

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

WEST GODAVARI -01/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

March-2023

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



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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**

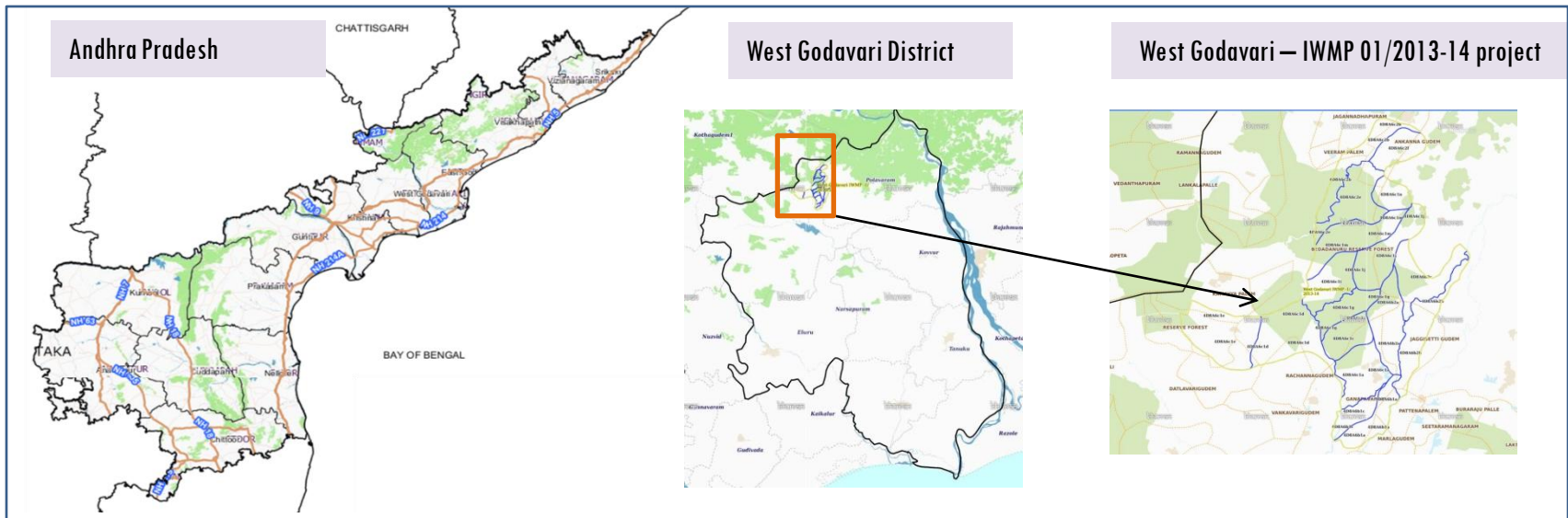
1. Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
2. National Remote Sensing Centre (NRSC), ISRO has designed and developed Bhuvan Geo-ICT Web portal tools namely - Srishti and Drishti for monitoring 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-01/2013-14, West Godavari District of Andhra Pradesh. The total geographical area of the project is 8,506 ha. It comprises of 17 micro watersheds.
4. In the project area 15 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 27.6 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. 53 % is covered by the agriculture, 20 % is covered by forest, 8.3 % is covered by plantation/horticulture , 5.5 % is covered by scrubland and remaining by other land use classes.

## STUDY AREA

**PROJECT : GANAPAVARAM WATERSHED - IWMP-01/2013-14**

**DISTRICT : WEST GODAVARI , STATE : ANDHRA PRADESH**

- The study area falls in Jeelugu Milli and Buttayagudem Mandals of West Godavari district of Andhra Pradesh state. The total geographical area of the project is 8,506 ha. It comprises of 17 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 Ganapavaram Watershed (IWMP-01/2013-14) in West Godavari, A.P**

- The region has a tropical climate similar to the rest of the Coastal Andhra region. The summers (March–June) are very hot and dry while the winters are fairly pleasant. The temperatures in the summers often rise over 50 degrees during the day. The rainy season (July–December).
- Mean rainfall receive over these district IS around 125-150 mm in June, 170-230 mm in July, 190-235 mm in August and 160-205 mm in September. The SW monsoon mean rainfall values for these district ranging from 695 mm to 775 mm.

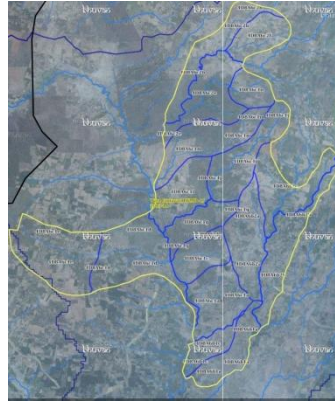
### Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			27-Nov-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			27-Nov-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	15
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**

<b>Sr. No</b>	<b>Activity</b>	<b>Number of Photographs uploaded in Drishti Mobile Application</b>	<b>Visible on satellite in Srishti Geoportal</b>
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	6	6
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	9	9
18	Others	0	0
	<b>TOTAL</b>	<b>15</b>	<b>15</b>

## 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 Ganapavaram Watershed (IWMP-01/2013-14) Natural Colour Composite (NCC)

