

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -06/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-20201

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

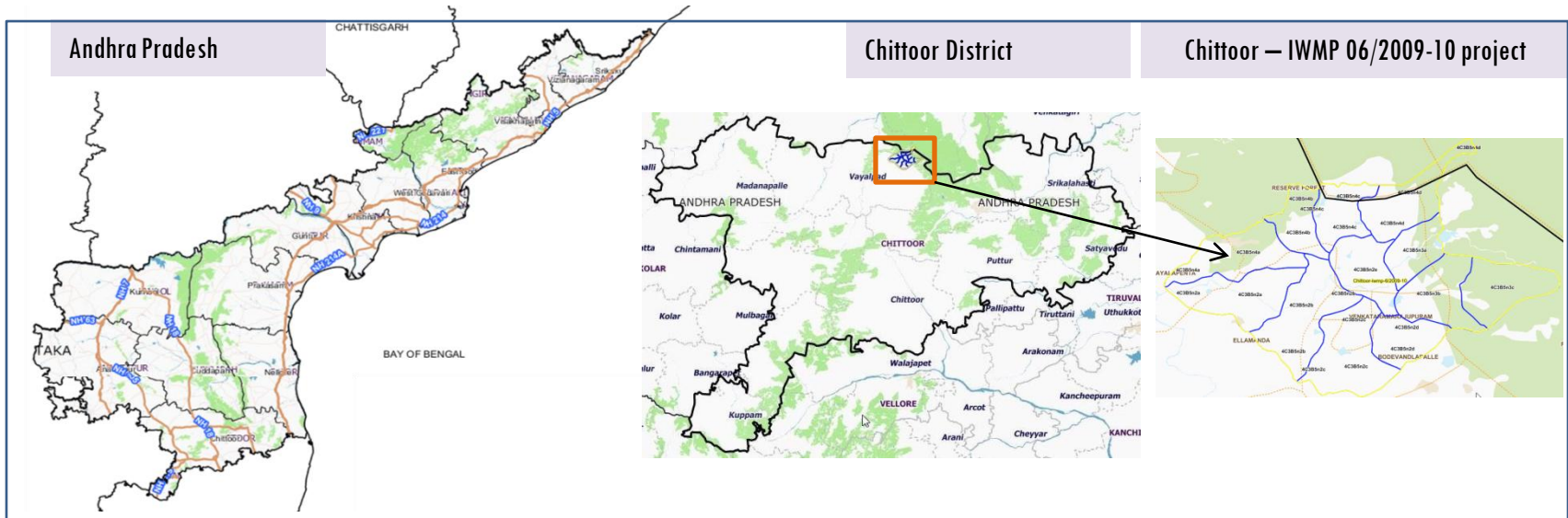
E X E C U T I V E S U M M A R Y

- 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-06/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 7019.77 ha. It comprises of 12 micro watersheds.
- In the project area 43 Drishti photos were uploaded showing 25 farm ponds/dug out pits, 9 check dam/ rock fill dam, recharge pits and remaining other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 25 new farm ponds or dug out pits, 9 check dams and 3 drainage treatments with 24.64 ha increase in the area.
- Major percentage i.e. 34.81 % is covered by the agriculture, 28.22 % is covered by forest, 17.88 % is covered by scrub land and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-06/2009-10

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Yerravaripalem Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 7019.77 ha. It comprises of 12 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



- 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
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			6-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			6-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	42
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

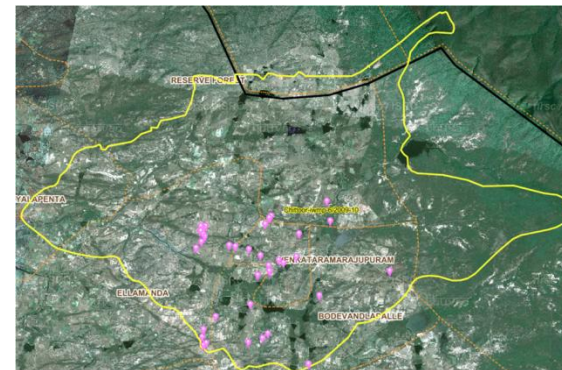


MWS Boundary



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	Agronomic measures	0	0
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	2	2
7	Existing activity	0	0
8	Checks & Plugs	12	10
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	25	20
11	Civil work-Check dams /Rock fill dam	3	1
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	0	0
18	Others	0	0
	TOTAL	42	33

