

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -18/2010-11

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

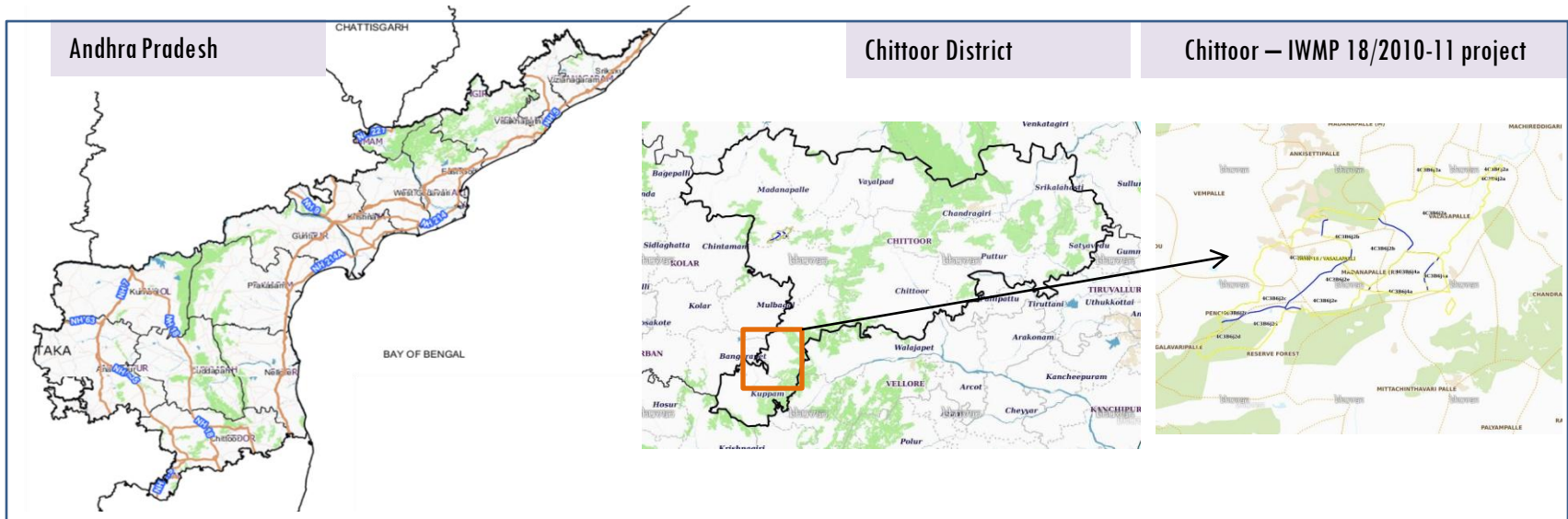
E X E C U T I V E S U M M A R Y

- 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-18/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 3,612 ha. It comprises of 6 micro watersheds.
- In the project area 278 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 33 ha increase in the area.
- Major percentage i.e. 46.57 % is covered by the agriculture, 26.96 % is covered by scrub land and 10.86 % is covered by forest and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-18/2010-11

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Madanapalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 3,612 ha. It comprises of 6 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.

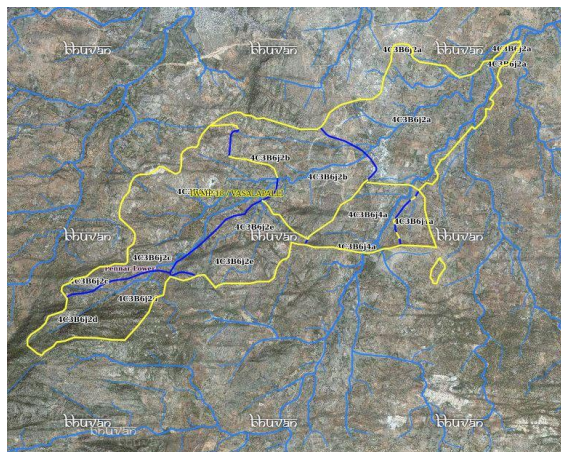
Satellite Data and Ancillary Data

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			
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	278
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

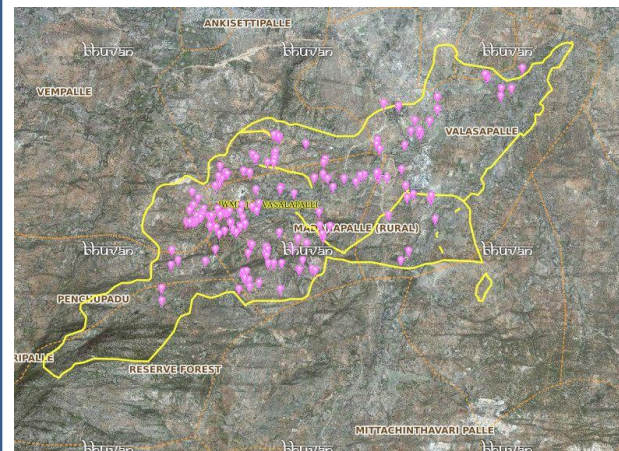


MWS Boundary



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	45	40
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	29	20
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	2	2
11	Civil work-Check dams /Rock fill dam	76	65
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)	6	6
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	43	25
18	Others	161	120
	TOTAL	362	278

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-18/2010-11

2009-10



January-2014



Feb-2015



March-2018



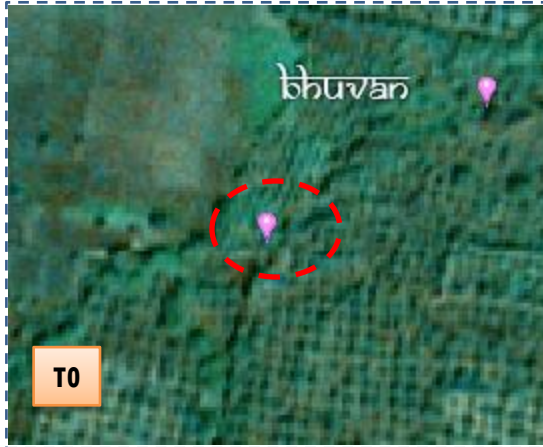
Jan-2019



Drishti Sl.No: 7023816
M.No:9100986285
Uuid:5a402f06b5af5bd1

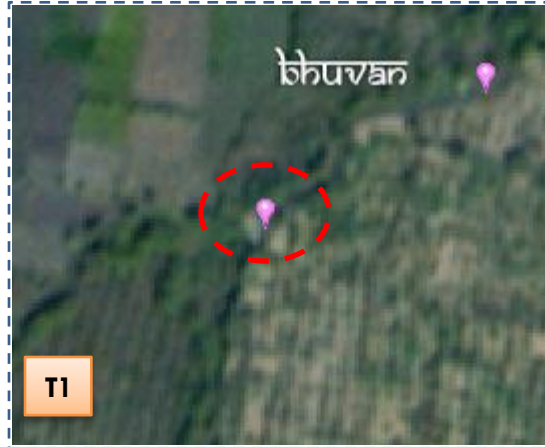
Activity : Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-18/2010-11



