

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -10/2010-11

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

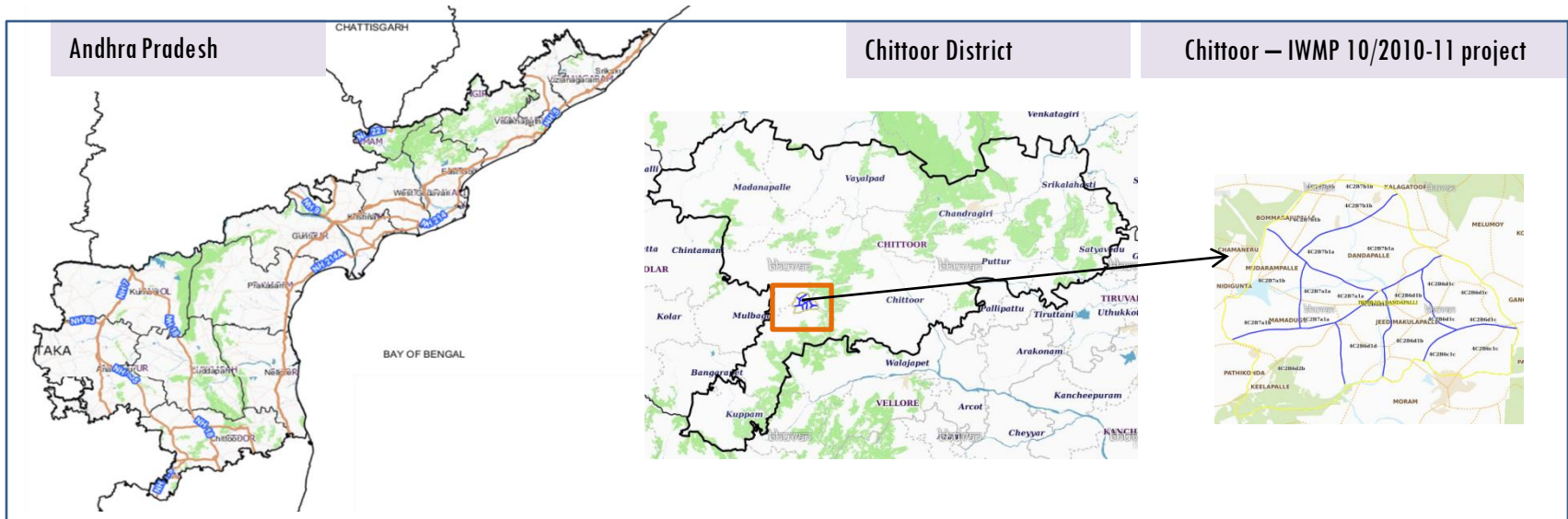
E X E C U T I V E S U M M A R Y

- 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-10/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 6,805 ha. It comprises of 9 micro watersheds.
- In the project area 313 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 29 ha increase in the area.
- Major percentage i.e. 67 % is covered by the agriculture, 8 is covered by water body, 6 % is covered by plantation and 6 % is covered by forest and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-10/2010-11

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Gangavaram Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 6,805 ha. It comprises of 9 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.

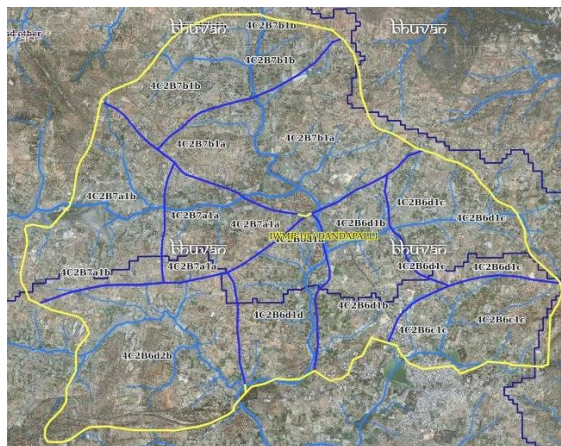
Satellite Data and Ancillary Data

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	313
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

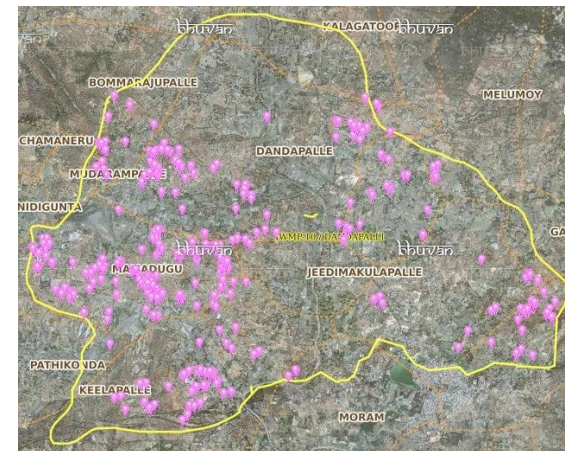


MWS Boundary



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	111	85
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	8	8
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	197	160
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)	0	0
16	Production system and micro-enterprises	35	20
17	Entry Point Activity (Cattle thought)	36	20
18	Others	27	20
	TOTAL	414	313

