

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

EAST GODAVARI -03/2013-14

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)  
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**

## **EXECUTIVE SUMMARY**

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

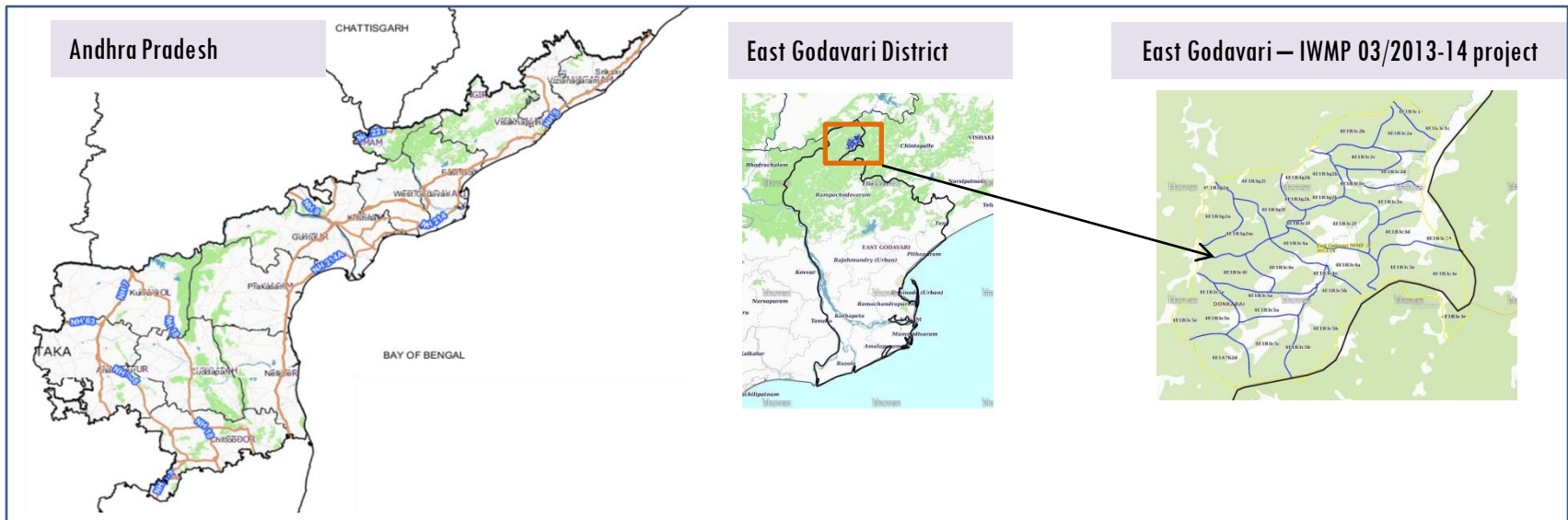
1. Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
2. National Remote Sensing Centre (NRSC), ISRO has designed and developed Bhuvan Geo-ICT Web portal tools namely – Srishti and Drishti for monitoring 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-03/2013-14, East Godavari District of Andhra Pradesh. The total geographical area of the project is **8,818 ha**. It comprises of 21 micro watersheds.
4. In the project area 22 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 5.6 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. 42.9 % is covered by the agriculture, 41 % is covered by forest, 12.7 % is covered by scrubland and remaining by other land use classes.

# 1. STUDY AREA

## PROJECT : PATHAKOTA WATERSHED (IWMP-03/2013-14)

### DISTRICT : EAST GODAVARI , STATE : ANDHRA PRADESH

- The study area falls in Y.Ramavaram Mandal of East Godavari district of Andhra Pradesh state. The total geographical area of the project is **8,818 ha**. It comprises of 21 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 Pathakota Watershed (IWMP-03/2013-14) 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 I.Satellite Data and Ancillary Data

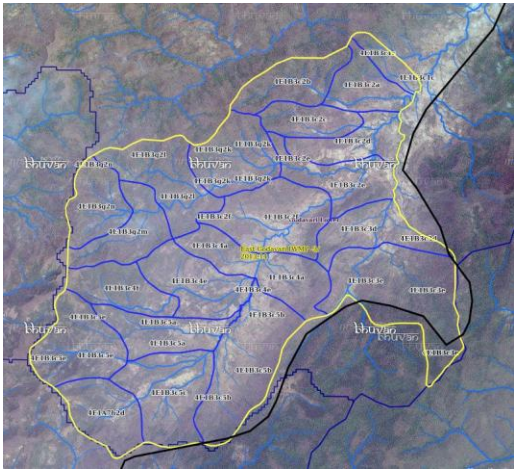
Satellite data	T0-A	T0-B	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			4-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			4-Mar-22
SCENE2			
SCENE 3			
SCENE 4			

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	22
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

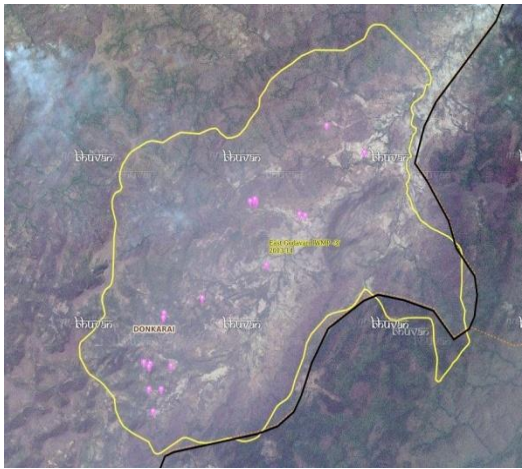


MWS Boundary



Project Boundary

Fig 3.Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

**Table 3. Classification of the Activities**

<b>Sr. No</b>	<b>Activity</b>	<b>Number of Photographs uploaded in Drishti Mobile Application</b>	<b>Visible on satellite in Srishti Geoportal</b>
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	4	4
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	7	7
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	1	1
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	3	3
18	Others	4	4
	<b>TOTAL</b>	<b>22</b>	<b>22</b>

