MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

Srikakulam -05/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2021

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

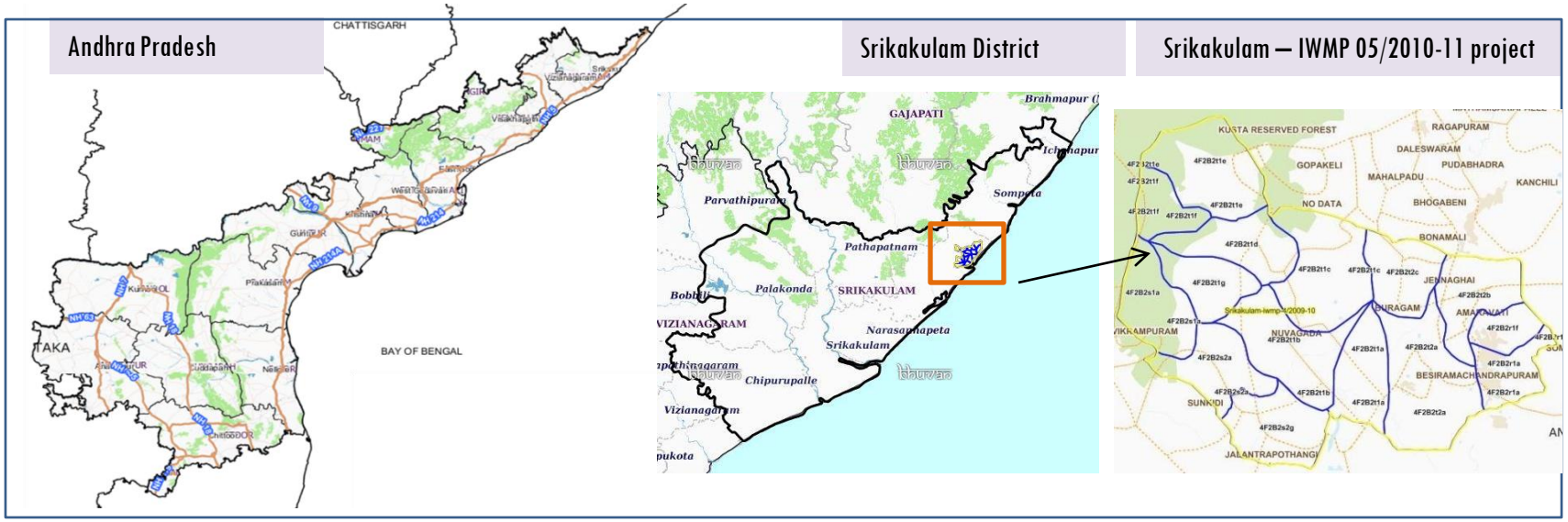
CONTENTS

EXECUTIVE SUMMARY

- 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-05/2010-11, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 5,277.92 ha. It comprises of 16 micro watersheds.
- In the project area 169 Drishti photos were uploaded showing 95 agriculture/horticulture, 2 afforestation, 39 check dams/checks & plugins, 23 Drainage treatments of Nala Revetment, loose boulder structures etc, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 23 new farm ponds or dug out pits and 39 check dams and drainage treatments with 14.92 ha increase in the area.
- Major percentage i.e. 61.32% is covered by the agriculture, 24.82% is covered by plantation, 2.86% is covered by scrubland, 7.95% is covered by plantation/horticulture and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-05/2010-11
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Vajrapukothuru Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 5277.92 ha. It comprises of 16 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (***Batch -1***) projects taking 2018-19 (T5) period satellite images



- The climate of the region is generally tropical, the mean maximum temperature is 30-40°C April-May and the mean minimum temperature is 17.4°C December-January during the summer season till the onset of the South-West monsoon the heat is oppressive and the day temperature is May sometimes go about 43°C.
- The rainfall in the region is considerably more in the hilly areas as compared to the plains, the annual normal rainfall is 1131 mm (i.e., 61% from South West monsoon and 2.2% from Northeast monsoon) is shared by summer showers and winter rains.

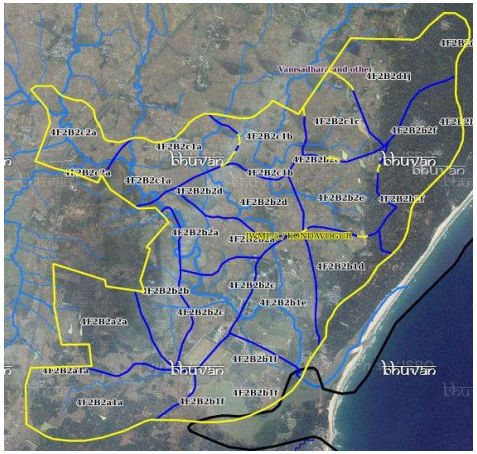
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			13-Feb-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			13-Feb-19
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	36
4	Detailed Project Report		

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



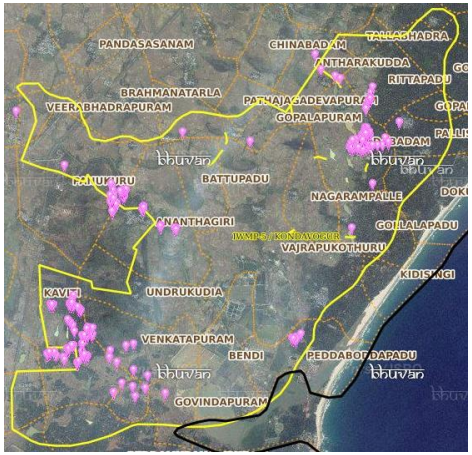
Legend

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	Agriculture/Horticulture	116	95
2	Afforestation	3	2
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	23	18
7	Terrace	0	0
8	Gabion structure	0	0
9	Checks & Plugs	9	9
10	Farm ponds/Dug out pit	8	6
11	Civil work-Check dams /Rock fill dam	34	30
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm	2	2
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	7	7
18	Others	17	0
	TOTAL	**219**	**169**

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 (2010-11) and T5 is 2018-19 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.

