MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

SRIKAKULAM -23/2013-14
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

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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-23/2013-14, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **5,152 ha.** It comprises of 21 micro watersheds.
4. In the project area 169 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 75 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. 47 % is covered by the agriculture, 20 % is covered by forest, 18 % is covered by scrubland and remaining by other land use classes.

STUDY AREA
PROJECT : GOWDAGURANTI WATERSHED - IWMP-23/2013-14
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Mandasa Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 5,271 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.

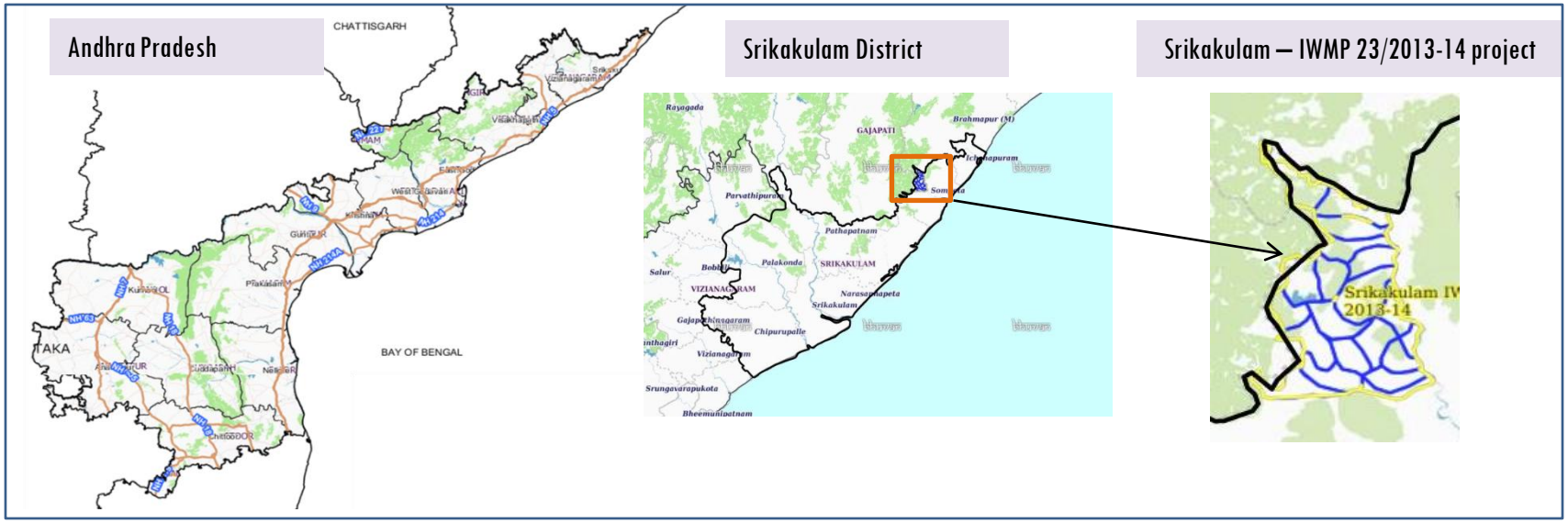


Fig.1. Location map of Gowdaguranti Watershed (IWMP-23/2013-14) in Srikakulam, A.P

- The Climate of the district is moderate and characterized by high humidity all through the year along with oppressive summer and good seasonal rainfall.
- The mean daily maximum temperature in the district is about 34 C in May and the mean daily minimum temperature is about 17.5 C in December/ January.
- The average annual rainfall of the district is 1067 mm, which ranges from nil rainfall in January and November 208mm in September and October. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June- September).

Table 1. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			26-Feb-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			26-Feb-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	169
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

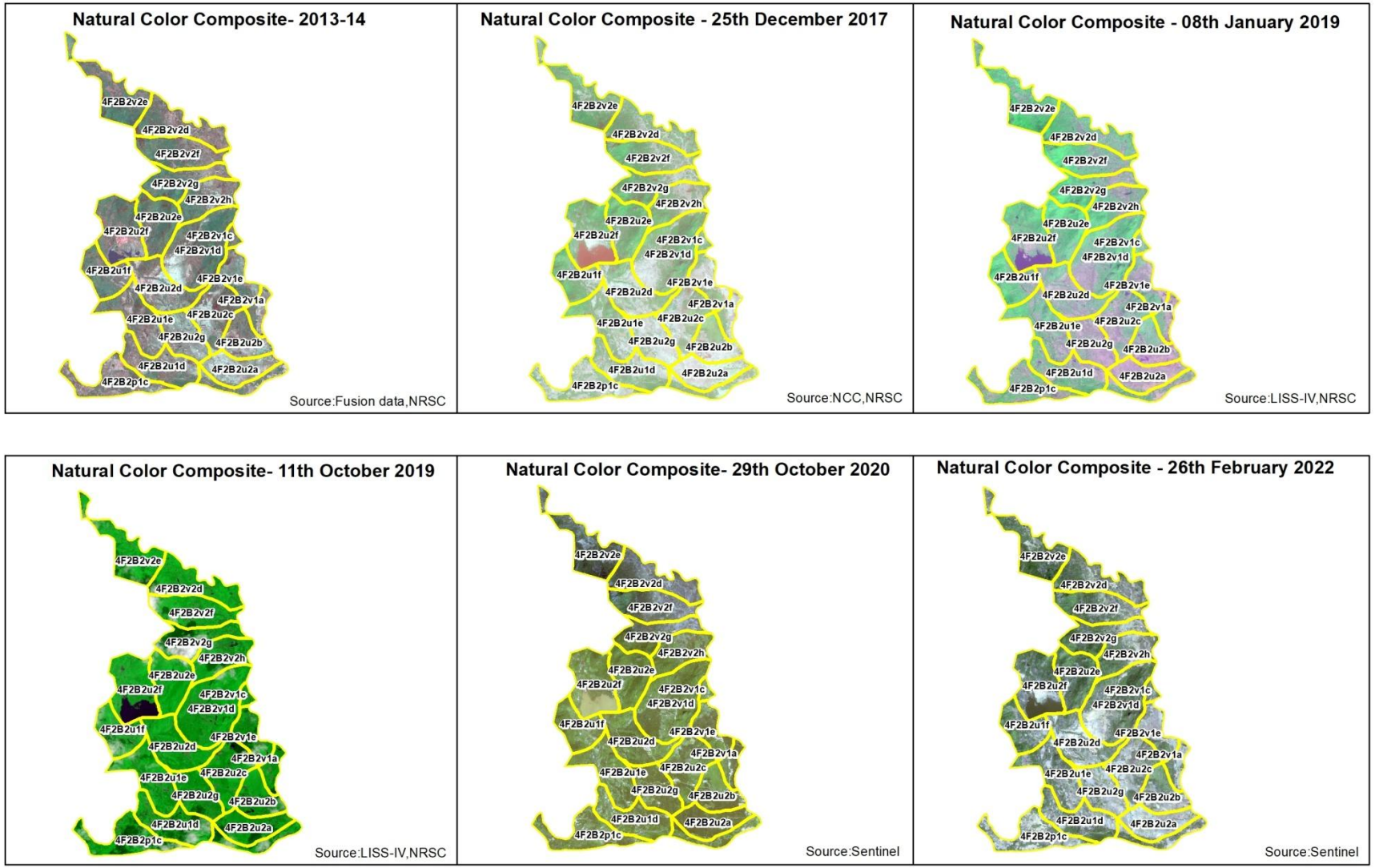
Sr. No	Activity	Number of Photographs uploaded in Drishti Mobile Application	Visible on satellite in Srishti Geoportal
1	Afforestation	6	0
2	Horticulture	0	0
3	Agriculture	149	1
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	1	0
7	Terrace	0	0
8	Checks & Plugs	7	7
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	1	0
11	Civil work-Check dams/Rock fill dam	32	23
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	15	0
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	26	17
18	Others	128	121
	TOTAL	**365**	**169**

