# BEFORE THE NATIONAL GREEN TRIBUNAL AT PUNE

## MEMORANDUM OF APPLICATION

## ORIGINAL APPLICATION NO. 166 OF 2024

Nusli Neville Wadia                                    …Applicant

Versus

State of Maharashtra & Ors.                          …Respondents

## **INDEX**

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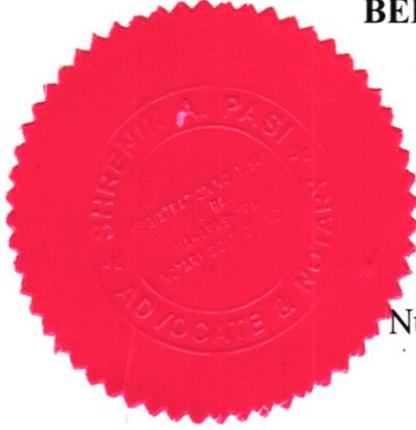Nusli Neville Wadia                                          …Applicant

V/s.

State of Maharashtra & Ors.                                 …Respondents

**<u>SHORT ADDITIONAL AFFIDAVIT ON BEHALF OF THE APPLICANT</u>**:

I, Shankar Kanhere, an adult, Indian Inhabitant, the Constituted Attorney of the Applicant in the captioned matter having my address at Neville House, 4$^{th}$ floor, J N Heredia Marg, Ballard Pier Estate, Fort Mumbai 400001, do hereby solemnly declare and state as under:-

1. I am the Constituted Attorney of the Applicant having my address as mentioned hereinabove. I am familiar with the facts of the case from the office records, and I am competent to depose to the facts in this Additional Affidavit.

2. I say that I am filing the present Affidavit for the limited purpose of placing on record certain additional facts, circumstances, and documents for the consideration of this Hon'ble Tribunal in the present matter. It is clarified that the present Additional Affidavit is filed in furtherance of and supplemental to the captioned Original Application

and the same be deemed to be forming part and parcel of the captioned Original Application unless contrary hereto. I crave leave of this Hon'ble Tribunal to file a further affidavit or affidavits along with documents in support thereof, if the circumstance so warrants. For the sake of brevity, the Applicant adopts, repeats and reiterates whatever is stated in the Memo of Original Application in the captioned OA as if the same are stated herein.

3. It is germane to bring on record certain important facts and their supporting documents which would be critical to the adjudication of the present matter and which are set out hereunder:

4. I say that on 27th July 2024, Advocate of the Applicant, under the instructions of the Applicant, addressed an email to this Hon'ble Tribunal to place before the Bench, a colour copy of the *'Exhibit-L-1'* annexed at Page 180 to the captioned Original Application. I say that inadvertently, an erroneous document dated 2nd May 2024 was emailed to this Hon'ble Tribunal on 27th July 2024. I say that the said erroneous document was taken on record by this Hon'ble Tribunal on 29th July 2024. Hereto annexed and marked as "**Exhibit-A**" is a colour copy of the Detailed Project Report dated 15th May 2024 annexed as Exhibit-L-1 to the captioned Original Application.
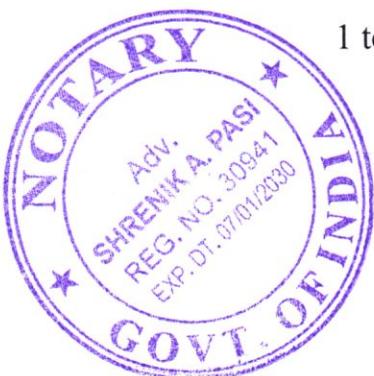
5. I say that I tender an unconditional apology to this Hon'ble Tribunal for the said inadvertence and requests the Hon'ble Tribunal to kindly disregard the erroneous document dated 2$^{nd}$ May 2024 emailed to the Hon'ble Tribunal on 27$^{th}$ July 2024 and take on record the colour copy of the Detailed Project Report dated 15$^{th}$ May 2024 which is already annexed as Exhibit-L-1 at Page 180 to the captioned Original Application.

6. In the aforesaid facts and circumstances, the Applicant requests this Hon'ble Tribunal to accept the unconditional apology for this inadvertence on the part of the Applicant.
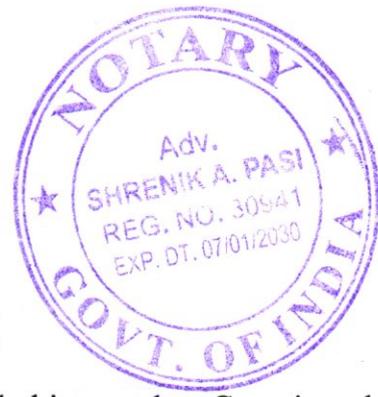
Date: 11 April 2025

Place:

Constituted Attorney of Applicant

Advocates for the Applicant

NOTARY
Adv.
SHRENIK A. PASI
REG. NO. 30941
EXP. DT. 07/01/2030
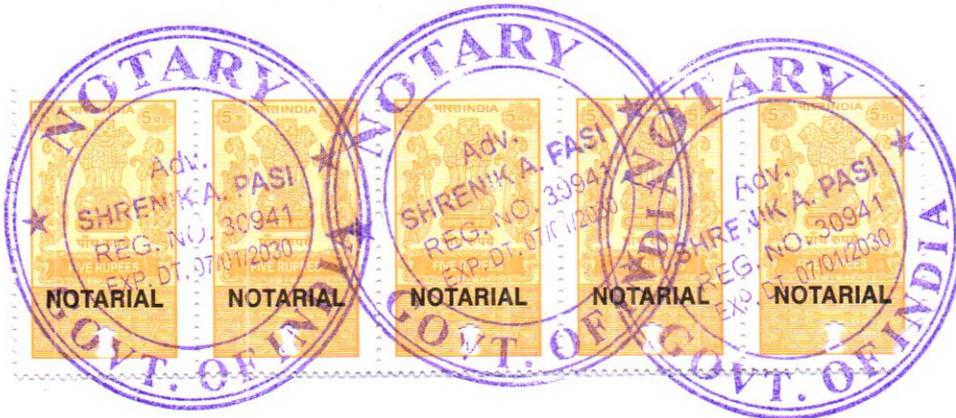GOVT. OF INDIA

**675**

## VERIFICATION

I, Shankar Kanhere, an adult, Indian Inhabitant, the Constituted Attorney of the Applicant in the captioned matter having my address at Neville House, 4th floor, J N Heredia Marg, Ballard Pier Estate, Fort Mumbai 400001, do hereby state that I have submitted this Affidavit on solemn affirmation and oath. I have verified that the facts are true based on office records available with the Applicant. I have not suppressed any material fact known to me and relevant to this matter.

Date: 11th April 2025

Place: Mumbai

Constituted Attorney of Applicant

BEFORE ME

Adv. Shrenik A. Pasi
Advocate & Notary.
GOVT. OF INDIA
Plot No. 150B, Waras Lane,
Worli Village, Mumbai-400 030.
Reg. Sr. No. 30941

NOTED & REGISTERED
Sr. No. 577. Page No. 08
Date 11/04/2025

**Exhibit-A**

15 May, 2024

# Detailed Project Report

## LAND USE & LAND COVER CHANGE DETECTION USING HIGH RESOLUTION SATELLITE IMAGERY for

**Survey No. - 239(pt.), CTS No. - 827/A/4A/2, 827/A/4/A/1, & 827/A/4/B, Village - Malad (East), Taluka - Borivali, District - Mumbai Suburban District, Maharashtra, India**



Detailed Project Report prepared by:

**OPSIS SYSTEM PRIVATE LIMITED  &**
Keota Shibtala, PO – Sahaganj, District – Hooghly
West Bengal – 712104

**ZENMARC SURVEYS PVT LTD**
15, Rane Estate, Kurar, Malad (East),
Mumbai- 400 097

1. **Introduction**

Malad is a suburb area of Mumbai city located in the state of Maharashtra. It is a growing residential area and important urban construction activities in progress. The area has undergone major changes in the last 20 years from a hilly forest region to a populated suburb region at present. The area is adjacent to Sanjay Gandhi National Park and home to a diverse flora and fauna. It is interest of the administration to study the changes happened in the area from its Land Use/ Land Cover perspective which may help to understand the type of changes that has happened in the past and monitors these changes going forward.

2. **Objective:**

The objective of this project is to prepare a land use and landcover change detection using high resolution satellite images for monitoring land use change pattern. This will be based on time series satellite imagery over the period from 2001 to 2024 of the area Malad (East), Mumbai, Maharashtra.

3. **Area of Interest:**

The area of interest for the current project is Malad (East), Mumbai. Malad is a suburb area in the western part of Mumbai, in the state of Maharashtra, India. The extent of the project area is E72° 52' 25.398" to E72° 53' 23.927" and N 19° 10' 03.251" to N 19° 10' 54.892". Area of the study region is 1.54sq KM (154.88 Ha).
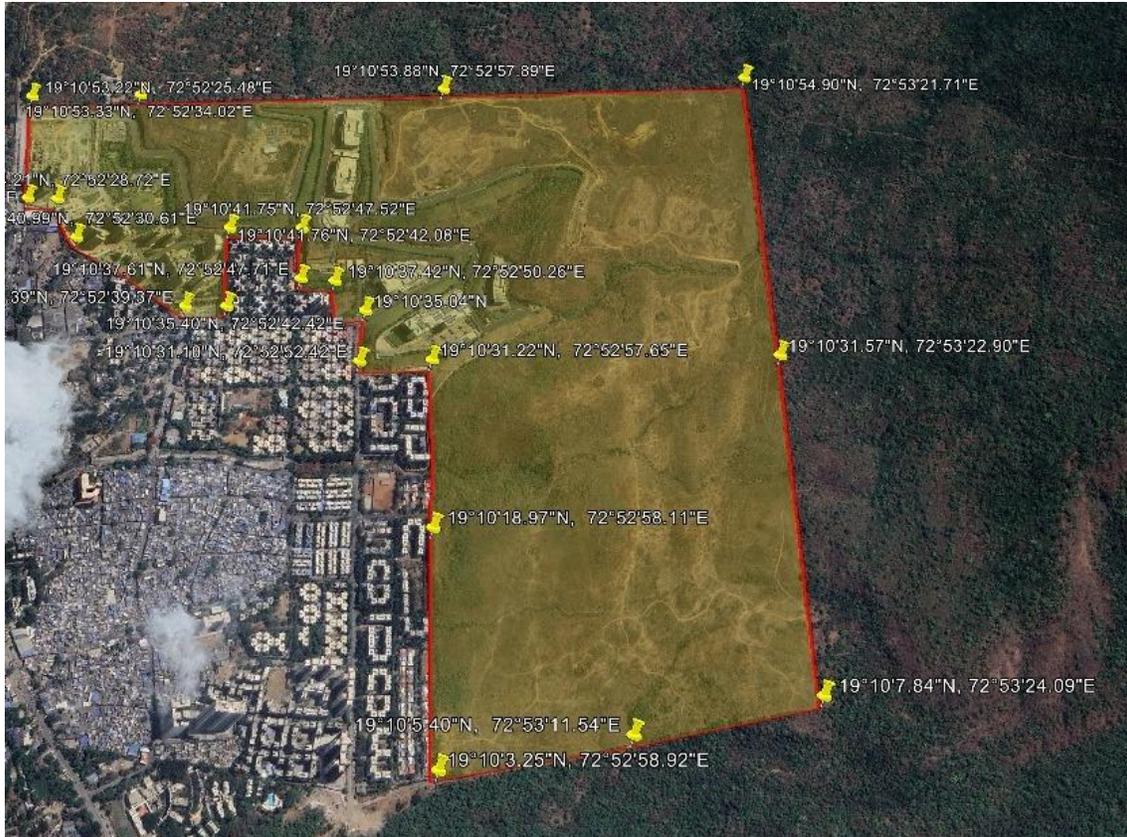
## 4. **Pre-requisite for the project**:

The basic input required for the project is the high-resolution time series satellite imagery of the area for different years (2001-2024). The set of imagery for these years were provided by Zenmarc and the same are used in this project to carry out the analysis activities.

## Detailed Information of input satellite Image Data used in this project

| Sr.No | Year | Image Band | Resolution | Projection |
|-------|------|------------|------------|------------|
| 1 | 11_Nov 2000 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.8m | WGS -84/UTM 43N |
| | | Panchromatic | 3.2m | |
| 2 | 25_Feb 2005 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.6m | WGS-84/UTM 43N |

| 3 | 13-May-08 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.6m | WGS-84/UTM 43N |
|---|---|---|---|---|
| 4 | 06-Jan-11 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 5 | 09-Oct-11 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 6 | 03Dec 2012 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 7 | 05-Nov-13 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |

| Sr.No | Year | Image  Band | Resolution | Projection |
|---|---|---|---|---|
| 8 | 25-Oct-18 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 9 | 15-Oct-19 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 10 | 03-Nov-21 | Band 1<br>Band 2<br>Band 3<br>Band 4 | 0.5m | WGS-84/UTM 43N |
| 11 | 21-Feb-22 | Band 1<br>Band 2 | .15m | WGS-84/UTM 43N |

| | | Band 3 | | |
| | | Band 4 | | |
| 12 | 20-Apr-23 | Band 1 | .15m | WGS-84/UTM 43N |
| | | Band 2 | | |
| | | Band 3 | | |
| | | Band 4 | | |
| 13 | 17-Jan-24 | Band 1 | 0.3m | WGS-84/UTM 43N |
| | | Band 2 | | |
| | | Band 3 | | |
| | | Band 4 | | |

## 5. **Methodology:**

Analysis of land use land cover change needs careful execution of several image processing and analysis activities. Effort involved both manual and computer based activities carried out by GIS specialists. Some of the important aspects of the methodology followed in this project are described below.

### 5.1 Projection System:

The projection system followed is Universal Transverse Mercator (UTM) with the following parameters,

| | | |
|---|---|---|
| **Projection** | : | Universal Transverse Mercator |
| **Spheroid** | : | WGS84 |
| **Datum** | : | WGS84 |
| **UTM Zone** | : | WGS1984 UTM Zone 43N |
| **False easting** | : | 500000.0 |
| **False northing** | : | 0.0 |
| **Central meridian** | : | 75.0 |
| **Scale factor** | : | 0.9996 |
| **Latitude of origin** | : | 0.0 |
| **Linear Unit** | : | Meter (1.0) |

### 5.2 Geo-Rectification:

While geo-rectifying the quadrant, care is taken such that the quadrant is lying within the mine boundary. While rectifying the quadrant with reference to the reference data, ground control points (GCP) are given in the area within buffer zone 10 km

**5.3 Pre-processing:**

Pre-processing of satellite data includes geometric correction, atmospheric correction and radiometric correction.

*Geometric Correction:*

The transformation of a remotely sensed image so that it has scale and projection properties of a given map projection is called geometric correction. A related technique called registration is the fitting of the coordinate system of one image to that of a second image of the same area. Geometric correction of remotely sensed image is required when the image is to be used in one of the following circumstances,

- To transform an image to match a map projection
- To locate points of interest on map and image
- To bring adjacent images into registration
- To overlay temporal sequences of images of the same area, perhaps acquired by different sensors and
- To overlay images and layers within a GIS.

The main sources of geometric error are,

- Instrument error
- Panoramic distortion
- Earth rotation
- Platform instability

Instrument error includes distortions in the optical system, non-linearity of the scanning mechanism and non-uniform sampling rates. Panoramic distortion is a function of the angular field of view of the sensor and affects instruments with a wide angular field of view. Earth rotation varies with latitude. The effect of the earth rotation is to skew the image. Platform instabilities include variations in altitude and attitude. All four sources of error contribute unequally to the geometric distortion present in an image.

The process of geometric correction includes,

- The determination of a relationship between the coordinate system of map and image
- The establishment of a set of points defining pixel centers in the corrected image when considered as a rectangular grid, define an image with the desired cartographic properties and
- The estimation of pixel values to be associated with those points.

*Radiometric Correction:*

Images taken in the optical and infrared bands at different times (multi-temporal images) are to be studied. One of the sources of variation that must be taken into account is differences in the angle of the sun. A low sun-angle image gives long shadow and for this reason might be preferred by geological users because these shadows may bring out subtle variations in topography. A high sun angle will generate a different shadow effect. If the reflecting surface is

Lambertian, then the magnitude of the radiant flux reaching the sensor will depend on the sun and the viewing angles. For comparative - purposes, therefore, a correction of image pixel values for sun elevation angle variations is needed. Such corrections are essential if multi-temporal images are to be compared, for changes in the sensor calibration factors will obscure real changes on the ground. This Geo-rectification part involves the precision geometric correction of Resource Sat- 2 & LISS-IV quadrant scenes with geometrically rectified precision data as reference.

### 5.4 Image Extraction:

Image Extraction is an important step before starting the image analysis. Generally a set of satellite images are received for the study area. The extent of the study area may be only a part of one satellite image scene. Sothe study area portion of the satellite image needs to be extracted. In this case our area of interest falls in multiple satellite image scenes. So first Image Mosaic process was run to combine the images laterally and the image extraction was done. A vector object for the study area boundary was created. Image Extract process was run to extract the portion from the image mosaic using the vector object.

### 5.5Image Enhancement:

Image Enhancement is a process of making an Image more interpretable for a particular application. Following two types of enhancement were performed for the extracted images before analysis

Pan-sharpening: As the input images were of different spatial resolution, a pan-sharpening process was run to enhancement the spatial resolution of the images wherever possible.

Image-Composite preparation: Generally satellite images are provided as separate band images. A single band image is displayed in Gray scale which is not very useful for image interpretation and analysis. So composite band images need to be prepared to view them as colour image. We have used two types of composite images - True Colour Composite and False Colour Composite for effective analysis of the study area.

Contrast Enhancement: Contrast enhancement is necessary to improve the visual quality of the images. Auto-normalize functionof the GIS software has been used to enhance the contrast of the composite band images. Below is an example of the effect of applying contrast enhancement on the images of the study area.

Raw Satellite Image             Enhanced Satellite Image

**5.6 Software Used:**

The main software that has been use to execute the land use and land cover study is entirely TNT Datum Workstation.

