

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

GUNTUR -01/2013-14

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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Andhra Pradesh



RURAL DEVELOPMENT AND  
WATERSHED MONITORING  
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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**

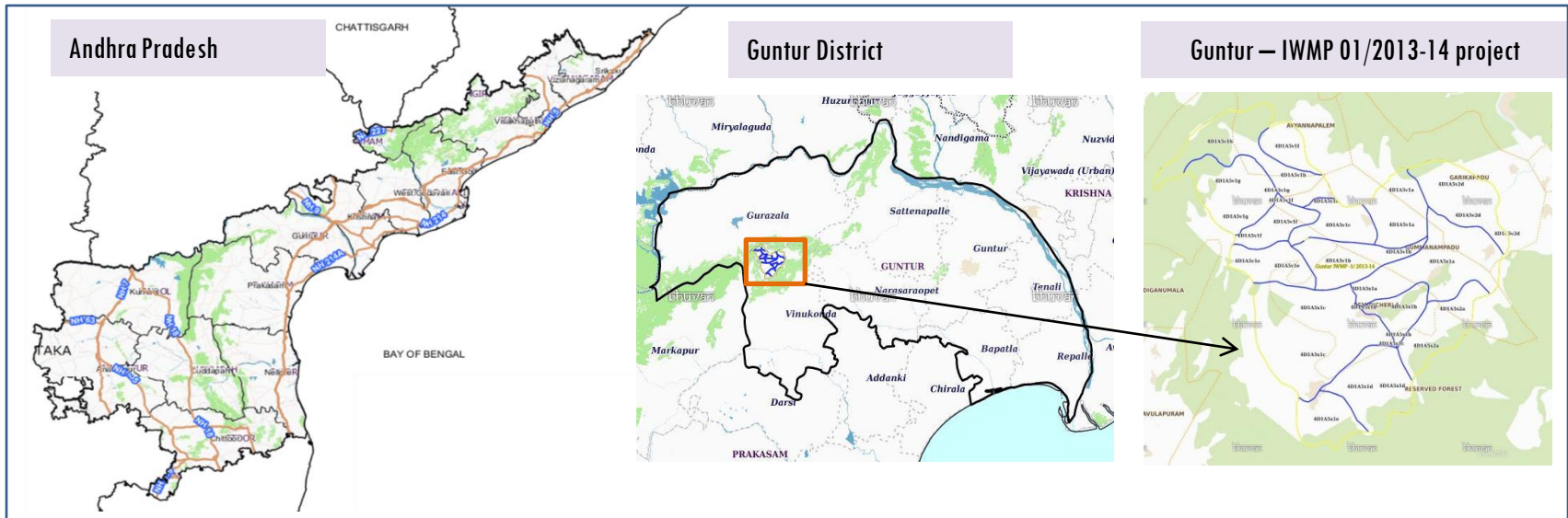
- Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
- National Remote Sensing Centre (NRSC), ISRO has designed and developed Bhuvan Geo-ICT Web portal tools namely - Srishti and Drishti for monitoring and 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).
- Current summary report gives details of Project - IWMP-01/2013-14, Guntur District of Andhra Pradesh. The total geographical area of the project is **10,057 ha**. It comprises of 13 micro watersheds.
- In the project area 35 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an increased by 21.8 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 65.8 % is covered by the agriculture, 18.7 % is covered by scrubland, 7.8 % is covered by forest and remaining by other land use classes.

# 1. STUDY AREA

## PROJECT : REMIDICHERLA WATERSHED (IWMP-01/2013-14)

### DISTRICT : GUNTUR , STATE : ANDHRA PRADESH

The study area falls in Bollapalle Mandal of Guntur district of Andhra Pradesh state. The total geographical area of the project is **10,057 ha**. It comprises of 15 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 and Figure 04.



**Fig.1. Location map of Remidicherla Watershed (IWMP-01/2013-14) in Guntur District, A.P**

- Guntur City falls within the hot humid region of the country and it is not more than 40 miles from the Sea. The climate of the district is generally hot in summer. The atmospheric humidity in the region around Guntur ranges from 63% to 81%.
- The average annual temperature is 28.5 C and annual rain fall is about 905 mm. Rain storms and cyclones are common in the region during the rainy season, which starts with the monsoons in early June. Cyclones may occur any time of the year, but occur more commonly between May and November.

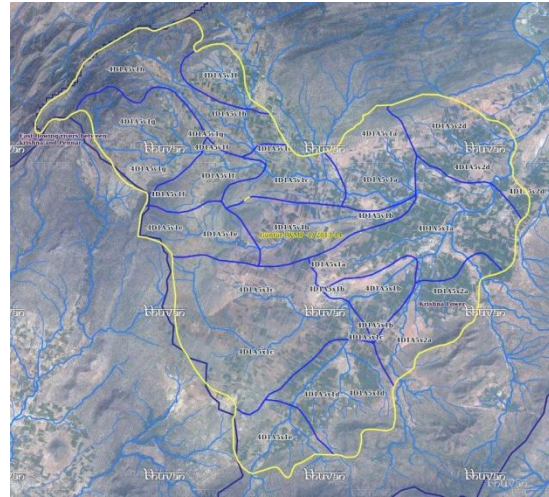
## Table I. Satellite Data and Ancillary Data

Satellite data	T0-A	T0-B	T5
	2013-14	2016-17	2017-18
LISS IV	2013-14		
SCENE 1			13-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			13-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	35
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

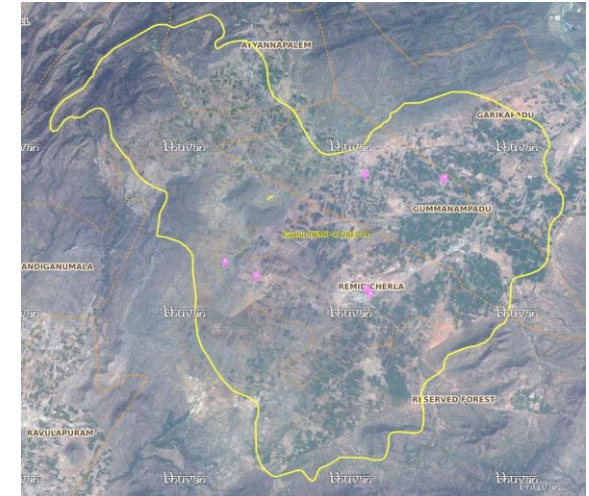


MWS Boundary



Project Boundary

## 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	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	0	0
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	0	0
18	Others	35	35
	<b>TOTAL</b>	<b>35</b>	<b>35</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.



