

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

CHITTOOR -02/2009-10

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

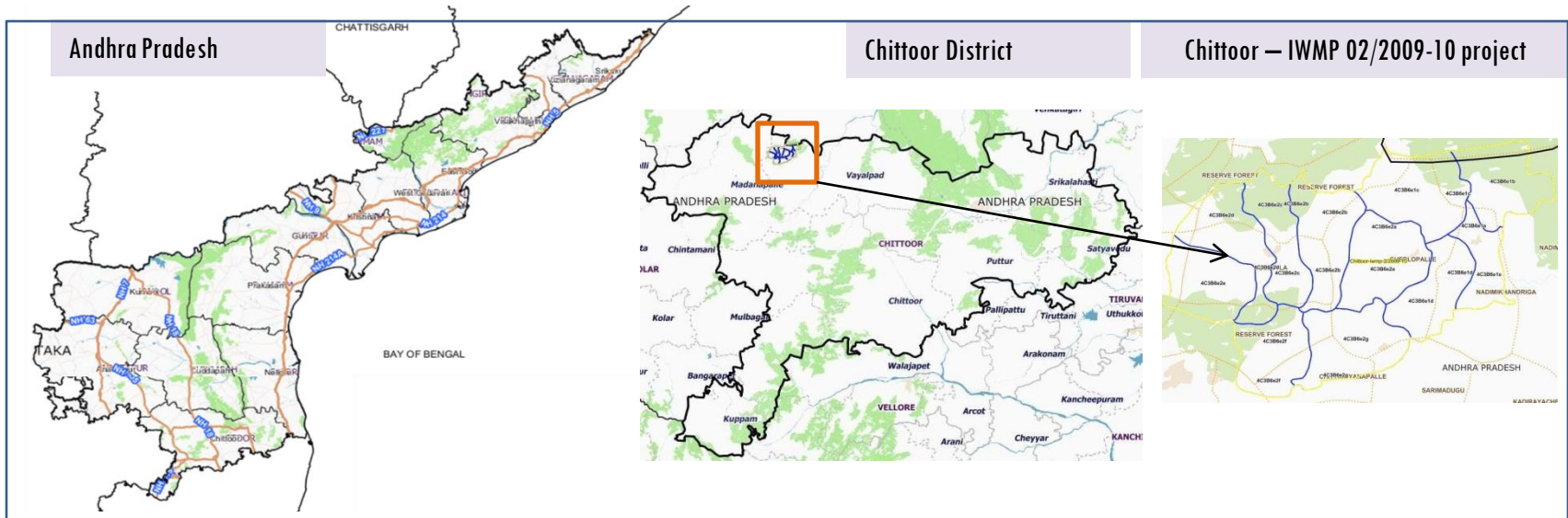
## **E X E C U T I V E   S U M M A R Y**

- 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-02/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 7,815.99 ha. It comprises of 11 micro watersheds.
- In the project area 74 Drishti photos were uploaded showing 35 water harvesting structures of check dams/Rock fill dam, recharge pits, 18 farm ponds, 10 check dams/rock fill dams 8 land developments of afforestation, horticulture, bund plantation of teak and remaining showing other activities.
- 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 4.91 ha increase in the area.
- Major percentage i.e. 39.29 % is covered by the agriculture, 29.90 % is covered by scrubland and 20.74 % is covered by forest and remaining by other land use classes.

# PROJECT : CHITTOOR - IWMP-02/2009-10

## DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Gurramkonda Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 7,815.99 ha. It comprises of 11 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2013-14 (T1) period (*Batch -1*) projects taking 2017-18 (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*	T 1-A**	T 1-B**	T 5
	2013-14	2013-14	2017-18
LISS IV	2013-14		
SCENE 1			30-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			30-Mar-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	Drishti Photographs		
		Total	74
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

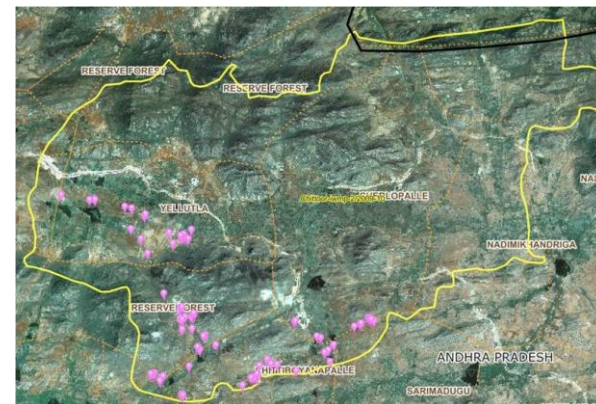


MWS Boundary



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	8	5
2	Afforestation	3	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	19	15
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	35	30
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	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle Trough & Water Tough )	9	0
18	Others	0	0
	<b>TOTAL</b>	<b>77</b>	<b>52</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 T2 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.



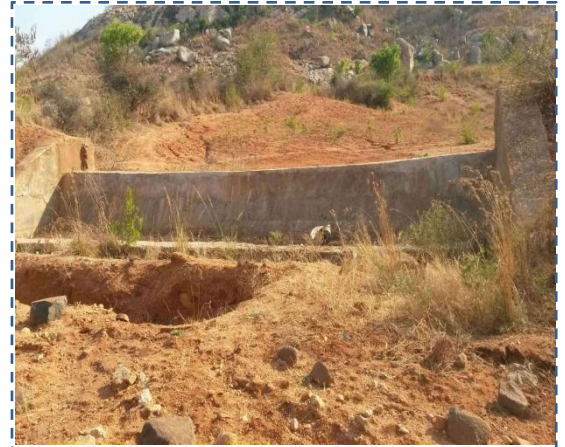
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-02/2009-10



T1:2009-10



T2: 26 February 2013

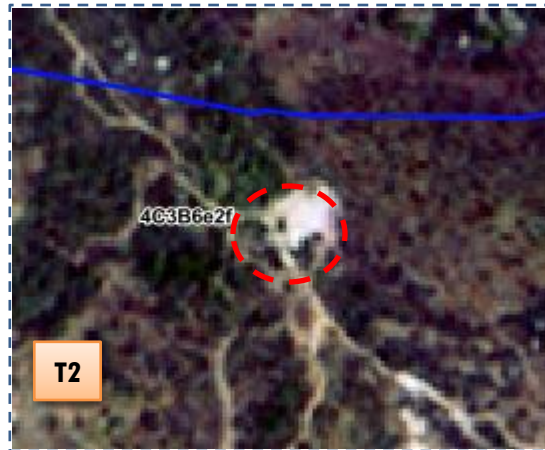


Drishti SI no. 568969 MWS :4C3B6e2f

Check dam



T2:2009-10



T2: 26 February 2013



Drishti SI no.568990 MWS : 4C3B6e2f

Check dam



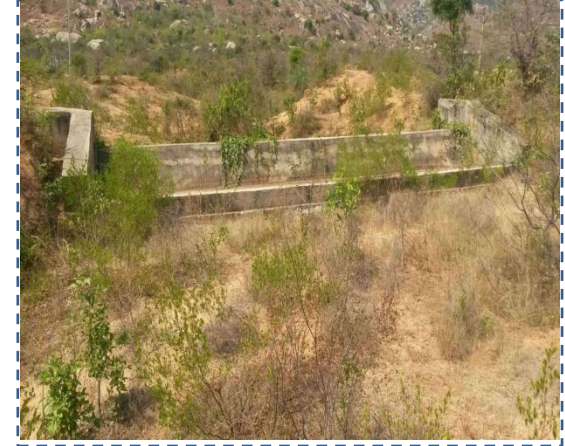
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-02/2009-10



