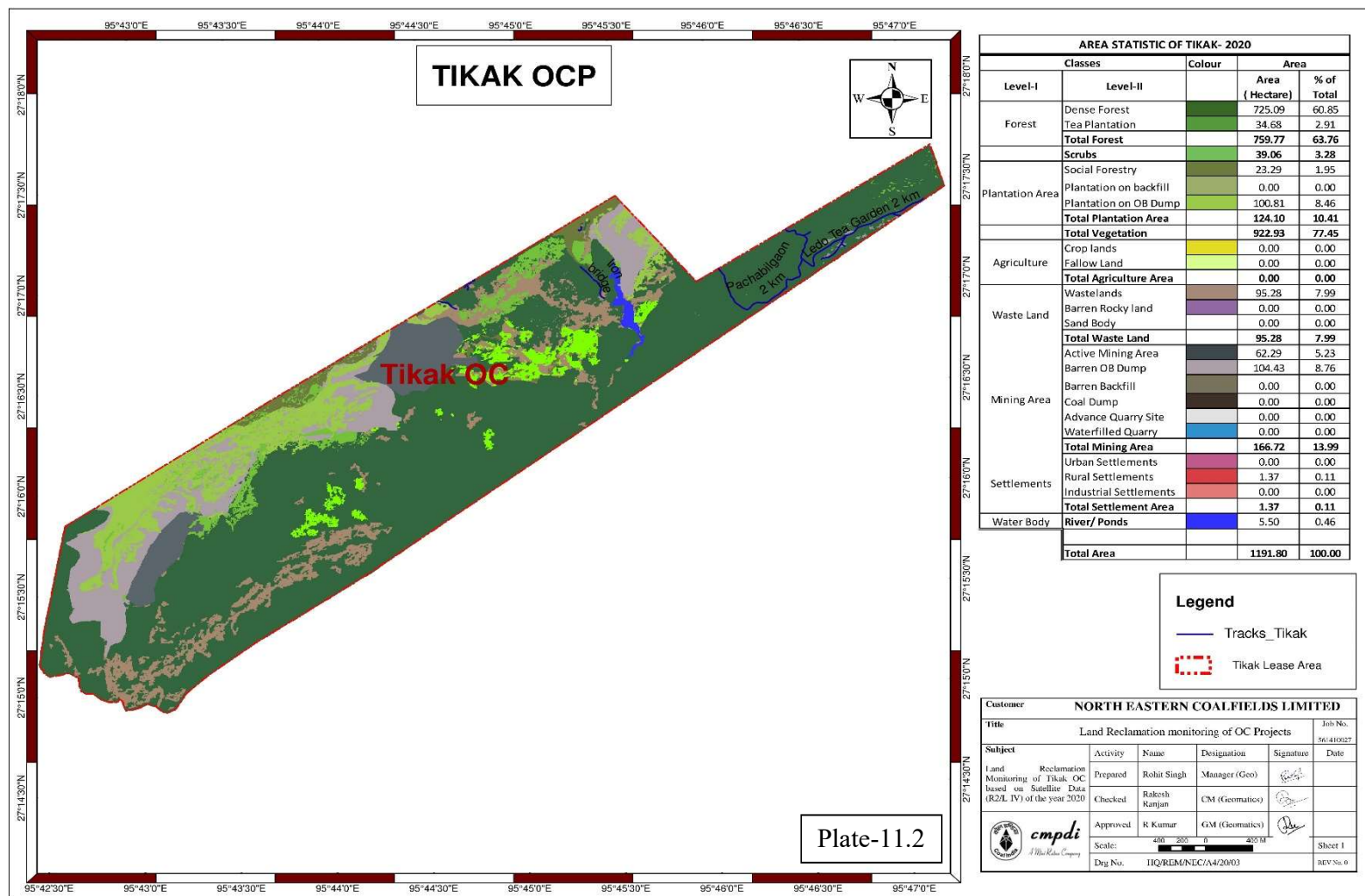
Figure 11.1: Projects wise Land Reclamation Status -2020 (NEC)