**Figure 4. Remidicherla Watershed (IWMP-01/2013-14) Natural Colour Composite -2013-14 TO 2021-22**

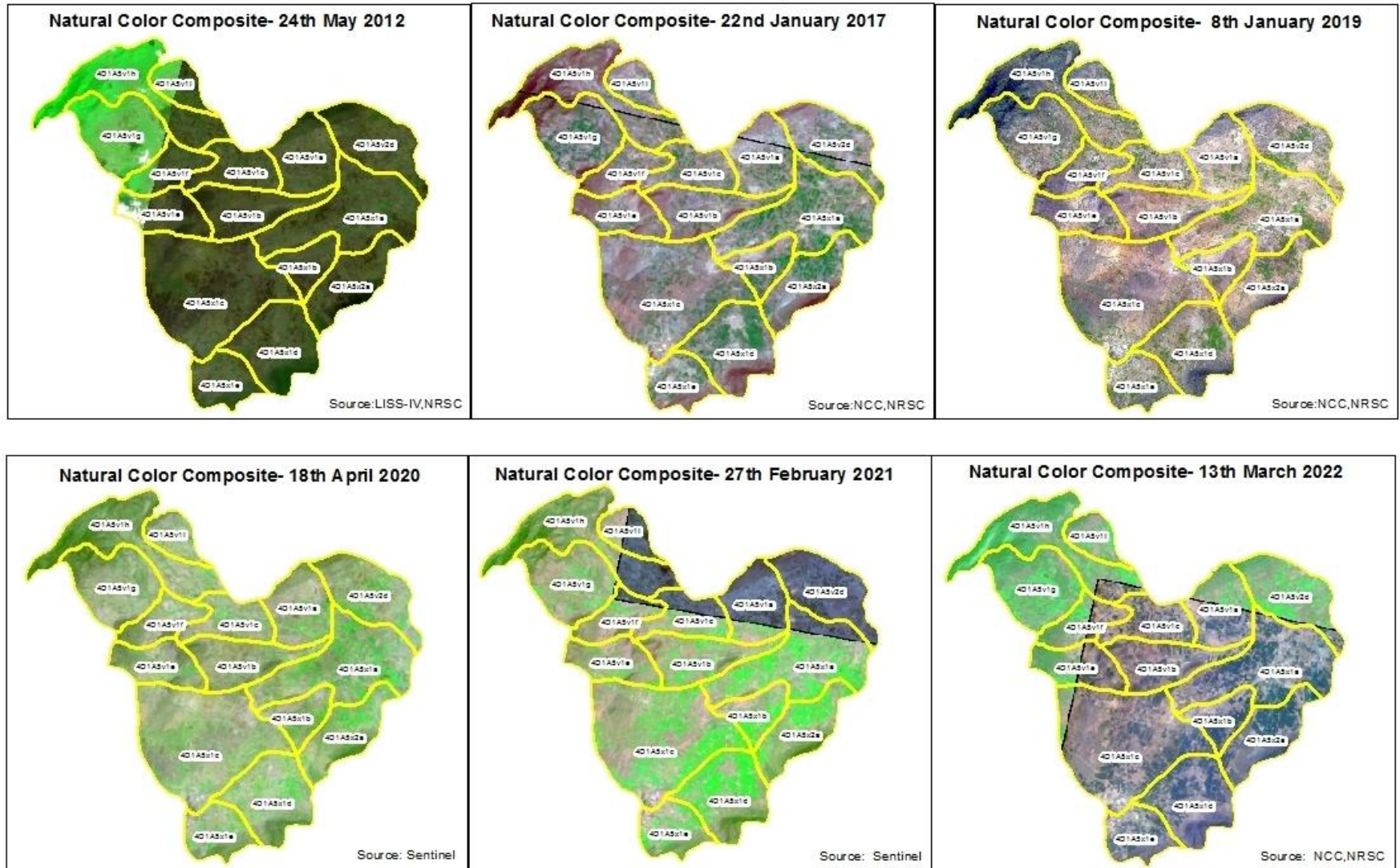


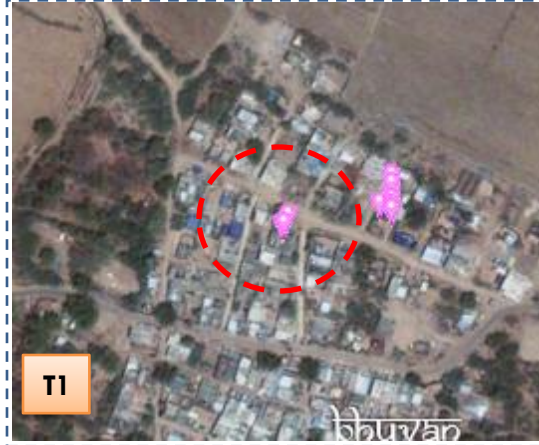


Fig 5. Monitoring of activities, Remidicherla Watershed (IWMP-01/2013-14) in Guntur Dt Andhra Pradesh



