MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -54/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2022

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

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

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-54/2011-12, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is 9,103.5 ha.   It comprises of 10 micro watersheds.

- In the project area 189 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.

- Water bodies have shown an increased by 76 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.

- Major percentage i.e. 39 % is covered by the agriculture, 33 % is covered by forest, 18 % is covered by scrubland, 4.5 % is covered by plantation and remaining by other land use classes.

PROJECT : ANANTAPURAMU - IWMP-54/2011-12
DISTRICT : ANANTAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Talupula Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 9,103.5 ha. It comprises of 10 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2011-12 (T0) period (*Batch -1*) projects taking 2019-20 (T5) period satellite images
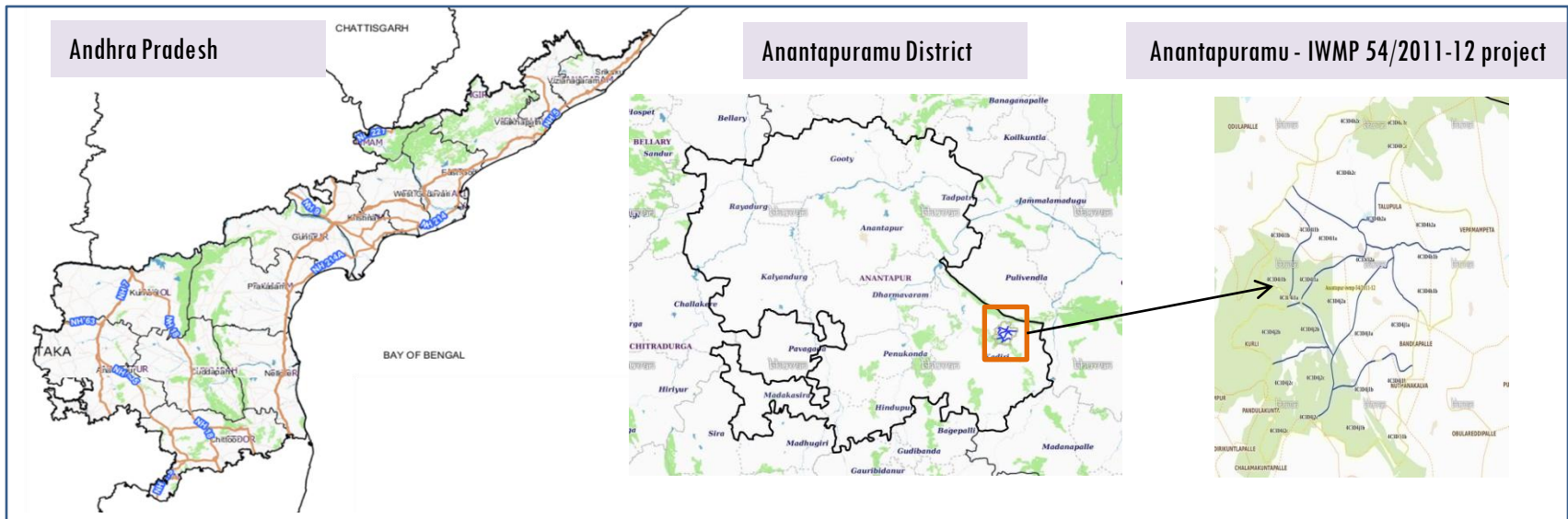
- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- 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
	2011-12	2013-14	2019-20
LISS IV	2011-12		
SCENE 1			14-Jan-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			14-Jan-20
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	189
4	Detailed Project Report		

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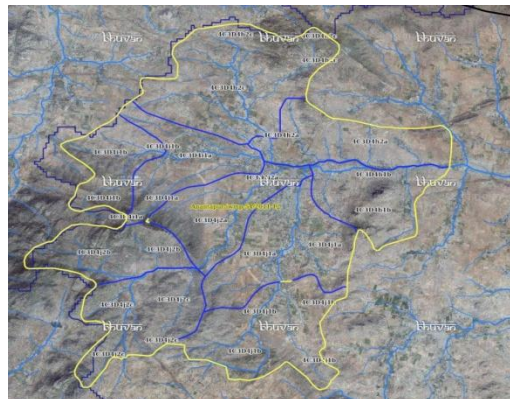
Legend

 Drainage (1:10000 Scale)
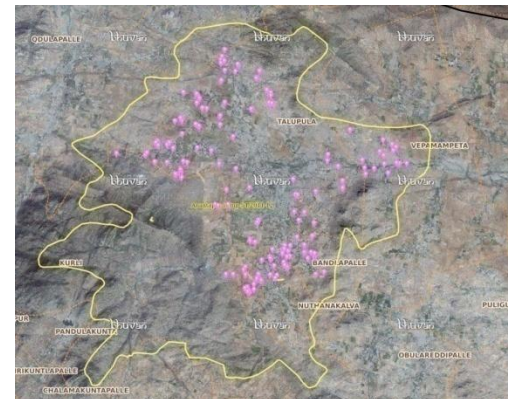
 MWS Boundary

 Project Boundary

Natural Color Composite overlaid with Drishti Points

Drishti Upload Status

Classification of the Activities

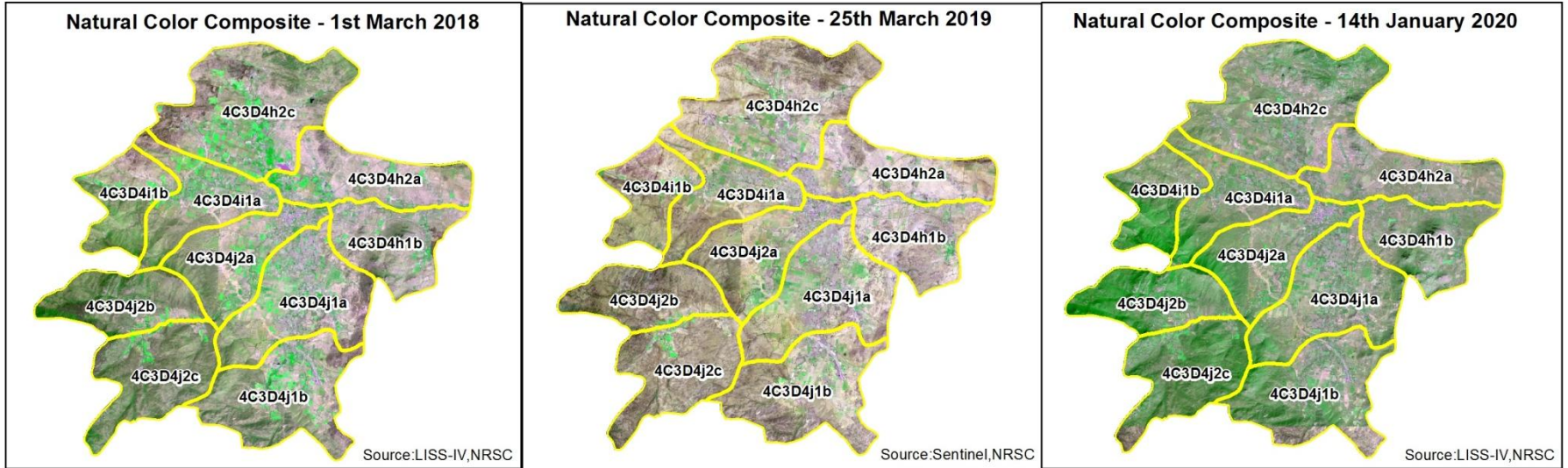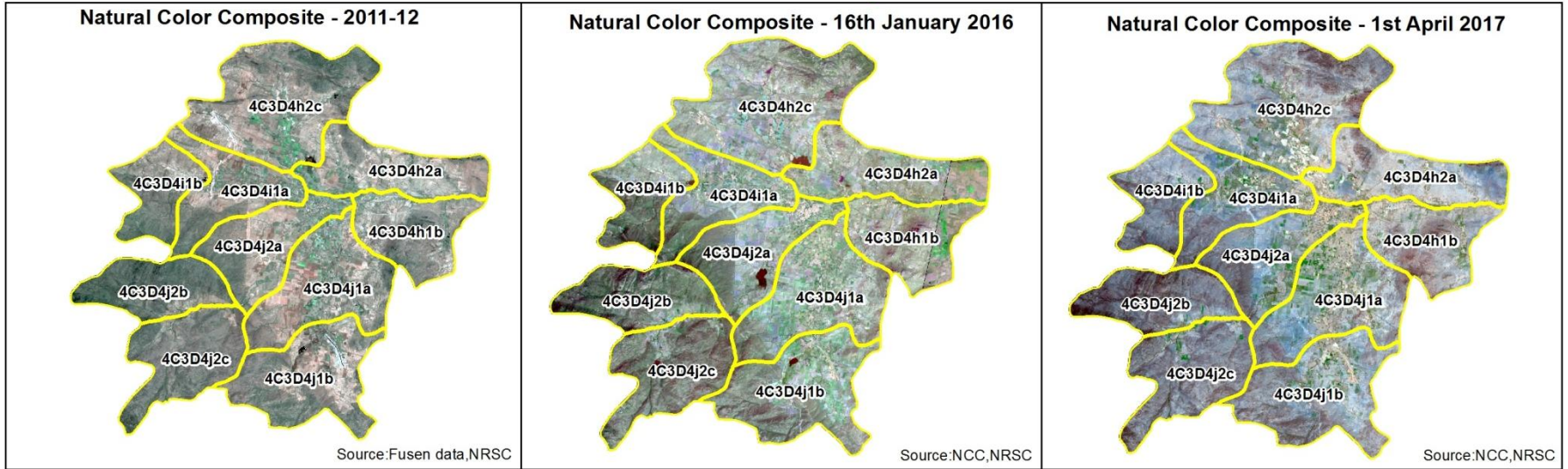| Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	102	97
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	3	3
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	49	44
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	4	4
18	Others	41	41
	TOTAL	**199**	**189**

