MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

YSR KADAPA -39/2012-13
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**

01.   STUDY AREA

02.   SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS

03.   MONITORING IN THE PROJECT AREA : Site wise changes in the project

04.   CONCLUSIONS

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-39/2012-13, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is **5,367.9** ha. It comprises of 11 micro watersheds.

- In the project area 687 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.

- Major percentage i.e. 59 % is covered by the agriculture, 22.8 % scrubland, 11.4 % forest area, 3.8 % is water body area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-39/2012-13
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Chakrayapet Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **5367.9** ha. It comprises of 11 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

Andhra Pradesh | YSR Kadapa District | YSR Kadapa – IWMP 39/2012-13 project
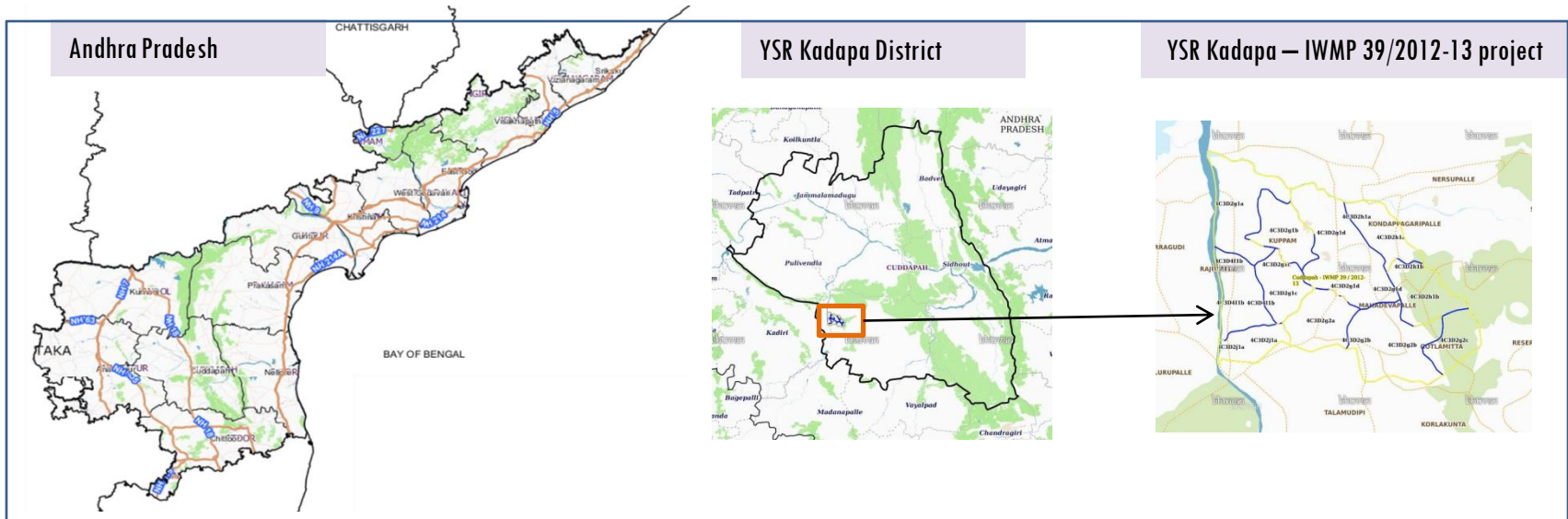
- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .

- The average annual rainfall of the YSR Kadapa District is 710 mm, which ranges from nil rainfall in January to 137 mm in October. October is the wettest month of the year. The mean seasonal rainfall distribution is 402.4 mm in southwest monsoon (June - September), 239.1 mm in northeast monsoon (October – December), distribution of rainfall in season wise 56.7 % in south west monsoon, 33.7 % in north east monsoon period.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2011-12	2020-21
LISS IV	2012-13		
SCENE 1			29-Nov-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			29-Nov-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	687
4	Detailed Project Report		

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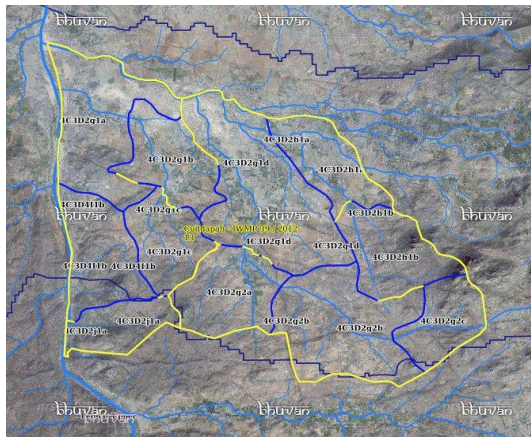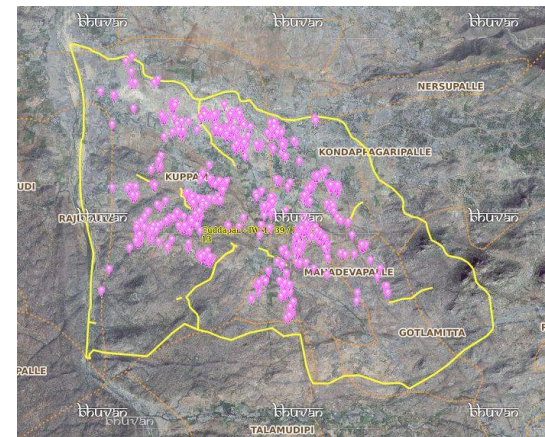