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-04/2010-11

T0:2010-11

T1: 04 March 2013

Drishti Sl no. 172463 MWS :4F2B2a1a

Bunding

T0:2010-11

T1: 04 March 2013

Drishti Sl no. 172444 MWS :4F2B2a1a

Farm pond

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-04/2010-11

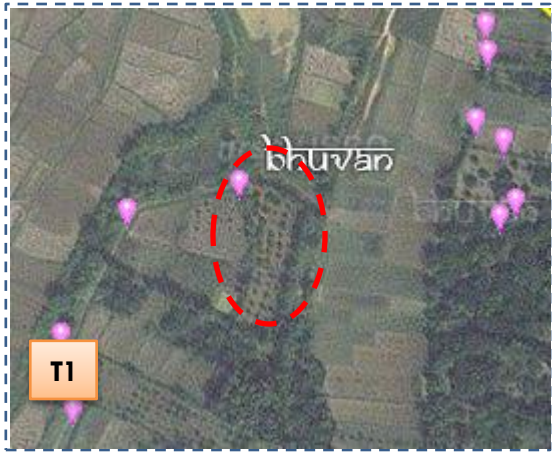
T0: 2010-11

T1: 04 March 2013

Drishti Sl no. 2559157 MWS :4F2B2b1e

Farm pond

T0: 2010-11



T1: 04 March 2013

Drishti Sl no. 2514711 MWS : 4F2B2c1c

Horticulture

Srikakulam–IWMP-05/2010-11

2009-10

Nov-2016

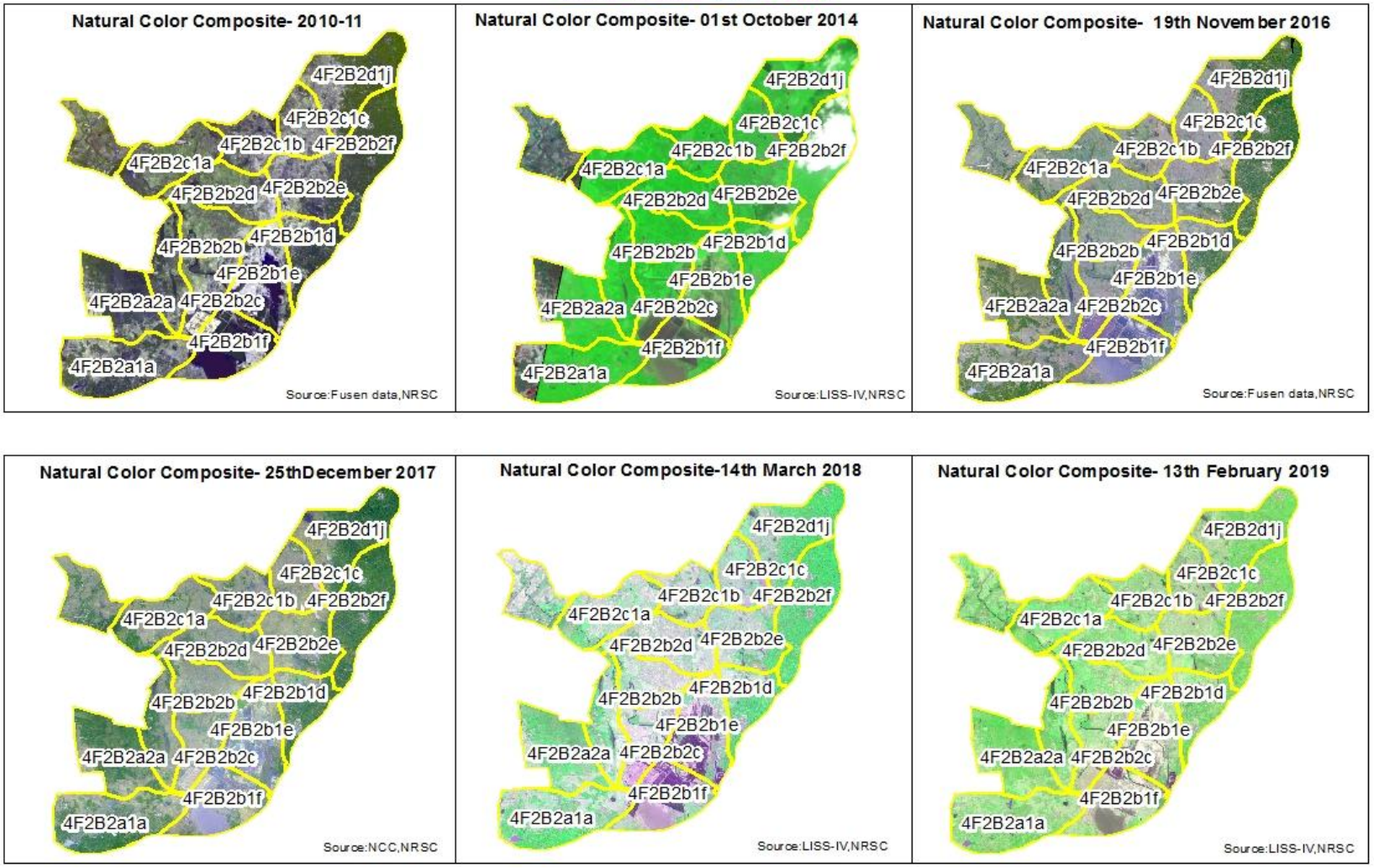
Dec-2017

Dec-2018

Activity : Farm pond

Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite



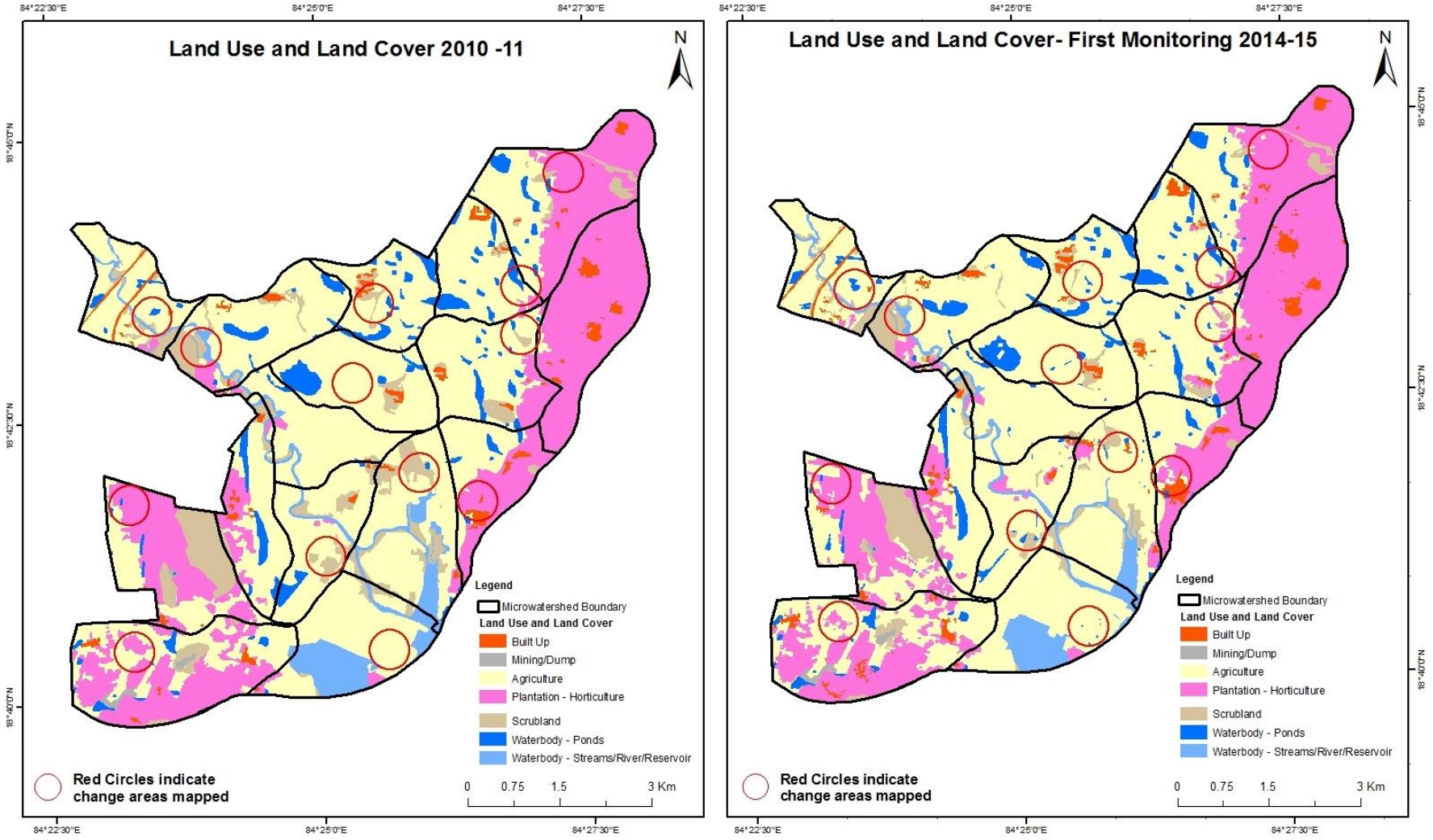
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover form 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 (2010-11) and row represents the T5 (2018-19)