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-10/2010-11

2009-10



January-2014



Feb-2016



April-2018



Jan-2019



Activity : Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-10/2010-11



T0:2010-11



T1: 01 December 2015

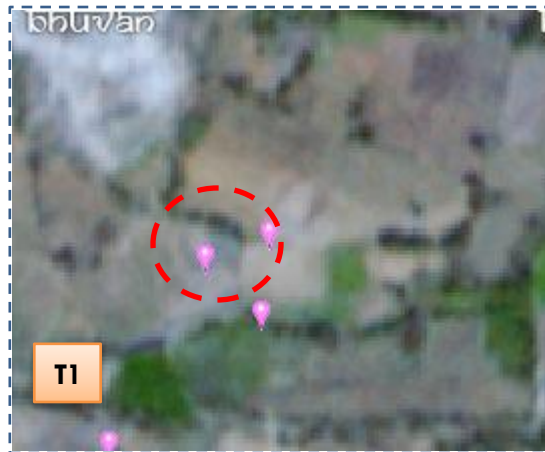


Drishti Sl no. 7043016 MWS :4C2B6d2b

Check dam



T0:2010-11



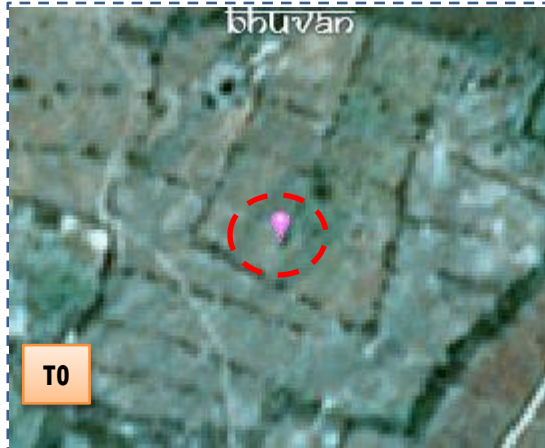
T1: 01 December 2015



Drishti Sl no. 633482 MWS : 4C2B6d2b

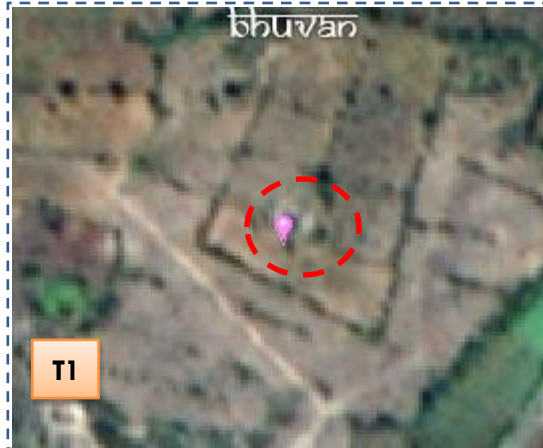
Water harvesting structure

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-10/2010-11



T0

T0: 2010-11



T1

T1: 01 December 2015



Drishti Sl no. 2522164 MWS : 4C2B7b1a

Water harvesting structure



T0

T0: 2010-11



T1

T1: 01 December 2015

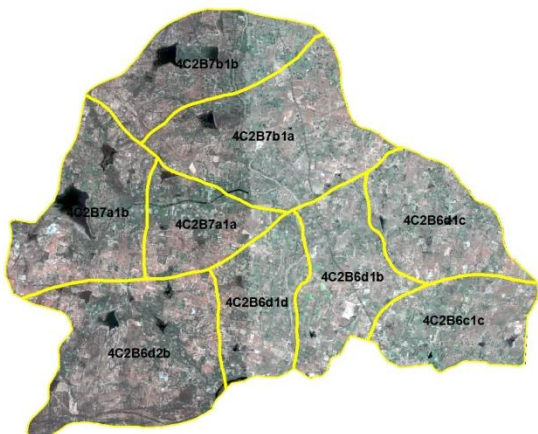


Drishti Sl no. 2498458 MWS : 4C2B7b1a

Water harvesting structure

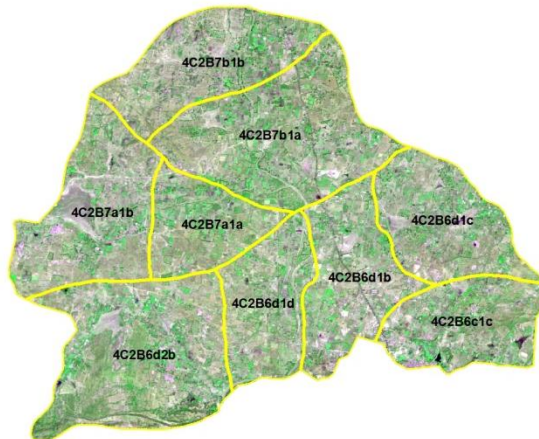
Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2010-11



