

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

VIZIANAGARAM -04/2013-14
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

		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-04/2013-14, Vizianagaram District of Andhra Pradesh. The total geographical area of the project is 7,020 ha. It comprises of 7 micro watersheds.
- In the project area 228 Drishti photos were uploaded showing 26 check dams/Rock fill dam, 18 entry point activities, 30 checks and plugins, 3 agriculture and 151 showing other activities.
- Water bodies have shown an decrease by 25 ha , which correspond to the various bodies that have been converted into other land use classes in this period..
- Major percentage i.e. 40 % is covered by the agriculture, 27 % is covered by forest 28 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : VANAJA WATERSHED - IWMP-04/2013-14

DISTRICT : VIZIANAGARAM , STATE : ANDHRA PRADESH

- The study area falls in Jiyammavalasa Mandal of Vizianagaram district of Andhra Pradesh state. The total geographical area of the project is 7,020 ha. It comprises of 7 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.

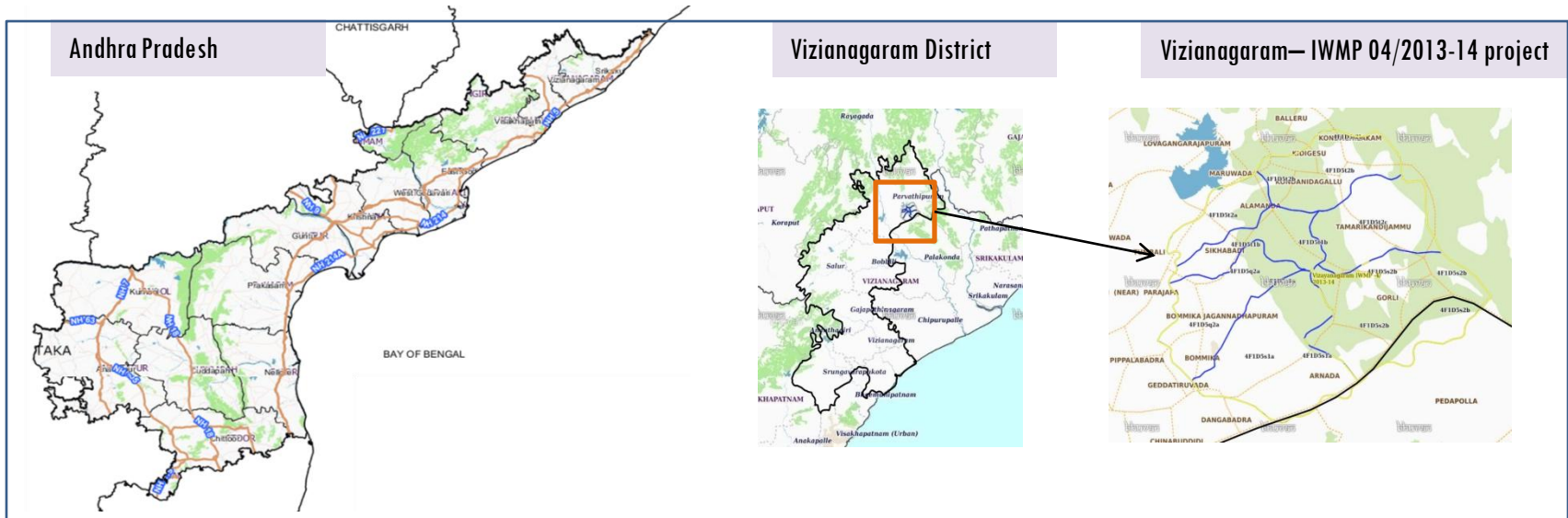


Fig.1. Location map of Vanaja Watershed (IWMP-04/2013-14) in Vizianagaram, A.P

- 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).

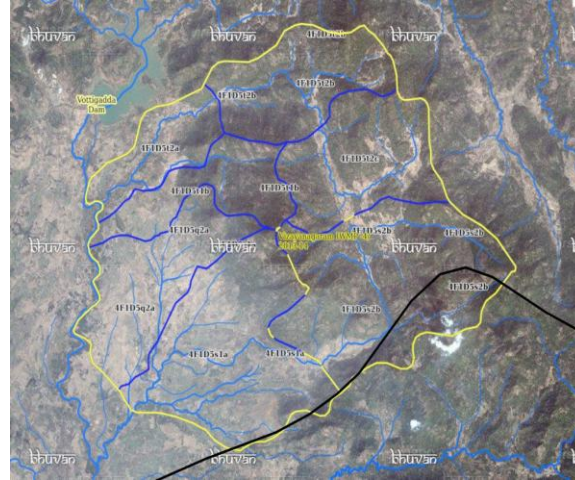
Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			2-Apr-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Apr-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	Drishiti Photographs		
		Total	228
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

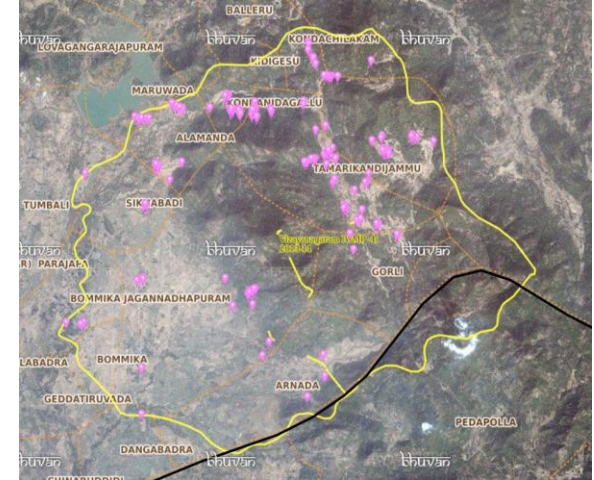


MWS Boundary



Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points



Drishiti 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	Agriculture/Horticulture	3	3
2	Afforestation	0	0
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	30	30
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	0	0
10	Civil work-Check dams/Rock fill dam	26	26
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	0	0
14	Livelihood Activities	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	19	18
17	Others	156	151
	TOTAL	234	228

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.

Fig4. Vanaja Watershed (IWMP-04/2013-14) Natural Colour Composite 2013-14 to 2017-18