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 (2011-12) and T5 is 2019-20 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.
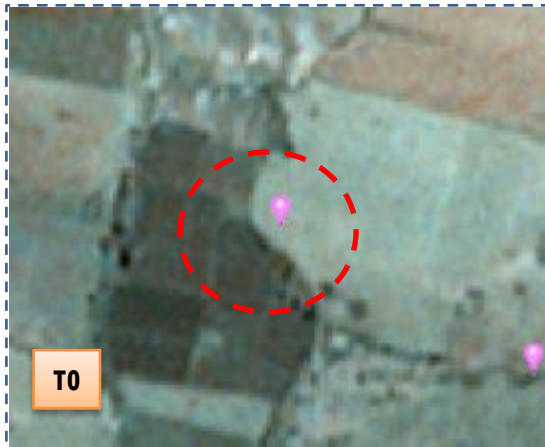
Natural Colour Composite (NCC)

Natural Color Composite - 2011-12
Source:Fusen data,NRSC

Natural Color Composite - 16th January 2016
Source:NCC,NRSC

Natural Color Composite - 1st April 2017
Source:NCC,NRSC

Natural Color Composite - 1st March 2018
Source:LISS-IV,NRSC

Natural Color Composite - 25th March 2019
Source:Sentinel,NRSC

Natural Color Composite - 14th January 2020
Source:LISS-IV,NRSC

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-54/2011-12

T0	T1	
T0:2011-12	T1: 18 January 2017	Drishti Sl no. 1798040 MWS : 4C3D4h2a

Farm pond
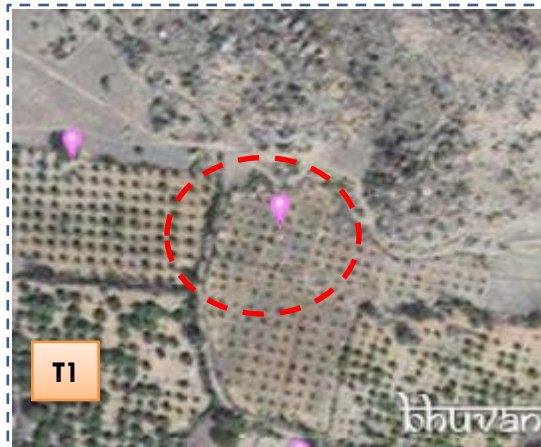
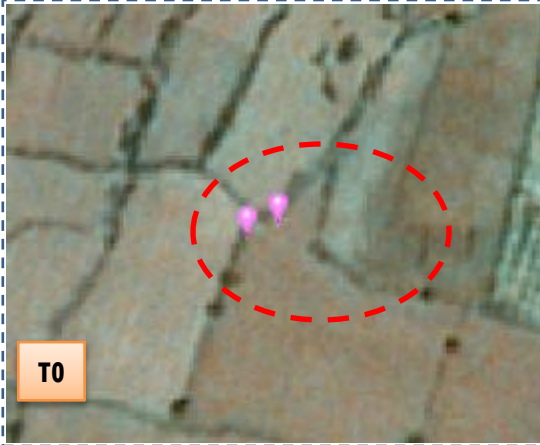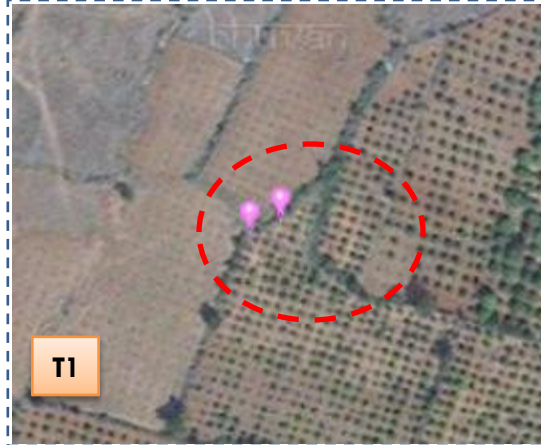| T0	T1	
T0:2011-12	T1: 18 January 2017	Drishti Sl no. 1793462 MWS : 4C3D4j1a

