

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -07/2009-10
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

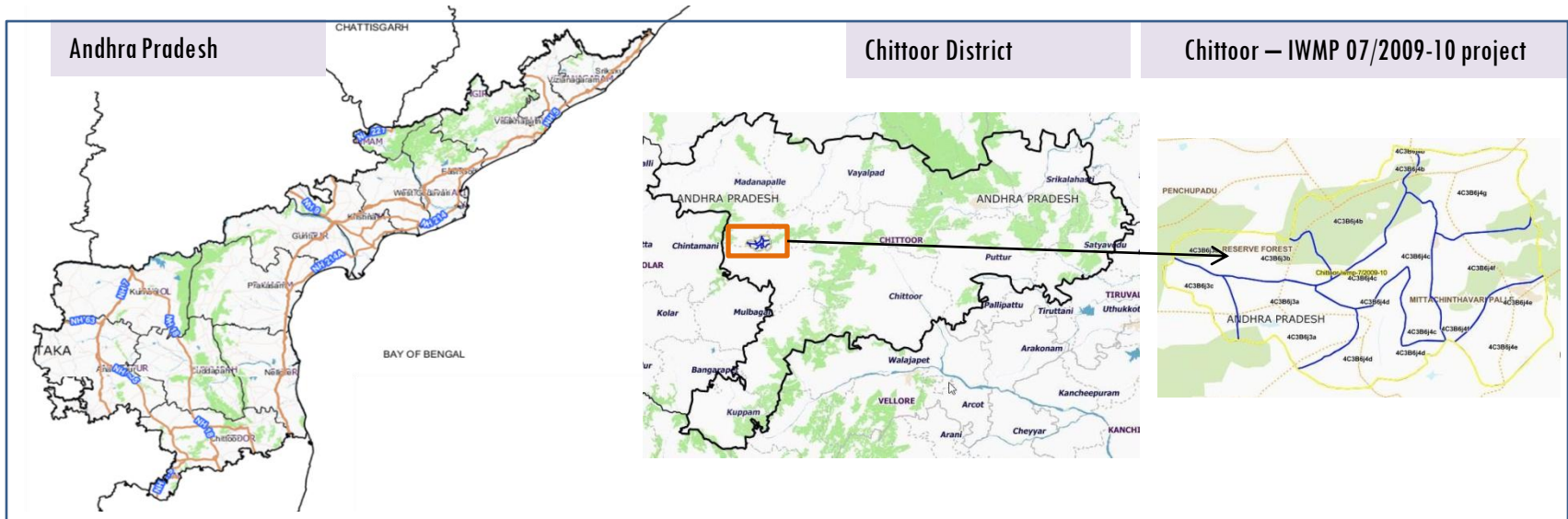
E X E C U T I V E S U M M A R Y

- 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-07/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 5245.46 ha. It comprises of 9 micro watersheds.
- In the project area 33 Drishti photos were uploaded showing 20 water harvesting structures of farm ponds/dug out pits, recharge pits, 3 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 8.16 ha increase in the area.
- Major percentage i.e. 43.21 % is covered by the agriculture, 28.05 % is covered by forest, 21.48 % is covered by scrub land and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-07/2009-10

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Punganur Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 5245.46 ha. It comprises of 9 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			1-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			1-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	33
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

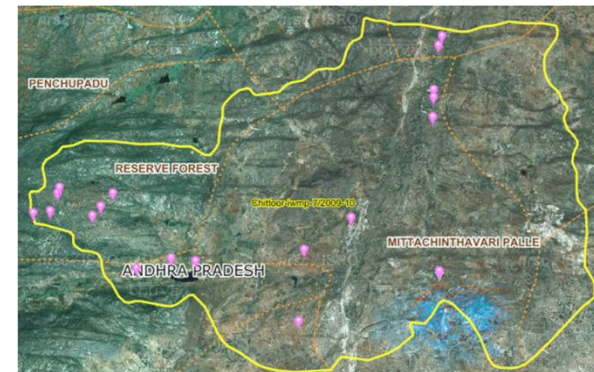


MWS Boundary



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	3	3
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	5	3
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	20	18
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, Solar light)	5	0
18	Others	0	0
	TOTAL	33	24