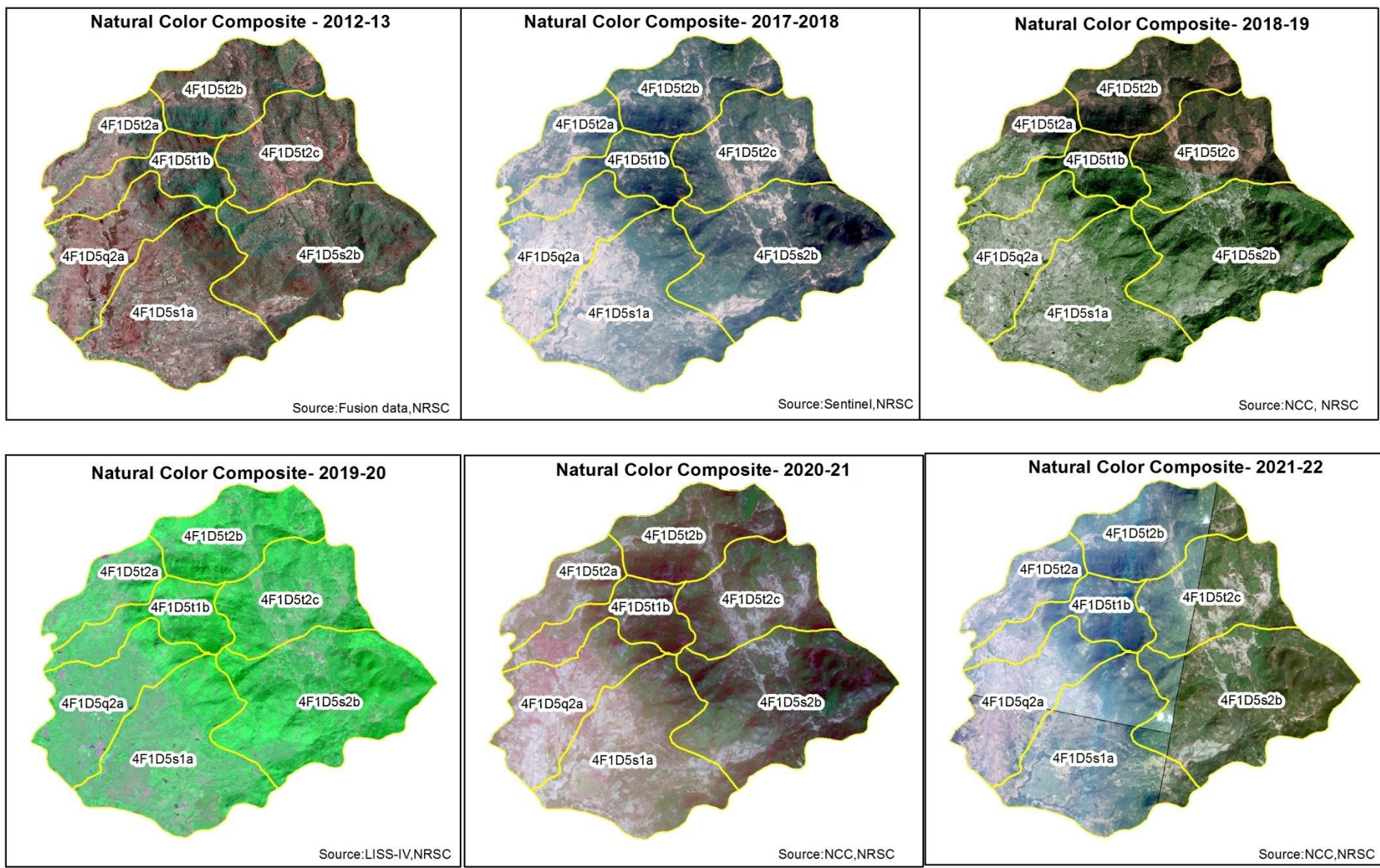
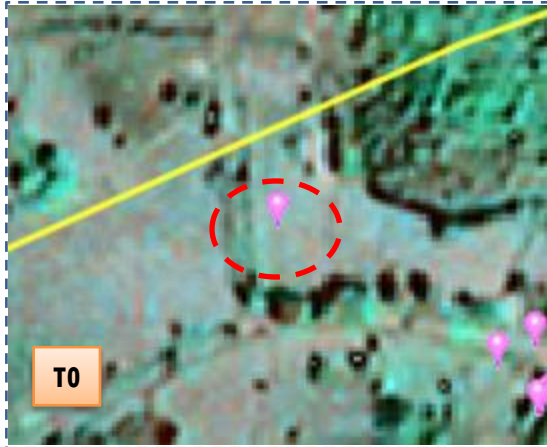
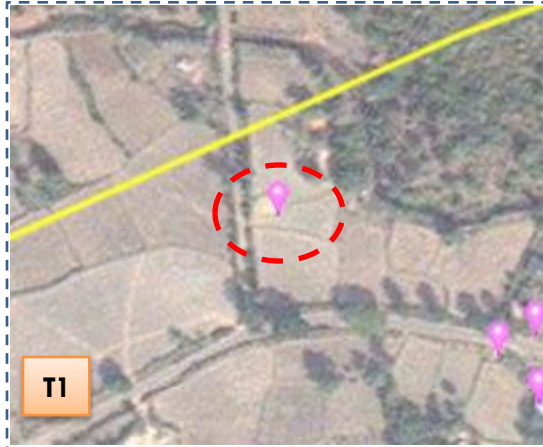


Fig 5. Monitoring of activities in Vanaja Watershed (IWMP-04/2013-14) Vizianagaram Dt Andhra Pradesh



T0:2009-10



T1: 06 January 2017



Drishti Sl no. 1665512 MWS :4F1D5t2a

Farm pond



T0:2009-10



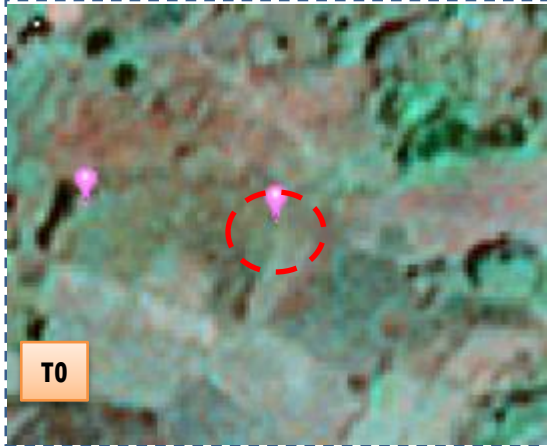
T1: 06 January 2017



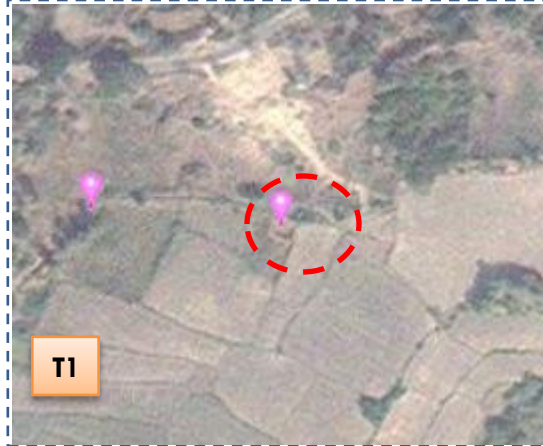
Drishti Sl no. 1680632 MWS :4F1D5t2b

Farm pond

Fig 6. Monitoring of activities in Vanaja Watershed (IWMP-04/2013-14) Vizianagaram Dt Andhra Pradesh



T0: 2009-10

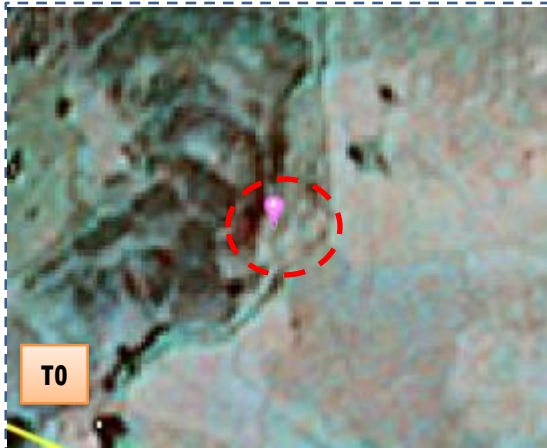


T1: 06 January 2017

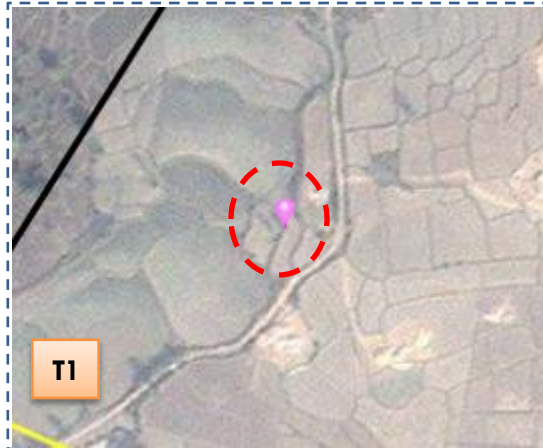


Drishti Sl no. 1809533 MWS : 4F1D5t2a

Farm pond



T0: 2009-10



T1: 06 January 2017



Drishti Sl no. 7010140 MWS : 4F1D5s2b

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)

