MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -09/2009-10
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

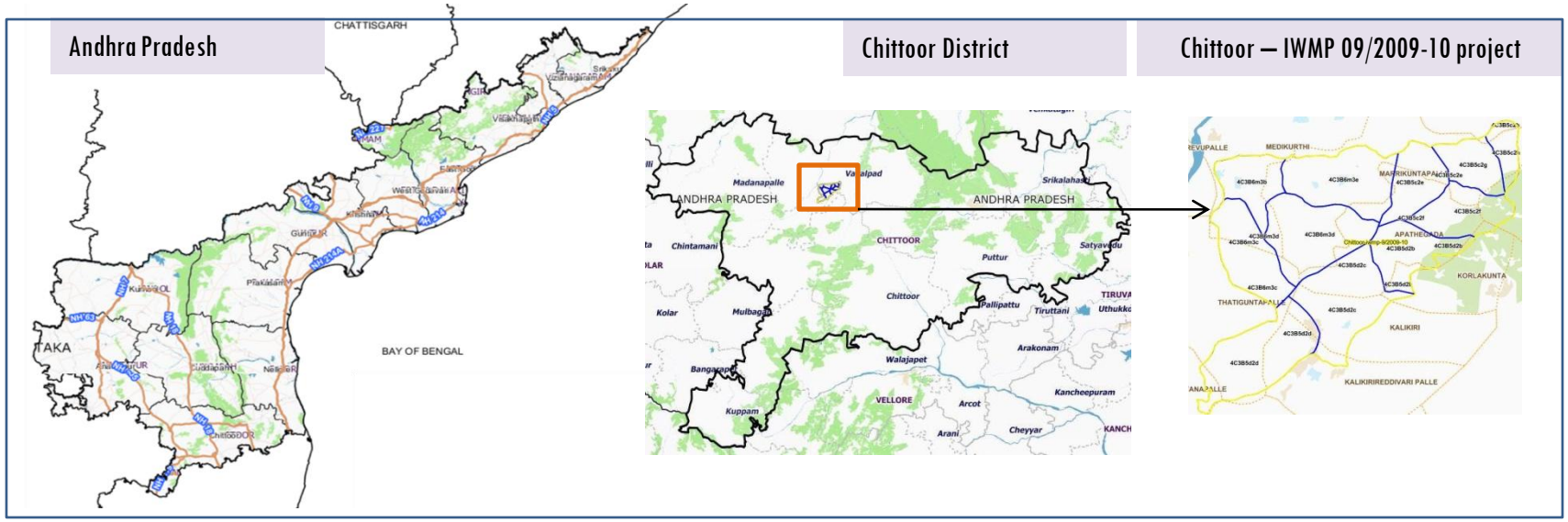
CONTENTS

EXECUTIVE SUMMARY

- 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-09/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 4437.03 ha. It comprises of 10 micro watersheds.
- In the project area 57 Drishti photos were uploaded showing 43 water harvesting structures of farm ponds/dug out pits, recharge pits, 8 Land development activities of afforestation, horticulture and bund plantation of teak and remaining other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and drainage treatments with 1.06 ha increase in the area.
- Major percentage i.e. 67.65 % is covered by the agriculture, 12.68 % is covered by scrub land, 1.01 % is covered by forest area and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-09/2009-10
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Kalikiri Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 4437.03 ha. It comprises of 10 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.

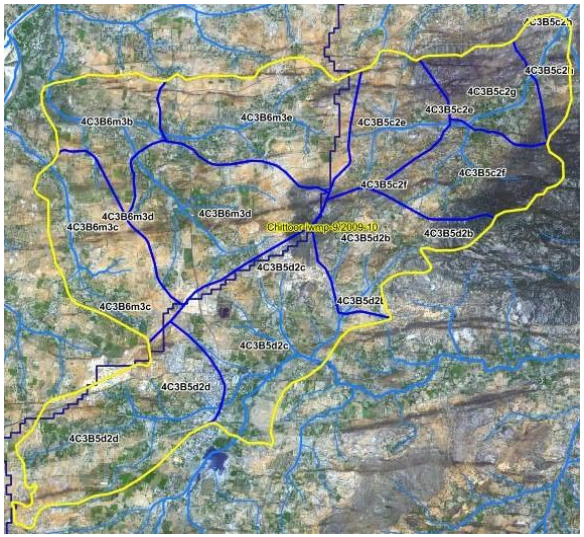
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			30-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
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	57
4	Detailed Project Report		

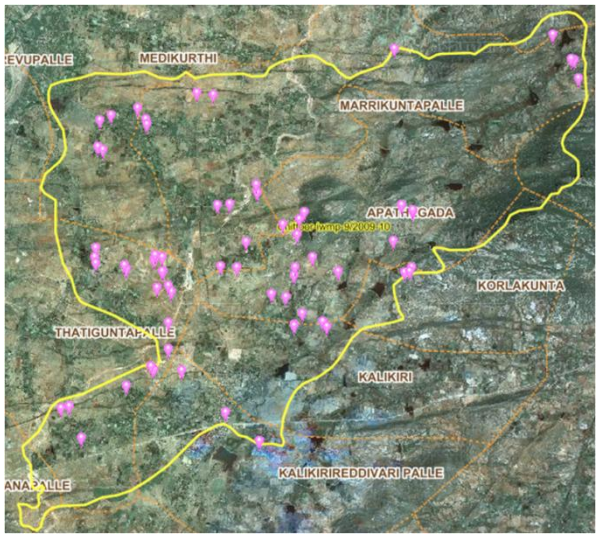
Natural Color Composite overlaid with Project boundaries and high detail stream network



Legend

- Drainage (1:10000 Scale)
- MWS Boundary
- Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

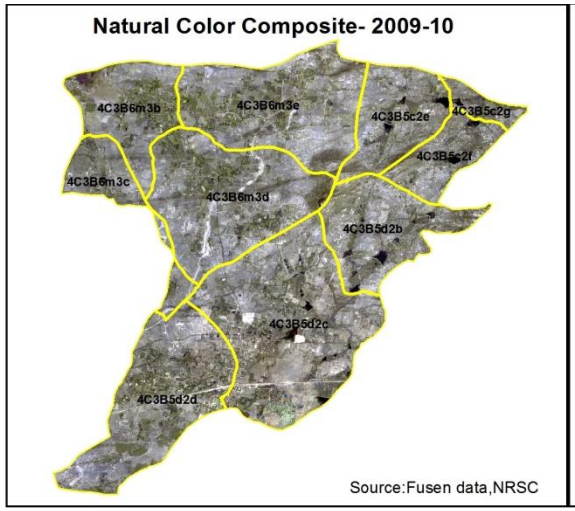
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/Horticulture	10	8
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Vegetative Engineering Structure	0	0
9	Checks and Plugs	1	1
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	52	42
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 (cattiltrough, Solar light)	7	0
18	Others	0	0
	TOTAL	**62**	**51**

