

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

VISAKHAPATNAM -13/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

February-2022

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



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RESOURCES
Ministry of Rural Development
Government of India

C O N T E N T S

EXECUTIVE SUMMARY

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

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-13/2013-14, Visakhapatnam District of Andhra Pradesh. The total geographical area of the project is 2,287 ha. It comprises of 8 micro watersheds.
4. In the project area 35 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 0.19 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
6. Major percentage i.e. 89 % is covered by the agriculture, 6.4 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : PEDAGARUVU - IWMP-13/2013-14

DISTRICT : VISAKHAPATNAM , STATE : ANDHRA PRADESH

- The study area falls in Chintapalle and G Madugula Mandals of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is 2,287 ha. It comprises of 8 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.

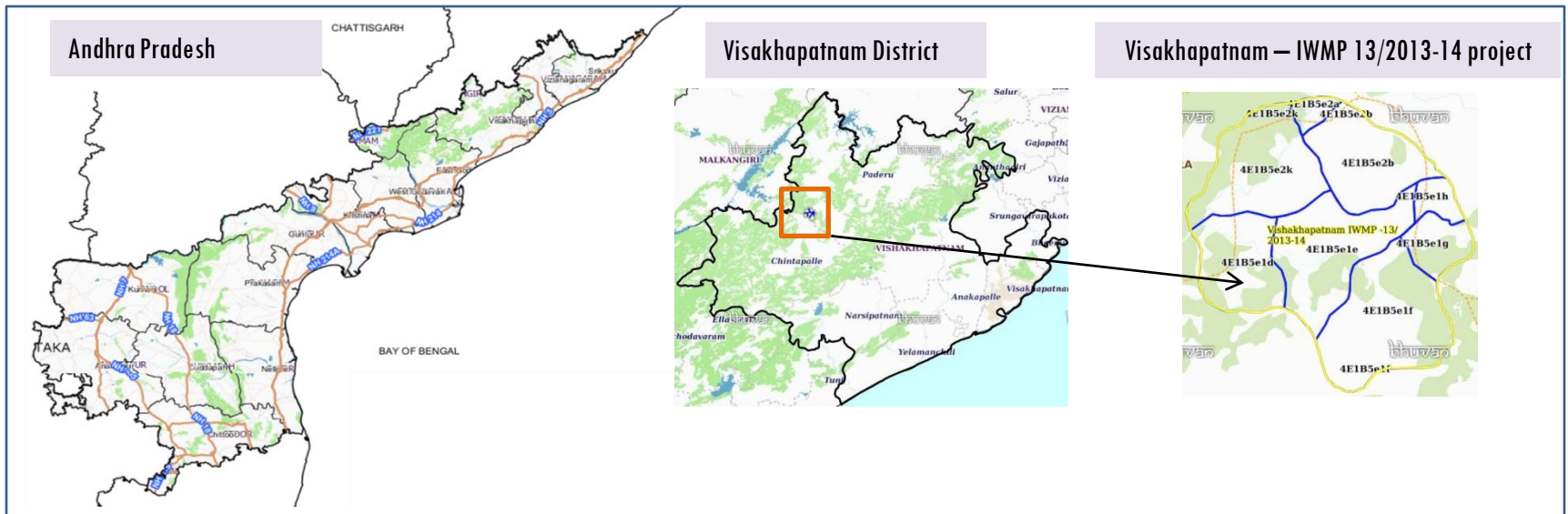


Fig.1. Location map of Pedagaruvu Watershed (IWMP-13/2013-14) in Visakhapatnam, A.P

- Visakhapatnam has a tropical wet and dry climate. The annual mean temperature ranges between 24.7 °C to 30.6 °C, with the maximum in the month of May and the minimum in January; the minimum temperatures ranges between 20-27 °C.
- The climate of the district is varied and has differing climate conditions in different parts. Near the coast the air is humid and moist and relaxing, but gets warmer towards the interior and cools down in the hilly areas on account of elevation and dense vegetation.

Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			14-Feb-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			14-Feb-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	Drishiti Photographs		
		Total	35
4	Detailed Project Report		

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



Legend




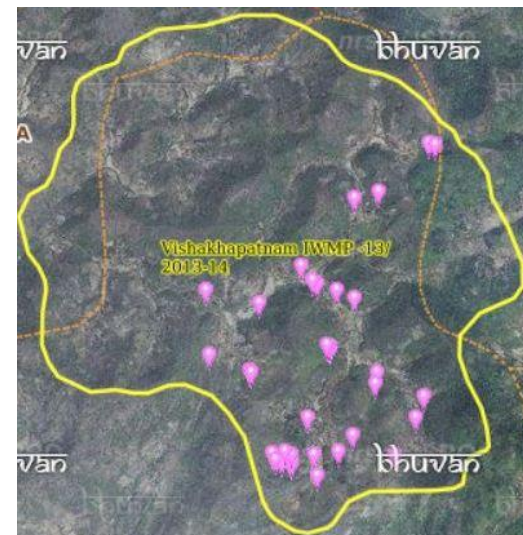
-  Drainage (1:10000 Scale)
-  MWS Boundary
-  Project Boundary

Fig3. Natural Color Composite overlaid with Drishti Points



Drishiti 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	0	0
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	11	11
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	1	1
18	Others	20	20
	TOTAL	35	35

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. Pedagaruvu Watershed (IWMP-13/2013-14) Natural Colour Composite-2013-14 to 2021-22

