MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -03/2009-10
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

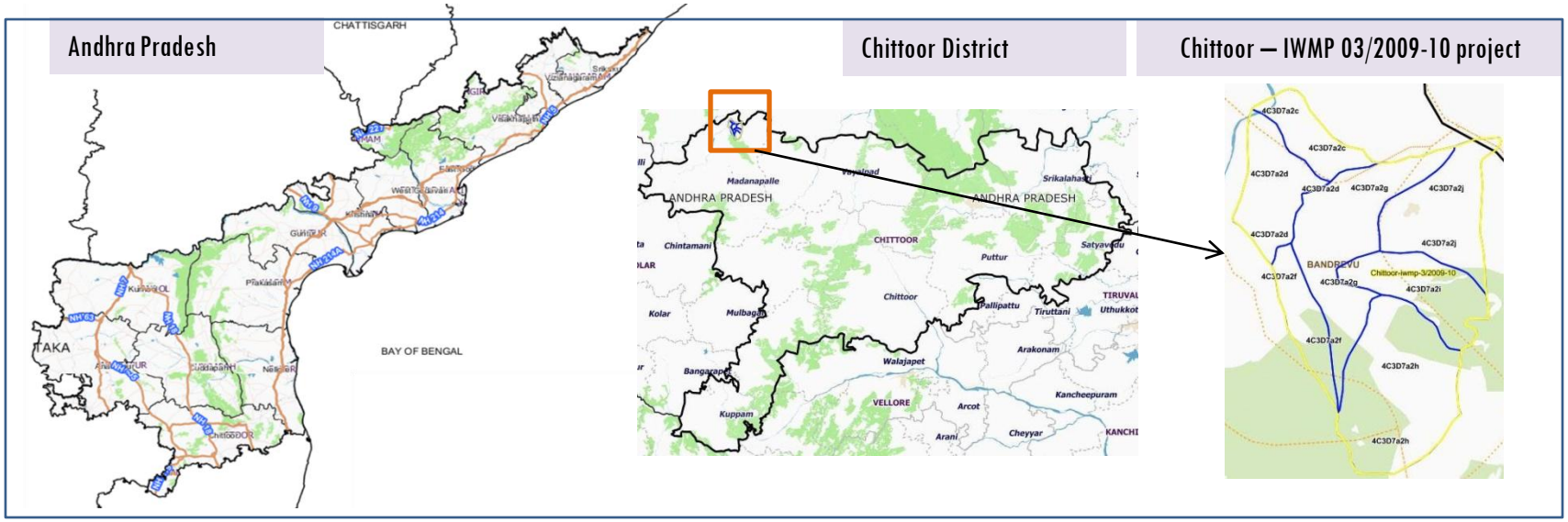
CONTENTS

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-03/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 3649.24 ha. It comprises of 08 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 9.55 ha increase in the area.
- Major percentage i.e. 42.46 % is covered by the agriculture, 22.72 % is covered by scrubland and 23.82 % is covered by forest and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-03/2009-10
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Peddamandyam Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 3649.24 ha. It comprises of 11 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			9-Dec-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			9-Dec-17
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

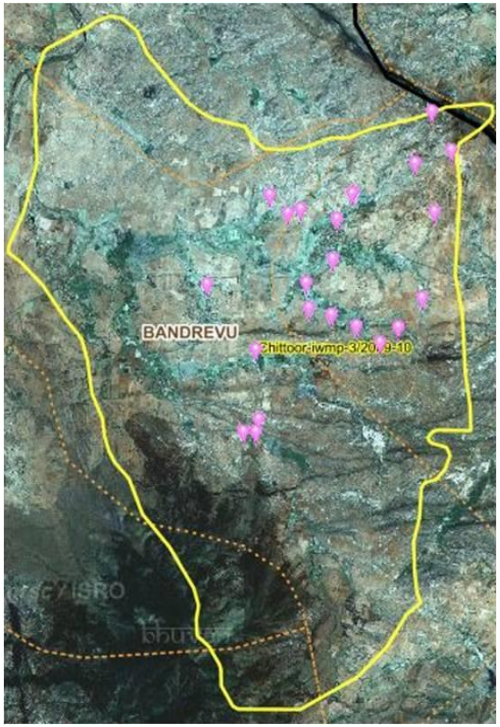
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

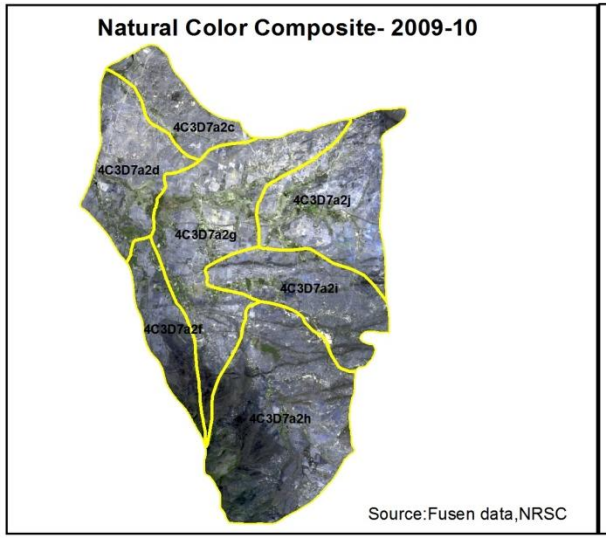
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Checks & Plugs	0	0
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	0	0
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)	28	23
17	Entry Point Activity	0	
18	Others	0	0
	TOTAL	**28**	**23**

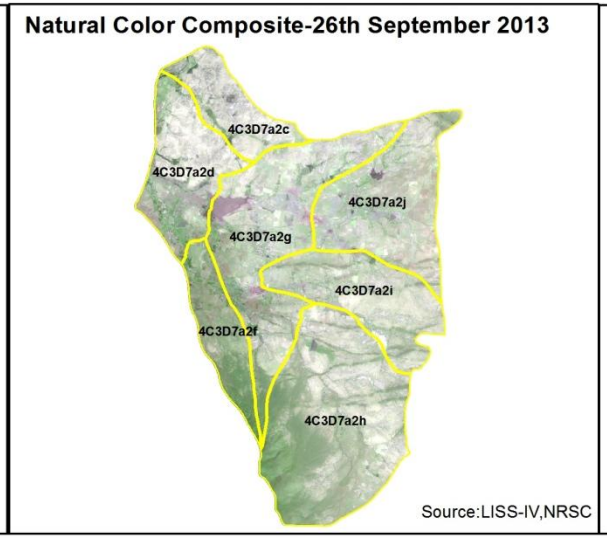
MONITORING IN THE PROJECT AREA

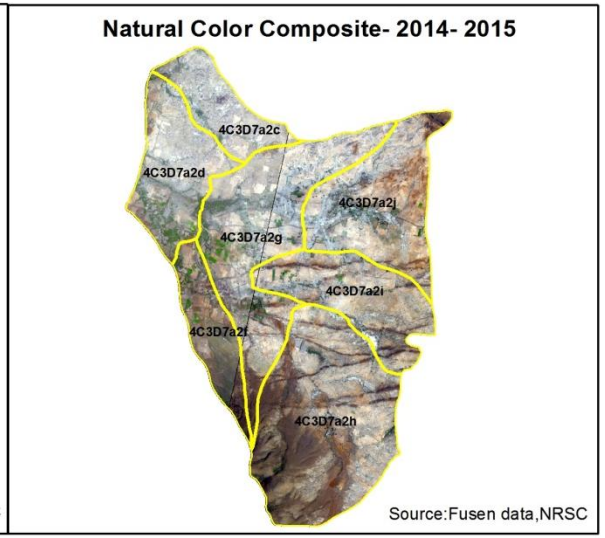
Site Wise Changes in the Project

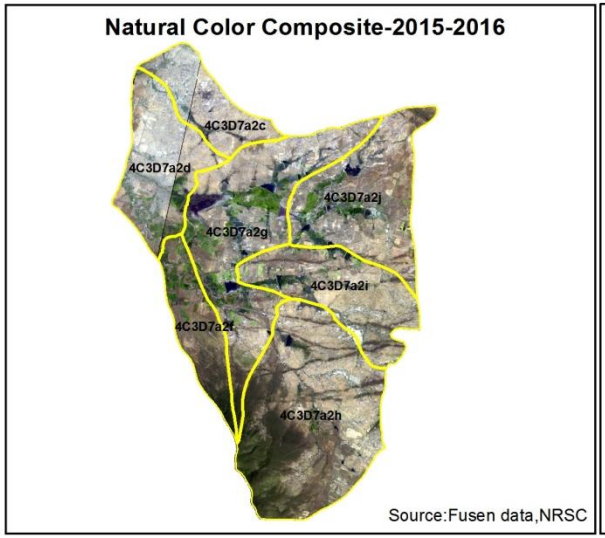
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match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

