

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -21/2010-11

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad  
March-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

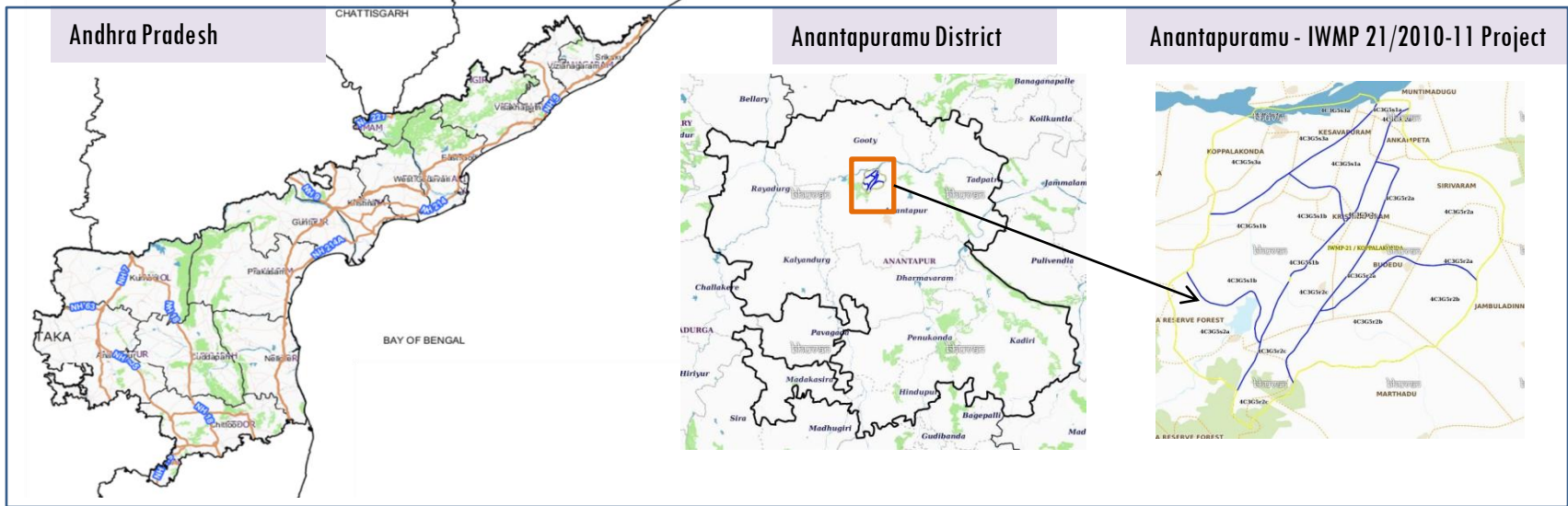
## **E X E C U T I V E   S U M M A R Y**

- 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-21/2010-11, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 10,582 ha. It comprises of 8 micro watersheds.
- In the project area 260 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an decrease by 58 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 72 % is covered by the agriculture, 10 % is covered by Scrub land, 8 % is covered by forest , 5 % is covered by plantation and remaining by other land use classes.

# PROJECT : ANANTAPURAMU – IWMP-21/2010-11

## DISTRICT : ANANTAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Garladinne Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 10,582 ha. It comprises of 8 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -II*) projects taking 2018-19 (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.

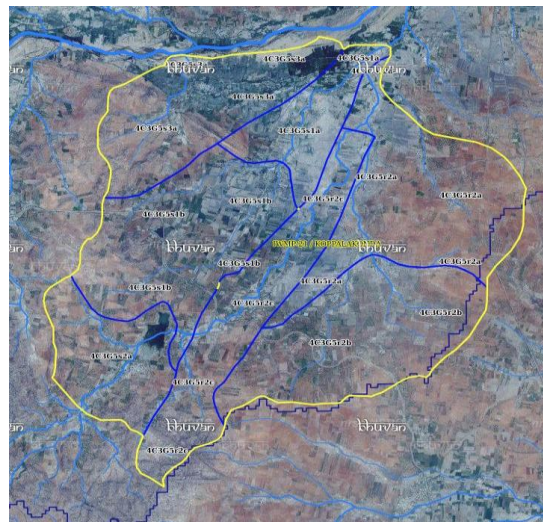
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			25-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			25-Mar-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	Drishiti Photographs		
		Total	260
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

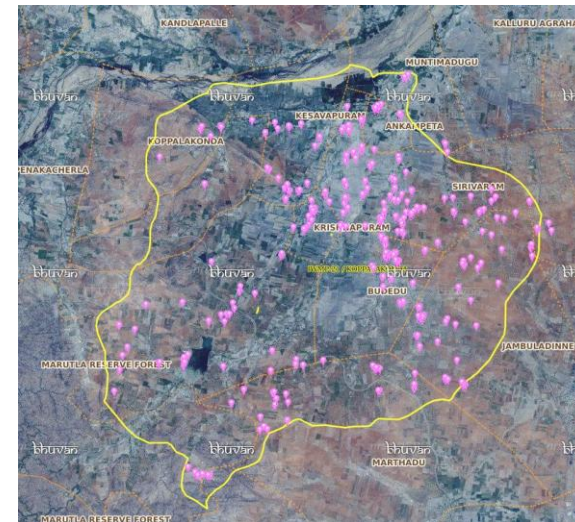


MWS Boundary



Project Boundary

## Natural Color Composite overlaid with Drishiti Points



### Drishiti Upload Status

## Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	4	4
2	Agriculture/Horticulture	18	18
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	22	15
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	47	35
10	Civil work-Check dams/Rock fill dam	107	92
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	7	7
14	Livelihood Activities-Plantation/Horticulture	11	10
15	Capacity Building Activities	0	0
16	Entry Point Activity	4	3
17	Others	141	76
	<b>TOTAL</b>	<b>361</b>	<b>260</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 (2010-11) and T5 is 2018-19 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.

