MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

EAST GODAVARI -13/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2023

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

AGRICULTURE & SOIL DIVISION
Andhra Pradesh Space Applications Centre (APSAC)
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RURAL DEVELOPMENT AND WATERSHED MONITORING DIVISION
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DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

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EXECUTIVE SUMMARY

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-13/2013-14, East Godavari District of Andhra Pradesh. The total geographical area of the project is 1,975 ha. It comprises of 8 micro watersheds.
4. In the project area 73 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 14 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. 30 % is covered by the agriculture, 14.7 % is covered by forest, 45 % is covered by scrubland, 5.7 % is covered by plantation/horticulture and remaining by other land use classes.

STUDY AREA
PROJECT : PAMUGANDI (IWMP-13/2013-14)
DISTRICT : EAST GODAVARI , STATE : ANDHRA PRADESH

- The study area falls in Devipatnam Mandal of East Godavari district of Andhra Pradesh state. The total geographical area of the project is 1,975 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 & Table 2.

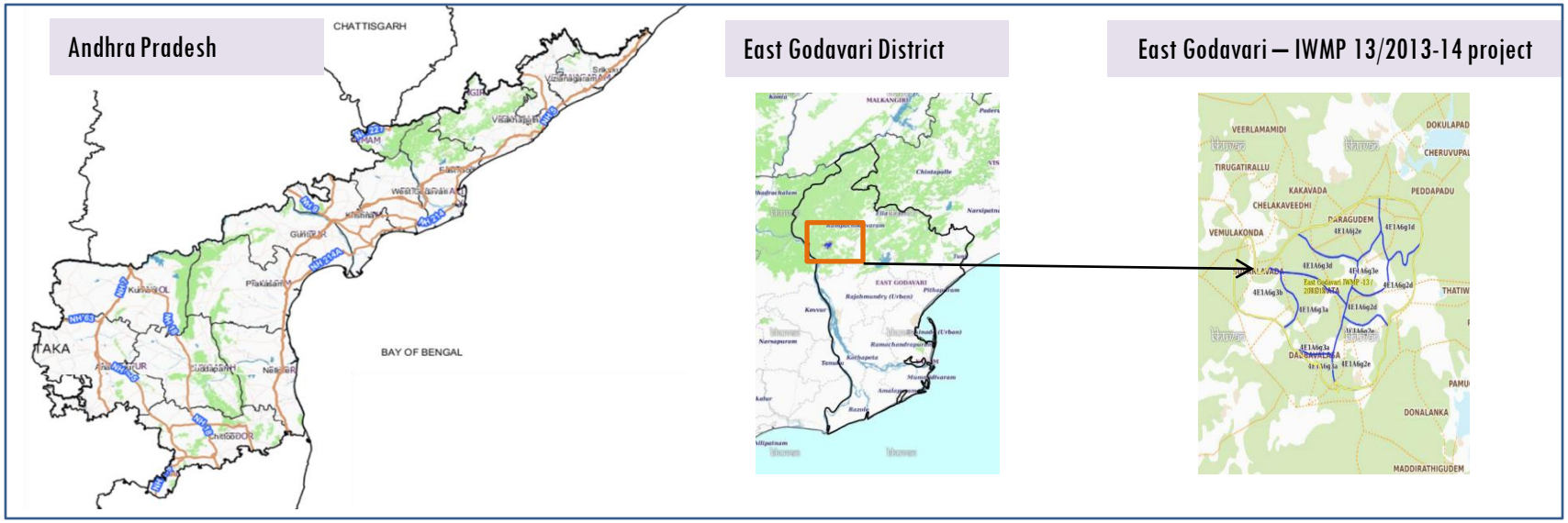


Fig.1. Location map of Pamugandi Watershed (IWMP-13/2013-14) in East Godavari District, A.P

- 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

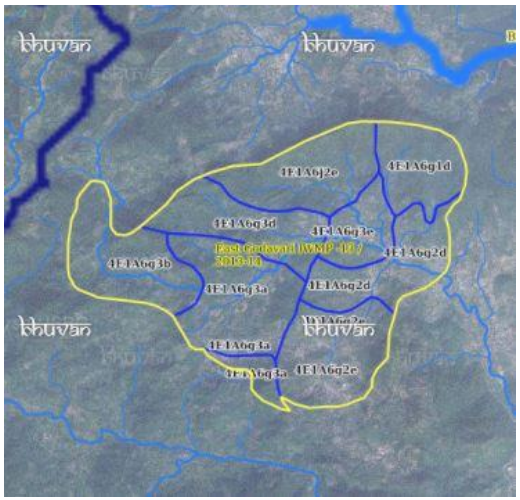
Satellite data	T0-A	T0-B	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			6-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			6-Mar-22
SCENE2			
SCENE 3			
SCENE 4			

Linear Image Self Scanner (LISS)

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	73
4	Detailed Project Report		

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



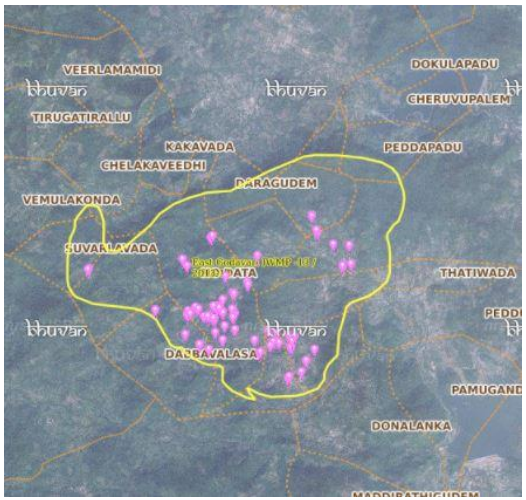
Legend

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	4	4
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	10	10
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	5	5
11	Civil work-Check dams/Rock fill dam	15	15
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	2	2
15	Livelihood Activities-Plantation/Horticulture	1	1
16	Capacity Building Activities	0	0
17	Entry Point Activity	12	12
18	Others	24	24
	TOTAL	**73**	**73**