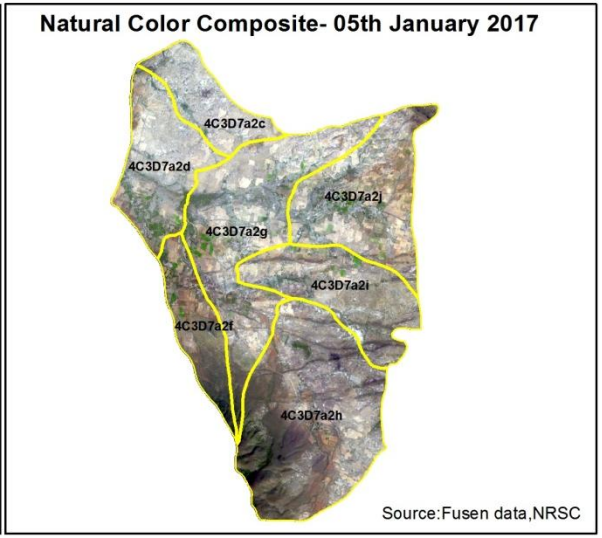
Natural Color Composite – 2009-10 to 2017-18



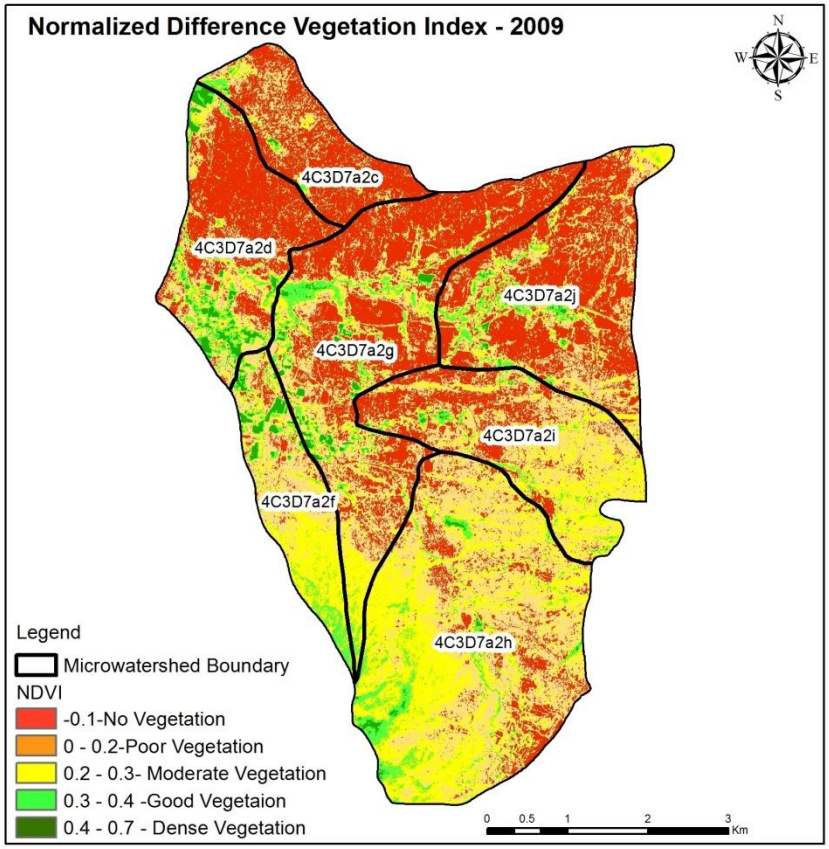




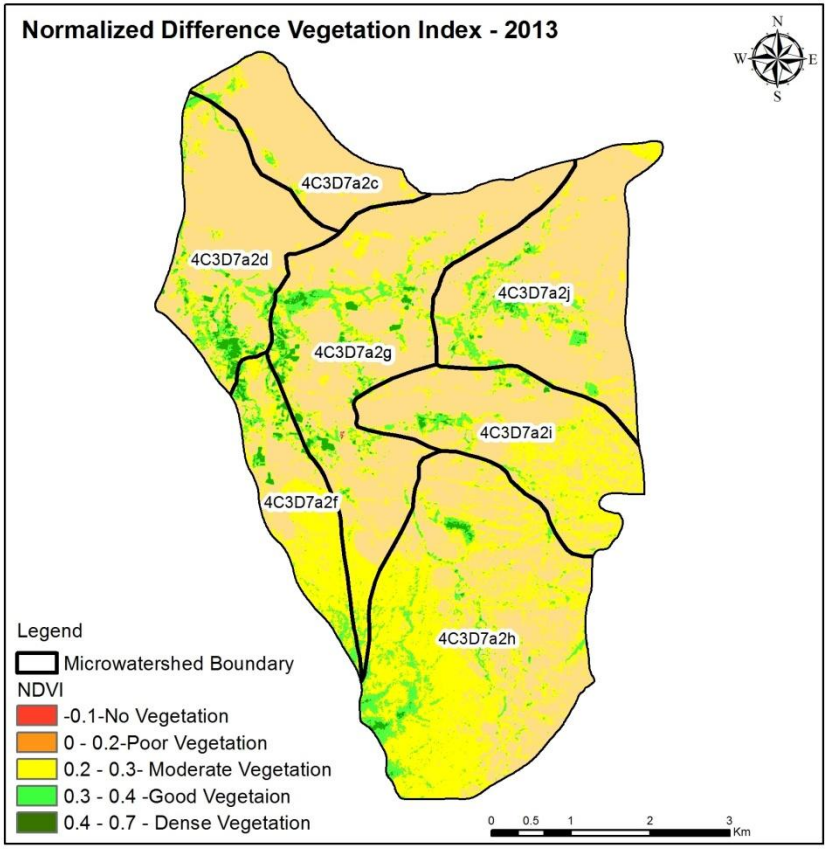




Changes in Vegetation Cover

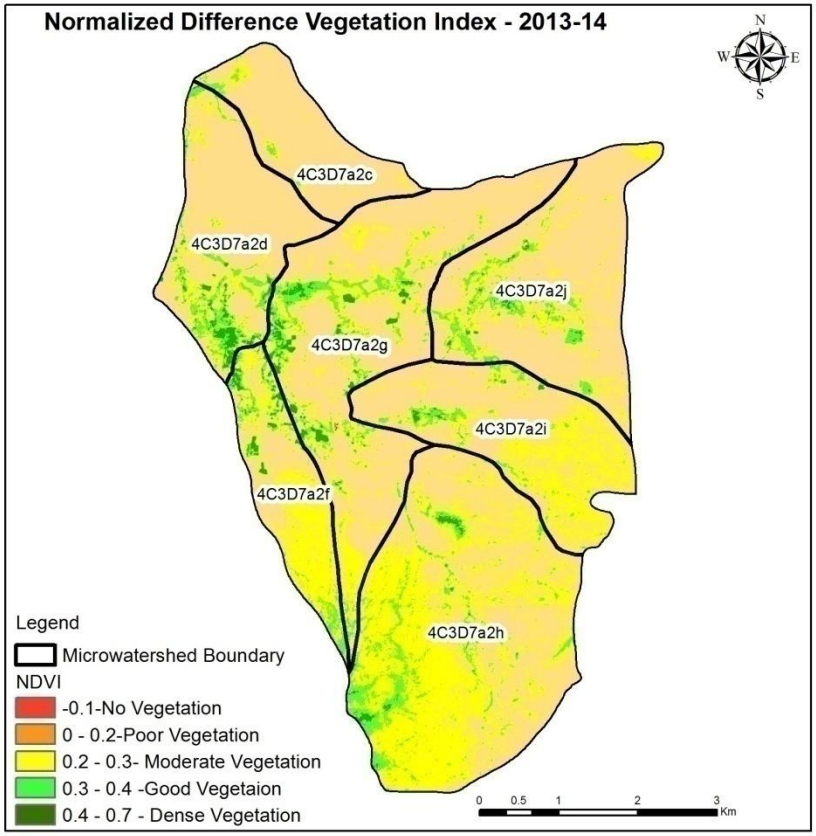


NDVI (2009-10)

