# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -13/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-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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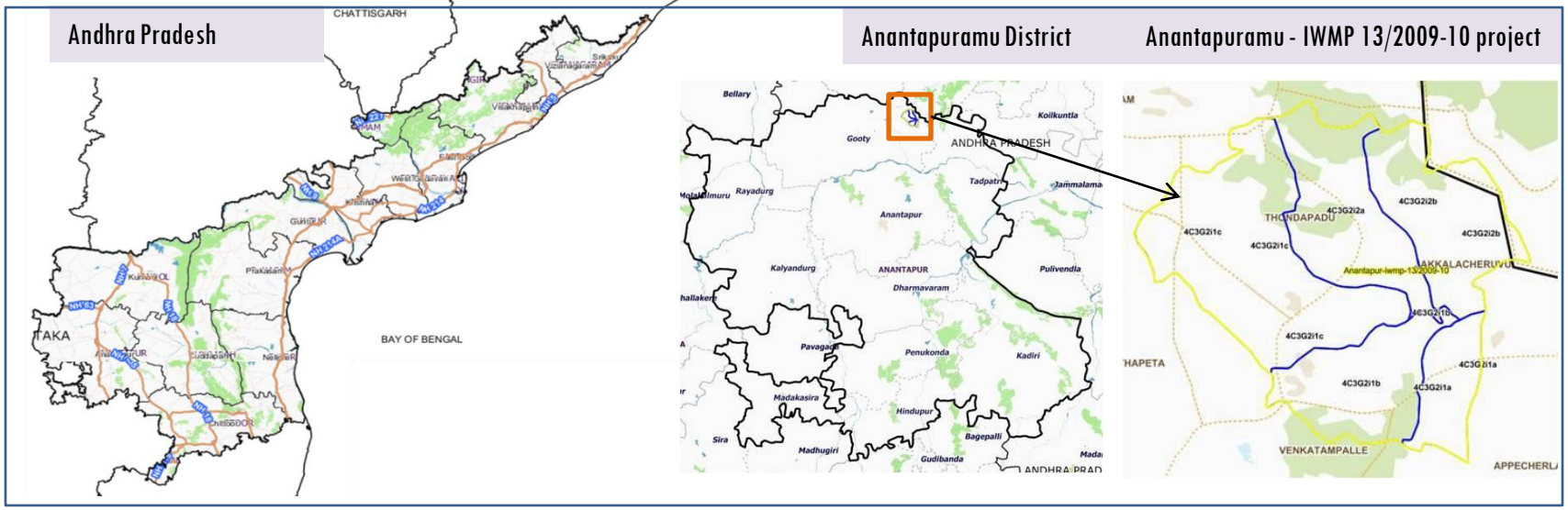
# EXECUTIVE SUMMARY

- 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-13/2009-10, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 4102.96 ha. It comprises of 5 micro watersheds.
- In the project area 5 Drishti photos were uploaded showing as check dams/check dam repair.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 74 new farm ponds or dug out pits with 3.07 ha increase in the area.
- Major percentage i.e. 51.60% is covered by the agriculture, 23.92 % is covered by Scrub land, 18.52 % is covered by forest and remaining by other land use classes.

# PROJECT : ANANTAPURAMU - IWMP-13/2009-10
## District : Anantapuramu , State : Andhra Pradesh

- The study area falls in Narpala Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 4102.96 ha. It comprises of 5 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2009-10 (T0) period (***Batch -1***) projects taking 2017-18 (T5) period satellite images




- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .
- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Total annual rainfall is about 22 in (560 mm).
- Anantapuram district receives moderate to good rainfall from July to October month.

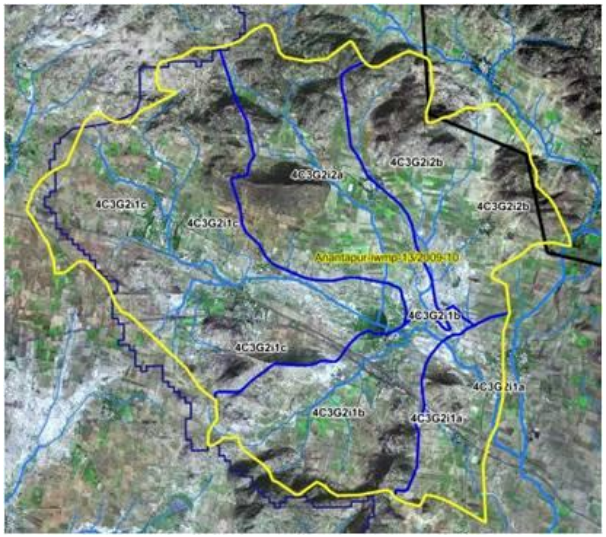
# Satellite Data and Ancillary Data

| Satellite data* | T0-A** | T0-B** | T5 |
|---|---|---|---|
| | 2009-10 | 2011-12 | 2017-18 |
| LISS IV | 2009-10 | | |
| SCENE 1 | | | 24-Jan-18 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| | | | |
| CARTO | 2009-10 | | |
| SCENE 1 | | | 24-Jan-18 |
| 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 | 195 |
| 4 | Detailed Project Report | | |
| | | | |

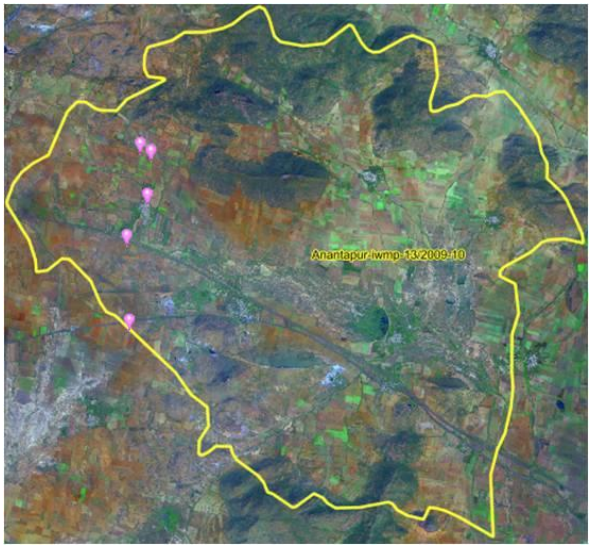
## Natural Color Composite overlaid with Project boundaries and high detail stream network




Legend

- Drainage (1:10000 Scale)
- MWS Boundary
- Project Boundary

## Natural Color Composite overlaid with Drishti Points




Drishti Upload Status

# Classification of the Activities

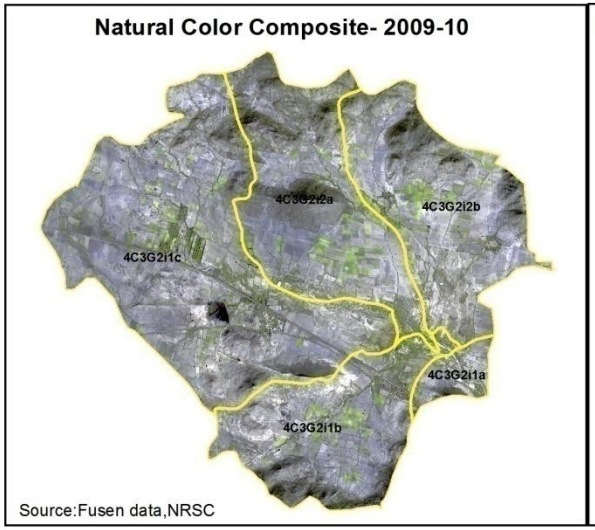
| Sr. No | Activity | Drishti Photo | Visible on satellite |
|---|---|---|---|
| 1 | Afforestation | 0 | 0 |
| 2 | Horticulture | 0 | 0 |
| 3 | Agriculture | 0 | 0 |
| 4 | Pasture | 0 | 0 |
| 5 | Trench | 0 | 0 |
| 6 | Field Bunds | 0 | 0 |
| 7 | Terrace | 0 | 0 |
| 8 | Checks & Plugs | 0 | 0 |
| 9 | Gabion structure | 0 | 0 |
| 10 | Farm ponds | 0 | 0 |
| 11 | Check dams /Check dam repair | 4 | 4 |
| 12 | Nallah Bunds | 0 | 0 |
| 13 | Percolation tanks / Ground water recharge structure | 0 | 0 |
| 14 | Production System and Micro-Enterprises | 0 | 0 |
| 15 | Livelihood Activities | 0 | 0 |
| 16 | Capacity Building Activities | 0 | 0 |
| 17 | Entry Point Activity | 0 | 0 |
| 18 | Others | 1 | 0 |
| | **TOTAL** | 5 | 4 |