Horticulture

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-54/2011-12

T0	T1	
T0:2011-12	T1: 18 January 2017	Drishti Sl no. 1797660 MWS : 4C3D4h2c

Horticulture

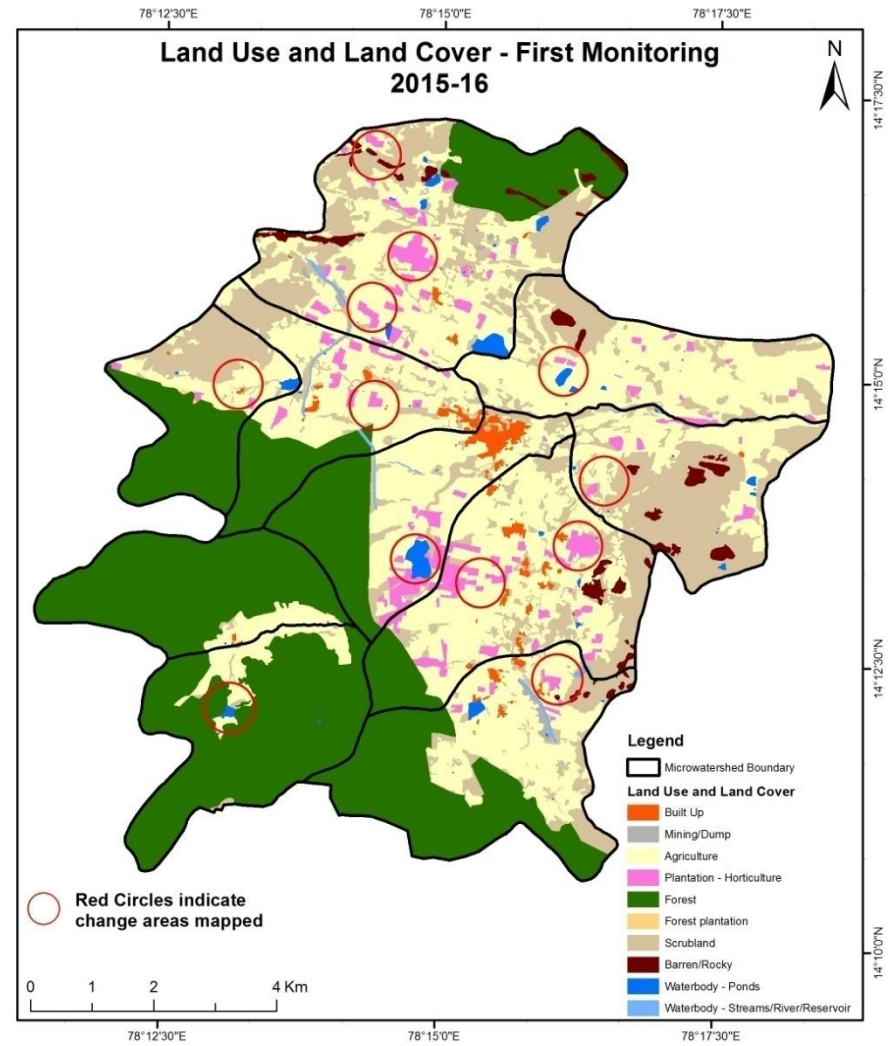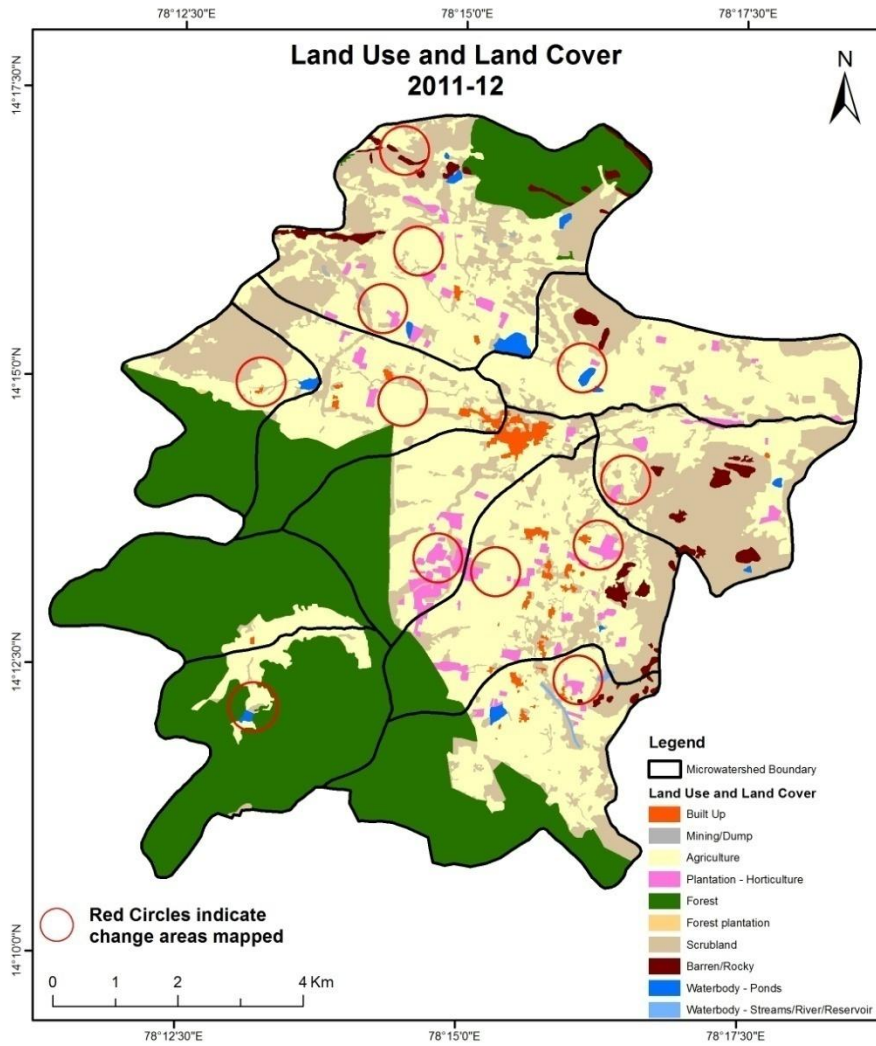| T0	T1	
T0:2011-12	T1: 18 January 2017	Drishti Sl no. 7043134 MWS : 4C3D4i1a

