MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -22/2010-11
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

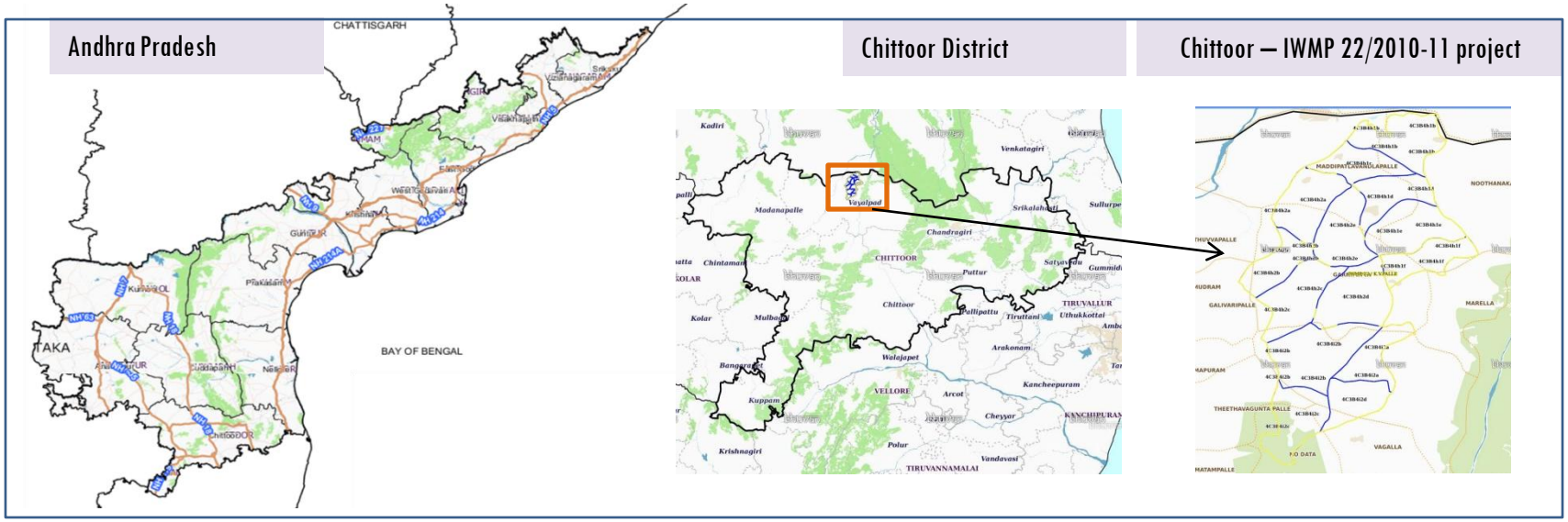
CONTENTS

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-22/2010-11, Chittoor District of Andhra Pradesh. The total geographical area of the project is 8,038 ha. It comprises of 15 micro watersheds.
- In the project area 123 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 21 ha increase in the area.
- Major percentage i.e. 60 % is covered by the agriculture, 19 % is covered by scrubland and 5.5 % is covered by water body and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-22/2010-11
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Kambhamvaripalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 8,038 ha. It comprises of 15 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.

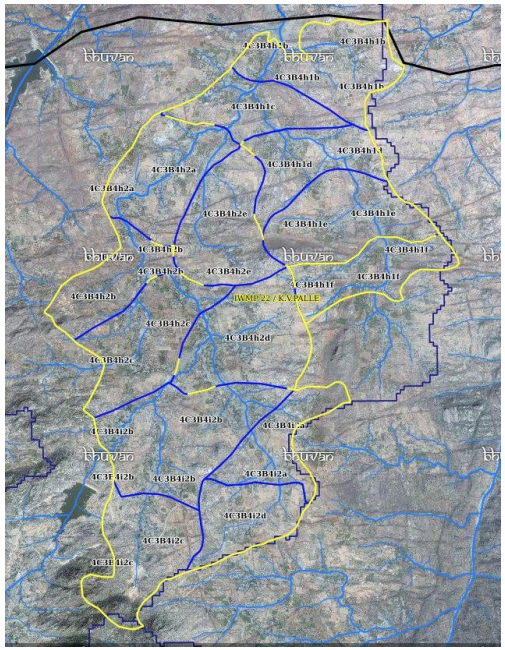
Satellite Data and Ancillary Data

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	123
4	Detailed Project Report		

