

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

CHITTOOR -11/2010-11  
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

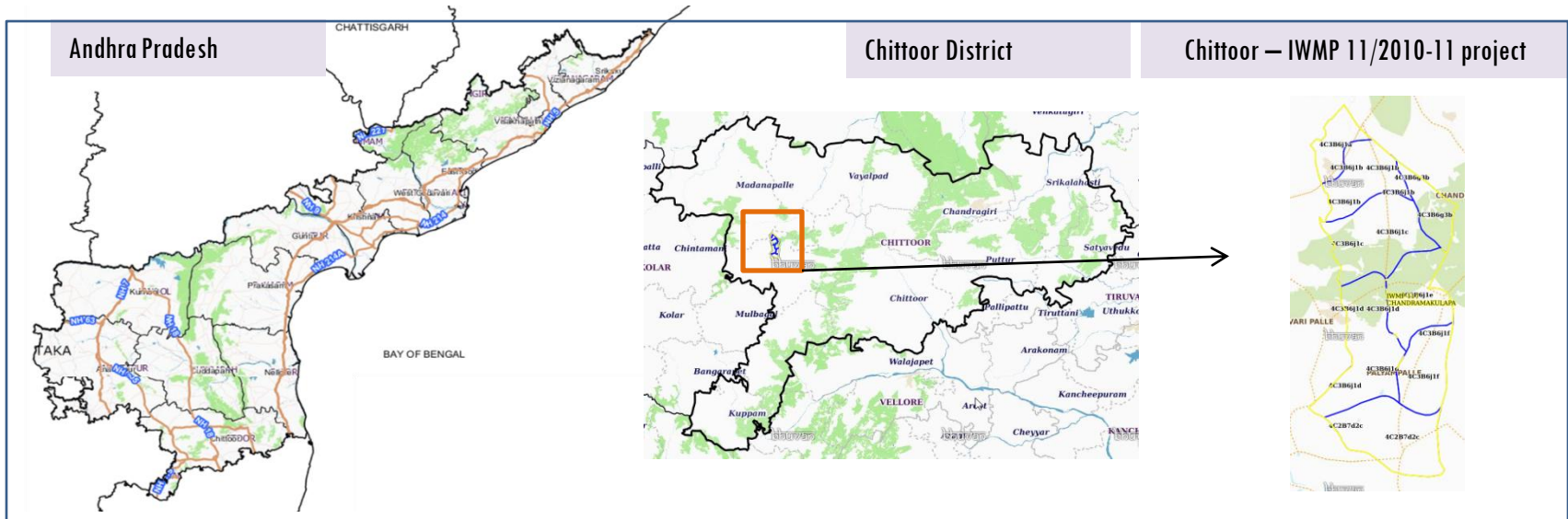
## **E X E C U T I V E   S U M M A R Y**

- 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-11/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 3,580 ha. It comprises of 9 micro watersheds.
- In the project area 19 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
- Water bodies have shown an decrease by 6.8 ha , which correspond to the various bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 45 % is covered by the agriculture, 18.7 % is covered by forest and 24 % is covered by scrubland and remaining by other land use classes.

# PROJECT : CHITTOOR – IWMP-11/2010-11

## DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Punganur Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 3,580 ha. It comprises of 9 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



- The climate of the district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.
- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

# 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	Drishti Photographs		
		Total	19
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	Agriculture/Horticulture	5	5
2	Bunding		
3	Black planting		
4	Bund Planting/Horticulture		
5	Trench		
6	Field Bunds		
7	Existing activity		
8	Checks & Plugs		
9	New activity (boulder removal, farm ponds, dug out pits etc.,)		
10	Farm ponds/Dug out pit	7	7
11	Civil work-Check dams /Rock fill dam	7	7
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check		
13	Land Developments (afforestation, horticulture and bund plantation of teak)		
14	Lm (fodder development, varmi compost)		
15	Livelihood Activities		
16	Water harvesting structures (recharge pits and check dams)		
17	Entry Point Activity (Cattle thought)		
18	Others		
	<b>TOTAL</b>	<b>19</b>	<b>19</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.

