MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

ANANTAPURAMU -72/2012-13
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
December-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-72/2012-13, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is **5,206** ha.   It comprises of 6 micro watersheds.

- In the project area 321 Drishti photos were uploaded showing check dams, Farm ponds, Horticulture and remaining showing others.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 80 new farm ponds or dug out pits.

- Major percentage i.e. 65% is covered by the agriculture, 16 % is covered by plantation, 9.8 % is covered by forest area and remaining by other land use classes.

PROJECT : ANANThAPURAMU - IWMP-72/2012-13
DISTRICT : ANANThAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Garladinne Mandal of Ananthapuramu district of Andhra Pradesh state. The total geographical area of the project is **5,206** ha. It comprises of 6 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2012-13 (T0) period (*Batch -1*) projects taking 2020-21 (T5) period satellite images
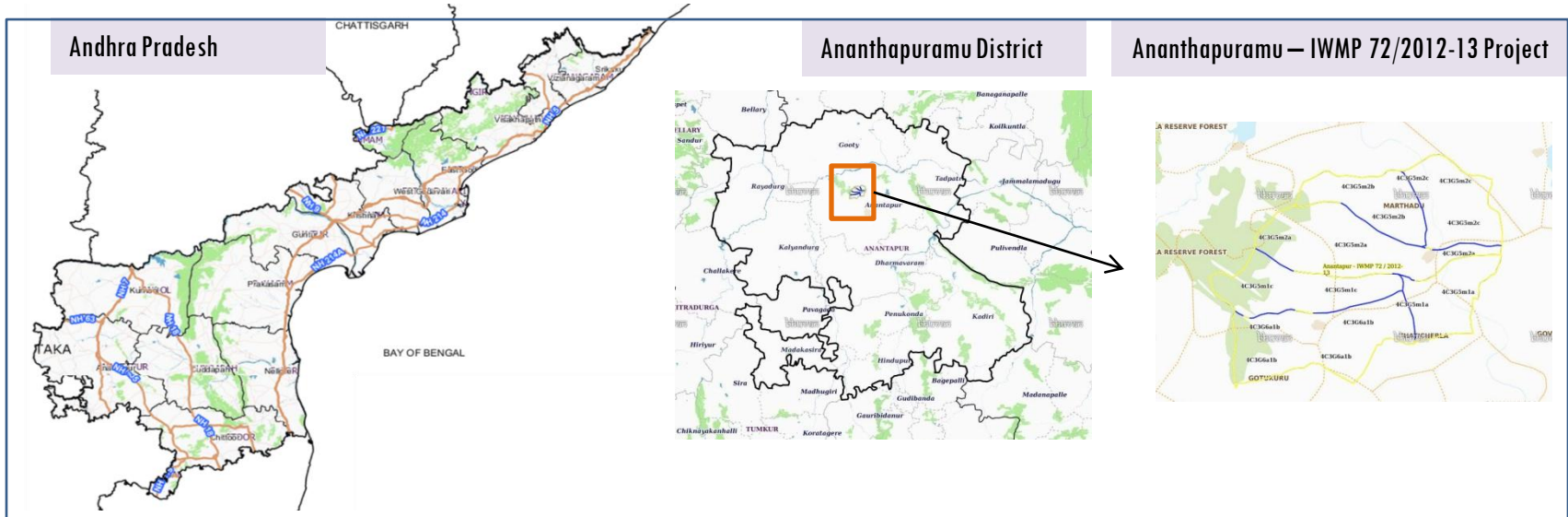
- Ananthapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- Ananthapuram 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).

- Ananthapuramu district receives moderate to good rainfall from July to October month.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2012-13	2020-21
LISS IV	2012-13		
SCENE 1			22-Dec-21
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			22-Dec-21
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	321
4	Detailed Project Report		

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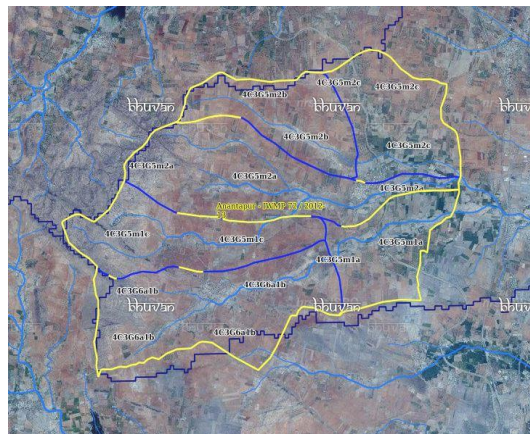
Legend

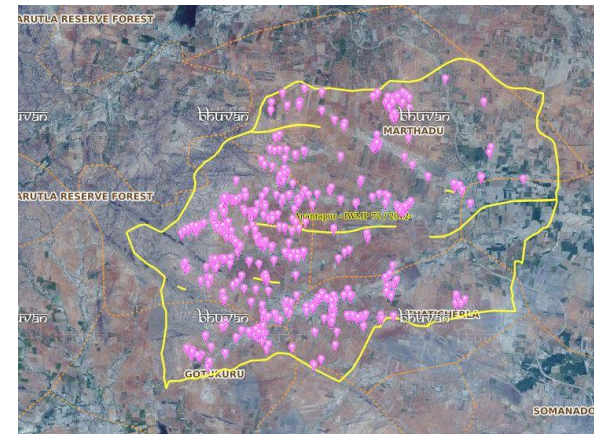|	
	Drainage (1:10000 Scale)
	MWS Boundary
	Project Boundary

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	22	85
60	Afforestation	21	21
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	39	20
6	Terrace	0	0
7	Checks & Plugs	87	50
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	117	80
10	Civil work-Check dams/Rock fill dam	23	23
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	7	7
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	96	60
	TOTAL	**475**	**321**

