

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

SRIKAKULAM -15/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

January-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**

01. STUDY AREA
02. SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS
03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

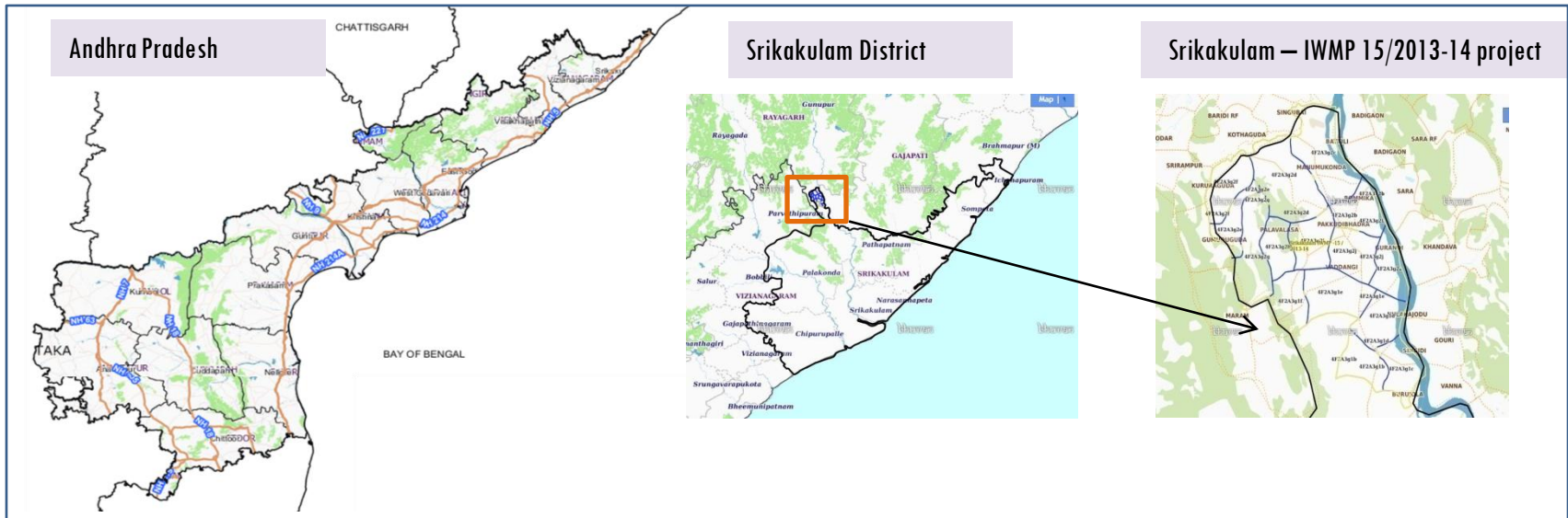
## **E X E C U T I V E   S U M M A R Y**

- 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-15/2013-14, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **5,114** ha. It comprises of 15 micro watersheds.
- In the project area 101 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an decreased by 18 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 60 % is covered by the agriculture, 10 % is covered by forest, 11 % is covered by plantation, 6.8 % is covered by scrubland and remaining by other land use classes.

# PROJECT : SRIKAKULAM - IWMP-15/2013-14

## DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Bhamini Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 5,114 ha. It comprises of 15 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2013-14 (T0) period (*Batch -1*) projects taking 2021-22 (T5) period satellite images



- 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).

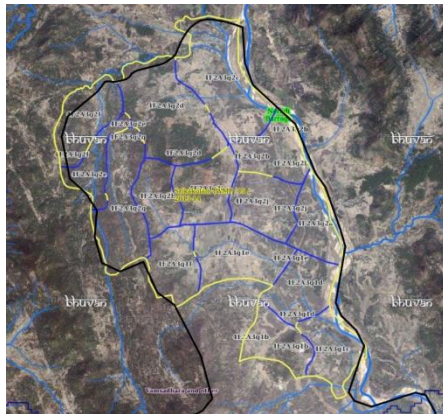
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			2-Feb-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Feb-22
SCENE2			
SCENE 3			
SCENE 4			

# 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	101
4	Detailed Project Report		

# Natural Color Composite overlaid with Project boundaries and high detail stream network



### Legend



Drainage (1:10000 Scale)