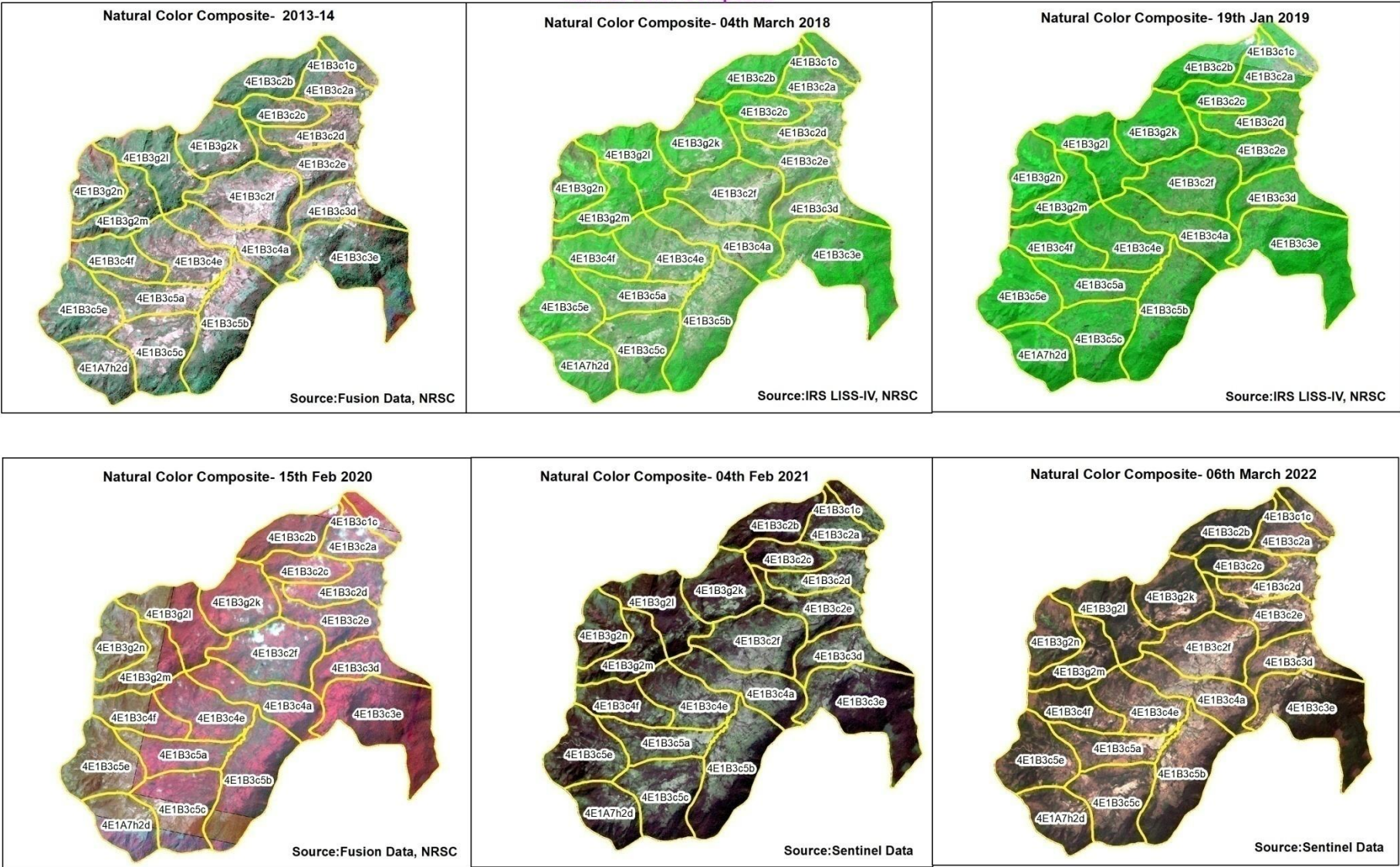
## 03. MONITORING IN THE PROJECT AREA

### 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.

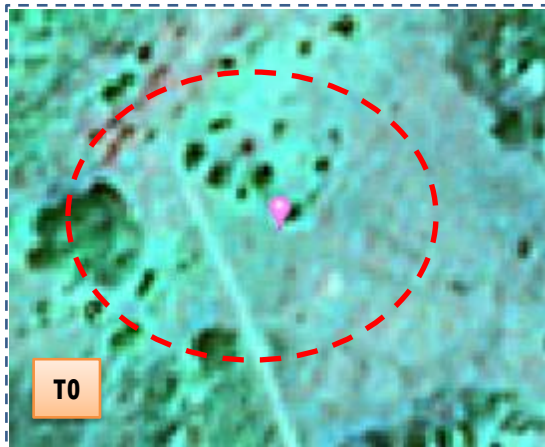


**Fig 4. Pathakota Watershed (IWMP-03/2013-14) Natural Colour Composite - 2013-14 to 2021-22**





**Fig 5. Monitoring of activities in Pathakota Watershed (IWMP-03/2013-14) East Godavari District Andhra Pradesh**



T0:2013-14

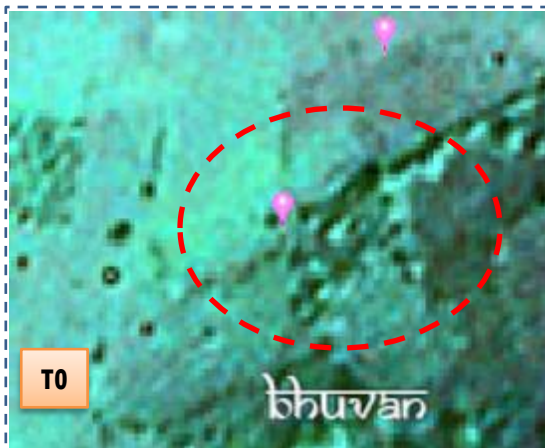


T1: 14 January 2019



Drishti SI no. 1712591 MWS : 4E1B3c5a

**Farm pond**



T0:2013-14



T1: 14 January 2019

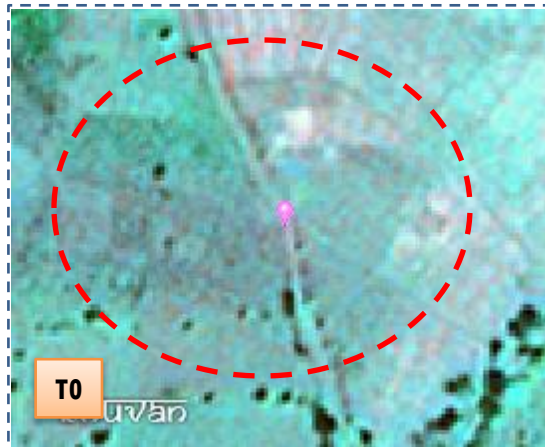


Drishti SI no. 1718375 MWS : 4E1B3c5E