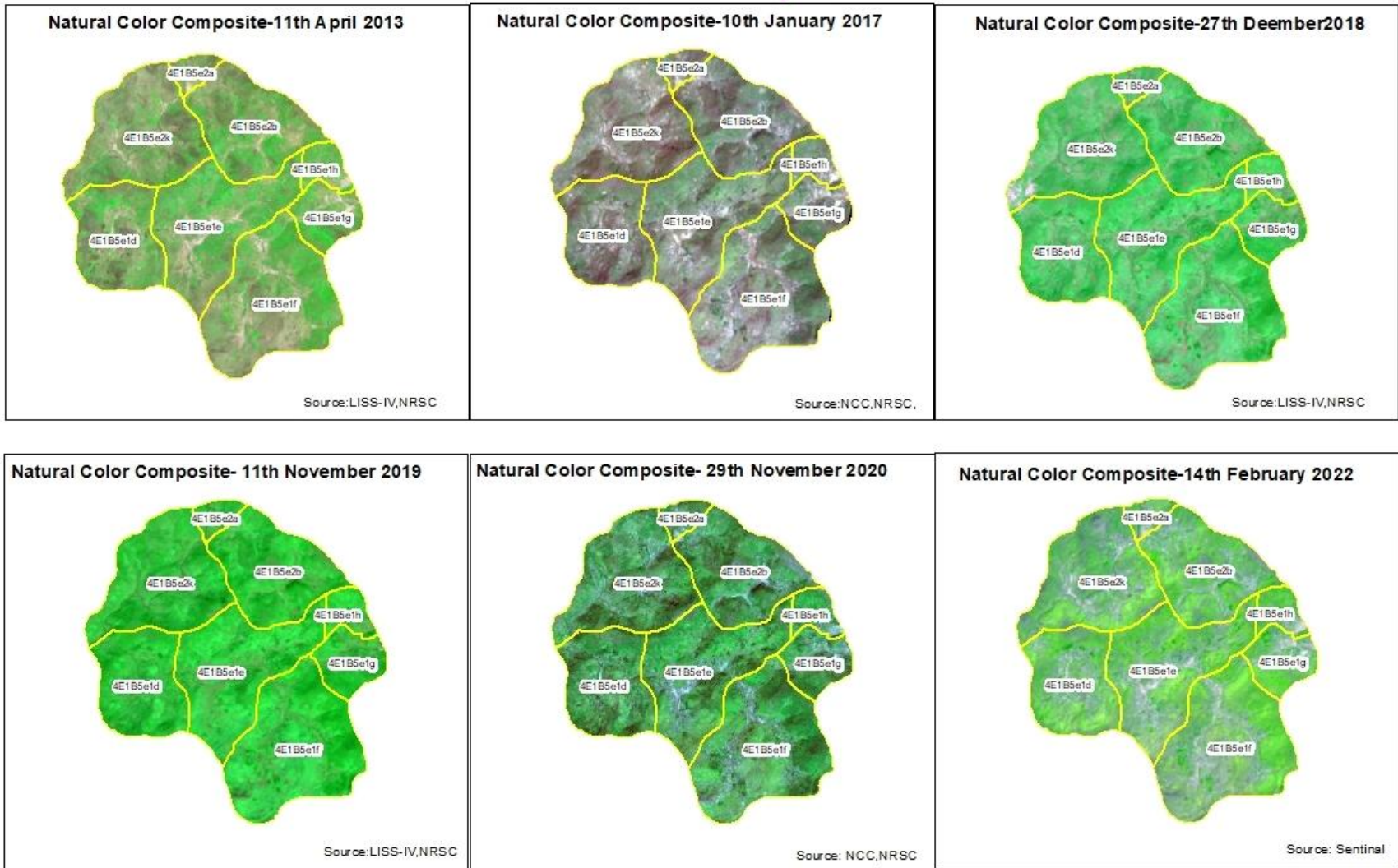
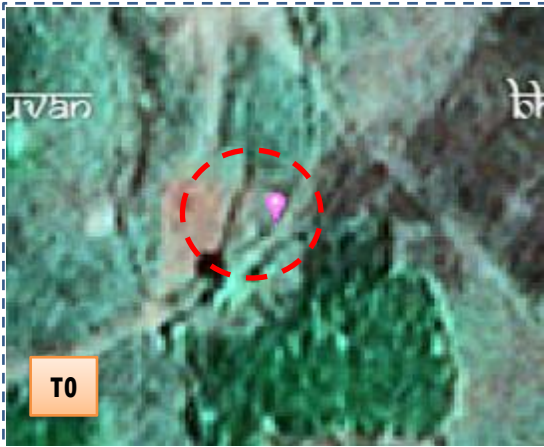


Fig 5. Pedagaruvu Watershed (IWMP-13/2013-14) Monitoring of activities in Visakhapatnam District Andhra Pradesh



T0:2013-14

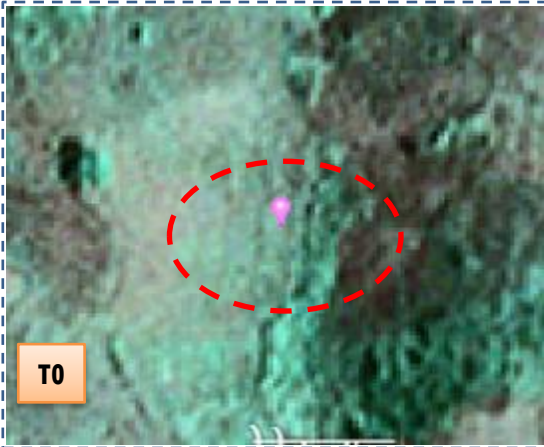


T1: 17 February 2017



Drishti SI no. 7013861 MWS : 4E1B5e1f

Percolation tank



T0:2013-14



T1: 17 February 2017



Drishti SI no. 7026262 MWS : 4E1B5e1f

Rock fill dam

Fig 6. Pedagaruvu Watershed (IWMP-13/2013-14) Monitoring of activities in Visakhapatnam District Andhra Pradesh



T0:2013-14

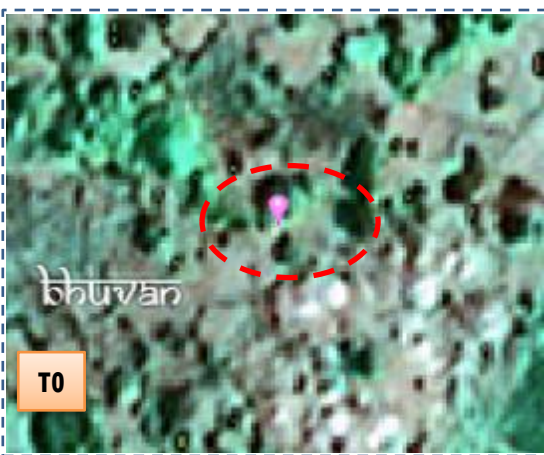


T1: 17 February 2017



Drishti SI no. 1659268 MWS : 4E1B5e1e

Farm pond



T0:2013-14



T1: 17 February 2017



Drishti SI no. 7013805 MWS : 4E1B5e1f

Gabion Structure

03. MONITORING IN THE PROJECT AREA

3.2 Land use and Land cover Changes in the Project

- Change in land use and land cover from 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. Pedagaruvu Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

