

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -04/2009-10  
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

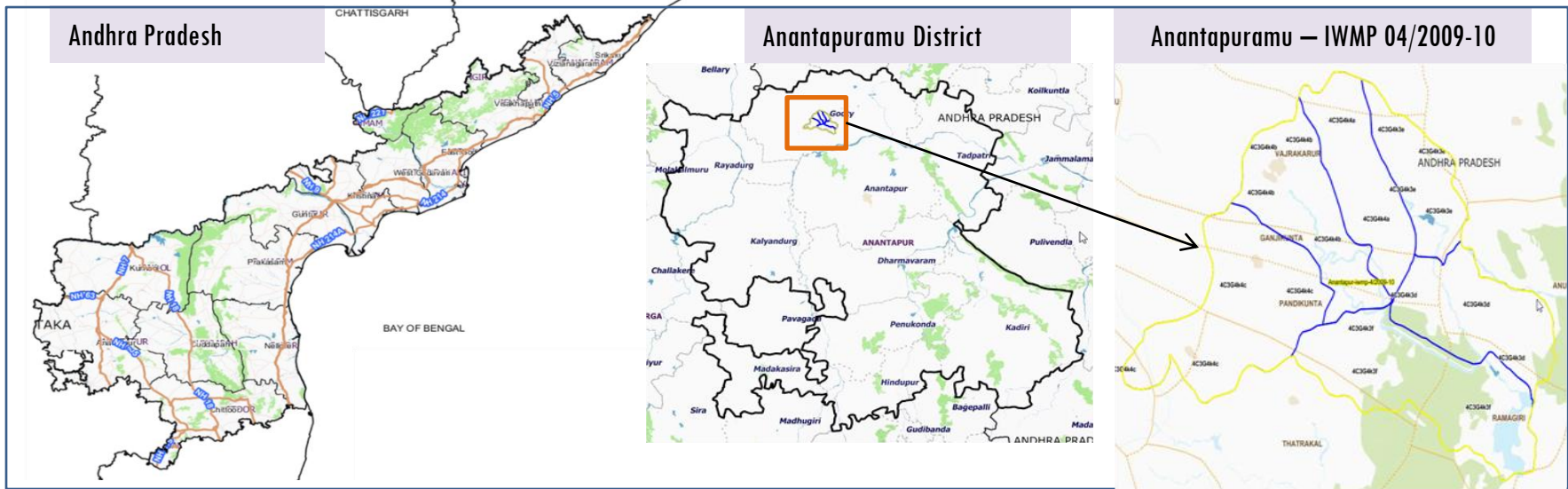
## **E X E C U T I V E   S U M M A R Y**

- 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-04/2009-10, Anantapur District of Andhra Pradesh. The total geographical area of the project is 7095.52 ha. It comprises of 6 micro watersheds.
- In the project area 171 Drishti photos were uploaded showing 63 check dams/percolatin tank/other civil works,11 Farm ponds, 89 new works, 8 fodder development/varmi compost, 1 rock fill dam and 17 drishti photos are other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 11 new farm ponds or dug out ponds with 8.05 ha increase in the area.
- Major percentage i.e. 70.45 % is covered by the agriculture, 17.22 % is covered by Scrubland, 8.05 % by forest land and remaining by other land use classes.

# PROJECT : ANANTAPURAMU - IWMP-04/2009-10

## District : Anantapuramu, State : Andhra Pradesh

- The study area falls in Vajrakarur Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 7095.52 ha. It comprises of 6 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



- Anantapuramu 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.
- Anantapuramu 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).
- Anantapuramu district receives moderate to good rainfall from July to October month.

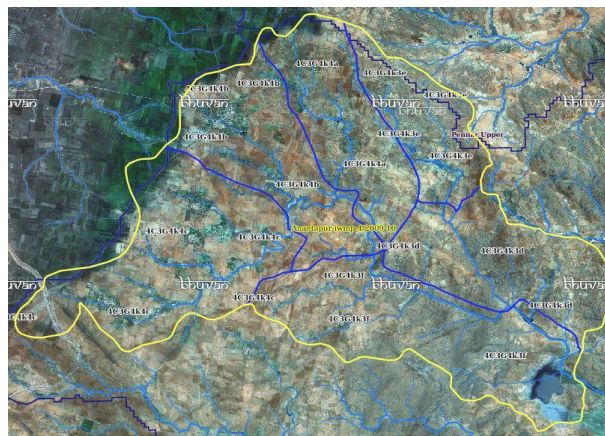
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			9-Jan-16
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			9-Nov-16
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	171
4	Detailed Project Report		

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



## Legend



Drainage (1:10000 Scale)

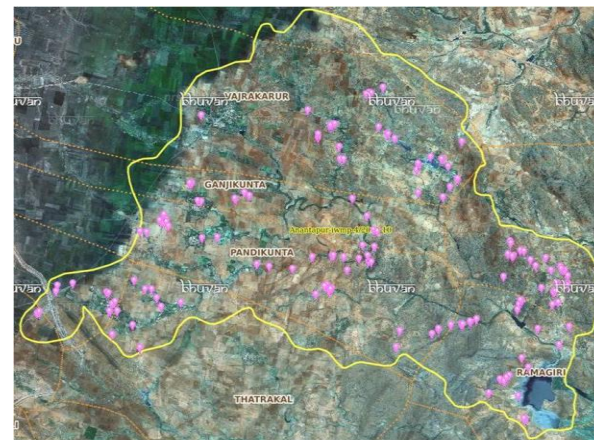


MWS Boundary



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	New activity	0	0
9	Fodder development/Varmi compost	0	0
10	Farm ponds/Dug out pits	9	8
11	Check dams /Civil work/Percolation tanks	3	3
12	Checks & Plugs	63	51
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	7	6
16	water harvesting structure	0	0
17	Entry Point Activity	0	0
18	Others	89	70
	<b>TOTAL</b>	<b>171</b>	<b>138</b>

## MONITORING IN THE PROJECT AREA

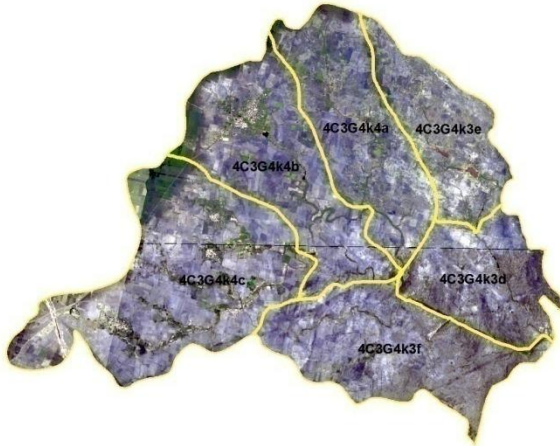
### Site Wise Changes in the Project

- 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.