T1: 2009-10



T2: 26 February 2013

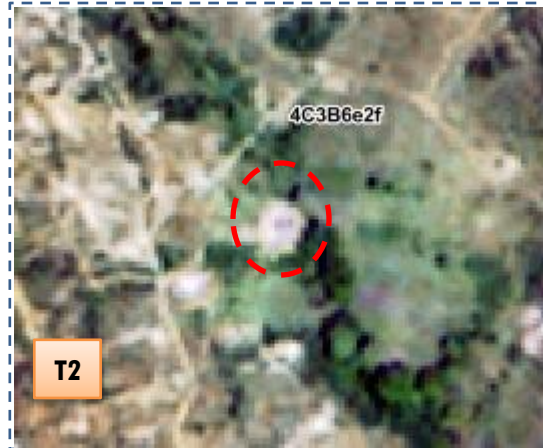


Drishti Sl no. 571603 MWS : 4C3B6e2c

Check dam



T1: 2009-10



T2: 26 February 2013



Drishti Sl no. 571603 MWS : 4C3B6e2f

Farm pond



Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-02/2009-10



T1

T1: 2009-10



T2

T2: 26 February 2013



Drishti Sl no. 571568 MWS : 4C3B6e2c

Farm pond



T1

T1: 2009-10



T2

T2: 26 February 2013



Drishti Sl no. 571688 MWS : 4C3B6e2e

Farm pond

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

Natural Color Composite- 2009-10



Source:Fusen data,NRSC

Natural Color Composite-2013-14



Source:LISS-IV,NRSC

Natural Color Composite- 12th February 2015



Source:Fusen data,NRSC

Natural Color Composite-05th January 2016



Source:Fusen data,NRSC

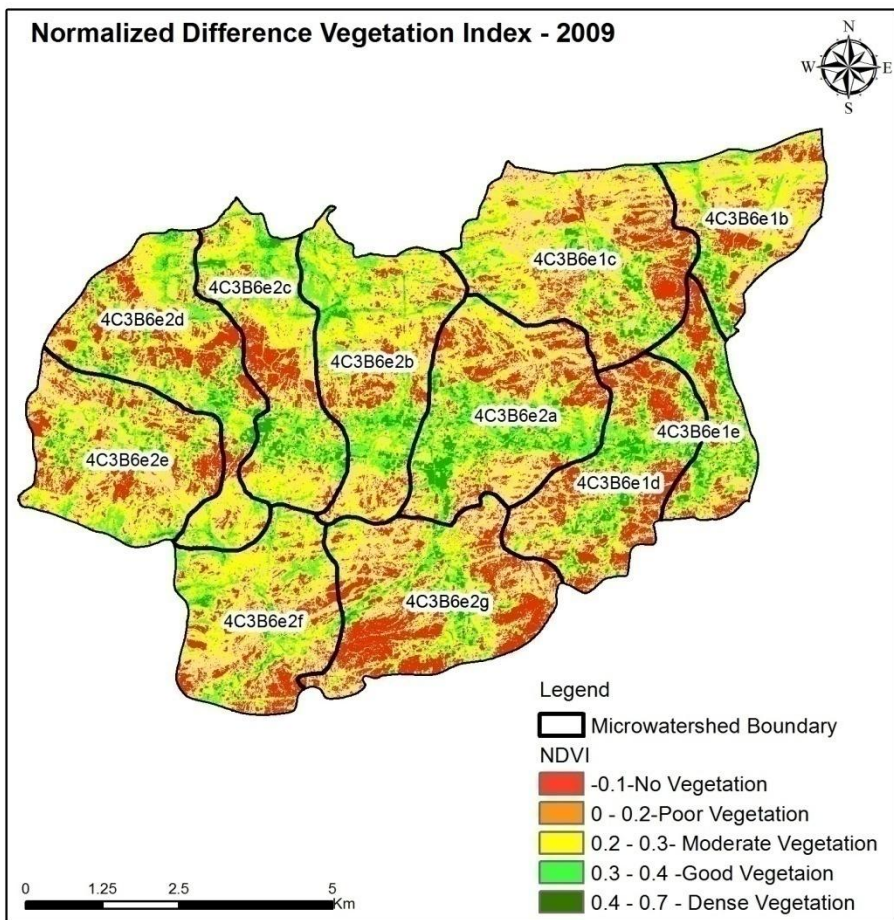
Natural Color Composite- 05th January 2017



