

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -13/2010-11

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-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

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

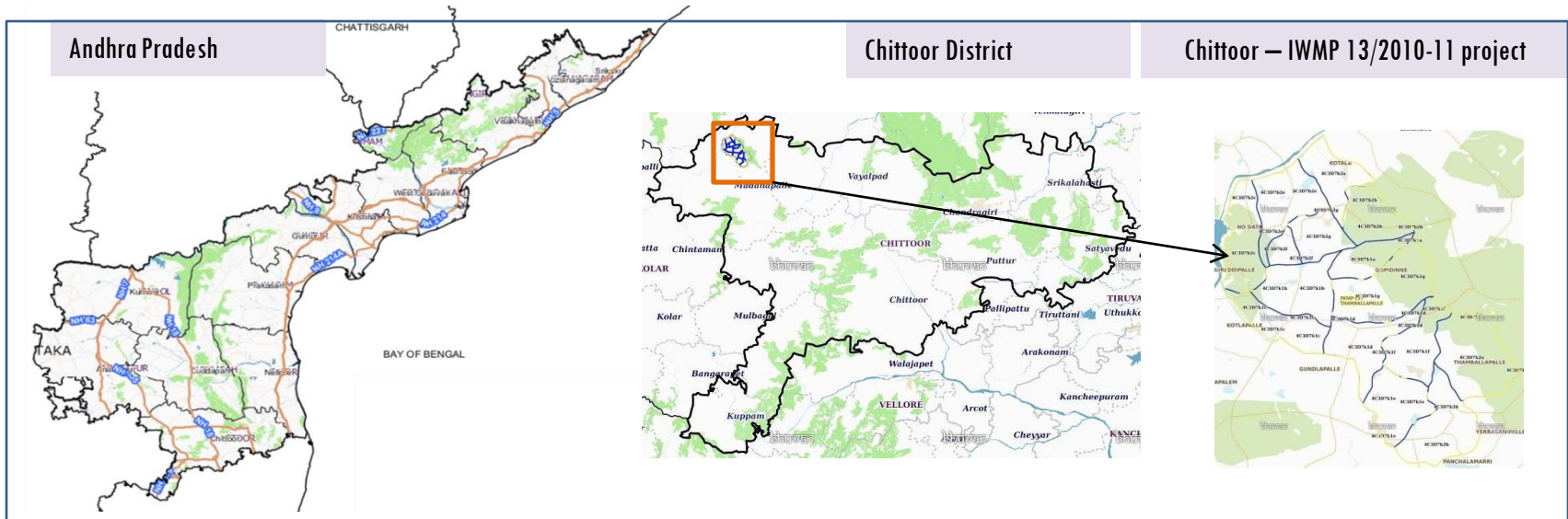
E X E C U T I V E S U M M A R Y

- 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-13/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 9,639 ha. It comprises of 10 micro watersheds.
- In the project area 140 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 66 ha increase in the area.
- Major percentage i.e. 41.5 % is covered by the agriculture, 30.5 % is covered by forest and 22 % is covered by scrubland and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-13/2010-11

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Thamballapalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 9,639 ha. It comprises of 10 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -II*) projects taking 2018-19 (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.

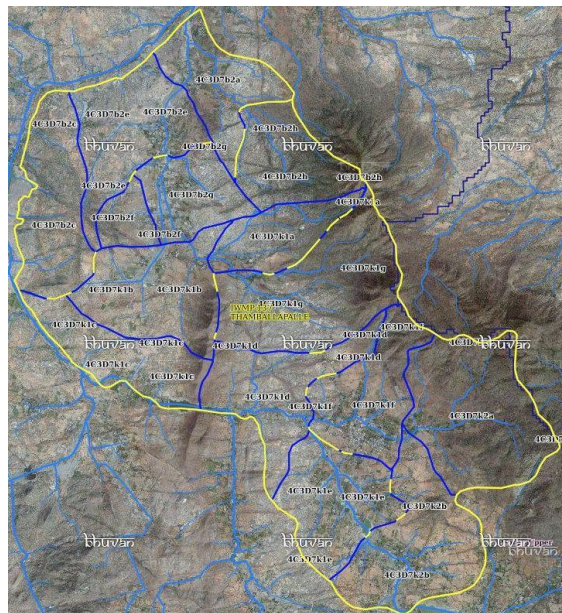
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			25-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			25-Mar-19
SCENE2			

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	140
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

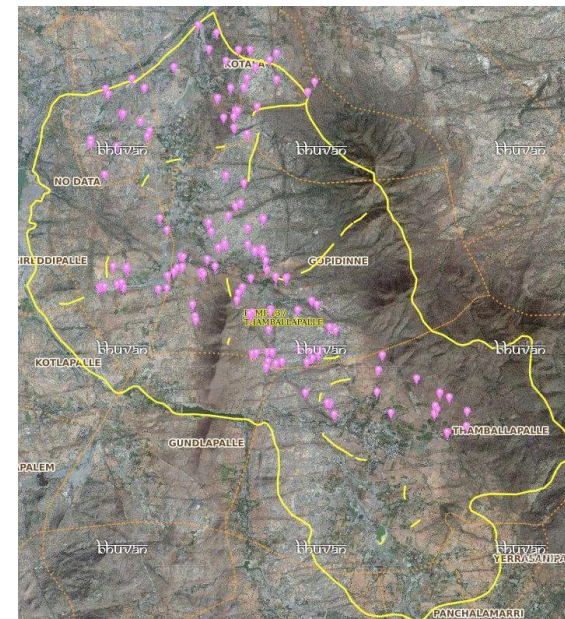


MWS Boundary



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	15	15
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	9	9
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	131	110
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	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	6	6
18	Others	0	0
	TOTAL	161	140

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 (2010-11) and T5 is 2018-19 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.