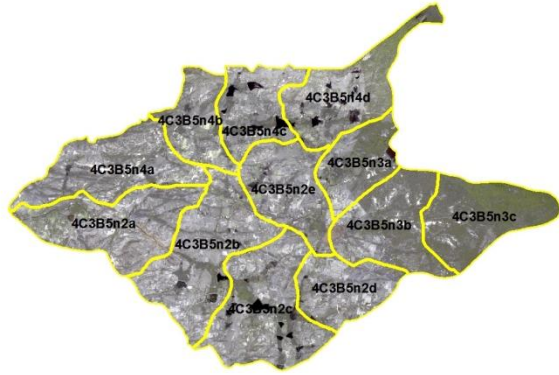
MONITORING IN THE PROJECT AREA

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-2013-2014



Source:Fusen data,NRSC

Natural Color Composite- 2015-2016



Source:LISS-IV,NRSC

Natural Color Composite- 2016-2017



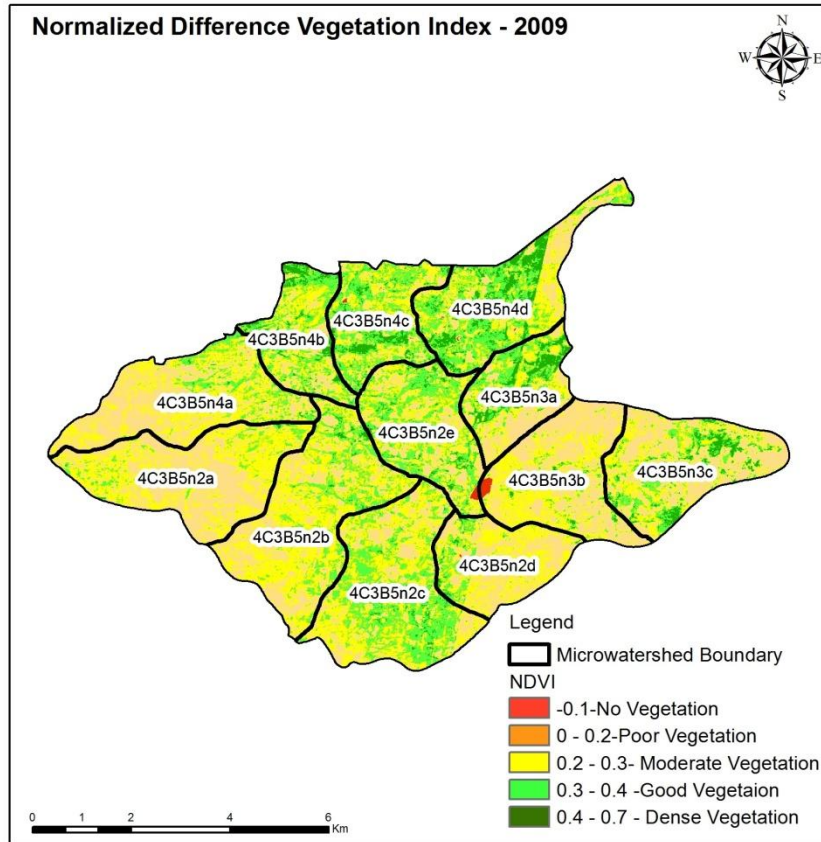
Source:Fusen data,NRSC

Natural Color Composite- 06th March 2018

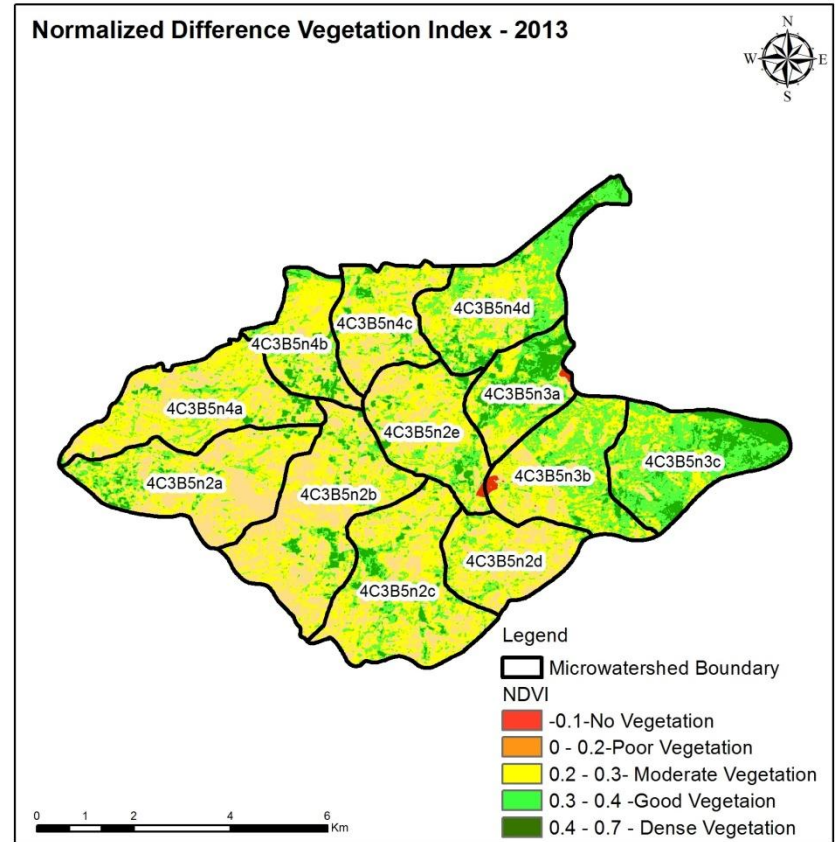


Source:LISS-IV,NRSC

Changes in Vegetation Cover

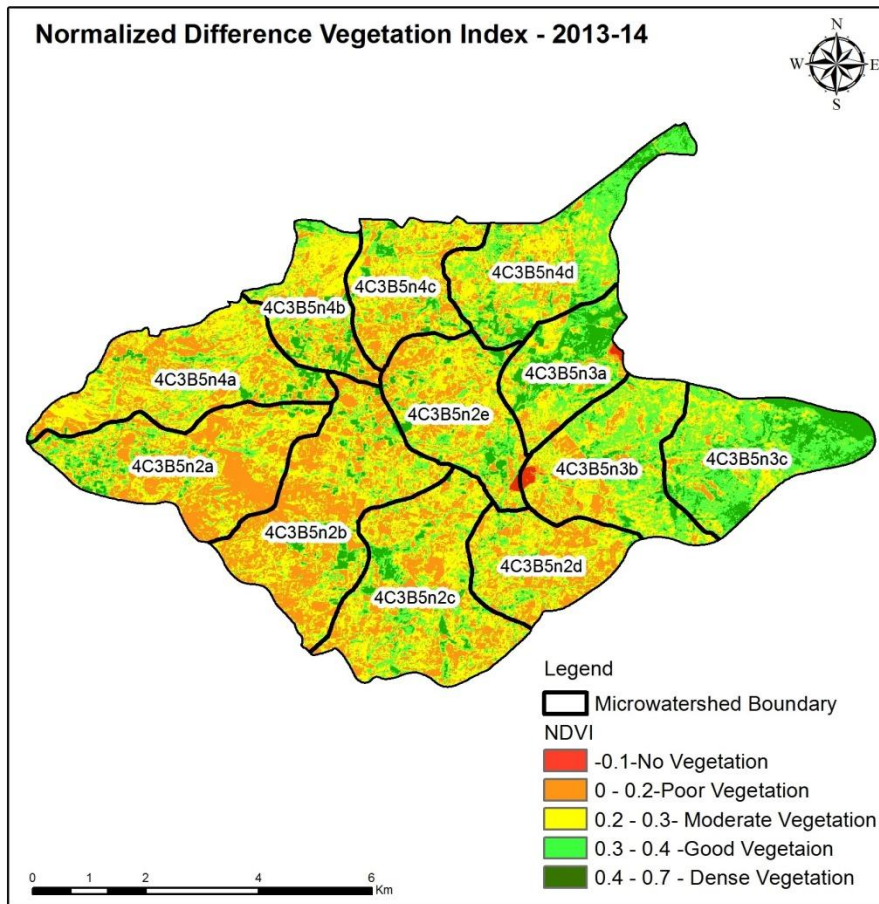


NDVI (2009-10)

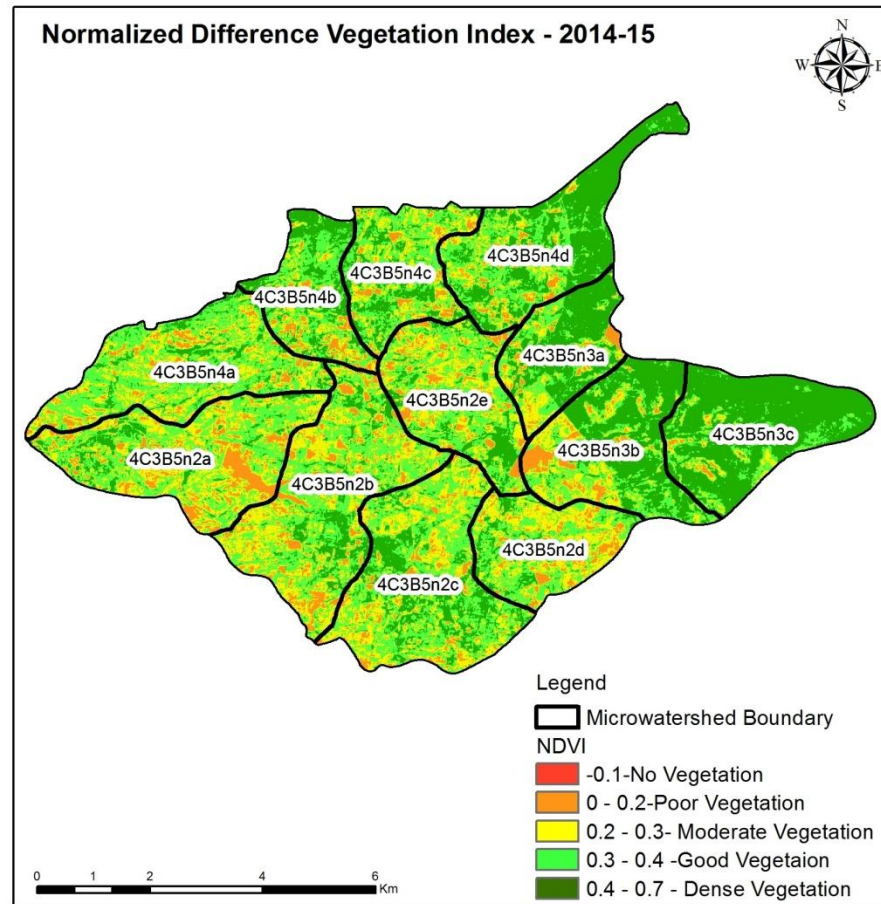


NDVI (2013-14)

