# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

SRIKAKULAM -10/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2022

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


AGRICULTURE & SOIL DIVISION
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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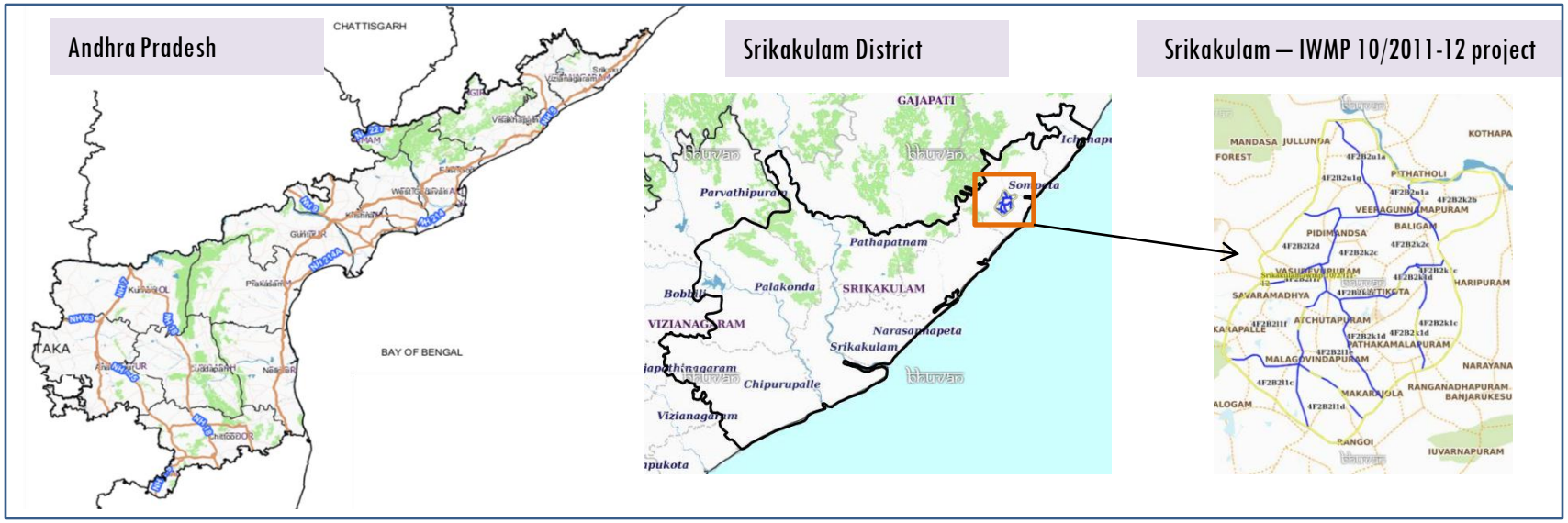
# EXECUTIVE SUMMARY

- 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-10/2011-12, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 3,514 ha. It comprises of 11 micro watersheds.
- In the project area 76 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an increased by 89 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 66 % is covered by the agriculture, 21 plantation, 5 % is covered by water body and remaining by other land use classes.

# PROJECT : SRIKAKULAM - IWMP-10/2011-12
# DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Mandasa Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 3,514 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 region is generally tropical, the mean maximum temperature is 30-40°C April-May and the mean minimum temperature is 17.4°C December-January during the summer season till the onset of the South-West monsoon the heat is oppressive and the day temperature is May sometimes go about 43°C.
- The rainfall in the region is considerably more in the hilly areas as compared to the plains, the annual normal rainfall is 1131 mm (i.e., 61% from South West monsoon and 2.2% from Northeast monsoon) is shared by summer showers and winter rains.

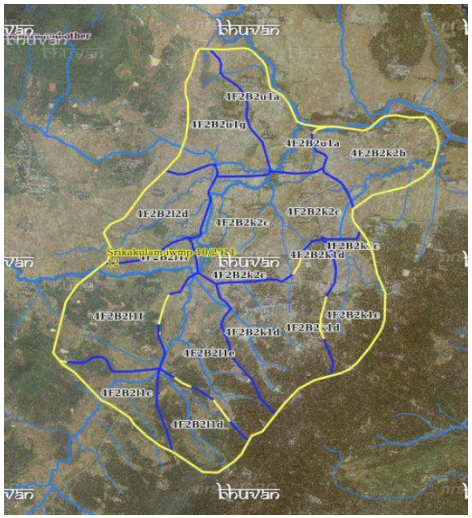
# Satellite Data and Ancillary Data

| Satellite data* | T0-A** | T0-B** | T5 |
|---|---|---|---|
| | 2011-12 | 2013-14 | 2015-16 |
| LISS IV | 2011-12 | | |
| SCENE 1 | | | 11-Oct-19 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| | | | |
| CARTO | 2011-12 | | |
| SCENE 1 | | | 11-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 | 76 |
| 4 | Detailed Project Report | | |

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



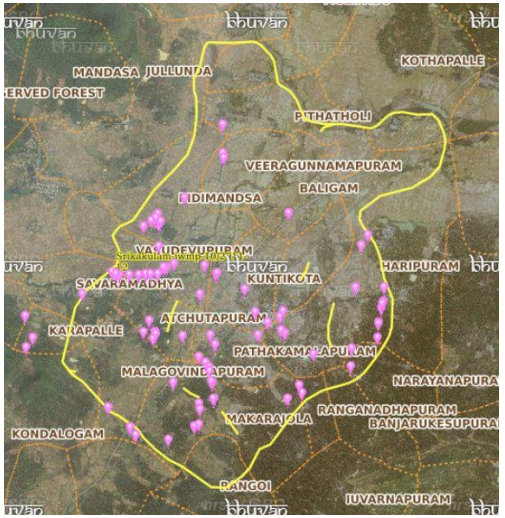
Legend

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 | 14 | 13 |
| 2 | Horticulture | 0 | 0 |
| 3 | Agriculture | 2 | 2 |
| 4 | Pasture | 0 | 0 |
| 5 | Trench | 0 | 0 |
| 6 | Field Bunds | 0 | 0 |
| 7 | Terrace | 0 | 0 |
| 8 | Checks & Plugs | 45 | 44 |
| 9 | Gabion structure | 0 | 0 |
| 10 | Farm ponds/Dug out pit | 0 | 0 |
| 11 | Civil work-Check dams/Rock fill dam | 9 | 9 |
| 12 | Nallah Bunds/Drainage treatment | 0 | 0 |
| 13 | Percolation tanks / Ground water recharge structure | 0 | 0 |
| 14 | Production System and Micro-Enterprises | 2 | 1 |
| 15 | Livelihood Activities-Plantation/Horticulture | 0 | 0 |
| 16 | Capacity Building Activities | 0 | 0 |
| 17 | Entry Point Activity | 0 | 0 |
| 18 | Others | 11 | 7 |
| | **TOTAL** | **83** | **76** |

# MONITORING IN THE PROJECT AREA

## Site Wise Changes in the Project

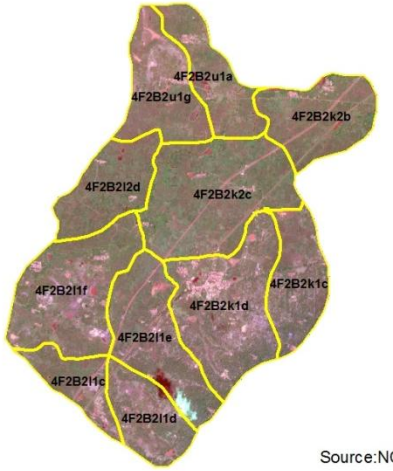
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2011-12) and T5 is 2019-20 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

