# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

CHITTOOR -19/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-2021

**T 0 - T 1 - T 2 - T 3 - T 4 - T 5**


AGRICULTURE & SOIL DIVISION
Andhra Pradesh Space Applications Centre (APSAC)
ITE&C Department Govt. of Andhra Pradesh

RURAL DEVELOPMENT AND WATERSHED MONITORING DIVISION
Land Resources and Land Use Mapping and Monitoring Group,
Remote Sensing Application Area,
National Remote Sensing Centre, ISRO

DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

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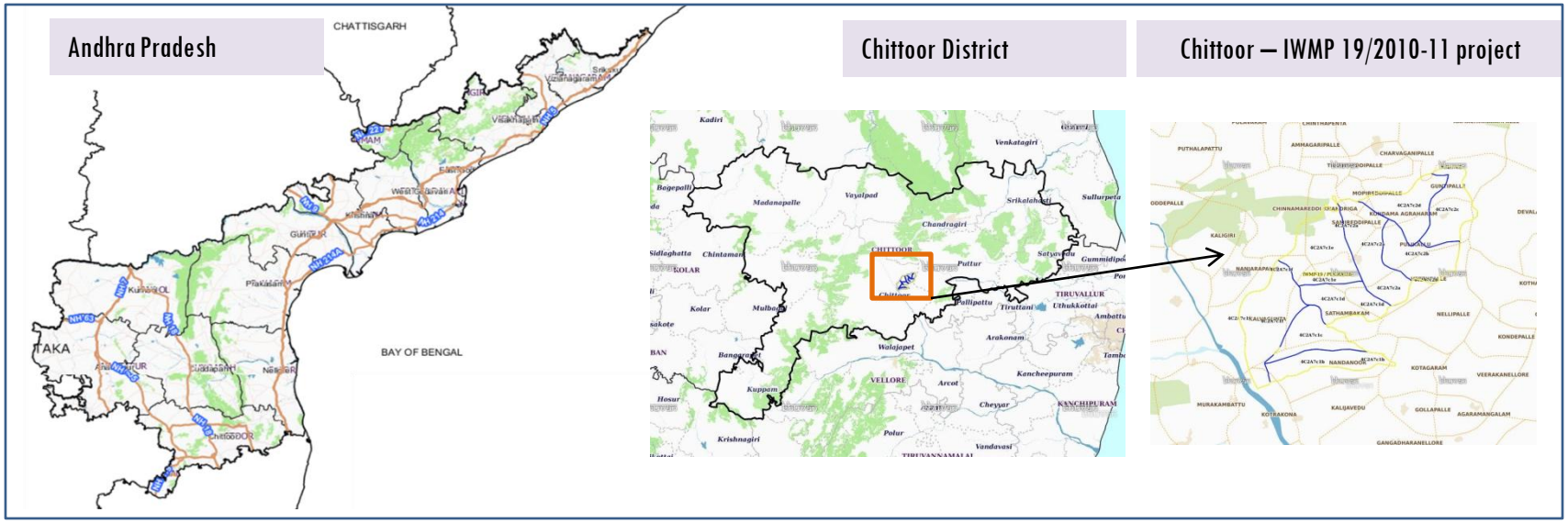
# EXECUTIVE SUMMARY

- Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
- National Remote Sensing Centre (NRSC), ISRO has designed and developed Bhuvan Geo-ICT Web portal tools namely – Srishti and Drishti for monitoring and evaluation of IWMP watersheds. It uses high spatial and temporal resolution sensors viz., Carto-1/2 (2.5 m) , LISS-IV(5.8 m color).
- Current summary report gives details of Project– IWMP-19/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 5,979 ha. It comprises of 10 micro watersheds.
- In the project area 367 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 87 ha increase in the area.
- Major percentage i.e. 64.34 % is covered by the agriculture, 10.59 % is covered by plantation and 0.69 % is covered by forest and remaining by other land use classes.

# PROJECT : CHITTOOR – IWMP-19/2010-11
# DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Penumuru Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 5,979 ha. It comprises of 10 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (***Batch -11***) projects taking 2018-19(T5) period satellite images




- The climate of the district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.
- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

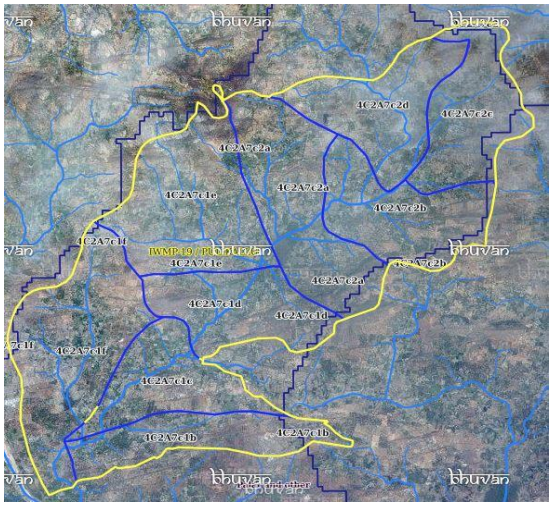
# Satellite Data and Ancillary Data

| Satellite data* | T0-A** | T0-B** | T5 |
|---|---|---|---|
| | 2010-11 | 2011-12 | 2018-19 |
| LISS IV | 2010-11 | | |
| SCENE 1 | | | 3-Oct-19 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| | | | |
| CARTO | 2010-11 | | |
| SCENE 1 | | | 3-Oct-19 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |

## Ancillary Data

| | Category | Sub category | Status |
|---|---|---|---|
| 1 | Thematic maps | | |
| | LULC ( 1: 10 000) | | |
| | | DRAIANGE | YES |
| | | SETTLEMENT | YES |
| | | ROADS/RAILS | No |
| | LULC (1: 50 000) | | |
| | | 2005-06 | |
| | | 2008-09 | |
| | | | |
| 2 | Activity Plan Maps | | |
| | | | |
| 3 | Drishti Photographs | | |
| | | Total | 28 |
| 4 | Detailed Project Report | | |
| | | | |

## Natural Color Composite overlaid with Project boundaries and high detail stream network



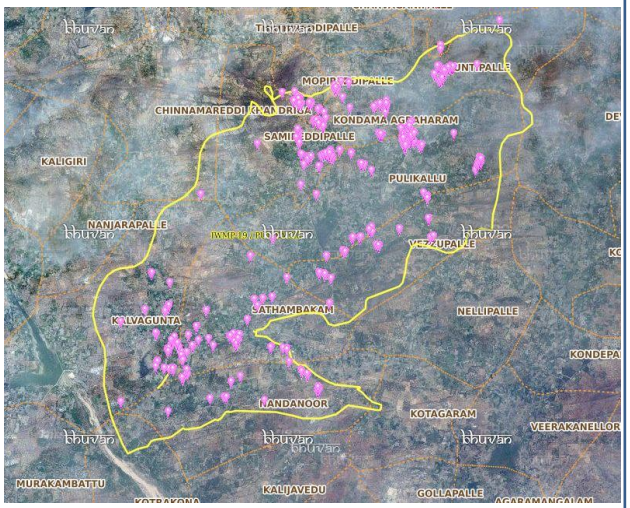
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

## Natural Color Composite overlaid with Drishti Points




Drishti Upload Status

# Classification of the Activities

| Sr. No | Activity | Drishti Photo | Visible on satellite |
|---|---|---|---|
| 1 | Agriculture | 206 | 150 |
| 2 | Bunding | 0 | 0 |
| 3 | Black planting | 0 | 0 |
| 4 | Bund Planting/Horticulture | 0 | 0 |
| 5 | Trench | 0 | 0 |
| 6 | Field Bunds | 0 | 0 |
| 7 | Existing activity | 0 | 0 |
| 8 | Checks & Plugs | 13 | 10 |
| 9 | New activity (boulder removal, farm ponds, dug out pits etc.,) | 0 | 0 |
| 10 | Farm ponds/Dug out pit | 0 | 0 |
| 11 | Civil work-Check dams /Rock fill dam | 85 | 80 |
| 12 | Drainage treatment /Nala Revetment, loose boulder structure, gully check | 0 | 0 |
| 13 | Land Developments (afforestation, horticulture and bund plantation of teak) | 0 | 0 |
| 14 | Lm (fodder development, varmi compost) | 0 | 0 |
| 15 | Livelihood Activities (Horticulture) | 0 | 0 |
| 16 | Production system and micro-enterprises | 9 | 7 |
| 17 | Entry Point Activity (Cattle thought) | 13 | 10 |
| 18 | Others | 127 | 110 |
| | **TOTAL** | **453** | **367** |