T0

T0:2013-14



T1

T1: 17 May 2018

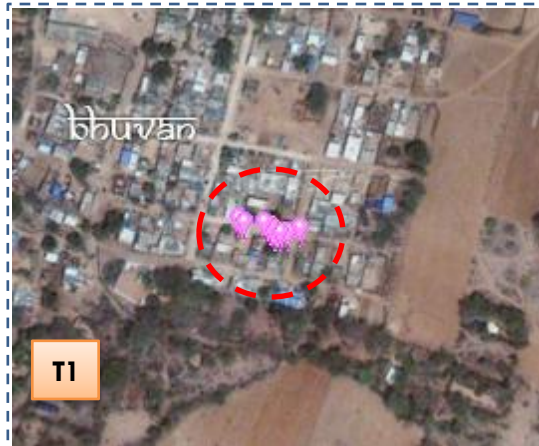


Drishti Sl no. 7036286 MWS : 4D1A5v1a

Production System and Micro-Enterprises



T0:2013-14



T1

T1: 17 May 2018



Drishti Sl no. 7036333 MWS : 4D1A5v1c

Production System and Micro-Enterprises



Fig 6. Monitoring of activities, Remidicherla Watershed (IWMP-01/2013-14) in Guntur Dt Andhra Pradesh



T0: 2013-14



T1: 17 May 2018



Drishiti Sl no. 7032643 MWS : 4D1A5x1b

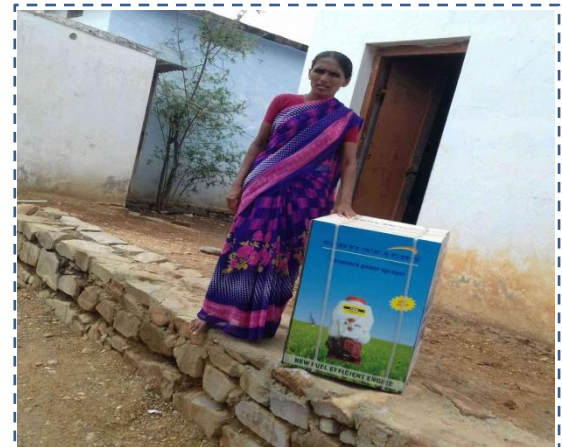
**Production System and Micro-Enterprises**



T0: 2013-14



T1: 17 May 2018



Drishiti Sl no. 7032659 MWS : 4D1A5x1b

**Production System and Micro-Enterprises**

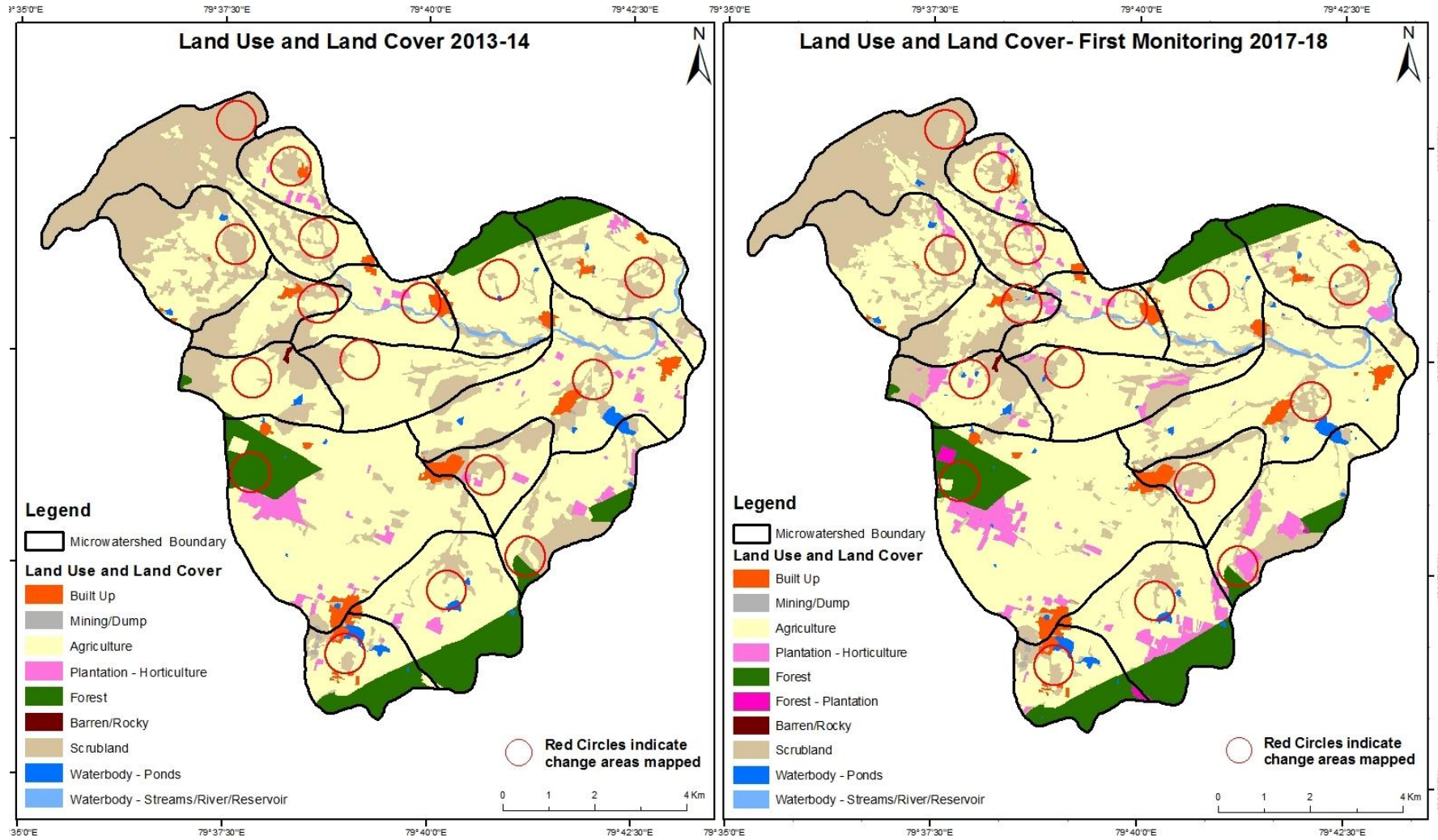
## 03. MONITORING IN THE PROJECT AREA

### 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. Remidicherla Watershed (IWMP-01/2013-14), Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)**

