MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT
IWMP-Batch-V

VIZIANAGARAM -01/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

March-2023

T 0 - T 1 - T 2 - T 3 - T 4 - T 5

APSAC

AGRICULTURE & SOIL
DIVISION
Andhra Pradesh Space
Applications Centre (APSAC)
ITE&C Department Govt. of
Andhra Pradesh

इसरो ISRO

RURAL DEVELOPMENT AND
WATERSHED MONITORING
DIVISION
Land Resources and Land Use
Mapping and Monitoring Group,
Remote Sensing Application Area,
National Remote Sensing Centre, ISRO

सत्यमेव जयते

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

EXECUTIVE SUMMARY

1. Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).

2. 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).

3. Current summary report gives details of Project – IWMP-01/2013-14, Vizianagaram District of   Andhra Pradesh.   The total geographical area of the project is 7,412 ha. It comprises of 17 micro watersheds.

4. In the project area 132 Drishti photos were uploaded showing 27 check dams/Rock fill dam, 29 entry point activities, 7 checks and plugins, 1 agriculture and 68 showing other activities.

5. Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 18 new farm ponds or dug out pits and 4 check dams and drainage treatments with 2.57 ha increase in the area.

6. Major percentage i.e. 57 % is covered by the forest, 31 % is covered by agriculture, 9 % is covered by scrubland and remaining by other land use classes.

The study area falls in Komarada Mandal of Vizianagaram district of Andhra Pradesh state. The total geographical area of the project is 7,412 ha. It comprises of 17 micro watersheds. Location Map of the study area is shown in Figure 1. Analysis is done for 2013-14 (T0) period (*Batch -1*) projects taking 2021-22 (T5) period satellite images, seen in Table 1 & 2,Fig 04.

Fig.1. Location map of Masimanda Watershed (IWMP-01/2013-14) in Vizianagaram, A.P

•The Climate of the district is moderate and characterized by high humidity all through the year along with oppressive summer and good seasonal rainfall.

•   The mean daily maximum temperature in the district is about 34 C in May and the mean daily minimum temperature is about 17.5 C in December/ January.

•   The average annual rainfall of the district is 1067 mm, which ranges from nil rainfall in January and November 208 mm in September and October. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (june- September).

4

Table 1. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			2-Apr-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Apr-22
SCENE2			
SCENE 3			
SCENE 4			

Table 2. 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	132
4	Detailed Project Report		

Fig 2. Natural Color Composite overlaid with Project boundaries and high detail stream network
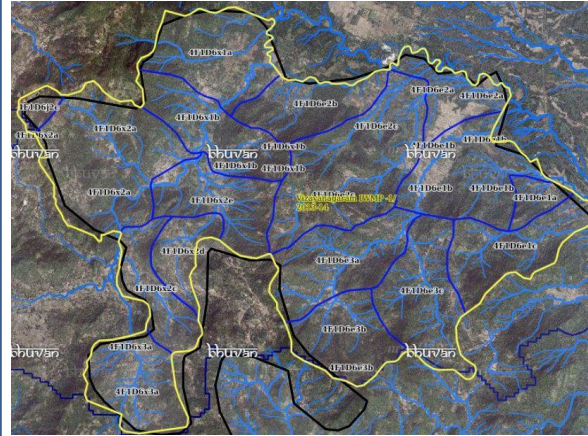
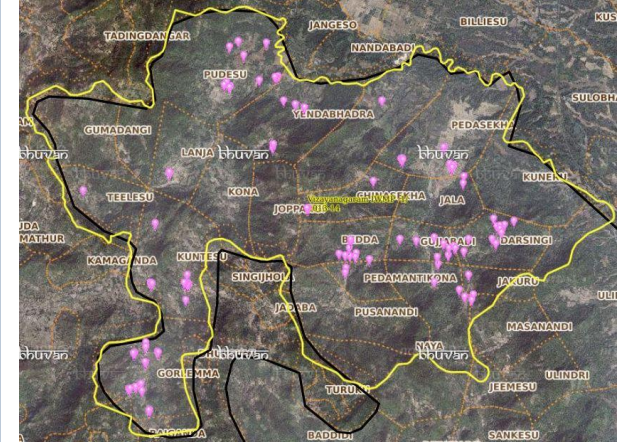**Legend**

 Drainage (1:10000 Scale)

 MWS Boundary

 Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points

Drishti Upload Status

Table 3. Classification of the Activities

Sr. No	Activity	Number of Photographs uploaded in Drishti Mobile Application	Visible on satellite in Srishti Geoportal
1	Agriculture/Horticulture	1	1
2	Afforestation	0	0
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	7	7
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	0	0
10	Civil work-Check dams/Rock fill dam	27	27
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	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	29	29
17	Others	70	68
	TOTAL	**134**	**132**

03. MONITORING IN THE PROJECT AREA

3.1 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 (2013-14) and T5 is 2021-22 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, figure 05 & 06.

