

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -12/2009-10

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

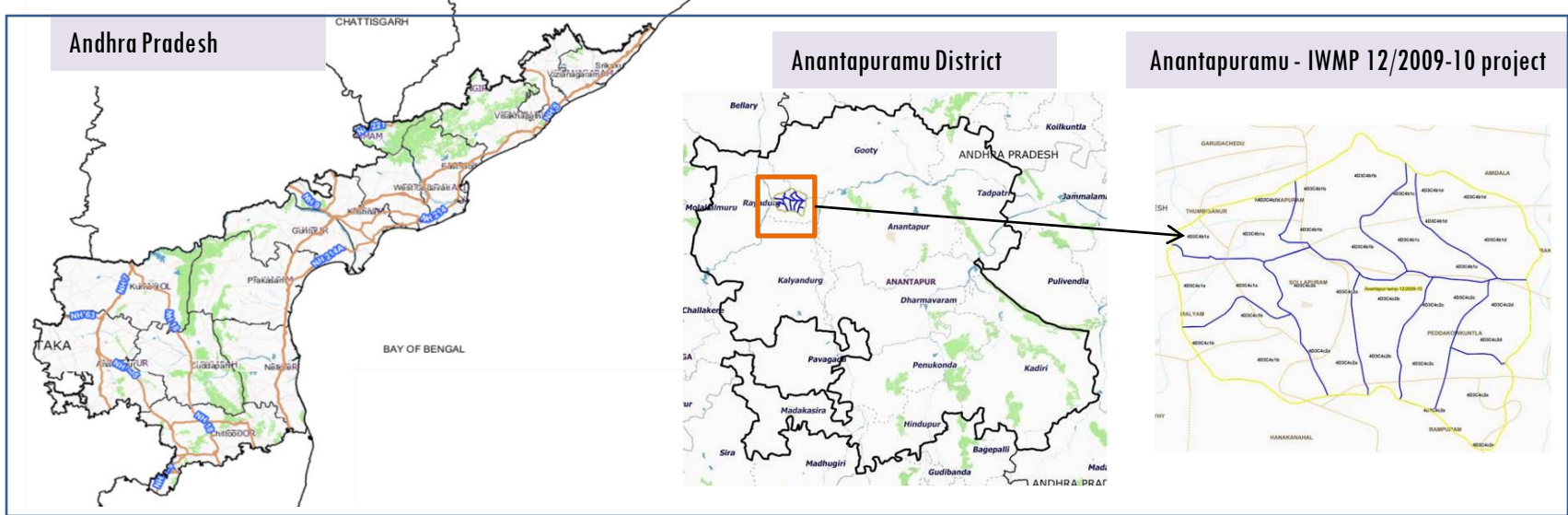
## **E X E C U T I V E   S U M M A R Y**

- 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-12/2009-10, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 12,485.14 ha. It comprises of 11 micro watersheds.
- In the project area 25 Drishti photos were uploaded showing 3 check dams, 3 Farm ponds and 19 are showing others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 3 new farm ponds or dug out pits with 1.37 ha increase in the area.
- Major percentage i.e. 91.88% is covered by the agriculture, 6.82 % is covered by Scrub land and remaining by other land use classes.

# PROJECT : ANANTAPURAMU - IWMP-12/2009-10

## District : Anantapuramu , State : Andhra Pradesh

- The study area falls in Kalyandurg Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 12,485.14 ha. It comprises of 11 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 inches (560 mm).
- Anantapuram district receives moderate to good rainfall from July to October month.

# Satellite Data and Ancillary Data

Satellite data*	T1-A**	T1-B**	T5
	2013-14	2011-12	2017-18
LISS IV	2013-14		
SCENE 1			1-Apr-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			1-Apr-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	Drishhti Photographs		
		Total	25
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

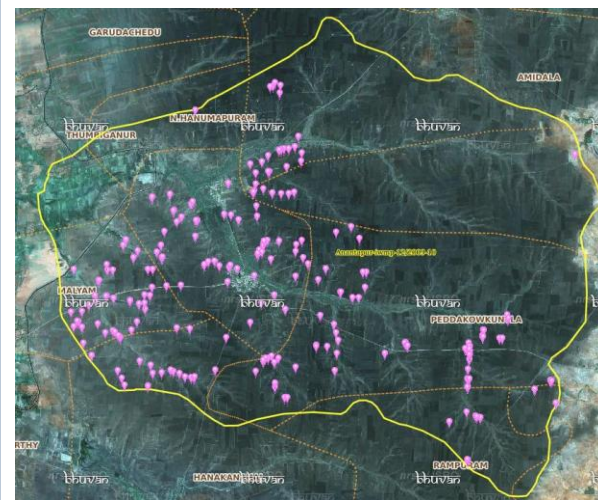


MWS Boundary



Project Boundary

## Natural Color Composite overlaid with Drishhti Points



### Drishhti Upload Status

## Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture/Plantation	0	0
3	Agriculture	0	0
4	Bunding	0	0
5	Drainage treatment	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	1	1
9	Gabion structure	0	0
10	Farm ponds /Dugout pit	5	4
11	Check dams	0	0
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	19	15
	<b>TOTAL</b>	<b>25</b>	<b>20</b>

