MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -27/2010-11
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

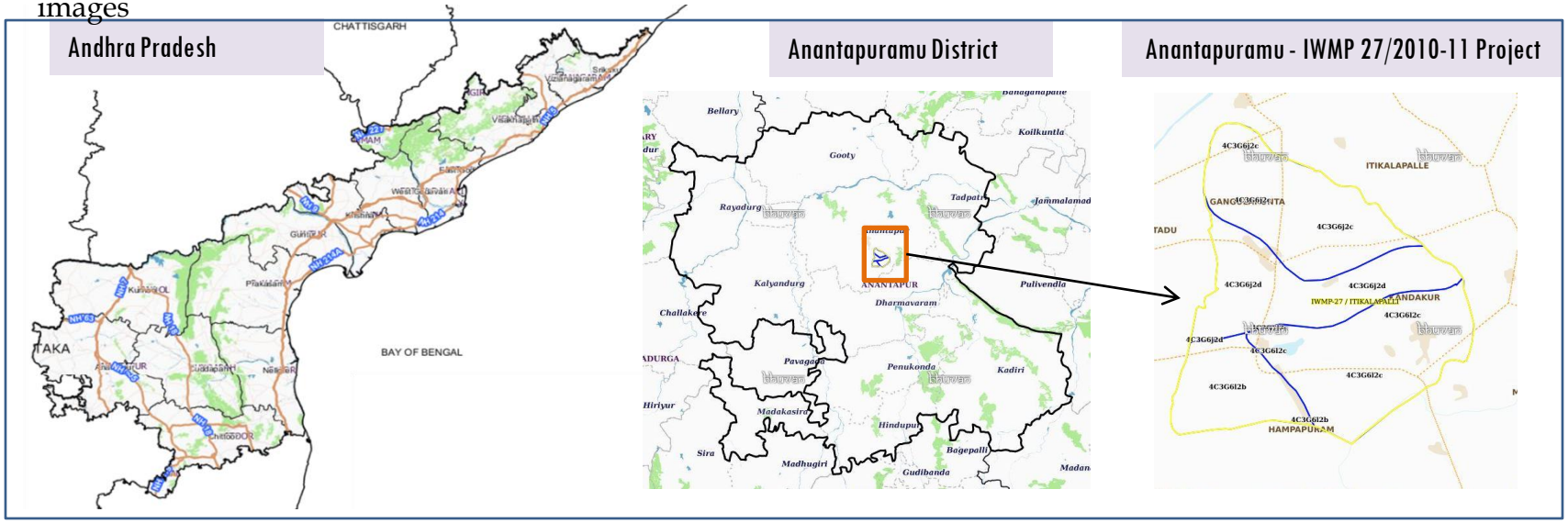
CONTENTS

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-27/2010-11, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 4,714 ha. It comprises of 4 micro watersheds.
- In the project area 502 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an increase by 6 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 76 % is covered by the agriculture, 9 % is covered by built-up land, 6 % is covered by scrubland and remaining by other land use classes.

PROJECT : ANANTAPURAMU – IWMP-27/2010-11
DISTRICT : ANANTAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Anantapuramu Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 4,714 ha. It comprises of 4 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



- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .
- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Total annual rainfall is about 22 in (560 mm).
- Anantapuram district receives moderate to good rainfall from July to October month.

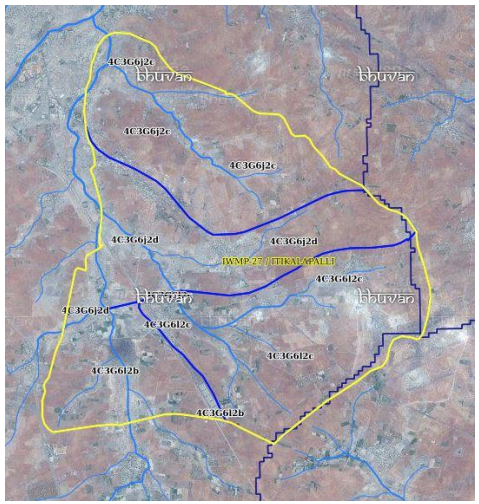
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			30-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			30-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	502
4	Detailed Project Report		

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



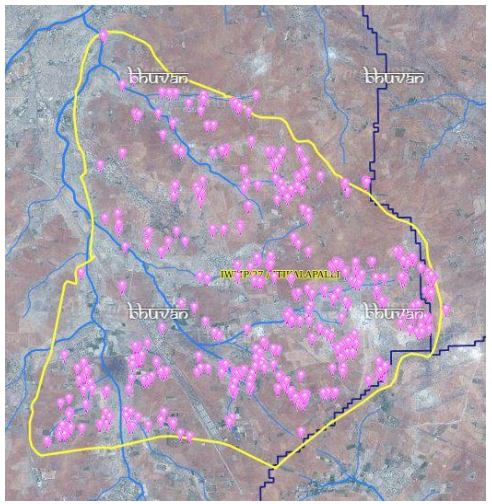
Legend

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	Afforestation	6	6
2	Agriculture/Horticulture	35	30
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	1	1
6	Terrace	0	0
7	Checks & Plugs	59	50
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	55	50
10	Civil work-Check dams/Rock fill dam	189	170
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	0	0
14	Livelihood Activities-Plantation/Horticulture	24	15
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	191	180
	TOTAL	**560**	**502**

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.