**5.7 Image Interpretation:**

Extracted and processed images have been analyzed to identify the spatial features present in the study area. Generally the features present in an image falls in specific feature classes depending on the geographic location and prevalent natural phenomena at the location.  After Interpretation of different year satellite images the classes has been identified are as follows:

- Forest Area
- De-Forested Area
- Built up Area
- Metalled Road
- Water bodies

The above identified feature classes have been digitized as different layers in vector objects. So this classification vector objects contain the type of features present, their location and areal

extent. This digitization process has been carried out for images of all the years 2001-2024. A sample screen shot of the vector has been given below for reference:
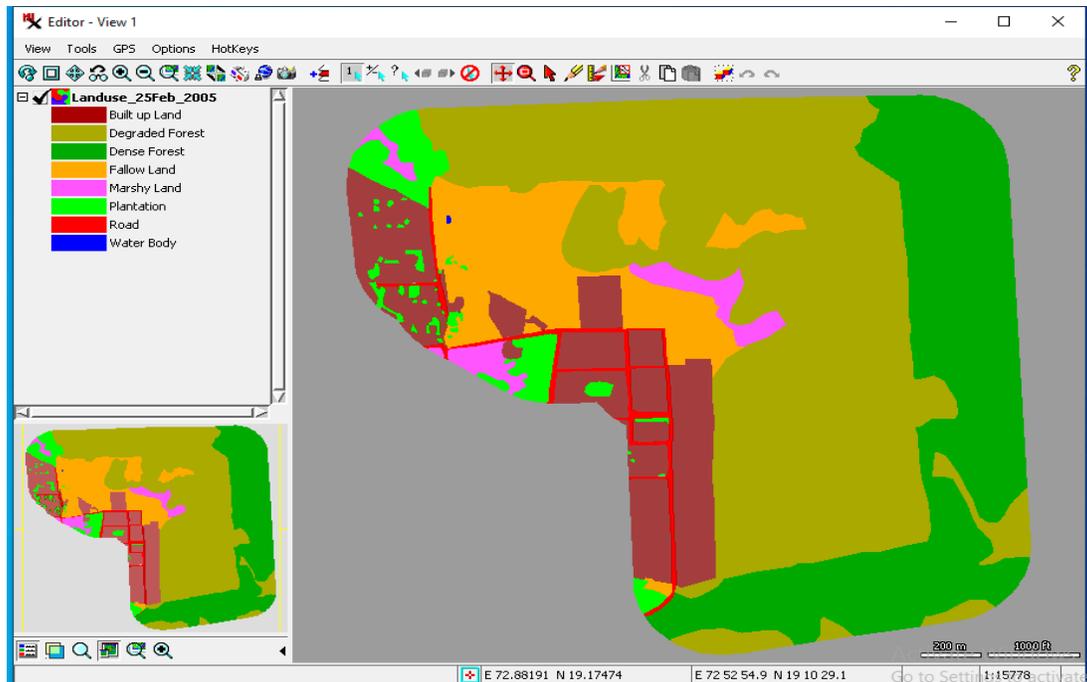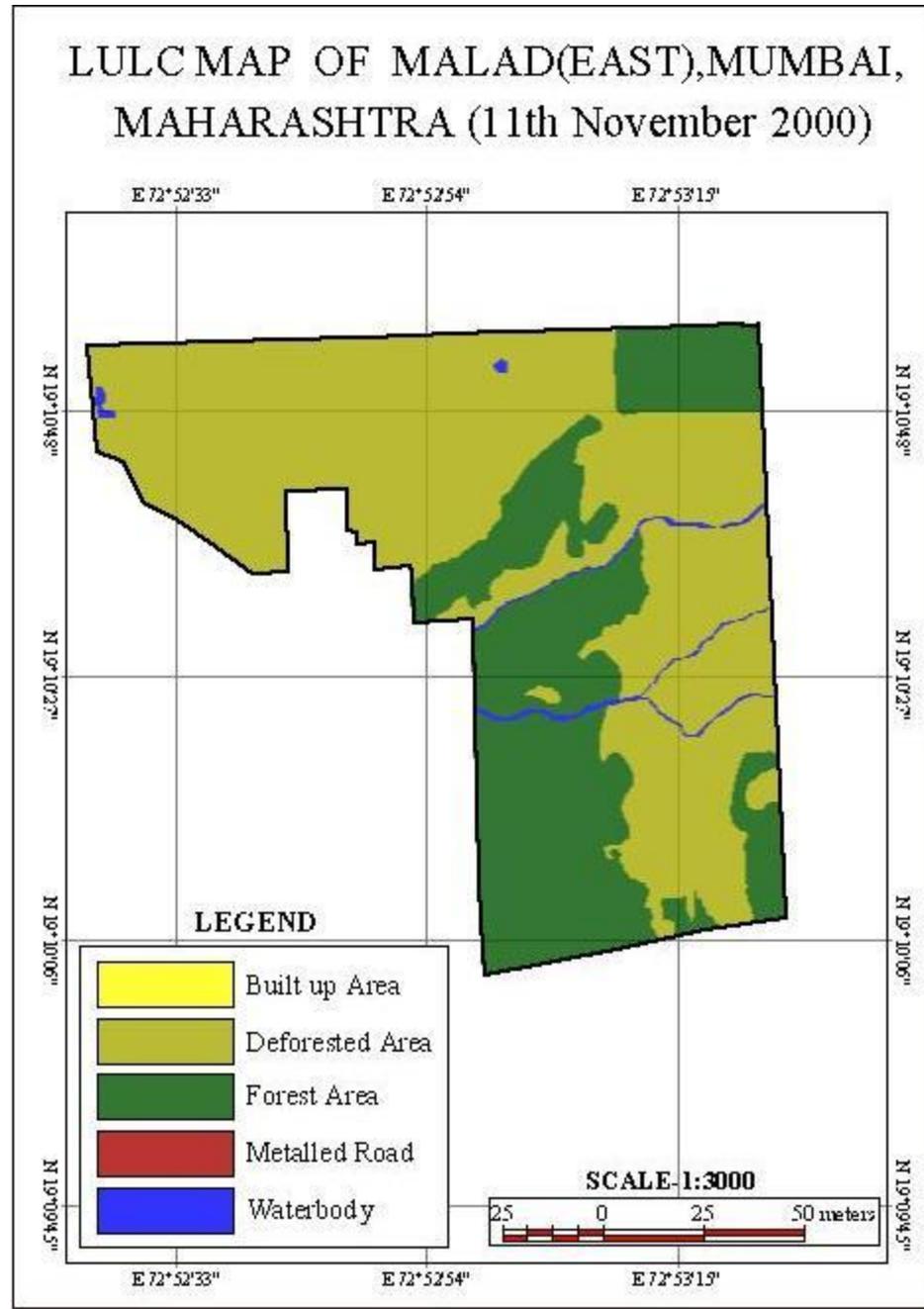


### 5.8 LULC Change Analysis:

A consolidated statistics has been prepared for Classification vector objects prepared for all the years for which images were given. Please refer to the Results section for details.

## 6. Results:

Land Use/Land Cover Maps has been prepared for all the years (the years for which images were received) and attached as annexure to this report. Area Statistics of Land Use classes for all the years have been prepared and listed here including the Satellite image and Land Use class maps for each year.

Image-11Nov, 2000

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|---|---|---|---|
| 1 | Forest Area | 528137.09 | 52.81 |
| 2 | Deforested Area | 1002112.80 | 100.21 |
| 3 | Built Up Area | 00 | 00 |
| 4 | Metalled Road | 00 | 00 |
| 5 | Waterbody | 18690.94 | 1.86 |

LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (11th November 2000)

LEGEND

Built up Area
Deforested Area
Forest Area
Metalled Road
Waterbody

SCALE-1:3000

# SATELLITE IMAGE OF MALAD(EAST),MUMBAI, MAHARASHTRA (11th November 2000)



SCALE-1:3000
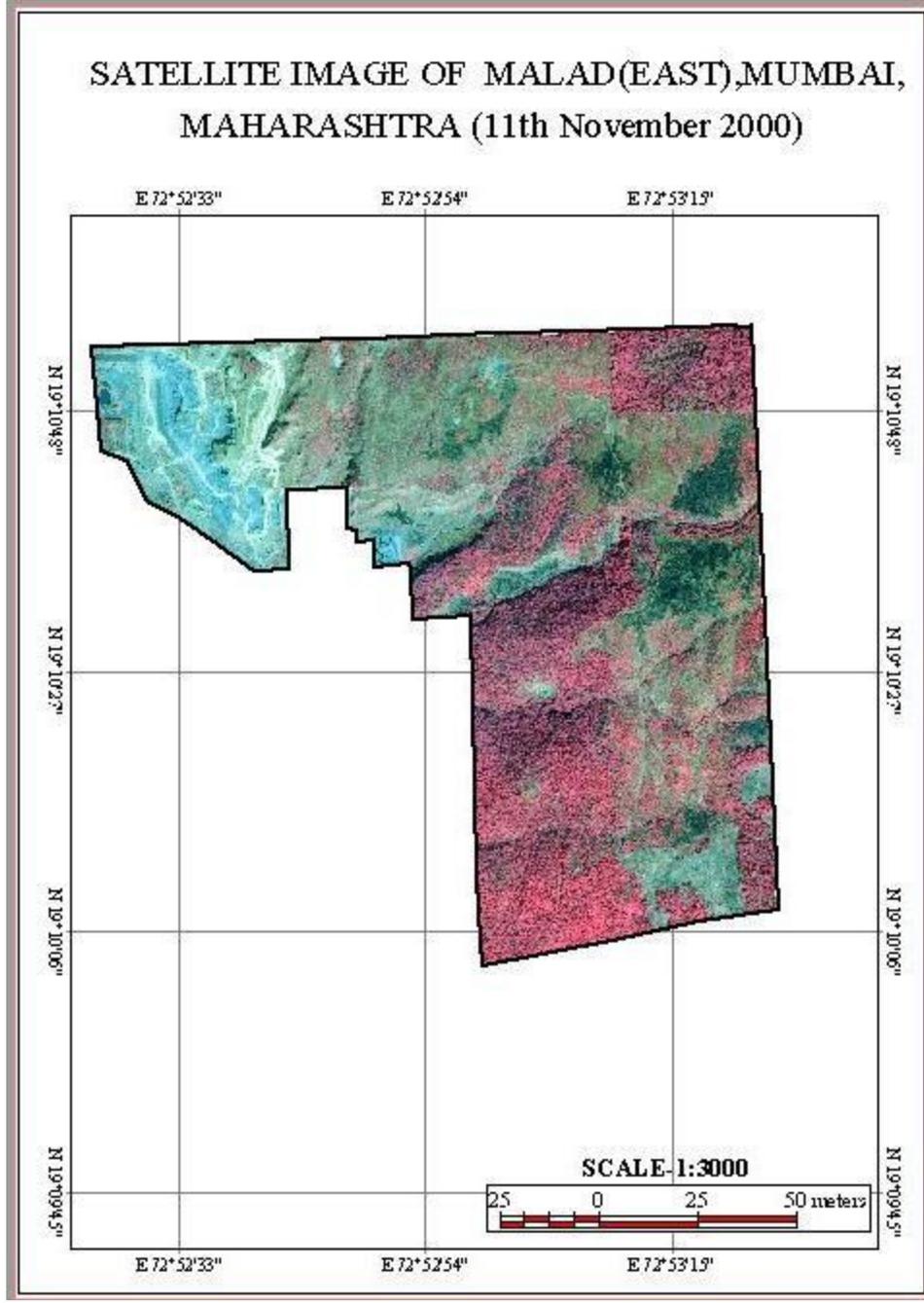
Image-25-Feb, 2005

| Sl.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1525796.21 | 152.57 |
| 3 | Built Up Area | 4631.64 | 0.46 |
| 4 | Metalled Road | 00 | 00 |
| 5 | Waterbody | 18512.98 | 1.85 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (25th February 2005)

SATELLITE IMAGE OF MALAD(EAST),MUMBAI, MAHARASHTRA (25th February 2005)
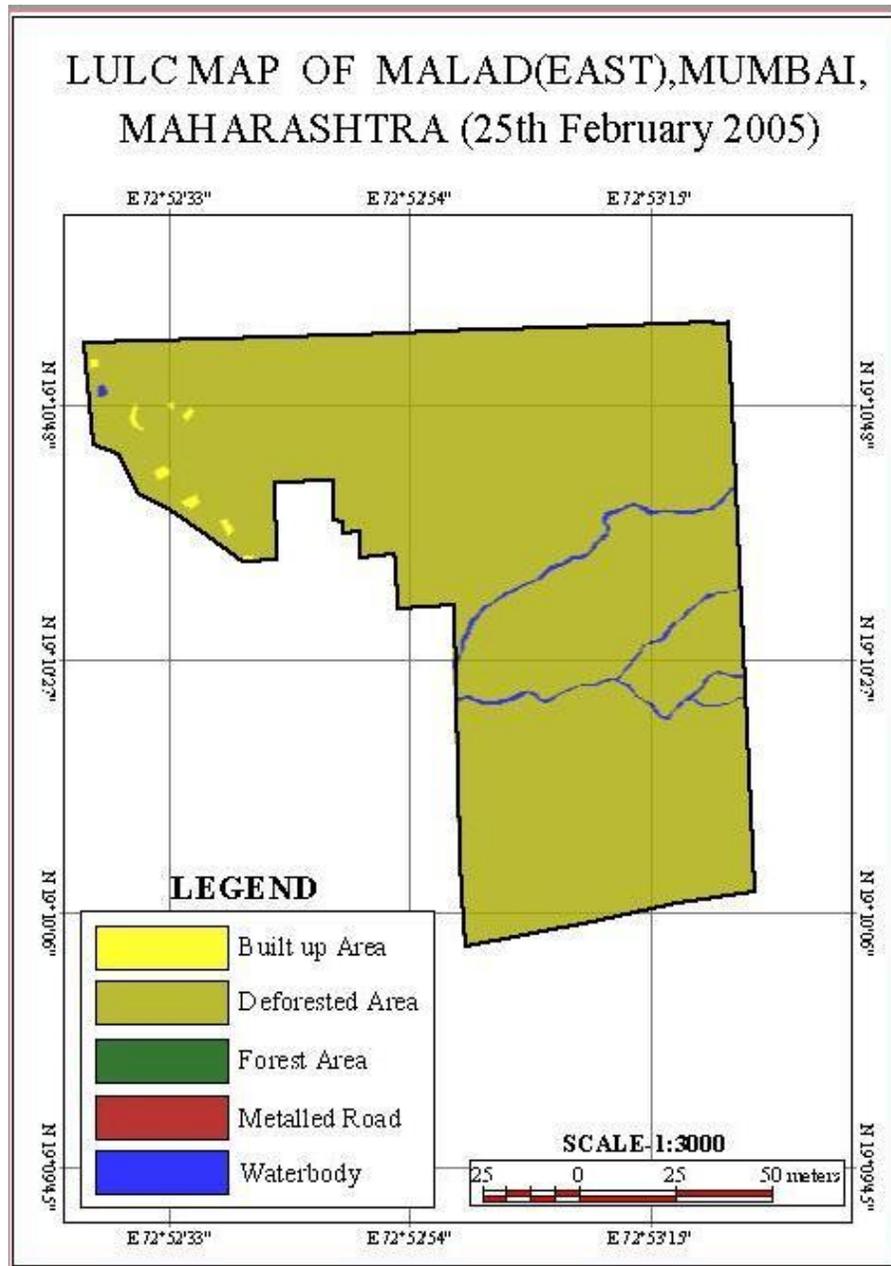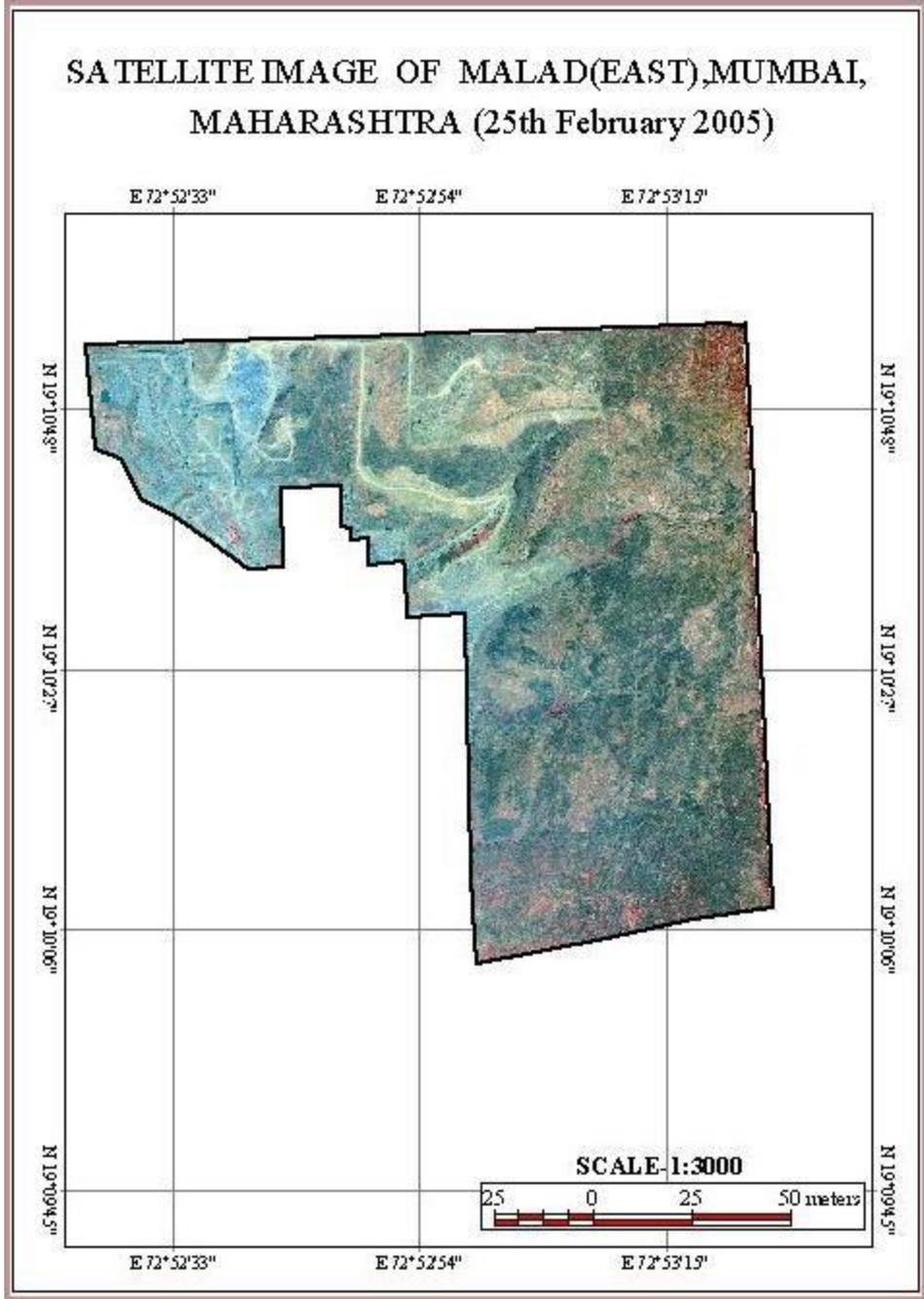
Image-13-May, 2008

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1384834.09 | 138.48 |
| 3 | Built Up Area | 121983.52 | 12.19 |
| 4 | Metalled Road | 25691.18 | 2.56 |
| 5 | Waterbody | 16432.03 | 1.64 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (13th May 2008)