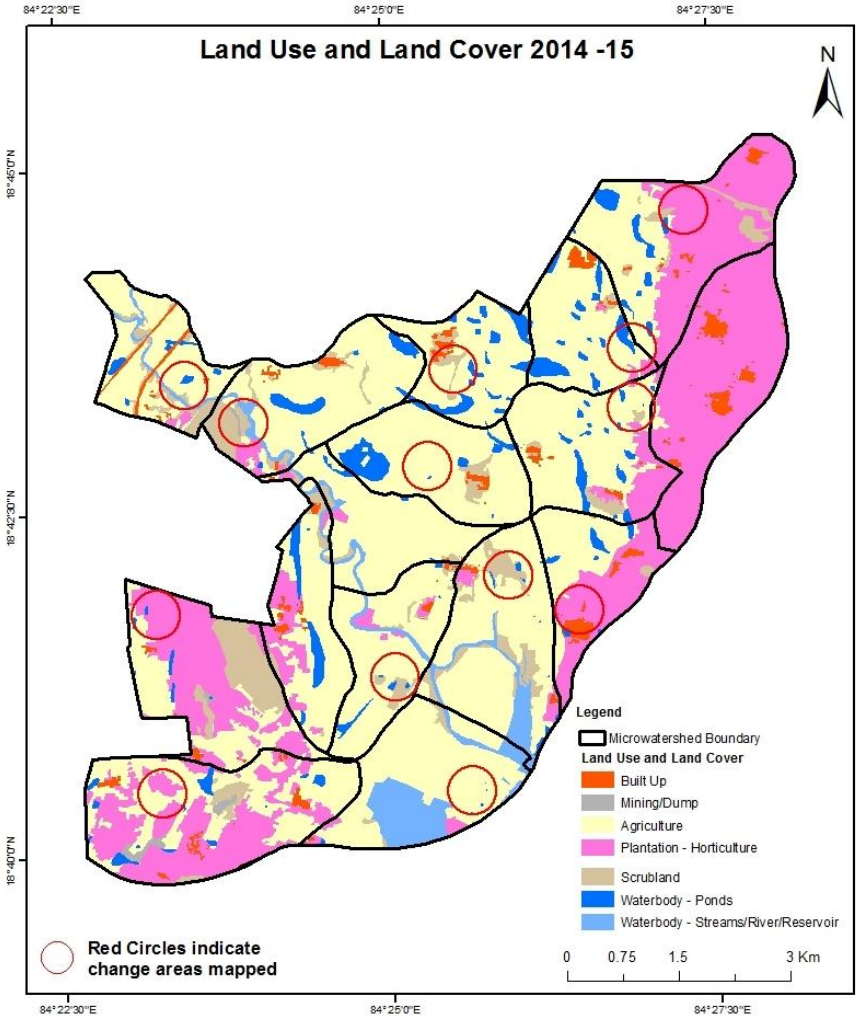
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

