MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -05/2009-10
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

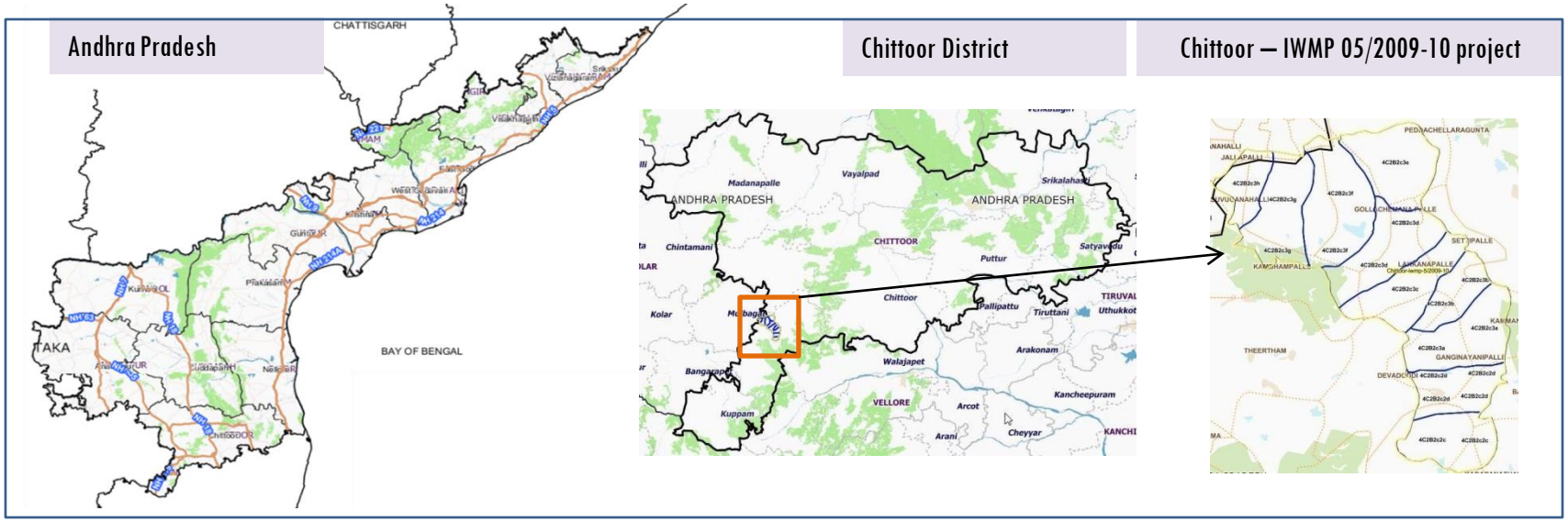
CONTENTS

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-05/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 5401.55 ha. It comprises of 10 micro watersheds.
- In the project area 28 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 2.11 ha increase in the area.
- Major percentage i.e. 77.59 % is covered by the agriculture, 5.54 % is covered by plantation and 3.68 % is covered by forest and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-05/2009-10
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Baireddipalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 5401.55 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.

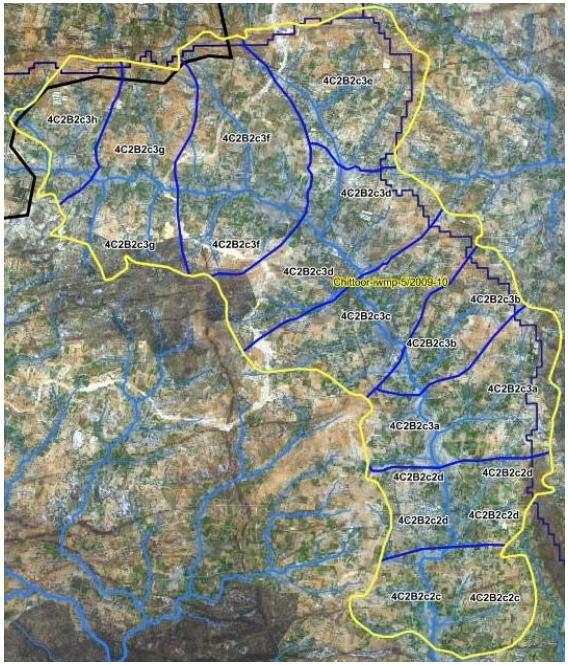
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			22-Feb-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			22-Feb-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	28
4	Detailed Project Report		

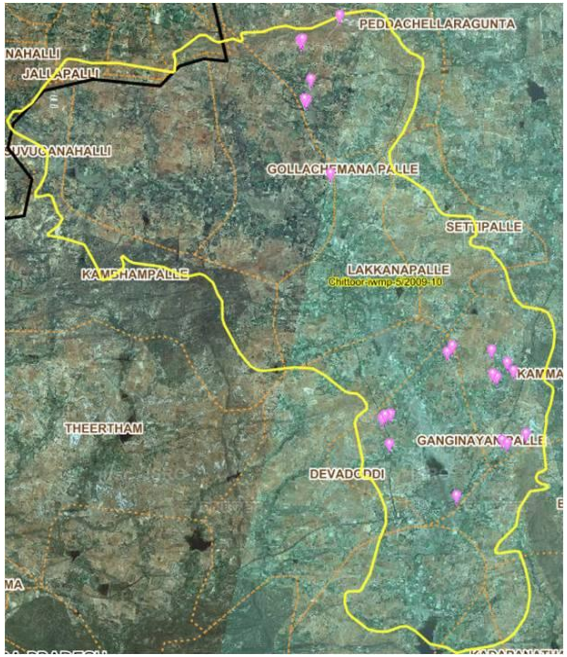
Natural Color Composite overlaid with Project boundaries and high detail stream network



Legend

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

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

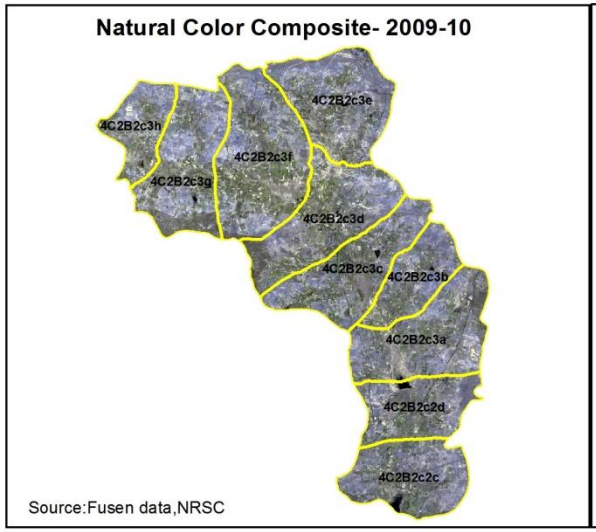
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture	2	2
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Checks & Plugs	4	4
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	1	1
11	Civil work-Check dams /Rock fill dam	10	8
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 (Horticulture)	7	3
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	2	0
18	Others	0	0
	TOTAL	**28**	**18**