# MONITORING IN THE PROJECT AREA

## Site Wise Changes in the Project

- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2010-11) and T5 is 2018-19 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

Chittoor–IWMP-19/2010-11

2009-10

Jan-2016

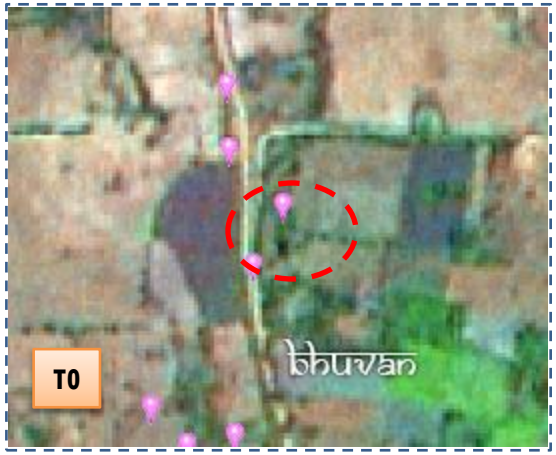
March-2017

Nov-2018

2019


Activity : Plantation

# Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-19/2010-11




T0:2010-11


T1: 01 January 2016

Drishti Sl no. 1685214 MWS : 4C2A7c2a

**Horticulture**

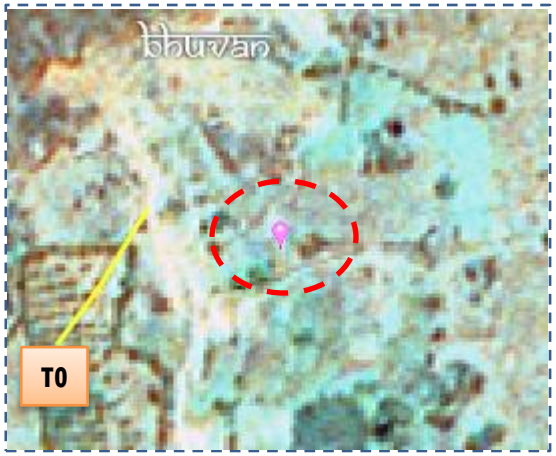

T0:2010-11


T1: 01 January 2016

Drishti Sl no. 1812254 MWS :4C2A7c2d

**Horticulture**

# Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-19/2010-11




T0: 2010-11


T1: 01 January 2016

Drishti Sl no. 1685204 MWS :4C2A7c2c

**Horticulture**


T0: 2010-11


T1: 01 January 2016

Drishti Sl no. 571612 MWS : 4C2A7c2c

**Horticulture**

# Natural Color Composite – 2010-11 to 2018-19

**Natural Color Composite- 2010-11**


Source:NCC,NRSC

**Natural Color Composite-27th March 2014**


Source:LISS-IV,NRSC

**Natural Color Composite- 10th January 2016**


Source:NCC,NRSC

**Natural Color Composite- 26th March 2017**


Source:NCC & LISS IV,NRSC

**Natural Color Composite- 6th March 2018**


Source:LISS-IV,NRSC

**Natural Color Composite- 03rd October 2019**


Source:LISS-IV,NRSC

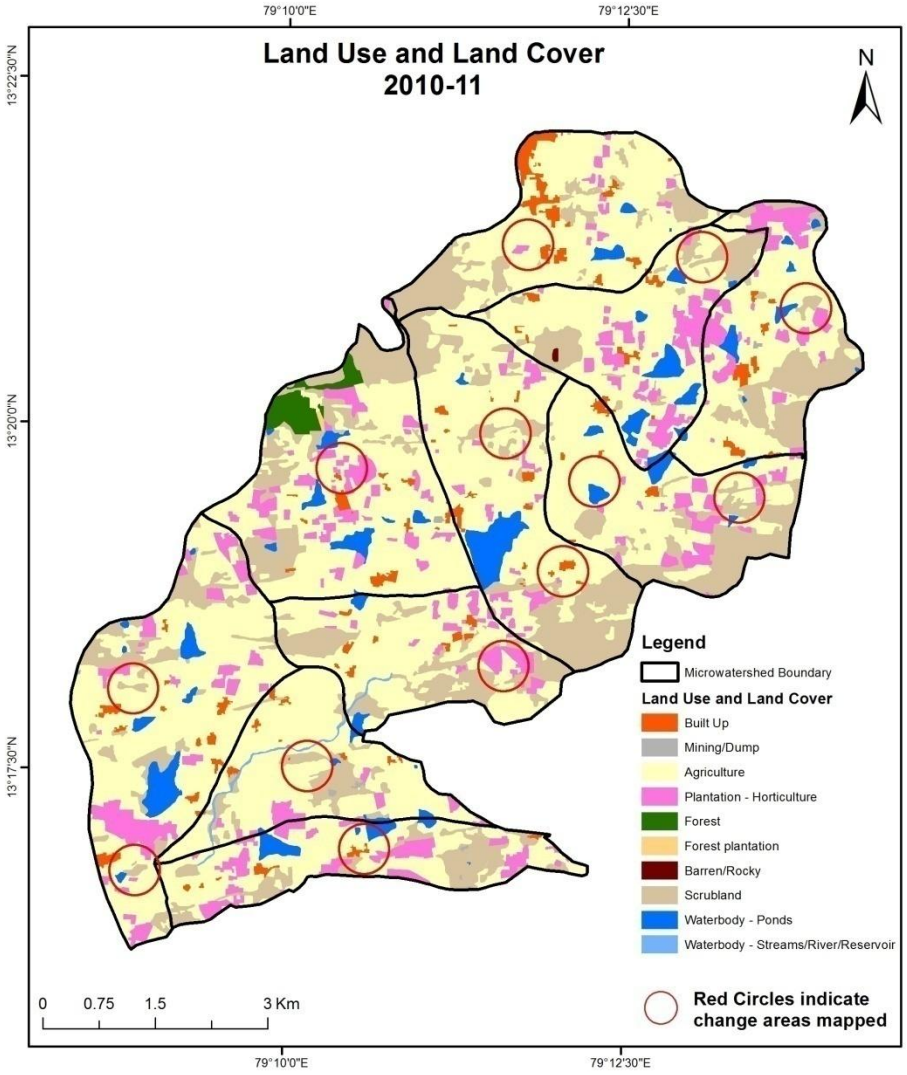
# MONITORING IN THE PROJECT AREA

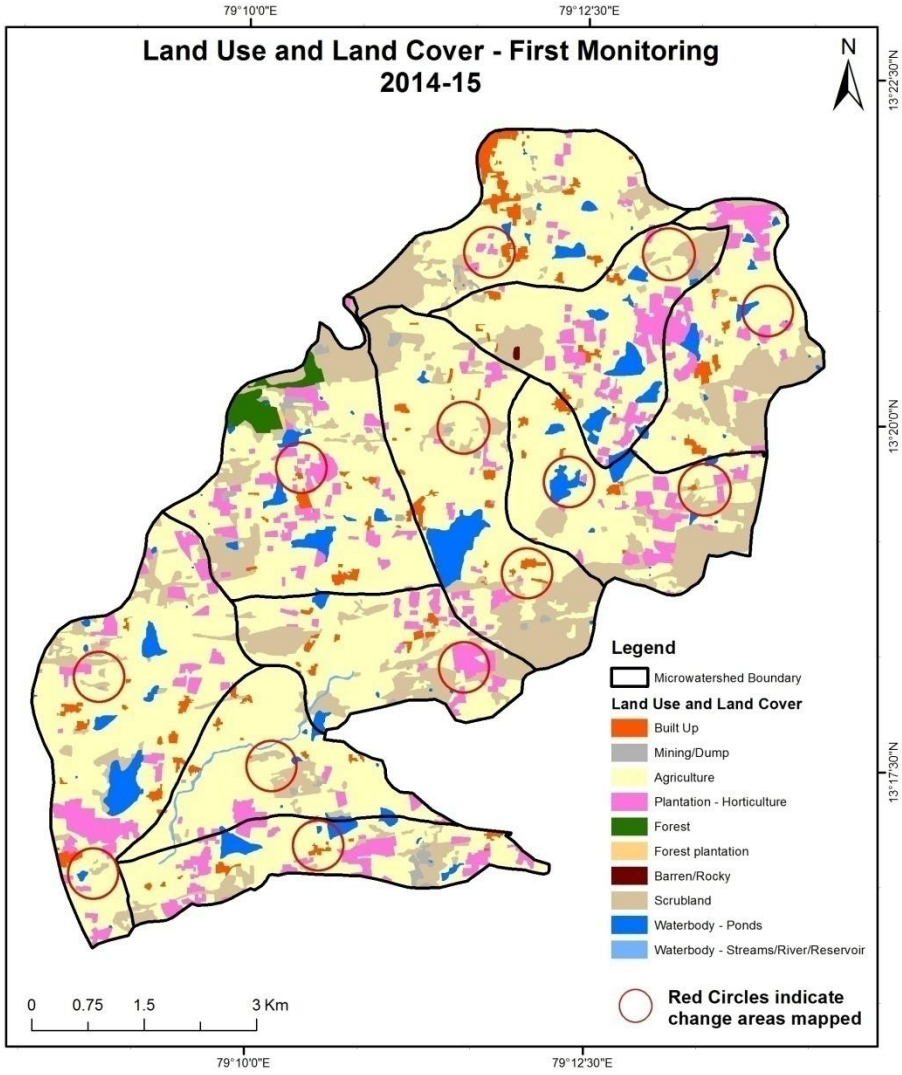
## Land use and Land cover Changes in the Project

- Change in land use and land cover form T0 to T5 are analyzed in terms of built up, mining/dump, agriculture, plantation- horticulture, forest, barren rocky waterbody-streams/river/reservoir and waterbody –ponds.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.
- The result obtained for the period T0 to T5 are given in the change matrix table.
- In matrix table column represents the T0 (2010-11) and row represents the T5 (2018-19)

**Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)**

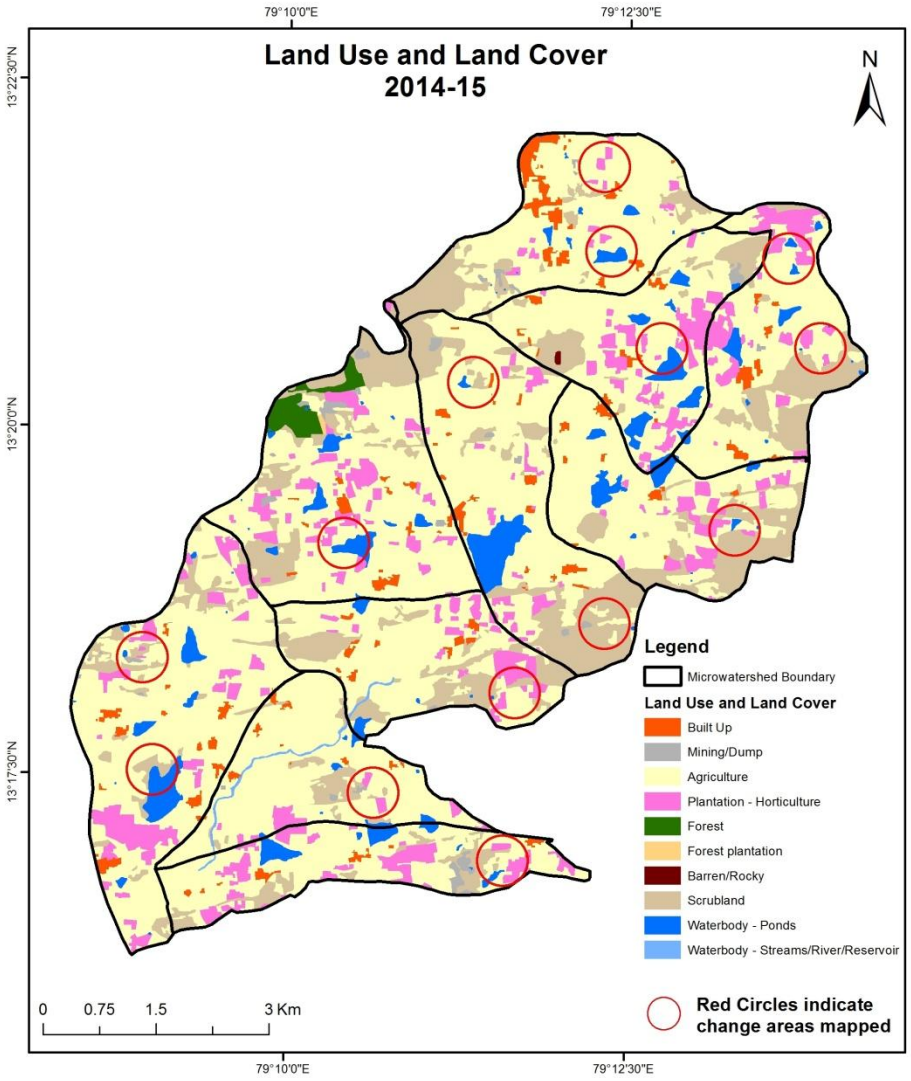
**Scale: 1:10000**

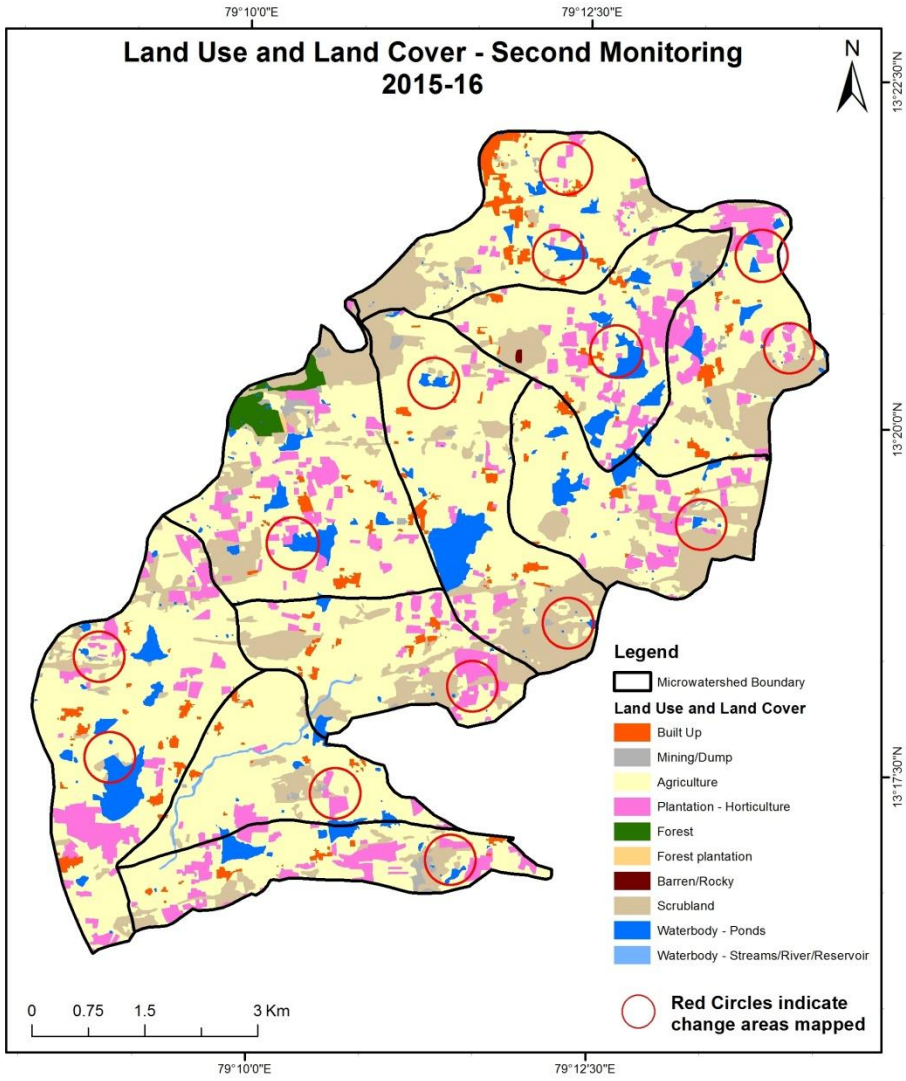


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

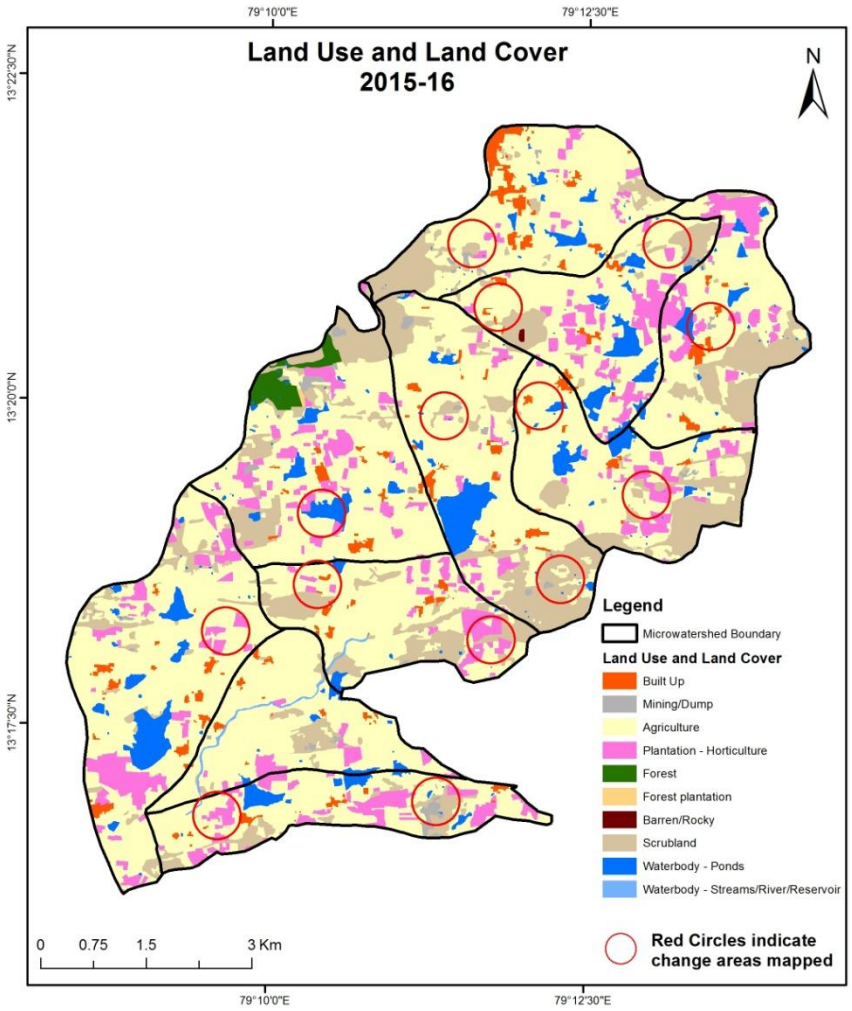
**Scale: 1:10000**

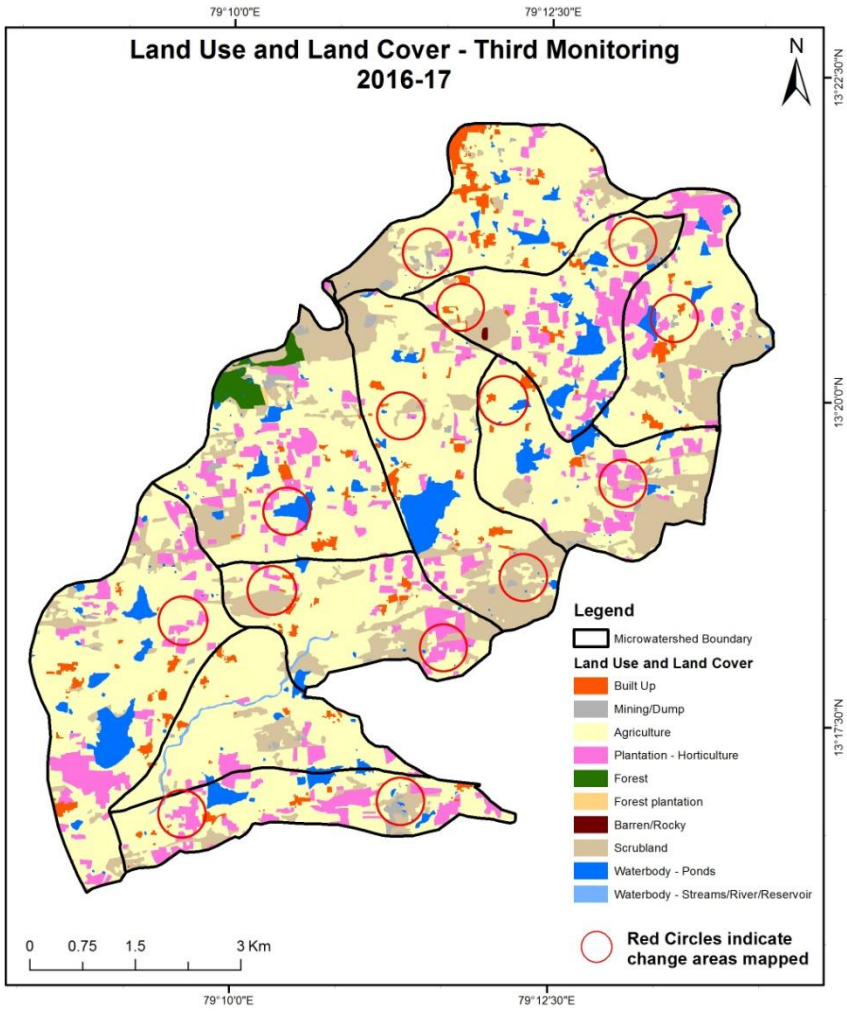


**Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)**

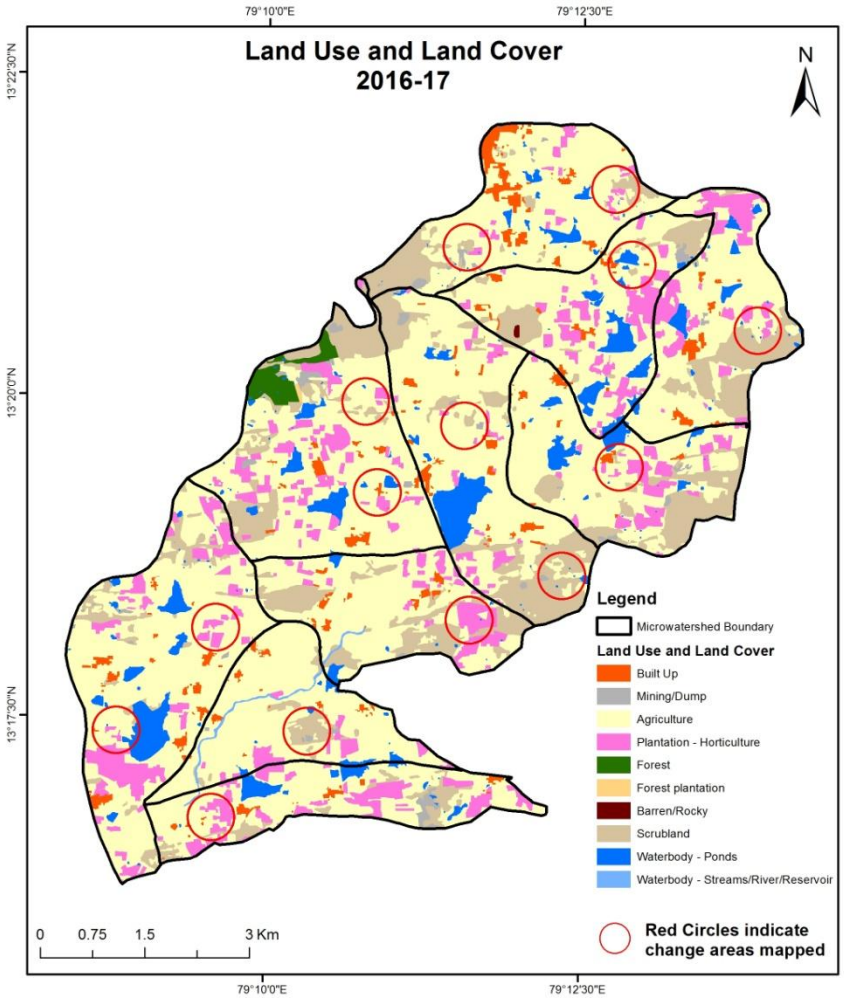
**Scale: 1:10000**

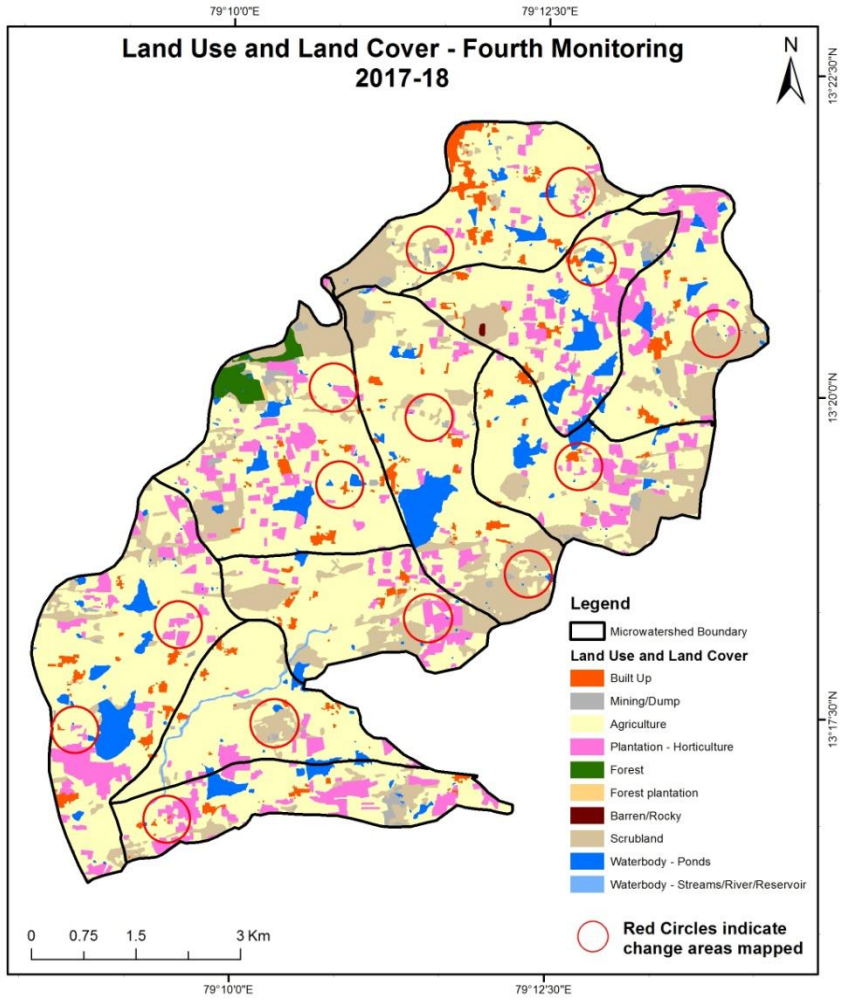


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

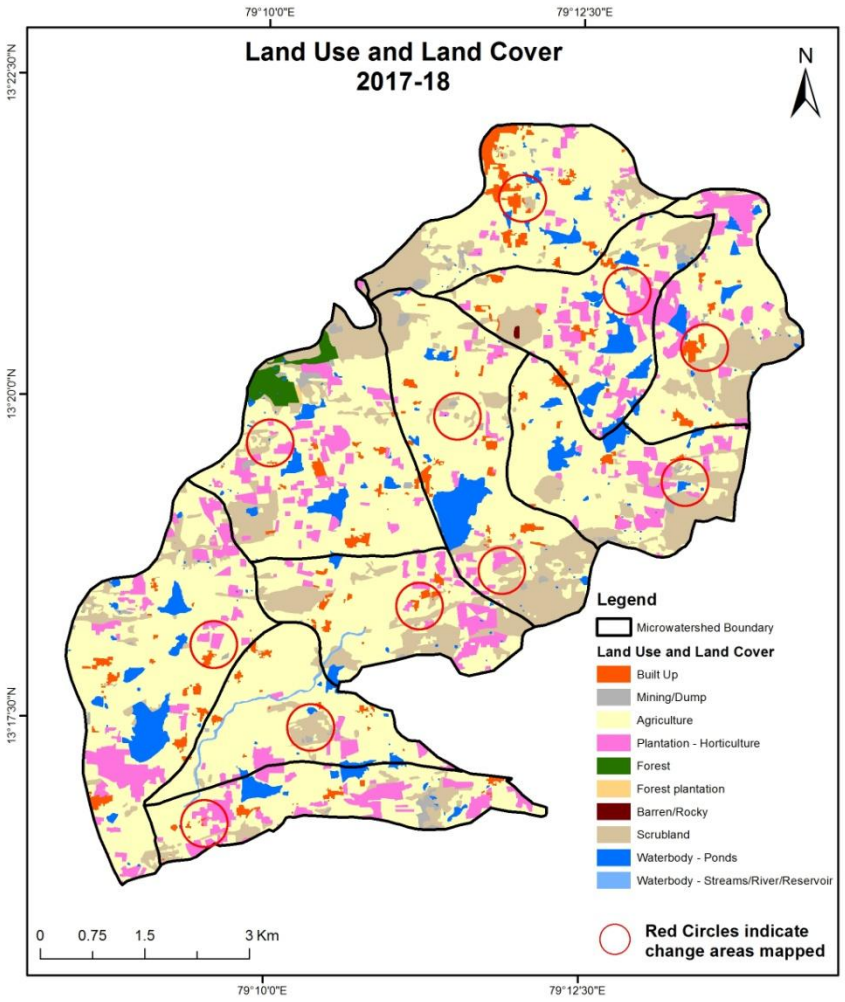
Scale: 1:10000

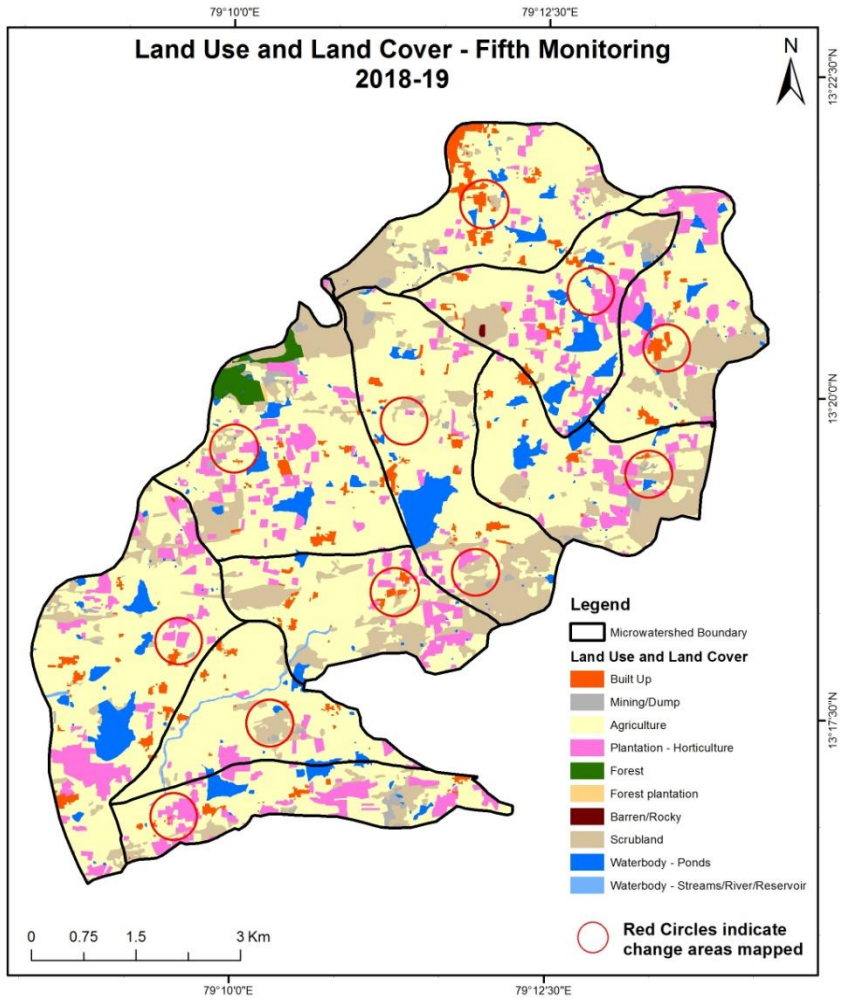


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

