

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

VISAKHAPATNAM -05/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

February-20202

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



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Andhra Pradesh



RURAL DEVELOPMENT AND  
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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-05/2013-14, Visakhapatnam District of Andhra Pradesh. The total geographical area of the project is **7,636 ha**. It comprises of 16 micro watersheds.
4. In the project area 7 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 0.79 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. 25.7 % is covered by the agriculture, 37 % is covered by forest, 34 % is covered by scrubland and remaining by other land use classes.

# STUDY AREA

## PROJECT : LINGETI - IWMP-05/2013-14

### DISTRICT : VISAKHAPATNAM , STATE : ANDHRA PRADESH

- The study area falls in Pedabayalu and G Madugula Mandals of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is 7,636 ha. It comprises of 18 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.

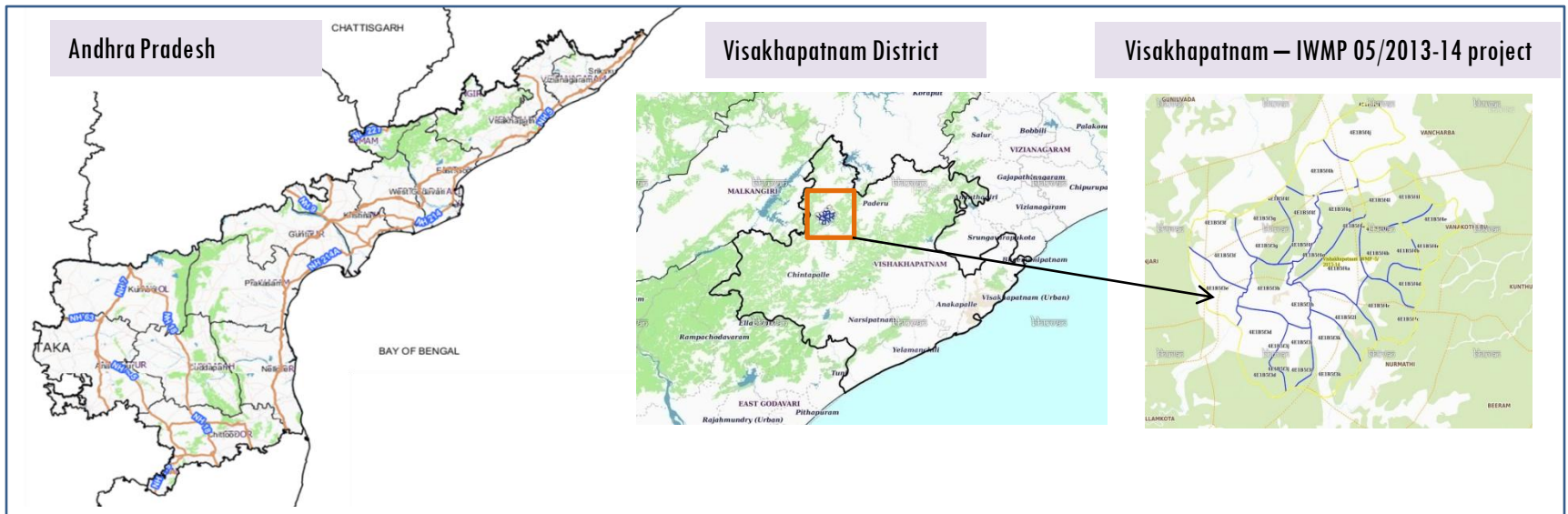


Fig.1. Location map of Lingeti Watershed (IWMP-05/2013-14) in Visakhapatnam, A.P

- 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.

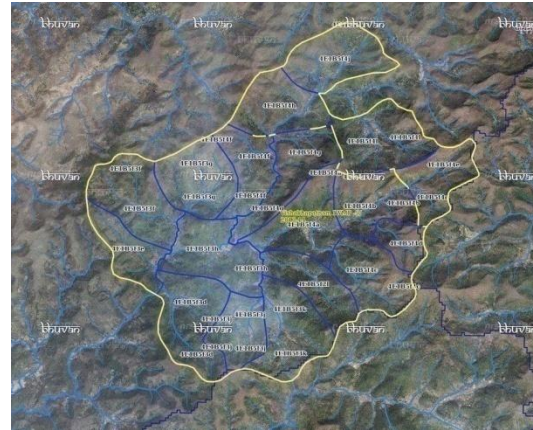
## Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-2	2021-22
LISS IV	2013-14		
SCENE 1			10-Jan-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			10-Jan-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	7
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	7	7
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	0	0
	<b>TOTAL</b>	<b>7</b>	<b>7</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. Location map of Lingeti Watershed (IWMP-05/2013-14) Natural Colour Composite (NCC)**