SATELLITE IMAGE OF MALAD(EAST),MUMBAI, MAHARASHTRA (13th May 2008)
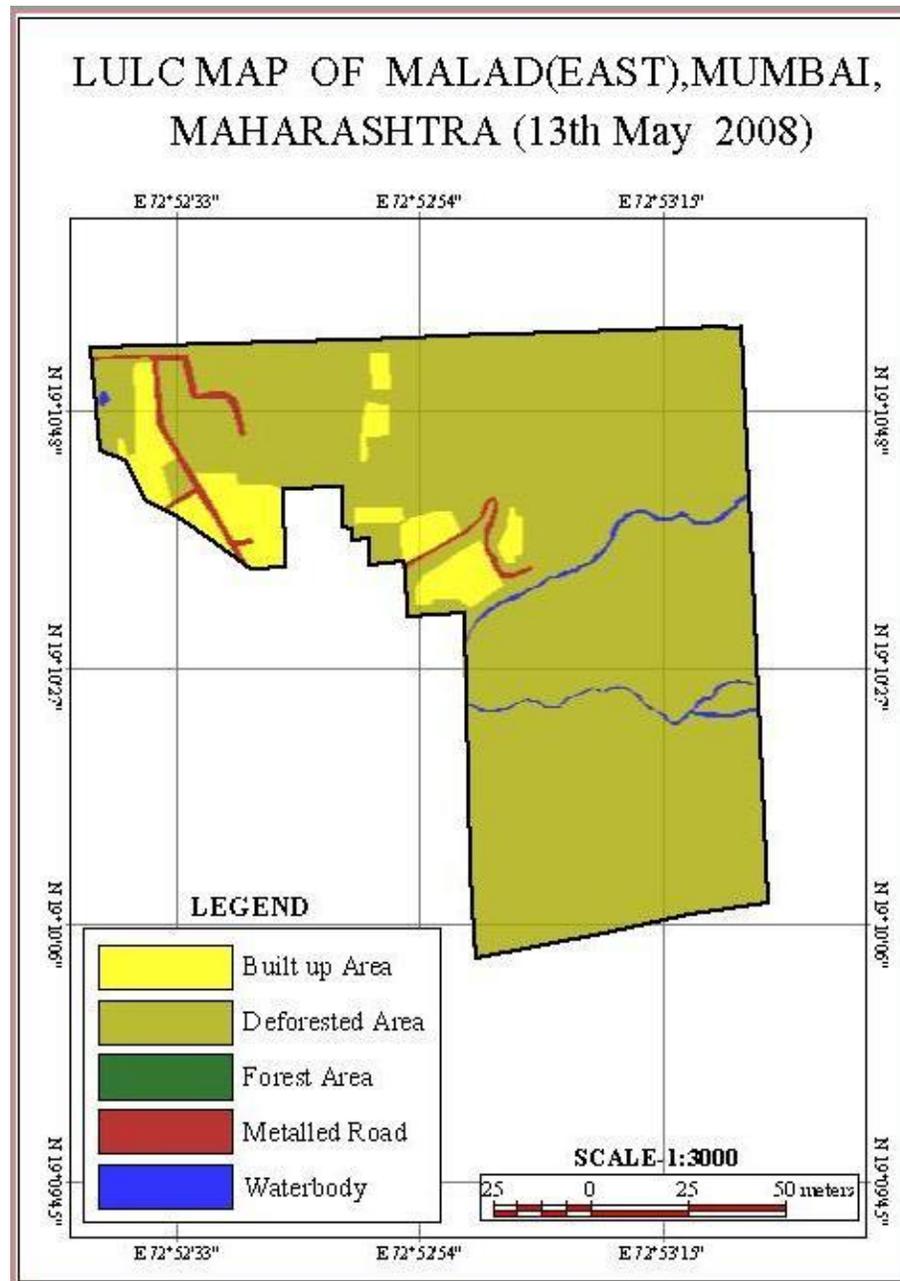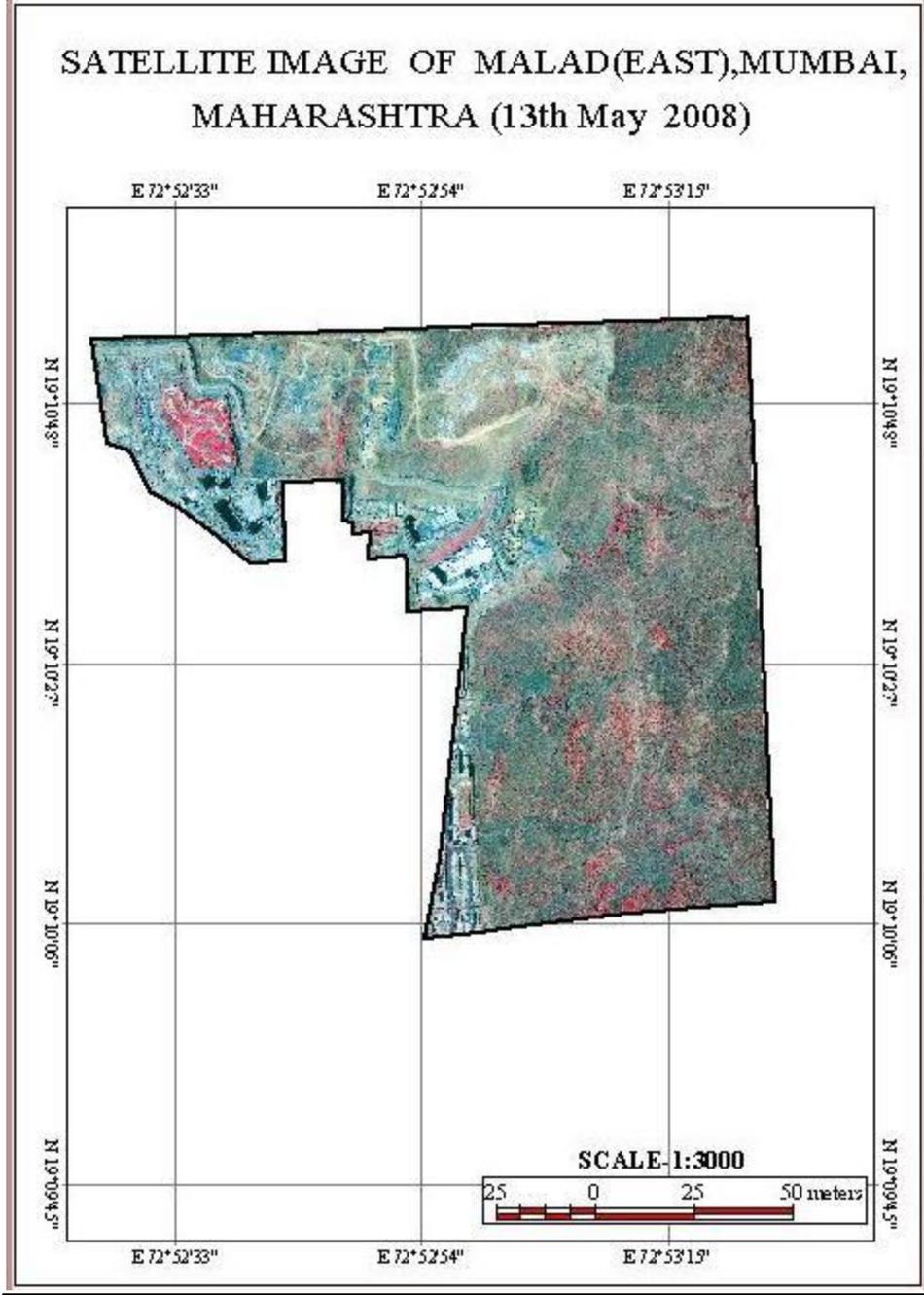
Image-06 Jan, 2011

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|---------------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1363475.79 | 136.34 |
| 3 | Built Up Area | 130779.47 | 13.07 |
| 4 | Metaled Road | 41388.69 | 4.13 |
| 5 | Waterbody | 13296.87 | 1.32 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (6th January 2011)

# SATELLITE IMAGE OF MALAD(EAST),MUMBAI, MAHARASHTRA (6th January 2011)



SCALE-1:3000

25    0    25    50 meters
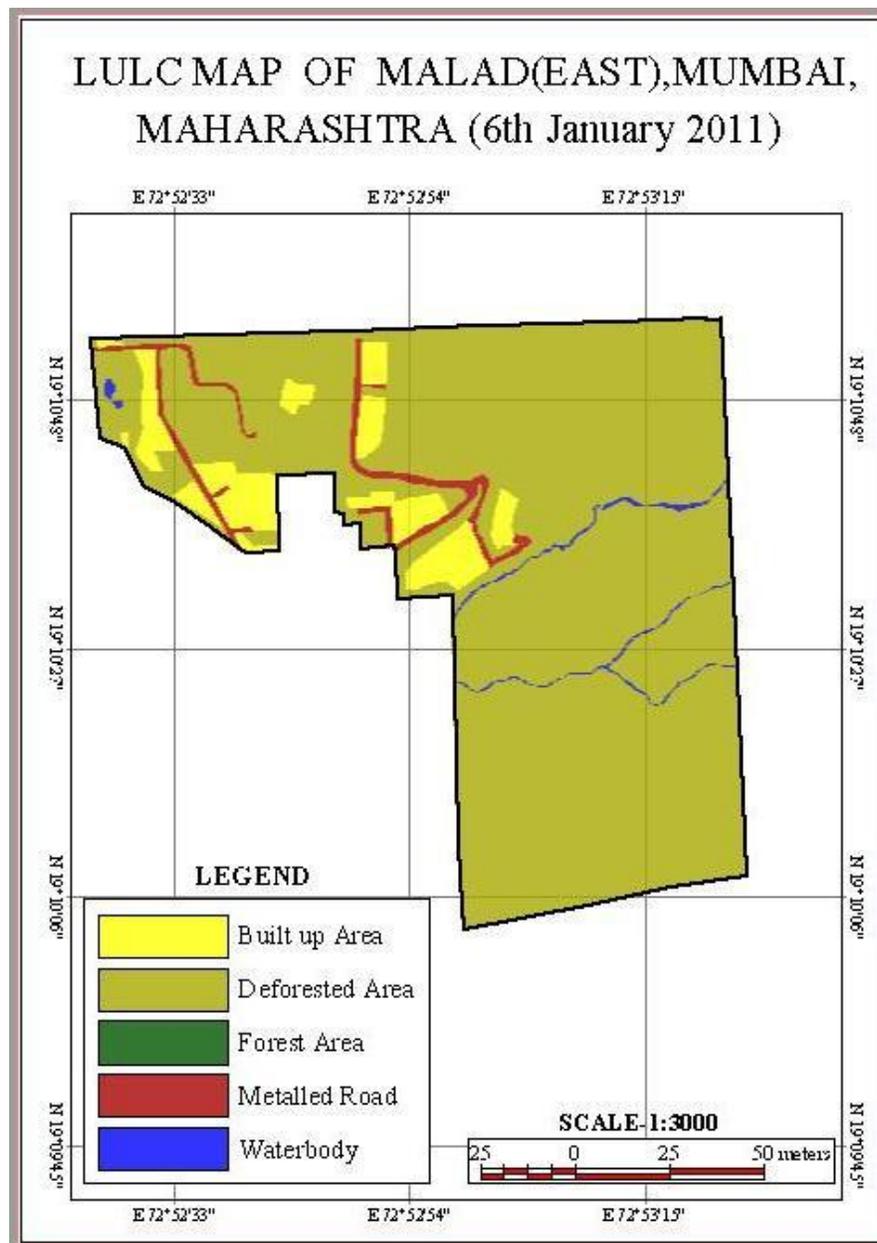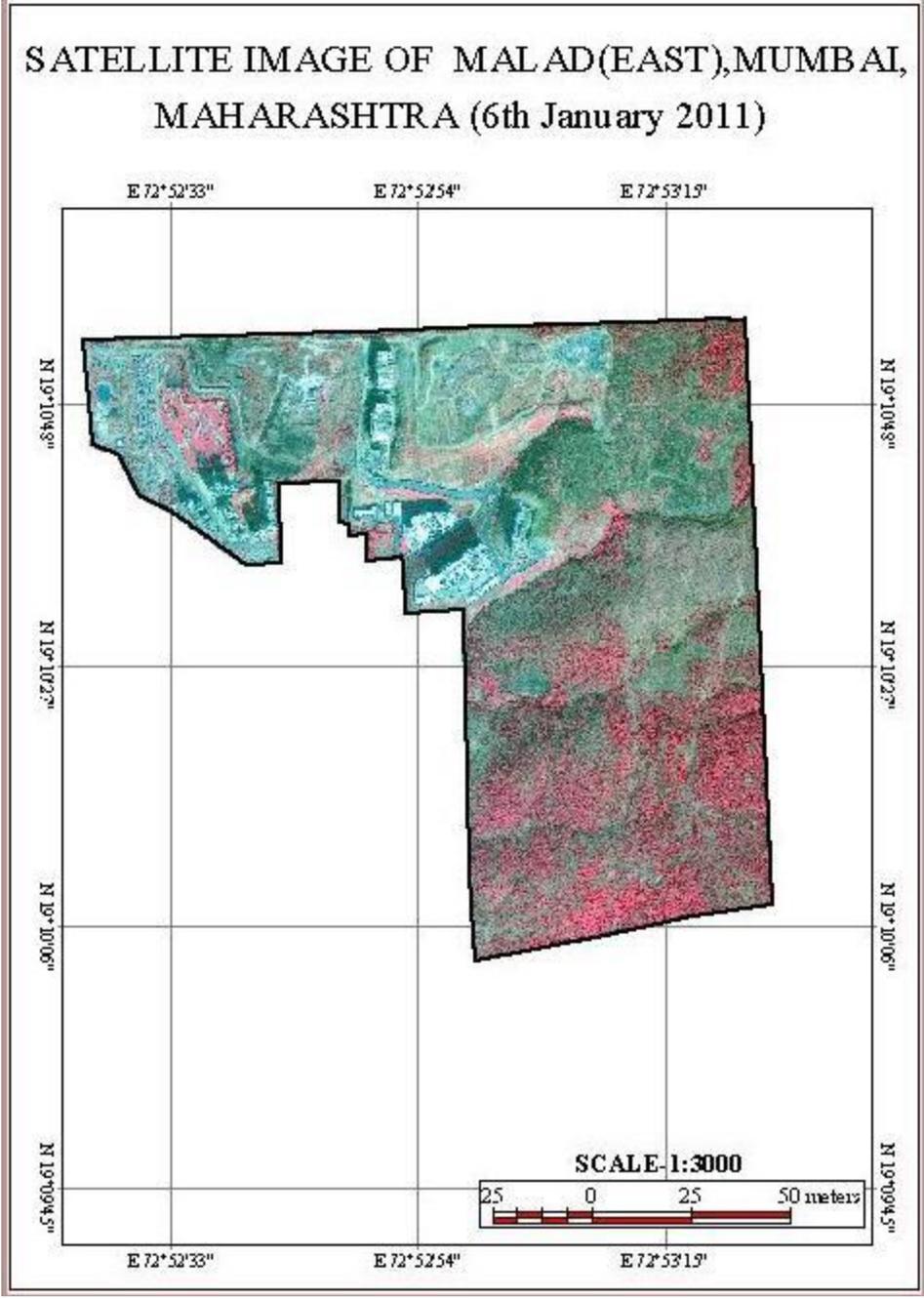
Image-09 Oct, 2011

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1353653.80 | 135.36 |
| 3 | Built Up Area | 136519.58 | 13.65 |
| 4 | Metalled Road | 41864.21 | 4.18 |
| 5 | Waterbody | 12965.27 | 1.29 |
| | | | |

LULC MAP OF MALAD(EAST)MUMBAI, MAHARASHTRA (9th October2011)