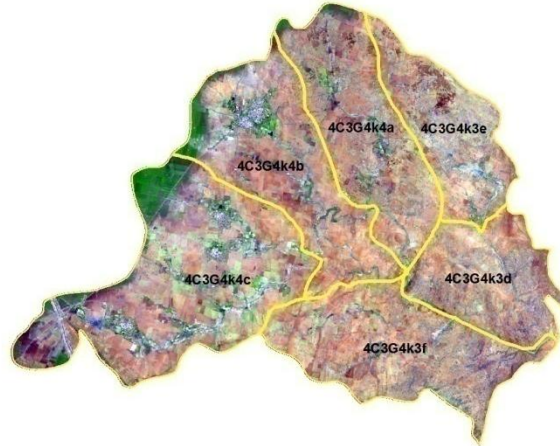
# Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2009-10



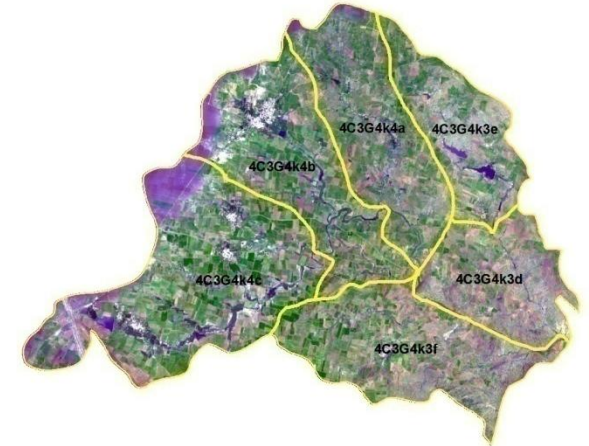
Source:Fusen data,NRSC

Natural Color Composite- 27th March 2013



Source:Fusen data,NRSC

Natural Color Composite- 28th October 2015



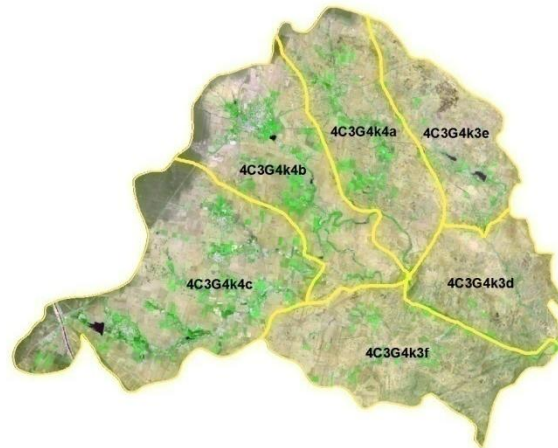
Source:Fusen data,NRSC

Natural Color Composite- 2016



Source:Fusen data,NRSC

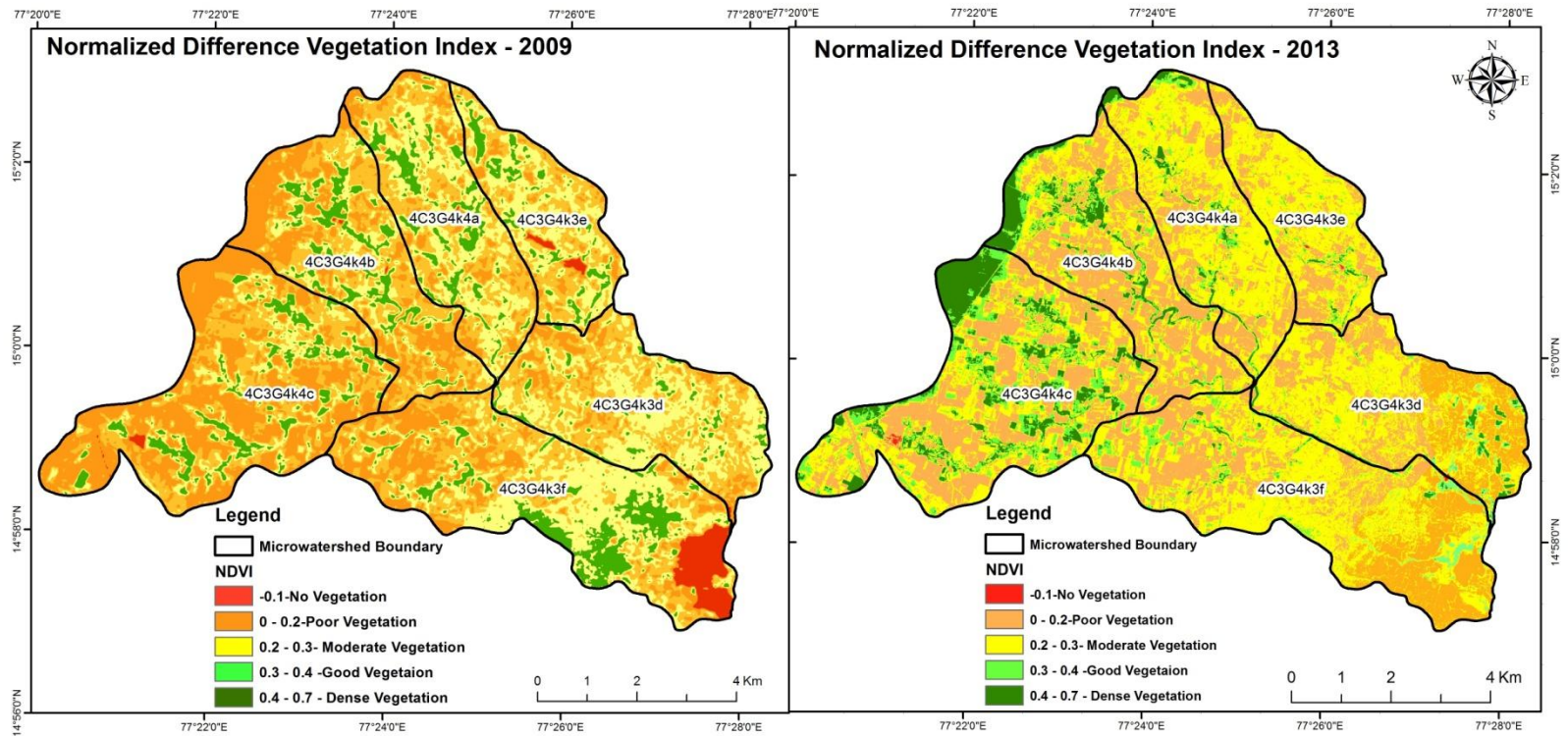
Natural Color Composite- 01st April 2018