T0

T0:2010-11



T1

T1: 22 October 2015



Drishti Sl no. 204963 MWS :4C3B6j2c

Check dam



T0:2010-11



T1

T1: 22 October 2015



Drishti Sl no. 204976 MWS :4C3B6j2c

Percolation Tank

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-18/2010-11



T0: 2010-11



T1: 22 October 2015



Drishti Sl no. 837784 MWS : 4C3B6j2b

Percolation Tank



T0: 2010-11



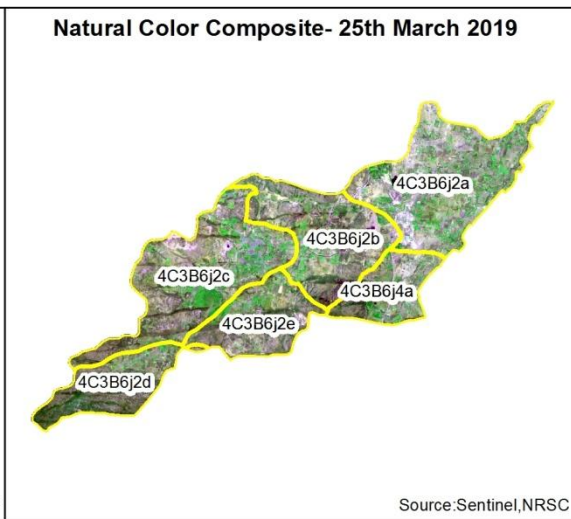
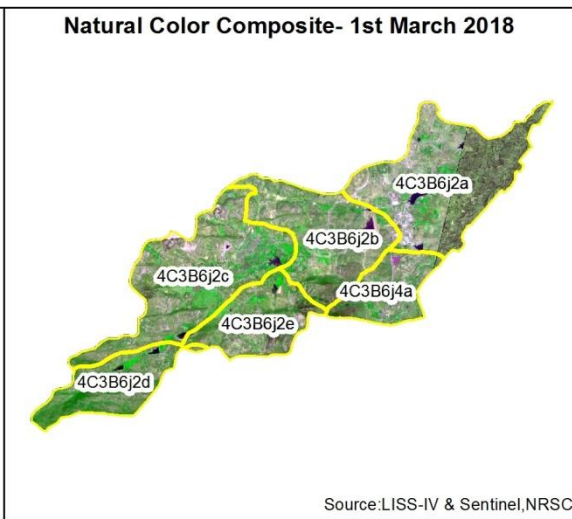
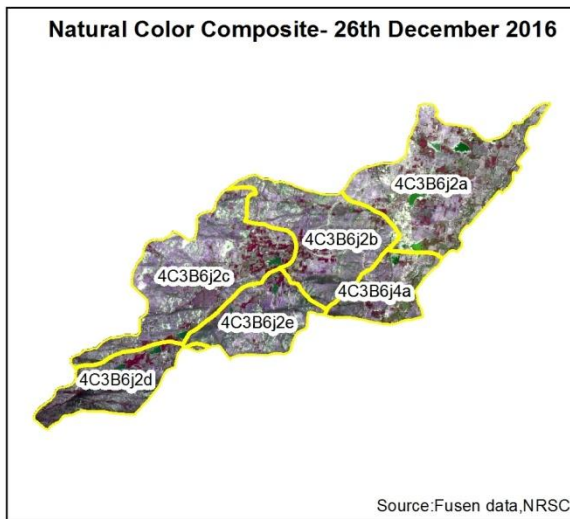
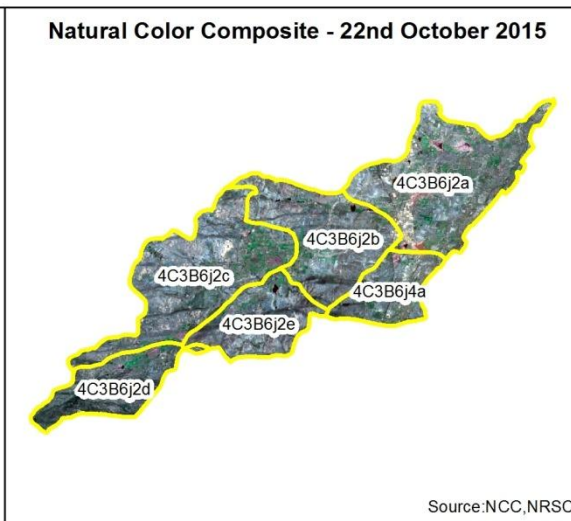
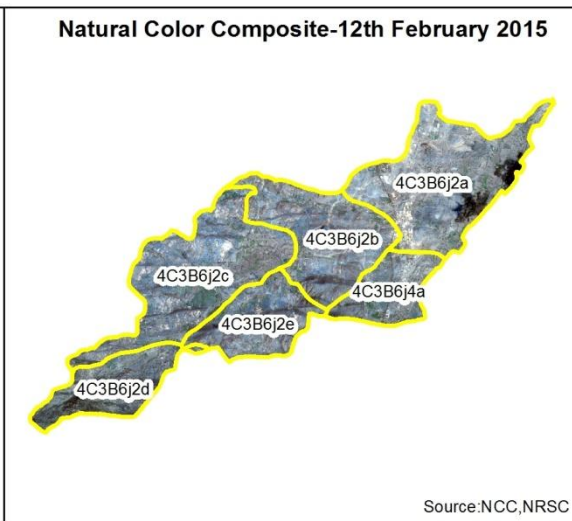
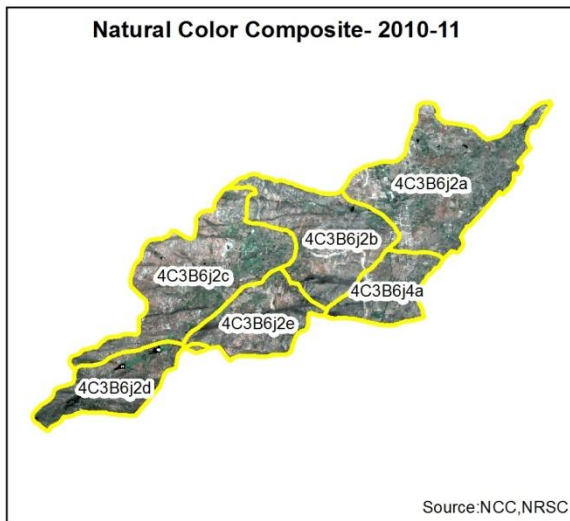
T1: 22 October 2015



Drishti Sl no. 866722 MWS :4C3B6j2e

Percolation Tank

Natural Color Composite – 2010-11 to 2018-19



MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

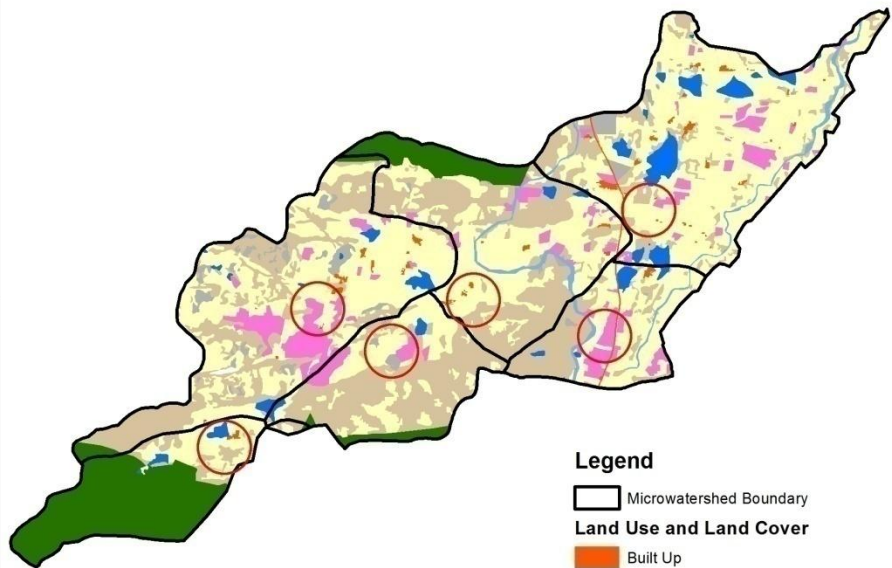
- Change in land use and land cover from T0 to T5 are analyzed in terms of built up, mining/dump, agriculture, plantation- horticulture, forest, barren rocky waterbody-streams/river/reservoir and waterbody -ponds.
- Captures are also provided wherever changes are observed in satellite images, that may 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