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



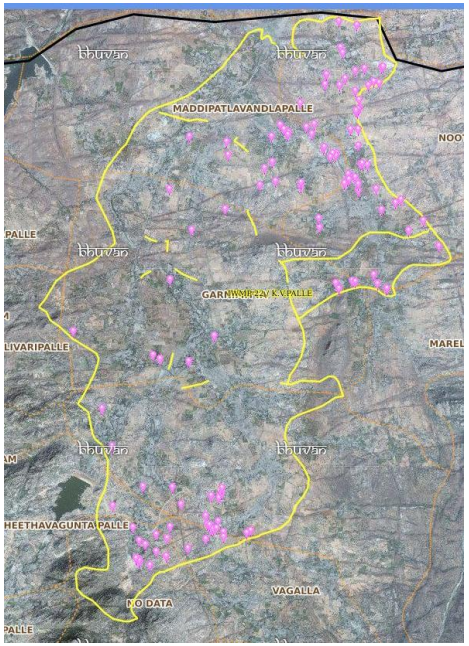
Legend

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	0	0
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	26	25
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	16	16
11	Civil work-Check dams /Rock fill dam	73	60
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	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	12	12
18	Others	18	10
	TOTAL	**145**	**123**

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-22/2010-11

2009-10

December-2013

Feb-2016

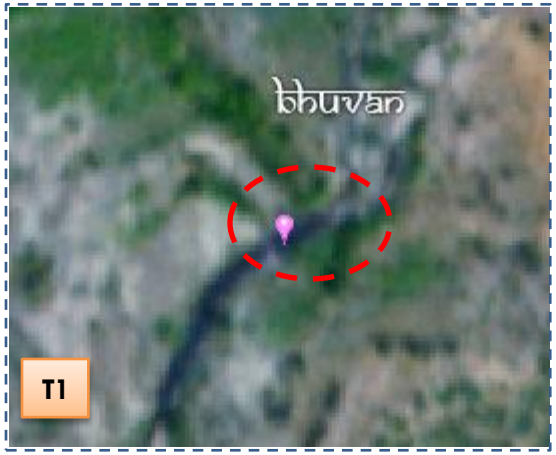
October-2018

Jan-2019

Activity : Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-22/2010-11

T0:2010-11



T1: 2 February 2016

Drishti Sl no. 130979 MWS :4C3B4h2a

Check dam

T0:2010-11

T1: 2 February 2016

Drishti Sl no. 1794970 MWS :4C3B4h2a

