MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

Srikakulam -09/2010-11
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

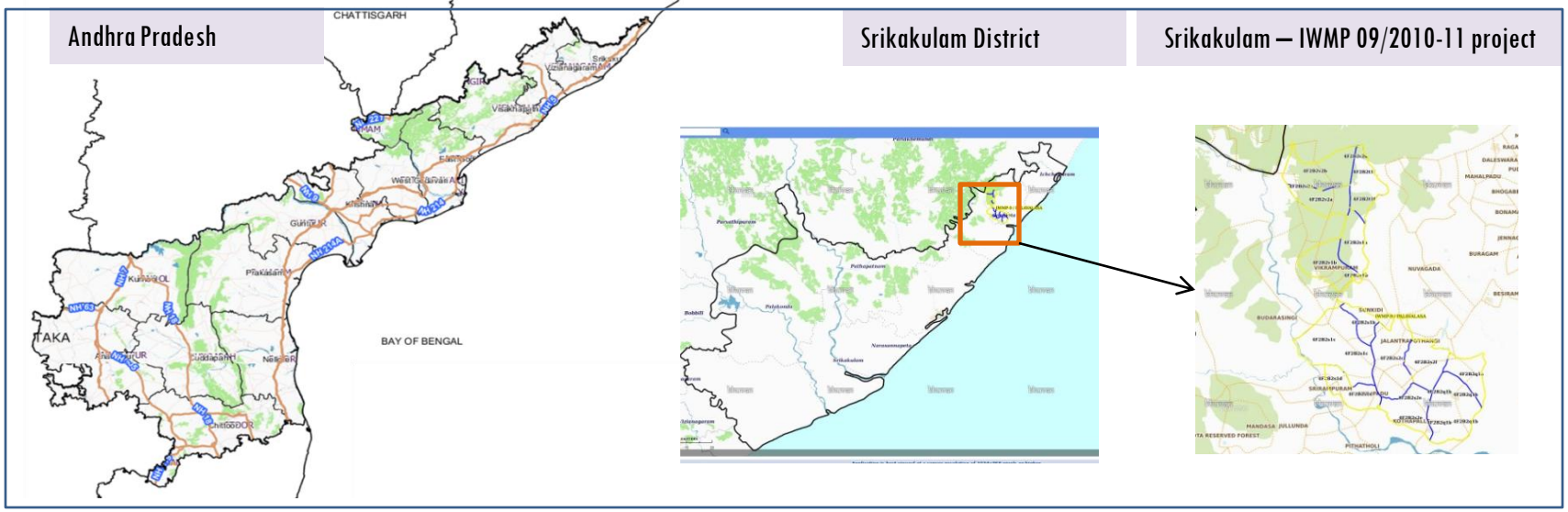
CONTENTS

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-09/2010-11, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 6334.29 ha. It comprises of 17 micro watersheds.
- In the project area 255 Drishti photos were uploaded showing 180 Agriculture/horticulture, 34 check dams/checks & plugins, 14 farm ponds etc, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 14 new farm ponds or dug out pits and 34 check dams/checks & plugins and drainage treatments with 10.32 ha increase in the area.
- Major percentage i.e. 50.11% is covered by the agriculture, 20.20% is covered by forest, 12.61 % is covered by plantation and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-09/2010-11
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Sompeta and Kanchili Mandals of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 6334.29 ha. It comprises of 17 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.

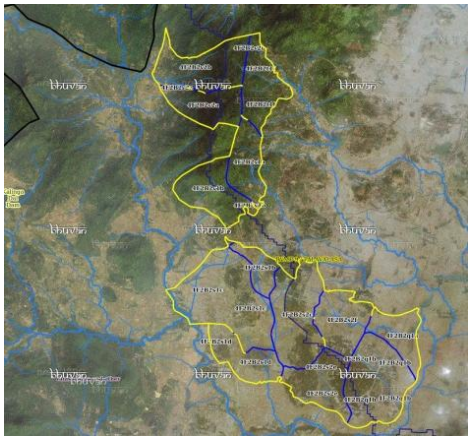
Satellite Data and Ancillary Data

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			

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	129
4	Detailed Project Report		

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



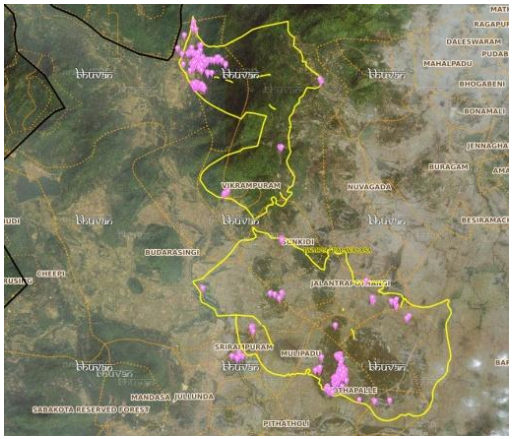
Legend

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	40	40
2	Afforestation	1	1
3	Black planting	0	0
4	Bund Planting	0	0
5	Checkdam	33	30
6	Field Bunds	2	2
7	Terrace	0	0
8	Checks & Plugs	34	28
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	23	23
11	Civil work-Check dams /Rock fill dam	0	0
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	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	4	4
18	Others	0	0
	TOTAL	**138**	**129**