Anantapuramu–IWMP-27/2010-11

2009-10

Feb-2015

November-2016

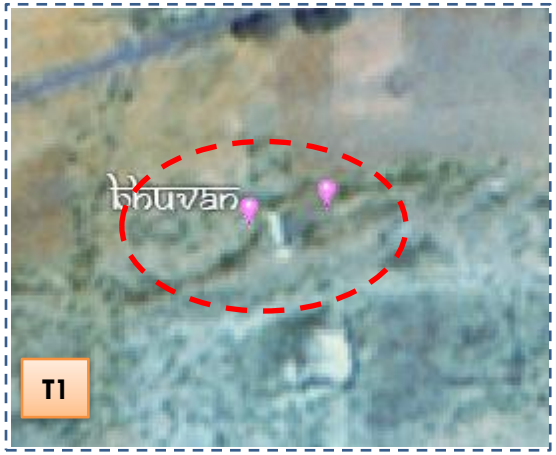
Jan-2017

Jan-2019

Activity : Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-27/2010-11

T0:2010-11



T1: 18 February 2015

Drishti SI no. 137320 MWS : 4C3C6I2c

Check dam

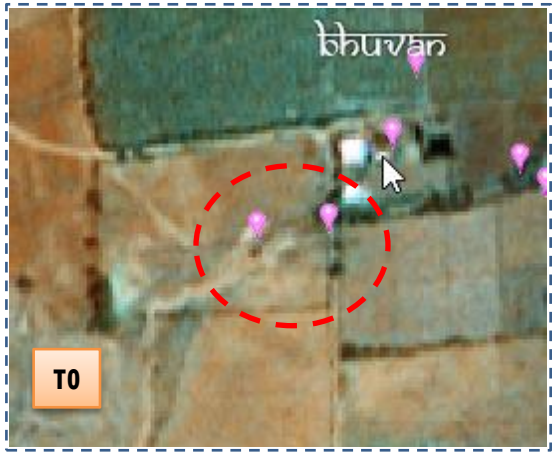
T0:2010-11

T1: 18 February 2015

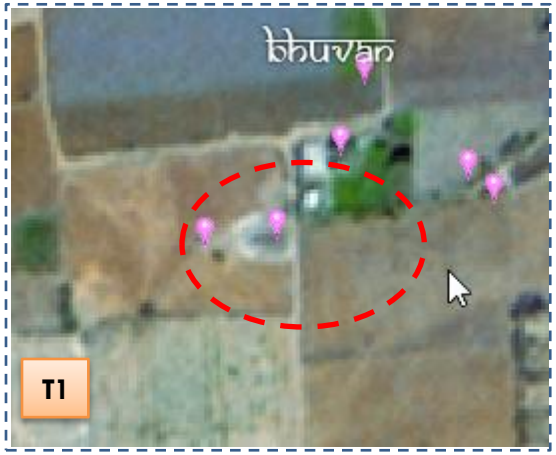
Drishti SI no. 137325 MWS : 4C3C6I2c

Dugout pit

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-27/2010-11



T0:2010-11

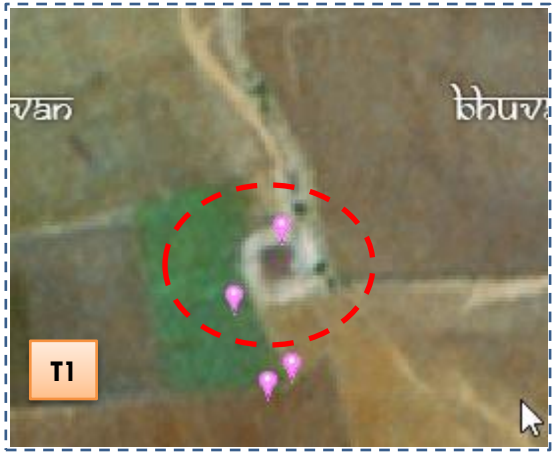


T1: 18 February 2015

Drishti Sl no. 137335 MWS : 4C3G6I2c

Dugout pit

T0:2010-11

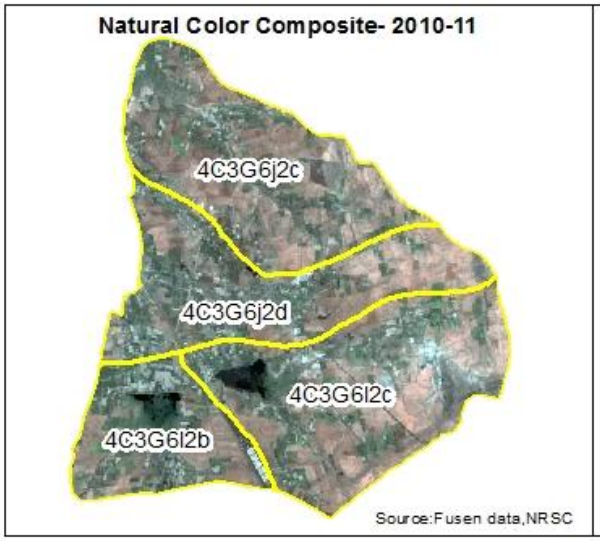


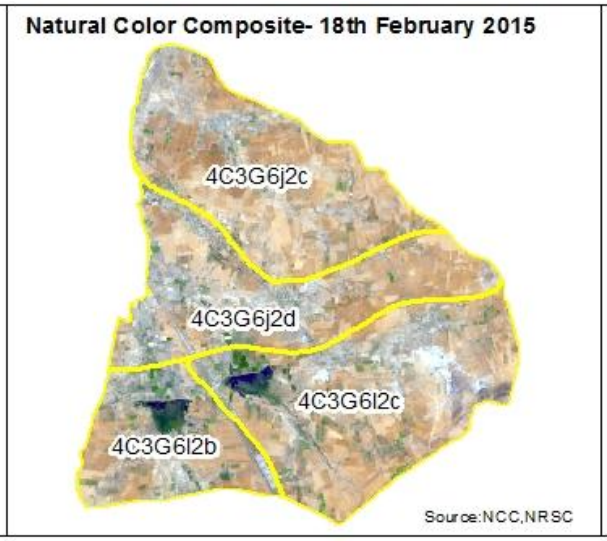
T1: 18 February 2015

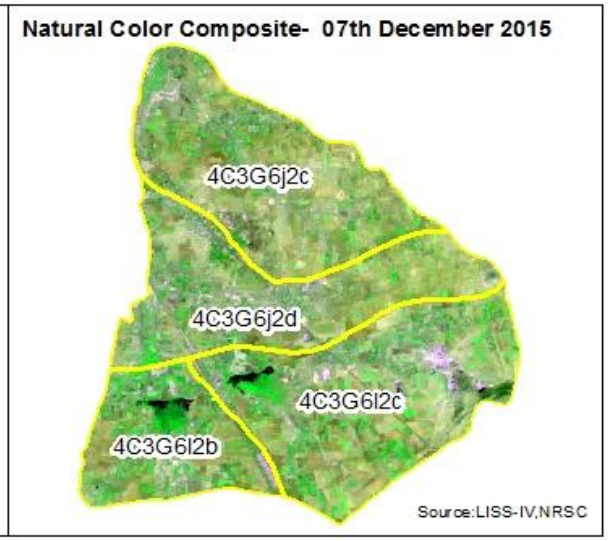
Drishti Sl no. 1895142 MWS : 4C3G6I2c

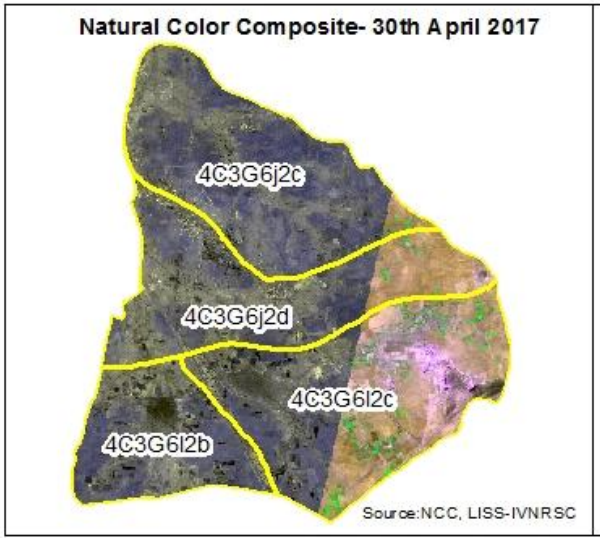
Farm pond

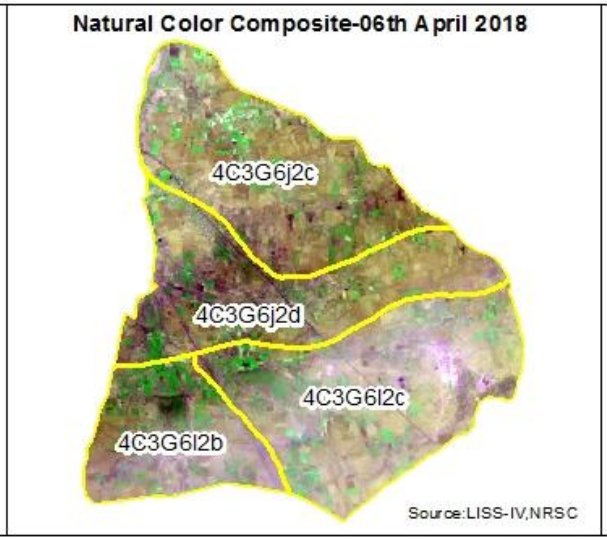
Natural Color Composite – 2010-11 to 2018-19