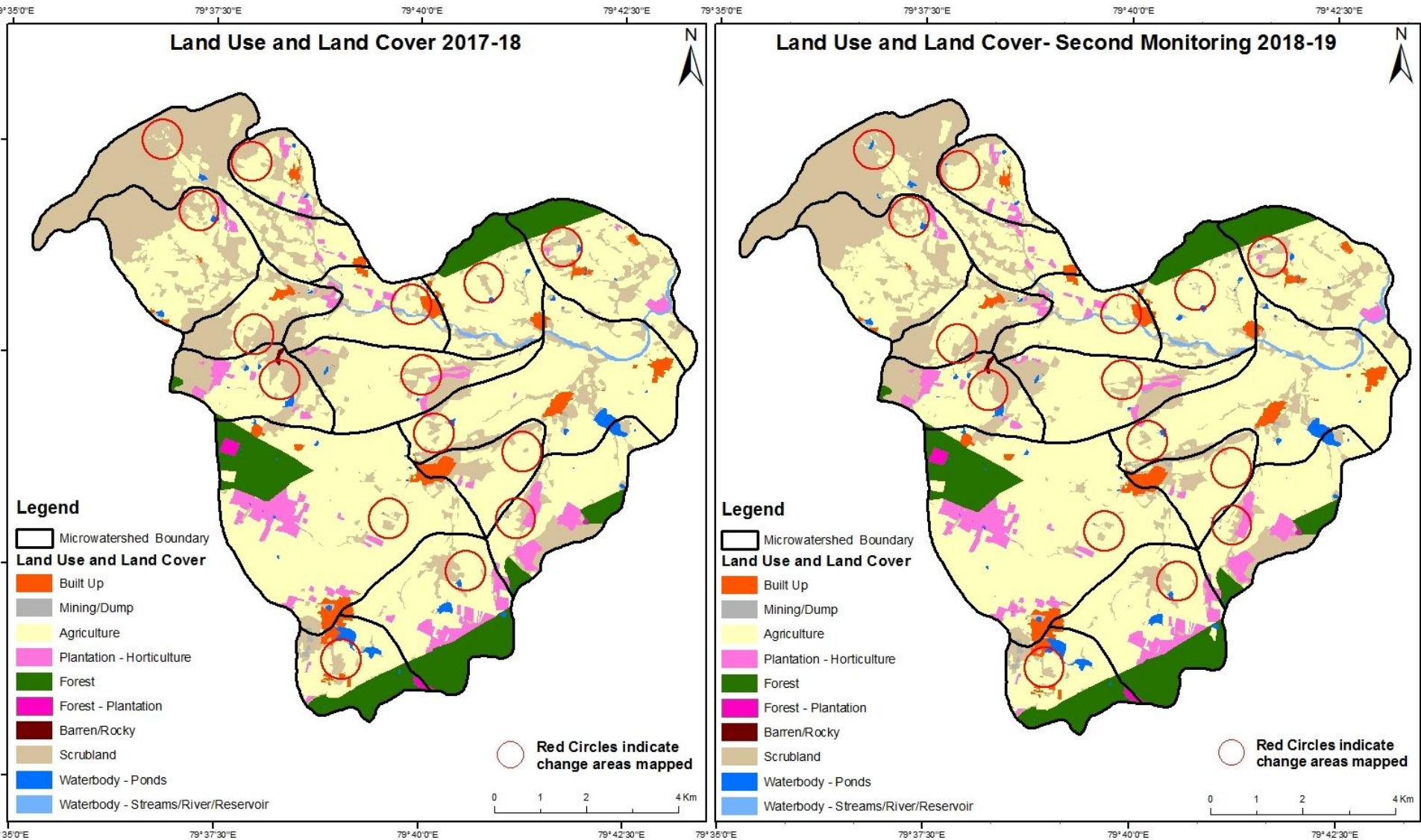
**Scale: 1:10000**





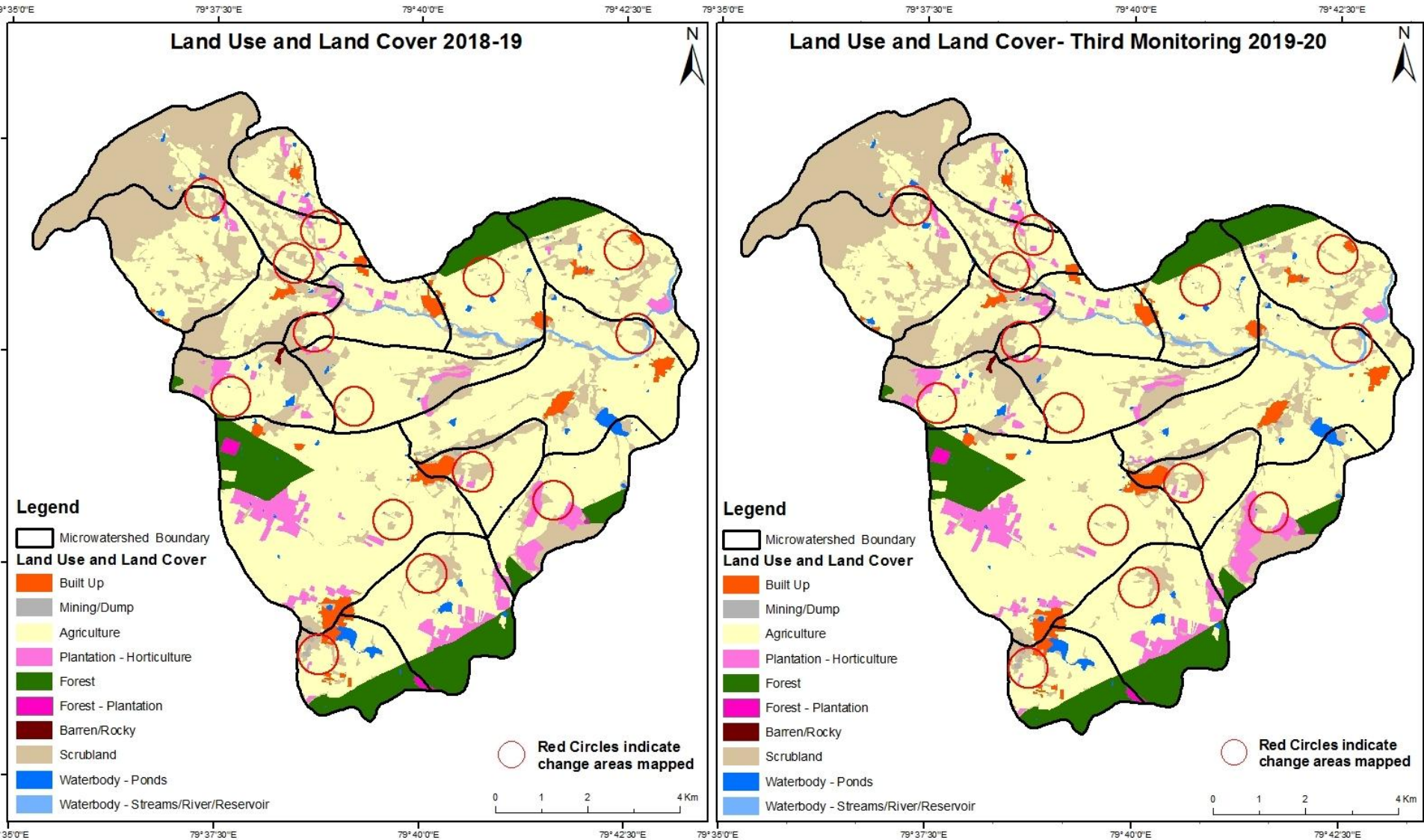
**Fig 8. Remidicherla Watershed (IWMP-01/2013-14), Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)**