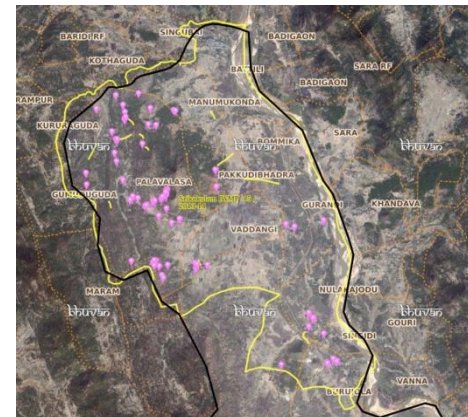


MWS Boundary



Project Boundary

# Natural Color Composite overlaid with Drishti Points



### Drishti Upload Status

## Classification of the Activities

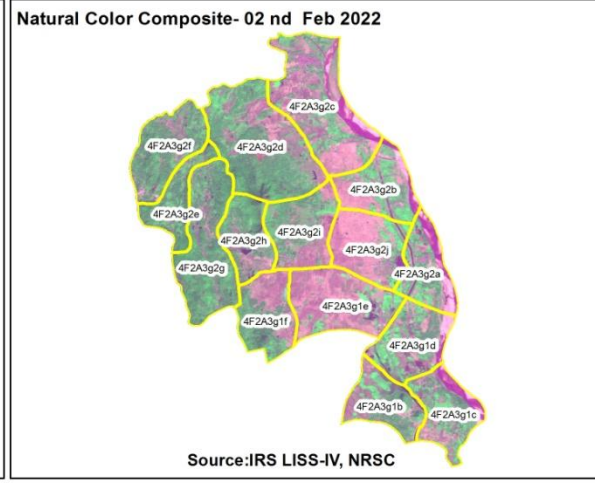
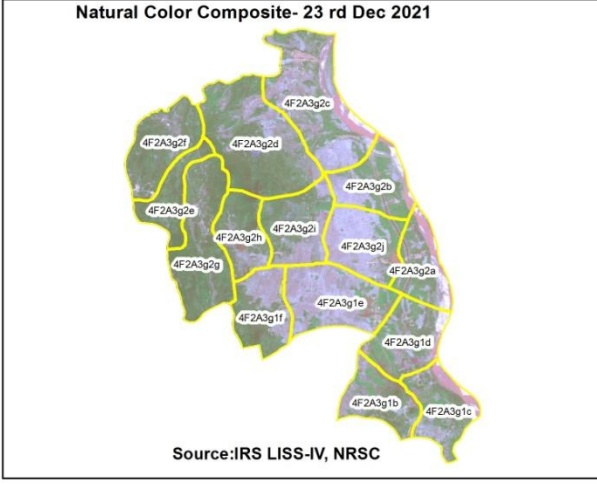
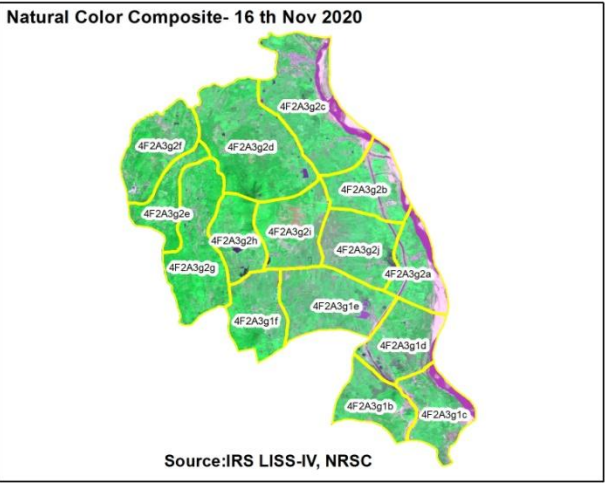
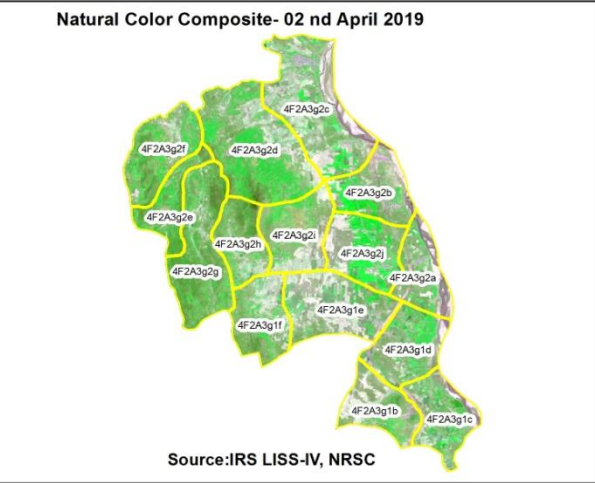
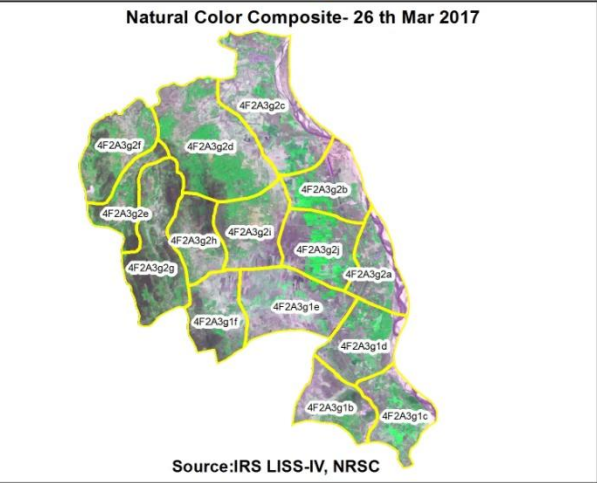
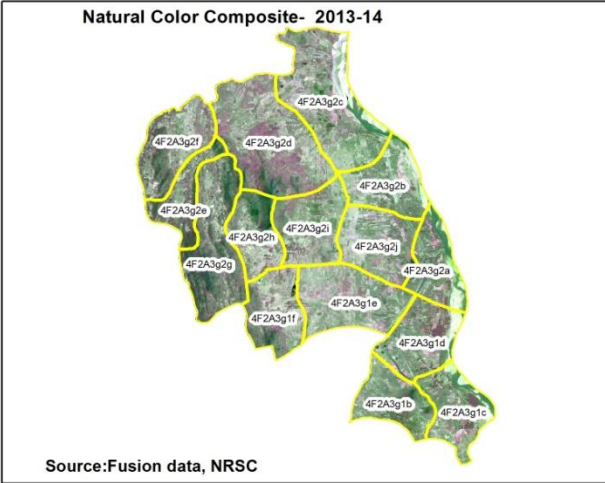
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	3	3
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	8	8
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	8	8
12	Nallah Bunds/Drainage 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	25	25
18	Others	57	57
	<b>TOTAL</b>	<b>101</b>	<b>101</b>

## MONITORING IN THE PROJECT AREA

### 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.

# Natural Colour Composite (NCC)





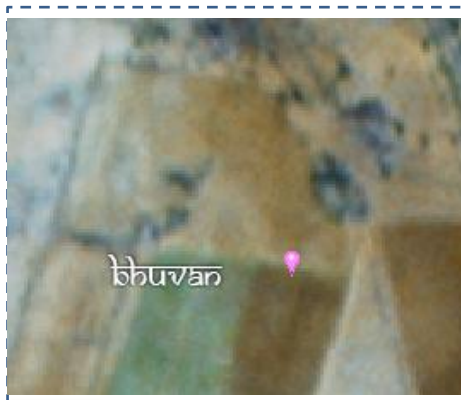
# Monitoring of activities in Srikakulam District, Andhra Pradesh. IWMP-15/2013-14