Horticulture

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 (2011-12) and row represents the T5 (2019-20)
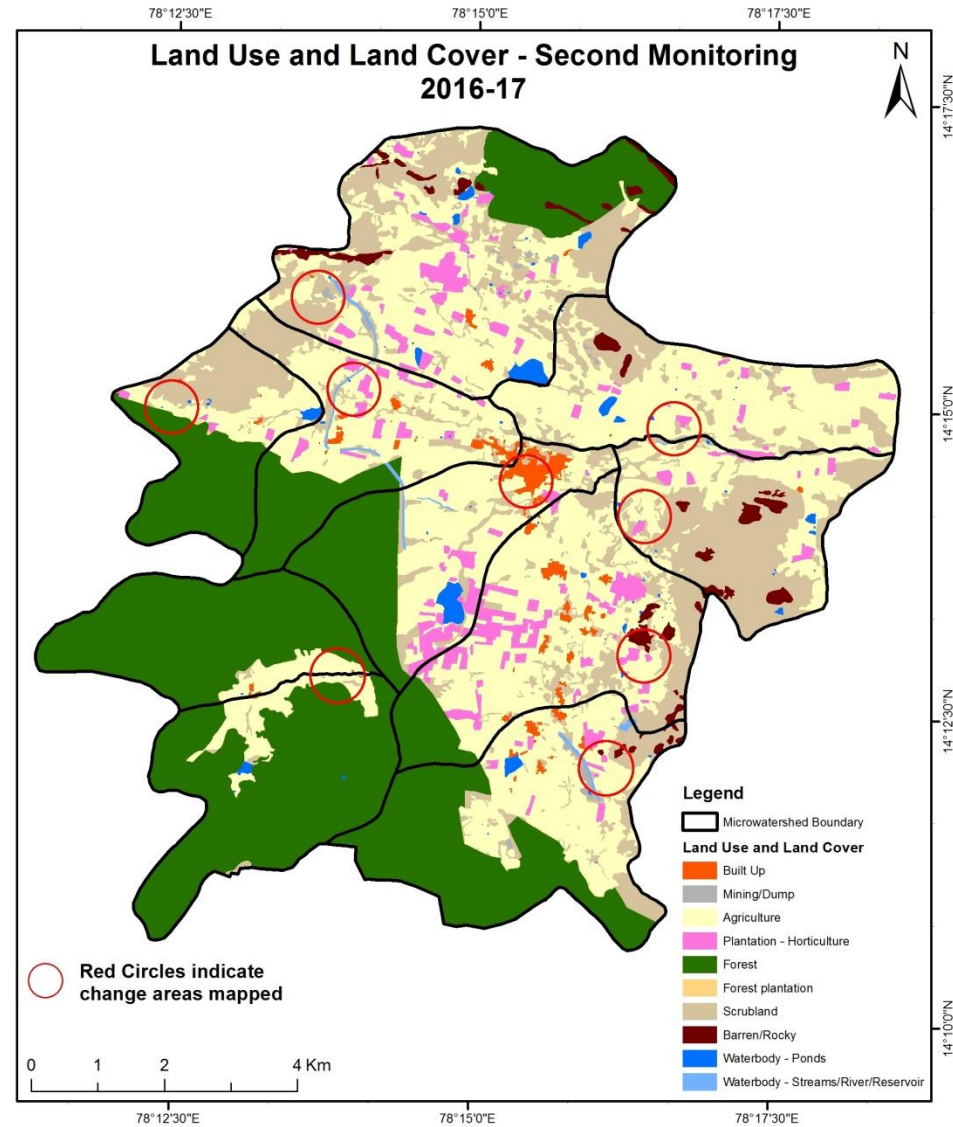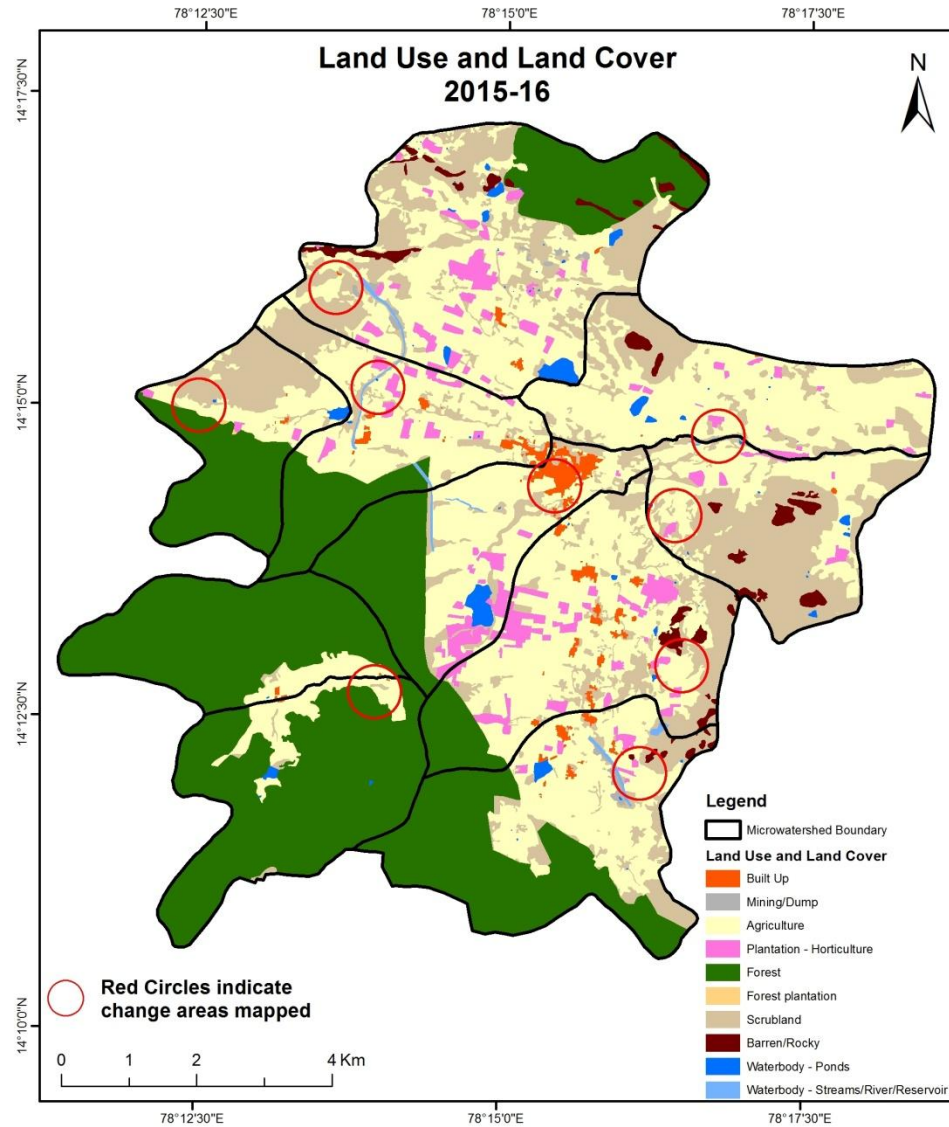
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)
Scale: 1:10000

Land Use and Land Cover 2011-12

Land Use and Land Cover - First Monitoring 2015-16

Legend

Microwatershed Boundary

Land Use and Land Cover

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

Red Circles indicate change areas mapped

0 1 2 4 Km

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

Scale: 1:10000

Land Use and Land Cover 2015-16

Land Use and Land Cover - Second Monitoring 2016-17

Red Circles indicate change areas mapped

Legend

Microwatershed Boundary

Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Forest plantation
- Scrubland
- Barren/Rocky
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