Fig 7. Vanaja Watershed (IWMP-04/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

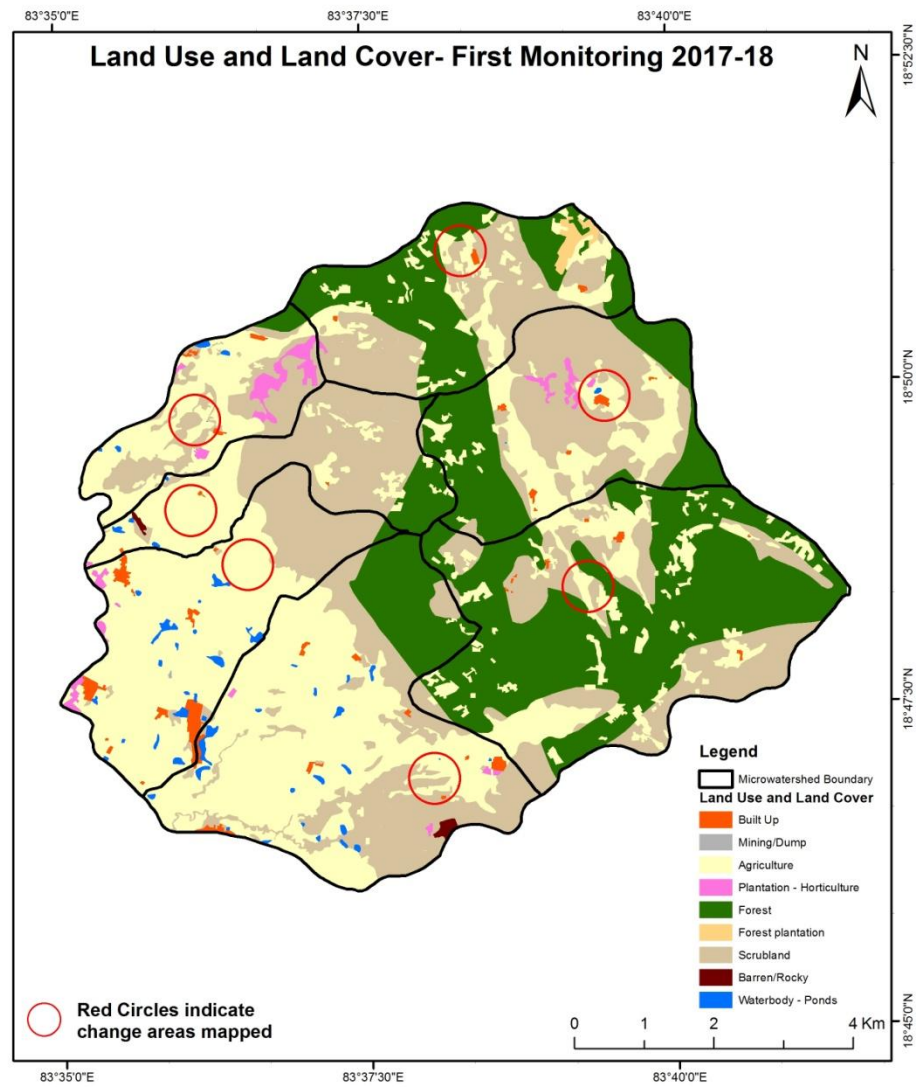
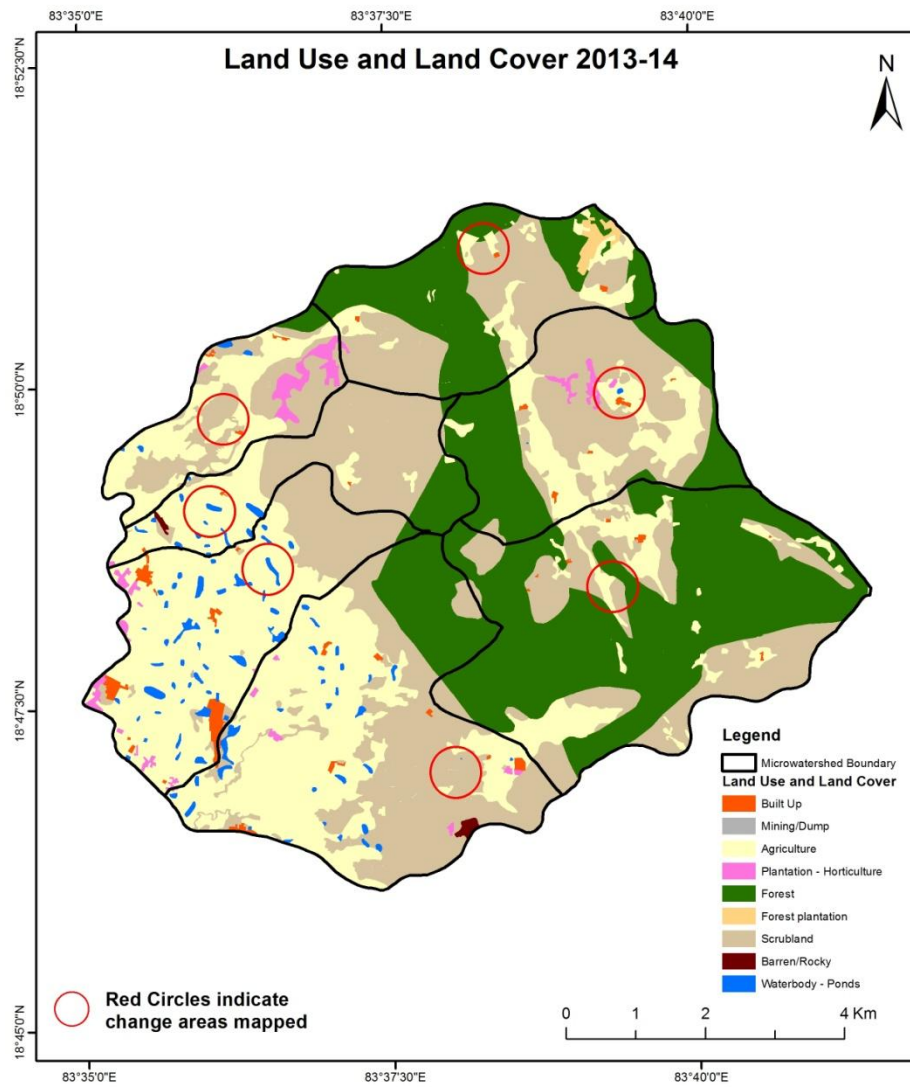


Fig 8. Vanaja Watershed (IWMP-04/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