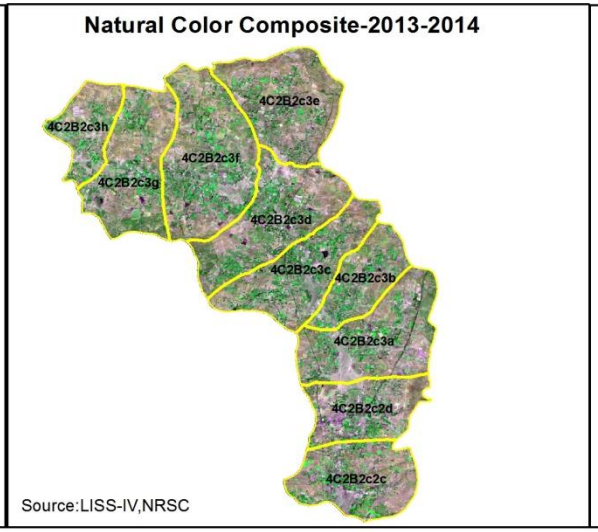
MONITORING IN THE PROJECT AREA

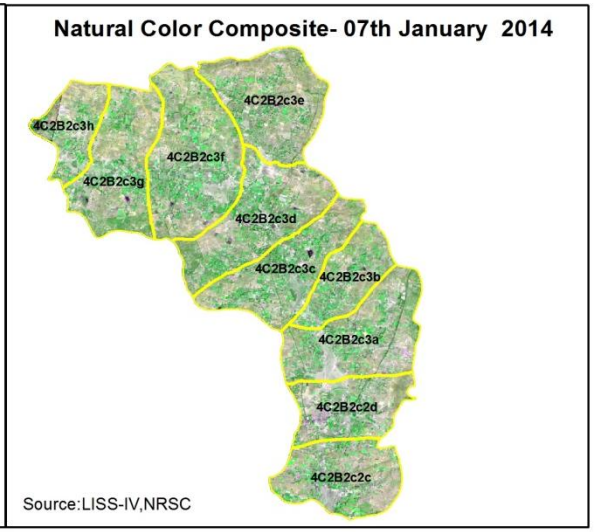
Site Wise Changes in the Project

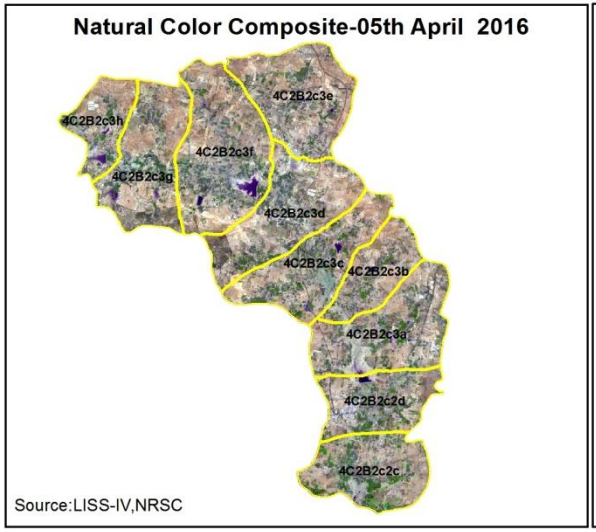
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match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

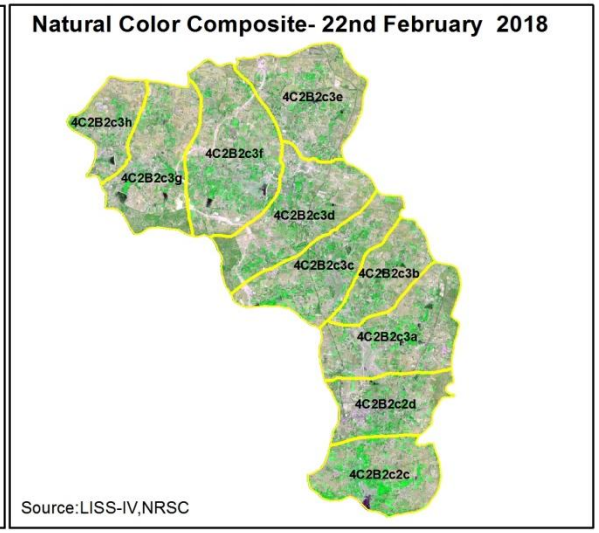
Natural Color Composite – 2009-10 to 2017-18



