# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

CHITTOOR -41/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2022

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


AGRICULTURE & SOIL DIVISION
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ITE&C Department Govt. of Andhra Pradesh

RURAL DEVELOPMENT AND WATERSHED MONITORING DIVISION
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Remote Sensing Application Area,
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DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

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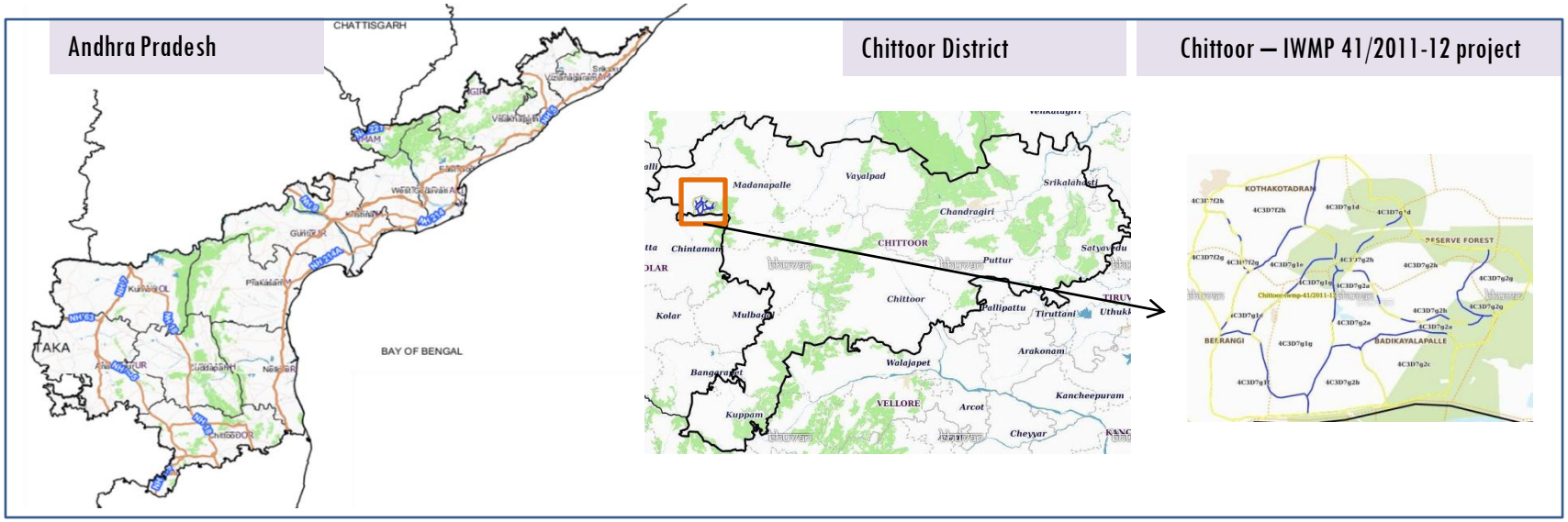
# EXECUTIVE SUMMARY

- 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-41/2011-12, Chittoor District of Andhra Pradesh. The total geographical area of the project is **6,205** ha. It comprises of 11 micro watersheds.
- In the project area 72 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 82 ha increase in the area.
- Major percentage i.e. 52 % is covered by the agriculture, 24 % is covered by forest and 9% is covered by scrub land and remaining by other land use classes.

# PROJECT : CHITTOOR – IWMP-41/2011-12
# DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in B.Kothakota Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is **6,205** ha. It comprises of 11 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2011-12 (T0) period (***Batch -1***) projects taking 2019-20 (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.

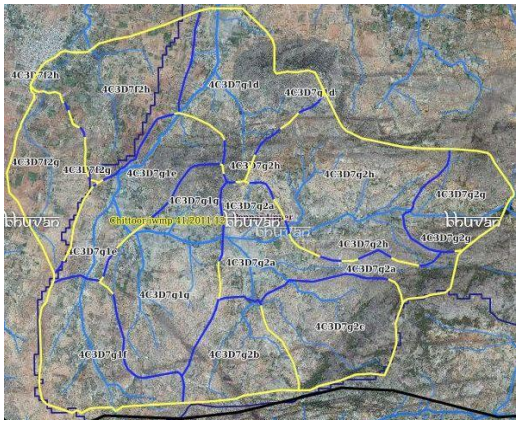
# Satellite Data and Ancillary Data

| Satellite data* | T0-A** | T0-B** | T5 |
|---|---|---|---|
| | 2011-12 | 2013-14 | 2019-20 |
| LISS IV | 2011-12 | | |
| SCENE 1 | | | 29-Nov-19 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| | | | |
| CARTO | 2011-12 | | |
| SCENE 1 | | | 29-Nov-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 | 72 |
| 4 | Detailed Project Report | | |

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



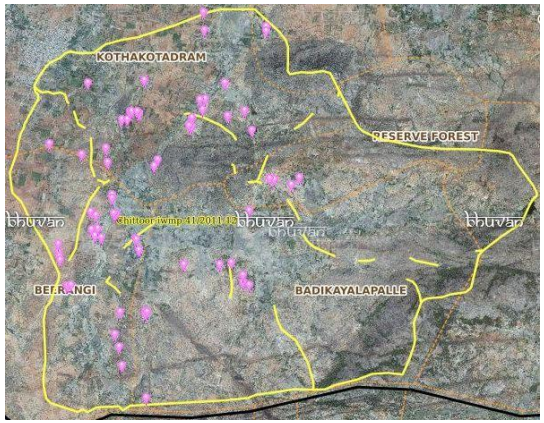
Legend

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 | Afforestation | 0 | 0 |
| 2 | Horticulture | 0 | 0 |
| 3 | Agriculture | 0 | 0 |
| 4 | Pasture | 0 | 0 |
| 5 | Trench | 0 | 0 |
| 6 | Field Bunds | 0 | 0 |
| 7 | Terrace | 0 | 0 |
| 8 | Checks & Plugs | 0 | 0 |
| 9 | Gabion structure | 0 | 0 |
| 10 | Farm ponds/Dug out pit | 0 | 0 |
| 11 | Civil work-Check dams/Rock fill dam | 48 | 48 |
| 12 | Nallah Bunds/Drainage treatment | 0 | 0 |
| 13 | Percolation tanks / Ground water recharge structure | 0 | 0 |
| 14 | Production System and Micro-Enterprises | 0 | 0 |
| 15 | Livelihood Activities-Plantation/Horticulture | 0 | 0 |
| 16 | Capacity Building Activities | 0 | 0 |
| 17 | Entry Point Activity | 20 | 19 |
| 18 | Others | 5 | 5 |
| | **TOTAL** | **73** | **72** |

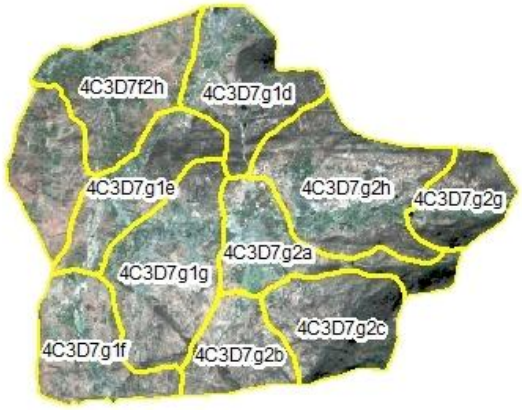
# MONITORING IN THE PROJECT AREA

## 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 (2011-12) and T5 is 2019-20 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.