**Horticulture**



**Fig 6. Monitoring of activities in Pathakota Watershed (IWMP-03/2013-14) East Godavari District Andhra Pradesh**



T0:2013-14

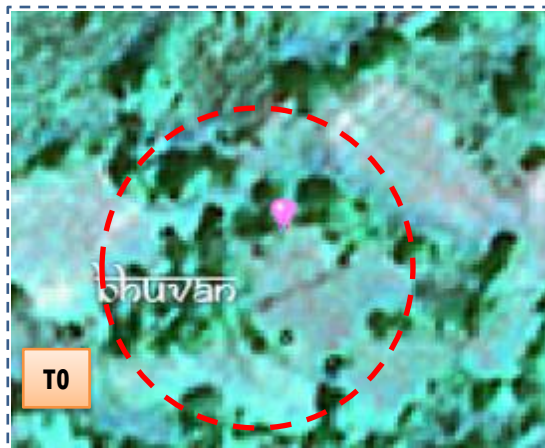


T1: 14 January 2019

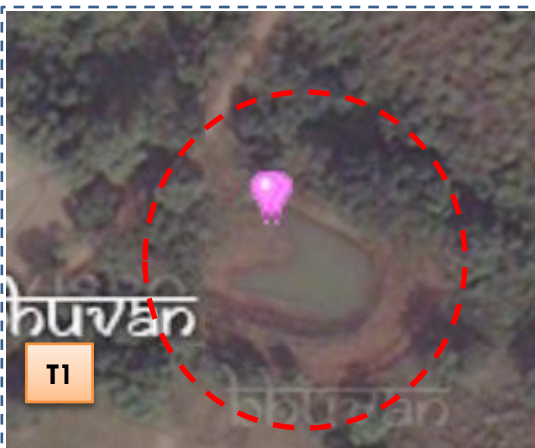


Drishti SI no. 7057714 MWS : 4E1B3c5c

**Horticulture**



T0:2013-14



T1: 14 January 2019



Drishti SI no. 7057715 MWS : 4E1A7h2d

**Percolation tank**

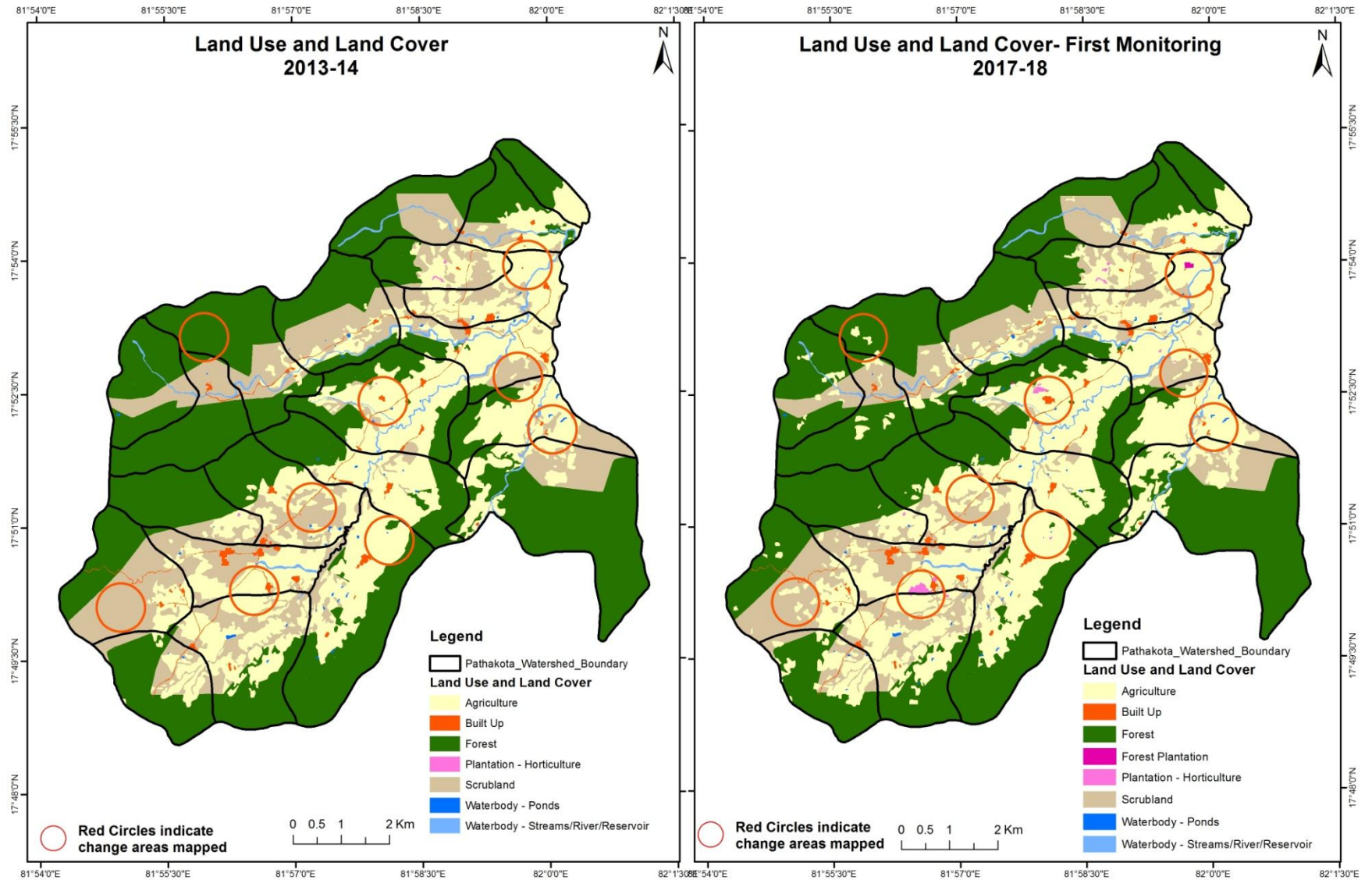
### 03. MONITORING IN THE PROJECT AREA

#### 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. Pathakota Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)**

