

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

CHITTOOR -26/2010-11  
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

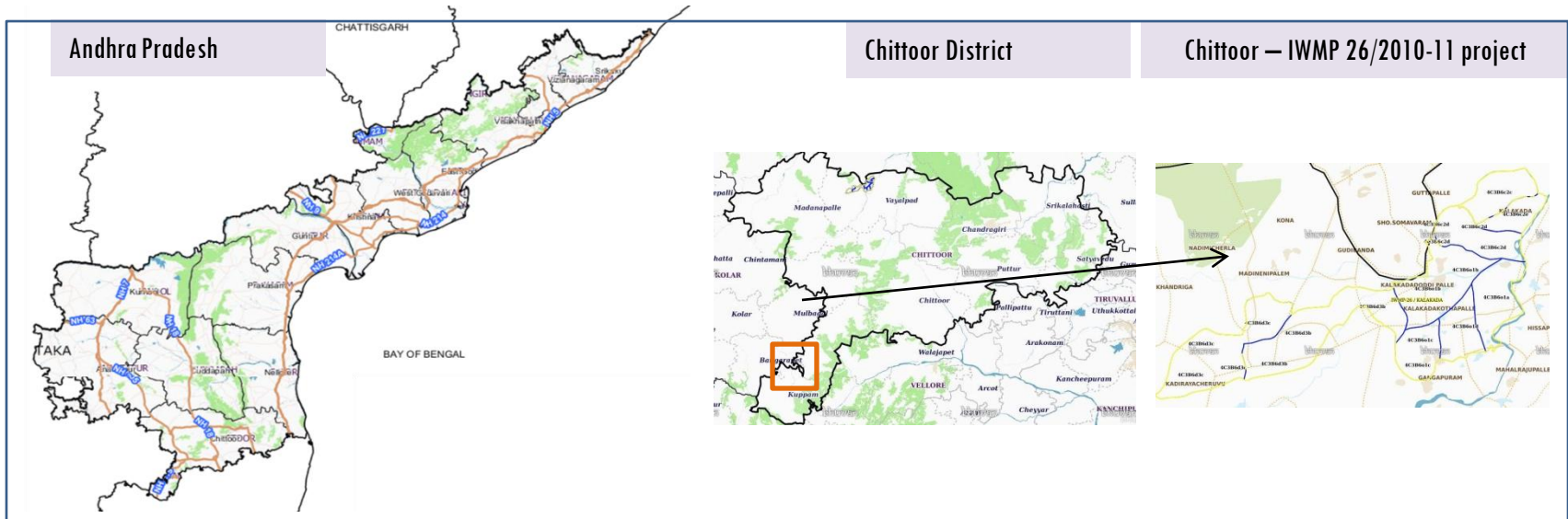
## **E X E C U T I V E   S U M M A R Y**

- 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-26/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 6,078 ha. It comprises of 11 micro watersheds.
- In the project area 82 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 31 ha increase in the area.
- Major percentage i.e. 69.97 % is covered by the agriculture, 15.07 % is covered by scrubland, 3.63 % is covered by plantation and 5.91 % is covered by water body and remaining by other land use classes.

# PROJECT : CHITTOOR – IWMP-26/2010-11

## DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Kalakada Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 6,078 ha. It comprises of 11 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	82
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

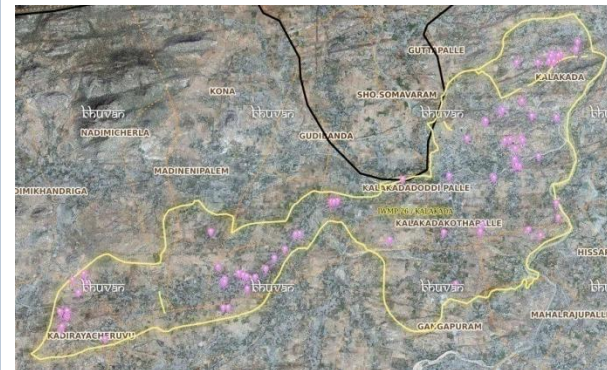


MWS Boundary



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	0	0
2	Afforestation	2	2
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Checks & Plugs	10	10
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	27	20
11	Civil work-Check dams /Rock fill dam	14	10
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	0	0
15	Livelihood Activities	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	0	0
18	Others	40	40
	<b>TOTAL</b>	<b>93</b>	<b>82</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-26/2010-11