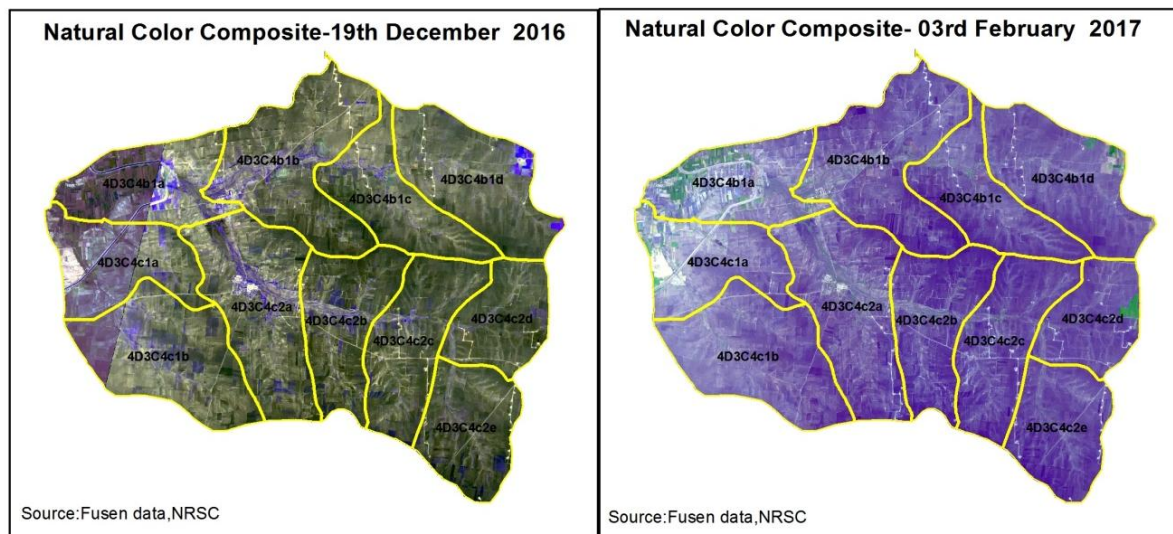
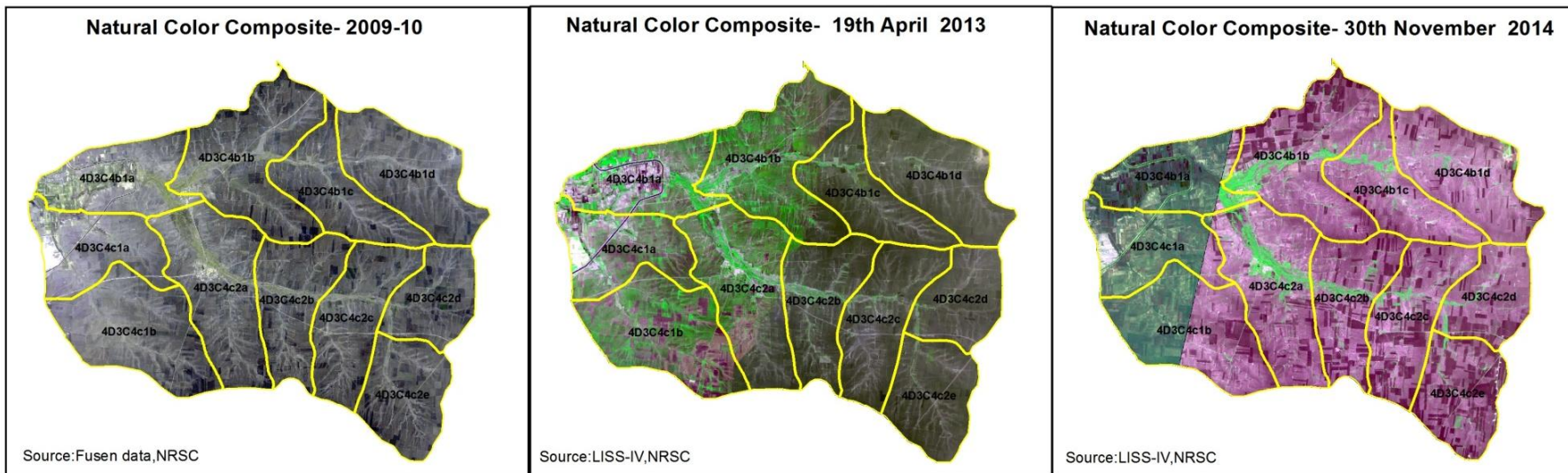
## MONITORING IN THE PROJECT AREA

### 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.

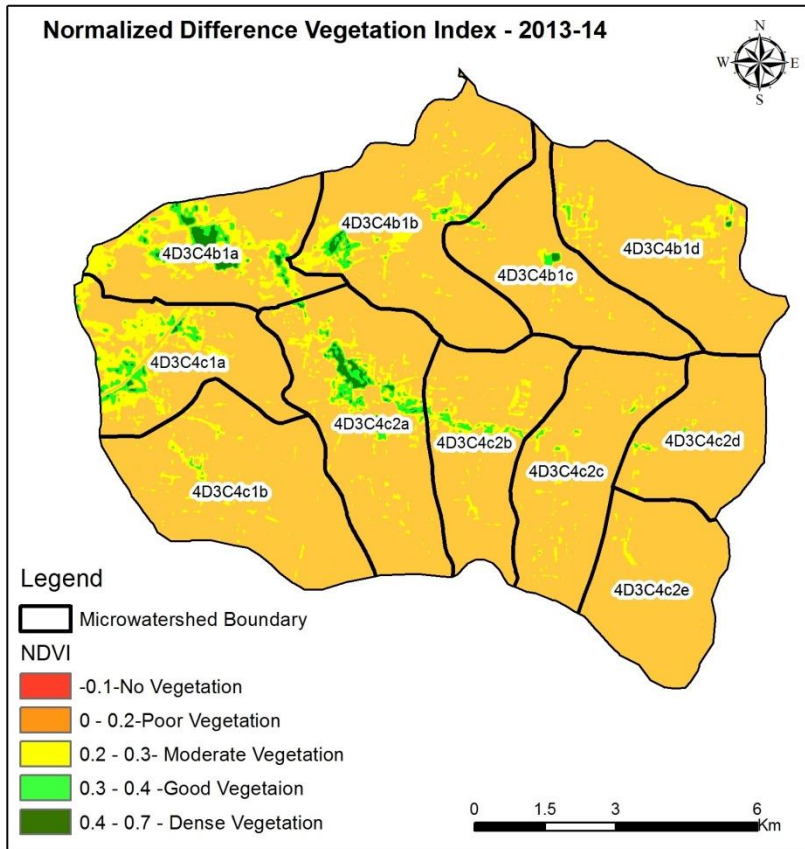


# Natural Color Composite – 2009-10 to 2017-18

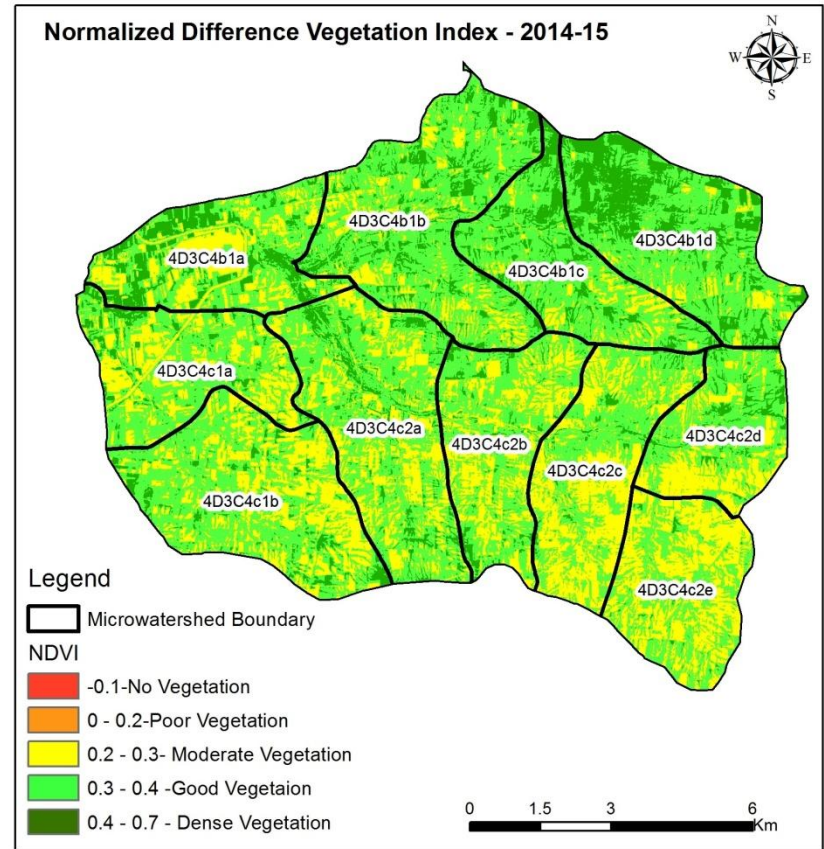




# Changes in Vegetation Cover



NDVI (2014-15)



NDVI ( 28 October 2016)