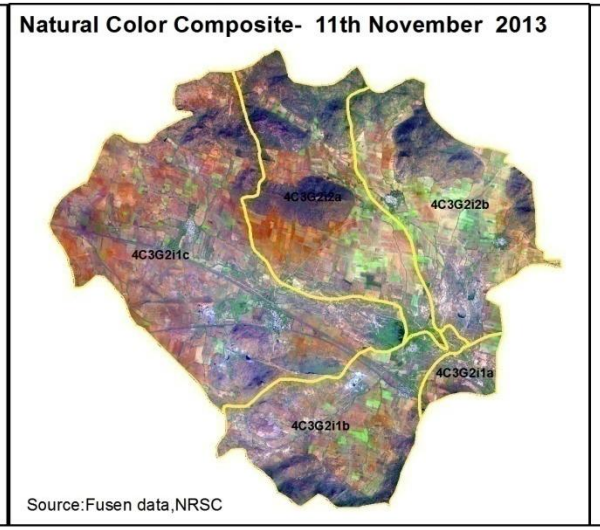
# MONITORING IN THE PROJECT AREA

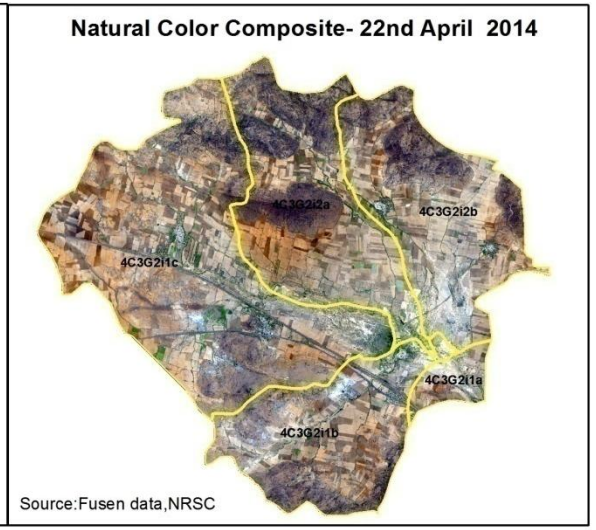
## Site Wise Changes in the Project

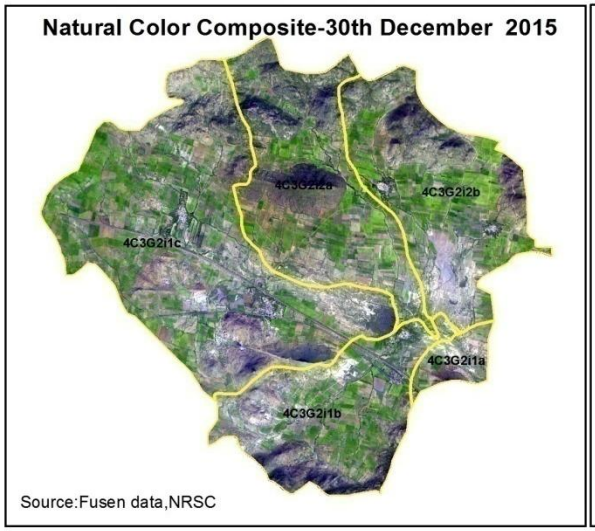
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

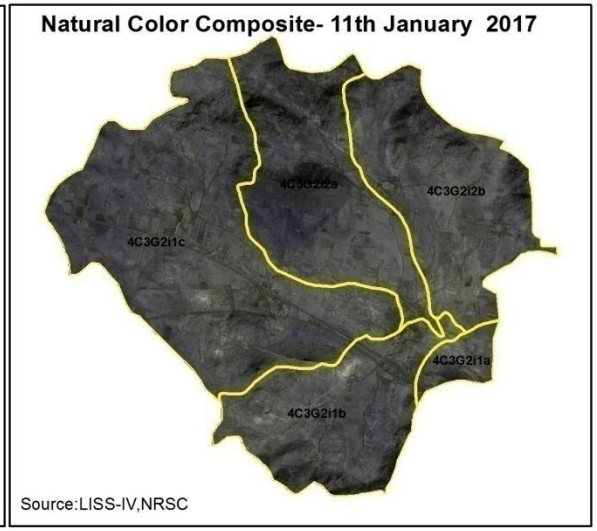
# Natural Color Composite – 2009-10 to 2017-18