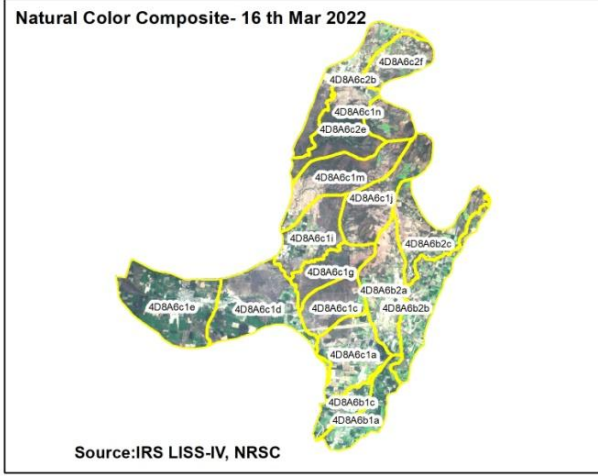
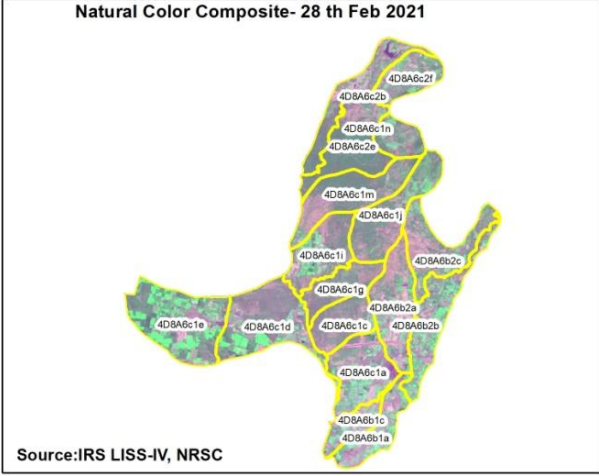
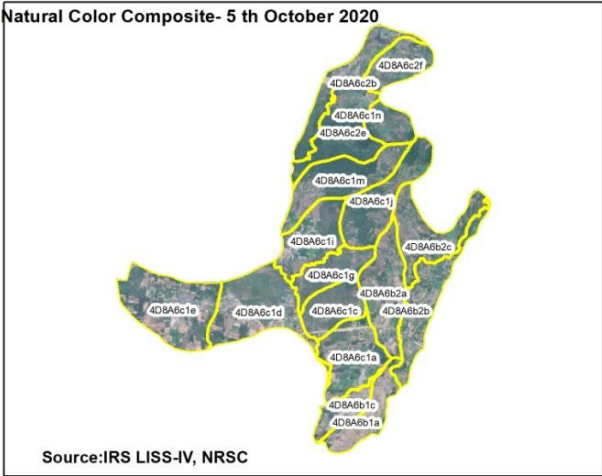
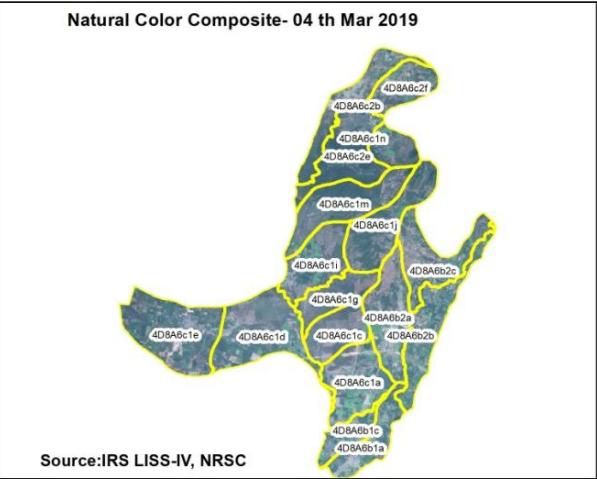
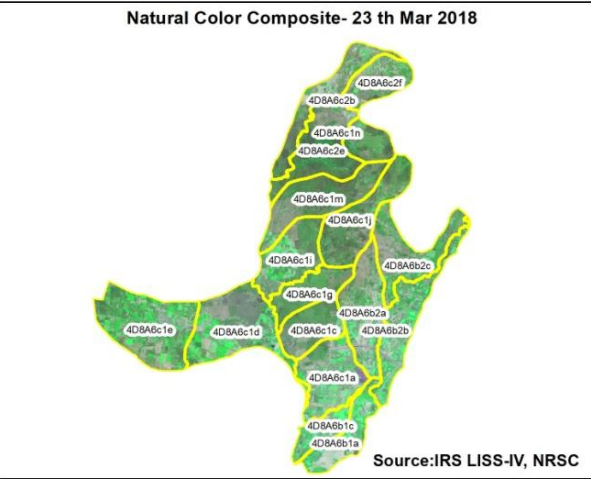
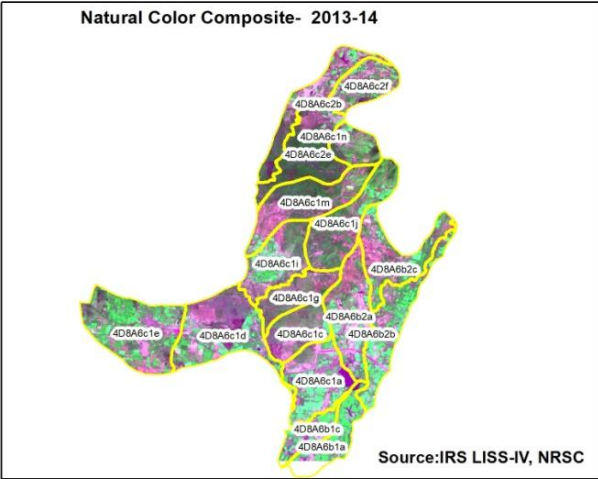




Fig 5. Monitoring of activities in Ganapavaram Watershed (IWMP-01/2013-14) West Godavari District, Andhra Pradesh



T0

T0:2013-14



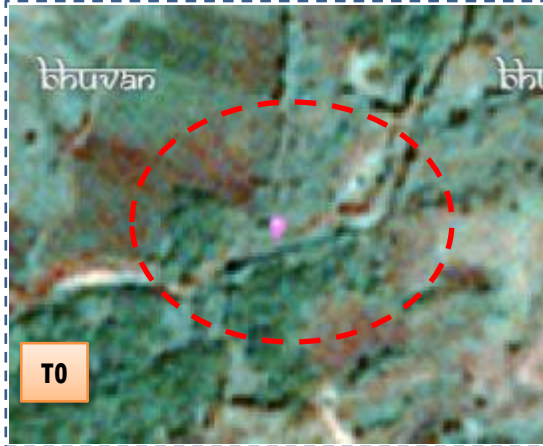
T1

T1: 10 April 2018



Drishti SI no. 2950709 MWS : 4D8A6c1a

Check dam



T0

T0:2013-14



T1

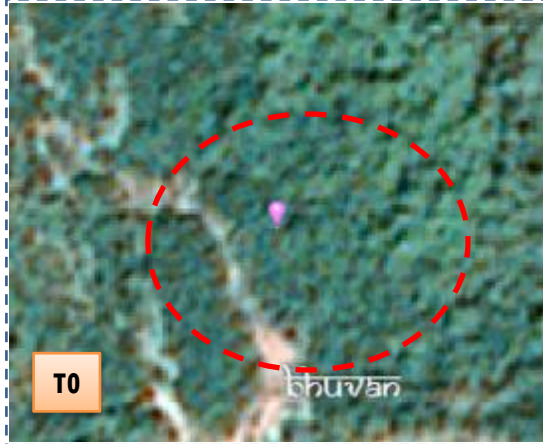
T1: 10 April 2018



Drishti SI no. 2952353 MWS : 4D8A6b2c

Check dam

Fig 6. Monitoring of activities in Ganapavaram Watershed (IWMP-01/2013-14) West Godavari District, Andhra Pradesh