# Natural Colour Composite (NCC)

**Natural Color Composite- 2011-12**

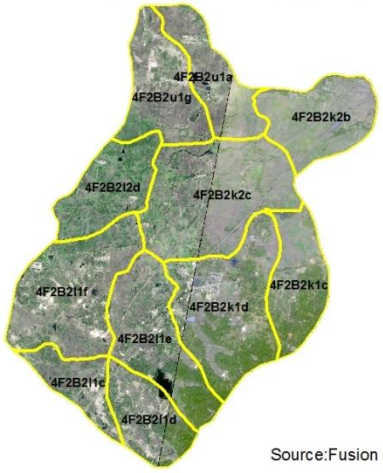

Source:Fusion data,NRSC

**Natural Color Composite- 07 th Nov 2015**



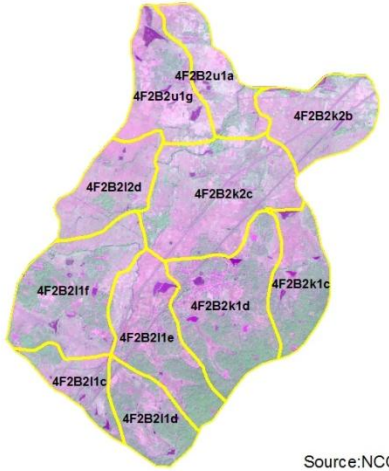

Source:NCC,NRSC

**Natural Color Composite- 19 th Nov 2016**



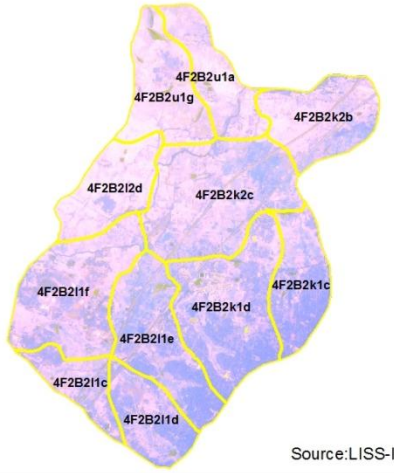

Source:Fusion data,NRSC

**Natural Color Composite- 25 th December 2017**




Source:NCC,NRSC

**Natural Color Composite-14th March 2018**




Source:LISS-IV,NRSC

**Natural Color Composite-11 th October 2019**


Source:LISS-IV,NRSC

# Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-10/2011-12

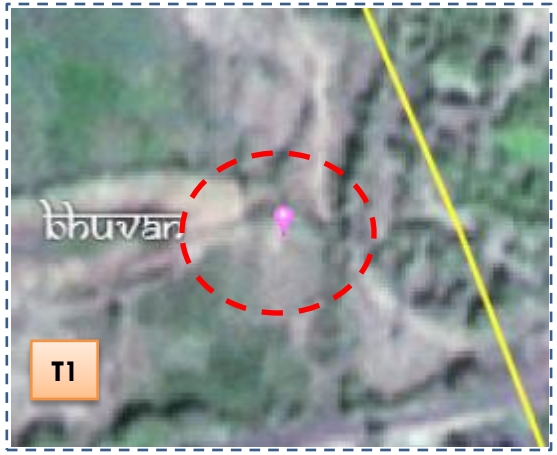

T0:2011-12


T1: 19 November 2016

Drishti SI no. 131976 MWS : 4F2B2k1c