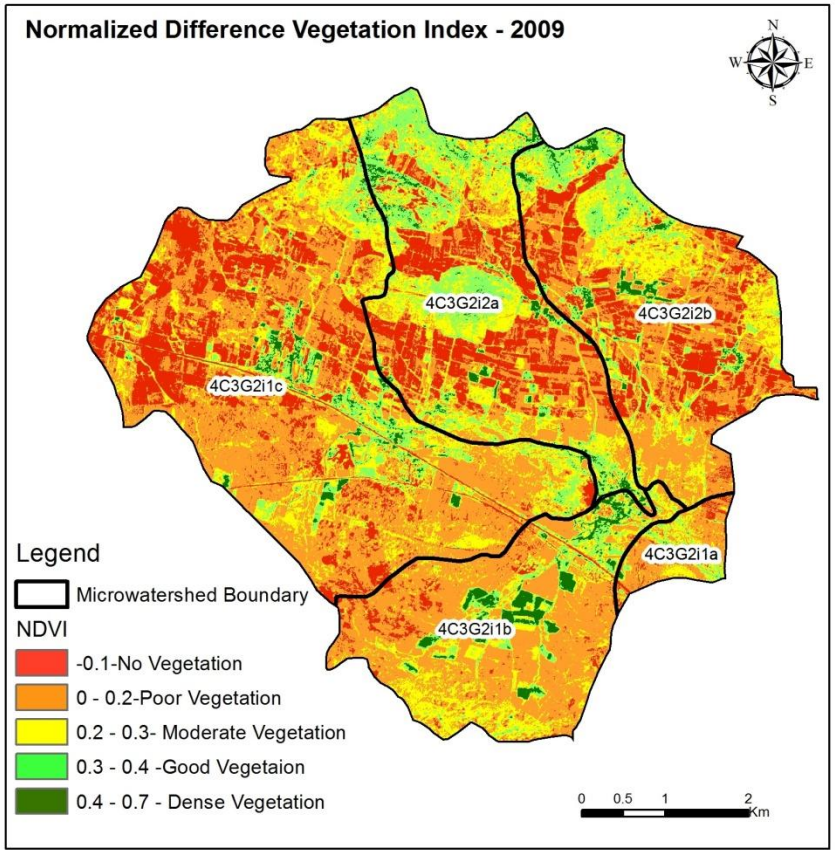



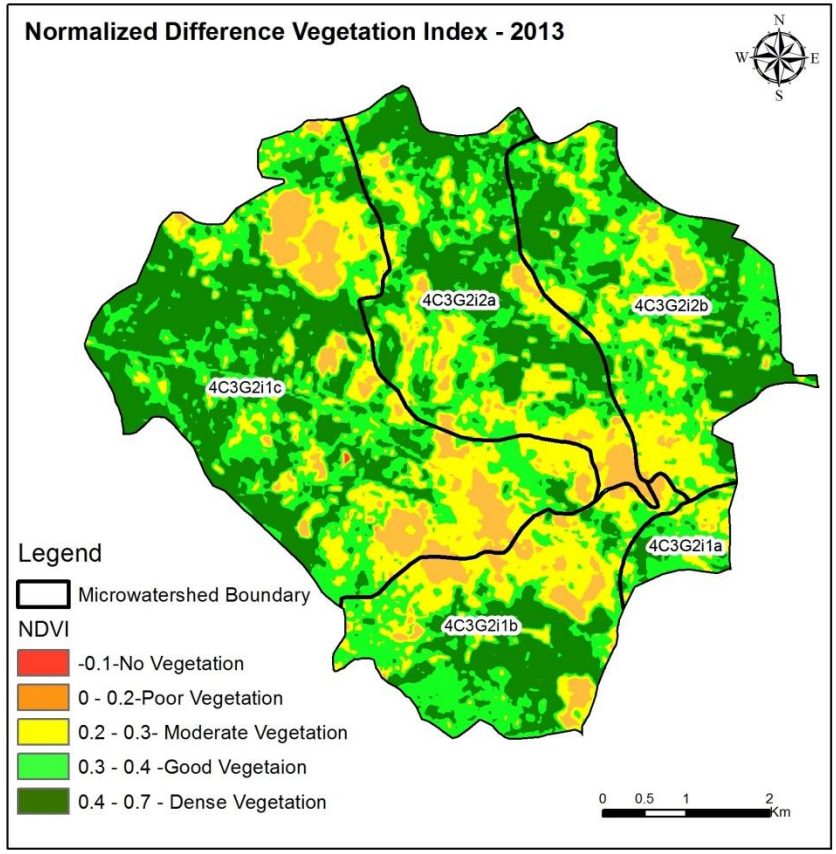



# Changes in Vegetation Cover

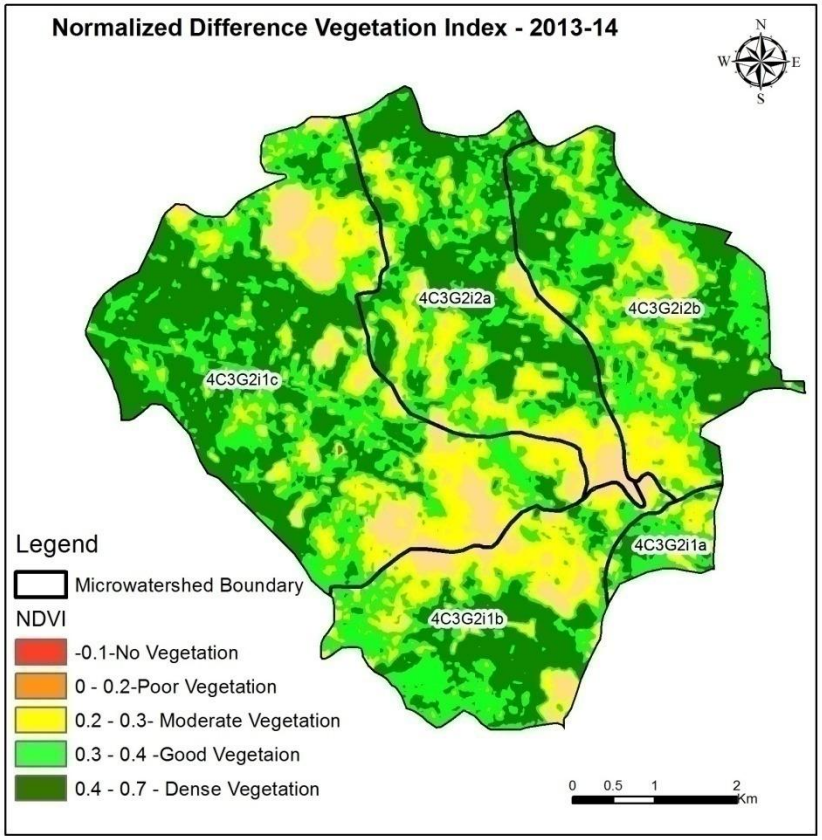



NDVI (2009-10)

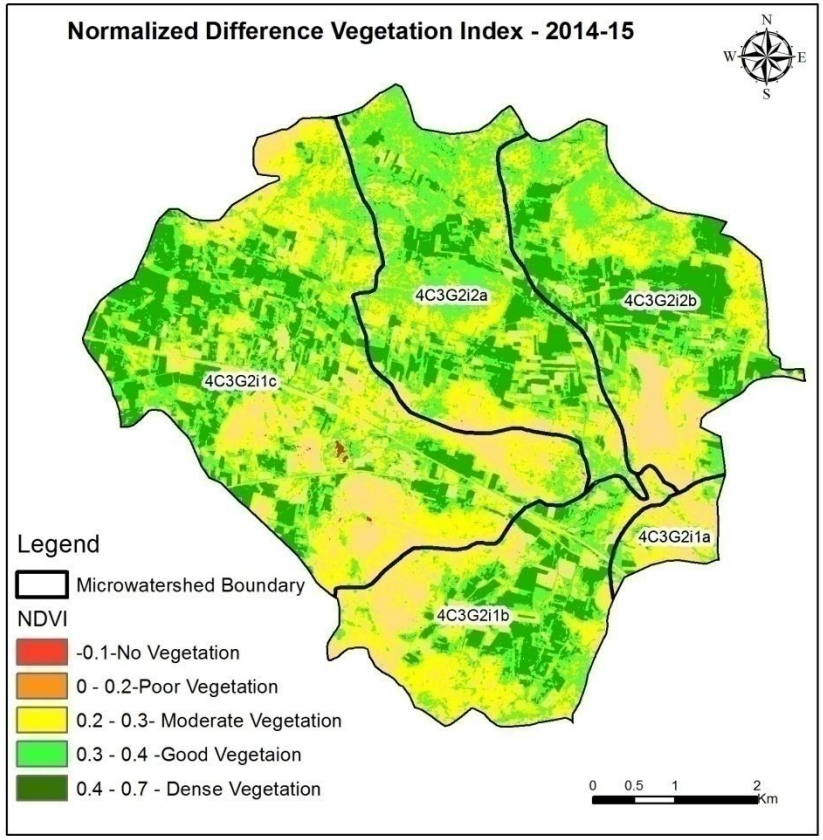



NDVI (12 October 2015)

# Changes in Vegetation Cover

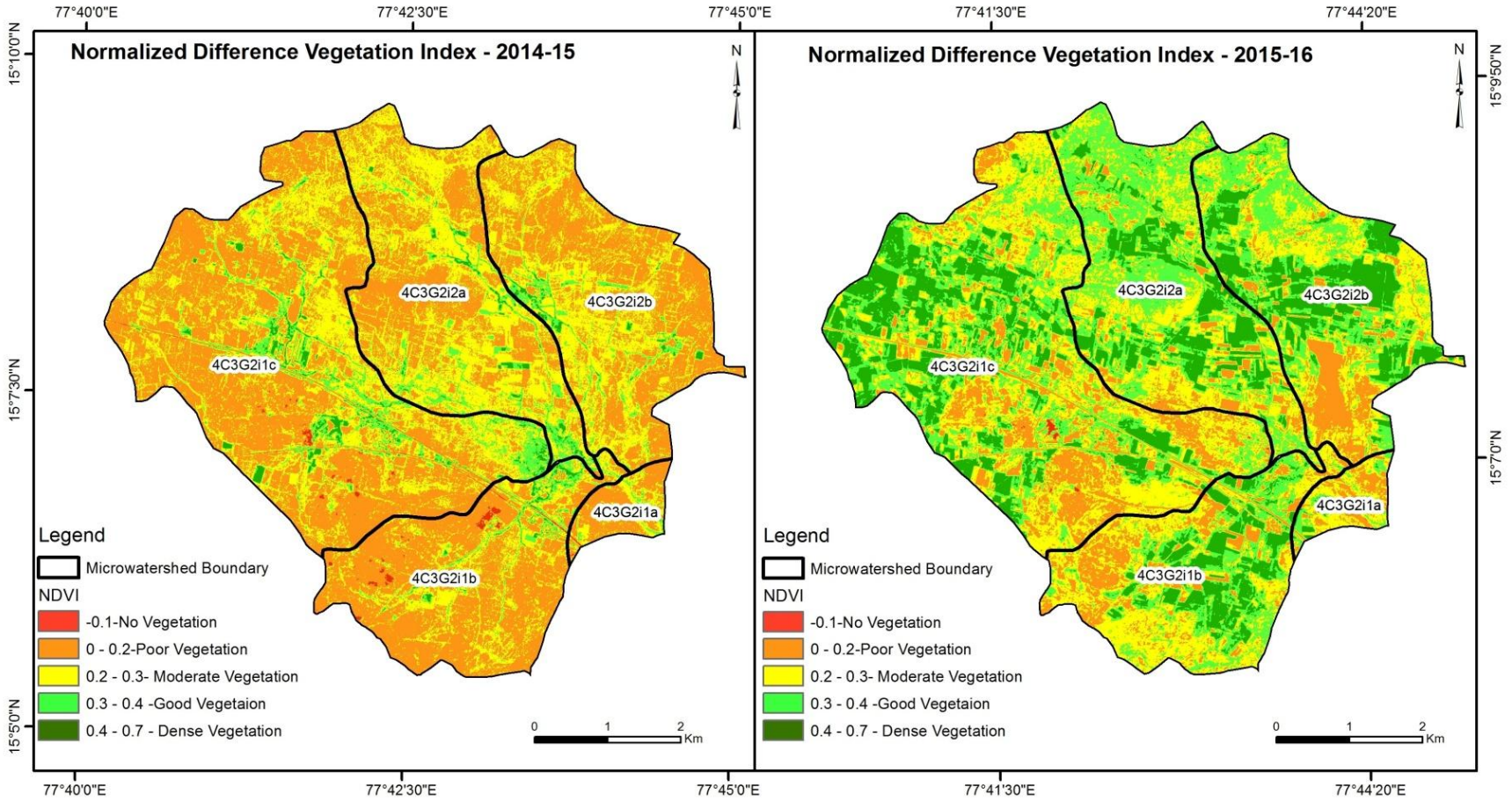



NDVI (2013-14)




NDVI (22 April 2015)

# Changes in Vegetation Cover




NDVI (2014-15)

NDVI (30 December 2015)

# Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-13/2009-10


T0:2009-10


T1: 11 November 2013

Drishti Sl no. 140330 MWS :4C3G2i1c

**Check dam**

T0:2009-10


T1: 11 November 2013

Drishti Sl no.140337 MWS : 4C3G2i1c

**Checkdam**

# Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-13/2009-10


T0: 2009-10


T1: 11 November 2013

Drishti Sl no. 140338 MWS :4C3G2i1c

**Check dam Repair**


T0: 2009-10


T1: 11 November 2013

Drishti Sl no. 140339 MWS :4C3G2i1c

**Check dam Repair**

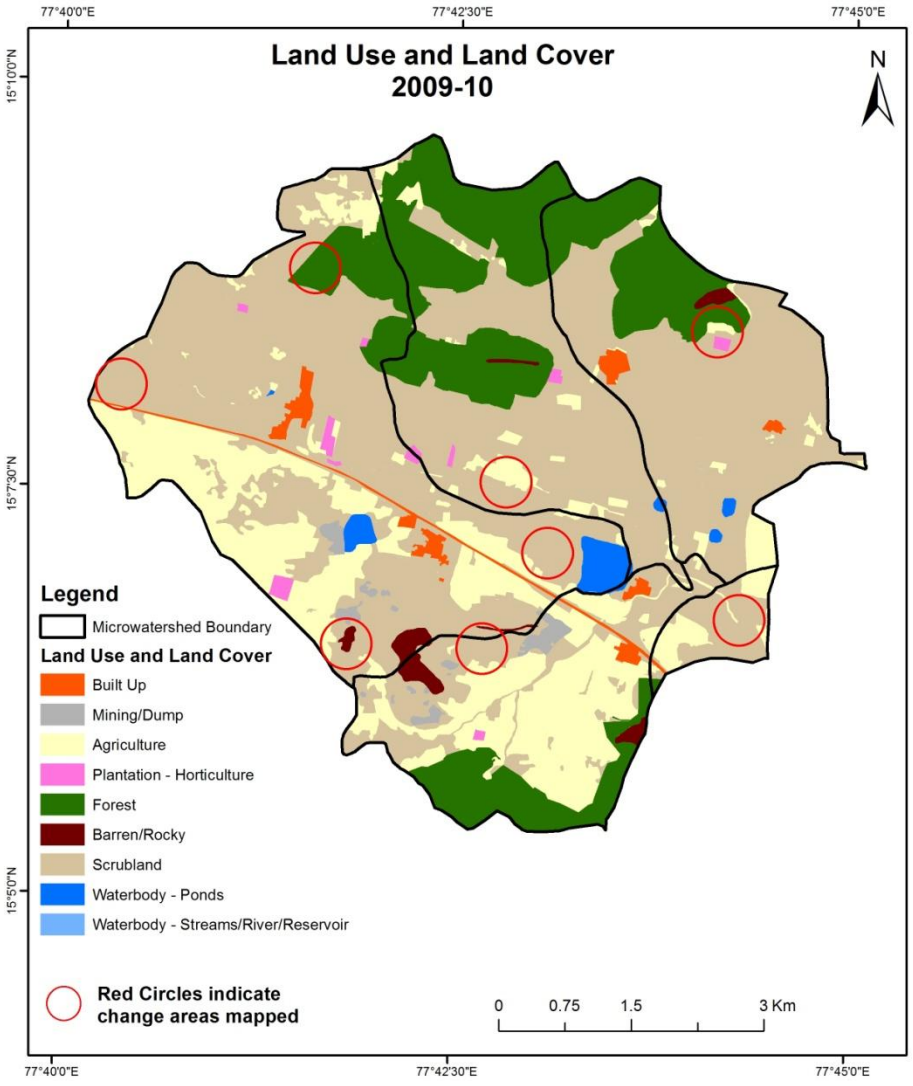
# MONITORING IN THE PROJECT AREA

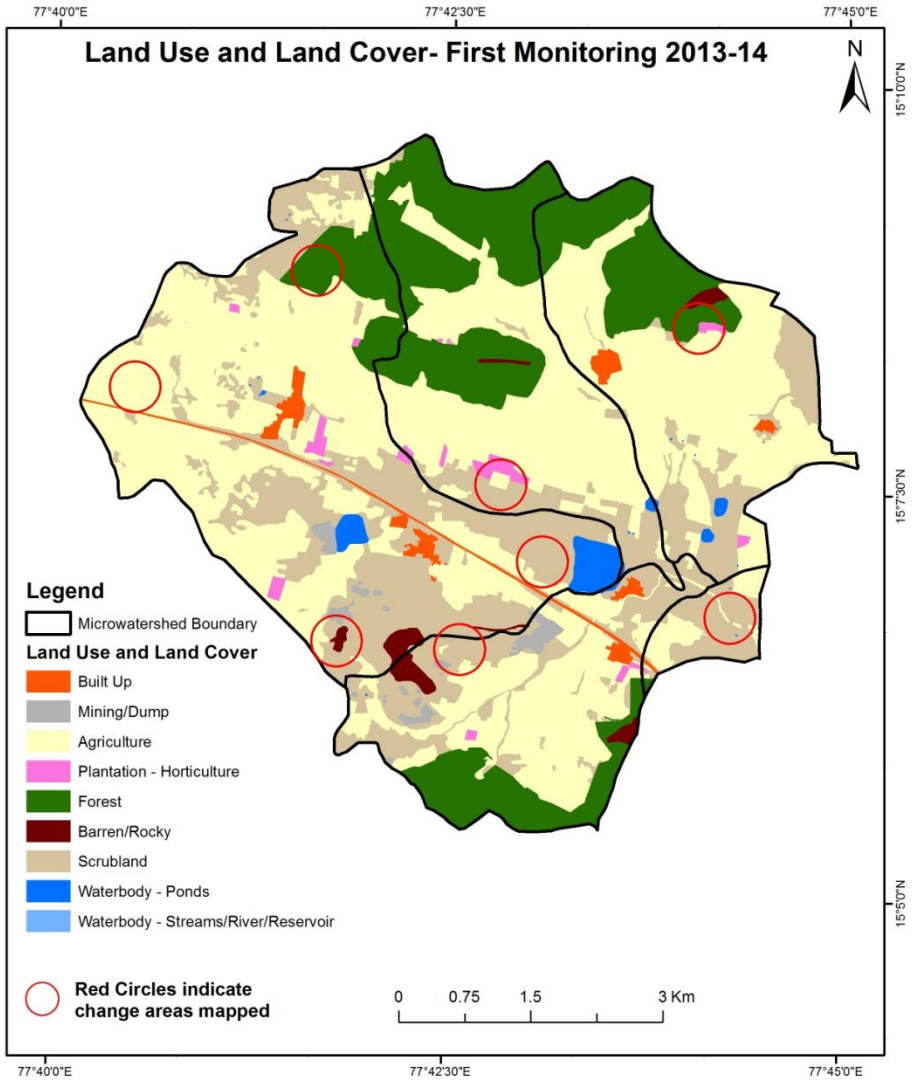
## Land use and Land cover Changes in the Project

- 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 (2017-18)

