MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

EAST GODAVARI -10/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2023

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

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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-10/2013-14, East Godavari District of Andhra Pradesh. The total geographical area of the project is **4,162 ha**. It comprises of 12 micro watersheds.
4. In the project area 92 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
5. Water bodies have shown an increased by 3.5 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
6. Major percentage i.e. 34.5 % is covered by the agriculture, 45.8 % is covered by forest, 13.4 % is covered by scrubland and remaining by other land use classes.

STUDY AREA
PROJECT : D.BHEEMAVARAM WATERSHED - IWMP-10/2013-14
DISTRICT : EAST GODAVARI , STATE : ANDHRA PRADESH

- The study area falls in Addateegala Mandal of East Godavari district of Andhra Pradesh state. The total geographical area of the project is **4162 ha**. It comprises of 12 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.

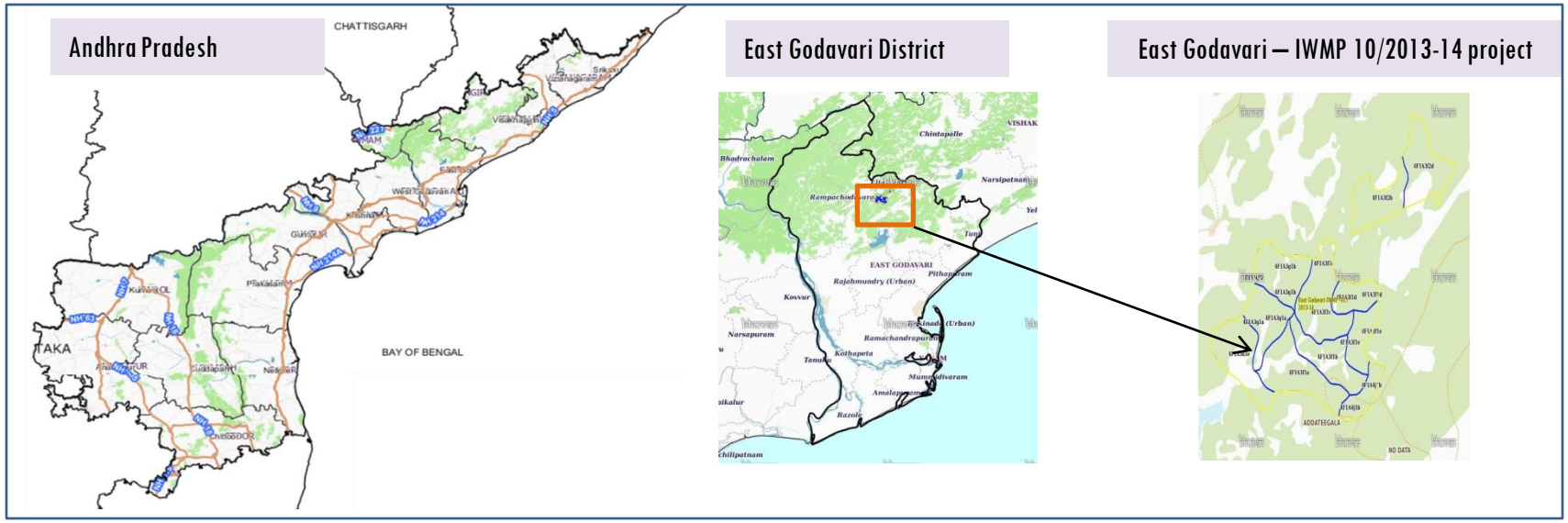


Fig.1. Location map of D.Bheemavaram Watershed (IWMP-10/2013-14) in East Godavari, A.P

- The Climate is Comparatively moderate throughout the year except during the months of April to June when the temperature reaches a maximum of 48 deg. Centigrade.

- The normal rainfall of the district is 1280 mm. More than half of the rainfall is brought by south-west monsoon while a large portion of the rest of the district receives rainfall from the North-East Monsoon also, during October and November.

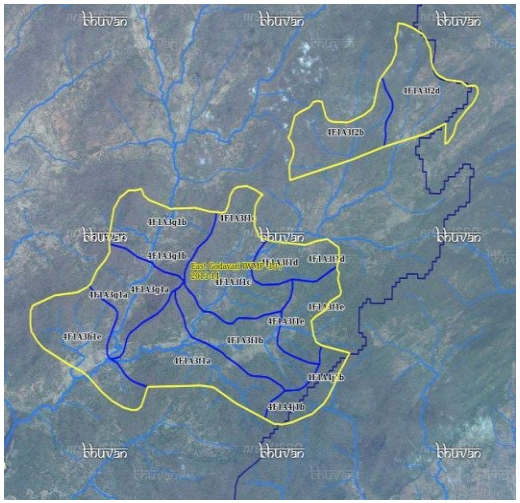
Table 1. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			28-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			28-Mar-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	92
4	Detailed Project Report		

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



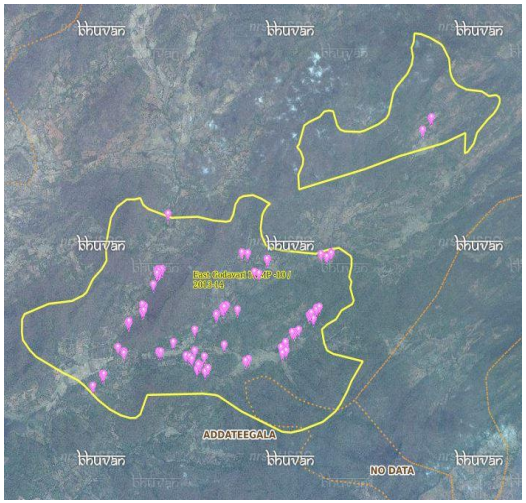
Legend

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	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	3	3
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	12	12
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	2	2
11	Civil work-Check dams/Rock fill dam	13	13
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	12	12
18	Others	50	50
	TOTAL	**92**	**92**