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

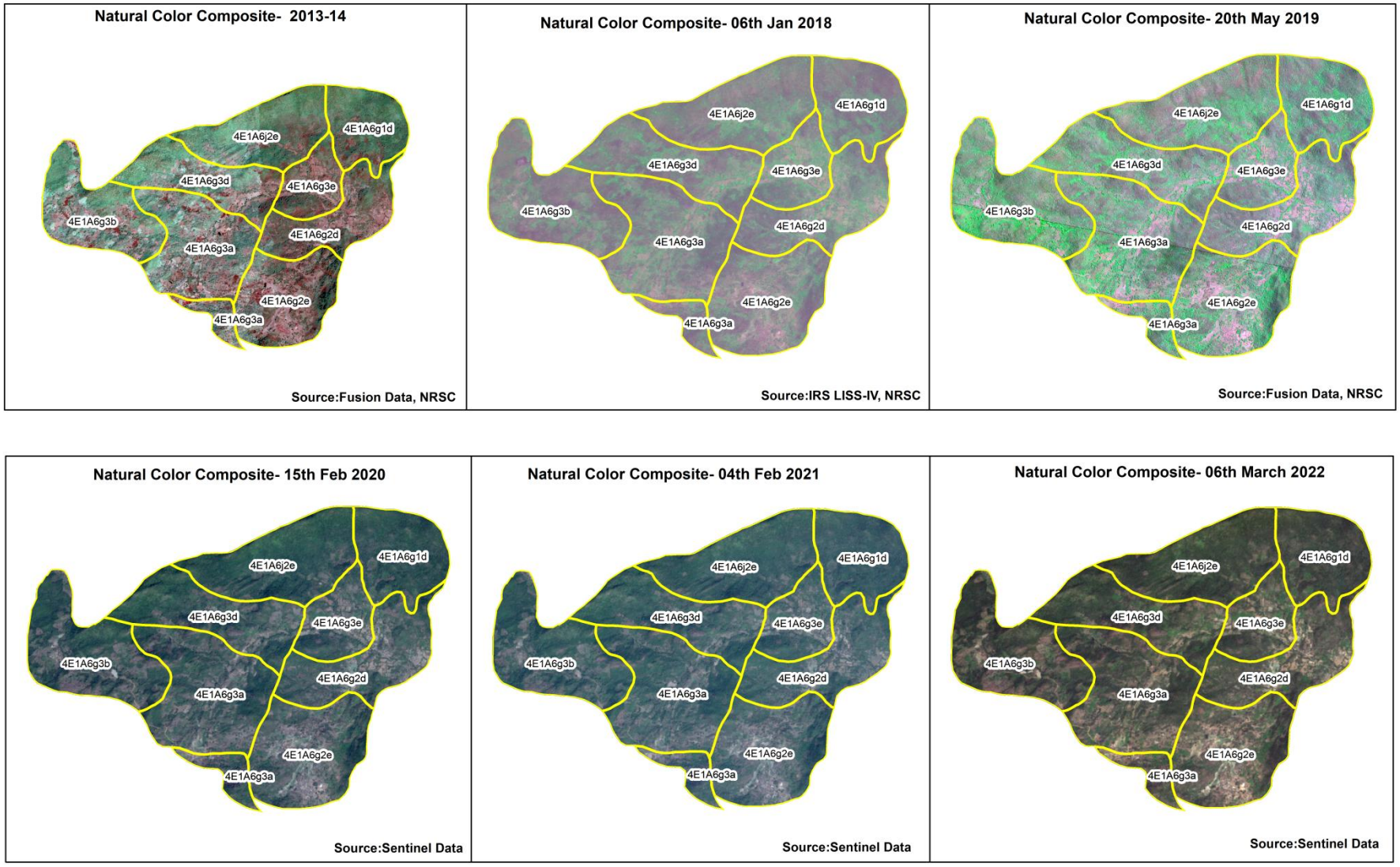


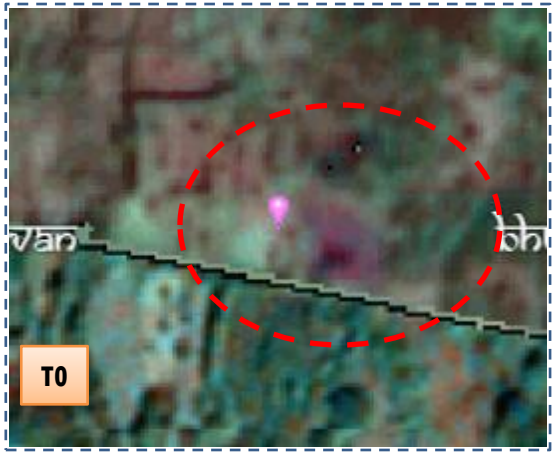
Fig 5. Monitoring of activities in Pamugandi Watershed (IWMP-13/2013-14) East Godavari District, Andhra Pradesh