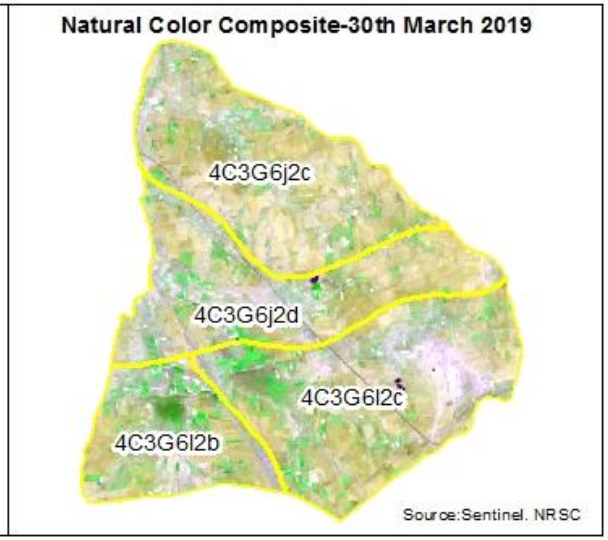












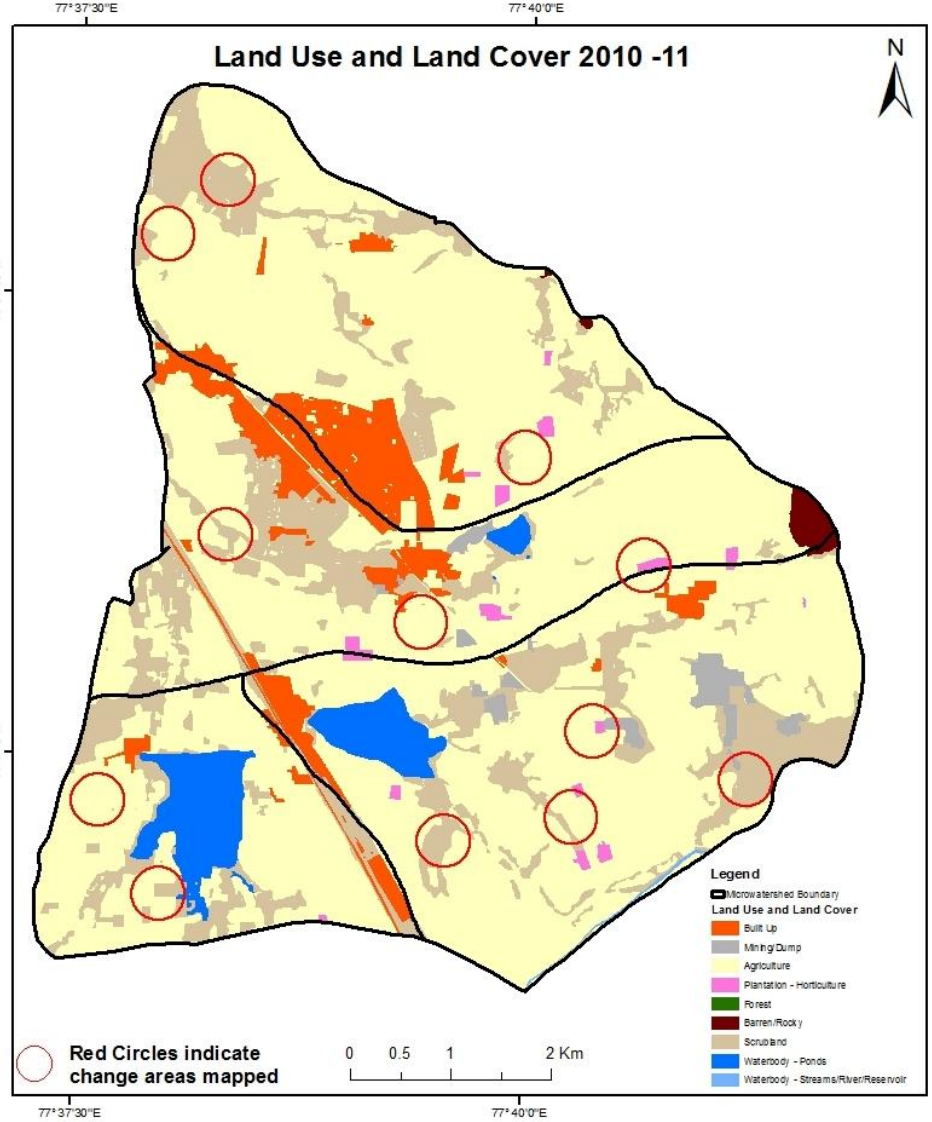
MONITORING IN THE PROJECT AREA

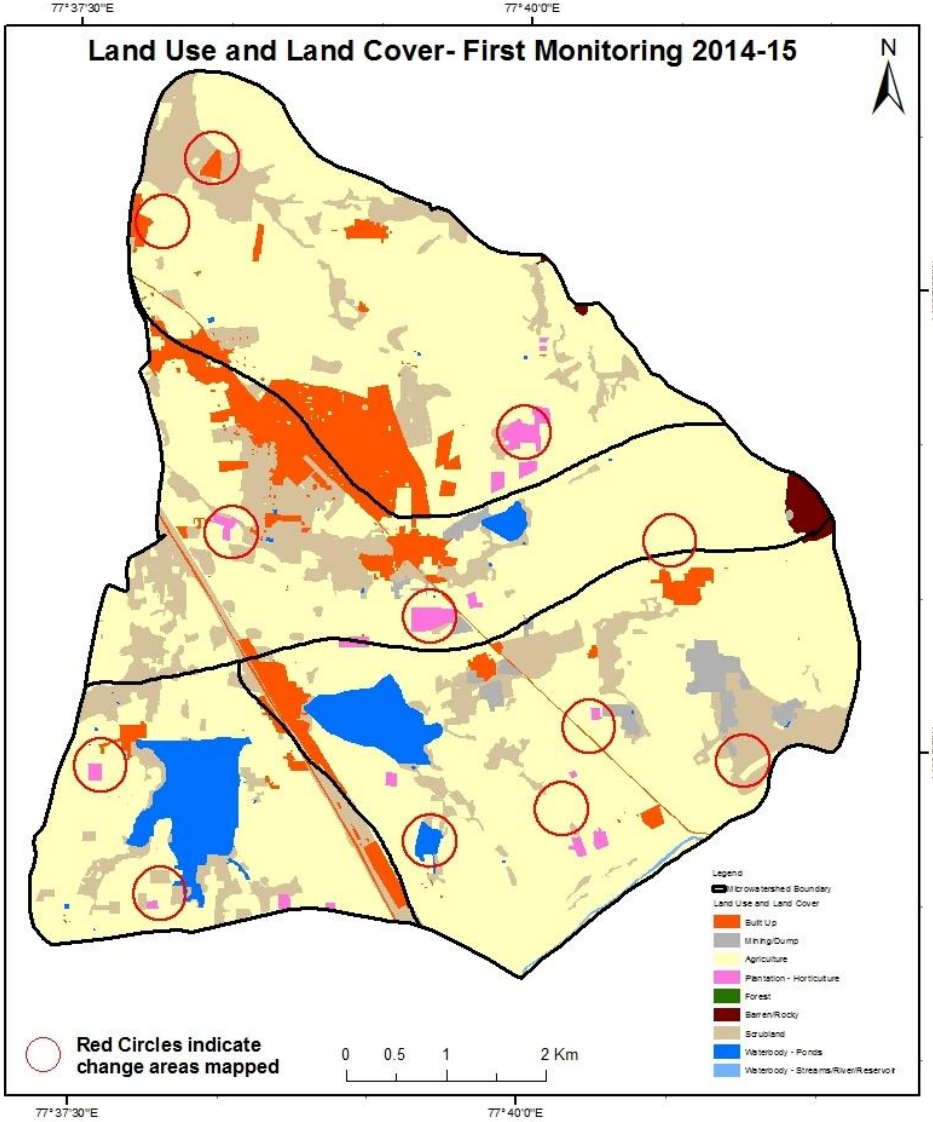
Land use and Land cover Changes in the Project

- Change in land use and land cover 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 (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)