Legend

 Drainage (1:10000 Scale)

 MWS Boundary

 Project Boundary

Natural Color Composite overlaid with Drishti Points

Drishti Upload Status
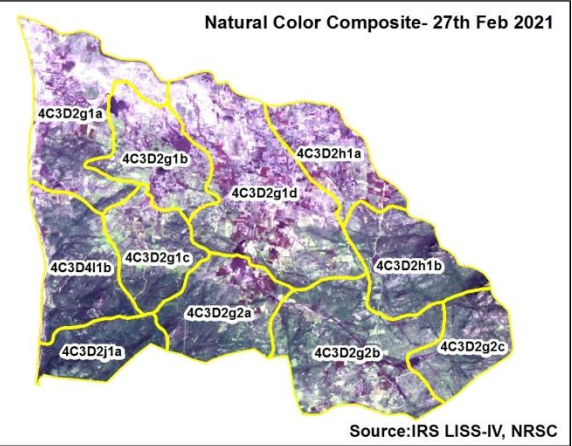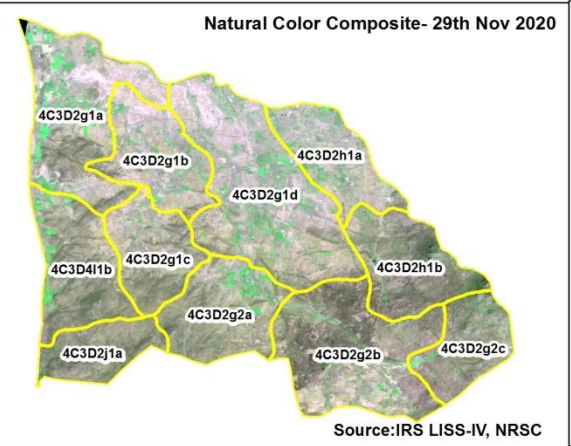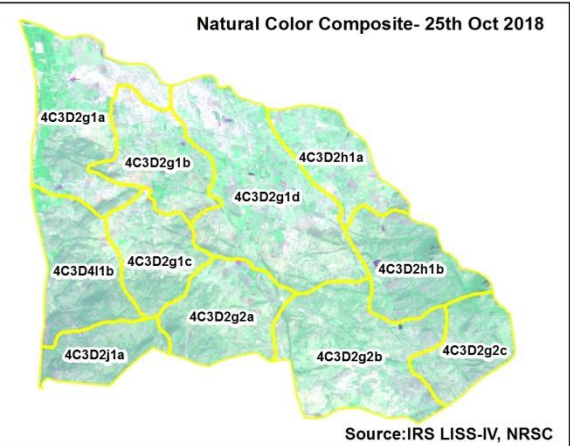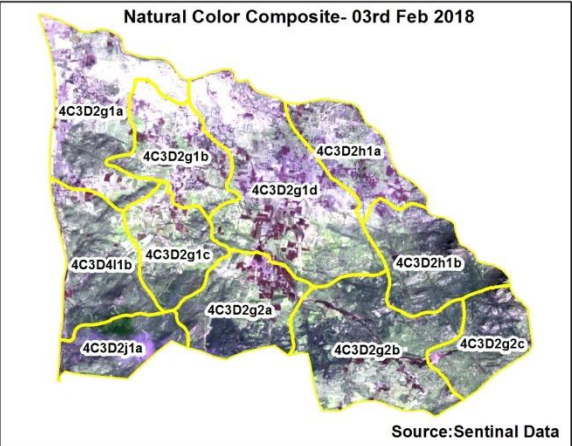
Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Afforestation	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	104	80
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	12	12
11	Civil work-Check dams /Rock fill dam	95	95
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	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	6	0
18	Others	704	500
	TOTAL	**915**	**687**

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)
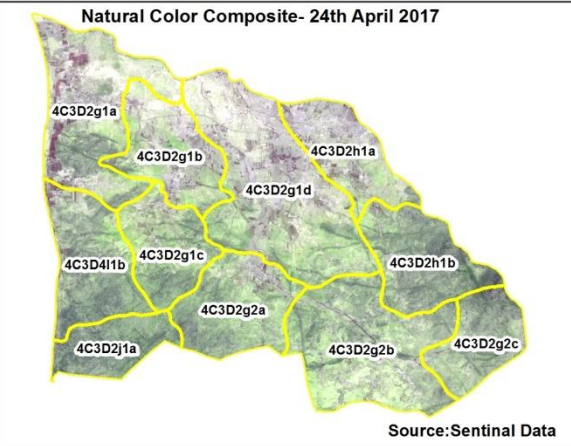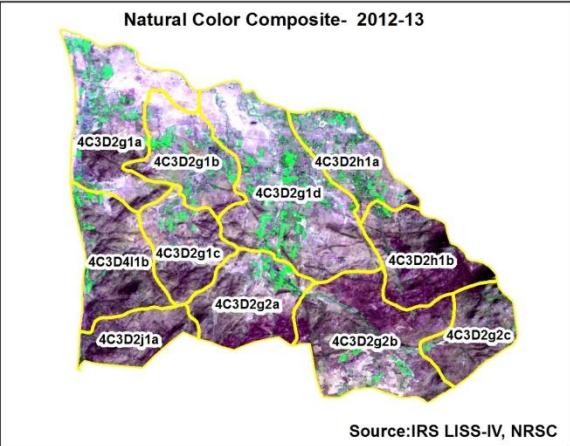
Natural Color Composite- 2012-13
Source:IRS LISS-IV, NRSC