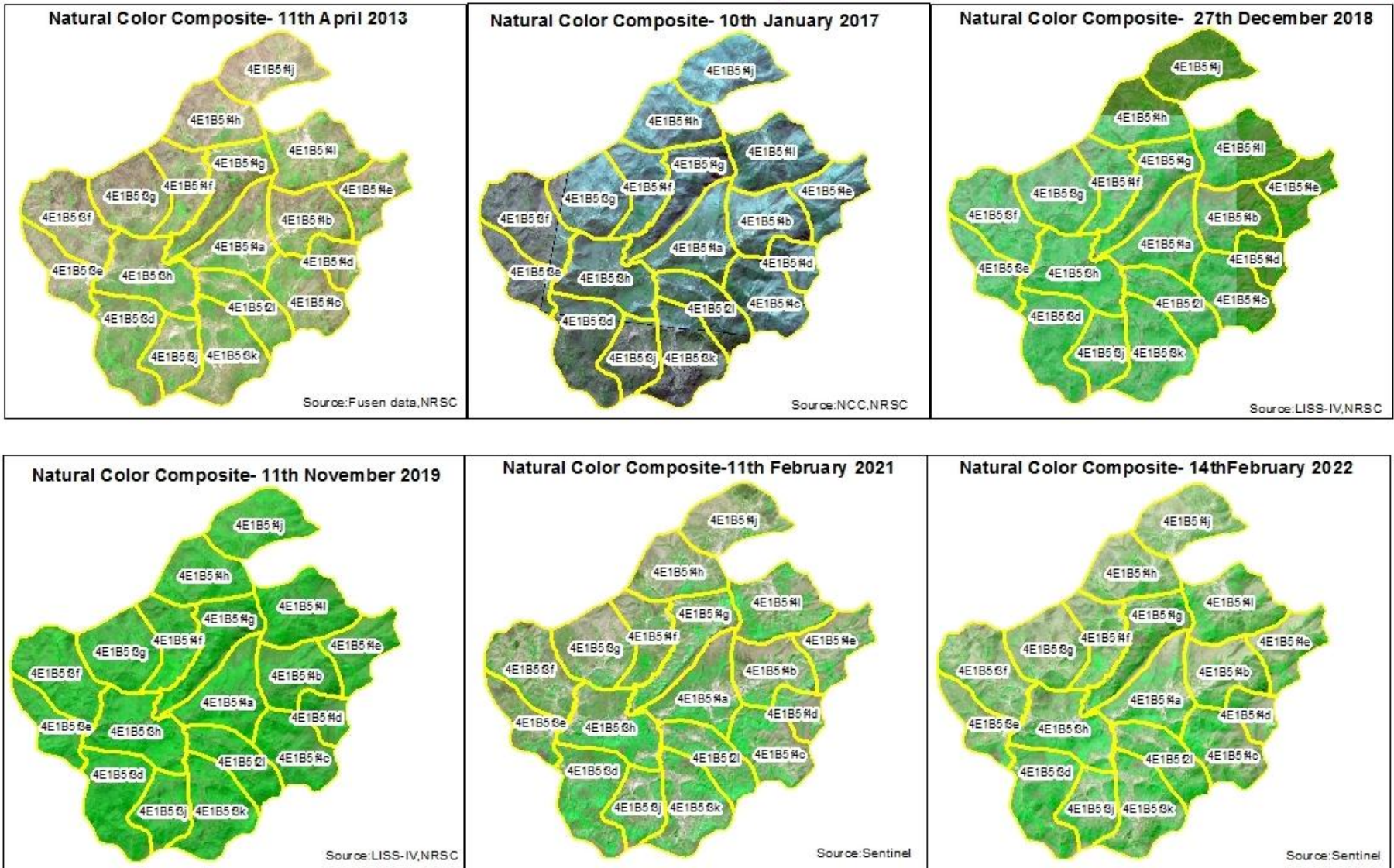
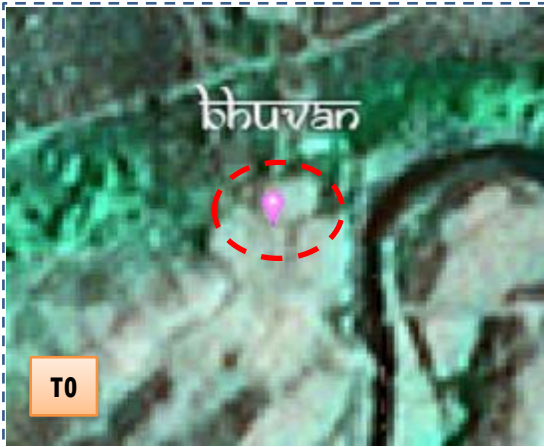




Fig 5. Lingeti Watershed (IWMP-05/2013-14) Monitoring of activities in Visakhapatnam District Andhra Pradesh.



T0

T0:2013-14



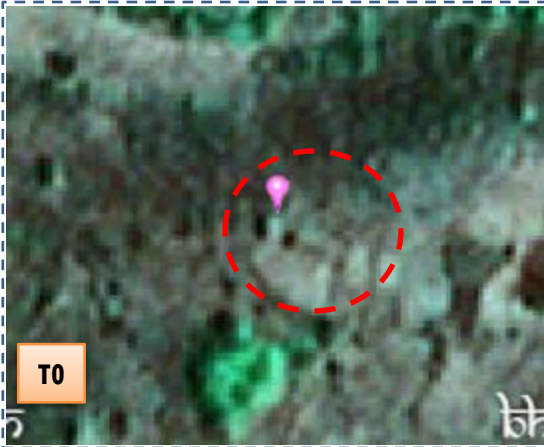
T1

T1: 25 November 2017



Drishti SI no. 1705741 MWS : 4E1B5f4a

Farm pond



T0

T0:2013-14



T1

T1: 25 November 2017

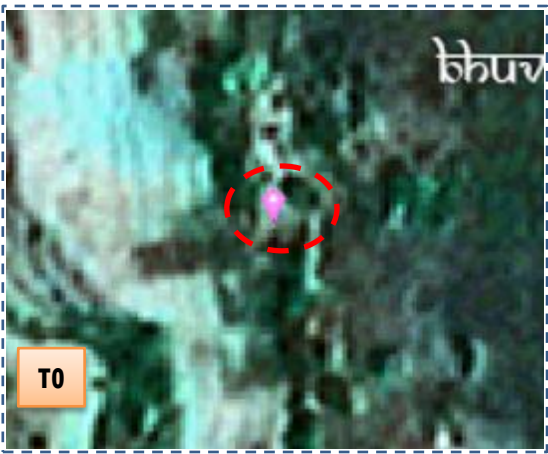


Drishti SI no. 1706003 MWS : 4E1B5f4b

Farm pond



Fig 6. Lingeti Watershed (IWMP-05/2013-14) Monitoring of activities in Visakhapatnam District Andhra Pradesh.