Anantapuramu-IWMP-21/2010-11

2009-10



June-2014



Feb-2015



Jan-2017



Jan-2019



Activity : Farm pond



Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-21/2010-11



T0:2010-11



T1: 02 May 2014

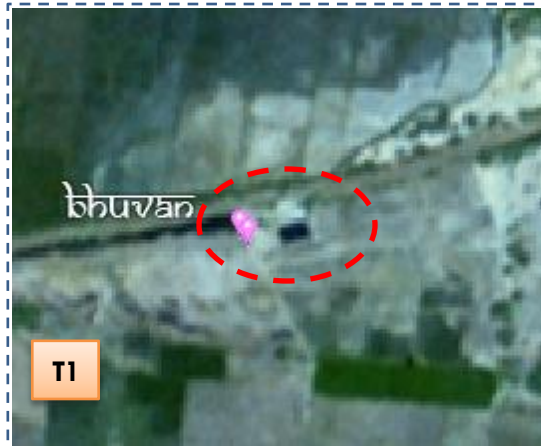


Drishti SI no. 133849 MWS : 4C3G5r2a

Dugout pit



T0:2010-11



T1: 02 May 2014



Drishti SI no. 1744763 MWS : 4C3G5s3a

Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-21/2010-11



T0:2010-11

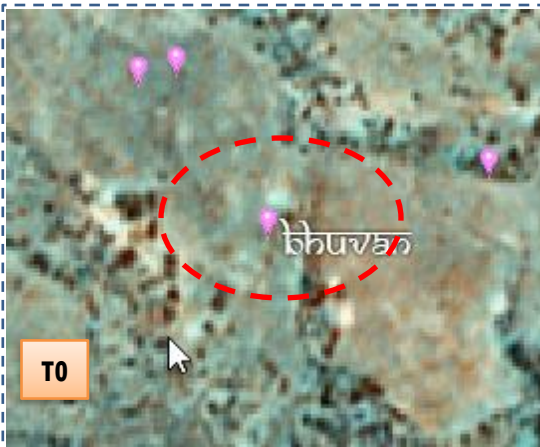


T1: 02 May 2014



Drishti Sl no. 1748604 MWS : 4C3G5s2a

Pond



T0:2010-11



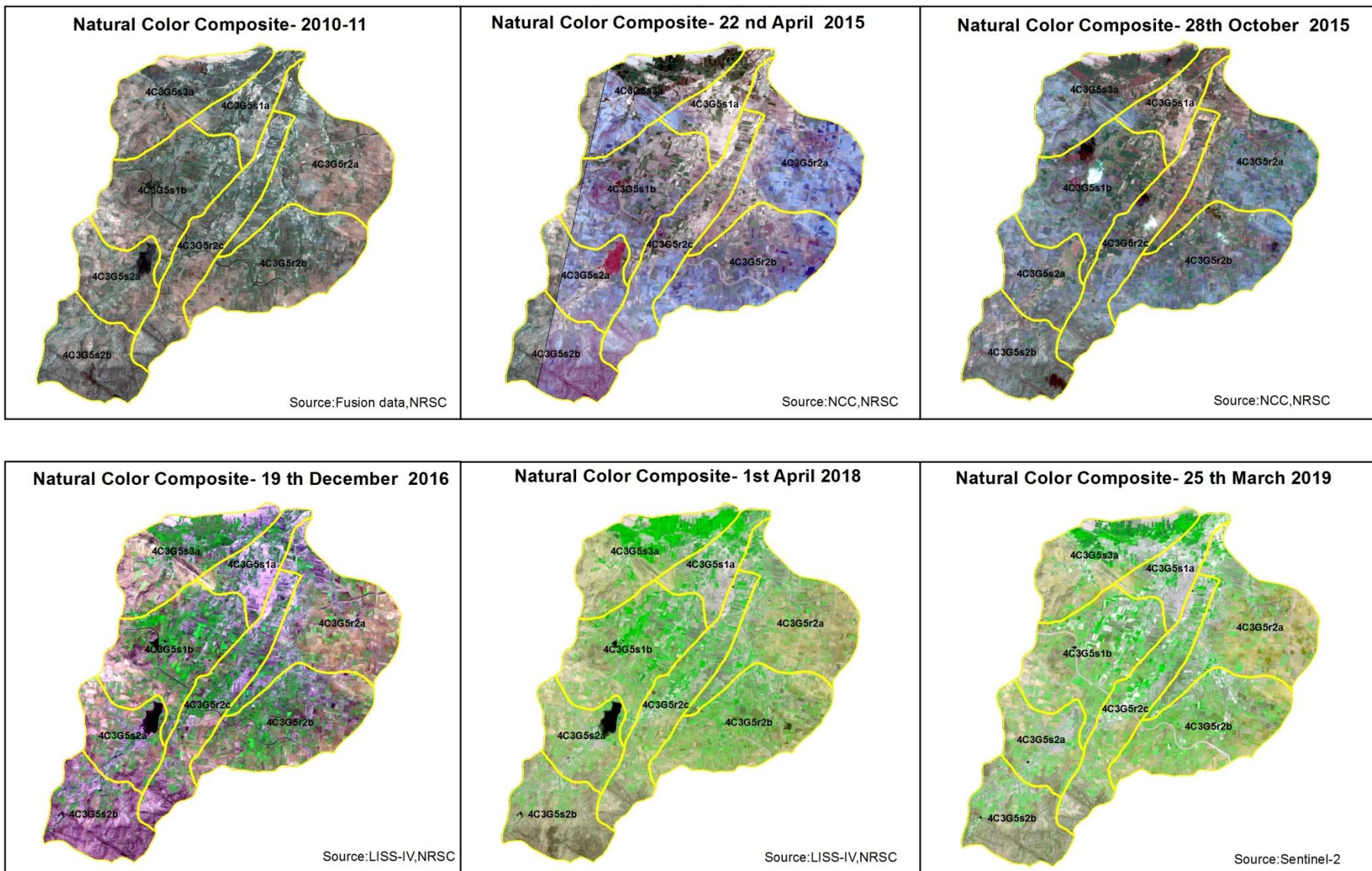
T1: 02 May 2014



Drishti Sl no. 1748675 MWS : 4C3G5r2c

Pond

# Natural Color Composite – 2010-11 to 2018-19



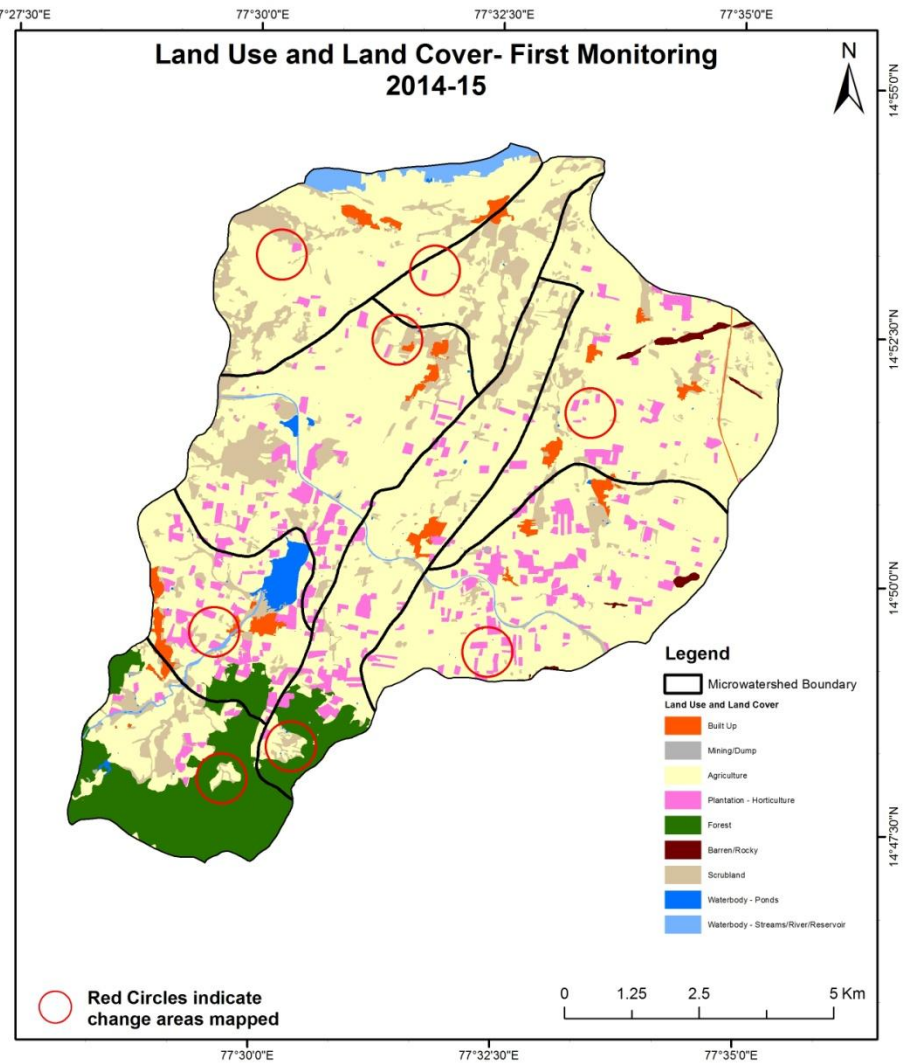
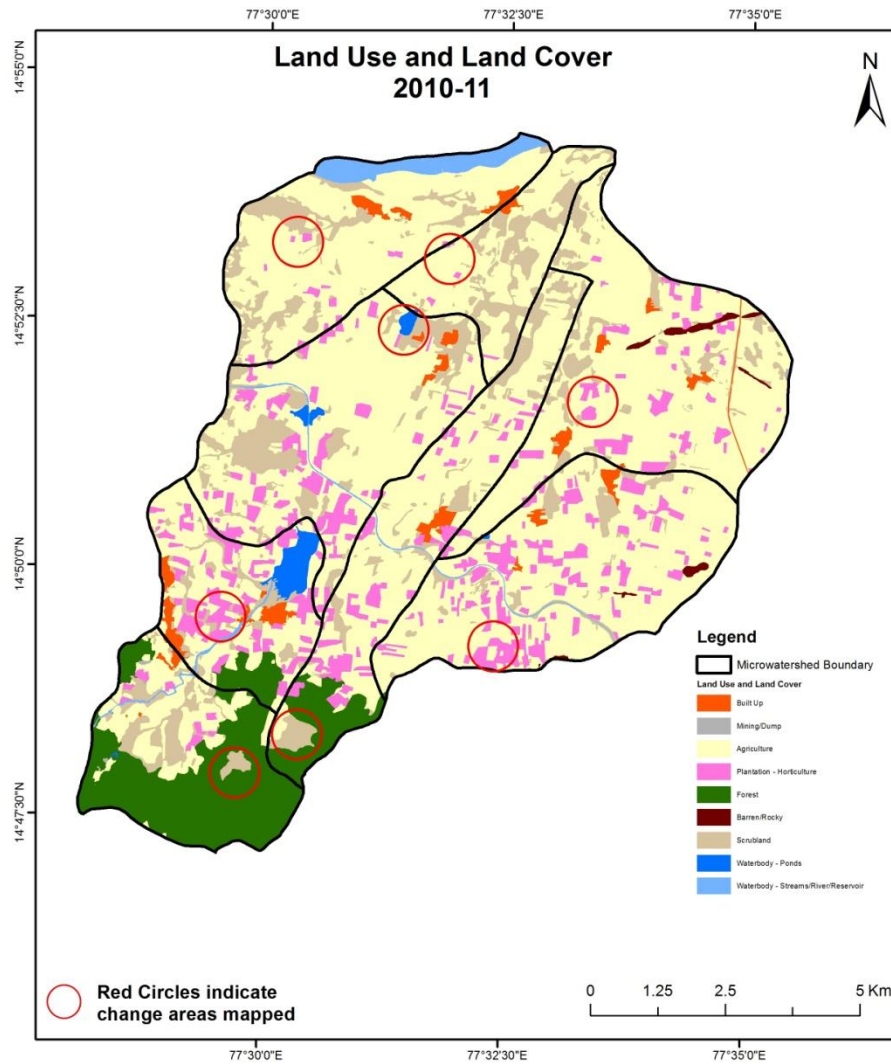
## MONITORING IN THE PROJECT AREA