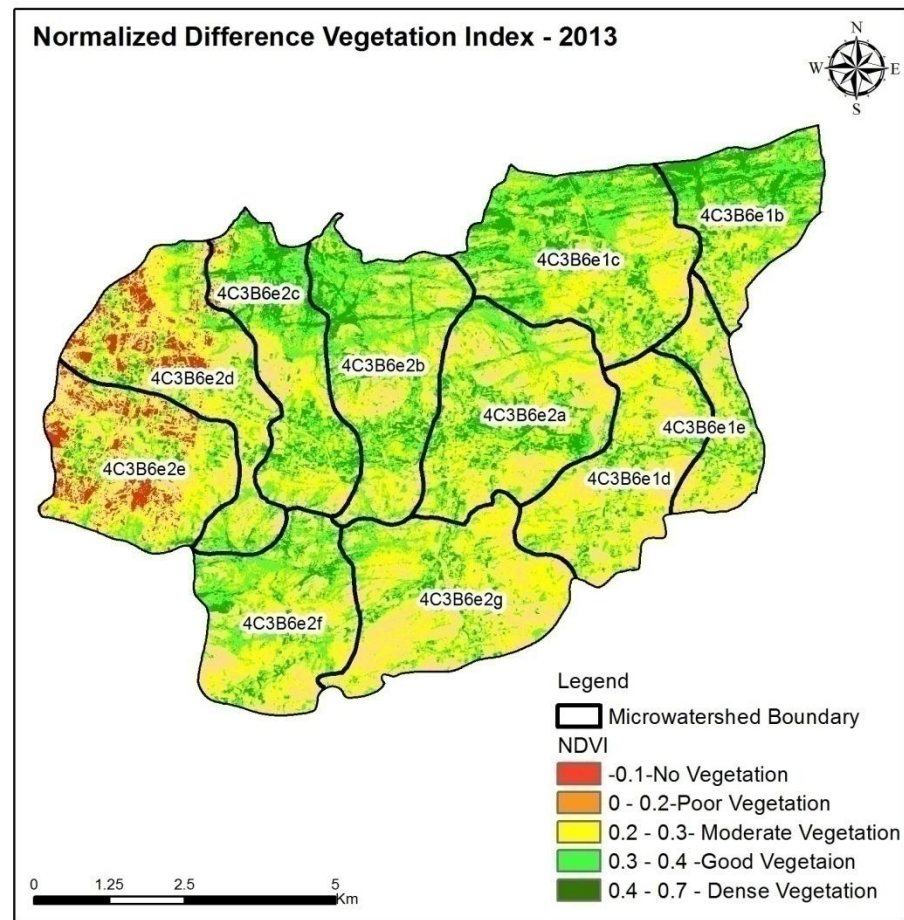
Source:LISS-IV,NRSC



# Changes in Vegetation Cover

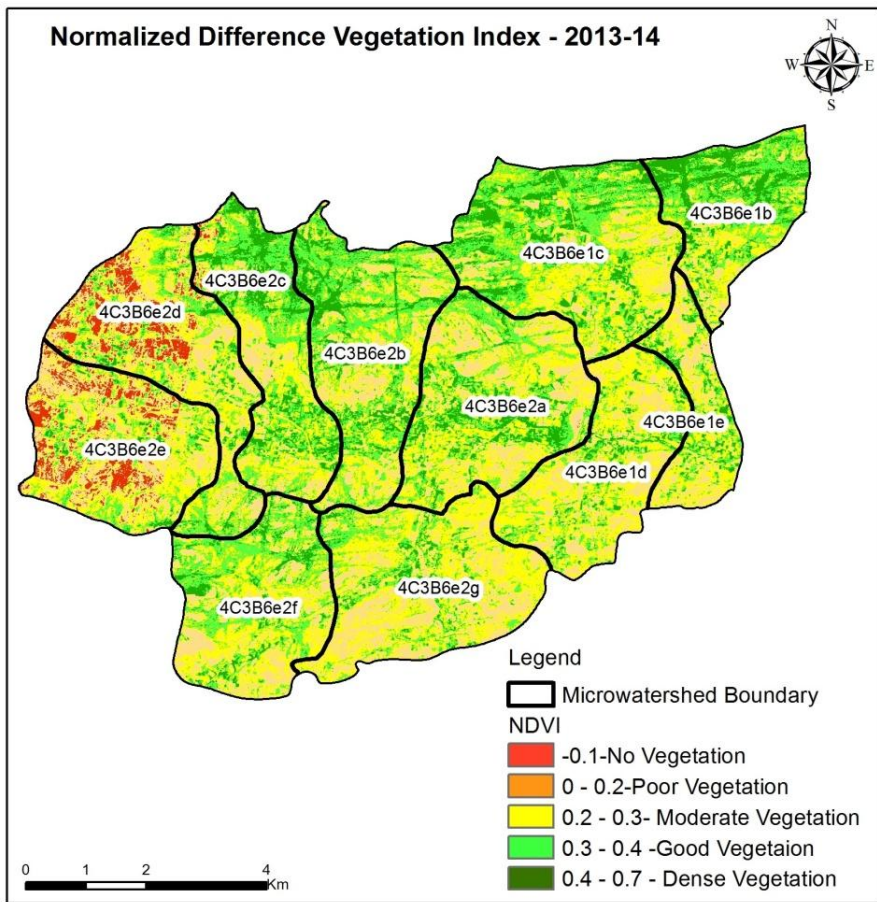


NDVI (2009-10)

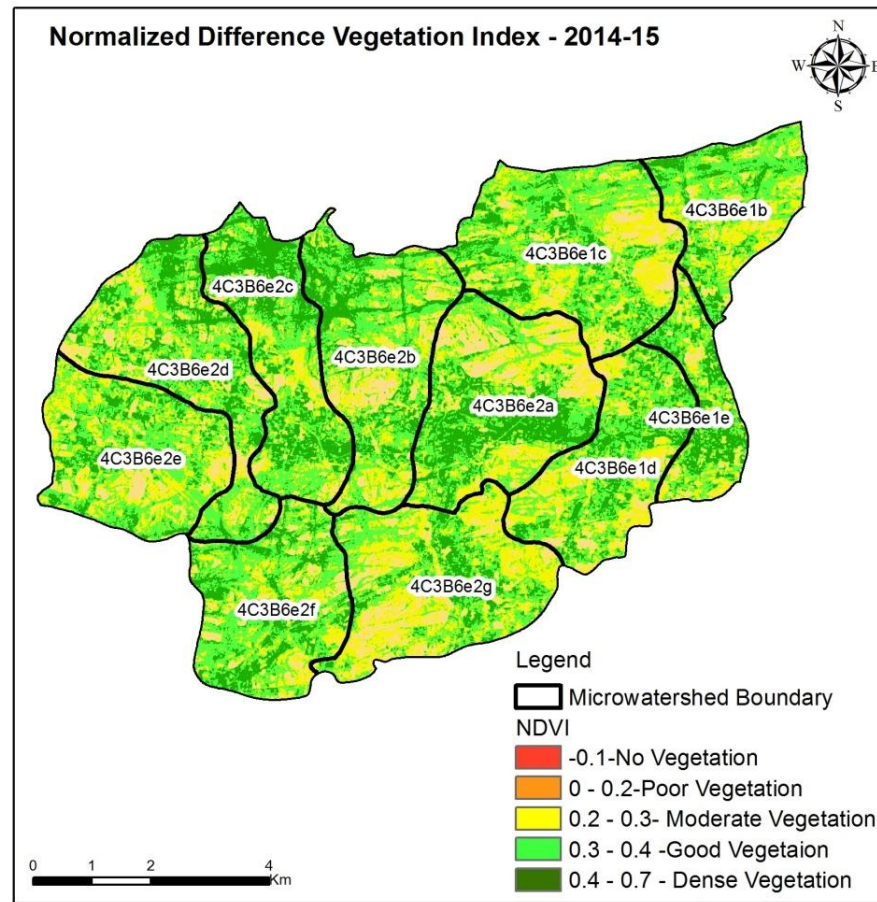


NDVI (2013-14)

# Changes in Vegetation Cover



NDVI (2013-14)



NDVI (2014-15)