Natural Color Composite- 24th April 2017
Source:Sentinal Data

Natural Color Composite- 03rd Feb 2018
Source:Sentinal Data

Natural Color Composite- 25th Oct 2018
Source:IRS LISS-IV, NRSC

Natural Color Composite- 29th Nov 2020
Source:IRS LISS-IV, NRSC

Natural Color Composite- 27th Feb 2021
Source:IRS LISS-IV, NRSC

T0	Satellite data 2010

T1	Satellite data 2012

T2	Satellite data 2015

T3	Satellite data 2017

T4	Satellite data 2018

T5	Satellite data 2020

Drishti Id. 2597101

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-39/2012-13

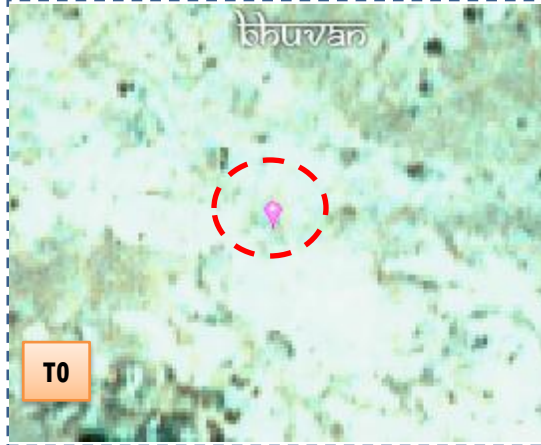| T0: 2012-13 | T1: 05 January 17 | Drishti Sl no. 2573689   MWS : 4C3D2g1d |

Farm Pond

| T0: 2012-13 | T1: 05 January 17 | Drishti Sl no. 2448258   MWS : 4C3D2g1c |

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-39/2012-13
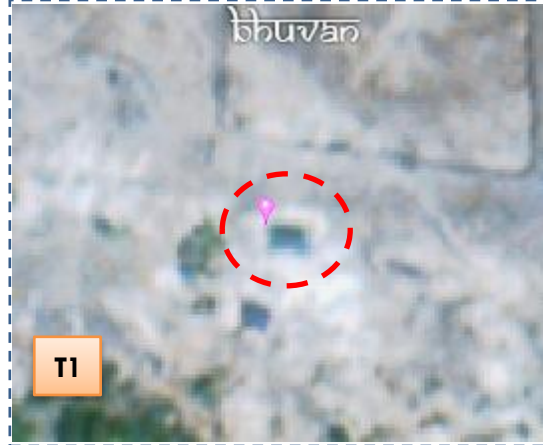
| T0: 2012-13 | T1: 05 January 17 | Drishti Sl no. 1896315   MWS : 4C3D2g1d |

Farm Pond

| T0: 2012-13 | T1: 05 January 17 | Drishti Sl no. 2460497   MWS : 4C3B7m1b |

Check Dam

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

Land Use and Land Cover 2012-13

Land Use and Land Cover- First Monitoring 2016-17

Legend

Microwwatershed Boundary

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 (2016-17 to 2017-18)