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-12/2009-10



T1

T1:2013



T2

T2: 30 December 2014



Drishti Sl no. 226606 MWS :4C3H1j2a

Checkdam



T1

T1:2013



T2

T2: 30 December 2014

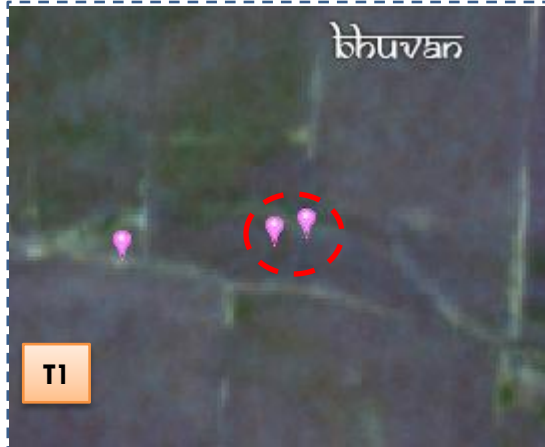


Drishti Sl no.129002 MWS : 4C3H1j1a

Farm pond



Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-12/2009-10



T1

T1: 2013



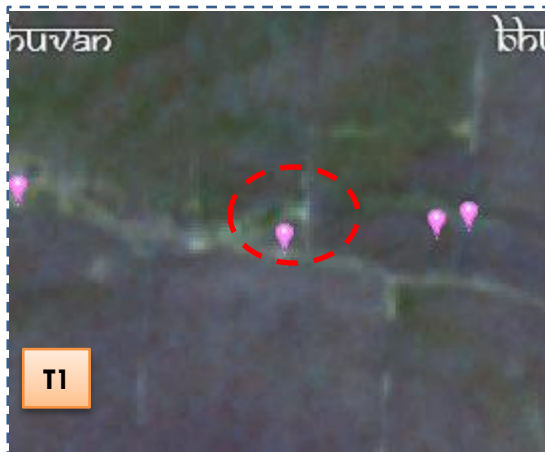
T2

T2: 28 October 2015



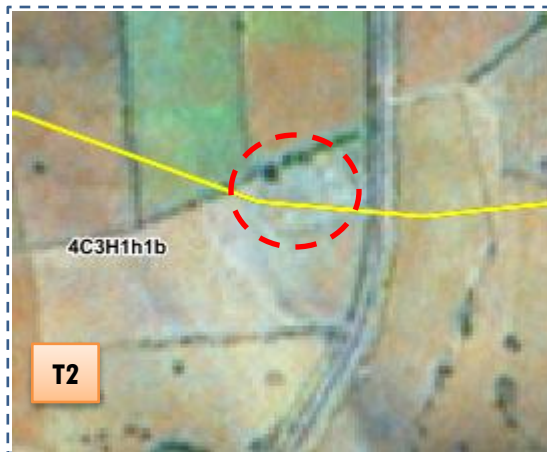
Drishti Sl no. 143978 MWS :4C3H1j2b

Rock fill dam



T1

T1: 2009-10



T2

T2: 27 March 2013

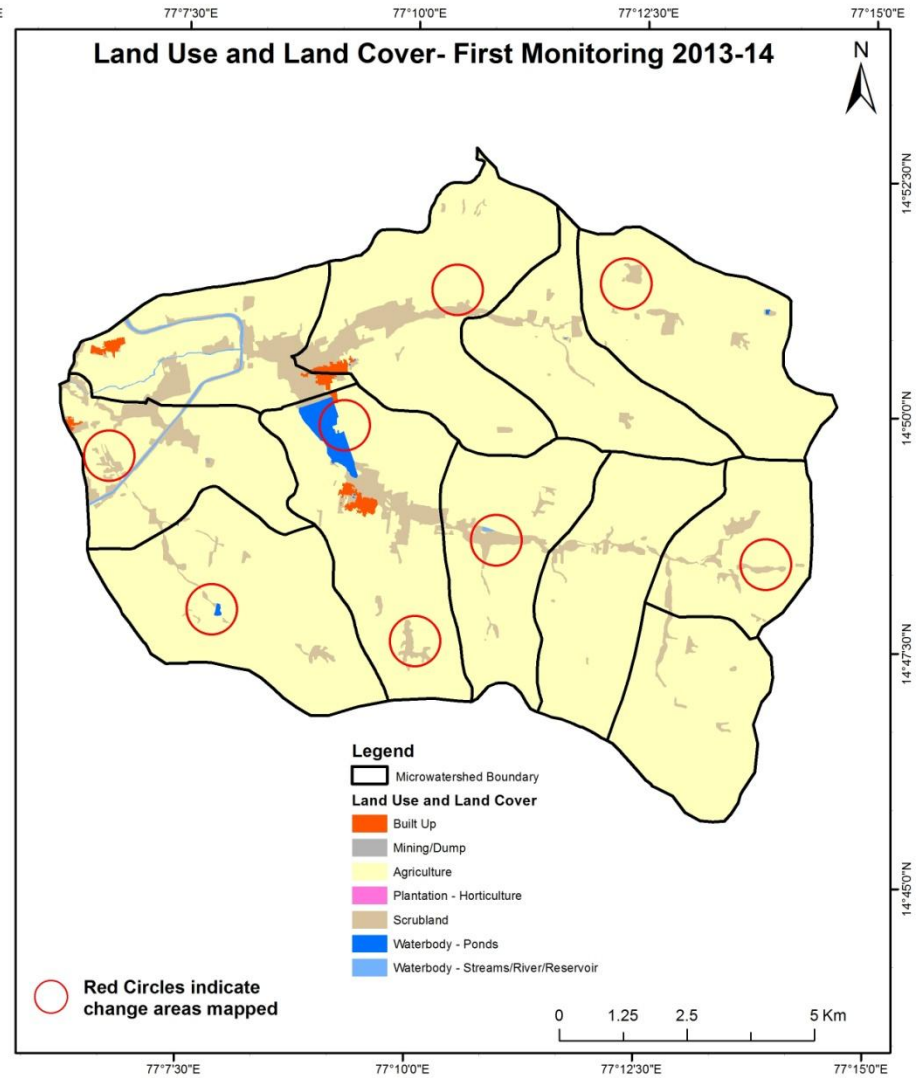
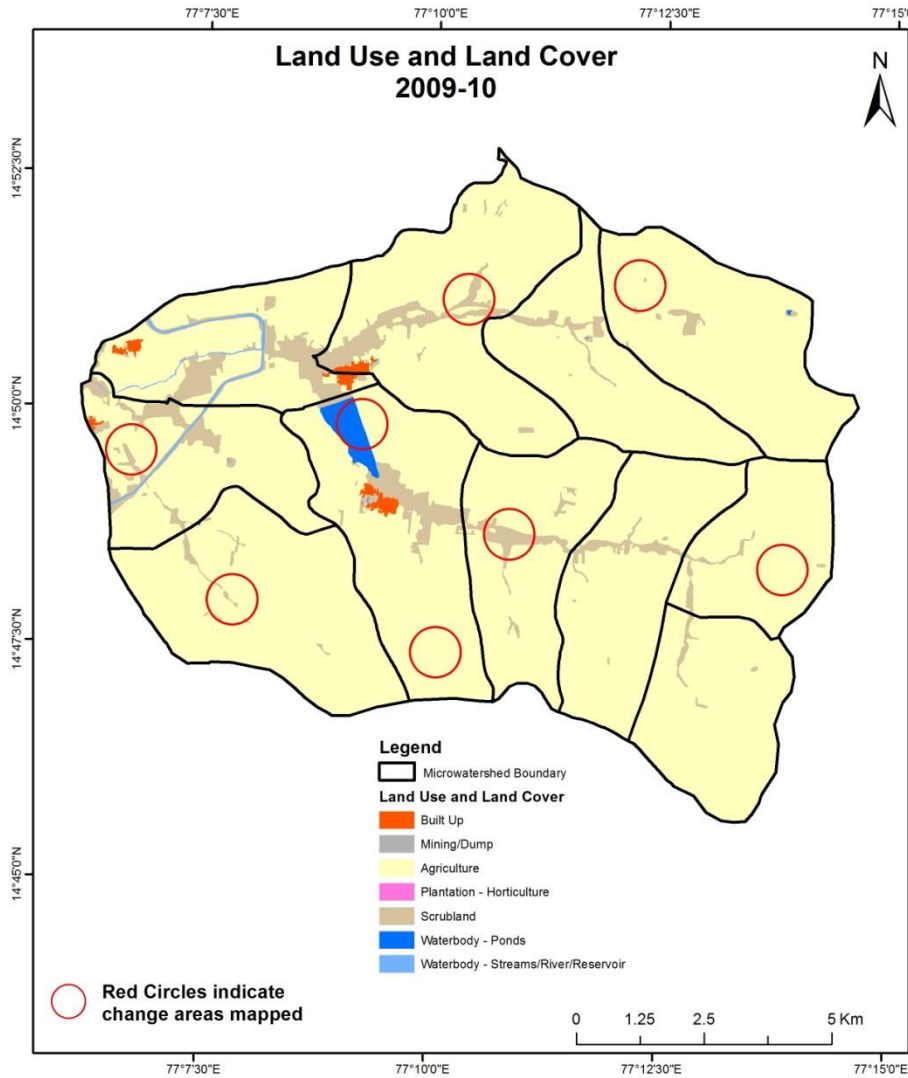