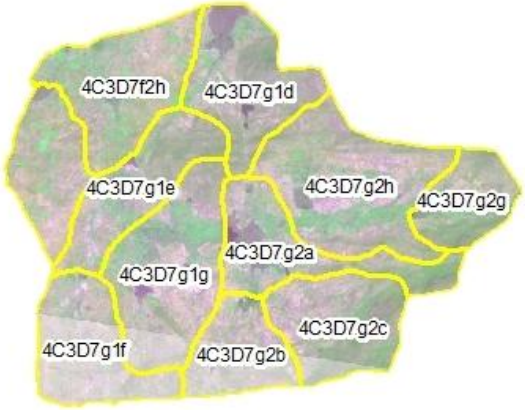
# Natural Color Composite

**Natural Color Composite- 2011-12**



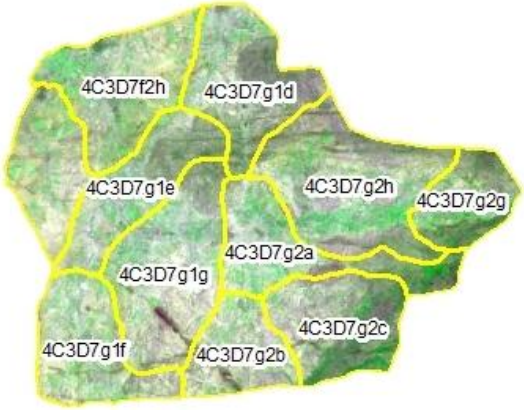

Source:Fusion data,NRSC

**Natural Color Composite-24th December 2015**



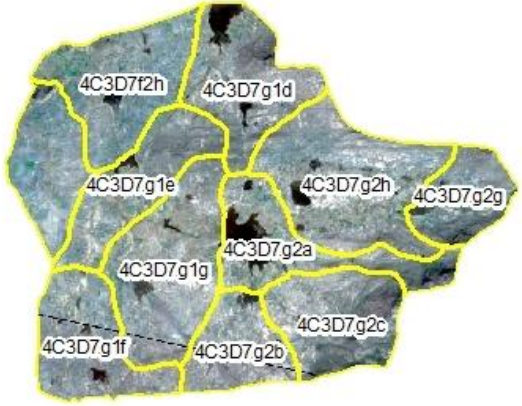

Source:LISS-IV,NRSC

**Natural Color Composite- 24th April 2017**



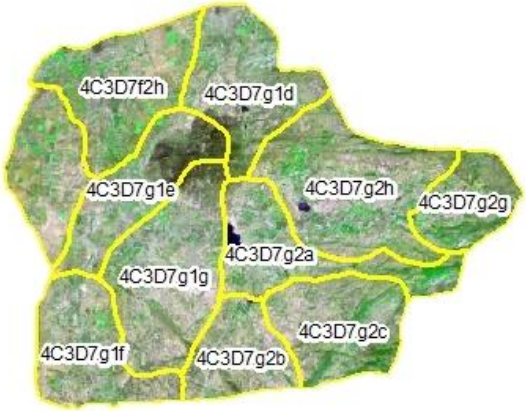

Source:Sentinel

**Natural Color Composite-09th December 2017**




Source:NCC, NRSC

**Natural Color Composite-24th January 2019**

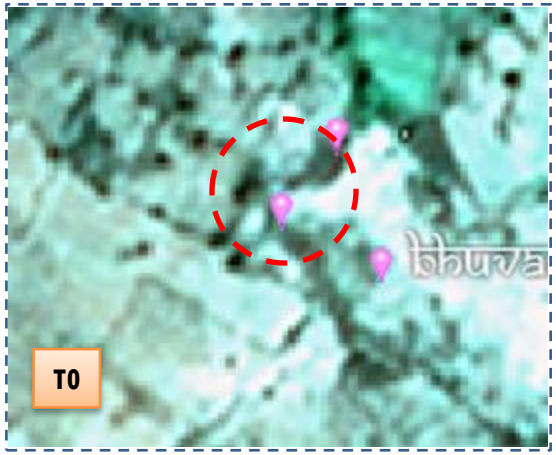



Source:Sentinel

**Natural Color Composite- 29th November 2019**


Source:Sentinel

# Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-41/2011-12




T0:2009-10


T1: 09 February 2017

Drishti Sl no. 1780857 MWS :4C3D7g1e

**Check dam**


T0:2009-10


T1: 09 February 2017

Drishti Sl no. 1738890 MWS :4C3D7f2h

**Farm pond**

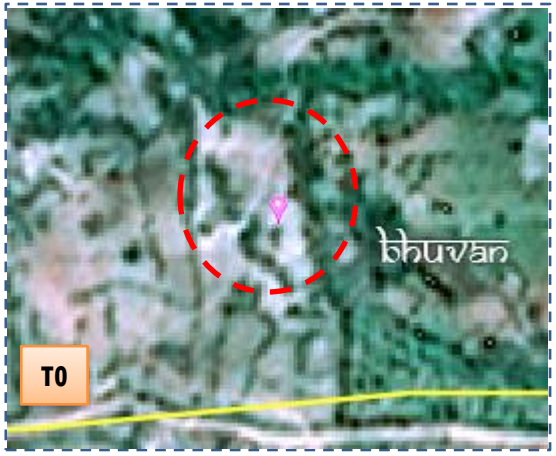
# Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-41/2011-12