Fig 4. Masimanda Watershed (IWMP-01/2013-14) Natural Colour Composite 2013-14 to 2021-22
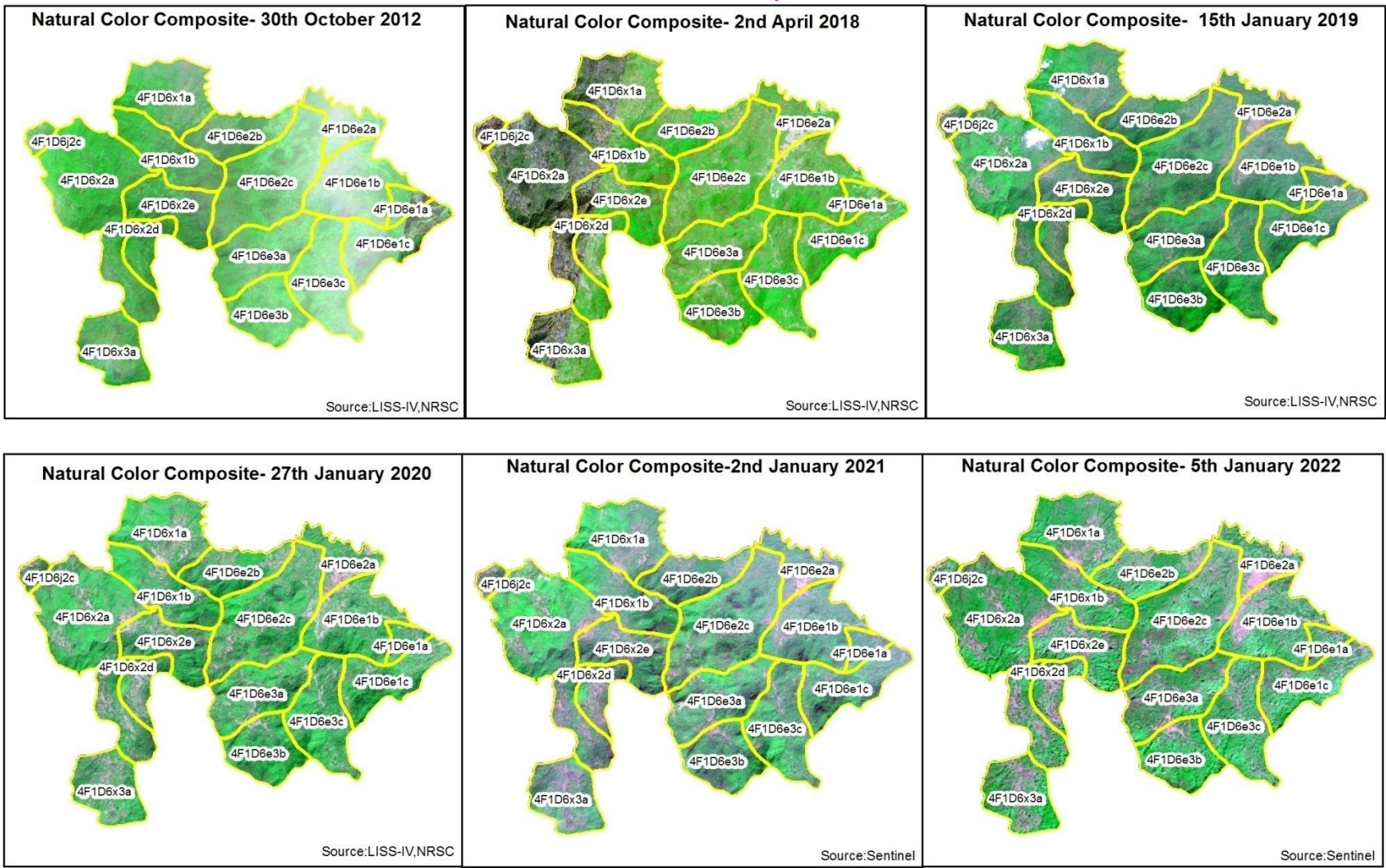
Fig 5. Monitoring of activities in Masimanda Watershed (IWMP-01/2013-14) Vizianagaram District , Andhra Pradesh
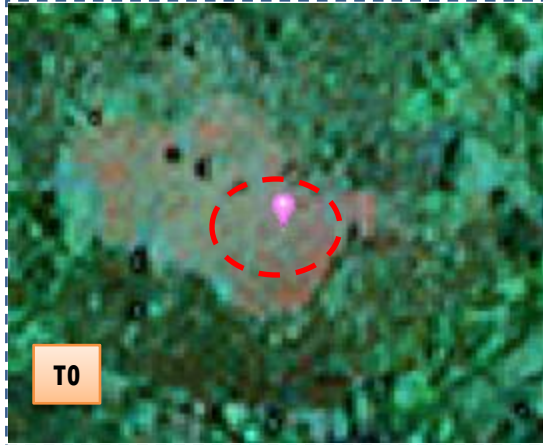
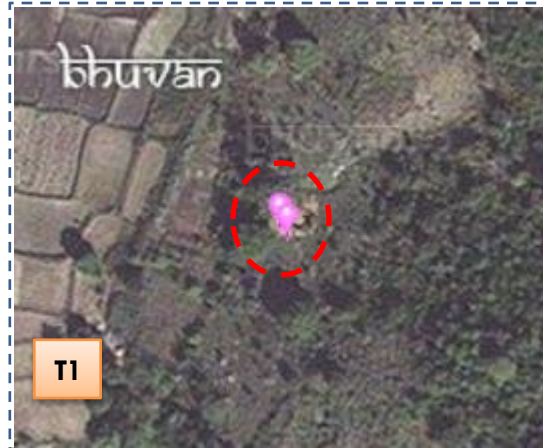| T0	T1	
T0:2009-10	T1: 29 December 2017	Drishti Sl no. 1668472 MWS :4F1D6e3a

Farm pond

T1		
T0:2009-10	T1: 29 December 2017	Drishti Sl no. 2486162 MWS :4F1D6x1a

Farm pond

Fig 6. Monitoring of activities in Masimanda Watershed (IWMP-01/2013-14) Vizianagaram District , Andhra Pradesh

| T0: 2009-10 | T1: 29 December 2017 | Drishti Sl no. 2486219   MWS : 4F1D6x1α |
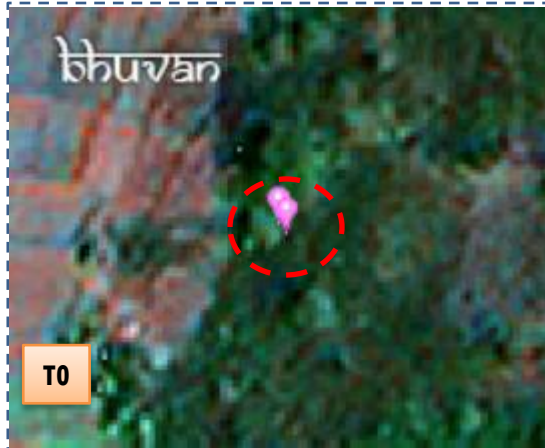
Farm pond

| T0: 2009-10 | T1: 29 December 2017 | Drishti Sl no. 7009852   MWS : 4F1D6e3c |

Farm pond

03. MONITORING IN THE PROJECT AREA

3.2 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, seen in fig 07 to fig 11.