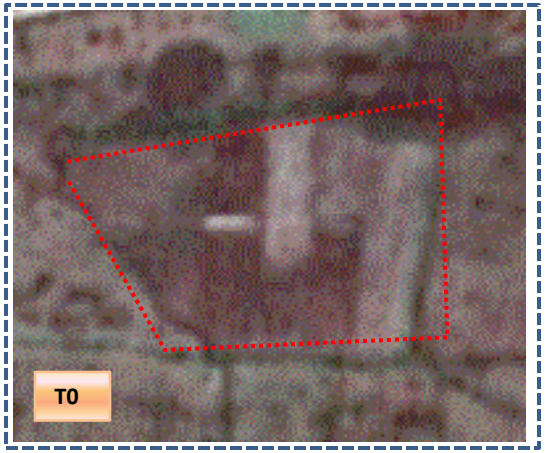
**Scale: 1:10000**



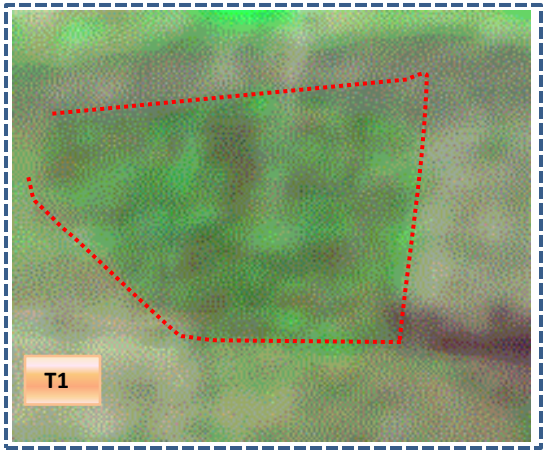



**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Plantation

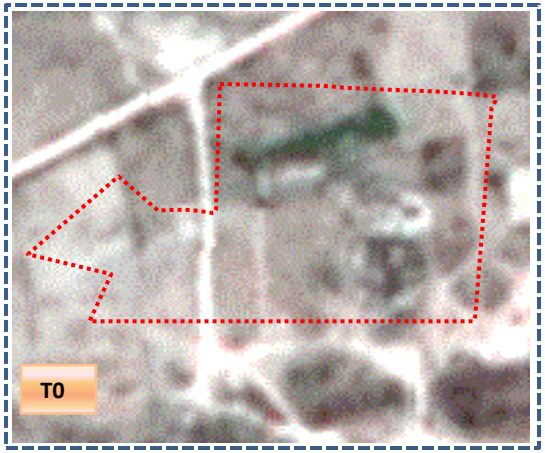



T0: 2010-11(79°10'53.215"E 13°16'49.987"N )

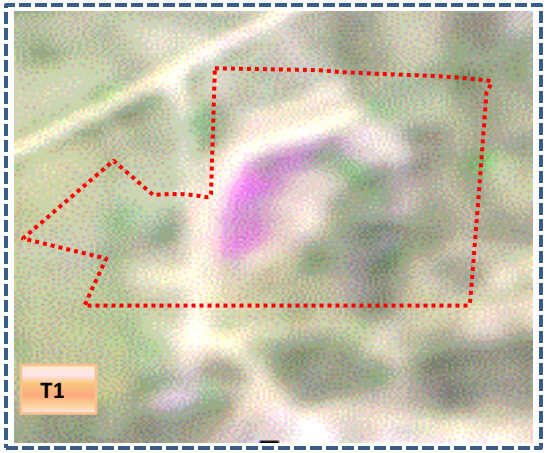



T1: 27 March 2014