Chittoor-IWMP-13/2010-11

2009-10

Feb-2015

January-2017



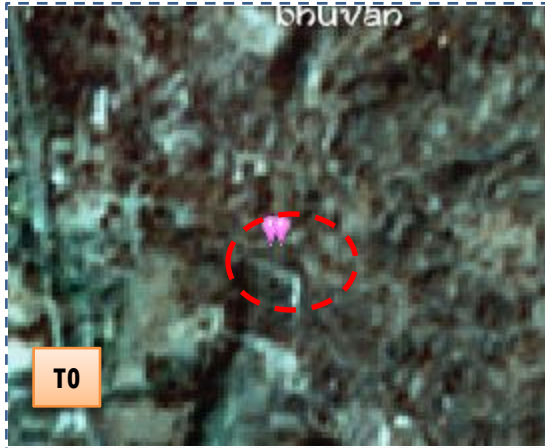
Dec-2017

Jan-2019



Activity : Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-13/2010-11



T0

T0:2010-11



T1

T1: 24 December 2015

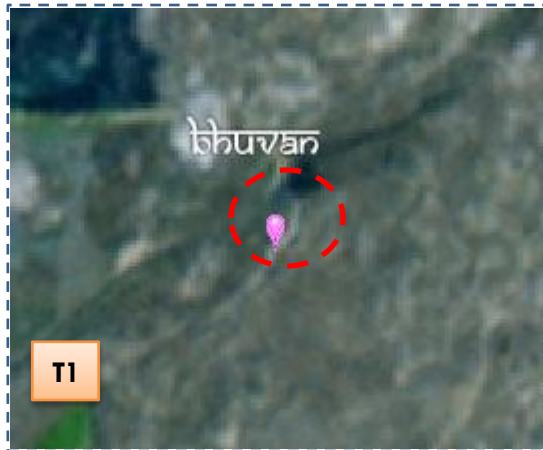


Drishti Sl no. 766591 MWS :4C3D7b2g

Check dam



T0:2010-11



T1

T1: 24 December 2015



Drishti Sl no. 1657452 MWS : 4C3D7k1a

Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-13/2010-11



T0

T0: 2010-11



T1

T1: 24 December 2015



Drishti Sl no. 1772524 MWS : 4C3D7b2g

Farm pond



T0

T0: 2010-11



T1

T1: 24 December 2015

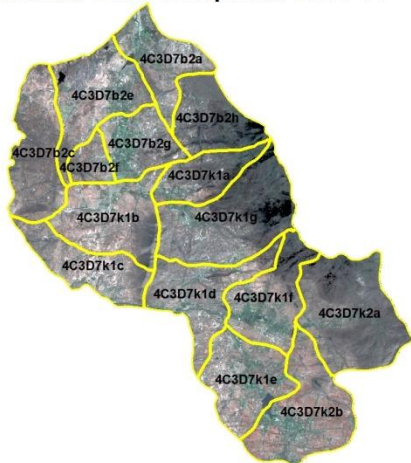


Drishti Sl no. 1657437 MWS :4C3D7b2g

Check dam

Natural Color Composite – 2010-11 to 2014-15