**Scale: 1:10000**



**Fig 9. Remidicherla Watershed (IWMP-01/2013-14), Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)**

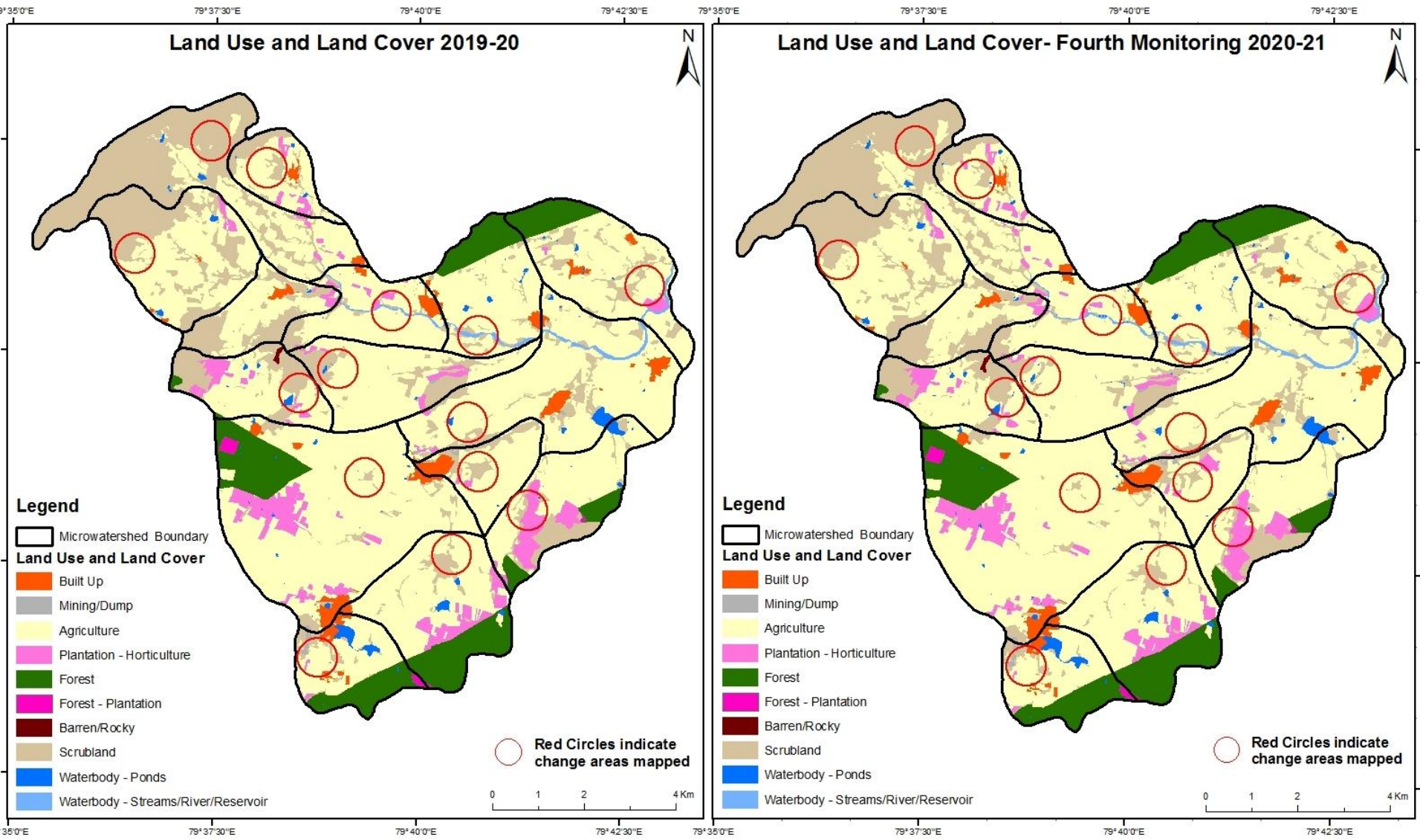
**Scale: 1:10000**





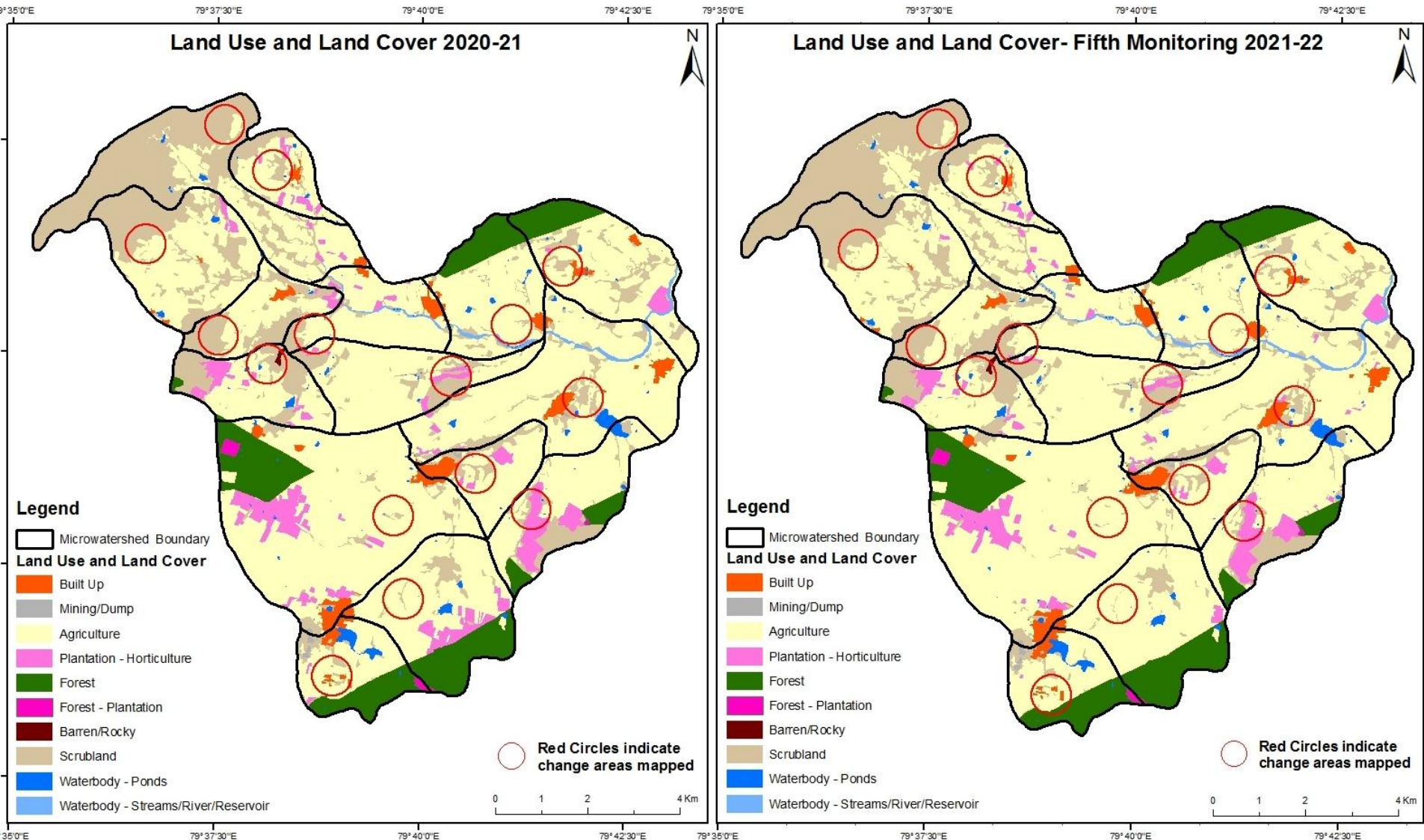
**Fig 10. Remidicherla Watershed (IWMP-01/2013-14), Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)**

Scale: 1:10000