## MONITORING IN THE PROJECT AREA

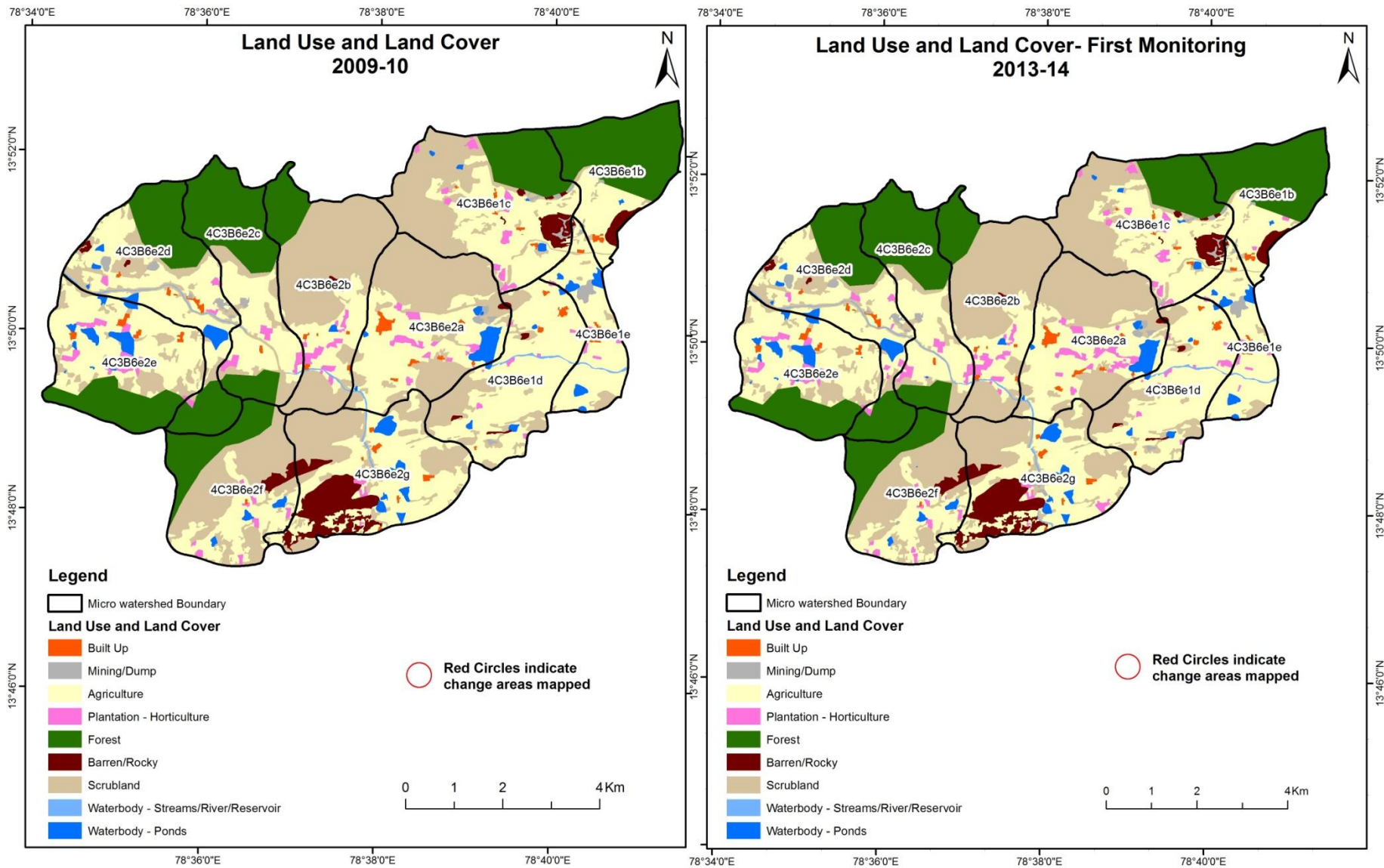
### Land use and Land cover Changes in the Project

- 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)



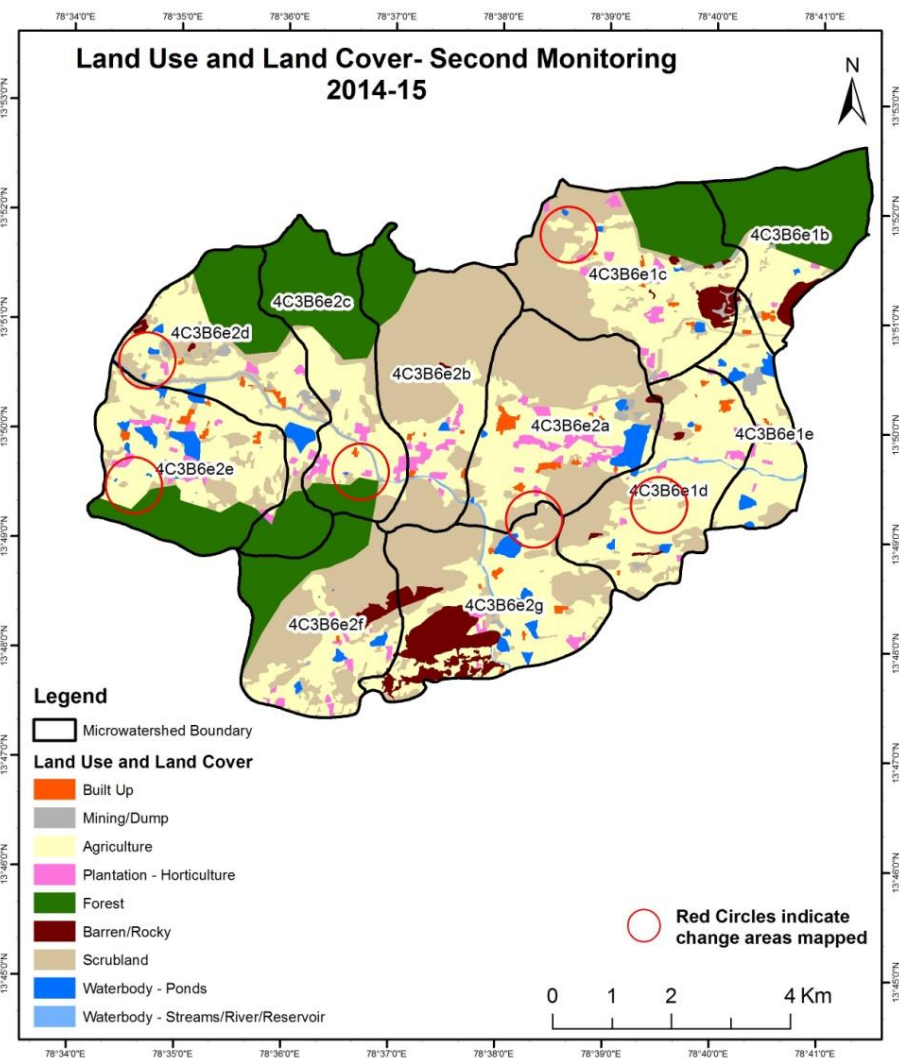
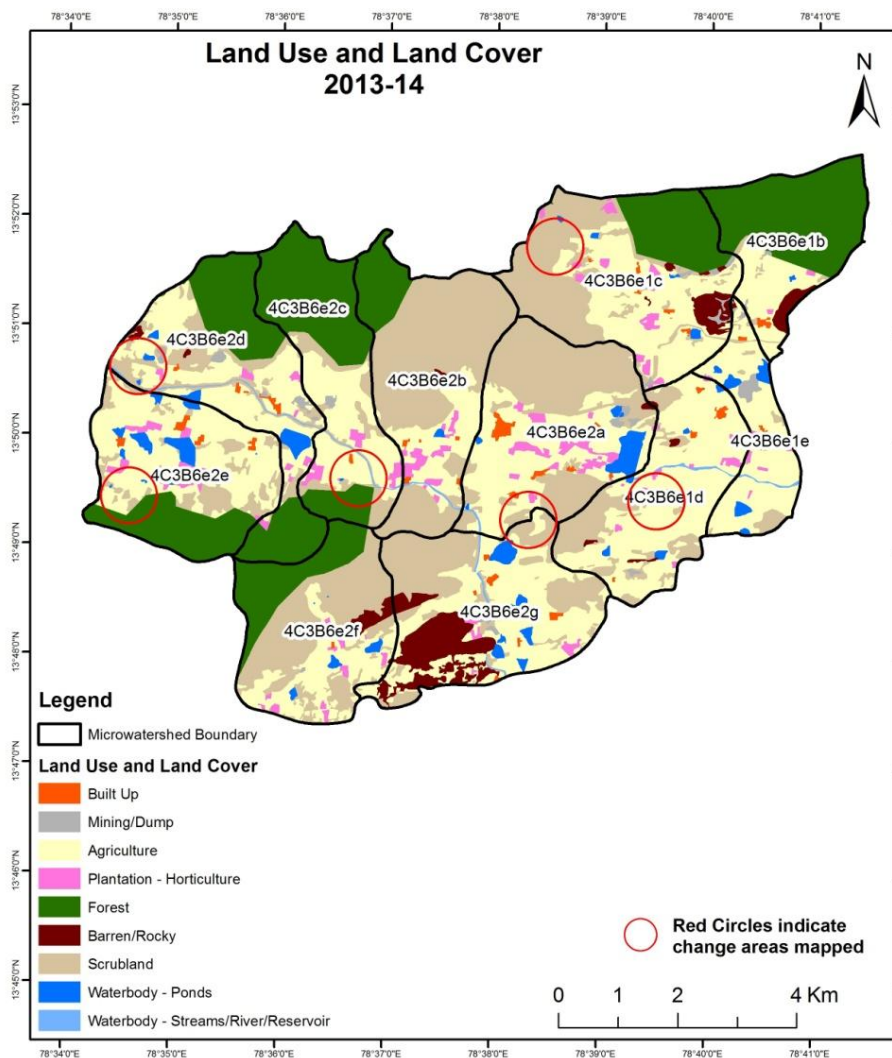
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