**Check dam**


T0:2011-12

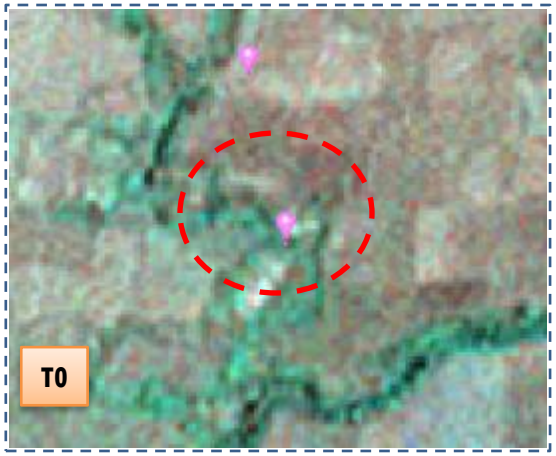



T1: 19 November 2016

Drishti SI no. 726464 MWS : 4F2B2k1c

**Check dam**

# Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-10/2011-12

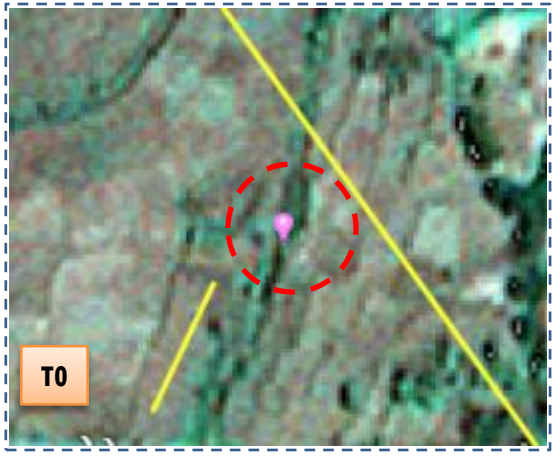



T0:2011-12


T1: 19 November 2016

Drishti Sl no. 131994 MWS : 4F2B2k1c

**Check dam**




T0:2011-12


T1: 19 November 2016

Drishti Sl no. 2427900 MWS : 4F2B2k1c

**Check dam**

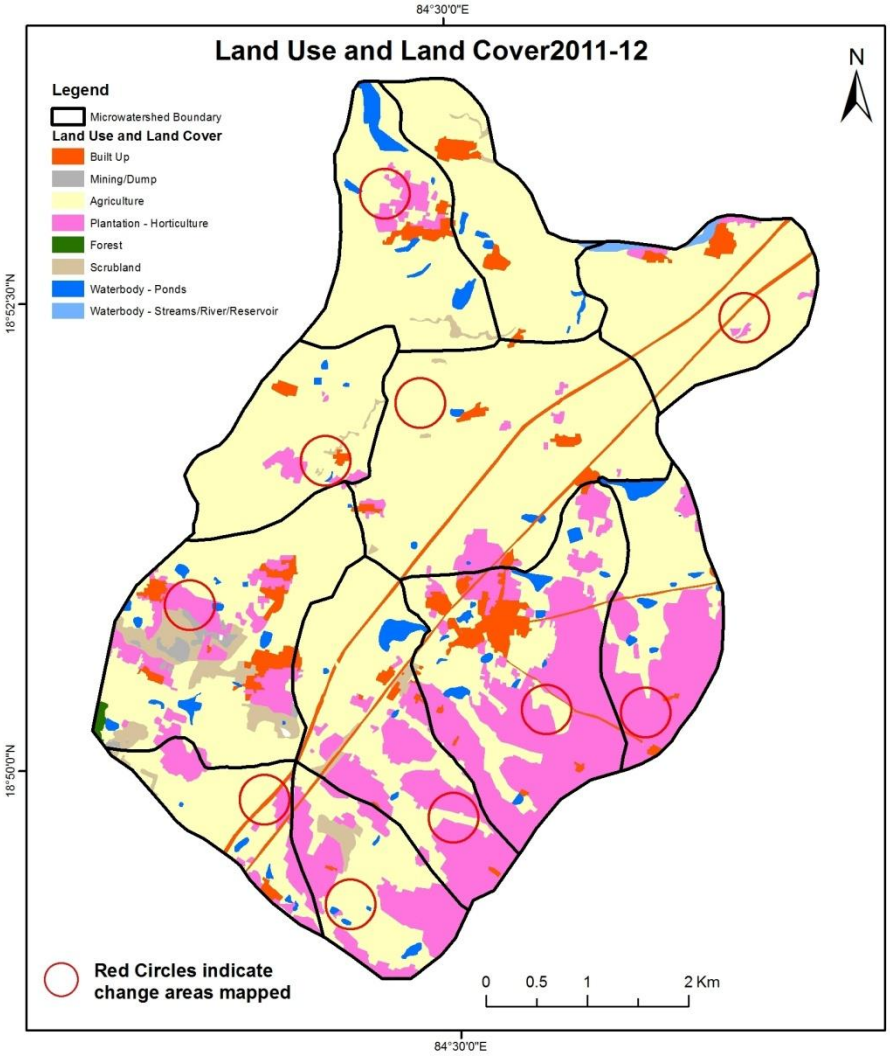
# MONITORING IN THE PROJECT AREA

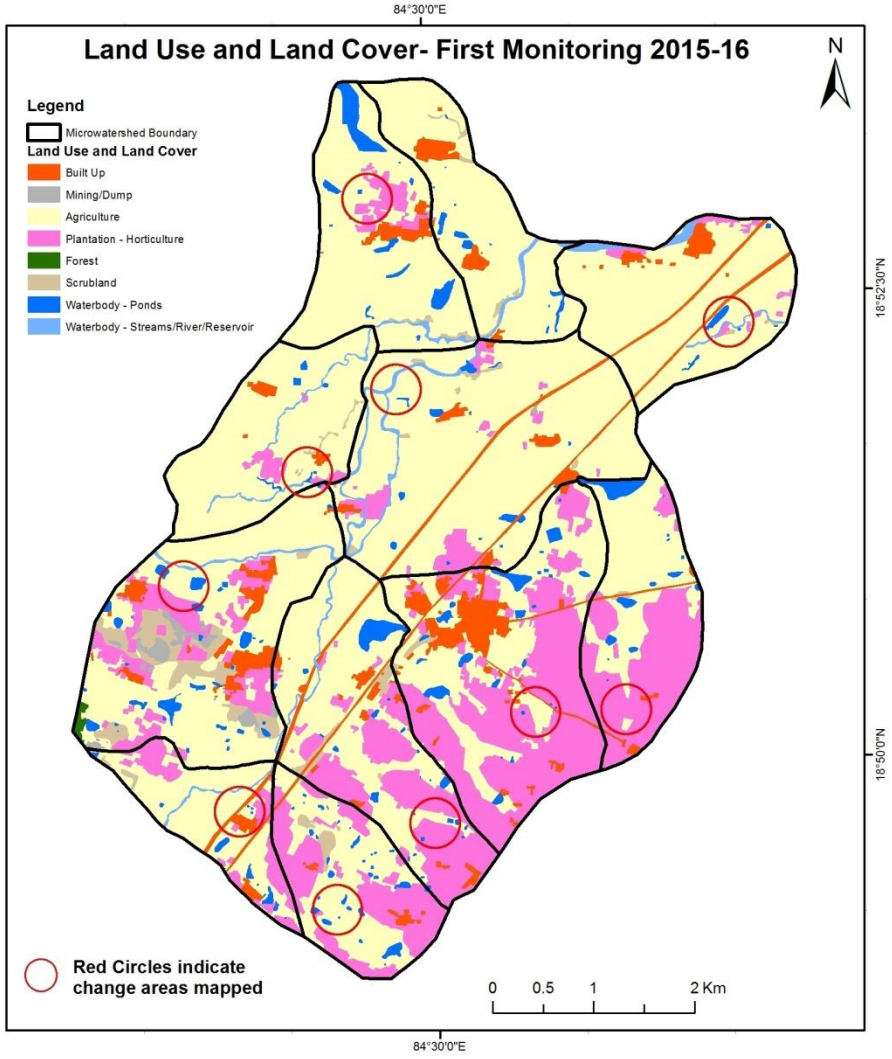
## Land use and Land cover Changes in the Project

- 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 (2009-10) 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)