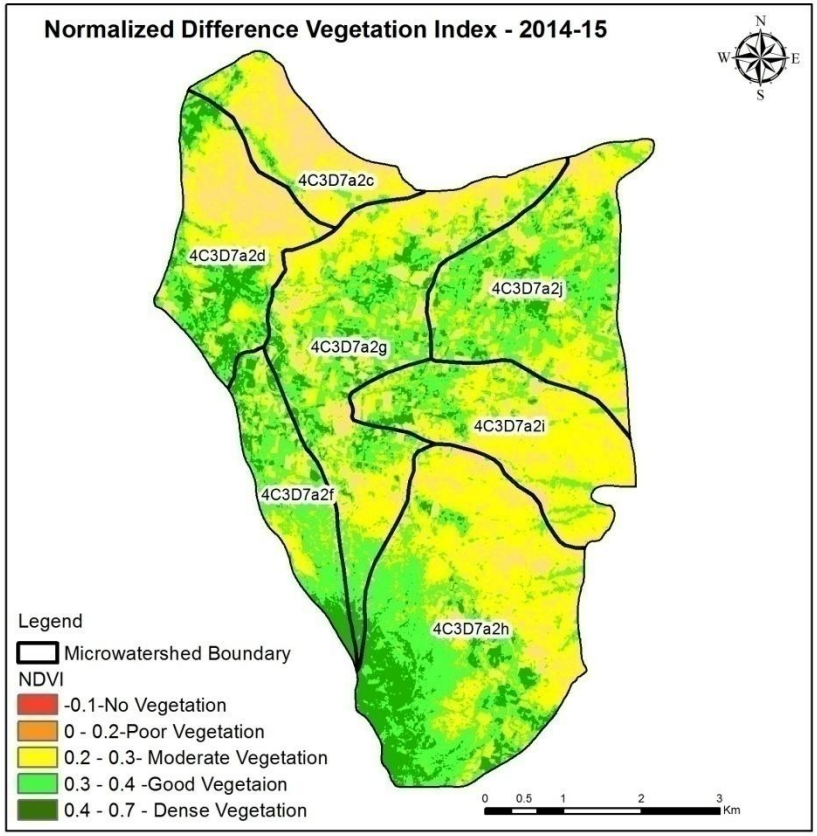


NDVI (2013-14)

Changes in Vegetation Cover

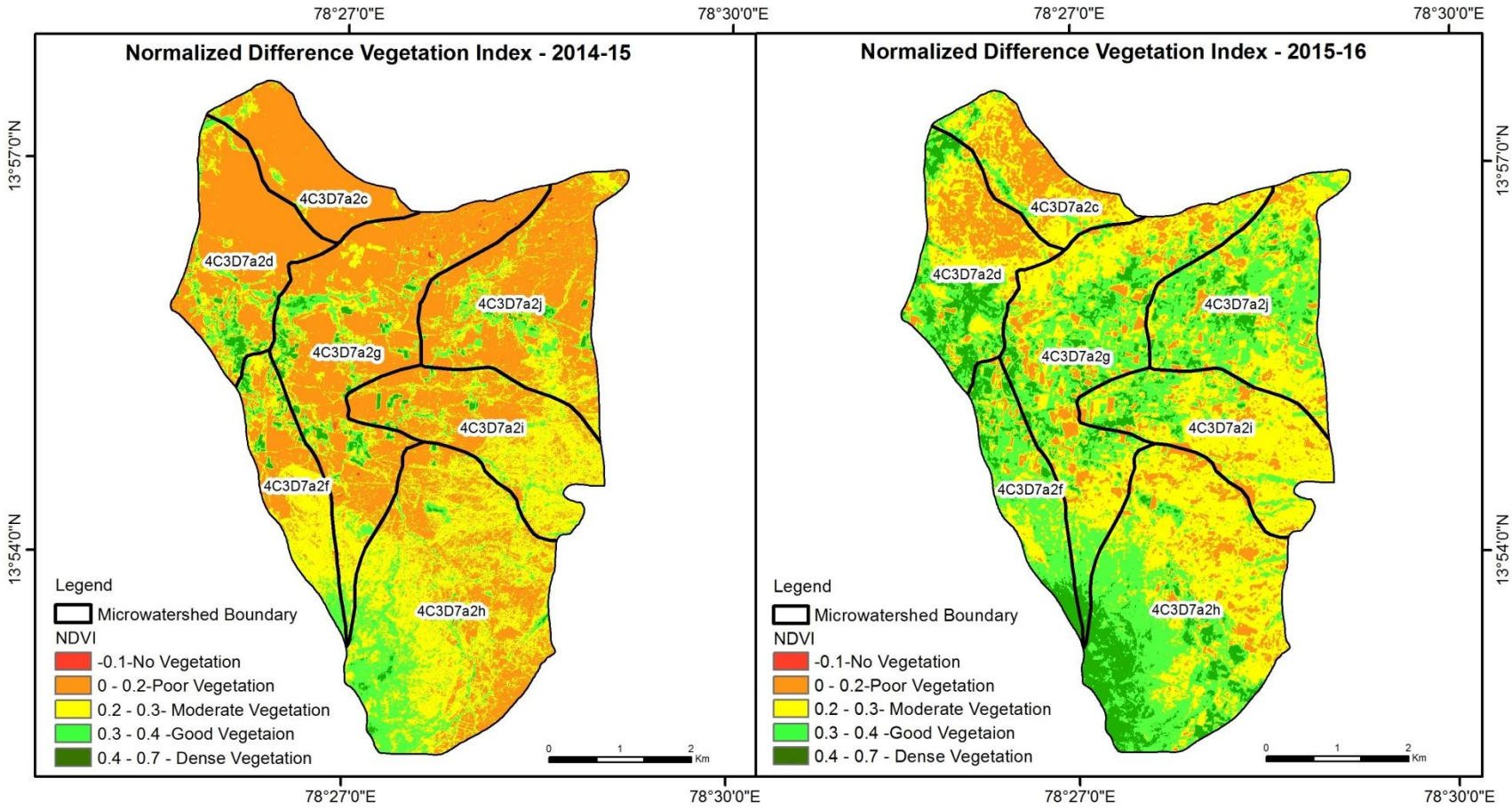


NDVI (2013-14)



NDVI (2014-15)

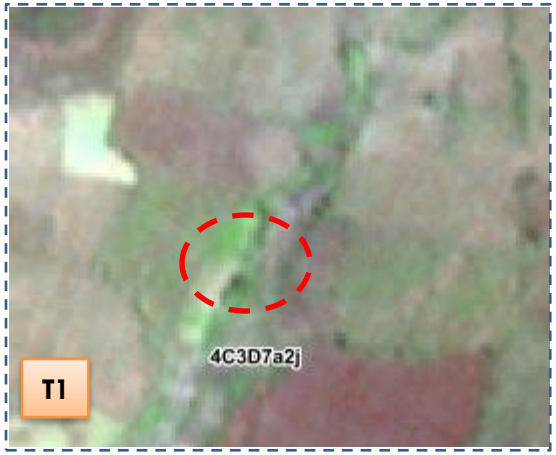
Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-03/2009-10