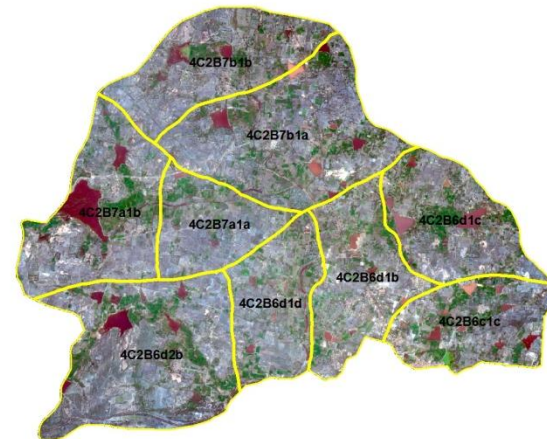
Source:Fusion data,NRSC

Natural Color Composite- 07th January 2014



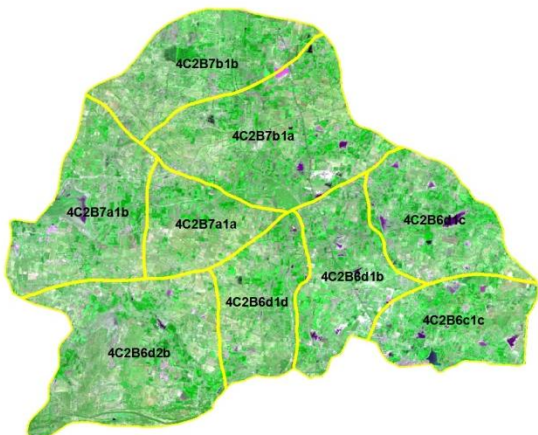
Source:LISS-IV,NRSC

Natural Color Composite- 02nd February 2016



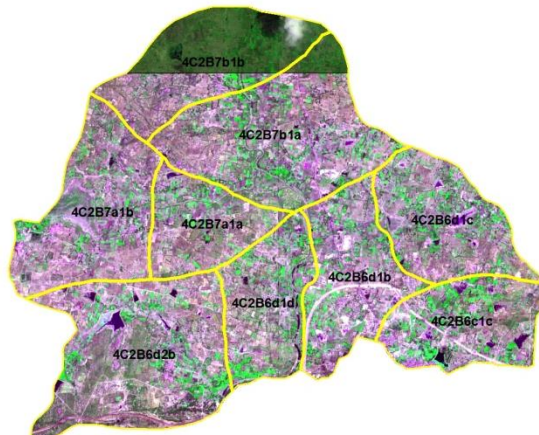
Source:NCC,NRSC

Natural Color Composite- 18th October 2016



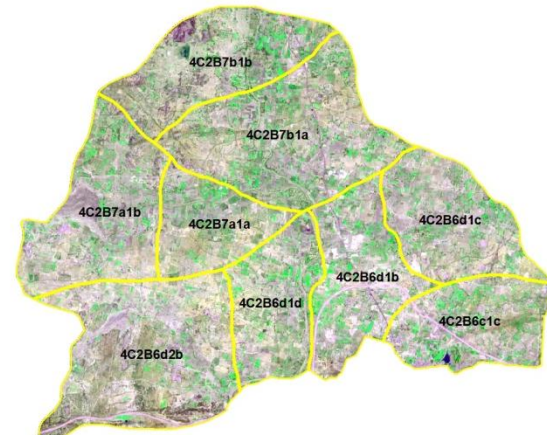
Source:LISS-IV,NRSC

Natural Color Composite- 22nd February 2018



Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019



Source:Sentinel,NRSC

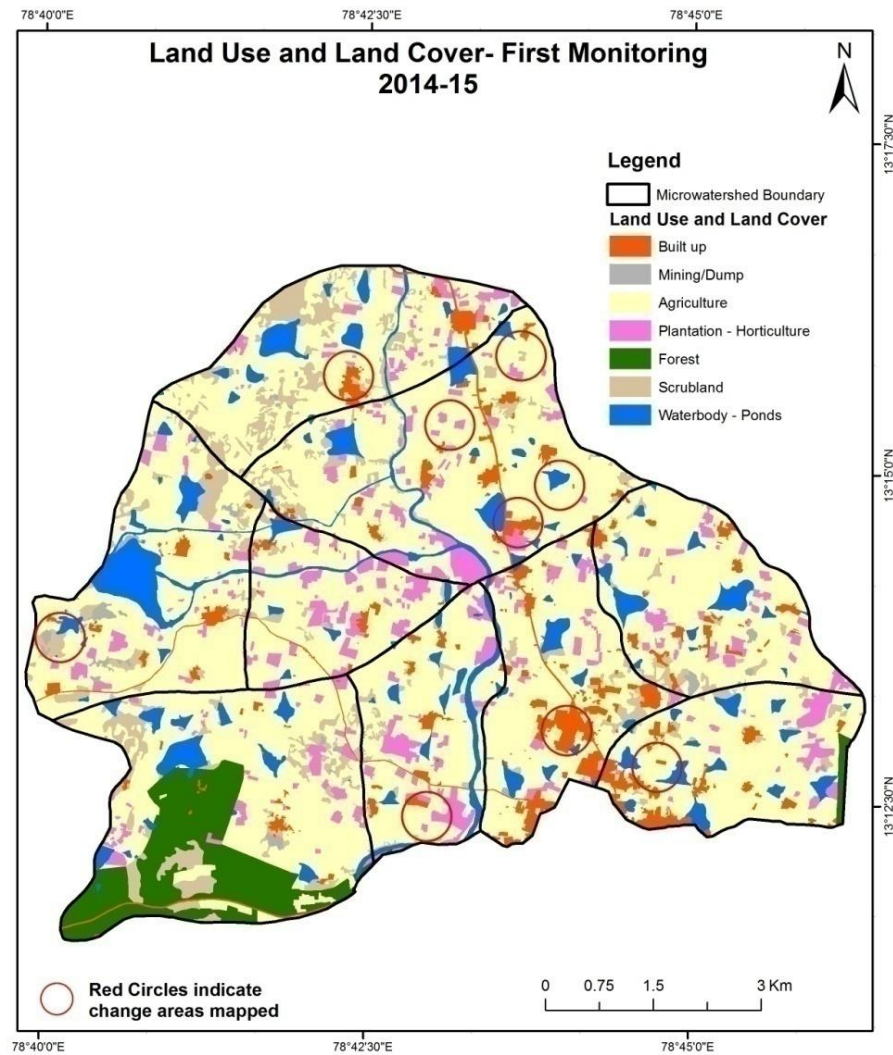
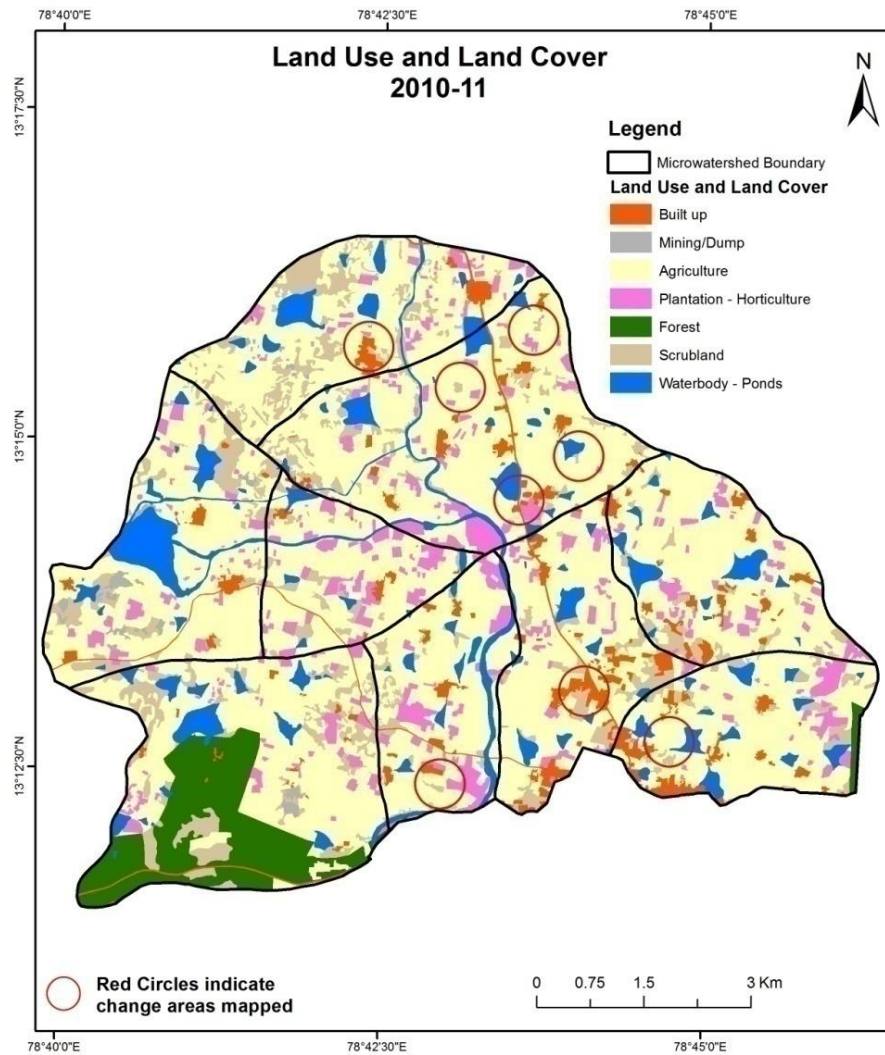
MONITORING IN THE PROJECT AREA

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)

