

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

GUNTUR -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

		Page Number
01.	STUDY AREA	05
02.	SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS	06
03.	MONITORING IN THE PROJECT AREA	
	3.1 . Site wise changes in the project	08
	3.2. Land use and Land cover Changes in the Project	11
04.	CONCLUSIONS	26

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-03/2013-14, Guntur District of Andhra Pradesh. The total geographical area of the project is **9,699 ha**. It comprises of 14 micro watersheds.
- In the project area Drishti points were not uploaded.
- Water bodies have shown an decreased by 57 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 48 % is covered by the agriculture, 44 % is covered by forest, 2.8 % is covered by scrubland and remaining by other land use classes.

1. STUDY AREA

PROJECT : MUTUKURU (IWMP-03/2013-14)

DISTRICT : GUNTUR , STATE : ANDHRA PRADESH

- The study area falls in Durgi Mandal of Guntur district of Andhra Pradesh state. The total geographical area of the project is **9,699 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.

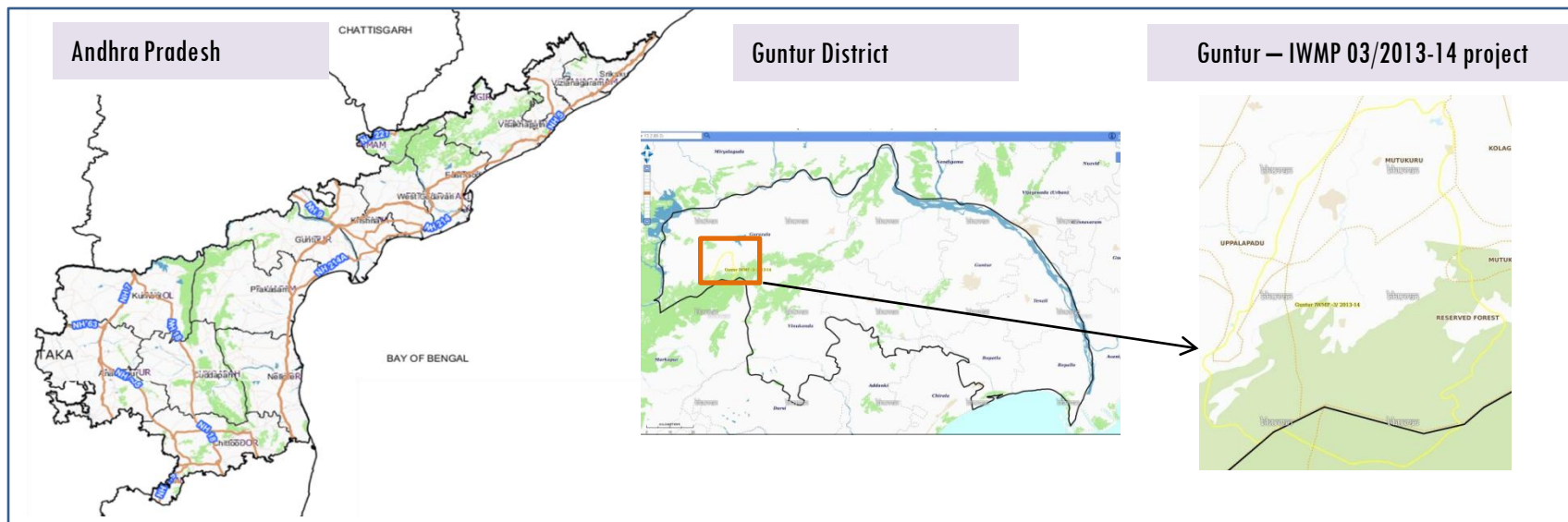


Fig.1. Location map of Mutukuru Watershed (IWMP-03/2013-14) in Guntur District, A.P

- 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

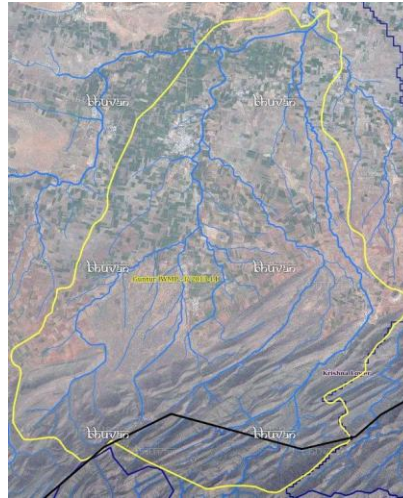
Satellite data	T0-A	T0-B	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			2-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Mar-22
SCENE2			
SCENE 3			
SCENE 4			

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	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

No Drishti Points
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, seen in figure 05 & 06.