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. D.Bheemavaram Watershed (IWMP-10/2013-14) Natural Colour Composite (NCC)

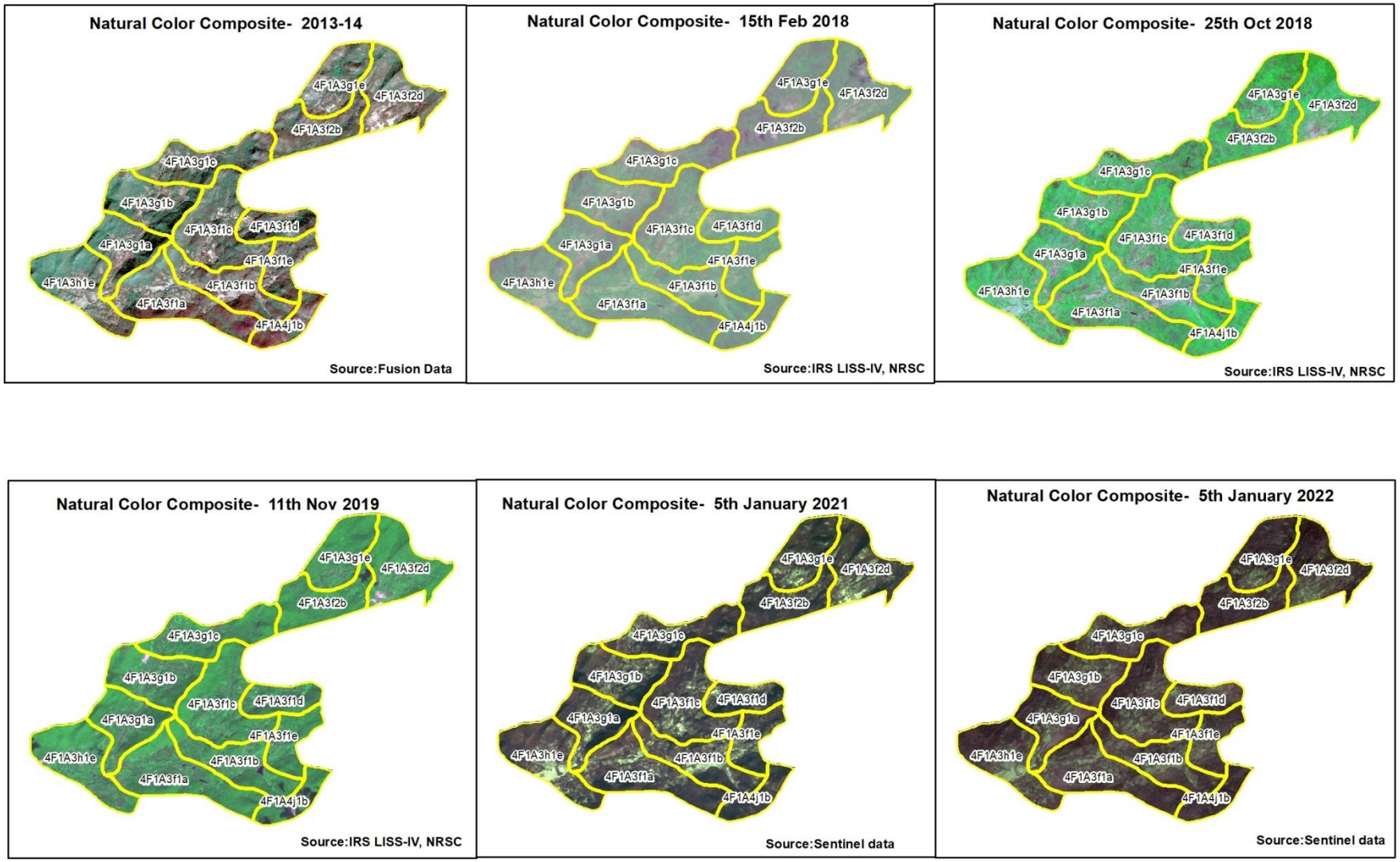
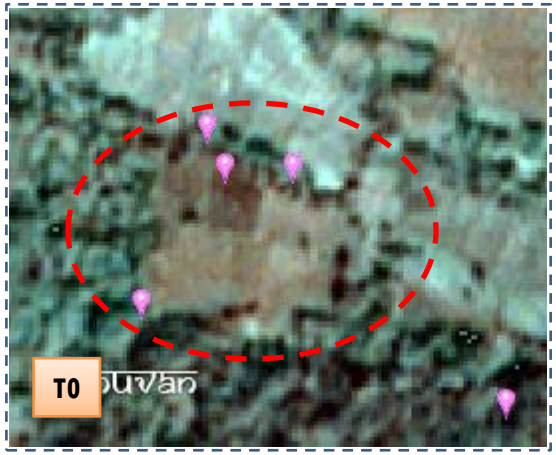


Fig 5. Monitoring of activities in D.Bheemavaram Watershed (IWMP-10/2013-14) East Godavari District Andhra Pradesh