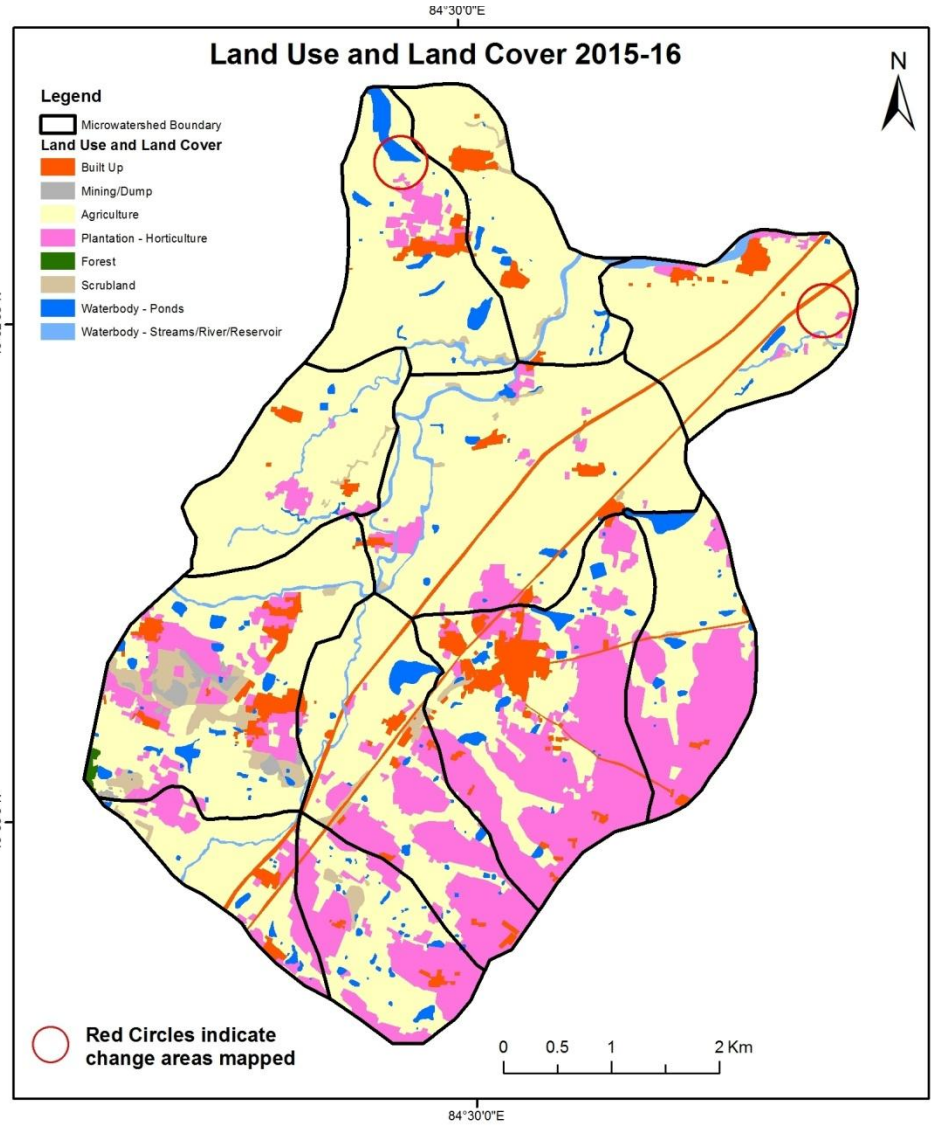
Scale: 1:10000

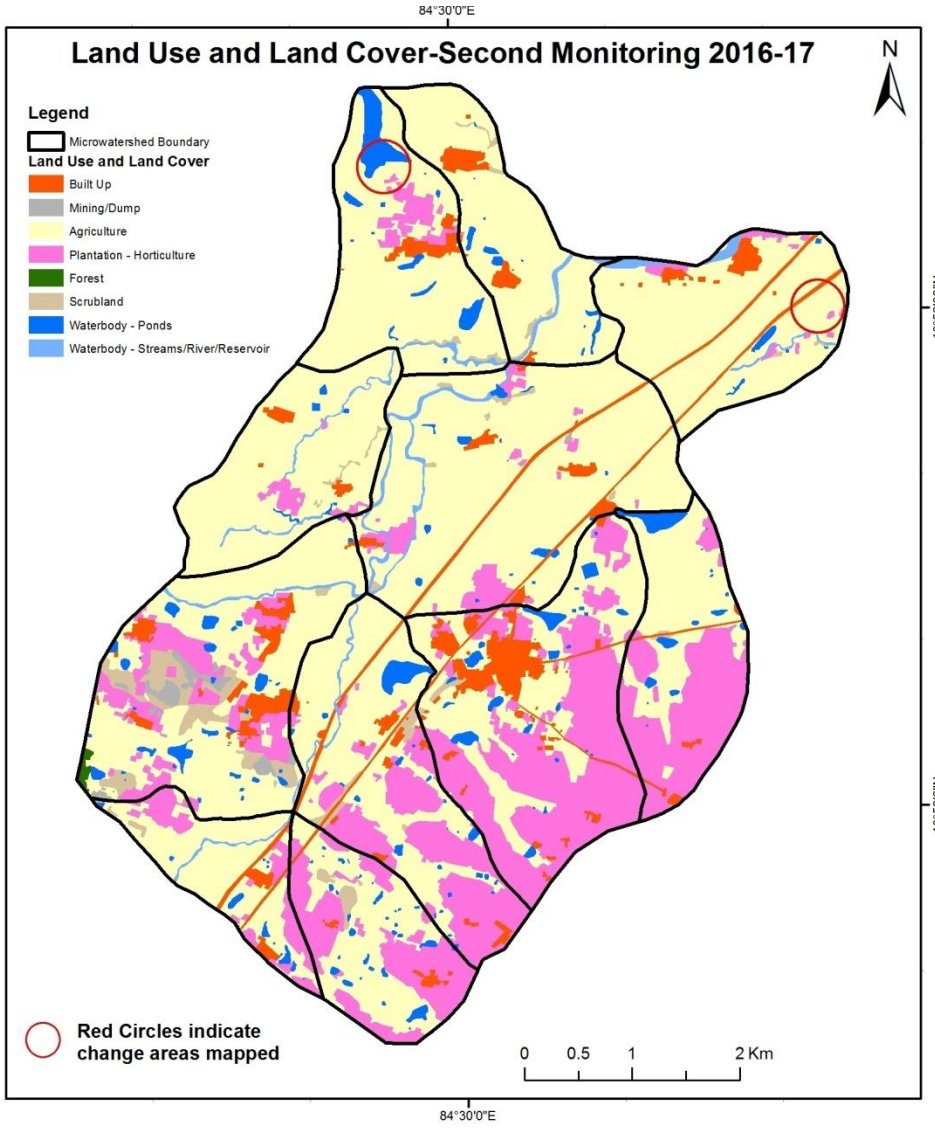


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

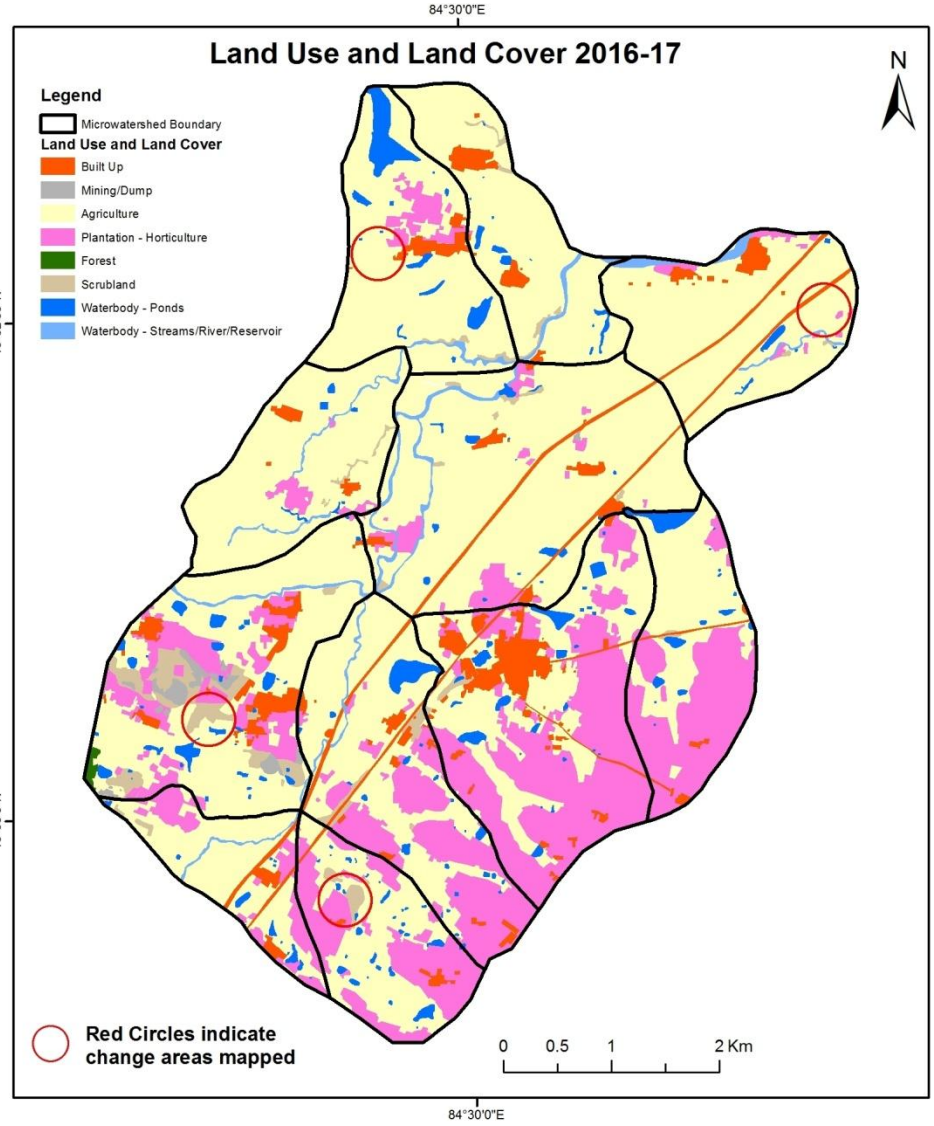
**Scale: 1:10000**

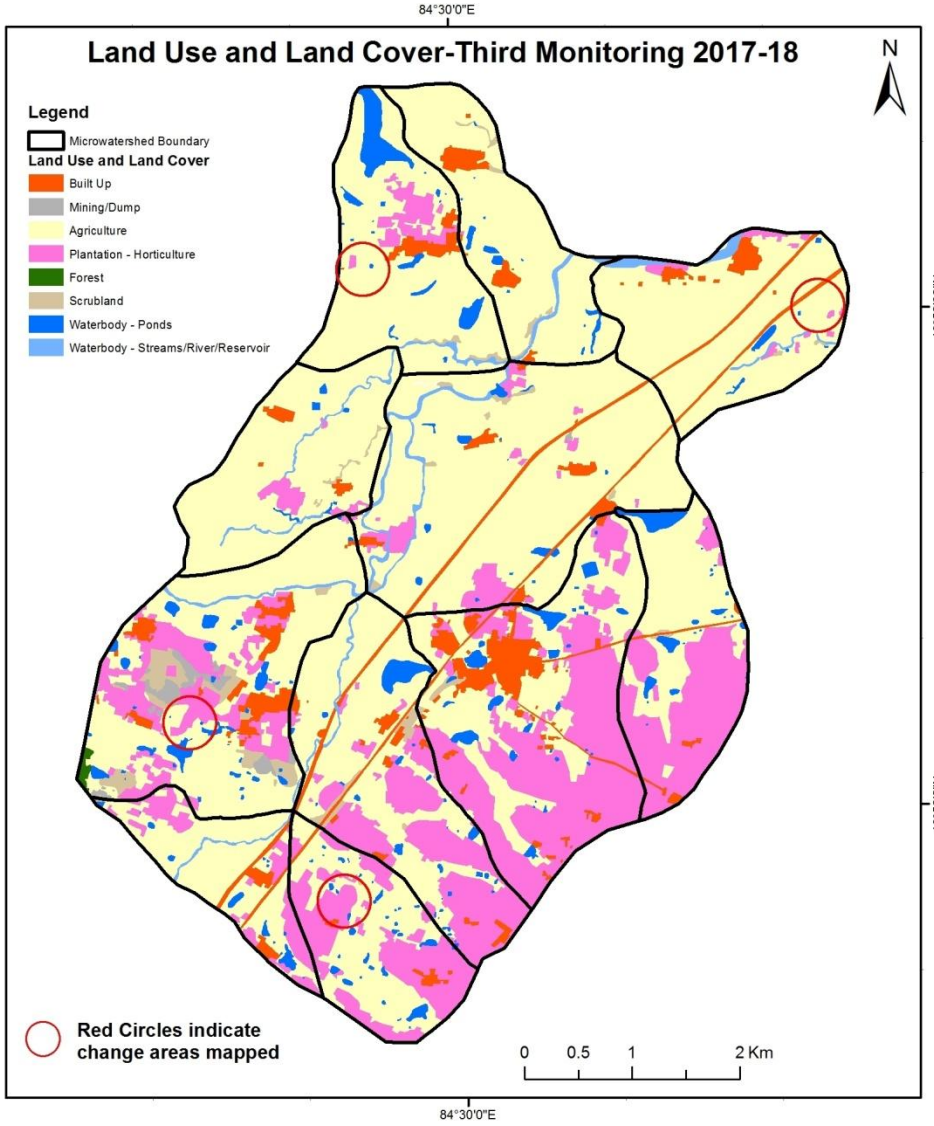