SATELLITE IMAGE OF MALAD(EAST)MUMBAI, MAHARASHTRA (9th October2011)
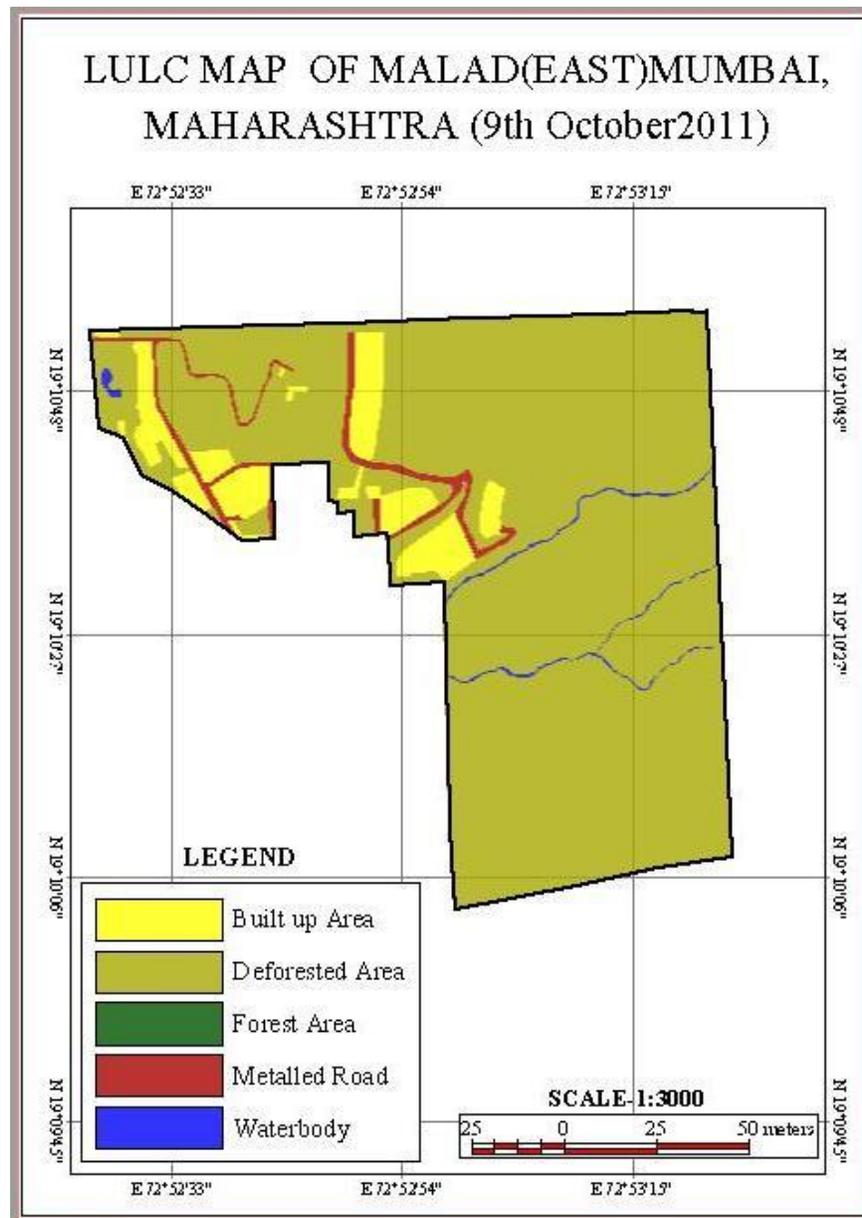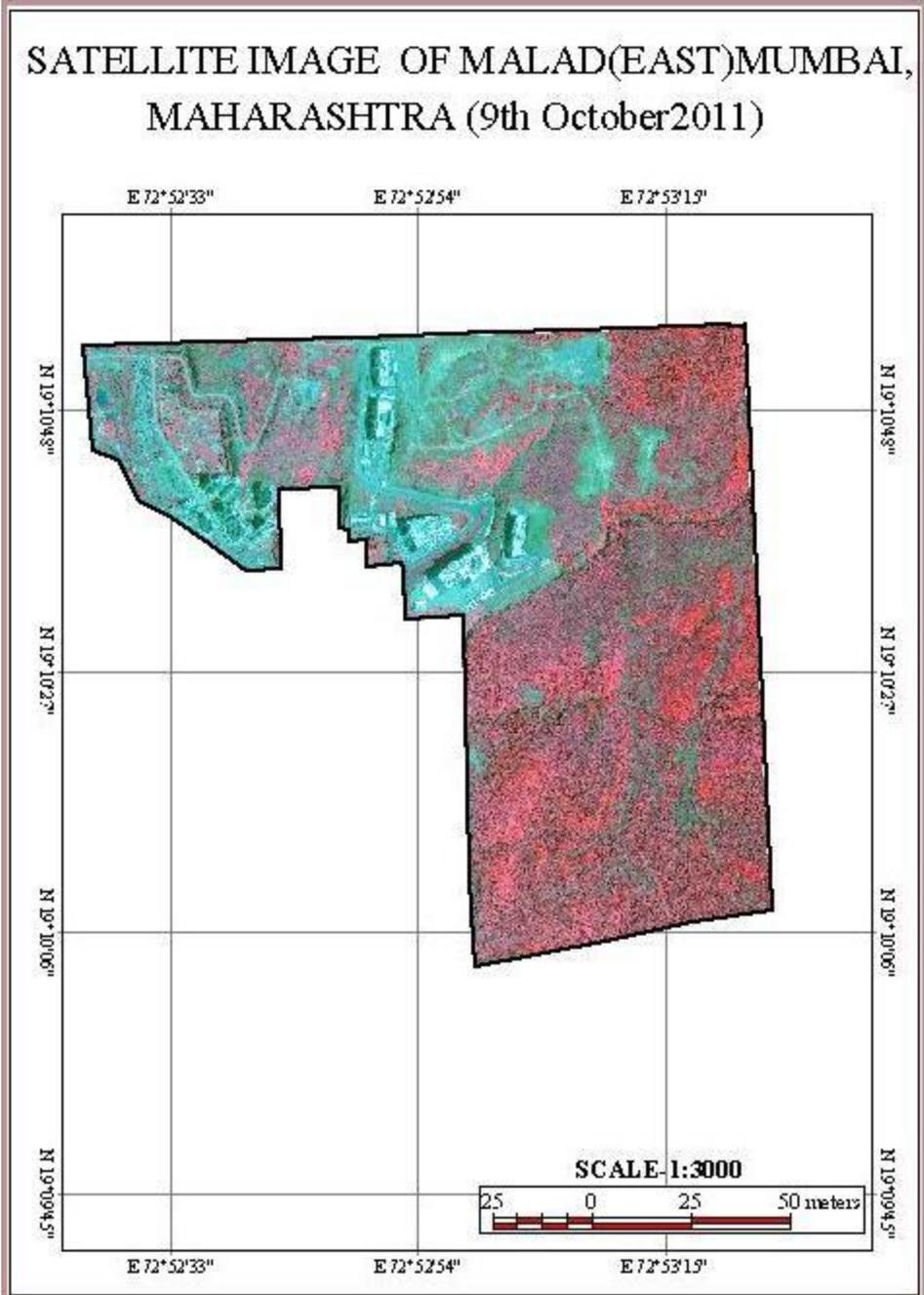
Image-03 December, 2012

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|-------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1314434.00 | 131.44 |
| 3 | Built Up Area | 173322.08 | 17.33 |
| 4 | Metalled Road | 51797.98 | 5.18 |
| 5 | Waterbody | 9386.76 | 0.94 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (3rd December2012)

LEGEND

Built up Area
Deforested Area
Forest Area
Metalled Road
Waterbody

SCALE-1:3000

SATELLITE MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (3rd December2012)
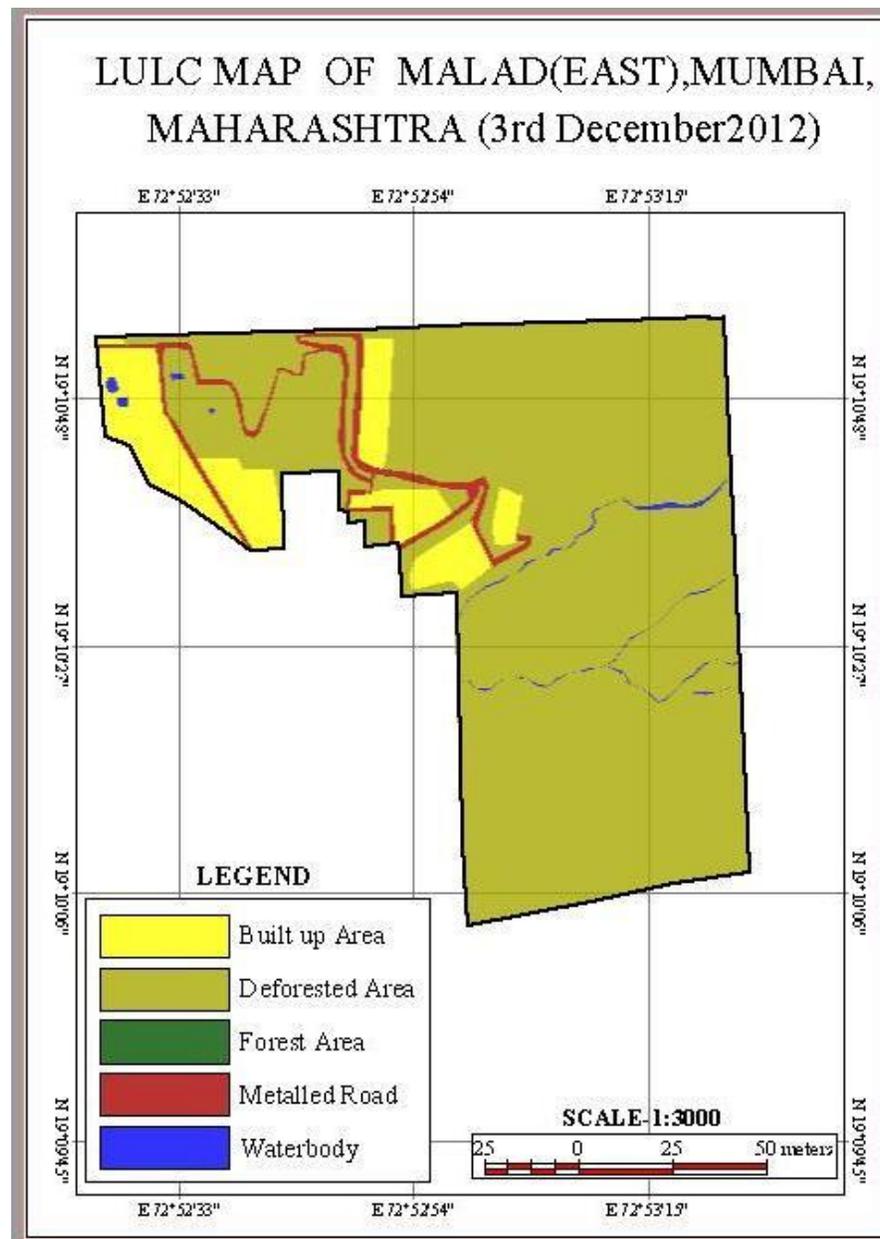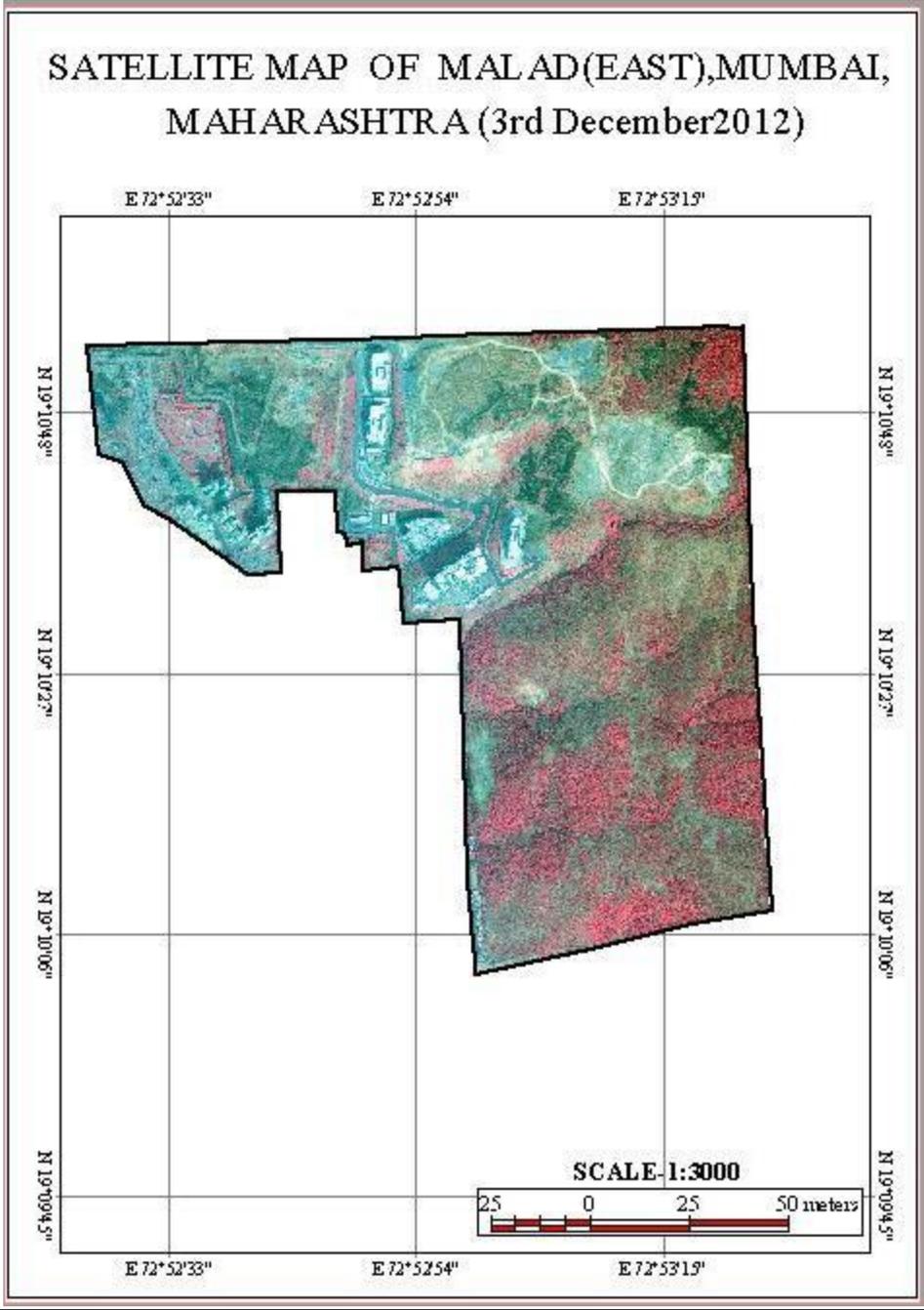
Image-05 Nov, 2013

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1296341.33 | 129.63 |
| 3 | Built Up Area | 173281.42 | 17.33 |
| 4 | Metaled Road | 66770.42 | 6.68 |
| 5 | Waterbody | 12947.66 | 1.29 |
| | | | |

LULC MAP OF MALAD(EAST)MUMBAI, MAHARASHTRA (5th November2013)

LEGEND

Built up Area
Deforested Area
Forest Area
Metalled Road
Waterbody

SCALE-1:3000
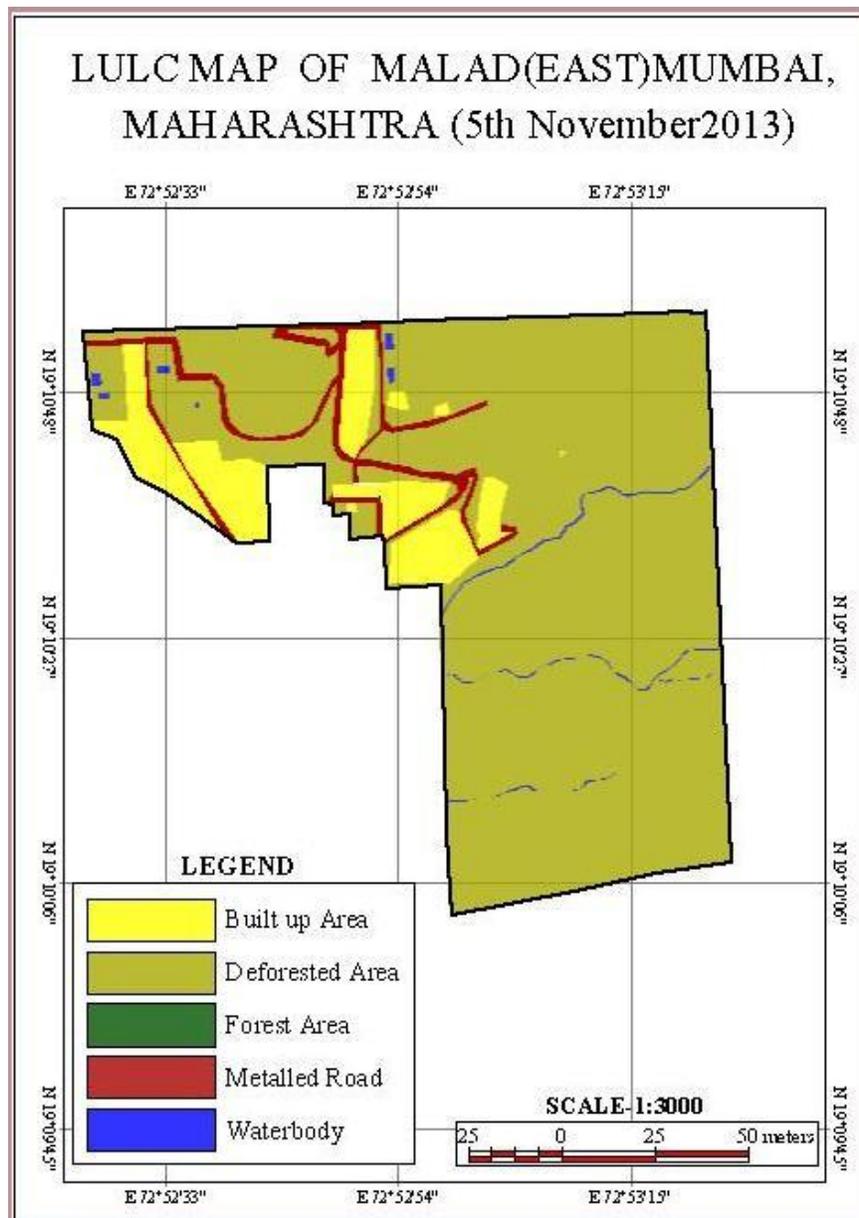
SATELLITE IMAGE OF MALAD(EAST)MUMBAI, MAHARASHTRA (5th November2013)
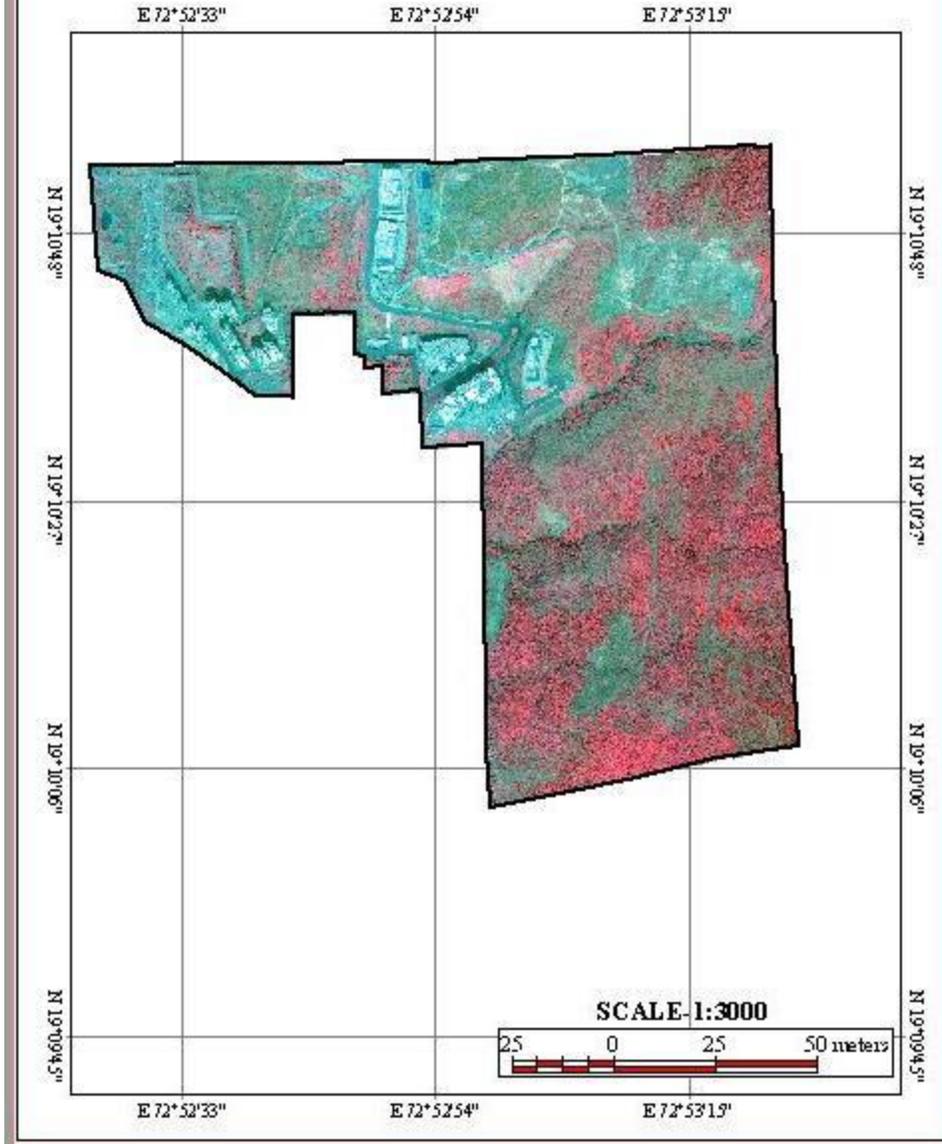
Image-25-Oct, 2018