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 (2012-13) and T5 is 2020-21 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.
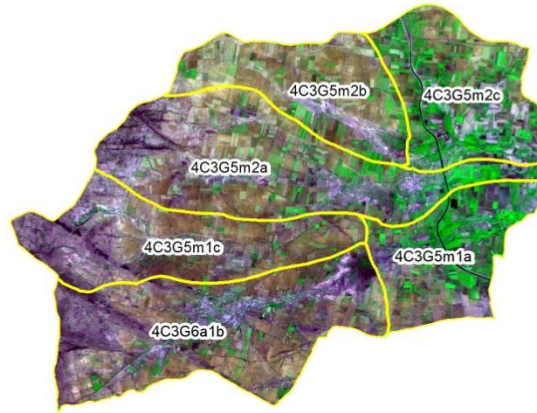
Natural Colour Composite (NCC)
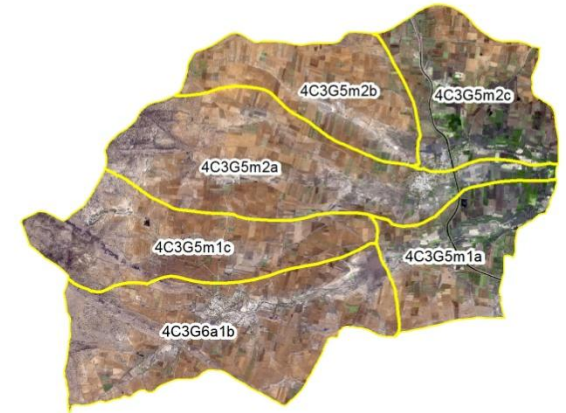

Natural Color Composite- 2012-13
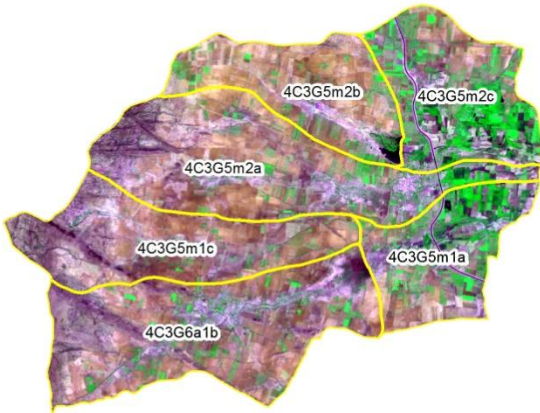Source:IRS LISS-IV, NRSC
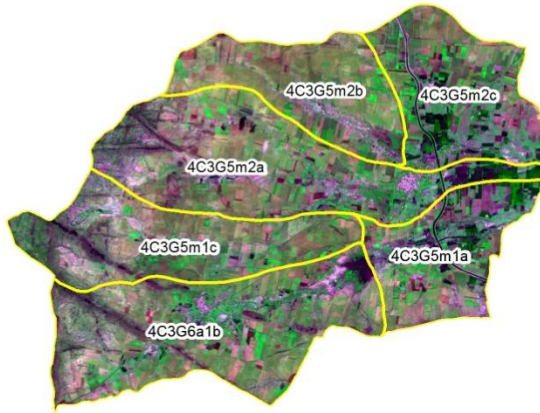
Natural Color Composite-19th December 2017
Source:IRS LISS-IV, NRSC
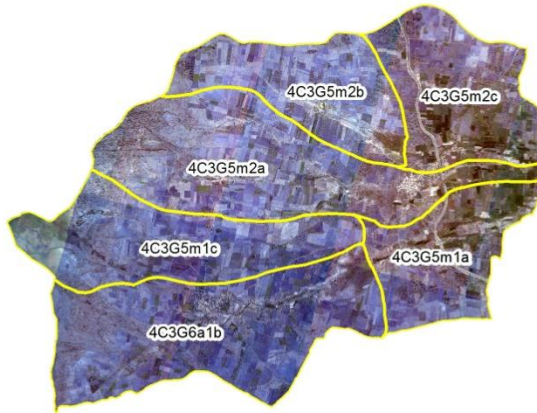
Natural Color Composite-24th January 2018
Source:Fusion Data, NRSC

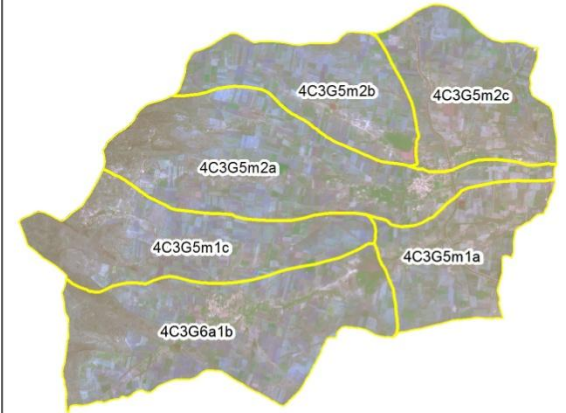Natural Color Composite- 4th January 2019
Source:IRS LISS-IV, NRSC

Natural Color Composite-20th March 2020
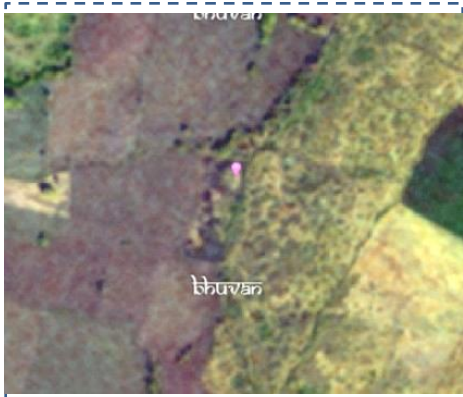Source:Fusion Data, NRSC

Natural Color Composite-22nd December 2021
Source:Fusion Data, NRSC

Monitoring of activities in Ananthapuram District Andhra Pradesh. IWMP-72/2012-13

T0	Satellite data 2013
T1	Satellite data 2015
T2	Satellite data 2016
T3	Satellite data 2017
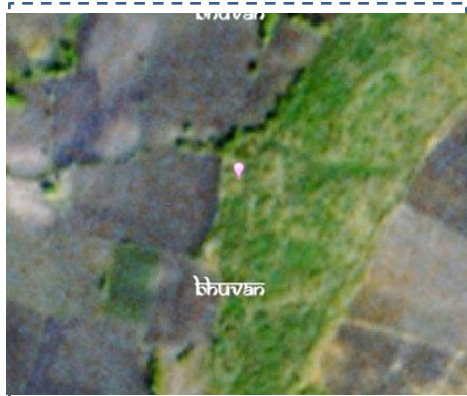
| T4 | Satellite data 2018 |
| T5 | Satellite data 2020 |

Drishti Id. 1742893

Check dam

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-72/2012-13
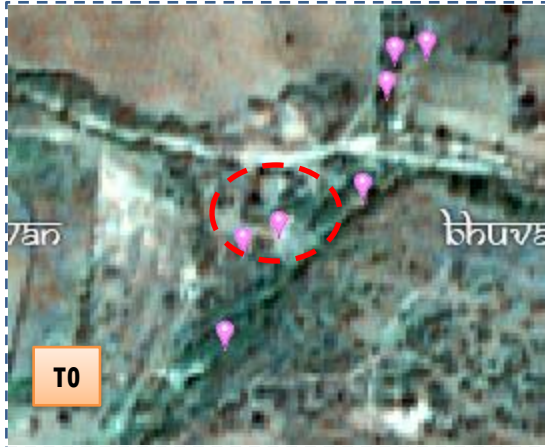
T0	T1	
T0:2012-13	T1: 09 November 2016	Drishti Sl no 135684- MWS :4C3G6a1b