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

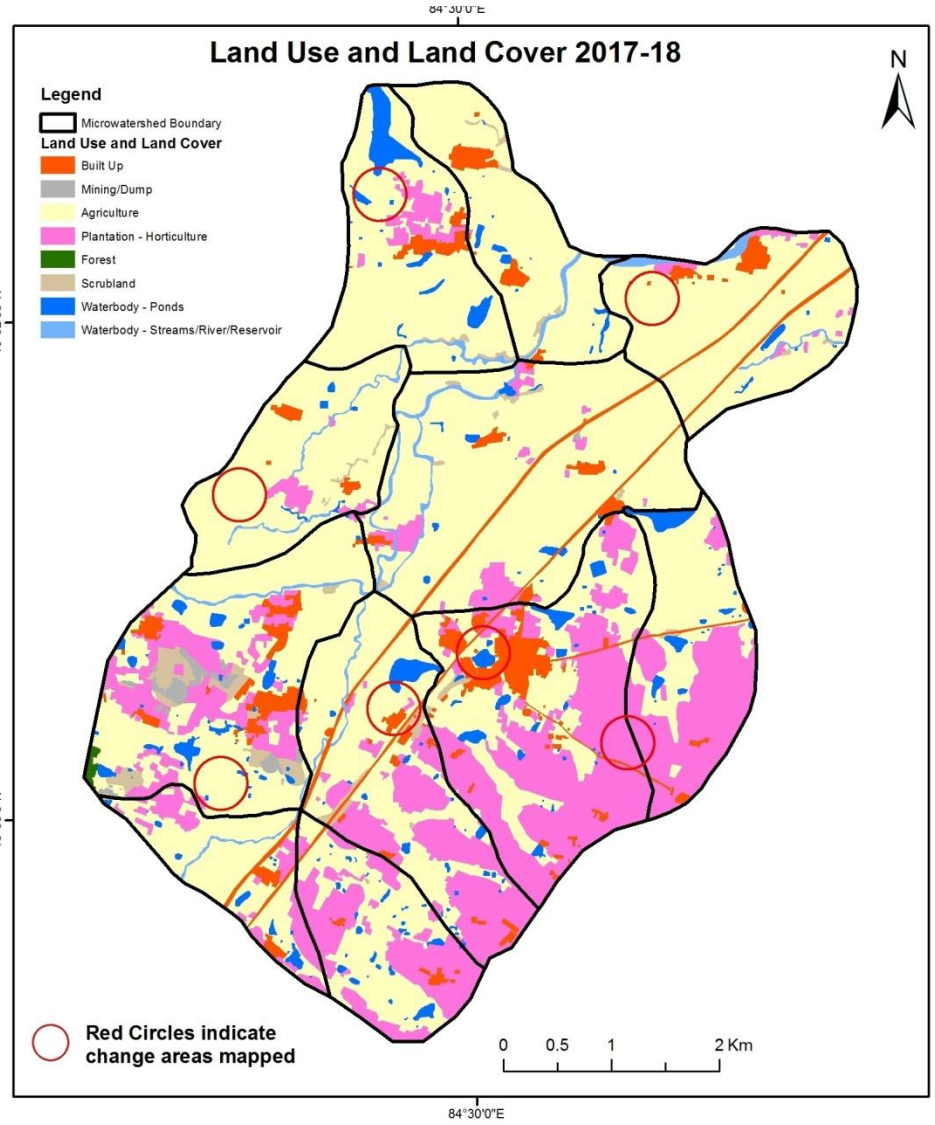
**Scale: 1:10000**

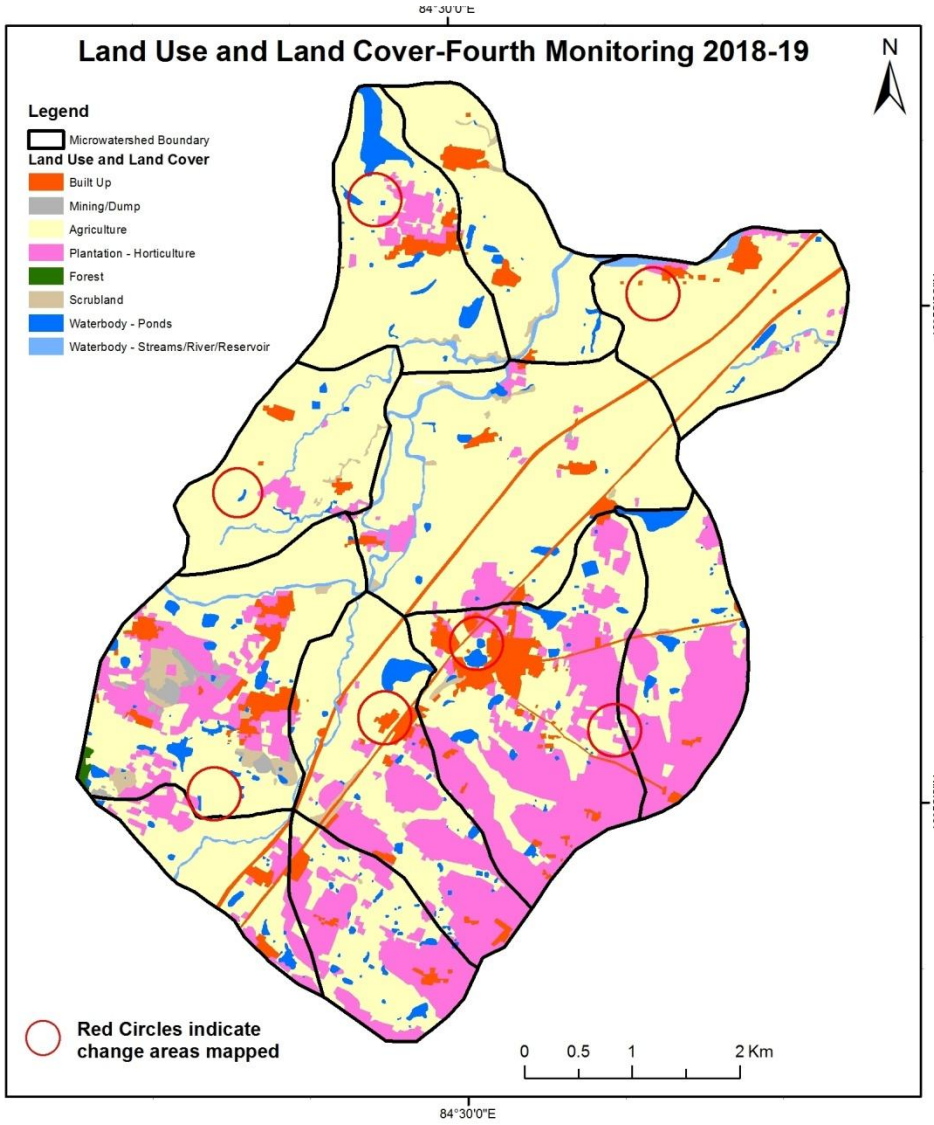


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

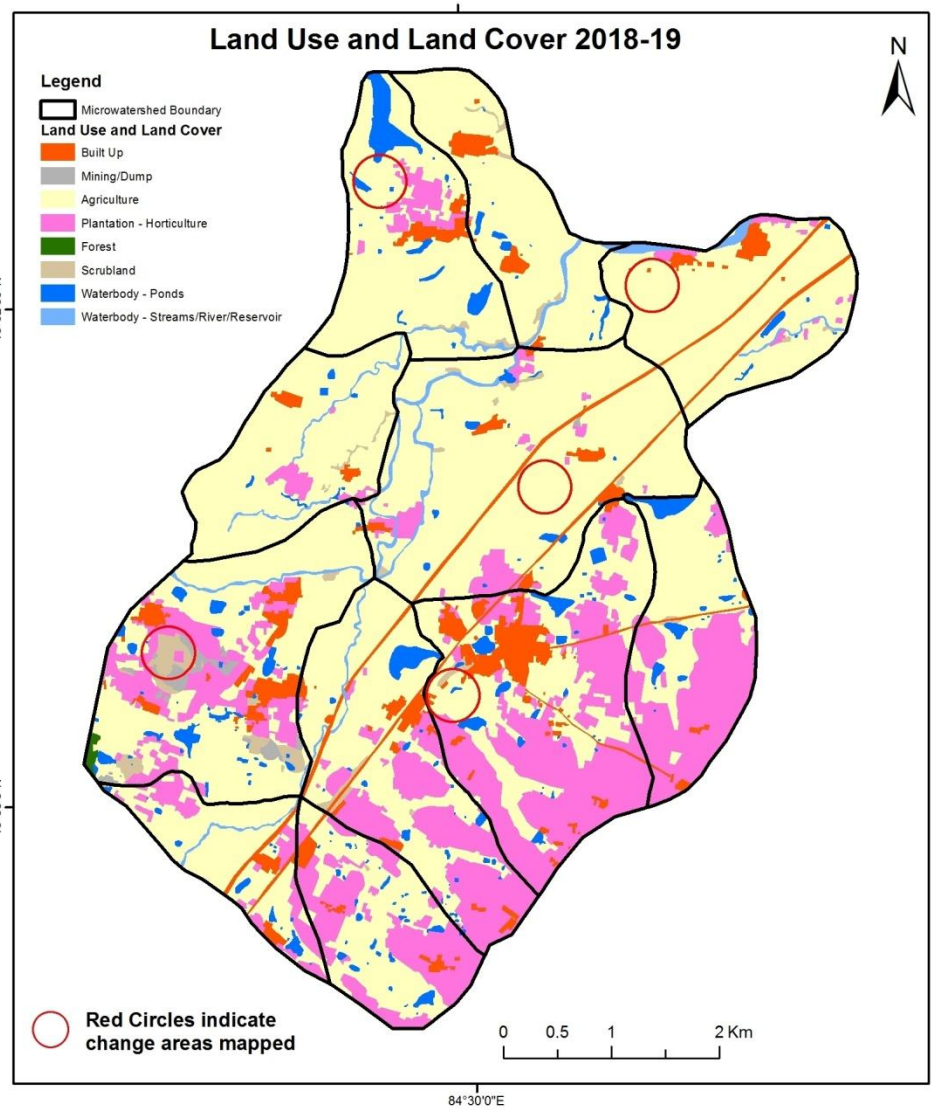