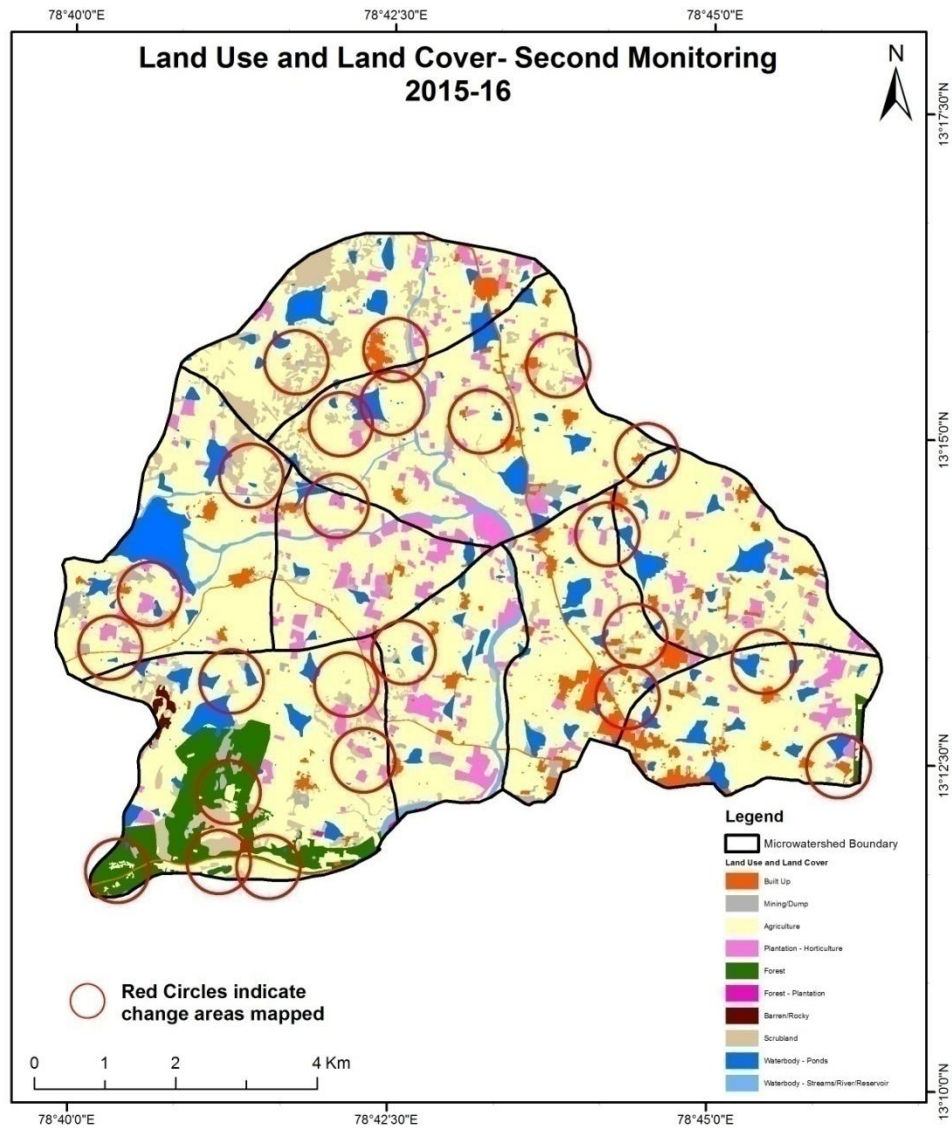
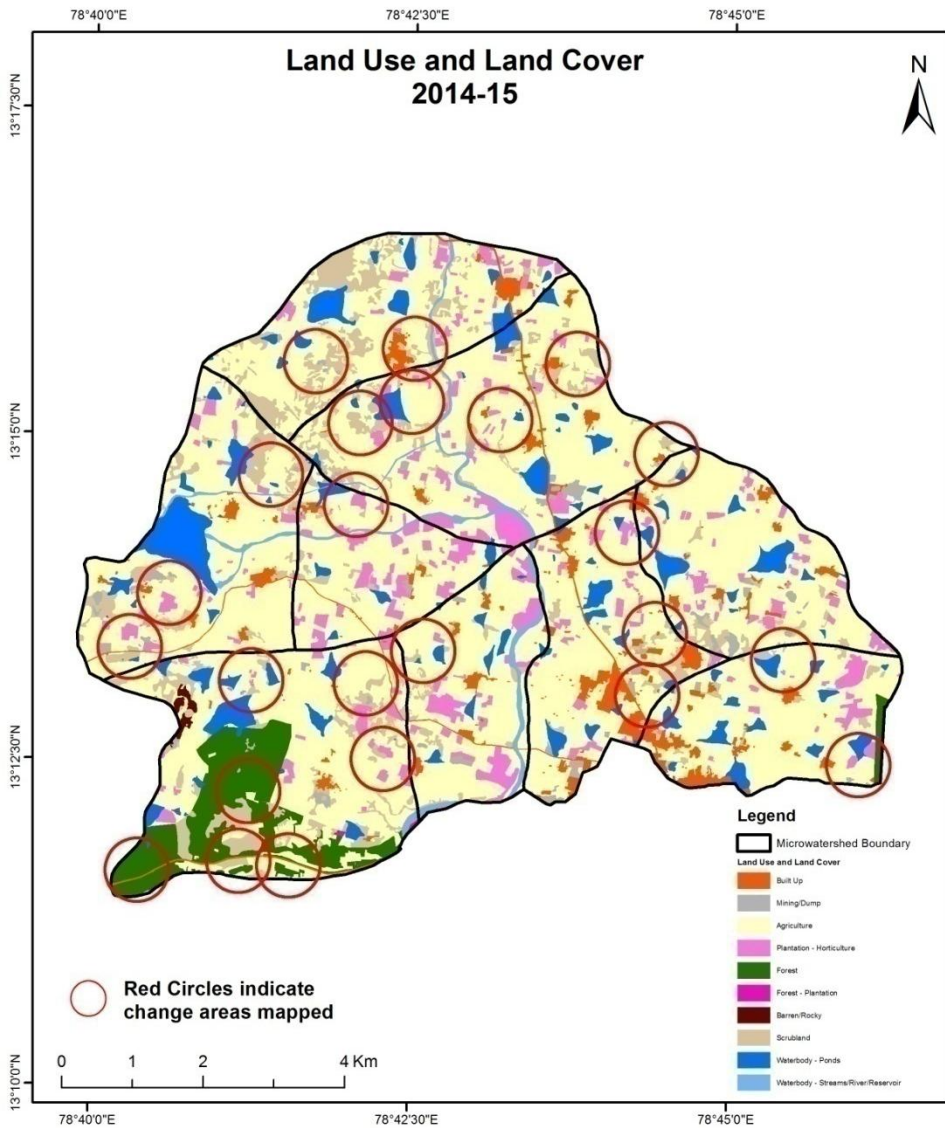
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



