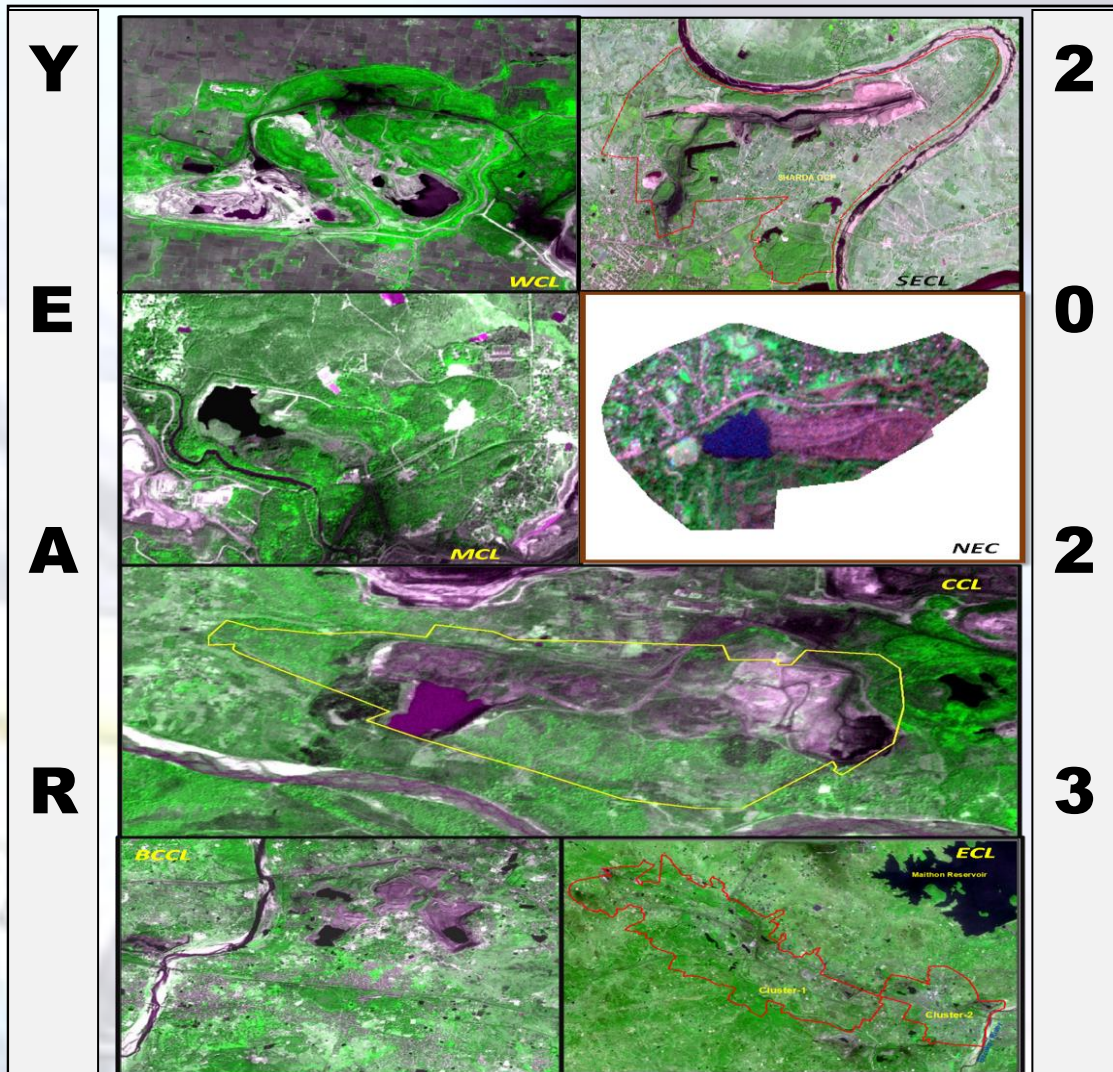


सीआईएल के ५ मिलियन घन मीटर (कोल+ अधिभार) से कम उत्पादन क्षमतावाले ३६ खदानों और ९ क्लस्टर परियोजनाओं की भूमि पुनरुद्धार हेतु २०२३ के उपग्रह डाटा के आधार पर निगरानी का प्रतिवेदन

Land Restoration / Reclamation Monitoring of 36 Coal Mines and 9 Cluster Projects of CIL producing less than 5 mcm (Coal+OB) annually based on Satellite Data for the Year 2023



Submitted to
Coal India Limited



कोल इंडिया लिमिटेड के ५ मिलियन घन मीटर (कोल+ अधिभार) से कम उत्पादन क्षमता वाले ३६ खदानों एवं ९ क्लस्टर का भूमि पुनरुद्धार हेतु २०२३ के उपग्रह डाटा के आधार पर निगरानी का प्रतिवेदन

**Land Restoration / Reclamation Monitoring of 36 Coal Mines
producing less than 5 m.cm (Coal + OB) per annum & 09
Clusters of Coal Mines of Coal India Ltd. based on Satellite
Data for the Year 2023**

March- 2024



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

अंतर्वस्तु

CONTENTS

कार्यकारी सारांश	4-13
Executive Summary	
1.0 Background	16
2.0 Objective	17
3.0 Methodology	18
4.0 Work plan	21
5.0 Land Reclamation in WCL	22
6.0 Land Reclamation in SECL	53
7.0 Land Reclamation in CCL	66
8.0 Land Reclamation in BCCL	85
9.0 Land Reclamation in ECL	106
10.0 Land Reclamation in MCL	125
11.0 Land Reclamation in NEC	145
शब्द-कोष	159
ABBREVIATIONS	162
GLOSSARY	163

कार्यकारी सारांश

१.० परियोजना

कोल इंडिया लिमिटेड के ५ मिलियन घनमीटर (कोल+ अधिभार) से कम उत्पादन क्षमता वाले ३६ (खुली+ भूमिगत) एवं ९ क्लस्टर खदानों के भूमि पुनरुद्धार हेतु वर्ष २०२३ के उपग्रह डाटा पर आधारित तीन वर्ष के अंतराल पर नियमित निगरानी।

२.० उद्देश्य

भूमि पुनरुद्धार (लैंड रिक्लेमेशन) का उद्देश्य कुल पट्टाक्षेत्र में बैकफील, वृक्षारोपण, सामाजिक वानिकी, सक्रिय खनन क्षेत्र, जल निकाय (वाटरड्रेनेज) बंजर भूमि, कृषि भूमि और जंगल के विभिन्न प्रकार के वितरण प्रणाली के क्षेत्र का आकलन करने के लिए है। यह अध्ययन केवल उपरोक्त सभी 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

कुल खदान पट्टा क्षेत्र ३८९७०.६४ हेक्टेयर में से ५ एम.सी.एम. (कोयला+ओबी) प्रति वर्ष से कम उत्पादन करने वाली ३६ ओपनकास्ट/भूमिगत परियोजनाओं और ९ समूहों, कुल ४५ परियोजनाएँ सीआईएल की विभिन्न सहायक कंपनियों से एक साथ लिए गए वर्ष २०२३-२४ के दौरान निगरानी के लिए विचार किया गया; कुल उत्खनन क्षेत्र केवल ५८३६.६३ हेक्टेयर है जिसमें से १९८६.६३ हेक्टेयर क्षेत्र (३४.०४%) बैकफिलिंग (तकनीकी रूप से सुधार) के अंतर्गत है, ७४३.२७ हेक्टेयर (१२.७३%) रोपण किया गया है (जैविक रूप से पुनः प्राप्त) और शेष ३१०६.७३ हेक्टेयर (५३.२३%) सक्रिय खनन के अंतर्गत है। विश्लेषण से स्पष्ट है कि सीआईएल की विभिन्न सहायक कंपनियों के तहत वर्ष २०२३-२४ में अध्ययन के लिए ली गई ३६ (३२ ओसी + ४ यूजी) परियोजनाओं और ९ क्लस्टरों का २७२९.९० हेक्टेयर (४६.७७%) क्षेत्र पुनर्ग्रहण के अधीन है और शेष ३१०६.७३ हेक्टेयर (५३.२३%) क्षेत्र सक्रिय खनन के अधीन है। सहायक कंपनीवार विवरण तालिका-१ और चित्र -१ में दिया गया है।

वर्ष २०२३-२४ में भूमि सुधार निगरानी के लिए चयनित परियोजनाओं को दो समूहों में विभाजित किया गया है जैसे- समूह (ए) में डब्ल्यूसीएल, एसईसीएल, सीसीएल, एमसीएल एव एनईसी से संबंधित ३३ परियोजनाएं शामिल हैं और ग्रुप (बी) में १२ परियोजनाएं (९ क्लस्टर+३

खदानों) शामिल हैं, जिनमें से ५ क्लस्टर बीसीसीएल के हैं और ४ क्लस्टर एव ३ खदानें ईसीएल की हैं।

- ग्रुप (ए) के लिए, २०२३-२४ के दौरान भूमि सुधार निगरानी के लिए विचार की गई ३३ परियोजनाओं में से १९९५३.७३ हेक्टेयर के कुल खनन पट्टा क्षेत्र में से: कुल उत्खनन क्षेत्र ३६५२.०५ हेक्टेयर है जिसमें से ६२५.५९ हेक्टेयर (१७.१३%) में रोपण किया गया है (जैविक रूप से पुनः प्राप्त), ९६४.४२ हेक्टेयर (२६.४१%) बैकफ़िलिंग (तकनीकी पुनर्ग्रहण) के अंतर्गत है और शेष २०६२.०४ हेक्टेयर (५६.४६%) सक्रिय खनन के अंतर्गत है। उपरोक्त ३३ परियोजनाओं की भूमि पुनर्ग्रहण का सहायक वार विवरण तालिका -१ (ए) और चित्र -१ में दिया गया है।
- वर्ष २०२०-२१ में इसी तरह की खदानों की निगरानी की गई। डब्ल्यूसीएल, एसईसीएल, सीसीएल, एमसीएल और एनईसी में ३३ परियोजनाओं के लिए उपग्रह डेटा के आधार पर भूमि पुनर्ग्रहण निगरानी की स्थिति की तुलना करने पर वर्ष २०२०-२०२१ में किए गए पिछले चक्र अध्ययन के संबंध में, यह देखा गया कि:
- वर्ष २०२३ में ग्रुप ए की ३३ खदानों का कुल लीजहोल्ड क्षेत्र (१९९५३.७३ हेक्टेयर) समान संख्या में परियोजनाओं के लिए २०२० के लीजहोल्ड क्षेत्र (२१७०१.४६ हेक्टेयर) की तुलना में कम है। लीजहोल्ड क्षेत्र में यह कमी सीसीएल और एमसीएल जैसी सहायक कंपनियों में कुछ परियोजनाओं की लीजहोल्ड सीमा के अद्यतनीकरण के कारण है। यह देखा गया है कि डब्ल्यूसीएल के तहत परियोजनाओं के कुल पट्टा क्षेत्र में कोई बदलाव नहीं हुआ है, जबकि एसईसीएल और एनईसी के तहत परियोजनाओं में क्रमशः ३.८४ हेक्टेयर और १९०.४३ हेक्टेयर की वृद्धि देखी गई है। इसके अलावा, सीसीएल की ४ खदानों, एमसीएल की १ खदान और एनईसी की १ खदानों की ईसी सीमाओं में संशोधन किया गया है, जिसके परिणामस्वरूप कुल पट्टा क्षेत्र में कमी आई है।
- ग्रुप ए के तहत ३३ परियोजनाओं के लिए, बैकफ़िलिंग (तकनीकी रूप से पुनः प्राप्त) क्षेत्र ९६४.४२ हेक्टेयर है; जो वर्ष २०२३ में कुल उत्खनन क्षेत्र का २६.४१% है। वर्ष २०२० के आंकड़ों की तुलना करने पर, यह देखा गया कि तकनीकी पुनर्ग्रहण (बैकफ़िलिंग) के तहत क्षेत्र ९७७.०७ हेक्टेयर से कम हो गया है; वर्ष २०२३ में कुल उत्खनन क्षेत्र का (३२.१६%) से ९६४.४२ (२६.४१%) हो गया।

- ग्रुप ए के तहत ३३ परियोजनाओं के लिए, वर्ष २०२३ में बैकफ़िलिंग (जैविक रूप से पुनः प्राप्त) क्षेत्र पर वृक्षारोपण का क्षेत्र ६२५.५९ हेक्टेयर है जो वर्ष कुल उत्खनन का १७.१३% है। वर्ष २०२० में यही ६१३.७५ हेक्टेयर था (कुल उत्खनन का २०.२०%)।
- समूह ए के तहत ३३ परियोजनाओं के लिए, बाहरी ओवर बर्डन डंप पर वृक्षारोपण का क्षेत्र वर्ष २०२० में ९०२.५१ हेक्टेयर की तुलना में १०६३.३४ हेक्टेयर है जो इस वर्ग के लिए बढ़ती प्रवृत्ति का संकेत देता है।
- समूह ए के तहत ३३ परियोजनाओं के लिए, सामाजिक वानिकी के तहत क्षेत्र वर्ष २०२३ में ५६९.१६ हेक्टेयर है जो वर्ष २०२० में ५५३.७४ हेक्टेयर है जो एक बढ़ती प्रवृत्ति का संकेत देता है।
- ग्रुप ए के तहत ३३ परियोजनाओं के लिए, सक्रिय खनन क्षेत्र २०६२.०४ हेक्टेयर है; वर्ष २०२३ में कुल उत्खनन क्षेत्र का ५६.४६% जबकि १४४७.७६ हेक्टेयर; वर्ष २०२० में उत्खनन क्षेत्र का ४७.६५% जो एक बढ़ती प्रवृत्ति का भी संकेत देता है।
- समूह ए के तहत ३३ परियोजनाओं के लिए, वर्ष २०२३ के लिए कुल उत्खनन क्षेत्र ३६५२.०५ हेक्टेयर है, जबकि वर्ष २०२० में ३०३८.५८ हेक्टेयर है।
- ग्रुप ए के तहत ३३ परियोजनाओं की कुल लीजहोल्ड के भीतर हरित आवरण उत्पादन का प्रतिशत २२५८.०९ हेक्टेयर (११.३२%) है, जबकि वर्ष २०२० में यह २०७०.०० हेक्टेयर (९.५४%) था।
- विश्लेषण से यह स्पष्ट है कि समूह ए के तहत ३३ परियोजनाओं के लिए भूमि सुधार के तहत क्षेत्र वर्ष २०२०-२१ में १५९०.८२ हेक्टेयर (५२.३५%) से वर्ष २०२३-२४ में १५९०.०१ हेक्टेयर (४३.५४%) की मामूली कमी आई है। वर्ष २०२० की तुलना में वर्ष २०२३, सीसीएल को छोड़कर, यह भी देखा गया है कि भूमि सुधार की निगरानी के लिए ली गई डब्ल्यूसीएल, एसईसीएल, एमसीएल और एनईसी की सभी परियोजनाओं में: भूमि सुधार (तकनीकी और जैविक) के तहत कुल क्षेत्र या तो बढ़ गया है या एमसीएल के मामले में स्थिर बना हुआ है। सीसीएल में पुनर्ग्रहण (तकनीकी और जैविक) के तहत कुल क्षेत्र ५०९.१० हेक्टेयर (वर्ष २०२०) से घटकर ३६५.०७ हेक्टेयर (वर्ष २०२३) हो गया है। यह ईसी सीमा में संशोधन के कारण हो सकता है जिसके परिणामस्वरूप इस वर्ष निगरानी के तहत सीसीएल परियोजनाओं के कुल पट्टा क्षेत्र में कमी आई है।

सीसीएल की ७ खदानों में से ४ खदानों की ईसी सीमा में यह बदलाव संबंधित सहायक कंपनी द्वारा अधिसूचित किया गया था।

- ग्रुप ए के तहत ३३ परियोजनाओं के लिए भूमि सुधार के तहत क्षेत्र में यह कमी मुख्य रूप से बैकफिलिंग (तकनीकी सुधार) के तहत क्षेत्र में कमी के कारण है।
- ग्रुप बी के लिए जिसमें १२ परियोजनाएं (९ क्लस्टर + ३ खदानें) शामिल हैं, जिसमें बीसीसीएल के ५ क्लस्टर और ईसीएल के ४ क्लस्टर और ३ खदानें शामिल हैं, कुल १२ क्लस्टर खदानों के लिए १९०१६.९१ हेक्टेयर की कुल खदान लीजहोल्ड में से; वर्ष २०२३-२४ के दौरान निगरानी के लिए क्रमशः बीसीसीएल में ०५ क्लस्टर और ईसीएल में ०७ क्लस्टर पर विचार किया गया, जिसमें ज्यादातर भूमिगत और कुछ खुली खदानें शामिल हैं; कुल उत्खनन क्षेत्र २१८४.५८ हेक्टेयर है, जिसमें से १०२२.२१ हेक्टेयर (४६.७९%) क्षेत्र बैकफिलिंग (तकनीकी सुधार) के अंतर्गत है, ११७.६८ हेक्टेयर (५.३९%) बैकफिल (जैविक रूप से पुनः प्राप्त) पर लगाया गया है और शेष १०४४.६९ हेक्टेयर (४७.८२%) क्षेत्र सक्रिय खनन के अंतर्गत है। तालिका-१(बी) से स्पष्ट है कि ११३९.८९ हेक्टेयर (५२.१८%) क्षेत्र पुनर्ग्रहण के अधीन है और शेष १०४४.६९ हेक्टेयर (४७.८२%) क्षेत्र सक्रिय खनन के अंतर्गत है।
- वर्ष २०२३ में १२ परियोजनाओं का कुल पट्टा क्षेत्र १९०१६.९१ हेक्टेयर है जो वर्ष २०२० में १८८७२.१३ हेक्टेयर से बढ़ गया है। सहायक कंपनी के अनुसार, बीसीसीएल में वर्ष २०२० से २०२३ तक कुल लीजहोल्ड का ८७.३१ हेक्टेयर क्षेत्र कम हुआ है, जबकि ईसीएल में कुल लीजहोल्ड क्षेत्र में २३२.०९ हेक्टेयर की वृद्धि देखी गई है। ऐसा बीसीसीएल और ईसीएल की चयनित खदानों की ईसी सीमाओं में संशोधन के कारण हुआ है।
- ग्रुप बी के तहत ईसीएल और बीसीसीएल परियोजना के लिए बैकफिलिंग (तकनीकी रूप से पुनर्प्राप्त) के तहत वर्ष २०२३ में क्षेत्र १०२२.२१ हेक्टेयर है जो ४६.७९% कुल उत्खनन का है। वर्ष २०२० में यह ८९८.३० हेक्टेयर था जो ४६.३०% कुल उत्खनन की थी। यह तकनीकी पुनर्ग्रहण के तहत क्षेत्र में लगभग १२४.२१ हेक्टेयर की वृद्धि दर्शाता है।
- तालिका-१ (बी) से यह भी देखा गया है कि वर्ष २०२० में १२३.८१ (६.३८%) की तुलना में वर्ष २०२३-२४ में बीसीसीएल और ईसीएल में खदानों के १२ समूहों के लिए जैविक पुनर्ग्रहण ११७.६८ हेक्टेयर (५.३९%) है। यह इन परियोजनाओं में जैविक सुधार के अंतर्गत आने वाले क्षेत्र में लगभग ६.१३ हेक्टेयर की कमी दर्शाता है।

- ग्रुप बी की खदानों/क्लस्टरों में बाहरी ओवर बर्डन डंप पर वृक्षारोपण का क्षेत्र वर्ष २०२३ में ३२०.६७ हेक्टेयर है, जबकि वर्ष २०२० में यह ३३३.६२ हेक्टेयर था।
- समूह बी की खदानों/समूहों में सामाजिक वानिकी के अंतर्गत क्षेत्र वर्ष २०२३ में ७८५.७० हेक्टेयर है जो वर्ष २०२० में ७८२.२२ हेक्टेयर है।
- समूह बी की खदानों/क्लस्टरों में सक्रिय खनन का क्षेत्र वर्ष २०२३ में १०४४.६९ हेक्टेयर है जो कुल उत्खनन क्षेत्र का ४७.८२% है। वर्ष २०२० में सक्रिय खनन का क्षेत्र ९१८.१८ हेक्टेयर है जो कुल उत्खनन क्षेत्र का ४७.३२% है।
- समूह बी की खदानों/क्लस्टरों में कुल उत्खनन क्षेत्र आकलन वर्ष २०२३ के लिए २१८४.५८ हेक्टेयर है जो वर्ष २०२० में १९४०.२९ हेक्टेयर था।
- भूमि पुनर्ग्रहण निगरानी के लिए वर्ष २०२३ के उपग्रह डेटा के आधार पर समूह बी खदानों/क्लस्टरों के विश्लेषण से यह स्पष्ट है कि बीसीसीएल और ईसीएल में वृक्षारोपण (हरित आवरण) के तहत कुल क्षेत्रफल १२२४.०५ हेक्टेयर (६.४४%) है, जबकि २०२० में यह १२३९.६५ (६.५७%) था।
- विश्लेषण से यह स्पष्ट है कि बीसीसीएल और ईसीएल से संबंधित समूह बी खदानों/क्लस्टरों के लिए भूमि सुधार के तहत वर्ष २०२०-२१ में १०२२.११ हेक्टेयर (कुल उत्खनन क्षेत्र का ५२.६८%) से वृद्धि हो कर वर्ष २०२३-२४ में ११३९.८९ हेक्टेयर (कुल उत्खनन क्षेत्र का ५२.१८%) हो गयी है।
- क्रमपरिवर्तनीय रूप से, जैसा कि विश्लेषण से स्पष्ट है कि सीआईएल की विभिन्न सहायक कंपनियों के तहत वर्ष २०२३-२४ में अध्ययन के लिए ली गई ३६ परियोजनाओं (३२ ओसी+४ यूजी) और ९ क्लस्टरों का २७२९.९० हेक्टेयर (४६.७७%) क्षेत्र पुनर्ग्रहण और संतुलन के अधीन है। बाकि ३१०६.७३ हेक्टेयर (५३.२३%) क्षेत्र सक्रिय खनन के अंतर्गत है। वर्ष २०२० की तुलना में पुनर्ग्रहण क्षेत्र में ११६.९७ हेक्टेयर की वृद्धि हुई है।

Executive Summary

- 1.0 Project** Monitoring of Land restoration / reclamation of 36 projects producing less than 5 mcm (Coal +OB) per annum & 09 clusters of coal mines in different subsidiaries of Coal India Ltd (CIL) based on satellite data regularly at an interval of three years.
- 2.0 Objective** Objective of the land restoration / reclamation monitoring is to assess the area of backfilled, plantation, social forestry, active mining area, water bodies, and distribution of wasteland, agricultural land and forest in the leasehold area of the project. This will help in assessing the progressive status of mined land reclamation and to take up remedial measures, if any, required for environmental protection.
- 3.0 Salient Findings** Out of the total mine leasehold area of 38970.64 ha of the 36 opencast/underground projects producing less than 5 m.cm (Coal +OB) per annum & 9 clusters taken together in different subsidiaries of CIL considered for monitoring during 2023-24; total excavated area is only 5836.63 hectares out of which 1986.63 hectares area (34.04%) is under backfilling (*Technically Reclamation*), 743.27 ha (12.73%) has been planted (*Biologically Reclaimed*), and balance 3106.73 ha (53.23%) is under active mining. It is evident from the analysis that 2729.90 hectares (46.77%) area of the 36 (32 OC+ 4 UG) projects and 9 clusters taken together for study in the year 2023-24 under different subsidiaries of CIL is under reclamation and balance 3106.73 ha (53.23%) area is under active mining. Subsidiary wise details are given in Table-1 & Fig-1.
- The projects selected for land reclamation monitoring in the year 2023-24 are subdivided into two groups viz- Group (A) includes 33 projects belonging to WCL, SECL, CCL, MCL & NEC and Group (B) includes 12 projects (9 clusters+3 mines) out of which 5 clusters belong to BCCL and 4 clusters and 3 mines belong to ECL.

- For Group A, out of total mine leasehold area of 19953.73 ha of the 33 projects considered for land reclamation monitoring during 2023-24: Total excavated area is 3652.05 ha out of which 964.42 ha (26.41%) is under backfilling (Technical Reclamation), 625.59 ha (17.13%) has been planted (*Biologically Reclaimed*) and balance 2062.04 ha (56.46%) is under active mining. Subsidiary wise detail of land reclamation of the above 33 projects is given in Table-1(A) & Fig (1).
- Similar set of mines was monitored in the year 2020-21. On comparing the status of land reclamation monitoring based on satellite data for 33 nos. of projects in WCL, SECL, CCL, MCL & NEC carried out in year 2023-24 with respect to previous cycle study done in the year 2020-2021, it was observed that:
- The total leasehold area of 33 mines of Group A in the year 2023 (19953.73 Ha) is less as compared to the leasehold area of 2020 (21701.46 Ha) for similar no. of projects. This reduction in leasehold area is due updation of leasehold boundary of some projects in subsidiaries like CCL and MCL. It has been observed that there is no change in total leasehold area of projects under WCL whereas projects under SECL and NEC has shown increase of 3.84 ha and 190.43 ha respectively. Further, there is modification in EC boundaries of 4 mines of CCL, 1 mine of MCL and 2 mines of NEC which has resulted in decrease of total leasehold area.
- For 33 projects under Group A, the area under backfilling (*technically reclaimed*) area is 964.42 ha; which is 26.41% of total excavated area in year 2023. On comparison to Year 2020 data, it was observed that the area under Technical Reclamation (Backfilling) has reduced from 977.07 ha; (32.16%) to 964.42 (26.41%) of the total excavated area in the year 2023.
- For 33 projects under Group A, the area under plantation on backfilling (*biologically reclaimed*) area is 625.59 ha; 17.13% of total excavated in year 2023 which has increased from 613.75 ha; 20.20% of total excavated area in the year 2020.

- For 33 projects under Group A, the area under *plantation on external over burden* dumps is 1063.34 ha compared to 902.51 ha in the year 2020 which indicates an increasing trend for this class.
- For 33 projects under Group A, the area under *social forestry* stands at 569.16 ha in the year 2023 to that of 553.74 ha in the year 2020 which indicates an increasing trend.
- For 33 projects under Group A, *Area under active mining* is at 2062.04 ha; 56.46% of the total excavated area in the year 2023 compared to 1447.76 ha; 47.65% of the excavated area in the year 2020 which also indicates an increasing trend.
- For 33 projects under Group A, the *total excavated area* is 3652.05 ha for the year 2023 as compared to 3038.58 Ha in the year 2020.
- The percentage of *Green Cover generation* within the total leasehold of 33 projects under Group A is 2258.09 ha (11.32%) as compared to 2070.00 Ha (9.54%) in the year 2020.
- It is evident from the analysis that area under land reclamation for 33 projects under Group A has marginally decreased from 1590.82 hectares (52.35%) in Yr. 2020-21 to 1590.01 ha (43.54%) in the Yr. 2023-24. It has been also observed that in all projects of WCL, SECL, MCL and NEC taken up for monitoring of land reclamation in 2023-24: the total area under reclamation (technical and biological) has either increased or remained static as in case MCL for the year 2023 as compared to the year 2020 except for CCL. In CCL, the total area under reclamation (technical and biological) has decreased from 509.10 ha (Yr. 2020) to 365.07 ha (Yr. 2023). This may be due to revision of EC boundary which resulted in decrease of total leasehold area of CCL projects under monitoring this year. This change in EC boundary of 4 mines out of 7 mines of CCL was notified by the concerned subsidiary.

- This decrease in *Area under Land Reclamation* for 33 projects under Group A is mainly due to decrease in area under backfilling (*Technical Reclamation*).
- For Group B which includes 12 projects (9 clusters+3 mines) which includes 5 clusters of BCCL and 4 clusters and 3 mines of ECL, out of the total mine leasehold of 19016.91 hectare for total 12 cluster of mines; 05 clusters in BCCL and 07 clusters in ECL respectively considered for monitoring during the year 2023-24 consisting of mostly underground and few opencast mines; total excavated area is 2184.58 hectare, out of which 1022.21 hectare (46.79%) area is under backfilling (*Technical Reclamation*), 117.68 hectare (5.39%) has been planted on backfill (*Biologically Reclaimed*), and balance 1044.69 hectare (47.82%) area is under active mining. It is evident from Table-1(B) that 1139.89 hectare (52.18%) area is under reclamation and balance 1044.69 hectare (47.82%) area is under active mining.
- The total leasehold area of 12 projects is 19016.91 hectares in 2023 which has increased from 18872.13 hectares as in the year 2020. Subsidiary wise, in BCCL, 87.31 ha area of total leasehold has decreased from year 2020 to 2023 whereas in ECL has shown increase of 232.09 ha in the total leasehold area. This is due to the modification in EC boundaries of selected mines of BCCL and ECL.
- The area under backfilling (*Technically Reclaimed*) for ECL and BCCL project under Group B is 1022.21 ha; 46.79% of total excavated in year 2023 as compared to 898.30 ha; 46.30% in the year 2020. This indicates an increase of about 124.21 Ha for area under *Technical Reclamation*.
- It has also been observed from Table-1(B) that Biological Reclamation for 12 clusters of mines in BCCL and ECL is 117.68 hectares (5.39%) in the year 2023-24 as compared to 123.81 (6.38%) in the year 2020. This indicates a decrease of about 6.13 Ha for area under *Biological Reclamation* in these projects.

- The area under *plantation on external over burden* dumps in Group B mines/ clusters is 320.67 ha in the year 2023 as compared to 333.62 ha in the year 2020.
- The area under *social forestry* in Group B mines/ clusters stands at 785.70 ha in the year 2023 to that of 782.22 ha in the year 2020.
- *Area under Active Mining* in Group B mines/ clusters is at 1044.69 ha; 47.82% of the total excavated in the year 2023 compared to 918.18 ha; 47.32% of the total excavated area in the year 2020.
- In Group B mines/ clusters the *total excavated area* is 2184.58 ha for the assessment year 2023 as compared to 1940.29 Ha. in year 2020.
- It is evident from analysis that for Group B mines/ clusters belonging to BCCL and ECL, taken for land reclamation monitoring based on satellite data of the Year 2023, total area under plantation (*Green cover*) is 1224.05 hectare (6.44%) as compared to 1239.65 (6.57%) in 2020.
- It is evident from the analysis that *Area under land Reclamation* for Group B mines/ clusters belonging to BCCL and ECL has marginally increased from 1022.11 hectares (52.68% of total excavated area) in Yr. 2020-21 to 1139.89 ha (52.18% of total excavated area) in the Yr. 2023-24.
- Commutatively, as it is evident from the analysis that 2729.90 hectares (46.77%) area of the 36 projects (32 OC+4 UG) and 9 clusters taken together for study in the year 2023-24 under different subsidiaries of CIL is under reclamation and balance 3106.73 ha (53.23%) area is under active mining. There is an increase of 116.97 Ha for *Area under Reclamation* as compared to the year 2020.

TABLE-1
SUBSIDIARY WISE LAND RECLAMATION STATUS IN 36 OC/UG PROJECTS AND 09 CLUSTERS OF MINES BASED ON
SATELLITE DATA OF YEAR 2023
(Projects producing less than 5 million cu. m. Coal + OB)

Sl. No.	Coal Company (No. of OC Projects and Cluster of mines)		Area in Hectare (% calculated in respect of total excavated area)																	
			Leasehold 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	Social Forestry, Avenue Plantation etc.														
1	2		3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11 (=4+5)	
	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
(A)	PROJECT WISE (OC)																			
1	WCL (13)	WCL (13)	7162.17	7162.17	359.43 28.51%	401.68 25.51%	63.43 5.03%	115.46 7.33%	643.15	802.99	336.68	308.55	837.69 66.45%	1057.67 67.16%	1260.55	1574.81	1043.26 14.57%	1227.00 17.13%	422.86 33.55%	517.14 32.84%
2	SECL (03)	SECL (03)	5051.78	5055.62	129.53 32.57%	144.03 33.47%	161.28 40.56%	171.87 39.94%	34.20	34.20	40.92	50.09	106.83 26.87%	114.43 26.59%	397.64	430.33	236.40 4.68%	256.16 5.07%	290.81 73.13%	315.90 73.41%
3	MCL (07)	MCL (07)	4288.49	4184.49	73.94 22.56%	69.28 21.13%	226.16 68.99%	230.82 70.41%	26.69	26.26	55.45	54.72	27.70 8.45%	27.70 8.45%	327.80	327.80	308.30 7.19%	311.80 7.45%	300.10 91.55%	300.10 91.55%
4	CCL (07)	CCL (07)	3611.15	1773.15	364.03 43.91%	276.67 24.73%	145.07 17.50%	88.40 7.90%	77.14	54.16	67.41	23.58	319.91 38.59%	753.71 67.37%	829.01	1118.78	289.62 8.02%	166.14 9.37%	509.10 61.41%	365.07 32.63%
5	NEC (03)	NEC (03)	1587.87	1778.30	50.14 22.43%	72.76 36.32%	17.81 7.97%	19.04 9.50%	121.33	145.73	53.28	132.22	155.63 69.61%	108.53 54.18%	223.58	200.33	192.42 12.12%	296.99 16.70%	67.95 30.39%	91.80 45.82%
TOTAL (A) (33)		TOTAL (A) (33)	21701.46	19953.73	977.07 32.16%	964.42 26.41%	613.75 20.20%	625.59 17.13%	902.51	1063.34	553.74	569.16	1447.76 47.65%	2062.04 56.46%	3038.58	3652.05	2070.00 9.54%	2258.09 11.32%	1590.82 52.35%	1590.01 43.54%
(B)		CLUSTERS WISE																		
1	BCCL (05)	BCCL (05)	7988.22	7900.91	657.49 50.55%	693.48 48.23%	27.81 2.14%	19.68 1.37%	113.72	92.77	504.23	517.10	615.44 47.31%	724.83 50.41%	1300.74	1437.99	645.76 8.08%	629.55 7.97%	685.30 52.69%	713.16 49.59%
2	ECL (07)	ECL (07)	10883.91	11116.00	240.81 37.65%	328.73 44.03%	96.00 15.01%	98.00 13.13%	219.90	227.90	277.99	268.60	302.74 47.34%	319.86 42.84%	639.55	746.59	593.89 5.46%	594.50 5.35%	336.81 52.66%	426.73 57.16%
TOTAL (B) (12)		TOTAL (B) (12)	18872.13	19016.91	898.30 46.30%	1022.21 46.79%	123.81 6.38%	117.68 5.39%	333.62	320.67	782.22	785.70	918.18 47.32%	1044.69 47.82%	1940.29	2184.58	1239.65 6.57%	1224.05 6.44%	1022.11 52.68%	1139.89 52.18%
TOTAL CIL (A+B) (45) Less than 5 MCM		TOTAL CIL (A+B) (45) Less than 5 MCM	40573.59	38970.64	1875.37 37.67%	1986.63 34.04%	737.56 12.29%	743.27 12.73%	1236.13	1384.01	1335.96	1354.86	2365.94 47.52%	3106.73 53.23%	4978.87	5836.63	3309.65 8.16%	3482.14 8.94%	2612.93 52.48%	2729.90 46.77%

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

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

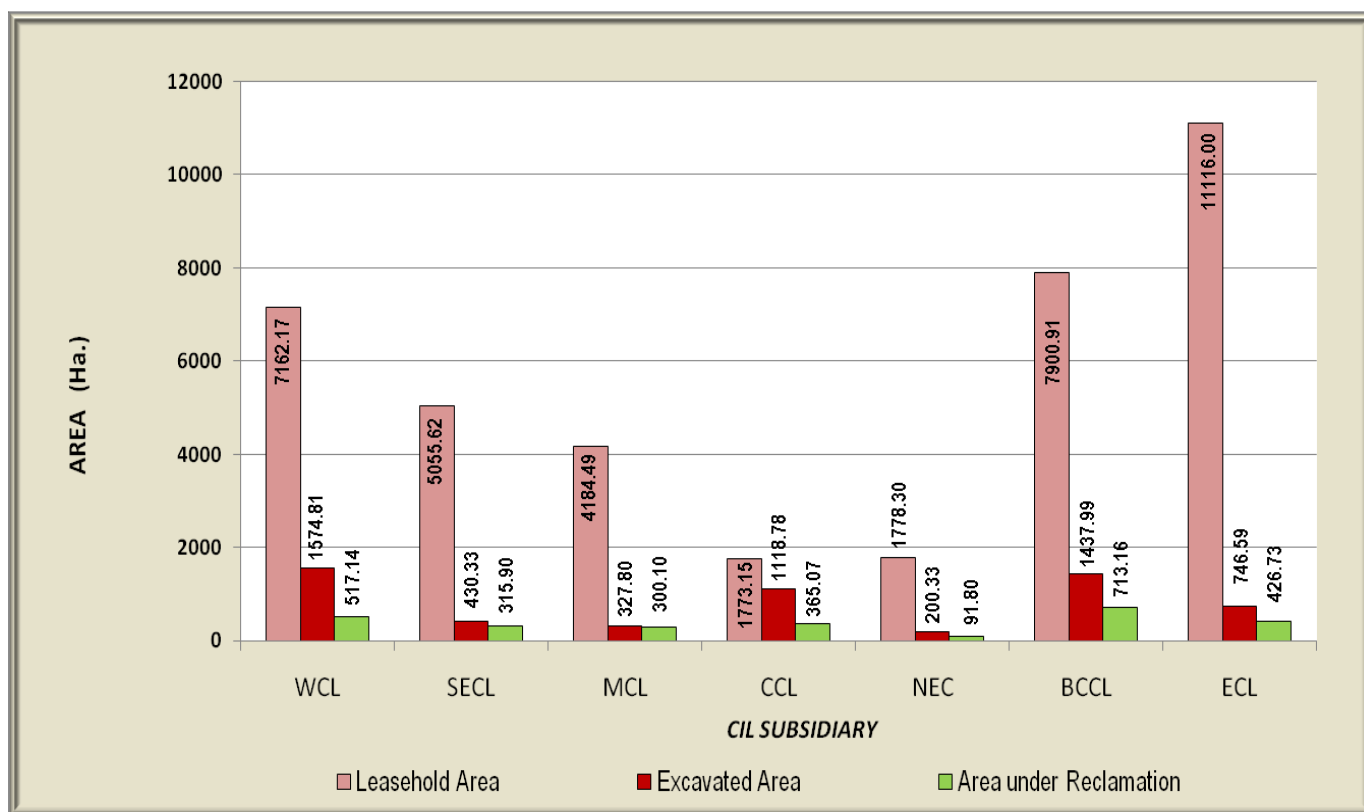


Figure 1: Land Reclamation Status in Opencast and Cluster of mines for the year 2023

STATUS OF LAND RECLAMATION WITHIN THE LEASEHOLD OF 36 OC/UG MINES & 09 CLUSTERS OF MINES FOR MONITORING IN THE YEAR 2023-24

(For projects producing Less than 5 MCM Coal+OB)
(Pie chart indicated distribution of Total Excavated Area Only)

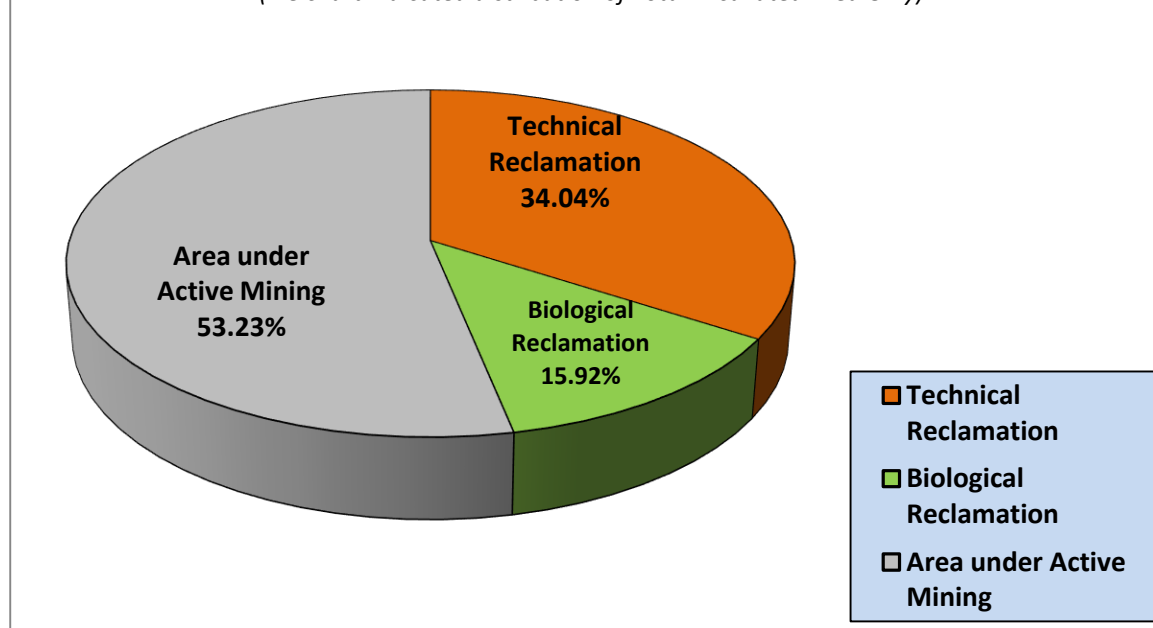


Figure 2: Chart indicating Land Reclamation Status in the year 2023

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 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 OC/UG projects and vegetation cover monitoring of 19 major coalfields. According to this work order, all mines in CIL with output capacity of 5 million cu. m (Coal +OB) shall be monitored every year and all mines below this capacity shall be monitored at an interval of 3 years. All coalfields in CIL shall also be monitored at an interval of 3 years as per a defined plan. Further, a revised work order was issued vide letter no. CIL/ENV/2022-23/W.O/10899 dated 06.07.2022 from Coal India Limited for the period 2022-23 to 2023-24.

According to this work order, 76 OC projects having more than 5 million cu. m (Coal+OB) per annum capacity shall be monitored every year and also land reclamation monitoring of 36 OC/UG projects having less than 5 million cu. m (Coal +OB) per annum capacity, totaling 109 OC mines and vegetation cover mapping of 07 coalfields for 2022-23 & totaling 123 (76+45) OC/UG mines and vegetation cover mapping of 07 coalfields for 2023-24, covering all the subsidiaries of Coal India Ltd. The result of land reclamation status of all such mines to be put on the website of CIL, (www.coalindia.in), CMPDI (www.cmpdi.co.in) and the concerned coal companies in public domain. Detail report to be submitted to Coal India and respective subsidiaries.

- 1.3** Land reclamation monitoring of all opencast coal mining projects would also comply the statutory requirements of Ministry of Environment & Forest (MoEF). Such monitoring would not only facilitate in taking timely mitigation measures against environmental degradation, but would also enable coal companies to utilize the reclaimed land for larger socio-economic benefits in a planned way.
- 1.4** CMPDI undertook the above study and the present report is embodying the findings in nutshell carrying out for the 45 opencast projects and 09 clusters of different subsidiaries producing less than 5 million cubic m. coal + OB in the year 2023-24 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.

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:

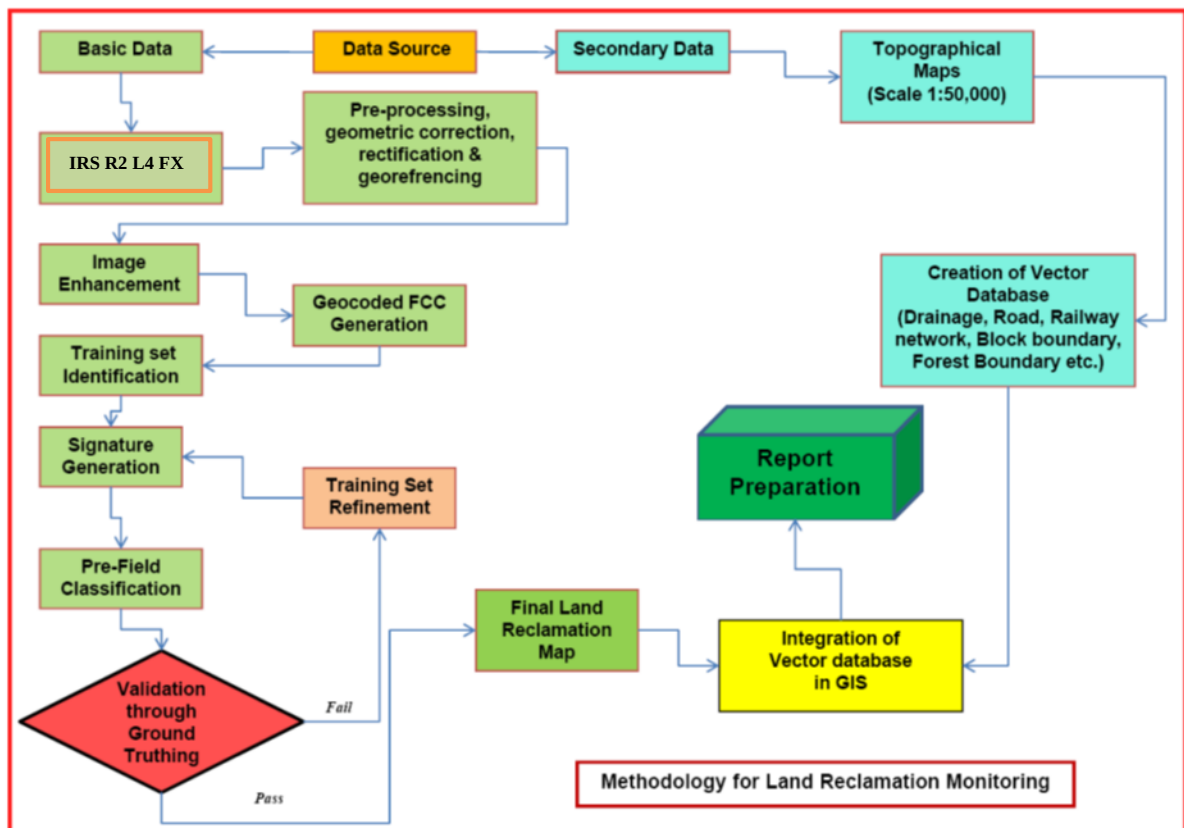


Figure 3: Methodology for Land Reclamation Monitoring

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

3.2 Satellite Data Processing: Satellite data are processed using ERDAS IMAGINE v 2022 s/w / PCI Geomatica v 10.1 s/w digital image processing s/w. Methodology involves the following major steps:

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

To improve the interpretability of the raw data, image enhancement is necessary. Local operations modify the value of each pixel based on brightness value of neighbouring pixels using ERDAS IMAGINE v 2022 s/w / PCI Geomatica 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 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 class is 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 45 opencast/underground projects subsidiaries producing less than 5 million cubic m (Coal +OB) and 09 clusters of different subsidiaries were taken up for the study during the year 2023-24. Based on the RESOURCESAT-2 satellite data, land reclamation /mine closure monitoring was carried out using ERDAS IMAGINE digital image processing s/w and Arc-Info GIS.

4.2 The list of 45 opencast/underground projects producing less than 5 mcm (Coal and OB together) annually of different CIL subsidiaries and 09 clusters of BCCL & ECL taken up for Land Reclamation monitoring based on satellite data of year 2023 is given in table below:

Subsidiary (No. of Projects)	Opencast Projects (Less than 5 million cu.m. Coal +OB per annum)
WCL (13)	Kolegaon, Bellora-Naigaon, Ghonsa, Ballarpur, Junad Extn., Urdhan, Gouri I & II Amalgamation, Bhatadi, Gondegaon, Kolarpimpri, Chhinda, Gouri Deep and Adasa OCPs
SECL (03)	Sharda, Kanchan and Rajgamar OCPs
MCL (07)	Lilari, Balanda, Chhendipada, Subhadra OCPs and Orient 1 & 2 UG , Orient 3 UG and Nandira UGs
CCL (07)	Amlo, Tarmi, Urimari, Govindpur, Topa, Jharkhand and New Giddi-C OCPs
NEC (03)	Ledo, Tirap and Tikak OCPs
BCCL (05)	Cluster-III, Cluster-V, Cluster –VIII, Cluster –IX and Cluster-XVII.
ECL (07)	Cluster-I, Cluster-II, Cluster –III and Cluster –IV, Chitra East, Mohanpur and Hurra OCPs
TOTAL (45)	

Subsidiary wise land reclamation status of the above mentioned 36 OC/UG projects and 09 clusters of BCCL & ECL derived from satellite data for the year 2023 are given in the following pages:

WESTERN COALFIELDS LIMITED

5.0 Land Reclamation Status in Western Coalfields Ltd.

5.1 Following 13 opencast projects producing less than 5 million cubic m. (Coal + OB together) of Western Coalfields Ltd. have been taken up for land reclamation monitoring during the year 2023-24:

- Kolegaon
- Bellora-Naigaon
- Ghonsa
- Ballarpur
- Junad Extn
- Urdhan
- Gouri I & II Amalgation
- Bhatadi
- Gondegaon
- Kolarpimpri
- Chhinda
- Gouri Deep
- Adasa UG to OC

5.2 Area statistics of different land use class present in the mine leasehold of the above projects for the year 2023 are shown in the Table: 5.2. Land use maps derived from satellite data of year 2023 are shown in Plate 5.1-5.13. Changes in the different land use classes based on satellite data are depicted in Bar Charts in Fig. 5.2- 5.14.

5.3 Study reveals that out of total mine leasehold area of 7162.17 Hectare of the 13 projects Viz, Kolgaon, Bellora-Naigaon, Ghonsa, Ballarpur, Junad Extn, Urdhan, Gauri I & II Amal., Bhatadi, Gondegaon, Kolarpimpri, Chhinda, Gauri deep and Adasa UG to OC considered for monitoring during year 2023-24; total excavated area is 1574.81 ha (21.99%), out of which 115.46 ha (7.33%) area has been planted on backfill (Biologically Reclaimed) and 401.68 Ha (25.51%)

area is under backfilling (Technically Reclaimed) and balance 1057.67 ha (67.16%) area is under active mining. It is evident from analysis that 517.14 ha (32.84%) area of above projects is under reclamation (Biologically and Technically). Project wise details area given in Table 5.1.

- 5.4** From analysis it is revealed that total vegetated area (Biological Reclamation) within leasehold of the above projects has increased to 115.46 ha (7.33%) in the year 2023-24 as compared to 63.43 Ha (5.03%) in the year 2020 and area under technical reclamation (area under backfilling) has also increased from 359.43 ha (28.51%) in the year 2020 to 401.68 ha (25.51%) area in the year 2023.
- 5.5** 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).
- 6.6** After analyzing the satellite data of year 2020 vs. 2023 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 1043.26 ha (Year 2020) to 1227.00 ha (Year 2023) in the span of three years. This increase of 183.74 ha area under total plantation in three years of time is due to the sincere efforts made by WCL towards generation of green cover in leasehold area of the 13 opencast projects considered for land reclamation in the year 2023-24.
- 5.7** Out of 13 projects of WCL, maximum land reclamation has been carried out in Ballarpur OCP (85.18%) followed by Gauri I & II Amal. OCP (61.21%), Bellora-Naigaon (44.52%), Junad Extn. OCP (38.82%), Bhatadi OCP (28.57%), Gondegaon OCP (27.28%), Kolarpimpri OCP (11.93%), Urdhan OCP (10.99%) and Ghonsa OCP (10.54%).

Table 5.1: Project wise Land Reclamation Status in Opencast Projects of WCL based on the Satellite data of the year 2023

(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, Avaneue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Kolegaon	397.52	397.52	0.00	0.00	0.00	0.00	72.83	83.45	25.63	24.11	48.03	67.64	48.03	67.64	98.46	107.56	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			24.77%	27.06%	0.00%	0.00%
2	Bellora-Naigaon	664.80	664.80	53.02	73.59	12.75	18.55	35.62	48.09	28.94	31.79	91.53	114.81	157.30	206.95	77.31	98.43	65.77	92.14
				33.71%	35.56%	8.11%	8.96%					58.19%	55.48%			11.63%	14.81%	41.81%	44.52%
3	Ghonsa	278.68	278.68	7.28	11.59	0.00	0.00	2.55	5.51	4.65	6.54	60.29	98.39	67.57	109.98	7.20	12.05	7.28	11.59
				10.77%	10.54%	0.00%	0.00%					89.23%	89.46%			2.58%	4.32%	10.77%	10.54%
4	Ballarpur	242.64	242.64	80.79	75.63	15.00	24.25	69.49	73.75	9.74	9.76	17.47	17.38	113.26	117.26	94.23	107.76	95.79	99.88
				71.33%	64.50%	13.24%	20.68%					15.42%	14.82%			38.84%	44.41%	84.58%	85.18%
5	Junad EXTN	449.63	449.63	34.51	37.39	2.46	4.51	65.57	74.65	28.81	33.69	61.54	66.03	98.51	107.93	96.84	112.85	36.97	41.90
				35.03%	34.64%	2.50%	4.18%					62.47%	61.18%			21.54%	25.10%	37.53%	38.82%
6	Urdhan	315.00	315.00	2.36	4.70	0.00	0.00	5.79	10.15	6.87	9.02	19.45	38.06	21.81	42.76	12.66	19.17	2.36	4.70
				10.82%	10.99%	0.00%	0.00%					89.18%	89.01%			4.02%	6.09%	10.82%	10.99%
7	Gouri I & II Amal.	676.53	676.53	106.53	89.42	29.20	59.74	150.98	205.78	96.21	61.57	95.57	94.53	231.30	243.69	276.39	327.09	135.73	149.16
				46.06%	36.69%	12.62%	24.51%					41.32%	38.79%			40.85%	48.35%	58.68%	61.21%
8	Bhatadi	847.37	847.37	21.94	38.67	0.00	0.00	30.86	50.43	46.12	42.58	71.92	96.68	93.86	135.35	76.98	93.01	21.94	38.67
				23.38%	28.57%	0.00%	0.00%					76.62%	71.43%			9.08%	10.98%	23.38%	28.57%
9	Gondegaon	791.40	791.40	42.29	55.84	0.00	0.00	73.47	96.43	62.15	51.26	157.19	148.83	199.48	204.67	135.62	147.69	42.29	55.84
				21.20%	27.28%	0.00%	0.00%					78.80%	72.72%			17.14%	18.66%	21.20%	27.28%
10	Kolarpimpri	1488.42	1488.42	10.71	14.85	4.02	8.41	115.55	134.64	8.21	12.02	140.37	171.68	155.10	194.94	127.78	155.07	14.73	23.26
				6.91%	7.62%	2.59%	4.31%					90.50%	88.07%			8.58%	10.42%	9.50%	11.93%
11	Chhinda	106.68	106.68	0.00	0.00	0.00	0.00	20.44	20.11	2.87	4.30	23.29	23.81	23.29	23.81	23.31	24.41	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			21.85%	22.88%	0.00%	0.00%
12	Gouri deep	339.10	339.10	0.00	0.00	0.00	0.00	0.00	0.00	8.00	8.00	51.04	62.77	51.04	62.77	8.00	8.00	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			2.36%	2.36%	0.00%	0.00%
13	Adasa UG to OC	564.40	564.40	0.00	0.00	0.00	0.00	0.00	0.00	8.48	13.91	0.00	57.06	0.00	57.06	8.48	13.91	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	100.00%			1.50%	2.46%	0.00%	0.00%
	TOTAL	7162.17	7162.17	359.43	401.68	63.43	115.46	643.15	802.99	336.68	308.55	837.69	1057.67	1260.55	1574.81	1043.26	1227.00	422.86	517.14
				28.51%	25.51%	5.03%	7.33%					66.45%	67.16%	17.60%	21.99%	14.57%	17.13%	33.55%	32.84%

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 above Table.
5. (%) calculated in the above Table is in respect to Total Excavated Area except for "Total Area under Plantation" where % is in terms of "Leasehold Area".