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1276299.43 | 127.62 |
| 3 | Built Up Area | 173264.92 | 17.33 |
| 4 | Metaled Road | 81000.96 | 8.10 |
| 5 | Waterbody | 18375.51 | 1.84 |
| | | | |



LULC MAP OF MALAD(EAST)MUMBAI, MAHARASHTRA (25th October,2018)

# SATELLITE IMAGE OF MALAD(EAST)MUMBAI, MAHARASHTRA (25th October,2018)
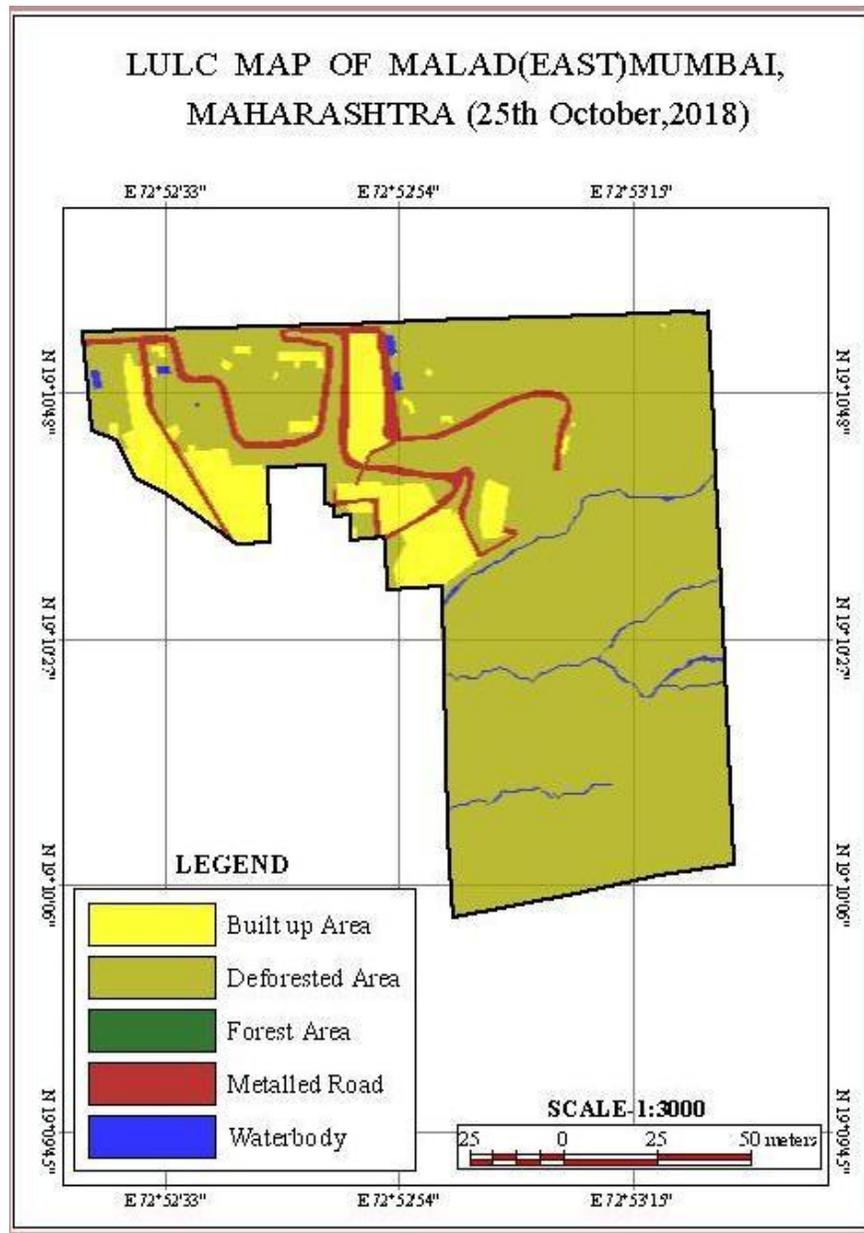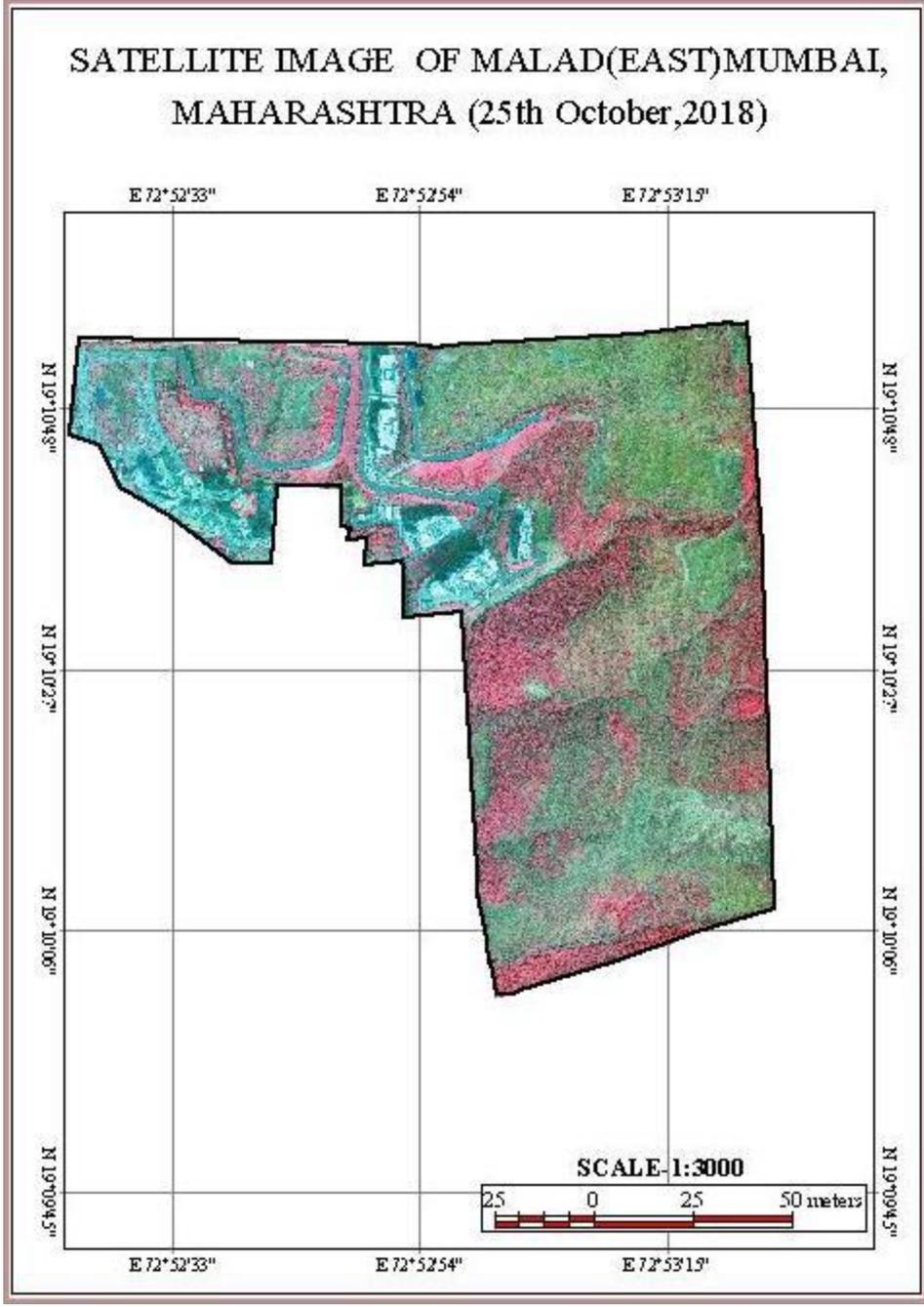
Image-15-oct, 2019

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1284397.40 | 128.44 |
| 3 | Built Up Area | 173353.43 | 17.33 |
| 4 | Metaled Road | 74936.97 | 7.49 |
| 5 | Waterbody | 16153.51 | 1.61 |
| | | | |



LULC MAP OF MALAD(EAST)MUMBAI, MAHARASHTRA (15th October 2019)

SATELLITE IMAGE OF MALAD(EAST)MUMBAI, MAHARASHTRA (15th October 2019)
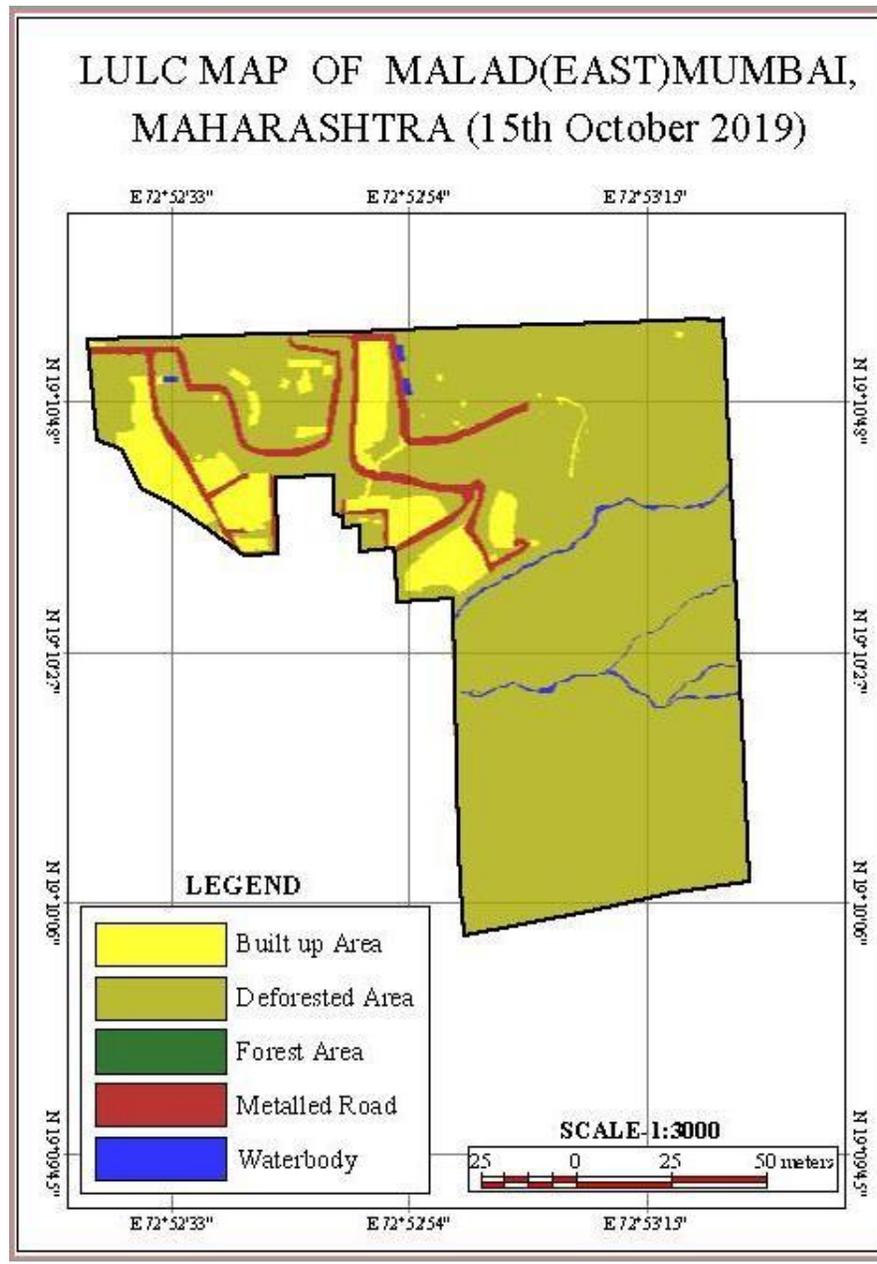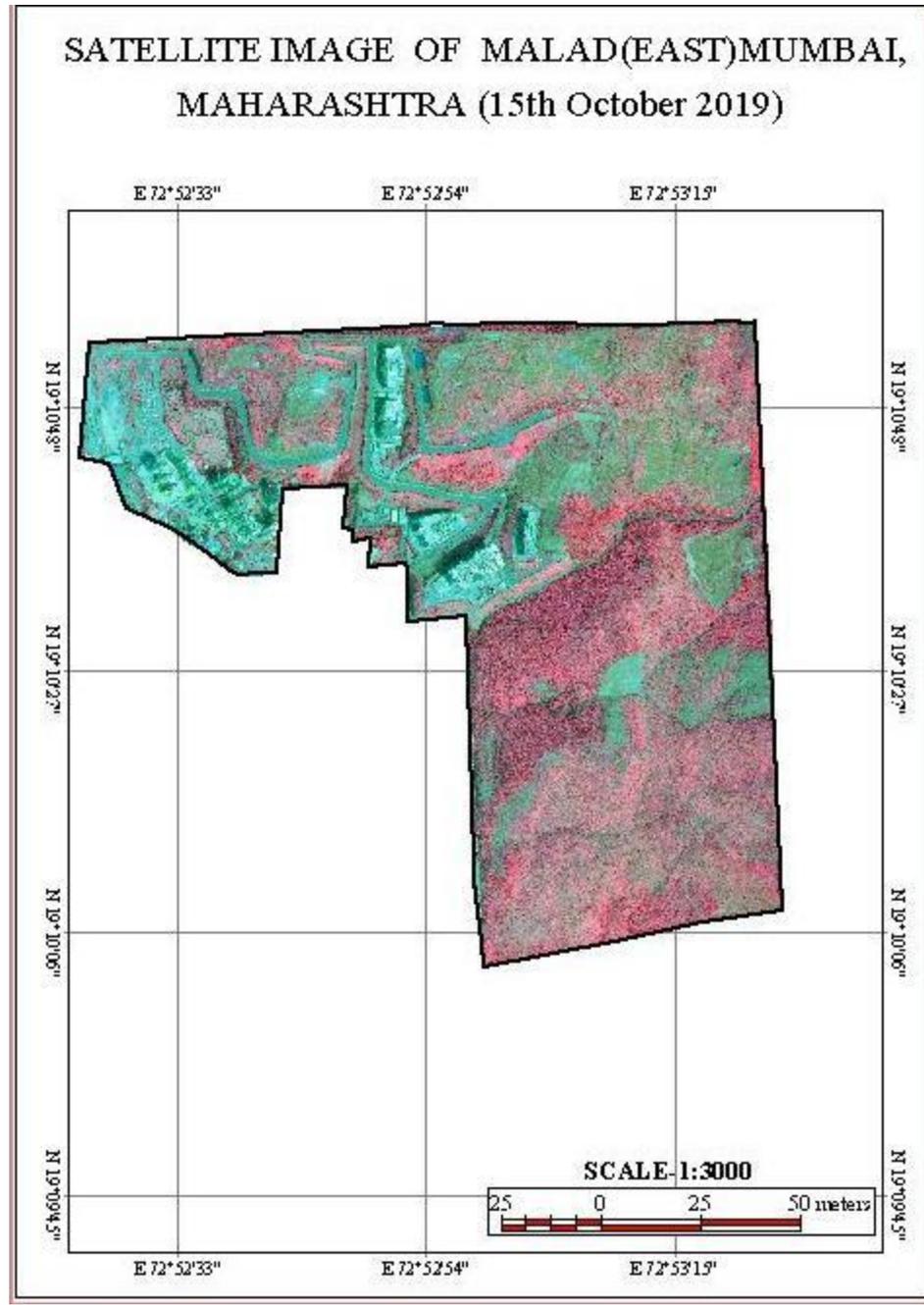
Image-03Nov, 2021

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1273264.58 | 127.33 |
| 3 | Built Up Area | 186396.13 | 18.64 |
| 4 | Metalled Road | 74984.92 | 7.50 |
| 5 | Waterbody | 15219.52 | 1.52 |
| | | | |



LULC MAP OF MALAD(EAST)MUMBAI, MAHARASHTRA (3rd November 2021)

