

महानदी कोलफील्ड्स लिमिटेड के ५ मिलियन घन मीटर (कोल+ अधिभार) से अधिक उत्पादन क्षमतावाले १३ खुली खदानों की भूमि पुनरुद्धार हेतु २०२५ के उपग्रह डाटा के आधार पर निगरानी का वार्षिक प्रतिवेदन

Land Restoration / Reclamation Monitoring of 13 opencast coal mines of Mahanadi Coalfields Ltd. (MCL) producing more than 5 million cu.m. (Coal+OB) per annum based on satellite data of the Year 2025



*Submitted to*  
**Mahanadi Coalfields Limited**



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March 2026

Remote Sensing Cell  
Geomatics Division  
CMPDI, Ranchi



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## कार्यकारी सारांश

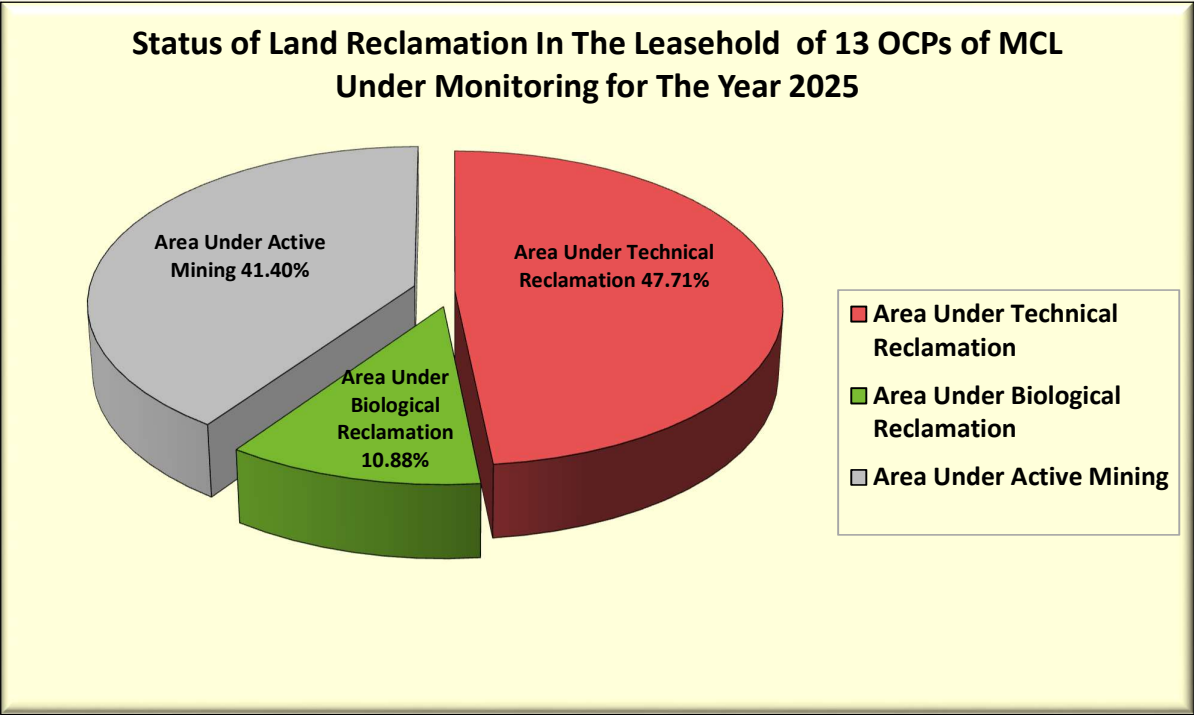
- १.० परियोजना** महानदी कोलफील्ड्स लिमिटेड के ५ मिलियन घन मीटर (कोल+ अधिभार) से अधिक उत्पादन क्षमतावाले १३ खुली खदानों के भूमि पुनरुद्धार हेतु वर्ष २०२५ के उपग्रह डाटा पर आधारित प्रत्येक साल का नियमित निगरानी।
- २.० उद्देश्य** भूमि पुनरुद्धार (लैंड रिक्लेमेशन) का उद्देश्य कुल पट्टाक्षेत्र में बैकफील, वृक्षारोपण, सामाजिक वानिकी, सक्रिय खनन क्षेत्र, जल निकास (वाटर ड्रेनेज) बंजर भूमि, कृषि भूमि और जंगल के विभिन्न प्रकार के वितरण प्रणाली के क्षेत्र का आकलन करने के लिए है। यह अध्ययन न केवल उपरोक्त सभी खुली खदानों के भूमि पुनरुद्धार (लैंड रिक्लेमेशन) का निगरानी के प्रगति का आकलन में मदद करेगा बल्कि पर्यावरण संरक्षण के लिए आवश्यक उपचारात्मक उपायों को क्रियान्वित करने में भी सहायता करेगा।
- ३.० मुख्य निष्कर्ष** • एमसीएल की १३ ओपनकास्ट परियोजनाओं में से १७६.६१ वर्ग किलोमीटर के कुल खदान पट्टा क्षेत्र में से अनंत, बलराम, लिंगराज, भरतपुर, भुवनेश्वरी, जगन्नाथ, हिंगुला, कनिहा, एकीकृत लखनपुर-बेलपाहार-लिलारी, समलेस्वरी, लजकुरा, गरजनबहाल और कुलड़ा २०२५-२६ के दौरान निगरानी के लिए विचार किया गया; कुल उत्खनन क्षेत्र ७६.०८ वर्ग किलोमीटर है, जिसमें से ८.२८ वर्ग किलोमीटर क्षेत्र (१०.८८%) वृक्षारोपण (जैविक रूप से पुनर्ग्रहण) के तहत, ३६.३० वर्ग किलोमीटर क्षेत्र (४७. ७१%) बैकफिलिंग (तकनीकी रूप से पुनर्ग्रहण) के तहत और ३१.५० वर्ग किलोमीटर क्षेत्र (४१. ४०%) सक्रिय खनन के तहत है। यह विश्लेषण से स्पष्ट है कि ओपनकास्ट परियोजनाओं की कुल उत्खनन भूमि का संचयी रूप से ५७.६०% क्षेत्र पुनर्ग्रहण (जैविक और तकनीकी) के अधीन हैं और ४१. ४०% क्षेत्र संतुलन सक्रिय खनन के अधीन है। प्रोजेक्ट वार विवरण तालिका -१ में दिए गए हैं और चित्र-१ में ग्राफिक रूप से दर्शाया गया है।

- विभिन्न परियोजनाओं में वर्ष २०२४ के संदर्भ में वर्ष २०२५ के लिए भूमि सुधार की स्थिति की तुलना करने पर, विश्लेषण से यह स्पष्ट है कि भूमि सुधार के अंतर्गत कुल क्षेत्रफल ४३.२८ वर्ग किलोमीटर (वर्ष २०२४) से बढ़कर ४४.५८ वर्ग किलोमीटर (वर्ष २०२५) हो गया है। एमसीएल की १३ परियोजनाओं में से, जगन्नाथ ओसी भूमि सुधार (७०.५९%) के लिए शीर्ष स्थान पर है, उसके बाद बलराम ओसी (६९.२८%) और समलेश्वरी ओसी (६८.१६%) हैं।
- एमसीएल में जैविक सुधार (बैकफ़िल पर वृक्षारोपण) का क्षेत्र ८.२२ वर्ग किलोमीटर (वर्ष २०२४) से बढ़कर ८.२८ वर्ग किलोमीटर (वर्ष २०२५) हो गया है और तकनीकी सुधार (बैकफ़िलिंग के तहत क्षेत्र) का क्षेत्र ३५.०६ वर्ग किलोमीटर (वर्ष २०२४) से बढ़कर ३६.३० वर्ग किलोमीटर (वर्ष २०२५) हो गया है। सुधार के कुल क्षेत्र में १.३० वर्ग किलोमीटर की वृद्धि भूमि सुधार और पर्यावरण संरक्षण की दिशा में महानदी कोलफील्ड्स लिमिटेड द्वारा किए गए प्रयासों का परिणाम है।
- कुछ परियोजनाओं में फील्ड दौर के दौरान यह देखा गया है कि एमसीएल द्वारा किए गए पौधरोपण के अलावा मिट्टी की उर्वरता अधिक होने के कारण पुराने और स्थिर बैकफ़िल क्षेत्र और डम्पों पर प्राकृतिक वनस्पति भी उगनी शुरू हो गई है। कुछ परियोजनाओं में नए वृक्षारोपण किए गए हैं लेकिन कम ऊंचाई के कारण यह उपग्रह डेटा में स्पष्ट नहीं है।

## **Executive Summary**

- 1.0 Projects** Land restoration / reclamation monitoring of 13 opencast coal mines of Mahanadi Coalfields Ltd. (MCL) producing 5 million cu.m. and more (Coal+OB) per annum based on satellite data on annual basis.
- 2.0 Objective** Objective of the land restoration / reclamation monitoring is to assess the area under backfilling, plantation, social forestry, active mining area, water bodies, distribution of wasteland, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection.
- 3.0 Salient Findings**
- Out of the total mine leasehold area of 176.61 Km<sup>2</sup> of the 13 opencast projects of MCL viz. Ananta, Balram, Lingaraj, Bharatpur, Bhubaneshwari, Jagannath, Hingula, Kaniha, Integrated Lakhanpur-Belpahar-Lilari, Samleswari, Lajkura, Garjanbahal and Kulda considered for monitoring during 2025-26; total excavated area is 76.08 Km<sup>2</sup>, out of which 8.28 Km<sup>2</sup> area (10.88%) has been planted, 36.30 Km<sup>2</sup> area (47.71%) is under backfilling and 31.50 Km<sup>2</sup> area (41.40%) is under active mining. It is evident from the analysis that 58.60% areas of the OC projects is under reclamation (biological and technical) and balance 41.40% area is under active mining. Project wise details are given in Table-1 & Fig-1.
  - On comparing the status of land reclamation for the year 2025 with respect to the year 2024 in different projects, it is evident from the analysis that total area under land reclamation has increased from 43.28 Km<sup>2</sup> (Yr.2024) to 44.58 Km<sup>2</sup> (Yr.2025). Out of 13 projects of MCL, Jagannath OC ranks on top for land reclamation (70.59%) followed by Balram OC (69.28%) and Samleswari OC (68.16%).
  - Area of biological reclamation (plantation on backfill) has been increased from 8.22 Km<sup>2</sup> (Yr. 2024) to 8.28 Km<sup>2</sup> (Yr. 2025) and area of technical reclamation (area under backfilling) has increased from 35.06 Km<sup>2</sup> (Yr.2024) to 36.30 Km<sup>2</sup> (Yr.2025) in MCL. The increase of 1.30 Km<sup>2</sup> in total area of reclamation is the result of the efforts of the Mahanadi Coalfields Ltd. taken up towards land reclamation and environmental protection.
  - In some of the projects it has been observed during field visit that natural vegetation has also started growing on the old and stabilized backfilled area and dumps due to high soil fertility besides plantation carried out by

MCL. New plantation has been carried out in some projects but due to low height it's signature not clear in satellite data.

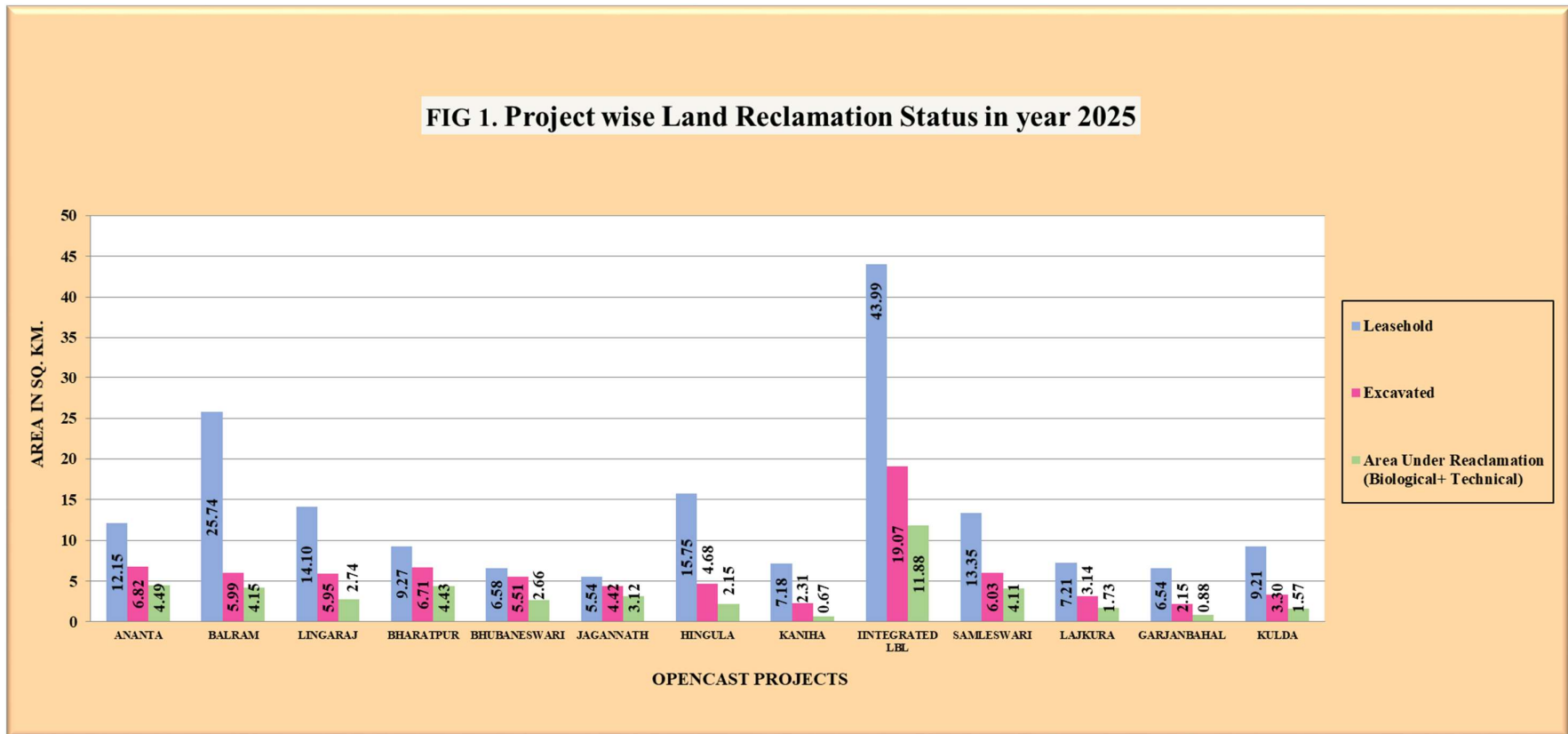


**Pie Chart indicating distribution of reclamation activities in OC mines of MCL**

Sl. No.	Project	Total Leasehold Area 2023	Total Leasehold Area 2024	Technical Reclamation		Plantation						Area Under Active Mining	Total Excavated Area		Total Area Under Plantation (%Green Cover Generated in Leasehold)		Total Area Under Reclamation				
				Area under Backfilling		Biological Reclamation		Other Plantation					2024	2025	2024	2025	2024	2025	2024	2025	
						Plantation on Excavated/Backfilled Area		Plantation on External Over Burden Dump	Social Forestry, Avenue Plantation Etc.	2024	2025										2024
1	2	3	4	5		6		7				8		9		10(=5+6+9)		11(=6+7+8)		12(=5+6)	
				2024	2025	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025	2024	2025
1	Ananta	14.20	12.15	3.56	3.60	0.92	0.89	0.08	0.08	0.19	0.17	2.21	2.33	6.69	6.82	1.19	1.14	4.48	4.49		
				53.21%	52.79%	13.75%	13.05%					33.03%	34.16%			8.38%	9.38%	66.97%	65.84%		
2	Balram	13.09	25.74	3.10	3.18	0.97	0.97	0.22	0.22	0.33	0.38	1.80	1.84	5.87	5.99	1.52	1.57	4.07	4.15		
				52.81%	53.09%	16.52%	16.19%					30.66%	30.72%			11.61%	6.10%	69.34%	69.28%		
3	Lingaraj	14.10	14.10	2.56	2.57	0.18	0.17	0.62	0.65	0.46	0.48	3.14	3.21	5.88	5.95	1.26	1.30	2.74	2.74		
				43.54%	43.19%	3.06%	2.86%					53.40%	53.95%			8.94%	9.22%	46.60%	46.05%		
4	Bharatpur	9.27	9.27	2.86	2.87	1.54	1.56	0.45	0.43	0.16	0.14	2.26	2.28	6.66	6.71	2.15	2.13	4.40	4.43		
				42.94%	42.77%	23.12%	23.25%					33.93%	33.98%			23.19%	22.98%	66.07%	66.02%		
5	Bhubaneswari	6.58	6.58	2.40	2.57	0.08	0.09	0.01	0.00	0.05	0.03	1.97	2.85	4.45	5.51	0.14	0.12	2.48	2.66		
				53.93%	46.64%	1.80%	1.63%					44.27%	51.72%			2.13%	1.82%	55.73%	48.28%		
6	Jagannath	5.54	5.54	1.23	1.43	1.74	1.69	0.00	0.00	0.11	0.10	1.39	1.30	4.36	4.42	1.85	1.79	2.97	3.12		
				28.21%	32.35%	39.91%	38.24%					31.88%	29.41%			33.39%	32.31%	68.12%	70.59%		
7	Hingula	15.75	15.75	2.01	2.06	0.09	0.09	0.12	0.07	0.29	0.29	2.49	2.53	4.59	4.68	0.50	0.45	2.10	2.15		
				43.79%	44.02%	1.96%	1.92%					54.25%	54.06%			3.17%	2.86%	45.75%	45.94%		
8	Kaniha	7.18	7.18	0.61	0.67	0.00	0.00	0.00	0.00	0.08	0.09	1.58	1.64	2.19	2.31	0.08	0.09	0.61	0.67		
				27.85%	29.00%	0.00%	0.00%					72.15%	71.00%			1.11%	1.25%	27.85%	29.00%		
9	Integrated Lakhanpur-Belpahar-Liari	43.99	43.99	9.70	9.95	1.90	1.93	1.14	1.14	0.78	0.70	6.54	7.19	18.14	19.07	3.82	3.77	11.60	11.88		
				53.47%	52.18%	10.47%	10.12%					36.05%	37.70%			8.68%	8.57%	63.95%	62.30%		
10	Samleswari	13.35	13.35	3.38	3.43	0.63	0.68	0.49	0.49	0.48	0.47	1.77	1.92	5.78	6.03	1.60	1.64	4.01	4.11		
				58.48%	56.88%	10.90%	11.28%					30.62%	31.84%			11.99%	12.28%	69.38%	68.16%		
11	Lajkura	7.21	7.21	1.54	1.61	0.11	0.12	0.10	0.10	0.16	0.09	1.39	1.41	3.04	3.14	0.37	0.31	1.65	1.73		
				50.66%	51.27%	3.62%	3.82%					45.72%	44.90%			5.13%	4.30%	54.28%	55.10%		
12	Garjanbahal	6.54	6.54	0.79	0.88	0.00	0.00	0.00	0.04	0.03	0.04	0.99	1.27	1.78	2.15	0.03	0.08	0.79	0.88		
				44.38%	40.93%	0.00%	0.00%					55.62%	59.07%			0.46%	1.22%	44.38%	40.93%		
13	Kulda	6.34	9.21	1.32	1.48	0.06	0.09	0.01	0.06	0.03	0.27	1.72	1.73	3.10	3.30	0.10	0.42	1.38	1.57		
				42.58%	44.85%	1.94%	2.73%					55.48%	52.42%			1.58%	4.56%	44.52%	47.58%		
	<b>Total</b>	<b>163.14</b>	<b>176.61</b>	<b>35.06</b>	<b>36.30</b>	<b>8.22</b>	<b>8.28</b>	<b>3.24</b>	<b>3.28</b>	<b>3.15</b>	<b>3.25</b>	<b>29.25</b>	<b>31.50</b>	<b>72.53</b>	<b>76.08</b>	<b>14.61</b>	<b>14.81</b>	<b>43.28</b>	<b>44.58</b>		
				48.34%	47.71%	11.33%	10.88%					40.33%	41.40%			8.96%	8.39%	59.67%	58.60%		

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

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



**Fig.1: Land reclamation status of OC projects in MCL for the year 2025**

## **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 scarcest natural resource in our country. Mining is a site specific industry and it could not be shifted anywhere else from the location where mineral occurs. It is a fact that surface mining activities do effect the land environment due to ground breaking. Therefore, there is an urgent need to reclaim and restore the mined out land for its productive use for sustainable development of mining. This will not only mitigate environmental degradation, but would also help in creating a more congenial environment for land acquisition by coal companies in future.
- 1.2** Keeping above in view, Coal India Ltd. (CIL) issued work order vide letter no. CIL/ENV/11463 dated 03.07.2024 for a period of three years to Central Mine Planning & Design Institute (CMPDI), Ranchi, for monitoring of land reclamation status of all the opencast coal mines having production of more than 5 million m<sup>3</sup> per annum (Coal + OB taken together per annum) regularly on annual basis and for monitoring of less than 5 million m<sup>3</sup> per annum capacity (Coal +OB) projects at an interval of three years based on remote sensing satellite data for sustainable development of mining. The result of land reclamation status of all such mines is to be put on the website of CIL, ([www.coalindia.in](http://www.coalindia.in)), CMPDI ([www.cmpdi.co.in](http://www.cmpdi.co.in)) and the concerned coal companies in public domain. Detailed report has to be submitted to Coal India and respective subsidiary companies.
- 1.3** Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment, Forest and 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.

