

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION SUMMARY REPORT

IWMP-Batch-V

VISAKHAPATNAM -14/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-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-14/2013-14, Visakhapatnam District of Andhra Pradesh. The total geographical area of the project is 5036.8 ha. It comprises of 14 micro watersheds.
4. In the project area Drishti photos were not uploaded.
5. Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 1.64 ha increase in the area.
6. Major percentage i.e. 40 % is covered by the agriculture, 37 % is covered by scrubland, 20 % is covered by forest and remaining by other land use classes.

STUDY AREA

PROJECT : GUMMAKOTA WATERSHED - IWMP-14/2013-14

DISTRICT : VISAKHAPATNAM , STATE : ANDHRA PRADESH

- The study area falls in Ananthagiri Mandal of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is 5036.8 ha. It comprises of 14 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.

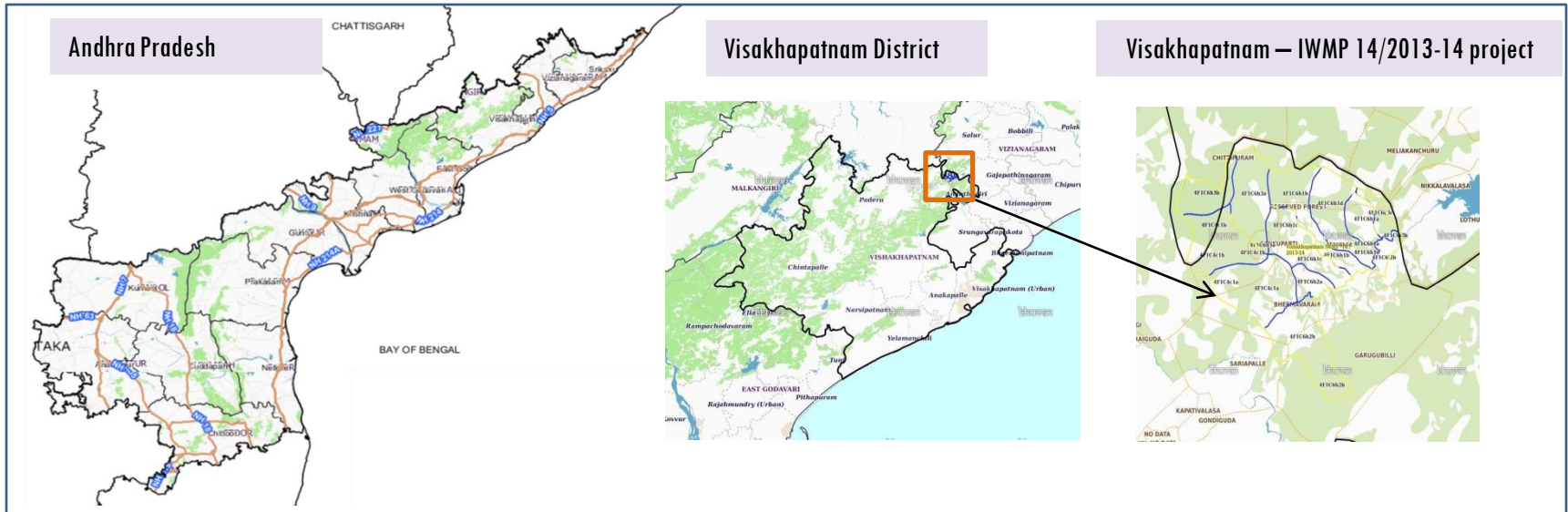


Fig.1. Location map of Gummakota Watershed (IWMP-14/2013-14) in Visakhapatnam District, A.P

- 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			28-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			28-Mar-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	0
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)



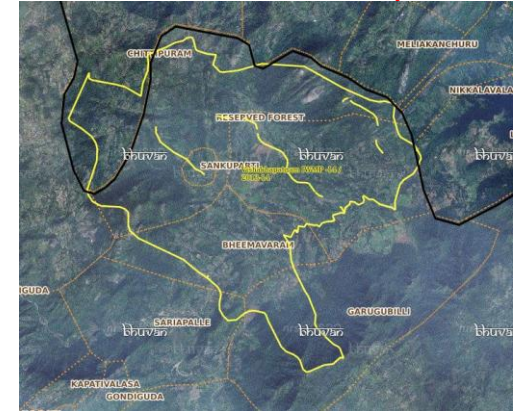
MWS Boundary



Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points

Drishti Point not uploaded



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	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	0	0
	TOTAL	0	0

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. Gummakota Watershed (IWMP-14/2013-14) Natural Colour Composite (NCC)-2013-14 to 2021-22