T0 Satellite data 2013



T1 Satellite data 2015



T2 Satellite data 2016



T3 Satellite data 2017



T4 Satellite data 2018



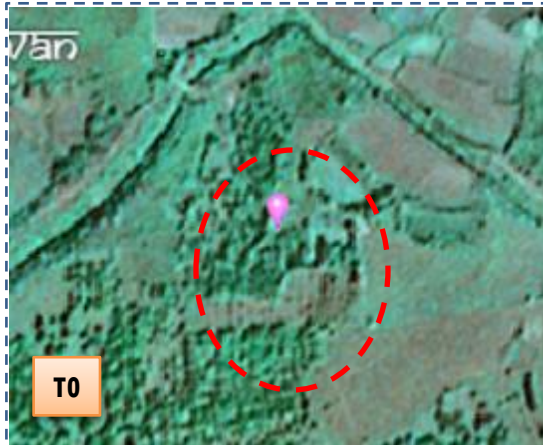
T5 Satellite data 2020



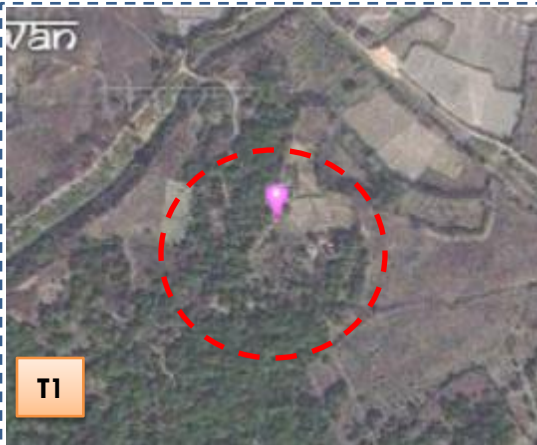
Drishti Id. 1704995

## Horticulture

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-15/2013-14



T0:2013-14

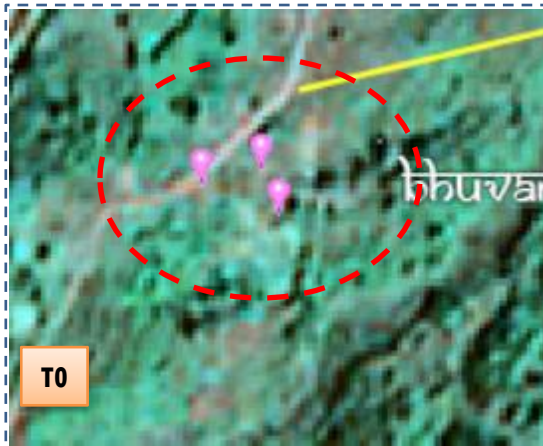


T1: 16 January 2017

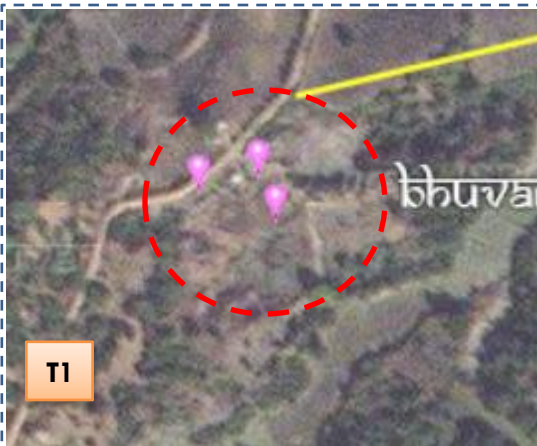


Drishti Sl no. 1761880 MWS : 4F2A3g2d

Farm pond



T0:2013-14



T1: 16 January 2017



Drishti Sl no. 7026495 MWS : 4F2A3g2g

Percolation tank



Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-15/2013-14



T0:2013-14



T1: 16 January 2017



Drishti SI no. 7026514 MWS : 4F2A3g2h

Percolation tank



T0:2013-14



T1: 16 January 2017



Drishti SI no. 7026516 MWS : 4F2A3g2h

Percolation tank

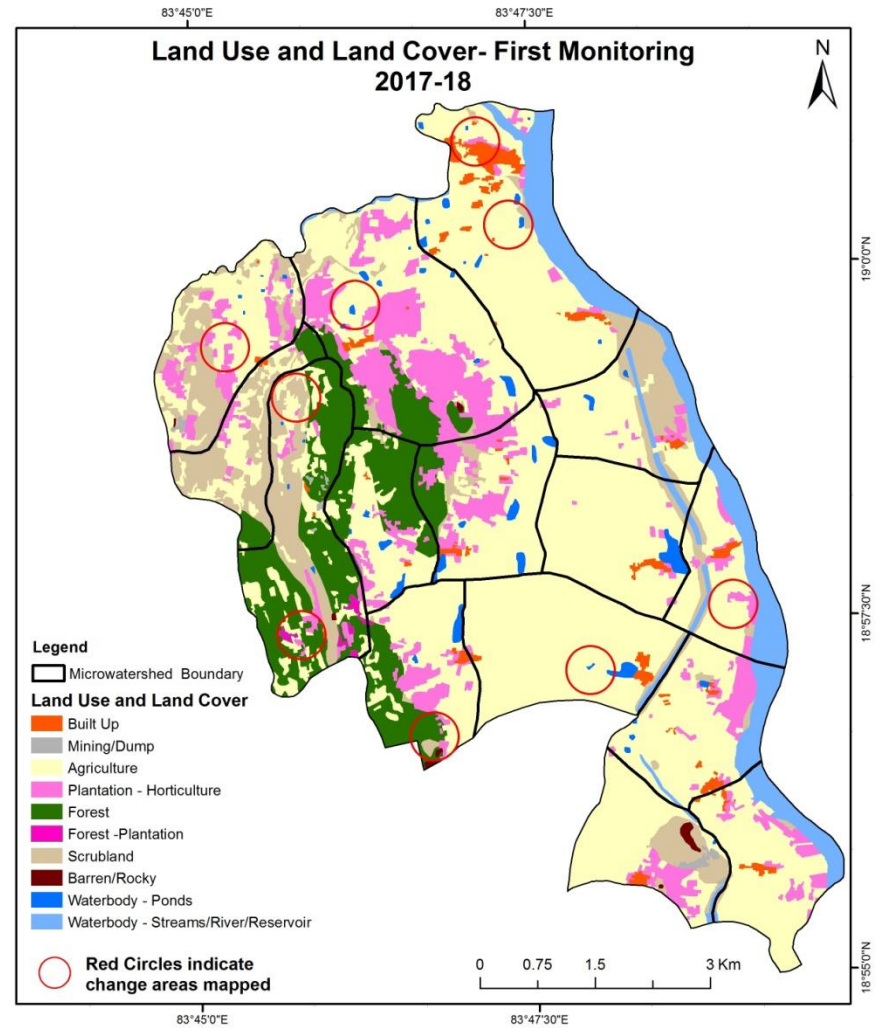
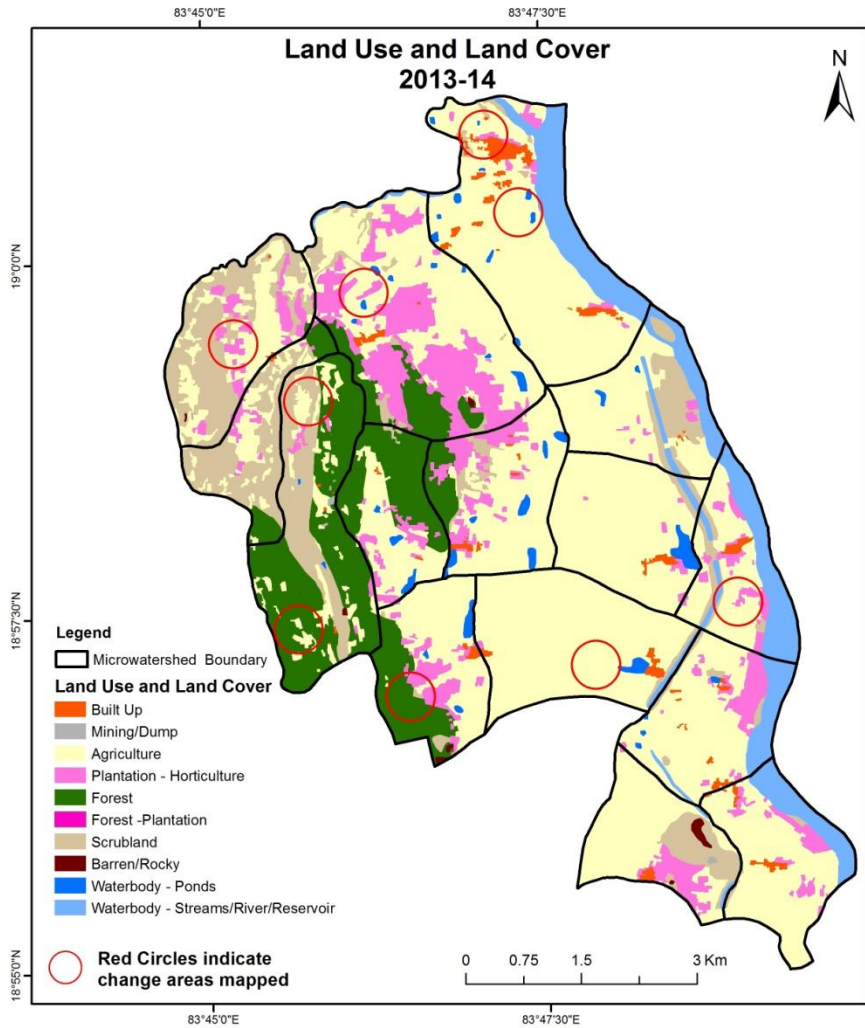
## MONITORING IN THE PROJECT AREA

### 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.
- 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.
- The result obtained for the period T0 to T5 are given in the change matrix table.
- In matrix table column represents the T0 (2013-14) and row represents the T5 (2021-22)