Scale: 1:10000

Land Use and Land Cover 2016-17

N

Legend

☐ Microwwatershed Boundary

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

Land Use and Land Cover- Second Monitoring 2017-18

N

Legend

☐ Microwwatershed Boundary

Land Use and Land Cover

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

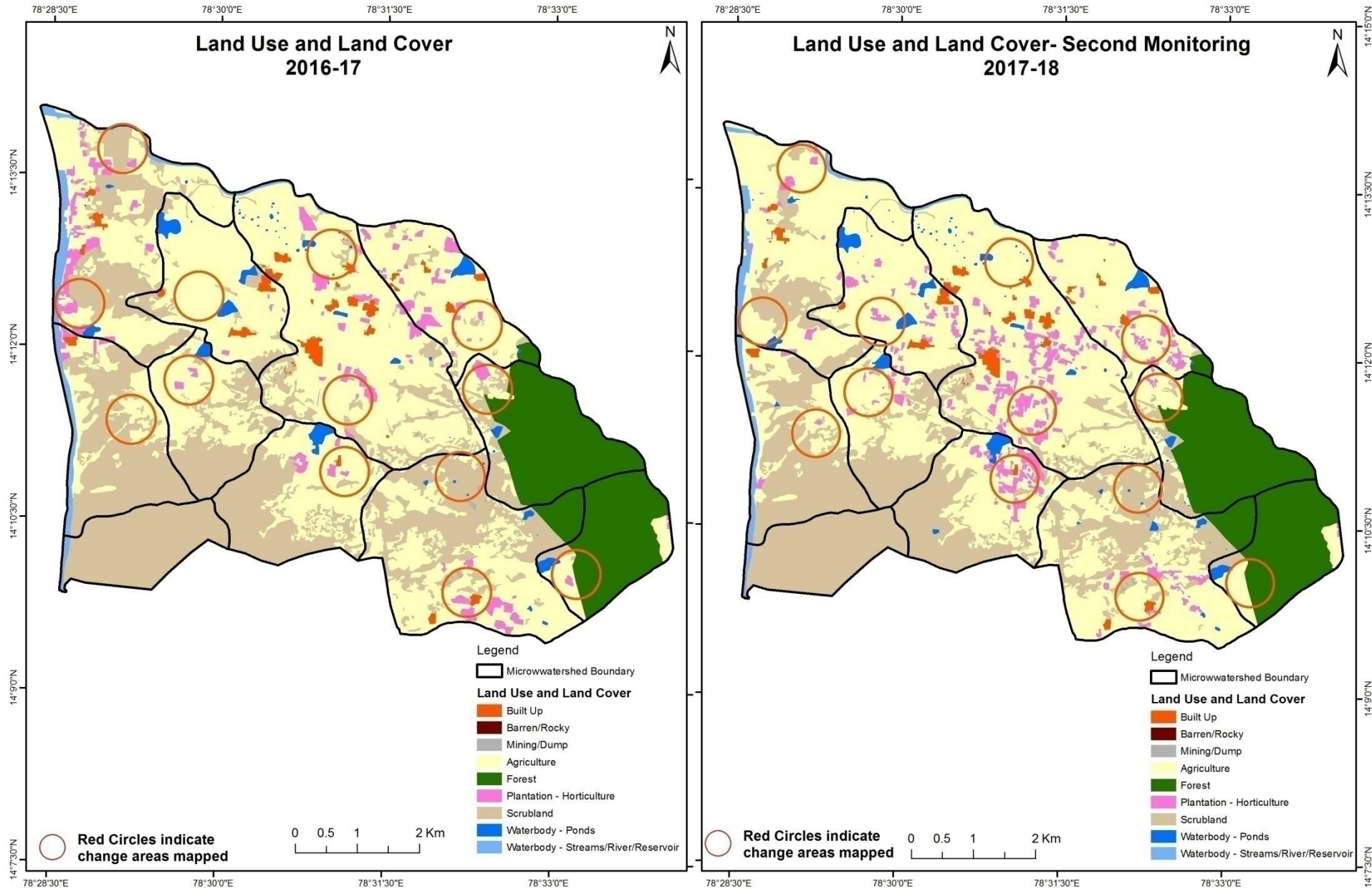◯ **Red Circles indicate change areas mapped**

