MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -20/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-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

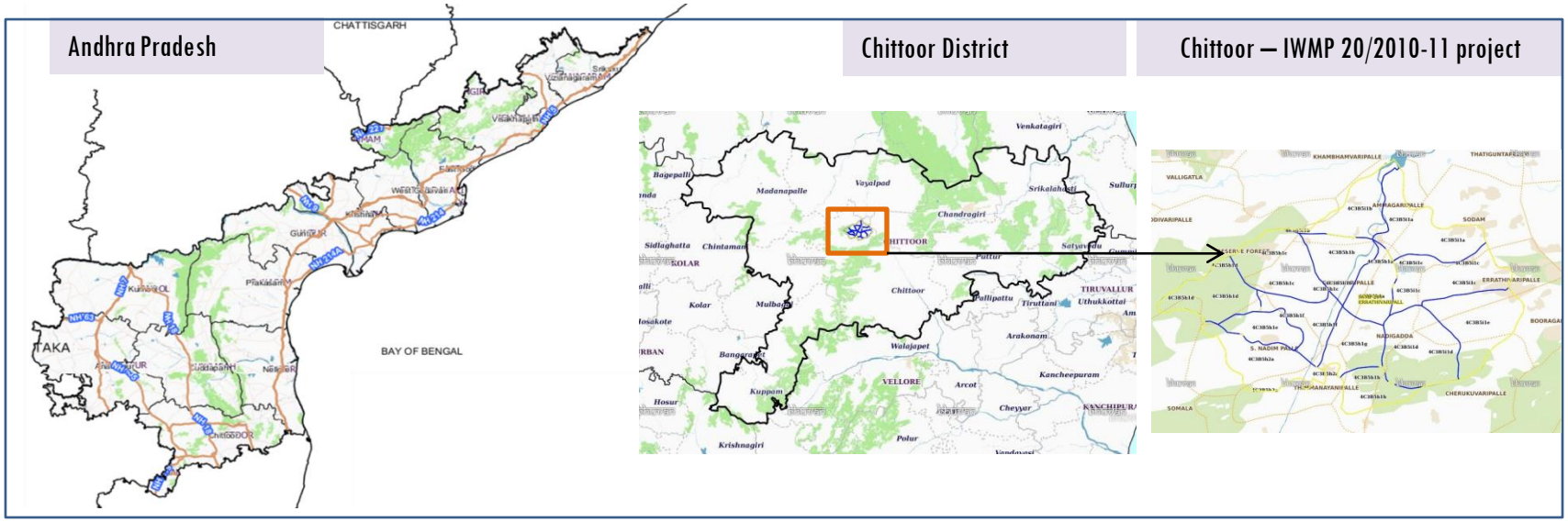
CONTENTS

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-20/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 8,801 ha. It comprises of 14 micro watersheds.
- In the project area 240 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 52 ha increase in the area.
- Major percentage i.e. 40.99 % is covered by the agriculture, 18.53 % is covered by plantation and 14.17 % is covered by forest and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-20/2010-11
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Sodam Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 8,801 ha. It comprises of 14 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (***Batch -II***) projects taking 2018-19 (T5) period satellite images



- The climate of the district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.
- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

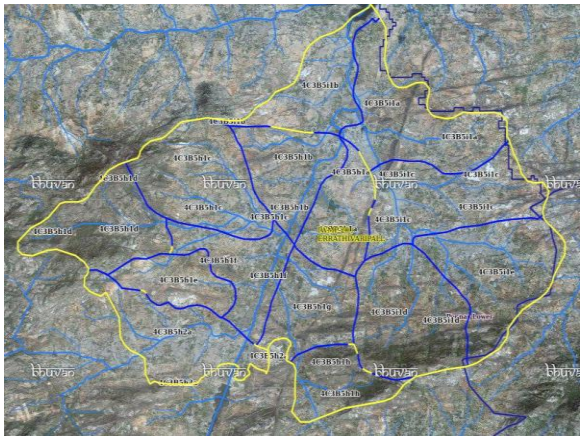
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			25-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			25-Mar-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	240
4	Detailed Project Report		

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



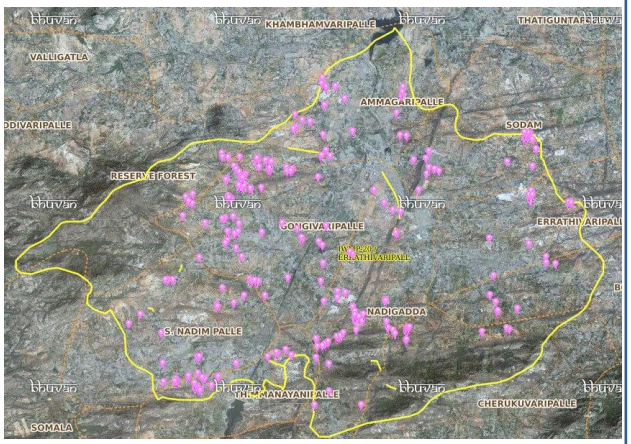
Legend

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	58	40
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Existing activity	0	0
8	Checks & Plugs	13	13
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	33	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 (fodder development, varmi compost)	0	0
15	Livelihood Activities (Horticulture)	0	0
16	Production system and micro-enterprises	0	0
17	Entry Point Activity (Cattle thought)	7	7
18	Others	194	150
	TOTAL	**305**	**240**

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.