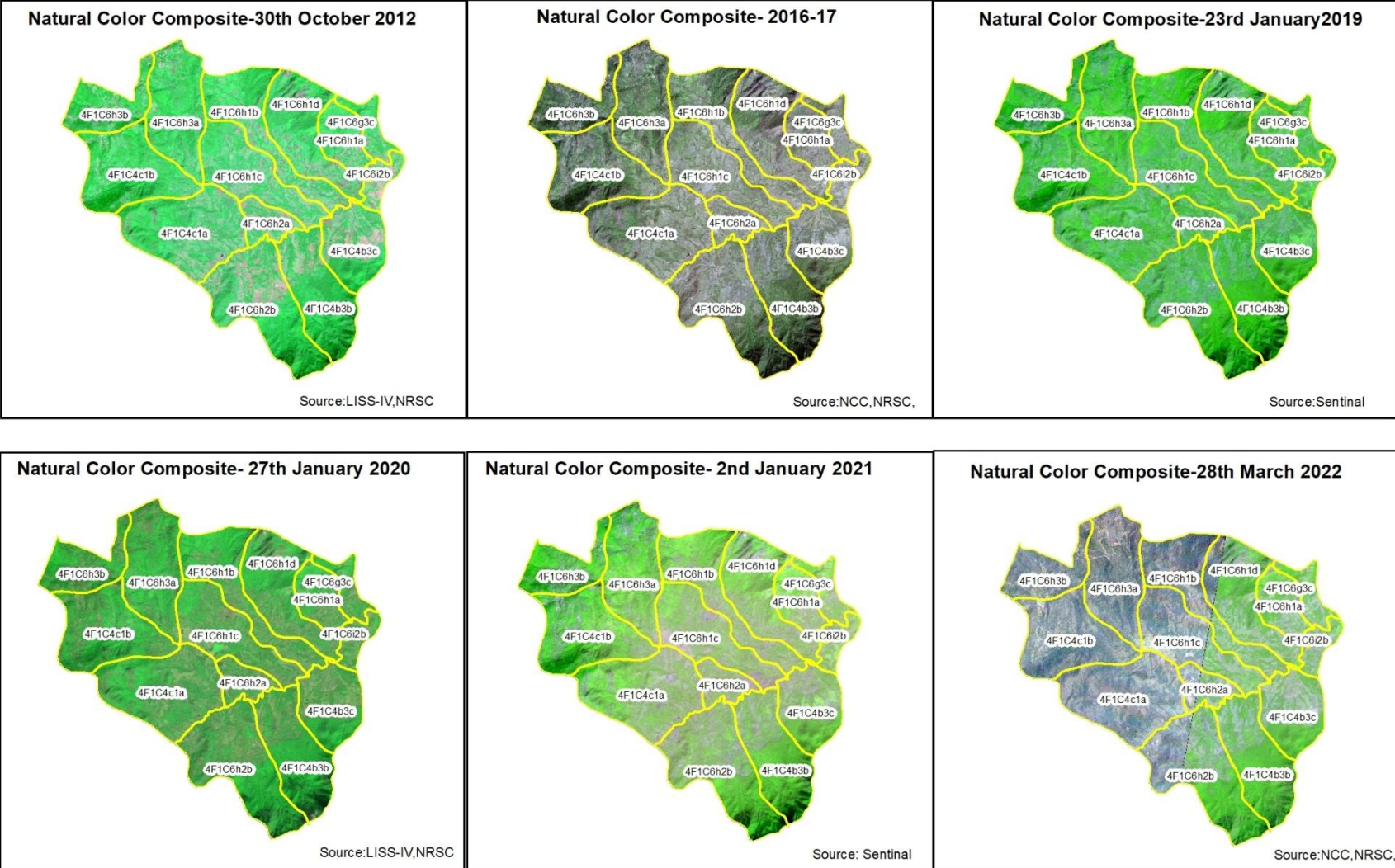








Fig 5. Gummakota Watershed (IWMP-14/2013-14) Drishti points were not uploaded in Bhuvan

		
<input type="text" value="T0:"/>	<input type="text" value="T1:"/>	<input type="text" value="Drishti Sl no MWS :"/>
		
		