**Fig 11. Remedicherla Watershed (IWMP-01/2013-14), Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)**

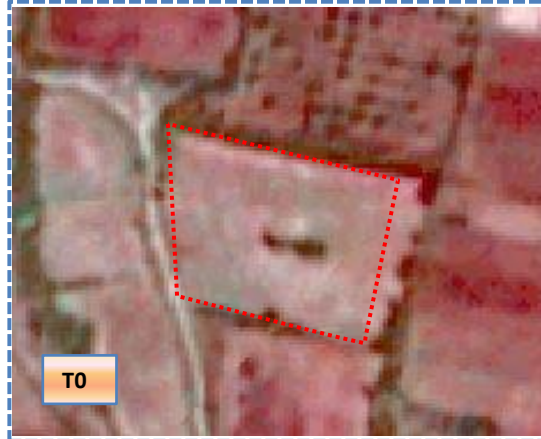
Scale: 1:10000



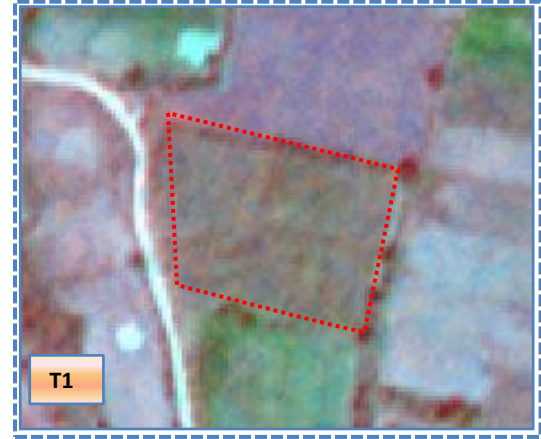


**Fig 12. Remidicherla Watershed (IWMP-01/2013-14), Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Plantation

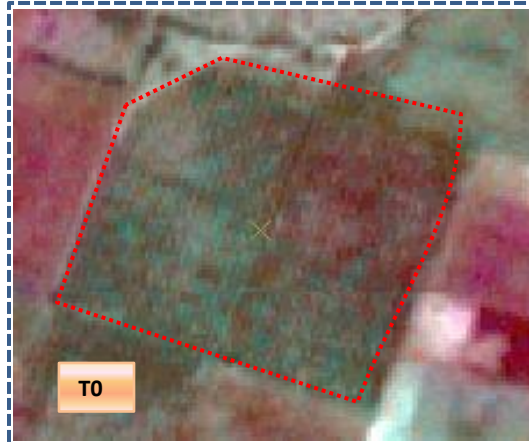


T0: 2013-14 (79°38'46.338"E 16°21'19.387"N)