Chittoor–IWMP-20/2010-11

2009-10

Jan-2014

Feb-2016

Dec-2017

OCT-2018

Activity : Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-20/2010-11

T0:2010-11

T1: 02 February 2016

Drishti Sl no. 1093876 MWS :4C3B5i1d

Farm pond

T0:2010-11

T1: 02 February 2016

Drishti Sl no. 1797832 MWS :4C3B5h1c

Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-20/2010-11

T0: 2010-11

T1: 02 February 2016

Drishti Sl no. 1726537 MWS : 4C3B5h1b

Horticulture

T0: 2010-11

T1: 02 February 2016

Drishti Sl no. 1778309 MWS :4C3B5i1d

Horticulture

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-20/2010-11

T0: 2010-11

T1: 02 February 2016

Drishti Sl no. 7042260 MWS :4C3B5i1d

Horticulture

T0: 2010-11

T1: 02 February 2016

Drishti Sl no. 338626 MWS :4C3B5h1g

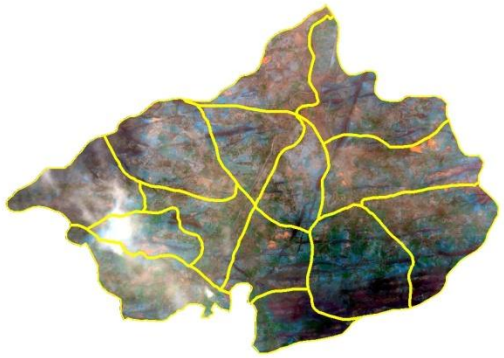
Percolation Tank

Natural Color Composite – 2010-11 to 2018-19

Natural Color Composite- 2009-10

Source:Fusion data,NRSC

Natural Color Composite- 26th March 2015



Source: NCC,NRSC

Natural Color Composite- 2nd February 2016

Source: NCC,NRSC

Natural Color Composite- 24th January 2017

Sentinel-II Data

Natural Color Composite- 30th March 2018

Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019

Sentinel-II Data

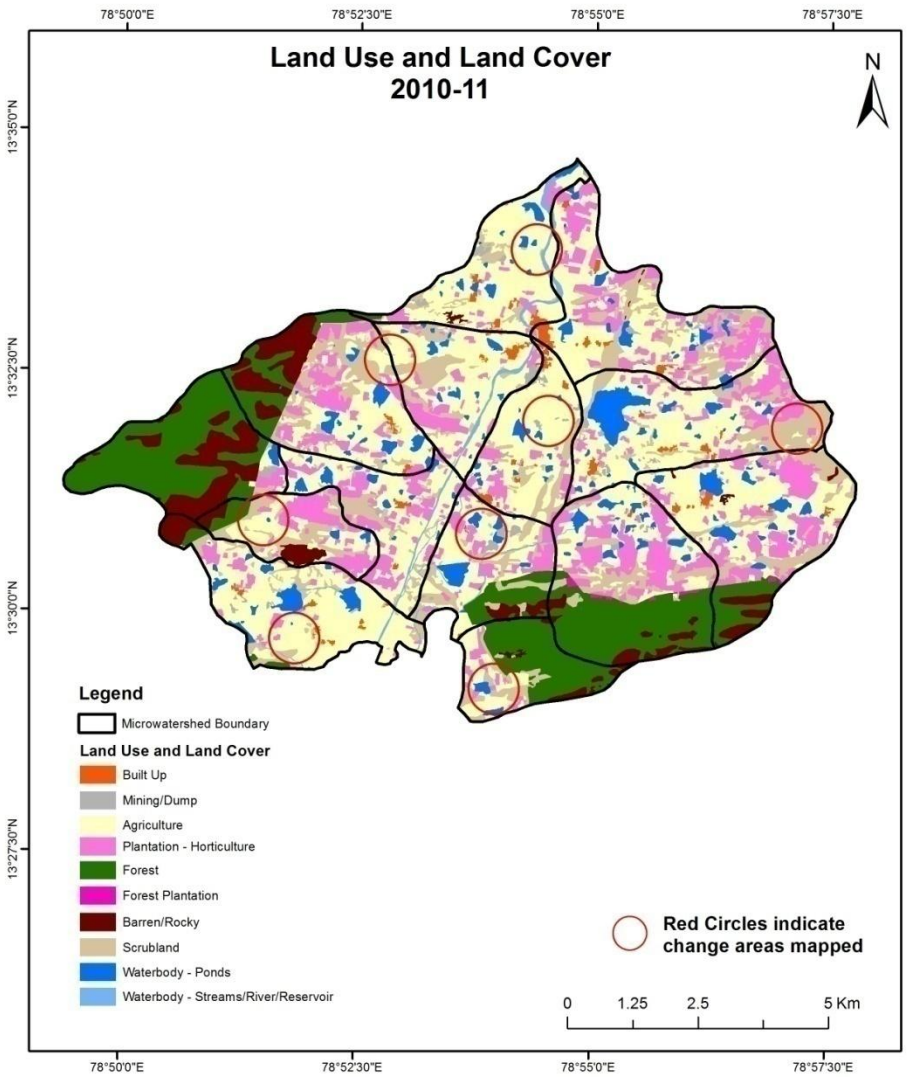
MONITORING IN THE PROJECT AREA

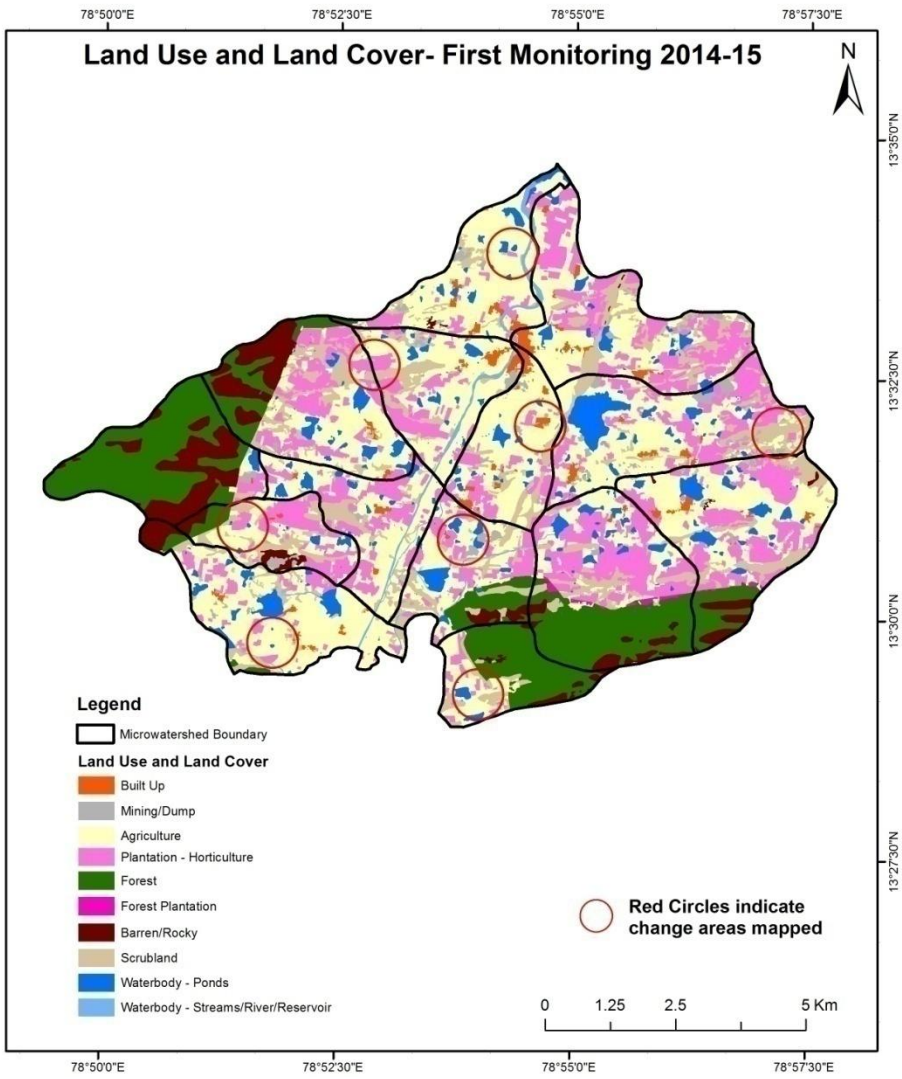
Land use and Land cover Changes in the Project