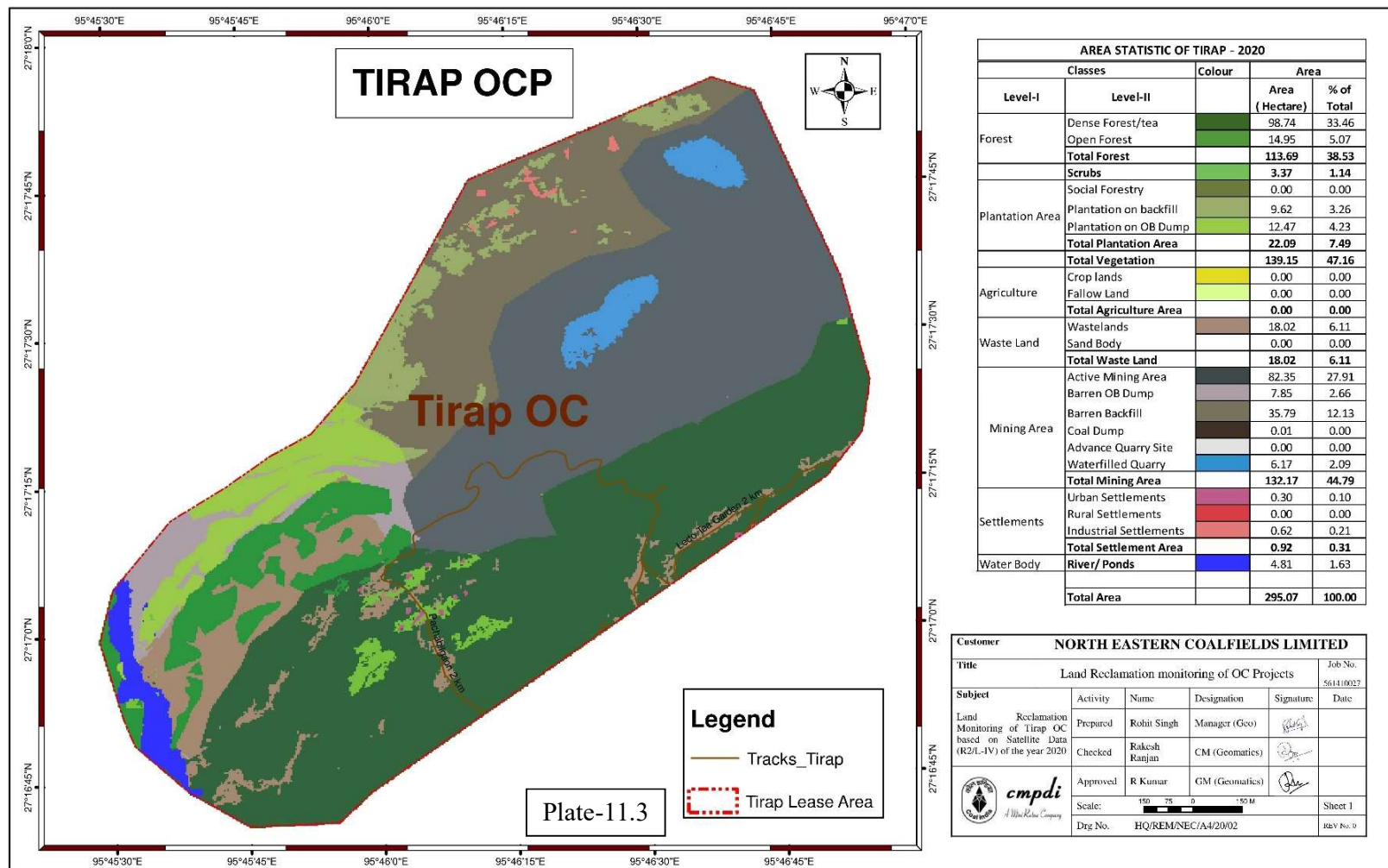
TABLE-11.2
PROJECT WISE STATUS OF LAND USE / COVER / LAND RECLAMATION IN 03 OC MINE OF NEC
PRODUCING LESS THAN 5 M.C.M (COAL+OB) BASED ON SATELLITE DATA OF THE YEAR 2020

(Area in Ha.)