T0:2013-14

T1: 29 November 2018

Drishti Sl no. 5119589 MWS : 4E1A6g3e

Percolation tank



T0:2013-14

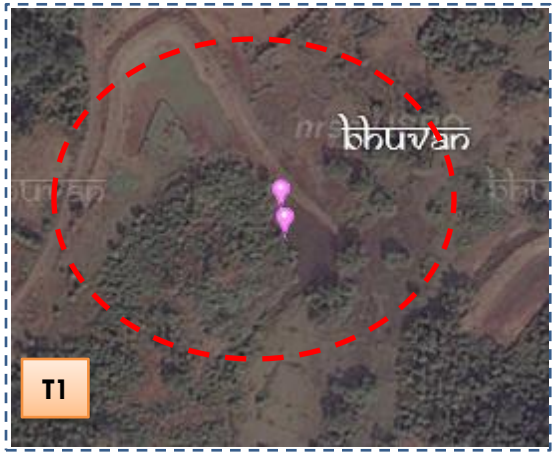
T1: 29 November 2018

Drishti Sl no. 5119600 MWS : 4E1A6g2d

Percolation tank

Fig 6. Monitoring of activities in Pamugandi Watershed (IWMP-13/2013-14) East Godavari District, Andhra Pradesh

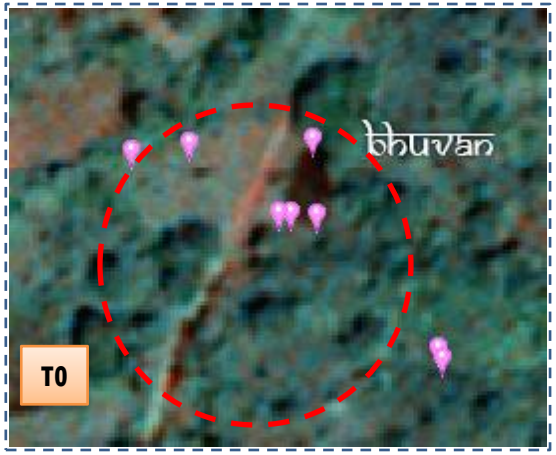
T0:2013-14



T1: 29 November 2018

Drishti SI no. 2408829 MWS : 4E1A6g3a

Percolation tank



T0:2013-14

T1: 29 November 2018

Drishti SI no. 5065903 MWS : 4E1A6g3a

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. Pamugandi 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