Figure 5.1: Land Reclamation status in OC projects producing less than 5mcm (Coal+ OB) of WCL in the year 2023

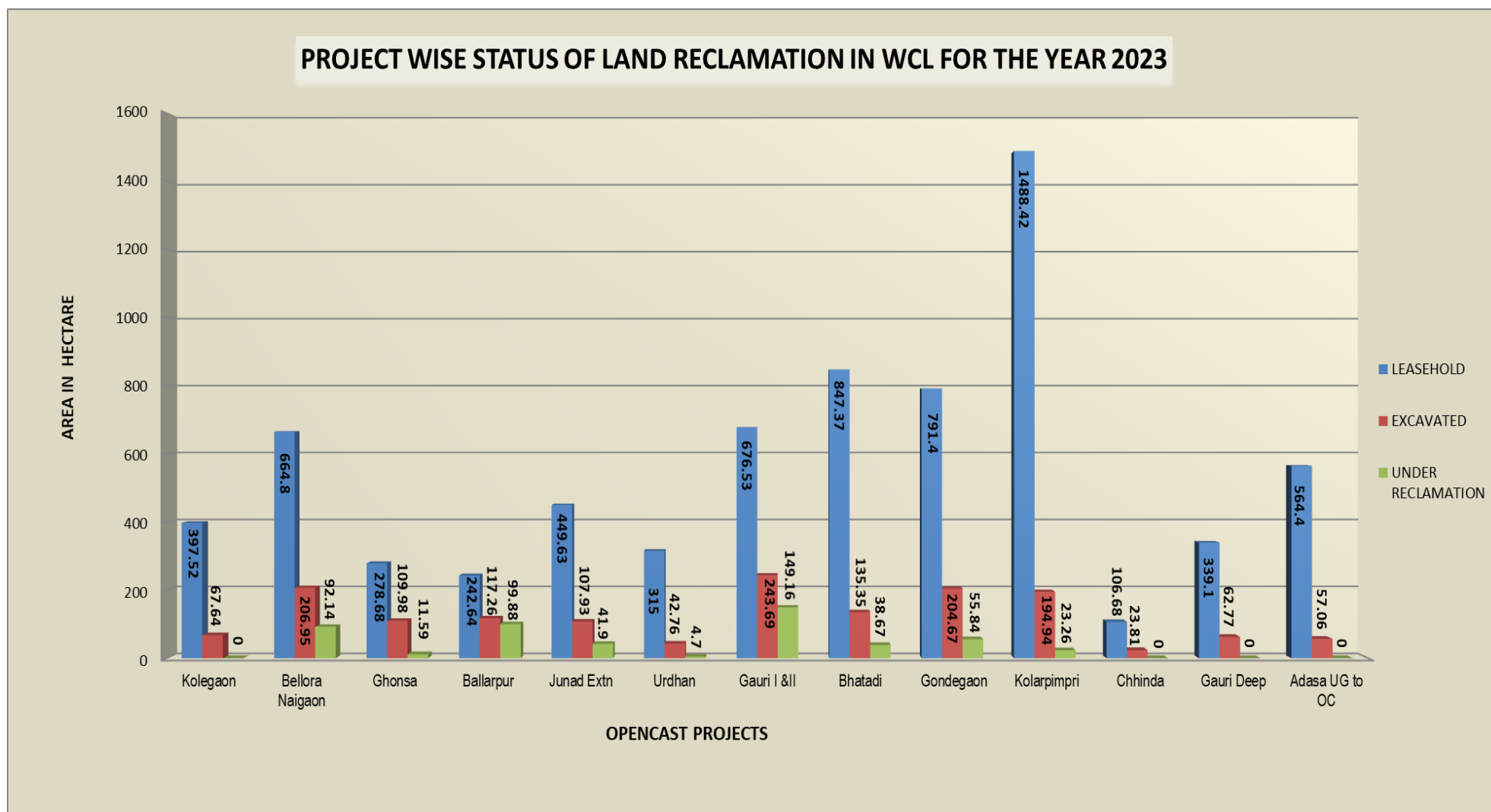
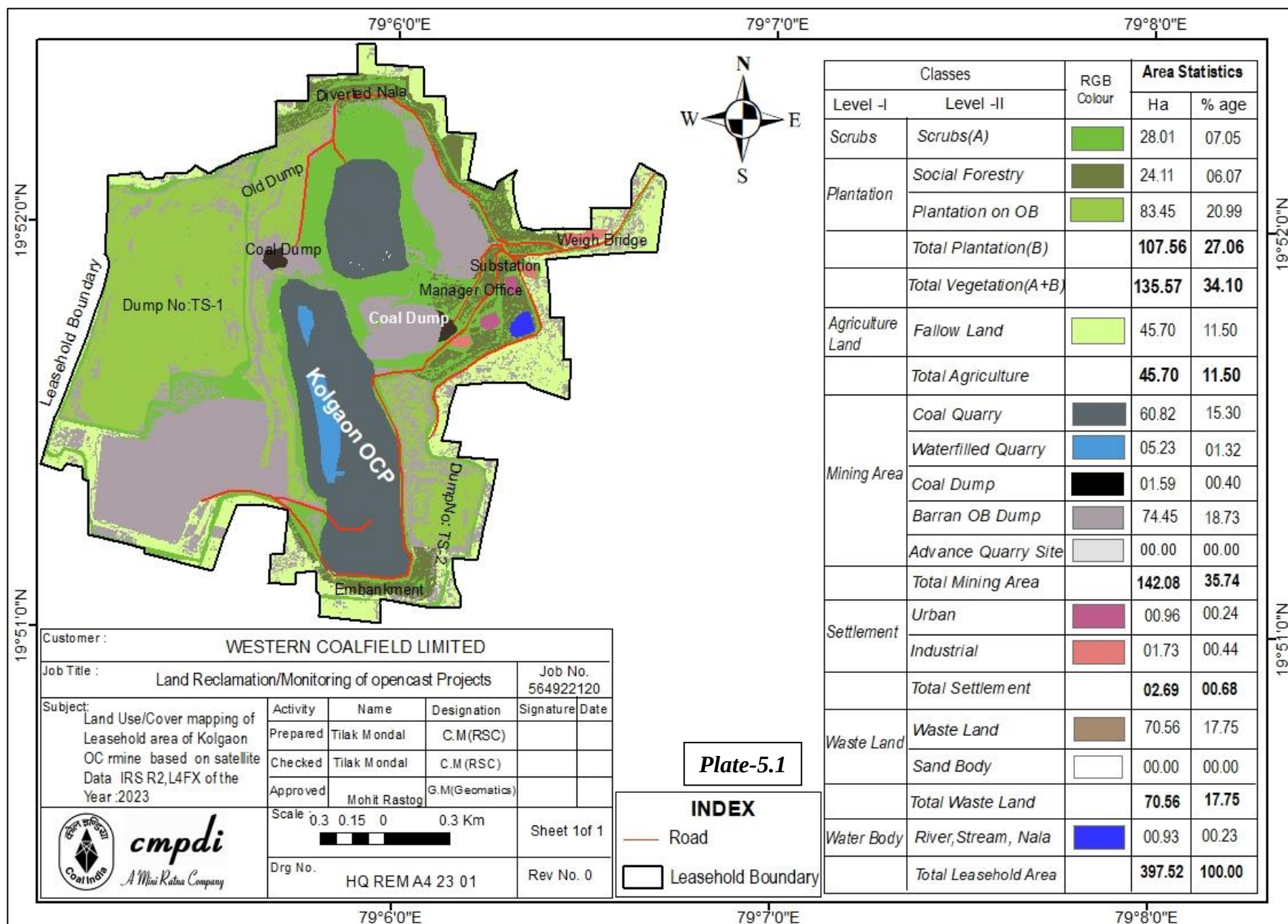
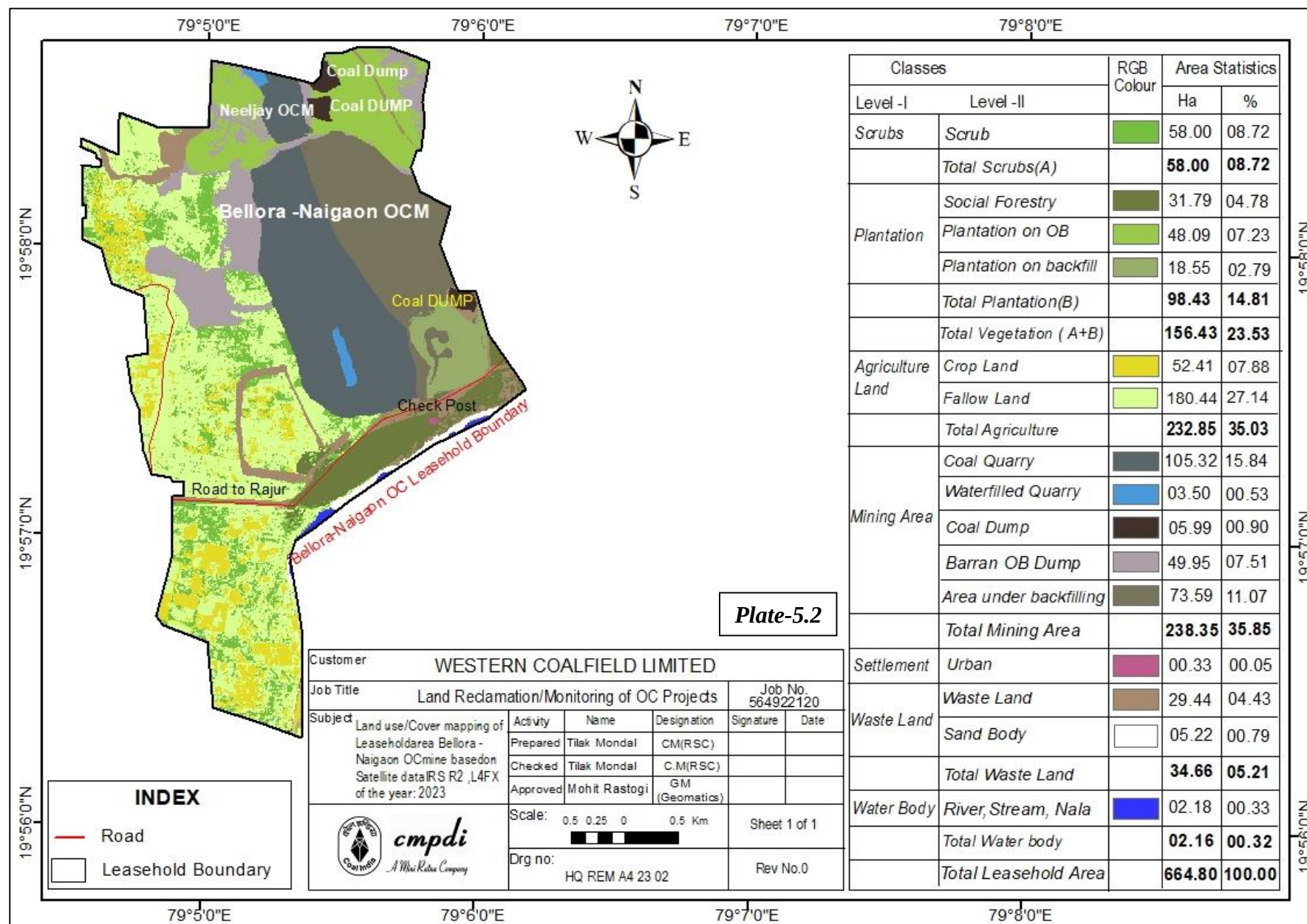
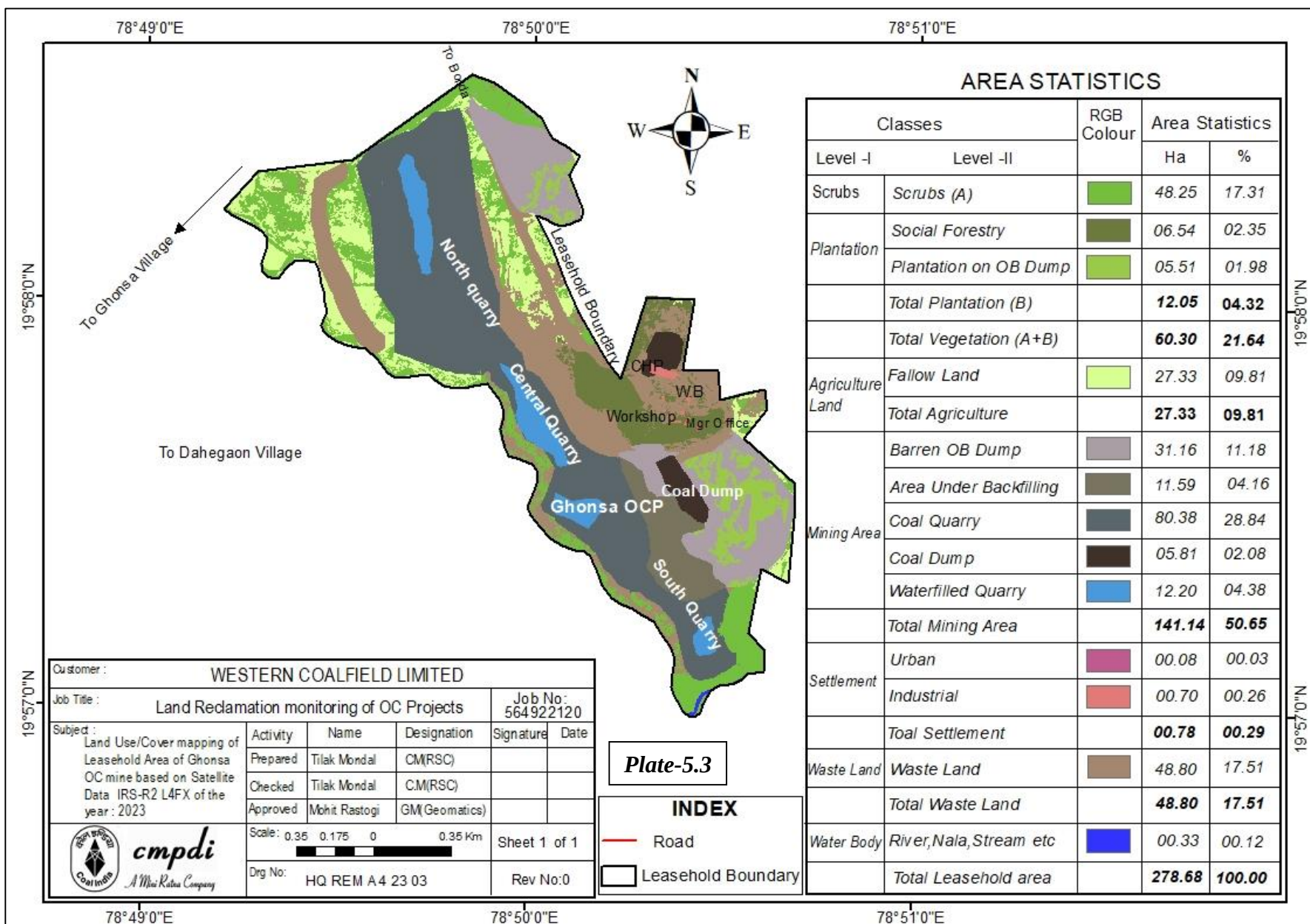


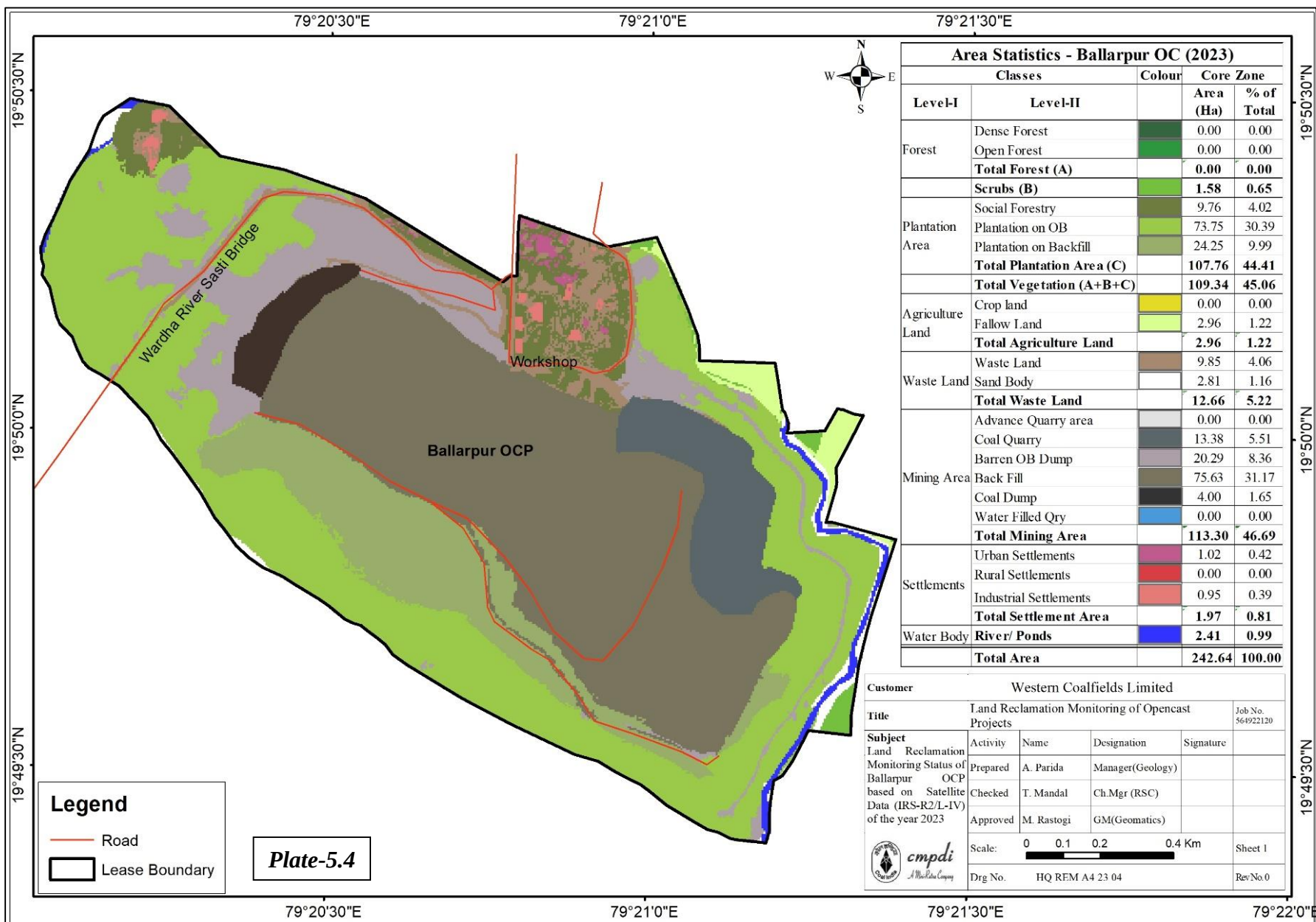
Table 5.2: STATUS OF LAND RECLAMATION IN WESTERN COALFIELDS LIMITED BASED ON SATELLITE DATA OF THE YEAR 2023

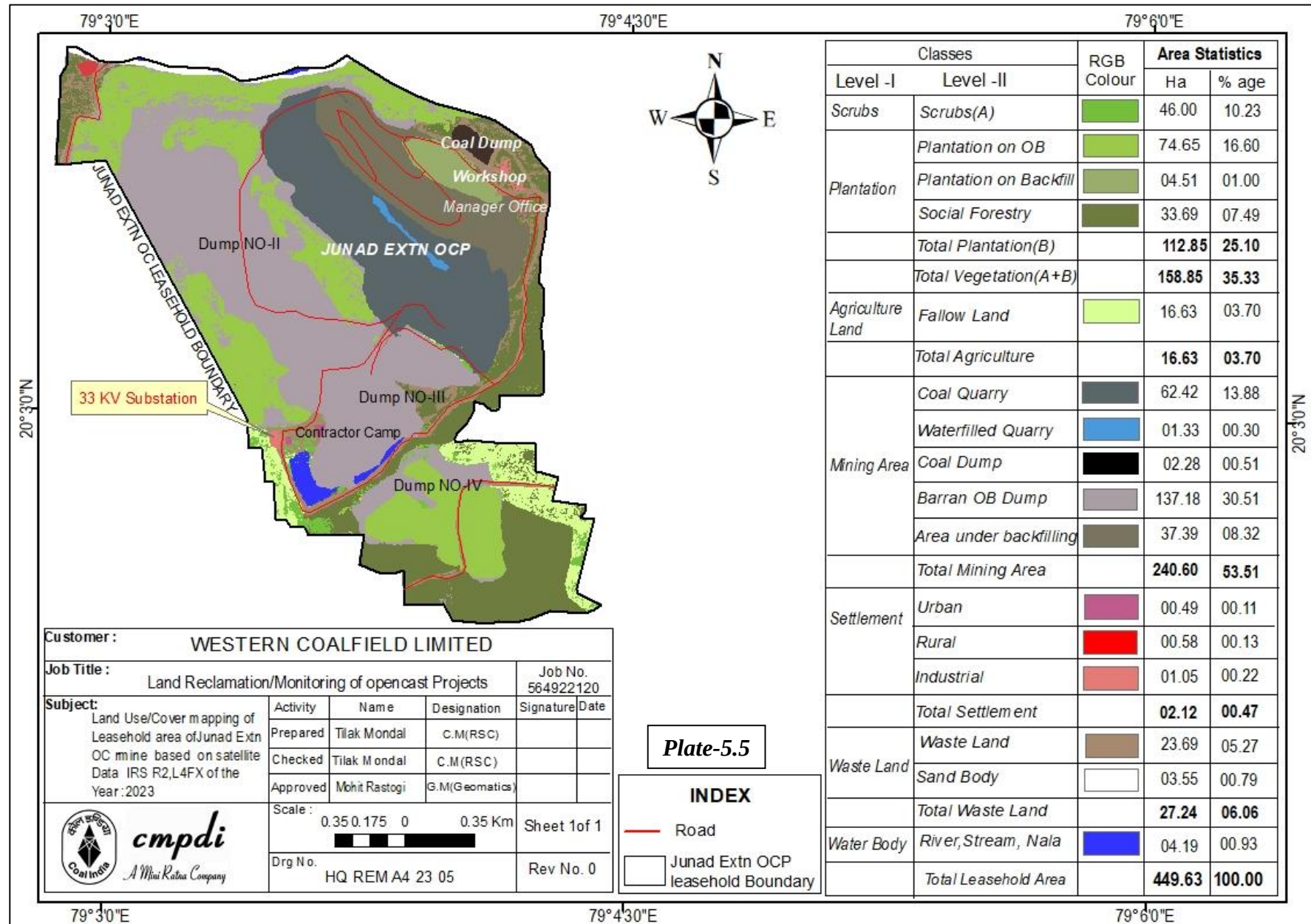
			Kolgaon		Bellora - Naigaon		Ghonsa		Ballarpur		Junad Extn		Urdhan		Gouri I & II		Bhatadi		Gondegaon		Kolar-Pimpri		Chhinda		Gouri Deep		Adasa UG to OC		Total	
FORESTS	Dense Forest		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Open Forest		0.00	0.00	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	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
SCRUB	Scrubs		28.01	7.05	58.00	8.72	48.25	17.31	1.58	0.65	46.00	10.23	29.55	9.38	13.93	2.06	80.18	9.46	47.22	5.97	249.73	16.78	10.04	9.41	37.89	11.17	96.72	17.14	747.10	10.4
PLANTATION	Social Forestry		24.11	6.07	31.79	4.78	6.54	2.35	9.76	4.02	33.69	7.49	9.02	2.86	61.57	9.10	42.58	5.02	51.26	6.48	12.02	0.81	4.30	4.03	8.00	2.36	13.91	2.46	308.55	4.31
	Plantation on OB Dump		83.45	20.99	48.09	7.23	5.51	1.98	73.75	30.39	74.65	16.60	10.15	3.22	205.78	30.42	50.43	5.95	96.43	12.18	134.64	9.05	20.11	18.85	0.00	0.00	0.00	0.00	802.99	11.21
	Plantation on Backfill		0.00	0.00	18.55	2.79	0.00	0.00	24.25	9.99	4.51	1.00	0.00	0.00	59.74	8.83	0.00	0.00	0.00	0.00	8.41	0.57	0.00	0.00	0.00	0.00	0.00	0.00	115.46	1.61
	Total Green Cover generated		107.56	27.06	98.43	14.80	12.05	4.33	107.76	44.40	112.85	25.09	19.17	6.08	327.09	48.35	93.01	10.97	147.69	18.66	155.07	10.43	24.41	22.88	8.00	2.36	13.91	2.46	1227.00	17.13
	Total Vegetation		135.57	34.11	156.43	23.52	60.30	21.64	109.34	45.05	158.85	35.32	48.72	15.46	341.02	50.41	173.19	20.43	194.91	24.63	404.80	27.21	34.45	32.29	45.89	13.53	110.63	19.60	1974.10	27.56
ACTIVE MINING	Coal Quarry		60.82	15.30	105.32	15.84	80.38	28.84	13.38	5.51	62.42	13.88	30.13	9.57	62.49	9.24	82.74	9.76	119.74	15.13	125.99	8.46	22.65	21.23	51.36	15.15	48.75	8.64	866.17	12.09
	Advance Quarry Site		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	7.33	2.16	0.00	0.00	7.37	0.10
	Quarry Filled With Water		5.23	1.32	3.50	0.53	12.20	4.38	0.00	0.00	1.33	0.30	1.13	0.36	28.30	4.18	0.52	0.06	19.86	2.51	41.99	2.82	0.64	0.60	0.00	0.00	2.29	0.41	116.99	1.63
	Coal Dump		1.59	0.40	5.99	0.90	5.81	2.08	4.00	1.65	2.28	0.51	6.80	2.16	3.70	0.55	13.42	1.58	9.23	1.17	3.70	0.25	0.52	0.49	4.08	1.20	6.02	1.07	67.14	0.94
	Total Area under Active Mining		67.64	17.02	114.81	17.27	98.39	35.30	17.38	7.16	66.03	14.69	38.06	12.09	94.53	13.98	96.68	11.40	148.83	18.81	171.68	11.53	23.81	22.32	62.77	18.51	57.06	10.12	1057.67	14.76
WASTELAND	Barren OB Dump		74.45	18.73	49.95	7.51	31.16	11.18	20.29	8.36	137.18	30.51	68.60	21.78	55.18	8.16	182.33	21.52	166.44	21.03	349.74	23.50	23.45	21.98	104.74	30.89	66.23	11.73	1329.74	18.57
	Barren Backfilled Area		0.00	0.00	73.59	11.07	11.59	4.16	75.63	31.17	37.39	8.32	4.70	1.49	89.42	13.22	38.67	4.56	55.84	7.06	14.85	1.00	0.00	0.00	0.00	0.00	0.00	0.00	401.68	5.61
	Total Area under backfill (Technical Reclamation)		0.00	0.00	73.59	11.07	11.59	4.16	75.63	31.17	37.39	8.32	4.70	1.49	89.42	13.22	38.67	4.56	55.84	7.06	14.85	1.00	0.00	0.00	0.00	0.00	0.00	0.00	401.68	5.61
	Total Area Under Mine Operation		142.09	35.75	238.35	35.85	141.14	50.64	113.30	46.69	240.60	53.52	111.36	35.36	239.13	35.36	317.68	37.48	371.11	46.89	536.27	36.03	47.26	44.30	167.51	49.40	123.29	21.85	2789.09	38.94
WATERBODIES	Waste Lands		70.56	17.75	29.44	4.43	48.80	17.51	9.85	4.07	23.69	5.27	30.38	9.64	51.72	7.64	72.91	8.60	79.94	10.10	55.66	3.74	1.91	1.79	10.19	3.01	24.25	4.30	509.30	7.11
	Fly Ash Pond / Sand Body		0.00	0.00	5.22	0.79	0.00	0.00	2.81	1.16	3.55	0.79	0.00	0.00	12.54	1.85	5.11	0.60	0.00	0.00	3.09	0.21	0.23	0.22	0.24	0.07	3.79	0.67	36.58	0.51
	Total Waterbodies		0.93	0.23	2.18	0.33	0.33	0.12	2.41	0.99	4.19	0.93	0.00	0.00	5.01	0.73	15.27	1.80	0.00	0.00	2.29	0.15	0.19	0.18	1.70	0.50	5.18	0.92	39.68	0.55
AGRICULTURE	Crop Lands		0.00	0.00	52.41	7.88	0.00	0.00	0.00	0.00	0.00	0.00	28.58	9.07	0.00	0.00	0.00	0.00	0.00	0.00	35.12	2.36	8.59	8.05	8.41	2.48	87.52	15.51	220.63	3.08
	Fallow Lands		45.70	11.50	180.44	27.14	27.33	9.81	2.96	1.22	16.63	3.70	92.82	29.47	25.44	3.76	256.43	30.26	138.81	17.54	435.43	29.25	12.99	12.18	103.97	30.66	202.74	35.92	1541.69	21.53
	Total Agriculture		45.70	11.50	232.85	35.02	27.33	9.81	2.96	1.22	16.63	3.70	121.40	38.54	25.44	3.76	256.43	30.26	138.81	17.54	470.55	31.61	21.58	20.23	112.38	33.14	290.26	51.43	1762.32	24.61
SETTLEMENTS	Urban Settlement		0.96	0.24	0.33	0.05	0.08	0.03	1.02	0.42	0.49	0.11	0.92	0.29	0.23	0.03	1.56	0.19	3.15	0.40	0.27	0.02	1.06	0.99	0.53	0.16	3.86	0.68	14.46	0.20
	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	3.71	0.44	0.00	0.00	6.01	0.40	0.00	0.00	0.00	0.00	2.81	0.50	14.78	0.22
	Industrial Settlement		1.73	0.44	0.00	0.00	0.70	0.25	0.95	0.39	1.05	0.23	0.55	0.17	1.44	0.21	1.51	0.18	3.48	0.44	9.48	0.64	0.00	0.00	0.66	0.19	0.33	0.06	21.88	0.31
	Total Settlement		2.69	0.68	0.33	0.05	0.78	0.28	1.97	0.81	2.12	0.47	3.14	0.99	1.67	0.24	6.78	0.81	6.63	0.84	15.76	1.06	1.06	0.99	1.19	0.35	7.00	1.24	51.12	0.73
Grand Total			397.52	100.00	664.80	100.00	278.68	100.00	242.64	100.00	449.63	100.00	315.00	100.00	676.53	100.00	847.37	100.00	791.40	100.00	1488.42	100.00	106.68	100.00	339.10	100.00	564.40	100.00	7162.17	100.00

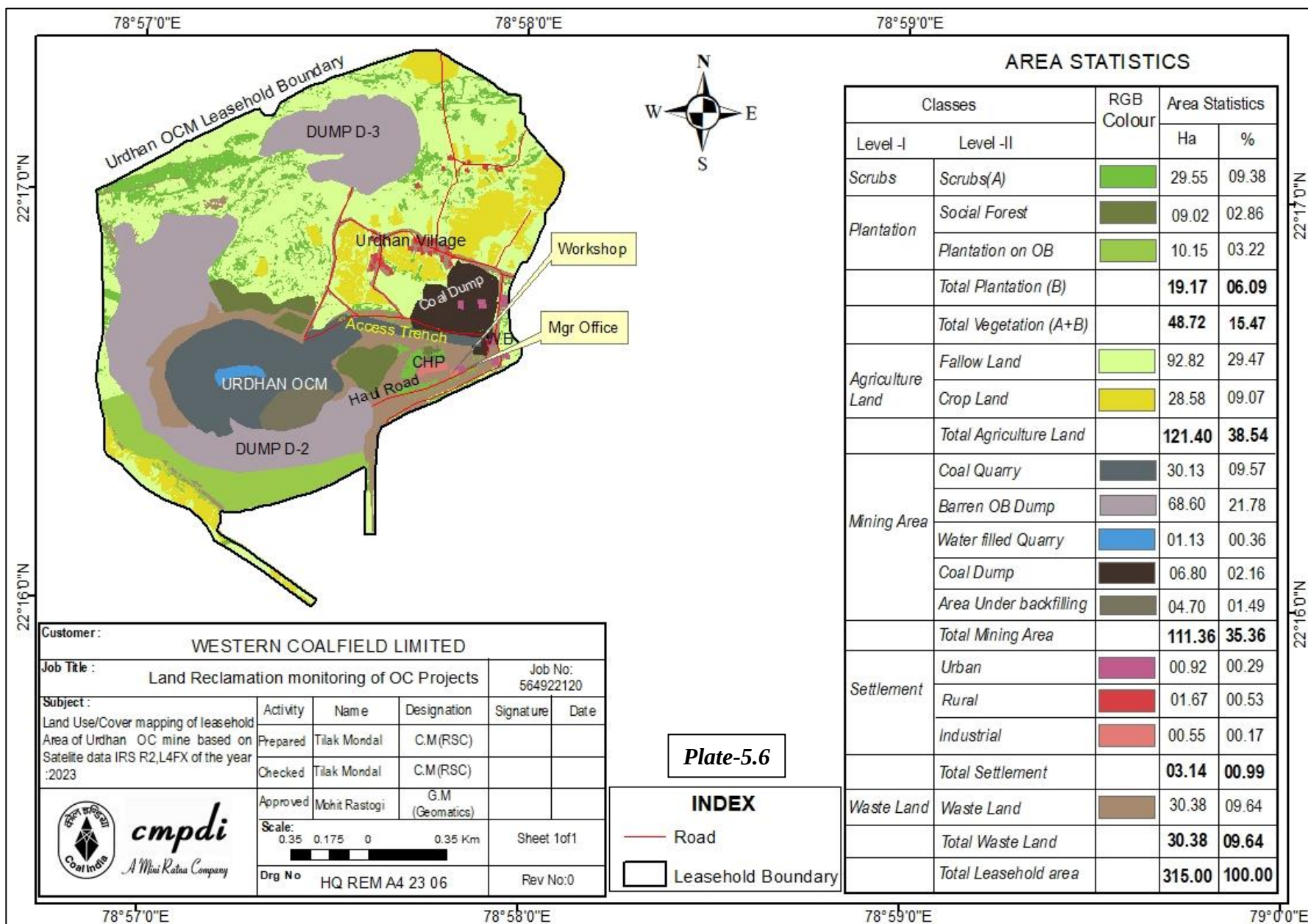


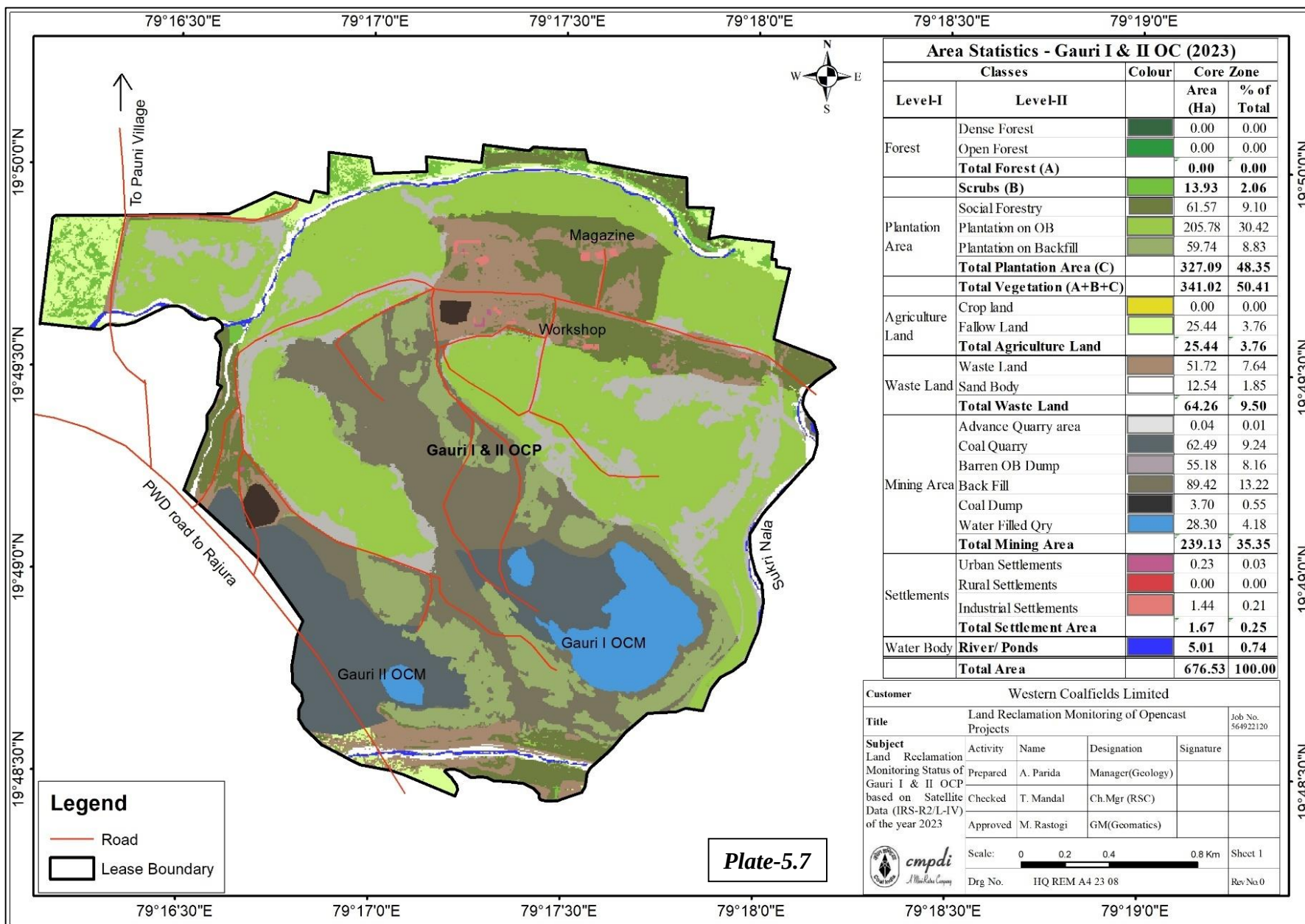


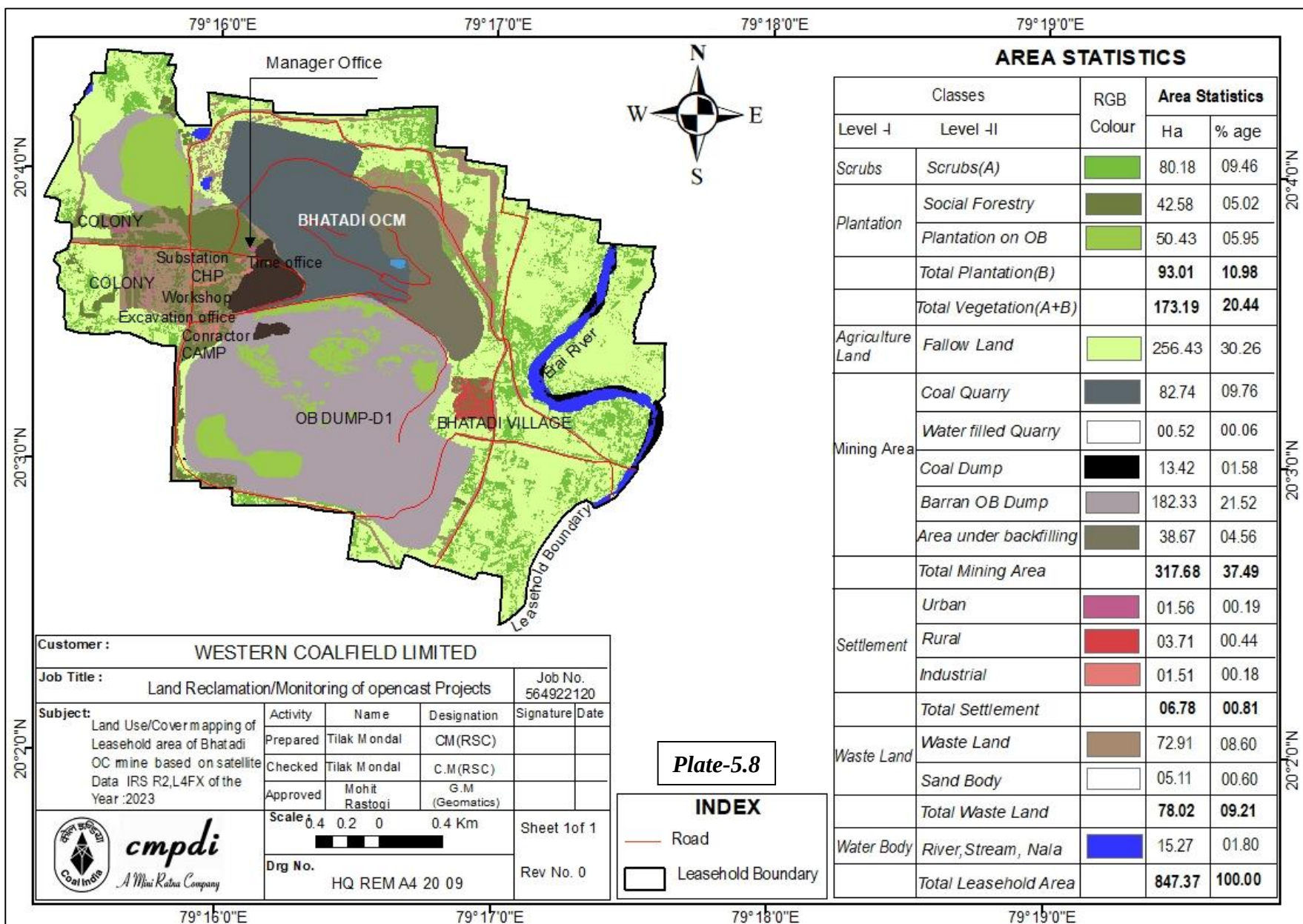


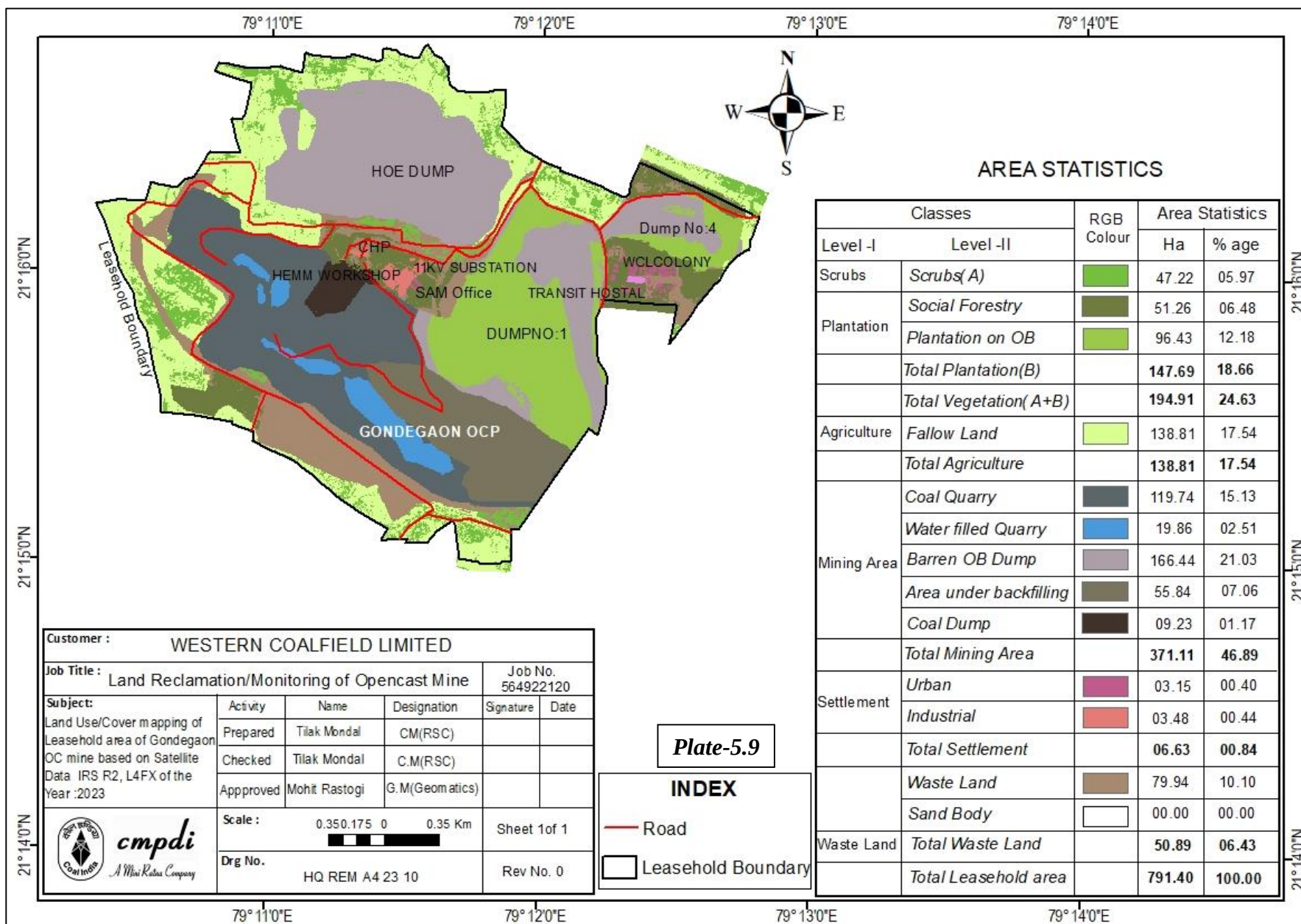


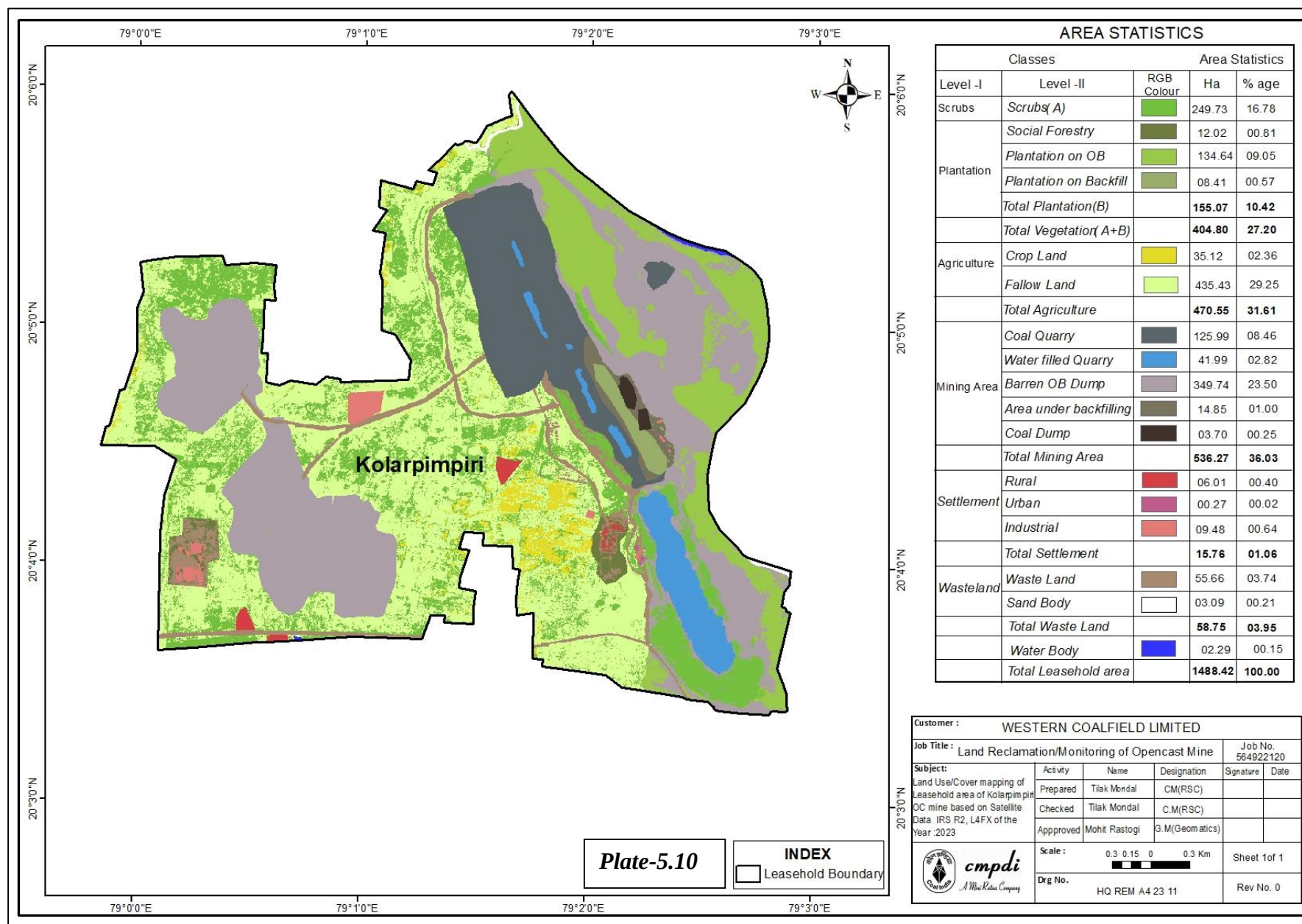


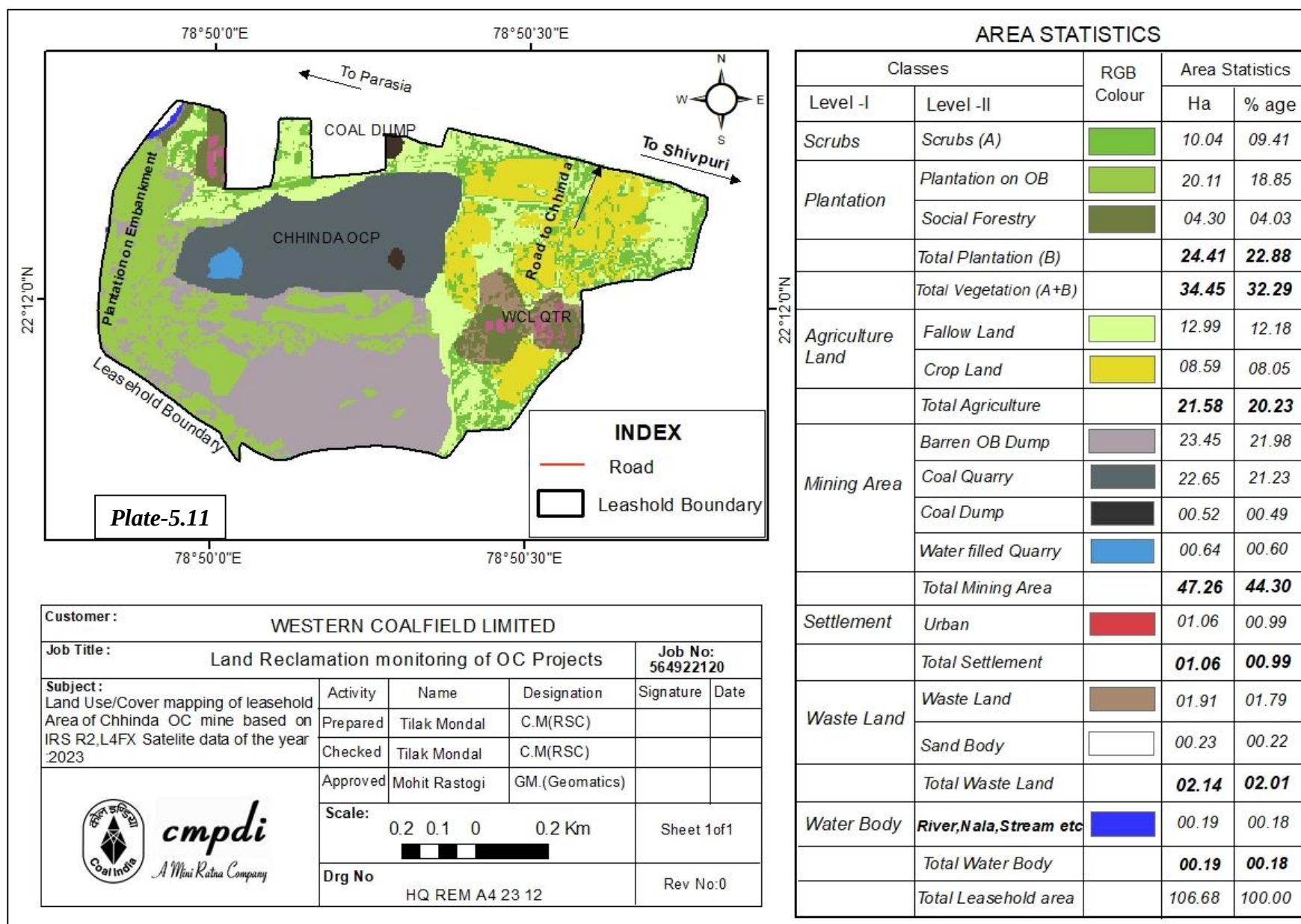


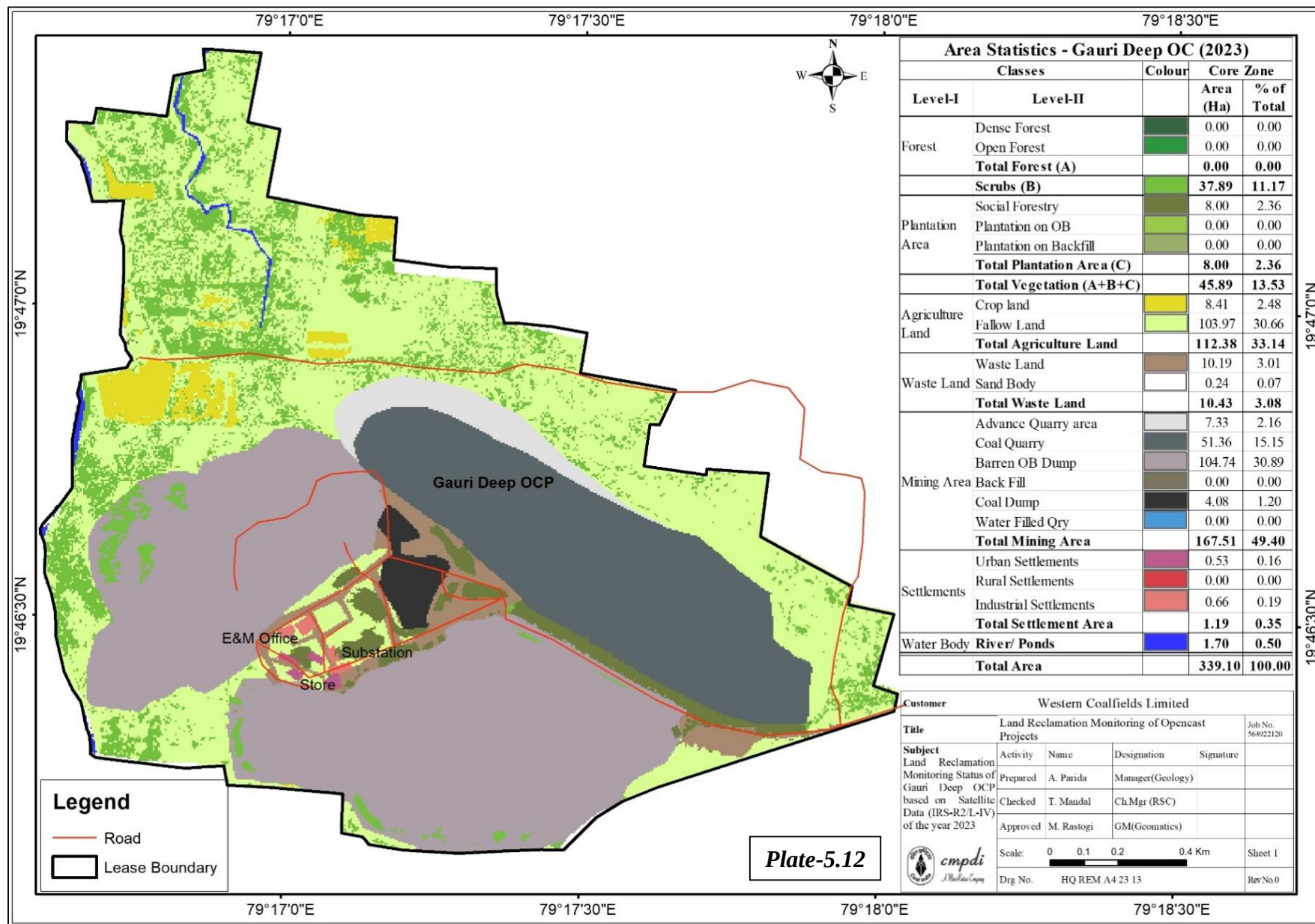


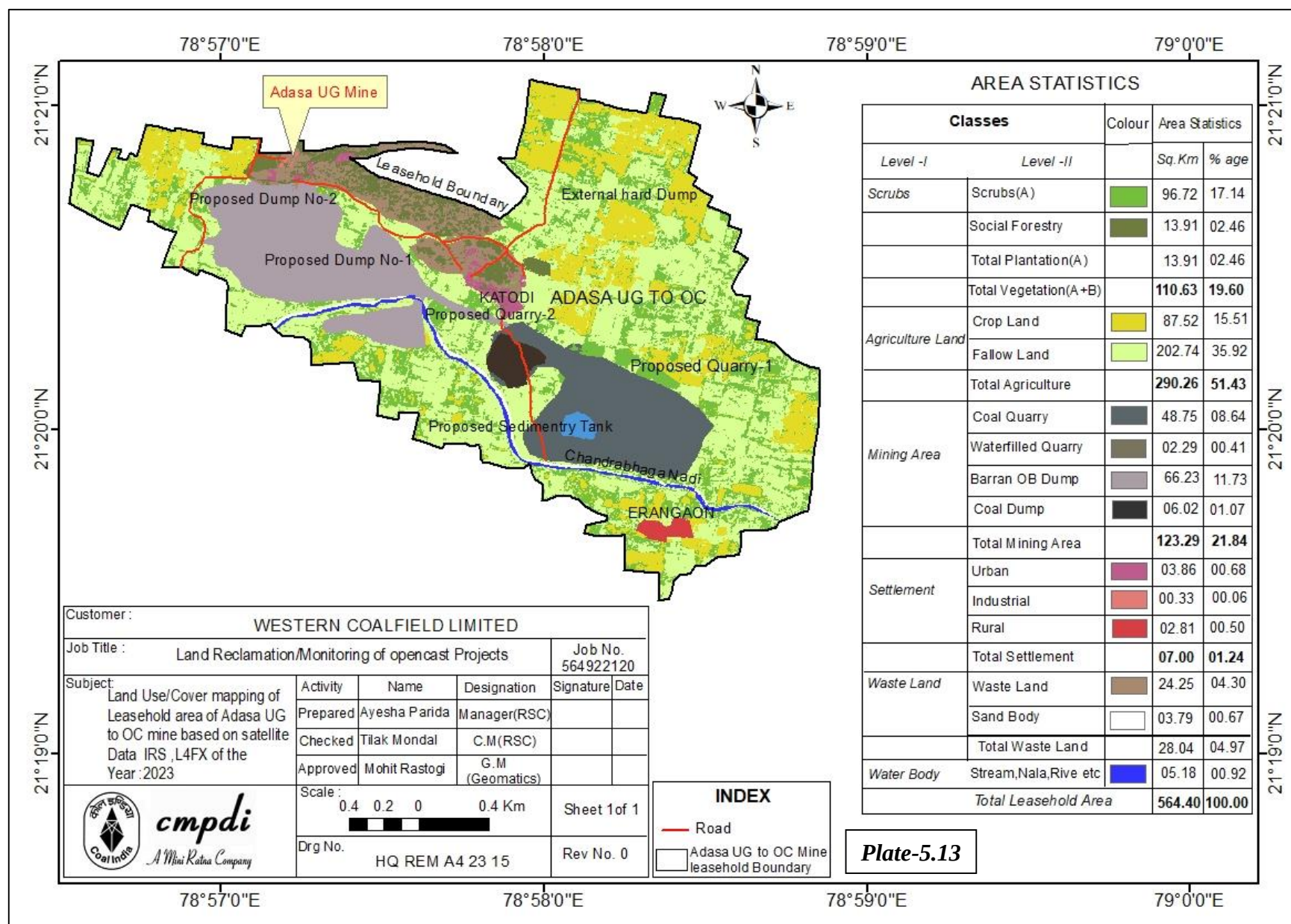












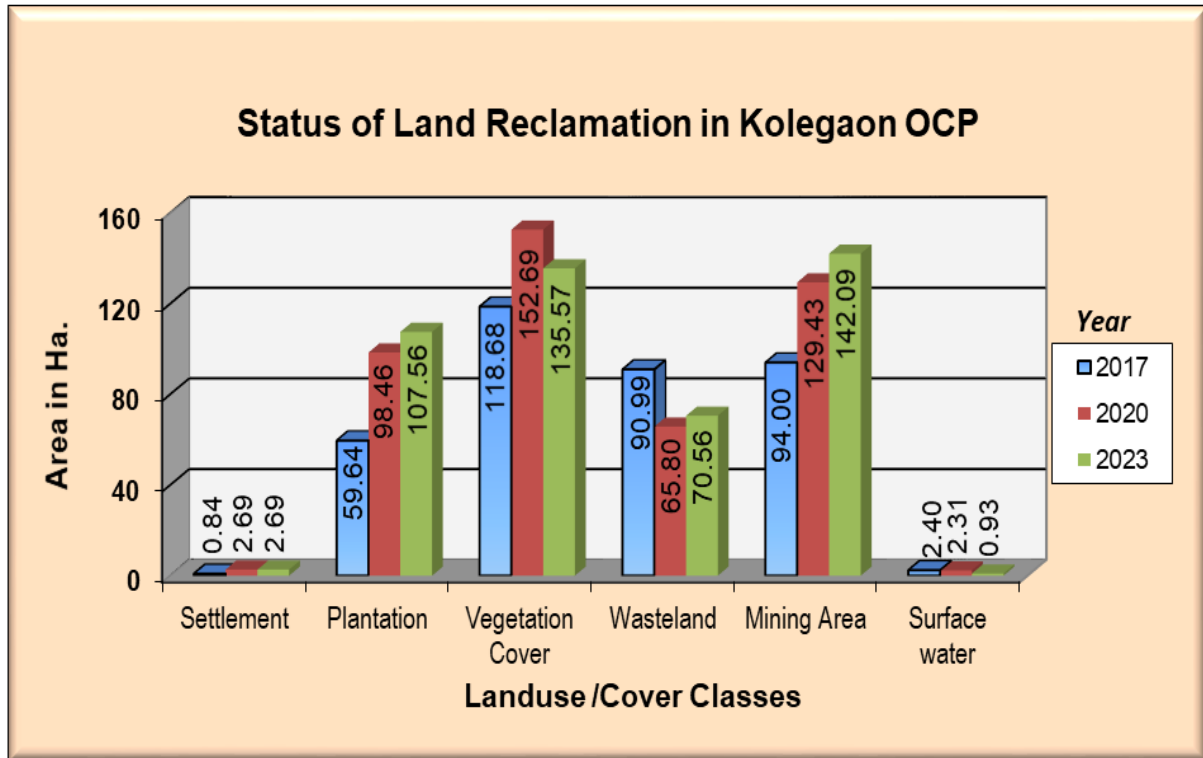


Figure- 5.2

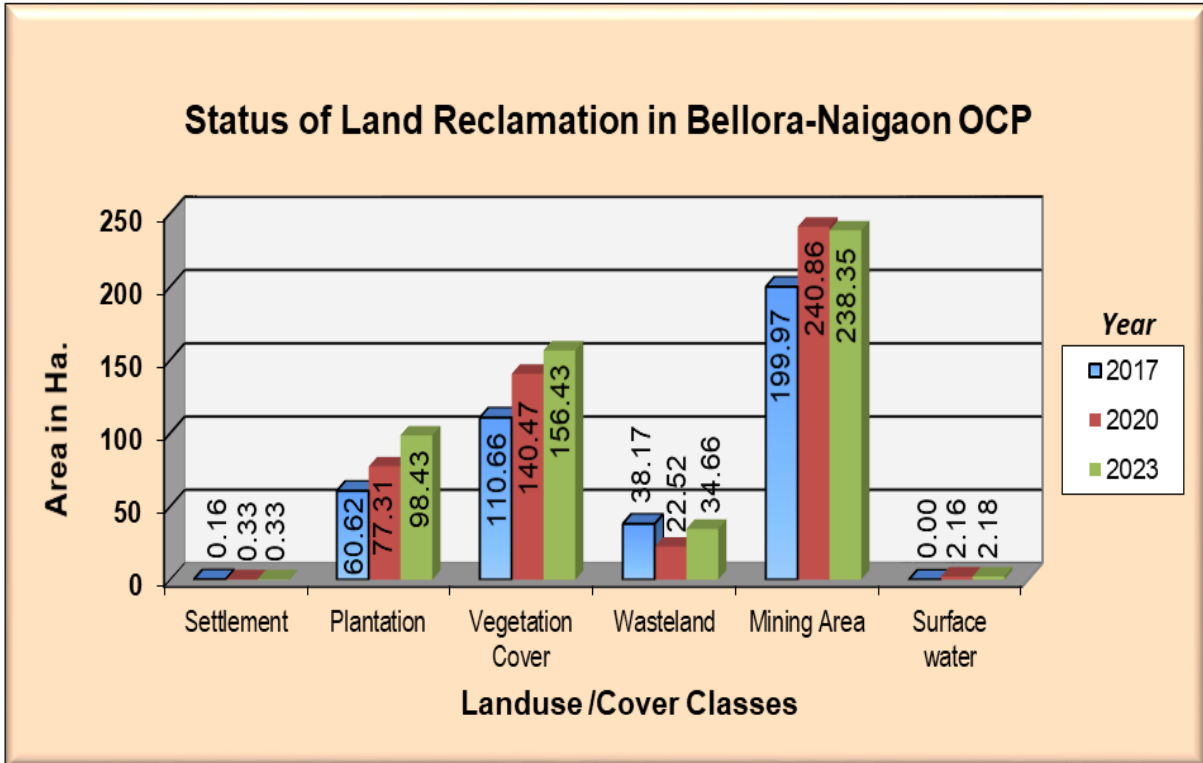


Figure- 5.3

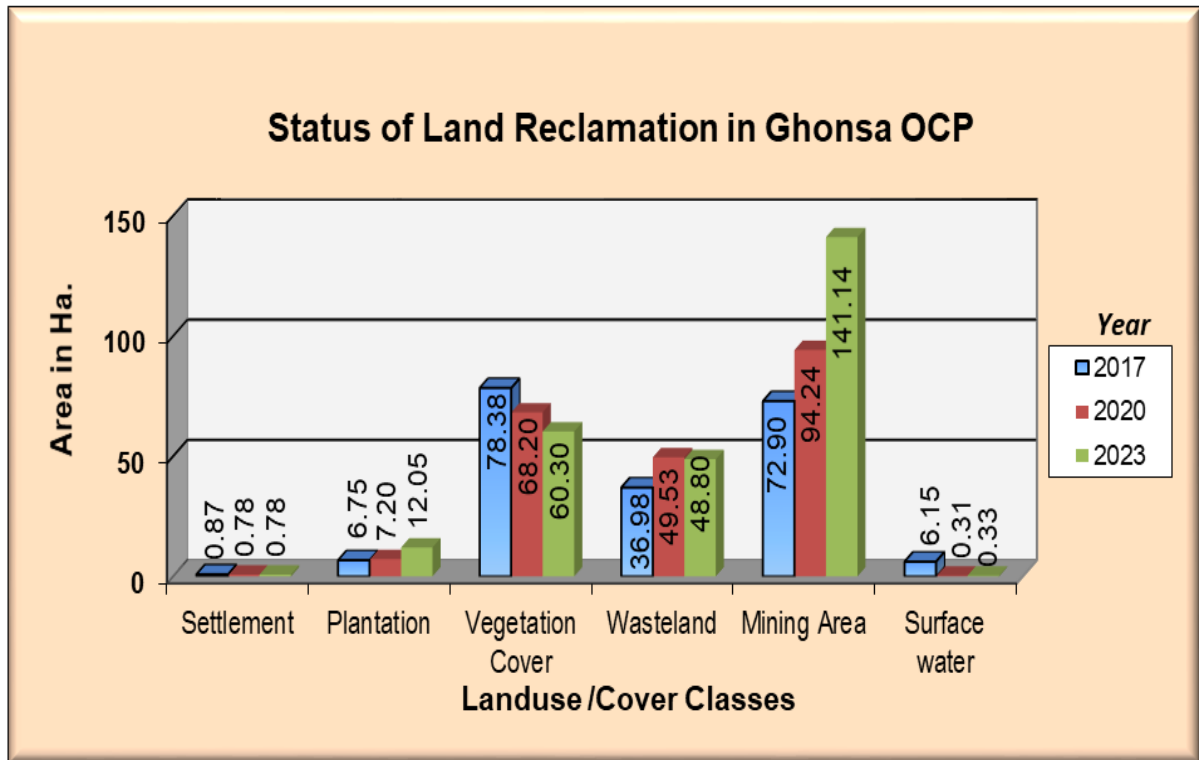


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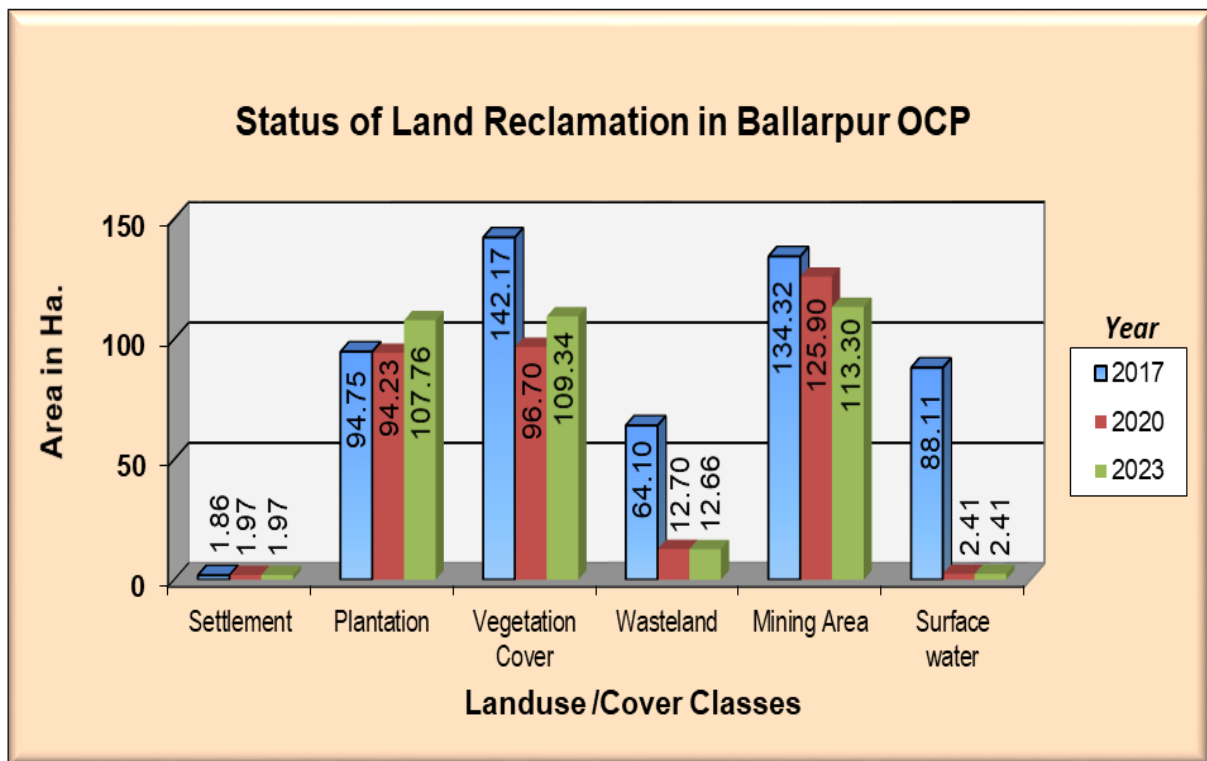