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

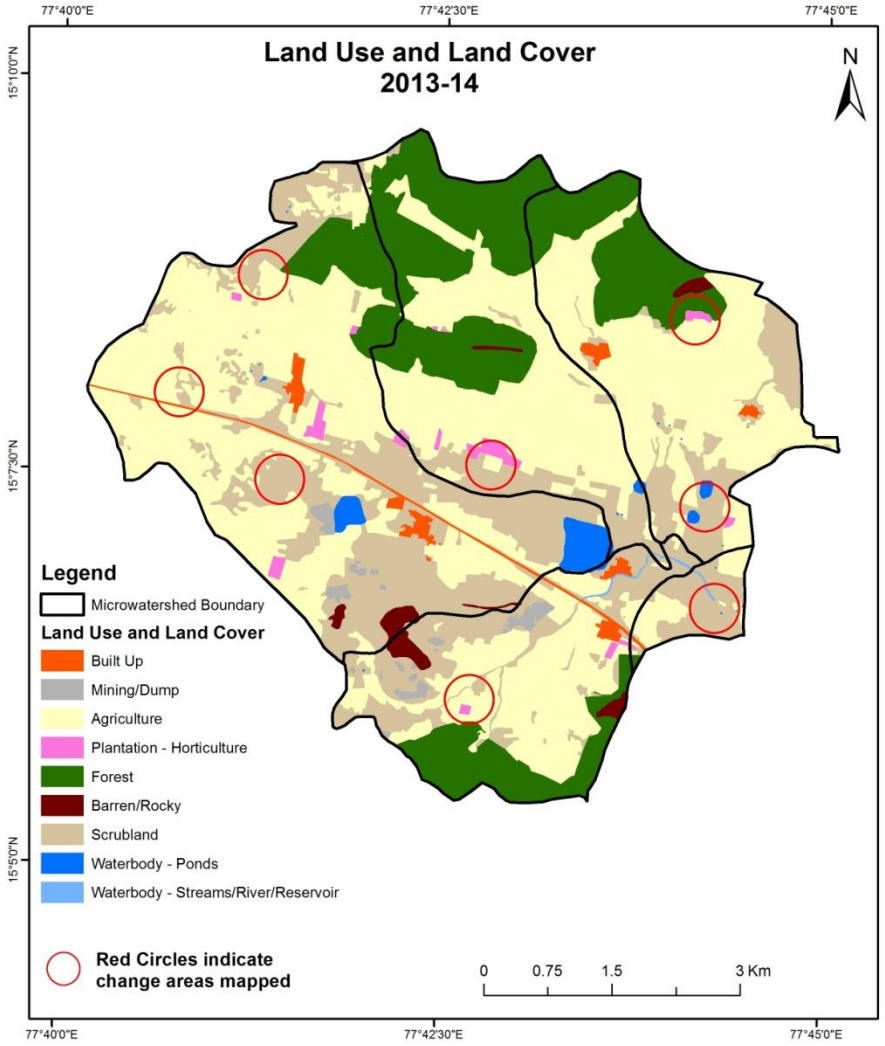
Scale: 1:10000

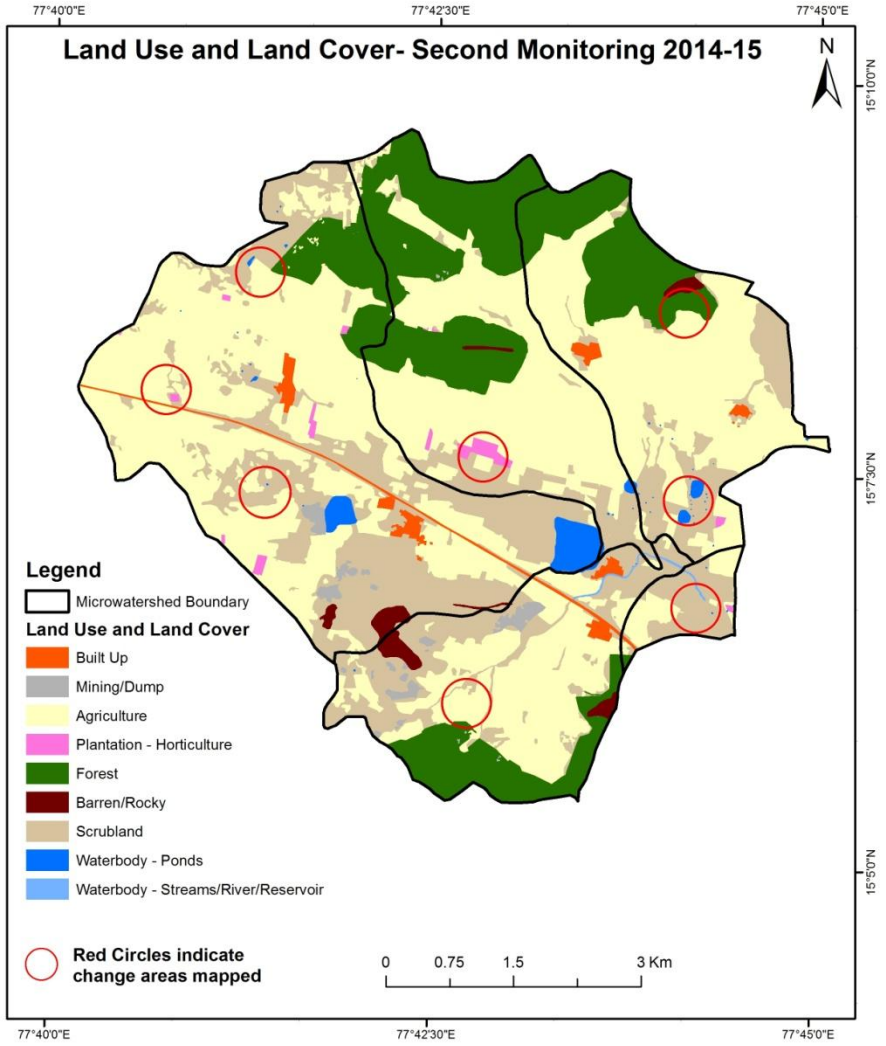


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

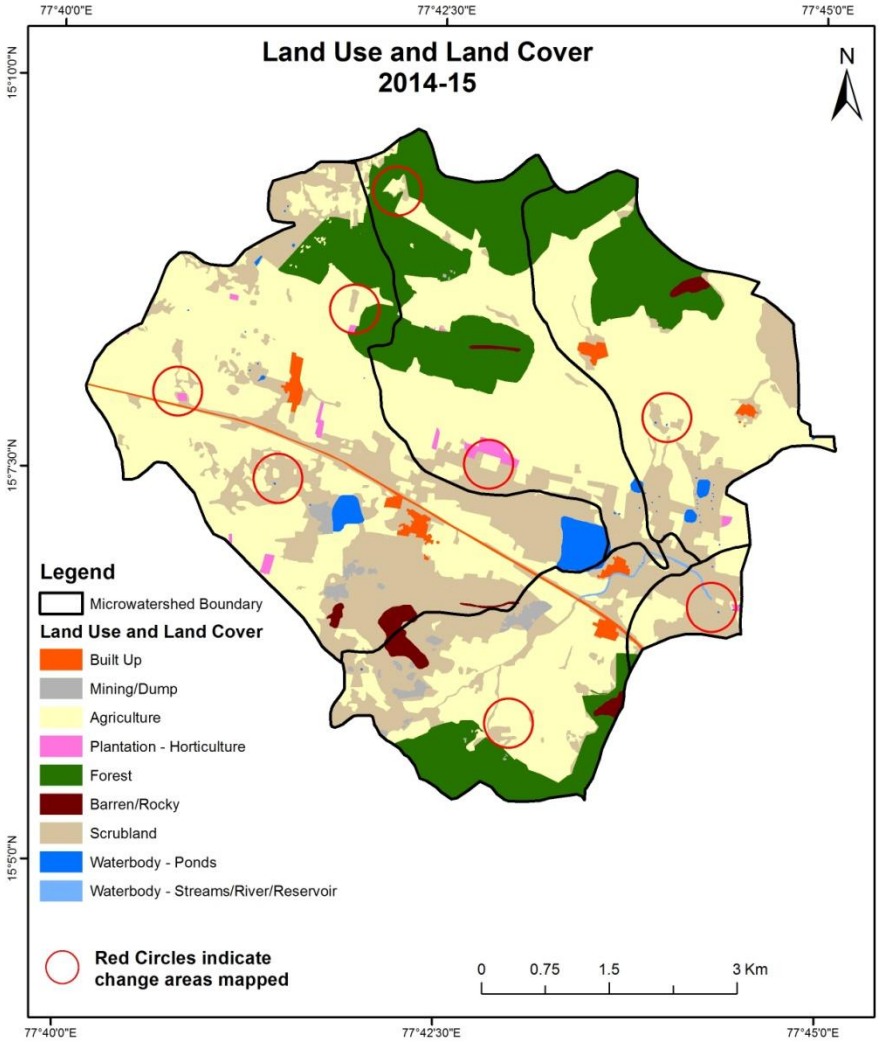
Scale: 1:10000

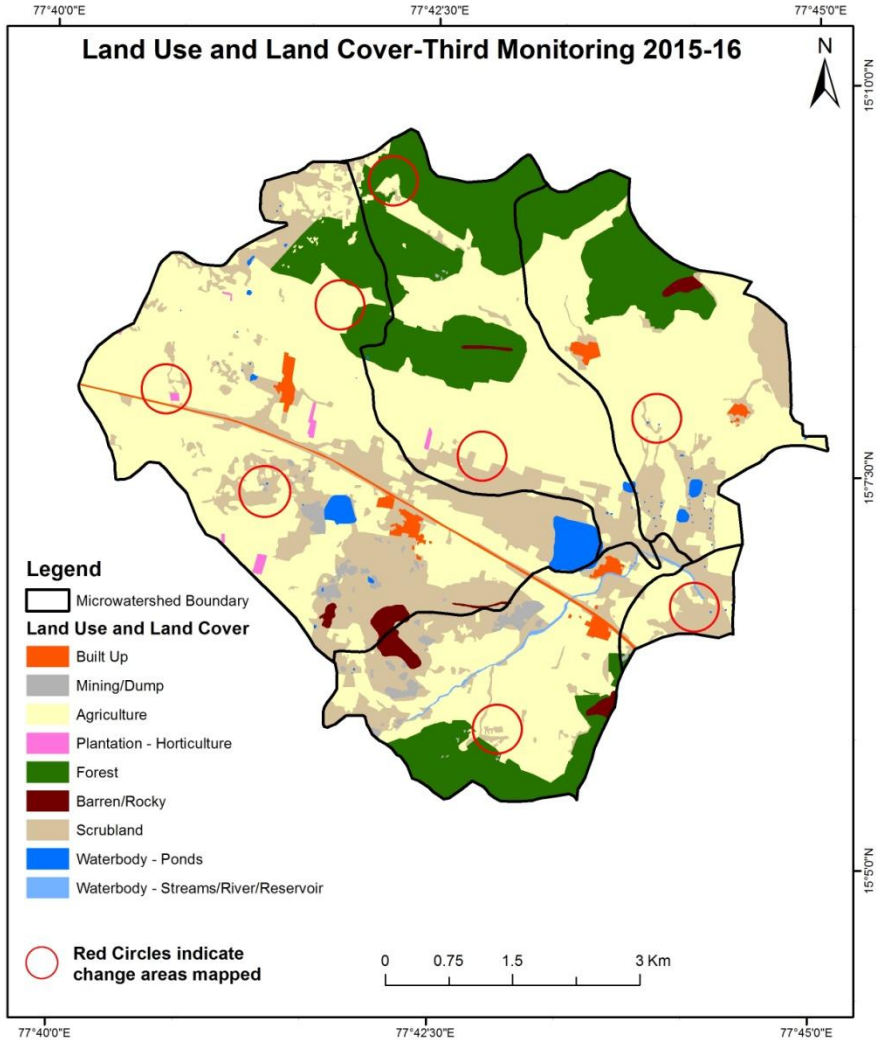


# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

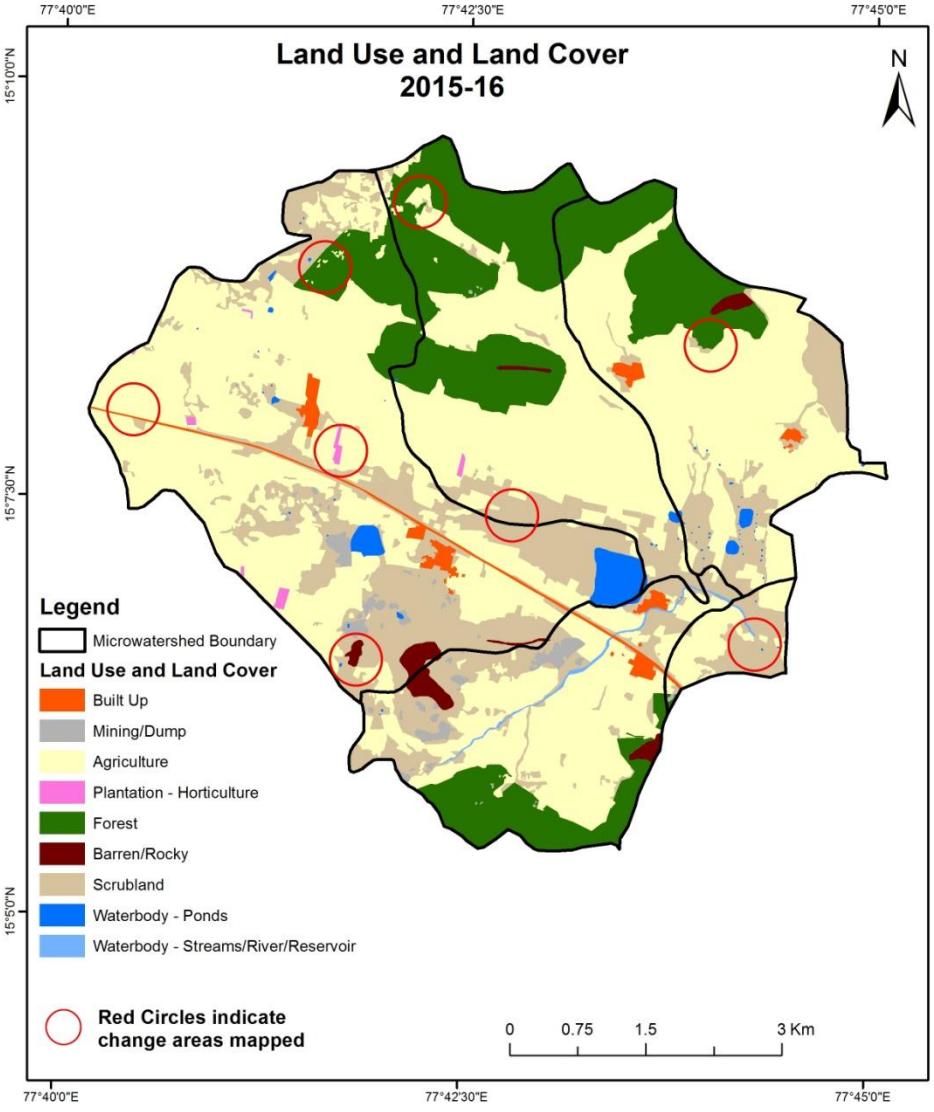
Scale: 1:10000

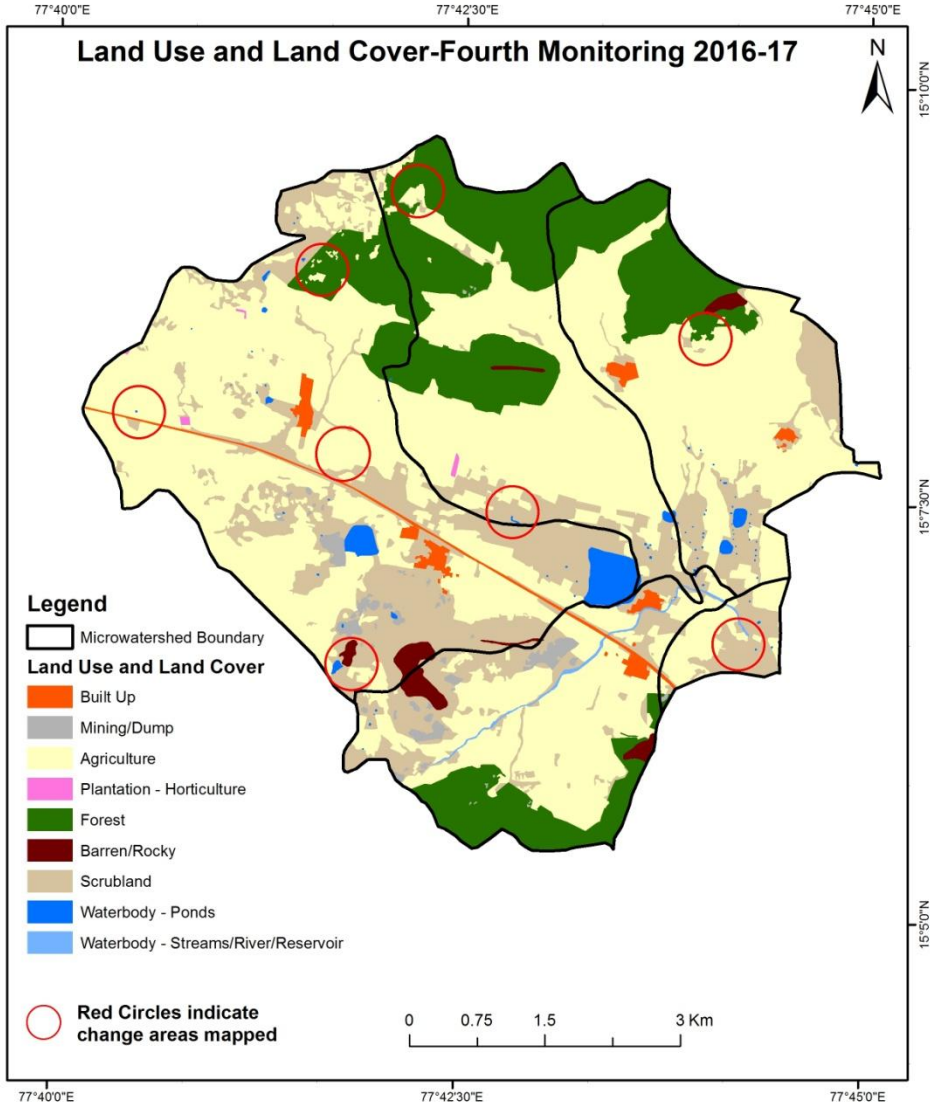


## Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

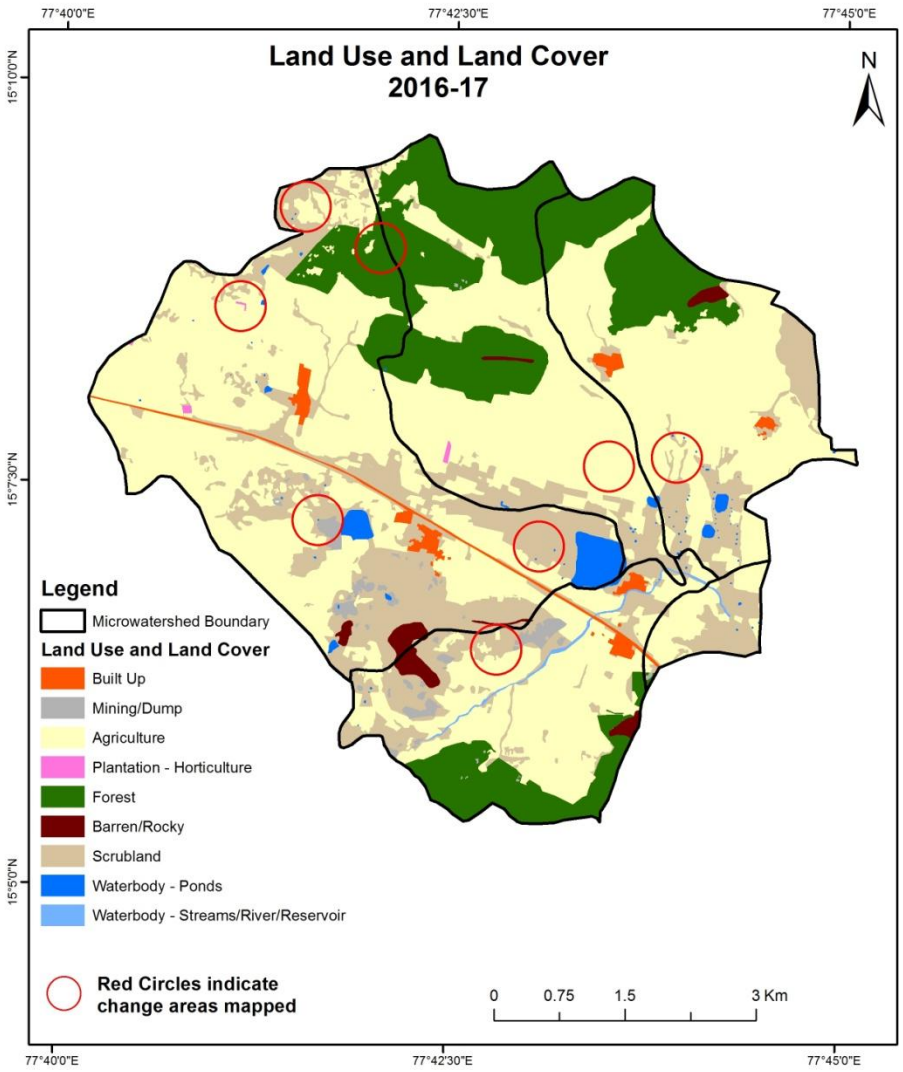
Scale: 1:10000

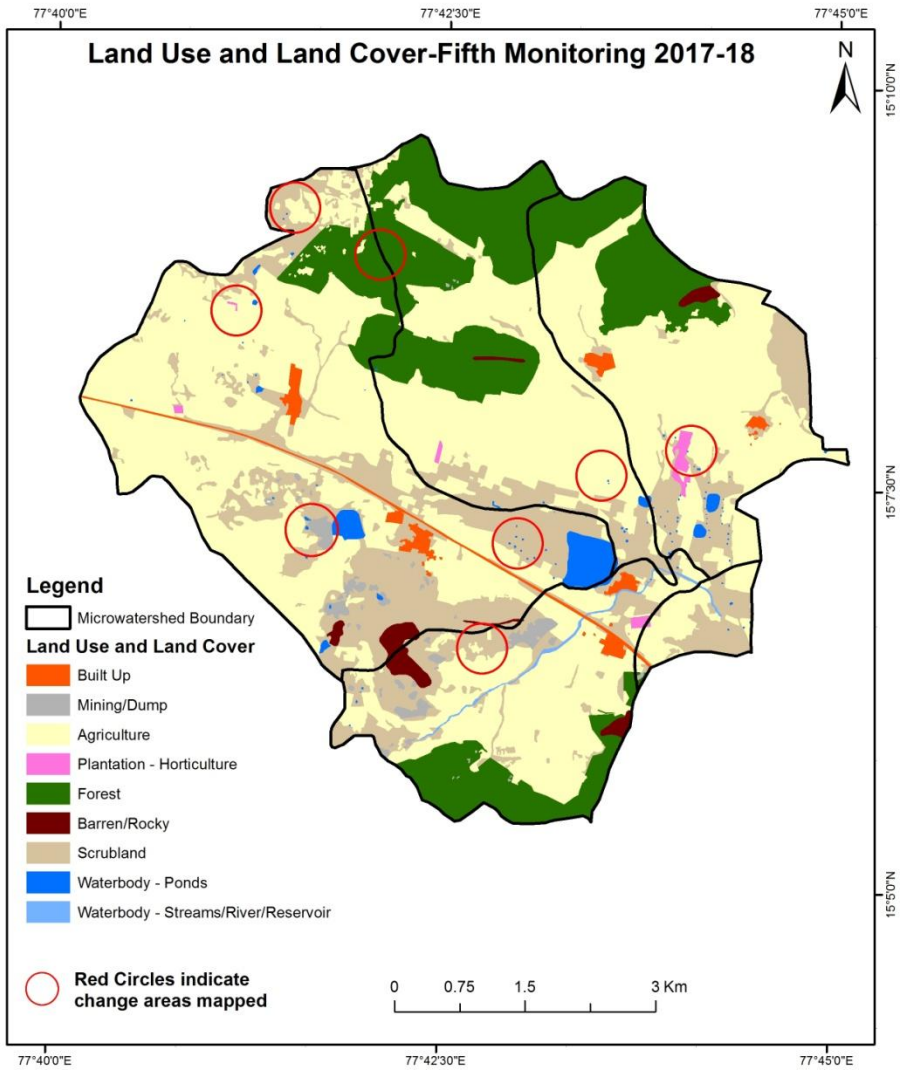


**Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)**

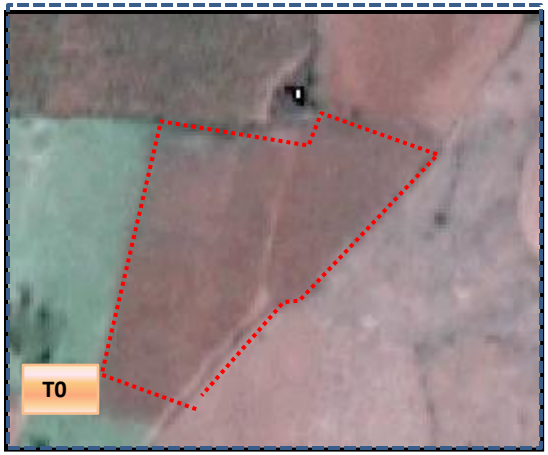
**Scale: 1:10000**



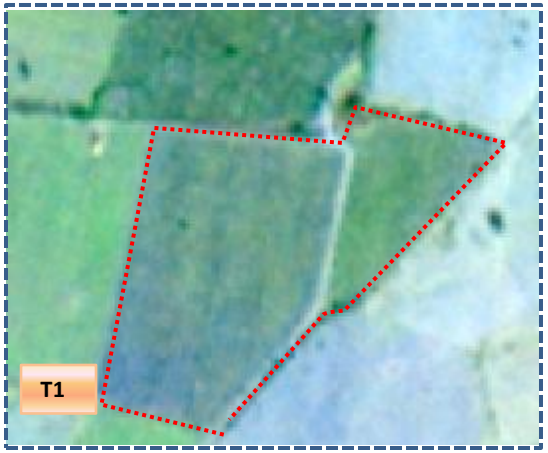



**Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Plantation

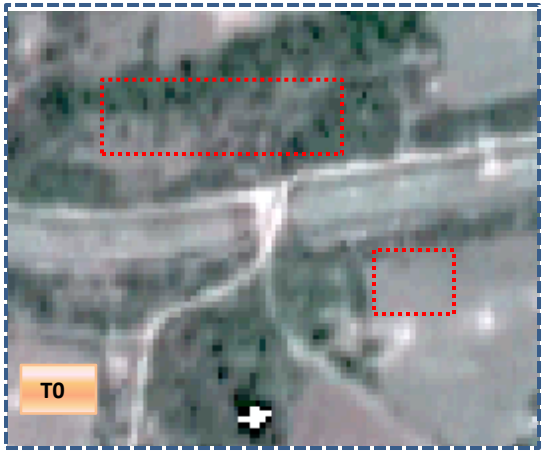



T0: 2009-10

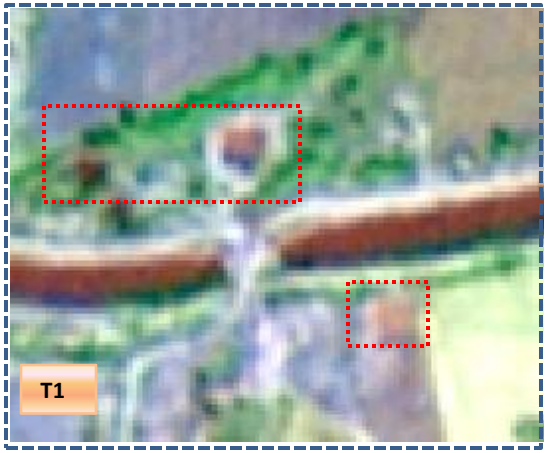



T1: 11 November 2013

Scrub to water body



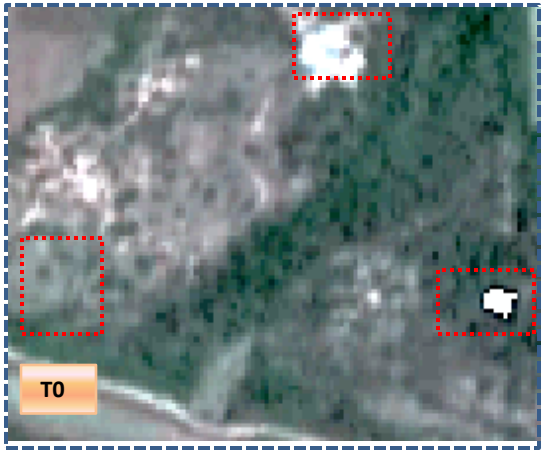

T0: 2009-10



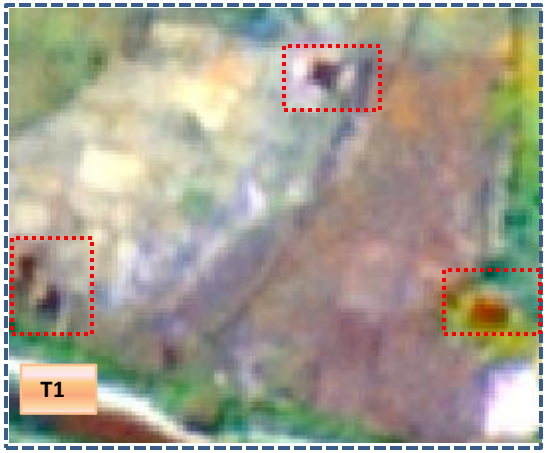

T1: 11 November 2013

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

Scrub to Water body




T0: 2009-10




T1: 11 November 2013

Scrub to Agriculture


T0: 2009-10


T1: 11 November 2013

**Table showing change matrix depicting Land cover transitions during study period- 2009-10 to 2013-14**

| 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 | 56.33 | | | | | | | | | | 56.33 |
| Mining/dump | | 32.21 | | | | | | | | | 32.21 |
| Agriculture | 0.05 | | 2016.05 | 19.81 | | | | 8.53 | | 0.05 | 2044.48 |
| Plantation Horticulture | | | 6.54 | 15.78 | | | | | | | 22.32 |
| Forest | | | 0.31 | | 755.44 | | | | | | 755.75 |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | 41.76 | | | | 41.76 |