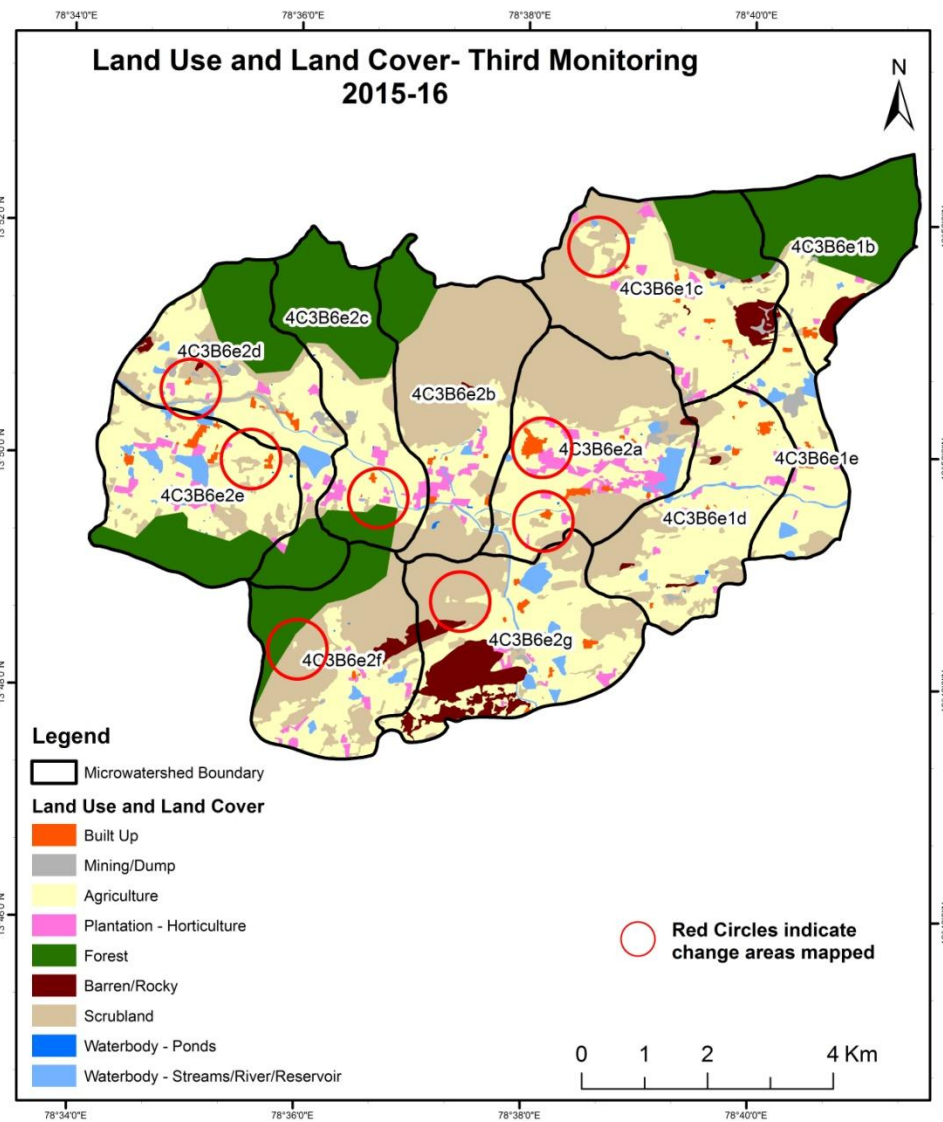
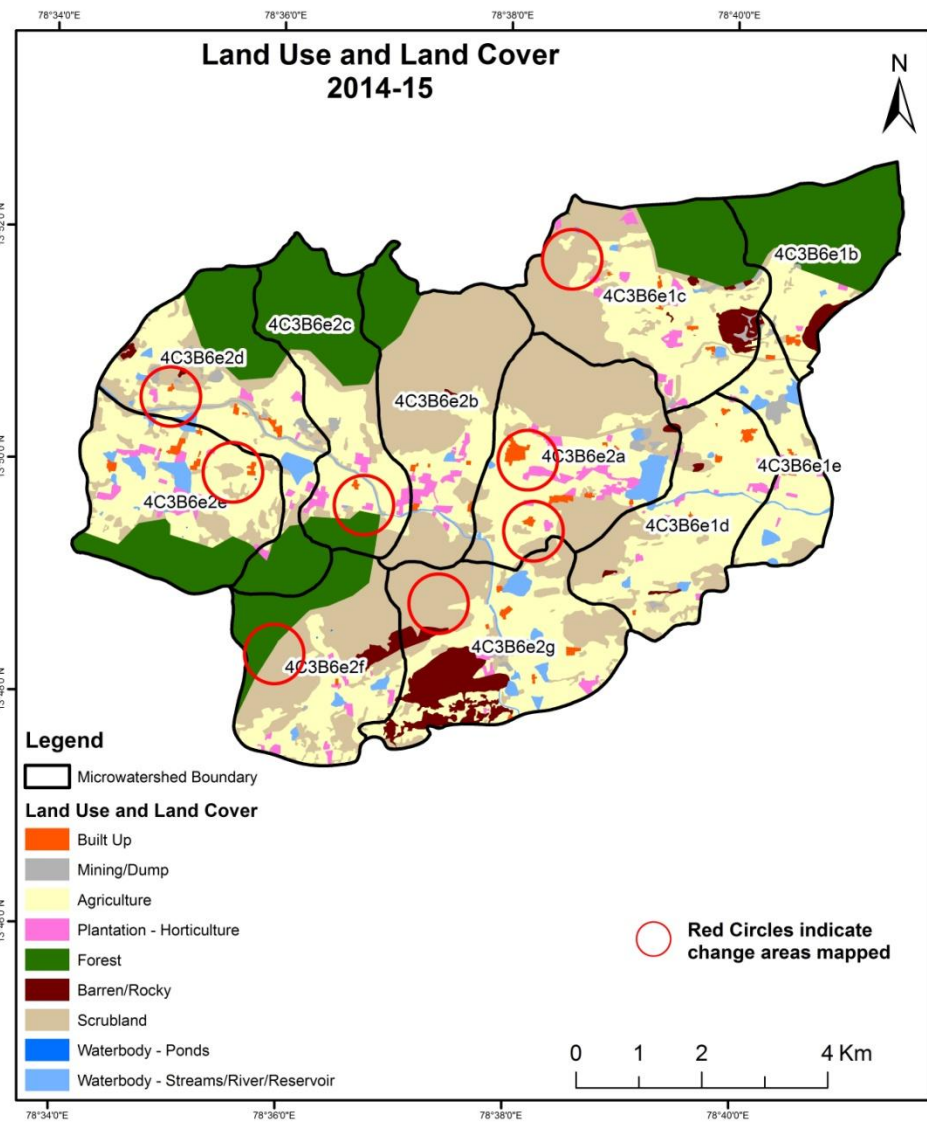
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