Changes in Vegetation Cover

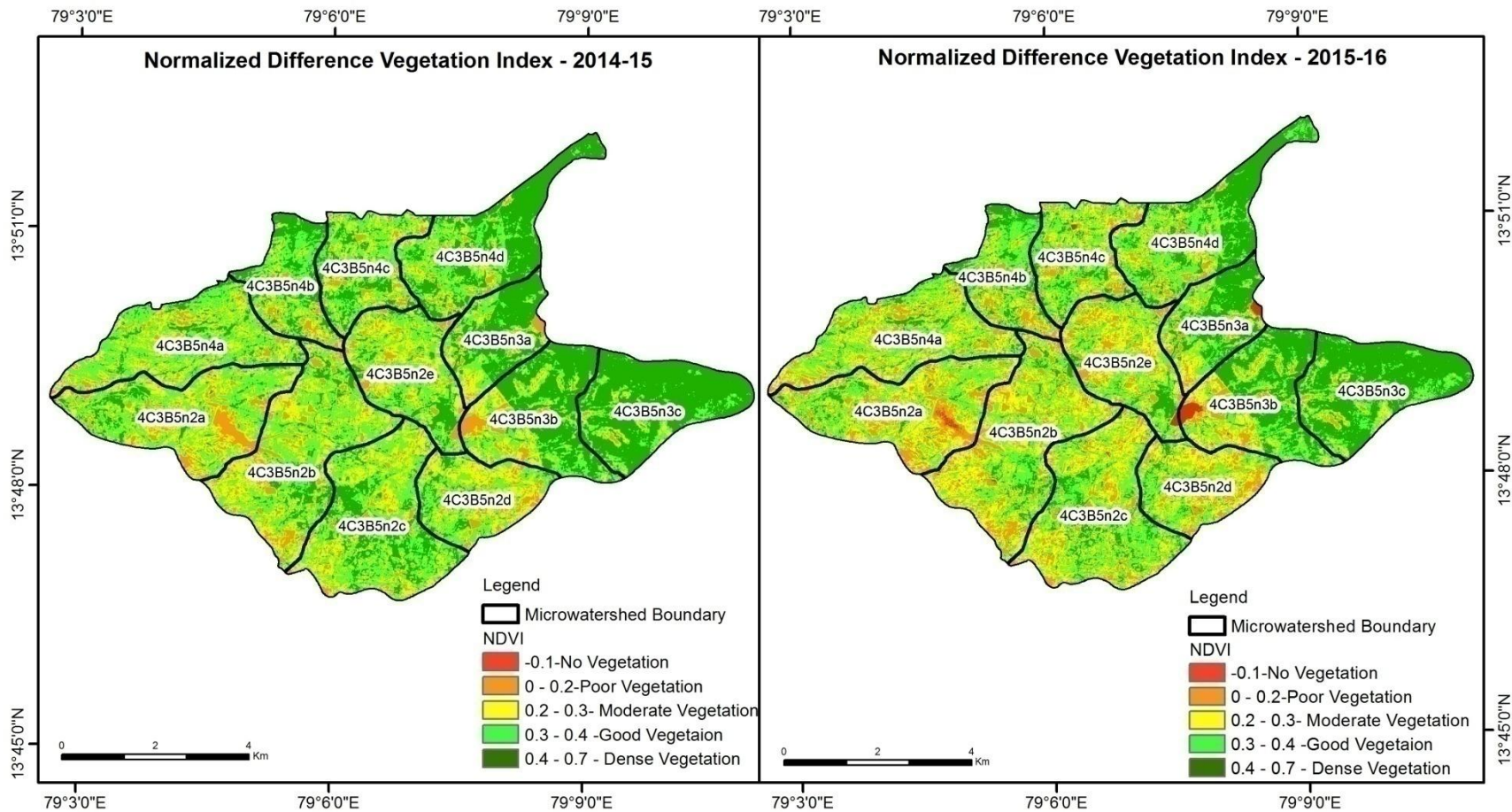


NDVI (2013-14)



NDVI (2014-15)

Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-06/2009-10



T0

T0:2009-10



T1

T1: 15 December 2013



Drishti Sl no. 805374 MWS :4C3B5n2c

Check dam



T0:2009-10



T1

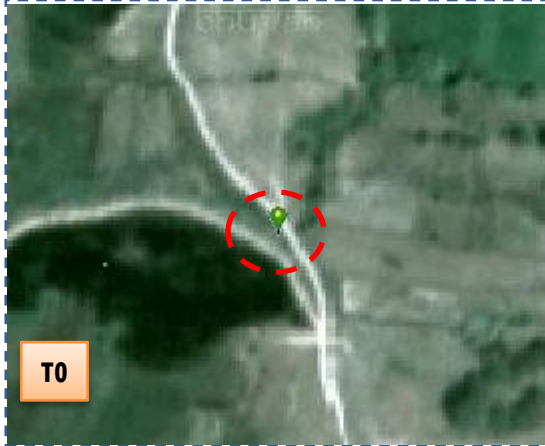
T1: 15 December 2013



Drishti Sl no. 853941 MWS : 4C3B5n2d

Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-06/2009-10



T0: 2009-10

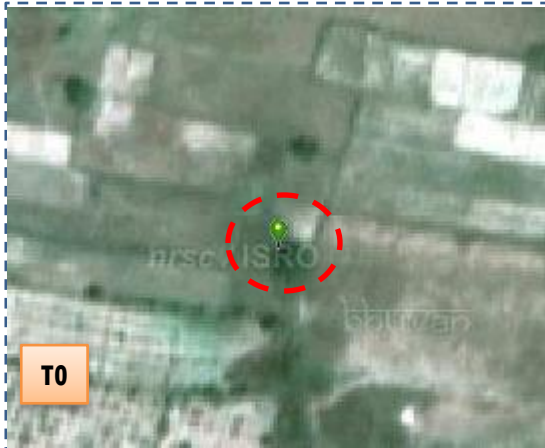


T1: 15 December 2013



Drishti Sl no. 846744 MWS : 4C3B5n2c

Bund planting



T0: 2009-10



T1: 15 December 2013



Drishti Sl no. 826688 MWS : 4C3B5n2c

Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-06/2009-10



T0: 2009-10



T1: 15 December 2013

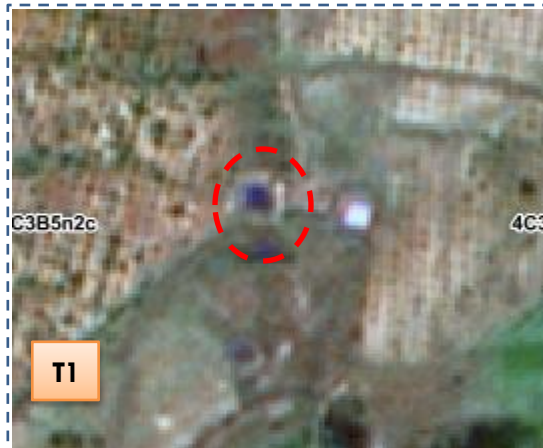


Drishti Sl no. 817842 MWS : 4C3B5n2d

Field bund



T0: 2009-10



T1: 15 December 2013



Drishti Sl no. 826700 MWS : 4C3B5n2c

Farm pond

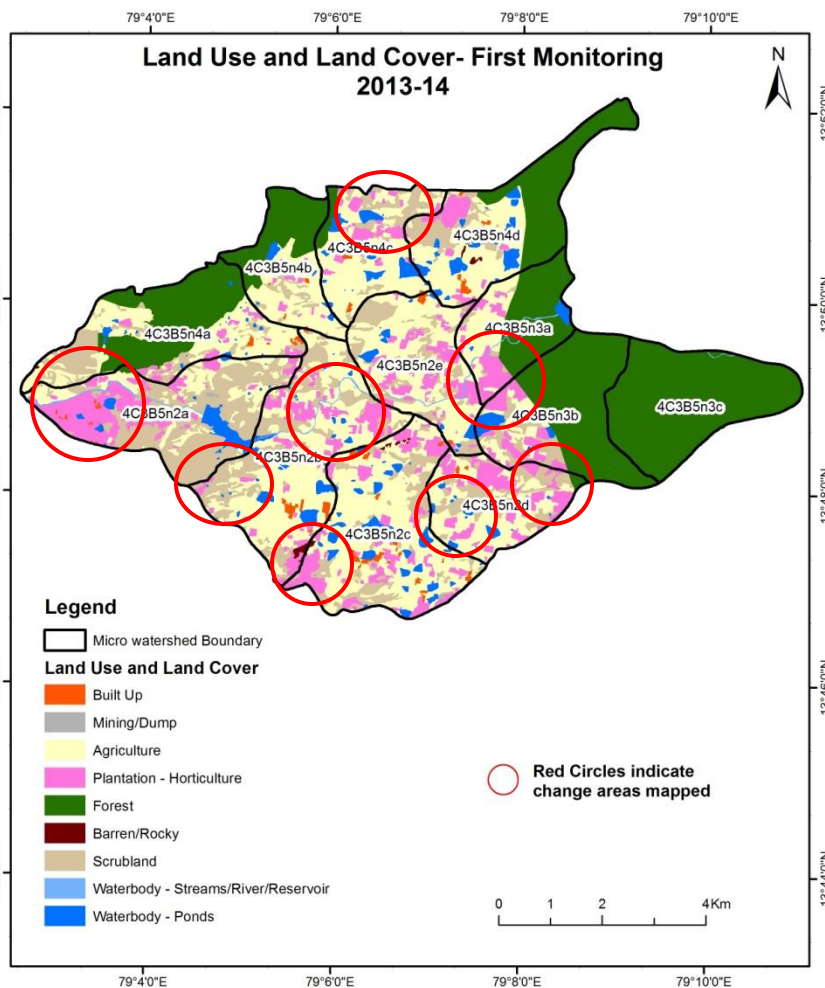
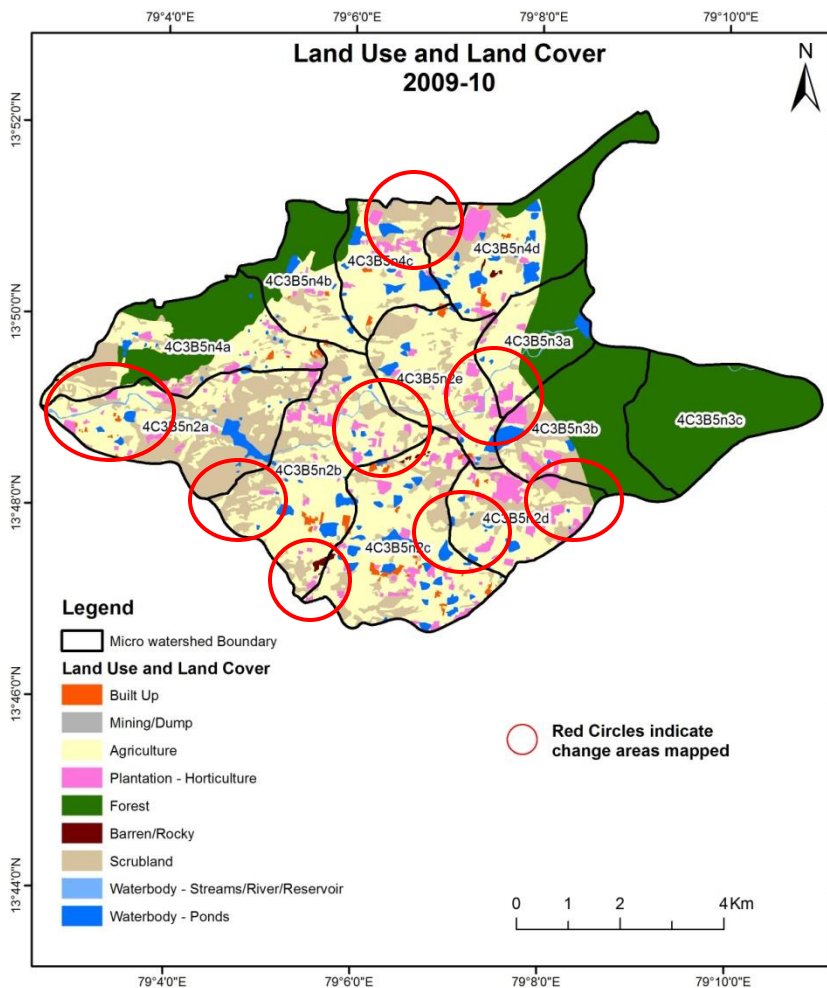
MONITORING IN THE PROJECT AREA

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)