- 1.4** Present report is embodying the finding of the study based on satellite data of the year 2025 carried out for 13 OC projects producing more than 5 mcm (Coal+OB) for Mahanadi Coalfields Ltd.

## **2.0 Objective**

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

## **3.0 Methodology**

There are number of steps involved between raw satellite data procurement and preparation of final map. National Remote Sensing Centre (NRSC) Hyderabad, being the nodal agency for satellite data supply in India, provides only raw digital satellite data, which needs further digital image processing for extracting the information and map preparation before uploading the same in the website. Methodology for land reclamation monitoring is given in Fig 2. Following steps are involved in land reclamation /restoration monitoring:

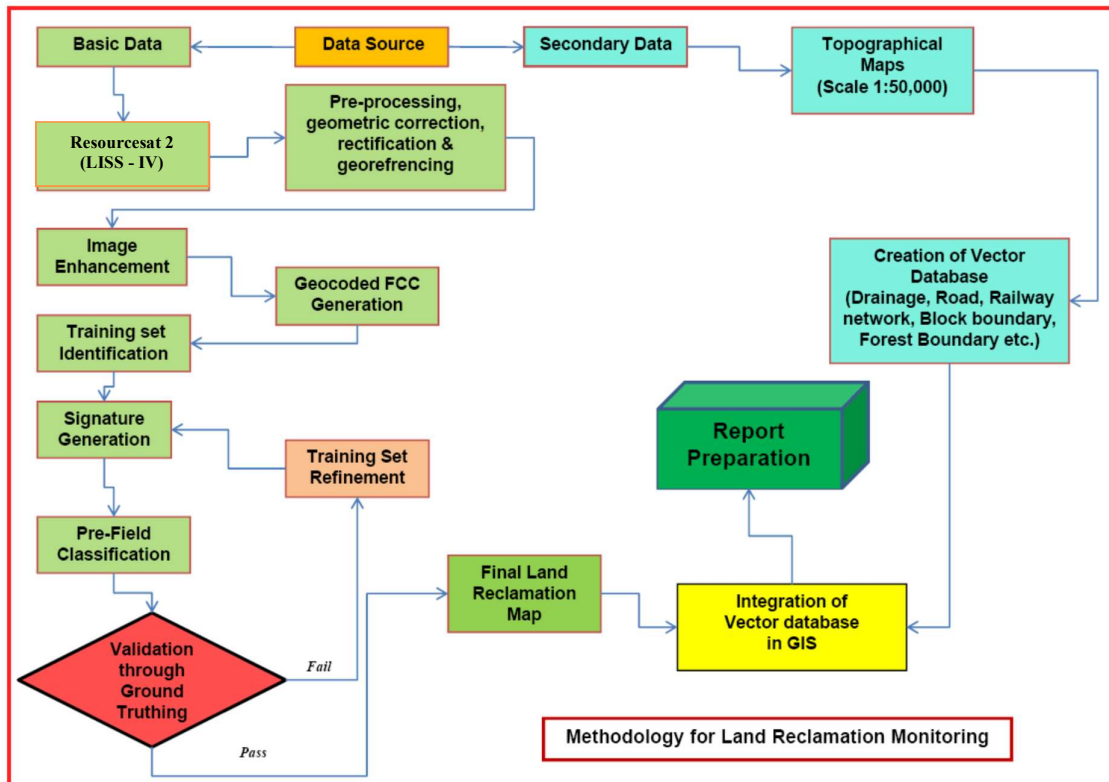


Figure: 2 - **Methodology for Land Reclamation Monitoring**

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

**Satellite Data Used:** The following data are used in the current study, IRS-R2A/LISS-IV data of 6<sup>th</sup> March, 2025 for mines of Talcher Coalfield and IRS-R2A/LISS-IV data of 5<sup>th</sup> February, 2025 for mines of Ib Valley Coalfield.

**3.2 Satellite Data Processing:** Satellite data are processed using ERDAS IMAGINE 2022 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, georeferencing is required for correction of image data using ground control points (GCP) to make it compatible to Sol toposheet.

- **Image enhancement:**

To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE 2022 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.2022 software.

- **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 10.8 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-of dates.

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

**4.1** Following sixteen opencast projects of MCL producing more than 5 million cubic meter and more (Coal + OB) were taken up for land reclamation monitoring based on satellite data of the year 2025.

- Ananta
- Balram
- Lingaraj
- Bharatpur
- Bhubaneswari
- Jagannath
- Hingula
- Kaniha
- Integrated Lakhanpur-Belpahar-Lilari
- Samleswari
- Lajkura
- Garjanbahal
- Kulda

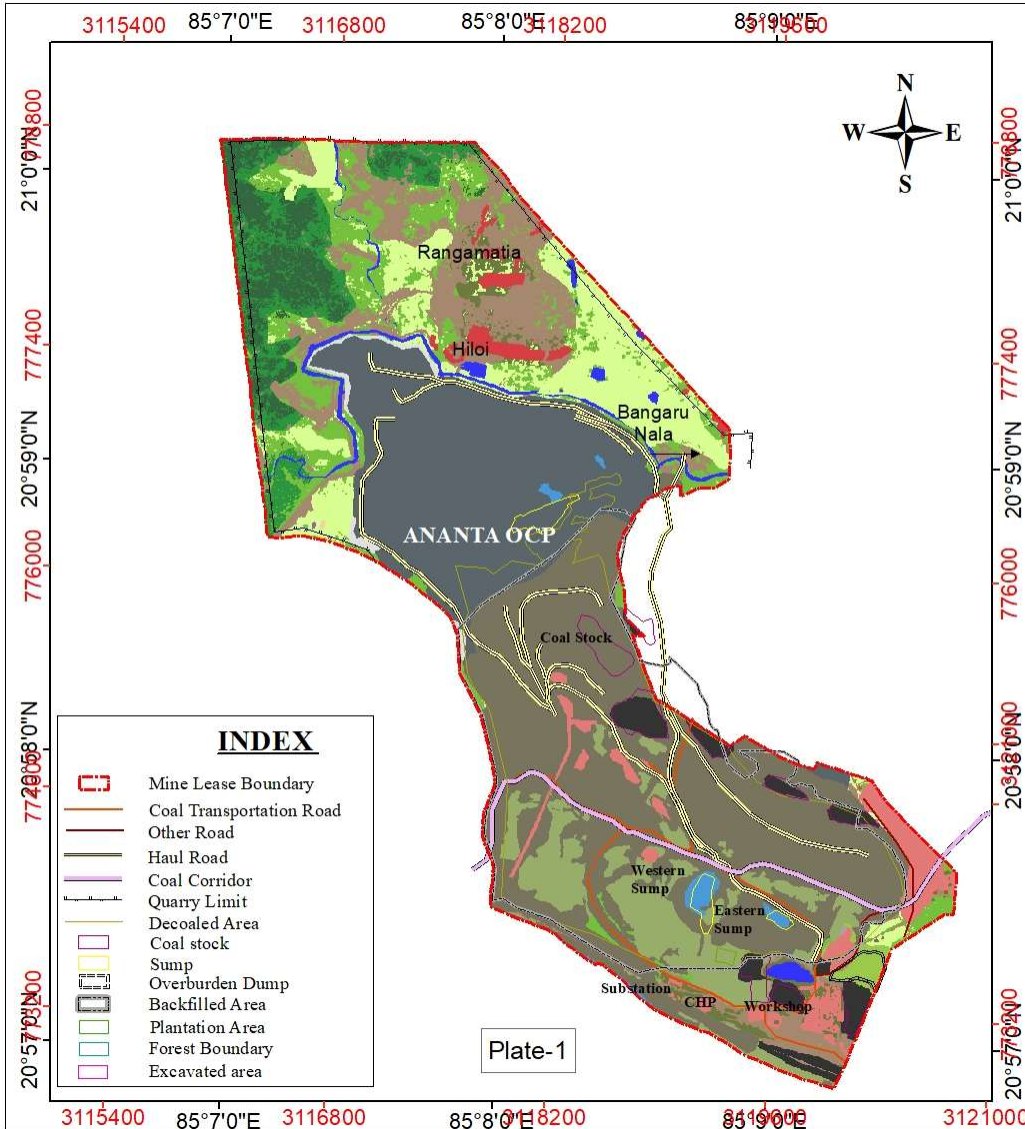
**4.2** Area statistics of different land use class present in the mine leasehold of the above projects for the year 2025 are shown in the Table -1. Land use maps derived from satellite data are shown in Plate 1 - 13. Land reclamation status of the above mentioned 13 projects, are mentioned in the Table 2 for the year 2025. Year wise changes in the different land use classes based on satellite data are depicted in Bar Charts in Fig. 3 - 18.

**4.3** Study reveals that out of total 76.08 Km<sup>2</sup> excavated area; 44.58 Km<sup>2</sup> area (58.60%) is under reclamation. Out of which 8.28 Km<sup>2</sup> (10.88%) area has been re-vegetated and 36.30 Km<sup>2</sup> (47.71%) area is under backfilling.

- 4.4** Total Area under active mining has increased from 29.25 Km<sup>2</sup> (Yr. 2024) to 31.50 Km<sup>2</sup> (Yr. 2025).
- 4.5** Analysis of satellite data indicates that plantation on backfill has increased in totality.
- 4.6** Plantation on External OB dump has marginally increased in totality. Area of Social forestry has increased due to plantation effort and change in lease boundary.
- 4.7** Study also reveals that area under barren backfilling (Technical Reclamation) has increased from 35.06 Km<sup>2</sup> in 2024 to 36.30 Km<sup>2</sup> in 2025.
- 4.8** It was observed that Green Cover has reduced in some projects of MCL due to reduction in plantation and social forestry in the leasehold areas resulted from mining activities. Though total area under green-cover for projects under study has increased.
- 4.9** On comparing the status of land reclamation for the year 2025 with respect to the year 2024 in different projects, it is evident that area of land reclamation has increased from 43.28 Km<sup>2</sup> (Yr.2024) to 44.58 Km<sup>2</sup> (Yr.2025).
- 4.10** Out of 13 projects of MCL, Jagannath OC ranks on top for land reclamation (70.59%) followed by Balram OC (69.28%) and Samleswari OC (68.16%).

Table 2.1: STATUS OF LAND RESTORATION / RECLAMATION IN MAHANADI COALFIELDS LIMITED BASED ON SATELLITE DATA OF THE YEAR 2025

LAND USE / COVER CLASSES		Colour Code	(Area in Sq. Kms.)																											
			ANANTA		BALRAM		LINGARAJ		BHARATPUR		BHUBANESHWARI		JAGANNATH		HINGULA		KANHA		INTEGRATED LBL		SAMLESWARI		LAJKURA		GARJANBAHAL		KULDA		TOTAL	
			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
SETTLEMENTS	Urban Settlement		0.00	0.00	0.00	0.00	0.44	3.12	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.06	0.00	0.00	0.01	0.02	0.00	0.02	0.08	1.11	0.00	0.00	0.00	0.00	0.54	0.31
	Rural Settlement		0.13	1.07	0.64	2.49	0.15	1.06	0.04	0.43	0.02	0.30	0.02	0.36	0.19	1.21	0.24	3.34	0.25	0.57	0.19	1.42	0.02	0.28	0.07	1.07	0.04	0.43	2.00	1.13
	Industrial Settlement		0.38	3.13	0.51	1.98	0.50	3.55	0.32	3.45	0.20	3.04	0.15	2.71	0.06	0.38	0.11	1.53	0.70	1.59	0.24	1.80	0.21	2.91	0.15	2.29	0.08	0.87	3.61	2.04
	<b>Total Settlements (A)</b>		<b>0.51</b>	<b>4.20</b>	<b>1.15</b>	<b>4.47</b>	<b>1.09</b>	<b>7.73</b>	<b>0.36</b>	<b>3.88</b>	<b>0.22</b>	<b>3.34</b>	<b>0.17</b>	<b>3.07</b>	<b>0.26</b>	<b>1.65</b>	<b>0.35</b>	<b>4.87</b>	<b>0.96</b>	<b>2.18</b>	<b>0.43</b>	<b>3.24</b>	<b>0.31</b>	<b>4.30</b>	<b>0.22</b>	<b>3.36</b>	<b>0.12</b>	<b>1.30</b>	<b>6.15</b>	<b>3.48</b>
FOREST	Dense Forest		0.48	3.95	0.19	0.74	0.00	0.00	0.02	0.22	0.00	0.00	0.00	0.00	0.93	5.90	0.00	0.00	2.02	4.59	0.16	1.20	0.41	5.69	0.08	1.22	0.34	3.69	4.63	2.62
	Open Forest		0.52	4.28	1.59	6.18	0.39	2.77	0.01	0.11	0.17	2.58	0.02	0.36	1.56	9.90	0.01	0.14	5.51	12.53	0.40	3.00	0.53	7.35	0.50	7.65	0.44	4.78	11.65	6.60
	<b>Total Forest (B)</b>		<b>1.00</b>	<b>8.23</b>	<b>1.78</b>	<b>6.92</b>	<b>0.39</b>	<b>2.77</b>	<b>0.03</b>	<b>0.32</b>	<b>0.17</b>	<b>2.58</b>	<b>0.02</b>	<b>0.36</b>	<b>2.49</b>	<b>15.81</b>	<b>0.01</b>	<b>0.14</b>	<b>7.53</b>	<b>17.12</b>	<b>0.56</b>	<b>4.19</b>	<b>0.94</b>	<b>13.04</b>	<b>0.58</b>	<b>8.87</b>	<b>0.78</b>	<b>8.47</b>	<b>16.28</b>	<b>9.22</b>
SCRUBS	Scrubs (C)		0.91	7.49	5.43	21.10	1.65	11.70	0.36	3.88	0.25	3.80	0.17	3.07	2.62	16.63	0.58	8.08	5.36	12.18	2.16	16.18	0.74	10.26	0.80	12.23	1.83	19.87	22.86	12.94
	Social Forestry		0.17	1.40	0.38	1.48	0.48	3.40	0.14	1.51	0.03	0.46	0.10	1.81	0.29	1.84	0.09	1.25	0.70	1.59	0.47	3.52	0.09	1.25	0.04	0.61	0.27	2.93	3.25	1.84
GREEN COVER	Plantation on External OB Dump		0.08	0.66	0.22	0.85	0.65	4.61	0.43	4.64	0.00	0.00	0.00	0.00	0.07	0.44	0.00	0.00	1.14	2.59	0.49	3.67	0.10	1.39	0.04	0.61	0.06	0.65	3.28	1.86
	Plantation on Backfill/Excavated Area(Biological Reclamation)		0.89	7.33	0.97	3.77	0.17	1.21	1.56	16.83	0.09	1.37	1.69	30.51	0.09	0.57	0.00	0.00	1.93	4.39	0.68	5.09	0.12	1.66	0.00	0.00	0.09	0.98	8.28	4.69
	<b>Total Plantation (Green Cover) (D)</b>		<b>1.14</b>	<b>9.38</b>	<b>1.57</b>	<b>6.10</b>	<b>1.30</b>	<b>9.22</b>	<b>2.13</b>	<b>22.98</b>	<b>0.12</b>	<b>1.82</b>	<b>1.79</b>	<b>32.31</b>	<b>0.45</b>	<b>2.86</b>	<b>0.09</b>	<b>1.25</b>	<b>3.77</b>	<b>8.57</b>	<b>1.64</b>	<b>12.28</b>	<b>0.31</b>	<b>4.30</b>	<b>0.08</b>	<b>1.22</b>	<b>0.42</b>	<b>4.56</b>	<b>14.81</b>	<b>8.39</b>
<b>Total Vegetation (B+C+D)</b>		<b>3.05</b>	<b>25.10</b>	<b>8.78</b>	<b>34.11</b>	<b>3.34</b>	<b>23.69</b>	<b>2.52</b>	<b>27.18</b>	<b>0.54</b>	<b>8.21</b>	<b>1.98</b>	<b>35.74</b>	<b>5.56</b>	<b>35.30</b>	<b>0.68</b>	<b>9.47</b>	<b>16.66</b>	<b>37.87</b>	<b>4.36</b>	<b>32.65</b>	<b>1.99</b>	<b>27.60</b>	<b>1.46</b>	<b>22.32</b>	<b>3.03</b>	<b>32.90</b>	<b>53.95</b>	<b>30.55</b>	
AGRICULTURE	Crop Lands		0.00	0.00	2.33	9.05	0.18	1.28	0.06	0.65	0.00	0.00	0.01	0.18	0.11	0.70	0.14	1.95	0.21	0.48	0.00	0.00	0.00	0.00	0.01	0.15	0.31	3.37	3.36	1.90
	Fallow Lands		1.11	9.14	5.37	20.86	0.75	5.32	0.43	4.64	0.13	1.98	0.11	1.99	2.01	12.76	1.72	23.96	3.63	8.25	0.84	6.29	0.42	5.83	1.62	24.77	0.81	8.79	18.95	10.73
	<b>Total Agriculture (E)</b>		<b>1.11</b>	<b>9.14</b>	<b>7.70</b>	<b>29.91</b>	<b>0.93</b>	<b>6.60</b>	<b>0.49</b>	<b>5.29</b>	<b>0.13</b>	<b>1.98</b>	<b>0.12</b>	<b>2.17</b>	<b>2.12</b>	<b>13.46</b>	<b>1.86</b>	<b>25.91</b>	<b>3.84</b>	<b>8.73</b>	<b>0.84</b>	<b>6.29</b>	<b>0.42</b>	<b>5.83</b>	<b>1.63</b>	<b>24.92</b>	<b>1.12</b>	<b>12.16</b>	<b>22.31</b>	<b>12.63</b>
WASTELANDS	Waste Lands		1.06	8.72	2.23	8.66	1.88	13.33	0.39	4.21	0.17	2.58	0.25	4.51	1.47	9.33	1.05	14.62	3.87	8.80	1.82	13.63	0.79	10.96	0.31	4.74	0.74	8.03	16.03	9.08
	Fly Ash Pond		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.12	2.17	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	0.12	0.07	
	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	0.06	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.06	0.03
	<b>Total Wasteland(F)</b>		<b>1.06</b>	<b>8.72</b>	<b>2.23</b>	<b>8.66</b>	<b>1.88</b>	<b>13.33</b>	<b>0.39</b>	<b>4.21</b>	<b>0.17</b>	<b>2.58</b>	<b>0.37</b>	<b>6.68</b>	<b>1.53</b>	<b>9.71</b>	<b>1.05</b>	<b>14.62</b>	<b>3.87</b>	<b>8.80</b>	<b>1.82</b>	<b>13.63</b>	<b>0.79</b>	<b>10.96</b>	<b>0.31</b>	<b>4.74</b>	<b>0.74</b>	<b>8.03</b>	<b>16.21</b>	<b>9.18</b>
ACTIVEMING	Coal Dump		0.31	2.55	0.27	1.05	0.34	2.41	0.25	2.70	0.09	1.37	0.14	2.53	0.42	2.67	0.18	2.51	0.60	1.36	0.21	1.57	0.08	1.11	0.33	5.05	0.18	1.95	3.40	1.93
	Coal Quarry		2.20	18.11	1.04	4.04	2.71	19.22	1.18	12.73	2.21	33.59	0.60	10.83	1.56	9.90	1.51	21.03	5.81	13.21	1.62	12.13	1.19	16.50	0.96	14.68	1.55	16.83	24.14	13.67
	Advance Quarry Site		0.06	0.49	0.24	0.93	0.26	1.84	0.15	1.62	0.36	5.47	0.07	1.26	0.18	1.14	0.09	1.25	0.80	1.82	0.19	1.42	0.18	2.50	0.27	4.13	0.10	1.09	2.95	1.67
	Quarry Filled with Water		0.07	0.58	0.56	2.18	0.24	1.70	0.95	10.25	0.28	4.26	0.63	11.37	0.79	5.02	0.04	0.56	0.58	1.32	0.11	0.82	0.04	0.55	0.04	0.61	0.08	0.87	4.41	2.50
	<b>Total Area under Active Mining</b>		<b>2.33</b>	<b>19.18</b>	<b>1.84</b>	<b>7.15</b>	<b>3.21</b>	<b>22.77</b>	<b>2.28</b>	<b>24.60</b>	<b>2.85</b>	<b>43.31</b>	<b>1.30</b>	<b>23.47</b>	<b>2.53</b>	<b>16.06</b>	<b>1.64</b>	<b>22.84</b>	<b>7.19</b>	<b>16.34</b>	<b>1.92</b>	<b>14.38</b>	<b>1.41</b>	<b>19.56</b>	<b>1.27</b>	<b>19.42</b>	<b>1.73</b>	<b>18.78</b>	<b>31.50</b>	<b>17.84</b>
WATER	Barren OB dump		0.01	0.08	0.13	0.51	0.66	4.68	0.09	0.97	0.00	0.00	0.00	0.00	0.89	5.65	0.66	9.19	0.40	0.91	0.14	1.05	0.54	7.49	0.41	6.27	0.62	6.73	4.55	2.58
	Area Under Backfilling(Technical Reclamation)		3.60	29.63	3.18	12.35	2.57	18.23	2.87	30.96	2.57	39.06	1.43	25.81	2.06	13.08	0.67	9.33	9.95	22.62	3.43	25.69	1.61	22.33	0.88	13.46	1.48	16.07	36.30	20.55
	<b>Total Area under Mine Operation</b>		<b>6.25</b>	<b>51.44</b>	<b>5.42</b>	<b>21.06</b>	<b>6.78</b>	<b>48.09</b>	<b>5.49</b>	<b>59.22</b>	<b>5.51</b>	<b>83.74</b>	<b>2.87</b>	<b>51.81</b>	<b>5.90</b>	<b>37.46</b>	<b>3.15</b>	<b>43.87</b>	<b>18.14</b>	<b>41.24</b>	<b>5.70</b>	<b>42.69</b>	<b>3.64</b>	<b>50.49</b>	<b>2.89</b>	<b>44.19</b>	<b>4.01</b>	<b>43.54</b>	<b>75.75</b>	<b>42.89</b>
Reservoir, nullah, ponds etc.		0.17	1.40	0.46	1.79	0.08	0.57	0.02	0.22	0.01	0.15	0.03	0.54	0.38	2.41	0.09	1.25	0.52	1.18	0.20	1.50	0.06	0.83	0.03	0.46	0.19	2.06	2.24	1.27	
<b>Total Waterbodies</b>		<b>0.17</b>	<b>1.40</b>	<b>0.46</b>	<b>1.79</b>	<b>0.08</b>	<b>0.57</b>	<b>0.02</b>	<b>0.22</b>	<b>0.01</b>	<b>0.15</b>	<b>0.03</b>	<b>0.54</b>	<b>0.38</b>	<b>2.41</b>	<b>0.09</b>	<b>1.25</b>	<b>0.52</b>	<b>1.18</b>	<b>0.20</b>	<b>1.50</b>	<b>0.06</b>	<b>0.83</b>	<b>0.03</b>	<b>0.46</b>	<b>0.19</b>	<b>2.06</b>	<b>2.24</b>	<b>1.27</b>	
<b>GRAND TOTAL</b>			<b>12.15</b>	<b>100.00</b>	<b>25.74</b>	<b>100.00</b>	<b>14.10</b>	<b>100.00</b>	<b>9.27</b>	<b>100.00</b>	<b>6.58</b>	<b>100.00</b>	<b>5.54</b>	<b>100.00</b>	<b>15.75</b>	<b>100.00</b>	<b>7.18</b>	<b>100.00</b>	<b>43.99</b>	<b>100.00</b>	<b>13.35</b>	<b>100.00</b>	<b>7.21</b>	<b>100.00</b>	<b>6.54</b>	<b>100.00</b>	<b>9.21</b>	<b>100.00</b>	<b>176.61</b>	<b>100.00</b>