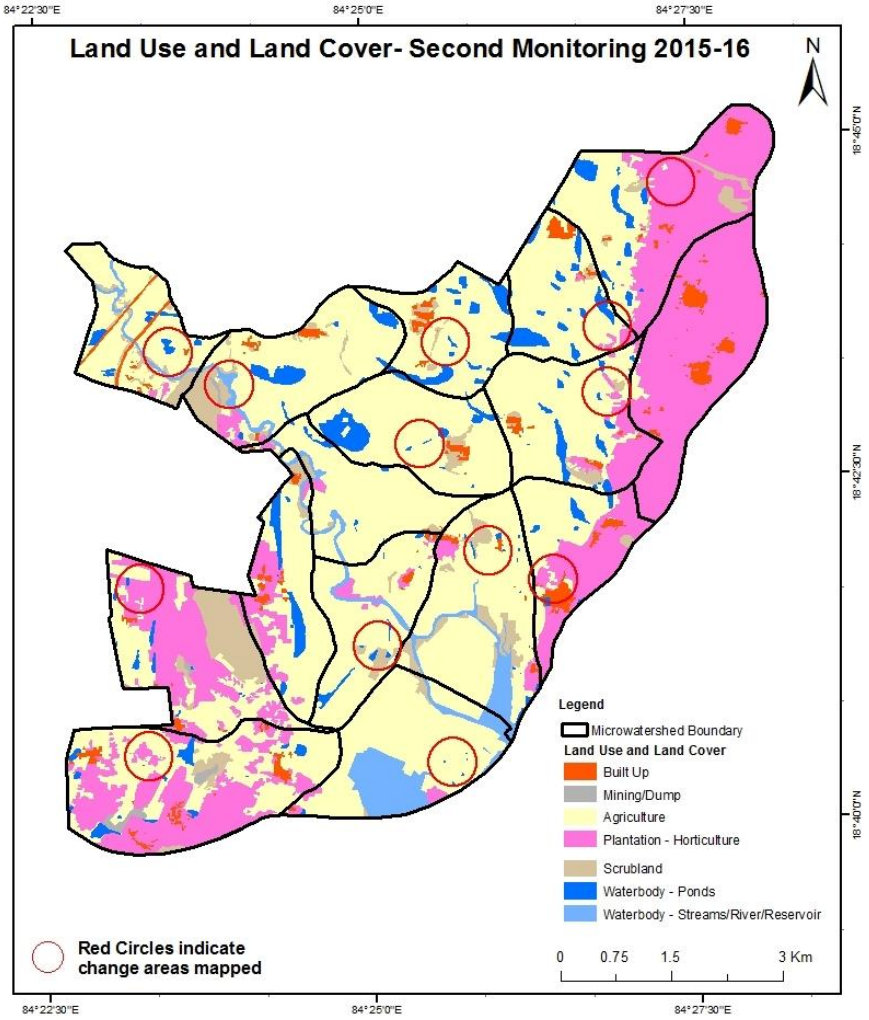
Scale: 1:10000



Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

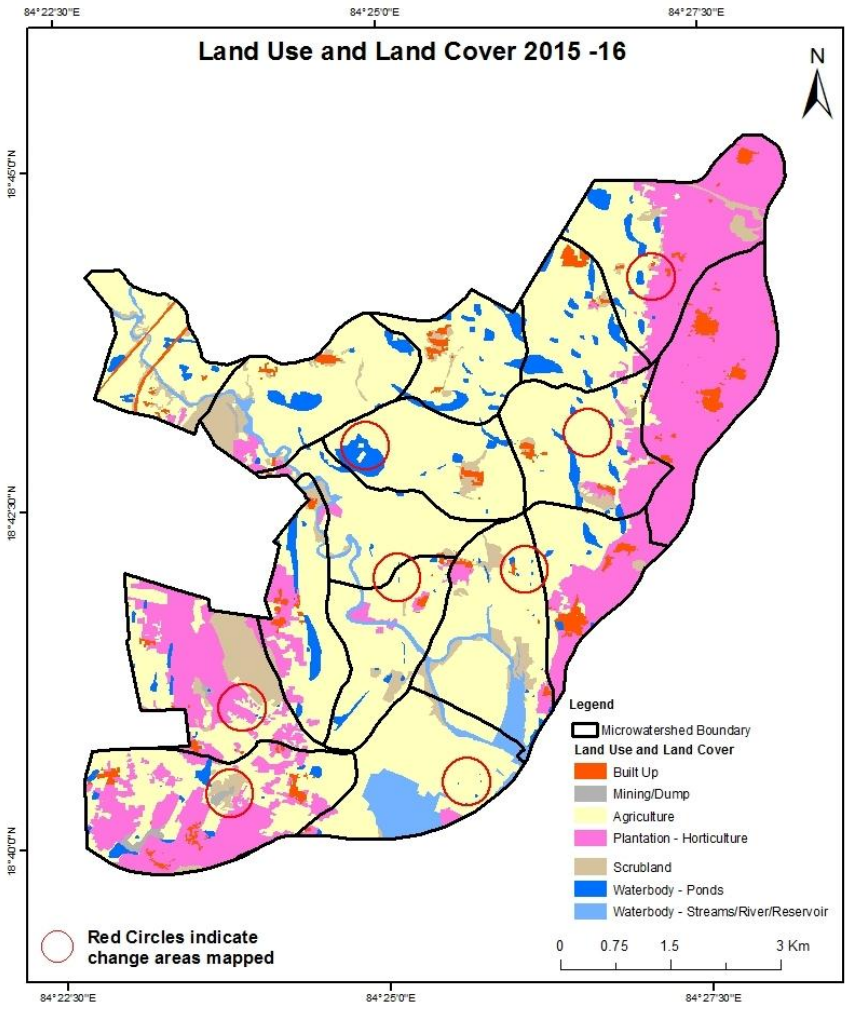
Scale: 1:10000

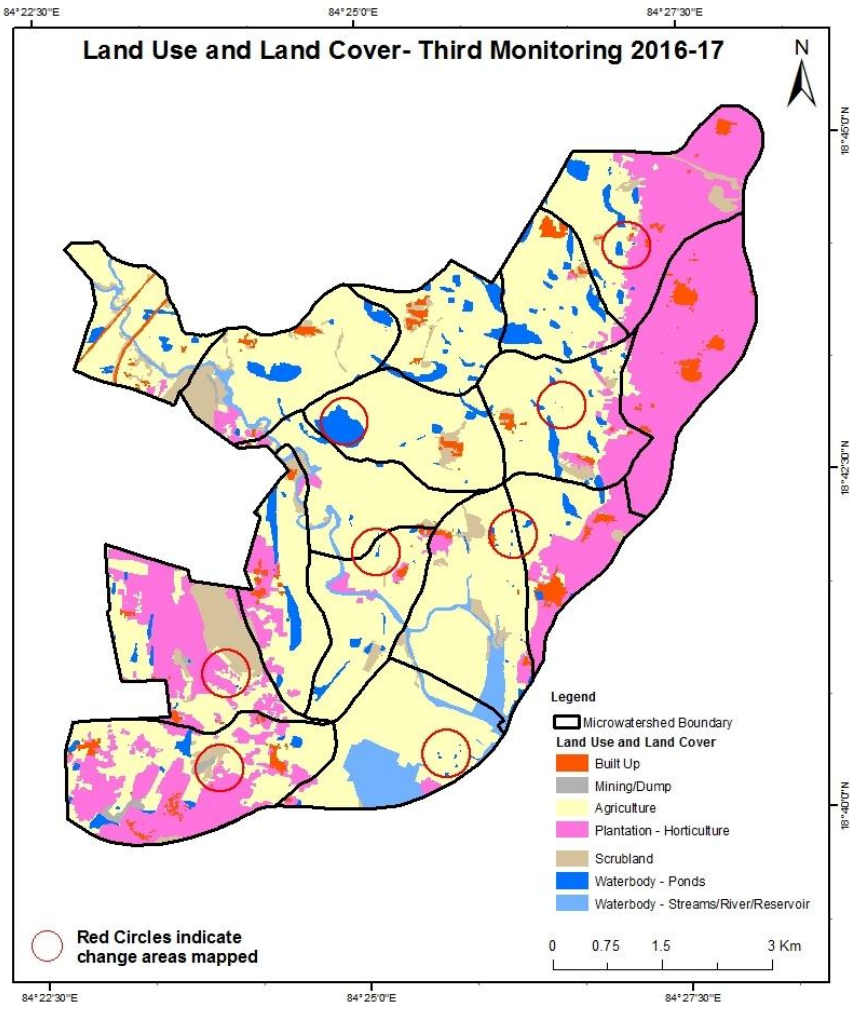




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

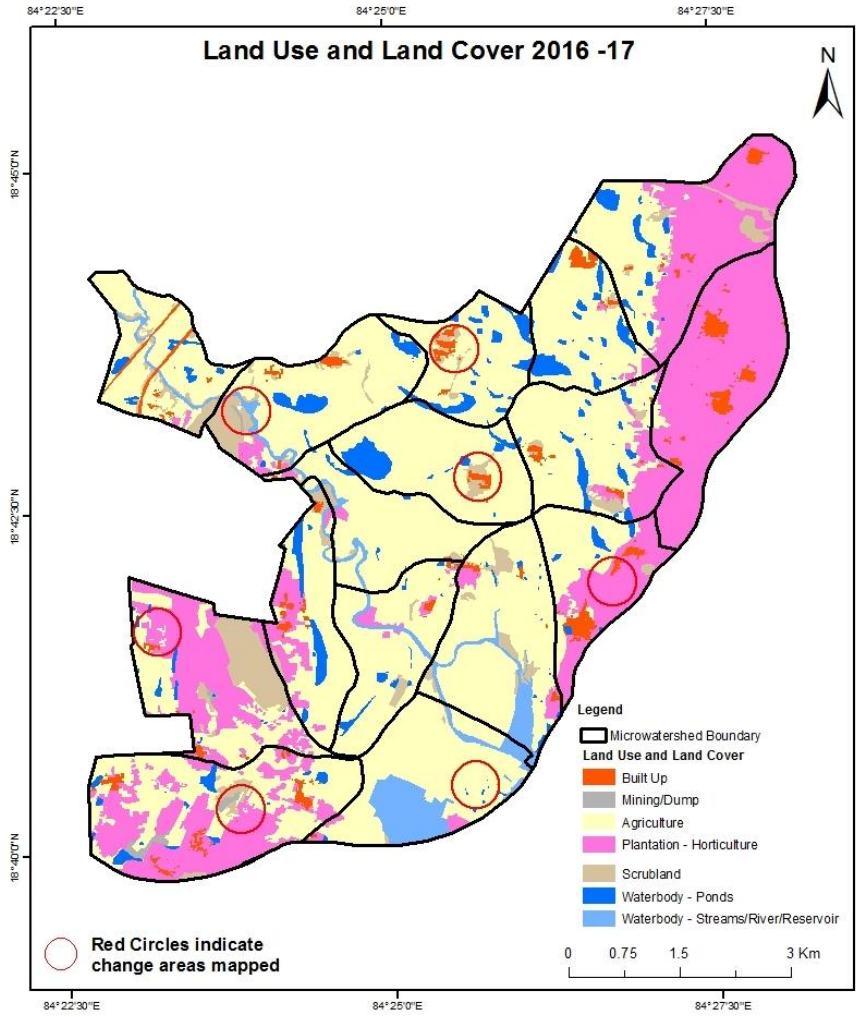
Scale: 1:10000

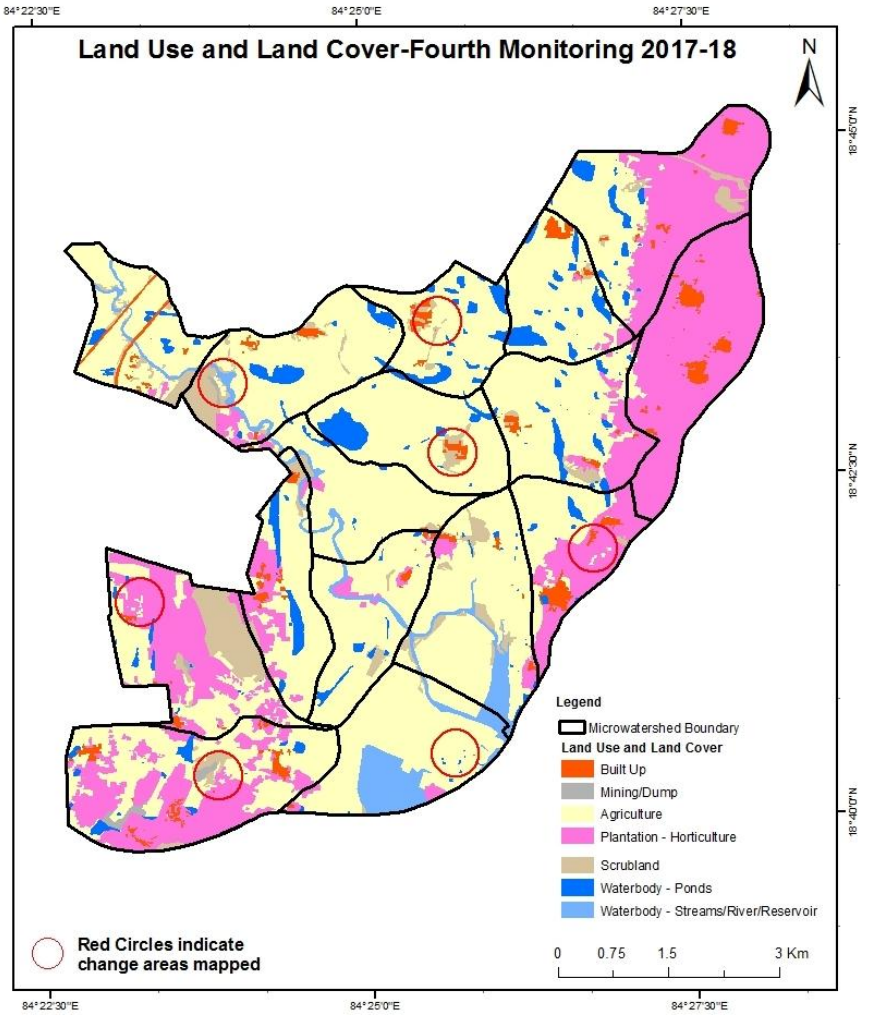




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