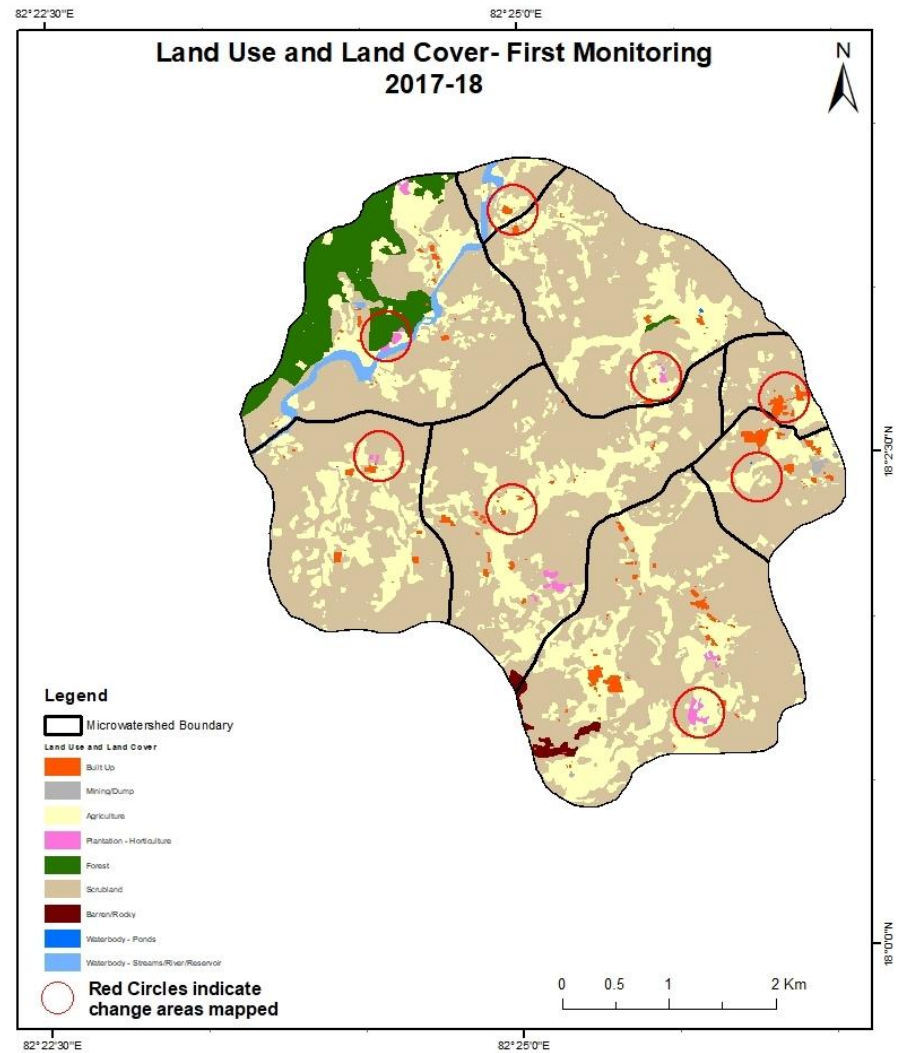
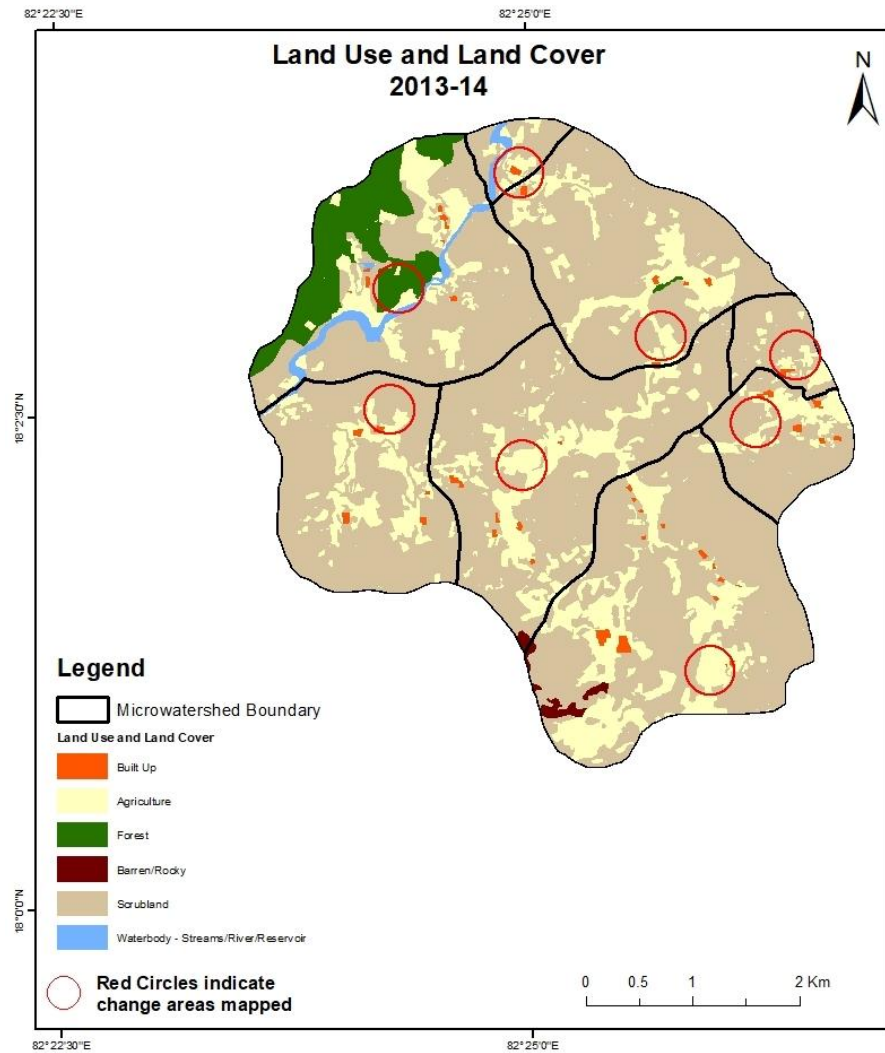