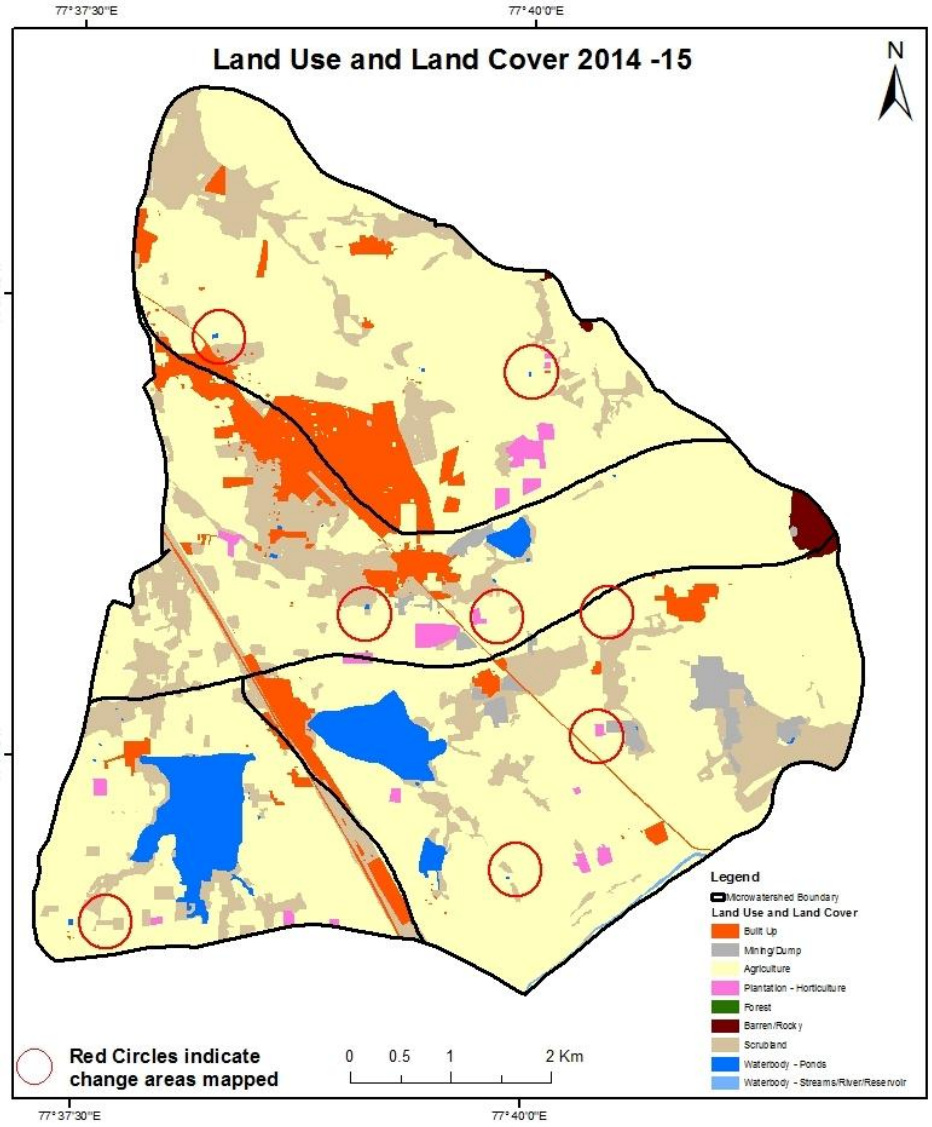
Scale: 1:10000

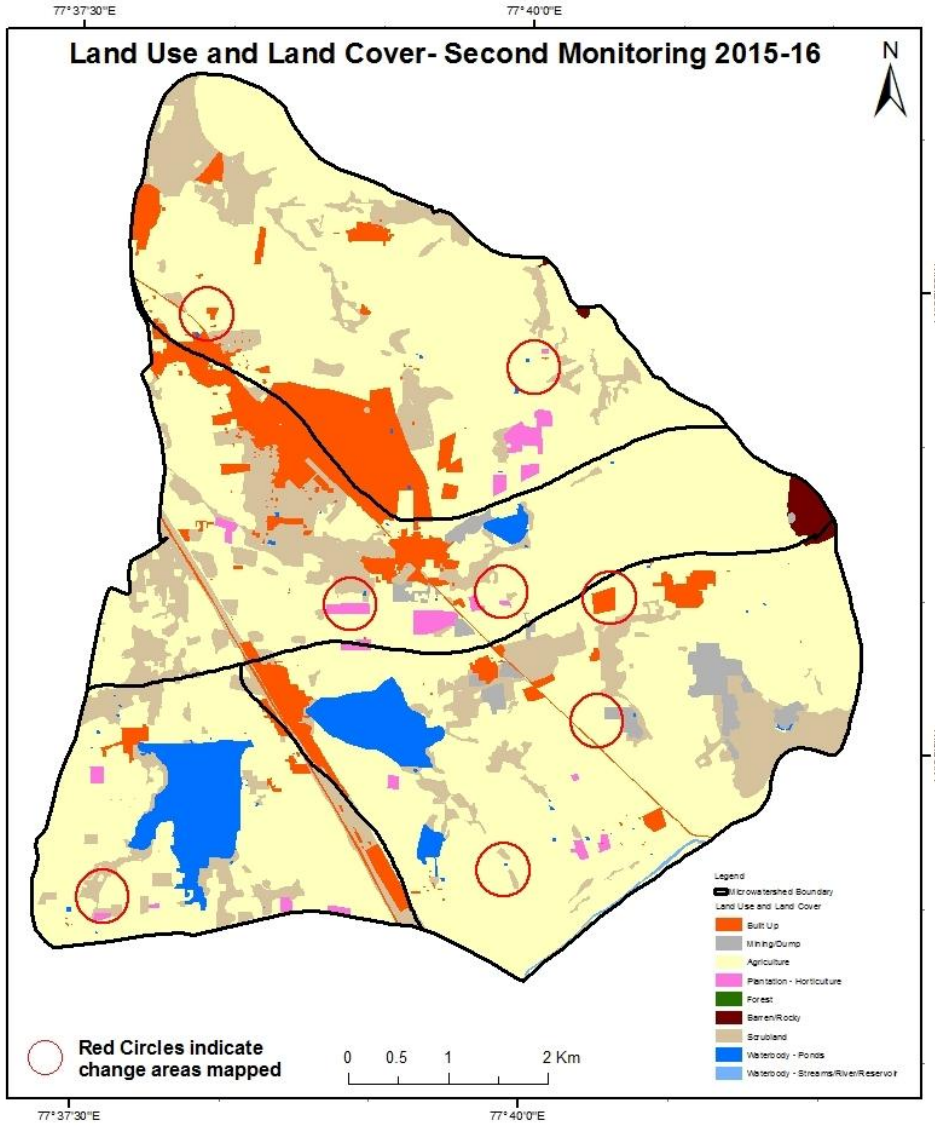




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

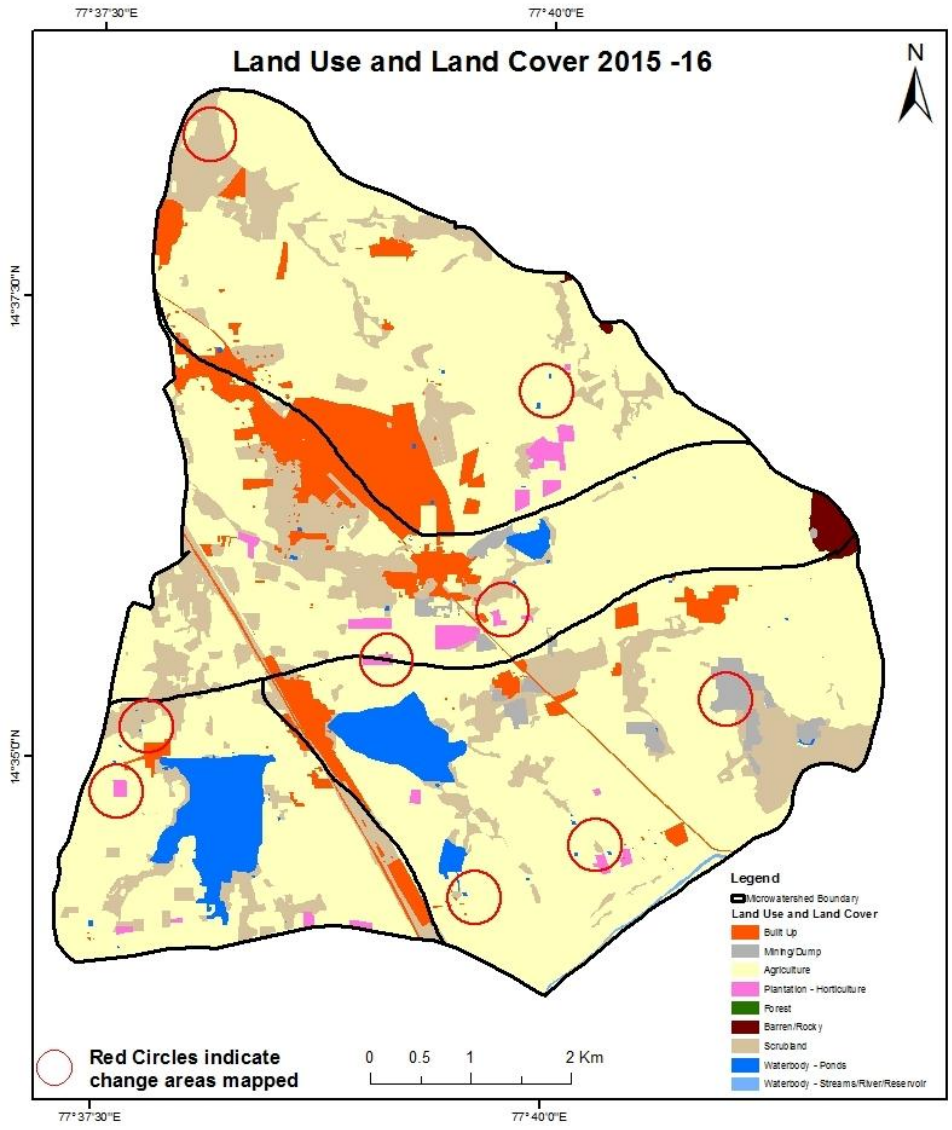
Scale: 1:10000

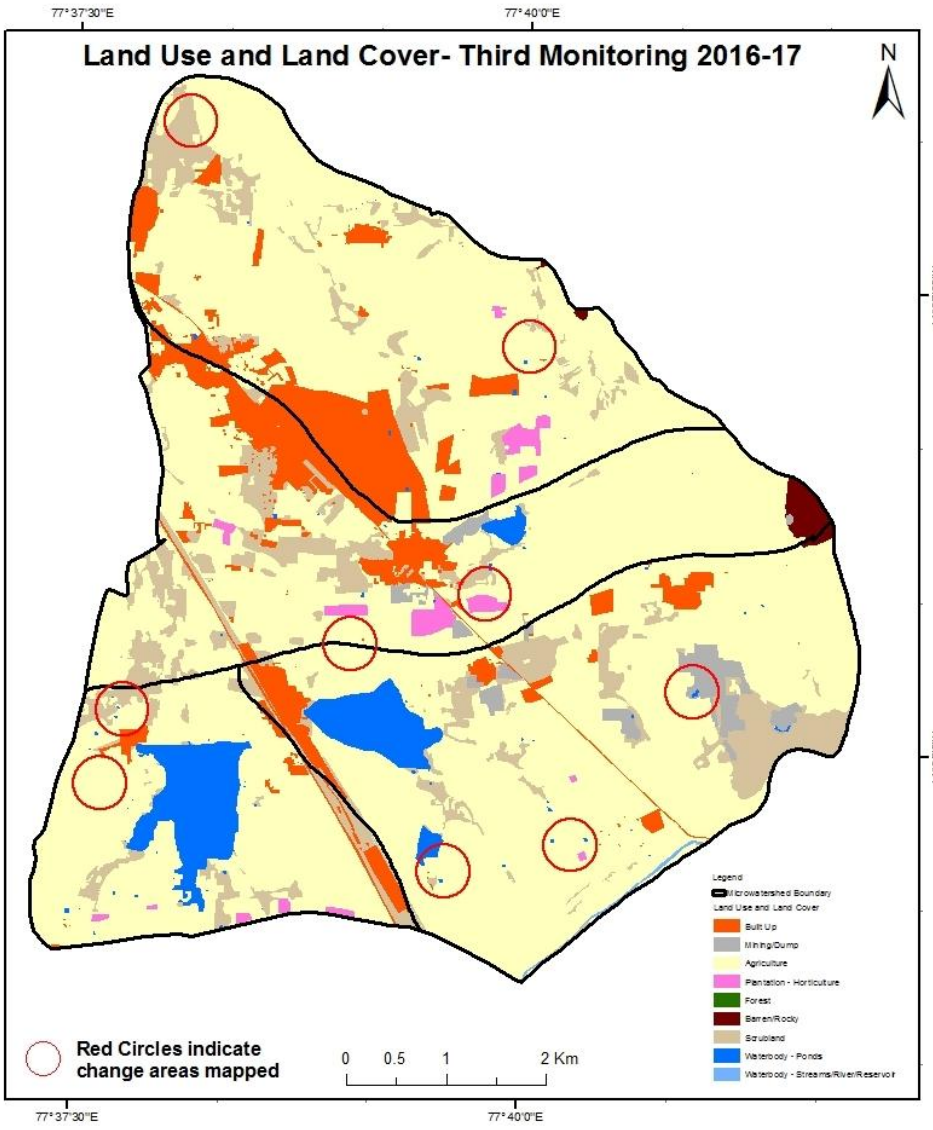




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