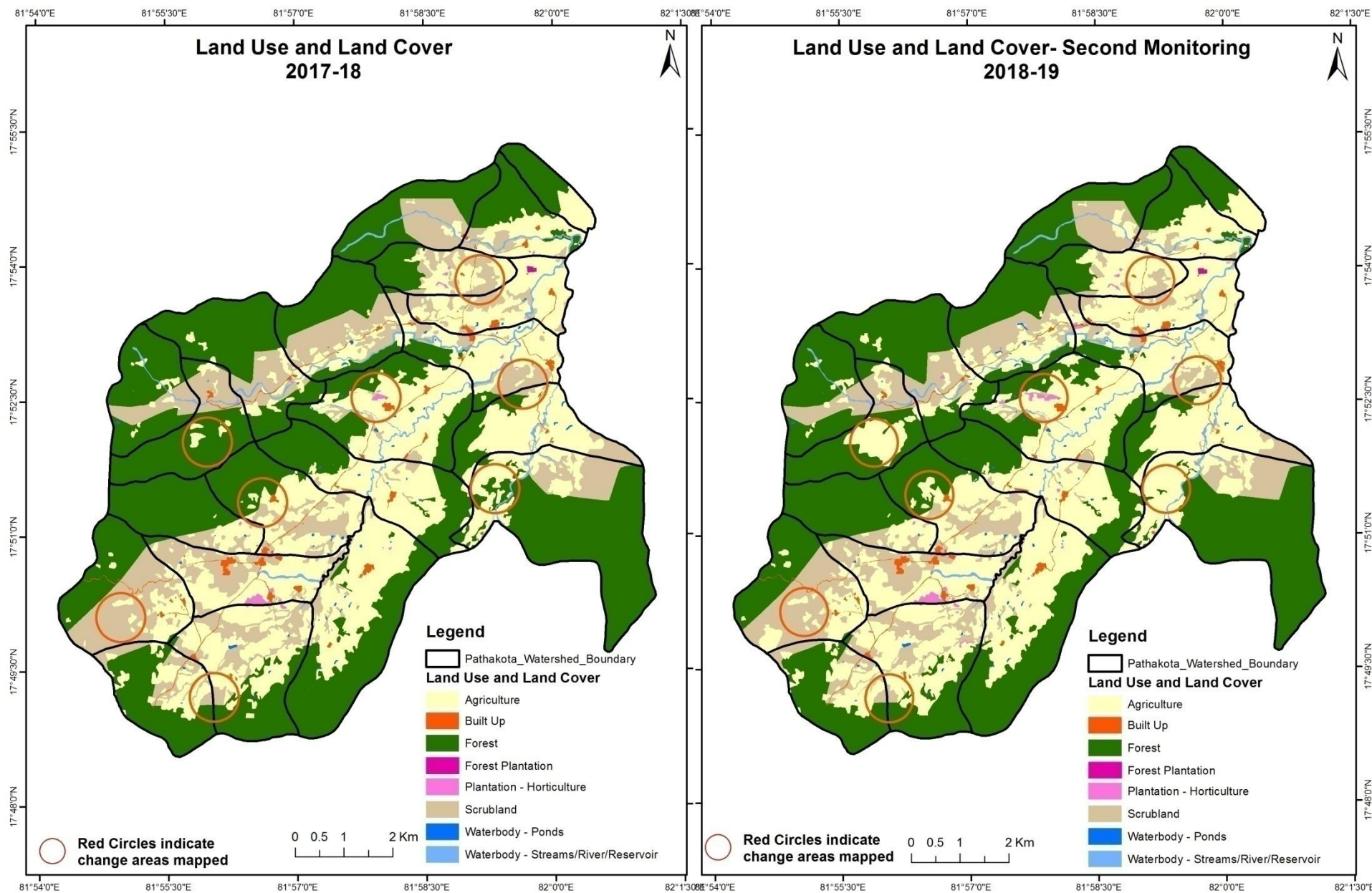
**Scale: 1:10000**





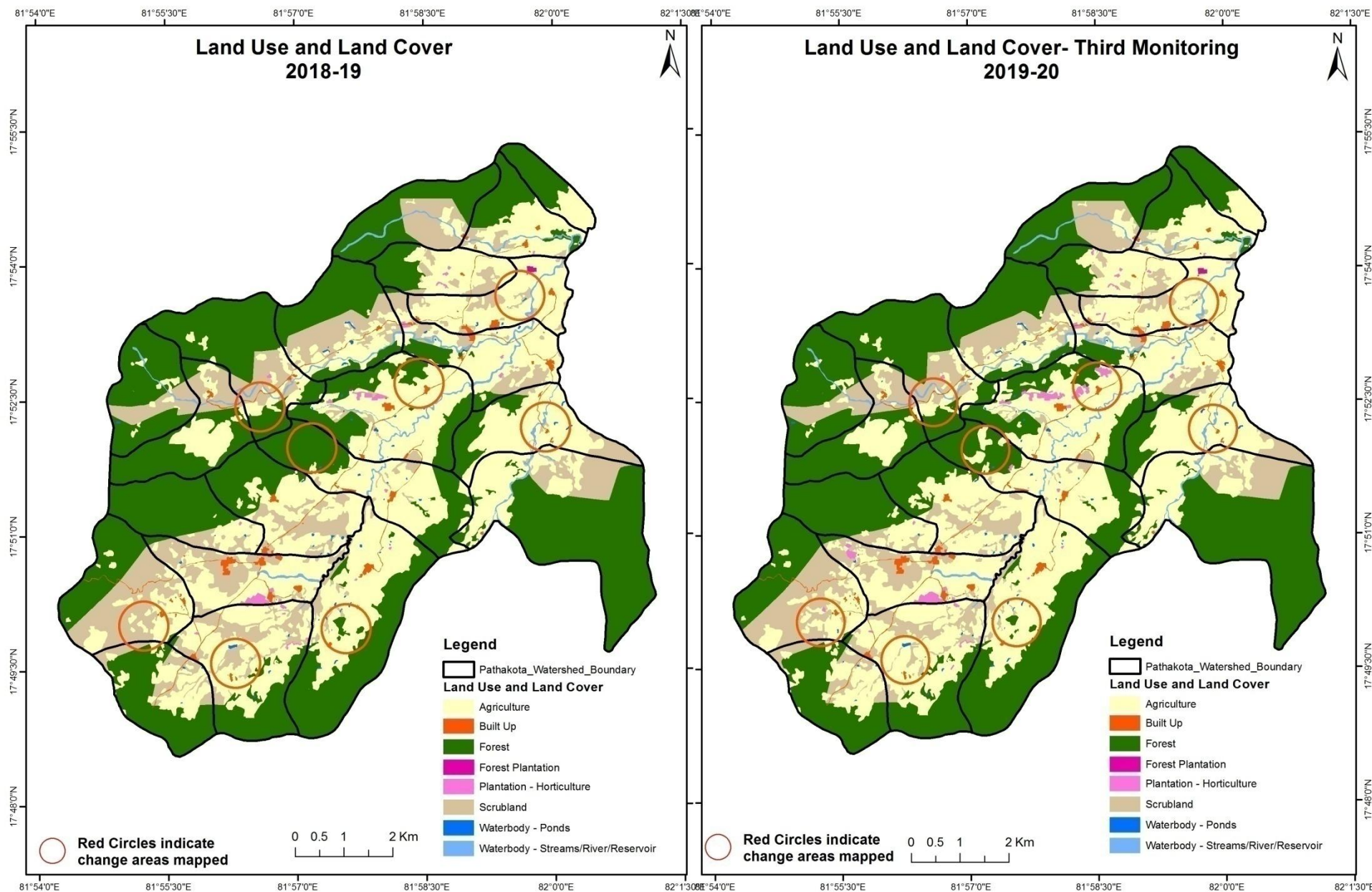
**Fig 8. Pathakota Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)**