Source:LISS-IV,NRSC



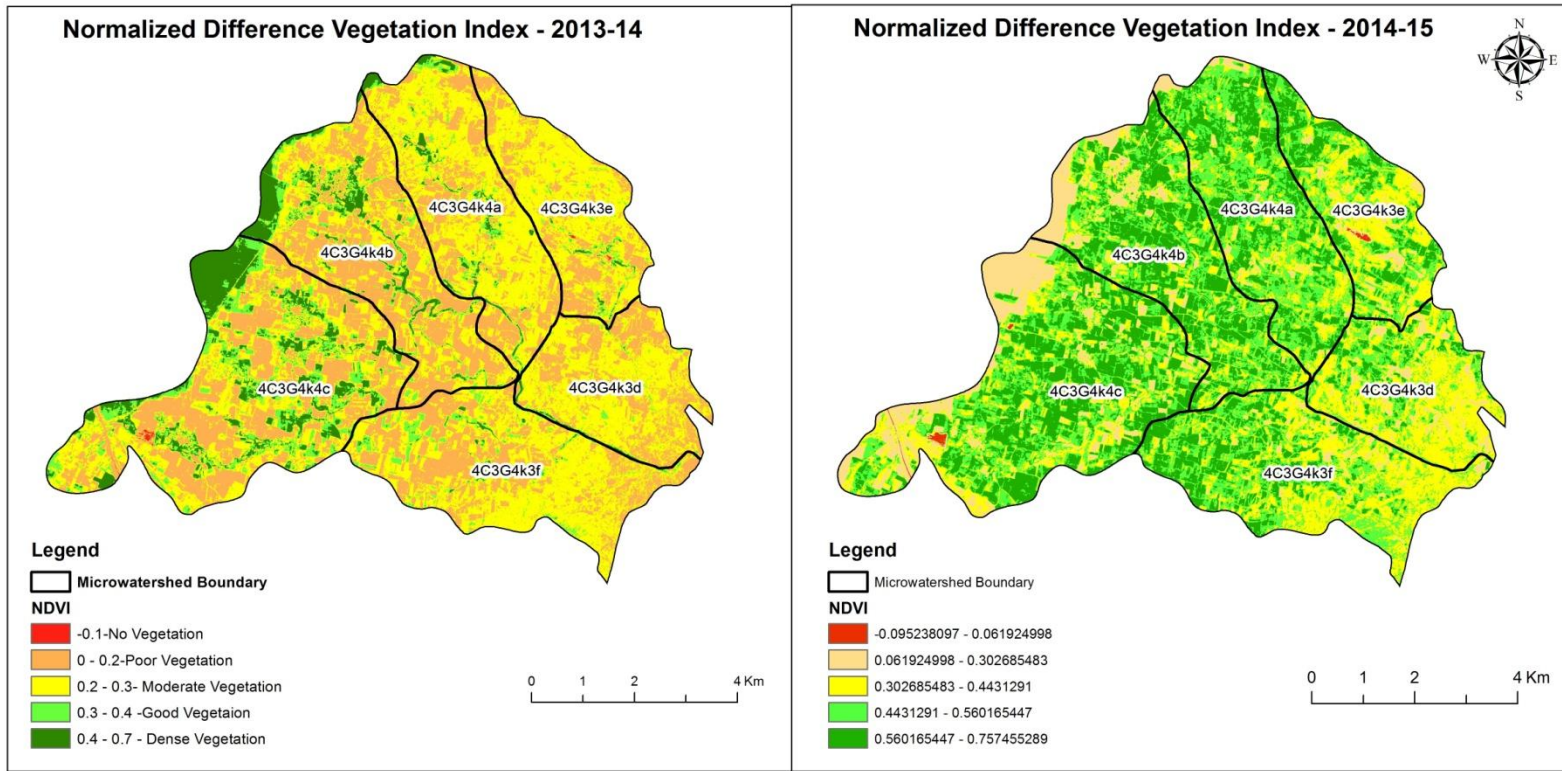
# Changes in Vegetation Cover



NDVI (2009-10)

NDVI (12 October 2015)

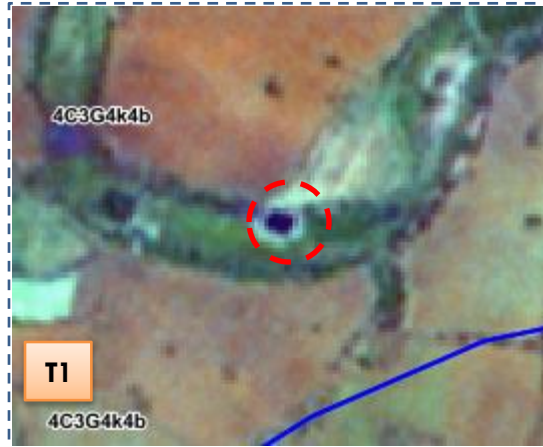
# Changes in Vegetation Cover



NDVI (2013-14)

NDVI (28 October 2015)

# Monitoring of activities in Anantapur District Andhra Pradesh. IWMP-04/2009-10



T0:2009-10

T1: 27 March 2013

Drishti SI no. 238590 MWS :4C3G4k4b

Farm pond



T0:2009-10

T1: 27 March 2013

Drishti SI no.781505 MWS : 4C3G4k3e

Check Dam



Monitoring of activities in Anantapuramu District Andhra Pradesh. IWMP-04/2009-10