**Scale: 1:10000**

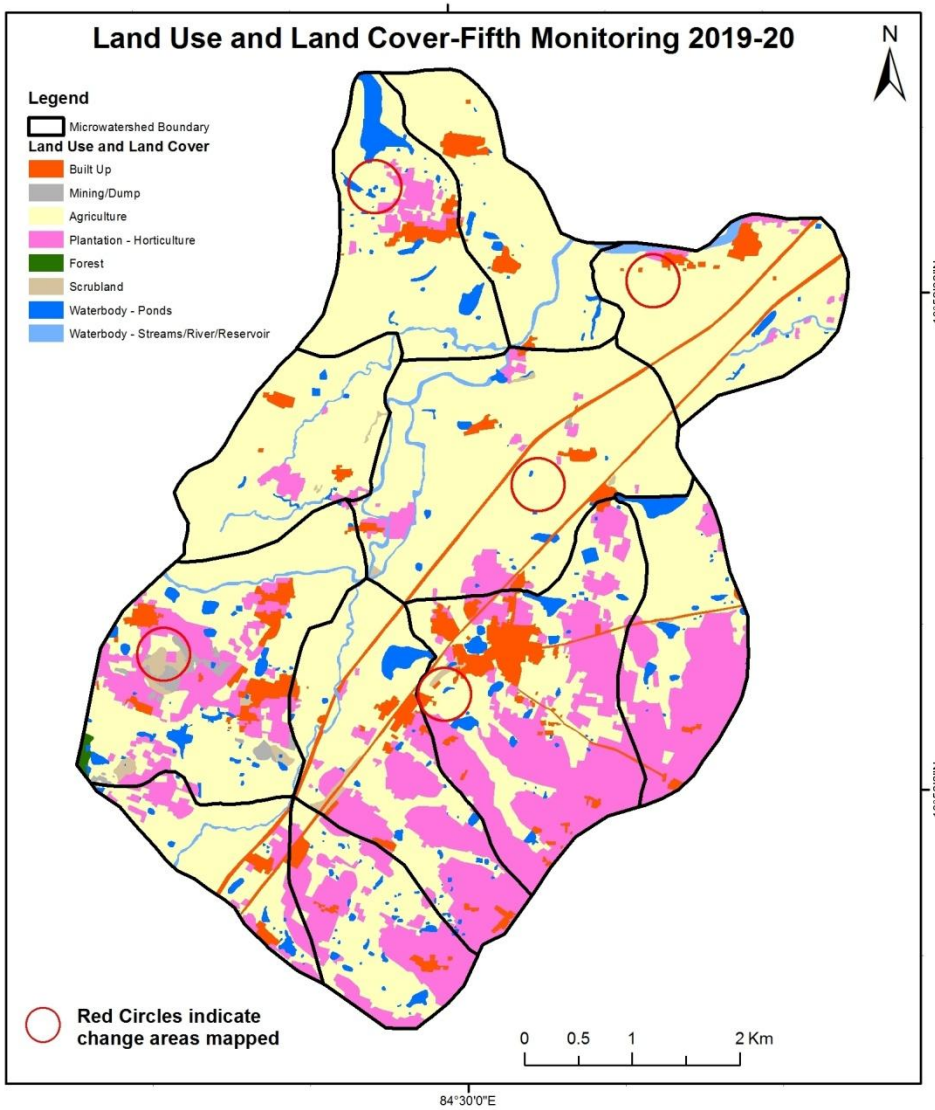


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

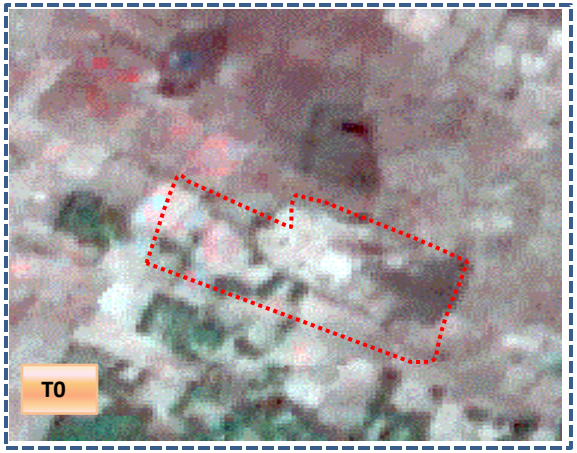
Scale: 1:10000



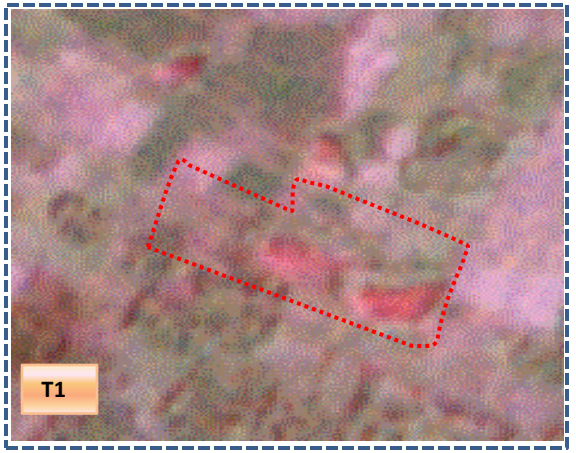