### 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 (2010-11) and row represents the T5 (2018-19)

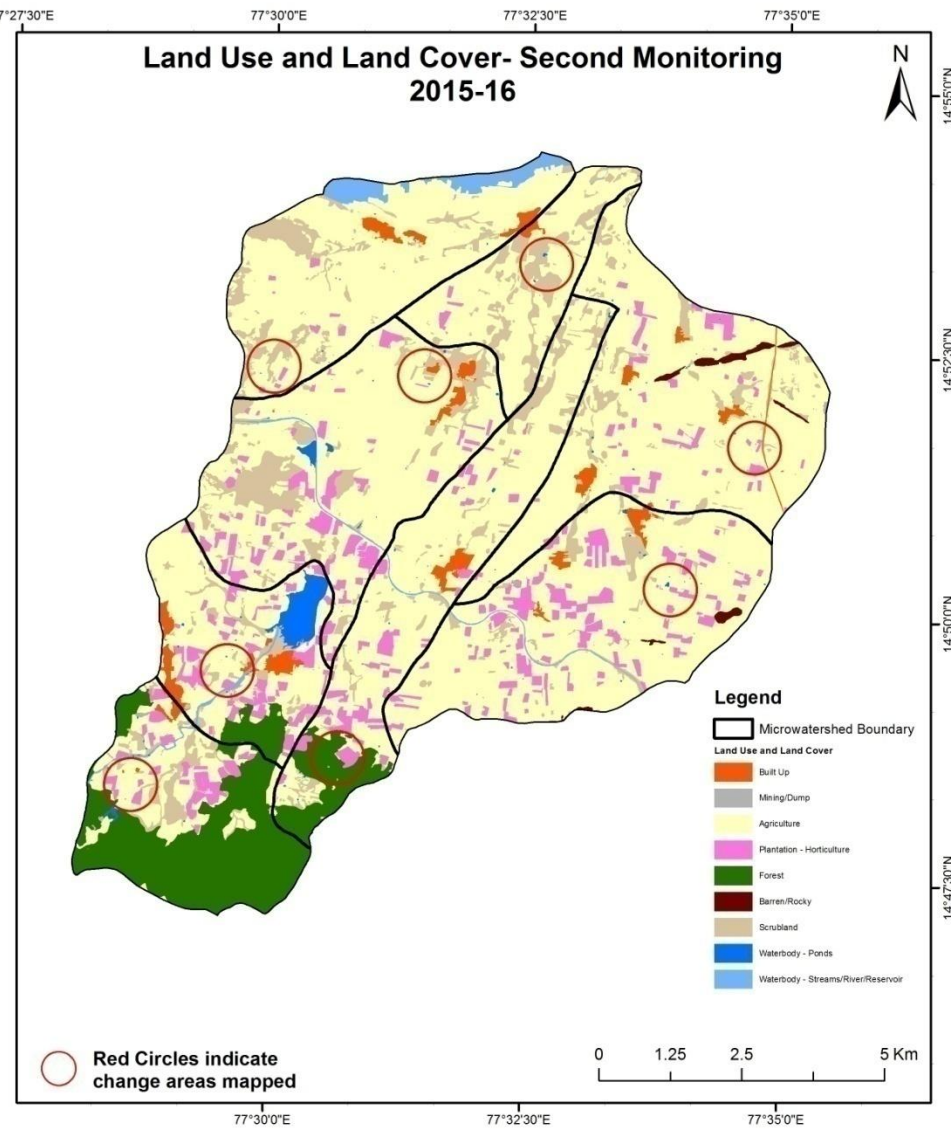
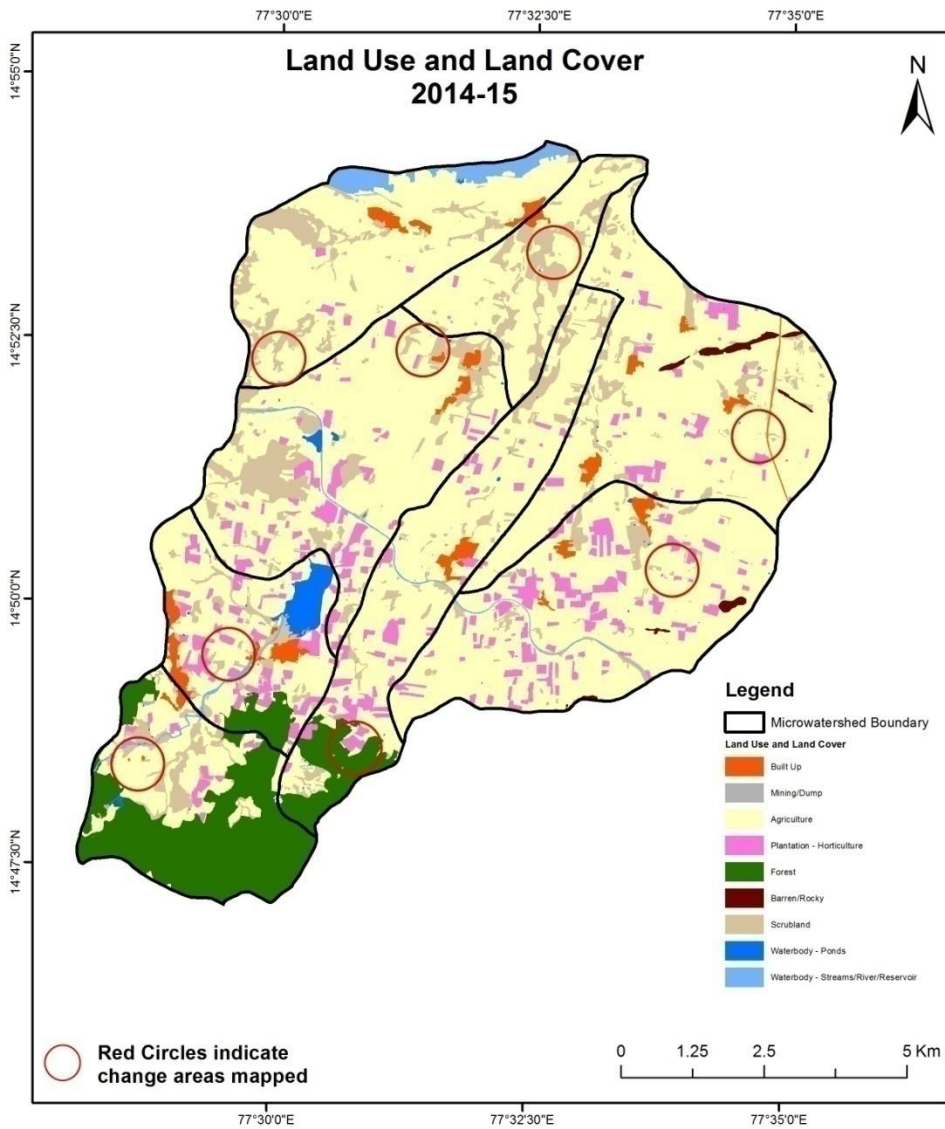
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