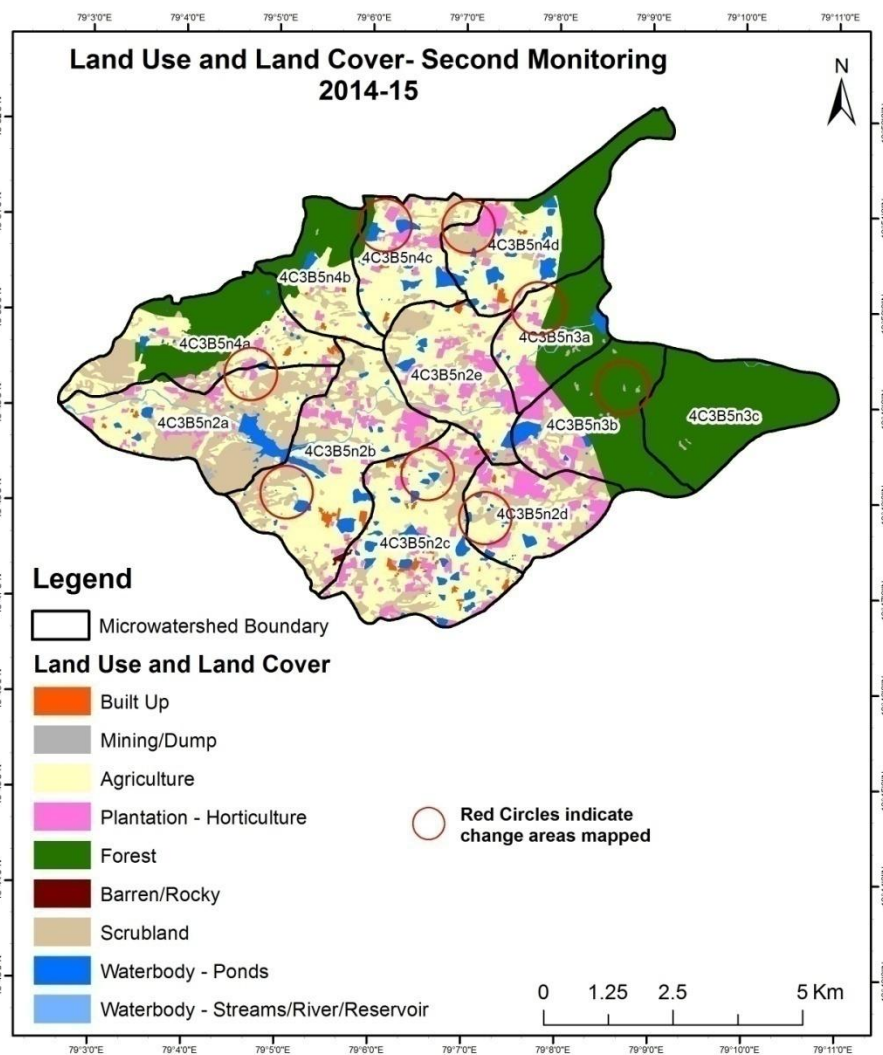
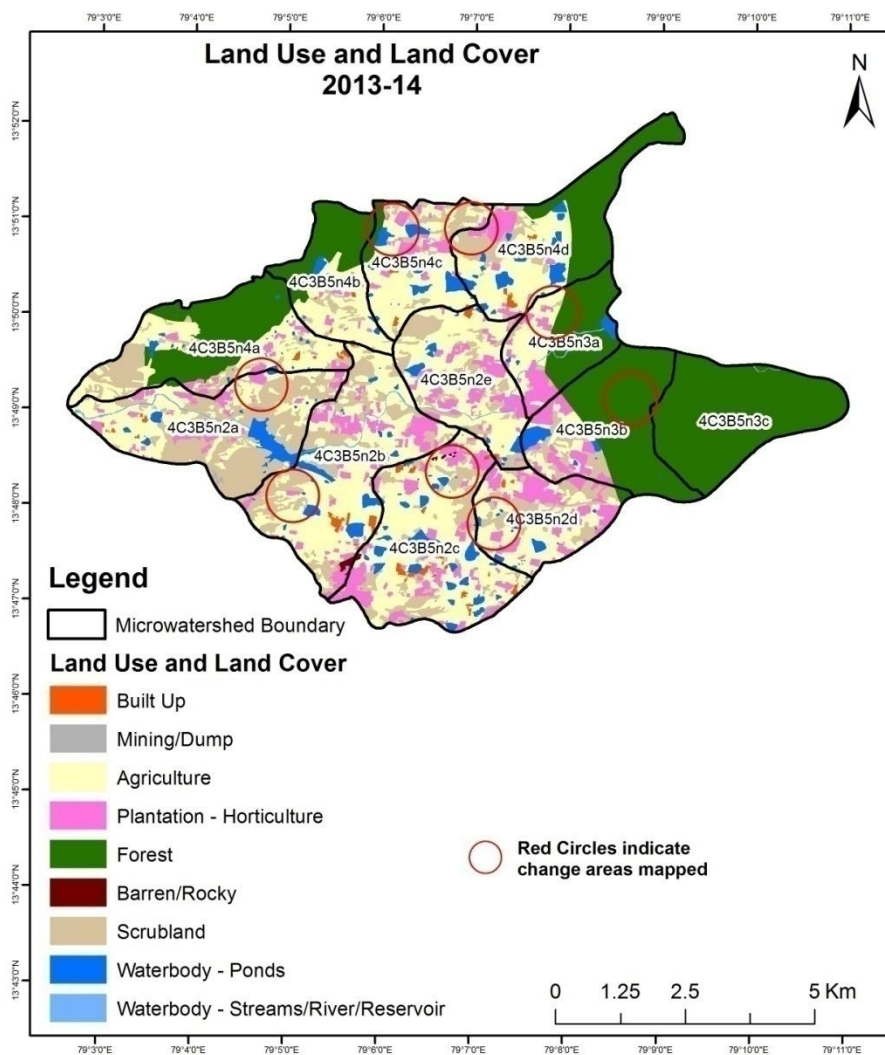
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



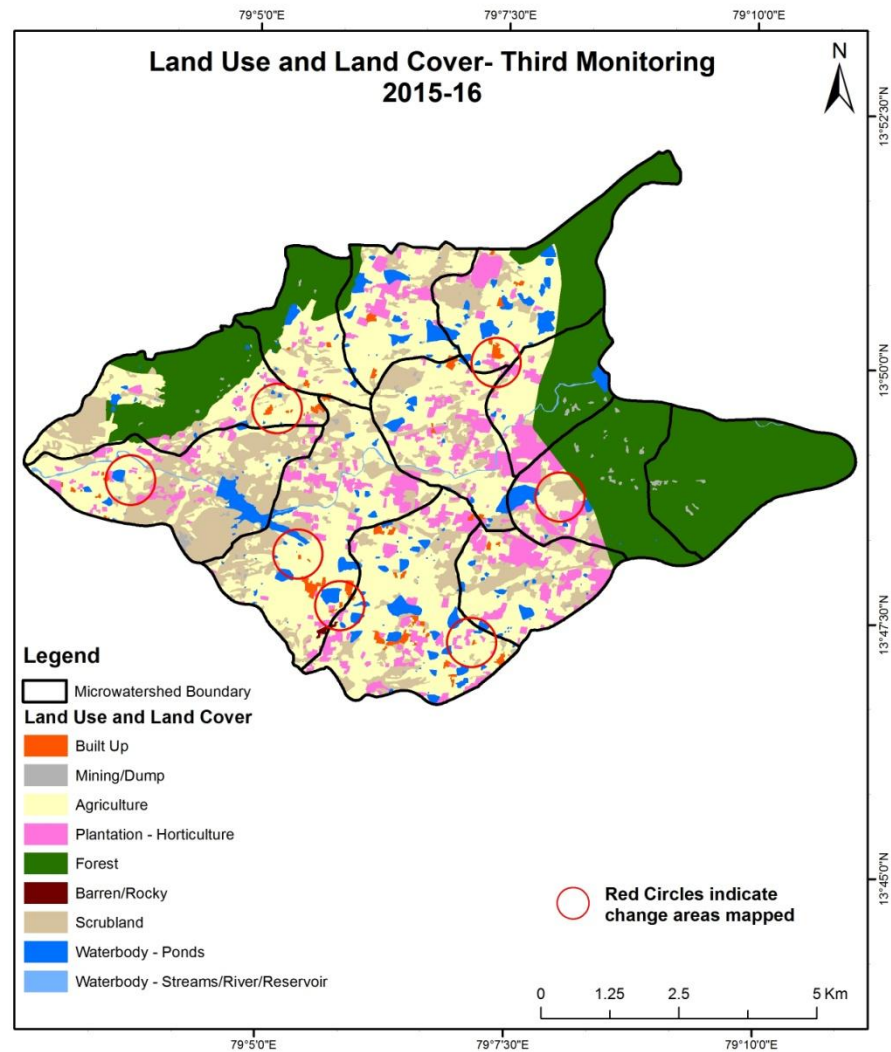
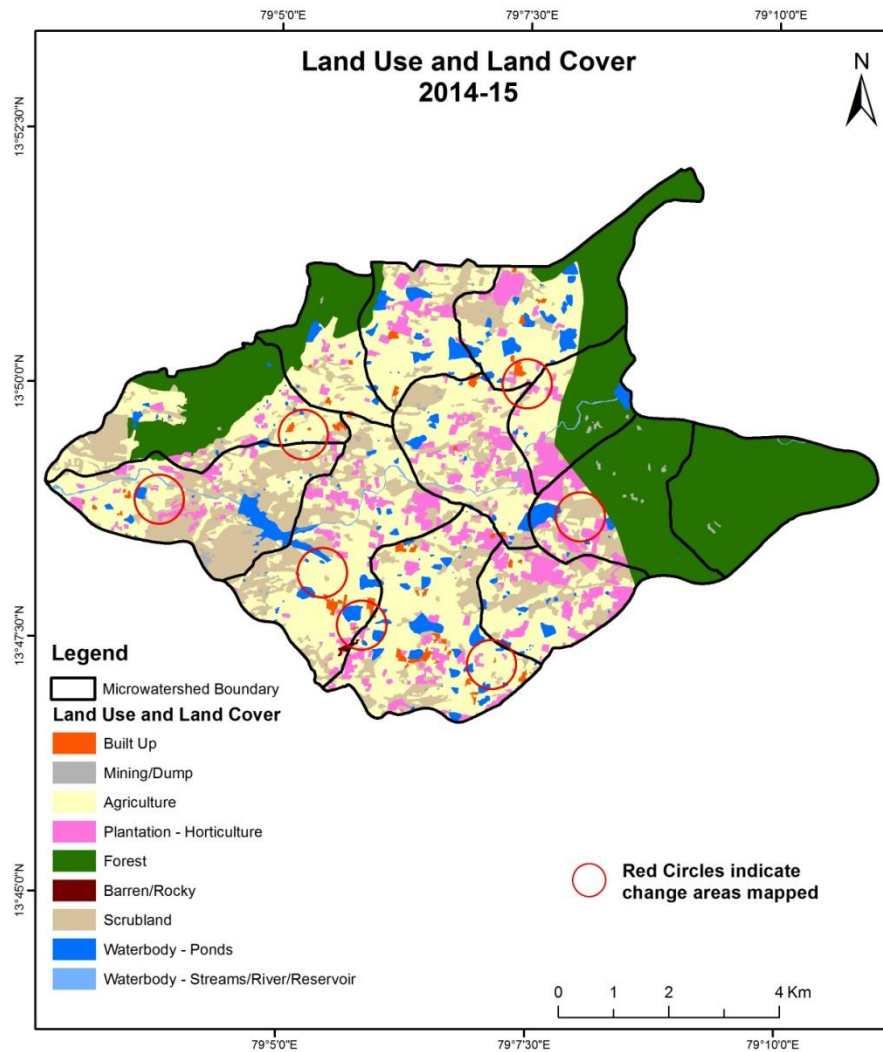
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