T0

T0: 2013-14



T1

T1: 25 November 2017



Drishti SI no. 1713104 MWS : 4E1B5f4a

Farm pond



T0

T0: 2013-14



T1

T1: 25 November 2017



Drishti SI no. 1713118 MWS : 4E1B5f4c

Farm pond

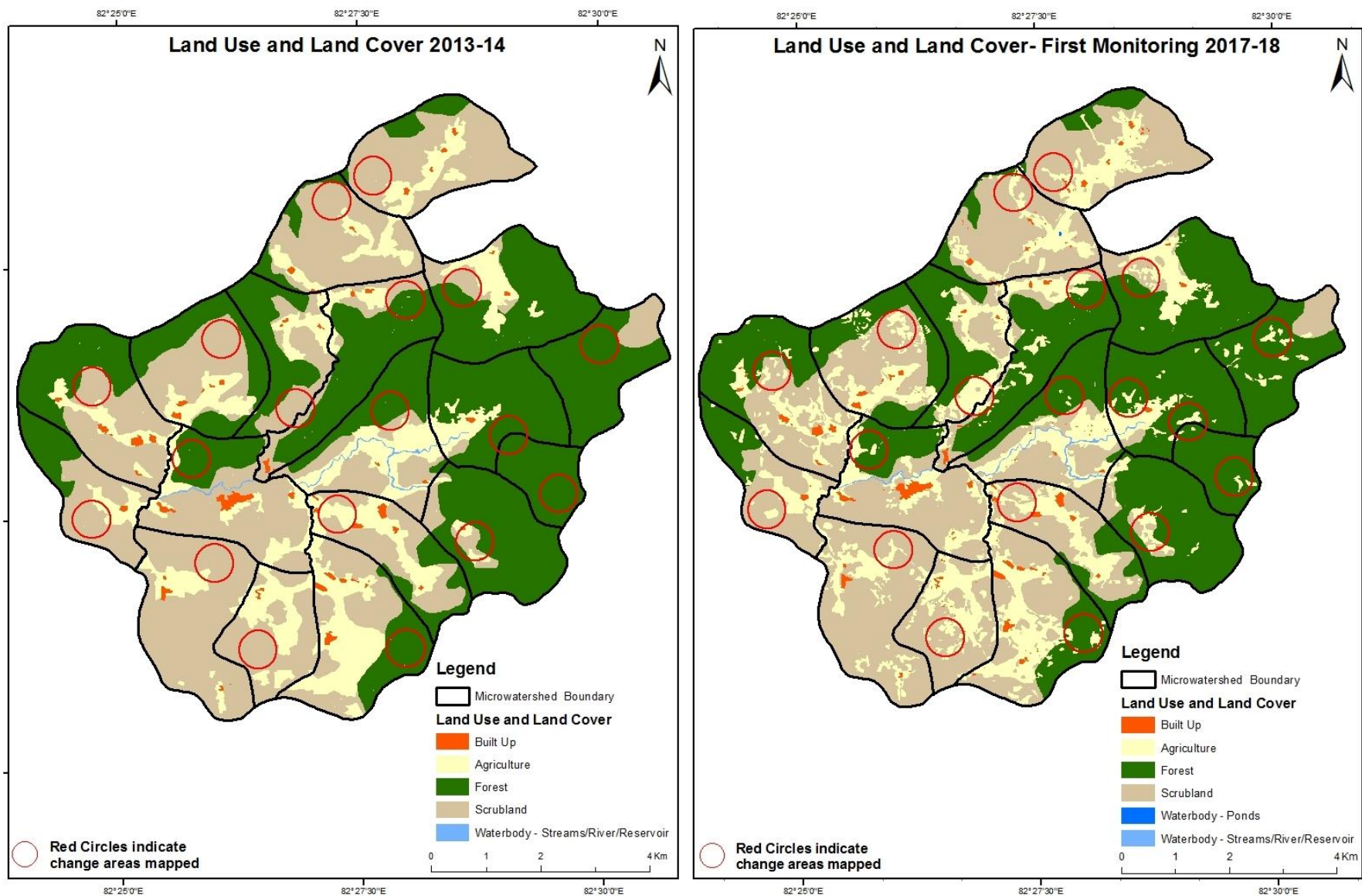
### 03. MONITORING IN THE PROJECT AREA

#### 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. Lingeti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)**

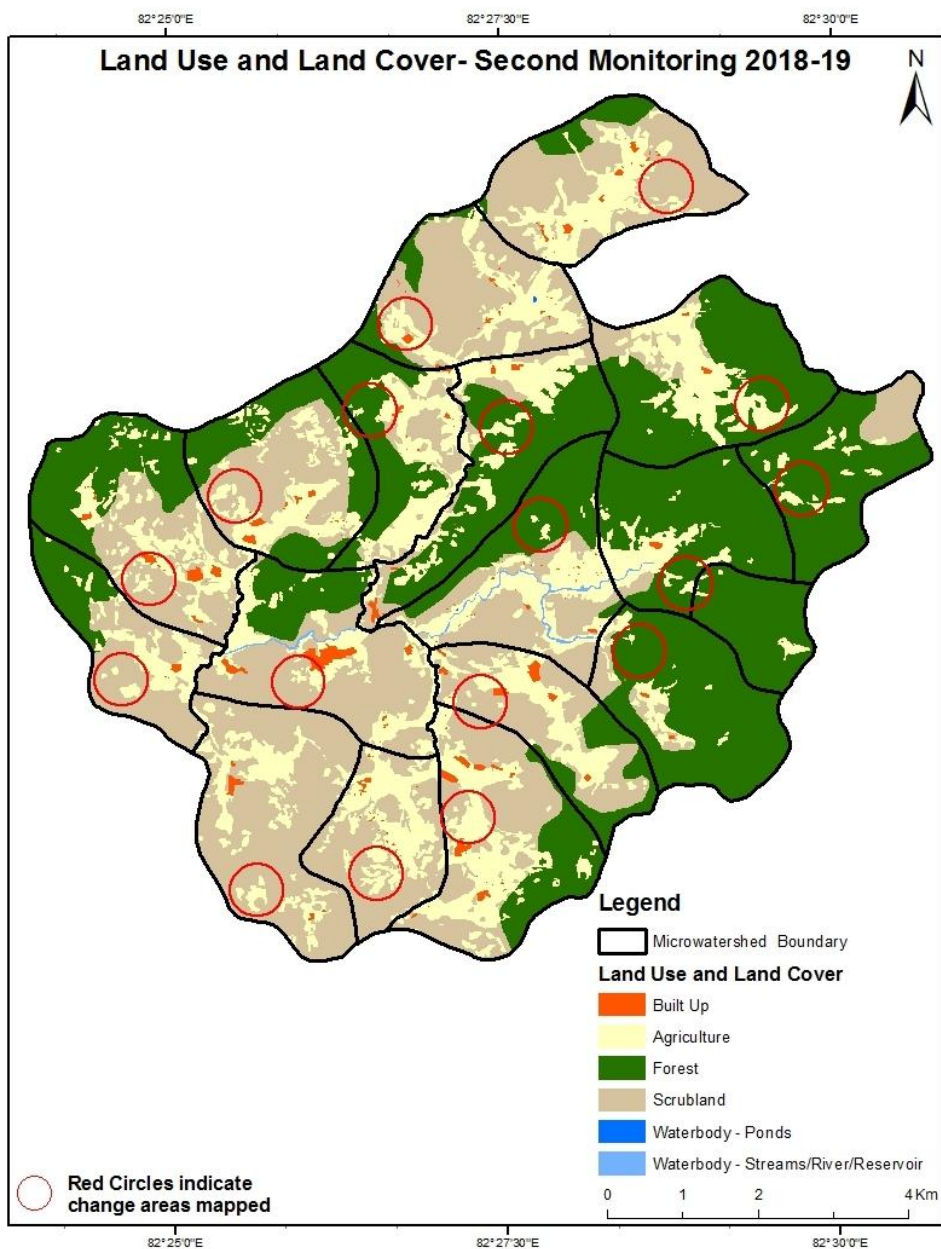
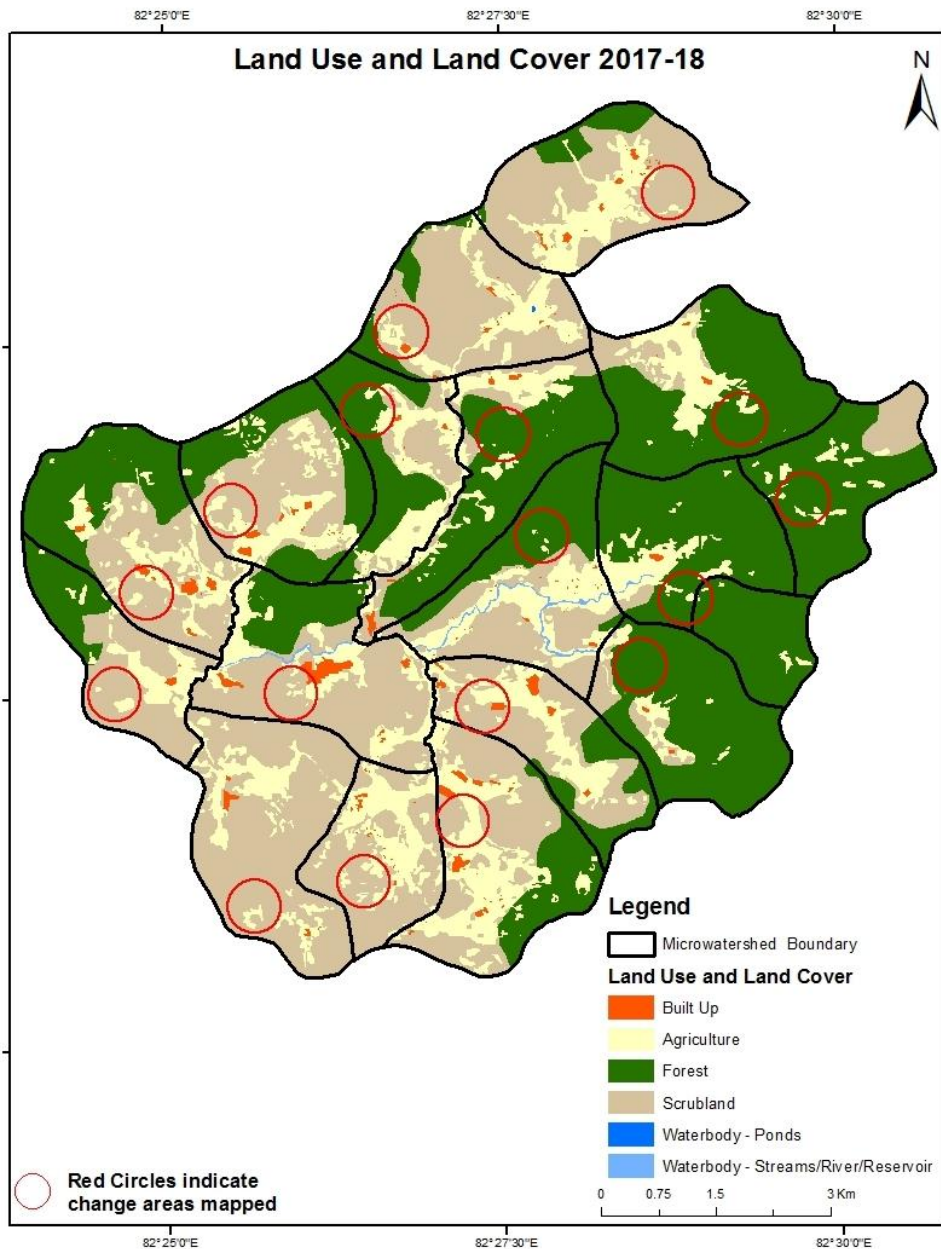
Scale: 1:10000