LEGEND

Built up Area
Deforested Area
Forest Area
Metalled Road
Waterbody

SCALE-1:3000
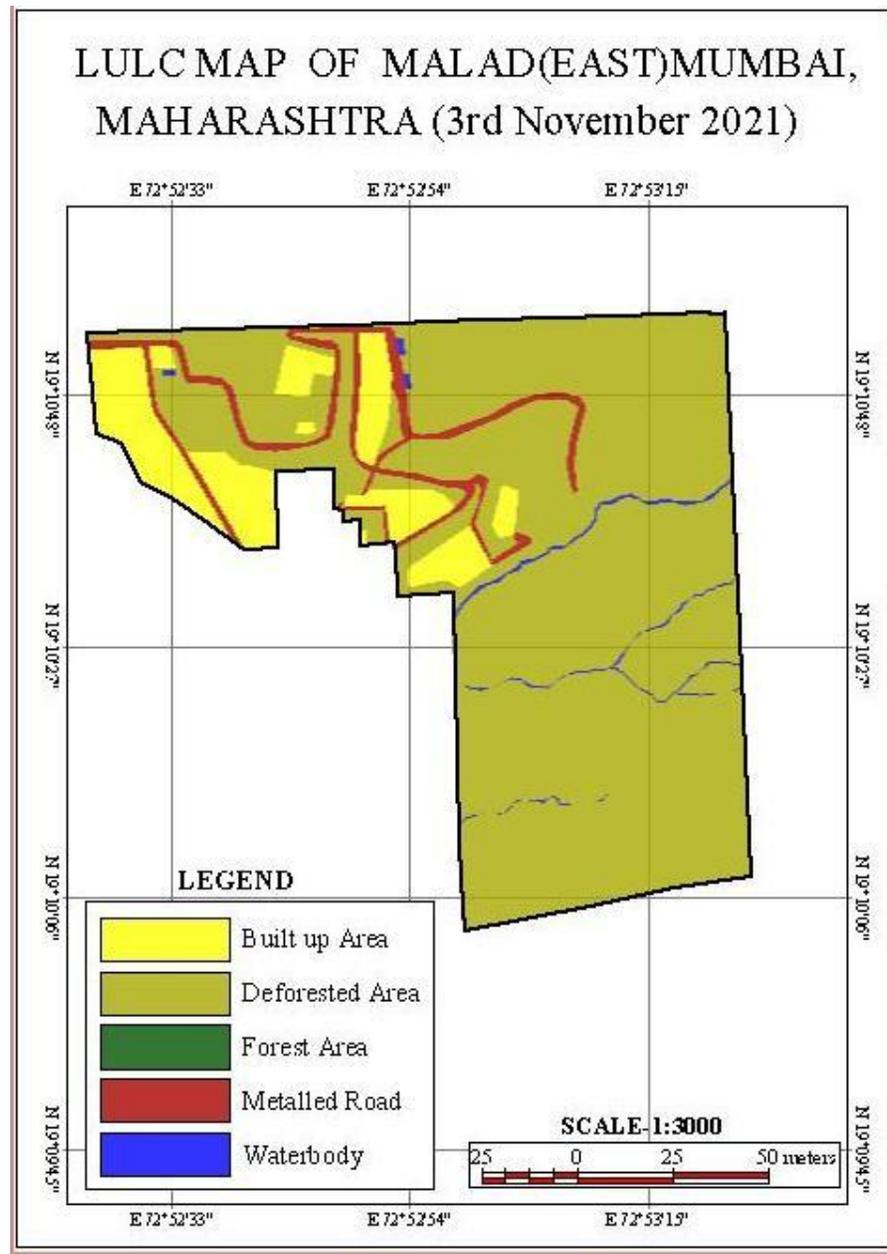
SATELLITE IMAGE OF MALAD(EAST)MUMBAI, MAHARASHTRA (3rd November 2021)
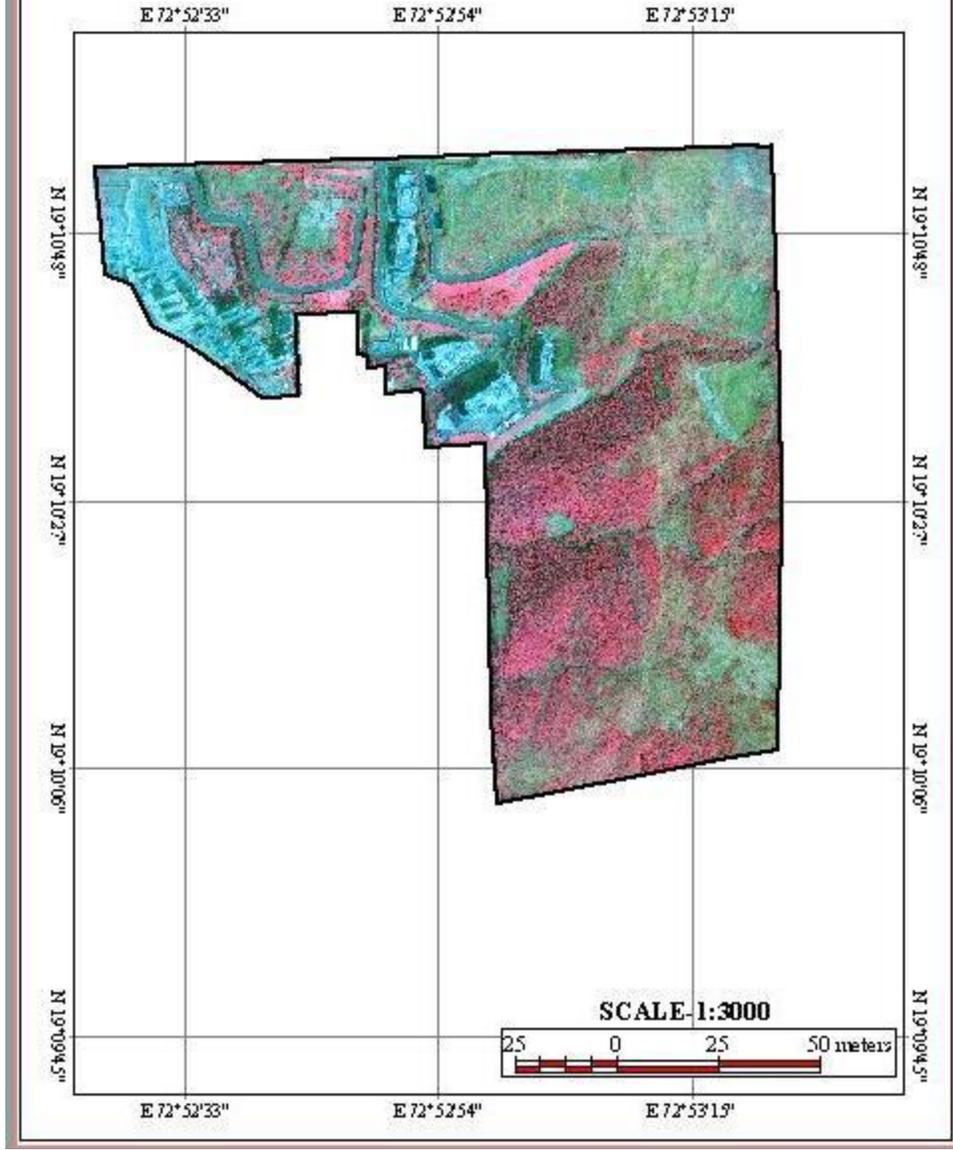
Image-21-Feb, 2022

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1275180.69 | 127.52 |
| 3 | Built Up Area | 191278.58 | 19.13 |
| 4 | Metalled Road | 74955.34 | 7.50 |
| 5 | Waterbody | 7526.20 | 0.75 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (21st February 2022)

SATELLITE MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (21st February 2022)
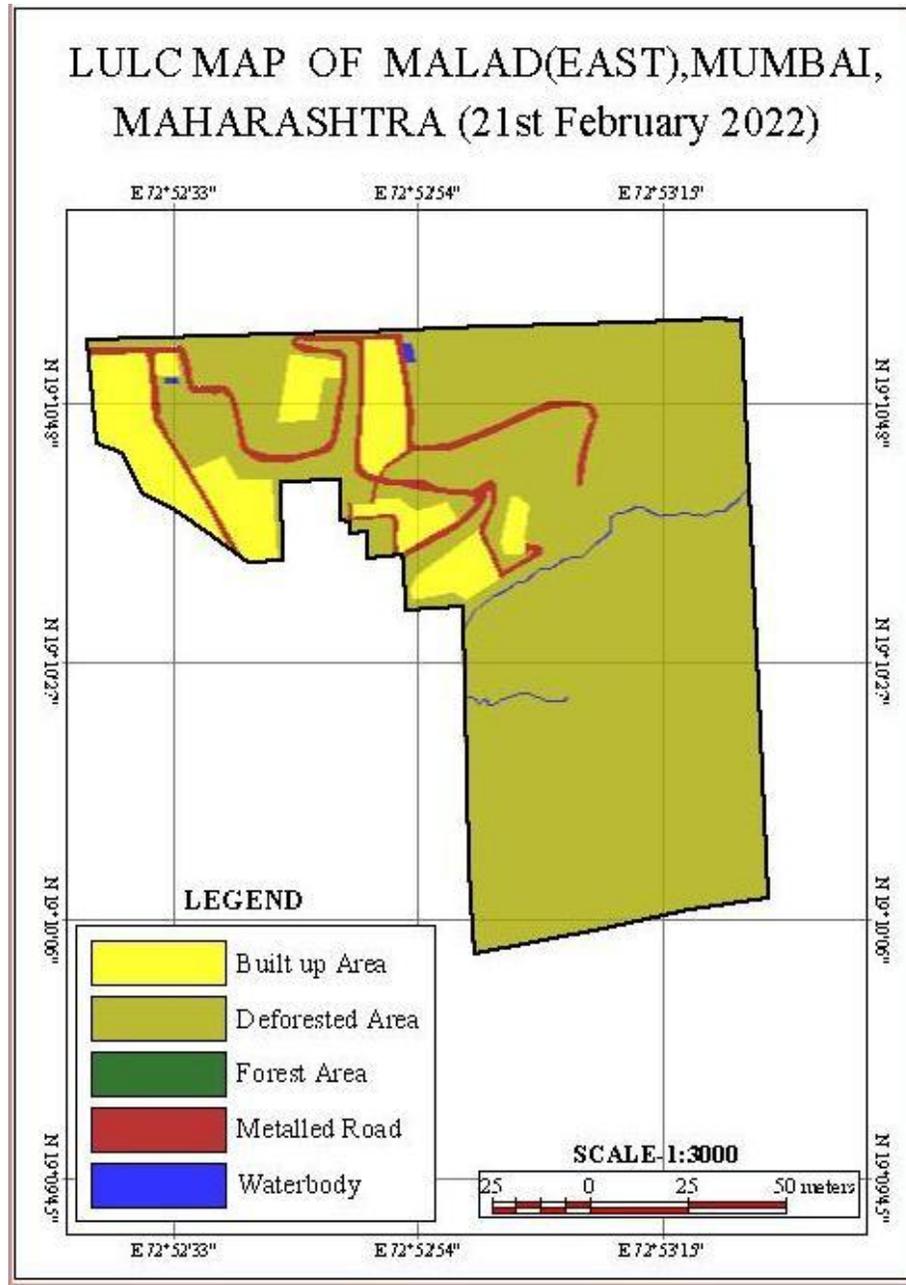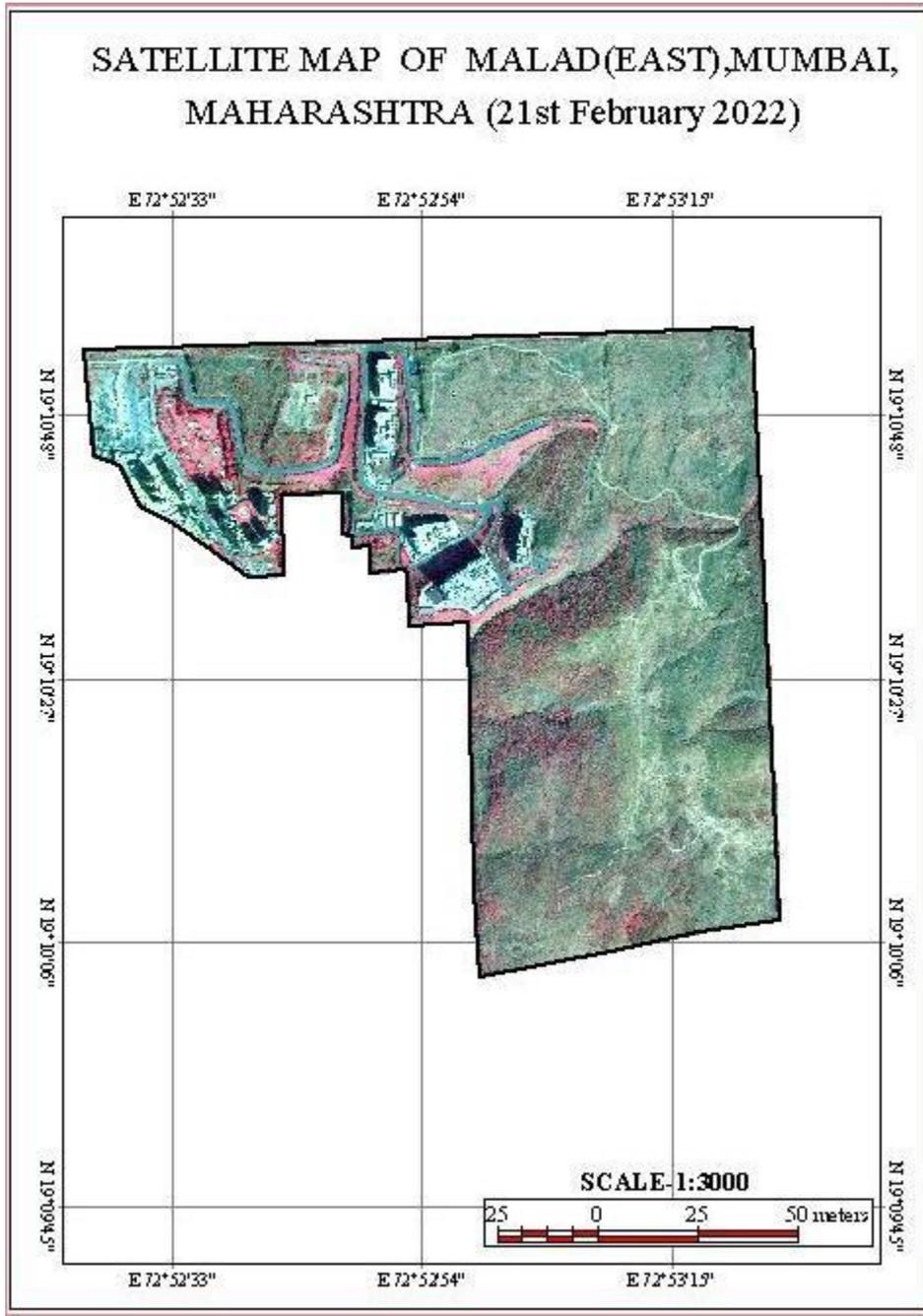
Image-20-April, 2023

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|-------|-------|----------------|------------------|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1271636.46 | 127.16 |
| 3 | Built Up Area | 191329.38 | 19.13 |
| 4 | Metalled Road | 77234.18 | 7.72 |
| 5 | Waterbody | 8740.80 | 0.87 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (20th April 2023)

LEGEND

Built up Area
Deforested Area
Forest Area
Metalled Road
Waterbody

SCALE-1:3000

SATELLITE IMAGE OF MALAD(EAST),MUMBAI, MAHARASHTRA (20th April 2023)

SCALE-1:3000
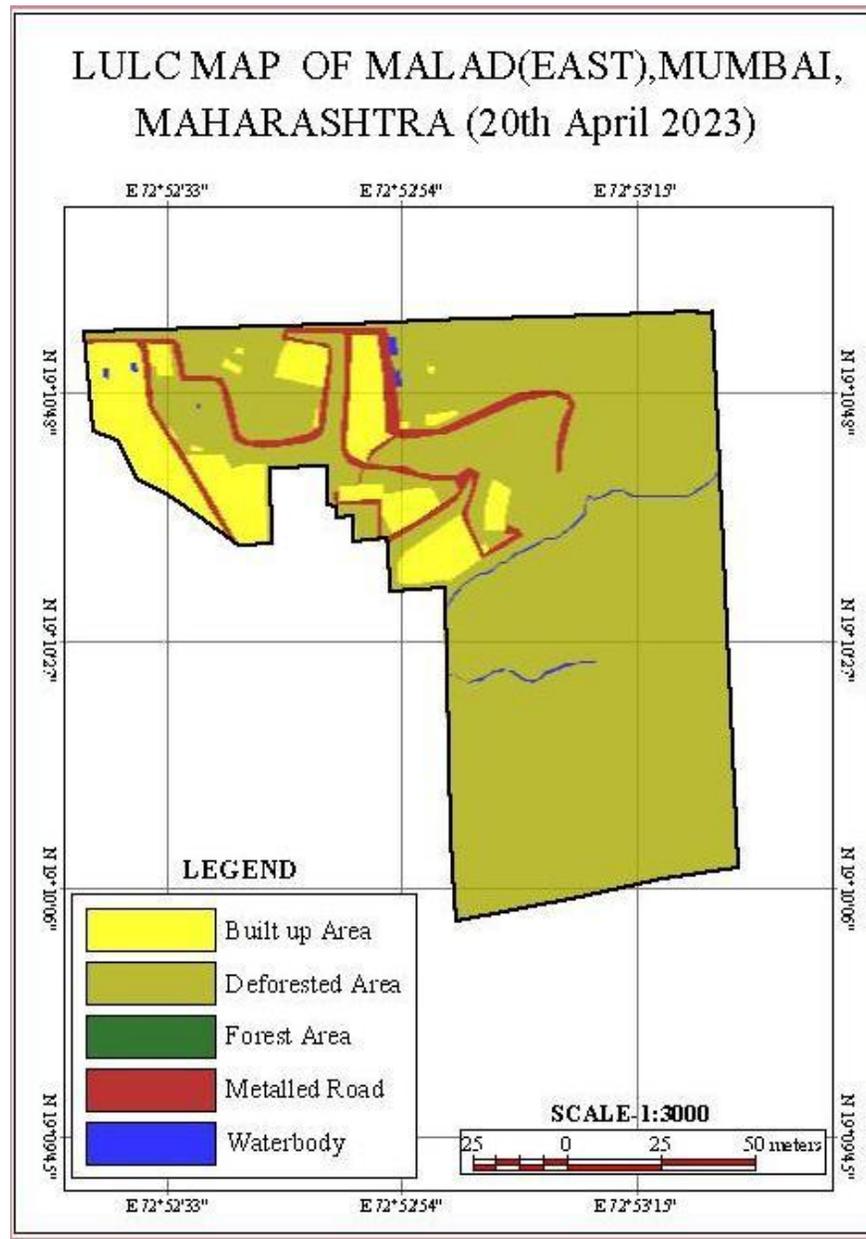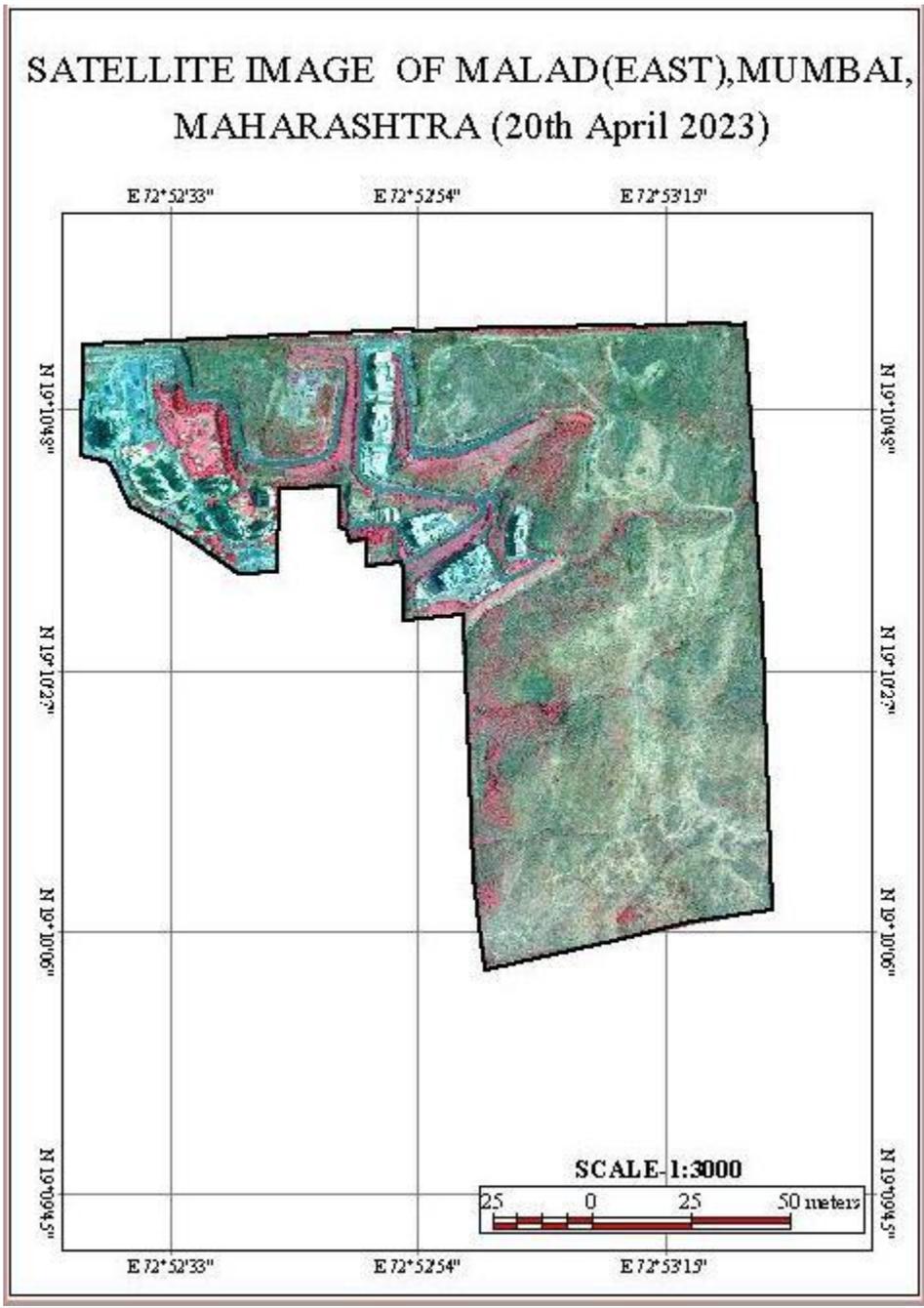
Image-17 January, 2024

| Sr.No | Class | Area In Sq. m. | Area in Hectares |
|---|---|---|---|
| 1 | Forest Area | 00 | 00 |
| 2 | Deforested Area | 1268534.85 | 126.85 |
| 3 | Built Up Area | 191341.13 | 19.13 |
| 4 | Metalled Road | 77159.83 | 7.72 |
| 5 | Waterbody | 11905.01 | 1.19 |
| | | | |



