

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

SRIKAKULAM -19/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

February-2023

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



AGRICULTURE & SOIL
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Andhra Pradesh



RURAL DEVELOPMENT AND
WATERSHED MONITORING
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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-19/2013-14, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **4,652 ha**. It comprises of 19 micro watersheds.
4. In the project area 138 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 28 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. 66 % is covered by the agriculture, 12 % is covered by forest, 6 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : PEDDASUNNAPURAM WATERSHED IWMP-19/2013-14

DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Pathapatnam Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 4,746 ha. It comprises of 19 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.

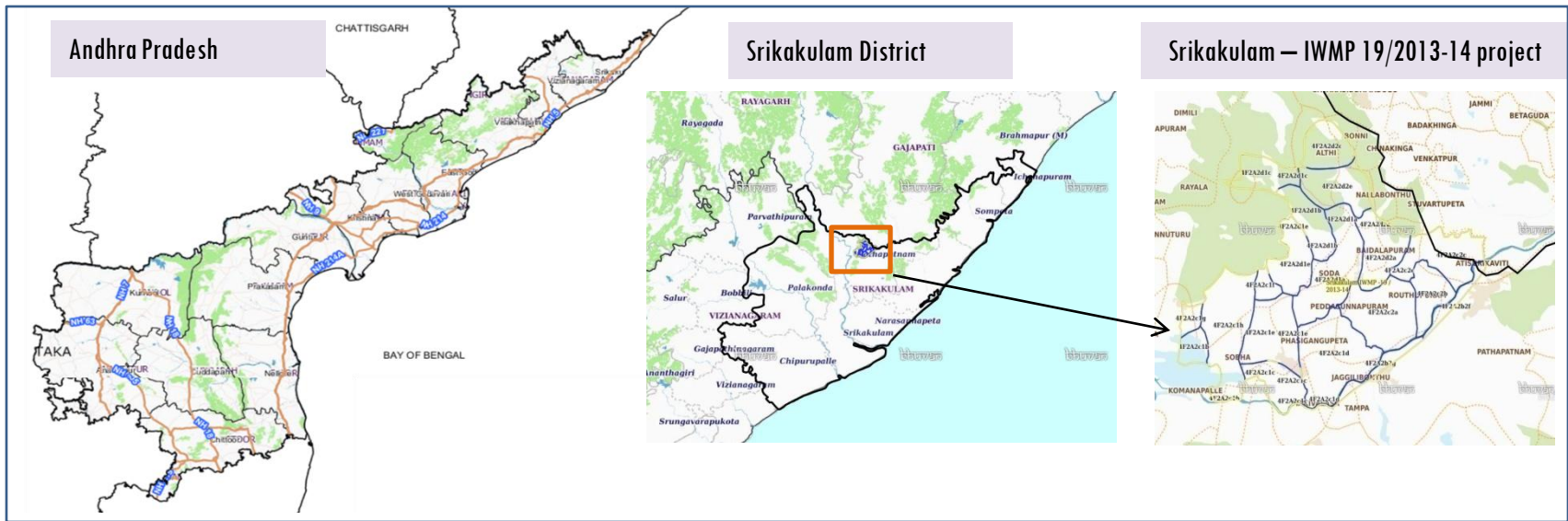


Fig.1. Location map of Peddasunnapuram Watershed (IWMP-19/2013-14) in Srikakulam, A.P

- 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 208 mm in September and October. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June- September).

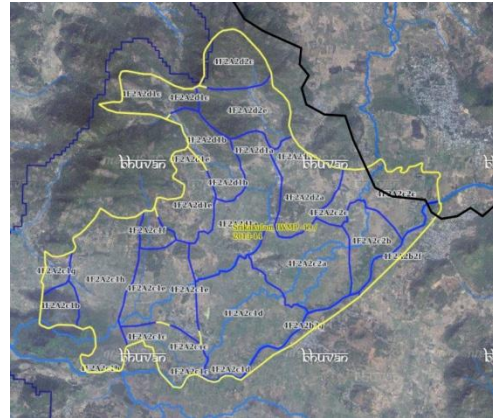
Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			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	138
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

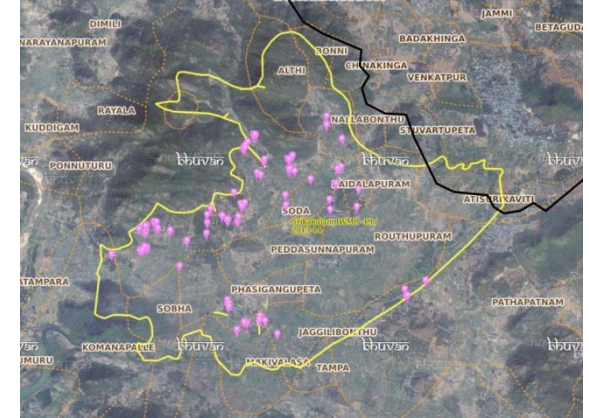


MWS Boundary



Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Table 3. Classification of the Activities