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

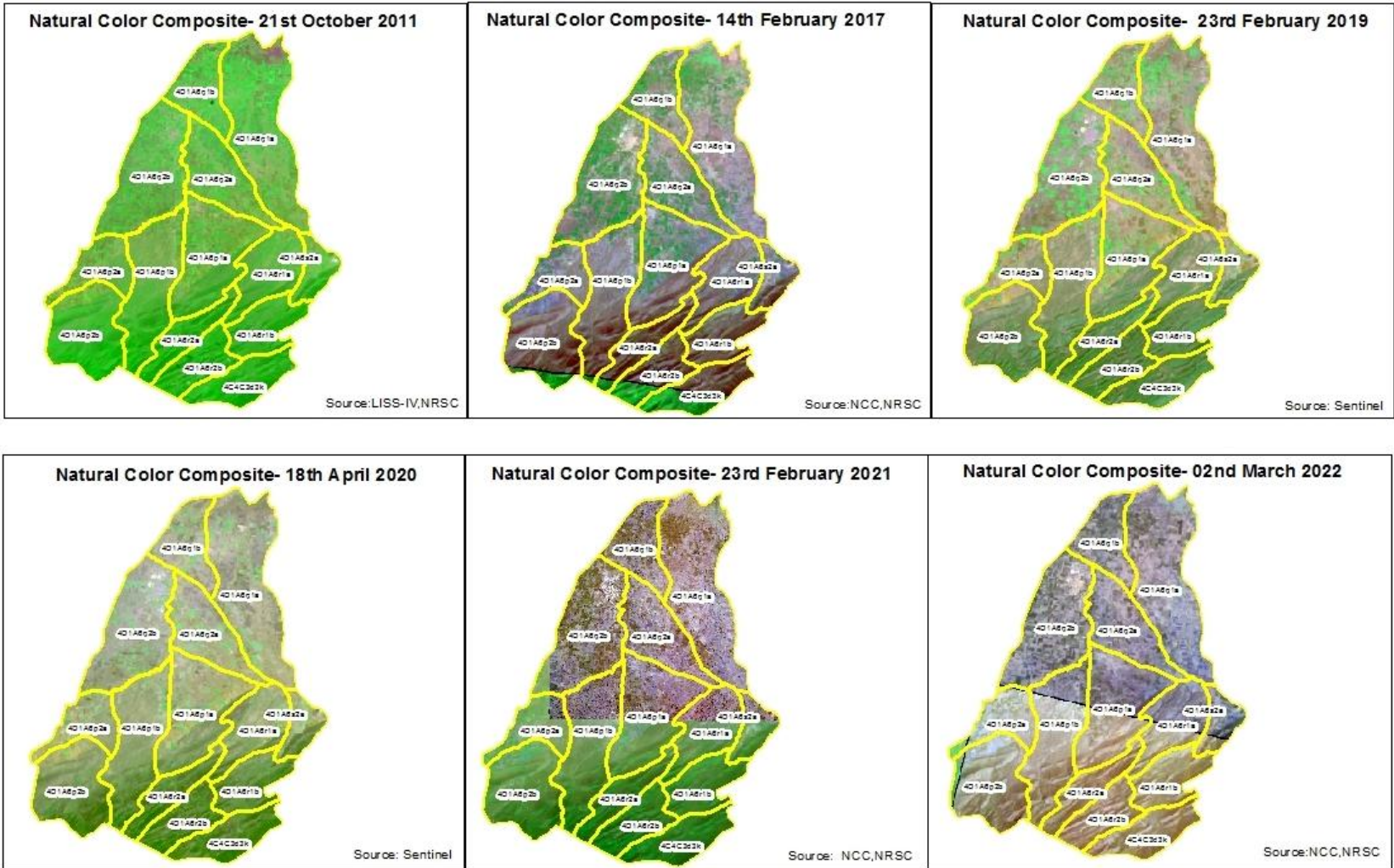


Fig 5. Monitoring of activities, Mutukuru watershed (IWMP-03/2013-14 to 2017-18), Guntur District, A.P

<p>T0</p>	<p>T1</p>	
<p>T0:</p>	<p>T1:</p>	<p>Drishti Sl no MWS :</p>
<p>T0</p>	<p>T1</p>	
<p>T0:</p>	<p>T1:</p>	<p>Drishti Sl no. MWS :</p>

03. MONITORING IN THE PROJECT AREA

3.2 Land use and Land cover Changes in the Project

1. 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 06 to fig 10.
2. 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 & 14.
3. The result obtained for the period T0 to T5 are given in the change matrix tables, seen in table 04 to table 08.
4. In matrix table column represents the T0 (2013-14) and row represents the T5 (2021-22) .