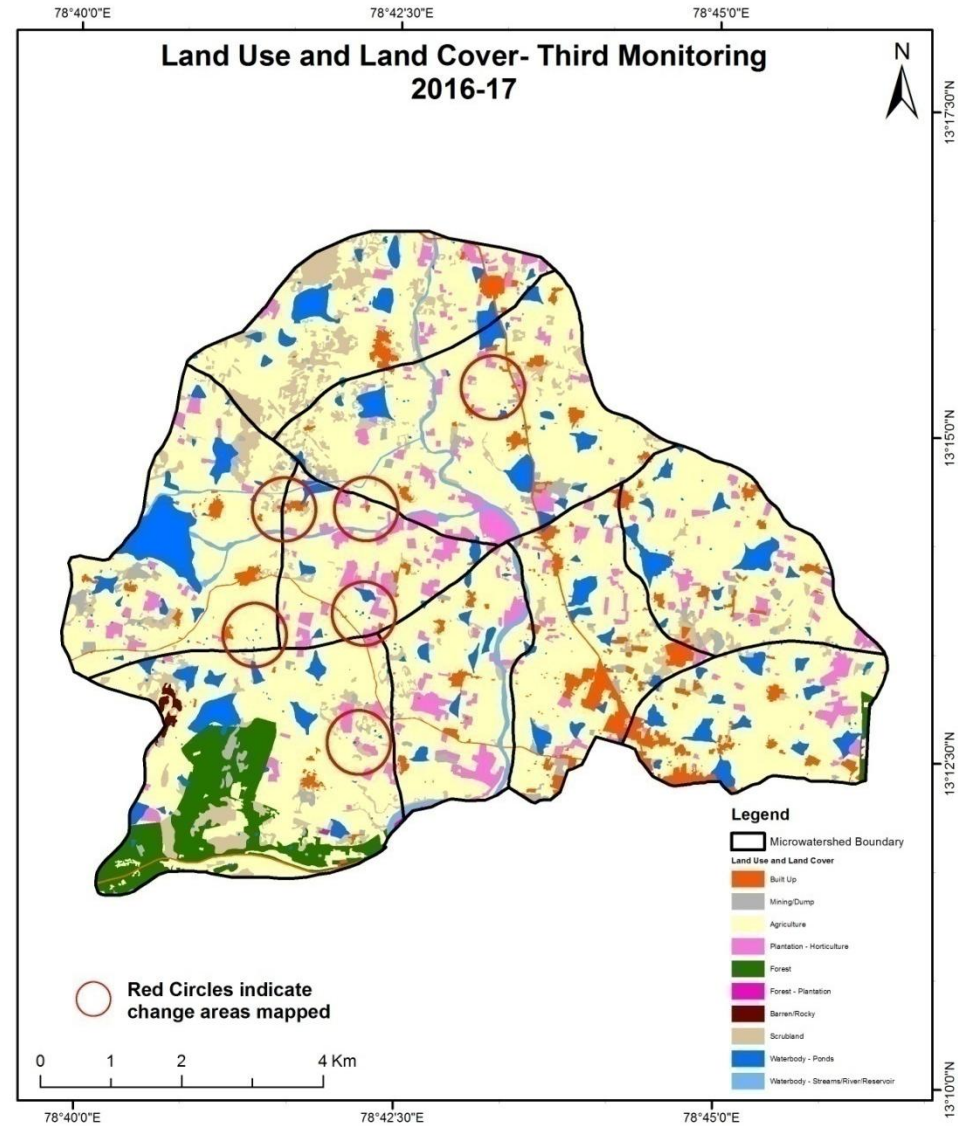
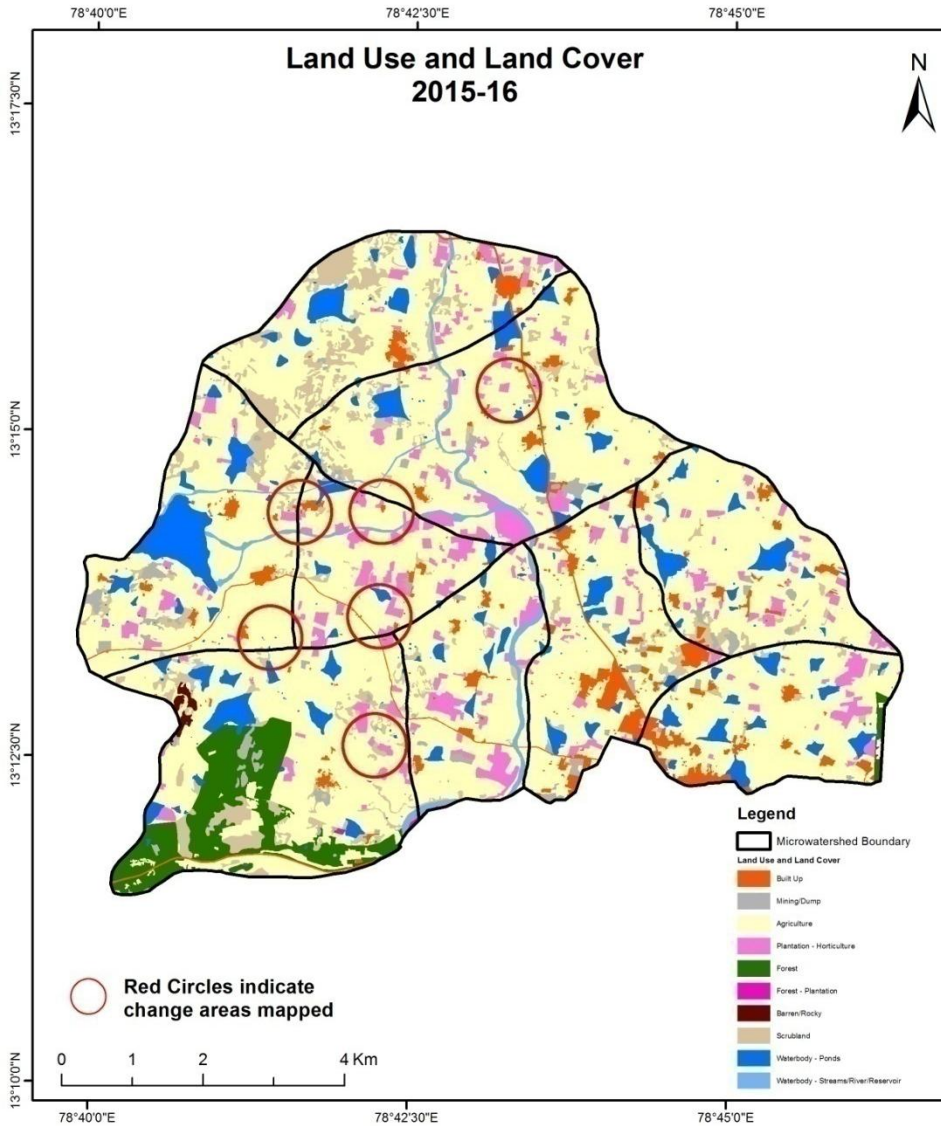
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