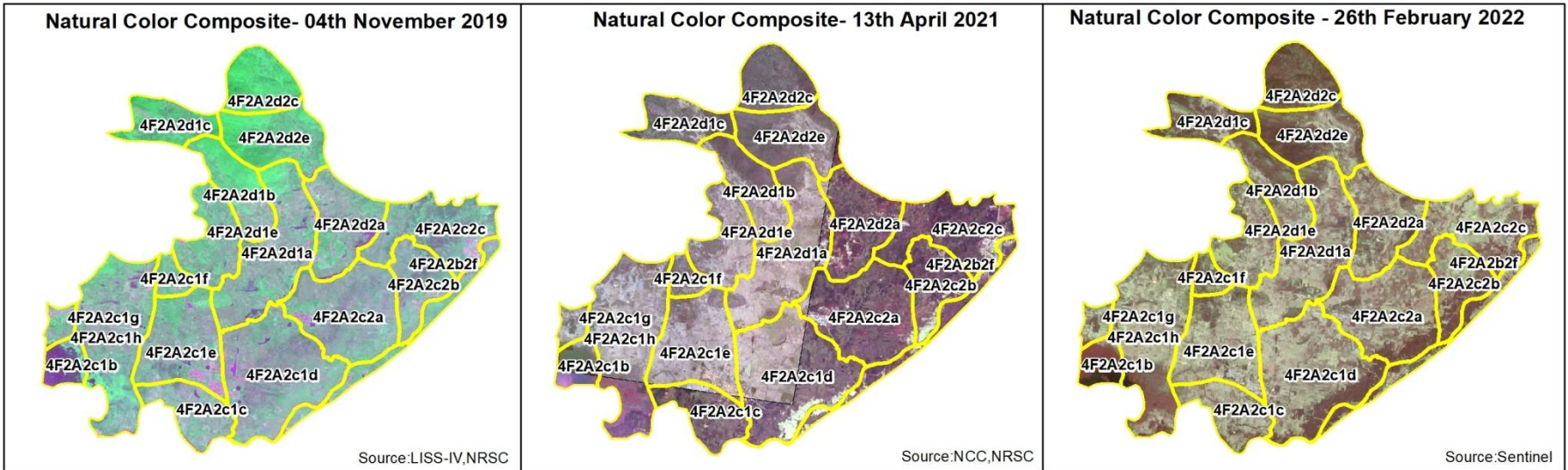
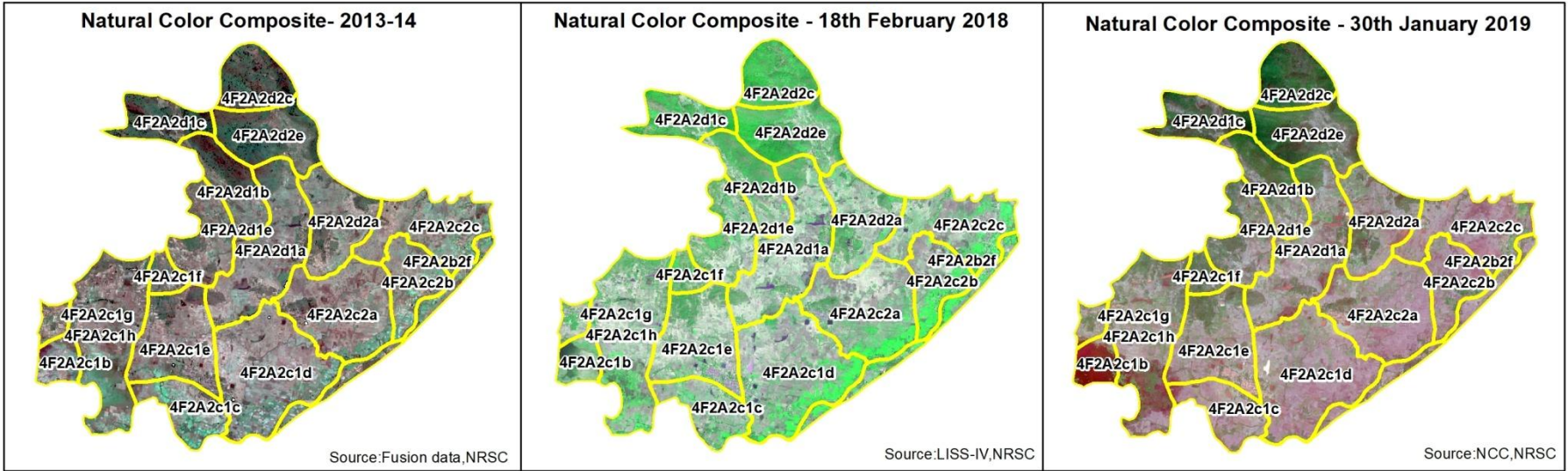
Sr. No	Activity	Number of Photographs uploaded in Drishti Mobile Application	Visible on satellite in Srishti Geoportal
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	9	9
11	Civil work-Check dams/Rock fill dam	22	22
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	18	17
18	Others	104	99
	TOTAL	144	138

03. MONITORING IN THE PROJECT AREA

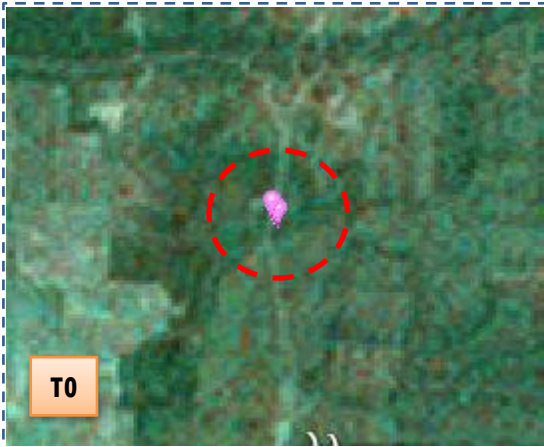
3.1 Site Wise Changes in the Project

- 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.

Peddasunnapuram Watershed (IWMP-19/2013-14) Natural Colour Composite (NCC)



Monitoring of activities in Peddasunnapuram Watershed (IWMP-19/2013-14) ,Srikakulam District Andhra Pradesh



T0:2013-14

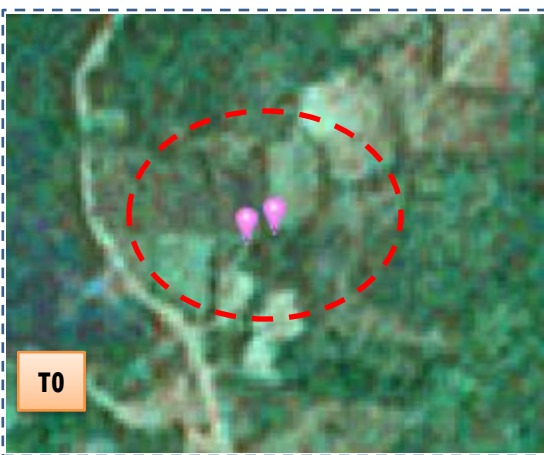


T1: 26 October 2018



Drishti Sl no. 7017698 MWS : 4F2A2c1h

Check dam



T0:2013-14



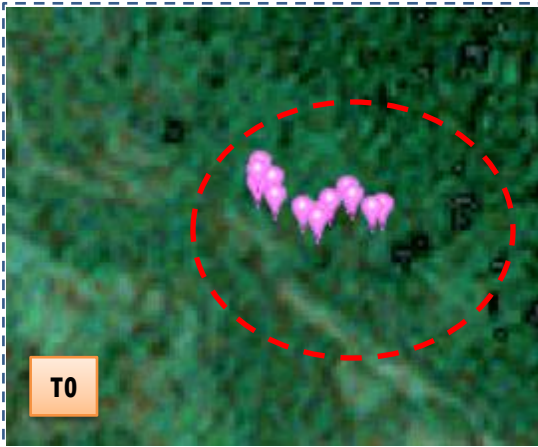
T1: 26 October 2018



Drishti Sl no. 2197518 MWS : 4F2A2d1a

Ground Water Recharge Structure

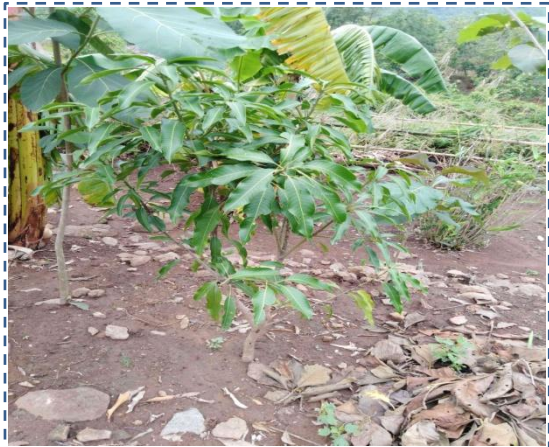
Monitoring of activities in Peddasunnapuram Watershed (IWMP-19/2013-14) ,Srikakulam District Andhra Pradesh