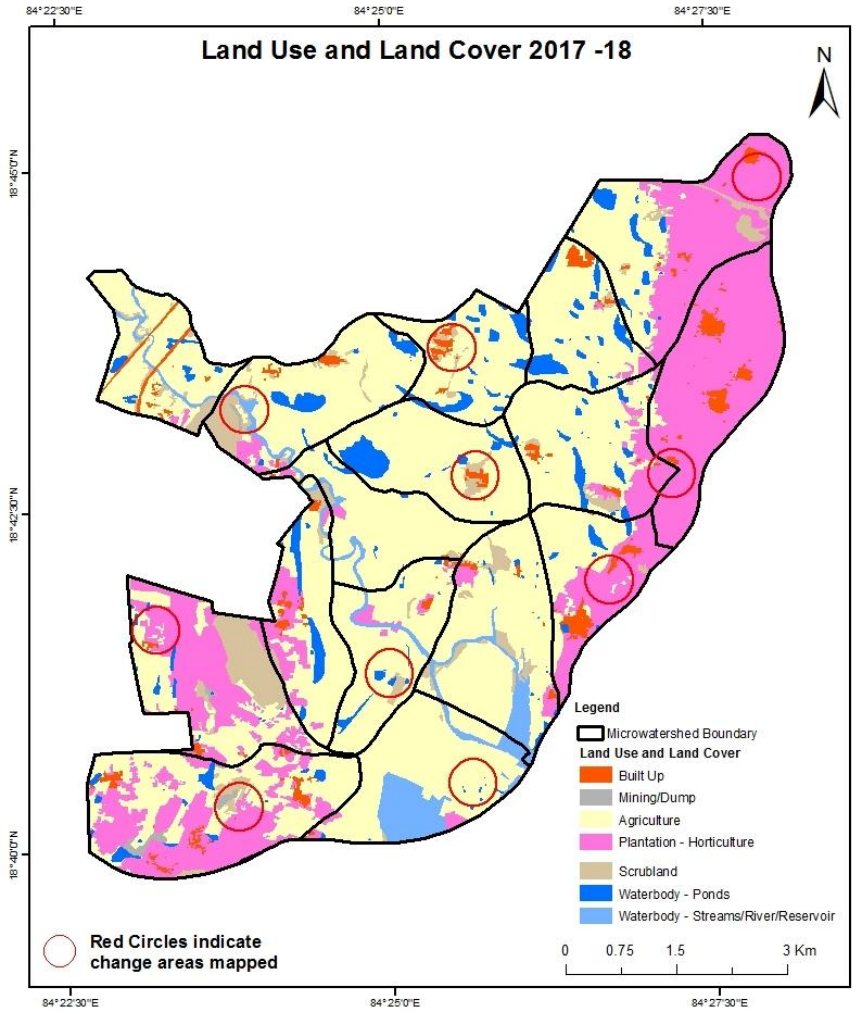
Scale: 1:10000

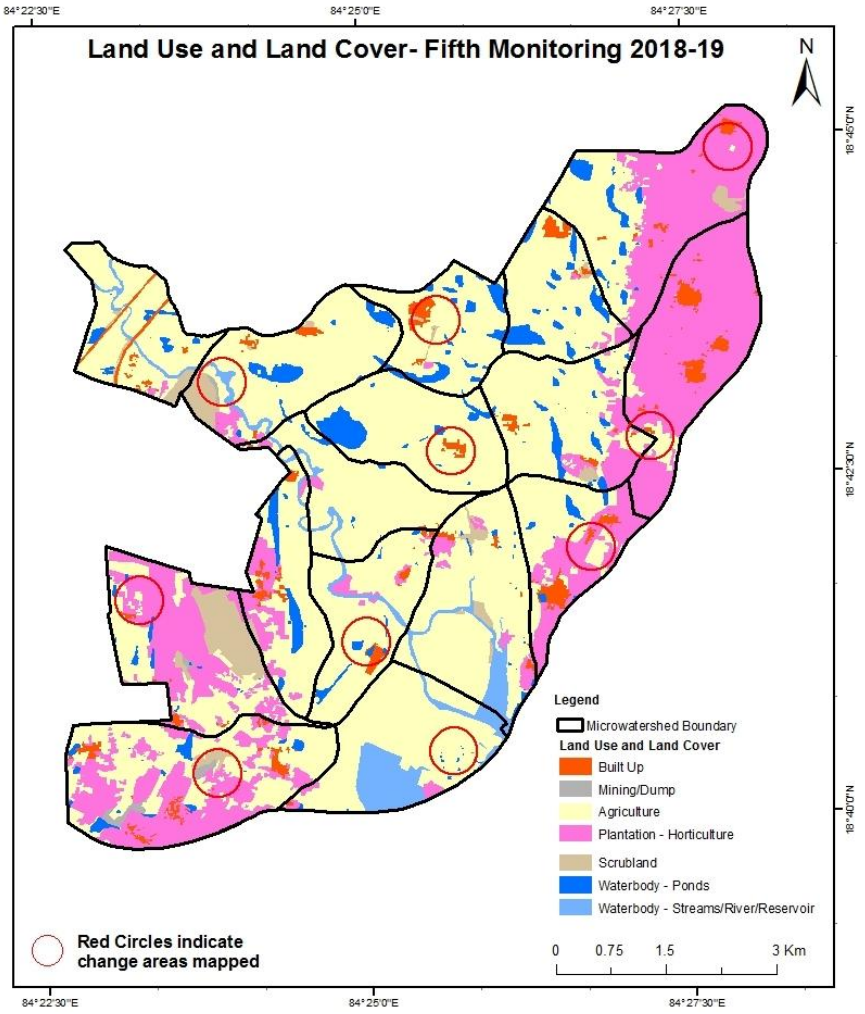




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

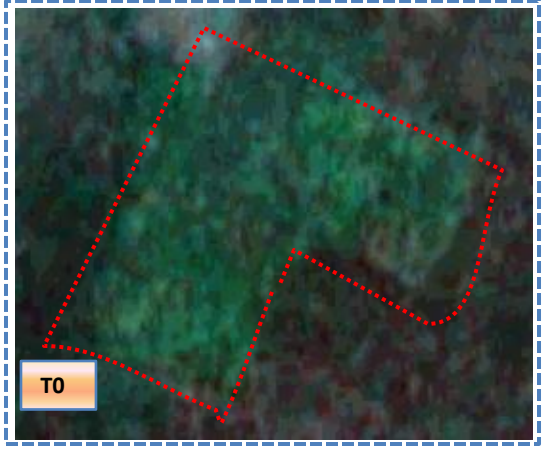
Scale: 1:10000



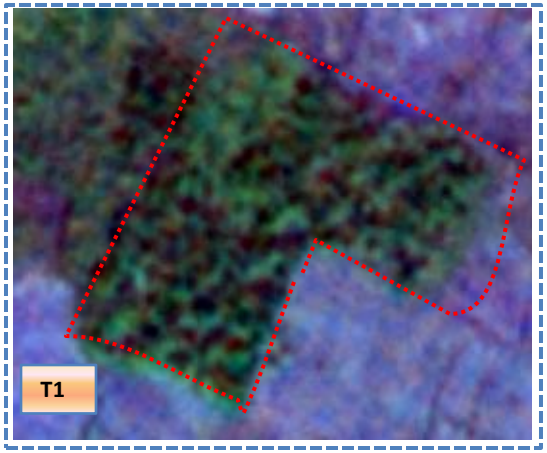


Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

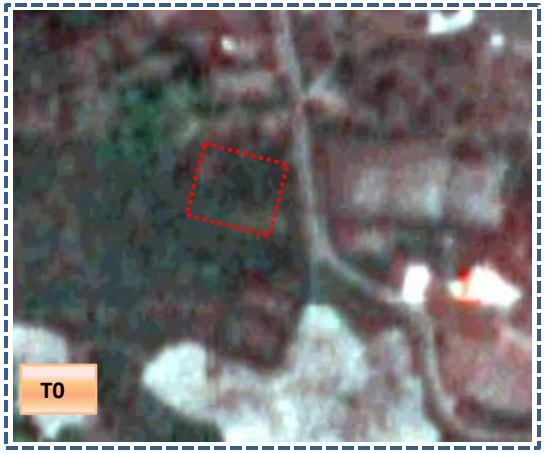


T0: 2010-11

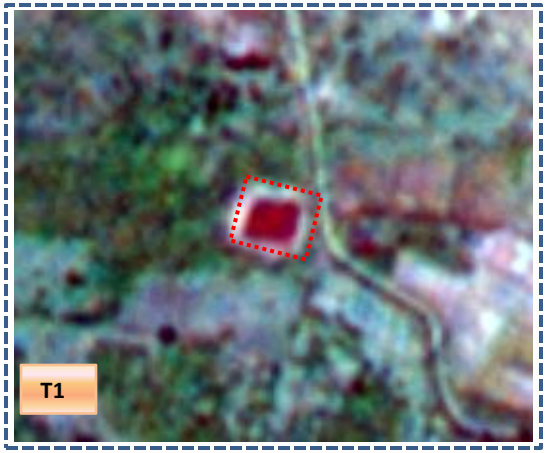