Area Statistics -Ananta OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Level-I	Level-II			
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		0.13	1.07
	Industrial Settlements		0.38	3.13
	<b>Total Settlement Area</b>		<b>0.51</b>	<b>4.20</b>
Forests	Dense Forest		0.48	3.95
	Open Forest		0.52	4.28
	<b>Total Forest (A)</b>		<b>1.00</b>	<b>8.23</b>
	Scrubs (B)		0.91	7.49
Plantation Area	Social Forestry		0.17	1.40
	Plantation on OB		0.08	0.66
	Orchard		0.00	0.00
	Plantation on Backfill		0.89	7.33
	<b>Total Plantation (C)</b>		<b>1.14</b>	<b>9.38</b>
	<b>Total Vegetation (A+B+C)</b>		<b>3.05</b>	<b>25.10</b>
Agriculture Land	Crop land		0.00	0.00
	Fallow Land		1.11	9.14
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>1.11</b>	<b>9.14</b>
Waste Land	Waste Land		1.06	8.72
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>1.06</b>	<b>8.72</b>
Mining Area	Coal Dump		0.31	2.55
	Coal Quarry		2.20	18.11
	Advance Quarry Site		0.06	0.49
	Quarry Filled with Water		0.07	0.58
	Barren OB Dump		0.01	0.08
	Backfill		3.60	29.63
	<b>Total Mining Area</b>		<b>6.25</b>	<b>51.44</b>
Water Body	River/ Ponds		0.17	1.40
	<b>Total Area</b>		<b>12.15</b>	<b>100.00</b>

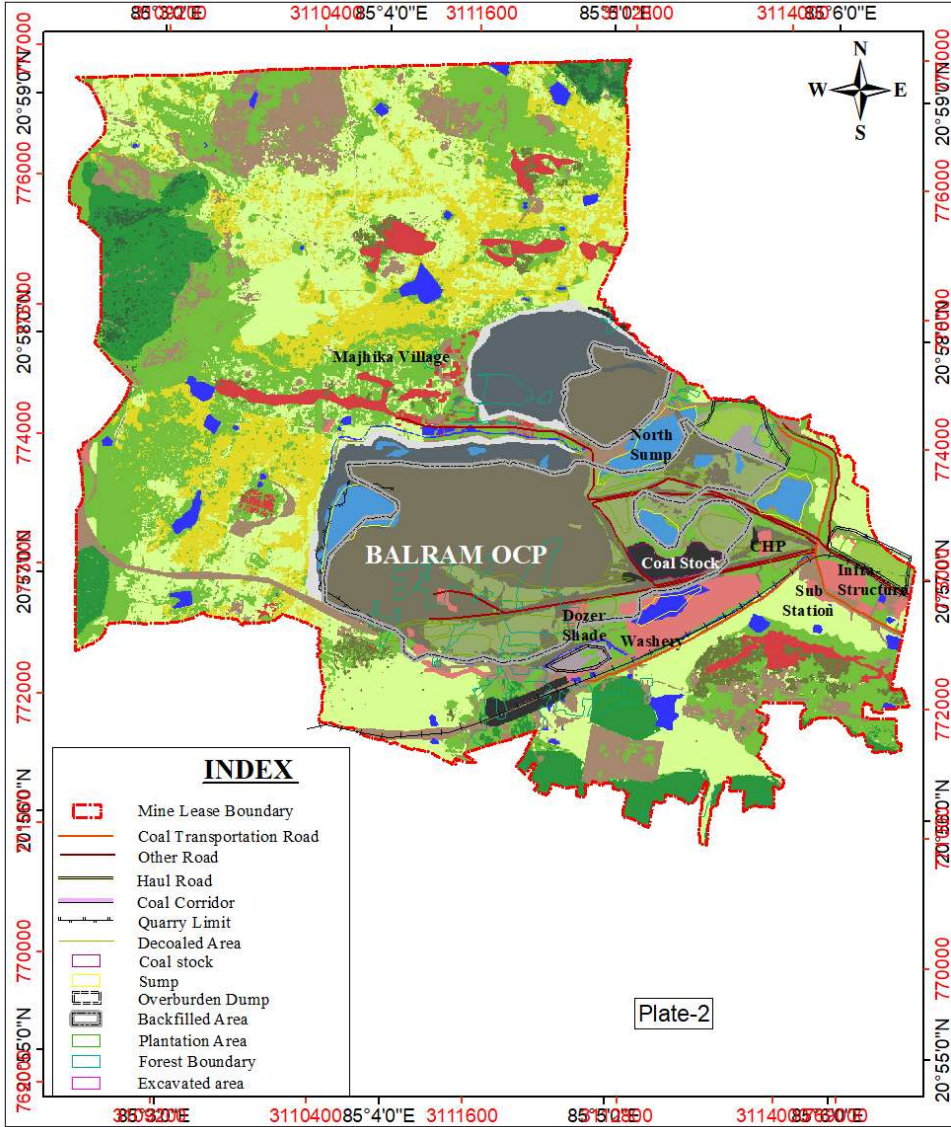
Customer: Mahanadi Coalfields Limited

Title: Land Reclamation Monitoring of OC Projects Job No. 564924124

Subject	Activity	Name	Designation	Signature	Date
Land Reclamation Status of Ananta OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S. Mishra	GM (Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM (Geomatics)	<i>M. Rastogi</i>	

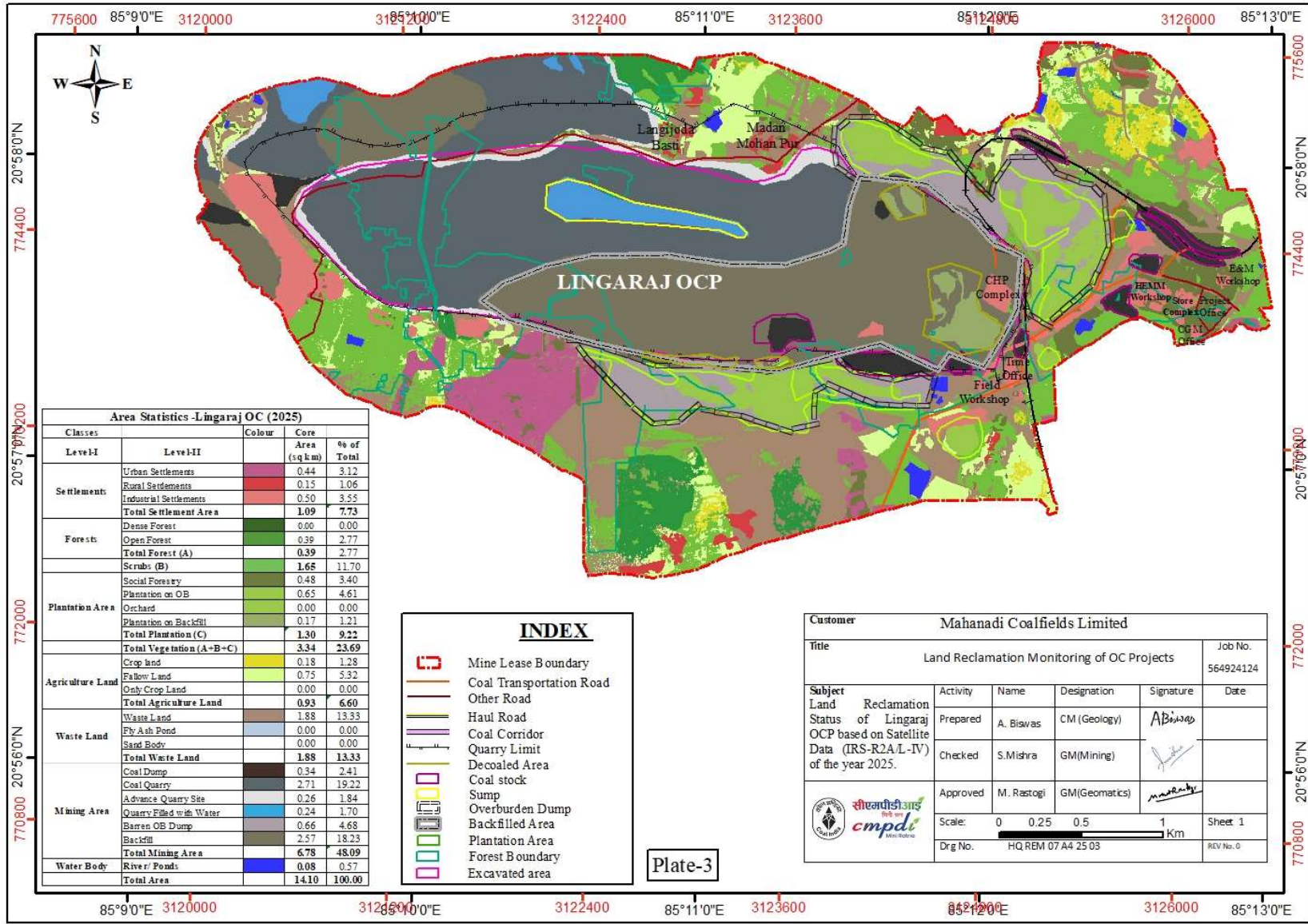
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Drg No. HQ.REM 07 A4 25 01 Sheet 1 REV No. 0



Area Statistics -Balram OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		0.64	2.49
	Industrial Settlements		0.51	1.98
	<b>Total Settlement Area</b>		<b>1.15</b>	<b>4.47</b>
Forests	Dense Forest		0.19	0.74
	Open Forest		1.59	6.18
	<b>Total Forest (A)</b>		<b>1.78</b>	<b>6.92</b>
Plantation Area	Scrubs (B)		5.43	21.10
	Social Forestry		0.38	1.48
	Plantation on OB		0.22	0.85
	Orchard		0.00	0.00
	Plantation on Backfill		0.97	3.77
	<b>Total Plantation (C)</b>		<b>1.57</b>	<b>6.10</b>
	<b>Total Vegetation (A+B+C)</b>		<b>8.78</b>	<b>34.11</b>
Agriculture Land	Crop land		2.33	9.05
	Fallow Land		5.37	20.86
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>7.70</b>	<b>29.91</b>
Waste Land	Waste Land		2.23	8.66
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>2.23</b>	<b>8.66</b>
Mining Area	Coal Dump		0.27	1.05
	Coal Quarry		1.04	4.04
	Advance Quarry Site		0.24	0.93
	Quarry Filled with Water		0.56	2.18
	Barren OB Dump		0.13	0.51
	Backfill		3.18	12.35
	<b>Total Mining Area</b>		<b>5.42</b>	<b>21.06</b>
Water Body	River/ Ponds		0.46	1.79
	<b>Total Area</b>		<b>25.74</b>	<b>100.00</b>

Customer		Mahanadi Coalfields Limited			
Title	Land Reclamation Monitoring of OC Projects				Job No. 564924124
Subject Land Reclamation Status of Balram OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Activity	Name	Designation	Signature	Date
	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S.Mishra	GM(Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM(Geomatics)	<i>M. Rastogi</i>	
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Drg No. HQ.REM 07 A4 25 02		REV.No. 0			