T0:2013-14

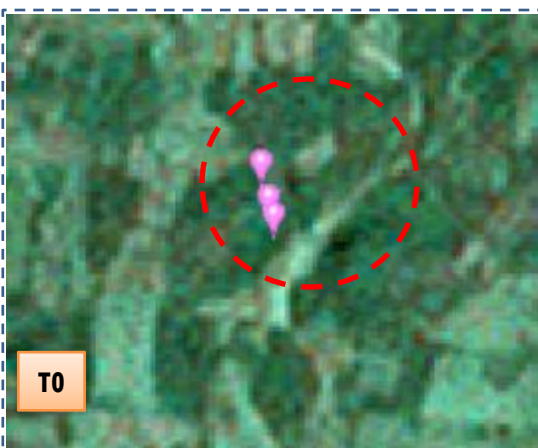


T1: 26 October 2018



Drishti Sl no. 7022656 MWS : 4F2A2d1b

Horticulture



T0:2013-14



T1: 26 October 2018



Drishti Sl no. 7036515 MWS : 4F2A2c1h

Percolation tank

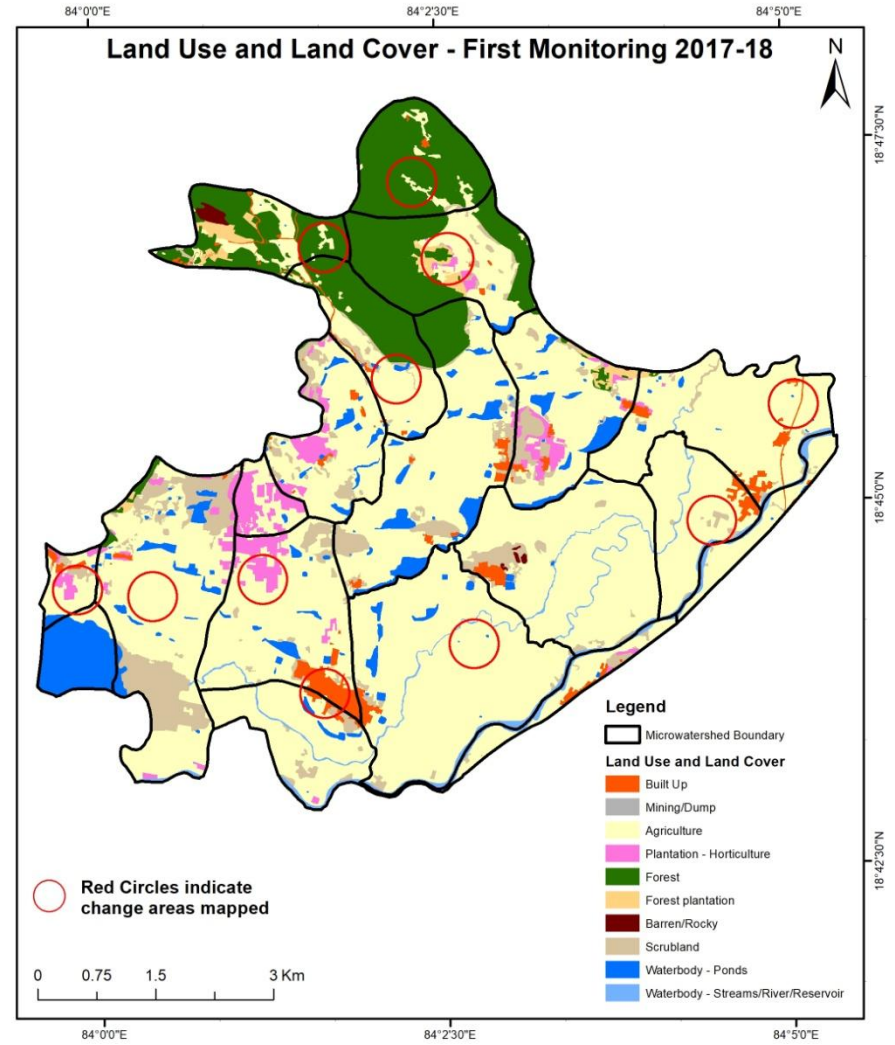
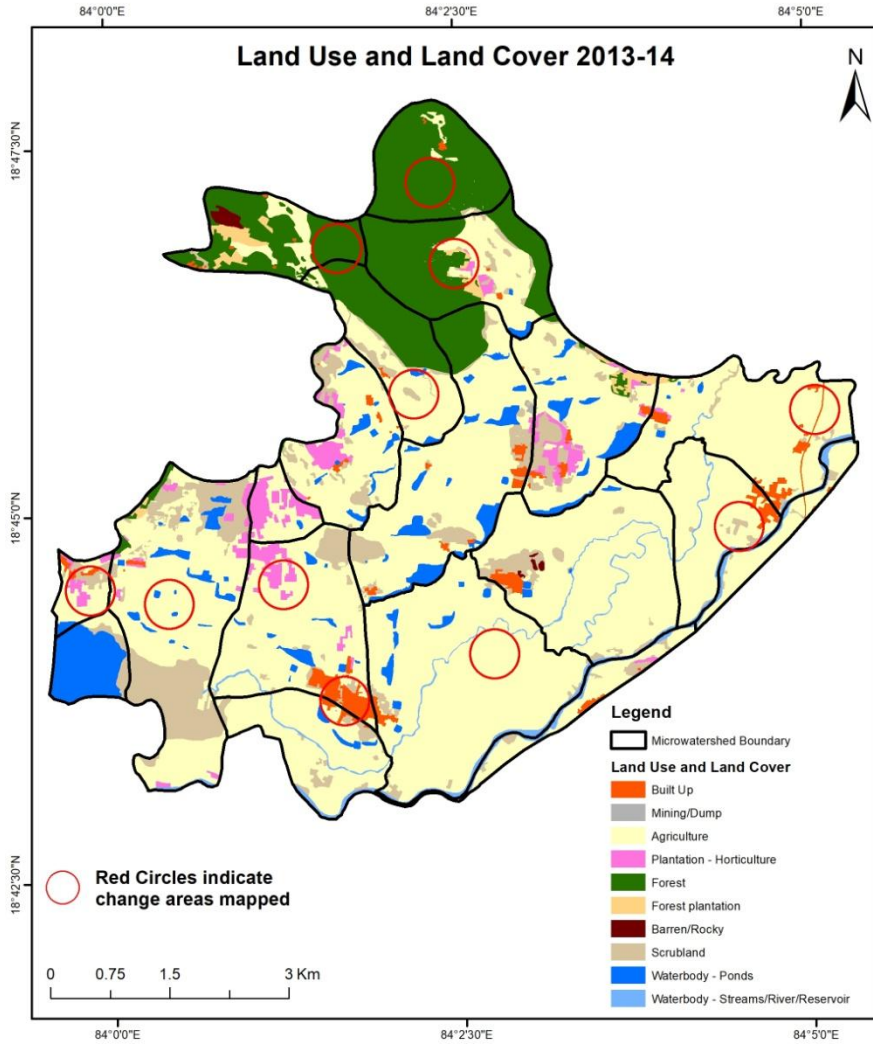
03. MONITORING IN THE PROJECT AREA

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)