T1: 04 March 2013

Agriculture to Water body



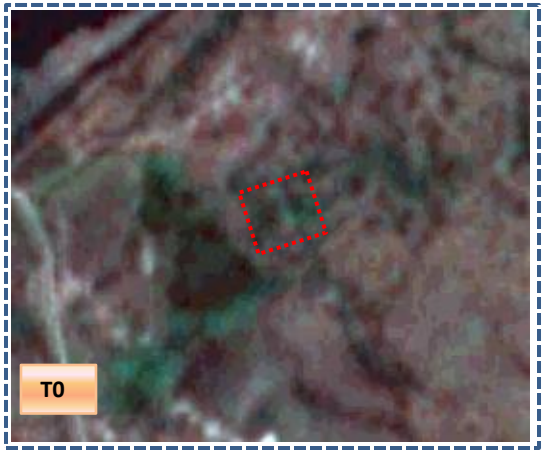
T0: 2010-11



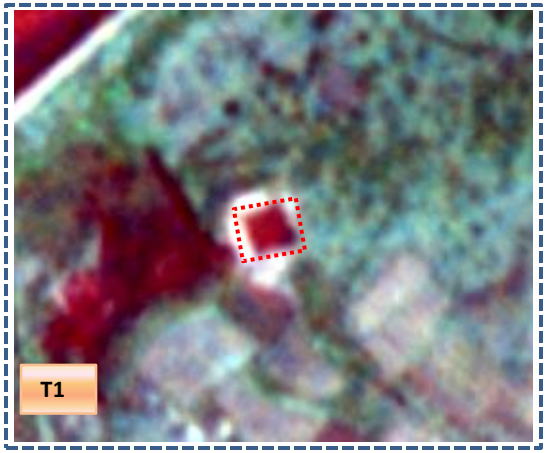
T1: 04 March 2013

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

Agriculture to Water body

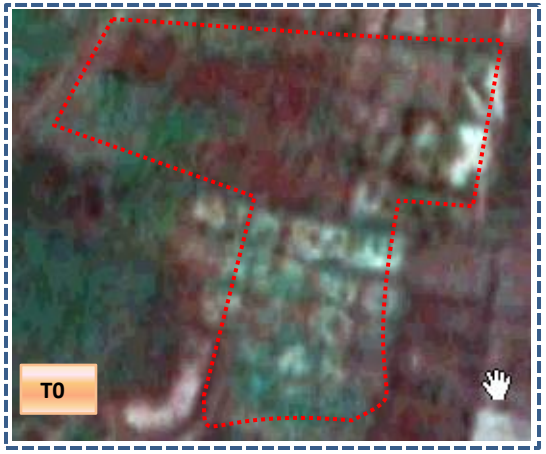


T0: 2010-11

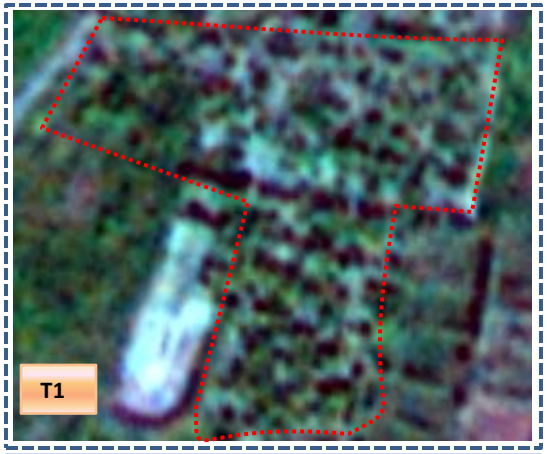


T1: 04 March 2013

Scrub to Water body



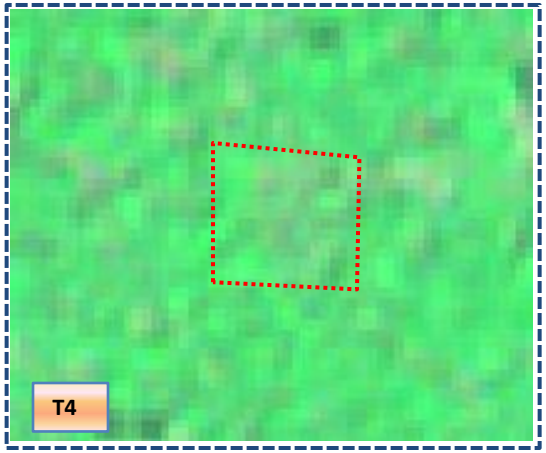