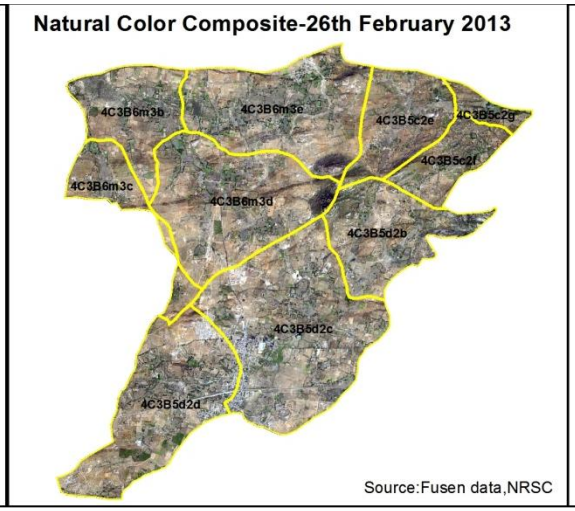
MONITORING IN THE PROJECT AREA

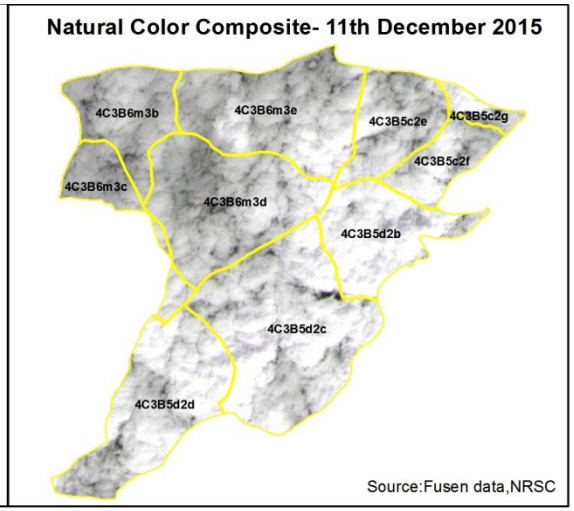
Site Wise Changes in the Project

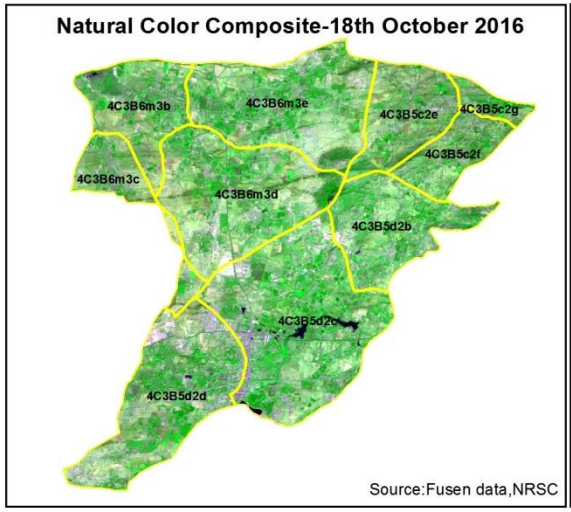
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

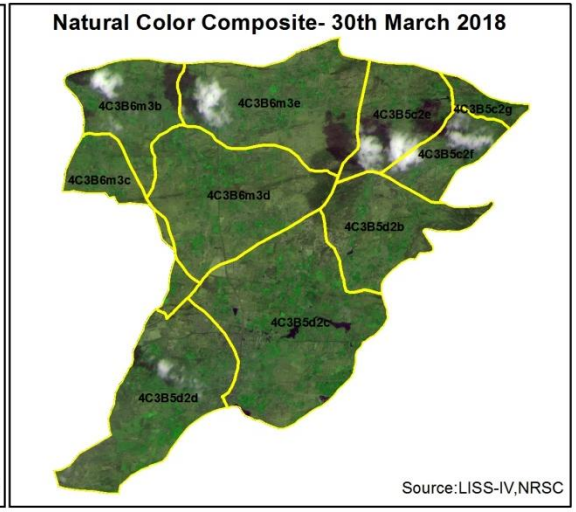
Natural Color Composite – 2009-10 to 2017-18