**Scale: 1:10000**



**Fig 9. Pathakota Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)**

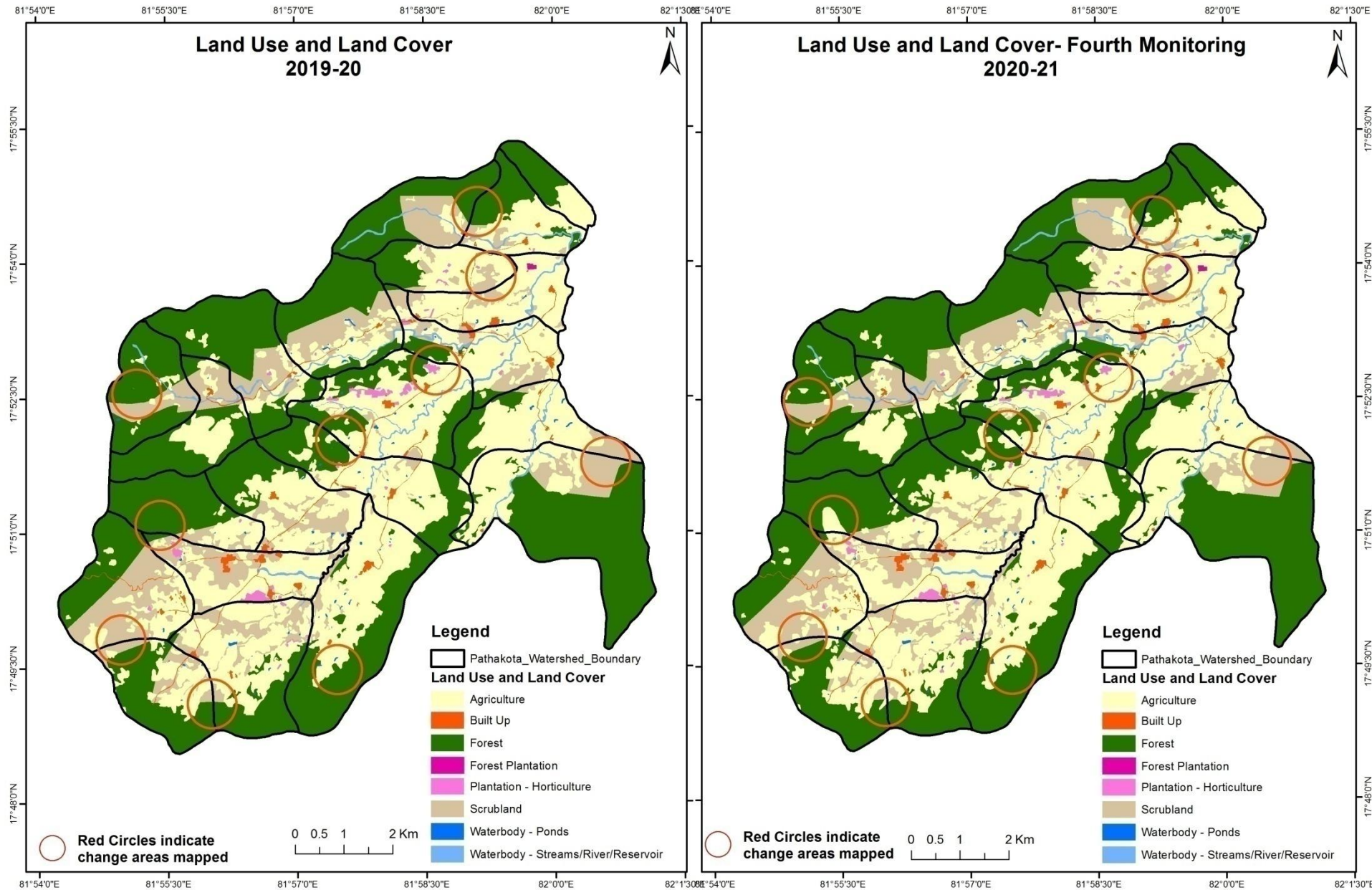