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



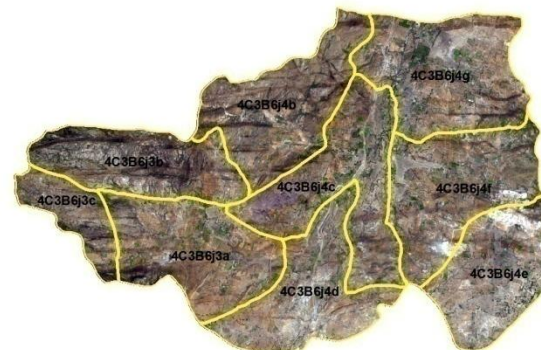
Source:Fusen data,NRSC

Natural Color Composite-2013-2014



Source:Fusen data,NRSC

Natural Color Composite- 2014-2015



Source:Fusen data,NRSC

Natural Color Composite- 2015-2016



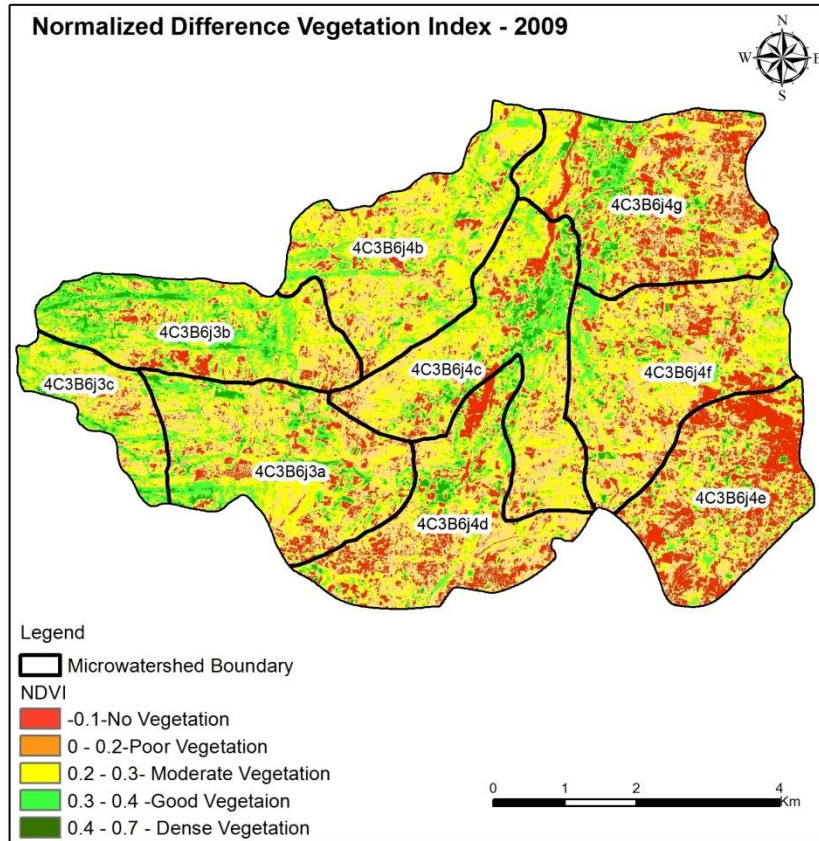
Source:Fusen data,NRSC

Natural Color Composite- 01st March 2018

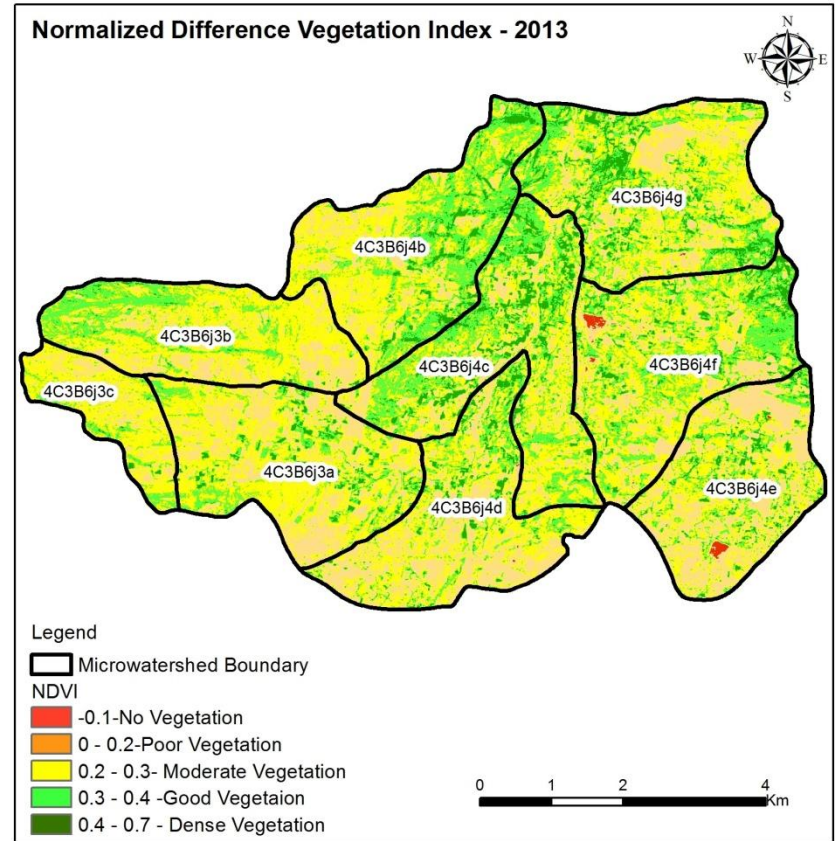


Source:LISS-IV,NRSC

Changes in Vegetation Cover

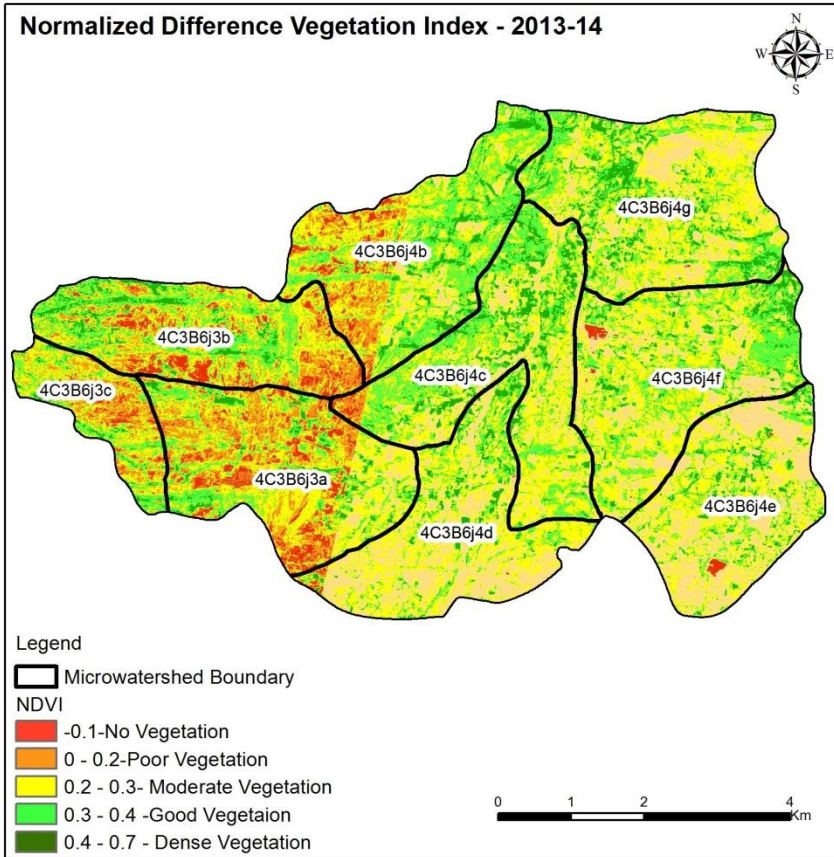


NDVI (2009-10)

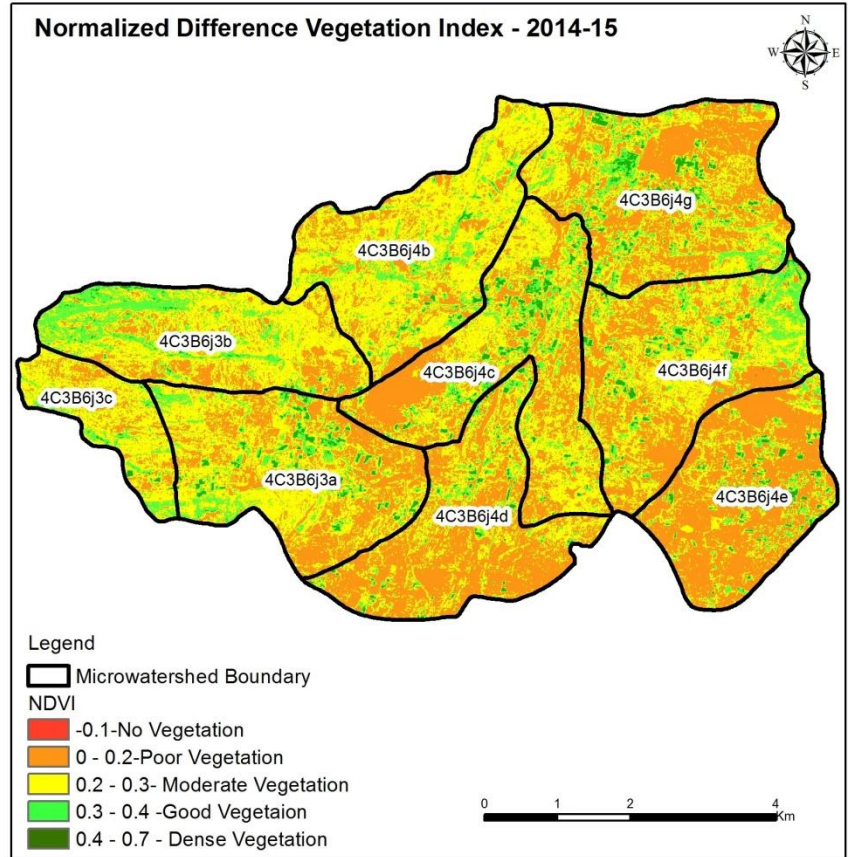


NDVI (2013-14)