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

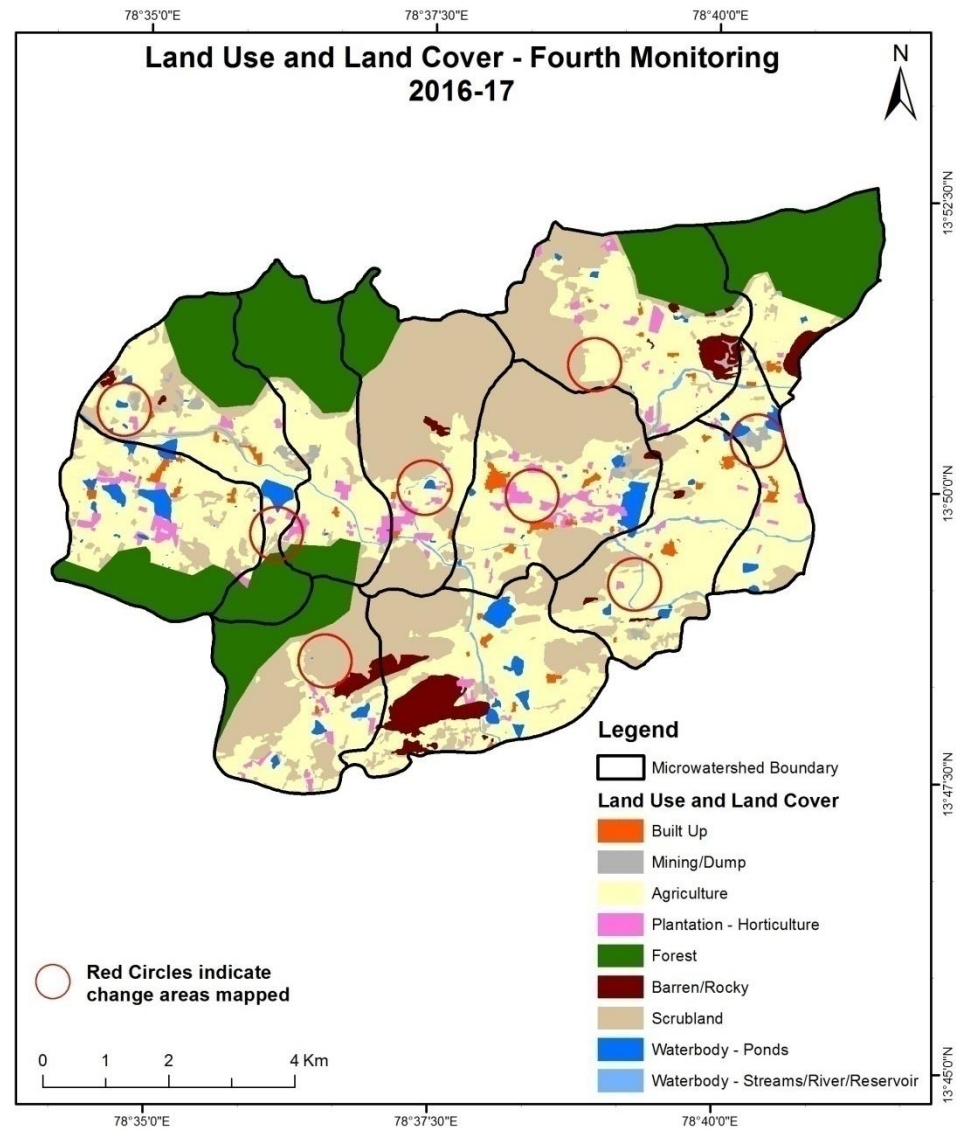
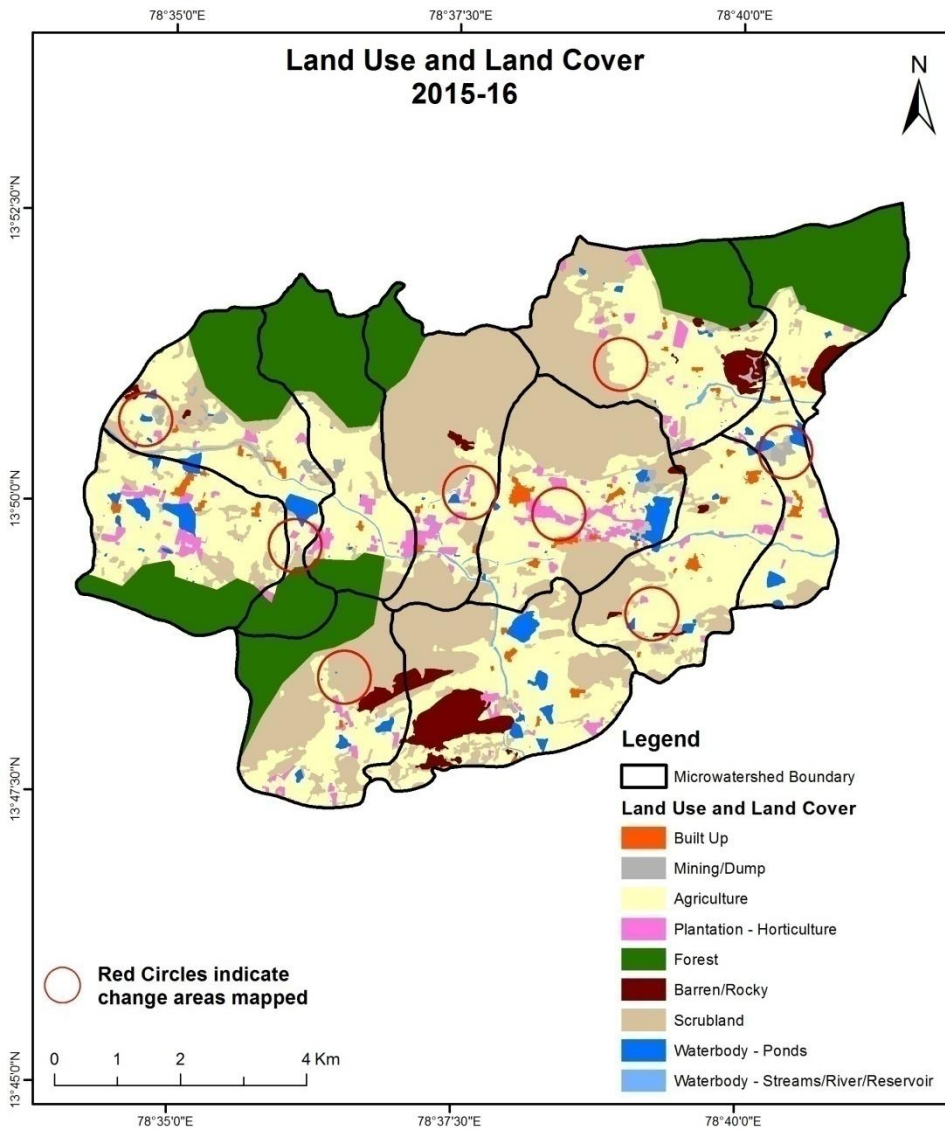
Scale: 1:10000