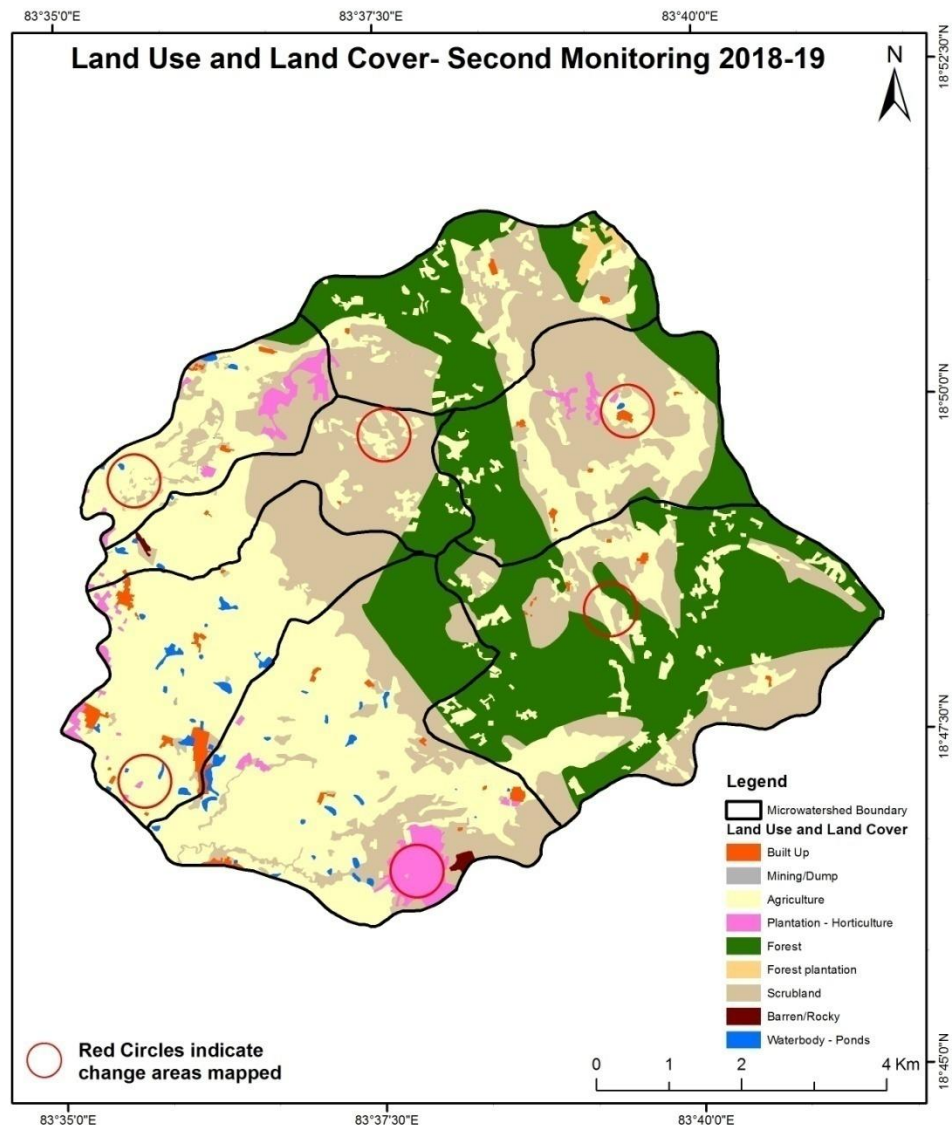
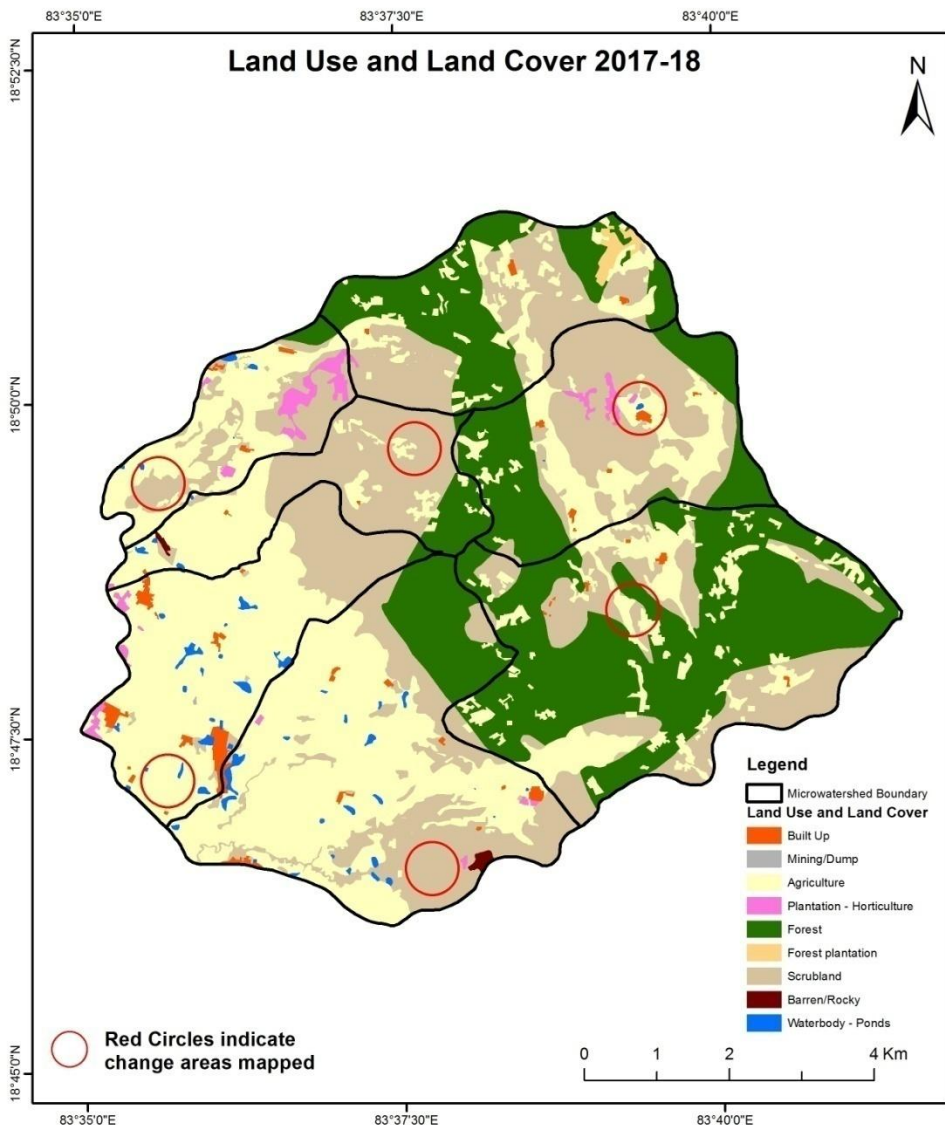


Fig 9. Vanaja Watershed (IWMP-04/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