Changes in Vegetation Cover

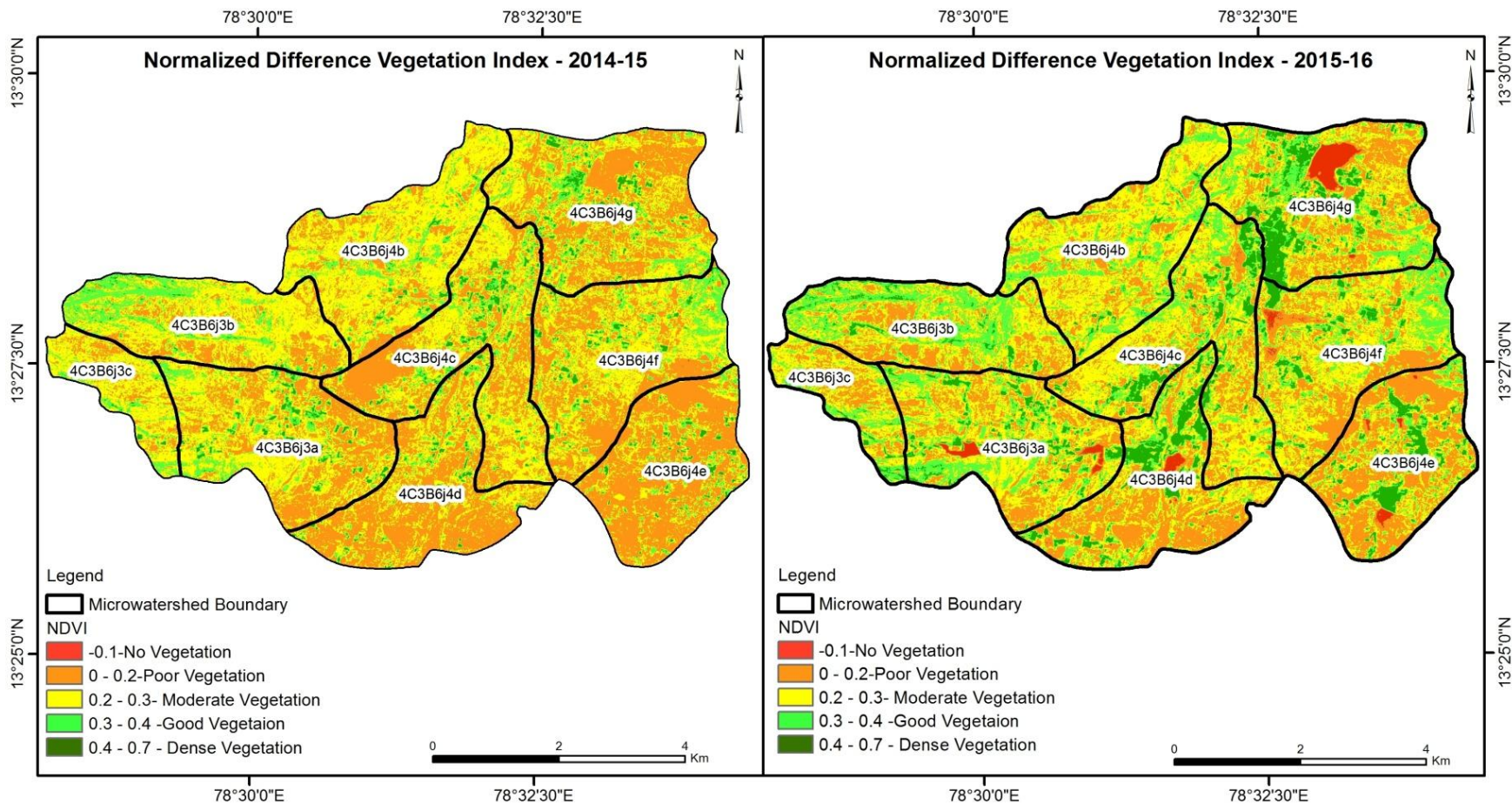


NDVI (2013-14)



NDVI (2014-15)

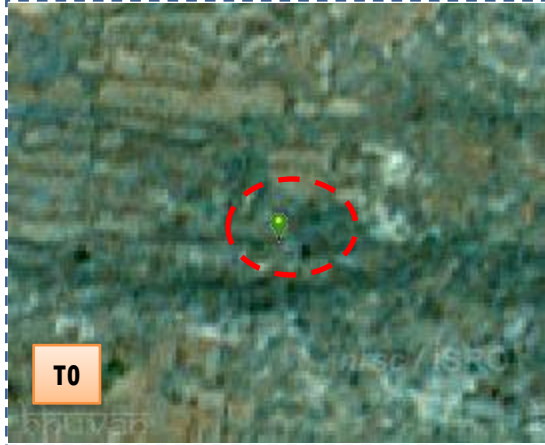
Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-07/2009-10