Check dam

T0:2012-13	T1: 09 November 2016	Drishti Sl no. 691491- MWS : 4C3G5m1c

Dough out Pit

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-72/2010-11
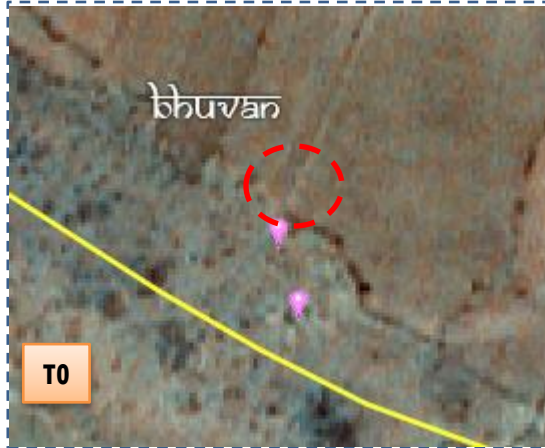
T0: 2012-13
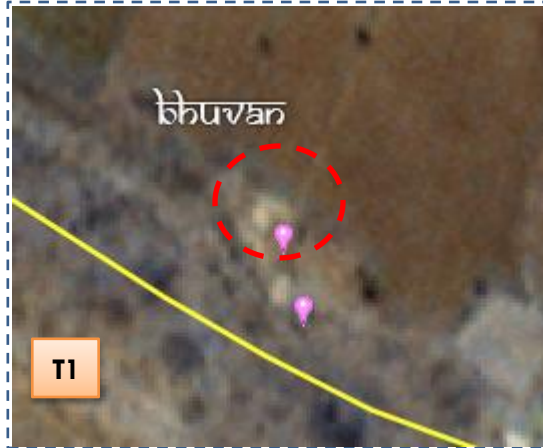
T1: 09 November 2016

Drishti Sl no. 588166   MWS :--------------

Checkdam
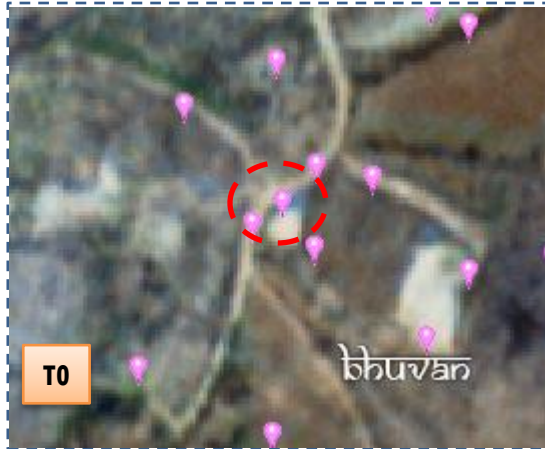
T0: 2012-13

T1: 09 November 2016

Drishti Sl no. 1024865-   MWS :4C3G6a1b

Thresing Floor

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 (2012-13) and row represents the T5 (2020-21)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2012-13 to 2016-17)
Scale: 1:10000
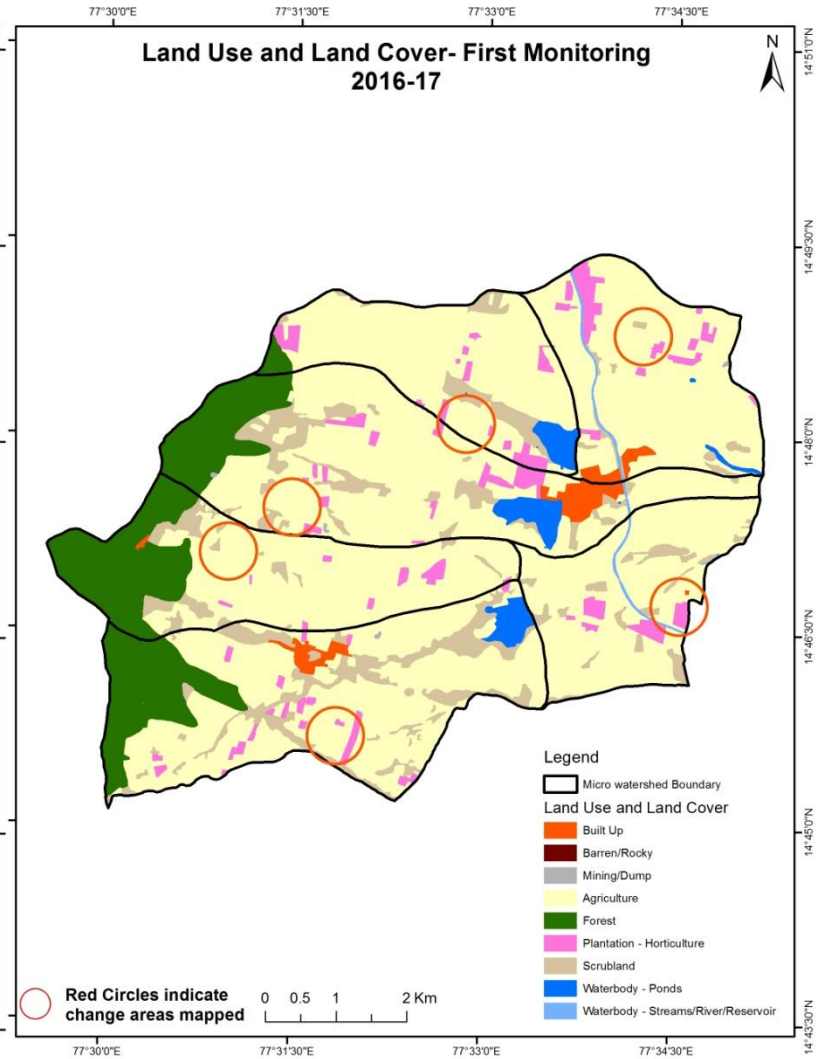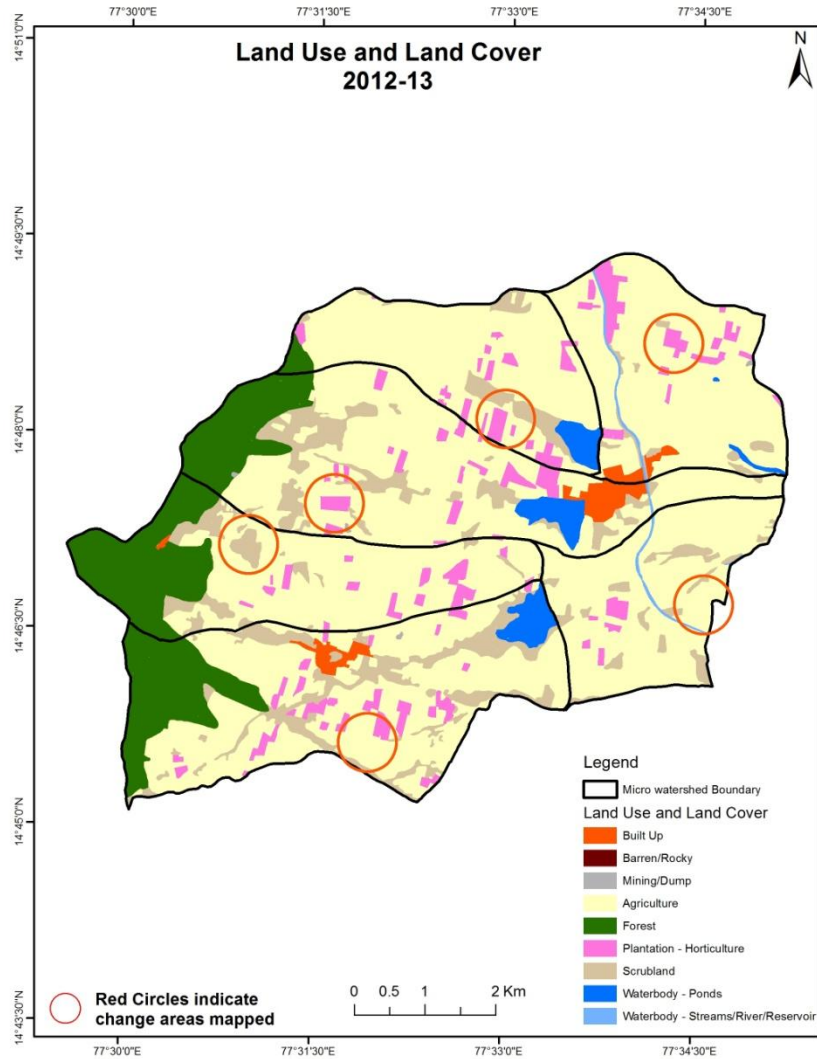
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