Fig 6. Mutukuru 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

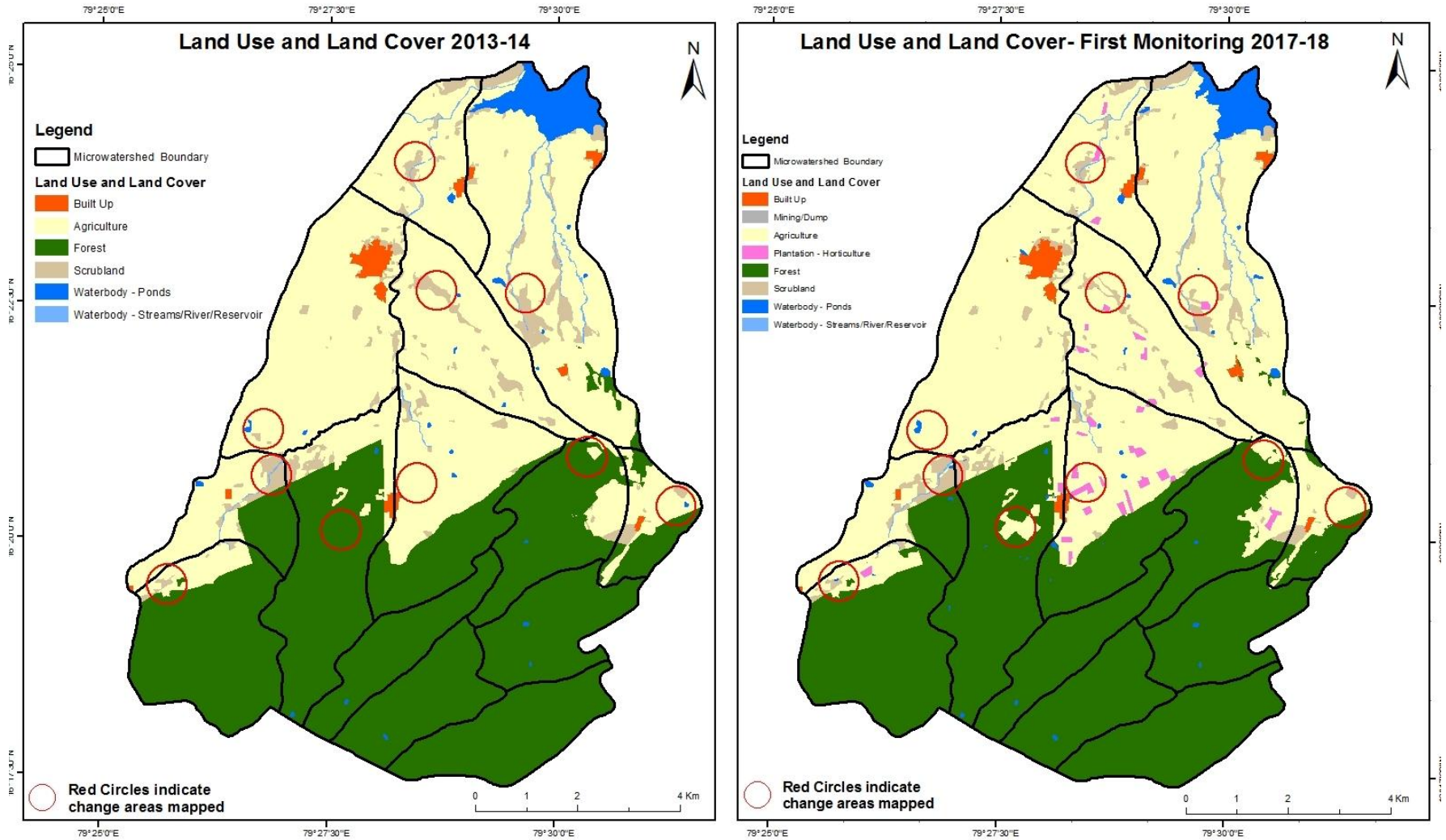


Fig 7. Mutukuru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

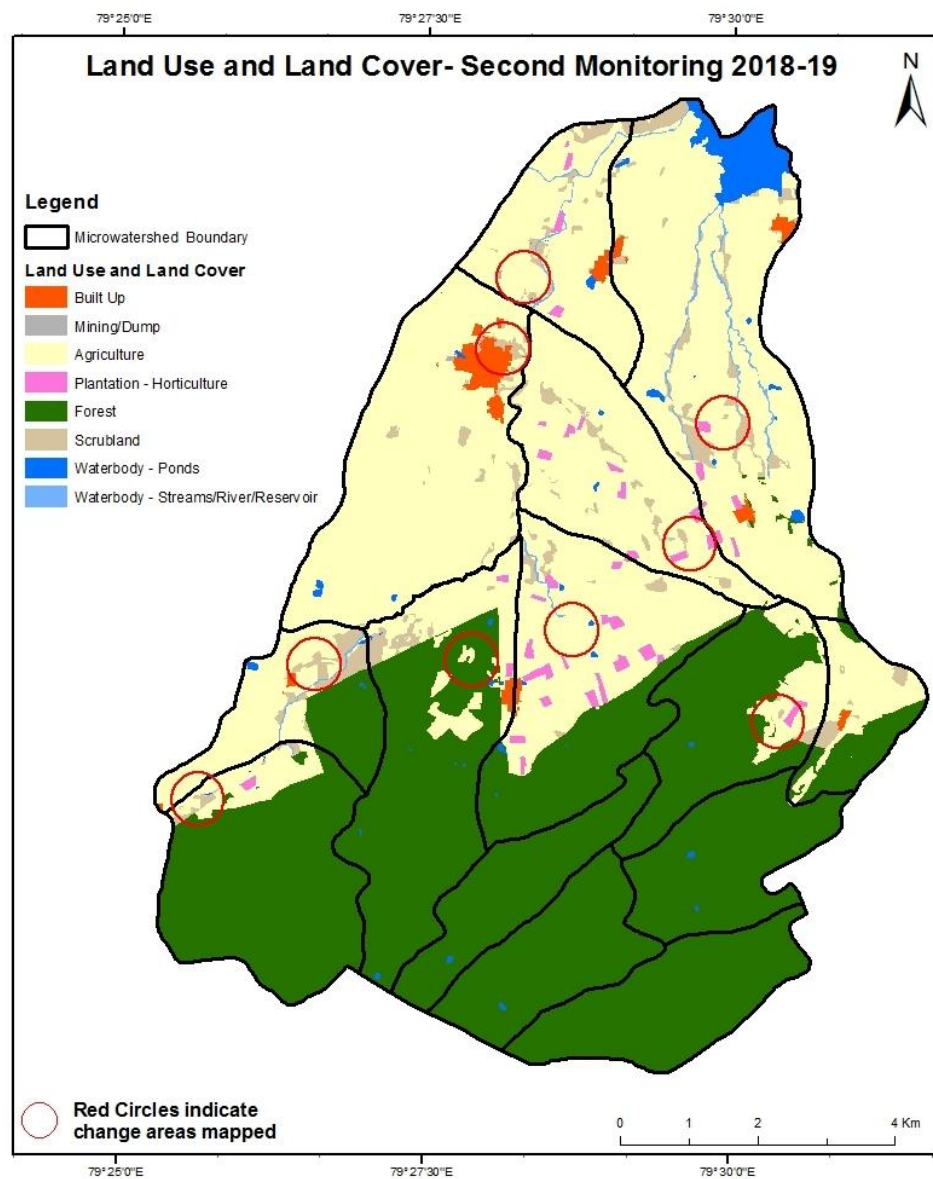
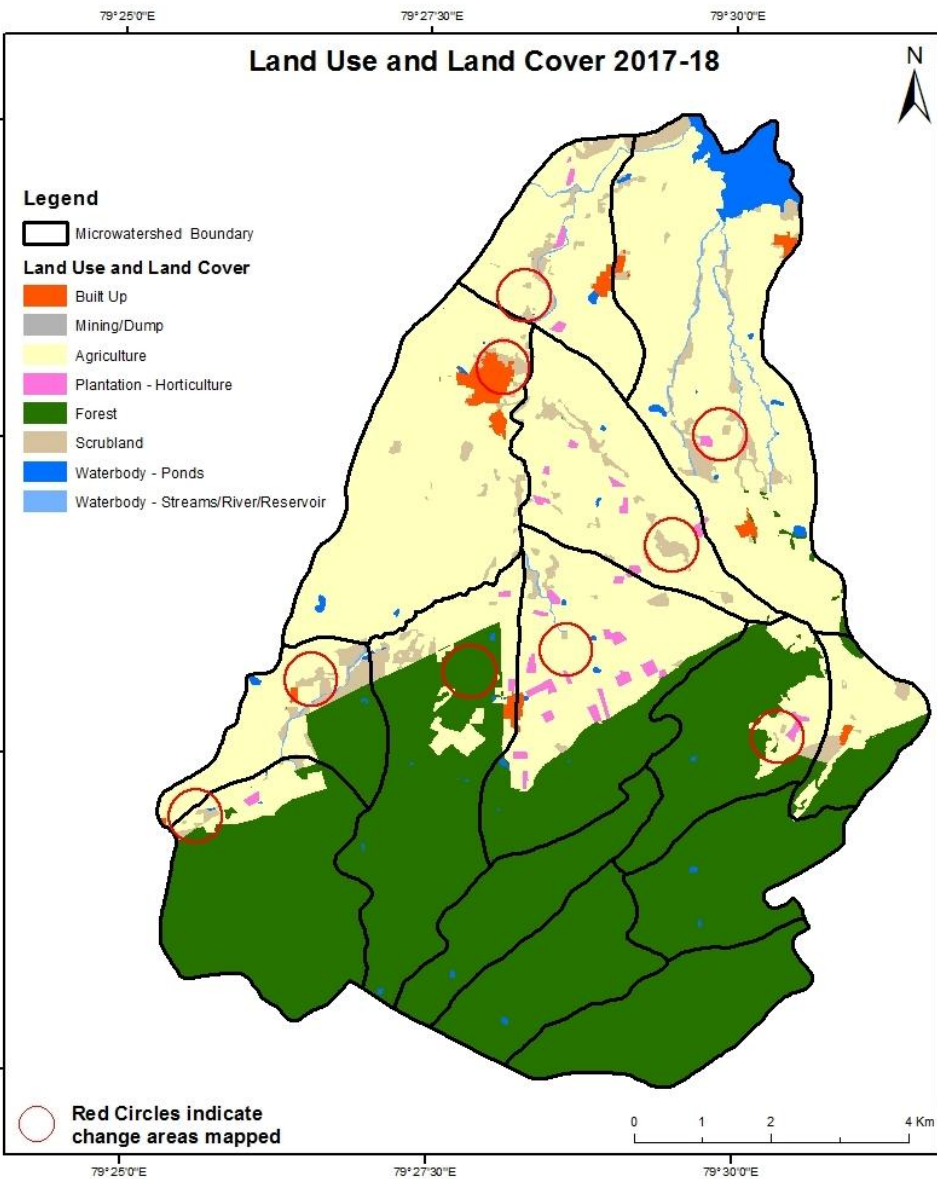


