

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -08/2009-10  
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

# C O N T E N T S

- **EXECUTIVE SUMMARY**

01. STUDY AREA
02. SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS
03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

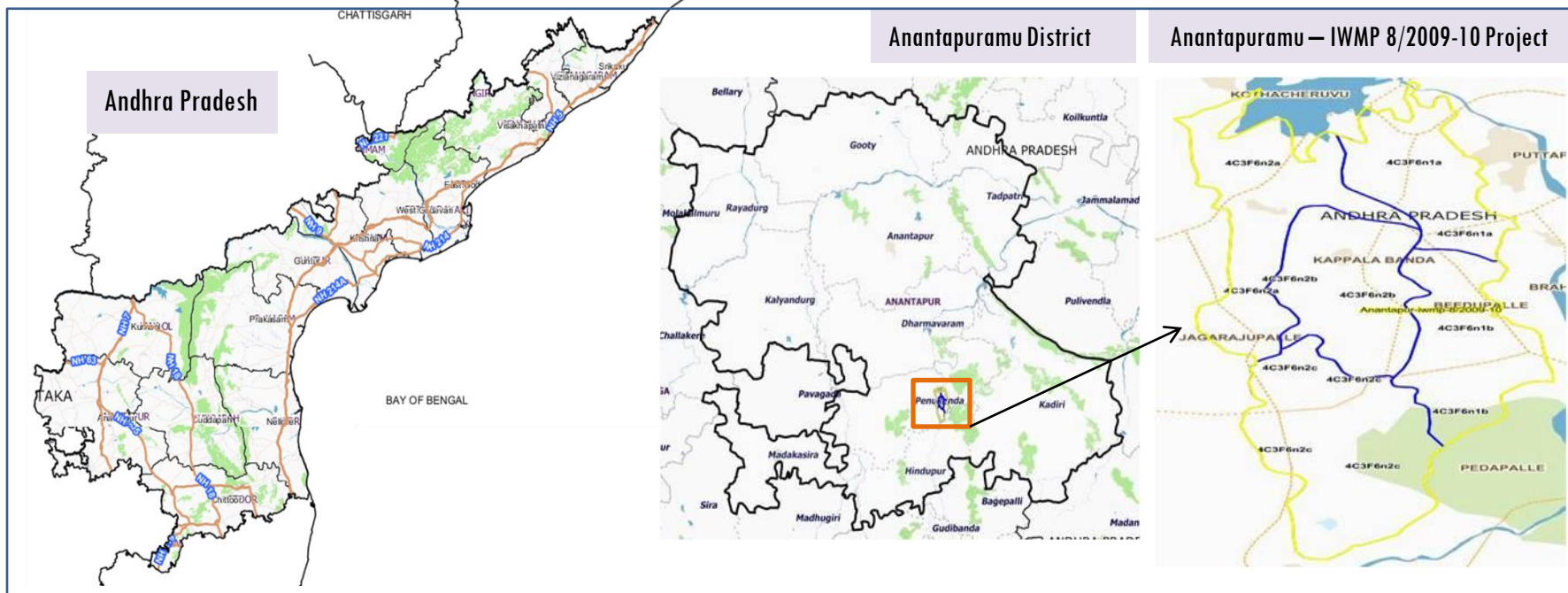
## **E X E C U T I V E   S U M M A R Y**

- 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-08/2009-10, Anantapuram District of Andhra Pradesh. The total geographical area of the project is 4602.63 ha. It comprises of 5 micro watersheds.
- In the project area 23 Drishti photos were uploaded showing 4 check dams, 19 Fodder and Varmicompost.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 7 new farm ponds or dug out pits with 0.58 ha increase in the area.
- Major percentage i.e. 47.80% is covered by the agriculture, 38.24% is covered by Scrubland, 6.65% by Forest Area and remaining by other land use classes.

## PROJECT : ANANTAPURAMU - IWMP-08/2009-10

### District : Anantapuramu , State : Andhra Pradesh

- The study area falls in Puttaparthi Mandal of Anantapuram district of Andhra Pradesh state. The total geographical area of the project is 4602.63 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.

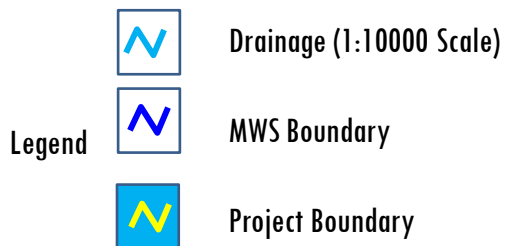
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10		2017-18
LISS IV	2009-10		
SCENE 1			25-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-Mar-18
SCENE2			
SCENE 3			

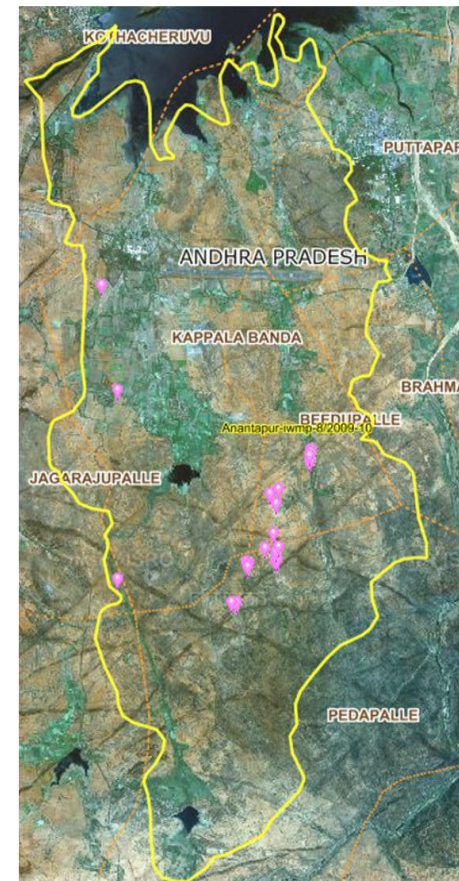
## Ancillary Data

	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	23
4	Detailed Project Report		

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



## Natural Color Composite overlaid with Drishti Points



## 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	Lm(Fodder development, Varmi compost)	0	0
8	Checks & Plugs	4	3
9	Gabion structure	0	0
10	Farm ponds	0	0
11	Check dams	5	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	19	16
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	0	0
	<b>TOTAL</b>	23	19