T0: 2009-10



T1: 27 March 2013



Drishti SI no. 238082 MWS :4C3Ci1f

Farm pond



T0: 2009-10



T1: 27 March 2013



Drishti SI no. 238404 MWS :4C3G4k3f

Percolation tank

Monitoring of activities in Anantapur District Andhra Pradesh. IWMP-04/2009-10



T0: January 23 2013

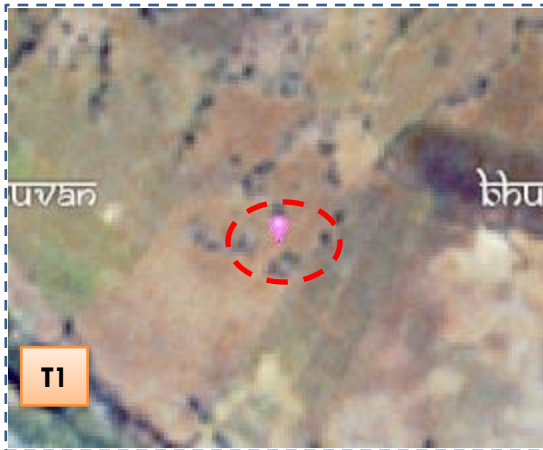


T1: 28 October 2015

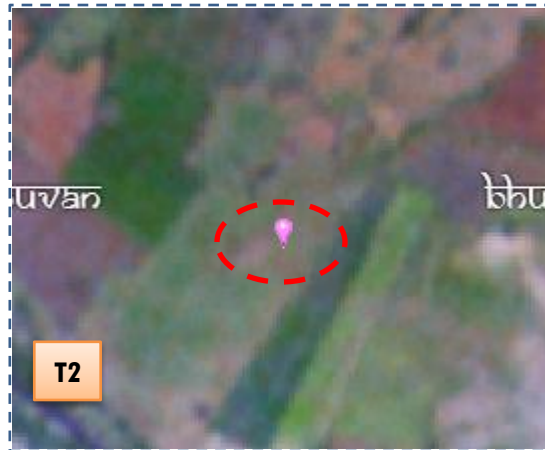


Drishti SI no.129688 MWS :4C3G4k4b

**Boulder Removal**



T0: January 23 2013



T1: 28 October 2015



Drishti SI no. 133205 MWS : 4C3G4k3e

**Boulder Removal**

## MONITORING IN THE PROJECT AREA

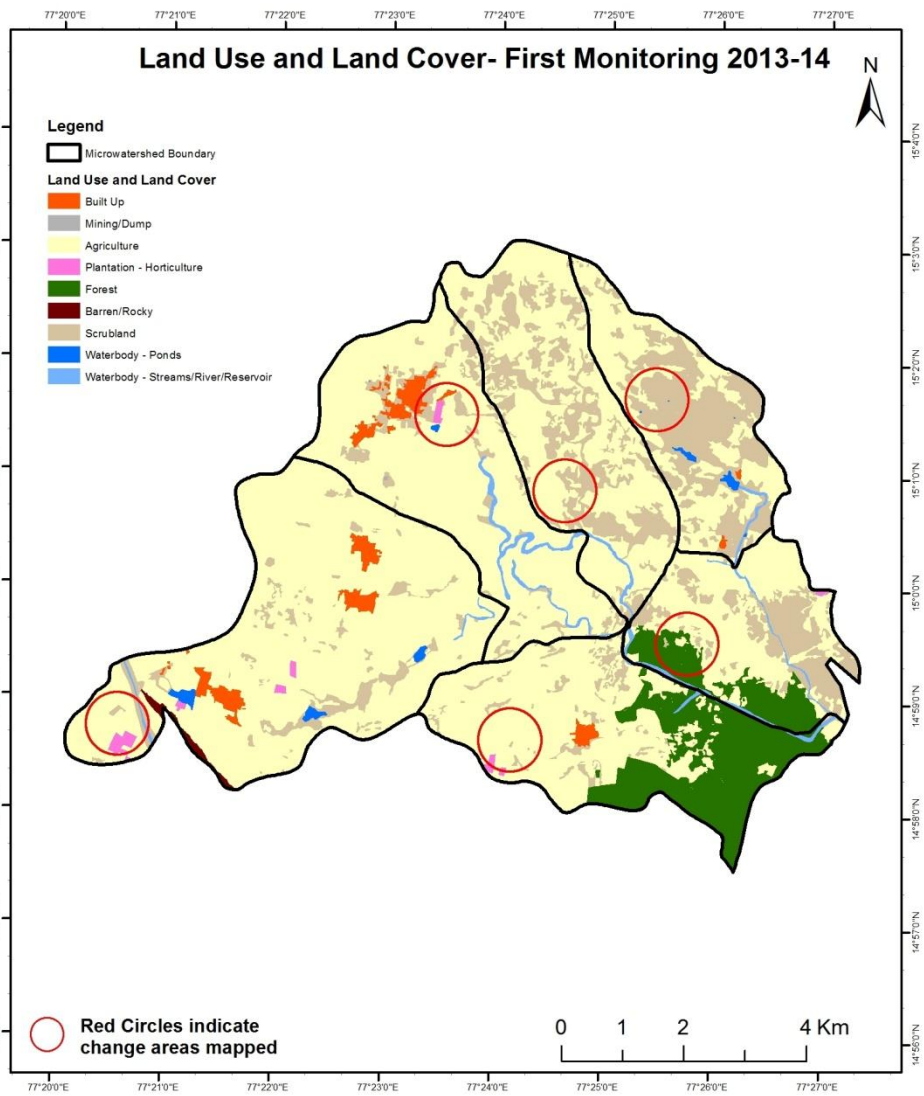
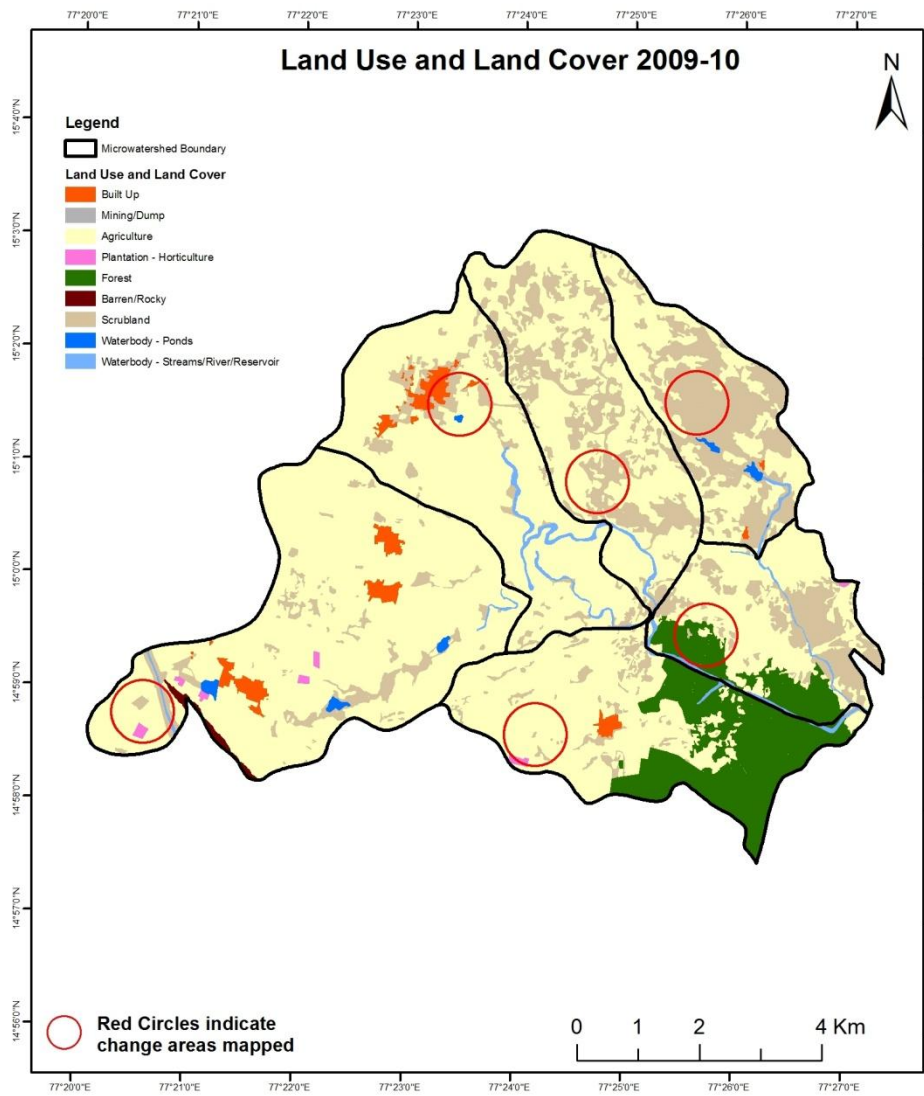
### Land use and Land cover Changes in the Project

- 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 pre implementation period as T0 (2009-10) and row represents the post implementation period as T5 (2017-18) .