Chittoor-IWMP-11/2010-11

2009-10



June-2014



Feb-2015



Jan-2017



Jan-2019



Drishti Sl.No.:133722  
M.No.:9502562555  
Uuid:3737f3a8dd8fa8cd

Activity : Farm pond



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



T0

T0:2010-11



T1

T1: 12 February 2015



Drishti Sl no. 133704 MWS :4C3B6j1b

Farm pond



T0:2010-11



T1

T1: 12 February 2015



Drishti Sl no. 133722 MWS : 4C3B6j1b

Farm pond

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



T0: 2010-11

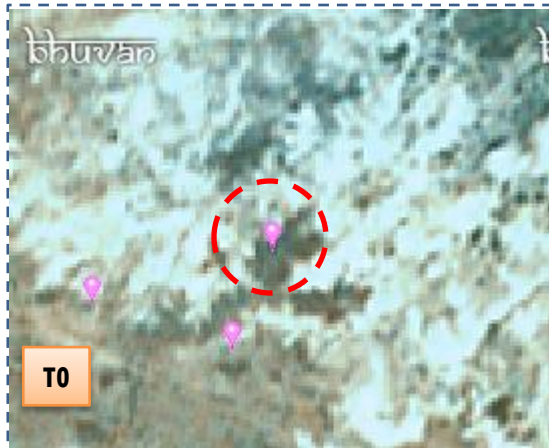


T1: 12 February 2015

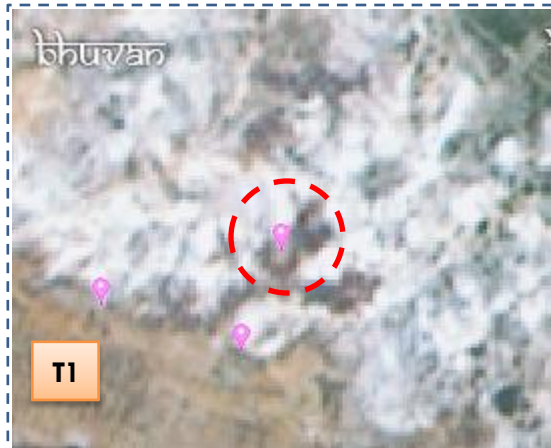


Drishti Sl no. 1652110 MWS :4C3B6j1f

Water Harvesting Structure



T0: 2010-11



T1: 12 February 2015



Drishti Sl no. 1652110 MWS :4C3B6j1f

Water Harvesting Structure

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

Natural Color Composite- 2010-11



Source:Fusion data,NRSC

Natural Color Composite- 12th February 2015



Source:NCC,NRSC

Natural Color Composite- 22nd October 2015



Source:NCC,NRSC

Natural Color Composite- 18th October 2016



Source:LISS-IV,NRSC

Natural Color Composite- 30th March 2018



Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019



Source:Sentinel,NRSC

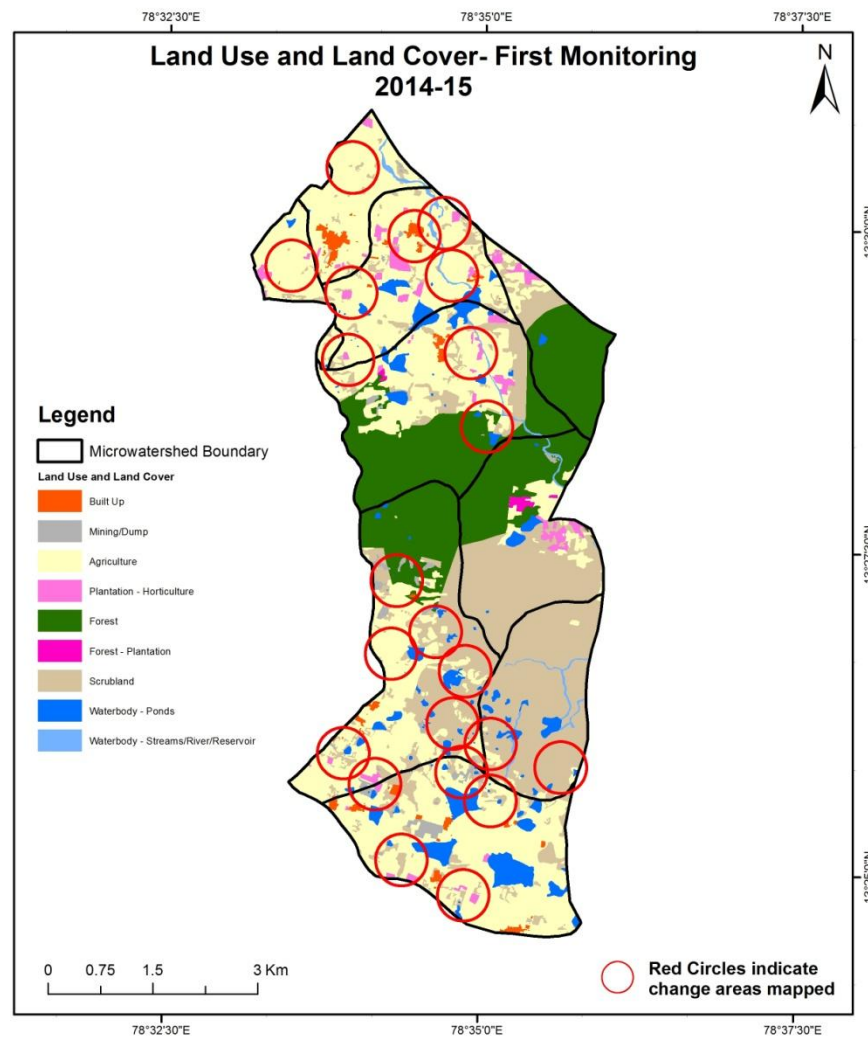
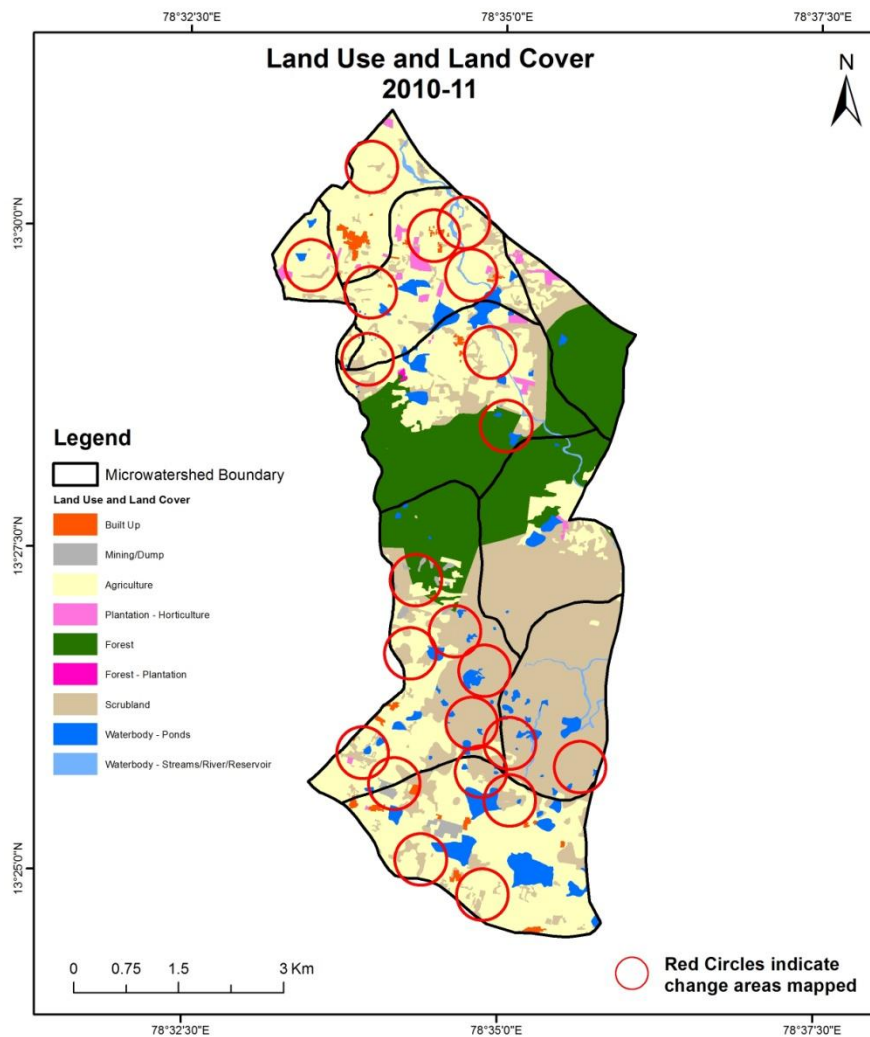
## MONITORING IN THE PROJECT AREA