Fig 8. Pedagaruvu Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

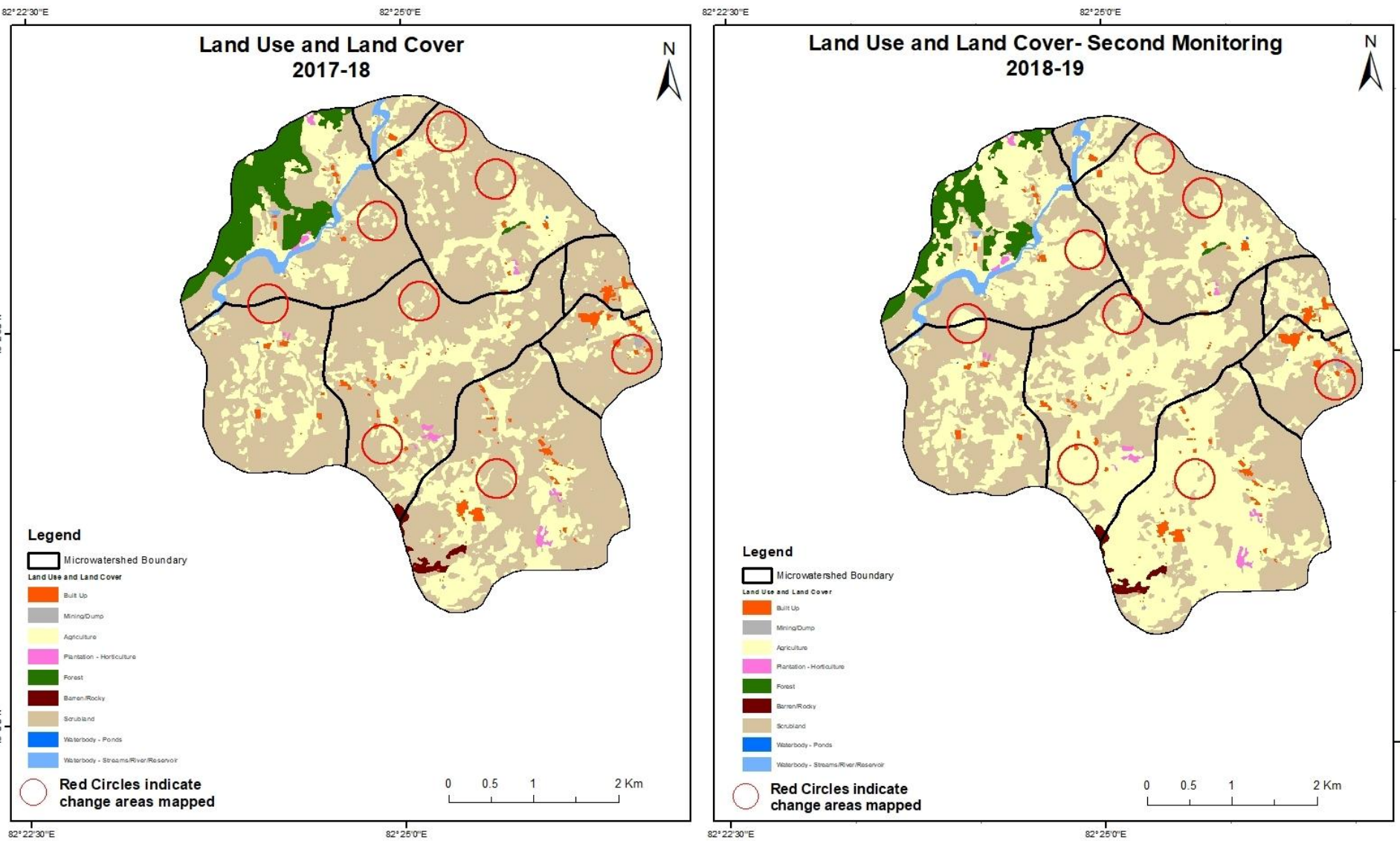


Fig 