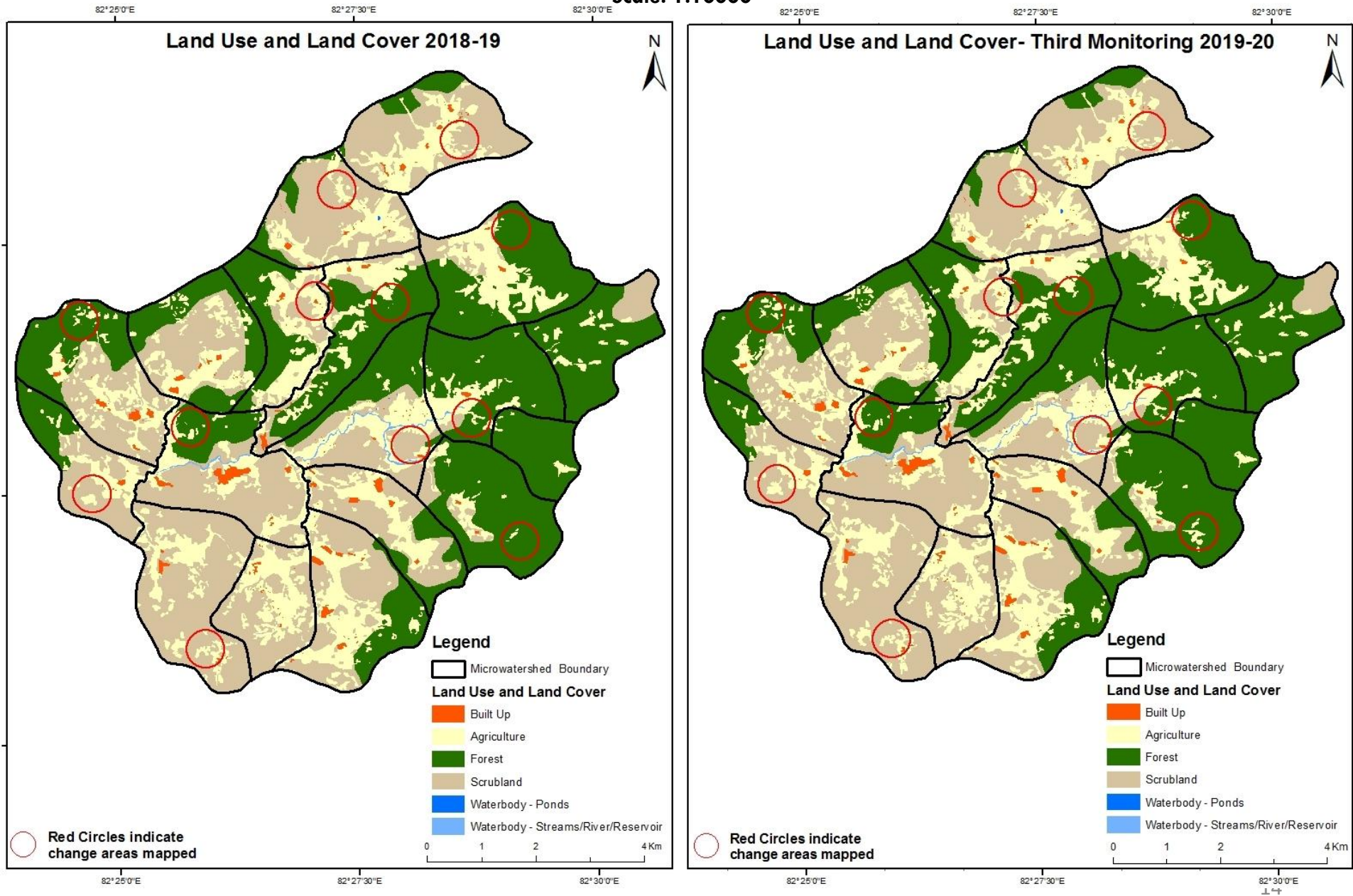
**Fig 8. Lingeti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)**