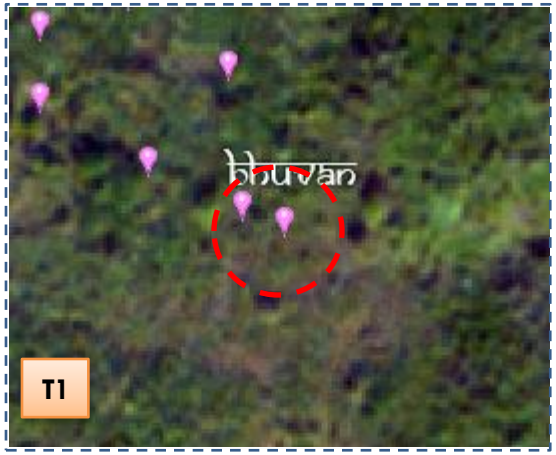
MONITORING IN THE PROJECT AREA

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-09/2010-11

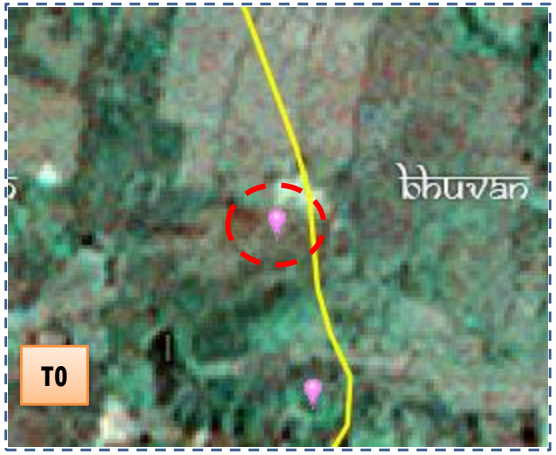
T0:2010-11



T1: 20 March 2013

Drishti Sl no. 2533776 MWS :4F2B2v2a

Afforestation



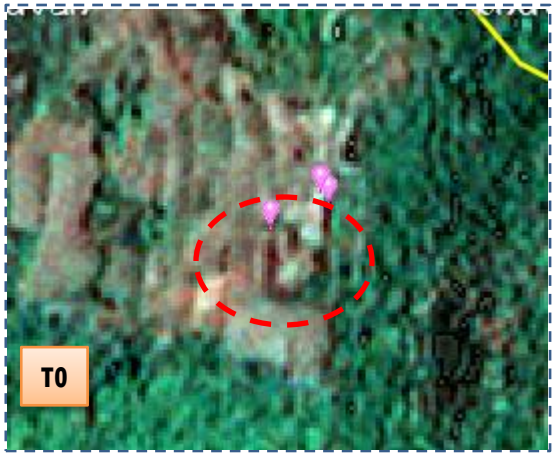
T0:2010-11

T1: 20 March 2013

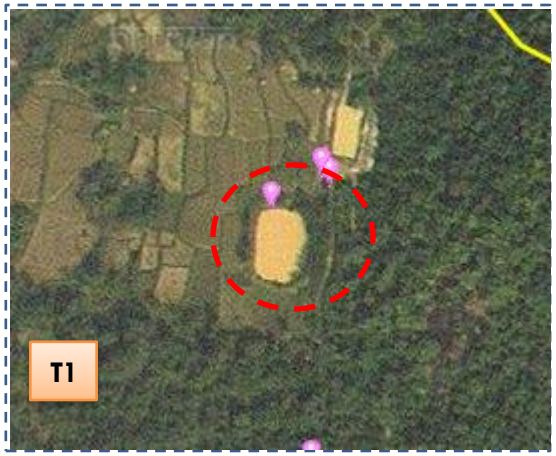
Drishti Sl no. 134582 MWS :4F2B2t1f

Farm pond

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-09/2010-11



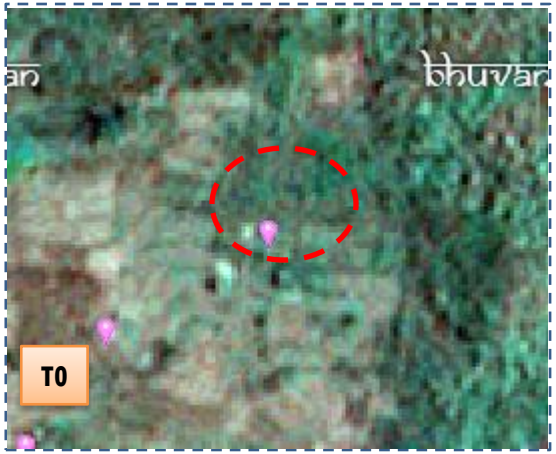