2009-10



Feb-2013



March-2018



2019



Activity : Check dam



Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-26/2010-11



T0:2010-11

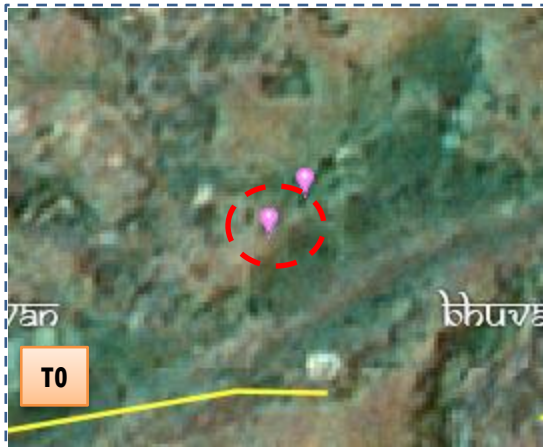


T1: 2 February 2015

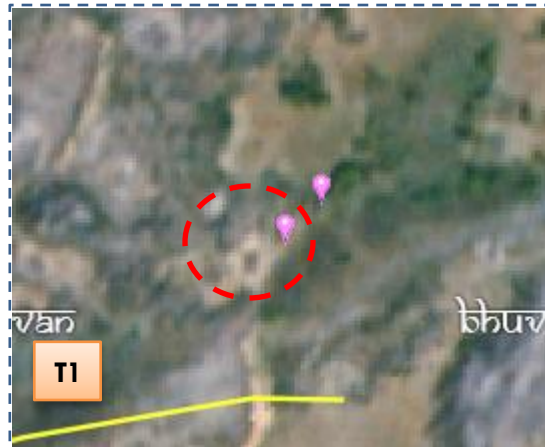


Drishti Sl no. 1678555 MWS :4C3B6o1b

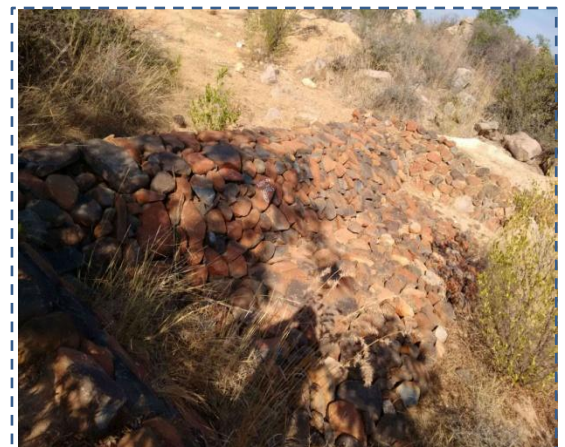
**Check dam**



T0:2010-11



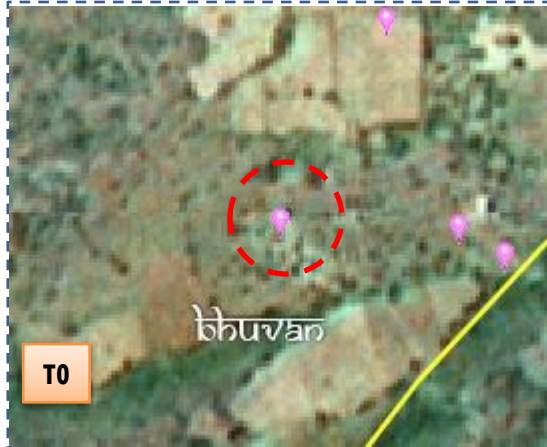
T1: 2 February 2015



Drishti Sl no. 1678506 MWS :4C3B6c2c

**Drainage Treatment**

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-26/2010-11



T0: 2010-11



T1: 2 February 2015



Drishti Sl no. 586322 MWS :4C3B6c2c

Dug out pit



T0: 2010-11



T1: 2 February 2015