- 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)

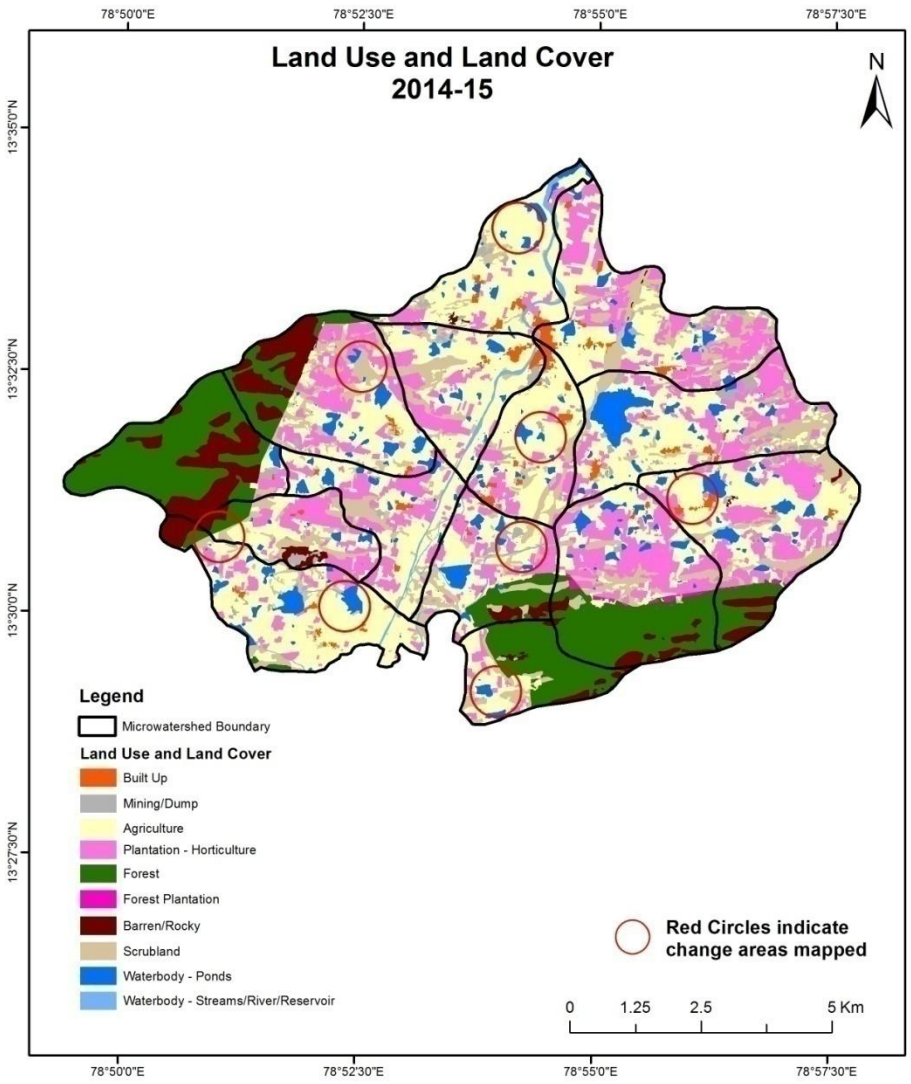
Scale: 1:10000

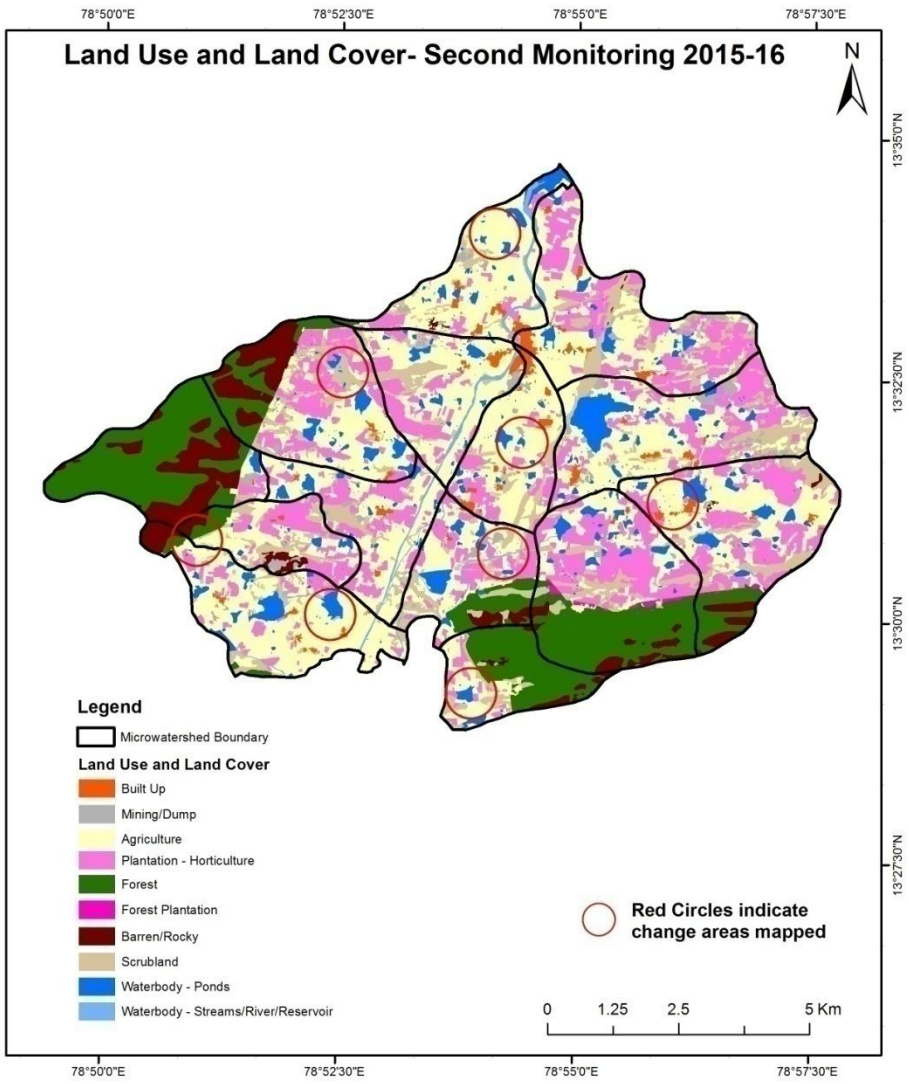




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

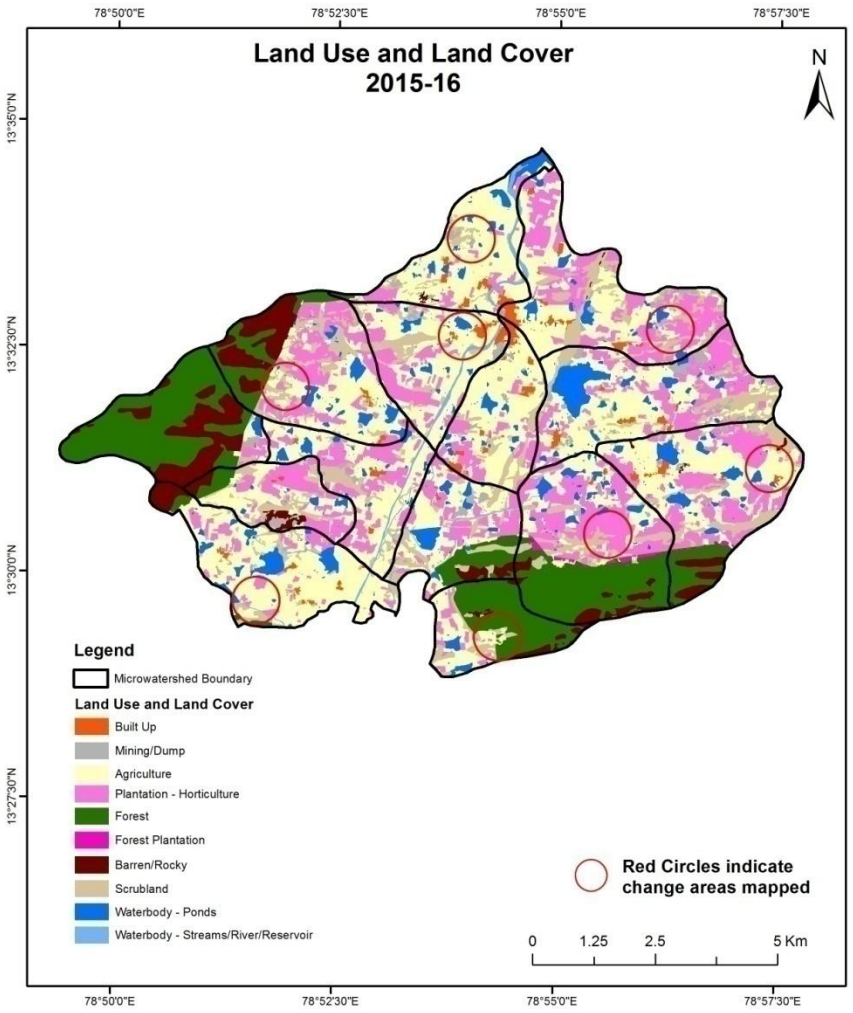