<input type="text" value="T0:"/>	<input type="text" value="T1:"/>	<input type="text" value="Drishti Sl no. MWS :"/>
		

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 6. Gummakota Watershed (IWMP-14/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

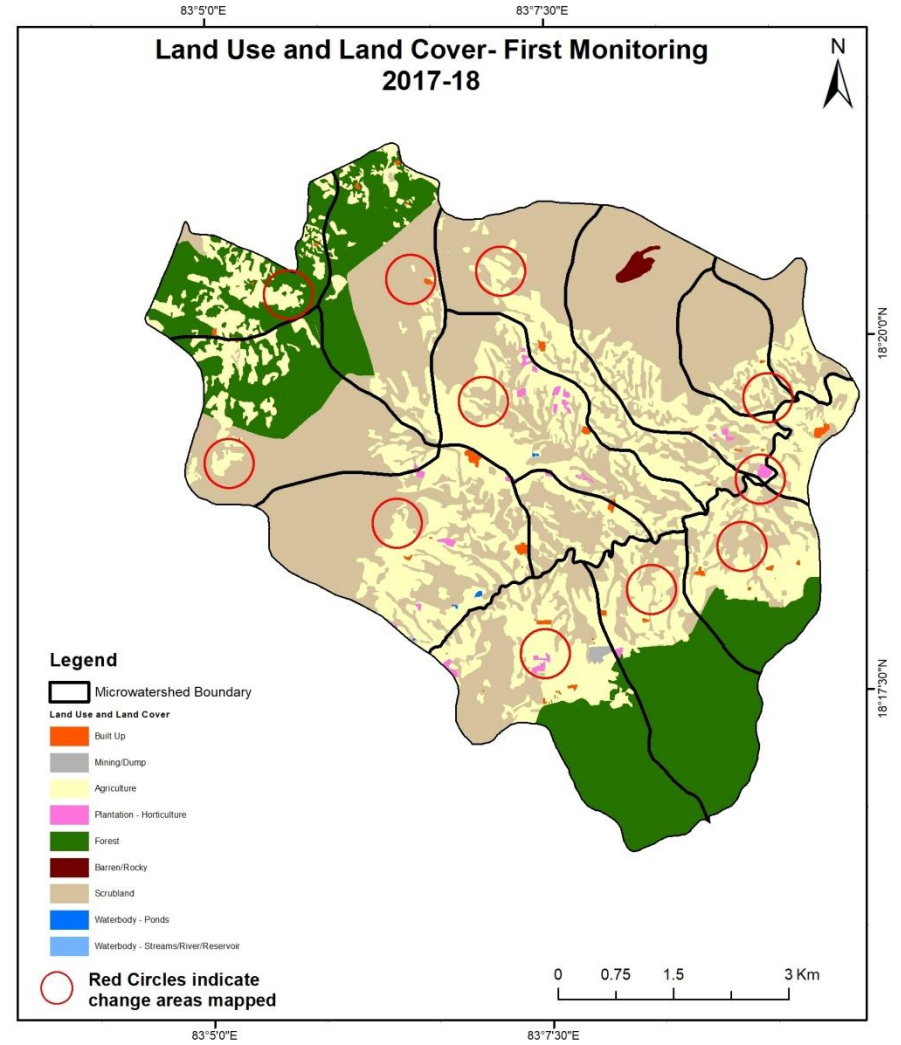
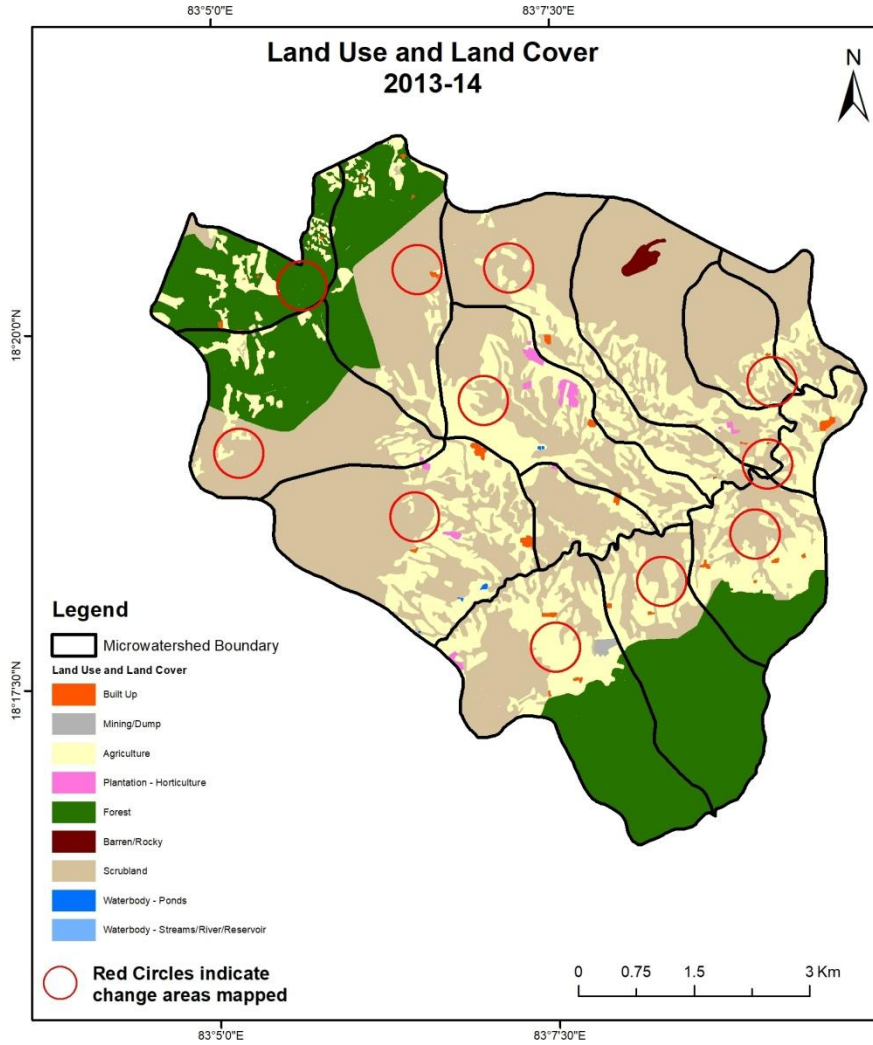