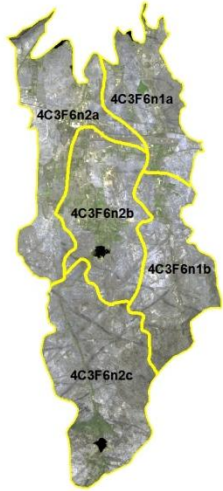
## MONITORING IN THE PROJECT AREA

### 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

Natural Color Composite- 2009-10



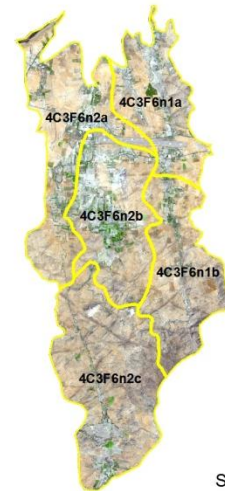
Source:Fusen data,NRSC

Natural Color Composite- 21st December 2013



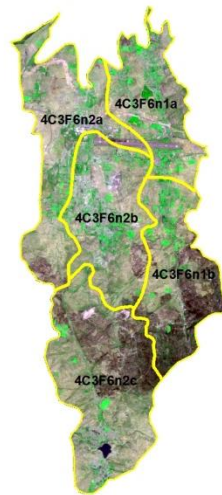
Source:LISS-IV,NRSC

Natural Color Composite- 26th January 2015



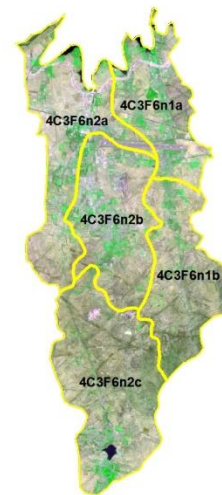
Source:Fusen data,NRSC

Natural Color Composite-16th February 2016



Source:LISS-IV,NRSC

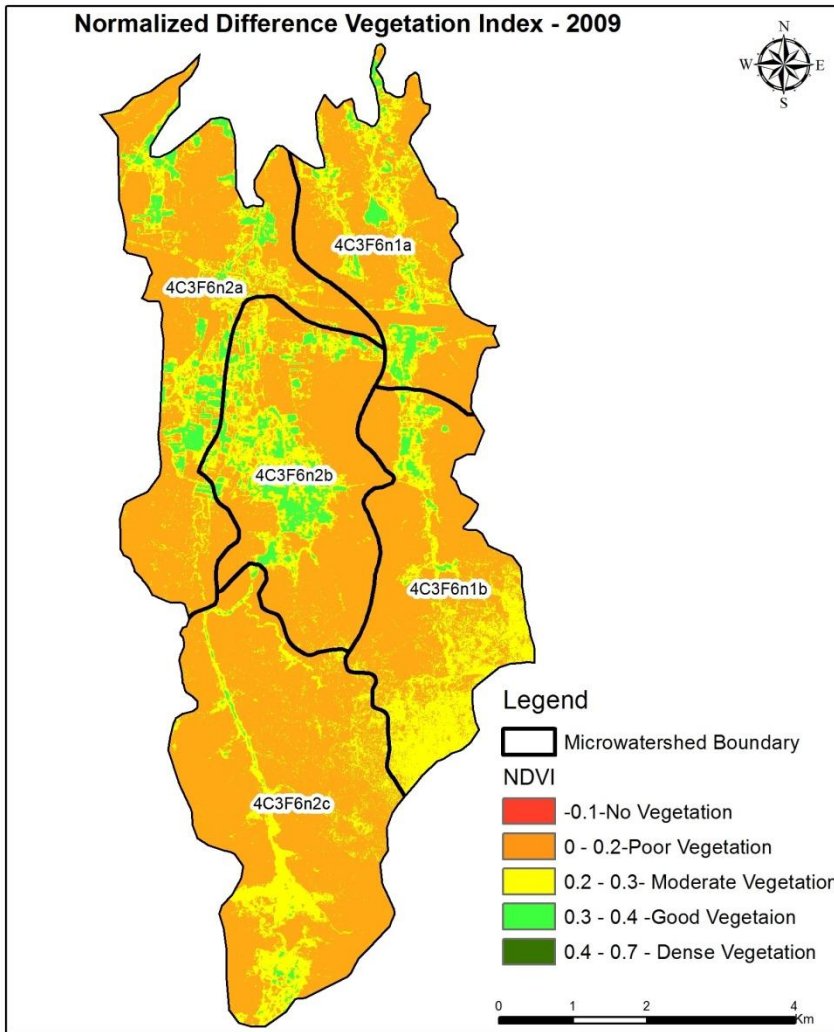
Natural Color Composite- 25th March 2018



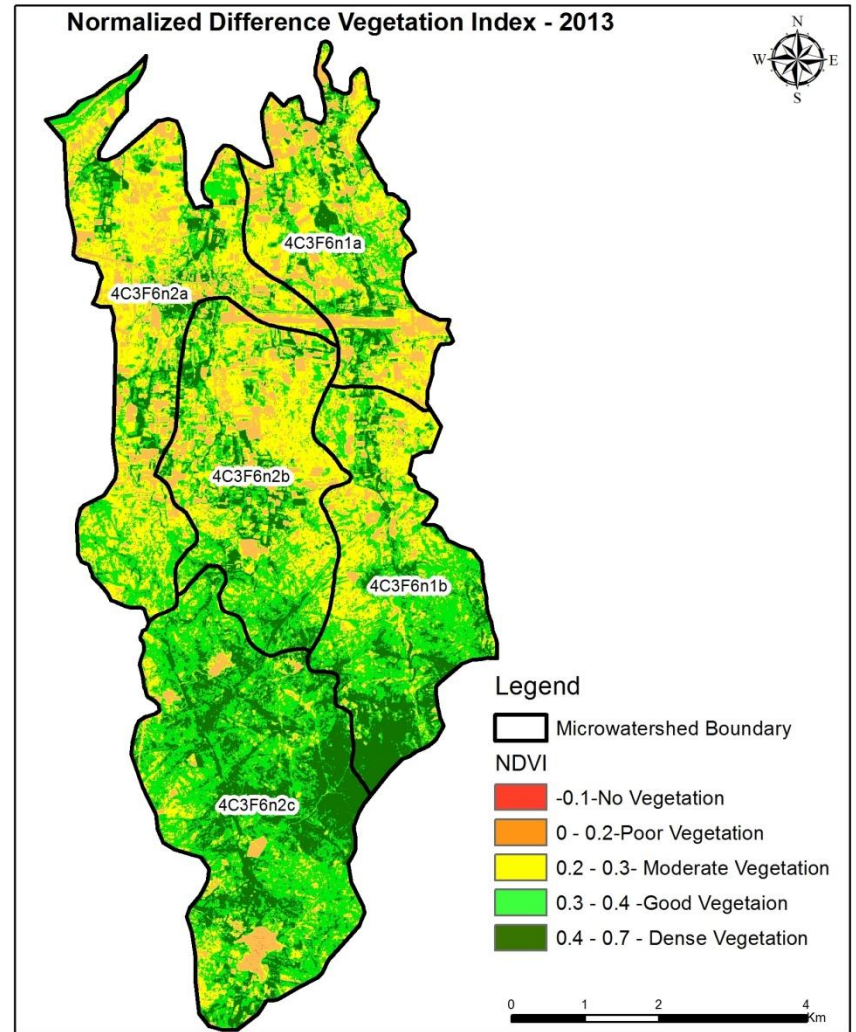
Source:LISS-IV,NRSC



# Changes in Vegetation Cover

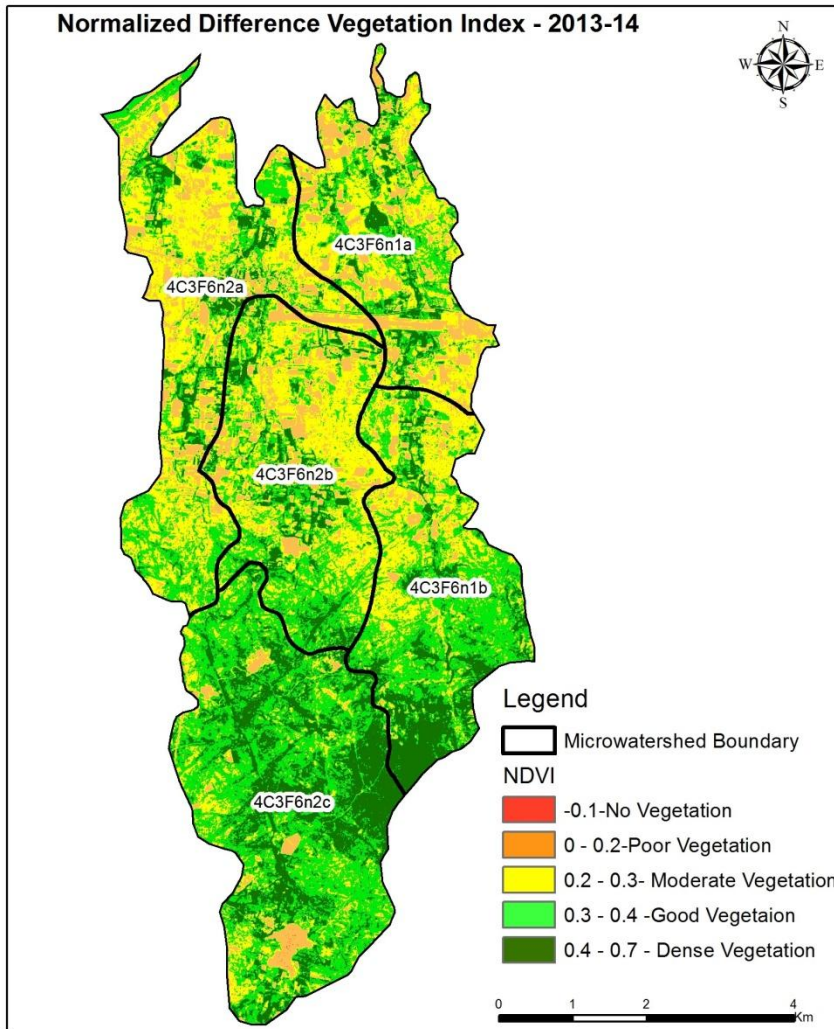


NDVI (2009-10)