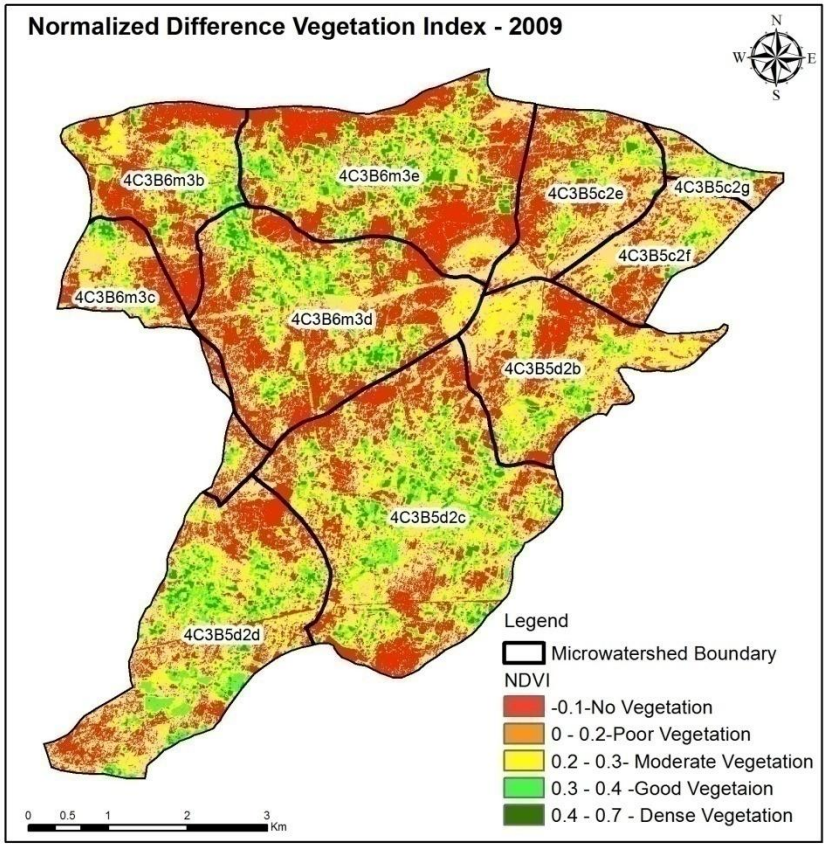




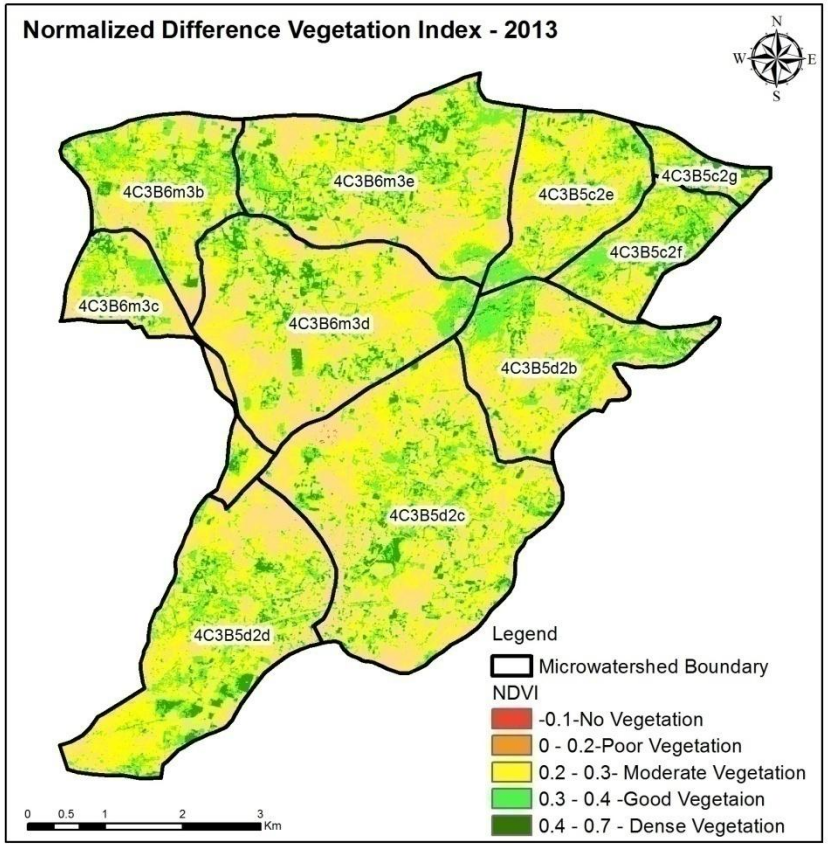




Changes in Vegetation Cover

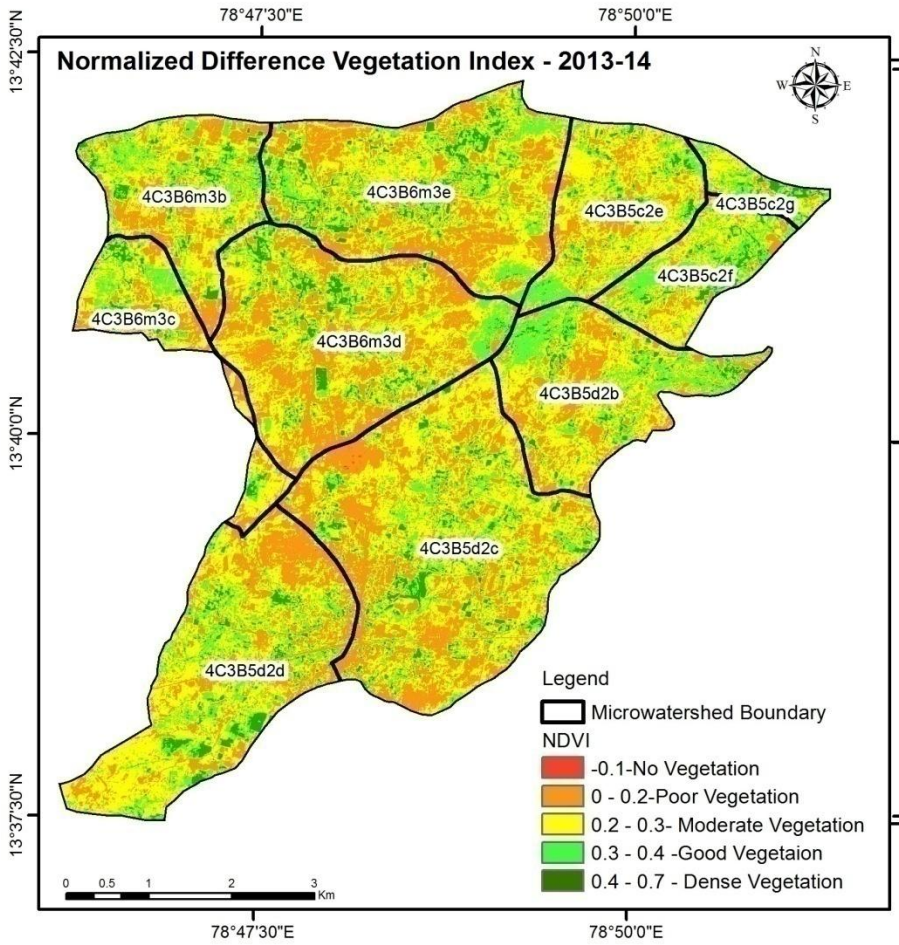


NDVI (2009-10)

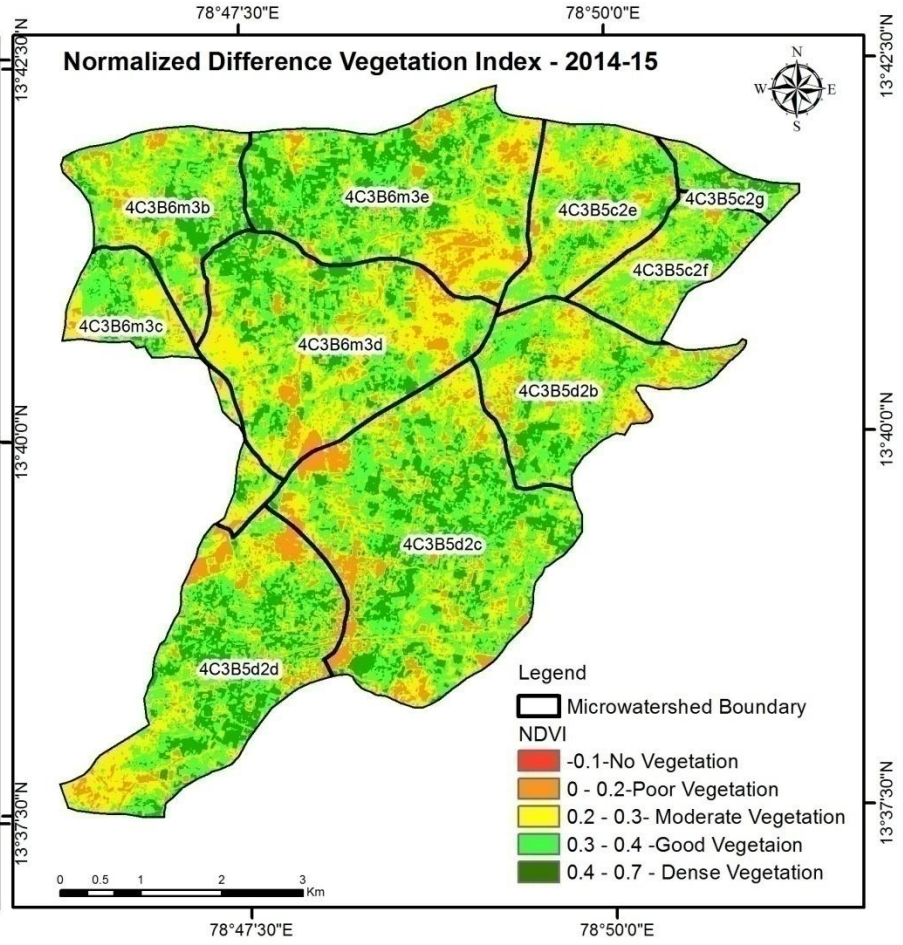


NDVI (2013-14)

Changes in Vegetation Cover



NDVI (2014-15)



NDVI (2015-16)

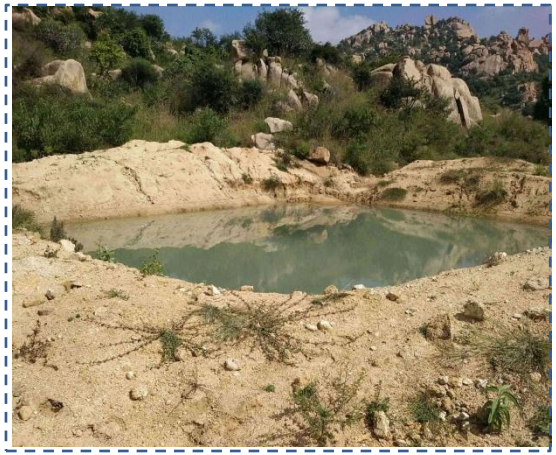
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-09/2009-10

T0:2009-10

T1: 15 December 2013

Drishti Sl no. 786031 MWS :4C3B5c2h

Farm pond



T0:2009-10

T1: 15 December 2013

Drishti Sl no. 2580389 MWS : 4C3B5c2h

Farm pond

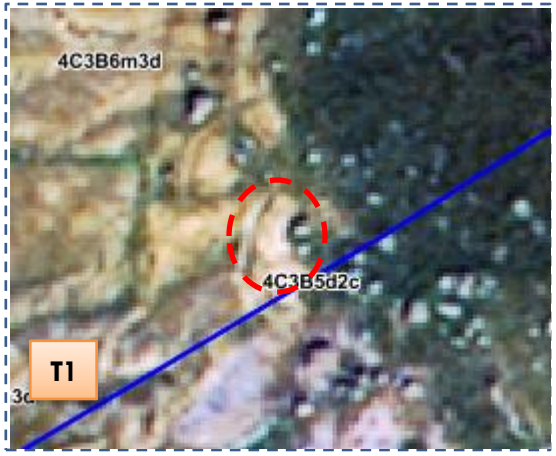
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-09/2009-10

T0: 2009-10

T1: 15 December 2013

Drishti Sl no. 572375 MWS : 4C3B6m3d

Groundwater recharge structure



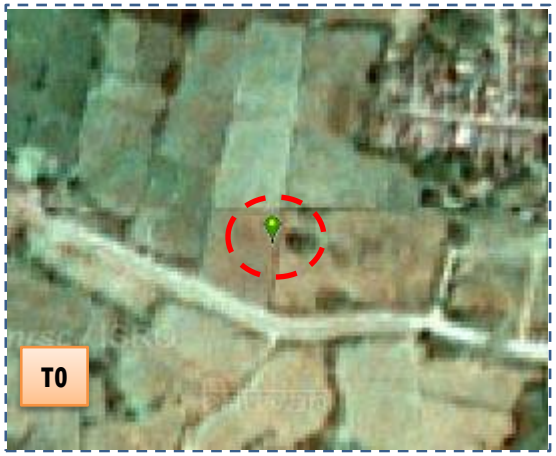
T0: 2009-10

T1: 15 December 2013

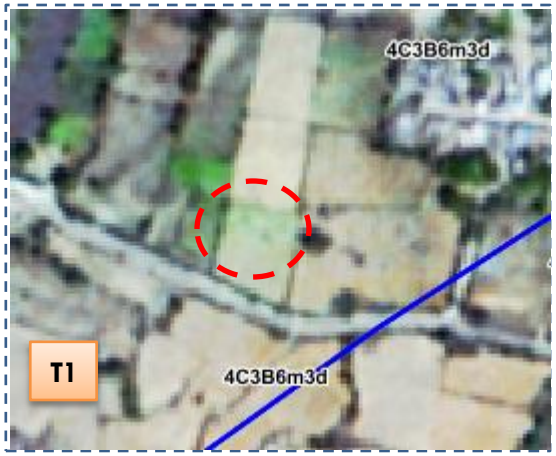
Drishti Sl no. 572413 MWS : 4C3B6m3d

Groundwater recharge structure

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-09/2009-10



T0: 2009-10



T1: 15 December 2013

Drishti Sl no. 572449 MWS : 4C3B6m3d

Horticulture

T0: 2009-10

T1: 15 December 2013

Drishti Sl no. 565435 MWS : 4C3B5d2d

Afforestation (Land Developments)