T0:2013-14

T1: 21 March 2018

Drishti Sl no. 7031524 MWS : 4F1A3f1a

Horticulture

T0:2013-14

T1: 21 March 2018

Drishti Sl no. 7033292 MWS : 4F1A3g1a

New activity

Fig 6. Monitoring of activities in D.Bheemavaram Watershed (IWMP-10/2013-14) East Godavari District Andhra Pradesh

T0:2013-14

T1: 21 March 2018

Drishti Sl no. 7031514 MWS : 4F1A3f1a

Percolation tank

T0:2013-14

T1: 21 March 2018

Drishti Sl no. 1669458 MWS : 4F1A3g1a

Soil Moisture Conservation

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. D.Bheemavaram Watershed (IWMP-10/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

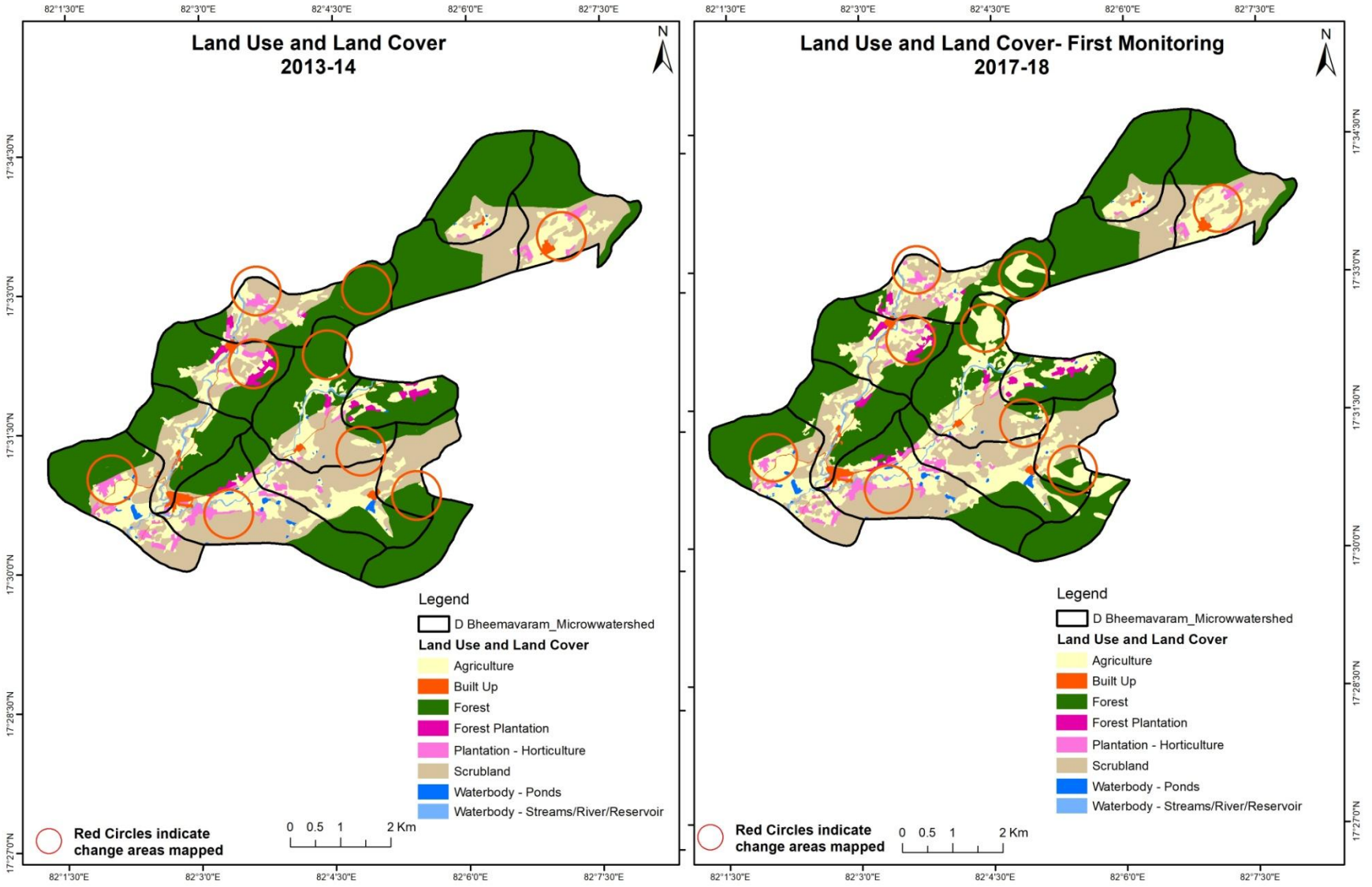


Fig 8. D.Bheemavaram Watershed (IWMP-10/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