**Land Use and Land Cover
2016-17**

**Land Use and Land Cover- Second Monitoring
2017-18**

Legend

- ☐ Micro watershed Boundary
- ■ Built Up
- ■ Barren/Rocky
- ■ Mining/Dump
- ■ Agriculture
- ■ Forest
- ■ Plantation - Horticulture
- ■ Scrubland
- ■ Waterbody - Ponds
- ■ Waterbody - Streams/River/Reservoir

○ **Red Circles indicate change areas mapped**

0 0.5 1   2 Km

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- Third Monitoring 2018-19

Legend

Micro watershed Boundary

Land Use and Land Cover

Land Use and Land Cover

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

Red Circles indicate change areas mapped

0 0.5 1   2 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000
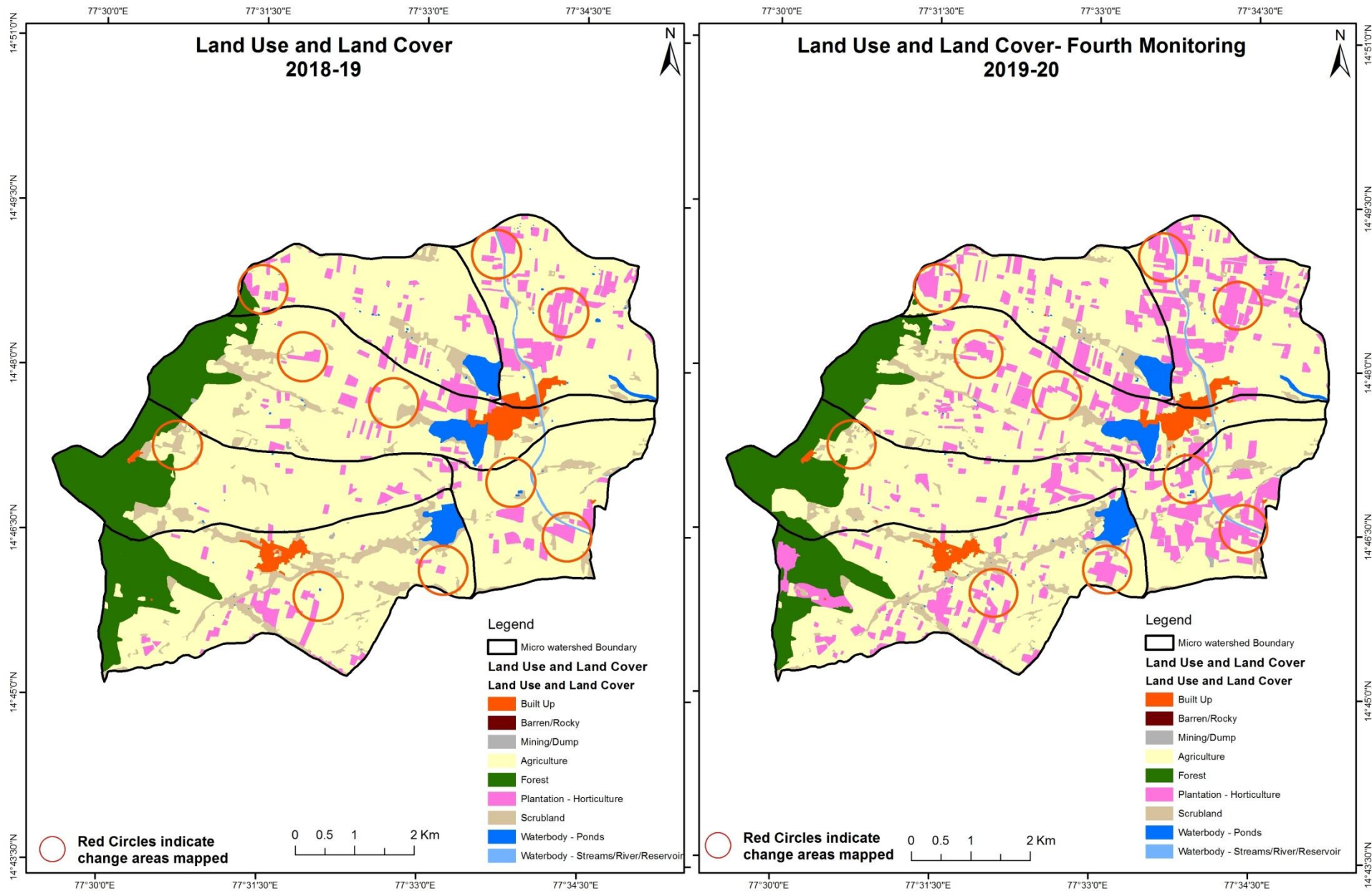
Land Use and Land Cover 2018-19