Farm pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-22/2010-11

T0: 2010-11

T1: 2 February 2015

Drishti Sl no. 1647431 MWS : 4C3B4h1d

Percolation Tank Repair

T0: 2010-11

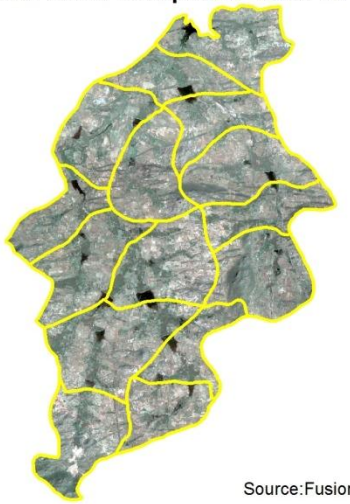
T1: 2 February 2015

Drishti Sl no. 184829 MWS : 4C3B4i2a

Percolation Tank

Natural Color Composite – 2010-11 to 2018-19

Natural Color Composite- 2009-10

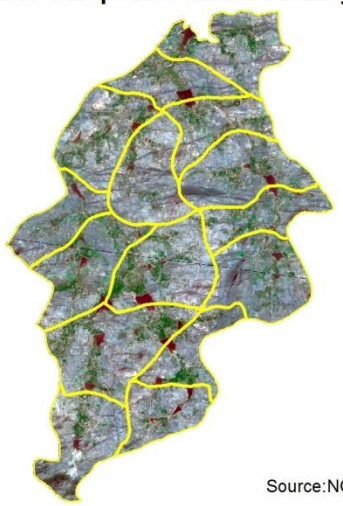


Source:Fusion data,NRSC

Natural Color Composite- 26th February 2013

Source:NCC,NRSC

Natural Color Composite- 02nd February 2016



Source:NCC,NRSC

Natural Color Composite- 18th October 2016

Source:LISS-IV,NRSC

Natural Color Composite- 30th March 2018

Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019

Sentinel-II Data

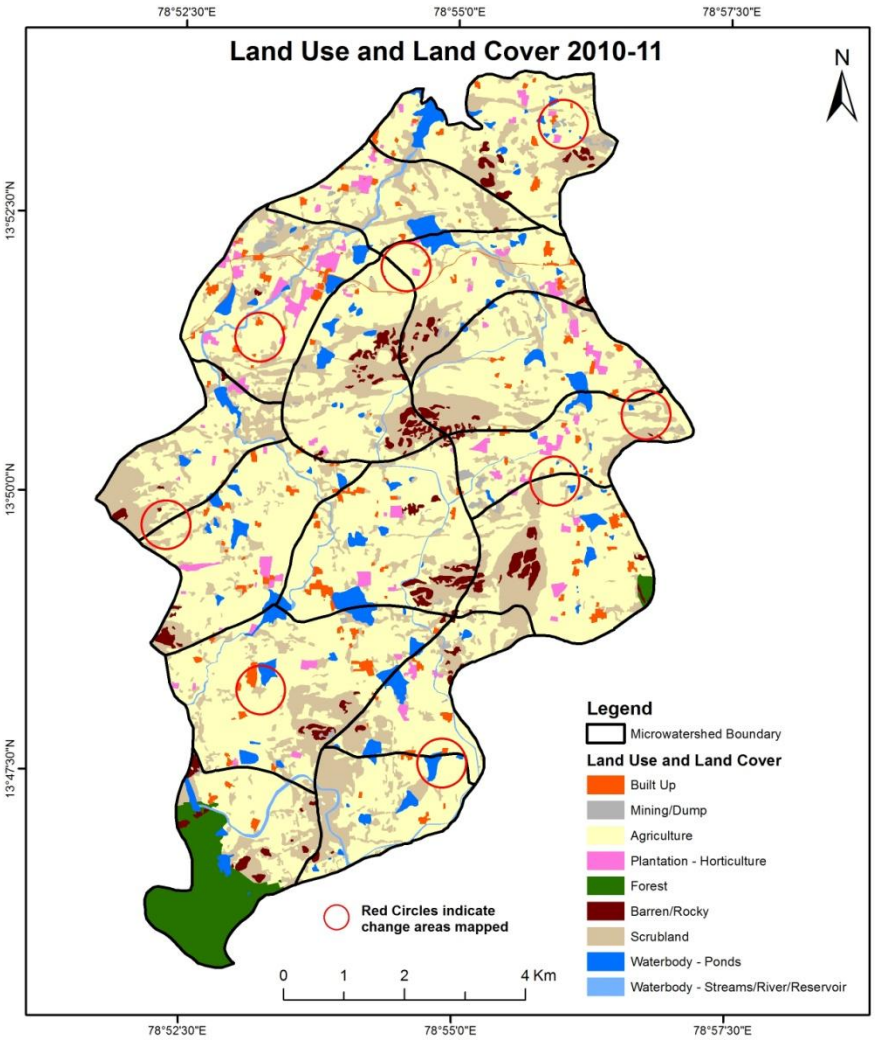
MONITORING IN THE PROJECT AREA

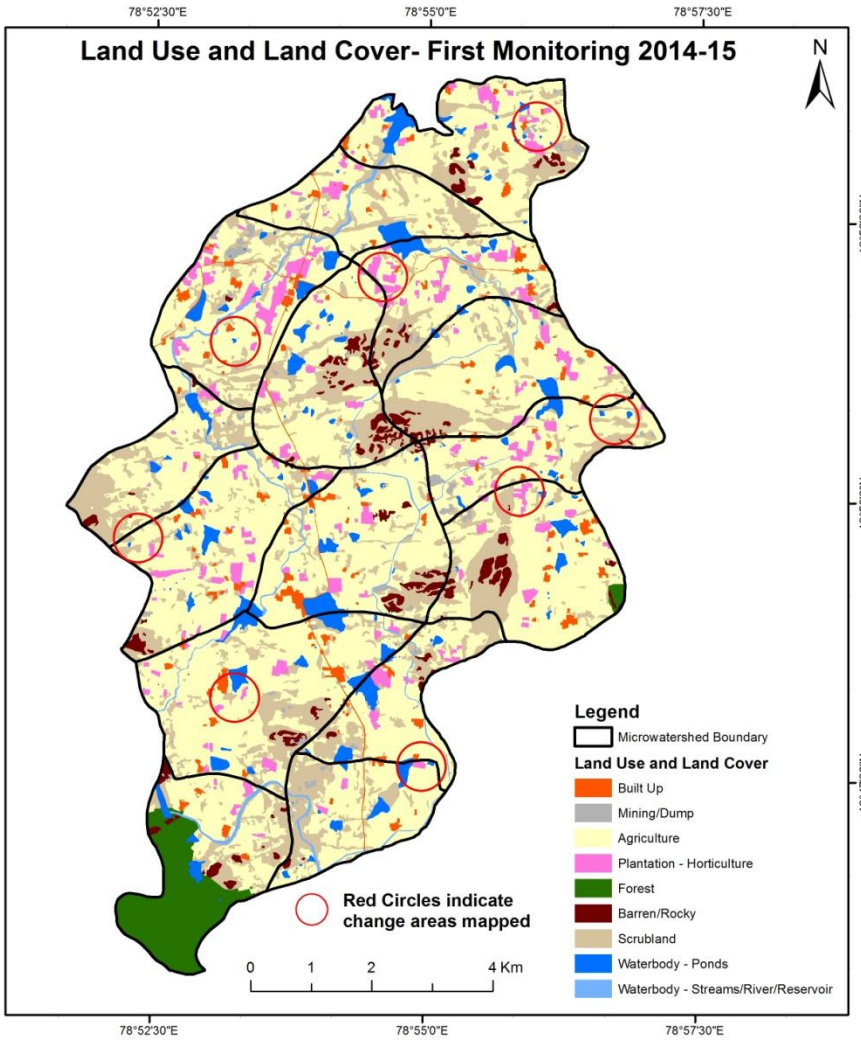
Land use and Land cover Changes in the Project