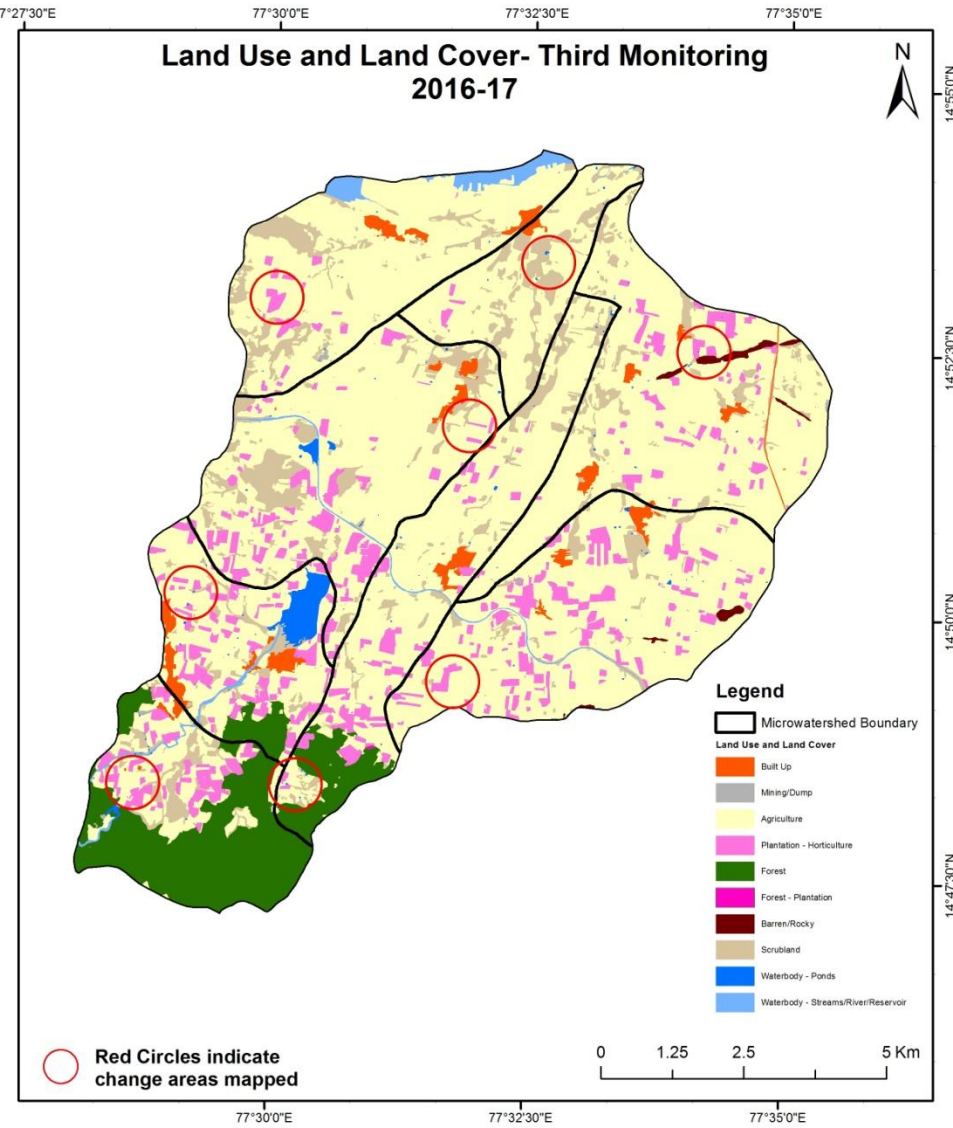
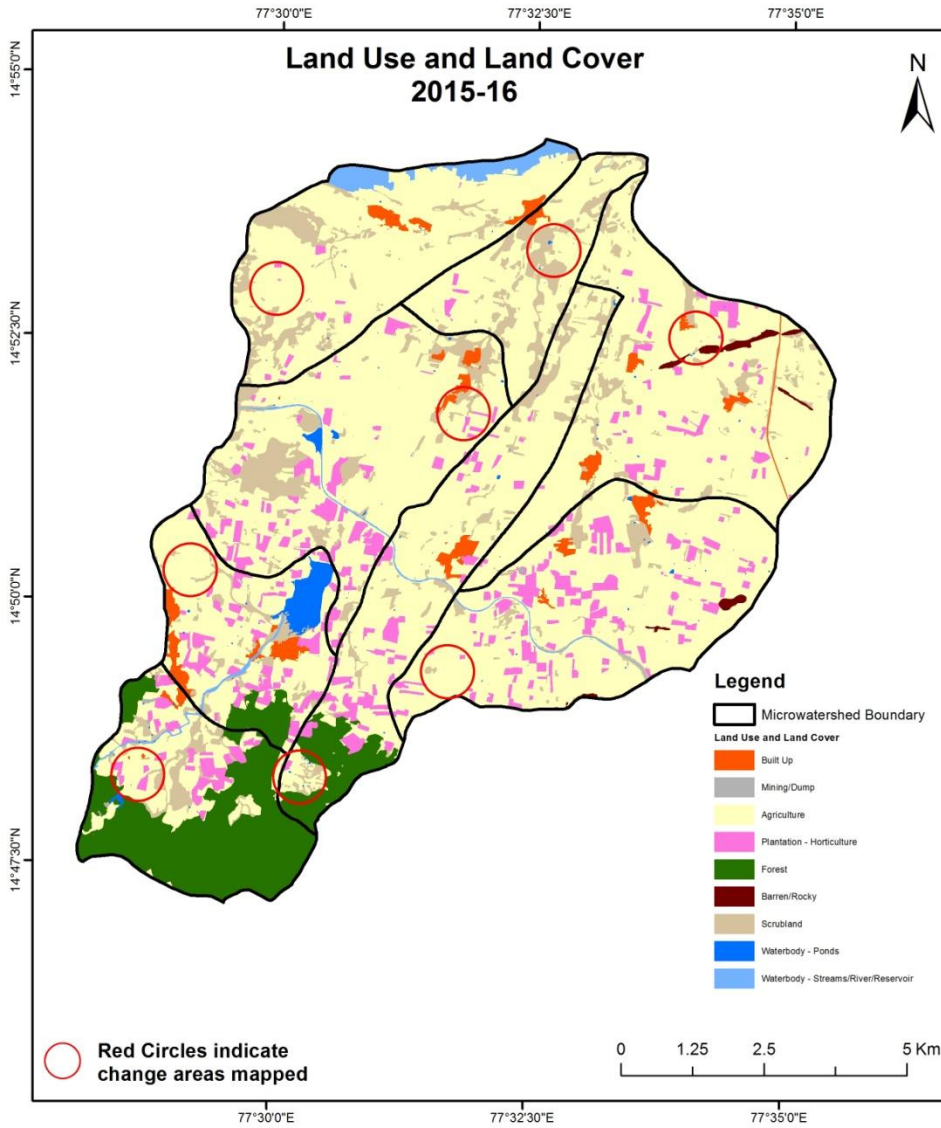
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