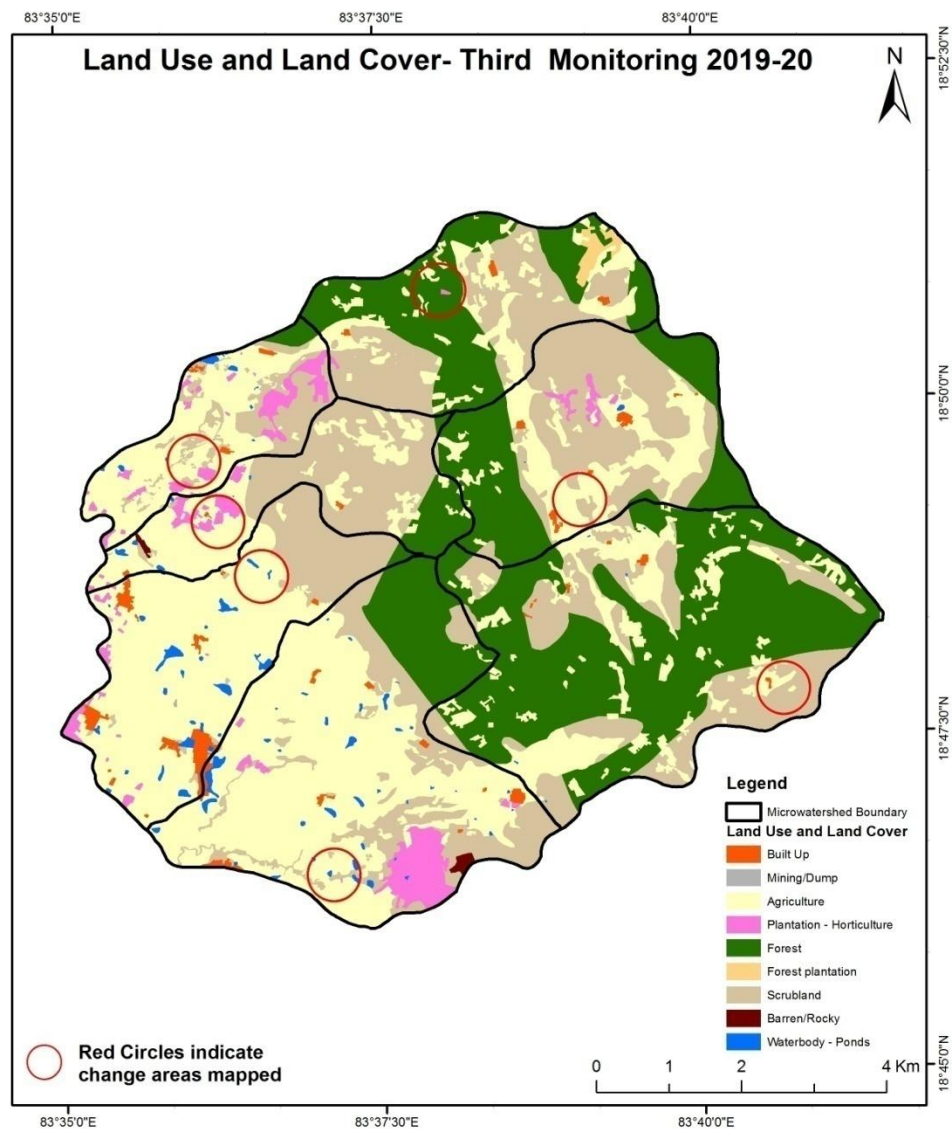
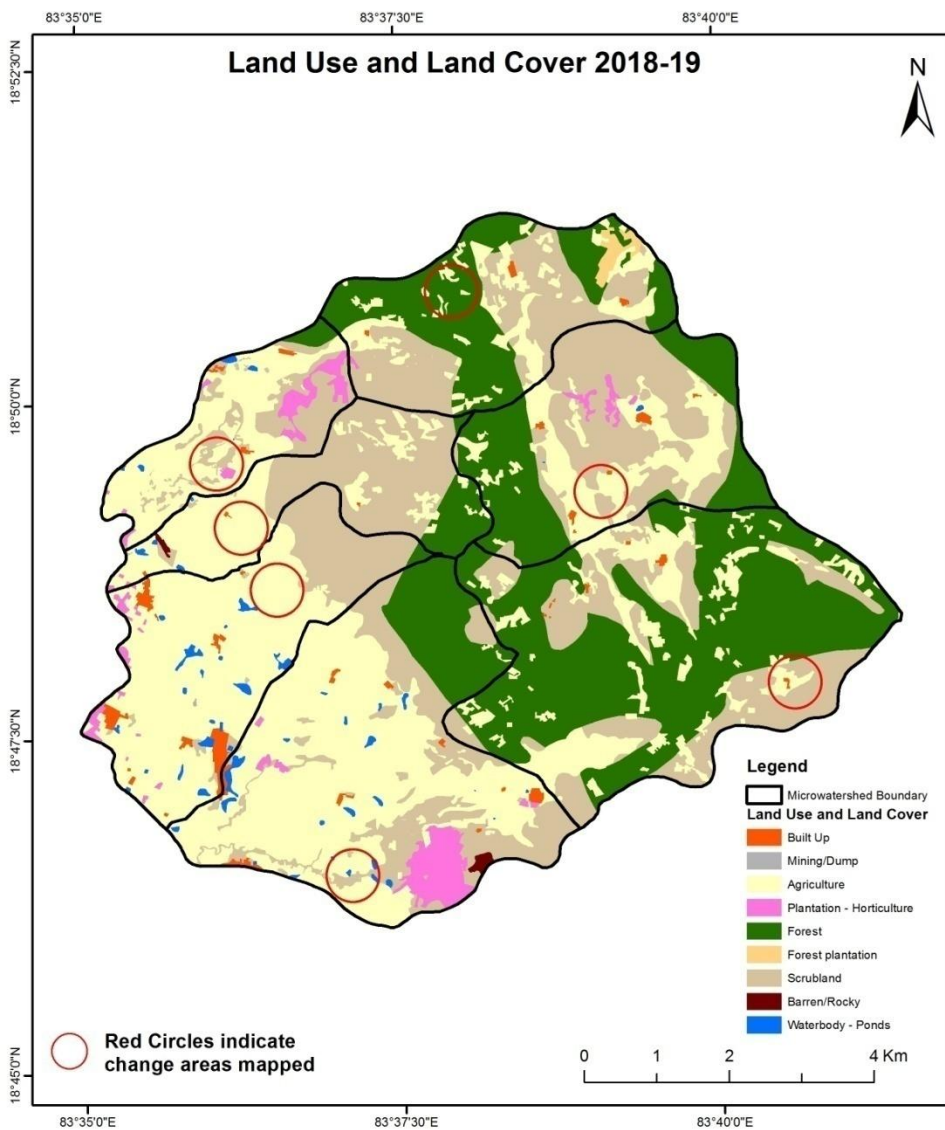


Fig 10. Vanaja Watershed (IWMP-04/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