T0: 2010-11



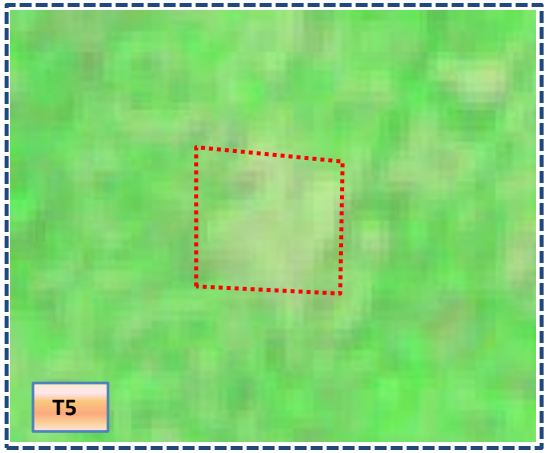
T1: 04 March 2013

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

Plantation to Agriculture

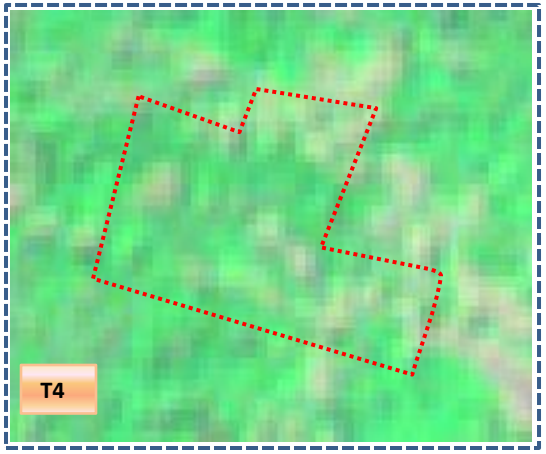


T4: 2017-18 (84°27'53.249"E 18°44'52.934"N)

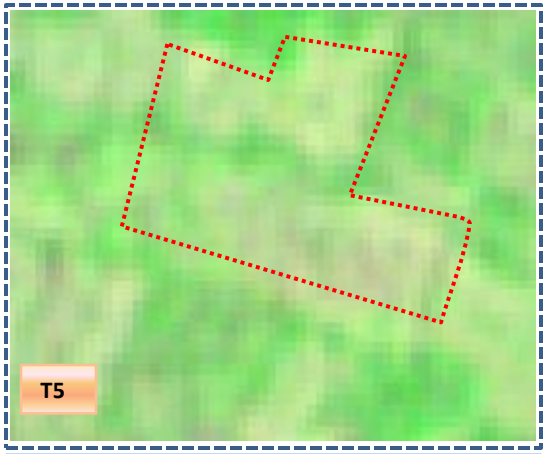


T5: 13 February 2019

Plantation to Agriculture



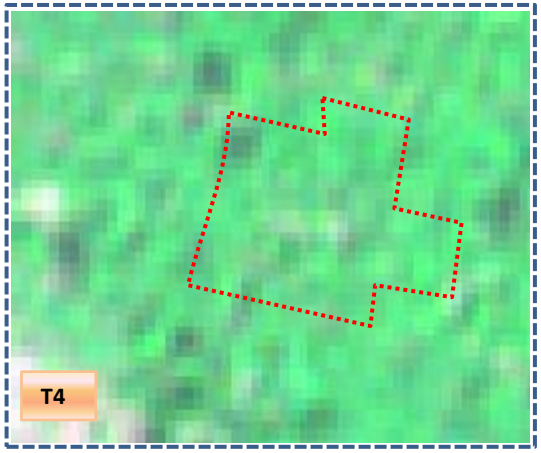
T4: 2017-18 (84°27'20.262"E 18°42'43.544"N)