Land Use and Land Cover- Fourth Monitoring 2019-20

Legend

Micro watershed Boundary

Land Use and Land Cover

Land Use and Land Cover

- Built Up
- Barren/Rocky
- Mining/Dump
- Agriculture
- Forest
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir
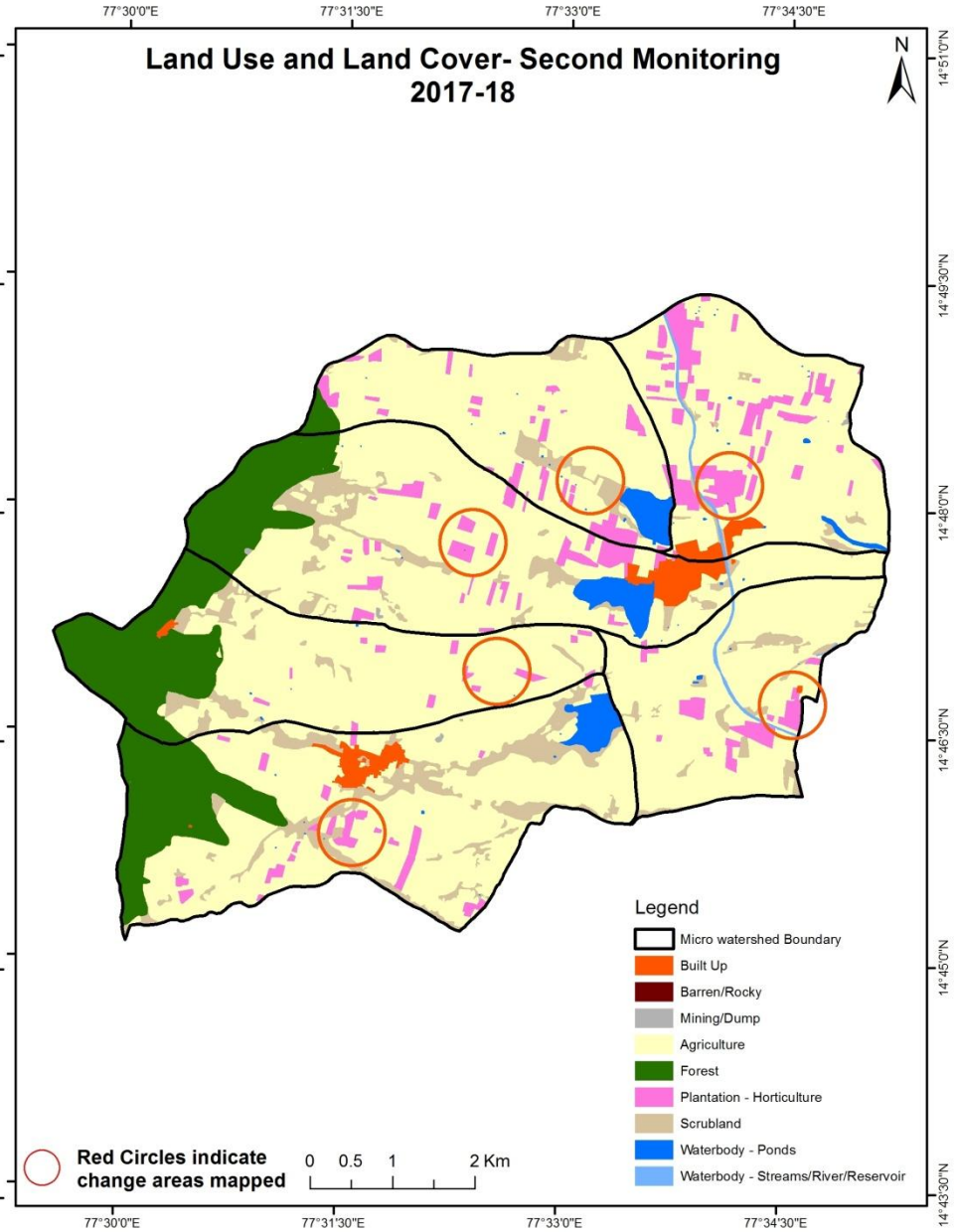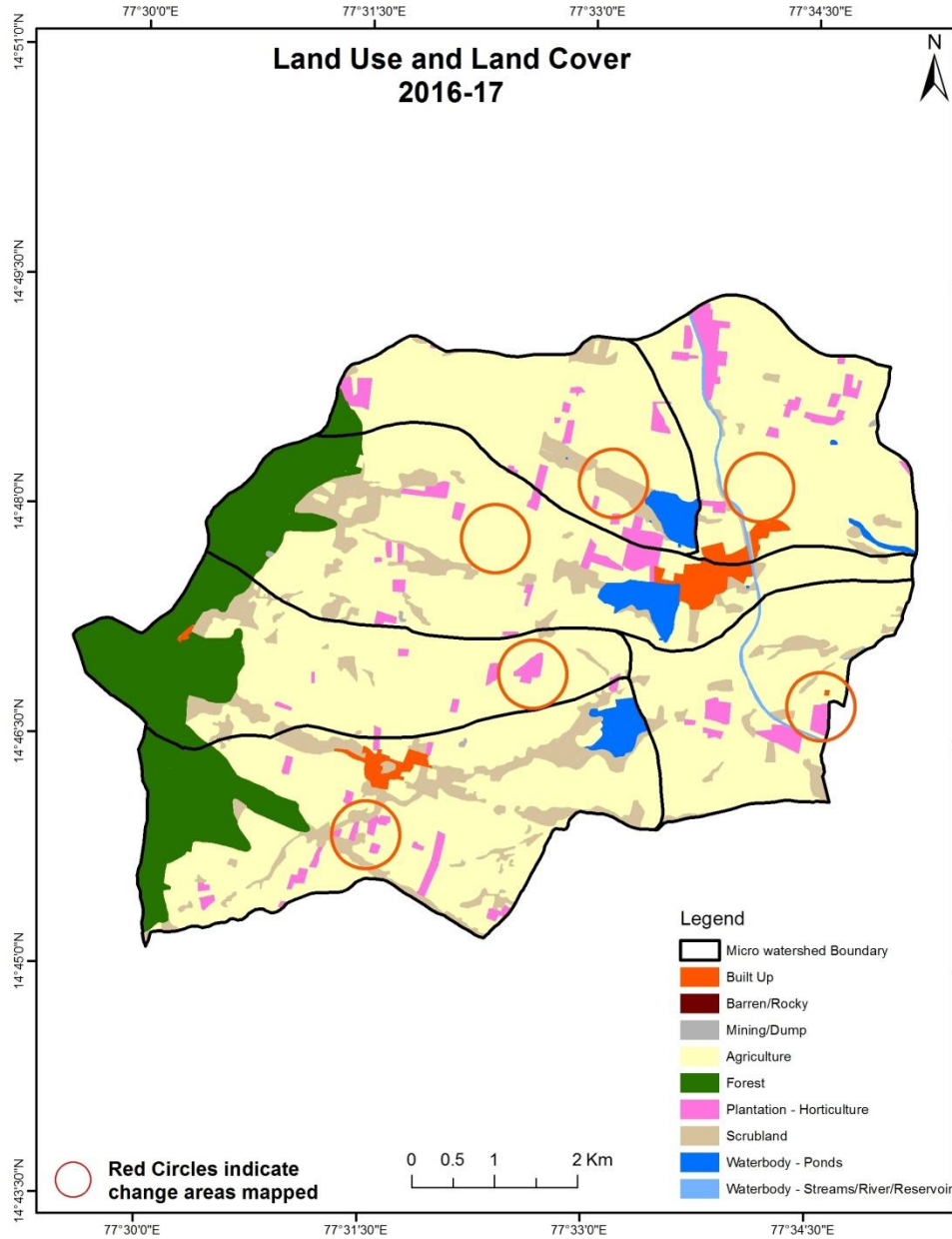
Red Circles indicate change areas mapped