T0:2009-10



T1: 26 February 2013



Drishti Sl no. 850497 MWS :4C3B6j3c

Bund



T0:2009-10



T1: 26 February 2013



Drishti Sl no. 1705193 MWS : 4C3B6j4d

Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-07/2009-10



T0

T0: 2009-10



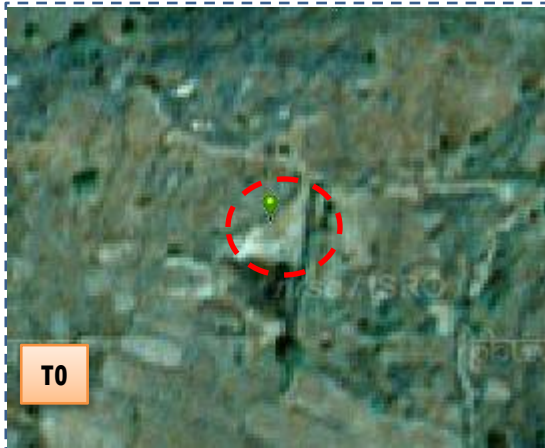
T1

T1: 26 February 2013



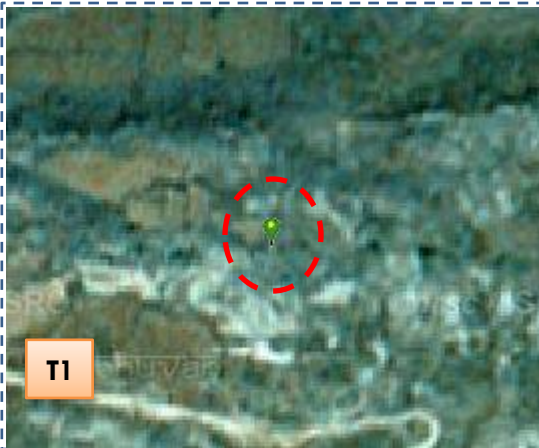
Drishti Sl no. 1657165 MWS : 4C3B6j3a

Horticulture



T0

T0: 2009-10



T1

T1: 26 February 2013



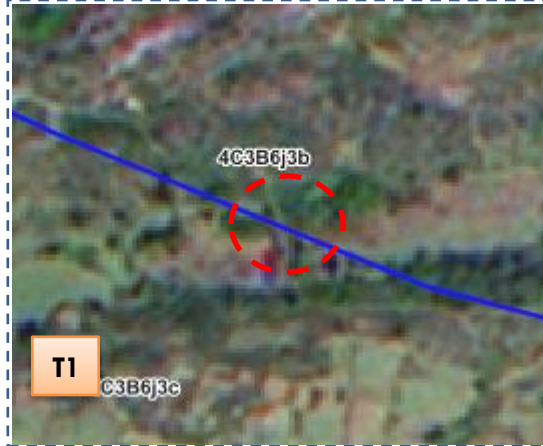
Drishti Sl no. 850502 MWS : 4C3B6j4d

Percolation Tank

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-07/2009-10



T0: 2009-10



T1: 26 February 2013

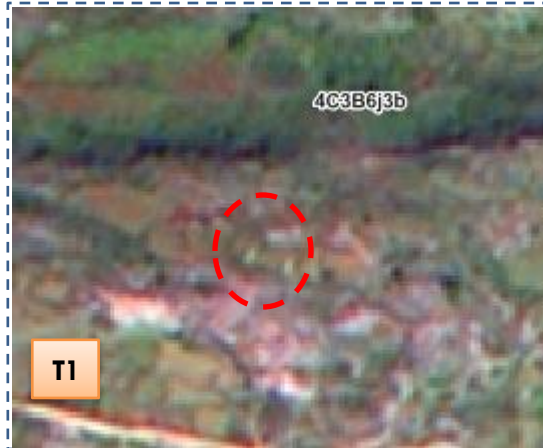


Drishti Sl no. 850492 MWS : 4C3B6j3b

Percolation Tank



T0: 2009-10



T1: 26 February 2013



Drishti Sl no. 850502 MWS : 4C3B5n2c

Soil moisture conservation

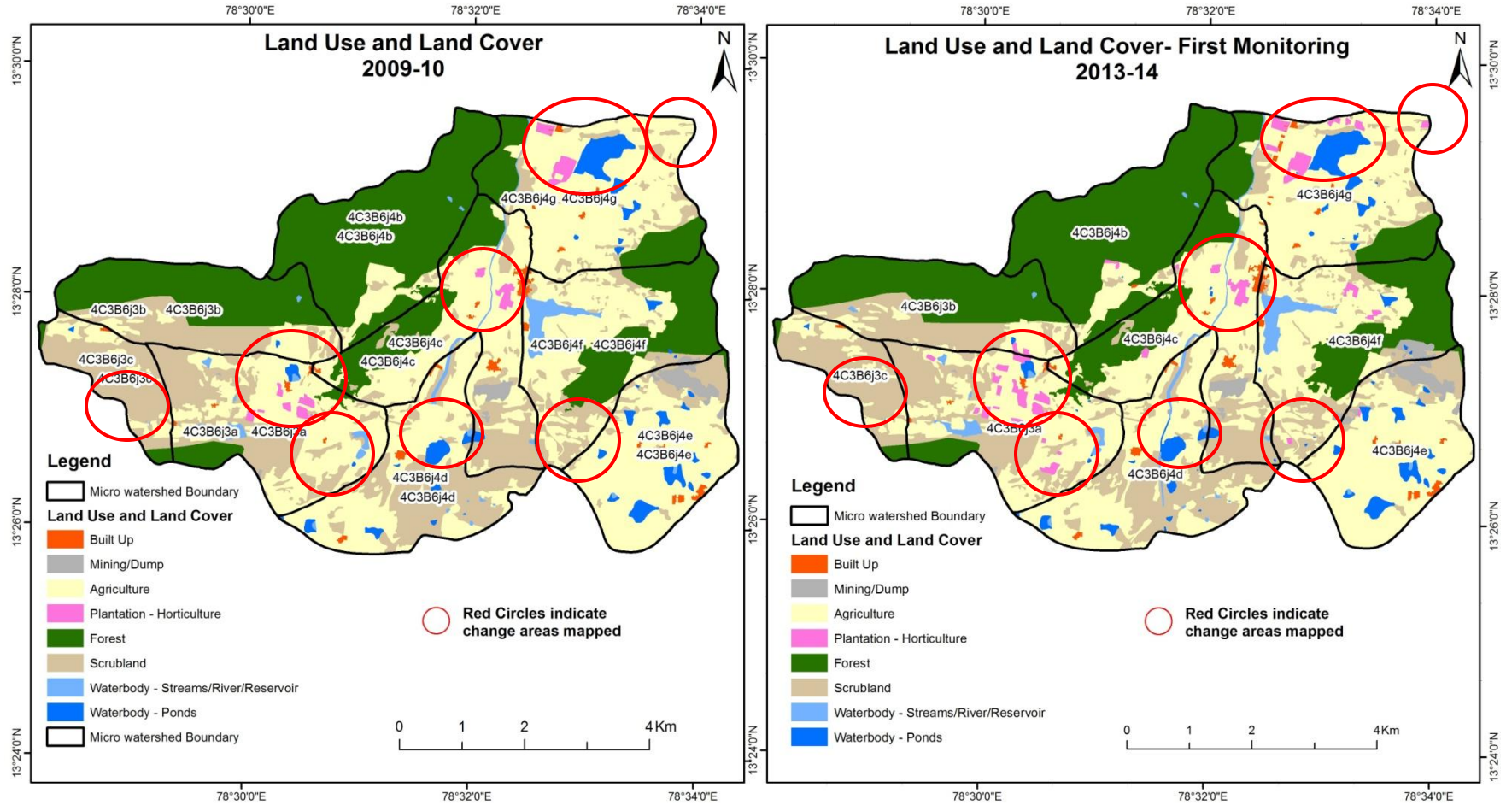
MONITORING IN THE PROJECT AREA

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)