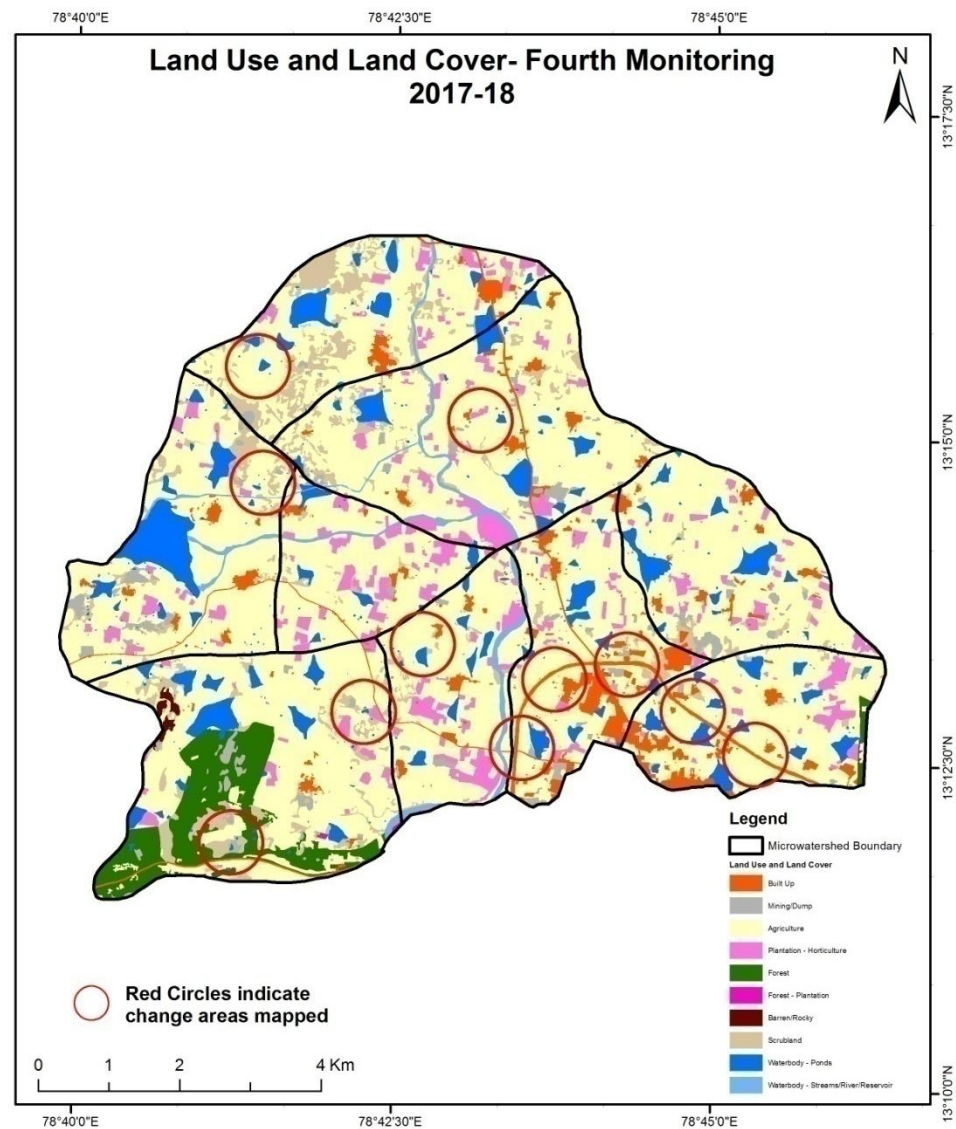
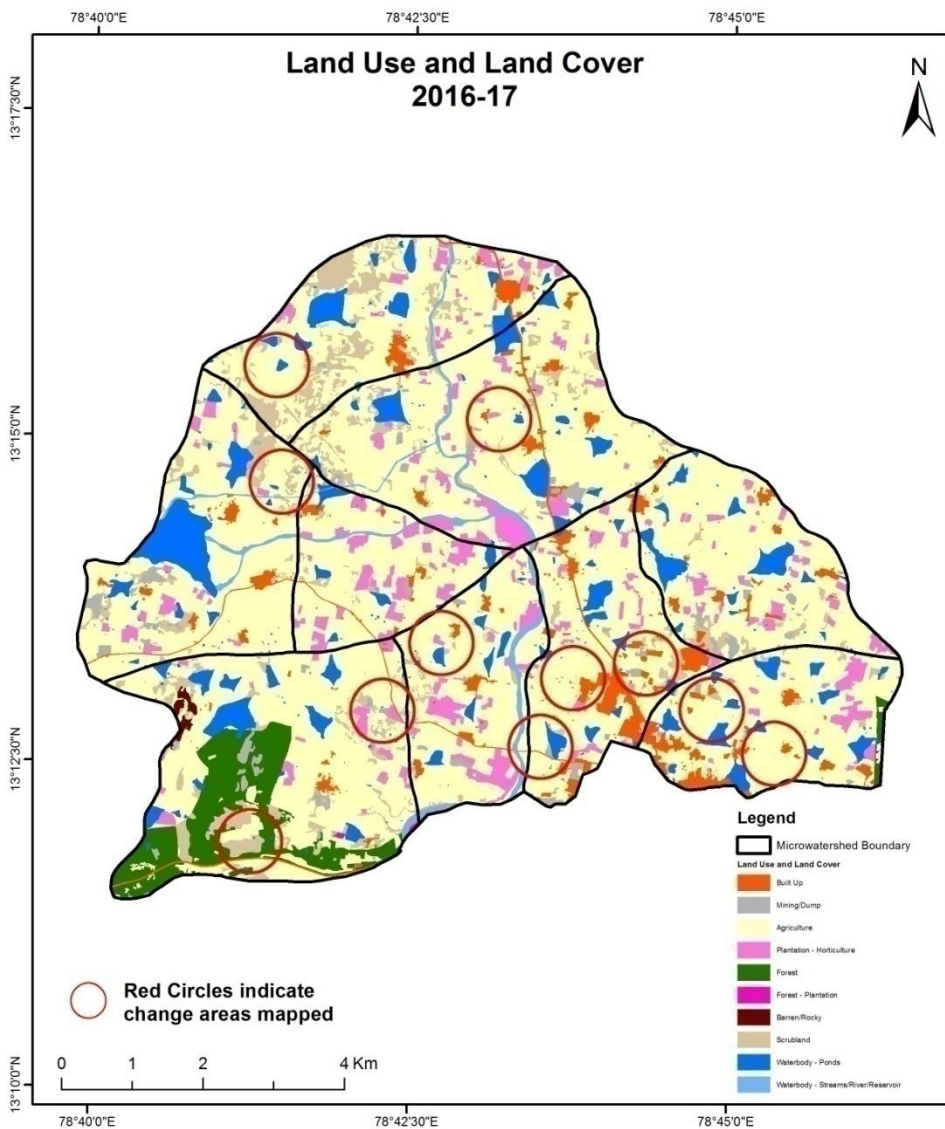
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