0   0.5   1   2 Km

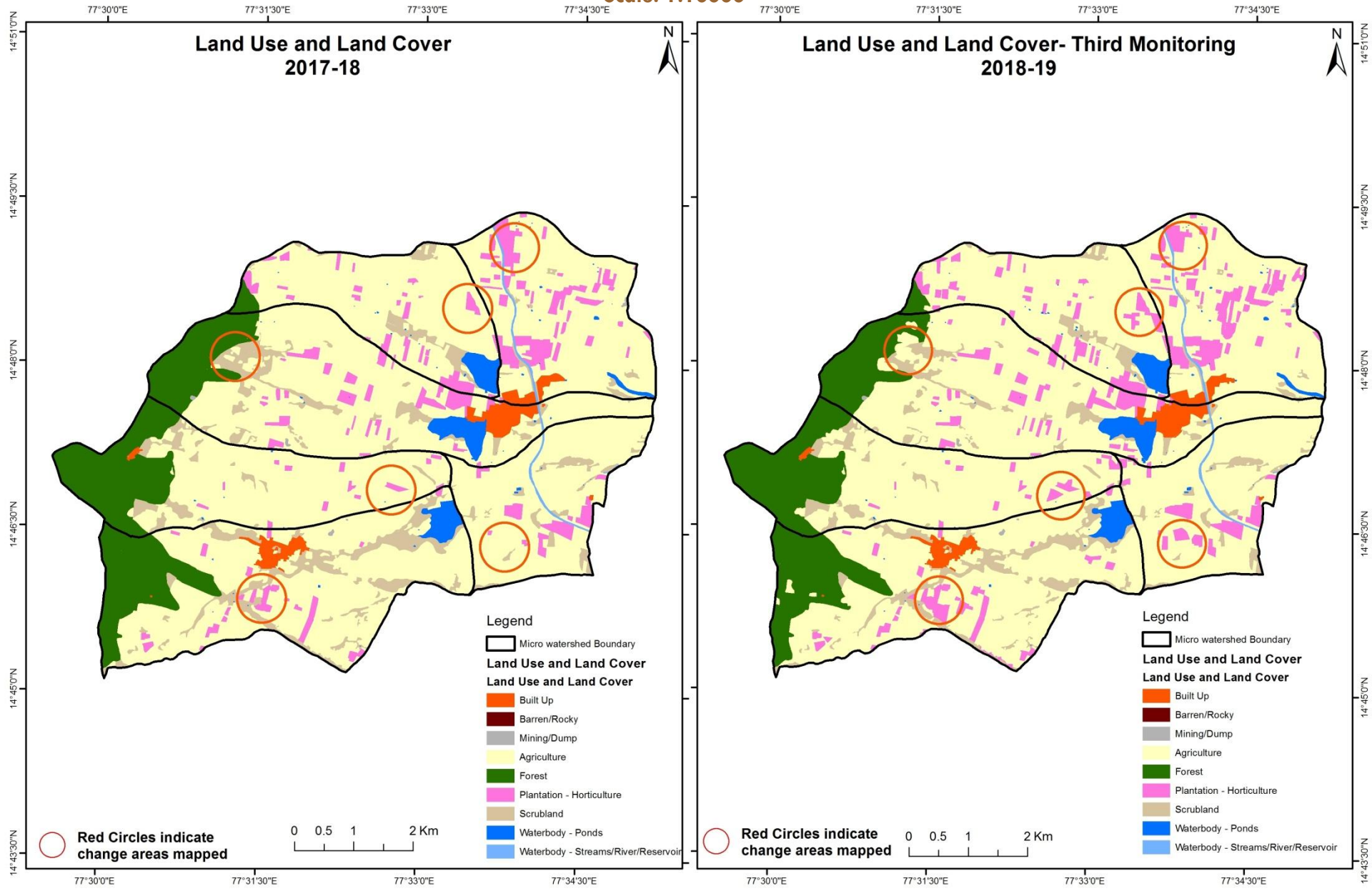# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000
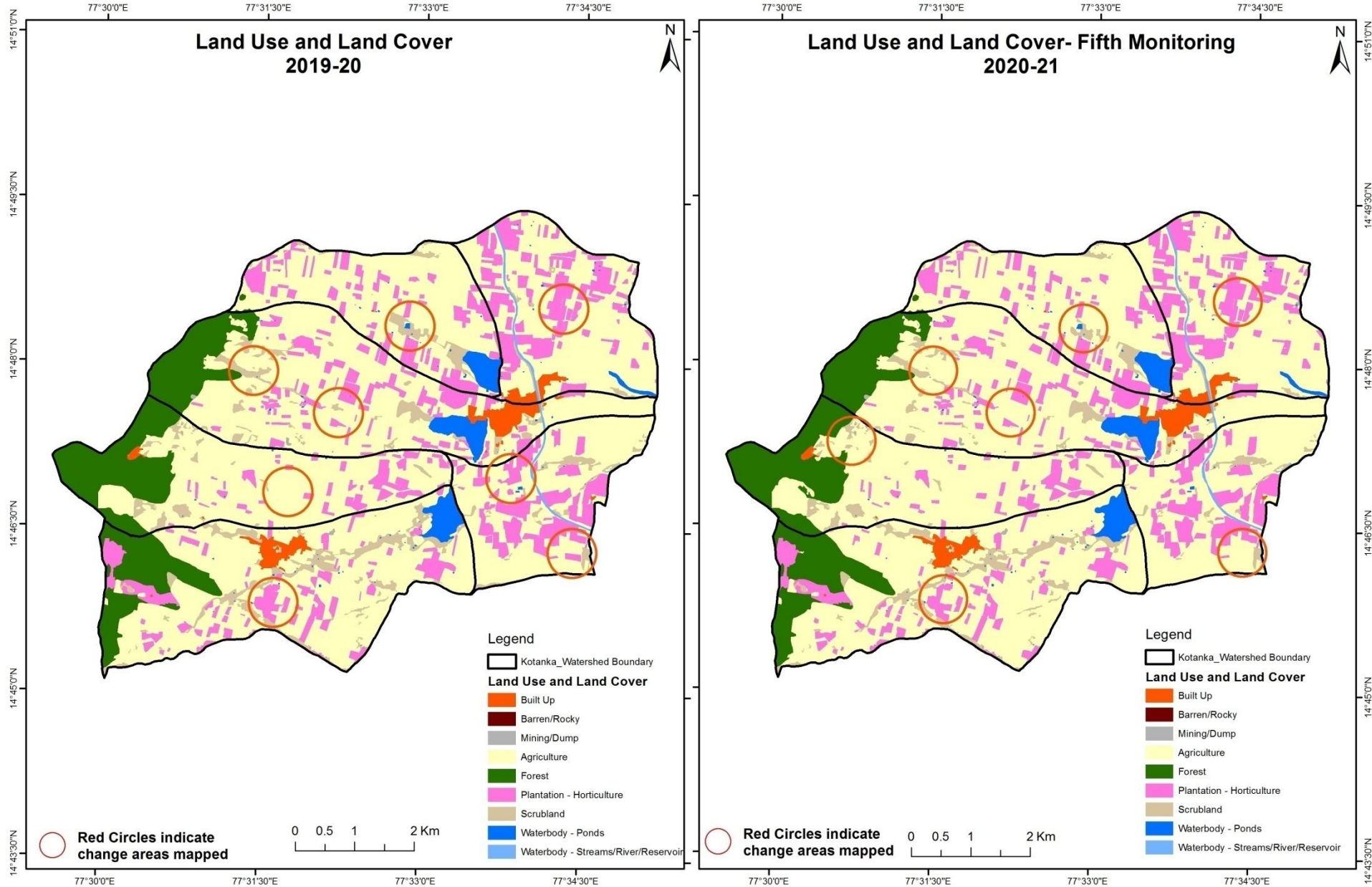
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Built-up