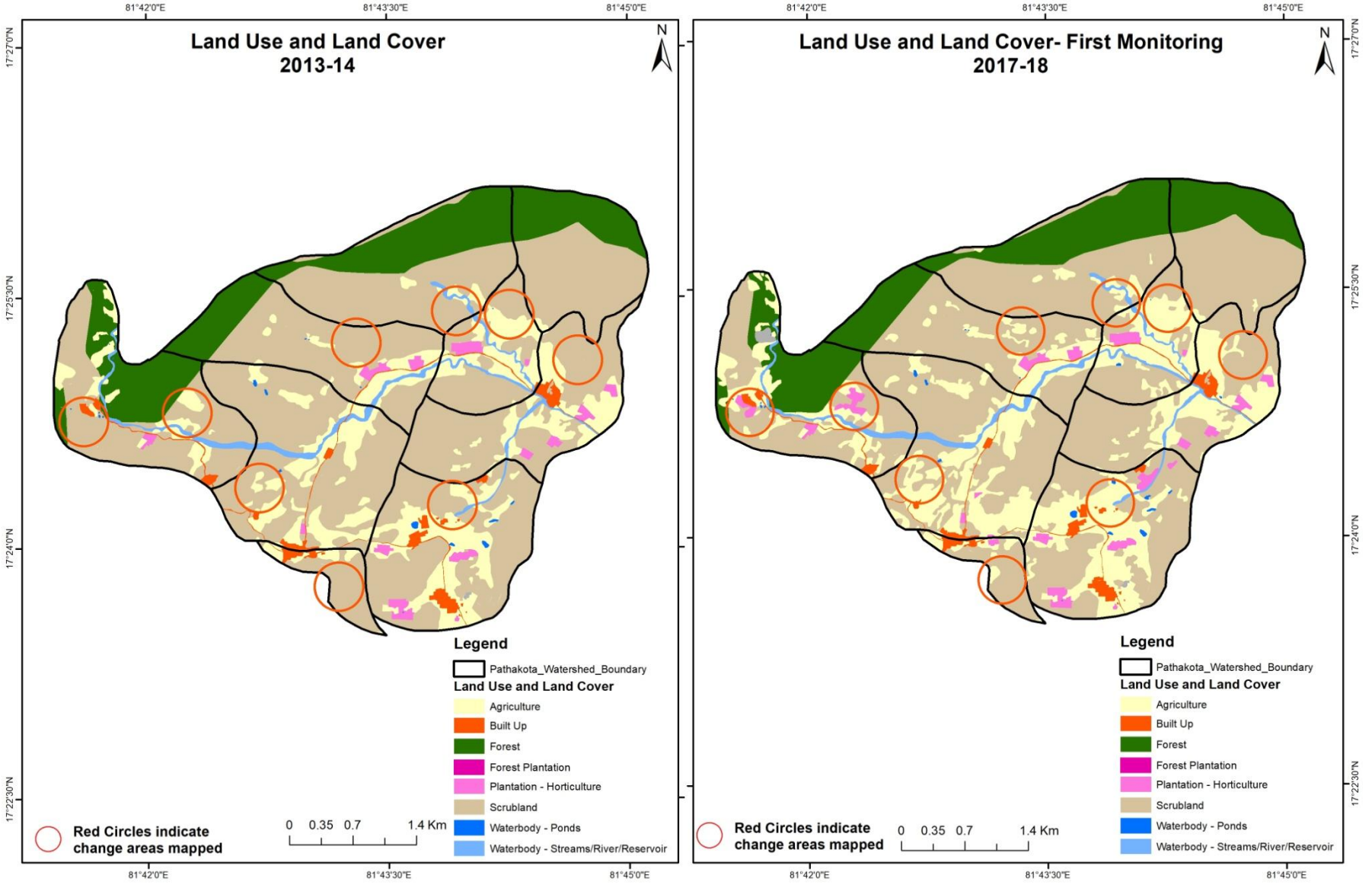


Fig 8. Pamugandi Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

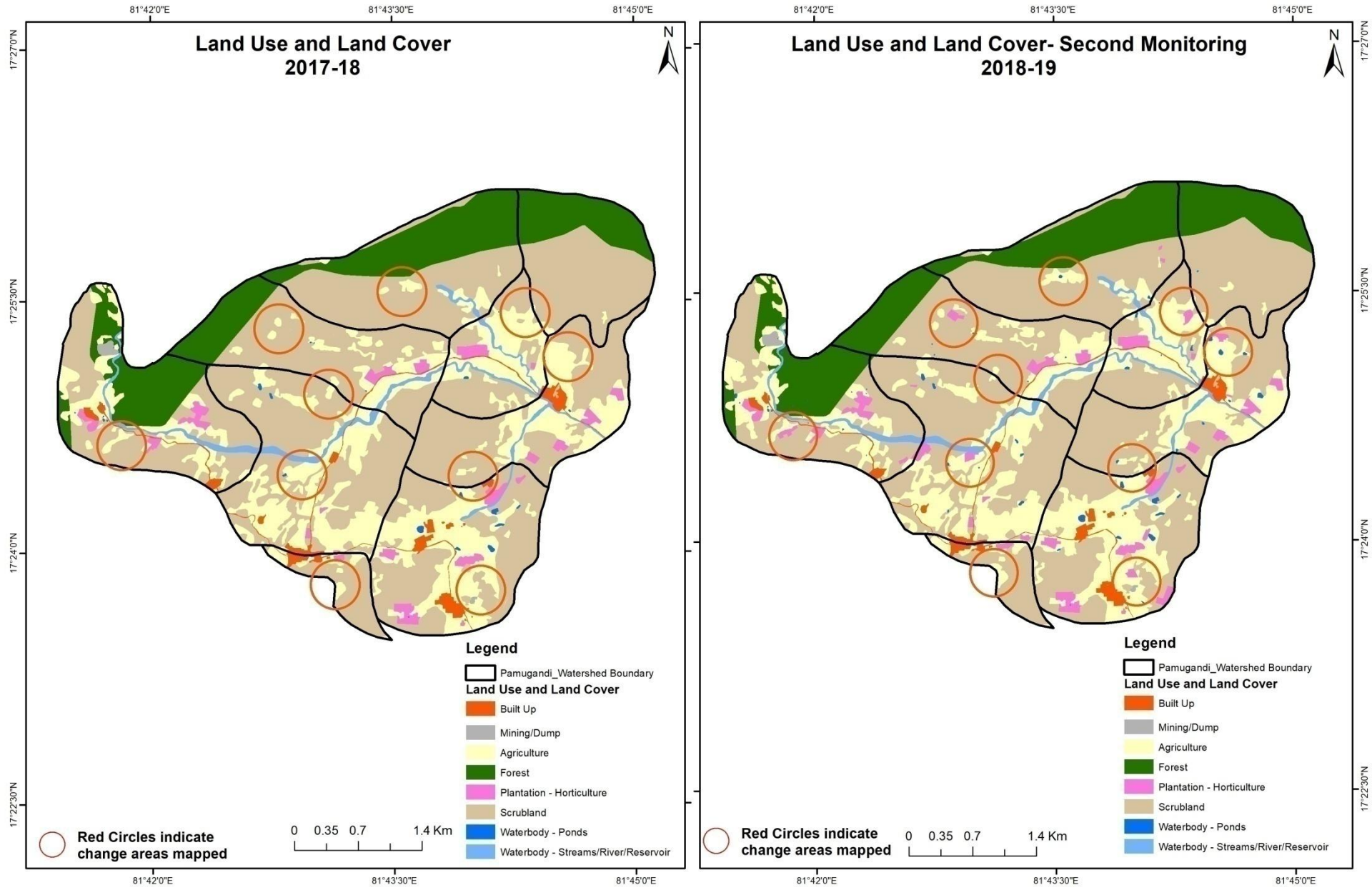


Fig 9. Pamugandi Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