T0: 2010-11



T1: 20 March 2013

Drishti Sl no. 2499421 MWS :4F2B2v2b

Farm pond



T0: 2010-11

T1: 20 March 2013

Drishti Sl no. 2569853 MWS :4F2B2v1b

Horticulture

Srikakulam–IWMP-09/2010-11

2009-10

Dec-2013

Nov-2016

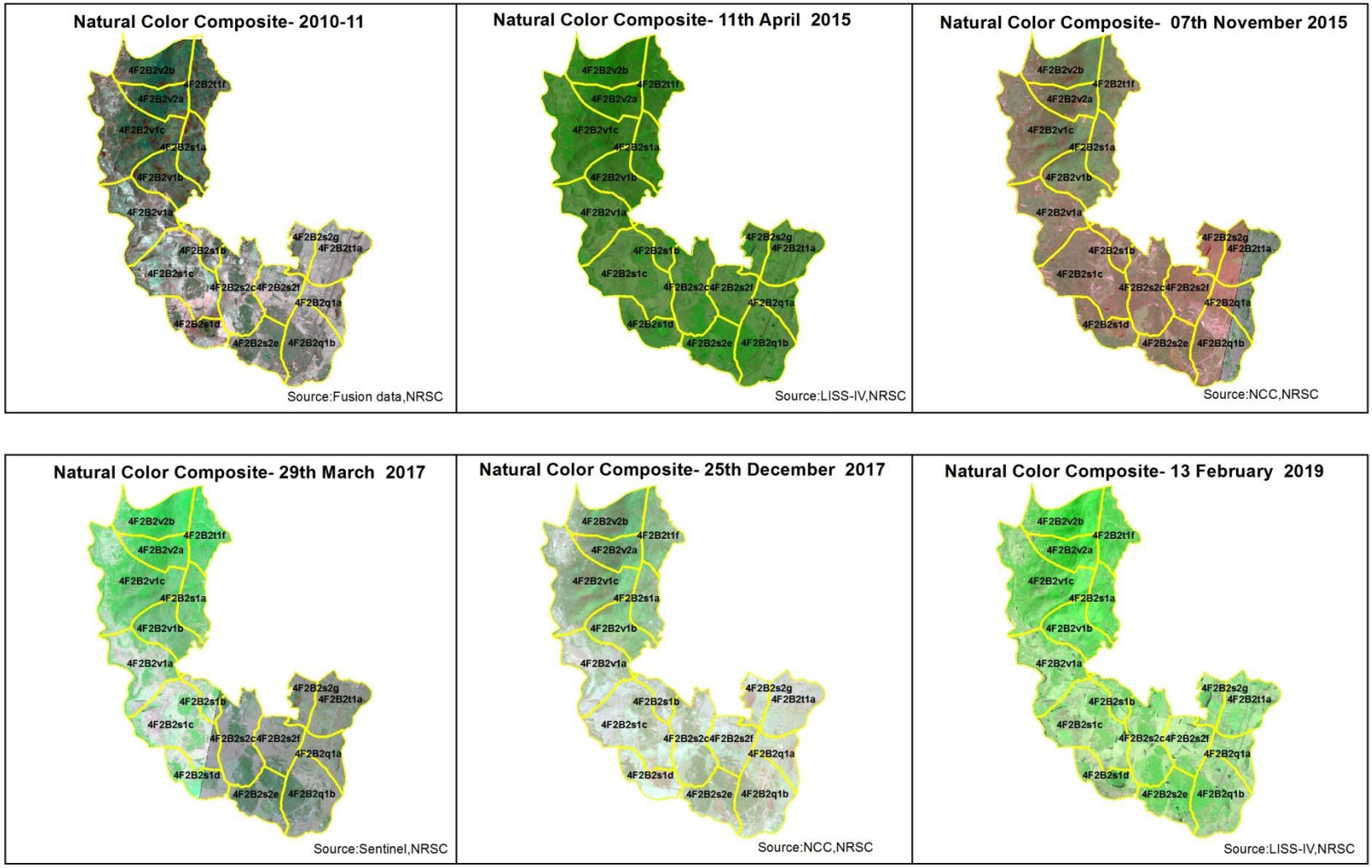
Dec-2017

March-2018

Activity : Farm pond

Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite



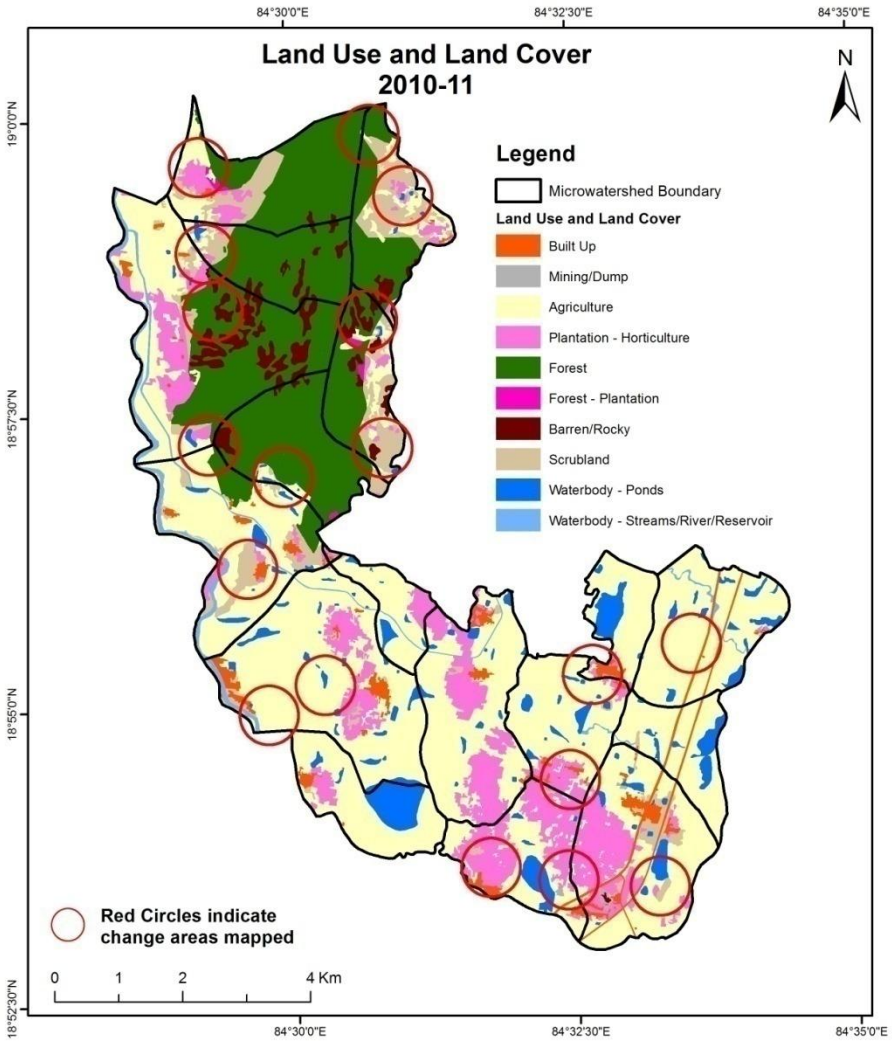
MONITORING IN THE PROJECT AREA

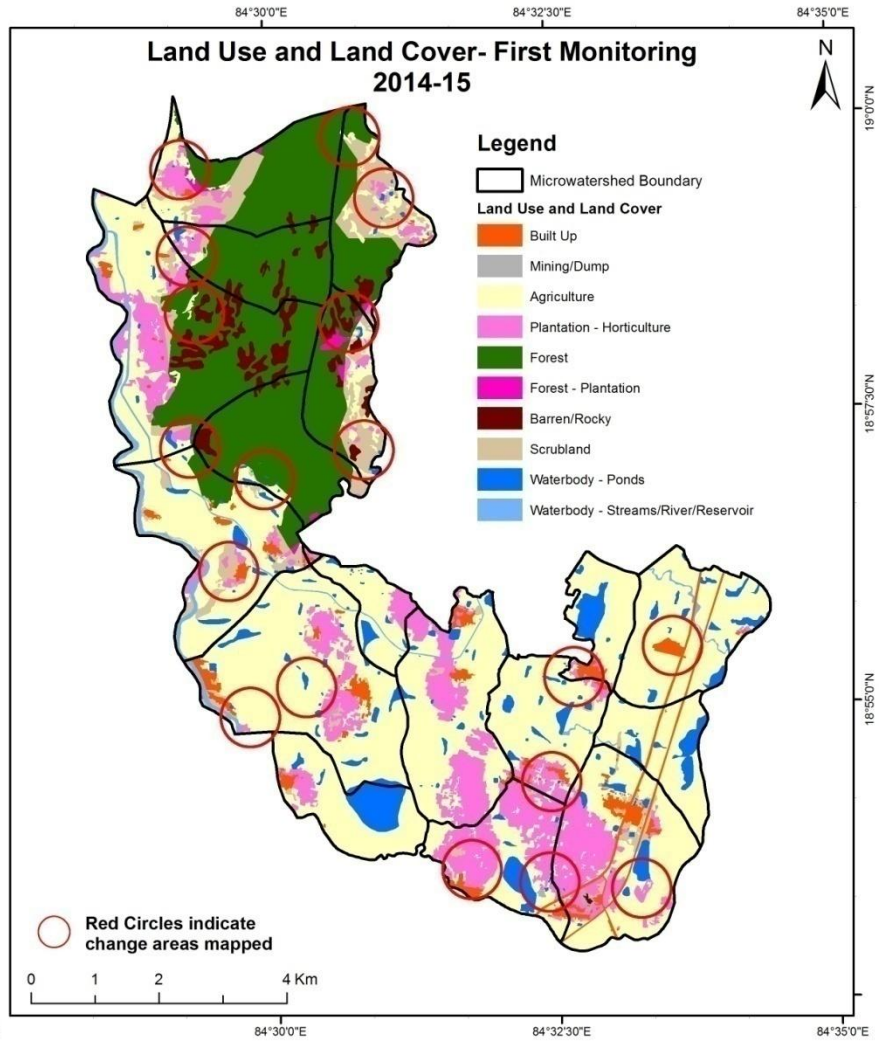
Land use and Land cover Changes in the Project