- 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)

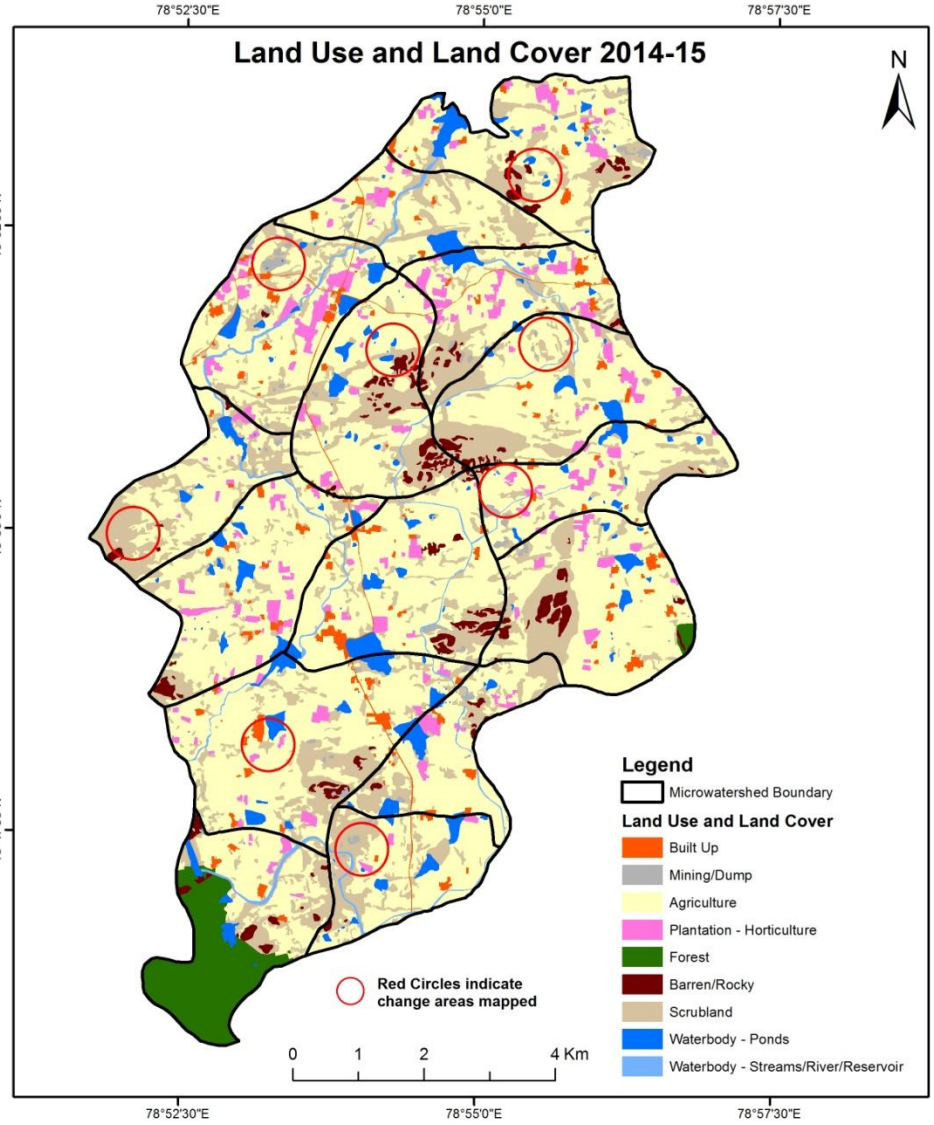
Scale: 1:10000