03. MONITORING IN THE PROJECT AREA

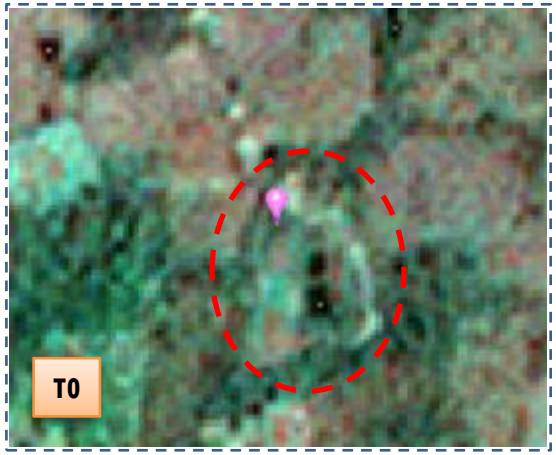
3.1 Site Wise Changes in the Project

- 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.

Gowdaguranti Watershed (IWMP-23/2013-14), Natural Colour Composite (NCC)



Monitoring of activities in Gowdaguranti Watershed (IWMP-23/2013-14), Srikakulam District Andhra Pradesh



T0:2013-14

T1: 08 January 2019

Drishti Sl no. 7245156 MWS : 4F2B2v2f

Percolation tank

T0:2013-14

T1: 08 January 2019

Drishti Sl no. 2509724 MWS : 4F2B2u1d

Percolation tank

Monitoring of activities in Gowdaguranti Watershed (IWMP-23/2013-14), Srikakulam District Andhra Pradesh