Natural Color Composite- 2010-11



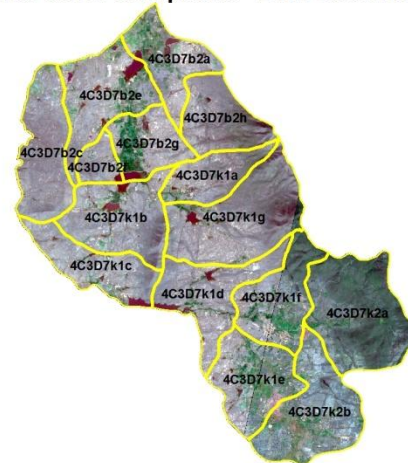
Source:Fusion data,NRSC

Natural Color Composite- 26th September 2013



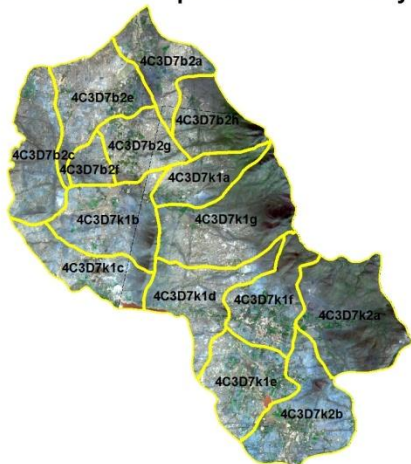
Source:NCC,NRSC

Natural Color Composite- 24th December 2015



Source:NCC,NRSC

Natural Color Composite- 05th January 2017



Source:NCC,NRSC

Natural Color Composite- 09th December 2017



Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019



Source:Sentinel,NRSC

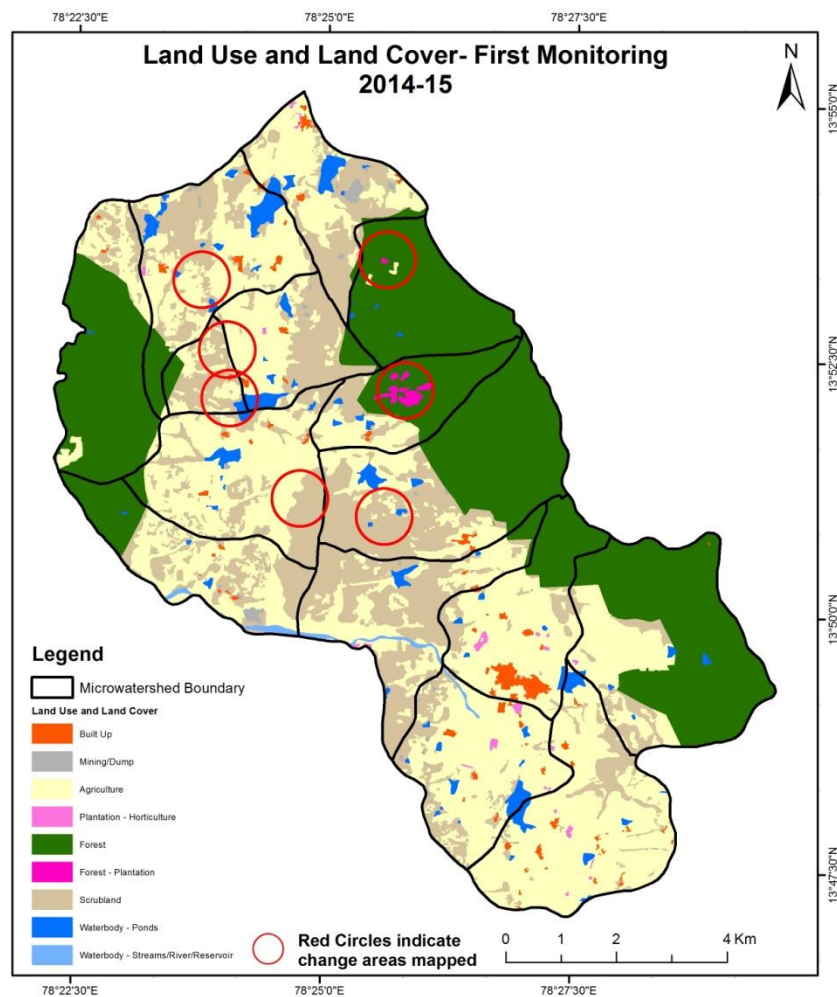
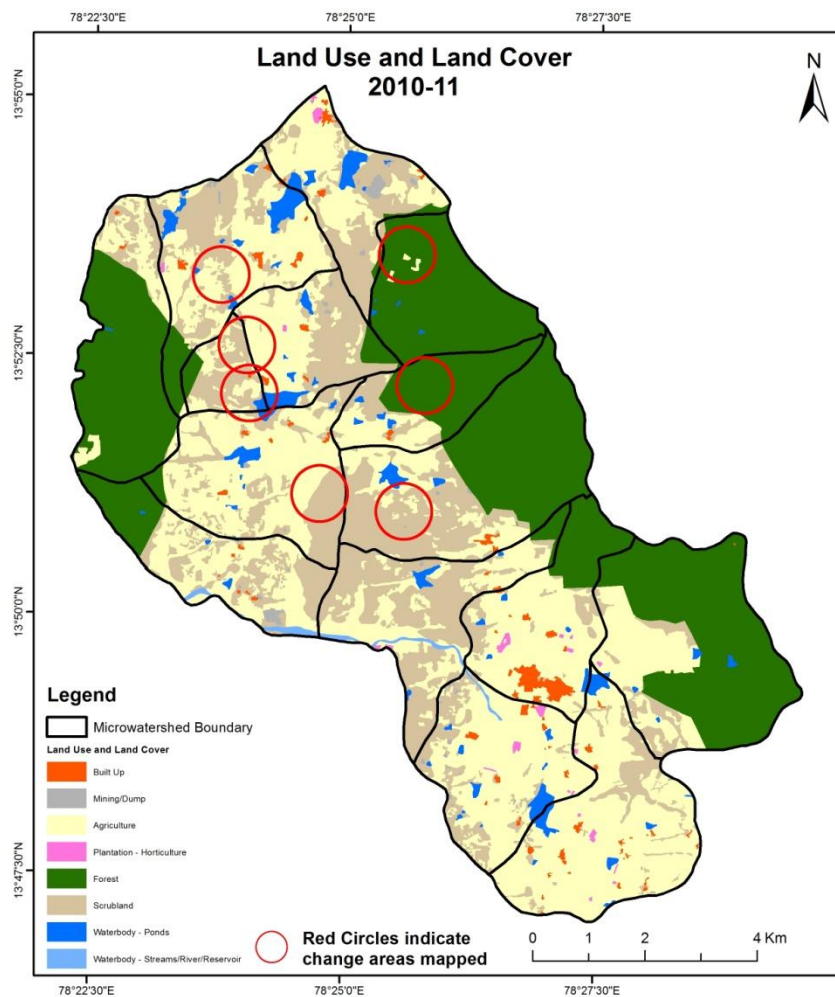
MONITORING IN THE PROJECT AREA

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 (2010-11) and row represents the T5 (2018-19)

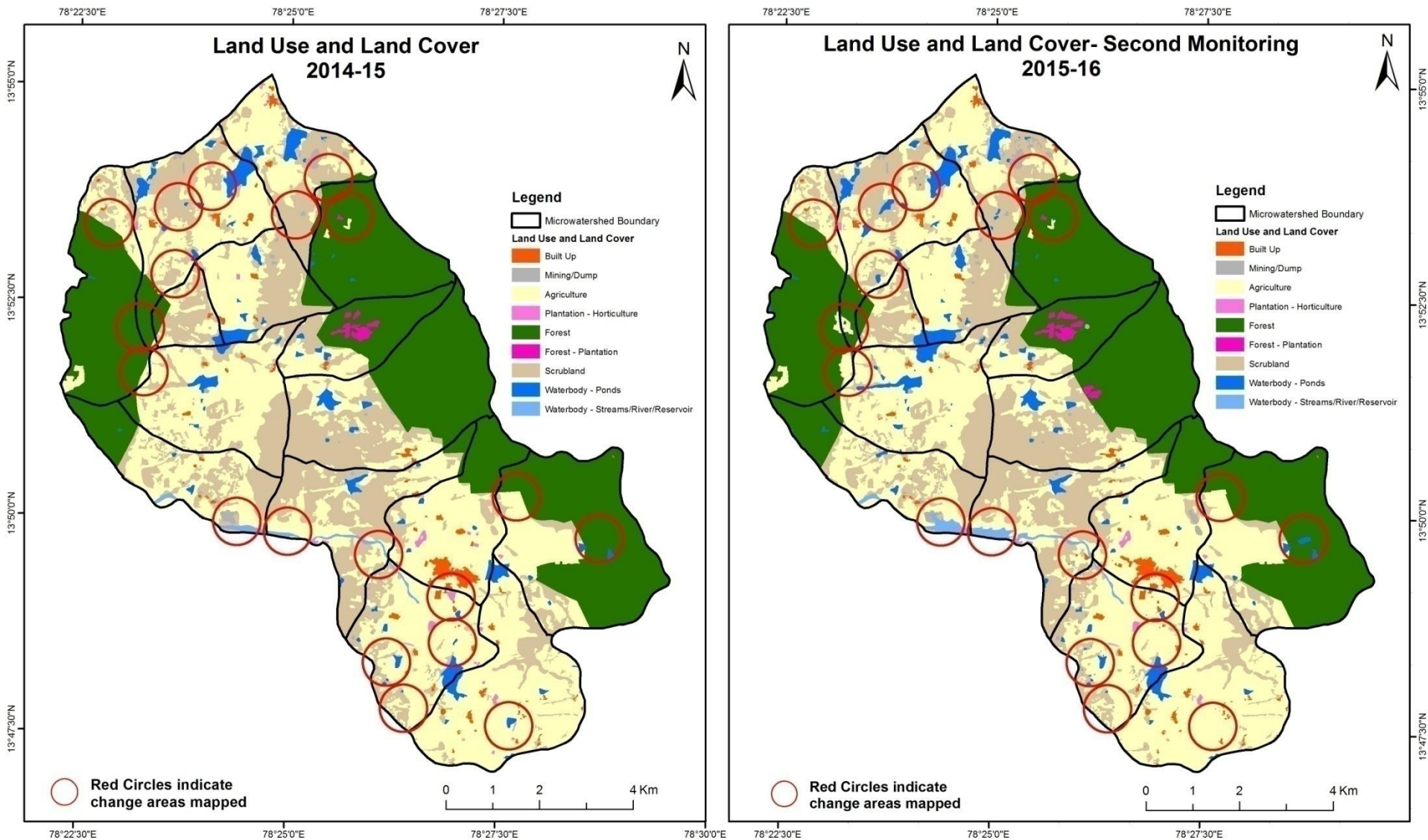
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