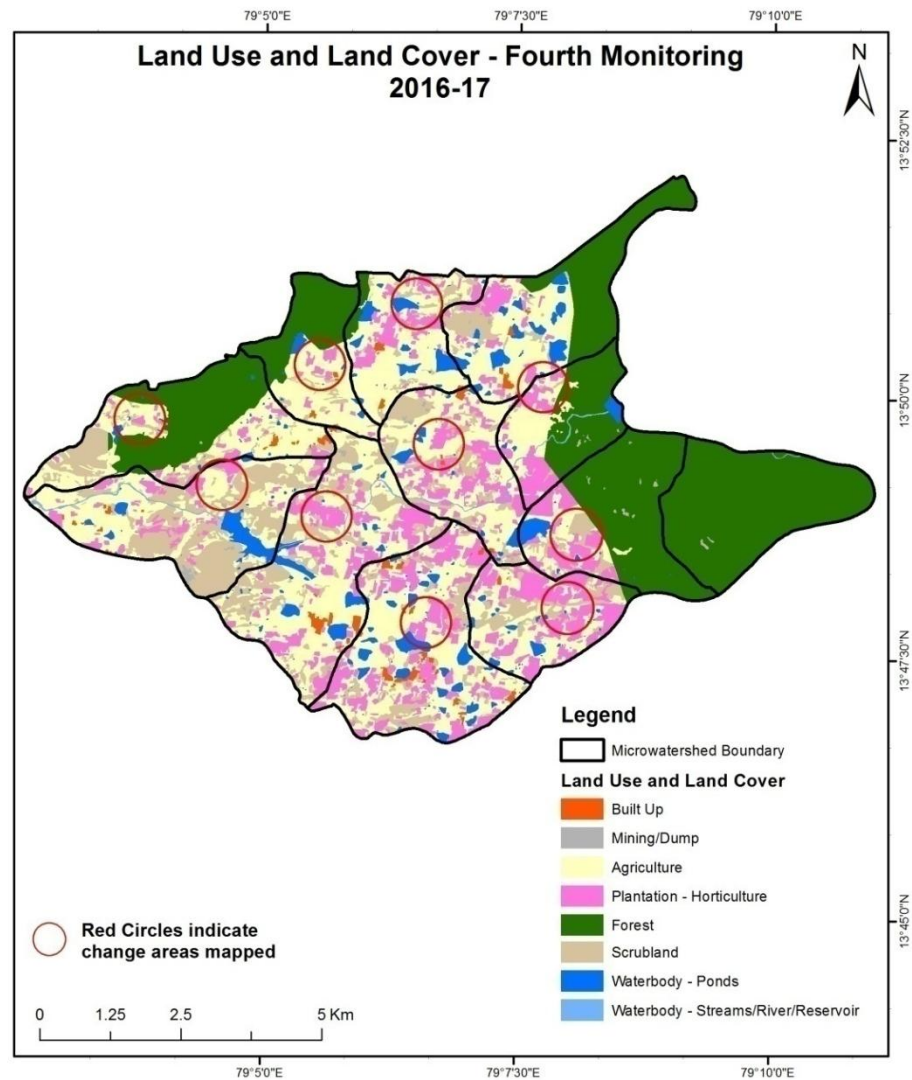
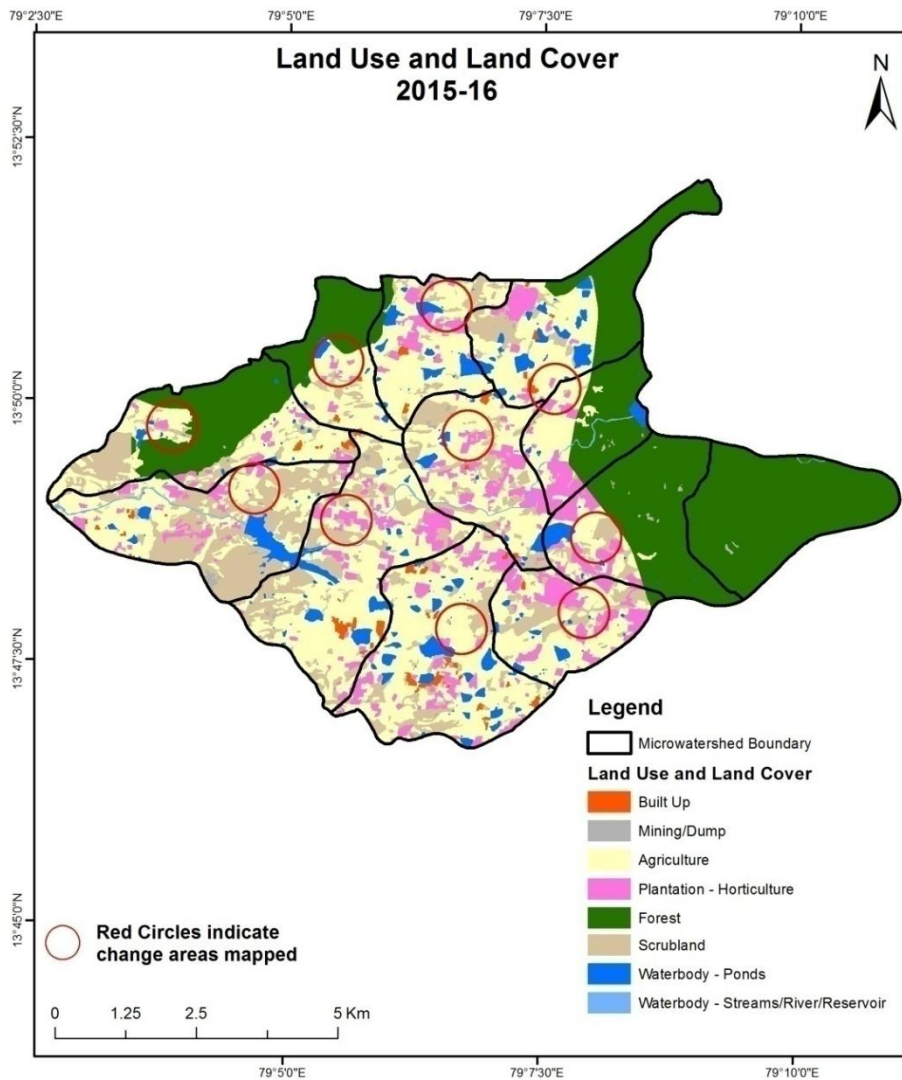
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