Scale: 1:10000



**Fig 9. Lingeti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)**

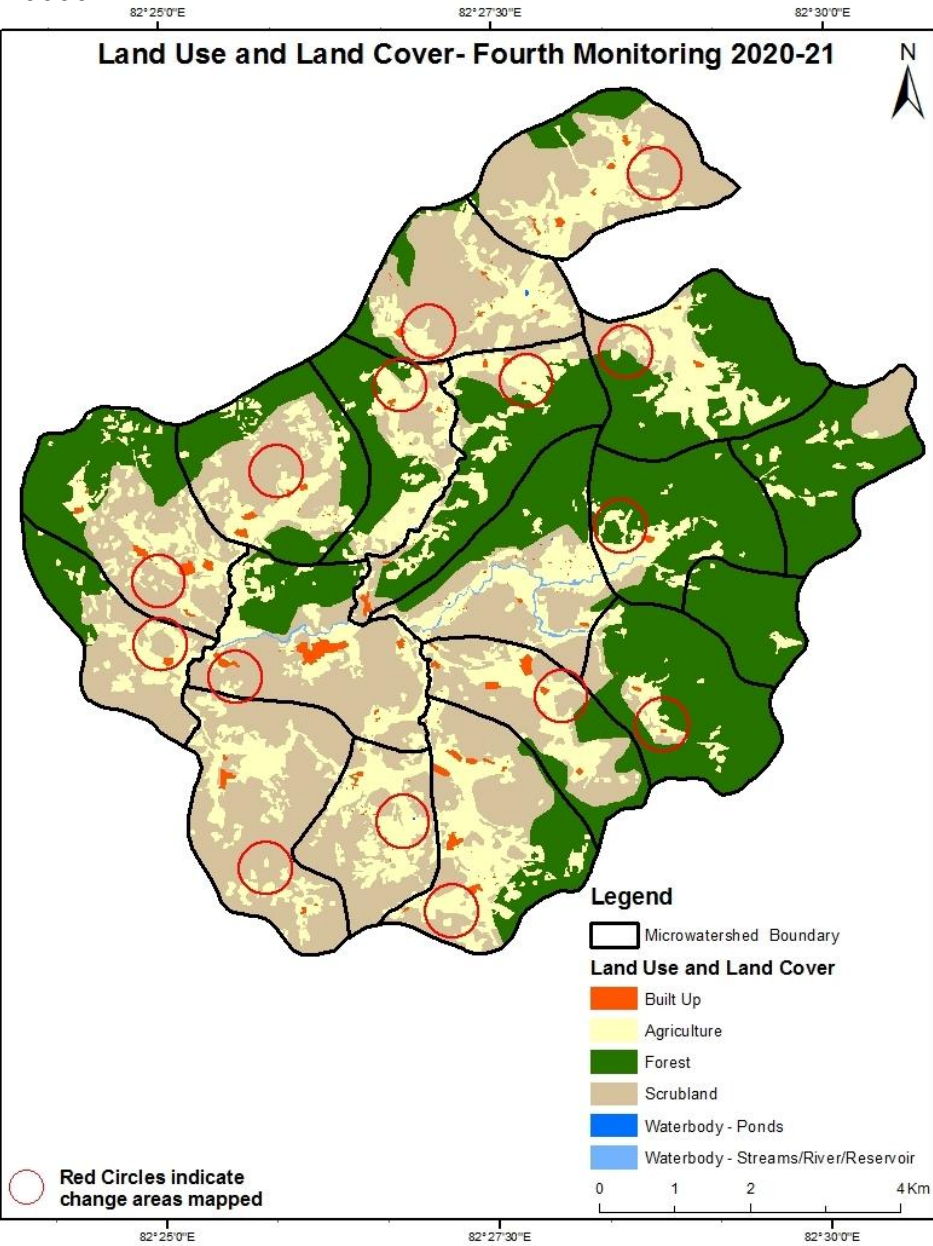
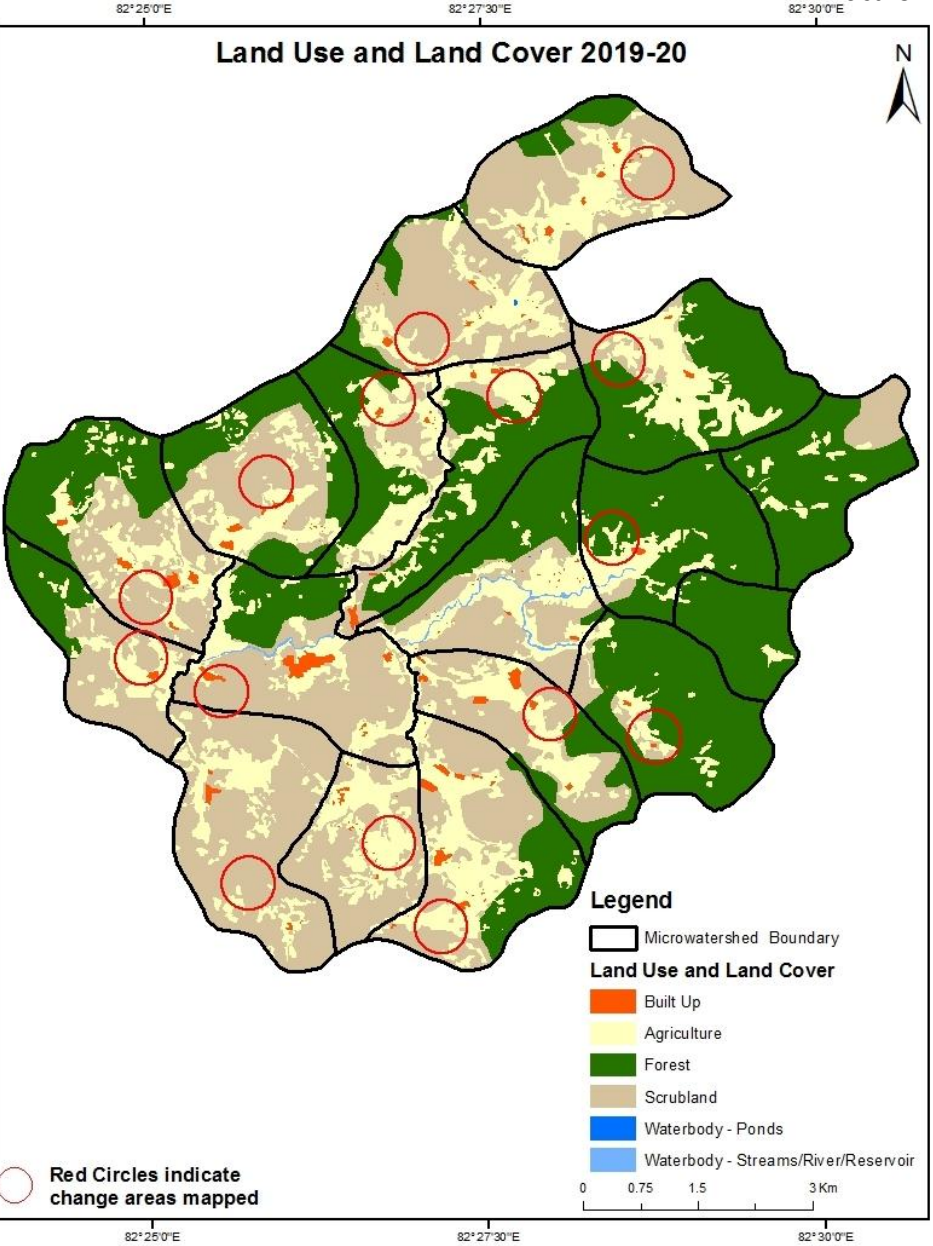
Scale: 1:10000