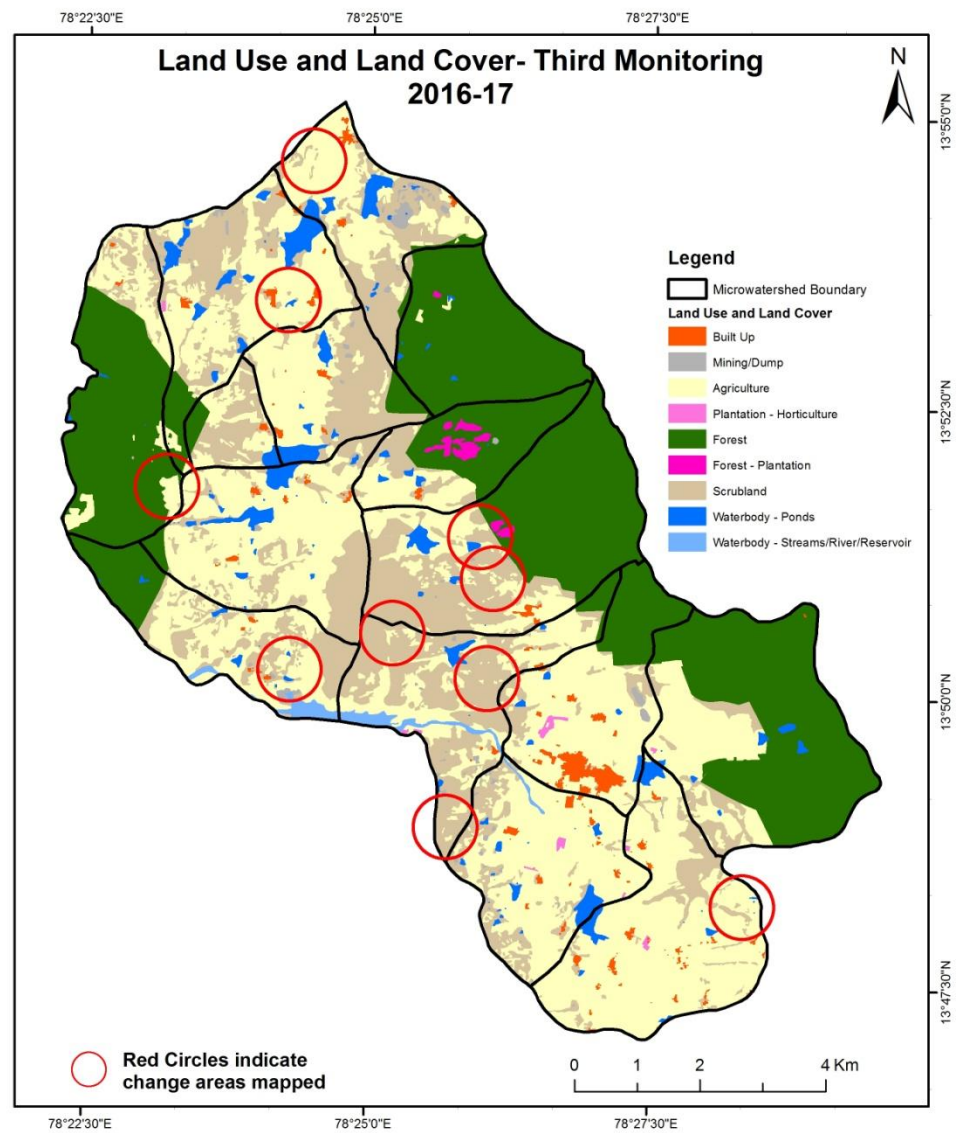
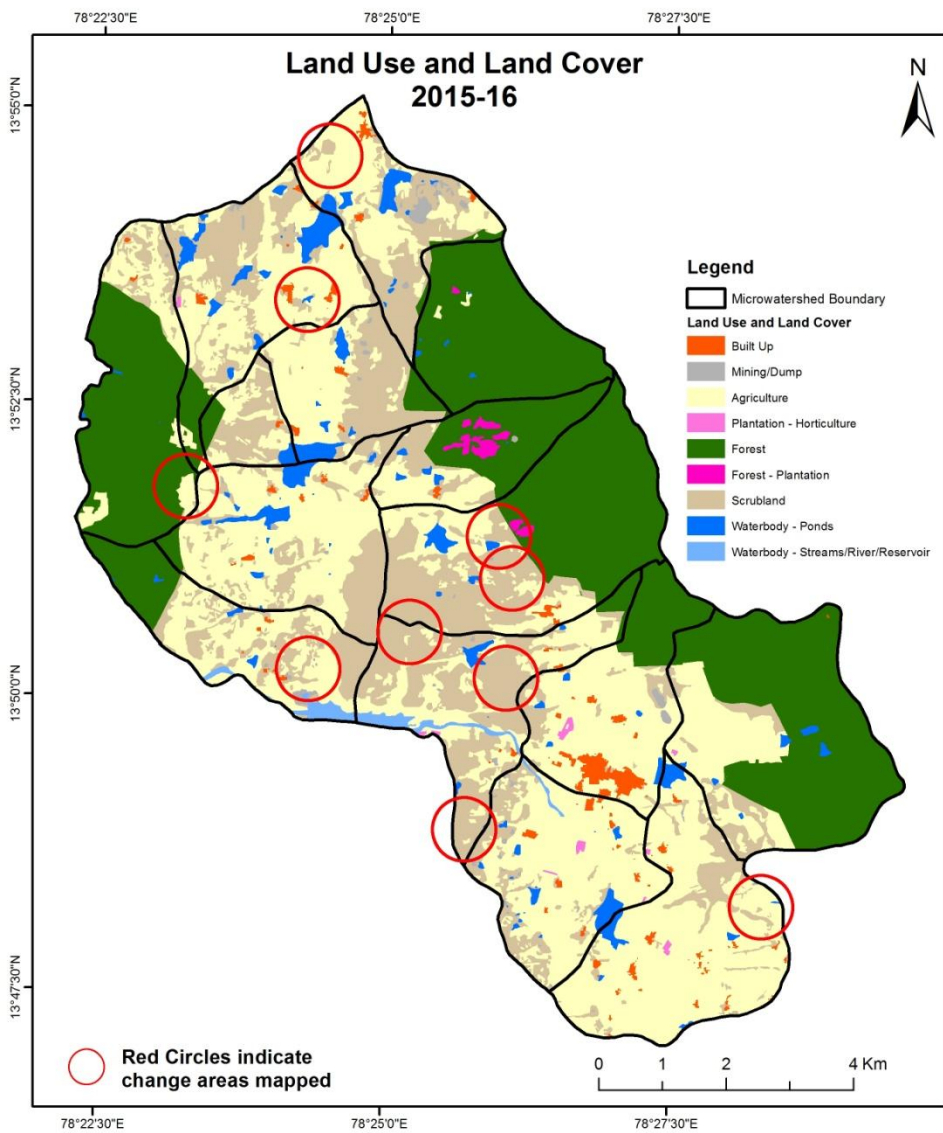
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