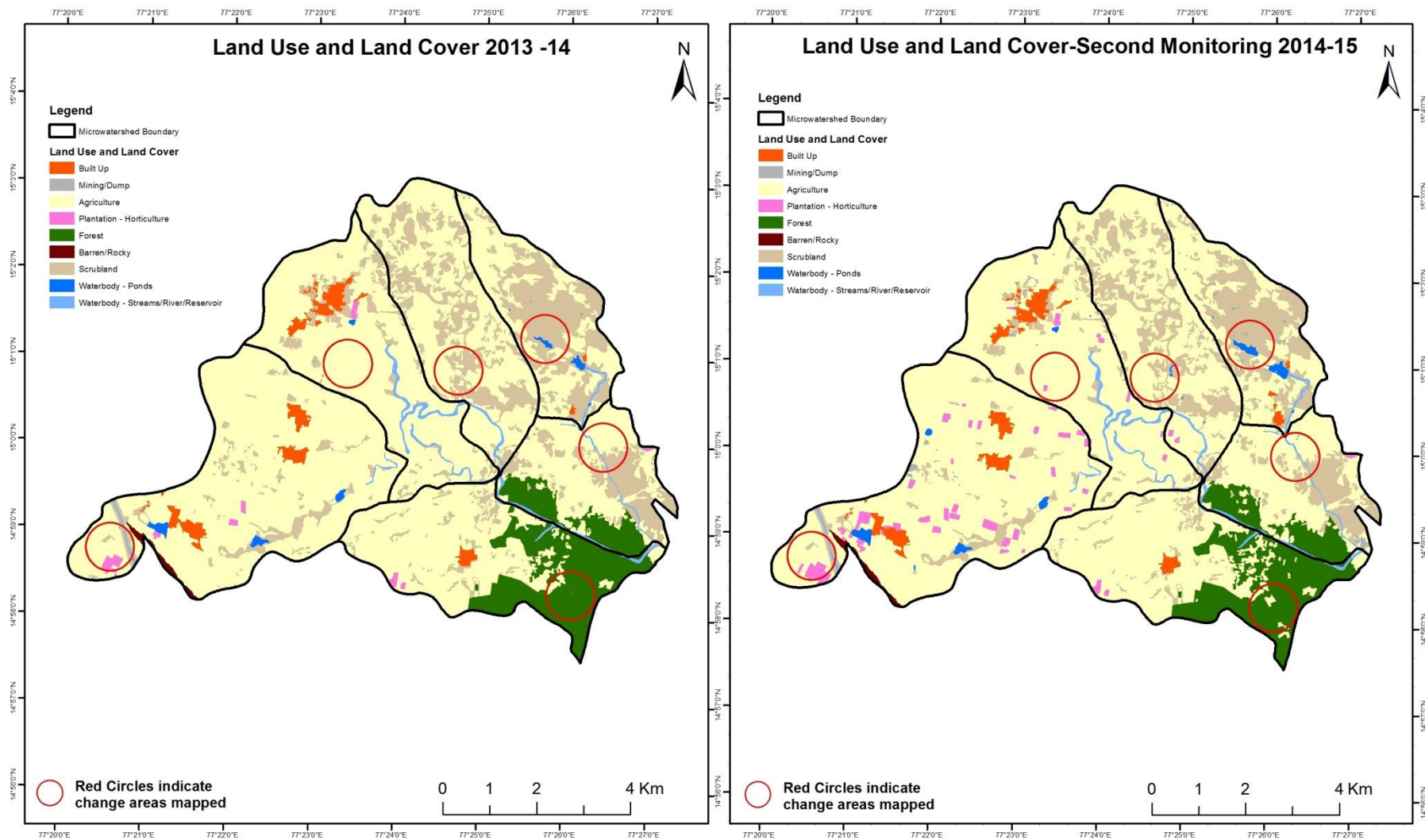
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



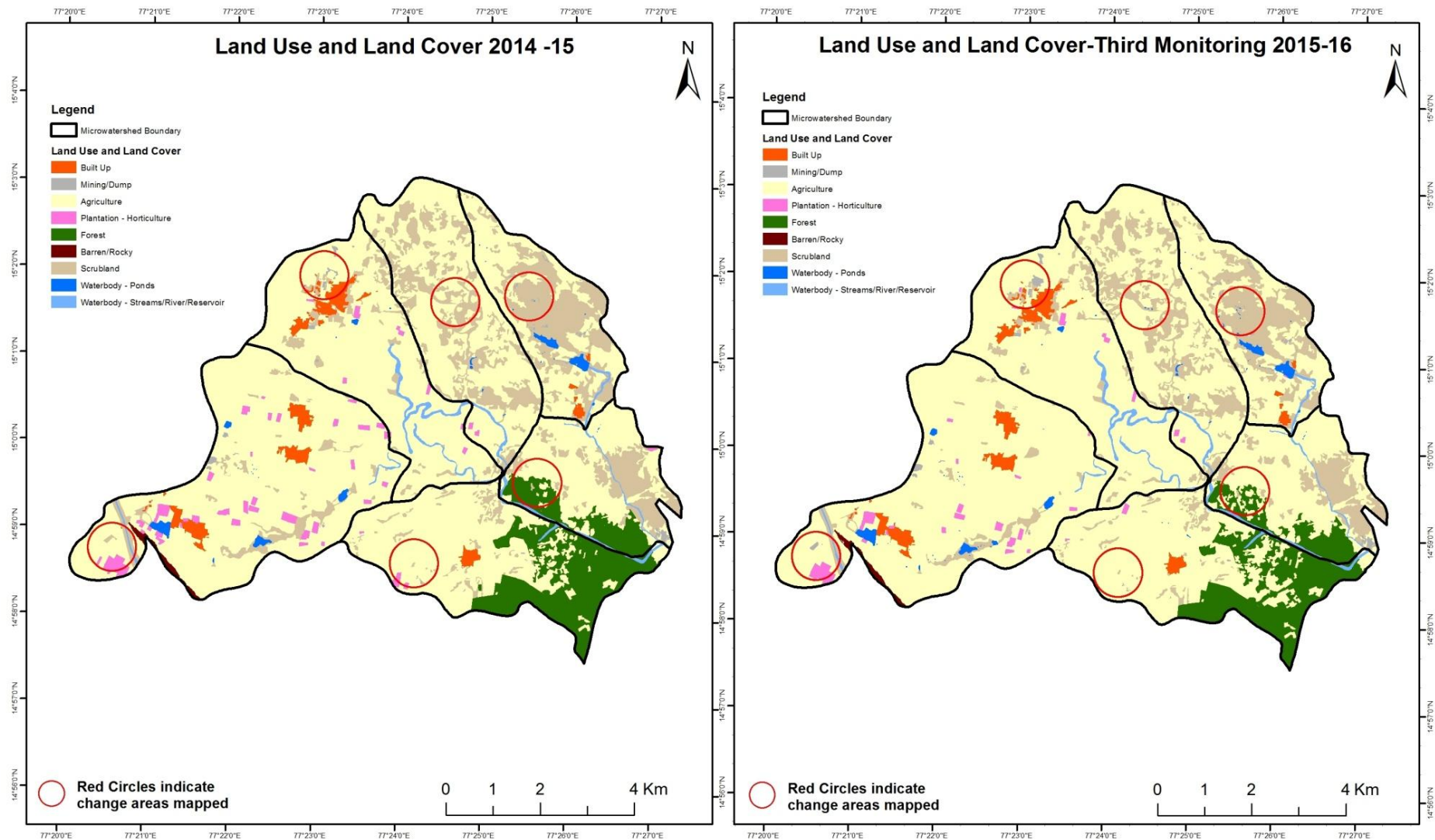
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