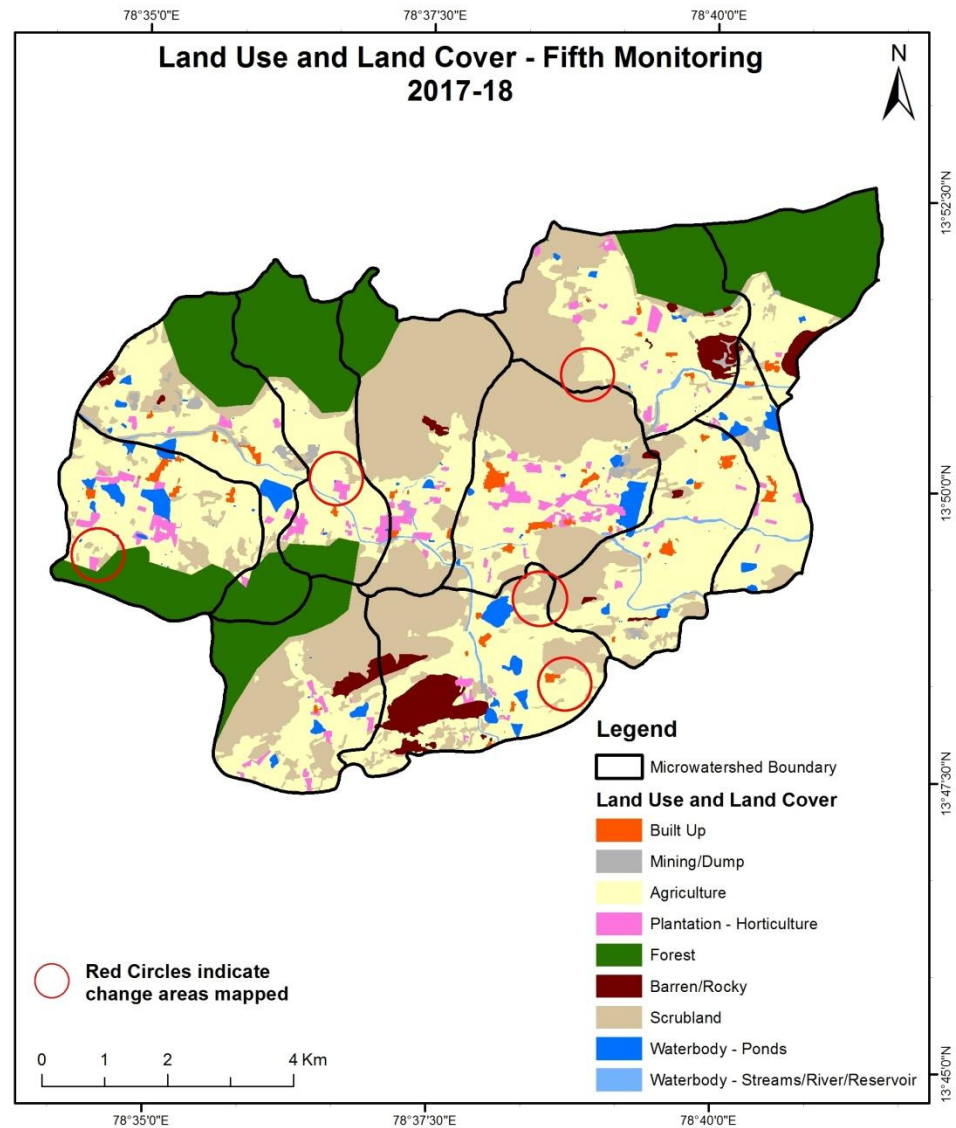
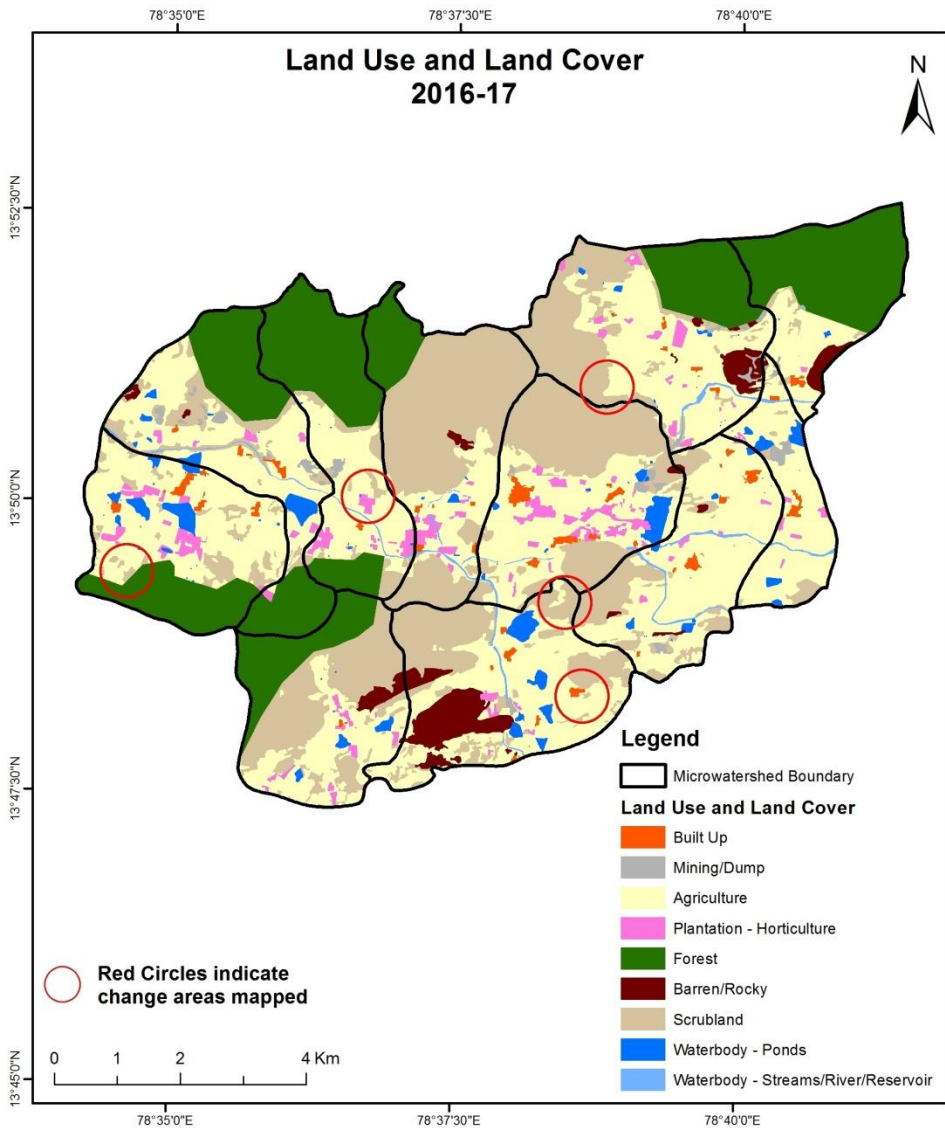
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