- 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)

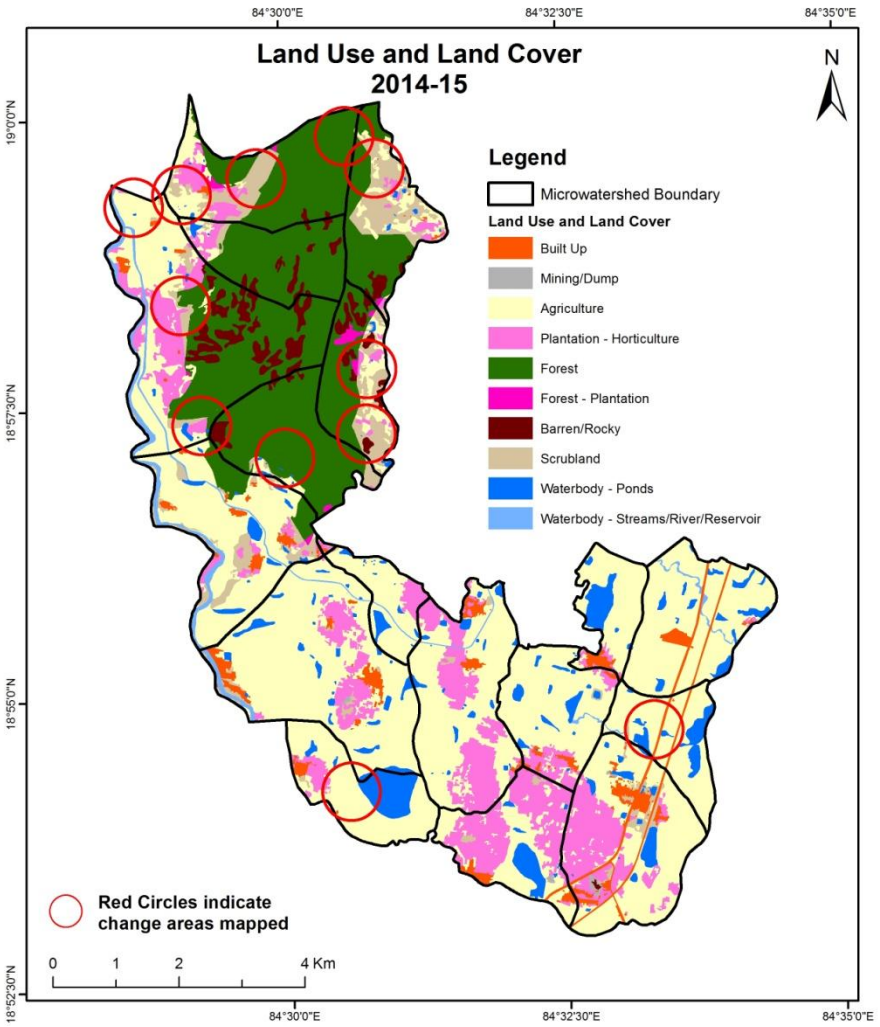
Scale: 1:10000

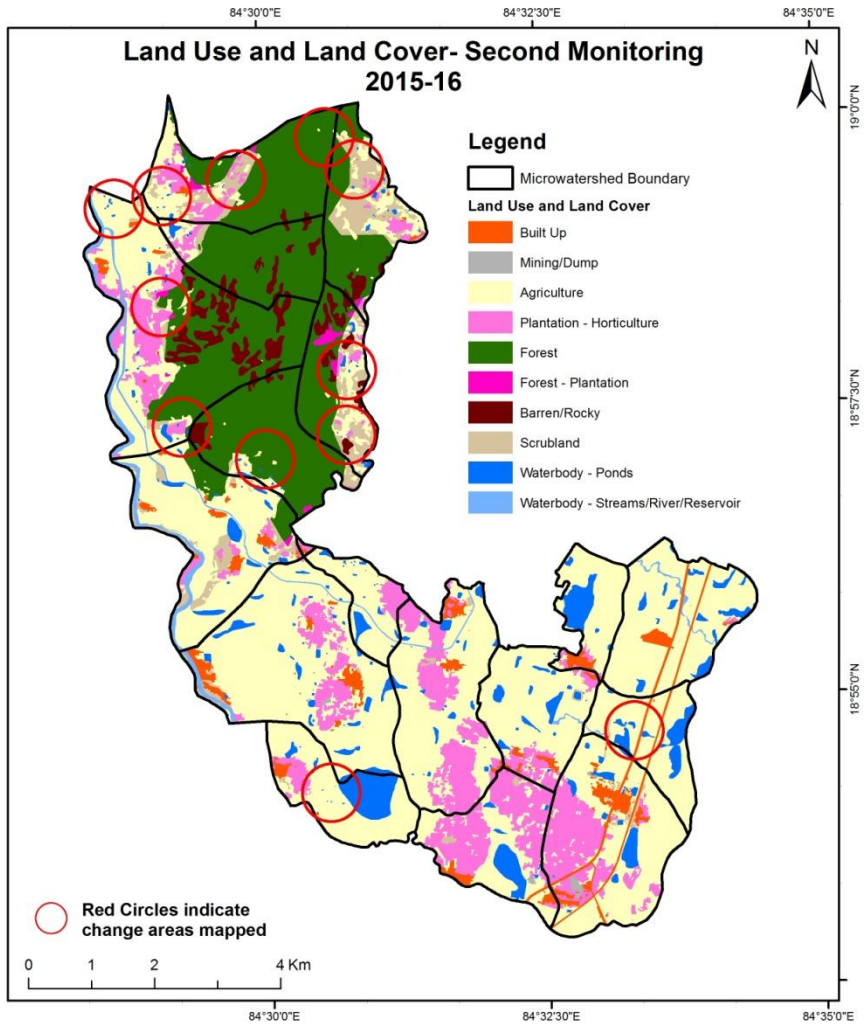




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

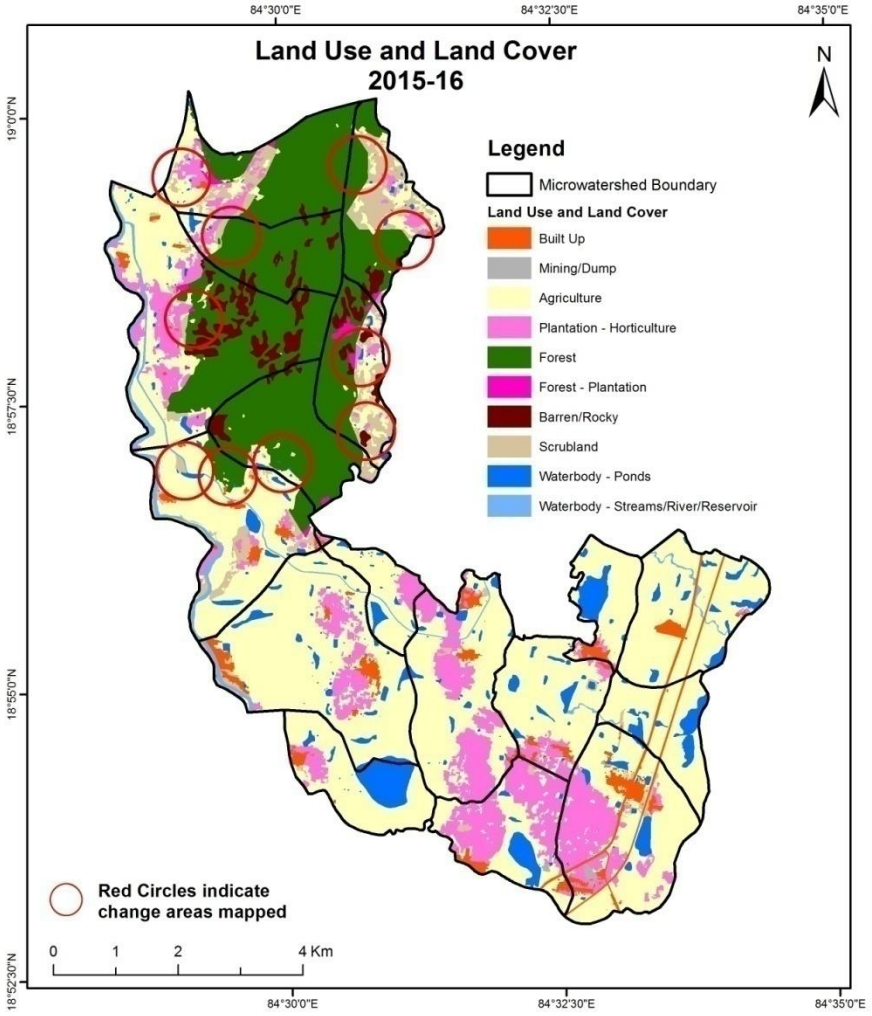
Scale: 1:10000

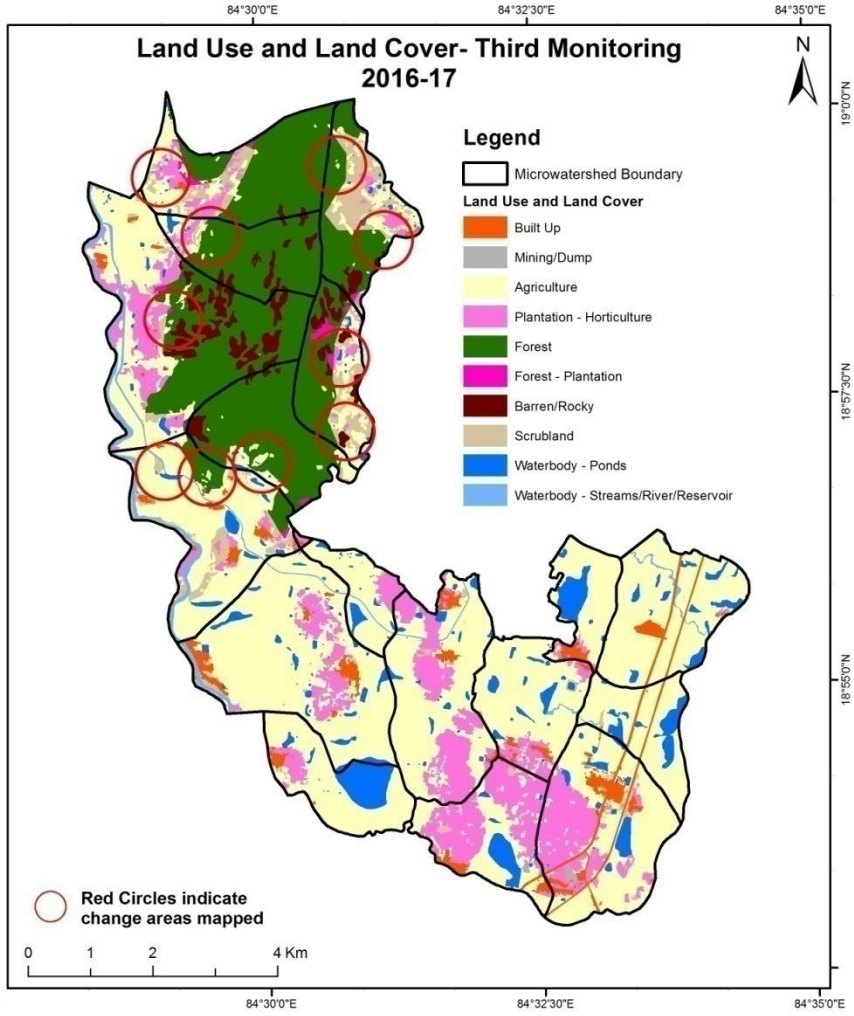




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

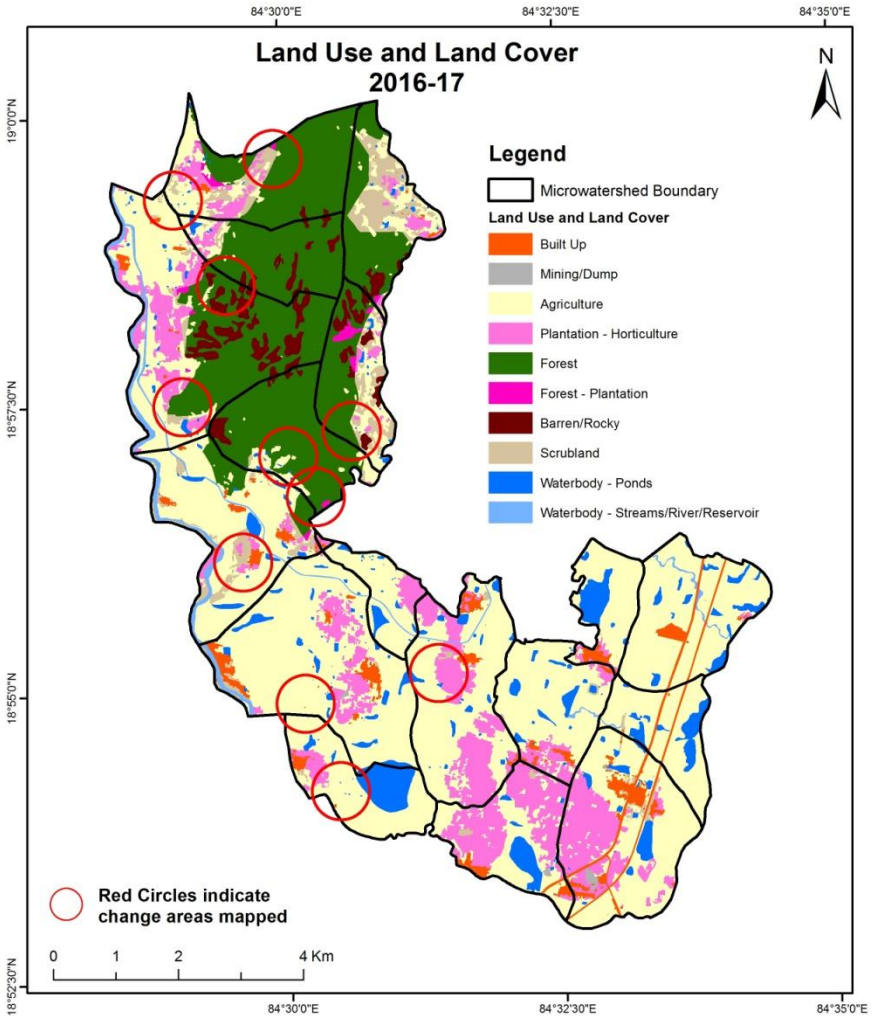
Scale: 1:10000

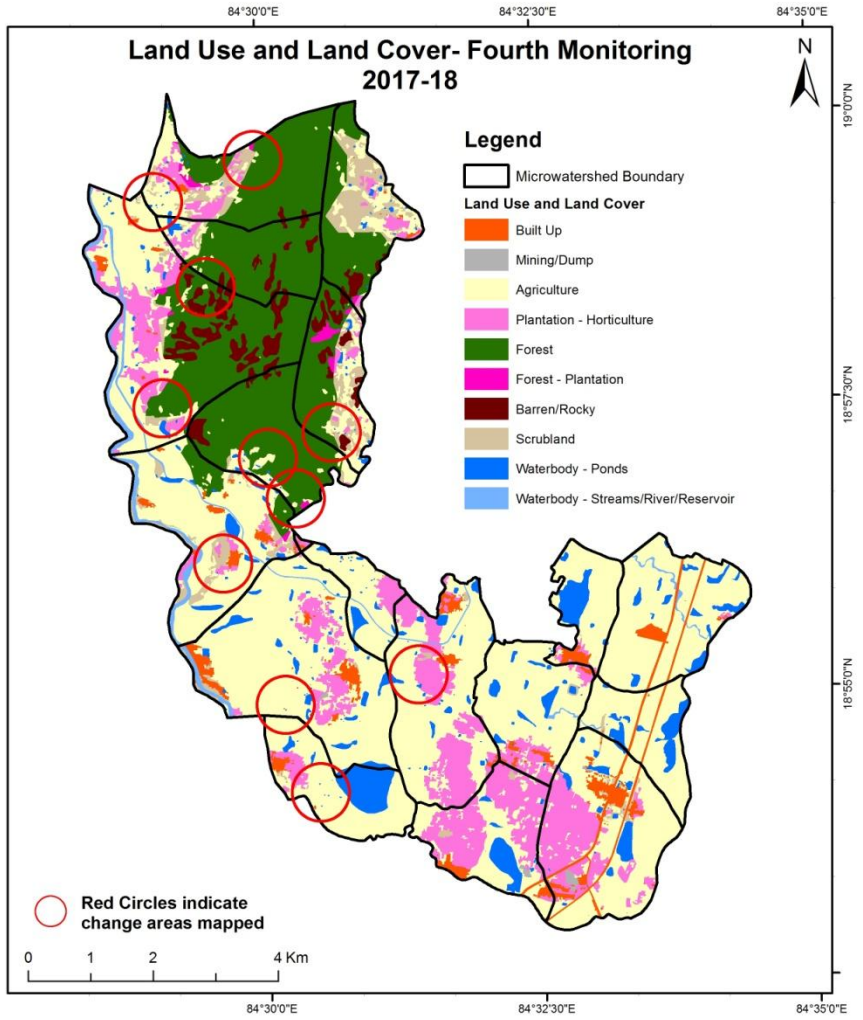




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

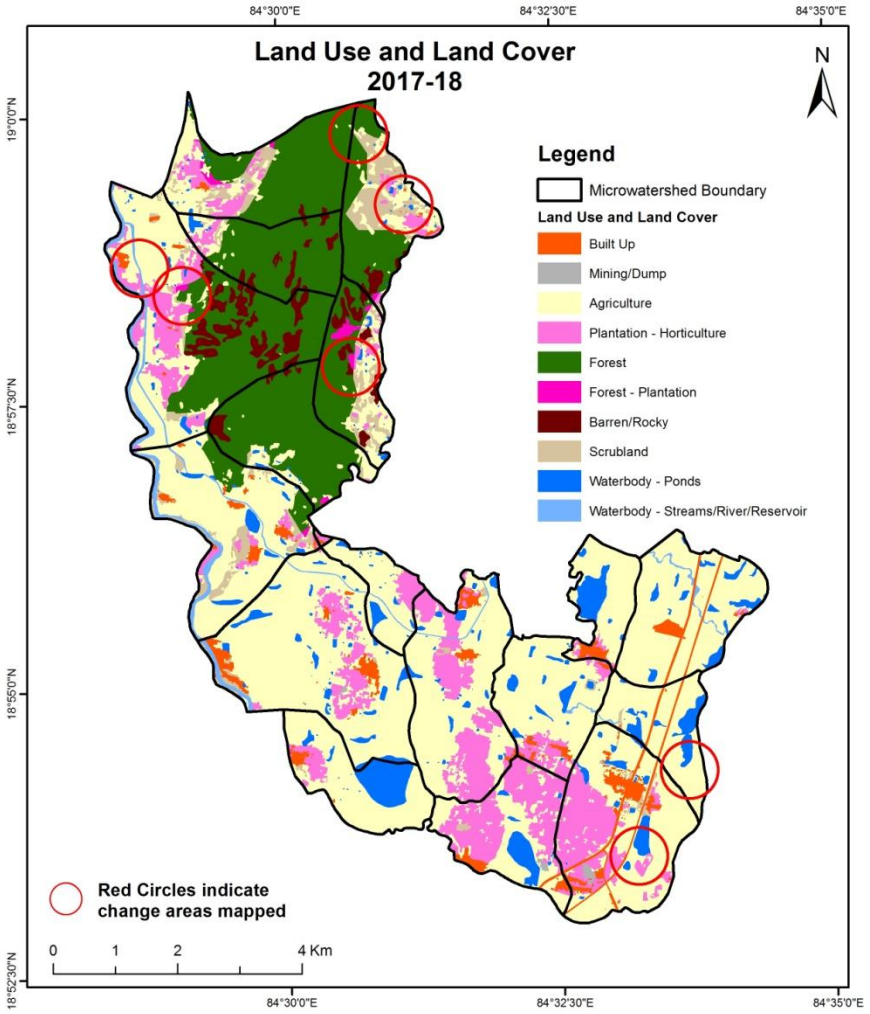
Scale: 1:10000

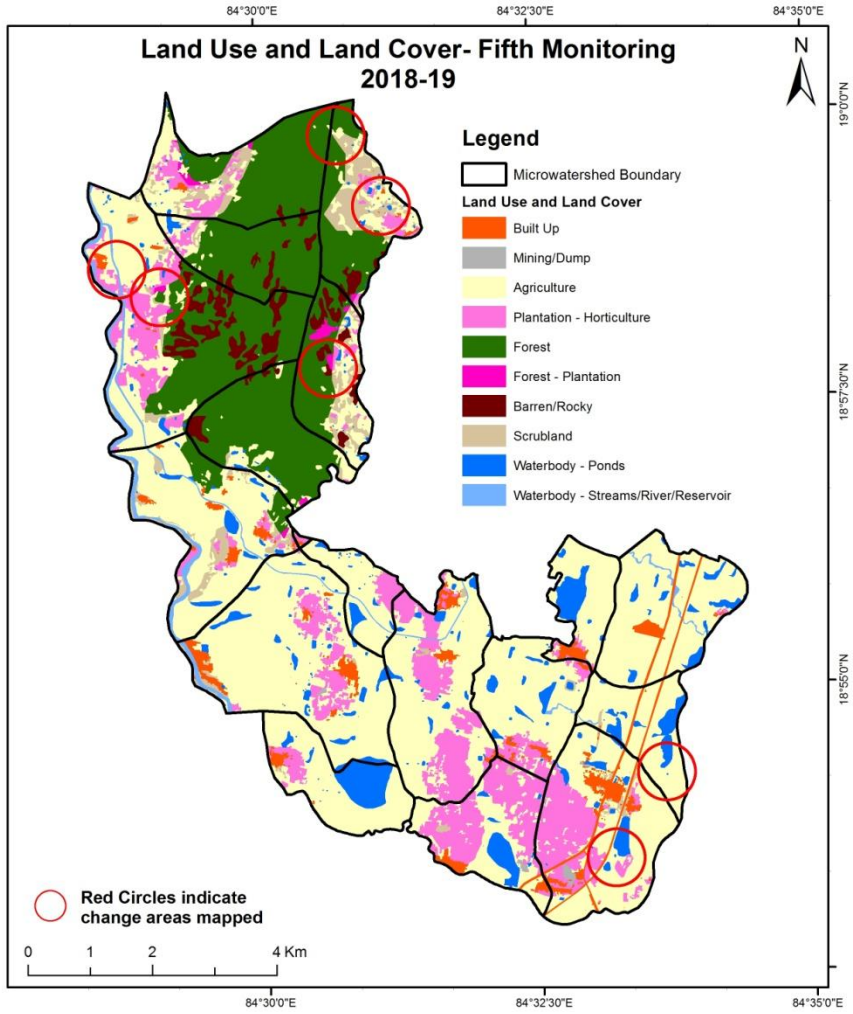




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

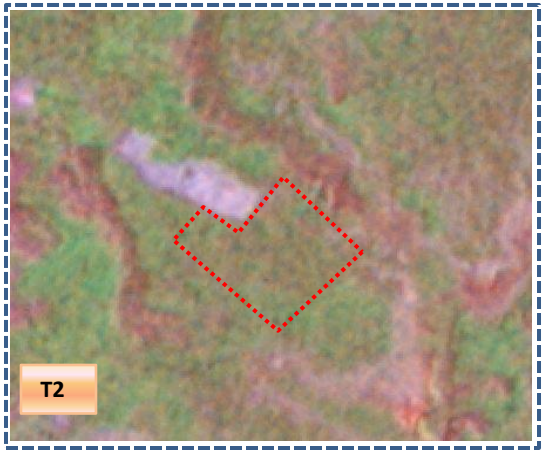
Scale: 1:10000



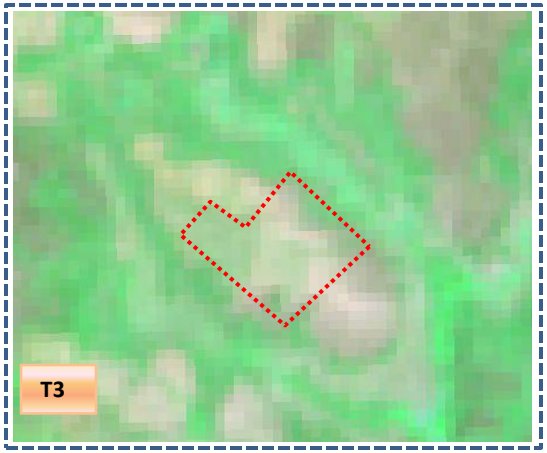


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T2: 2015-16 (84°30'54.33"E 18°57'9.455"N)



T3: 29 March 2017

Scrub to Agriculture

T2: 2015-16 (84°29'47.172"E 18°59'27.715"N)

T3: 29 March 2017

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	170.74										170.74
Mining/dump		6.33									6.33
Agriculture	16.83		3013.94	44.34		4.56				12.85	3092.52