T0:2013-14

T1: 08 January 2019

Drishti Sl no. 7018085 MWS : 4F2B2v2f

Percolation tank

T0:2013-14

T1: 08 January 2019

Drishti Sl no. 7024505 MWS : 4F2B2v2g

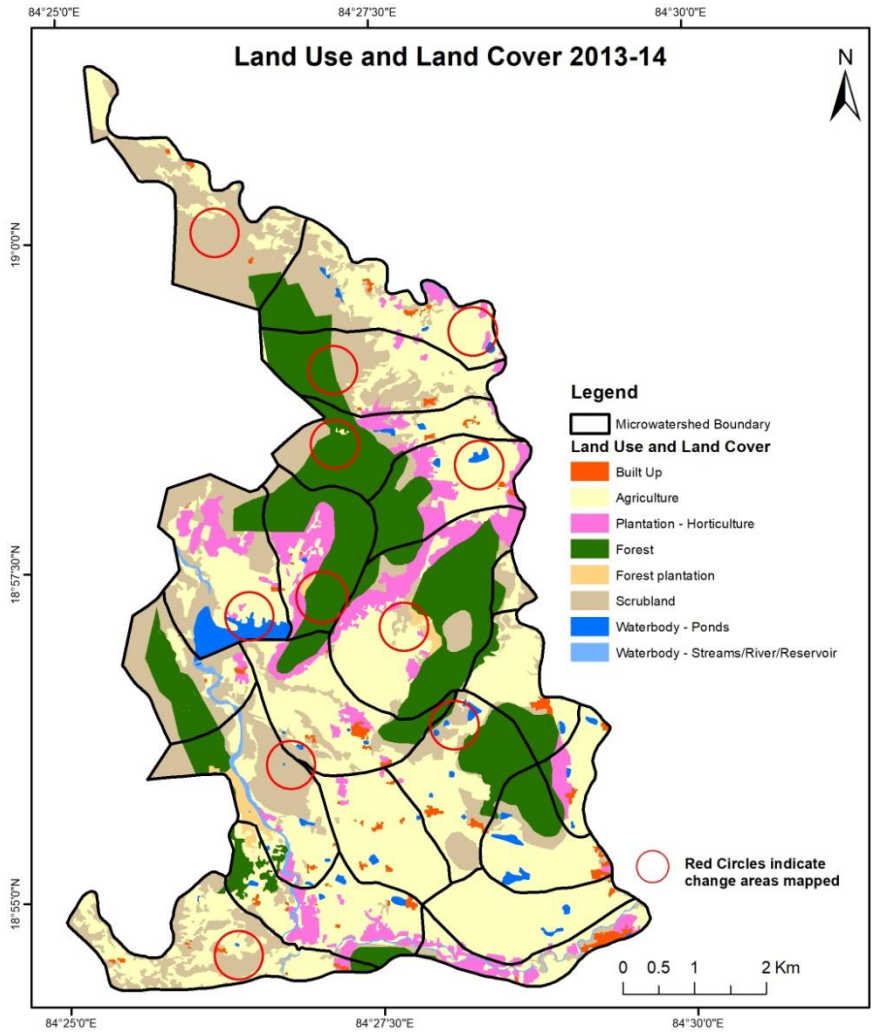
Percolation tank

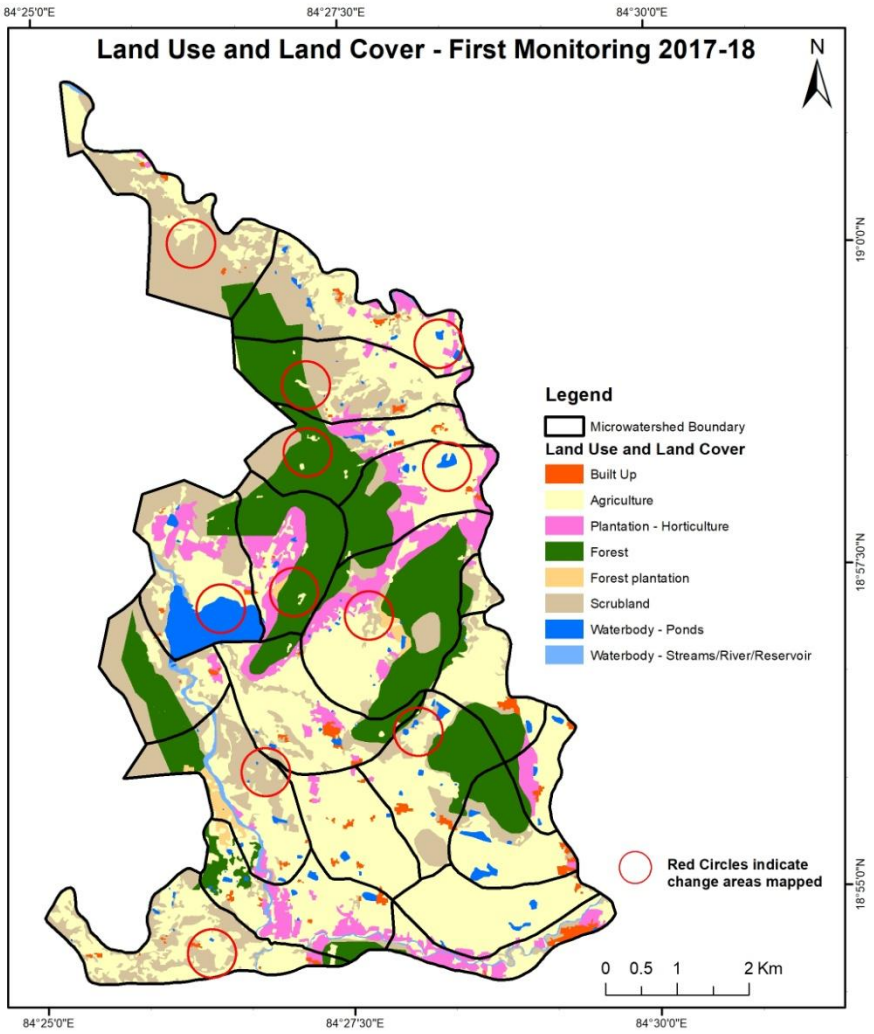
3.2 Land use and Land cover Changes in the Project

- 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)

Gowdaguranti Watershed (IWMP-23/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