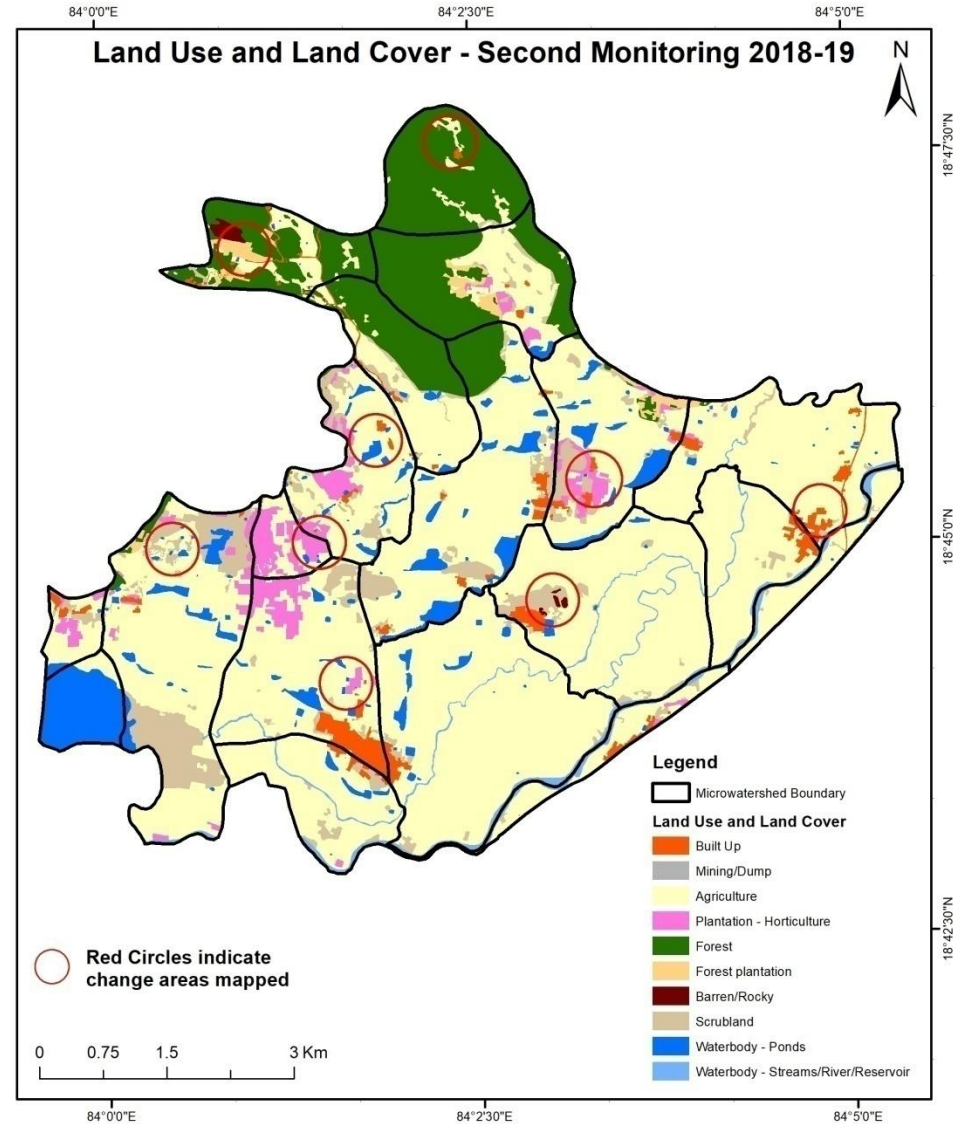
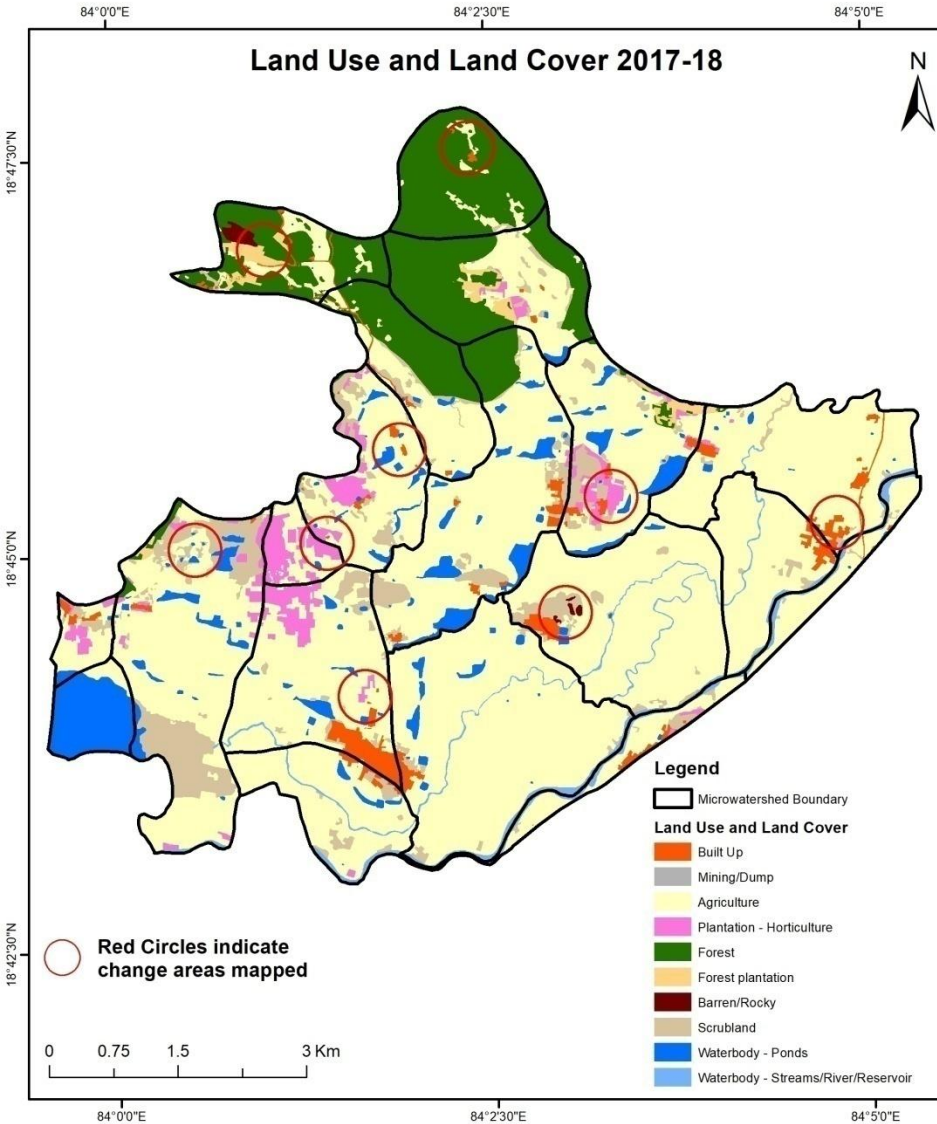
Peddasunnapuram Watershed (IWMP-19/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000