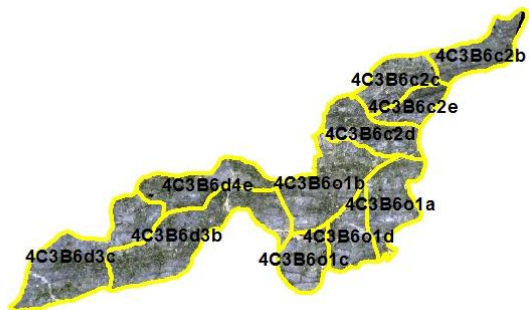
Drishti Sl no. 818693 MWS :4C3B6c2c

Dug out pit



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

Natural Color Composite- 2010-11



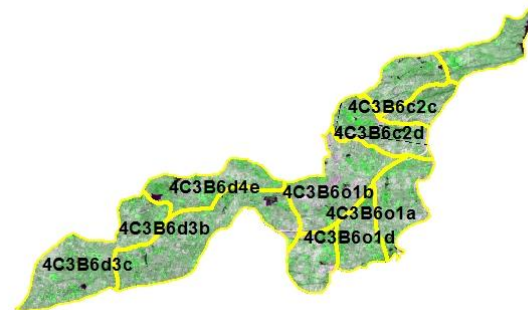
Source: NCC, NRSC

Natural Color Composite-26th February 2013



Source: NCC, NRSC

Natural Color Composite- 02nd Feb 2016



Source: LISS-IV, NRSC

Natural Color Composite- 16th October 2016



Source: LISS-IV, NRSC

Natural Color Composite- 30th March 2018



Source: LISS-IV, NRSC

Natural Color Composite- 25th March 2019



Source: LISS-IV, NRSC

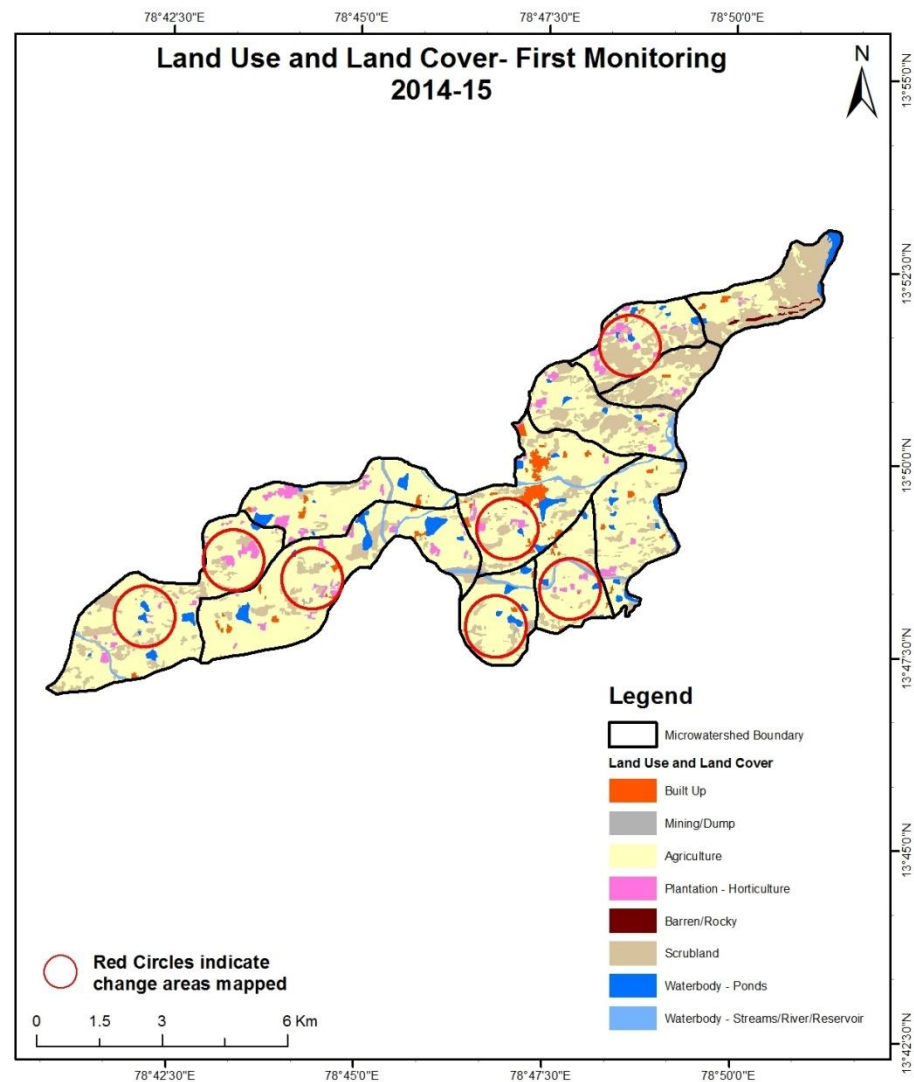
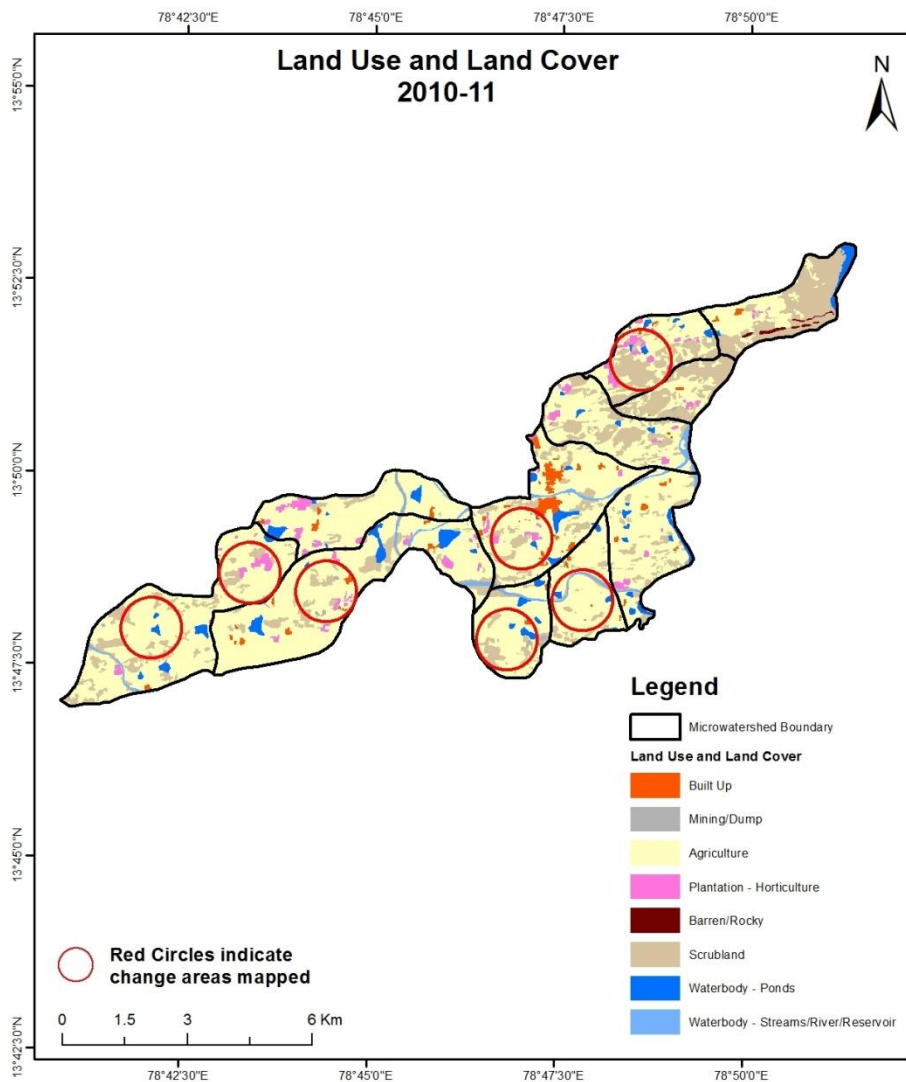
## MONITORING IN THE PROJECT AREA