Scale: 1:10000

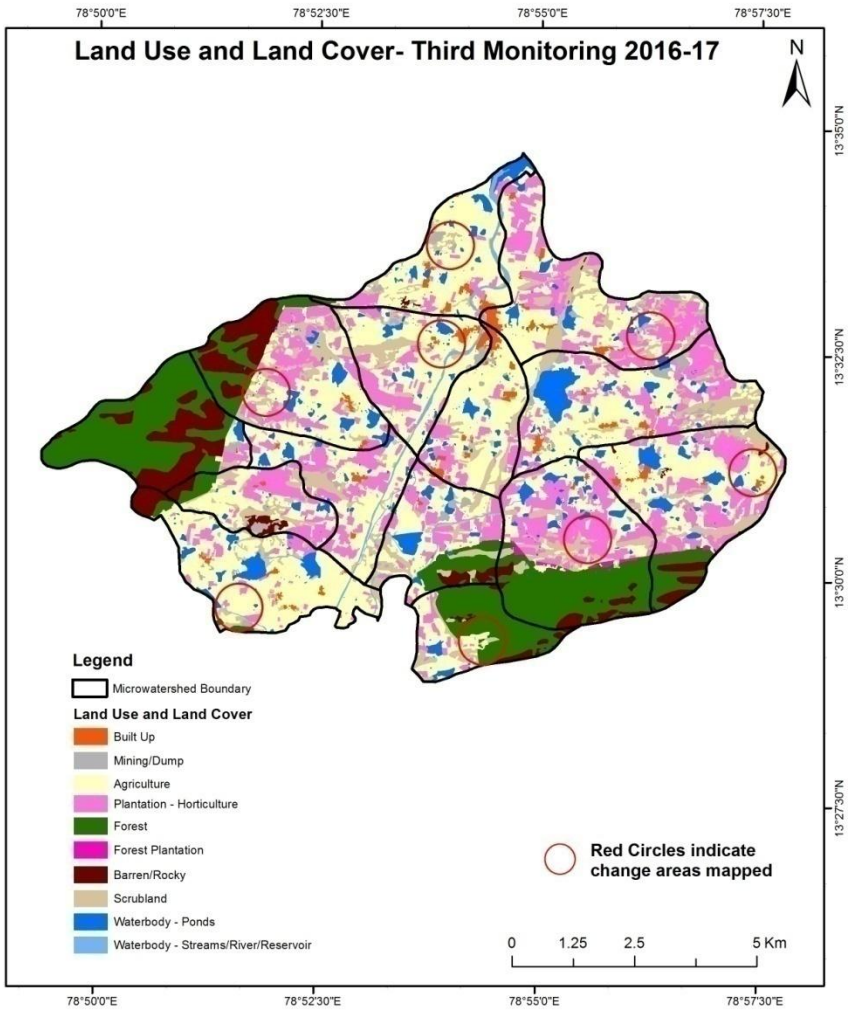




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

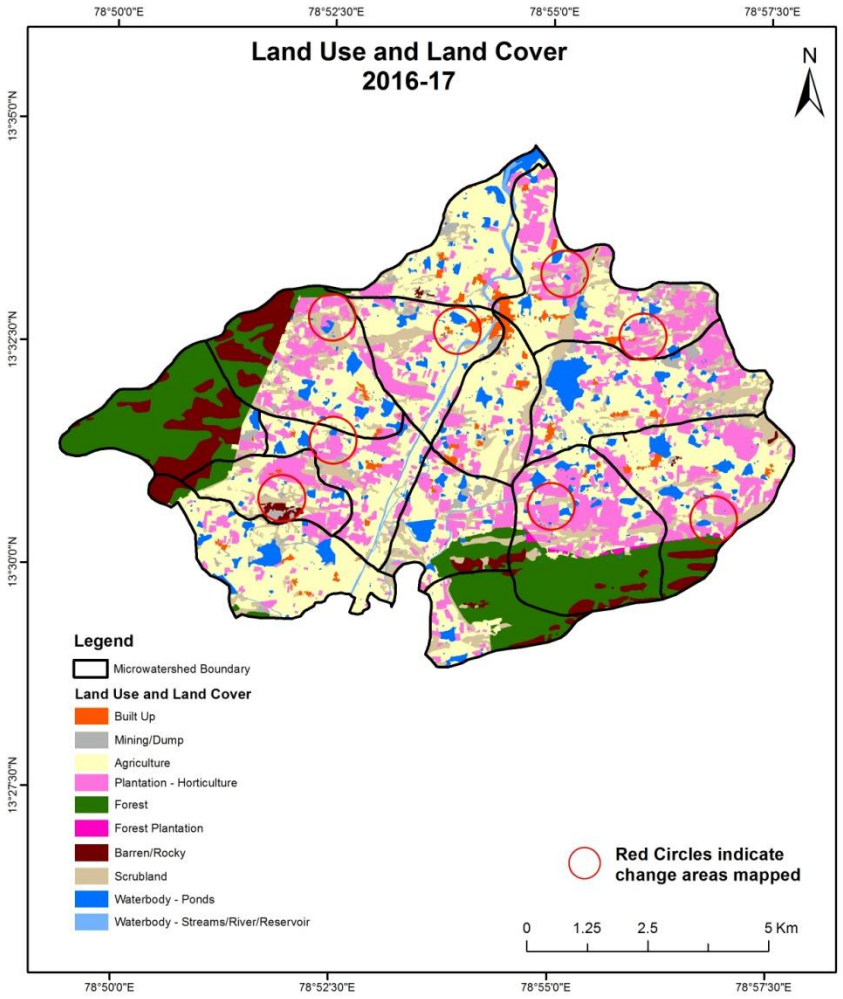
Scale: 1:10000

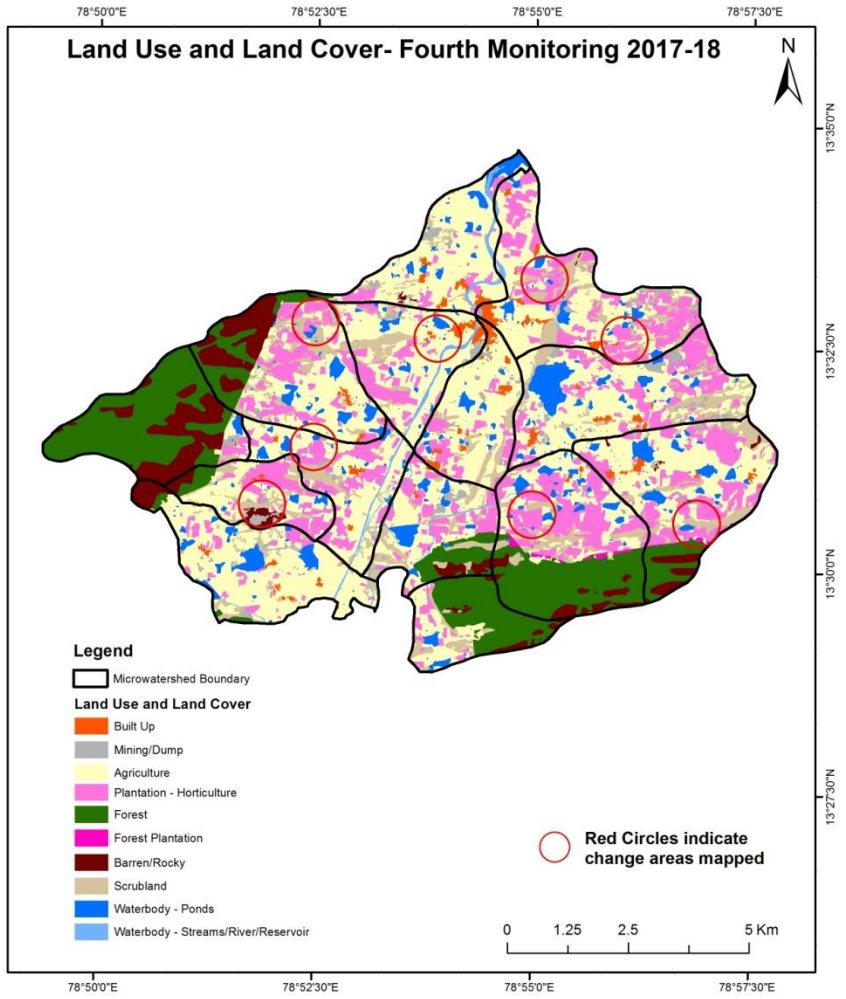