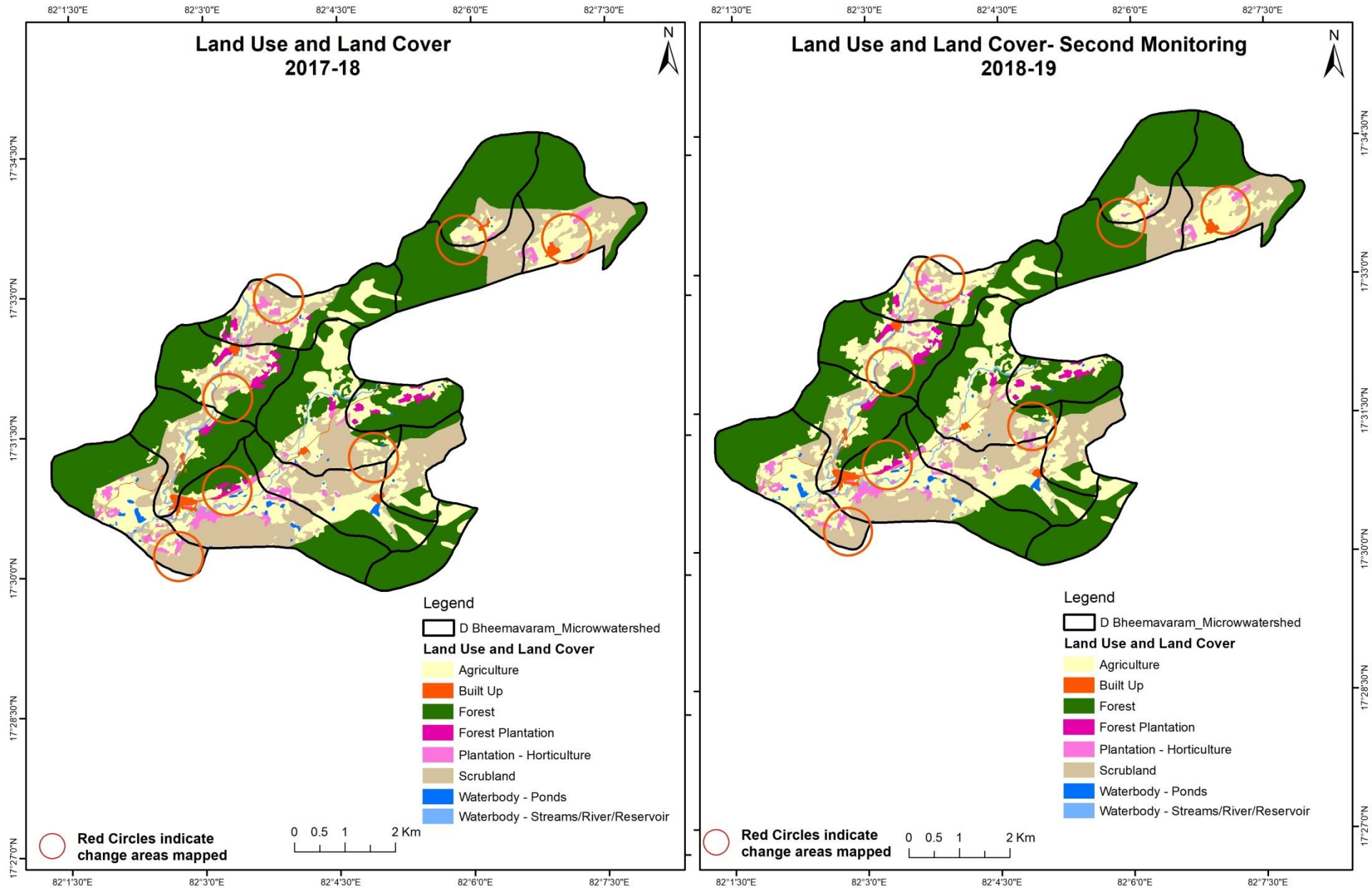


Fig 9. D.Bheemavaram Watershed (IWMP-10/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