T0:2009-10

T1: 26 September 2013

Drishti Sl no. 766955 MWS :4C3D7a2j

Check dam

T0:2009-10

T1: 26 September 2013

Drishti Sl no.766964 MWS : 4C3D7a2g

Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-03/2009-10

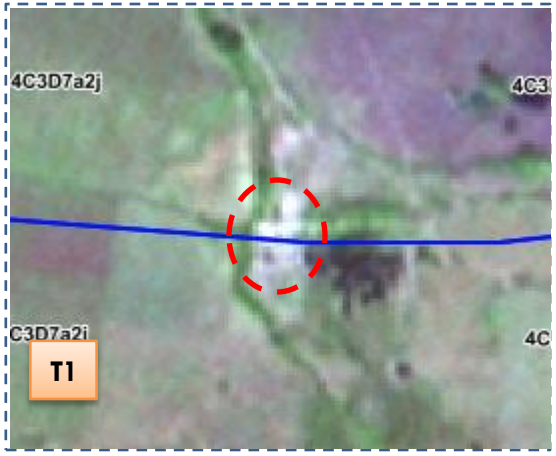
T0: 2009-10

T1: 26 September 2013

Drishti Sl no. 766965 MWS : 4C3D7a2j

Check dam

T0: 2009-10



T1: 26 September 2013

Drishti Sl no. 716536 MWS : 4C3D7a2j

Percolation Tank

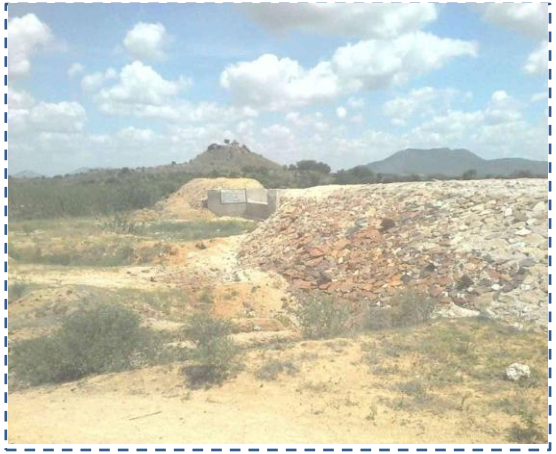
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-03/2009-10

T0: 2009-10

T1: 26 September 2013

Drishti Sl no. 766949 MWS : 4C3D7a2j

Percolation Tank



T0: 2009-10

T1: 26 September 2013

Drishti Sl no. 571688 MWS : 4C3D7a2j

Percolation Tank

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-03/2009-10

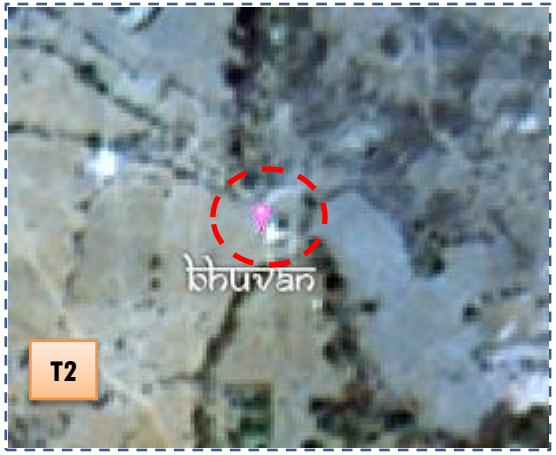
T1:2013

T2: 12 February 2015

Drishti Sl no. 766956 MWS :4C3D7a2j

Check dam

T1:2013

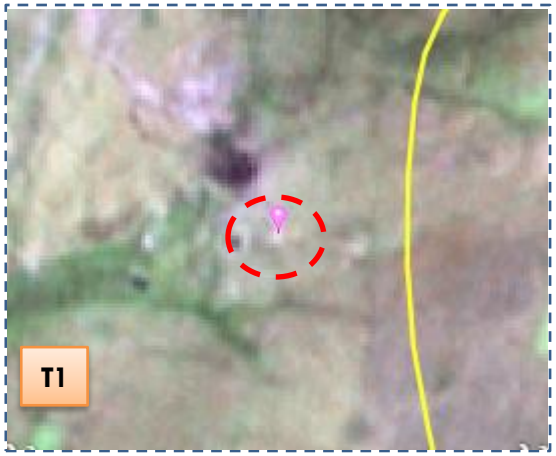


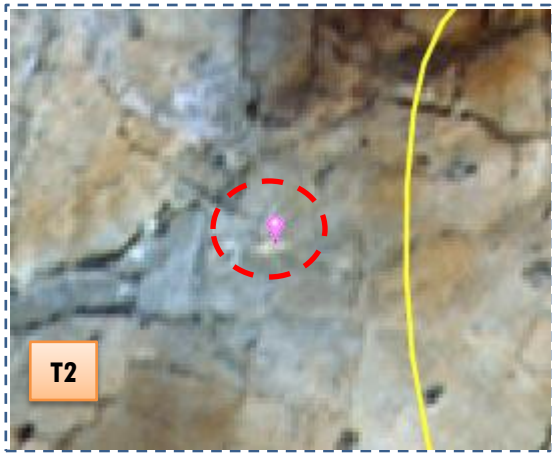
T2: 12 February 2015

Drishti Sl no. 766959 MWS : 4C3D7a2g

Farm Pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-03/2009-10





T1: 2013

T2: 12 February 2015

Drishti Sl no. 766948 MWS : 4C3D7a2j

Percolation Tank

T1: 2013

T2: 12 February 2015

Drishti Sl no. 766949 MWS : 4C3D7a2j

Percolation Tank

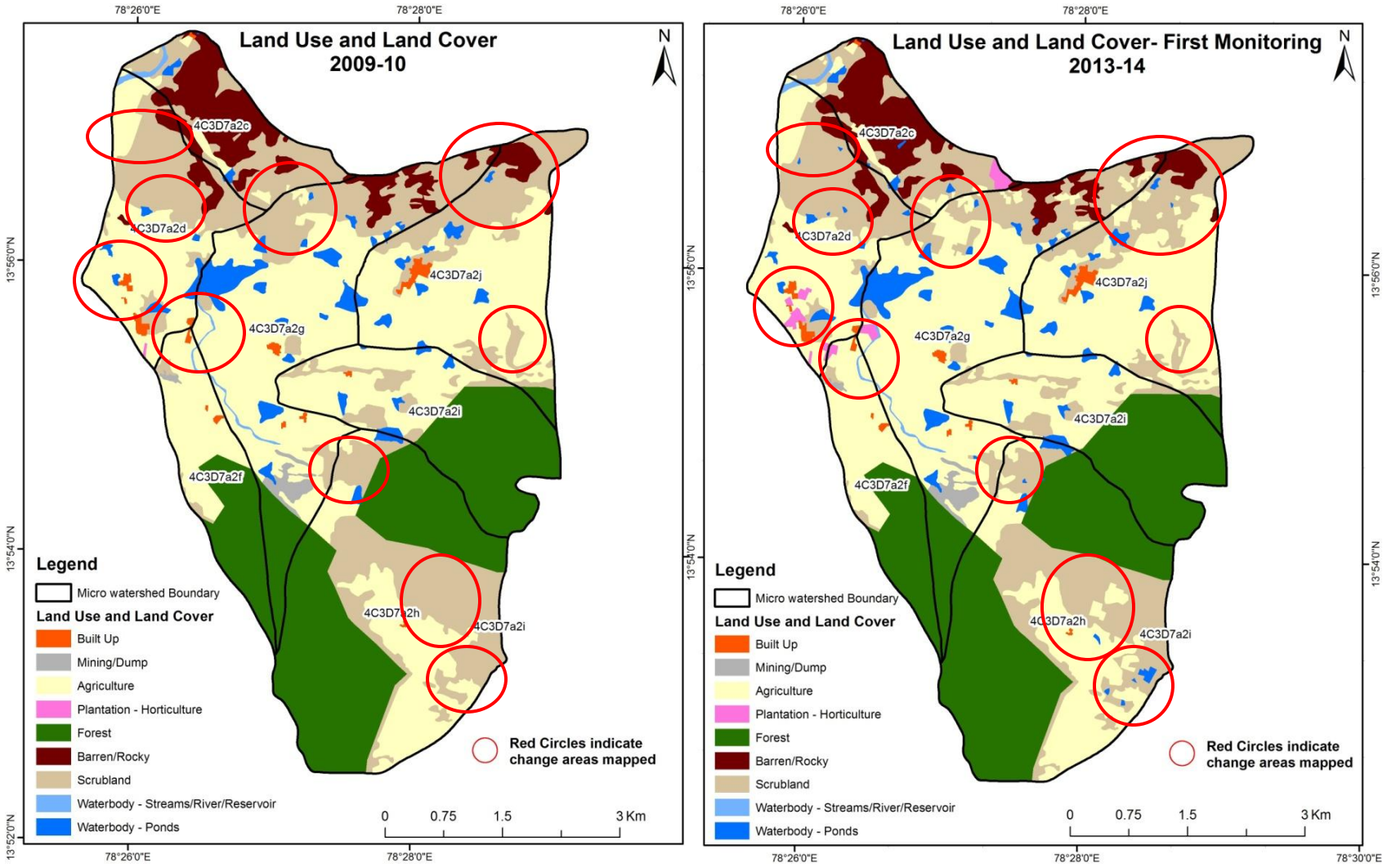
MONITORING IN THE PROJECT AREA

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)