Fig 7. Gummakota Watershed (IWMP-14/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

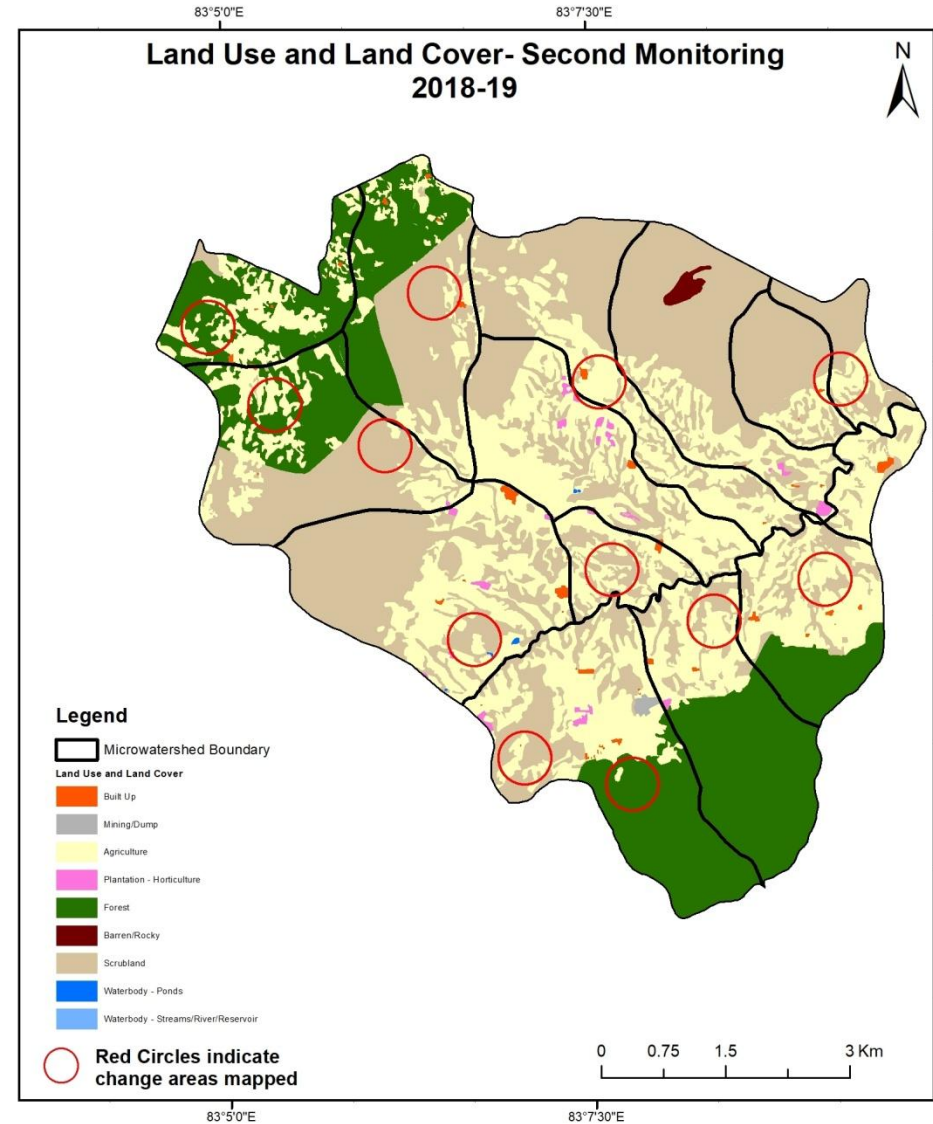
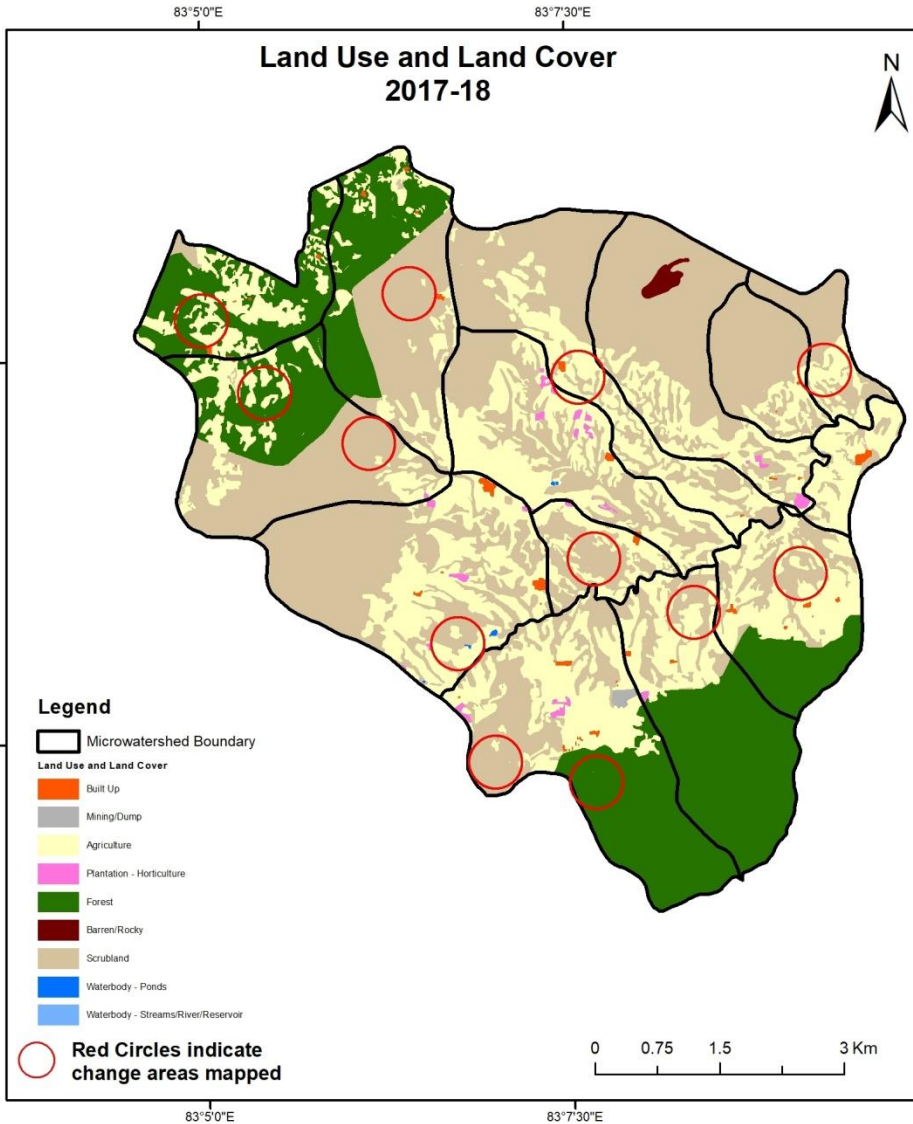


Fig 8. Gummakota Watershed (IWMP-14/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