Scrub to Water body



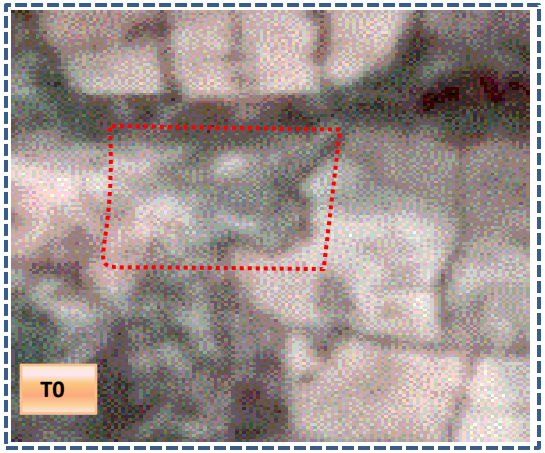

T0: 2010-11 (79°11'16.129"E 13°16'59.667"N )



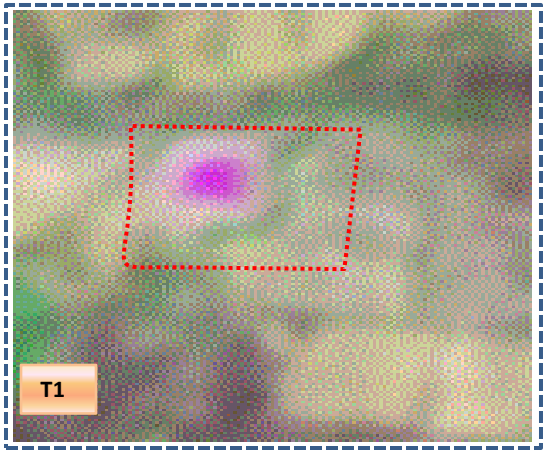

T1: 27 March 2014

**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Water body

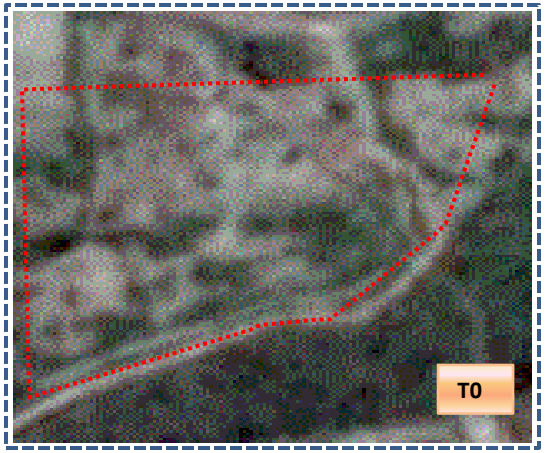



T0: 2010-11(79°13'28.014"E 13°19'18.165"N )