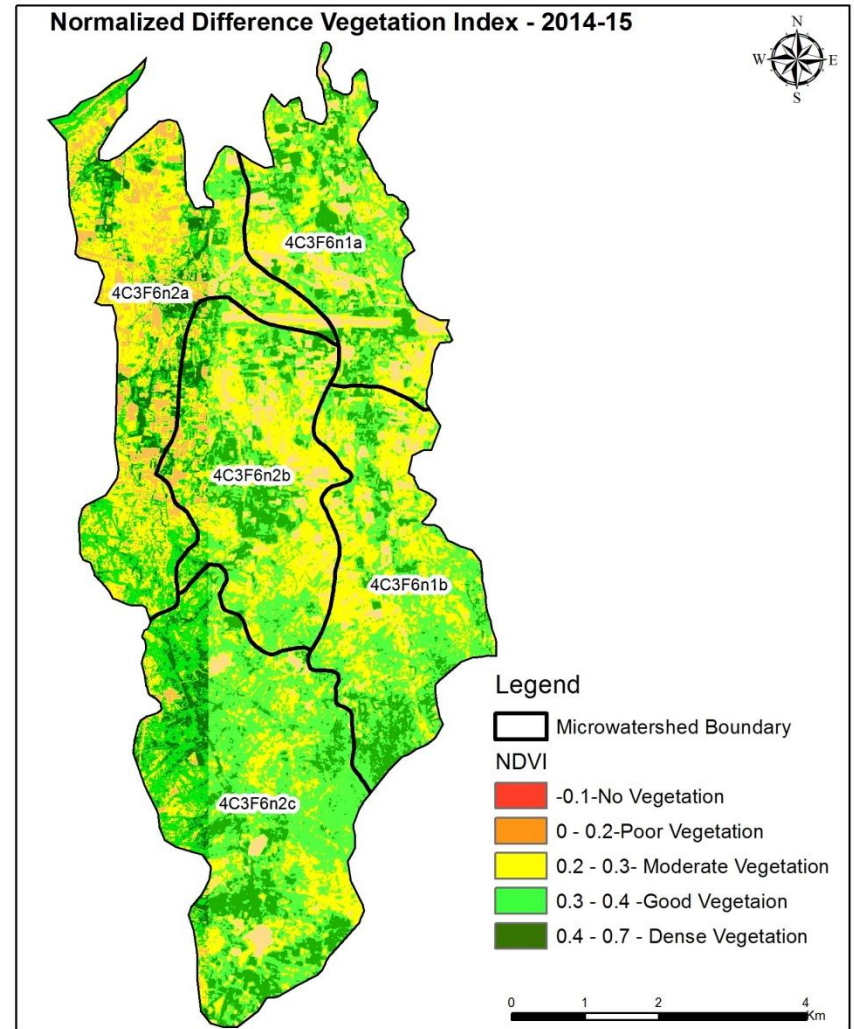


NDVI (12 October 2015)

# Changes in Vegetation Cover

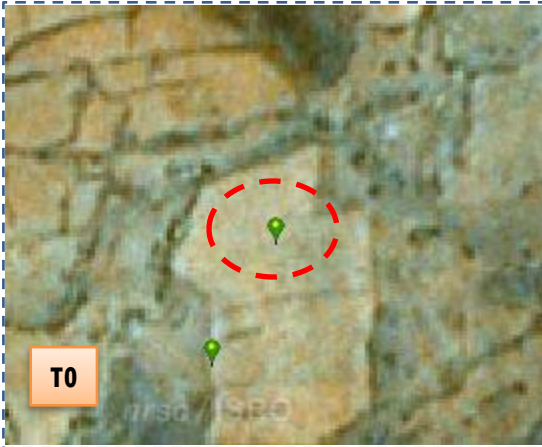


NDVI (2013-14)



NDVI (12 October 2015)