T0: 2009-10

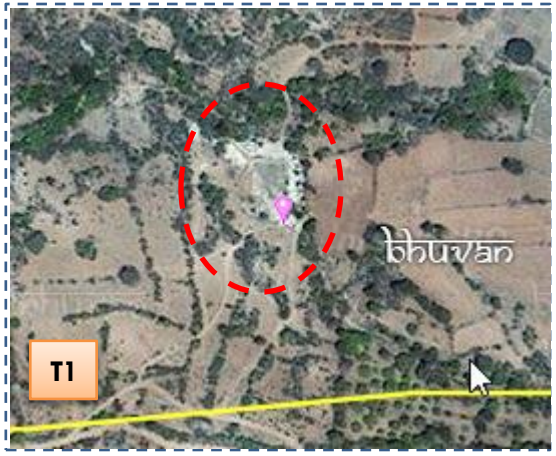

T1: 09 February 2017

Drishti Sl no. 1780819 MWS :4C3D7f2g

**Farm pond**




T0: 2009-10




T1: 09 February 2017

Drishti Sl no. 1802507 MWS :4C3D7g1f

**Percolation Tank**

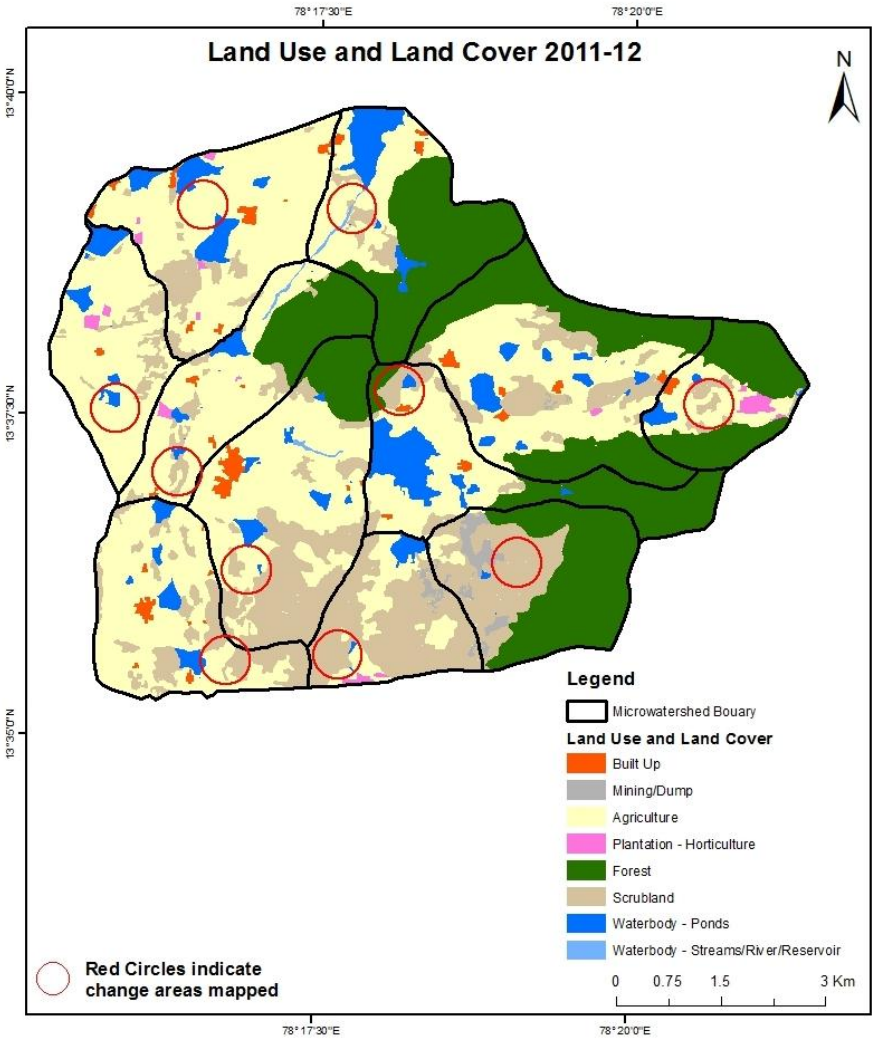
# MONITORING IN THE PROJECT AREA

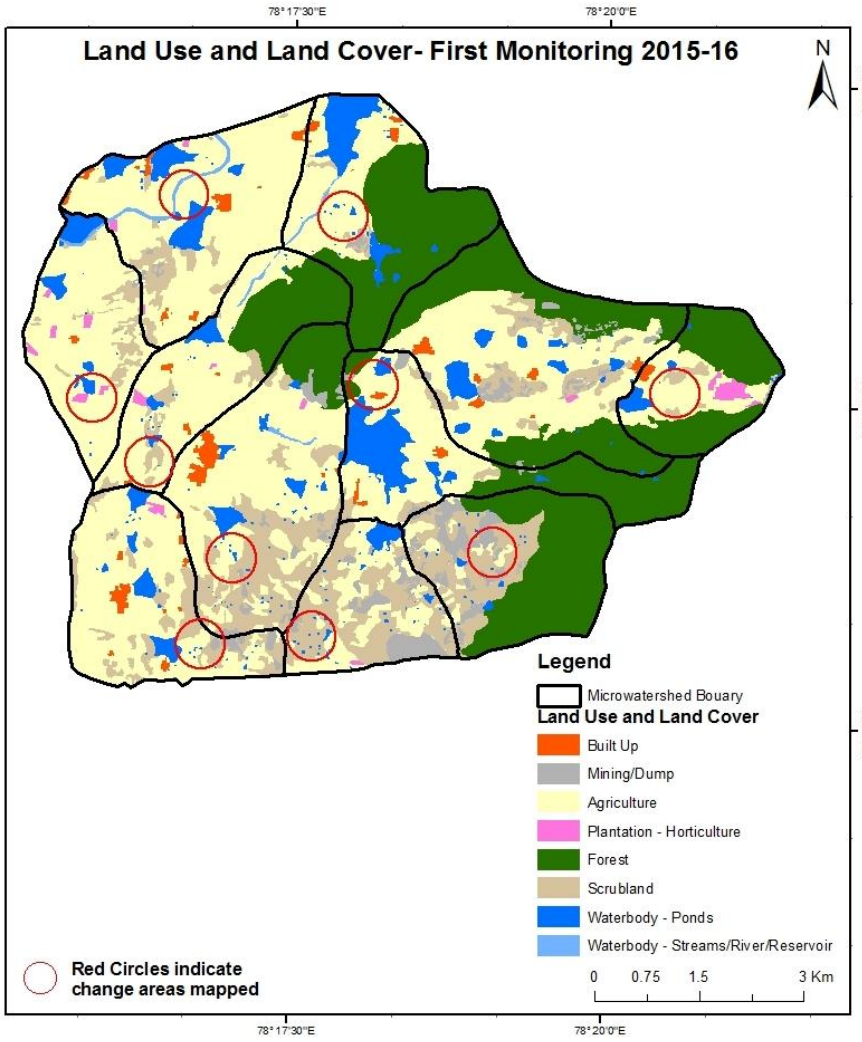
## Land use and Land cover Changes in the Project

- 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 (2011-12) and row represents the T5 (2019-20)