### 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)

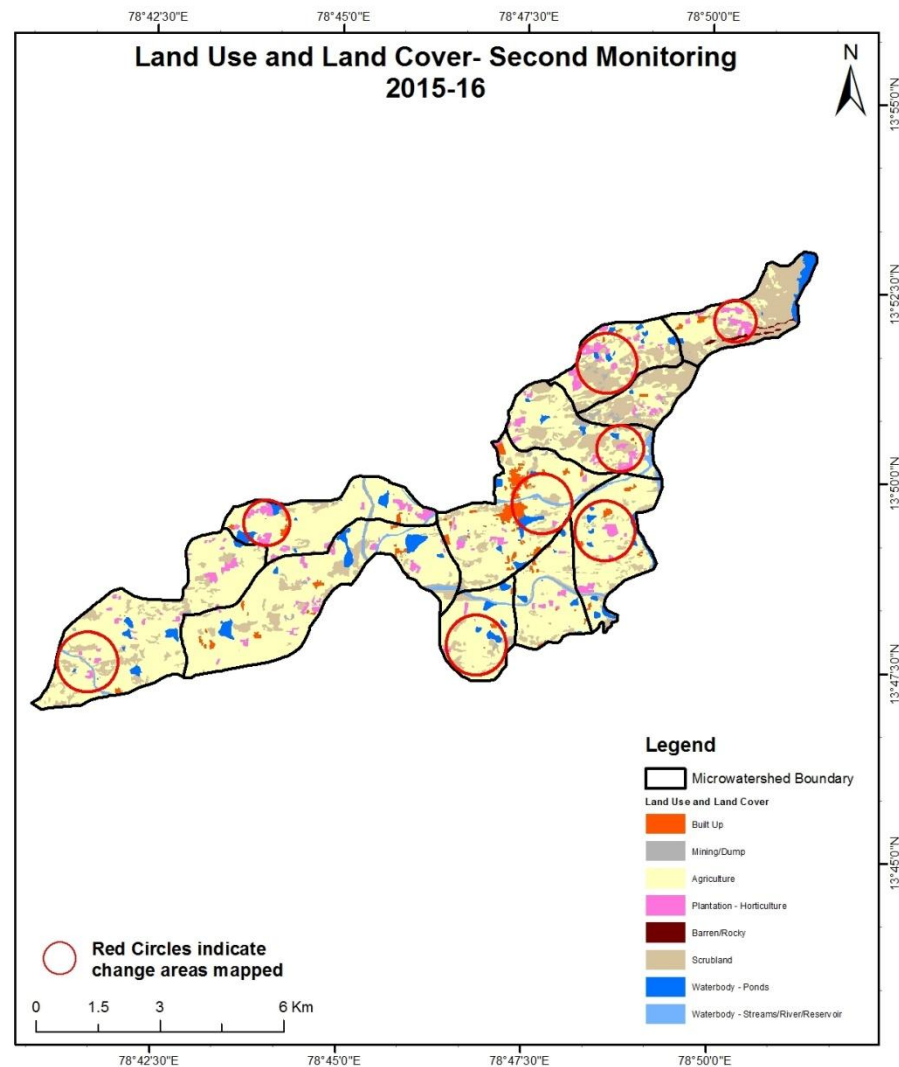
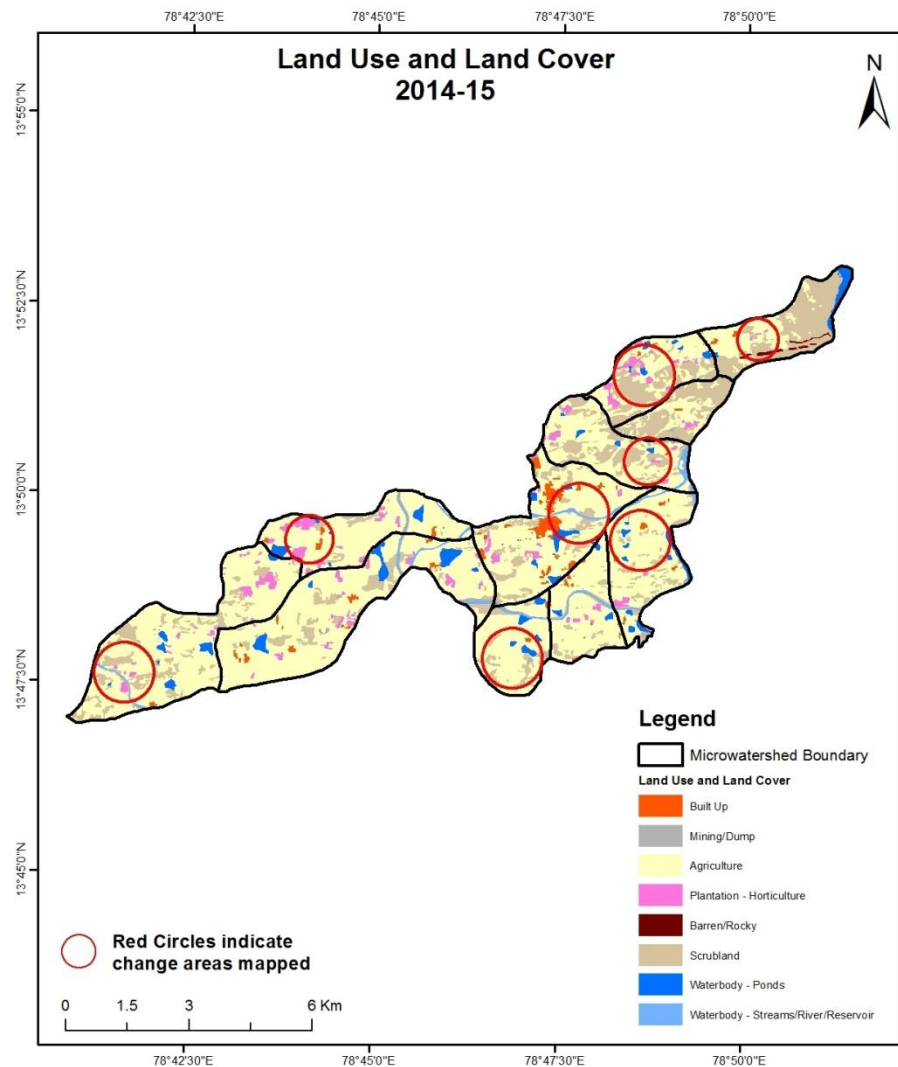
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