| Scrub | 0.46 | 1.52 | 70.10 | | | | | 1027.12 | | 0.70 | 1099.89 |
| Waterbody-Streams/River | | | | | | | | | 2.51 | | 2.51 |
| Waterbody – Ponds | | | | | | | | | | 47.70 | 47.70 |
| **Grand Total** | **56.84** | **33.73** | **2093.00** | **35.59** | **755.44** | | **41.76** | **1035.64** | **2.51** | **48.45** | **4102.96** |

- 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 28.43 ha of the agriculture area has decreased and it is converted into built-up, plantation, scrubland and water body in T1.
- In T1 76.94 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- 2013-14 to 2014-15**

| 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 | 56.84 | | | | | | | | | | 56.84 |
| Mining/dump | | 33.73 | | | | | | | | | 33.73 |
| Agriculture | 0.08 | | 2051.72 | 3.15 | | | | 38.05 | | | 2093.00 |
| Plantation Horticulture | | | 13.86 | 8.00 | | | | 13.73 | | | 35.59 |
| Forest | | 0.75 | 1.41 | | 753.28 | | | | | | 755.44 |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | 41.76 | | | | 41.76 |
| Scrub | 0.14 | 1.69 | 72.54 | 0.94 | | | | 959.06 | | 1.27 | 1035.64 |
| Waterbody-Streams/River | | | | | | | | | 2.51 | | 2.51 |
| Waterbody – Ponds | | | | | | | | | | 48.45 | 48.45 |
| **Grand Total** | **57.06** | **36.17** | **2139.53** | **12.09** | **753.28** | | **41.76** | **1010.84** | **2.51** | **49.72** | **4102.96** |

- 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 41.28 ha of the agriculture area has decreased and it is converted into built up, plantation and scrubland and in T2.
- In T2 87.81 ha of the agriculture area has increased from plantations, 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- 2014-15 to 2015-16**

| 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 | 57.06 | | | | | | | | | | 57.06 |