Fig 8. Mutukuru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

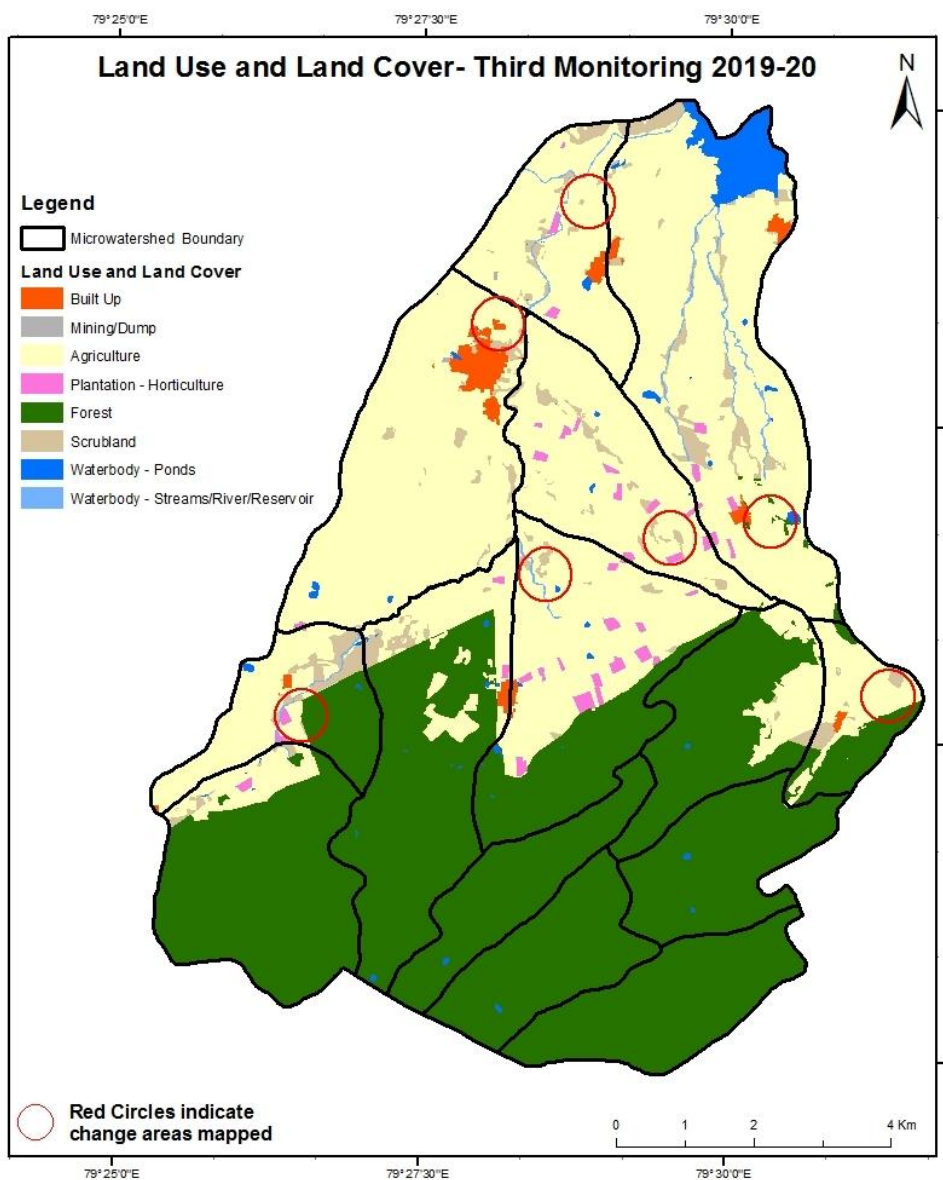
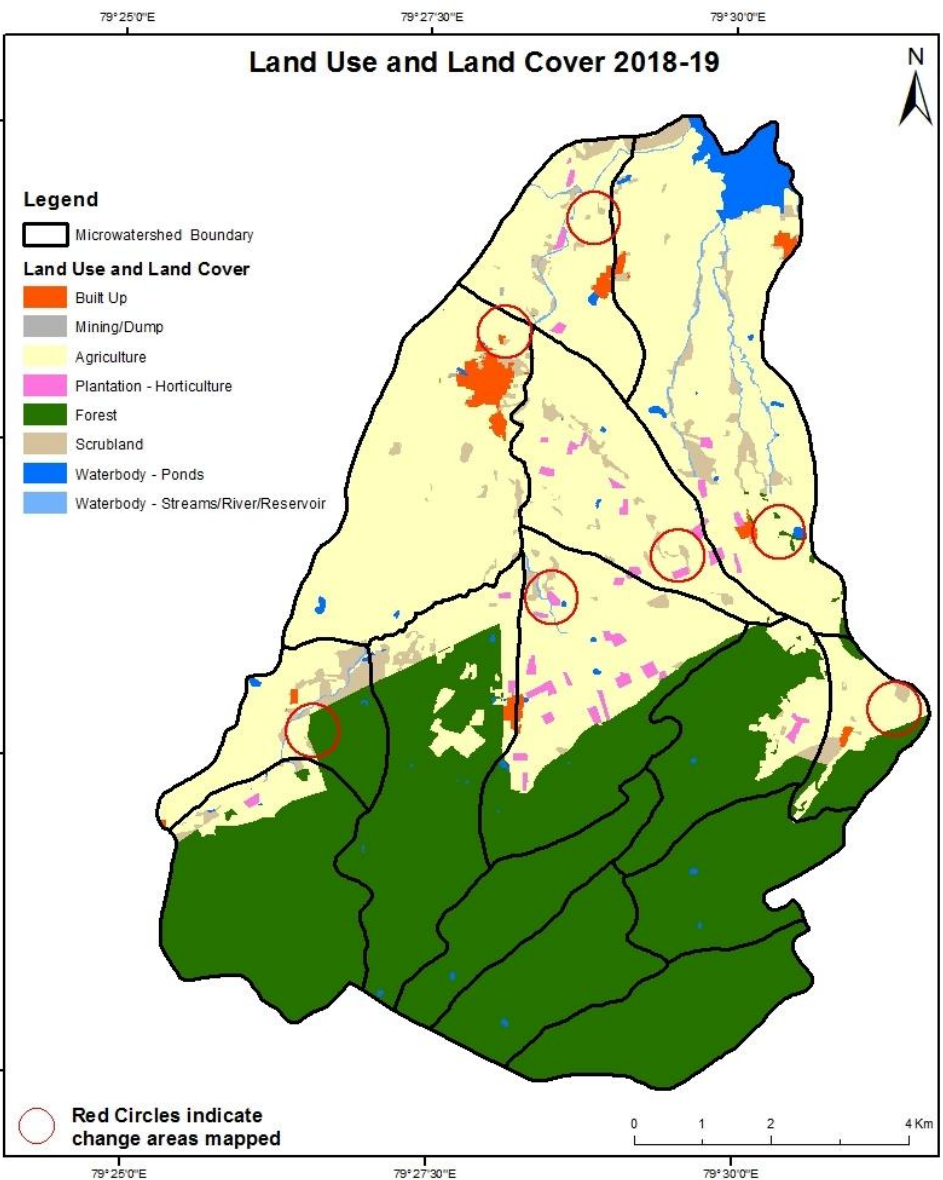