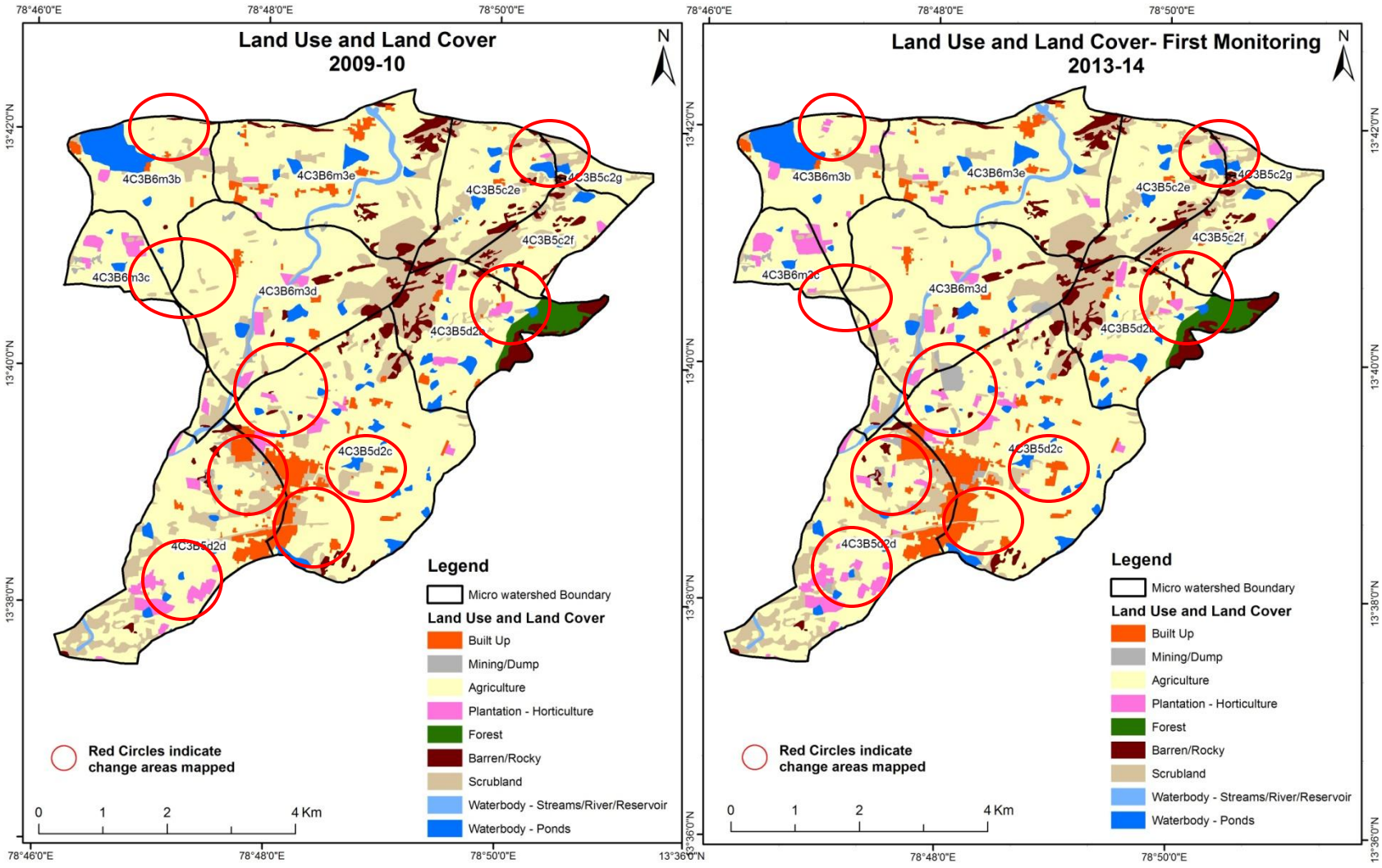
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover form 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)

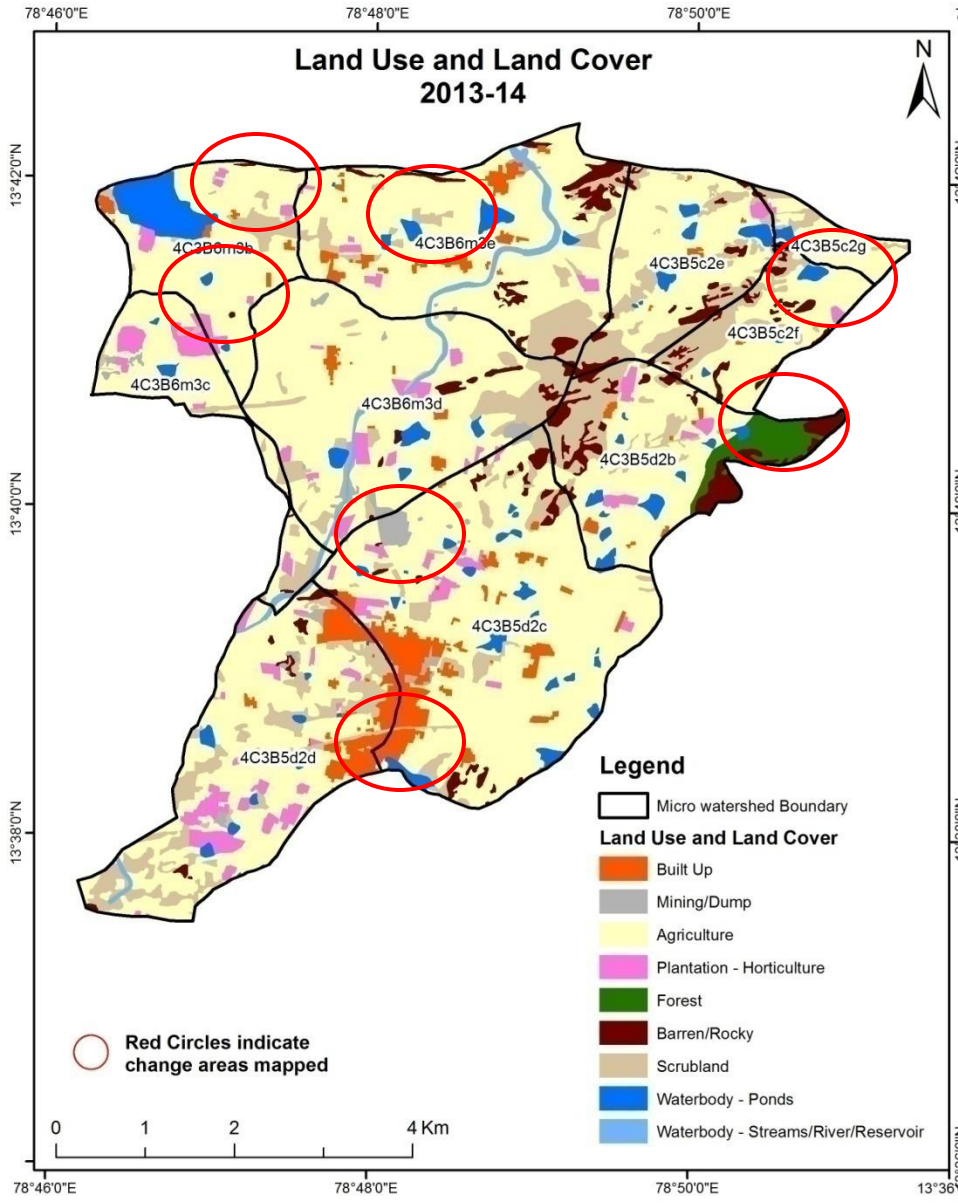
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