Drishti Sl no. 129201 MWS :4C3H1h1b

Land development

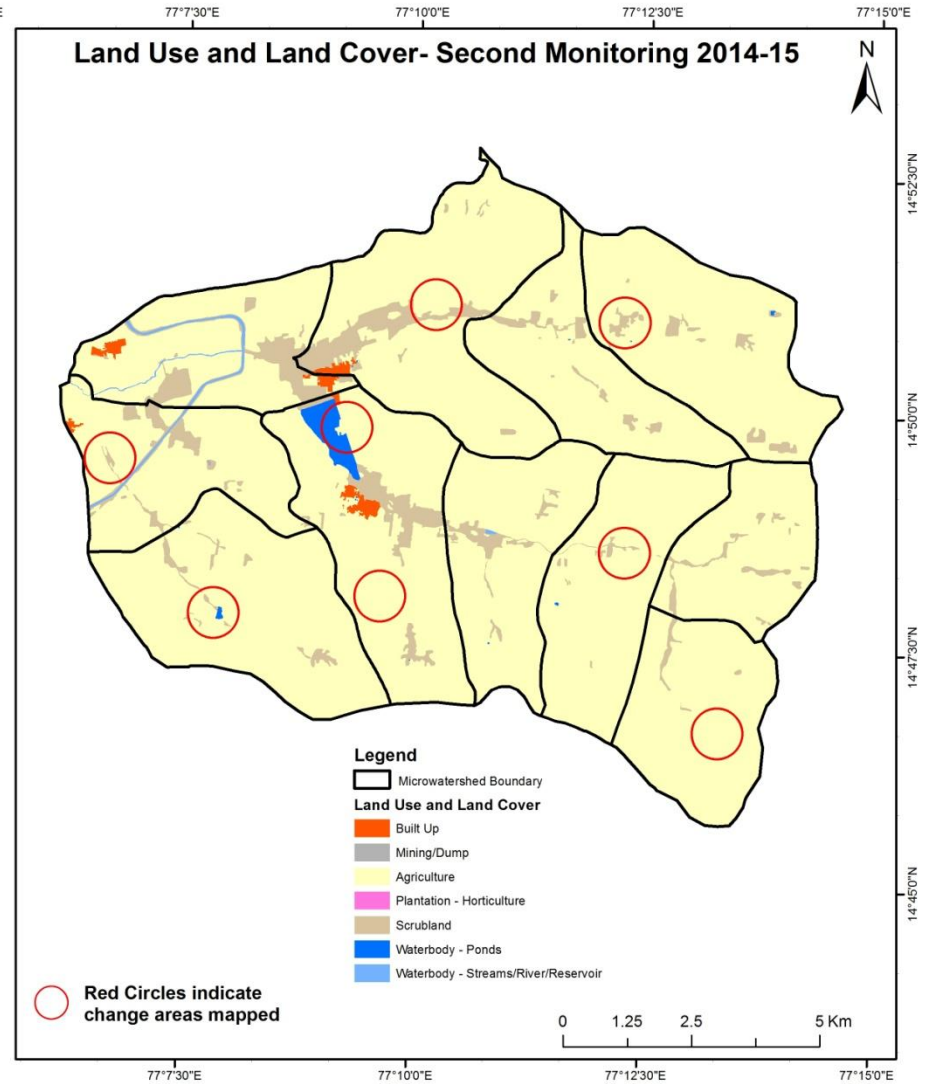
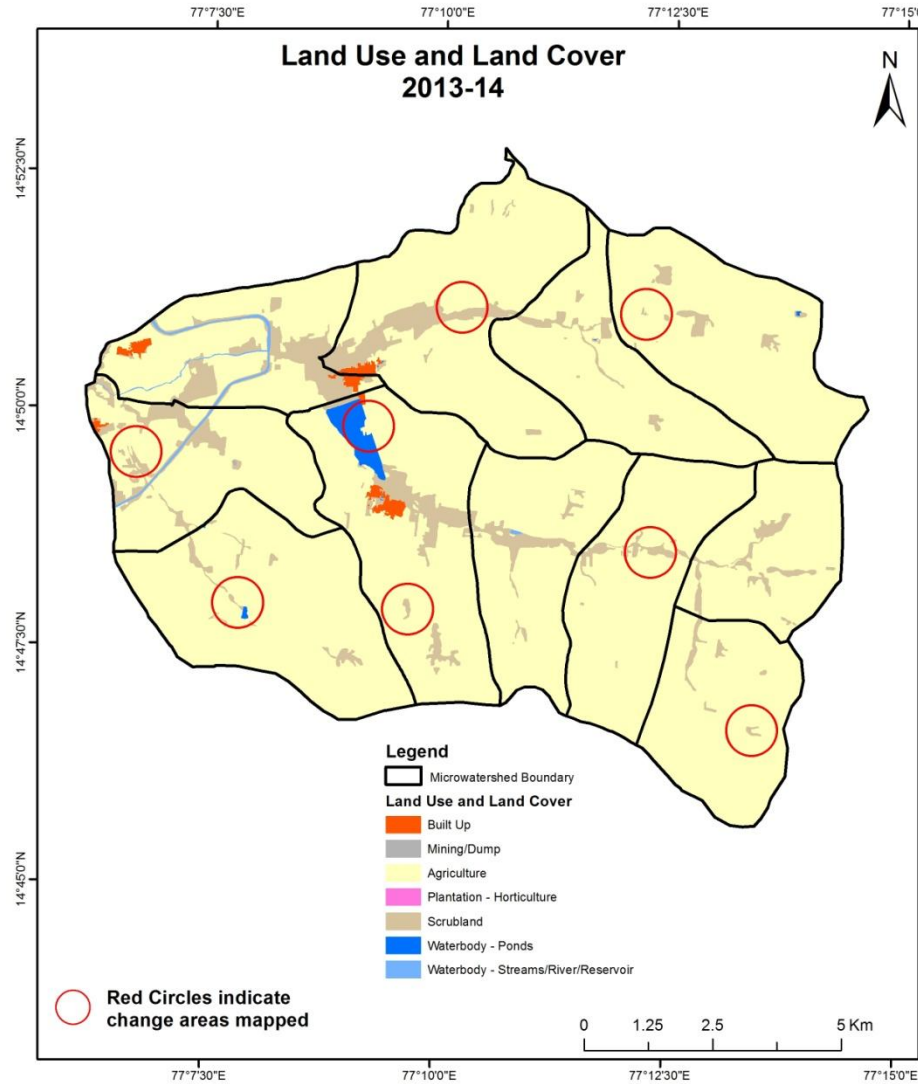
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