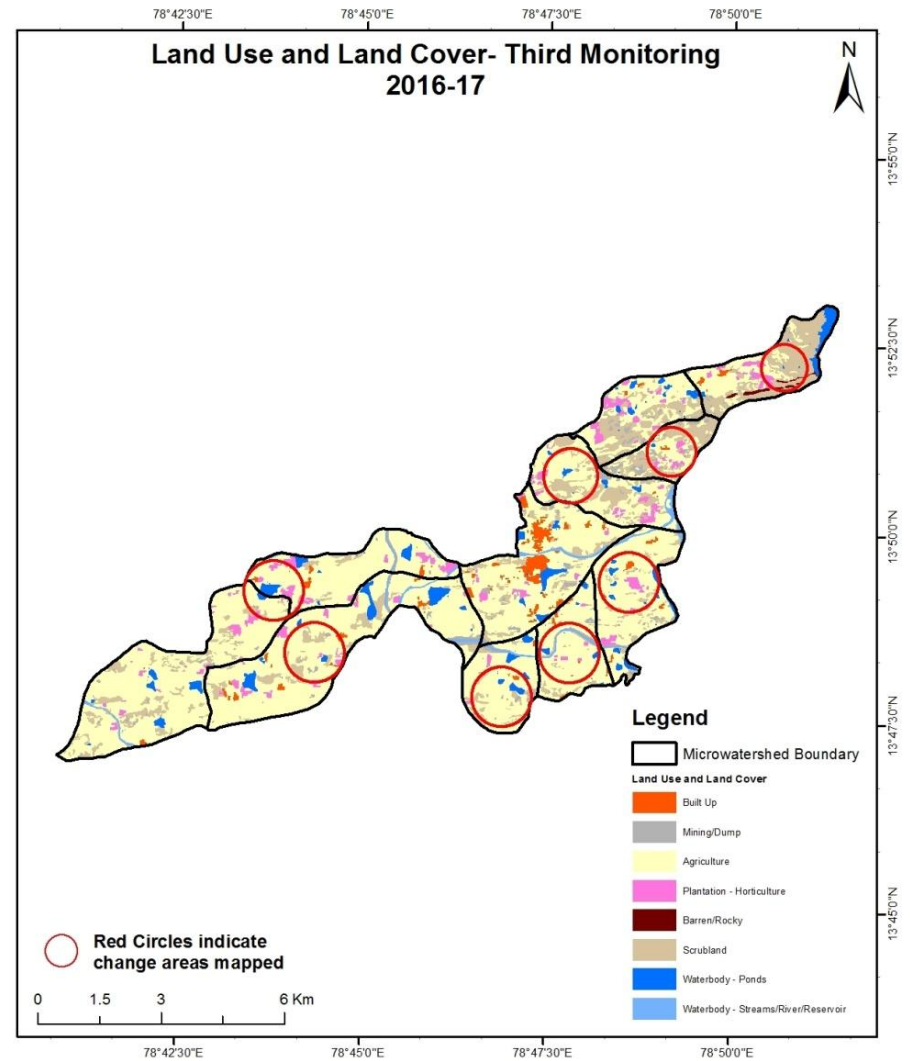
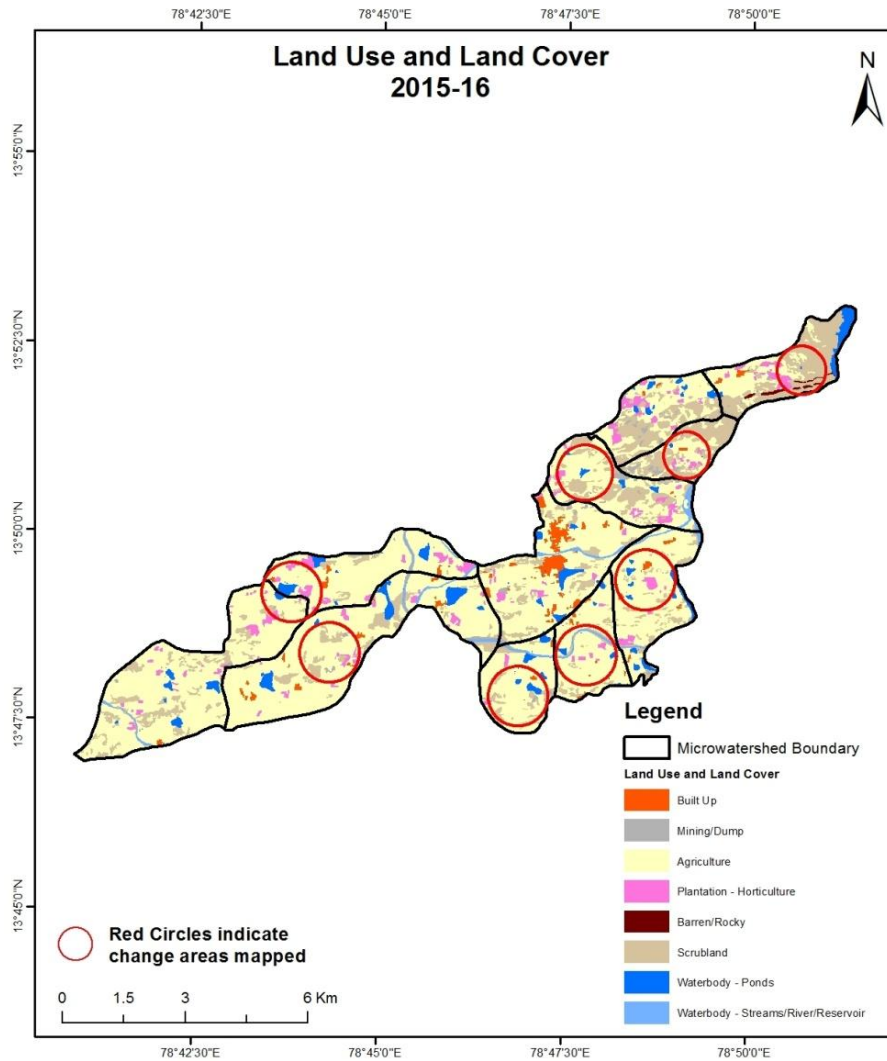
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