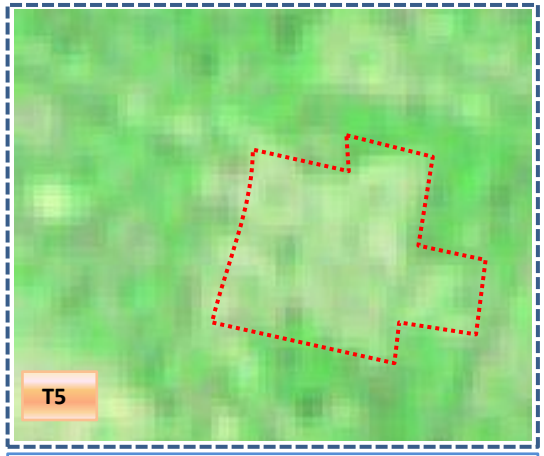
T5: 13 February 2019

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

Plantation to Agriculture

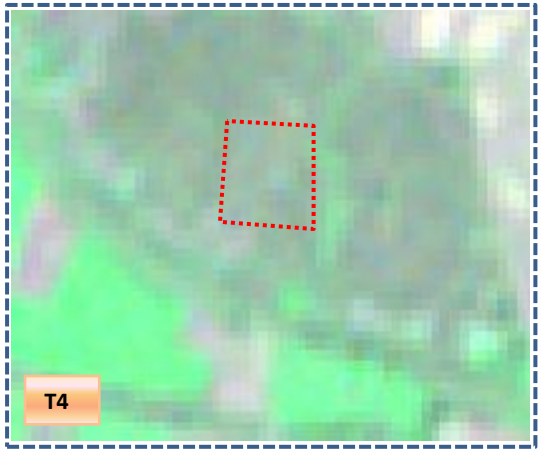


T4: 2017-18 (84°26'36.372"E 18°41'47.593"N)

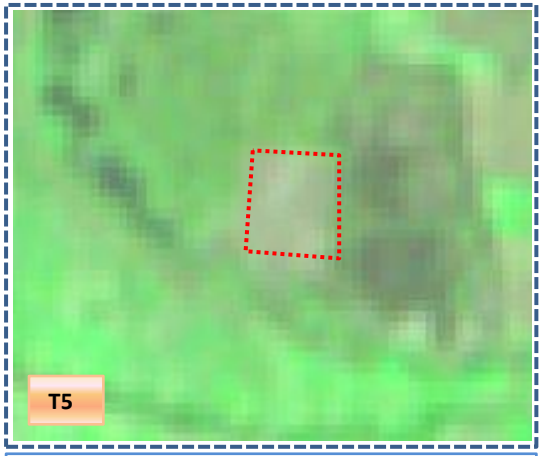


T5: 13 February 2019

Water body to Agriculture



T4: 2017-18(84°24'11.955"E 18°43'17.983"N)



T5: 13 February 2019

Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15

Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	100.28										100.28
Mining/dump		14.09	1.56								15.65
Agriculture	6.86		2921.80	2.65				5.24		2.36	2938.90
Plantation Horticulture	9.89		27.98	1323.79						0.31	1361.97
Forest											
Forest Plantation											
Barren Rocky											
Scrub	2.79		43.77	29.41				321.15		2.30	399.42
Waterbody-Streams/River			37.01						184.15		221.16
Waterbody – Ponds			14.03							226.51	240.54
Grand Total	**119.81**	**14.09**	**3046.14**	**1355.86**				**326.39**	**184.15**	**231.48**	**5277.92**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T0 17.10 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body of T1.
- In T1 124.34 ha of agriculture are increased from mining/dump, plantation and scrubland 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-2014-15 to 2015-16

Land cover	Monitoring period (T2)										Units in Hectares
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	119.81										119.81
Mining/dump		14.09									14.09
Agriculture	3.82		3016.35	11.83				1.87		12.26	3046.14
Plantation Horticulture	6.76		39.37	1309.29						0.44	1355.86
Forest											
Forest Plantation											
Barren Rocky											
Scrub	1.45		39.39	4.79				280.18		0.58	326.39
Waterbody-Streams/River			2.42						181.73		184.15
Waterbody – Ponds	0.34		7.85							223.29	231.48
Grand Total	**132.18**	**14.09**	**3105.38**	**1325.91**				**282.06**	**181.73**	**236.57**	**5277.92**

• 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 29.79 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body of T2.

• In T2 89.03 ha of agriculture are increased from plantation, scrubland and water body 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-2015-16 to 2016-17

Land cover	Monitoring period (T3)										Units in Hectares
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	132.18										132.18
Mining/dump		14.09									14.09
Agriculture	0.31		3095.88	2.35				0.07		6.78	3105.38
Plantation Horticulture	0.23			1325.68							1325.91
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.10		20.62	0.75				259.04		1.54	282.06
Waterbody-Streams/River									181.73		181.73
Waterbody – Ponds										236.57	236.57
Grand Total	**132.81**	**14.09**	**3116.50**	**1328.78**				**259.11**	**181.73**	**244.89**	**5277.92**

• 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 9.50 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body of T3.

• In T3 20.62 ha of agriculture are increased from scrubland 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-2016-17 to 2017-18

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	132.81										132.81
Mining/dump		14.09									14.09
Agriculture	1.19		3110.66					4.27		0.39	3116.50
Plantation Horticulture	0.60		1.63	1326.56							1328.78
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.64		8.32	2.62				247.53			259.11
Waterbody-Streams/River			6.82						174.91		181.73
Waterbody – Ponds			1.34							243.55	244.89
Grand Total	**135.25**	**14.09**	**3128.76**	**1329.17**				**251.80**	**174.91**	**243.93**	**5277.92**

• 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 5.85 ha of agriculture are decreased and it is converted into built-up, scrubland and water body of T4.

• In T4 18.10 ha of agriculture are increased from plantation, scrubland and water body 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-2017-18 to 2018-19

Land cover	Monitoring period (T5)										Units in Hectares
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	135.25										135.25
Mining/dump		14.09									14.09
Agriculture	1.48		3126.27	0.49						0.52	3128.76
Plantation Horticulture	2.17		48.22	1278.53						0.26	1329.17
Forest											
Forest Plantation											
Barren Rocky											
Scrub	8.42		61.56	30.91				150.91			251.80
Waterbody-Streams/River									174.91		174.91
Waterbody – Ponds			0.28							243.65	243.93
Grand Total	**147.32**	**14.09**	**3236.34**	**1309.92**				**150.91**	**174.91**	**244.43**	**5277.92**

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.
- In T4 2.48 ha of agriculture are decreased and it is converted into built-up, plantation and water body of T5.
- In T5 110.06 ha of agriculture are increased from plantation, scrubland and water body 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 decrease of 42.36 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 107.24, 59.24, 11.12, 12.25 & 107.58 Hectares From T0 to T1, T1 to T2 , T2 to T3, T3 to T4 & T4 to T5 and overall increase of 297.43 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is decrease of 52.05 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 248.51 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (8) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (6) verified from the portal.