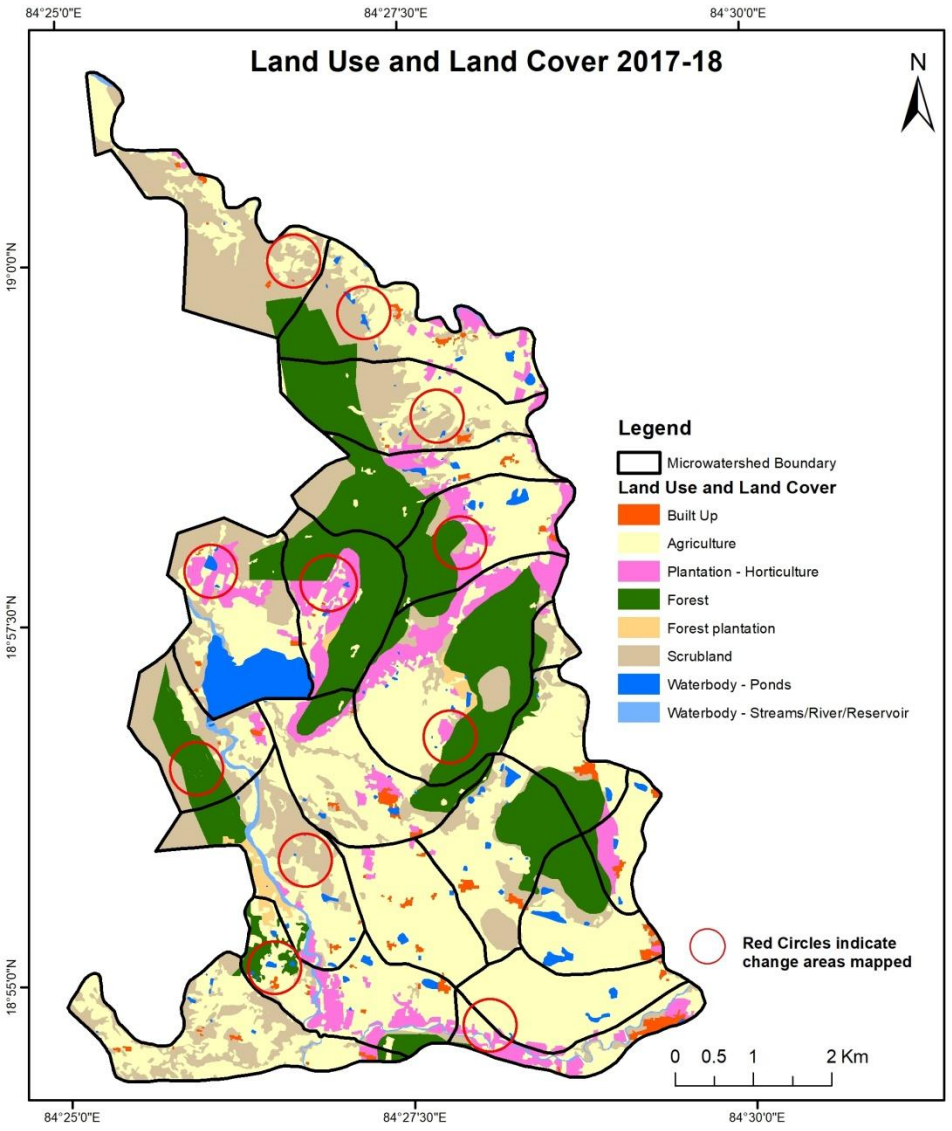
Scale: 1:10000

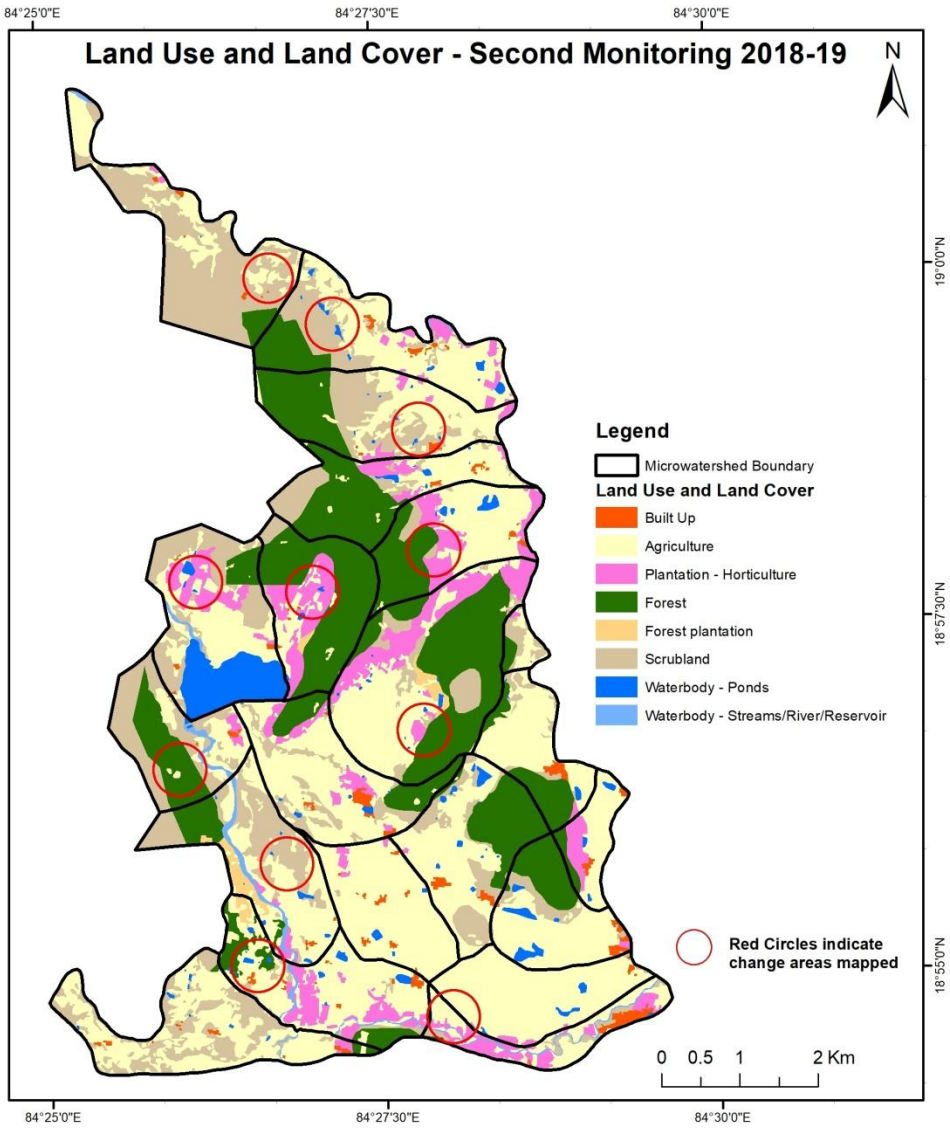




Gowdaguranti Watershed (IWMP-23/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