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

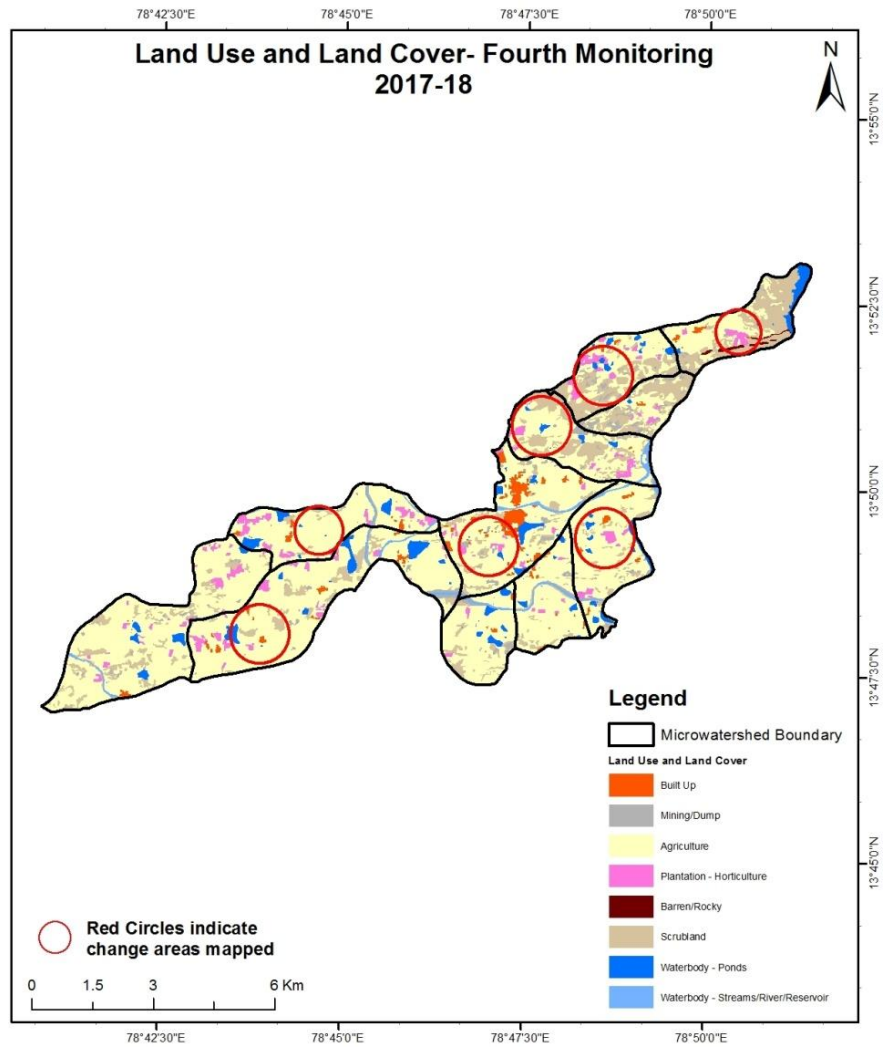
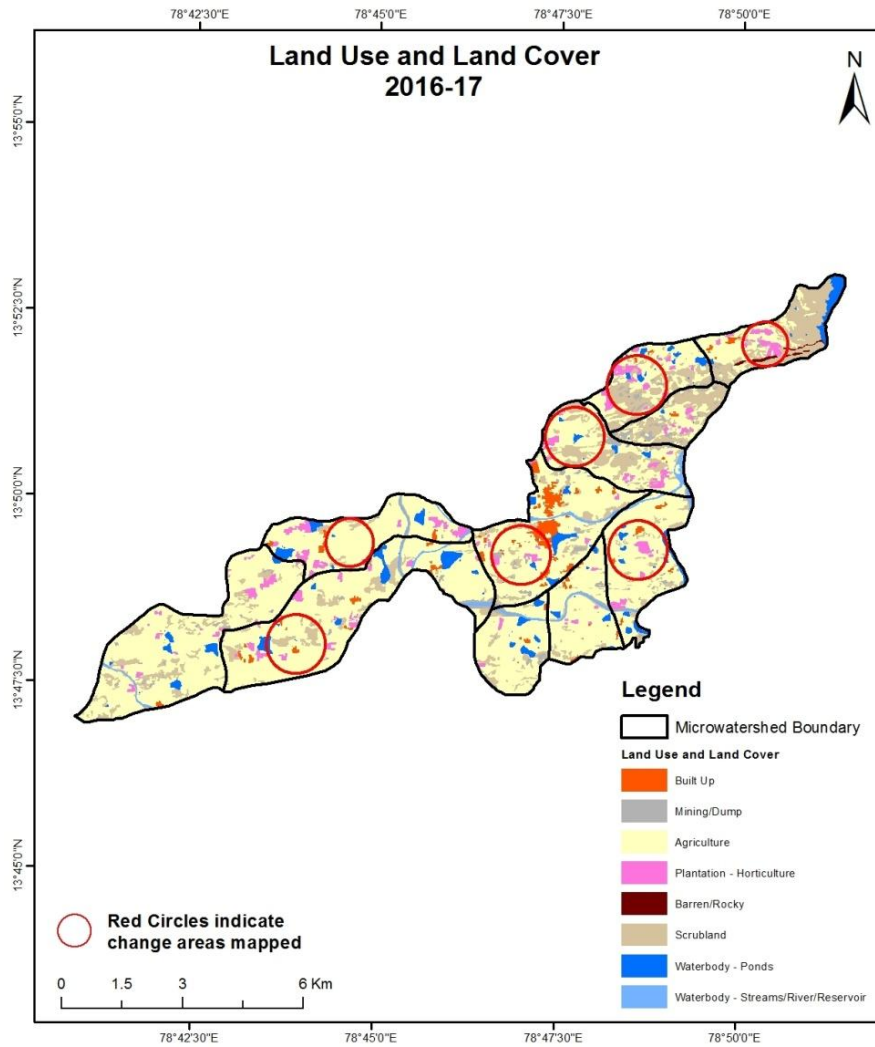
Scale: 1:10000





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

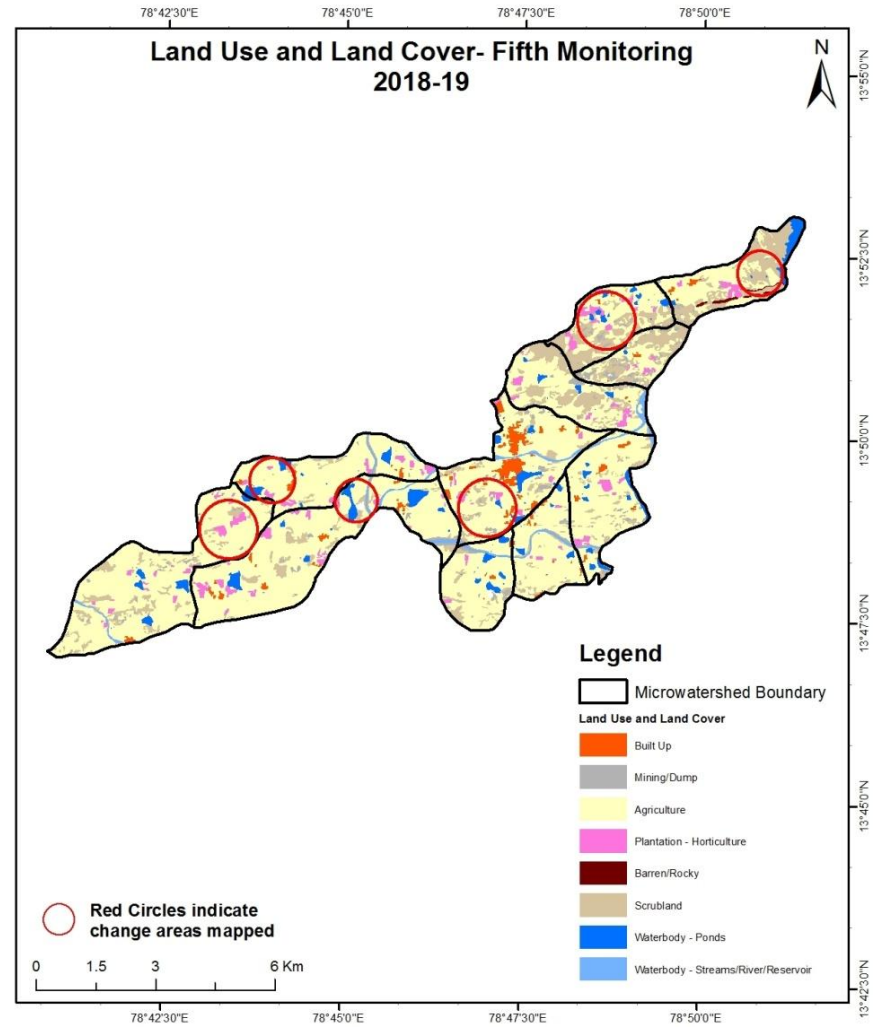
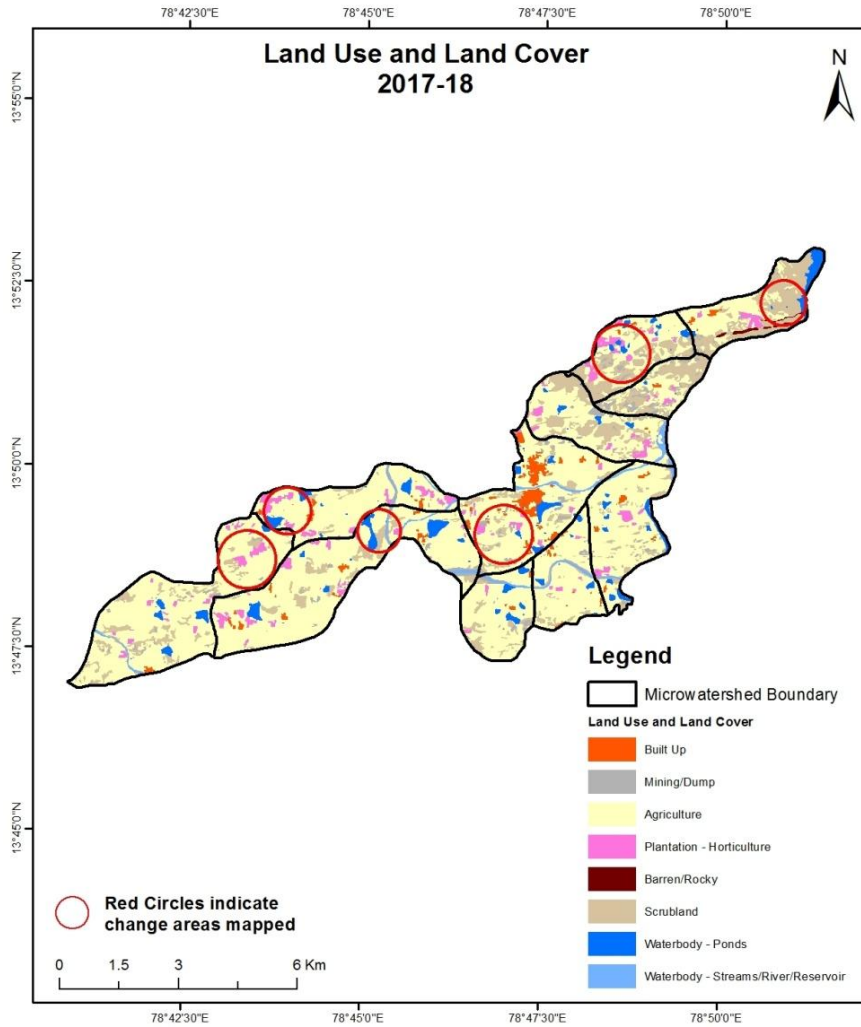
Scale: 1:10000