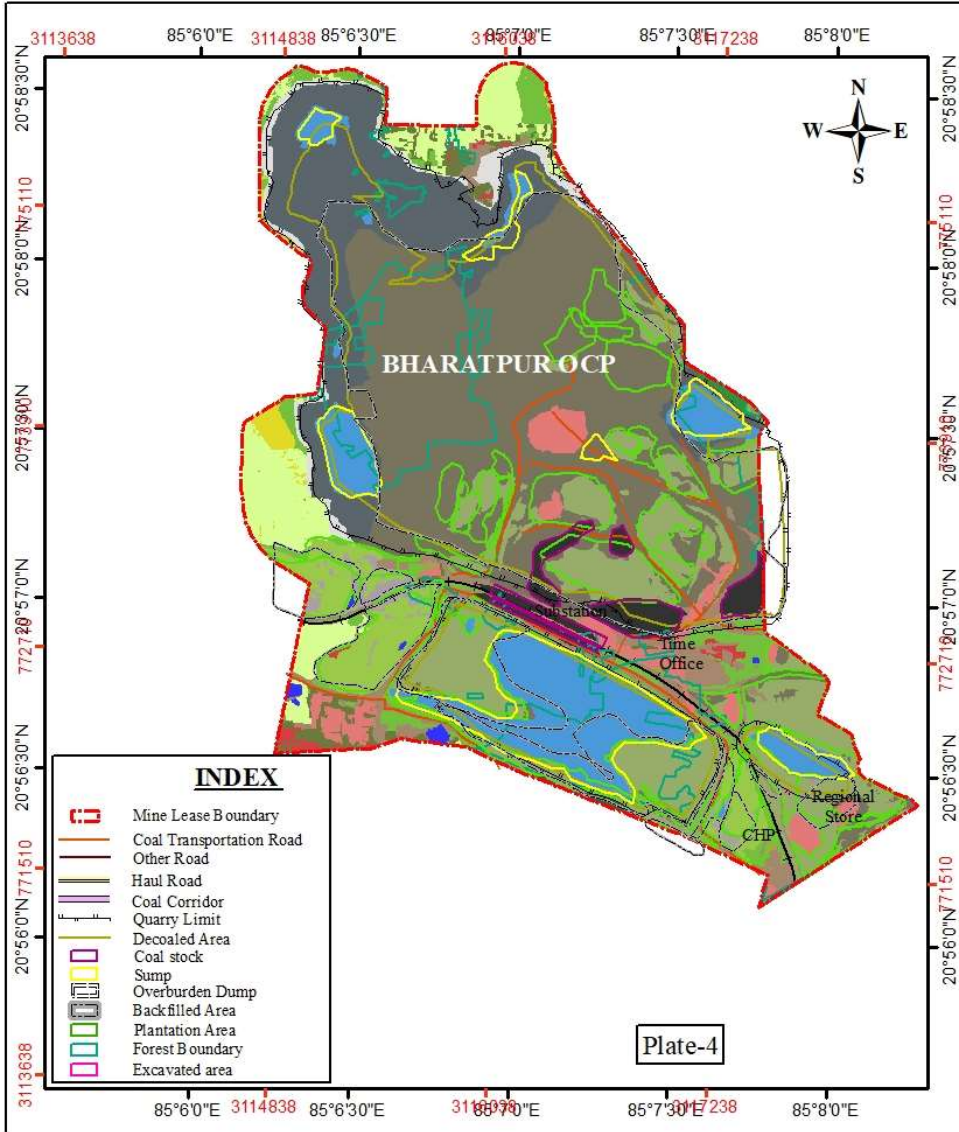
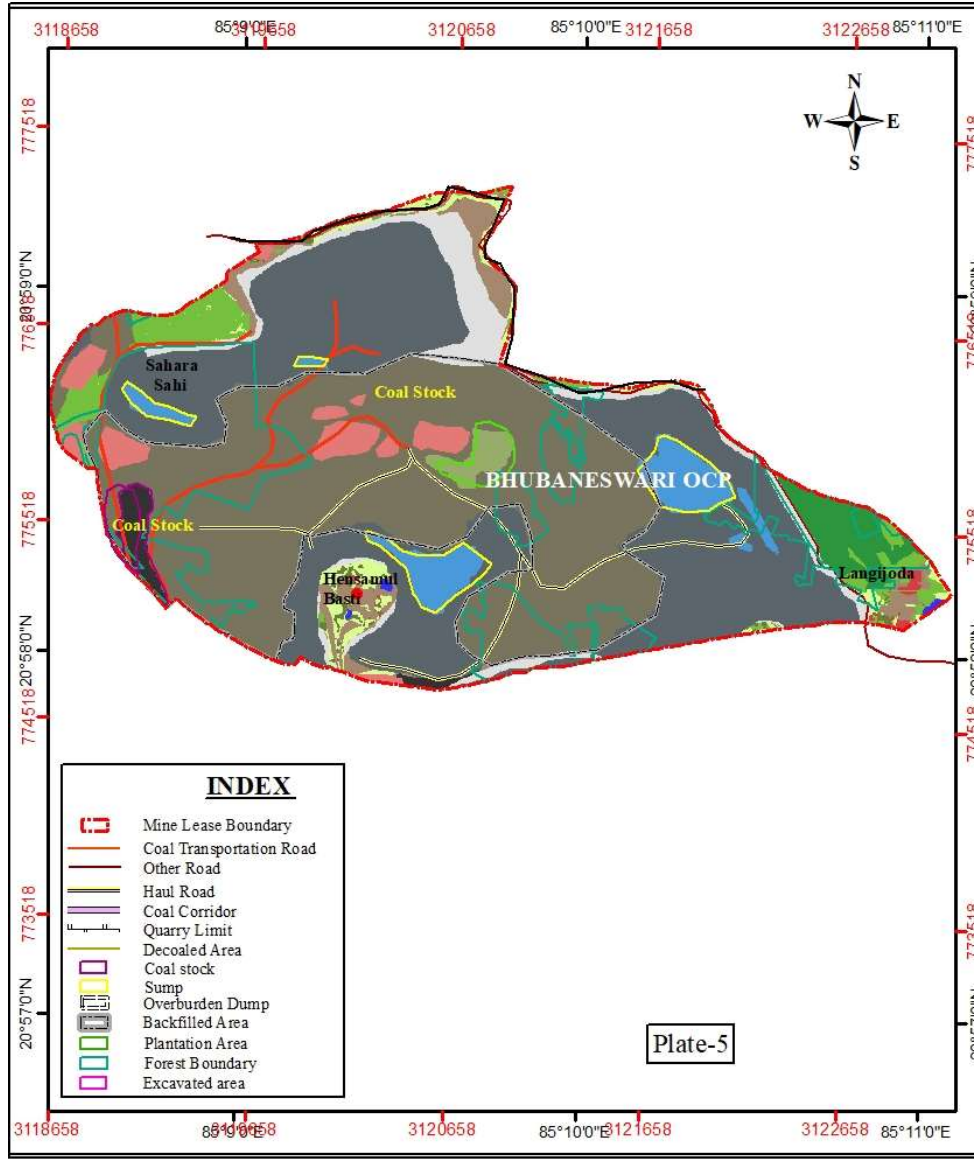


Plate-4

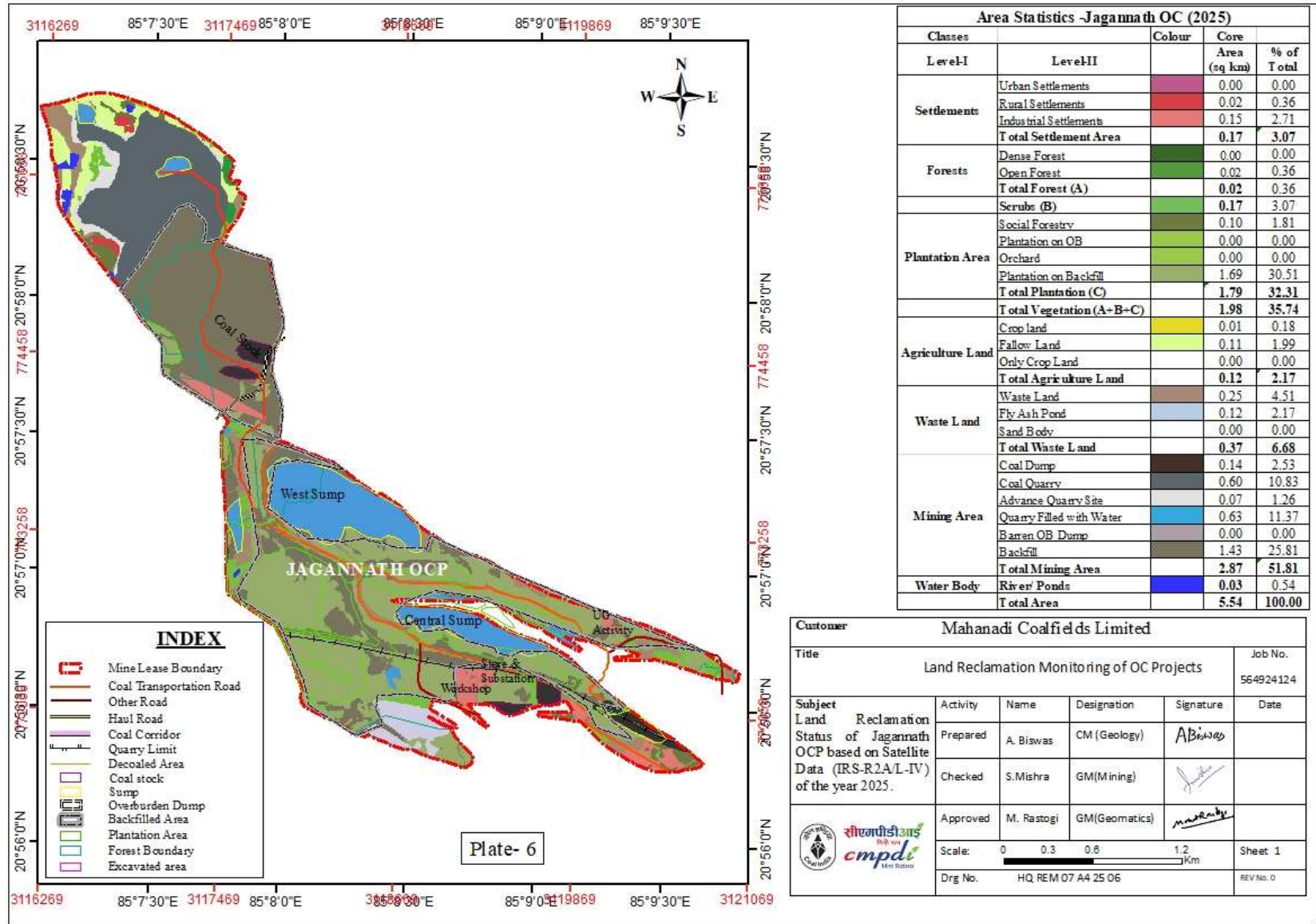
Area Statistics -Bharatpur OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Level-I	Level-II			
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		0.04	0.43
	Industrial Settlements		0.32	3.45
	<b>Total Settlement Area</b>		<b>0.36</b>	<b>3.88</b>
Forests	Dense Forest		0.02	0.22
	Open Forest		0.01	0.11
	<b>Total Forest (A)</b>		<b>0.03</b>	<b>0.32</b>
	Scrubs (B)		0.36	3.88
Plantation Area	Social Forestry		0.14	1.51
	Plantation on OB		0.43	4.64
	Orchard		0.00	0.00
	Plantation on Backfill		1.56	16.83
	<b>Total Plantation (C)</b>		<b>2.13</b>	<b>22.98</b>
	<b>Total Vegetation (A+B+C)</b>		<b>2.52</b>	<b>27.18</b>
Agriculture Land	Crop land		0.06	0.65
	Fallow Land		0.43	4.64
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>0.49</b>	<b>5.29</b>
Waste Land	Waste Land		0.39	4.21
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>0.39</b>	<b>4.21</b>
Mining Area	Coal Dump		0.25	2.70
	Coal Quarry		1.18	12.73
	Advance Quarry Site		0.15	1.62
	Quarry Filled with Water		0.95	10.25
	Barren OB Dump		0.09	0.97
	Backfill		2.87	30.96
	<b>Total Mining Area</b>		<b>5.49</b>	<b>59.22</b>
Water Body	River/ Ponds		0.02	0.22
	<b>Total Area</b>		<b>9.27</b>	<b>100.00</b>

Customer						Mahanadi Coalfields Limited							
Title						Land Reclamation Monitoring of OC Projects						Job No. 564924124	
Subject						Land Reclamation Status of Bharatpur OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.							
Activity		Name		Designation		Signature		Date					
Prepared		A. Biswas		CM (Geology)		<i>A. Biswas</i>							
Checked		S. Mishra		GM (Mining)		<i>S. Mishra</i>							
Approved		M. Rastogi		GM (Geomatics)		<i>M. Rastogi</i>							
Scale:						0 0.3 0.6 1.2 Km						Sheet 1	
Drg No.						HQ REM 07 A4 25 04						REV No. 0	



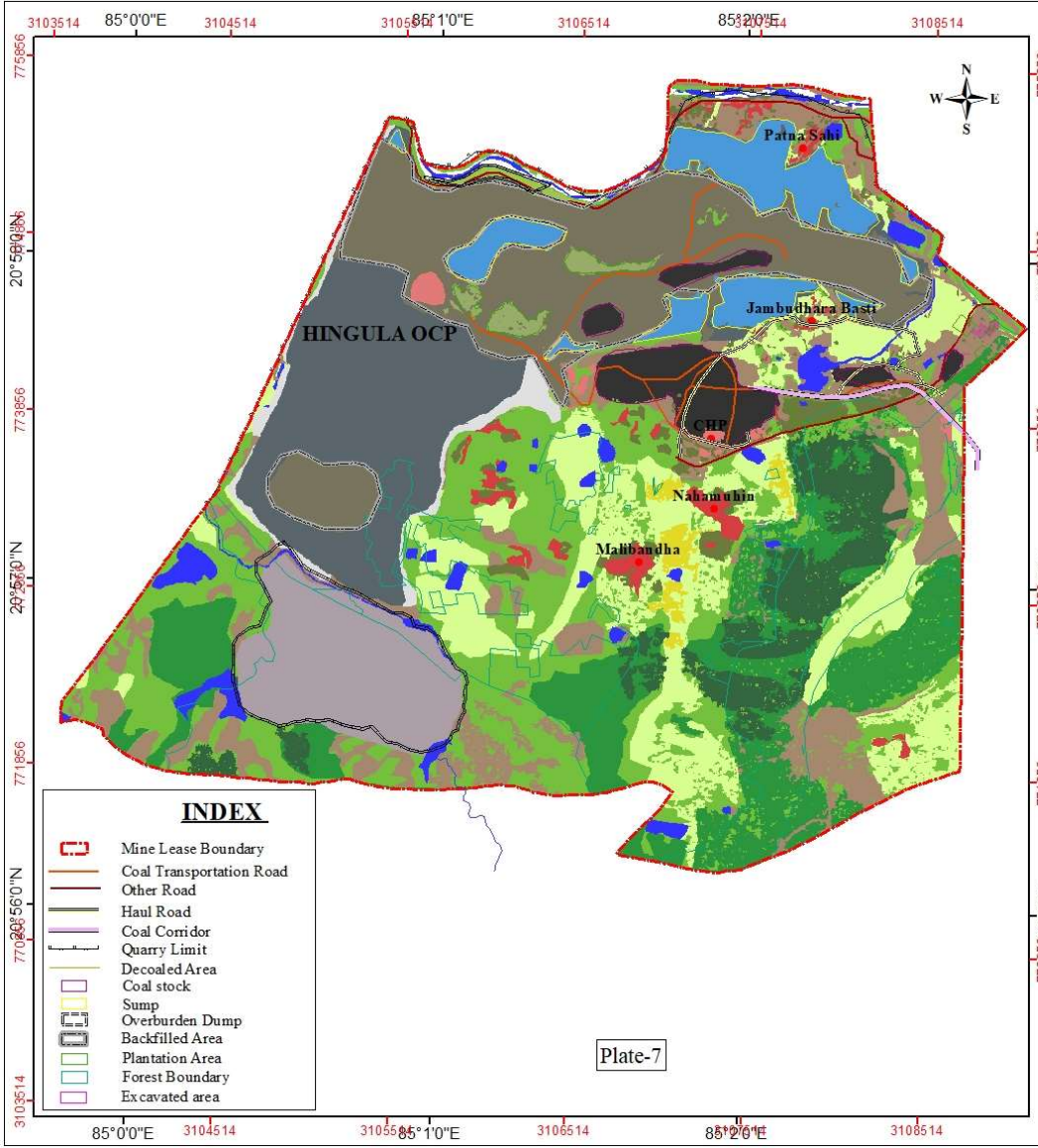
Area Statistics -Bhubaneswari OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Level-I	Level-II			
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		0.02	0.30
	Industrial Settlements		0.20	3.04
	<b>Total Settlement Area</b>		<b>0.22</b>	<b>3.34</b>
Forests	Dense Forest		0.00	0.00
	Open Forest		0.17	2.58
	<b>Total Forest (A)</b>		<b>0.17</b>	<b>2.58</b>
	<b>Scrubs (B)</b>		<b>0.25</b>	<b>3.80</b>
Plantation Area	Social Forestry		0.03	0.46
	Plantation on OB		0.00	0.00
	Orchard		0.00	0.00
	Plantation on Backfill		0.09	1.37
	<b>Total Plantation (C)</b>		<b>0.12</b>	<b>1.82</b>
	<b>Total Vegetation (A+B+C)</b>		<b>0.54</b>	<b>8.21</b>
Agriculture Land	Crop land		0.00	0.00
	Fallow Land		0.13	1.98
	Orly Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>0.13</b>	<b>1.98</b>
Waste Land	Waste Land		0.17	2.58
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>0.17</b>	<b>2.58</b>
Mining Area	Coal Dump		0.09	1.37
	Coal Quarry		2.21	33.59
	Advance Quarry Site		0.36	5.47
	Quarry Filled with Water		0.28	4.26
	Barren OB Dump		0.00	0.00
	Backfill		2.57	39.06
	<b>Total Mining Area</b>		<b>5.51</b>	<b>83.74</b>
Water Body	River/ Ponds		0.01	0.15
	<b>Total Area</b>		<b>6.58</b>	<b>100.00</b>

Customer		Mahanadi Coalfields Limited			
Title		Land Reclamation Monitoring of OC Projects			Job No. 564924124
Subject	Land Reclamation Status of Bhubaneswari OCP based on Satellite Data (IRS-R2 A/L-IV) of the year 2025.	Activity	Name	Designation	Signature
		Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>
		Checked	S.Mishra	GM(Mining)	<i>S.Mishra</i>
		Approved	M. Rastogi	GM(Geomatics)	<i>M. Rastogi</i>
Scale:		0 0.275 0.55 1.1 Km			
Drg No.		HQ REM 07 A4 25 05			Sheet 1
					REV No. 0



Area Statistics -Jagannath OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Settlements	Level-I			
	Level-II			
	Urban Settlements		0.00	0.00
	Rural Settlements		0.02	0.36
	Industrial Settlements		0.15	2.71
	<b>Total Settlement Area</b>		<b>0.17</b>	<b>3.07</b>
Forests	Dense Forest		0.00	0.00
	Open Forest		0.02	0.36
	<b>Total Forest (A)</b>		<b>0.02</b>	<b>0.36</b>
Plantation Area	Scrubs (B)		0.17	3.07
	Social Forestry		0.10	1.81
	Plantation on OB		0.00	0.00
	Orchard		0.00	0.00
	Plantation on Backfill		1.69	30.51
	<b>Total Plantation (C)</b>		<b>1.79</b>	<b>32.31</b>
	<b>Total Vegetation (A+B+C)</b>		<b>1.98</b>	<b>35.74</b>
Agriculture Land	Crop land		0.01	0.18
	Fallow Land		0.11	1.99
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>0.12</b>	<b>2.17</b>
Waste Land	Waste Land		0.25	4.51
	Fly Ash Pond		0.12	2.17
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>0.37</b>	<b>6.68</b>
Mining Area	Coal Dump		0.14	2.53
	Coal Quarry		0.60	10.83
	Advance Quarry Site		0.07	1.26
	Quarry Filled with Water		0.63	11.37
	Barren OB Dump		0.00	0.00
	Backfill		1.43	25.81
	<b>Total Mining Area</b>		<b>2.87</b>	<b>51.81</b>
Water Body	River/ Ponds		0.03	0.54
	<b>Total Area</b>		<b>5.54</b>	<b>100.00</b>