Fig 9. Mutukuru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

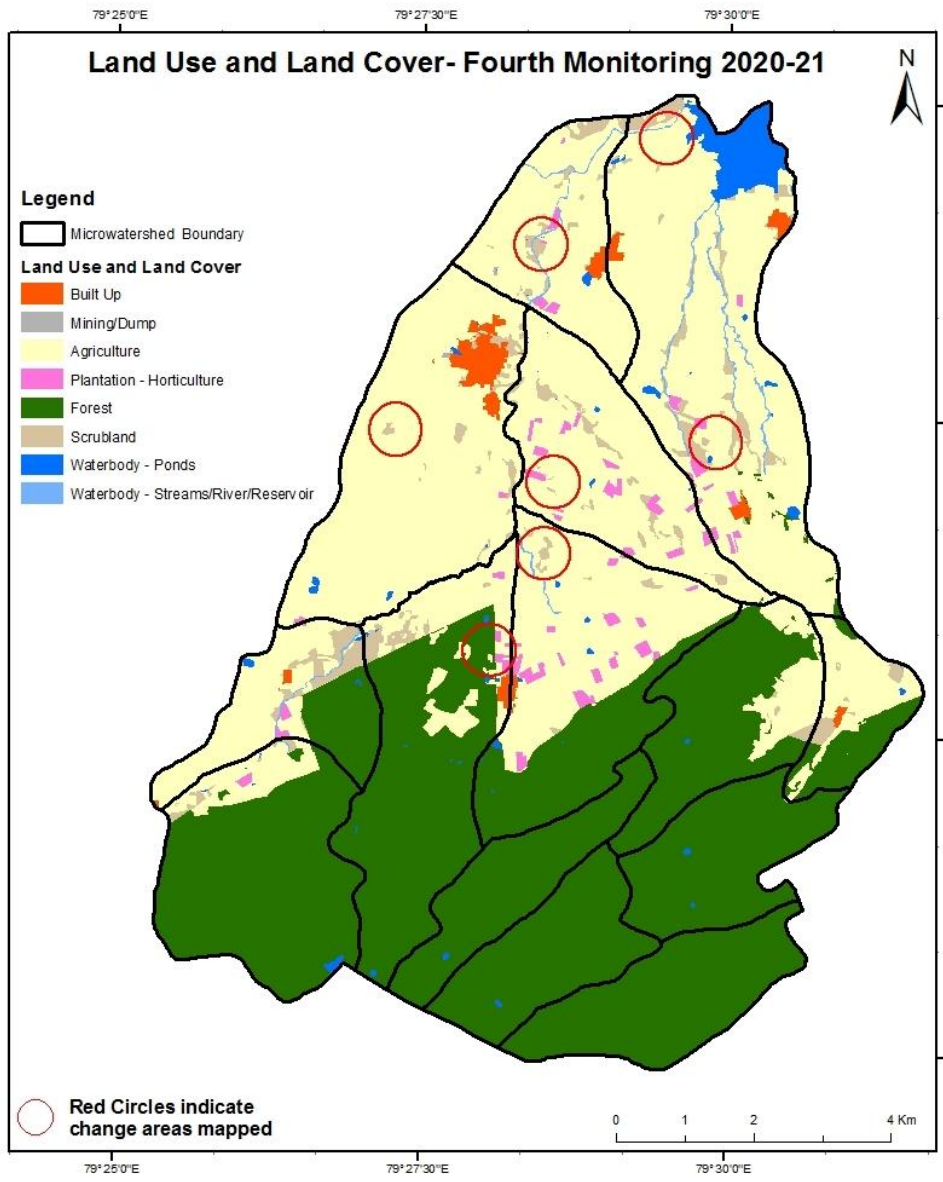
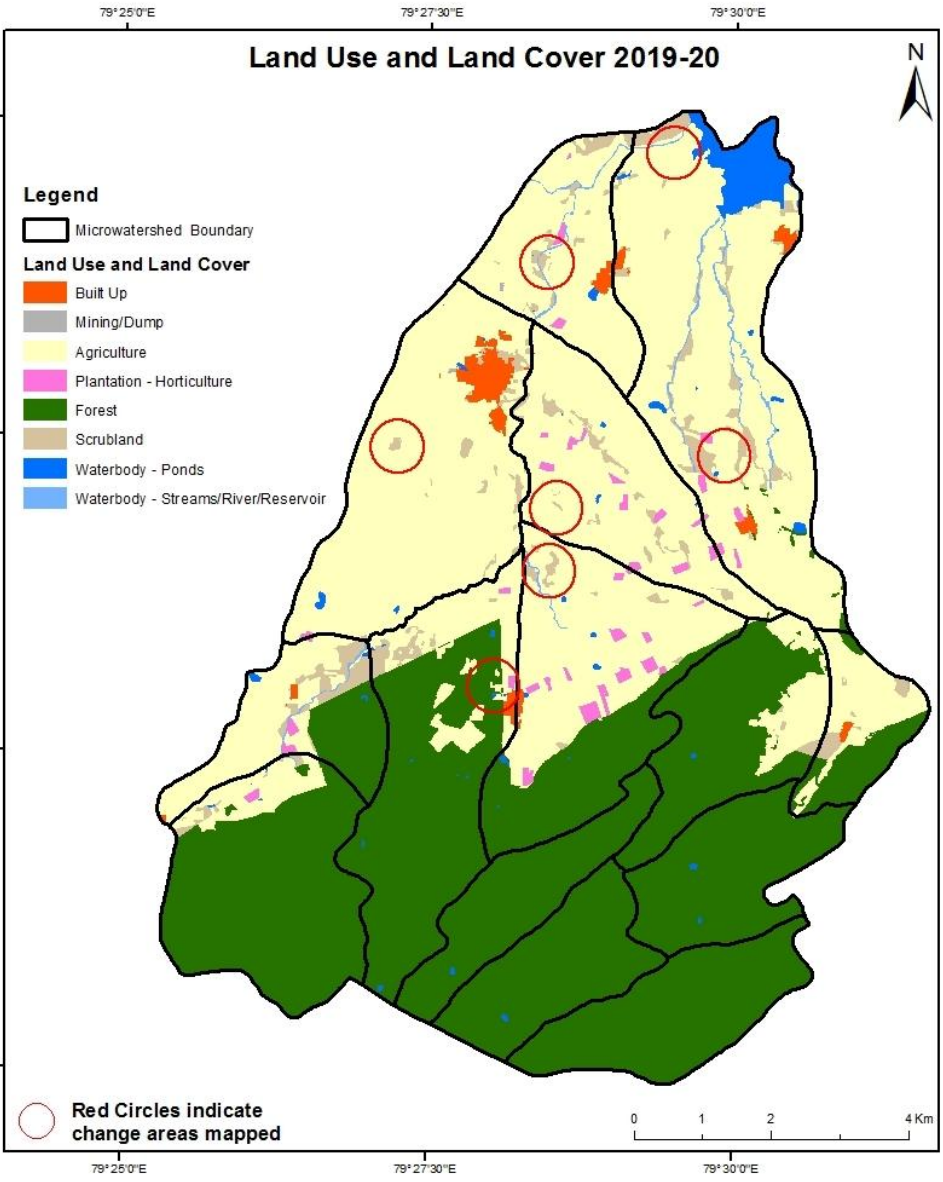