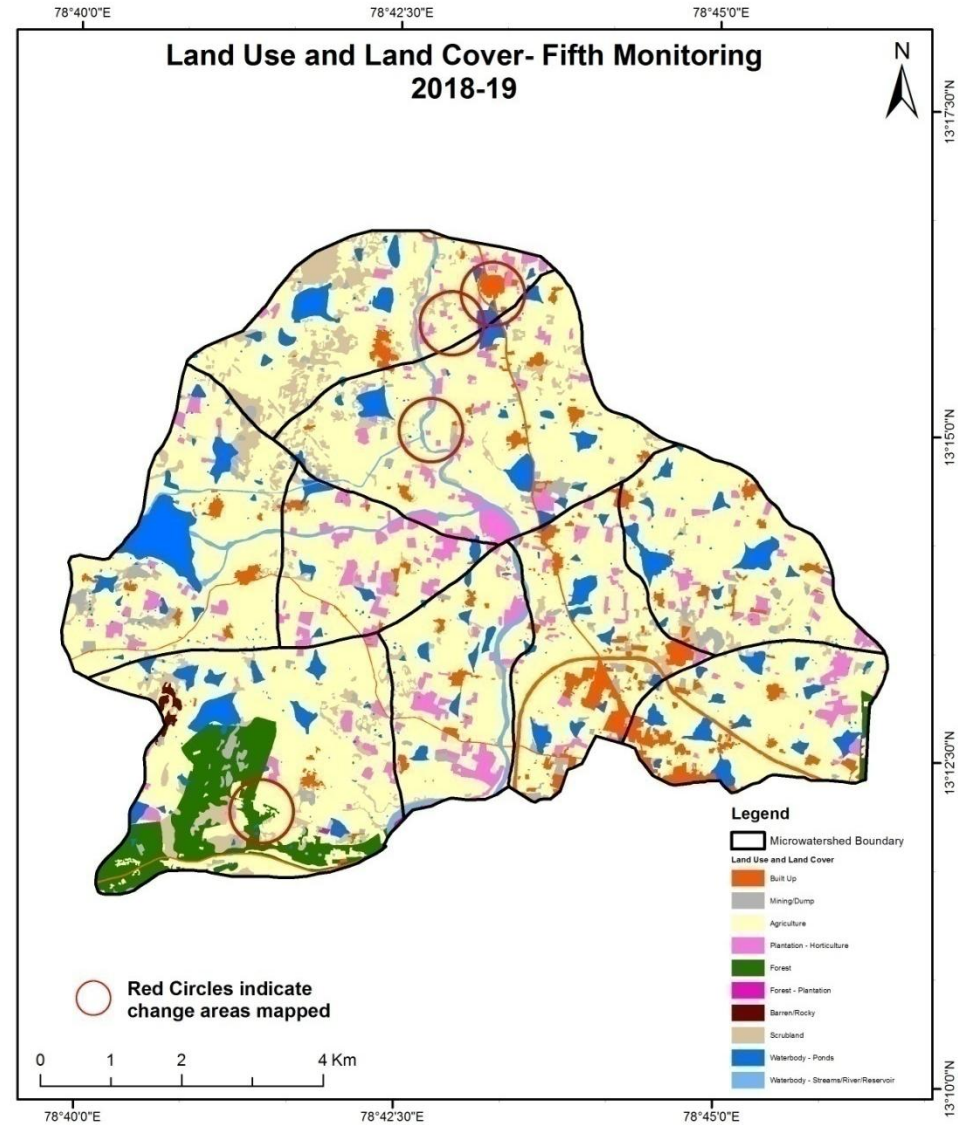
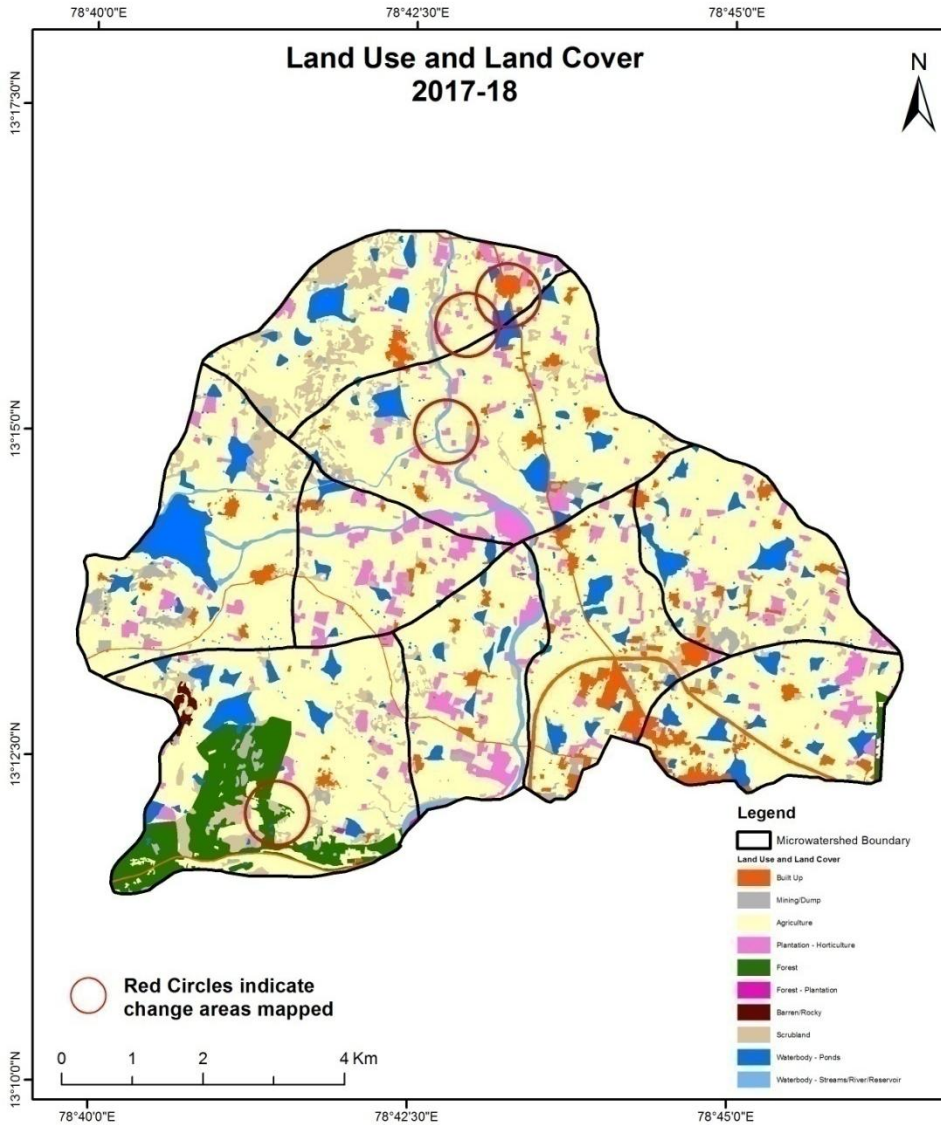
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

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

Forest to Agriculture



T2: 2015-16 (78°41'1.335"E 13°11'55.834"N)



T3: 18 October 2016

Agriculture to Water body



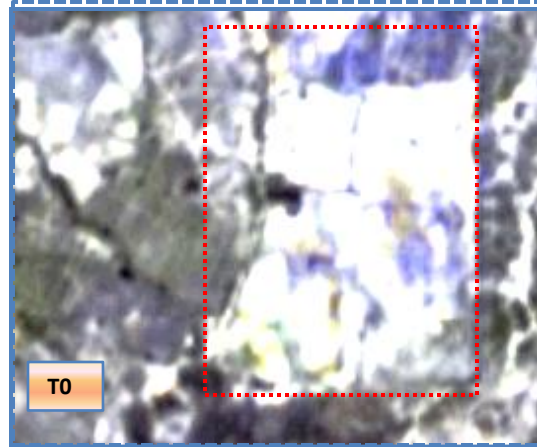
T2: 2015-16 (78°42'11.268"E 13°13'37.808"N)