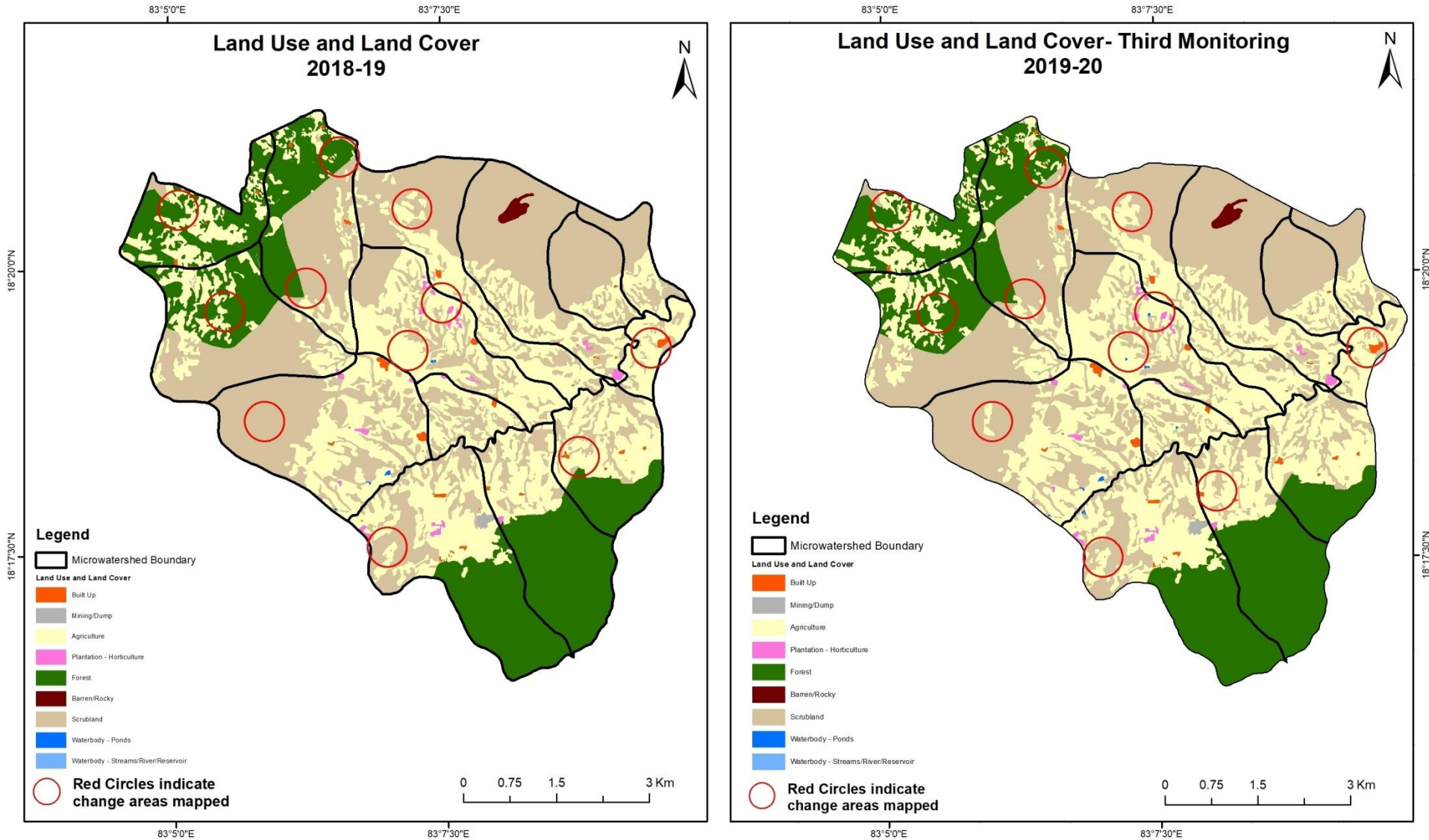


Fig 9. Gummakota Watershed (IWMP-14/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