Plantation Horticulture	3.47		12.61	739.21						0.58	755.87
Forest			2.44		1334.51	3.68				0.50	1341.14
Forest Plantation						5.54					5.54
Barren Rocky							165.78				165.78
Scrub	2.72		17.59	17.86				350.09		2.37	390.64
Waterbody-Streams/River									103.49		103.49
Waterbody – Ponds	0.05									302.20	302.24
Grand Total	**193.82**	**6.33**	**3046.59**	**801.41**	**1334.51**	**13.78**	**165.78**	**350.09**	**103.49**	**318.49**	**6334.29**

• 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 78.57 ha of agriculture are decreased and it is converted into built-up, plantation, forest plantation and water body of T1.

• In T1 32.65 ha of agriculture are increased from plantation, forest 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	193.82										193.82
Mining/dump		6.33									6.33
Agriculture	1.29		3026.36	10.25						8.70	3046.59
Plantation Horticulture	1.44		28.42	770.75						0.80	801.41
Forest	0.06		14.94		1315.31	3.51				0.68	1334.51
Forest Plantation						13.78					13.78
Barren Rocky		1.04					164.74				165.78
Scrub	1.27		60.10	14.43				272.87		1.42	350.09
Waterbody-Streams/River									103.49		103.49
Waterbody – Ponds										318.49	318.49