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

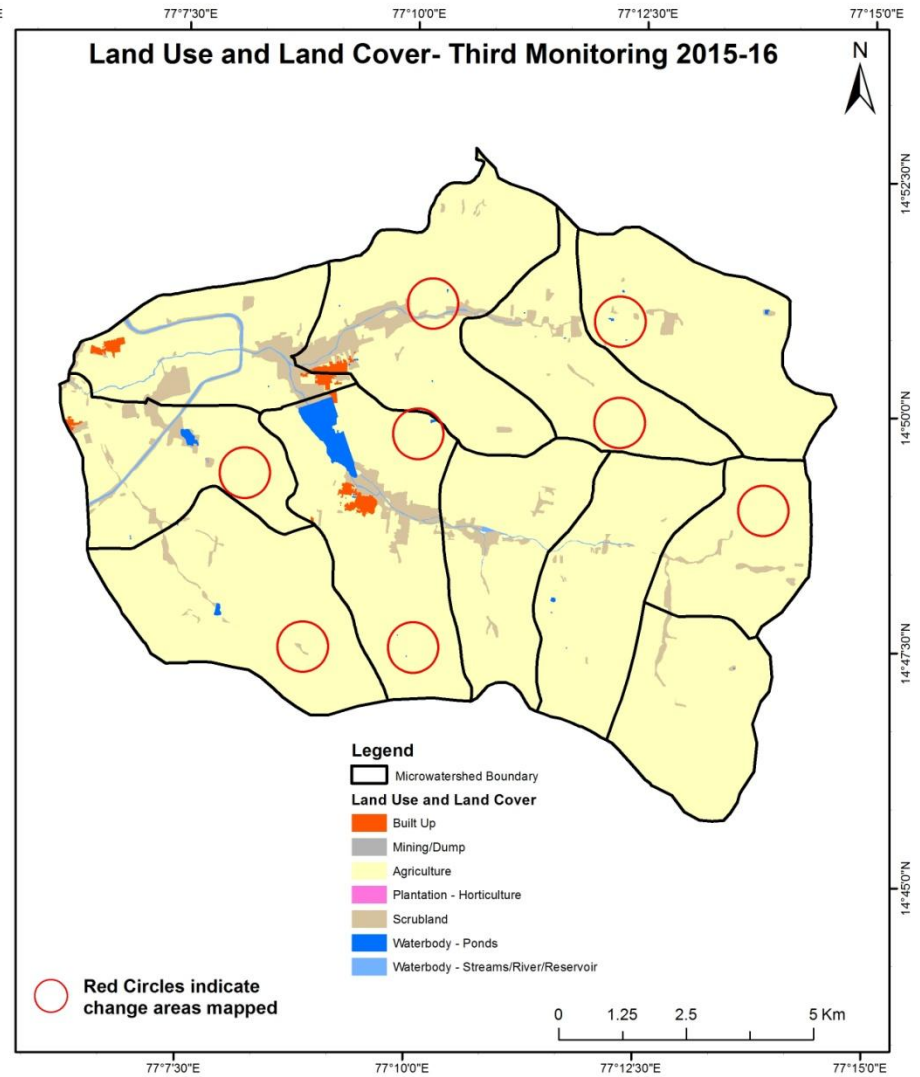
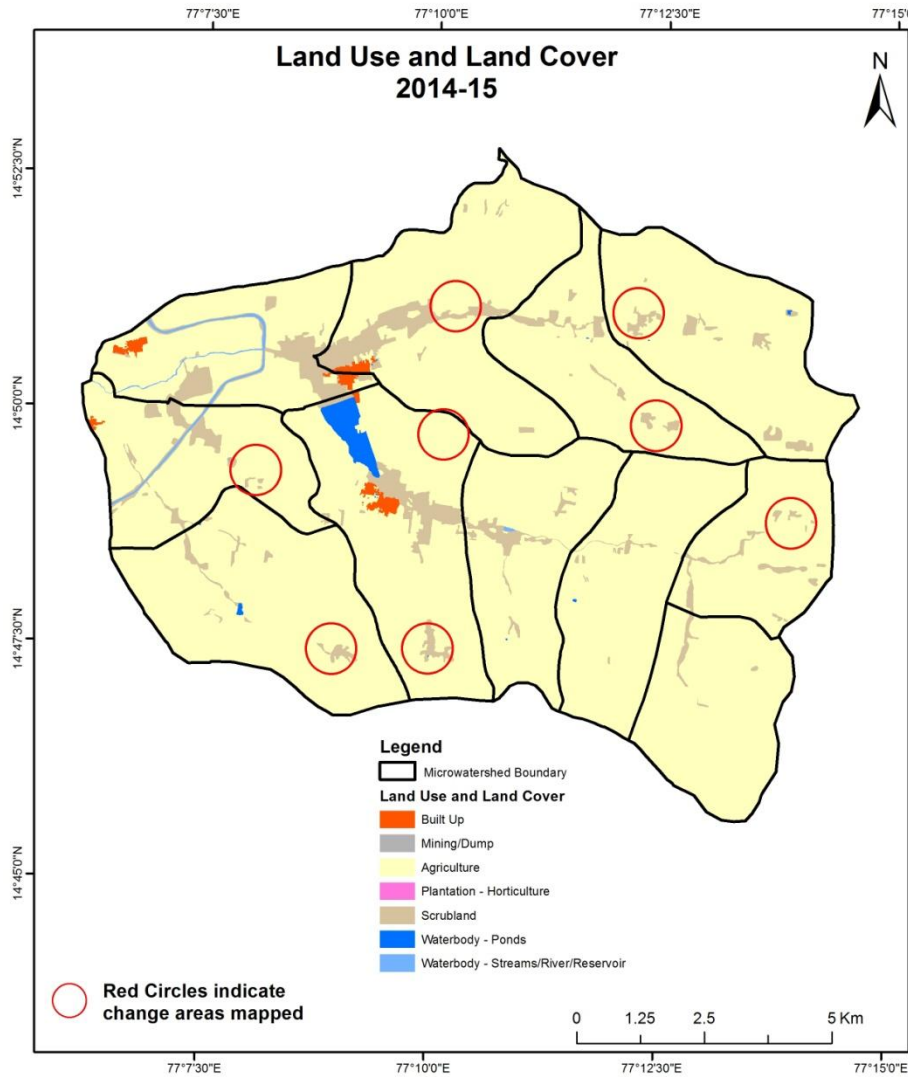
Scale: 1:10000