78°30'0"E 78°32'30"E 78°35'0"E

Land Use and Land Cover 2010-11

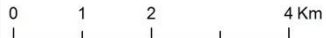


Legend

— Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

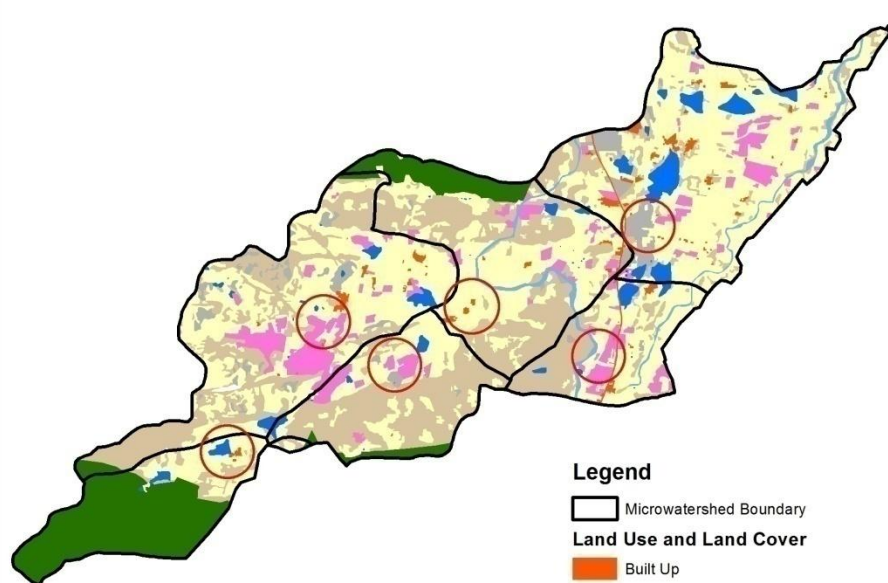


○ Red Circles indicate
change areas mapped

78°30'0"E 78°32'30"E 78°35'0"E

78°30'0"E 78°32'30"E 78°35'0"E

Land Use and Land Cover - First Monitoring 2014-15



Legend

— Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

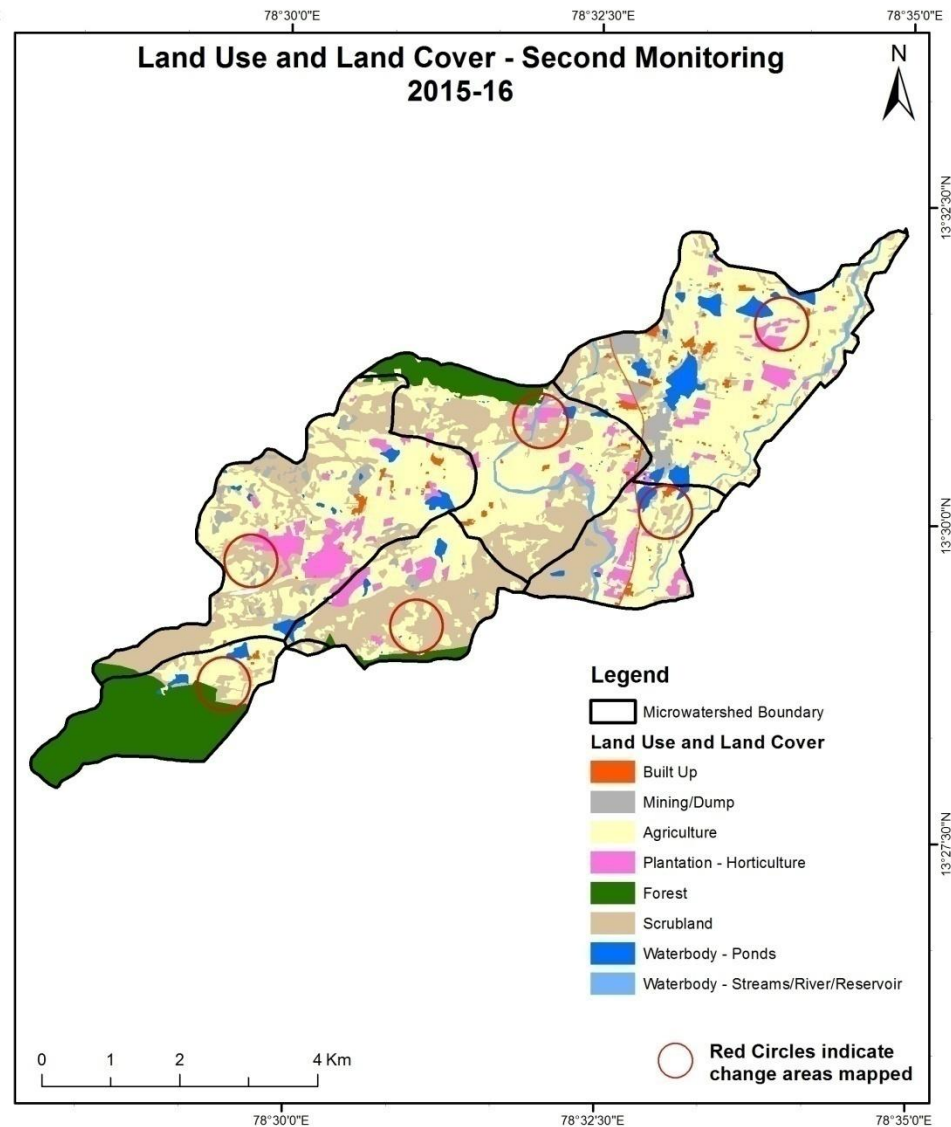
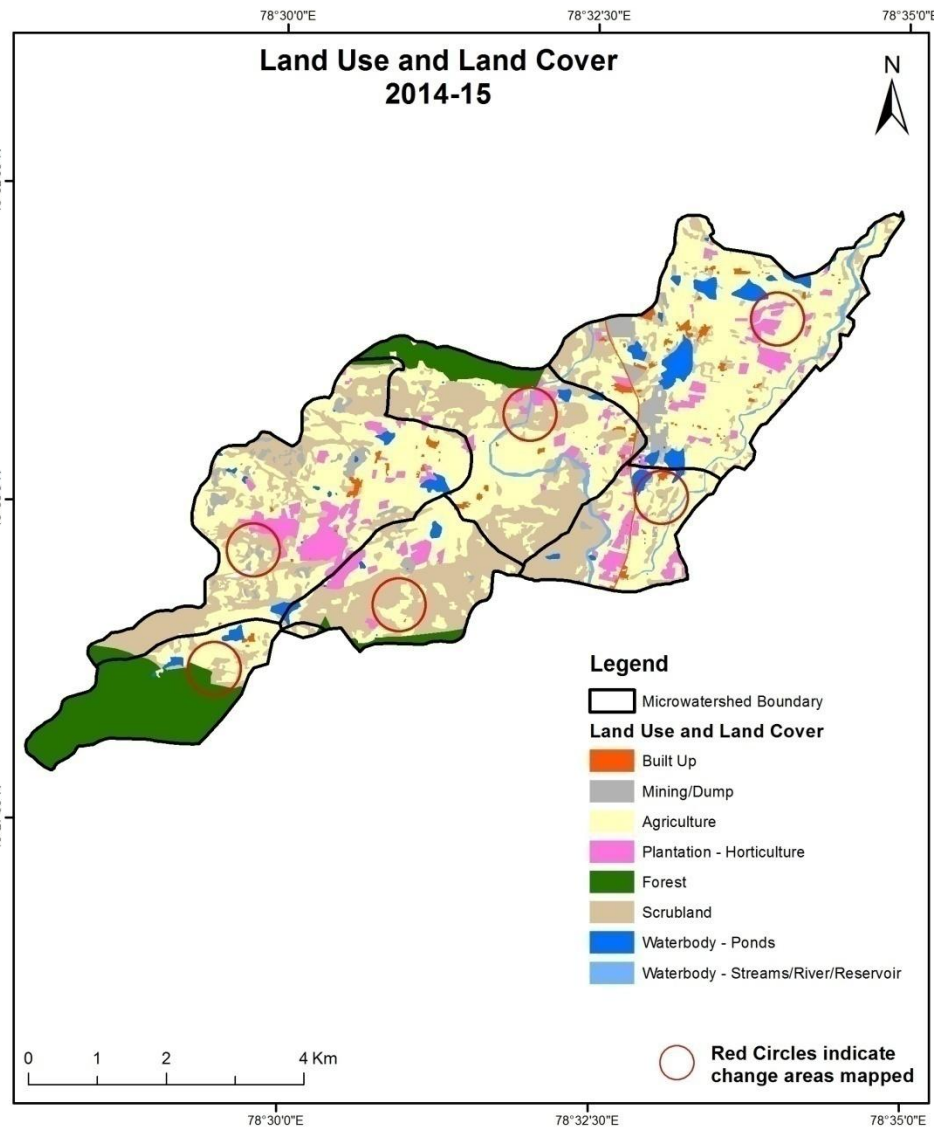