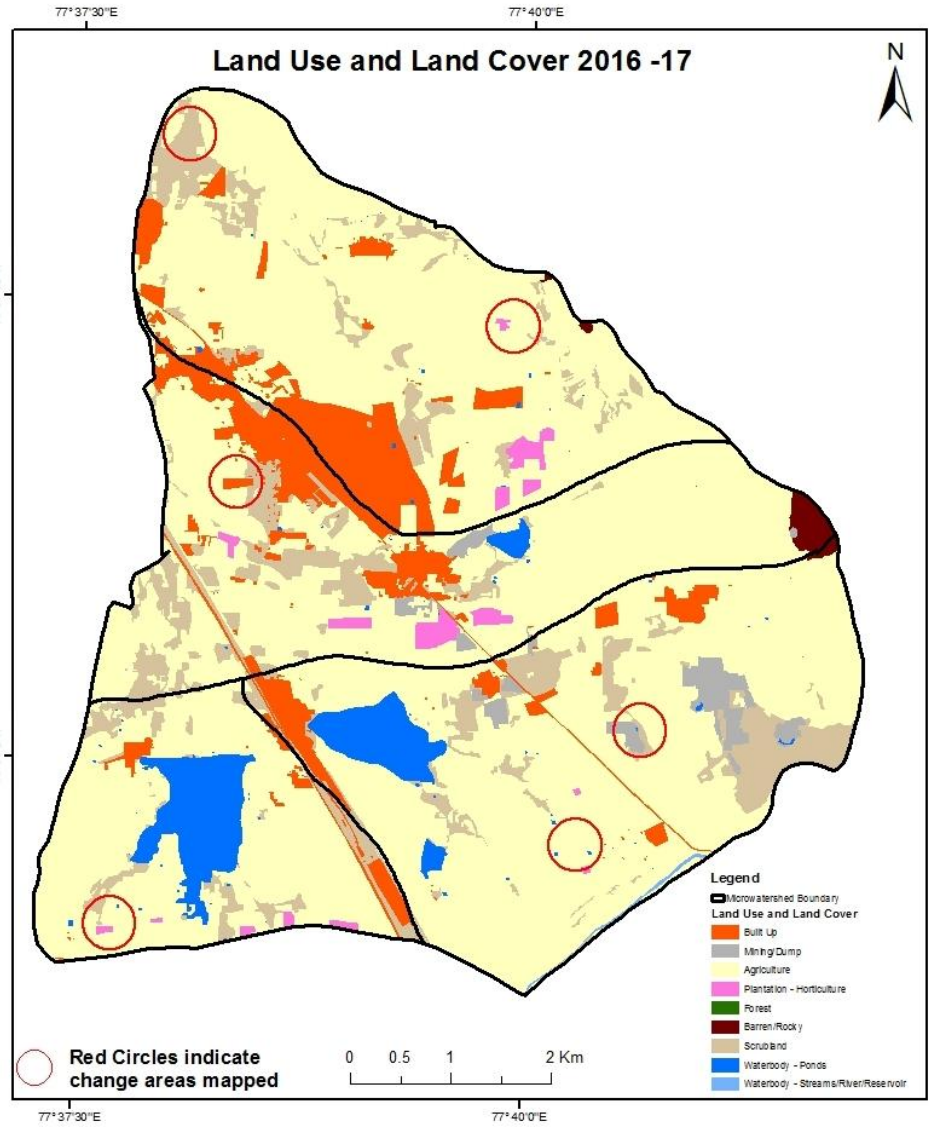
Scale: 1:10000

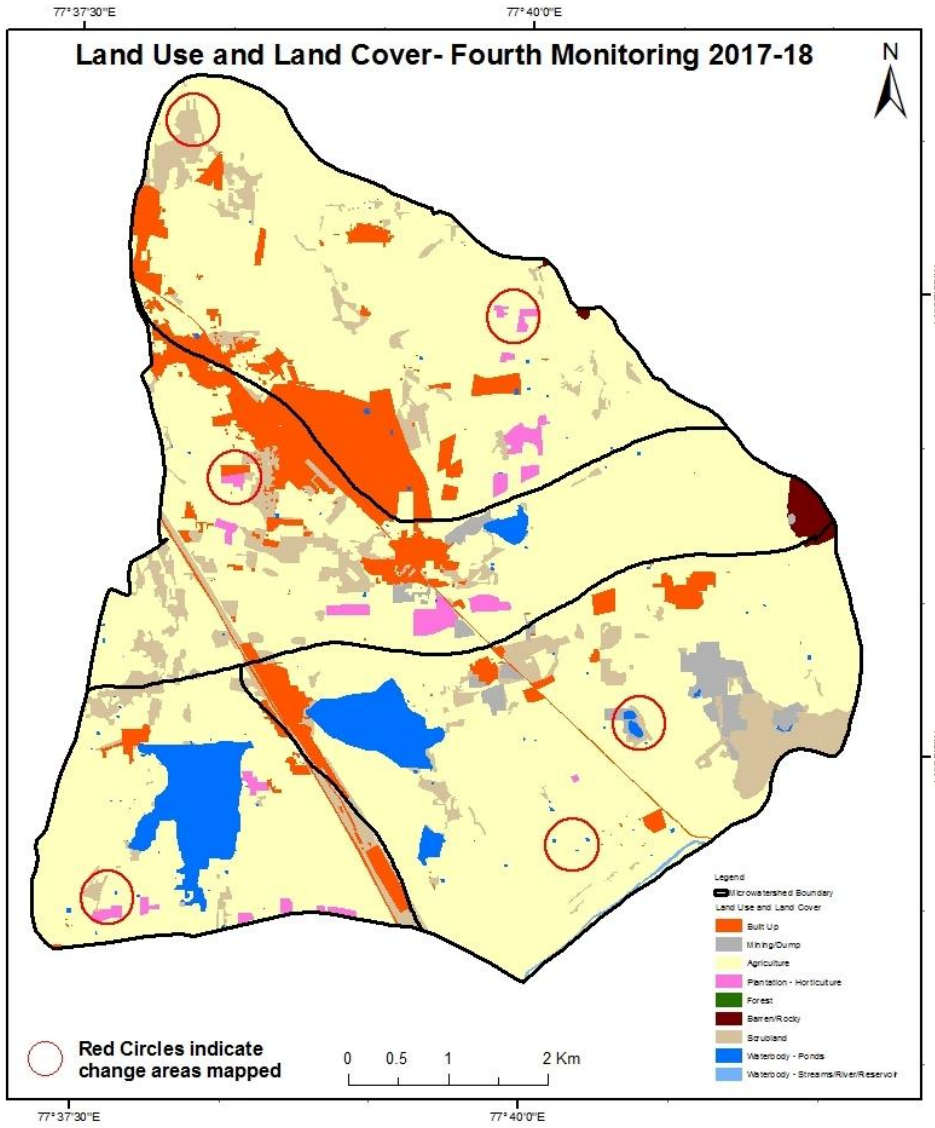




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

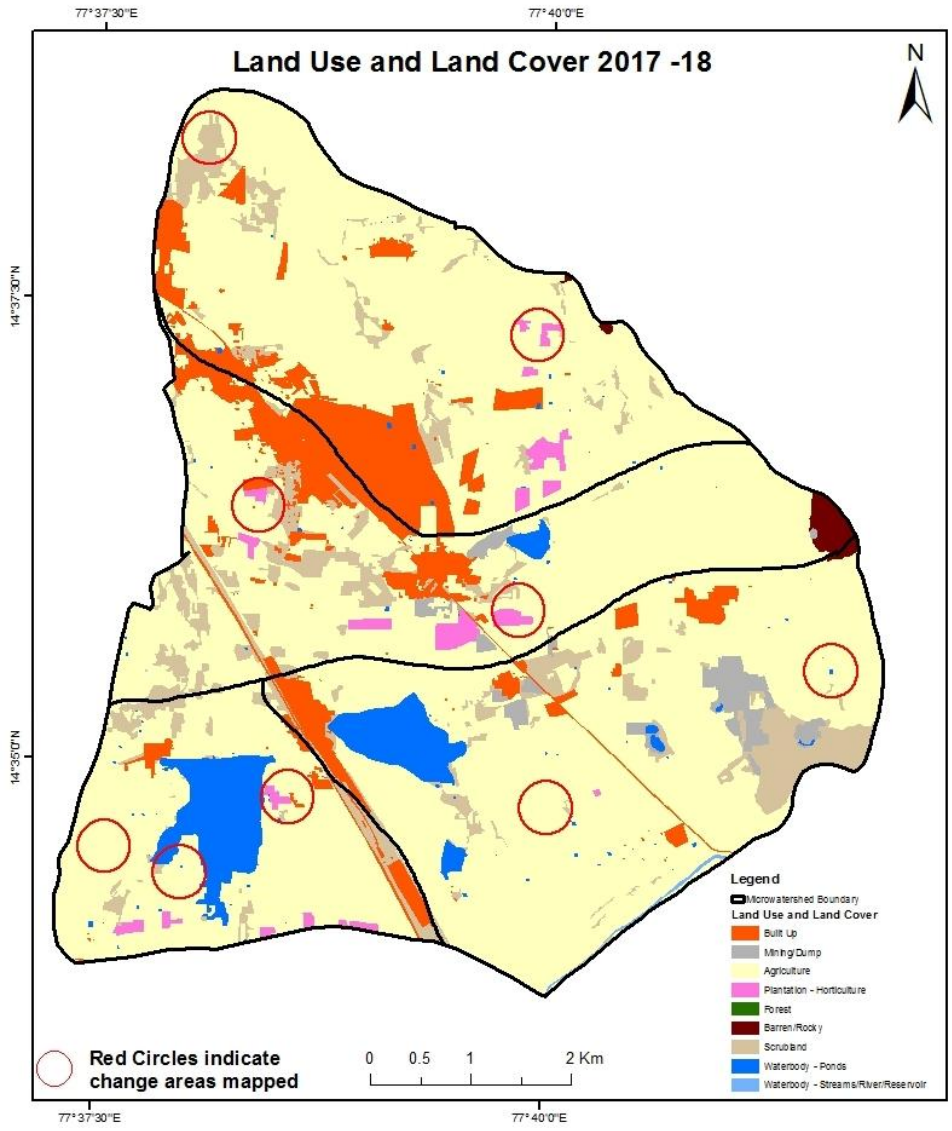
Scale: 1:10000

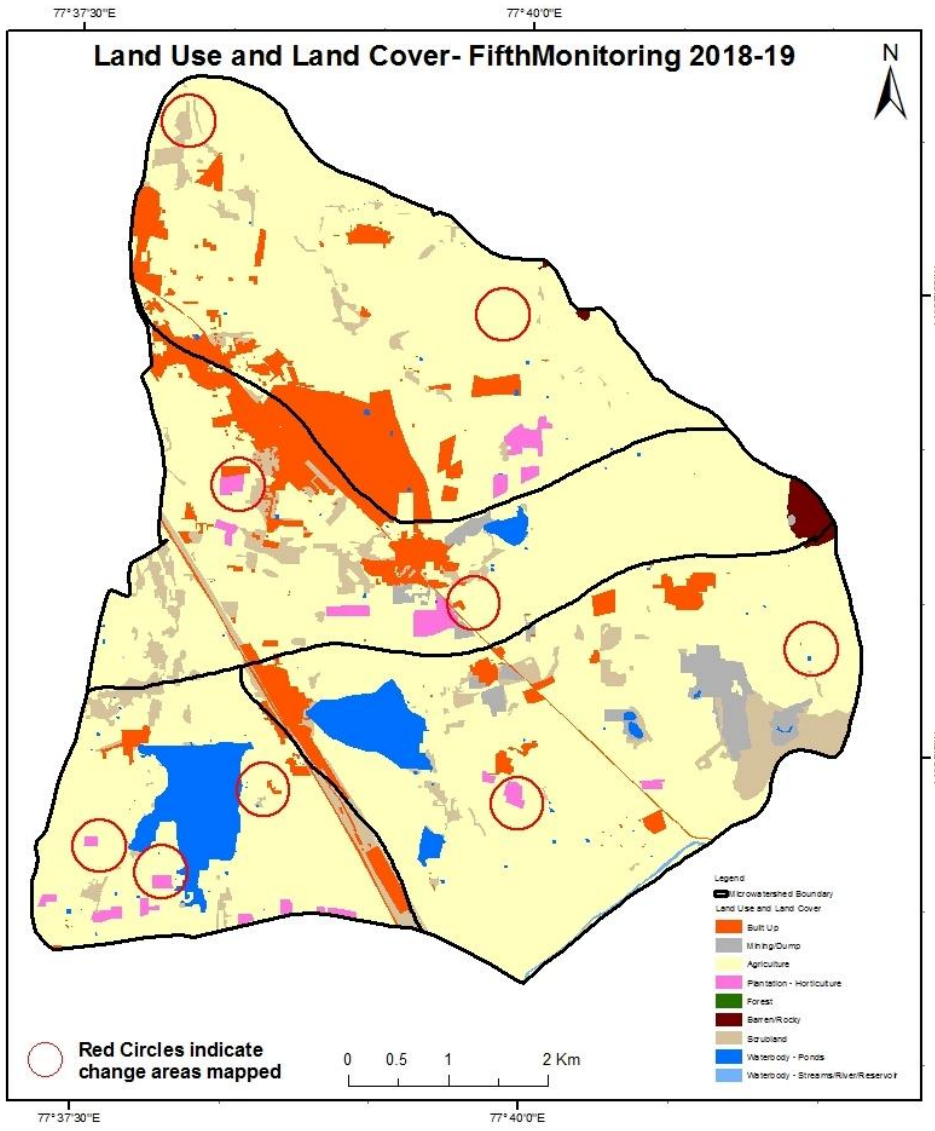




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