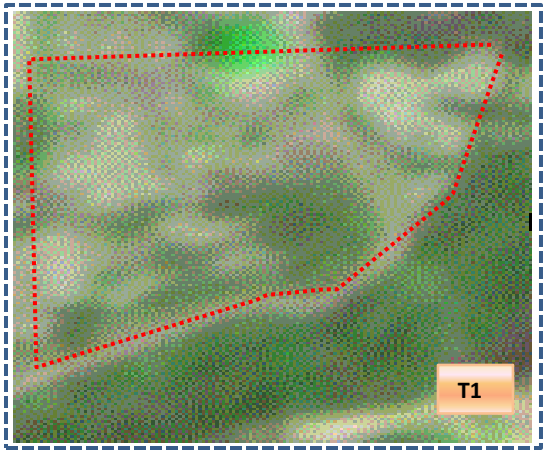



T1: 27 March 2014

Scrub to Agriculture




T0: 2010-11(79°12'12.079"E 13°18'49.396"N )

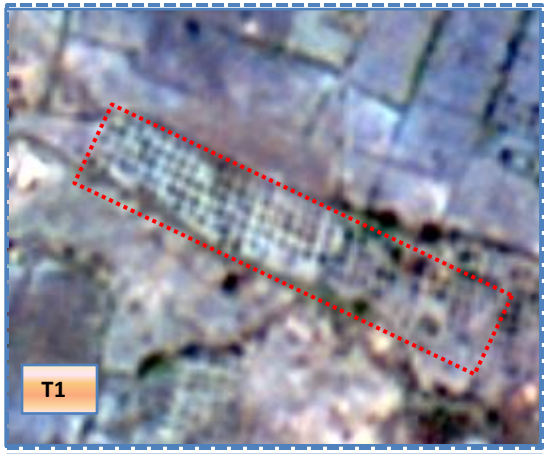



T1: 27 March 2014

**Land Use and Land Cover changes for Pre and Post treatment dates**

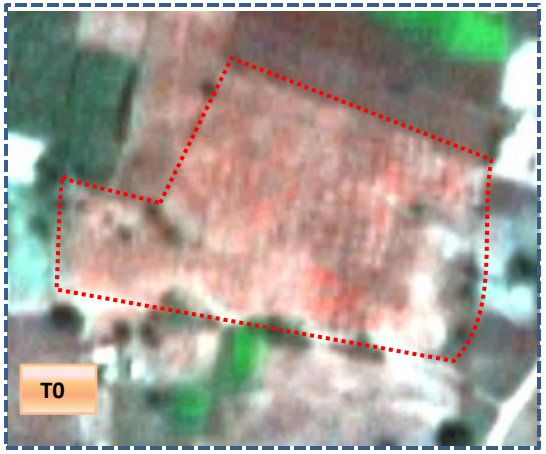
Agriculture to Plantation


T0: 2010-11

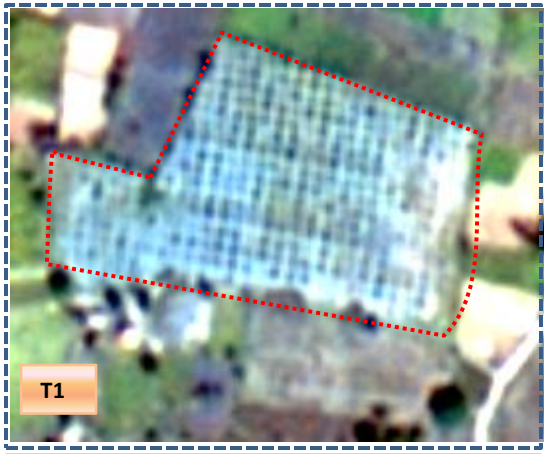



T1: 26 February 2015

Agriculture to Plantation



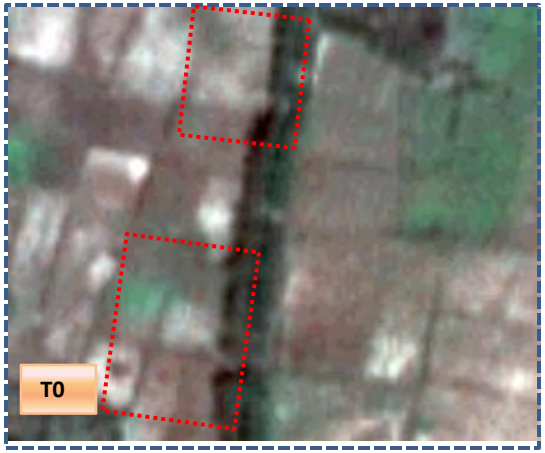

T0: 2010-11



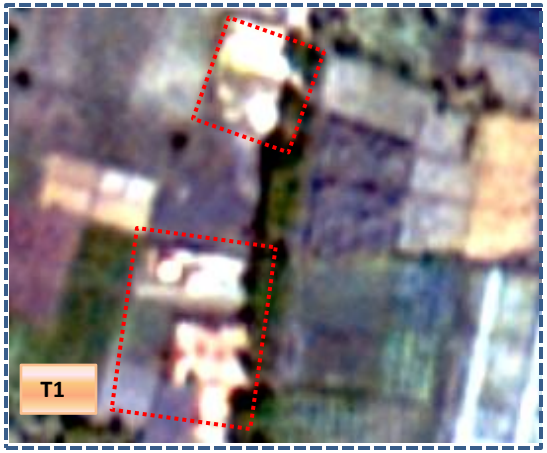

T1: 26 February 2015

**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Built-up



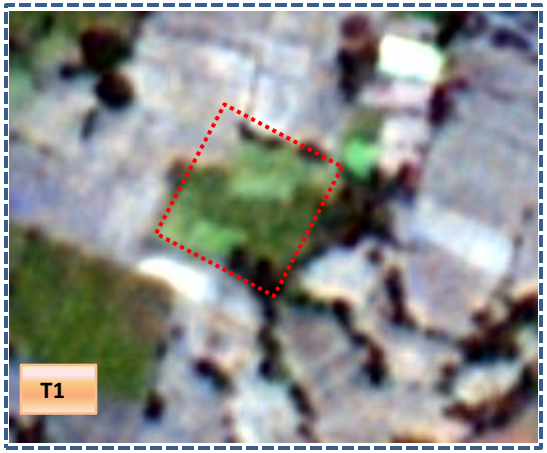

T0: 2010-11




T1: 26 February 2015

Agriculture to Plantation


T0: 2010-11




T1: 26 February 2015

**Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15**

| Land cover | Monitoring period (T1) | | | | | | | | | | Units in Hectares |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T0 | Built up | Mining/ dump | Agriculture | Plantation Horticulture | Forest | Forest Plantation | Barren Rocky | Scrub | Waterbody-Streams/River | Water body Ponds | Grand Total |
| Built up | 138.24 | | | | | | | | | | 138.24 |
| Mining/dump | | 6.20 | | | | | | | | | 6.20 |
| Agriculture | 9.58 | 6.85 | 3682.38 | 35.90 | | | | | | 15.51 | 3750.23 |
| Plantation Horticulture | 0.18 | 0.29 | 41.08 | 539.01 | | | | | | 0.25 | 580.81 |
| Forest | | 1.65 | 0.48 | | 41.36 | | | | | 0.36 | 43.85 |
| Forest Plantation | | | | | | 1.57 | | | | | 1.57 |
| Barren Rocky | | | | | | | 1.39 | | | | 1.39 |
| Scrub | 3.49 | 26.52 | 178.91 | 0.12 | | | | 995.14 | | 4.04 | 1208.21 |
| Waterbody-Streams/River | | | | | | | | | 12.75 | | 12.75 |
| Waterbody – Ponds | | | 1.10 | | | | | | | 234.85 | 235.96 |
| **Grand Total** | **151.49** | **41.53** | **3903.95** | **575.03** | **41.36** | **1.57** | **1.39** | **995.14** | **12.75** | **255.01** | **5979.22** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T0 67.85 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T1.
- In T1 221.57 ha of agriculture are increased from plantation, forest, scrubland and water body of T0. The additional agriculture are coming from water body in T5 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2014-15 to 2015-16**