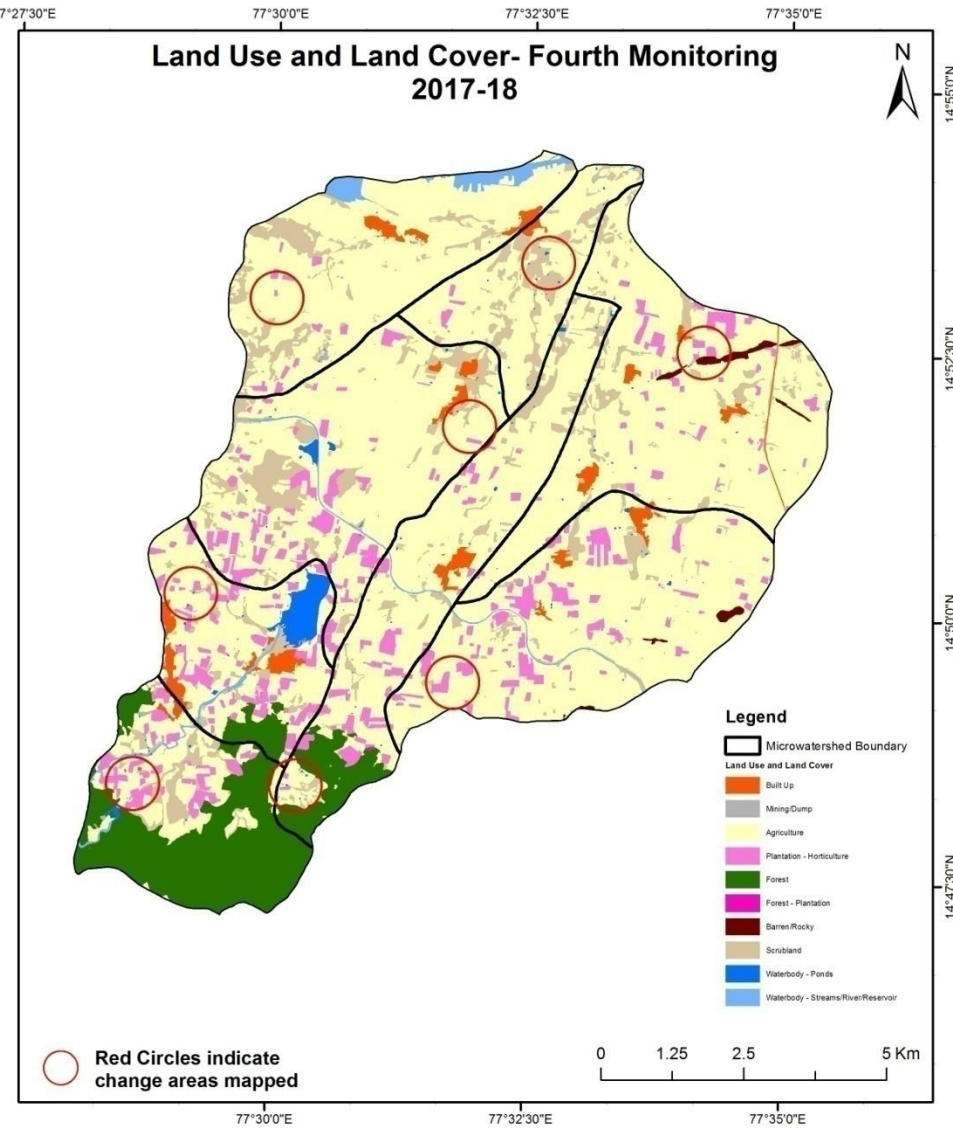
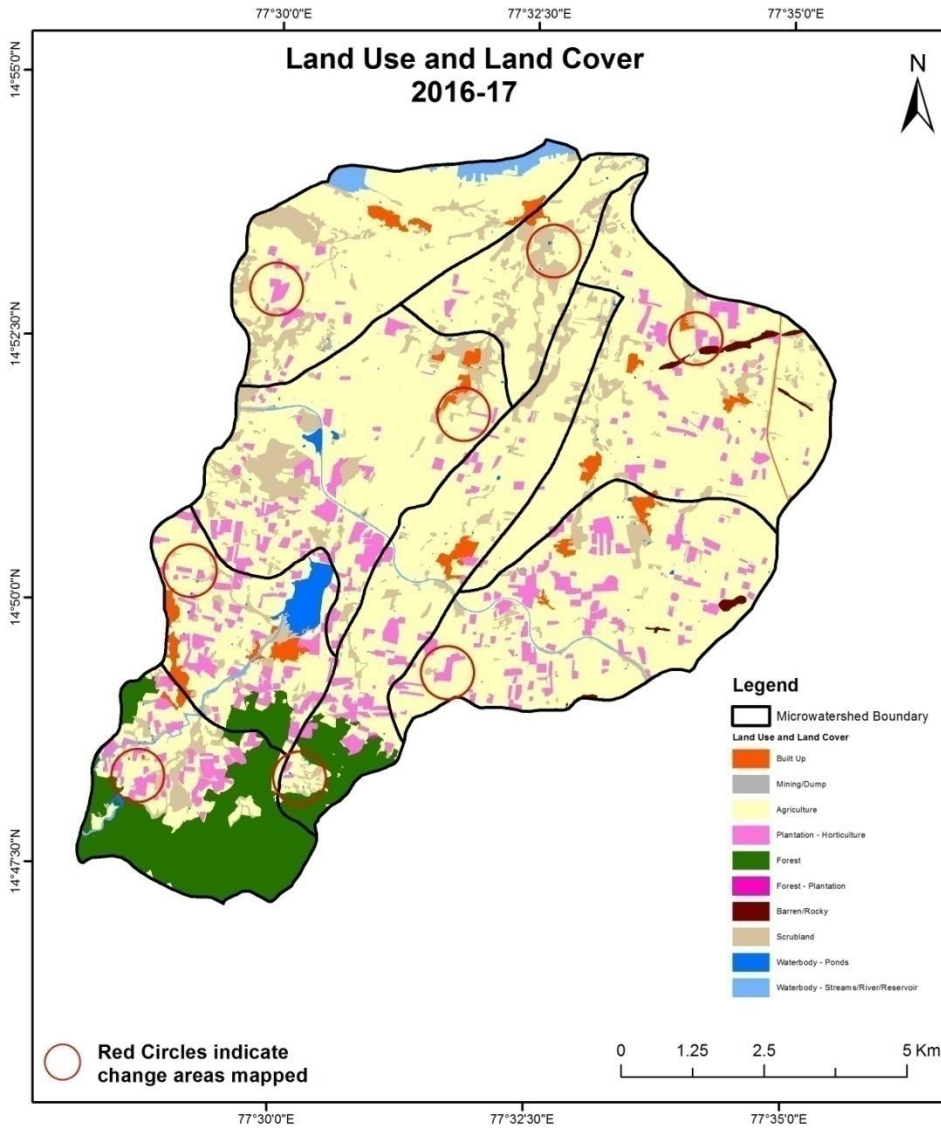
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