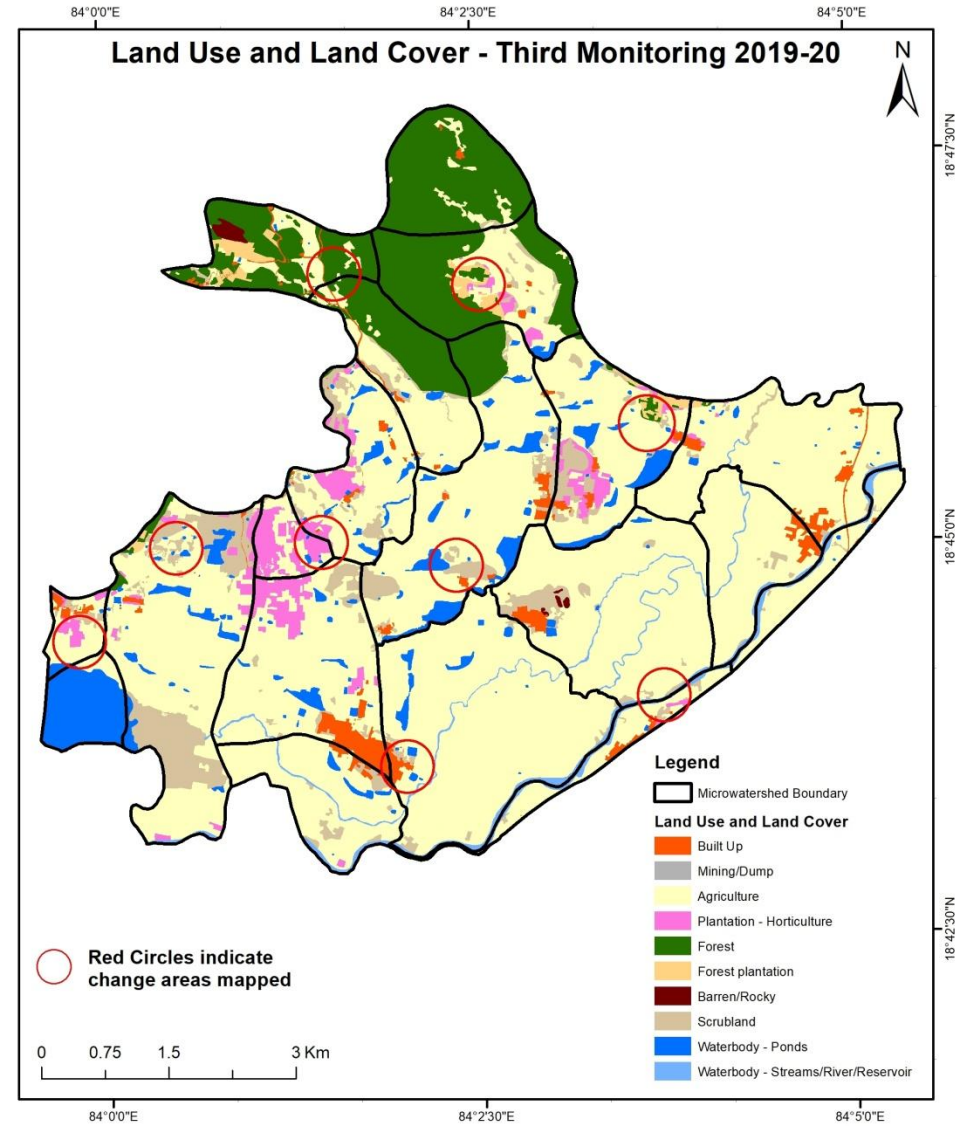
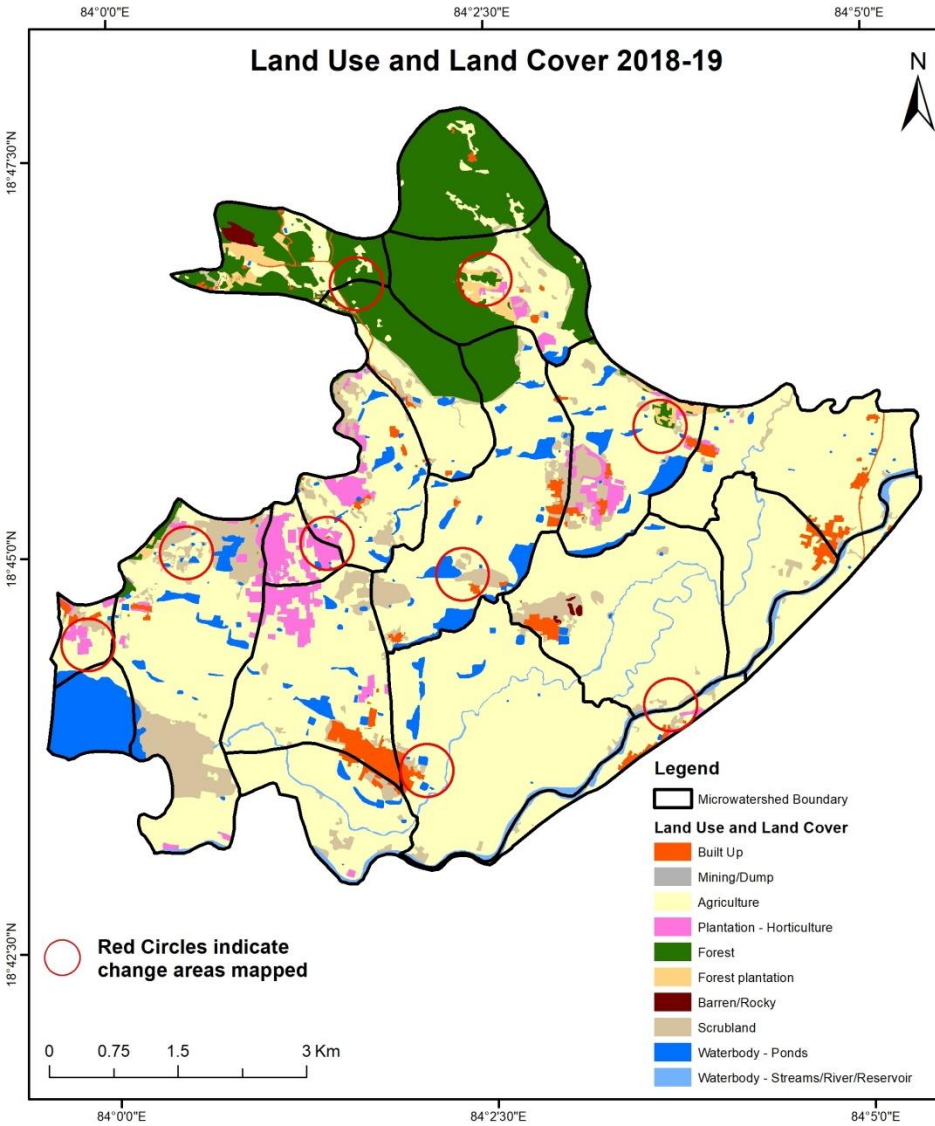
Peddasunnapuram Watershed (IWMP-19/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