- 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, seen in fig 12 & 13 .

- The result obtained for the period T0 to T5 are given in the change matrix table, seen in table 04 to table 08.

- In matrix table column represents the T0 (2013-14) and row represents the T5 (2021-22)
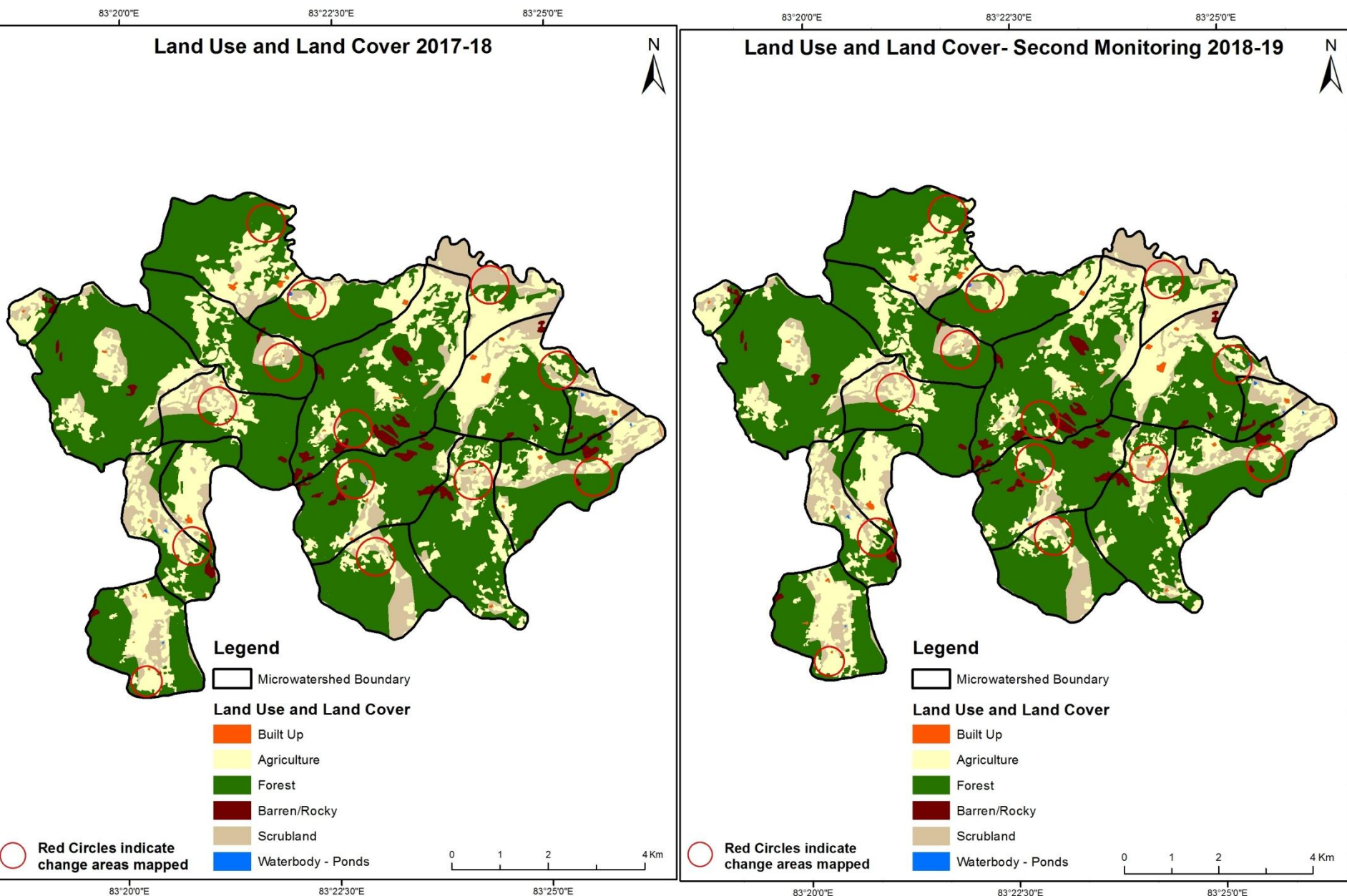
Fig 7. Masimanda Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)