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

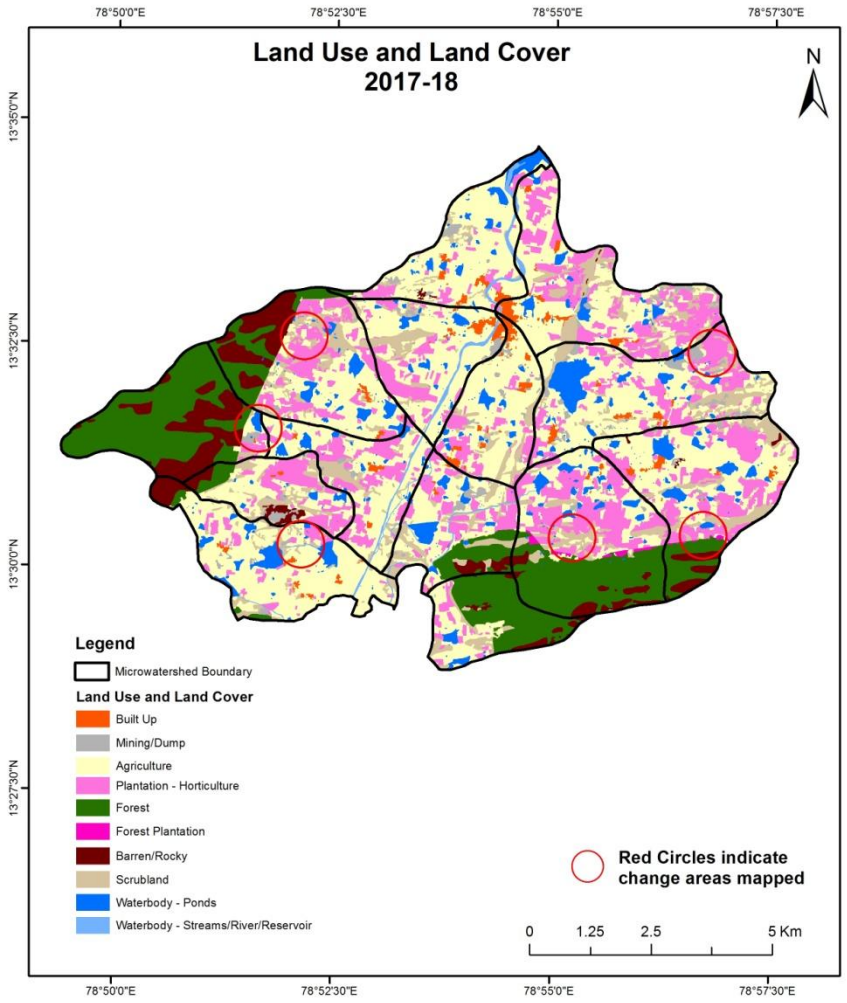
Scale: 1:10000

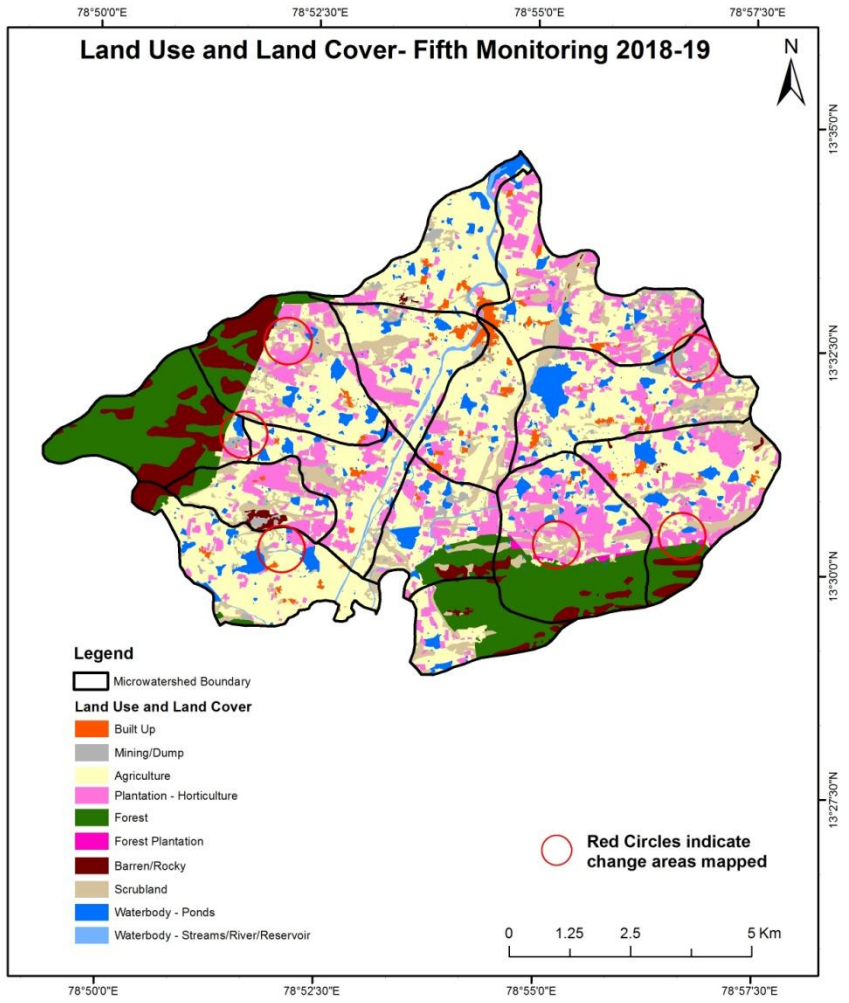




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000





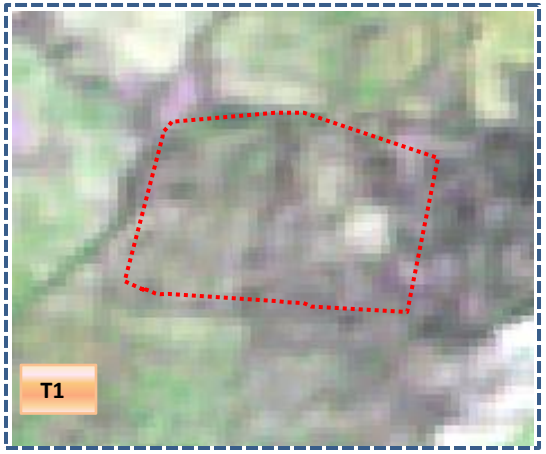
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Water body

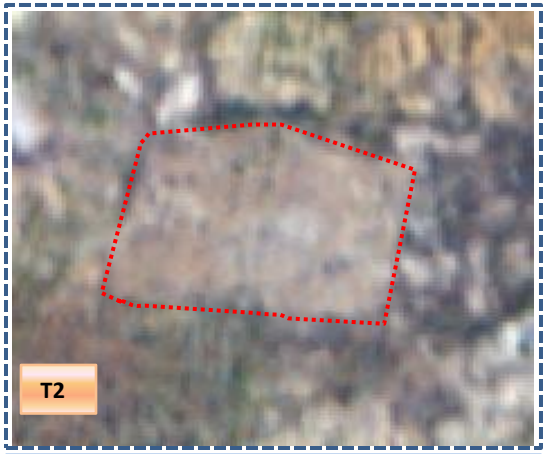
T0: 2014-15(78°52'15.578E 13°32'45.948N)

T2: 02 Feb 2016

Scrub to Agriculture



T1: 2014-15(78°52'9.838E 13°32'30.272N)