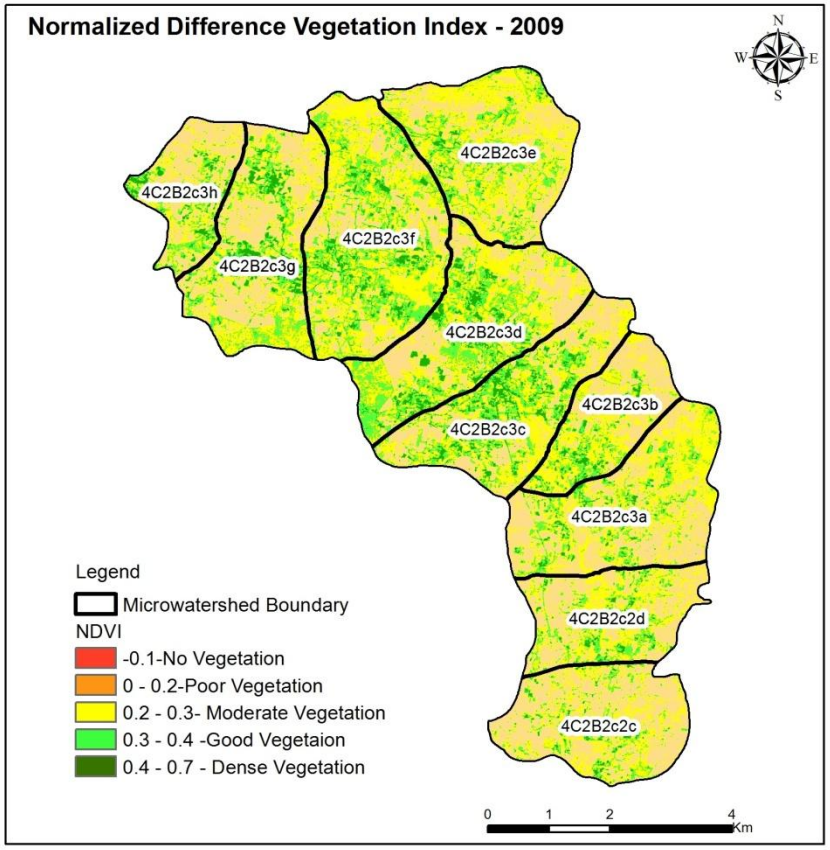




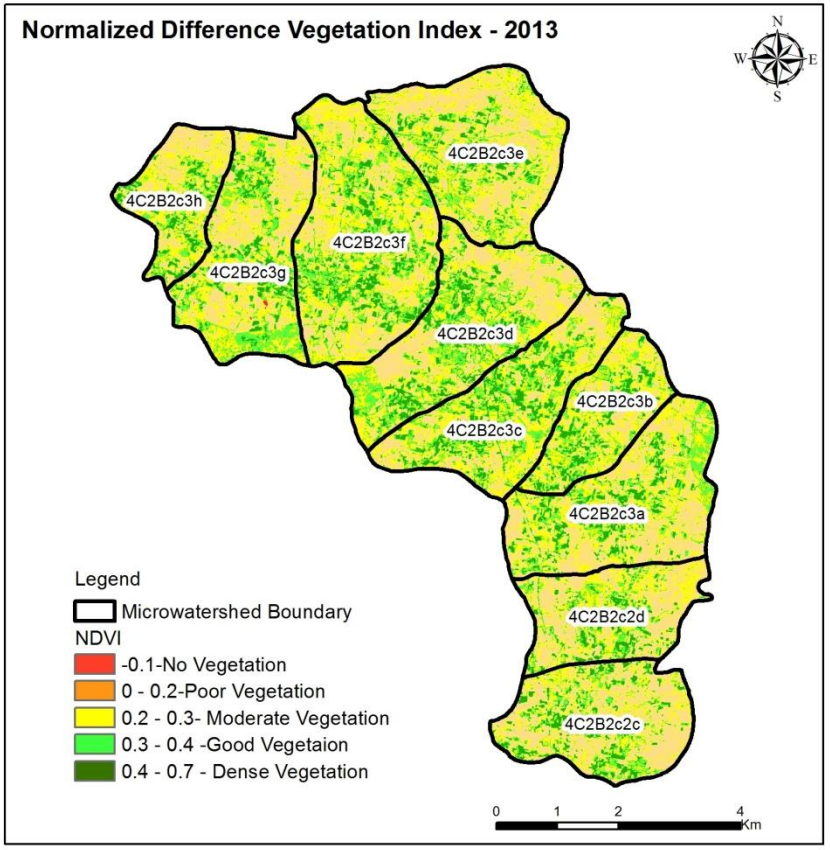




Changes in Vegetation Cover

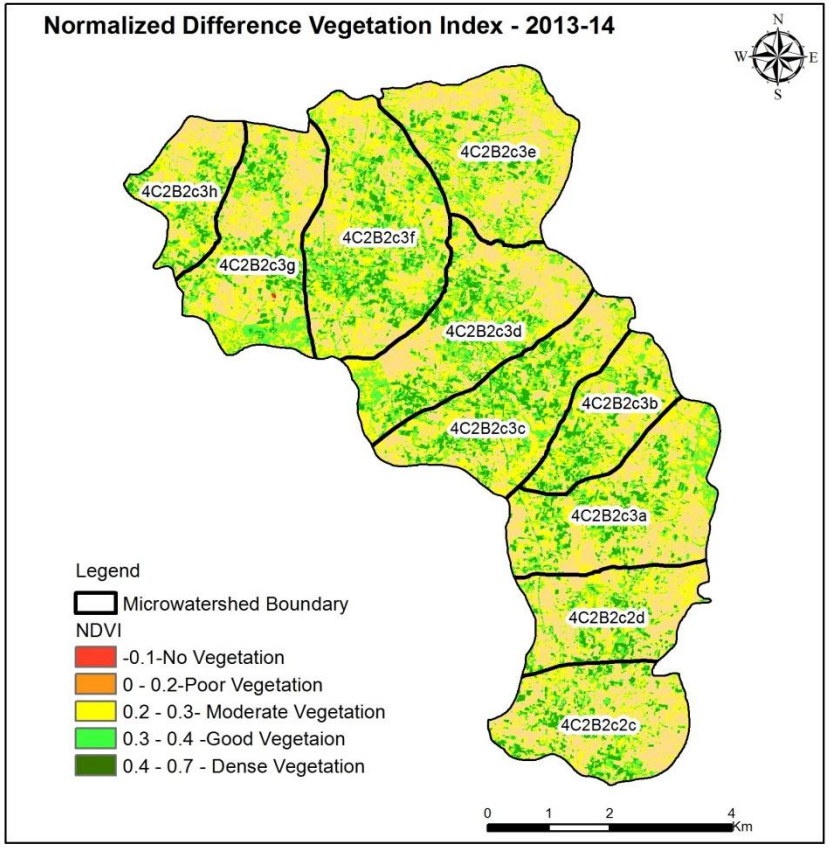


NDVI (2009-10)

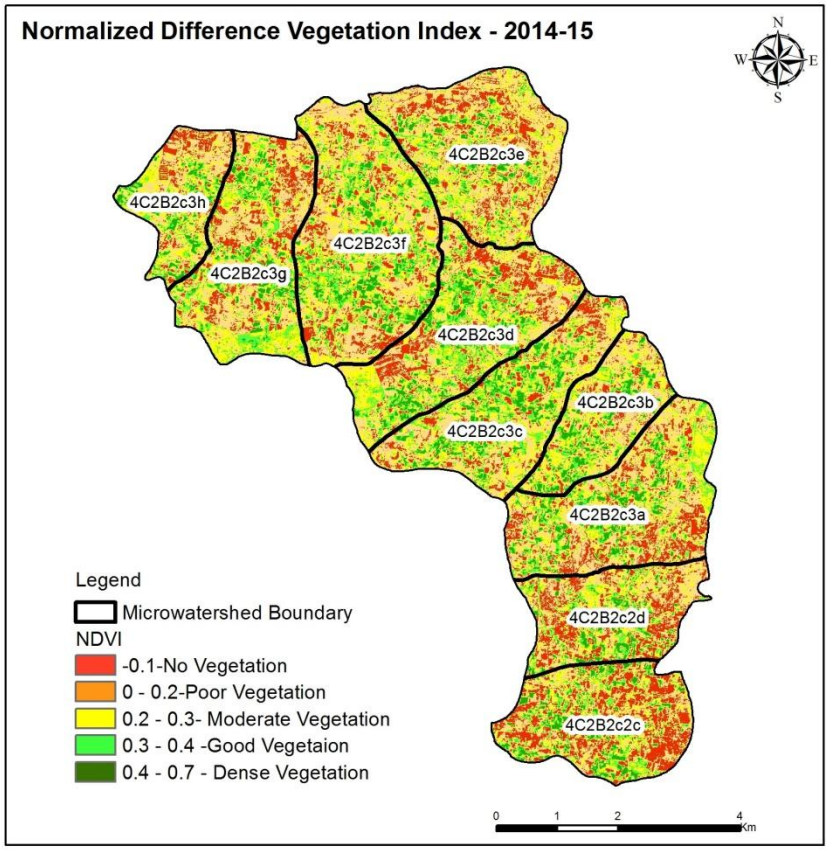


NDVI (2013-14)

Changes in Vegetation Cover



NDVI (2013-14)



NDVI (2014-15)