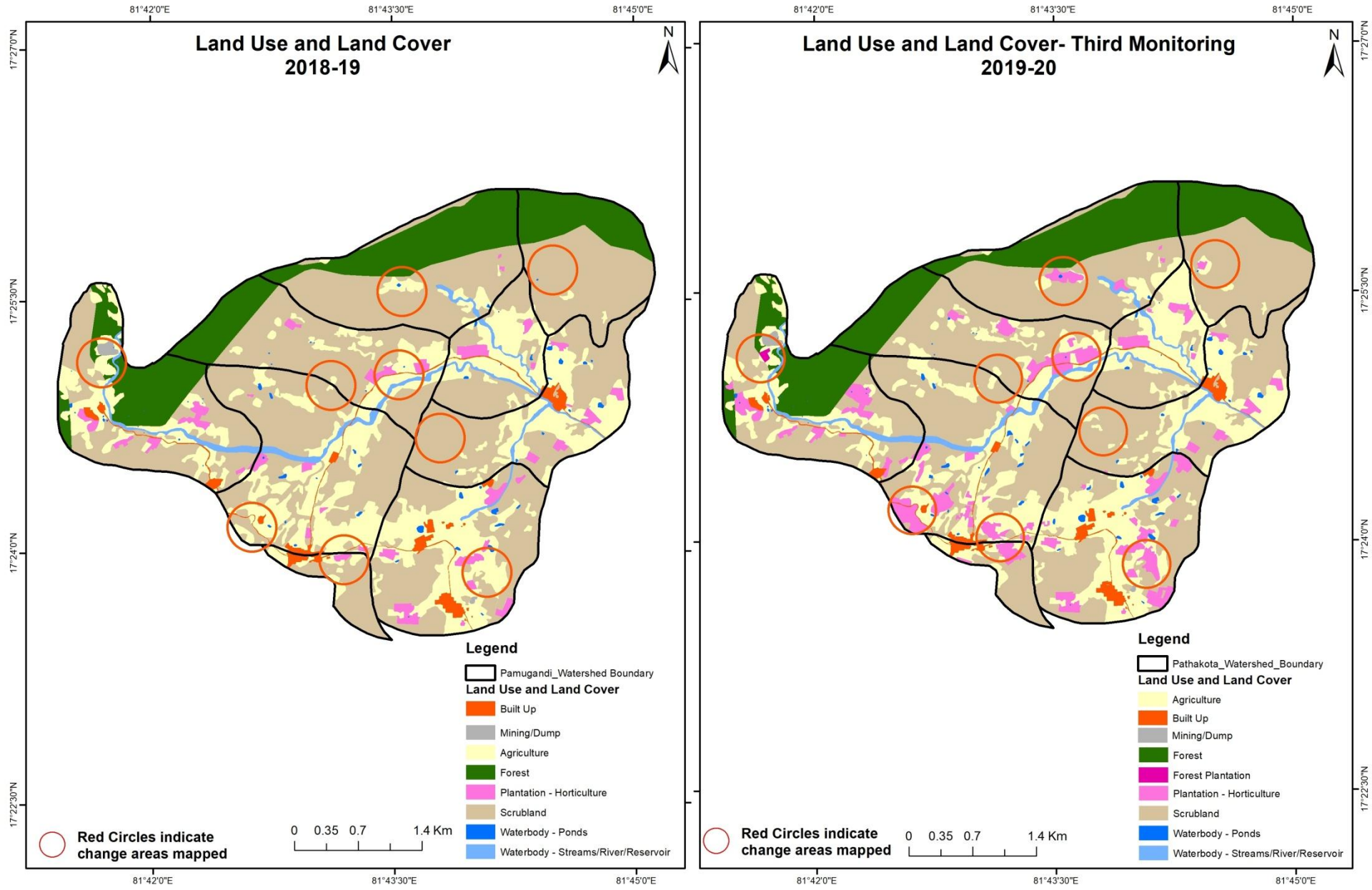


Fig 10. Pamugandi Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

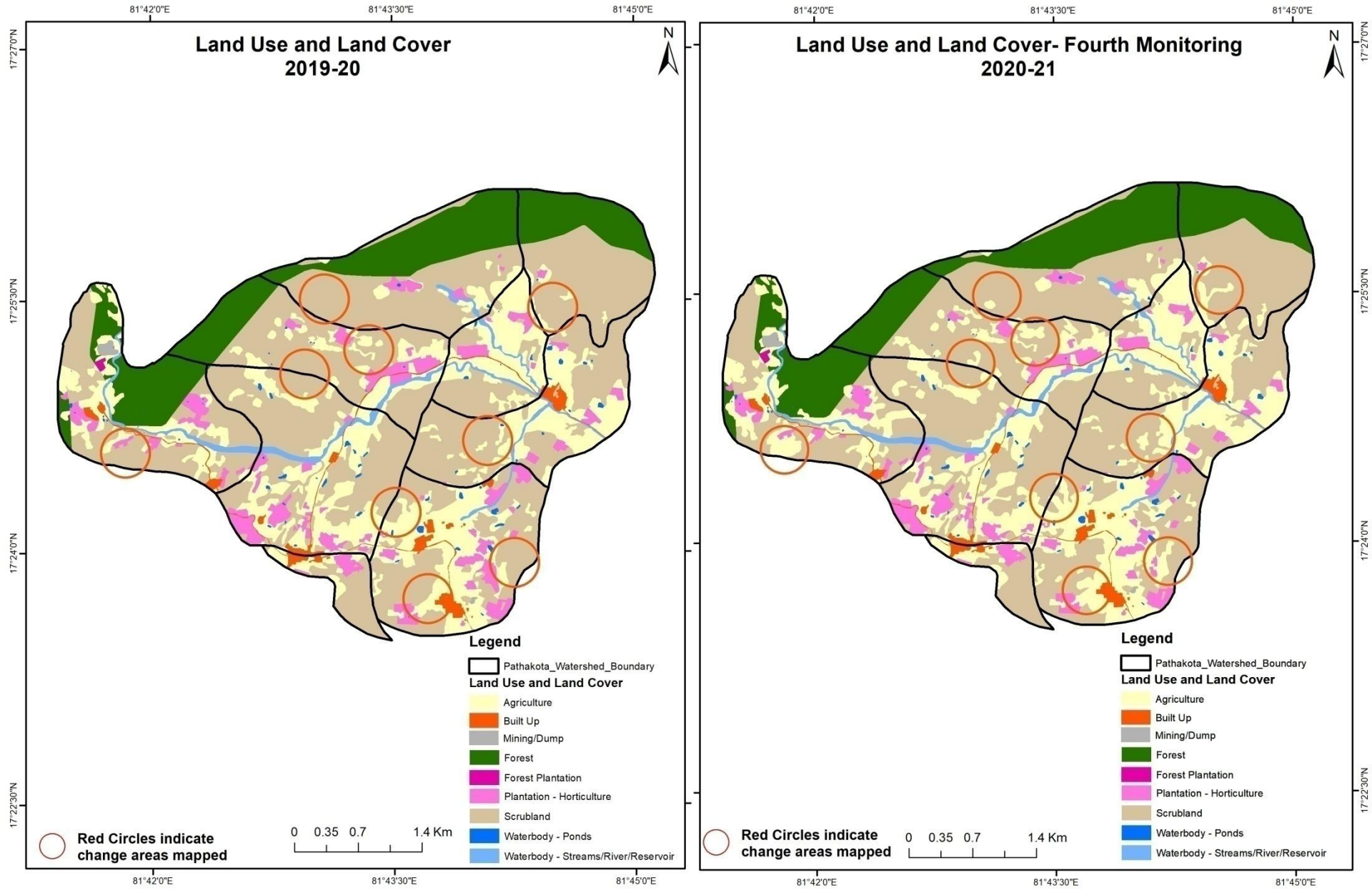


Fig 11. Pamugandi Watershed (IWMP-13/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