0   1   2   4 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)
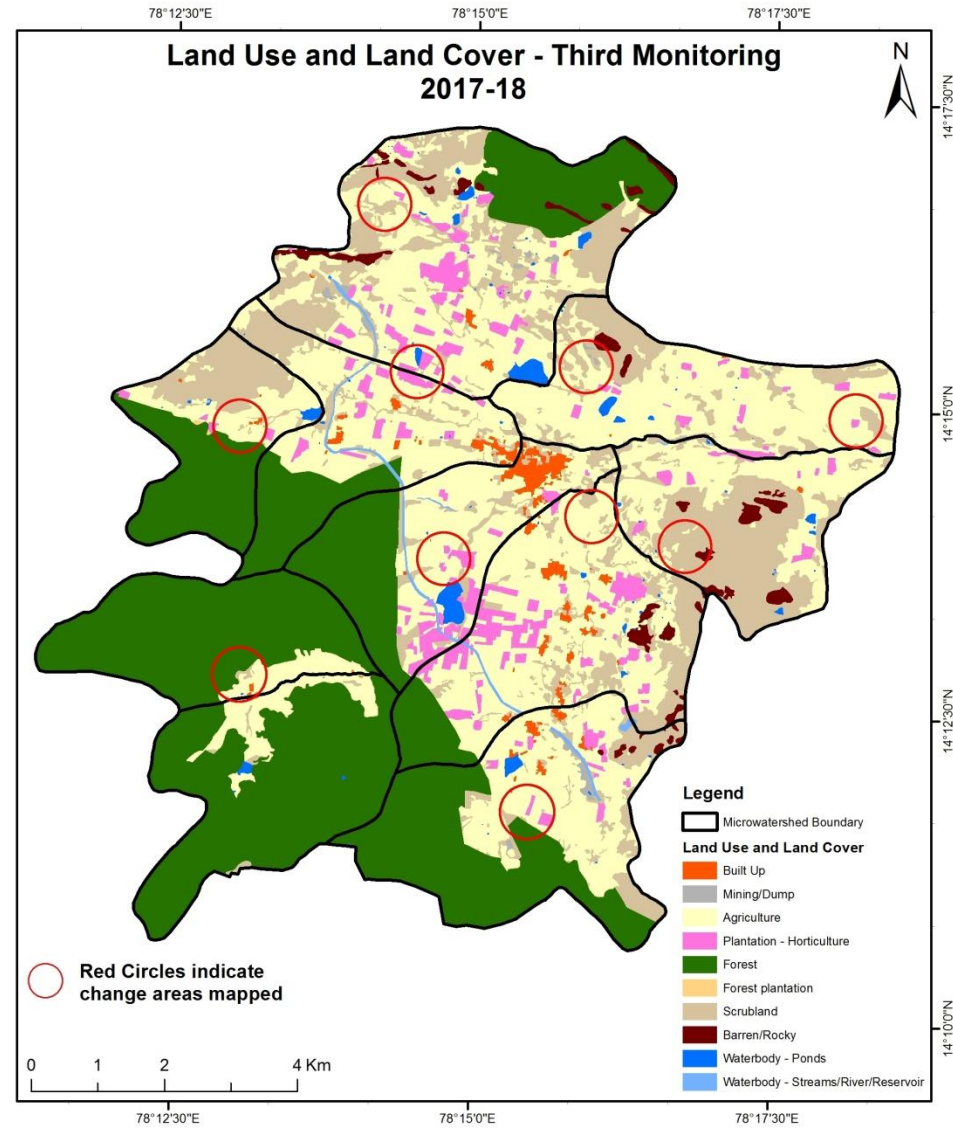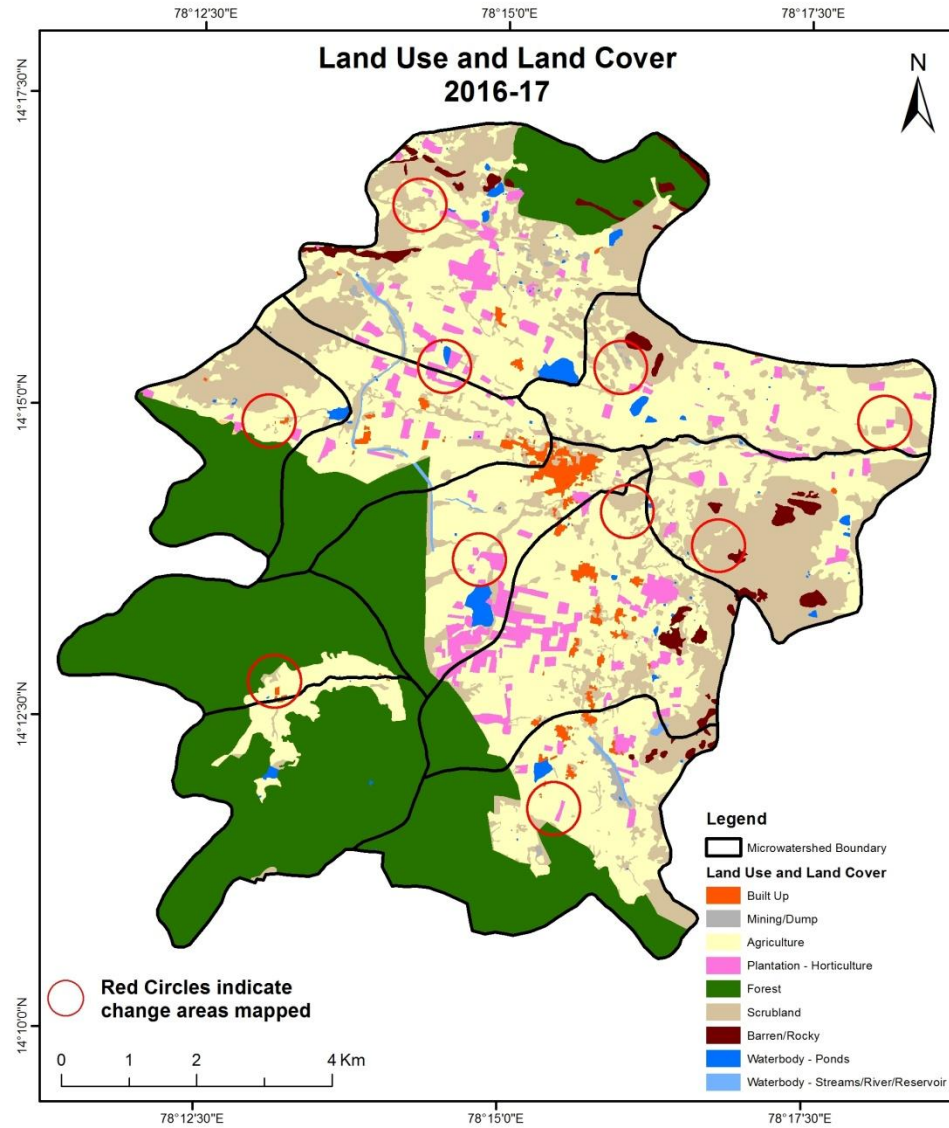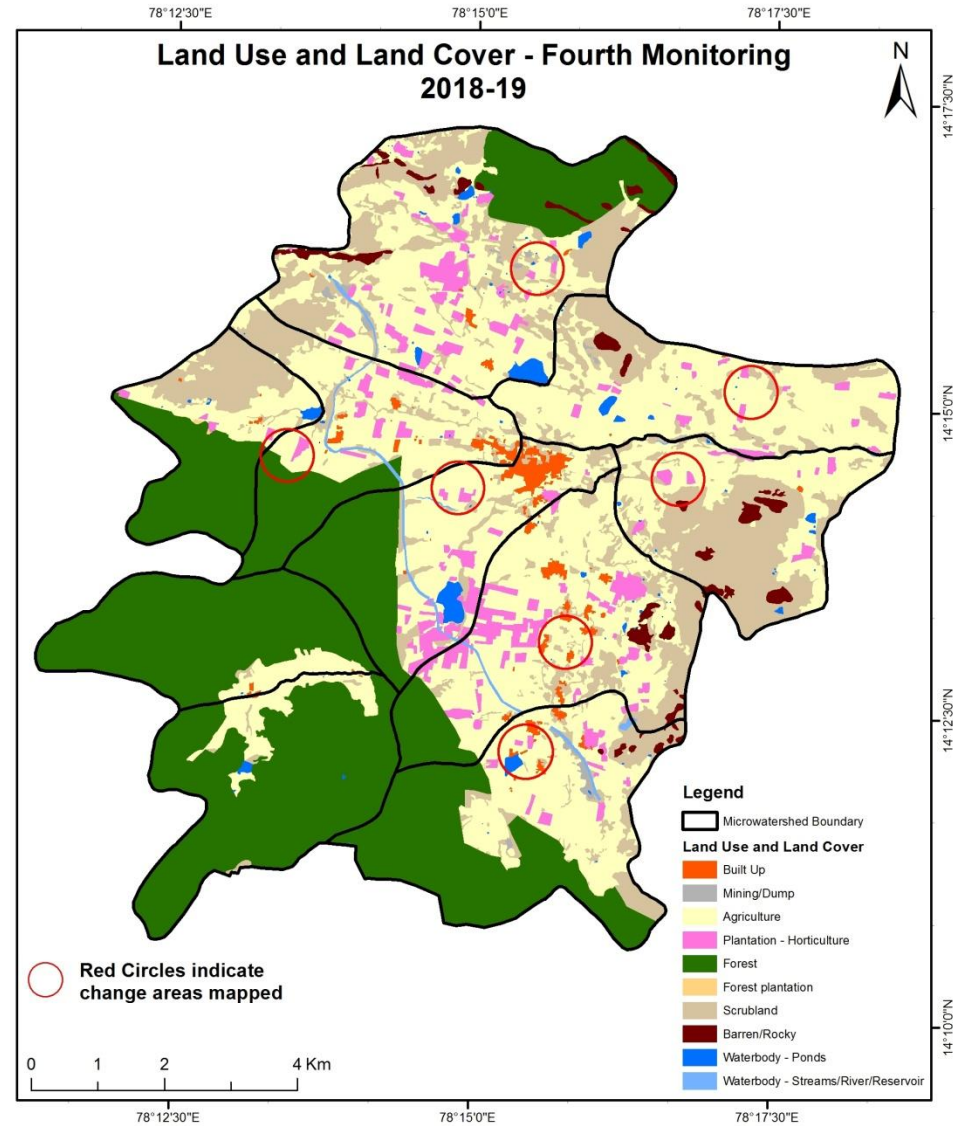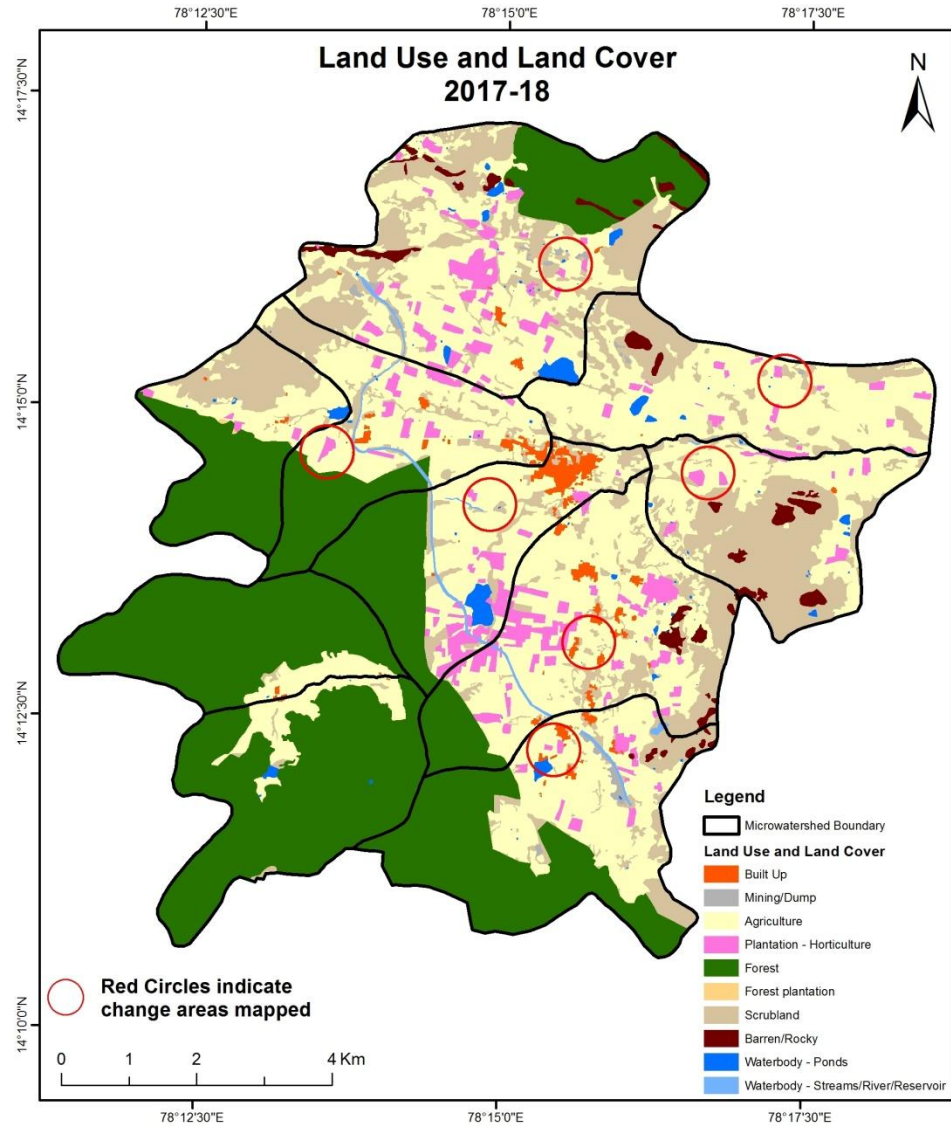## Scale: 1:10000