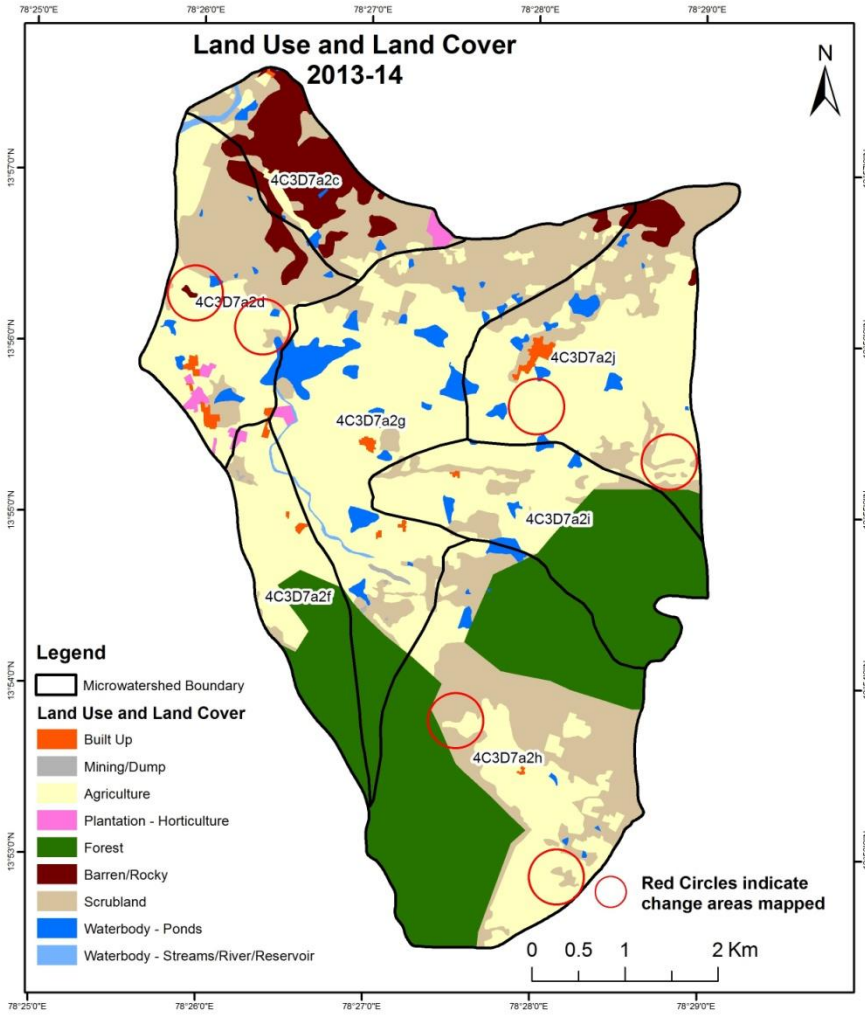
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