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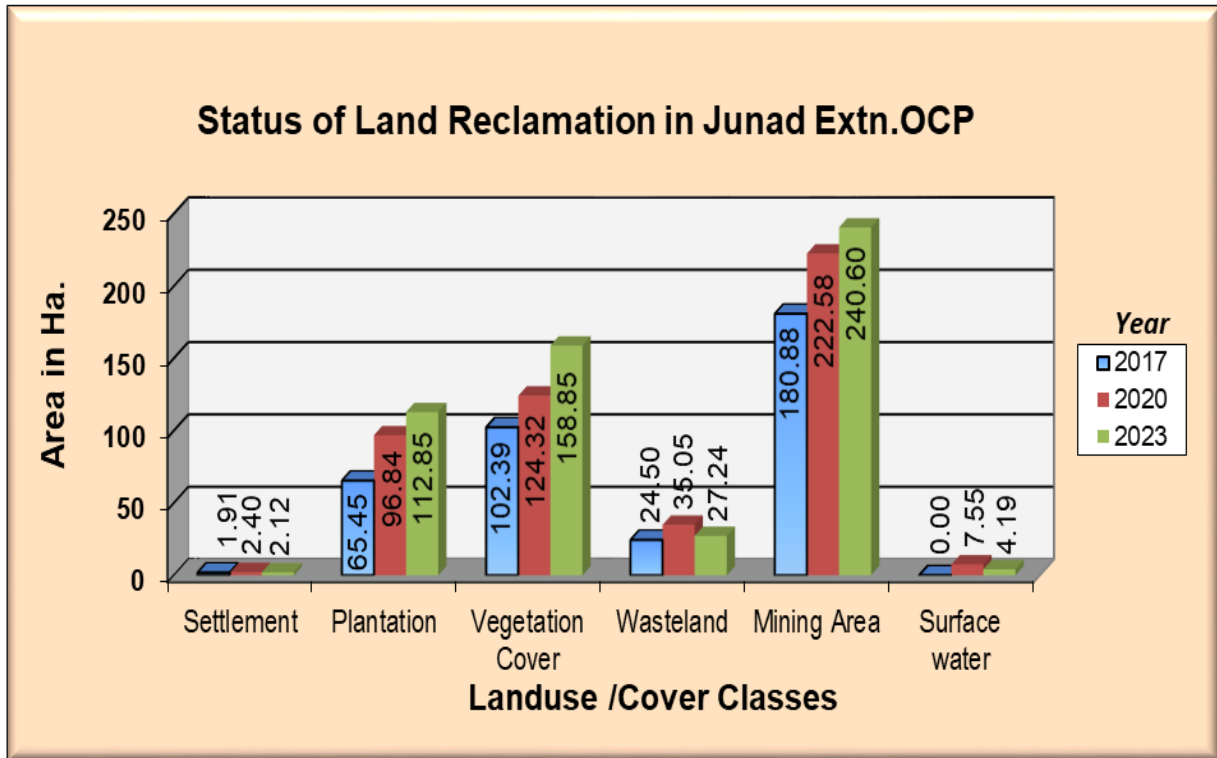


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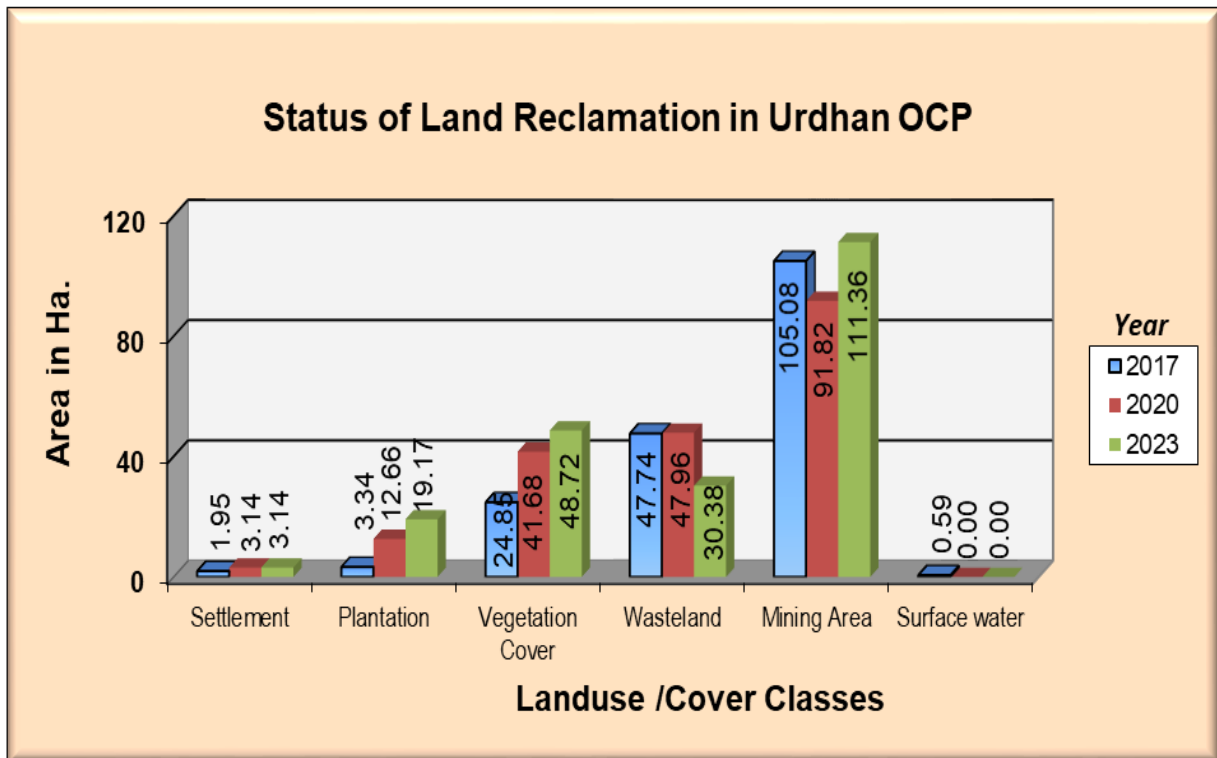


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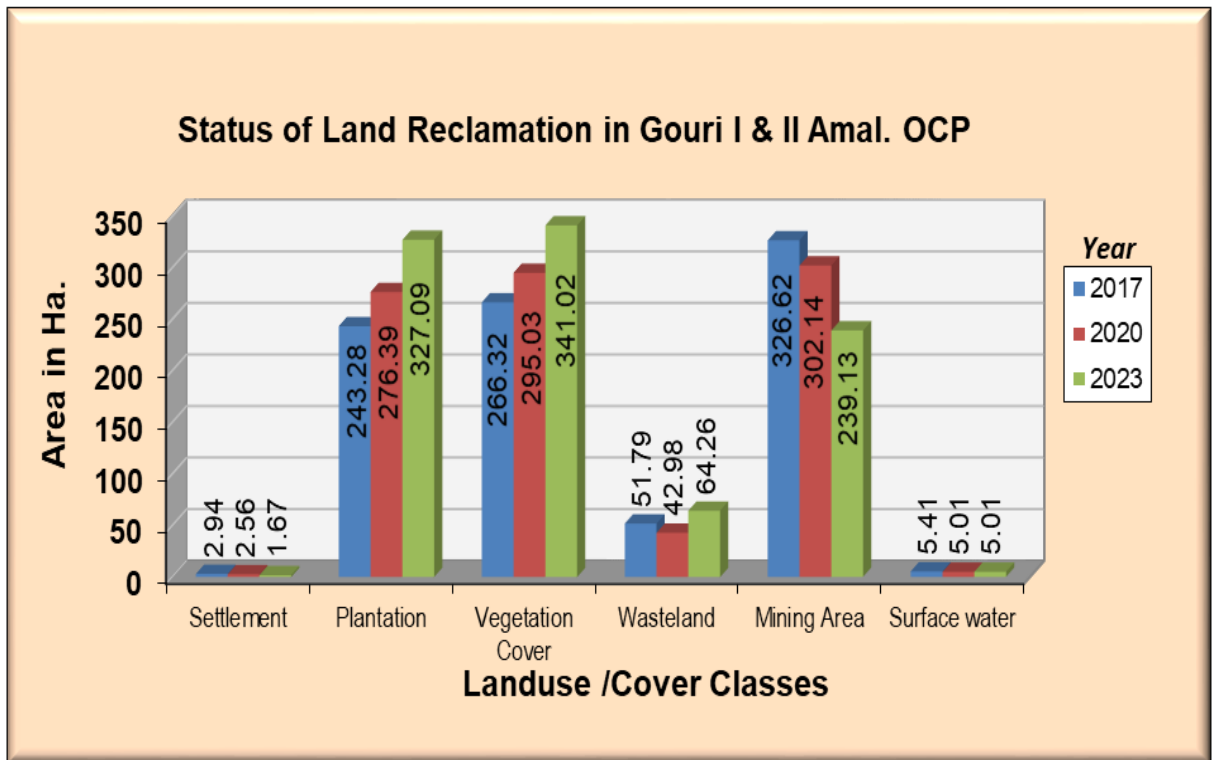


Figure- 5.8

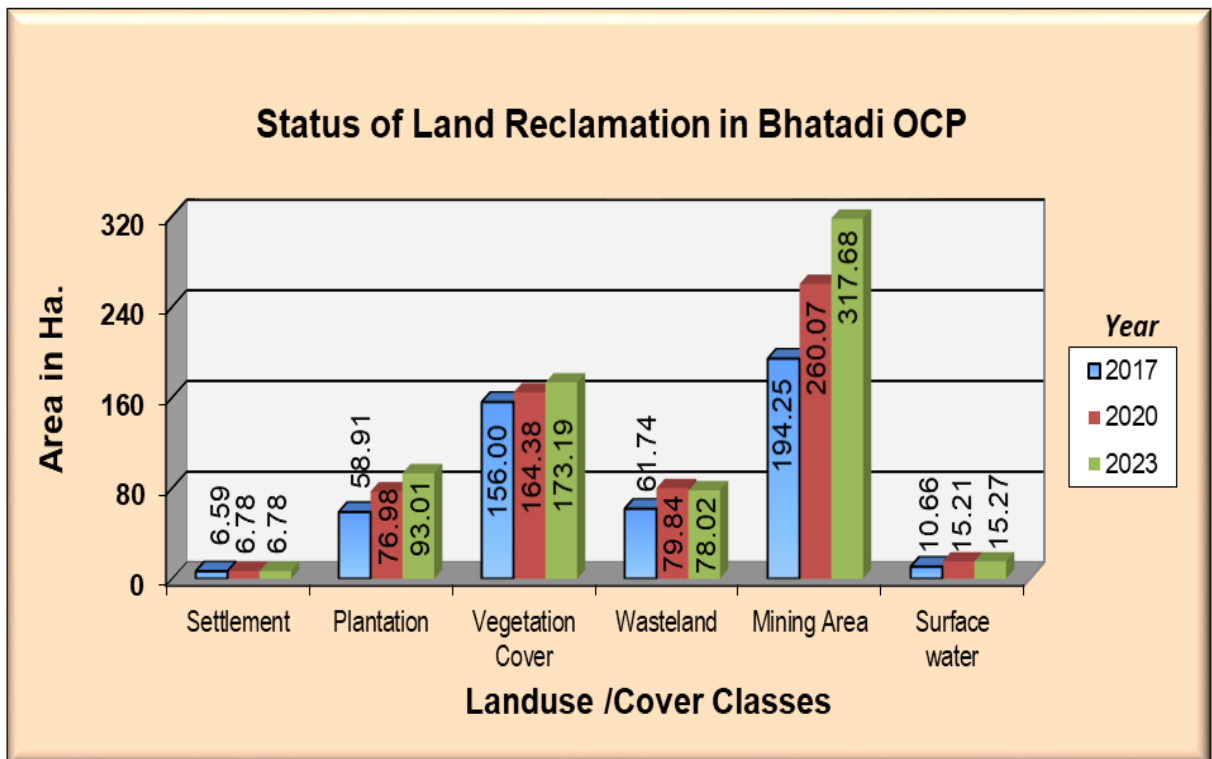


Figure- 5.9

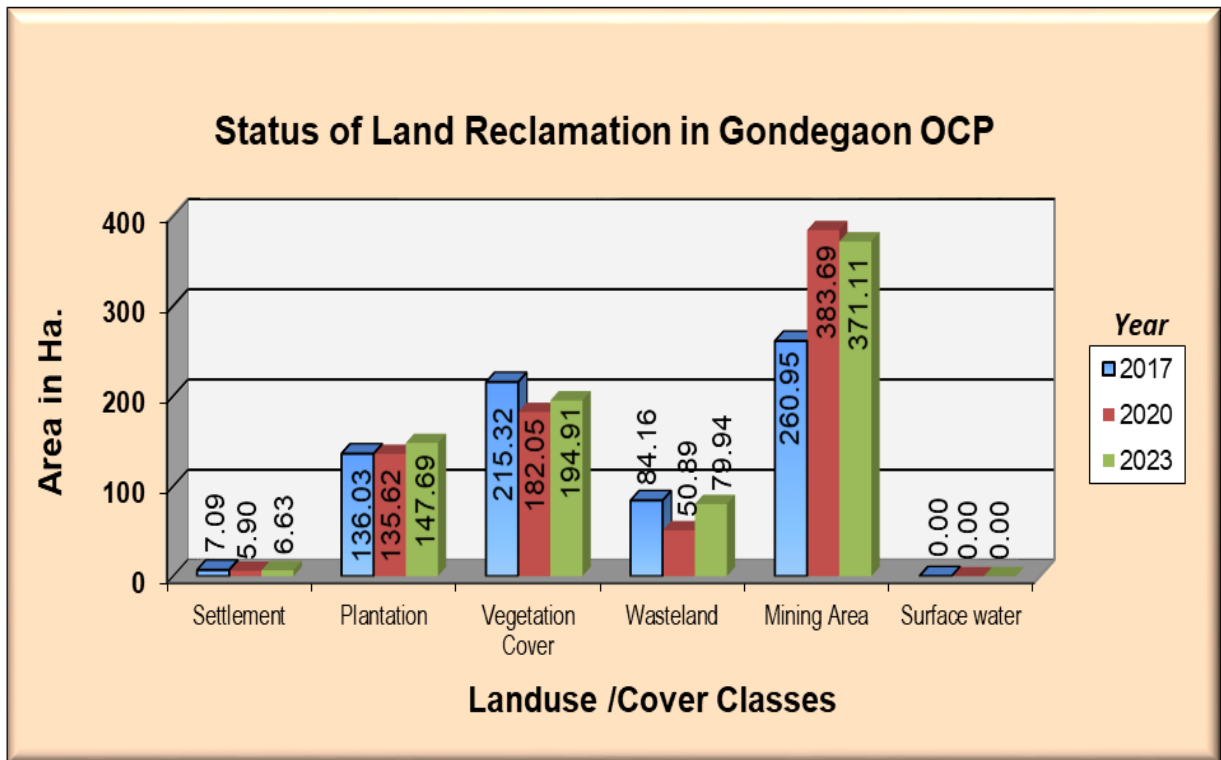


Figure- 5.10

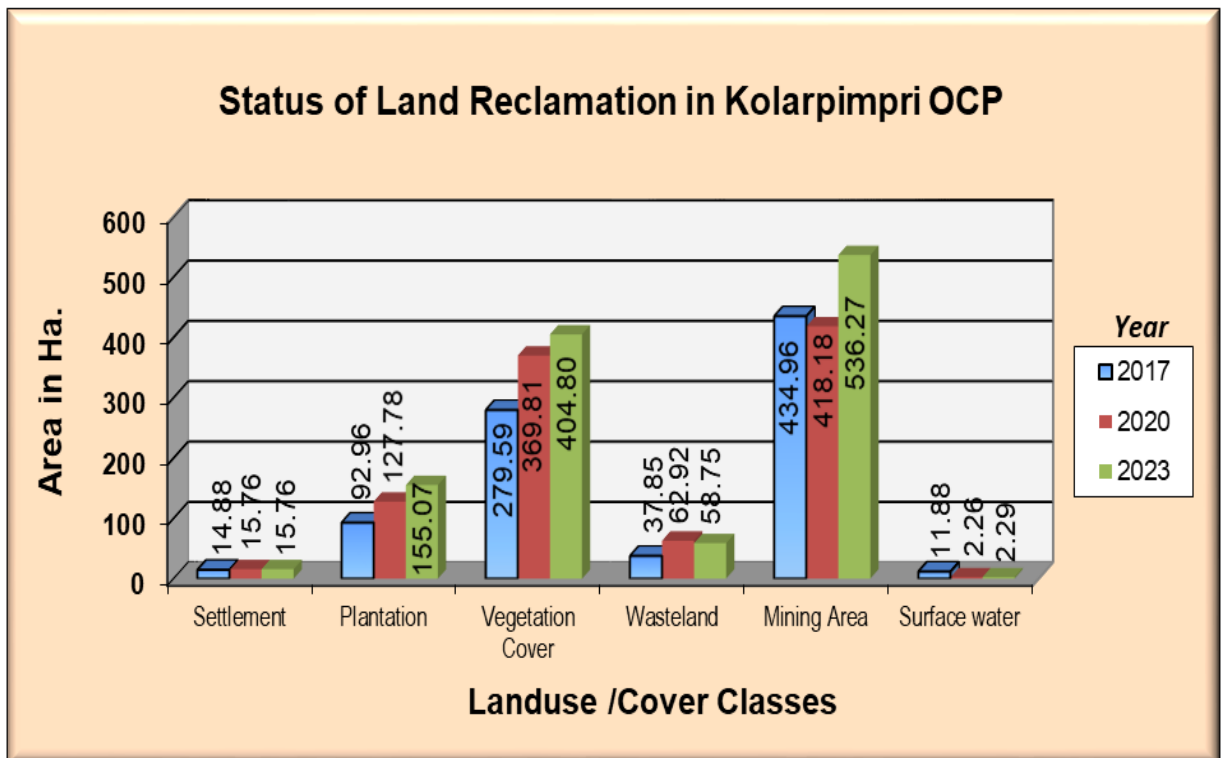


Figure- 5.11

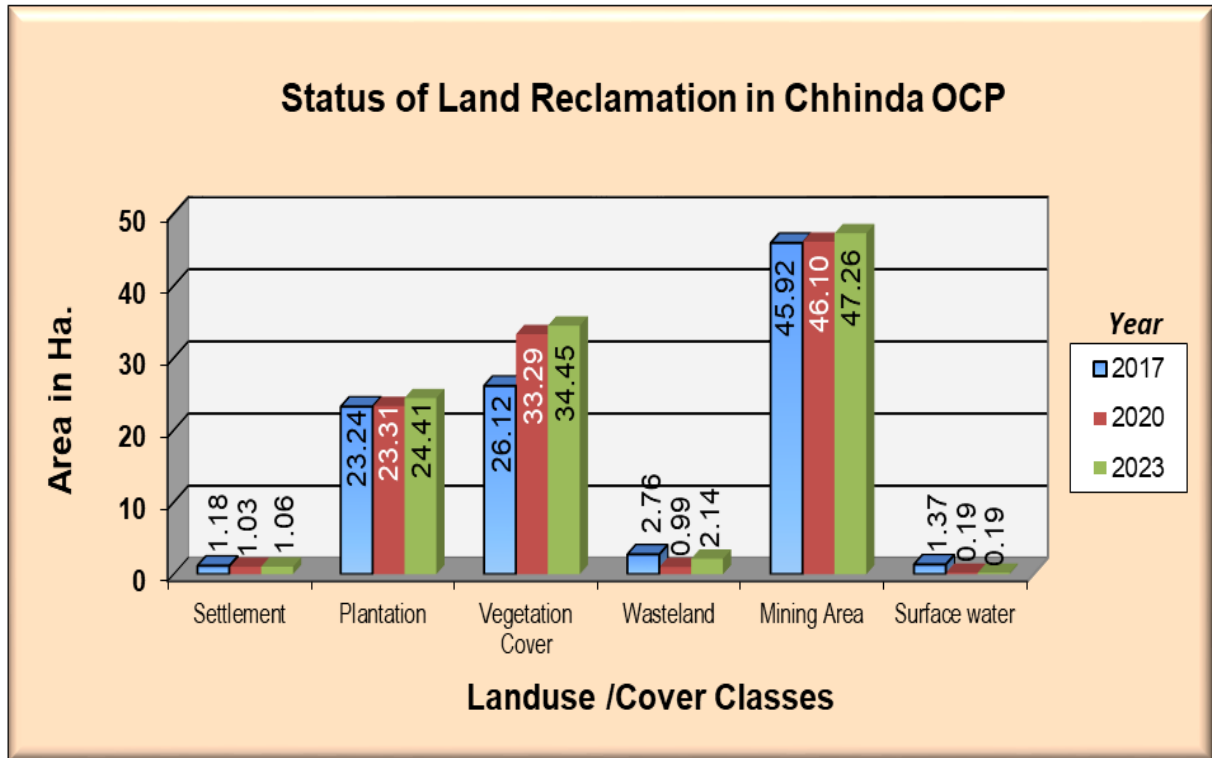


Figure- 5.12

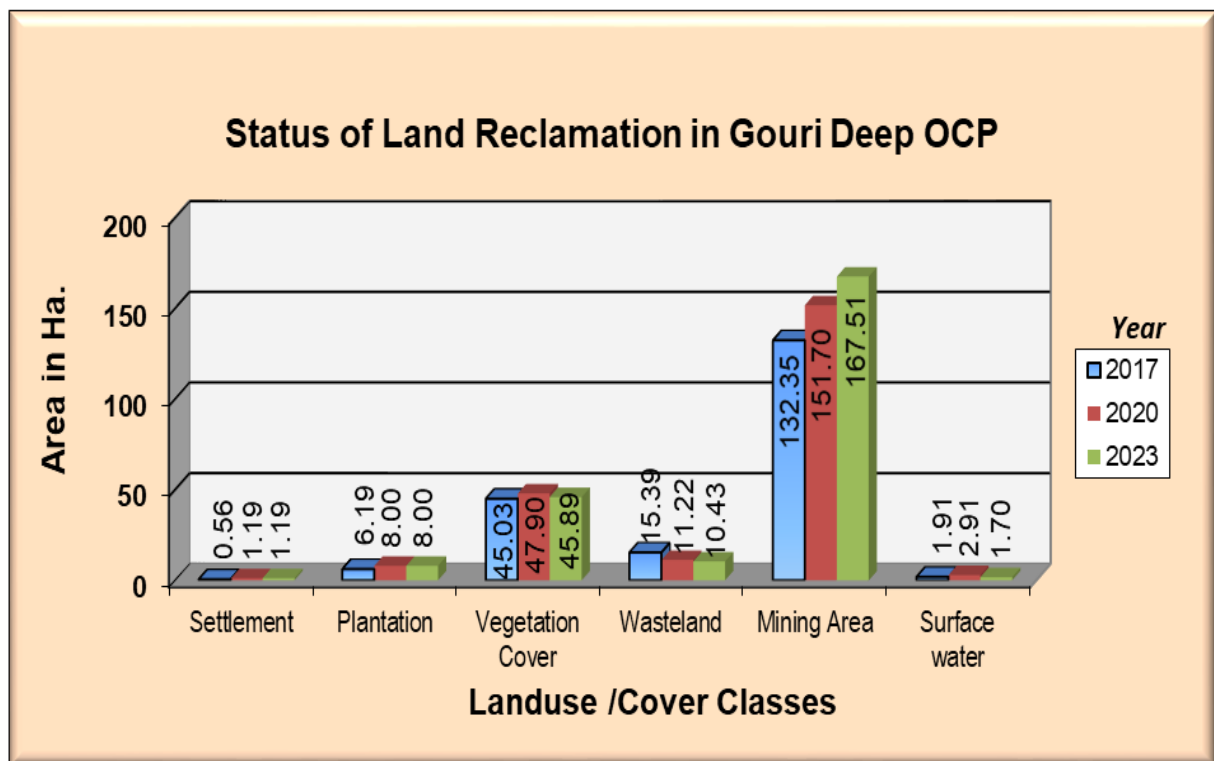


Figure- 5.13

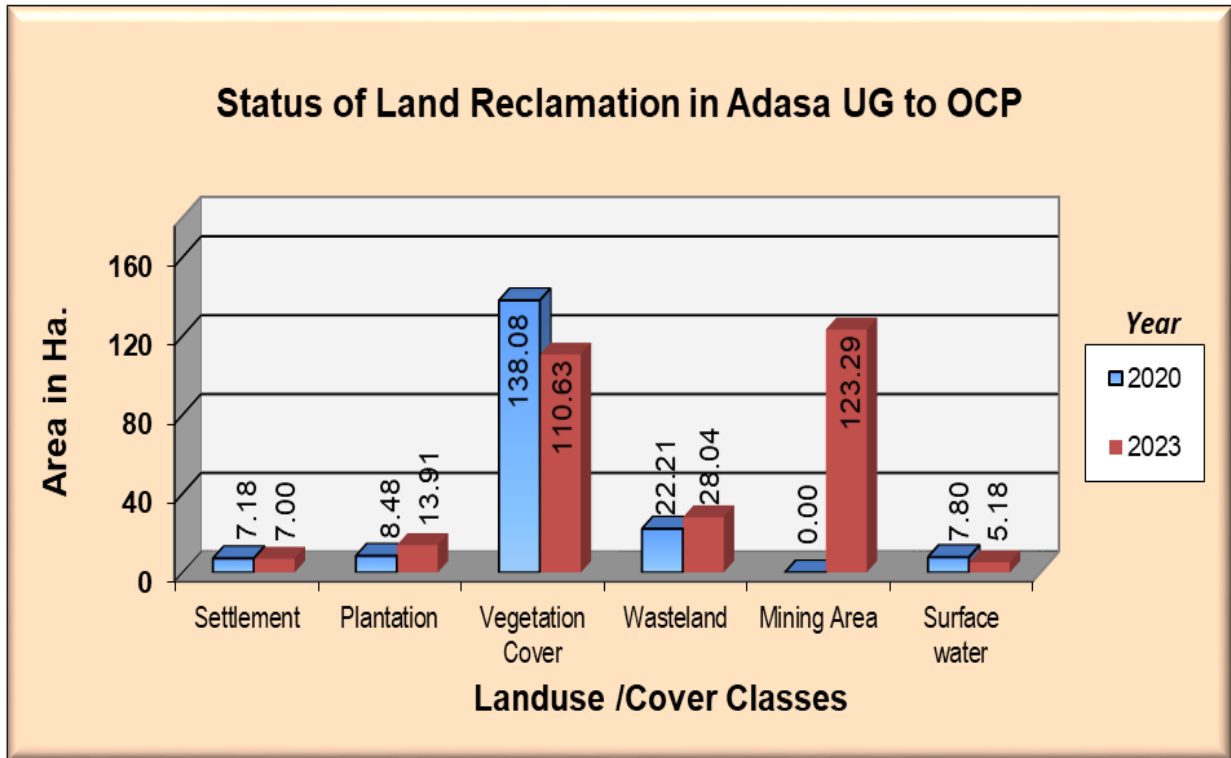


Figure- 5.14



Photo 5.1: Plantation under social forestry in Adasa UG to OC Project

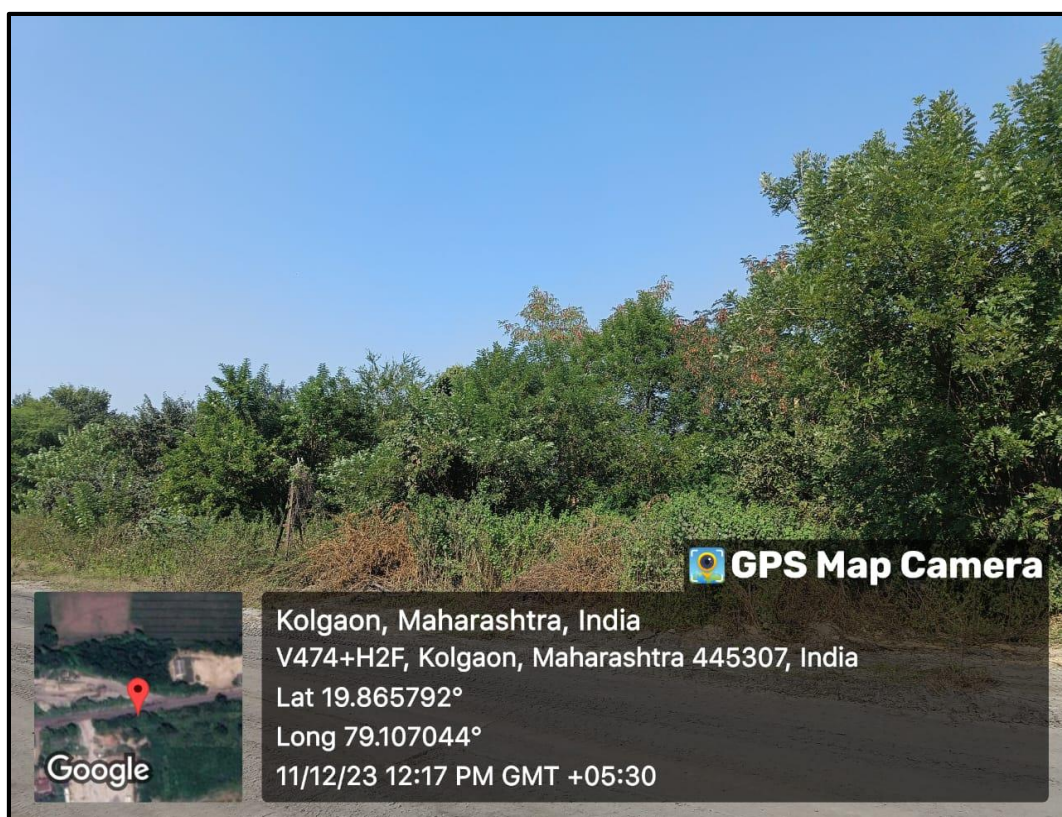


Photo 5.2: Social Forestry Plantation in Kolgaon OCP



Photo 5.3: Plantation on Barren OB in Bellora-Naigaon OCP



Photo 5.4: Plantation on Barren OBDump in Ghonsa OCP



Photo 5.5: Plantation on Barren OB Dump in Junad Extn. OCP

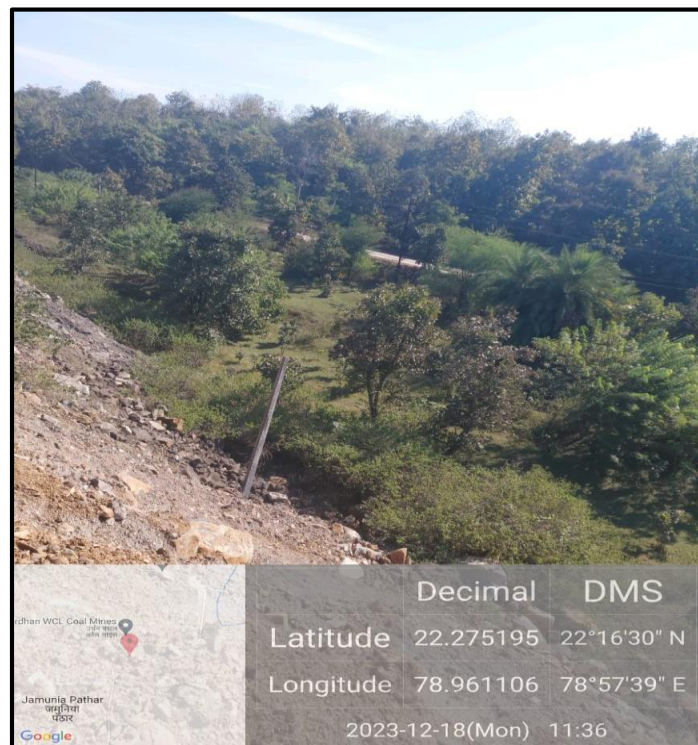


Photo 5.6: Social Forestry Plantation in Urdhan OCP



Photo 5.7: Plantation on Barren OB Dump in Bhatadi OCP



Photo 5.8: Plantation on Barren OB Dump in Gondegaon OCP

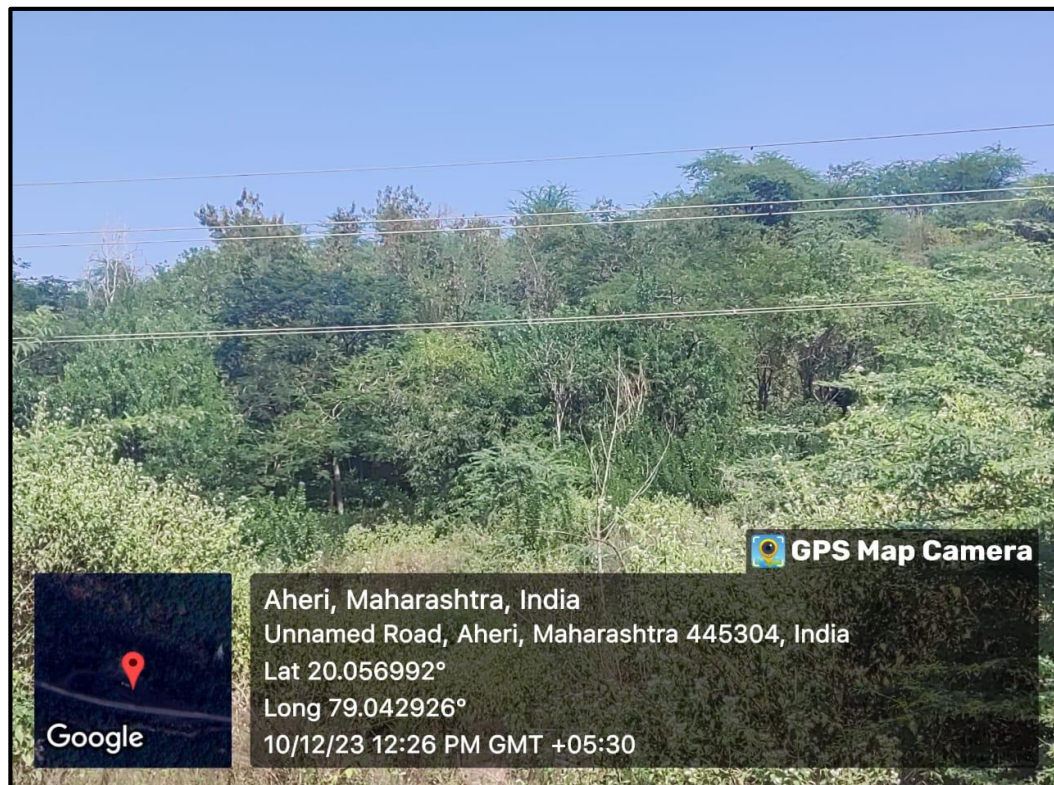


Photo 5.9: Plantation on OB in Kolarpimpri OCP



Photo 5.10: Plantation on OB in Gauri Deep OCP

SOUTH EASTERN COALFIELDS LIMITED

6.0 Land Reclamation Status in South Eastern Coalfields Limited

- 6.1** Following 03 projects (2 OC+1UG) of SECL producing less than 5 million cubic meter (Coal +OB) together, were taken up for land reclamation monitoring during the year 2023-24:
- Sharda OC
 - Kanchan OC
 - Rajgamar UG
- 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 2023 are shown in the Table - 6.2. Land use maps derived from satellite data are shown in Plate 6.1 – 6.3. Different land use classes based on satellite data are depicted in Bar Charts in Fig.6.3 – 6.5.
- 6.3** Study reveals that out of total leasehold area 5055.62 Ha, excavated area is 430.33 Ha. Total area under reclamation is 315.90 Ha (73.41% of excavated area), out of which 144.03 Ha. (33.47% of excavated area) is under technical reclamation and 171.87 Ha. (39.94% of excavated area) has been revegetated (Biologically reclaimed).
- 6.4** On comparing the status of land reclamation for the year 2023 with respect to the year 2020 in projects taken for land reclamation, it is evident that area of land reclamation has increased from 290.81 Ha (Yr. 2020) to 315.90 Ha (Yr. 2023). This increase of 25.09 Ha area in land reclamation includes both plantation on Backfill (Biological Reclamation) and area under backfilling (Technical Reclamation) which are 10.59 Ha area and 14.5 Ha area respectively.
- 6.5** After analyzing the satellite data of year 2023, it is evident that Green Cover which includes plantation carried out on backfilled area, external OB dumps as well as

- under social forestry in all the mines of SECL taken up for study has reached to 50.09 Ha area as compared to 40.92 Ha in the year 2020 within the entire leasehold area of 5055.62 Ha.
- 6.6** Leasehold area of Kanchan OC has increased from 693.99 Ha (Yr 2020) to 697.83 Ha (Yr 2023). The modification has been done as per data received from SECL
- 6.7** In Rajgamar UG, area under social forestry has increased to 46.70 Ha in the year 2023 as compared to 37.53 Ha in the year 2020, whereas area under social forestry of the remaining projects taken for land reclamation in the year 2023 has remained constant with respect to the year 2020.
- 6.8** The study also reveals that area under Technical reclamation in Kanchan and Sharda OCP shows an increasing trend. No technical reclamation has been done in Rajgamar UG as it is an underground project.
- 6.9** Out of the 3 projects of SECL, Sharda OCP ranks on top for area under reclamation (81.38%) followed by Kanchan OCP (61.77%).

Table 6.1: Project wise Land Reclamation Status in 03 Projects of SECL based on the Satellite data of the year 2023

(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, Avanne Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Sharda	871.21	871.21	62.00	72.15	124.00	135.68	34.20	34.20	3.39	3.39	63.38	47.54	249.38	255.37	161.59	173.27	186.00	207.83
				24.86%	28.25%	49.72%	53.13%					25.42%	18.62%			18.55%	19.89%	74.58%	81.38%
2	Kanchan	693.99	697.83	67.53	71.88	37.28	36.19	0.00	0.00	0.00	0.00	43.45	66.89	148.26	174.96	37.28	36.19	104.81	108.07
				45.55%	41.08%	25.15%	20.68%					29.31%	38.23%			5.34%	5.19%	70.69%	61.77%
3	Rajgamar UG	3486.58	3486.58	0.00	0.00	0.00	0.00	0.00	0.00	37.53	46.70	0.00	0.00	0.00	0.00	37.53	46.70	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			1.08%	1.34%	0.00%	0.00%
	TOTAL	5051.78	5055.62	129.53	144.03	161.28	171.87	34.20	34.20	40.92	50.09	106.83	114.43	397.64	430.33	236.40	256.16	290.81	315.90
				32.57%	33.47%	40.56%	39.94%					26.87%	26.59%			4.68%	5.07%	73.13%	73.41%

Note: In reference to above table different parameters as 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 Backfill 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 above Table.
5. (%) calculated in above Table is in respect to Total Excavated area except for "Total Area under plantation" where % is in terms of "Leasehold Area".

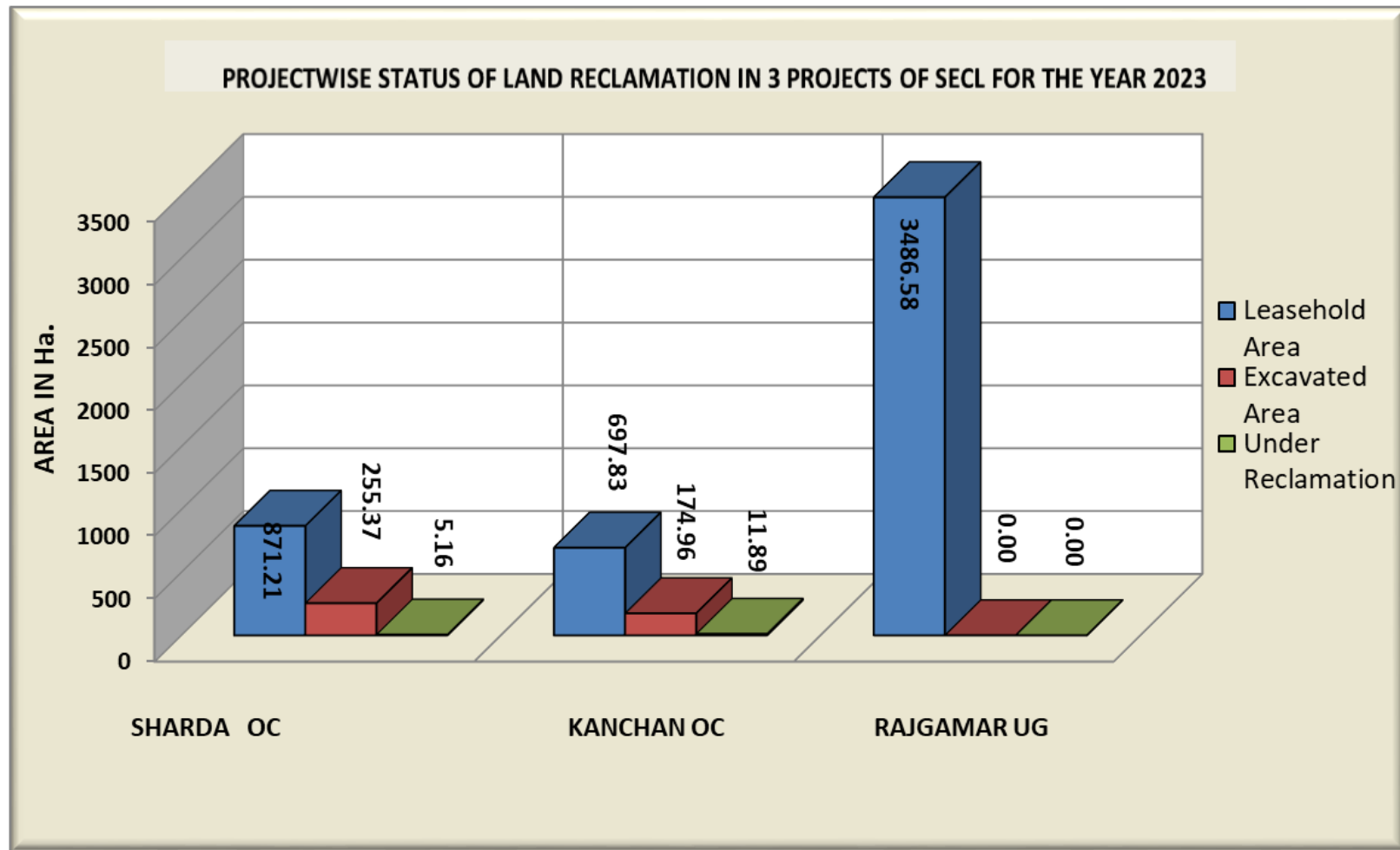
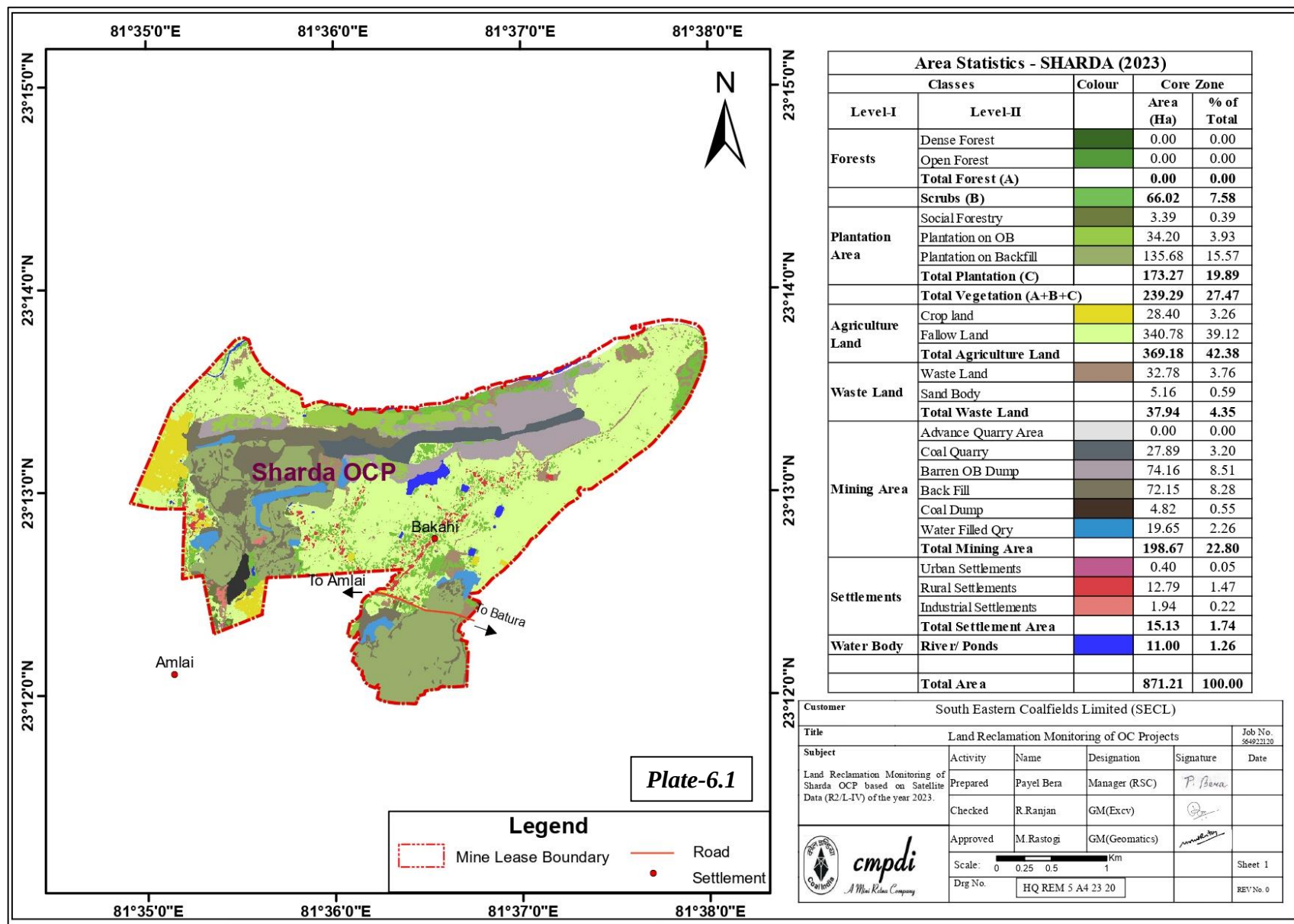
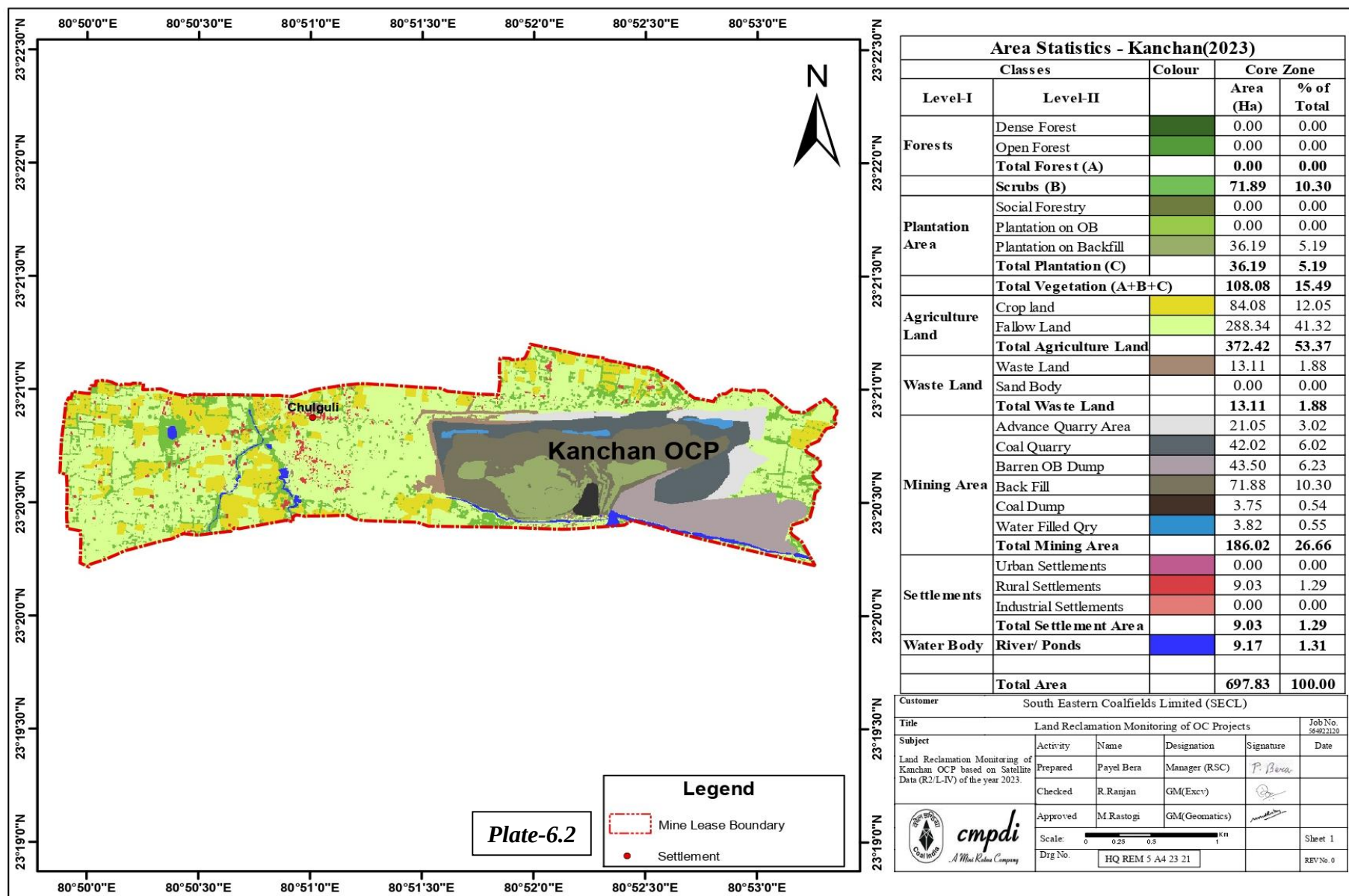


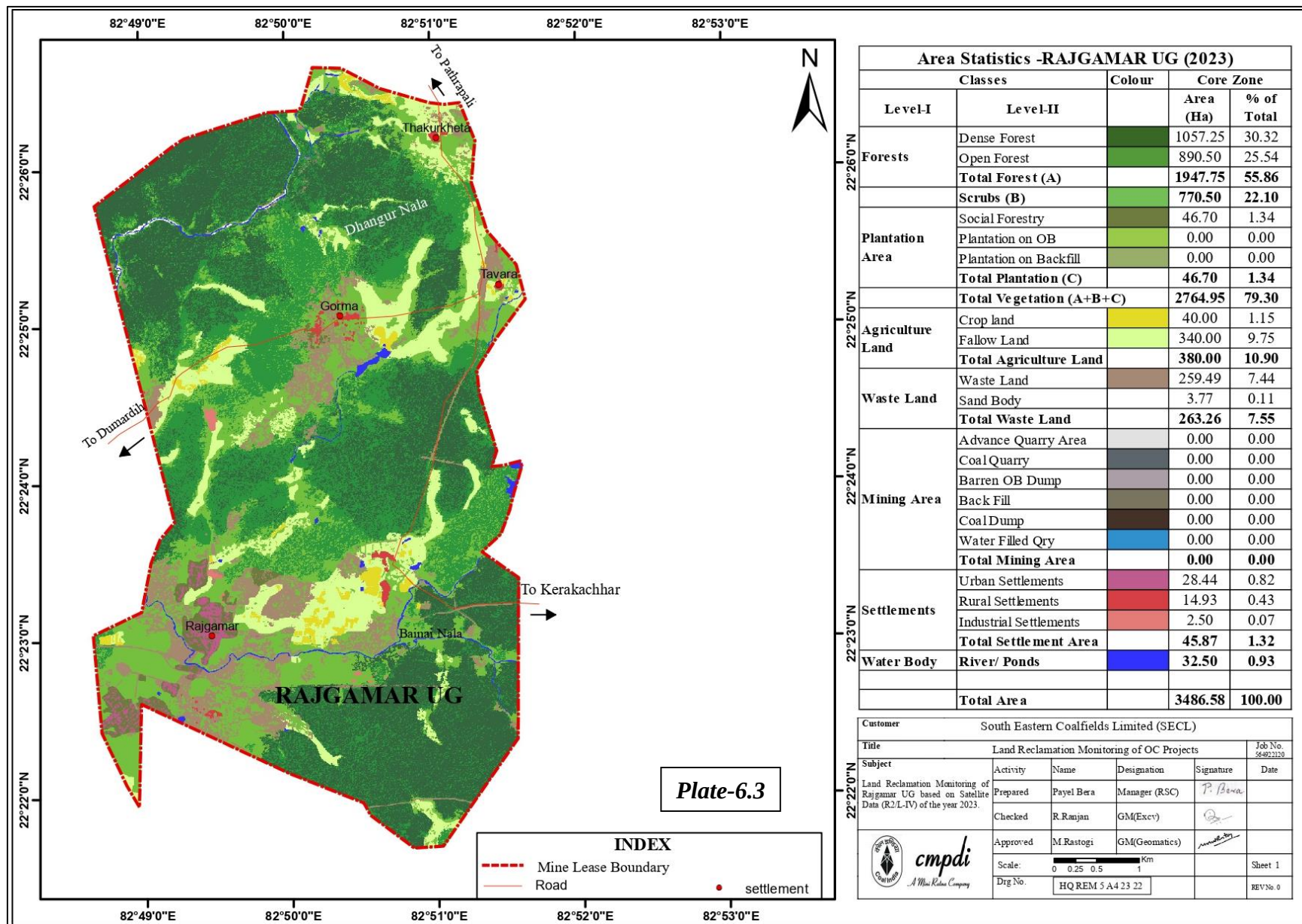
Figure 6.1: Land Reclamation status in 03 projects producing less than 5 mcm (Coal+ OB) of SECL in the year-2023

Table 6.2: Status of Land Reclamation in South Eastern Coalfields Ltd. based on Satellite Data of the Year 2023