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-05/2009-10

T0:2009-10

T1: 26 February 2013

Drishti SI no. 571589 MWS :4C2B2c3b

Check dam

T0:2009-10

T1: 26 February 2013

Drishti SI no.1686474 MWS : 4C2B2c3a

Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-05/2009-10

T0: 2009-10

T1: 26 February 2013

Drishti Sl no. 571441 MWS : 4C2B2c3e

Horticulture

T0: 2009-10

T1: 26 February 2013

Drishti Sl no. 571612 MWS : 4C3D7a2j

Horticulture

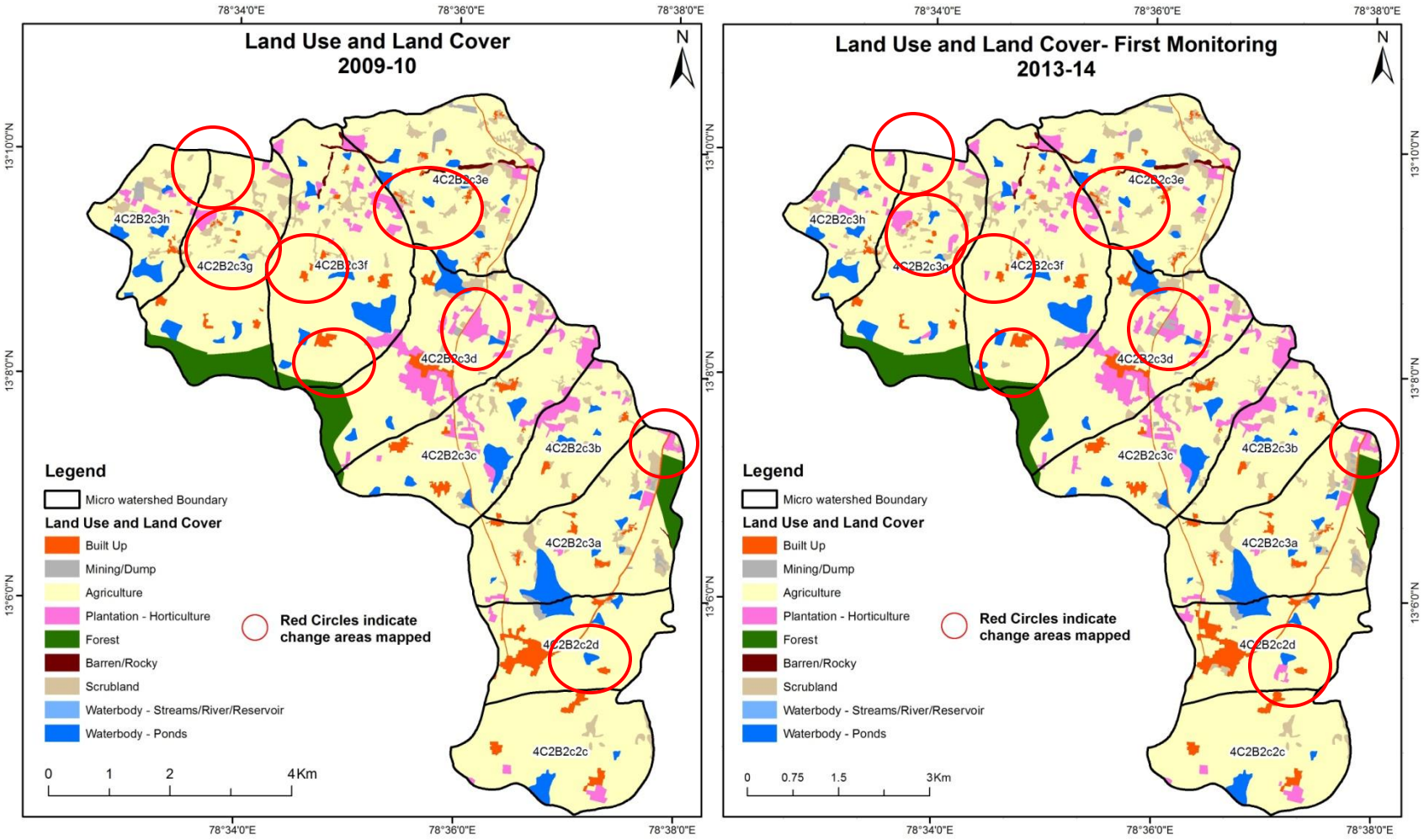
MONITORING IN THE PROJECT AREA

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)

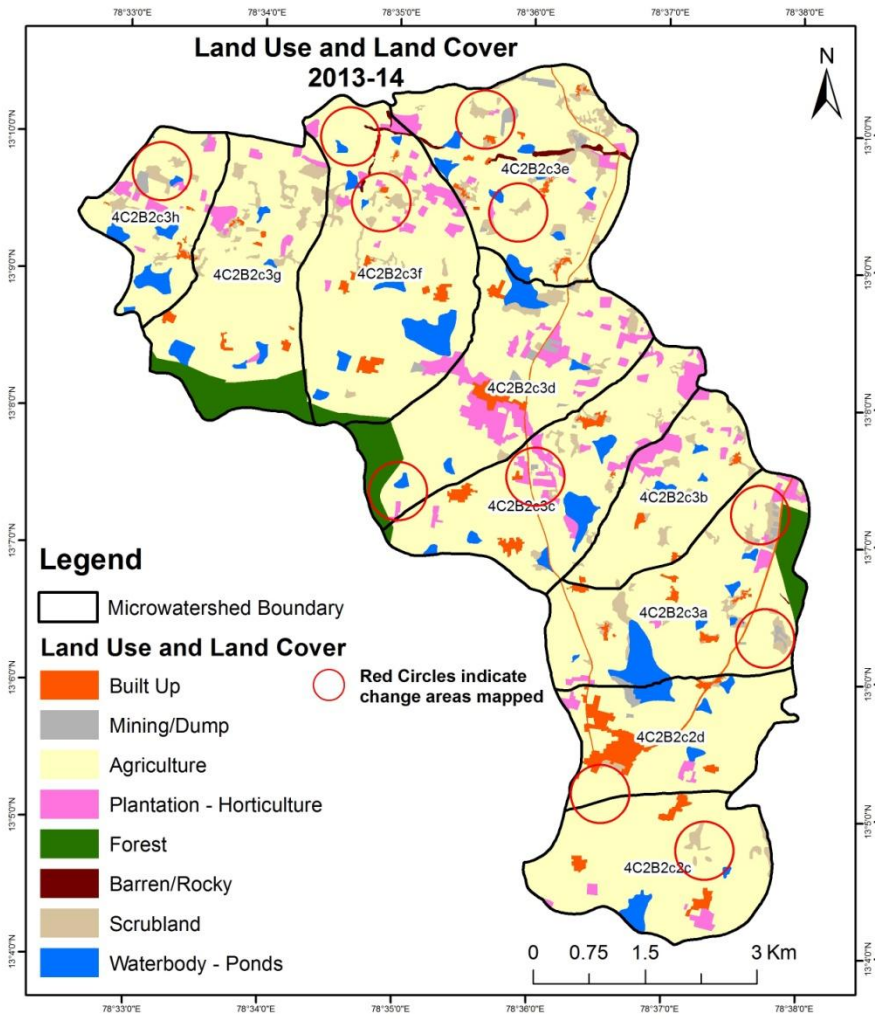
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