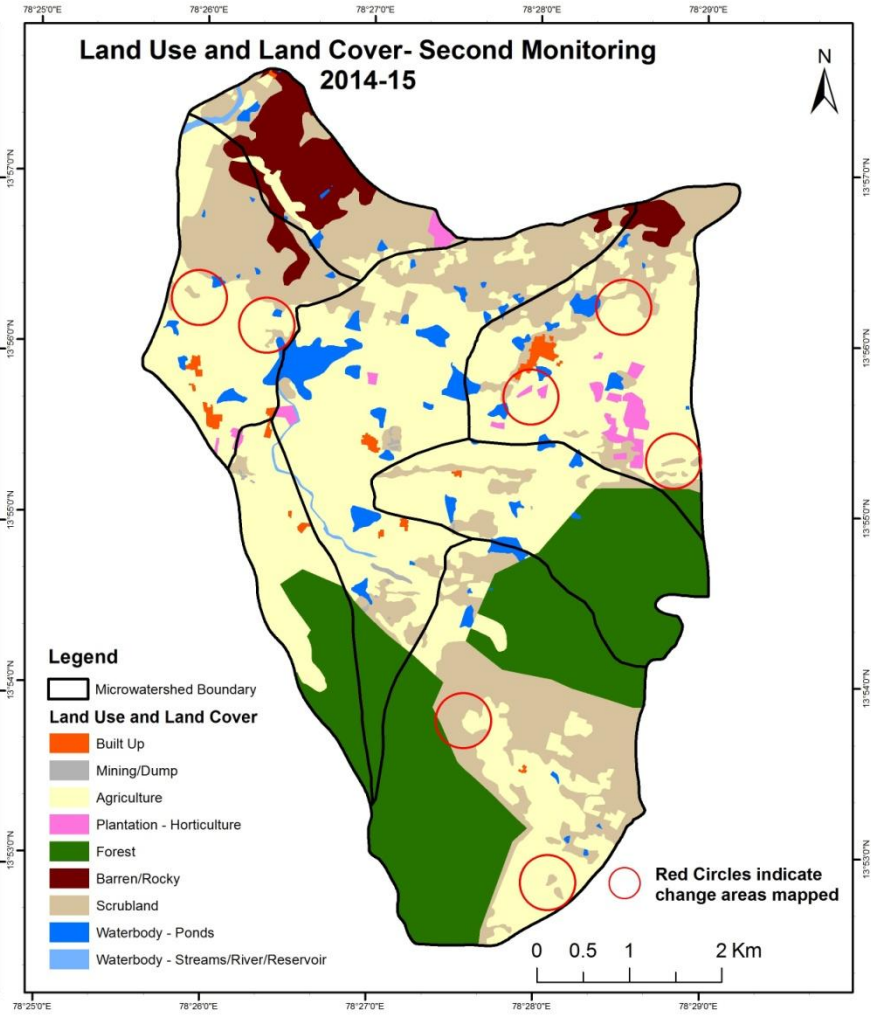
Scale: 1:10000



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

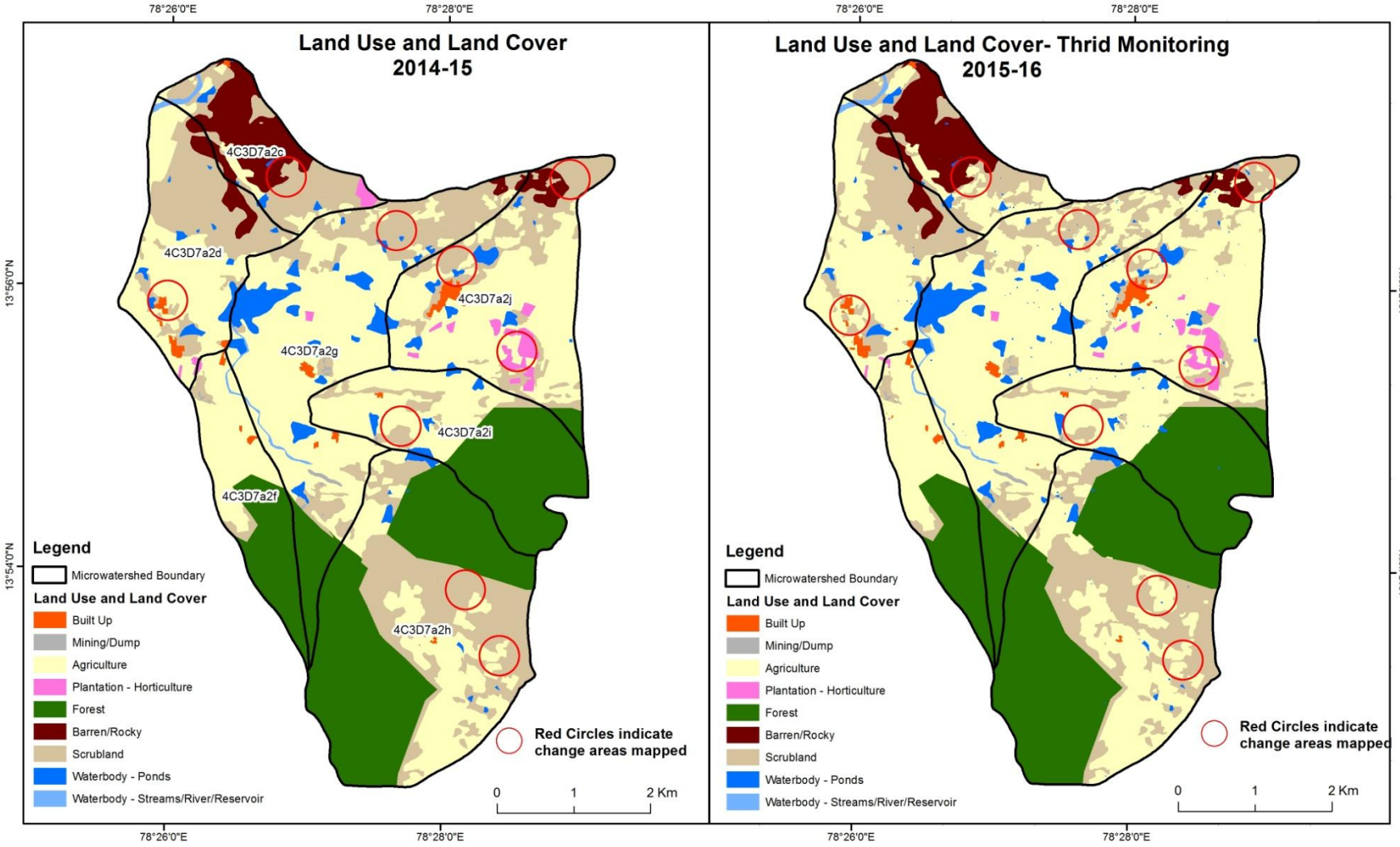
Scale: 1:10000





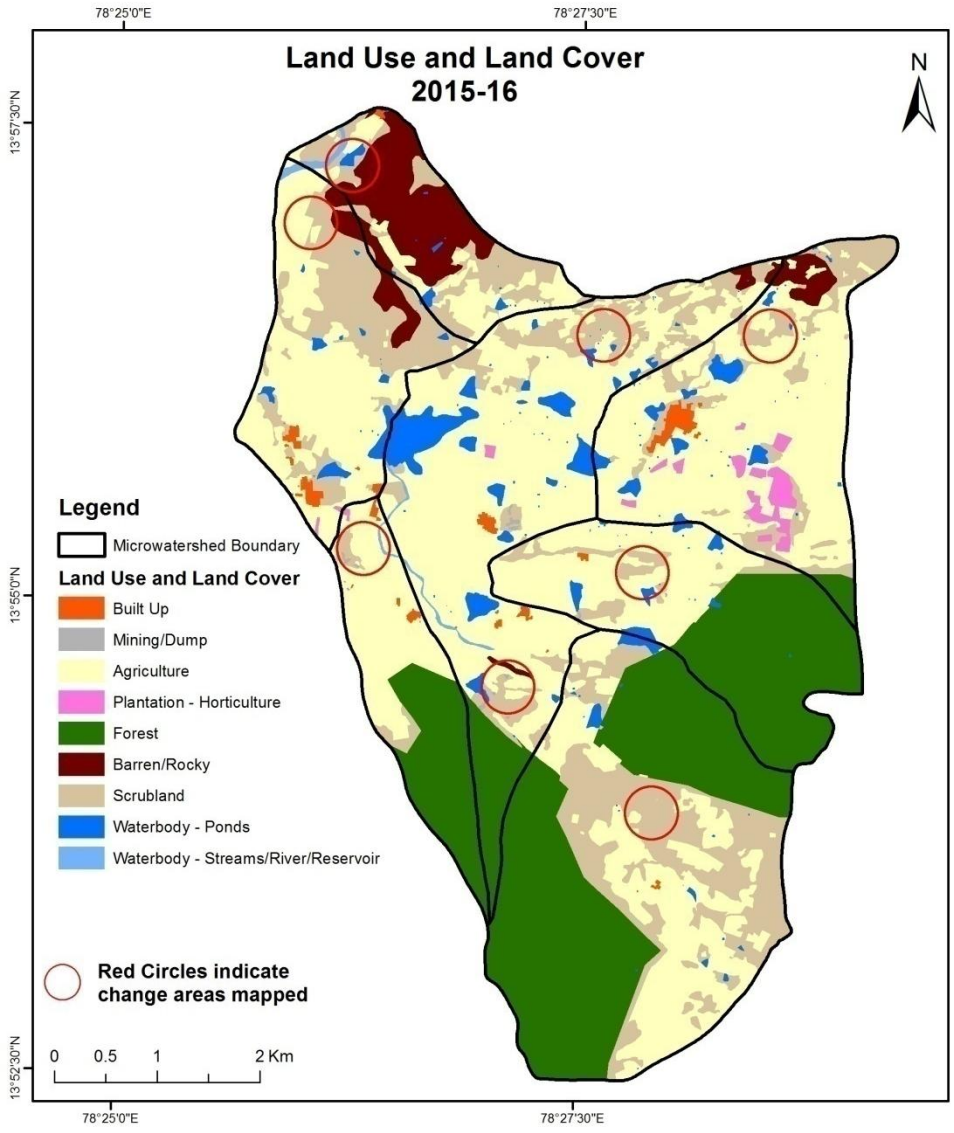
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