		SHARDA		KANCHAN		RAJGAMAR UG		TOTAL	
		Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest	0.00	0.00	0.00	0.00	1057.25	30.32	1057.25	20.91
	Open Forest	0.00	0.00	0.00	0.00	890.50	25.54	890.50	17.61
	Total Forest	0.00	0.00	0.00	0.00	1947.75	55.86	1947.75	38.53
SCRUBS	Scrubs	66.02	7.58	71.89	10.30	770.50	22.10	908.41	17.97
PLANTATION	Social Forestry/Avenue Plantation	3.39	0.39	0.00	0.00	46.70	1.34	50.09	0.99
	Plantation on OB Dump	34.20	3.93	0.00	0.00	0.00	0.00	34.20	0.68
	Plantation on Backfill (Biological Reclamation)	135.68	15.57	36.19	5.19	0.00	0.00	171.87	3.40
	Total Plantation(Green Cover)	173.27	19.89	36.19	5.19	46.70	1.34	256.16	5.07
	Total Vegetation	239.29	27.47	108.08	15.49	2764.95	79.30	3112.32	61.57
ACTIVE MINING	Coal Dump	4.82	0.55	3.75	0.54	0.00	0.00	8.57	0.17
	Coal Quarry	27.89	3.20	42.02	6.02	0.00	0.00	69.91	1.38
	Advance Quarry Site	0.00	0.00	21.05	3.02	0.00	0.00	21.05	0.42
	Quarry Filled With Water	19.65	2.26	3.82	0.55	0.00	0.00	23.47	0.46
	Total Area under Active Mining	47.54	5.46	66.89	9.59	0.00	0.00	114.43	2.26
	Barren OB Dump	74.16	8.51	43.50	6.23	0.00	0.00	117.66	2.33
RECLAIMED	Area Under Backfilling (Technical Reclamation)	72.15	8.28	71.88	10.30	0.00	0.00	144.03	2.85
	Total Area under Technical Reclamation	72.15	8.28	71.88	10.30	0.00	0.00	144.03	2.85
	Total Area under Mine Operation	198.67	22.80	186.02	26.66	0.00	0.00	384.69	7.61
WASTELAND	Waste Lands	32.78	3.76	13.11	1.88	259.49	7.44	305.38	6.04
	Fly Ash Pond / Sand Body	5.16	0.59	0.00	0.00	3.77	0.11	8.93	0.18
	Total Wasteland	37.94	4.35	13.11	1.88	263.26	7.55	314.31	6.22
WATERBODIES	Reservoir, nallah, ponds	11.00	1.26	9.17	1.31	32.50	0.93	52.67	1.04
	Total Waterbodies	11.00	1.26	9.17	1.31	32.50	0.93	52.67	1.04
AGRICULTURE	Crop Lands	28.40	3.26	84.08	12.05	40.00	1.15	152.48	3.02
	Fallow Lands	340.78	39.12	288.34	41.32	340.00	9.75	969.12	19.17
	Total Agriculture	369.18	42.38	372.42	53.37	380.00	10.90	1121.60	22.19
SETTLEMENTS	Urban Settlement	0.40	0.05	0.00	0.00	28.44	0.82	28.84	0.57
	Rural Settlement	12.79	1.47	9.03	1.29	14.93	0.43	36.75	0.73
	Industrial Settlement	1.94	0.22	0.00	0.00	2.50	0.07	4.44	0.09
	Total Settlement	15.13	1.74	9.03	1.29	45.87	1.32	70.03	1.39
	Grand Total	871.21	100.00	697.83	100.00	3486.58	100.00	5055.62	100.00







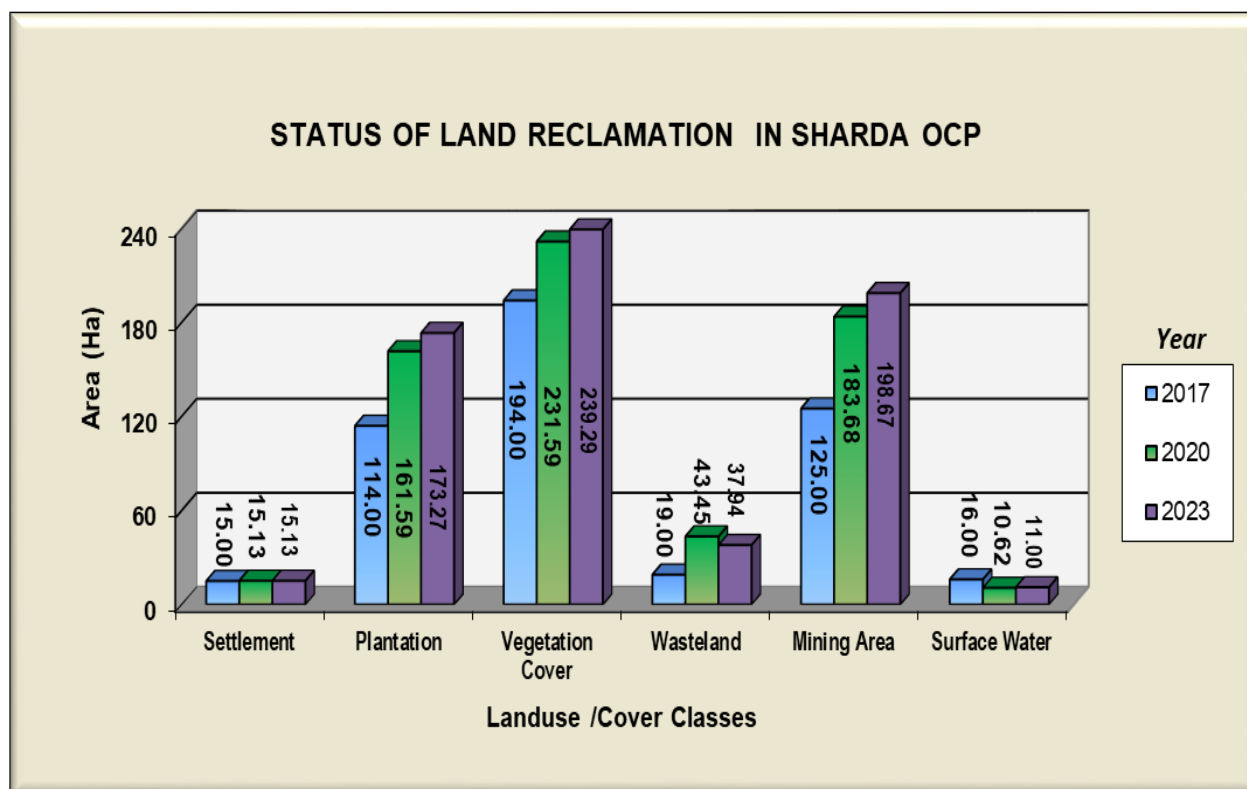


Figure- 6.2

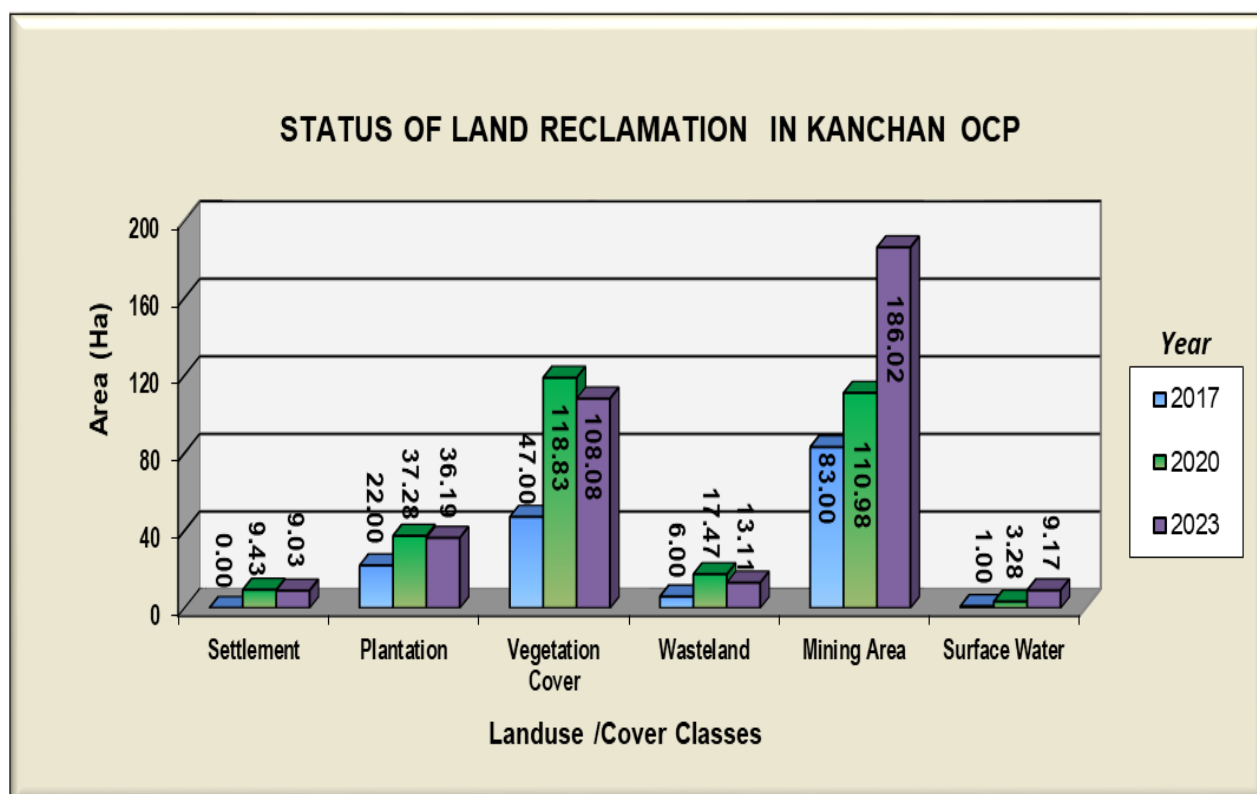


Figure- 6.3

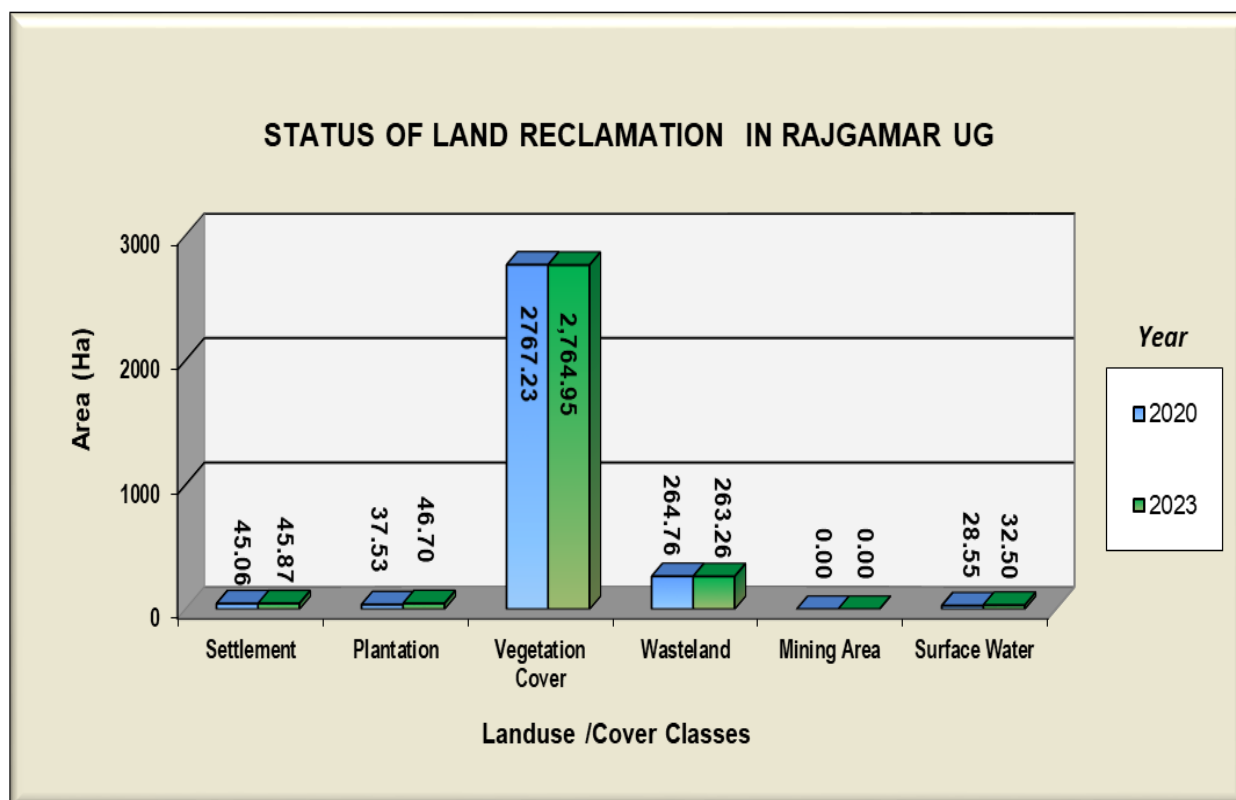
**Figure- 6.4**



Photo 6.1: Plantation in Sharda OCP



Photo 6.2: Plantation on Backfill in Sharda OCP

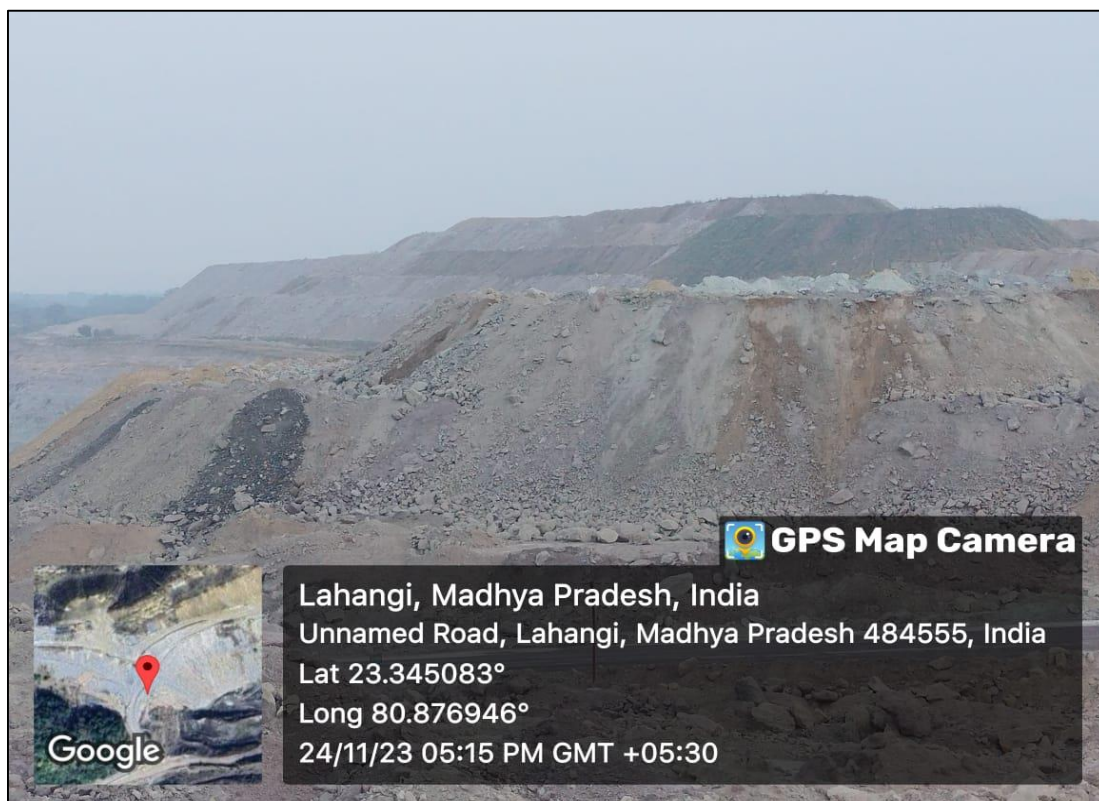


Photo 6.3: Backfill in Kanchan OCP

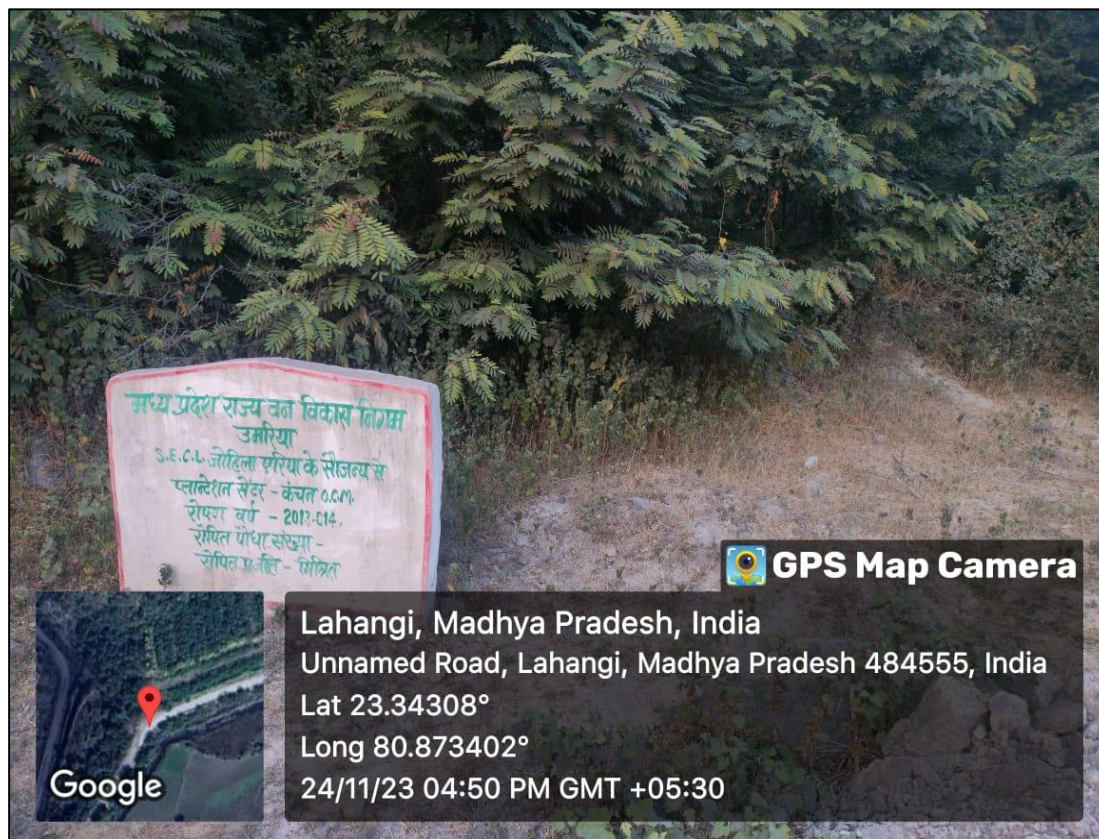


Photo 6.4: Plantation on Backfill in Kanchan OCP

CENTRAL COALFIELDS LIMITED

7.0 Land Reclamation Status in Central Coalfields Limited

7.1 Following 07 OC Projects of CCL producing less than 5 million m³ (Coal +OB) annually were taken up for Land Reclamation monitoring based on satellite data of the year 2023.

- Amlo
- Tarmi
- Urimari
- Govindpur
- Topa
- Jharkhand
- New Giddi-C

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 classes present in the mine leasehold of the above projects for the year 2023 are shown in Table 7.2. Land use maps derived from the satellite data are shown in Plate 7.1 – 7.7. Different land use classes based on satellite data are depicted in bar charts in Fig. 7.2 – 7.8.

7.3 The total leasehold area for the assessment year 2023 is 1773.15 ha with respect to 3611.15 ha in year 2020. This is due to modification in EC boundaries in 4 mines namely Tarmi, Urimari, Topa and Jharkhand OCP.

7.4 Study reveals that out of total mine leasehold area of 1773.15 ha of the 7 OC projects of CCL mentioned above taken for this study in 2023-24; total excavated area is 1118.78 hectare, out of which 88.40 ha area (7.90%) has been planted (*Biologically Reclaimed*), 276.67 ha area (24.73%) is under backfilling (*Technically Reclaimed*) and balance 753.71 hectare (67.37%) is under active mining.

7.5 Area under backfilling (*Technically Reclaimed*) in Tarmi OC is 34.11 ha, Urimari OC is 34.11 ha, Topa OC is 10.62 ha and in Jharkhand OC it is 61.14 ha. It has been also observed that for projects Amlo, Govindpur and New Giddi-C,

area under technical reclamation has gone down in 2023 as compared to the year 2020 as some reclaimed area have been re-handled.

- 7.6** In Amlo opencast project, there is increase of 0.65 ha area under plantation on Backfill (*Biologically Reclaimed*). Tarmi OC accounted 5.46 ha, Urimari OC is at 48.84 ha, Topa OC is at 2.53 ha and Jharkhand OC is having 34.90 ha of area under Biologically reclaimed area. There is decrease of 4.92 ha and 10.34 ha areas under plantation on backfill respectively in Govindpur and New Giddi-C OC which is due to increase in mining activities.
- 7.7** Green Cover generation within the leasehold is combination of plantation done on excavated or backfilled area, on external over burden dumps, social forestry or avenue plantations etc. Every opencast mine taken up for assessment have taken steps to increase the percentage of *Green Cover* generation within their leasehold. 166.14 ha area of green cover has been generated which is 9.37% of total leasehold area of 7 mines.
- 7.8** The total excavated area is 1118.78 ha for the 7 mines assessed in year 2023.
- 7.9** The increase in mining activity to meet the production target has evidently been seen on the area under active mining. It accounts 67.37% of total excavated area.
- 7.10** Out of 7 projects of CCL taken for this study, Urimari OC mine ranks on top for land reclamation (46.98%) followed by Jharkhand OC mine (41.33%) and Govindpur Open Cast mine (34.39%).

Table 7.1: Project wise Land Reclamation Status in Opencast Projects of CCL based on the Satellite data of the year 2023
(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)	
		2020	2023*	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Amlo	247.59	247.59	39.51	31.01	14.58	15.23	15.27	18.02	1.53	2.00	39.62	120.38	93.71	166.62	31.38	35.25	54.09	46.24
				42.16%	18.61%	15.56%	9.14%					42.28%	72.25%			12.67%	14.24%	57.72%	27.75%
2	Tarmi	590.00	258.70	23.06	34.11	11.85	5.46	12.62	8.51	0.46	0.46	25.11	75.85	60.02	115.42	24.93	14.43	34.91	39.57
				38.42%	29.55%	19.74%	4.73%					41.84%	65.72%			4.23%	5.58%	58.16%	34.28%
3	Urimari	1443.50	243.09	91.58	73.61	48.80	17.62	0.06	0.00	42.67	0.88	63.74	102.97	204.12	194.20	91.53	18.50	140.38	91.23
				44.87%	37.90%	23.91%	9.07%					31.23%	53.02%			6.34%	7.61%	68.77%	46.98%
4	Govindpur	274.95	274.95	66.56	58.79	17.50	12.58	2.03	1.46	0.22	0.00	60.02	136.18	144.08	207.55	19.75	14.04	84.06	71.37
				46.20%	28.33%	12.15%	6.06%					41.66%	65.61%			7.18%	5.11%	58.34%	34.39%
5	Topa	520.91	276.66	20.89	10.62	3.75	2.53	43.81	5.89	14.22	12.72	55.71	108.72	80.35	121.87	61.78	21.14	24.64	13.15
				26.00%	8.71%	4.67%	2.08%					69.33%	89.21%			11.86%	7.64%	30.67%	10.79%
6	Jharkhand	323.88	261.84	91.21	61.14	38.25	34.98	0.33	0.32	2.48	0.96	48.93	136.45	178.39	232.57	41.06	36.26	129.46	96.12
				51.13%	26.29%	21.44%	15.04%					27.43%	58.67%			12.68%	13.85%	72.57%	41.33%
7	New Giddi-C	210.32	210.32	31.22	7.39	10.34	0.00	3.02	19.96	5.83	6.56	26.78	73.16	68.34	80.55	19.19	26.52	41.56	7.39
				45.68%	9.17%	15.13%	0.00%					39.19%	90.83%			9.12%	12.61%	60.81%	9.17%
TOTAL		3611.15	1773.15	364.03	276.67	145.07	88.40	77.14	54.16	67.41	23.58	319.91	753.71	829.01	1118.78	289.62	166.14	509.10	365.07
				43.91%	24.73%	17.50%	7.90%					38.59%	67.37%			16.33%	9.37%	61.41%	32.63%

Note: In reference to above table different parameters as 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 Backfill 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 above Table.
5. (%) calculated in above Table is in respect to Total Excavated area except for " Total Area under plantation " where % is in terms of "Leasehold Area " .
6. Tarmi, Urimari, Topa and Jharkhand OCP's leasehold boundaries have changed due to EC boundary modifications.

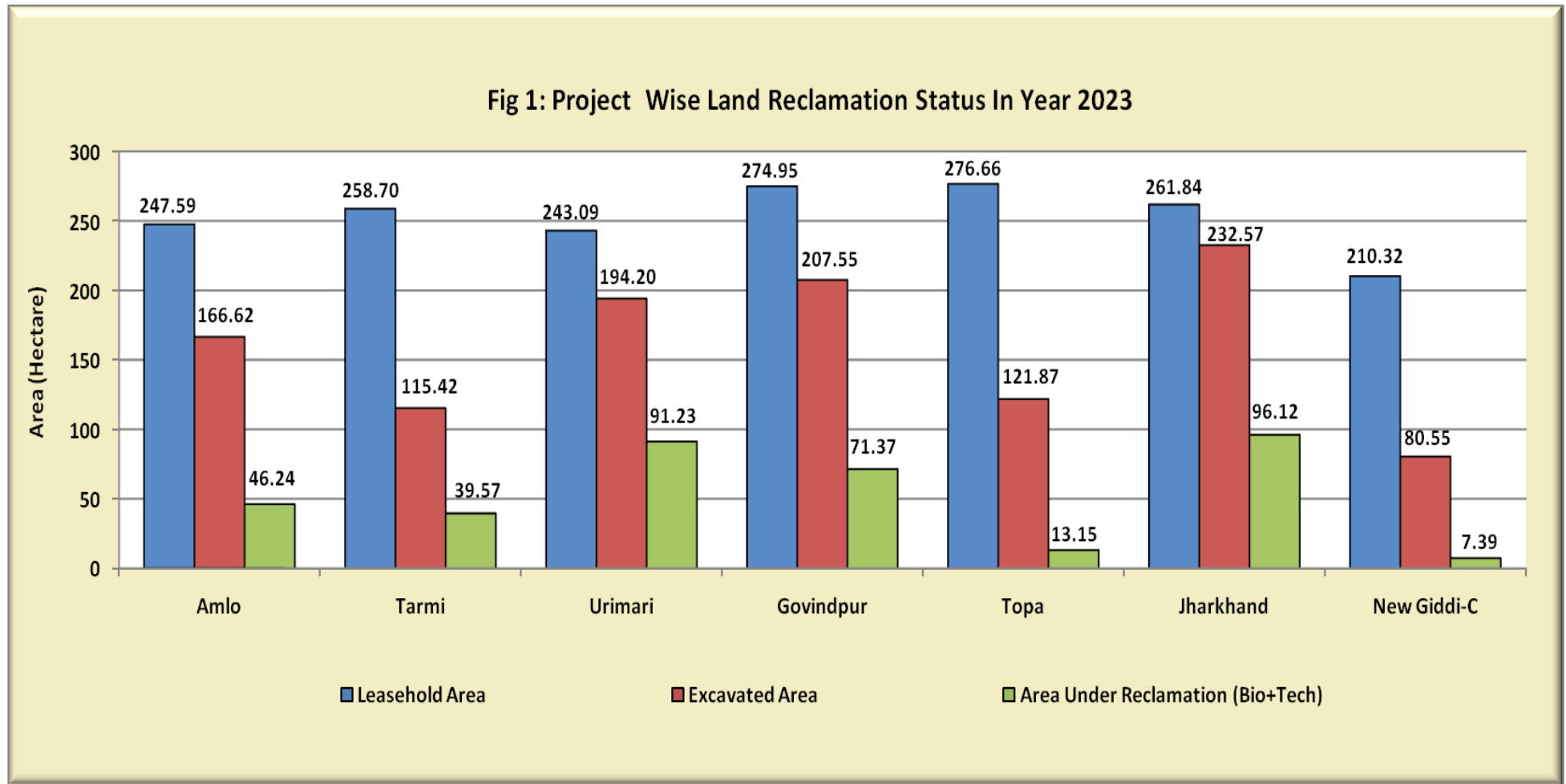
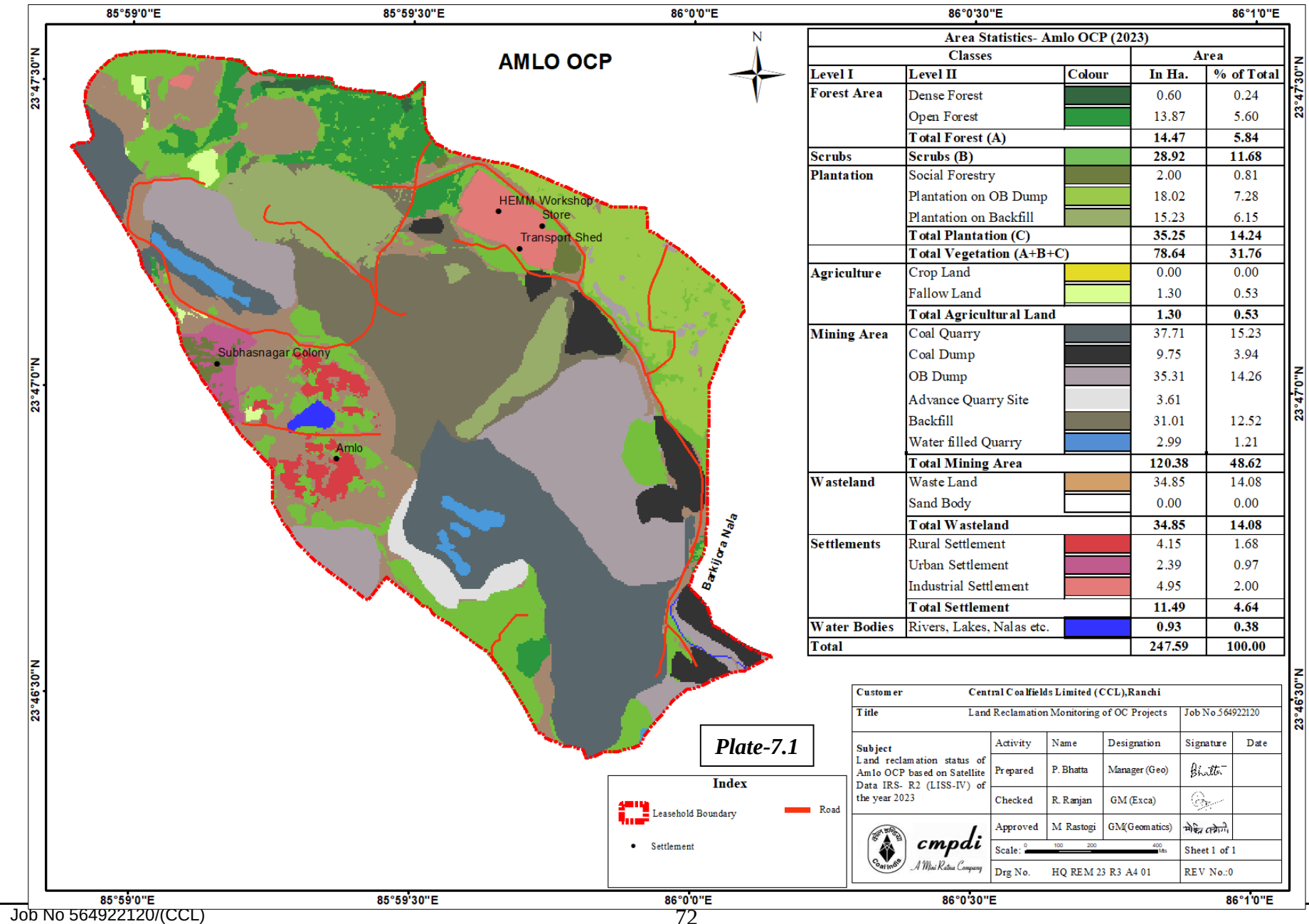
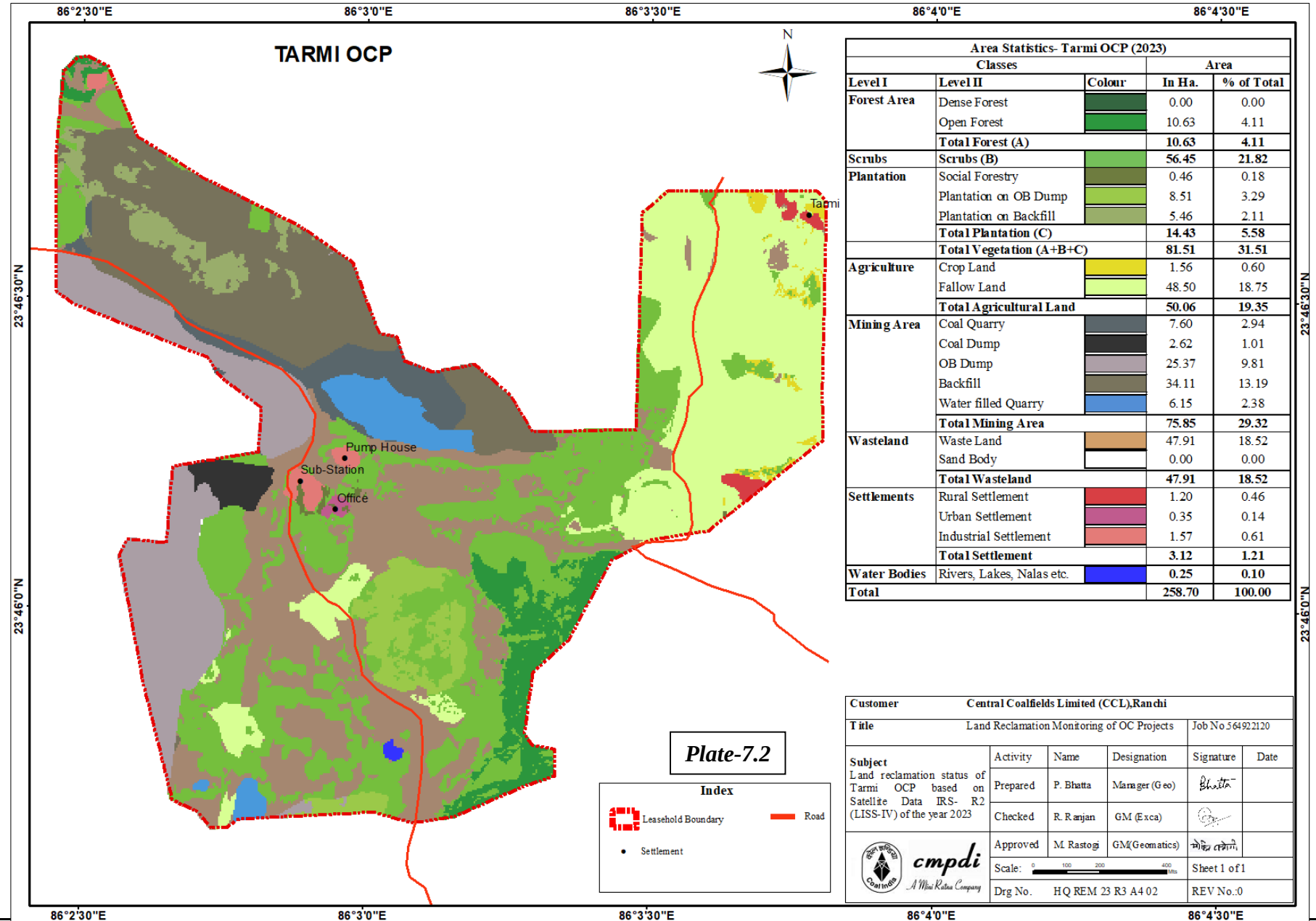


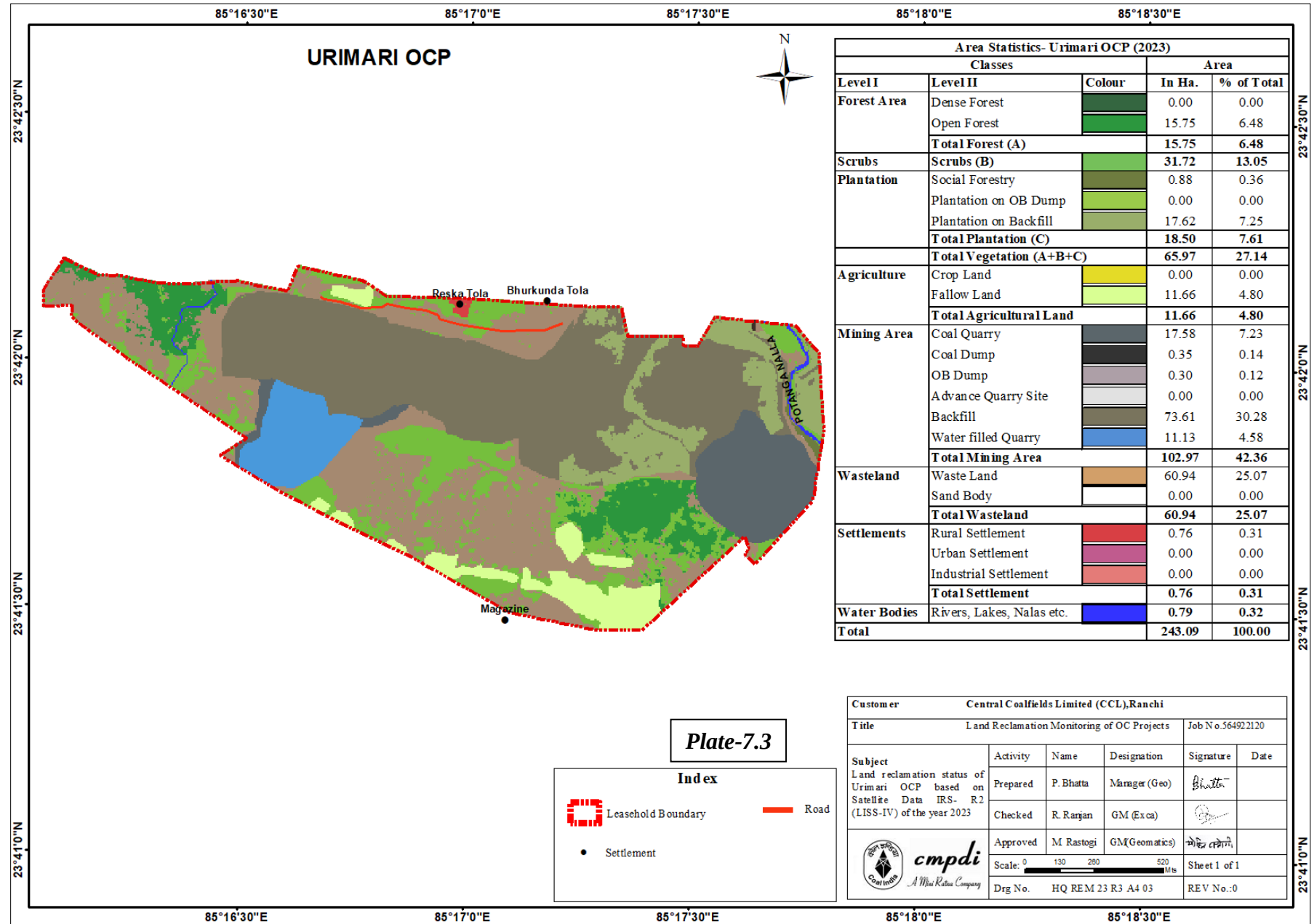
Figure 7.1: Land Reclamation status in OC projects producing less than 5 mcm (Coal+ OB) of CCL in the year 2023

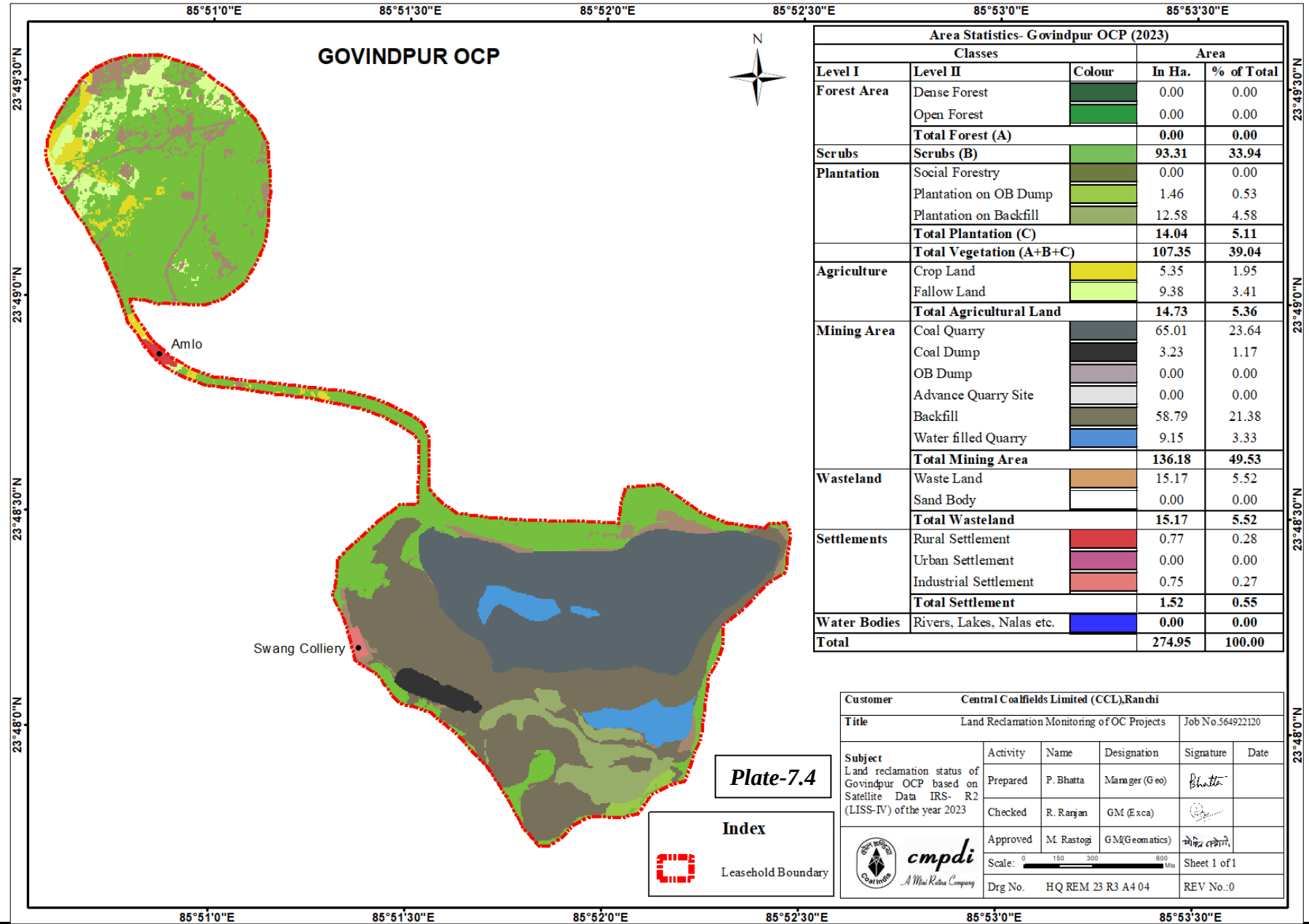
TABLE: 7.1 PROJECT WISE AREA STATISTICS OF LAND USE/ COVER CLASSES IN PROJECTS OF CCL BASED ON SATELLITE DATA OF THE YEAR 2023

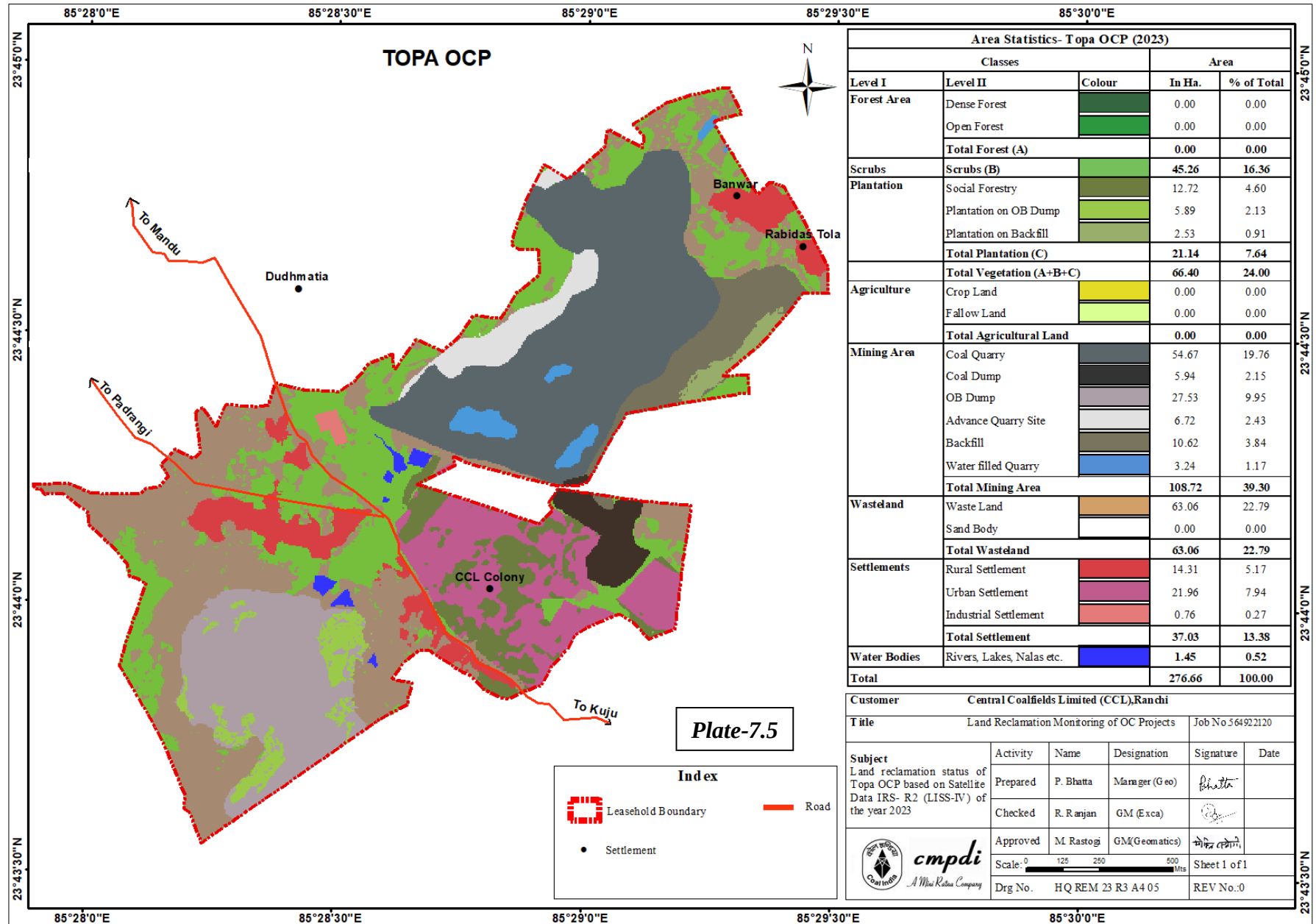
(Area in Hactare)																		
LAND USE / COVER CLASSES		CLR. CODE	AMLO		TARMI		URIMARI		GOVINDPUR		TOPA		JHARKHAND		NEW GIDDI-C		TOTAL	
FORESTS			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
	Dense Forest		0.60	0.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.60	0.03
	Open Forest		13.87	5.60	10.63	4.11	15.75	6.48	0.00	0.00	0.00	0.00	4.87	1.86	0.00	0.00	45.12	2.54
	Total Forest (A)		14.47	5.84	10.63	4.11	15.75	6.48	0.00	0.00	0.00	0.00	4.87	1.86	0.00	0.00	45.72	2.58
PLANTATION																		
	Scrubs (B)		28.92	11.68	56.45	21.82	31.72	13.05	93.31	33.94	45.26	16.36	34.11	13.03	48.86	23.23	338.63	19.10
	Social Forestry (C)		2.00	0.81	0.46	0.18	0.88	0.36	0.00	0.00	12.72	4.60	0.96	0.37	6.56	3.12	23.58	1.33
	Plantation on External OB Dump		18.02	7.28	8.51	3.29	0.00	0.00	1.46	0.53	5.89	2.13	0.32	0.12	19.96	9.49	54.16	3.05
PLANTATION																		
	Plantation on Backfill / Excavated Area (Biological Reclamation)		15.23	6.15	5.46	2.11	17.62	7.25	12.58	4.58	2.53	0.91	34.98	13.36	0.00	0.00	88.40	4.99
	Total Area under Plantation (Green Cover) (D)		35.25	14.24	14.43	5.58	18.50	7.61	14.04	5.11	21.14	7.64	36.26	13.85	26.52	12.61	166.14	9.37
	Total Vegetation (A to D)		78.64	31.76	81.51	31.51	65.97	27.14	107.35	39.05	66.40	24.00	75.24	28.74	75.38	35.84	550.49	31.05
AREA UNDER ACTIVE MINING																		
	Coal Quarry		37.71	15.23	7.60	2.94	17.58	7.23	65.01	23.64	54.67	19.76	58.06	22.17	18.02	8.57	258.65	14.59
	Coal Dump		9.75	3.94	2.62	1.01	0.35	0.14	3.23	1.17	5.94	2.15	1.51	0.58	3.73	1.77	27.13	1.53
	Advance Quarry Site		3.61	1.46	0.00	0.00	0.00	0.00	0.00	0.00	6.72	2.43	0.00	0.00	2.49	1.18	12.82	0.72
AREA UNDER ACTIVE MINING																		
	Quarry Filled With Water		2.99	1.21	6.15	2.38	11.13	4.58	9.15	3.33	3.24	1.17	9.19	3.51	12.53	5.96	54.38	3.07
	Total Area under Active Mining (F)		54.06	21.84	16.37	6.33	29.06	11.95	77.39	28.14	70.57	25.51	68.76	26.26	36.77	17.48	352.98	19.91
	Barren OB Dump (G)		35.31	14.26	25.37	9.81	0.30	0.12	0.00	0.00	27.53	9.95	6.55	2.50	29.00	13.79	124.06	7.00
TECHNICAL RECLAMATION																		
	Area under Barren Backfilling (Technical Reclamation)		31.01	12.52	34.11	13.19	73.61	30.28	58.79	21.38	10.62	3.84	61.14	23.35	7.39	3.51	276.67	15.60
	Total Area under Technical Reclamation (H)		31.01	12.52	34.11	13.19	73.61	30.28	58.79	21.38	10.62	3.84	61.14	23.35	7.39	3.51	276.67	15.60
	Total Area under Mining Activity (F+G+H)		120.38	48.62	75.85	29.33	102.97	42.35	136.18	49.52	108.72	39.30	136.45	52.11	73.16	34.78	753.71	42.51
WASTELAND																		
	Waste Lands		34.85	14.08	47.91	18.52	60.94	25.07	15.17	5.52	63.06	22.79	21.69	8.28	25.84	12.29	269.46	15.20
	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 (I)		34.85	14.08	47.91	18.52	60.94	25.07	15.17	5.52	63.06	22.79	21.69	8.28	25.84	12.29	269.46	15.20
WATERBODIES																		
	Reservoir, nallah, ponds		0.93	0.38	0.25	0.10	0.79	0.32	0.00	0.00	1.45	0.52	1.27	0.49	0.00	0.00	4.69	0.26
	Total Waterbodies (J)		0.93	0.38	0.25	0.10	0.79	0.32	0.00	0.00	1.45	0.52	1.27	0.49	0.00	0.00	4.69	0.26
	Crop Lands		0.00	0.00	1.56	0.60	0.00	0.00	5.35	1.95	0.00	0.00	5.71	2.18	0.00	0.00	12.62	0.71
AGRICULTURE																		
	Fallow Lands		1.30	0.53	48.50	18.75	11.66	4.80	9.38	3.41	0.00	0.00	2.82	1.08	29.03	13.80	102.69	5.79
	Total Agriculture (K)		1.30	0.53	50.06	19.35	11.66	4.80	14.73	5.36	0.00	0.00	8.53	3.26	29.03	13.80	115.31	6.50
	Urban Settlement		2.39	0.97	0.35	0.15	0.00	0.00	0.00	0.00	21.96	7.94	10.92	4.17	1.62	0.77	37.24	2.10
SETTLEMENTS																		
	Rural Settlement		4.15	1.68	1.20	0.46	0.76	0.31	0.77	0.28	14.31	5.17	0.000	0.00	4.35	2.07	25.54	1.44
	Industrial Settlement		4.95	2.00	1.57	0.61	0.00	0.00	0.75	0.27	0.76	0.27	7.74	2.96	0.94	0.45	16.71	0.94
	Total Settlement (L)		11.49	4.65	3.12	1.22	0.76	0.31	1.52	0.55	37.03	13.38	18.66	7.13	6.91	3.29	79.49	4.48
Grand Total (A to L)			247.59	100.00	258.70	100.00	243.09	100.00	274.95	100.00	276.66	100.00	261.84	100.00	210.32	100.00	1773.15	100.00