T0

bhuvan

T0:2013-14



T1

bhuvan

T1: 10 April 2018



Drishti SI no. 2956414 MWS : 4D8A6b2a

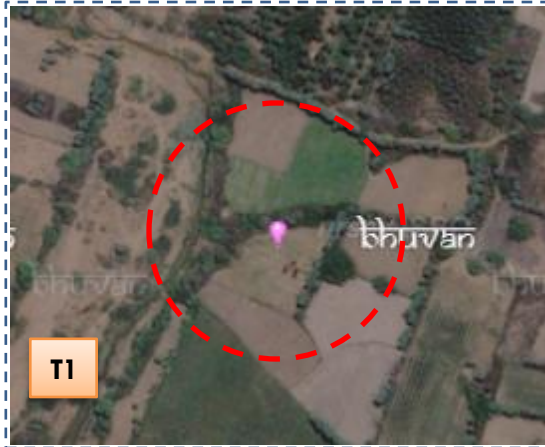
Check dam



T0

bhuvan

T0:2013-14



T1

bhuvan

T1: 10 April 2018



Drishti SI no. 5053952 MWS : 4D8A6b2b

Check dam

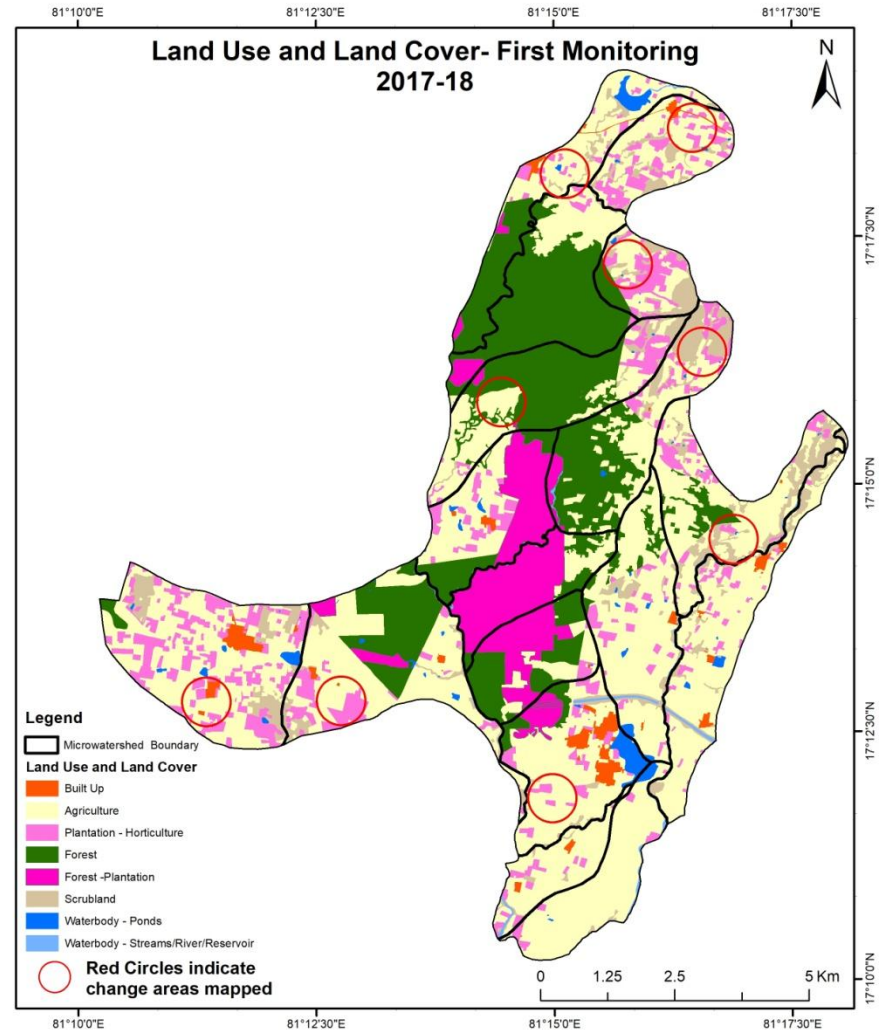
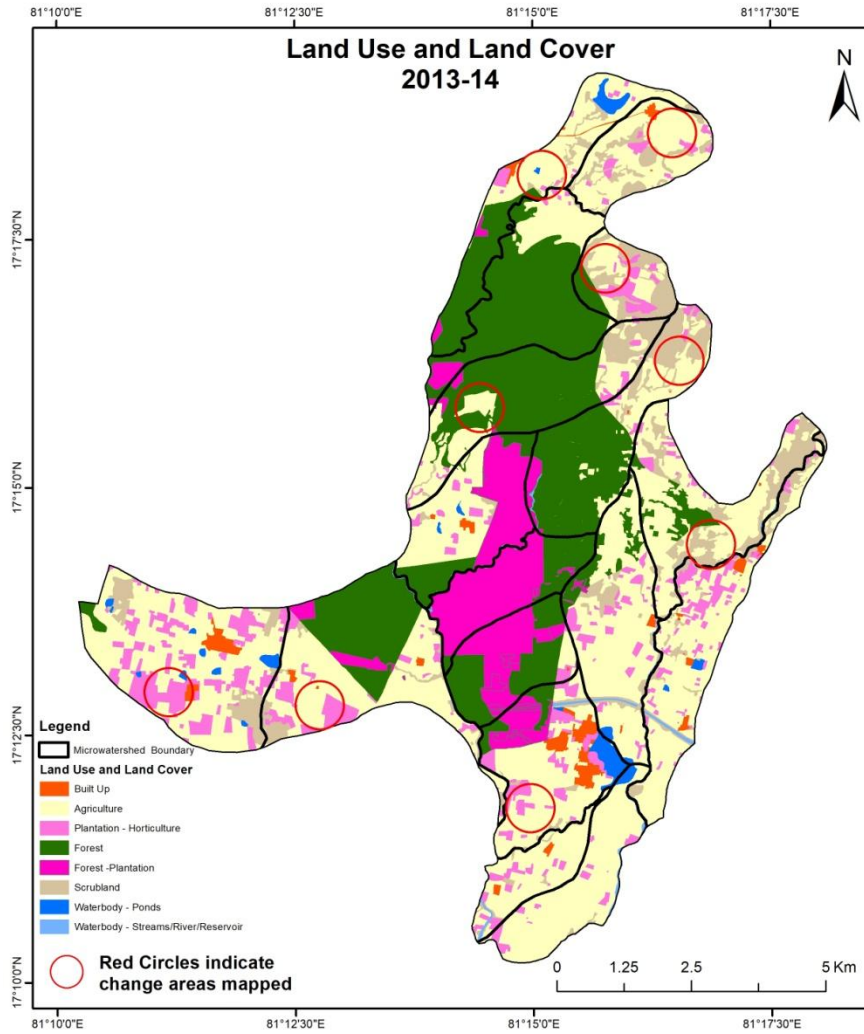
### 03. MONITORING IN THE PROJECT AREA