**Scale: 1:10000**





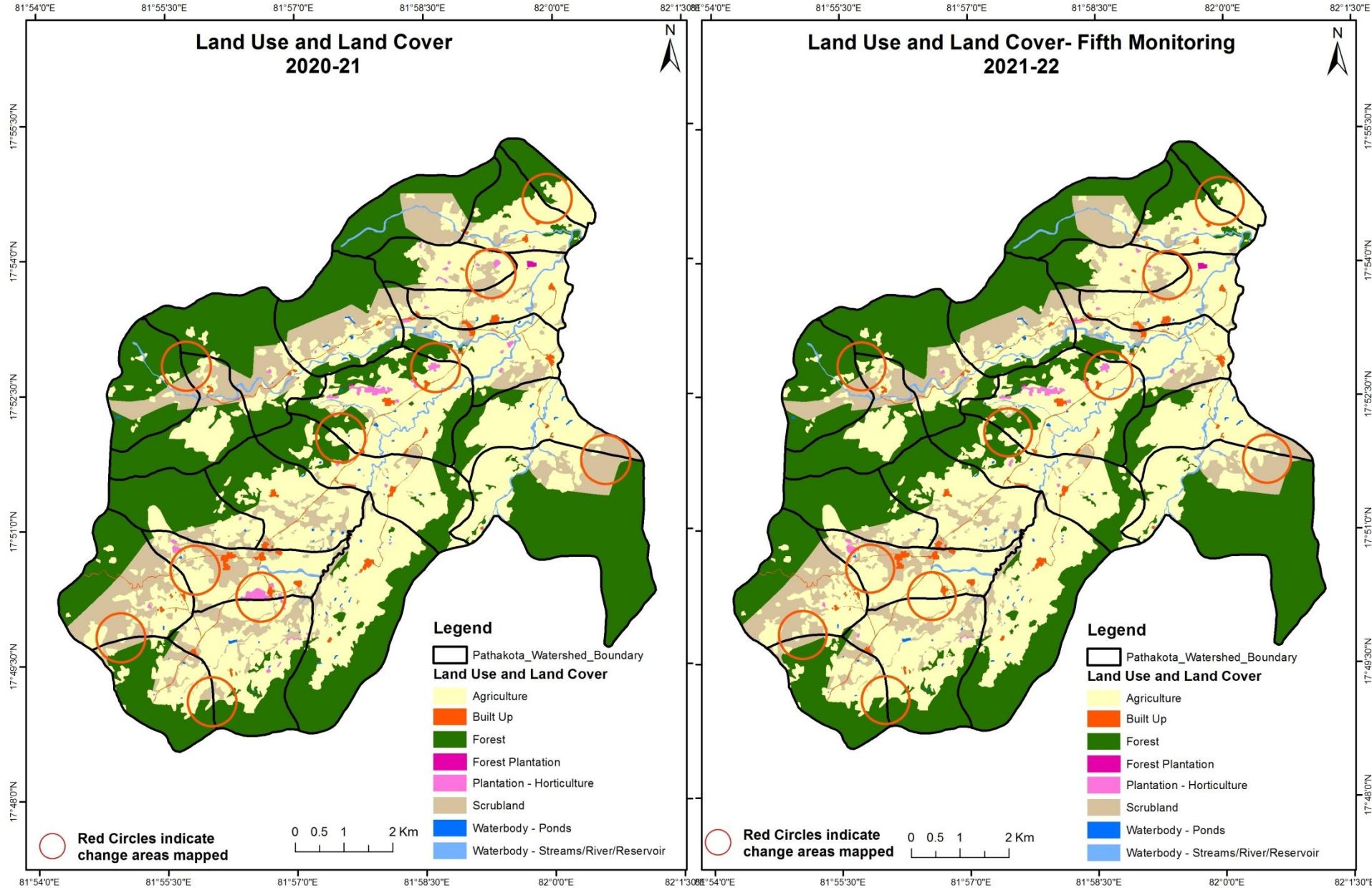
**Fig 10. Pathakota Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)**