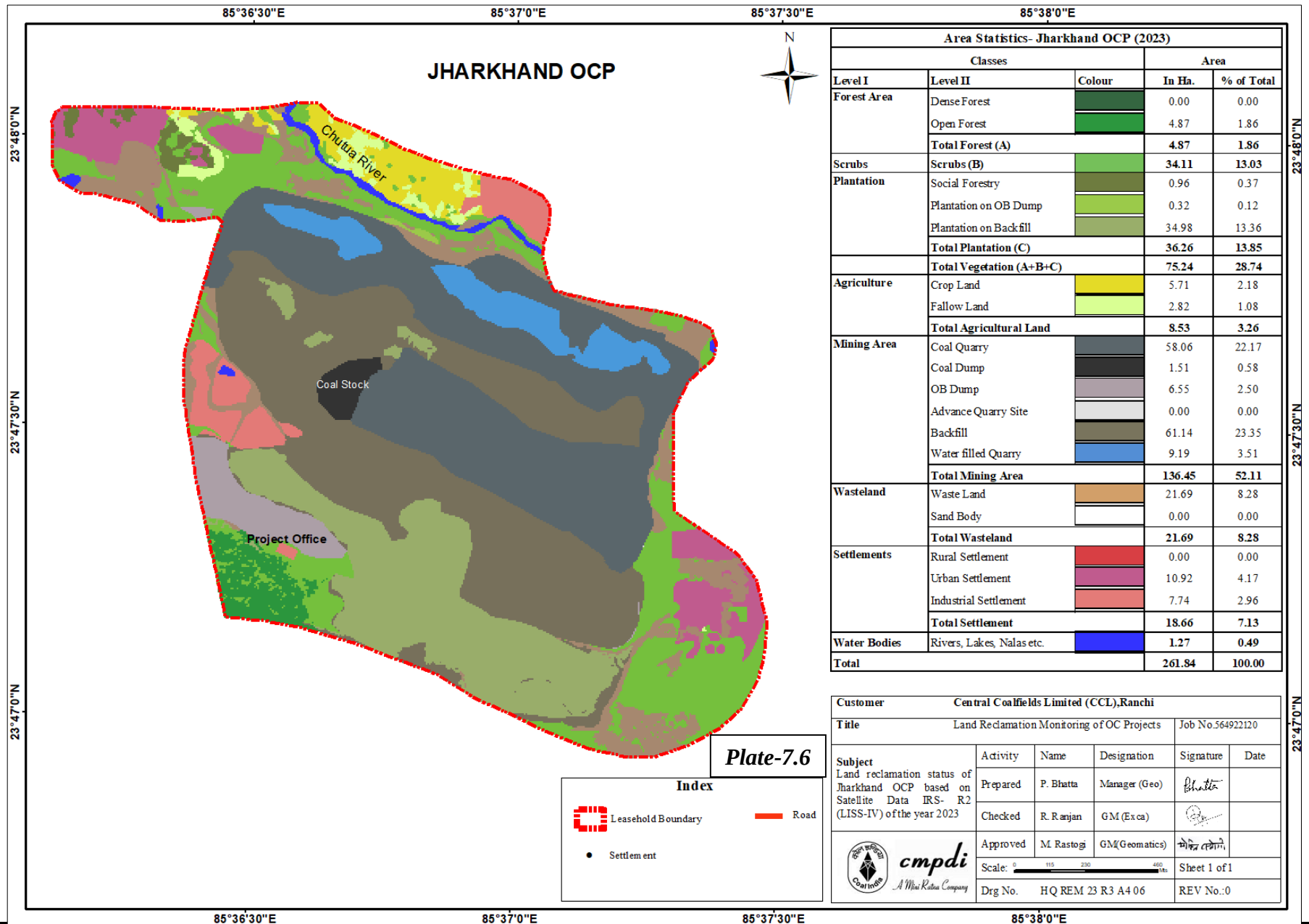


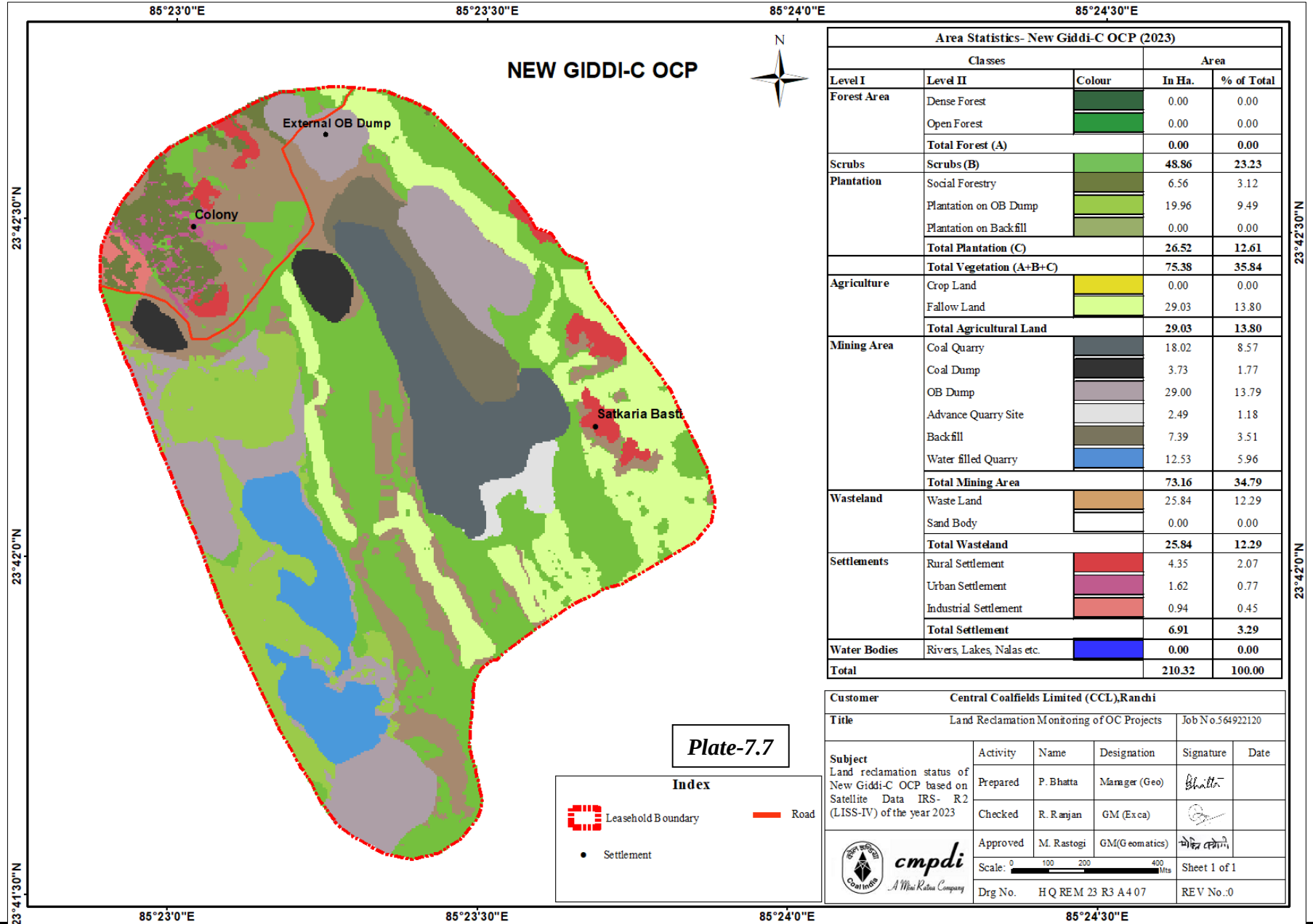












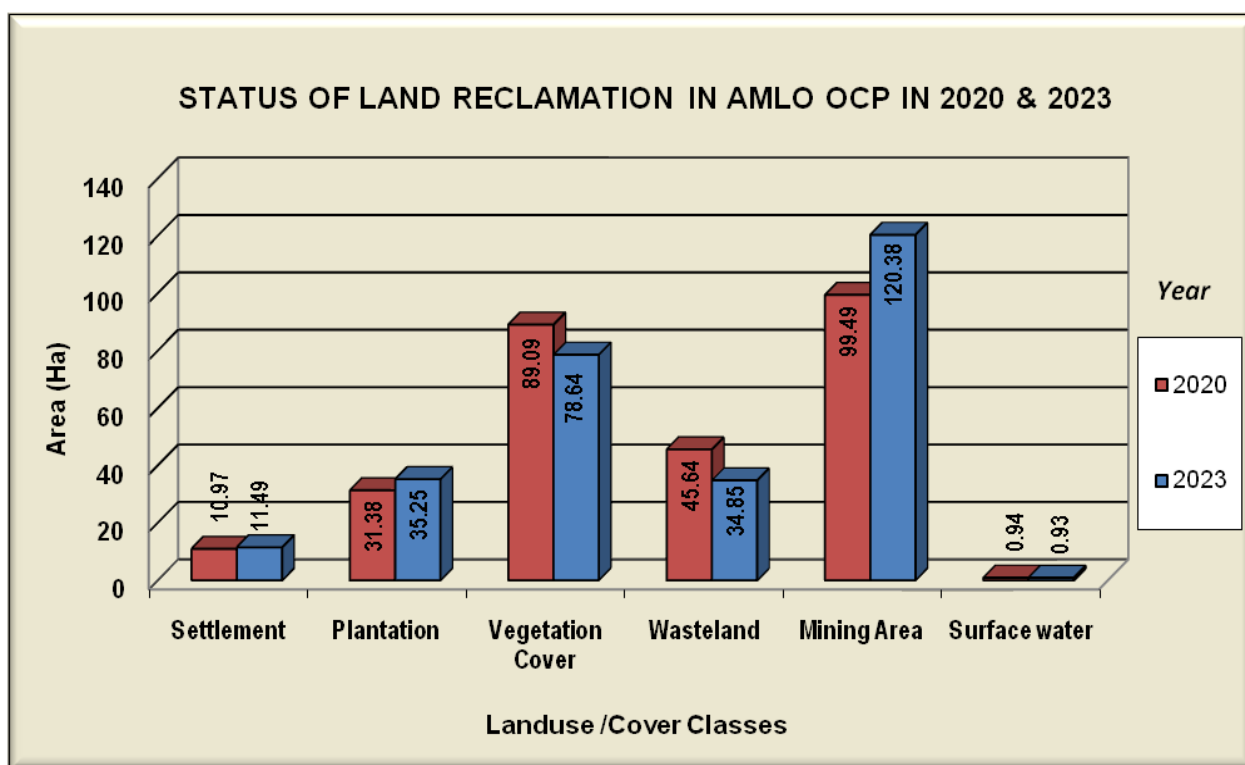


Figure- 7.2: Bar Chart of Land Reclamation Status in Amlo OCP

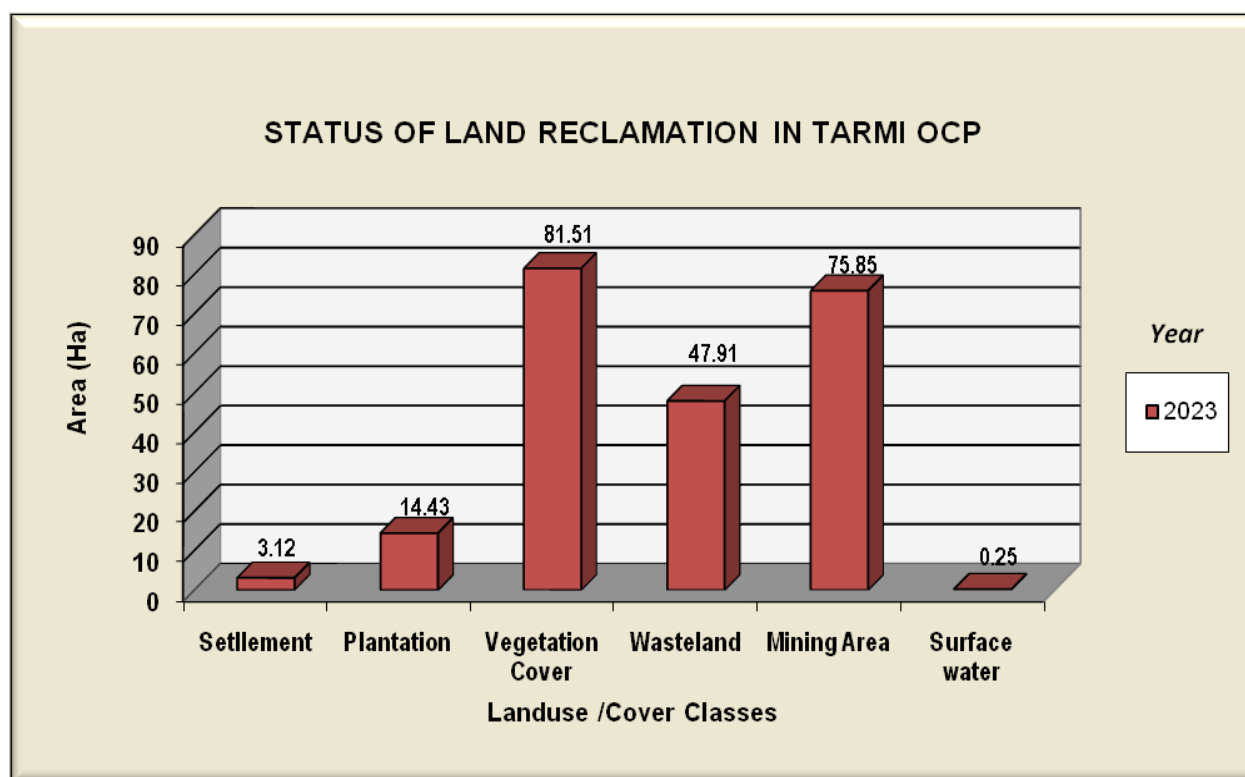


Figure- 7.3: Bar Chart of Land Reclamation Status in Tarmi OCP

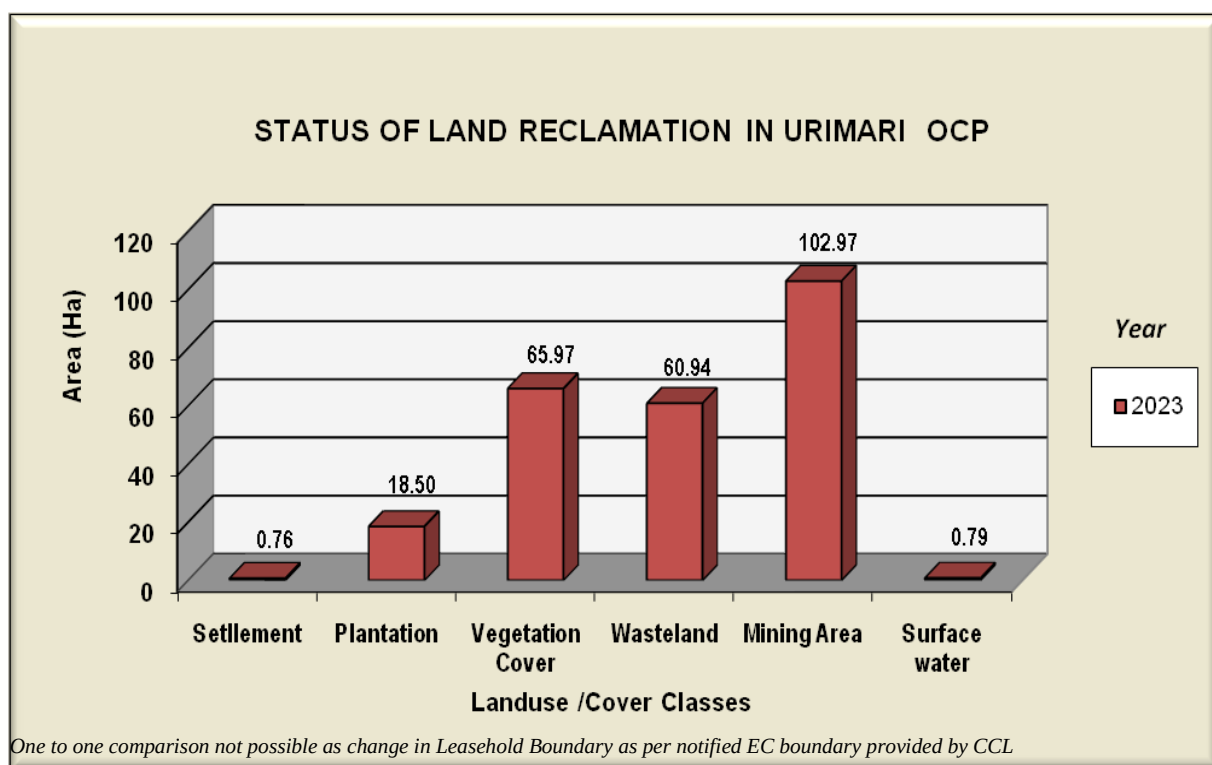


Figure- 7.4: Bar Chart of Land Reclamation Status in Urimari OCP

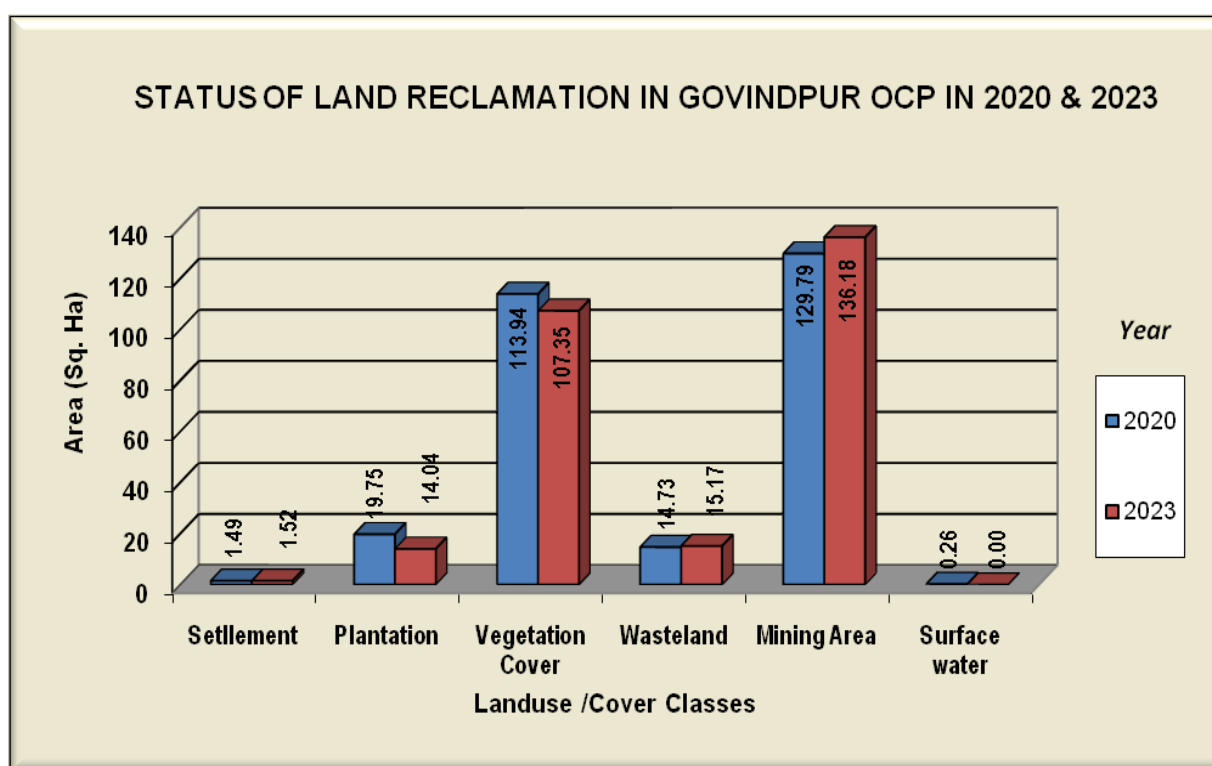


Figure- 7.5: Bar Chart of Land Reclamation Status in Govindpur OCP

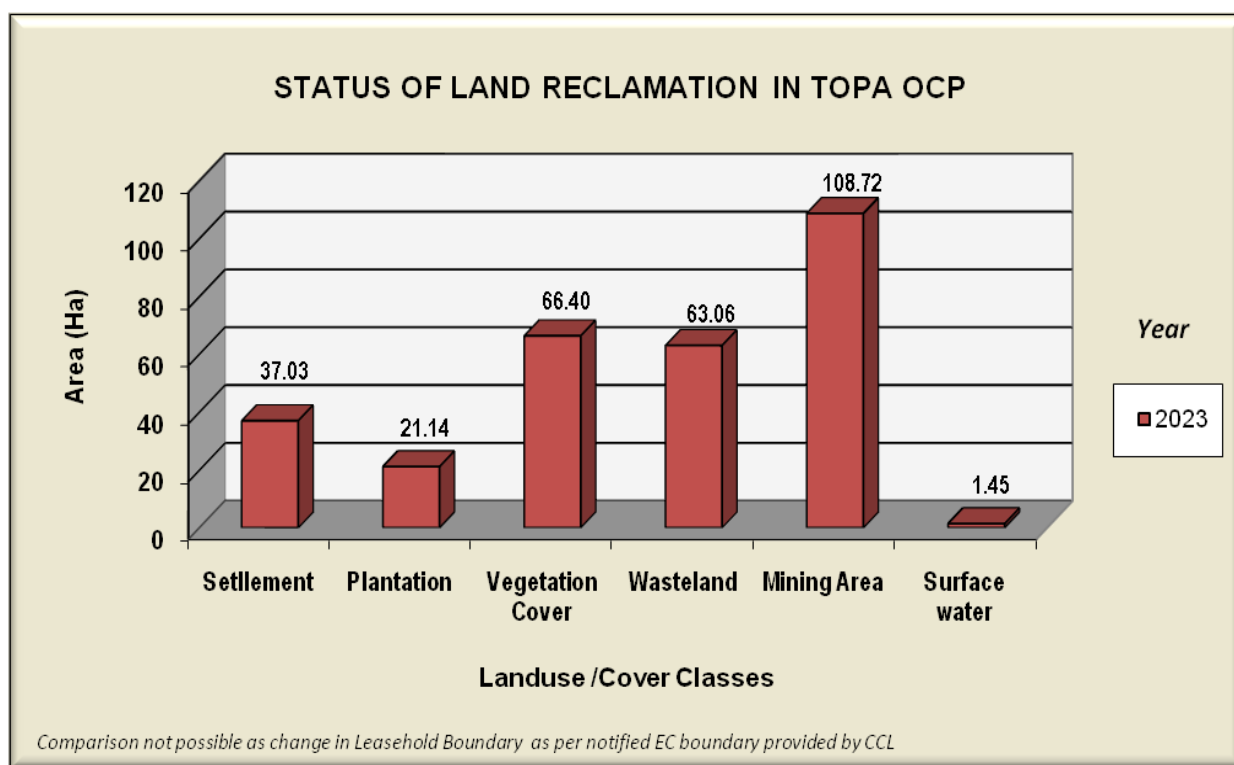


Figure- 7.6: Bar Chart of Land Reclamation Status in Topa OCP

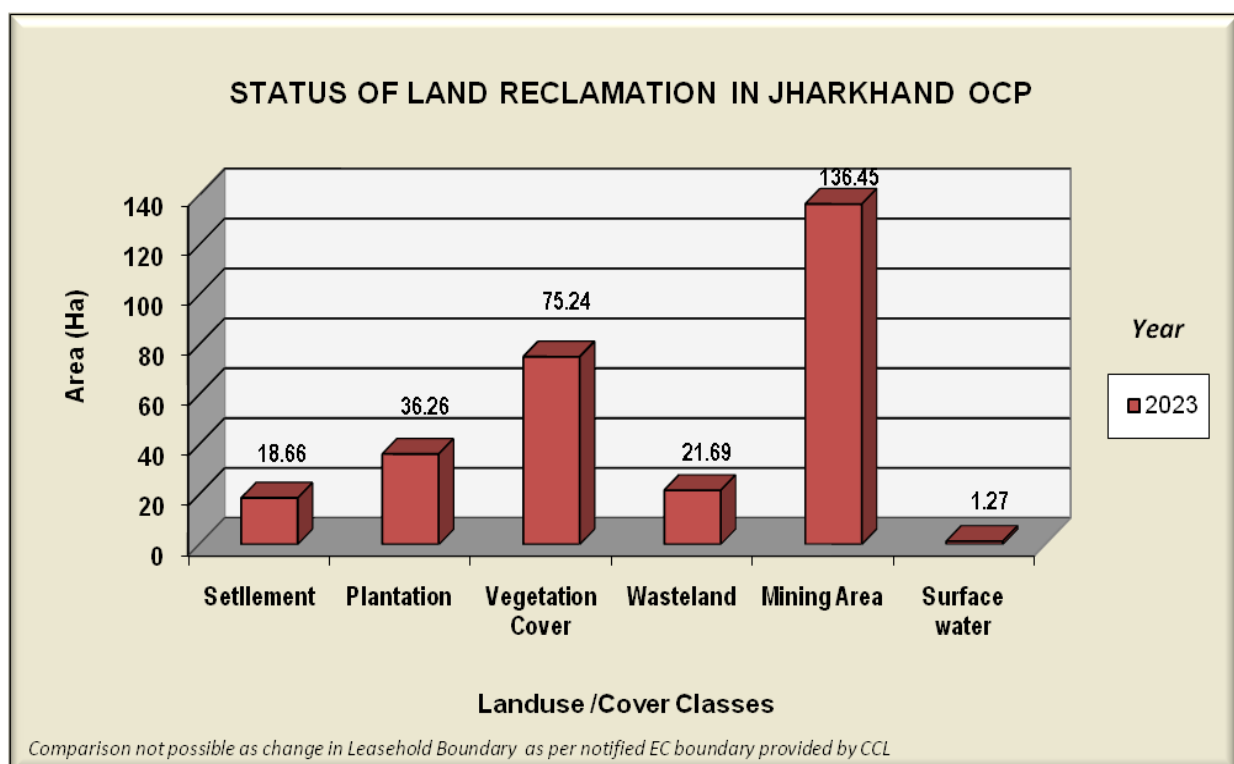


Figure- 7.7: Bar Chart of Land Reclamation Status in Jharkhand OCP

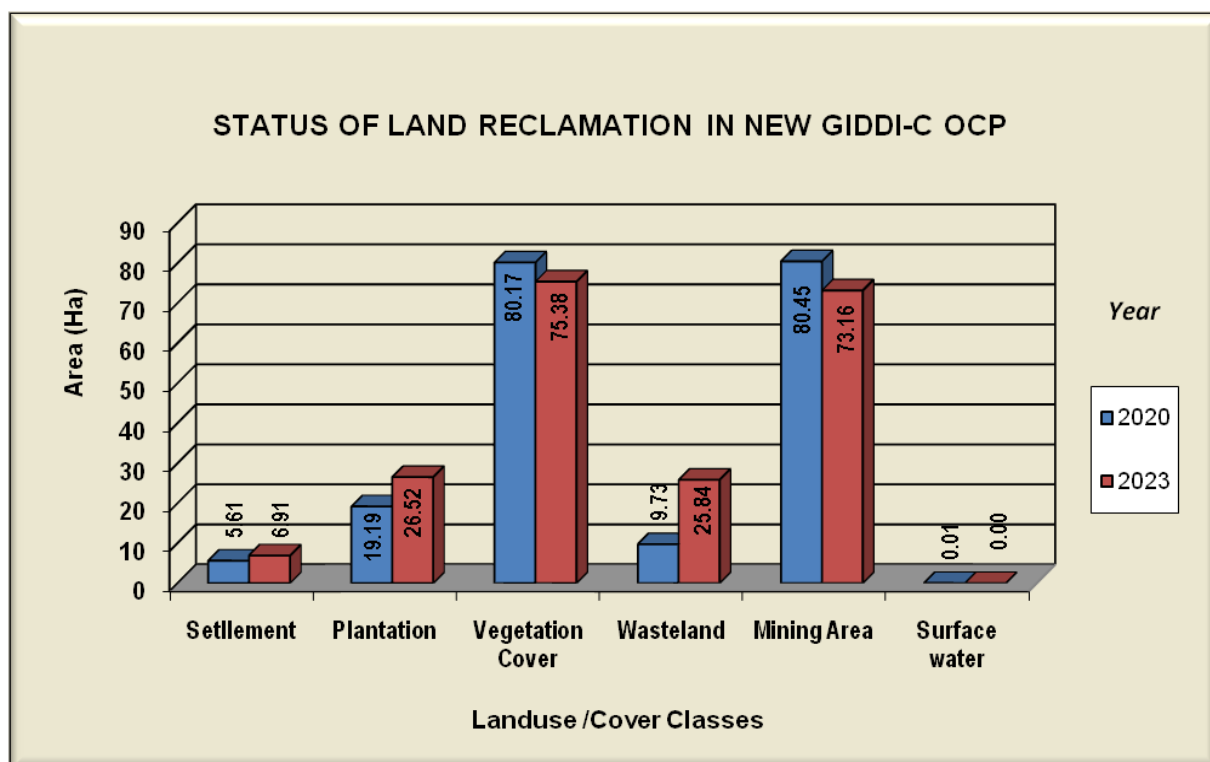


Figure- 7.8: Bar Chart of Land Reclamation Status in New Giddi-C OCP



Photo 7.1: Plantation site in Amlo OCP



Photo 7.2: Plantation on External OB Dump in Tarmi OCP



Photo 7.3: Overview of Urimari Opencast Project



Photo 7.4: Plantation on Backfill in Jharkhand OCP

BHARAT COKING COAL LIMITED

8.0 Land Reclamation Status in Bharat Coking Coal Limited

8.1 Following 5 clusters of mines comprising both opencast and underground projects of Bharat Coking Coal Ltd. have been taken up for land reclamation monitoring during the year 2023-24:

- Cluster III: Jogidih Colliery, Maheshpur Colliery, South Govindpur Colliery, Teturiya Colliery, Govindpur Colliery, New Akashkinaree Mine, Block-IV/Kooridih Mixed Mine
- Cluster V: Nichitpur OCP, Tetulmari OCP & UG section, Mudidih OCP & UG section, Sendra Bansjora OCP & UG section, Kankanee OCP & UG section, Bansdeopur OCP & UG section, Loyabad UG
- Cluster VIII: Bastacolla Colliery OC & UG, Bera Colliery OC & UG, Dobari Colliery UG, Ghanoodih Colliery OC, Kuya Colliery OC & UG, Goluckdih OC, Kujama Colliery OC
- Cluster IX: Lodna UG, Bagdigi UG, Joyrampur UG, Bararee UG, Jealgora UG, NTST Expn. OCP
- Cluster XVII: Begunia UG, Victoria West UG, Kalyaneswari OCP

8.2 Cluster wise Land Reclamation status of above mentioned clusters in BCCL is given in Table 8.1 and also shown graphically in Fig 8.1. Area statistics of different land use classes present in the mine leasehold of the above clusters for the year 2023 are shown in Table 8.2. Land use maps derived from the 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. 8.3 – 8.7.

8.3 Study reveals that out of total mine leasehold area of 7900.91 ha of the 5 clusters of mines (Opencast +Underground) of BCCL mentioned above taken for this study in 2023-24, total excavated area is 1437.99 ha out of which 19.68 ha (1.37%) has been planted (*Biologically Reclaimed*), 693.48 ha (48.23%) is under backfilling (*Technically Reclaimed*) and balance 724.83 ha (50.41%) is under active mining.

- 8.4** The leasehold boundaries of the above mentioned 5 clusters of mines (Opencast +Underground) are updated as per EC.
- 8.5** It is seen that technical reclamation in the above 5 Clusters has increased from 657.49 ha (Year 2020) to 693.48 ha (Year 2023).
- 8.6** Study indicates that Cluster III and Cluster V of BCCL considered for this study in the year 2023-24 indicate increasing trend in Biological Reclamation (plantation on backfill) with respect to the year 2020. Area under plantation on backfill has increased from 3.89 ha (Year 2020) to 4.96 ha (Year 2023) in Cluster III and from 7.19 ha (Year 2020) to 7.41 ha (Year 2023) in Cluster V respectively. Whereas in Cluster VIII, plantation on backfill has decreased from 9.93 ha (Year 2020) to 4.08 ha (Year 2023) due to rehandling of backfill. In Cluster IX, biological reclamation has decreased from 6.80 ha (Year 2020) to 3.23ha (Year 2023) due to the effect of underground fire. In Cluster XVII biological reclamation has not been started yet.
- 8.7** On comparing the status of plantation on OB dumps for the year 2023 with respect to the year 2020 in the above Cluster of mines of BCCL, it is evident from the analysis that area under plantation on OB dumps has increased from 21.11 ha (Year 2020) to 28.67 ha (Year 2023) in Cluster III. This increase in span of three years is due to the sincere effort made by BCCL towards environmental protection in these Clusters. Plantation on OB has decreased from 23.85 ha (Year 2020) to 19.84 ha (Year 2023) in Cluster V. In Cluster VIII, it has decreased from 21.97 ha (Year 2020) to 16.86 ha (Year 2023) and in Cluster IX, it has decreased from 41.79 ha (Year 2020) to 22.40 ha (Year 2023) due to rehandling of OB dumps. But in the above Clusters where plantation on OB dumps has decreased, new plantations on OB dumps and their slopes has been started by BCCL but their height and canopy cover are not enough to be captured in satellite imagery. In Cluster XVII there is no change or plantation on OB dumps is static during the last three-year duration.

- 8.8** It is seen that total plantation under social forestry has increased from 504.23 ha (Year 2020) to 517.10 ha (Year 2023). Plantation under social forestry has decreased from 162.33 ha (Year 2020) to 141.36 ha (Year 2023) in Cluster III. In Cluster VIII it has decreased from 24.70 ha (Year 2020) to 22.63 ha. (Year 2023) and in Cluster IX it has decreased from 168.58 ha. (Year 2020) to 151.33 ha (Year 2023). This decrease of 20.97 ha area in Cluster III, 2.07 ha in Cluster VIII and 17.25 ha in Cluster IX is due to change in shape and area of these clusters. In Cluster V plantation under social forestry has increased from 105.29 ha (Year 2020) to 158.45 ha (Year 2023). Ongoing projects like road side plantations and river side plantations in this cluster are under progress. In Cluster XVII there is no change or plantation under social forestry is static during the last three-year duration.
- 8.9** In Cluster III, it is seen that total excavated area has decreased from 169.05 ha (Year 2020) to 158.55 ha (Year 2023). This decrease of 10.50 ha area is due to reduction in area under mining which has happened due to change in shape and area of this cluster. The Cluster boundary is updated as per EC.
- 8.10** After analyzing the satellite data of the year 2020 vs 2023, it reveals that area under total plantation (Green cover) carried out on backfilled area, OB dumps as well as under social forestry in the above clusters of BCCL has decreased from 645.76 ha (8.08%) to 629.55 ha (7.97%) in span of last three years. The reason for this reduction in area under green cover has been described separately earlier in point no. 4.6, 4.7 and 4.8.
- 8.11** On comparing the status of land reclamation for the year 2023 with respect to the year 2020 it is evident from the analysis that total area under land reclamation has increased from 685.30 ha (Year 2020) to 713.16 ha (Year 2023). This increase of 27.86 ha area under land reclamation is due to increase in reclamation activities in Cluster III, Cluster V & Cluster IX. In Cluster VIII, it is seen that total area under reclamation has decreased from 216.84ha (Year

2020) to 202.16 ha (Year 2023). This decrease of 14.68 ha area is due to reduction in area under backfilling which is due to change in shape and reduction of leasehold area of this cluster. The cluster boundary is updated as per EC.

8.12 The area under total plantation (Green Cover) is maximum in Cluster III (12.32%) followed by Cluster V with (9.49%), Cluster IX with (9.11%), Cluster VIII with (3.68%) and Cluster XVII with (3.46%).

8.13 Out of the 5 Clusters in BCCL considered for satellite data based land reclamation monitoring in 2023-24, Cluster XVII tops with 65.67% reclamation followed by Cluster VIII with 57.17%, Cluster V with 52.36%, Cluster III with 46.46% and Cluster IX with 31.65%.

Table 8.1

Land Reclamation Status in 5 Clusters (Underground + Opencast Mines) of BCCL based on Satellite Data of the Year 2023

(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, Awanue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Cluster III	1552.53	1420.61	60.37	68.71	3.89	4.96	21.11	28.67	162.33	141.36	104.79	84.88	169.05	158.55	187.33	174.99	64.26	73.67
				35.71%	43.34%	2.30%	3.13%					61.99%	53.54%			12.07%	12.32%	38.01%	46.46%
2	Cluster V	1724.52	1957.08	187.59	193.60	7.19	7.41	23.85	19.84	105.29	158.45	103.52	182.86	298.30	383.87	136.33	185.70	194.78	201.01
				62.89%	50.43%	2.41%	1.93%					34.70%	47.64%			7.91%	9.49%	65.30%	52.36%
3	Cluster VIII	1331.95	1183.92	206.91	198.08	9.93	4.08	21.97	16.86	24.70	22.63	124.49	151.45	341.33	353.61	56.60	43.57	216.84	202.16
				60.62%	56.02%	2.91%	1.15%					36.47%	42.83%			4.25%	3.68%	63.53%	57.17%
4	Cluster IX	1967.22	1942.12	77.53	108.00	6.80	3.23	41.79	22.40	168.58	151.33	217.24	240.24	301.57	351.47	217.17	176.96	84.33	111.23
				25.71%	30.73%	2.25%	0.92%					72.04%	68.35%			11.04%	9.11%	27.96%	31.65%
5	Cluster XVII	1412.00	1397.18	125.09	125.09	0.00	0.00	5.00	5.00	43.33	43.33	65.40	65.40	190.49	190.49	48.33	48.33	125.09	125.09
				65.67%	65.67%	0.00%	0.00%					34.33%	34.33%			3.42%	3.46%	65.67%	65.67%
	TOTAL	7988.22	7900.91	657.49	693.48	27.81	19.68	113.72	92.77	504.23	517.10	615.44	724.83	1300.74	1437.99	645.76	629.55	685.30	713.16
				50.55%	48.23%	2.14%	1.37%					47.31%	50.41%			8.08%	7.97%	52.69%	49.59%
(% is calculated with respect to Excavated Area as applicable)																			

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

Note: In reference to above table different parameters as 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 Backfill 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 above Table.
- 5 (%) calculated in above Table is in respect to Total Excavated area except for "Total Area under plantation "where % is in terms of leasehold Area."

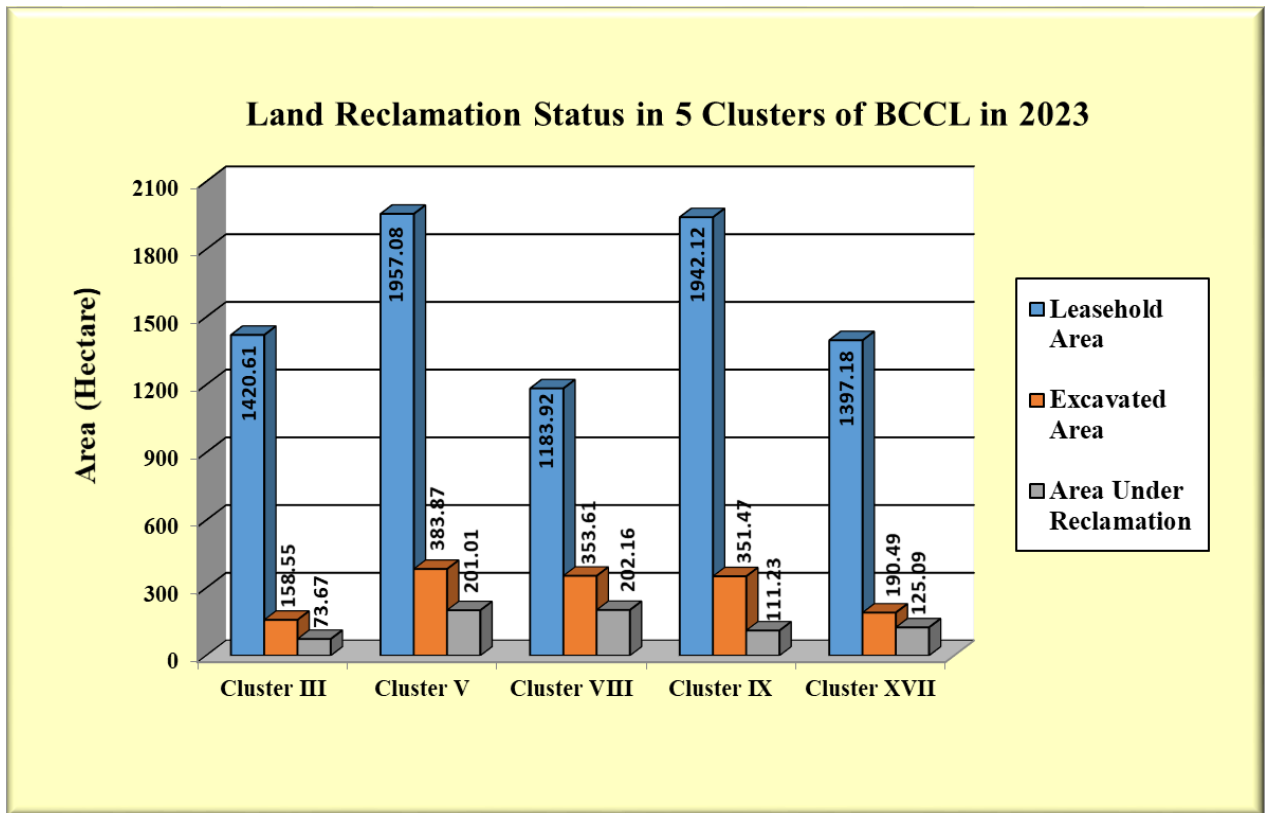


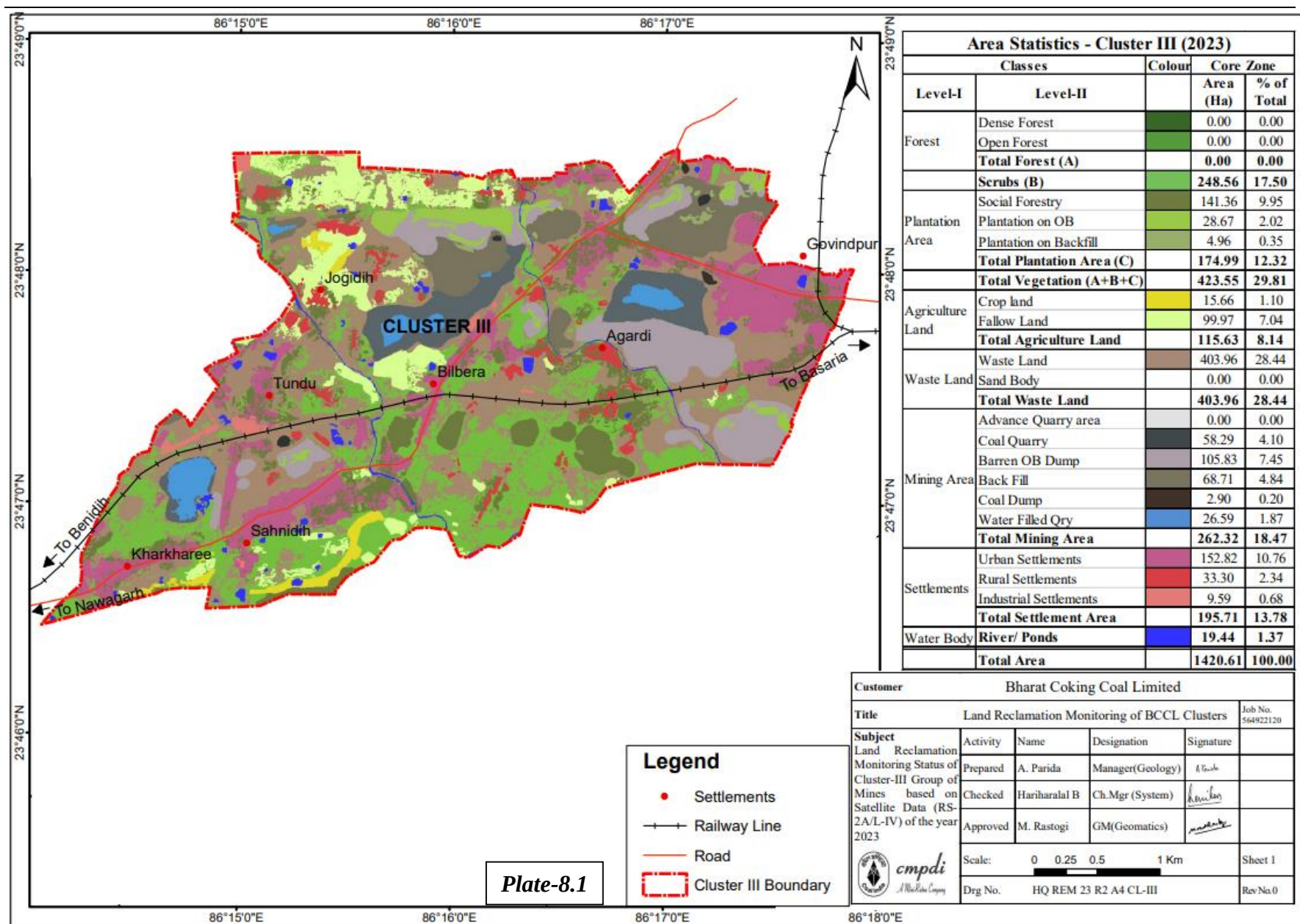
Figure 8.1: Cluster wise Land reclamation status based on Satellite data of the year 2023

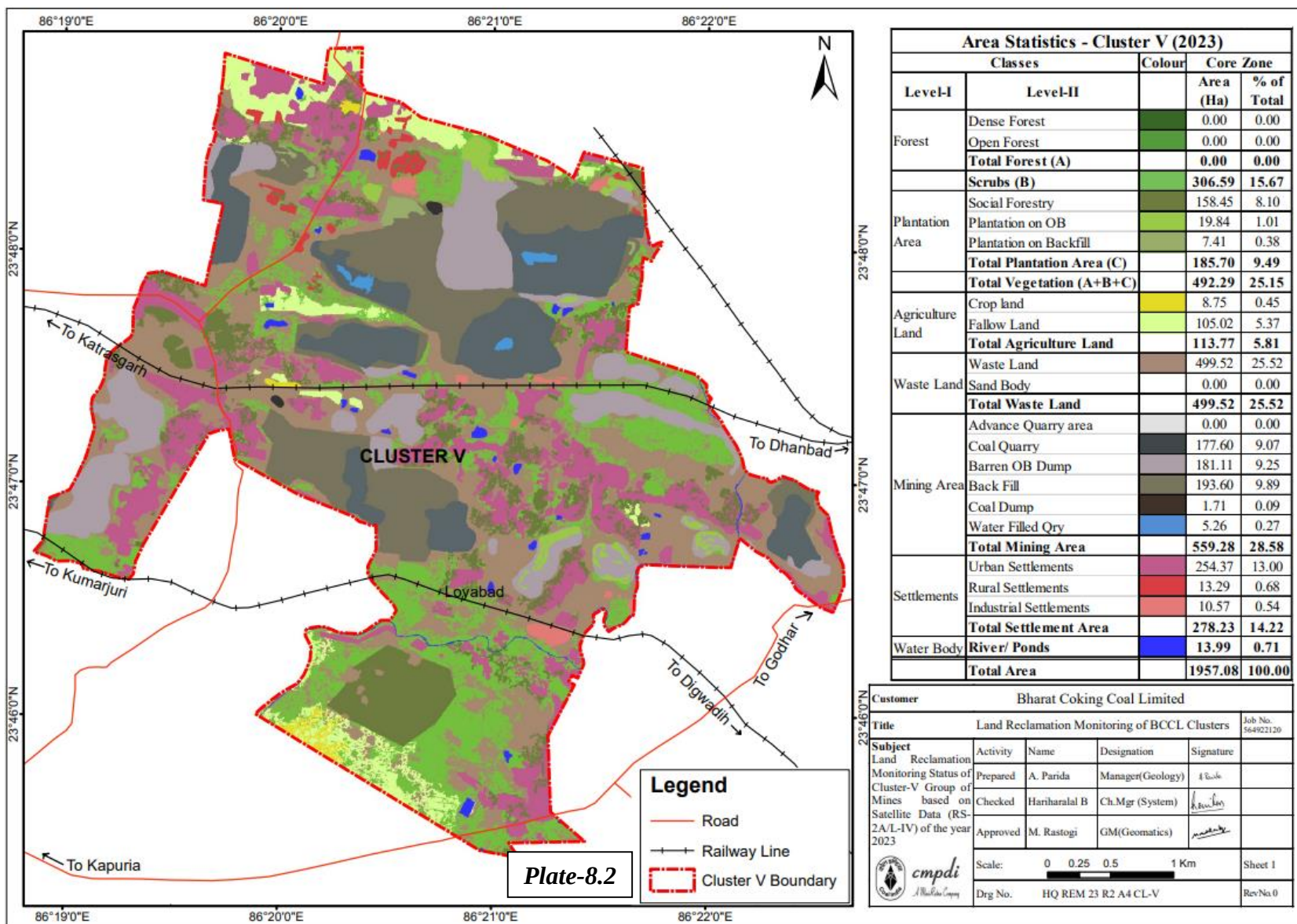
Table 8.2

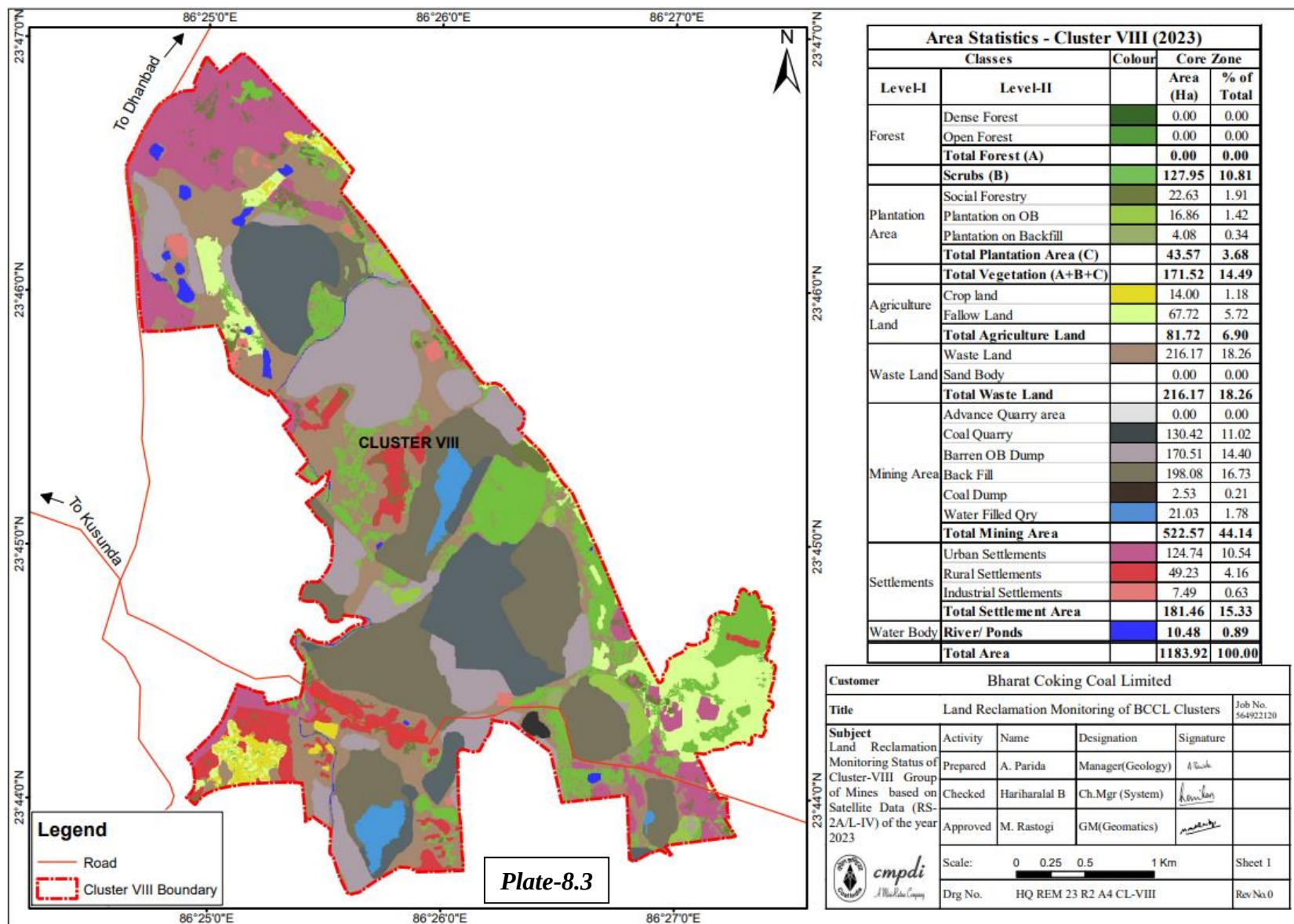
Cluster wise Area Statistics of Land Use/ Cover classes in 5 Clusters of (UG+OC) mines of BCCL based on Satellite Data of the year 2023

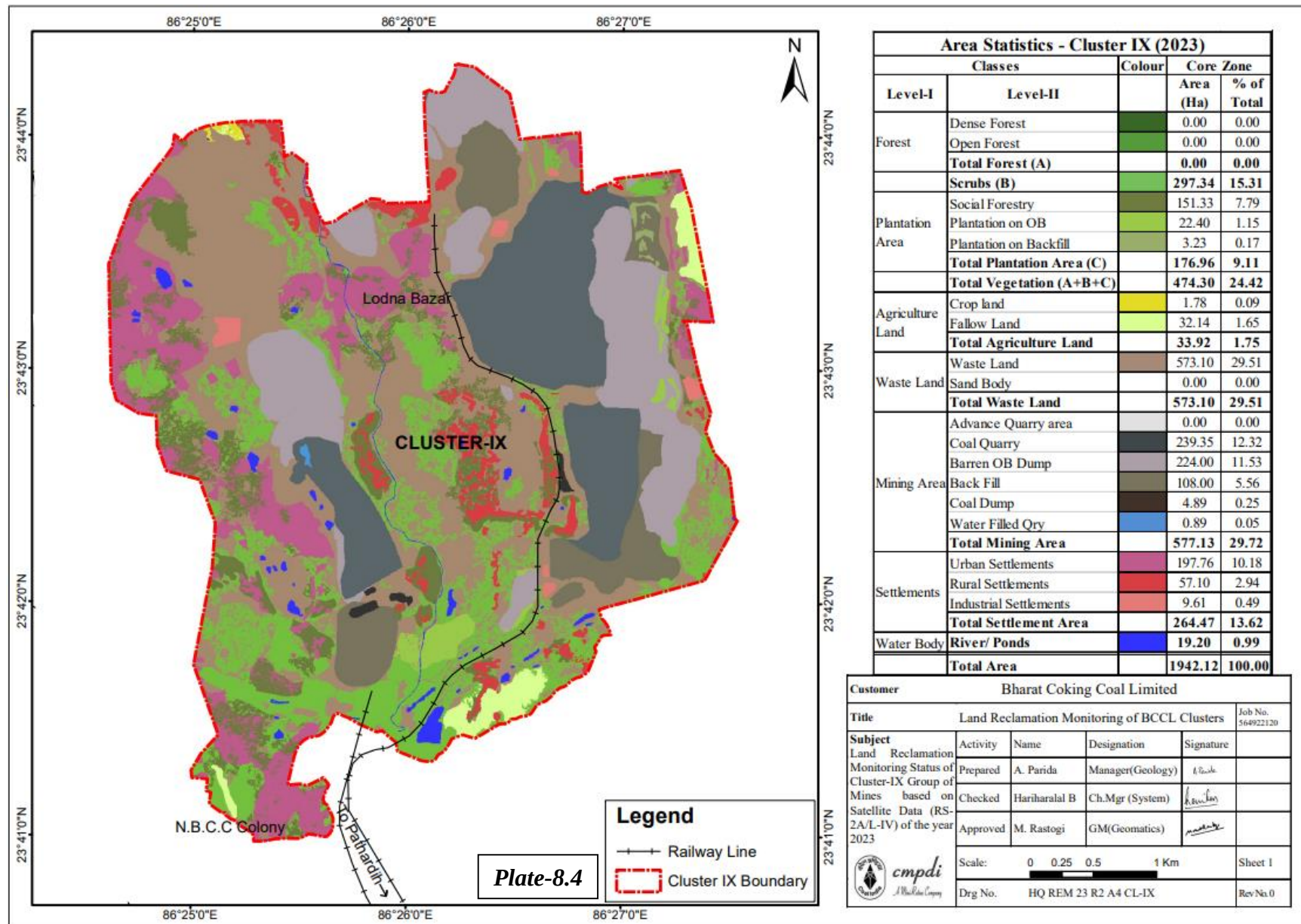
(Area in Hectare)

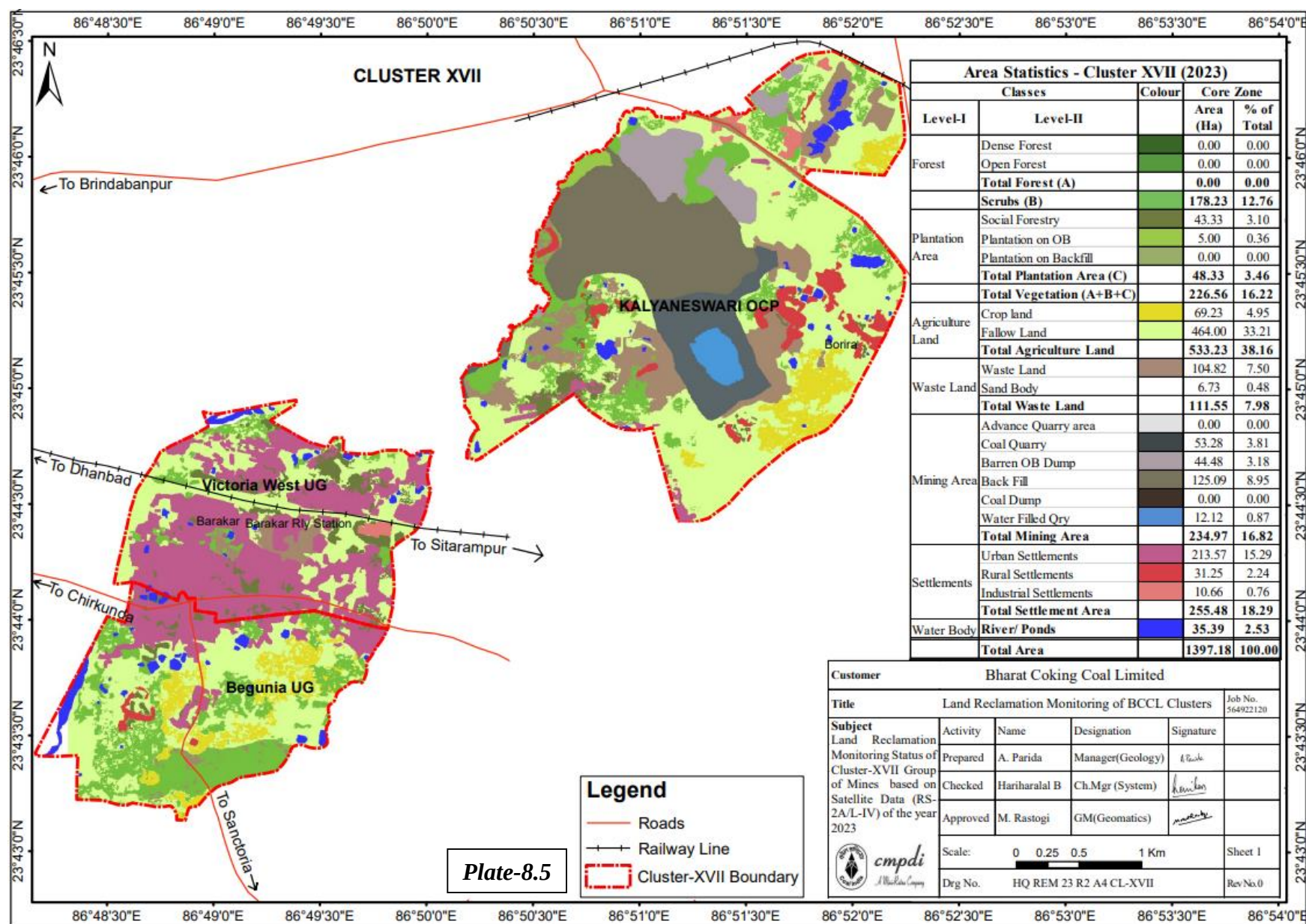
Status of Land Reclamation in 5 Clusters of (UG+OC) mines of Bharat Coking Coal Ltd. based on Satellite data of the Year 2023													
<i>(Area in Hectare)</i>													
		CLUSTER III		CLUSTER V		CLUSTER VIII		CLUSTER IX		CLUSTER XVII		TOTAL	
		Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	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)	248.56	17.50	306.59	15.67	127.95	10.81	297.34	15.31	178.23	12.76	1158.67	14.67
PLANTATION	Social Forestry/Avenue Plantation	141.36	9.95	158.45	8.10	22.63	1.91	151.33	7.79	43.33	3.10	517.10	6.54
	Plantation on OB Dump	28.67	2.02	19.84	1.01	16.86	1.42	22.40	1.15	5.00	0.36	92.77	1.17
	Plantation on Backfill (Biological Reclamation)	4.96	0.35	7.41	0.38	4.08	0.34	3.23	0.17	0.00	0.00	19.68	0.25
	Total Plantation (C)	174.99	12.32	185.70	9.49	43.57	3.68	176.96	9.11	48.33	3.46	629.55	7.97
	Total Vegetation (A+B+C)	423.55	29.81	492.29	25.15	171.52	14.49	474.30	24.42	226.56	16.22	1788.22	22.63
ACTIVE MINING	Coal Dump	2.90	0.20	1.71	0.09	2.53	0.21	4.89	0.25	0.00	0.00	12.03	0.15
	Coal Quarry	58.29	4.10	177.60	9.07	130.42	11.02	239.35	12.32	53.28	3.81	658.94	8.34
	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	26.59	1.87	5.26	0.27	21.03	1.78	0.89	0.05	12.12	0.87	65.89	0.83
	Total Area under Active Mining	84.88	5.97	182.86	9.34	151.45	12.79	240.24	12.37	65.40	4.68	724.83	9.17
	Barren OB Dump	105.83	7.45	181.11	9.25	170.51	14.40	224.00	11.53	44.48	3.18	725.93	9.19
RECLAIMED	Area Under Backfilling (Technical Reclamation)	68.71	4.84	193.60	9.89	198.08	16.73	108.00	5.56	125.09	8.95	693.48	8.78
	Total Area under Mine Operation	262.32	18.47	559.28	28.58	522.57	44.14	577.13	29.72	234.97	16.82	2156.27	27.29
WASTELAND	Waste Lands	403.96	28.44	499.52	25.52	216.17	18.26	573.10	29.51	104.82	7.50	1797.57	22.75
	Fly Ash Pond / Sand Body	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.73	0.48	6.73	0.09
	Total Wasteland	403.96	28.44	499.52	25.52	216.17	18.26	573.10	29.51	111.55	7.98	1804.30	22.84
WATERBODIES	Reservoir, Nallah, Ponds	19.44	1.37	13.99	0.71	10.48	0.89	19.20	0.99	35.39	2.53	98.50	1.25
	Total Waterbodies	19.44	1.37	13.99	0.71	10.48	0.89	19.20	0.99	35.39	2.53	98.50	1.25
AGRICULTURE	Crop Lands	15.66	1.10	8.75	0.45	14.00	1.18	1.78	0.09	69.23	4.95	109.42	1.38
	Fallow Lands	99.97	7.04	105.02	5.37	67.72	5.72	32.14	1.65	464.00	33.21	768.85	9.73
	Total Agriculture	115.63	8.14	113.77	5.81	81.72	6.90	33.92	1.75	533.23	38.16	878.27	11.12
SETTLEMENTS	Urban Settlement	152.82	10.76	254.37	13.00	124.74	10.54	197.76	10.18	213.57	15.29	943.26	11.94
	Rural Settlement	33.30	2.34	13.29	0.68	49.23	4.16	57.10	2.94	31.25	2.24	184.17	2.33
	Industrial Settlement	9.59	0.68	10.57	0.54	7.49	0.63	9.61	0.49	10.66	0.76	47.92	0.61
	Total Settlements	195.71	13.78	278.23	14.22	181.46	15.33	264.47	13.62	255.48	18.29	1175.35	14.88
	Grand Total	1420.61	100.00	1957.08	100.00	1183.92	100.00	1942.12	100.00	1397.18	100.00	7900.91	100.00