#### 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)

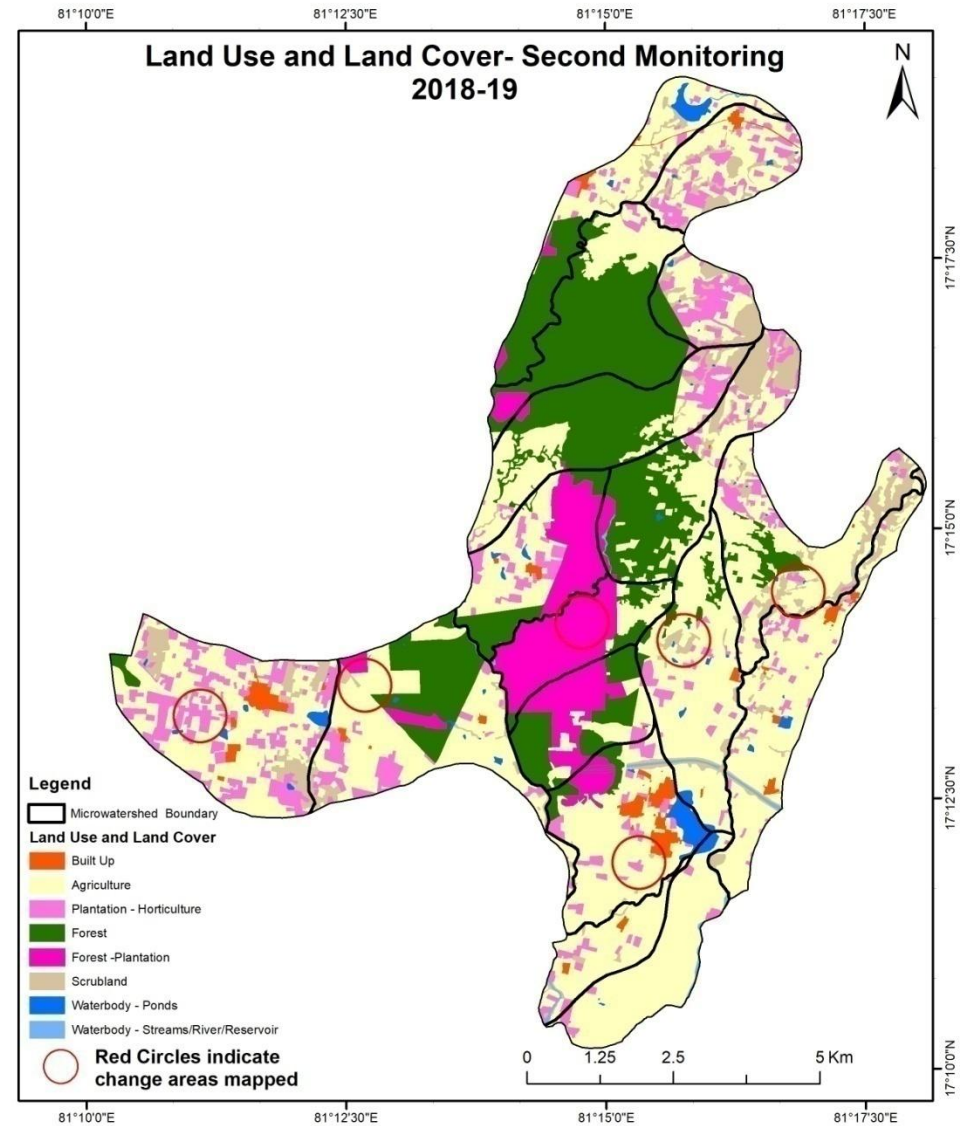
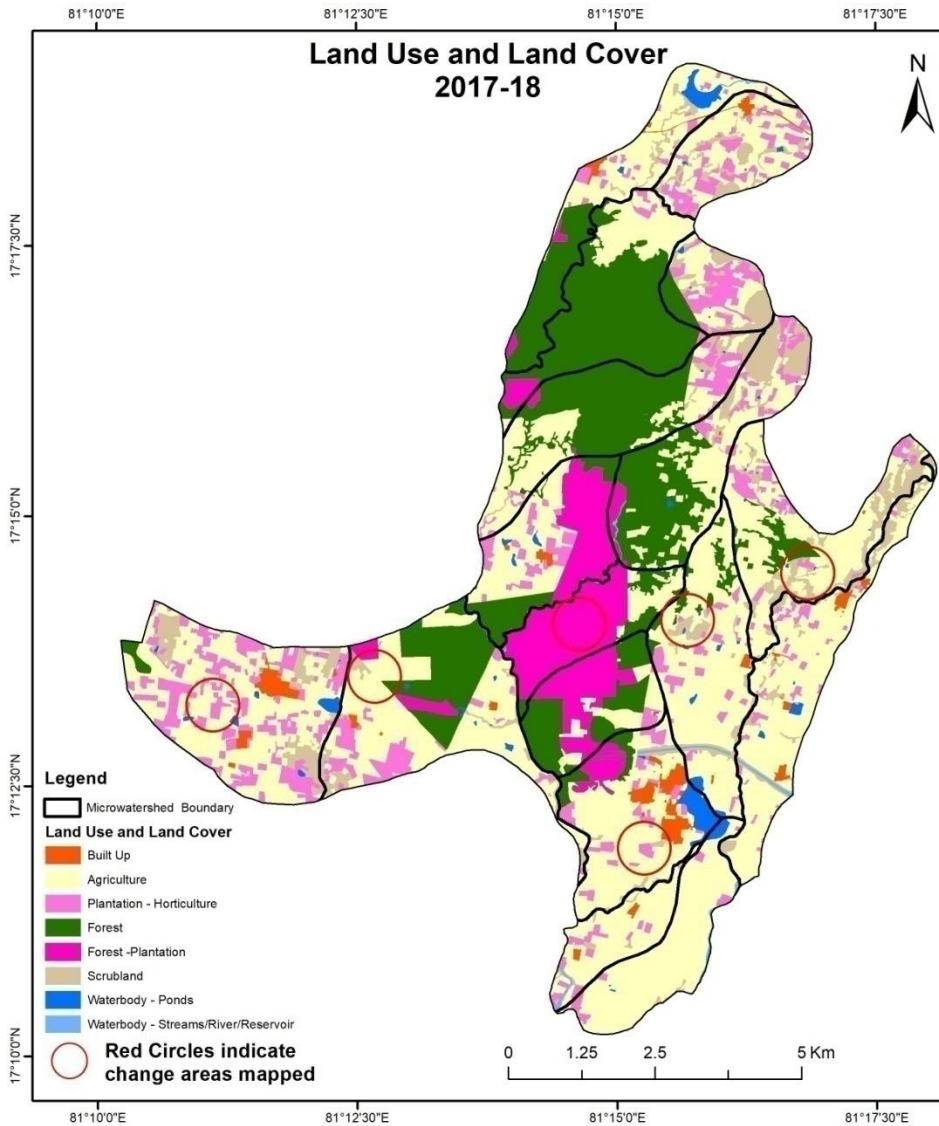
**Fig 7. Ganapavaram Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)**

**Scale: 1:10000**



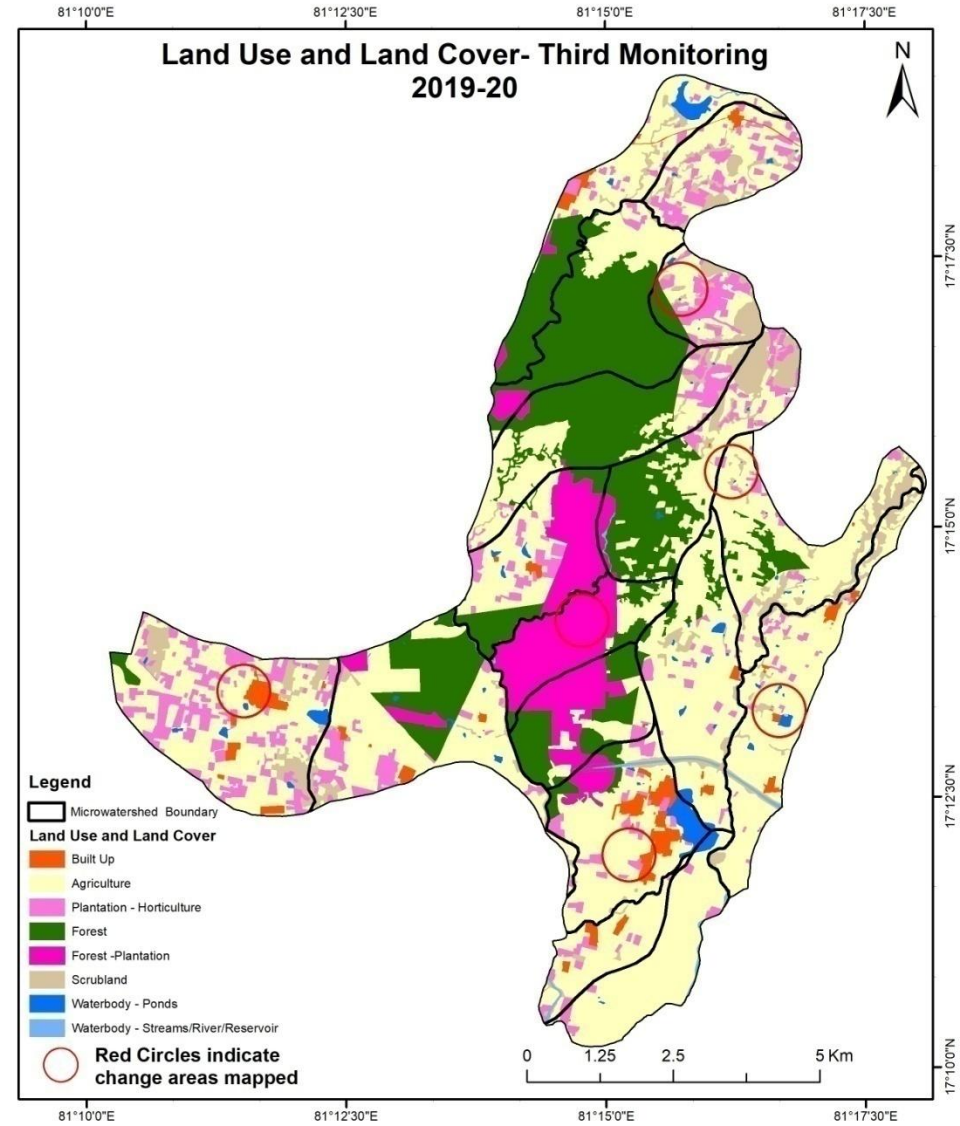
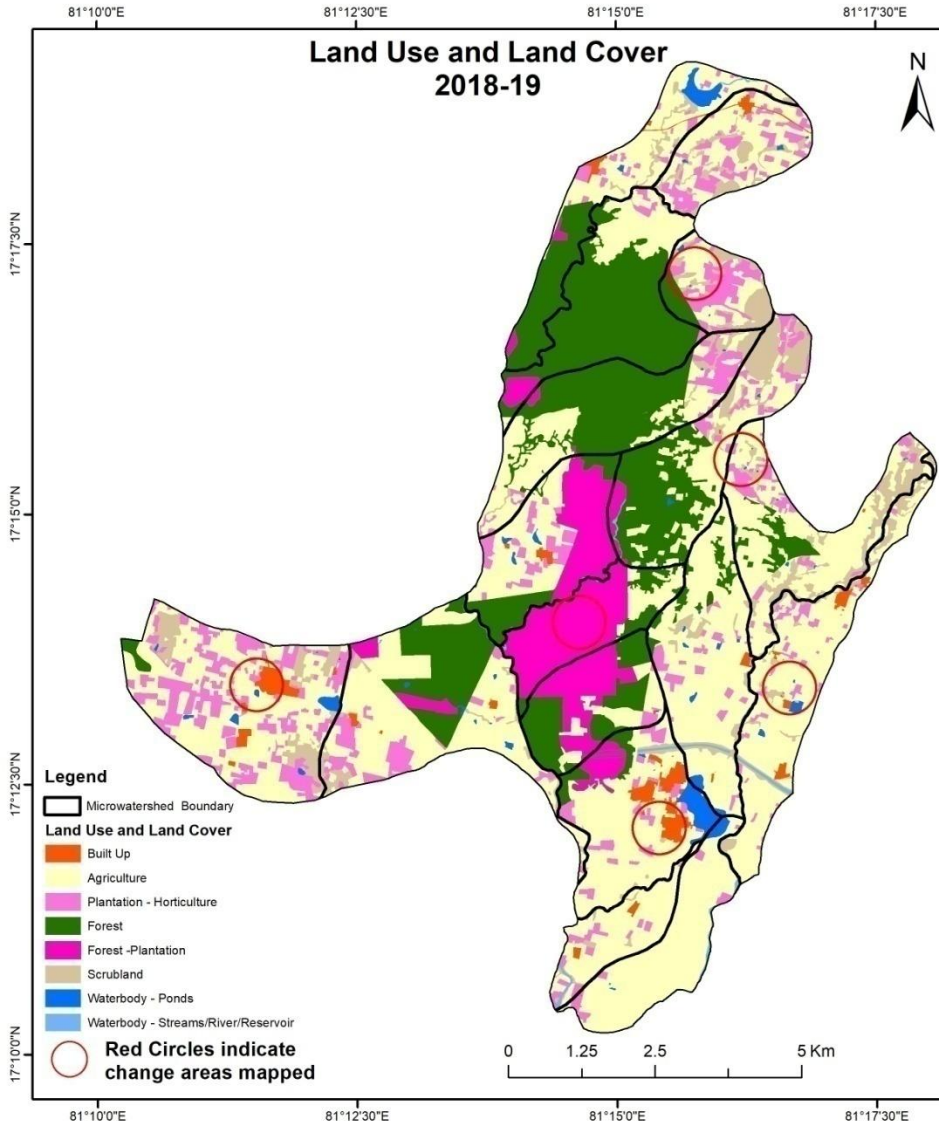
**Fig 8. Ganapavaram Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)**