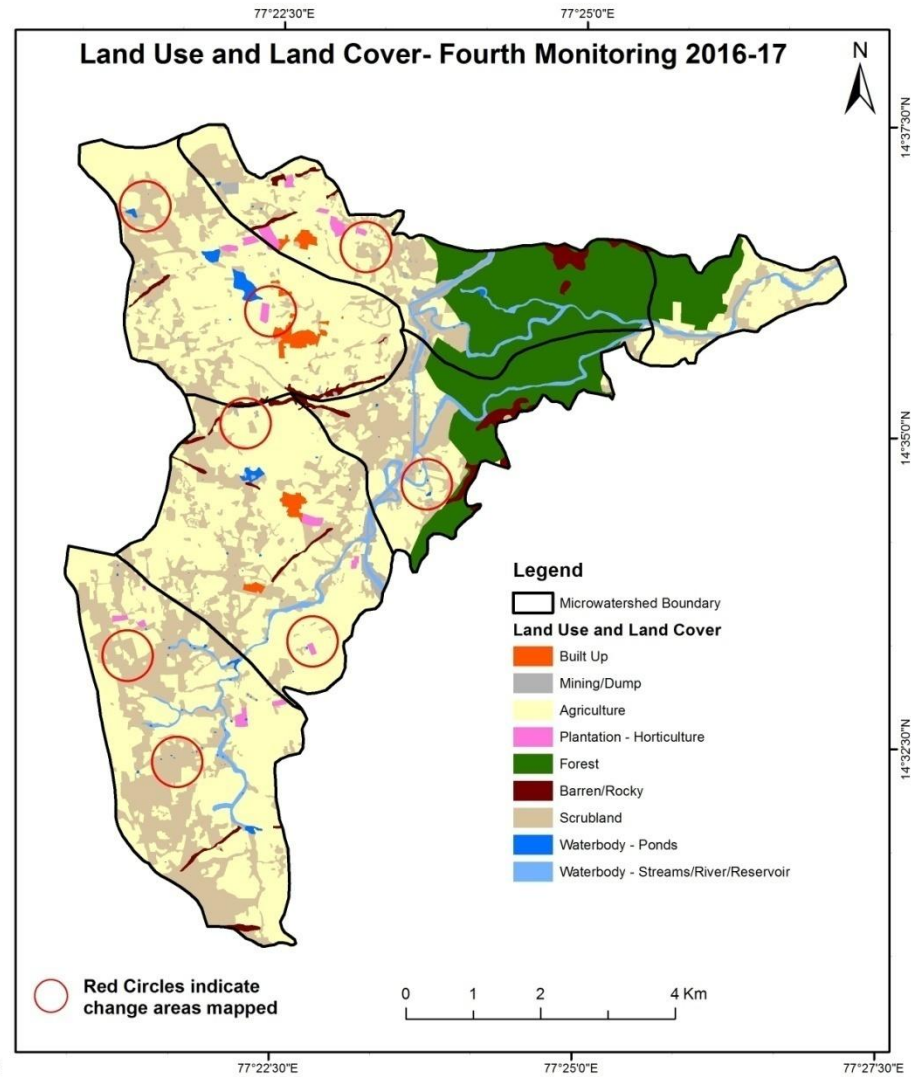
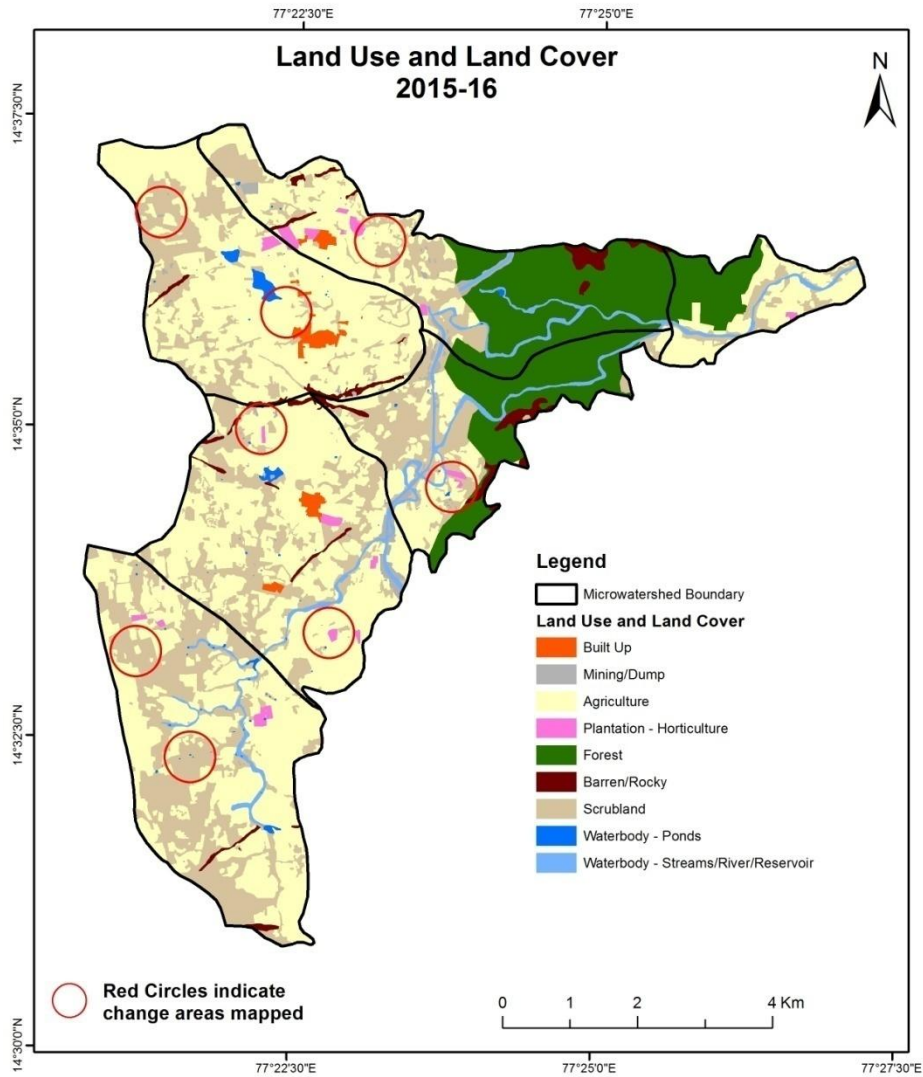
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