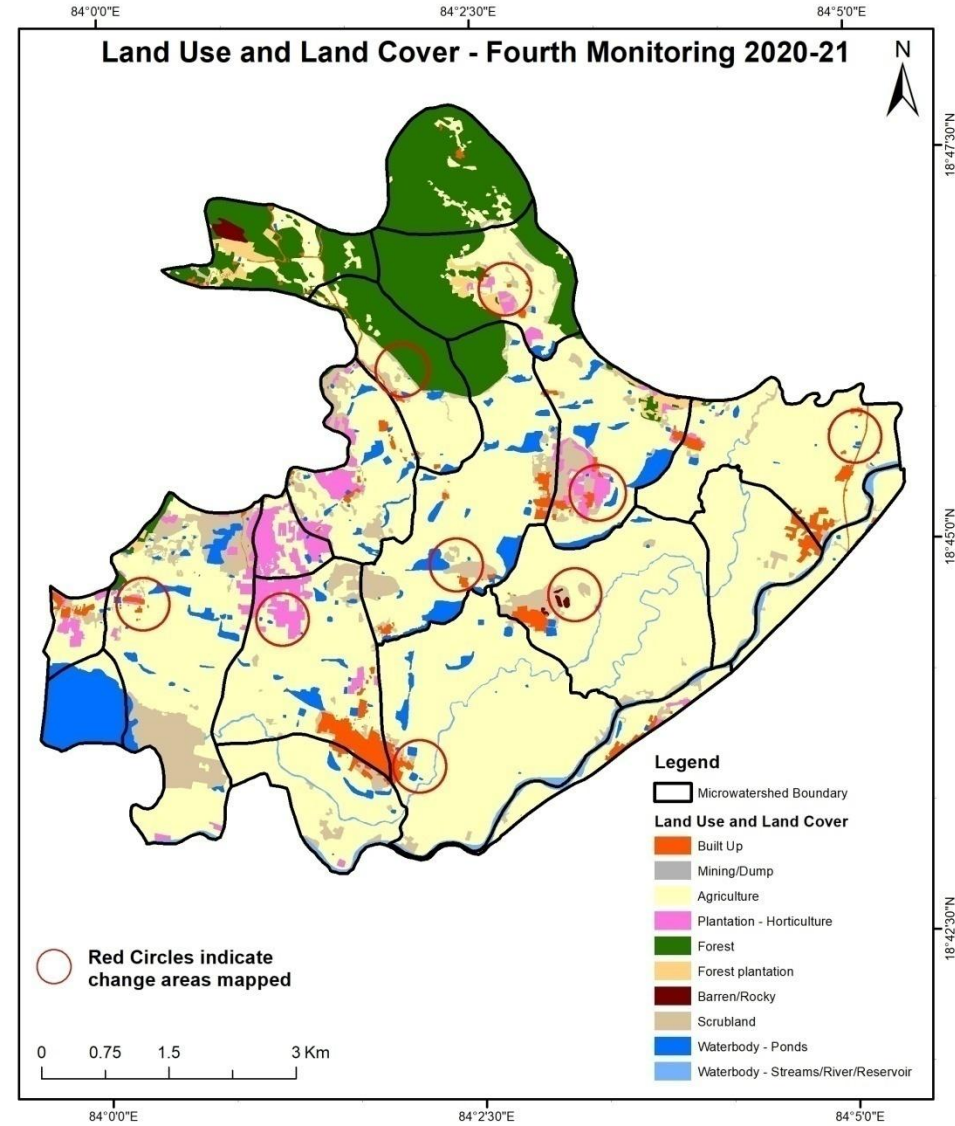
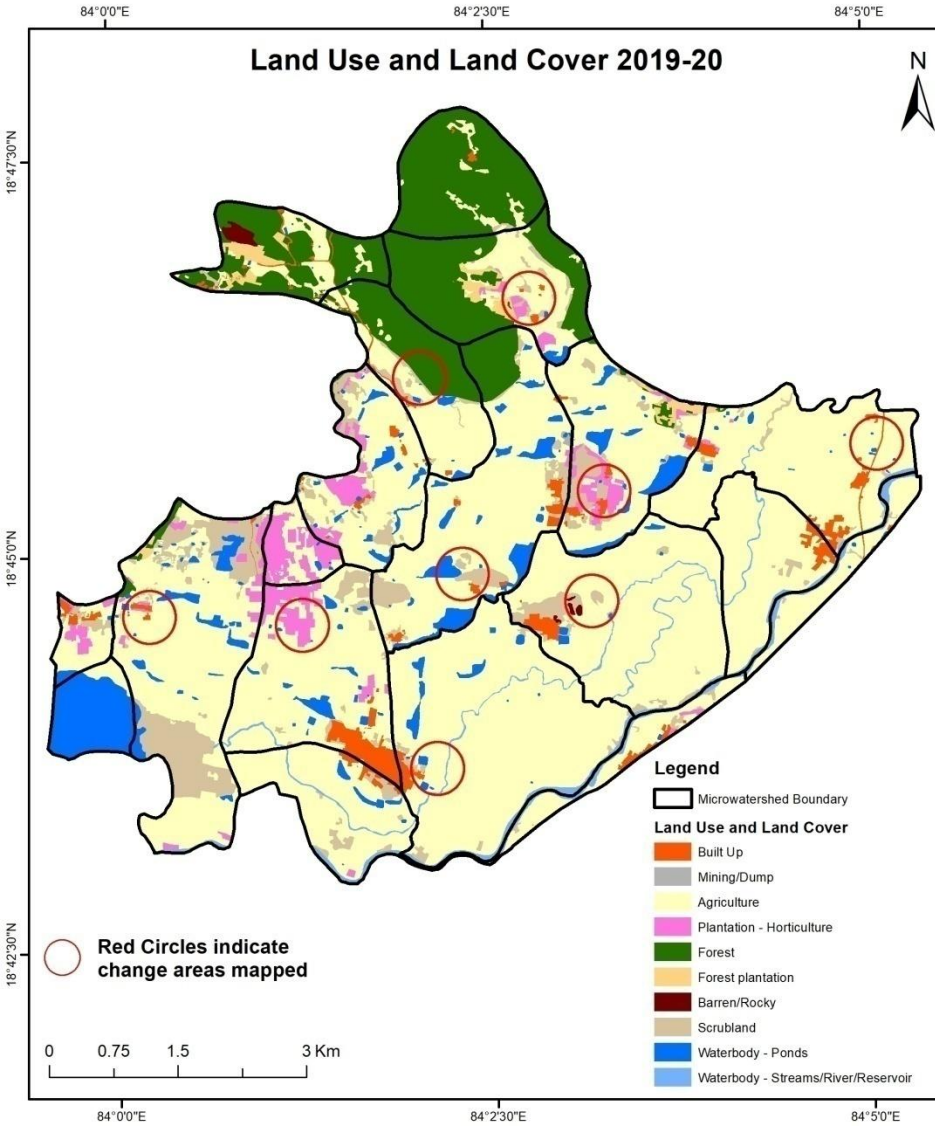
Peddasunnapuram Watershed (IWMP-19/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000