0 0.5 1   2 Km

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

Scale: 1:10000

Land Use and Land Cover 2017-18

N

Legend

☐ Microwwatershed Boundary

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

Land Use and Land Cover- Third Monitoring 2018-19

N

Legend

☐ Microwwatershed Boundary

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

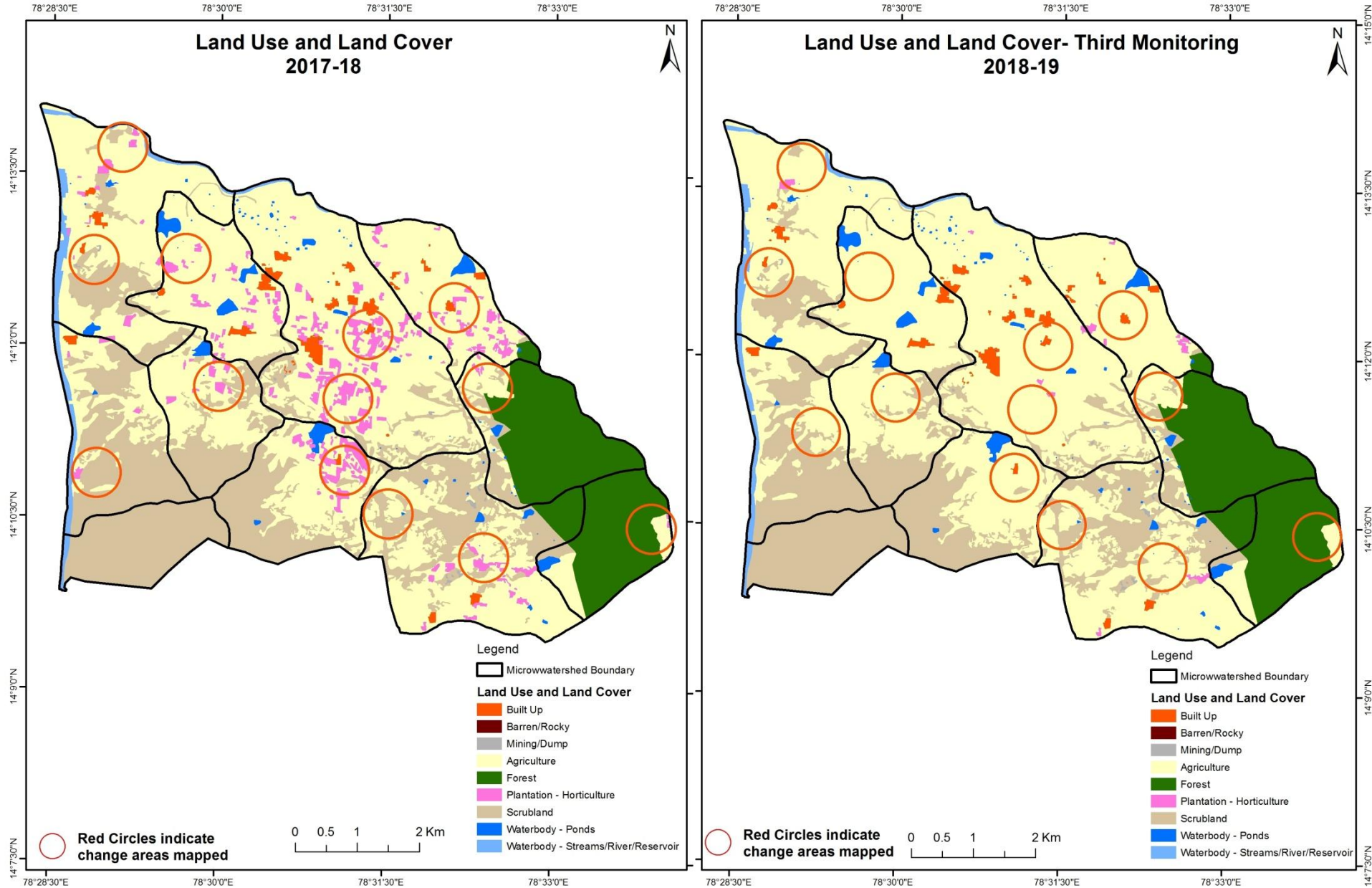# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