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

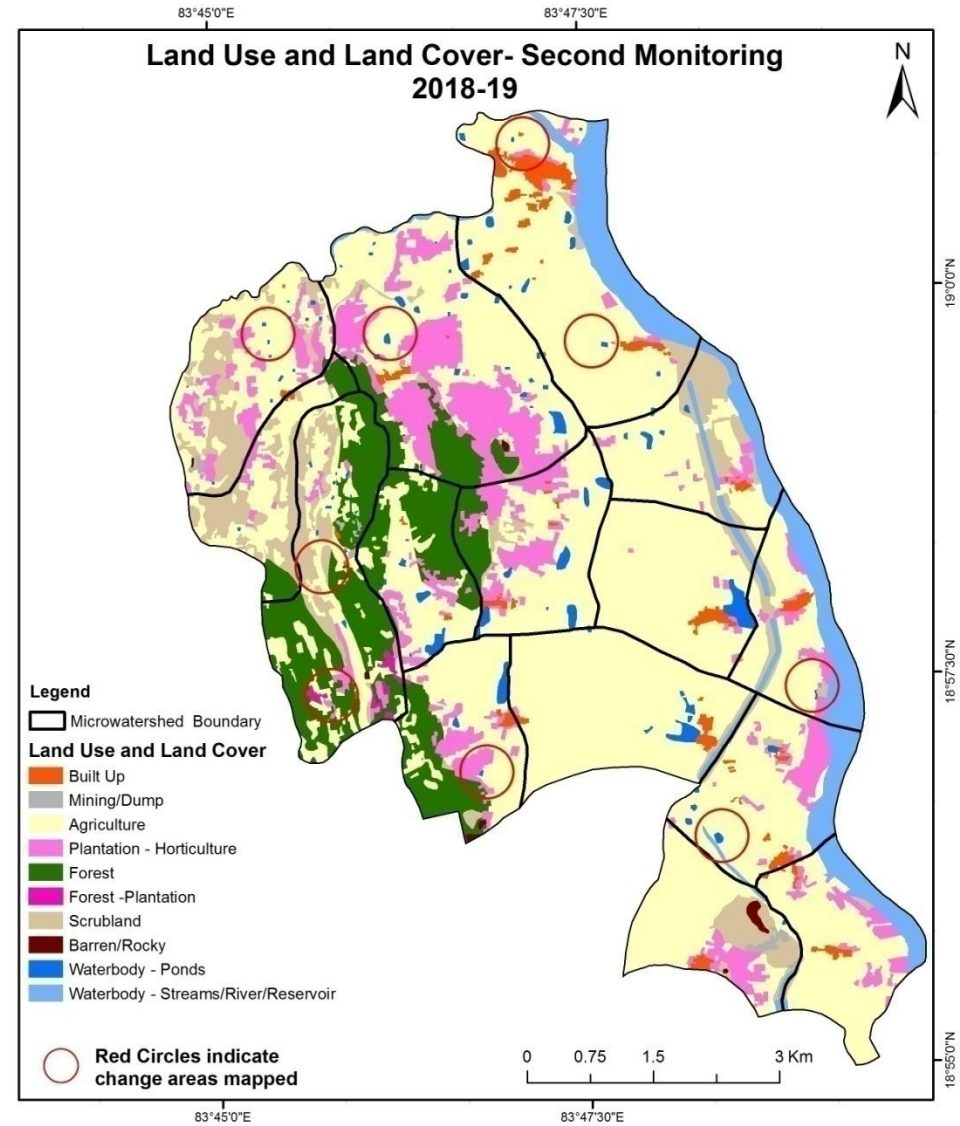
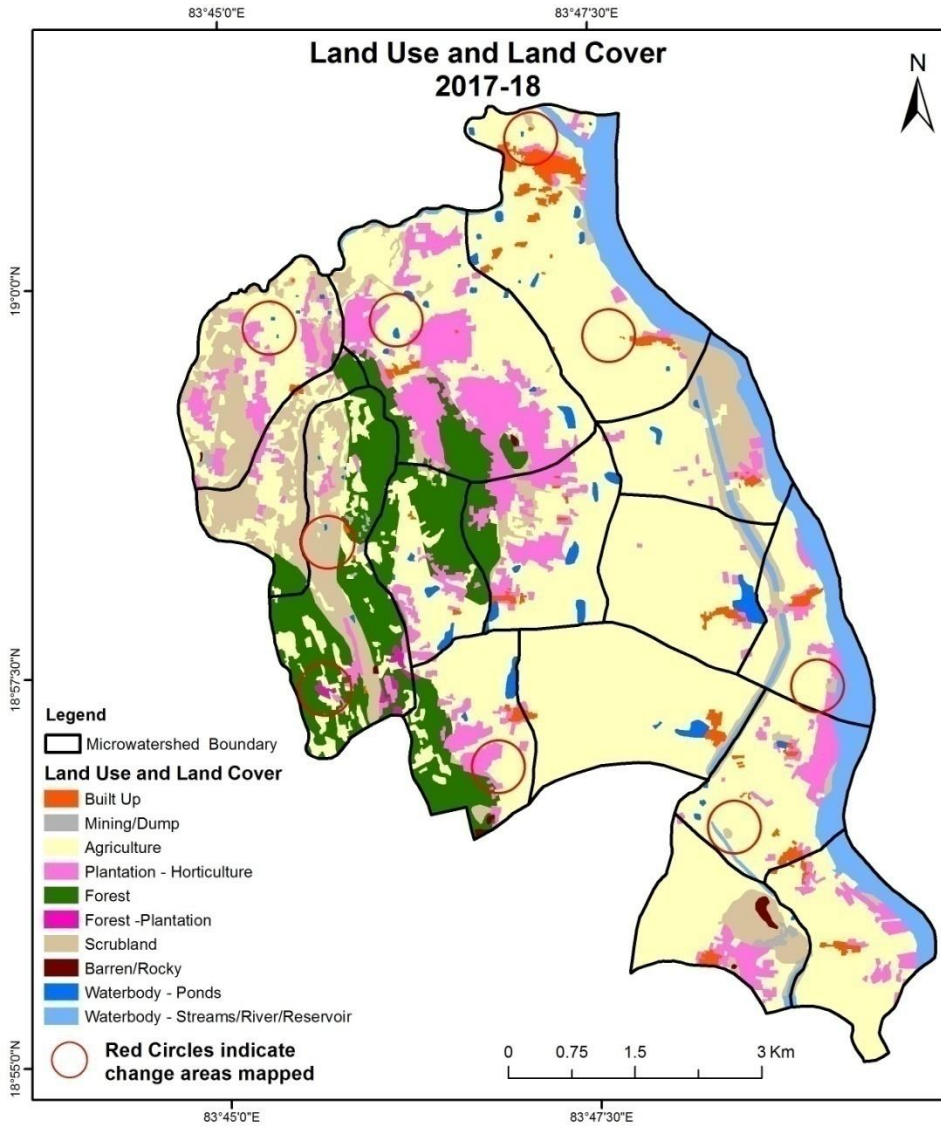
Scale: 1:10000