**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Water body



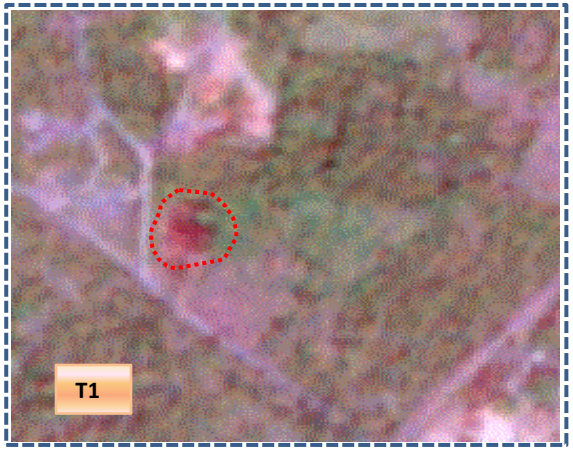

T0: 2011-12 (84°29'36.686"E 18°49'26.622"N)




T1: 07 November 2015

Scrub to water body

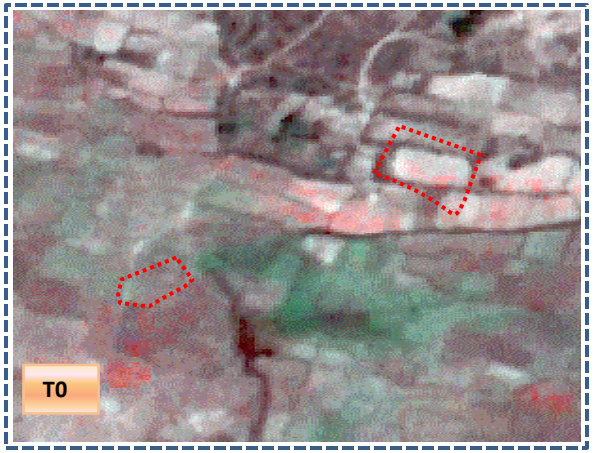

T0: 2011-12 (84°28'40.879"E 18°50'42.567"N)