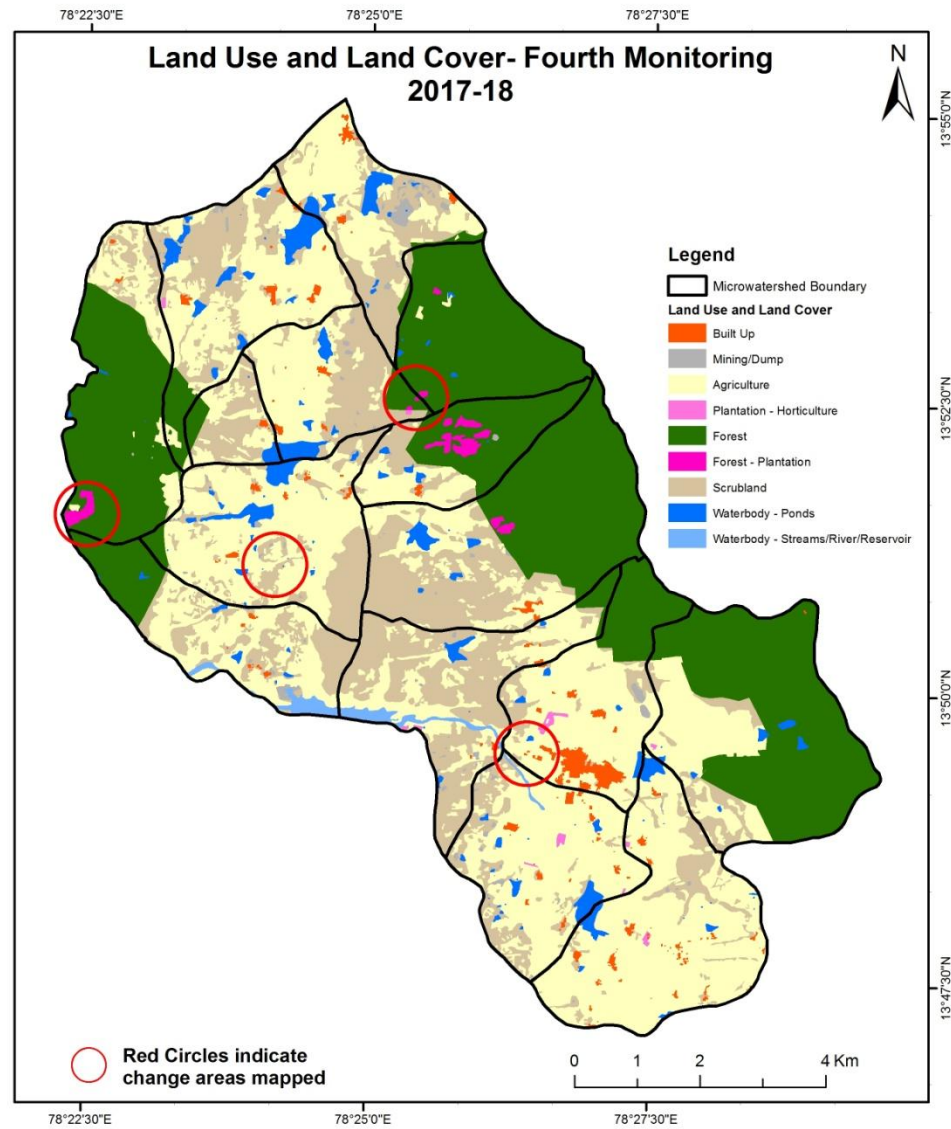
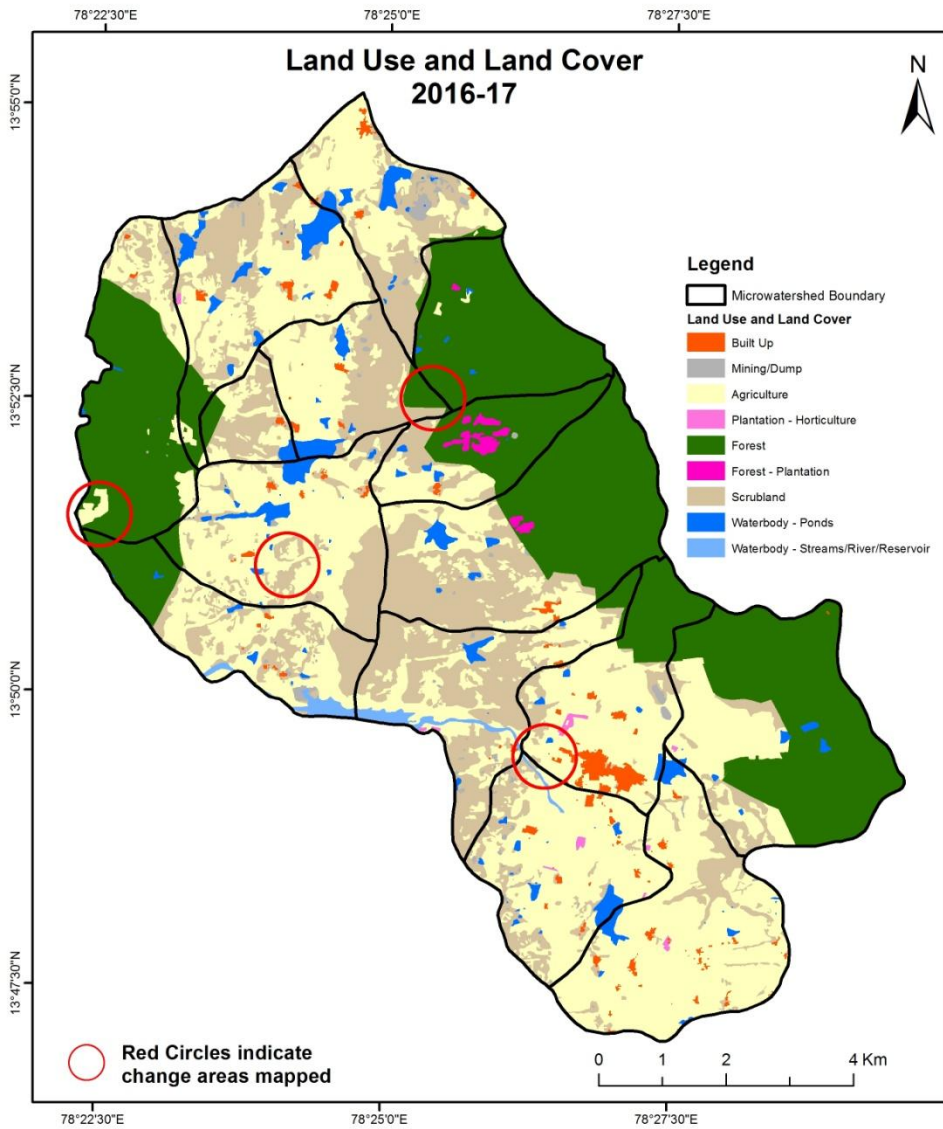
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