**Scale: 1:10000**



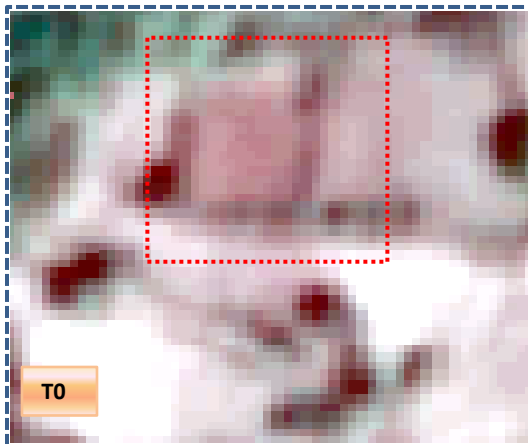
**Fig 11. Pathakota Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)**

**Scale: 1:10000**



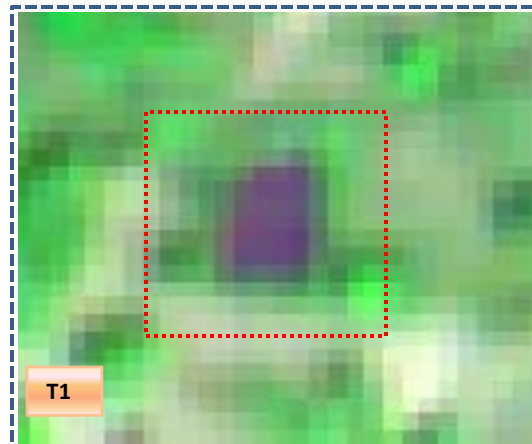
**Fig 12.Pathakota Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Water body



T0

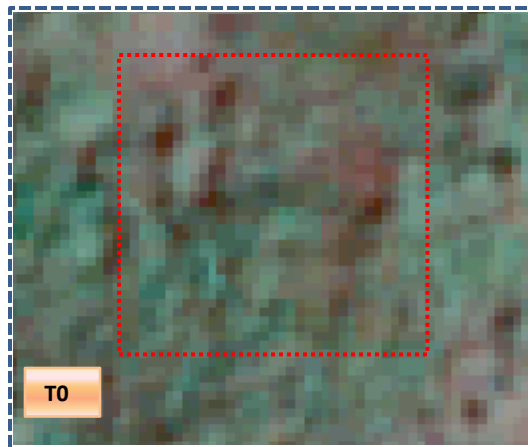
T0: 2013-14 ( $81^{\circ}55'53.857''\text{E}$   $17^{\circ}49'32.036''\text{N}$ )



T1

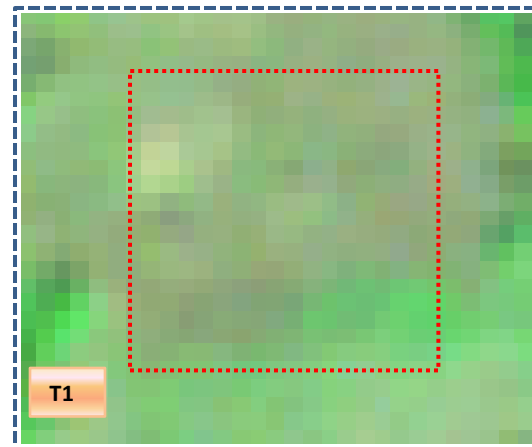
T1: 04 March 2018

Scrubland to Agriculture



T0

T0: 2013-14 ( $81^{\circ}58'37.668''\text{E}$   $17^{\circ}53'18.482''\text{N}$ )



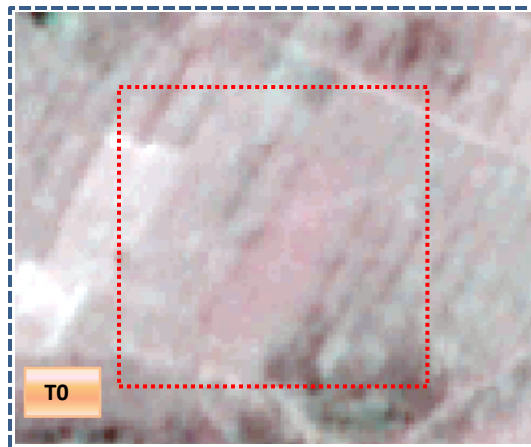
T1

T1: 04 March 2018

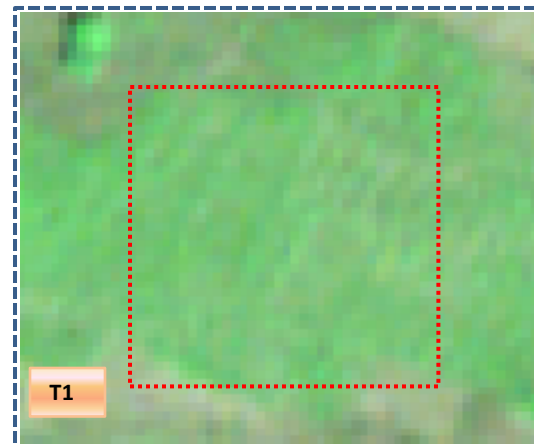


**Fig 13.Pathakota Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates**

### Agriculture to Plantation



T0: 2013-14 (81°56'33.403"E 17°50'16.872"N)

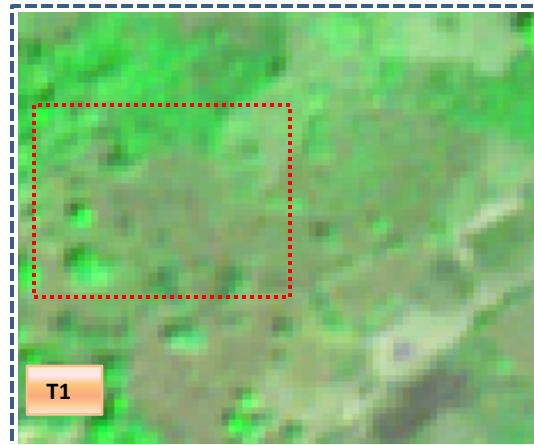


T1: 04 March 2018

### Scrubland to Agriculture



T0: 2013-14 (81°55'40.975"E 17°50'26.252"N)