9. Pedagaruvu Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

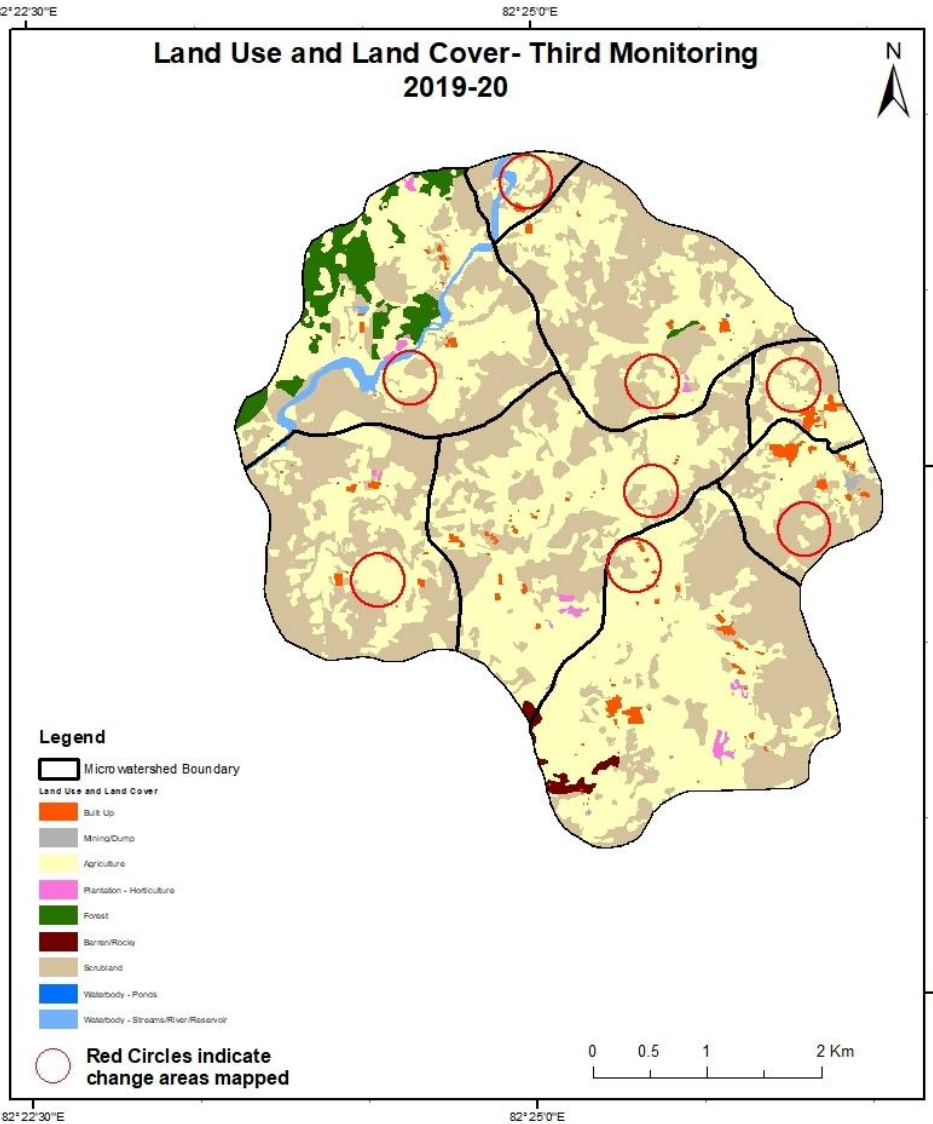
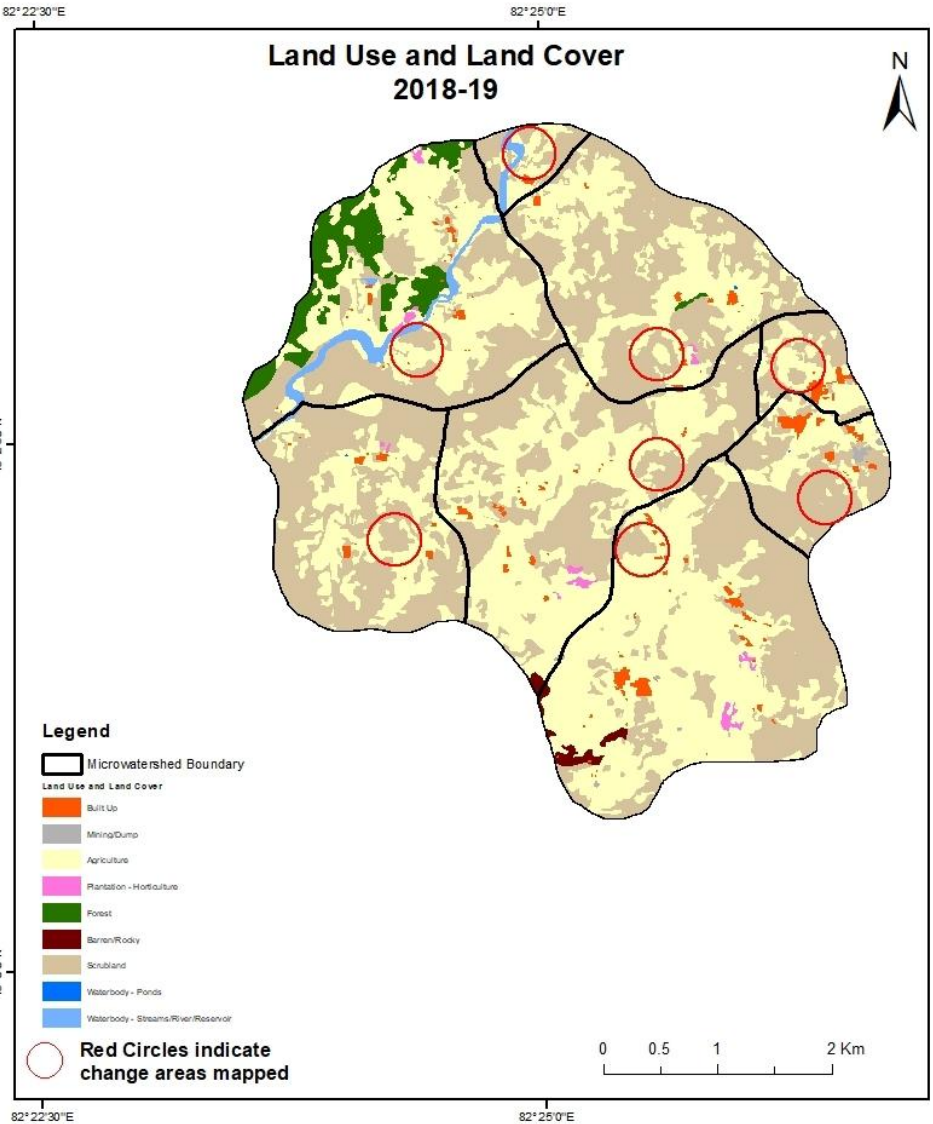