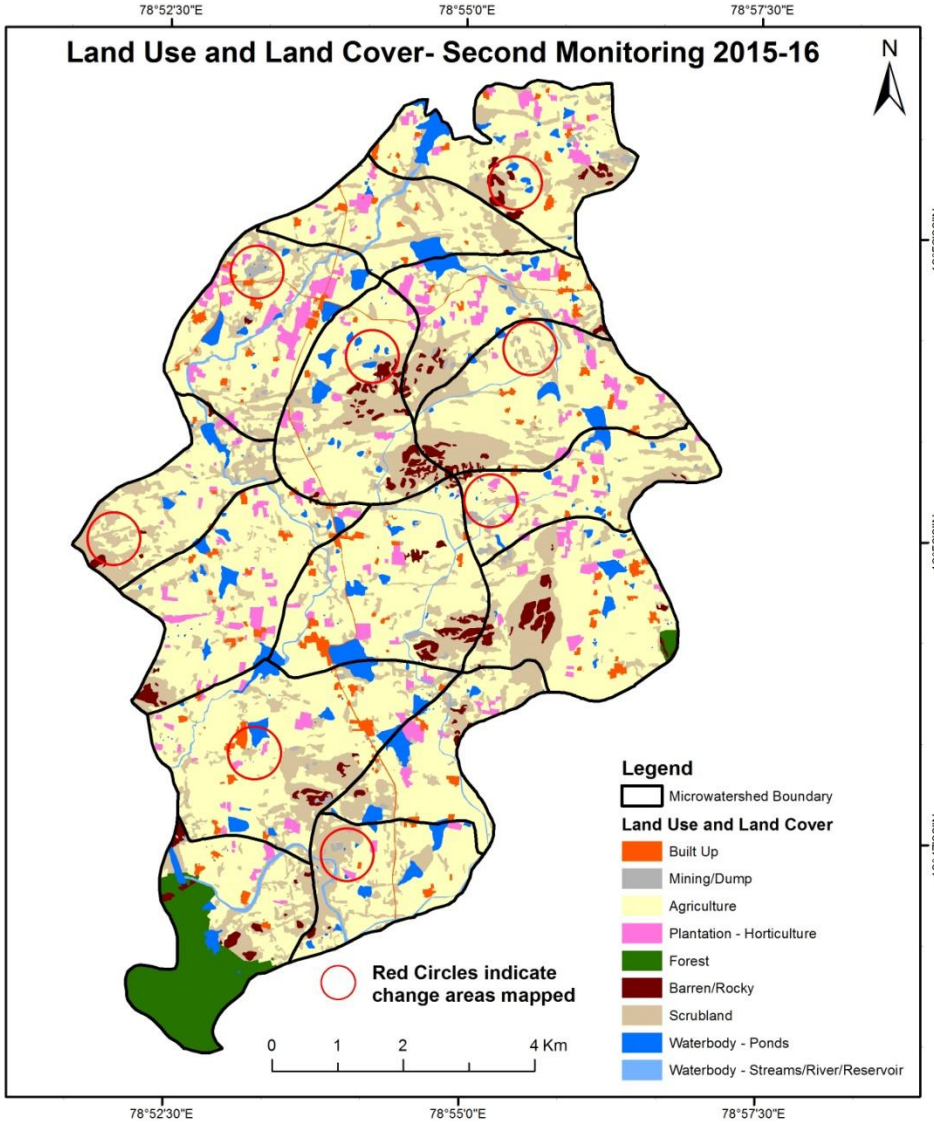




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