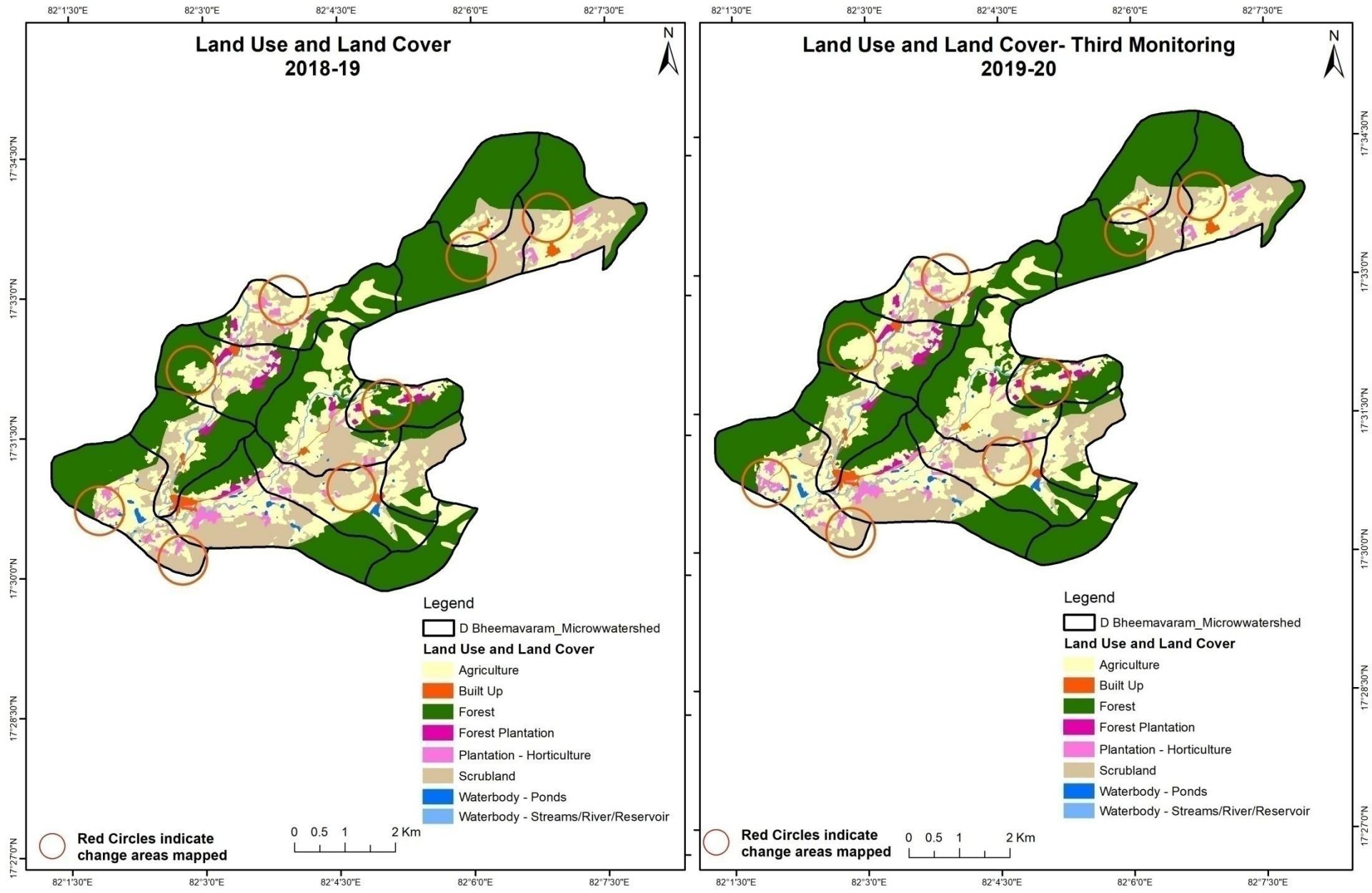


Fig 10. D.Bheemavaram Watershed (IWMP-10/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

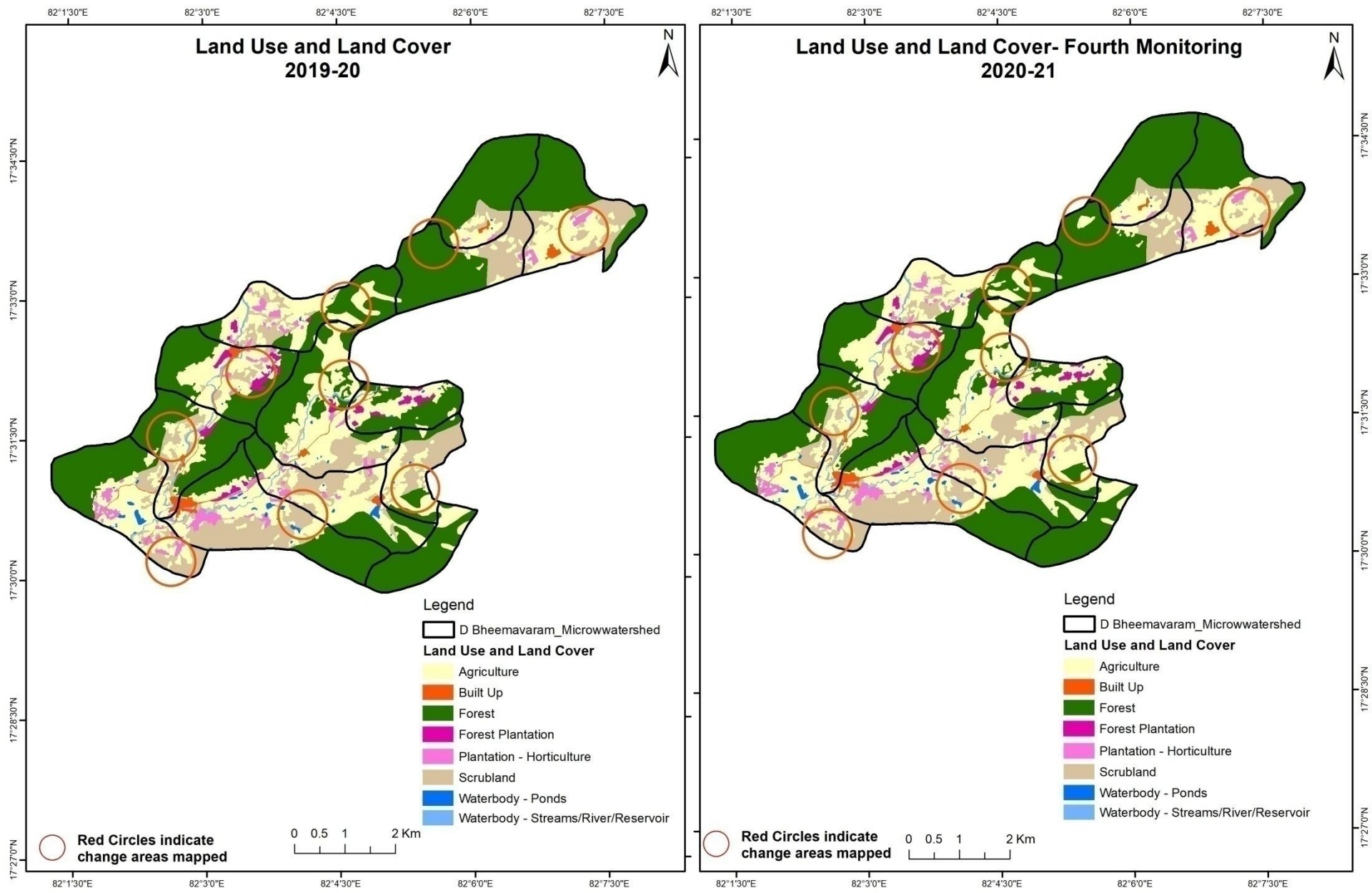


FIG 11. D.Bheemavaram Watershed (IWMP-10/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