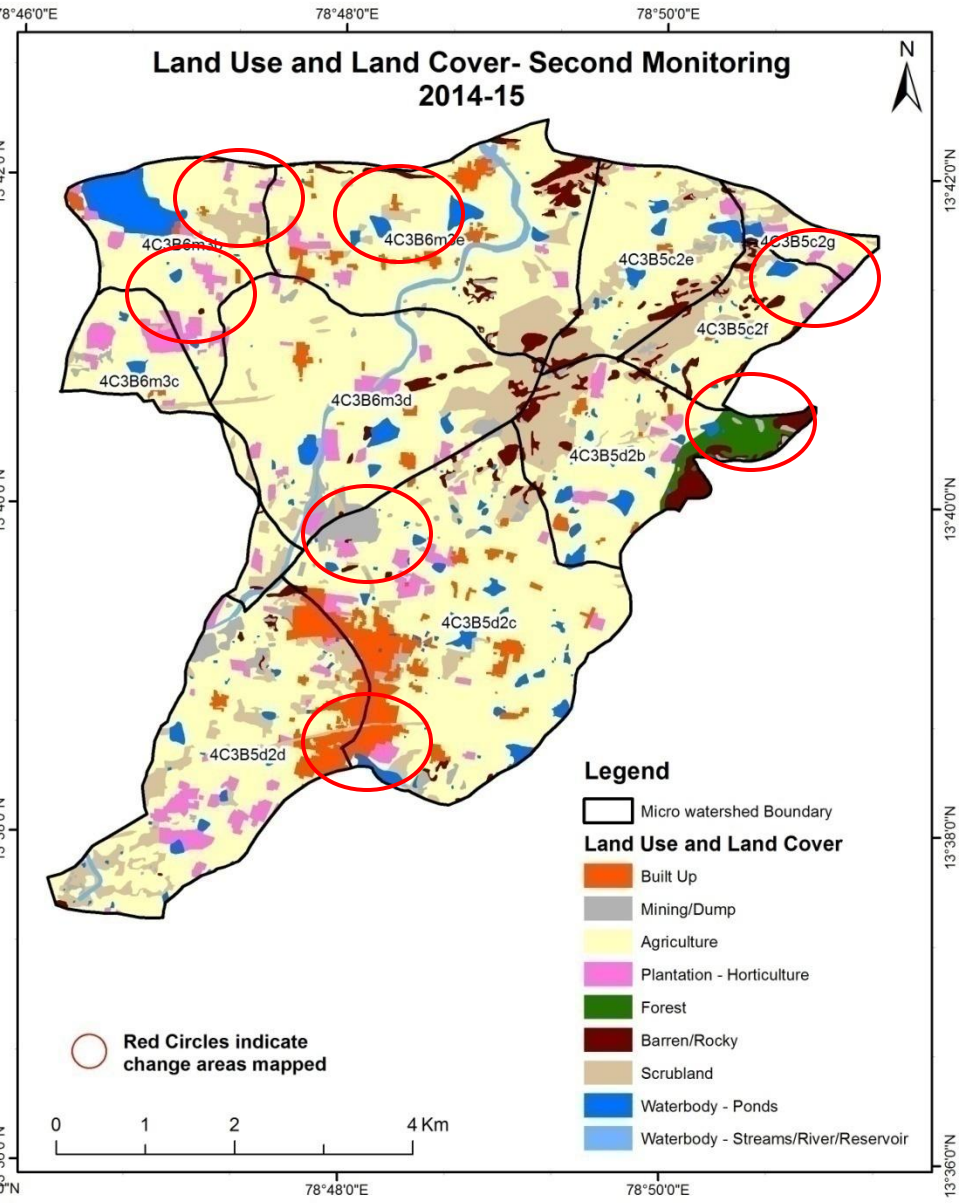
Scale: 1:10000



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

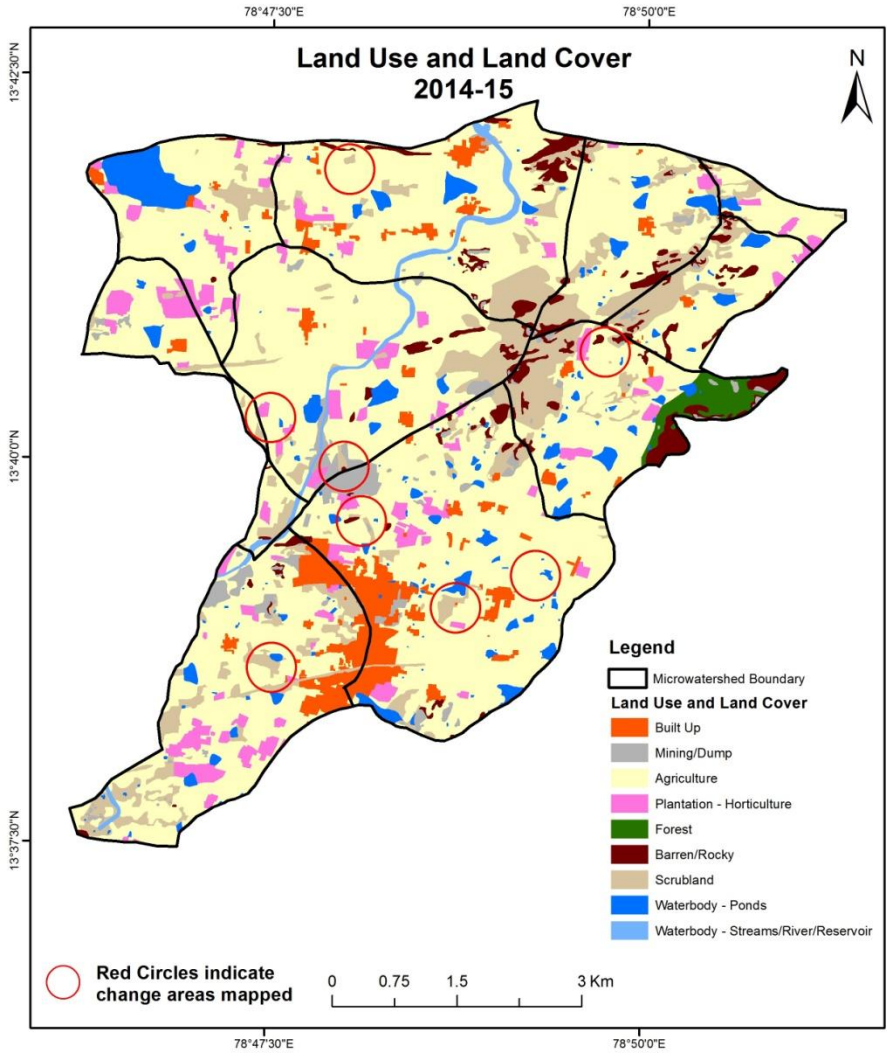
Scale: 1:10000

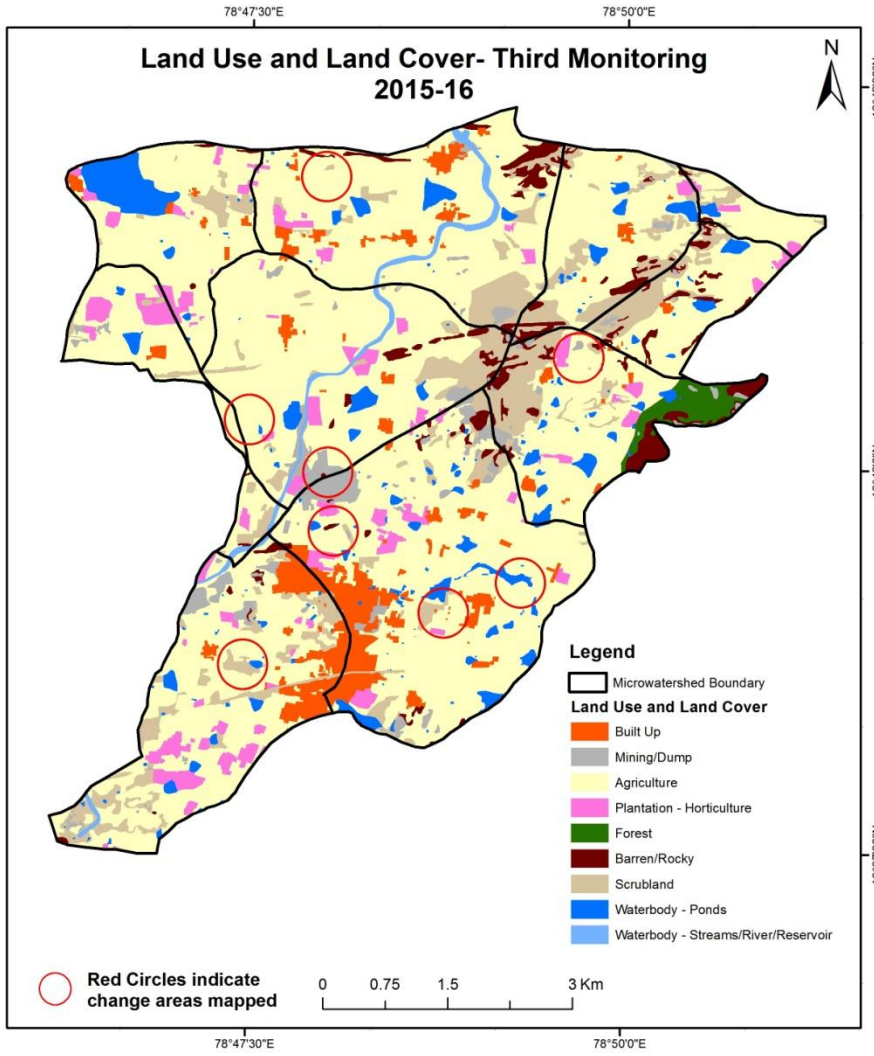




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

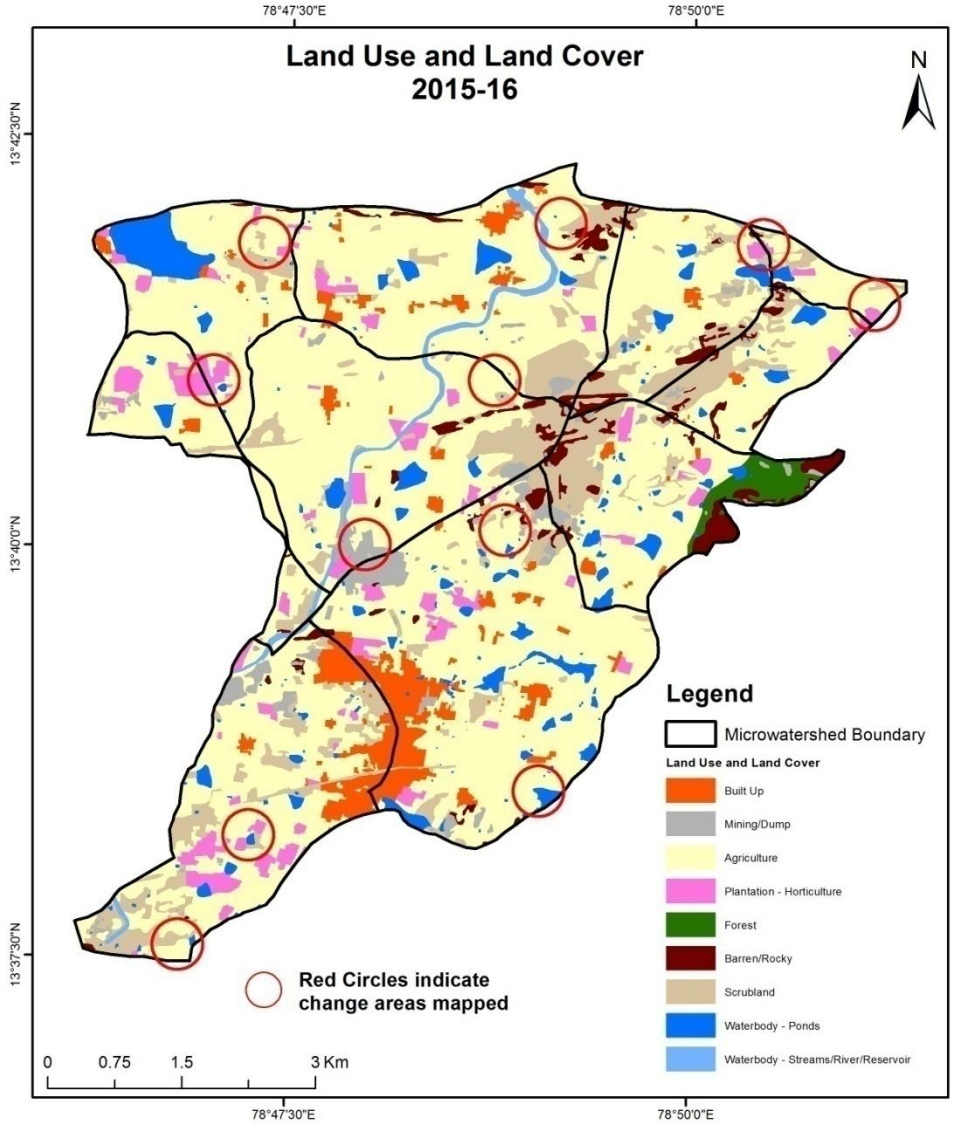
Scale: 1:10000

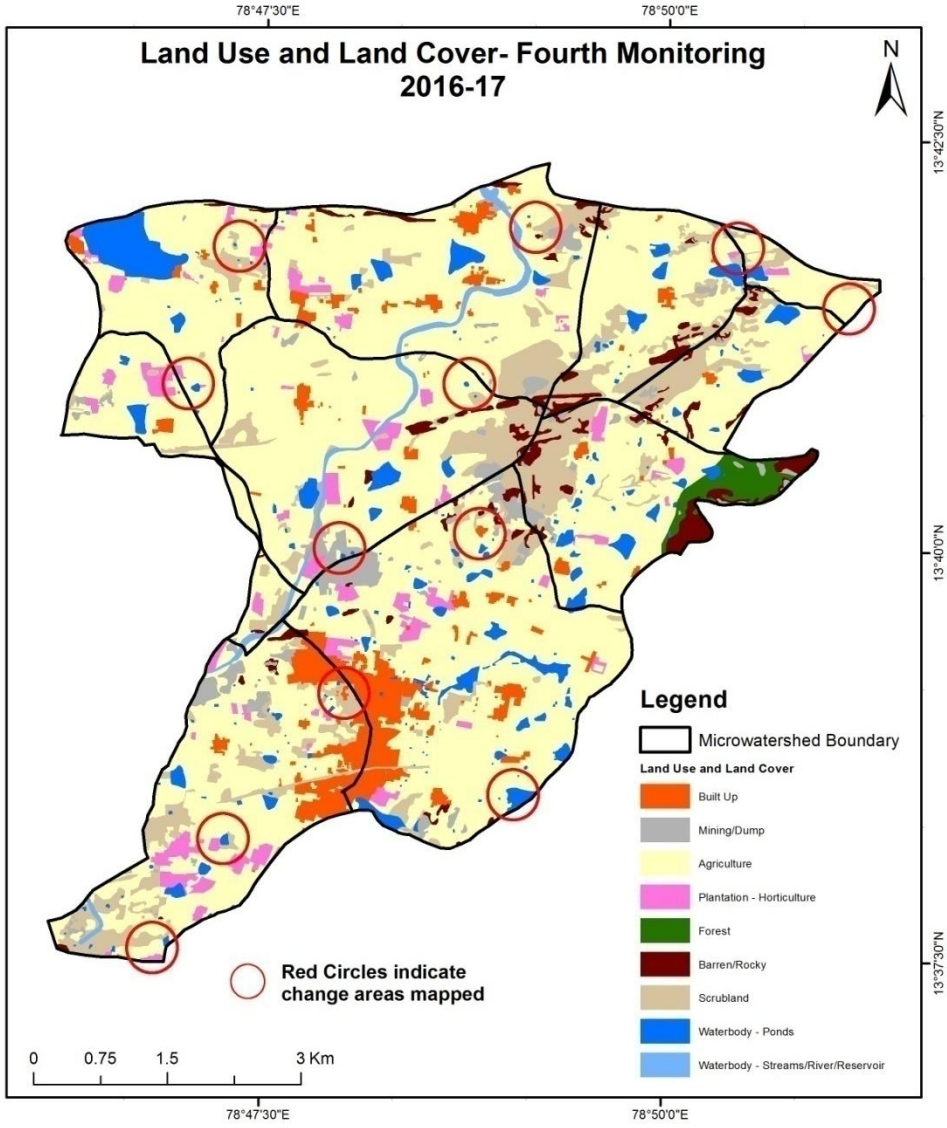




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

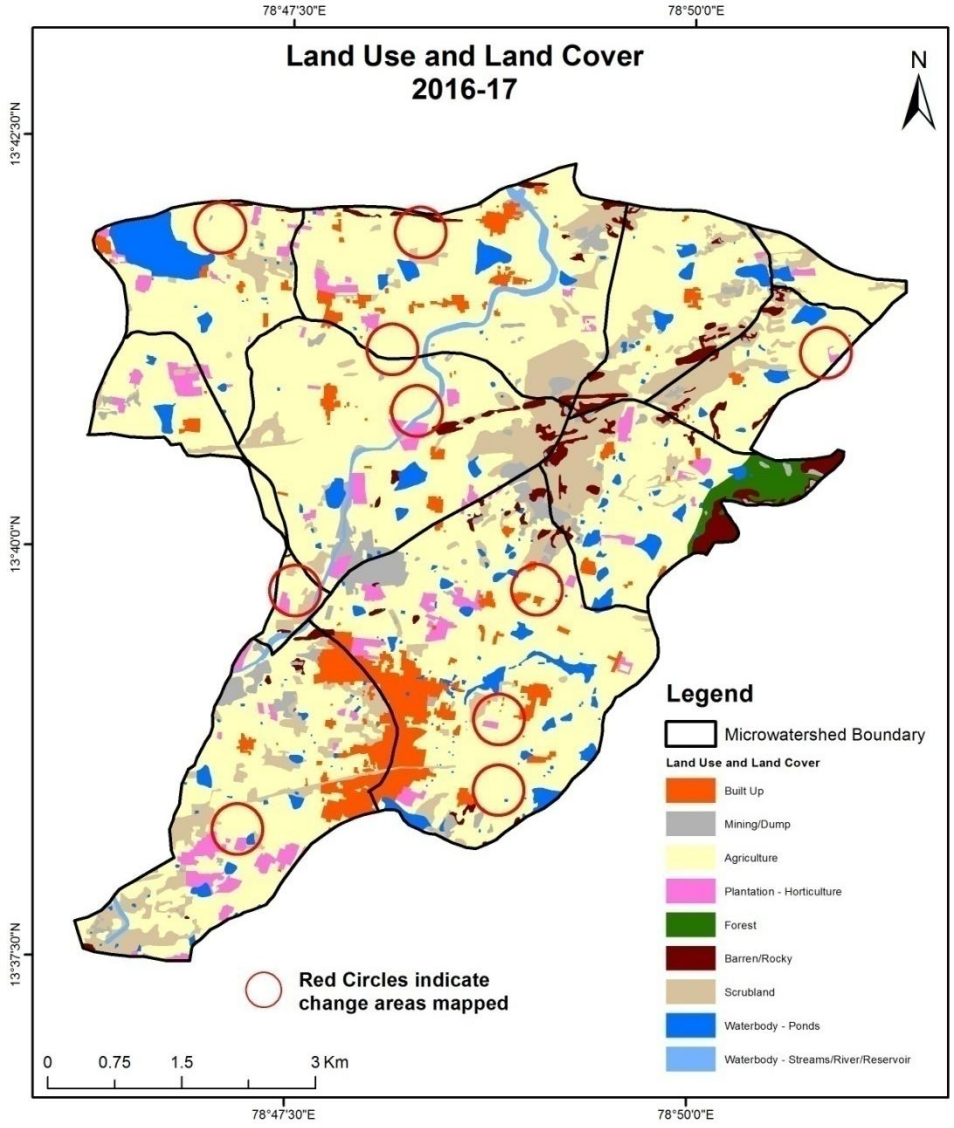
Scale: 1:10000

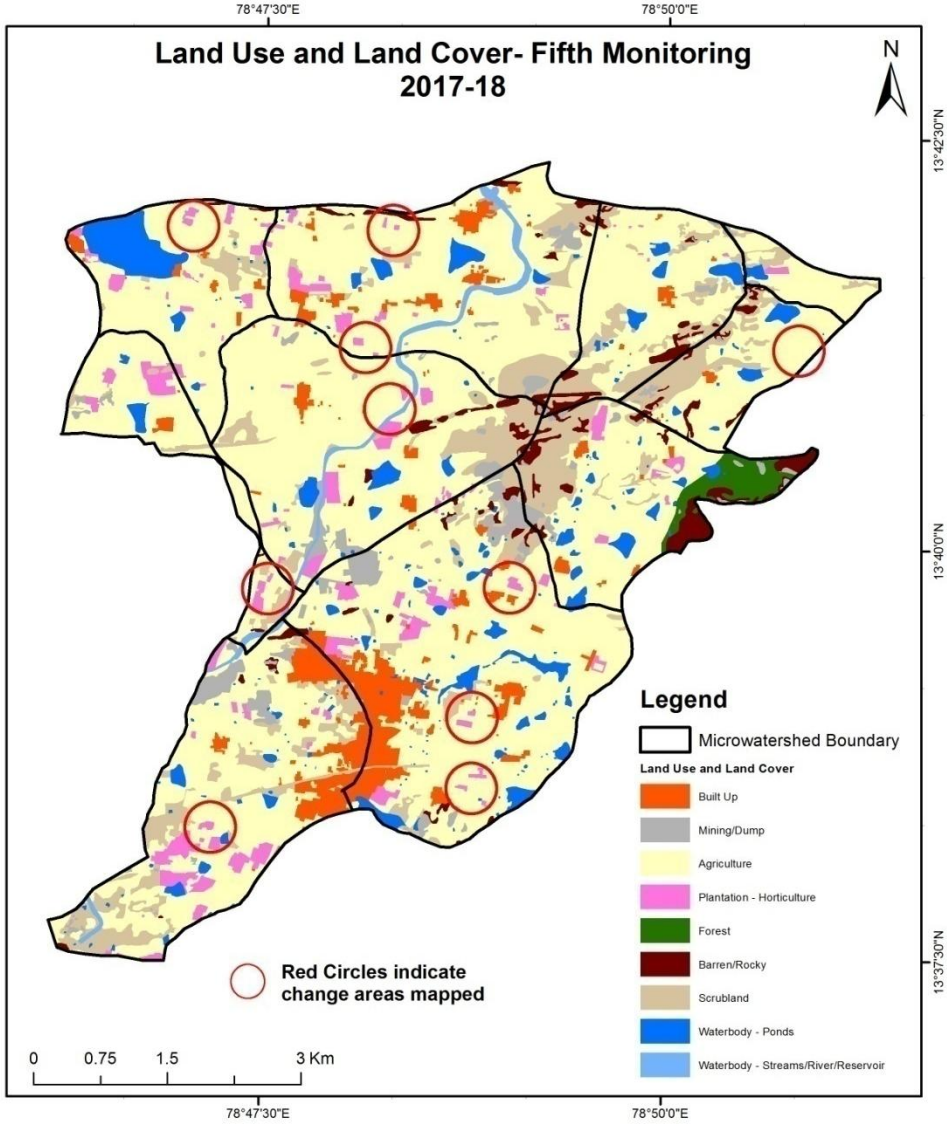




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

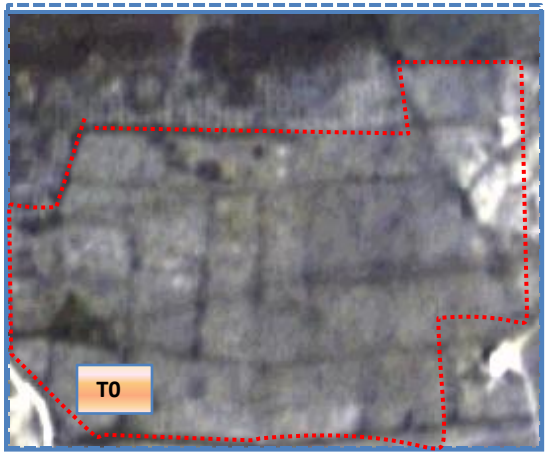
Scale: 1:10000





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

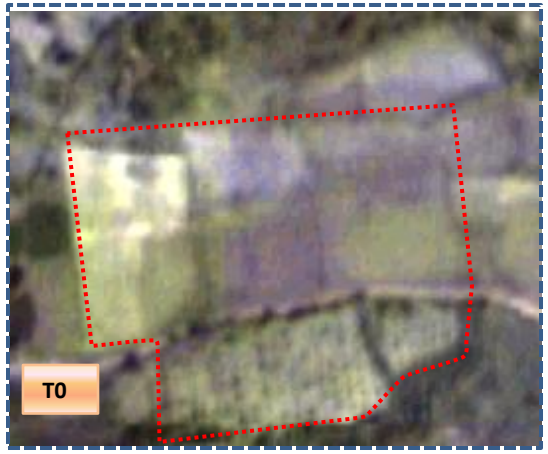
Agriculture to Plantation



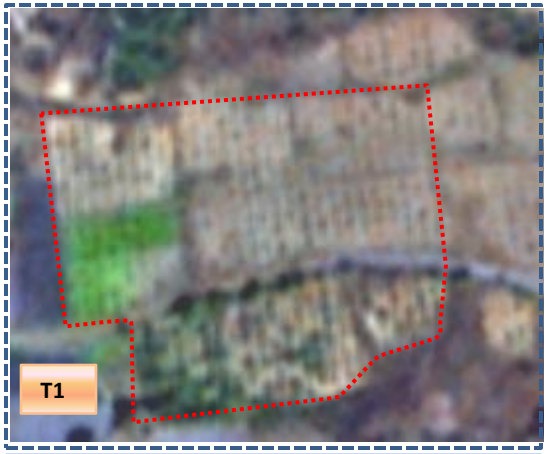
T0: 2009-10

T1: 15 December 2013

Agriculture to Plantation



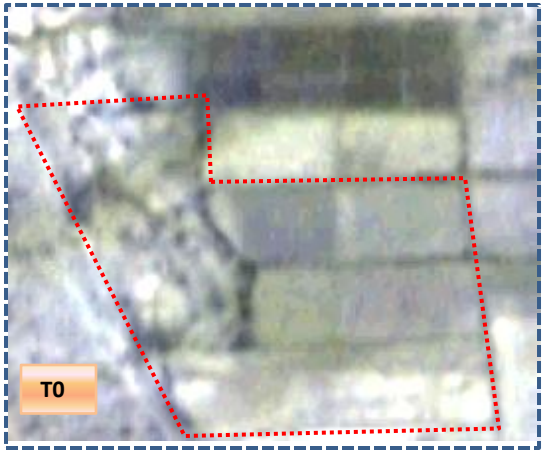
T0: 2009-10



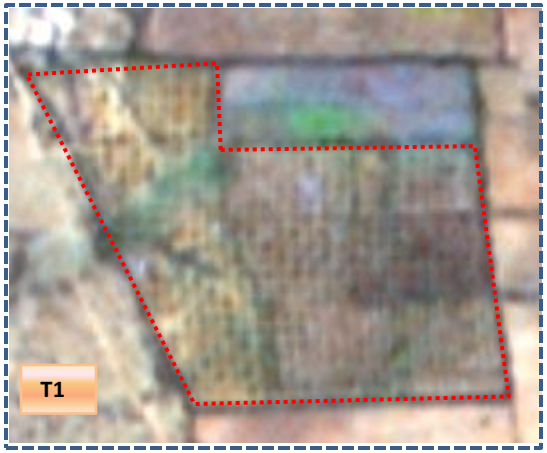
T1: 15 December 2013

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

Scrub to Plantation

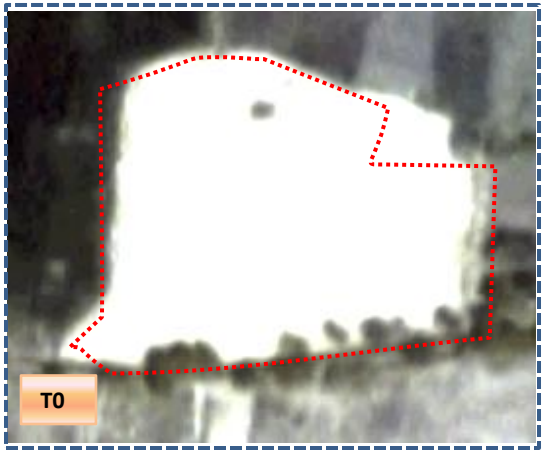


T0: 2009-10

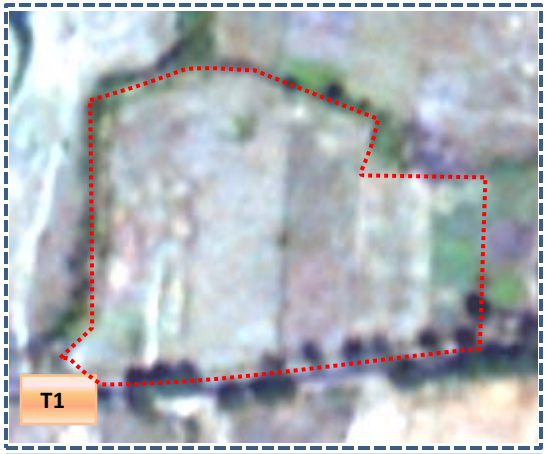


T1: 15 December 2013

Scrub to Agriculture



T0: 2009-10



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)										
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	178.96										178.96
Mining/dump		21.39									21.39
Agriculture	10.06	18.30	2964.12	51.24				17.21		0.45	3061.37
Plantation Horticulture	1.25		5.89	116.14							123.28
Forest					44.77						44.77
Forest Plantation											