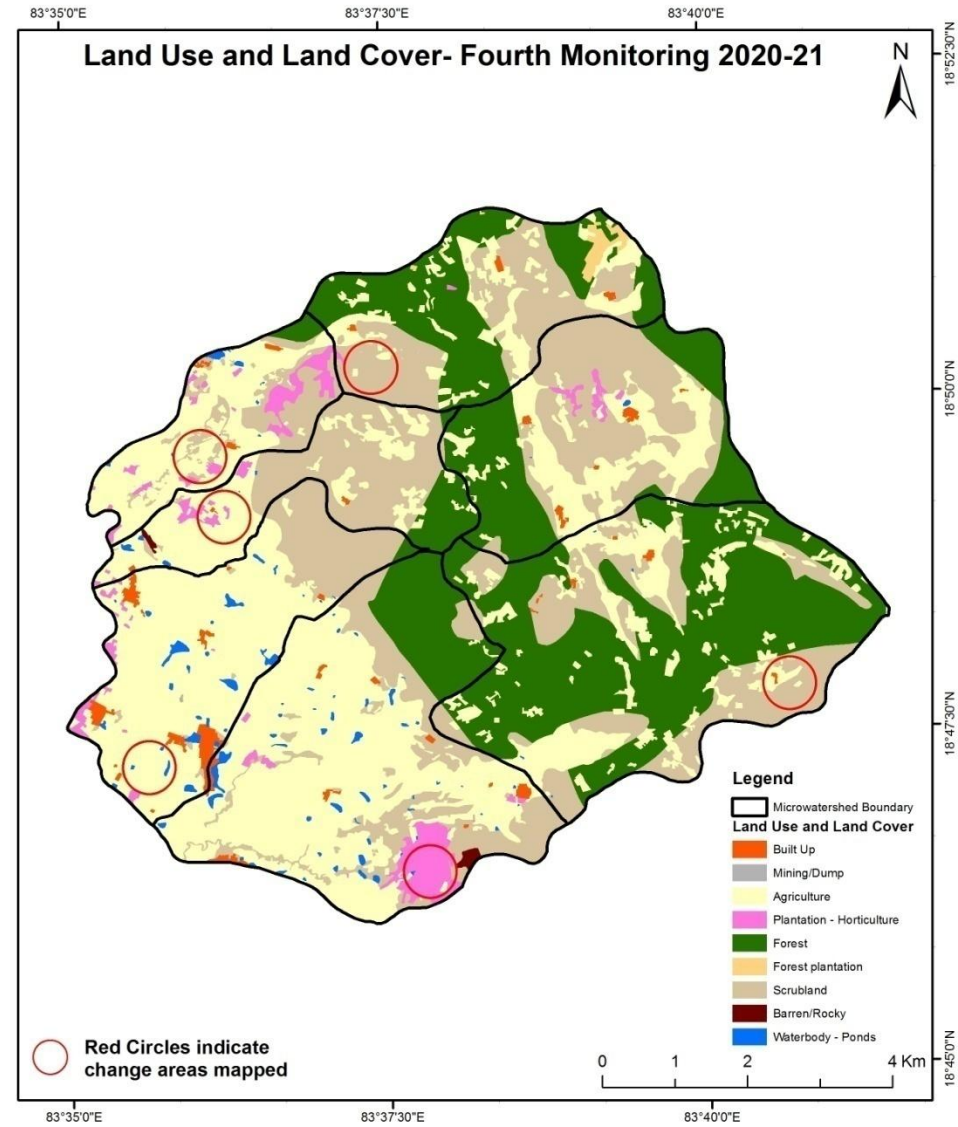
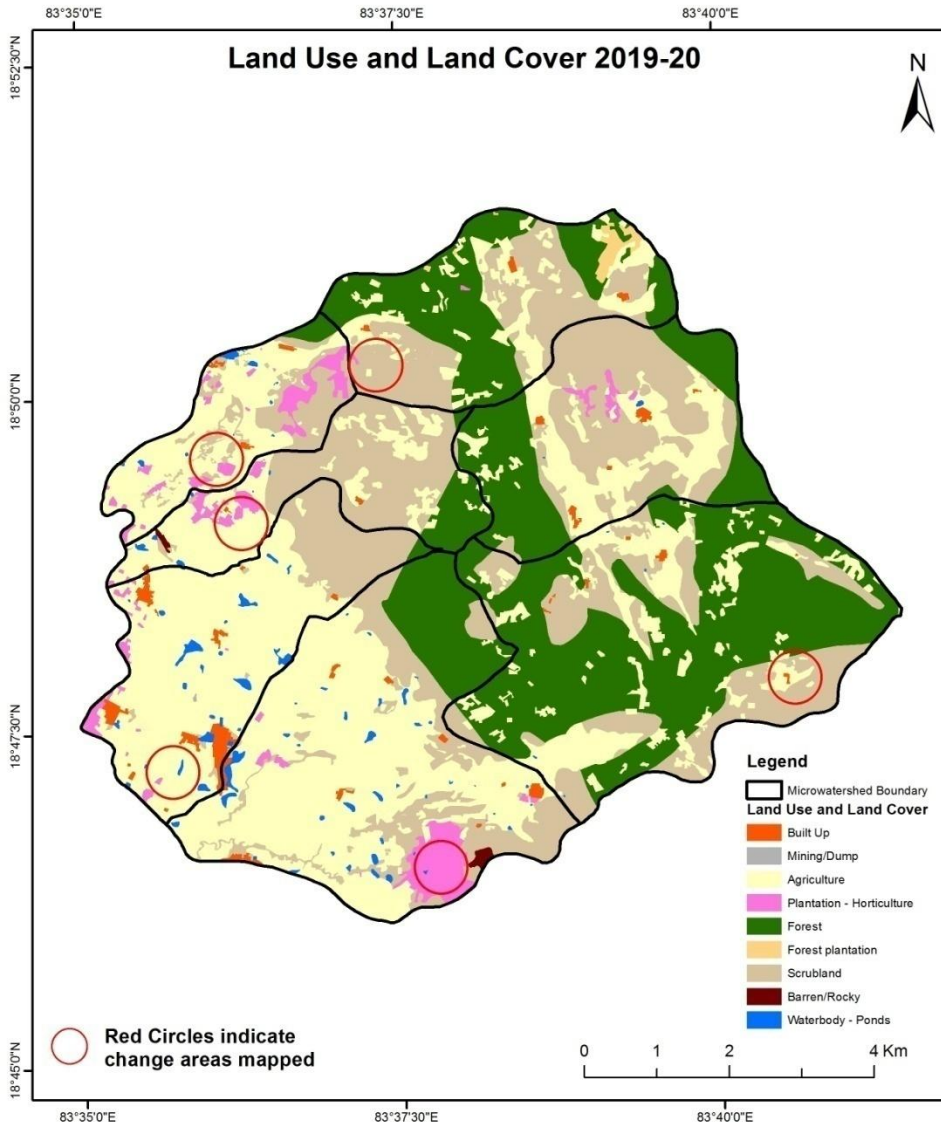


Fig 11. Vanaja Watershed (IWMP-04/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