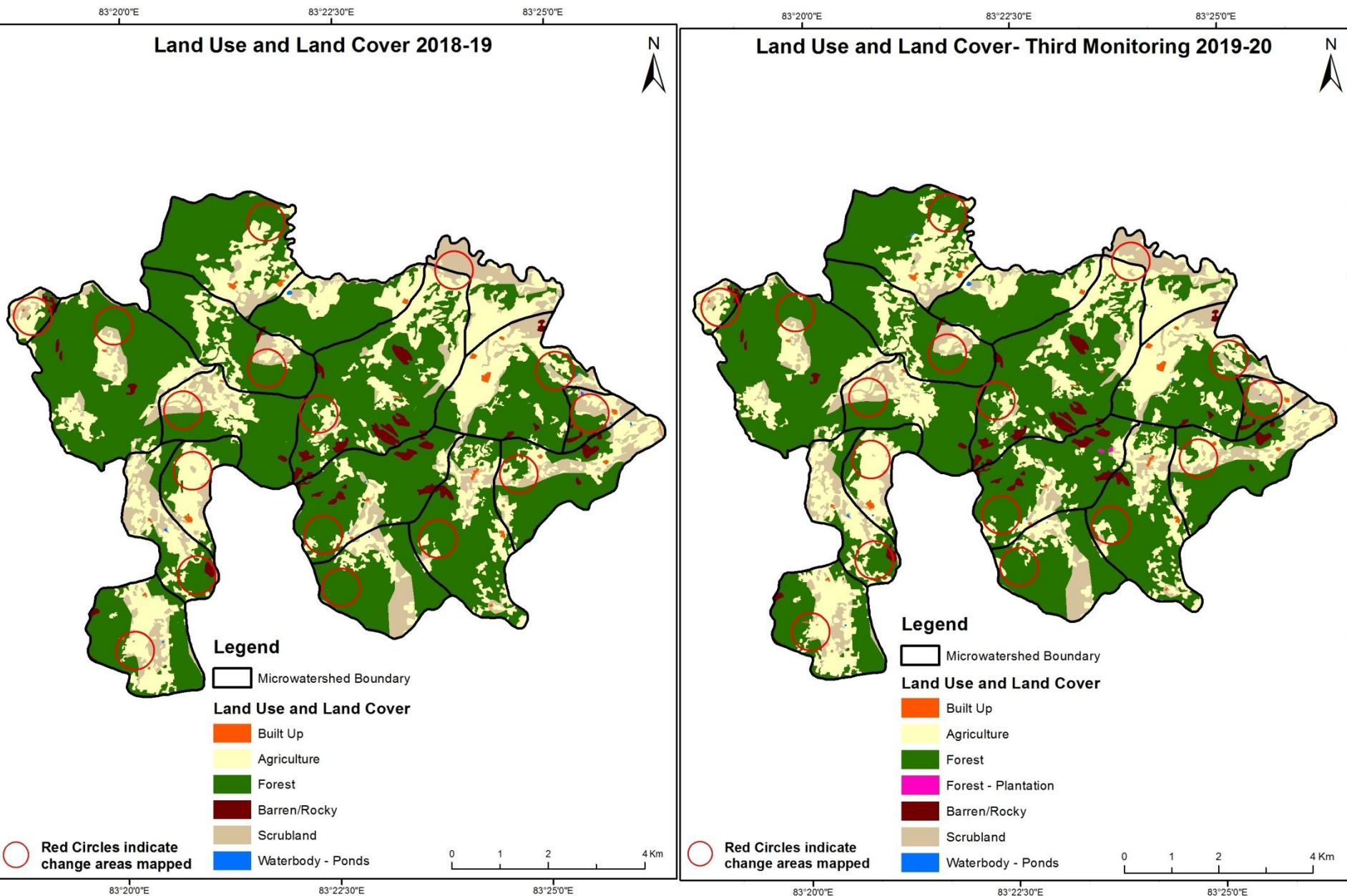
Scale: 1:10000
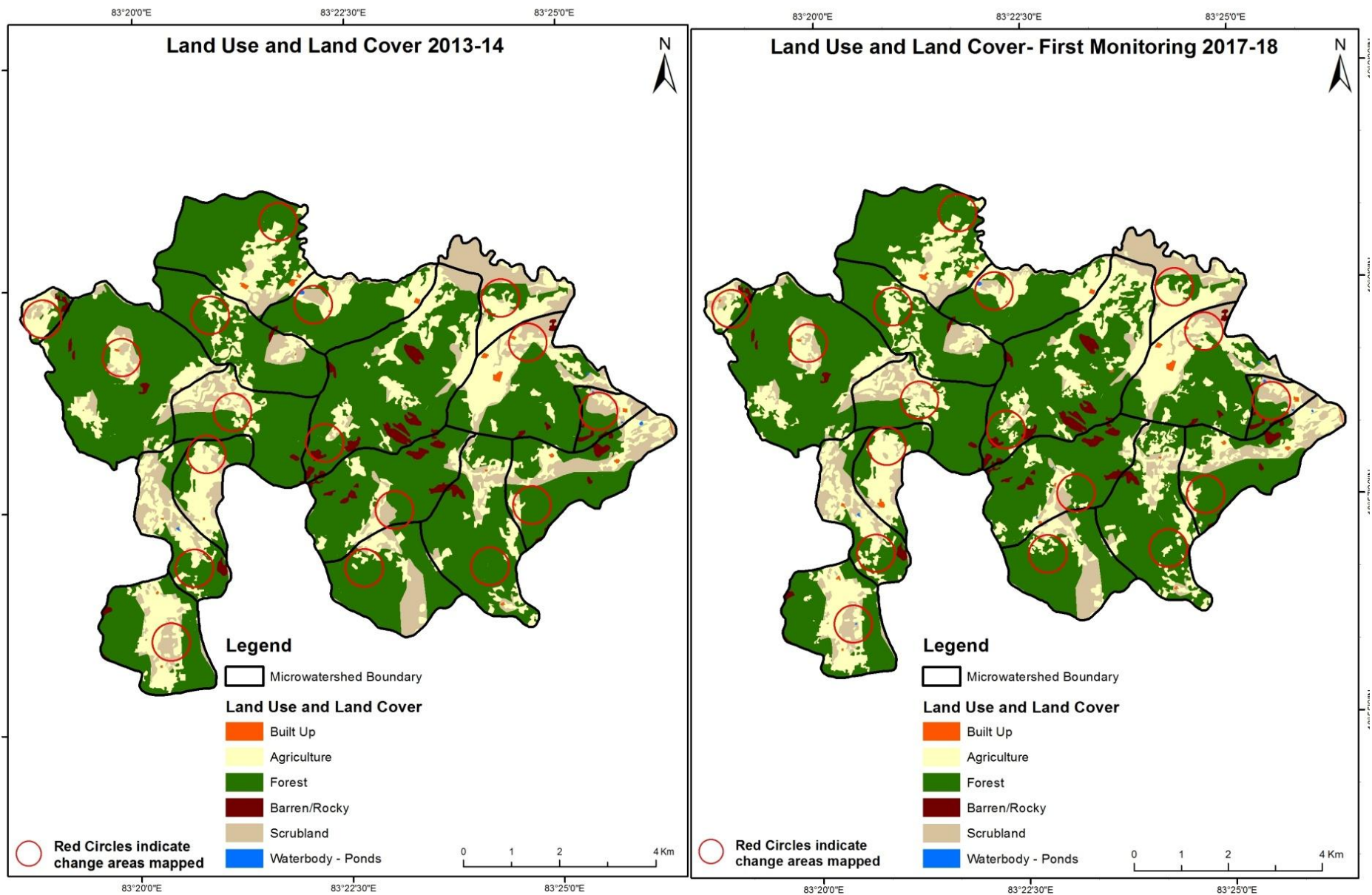
Fig 8. Masimanda Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
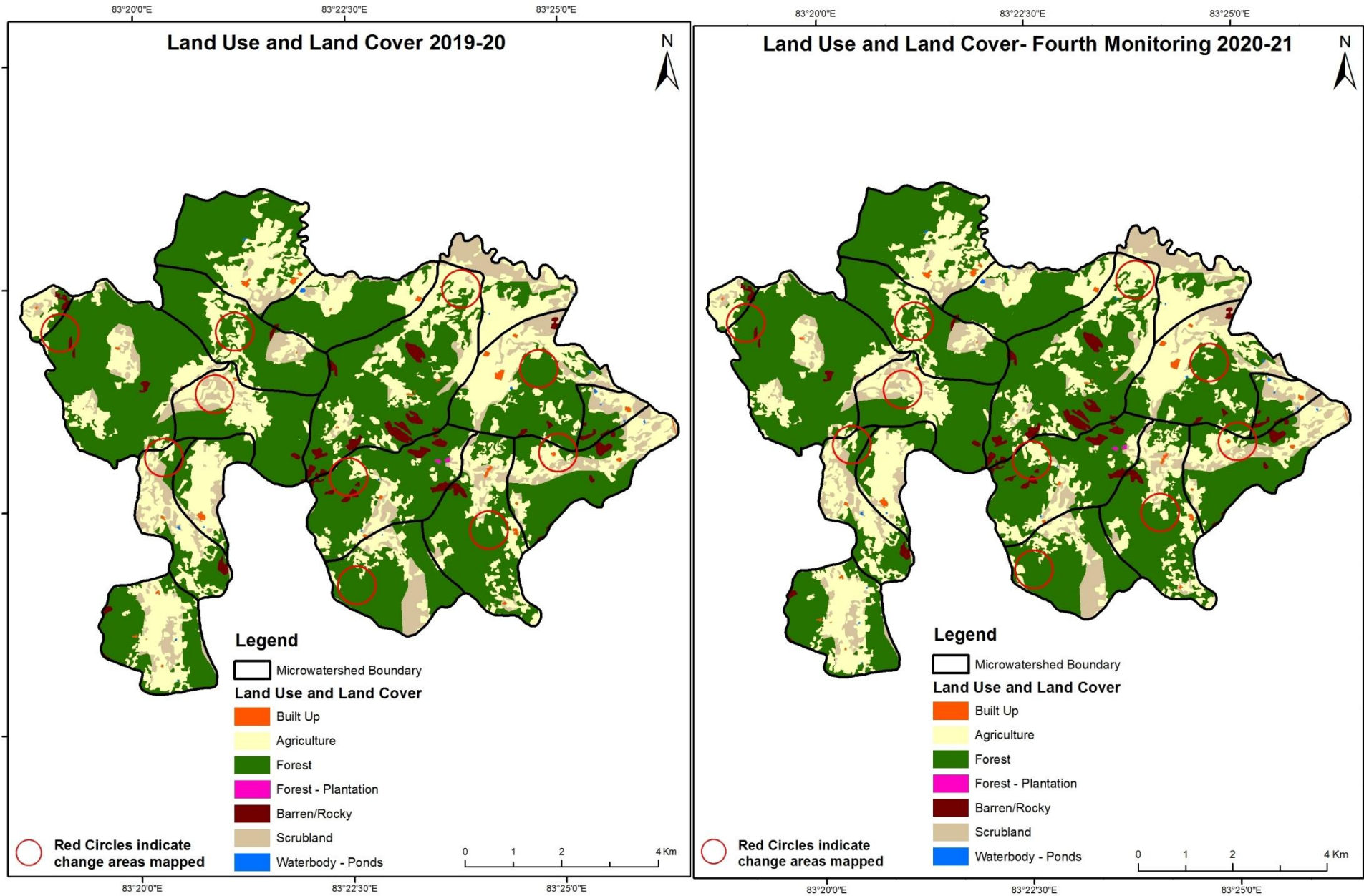
Scale: 1:10000