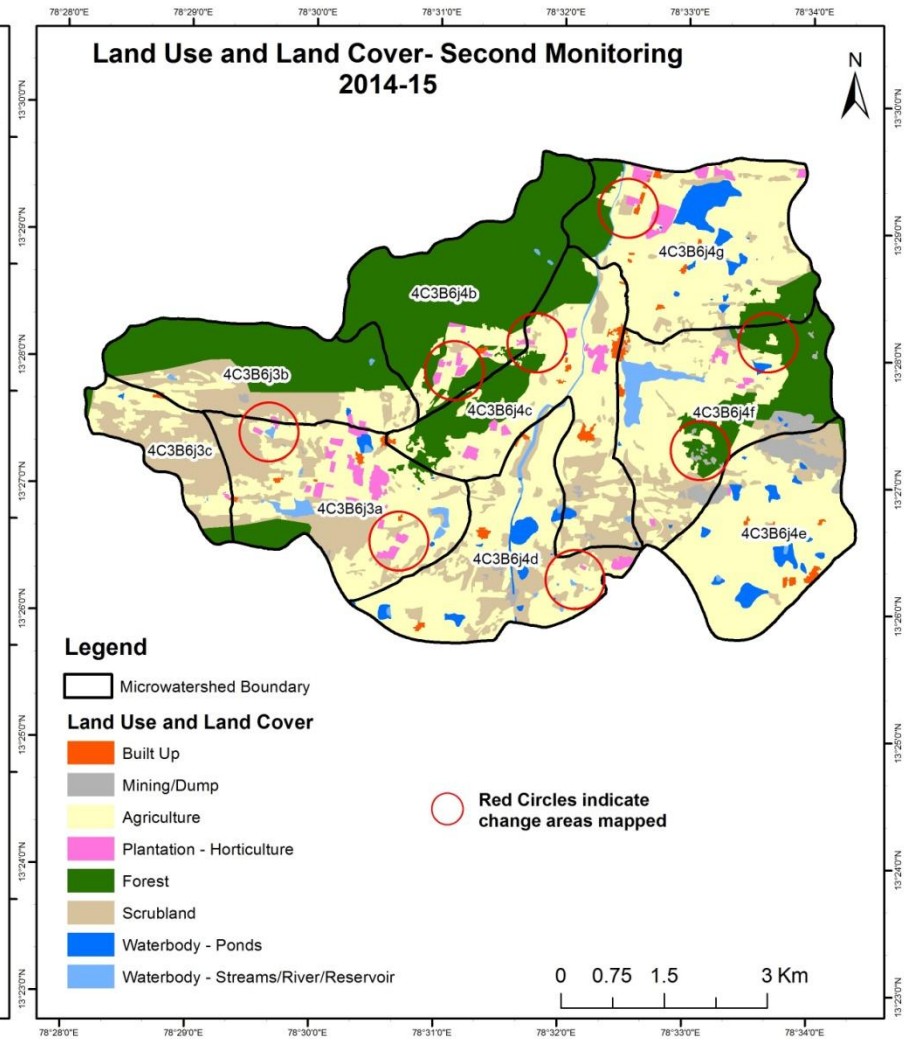
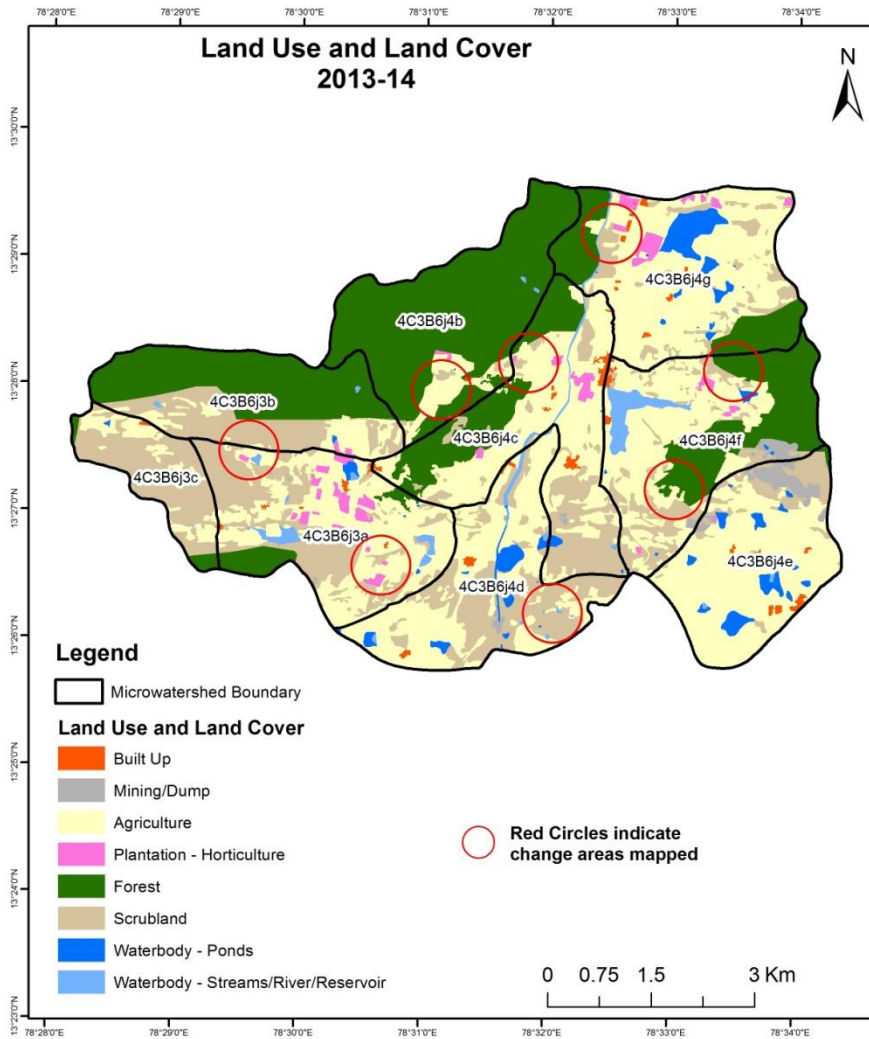
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



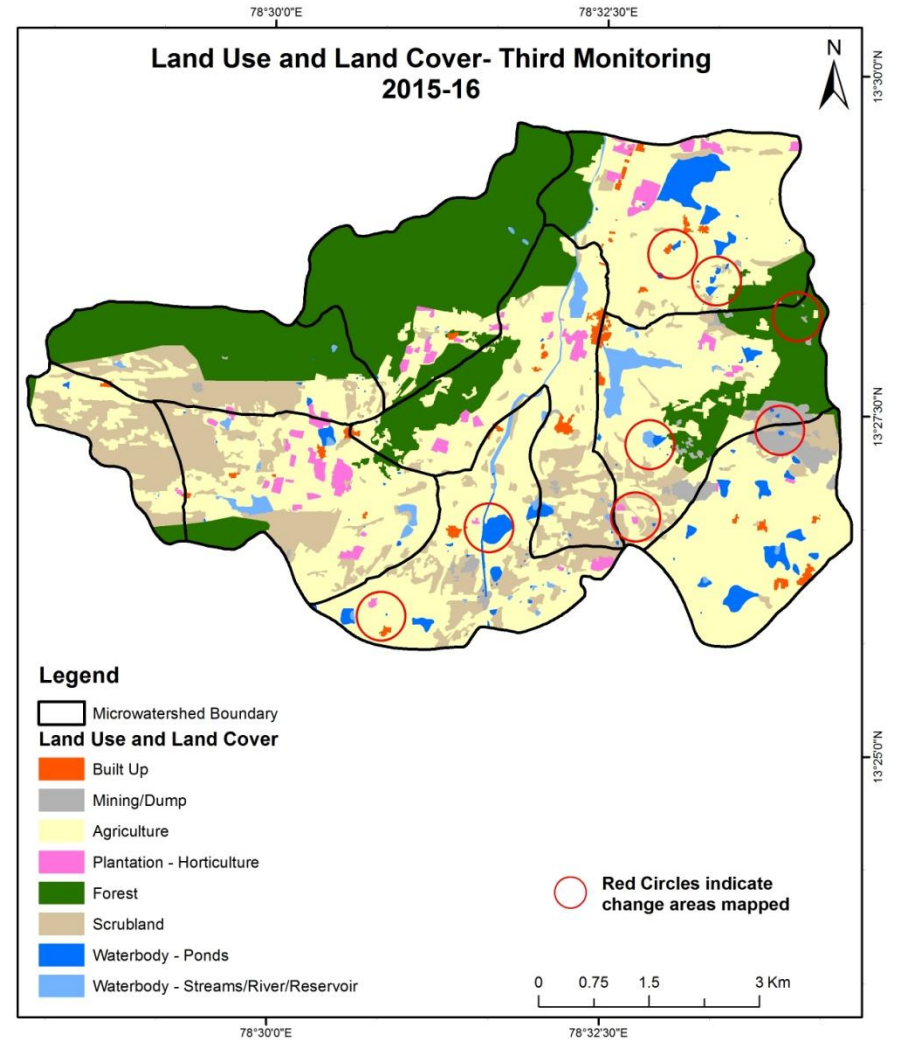
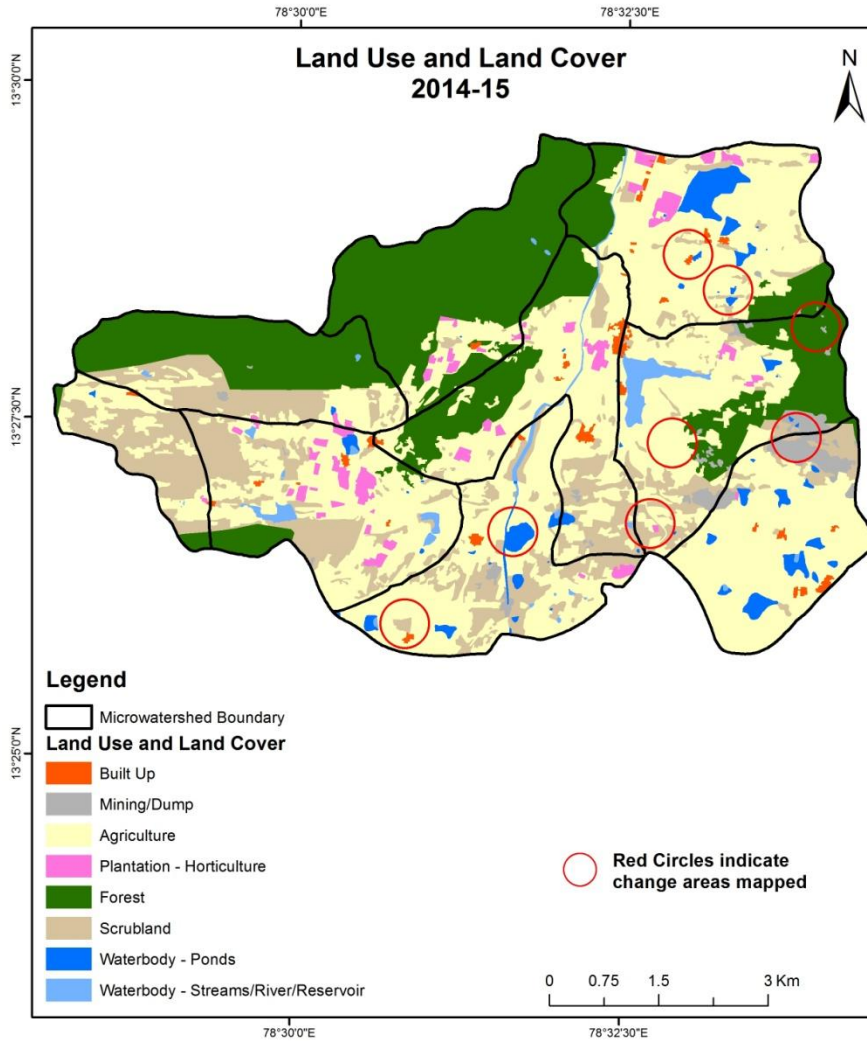
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