**Fig 10. Location map of Lingeti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)**

Scale: 1:10000



**Fig 11. Location map of Lingeti Watershed (IWMP-05/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)**

**Scale: 1:10000**

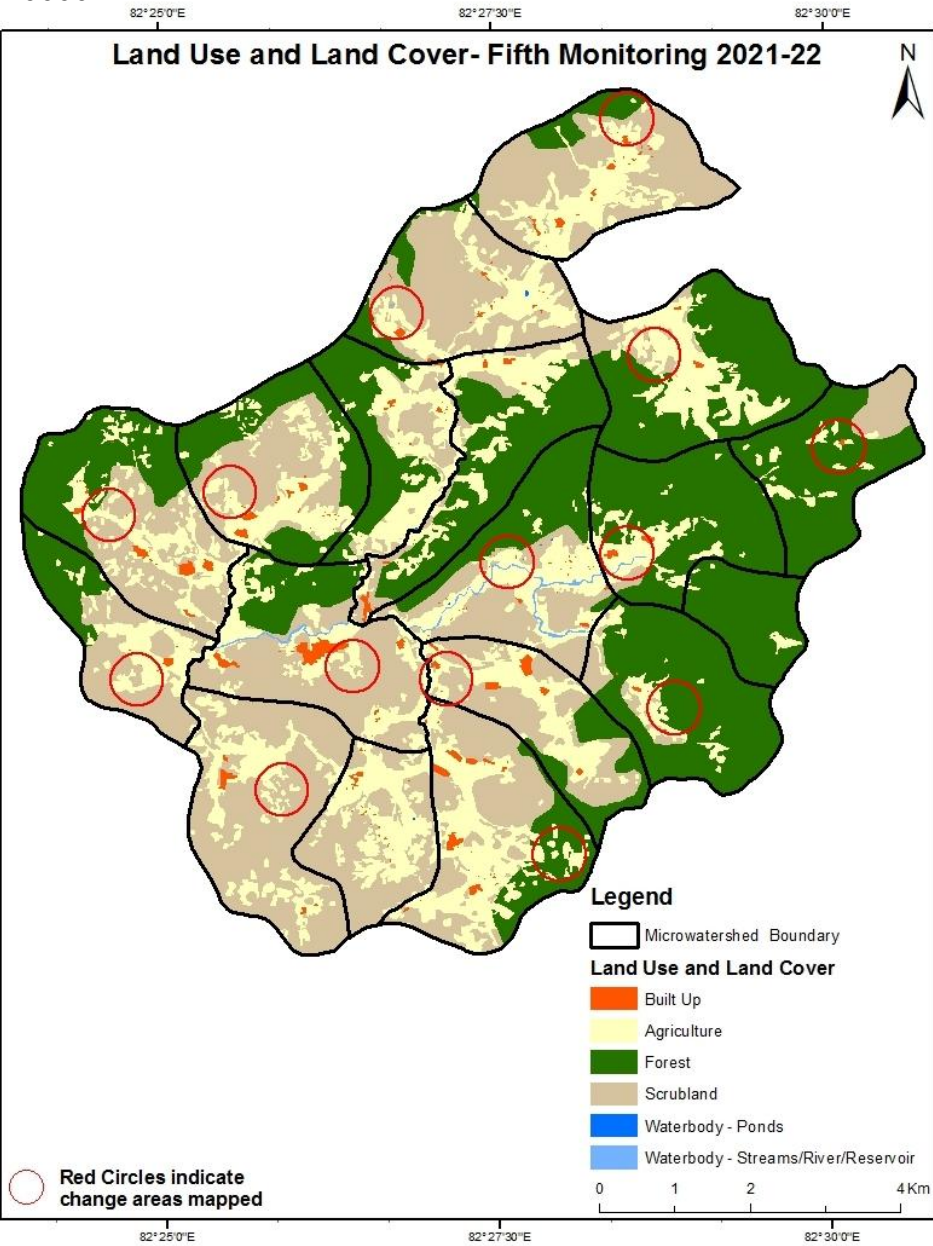
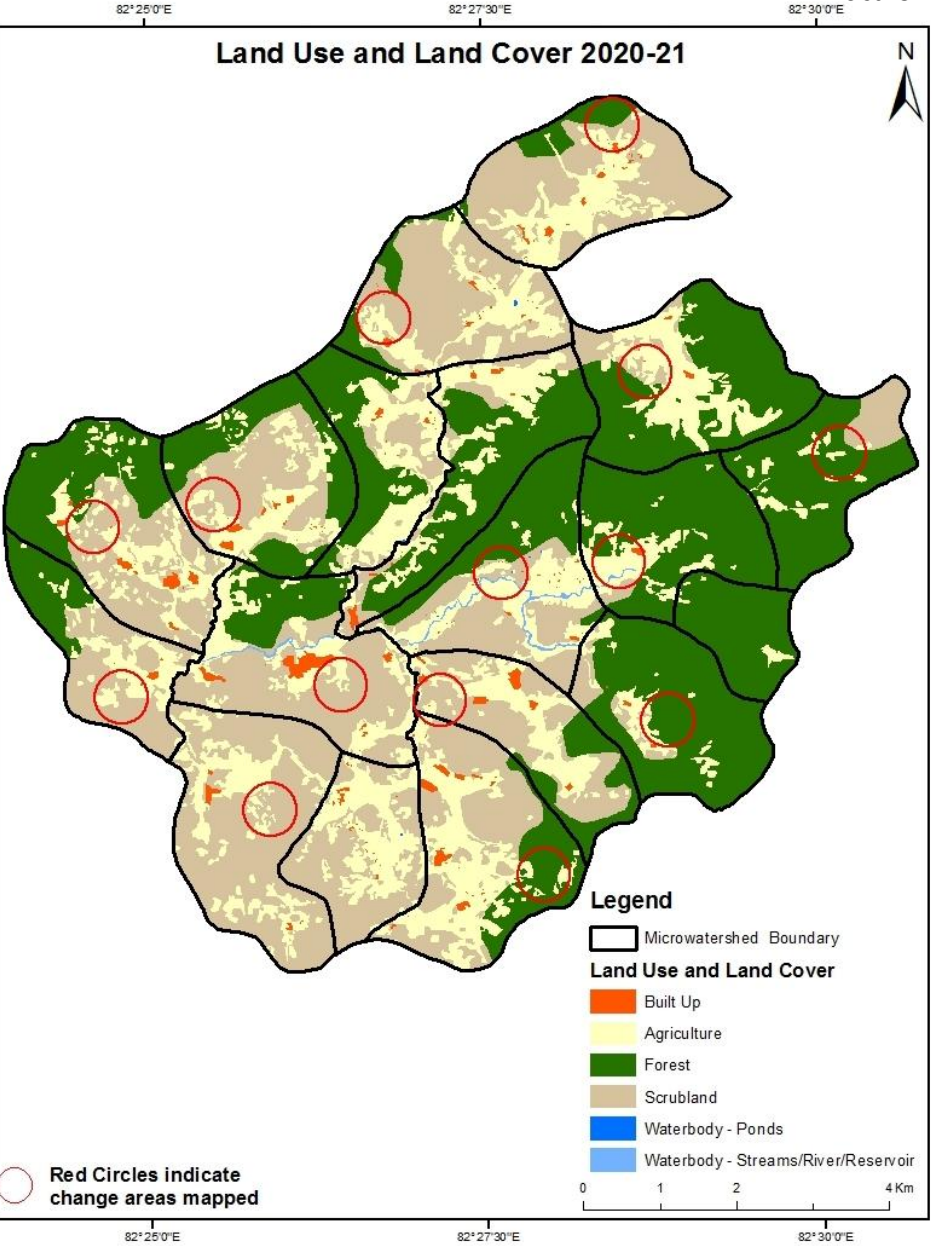
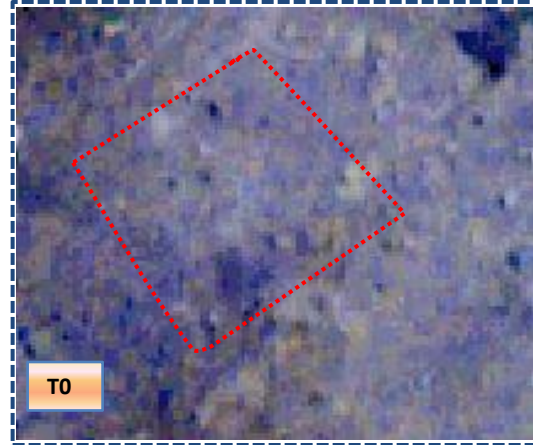