**Scale: 1:10000**



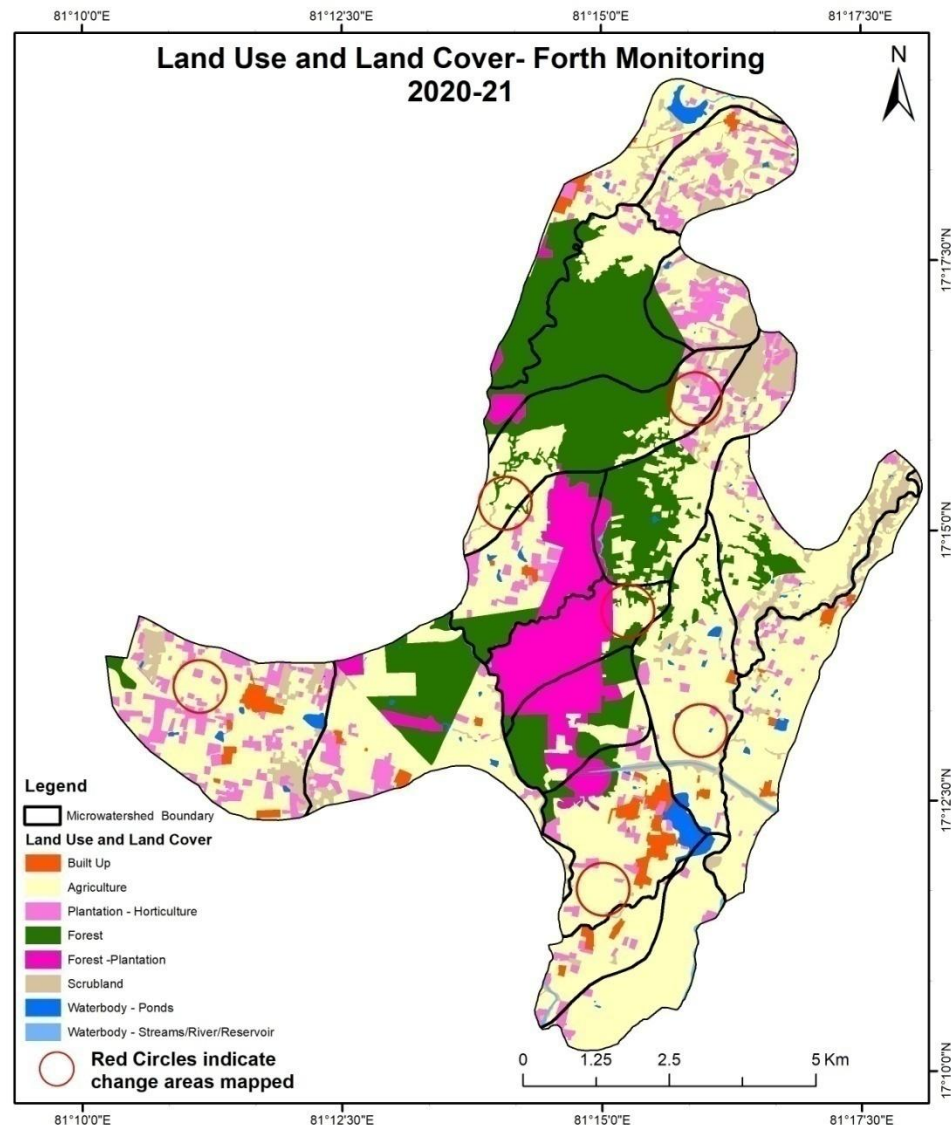
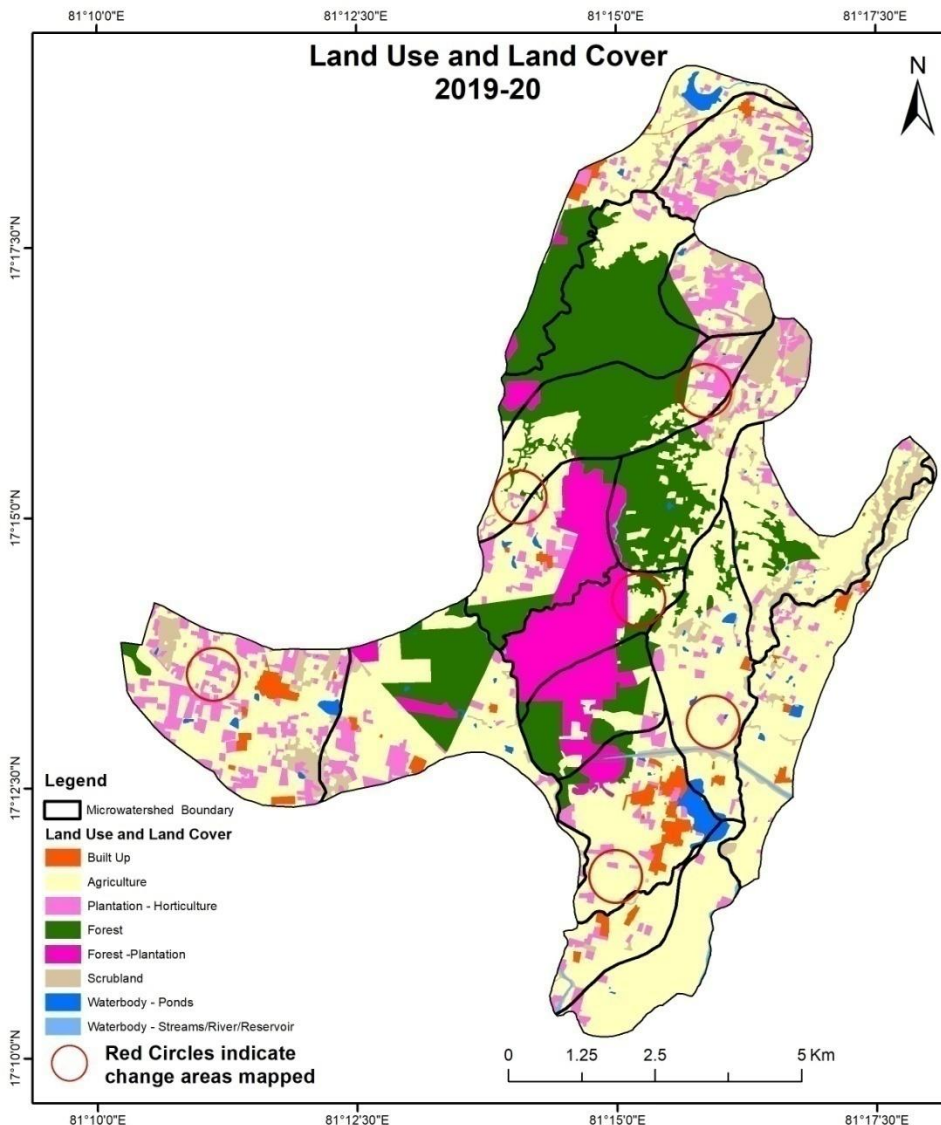
**Fig 9. Ganapavaram Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)**