○ Red Circles indicate
change areas mapped

78°30'0"E 78°32'30"E 78°35'0"E

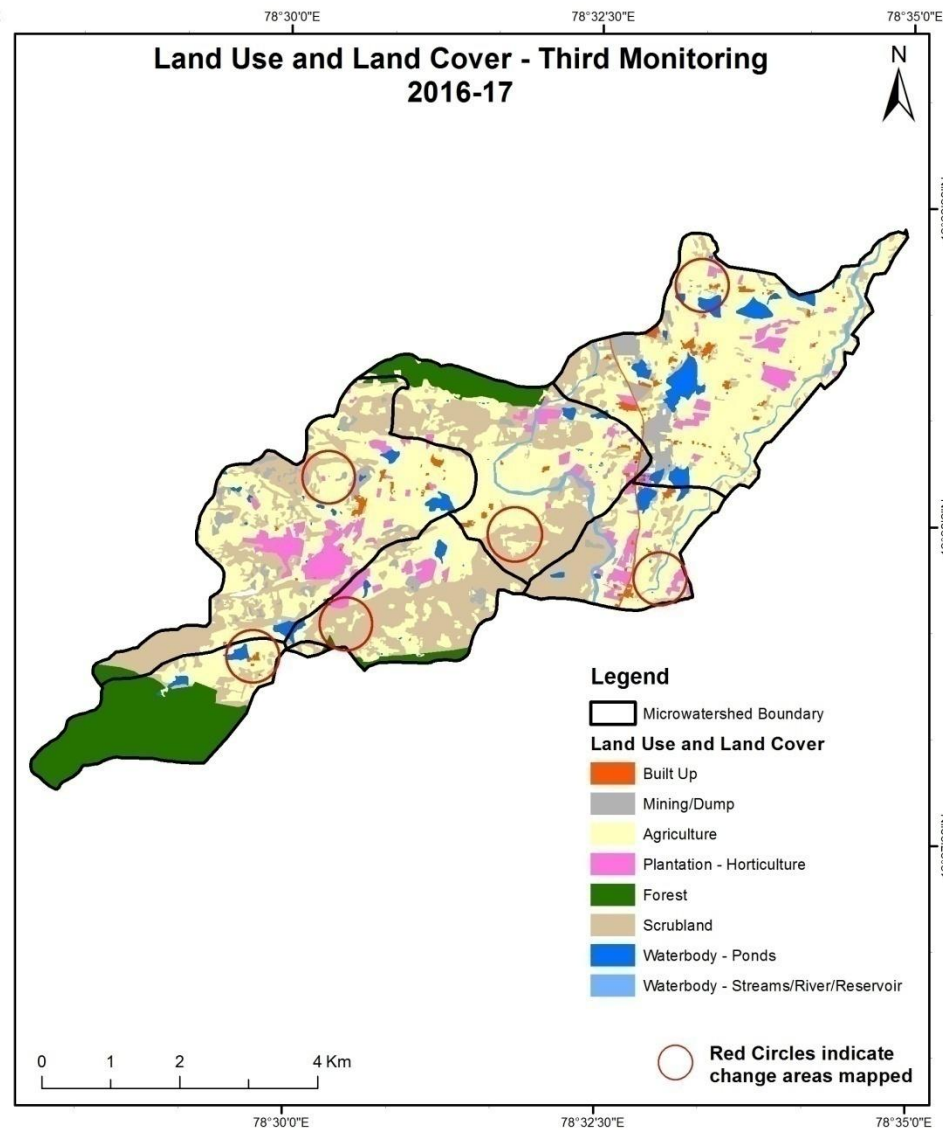
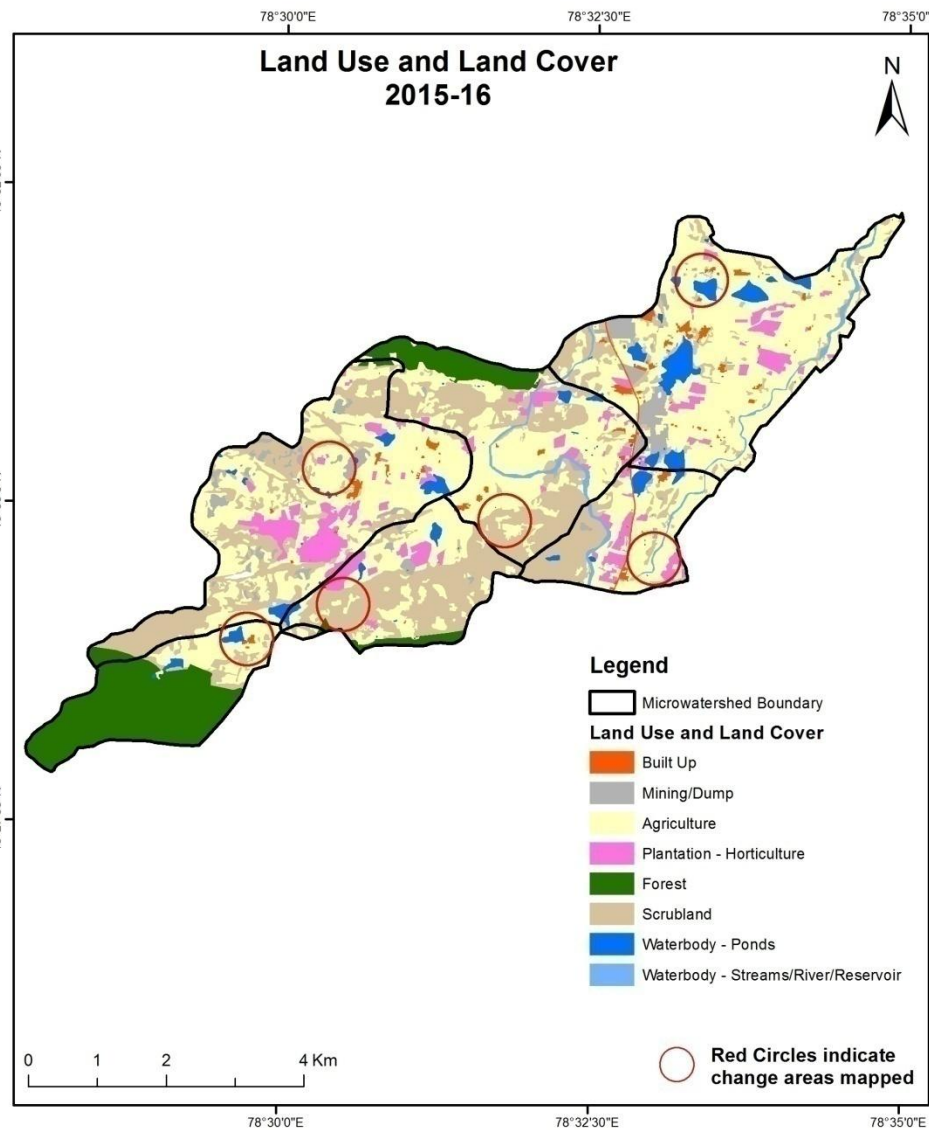
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