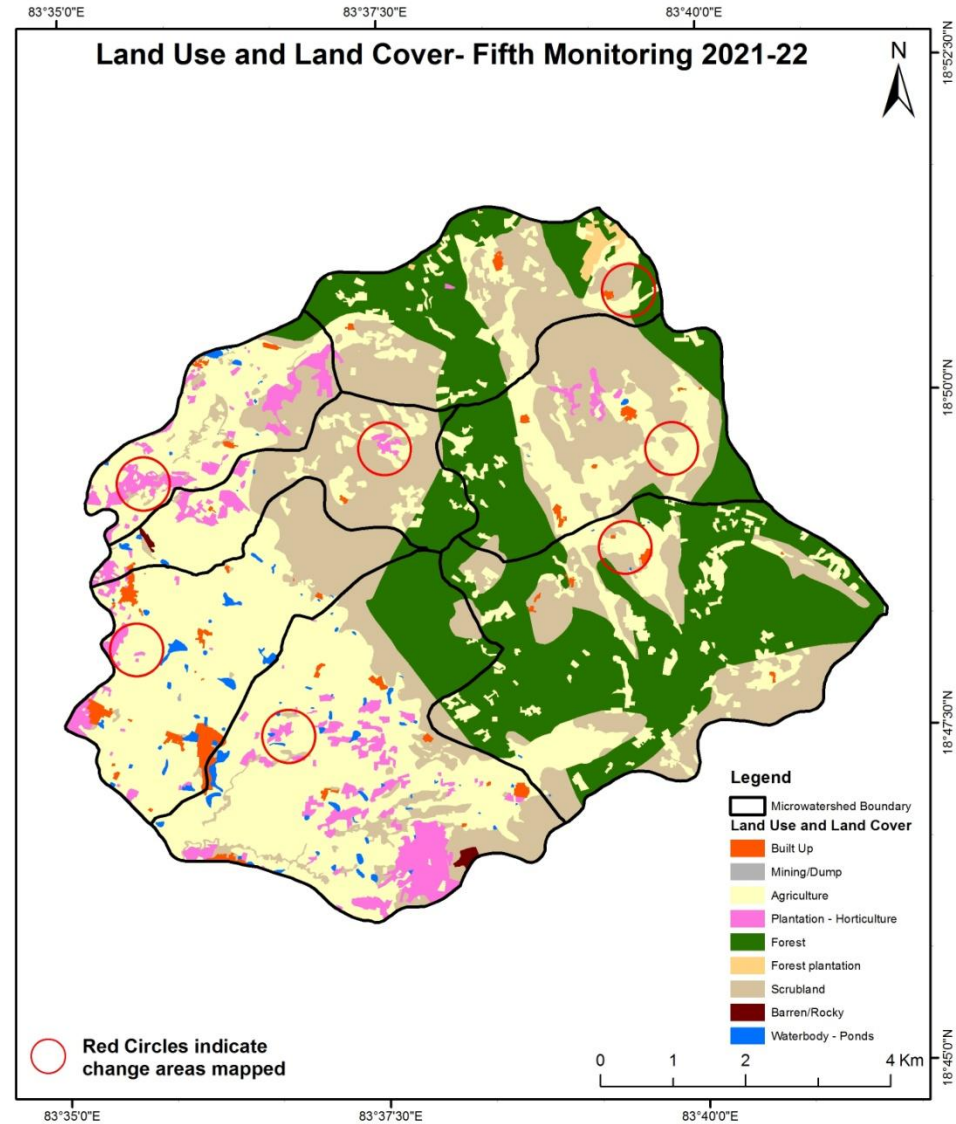
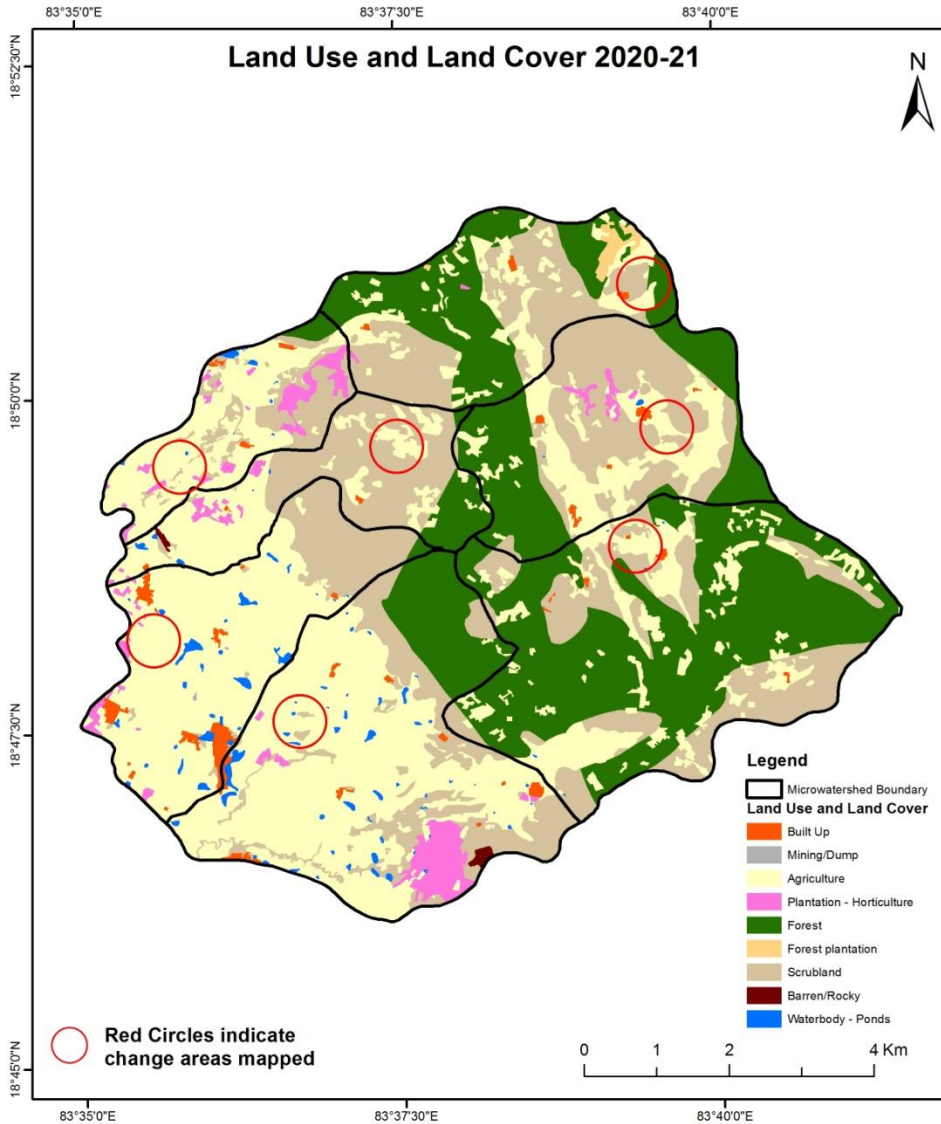
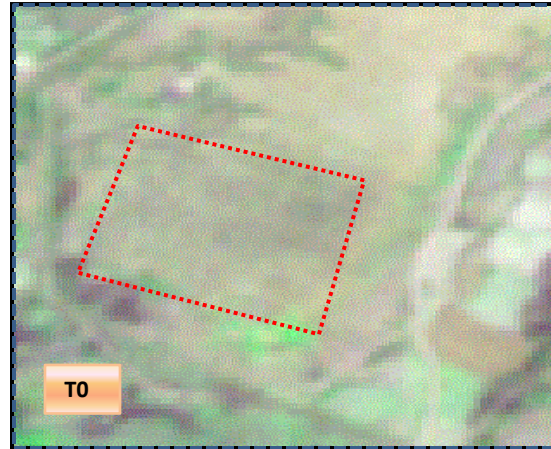


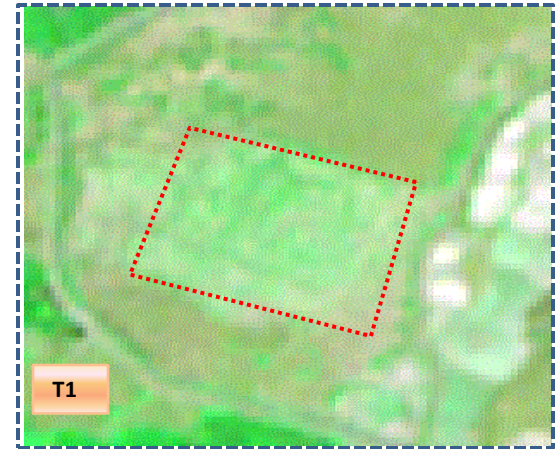
Fig 12. Vanaja Watershed (IWMP-04/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

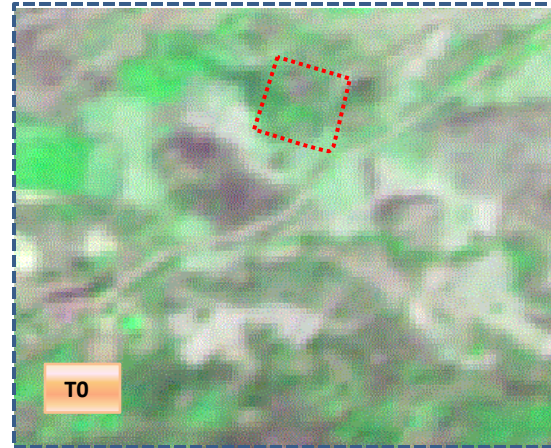
T0: 2013-14(83°36'11.016"E 18°49'29.751"N)



T1

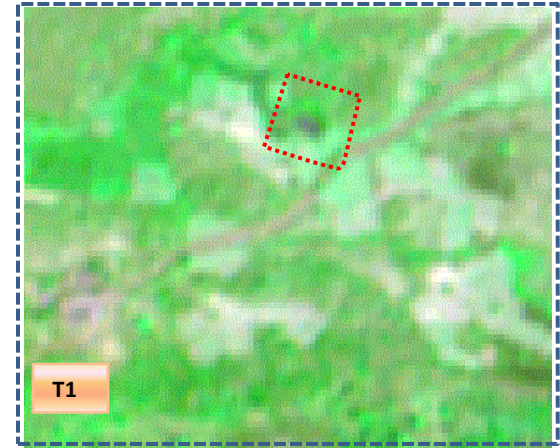
T1: 02 April 2018

Agriculture to Waterbody



T0

T0: 2013-14 (83°38'12.643"E 18°46'53.566"N)