Fig 10. Pedagaruvu Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

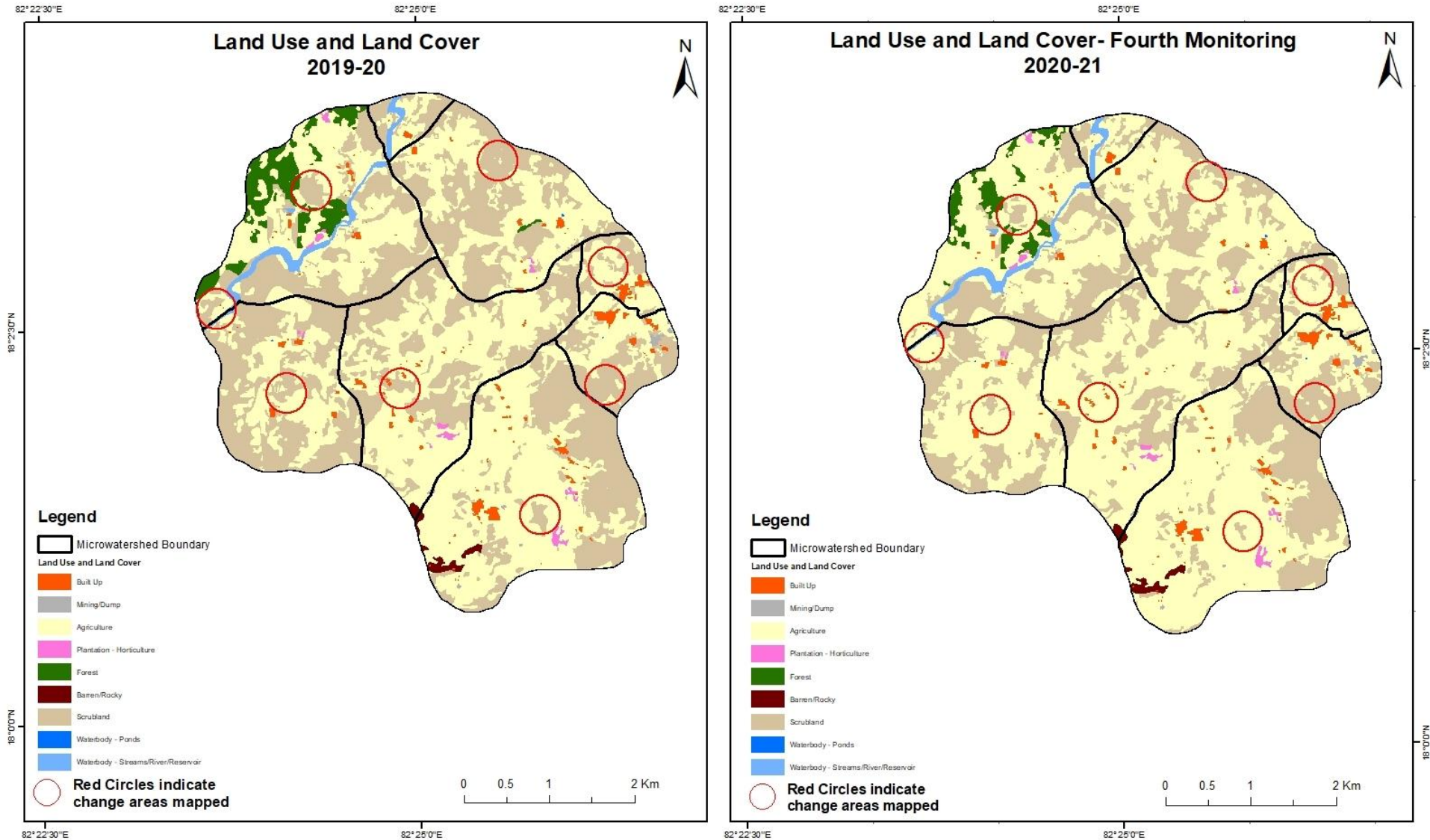


Fig 11. Pedagaruvu Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

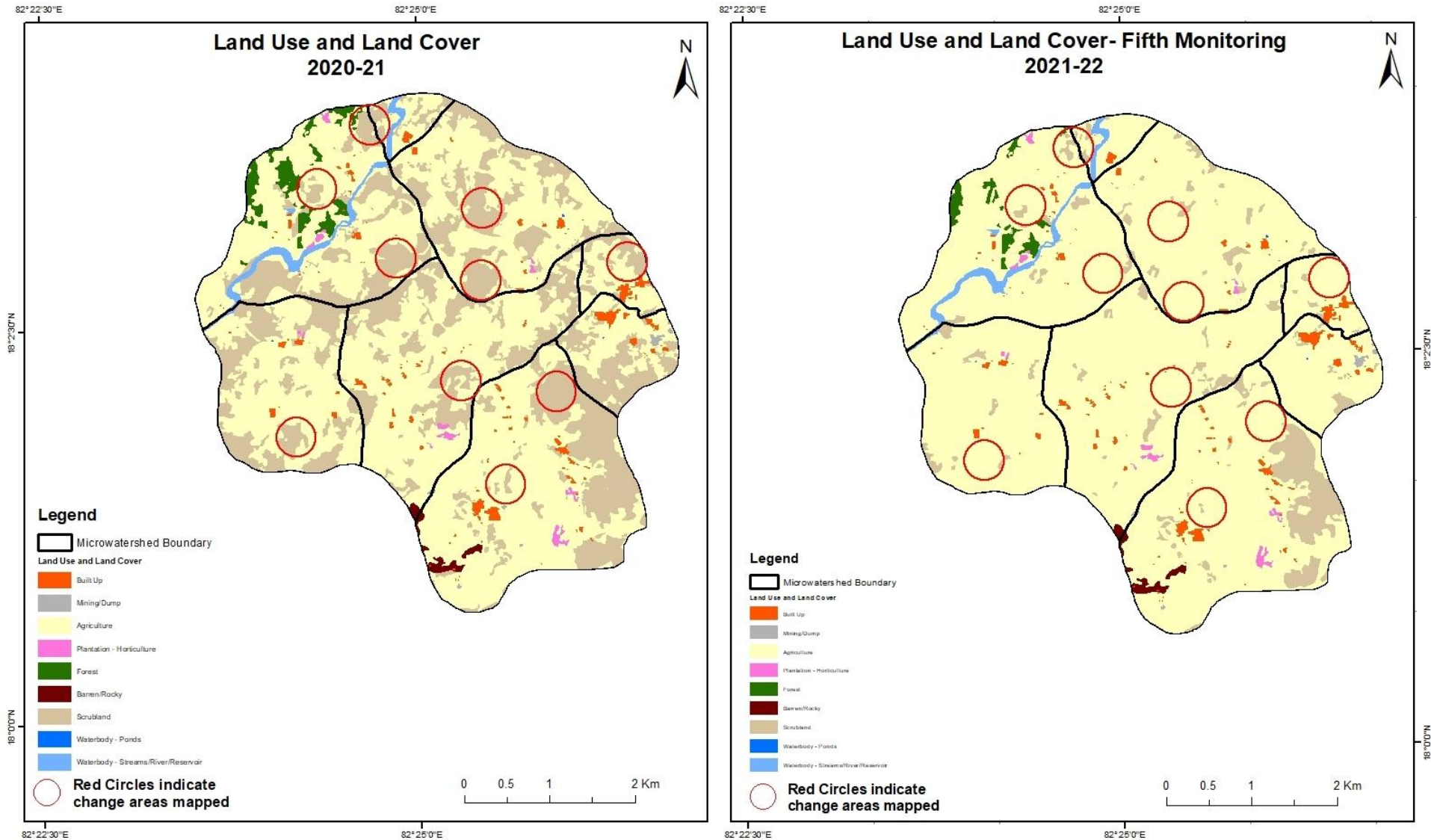
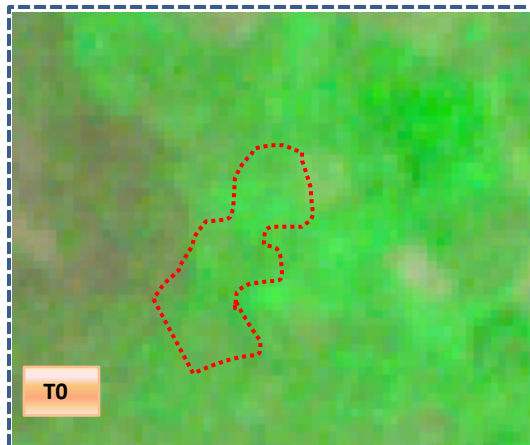
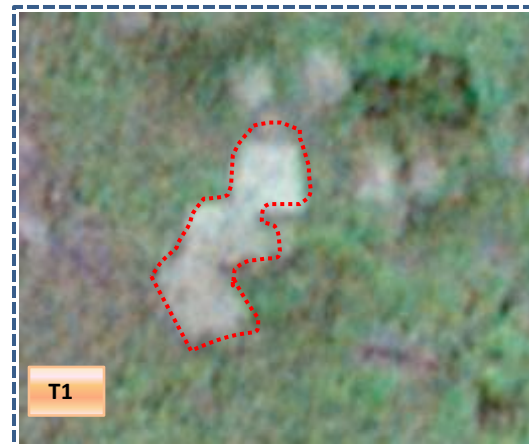