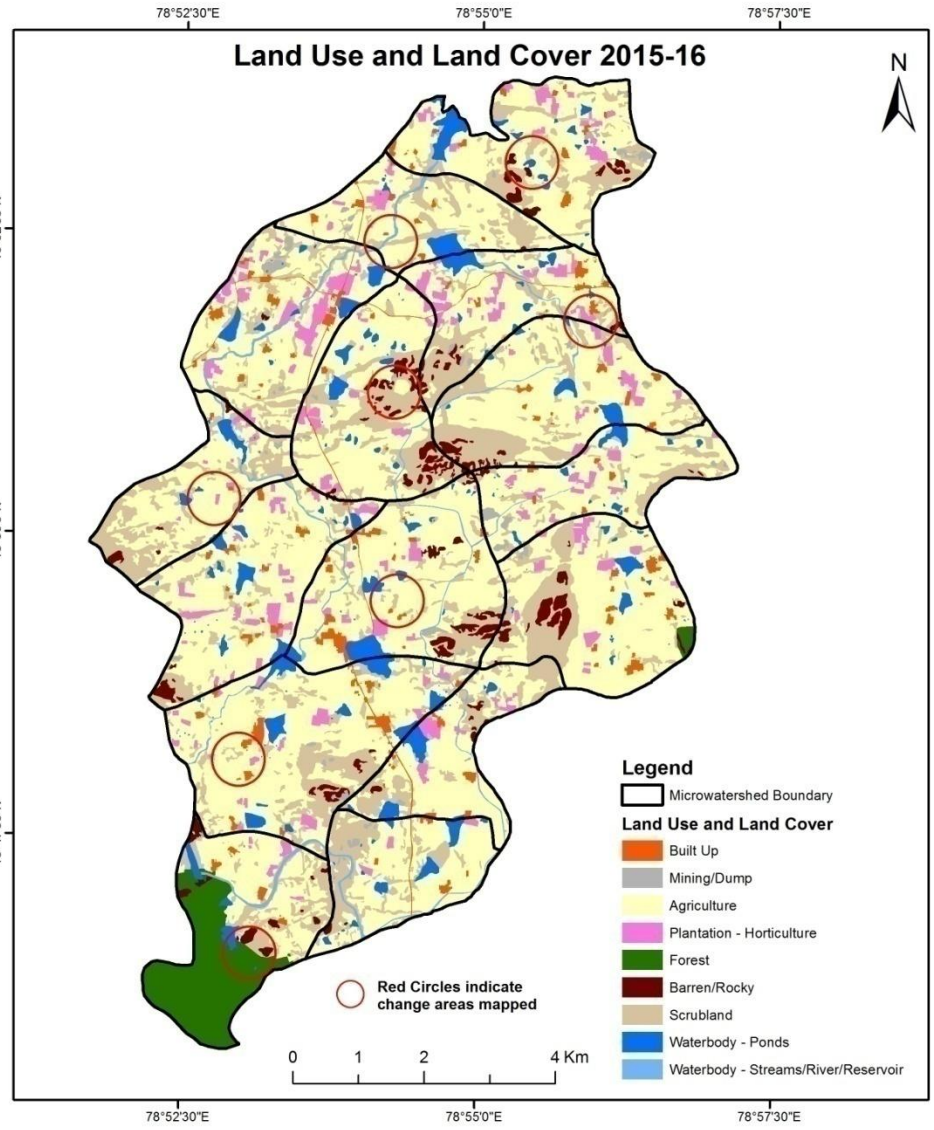
Scale: 1:10000

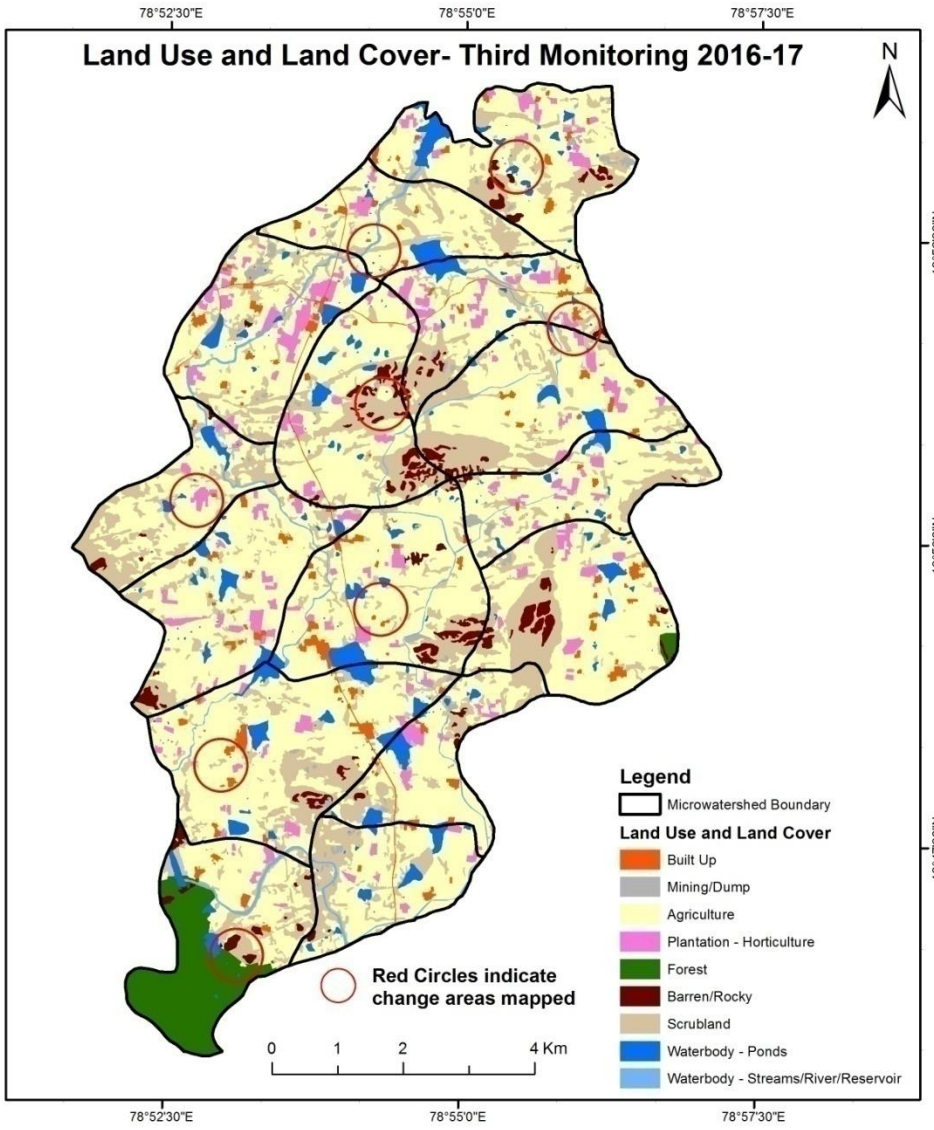




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