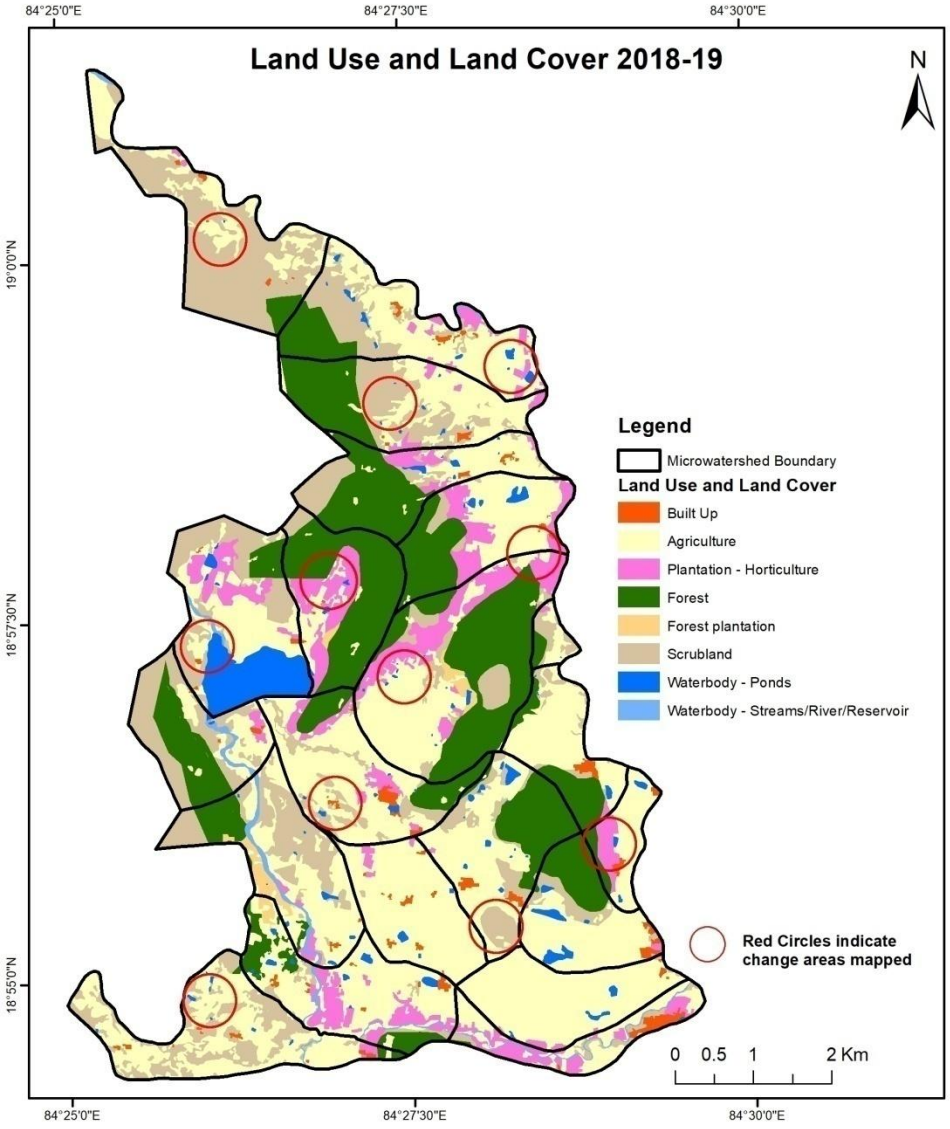
Scale: 1:10000

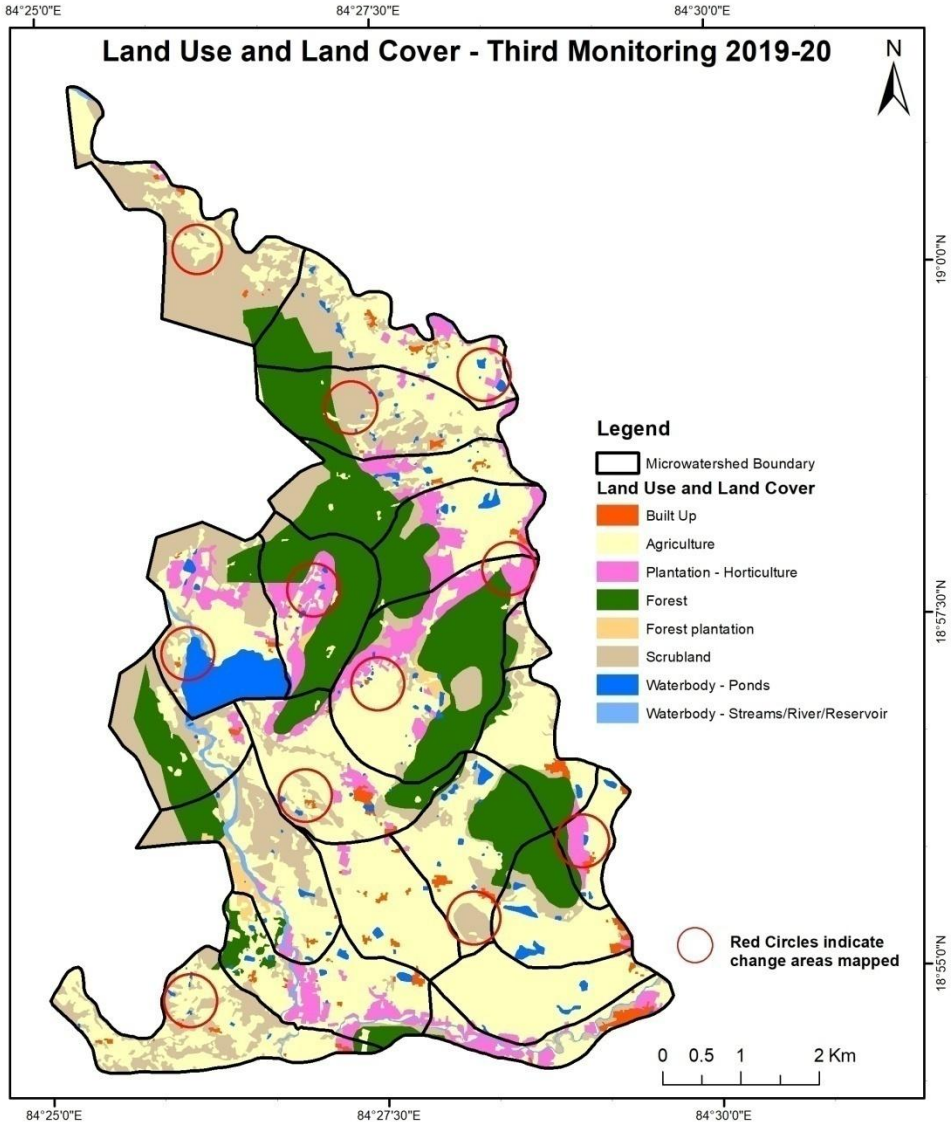




Gowdaguranti Watershed (IWMP-23/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