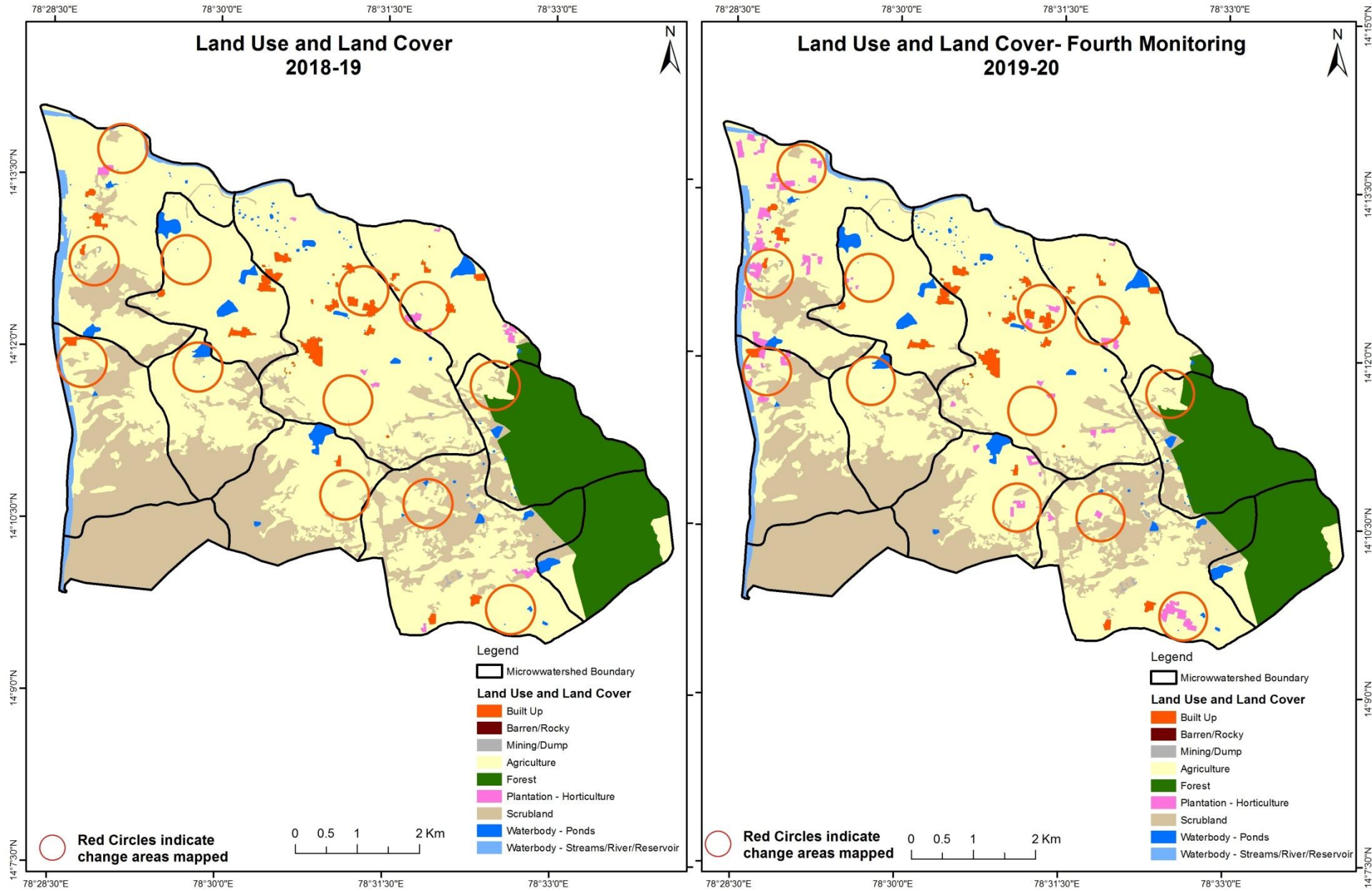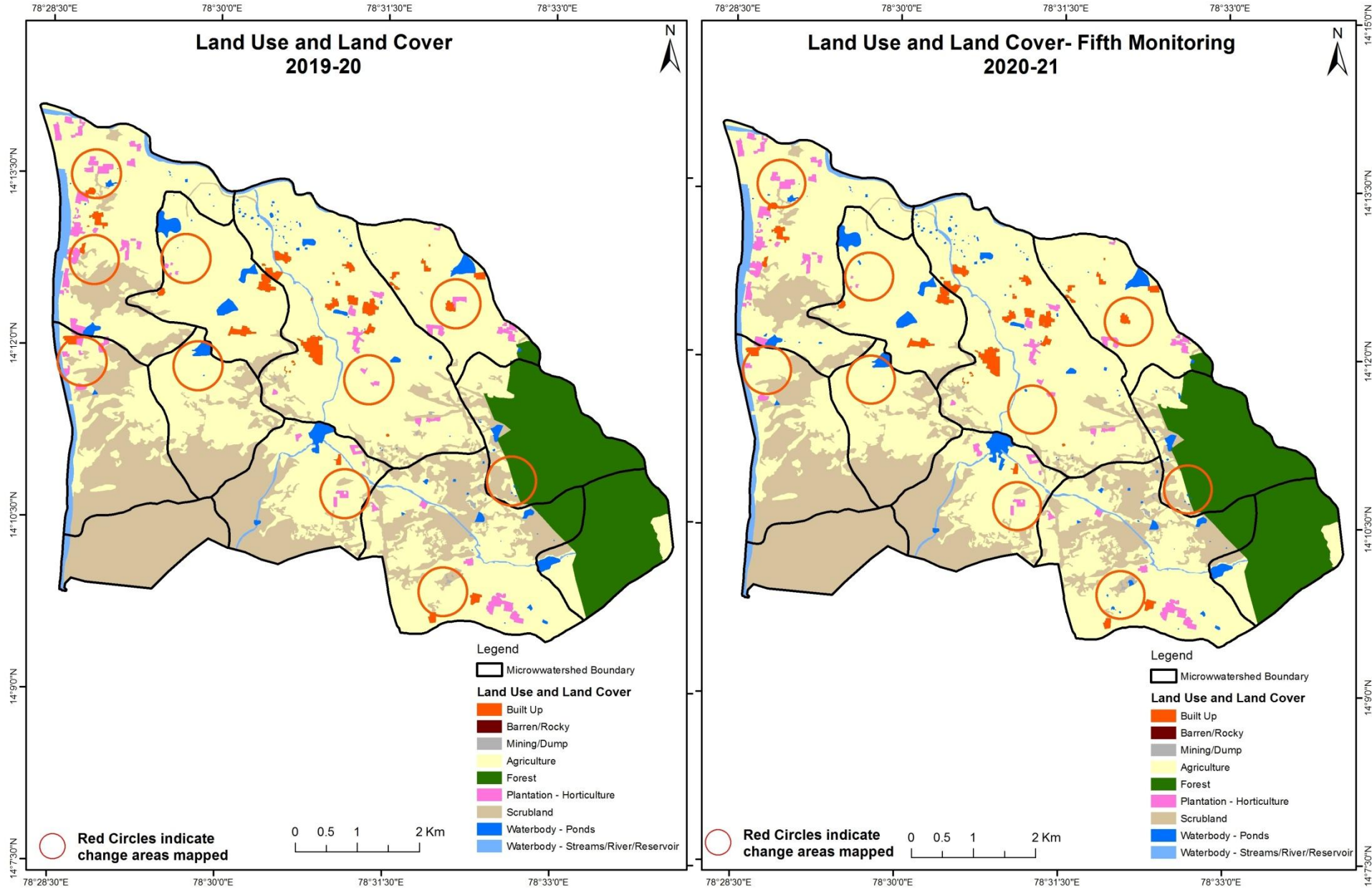Land Use and Land Cover
2018-19