Fig 10. Mutukuru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

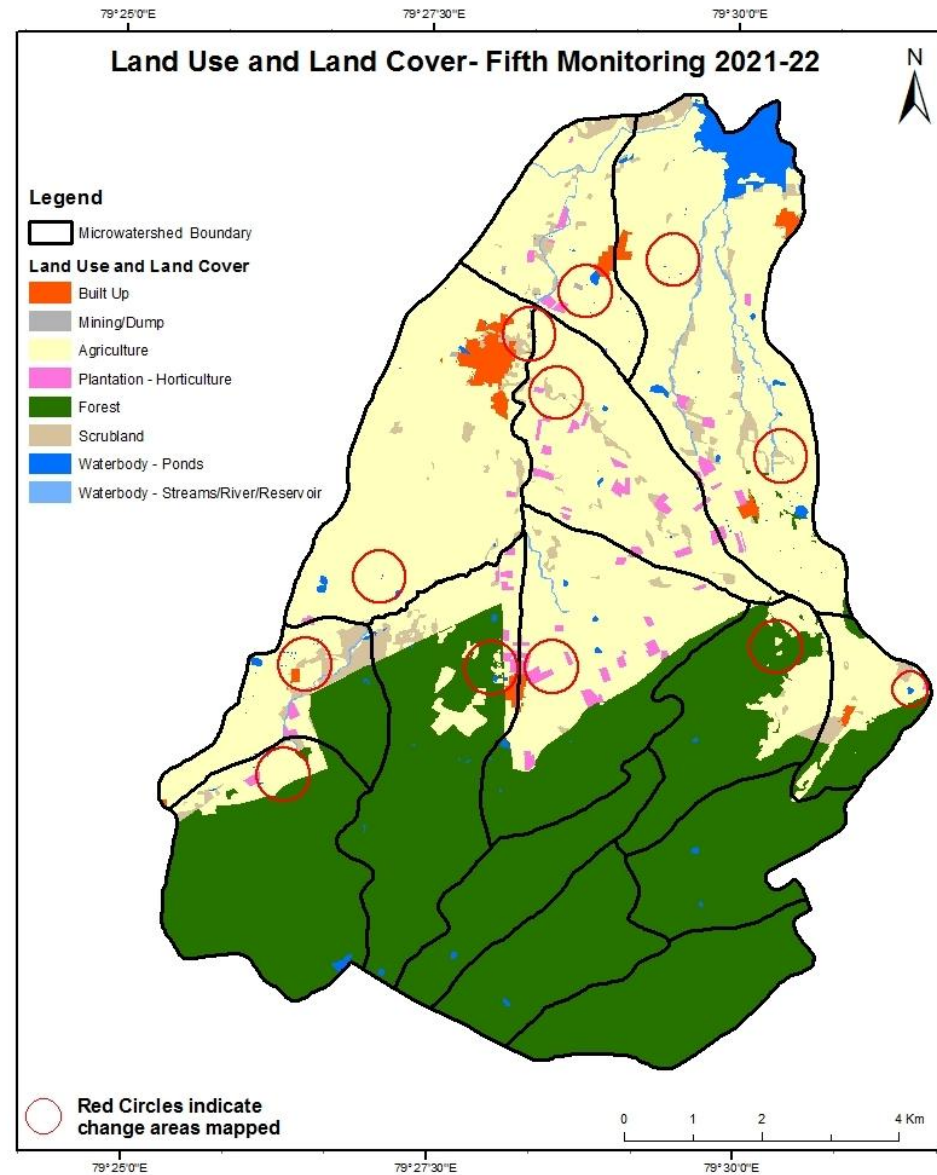
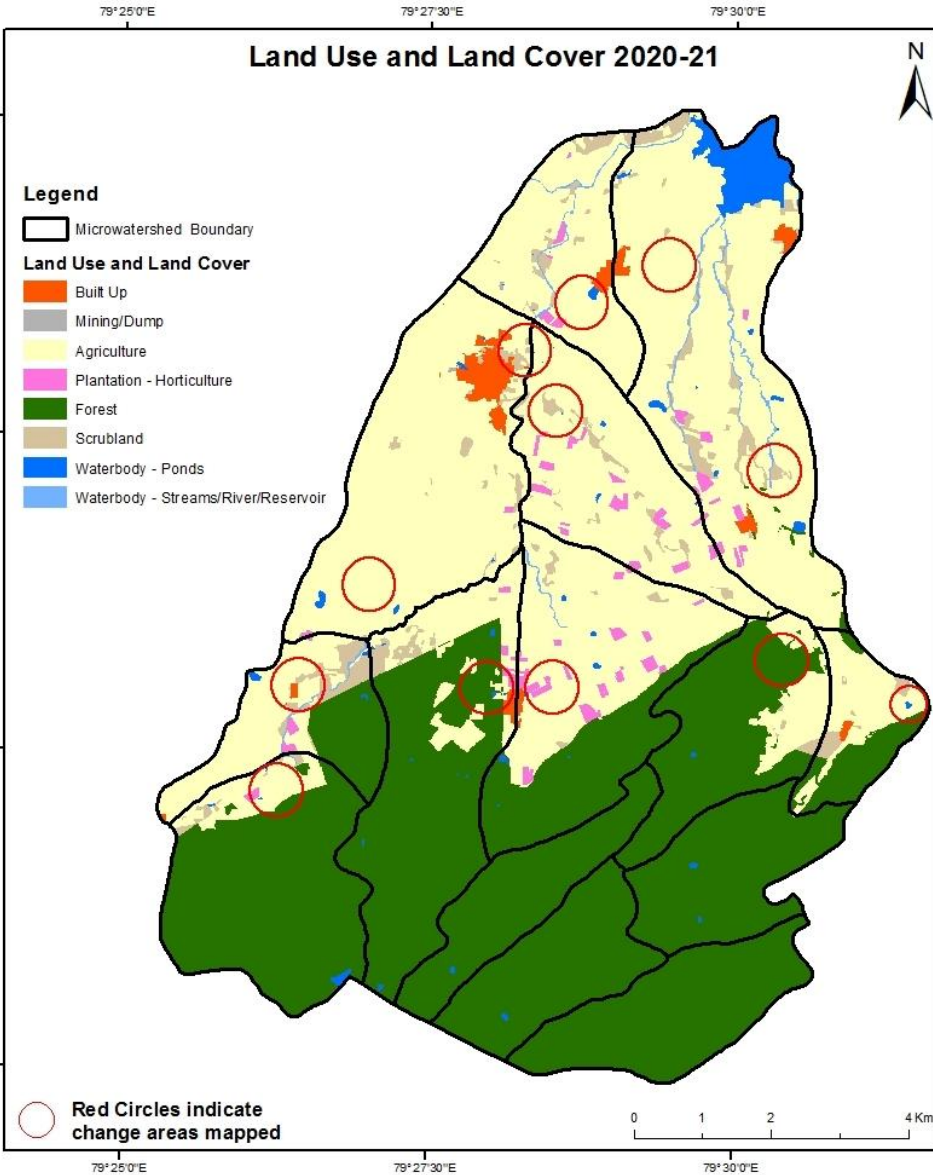
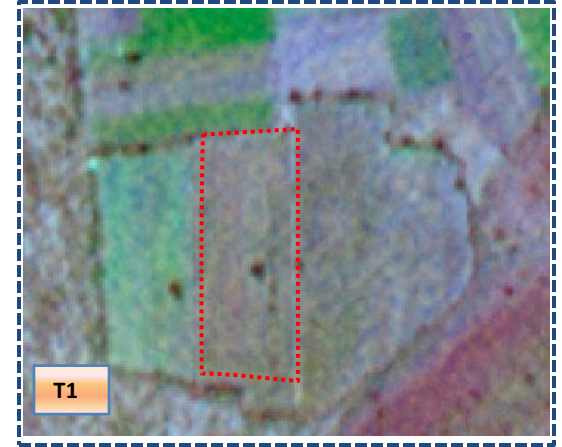