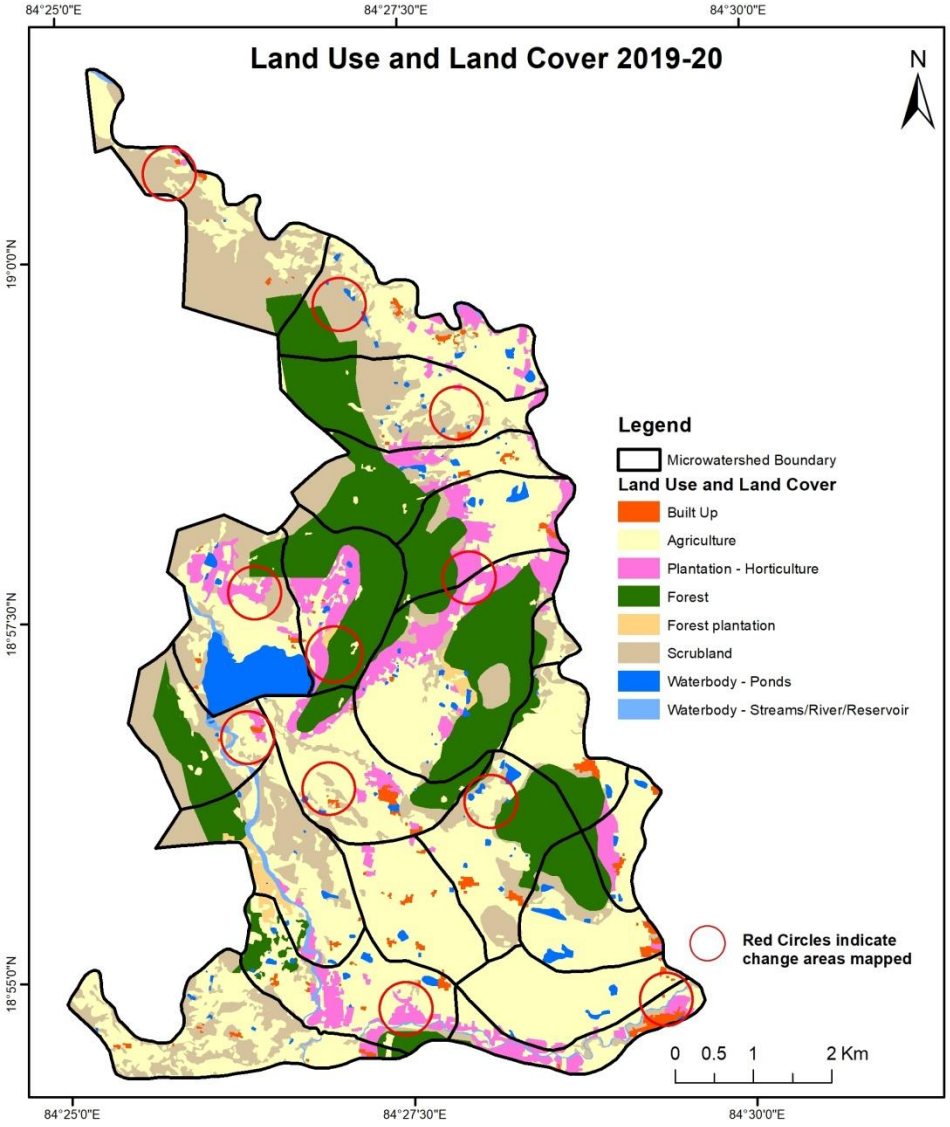
Scale: 1:10000

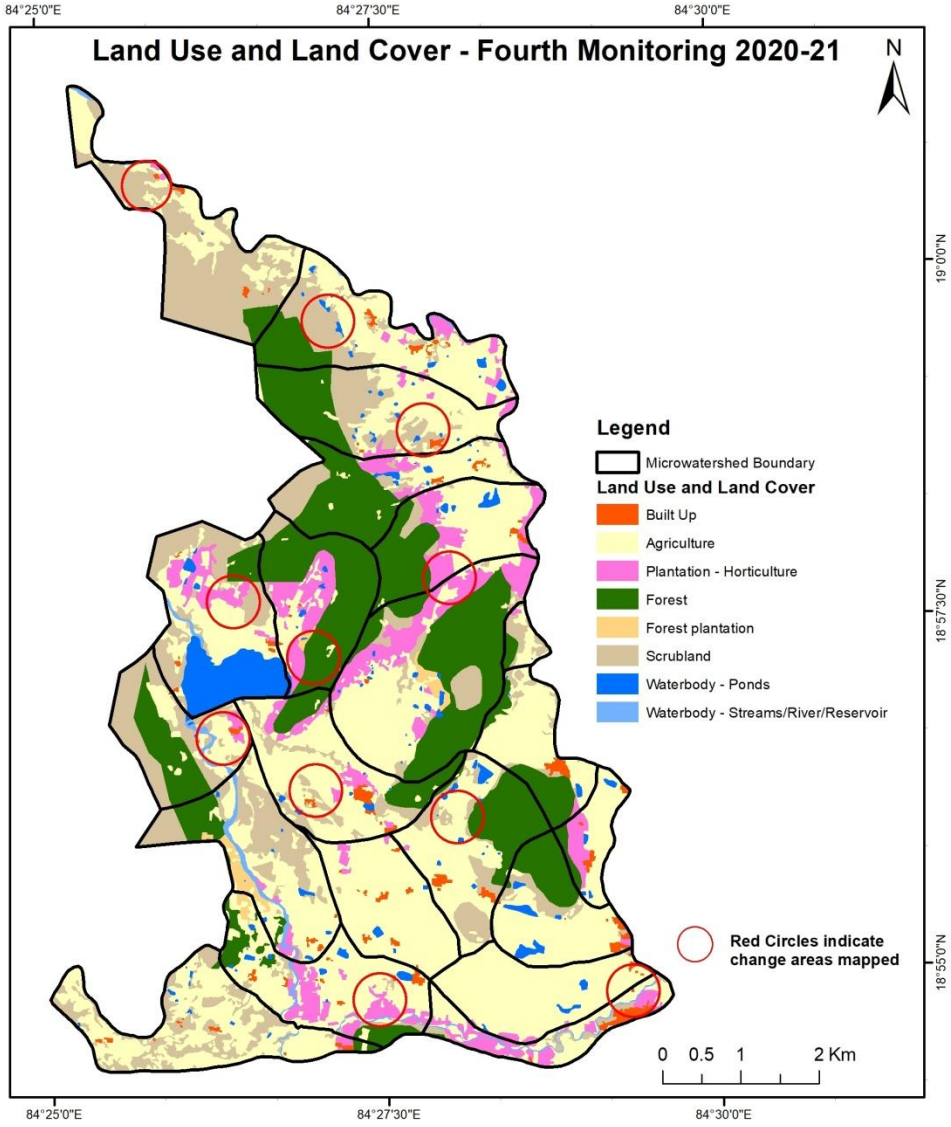




Gowdaguranti Watershed (IWMP-23/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