LULC MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (17th January 2024)

# SATELLITE MAP OF MALAD(EAST),MUMBAI, MAHARASHTRA (17th January 2024)



SCALE-1:3000
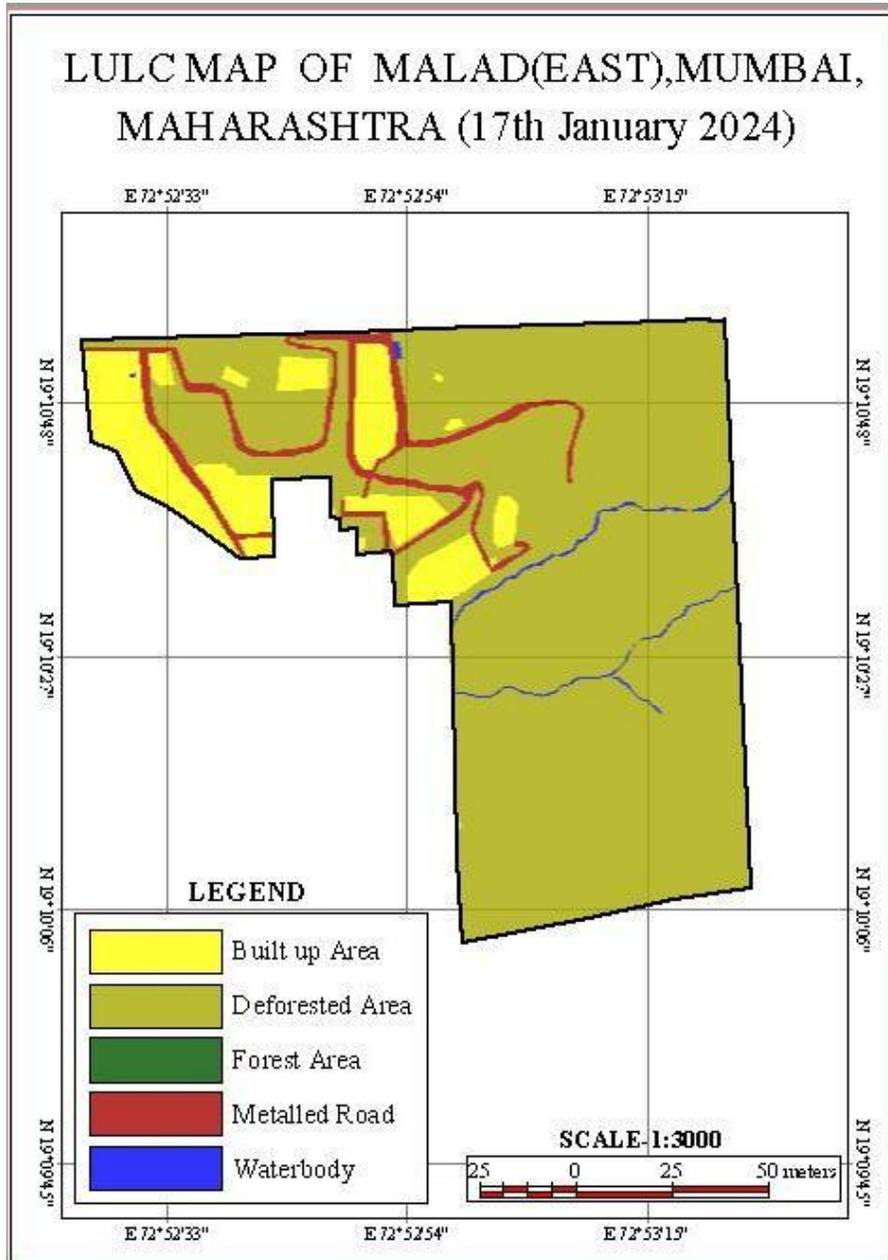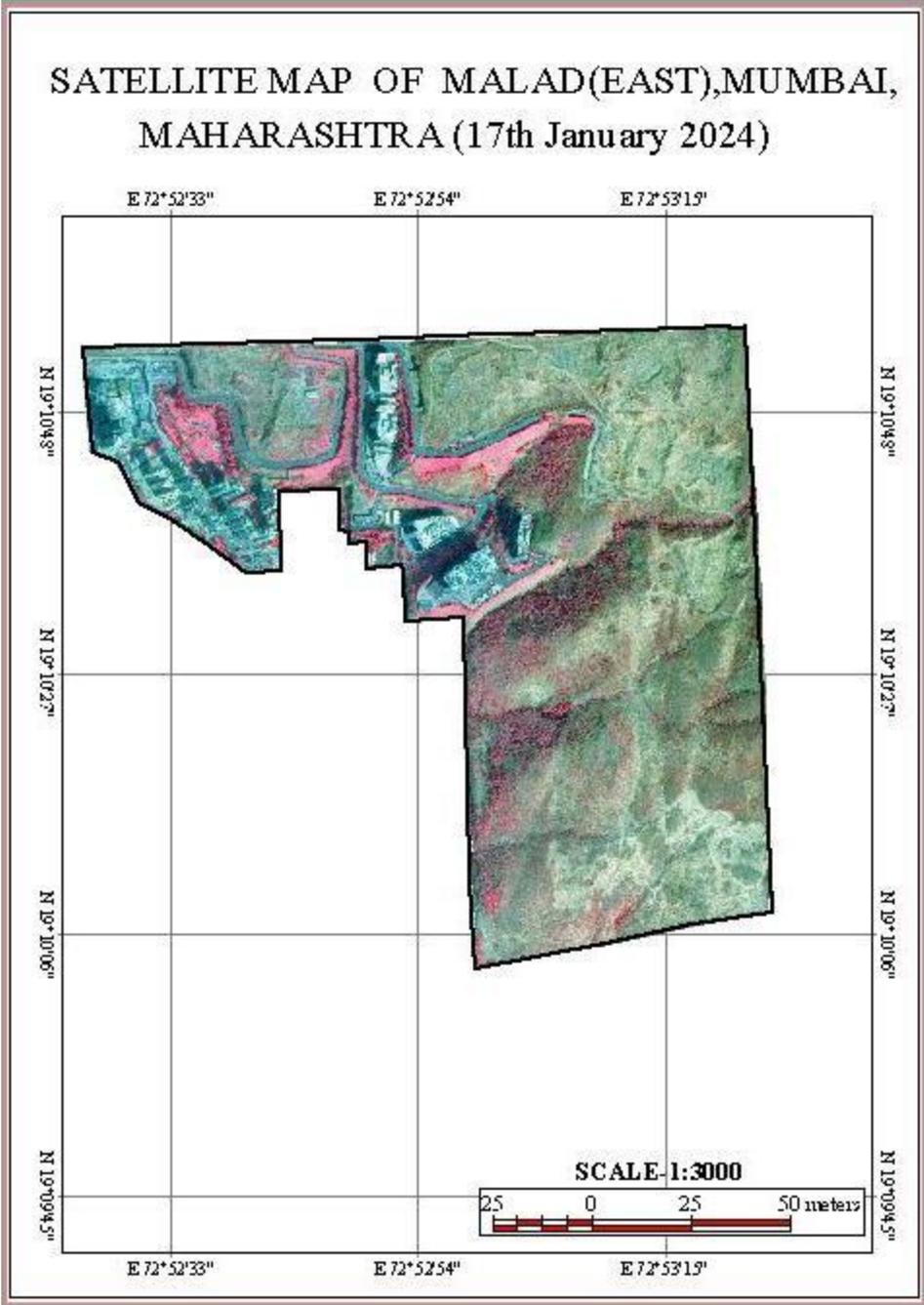
**Broad Observation on the Land Use Area Statistics for all years:**

*Broad Observations on the Land Use changes during the time span 2000-2019*:

- Around **52.8** Ha of Forest Area in 2000 is converted to Non-Forest areas
- Deforested Area found in 2000 was **100.2** Ha but changed to **128.4** Ha. An increase of**28** Ha. of Deforested area
- Built-up areaof size **17.3** Ha has been newly developedduring these years. Indicates conversion of land to settlement and urban areas happened during this period
- Area of Metaled Roads increased from Zero to **7.5** Ha. Indicates Road construction happened over this time
- Area of water bodies decreased by **0.25** Ha. Indicates there was some change in water bodies in some of the area

*Broad Observations on the Land Use changes during the time span 2019-2024*:

- Deforested Area changed from **128.4** Ha to **126.8** Ha. A decrease of**1.6** Ha. of Deforested area
- Built-up area of size **1.8** Ha has been newly developed during these years. Possibly conversion of some deforested land to Built-up area have taken place
- Very small increase in Metalled Roads by **0.2** Ha
- Area of water bodies decreased by **0.4** Ha. Indicates there was some change in water bodies in some of the area
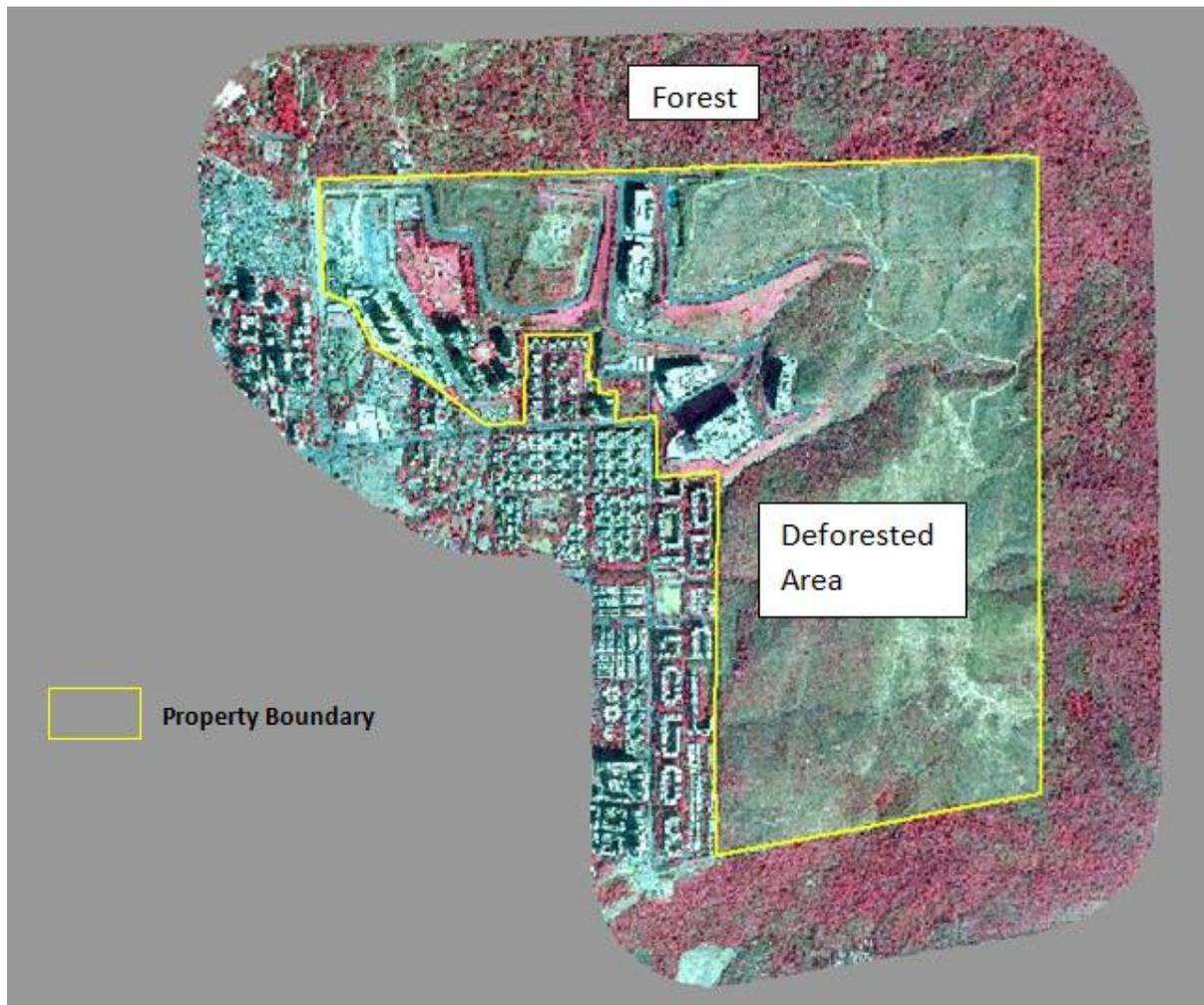
**Year wise Variations of Classified Area**