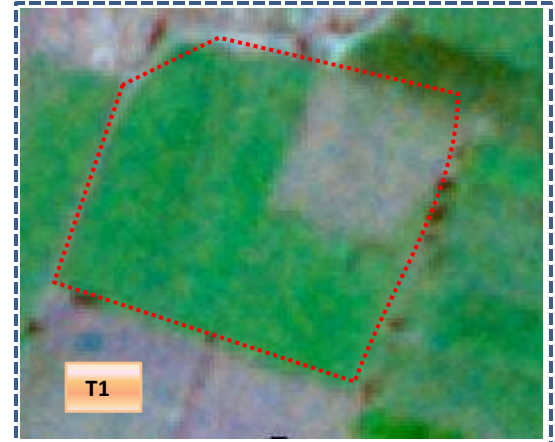


T1: 22 January 2017

Plantation to Agriculture



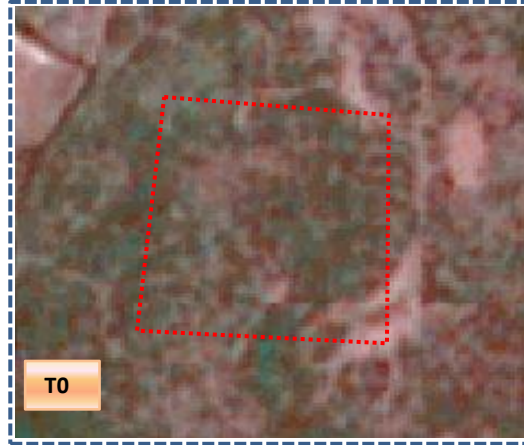
T0: 2013-14 (79°42'34.706"E 16°19'28.803"N)



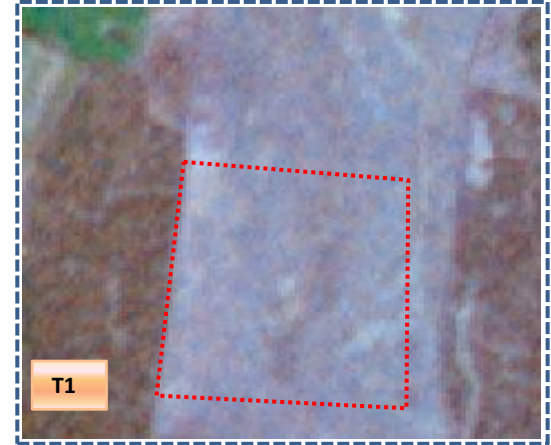
T1: 22 January 2017

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

Scrub to Agriculture

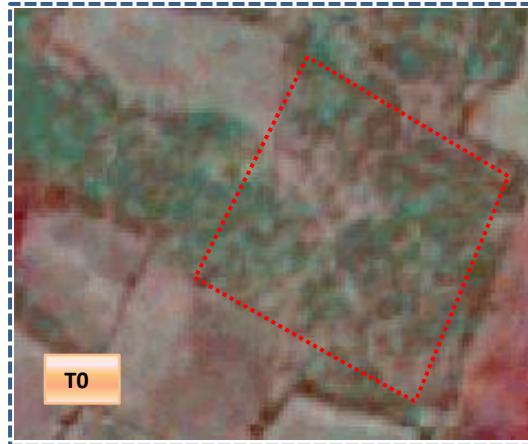


T0: 2013-14 (79°37'33.486"E 16°21'21.377"N)



T1: 22 January 2017

Scrub to Agriculture



T0: 2013-14 (79°36'29.651"E 16°20'55.304"N)



T1: 22 January 2017

**Table 4. showing change matrix depicting Land cover transitions for Remidicherla Watershed (IWMP-01/2013-14) 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	
<b>Built up</b>	203.99										<b>203.99</b>	
<b>Mining/dump</b>		7.74									<b>7.74</b>	
<b>Agriculture</b>	3.7		5792.75	212.83		18.68		238.22		10.29	<b>6276.47</b>	
<b>Plantation Horticulture</b>	0.06		79.3	126.62				1.46		0.59	<b>208.03</b>	
<b>Forest</b>			9.77		790.17	1.39				0.6	<b>801.93</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							3.78				<b>3.78</b>	
<b>Scrub</b>	2.53	1.45	331.9	71.25				2023.07		3.57	<b>2433.77</b>	
<b>Waterbody-Streams/River</b>			0.12						56.56		<b>56.68</b>	
<b>Waterbody – Ponds</b>										64.8	<b>64.8</b>	
<b>Grand Total</b>	<b>210.28</b>	<b>9.19</b>	<b>6213.84</b>	<b>410.7</b>	<b>790.17</b>	<b>20.07</b>	<b>3.78</b>	<b>2262.75</b>	<b>56.56</b>	<b>79.85</b>	<b>10057.19</b>	

**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 483 ha of the agriculture area has decreased and it is converted into Built-up (3.7 ha), plantation/horticulture (212 ha), forest plantation (18 ha), scrub (238 ha) and water body (10 ha) in T1.
3. In T1 421 ha of the agriculture area has increased from plantations/horticulture (79 ha), forest (9.7 ha) and scrubland (331 ha) of T0.