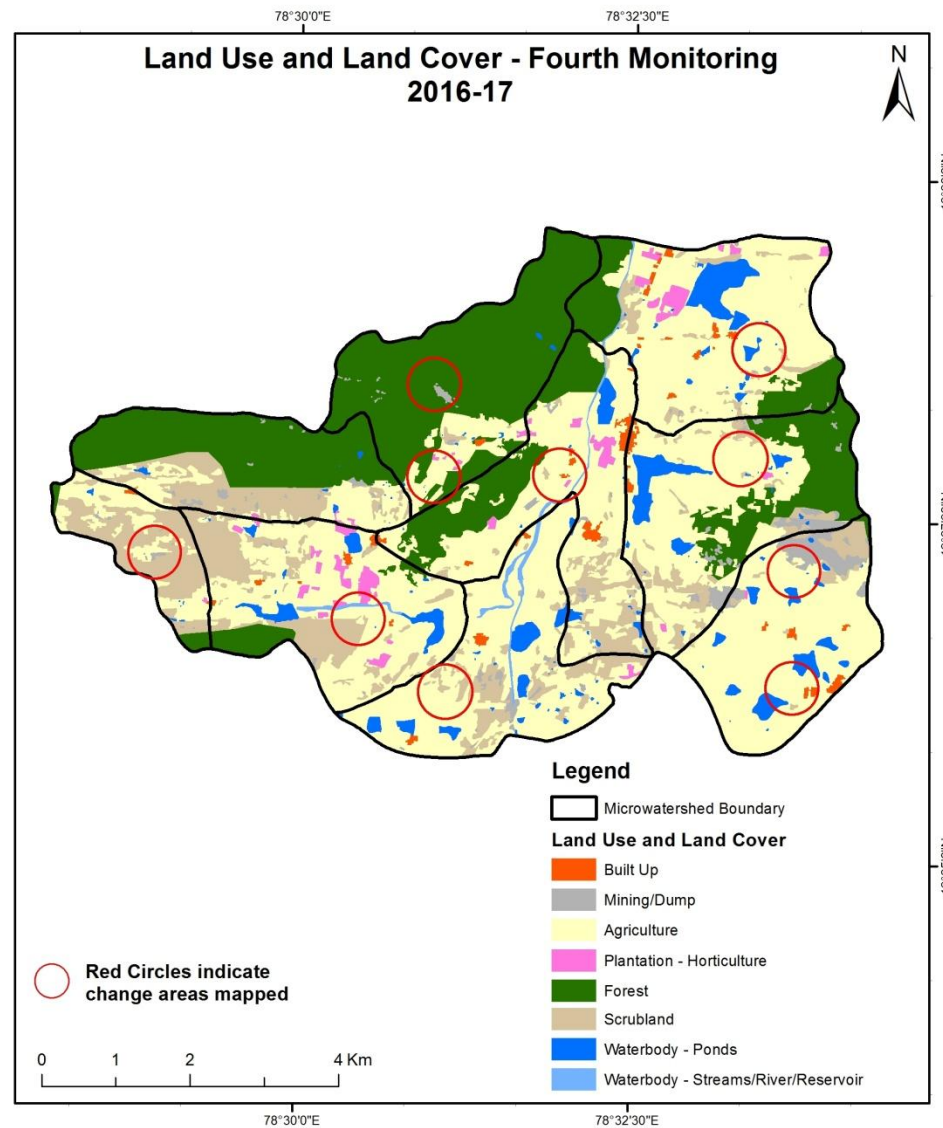
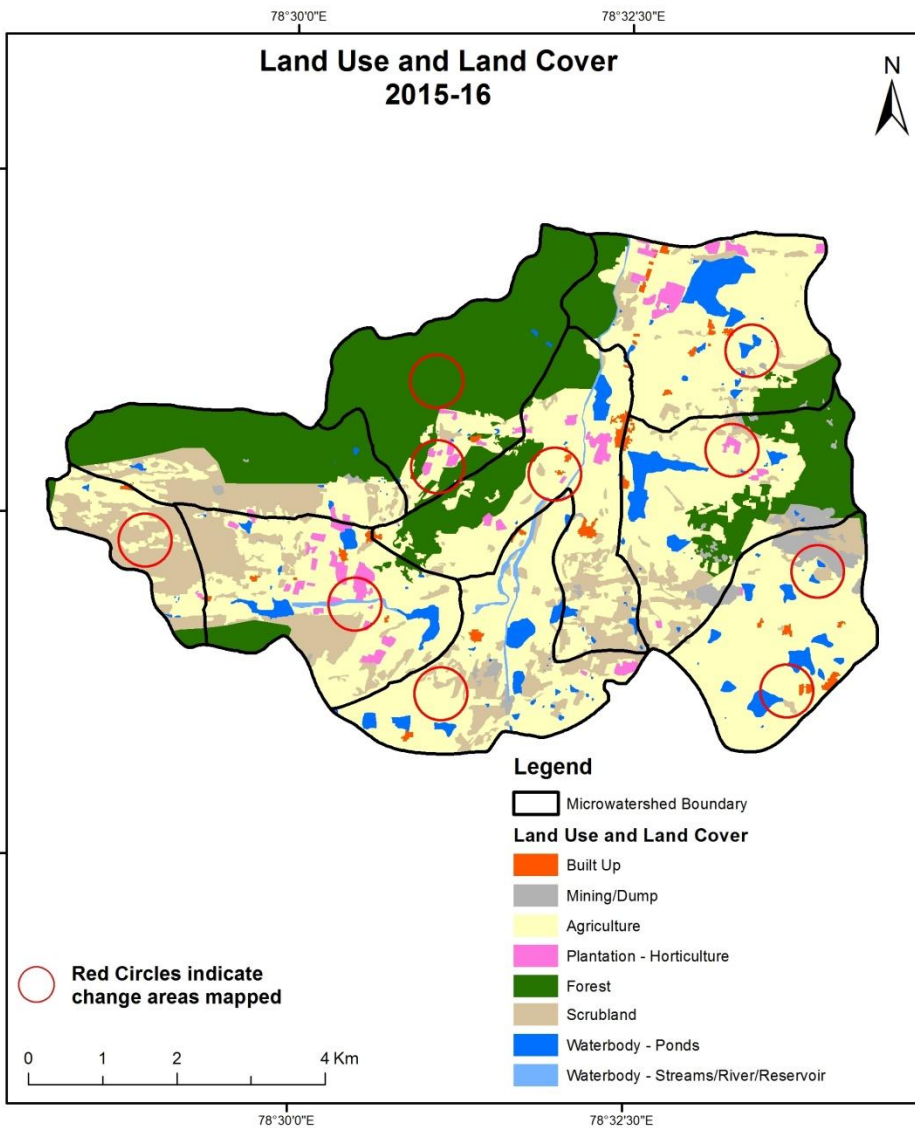
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