T0

T1

T0: 2012-13(77°34'37.074"E 14°46'49.591"N)
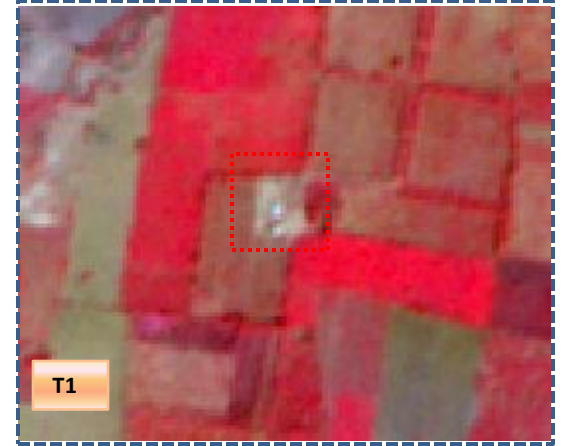
T1: 09 Nov 2016

Agriculture to Plantation

T0

T1

T0: 2012-13 (77°34'20.775"E 14°46'33.152"N)

T1: 09 Nov 2016

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

Agriculture to Water body

T0: 2012-13(77°33'29.669"E 14°47'9.761"N)
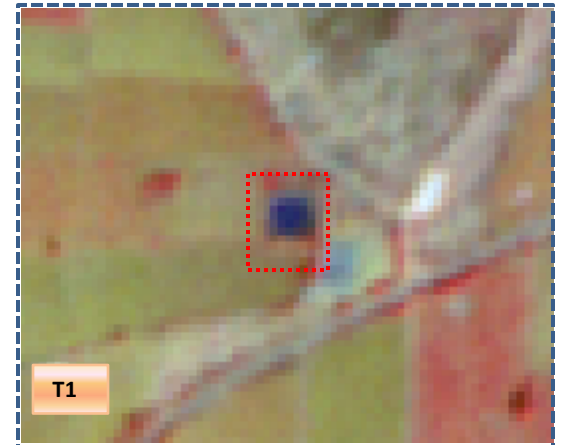
T1: 09 Nov 2016

Plantation to Agriculture

T0: 2012-13(77°31'37.585"E 14°47'29.219"N)

T1: 09 Nov 2016

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

Scrub to Agriculture

T0: 2012-13(77°33'49.437"E 14°47'17.58"N)

T1: 09 Nov 2016

Scrub to Water body

T0: 2012-13(77°32'50.818"E 14°48'20.023"N)
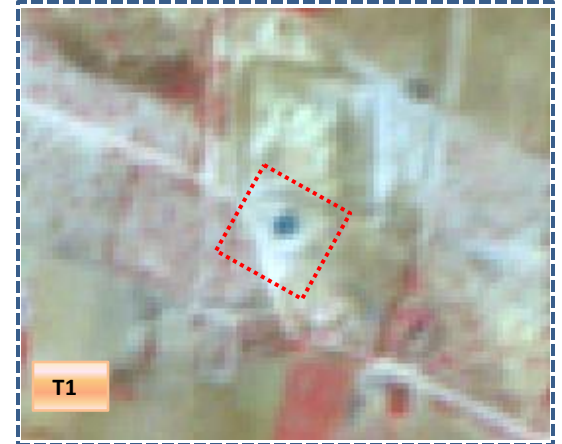
T1: 09 Nov 2016