**Table 5. showing change matrix depicting Land cover transitions for Remidicherla Watershed (IWMP-01/2013-14) 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	210.28										210.28
Mining/dump		9.19									9.19
Agriculture	0.62		6206.33	4.39				2.37		0.13	6213.84
Plantation Horticulture			4.73	405.97							410.7
Forest			3.18		786.99						790.17
Forest Plantation						20.07					20.07
Barren Rocky							3.78				3.78
Scrub	1.07	2.88	170.32					2084.99		3.49	2262.75
Waterbody- Streams/River			0.6						55.96		56.56
Waterbody – Ponds			0.55							79.3	79.85
<b>Grand Total</b>	<b>211.97</b>	<b>12.07</b>	<b>6385.71</b>	<b>410.36</b>	<b>786.99</b>	<b>20.07</b>	<b>3.78</b>	<b>2087.36</b>	<b>55.96</b>	<b>82.92</b>	<b>10057.19</b>

4. In T1 7.5 ha of the agriculture area has decreased and it is converted into Built-up (0.6 ha) , plantations/horticulture (4.3 ha), scrub(2.3 ha) and water body (0.13 ha)in T2.

5. In T2 178.8 ha of the agriculture area has increased from plantations/horticulture (4.7 ha),forest (3 ha) scrubland(170 ha) and water body (0.6 ha) of T1.



**Table 6. showing change matrix depicting Land cover transitions for Remidicherla Watershed (IWMP-01/2013-14) 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		
<b>Built up</b>	211.97												<b>211.97</b>
<b>Mining/dump</b>		12.07											<b>12.07</b>
<b>Agriculture</b>	0.21	0.35	6350.04	35.03							0.08		<b>6385.71</b>
<b>Plantation Horticulture</b>			6.5	403.78							0.08		<b>410.36</b>
<b>Forest</b>					786.99								<b>786.99</b>
<b>Forest Plantation</b>						20.07							<b>20.07</b>
<b>Barren Rocky</b>							3.78						<b>3.78</b>
<b>Scrub</b>	0.33		40.53	9.92				2035.98			0.6		<b>2087.36</b>
<b>Waterbody- Streams/River</b>			0.73						55.23				<b>55.96</b>
<b>Waterbody – Ponds</b>											82.92		<b>82.92</b>
<b>Grand Total</b>	<b>212.51</b>	<b>12.42</b>	<b>6397.8</b>	<b>448.73</b>	<b>786.99</b>	<b>20.07</b>	<b>3.78</b>	<b>2035.98</b>	<b>55.23</b>	<b>83.68</b>			<b>10057.19</b>

6. In T2 35. ha of the agriculture area has decreased and it is converted into Built-up (0.2 ha), plantations/horticulture(35 ha) and water body (0.08 ha) in T3.

7. In T3 47.7 ha of the agriculture area has increased from plantations/horticulture (6.5 ha) , scrubland (40 ha) and water body (0.7 ha) of T2.

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

Land cover	Units in Hectares										
	Monitoring period (T4)										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	212.51										212.51
Mining/dump		12.42									12.42
Agriculture		0.87	6371.61	24.73						0.59	6397.8
Plantation Horticulture			24.64	424.09							448.73
Forest					786.99						786.99
Forest Plantation						20.07					20.07
Barren Rocky							3.78				3.78
Scrub	0.11	0.38	68.01	3.21				1961.3		2.97	2035.98
Waterbody- Streams/River									55.23		55.23
Waterbody – Ponds										83.68	83.68
<b>Grand Total</b>	<b>212.62</b>	<b>13.67</b>	<b>6464.26</b>	<b>452.03</b>	<b>786.99</b>	<b>20.07</b>	<b>3.78</b>	<b>1961.3</b>	<b>55.23</b>	<b>87.24</b>	<b>10057.19</b>

8. In T3 25.3 ha of the agriculture area has decreased and it is converted into built-up (0.8 ha) plantations/horticulture (24.7 ha) and water body (0.5 ha) in T4.

9. In T4 92.6 ha of the agriculture area has increased from plantations/horticulture (24.6 ha) and scrubland (68 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Remidicherla Watershed (IWMP-01/2013-14) 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		
<b>Built up</b>	212.62												<b>212.62</b>
<b>Mining/dump</b>		13.58	0.09										<b>13.67</b>
<b>Agriculture</b>	1.05	1.86	6438.27	22.81						0.27			<b>6464.26</b>
<b>Plantation Horticulture</b>			118.79	333.24									<b>452.03</b>
<b>Forest</b>					786.99								<b>786.99</b>
<b>Forest Plantation</b>						20.07							<b>20.07</b>
<b>Barren Rocky</b>							3.78						<b>3.78</b>
<b>Scrub</b>	1.4	0.18	64.92	7.28				1886.04		1.48			<b>1961.3</b>
<b>Waterbody- Streams/River</b>			0.54						54.69				<b>55.23</b>
<b>Waterbody – Ponds</b>			0.38							86.86			<b>87.24</b>
<b>Grand Total</b>	<b>215.07</b>	<b>15.62</b>	<b>6622.99</b>	<b>363.33</b>	<b>786.99</b>	<b>20.07</b>	<b>3.78</b>	<b>1886.04</b>	<b>54.69</b>	<b>88.61</b>			<b>10057.19</b>

10. In T3 24.1 ha of the agriculture area has decreased and it is converted into built-up (1 ha), mining/dump (1.8 ha) plantations/horticulture (22.8 ha) in T4.

11. In T4 184.2 ha of the agriculture area has increased from plantations/horticulture (118 ha), scrubland (64 ha) and water body (0.9 ha) of T3.

# 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 21 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 442, 226, 74 & 78 Hectares from T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 346 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
5. About **155 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2013-14 (T0) to 2019-20 (T4) years.
6. There is a decrease of 547 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