14

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
2017-18

Land Use and Land Cover - Fourth Monitoring
2018-19

Legend

☐ Microwatershed Boundary

Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Forest plantation
- Scrubland
- Barren/Rocky
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

○ **Red Circles indicate change areas mapped**

0   1   2   4 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)
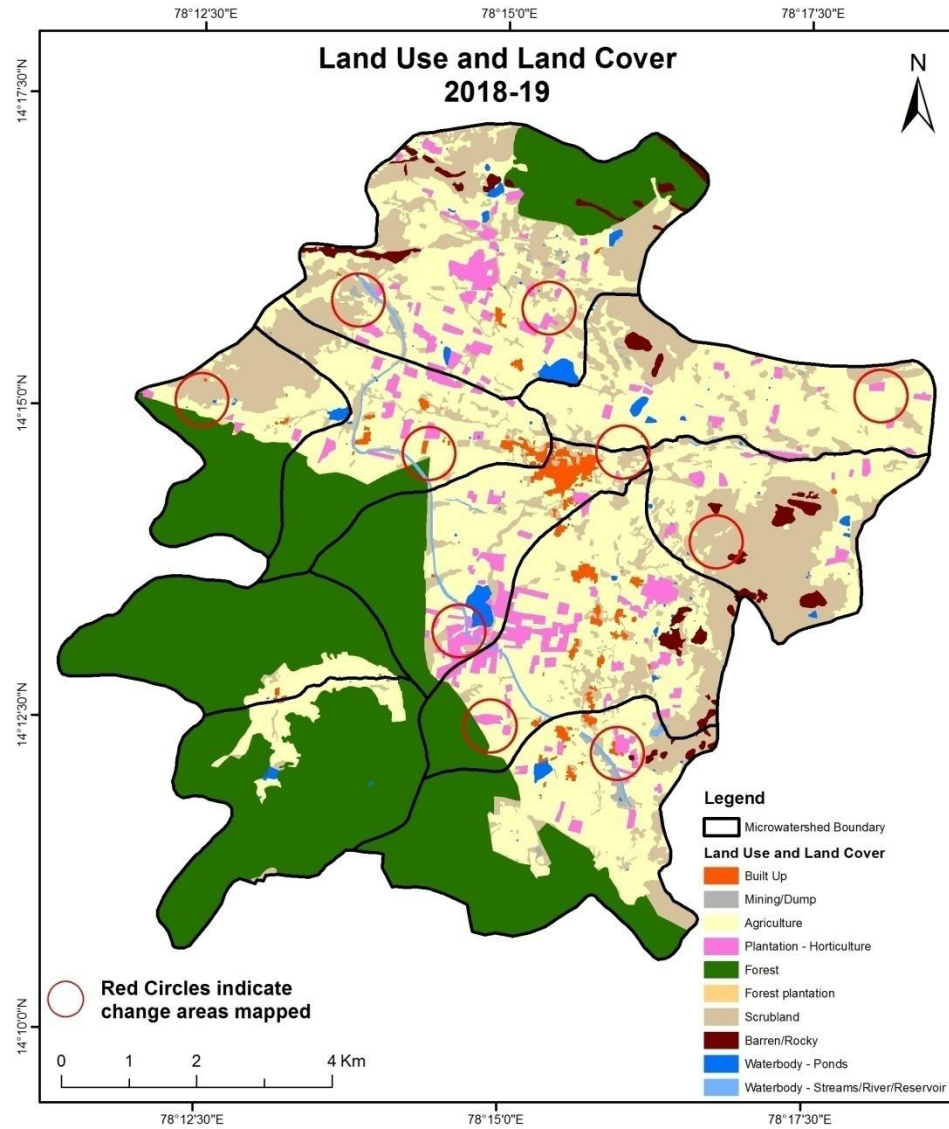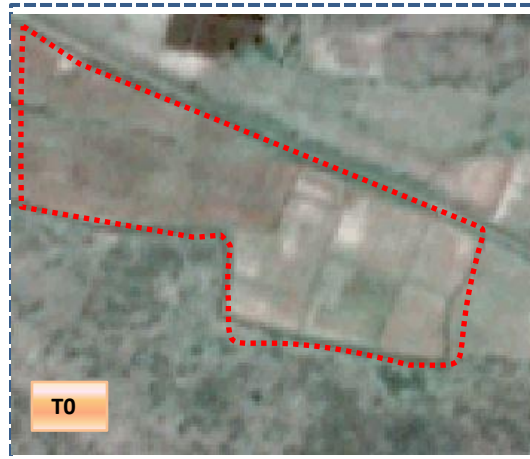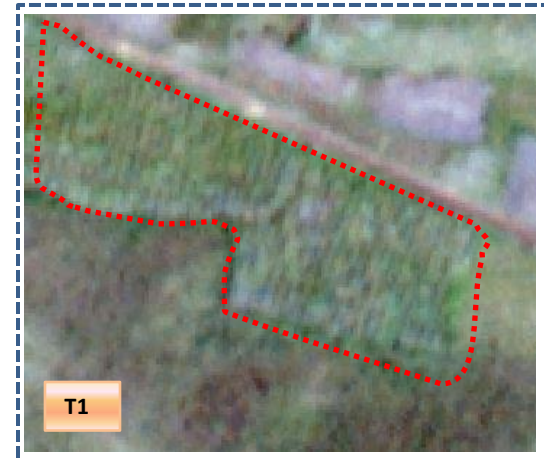## Scale: 1:10000
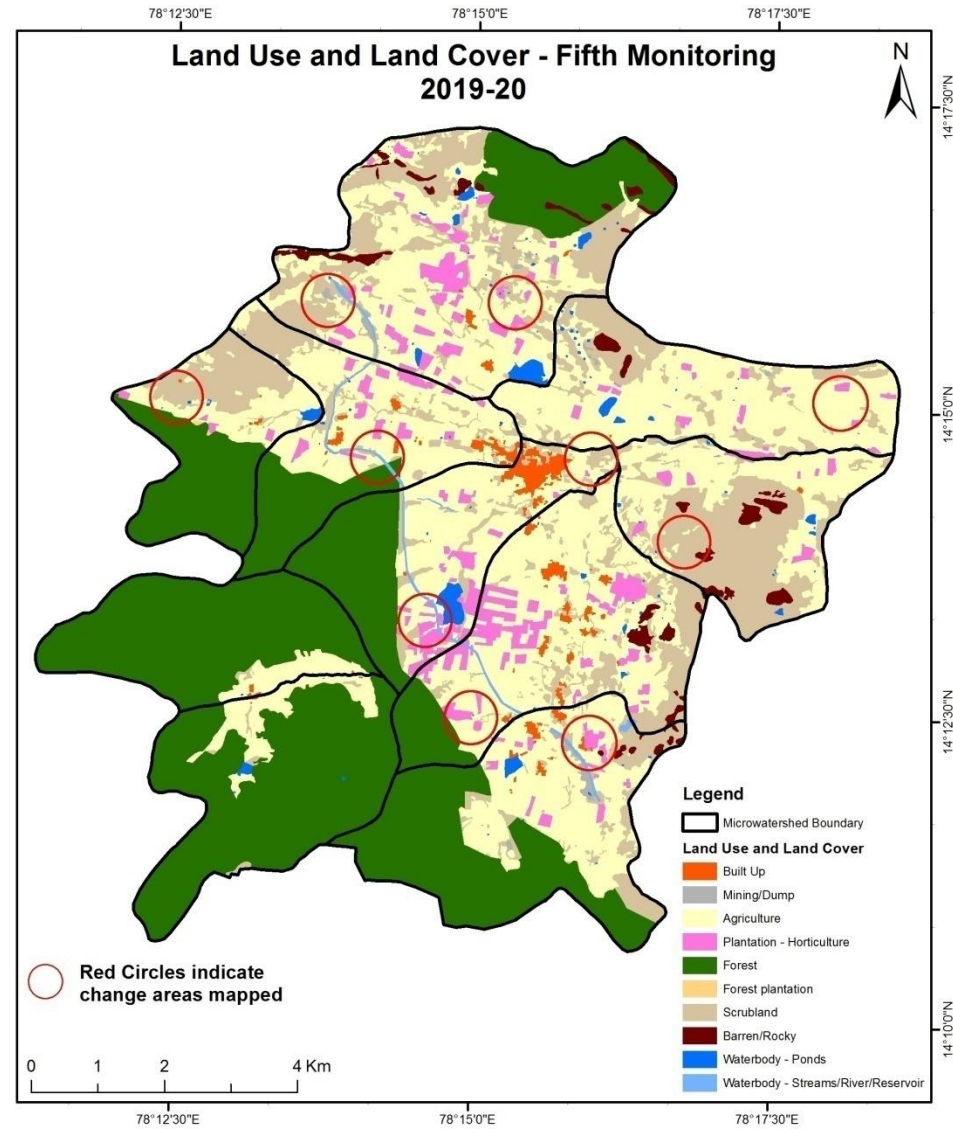
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