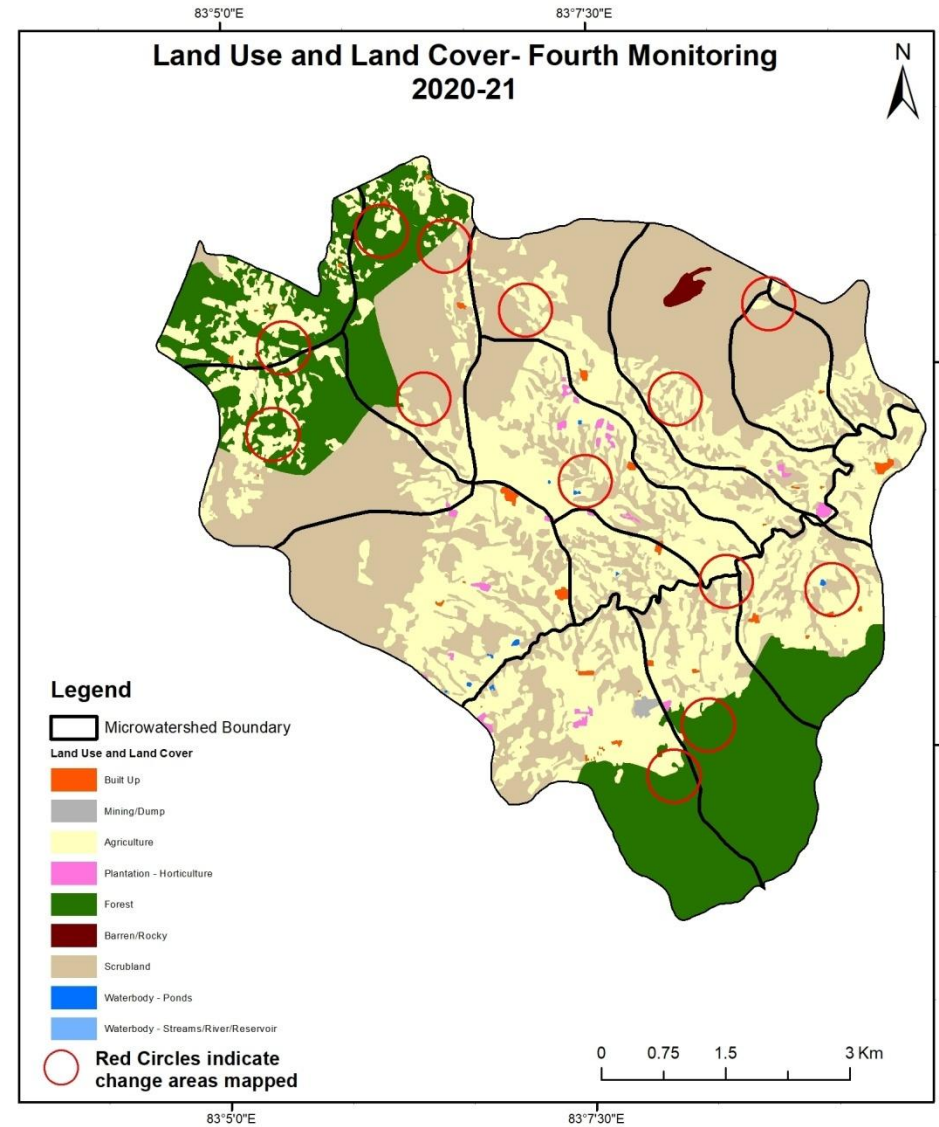
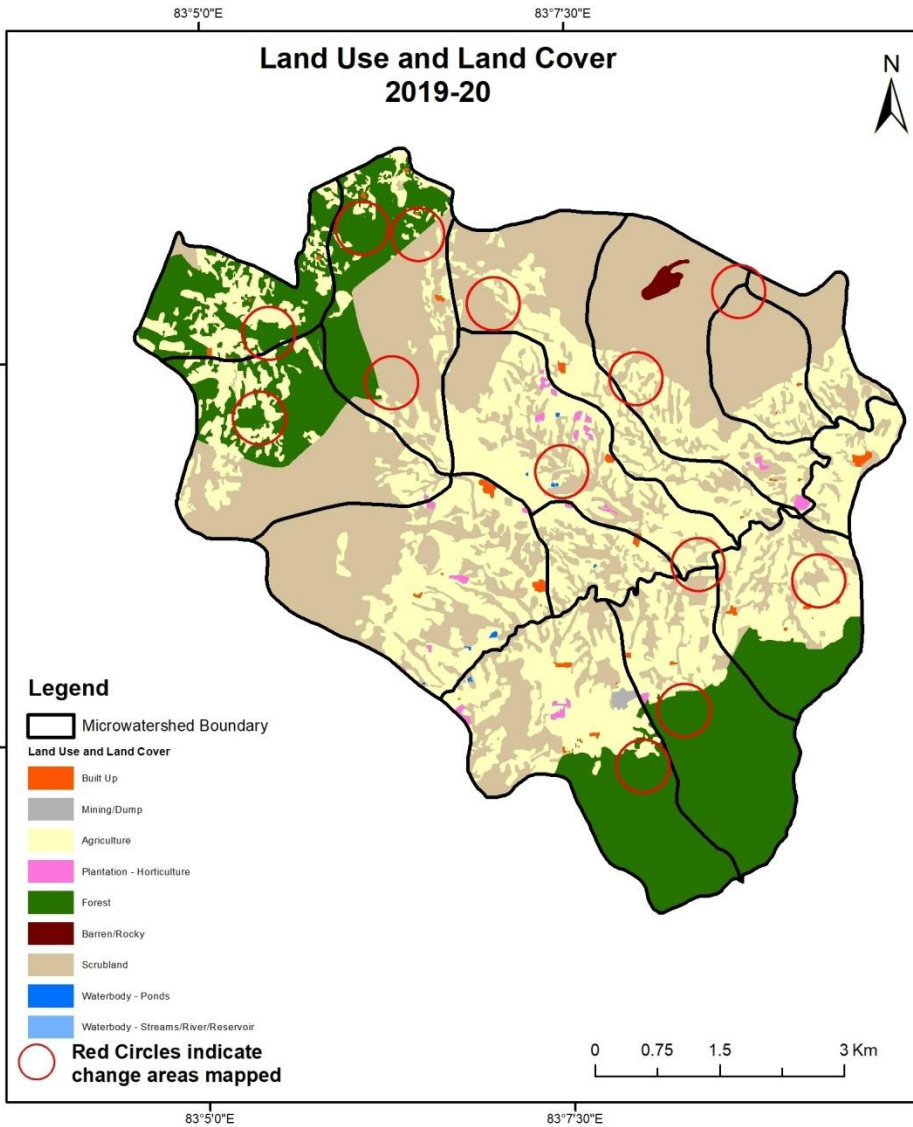