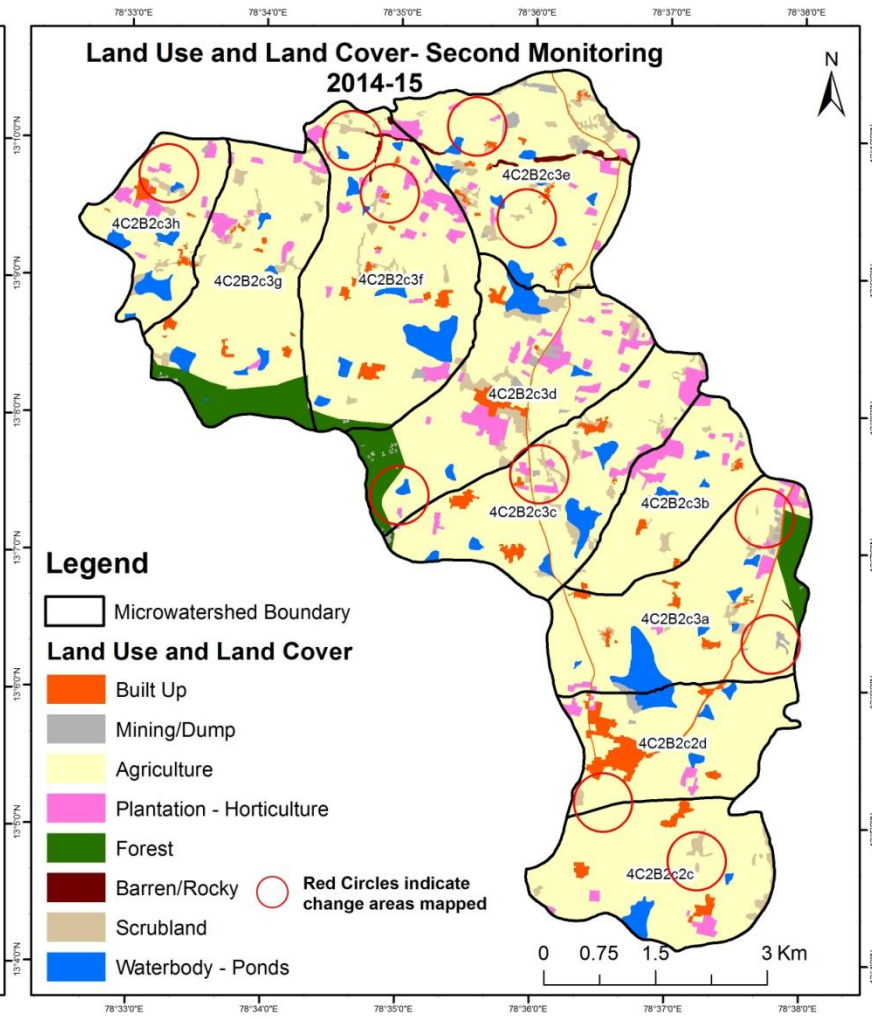
Scale: 1:10000



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

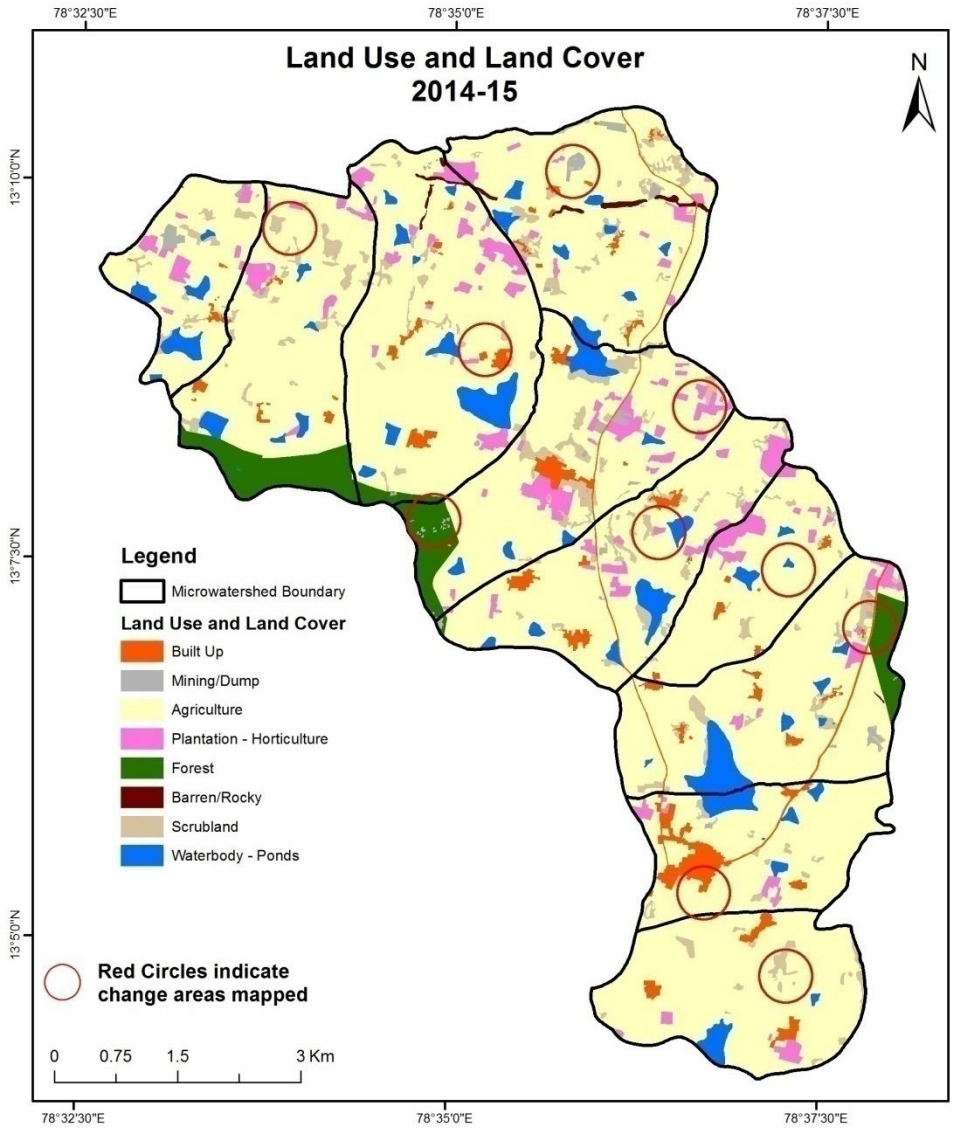
Scale: 1:10000

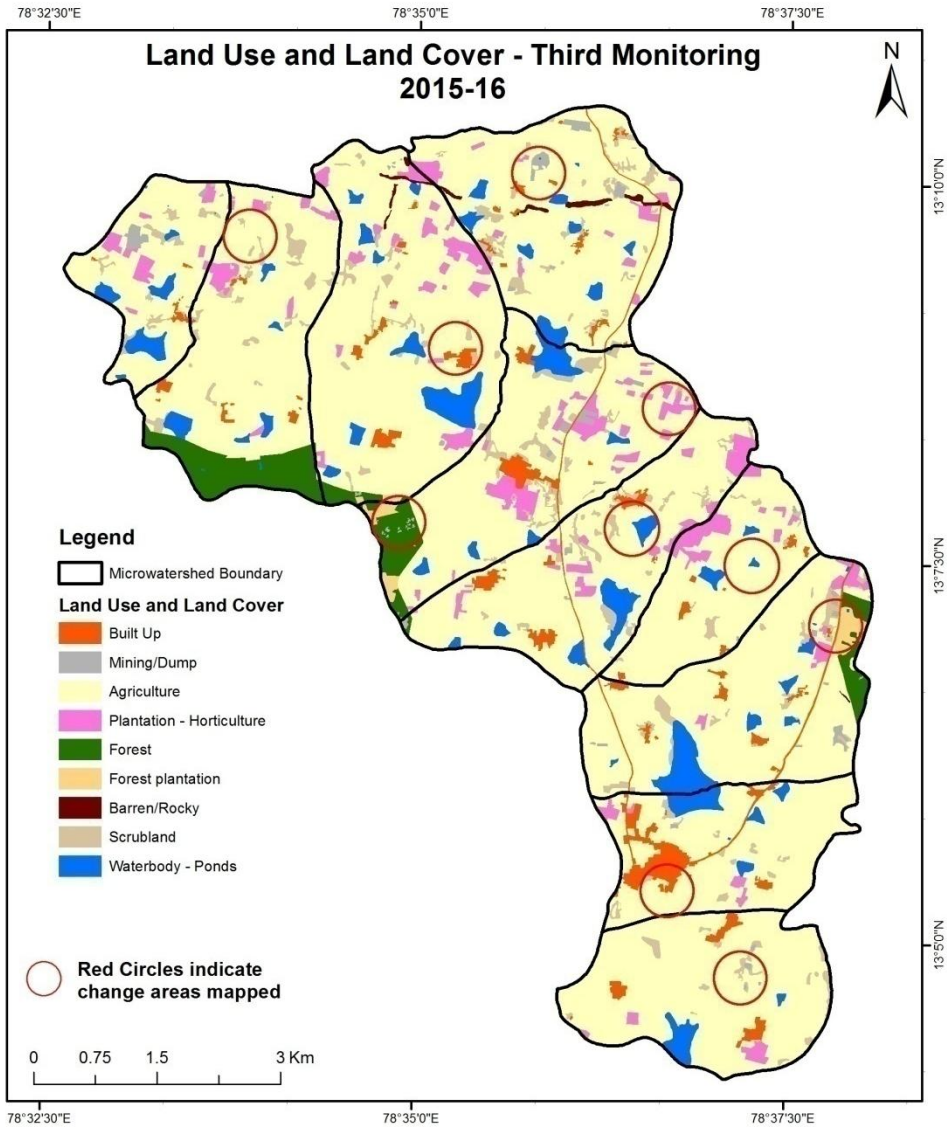




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

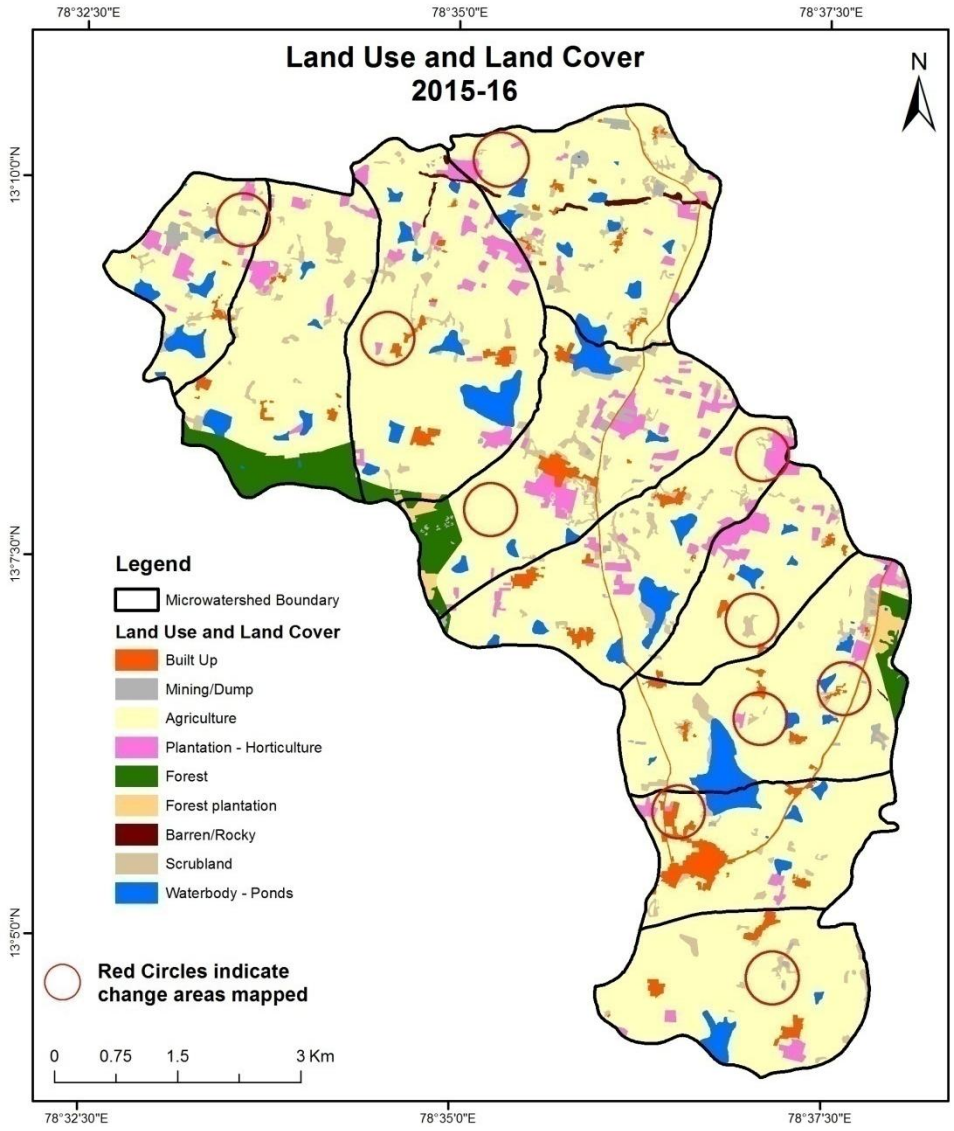
Scale: 1:10000

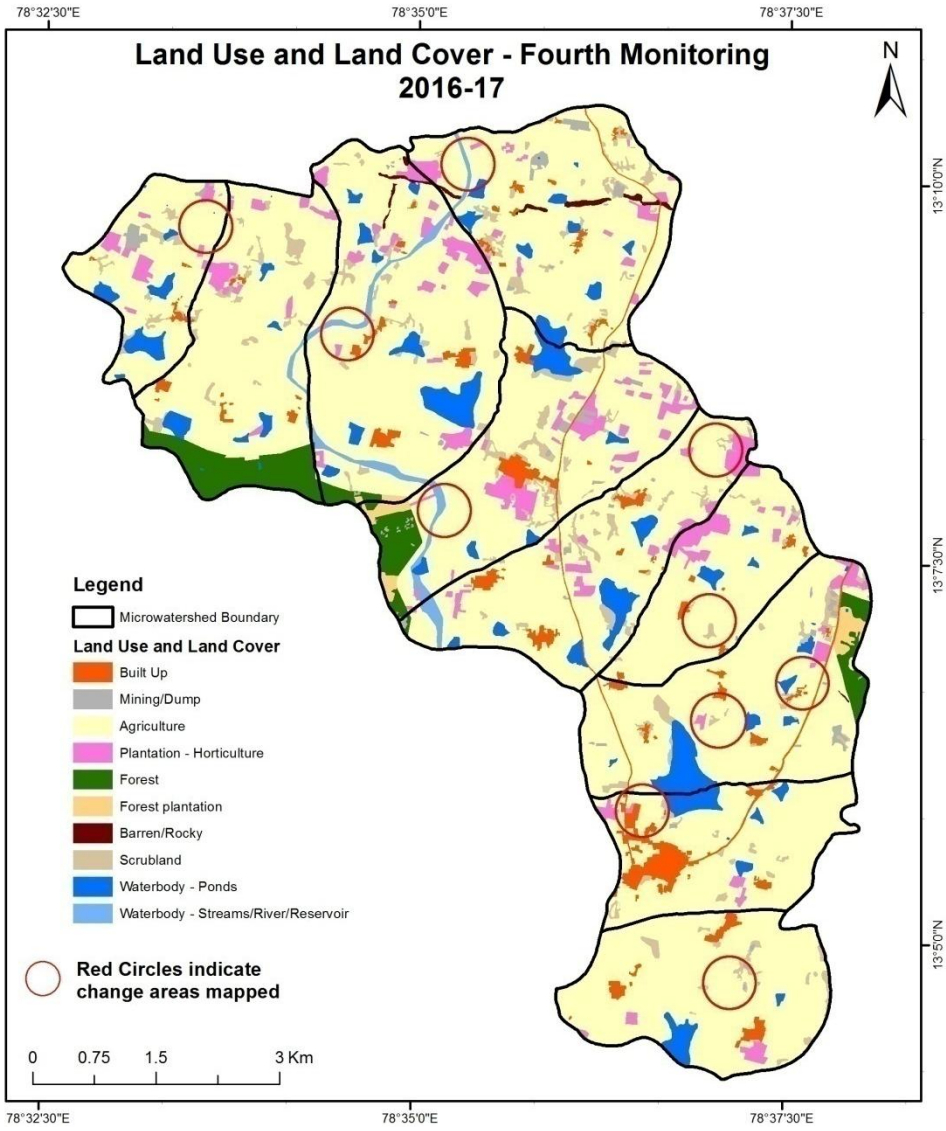




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

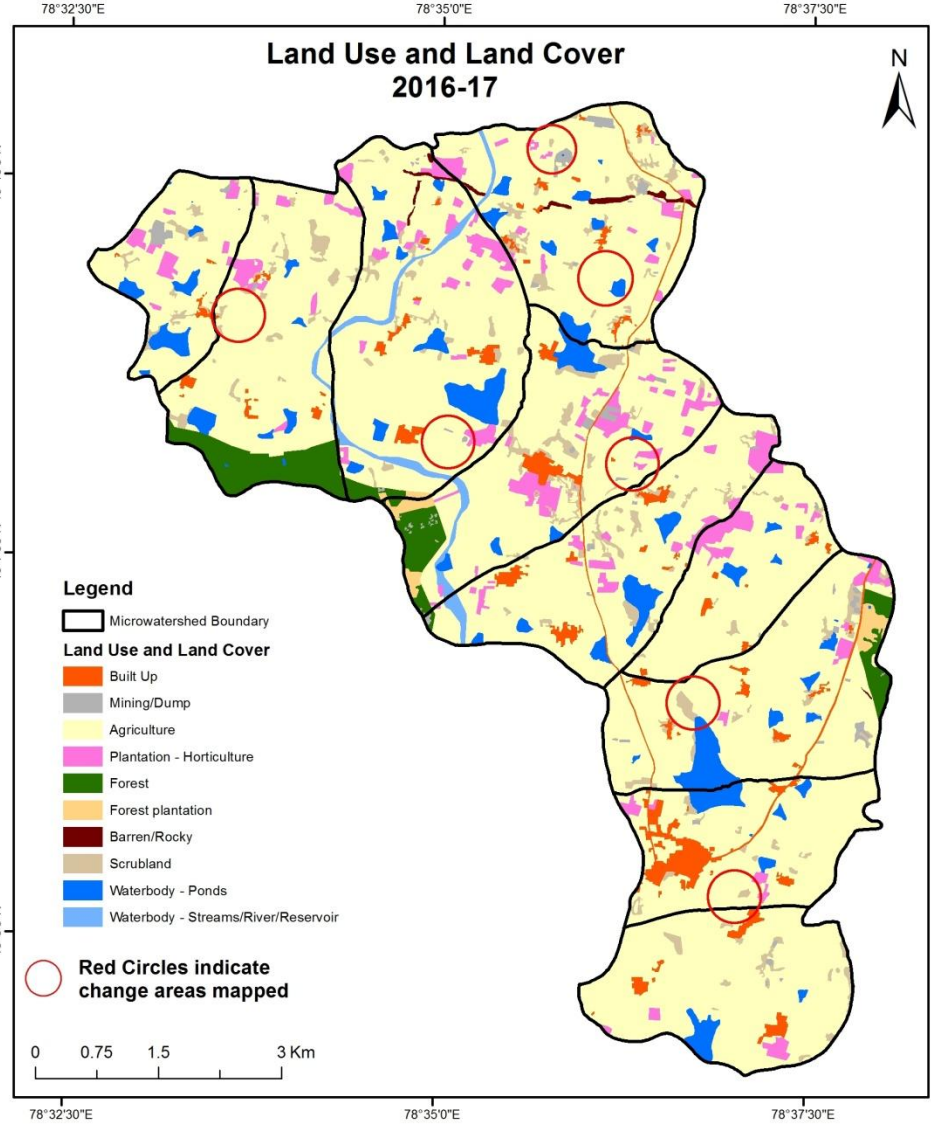
Scale: 1:10000

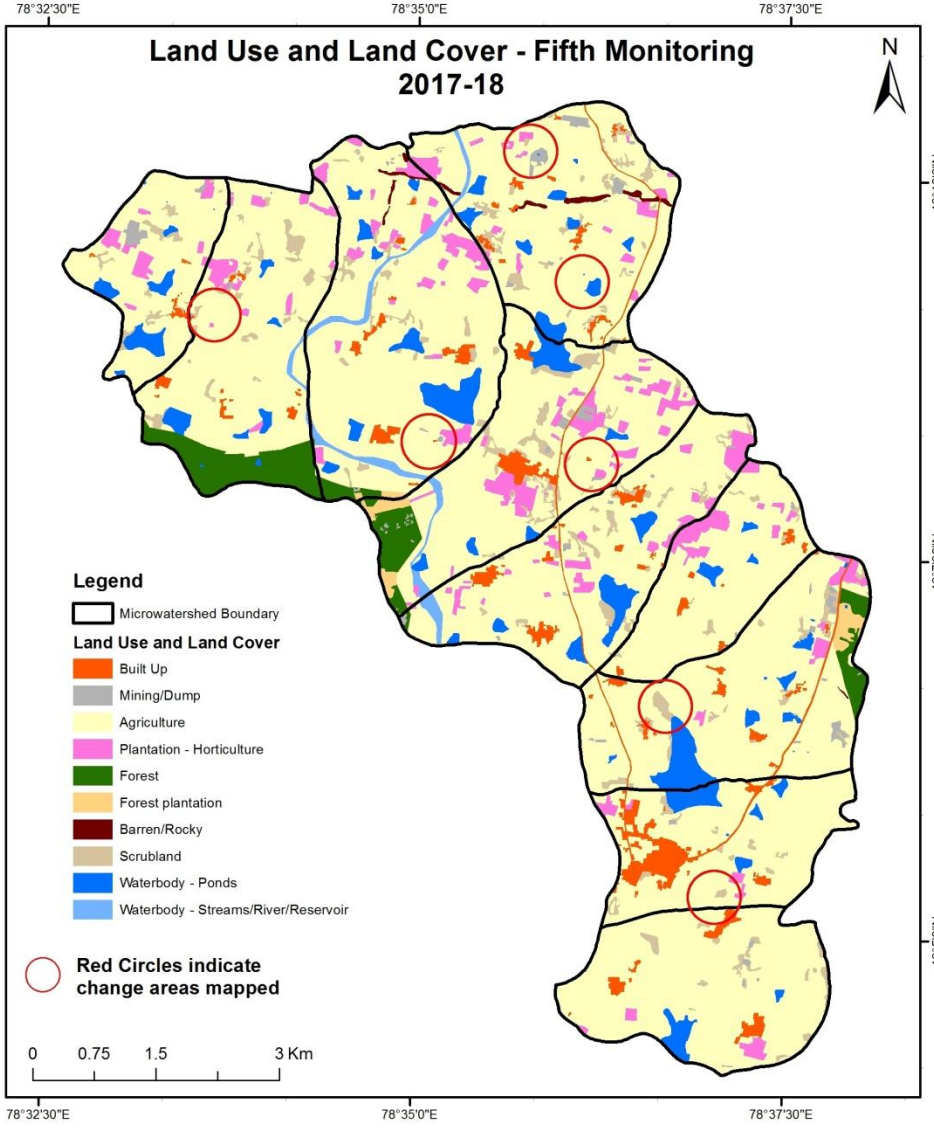




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

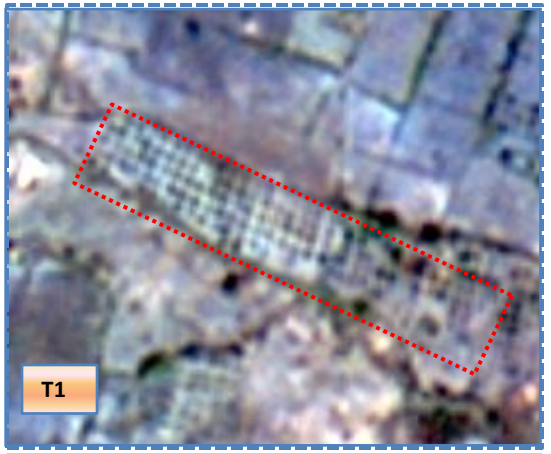




Land Use and Land Cover changes for Pre and Post treatment dates

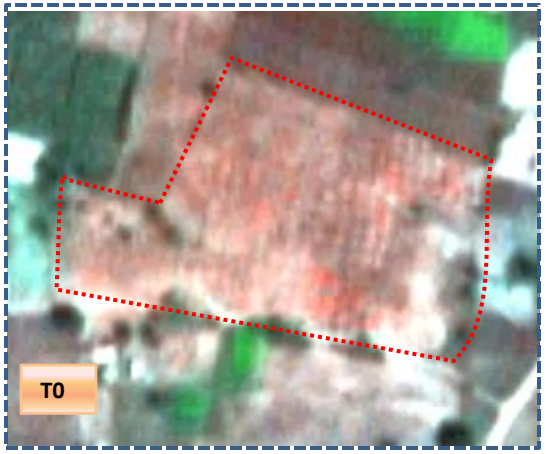
Agriculture to Plantation

T0: 2009-10

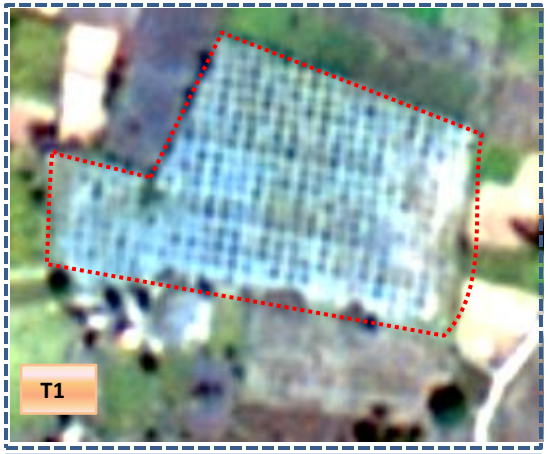


T1: 26 February 2013

Agriculture to Plantation



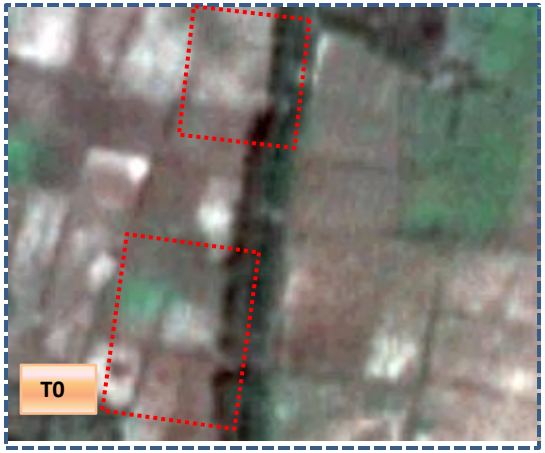
T0: 2009-10



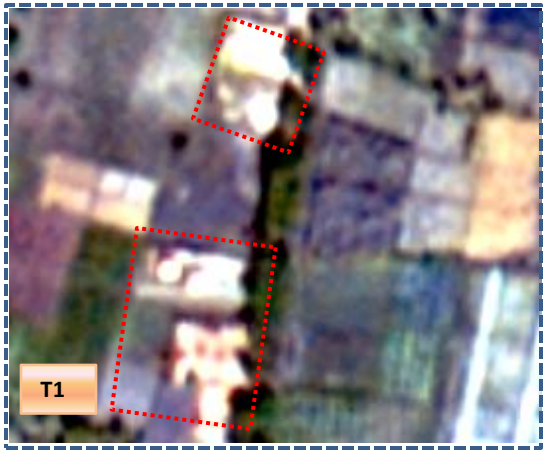
T1: 26 February 2013

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

Agriculture to Built-up



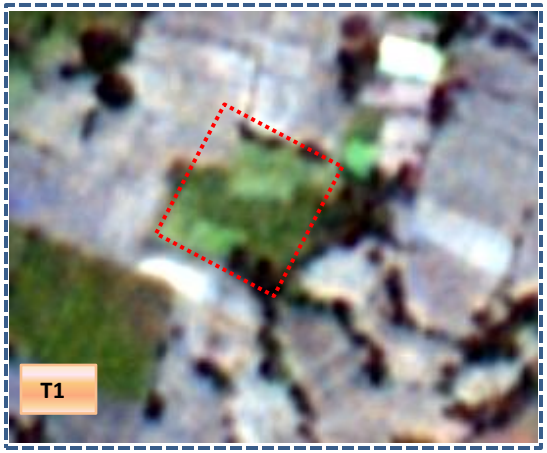
T0: 2009-10



T1: 26 February 2013

Agriculture to Plantation

T0: 2009-10



T1: 26 February 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	157.92										157.92
Mining/dump		21.98									21.98
Agriculture	4.10	1.43	4140.45	30.62						0.07	4176.67