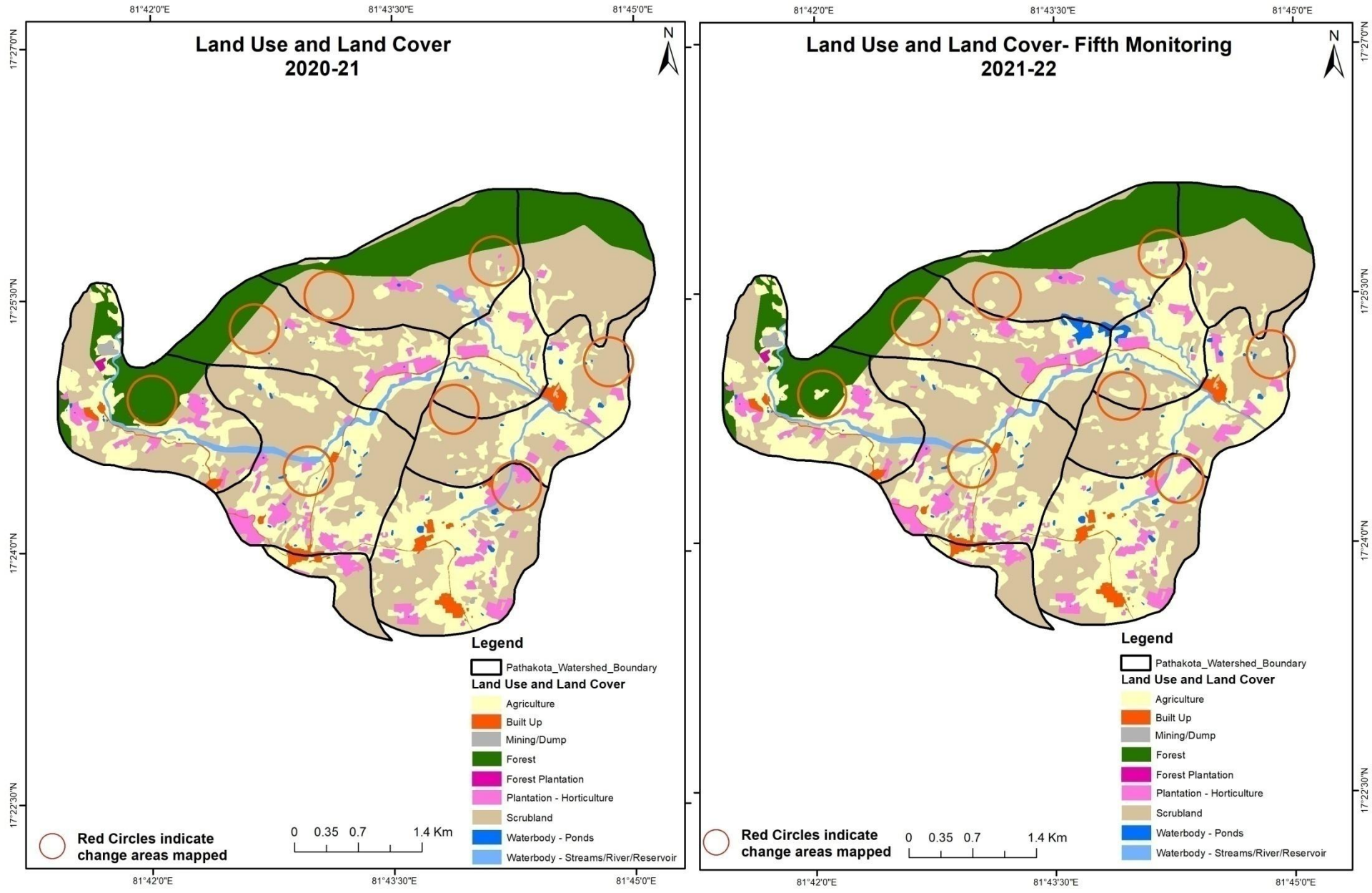
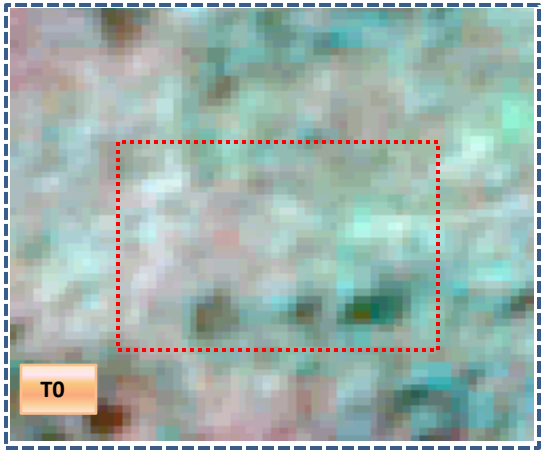
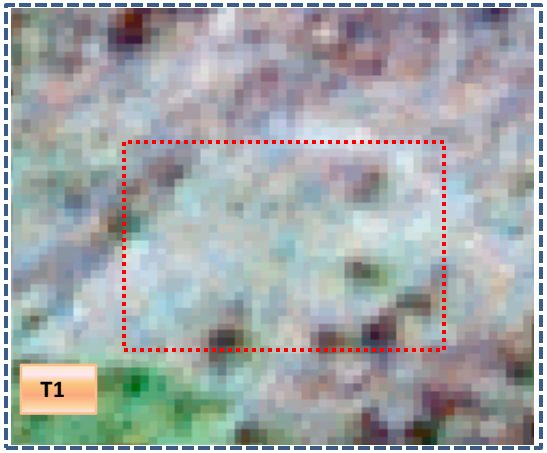