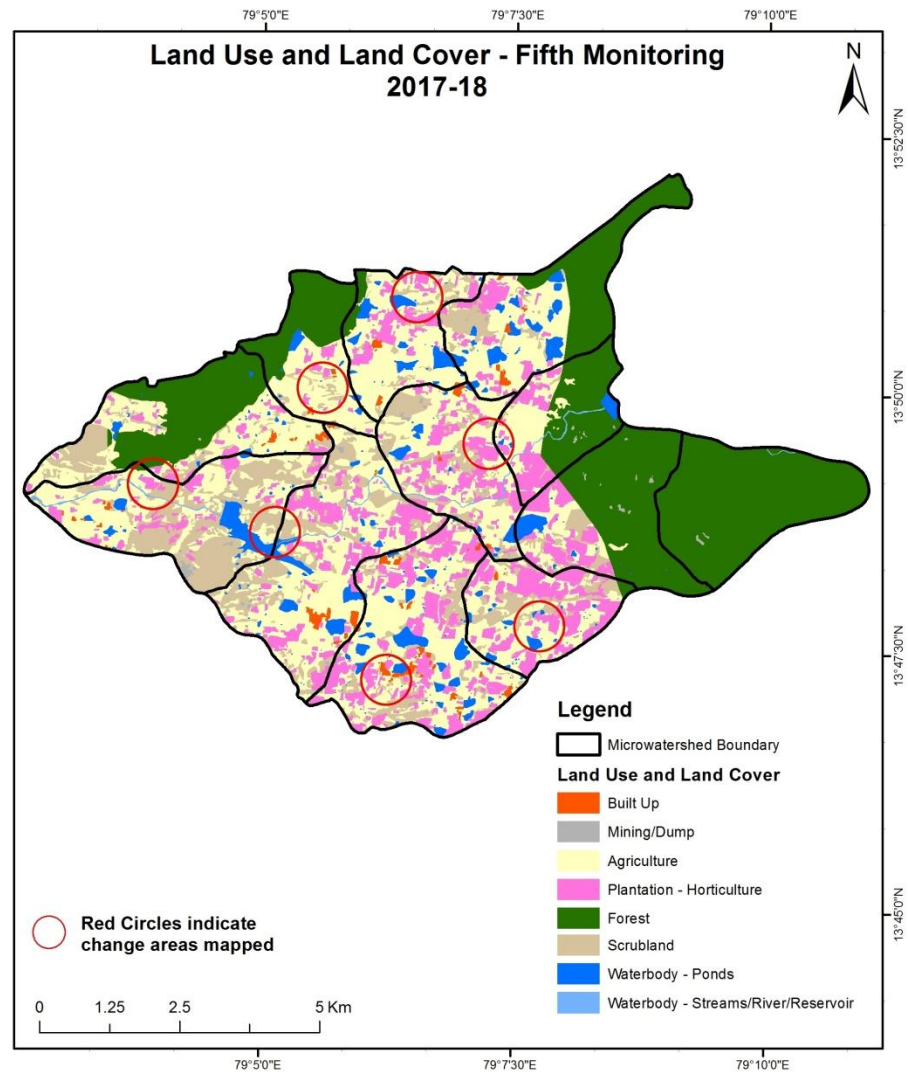
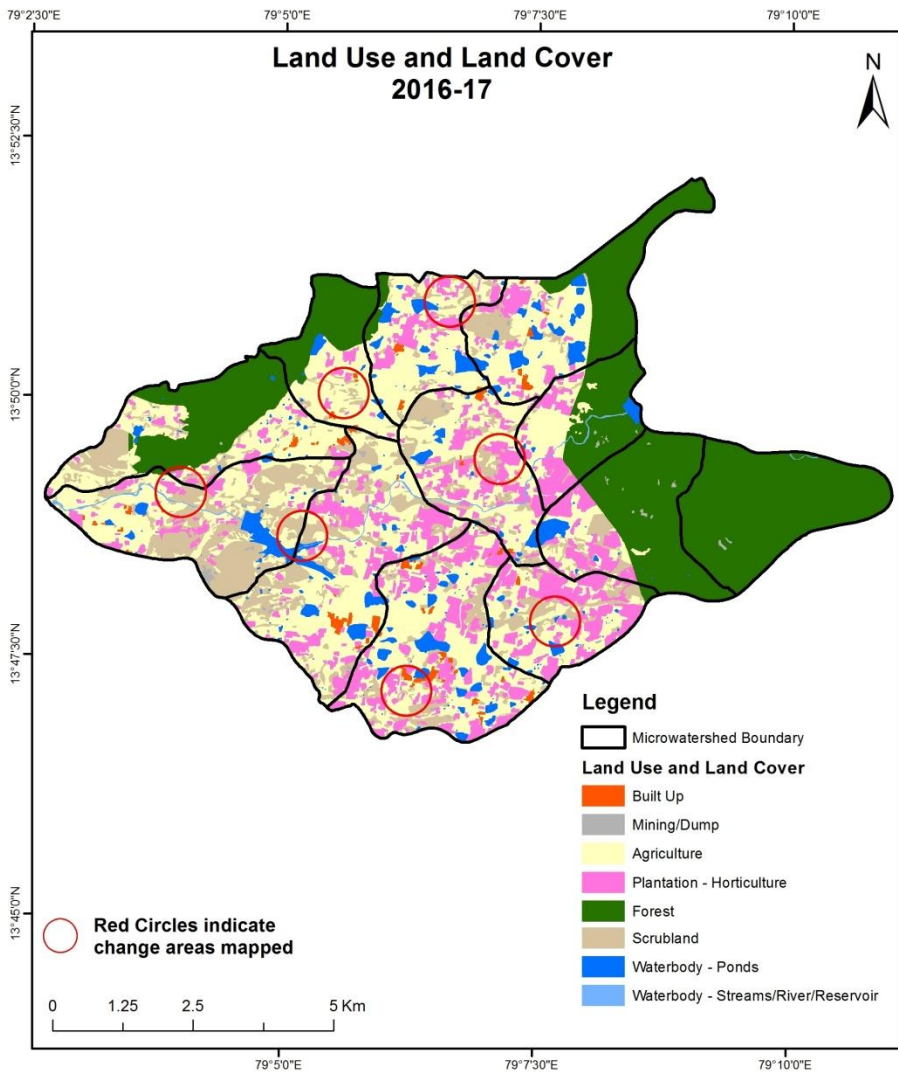
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