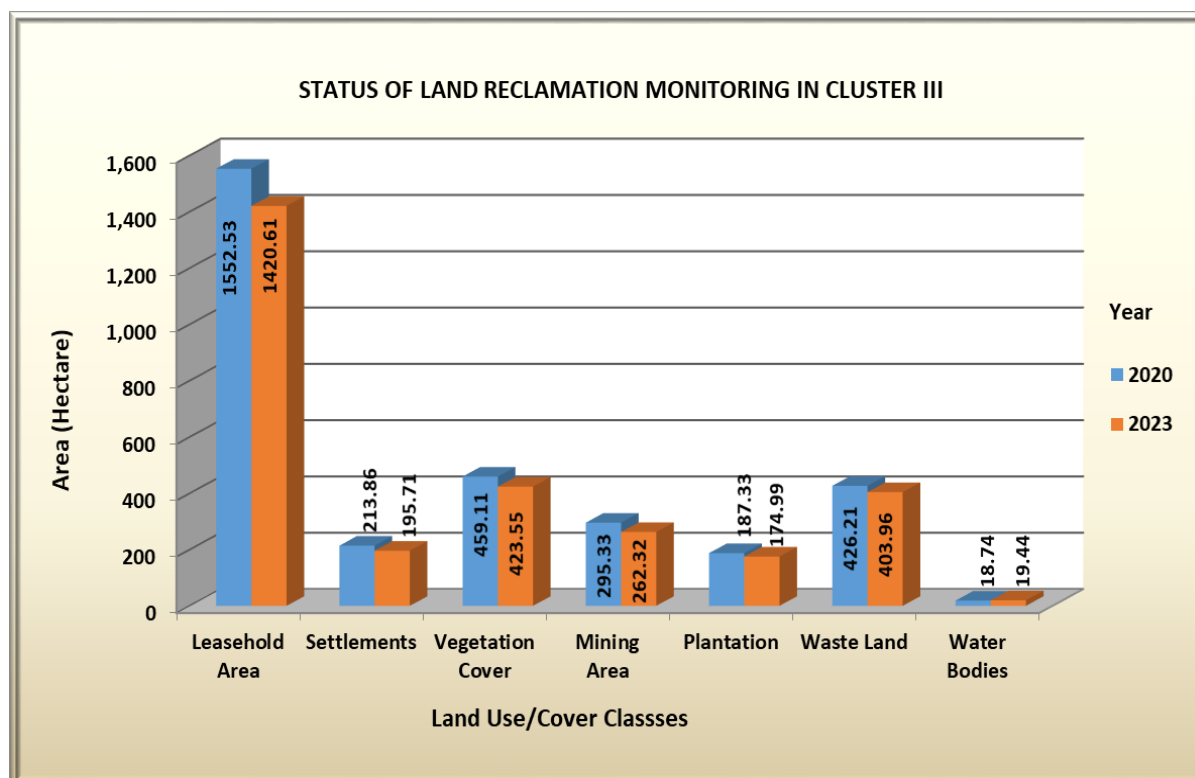


Figure- 8.2

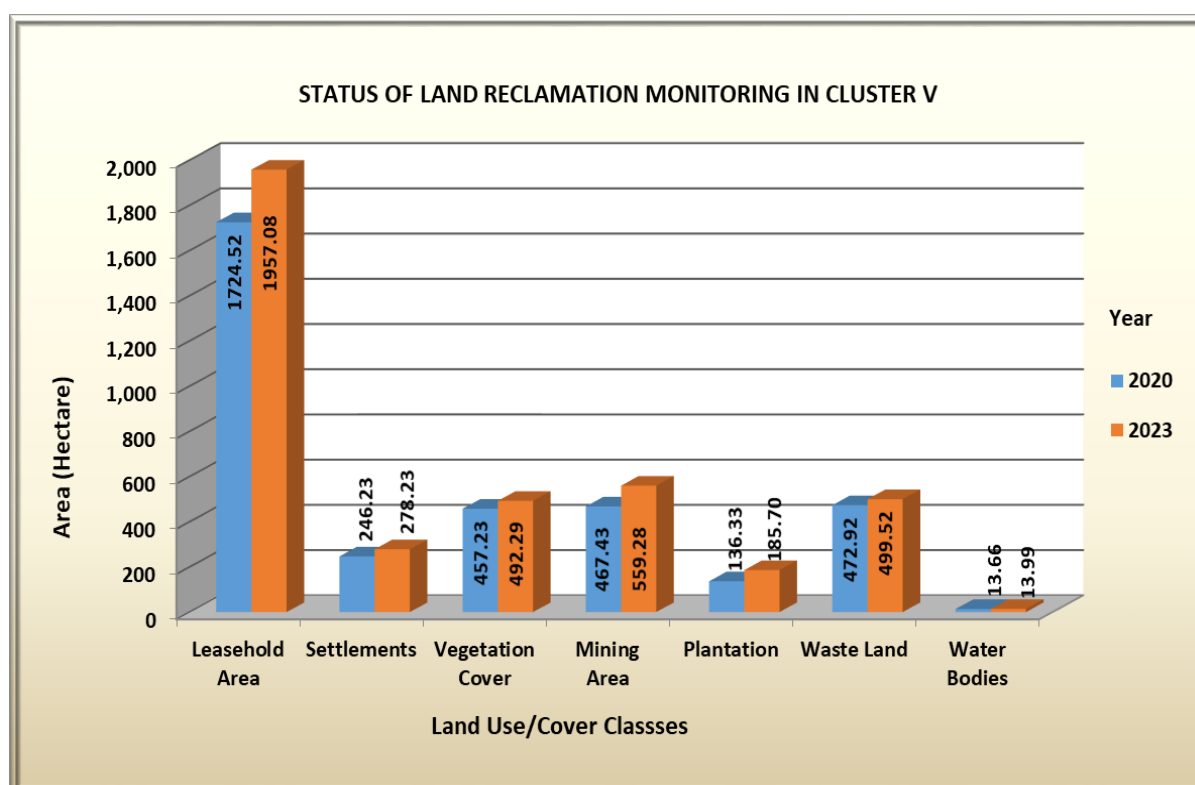


Figure- 8.3

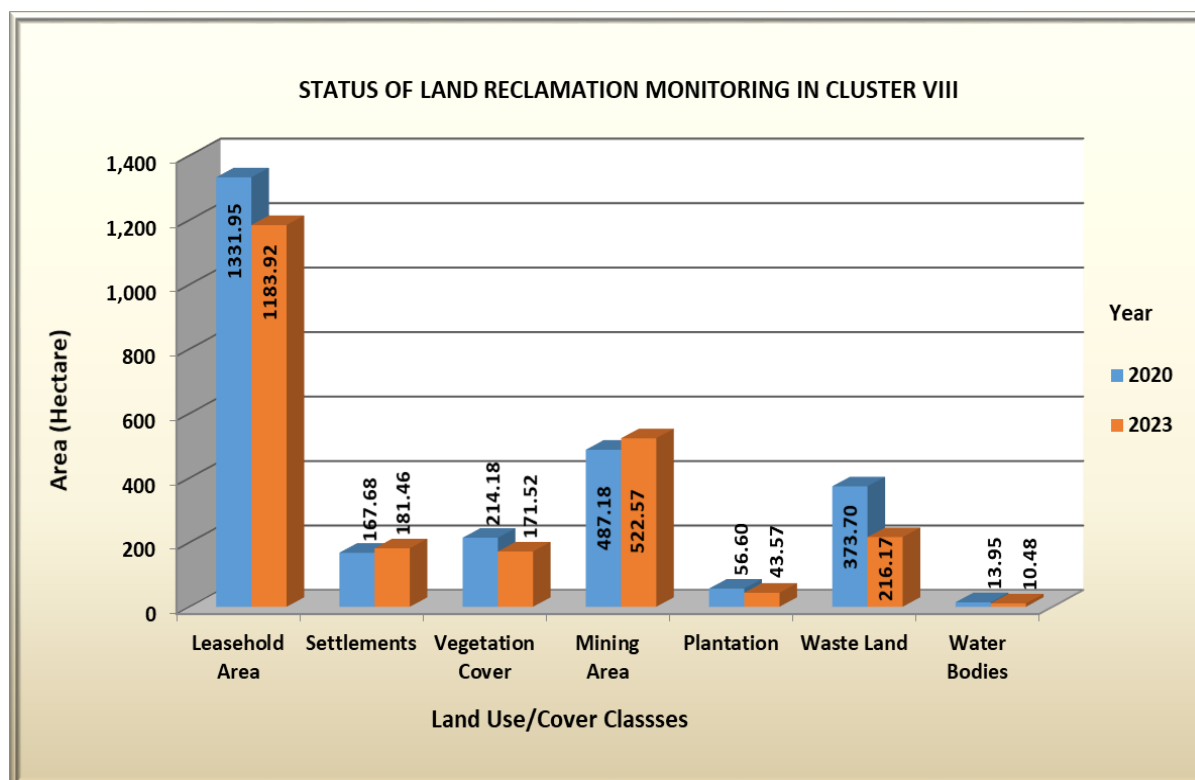


Figure- 8.4

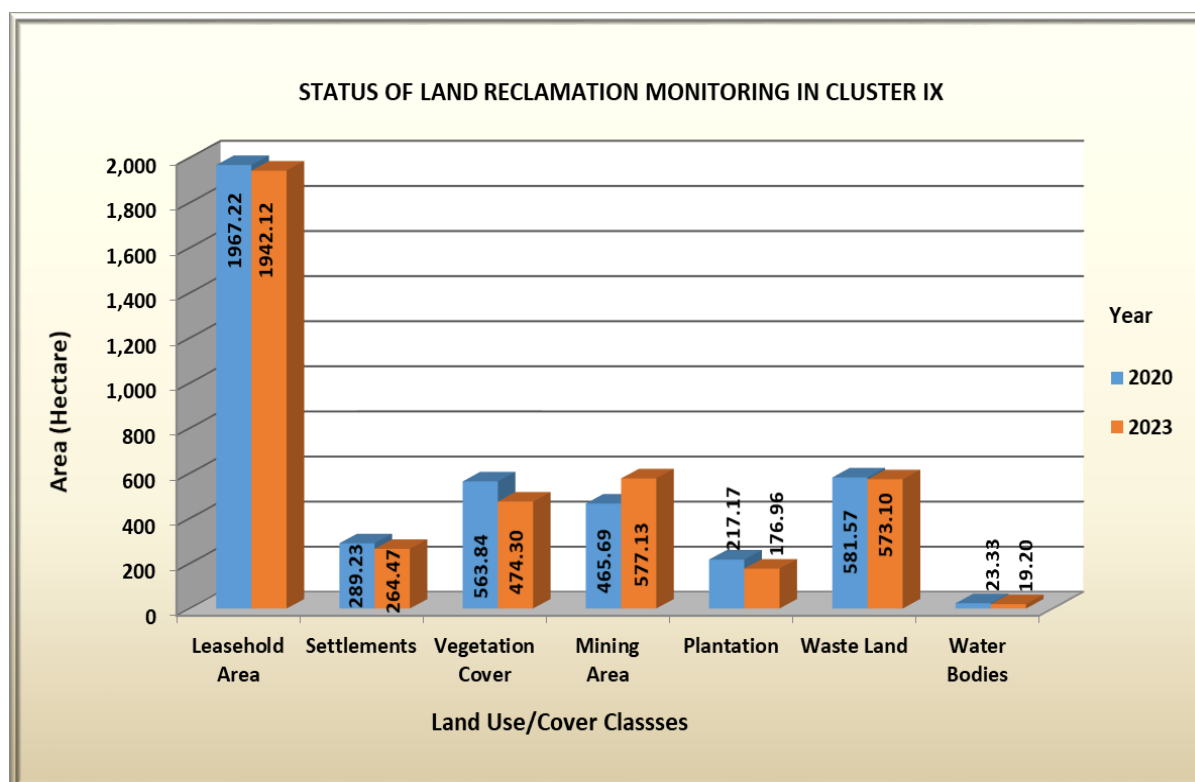


Figure- 8.5

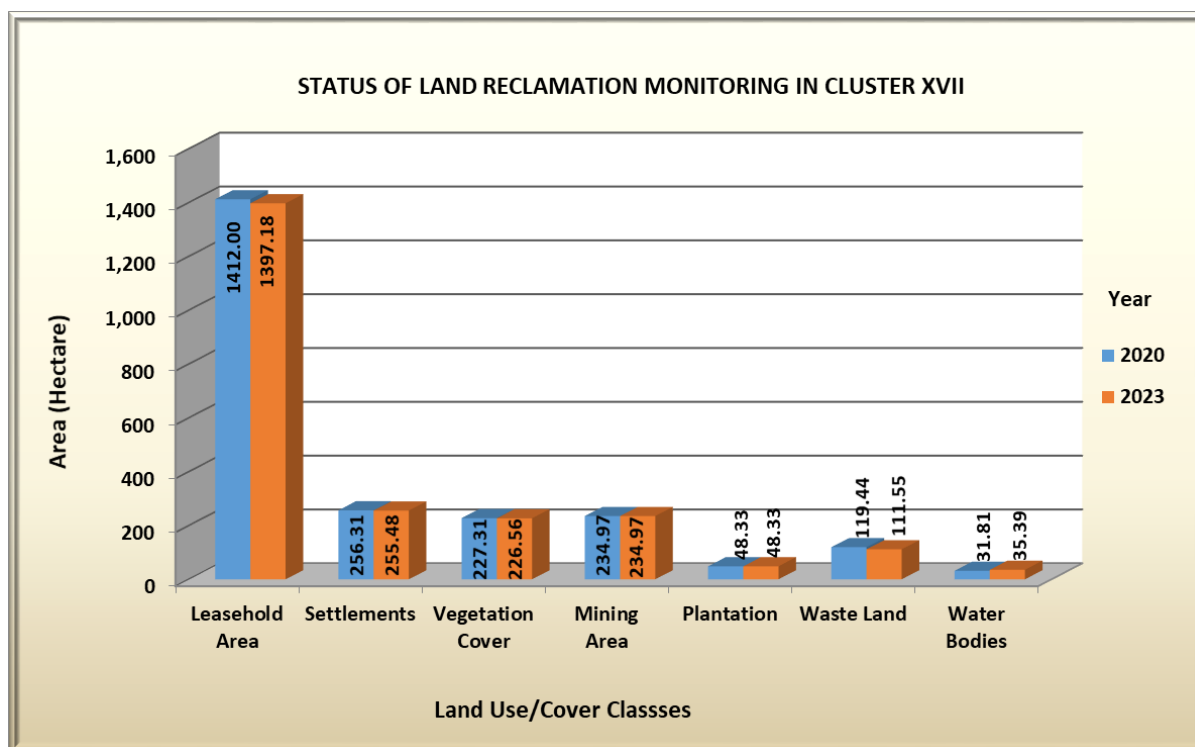


Figure- 8.6



Photograph 8.1: Plantation on OB dump, Cluster XVII



Photograph 8.2: Plantation on OB dump, Cluster III



Photograph 8.3: Plantation on OB dump, Cluster III



Photograph 8.4: Plantation on OB dump, Cluster V



Photograph 8.5: Plantation on OB dump, Cluster V



Photograph 8.6: Plantation on OB dump, Cluster V



Photograph 8.7: Plantation on OB Dump, Cluster VIII



Photograph 8.8: Plantation on OB Dump, Cluster VIII



Photograph 8.9: Ashok Vatika, Cluster VIII



Photograph 8.10: Plantation on OB Dump, Cluster IX

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 in the Raniganj Coalfield. Following four clusters of mines and three OC projects of Eastern Coalfields Ltd. have been taken up for land reclamation monitoring in 2023, on three years cycle basis. Some of the mines in these clusters are as given below.

- Cluster - I (Chapapur OC, Nirsa OC, Khudiya OC and Kapasara OC)
- Cluster - II (Rajpura OC, Kumardhubi UG & Barmuri OC)
- Cluster - III (Bonjehamari, Sangramgarh & Dabour – all UG & OC)
- Cluster -IV (Itapara OC, Gaurangdih & Begunia OC)

9.2 Project wise Land Reclamation status in SECL 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 2023 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 based on satellite data reveals that 426.73 ha. (57.16%) of area have come under reclamation in ECL, out of which 328.73 ha. (44.03%) is under backfilling (Technical Reclamation) and 98.00 ha. (13.13%) is under Plantation (Biological reclamation).

9.4 On comparing the status of land reclamation for the year 2023 with respect to the year 2020, it is seen from the analysis that the total area of land reclamation has increased from 336.81 ha (Yr. 2020) to 426.73 ha (Yr. 2023).

9.5 Area of total plantation area increased from 593.89ha (5.46%) in 2020 to 594.00 ha. in 2023, which is 5.34% of the total leasehold area of the four clusters.

-
- 9.6** Of the four clusters of ECL in 2023, Cluster-II tops with 78.38% reclamation followed by Cluster-I with 67.19% reclamation.
- 9.7** Of the three opencast mines of ECL in 2023, Mohanpur tops with 40.77% reclamation followed by Chitra East with 39.94% reclamation.

Table 9.2

Status of Land Reclamation in four Clusters and three OCPs of ECL based on Satellite Data of the Year 2020 & 2023

(Clusters of Mines producing less than 5 mcm of Coal + OB annually)

(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 OB Dumps		Social Forestry/ Auanue Plantation									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Cluster I	3692.00	3692.00	90.00	110.00	60.00	60.00	148.00	152.00	87	87.00	74.00	83.00	224.00	253.00	295.00	299.00	150.00	170.00
				40.18%	43.48%	26.79%	23.72%					33.04%	32.81%			7.99%	8.10%	66.96%	67.19%
2	Cluster II	1018.00	1018.00	48.00	50.00	35.00	37.00	17.00	19.00	37	37.00	29.00	24.00	112.00	111.00	89.00	93.00	83.00	87.00
				42.86%	45.05%	31.25%	33.33%					25.89%	21.62%			8.74%	9.14%	74.11%	78.38%
3	Cluster III	1628.00	1628.00	48	63.00	0.00	0.00	6.00	6.00	90	87.00	49.00	49.00	97.00	112.00	96.00	93.00	48.00	63.00
				49.48%	56.25%	0.00%	0.00%					50.52%	43.75%			5.90%	5.71%	49.48%	56.25%
4	Cluster IV	2721.00	2721.00	1.00	29.00	1.00	1.00	23.00	23.00	30.00	30.00	55.00	44.00	57.00	74.00	54.00	54.00	2.00	30.00
				1.75%	39.19%	1.75%	1.35%					96.49%	43.75%			1.98%	1.98%	3.51%	40.54%
2	Chitra East	714.00	714.00	31.81	47.13	0.00	0.00	14.90	14.90	27.99	27.00	77.74	70.86	109.55	117.99	42.89	41.90	31.81	47.13
				29.04%	39.94%	0.00%	0.00%					70.96%	60.06%			6.01%	5.87%	29.04%	39.94%
3	Mohanpur	164.91	397.00	22	29.60	0.00	0.00	11.00	12.50	6	0.60	18.00	43.00	40.00	72.60	17.00	13.10	22.00	29.60
				55.00%	40.77%	0.00%	0.00%					45.00%	59.23%			10.31%	3.30%	55.00%	40.77%
4	Hurra C	946.00	946.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.00	0.00	6.00	0.00	0.00	0.00	0.00
				0.00	0.00%	0.00	0.00%					0.00	59.23%			0.00	0.00%	0.00	0.00%
	TOTAL	10883.91	11116.00	240.81	328.73	96.00	98.00	219.90	227.40	277.99	268.60	302.74	319.86	639.55	746.59	593.89	594.00	336.81	426.73
				37.65%	44.03%	15.01%	13.13%					47.34%	42.84%			5.46%	5.34%	52.66%	57.16%

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

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

- 1 Leaseholds area as per the EC boundary
- 2 Area under **Biological Reclamation** includes Area under Plantation done on Backfill only
- 3 Area under **Technical Reclamation** includes Area under Backfilling only
- 4 Area under **Active Mining** includes Coal Quarry, Quarry filled with water & Advance Quarry Site, if any. Coal dump is excluded
- 5 Social Forestry and Plantation on External OB dumps are not included in Biological Reclamation, and are put under separate categories
- 6 (%) calculated in the above table is in respect of total excavated area only, except for "Total area under plantation" where % is in terms of leasehold area.

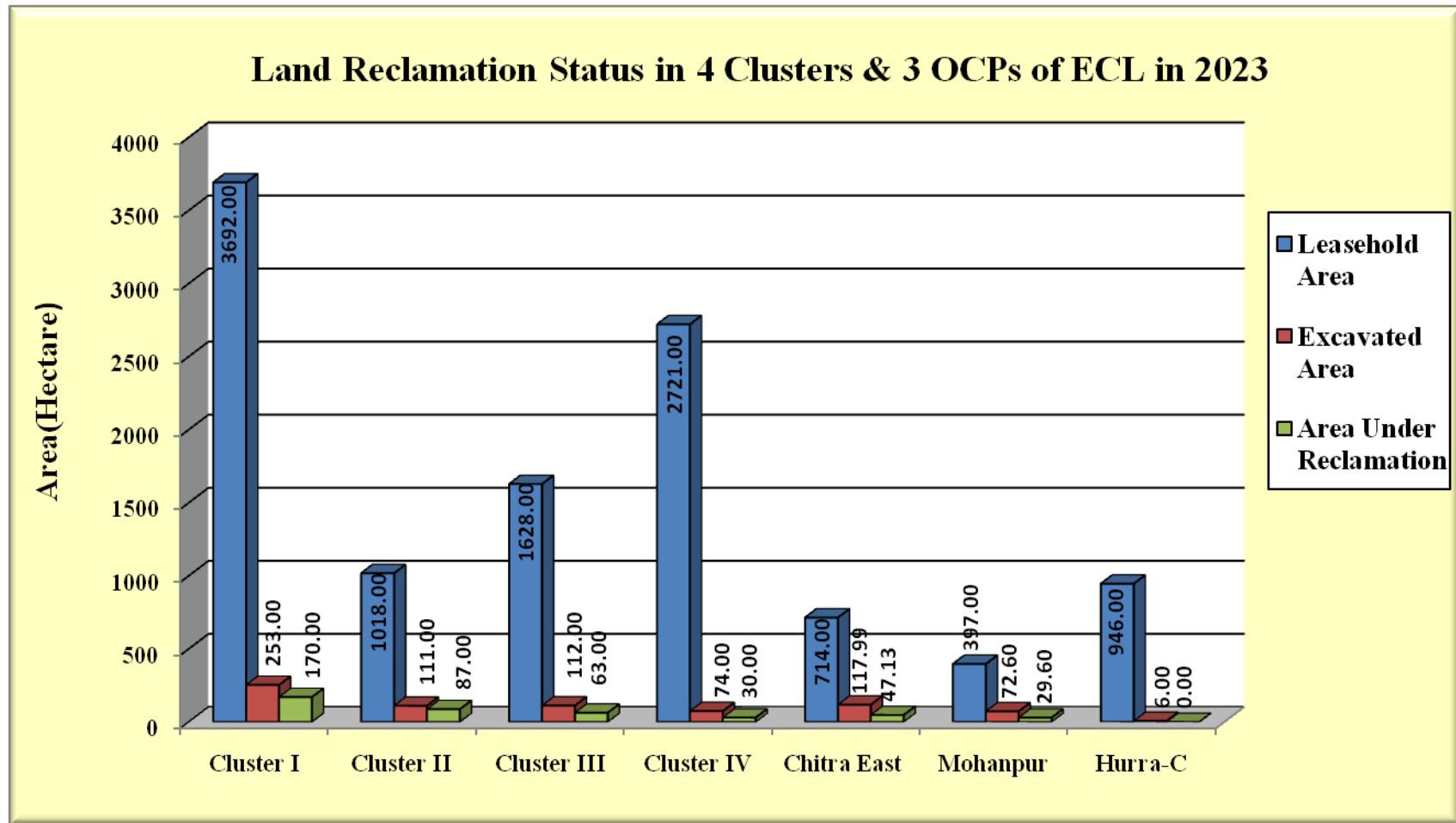
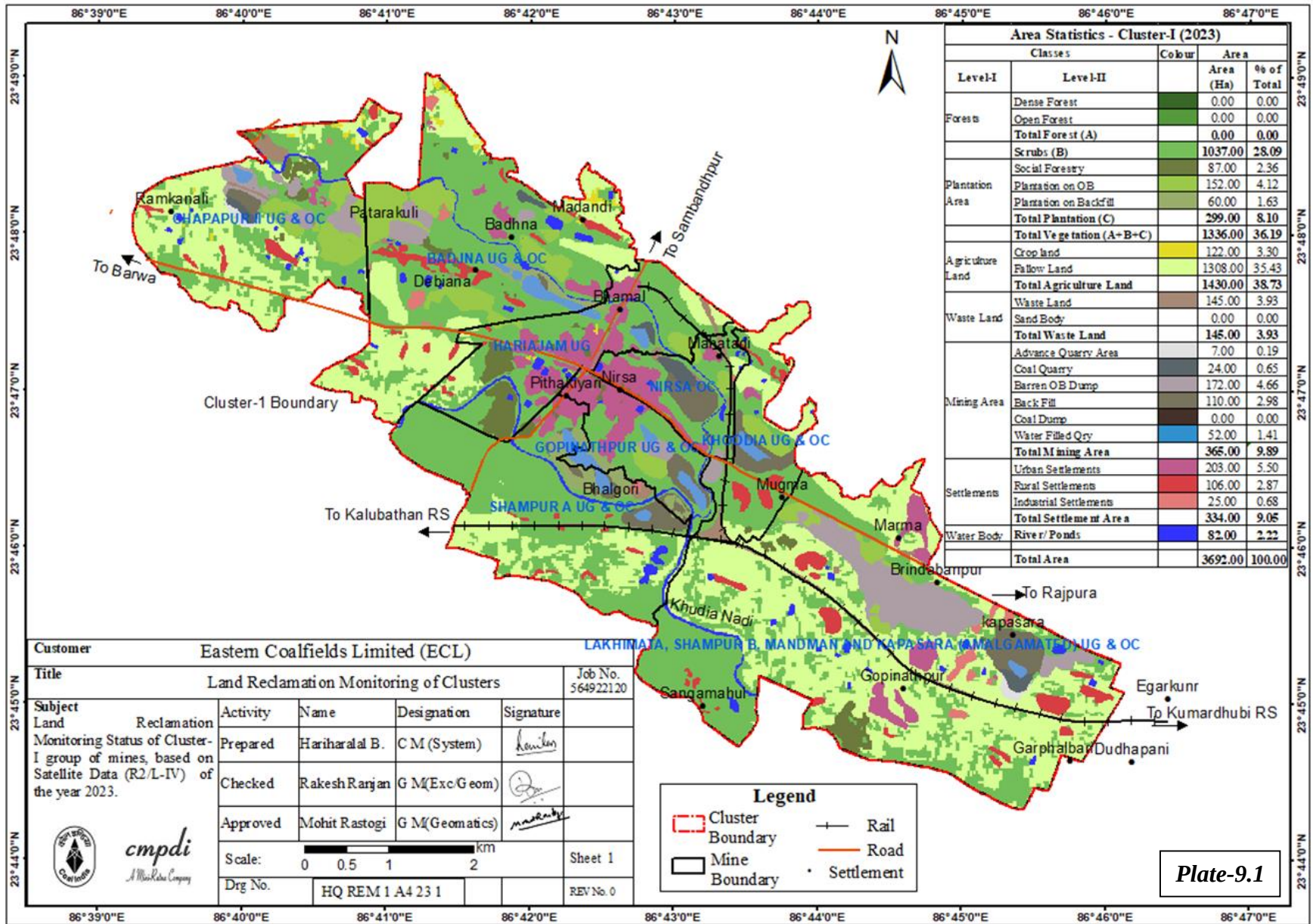
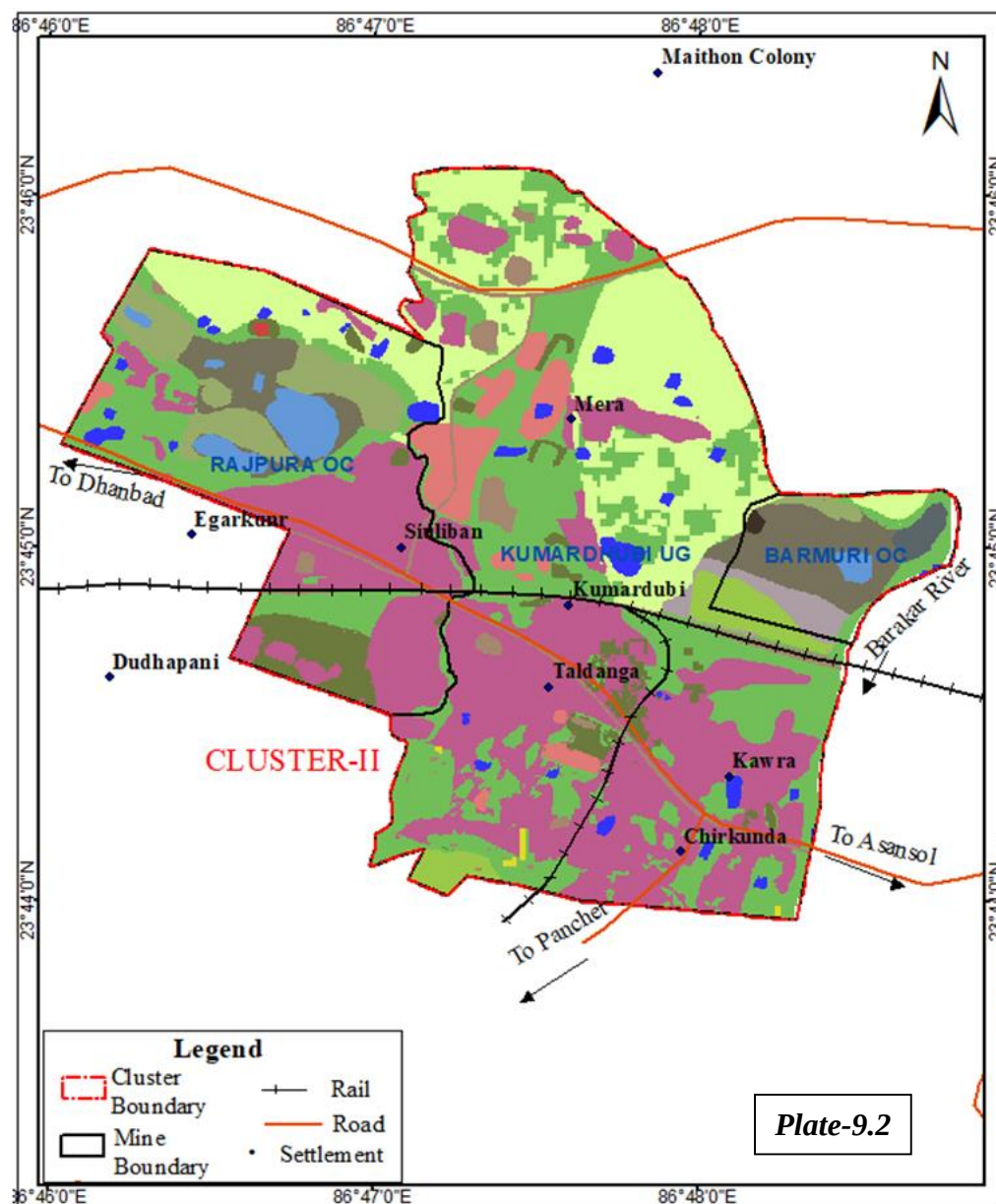


Figure 9.1: Cluster and project wise Land Reclamation Status based on satellite data of the year 2023

TABLE-9.2
CLUSTER/PROJECT WISE AREA STATISTICS OF LAND USE/ COVER CLASSES IN 4 CLUSTER
OF (OC+UG) MINES AND 3 OCPs OF ECL BASED ON SATELLITE DATA OF THE YEAR 2023

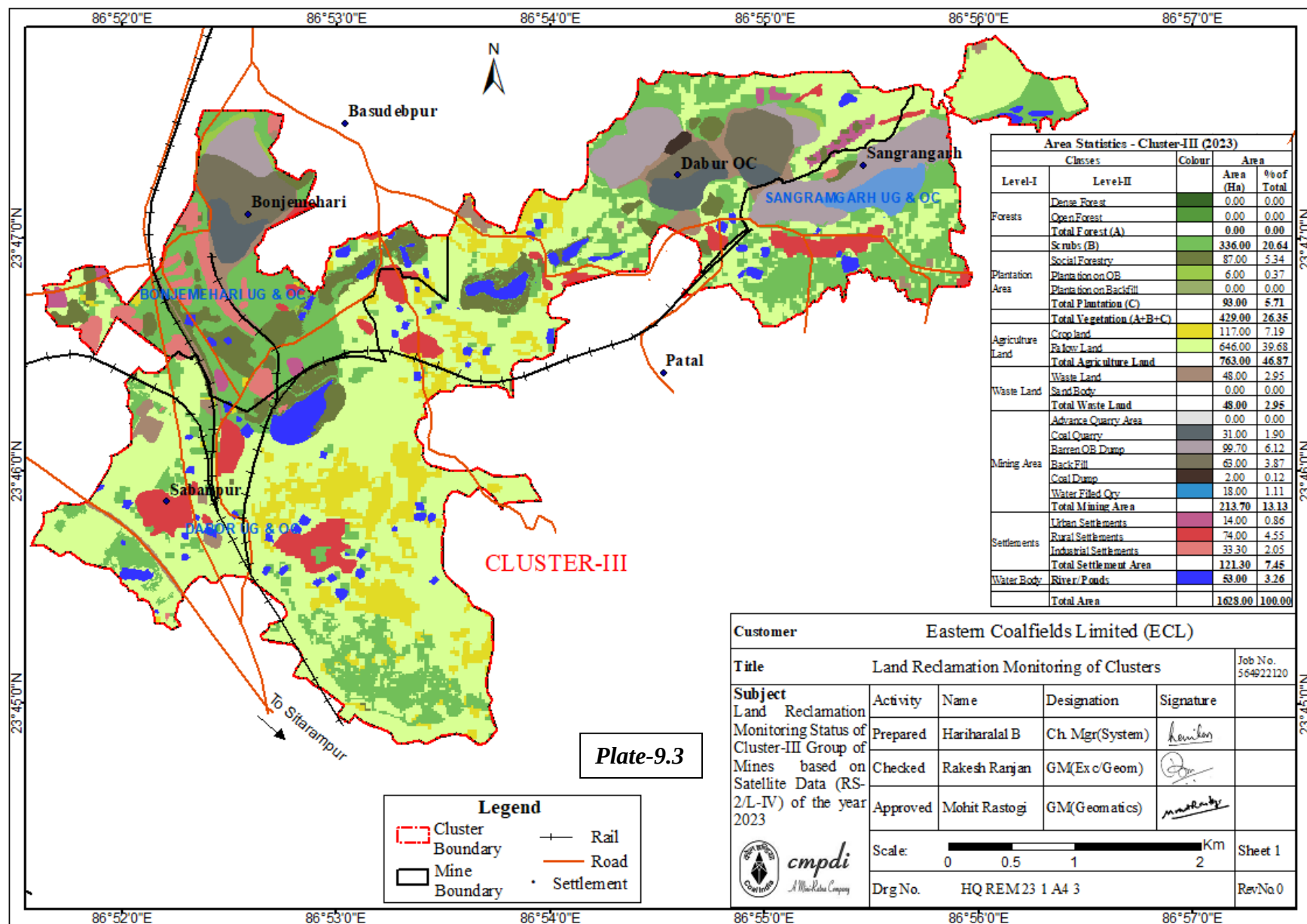
Cluster/ Project wise Area Statistics of Land Use/ Cover in 4 Clusters of (UG+OC) mines and 3 OCPs of ECL based on Satellite data of the Year 2023																		
(Area in Hectare)																		
			CLUSTER I		CLUSTER II		CLUSTER III		CLUSTER IV		CHITRA EAST		MOHANPUR		HURRA-C		TOTAL	
			Area	%	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	47.00	4.97	47.00	0.42
	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	330.00	34.88	346.96	3.12
	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	377.00	39.85	393.96	3.54
SCRUBS	Scrubs		1037.00	28.09	273.00	26.82	336.00	20.64	414.00	15.21	124.60	17.45	75.30	18.97	213.00	22.52	2472.90	22.25
	Social Forestry/Avenue Plantation		87.00	2.36	37.00	3.63	87.00	5.34	30.00	1.10	27.00	3.78	0.60	0.15	0.00	0.00	268.60	2.42
PLANTATION	Plantation on OB Dump		152.00	4.12	19.00	1.87	6.00	0.37	23.00	0.85	14.90	2.09	12.50	3.15	0.00	0.00	227.40	2.05
	Plantation on Backfill		60.00	1.63	37.00	3.63	0.00	0.00	1.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	98.00	0.88
	(Biological Reclamation)																	
	Total Plantation		299.00	8.10	93.00	9.14	93.00	5.71	54.00	1.98	41.90	5.87	13.10	3.30	0.00	0.00	594.00	5.34
	Total Vegetation		1336.00	36.19	366.00	35.95	429.00	26.35	468.00	17.20	183.46	25.69	88.40	22.27	590.00	62.37	3460.86	31.13
ACTIVE MINING	Coal Dump		0.00	0.00	1.00	0.10	2.00	0.12	1.00	0.04	8.08	1.13	1.00	0.25	0.00	0.00	13.08	0.12
	Coal Quarry		24.00	0.65	5.00	0.49	31.00	1.90	34.00	1.25	58.29	8.16	33.00	8.31	6.00	0.63	191.29	1.72
	Advance Quarry Site		7.00	0.19	0.00	0.00	0.00	0.00	2.00	0.07	7.04	0.99	9.00	2.27	0.00	0.00	25.04	0.23
	Quarry Filled With Water		52.00	1.41	19.00	1.87	18.00	1.11	8.00	0.29	5.53	0.77	1.00	0.25	0.00	0.00	103.53	0.93
	Total Area under Active Mining		83.00	2.25	24.00	2.36	49.00	3.01	44.00	1.62	70.86	9.92	43.00	10.83	6.00	0.63	319.86	2.88
	Barren OB Dump		172.00	4.66	11.00	1.08	99.70	6.12	77.00	2.83	58.50	8.19	64.30	16.20	9.00	0.95	491.50	4.42
RECLAIMED	Area Under Backfilling (Technical Reclamation)		110.00	2.98	50.00	4.91	63.00	3.87	29.00	1.07	47.13	6.60	29.60	7.46	0.00	0.00	328.73	2.96
	Total Area under Technical Reclamation		110.00	2.98	50.00	4.91	63.00	3.87	29.00	1.07	47.13	6.60	29.60	7.46	0.00	0.00	328.73	2.96
	Total Area under Mine Operation		365.00	9.89	86.00	8.45	213.70	13.13	151.00	5.55	184.57	25.85	137.90	34.74	15.00	1.59	1153.17	10.37
WASTELAND	Waste Lands		145.00	3.93	31.00	3.05	48.00	2.95	52.00	1.91	88.70	12.42	20.70	5.21	65.00	6.87	450.40	4.05
	Fly Ash Pond / Sand Body		0.00	0.00	1.00	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.00	0.01
	Total Wasteland		145.00	3.93	32.00	3.14	48.00	2.95	52.00	1.91	88.70	12.42	20.70	5.21	65.00	6.87	451.40	4.06
WATERBODIES	Reservoir, Nallah, Ponds		82.00	2.22	17.00	1.67	53.00	3.26	65.00	2.39	4.85	0.68	10.20	2.57	2.00	0.21	234.05	2.11
	Total Waterbodies		82.00	2.22	17.00	1.67	53.00	3.26	65.00	2.39	4.85	0.68	10.20	2.57	2.00	0.21	234.05	2.11
AGRICULTURE	Crop Lands		122.00	3.30	2.00	0.20	117.00	7.19	245.00	9.00	5.45	0.76	18.30	4.61	11.00	1.16	520.75	4.68
	Fallow Lands		1308.00	35.43	182.00	17.88	646.00	39.68	1602.00	58.88	222.85	31.21	120.20	30.28	255.00	26.96	4336.05	39.01
	Total Agriculture		1430.00	38.73	184.00	18.07	763.00	46.87	1847.00	67.88	228.30	31.97	138.50	34.89	266.00	28.12	4856.80	43.69
SETTLEMENTS	Urban Settlement		203.00	5.50	297.00	29.17	14.00	0.86	10.00	0.37	12.46	1.75	0.00	0.00	0.00	0.00	536.46	4.83
	Rural Settlement		106.00	2.87	3.00	0.29	74.00	4.55	122.00	4.48	7.07	0.99	0.60	0.15	8.00	0.85	320.67	2.88
	Industrial Settlement		25.00	0.68	33.00	3.24	33.30	2.05	6.00	0.22	4.59	0.64	0.70	0.18	0.00	0.00	102.59	0.92
	Total Settlements		334.00	9.05	333.00	32.71	121.30	7.45	138.00	5.07	24.12	3.38	1.30	0.33	8.00	0.85	959.72	8.63
	Grand Total		3692.00	100.00	1018.00	100.00	1628.00	100.00	2721.00	100.00	714.00	100.00	397.00	100.00	946.00	100.00	11116.00	100.00

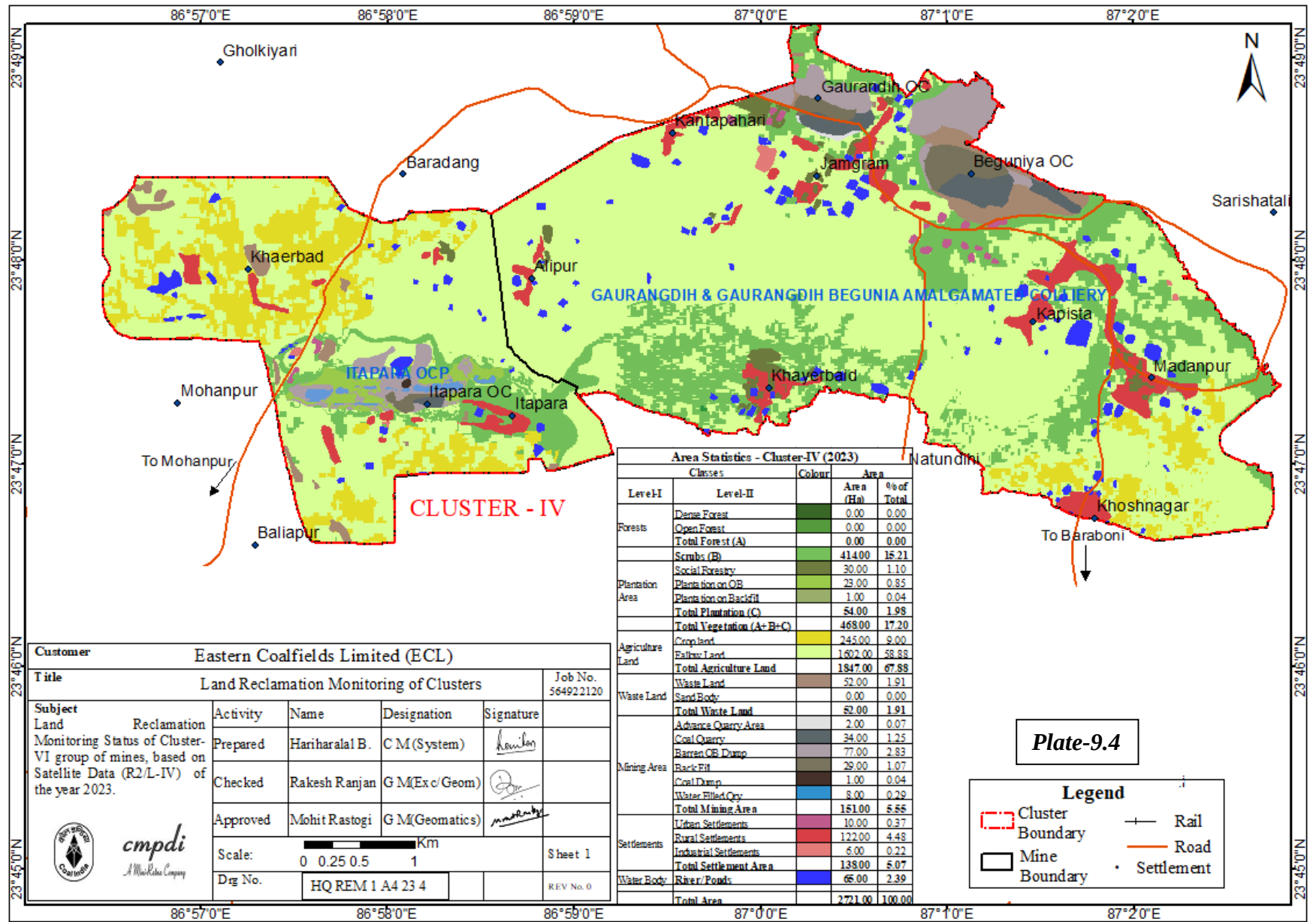




Area Statistics - Cluster-II (2023)				
Classes		Colour	Area	
Level-I	Level-II		Area (Ha)	% of Total
Forests	Dense Forest		0.00	0.00
	Open Forest		0.00	0.00
	Total Forest (A)		0.00	0.00
Plantation Area	Scrubs (B)		273.00	26.82
	Social Forestry		37.00	3.63
	Plantation on OB		20.00	1.96
	Plantation on Backfill		38.00	3.73
	Total Plantation (C)		95.00	9.33
	Total Vegetation (A+B+C)		368.00	36.15
Agriculture Land	Crop land		2.00	0.20
	Fallow Land		180.00	17.68
	Total Agriculture Land		182.00	17.88
Waste Land	Waste Land		31.00	3.05
	Sand Body		1.00	0.10
	Total Waste Land		32.00	3.14
Mining Area	Advance Quarry Area		0.00	0.00
	Coal Quarry		5.00	0.49
	Barren OB Dump		11.00	1.08
	Back Fill		50.00	4.91
	Coal Dump		1.00	0.10
	Water Filled Qry		19.00	1.87
	Total Mining Area		86.00	8.45
	Total Settlements		297.00	29.17
Settlements	Rural Settlements		3.00	0.29
	Industrial Settlements		33.00	3.24
	Total Settlement Area		333.00	32.71
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. 564922120
Subject Land Reclamation Monitoring Status of Cluster-II Group of Mines based on Satellite Data (RS-2/L-IV) of the year 2023	Activity	Name	Designation	Signature	
	Prepared	Harihar Lal B	Ch. Mgr(System)	<i>harilal</i>	
	Checked	Rakesh Ranjan	GM(Exc/Geom)	<i>Rakesh</i>	
	Approved	Mohit Rastogi	GM(Geomatics)	<i>mohit</i>	
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Drg No.		HQ REM 23 1 A 4 2			Rev.No.0





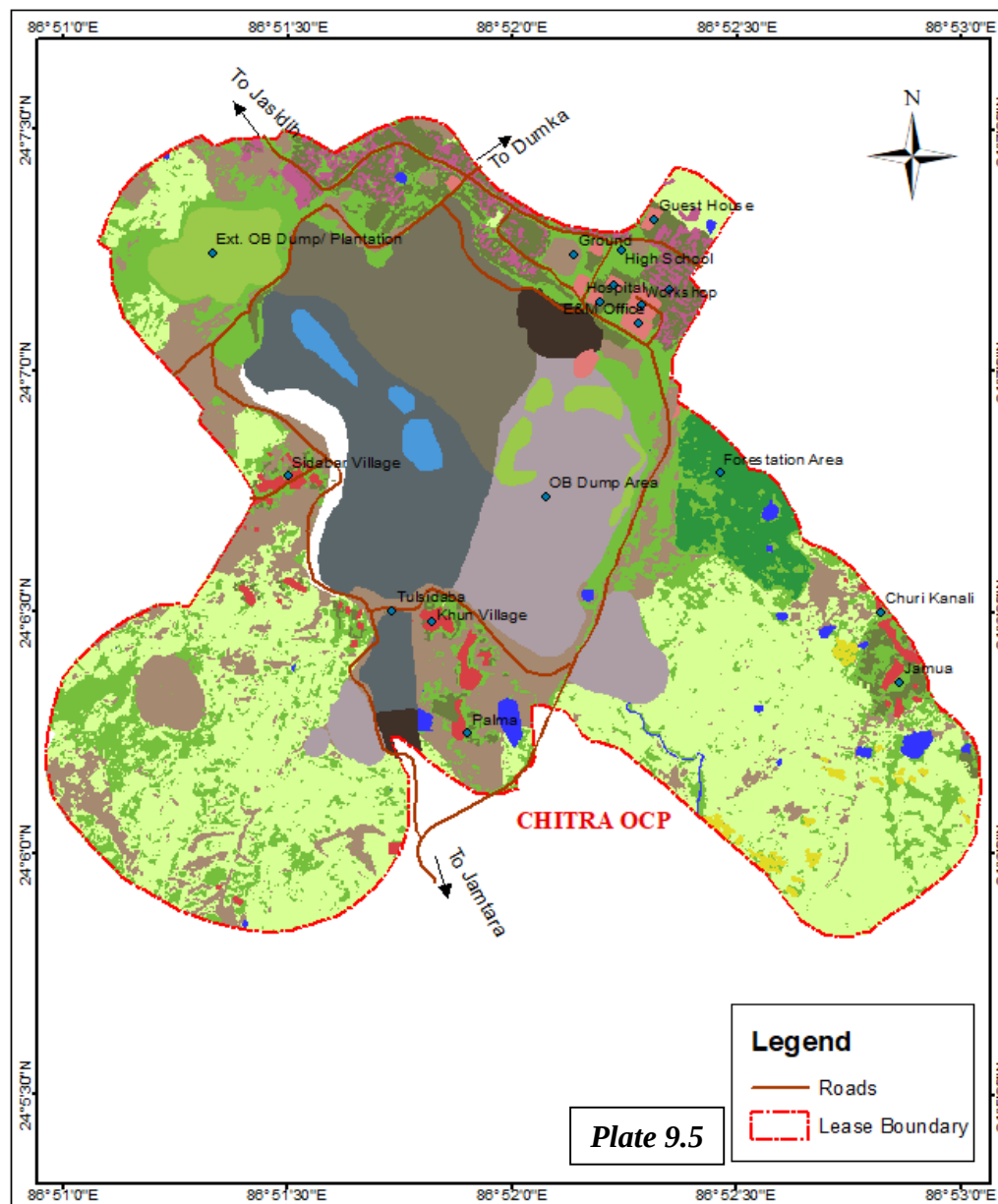
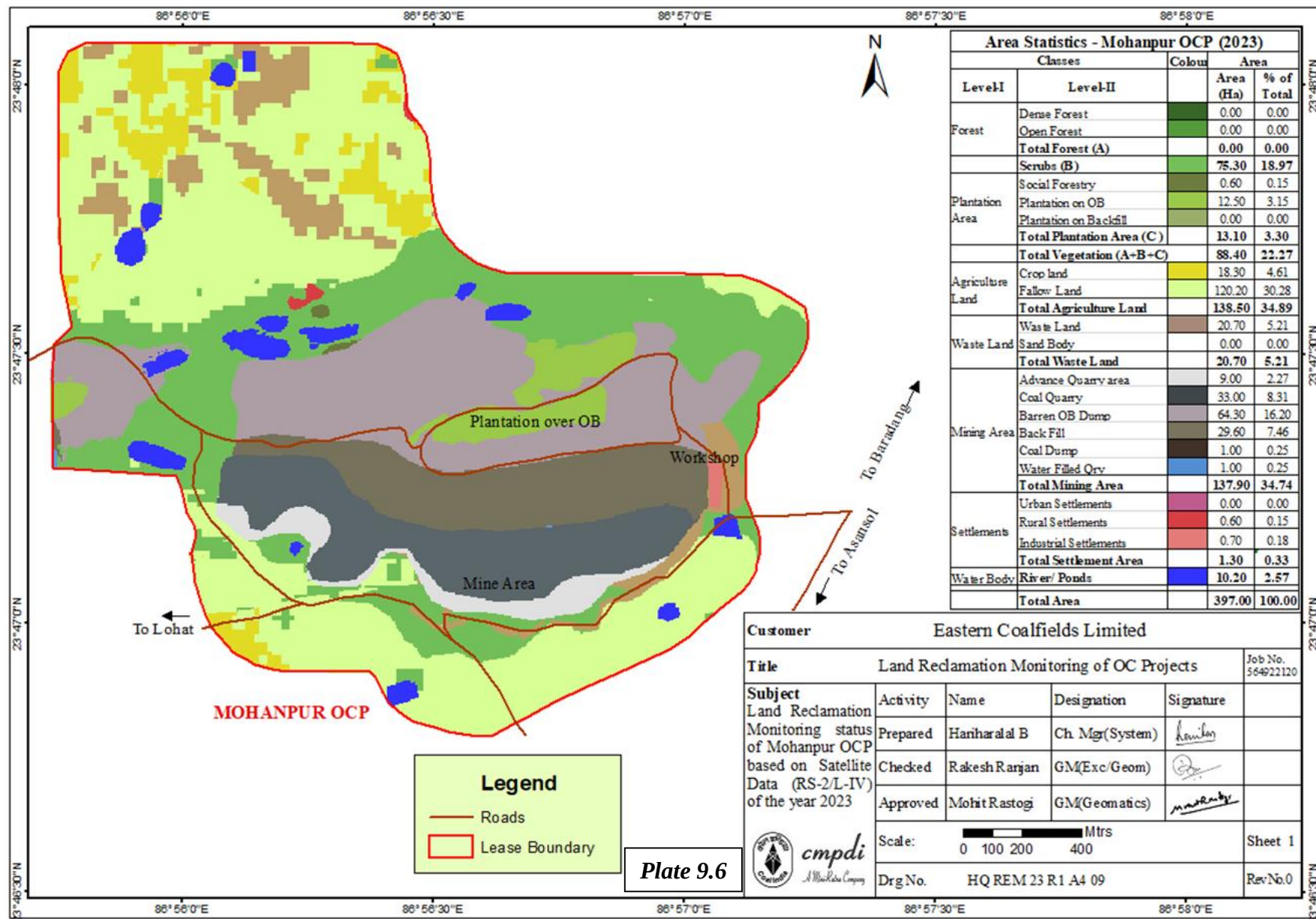


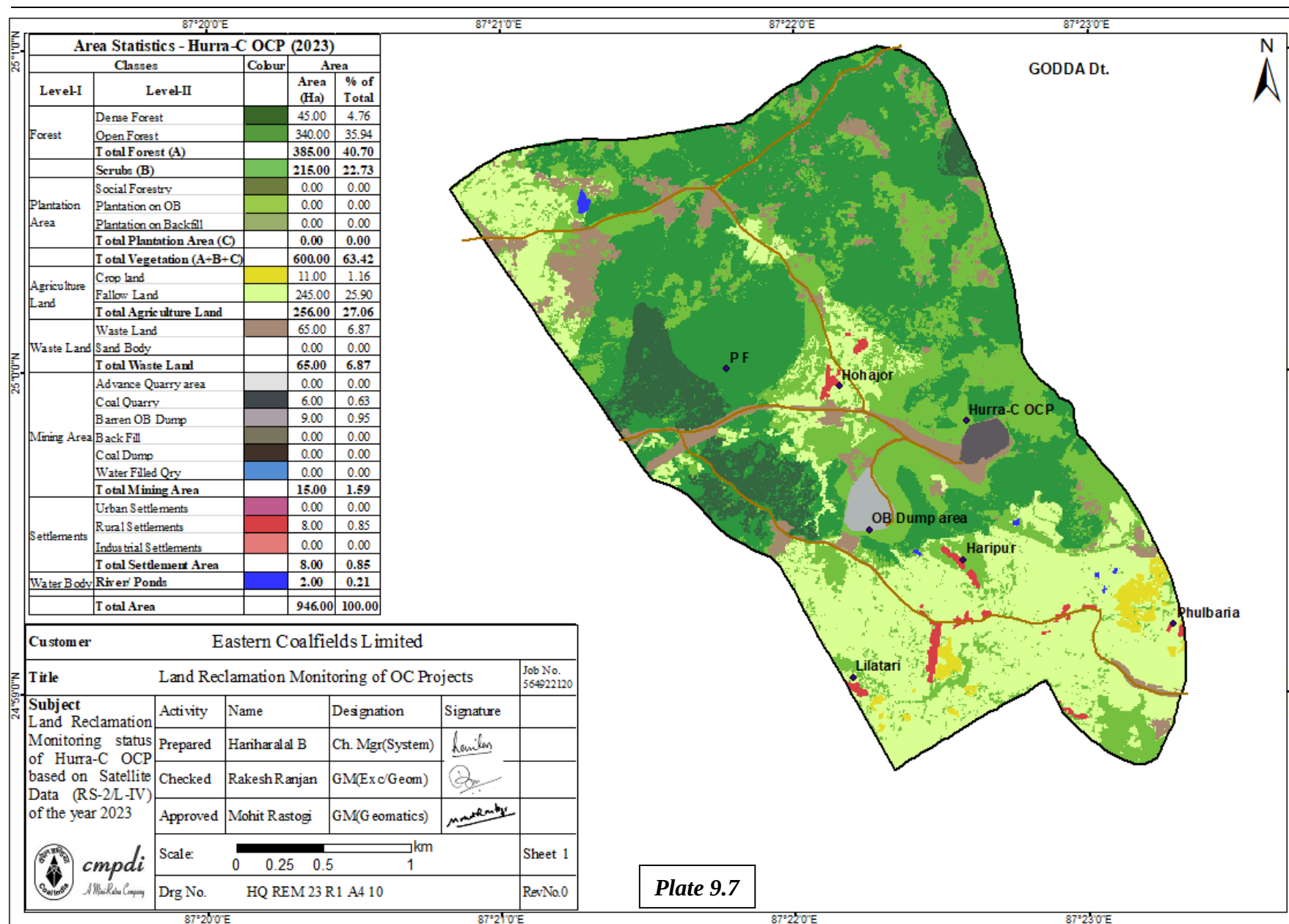
Plate 9.5

Area Statistics - Chitra East OCP (2023)

Level-I	Classes	Colour	Area	
			Area (Ha)	% of Total
Forest	Dense Forest		0.00	0.00
	Open Forest		16.96	2.38
	Total Forest (A)		16.96	2.38
	Scrubs (B)		124.60	17.45
Plantation Area	Social Forestry		27.00	3.78
	Plantation on OB		14.90	2.09
	Plantation on Backfill		0.00	0.00
	Total Plantation Area (C)		41.90	5.87
	Total Vegetation (A+B+C)		183.46	25.69
Agriculture Land	Cropland		5.45	0.76
	Fallow Land		222.85	31.21
	Total Agriculture Land		228.30	31.97
Waste Land	Waste Land		88.70	12.42
	Sand Body		0.00	0.00
	Total Waste Land		88.70	12.42
Mining Area	Advance Quarryarea		7.04	0.99
	Coal Quarry		58.29	8.16
	Barren OB Dump		58.50	8.19
	Back Fill		47.13	6.60
	Coal Dump		8.08	1.13
	Water Filled Ory		5.53	0.77
	Total Mining Area		184.57	25.85
Settlements	Urban Settlements		12.46	1.75
	Rural Settlements		7.07	0.99
	Industrial Settlements		4.59	0.64
	Total Settlement Area		24.12	3.38
Water Body	River/ Ponds		4.85	0.68
	Total Area		714.00	100.00

Customer Eastern Coalfields Limited				
Title Land Reclamation Monitoring of OC Projects				Job No. 564922120
Subject Land Reclamation Monitoring status of Chitra OCP based on Satellite Data (RS-2/L-IV) of the year 2023	Activity	Name	Designation	Signature
	Prepared	Hariharalal B	Ch. Mgr(System)	<i>[Signature]</i>
	Checked	Rakesh Ranjan	GM(Ex c/Geom)	<i>[Signature]</i>
	Approved	Mohit Rastogi	GM(Geomatics)	<i>[Signature]</i>
Scale: 0 0.25 0.5 1 km				Sheet 1
Drg No. HQ REM23 R1 A4 08				Rev.No.0