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

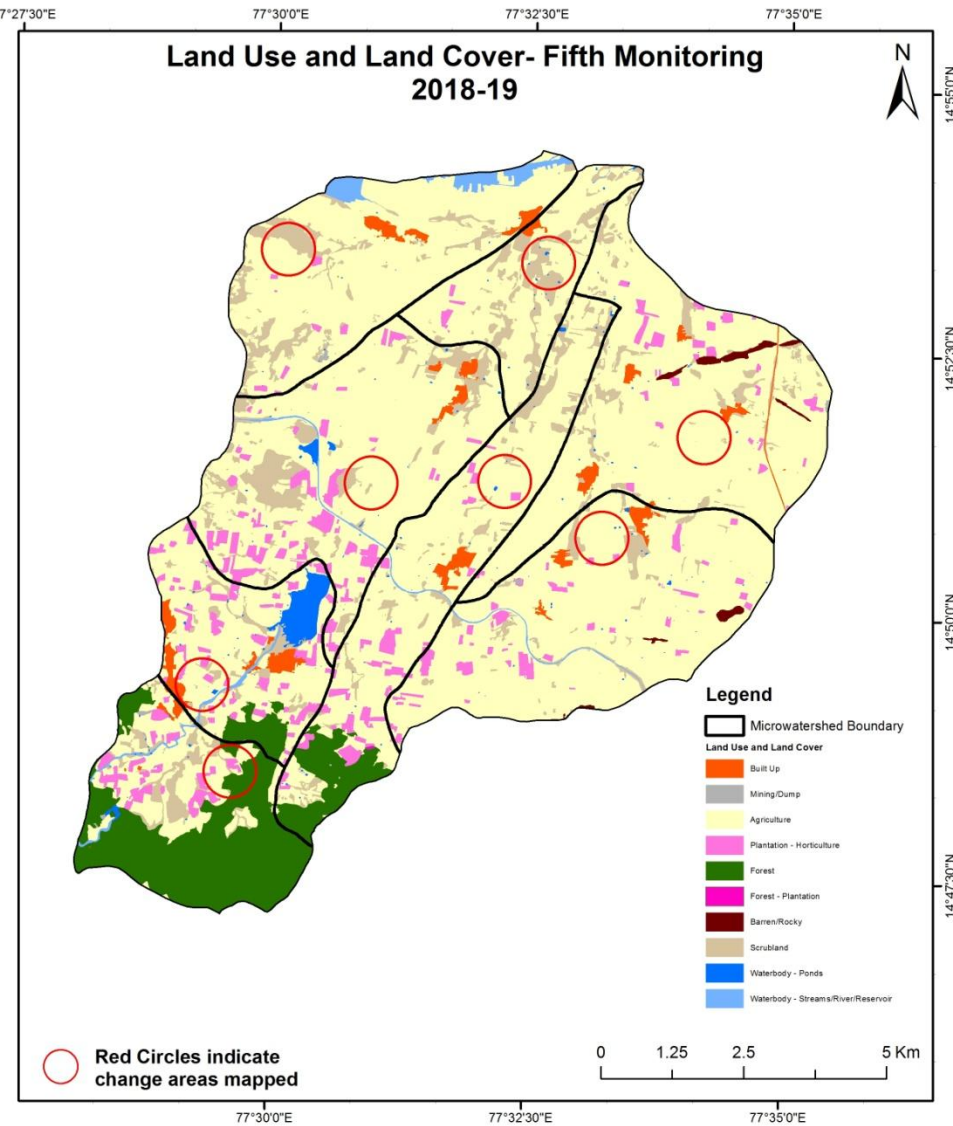
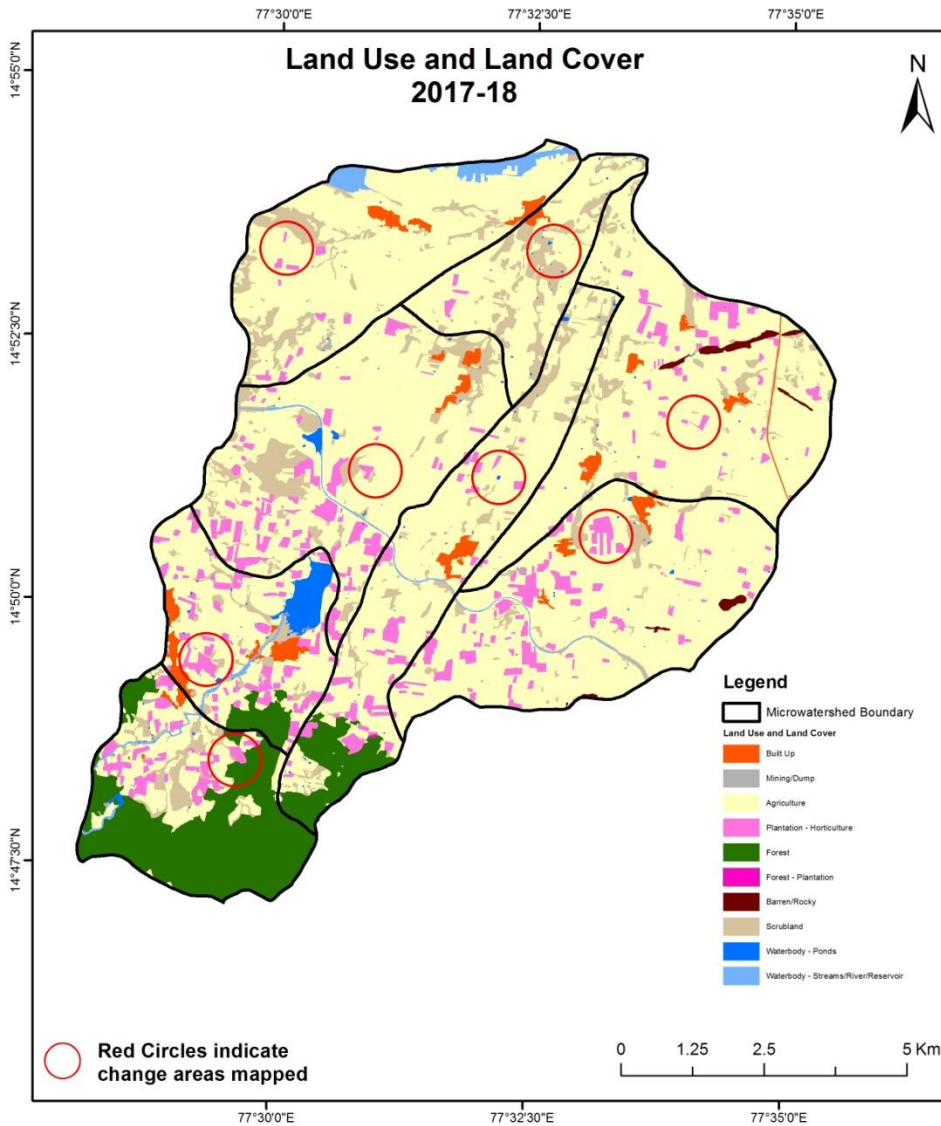
Scale: 1:10000





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

Scale: 1:10000

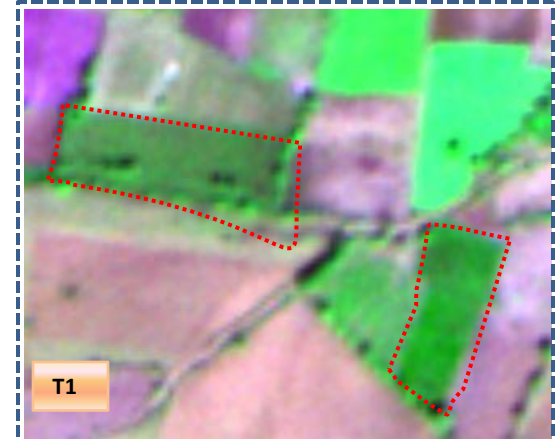


## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0: 2015-16(77°30'10.736"E 14°53'9.151"N )



T1: 19<sup>th</sup> December 2016

Scrub to Water body



T0: 2015-16 (77°29'45.666"E 14°51'8.808"N )



T1: 19<sup>th</sup> December 2016

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

Agriculture to Plantation



T0

T0: 2010-11(77°29'50.601E 14°49'46.664N)



T1

T1: 02 May 2014

Agriculture to Plantation



T0

T0: 2010-11(77°30'16.211E 14°49'39.915N)