Fig 11. Mutukuru Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

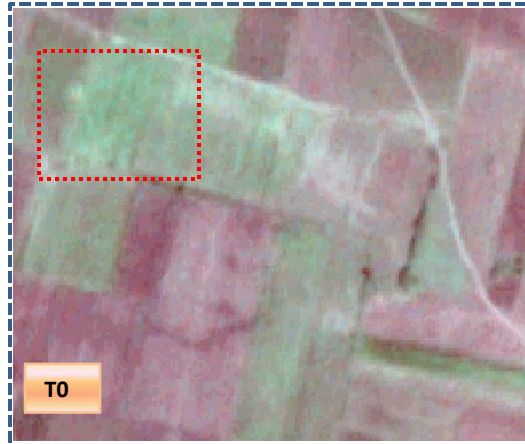


T0: 2013-14 (79°28'16.396"E 16°19'48.16"N)



T1: 14 February 2017

Agriculture to Water body



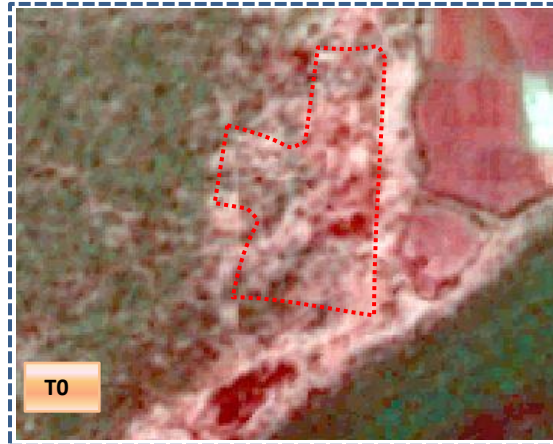
T0: 2013-14 (79°27'36.271"E 16°23'31.918"N)



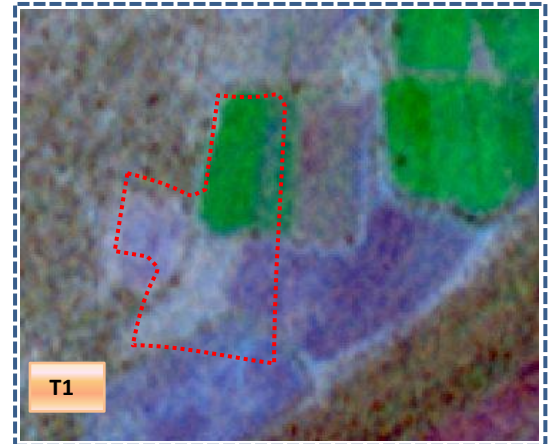
T1: 14 February 2017

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

Forest to Agriculture

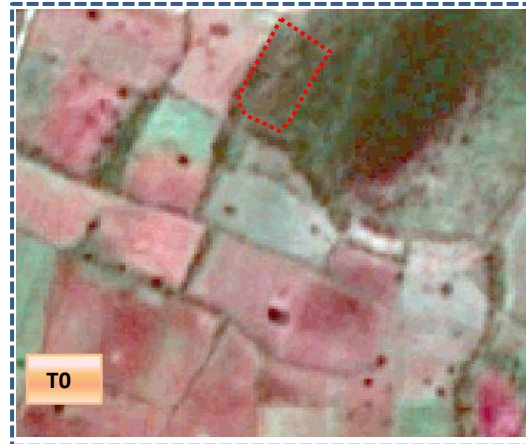


T0: 2013-14 (79°30'14.646"E 16°19'57.663"N)