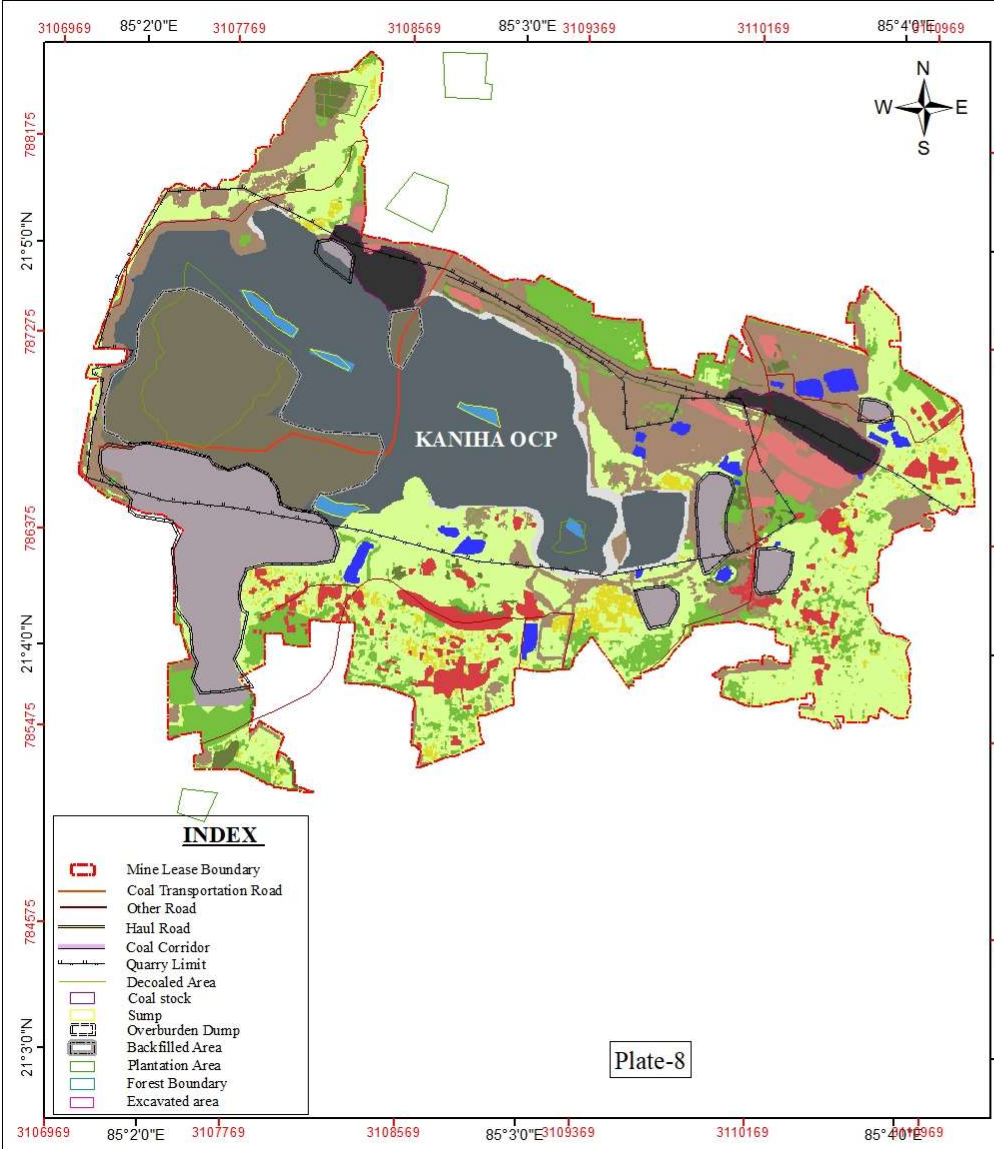
Customer: Mahanadi Coalfields Limited					
Title: Land Reclamation Monitoring of OC Projects					Job No. 564924124
Subject: Land Reclamation Status of Jagannath OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Activity	Name	Designation	Signature	Date
	Prepared	A. Biswas	CM (Geology)	<i>ABiswas</i>	
	Checked	S.Mishra	GM(Mining)	<i>S.Mishra</i>	
	Approved	M. Rastogi	GM(Geomatics)	<i>M.Rastogi</i>	
Scale: 0 0.3 0.6 1.2 Km					Sheet 1
Drg No. HQ REM 07 A4 25 06					REV No. 0



Area Statistics -Hingula OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Level-I	Level-II			
Settlements	Urban Settlements		0.01	0.06
	Rural Settlements		0.19	1.21
	Industrial Settlements		0.06	0.38
	<b>Total Settlement Area</b>		<b>0.26</b>	<b>1.65</b>
Forests	Dense Forest		0.93	5.90
	Open Forest		1.56	9.90
	<b>Total Forest (A)</b>		<b>2.49</b>	<b>15.81</b>
	<b>Scrubs (B)</b>		<b>2.62</b>	<b>16.63</b>
Plantation Area	Social Forestry		0.29	1.84
	Plantation on OB		0.07	0.44
	Orchard		0.00	0.00
	Plantation on Backfill		0.09	0.57
	<b>Total Plantation (C)</b>		<b>0.45</b>	<b>2.86</b>
<b>Total Vegetation (A+B+C)</b>			<b>5.56</b>	<b>35.30</b>
Agriculture Land	Crop land		0.11	0.70
	Fallow Land		2.01	12.76
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>2.12</b>	<b>13.46</b>
Waste Land	Waste Land		1.47	9.33
	Fly Ash Pond		0.00	0.00
	Sand Body		0.06	0.38
	<b>Total Waste Land</b>		<b>1.53</b>	<b>9.71</b>
Mining Area	Coal Dump		0.42	2.67
	Coal Quarry		1.56	9.90
	Advance Quarry Site		0.18	1.14
	Quarry Filled with Water		0.79	5.02
	Barren OB Dump		0.89	5.65
	Backfill		2.06	13.08
	<b>Total Mining Area</b>		<b>5.90</b>	<b>37.46</b>
Water Body	River/ Ponds		0.38	2.41
<b>Total Area</b>			<b>15.75</b>	<b>100.00</b>

Customer: Mahanadi Coalfields Limited					
Title: Land Reclamation Monitoring of OC Projects					Job No. 564924124
Subject Land Reclamation Status of Hingula OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Activity	Name	Designation	Signature	Date
	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S. Mishra	GM (Mining)	<i>S. Mishra</i>	
Approved	M. Rastogi	GM (Geomatics)	<i>M. Rastogi</i>		
Scale: 0 0.25 0.5 1 Km		Sheet 1			
Drg No. HQ REM 07 A4 25 07		REV No. 0			



Classes	Level-II	Colour	Core Area (sq km)	% of Total
Settlements	Urban Settlements		0.00	0.00
	Rural Settlements		0.24	3.34
	Industrial Settlements		0.11	1.53
	<b>Total Settlement Area</b>		<b>0.35</b>	<b>4.87</b>
Forests	Dense Forest		0.00	0.00
	Open Forest		0.01	0.14
	<b>Total Forest (A)</b>		<b>0.01</b>	<b>0.14</b>
	<b>Scrubs (B)</b>		<b>0.58</b>	<b>8.08</b>
Plantation Area	Social Forestry		0.09	1.25
	Plantation on OB		0.00	0.00
	Orchard		0.00	0.00
	Plantation on Backfill		0.00	0.00
	<b>Total Plantation (C)</b>		<b>0.09</b>	<b>1.25</b>
<b>Total Vegetation (A+B+C)</b>			<b>0.68</b>	<b>9.47</b>
Agriculture Land	Crop land		0.14	1.95
	Fallow Land		1.72	23.96
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>1.86</b>	<b>25.91</b>
Waste Land	Waste Land		1.05	14.62
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>1.05</b>	<b>14.62</b>
Mining Area	Coal Dump		0.18	2.51
	Coal Quarry		1.51	21.03
	Advance Quarry Site		0.09	1.25
	Quarry Filled with Water		0.04	0.56
	Barren OB Dump		0.66	9.19
	Backfill		0.67	9.33
	<b>Total Mining Area</b>		<b>3.15</b>	<b>43.87</b>
Water Body	River/ Ponds		0.09	1.25
<b>Total Area</b>			<b>7.18</b>	<b>100.00</b>

Customer: Mahanadi Coalfields Limited

Title: Land Reclamation Monitoring of OC Projects

Job No. 564924124

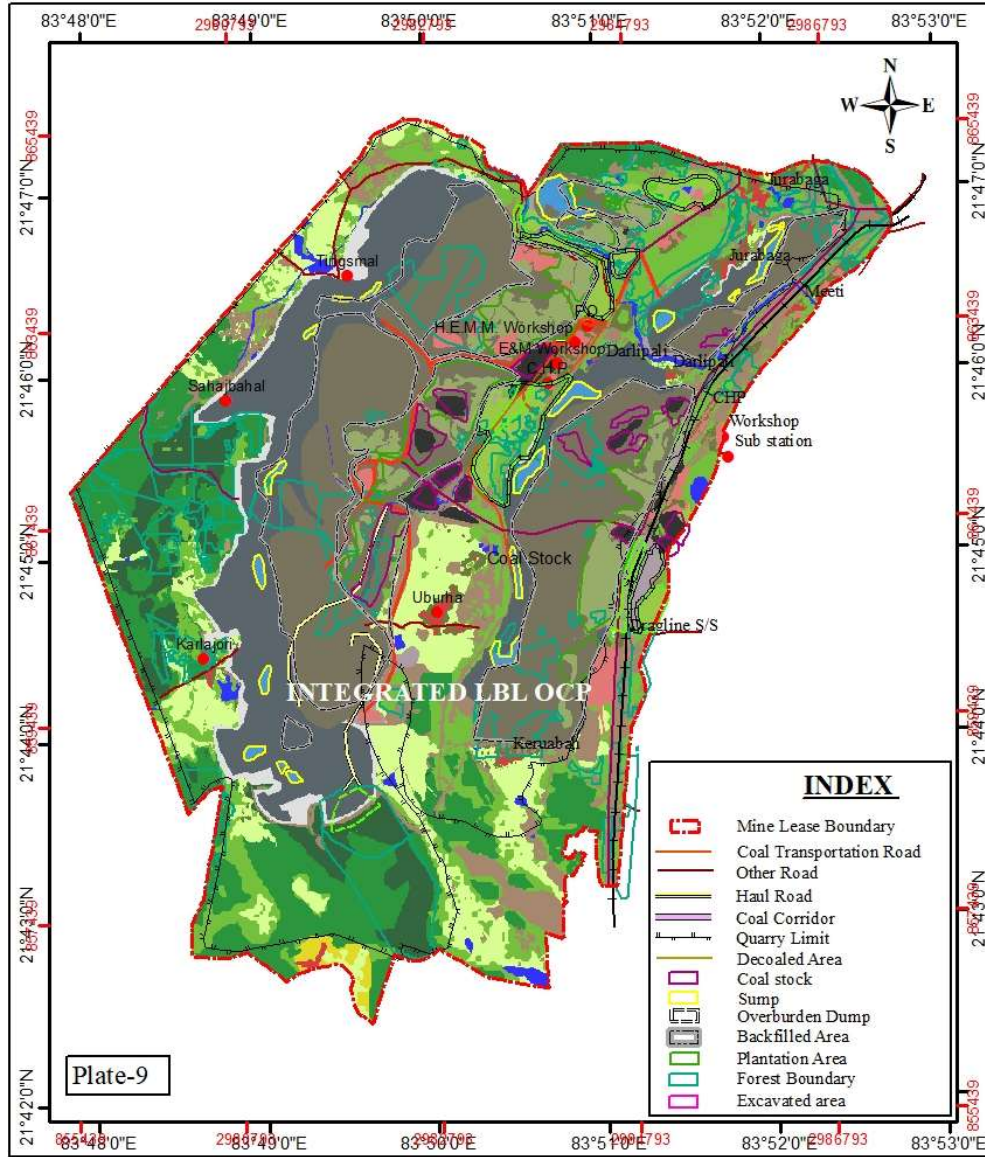
Subject	Activity	Name	Designation	Signature	Date
Land Reclamation Status of Kaniha OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S. Mishra	GM (Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM (Geomatics)	<i>M. Rastogi</i>	

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Drng No. HQ REM 07 A4 25 08

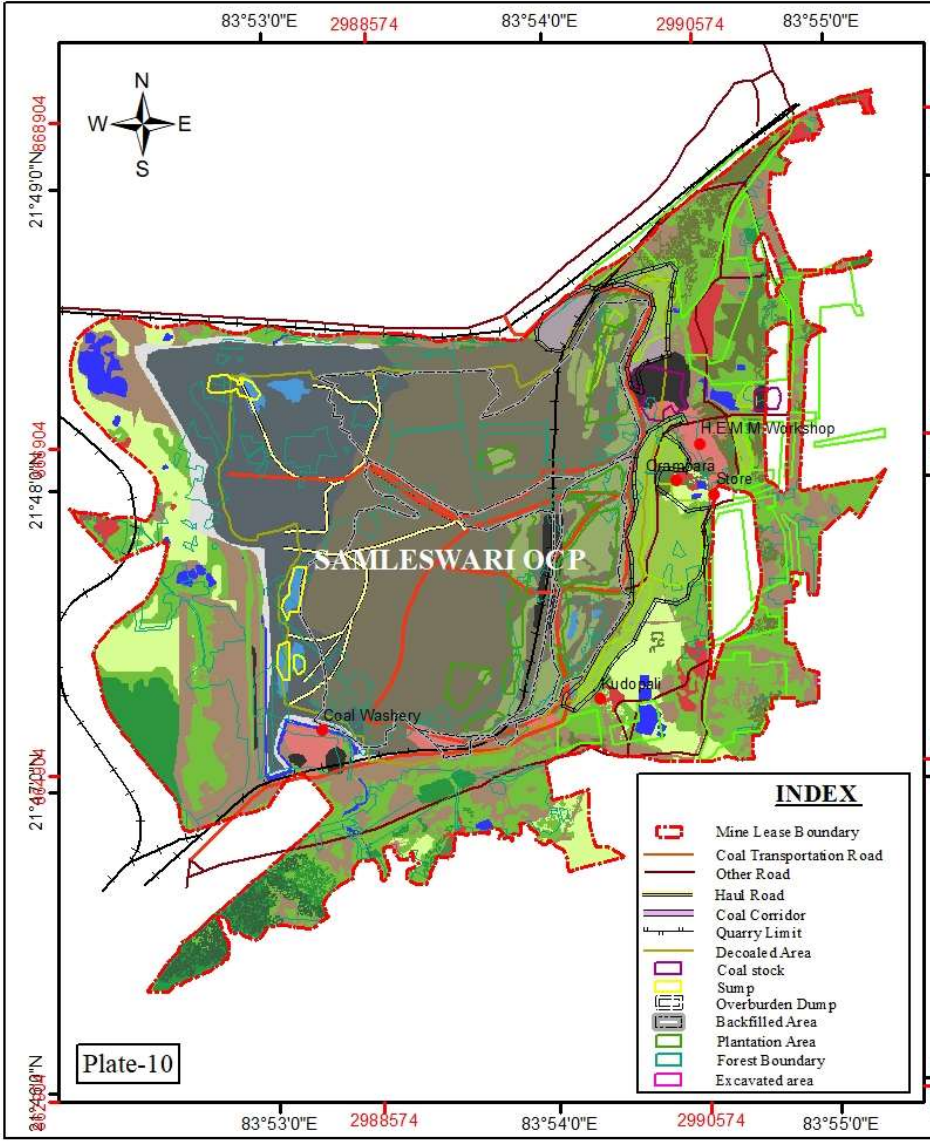
Sheet 1

REV No. 0



Area Statistics -Integrated Lakhanpur-Belpahar-Lilari OC (2025)				
Classes		Colour	Core Area (sq km)	% of Total
Settlements	Level-I			
	Level-II			
	Urban Settlements		0.01	0.02
	Rural Settlements		0.25	0.57
Forests	Industrial Settlements		0.70	1.59
	<b>Total Settlement Area</b>		<b>0.96</b>	<b>2.18</b>
	Dense Forest		2.02	4.59
Plantation Area a	Open Forest		5.51	12.53
	<b>Total Forest (A)</b>		<b>7.53</b>	<b>17.12</b>
	Scrubs (B)		5.36	12.18
Agriculture Land	Social Forestry		0.70	1.59
	Plantation on OB		1.14	2.59
	Orchard		0.00	0.00
	Plantation on Backfill		1.93	4.39
Waste Land	<b>Total Plantation (C)</b>		<b>3.77</b>	<b>8.57</b>
	<b>Total Vegetation (A+B+C)</b>		<b>16.66</b>	<b>37.87</b>
	Crop land		0.21	0.48
	Fallow Land		3.63	8.25
Mining Area	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>3.84</b>	<b>8.73</b>
	Waste Land		3.87	8.80
	Fly Ash Pond		0.00	0.00
Water Body	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>3.87</b>	<b>8.80</b>
	Coal Dump		0.60	1.36
	Coal Quarry		5.81	13.21
	Advance Quarry Site		0.80	1.82
	Quarry Filled with Water		0.58	1.32
	Barren OB Dump		0.40	0.91
Mining Area	Backfill		9.95	22.62
	<b>Total Mining Area</b>		<b>18.14</b>	<b>41.24</b>
Water Body	River/ Ponds		0.52	1.18
	<b>Total Area</b>		<b>43.99</b>	<b>100.00</b>

Customer: Mahanadi Coalfields Limited					
Title: Land Reclamation Monitoring of OC Projects					Job No. 564924124
Subject: Land Reclamation Status of Integrated Lakhanpur-Belpahar-Lilari OCP based on Satellite Data (IRS-R2.A.L-IV) of the year 2025.	Activity: Prepared	Name: A. Biswas	Designation: CM (Geology)	Signature: <i>A. Biswas</i>	Date:
	Checked	S. Mishra	GM (Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM (Geomatics)	<i>M. Rastogi</i>	
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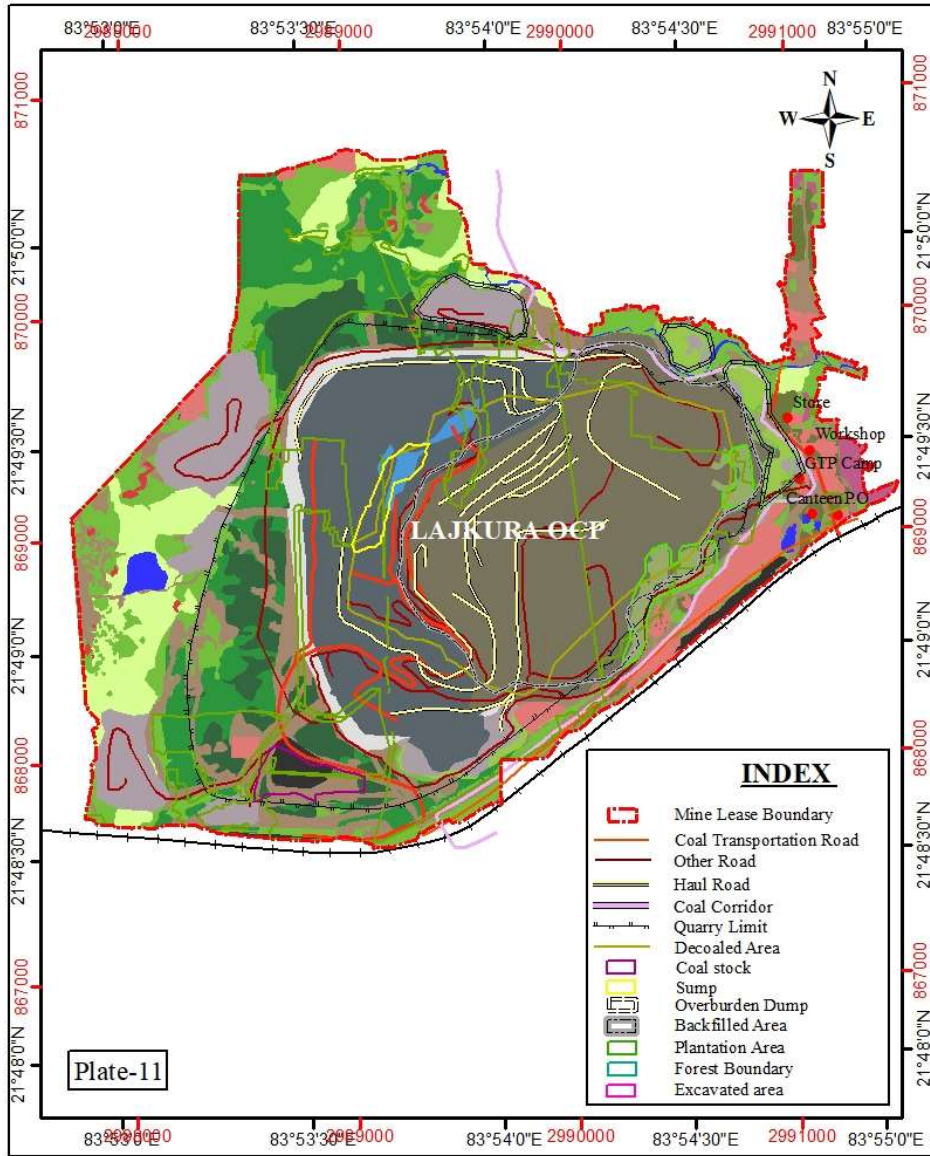