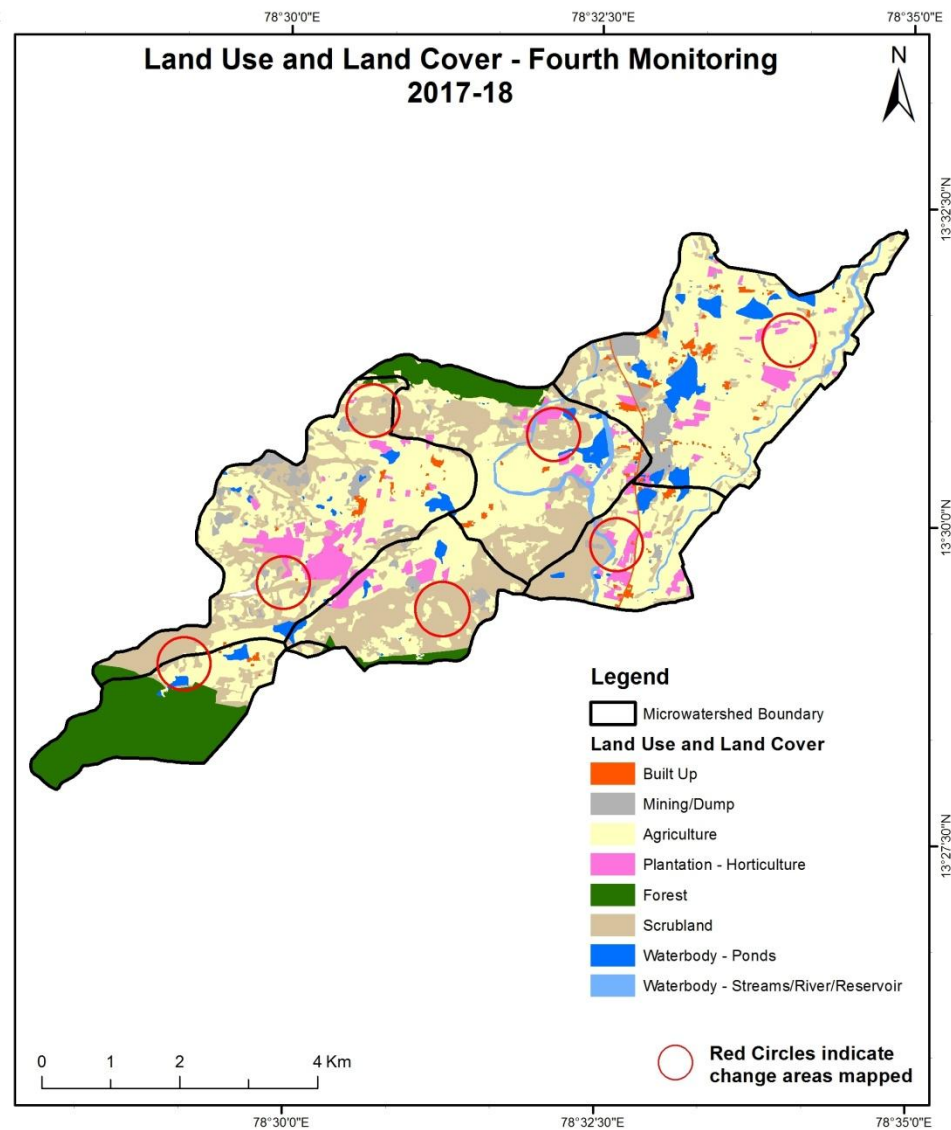
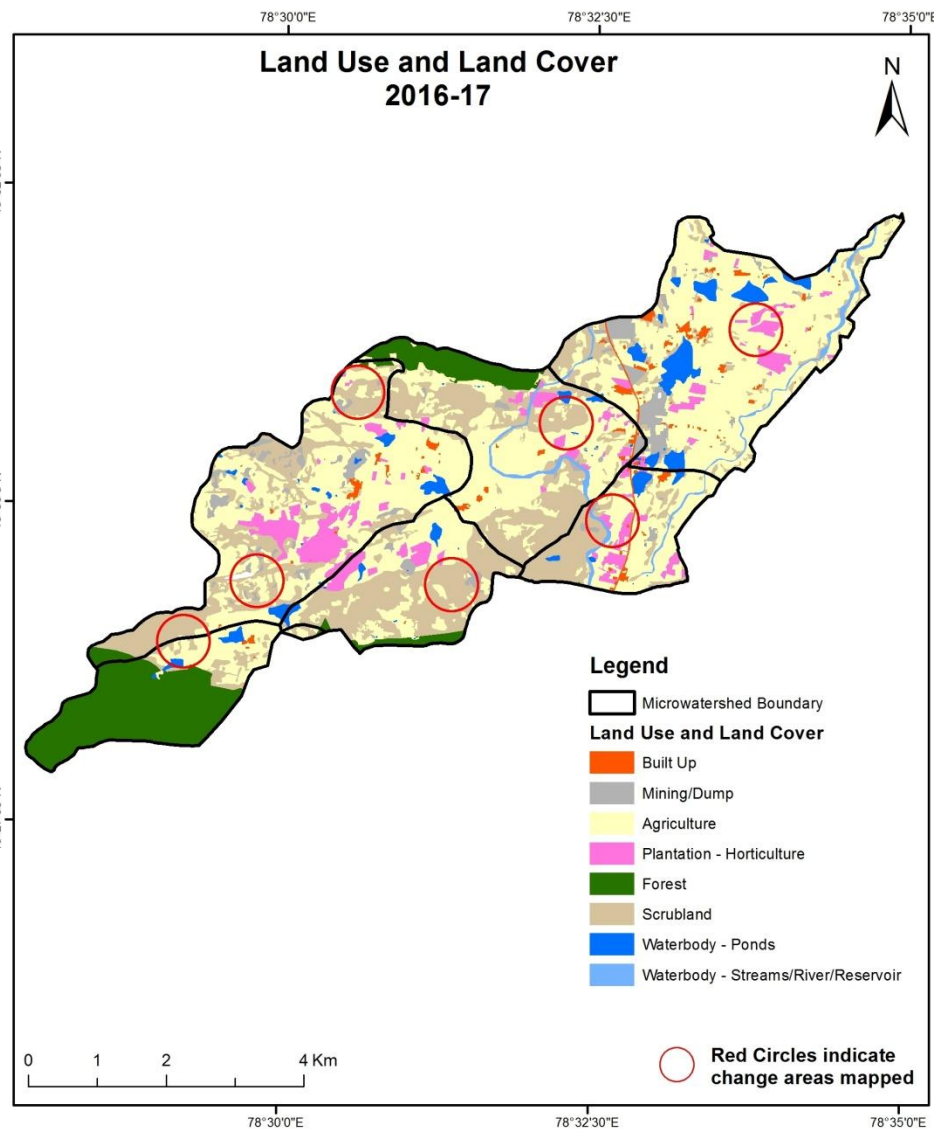
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