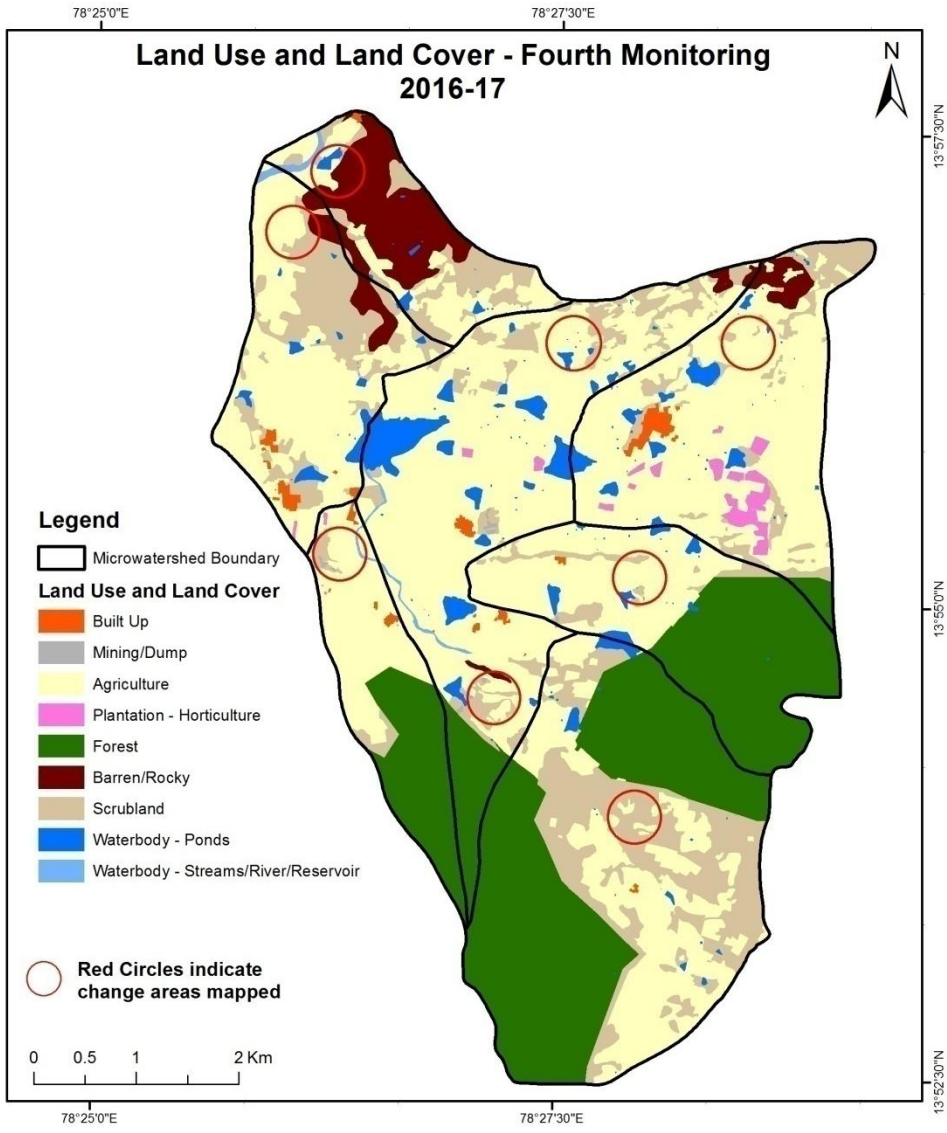
Scale: 1:10000



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

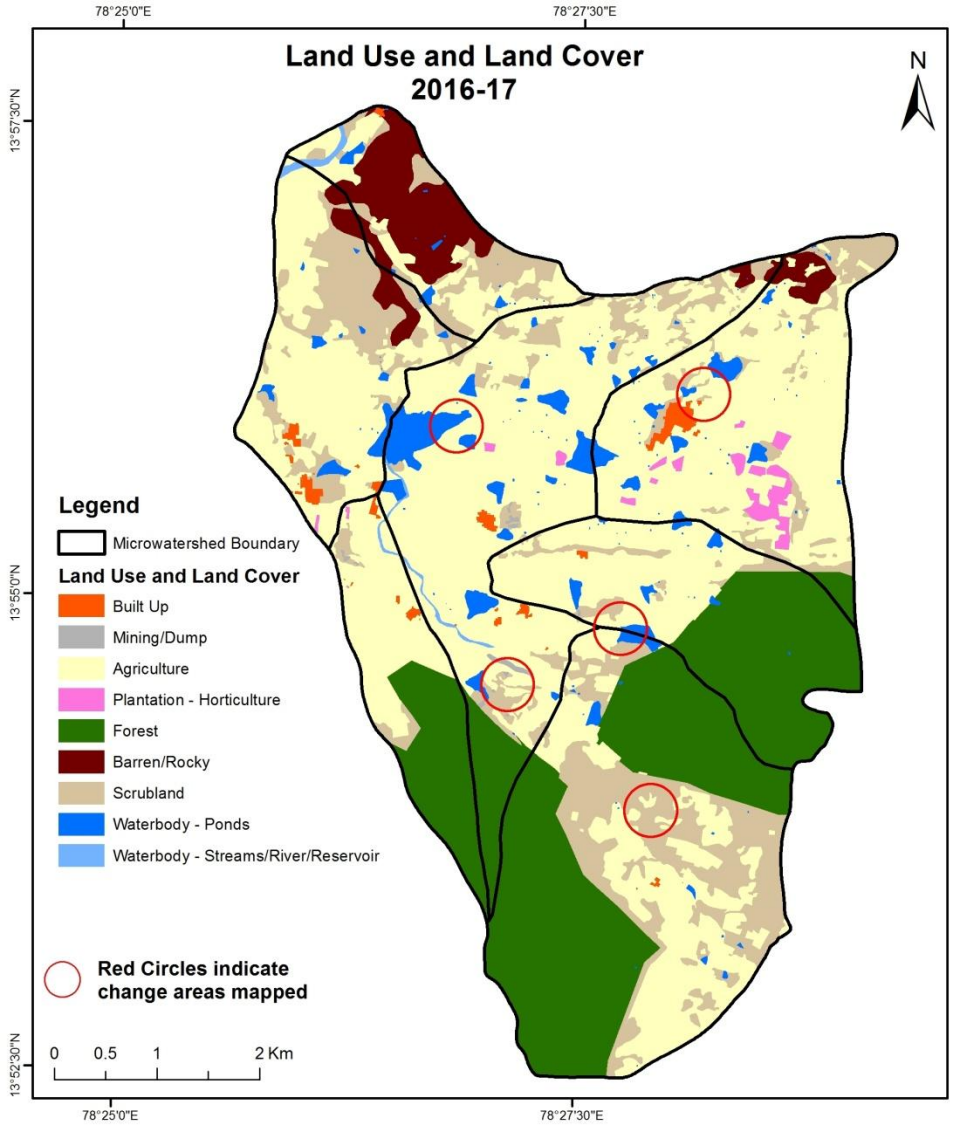
Scale: 1:10000

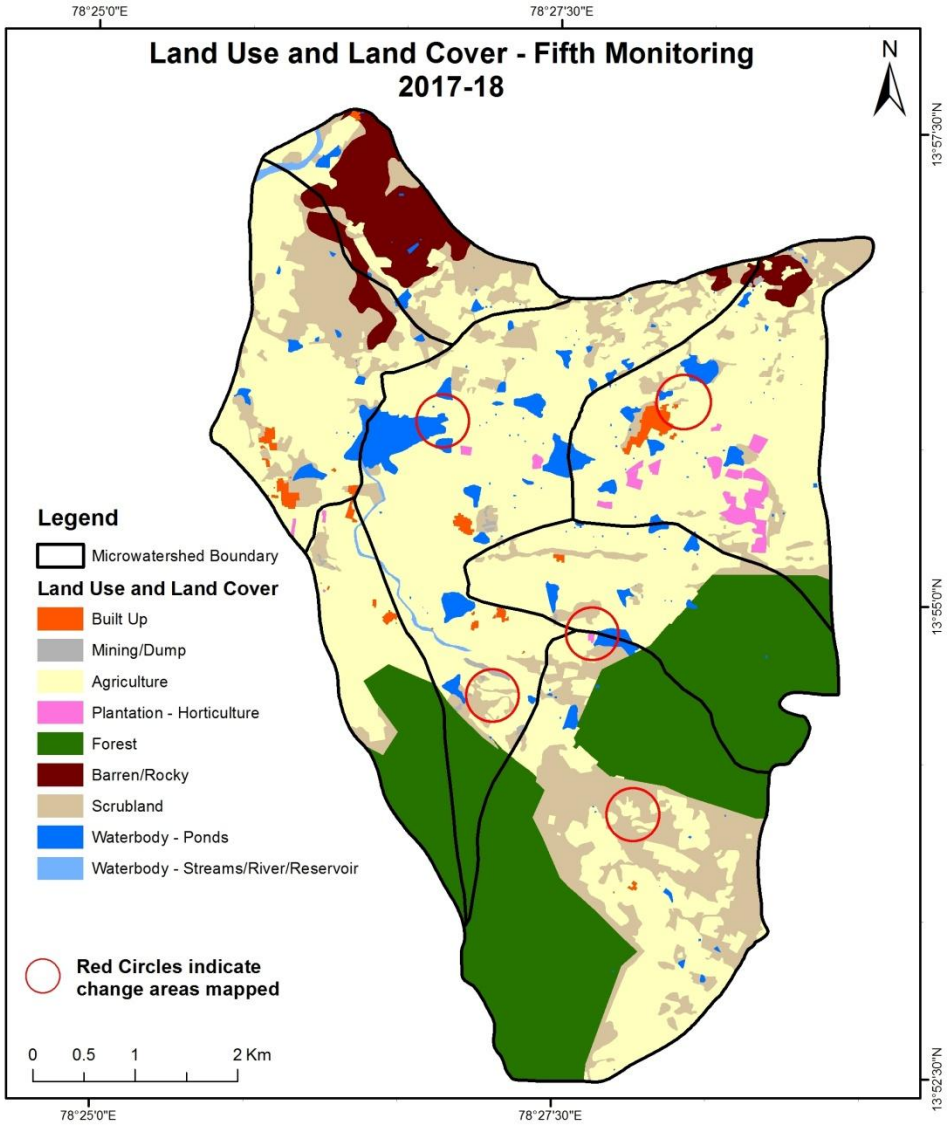




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000





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

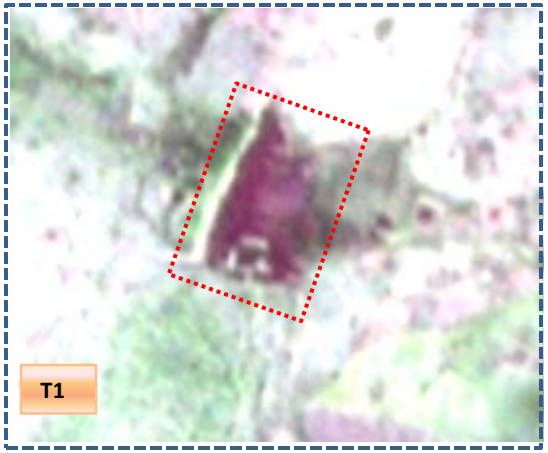
Scrub to Water body

T0: 2009-10

T1: 26 September 2013

Scrub to Water body

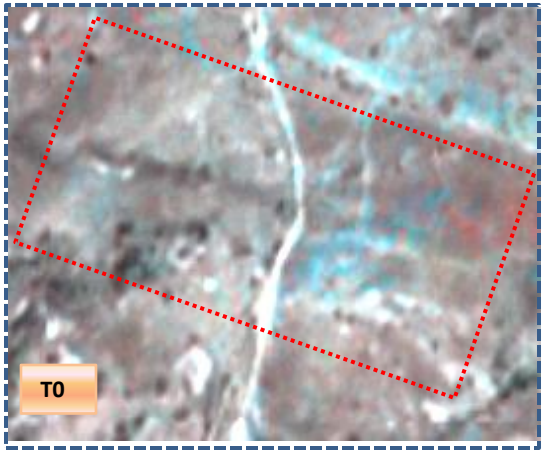
T0: 2009-10



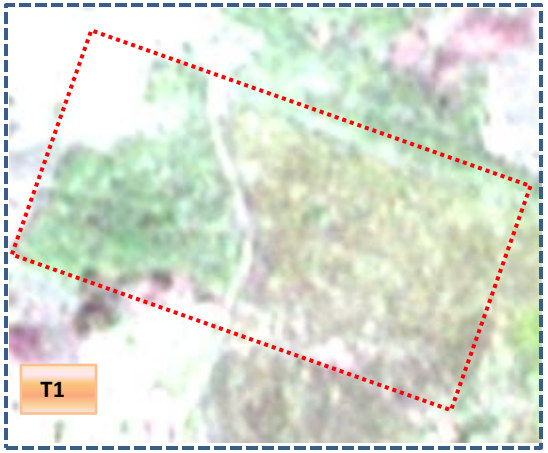
T1: 26 September 2013

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

Scrub to Plantation

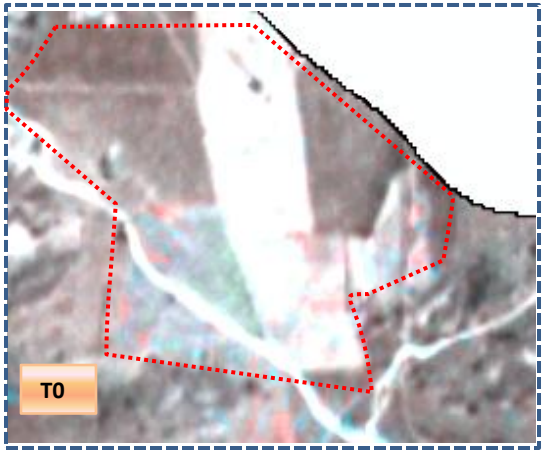


T0: 2009-10

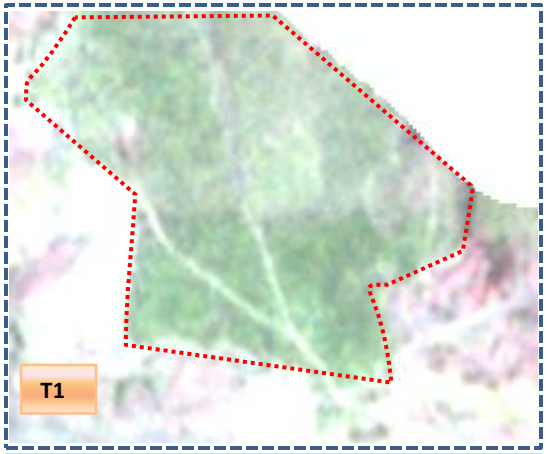


T1: 26 September 2013

Agriculture to Plantation



T0: 2009-10



T1: 26 September 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	21.17										21.17
Mining/dump		3.50									3.50
Agriculture			1426.12	4.79						0.70	1431.62
Plantation Horticulture				0.61							0.61
Forest					870.81					0.67	871.48
Forest Plantation											
Barren Rocky							158.03				158.03
Scrub			78.83	6.44				943.40		10.72	1039.38
Waterbody-Streams/River									12.31		12.31
Waterbody – Ponds										111.15	111.15
Grand Total	**21.17**	**3.50**	**1504.95**	**11.85**	**870.81**		**158.03**	**943.40**	**12.31**	**123.24**	**3649.24**

• 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 5.49 ha of the agriculture area has decreased and it is converted into plantation and water body in T1.

• In T1 78.83 ha of the agriculture area has increased from scrubland of T0.

• Overall 73.33 ha of the agriculture area has been increased. 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
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	21.167										21.167
Mining/dump		3.498									3.498
Agriculture	0.957	0.055	1477.131	26.773				0.032			1504.949
Plantation Horticulture			2.560	9.289							11.848
Forest					870.809						870.809
Forest Plantation											
Barren Rocky							158.025				158.025
Scrub	1.188	1.524	42.439	0.921				897.299		0.024	943.395
Waterbody-Streams/River									12.308		12.308
Waterbody – Ponds			0.980							122.258	123.238
Grand Total	**23.313**	**5.078**	**1523.109**	**36.983**	**870.809**		**158.025**	**897.331**	**12.308**	**122.282**	**3649.238**

• 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 27.82 ha of the agriculture area has decreased and it is converted into built up, mining, plantations and scrub in T2.

• In T2 45.98 ha of the agriculture area has increased from scrubland, plantation and water body of T1.

• Overall 18.16 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
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	23.31										23.31
Mining/dump		5.08									5.08
Agriculture	2.17		1516.75	0.45				0.54		3.21	1523.11
Plantation Horticulture			8.05	28.93							36.98
Forest			1.67		869.03					0.10	870.81