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

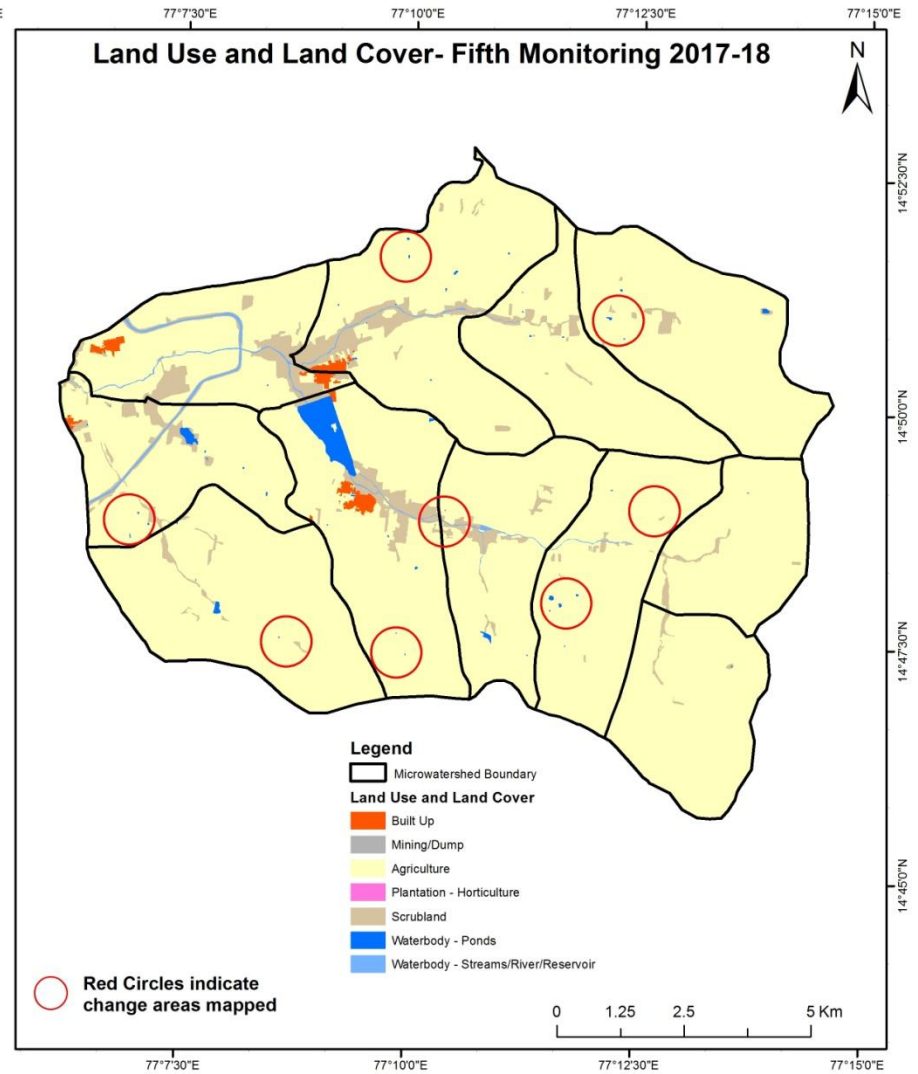
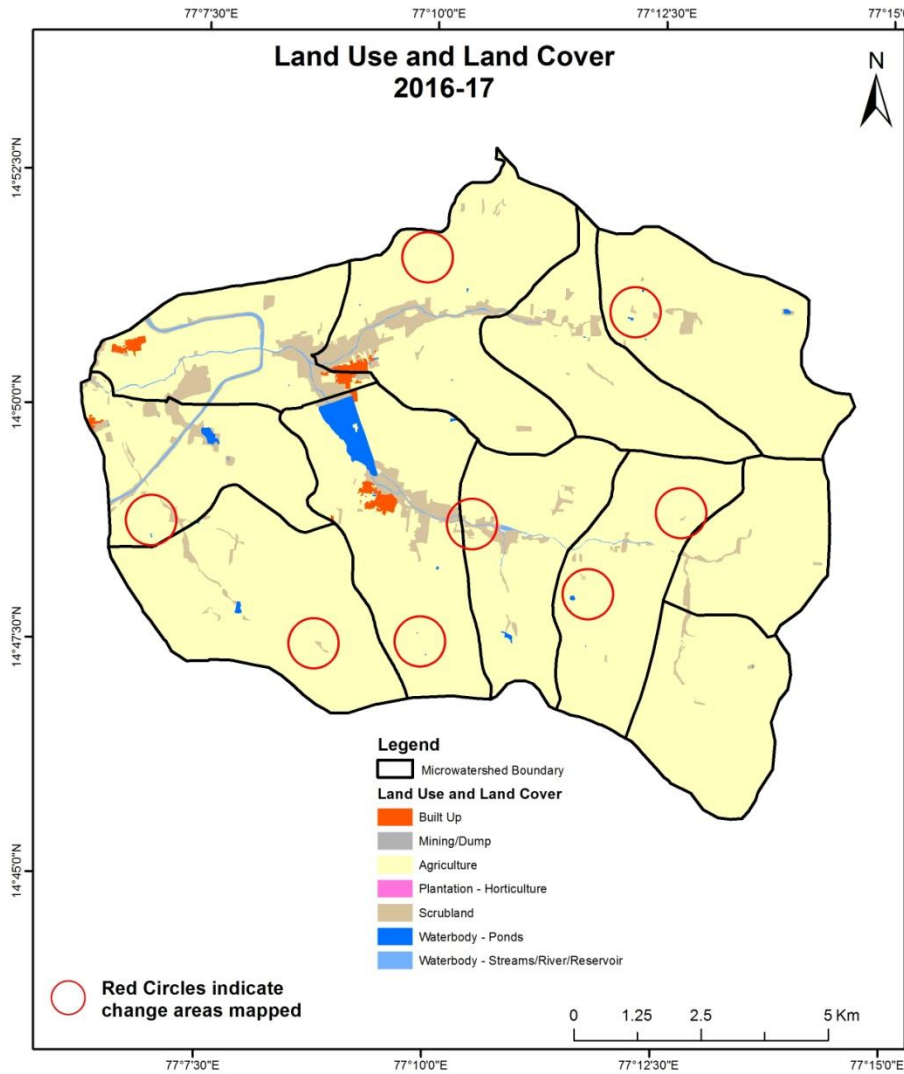
Scale: 1:10000





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

Scale: 1:10000



## MONITORING IN THE PROJECT AREA

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

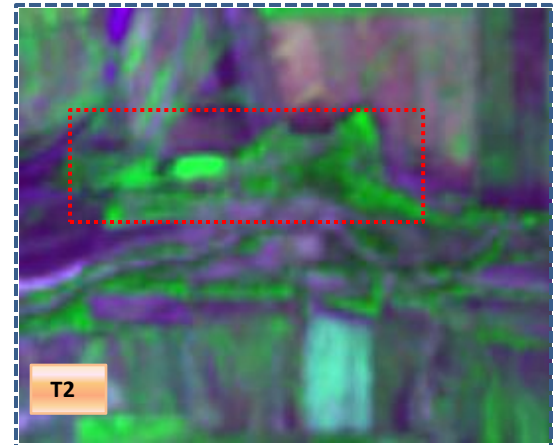
- Change in land use and land cover from T0 to T5 are analyzed in terms of built up, mining/dump, agriculture, plantation- horticulture, forest, barren rocky waterbody-streams/river/reservoir and waterbody -ponds.
- Captures are also provided wherever changes are observed in satellite images, that may 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)