Fig 10. Gummakota Watershed (IWMP-14/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

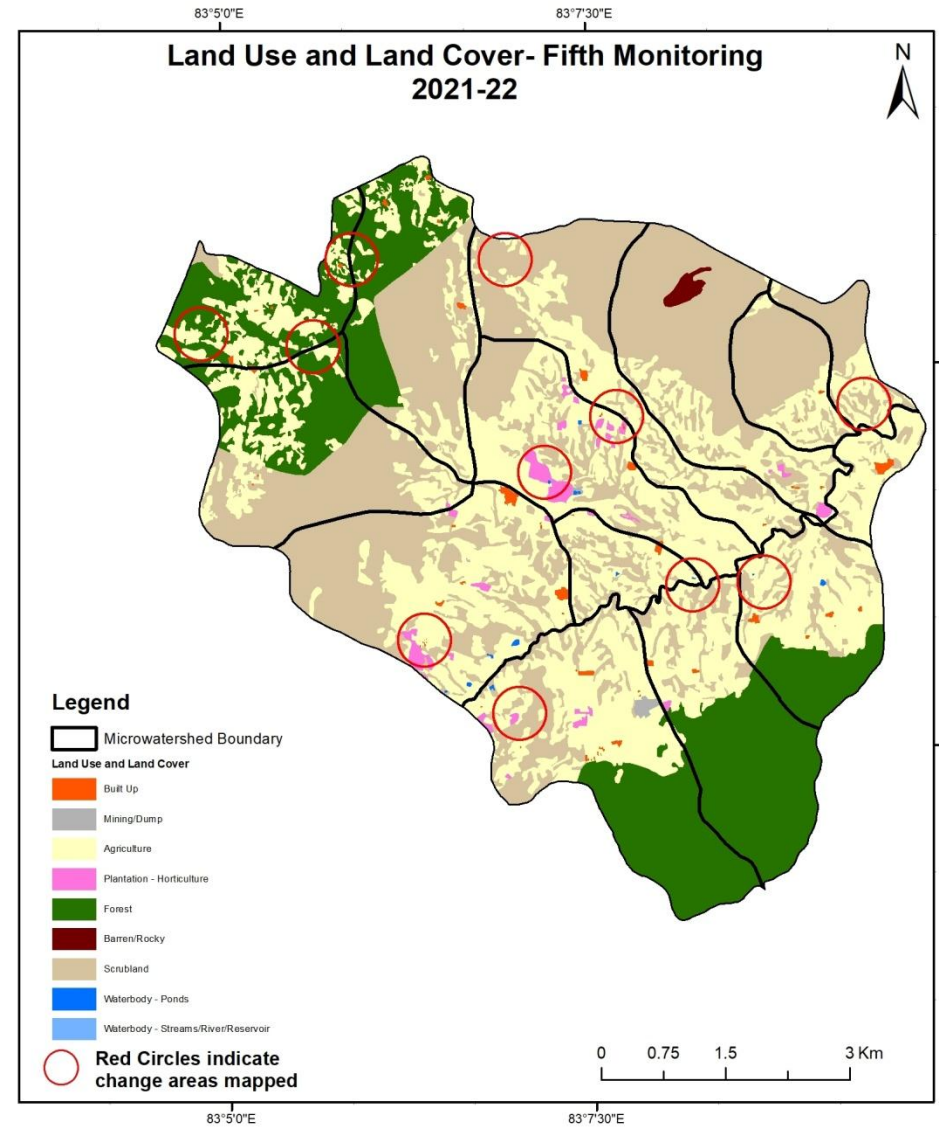
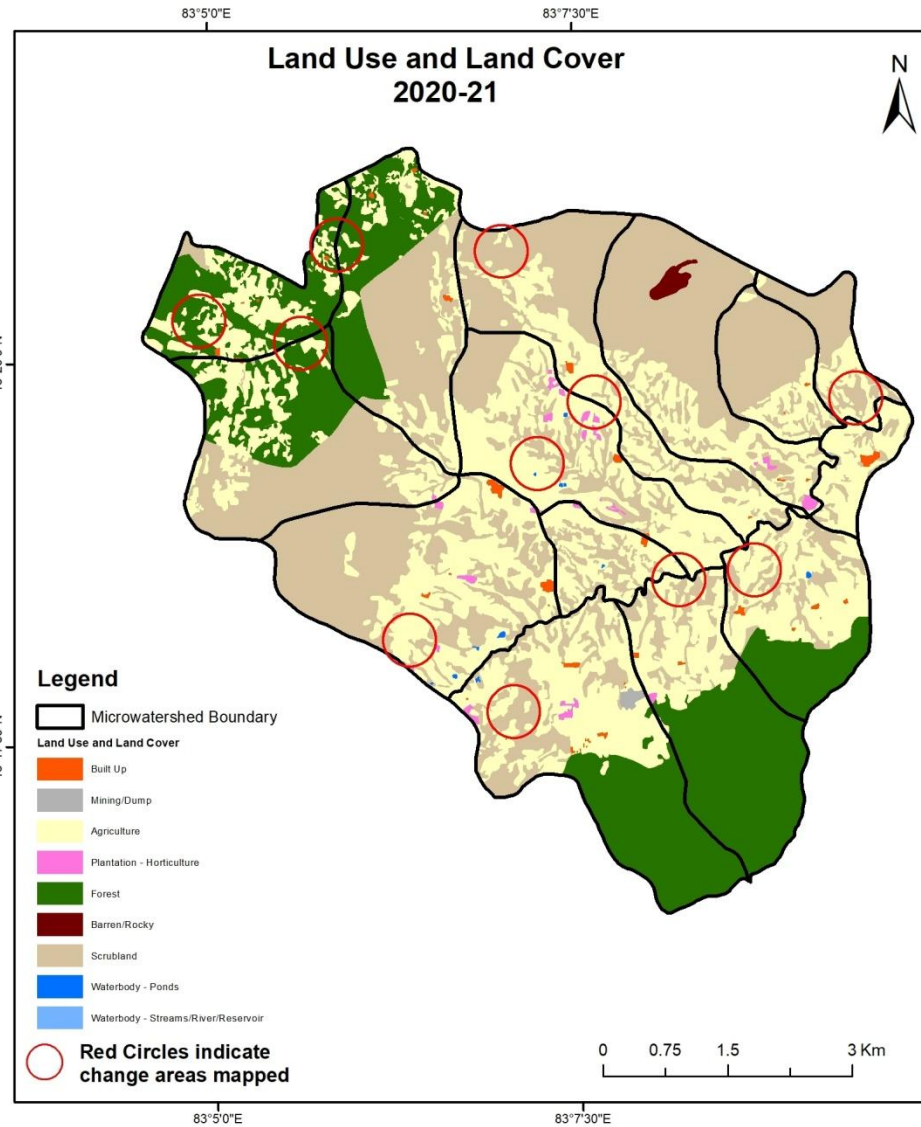
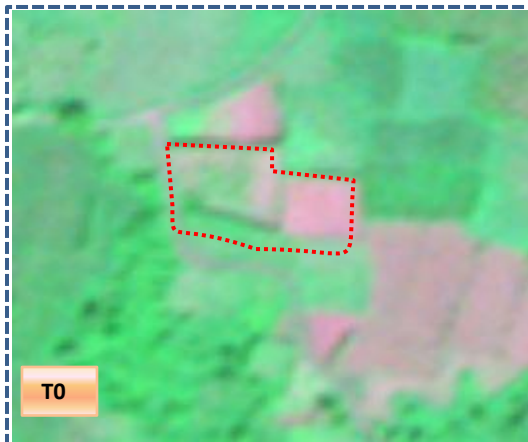


Fig 11. Gummakota Watershed (IWMP-14/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

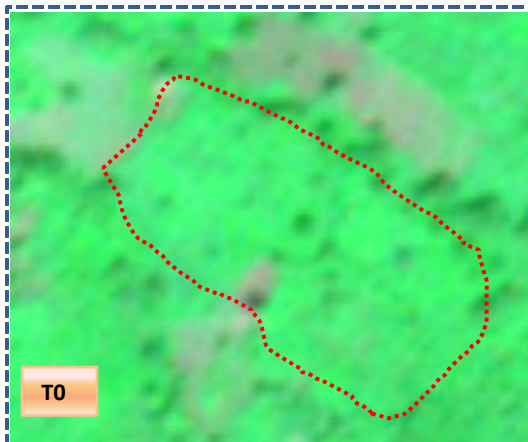


T0: 2013-14 (83°7'15.636"E 18°18'59.146"N)

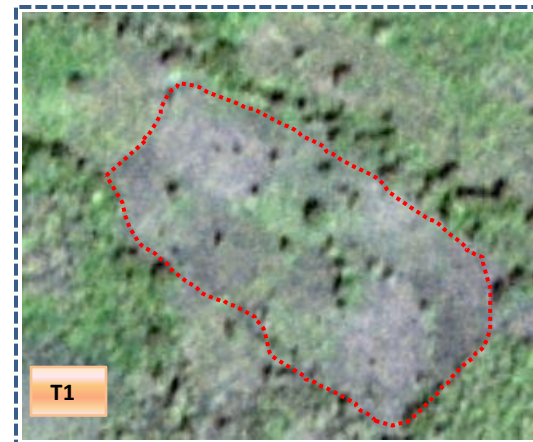


T1: 10 January 2017

Scrub to Agriculture



T0: 2013-14 (83°7'8.368"E 18°20'28.772"N)