| Mining/dump | | 36.08 | | | | | | | | 0.10 | 36.17 |
| Agriculture | 0.61 | | 2128.53 | 0.41 | | | | 5.25 | 4.73 | | 2139.53 |
| Plantation Horticulture | | | 3.30 | 7.99 | | | | 0.80 | | | 12.09 |
| Forest | | 0.59 | 11.66 | | 740.96 | | | | | 0.07 | 753.28 |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | 41.76 | | | | 41.76 |
| Scrub | 0.85 | 6.73 | 145.78 | | | | | 850.18 | 5.79 | 1.51 | 1010.84 |
| Waterbody-Streams/River | | | 1.92 | | | | | | 0.59 | | 2.51 |
| Waterbody – Ponds | | | | | | | | | | 49.72 | 49.72 |
| **Grand Total** | **58.52** | **43.40** | **2291.19** | **8.40** | **740.96** | | **41.76** | **856.23** | **11.10** | **51.40** | **4102.96** |

• 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 11.00 ha of the agriculture area has decreased and it is converted into built-up, plantation, scrubland and water body in T3.

• In T3 162.66 ha of the agriculture area has increased from plantations, forest, scrubland and water body of T2. The additional agriculture are coming from water body in T3 represents seasonal agriculture.

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

| 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 | 58.52 | | | | | | | | | | 58.52 |
| Mining/dump | | 43.40 | | | | | | | | | 43.40 |
| Agriculture | | 0.23 | 2281.48 | | | | | 9.29 | | 0.20 | 2291.19 |
| Plantation Horticulture | | | 5.52 | 2.88 | | | | | | | 8.40 |
| Forest | | | 9.69 | | 731.27 | | | | | | 740.96 |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | 41.76 | | | | 41.76 |
| Scrub | | 0.13 | 19.38 | | | | | 834.67 | | 2.06 | 856.23 |
| Waterbody-Streams/River | | | | | | | | | 11.10 | | 11.10 |
| Waterbody – Ponds | | | | | | | | | | 51.40 | 51.40 |