Scale: 1:10000



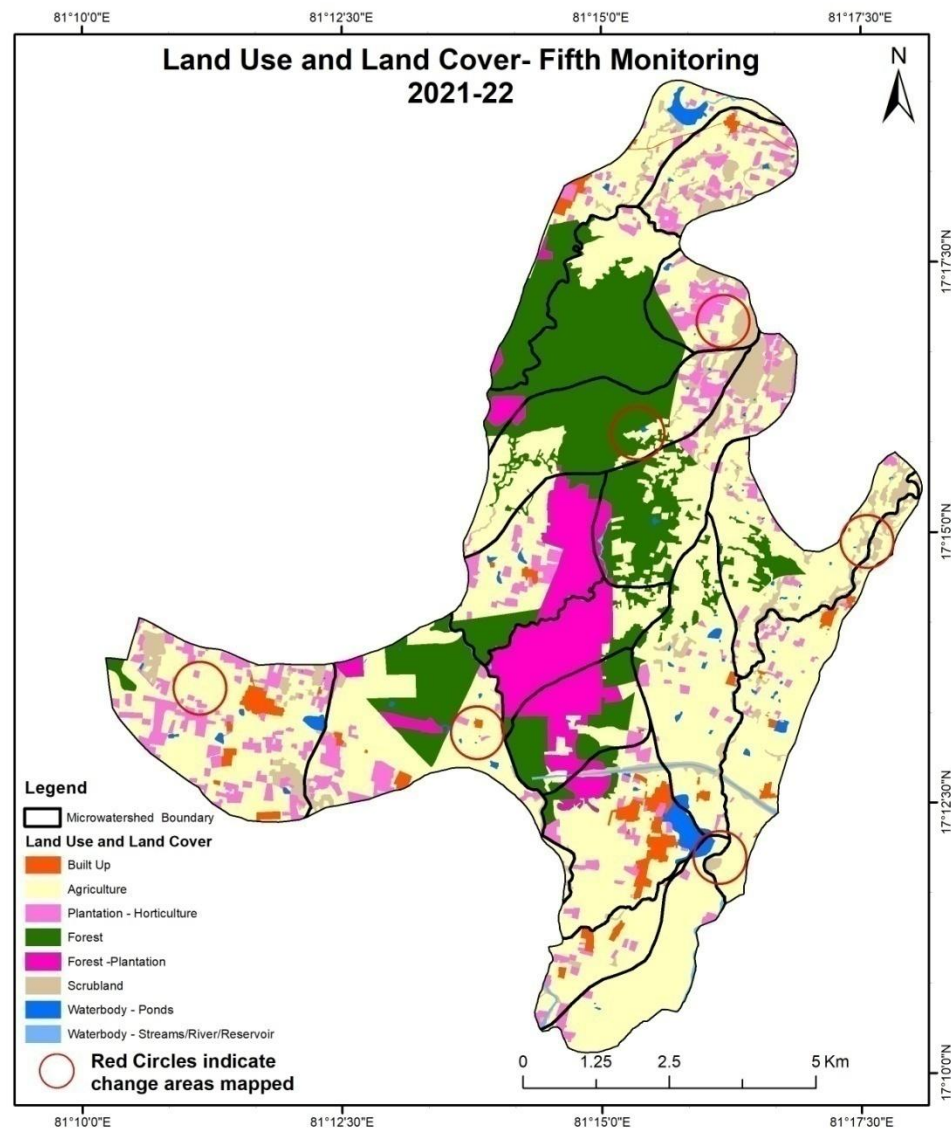
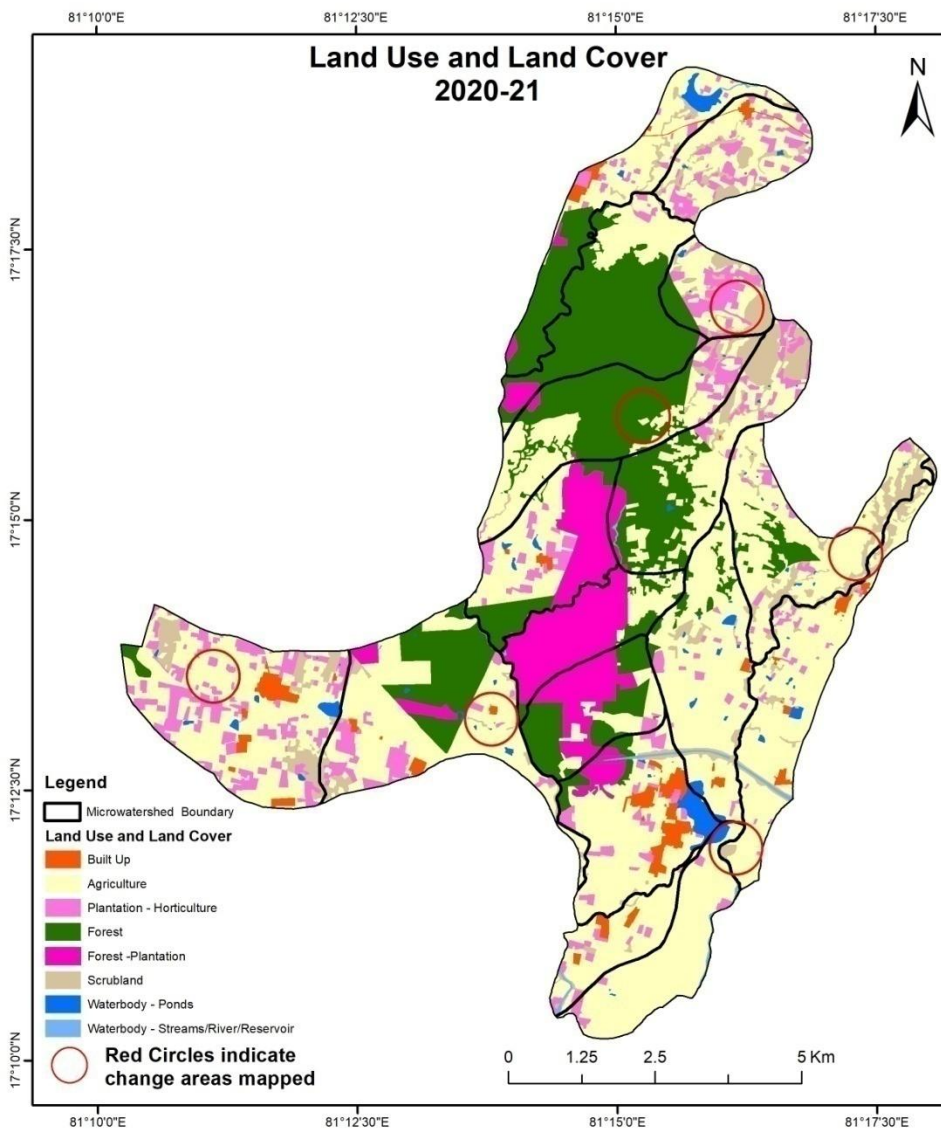
**Fig 10. Ganapavaram Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)**