Plantation Horticulture				234.57							234.57
Forest					198.71						198.71
Forest Plantation											
Barren Rocky							14.82				14.82
Scrub		5.53	8.40	0.53				325.42		2.22	342.10
Waterbody-Streams/River											
Waterbody – Ponds										251.11	251.11
Grand Total	**162.02**	**28.95**	**4148.85**	**265.72**	**198.71**		**14.82**	**325.42**		**253.41**	**5397.90**

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

• In T1 8.40 ha of the agriculture area has increased from scrubland of T0.

• Overall 27.82 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	162.02										162.02
Mining/dump		28.95									28.95
Agriculture	0.75	0.58	4140.15	7.27						0.10	4148.85
Plantation Horticulture	0.13		20.89	244.70							265.72
Forest		2.86			195.71					0.14	198.71
Forest Plantation											
Barren Rocky							14.82				14.82
Scrub		0.46	81.03	2.30				241.63			325.42
Waterbody-Streams/River											
Waterbody – Ponds			1.75							251.65	253.41
Grand Total	**162.90**	**32.85**	**4243.82**	**254.28**	**195.71**		**14.82**	**241.63**		**251.90**	**5397.90**

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

• In T2 103.67 ha of the agriculture area has increased from plantation, scrubland water body of T1.

• Overall 94.97 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)										
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	162.90										162.90