### 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)

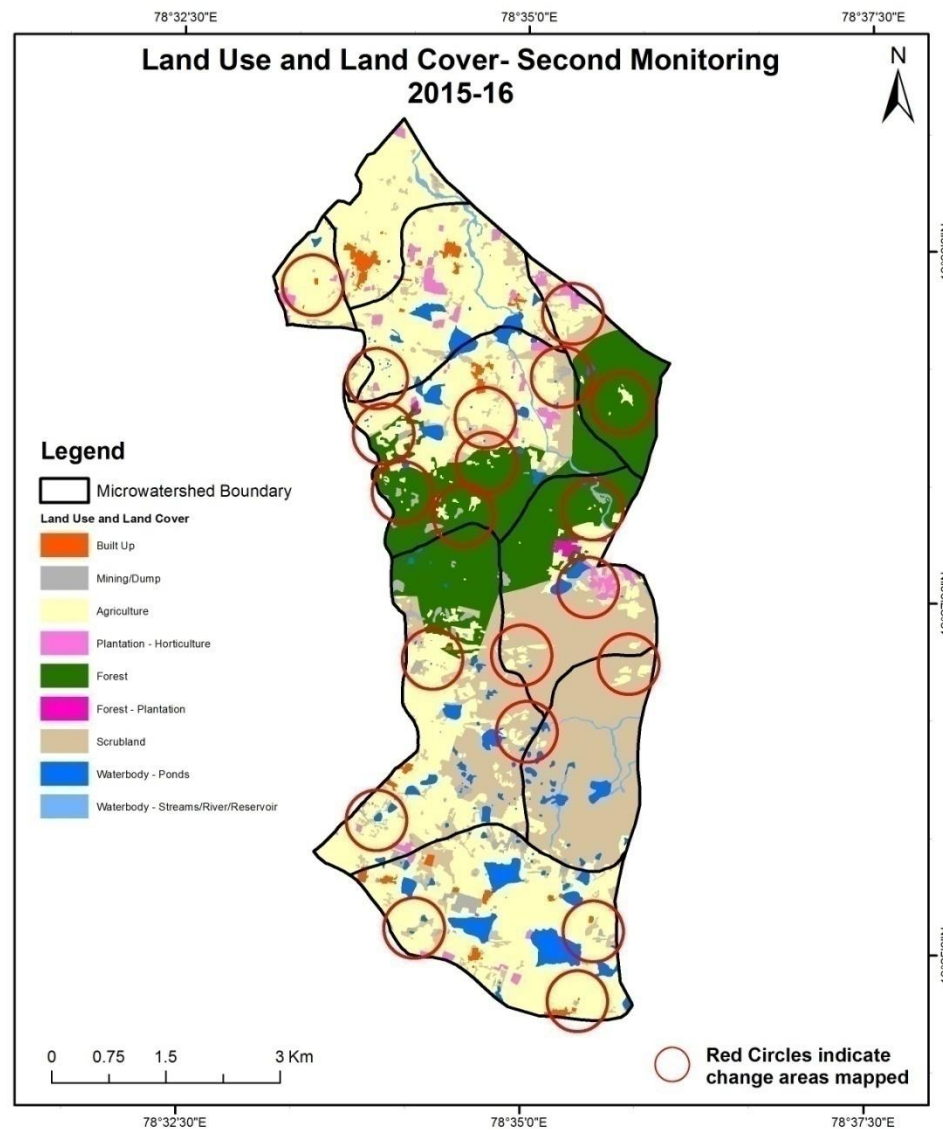
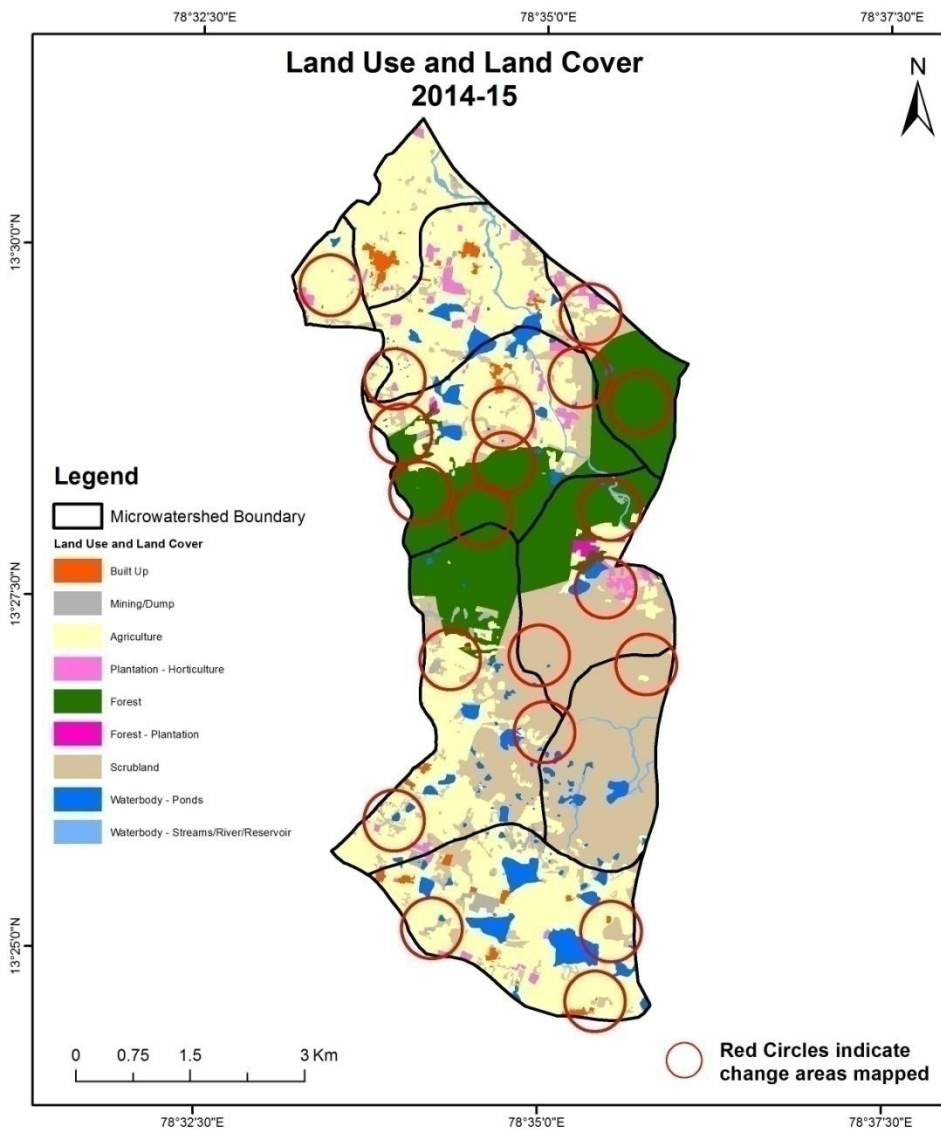
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