Forest Plantation											
Barren Rocky							158.03				158.03
Scrub	0.70		203.19					691.72		1.72	897.33
Waterbody-Streams/River									12.31		12.31
Waterbody – Ponds			1.33							120.95	122.28
Grand Total	**26.18**	**5.08**	**1731.00**	**29.38**	**869.03**		**158.03**	**692.26**	**12.31**	**125.98**	**3649.24**

• 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 6.36 ha of the agriculture area has decreased and it is converted into built-up, plantations, scrub and water body in T3.

• In T3 214.25 ha of the agriculture area has increased from plantation, forest scrubland and water body, of T2 and the overall agriculture area has been increased around 207.89 ha.

• 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
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	26.18										26.18
Mining/dump		5.08									5.08
Agriculture	0.07		1833.58	2.24						3.76	1839.65
Plantation Horticulture				27.73							27.73
Forest		0.82					157.20				158.03
Forest Plantation			0.12		868.15						868.27
Barren Rocky											
Scrub		0.62	4.58					581.71		0.76	587.67
Waterbody-Streams/River									12.31		12.31
Waterbody – Ponds			0.31					3.35		120.66	124.33
Grand Total	**26.25**	**6.52**	**1838.60**	**29.97**	**868.15**		**157.20**	**585.06**	**12.31**	**125.19**	**3649.24**

• 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 6.07 ha of the agriculture area has decreased and it is converted into builtup plantations and water body in T4.

• In T4 5.02 ha of the agriculture area has increased from, forest plantation, scrub and water body of T3 and the overall agriculture area has been decrease around 1.05 ha.

• 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
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	26.18										26.18
Mining/dump		2.83									2.83
Agriculture	0.07		1833.58	2.24						3.76	1839.65
Plantation Horticulture				27.73							27.73
Forest					868.15						868.15
Forest Plantation											
Barren Rocky		0.82					159.45				160.27
Scrub		0.62	4.71					585.06		0.76	591.14
Waterbody-Streams/River									12.31		12.31
Waterbody – Ponds			0.31							120.66	120.98
Grand Total	**26.25**	**4.28**	**1838.60**	**29.97**	**868.15**		**159.45**	**585.06**	**12.31**	**125.19**	**3649.24**

• 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 6.07 ha of the agriculture area has decreased and it is converted into built-up, plantations and water body in T5.

• In T5 5.02 ha of the agriculture area has increased from mining, barren rocky and scrubland of T4 and the overall 1.05 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 14.04 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 73.33, 18.16, 207.89 & 108.65 Hectares From T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 406 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 29 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 454.33 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.