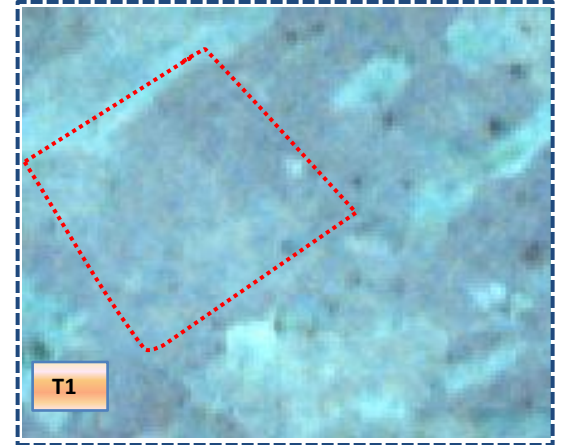


Fig 12. Lingeti Watershed (IWMP-05/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0: 2013-14 (82°26'0.962"E 18°9'25.745"N)

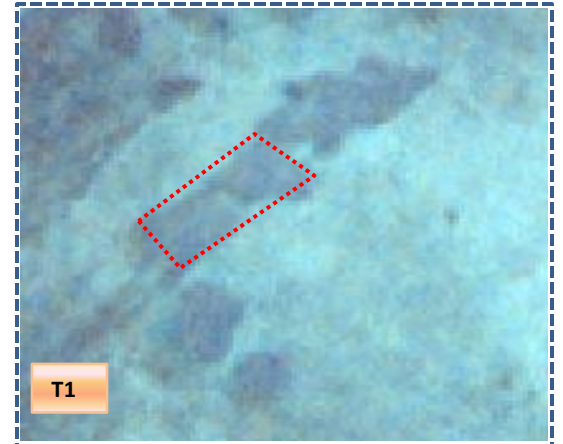


T1: 10 January 2017

Scrub to Agriculture



T0: 2013-14 (82°25'41.52"E 18°9'9.708"N)



T1: 10 January 2017

**Fig 13. Lingeti Watershed (IWMP-05/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates**

Forest to Agriculture

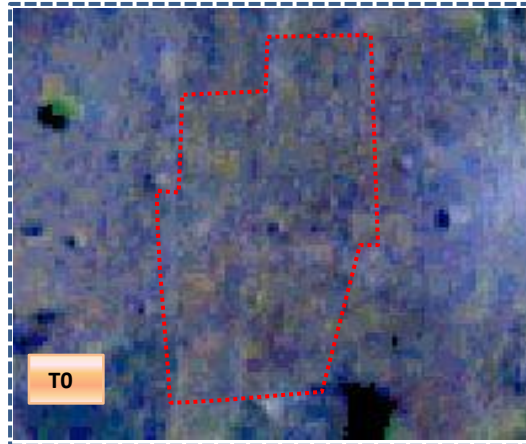


T0: 2013-14 (82°26'25.541"E 18°8'20.607"N)