Classes	Level-I	Level-II	Colour	Core Area (sq km)	% of Total
Settlements	Urban Settlements			0.003	0.02
	Rural Settlements			0.19	1.42
	Industrial Settlements			0.24	1.80
<b>Total Settlement Area</b>				<b>0.43</b>	<b>3.24</b>
Forests	Dense Forest			0.16	1.20
	Open Forest			0.40	3.00
	<b>Total Forest (A)</b>			<b>0.56</b>	<b>4.19</b>
<b>Scrubs (B)</b>				<b>2.16</b>	<b>16.18</b>
Plantation Area	Social Forestry			0.47	3.52
	Plantation on OB			0.49	3.67
	Orchard			0.00	0.00
	Plantation on Backfill			0.68	5.09
	<b>Total Plantation (C)</b>			<b>1.64</b>	<b>12.28</b>
<b>Total Vegetation (A+B+C)</b>				<b>4.36</b>	<b>32.65</b>
Agriculture Land	Crop land			0.00	0.00
	Fallow Land			0.84	6.29
	Only Crop Land			0.00	0.00
	<b>Total Agriculture Land</b>			<b>0.84</b>	<b>6.29</b>
Waste Land	Waste Land			1.82	13.63
	Fly Ash Pond			0.00	0.00
	Sand Body			0.00	0.00
	<b>Total Waste Land</b>			<b>1.82</b>	<b>13.63</b>
Mining Area	Coal Dump			0.21	1.57
	Coal Quarry			1.62	12.13
	Advance Quarry Site			0.19	1.42
	Quarry Filled with Water			0.11	0.82
	Barren OB Dump			0.14	1.05
	Backfill			3.43	25.69
<b>Total Mining Area</b>				<b>5.70</b>	<b>42.69</b>
Water Body	River/ Ponds			0.20	1.50
<b>Total Area</b>				<b>13.35</b>	<b>100.00</b>

**INDEX**

- Mine Lease Boundary
- Coal Transportation Road
- Other Road
- Haul Road
- Coal Corridor
- Quarry Limit
- Decoaled Area
- Coal stock
- Sump
- Overburden Dump
- Backfilled Area
- Plantation Area
- Forest Boundary
- Ex cavated area

Customer: Mahanadi Coalfields Limited					
Title: Land Reclamation Monitoring of OC Projects					Job No. 564924124
Subject Land Reclamation Status of Samleswari OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Activity	Name	Designation	Signature	Date
	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S. Mishra	GM (Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM (Geomatics)	<i>M. Rastogi</i>	
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Drg No. HQ REM 07 A4 25 10					REV No 0



Area Statistics -Lajkura OC (2025)				
Classes	Level-II	Colour	Area (sq km)	% of Total
Settlement	Urban Settlements		0.08	1.11
	Rural Settlements		0.02	0.28
	Industrial Settlements		0.21	2.91
	<b>Total Settlement Area</b>		<b>0.31</b>	<b>4.30</b>
Forests	Dense Forest		0.41	5.69
	Open Forest		0.53	7.35
	<b>Total Forest (A)</b>		<b>0.94</b>	<b>13.04</b>
Plantation Area	Scrubs (B)		0.74	10.26
	Social Forestry		0.09	1.25
	Plantation on OB		0.10	1.39
	Orchard		0.00	0.00
	Plantation on Backfill		0.12	1.66
<b>Total Plantation (C)</b>		<b>0.31</b>	<b>4.30</b>	
<b>Total Vegetation (A+B+C)</b>			<b>1.99</b>	<b>27.60</b>
Agriculture Land	Crop Land		0.00	0.00
	Fallow Land		0.42	5.83
	Only Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>0.42</b>	<b>5.83</b>
Waste Land	Waste Land		0.79	10.96
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>0.79</b>	<b>10.96</b>
Mining Area	Coal Dump		0.08	1.11
	Coal Quarry		1.19	16.50
	Advance Quarry Site		0.18	2.50
	Quarry Filled with Water		0.04	0.55
	Barren OB Dump		0.54	7.49
	Backfill		1.61	22.33
<b>Total Mining Area</b>		<b>3.64</b>	<b>50.49</b>	
Water Body	River/ Ponds		0.06	0.83
<b>Total Area</b>			<b>7.21</b>	<b>100.00</b>

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- Backfilled Area
- Plantation Area
- Forest Boundary
- Excavated area

Customer: Mahanadi Coalfields Limited

Title: Land Reclamation Monitoring of OC Projects

Job No. 564924124

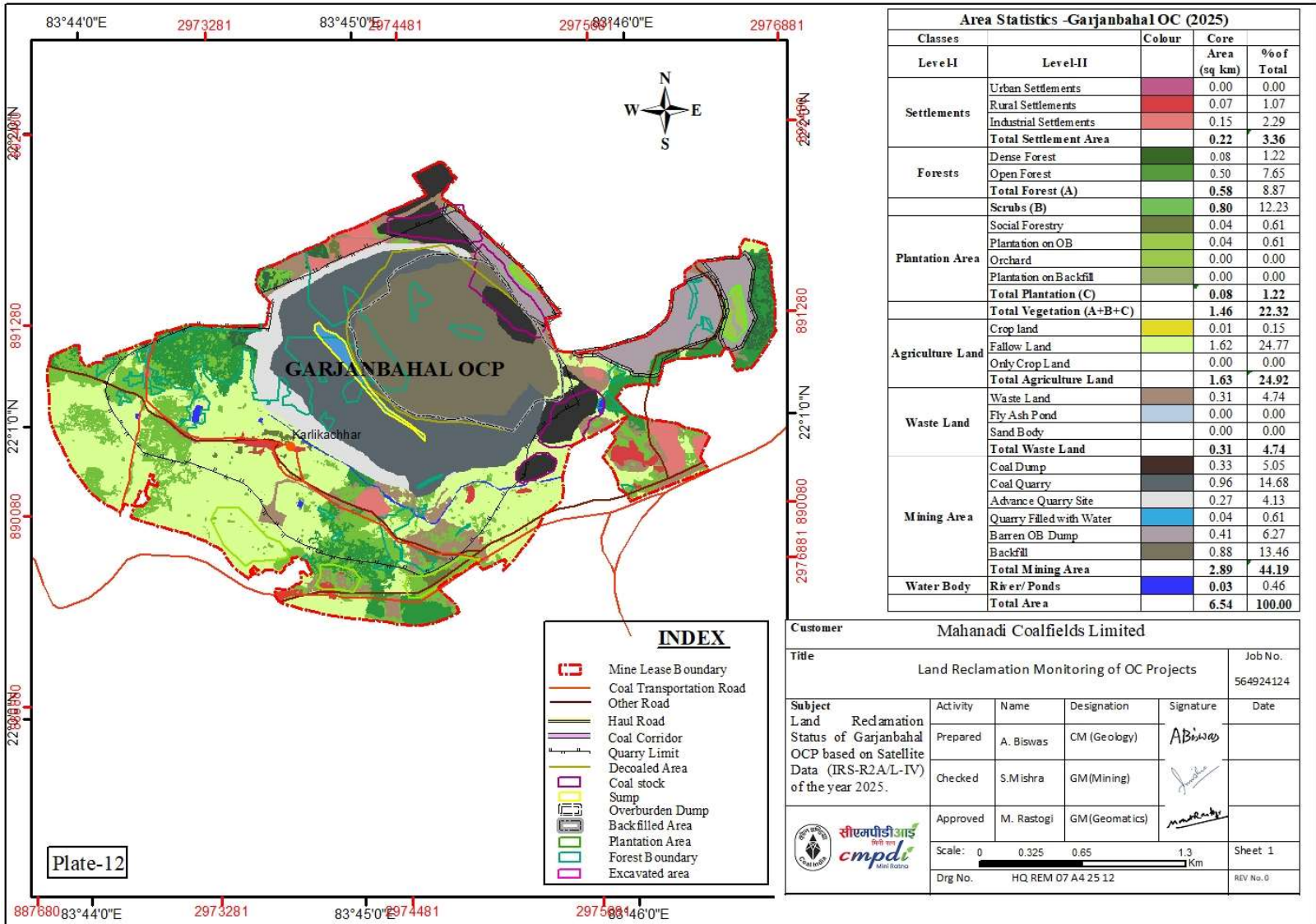
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Land Reclamation Status of Lajkura OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S.Mishra	GM(Mining)	<i>S. Mishra</i>	
	Approved	M. Rastogi	GM(Geomatics)	<i>M. Rastogi</i>	

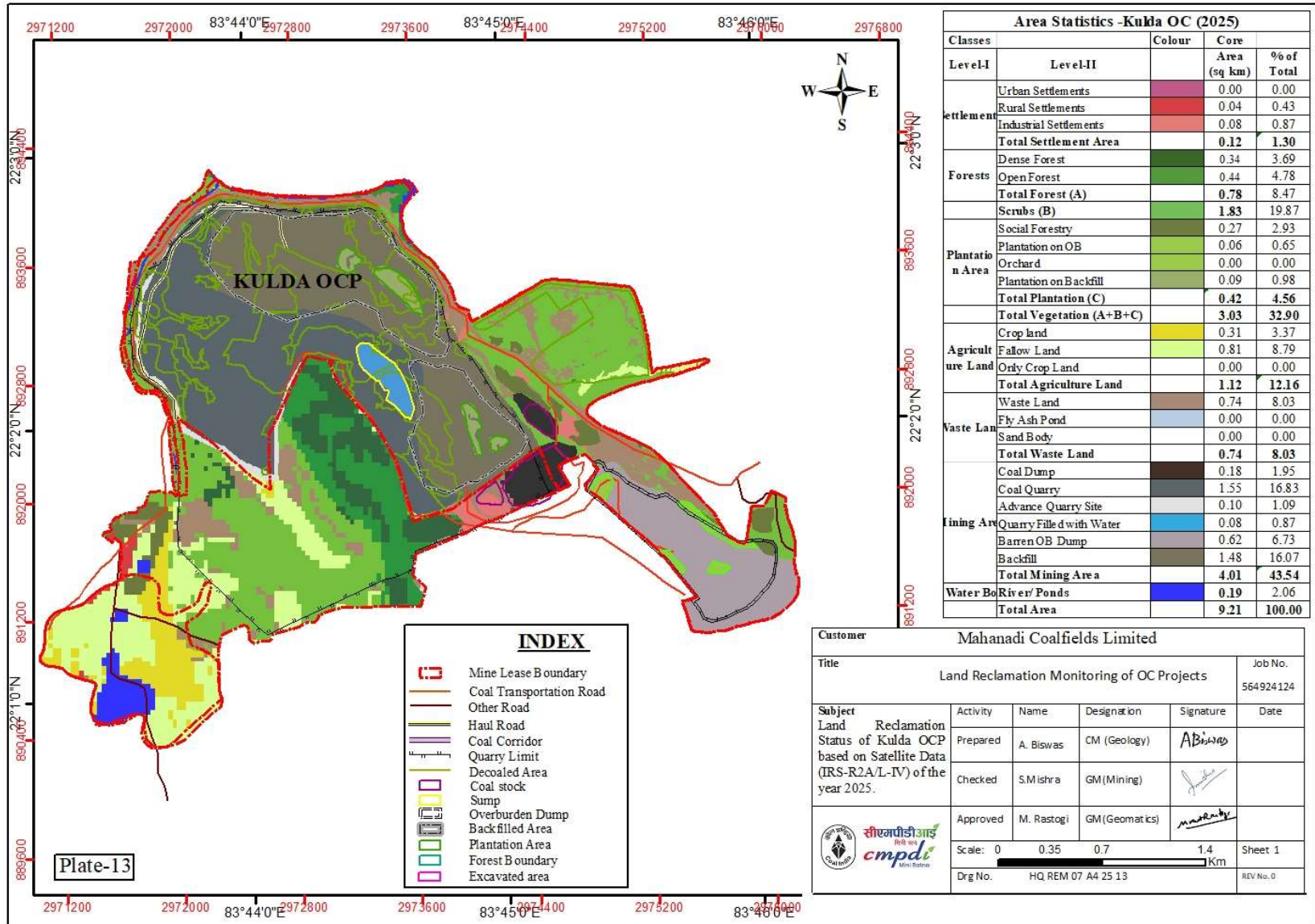
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Sheet 1

REV No. 0





Area Statistics -Kulda OC (2025)				
Classes	Level-II	Colour	Core Area (sq km)	% of Total
Settlement	Urban Settlements		0.00	0.00
	Rural Settlements		0.04	0.43
	Industrial Settlements		0.08	0.87
	<b>Total Settlement Area</b>		<b>0.12</b>	<b>1.30</b>
Forests	Dense Forest		0.34	3.69
	Open Forest		0.44	4.78
	<b>Total Forest (A)</b>		<b>0.78</b>	<b>8.47</b>
	Scrubs (B)		<b>1.83</b>	<b>19.87</b>
Plantation Area	Social Forestry		0.27	2.93
	Plantation on OB		0.06	0.65
	Orchard		0.00	0.00
	Plantation on Backfill		0.09	0.98
	<b>Total Plantation (C)</b>		<b>0.42</b>	<b>4.56</b>
	<b>Total Vegetation (A+B+C)</b>		<b>3.03</b>	<b>32.90</b>
Agriculture Land	Crop land		0.31	3.37
	Fallow Land		0.81	8.79
	Orly Crop Land		0.00	0.00
	<b>Total Agriculture Land</b>		<b>1.12</b>	<b>12.16</b>
Waste Land	Waste Land		0.74	8.03
	Fly Ash Pond		0.00	0.00
	Sand Body		0.00	0.00
	<b>Total Waste Land</b>		<b>0.74</b>	<b>8.03</b>
Mining Area	Coal Dump		0.18	1.95
	Coal Quarry		1.55	16.83
	Advance Quarry Site		0.10	1.09
	Quarry Filled with Water		0.08	0.87
	Barren OB Dump		0.62	6.73
	Backfill		1.48	16.07
	<b>Total Mining Area</b>		<b>4.01</b>	<b>43.54</b>
Water Body	River/ Ponds		0.19	2.06
	<b>Total Area</b>		<b>9.21</b>	<b>100.00</b>

Customer		Mahanadi Coalfields Limited			
Title		Land Reclamation Monitoring of OC Projects			Job No. 564924124
Subject Land Reclamation Status of Kulda OCP based on Satellite Data (IRS-R2A/L-IV) of the year 2025.	Activity	Name	Designation	Signature	Date
	Prepared	A. Biswas	CM (Geology)	<i>A. Biswas</i>	
	Checked	S.Mishra	GM(Mining)	<i>S. Mishra</i>	
Approved	M. Rastogi	GM(Geomatics)	<i>M. Rastogi</i>		
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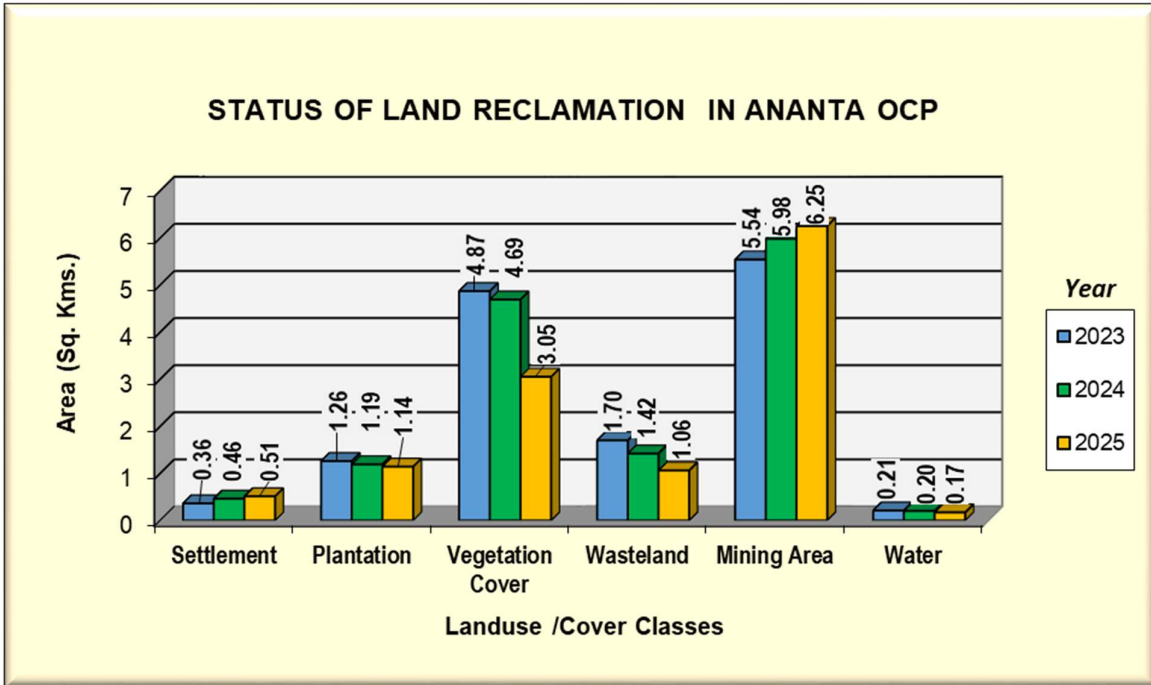