		Ledo		Tikak(4 miles leased area including Namdang)		Tirap		TOTAL	
		Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest/Tea 	0.00	0.00	725.09	60.85	98.74	33.46	823.83	51.88
	Tea Plantation 	2.29	2.27	34.68	2.91	14.95	5.07	51.92	3.27
	Total Forest/Tea Plantation	2.29	2.27	759.77	63.76	113.69	38.53	875.75	55.15
SCRUB									
	Scrubs 	8.00	7.92	39.06	3.28	3.37	1.14	50.43	3.18
PLANTATION	Social Forestry 	29.99	29.69	23.29	1.95	0.00	0.00	53.28	3.36
	Plantation on OB Dump 	8.05	7.97	100.81	8.46	12.47	4.23	121.33	7.64
	Plantation on Backfill (Biological Reclamation) 	8.19	8.11	0.00	0.00	9.62	3.26	17.81	1.12
	Total Plantation(Green Cover generated)	46.23	45.77	124.10	10.41	22.09	7.49	192.42	12.12
	Total Vegetation	56.52	55.96	922.93	77.45	139.15	47.16	1118.60	70.45
ACTIVE MINING	Active Mining Area/Coal Quarry 	0.00	0.00	62.29	5.23	82.35	27.91	144.64	9.11
	Coal Dump 	0.00	0.00	0.00	0.00	0.01	0.00	0.01	0.00
	Advance Quarry Site 	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Quarry Filled With Water(Sump) 	4.81	4.76	0.00	0.00	6.17	2.09	10.98	0.69
	Total Area under Active Mining	4.81	4.76	62.29	5.23	88.53	30.00	155.63	9.80
RECLAIMED	Barren OB Dump 	4.36	4.32	104.43	8.76	7.85	2.66	116.64	7.35
	Barren Backfilled Area (Technical Reclamation) 	14.35	14.21	0.00	0.00	35.79	12.13	50.14	3.16
	Total Area under Technical Reclamation	14.35	14.21	0.00	0.00	35.79	12.13	50.14	3.16
WASTELANDS	Waste Lands 	4.63	4.58	95.28	7.99	18.02	6.11	117.93	7.43
	Fly Ash Pond / Sand Body 	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Wasteland	4.63	4.58	95.28	7.99	18.02	6.11	117.93	7.43
WATERBODIES	Reservoir, nallah, ponds 	0.00	0.00	5.50	0.46	4.81	1.63	10.31	0.65
	Total Waterbodies	0.00	0.00	5.50	0.46	4.81	1.63	10.31	0.65
AGRICULTURE	Crop Lands 	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Fallow Lands 	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Agriculture	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SETTLEMENTS	Urban Settlement 	16.33	16.17	0.00	0.00	0.30	0.10	16.63	1.05
	Rural Settlement 	0.00	0.00	1.37	0.11	0.00	0.00	1.37	0.09
	Industrial Settlement 	0.00	0.00	0.00	0.00	0.62	0.21	0.62	0.04
	Total Settlement	16.33	16.17	1.37	0.11	0.92	0.31	18.62	1.17
	Grand Total	101.00	100.00	1191.80	100.00	295.07	100.00	1587.87	100.00