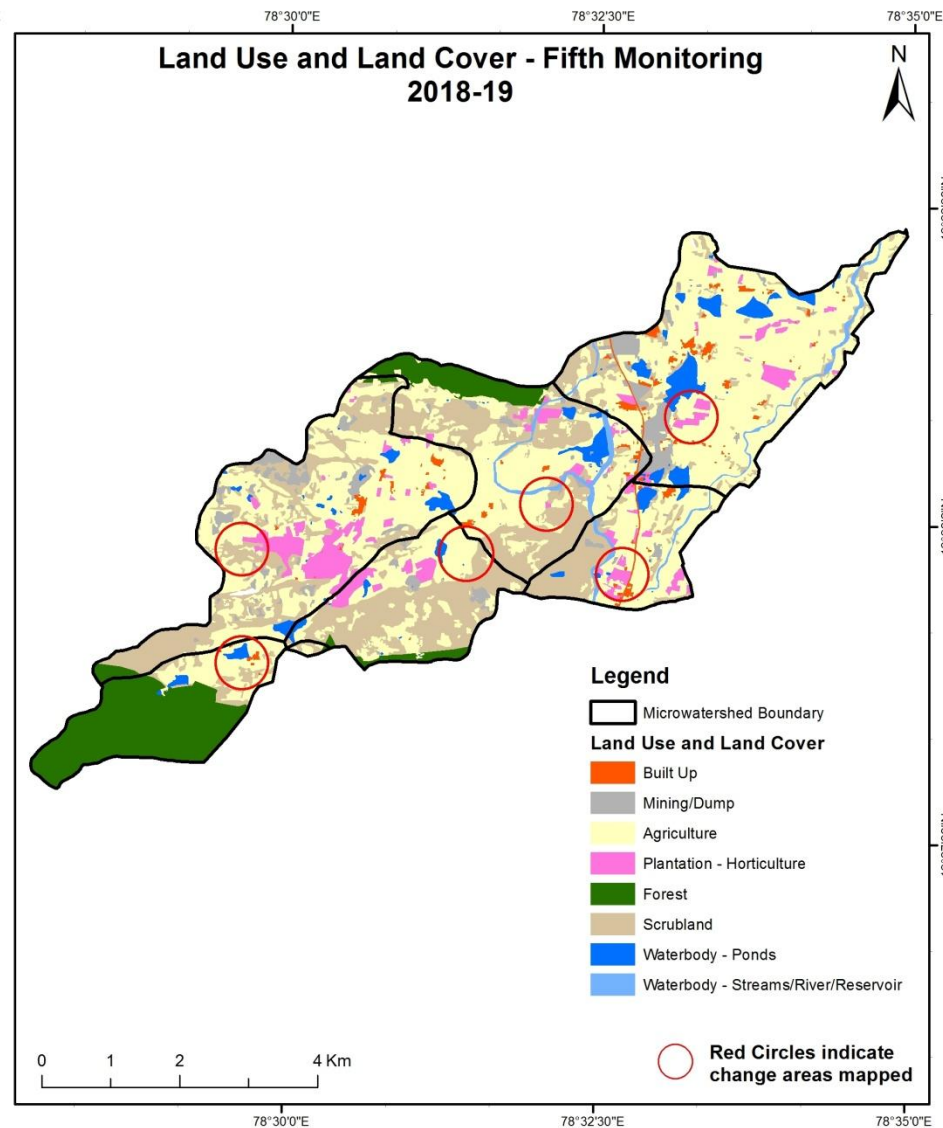
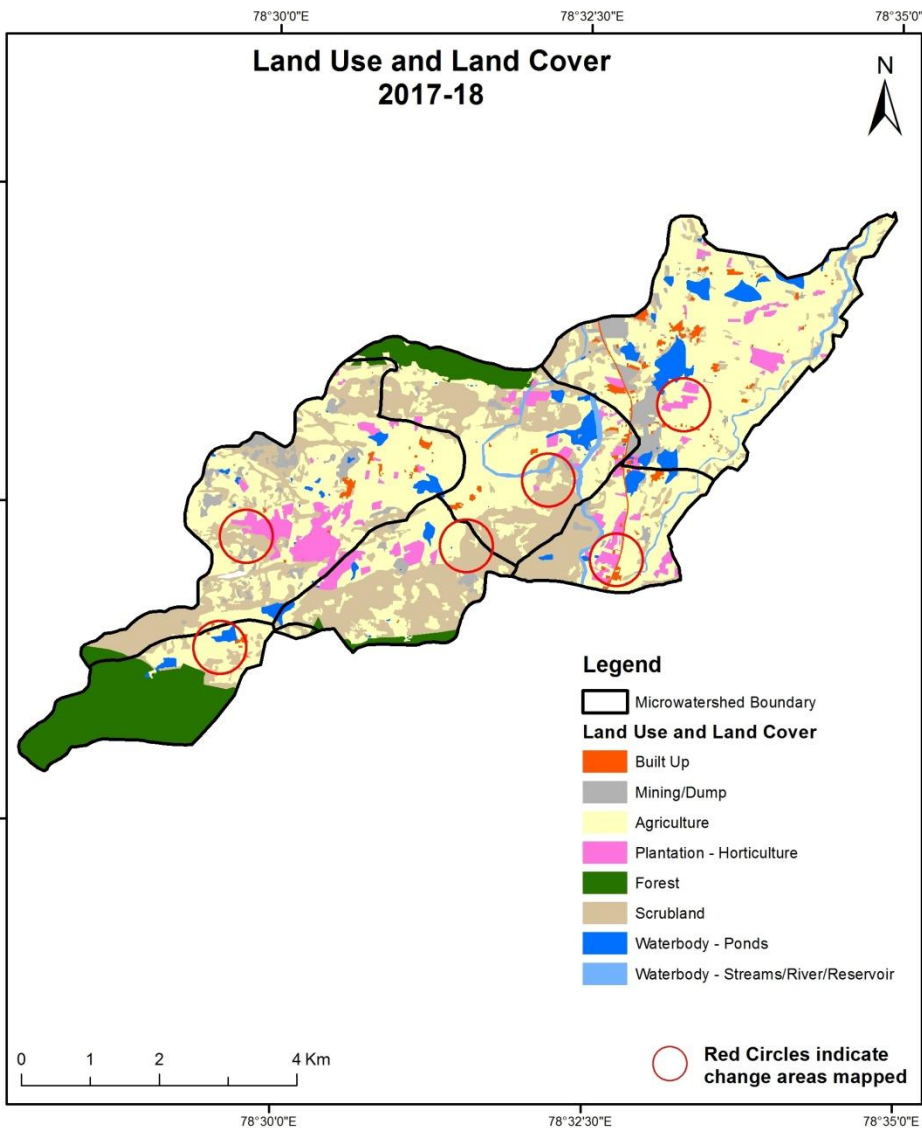
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