Land Use and Land Cover- Fourth Monitoring
2019-20

Legend
☐ Microwwatershed Boundary
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
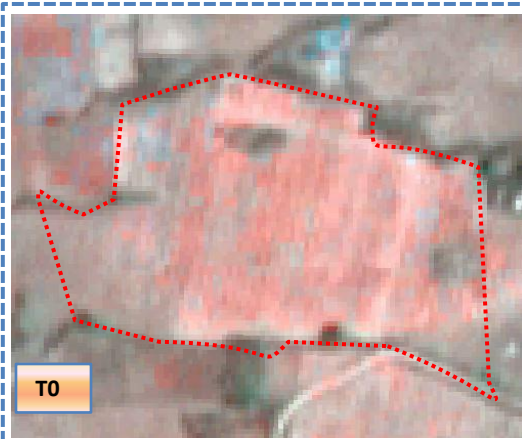
0 0.5 1   2 Km

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 2019-20

N

Legend

☐ Microwwatershed Boundary

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

Land Use and Land Cover- Fifth Monitoring 2020-21

N

Legend

☐ Microwwatershed Boundary

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**
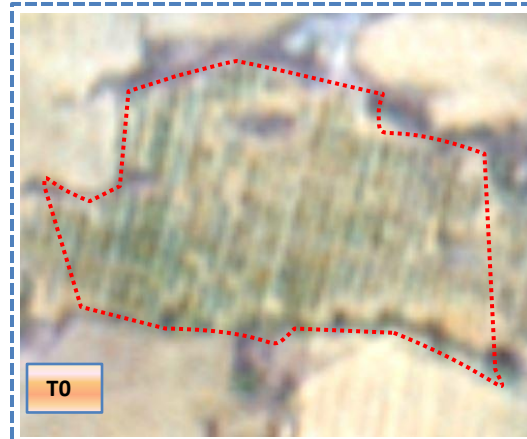
0   0.5   1   2 Km

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

Agriculture to Plantation

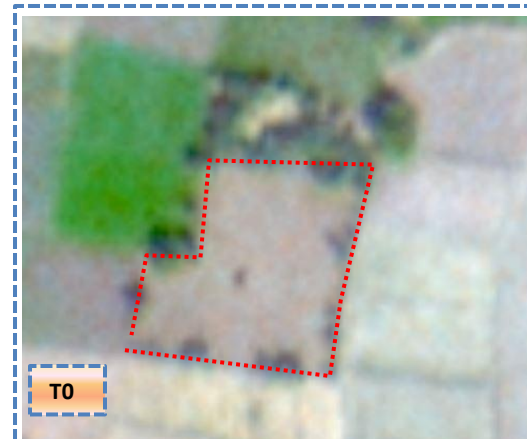T0: 2012-213 (78°32'11.314"E 14°9'48.548"N)
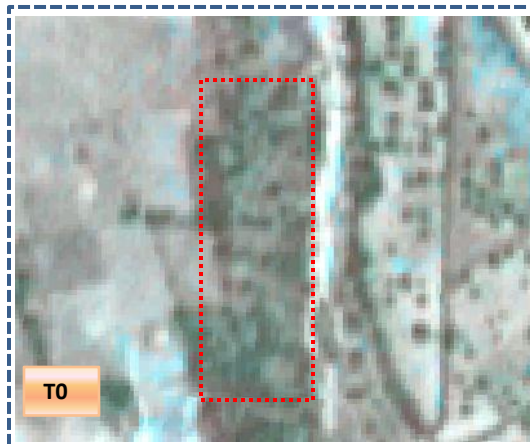
T0: 05 January 17

Plantation to Agriculture
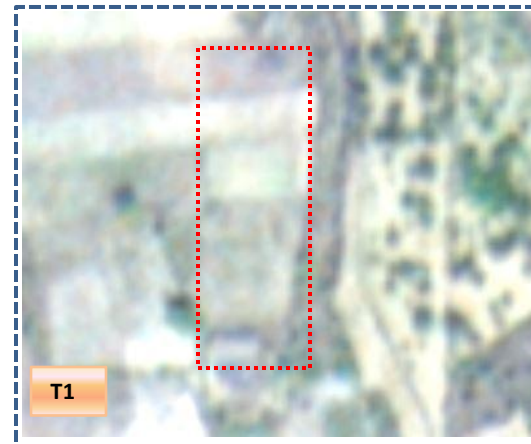
T0: 2012-13 (78°30'44.192"E 14°12'19.459"N)

T0: 05 January 17

Land Use and Land Cover changes for Pre and Post treatment dates
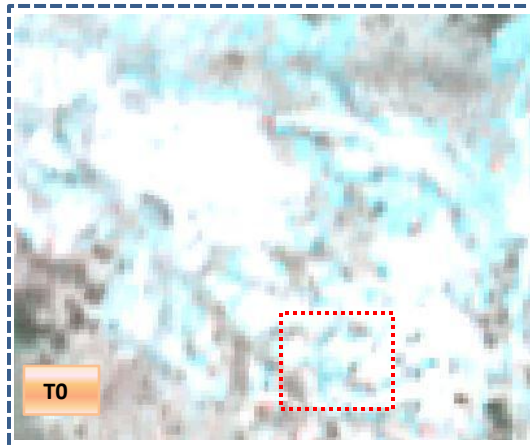
Scrub to Agriculture