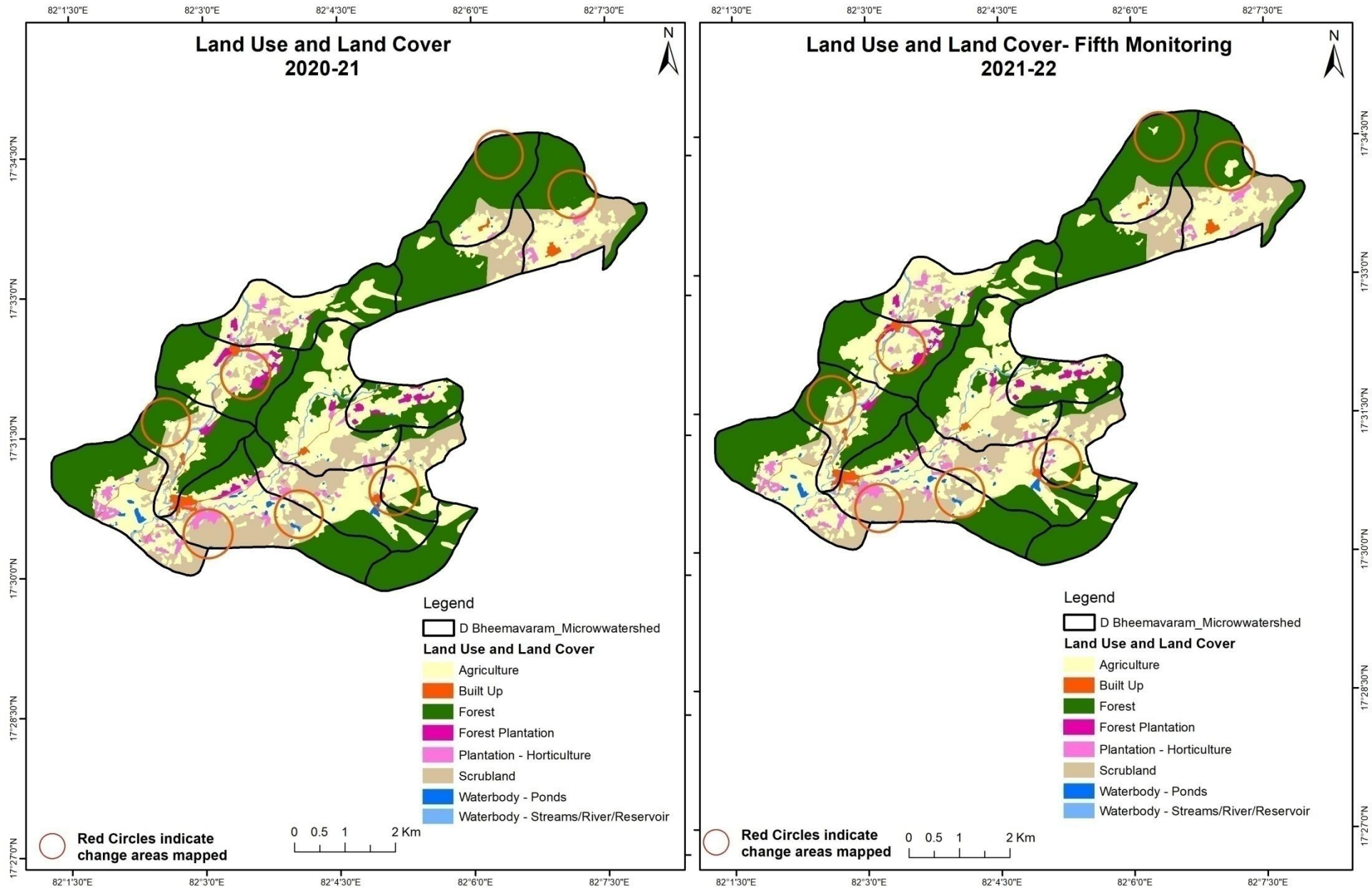
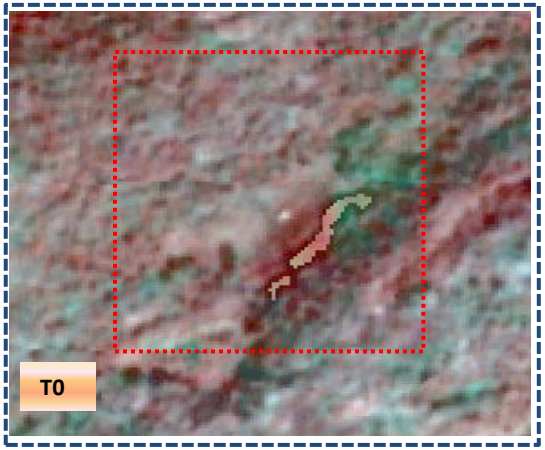
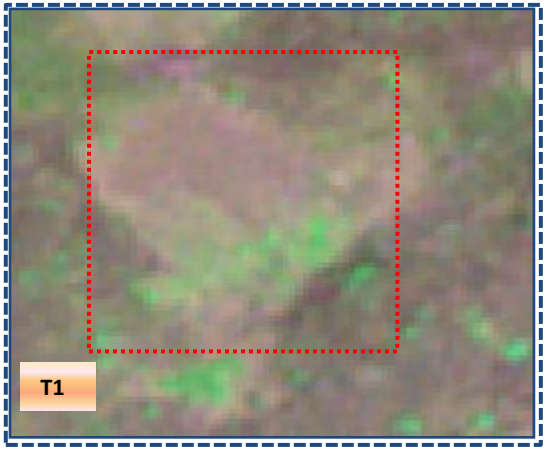