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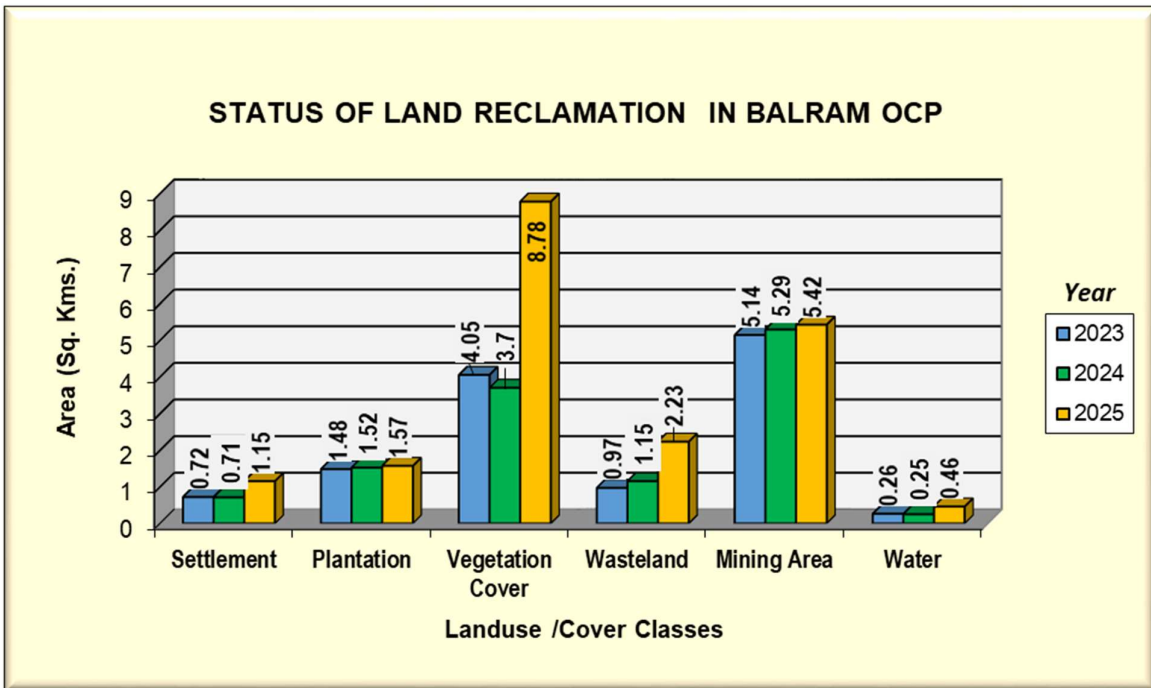


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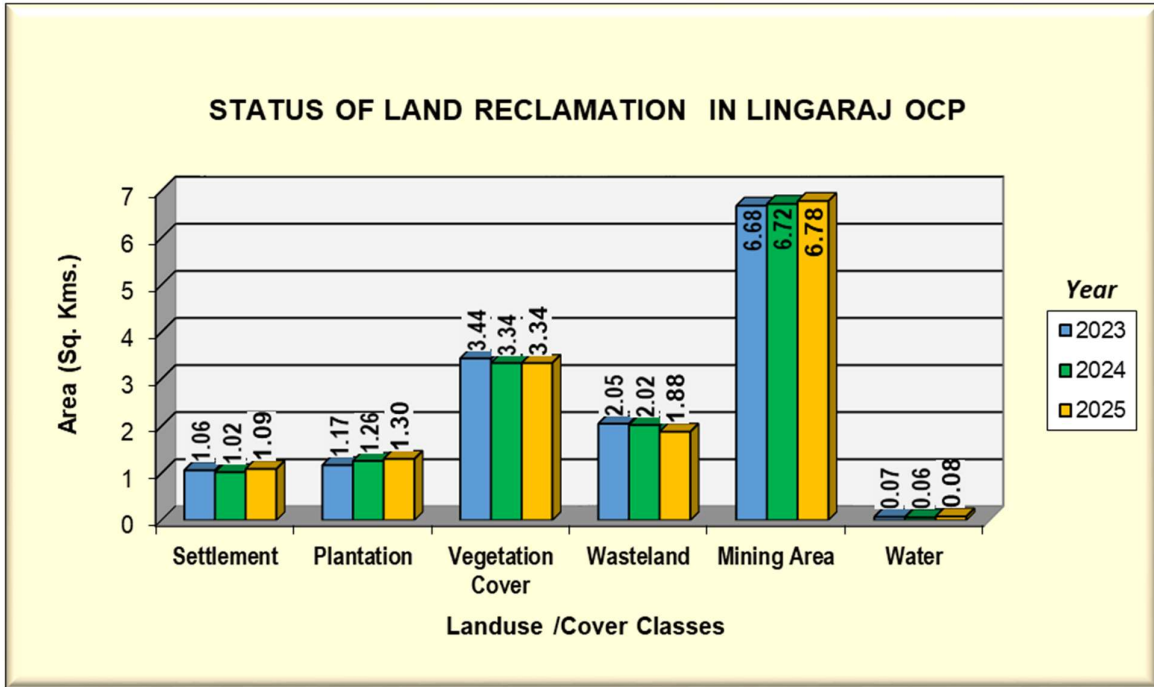


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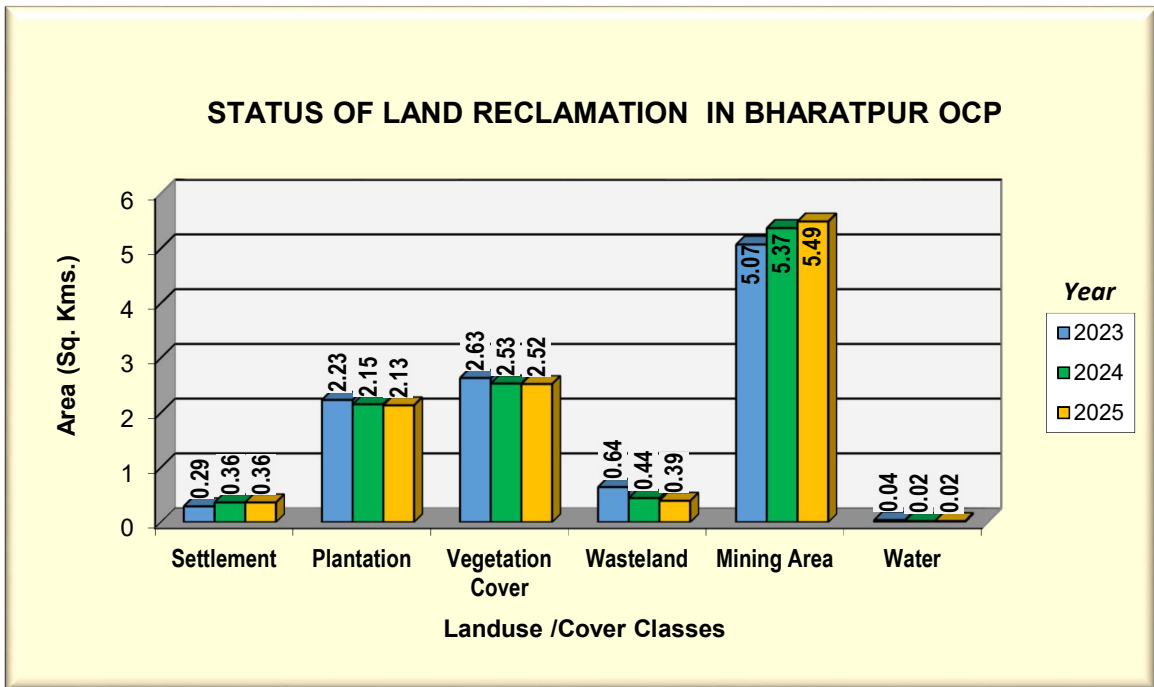


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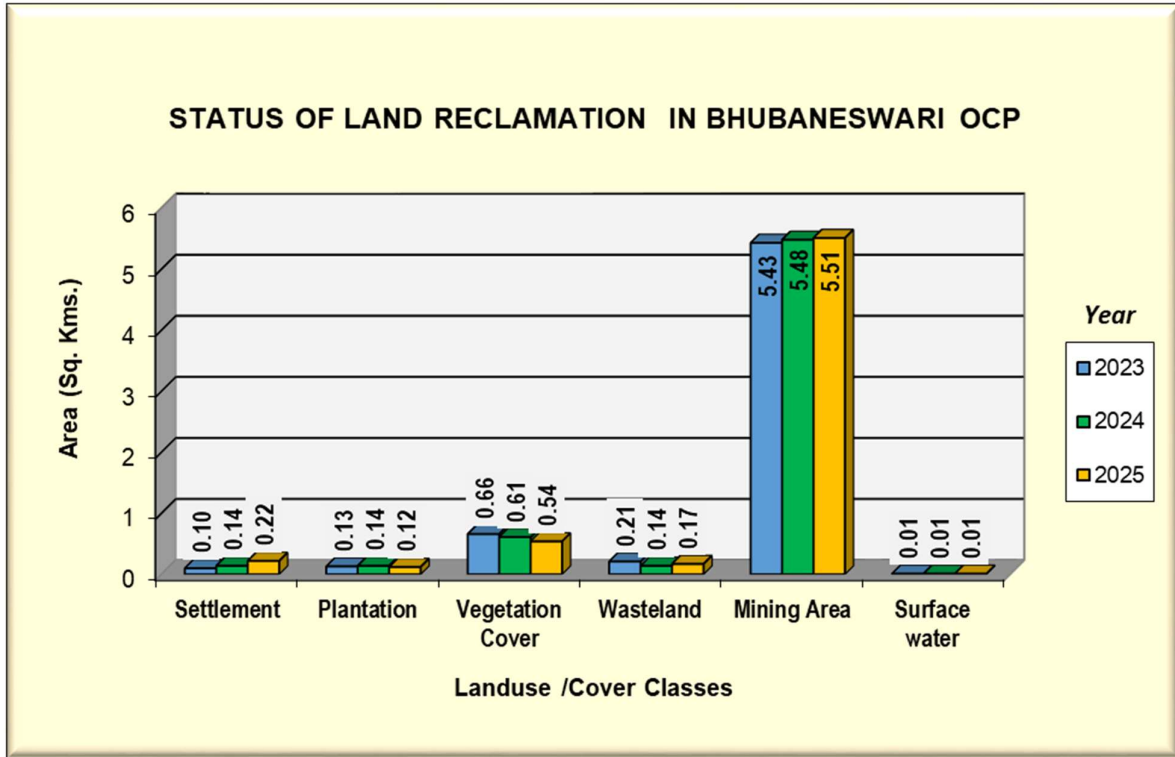


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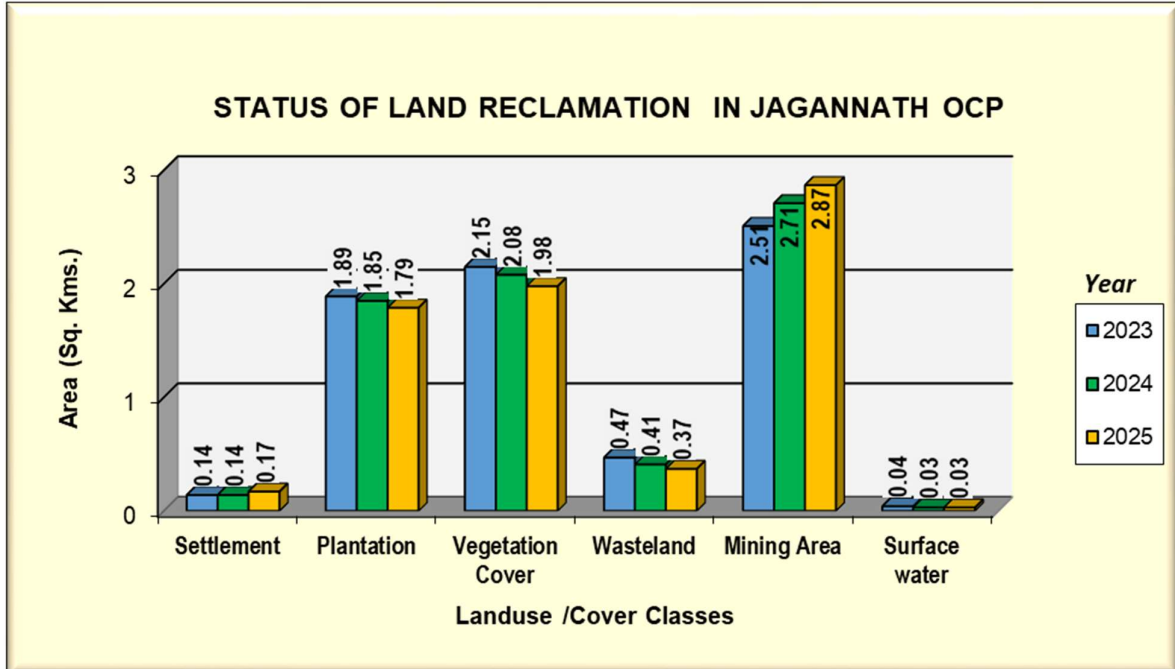


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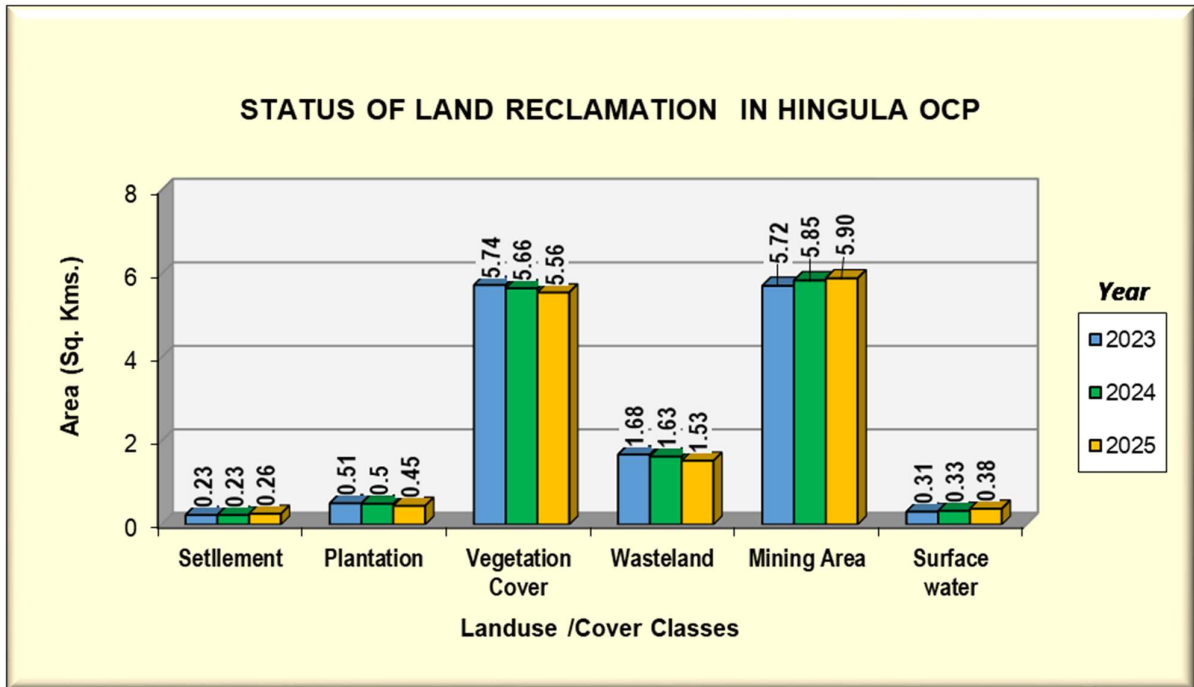


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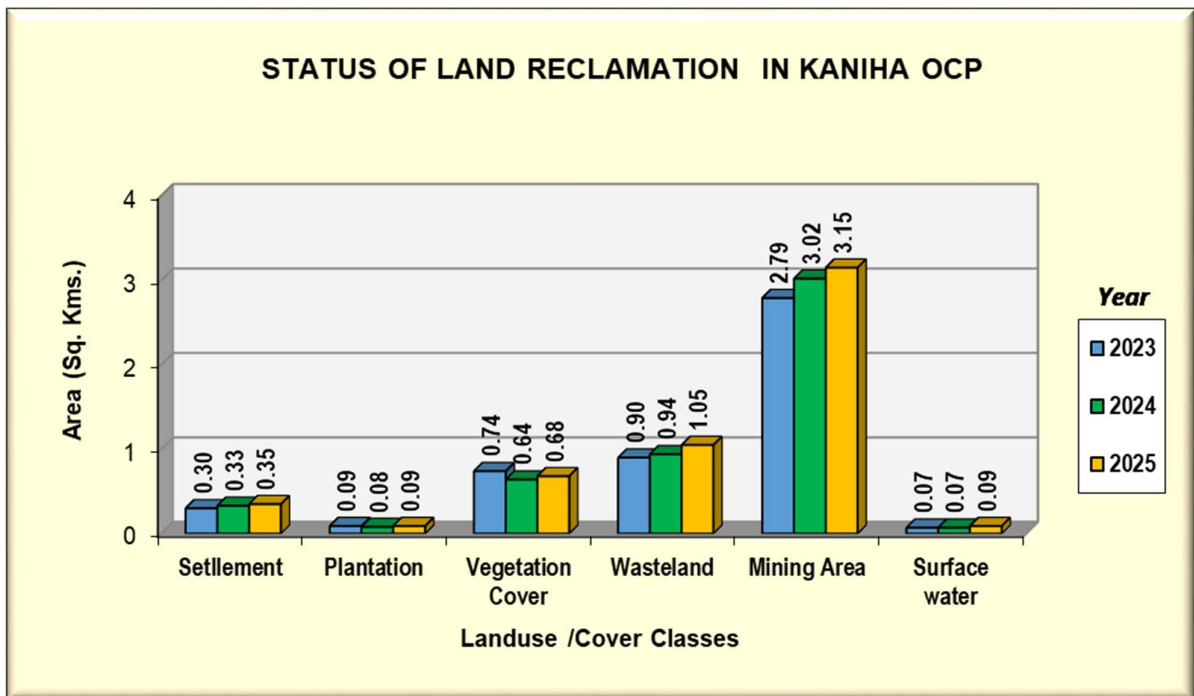


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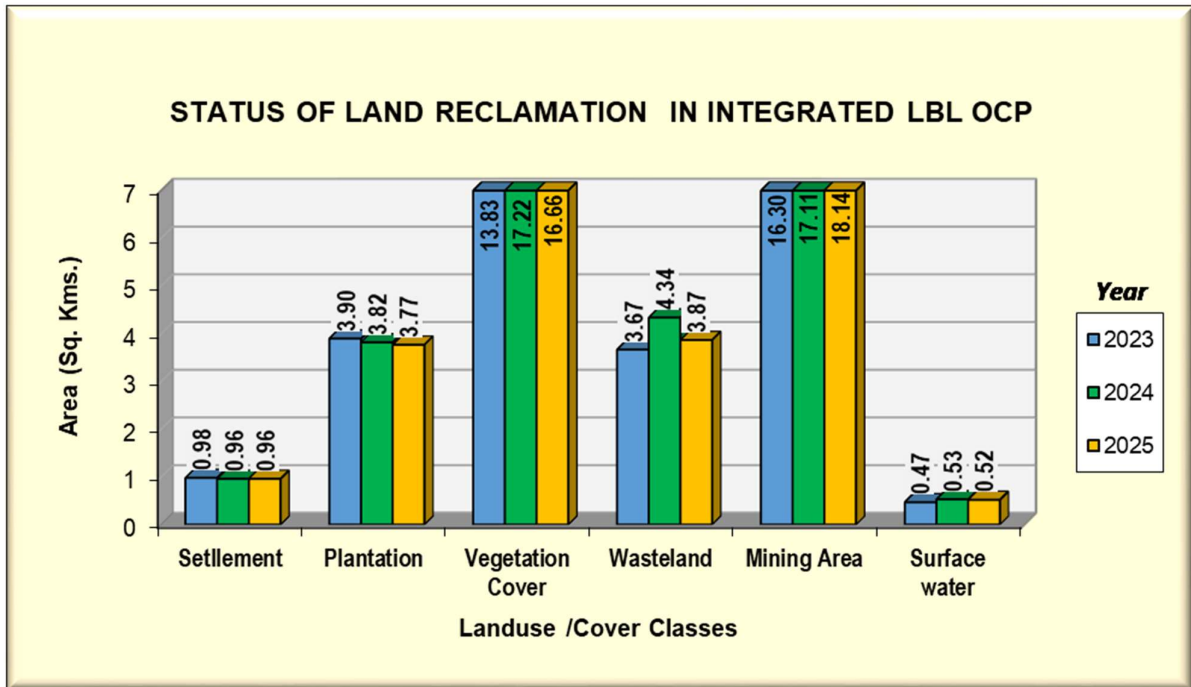