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-08/2009-10



T0:2009-10



T1: 21 December 2013



Drishti Sl no. 132446 MWS :4C3F6n1b

Horticulture



T0:2009-10



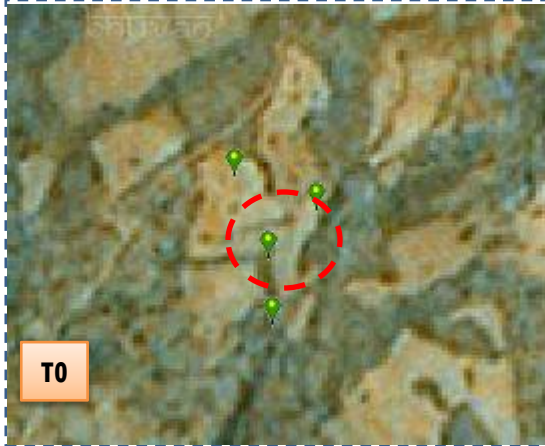
T1: 21 December 2013



Drishti Sl no.131241 MWS : 4C3F6n2c

Horticulture

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-08/2009-10



T0

T0: 2009-10



T1

T1: 21 December 2013



Drishti Sl no. 132461 MWS :4C3F6n2c

Percolation tank



T0

T0: 2009-10



T1

T1: 21 December 2013



Drishti Sl no. 132476 WS :4C3F6n1b

Horticulture

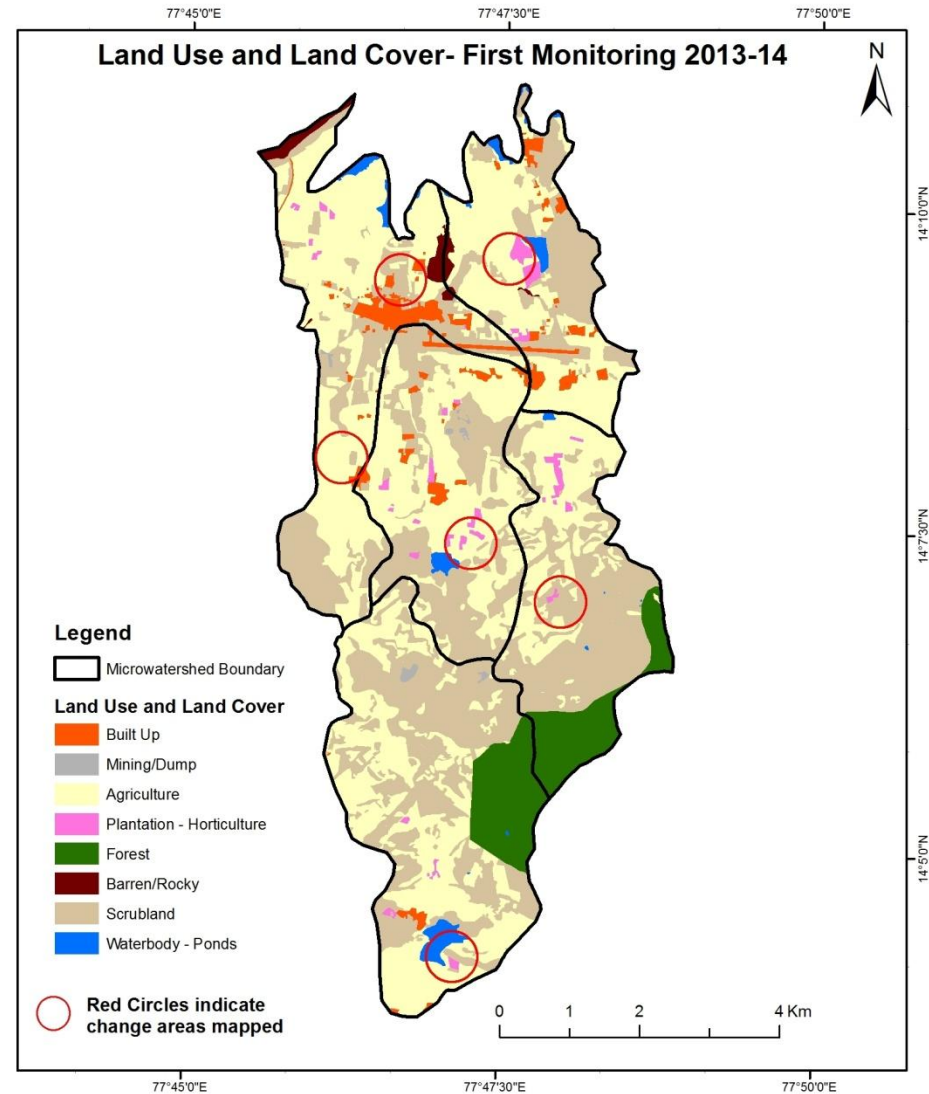
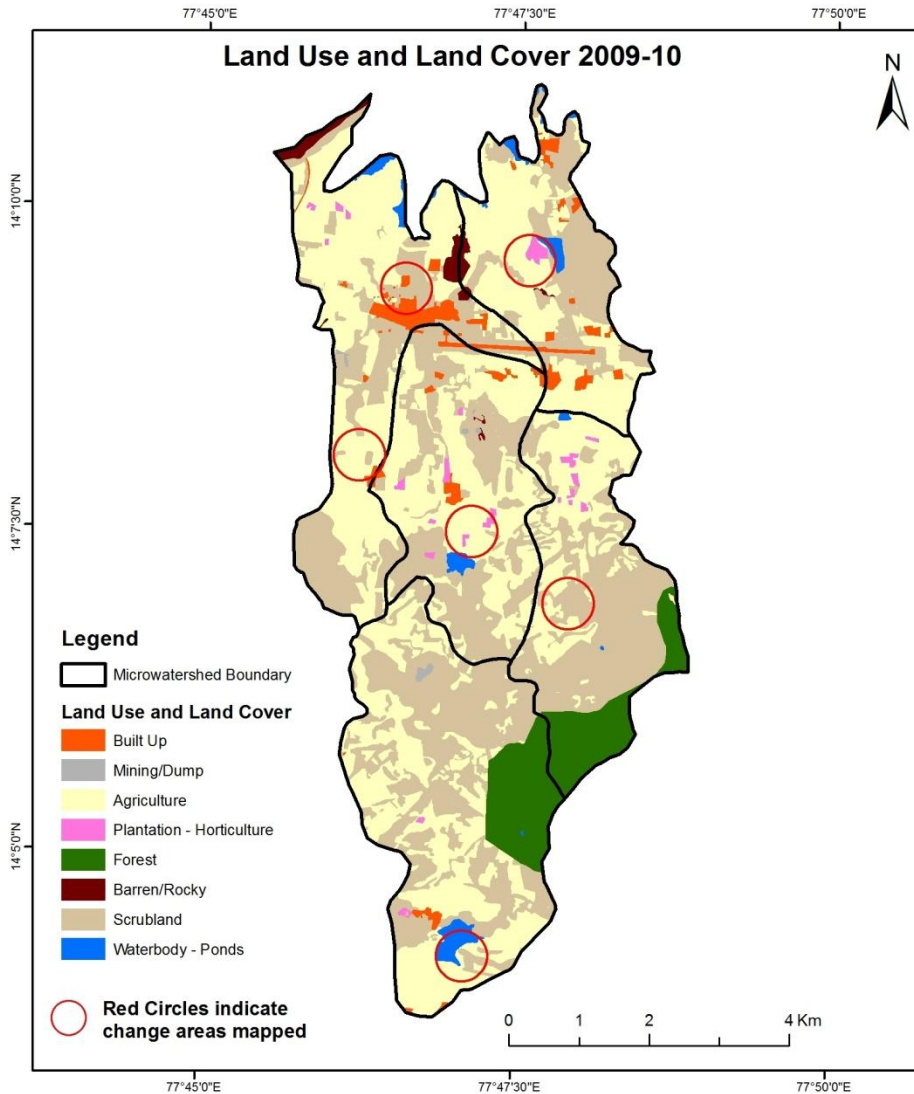
## MONITORING IN THE PROJECT AREA

### Land use and Land cover Changes in the Project

- Change in land use and land cover from 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)