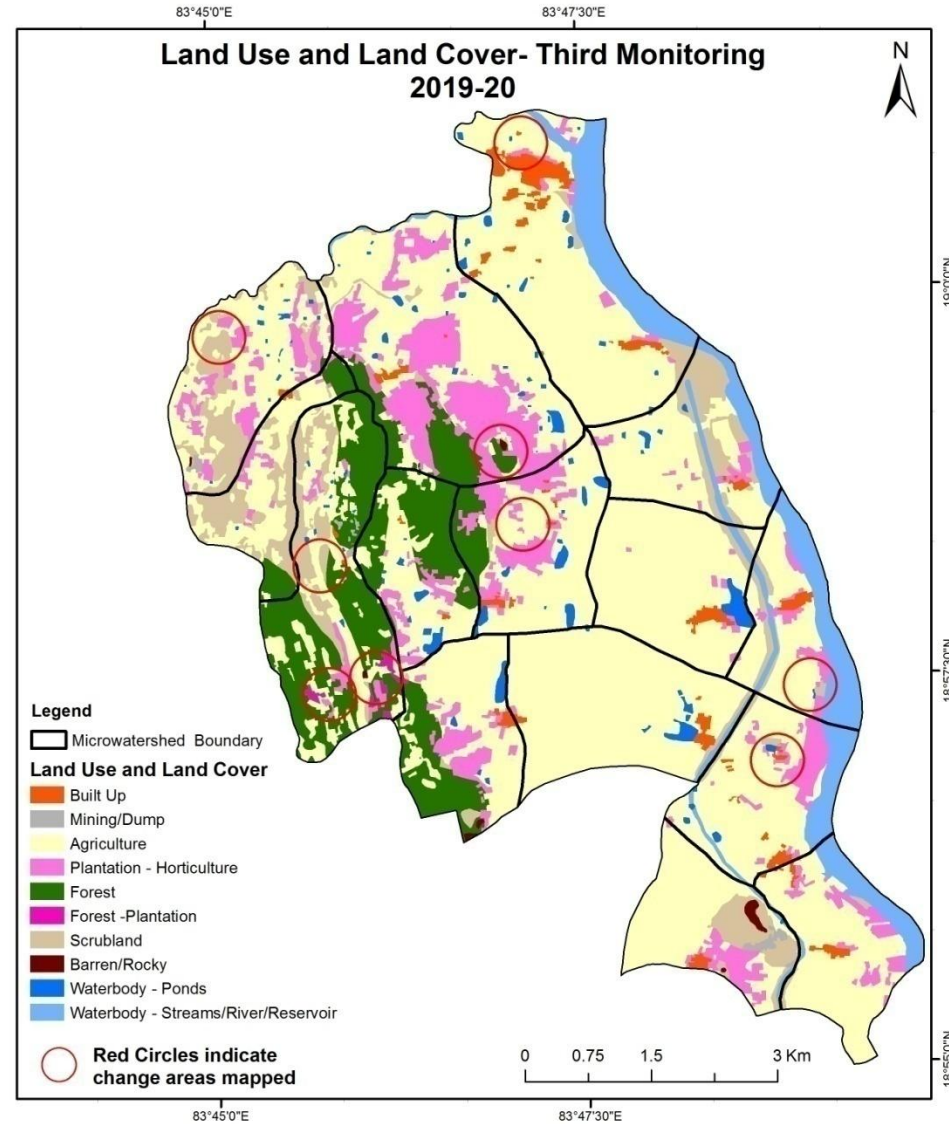
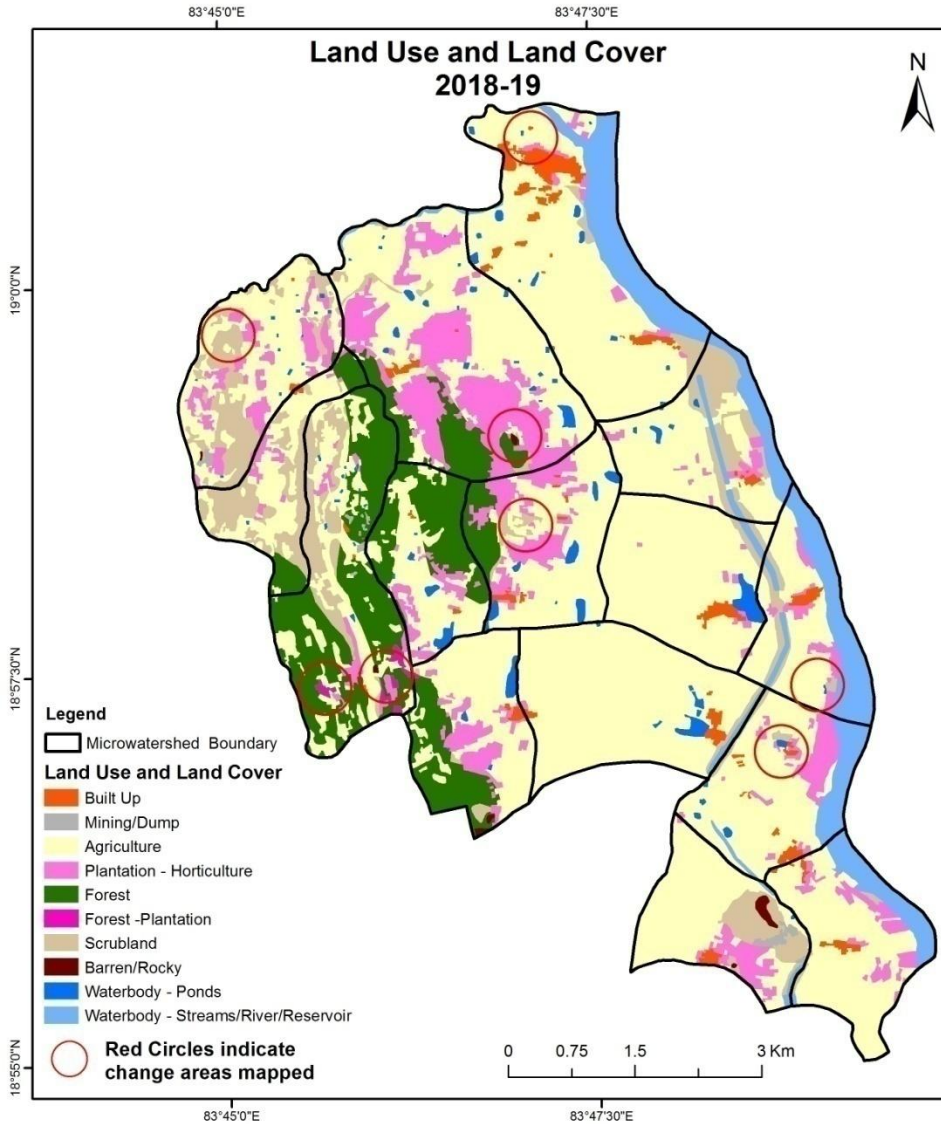
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

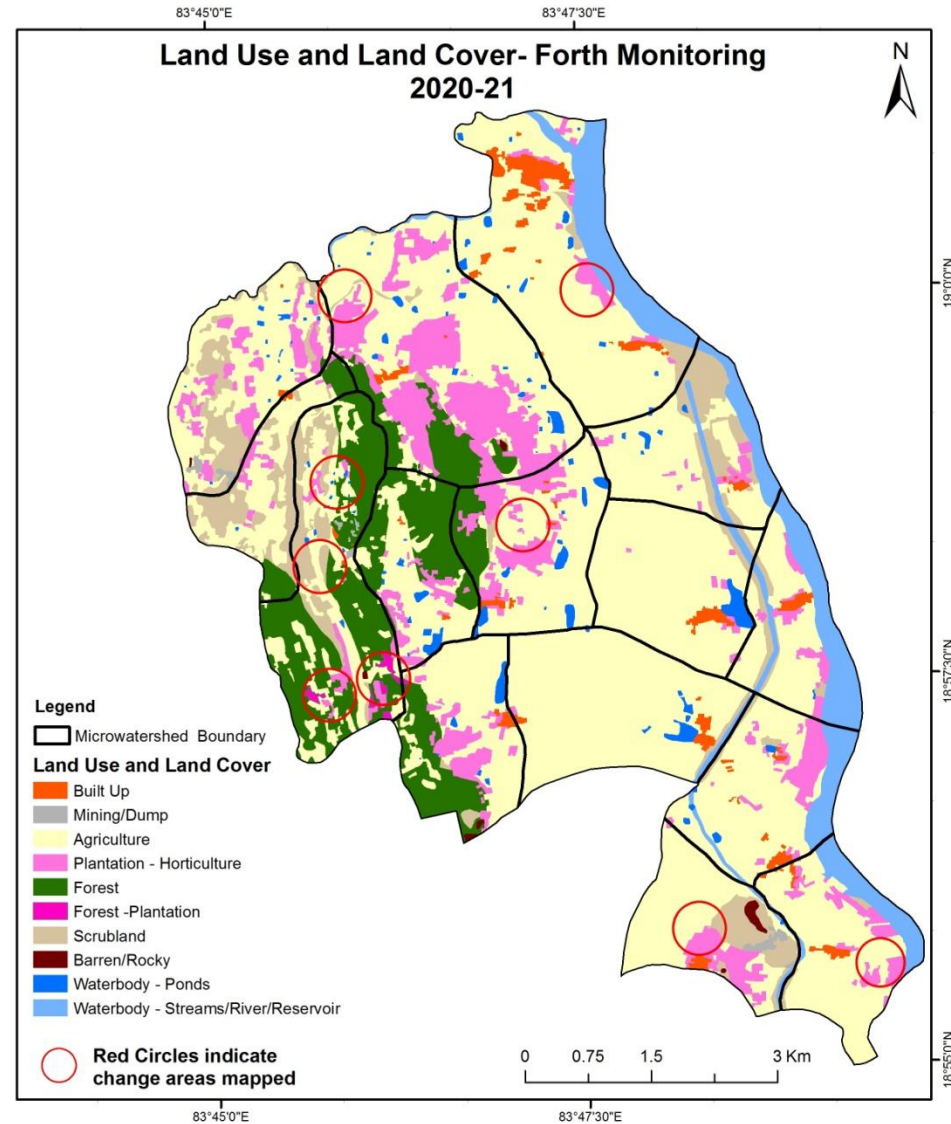
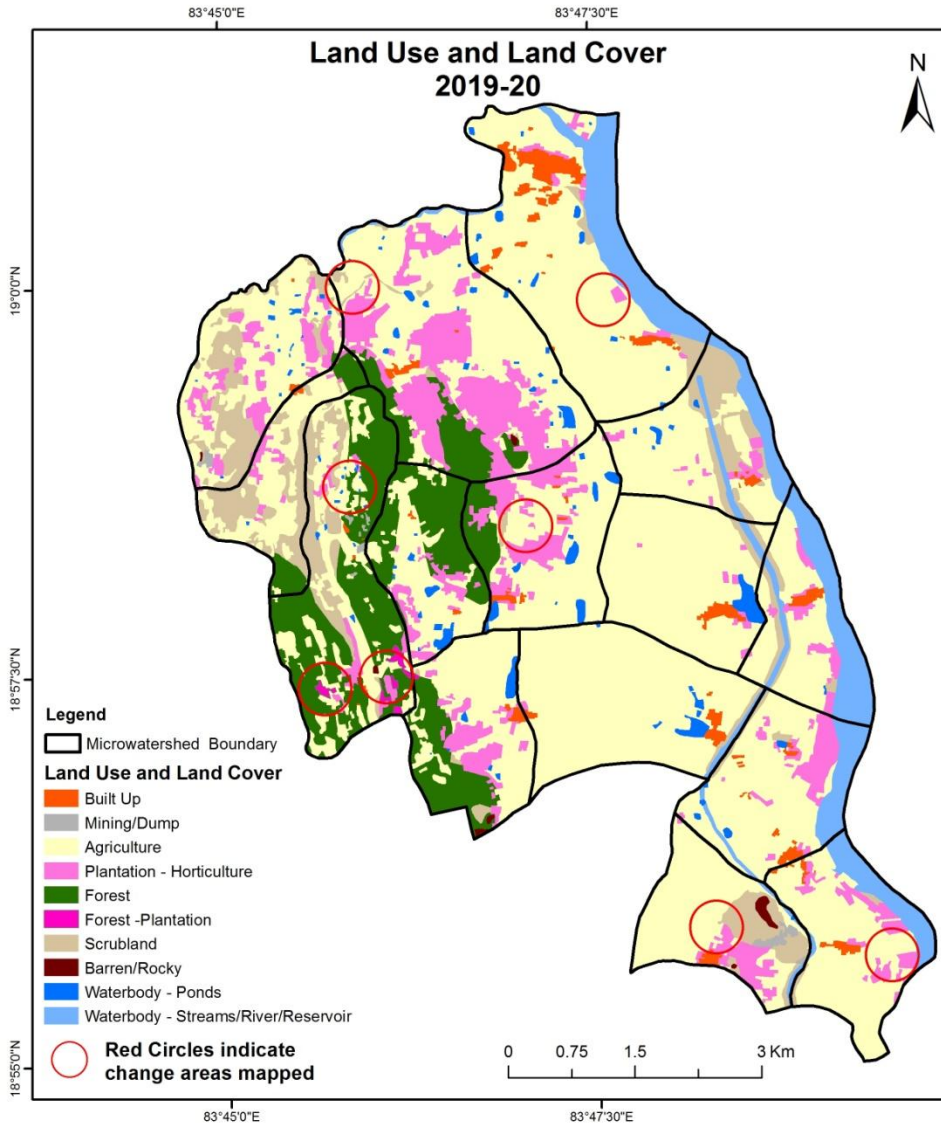
Scale: 1:10000





# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

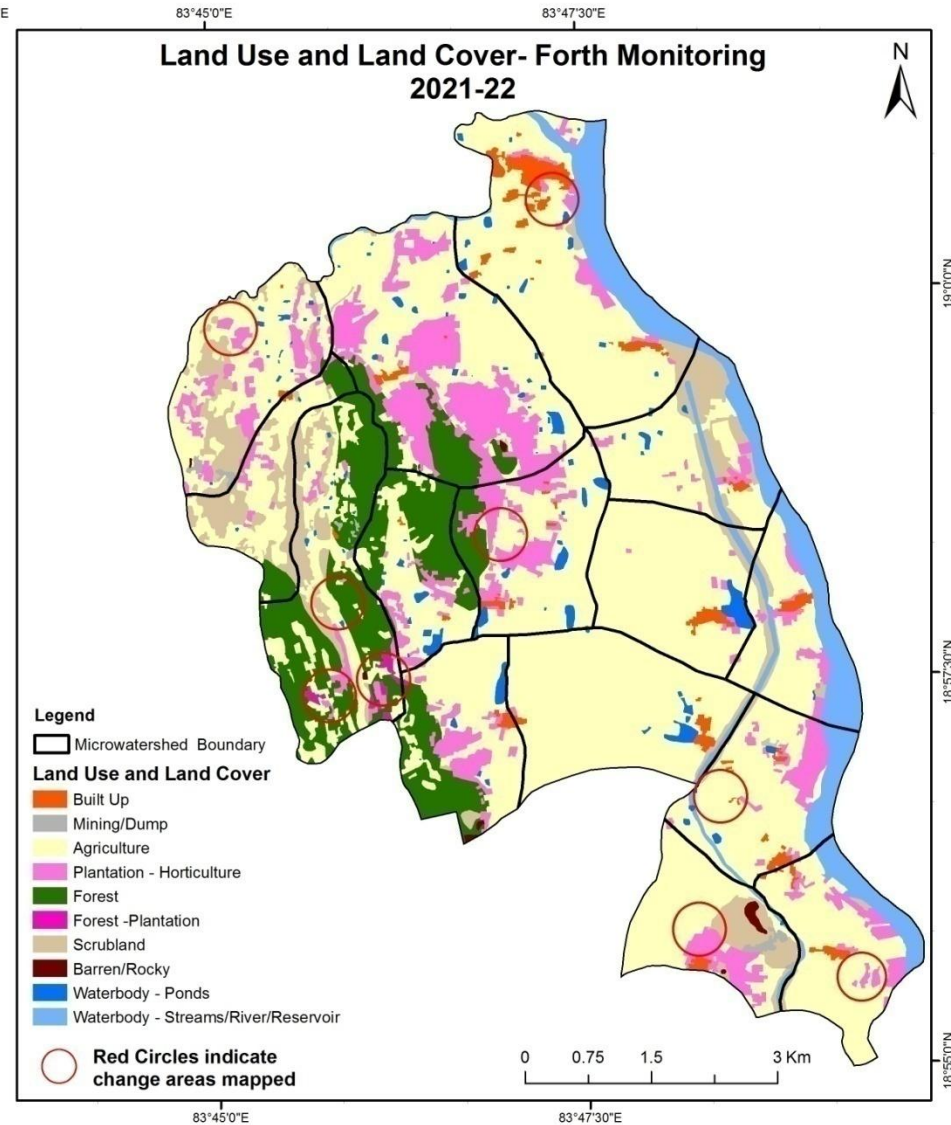
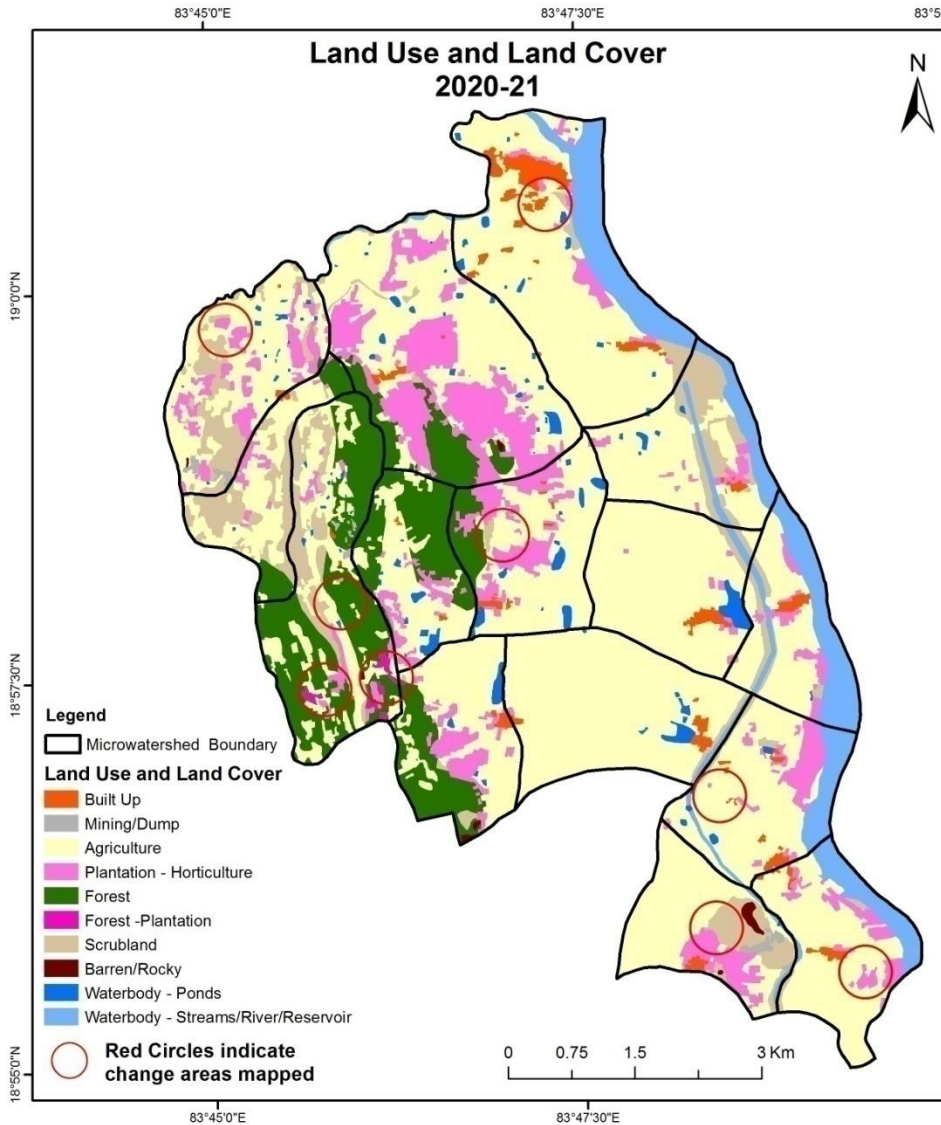
Scale: 1:10000