Grand Total	**197.88**	**7.37**	**3129.81**	**795.42**	**1315.31**	**17.30**	**164.74**	**272.87**	**103.49**	**330.09**	**6334.29**

- 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 20.23 ha of agriculture are decreased and it is converted into built-up, plantation and water body of T2.
- In T2 103.46 ha of agriculture are increased from plantation, forest 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-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	197.88										197.88
Mining/dump		7.37									7.37
Agriculture	0.67		3126.53	1.75						0.87	3129.81
Plantation Horticulture	0.69		2.51	792.16						0.06	795.42
Forest			17.45		1297.87						1315.31
Forest Plantation						17.30					17.30
Barren Rocky							164.74				164.74
Scrub	0.46		15.88					256.38		0.15	272.87
Waterbody-Streams/River									103.49		103.49
Waterbody – Ponds										330.09	330.09
Grand Total	**199.70**	**7.37**	**3162.37**	**793.91**	**1297.87**	**17.30**	**164.74**	**256.38**	**103.49**	**331.17**	**6334.29**

- 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 3.28 ha of agriculture are decreased and it is converted into built-up, plantation and water body of T3.
- In T3 35.84 ha of agriculture are increased from plantation, forest and 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	199.70										199.70
Mining/dump		7.37									7.37
Agriculture	1.48	1.25	3150.80	4.54						4.30	3162.37
Plantation Horticulture	1.79		0.31	791.76						0.05	793.91
Forest			10.81		1286.95					0.11	1297.87
Forest Plantation						17.30					17.30
Barren Rocky							164.74				164.74
Scrub	0.31		5.39					250.50		0.18	256.38
Waterbody-Streams/River									103.49		103.49
Waterbody – Ponds										331.17	331.17
Grand Total	**203.27**	**8.63**	**3167.31**	**796.31**	**1286.95**	**17.30**	**164.74**	**250.50**	**103.49**	**335.80**	**6334.29**

• 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 11.58 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T4.

• In T4 16.51 ha of agriculture are increased from plantation, forest and 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-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	203.27										203.27
Mining/dump		8.63									8.63
Agriculture	1.11		3160.13	5.64						0.43	3167.31
Plantation Horticulture	1.17		2.12	793.02							796.31
Forest			7.30		1279.65						1286.95
Forest Plantation						17.30					17.30
Barren Rocky							164.74				164.74
Scrub	0.10		4.56					245.84			250.50
Waterbody-Streams/River									103.49		103.49
Waterbody – Ponds										335.80	335.80
Grand Total	**205.65**	**8.63**	**3174.10**	**798.66**	**1279.65**	**17.30**	**164.74**	**245.84**	**103.49**	**336.23**	**6334.29**

- 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 7.18 ha of agriculture are decreased and it is converted into built-up, plantation and water body of T5.
- In T5 13.98 ha of agriculture are increased from plantation, forest 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 33.99 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 83.22,32.56,4.93 & 6.79 Hectares From T1 to T2 , T2 to T3, T3 to T4 & T4 to T5 and there is an decrease of 45.92 Hectares From T0 to T1. The overall increase of 81.59 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is increase of 42.79 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 144.79 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (23) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (23) verified from the portal.