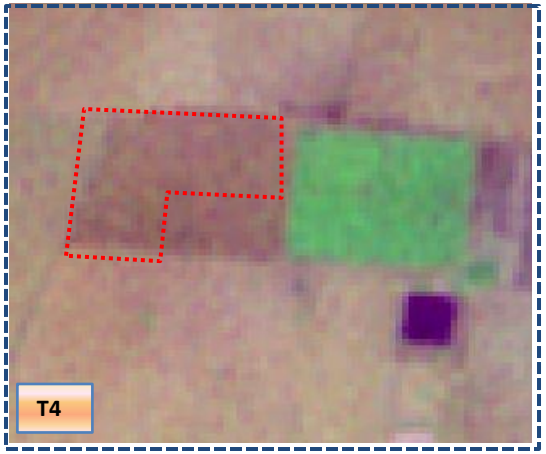
Scale: 1:10000



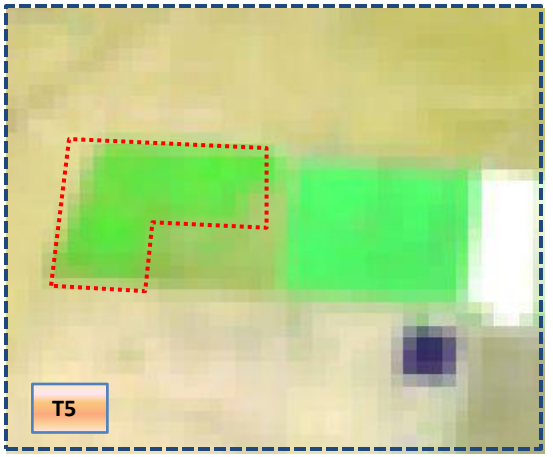


Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

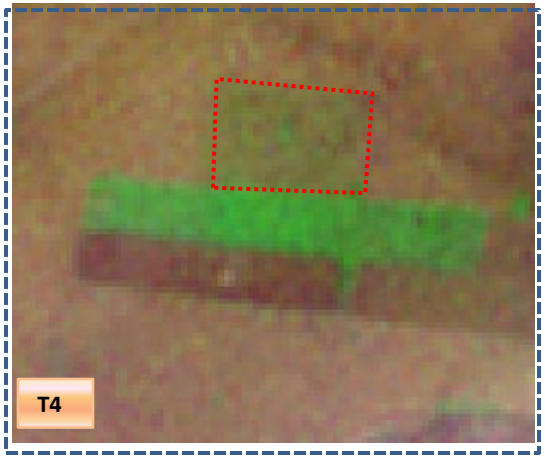


T4: 2017-18(77°37'21.784"E 14°34'10.248"N)

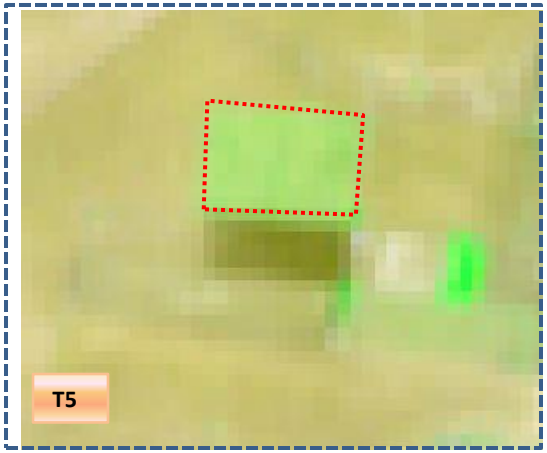


T5: 30 March 2019

Agriculture to Plantation