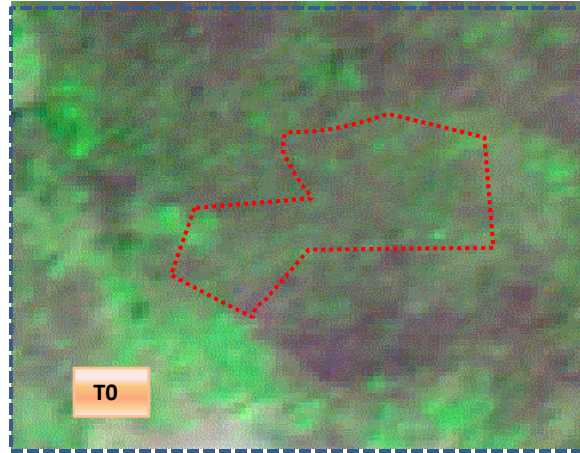


T1

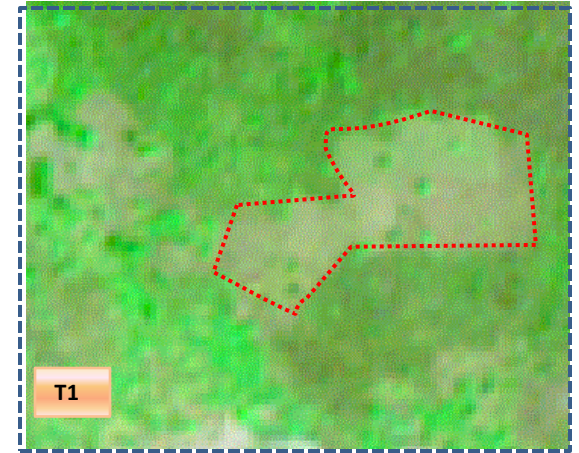
T1: 02 April 2018

Fig 13. Vanaja Watershed (IWMP-04/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

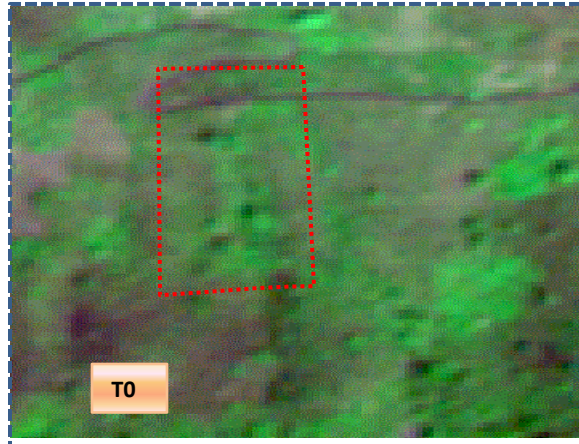


T0:2013-14 (83°37'16.793"E 18°50'44.846"N)



T1: 02 April 2018

Scrub to Agriculture



T0: 2013-14(83°37'40.18"E 18°50'20.862"N)



T0: 02 April 2018

Table 4. showing change matrix depicting Land cover transitions for Vanaja Watershed (IWMP-04/2013-14) 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	51.8												51.8
Mining/dump		0.43											0.43
Agriculture	7.42		2213.05	2.48				5.83		1.17			2229.95
Plantation Horticulture			10.04	66.87				1.27					78.18
Forest			143.02		1928.81								2071.83
Forest Plantation						20.96							20.96
Barren Rocky							8.43						8.43
Scrub	5.97		271.43					2201.25		0.07			2478.72
Waterbody- Streams/River													
Waterbody – Ponds			36.05							44.41			80.46
Grand Total	65.19	0.43	2673.59	69.35	1928.81	20.96	8.43	2208.35		45.65			7020.76

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
- In T0 11ha of the agriculture area has decreased and it is converted into Built-up (7.4 ha), plantation/horticulture (2.4 ha), scrubland (5.8 ha) and water body (1.1 ha) in T1.
- In T1 460 ha of the agriculture area has increased from plantations/horticulture (10 ha), forest (143 ha) and scrubland (271 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Vanaja Watershed (IWMP-04/2013-14) 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	65.19										65.19	
Mining/dump		0.43									0.43	
Agriculture	0.16		2659.38	14.05							2673.59	
Plantation Horticulture				69.35							69.35	
Forest					1928.81						1928.81	
Forest Plantation						20.96					20.96	
Barren Rocky							8.43				8.43	
Scrub			83.78	72.22				2052.35			2208.35	
Waterbody-Streams/River												
Waterbody – Ponds										45.65	45.65	
Grand Total	65.35	0.43	2743.16	155.62	1928.81	20.96	8.43	2052.35		45.65	7020.76	

- In T1 14 ha of the agriculture area has decreased and it is converted into Built-up (0.16 ha), plantations/horticulture (14 ha) in T2.
- In T2 83 ha of the agriculture area has increased from scrubland (83 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Vanaja Watershed (IWMP-04/2013-14) 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	65.35												65.35
Mining/dump		0.43											0.43
Agriculture	3.57		2693.62	40.11		0.32					5.54		2743.16
Plantation Horticulture			1.99	153.53							0.1		155.62
Forest			6.83		1921.11	0.87							1928.81
Forest Plantation						20.96							20.96
Barren Rocky							8.43						8.43
Scrub	5.34		66.19	0.9				1978.76			1.16		2052.35
Waterbody- Streams/River													
Waterbody – Ponds											45.65		45.65
Grand Total	74.26	0.43	2768.63	194.54	1921.11	22.15	8.43	1978.76			52.45		7020.76

- In T2 49 ha of the agriculture area has decreased and it is converted into Built-up (3.5 ha), plantations/horticulture (40 ha), and water body (5.5 ha) in T3.
- In T3 75 ha of the agriculture area has increased from plantations/horticulture (2 ha), forest (6.8 ha), scrubland (66 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Vanaja Watershed (IWMP-04/2013-14) 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	74.26										74.26
Mining/dump		0.43									0.43
Agriculture	1.83		2630.59	131.15				2.31		2.75	2768.63
Plantation Horticulture	0.16		5.72	188.66							194.54
Forest	0.35		14.79		1905.97						1921.11
Forest Plantation						22.15					22.15
Barren Rocky							8.43				8.43
Scrub	5.85		108.85	7.13				1856.37		0.56	1978.76
Waterbody-Streams/River											
Waterbody – Ponds			0.9	0.43						51.12	52.45
Grand Total	82.45	0.43	2760.85	327.37	1905.97	22.15	8.43	1858.68		54.43	7020.76

- In T3 135 ha of the agriculture area has decreased and it is converted into built-up (1.8 ha), plantations/horticulture (131 ha), scrubland (2.3 ha) and water body (2.7 ha) in T4.
- In T4 130 ha of the agriculture area has increased from plantations/horticulture (5.7 ha), forest (14.7 ha) scrubland (108 ha) and water body (0.9 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Vanaja Watershed (IWMP-04/2013-14) 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	74.61		1.83	0.16				5.85					82.45
Mining/dump		0.43											0.43
Agriculture			2644.39	1.58	8.92			105.79		0.17			2760.85
Plantation Horticulture			147.24	172.57				7.13		0.43			327.37
Forest					1905.97								1905.97
Forest Plantation						22.15							22.15
Barren Rocky							8.43						8.43
Scrub			2.64					1856.04					1858.68
Waterbody- Streams/River													
Waterbody – Ponds										54.43			54.43
Grand Total	74.61	0.43	2796.1	174.31	1914.89	22.15	8.43	1974.81		55.03			7020.76

•In T4 116 ha of the agriculture area has decreased and it is converted into plantations/horticulture (1.5 ha), forest (8.9 ha), scrubland (105 ha) and water body (0.17 ha) in T5.

•In T5 151 ha of the agriculture area has increased from built-up (1.8 ha), plantations/horticulture (147 ha) and scrubland (2.6 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 decrease of 25 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 443, 69, 25 & 35 Hectares from T0-T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 566 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. About **96 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 503 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