Fig 12. Pedagaruvu Watershed (IWMP-13/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

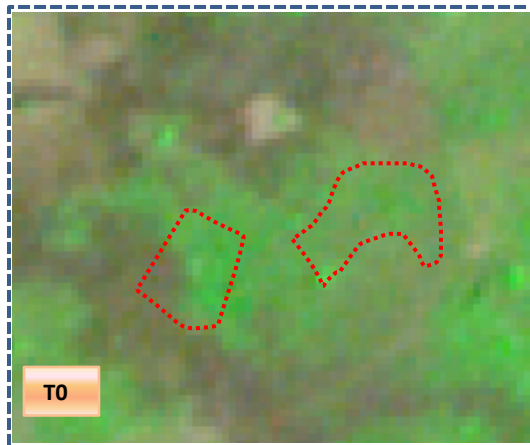


T0: 2013-14 (82°26'4.752"E 18°2'48.811"N)

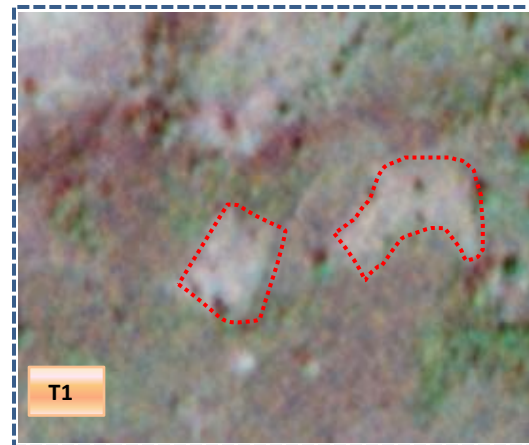


T1: 10 January 2017

Scrub to Agriculture



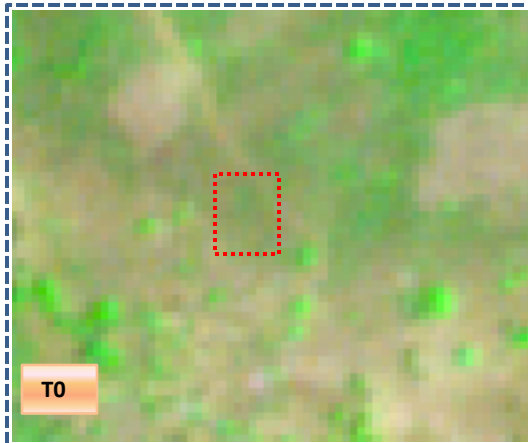
T0: 2013-14 (82°24'48.962"E 18°3'10.603"N)



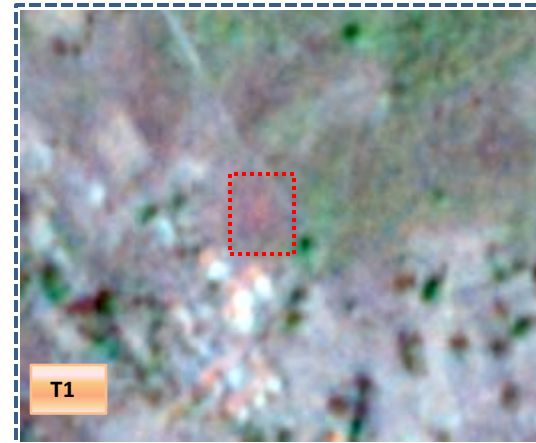
T1: 10 January 2017

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

Scrub to water body

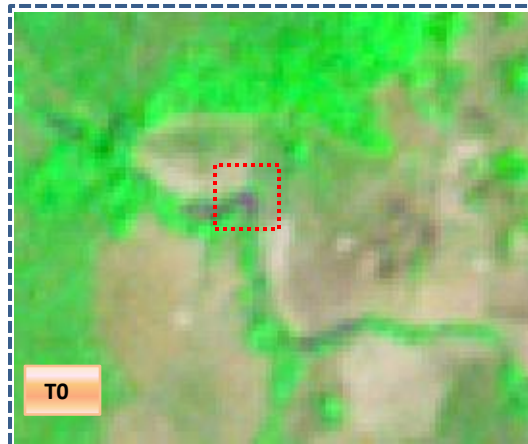


T0: 2013-14 (82°25'58.149"E 18°3'13.081"N)