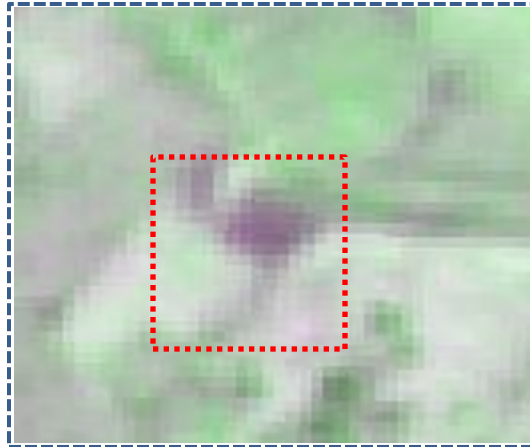
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

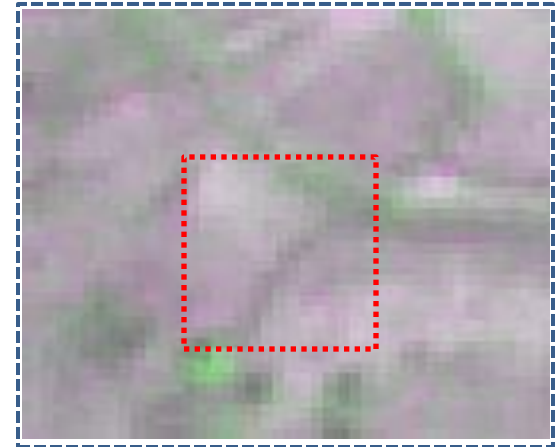


## Land Use and Land Cover changes for Pre and Post treatment dates

### Scrub To Agriculture

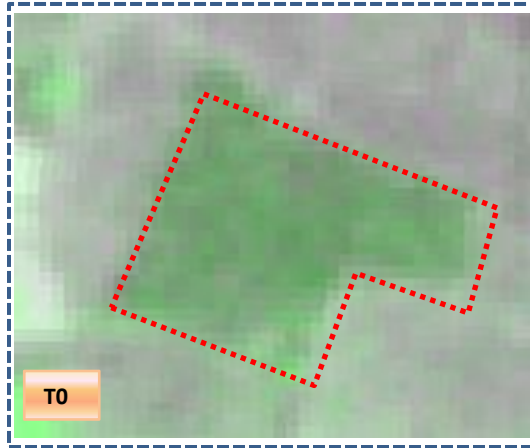


T0: 2013-14 (83°46'37.723"E 18°59'59.738"N)

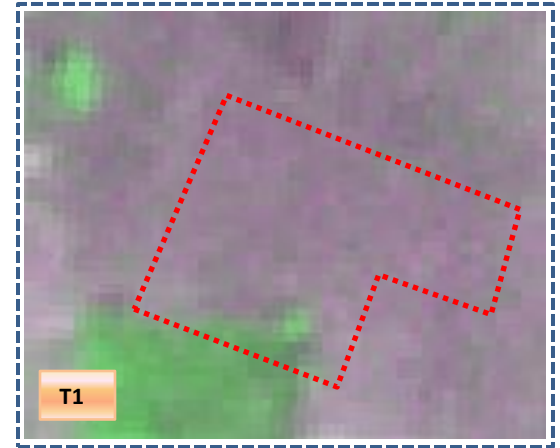


T1: 26 March 2017

### Plantation to Agriculture



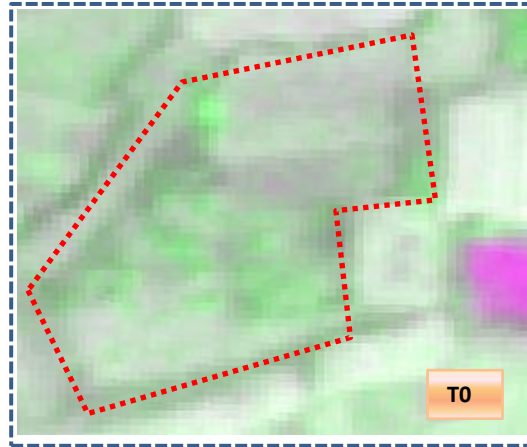
T0: 2013-14 (83°46'50.431"E 19°1'6.48"N)



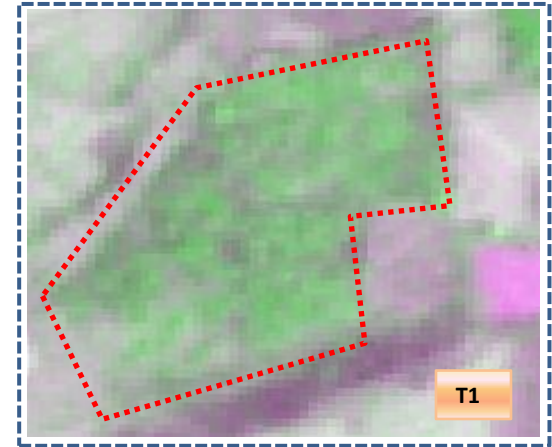
T1: 26 March 2017

## Land Use and Land Cover changes for Pre and Post treatment dates

### Agriculture to Plantation

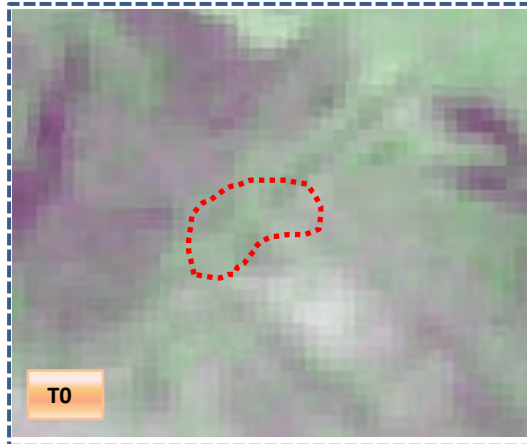


T0: 2013-14 ( $83^{\circ}46'37.723''E$   $18^{\circ}59'59.738''N$ )