Agriculture to Plantation



T0

T0: 2009-10



T1

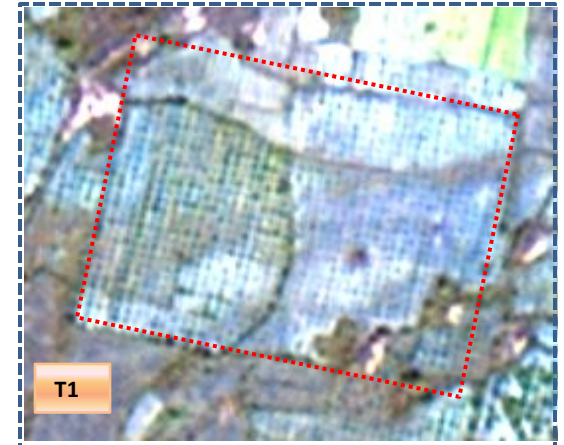
T1: 15 December 2013

Agriculture to Plantation



T0

T0: 2009-10



T1

T1: 15 December 2013

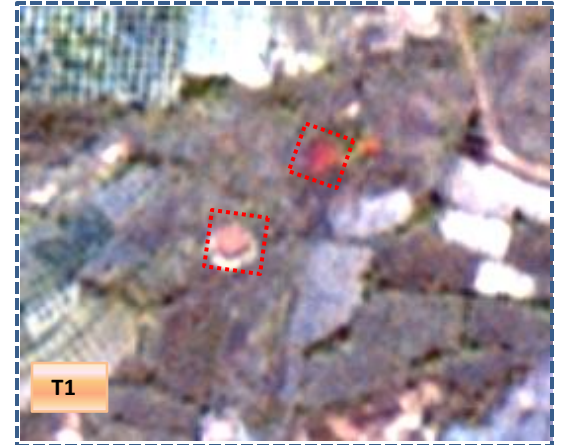
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



T0

T0: 2009-10



T1

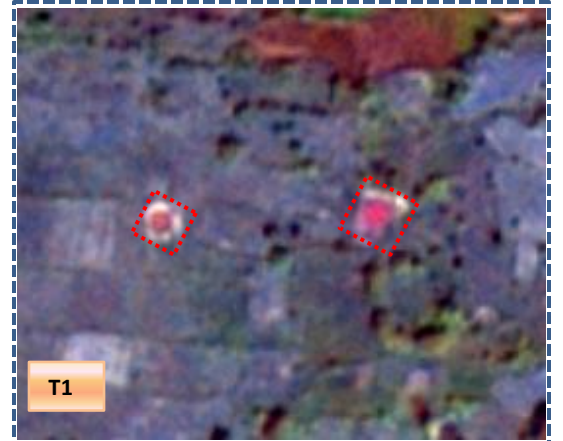
T1: 15 December 2013

Scrub to Water body



T0

T0: 2009-10



T1

T1: 15 December 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
Built up	54.87										54.87	
Mining/dump		1.27									1.27	
Agriculture	1.91		2445.43	383.65						7.79	2838.79	
Plantation Horticulture			2.76	401.19						0.04	403.99	
Forest					1986.37					0.38	1986.75	
Forest Plantation												
Barren Rocky												
Scrub		3.49	50.72	11.39				1324.69		15.92	1406.21	
Waterbody- Streams/River									27.78		27.78	
Waterbody – Ponds										297.76	297.76	
Grand Total	56.78	4.77	2498.91	796.23	1986.37			1324.69	27.78	321.89	7017.42	

- 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 393.35 ha of the agriculture area has decreased and it is converted into, Built-up, plantation and water body in T1.
- In T1 53.48 ha of the agriculture area has increased from scrubland and plantation of T0.
- Overall 339.98 ha of the agriculture area has been decreased. 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		
Built up	56.78												56.78
Mining/dump	0.55	4.04						0.18					4.77
Agriculture	4.83		2492.19	1.57							0.32		2498.91
Plantation Horticulture	0.83		136.53	658.87									796.23
Forest		6.04			1980.33								1986.37
Forest Plantation													
Barren Rocky													
Scrub	0.47	12.21	38.71	4.81				1266.58			1.91		1324.69
Waterbody- Streams/River									27.78				27.78
Waterbody – Ponds		0.33									321.56		321.89
Grand Total	63.46	22.61	2667.43	665.26	1980.33			1266.76	27.78		323.79		7017.42

- 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 6.72ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 175.24 ha of the agriculture area has been increased from scrubland and plantation, of T1. Overall 168.52 ha of the agriculture area has been increased. 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	
Built up	63.46										63.46	
Mining/dump		22.61									22.61	
Agriculture	4.41		2648.23	11.58				0.25		2.95	2667.43	
Plantation Horticulture			1.18	664.08							665.26	
Forest			11.61		1968.22					0.50	1980.33	
Forest Plantation												
Barren Rocky												
Scrub	0.37		106.81					1158.51		1.07	1266.76	
Waterbody- Streams/River									27.78		27.78	
Waterbody – Ponds			0.55							323.24	323.79	
Grand Total	68.24	22.61	2768.38	675.66	1968.22			1158.76	27.78	327.77	7017.42	

- 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 19.20 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrub and water body in T3.
- In T3 120.15 ha of the agriculture area has been increased from plantation, forest, scrubland and water body of T2.
- Overall 100.95 ha of the agriculture area has been increased during the project period (T2 to T3).
- 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	
Built up	68.24										68.24	
Mining/dump		22.61									22.61	
Agriculture	1.44	0.64	2306.53	454.71						5.06	2768.38	
Plantation Horticulture	0.11		21.68	653.87							675.66	
Forest			2.66		1965.07					0.50	1968.22	
Forest Plantation												
Barren Rocky												
Scrub	0.43	1.24	143.24	8.17				1003.86		1.82	1158.76	
Waterbody- Streams/River									27.78		27.78	
Waterbody – Ponds			0.72							327.05	327.77	
Grand Total	70.22	24.50	2474.83	1116.75	1965.07			1003.86	27.78	334.42	7017.42	

- 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 461.85 ha of the agriculture area has decreased and it is converted into Built-up, plantation, mining dump and water body in T4.
- In T4 168.30 ha of the agriculture area has been increased from plantation, forest, scrubland and water body of T3.
- Overall 293.55 ha of the agriculture area has been decreased during the project period (T2 to 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		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
T4													
Built up	70.22												70.22
Mining/dump		24.50											24.50
Agriculture			2463.35	6.27							5.21		2474.83
Plantation Horticulture			2.53	1114.22									1116.75
Forest					1965.07								1965.07
Forest Plantation													
Barren Rocky													
Scrub	0.05	0.20	1.48					1000.67			1.45		1003.86
Waterbody- Streams/River									27.78				27.78
Waterbody – Ponds											334.42		334.42
Grand Total	70.27	24.69	2467.36	1120.49	1965.07			1000.67	27.78		341.09		7017.42

- 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 11.48 ha of the agriculture area has decreased and it is converted into plantation and water body in T5.
- In T5 4.01 ha of the agriculture area has been increased from plantation and scrubland of T4.
- Overall 7.47 ha of the agriculture area has been decreased during the project period (T4 to T5).
- 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 43.33 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 168.52 & 100.95 Hectares From T1-T2 and T2-T3, respectively and overall increase of 269.47 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 716 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 405.54 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (20) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (25) verified from the portal.