Fig 12. D.Bheemavaram Watershed (IWMP-10/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrubland to Agriculture

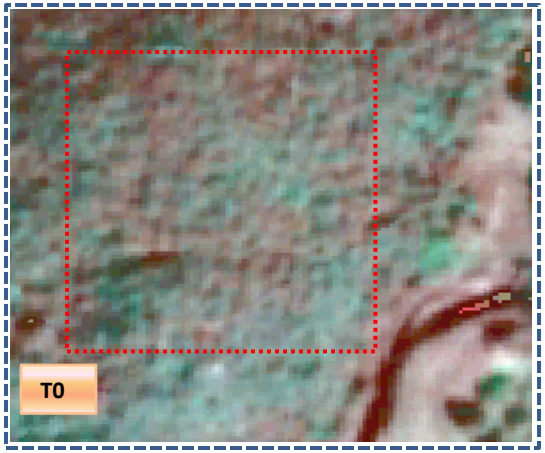


T0: 2013-14 (82°4'41.397"E 17°31'2.994"N)

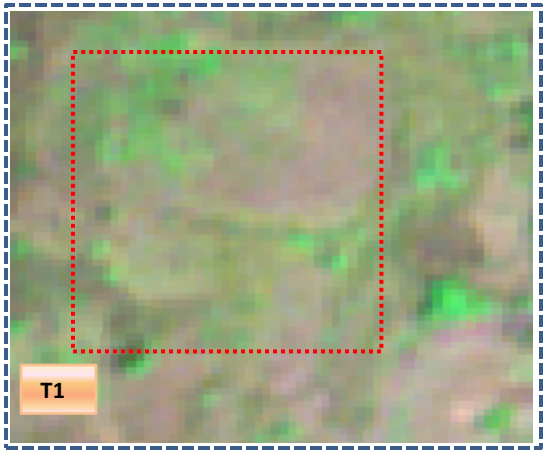


T1: 28 March 2018

Scrubland to Agriculture



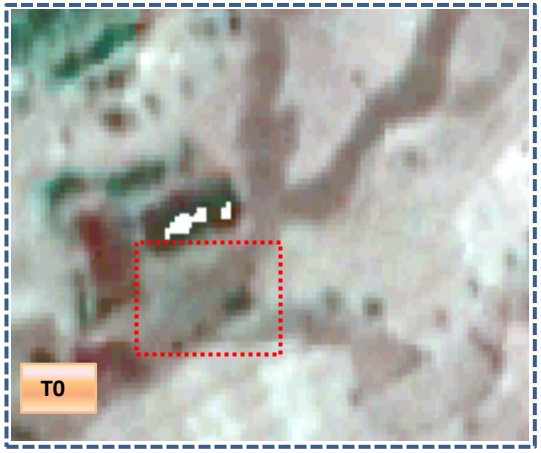
T0: 2013-14 (82°4'0.91"E 17°31'31.172"N)



T1: 28 March 2018

Fig 13. D.Bheemavaram Watershed (IWMP-10/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

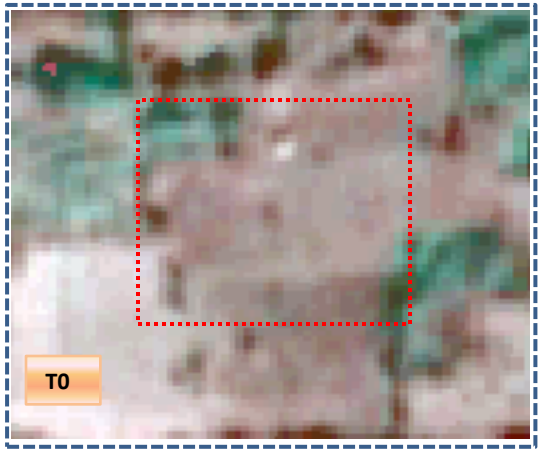
Agriculture to Water body



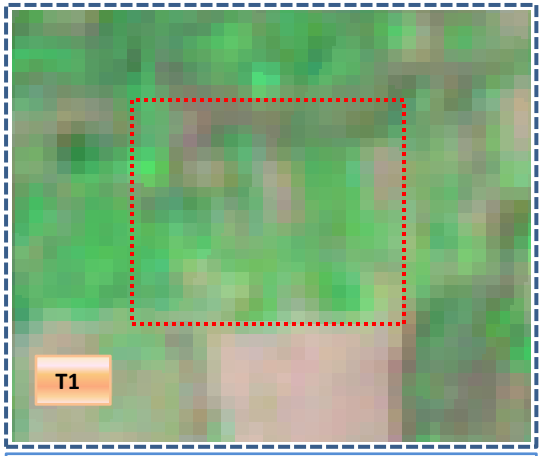
T0: 2013-14(82°2'0.32"E 17°30'34.449"N)