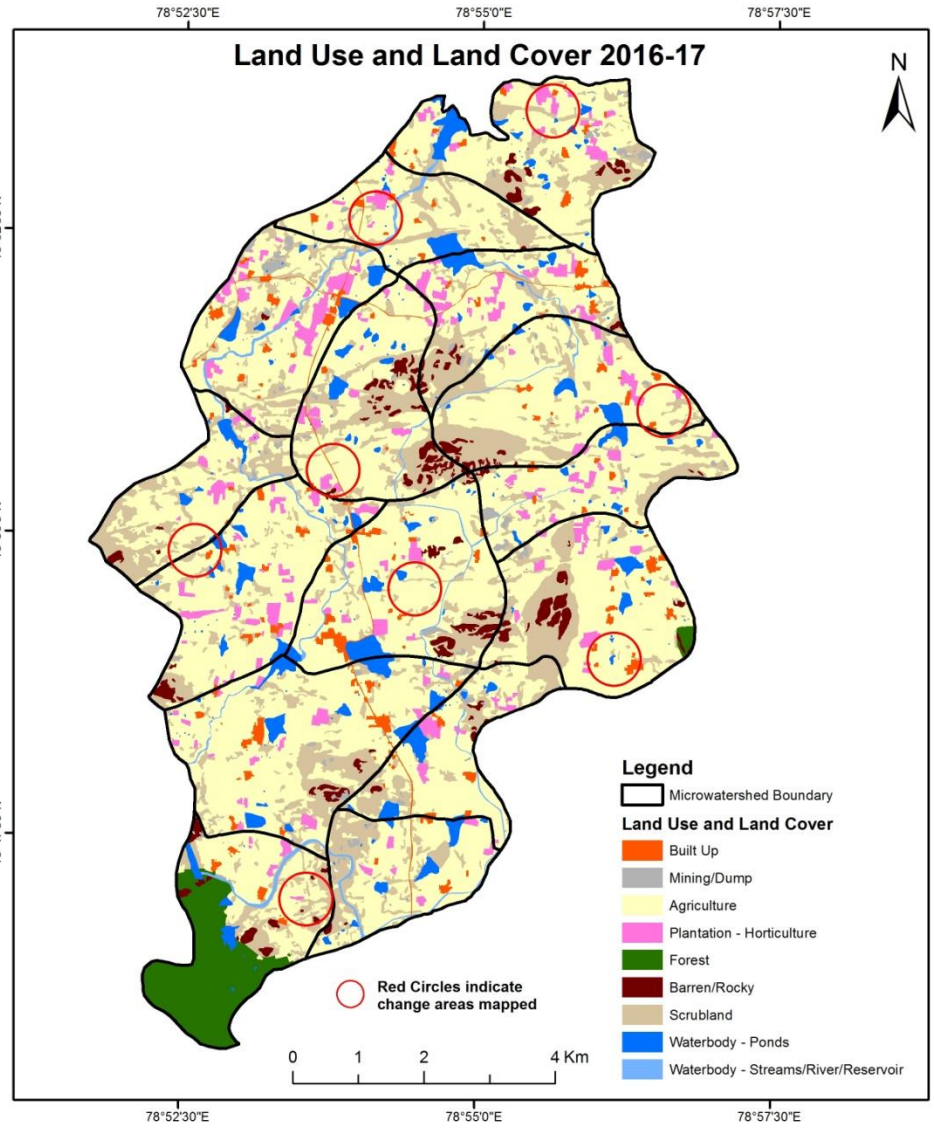
Scale: 1:10000

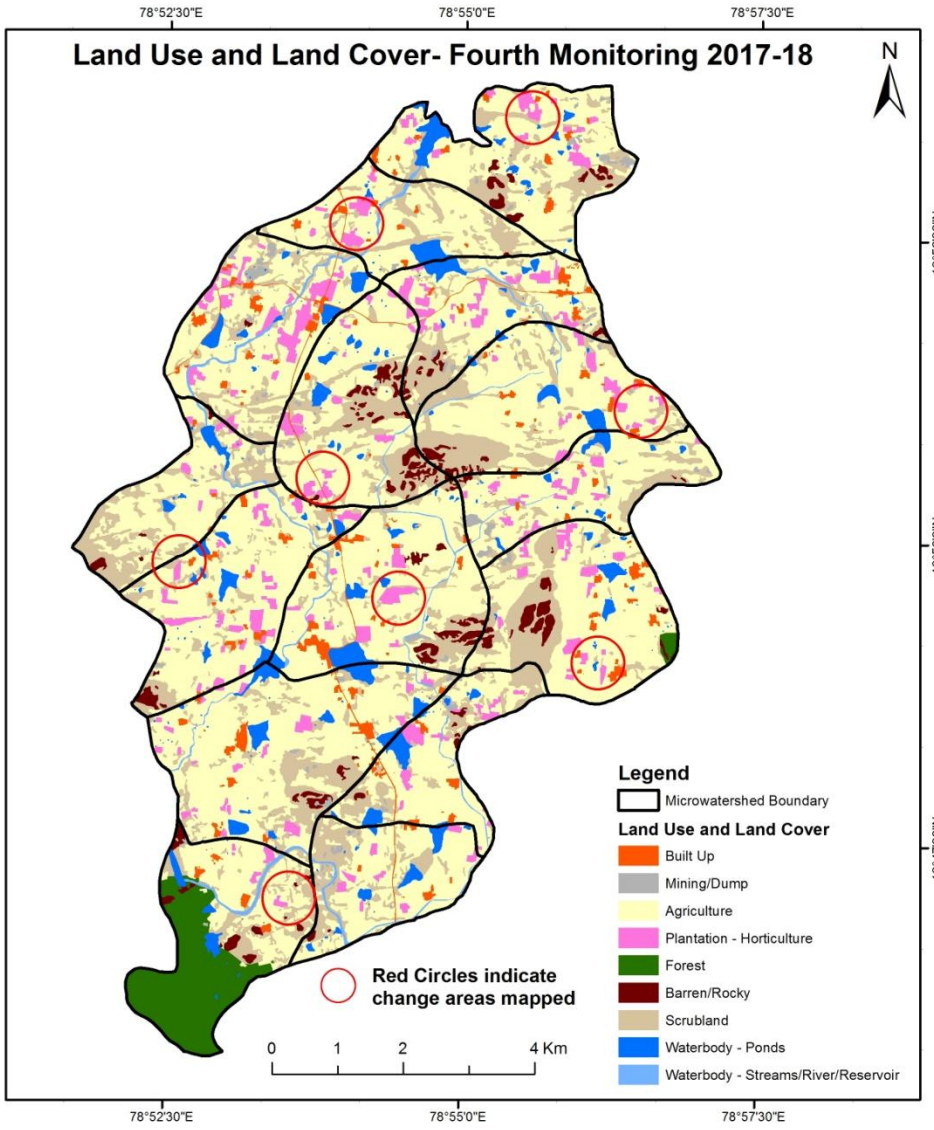