T0

T1

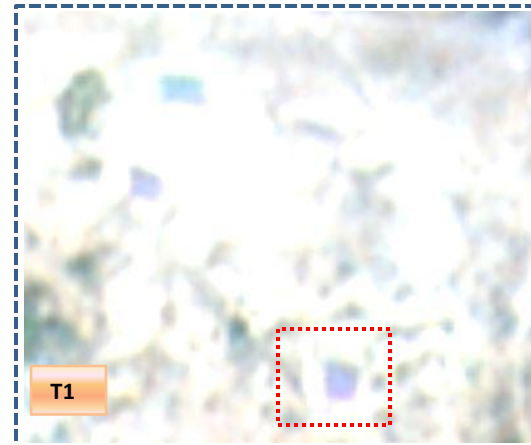T0: 2012-13 (78°30'39.785"E 14°12'59.859"N)

T1: 05 January 17

Scrub To Water body

T0

T1

T0: 2012-13 (78°30'31.169"E 14°13'10.051"N)

T1: 05 January 17

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	65.12										65.12
Mining/dump		4.85									4.85
Agriculture	0.10		1977.22	125.13					0.17	0.08	2102.71
Plantation Horticulture			3.67	42.15							45.82
Forest			0.46		611.94					0.09	612.48
Forest Plantation											
Barren Rocky											
Scrub			651.12	4.81				1666.18	0.53	3.71	2326.35
Waterbody-Streams/River			15.72						127.57		143.28
Waterbody – Ponds										67.35	67.35
Grand Total	65.22	4.85	2648.18	172.09	611.94			1666.18	128.27	71.23	5367.97

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

• In T1 670 ha of the agriculture area has increased from plantations, forest, scrubland and water body of T2. 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	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	64.41										64.41
Mining/dump		5.59									5.59
Agriculture			2453.50	218.21						1.13	2672.83
Plantation Horticulture			156.69	16.78							173.47
Forest					611.89					0.05	611.94
Forest Plantation											
Barren Rocky											
Scrub			259.54	0.31				1412.20		4.01	1676.06
Waterbody- Streams/River			6.07						89.44		95.51
Waterbody – Ponds										68.15	68.15
Grand Total	64.41	5.59	2875.80	235.29	611.89			1412.20	89.44	73.34	5367.97

- 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 219 ha of the agriculture area has decreased and it is converted into plantations and water body in T2.

- In T2 416 ha of the agriculture area has increased from plantations, scrubland and water body 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
Built up	64.41										64.41
Mining/dump		5.59									5.59
Agriculture	0.11		2870.62	4.77						0.30	2875.80
Plantation Horticulture			223.02	12.28							235.29
Forest					611.89						611.89
Forest Plantation											
Barren Rocky											
Scrub			103.63					1308.53		0.04	1412.20
Waterbody-Streams/River									89.44		89.44
Waterbody – Ponds										73.34	73.34
Grand Total	64.52	5.59	3197.27	17.04	611.89			1308.53	89.44	73.67	5367.97

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 05 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T3.
- In T3 326 ha of the agriculture area has increased from plantations 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 T3	Monitoring period (T4) 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	64.52										64.52
Mining/dump		5.59									5.59
Agriculture			3124.73	72.39						0.15	3197.27
Plantation Horticulture			11.32	5.72							17.04
Forest					611.89						611.89
Forest Plantation											
Barren Rocky											
Scrub			51.71					1256.83			1308.53
Waterbody-Streams/River									89.44		89.44
Waterbody – Ponds										73.67	73.67
Grand Total	64.52	5.59	3187.76	78.11	611.89			1256.83	89.44	73.83	5367.97

• 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 72 ha of the agriculture area has decreased and it is converted into plantations and water body in T4.

•In T4 63 ha of the agriculture area has increased from plantations 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-2019-20 to 2020-21

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	65.33										65.33
Mining/dump		4.85									4.85
Agriculture			3137.39	1.11						5.85	3144.35
Plantation Horticulture			10.61	80.43							91.04
Forest					611.89						611.89
Forest Plantation											
Barren Rocky											
Scrub			23.76					1225.83		0.95	1250.54
Waterbody-Streams/River									124.95		124.95
Waterbody – Ponds										75.01	75.01
Grand Total	65.33	4.85	3171.77	81.54	611.89			1225.83	124.95	81.81	5367.97

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

•In T5 34 ha of the agriculture area has increased from plantations 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 3.3 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 545, 202, 321 & 27 Hectares from T0-T1, T1-T2, T2-T3 & T4-T5 respectively and there is a decrease of 9.5 Hectares from T3-T4 and overall increase of 1,069 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.

5. Abut **35 Hectares of the plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) to 2020-21 (T5) .

6. There is a decrease of 1,100 Hectares in Scrubland area as compared between 2012-13 (T0) & 2020-21 (T5) years.

7. Farm ponds (12) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (12) verified from the portal.