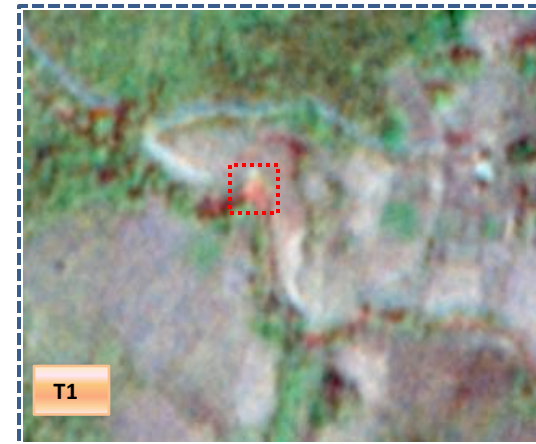


T1: 10 January 2017

Agriculture to water body



T0: 2013-14 (82°24'1.956"E 18°2'25.516"N)



T1: 10 January 2017

Table 4. showing change matrix depicting Land cover transitions for Pedagaruvu Watershed (IWMP-13/2013-14) during study period-2013-14 to 2017-18

Land cover	Monitoring period (T1)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	17.57												17.57
Mining/dump													
Agriculture	12.16	2.03	438.94	6.28						0.04			459.45
Plantation Horticulture													
Forest	0.06		4.37		111.63								116.06
Forest Plantation													
Barren Rocky	0.09						10.26						10.35
Scrub	1.34	0.72	110.77	2.62				1541.10		0.15			1656.71
Waterbody- Streams/River									27.54				27.54
Waterbody – Ponds													
Grand Total	31.23	2.75	554.08	8.90	111.63		10.26	1541.10	27.54	0.19			2287.68

Interpretation: The example of “Agriculture” Land cover for the period 2009-10 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 20 ha of the agriculture area has decreased and it is converted into Built-up (12 ha), plantation/horticulture (6.2 ha) and water body (0.4 ha) in T1.
3. In T1 115 ha of the agriculture area has increased from forest (4.3 ha) and scrubland (110 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Pedagaruvu Watershed (IWMP-13/2013-14) during study period-2017-18 to 2018-19

Land cover	Monitoring period (T2)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
T1													
Built up	31.23												31.23
Mining/dump		2.75											2.75
Agriculture	0.44		553.64										554.08
Plantation Horticulture				8.90									8.90
Forest			40.41		71.22								111.63
Forest Plantation													
Barren Rocky							10.26						10.26
Scrub	0.41		480.52					1060.17					1541.10
Waterbody- Streams/River									27.54				27.54
Waterbody – Ponds											0.19		0.19
Grand Total	32.08	2.75	1074.57	8.90	71.22		10.26	1060.17	27.54		0.19		2287.68

4. In T1 0.4 ha of the agriculture area has decreased and it is converted into Built-up (0.4 ha) in T2.

5. In T2 520 ha of the agriculture area has increased from forest (40 ha) and scrubland (480 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Pedagaruvu Watershed (IWMP-13/2013-14) during study period-2018-19 to 2019-20

Land cover	Monitoring period (T3)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	32.08												32.08
Mining/dump		2.75											2.75
Agriculture	0.13		1074.44										1074.57
Plantation Horticulture				8.90									8.90
Forest			6.34		64.88								71.22
Forest Plantation													
Barren Rocky							10.26						10.26
Scrub			110.13					950.04					1060.17
Waterbody- Streams/River									27.54				27.54
Waterbody – Ponds											0.19		0.19
Grand Total	32.21	2.75	1190.91	8.90	64.88		10.26	950.04	27.54		0.19		2287.68

• In T2 0.13 ha of the agriculture area has decreased and it is converted into Built-up (0.13 ha) in T3.

• In T3 224 ha of the agriculture area has increased from forest (6.34 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Pedagaruvu Watershed (IWMP-13/2013-14) during study period-2019-20 to 2020-21

Land cover	Monitoring period (T4)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	32.21												32.21
Mining/dump		2.75											2.75
Agriculture	0.45		1190.46										1190.91
Plantation Horticulture				8.90									8.90
Forest			29.35		35.53								64.88
Forest Plantation													
Barren Rocky							10.26						10.26
Scrub			247.13					702.91					950.04
Waterbody- Streams/River									27.54				27.54
Waterbody – Ponds											0.19		0.19
Grand Total	32.66	2.75	1466.93	8.90	35.53		10.26	702.91	27.54		0.19		2287.68

•In T3 1.17 ha of the agriculture area has decreased and it is converted into built-up (0.4 ha) in T4.

•In T4 80 ha of the agriculture area has increased from forest (29.3 ha) and scrubland (247 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Pedagaruvu Watershed (IWMP-13/2013-14) during study period-2020-21 to 2021-22

Land cover	Monitoring period (T5)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	32.66												32.66
Mining/dump		2.75											2.75
Agriculture			1466.93										1466.93
Plantation Horticulture				8.90									8.90
Forest			16.55		18.98								35.53
Forest Plantation													
Barren Rocky							10.26						10.26
Scrub			554.99					147.92					702.91
Waterbody- Streams/River									27.54				27.54
Waterbody – Ponds											0.19		0.19
Grand Total	32.66	2.75	2038.48	8.90	18.98		10.26	147.92	27.54		0.19		2287.68

•In T5 571 ha of the agriculture area has increased from forest (16.5 ha) and scrubland (554.9 ha) of T4.

Conclusion

1. 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.
2. There is an increase of 0.19 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
3. There is an increase of 94, 520, 116, 276 & 571 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1,579 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2021-22 (T5) years.
4. About **8.9 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) to 2021-22 (T5) years.
5. There is a decrease of 1,508 Hectares in Scrubland area as compared between 2012-13 (T0) & 2021-22 (T5) years.
6. Farm ponds (09) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (09) 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