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

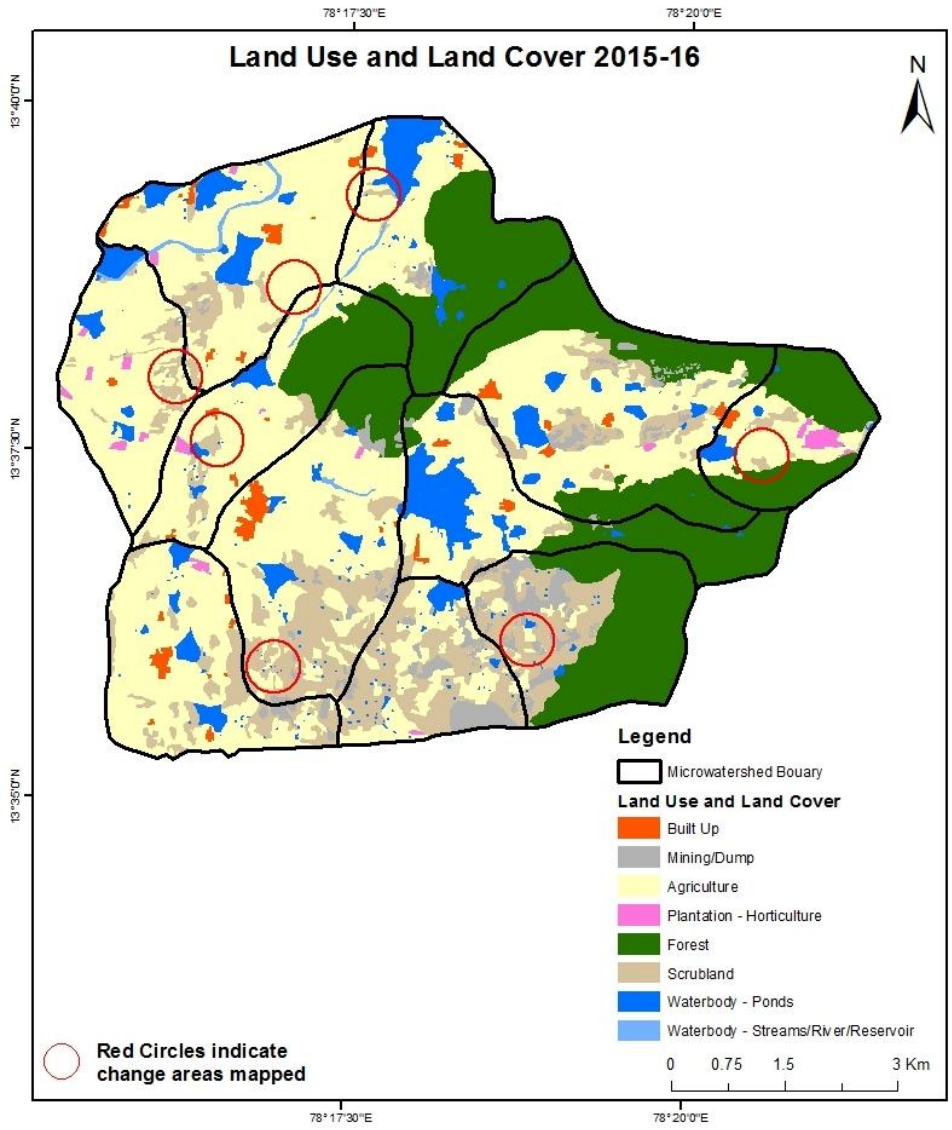
Scale: 1:10000

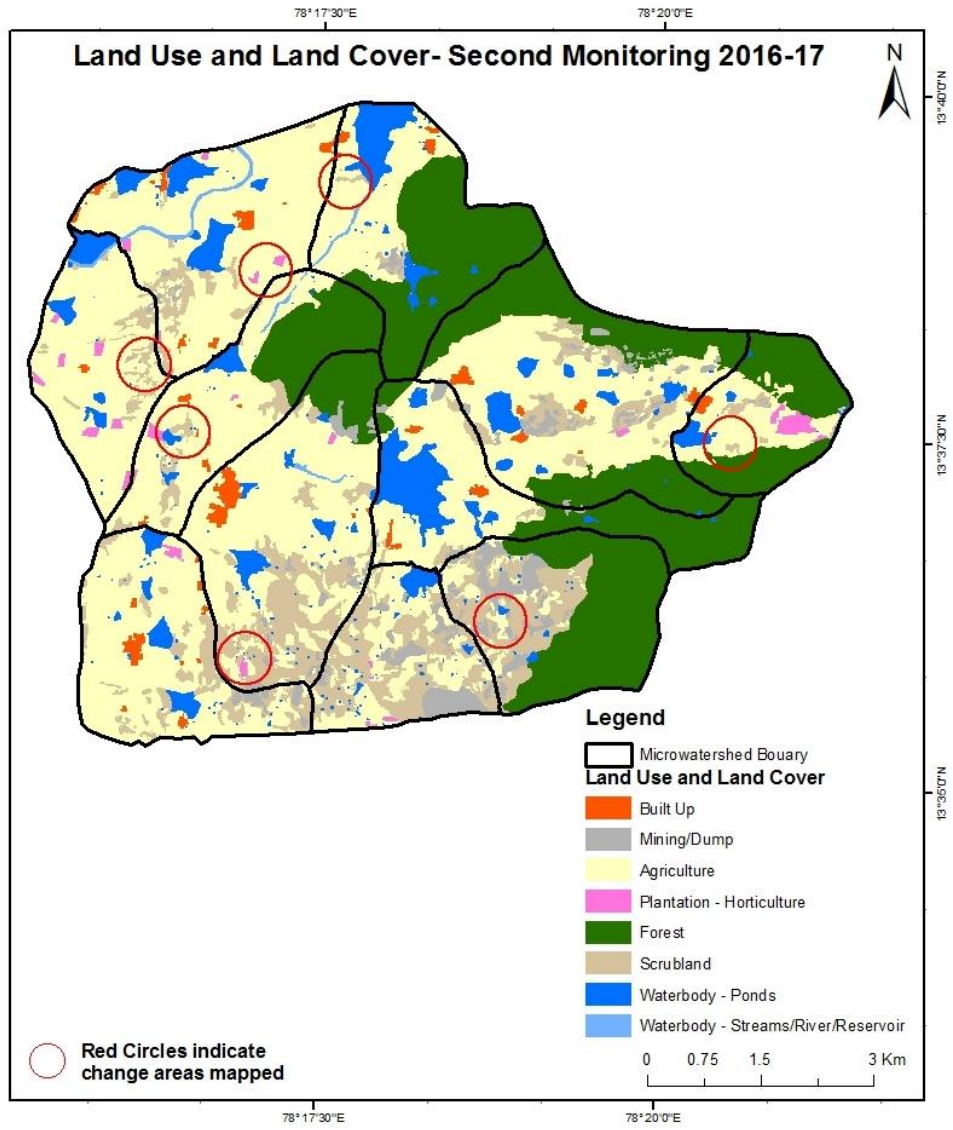


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

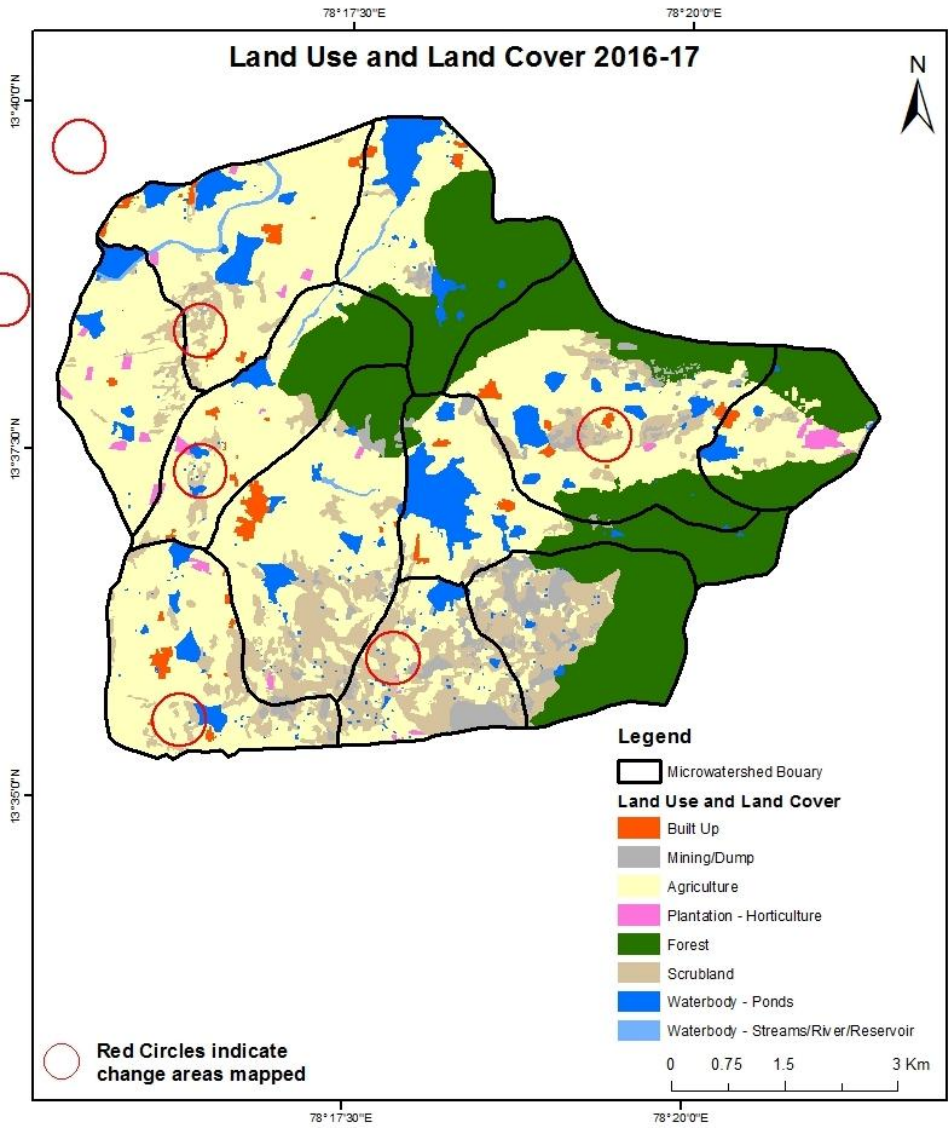