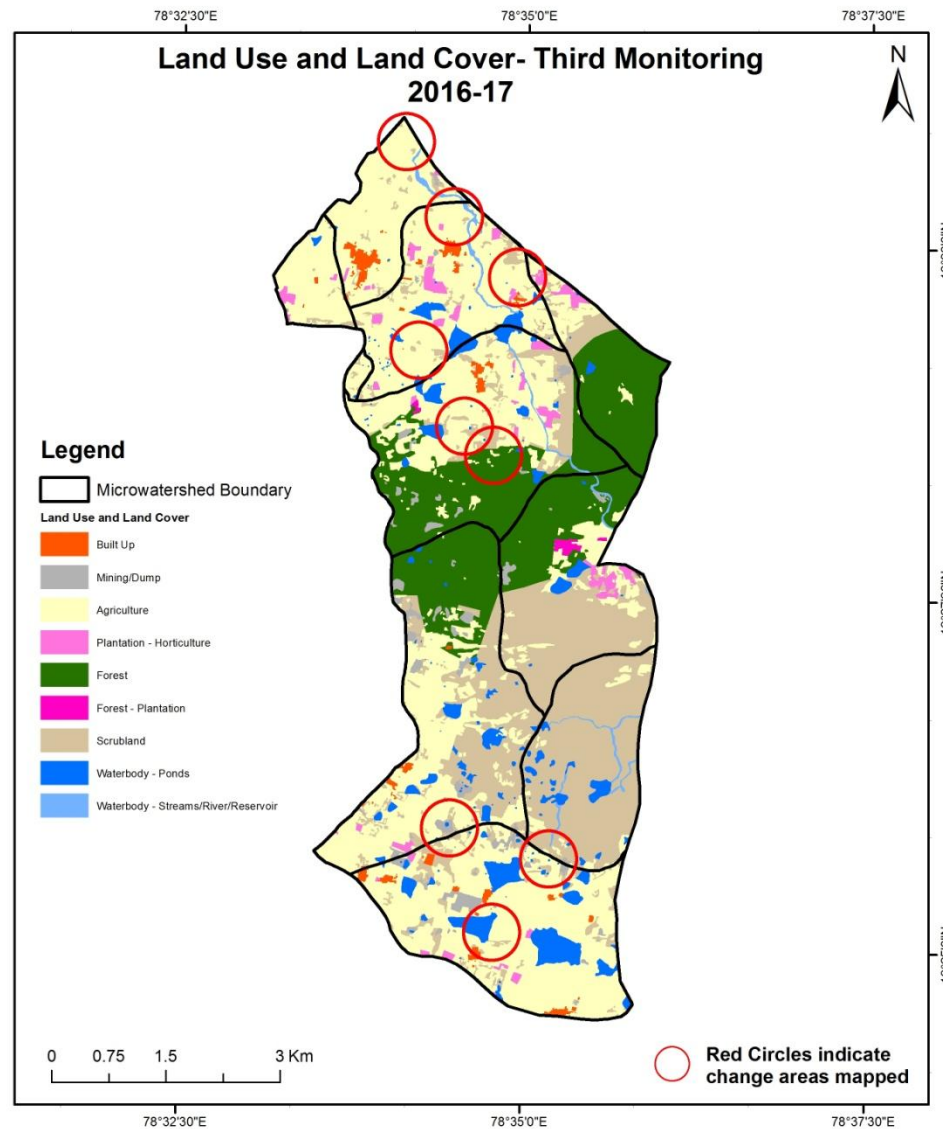
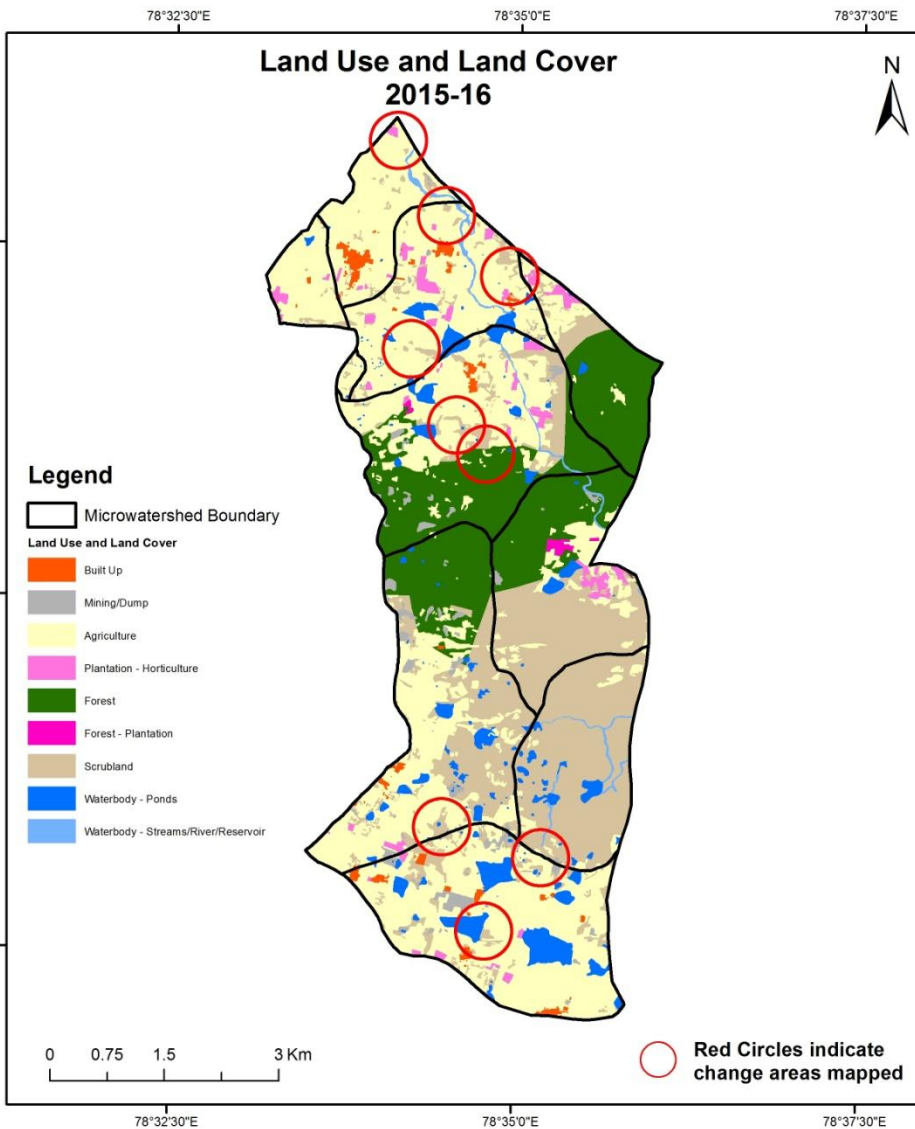
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