Mining/dump		32.85									32.85
Agriculture	3.72	2.35	4222.22	5.15						10.37	4243.82
Plantation Horticulture		0.32	9.97	243.99							254.28
Forest			1.71		166.99	26.59				0.42	195.71
Forest Plantation											
Barren Rocky		0.27					14.55				14.82
Scrub	0.52	1.83	28.51	0.11				208.86		1.79	241.63
Waterbody-Streams/River											
Waterbody – Ponds			3.08							248.82	251.90
Grand Total	**167.14**	**37.62**	**4265.50**	**249.25**	**166.99**	**26.59**	**14.55**	**208.86**		**261.41**	**5397.90**

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

• In T3 43.27 ha of the agriculture area has increased from plantation, forest and scrubland of T2.

• Overall 21.68 ha of the agriculture area has been decreased. 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	167.14										167.14
Mining/dump		37.62									37.62
Agriculture	5.88	0.57	4197.16	5.04					56.17	0.67	4265.50
Plantation Horticulture				248.73					0.52		249.25
Forest					164.39	2.60					166.99
Forest Plantation						26.59					26.59
Barren Rocky							14.55				14.55
Scrub	0.92	1.28	5.61					201.05			208.86
Waterbody-Streams/River											
Waterbody – Ponds			0.81							260.59	261.41
Grand Total	**173.94**	**39.48**	**4203.58**	**253.77**	**164.39**	**29.19**	**14.55**	**201.05**	**56.69**	**261.27**	**5397.90**

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

• In T4 6.43 ha of the agriculture area has increased from scrubland of T3.

• Overall 61.91 ha of the agriculture area has been decreased. 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	173.94										173.94
Mining/dump		39.48									39.48
Agriculture	4.87	0.82	4184.60	12.41						0.88	4203.58
Plantation Horticulture		0.16	0.34	253.26							253.77
Forest					164.19					0.20	164.39
Forest Plantation						29.19					29.19
Barren Rocky							14.55				14.55
Scrub	0.17	0.36	1.42					199.10			201.05
Waterbody-Streams/River			1.96						54.73		56.69
Waterbody – Ponds			1.16							260.11	261.27
Grand Total	**178.98**	**40.82**	**4189.48**	**265.67**	**164.19**	**29.19**	**14.55**	**199.10**	**54.73**	**261.19**	**5397.90**

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

• In T5 4.88 ha of the agriculture area has increased from plantation ,scrubland and water body of T4.

• Overall 14.10 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 64.81 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 94.97 and 21.68, Hectares From T1-T2 & T2-T3, respectively and overall increase of 116.65 Hectares in Crop land area as compared between baseline LU/LC data LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 31 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 143 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (1) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.