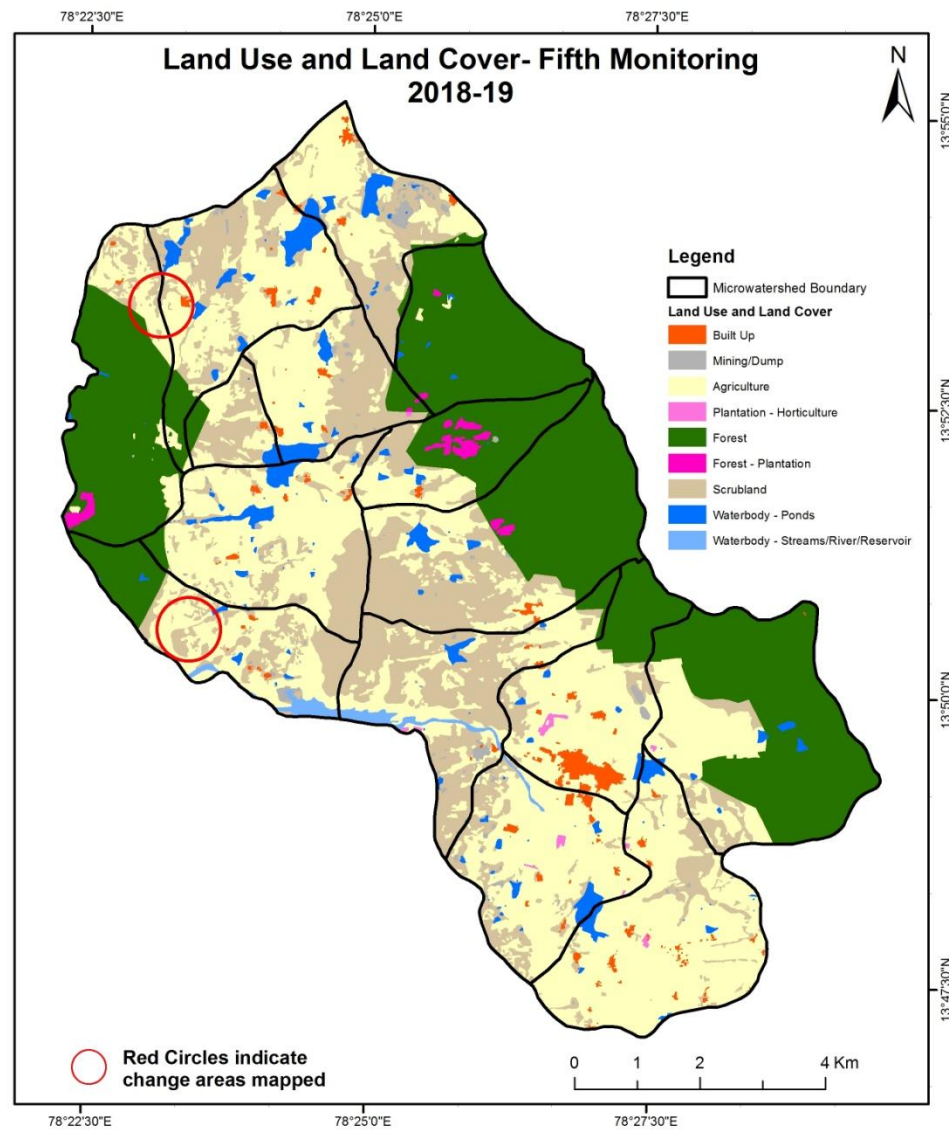
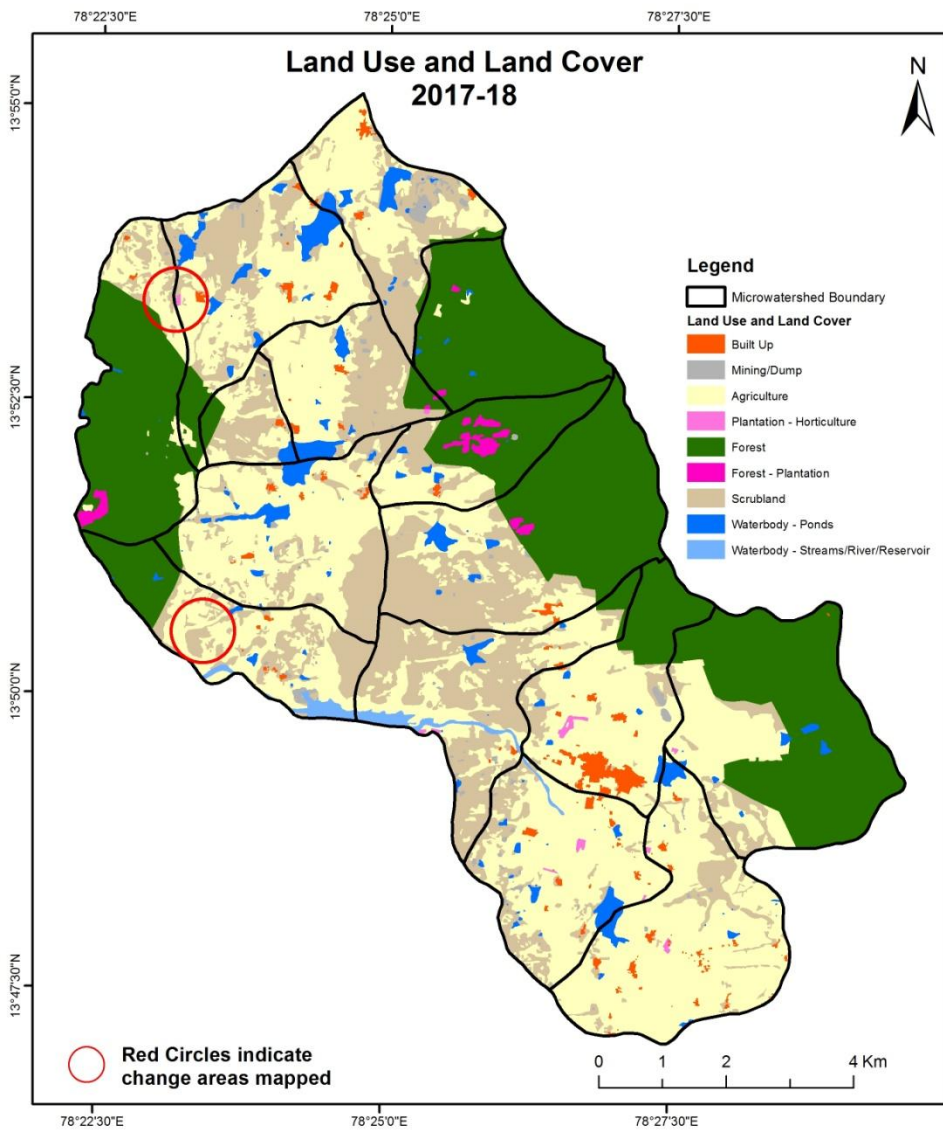
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