T1

T1: 02 May 2014

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

Agriculture to Water body

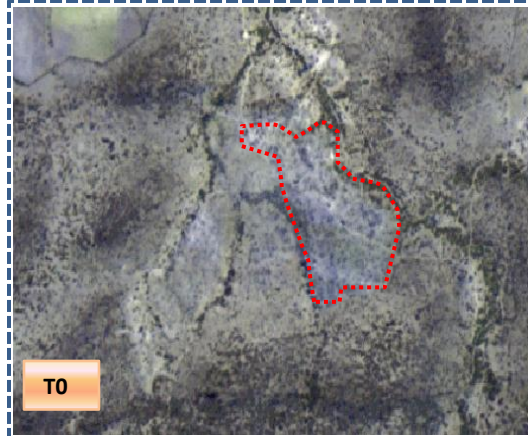


T0: 2010-11(77°29'15.569E 14°48'2.619N)



T1: 02 May 2014

Scrub to Agriculture



T0: 2010-11(77°29'39.992E 14°48'1.695N)



T1: 02 May 2014

**Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15**

Land cover	Monitoring period (T1)										Units in Hectares	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>Built up</b>	197.84									0.06	<b>197.89</b>	
<b>Mining/dump</b>		6.28									<b>6.28</b>	
<b>Agriculture</b>	6.07	0.97	6545.69	90.85				0.53		3.73	<b>6647.84</b>	
<b>Plantation Horticulture</b>	0.23		373.87	640.71						0.20	<b>1015.00</b>	
<b>Forest</b>	0.04	0.21	22.87		872.39			0.26		2.00	<b>897.79</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							40.26				<b>40.26</b>	
<b>Scrub</b>	4.52		300.95					1195.54		3.34	<b>1504.35</b>	
<b>Waterbody- Streams/River</b>			33.12						148.18	0.70	<b>182.01</b>	
<b>Waterbody – Ponds</b>			16.43					0.26		74.35	<b>91.05</b>	
<b>Grand Total</b>	<b>208.70</b>	<b>7.45</b>	<b>7292.94</b>	<b>731.56</b>	<b>872.39</b>		<b>40.26</b>	<b>1196.59</b>	<b>148.18</b>	<b>84.38</b>	<b>10582.46</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 101 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation, scrubland and water body in T1.
- In T1 747 ha of the agriculture area has increased from plantations, forest, scrubland and water body 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-2014-15 to 2015-16**

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	208.70										208.70
Mining/dump		7.45									7.45
Agriculture	1.01	0.17	7134.07	154.47				0.18		3.03	7292.94
Plantation Horticulture			96.97	634.53						0.06	731.56
Forest			8.43		863.26			0.66		0.04	872.39
Forest Plantation											
Barren Rocky							40.26				40.26
Scrub	0.12		68.98	1.00				1124.50	0.46	1.52	1196.59
Waterbody- Streams/River			3.12						145.06		148.18
Waterbody – Ponds			0.70							83.69	84.38
<b>Grand Total</b>	<b>209.83</b>	<b>7.63</b>	<b>7312.27</b>	<b>790.00</b>	<b>863.26</b>		<b>40.26</b>	<b>1125.34</b>	<b>145.53</b>	<b>88.34</b>	<b>10582.46</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 158 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation, scrubland and water body in T2.
- In T2 178 ha of the agriculture area has increased from plantations, forest, 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-2015-16 to 2016-17**

Land cover	Monitoring period (T3)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	209.83												209.83
Mining/dump		7.63											7.63
Agriculture	0.15	0.18	7128.19	178.82					3.68		1.26		7312.27
Plantation Horticulture			35.25	754.68							0.07		790.00
Forest			0.35		862.08	0.82							863.26
Forest Plantation													
Barren Rocky							40.26						40.26
Scrub		2.40	16.75	0.46				1104.75			0.98		1125.34
Waterbody- Streams/River			20.62						124.90				145.53
Waterbody – Ponds											88.34		88.34
<b>Grand Total</b>	<b>209.98</b>	<b>10.20</b>	<b>7201.18</b>	<b>933.96</b>	<b>862.08</b>	<b>0.82</b>	<b>40.26</b>	<b>1104.75</b>	<b>128.58</b>		<b>90.64</b>		<b>10582.46</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 180 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation, scrubland and water body in T3.
- In T3 72 ha of the agriculture area has increased from plantations, 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-2016-17 to 2017-18**

Land cover	Monitoring period (T4)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>Built up</b>	209.98												<b>209.98</b>
<b>Mining/dump</b>		10.20											<b>10.20</b>
<b>Agriculture</b>	0.56		7135.84	62.88							1.90		<b>7201.18</b>
<b>Plantation Horticulture</b>			222.22	711.63							0.11		<b>933.96</b>
<b>Forest</b>			10.63		851.12						0.34		<b>862.08</b>
<b>Forest Plantation</b>						0.82							<b>0.82</b>
<b>Barren Rocky</b>							40.26						<b>40.26</b>
<b>Scrub</b>			30.61	1.43				1070.25			2.46		<b>1104.75</b>
<b>Waterbody- Streams/River</b>			7.80						120.78				<b>128.58</b>
<b>Waterbody – Ponds</b>											90.64		<b>90.64</b>
<b>Grand Total</b>	<b>210.54</b>	<b>10.20</b>	<b>7407.09</b>	<b>775.94</b>	<b>851.12</b>	<b>0.82</b>	<b>40.26</b>	<b>1070.25</b>	<b>120.78</b>		<b>95.45</b>		<b>10582.46</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 65 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body in T4.
- In T4 271 ha of the agriculture area has increased from plantations, 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-2017-18 to 2018-19**

Land cover	Monitoring period (T5)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>Built up</b>	210.54												<b>210.54</b>
<b>Mining/dump</b>		10.20											<b>10.20</b>
<b>Agriculture</b>			7394.84	12.25									<b>7407.09</b>
<b>Plantation Horticulture</b>			229.20	546.74									<b>775.94</b>
<b>Forest</b>					851.12								<b>851.12</b>
<b>Forest Plantation</b>						0.82							<b>0.82</b>
<b>Barren Rocky</b>							40.26						<b>40.26</b>
<b>Scrub</b>			7.12					1062.83			0.30		<b>1070.25</b>
<b>Waterbody- Streams/River</b>			1.98						118.80				<b>120.78</b>
<b>Waterbody – Ponds</b>											95.45		<b>95.45</b>
<b>Grand Total</b>	<b>210.54</b>	<b>10.20</b>	<b>7633.15</b>	<b>558.99</b>	<b>851.12</b>	<b>0.82</b>	<b>40.26</b>	<b>1062.83</b>	<b>118.80</b>		<b>95.75</b>		<b>10582.46</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 12 ha of the agriculture area has decreased and it is converted into plantation in T5.
- In T5 238 ha of the agriculture area has increased from plantations, scrubland and water body 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 decrease of 58 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 645, 19, 205 & 226 Hectares From T0 to T1, T1-T2, T3 to T4 & T4-T5 respectively and overall increase of 985 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 441 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (35) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (47) verified from the portal.