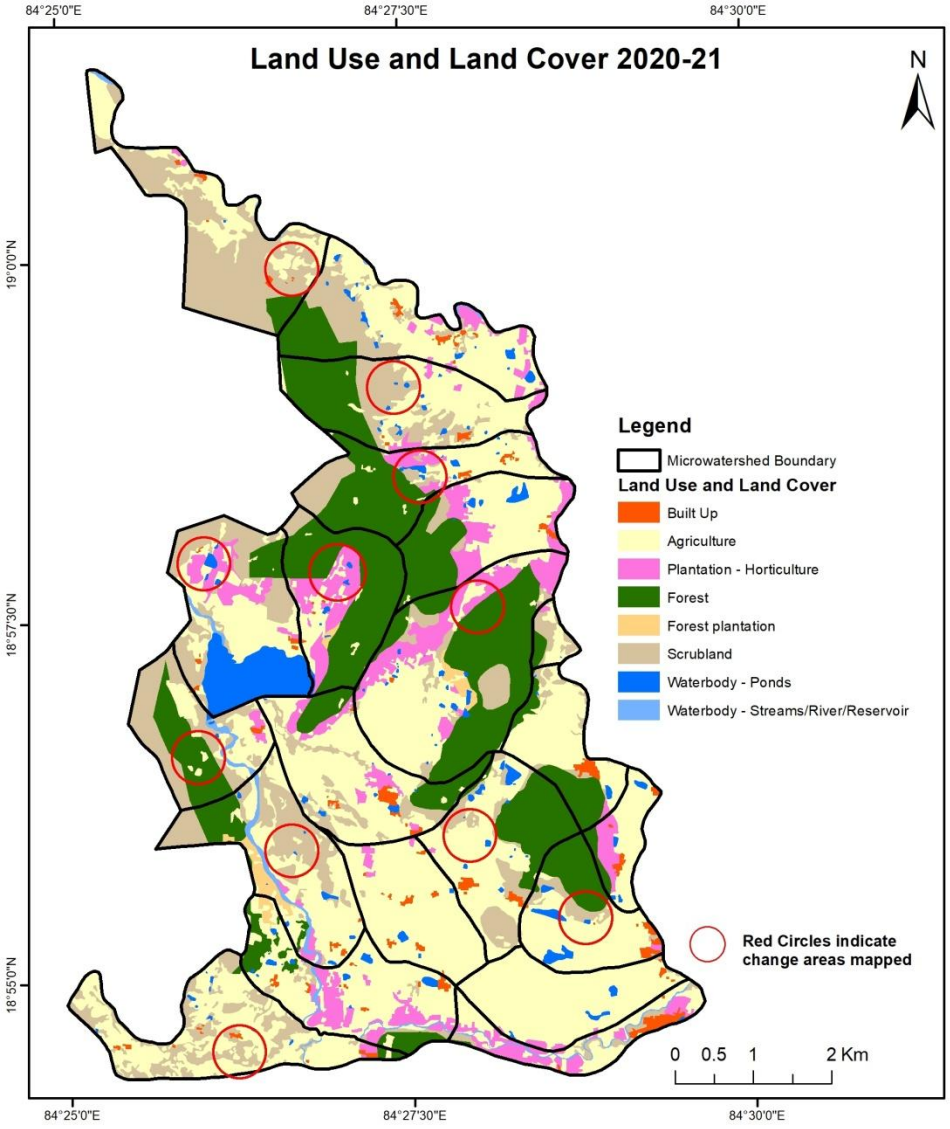
Scale: 1:10000

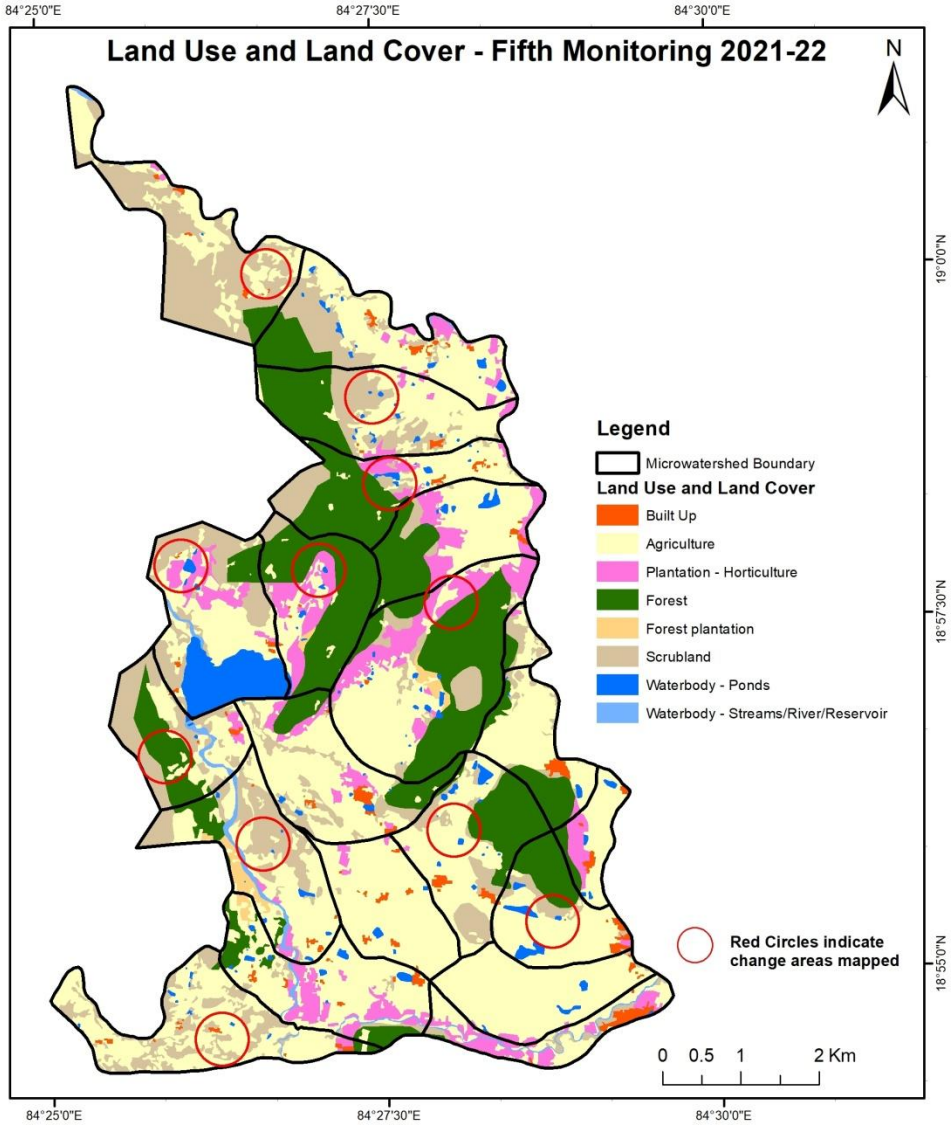




Gowdaguranti Watershed (IWMP-23/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

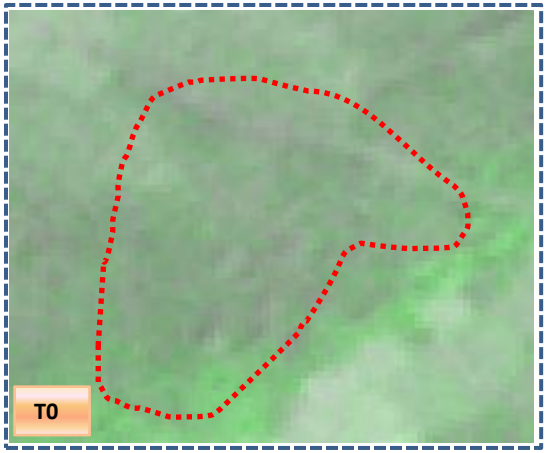
Scale: 1:10000



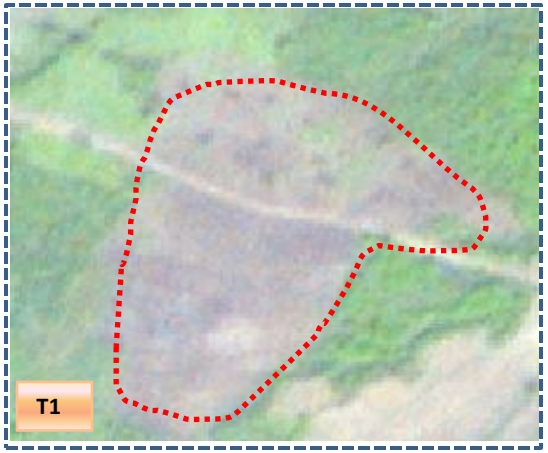


Gowdaguranti Watershed (IWMP-23/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub To Agriculture

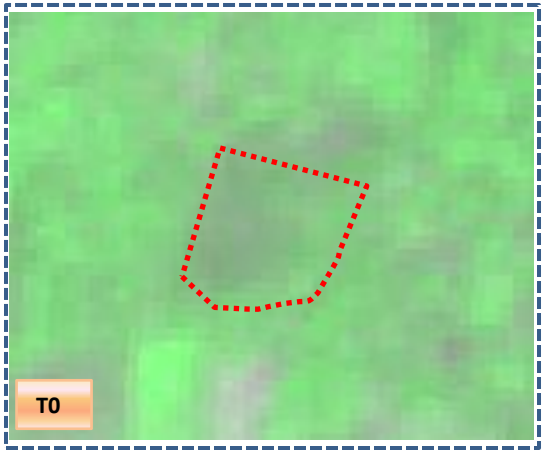


T0: 2013-14 (84°26'25.27"E 18°54'30.742"N)



T1: 25 December 2017

Plantation to Agriculture

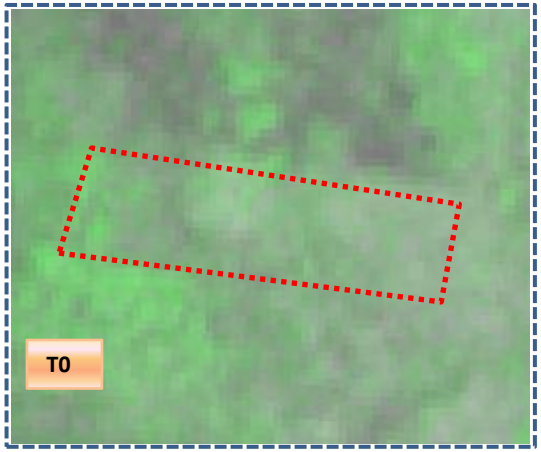


T0: 2013-14 (84°26'50.406"E 18°54'43.75"N)

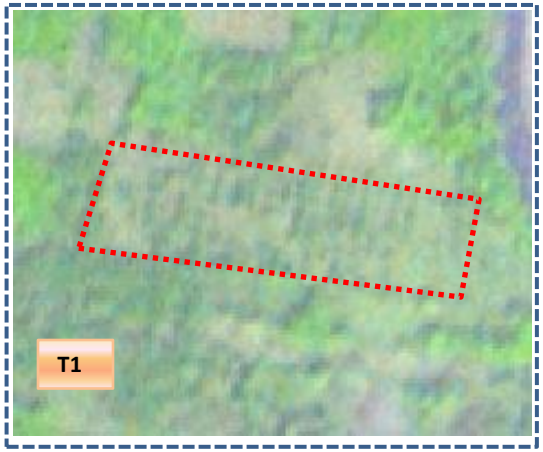
T1: 25 December 2017

Gowdaguranti Watershed (IWMP-23/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

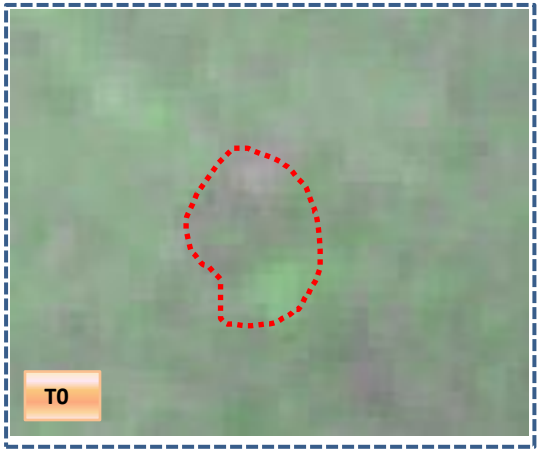


T0:2013-14 (84°28'29.924"E 18°57'33.299"N)