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

Agriculture to Plantation



T2

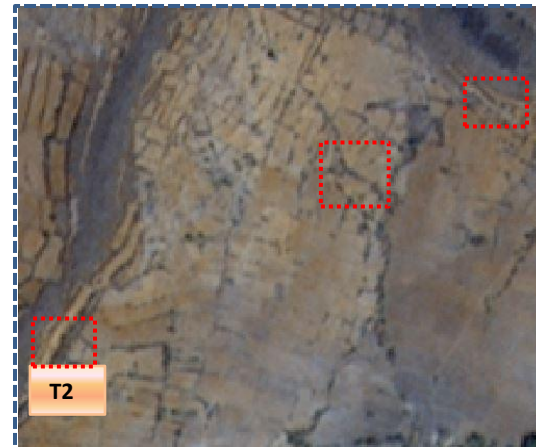
T2: 2015-16 (78°26'42.354"E 13°49'49.674"N)



T3

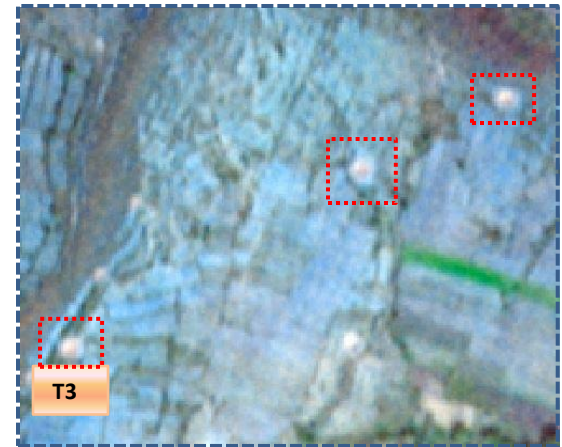
T3: 03 March 2017

Agriculture to Water body



T2

T2: 2015-16 (78°27'58.684"E 13°48'10.821"N)