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

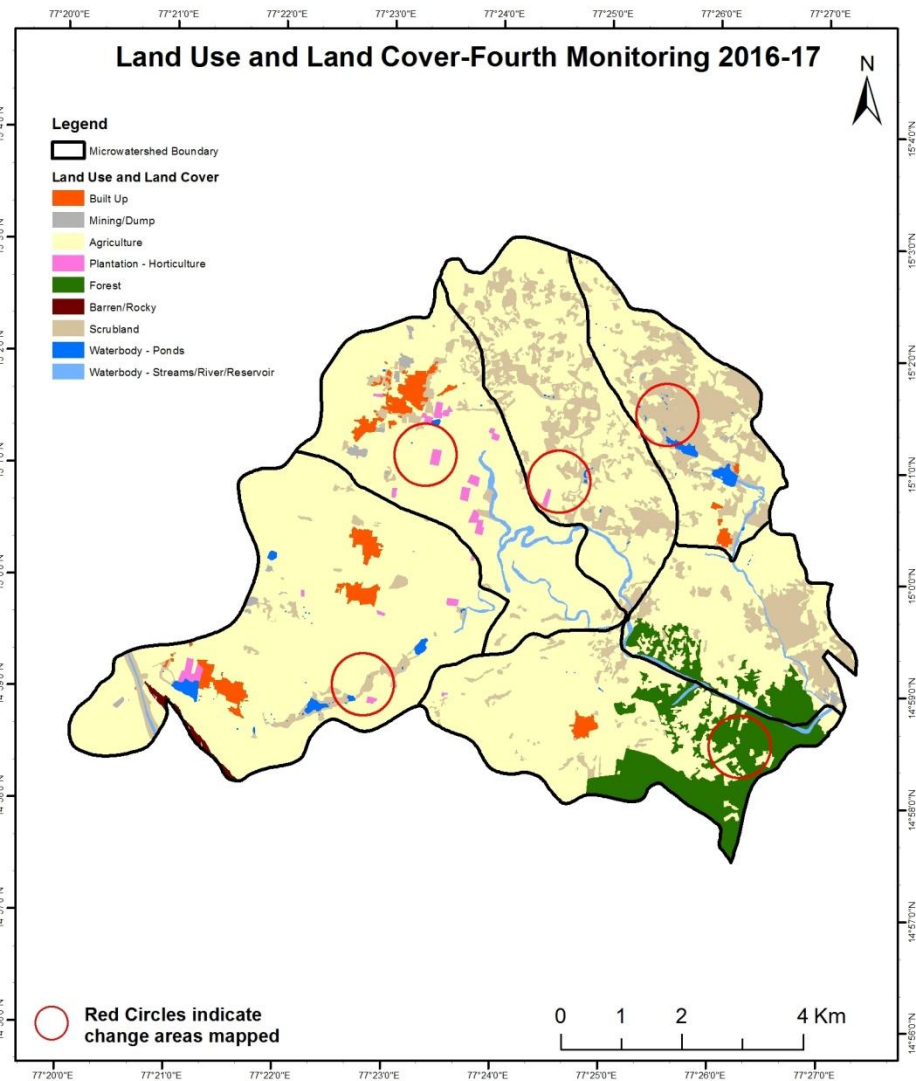
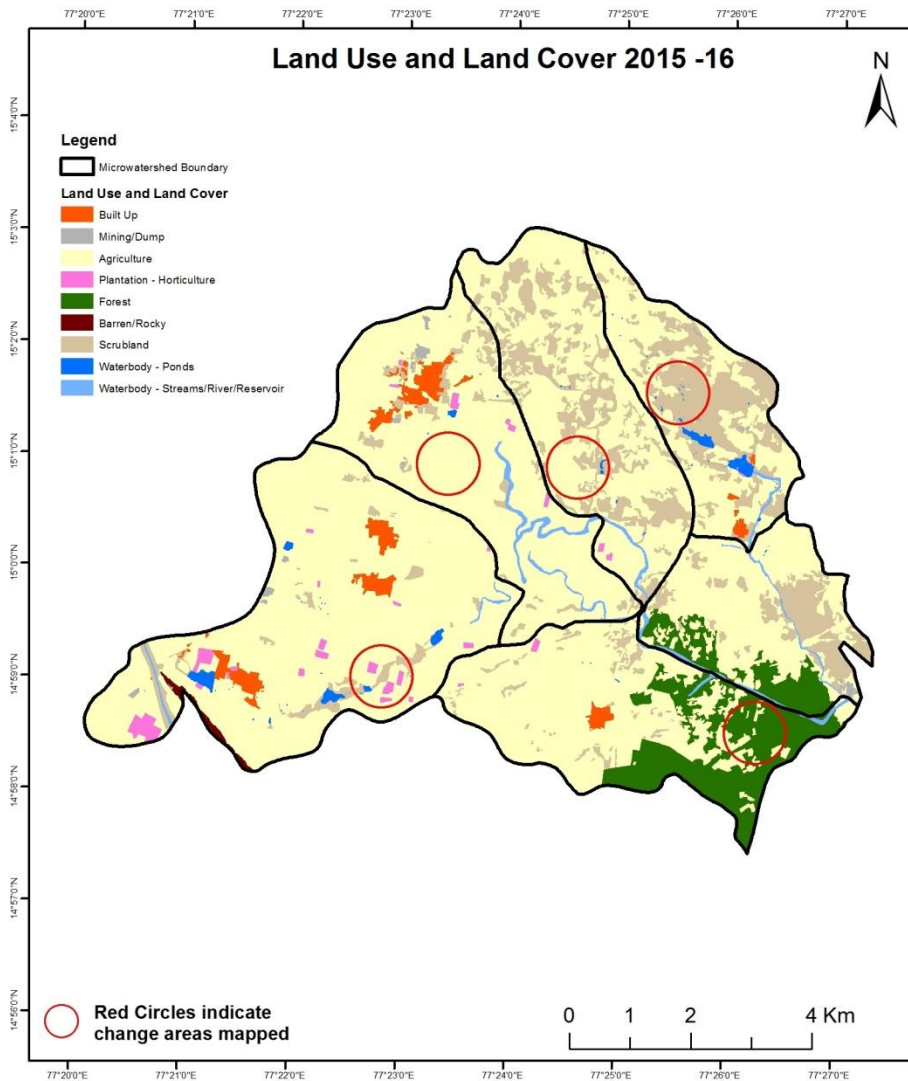
Scale: 1:10000