T1: 10 January 2017

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

Scrub to Agriculture

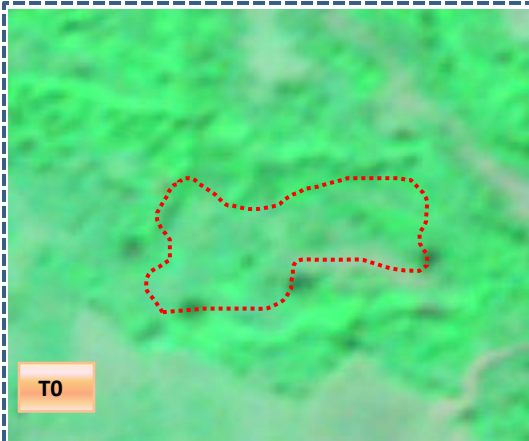


T0: 2013-14 (83°5'7.211"E 18°19'44.395"N)



T1: 10 January 2017

Scrub to Agriculture



T0: 2013-14(83°7'15.33"E 18°19'18.405"N)



T1: 10 January 2017

Table 4. showing change matrix depicting Land cover transitions for Gummakota Watershed (IWMP-14/2013-14) 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	19.59												19.59
Mining/dump		5.07											5.07
Agriculture	0.98	0.05	1296.04	4.95									1302.02
Plantation Horticulture			4.62	13.14									17.76
Forest	0.07		97.63		1122.99								1220.69
Forest Plantation													
Barren Rocky							12.38						12.38
Scrub	0.18		203.13	4.06				2228.1					2435.47
Waterbody- Streams/River									22.64				22.64
Waterbody – Ponds											1.21		1.21
Grand Total	20.82	5.12	1601.42	22.15	1122.99		12.38	2228.1	22.64		1.21		5036.83

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 05 ha of the agriculture area has decreased and it is converted into Built-up(0.9 ha) and plantation/horticulture (4.9) in T1.
3. In T1 305 ha of the agriculture area has increased from plantations/horticulture (4.6 ha), forest (97.6 ha) and scrubland (203 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Gummakota Watershed (IWMP-14/2013-14) 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	
Built up	20.82										20.82	
Mining/dump		5.12									5.12	
Agriculture		0.25	1601.17								1601.42	
Plantation Horticulture				22.15							22.15	
Forest			22.2		1100.79						1122.99	
Forest Plantation												
Barren Rocky							12.38				12.38	
Scrub			166.72					2061.38			2228.1	
Waterbody-Streams/River									22.64		22.64	
Waterbody – Ponds										1.21	1.21	
Grand Total	20.82	5.37	1790.09	22.15	1100.79		12.38	2061.38	22.64	1.21	5036.83	

4. In T1 0.25 ha of the agriculture area has decreased and it is converted into mining/dump (0.25 ha) in T2.

5. In T2 235 ha of the agriculture area has increased from forest (22.2 ha), scrubland (166.7 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Gummakota Watershed (IWMP-14/2013-14) 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	20.82												20.82
Mining/dump		5.37											5.37
Agriculture	0.43		1789.53								0.13		1790.09
Plantation Horticulture				22.15									22.15
Forest			10.15		1090.64								1100.79
Forest Plantation													
Barren Rocky							12.38						12.38
Scrub			53.44					2007.32			0.62		2061.38
Waterbody- Streams/River									22.64				22.64
Waterbody – Ponds											1.21		1.21
Grand Total	21.25	5.37	1853.12	22.15	1090.64		12.38	2007.32	22.64		1.96		5036.83

6. In T2 0.5 ha of the agriculture area has decreased and it is converted into Built-up (0.43 ha) and water body (0.13 ha) in T3.

7. In T3 63.5 ha of the agriculture area has increased from forest (10.15 ha) and scrubland (53.4 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Gummakota Watershed (IWMP-14/2013-14) 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	21.25												21.25
Mining/dump		5.37											5.37
Agriculture			1852.37								0.75		1853.12
Plantation Horticulture				22.15									22.15
Forest			26.46		1064.18								1090.64
Forest Plantation													
Barren Rocky							12.38						12.38
Scrub			51.19					1956.13					2007.32
Waterbody-Streams/River									22.64				22.64
Waterbody – Ponds											1.96		1.96
Grand Total	21.25	5.37	1930.02	22.15	1064.18		12.38	1956.13	22.64		2.71		5036.83

8. In T3 0.75 ha of the agriculture area has decreased and it is converted into water body (0.75 ha) in T4.

9. In T4 77.6 ha of the agriculture area has increased from forest (26.4 ha) and scrubland (51 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Gummakota Watershed (IWMP-14/2013-14) 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	21.25												21.25
Mining/dump		5.37											5.37
Agriculture	1.5	1.15	1903.03	24.2							0.14		1930.02
Plantation Horticulture				22.15									22.15
Forest			13.34		1050.84								1064.18
Forest Plantation													
Barren Rocky							12.38						12.38
Scrub	0.09		76.37					1879.67					1956.13
Waterbody- Streams/River									22.64				22.64
Waterbody – Ponds											2.71		2.71
Grand Total	22.84	6.52	1992.74	46.35	1050.84		12.38	1879.67	22.64		2.85		5036.83

10. In T4 25.8 ha of the agriculture area has decreased and it is converted into built-up (1.5 ha), mining/dump (1.1 ha), plantations/horticulture (24 ha) and water body (0.14 ha) in T5.

11. In T5 80 ha of the agriculture area has increased from forest (13.3 ha) and scrubland (76.3 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 1.6 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 299, 188, 63, 76 & 62 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 690 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About **28 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2013-14 (T0) to 2021-22 (T5) years.
5. There is a decrease of 555 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. Farm ponds (0) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) 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