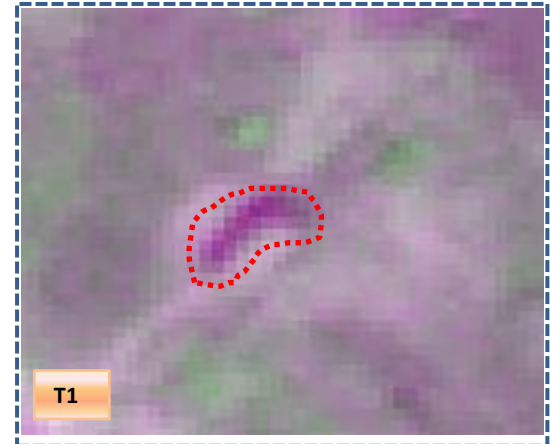


T1: 26 March 2017

### Agriculture to Waterbody



T0: 2013-14 ( $83^{\circ}48'48.618''E$   $18^{\circ}55'54.024''N$ )



T1: 26 March 2017

**Table showing change matrix depicting Land cover transitions 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>	71.94												<b>71.94</b>
<b>Mining/dump</b>		2.88											<b>2.88</b>
<b>Agriculture</b>	11.2	2.19	2750.62	67.64				29.19	3.32	1.73			<b>2865.89</b>
<b>Plantation Horticulture</b>	2.07		16.76	507.26									<b>526.09</b>
<b>Forest</b>	0.34	1.3	63.75		523.39	9.24							<b>598.02</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							8.41						<b>8.41</b>
<b>Scrub</b>	4.18	5.91	76.34	14.87				492.27		1.26			<b>594.83</b>
<b>Waterbody- Streams/River</b>			5.24					7.09	374.49				<b>386.82</b>
<b>Waterbody – Ponds</b>	0.32		1.53							57.95			<b>59.8</b>
<b>Grand Total</b>	<b>90.05</b>	<b>12.28</b>	<b>2914.24</b>	<b>589.77</b>	<b>523.39</b>	<b>9.24</b>	<b>8.41</b>	<b>528.55</b>	<b>377.81</b>	<b>60.94</b>			<b>5114.68</b>

- 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 115 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T1.
- In T1 163 ha of the agriculture area has increased from plantations, forest, scrubland and water body of T0. The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions 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>	90.05										<b>90.05</b>	
<b>Mining/dump</b>		12.28									<b>12.28</b>	
<b>Agriculture</b>	3.4		2899.14							11.7	<b>2914.24</b>	
<b>Plantation Horticulture</b>			4.58	584.89						0.3	<b>589.77</b>	
<b>Forest</b>					523.33					0.06	<b>523.39</b>	
<b>Forest Plantation</b>						9.24					<b>9.24</b>	
<b>Barren Rocky</b>							8.41				<b>8.41</b>	
<b>Scrub</b>			120.52					406.9		1.13	<b>528.55</b>	
<b>Waterbody- Streams/River</b>									377.81		<b>377.81</b>	
<b>Waterbody – Ponds</b>										60.94	<b>60.94</b>	
<b>Grand Total</b>	<b>93.45</b>	<b>12.28</b>	<b>3024.24</b>	<b>584.89</b>	<b>523.33</b>	<b>9.24</b>	<b>8.41</b>	<b>406.9</b>	<b>377.81</b>	<b>74.13</b>	<b>5114.68</b>	

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T1 15 ha of the agriculture area has decreased and it is converted into Built-up and water body in T2.
- In T2 125 ha of the agriculture area has increased from plantations and scrubland of T1.
- The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

**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		
<b>Built up</b>	93.45												<b>93.45</b>
<b>Mining/dump</b>		12.16							0.12				<b>12.28</b>
<b>Agriculture</b>	2.23		3010.81						6.62	4.58			<b>3024.24</b>
<b>Plantation Horticulture</b>	0.39		2.13	582.37									<b>584.89</b>
<b>Forest</b>			3.7		519.59						0.04		<b>523.33</b>
<b>Forest Plantation</b>						9.24							<b>9.24</b>
<b>Barren Rocky</b>							8.41						<b>8.41</b>
<b>Scrub</b>			22.11					382.29	1.9	0.6			<b>406.9</b>
<b>Waterbody- Streams/River</b>								1.61	376.2				<b>377.81</b>
<b>Waterbody – Ponds</b>										74.13			<b>74.13</b>
<b>Grand Total</b>	<b>96.07</b>	<b>12.16</b>	<b>3038.75</b>	<b>582.37</b>	<b>519.59</b>	<b>9.24</b>	<b>8.41</b>	<b>383.9</b>	<b>384.84</b>	<b>79.35</b>			<b>5114.68</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T2 13 ha of the agriculture area has decreased and it is converted into Built-up and water body in T3.
- In T3 27 ha of the agriculture area has increased from plantations, forest and water body of T2.
- The additional agriculture are coming from waterbody in T3 represents seasonal agriculture.

**Table showing change matrix depicting Land cover transitions 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	96.07											96.07
Mining/dump		12.16										12.16
Agriculture			3021.06	17.69								3038.75
Plantation Horticulture				582.37								582.37
Forest					519.59							519.59
Forest Plantation						9.24						9.24
Barren Rocky							8.41					8.41
Scrub		2.93	13.75					367.22				383.9
Waterbody- Streams/River									384.84			384.84
Waterbody – Ponds										79.35		79.35
<b>Grand Total</b>	<b>96.07</b>	<b>15.09</b>	<b>3034.81</b>	<b>600.06</b>	<b>519.59</b>	<b>9.24</b>	<b>8.41</b>	<b>367.22</b>	<b>384.84</b>	<b>79.35</b>		<b>5114.68</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T3 17 ha of the agriculture area has decreased and it is converted into plantations in T4.
- In T4 13 ha of the agriculture area has increased from scrubland of T3.
- The additional agriculture are coming from waterbody in T4 represents seasonal agriculture.



**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		
<b>Built up</b>	96.07												<b>96.07</b>
<b>Mining/dump</b>		15.09											<b>15.09</b>
<b>Agriculture</b>			3034.81										<b>3034.81</b>
<b>Plantation Horticulture</b>			1.28	598.78									<b>600.06</b>
<b>Forest</b>					519.59								<b>519.59</b>
<b>Forest Plantation</b>						9.24							<b>9.24</b>
<b>Barren Rocky</b>							8.41						<b>8.41</b>
<b>Scrub</b>			11.11	4.13				351.57			0.41		<b>367.22</b>
<b>Waterbody- Streams/River</b>									384.84				<b>384.84</b>
<b>Waterbody – Ponds</b>											79.35		<b>79.35</b>
<b>Grand Total</b>	<b>96.07</b>	<b>15.09</b>	<b>3047.2</b>	<b>602.91</b>	<b>519.59</b>	<b>9.24</b>	<b>8.41</b>	<b>351.57</b>	<b>384.84</b>		<b>79.76</b>		<b>5114.68</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T5 12 ha of the agriculture area has increased from plantations and scrubland of T4.
- The additional agriculture are coming from waterbody in T5 represents seasonal agriculture.



# Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. 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.
3. There is an increase of 18 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 48, 110, 14 & 12 Hectares from T0-T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 181 Hectares in Crop land area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
5. About **76 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 243 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.