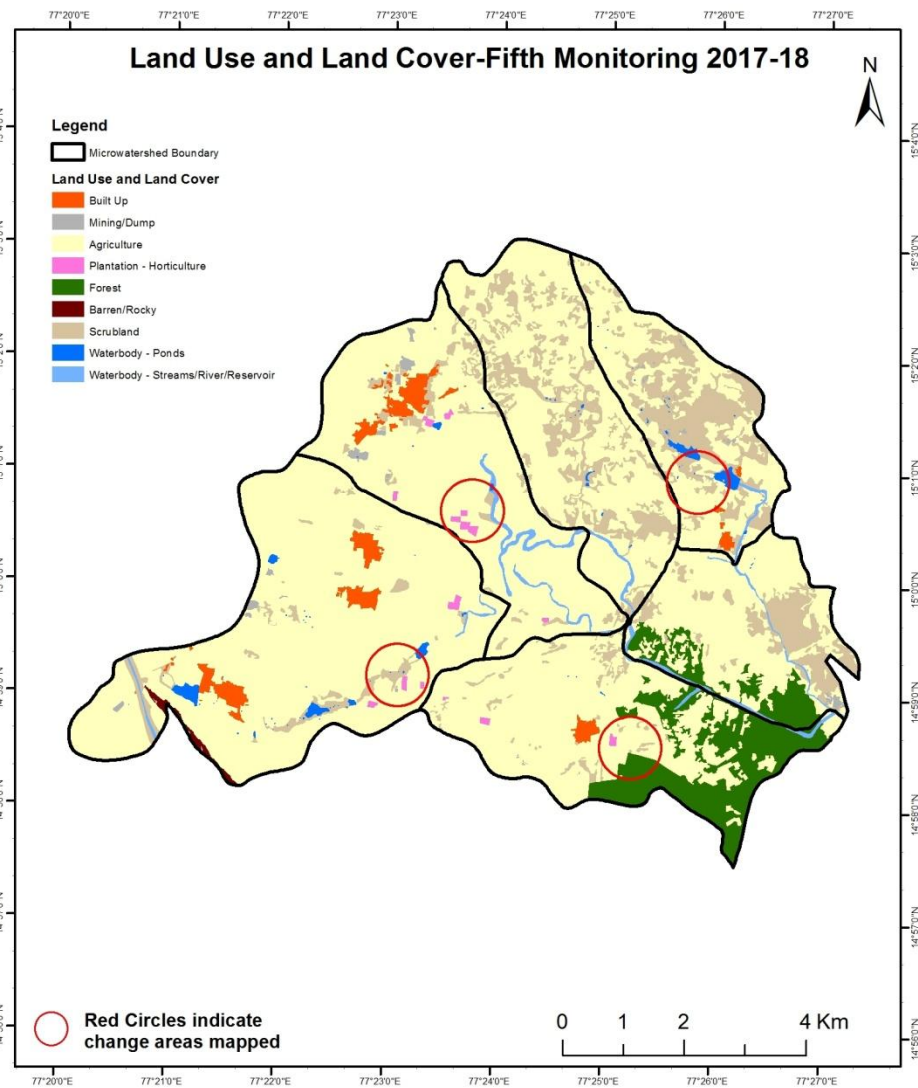
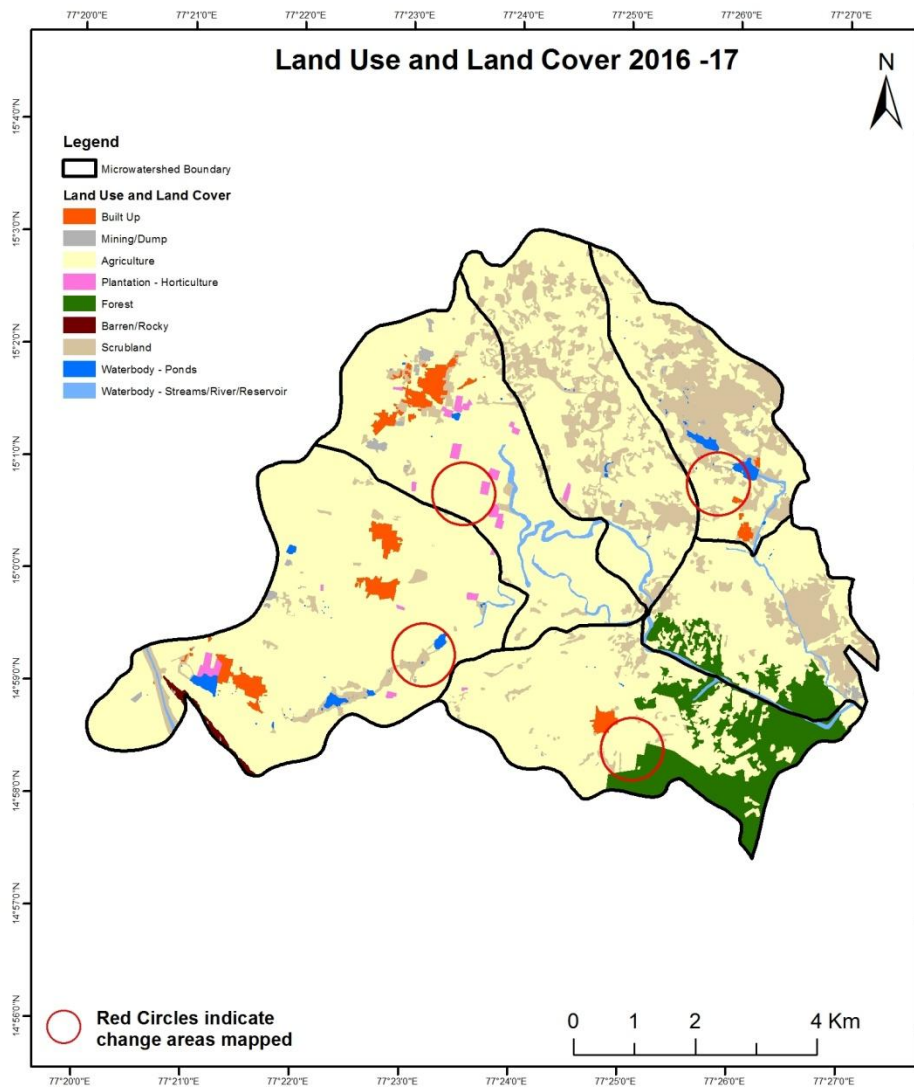
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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



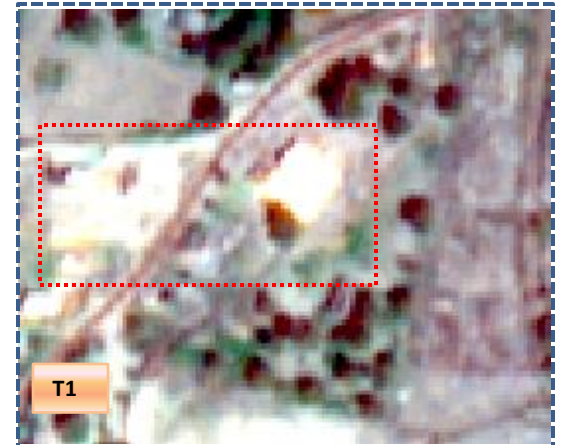
## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Built up