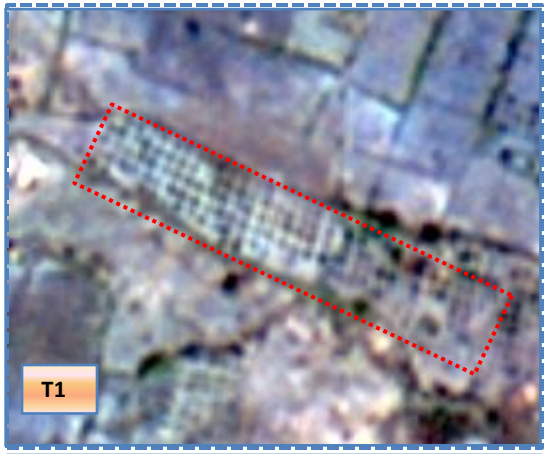


T2: 02 Feb 2016

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

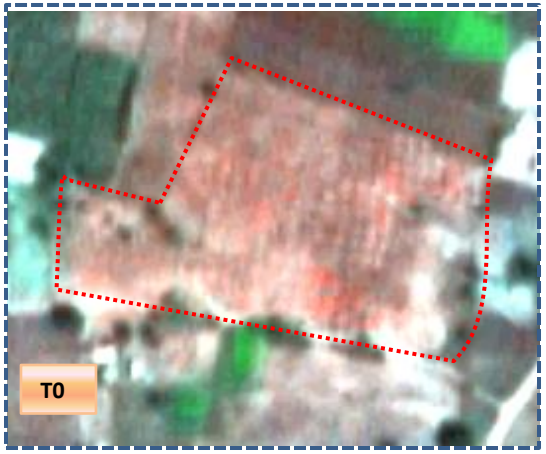
Agriculture to Plantation

T0: 2010-11

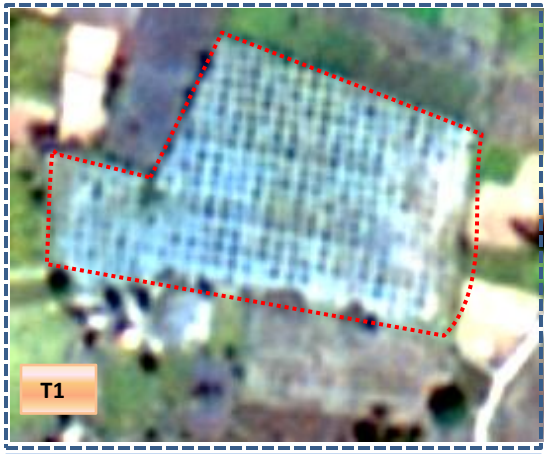


T1: 26 February 2015

Agriculture to Plantation



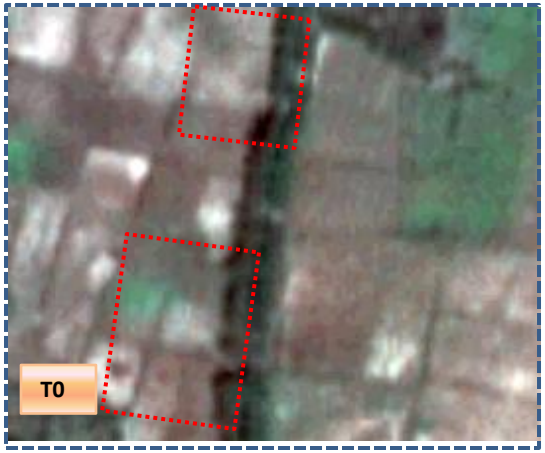
T0: 2010-11



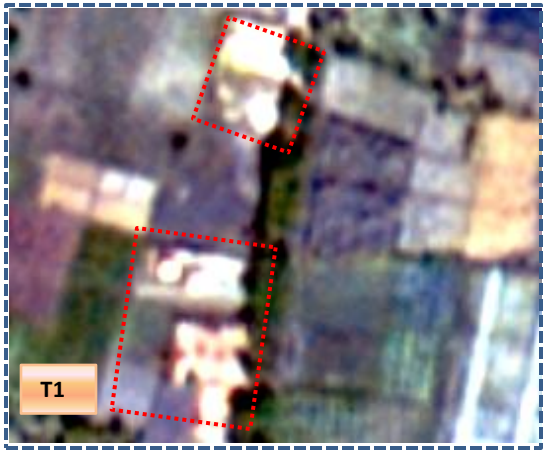
T1: 26 February 2015

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

Agriculture to Built-up



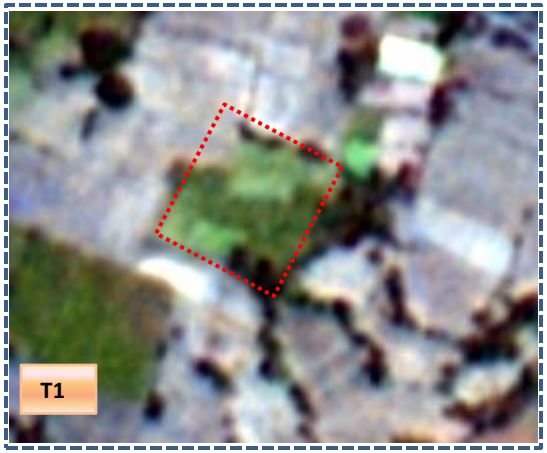
T0: 2010-11



T1: 26 February 2015

Agriculture to Plantation

T0: 2010-11



T1: 26 February 2015

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	106.53										106.53
Mining/dump		75.89								2.60	78.49
Agriculture	23.29	11.34	3152.43	389.56						21.45	3598.07
Plantation Horticulture	8.10	1.66	46.85	1374.70						3.78	1435.10
Forest			10.32		1252.40	4.71				0.35	1267.78
Forest Plantation						10.14				0.02	10.16
Barren Rocky		11.26					492.05				503.31
Scrub	1.20	40.35	123.37	35.37				1045.73		4.14	1250.16
Waterbody-Streams/River									79.72		79.72
Waterbody – Ponds		0.77	3.38	3.05						464.58	471.78
Grand Total	**139.12**	**141.27**	**3336.37**	**1802.68**	**1252.40**	**14.85**	**492.05**	**1045.73**	**79.72**	**496.93**	**8801.10**

• 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 445.64 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T1.

• In T1 183.93 ha of agriculture are increased from plantation, forest, scrubland and water body of T0. The additional agriculture are coming from water body in T5 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	139.12										139.12
Mining/dump		141.27									141.27
Agriculture	1.03	3.51	3256.95	47.57						27.31	3336.37
Plantation Horticulture	0.37		17.38	1783.33						1.59	1802.68
Forest			1.96		1250.36					0.08	1252.40
Forest Plantation						14.82				0.03	14.85
Barren Rocky		1.19					490.86				492.05
Scrub	0.11	5.69	42.26	17.10				978.68		1.88	1045.73
Waterbody-Streams/River									79.72		79.72
Waterbody – Ponds			3.06							493.87	496.93
Grand Total	**140.63**	**151.66**	**3321.61**	**1847.99**	**1250.36**	**14.82**	**490.86**	**978.68**	**79.72**	**524.78**	**8801.10**

- 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 79.41 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T2.
- In T2 64.66 ha of agriculture are increased from plantation, forest, 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	140.63										140.63
Mining/dump		151.66									151.66
Agriculture	3.17		3311.63	5.96						0.85	3321.61
Plantation Horticulture	0.10		129.68	1718.02						0.19	1847.99
Forest			0.59		1249.77						1250.36
Forest Plantation			0.19			14.63					14.82