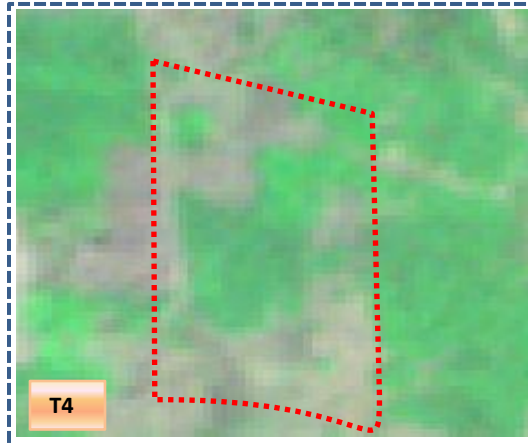
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

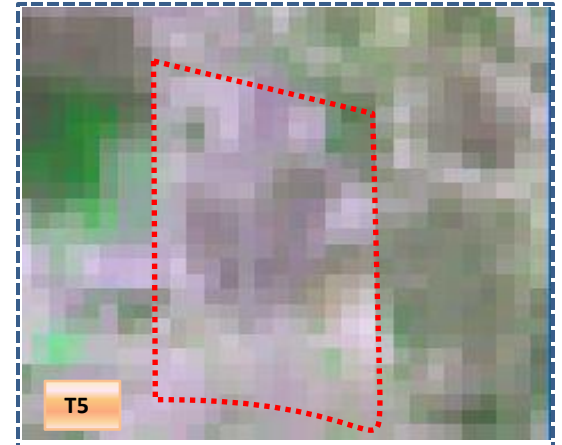


## Land Use and Land Cover changes for Pre and Post treatment dates

Plantation to Agriculture

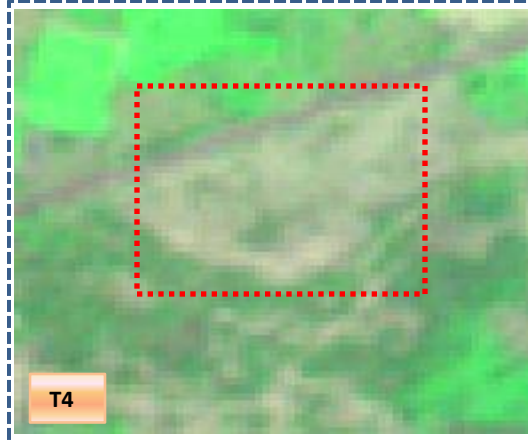


T4: 2017-18(78°45'52.873"E 13°49'40.305"N)



T5: 25 March 2019

Scrub to Agriculture



T4: 2017-18 (78°42'32.576"E 13°47'54.064"N )