T0

T0: 2009-10



T1

T1: 27 March 2013

Agriculture to Plantation



T0

T0: 2009-10



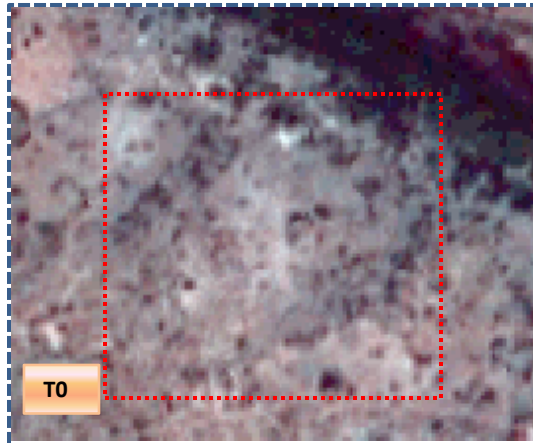
T1

T1: 27 March 2013

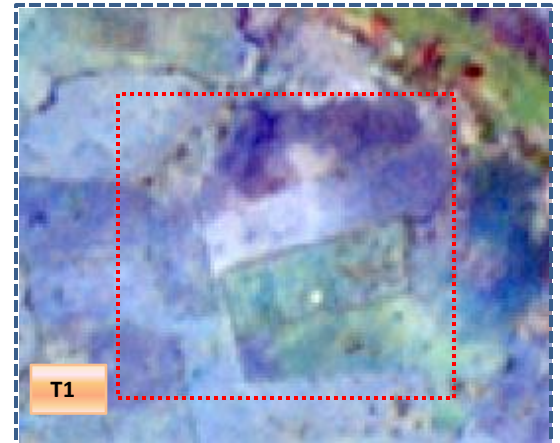


## Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

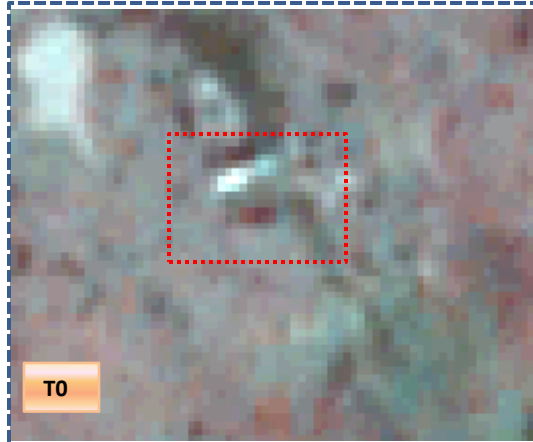


T0: 2009-10

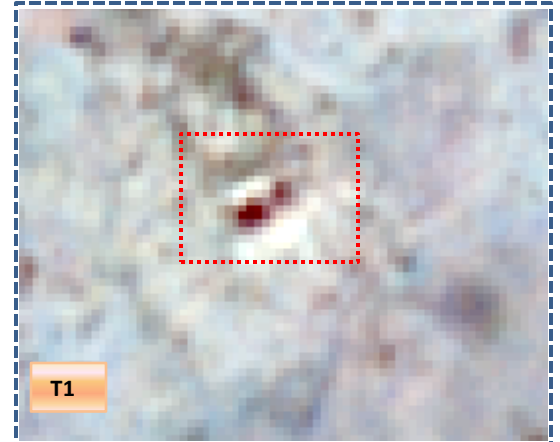


T1: 23 May 2013

Agriculture to Waterbody



T0: 2009-10



T1: 23 May 2013

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

Agriculture to Plantation

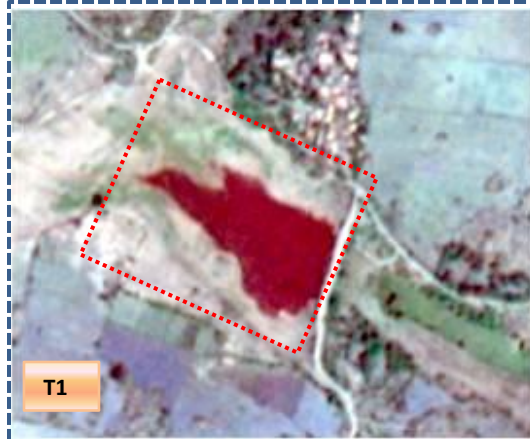


T0: 2013-14

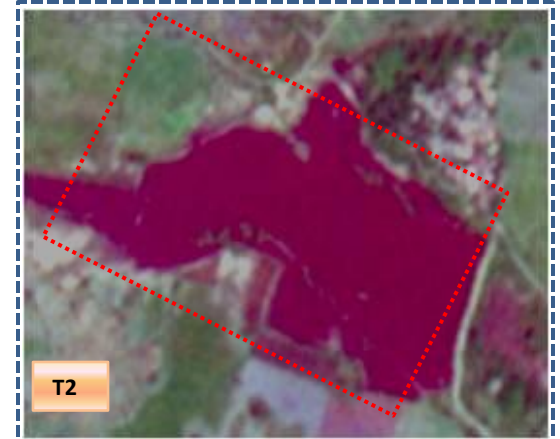


T1: 28 October 2015

Increase Water spread



T0: 2013-14



T1: 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	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	109.91										109.91
Mining/dump											
Agriculture	4.72		4893.01	14.69							4912.42
Plantation Horticulture			2.88	15.30							18.18
Forest			21.27		570.74					0.04	592.05
Forest Plantation											
Barren Rocky							17.46				17.46
Scrub	6.85	0.44	30.68	0.11				1276.18		1.93	1316.19
Waterbody- Streams/River									104.44		104.44
Waterbody – Ponds										24.86	24.86
<b>Grand Total</b>	<b>121.49</b>	<b>0.44</b>	<b>4947.83</b>	<b>30.10</b>	<b>570.74</b>		<b>17.46</b>	<b>1276.18</b>	<b>104.44</b>	<b>26.83</b>	<b>7095.52</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 19.41 ha of agriculture land are decreased and it is converted into built up and plantation in T1.
- In T1 54.83 ha of agriculture area has increased from plantation, 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	121.49										121.49
Mining/dump		0.44									0.44
Agriculture	4.43	13.41	4850.53	77.16						2.30	4947.83
Plantation Horticulture			1.24	28.86							30.10
Forest			25.71		545.03						570.74
Forest Plantation											
Barren Rocky							17.46				17.46
Scrub	6.04	9.57	123.57					1125.68		11.32	1276.18
Waterbody- Streams/River									104.44		104.44
Waterbody – Ponds										26.83	26.83
<b>Grand Total</b>	<b>131.96</b>	<b>23.42</b>	<b>5001.05</b>	<b>106.02</b>	<b>545.03</b>		<b>17.46</b>	<b>1125.68</b>	<b>104.44</b>	<b>40.45</b>	<b>7095.52</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 97.30 ha of agriculture land are decreased and it is converted into built up, mining/dump, plantation and water body in T2.
- In T2 150.52 ha of agriculture area has 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										
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	131.96										131.96
Mining/dump		23.42									23.42
Agriculture	0.39	2.40	4994.50	3.09						0.67	5001.05
Plantation Horticulture			50.01	56.01							106.02
Forest			61.62		483.41						545.03
Forest Plantation											
Barren Rocky		0.24					17.22				17.46
Scrub		1.78	122.28					999.22		2.41	1125.68
Waterbody- Streams/River			0.96						103.49		104.44
Waterbody – Ponds										40.45	40.45
<b>Grand Total</b>	<b>132.34</b>	<b>27.83</b>	<b>5229.37</b>	<b>59.10</b>	<b>483.41</b>		<b>17.22</b>	<b>999.22</b>	<b>103.49</b>	<b>43.53</b>	<b>7095.52</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 6.54 ha of agriculture land are decreased and it is converted into built-up, mining/dump, plantation and water body in T3.
- In T3 234.87 ha of agriculture area has increased from plantation, 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- 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	132.34										132.34
Mining/dump		27.83									27.83
Agriculture	0.11		5196.58	29.43				3.10		0.16	5229.37
Plantation Horticulture			44.77	13.78						0.56	59.10
Forest			35.16		448.25						483.41
Forest Plantation											
Barren Rocky		0.42					16.81				17.22
Scrub		5.14	39.78					953.80		0.50	999.22
Waterbody- Streams/River									103.49		103.49
Waterbody – Ponds										43.53	43.53
<b>Grand Total</b>	<b>132.45</b>	<b>33.39</b>	<b>5316.29</b>	<b>43.20</b>	<b>448.25</b>		<b>16.81</b>	<b>956.90</b>	<b>103.49</b>	<b>44.74</b>	<b>7095.52</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 32.79 ha of agriculture land are decreased and it is converted into built-up, plantation, scrubland and water body in T4.
- In T4 119.71 ha of agriculture area has increased from plantation, forest 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- 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	132.45										132.45
Mining/dump		33.35								0.04	33.39
Agriculture	0.71		5299.18	14.95				1.36		0.09	5316.29
Plantation Horticulture			34.29	8.91							43.20
Forest			2.54		445.70						448.25
Forest Plantation											
Barren Rocky							16.81				16.81
Scrub			25.22					931.23		0.44	956.90
Waterbody- Streams/River									102.83	0.66	103.49
Waterbody – Ponds										44.74	44.74
<b>Grand Total</b>	<b>133.17</b>	<b>33.35</b>	<b>5361.24</b>	<b>23.87</b>	<b>445.70</b>		<b>16.81</b>	<b>932.59</b>	<b>102.83</b>	<b>45.97</b>	<b>7095.52</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 17.11 ha of agriculture land are decreased and it is converted into built-up, plantation, scrubland and water body in T5.
- In T5 62.06 ha of agriculture area has increased from plantation, 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 19.50 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 35.42, 53.22, 228.32, 86.92 & 44.94 Hectares From T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 448.82 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 383.60 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (8) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (9) verified from the portal.