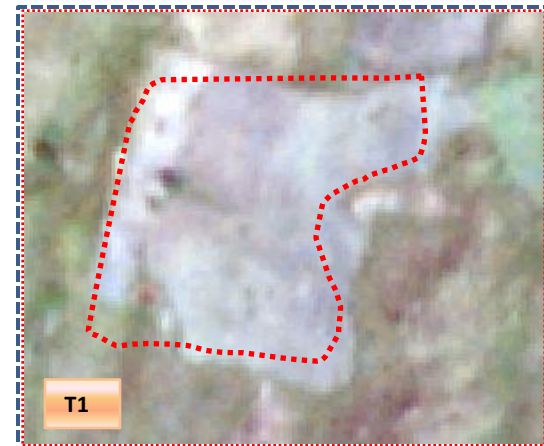T0: 2011-12 (78°12'3.791"E 14°15'5.546"N)

T1: 16 January 2016

Scrub to Agriculture

T1: 2011-12 (78°16'58.485"E 14°14'13.163"N)

T2: 16 January 2016

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

Plantation to Water body

T0: 2011-12(78°14'47.016"E 14°13'29.552"N)

T1: 16 January 2016

Scrub to Waterbody

T0: 2011-12(78°16'31.418"E 14°13'51.62"N)
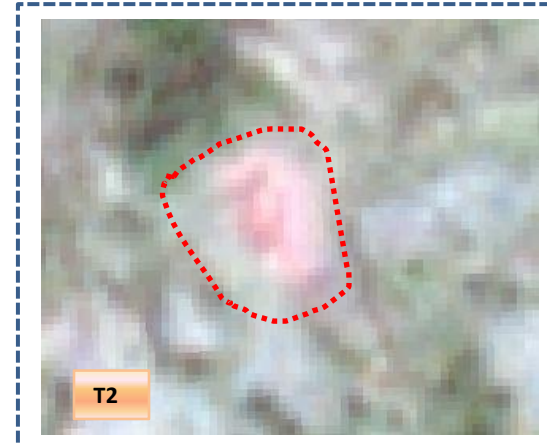
T1: 16 January 2016

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

Agriculture to Plantation
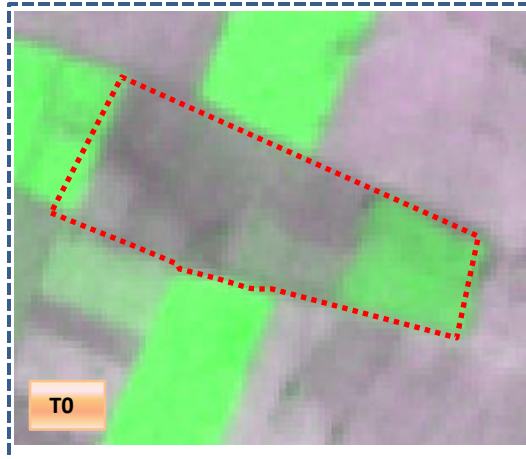
T0: 2011-12 (77°24'13.153"E 14°44'57.755"N)
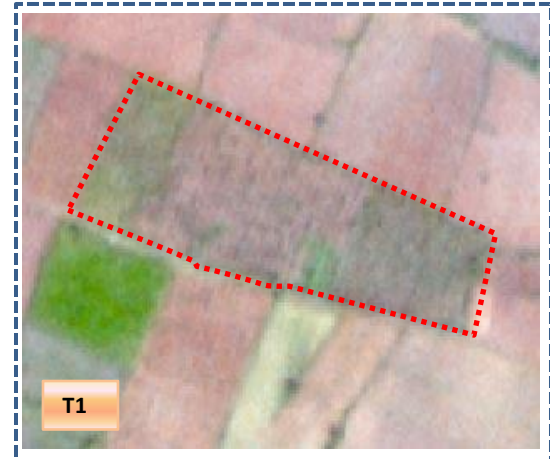
T1: 28 October 2015

Scrub to Plantation

T0: 2011-12 (78°16'57.474"E 14°14'13.557"N)