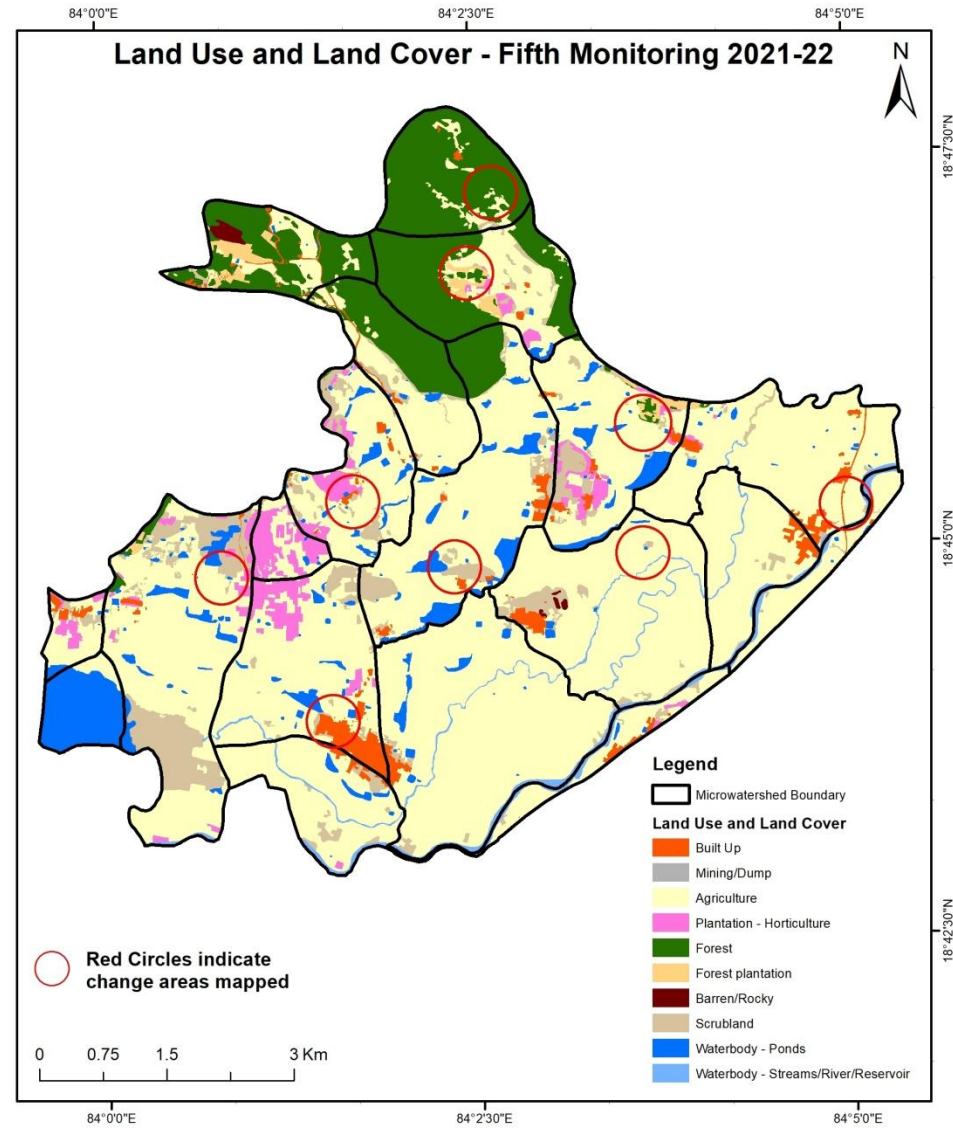
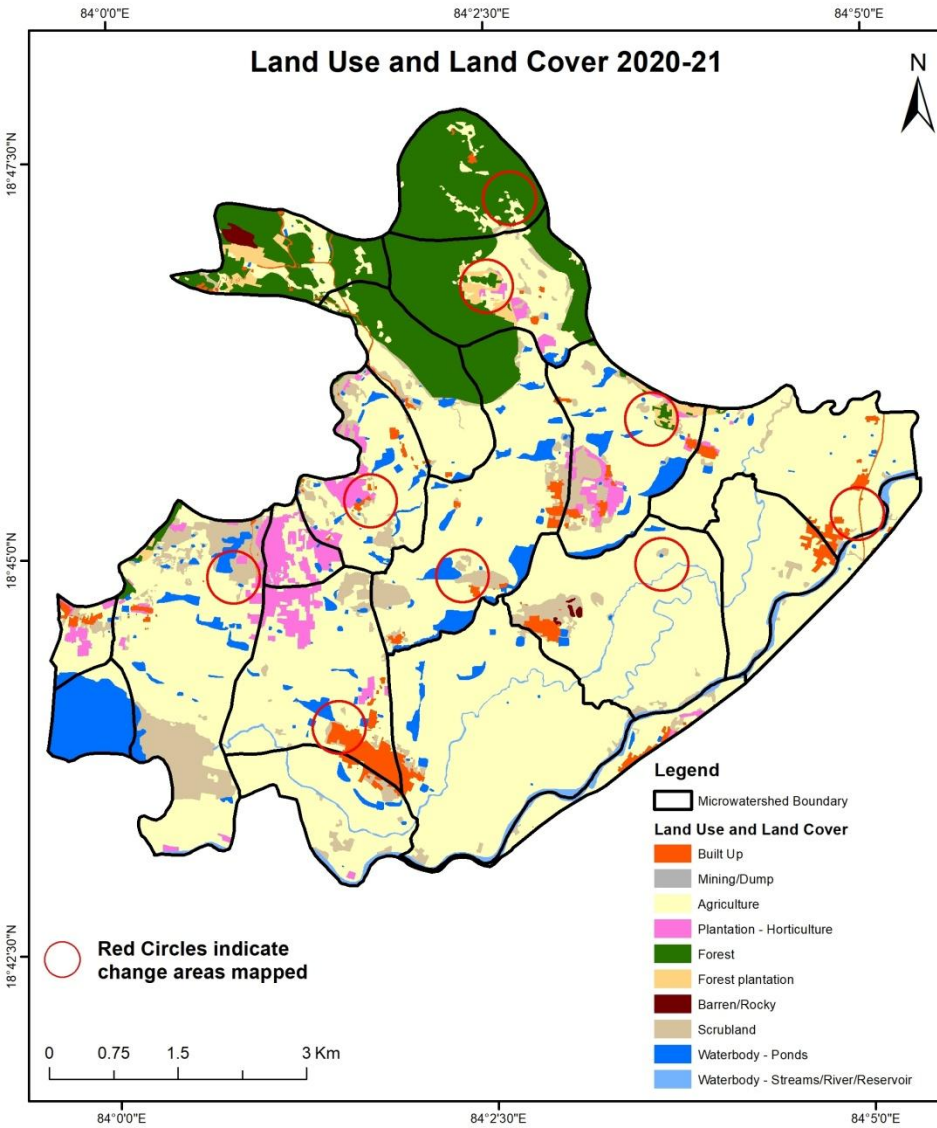
Peddasunnapuram Watershed (IWMP-19/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000



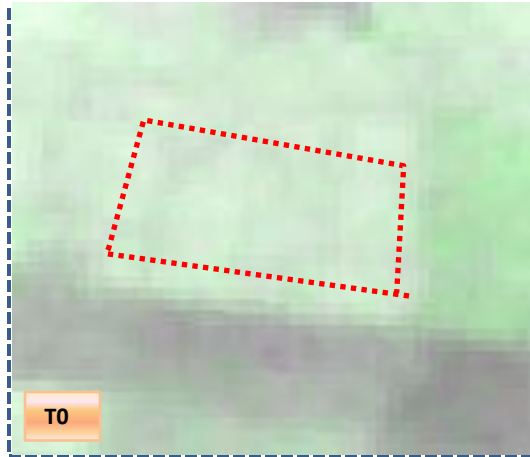
Peddasunnapuram Watershed (IWMP-19/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000



Peddasunnapuram Watershed (IWMP-19/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

T0: 2013-14 (77°50'50.676"E 14°21'19.556"N)



T1

T1: 13 February 2017

Plantation to Agriculture



T0

T0: 2013-14 (84°0'21.175"E 18°43'22.348"N)



T1

T1: 13 February 2017

Peddasunnapuram Watershed (IWMP-19/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