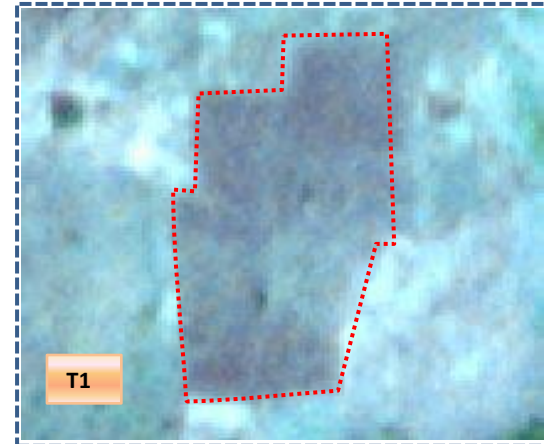


T1: 10 January 2017

Forest to Agriculture



T0: 2013-14 (82°29'36.443"E 18°9'5.903"N)



T1: 10 January 2017

**Table 4. showing change matrix depicting Land cover transitions for Lingeti Watershed (IWMP-05/2013-14) 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>	68.13										<b>68.13</b>	
<b>Mining/dump</b>												
<b>Agriculture</b>	9.3		1006.9					207.82		0.31	<b>1224.33</b>	
<b>Plantation Horticulture</b>												
<b>Forest</b>	0.59		124.25		3067.19					0.03	<b>3192.06</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>												
<b>Scrub</b>	2.58		389.68					2731.31			<b>3123.57</b>	
<b>Waterbody- Streams/River</b>												
<b>Waterbody – Ponds</b>									28.45		<b>28.45</b>	
<b>Grand Total</b>	<b>80.6</b>		<b>1520.83</b>		<b>3067.19</b>			<b>2939.13</b>	<b>28.45</b>	<b>0.34</b>	<b>7636.54</b>	

**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 9.6 ha of the agriculture area has decreased and it is converted into Built-up (9.3 ha), scrub (207 ha) and water body (0.3 ha) in T1.
3. In T1 513 ha of the agriculture area has increased from forest (124 ha) and scrubland (389 ha) of T0.

**Table 5. showing change matrix depicting Land cover transitions for Lingeti Watershed (IWMP-05/2013-14) 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	
<b>Built up</b>	80.6										<b>80.6</b>	
<b>Mining/dump</b>												
<b>Agriculture</b>	1.12		1519.64							0.07	<b>1520.83</b>	
<b>Plantation Horticulture</b>												
<b>Forest</b>			121.26		2945.93						<b>3067.19</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>												
<b>Scrub</b>	0.24		149.76					2788.98		0.15	<b>2939.13</b>	
<b>Waterbody- Streams/River</b>									28.45		<b>28.45</b>	
<b>Waterbody – Ponds</b>										0.34	<b>0.34</b>	
<b>Grand Total</b>	<b>81.96</b>		<b>1790.66</b>		<b>2945.93</b>			<b>2788.98</b>	<b>28.45</b>	<b>0.56</b>	<b>7636.54</b>	

- In T1 1.1 ha of the agriculture area has decreased and it is converted into Built-up (1.1 ha) and water body (0.07 ha) in T2.
- In T2 271 ha of the agriculture area has increased from forest (121 ha) and scrubland (149 ha) of T1.



**Table 6. showing change matrix depicting Land cover transitions for Lingeti Watershed (IWMP-05/2013-14) 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	81.96												81.96
Mining/dump													
Agriculture	0.12		1790.54										1790.66
Plantation Horticulture													
Forest			16.5		2929.43								2945.93
Forest Plantation													
Barren Rocky													
Scrub			14.17					2774.81					2788.98
Waterbody- Streams/River									28.45				28.45
Waterbody – Ponds											0.56		0.56
<b>Grand Total</b>	<b>82.08</b>		<b>1821.21</b>		<b>2929.43</b>			<b>2774.81</b>	<b>28.45</b>		<b>0.56</b>		<b>7636.54</b>

- In T2 0.12 ha of the agriculture area has decreased and it is converted into Built-up (0.12 ha) in T3.
- In T3 30.6 ha of the agriculture area has increased from forest (16.5 ha) and scrubland (14 ha) of T2.

**Table 7. showing change matrix depicting Land cover transitions for Lingeti Watershed (IWMP-05/2013-14) 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		
<b>Built up</b>	82.08												<b>82.08</b>
<b>Mining/dump</b>													
<b>Agriculture</b>	0.36		1820.62							0.23			<b>1821.21</b>
<b>Plantation Horticulture</b>													
<b>Forest</b>			26.71		2902.72								<b>2929.43</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>													
<b>Scrub</b>			70.13					2704.68					<b>2774.81</b>
<b>Waterbody- Streams/River</b>									28.45				<b>28.45</b>
<b>Waterbody – Ponds</b>											0.56		<b>0.56</b>
<b>Grand Total</b>	<b>82.44</b>		<b>1917.46</b>		<b>2902.72</b>			<b>2704.68</b>	<b>28.45</b>		<b>0.79</b>		<b>7636.54</b>

- In T3 0.5 ha of the agriculture area has decreased and it is converted into built-up (0.36 ha) and water body (0.23 ha) in T4.
- In T4 96 ha of the agriculture area has increased from forest (26.7 ha) and scrubland (70 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Lingeti Watershed (IWMP-05/2013-14) during study period-2020-21 to 2021-22**

Land cover	Monitoring period (T5)										
	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>	82.44										<b>82.44</b>
<b>Mining/dump</b>											
<b>Agriculture</b>	2.76	0.64	1914.06								<b>1917.46</b>
<b>Plantation Horticulture</b>											
<b>Forest</b>	0.11		11.49		2891.12						<b>2902.72</b>
<b>Forest Plantation</b>											
<b>Barren Rocky</b>											
<b>Scrub</b>	0.84		38.21					2665.63			<b>2704.68</b>
<b>Waterbody- Streams/River</b>									28.45		<b>28.45</b>
<b>Waterbody – Ponds</b>										0.79	<b>0.79</b>
<b>Grand Total</b>	<b>86.15</b>	<b>0.64</b>	<b>1963.76</b>		<b>2891.12</b>			<b>2665.63</b>	<b>28.45</b>	<b>0.79</b>	<b>7636.54</b>

- In T4 3.4 ha of the agriculture area has decreased and it is converted into built-up (2.7 ha), mining/dump (0.6 ha) in T5.
- In T5 49.7 ha of the agriculture area has increased from forest (11 ha) and scrubland (38 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 0.79 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 296, 269, 30, 96 & 46 Hectares from T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 739 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 457 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