T1: 28 October 2015

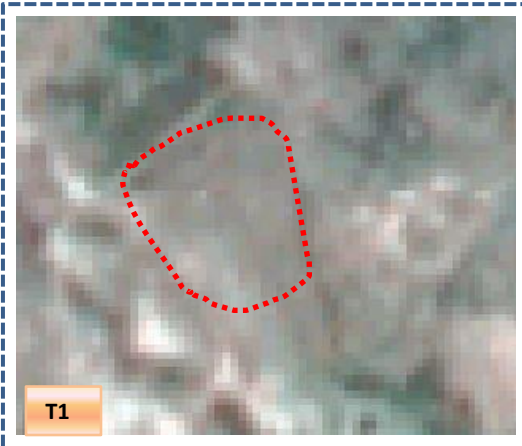# Land Use and Land Cover changes for Pre and Post treatment dates

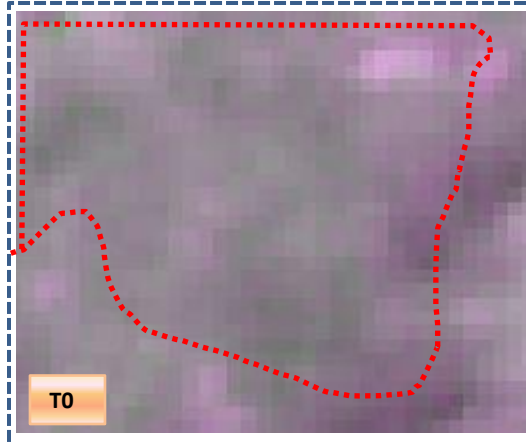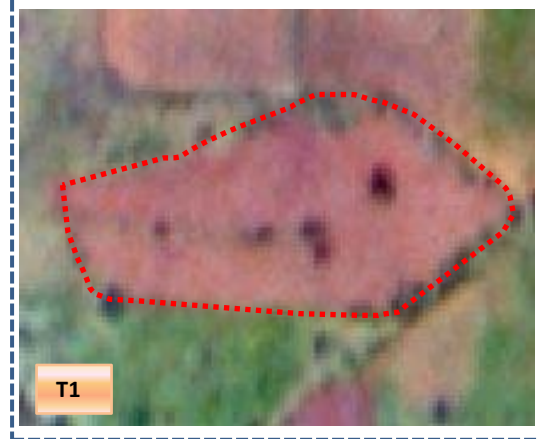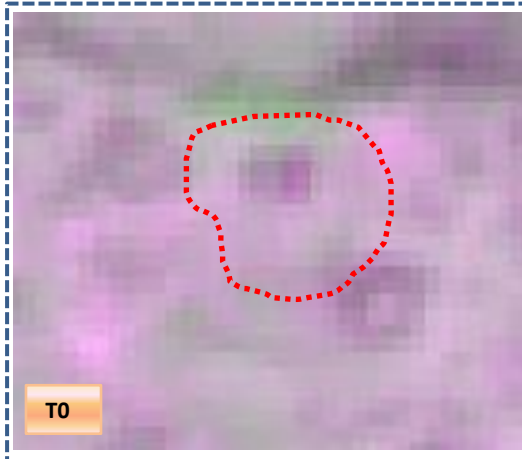Plantation to Agriculture

T0

T1

T0: 2011-12(77°49'57.333"E 14°25'11.022"N)

T1: 28 October2015

Agriculture to Waterbody

T0

T1

T0: 2011-12(77°26'51.672"E 14°44'0.181"N)

T1: 28 October 2015

Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

Land cover T0	Monitoring period (T1) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Units in Hectares Grand Total
Built up	82.08										82.08
Mining/dump		6.88									6.88
Agriculture	15.60	2.54	3438.03	145.64					15.45	12.77	3630.03
Plantation Horticulture	1.12		2.46	189.59				1.46		10.69	205.32
Forest			4.28		3070.91	0.36			1.71	0.46	3077.73
Forest Plantation						0.80					0.80
Barren Rocky							129.31				129.31
Scrub	4.10	8.88	36.51					1852.87	10.14	3.31	1915.81
Waterbody-Streams/River									7.90		7.90
Waterbody – Ponds										47.65	47.65
Grand Total	102.90	18.30	3481.29	335.23	3070.91	1.16	129.31	1854.33	35.20	74.88	9103.51

• 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 192 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.

• In T1 43 ha of the agriculture area has increased from plantations, forest and scrubland of T0.

• The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2015-16 to 2016-17

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	102.90										**102.90**
Mining/dump		18.30									**18.30**
Agriculture	3.00	0.27	3410.26	65.70			0.03		0.57	1.46	**3481.29**
Plantation Horticulture			12.37	322.85							**335.23**
Forest					3070.82					0.10	**3070.91**
Forest Plantation						1.16					**1.16**
Barren Rocky							129.31				**129.31**
Scrub	0.22	4.18	54.38					1792.73	1.59	1.23	**1854.33**
Waterbody-Streams/River									35.20		**35.20**
Waterbody – Ponds										74.88	**74.88**
Grand Total	**106.11**	**22.75**	**3477.02**	**388.56**	**3070.82**	**1.16**	**129.34**	**1792.73**	**37.37**	**77.67**	**9103.51**

• 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 71 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T2.

• In T2 66 ha of the agriculture area has increased from plantations and scrubland of T1. The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

Land cover T2	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	106.11										106.11
Mining/dump		22.75									22.75
Agriculture	2.29	0.91	3431.27	31.15					11.35	0.04	3477.02
Plantation Horticulture	0.18		4.41	381.85					2.03	0.09	388.56
Forest			0.95		3069.87						3070.82
Forest Plantation						1.16					1.16
Barren Rocky							129.34				129.34
Scrub	0.15		99.20					1692.39	0.82	0.15	1792.73
Waterbody-Streams/River									37.37		37.37
Waterbody – Ponds										77.67	77.67
Grand Total	108.74	23.66	3535.83	413.01	3069.87	1.16	129.34	1692.39	51.58	77.94	9103.51

(Monitoring period (T3); Units in Hectares)

• 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 45 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.

• In T3 104 ha of the agriculture area has increased from plantations, forest and scrubland of T2.

• The additional agriculture are coming from waterbody in T3 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2017-18 to 2018-19

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	108.74										108.74
Mining/dump		23.66									23.66
Agriculture	0.36		3532.06	3.42							3535.83
Plantation Horticulture				413.01							413.01
Forest			0.09		3069.77						3069.87
Forest Plantation						1.16					1.16
Barren Rocky							129.34				129.34
Scrub			11.00					1681.40			1692.39
Waterbody-Streams/River									51.58		51.58
Waterbody – Ponds										77.94	77.94
Grand Total	109.10	23.66	3543.15	416.42	3069.77	1.16	129.34	1681.40	51.58	77.94	9103.51

• 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 03 ha of the agriculture area has decreased and it is converted into Built-up and plantations in T4.

• In T4 11 ha of the agriculture area has increased from forest and scrubland of T3.

• The additional agriculture are coming from waterbody in T4 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2018-19 to 2019-20

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	109.10										109.10
Mining/dump		23.66									23.66
Agriculture	1.34		3531.12	8.76						1.93	3543.15
Plantation Horticulture			11.93	404.49							416.42
Forest					3069.77						3069.77
Forest Plantation						1.16					1.16
Barren Rocky							129.34				129.34
Scrub	0.06	0.97	25.34					1653.91		1.11	1681.40
Waterbody-Streams/River									51.58		51.58
Waterbody – Ponds			0.54							77.40	77.94
Grand Total	110.50	24.62	3568.93	413.25	3069.77	1.16	129.34	1653.91	51.58	80.44	9103.51

• 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 12 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T5.

•In T5 37 ha of the agriculture area has increased from plantations, scrubland and water body of T4.

• 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 76 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.

4. There is an increase of 58, 07 & 25 Hectares from T2-T3, T3 to T4 & T4-T5 respectively, there is a decrease of 148 & 04 ha from T0 - T1 & T1-T2 and overall decrease of 61 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.

5. There is **an increase of 207 ha of the Plantation/Horticulture** area has been increased between 2011-12 (T0) & 2019-20 (T5) years.

6. There is a decrease of 261 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.

7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.