T5: 25 March 2019

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

### Scrub to Agriculture



T0: 2010-11

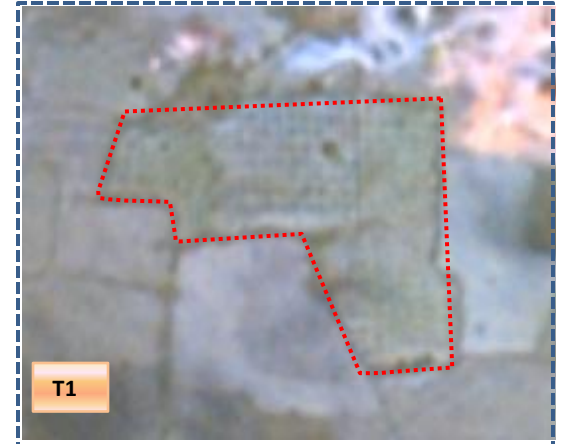


T1: 2 February 2015

### Agriculture to Plantation



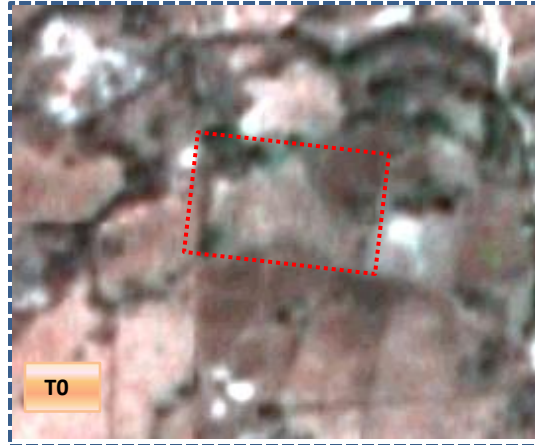
T0: 2010-11



T1: 2 February 2015

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

Agriculture to Plantation



T0

T0: 2010-11



T1

T1: 2 February 2015

Agriculture to Plantation



T0

T0: 2010-11



T1

T1: 2 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										Grand Total
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	
Built up	114.19										114.19
Mining/dump		32.62									32.62
Agriculture	8.26		4102.88	42.12				3.82		3.18	4160.24
Plantation Horticulture			2.19	160.57							162.77
Forest											
Forest Plantation											
Barren Rocky							12.31				12.31
Scrub	2.27	1.25	33.59	0.38				1230.25		0.53	1268.25
Waterbody- Streams/River									115.08		115.08
Waterbody – Ponds			1.79							211.23	213.02
<b>Grand Total</b>	<b>124.71</b>	<b>33.86</b>	<b>4140.45</b>	<b>203.07</b>			<b>12.31</b>	<b>1234.06</b>	<b>115.08</b>	<b>214.93</b>	<b>6078.48</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 57.36 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body of T1.
- In T1 37.57 ha of agriculture are increased from plantation, scrubland and water body of T0. The additional agriculture are coming from water body in T5 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>T1</b>													
<b>Built up</b>	124.71												<b>124.71</b>
<b>Mining/dump</b>		33.86											<b>33.86</b>
<b>Agriculture</b>	6.88	0.10	4028.03	84.77				12.75			7.91		<b>4140.45</b>
<b>Plantation Horticulture</b>			27.57	171.39							4.11		<b>203.07</b>
<b>Forest</b>													
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							12.31						<b>12.31</b>
<b>Scrub</b>	1.75	44.90	83.94	0.16				1092.74			10.56		<b>1234.06</b>
<b>Waterbody- Streams/River</b>									115.08				<b>115.08</b>
<b>Waterbody – Ponds</b>											214.93		<b>214.93</b>
<b>Grand Total</b>	<b>133.34</b>	<b>78.86</b>	<b>4139.54</b>	<b>256.33</b>			<b>12.31</b>	<b>1105.49</b>	<b>115.08</b>		<b>237.52</b>		<b>6078.48</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 112.41 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T2.
- In T2 111.50 ha of agriculture are increased from plantation 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-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	133.34										133.34
Mining/dump		78.86									78.86
Agriculture	9.14	4.14	4066.70	25.66				27.53		6.37	4139.54
Plantation Horticulture	0.11		19.67	233.63				2.92			256.33
Forest											
Forest Plantation											
Barren Rocky							12.31				12.31
Scrub	0.54	69.89	37.10					993.13		4.83	1105.49
Waterbody- Streams/River									115.08		115.08
Waterbody – Ponds	0.17	1.05	0.13							236.18	237.52
<b>Grand Total</b>	<b>143.30</b>	<b>153.94</b>	<b>4123.60</b>	<b>259.29</b>			<b>12.31</b>	<b>1023.57</b>	<b>115.08</b>	<b>247.38</b>	<b>6078.48</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 72.83 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T3.
- In T3 56.90 ha of agriculture are 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-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>T3</b>												
<b>Built up</b>	143.30										<b>143.30</b>	
<b>Mining/dump</b>		153.94									<b>153.94</b>	
<b>Agriculture</b>	2.92	1.55	4038.26	29.27				50.23		1.37	<b>4123.60</b>	
<b>Plantation Horticulture</b>			51.12	208.12						0.05	<b>259.29</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							12.31				<b>12.31</b>	
<b>Scrub</b>	0.90	4.53	73.64	7.63				935.35		1.52	<b>1023.57</b>	
<b>Waterbody- Streams/River</b>									115.08		<b>115.08</b>	
<b>Waterbody – Ponds</b>			5.91							241.47	<b>247.38</b>	
<b>Grand Total</b>	<b>147.12</b>	<b>160.02</b>	<b>4168.94</b>	<b>245.02</b>			<b>12.31</b>	<b>985.58</b>	<b>115.08</b>	<b>244.40</b>	<b>6078.48</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 85.34 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T4.
- In T4 130.67 ha of agriculture are increased from plantation, 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>	147.12										<b>147.12</b>	
<b>Mining/dump</b>		159.80	0.22								<b>160.02</b>	
<b>Agriculture</b>	0.26	3.28	4164.23					1.16			<b>4168.94</b>	
<b>Plantation Horticulture</b>			24.61	220.41							<b>245.02</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							12.31				<b>12.31</b>	
<b>Scrub</b>		6.56	64.08					914.94			<b>985.58</b>	
<b>Waterbody- Streams/River</b>									115.08		<b>115.08</b>	
<b>Waterbody – Ponds</b>										244.40	<b>244.40</b>	
<b>Grand Total</b>	<b>147.38</b>	<b>169.64</b>	<b>4253.15</b>	<b>220.41</b>			<b>12.31</b>	<b>916.10</b>	<b>115.08</b>	<b>244.40</b>	<b>6078.48</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 4.71 ha of agriculture are decreased and it is converted into built-up, mining/dump and scrubland of T5.
- In T5 88.92 ha of agriculture are increased from mining/dump, 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 31.38 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 45.33 & 84.21 Hectares From T3 to T4 & T4 to T5 and There is an decrease of 19.79, 0.91 & 15.93 Hectares From T0 to T1, T1 to T2, T2 to T3 . The overall increase of 92.91 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is increase of 57.64 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 352.16 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (27) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (20) verified from the portal.