## Year wise Deforested Area



## Year wise Built Up Area

Year wise Area of Metalled Roads



Year wise Area of Water bodies
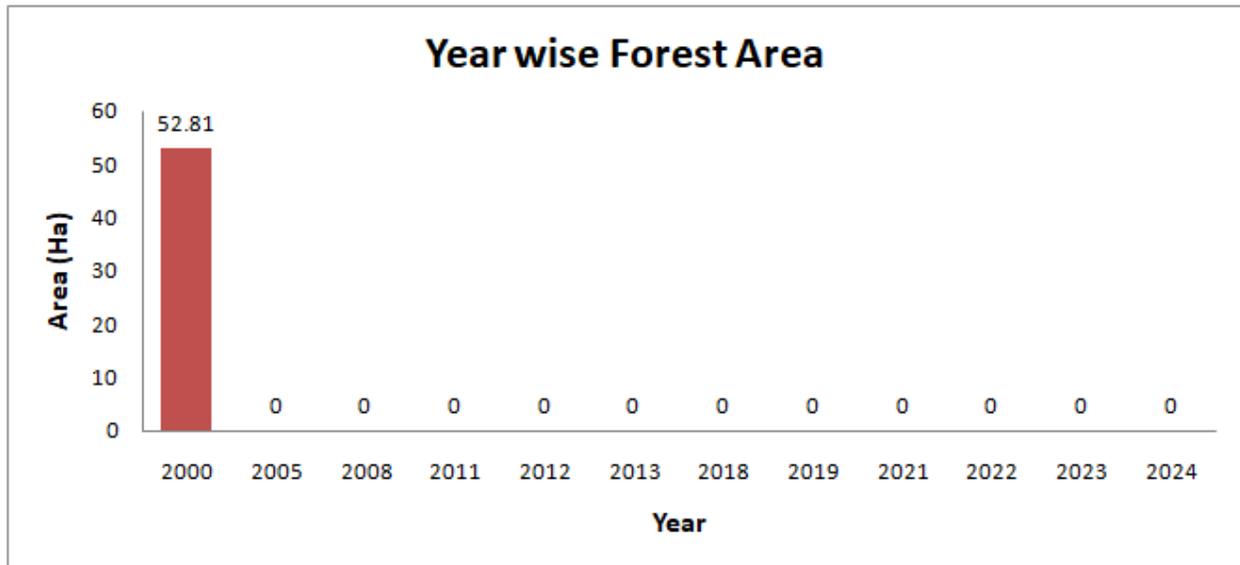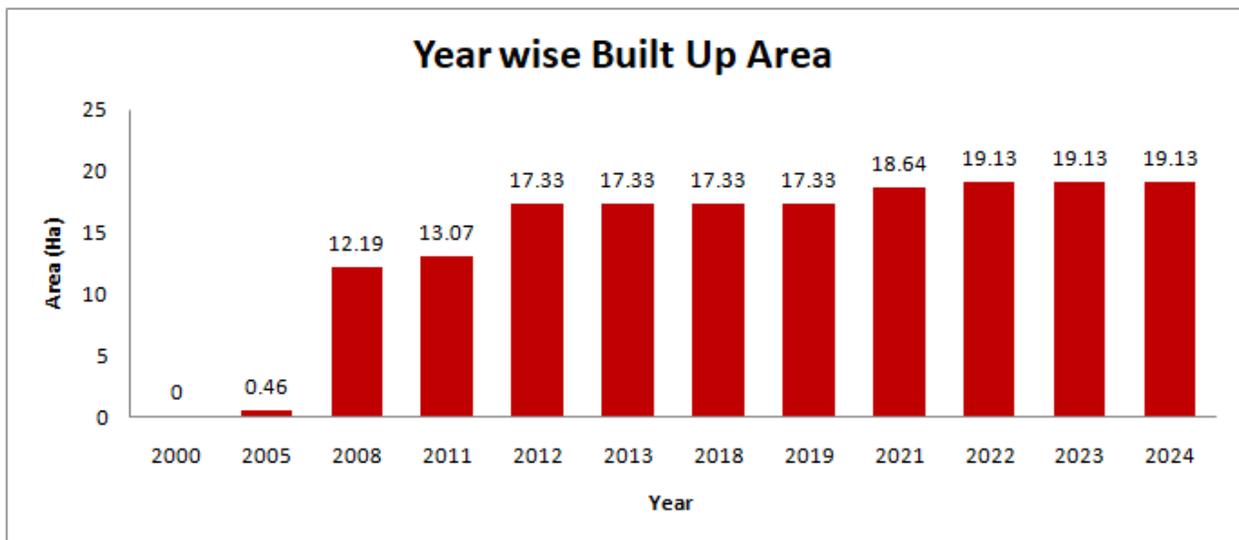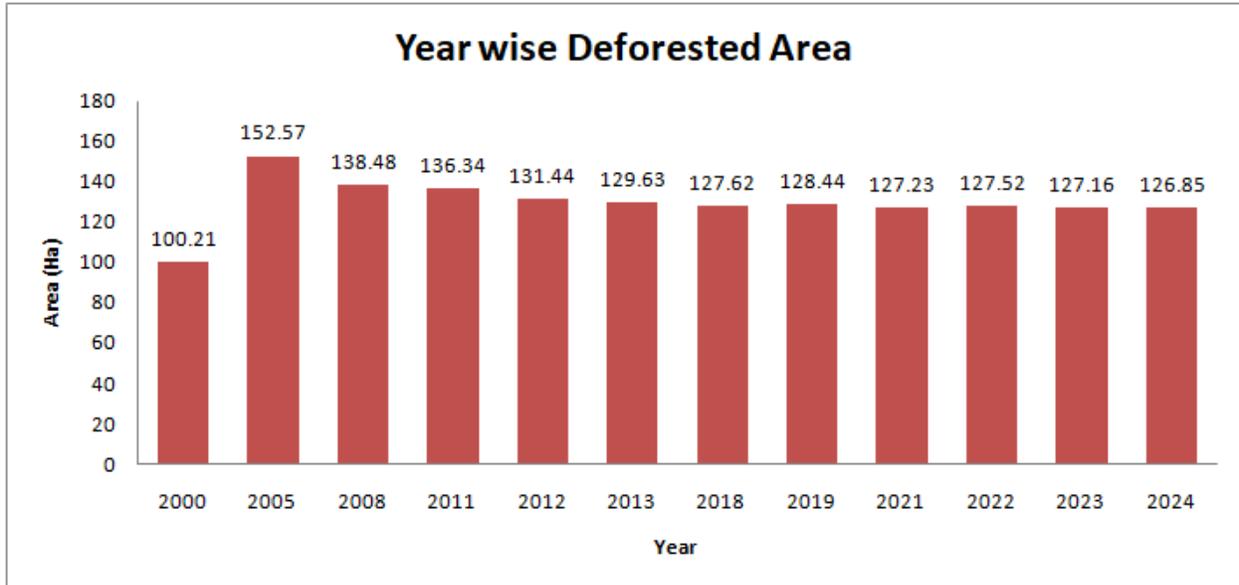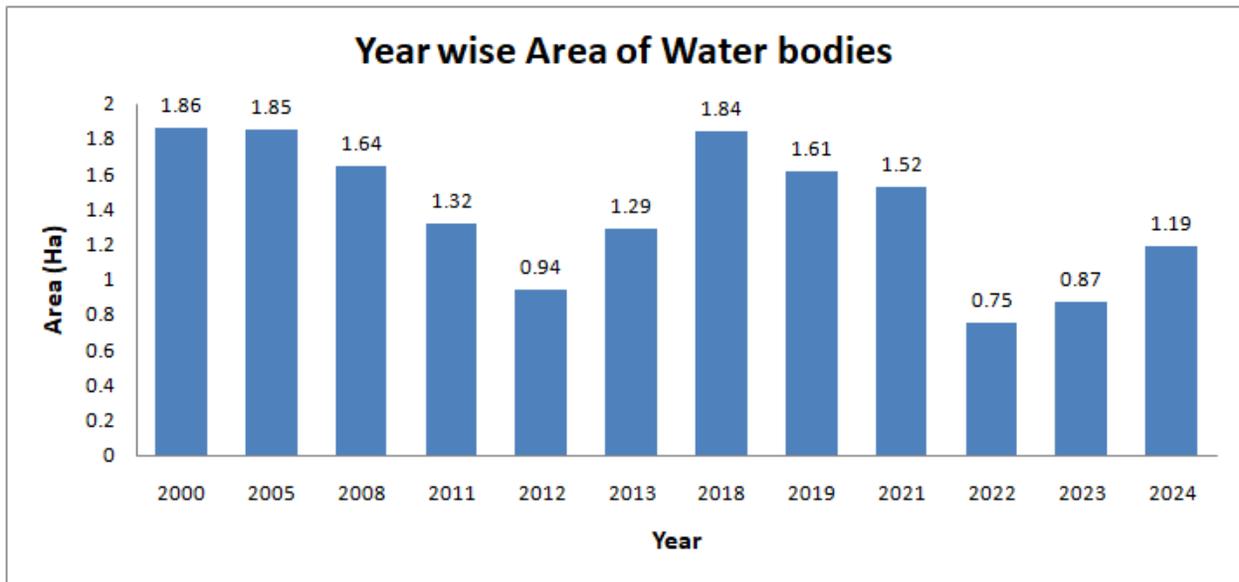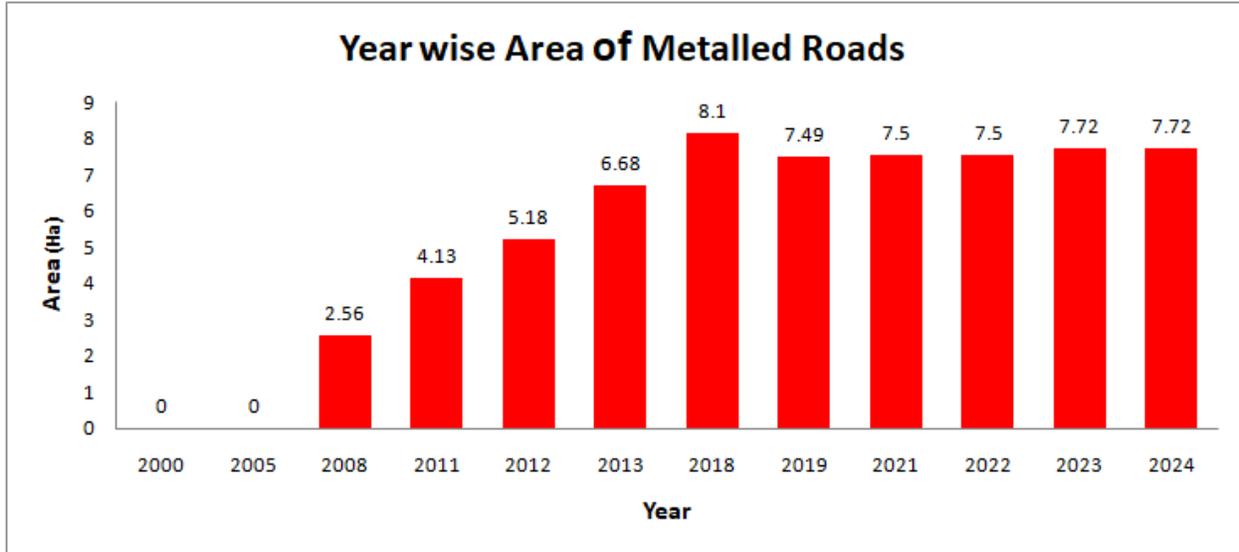
**GENERAL TECHNICAL FOOTNOTES**



a) The above is the image of 2024 displayed as False Color Composite (FCC) image. This technique is used in satellite image processing to easily identify the Forest area.

b) The chlorophyll content of the leaves emits high energy which is captured by satellite and filtered through RED using Remote Sensing technique to identify Forest areas easily.

c) Thus, the dark RED in the Satellite image represents Forest

d) The light tone of RED and BLUISH areas represents shrubs, marshy land broadly due to loss of greenery (deforestation) and called Deforested Areas.

e) No natural degradation will have such a sharp change in tonal variation along a man-made boundary (the yellow line), hence, the area within the boundary has witnessed deforestation.

## Concluding Remarks

1.      The area of the private property is 1.548 sqkms or 154.88 Ha.

2.      We have studied and analyzed the satellite images since 2000 of the said privately held property, henceforth termed as "Area of Interest" (or AOI). The property is demarcated by a wall which is apparent in the images.

3.      Detail surveyed boundary is available & can be correlated with Government records.

4.      On observation of the relative surrounding, it is seen that the current study area is surrounded by Sanjay Gandhi National Park (included in the images received for study area).

5.      As of the latest available image in 2024, The immediate surroundings of the AOI is still forest.

6.      Analysis reveals that in 2000, the Forest Area covered 52.8 Ha, while the Deforested Area was 100.21 Ha.

7.      By 2005, the Forest Area was 0 Ha, while the Deforested Area totaled 152.57 Ha. This transformation is clearly showed in the chart below.
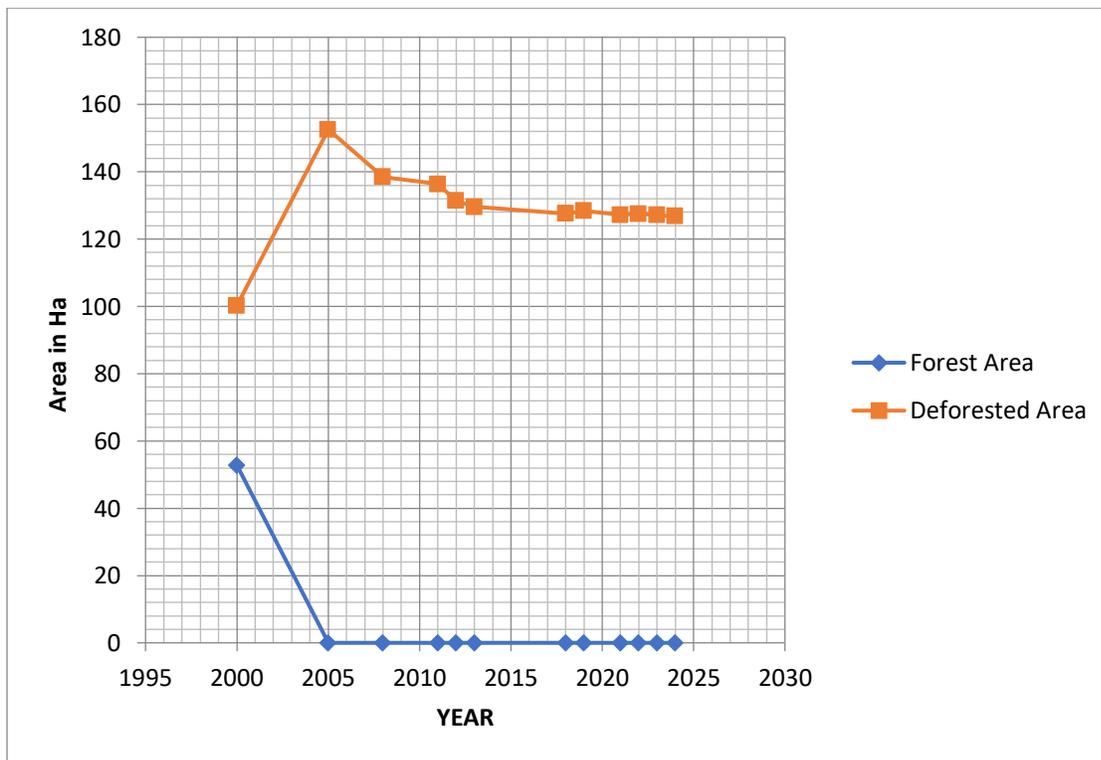


1.  In 2012, compared to 2005, the deforested area decreased by 21.13 Ha (152.57 – 131.44) but building & road increased by 22.51 Ha.Its obvious that settlement happened on the deforested areas.

2. Similarly in 2024, compared to 2012, the deforested area further decreased by 4.59 Ha but again Settlement & Road increased by 4.34 Ha (see chart below)
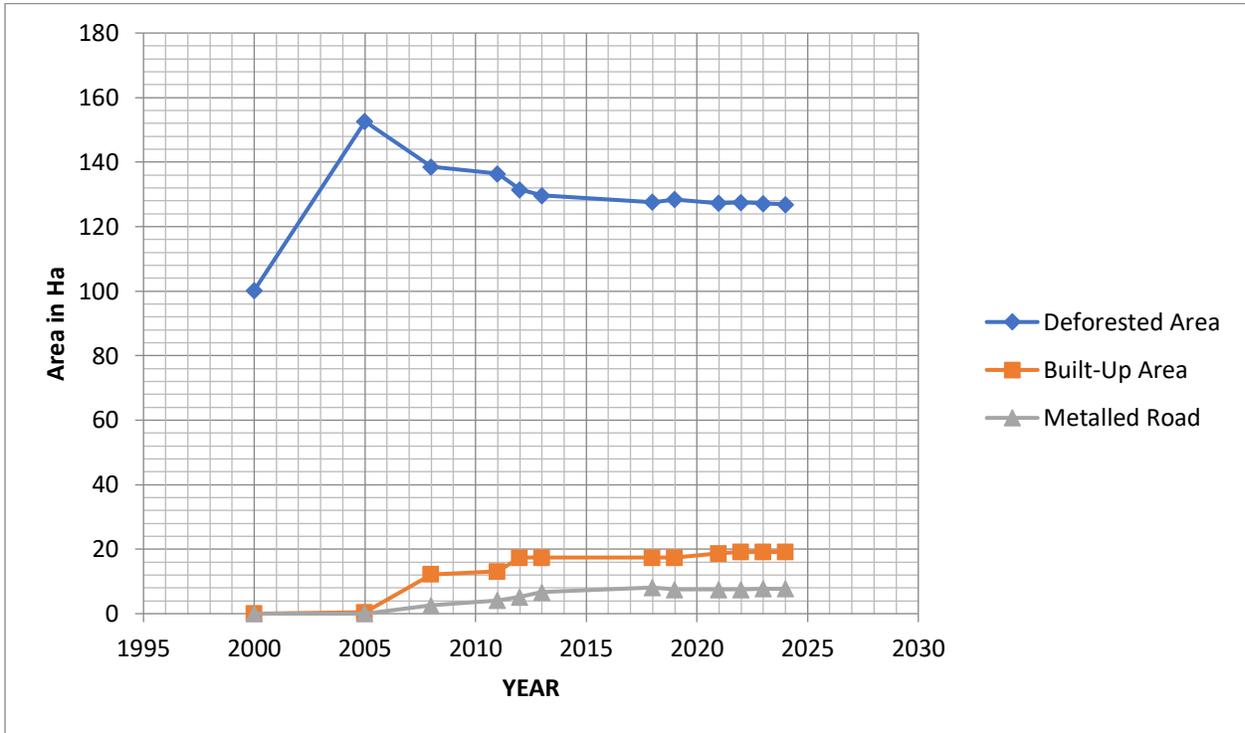


3. The waterbodies in 2000 were 1.86 Ha and decreased to 1.19 Ha in 2024. There was a spike effect in 2018-19 , may be because of monsoon effect .
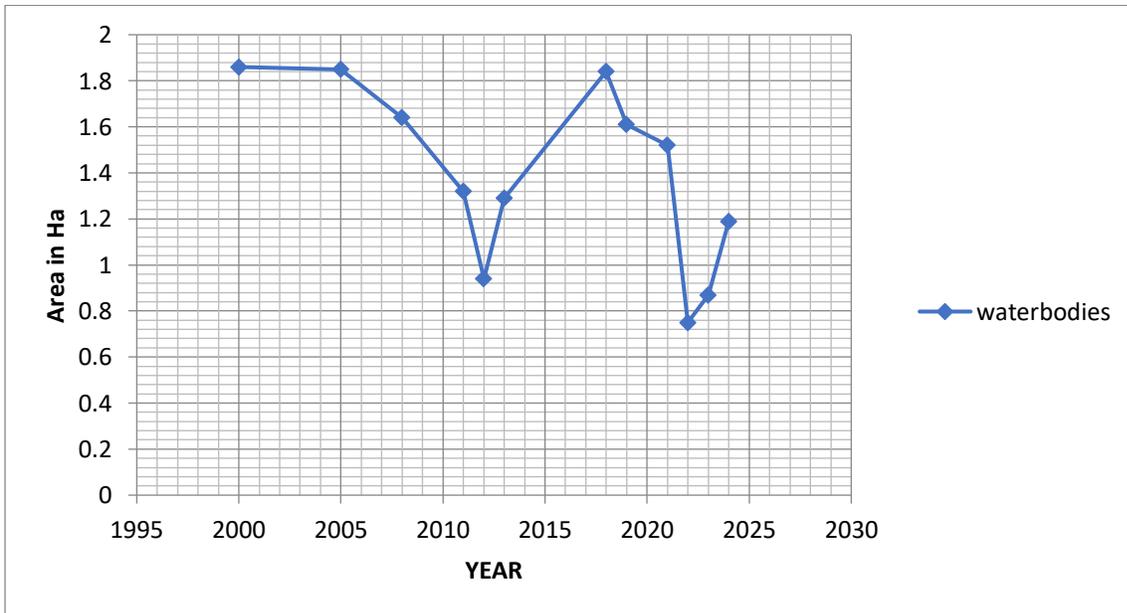
**The Summary of the Class Area in Hectares Year-Wise Over the Time Period :**

| YEAR | Forest Area | De-forested Area | Water-bodies | Built-Ups Area | Metaled Road |
|------|-------------|------------------|--------------|----------------|--------------|
| 2000 | 52.81 | 100.21 | 1.86 | 0 | 0 |
| 2005 | 0 | 152.57 | 1.85 | 0.46 | 0 |
| 2008 | 0 | 138.48 | 1.64 | 12.19 | 2.56 |
| 2011 | 0 | 136.34 | 1.32 | 13.07 | 4.13 |
| 2012 | 0 | 131.44 | 0.94 | 17.33 | 5.18 |
| 2013 | 0 | 129.63 | 1.29 | 17.33 | 6.68 |
| 2018 | 0 | 127.62 | 1.84 | 17.33 | 8.10 |
| 2019 | 0 | 128.44 | 1.61 | 17.33 | 7.49 |
| 2021 | 0 | 127.23 | 1.52 | 18.64 | 7.50 |
| 2022 | 0 | 127.52 | 0.75 | 19.13 | 7.50 |
| 2023 | 0 | 127.16 | 0.87 | 19.13 | 7.72 |
| 2024 | 0 | 126.85 | 1.19 | 19.13 | 7.72 |

The increase of degraded forest is likely to negatively impact the environmental quality and though the area is small, yet the presence of natural forest in the immediate vicinity indicates that degradation is not natural and proper initiatives may still restore the impact.

7. **Conclusion:**

The Land Use /Land Cover classification of the area was done using the satellite images given for the years(2000 – 2024). The satellite images are authentic source of landcover information and are available for analysis using any standard image processing software by domain experts.

After proper referencing of the images in a unified frame of earth reference, all the images were classified to find forest area, deforested area, settlements, roads and waterbodies.

They were statistically analyzed and observed that forest area dropped to nil in a span of five years (2000-2005) and the deforested areas increase in the same period. There after settlement appeared in 2008 on the deforested land. The water bodies also underwent a decrease in area.

Though the area is small, yet, the increase of deforested area is likely to negatively impact the environmental quality, especially when no sign of degradation is obvious by the presence of forest in the vicinity (Sanjay Gandhi National Park). However, the water bodies have not significantly changed. Proper green initiatives may still restore the slight negative impact.

The above report contains all the derived analysis, images and the classified information in the form of report and observations. The map and images were also delivered for future reference in digital format.

The analysis was done using TNTmips Datum software developed by Micro Images, Landscan USA.