Barren Rocky		6.04					160.22				166.26
Scrub	13.43	1.05	4.22	1.19				595.48	0.84		616.21
Waterbody-Streams/River									46.28		46.28
Waterbody – Ponds										178.51	178.51
Grand Total	**203.69**	**46.78**	**2974.24**	**168.57**	**44.77**		**160.22**	**612.68**	**47.12**	**178.96**	**4437.03**

• 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 97.25 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrub, and water body in T1.

• In T1 10.11 ha of the agriculture area has increased from plantation and scrubland area of T0.

• Overall 87.13 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)										
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	203.69										203.69
Mining/dump		46.78									46.78
Agriculture	23.04	30.19	2842.56	61.36				0.39		16.69	2974.24
Plantation Horticulture		1.35	6.54	160.67							168.57
Forest		1.58			42.88					0.31	44.77
Forest Plantation											
Barren Rocky		23.36					136.86				160.22
Scrub	3.81	3.10	59.86	5.48				534.67		5.75	612.68
Waterbody-Streams/River									47.12		47.12
Waterbody – Ponds			0.82							178.14	178.96
Grand Total	**230.55**	**106.36**	**2909.79**	**227.52**	**42.88**		**136.86**	**535.07**	**47.12**	**200.89**	**4437.03**

• 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 131.67 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrub and water body in T2.

• In T2 67.23 ha of the agriculture area has increased from plantation, scrubland and water body area of T1.

• Overall 64.45 ha of the agriculture area has been decreased. 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)										