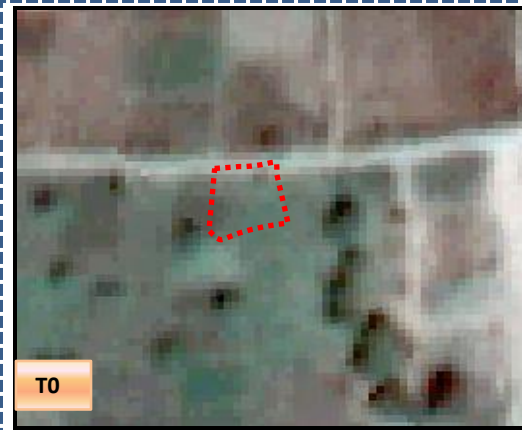
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



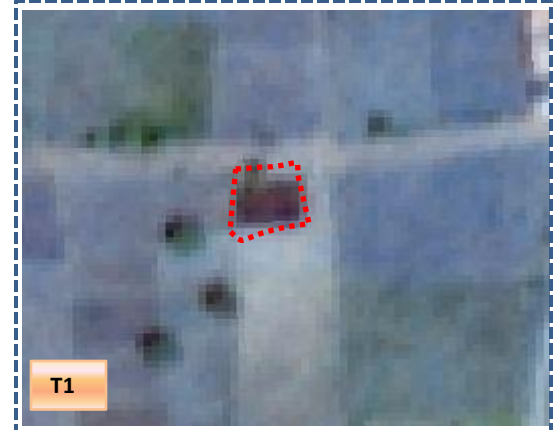
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



T0

T0: 2010-11 (78°31'36.364"E 13°30'30.133"N)



T1

T1: 12 February 2015

Agriculture to Plantation



T0

T0: 2010-11 (78°30'4.188"E 13°29'58.17"N)

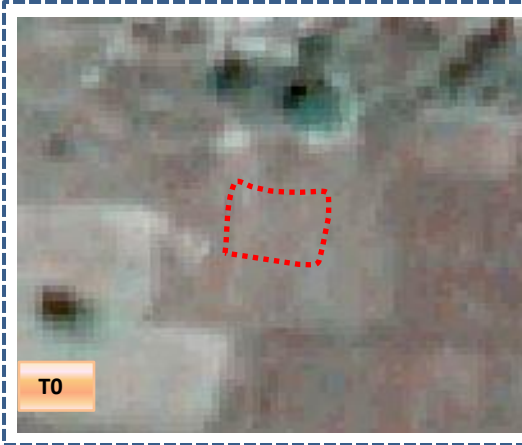


T1

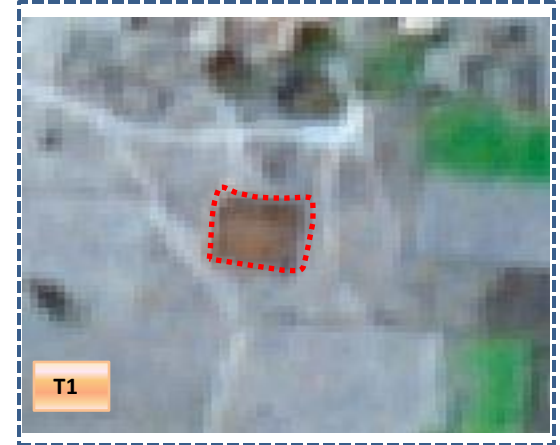
T1: 12 February 2015

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

Agriculture to Water body

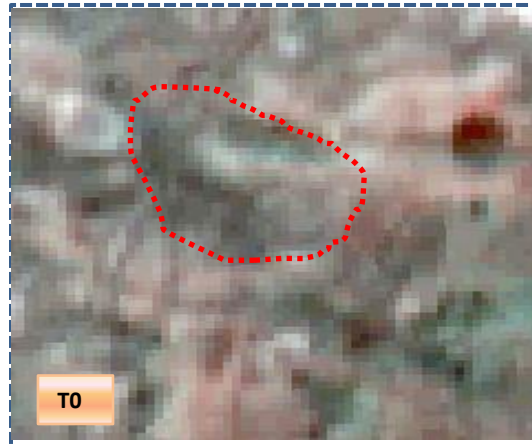


T0: 2014-15 (78°33'31.213"E 13°31'2.438"N)

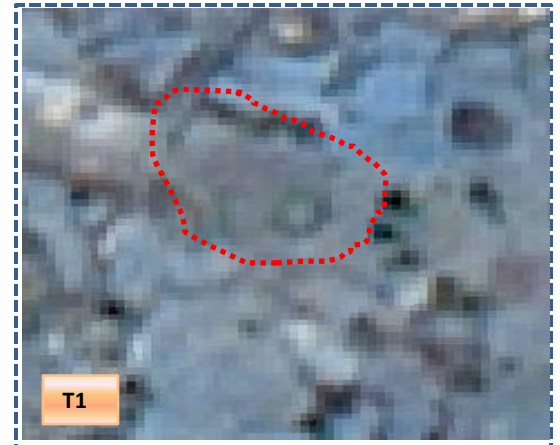


T1: 12 February 2015

Scrubland to Agriculture



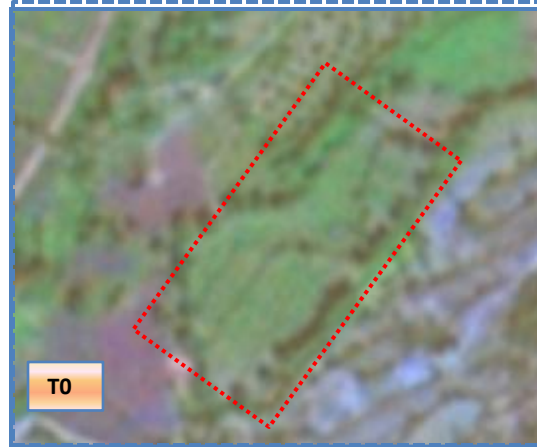
T0: 2014-15 (78°29'19.354"E 13°28'58.895"N)