| Land cover | Monitoring period (T2) | | | | | | | | | | Units in Hectares |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T1 | Built up | Mining/ dump | Agriculture | Plantation Horticulture | Forest | Forest Plantation | Barren Rocky | Scrub | Waterbody-Streams/River | Water body Ponds | Grand Total |
| Built up | 151.49 | | | | | | | | | | 151.49 |
| Mining/dump | | 41.53 | | | | | | | | | 41.53 |
| Agriculture | 5.94 | 1.13 | 3784.21 | 59.63 | | | | 1.94 | | 51.10 | 3903.95 |
| Plantation Horticulture | 0.32 | | 6.52 | 567.50 | | | | | | 0.70 | 575.03 |
| Forest | | | | | 40.96 | | | | | 0.40 | 41.36 |
| Forest Plantation | | | | | | 1.57 | | | | | 1.57 |
| Barren Rocky | | | | | | | 1.39 | | | | 1.39 |
| Scrub | 1.02 | 3.07 | 40.40 | 0.61 | | | | 928.94 | | 21.11 | 995.14 |
| Waterbody-Streams/River | | | | | | | | | 12.75 | | 12.75 |
| Waterbody – Ponds | | | 5.07 | | | | | | | 249.93 | 255.01 |
| **Grand Total** | **158.77** | **45.72** | **3836.20** | **627.74** | **40.96** | **1.57** | **1.39** | **930.87** | **12.75** | **323.25** | **5979.22** |

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T1 119.74 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T2.
- In T2 51.99 ha of agriculture are increased from plantation, scrubland and water body of T1. The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2015-16 to 2016-17**

| Land cover | Monitoring period (T3) | | | | | | | | | | Units in Hectares |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T2 | Built up | Mining/ dump | Agriculture | Plantation Horticulture | Forest | Forest Plantation | Barren Rocky | Scrub | Waterbody-Streams/River | Water body Ponds | Grand Total |
| Built up | 158.77 | | | | | | | | | | 158.77 |
| Mining/dump | | 45.43 | | | | | | | | 0.29 | 45.72 |
| Agriculture | 5.46 | 1.16 | 3808.44 | 20.90 | | | | | | 0.23 | 3836.20 |
| Plantation Horticulture | | | 2.65 | 624.93 | | | | | | 0.15 | 627.74 |
| Forest | | | | | 40.96 | | | | | | 40.96 |
| Forest Plantation | | | | | | 1.57 | | | | | 1.57 |
| Barren Rocky | | | | | | | 1.39 | | | | 1.39 |
| Scrub | 1.48 | 6.16 | 17.92 | 3.13 | | | | 902.10 | | 0.08 | 930.87 |
| Waterbody-Streams/River | | | | | | | | | 12.75 | | 12.75 |
| Waterbody – Ponds | | | 2.68 | | | | | | | 320.57 | 323.25 |
| **Grand Total** | **165.71** | **52.76** | **3831.69** | **648.95** | **40.96** | **1.57** | **1.39** | **902.10** | **12.75** | **321.33** | **5979.22** |

• In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.

• In T2 27.76 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T3.

• In T3 23.25 ha of agriculture are increased from plantation, scrubland and water body of T2. The additional agriculture are coming from waterbody in T3 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18**

| Land cover | Monitoring period (T4) | | | | | | | | | | Units in Hectares |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T3 | Built up | Mining/ dump | Agriculture | Plantation Horticulture | Forest | Forest Plantation | Barren Rocky | Scrub | Waterbody-Streams/River | Water body Ponds | Grand Total |
| Built up | 165.71 | | | | | | | | | | 165.71 |
| Mining/dump | | 52.76 | | | | | | | | | 52.76 |
| Agriculture | 2.14 | 0.72 | 3823.41 | 5.13 | | | | | | 0.29 | 3831.69 |
| Plantation Horticulture | 0.12 | 0.10 | 11.09 | 637.61 | | | | | | 0.03 | 648.95 |
| Forest | | | | | 40.96 | | | | | | 40.96 |
| Forest Plantation | | | | | | 1.57 | | | | | 1.57 |
| Barren Rocky | | | | | | | 1.39 | | | | 1.39 |
| Scrub | 0.30 | 2.99 | 1.52 | | | | | 897.17 | | 0.13 | 902.10 |
| Waterbody-Streams/River | | | | | | | | | 12.75 | | 12.75 |
| Waterbody – Ponds | | | | | | | | | | 321.33 | 321.33 |
| **Grand Total** | **168.27** | **56.57** | **3836.02** | **642.74** | **40.96** | **1.57** | **1.39** | **897.17** | **12.75** | **321.78** | **5979.22** |

• In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.

• In T3 8.28 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T4.

• In T4 12.62 ha of agriculture are increased from plantation and scrubland of T3. The additional agriculture are coming from waterbody in T4 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period-2017-18 to 2018-19**

| Land cover | Monitoring period (T5) | | | | | | | | | | Units in Hectares |
|---|---|---|---|---|---|---|---|---|---|---|---|
| T4 | Built up | Mining/ dump | Agriculture | Plantation Horticulture | Forest | Forest Plantation | Barren Rocky | Scrub | Waterbody-Streams/River | Water body Ponds | Grand Total |
| Built up | 168.27 | | | | | | | | | | 168.27 |
| Mining/dump | | 56.57 | | | | | | | | | 56.57 |
| Agriculture | 0.83 | 1.78 | 3830.82 | 0.60 | | | | | 1.55 | 0.44 | 3836.02 |
| Plantation Horticulture | 0.20 | | 9.86 | 632.67 | | | | | | | 642.74 |
| Forest | | | | | 40.96 | | | | | | 40.96 |
| Forest Plantation | | | | | | 1.57 | | | | | 1.57 |
| Barren Rocky | | | | | | | 1.39 | | | | 1.39 |
| Scrub | | 0.69 | 6.42 | | | | | 890.07 | | | 897.17 |
| Waterbody-Streams/River | | | | | | | | | 12.75 | | 12.75 |
| Waterbody – Ponds | | | | | | | | | | 321.78 | 321.78 |
| **Grand Total** | **169.30** | **59.03** | **3847.10** | **633.28** | **40.96** | **1.57** | **1.39** | **890.07** | **14.30** | **322.22** | **5979.22** |

• In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.

• In T4 5.20 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T5.

• In T5 16.28 ha of agriculture are increased from plantation and scrubland of T4. The additional agriculture are coming from waterbody in T5 represents seasonal agriculture.

# Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. The LULC shows that there is an increase in Crop land, Built up area, Reservoir / Tanks & decrease in Scrubland as presented in the change matrix for different years.
3. There is an increase of 87.81 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 153.72, 4.33 & 11.08 Hectares From T0 to T1, T3 to T4 & T4 toT5 and There is an decrease of 67.75 & 4.51 Hectares From T1 to T2 & T2 to T3 . The overall increase of 96 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is increase of 52.47 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 318.15 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.