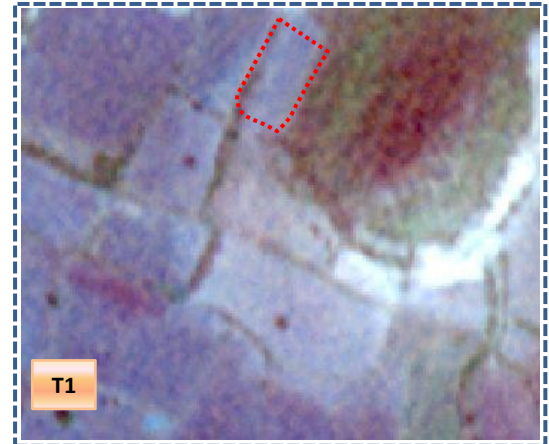


T1: 14 February 2017

Scrub to Agriculture



T0: 2013-14 (79°31'18.653"E 16°20'33.624"N)



T1: 14 February 2017

Table 4. showing change matrix depicting Land cover transitions for Mutukuru Watershed (IWMP-03/2013-14)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	79.63												79.63
Mining/dump													
Agriculture	6.65	0.09	4410.02	74.87	18.85			8.65		4.95			4524.08
Plantation Horticulture													
Forest			94.51		4322.98					2.78			4420.27
Forest Plantation													
Barren Rocky													
Scrub	5.81	0.07	51.32	0.27				340.93		0.65			399.05
Waterbody- Streams/River									65.39				65.39
Waterbody – Ponds			67.15							143.47			210.62
Grand Total	92.09	0.16	4623	75.14	4341.83			349.58	65.39	151.85			9699.04

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 change in between the classes.
2. In T0 114 ha of the agriculture area has decreased and it is converted into Built-up (6.65 ha), mining/dump (0.09 ha), plantation/horticulture (74.8 ha), forest (18.85 ha), scrub (8.65 ha) and water body (4.95 ha) in T1.
3. In T1 212 ha of the agriculture area has increased from forest (94.5 ha), scrubland (51.3 ha) and water body (67 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions Mutukuru Watershed (IWMP-03/2013-14) 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	92.09												92.09
Mining/dump		0.16											0.16
Agriculture	6.62	1.58	4595.1	17.33				2.33		0.04			4623
Plantation Horticulture			2.05	73.09									75.14
Forest			9.46		4332.37								4341.83
Forest Plantation													
Barren Rocky													
Scrub	1.7		41.69					306.19					349.58
Waterbody- Streams/River									65.39				65.39
Waterbody – Ponds			3.44							148.41			151.85
Grand Total	100.41	1.74	4651.74	90.42	4332.37			308.52	65.39	148.45			9699.04

4. In T1 27 ha of the agriculture area has decreased and it is converted into Built-up (6.6 ha), mining/dump (1.5 ha), plantations/horticulture (17.3 ha) , scrubland (2.3 ha) and water body (0.04 ha) in T2.

5. In T2 54 ha of the agriculture area has increased from plantations (2.05 ha), forest (9.4 ha) scrubland (41.6 ha)and water body (3.4 ha) of T1.

Table showing change matrix depicting Land cover transitions 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	100.41										100.41	
Mining/dump		1.74									1.74	
Agriculture	2.04		4632.27	17.43							4651.74	
Plantation Horticulture			23.78	66.64							90.42	
Forest	0.11		2.25		4330.01						4332.37	
Forest Plantation												
Barren Rocky												
Scrub	0.71	0.62	7.64					299.55			308.52	
Waterbody- Streams/River									65.39		65.39	
Waterbody – Ponds			0.37							148.08	148.45	
Grand Total	103.27	2.36	4666.31	84.07	4330.01			299.55	65.39	148.08	9699.04	

6. In T2 19.4 ha of the agriculture area has decreased and it is converted into Built-up (2.04 ha) and plantations/horticulture (17.4 ha) in T3.

7. In T3 10.2 ha of the agriculture area has increased from plantations (23.7 ha), forest (2.25 ha), scrubland (7.6 ha) and water body (0.37 ha) of T2.

Table showing change matrix depicting Land cover transitions 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	103.27												103.27
Mining/dump		2.32									0.04		2.36
Agriculture	2.25	0.01	4621.62	40.02				1.28			1.13		4666.31
Plantation Horticulture			5.19	78.88									84.07
Forest	0.06		0.62		4325.52						3.81		4330.01
Forest Plantation													
Barren Rocky													
Scrub	3.09		12.1	1.7				282.41			0.25		299.55
Waterbody- Streams/River									65.39				65.39
Waterbody – Ponds			2.21								145.87		148.08
Grand Total	108.67	2.33	4641.74	120.6	4325.52			283.69	65.39		151.1		9699.04

8. In T3 19.4 ha of the agriculture area has decreased and it is converted into built-up (2.25 ha), mining/dump (0.01 ha), plantations (40 ha), scrub (1.2 ha) and water body (1.1 ha) in T4.

9. In T4 10.2 ha of the agriculture area has increased from plantations (5.1 ha), forest (0.62 ha), scrubland (12 ha) and water body (2.2 ha) of T3.

Table showing change matrix depicting Land cover transitions 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		
T4													
Built up	108.67												108.67
Mining/dump		2.33											2.33
Agriculture	0.47	1.26	4626.11	7.4						6.4			4641.74
Plantation Horticulture			7.24	113.36									120.6
Forest	0.04		10.74		4314.58						0.16		4325.52
Forest Plantation													
Barren Rocky													
Scrub	0.56		11.73					271.34			0.06		283.69
Waterbody- Streams/River									65.39				65.39
Waterbody – Ponds			4.62								146.48		151.1
Grand Total	109.74	3.59	4660.44	120.76	4314.58			271.34	65.39		153.1		9699.04

10. In T4 44.6 ha of the agriculture area has decreased and it is converted into built-up (0.4 ha), mining/dump (1.2 ha), plantations/horticulture (7.4 ha) and water body (6.4 ha) in T5.

11. In T5 14.9 ha of the agriculture area has increased from plantations/horticulture (7.2 ha), forest (10.7 ha) and scrubland (11.7 ha) and water body (4.6 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 decrease of 57 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 98, 28, 14 & 18 Hectares from T0-T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 136 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
5. About **120 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 127 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
7. 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