T1: 28 March 2018

Agriculture to Plantation



T0: 2013-14 (82°3'48.097"E 17°30'55.068“N)



T1: 28 March 2018

Table showing change matrix depicting Land cover transitions for D.Bheemavaram Watershed (IWMP-10/2013-14) during study period-2013-14 to 2017-18

Units in Hectares

Land cover	Monitoring period (T1)										
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	46.44										**46.44**
Mining/dump											
Agriculture			591.69	8.43		4.93				1.7	**606.75**
Plantation Horticulture			20.66	91.09							**111.75**
Forest			206.91		2055.25	3.95				0.21	**2266.32**
Forest Plantation			3.3			39.56					**42.86**
Barren Rocky											
Scrub			118.99	1.12				918.92		0.3	**1039.33**
Waterbody-Streams/River									30.83		**30.83**
Waterbody – Ponds										18.1	**18.1**
Grand Total	**46.44**		**941.55**	**100.64**	**2055.25**	**48.44**		**918.92**	**30.83**	**20.31**	**4162.38**

Interpretation: The example of "Agriculture" Land cover for the period 2013-14 to 2017-18

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 15 ha of the agriculture area has decreased and it is converted into plantation/horticulture (8.4 ha), forest plantation/horticulture (4.9 ha) and water body (1.7 ha) in T1.

3. In T1 350 ha of the agriculture area has increased from plantations/horticulture (20 ha), forest (206 ha), forest plantation(3 ha) and scrubland (118 ha) 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-2017-18 to 2018-19

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	46.44										46.44
Mining/dump											
Agriculture			936.59	4.8						0.16	941.55
Plantation Horticulture			4.53	96.11							100.64
Forest			38.08		2017.17						2055.25
Forest Plantation			3.63			44.67				0.14	48.44
Barren Rocky											
Scrub			124.26					794.56		0.1	918.92
Waterbody-Streams/River									30.83		30.83
Waterbody – Ponds										20.31	20.31
Grand Total	46.44		1107.09	100.91	2017.17	44.67		794.56	30.83	20.71	4162.38

4. In T1 4.9 ha of the agriculture area has decreased and it is converted into plantations/horticulture (4.8 ha) and water body (0.16 ha) in T2.

5. In T2 170 ha of the agriculture area has increased from plantations/horticulture (4.5 ha), forest (38 ha), forest plantation (3.6 ha) and scrubland (124 ha) of T1.

Table showing change matrix depicting Land cover transitions 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	46.44										46.44
Mining/dump											
Agriculture	0.55		1104.64	1.27		0.32				0.31	1107.09
Plantation Horticulture			0.8	100.11							100.91
Forest			58.95		1958.22						2017.17
Forest Plantation						44.67					44.67
Barren Rocky											
Scrub			107.68	4.21				682.41		0.26	794.56
Waterbody-Streams/River									30.83		30.83
Waterbody – Ponds										20.71	20.71
Grand Total	46.99		1272.07	105.59	1958.22	44.99		682.41	30.83	21.28	4162.38

6. In T2 9.1 ha of the agriculture area has decreased and it is converted into Built-up (0.5 ha), plantations (1.2 ha) and water body (0.31 ha) in T3.

7. In T3 132 ha of the agriculture area has increased from plantations/horticulture (0.8 ha) forest (589 ha) and scrubland (107 ha) of T2.

Table showing change matrix depicting Land cover transitions during study period-2019-20 to 2020-21

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	46.99										46.99
Mining/dump											
Agriculture			1262.88	9.1						0.09	1272.07
Plantation Horticulture			2.44	103.15							105.59
Forest			38.65		1919.57						1958.22
Forest Plantation			0.37			44.62					44.99
Barren Rocky											
Scrub			90.77					591.4		0.24	682.41
Waterbody-Streams/River										21.28	21.28
Waterbody – Ponds									30.83		30.83
Grand Total	46.99		1395.11	112.25	1919.57	44.62		591.4	30.83	21.61	4162.38

8. In T3 3.6 ha of the agriculture area has decreased and it is converted into plantations/horticulture (9.1 ha), and water body (0.9 ha) in T4.

9. In T4 48 ha of the agriculture area has increased from plantations/horticulture (2.4 ha), forest (38.6 ha), forest plantation (0.37 ha) and scrubland (90.7 ha) of T3.

Table showing change matrix depicting Land cover transitions 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	46.99										46.99
Mining/dump											
Agriculture			1391.47	3.27		0.37					1395.11
Plantation Horticulture			3.64	108.61							112.25
Forest			11.76		1907.81						1919.57
Forest Plantation			1.64			42.98					44.62
Barren Rocky											
Scrub			31.19	0.45				559.76			591.4
Waterbody-Streams/River									30.83		30.83
Waterbody – Ponds										21.61	21.61
Grand Total	46.99		1439.7	112.33	1907.81	43.35		559.76	30.83	21.61	4162.38

10. In T4 1.17 ha of the agriculture area has decreased and it is converted into plantations/plantation (3.2 ha), forest plantation (0.37 ha) in T5.

11. In T5 80 ha of the agriculture area has increased from plantations/horticulture (3.6 ha), forest (11.7 ha), forest plantation (1.6 ha) and scrubland (31 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 3.5 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 334, 165, 164, 123 & 44 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 832 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About 0.58 ha of the plantation/horticulture area has been increased in during the monitoring period of 2013-14 (T0) to 2021-22 (T5) years.
5. There is a decrease of 479 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. Farm ponds (02) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (02) 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