Scale: 1:10000



**Fig 11. Ganapavaram Watershed (IWMP-01/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)**

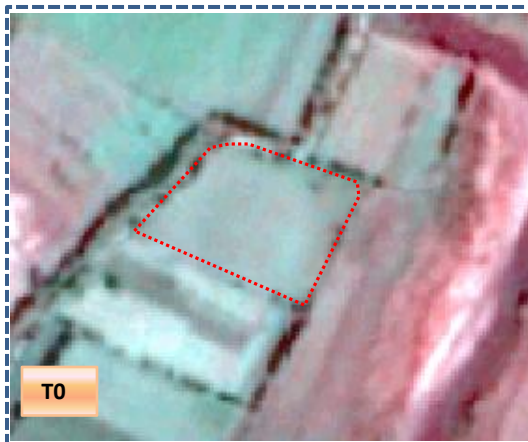
Scale: 1:10000





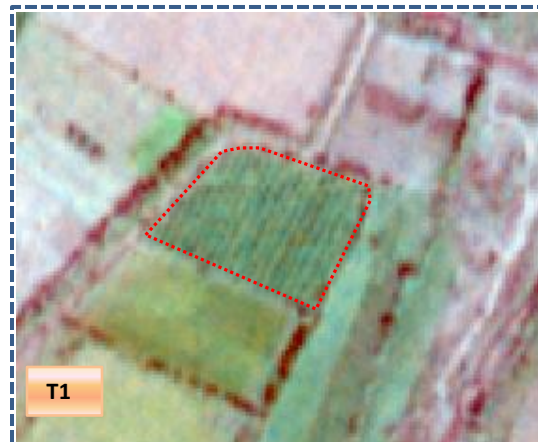
**Fig 12. Ganapavaram Watershed (IWMP-01/2013-14) -Land Use and Land Cover changes for Pre and Post treatment dates**

Agriculture to Plantation



T0

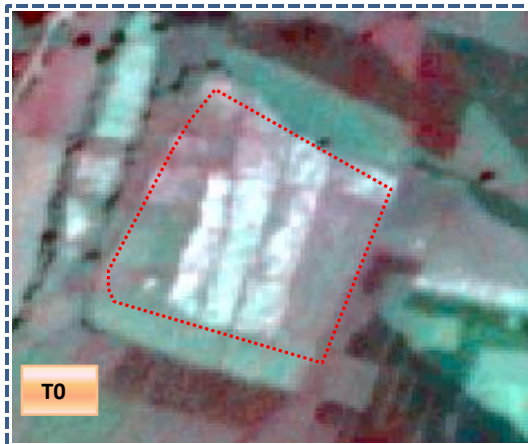
T0: 2013-14 (81°16'12.863"E 17°13'16.572"N)



T1

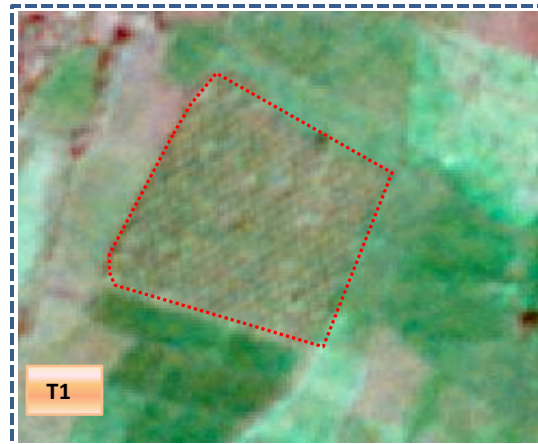
T1: 27 November 2017

Agriculture to Plantation



T0

T0: 2013-14 (81°15'47.491"E 17°11'50.825"N)

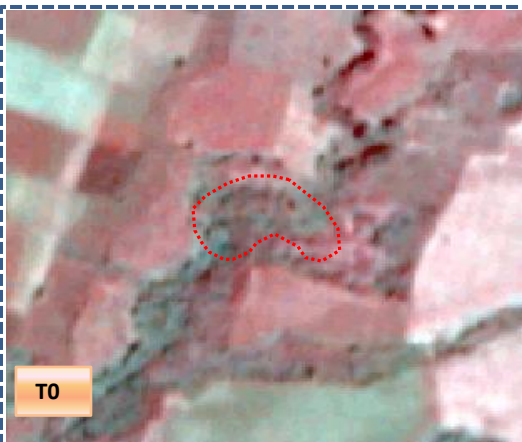


T1

T1: 27 November 2017

**Fig 13. Ganapavaram Watershed (IWMP-01/2013-14) -Land Use and Land Cover changes for Pre and Post treatment dates**

Scrub to Water body

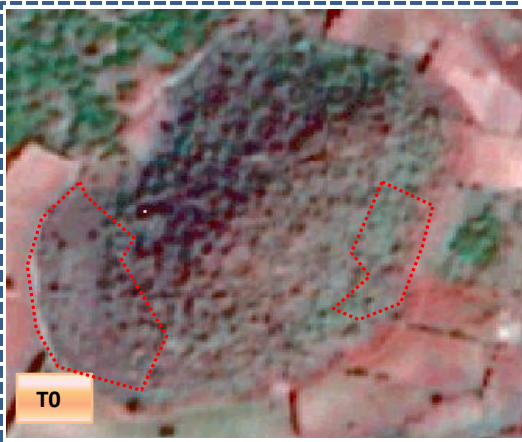


T0: 2013-14 (81°15'40.203"E 17°18'15.99"N)