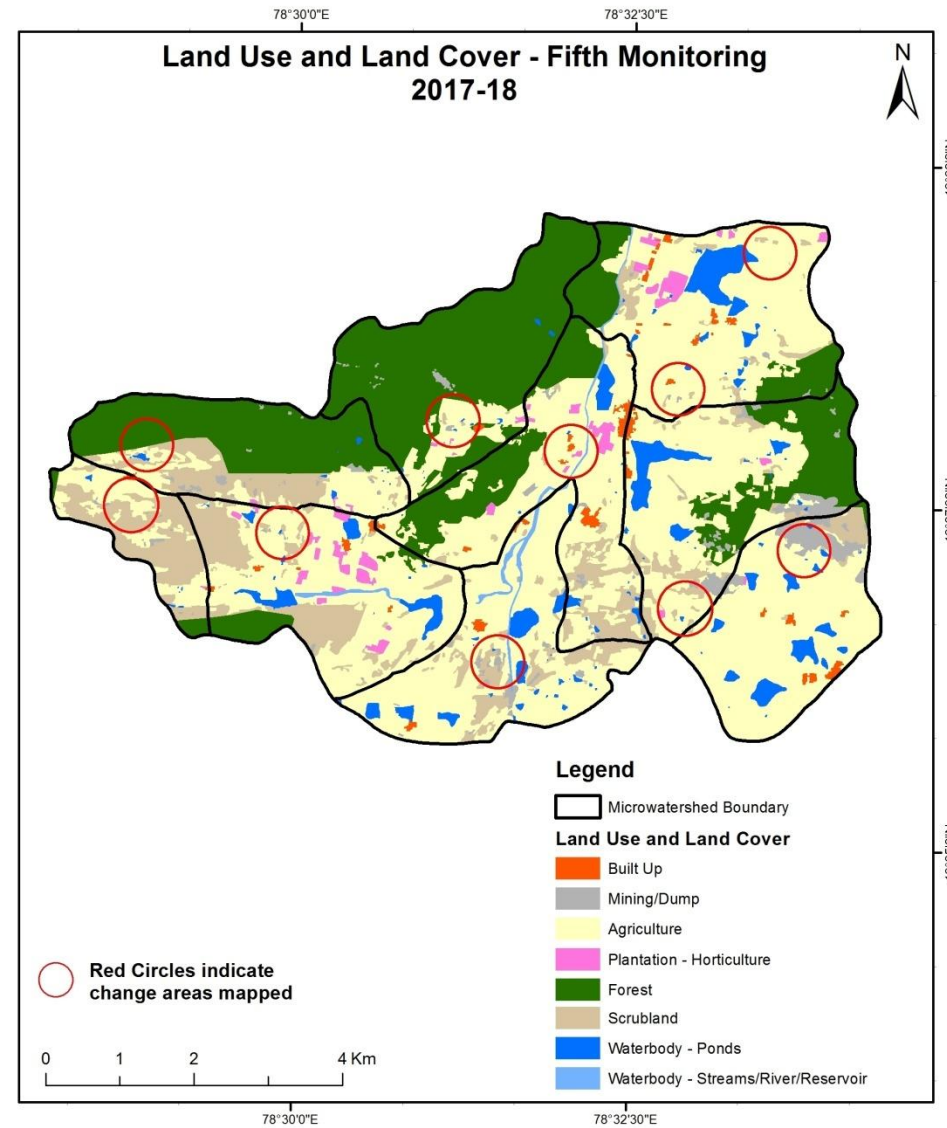
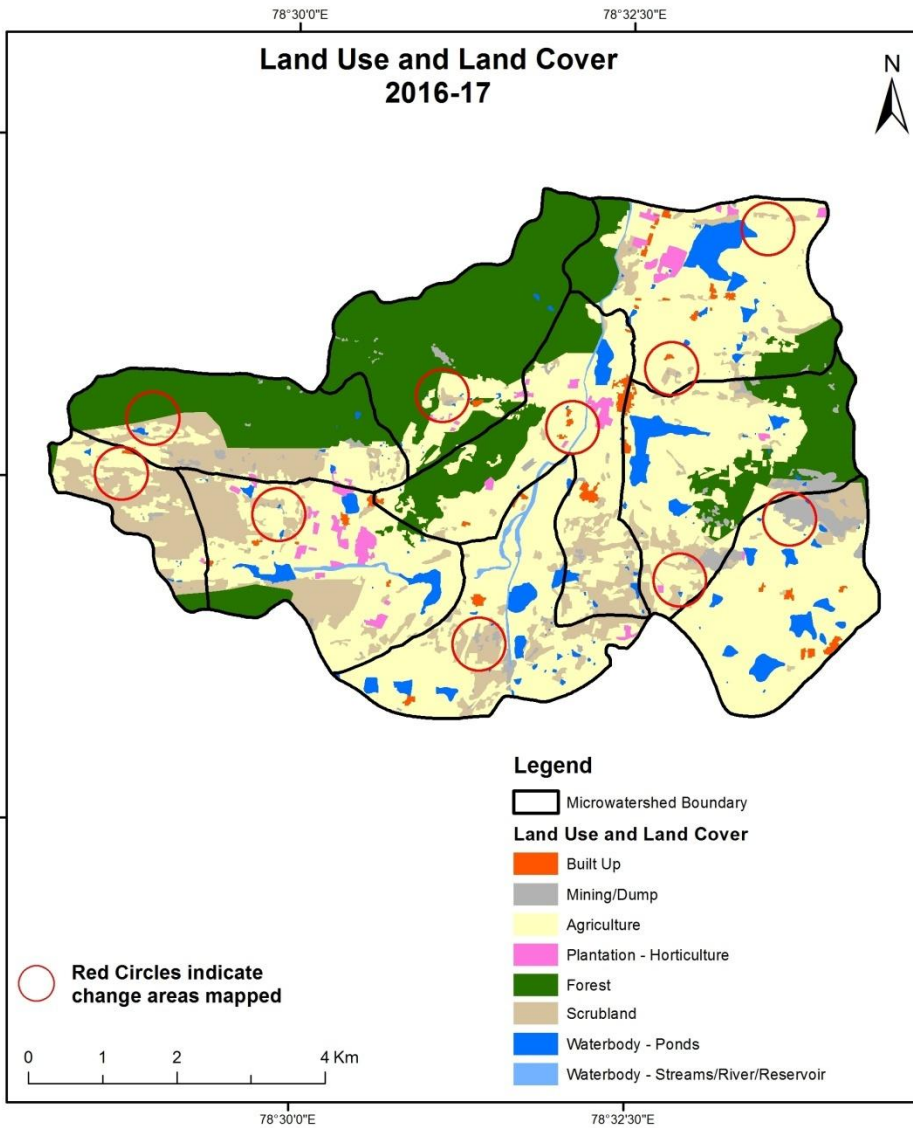
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