Fig12. Pamugandi Watershed (IWMP-13/2013-14), Land Use and Land Cover changes for Pre and Post treatment dates

Scrubland to Agriculture

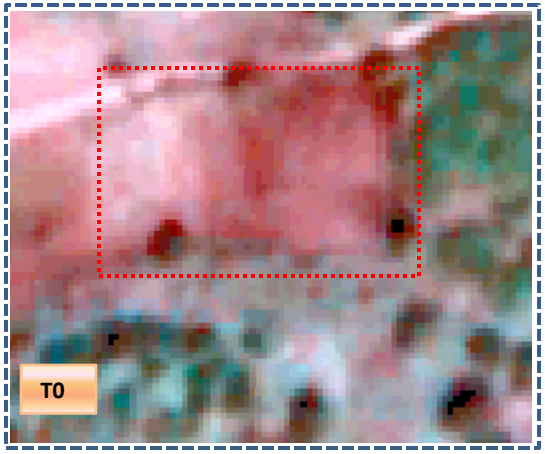


T0: 2013-14 (81°43'20.012"E 17°25'15.616"N)

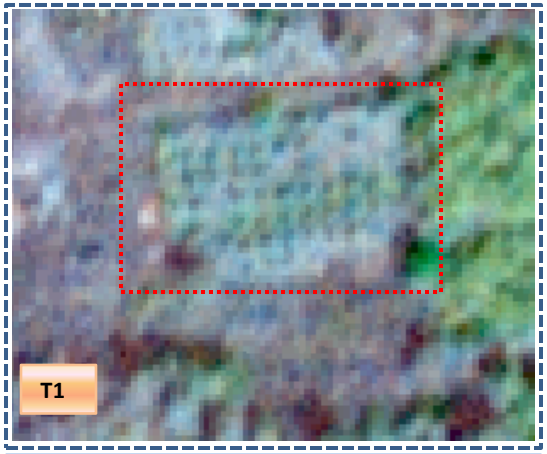


T1: 06 January 2018

Agriculture to Plantation



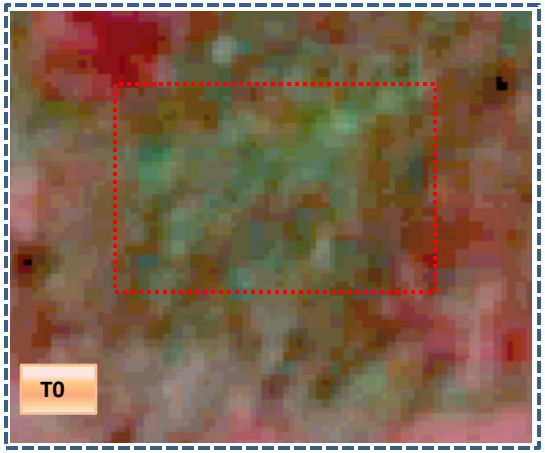
T0: 2013-14 (81°43'9.402"E 17°23'57.857"N)



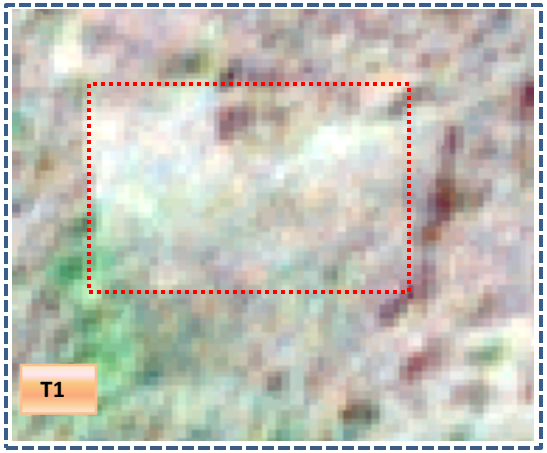
T1: 06 January 2018

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

Scrubland to Agriculture

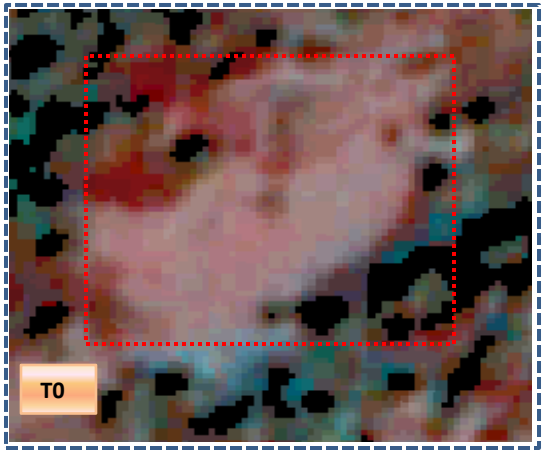


T0: 2013-14 (81°43'46.953"E 17°25'13.566"N)