T3

T3: 03 March 2017

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

Agriculture to Plantation



T0: 2010-11



T1: 26 February 2015

Agriculture to Plantation



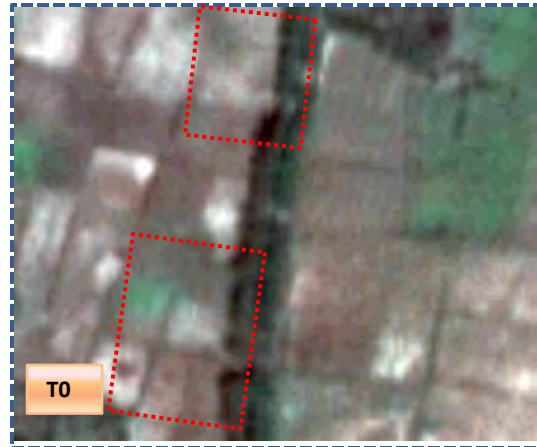
T0: 2010-11



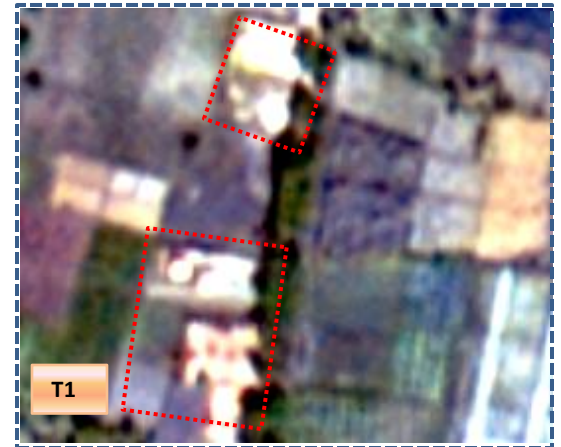
T1: 26 February 2015

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

Agriculture to Built-up



T0: 2010-11



T1: 26 February 2015

Agriculture to Plantation



T0

T0: 2010-11



T1

T1: 26 February 2015

Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15

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	101.16												101.16
Mining/dump		36.47											36.47
Agriculture	0.36		3943.78			1.09							3945.24
Plantation Horticulture			2.58	24.47									27.05
Forest					2938.08	21.30							2959.38
Forest Plantation													
Barren Rocky													
Scrub			16.58					2279.02			2.42		2298.02
Waterbody- Streams/River									36.79				36.79
Waterbody – Ponds											235.34		235.34
Grand Total	101.52	36.47	3962.95	24.47	2938.08	22.39		2279.02	36.79		237.76		9639.45

- 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 0.36 ha of the agriculture area has decreased and it is converted into Built-up, and Forest Plantation in T1.
- In T1 19 ha of the agriculture area has increased from scrubland of T0. Overall 17 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-2014-15 to 2015-16

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	101.52										101.52	
Mining/dump		34.13							2.34		36.47	
Agriculture	11.30	2.74	3925.87						18.74	4.29	3962.95	
Plantation Horticulture			10.08	14.38							24.47	
Forest		0.82	21.81		2901.35	9.18				4.93	2938.08	
Forest Plantation						22.39					22.39	
Barren Rocky												
Scrub	0.74	13.27	34.07					2195.65	2.76	32.52	2279.02	
Waterbody- Streams/River									36.79		36.79	
Waterbody – Ponds	0.05		5.52							232.20	237.76	
Grand Total	113.61	50.96	3997.35	14.38	2901.35	31.57		2195.65	60.64	273.94	9639.45	

- 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 18 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T2.
- In T2 71 ha of the agriculture area has increased from plantation, forest, scrubland and water body area of T1. Overall 34 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-2015-16 to 2016-17

Land cover	Monitoring period (T3)										
	Units in Hectares										Grand Total
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	
Built up	113.61										113.61
Mining/dump		50.89								0.08	50.96
Agriculture	2.46	0.47	3986.91	1.21			4.66			1.63	3997.35
Plantation Horticulture	0.28			14.10							14.38
Forest		0.35	1.72		2899.07					0.20	2901.35
Forest Plantation						31.57					31.57
Barren Rocky											
Scrub	1.80	3.87	29.86				2158.78			1.33	2195.65
Waterbody- Streams/River									60.64		60.64
Waterbody – Ponds										273.94	273.94
Grand Total	118.14	55.58	4018.50	15.32	2899.07	31.57	2163.44		60.64	277.18	9639.45

- 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 05 ha of the agriculture area has decreased and it is converted into plantation, Built-up, mining/dump and water body in T3.
- In T3 31 ha of the agriculture area has increased from forest and scrubland of T2. Overall 21 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-2016-17 to 2017-18

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	118.14												118.14
Mining/dump		55.56									0.02		55.58
Agriculture	2.04	1.13	3999.34			12.62		2.83			0.55		4018.50
Plantation Horticulture				15.32									15.32
Forest					2896.54	2.53							2899.07
Forest Plantation						31.57							31.57
Barren Rocky													
Scrub	0.11	4.75	5.19	0.67				2152.33			0.38		2163.44
Waterbody- Streams/River									60.64				60.64
Waterbody – Ponds											277.18		277.18
Grand Total	120.30	61.44	4004.53	15.99	2896.54	46.72		2155.16	60.64		278.13		9639.45

- 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 6.5 ha of the agriculture area has decreased and it is converted into plantation, Built-up, mining/dump, scrub and water body in T4.
- In T4 5.19 ha of the agriculture area has increased from scrubland of T3. Overall 13 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-2017-18 to 2018-19

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		
Built up	120.30												120.30
Mining/dump		61.44											61.44
Agriculture	3.40	5.56	3995.57										4004.53
Plantation Horticulture			1.18	14.81									15.99
Forest					2896.54								2896.54
Forest Plantation						46.72							46.72
Barren Rocky													
Scrub	0.63		9.33					2145.20					2155.16
Waterbody- Streams/River									60.64				60.64
Waterbody – Ponds										278.13			278.13
Grand Total	124.33	66.99	4006.08	14.81	2896.54	46.72		2145.20	60.64	278.13			9639.45

- 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 8.9 ha of the agriculture area has decreased and it is converted into plantation, Built-up, mining/dump, scrub and water body in T5.
- In T5 10 ha of the agriculture area has increased from plantation and scrubland of T4. Overall 1.5 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 66 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 17, 34, 21 & 1.5 Hectares From T0 to T1, T1-T2, T2 -T3 & T4-T5 respectively and overall increase of 60 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is a decrease of 152 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.