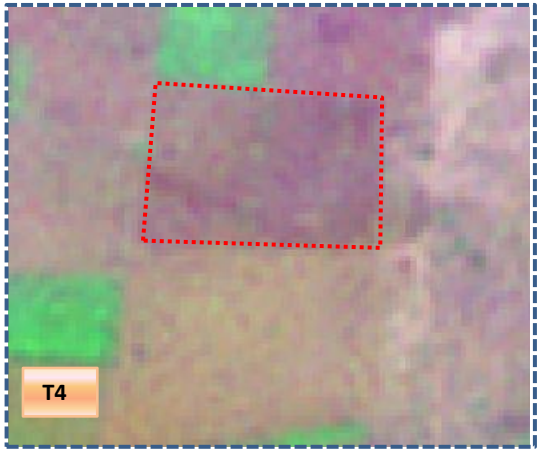
T4: 2017-18 (77°37'35.92"E 14°34'28.975"N)



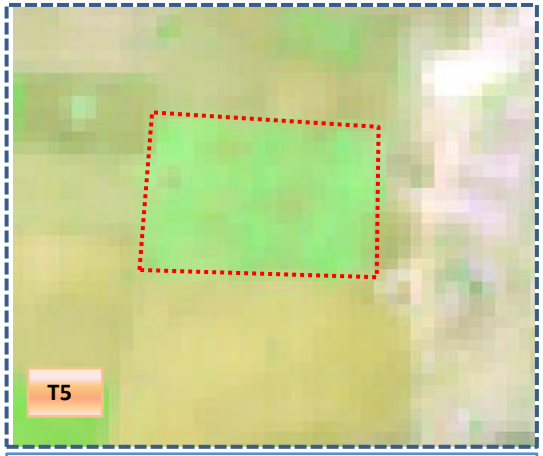
T5: 30 March 2019

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

Agriculture to Plantation

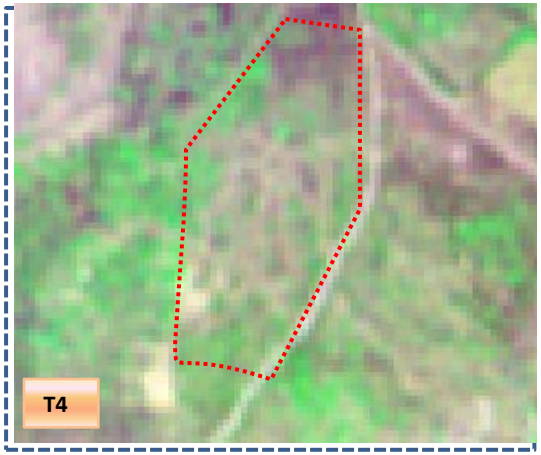


T4: 2017-18 (77°38'0.497"E 14°34'15.491"N)