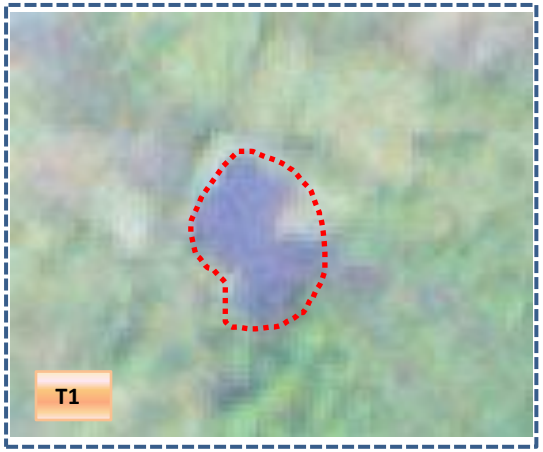


T1: 25 December 2017

Agriculture to Waterbody



T0: 2013-14 (84°27'49.62"E 18°56'53.604"N)



T1: 25 December 2017

Table showing change matrix depicting Land cover transitions for Gowdaguranti Watershed (IWMP-23/2013-14) 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	61.01										**61.01**
Mining/dump											
Agriculture	2.11		2168.45	12.86					3.11	37.59	**2224.11**
Plantation Horticulture	0.23		8.87	403.21						2.26	**414.58**
Forest			16.16		1089.10					0.74	**1106.00**
Forest Plantation			1.10			34.66				1.04	**36.80**
Barren Rocky											
Scrub	0.77		98.48					1055.83		16.74	**1171.82**
Waterbody-Streams/River									47.90		**47.90**
Waterbody – Ponds										90.52	**90.52**
Grand Total	**64.13**		**2293.04**	**416.07**	**1089.10**	**34.66**		**1055.83**	**51.01**	**148.90**	**5152.73**

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 55 ha of the agriculture area has decreased and it is converted into Built-up (2.1 ha), plantation/horticulture (12.8 ha) and water body (3.1 ha) in T1.

3. In T1 124 ha of the agriculture area has increased from plantations /horticulture (8.8 ha), forest (16 ha), forest plantatin (1 ha) and scrubland (98 ha) of T0.

Table showing change matrix depicting Land cover transitions for Gowdaguranti Watershed (IWMP-23/2013-14) 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	64.13										**64.13**
Mining/dump											
Agriculture	0.28		2292.28							0.48	**2293.04**
Plantation Horticulture			2.63	413.17						0.27	**416.07**
Forest			1.12		1087.97						**1089.10**
Forest Plantation						34.66					**34.66**
Barren Rocky											
Scrub	0.07		6.57					1048.76		0.42	**1055.83**
Waterbody-Streams/River									51.01		**51.01**
Waterbody – Ponds										148.90	**148.90**
Grand Total	**64.48**		**2302.61**	**413.17**	**1087.97**	**34.66**		**1048.76**	**51.01**	**150.07**	**5152.73**

4. In T1 0.7 ha of the agriculture area has decreased and it is converted into Built-up (0.2 ha) and water body (0.4 ha) in T2.

5. In T2 10 ha of the agriculture area has increased from plantations/horticulture (2.6 ha) and scrubland (6.5 ha) of T1.

Table showing change matrix depicting Land cover transitions for Gowdaguranti Watershed (IWMP-23/2013-14) 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	64.48										**64.48**
Mining/dump											
Agriculture	2.75		2295.87							3.99	**2302.61**
Plantation Horticulture	0.31		3.18	407.72						1.96	**413.17**
Forest			4.27		1082.92					0.79	**1087.97**
Forest Plantation						34.34				0.32	**34.66**
Barren Rocky											
Scrub	0.42		7.75					1036.88		3.71	**1048.76**
Waterbody-Streams/River									51.01		**51.01**
Waterbody – Ponds										150.07	**150.07**
Grand Total	**67.96**		**2311.07**	**407.72**	**1082.92**	**34.34**		**1036.88**	**51.01**	**160.84**	**5152.73**

6. In T2 6.7 ha of the agriculture area has decreased and it is converted into Built-up (2.7 ha) and water body (3.9 ha) in T3.

7. In T3 15.2 ha of the agriculture area has increased from plantations/horticulture (3 ha) forest (4 ha) and scrubland (7.7 ha) of T2.

Table showing change matrix depicting Land cover transitions for Gowdaguranti Watershed (IWMP-23/2013-14) 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	67.96										**67.96**
Mining/dump											
Agriculture	3.00		2307.59							0.48	**2311.07**
Plantation Horticulture	0.52		3.04	404.15							**407.72**
Forest			4.47		1078.44						**1082.92**
Forest Plantation			0.50			33.64				0.20	**34.34**
Barren Rocky											
Scrub	1.33		40.07					994.52		0.96	**1036.88**
Waterbody-Streams/River									51.01		**51.01**
Waterbody – Ponds										160.84	**160.84**
Grand Total	**72.82**		**2355.67**	**404.15**	**1078.44**	**33.64**		**994.52**	**51.01**	**162.47**	**5152.73**

8. In T3 3.4 ha of the agriculture area has decreased and it is converted into built-up (3 ha) and water body (0.4 ha) in T4.

9. In T4 48 ha of the agriculture area has increased from plantations/horticulture (3 ha), forest (4 ha), forest plantation (0.5 ha) and scrubland (40 ha) of T3.

Table showing change matrix depicting Land cover transitions for Gowdaguranti Watershed (IWMP-23/2013-14) 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	72.82										**72.82**
Mining/dump											
Agriculture	2.48		2353.20								**2355.67**
Plantation Horticulture	0.04		7.83	396.28							**404.15**
Forest			19.49		1058.95						**1078.44**
Forest Plantation			0.45			33.19					**33.64**
Barren Rocky											
Scrub	0.49		42.09					951.94			**994.52**
Waterbody-Streams/River									51.01		**51.01**
Waterbody – Ponds										162.47	**162.47**
Grand Total	**75.83**		**2423.05**	**396.28**	**1058.95**	**33.19**		**951.94**	**51.01**	**162.47**	**5152.73**

10. In T4 2.4 ha of the agriculture area has decreased and it is converted into built-up (2.4 ha) in T5.

11. In T5 69 ha of the agriculture area has increased from plantations/horticulture (7.8 ha), forest (19 ha) and scrubland(42 ha) of T4.

Conclusion

1. The LULC 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 75 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
3. There is an increase of 68, 9, 8, 44 & 67 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 198 Hectares in Crop land area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
4. There is a decrease of 219 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
5. Farm ponds (09) is visible on IWMP 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