**Scale: 1:10000**

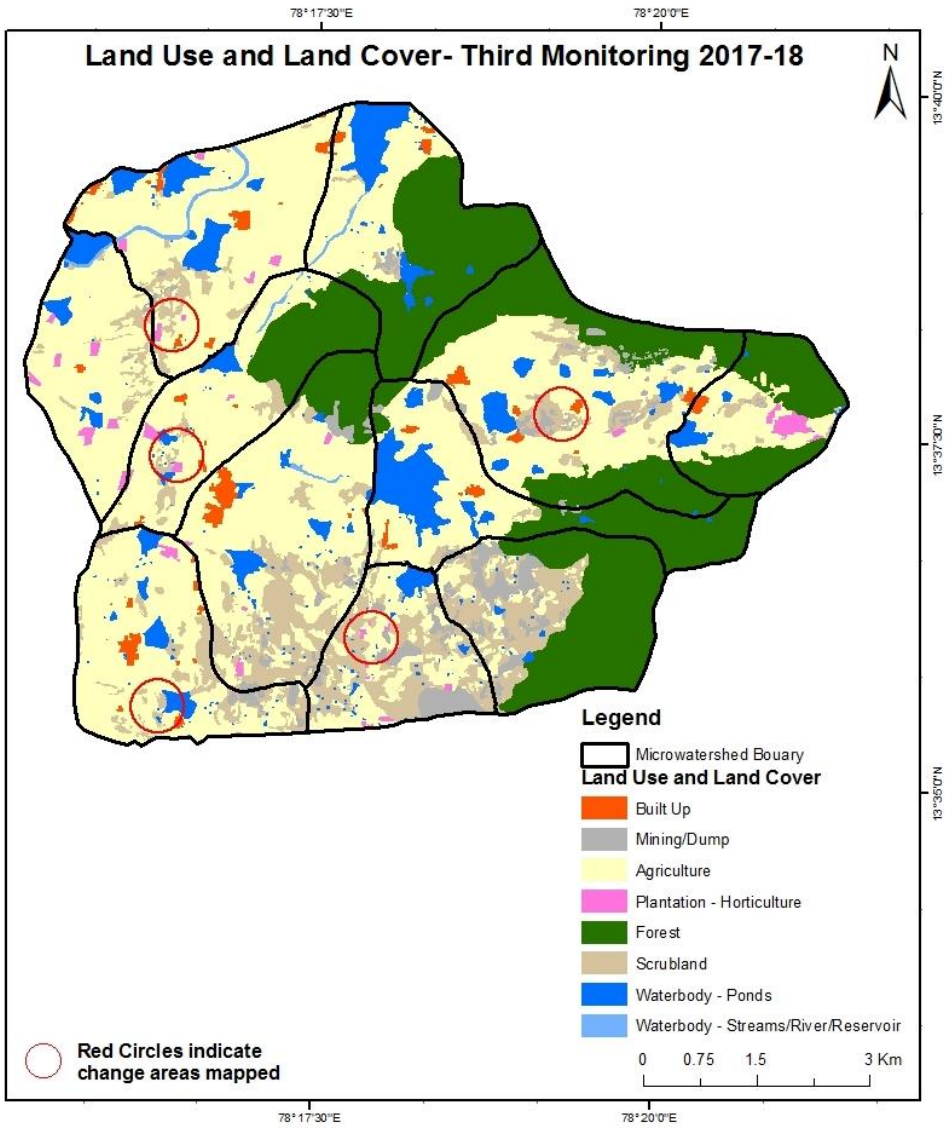


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

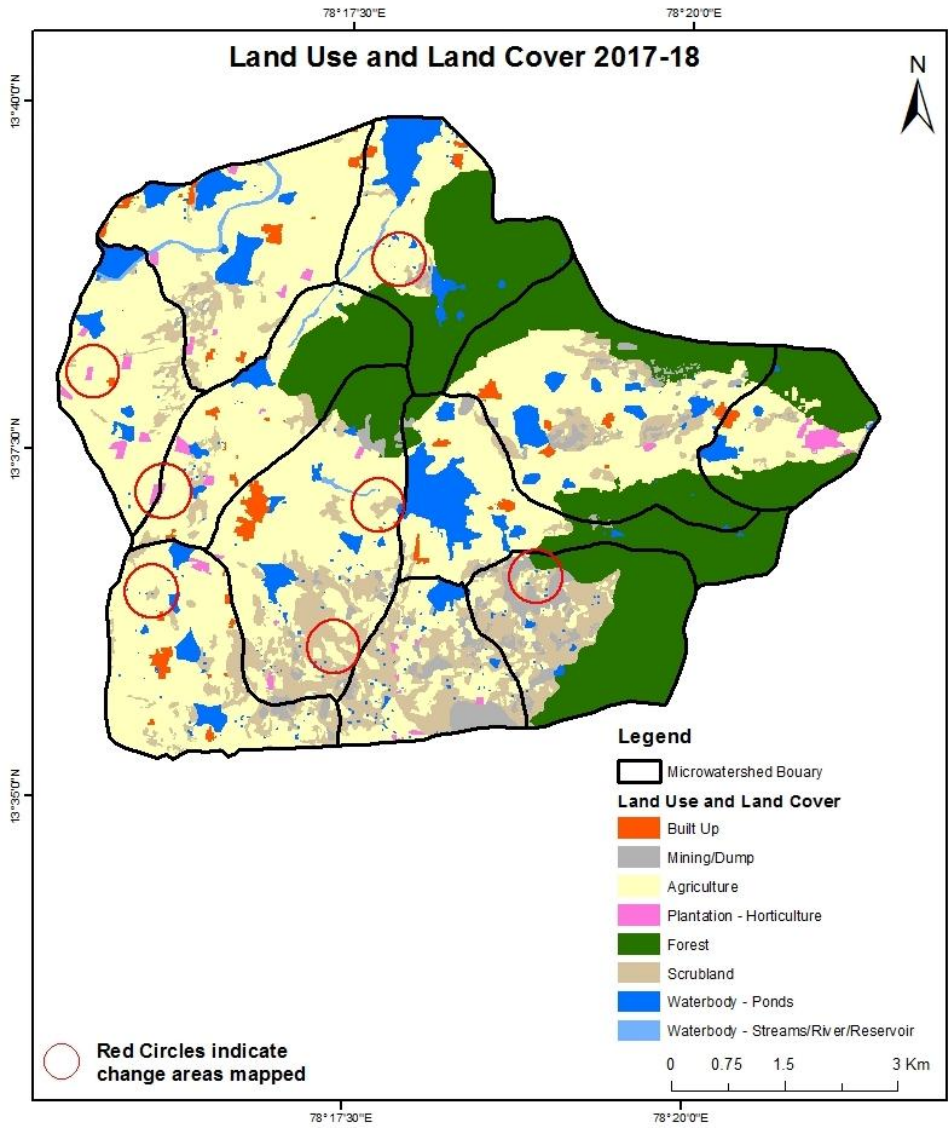
Scale: 1:10000

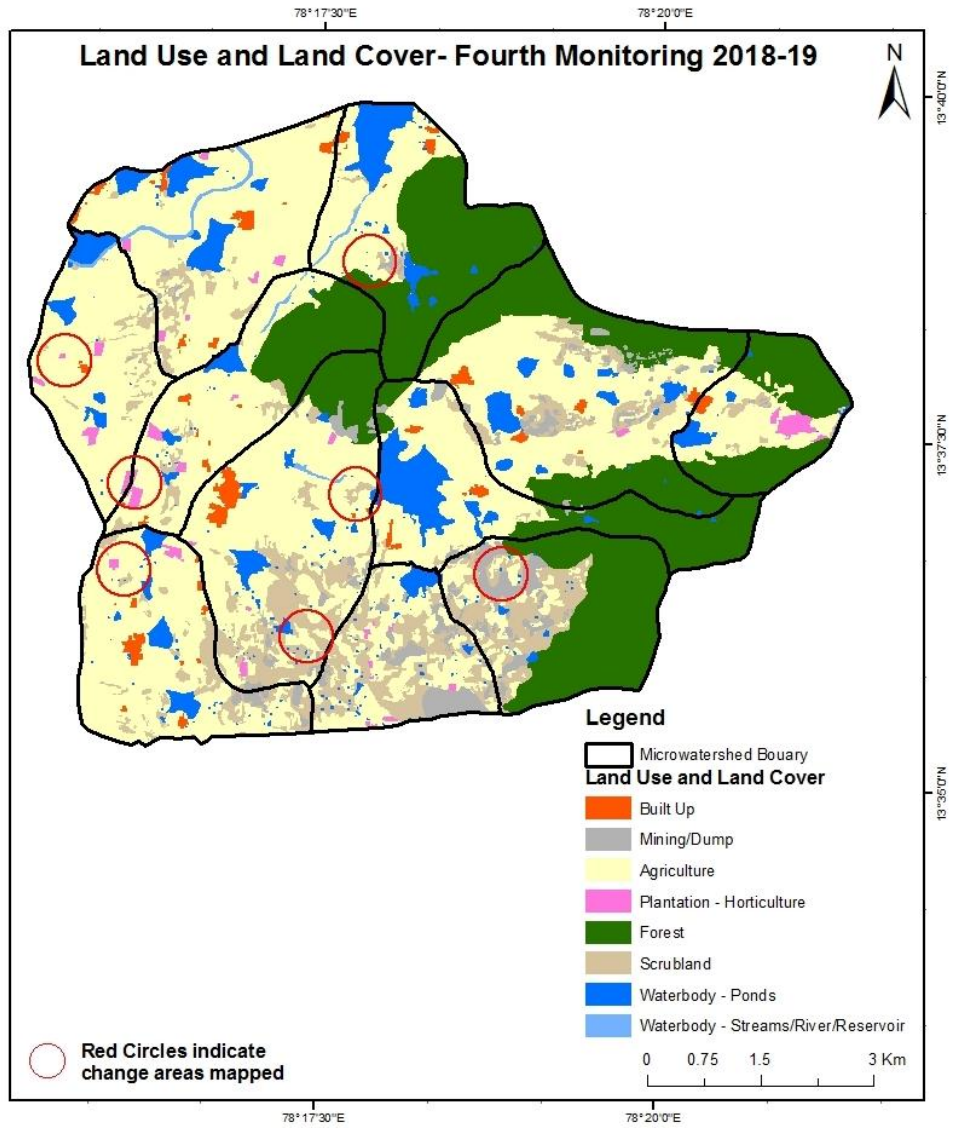


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