Table showing change matrix depicting Land cover transitions during study period-2012-13 to 2016-17
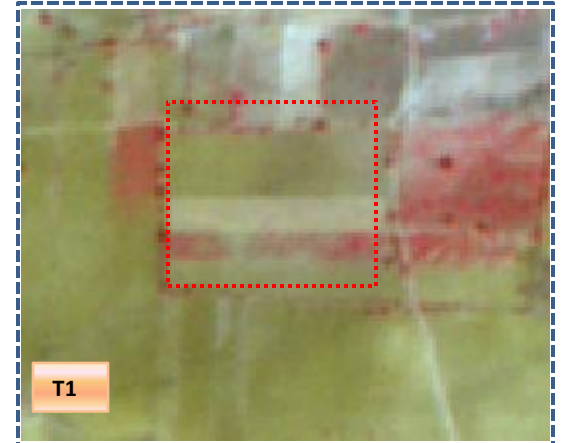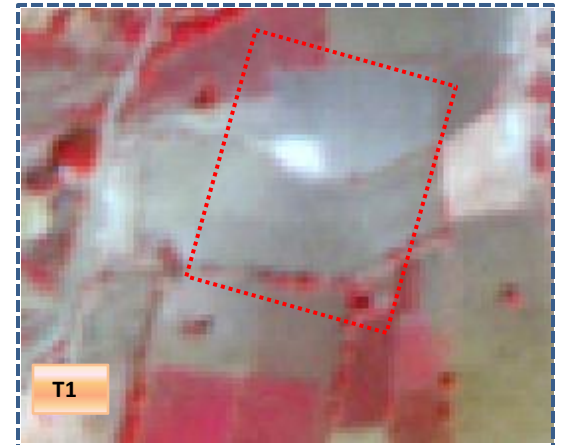
Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	77.34										77.34
Mining/dump		2.85									2.85
Agriculture	0.40		3495.10	46.65						0.27	3542.42
Plantation Horticulture			120.51	165.52							286.03
Forest					610.40						610.40
Forest Plantation											
Barren Rocky											
Scrub	1.93		47.44					502.19		0.17	551.74
Waterbody- Streams/River									21.33		21.33
Waterbody – Ponds			9.80							104.22	114.02
Grand Total	79.67	2.85	3672.86	212.16	610.40			502.19	21.33	104.65	5206.12

• 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 47 ha of the agriculture area has decreased and it is converted into Built-up , plantations and water body in T1.

• In T1 177 ha of the agriculture area has increased from plantations, scrubland and water body 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-2016-17 to 2017-18

Land cover / T1	Monitoring period (T2) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	79.67										79.67
Mining/dump		2.78	0.07								2.85
Agriculture	3.81	0.34	3529.22	136.10				1.21		2.17	3672.86
Plantation Horticulture	0.32		30.56	181.28							212.16
Forest	0.65		2.17		607.59						610.40
Forest Plantation											
Barren Rocky											
Scrub	4.87		96.65	3.79				395.64		1.25	502.19
Waterbody-Streams/River									21.33		21.33
Waterbody – Ponds	1.39									103.27	104.65
Grand Total	90.70	3.12	3658.67	321.18	607.59			396.85	21.33	106.68	5206.12

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 T1 142 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations, scrub and water body in T2.

• In T2 127 ha of the agriculture area has increased from mining/dump, plantations, forest 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-2017-18 to 2018-19

Land cover T2	Monitoring period (T3) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total (Units in Hectares)
Built up	89.41		1.02	0.27							**90.70**
Mining/dump		3.05								0.07	**3.12**
Agriculture	1.36		3559.93	96.57						0.82	**3658.67**
Plantation Horticulture	0.03		15.13	306.02							**321.18**
Forest			20.44		587.15						**607.59**
Forest Plantation											
Barren Rocky											
Scrub			55.97	3.46				337.34		0.09	**396.85**
Waterbody- Streams/River									21.33		**21.33**
Waterbody – Ponds	0.39									106.29	**106.68**
Grand Total	**91.19**	**3.05**	**3652.49**	**406.31**	**587.15**			**337.34**	**21.33**	**107.27**	**5206.12**

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

•In T3 71 ha of the agriculture area has increased from built-up, 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-2018-19 to 2019-20

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	85.09		5.53					0.57			91.19
Mining/dump		2.87		0.18							3.05
Agriculture	2.14	0.16	3165.84	473.68	1.84			3.33		5.50	3652.49
Plantation Horticulture			62.06	343.94				0.26		0.04	406.31
Forest	0.17		40.99	34.73	509.57			1.68			587.15
Forest Plantation											
Barren Rocky											
Scrub	0.68	0.24	67.41	6.12				261.86		1.03	337.34
Waterbody-Streams/River									21.33		21.33
Waterbody – Ponds	0.24		1.82	0.24						104.98	107.27
Grand Total	88.33	3.27	3343.65	858.89	511.41			267.70	21.33	111.55	5206.12

• 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 481 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations, forest, scrub and water body in T4.

• In T4 177 ha of the agriculture area has increased from built-up, plantations, forest, scrubland and water body 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-2019-20 to 2020-21

Land cover T4	Monitoring period (T5) 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	88.33										88.33
Mining/dump		3.27									3.27
Agriculture			3343.17					0.33		0.14	3343.65
Plantation Horticulture			34.95	823.94							858.89
Forest			7.11		504.30						511.41
Forest Plantation											
Barren Rocky											
Scrub			30.66					237.04			267.70
Waterbody-Streams/River									21.33		21.33
Waterbody – Ponds										111.55	111.55
Grand Total	88.33	3.27	3415.89	823.94	504.30			237.37	21.33	111.69	5206.12

• 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 0.48 ha of the agriculture area has decreased and it is converted into scrub and water body in T5.

•In T5 72 ha of the agriculture area has increased from built-up, plantations, forest and scrubland 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 decrease of 02 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.

4. There is an increase of 130 & 72 Hectares from T0- T1 & T4-T5 and there is a decrease of 14, 06 & 308 Hectares from T1-T2, T2-T3 & T3-T4 respectively and overall decrease of 126 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2020-21 (T5) years.

5. There is an **increase of 537 Hectares in plantation/horticulture** area in during the monitoring period of 2011-12 (T0) & 2020-21 (T5) years.

6. There is a decrease of 314 Hectares in Scrubland area as compared between 2011-12 (T0) & 2020-21 (T5) years.

7. Farm ponds (80) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (117) verified from the portal.