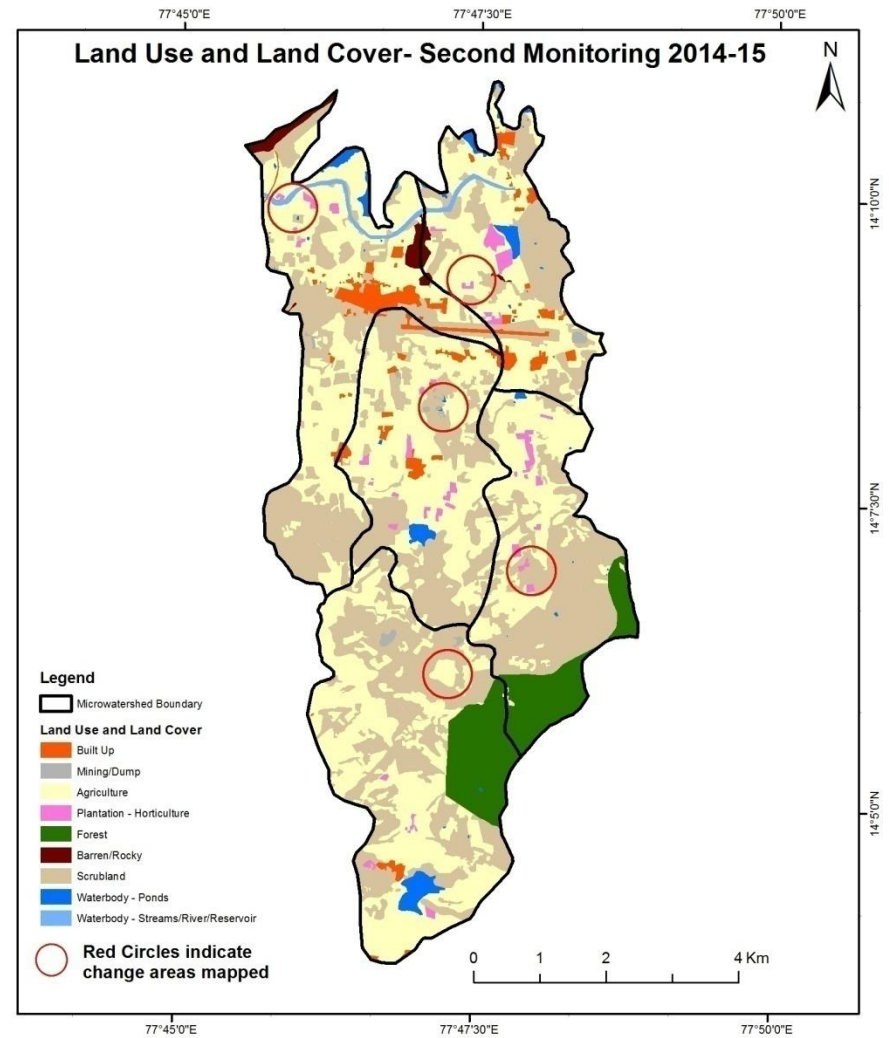
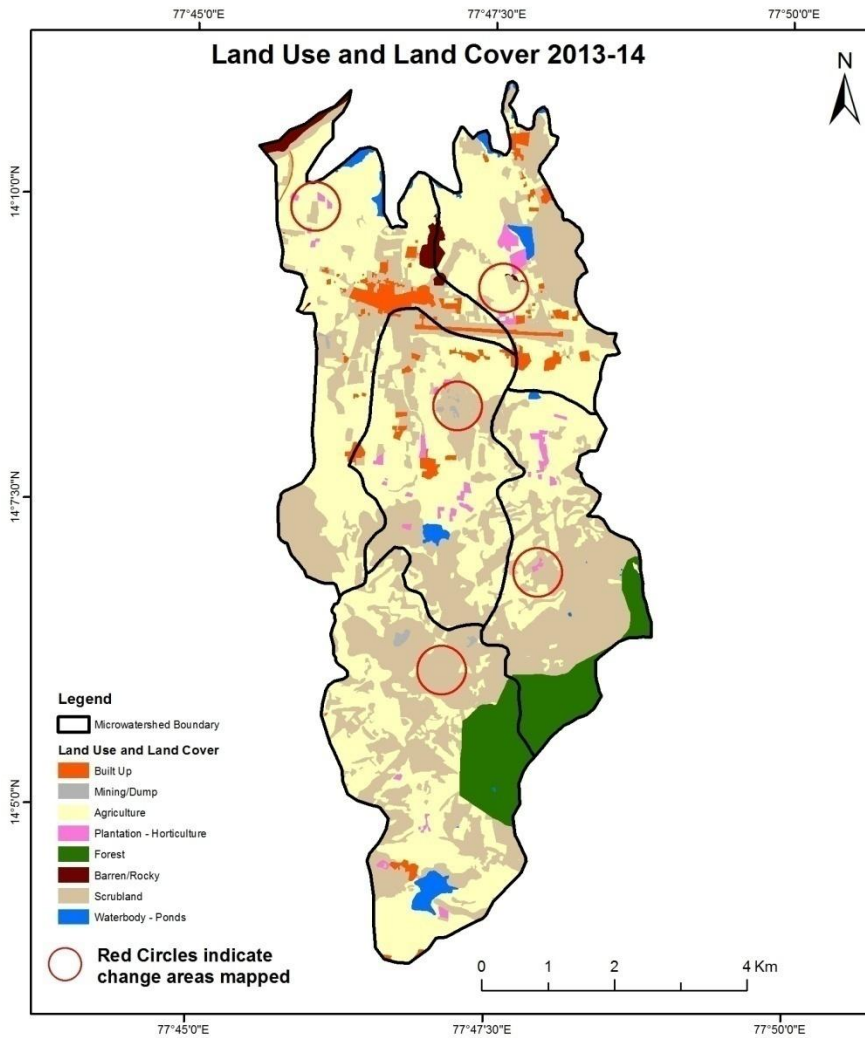
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



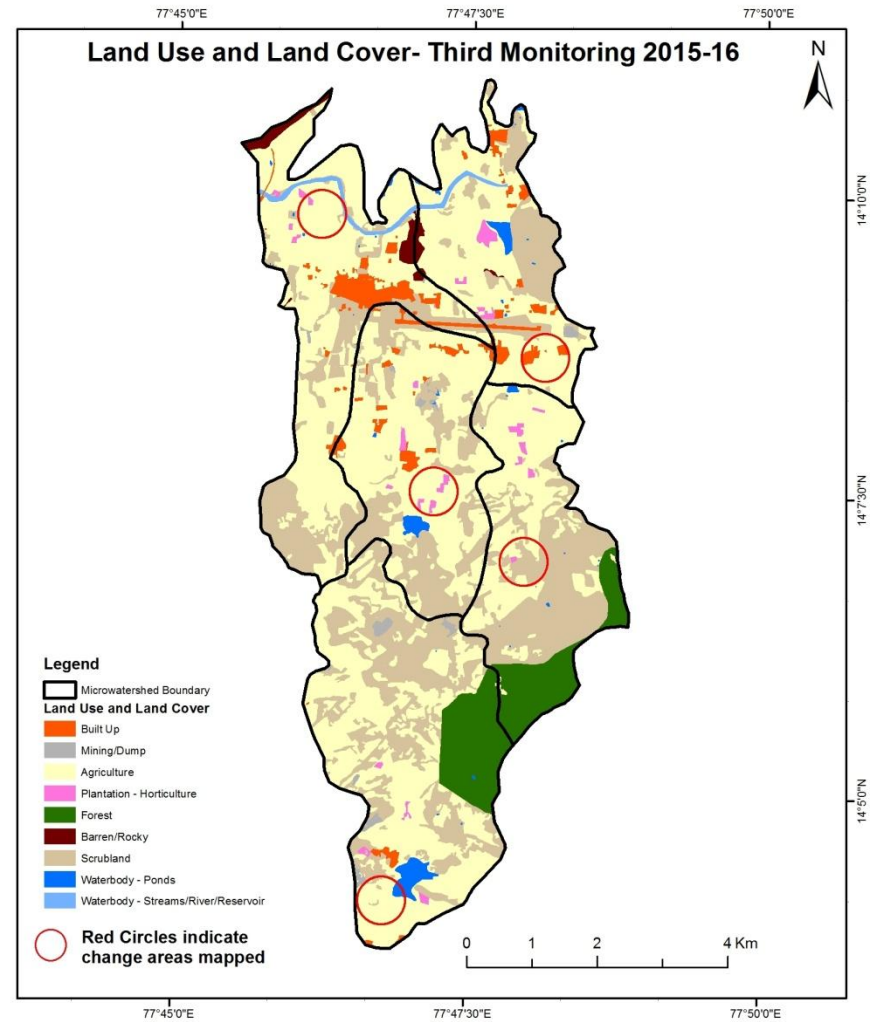
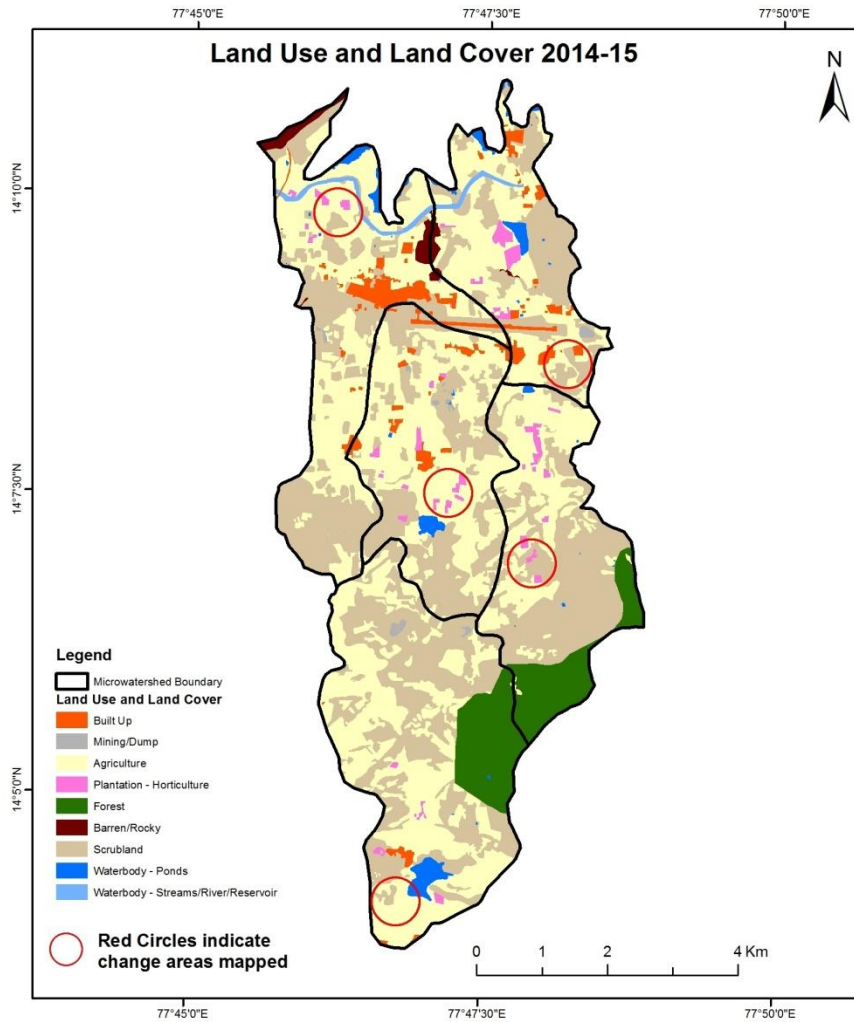
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