T1: 04 March 2018

**Table 4. showing change matrix depicting Land cover transitions for Pathakota Watershed (IWMP-03/2013-14) during study period-2013-14 to 2017-18**

Land cover	Units in Hectares										
	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	95.81										95.81
Mining/dump											
Agriculture	2.59		2519.74	14.06		1.79			0.05	0.57	2538.8
Plantation Horticulture				1.79							1.79
Forest			167.53		4064.64	0.16				0.77	4233.1
Forest Plantation											
Barren Rocky											
Scrub			236.2					1581.26	0.82	0.32	1818.6
Waterbody- Streams/River									119.13		119.13
Waterbody – Ponds			0.18							11.41	11.59
Grand Total	98.4		2923.65	15.85	4064.64	1.95		1581.26	120	13.07	8818.82

**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 19 ha of the agriculture area has decreased and it is converted into Built-up(5.5 ha), plantation/horticulture (14 ha), forest plantation (1.7 ha) and water body (0.6 ha) in T1.
3. In T1 403 ha of the agriculture area has increased from forest (167.5 ha), scrubland (236.2 ha) and water body (0.18 ha) of T0.

**Table 5. showing change matrix depicting Land cover transitions for Pathakota Watershed (IWMP-03/2013-14)  
during study period-2017-18 to 2018-19**

Land cover	Monitoring period (T2)										Units in Hectares
		Mining/ dump		Plantation Horticulture		Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T1	Built up		Agriculture		Forest						
Built up	97.42		0.98								98.4
Mining/dump											
Agriculture	3.31		2910.4	9.37						0.57	2923.65
Plantation Horticulture			0.27	15.58							15.85
Forest			210.45		3854.02					0.17	4064.64
Forest Plantation						1.95					1.95
Barren Rocky											
Scrub			181.7	1.46				1396.61		1.49	1581.26
Waterbody- Streams/River									120		120
Waterbody – Ponds										13.07	13.07
Grand Total	100.73		3303.8	26.41	3854.02	1.95		1396.61	120	15.3	8818.82

4. In T1 13 ha of the agriculture area has decreased and it is converted into Built-up (3.3 ha), plantations/horticulture (9.3 ha) and water body (0.5 ha) in T2.

5. In T2 393 ha of the agriculture area has increased from built-up (0.9 ha), plantations/horticulture (0.2 ha) and scrubland (181 ha) of T1.



**Table 6. showing change matrix depicting Land cover transitions for Pathakota Watershed (IWMP-03/2013-14) 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
T2											
Built up	100.68		0.05								100.73
Mining/dump											
Agriculture	1.23		3284.59	17.31						0.67	3303.8
Plantation Horticulture			0.24	26.17							26.41
Forest			74.92	1.06	3778					0.04	3854.02
Forest Plantation						1.95					1.95
Barren Rocky											
Scrub			96.6	4.11				1295.78		0.12	1396.61
Waterbody- Streams/River									120		120
Waterbody – Ponds										15.3	15.3
Grand Total	101.91		3456.4	48.65	3778	1.95		1295.78	120	16.13	8818.82

6. In T2 19.2 ha of the agriculture area has decreased and it is converted into Built-up (1.2 ha), plantations/horticulture (17 ha) and water body (0.6 ha) in T3.

7. In T3 171.8 ha of the agriculture area has increased from Built-up (0.05 ha), plantations /horticulture (0.2 ha), forest (74.9 ha) and scrubland (96.6 ha) of T2.

**Table 7. showing change matrix depicting Land cover transitions for Pathakota Watershed (IWMP-03/2013-14) 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
T3	Built up										
Built up	101.91										101.91
Mining/dump											
Agriculture	0.03		3452.43	3.75						0.19	3456.4
Plantation Horticulture			6.17	42.48							48.65
Forest			109.65		3668.35						3778
Forest Plantation						1.95					1.95
Barren Rocky											
Scrub	0.11		80.36					1215.25		0.06	1295.78
Waterbody- Streams/River									120		120
Waterbody – Ponds										16.13	16.13
Grand Total	102.05		3648.61	46.23	3668.35	1.95		1215.25	120	16.38	8818.82

8. In T3 3.9ha of the agriculture area has decreased and it is converted into plantations/horticulture (3.7 ha) and water body (0.19 ha) in T4.

9. In T4 196 ha of the agriculture area has increased from plantations/horticulture (6.1 ha) , forest (109.6 ha) and scrubland (80.3 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Pathakota Watershed (IWMP-03/2013-14)  
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	102.05										102.05
Mining/dump											
Agriculture			3644.69	3.92							3648.61
Plantation Horticulture			19.13	27.1							46.23
Forest			25.78		3642.57						3668.35
Forest Plantation						1.95					1.95
Barren Rocky											
Scrub			94.74					1120.51			1215.25
Waterbody- Streams/River									120		120
Waterbody – Ponds										16.38	16.38
Grand Total	102.05		3784.34	31.02	3642.57	1.95		1120.51	120	16.38	8818.82

10. In T4 3.9 ha of the agriculture area has decreased and it is converted into plantations/horticulture (3.9 ha) in T5.

11. In T5 139 ha of the agriculture area has increased from plantations/horticulture (19.1 ha), forest (25.7 ha) and scrubland (94.7 ha ) of T4.

# Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. 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.
3. There is an increase of 5.6 Hectares in Reservoir / Tanks area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 384, 380, 152, 192 & 135 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1245 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
5. About **29 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2013-14 (T0) to 2021-22 (T5) years.
6. There is a decrease of 698 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
7. 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