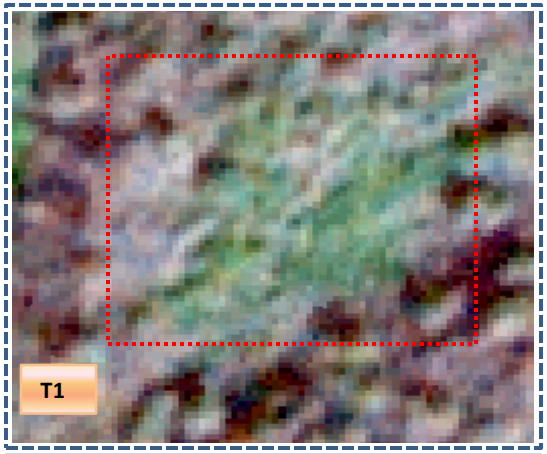


T1: 06 January 2018

Agriculture to Plantation



T0: 2013-14 (81°44'17.411"E 17°24'25.675"N)



T1: 06 January 2018

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

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	34.09										**34.09**
Mining/dump		0.4									**0.4**
Agriculture		0.93	309.44	6.34						0.49	**317.2**
Plantation Horticulture				26.85							**26.85**
Forest		1.84	6.07		296.73						**304.64**
Forest Plantation											
Barren Rocky											
Scrub			134.38	5.19				1110.58		0.41	**1250.56**
Waterbody-Streams/River									39.44		**39.44**
Waterbody – Ponds										2.76	**2.76**
Grand Total	**34.09**	**3.17**	**449.89**	**38.38**	**296.73**			**1110.58**	**39.44**	**3.66**	**1975.94**

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 7.7 ha of the agriculture area has decreased and it is converted into mining/dump (0.93 ha), plantation/horticulture (6.34 ha) and water body (0.49 ha) in T1.
3. In T1 134 ha of the agriculture area has increased from forest (6.07 ha) and scrubland (134.38 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Pamugandi Watershed (IWMP-13/2013-14) 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	34.09										**34.09**
Mining/dump		3.17									**3.17**
Agriculture			437.47	5.24				4.96		2.22	**449.89**
Plantation Horticulture			0.26	38.12							**38.38**
Forest			1.8		294.87					0.06	**296.73**
Forest Plantation											
Barren Rocky											
Scrub			34.44	8.89				1066.58		0.67	**1110.58**
Waterbody-Streams/River									39.44		**39.44**
Waterbody – Ponds										3.66	**3.66**
Grand Total	**34.09**	**3.17**	**473.97**	**52.25**	**294.87**			**1071.54**	**39.44**	**6.61**	**1975.94**

4. In T1 7.4 ha of the agriculture area has decreased and it is converted into plantations/horticulture (5.24 ha), scrubland (4.96 ha) and water body (2.22 ha) in T2.

5. In T2 34.7 ha of the agriculture area has increased from plantations/horticulture (0.26 ha), forest (1.8 ha) and scrubland (34.44 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Pamugandi Watershed (IWMP-13/2013-14) 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	34.09										**34.09**
Mining/dump		3.17									**3.17**
Agriculture			428.06	43.87		1.08				0.96	**473.97**
Plantation Horticulture			0.35	51.9							**52.25**
Forest					294.87						**294.87**
Forest Plantation											
Barren Rocky											
Scrub			44.7	18.64				1007.65		0.55	**1071.54**
Waterbody-Streams/River									39.44		**39.44**
Waterbody – Ponds										6.61	**6.61**
Grand Total	**34.09**	**3.17**	**473.11**	**114.41**	**294.87**	**1.08**		**1007.65**	**39.44**	**8.12**	**1975.94**

6. In T2 44 ha of the agriculture area has decreased and it is converted into plantations/horticulture (43.87 ha), forest-plantation (1.08 ha) and water body (0.96 ha) in T3.

7. In T3 45 ha of the agriculture area has increased from plantations/horticulture (0.35 ha) and scrubland (44.7 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Pamugandi Watershed (IWMP-13/2013-14) 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	34.09										**34.09**
Mining/dump		3.17									**3.17**
Agriculture			473.11								**473.11**
Plantation Horticulture			5.12	109.29							**114.41**
Forest			2.2		292.67						**294.87**
Forest Plantation						1.08					**1.08**
Barren Rocky											
Scrub			52.31					955.34			**1007.65**
Waterbody-Streams/River									39.44		**39.44**
Waterbody – Ponds										8.12	**8.12**
Grand Total	**34.09**	**3.17**	**532.74**	**109.29**	**292.67**	**1.08**		**955.34**	**39.44**	**8.12**	**1975.94**

9. In T4 59.6 ha of the agriculture area has increased from plantations/horticulture (5.12 ha), forest (2.2 ha) and scrubland (52.31 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Pamugandi Watershed (IWMP-13/2013-14) 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	34.09										**34.09**
Mining/dump		3.17									**3.17**
Agriculture			526.18	6.56							**532.74**
Plantation Horticulture			4.08	105.21							**109.29**
Forest			1.67		291						**292.67**
Forest Plantation						1.08					**1.08**
Barren Rocky											
Scrub			56.11					890.12	9.11		**955.34**
Waterbody-Streams/River										39.44	**39.44**
Waterbody – Ponds									8.12		**8.12**
Grand Total	**34.09**	**3.17**	**588.04**	**111.77**	**291**	**1.08**		**890.12**	**17.23**	**39.44**	**1975.94**

10. In T4 6.5 ha of the agriculture area has decreased and it is converted into plantations/horticulture (6.56 ha) in T5.

11. In T5 61.8 ha of the agriculture area has increased from plantations/horticulture (4.08 ha), forest (1.67 ha) and scrubland (56.11 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 14 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 132, 24, 60 & 55 Hectares from T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 561 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 850 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
5. Farm ponds (09) is visible on IWMP (Integrated Watershed Management Programme) 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