T1: 12 February 2015

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

Agriculture to Plantation



T0

T0: 2010-11



T1

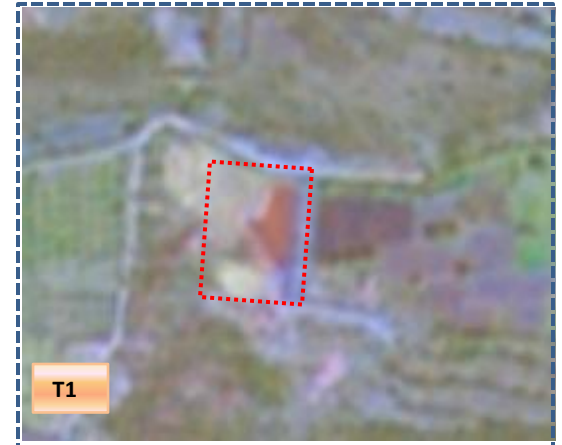
T1: 22 October 2015

Agriculture to Water body



T0

T0: 2010-11

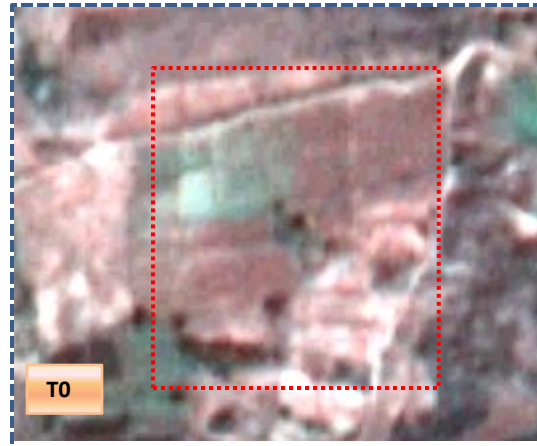


T1

T1: 22 October 2015

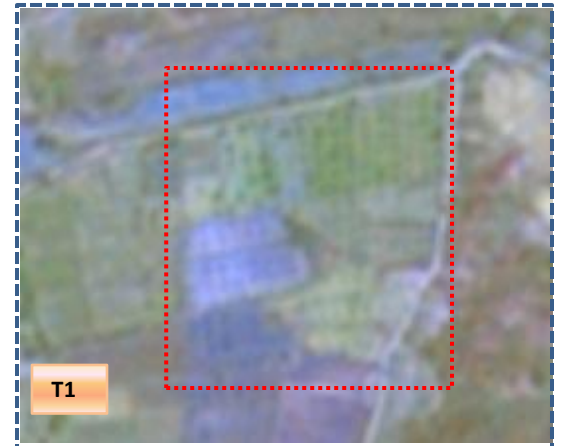
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

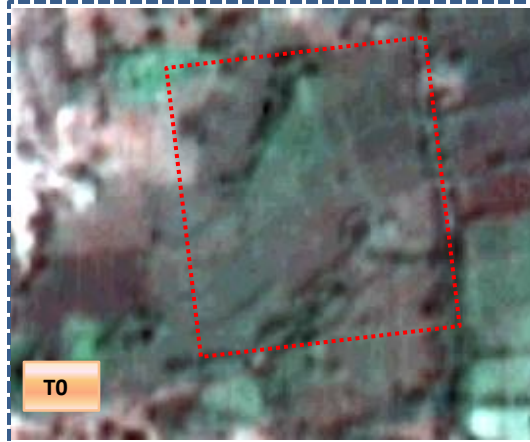
T0: 2010-11



T1

T1: 22 October 2015

Agriculture to Plantation



T0

T0: 2010-11



T1

T1: 22 October 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	
T0												
Built up	33.45										33.45	
Mining/dump		75.28									75.28	
Agriculture	11.01	23.43	1633.45	31.17						2.42	1701.48	
Plantation Horticulture	0.43		9.38	207.15						0.58	217.53	
Forest			3.95		390.30					0.03	394.29	
Forest Plantation												
Barren Rocky							3.88				3.88	
Scrub	4.81	12.52	40.93	2.04				965.26		0.11	1025.68	
Waterbody- Streams/River									50.49		50.49	
Waterbody – Ponds										110.49	110.49	
Grand Total	49.71	111.24	1687.71	240.36	390.30		3.88	965.26	50.49	113.63	3612.57	

- 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 68 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 54 ha of the agriculture area has increased from plantation, forest and scrubland of T0, and overall 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-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		
T1													
Built up	49.71												49.71
Mining/dump		111.24											111.24
Agriculture	0.69	0.16	1681.99	0.79							4.08		1687.71
Plantation Horticulture	0.02		21.68	218.63							0.03		240.36
Forest			4.80		385.46						0.04		390.30
Forest Plantation													
Barren Rocky							3.88						3.88
Scrub	0.28	0.29	32.99					930.57			1.12		965.26
Waterbody- Streams/River									50.49				50.49
Waterbody – Ponds											113.63		113.63
Grand Total	50.70	111.68	1741.46	219.42	385.46		3.88	930.57	50.49		118.90		3612.57

- 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 05 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 59 ha of the agriculture area has increased from plantation, forest and scrubland of T1, and overall 53 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
Built up	50.70										50.70	
Mining/dump		111.52								0.16	111.68	
Agriculture	2.32	2.90	1734.56	0.66						1.03	1741.46	
Plantation Horticulture	0.55		13.59	205.11						0.16	219.42	
Forest					385.46						385.46	
Forest Plantation												
Barren Rocky							3.88				3.88	
Scrub	0.34	15.32	8.99					905.72		0.20	930.57	
Waterbody- Streams/River									50.49		50.49	
Waterbody – Ponds										118.90	118.90	
Grand Total	53.92	129.74	1757.14	205.76	385.46		3.88	905.72	50.49	120.45	3612.57	

- 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 06 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T3.
- In T3 22 ha of the agriculture area has increased from plantation and scrubland of T2, and overall 15 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-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		
T3													
Built up	53.92												53.92
Mining/dump		129.74											129.74
Agriculture	0.80	5.33	1728.92	2.39					5.71	13.99			1757.14
Plantation Horticulture	0.20		6.36	197.25					1.57	0.39			205.76
Forest			1.06		384.41								385.46
Forest Plantation													
Barren Rocky		0.36					3.51						3.88
Scrub	0.33	9.91	8.55					885.05	0.72	1.16			905.72
Waterbody- Streams/River									50.49				50.49
Waterbody – Ponds									0.59	119.86			120.45
Grand Total	55.25	145.34	1744.89	199.64	384.41		3.51	885.05	59.08	135.40			3612.57

- 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 22 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T4.
- In T4 15 ha of the agriculture area has increased from plantation and scrubland of T3, and overall 12 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	
T4												
Built up	55.25										55.25	
Mining/dump		145.34									145.34	
Agriculture		0.65	1744.24								1744.89	
Plantation Horticulture			15.62	184.03							199.64	
Forest					384.41						384.41	
Forest Plantation												
Barren Rocky							3.51				3.51	
Scrub		2.53	0.91					881.61			885.05	
Waterbody- Streams/River									59.08		59.08	
Waterbody – Ponds										135.40	135.40	
Grand Total	55.25	148.52	1760.76	184.03	384.41		3.51	881.61	59.08	135.40	3612.57	

- 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 0.6 ha of the agriculture area has decreased and it is converted into Built-up area in T5.
- In T5 16 ha of the agriculture area has increased from plantation and scrubland of T4, and overall 15 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 33 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 53, 15 & 15 Hectares From T1 to T2, T2-T3 & T4-T5 respectively and overall increase of 59 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a decrease of 144 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (2) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (2) verified from the portal.