Barren Rocky							490.86				490.86
Scrub	0.37	5.96	18.26	3.88				950.10		0.11	978.68
Waterbody-Streams/River									79.72		79.72
Waterbody – Ponds			4.92							519.86	524.78
Grand Total	**144.27**	**157.62**	**3465.27**	**1727.86**	**1249.77**	**14.63**	**490.86**	**950.10**	**79.72**	**521.01**	**8801.10**

- 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 9.98 ha of agriculture are decreased and it is converted into built-up, plantation and water body of T3.
- In T3 153.45 ha of agriculture are increased from plantation, forest, forest palntation, scrubland 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-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	144.27										144.27
Mining/dump		157.48								0.14	157.62
Agriculture	2.38	0.32	3441.77	20.39						0.42	3465.27
Plantation Horticulture	0.47		24.73	1702.44						0.23	1727.86
Forest			2.26		1247.51						1249.77
Forest Plantation						14.60				0.03	14.63
Barren Rocky							490.86				490.86
Scrub	0.42	0.87	26.60	6.46				915.61		0.14	950.10
Waterbody-Streams/River									79.72		79.72
Waterbody – Ponds										521.01	521.01
Grand Total	**147.53**	**158.67**	**3495.36**	**1729.29**	**1247.51**	**14.60**	**490.86**	**915.61**	**79.72**	**521.97**	**8801.10**

- 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 23.50 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T4.
- In T4 53.59 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	147.53										147.53
Mining/dump		158.58								0.08	158.67
Agriculture	0.59	2.03	3490.86	0.59						1.29	3495.36
Plantation Horticulture	0.22	0.22	98.12	1630.14						0.60	1729.29
Forest			0.73		1246.77						1247.51
Forest Plantation						14.60					14.60
Barren Rocky							490.86				490.86
Scrub		4.56	17.45	0.50				893.01		0.10	915.61
Waterbody-Streams/River									79.72		79.72
Waterbody – Ponds										521.97	521.97
Grand Total	**148.34**	**165.39**	**3607.16**	**1631.22**	**1246.77**	**14.60**	**490.86**	**893.01**	**79.72**	**524.04**	**8801.10**

- 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 4.50 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T5.
- In T5 116.30 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 52 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 143.66, 30.09 & 111.81 Hectares From T2 to T3, T3 to T4 & T4 toT5 and There is an decrease of 261.70 & 14.76 Hectares From T0 to T1 & T1 to T2 . The overall increase of 9.09 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is increase of 196.13 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 357.16 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (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.