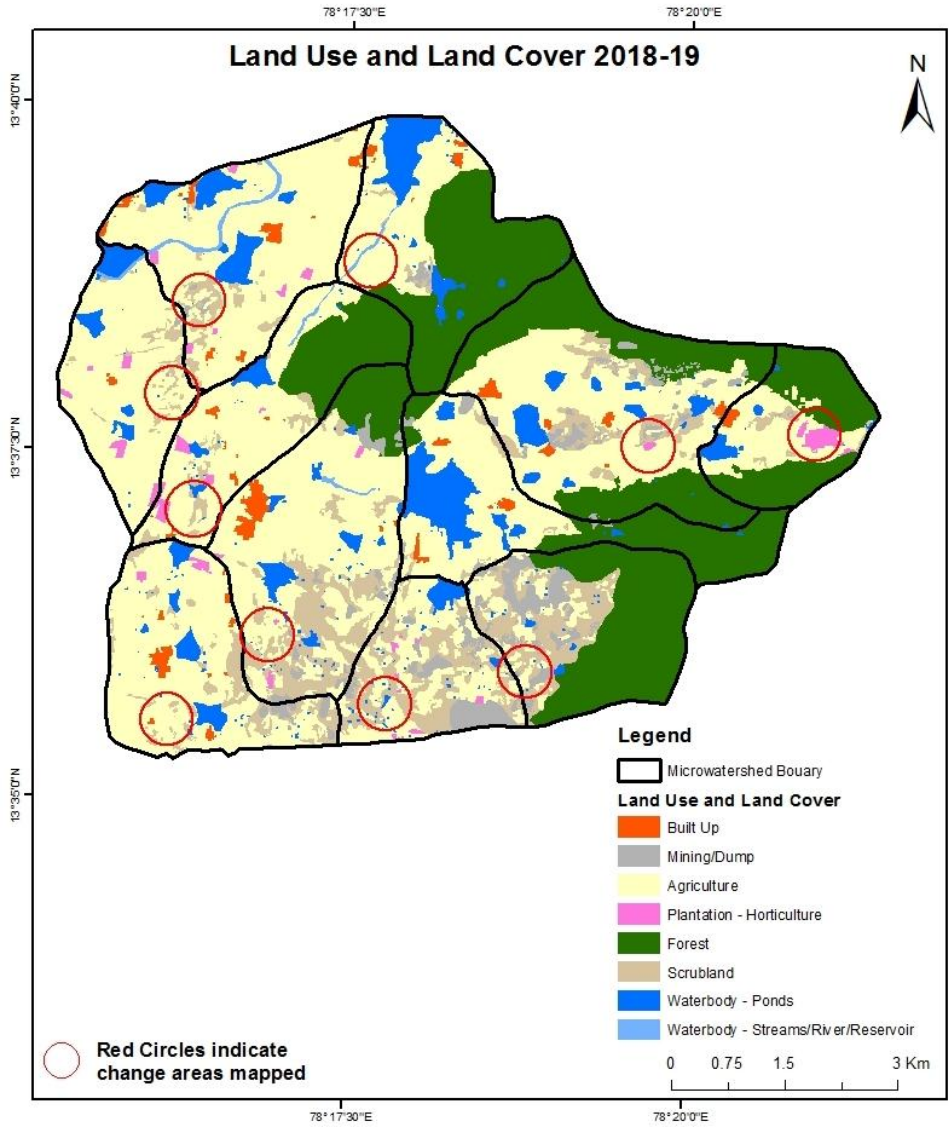
**Scale: 1:10000**

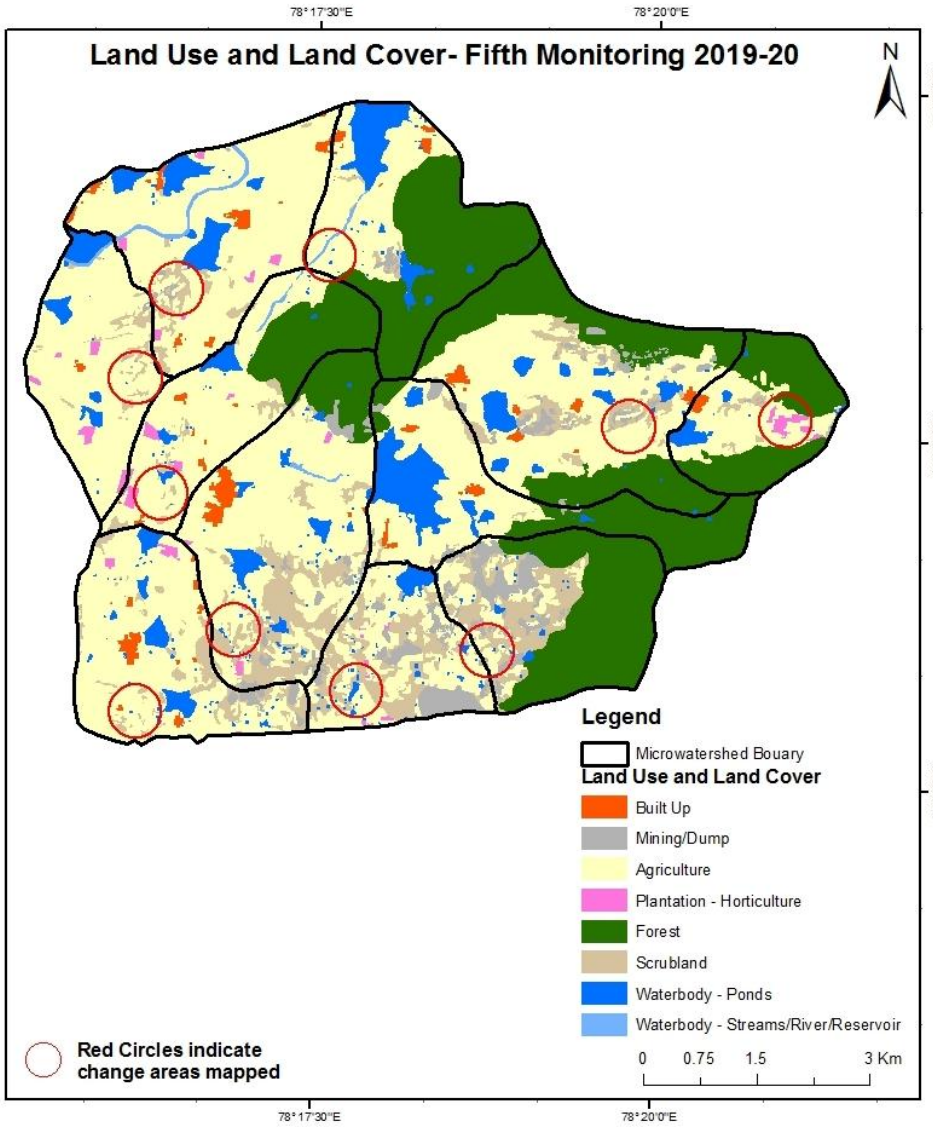


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

**Scale: 1:10000**

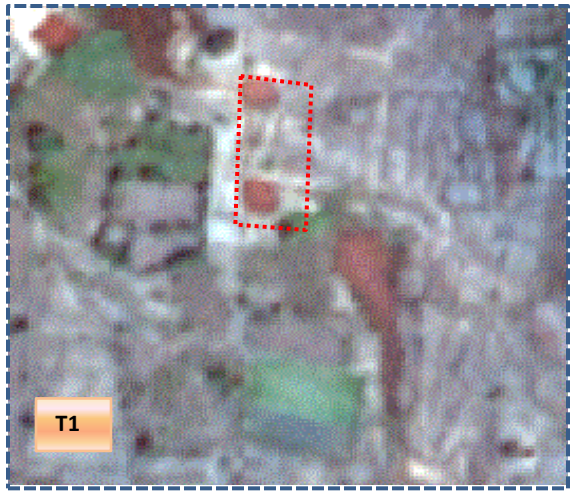