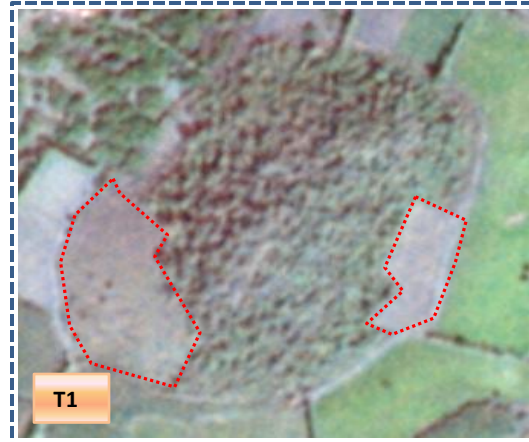


T1: 27 November 2017

Scrub to Agriculture



T0: 2013-14 (81°16'8.315"E 17°18'18.467"N)



T1: 27 November 2017

**Table 4. showing change matrix depicting Land cover transitions for Ganapavaram Watershed (IWMP-01/2013-14) 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	
<b>Built up</b>	121.72										<b>121.72</b>	
<b>Mining/dump</b>												
<b>Agriculture</b>	10.17		3475.41	366.09	0.93				1.91	8.29	<b>3862.8</b>	
<b>Plantation Horticulture</b>	1.81		215.9	481.15				15.6		2.76	<b>717.22</b>	
<b>Forest</b>			328.82		1767.61					1.03	<b>2097.46</b>	
<b>Forest Plantation</b>			72.46			668.93				1.36	<b>742.75</b>	
<b>Barren Rocky</b>												
<b>Scrub</b>	0.76		99.25	55.01				593.61		4.37	<b>753</b>	
<b>Waterbody-Streams/River</b>									117.81		<b>117.81</b>	
<b>Waterbody – Ponds</b>			2.4	4.32						86.91	<b>93.63</b>	
<b>Grand Total</b>	<b>134.46</b>		<b>4194.24</b>	<b>906.57</b>	<b>1768.54</b>	<b>668.93</b>		<b>609.21</b>	<b>119.72</b>	<b>104.72</b>	<b>8506.39</b>	

**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 387 ha of the agriculture area has decreased and it is converted into Built-up (10 ha), plantation/horticulture (366 ha), forest (0.9 ha) and water body (10 ha) in T1.
3. In T1 718 ha of the agriculture area has increased from plantations/horticulture (215 ha), forest (328 ha), forest plantation (72 ha), scrubland (99 ha) and water body (2.4 ha) of T0.

**Table 5. showing change matrix depicting Land cover transitions for Ganapavaram Watershed (IWMP-01/2013-14) 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	
<b>Built up</b>	134.46										<b>134.46</b>	
<b>Mining/dump</b>												
<b>Agriculture</b>			4182.9	11.34							<b>4194.24</b>	
<b>Plantation Horticulture</b>	1.84		30.35	874.38							<b>906.57</b>	
<b>Forest</b>					1768.54						<b>1768.54</b>	
<b>Forest Plantation</b>						668.93					<b>668.93</b>	
<b>Barren Rocky</b>												
<b>Scrub</b>			39.5					569.71			<b>609.21</b>	
<b>Waterbody- Streams/River</b>									119.72		<b>119.72</b>	
<b>Waterbody – Ponds</b>										104.72	<b>104.72</b>	
<b>Grand Total</b>	<b>136.3</b>		<b>4252.75</b>	<b>885.72</b>	<b>1768.54</b>	<b>668.93</b>		<b>569.71</b>	<b>119.72</b>	<b>104.72</b>	<b>8506.39</b>	

4. In T1 11.3 ha of the agriculture area has decreased and it is converted into plantations/horticulture (11.3 ha) in T2.

5. In T2 70 ha of the agriculture area has increased from plantations/horticulture (30.3 ha) and scrubland (39.5 ha) of T1.

**Table 6. showing change matrix depicting Land cover transitions for Ganapavaram Watershed (IWMP-01/2013-14) 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		
<b>Built up</b>	136.3												<b>136.3</b>
<b>Mining/dump</b>													
<b>Agriculture</b>	44.02		4202.92						0.27	5.54			<b>4252.75</b>
<b>Plantation Horticulture</b>	0.45		80.03	804.79						0.45			<b>885.72</b>
<b>Forest</b>					1767.84				0.7				<b>1768.54</b>
<b>Forest Plantation</b>						667.54			1.39				<b>668.93</b>
<b>Barren Rocky</b>													
<b>Scrub</b>	1.28		20.31					547.45		0.67			<b>569.71</b>
<b>Waterbody- Streams/River</b>									119.72				<b>119.72</b>
<b>Waterbody – Ponds</b>										104.72			<b>104.72</b>
<b>Grand Total</b>	<b>182.05</b>		<b>4303.26</b>	<b>804.79</b>	<b>1767.84</b>	<b>667.54</b>		<b>547.45</b>	<b>122.08</b>	<b>111.38</b>			<b>8506.39</b>

6. In T2 49.8 ha of the agriculture area has decreased and it is converted into Built-up (44 ha) and water body (5.8 ha) in T3.

7. In T3 100.3 ha of the agriculture area has increased from plantations /horticulture (80 ha) and scrubland (20.3 ha) of T2.

**Table 7. showing change matrix depicting Land cover transitions for Ganapavaram Watershed (IWMP-01/2013-14) 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		
<b>Built up</b>	182.05												<b>182.05</b>
<b>Mining/dump</b>													
<b>Agriculture</b>			4302.97								0.29		<b>4303.26</b>
<b>Plantation Horticulture</b>			62.01	742.78									<b>804.79</b>
<b>Forest</b>			42.92		1724.92								<b>1767.84</b>
<b>Forest Plantation</b>						667.54							<b>667.54</b>
<b>Barren Rocky</b>													
<b>Scrub</b>								547.45					<b>547.45</b>
<b>Waterbody- Streams/River</b>									122.08				<b>122.08</b>
<b>Waterbody – Ponds</b>											111.38		<b>111.38</b>
<b>Grand Total</b>	<b>182.05</b>		<b>4407.9</b>	<b>742.78</b>	<b>1724.92</b>	<b>667.54</b>		<b>547.45</b>	<b>122.08</b>		<b>111.67</b>		<b>8506.39</b>

8. In T3 0.29 ha of the agriculture area has decreased and it is converted into water body (0.29 ha) in T4.

9. In T4 105 ha of the agriculture area has increased from plantations/horticulture (62 ha) and forest (42.9 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Ganapavaram Watershed (IWMP-01/2013-14) 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		
<b>Built up</b>	182.05												<b>182.05</b>
<b>Mining/dump</b>													
<b>Agriculture</b>	2.07		4402.99						1.32	1.52			<b>4407.9</b>
<b>Plantation Horticulture</b>	0.43		33.01	707.61				1.73					<b>742.78</b>
<b>Forest</b>			14.04		1708.27			1.08	0.92	0.61			<b>1724.92</b>
<b>Forest Plantation</b>						661.7		4.93	0.91				<b>667.54</b>
<b>Barren Rocky</b>													
<b>Scrub</b>			80.37					466.98		0.1			<b>547.45</b>
<b>Waterbody- Streams/River</b>									122.08				<b>122.08</b>
<b>Waterbody – Ponds</b>										111.67			<b>111.67</b>
<b>Grand Total</b>	<b>184.55</b>		<b>4530.41</b>	<b>707.61</b>	<b>1708.27</b>	<b>661.7</b>		<b>474.72</b>	<b>125.23</b>	<b>113.9</b>			<b>8506.39</b>

10. In T4 5 ha of the agriculture area has decreased and it is converted into built-up (2 ha) and water body (2.8 ha) in T5.

11. In T5 127 ha of the agriculture area has increased from plantations/horticulture (33 ha), forest (14 ha) and scrubland (80.3 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 27 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 331, 58, 50, 104 & 122 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 667 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. There is a decrease of 278 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
5. 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