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	230.55										230.55
Mining/dump		105.88	0.48								106.36
Agriculture	1.09	12.07	2889.46	0.69						6.49	2909.79
Plantation Horticulture			37.36	190.16							227.52
Forest					42.88						42.88
Forest Plantation											
Barren Rocky		6.99					129.87				136.86
Scrub	1.02	1.58	23.58					508.42		0.47	535.07
Waterbody-Streams/River									47.12		47.12
Waterbody – Ponds										200.89	200.89
Grand Total	**232.66**	**126.51**	**2950.88**	**190.85**	**42.88**		**129.87**	**508.42**	**47.12**	**207.85**	**4437.03**

• 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 20.33 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T3.

• In T3 60.94 ha of the agriculture area has increased from mining/dump, plantation and scrubland area of T2.

• Overall 41.09 ha of the agriculture area has been increased. 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)										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	232.66										232.66
Mining/dump		126.35								0.16	126.51
Agriculture	5.29	1.78	2936.02	2.29						5.50	2950.88
Plantation Horticulture	0.13		41.02	149.70							190.85
Forest					42.83					0.04	42.88
Forest Plantation											
Barren Rocky		10.75					119.12				129.87
Scrub	1.01	1.34	2.88					502.76		0.43	508.42
Waterbody-Streams/River									47.12		47.12
Waterbody – Ponds			0.19							207.66	207.85
Grand Total	**239.08**	**140.22**	**2980.10**	**151.99**	**42.83**		**119.12**	**502.76**	**47.12**	**213.79**	**4437.03**

• 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 14.86 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T4.

• In T4 44.08 ha of the agriculture area has increased from plantation , scrubland and water body area of T3.

• Overall 29.22 ha of the agriculture area has been increased. 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)										
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	239.08										239.08
Mining/dump		140.22									140.22
Agriculture	0.11	8.45	2949.77	21.34						0.44	2980.10
Plantation Horticulture			8.78	143.22							151.99
Forest					42.83						42.83
Forest Plantation											
Barren Rocky							119.12				119.12
Scrub		3.13	12.88					486.75			502.76
Waterbody-Streams/River									47.12		47.12
Waterbody – Ponds										213.79	213.79
Grand Total	**239.19**	**151.80**	**2971.43**	**164.56**	**42.83**		**119.12**	**486.75**	**47.12**	**214.22**	**4437.03**

• 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 30.33 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T5.

• In T5 21.66 ha of the agriculture area has increased from plantation and scrubland area of T4.

• Overall 8.67 ha of the agriculture area has been decreased. 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 36.55 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 58.95 & 29.22 Hectares From T2-T3 and T3-T4 respectively and overall increase of 382.23 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 41 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 129.47 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.