**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Water body

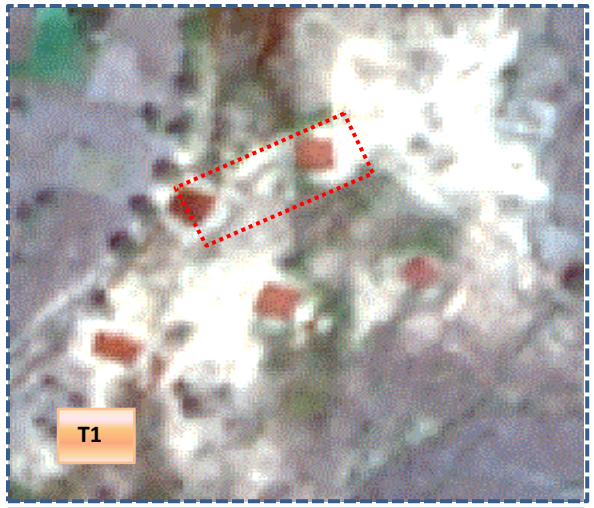

T0: 2011-12(78°16'59.938"E 13°36'21.815"N)




T1: 24 Dec 2015

Scrub to Water body

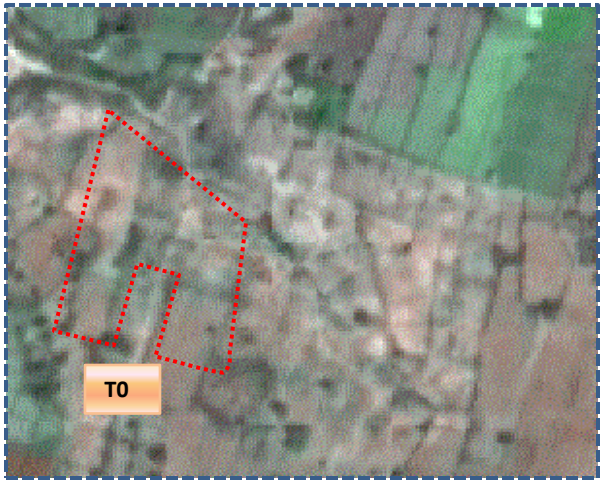

T0: 2011-12 (78°16'13.528"E 13°36'37.87"N)