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

Scrub to Agriculture



T1: 2013

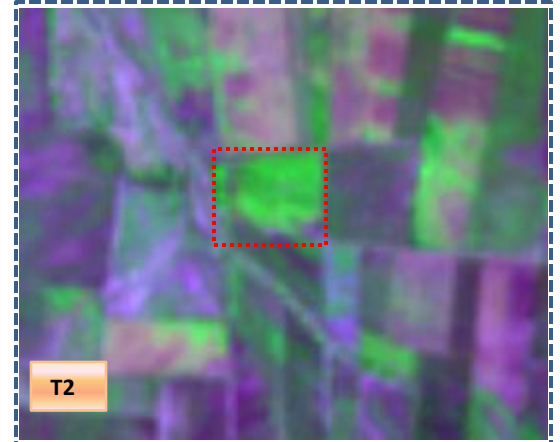


T2: 28 October 2015

Scrub to Agriculture



T1: 2013



T2: 28 October 2015

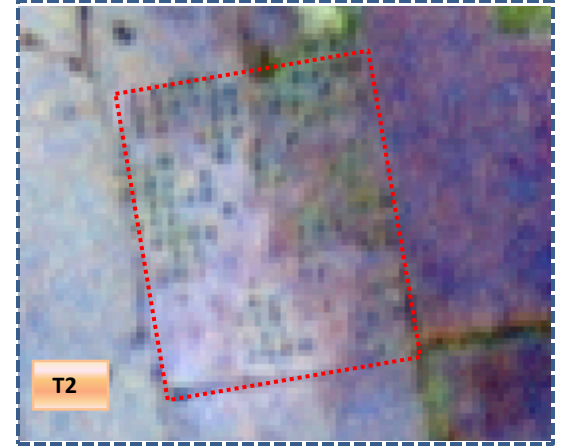
## Land Use and Land Cover changes for Pre and Post treatment dates

### Scrub to Plantation



T1

T1: 2009-10



T2

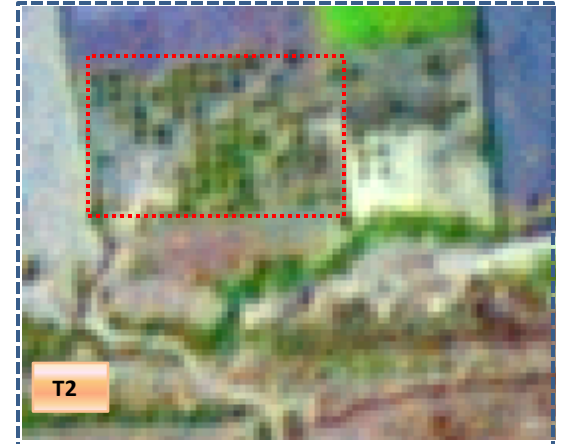
T2: 28 October 2015

### Agriculture to Plantation



T1

T1: 2013



T2

T2: 28 October 2015

**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	Scrubland	Waterbody- Streams/ River	Water body Ponds	Grand Total
Built up	58.96										58.96
Mining/dump		0.61									0.61
Agriculture	5.09		11324.43					173.03		2.36	11504.91
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrubland	1.48		60.54					740.66	1.34	0.40	804.42
Waterbody- Streams/River			0.63						39.56		40.19
Waterbody – Ponds			3.35							72.70	76.05
<b>Grand Total</b>	<b>65.53</b>	<b>0.61</b>	<b>11388.95</b>					<b>913.69</b>	<b>40.90</b>	<b>75.46</b>	<b>12485.14</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 180.48 ha of the agriculture area has decreased and it is converted into built up, scrubland and water body in T2.
- In T2 64.52 ha of the agriculture area has increased from scrubland and water body of T1. The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions during study period- 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	Scrubland	Waterbody- Streams/ River	Water body Ponds	Grand Total
Built up	65.53										65.53
Mining/dump		0.61									0.61
Agriculture			11328.53					60.41			11388.95
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrubland	0.42		223.30					689.31		0.66	913.69
Waterbody- Streams/River									40.90		40.90
Waterbody – Ponds										75.46	75.46
<b>Grand Total</b>	<b>65.95</b>	<b>0.61</b>	<b>11551.84</b>					<b>749.72</b>	<b>40.90</b>	<b>76.12</b>	<b>12485.14</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 60.41 ha of the agriculture area has decreased and it is converted into scrub land in T2.
- In T2 223.30 ha of the agriculture area has increased from 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	Scrubland	Waterbody- Streams/ River	Water body Ponds	Grand Total
Built up	65.95										65.95
Mining/dump		0.61									0.61
Agriculture	2.10		11514.12					32.45		3.16	11551.84
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrubland	0.86		100.69					614.36	27.03	6.79	749.72
Waterbody- Streams/River									40.90		40.90
Waterbody – Ponds			0.11							76.01	76.12
<b>Grand Total</b>	<b>68.91</b>	<b>0.61</b>	<b>11614.92</b>					<b>646.81</b>	<b>67.93</b>	<b>85.96</b>	<b>12485.14</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 T2 37.72 ha of the agriculture area has been decreased and it is converted into built-up, scrubland and water body area in T3.
- In T3 100.80 ha of the agriculture area has increased from 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	Scrubland	Waterbody- Streams/ River	Water body Ponds	Grand Total
Built up	68.91										68.91
Mining/dump		0.57								0.04	0.61
Agriculture			11610.50							4.42	11614.92
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrubland			21.37					625.01		0.43	646.81
Waterbody- Streams/River									67.93		67.93
Waterbody – Ponds										85.96	85.96
<b>Grand Total</b>	<b>68.91</b>	<b>0.57</b>	<b>11631.87</b>					<b>625.01</b>	<b>67.93</b>	<b>90.85</b>	<b>12485.14</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 T3 4.42 ha of the agriculture area has been decreased and it is converted into water body area in T4.
- In T4 21.37 ha of the agriculture area has increased from 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- 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	Scrubland	Waterbody- Streams/ River	Water body Ponds	Grand Total
Built up	68.91										68.91
Mining/dump		0.57									0.57
Agriculture			11628.78							3.09	11631.87
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrubland			2.47					622.32		0.21	625.01
Waterbody- Streams/River									67.93		67.93
Waterbody – Ponds										90.85	90.85
<b>Grand Total</b>	<b>68.91</b>	<b>0.57</b>	<b>11631.25</b>					<b>622.32</b>	<b>67.93</b>	<b>94.16</b>	<b>12485.14</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 T4 3.09 ha of the agriculture area has been decreased and it is converted into water body area in T5.
- In T5 2.47 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 45.85 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 162.89, 63.08 & 16.95 Hectares From T0-T1, T2-T3 & T3-T4 respectively and overall increase of 242.93 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 182.10 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (4) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (5) verified from the portal.