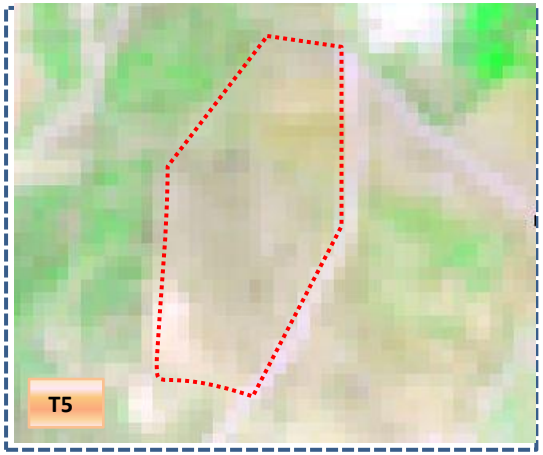


T5: 30 March 2019

Scrub to Agriculture



T4: 2017-18(77°38'6.987"E 14°38'14.173"N)



T5: 30 March 2019

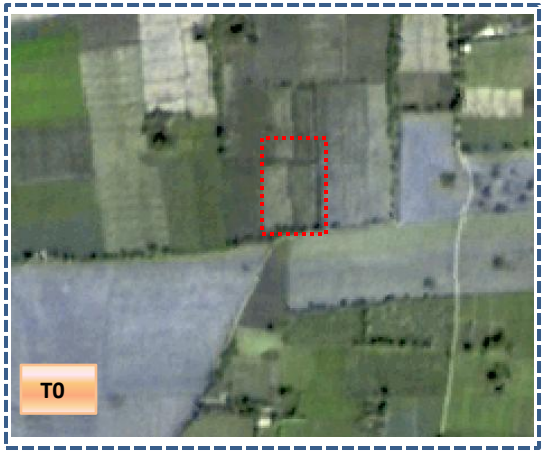
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

T0: 2010-11(77°38'14.2E 14°35'21.816N)

T1: 18 February 2015

Agriculture to Plantation



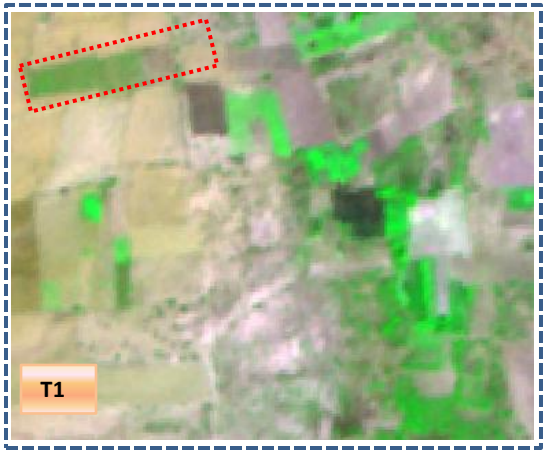
T0: 2010-11(77°37'40.236E 14°34'49.65N)

T1: 18 February 2015

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

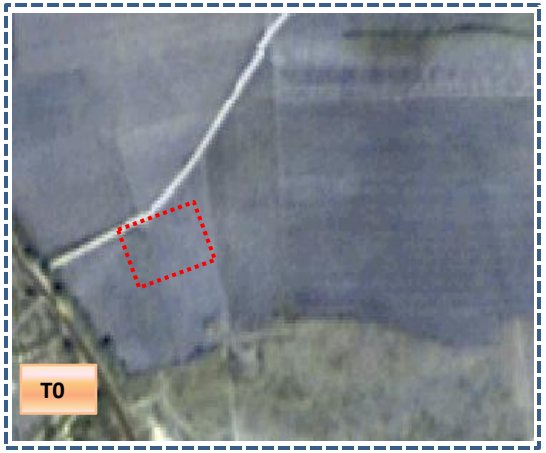
Agriculture to Plantation

T0: 2010-11(77°37'49.776E 14°35'37.705N)



T1: 18 February 2015

Agriculture to Pond



T0: 2010-11(77°38'13.202E 14°37'20.969N)

T1: 18 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
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	307.59	2.10									**309.69**
Mining/dump	0.32	58.38	1.46							0.07	**60.22**
Agriculture	37.19	1.71	3150.64	26.64				44.84		1.71	**3262.72**
Plantation Horticulture			15.09	16.00							**31.09**
Forest											
Forest Plantation											
Barren Rocky		0.69					22.87				**23.56**
Scrub	12.60	1.51	134.52	2.96				678.38		8.48	**838.45**
Waterbody-Streams/River									5.09		**5.09**
Waterbody – Ponds										184.10	**184.10**
Grand Total	**357.70**	**64.39**	**3301.70**	**45.60**			**22.87**	**723.22**	**5.09**	**194.36**	**4714.93**

- 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 112 ha of the agriculture area has decreased and it is converted into built up, mining, plantation, scrubland and water body in T1.
- In T1 149 ha of the agriculture area has increased from mining, plantations and scrubland of T0 and overall 38 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
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	357.70										**357.70**
Mining/dump		64.39									**64.39**
Agriculture	21.52	2.06	3264.27	7.26				4.51		2.08	**3301.70**
Plantation Horticulture	0.03		3.04	42.53							**45.60**
Forest											
Forest Plantation											
Barren Rocky							22.87				**22.87**
Scrub	2.91		15.19					704.72		0.40	**723.22**
Waterbody-Streams/River									5.09		**5.09**
Waterbody – Ponds			2.21							192.15	**194.36**
Grand Total	**382.15**	**66.45**	**3284.71**	**49.79**			**22.87**	**709.23**	**5.09**	**194.64**	**4714.93**

• 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 37 ha of the agriculture area has decreased and it is converted into built up, mining, plantation, scrubland and water body in T2.

• In T2 20 ha of the agriculture area has increased from plantations and scrubland of T1 and overall 16 ha of the agriculture area has been decreased. 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
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	381.69		0.46								382.15
Mining/dump		65.95	0.16							0.34	66.45
Agriculture	24.51	3.01	3242.09	7.93				6.33		0.83	3284.71
Plantation Horticulture			10.79	39.00							49.79
Forest											
Forest Plantation											
Barren Rocky							22.87				22.87
Scrub	7.67	2.52	199.11	1.38				498.05		0.50	709.23
Waterbody-Streams/River									5.09		5.09
Waterbody – Ponds	0.29		4.43							189.92	194.64
Grand Total	414.16	71.48	3457.04	48.32			22.87	504.38	5.09	191.58	4714.93

• 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 42 ha of the agriculture area has decreased and it is converted into built up, mining, plantation, scrubland and water body in T3.

• In T3 214 ha of the agriculture area has increased from mining, plantation, scrubland and water body of T2 and overall 172 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
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	413.73		0.43								414.16
Mining/dump		68.97								2.51	71.48
Agriculture	11.80	1.69	3426.28	14.04				1.92		1.32	3457.04
Plantation Horticulture			1.56	46.76							48.32
Forest											
Forest Plantation											
Barren Rocky							22.87				22.87
Scrub	1.19		113.09					389.79		0.33	504.38
Waterbody-Streams/River									5.09		5.09
Waterbody – Ponds										191.58	191.58
Grand Total	426.71	70.67	3541.35	60.80			22.87	391.70	5.09	195.73	4714.93

• 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 30 ha of the agriculture area has decreased and it is converted into built up, mining, plantation, scrubland and water body in T4.

• In T4 114 ha of the agriculture area has increased from plantation and scrubland of T3 and overall 84 ha 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-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	426.71										426.71
Mining/dump		68.34	2.08								70.67
Agriculture	8.98	1.20	3515.38	15.17				0.54		0.07	3541.35
Plantation Horticulture			14.40	46.40							60.80
Forest											
Forest Plantation											
Barren Rocky							22.87				22.87
Scrub	1.17	10.77	82.59					297.18			391.70
Waterbody-Streams/River									5.09		5.09
Waterbody – Ponds			4.70					0.07		190.97	195.73
Grand Total	436.86	80.31	3619.15	61.57			22.87	297.78	5.09	191.04	4714.93

• 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 25 ha of the agriculture area has decreased and it is converted into built up, mining, plantation, scrubland and water body in T5.

• In T5 101 ha of the agriculture area has increased from mining/dump, plantation, scrubland and water body of T4 and overall 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 6.9 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 38, 172, 84 & 77 Hectares From T0 to T1, T2-T3, T3-T4 & T4-T5 respectively and overall decrease of 356 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is an increase of 30 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 540 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (50) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (55) verified from the portal.