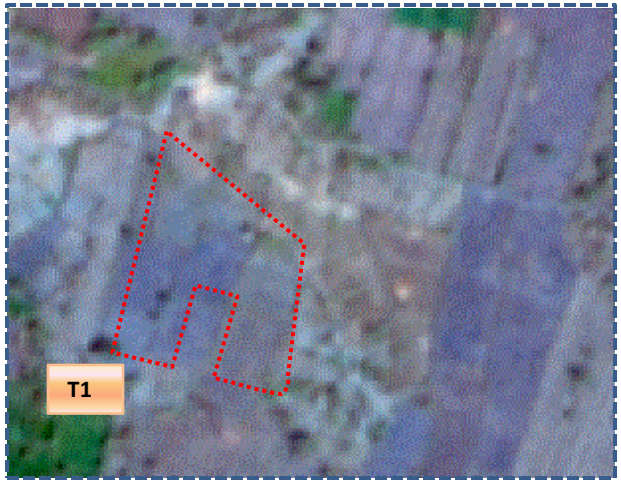



T1: 24 Dec 2015

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

Scrub to Agriculture

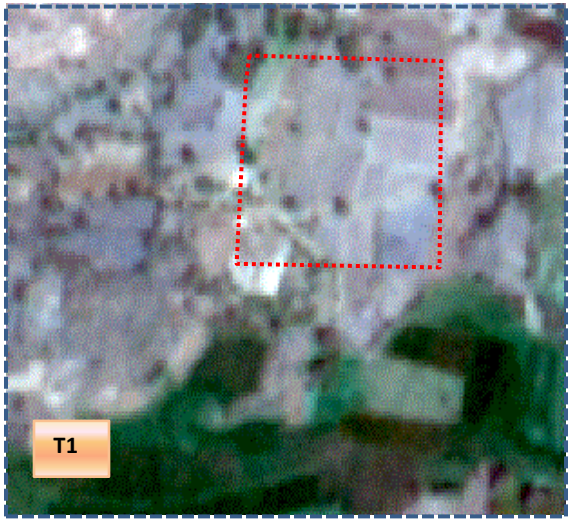



T0: 2011-12(78°16'49.022"E 13°38'38.434"N)

T1:24 Dec 2015

Scrub to Agriculture


T0: 2011-12(78°20'36.011"E 13°37'40.661"N)

T1: 24 Dec 2015

**Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16**

| 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 | 77.99 | | | | | | | | | | **77.99** |
| Mining/dump | | 46.90 | | | | | | | | | **46.90** |
| Agriculture | 6.93 | 8.78 | 2768.72 | 15.58 | | | | 0.27 | 17.22 | 20.70 | **2838.20** |
| Plantation Horticulture | | | 13.55 | 22.18 | | | | | | 0.14 | **35.87** |
| Forest | | 23.91 | 11.87 | | 1562.08 | | | | | 5.03 | **1602.89** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.93 | 132.18 | 190.62 | | | | | 868.54 | | 18.64 | **1210.91** |
| Waterbody-Streams/River | | | | | | | | | 10.77 | | **10.77** |
| Waterbody – Ponds | | | | | | | | | | 381.74 | **381.74** |
| Grand Total | **85.86** | **211.77** | **2984.76** | **37.77** | **1562.08** | | | **868.81** | **27.99** | **426.24** | **6205.28** |

- 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 69 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T1.
- In T1 216 ha of the agriculture area has increased from plantations, forest and scrubland of T0.
- The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

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

| 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 | 85.86 | | | | | | | | | | **85.86** |
| Mining/dump | | 211.70 | 0.07 | | | | | | | | **211.77** |
| Agriculture | 1.92 | 0.58 | 2964.86 | 10.60 | | | | | | 6.79 | **2984.76** |
| Plantation Horticulture | | | | 37.77 | | | | | | | **37.77** |
| Forest | | | 11.20 | | 1550.88 | | | | | | **1562.08** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | 4.75 | 112.97 | | | | | 750.90 | | 0.19 | **868.81** |
| Waterbody-Streams/River | | | | | | | | | 27.99 | | **27.99** |
| Waterbody – Ponds | | | | | | | | | | 426.24 | **426.24** |
| Grand Total | **87.78** | **217.03** | **3089.10** | **48.37** | **1550.88** | | | **750.90** | **27.99** | **433.23** | **6205.28** |

- 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 19 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 124 ha of the agriculture area has increased from forest and scrubland 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-2016-17 to 2017-18**

| 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 | 87.78 | | | | | | | | | | **87.78** |
| Mining/dump | | 217.03 | | | | | | | | | **217.03** |
| Agriculture | 1.54 | | 3077.96 | 9.28 | | | | | | 0.31 | **3089.10** |
| Plantation Horticulture | | | | 48.29 | | | | | | 0.09 | **48.37** |
| Forest | | | 0.11 | | 1550.77 | | | | | | **1550.88** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | 27.79 | 0.28 | | | | 721.35 | | 1.47 | **750.90** |
| Waterbody-Streams/River | | | | | | | | | 27.99 | | **27.99** |
| Waterbody – Ponds | | | 0.42 | | | | | | | 432.80 | **433.23** |
| Grand Total | **89.32** | **217.03** | **3106.29** | **57.85** | **1550.77** | | | **721.35** | **27.99** | **434.67** | **6205.28** |

- 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 11 ha of the agriculture area has decreased and it is converted into Built-up , plantation and water body in T3.
- In T3 28 ha of the agriculture area has increased from forest, 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-2017-18 to 2018-19**

| 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 | 89.32 | | | | | | | | | | **89.32** |
| Mining/dump | | 216.67 | 0.36 | | | | | | | | **217.03** |
| Agriculture | 0.82 | | 3099.25 | 6.05 | | | | | | 0.16 | **3106.29** |
| Plantation Horticulture | | | 5.27 | 52.59 | | | | | | | **57.85** |
| Forest | | | 1.46 | | 1549.31 | | | | | | **1550.77** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | 74.69 | | | | | 643.67 | | 3.00 | **721.35** |
| Waterbody-Streams/River | | | | | | | | | 27.99 | | **27.99** |
| Waterbody – Ponds | | | 1.07 | | | | | | | 433.60 | **434.67** |
| Grand Total | **90.14** | **216.67** | **3182.09** | **58.64** | **1549.31** | | | **643.67** | **27.99** | **436.76** | **6205.28** |

- 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 07 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T4 82 ha of the agriculture area has increased from plantations, forest, scrubland and water body 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-2018-19 to 2019-20**

| 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 | 90.14 | | | | | | | | | | **90.14** |
| Mining/dump | | 216.35 | 0.29 | | | | | | | 0.03 | **216.67** |
| Agriculture | 0.37 | | 3175.46 | | | | | | | 6.26 | **3182.09** |
| Plantation Horticulture | | | 7.45 | 51.19 | | | | | | | **58.64** |
| Forest | | | 3.49 | | 1544.95 | | | | | 0.88 | **1549.31** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | 73.10 | | | | | 567.42 | | 3.15 | **643.67** |
| Waterbody-Streams/River | | | | | | | | | 27.99 | | **27.99** |
| Waterbody – Ponds | | | | | | | | | | 436.76 | **436.76** |
| Grand Total | **90.52** | **216.35** | **3259.79** | **51.19** | **1544.95** | | | **567.42** | **27.99** | **447.08** | **6205.28** |

• 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 06 ha of the agriculture area has decreased and it is converted into Built-up and water body in T5.

•In T5 84 ha of the agriculture area has increased from plantations, forest 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 82 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2019-20 (T5) years.
4. There is an increase of 146, 17, 75 & 77 Hectares From T0 to T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 421 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2019-20 (T5) years.
5. There is an increase of 15 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2019-20 (T5) years.
6. There is a decrease of 643 Hectares in Scrubland area as compared between 2010-11 (T0) & 2019-20 (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.