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

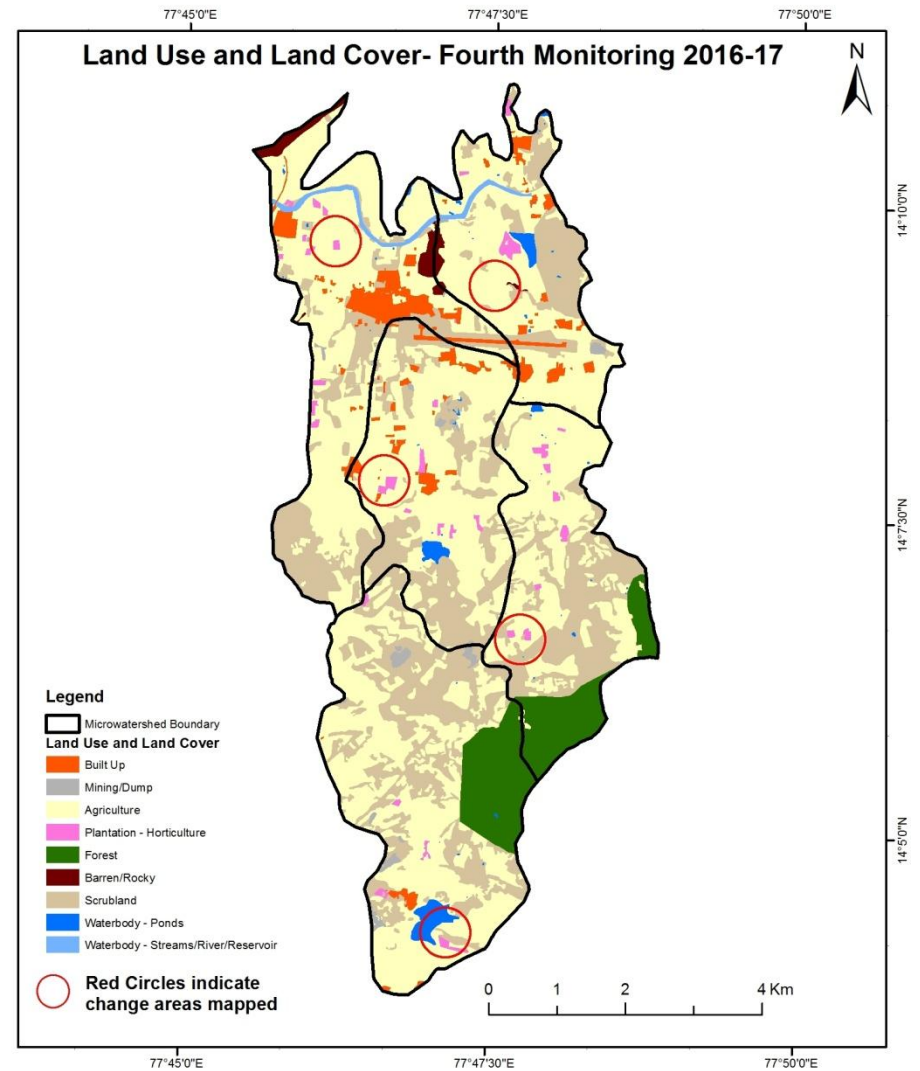
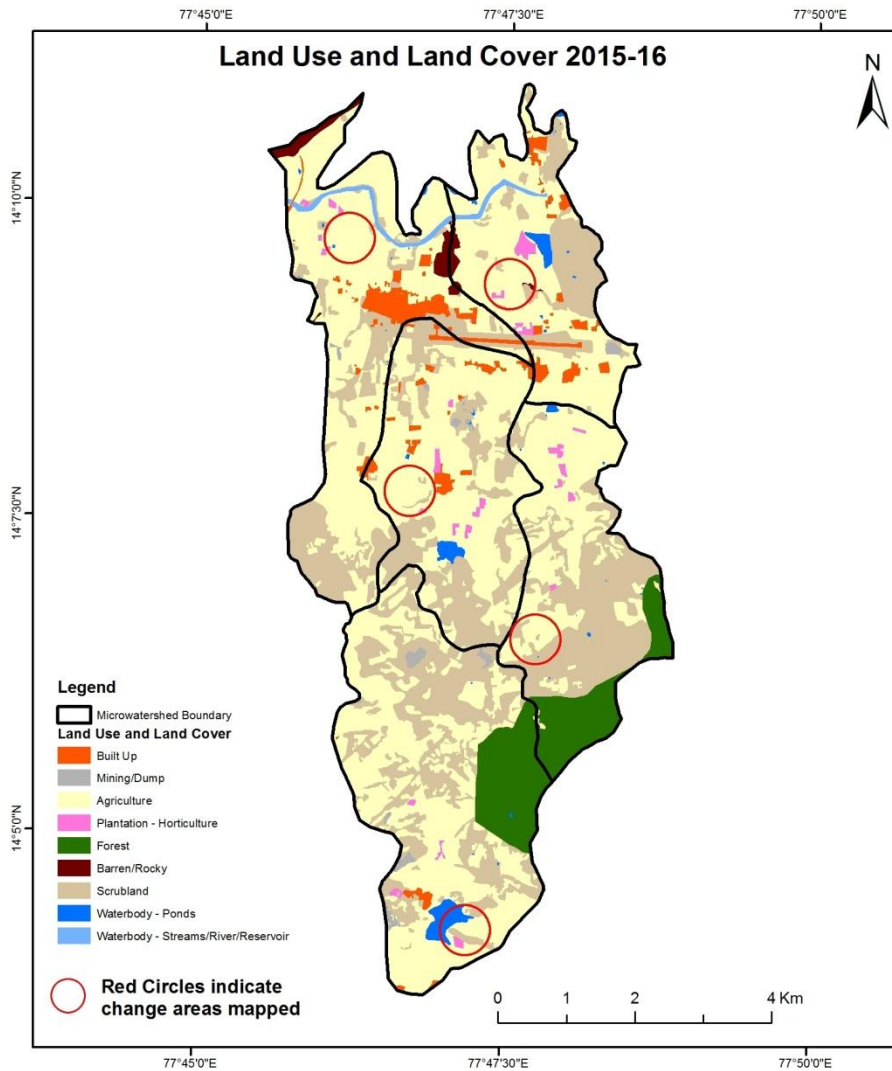
Scale: 1:10000