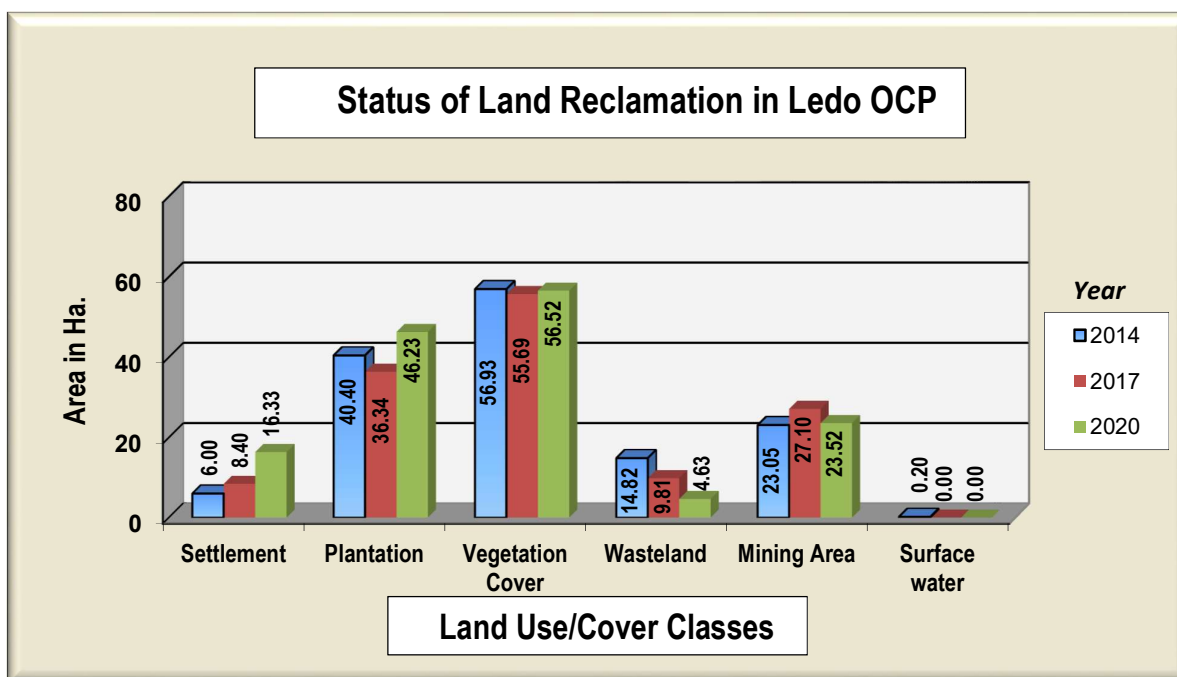


Figure -11.2

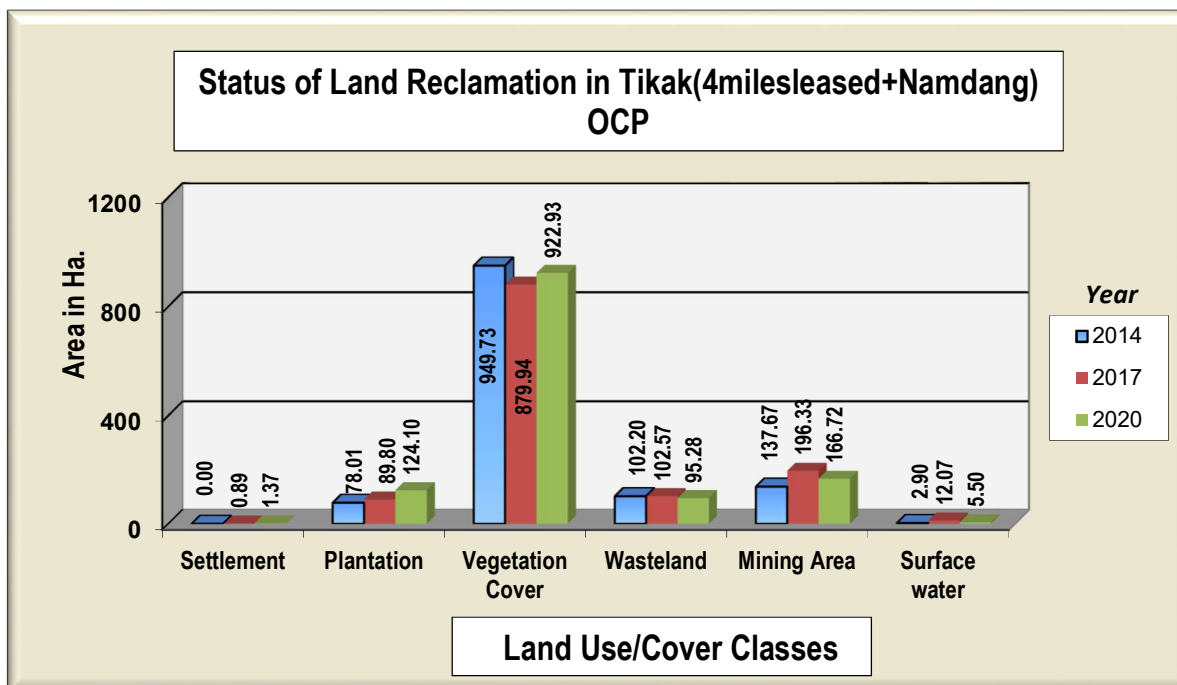


Figure -11.3

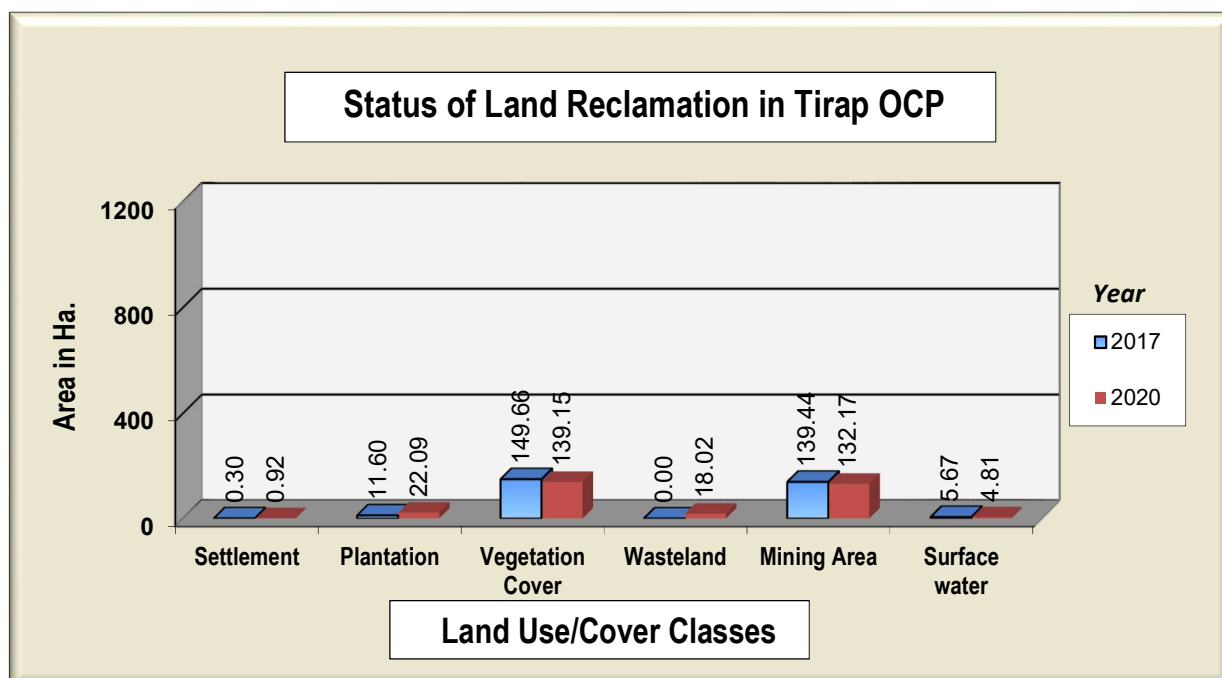


Figure -11.4



Photo-11.1 Plantation on OB Dump in Ledo OCP



Photo 11.2 Plantation on OB Dump in Ledo OCP



Photo-11.3: Plantation on OB Dump in Tikak OCP



Photo-11.4: Banner showing plantation under S&T Project ,GOI (Collaboration with CMPDI&MOC)



Photo-11.5: Plantation on OB in Tikak OCP



Photo-11.6: Plantation on OB in Tikak OCP



Photo-11.7: Plantation on backfill in Tirap OCP



Photo-11.8: Plantation on backfill in Tirap OCP



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