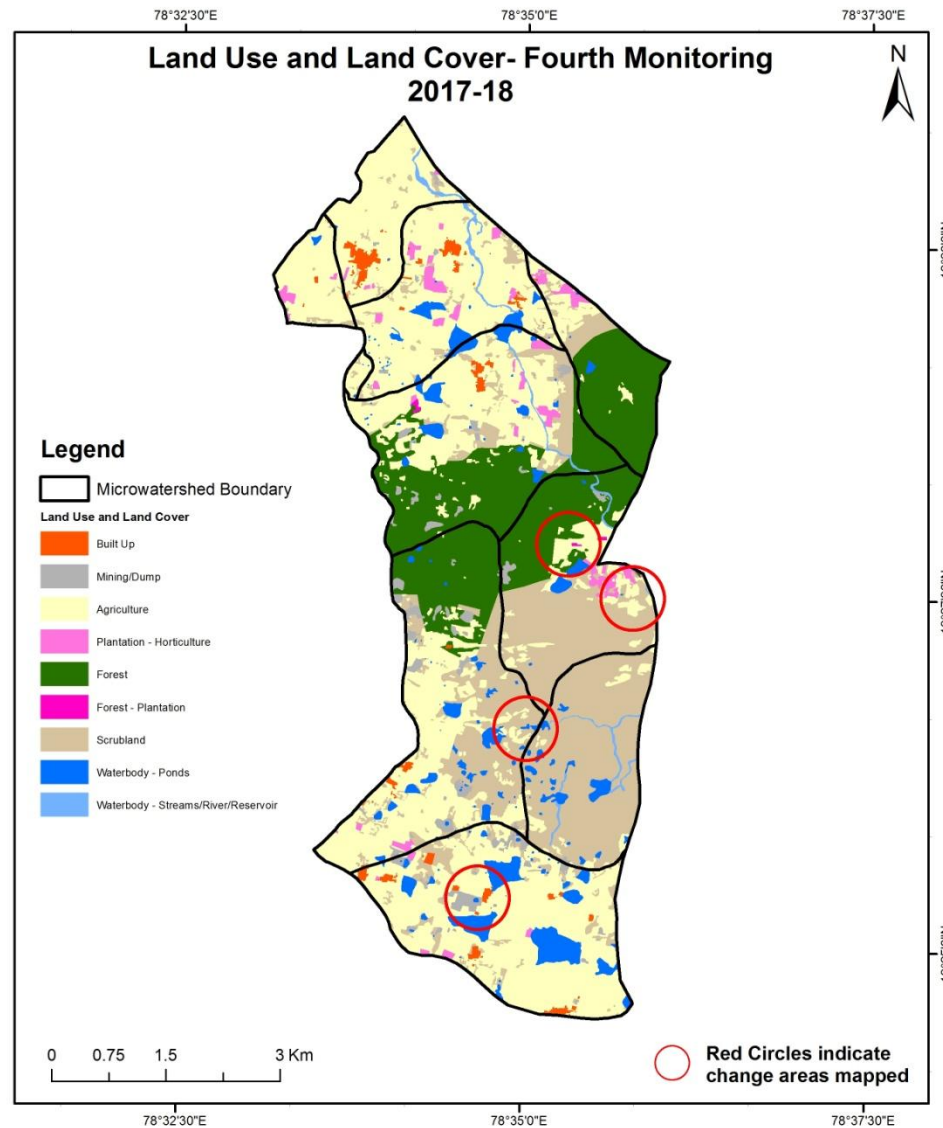
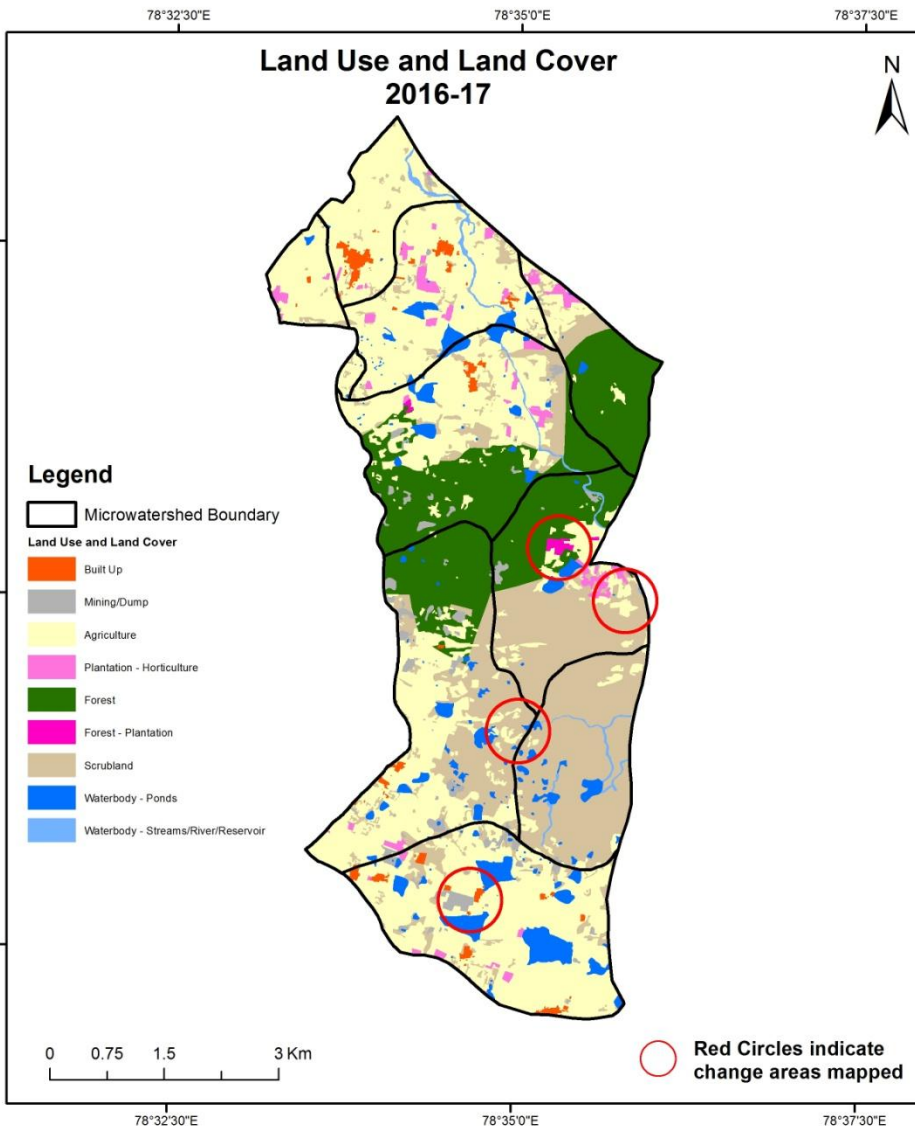
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