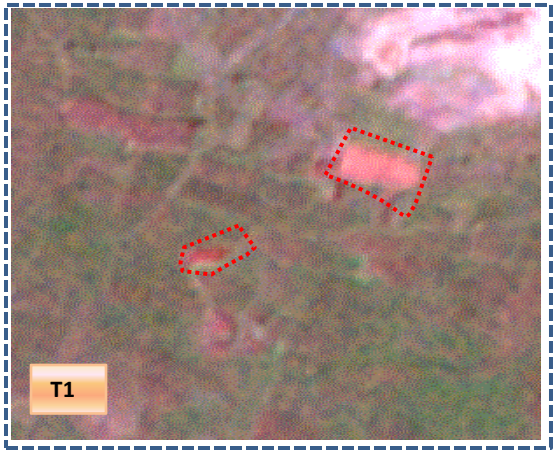

T1: 07 November 2015

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

Agriculture to Water body



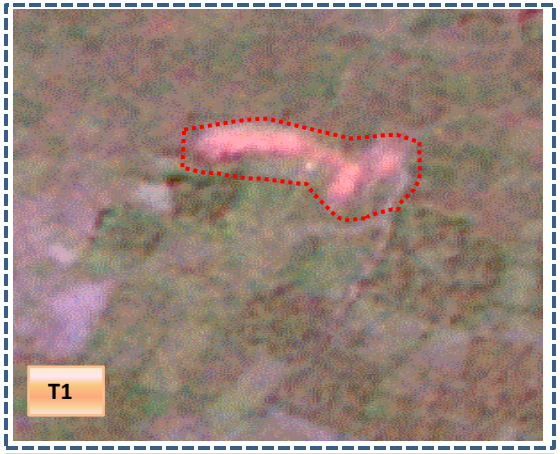

T0: 2011-12 (84°28'54.484"E 18°50'11.455"N)




T1: 07 November 2015

Agriculture to Water body


T0: 2011-12 (84°28'18.946"E 18°50'21.746"N)




T1: 07 November 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 | 175.19 | | | | | | | | | | **175.19** |
| Mining/dump | | 13.25 | | | | | | | | | **13.25** |
| Agriculture | 12.68 | 1.02 | 2290.52 | 25.50 | | | | 8.70 | 46.10 | 21.10 | **2405.61** |
| Plantation Horticulture | 10.45 | 0.19 | 15.24 | 720.81 | | | | | | 1.49 | **748.18** |
| Forest | | | 0.24 | | 3.14 | | | | | | **3.38** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | 2.52 | 7.43 | 1.93 | | | | 66.95 | | 1.17 | **79.99** |
| Waterbody-Streams/River | | | | | | | | | | 79.54 | **79.54** |
| Waterbody – Ponds | | | | | | | | | 9.00 | | **9.00** |
| Grand Total | **198.32** | **16.97** | **2313.43** | **748.23** | **3.14** | | | **75.65** | **55.09** | **104.00** | **3514.83** |

- 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 106 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 22 ha of the agriculture area has increased from plantations 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 | 198.32 | | | | | | | | | | **198.32** |
| Mining/dump | | 16.97 | | | | | | | | | **16.97** |
| Agriculture | 0.81 | | 2298.61 | 8.45 | | | | | | 5.57 | **2313.43** |
| Plantation Horticulture | 0.08 | | 1.53 | 746.62 | | | | | | | **748.23** |
| Forest | | | | | 3.14 | | | | | | **3.14** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | | | | | | 75.61 | | 0.04 | **75.65** |
| Waterbody-Streams/River | | | | | | | | | 55.09 | | **55.09** |
| Waterbody – Ponds | | | | | | | | | | 104.00 | **104.00** |
| Grand Total | **199.20** | **16.97** | **2300.14** | **755.07** | **3.14** | | | **75.61** | **55.09** | **109.60** | **3514.83** |

- 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 14.8 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 1.5 ha of the agriculture area has increased from plantations 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 | 199.20 | | | | | | | | | | **199.20** |
| Mining/dump | | 16.97 | | | | | | | | | **16.97** |
| Agriculture | 0.42 | | 2287.17 | 5.26 | | | | | | 7.29 | **2300.14** |
| Plantation Horticulture | 0.37 | | 7.55 | 746.47 | | | | | | 0.67 | **755.07** |
| Forest | | | | | 3.14 | | | | | | **3.14** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | | | 2.37 | 21.02 | | | | 52.22 | | | **75.61** |
| Waterbody-Streams/River | | | | | | | | | 55.09 | | **55.09** |
| Waterbody – Ponds | | | | | | | | | | 109.60 | **109.60** |
| Grand Total | **200.00** | **16.97** | **2297.08** | **772.76** | **3.14** | | | **52.22** | **55.09** | **117.57** | **3514.83** |

- 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 12.9 ha of the agriculture area has decreased and it is converted into Built-up , plantations and water body in T3.
- In T3 9.9 ha of the agriculture area has increased from plantations and scrubland 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 | 200.00 | | | | | | | | | | **200.00** |
| Mining/dump | | 16.97 | | | | | | | | | **16.97** |
| Agriculture | 4.00 | 0.31 | 2291.57 | | | | | | | 1.20 | **2297.08** |
| Plantation Horticulture | 3.18 | | 18.56 | 751.01 | | | | | | | **772.76** |
| Forest | | | | | 3.14 | | | | | | **3.14** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 3.51 | | 0.81 | 4.18 | | | | 43.72 | | | **52.22** |
| Waterbody-Streams/River | | | | | | | | | 55.09 | | **55.09** |
| Waterbody – Ponds | | | | | | | | | | 117.57 | **117.57** |
| Grand Total | **210.69** | **17.28** | **2310.95** | **755.19** | **3.14** | | | **43.72** | **55.09** | **118.77** | **3514.83** |

- 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 5.5 ha of the agriculture area has decreased and it is converted into Built-up and water body in T4.
- In T4 19.3 ha of the agriculture area has increased from plantations 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-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 | 210.69 | | | | | | | | | | **210.69** |
| Mining/dump | | 17.28 | | | | | | | | | **17.28** |
| Agriculture | 1.03 | | 2306.25 | | | | | | | 3.67 | **2310.95** |
| Plantation Horticulture | 1.27 | | | 753.65 | | | | | | 0.27 | **755.19** |
| Forest | | | | | 3.14 | | | | | | **3.14** |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | | | | | |
| Scrub | 0.18 | | 21.61 | | | | | 21.86 | | 0.08 | **43.72** |
| Waterbody-Streams/River | | | | | | | | | 55.09 | | **55.09** |
| Waterbody – Ponds | | | | | | | | | | 118.77 | **118.77** |
| Grand Total | **213.16** | **17.28** | **2327.86** | **753.65** | **3.14** | | | **21.86** | **55.09** | **122.78** | **3514.83** |

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

•In T5 21.6 ha of the agriculture area has increased from 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 89 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
4. There is an increase of 13, & 14 Hectares From T3 to T4 & T4-T5 respectively, there is a decrease of 92, 13 & 3 hectares from T0 to T1, T1-T2, T2-T3 and overall decrease of 77 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is an increase of 5.4 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 58 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (7) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (7) verified from the portal.