Fig 9. Masimanda Watershed (IWMP-01/2013-14) 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

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- ■ Built Up
- ■ Agriculture
- ■ Forest
- ■ Barren/Rocky
- ■ Scrubland
- ■ Waterbody - Ponds

○ Red Circles indicate change areas mapped

0 1 2 4 Km

Land Use and Land Cover- Third Monitoring 2019-20

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- ■ Built Up
- ■ Agriculture
- ■ Forest
- ■ Forest - Plantation
- ■ Barren/Rocky
- ■ Scrubland
- ■ Waterbody - Ponds

○ Red Circles indicate change areas mapped

0 1 2 4 Km

Fig 10. Masimanda Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

Fig 11. Masimanda Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)
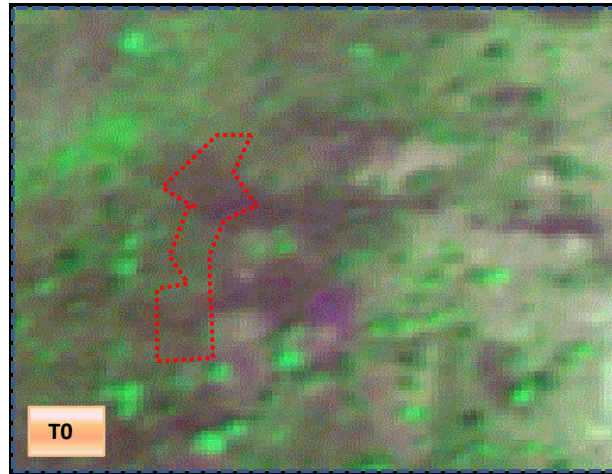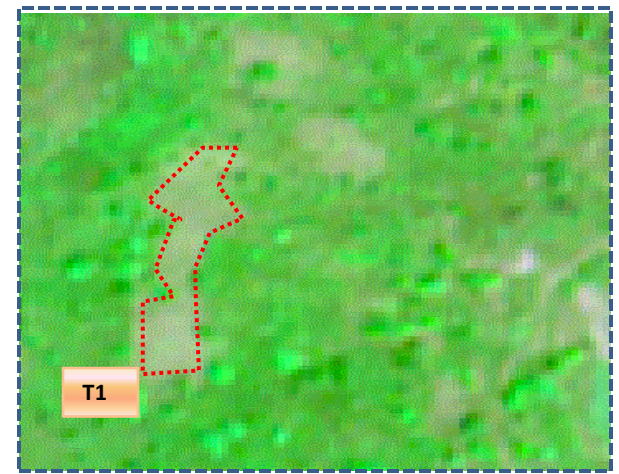
Scale: 1:10000
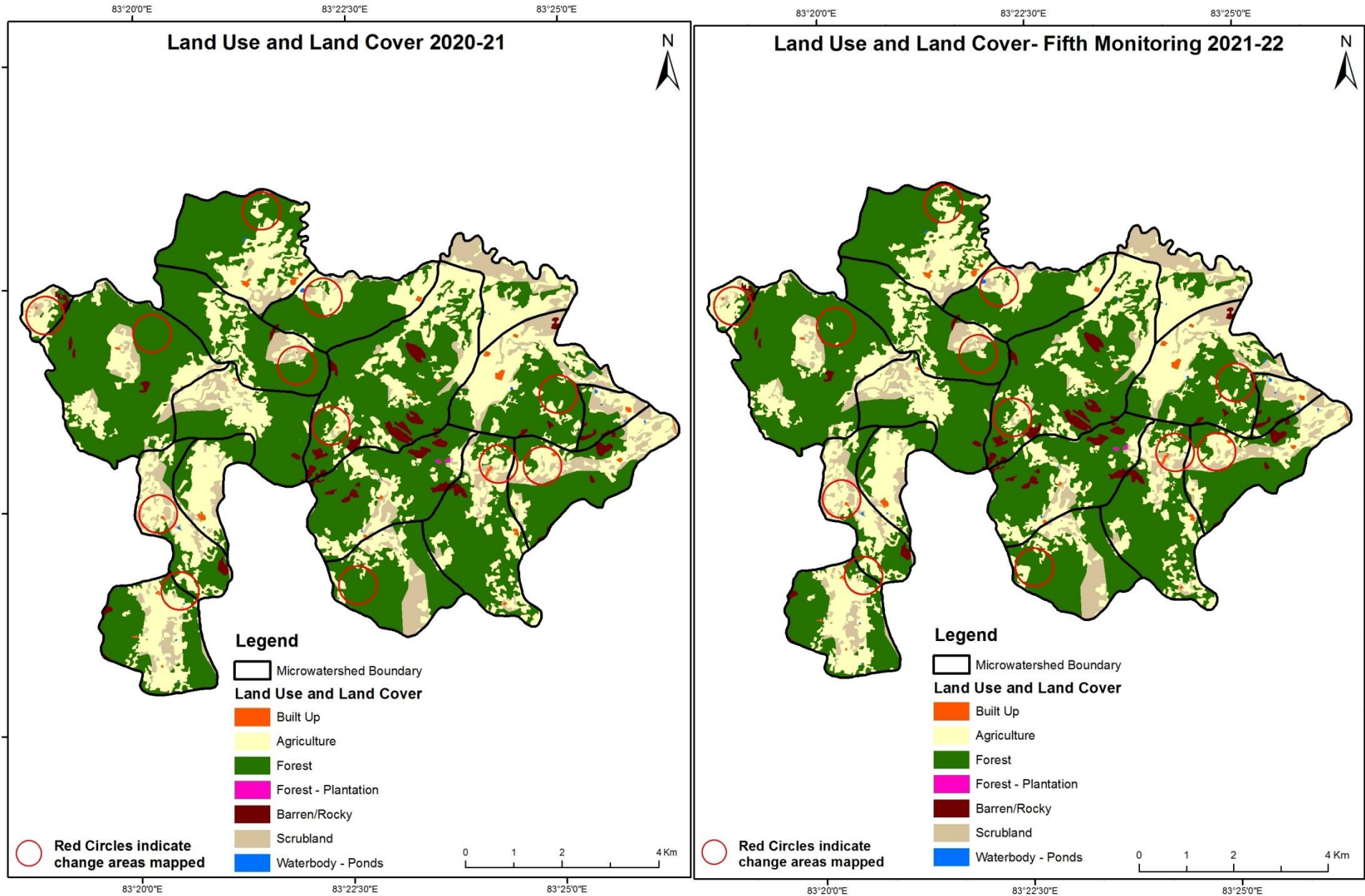
Fig 12. Masimanda Watershed (IWMP-01/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates
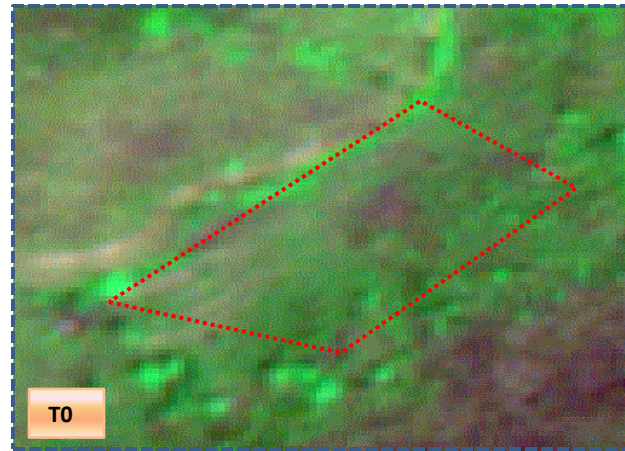
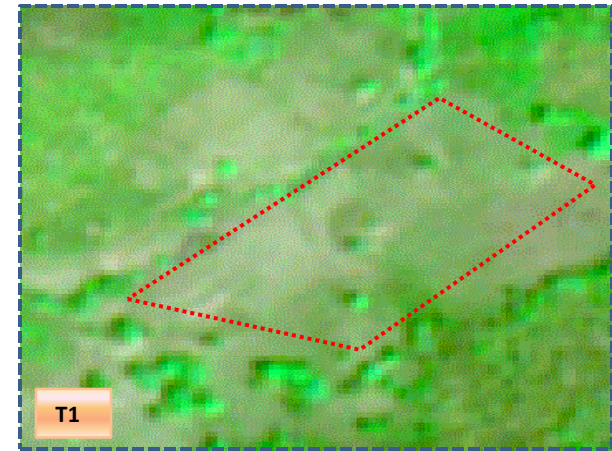Scrub to Agriculture