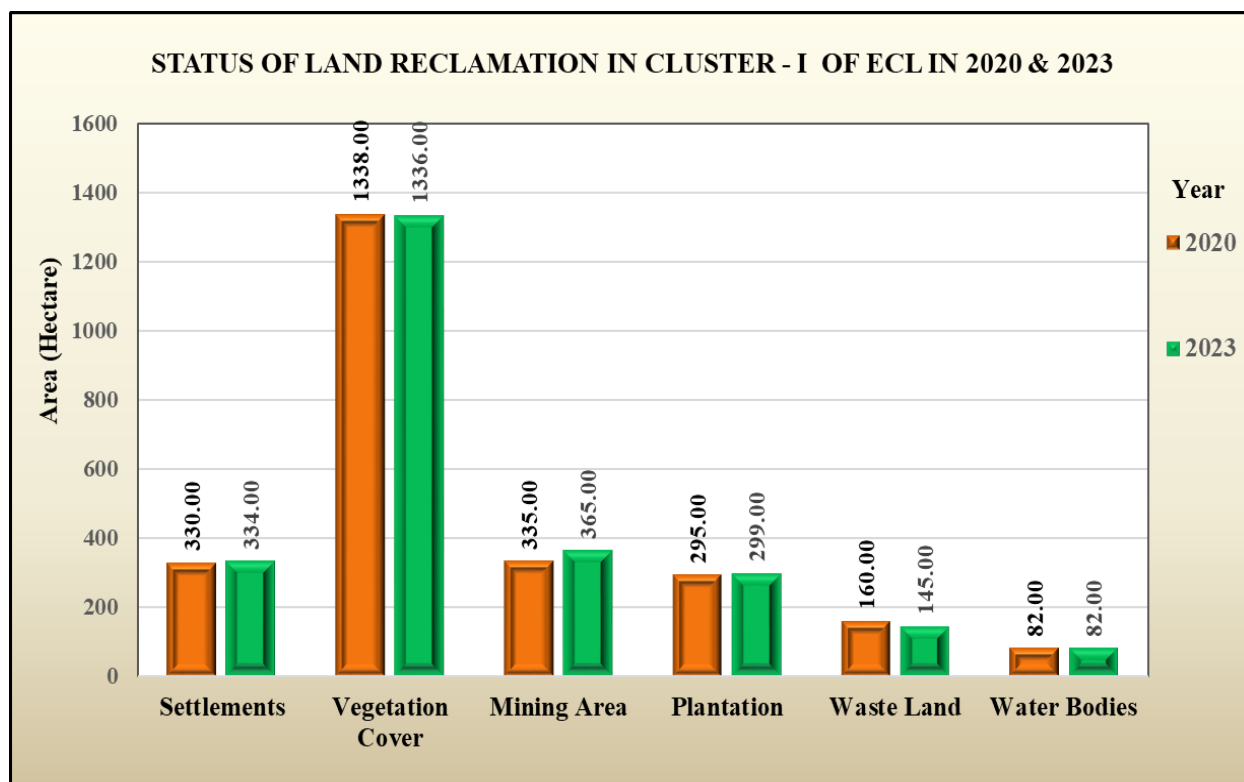


Figure- 9.2: Bar-Chart of Land Reclamation Status in Cluster I

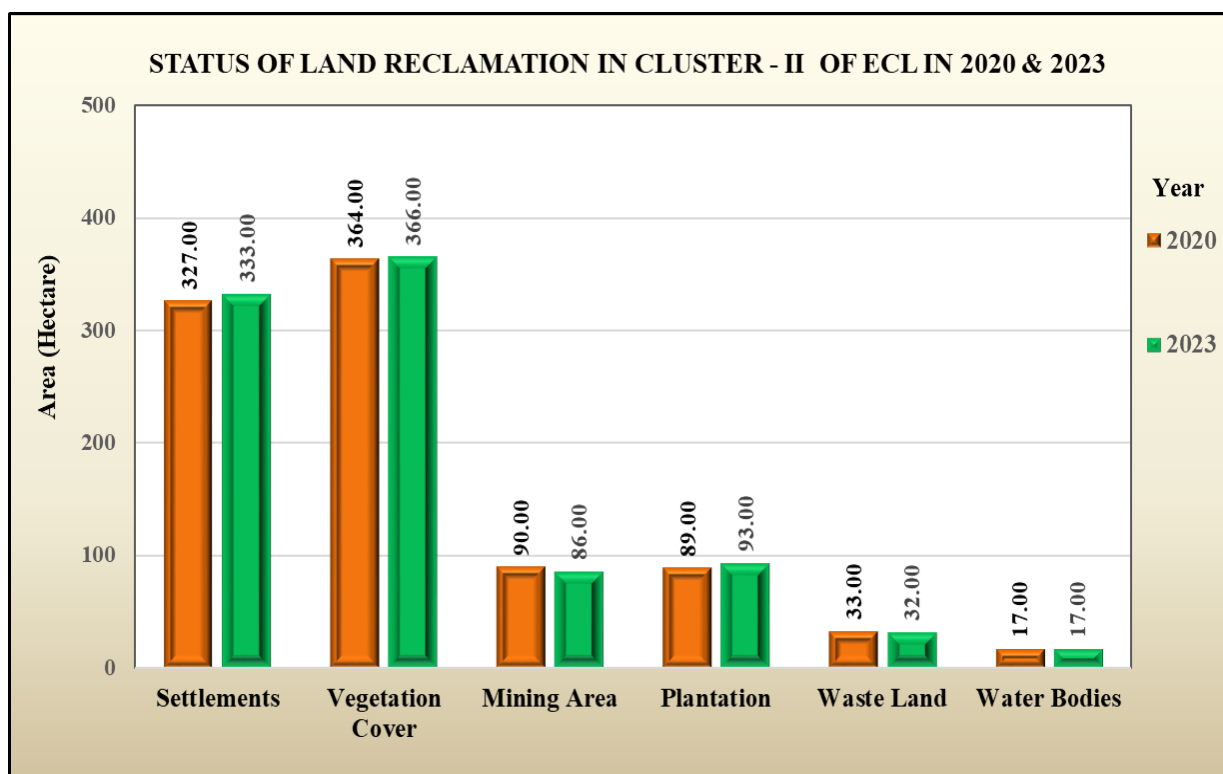


Figure- 9.3: Bar-Chart of Land Reclamation Status in Cluster II

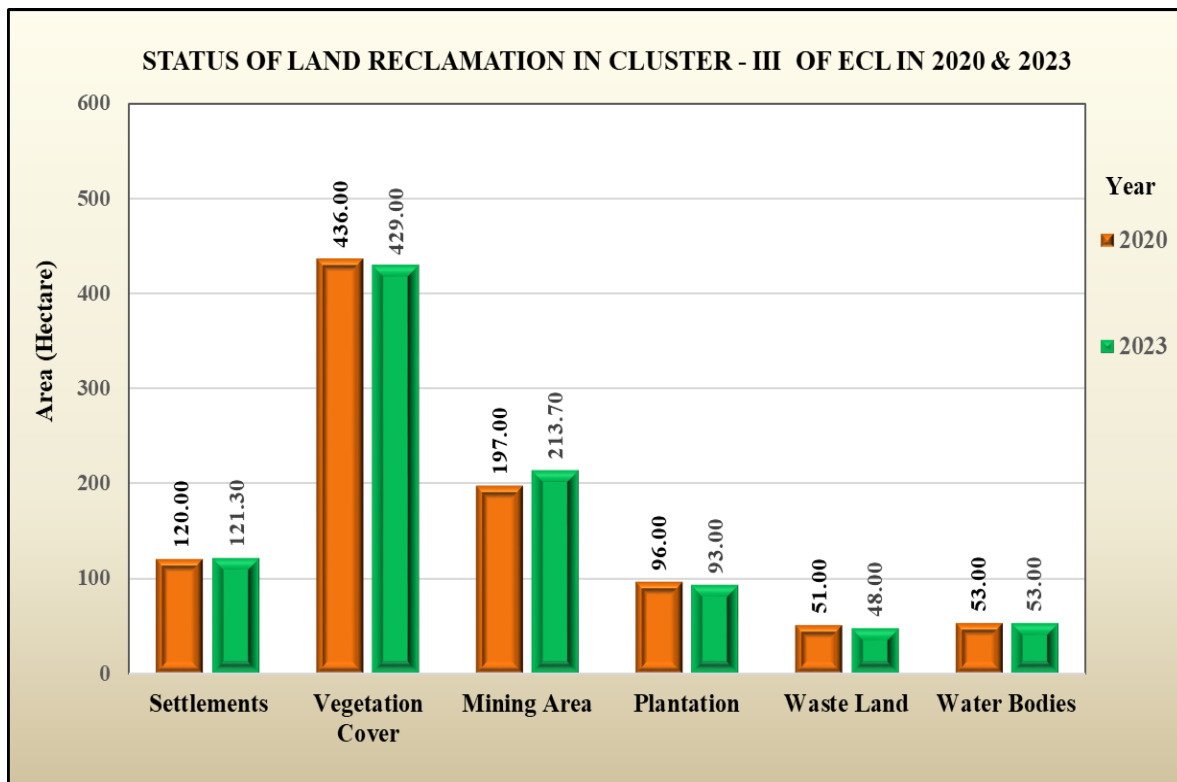


Figure- 9.4: Bar-Chart of Land Reclamation Status in Cluster III

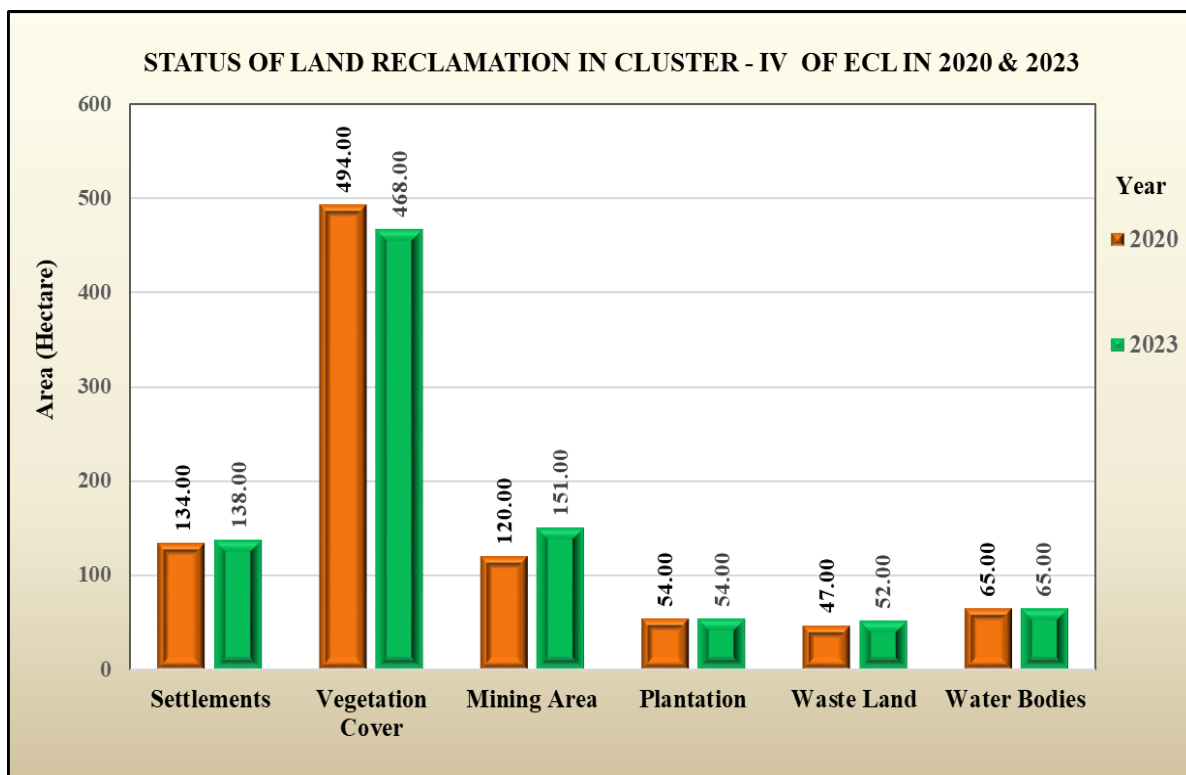


Figure- 9.5: Bar-Chart of Land Reclamation Status in Cluster IV

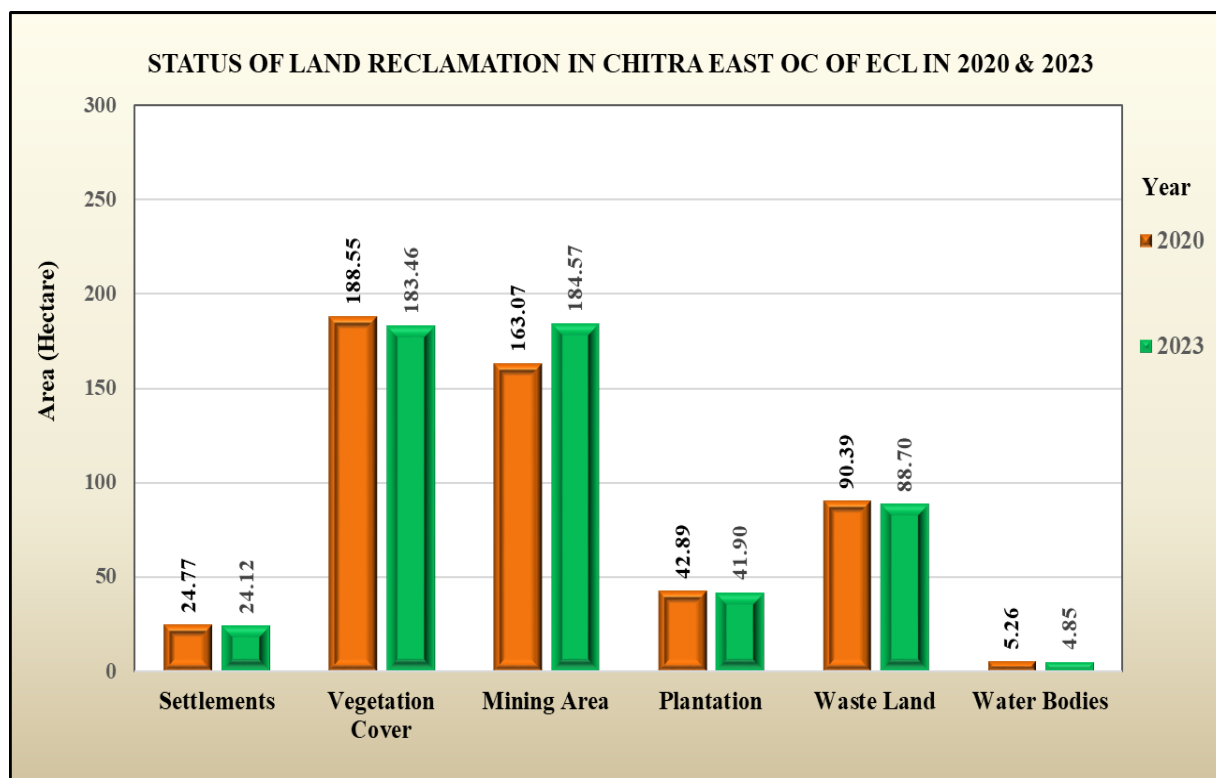


Figure- 9.6: Bar-Chart of Land Reclamation Status in Chitra East OC

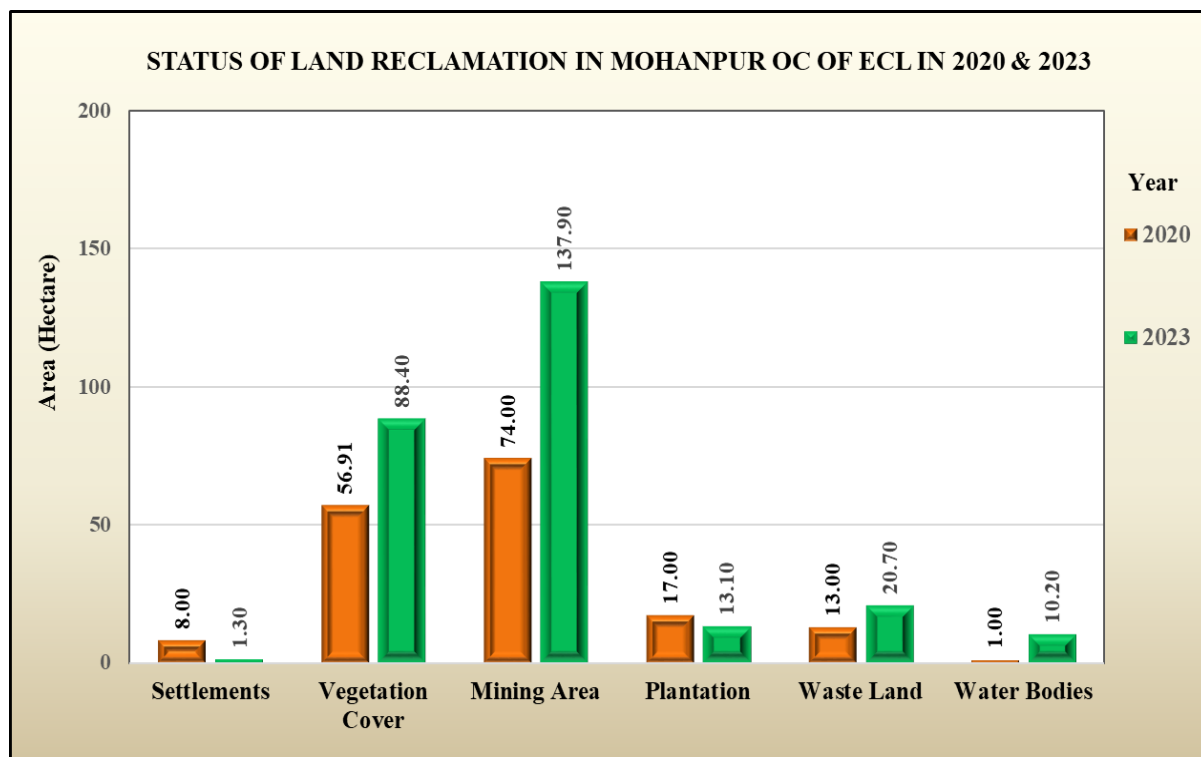


Figure- 9.7: Bar-Chart of Land Reclamation Status in Mohanpur OC

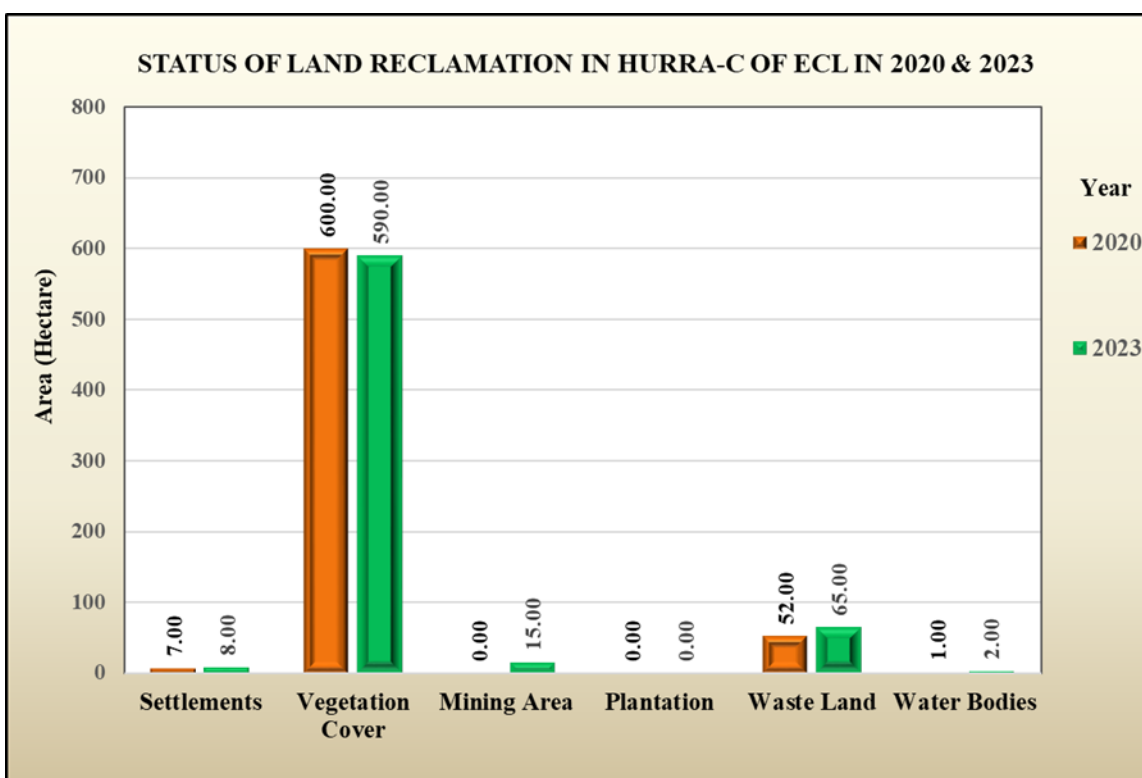


Figure- 9.8: Bar-Chart of Land Reclamation Status in Hurra-C OC



Photo 9.1: Plantation on backfilled area in Gopinathpur OCP, Cluster-I, ECL



Photo 9.2: Plantation on backfilled area in Shampur-A OC, Cluster-I, ECL



Photo 9.3: Plantation on OB dump area in Khoodia OC, Cluster-I, ECL

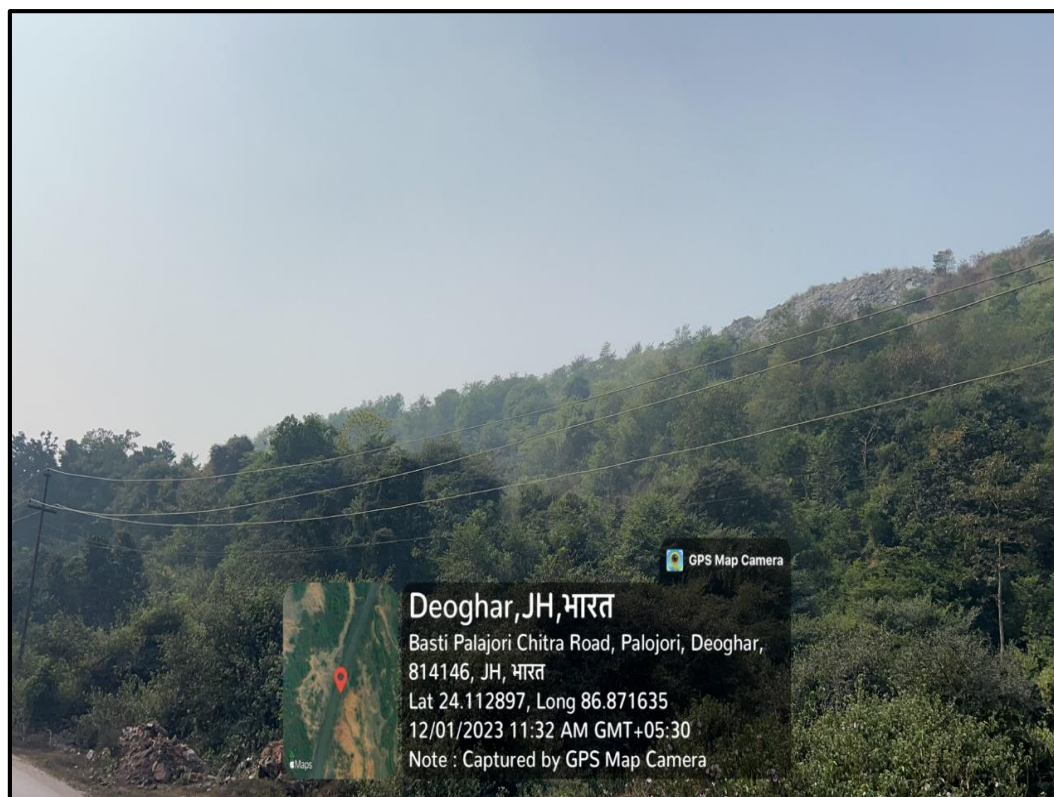


Photo 9.4: Plantation on external OB in Chitra East OC, ECL

MAHANADI COALFIELDS LIMITED

10.0 Land Reclamation Status in Mahanadi Coalfields Limited

10.1 Following 4 OC & 3 UG projects producing less than 5 million m³ (Coal + OB) per annum of Mahanadi Coalfields Ltd. have been taken up for land reclamation monitoring based on Satellite data during the year 2023-24:

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

10.2 Area statistics of different land use classes present in OC & UG projects in the year 2023 is given in Table-2. Land use maps derived from the satellite data is given in Plate no. 10.1 to 10.7. Land use status of above OC as well as UG mines are shown in Fig. 10.2 – 10.8 and field photographs showing plantation on backfilled area in mining projects are shown in photos. 10.1 -10.8.

10.3 Study reveals that 300.10 Ha (91.55%) of excavated area has already been put under reclamation by MCL, out of which 230.82 Ha (70.41%) area has been planted and 69.28 Ha (21.13%) area is under backfilling.

10.4 It is important to mention here that the leasehold boundary of Nandira UGP is updated as per EC. This updation of EC boundary has resulted in a decrease in area under social forestry due to decrease in leasehold area.

10.5 After analyzing the satellite data of year 2020 vs. 2023 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 and UG mines of MCL has increased from 308.30 Ha (Yr 2020) to 311.80 Ha (Yr 2023). This increase of 3.50 Ha plantation area in three years is due to increase in biological reclamation in Chhendipada OC.

- 10.6** In Chhendipada OCP, total area under plantation increased from 9.37 Ha. (Yr 2020) to 15.71 Ha (Yr 2023) which indicate that MCL is committed for reclamation of mined land for maintaining the ecological balance in the region.
- 10.7** 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 of 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. (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 2023 has been carried out under more than 5 mcm category.
- 10.8** 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 next cycle of three years.
- 10.9** The area under total plantation (Green Cover) is maximum in Chhendipada OC (64.65%) followed by Balanda OC with (57.48%) and Lilari OC with (25.25%).
- 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 2023.

Table-10.1
LAND RECLAMATION STATUS IN 4 OC and 3 UG MINES OF MCL BASED ON SATELLITE DATA OF THE YEAR 2023

(PROJECT PRODUCING LESS THAN 5M.CM (COAL+OB) ANUALLY)

(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 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)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Lilari OC	201.00	201.00	35.97	35.97	24.80	24.80	23.85	23.42	2.53	2.53	5.52	5.52	66.29	66.29	51.18	50.75	60.77	60.77
				54.26%	54.26%	37.41%	37.41%					8.33%	8.33%			25.46%	25.25%	91.67%	91.67%
2	Orient 1&2 UG	1144.28	1144.28	0.00	0.00	0.00	0.00	0.00	0.00	21.73	21.73	0.00	0.00	0.00	0.00	21.73	21.73	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			1.90%	1.90%	0.00%	0.00%
3	Orient 3 UG	981.84	981.84	0.00	0.00	0.00	0.00	0.00	0.00	18.31	18.31	0.00	0.00	0.00	0.00	18.31	18.31	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			1.86%	1.86%	0.00%	0.00%
4	Nandira UG	474.00	370.00	0.00	0.00	0.00	0.00	0.00	0.00	4.15	3.42	0.00	0.00	0.00	0.00	4.15	3.42	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					0.00%	0.00%			0.88%	0.92%	0.00%	0.00%
5	Balanda OC	351.22	351.22	31.11	32.79	196.90	195.22	0.00	0.00	6.66	6.66	18.21	18.21	246.22	246.22	203.56	201.88	228.01	228.01
				12.64%	13.32%	79.97%	79.29%					7.40%	7.40%			57.96%	57.48%	92.60%	92.60%
6	Chhendipada OC	24.30	24.30	6.86	0.52	4.46	10.80	2.84	2.84	2.07	2.07	3.97	3.97	15.29	15.29	9.37	15.71	11.32	11.32
				44.87%	3.40%	29.17%	70.63%					25.96%	25.96%			38.56%	64.65%	74.04%	74.04%
7	Subhadra OC	1111.85	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	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	4288.49	4184.49	73.94	69.28	226.16	230.82	26.69	26.26	55.45	54.72	27.70	27.70	327.80	327.80	308.30	311.80	300.10	300.10
				22.56%	21.13%	68.99%	70.41%					8.45%	8.45%			7.19%	7.45%	91.55%	91.55%

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

Note: In reference to above table different parameters as 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 Backfill 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 above Table.
5. (%) calculated in above Table is in respect to Total Excavated area except for " Total Area under plantation " where % is in terms of "Leasehold Area ".

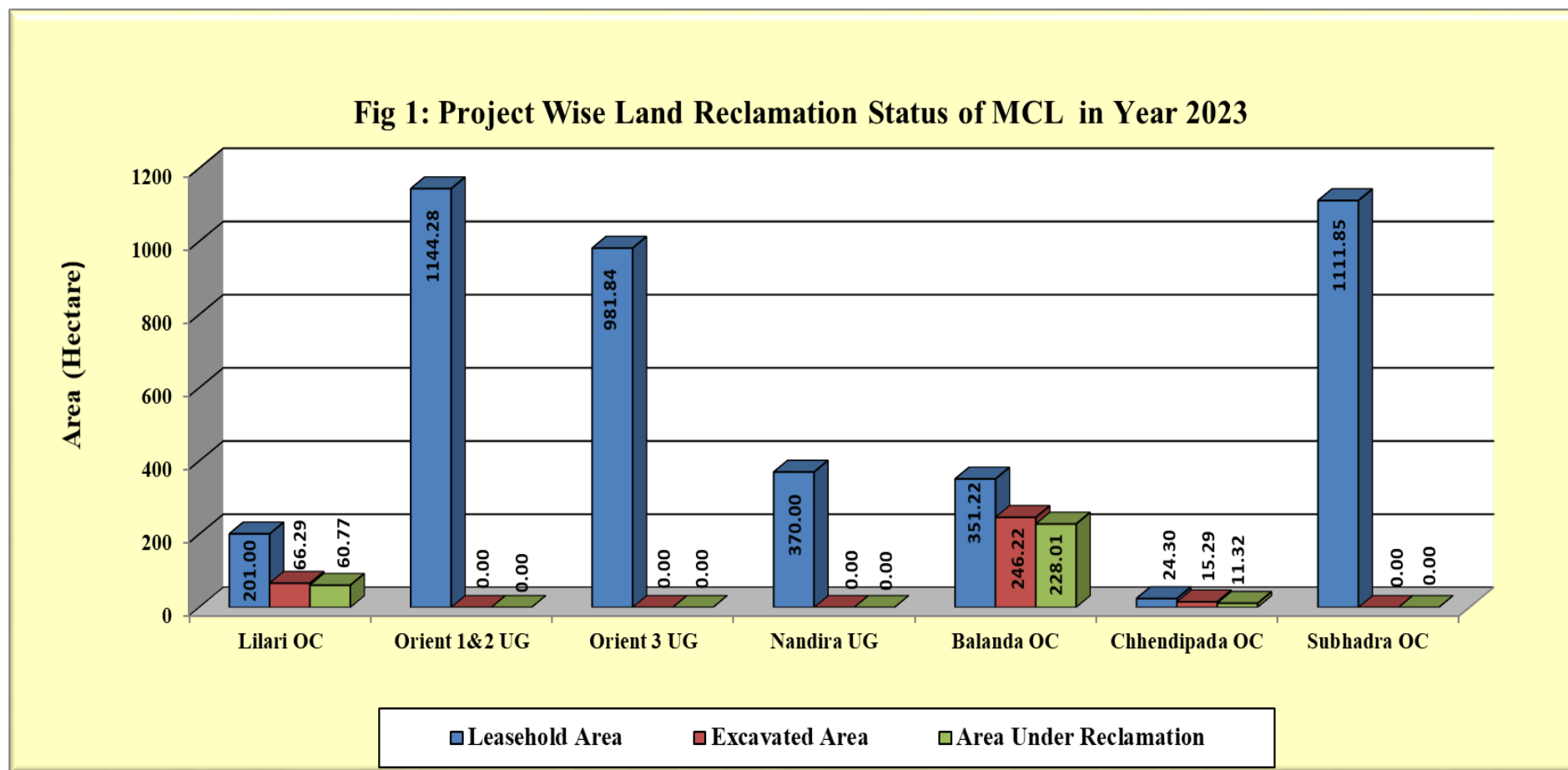
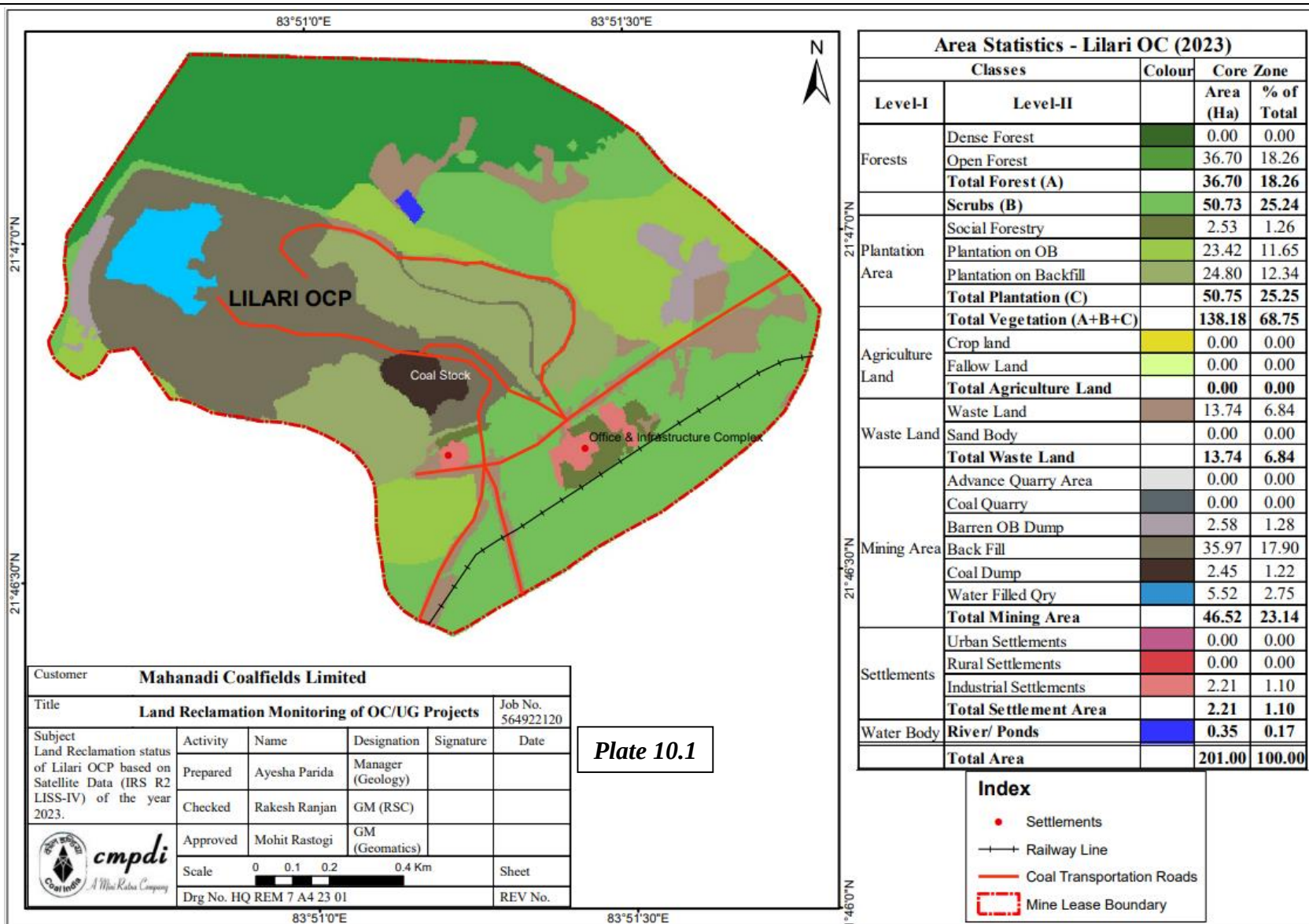


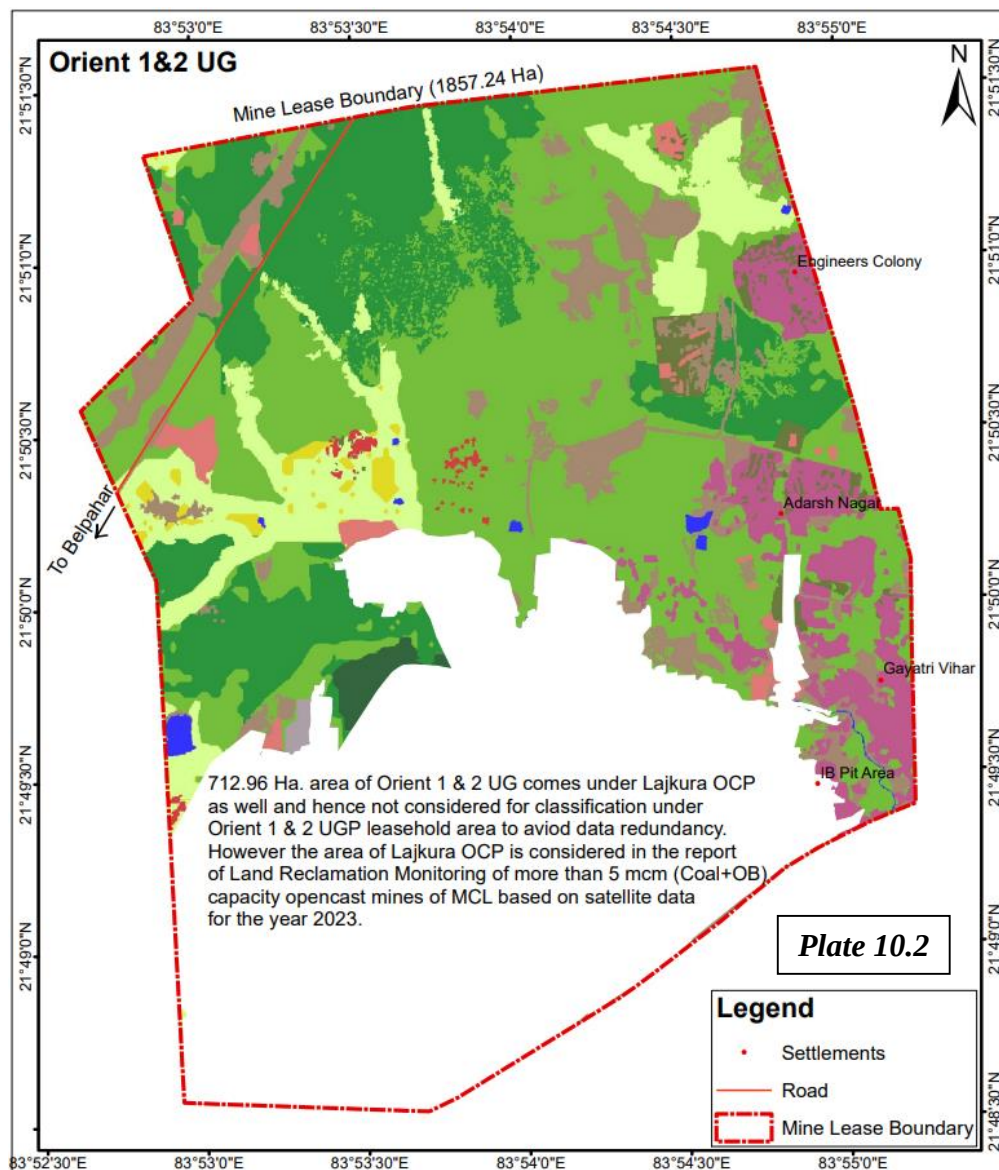
Fig. 10.1: Status of Land Reclamation in 4 OC and 3 UG mines based on Satellite data of the year 2023

Table 10.2: Area Statistics of Land use/cover Classes in Mines of MCL based on Satellite Data of the Year 2023
(Area in Ha.)

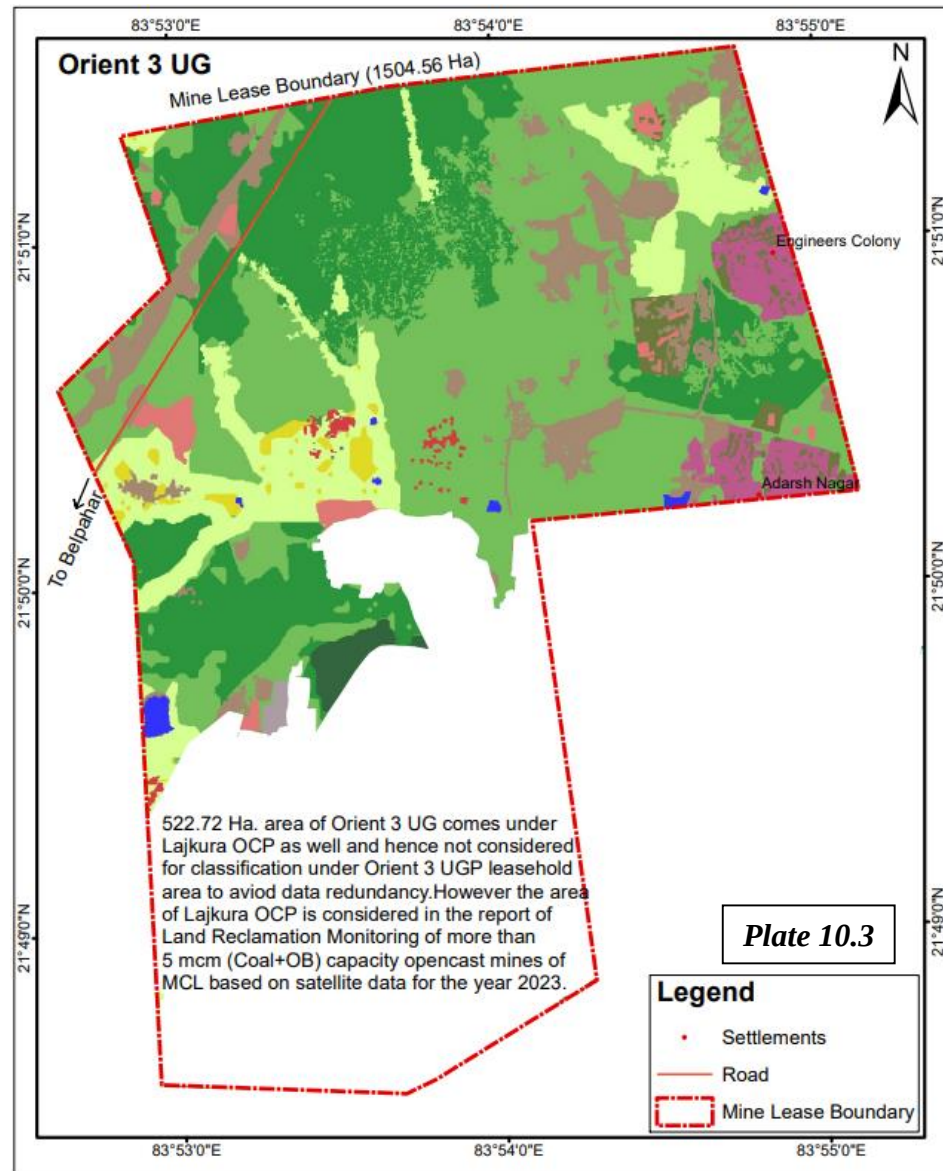
	Land Use Cover Classes	Color Code	Lilari OC		Orient 1&2 UG		Orient 1&2 UG without Lajkura OCP common area*		Orient 3 UG		Orient 3 UG without Lajkura OCP common area**		Nandira UG		Balanda OC		Chhendipada OC		Subhadra OC		TOTAL	
			Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%	Area	%
FORESTS	Dense Forest		0.00	0.00	59.63	3.21	10.95	0.96	58.89	3.91	10.28	1.05	153.19	41.40	0.00	0.00	1.57	6.46	0.00	0.00	273.28	5.04
	Open Forest		36.70	18.26	307.53	16.56	255.99	22.37	307.59	20.44	256.11	26.08	149.18	40.32	0.00	0.00	0.00	0.00	62.31	5.60	863.31	15.93
	Total Forest		36.70	18.26	367.16	19.77	266.94	23.33	366.48	24.36	266.39	27.13	302.37	81.72	0.00	0.00	1.57	6.46	62.31	5.60	1136.59	20.97
SCRUBS	Scrubs		50.73	25.24	547.83	29.50	473.22	41.36	454.50	30.21	399.21	40.66	35.23	9.52	9.12	2.60	2.13	8.77	589.20	52.99	1688.74	31.16
GREEN COVER	Social Forestry/Avenue Plantation		2.53	1.26	37.84	2.04	21.73	1.90	18.55	1.23	18.31	1.86	3.42	0.92	6.66	1.90	2.07	8.52	0.00	0.00	71.07	1.31
	Plantation on OB Dump		23.42	11.65	11.76	0.63	0.00	0.00	3.56	0.24	0.00	0.00	0.00	0.00	0.00	0.00	2.84	11.69	0.00	0.00	41.58	0.77
	Plantation on Backfill (Biological Reclamation)		24.80	12.34	12.74	0.69	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	195.22	55.58	10.80	44.44	0.00	0.00	243.56	4.49
	Total Plantation		50.75	25.25	62.34	3.36	21.73	1.90	22.11	1.47	18.31	1.86	3.42	0.92	201.88	57.48	15.71	64.65	0.00	0.00	356.21	6.57
	Total Vegetation		138.18	68.75	977.33	52.62	761.89	66.58	843.09	56.04	683.91	69.66	341.02	92.17	211.00	60.08	19.41	79.88	651.51	58.60	3181.54	58.70
ACTIVE MINING	Coal Dump		2.45	1.22	2.51	0.14	0.00	0.00	1.16	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.12	0.11
	Coal Quarry		0.00	0.00	92.08	4.96	0.00	0.00	90.76	6.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	182.84	3.37
	Advance Quarry Site		0.00	0.00	20.36	1.10	0.00	0.00	20.32	1.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	40.68	0.75
	Quarry Filled With Water		5.52	2.75	2.82	0.15	0.00	0.00	2.82	0.19	0.00	0.00	0.00	0.00	18.21	5.18	3.97	16.34	0.00	0.00	33.34	0.62
	Total Area under Active Mining		5.52	2.75	115.26	6.21	0.00	0.00	113.90	7.57	0.00	0.00	0.00	0.00	18.21	5.18	3.97	16.34	0.00	0.00	256.86	4.74
	Barren OB Dump		2.58	1.28	54.33	2.93	2.92	0.26	51.33	3.41	2.92	0.30	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	108.24	2.00
RECLAME	Area Under Backfilling (Technical Reclamation)		35.97	17.90	152.68	8.22	0.00	0.00	73.77	4.90	0.00	0.00	0.00	0.00	32.79	9.34	0.52	2.14	0.00	0.00	295.73	5.46
	Total Area under Technical Reclamation		35.97	17.90	152.68	8.22	0.00	0.00	73.77	4.90	0.00	0.00	0.00	0.00	32.79	9.34	0.52	2.14	0.00	0.00	295.73	5.46
	Total Area under Mining Activity		46.52	23.14	324.78	17.49	2.92	0.26	240.16	15.96	2.92	0.30	0.00	0.00	51.00	14.52	4.49	18.48	0.00	0.00	666.95	12.30
WASTELAND	Waste Lands		13.74	6.84	221.77	11.94	129.30	11.30	171.97	11.43	100.39	10.22	16.35	4.42	13.41	3.82	0.40	1.65	27.51	2.47	465.15	8.58
	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	3.84	0.35	78.82	1.45
	Total Wasteland		13.74	6.84	221.77	11.94	129.30	11.30	171.97	11.43	100.39	10.22	16.35	4.42	88.39	25.17	0.40	1.65	31.35	2.82	543.97	10.04
WATERBODIES	Reservoir, Nallah, Ponds		0.35	0.17	11.72	0.63	5.82	0.51	8.47	0.56	4.73	0.48	1.02	0.28	0.14	0.04	0.00	0.00	23.78	2.14	45.48	0.84
	Total Waterbodies		0.35	0.17	11.72	0.63	5.82	0.51	8.47	0.56	4.73	0.48	1.02	0.28	0.14	0.04	0.00	0.00	23.78	2.14	45.48	0.84
AGRICULTURE	Crop Lands		0.00	0.00	10.86	0.58	10.85	0.95	10.86	0.72	10.85	1.11	0.13	0.04	0.00	0.00	0.00	0.00	0.00	0.00	21.85	0.40
	Fallow Lands		0.00	0.00	170.04	9.16	124.30	10.86	167.93	11.16	124.29	12.66	5.31	1.44	0.00	0.00	0.00	0.00	380.67	34.24	723.95	13.36
	Total Agriculture		0.00	0.00	180.90	9.74	135.15	11.81	178.79	11.88	135.14	13.76	5.44	1.47	0.00	0.00	0.00	0.00	380.67	34.24	745.80	13.76
SETTLEMENTS	Urban Settlement		0.00	0.00	93.40	5.03	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	127.44	2.35
	Rural Settlement		0.00	0.00	6.91	0.37	4.54	0.40	6.90	0.46	4.54	0.46	2.23	0.60	0.00	0.00	0.00	0.00	24.54	2.21	40.58	0.75
	Industrial Settlement		2.21	1.10	40.43	2.18	19.14	1.67	21.14	1.41	16.17	1.65	3.94	1.06	0.69	0.20	0.00	0.00	0.00	0.00	68.41	1.26
	Total Settlements		2.21	1.10	140.74	7.58	109.20	9.54	62.08	4.13	54.75	5.58	6.17	1.67	0.69	0.20	0.00	0.00	24.54	2.21	236.43	4.36
	Grand Total		201.00	100.00	1857.24	100.00	1144.28	100.00	1504.56	100.00	981.84	100.00	370.00	100.00	351.22	100.00	24.30	100.00	1111.85	100.00	5420.17	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 2023 has been carried out under more than 5 mcm category

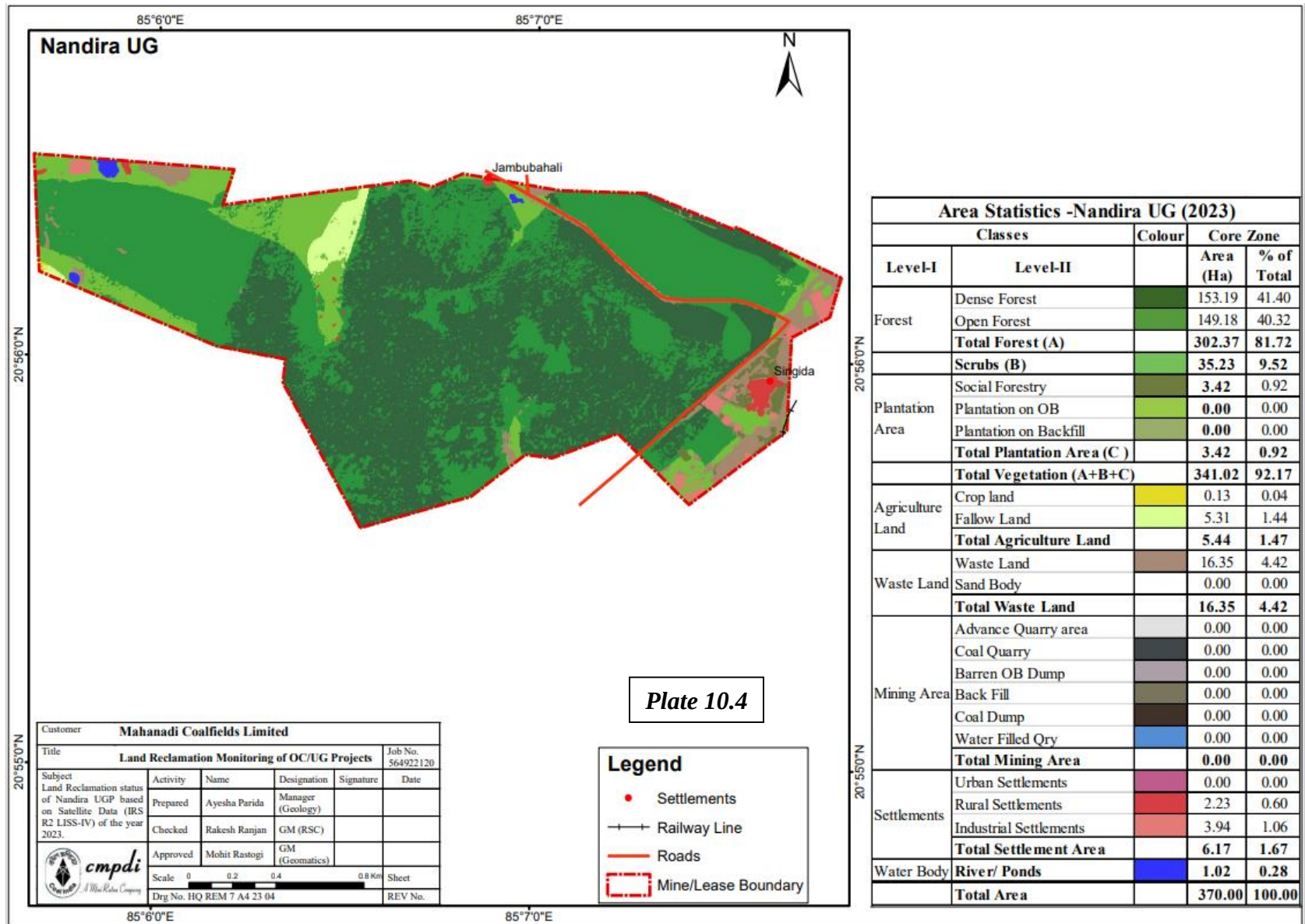


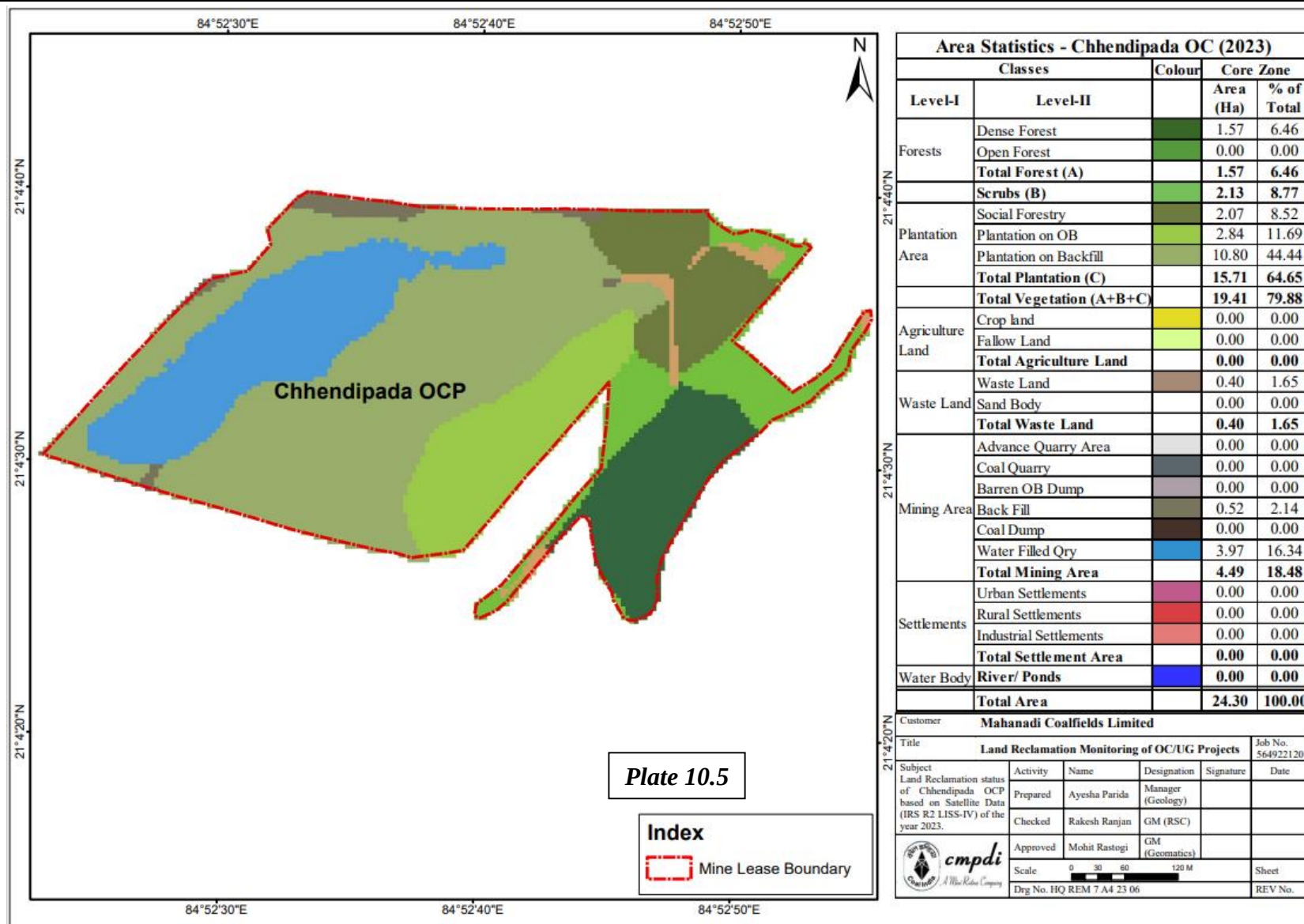


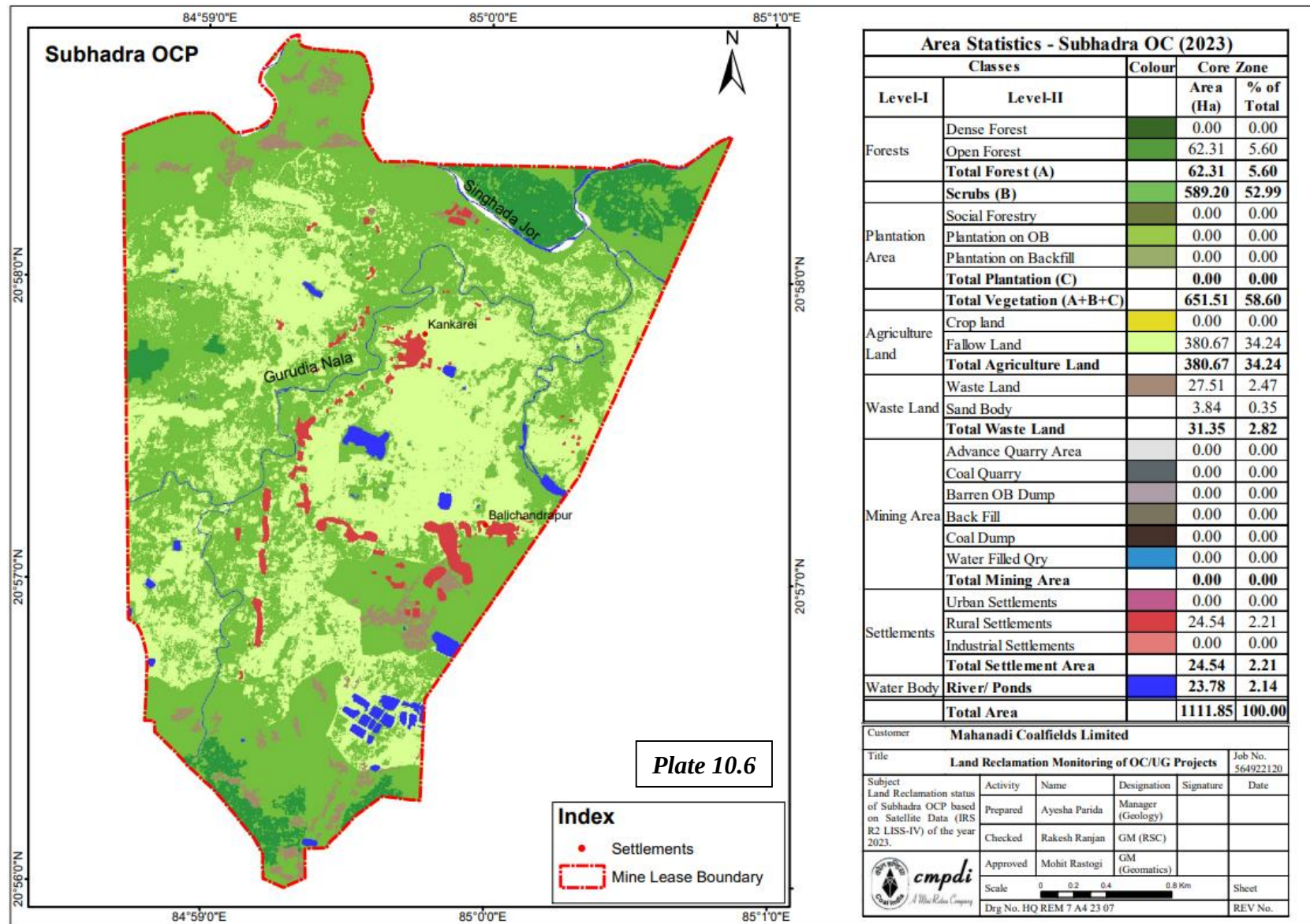
Area Statistics - Orient 1 & 2 UG (2023)					
Classes		Colour	Core Zone		
Level-I	Level-II		Area (Ha)	% of Total	
Forests	Dense Forest		10.95	0.96	
	Open Forest		255.99	22.37	
	Total Forest (A)		266.94	23.33	
	Scrubs (B)		473.22	41.36	
Plantation Area	Social Forestry		21.73	1.90	
	Plantation on OB		0.00	0.00	
	Plantation on Backfill		0.00	0.00	
	Total Plantation (C)		21.73	1.90	
	Total Vegetation (A+B+C)		761.89	66.58	
Agriculture Land	Crop land		10.85	0.95	
	Fallow Land		124.30	10.86	
	Total Agriculture Land		135.15	11.81	
Waste Land	Waste Land		129.30	11.30	
	Sand Body		0.00	0.00	
	Total Waste Land		129.30	11.30	
	Mining Area	Advance Quarry Area		0.00	0.00
Coal Quarry			0.00	0.00	
Barren OB Dump			2.92	0.26	
Back Fill			0.00	0.00	
Coal Dump			0.00	0.00	
Water Filled Qry			0.00	0.00	
Total Mining Area			2.92	0.26	
Settlements	Urban Settlements		85.52	7.47	
	Rural Settlements		4.54	0.40	
	Industrial Settlements		19.14	1.67	
	Total Settlement Area		109.20	9.54	
Water Body	River/ Ponds		5.82	0.51	
	Area(without Lajkura OCP)		1144.28	100.00	
	Area under Lajkura OCP		712.96		
	Total area of Orient 1 & 2 UGP		1857.24		
Customer	Mahanadi Coalfields Limited				
Title	Land Reclamation Monitoring of OC/UG Projects			Job No. 564922120	
Subject Land Reclamation status of Orient 1 & 2 UGP based on Satellite Data (IRS R2 LISS-IV) of the year 2023.	Activity	Name	Designation	Signature	Date
	Prepared	Ayesha Parida	Manager (Geology)		
	Checked	Rakesh Ranjan	GM (RSC)		
 cmpdi A Mahanadi Company	Approved	Mohit Rastogi	GM (Geomatics)		
	Scale	0 0.25 0.5 1 Km			Sheet
	Drg No. HQ REM 7 A4 23 02				



Area Statistics - Orient 3 UG (2023)				
Level-I	Classes	Colour	Area (Ha)	% of Total
Forests	Dense Forest		10.28	1.05
	Open Forest		256.11	26.08
	Total Forest (A)		266.39	27.13
	Scrubs (B)		399.21	40.66
Plantation Area	Social Forestry		18.31	1.86
	Plantation on OB		0.00	0.00
	Plantation on Backfill		0.00	0.00
	Total Plantation (C)		18.31	1.86
	Total Vegetation (A+B+C)		683.91	69.66
Agriculture Land	Crop land		10.85	1.11
	Fallow Land		124.29	12.66
	Total Agriculture Land		135.14	13.76
Waste Land	Waste Land		100.39	10.22
	Sand Body		0.00	0.00
	Total Waste Land		100.39	10.22
Mining Area	Advance Quarry Area		0.00	0.00
	Coal Quarry		0.00	0.00
	Barren OB Dump		2.92	0.30
	Back Fill		0.00	0.00
	Coal Dump		0.00	0.00
	Water Filled Qry		0.00	0.00
	Total Mining Area		2.92	0.30
Settlements	Urban Settlements		34.04	3.47
	Rural Settlements		4.54	0.46
	Industrial Settlements		16.17	1.65
	Total Settlement Area		54.75	5.58
Water Body	River/ Ponds		4.73	0.48
	Area (without Lajkura OCP)		981.84	100.00
	Area under Lajkura OCP		522.72	
	Total Area of Orient 3 UGP		1504.56	
Customer Mahanadi Coalfields Limited				
Title Land Reclamation Monitoring of OC/UG Projects				
Subject		Job No. 564922120		
Land Reclamation status of Orient 3 UGP based on Satellite Data (IRS R2 LISS-IV) of the year 2023.	Activity	Name	Designation	Signature
	Prepared	Ayesha Parida	Manager (Geology)	
	Checked	Rakesh Ranjan	GM (RSC)	
	Approved	Mohit Rastogi	GM (Geomatics)	
Scale 0 0.25 0.5 1 Km		Sheet		
Drp No. HQ REM 7 A4 23 03		REV No.		