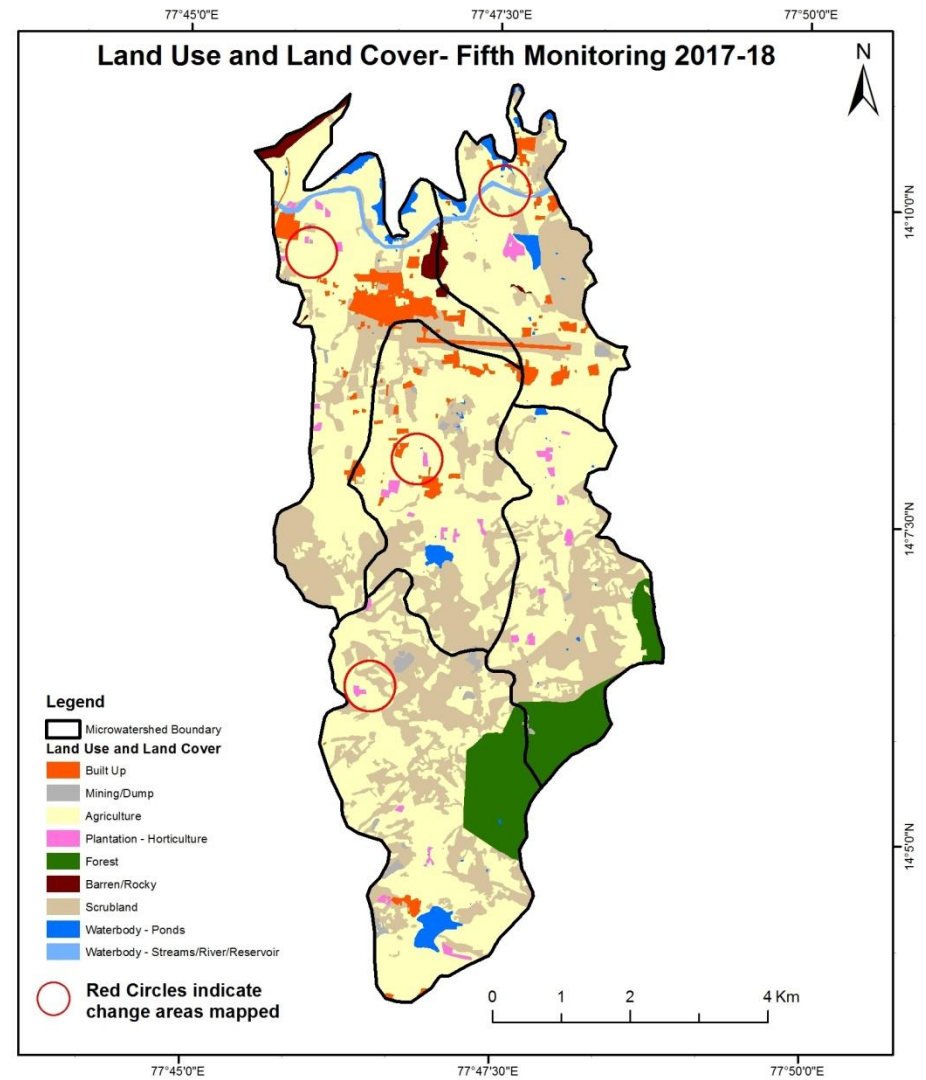
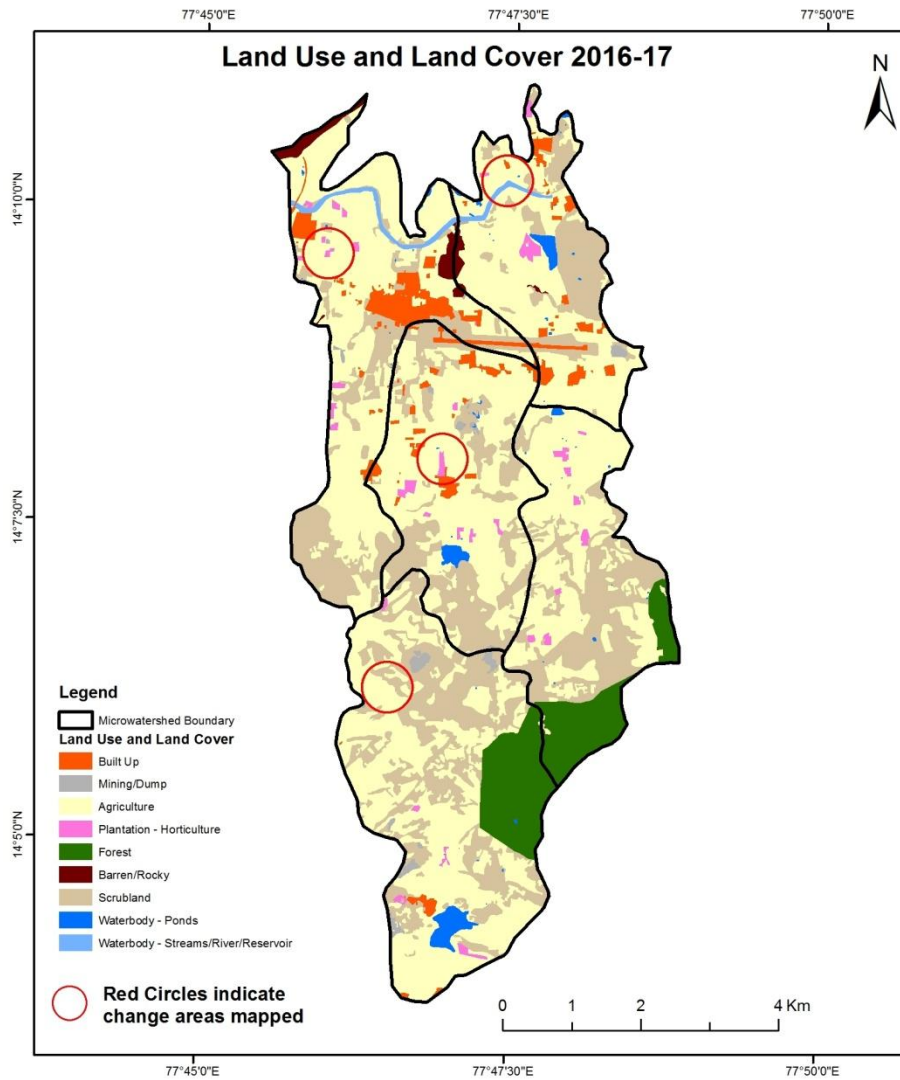
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