T0: 2013-14(83°24'41.761"E 18°58'7.252"N)

T1: 02 April 2018
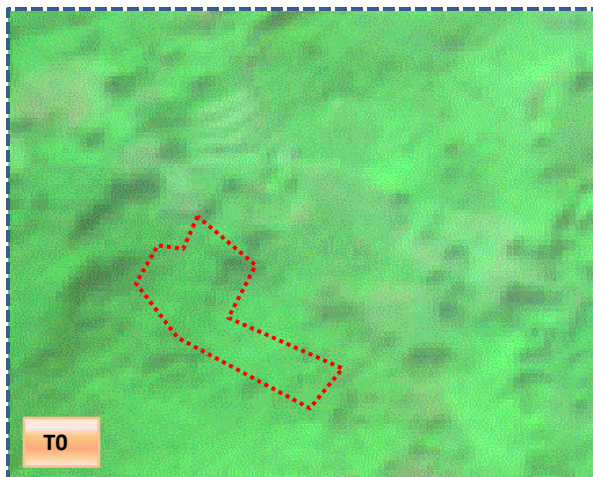
Scrub to Agriculture

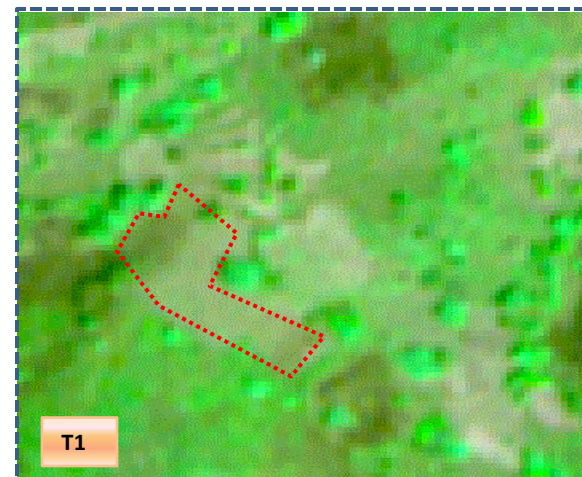T0: 2013-14 (83°23'14.833"E 18°57'51.109"N)

T1: 02 April 2018

Fig 13. Masimanda Watershed (IWMP-01/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

T0

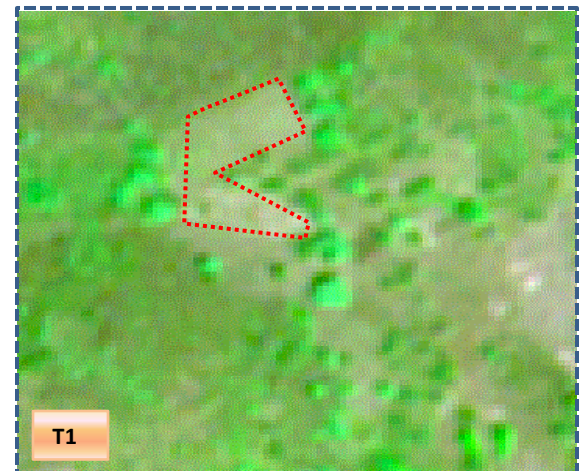T1

T0: 2013-14(83°22'36.446"E 18°56'59.084"N)