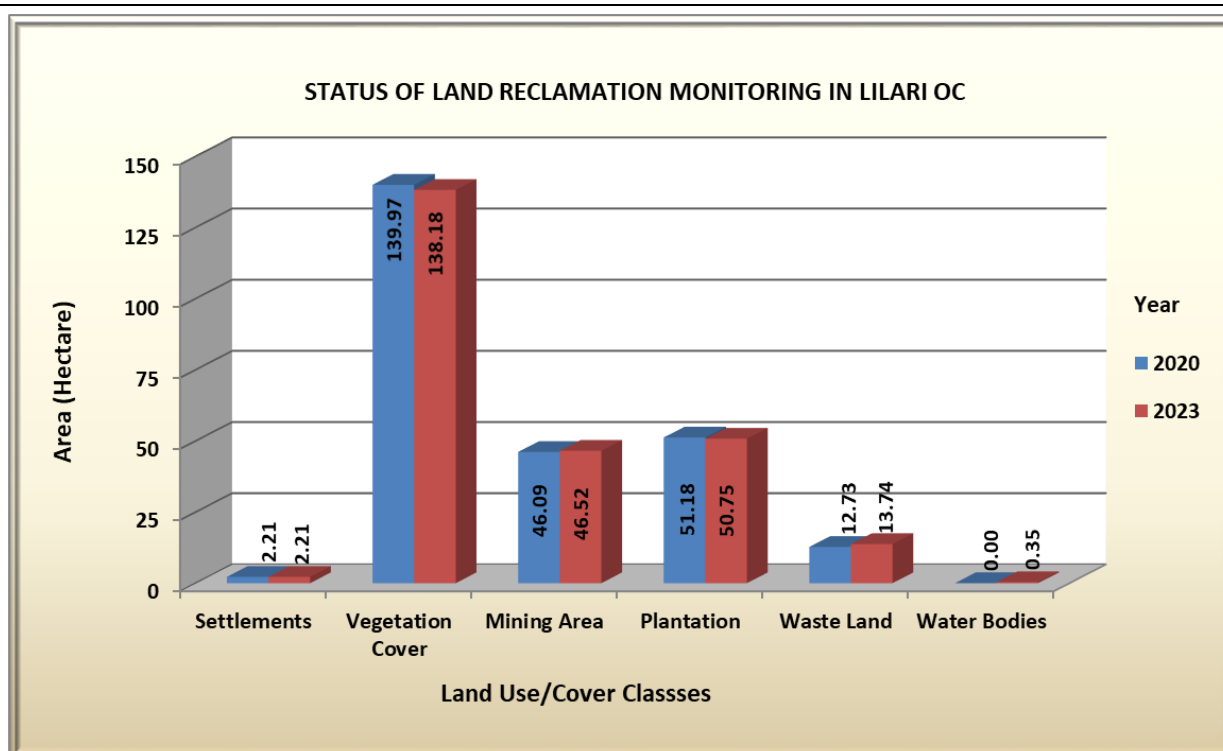


Figure – 10.2: Status of Land Reclamation in Lilari OC

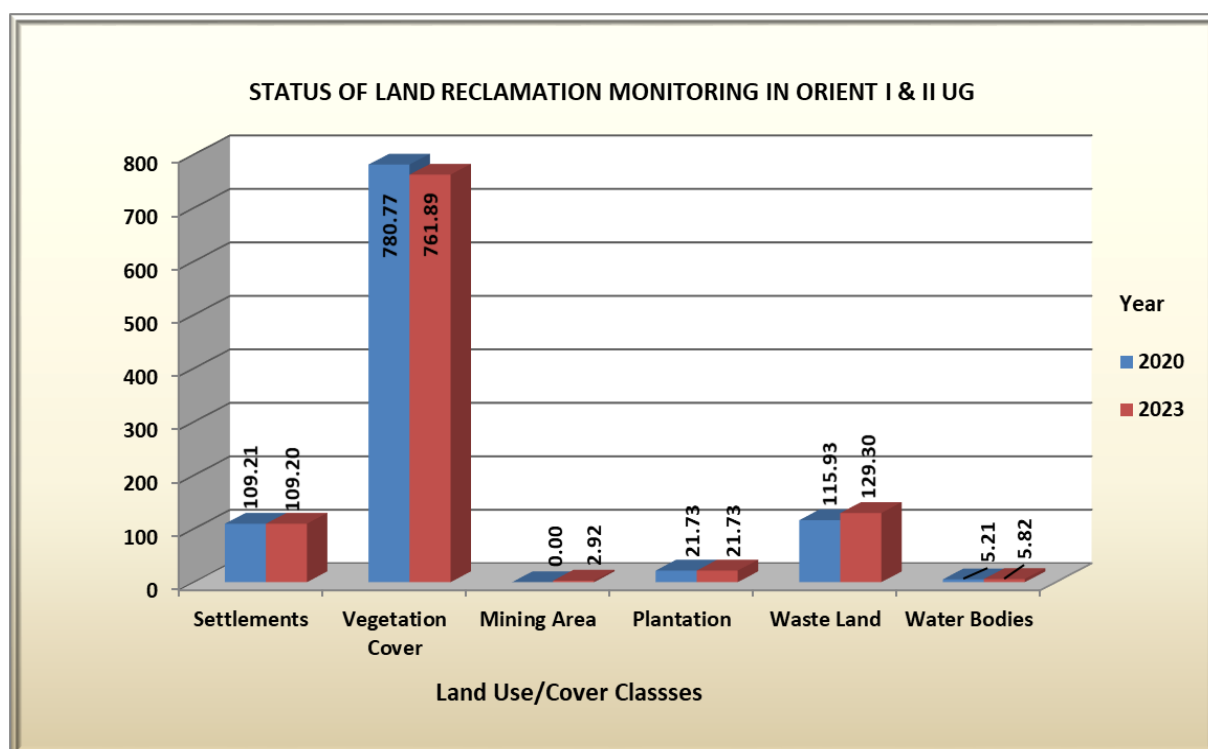


Figure – 10.3: Status of Land Reclamation in Orient I & II UG

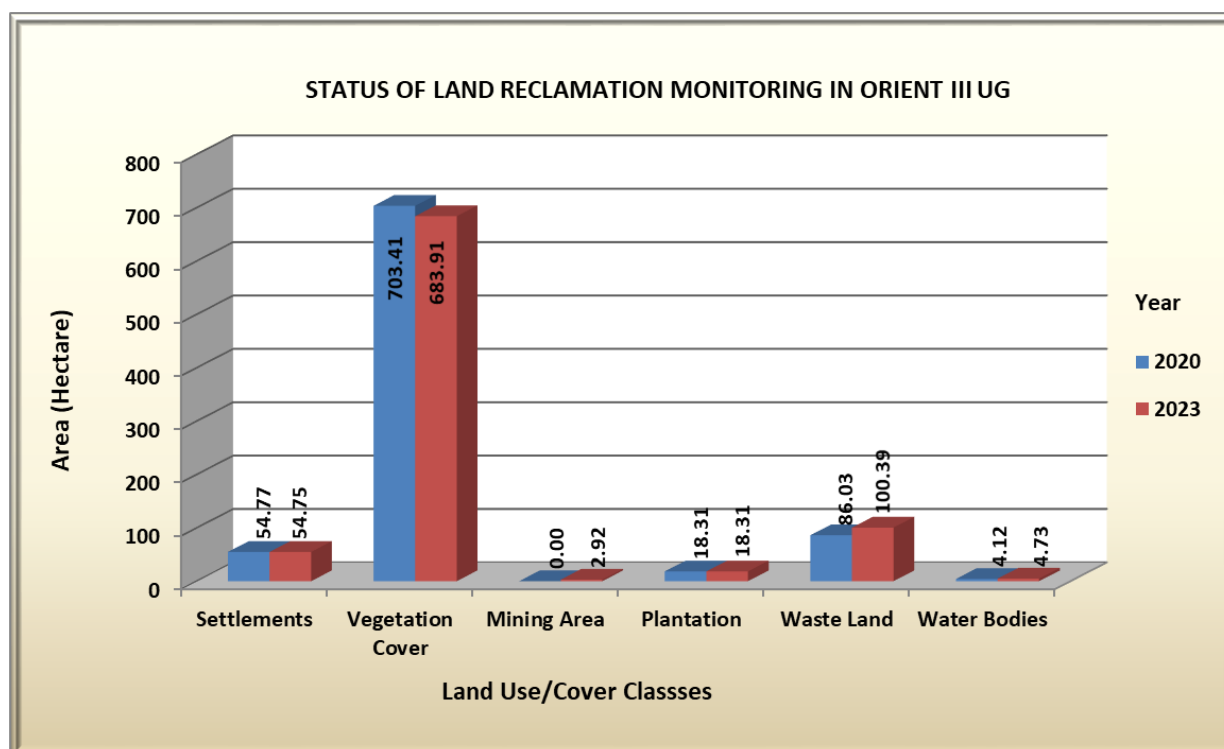


Figure – 10.4: Status of Land Reclamation in Orient III UG

Note: It may be noted that mining area coming under Orient III UG is the part of OB Dump of Lajkura OC which comes within the boundary of Orient III UG

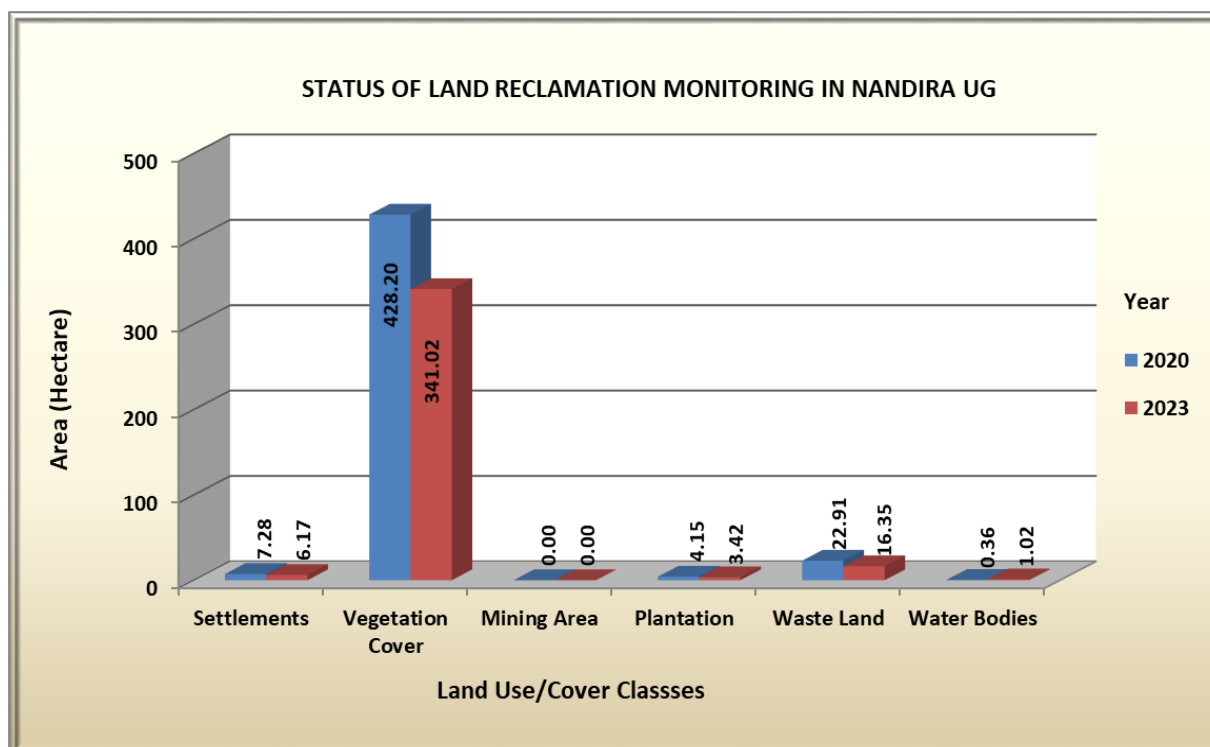


Figure – 10.5: Status of Land Reclamation in Nandira UG

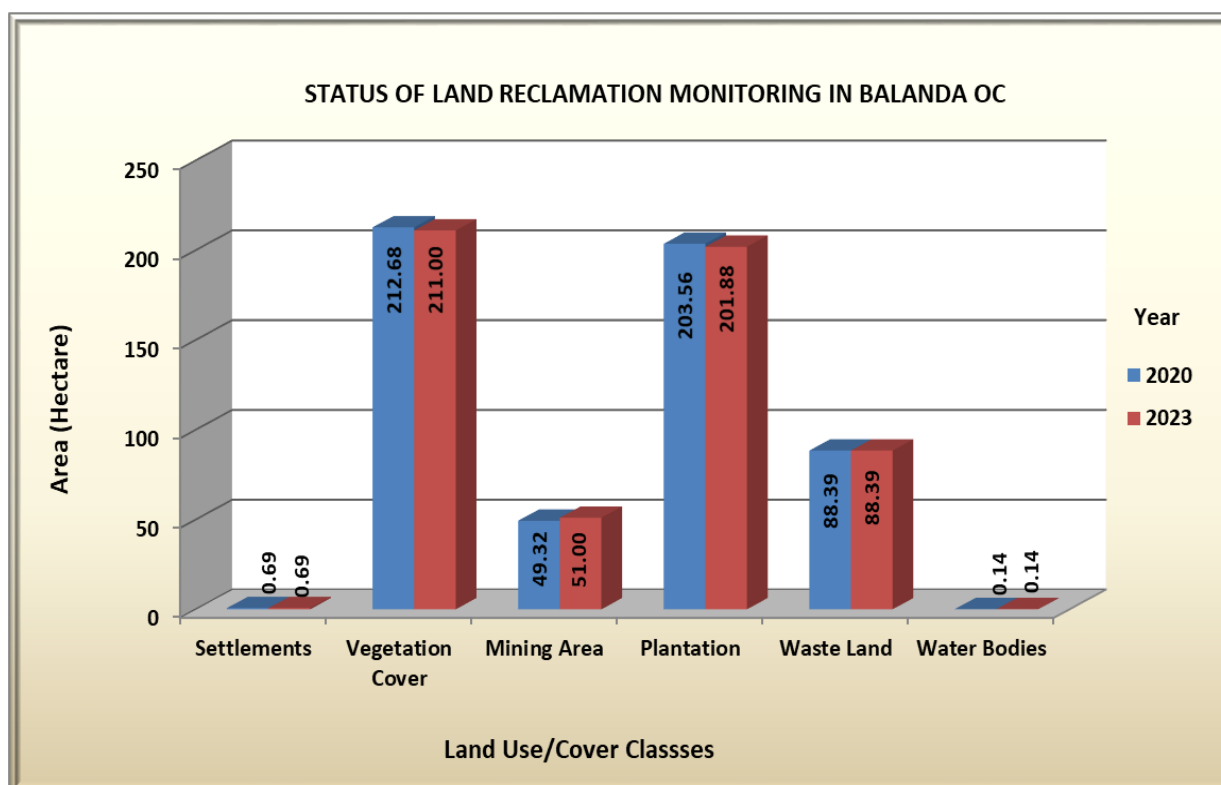


Figure – 10.6: Status of Land Reclamation in Balanda OC

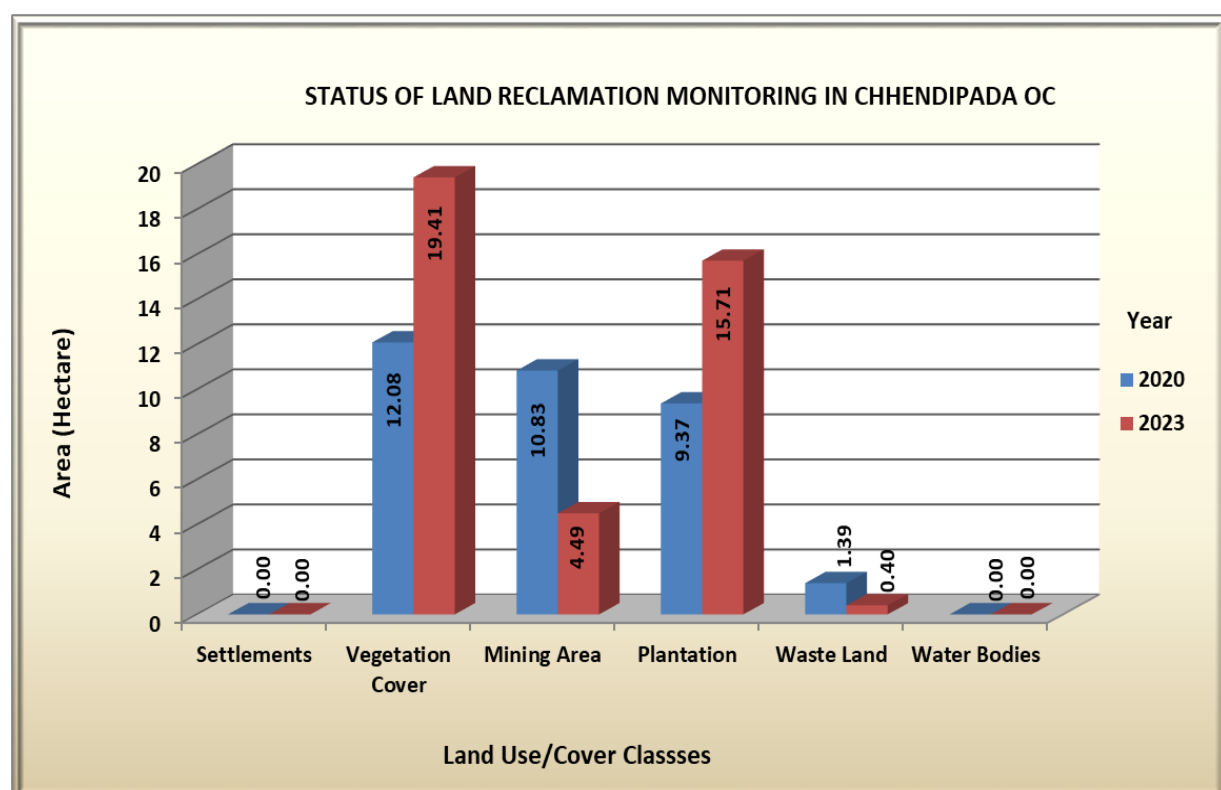


Figure – 10.7: Status of Land Reclamation in Chhendipada OC

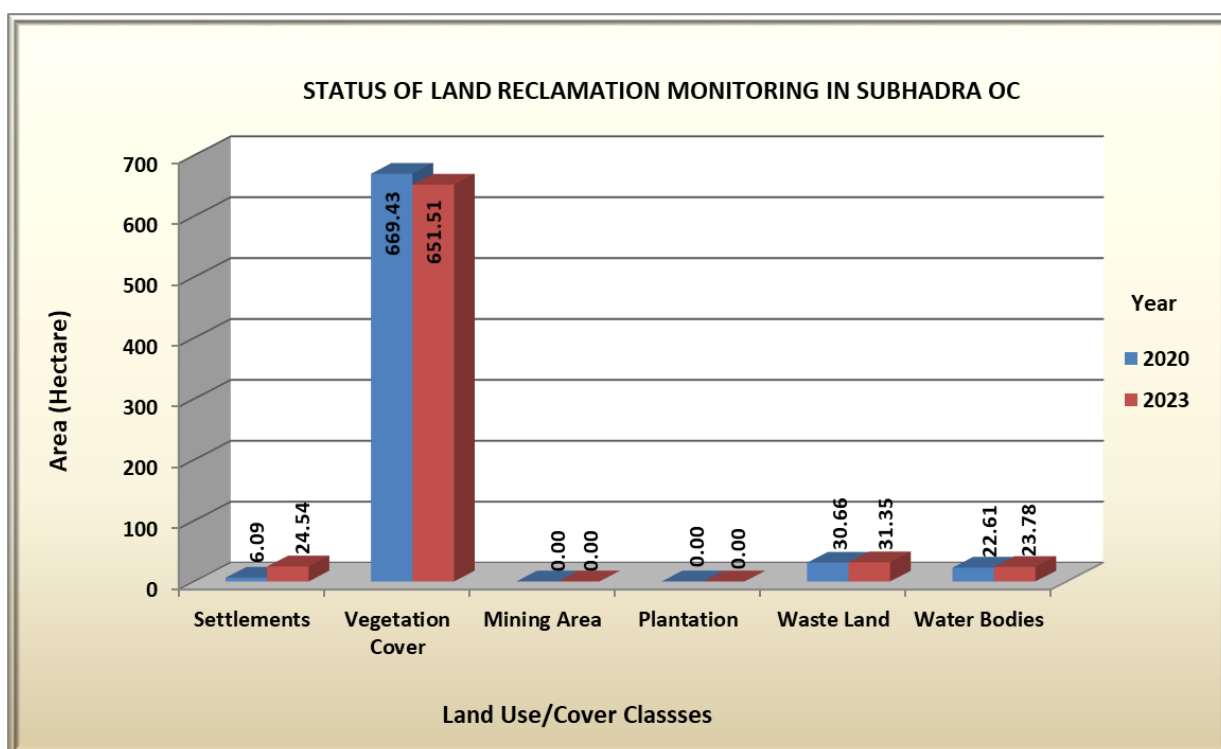


Figure – 10.8: Status of Land Reclamation in Subhadra OC

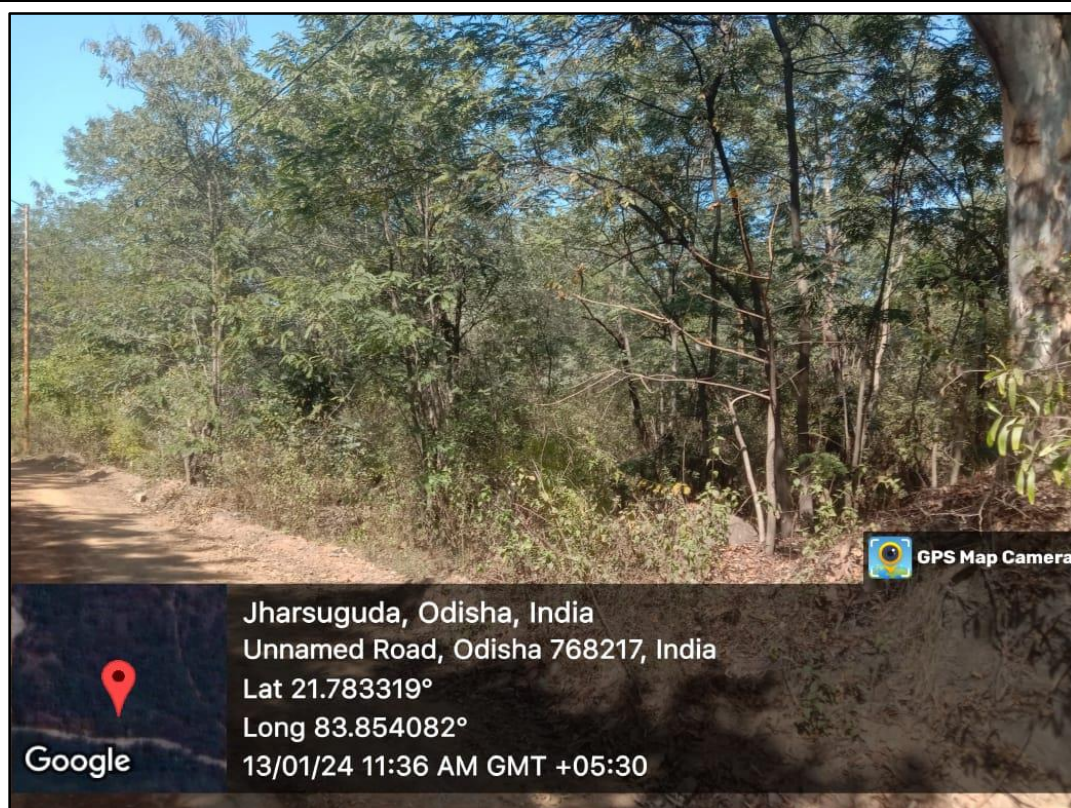


Photo 10.1: Plantation on OB Dump (Lilari OCP)



Photo 10.2: Plantation on backfill (Lilari OCP)



Photo 10.3: Plantation under social forestry (Orient 1 & 2 UGP)



Photo 10.4: Plantation under social forestry (Orient 3 UGP)



Photo 10.5: Incline No.-1 (Nandira Colliery)



Photo 10.6: Plantation on backfill (Balanda OCP)



Photo 10.7: Plantation on backfill (Chhendipada OCP)

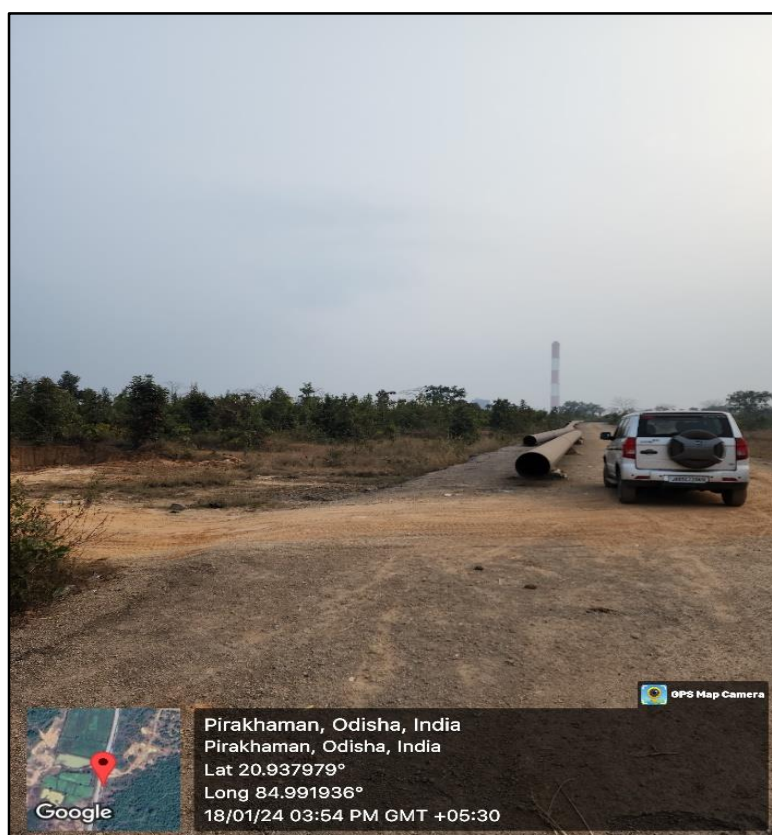


Photo 10.8: Within the lease boundary of Subhadra OCP

NORTH EASTERN COALFIELDS LIMITED

11.1 Land Reclamation Status in North Eastern Coalfields

11.1 Following three opencast projects of NEC producing less than 5 million cubic m. (Coal+OB) together, were taken up for land reclamation monitoring during the year 2023-24:

- Ledo
- Tikak
- Tirap

11.2 Area statistics of different land use class present in the mine leasehold of the above projects for the year 2023 are shown in the Table – 11.1. 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 11.2-11.4.

11.3 The leasehold area of Tikak and Tirap OCP have been modified from earlier monitoring period i.e. year 2020. The leasehold area of Tikak OCP has changed from 1191.80 Ha to 1107.90 Ha. The reduction in this area is due to change of shape of leasehold at western part of project boundary. Similarly, Tirap OCP has been modified from 295.07 Ha to 569.40 Ha in year 2023. Due to modification in leasehold areas of the projects, the class values are changed as compared to year 2020.

11.4 Study reveals that out of total 200.33 Ha excavated area; 91.80 Ha area (45.82%) is under reclamation out of which 19.04 Ha. (9.50%) area has been revegetated and 72.76 Ha. (36.32%) area is under backfilling (Technical reclamation) (Table-11.1). There is an increase of 23.85 Hectare area under reclamation in NEC with respect to the year 2020 where area under reclamation was 91.80 Hectare (45.82%). Technical Reclamation (Backfilling) has also increased from 50.14 Hectare in the Year 2020 to 72.76 Hectare in the year 2023. Overall Percentage of plantation /vegetation has increased from 12.12% in year 2020 to 16.70% in year 2023.

11.5 After analyzing the satellite data of the year 2020 vs 2023 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 192.42 Hectare (Year 2020) to 296.99Hectare (Year 2023)in the span of last three years. This increase of 104.57 Hectare area of plantation in three years is due to major change in Tirap leasehold boundary from 295.07 Ha (year 2020) to 569.40 Ha in (year 2023).

11.6 Out of 3 projects of NEC, maximum land reclamation has been carried out in Ledo opencast project (96.60%) followed by Tirap OCM with 49.70%.

Table-11.1

**Status of Land Reclamation in North Eastern Coalfields Limited based on Satellite Data for the Year 2023
(Projects producing less than 5 mcm of Coal+OB annually)**

(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, Avarue Plantation Etc.									
1	2	3		4		5		6		7		8		9 (=4+5+8)		10 (=5+6+7)		11(=4+5)	
		2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023	2020	2023
1	Ledo	101.00	101.00	14.35	18.65	8.19	6.64	8.05	12.62	29.99	25.30	4.81	0.89	27.35	26.18	46.23	44.56	22.54	25.29
				52.47%	71.24%	29.95%	25.36%					17.59%	3.40%			45.77%	44.12%	82.41%	96.60%
2	Tikak	1191.80	1107.90	0.00	0.00	0.00	0.00	100.81	74.61	23.29	15.56	62.29	40.32	62.29	40.32	124.10	90.17	0.00	0.00
				0.00%	0.00%	0.00%	0.00%					100.00%	100.00%			10.41%	8.14%	0.00%	0.00%
3	Tirap	295.07	569.40	35.79	54.11	9.62	12.40	12.47	58.50	0.00	91.36	88.53	67.32	133.94	133.83	22.09	162.26	45.41	66.51
				26.72%	40.43%	7.18%	9.27%					66.10%	50.30%			7.49%	28.50%	33.90%	49.70%
	TOTAL	1587.87	1778.30	50.14	72.76	17.81	19.04	121.33	145.73	53.28	132.22	155.63	108.53	223.58	200.33	192.42	296.99	67.95	91.80
				22.43%	36.32%	7.97%	9.50%					69.61%	54.18%			12.12%	16.70%	30.39%	45.82%
(% is calculated with respected to Excavated Area as applicable)																			

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 Backfilling only
- Area under Active Mining Includes Coal Quarry, Advance Quarry Site, Quarry filled with water etc., if any.
- 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.
- (%) 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".
- It is noted that leasehold area of Tikak and Tirap Projects has been modified by NEC and similarly processed classified values are changed on comparing data with previous monitoring records.
(% is calculated with respected to Excavated Area as applicable)

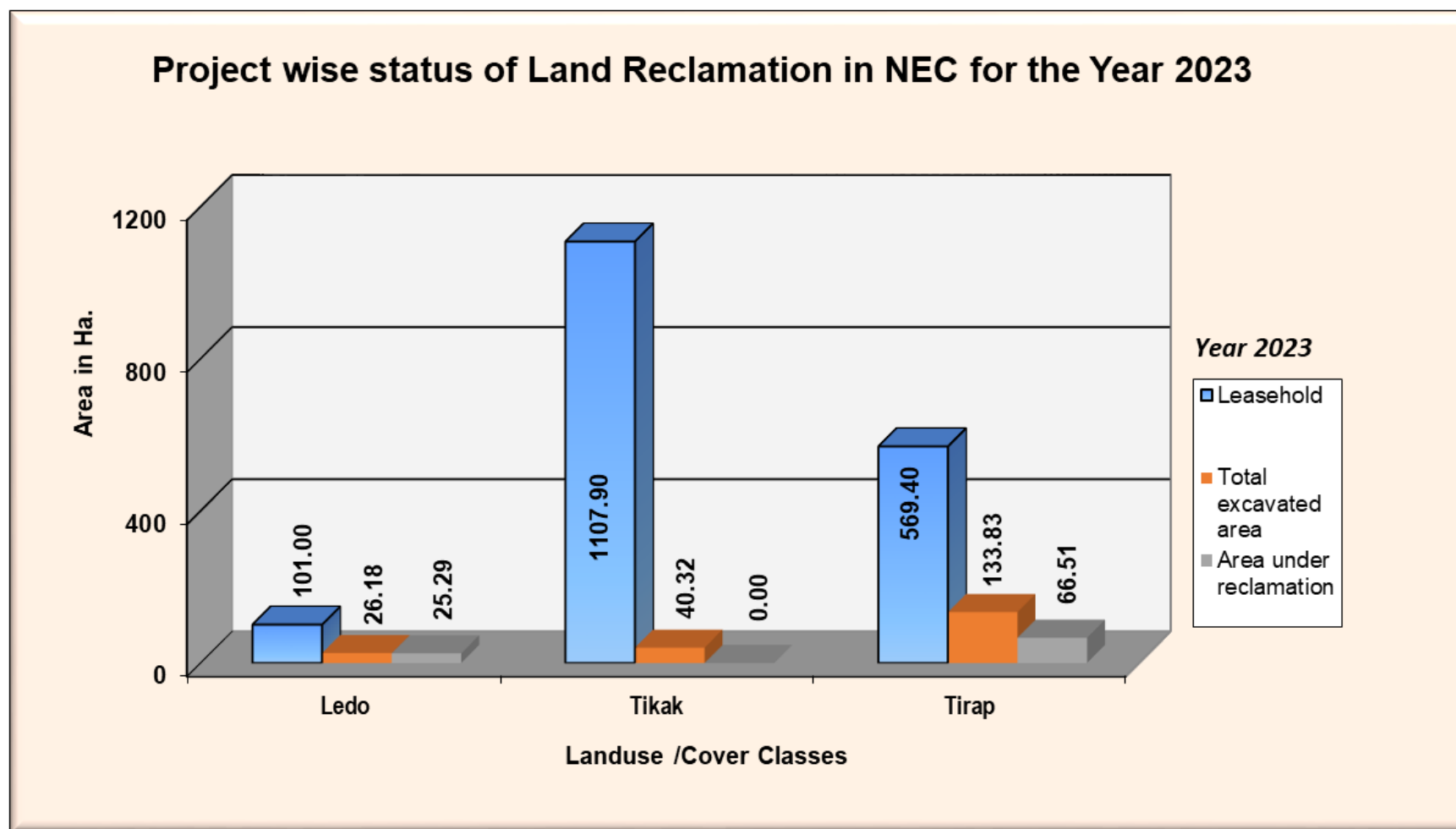


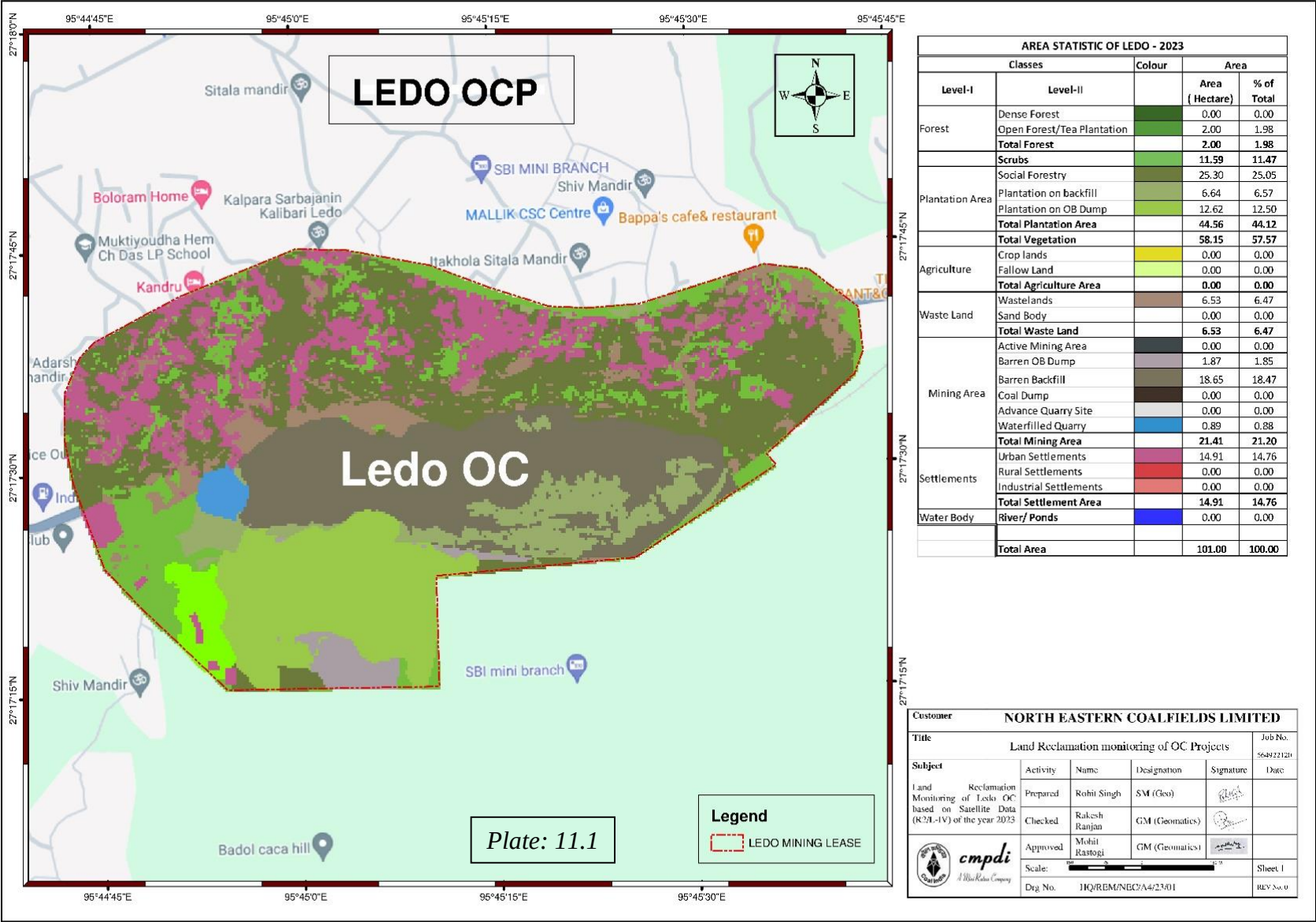
Fig.11.1: Land reclamation status in OC projects of NEC in the year 2023

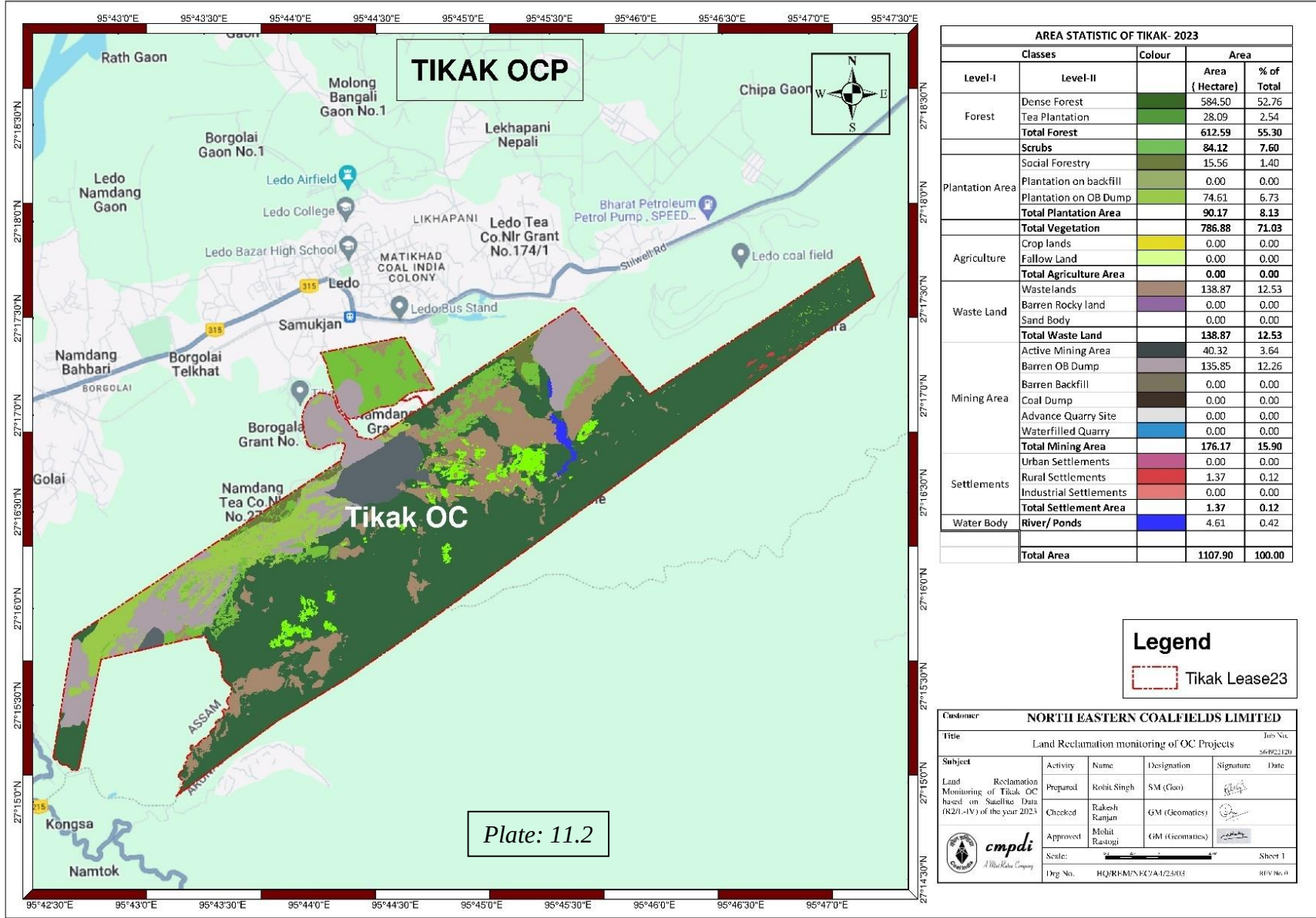
TABLE -2

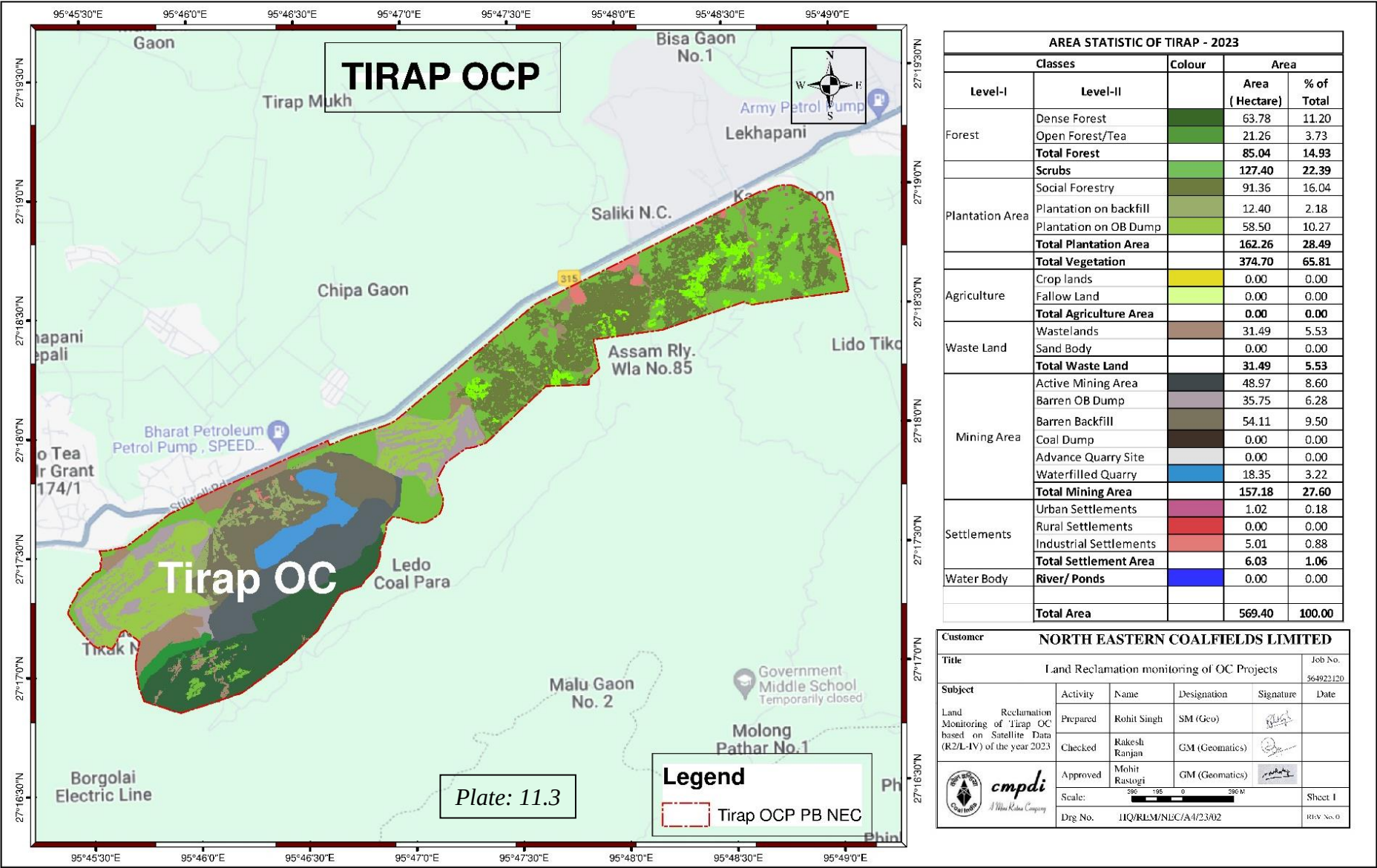
Status of Land Use Cover/ Reclamation in OC Mines(<5mcu.m) of North Eastern Coalfields based on Satellite data of the Year 2023

(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	584.50	52.76	63.78	11.20	648.28	36.46
	Tea Plantation		2.00	1.98	28.09	2.54	21.26	3.73	51.35	2.89
	Total Forest/Tea Plantation		2.00	1.98	612.59	55.30	85.04	14.93	699.63	39.34
SCRUB										
	Scrubs		11.59	11.47	84.12	7.60	127.40	22.39	223.11	12.55
PLANTATION	Social Forestry		25.30	25.05	15.56	1.40	91.36	16.04	132.22	7.44
	Plantation on OB Dump		12.62	12.50	74.61	6.73	58.50	10.27	145.73	8.19
	Plantation on Backfill (Biological Reclamation)		6.64	6.57	0.00	0.00	12.40	2.18	19.04	1.07
	Total Plantation(Green Cover generated)		44.56	44.12	90.17	8.13	162.26	28.49	296.99	16.70
	Total Vegetation		58.15	57.57	786.88	71.03	374.70	65.81	1219.73	68.59
ACTIVE MINING	Active Mining Area/Coal Quarry		0.00	0.00	40.32	3.64	48.97	8.60	89.29	5.02
	Coal Dump		0.00	0.00	0.00	0.00	0.00	0.00	0.00	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)		0.89	0.88	0.00	0.00	18.35	3.22	19.24	1.08
	Total Area under Active Mining		0.89	0.88	40.32	3.64	67.32	11.82	108.53	6.10
RECLAIMED	Barren OB Dump		1.87	1.85	135.85	12.26	35.75	6.28	173.47	9.75
	Barren Backfilled Area (Technical Reclamation)		18.65	18.47	0.00	0.00	54.11	9.50	72.76	4.09
	Total Area under Technical Reclamation		18.65	18.47	0.00	0.00	54.11	9.50	72.76	4.09
WASTELANDS	Waste Lands		6.53	6.47	138.87	12.53	31.49	5.53	176.89	9.95
	Fly Ash Pond / Sand Body		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Total Wasteland		6.53	6.47	138.87	12.53	31.49	5.53	176.89	9.95
WATERBODIES	Reservoir, nallah, ponds		0.00	0.00	4.61	0.42	0.00	0.00	4.61	0.26
	Total Waterbodies		0.00	0.00	4.61	0.42	0.00	0.00	4.61	0.26
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		14.91	14.76	0.00	0.00	1.02	0.18	15.93	0.90
	Rural Settlement		0.00	0.00	1.37	0.12	0.00	0.00	1.37	0.08
	Industrial Settlement		0.00	0.00	0.00	0.00	5.01	0.88	5.01	0.28
	Total Settlement		14.91	14.76	1.37	0.12	6.03	1.06	22.31	1.25
	Grand Total		101.00	100.00	1107.90	100.00	569.40	100.00	1778.30	100.00







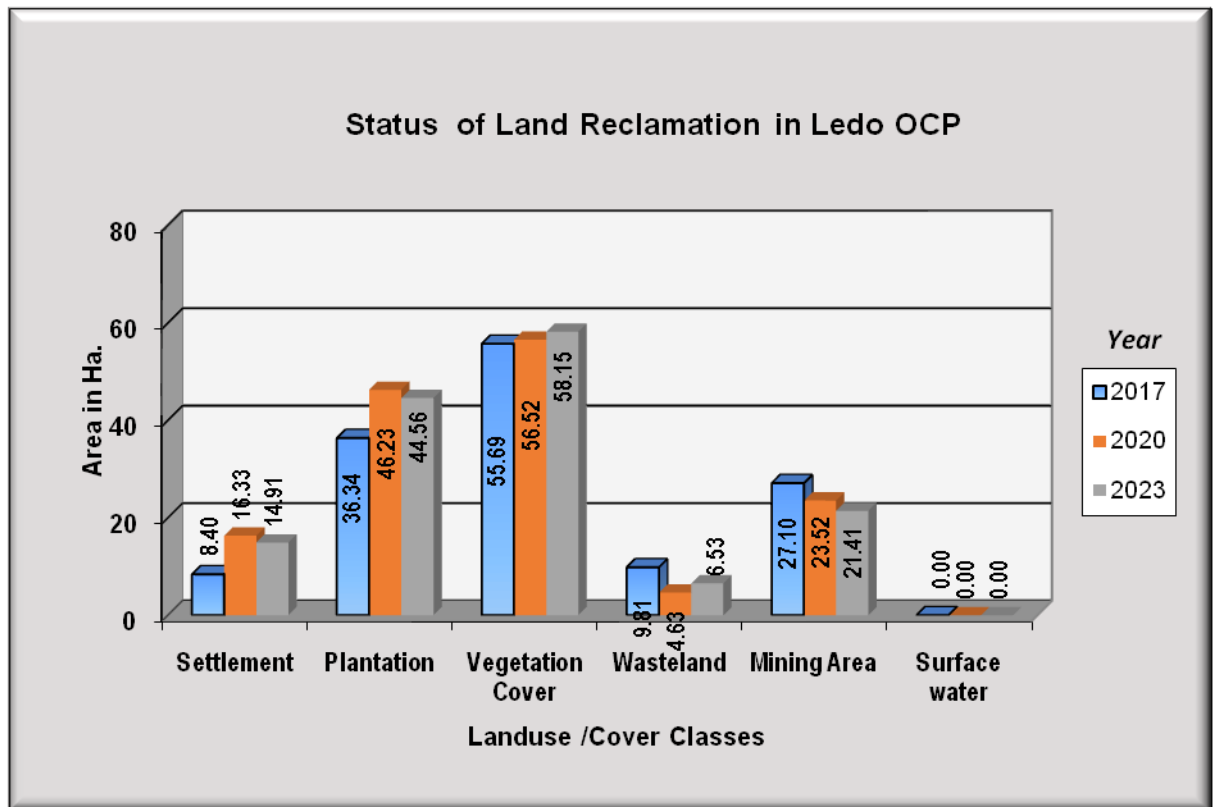


Fig. 11.1: Status of Land Reclamation in Ledo OCP

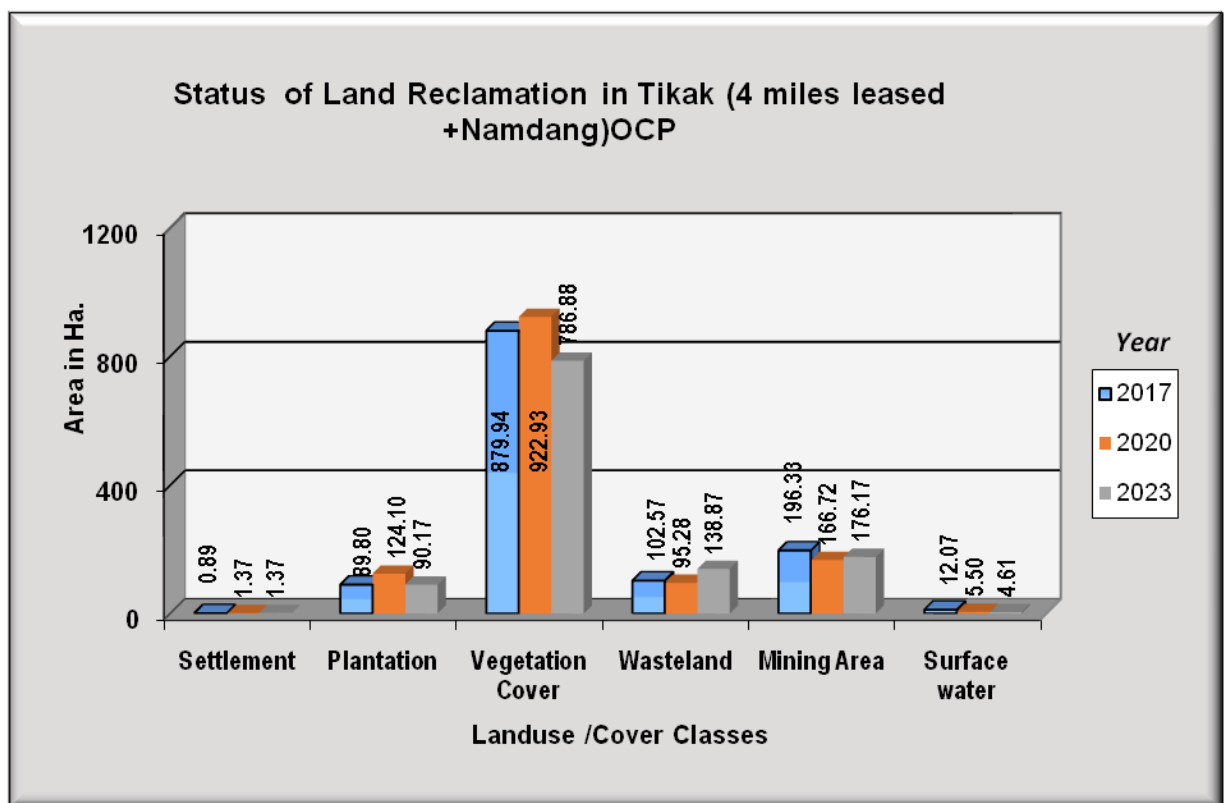


Fig. 11.2: Status of Land Reclamation in Ledo OCP

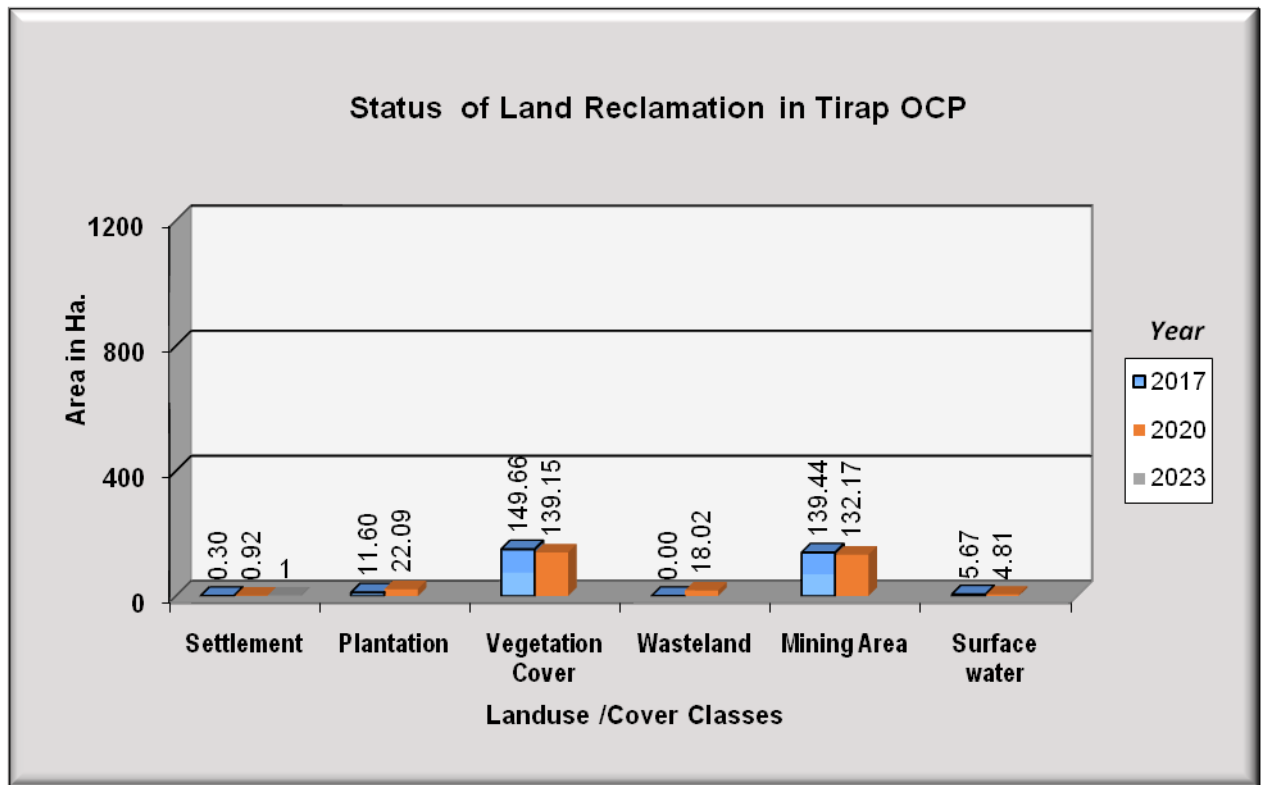


Fig. 11.3: Status of Land Reclamation in Ledo OCP



Photo 11.1: Plantation on Backfill in Ledo OCP



Photo 11.2: Plantation area in Ledo OCP



Photo 11.3: Plantation on OB in Tirap OCP

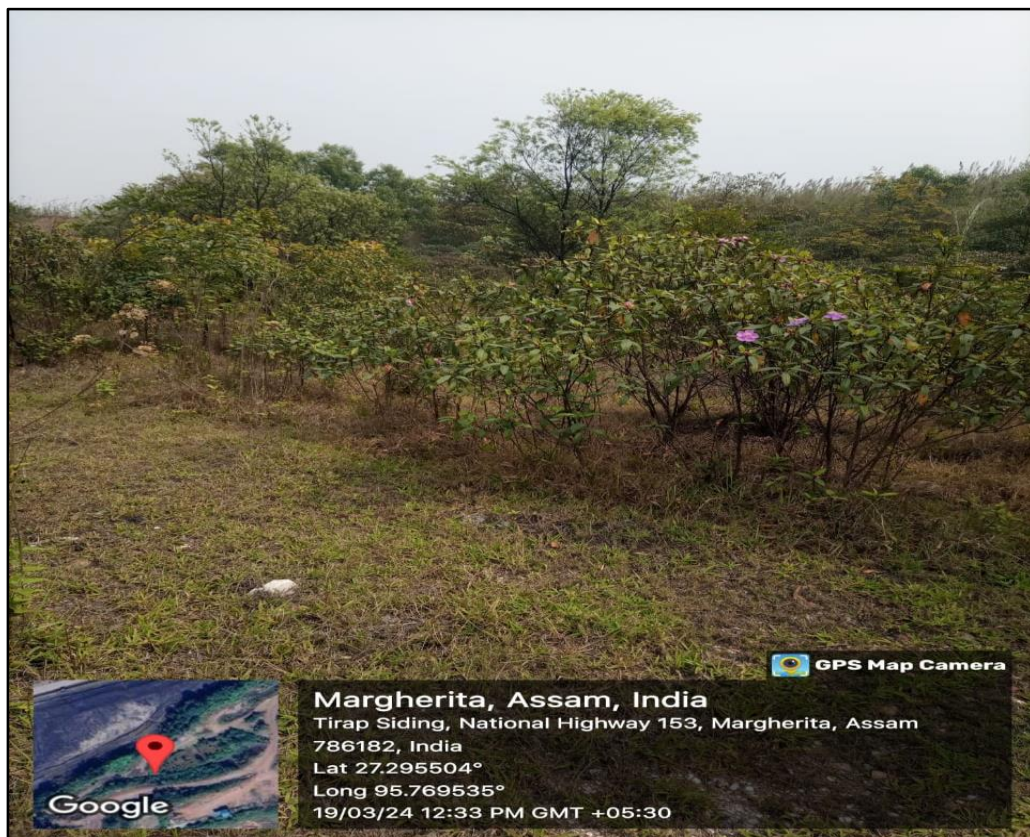


Photo 11.4: Plantation on Backfill in Tirap OCP



Photo 11.5: Plantation in Tikak OCP



Photo 11.6: Plantation in Tikak OCP

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	दस लाख
15	Background	पृष्ठभूमि
16	Planning	योजनाबद्ध
17	Assess	आकलन
18	Status	स्थिति
19	Regularly	निरंतर
20	Satellite	उपग्रह
21	Subsidiary	अनुषांगिक
22	Production	उत्पादन
23	Biological Reclamation	जैविक पुनरुद्धार
24	Technical Reclamation	तकनीकी पुनरुद्धार
25	Leasehold Area	पट्टाक्षेत्र
26	Excavated Area	उत्खनन क्षेत्र
27	Active mining	सक्रिय खनन
28	Environmental Protection	पर्यावरणसं रक्षण
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	घन मीटर
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	छविगुणवृद्धि -
51	Training set selection	प्रशिक्षण सेट का चयन
52	Classification and Accuracy assessment	वर्गीकरण और मूल्यांकन की सटीकता
53	Area calculation	क्षेत्रगणना
54	Temporal	लौकिक
55	Processing	प्रसंस्करण
56	Overlay of Vector data base	वेक्टर डेटा बेस का आरोपन
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	जलनिकाय
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 mines clubbed together for administrative purposes.
26.	Arc GIS	GIS Software used for Map preparation
27.	ERDAS IMAGINE	Satellite Image Data Classification Software



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