### Scrub to Agriculture



T0: 2009-10

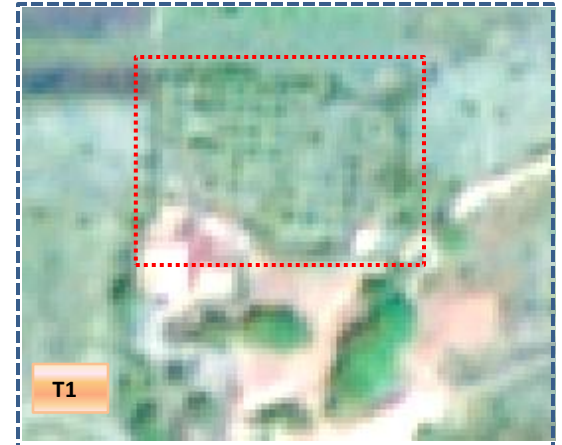


T1: 21 December 2013

### Scrub to Plantation



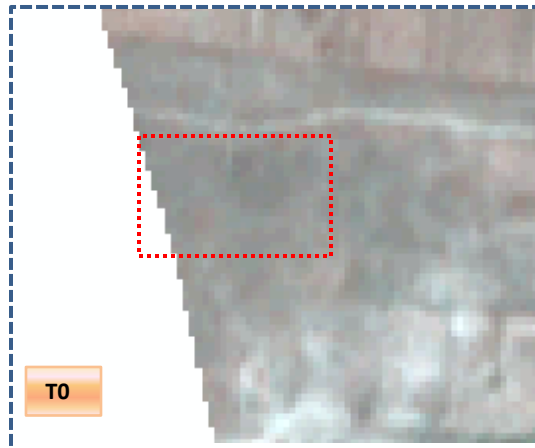
T0: 2009-10



T1: 21 December 2013

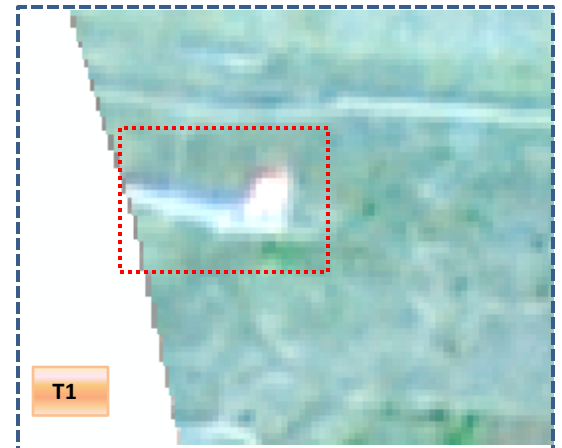
## Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Built-up



T0

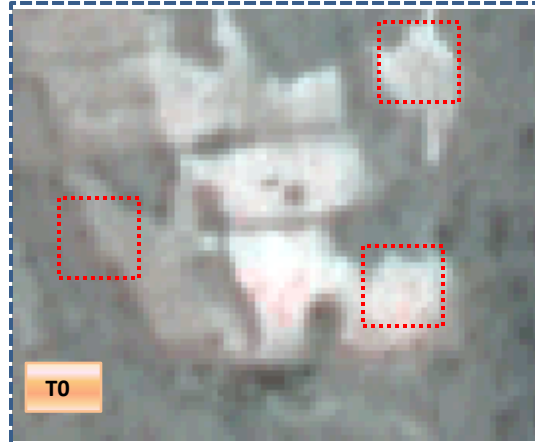
T0: 2009-10



T1

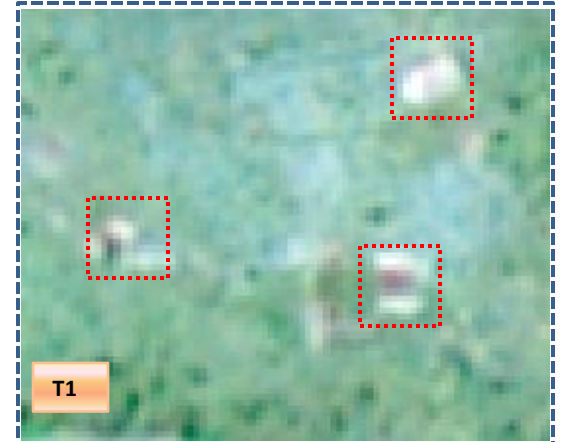
T1: 21 December 2013

Scrub to Waterbody



T0

T0: 2009-10



T1

T1: 21 December 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	120.63										120.63
Mining/dump		7.21									7.21
Agriculture	4.98		2113.23	11.85				0.37			2130.43
Plantation Horticulture			0.60	32.30							32.90
Forest					305.95						305.95
Forest Plantation											
Barren Rocky		1.36					39.98				41.34
Scrub	16.29	1.75	86.90	9.95				1779.96		0.25	1895.11
Waterbody- Streams/River											
Waterbody – Ponds										69.08	69.08
<b>Grand Total</b>	<b>141.90</b>	<b>10.32</b>	<b>2200.73</b>	<b>54.10</b>	<b>305.95</b>		<b>39.98</b>	<b>1780.34</b>		<b>69.32</b>	<b>4602.63</b>

- 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 17.20 ha of agriculture are decreased and it is converted into built up, plantation and scrub land in T1.
- In T1 87.50 ha of agriculture are increased from plantation 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	141.90										141.90
Mining/dump		9.94								0.38	10.32
Agriculture			1833.52	9.27				325.82	31.40	0.72	2200.73
Plantation Horticulture			0.61	53.49							54.10
Forest			1.76		304.19						305.95
Forest Plantation											
Barren Rocky							39.98				39.98
Scrub		4.52	293.76					1480.68		1.38	1780.34
Waterbody- Streams/River											
Waterbody – Ponds										69.32	69.32
<b>Grand Total</b>	<b>141.90</b>	<b>14.46</b>	<b>2129.64</b>	<b>62.76</b>	<b>304.19</b>		<b>39.98</b>	<b>1806.49</b>	<b>31.40</b>	<b>71.81</b>	<b>4602.63</b>

- 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 367.21 ha of agriculture are decreased and it is converted into plantation, scrub land and water body in T2.
- In T2 296.12 ha of agriculture are increased from plantation, 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										Grand Total
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	
Built up	141.90										141.90
Mining/dump		14.46									14.46
Agriculture	4.07		2078.48					46.91		0.19	2129.64
Plantation Horticulture			22.68	40.08							62.76
Forest					304.19						304.19
Forest Plantation											
Barren Rocky							39.98				39.98
Scrub	2.01	13.00	446.84					1344.57		0.08	1806.49
Waterbody- Streams/River									31.40		31.40
Waterbody – Ponds			20.42							51.39	71.81
<b>Grand Total</b>	<b>147.98</b>	<b>27.46</b>	<b>2568.42</b>	<b>40.08</b>	<b>304.19</b>		<b>39.98</b>	<b>1391.48</b>	<b>31.40</b>	<b>51.66</b>	<b>4602.63</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
- In T2 51.16 ha of agriculture are decreased and it is converted into built up, scrubland and water body in T3.
- In T3 489.94 ha of agriculture area has 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- 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	147.98										147.98
Mining/dump		27.46									27.46
Agriculture	26.83	1.27	2508.21	23.10				8.14		0.86	2568.42
Plantation Horticulture			9.57	30.51							40.08
Forest			2.42		301.77						304.19
Forest Plantation											
Barren Rocky							39.98				39.98
Scrub	1.42	2.78	87.24	0.09				1299.64		0.30	1391.48
Waterbody- Streams/River									31.40		31.40
Waterbody – Ponds			0.51							51.15	51.66
<b>Grand Total</b>	<b>176.22</b>	<b>31.51</b>	<b>2607.95</b>	<b>53.71</b>	<b>301.77</b>		<b>39.98</b>	<b>1307.78</b>	<b>31.40</b>	<b>52.31</b>	<b>4602.63</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
- In T3 60.20 ha of agriculture are decreased and it is converted into built up, mining/dump, plantation, scrubland and water body in T4.
- In T4 99.74 ha of agriculture area has increased from plantation, 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- 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	176.22										176.22
Mining/dump		31.51									31.51
Agriculture	5.35	3.41	2564.56	1.78				0.20	1.76	30.89	2607.95
Plantation Horticulture			9.28	44.43							53.71
Forest					301.77						301.77
Forest Plantation											
Barren Rocky							39.98				39.98
Scrub	0.77	1.68	17.68					1287.15		0.50	1307.78
Waterbody- Streams/River									31.40		31.40
Waterbody – Ponds										52.31	52.31
<b>Grand Total</b>	<b>182.35</b>	<b>36.60</b>	<b>2591.52</b>	<b>46.21</b>	<b>301.77</b>		<b>39.98</b>	<b>1287.35</b>	<b>33.16</b>	<b>83.70</b>	<b>4602.63</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
- In T4 43.39 ha of agriculture are decreased and it is converted into built up, mining/dump, plantation, scrubland and water body in T5.
- In T5 26.96 ha of agriculture area has 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 47.78 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 70.3, 438.8 & 39.5 Hectares From T0-T1, T2-T3 & T3-T4 respectively and overall increase of 548.6 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 607.76 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.