| **Grand Total** | **58.52** | **43.76** | **2316.05** | **2.88** | **731.27** | | **41.76** | **843.96** | **11.10** | **53.65** | **4102.96** |

• 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 9.71 ha of the agriculture area has decreased and it is converted into mining/dump, scrubland and water body in T4.

•In T4 34.58 ha of the agriculture area has been increased from plantation, forest and scrubland area of T3.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 (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 | 58.52 | | | | | | | | | | 58.52 |
| Mining/dump | | 43.76 | | | | | | | | | 43.76 |
| Agriculture | 0.07 | | 2304.00 | 11.91 | | | | | | 0.07 | 2316.05 |
| Plantation Horticulture | | | 0.26 | 2.63 | | | | | | | 2.88 |
| Forest | | | | | 731.27 | | | | | | 731.27 |
| Forest Plantation | | | | | | | | | | | |
| Barren Rocky | | | | | | | 41.76 | | | | 41.76 |
| Scrub | 0.07 | | 5.56 | | | | | 837.60 | | 0.74 | 843.96 |
| Waterbody-Streams/River | | | | | | | | | 11.10 | | 11.10 |
| Waterbody – Ponds | | | | | | | | | | 53.65 | 53.65 |
| **Grand Total** | **58.66** | **43.76** | **2309.81** | **14.54** | **731.27** | | **41.76** | **837.60** | **11.10** | **54.46** | **4102.96** |

• 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 12.05 ha of the agriculture area has decreased and it is converted into built up, plantation and water body in T5.

•In T5 5.81 ha of the agriculture area has been increased from plantation and scrubland area 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 15.35 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
4. There is an increase of 48.51, 46.54, 151.65 & 24.87 Hectares From T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 271.57 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a decrease of 262.30 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.