Scrub to Agriculture



T1: 2009-10



T2: 26 February 2013

Scrub to Agriculture



T1: 2009-10



T2: 26 February 2013

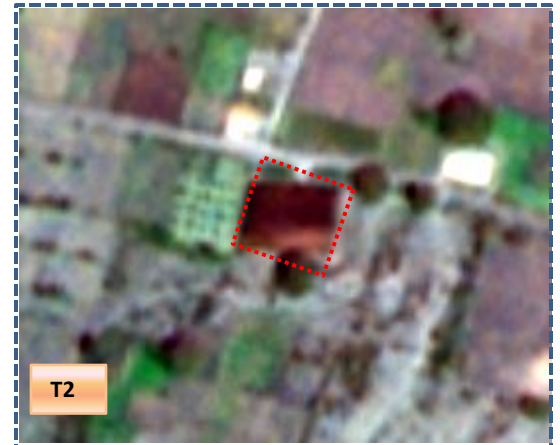


## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



T1: 2009-10

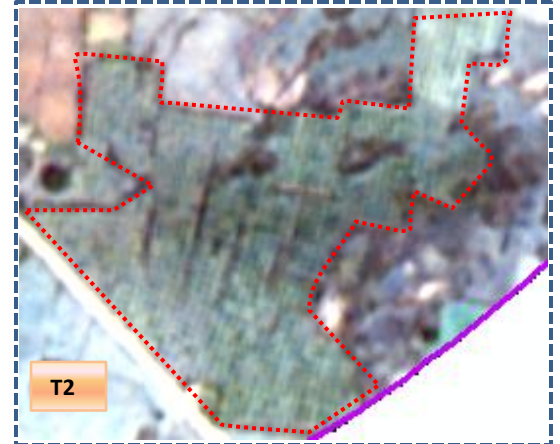


T2: 26 February 2013

Agriculture Plantation



T1: 2009-10



T2: 26 February 2013

**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	68.30										68.30
Mining/dump		50.47									50.47
Agriculture	1.16	3.10	3015.76	34.15						1.00	3055.16
Plantation Horticulture			3.44	167.61							171.05
Forest					1621.38						1621.38
Forest Plantation											
Barren Rocky							210.95				210.95
Scrub			38.27	8.61				2397.16	1.32	0.07	2445.43
Waterbody- Streams/River									32.85		32.85
Waterbody – Ponds										160.41	160.41
<b>Grand Total</b>	<b>69.46</b>	<b>53.57</b>	<b>3057.46</b>	<b>210.37</b>	<b>1621.38</b>		<b>210.95</b>	<b>2397.16</b>	<b>34.17</b>	<b>161.48</b>	<b>7815.99</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 39.40 ha of the agriculture area has decreased and it is converted into built-up, mining dump, plantation, and water body in T1.
- In T1 41.70 ha of the agriculture area has increased from plantations and scrubland of T0.
- Overall 2.30 ha of the agriculture area has been increase during the project period. 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		
	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>	69.46												69.46
<b>Mining/dump</b>		52.94	0.62										53.57
<b>Agriculture</b>	6.13	0.32	3042.51	6.12				2.38					3057.46
<b>Plantation Horticulture</b>			0.31	210.06									210.37
<b>Forest</b>					1621.38								1621.38
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							210.95						210.95
<b>Scrub</b>	0.67	3.86	63.52					2329.02		0.08			2397.16
<b>Waterbody- Streams/River</b>									34.17				34.17
<b>Waterbody – Ponds</b>										161.48			161.48
<b>Grand Total</b>	<b>76.26</b>	<b>57.13</b>	<b>3106.97</b>	<b>216.18</b>	<b>1621.38</b>		<b>210.95</b>	<b>2331.40</b>	<b>34.17</b>	<b>161.57</b>			<b>7815.99</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 14.95 ha of the agriculture area has decreased and it is converted into built-up, mining dump, plantation and scrubland in T2.
- In T2 68.83 ha of the agriculture area has increased from mining dump and scrubland of T1.
- Overall 49.50 ha of the agriculture area has been increased during the project period. 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		
	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>	76.26												76.26
<b>Mining/dump</b>		57.13											57.13
<b>Agriculture</b>	4.01		3070.10	23.27					2.32		7.27		3106.97
<b>Plantation Horticulture</b>			7.79	208.33							0.07		216.18
<b>Forest</b>			0.48		1620.90								1621.38
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							210.95						210.95
<b>Scrub</b>	1.45		119.89	2.86				2198.11	8.94		0.14		2331.40
<b>Waterbody- Streams/River</b>									34.17				34.17
<b>Waterbody – Ponds</b>			0.75	0.08							160.74		161.57
<b>Grand Total</b>	<b>81.72</b>	<b>57.13</b>	<b>3199.01</b>	<b>234.54</b>	<b>1620.90</b>		<b>210.95</b>	<b>2198.11</b>	<b>45.43</b>		<b>168.21</b>		<b>7815.99</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 36.87 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body in T3.
- In T3 128.91 ha of the agriculture area has increased from plantations, forest, scrubland and water body of T2.
- Overall 92.04 ha of the agriculture area has been increased during the project period. 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		
	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>	81.72												81.72
<b>Mining/dump</b>		56.41						0.71					57.13
<b>Agriculture</b>		0.68	3192.14	0.87					4.64		0.67		3199.01
<b>Plantation Horticulture</b>			36.24	198.14							0.16		234.54
<b>Forest</b>					1620.90								1620.90
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							210.95						210.95
<b>Scrub</b>		4.16	65.97	1.42				2121.36	5.19				2198.11
<b>Waterbody- Streams/River</b>									45.43				45.43
<b>Waterbody – Ponds</b>			3.77								164.44		168.21
<b>Grand Total</b>	<b>81.72</b>	<b>61.26</b>	<b>3298.13</b>	<b>200.43</b>	<b>1620.90</b>		<b>210.95</b>	<b>2122.07</b>	<b>55.27</b>		<b>165.27</b>		<b>7815.99</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 6.87 ha of the agriculture area has decreased and it is converted into mining/dump, plantation and water body in T4.
- In T4 105.99 ha of the agriculture area has increased from plantations, scrubland and water body of T3.
- Overall 99.12 ha of the agriculture area has been increase during the project period. 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>T4</b>												
<b>Built up</b>	81.72										81.72	
<b>Mining/dump</b>		61.26									61.26	
<b>Agriculture</b>			3295.30	2.69						0.14	3298.13	
<b>Plantation Horticulture</b>			2.03	198.40							200.43	
<b>Forest</b>					1620.90						1620.90	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							210.95				210.95	
<b>Scrub</b>		0.90	7.77					2113.39			2122.07	
<b>Waterbody- Streams/River</b>									55.27		55.27	
<b>Waterbody – Ponds</b>			1.01							164.27	165.27	
<b>Grand Total</b>	<b>81.72</b>	<b>62.16</b>	<b>3306.11</b>	<b>201.09</b>	<b>1620.90</b>		<b>210.95</b>	<b>2113.39</b>	<b>55.27</b>	<b>164.40</b>	<b>7815.99</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 2.83 ha of the agriculture area has decreased and it is converted into plantation and water body in T5.
- In T5 10.81 ha of the agriculture area has increased from plantations, scrubland and water body of T4.
- Overall 7.98 ha of the agriculture area has been increased during the project period. 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 26.41 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 2.30, 49.50, 92.04, 99.12 & 7.98 Hectares From T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 250.94 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 30 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 332.04 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.