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

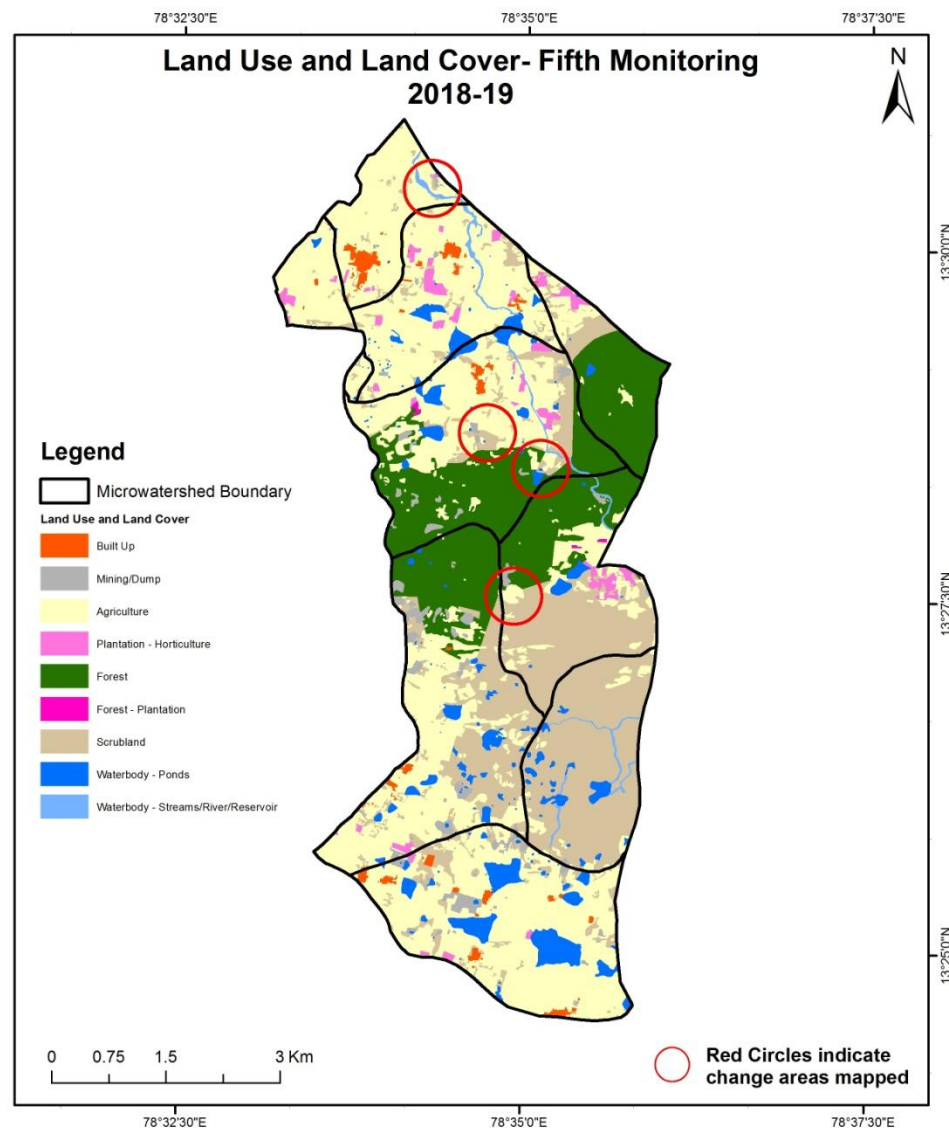
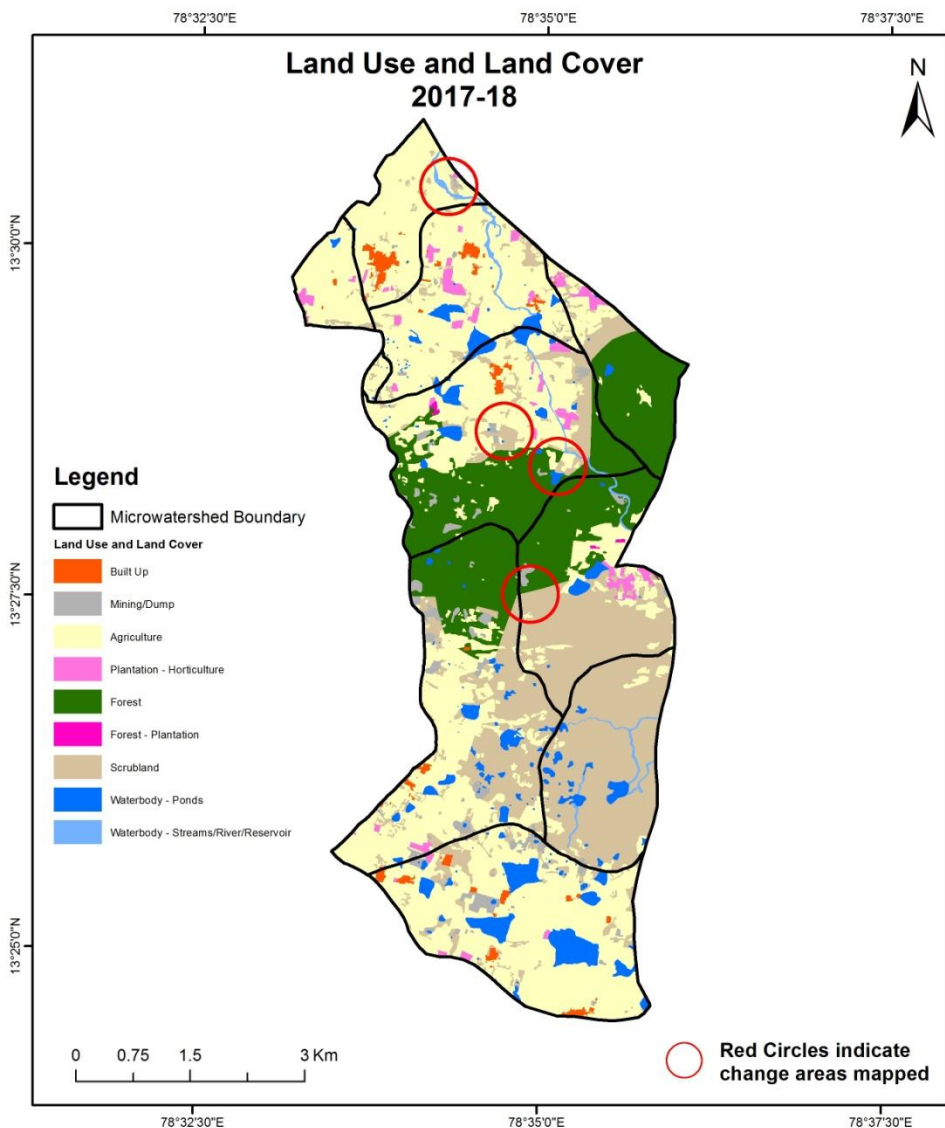
Scale: 1:10000