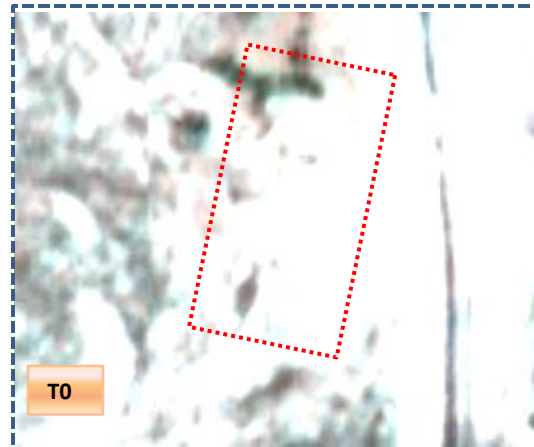


T0: 2009-10

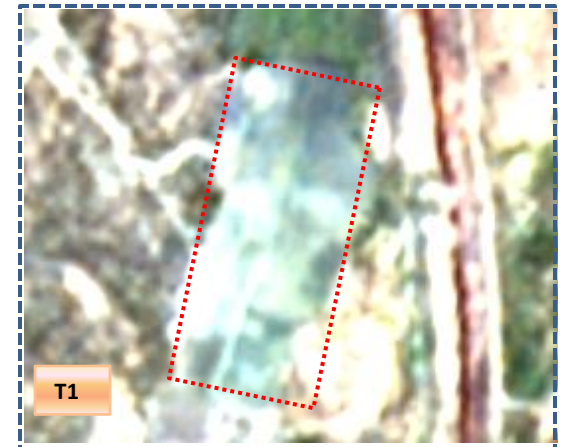


T1: 26 February 2013

Scrub to Agriculture



T0: 2009-10



T1: 26 February 2013

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

Agriculture to Water body



T0

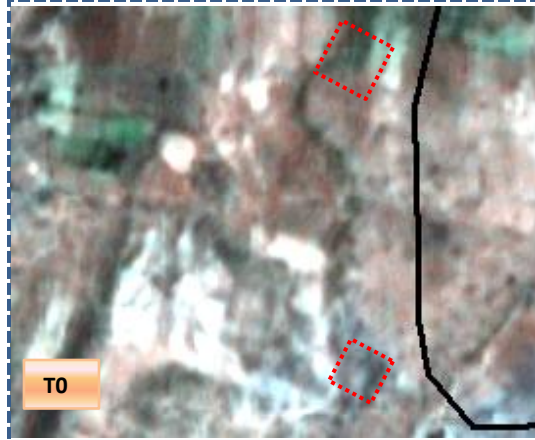
T0: 2009-10



T1

T1: 26 February 2013

Scrub to Water body



T0

T0: 2009-10



T1

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)										
											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	37.82										37.82
Mining/dump		34.49									34.49
Agriculture	2.56	5.45	2233.14	39.21				7.43	4.67	7.49	2299.95
Plantation Horticulture				38.64							38.64
Forest		4.90	11.09		1464.44					0.11	1480.54
Forest Plantation											
Barren Rocky											
Scrub		6.95	29.22					1099.16		2.19	1137.52
Waterbody- Streams/River									28.06		28.06
Waterbody – Ponds										188.44	188.44
Grand Total	40.38	51.80	2273.45	77.84	1464.44			1106.59	32.73	198.22	5245.46

- 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 66.81 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 40.31 ha of the agriculture area has increased from scrubland and forest area of T0.
- Overall 26.50 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
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	40.38										40.38
Mining/dump		51.80									51.80
Agriculture	4.05	4.21	2241.10	22.08						2.01	2273.45
Plantation Horticulture	0.09			77.75							77.84
Forest	0.56	8.91	60.54		1394.43						1464.44
Forest Plantation											
Barren Rocky											
Scrub	1.05	17.17	228.05	6.01				854.17		0.14	1106.59
Waterbody- Streams/River									32.73		32.73
Waterbody – Ponds										198.22	198.22
Grand Total	46.13	82.09	2529.69	105.84	1394.43			854.17	32.73	200.37	5245.46

- 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 32.35 ha of the agriculture area has been decreased and it is converted into, Built-up, and mining/dump, plantation and water body in T2.
- In T2 288.59 ha of the agriculture area has increased from scrubland and forest area of T1.
- Overall 256.24 ha of the agriculture area has been Increased from T1 to T2. 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	46.13										46.13
Mining/dump		82.09									82.09
Agriculture	0.13	1.21	2515.75	0.52						12.09	2529.69
Plantation Horticulture			1.12	104.72							105.84
Forest		1.96	1.54		1390.54					0.38	1394.43
Forest Plantation											
Barren Rocky											
Scrub	0.08	6.91	90.58					752.10		4.50	854.17
Waterbody-Streams/River									32.73		32.73
Waterbody – Ponds										200.37	200.37
Grand Total	46.34	92.17	2608.99	105.23	1390.54			752.10	32.73	217.35	5245.46

- 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 13.39 ha of the agriculture area has been decreased and it is converted into Built-up, mining/dump, plantation, and water body in T3.
- In T3 93.25 ha of the agriculture area has been increased from plantation, forest and scrubland area of T2 and overall 79.30 ha of the agriculture area has been decreased from 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
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	46.34										46.34
Mining/dump		91.24						0.93			92.17
Agriculture	2.48	3.09	2602.45					0.85		0.12	2608.99
Plantation Horticulture			29.47	75.76							105.23
Forest		4.90	0.66		1384.81					0.17	1390.54
Forest Plantation											
Barren Rocky											
Scrub		15.64	37.64					698.28		0.55	752.10
Waterbody- Streams/River									32.73		32.73
Waterbody – Ponds			0.88							216.47	217.35
Grand Total	48.83	114.88	2671.11	75.76	1384.81			700.05	32.73	217.30	5245.46

- 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 6.54 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, scrub, and water body in T4.
- In T4 68.65 ha of the agriculture area has increased from Plantation, forest, scrubland and water body area of T3.
- Overall 62.11ha 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)										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	48.83												48.83
Mining/dump		114.88											114.88
Agriculture	0.13	0.51	2668.71	0.74							1.02		2671.11
Plantation Horticulture			7.24	68.52									75.76
Forest			6.17		1378.64								1384.81
Forest Plantation													
Barren Rocky													
Scrub		0.80	69.76					629.49					700.05
Waterbody- Streams/River									32.73				32.73
Waterbody – Ponds											217.30		217.30
Grand Total	48.95	116.19	2751.88	69.26	1378.64			629.49	32.73		218.32		5245.46

- 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 2.40 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, and water body in T5.
- In T5 83.17 ha of the agriculture area has increased from Plantation , forest and scrubland and area of T4.
- Overall 80.77 ha of the agriculture area has been increased. 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 34.55 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 256.24, 79.30, 62.11 & 80.77 Hectares From , T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 478.42 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 506.63 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.