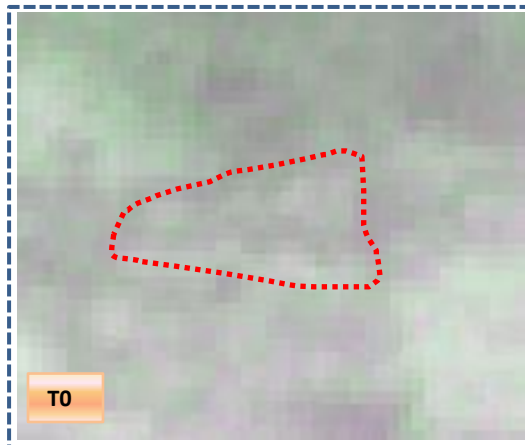


T0: 2013-14 (84°1'39.142"E 18°44'43.19"N)

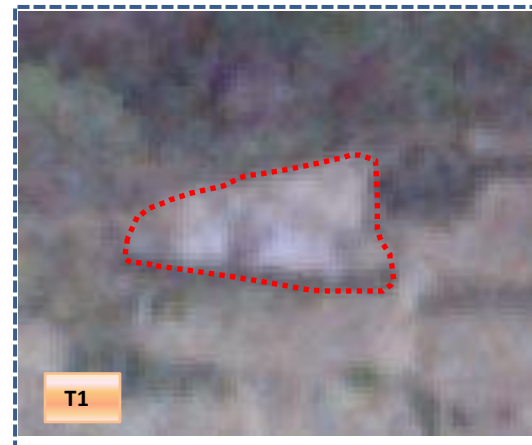


T1: 13 February 2017

Agriculture to Waterbody



T0: 2013-14 (84°1'39.071"E 18°44'39.249"N)



T1: 13 February 2017

Table showing change matrix depicting Land cover transitions for Peddasunnapuram Watershed (IWMP-19/2013-14) 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	94.36												94.36
Mining/dump		1.23											1.23
Agriculture	9.48		2985.97	20.94							6.83		3023.22
Plantation Horticulture	1.10		0.38	124.81									126.29
Forest	3.91		24.12		603.91	6.22							638.15
Forest Plantation	0.28		0.05			35.13							35.46
Barren Rocky							9.37						9.37
Scrub	4.86		51.17					320.02			17.01		393.07
Waterbody- Streams/River									104.82				104.82
Waterbody – Ponds			2.54								223.88		226.42
Grand Total	114.00	1.23	3064.23	145.75	603.91	41.34	9.37	320.02	104.82	247.72			4652.39

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 37 ha of the agriculture area has decreased and it is converted into Built-up (9 ha), plantation/horticulture (20 ha) and water body (6 ha) in T1.
3. In T1 78 ha of the agriculture area has increased from plantation/horticulture (0.3 ha), forest (24 ha), scrubland (51 ha) and water body (2.5 ha) of T0.

Table showing change matrix depicting Land cover transitions for Peddasunnapuram Watershed (IWMP-19/2013-14) 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	114.00										114.00	
Mining/dump		1.23									1.23	
Agriculture	2.40		3045.55	11.20						5.07	3064.23	
Plantation Horticulture	0.07		0.85	144.83							145.75	
Forest			0.59		603.32						603.91	
Forest Plantation						41.34					41.34	
Barren Rocky							9.37				9.37	
Scrub	0.71		5.94					310.82		2.55	320.02	
Waterbody- Streams/River									104.82		104.82	
Waterbody – Ponds										247.72	247.72	
Grand Total	117.19	1.23	3052.92	156.03	603.32	41.34	9.37	310.82	104.82	255.35	4652.39	

4. In T1 18.6 ha of the agriculture area has decreased and it is converted into Built-up (2.4 ha), plantation/horticulture (11 ha), and water body (5 ha) in T2.

5. In T2 7.3 ha of the agriculture area has increased from plantation/horticulture (0.8 ha), forest (0.5 ha) and scrubland (5.9 ha) of T1.

Table showing change matrix depicting Land cover transitions for Peddasunnapuram Watershed (IWMP-19/2013-14) 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	117.19										117.19	
Mining/dump		1.23									1.23	
Agriculture	2.11		3047.95							2.87	3052.92	
Plantation Horticulture	0.14		0.66	155.08						0.16	156.03	
Forest	0.06		2.78		600.48						603.32	
Forest Plantation						41.34					41.34	
Barren Rocky							9.37				9.37	
Scrub	0.78		0.11					309.24		0.69	310.82	
Waterbody- Streams/River									104.82		104.82	
Waterbody – Ponds	0.01									255.34	255.35	
Grand Total	120.28	1.23	3051.50	155.08	600.48	41.34	9.37	309.24	104.82	259.05	4652.39	

- In T2 4.9 ha of the agriculture area has decreased and it is converted into Built-up (2.1 ha) and water body (2.8 ha) in T3.
- In T3 3.5 ha of the agriculture area has increased from plantation/horticulture(0.6 ha), forest (2.7 ha) and scrubland (0.1 ha) of T2.

Table showing change matrix depicting Land cover transitions for Peddasunnapuram Watershed (IWMP-19/2013-14) 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	120.28										120.28
Mining/dump		1.23									1.23
Agriculture	3.85		3045.78	0.74						1.13	3051.50
Plantation Horticulture	0.18		0.65	154.25							155.08
Forest			4.72		595.38	0.24				0.14	600.48
Forest Plantation						41.34					41.34
Barren Rocky							9.37				9.37
Scrub	0.98		3.52	0.01				303.45		1.28	309.24
Waterbody- Streams/River									104.82		104.82
Waterbody – Ponds	0.13		3.19							255.74	259.05
Grand Total	125.41	1.23	3057.85	155.00	595.38	41.59	9.37	303.45	104.82	258.29	4652.39

- In T3 5.7 ha of the agriculture area has decreased and it is converted into built-up (3.8 ha), plantation/horticulture (0.7 ha), water body (1.1 ha) in T4.
- In T4 12 ha of the agriculture area has increased from plantation/horticulture(0.6 ha), forest (4.7 ha), scrubland (3.5 ha) and water body (3.1 ha) of T3.

Table showing change matrix depicting Land cover transitions for Peddasunnapuram Watershed (IWMP-19/2013-14) 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		
T4													
Built up	125.41												125.41
Mining/dump		1.23											1.23
Agriculture	0.27		3057.41	0.10						0.08			3057.85
Plantation Horticulture	0.11		1.50	153.39									155.00
Forest			2.97		592.41								595.38
Forest Plantation			0.19			41.40							41.59
Barren Rocky							9.37						9.37
Scrub	0.33		4.70					298.35		0.07			303.45
Waterbody- Streams/River									104.82				104.82
Waterbody – Ponds			3.29							255.00			258.29
Grand Total	126.12	1.23	3070.06	153.49	592.41	41.40	9.37	298.35	104.82	255.15			4652.39

- In T4 0.4 ha of the agriculture area has decreased and it is converted into built-up (0.2 ha), plantation/horticulture (0.1 ha) and water body (0.08 ha) in T5.
- In T5 12.6 ha of the agriculture area has increased from plantations/horticulture (1.5 ha), forest (2.9 ha), forest plantation (0.19 ha), scrubland (4.7 ha) and water body (3.2 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 28 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 41, 6 & 12 Hectares from T0-T1, T3-T4 & T4-T5 respectively and overall increase of 46 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About **27 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 94 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. 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