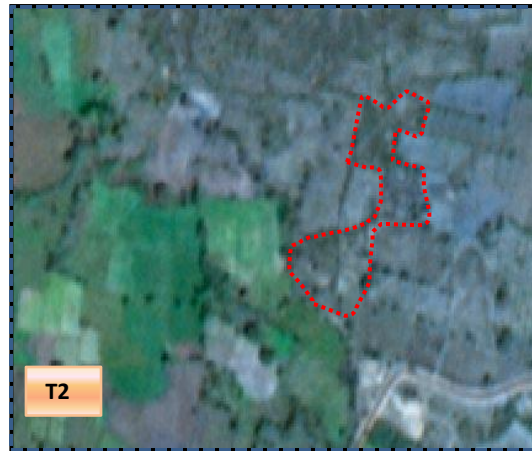
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

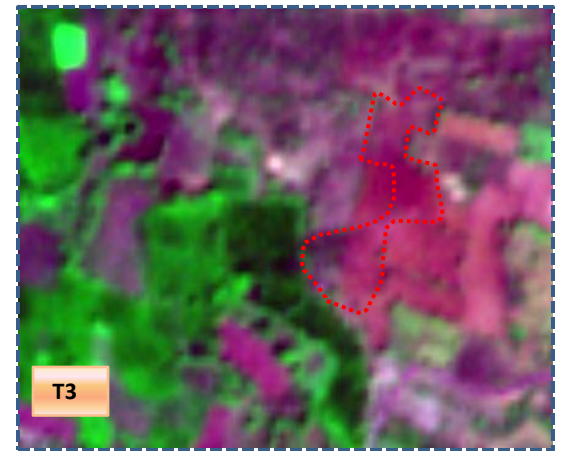


## Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T2: 2015-16 (78°34'58.211"E 13°29'49.004"N )

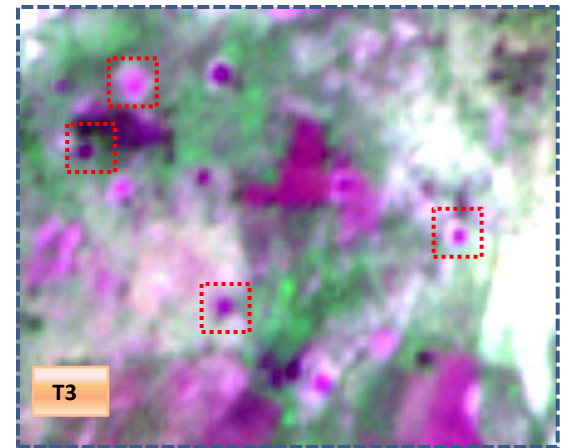


T3: 18 October 2016

Agriculture to Water body



T2: 2015-16 (78°35'4.909"E 13°25'41.682"N )