T1: 02 April 2018

Scrub to Agriculture

T0

T1

T0: 2013-14(83°22'14.299"E 18°58'38.831"N)

T1: 02 April 2018

Table 4. showing change matrix depicting Land cover transitions for Masimanda Watershed (IWMP-01/2013-14) during study period-2013-14 to 2017-18

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	Grand Total (Units in Hectares)
Built up	16.36										16.36
Mining/dump											
Agriculture	5.29		1578.92							0.2	1584.41
Plantation Horticulture											
Forest	0.56		232.59		4539.41					0.12	4772.68
Forest Plantation											
Barren Rocky							130.26				130.26
Scrub			76					830.27		0.38	906.65
Waterbody-Streams/River											
Waterbody – Ponds			0.27							2.18	2.45
Grand Total	22.21		1887.78		4539.41		130.26	830.27		2.88	7412.81

Interpretation: The example of "Agriculture" Land cover for the period 2013-14 to 2021-22

1. In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.

2. In T0 5.4 ha of the agriculture area has decreased and it is converted into Built-up (5.2 ha) and water body (0.2 ha) in T1.

3. In T1 308 ha of the agriculture area has increased from forest (232.5 ha) , scrubland (76 ha) and water body (0.27 ha)of T0.

Table 5. showing change matrix depicting Land cover transitions for Masimanda Watershed (IWMP-01/2013-14) during study period-2017-18 to 2018-19

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 (Units in Hectares)
Built up	22.21										22.21
Mining/dump											
Agriculture	3.16		1884.55							0.07	1887.78
Plantation Horticulture											
Forest	0.4		29.37		4509.64						4539.41
Forest Plantation											
Barren Rocky							130.26				130.26
Scrub			26.53					803.74			830.27
Waterbody-Streams/River											
Waterbody – Ponds										2.88	2.88
Grand Total	25.77		1940.45		4509.64		130.26	803.74		2.95	7412.81

4. In T1 3.2 ha of the agriculture area has decreased and it is converted into Built-up(3.1 ha) and water body (0.07 ha) in T2.

5. In T2 55 ha of the agriculture area has increased from forest (29.3 ha) and scrubland (26.5 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Masimanda Watershed (IWMP-01/2013-14) during study period-2018-19 to 2019-20

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	25.77										25.77
Mining/dump											
Agriculture	0.3		1939.37							0.78	1940.45
Plantation Horticulture											
Forest			158.95		4348.95	1.69				0.05	4509.64
Forest Plantation											
Barren Rocky							130.26				130.26
Scrub			76.58					726.82		0.34	803.74
Waterbody-Streams/River											
Waterbody – Ponds										2.95	2.95
Grand Total	26.07		2174.9		4348.95	1.69	130.26	726.82		4.12	7412.81

6. In T2 1.08 ha of the agriculture area has decreased and it is converted into Built-up (0.3 ha) and water body (0.78 ha) in T3.

7. In T3 224 ha of the agriculture area has increased from forest (158.9 ha) and scrubland (76.5 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Masimanda Watershed (IWMP-01/2013-14) during study period-2019-20 to 2020-21

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	Grand Total
Built up	26.07										26.07
Mining/dump											
Agriculture	0.18		2174.29							0.43	2174.9
Plantation Horticulture											
Forest			53.95		4294.81					0.19	4348.95
Forest Plantation						1.69					1.69
Barren Rocky							130.26				130.26
Scrub			2.61					724.14		0.07	726.82
Waterbody- Streams/River											
Waterbody – Ponds										4.12	4.12
Grand Total	26.25		2230.85		4294.81	1.69	130.26	724.14		4.81	7412.81

Units in Hectares

8. In T3 0.61 ha of the agriculture area has decreased and it is converted into built-up (0.18 ha) and water body (0.43 ha) in T4.

9. In T4 56.5 ha of the agriculture area has increased from forest (53.9 ha) and scrubland (2.6 ha) of T3.

Table 8.showing change matrix depicting Land cover transitions for Masimanda Watershed (IWMP-01/2013-14) during study period-2020-21 to 2021-22

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	26.25										26.25
Mining/dump											
Agriculture			2230.74							0.11	2230.85
Plantation Horticulture											
Forest			57.6		4237.21						4294.81
Forest Plantation						1.69					1.69
Barren Rocky							130.26				130.26
Scrub			12.37					711.67		0.1	724.14
Waterbody-Streams/River											
Waterbody – Ponds										4.81	4.81
Grand Total	26.25		2300.71		4237.21	1.69	130.26	711.67		5.02	7412.81

10. In T4 0.11 ha of the agriculture area has decreased and it is converted into water body (0.11 ha) in T5.

11. In T5 70 ha of the agriculture area has increased from forest (57.6 ha) and scrubland (12.3 ha) of T4.

Conclusion

1. The Land Use/Land Cover 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.

2. There is an increase of 2.57 Hectares in Reservoir / Tanks area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.

3. There is an increase of 303, 52, 234, 55 & 69 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 716 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.

4. There is a decrease of 194 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.

5. Farm ponds (0) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.

Abbreviations

➢ IWMP -Integrated Watershed Management Programme

➢ LU/LC-Land Use/Land Cover

➢ DRISHTI- a mobile based android application

➢ SHRISTI- a web GIS interface on Bhuvan

➢ LISS – Linear Image Self Scanner

➢ PAN - Panchromatic Image

➢ FCC – False Colour Composite

➢ NCC – Natural Colour Composite

➢ NRSC – National Remote Sensing Centre

➢ DoLR – Department of Land Records