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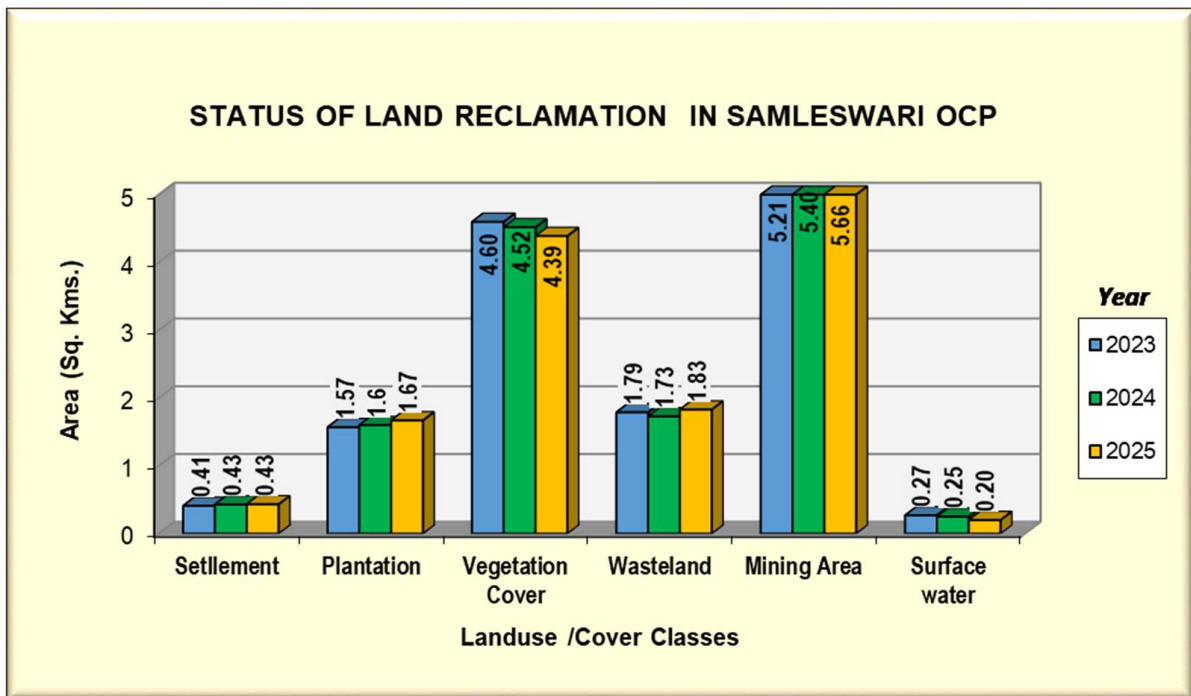


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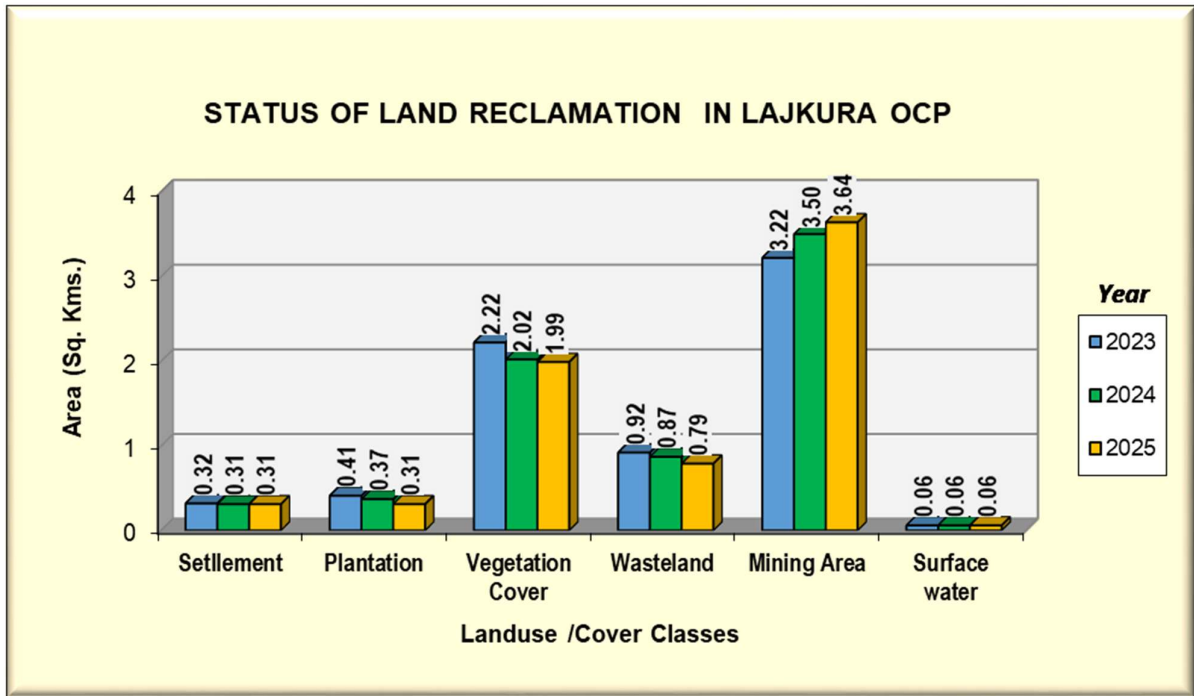


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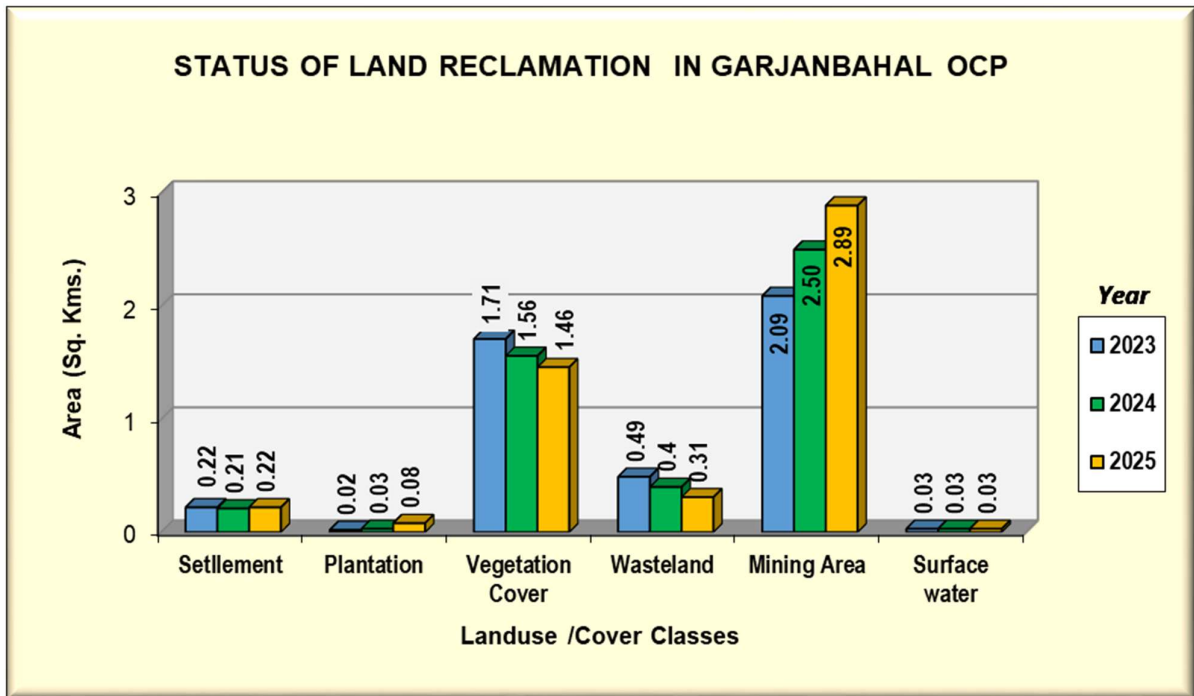


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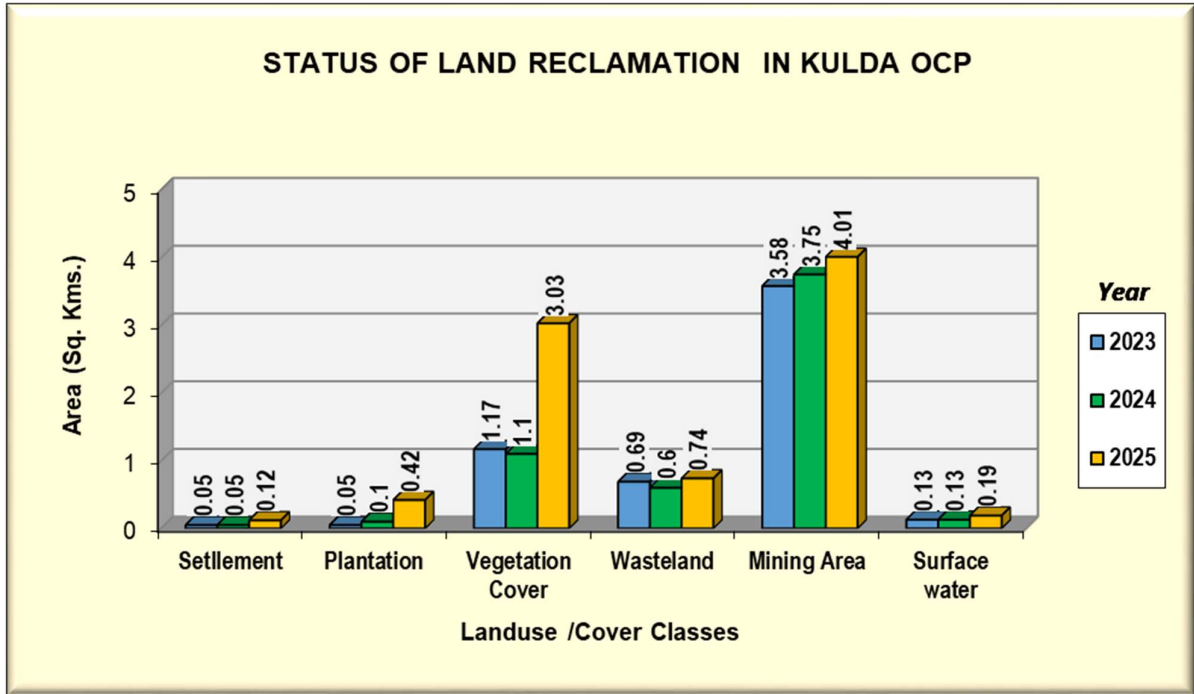


Figure 15



**Photograph-1: Plantation on Internal OB/Backfill (Ananta OC Mine)**



**Photograph-2: Plantation on External OB (Balram OC Mine)**



**Photograph-3: Plantation on Internal OB/Backfill (Lingaraj OC Mine)**



**Photograph-4: Plantation on Internal OB/Backfill (Bharatpur OC Mine)**



**Photograph-5: New Plantation on Internal OB/Backfill (Bhubaneswari OC Mine)**



**Photograph-6: New Plantation on Internal OB/Backfill (Jagannath OC Mine)**



**Photograph-7: New Plantation on Internal OB/Backfill (Hingula OC Mine)**



**Photograph-8: Plantation on Internal OB/ Backfill (Integrated LBL OC Mine)**



**Photograph-9: Plantation on External OB (Integrated LBL OC Mine)**



**Photograph-10: New plantation on Internal OB/Backfill (Samleswari OC Mine)**



**Photograph-11: New Plantation on Internal OB/Backfill (Lajkura OC Mine)**



**Photograph-12: Plantation on External OB (Garjanbahal OC Mine)**



**Photograph-13: Safety Zone Plantation (Kulda OC Mine)**

## शब्द-कोष

1	Land Reclamation	भूमि पुनरुद्धार
2	Over Burden	अधिभार
3	Monitoring	निगरानी
4	Report	प्रतिवेदन
5	Executive Summary	कार्यकारी सारांश
6	Opencast Mine	खुली खदान
7	Objective	उद्देश्य
8	Methodology	कार्य प्रणाली अथवा प्रक्रिया
9	Table	तालिका
10	List of Tables	तालिकाओं की सूची
11	Map	मानचित्र
12	Social Forestry	सामाजिक वानिकी
13	Plantation	पौधारोपण
14	Million	घनमीटर
15	Background	पृष्ठभूमि
16	Planning	योजनाबद्ध
17	Asses	आकलन
18	Status	स्थिति
19	Regularly	निरंतर
20	Satellite	उपग्रह
21	Subsidiary	अनुषांगिक
22	Production	उत्पादन
23	Biological Reclamation	जैविक पुनरुद्धार
24	Technical Reclamation	तकनिकी पुनरुद्धार

25	Leasehold Area	पट्टा क्षेत्र
26	Excavated Area	उत्खनन क्षेत्र
27	Active mining	सक्रिय खनन
28	Environmental Protection	पर्यावरण संरक्षण
29	Remedial Measure	उपचारात्मक उपाय
30	Interval	अंतराल
31	Systematic Error	व्यवस्थित त्रुटियाँ।
32	Error	अशुद्धियाँ
33	Curvature	वक्रता
34	Geometric	ज्यामितिक
35	Distortion	विरूपण
36	Plantation	पौधारोपण
37	Capacity	क्षमता
38	Software	सॉफ्टवेयर
39	Class	वर्ग
40	Accuracy	सटीकता
41	Statistical Separation	सांख्यिकीय पृथक्करण
42	Cubic meter	घनमीटर
43	Depicted	दर्शाया गया
44	Percentage	प्रतिशत
45	Salient Findings	मुख्य निष्कर्ष
46	Methodology	पद्धति
47	Data Procurement	डाटा क्रय
48	Satellite data Processing	उपग्रह डेटा प्रसंस्करण
49	Rectification and geo-referencing	सुधार और भूसन्दर्भ-

50	Image enhancement	छविगुण - बृद्धि
51	Training set selection	प्रशिक्षण सेट का चयन
52	Classification and Accuracy assessment	वर्गीकरण और मूल्यांकन की सटीकता
53	Area calculation	क्षेत्र गणना
54	Temporal	लौकिक
55	Processing	प्रसंस्करण
56	Overlay of Vector data base	वेक्टर डेटा बेस का अरोपन
57	Area calculation	क्षेत्रगणना-
58	Pre-field map preparation	क्षेत्र जाने के पहले नक्शे की तैयारी
59	Ground Truthing	भू-सत्यापन
60	Ground Information	भू-सूचना
61	Interpretation	व्याख्या
62	Eco-system	पारिस्थितिकी तंत्र
63	Minor	मामुली
64	Water Drainage	जल निकाय
65	Interval	अंतराल
66	Maximum	अधिकतम
67	Coal field	कोयला क्षेत्र
68	Design	परिकल्पना
69	Superimpose	आरोपित
70	Update	अद्यतनीकरण/नवीनीकरण
71	Cumulative	संचयित
72	Embankment	तटबंध
73	Cluster	खुली तथा भूमिगत खदानों के समूह

## ABBREVIATIONS

Sol	Survey of India
MoEF&CC	Ministry of Environment, Forest & Climate Change
CIL	Coal India Limited
ECL	Eastern Coalfields Limited
BCCL	Bharat Coking Coal Limited
CCL	Central Coalfields Limited
WCL	Western Coalfields Limited
SECL	South Eastern Coalfields Limited
NCL	Northern Coalfields Limited
MCL	Mahanadi Coalfields Limited
NEC	North Eastern Coalfields
CMPDIL	Central Mine Planning & Design Institute Ltd
NRSC	National Remote Sensing Centre
R2/ R2A	Resource-Sat Satellites
LISS - 4	Linear Imaging and Self Scanning Sensor
FCC	False Colour Composite
OCP	Opencast Project
UGP	Underground Project
OB	Over Burden
GCP	Ground Control points
GIS	Geographic Information System
WGS-84	World Geodetic System
UTM	Universal Transverse Mercator

## GLOSSARY

Sl.	Term	Definition
1.	Land Reclamation	To manage, reclaim and restore mined out/ degraded land as close as possible to its original stage
2.	Over Burden	The material that lies above the coal seam/ deposit
3.	Monitoring	A process of evaluation to check or keep record for a period of time.
4.	Opencast Coal Mine	Open-pit mining, also known as opencast mining, is a surface mining technique that extracts minerals from an open pit in the ground.
5.	Social Forestry	Social forestry is the management and protection of forests and afforestation of barren and deforested lands with the purpose of helping environmental, social and rural development. Plantation (Social/ Avenue or other) carried out outside mining area.
6.	Biological Reclamation	Plantation on Backfilled areas (Stabilized Internal Dumps)
7.	Technical Reclamation	Area under backfilling (Over burden dumped inside the mine voids) in mining area.
8.	Green Cover Generation	Total Plantation carried out in the lease area of Project. This include Plantation on Backfill, Plantation on OB and Social Forestry
9.	Leasehold Area	The area, for which lease is granted for the purpose of undertaking mining and allied operations
10.	Excavated area	Mined out area which includes active mining, area under backfilling and plantation on backfilled areas
11.	Active Mining	Mining areas which include Coal Quarry, Advance Quarry, Quarry Filled with Water etc.
12.	Environmental Protection	It is the practice of protecting the natural environment by individuals, organizations and governments. Its objectives are to conserve natural resources and the existing natural environment and, where possible, to mitigate damage and reverse trends.
13.	Remedial Measure	Any measure or action required or undertaken to investigate, monitor, clean up, remove, treat, prevent, contain or otherwise remediate the presence or release of any hazardous substance or activity.

14.	Systematic Error	Every measurement differing from the true measurement in the same direction, and even by the same amount in some cases
15.	Geometric Distortion	It refers to the improper positioning of any image with respect to their true geographic position when viewed in a properly scaled common image display plane.
16.	Land Use/Cover Class	Land cover is what covers the surface of the earth and land use describes how the land is used.
17.	Accuracy	The closeness of agreement between a measured quantity value and a true quantity value.
18.	Environmental Clearance	Environmental Clearance (EC) for any developmental projects like coal mining projects etc. has been made mandatory by the Ministry of Environment, Forests and Climate Change (MoEF&CC) through its Notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986.
19.	Rectification and Geo-referencing	Geo-referencing is the assigning of absolute location of a data point or data points. Geo-rectification refers to the removal of geometric distortions between sets of data points, most often the removal of terrain, platform, and sensor induced distortions from remote sensing imagery
20.	Image Enhancement	It is the process of modifying digital images so that the results are more suitable for processing or further image analysis.
21.	Training set selection	It is a portion of a data set used to fit or train a model for prediction or classification of values that are known in the training set, but unknown in other (future) data
22.	Image Classification	It refers to the task of extracting information classes from a multiband raster image. The resulting raster from image classification can be used to create thematic maps.
23.	Temporal Changes	The 'temporal change' means the change in any entity with a period of time.
24.	Ground Truthing	Collection of primary/ basic information from ground realities for satellite image interpretation and thematic mapping.
25.	Cluster	Group of opencast and/ or underground minesclubbed together for administrative purposes.
26	Arc GIS	GIS Software used for Map preparation
27	ERDAS IMAGINE	Satellite Image Data Classification Software



## Central Mine Planning & Design Institute Ltd.

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