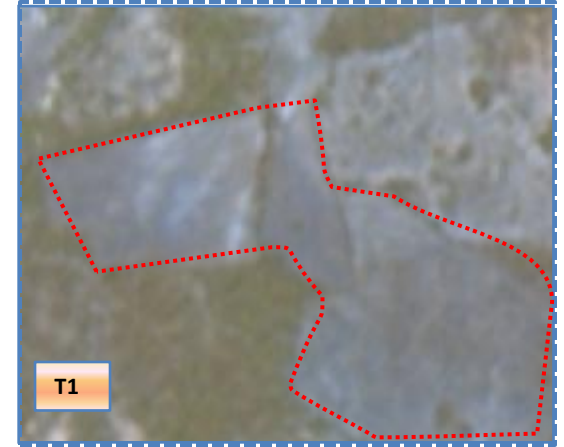
T3: 18 October 2016

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

### Scrub to Agriculture



T0: 2010-11



T1: 12 February 2015

### Agriculture to Plantation



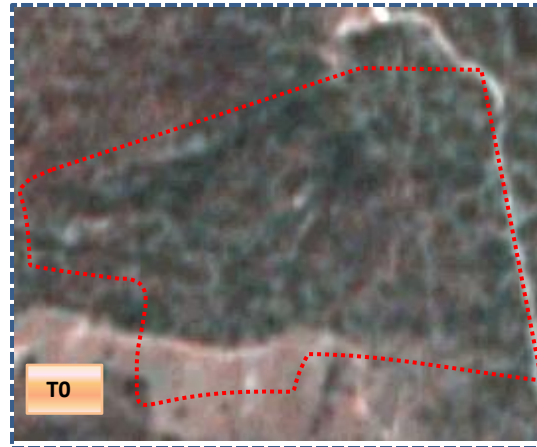
T0: 2010-11



T1: 12 February 2015

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

Scrub to Agriculture

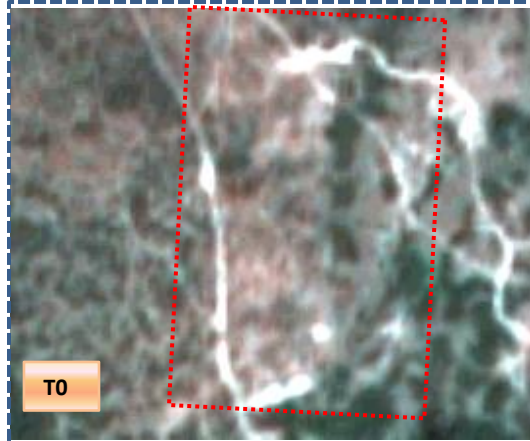


T0: 2010-11



T1: 12 February 2015

Scrub to Agriculture



T0: 2010-11



T1: 12 February 2015

**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>	32.26												<b>32.26</b>
<b>Mining/dump</b>		20.96									0.78		<b>21.74</b>
<b>Agriculture</b>	9.22	1.40	1414.48	30.23		5.66		5.74			0.99		<b>1467.73</b>
<b>Plantation Horticulture</b>	0.04		0.54	38.23							0.18		<b>38.99</b>
<b>Forest</b>	0.16	3.61	17.82		710.03						0.47		<b>732.09</b>
<b>Forest Plantation</b>						1.21							<b>1.21</b>
<b>Barren Rocky</b>													
<b>Scrub</b>	0.80	11.19	104.11	1.29				962.48			4.05		<b>1083.93</b>
<b>Waterbody- Streams/River</b>									29.23				<b>29.23</b>
<b>Waterbody – Ponds</b>			3.45								169.72		<b>173.17</b>
<b>Grand Total</b>	<b>42.49</b>	<b>37.16</b>	<b>1540.41</b>	<b>69.75</b>	<b>710.03</b>	<b>6.87</b>		<b>968.22</b>	<b>29.23</b>		<b>176.19</b>		<b>3580.34</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 47 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, forest plantation, scrub and water body in T1.
- In T1 125 ha of the agriculture area has been increased from plantation, forest, scrubland and water body of T0.
- Overall 72 ha of the agriculture area has been increased, the additional agriculture area is shifted 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		
	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>	42.49												<b>42.49</b>
<b>Mining/dump</b>		37.16											<b>37.16</b>
<b>Agriculture</b>	0.62	2.32	1534.88	0.54						2.05			<b>1540.41</b>
<b>Plantation Horticulture</b>	0.06		1.51	68.17									<b>69.75</b>
<b>Forest</b>		10.59	20.47		678.97								<b>710.03</b>
<b>Forest Plantation</b>						6.87							<b>6.87</b>
<b>Barren Rocky</b>													
<b>Scrub</b>	0.07	7.59	56.39					900.69		3.49			<b>968.22</b>
<b>Waterbody- Streams/River</b>									29.23				<b>29.23</b>
<b>Waterbody – Ponds</b>			4.74							171.45			<b>176.19</b>
<b>Grand Total</b>	<b>43.25</b>	<b>57.65</b>	<b>1618.00</b>	<b>68.71</b>	<b>678.97</b>	<b>6.87</b>		<b>900.69</b>	<b>29.23</b>	<b>176.99</b>			<b>3580.34</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 5 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 83 ha of the agriculture area has been increased from plantation, forest, scrubland and water body of T1.
- Overall 77 ha of the agriculture area has been increased, the additional agriculture area is shifted 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		
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	43.25												43.25
Mining/dump		57.65											57.65
Agriculture	0.09	0.55	1616.22	0.75						0.39			1618.00
Plantation Horticulture			2.53	66.11						0.07			68.71
Forest		3.20	0.24		675.53								678.97
Forest Plantation						6.84				0.03			6.87
Barren Rocky													
Scrub		4.42	5.28					890.86		0.13			900.69
Waterbody- Streams/River									29.23				29.23
Waterbody – Ponds										176.99			176.99
<b>Grand Total</b>	<b>43.34</b>	<b>65.81</b>	<b>1624.27</b>	<b>66.86</b>	<b>675.53</b>	<b>6.84</b>		<b>890.86</b>	<b>29.23</b>	<b>177.61</b>			<b>3580.34</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 1.7 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T3.
- In T3 8.05 ha of the agriculture area has been increased from plantation ,forest and scrub land area of T2.
- Overall 6.2 ha of the agriculture area has been increased, the additional agriculture area is shifted 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>	43.34										<b>43.34</b>	
<b>Mining/dump</b>		65.44								0.37	<b>65.81</b>	
<b>Agriculture</b>	0.16	2.54	1621.56							0.02	<b>1624.27</b>	
<b>Plantation Horticulture</b>	0.08		3.44	63.34							<b>66.86</b>	
<b>Forest</b>			0.42		675.11						<b>675.53</b>	
<b>Forest Plantation</b>			4.77			2.07					<b>6.84</b>	
<b>Barren Rocky</b>												
<b>Scrub</b>		1.79	1.77					885.44		1.86	<b>890.86</b>	
<b>Waterbody- Streams/River</b>									29.23		<b>29.23</b>	
<b>Waterbody – Ponds</b>										177.61	<b>177.61</b>	
<b>Grand Total</b>	<b>43.58</b>	<b>69.76</b>	<b>1631.96</b>	<b>63.34</b>	<b>675.11</b>	<b>2.07</b>		<b>885.44</b>	<b>29.23</b>	<b>179.86</b>	<b>3580.34</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 2.7 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T4.
- In T4 5.6 ha of the agriculture area has been increased from plantation ,forest , forest plantation and scrub land area of T3.
- Overall 7.6 ha of the agriculture area has been increased, the additional agriculture area is shifted 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>	43.58												<b>43.58</b>
<b>Mining/dump</b>		69.76											<b>69.76</b>
<b>Agriculture</b>	0.46		1631.50										<b>1631.96</b>
<b>Plantation Horticulture</b>			1.09	62.25									<b>63.34</b>
<b>Forest</b>		0.96	3.77		670.38								<b>675.11</b>
<b>Forest Plantation</b>						2.07							<b>2.07</b>
<b>Barren Rocky</b>													
<b>Scrub</b>		1.27	8.89					875.13			0.15		<b>885.44</b>
<b>Waterbody- Streams/River</b>									29.23				<b>29.23</b>
<b>Waterbody – Ponds</b>											179.86		<b>179.86</b>
<b>Grand Total</b>	<b>44.04</b>	<b>71.98</b>	<b>1645.26</b>	<b>62.25</b>	<b>670.38</b>	<b>2.07</b>		<b>875.13</b>	<b>29.23</b>		<b>180.01</b>		<b>3580.34</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 0.4 ha of the agriculture area has decreased and it is converted into Built-up area in T5.
- In T5 13.7 ha of the agriculture area has been increased from plantation ,forest and scrub land area of T4.
- Overall 13.2 ha of the agriculture area has been increased, the additional agriculture area is shifted 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 6.8 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 72, 77, 6,7 & 13 Hectares From T0 to T1, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 177 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is an increase of 23 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 208 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (7) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (7) verified from the portal.