T3: 18 October 2016

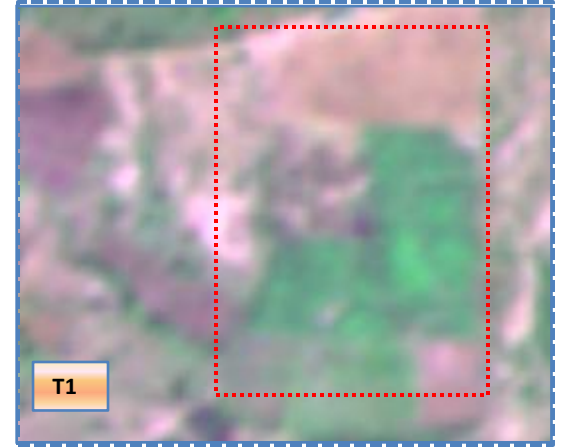
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0

T0: 2010-11



T1

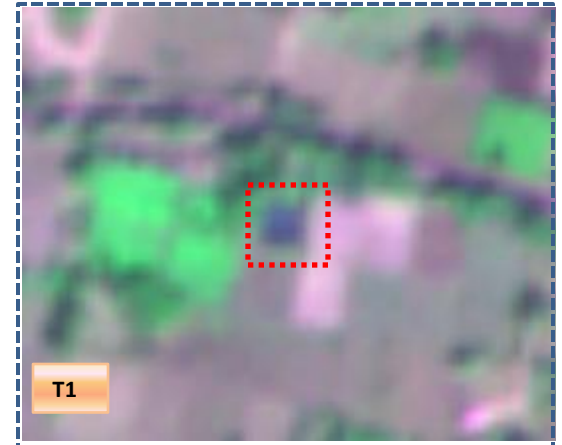
T1: 01 December 2015

Agriculture to Water body



T0

T0: 2010-11



T1

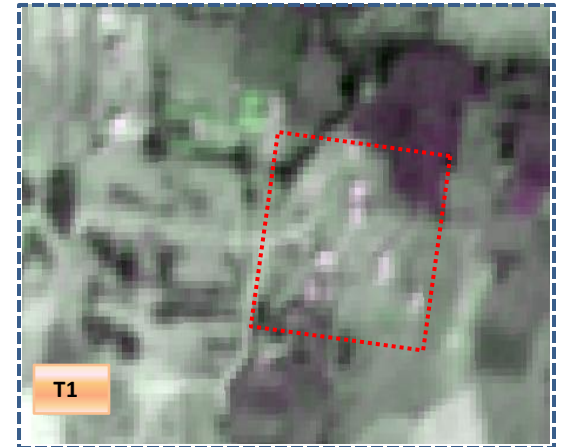
T1: 01 December 2015

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

Scrub to Built-up



T0: 2010-11



T1: 01 December 2015

Agriculture to Built-up



T0: 2010-11



T1: 01 December 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	251.23												251.23
Mining/dump		93.54											93.54
Agriculture	20.12	1.29	4281.91	5.26							0.93		4309.52
Plantation Horticulture	0.38		31.36	455.51							0.54		487.79
Forest			52.44		302.19								354.62
Forest Plantation						2.48							2.48
Barren Rocky							10.78						10.78
Scrub	15.24		132.49	1.54				583.34			1.32		733.93
Waterbody- Streams/River									96.19				96.19
Waterbody – Ponds			5.80								460.02		465.82
Grand Total	286.98	94.83	4503.99	462.31	302.19	2.48	10.78	583.34	96.19	462.82			6805.90

- 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 27 ha of the agriculture area has decreased and it is converted into Built-up, mining-dump, plantation and water body in T1.
- In T1 222 ha of the agriculture area has been increased from plantation, forest, scrubland and water bodies of T0, and overall 194 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	286.98												286.98
Mining/dump		94.80										0.03	94.83
Agriculture	16.97	2.11	4458.54	6.36								20.01	4503.99
Plantation Horticulture	0.54		33.75	427.73								0.29	462.31
Forest	0.54	11.41	20.56		269.09	0.04						0.53	302.19
Forest Plantation						2.48							2.48
Barren Rocky							10.78						10.78
Scrub	2.91	5.46	106.61					460.15				8.21	583.34
Waterbody- Streams/River									96.19				96.19
Waterbody – Ponds			1.53									461.29	462.82
Grand Total	307.94	113.78	4620.99	434.10	269.09	2.52	10.78	460.15	96.19	490.37			6805.90

- 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 45 ha of the agriculture area has decreased and it is converted into Built-up, mining-dump, plantation and water body in T2.
- In T2 162 ha of the agriculture area has been increased from plantation, forest, scrubland and water bodies of T1, and overall 117 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	307.94										307.94	
Mining/dump		113.78									113.78	
Agriculture	1.40	1.47	4614.06	3.30						0.76	4620.99	
Plantation Horticulture	0.17		8.42	425.37						0.13	434.10	
Forest	0.23	0.14	0.62		267.84					0.26	269.09	
Forest Plantation						2.48				0.04	2.52	
Barren Rocky							10.78				10.78	
Scrub	0.16	0.26						459.64		0.08	460.15	
Waterbody- Streams/River									96.19		96.19	
Waterbody – Ponds										490.37	490.37	
Grand Total	309.91	115.66	4623.10	428.67	267.84	2.48	10.78	459.64	96.19	491.63	6805.90	

- 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 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 09 ha of the agriculture area has been increased from plantation and forest of T2, and overall 02 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	309.91												309.91
Mining/dump		115.07									0.59		115.66
Agriculture	37.04	6.11	4570.78	7.62							1.54		4623.10
Plantation Horticulture	0.09		7.13	421.42							0.03		428.67
Forest		1.42			266.08						0.33		267.84
Forest Plantation						2.48							2.48
Barren Rocky							10.78						10.78
Scrub	1.50	20.22	0.94					434.89			2.09		459.64
Waterbody- Streams/River									96.19				96.19
Waterbody – Ponds	0.45										491.18		491.63
Grand Total	348.99	142.83	4578.85	429.04	266.08	2.48	10.78	434.89	96.19	495.76			6805.90

- 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 52 ha of the agriculture area has decreased and it is converted into Built-up, mining-dump, plantation and water body in T4.
- In T4 08 ha of the agriculture area has been increased from plantation and scrubland of T3, and overall 44 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										
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	348.99										348.99
Mining/dump		142.83									142.83
Agriculture	3.33	0.43	4575.04							0.06	4578.85
Plantation Horticulture	0.26		21.09	407.69							429.04
Forest					266.08						266.08
Forest Plantation						2.48					2.48
Barren Rocky							10.78				10.78
Scrub	0.04	0.82	7.86					426.17			434.89
Waterbody- Streams/River									96.19		96.19
Waterbody – Ponds	0.68									495.08	495.76
Grand Total	353.30	144.08	4603.98	407.69	266.08	2.48	10.78	426.17	96.19	495.14	6805.90

- 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 03 ha of the agriculture area has decreased and it is converted into Built-up, mining-dump, plantation and water body in T5.
- In T5 28 ha of the agriculture area has been increased from plantation and scrubland of T4, and overall 25 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 29 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 194, 117, 02 & 25 Hectares From T0 to T1, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 294 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 307 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.