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

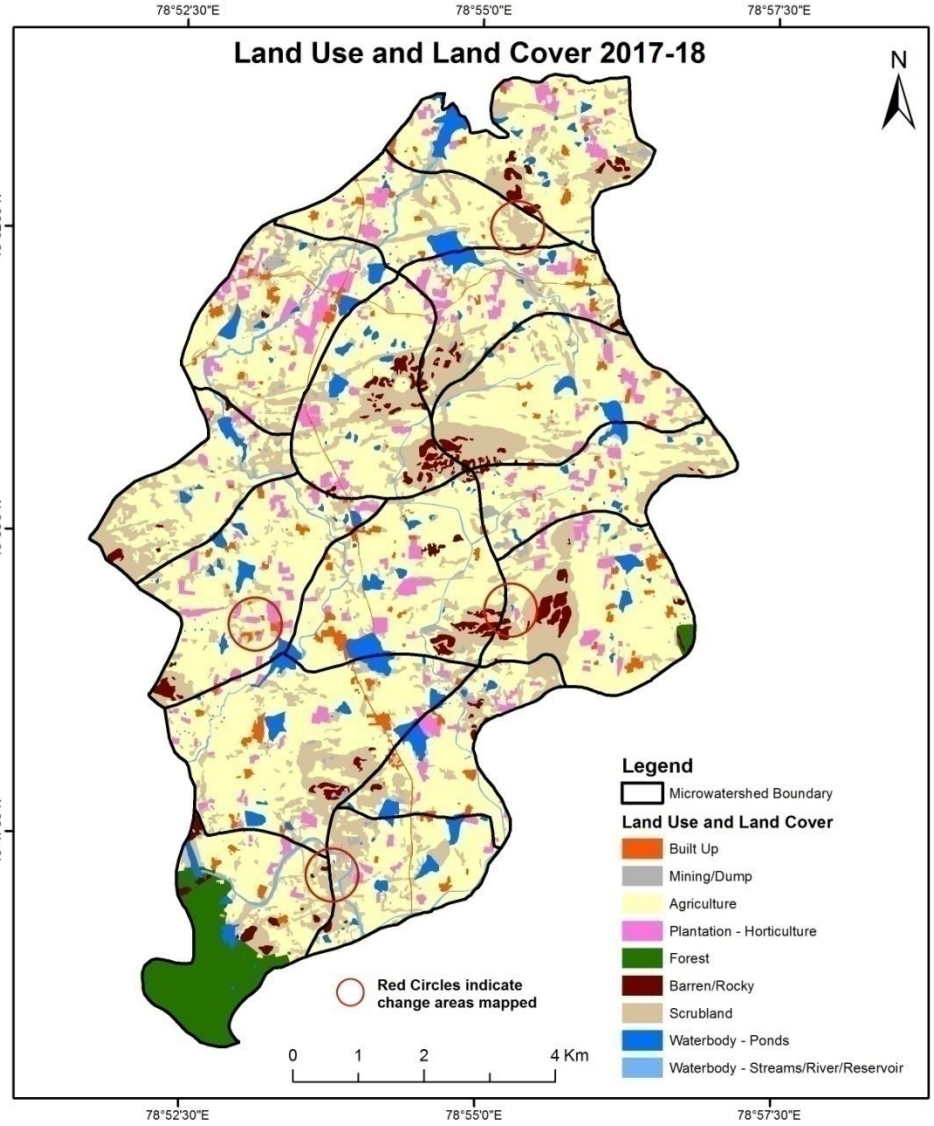
Scale: 1:10000

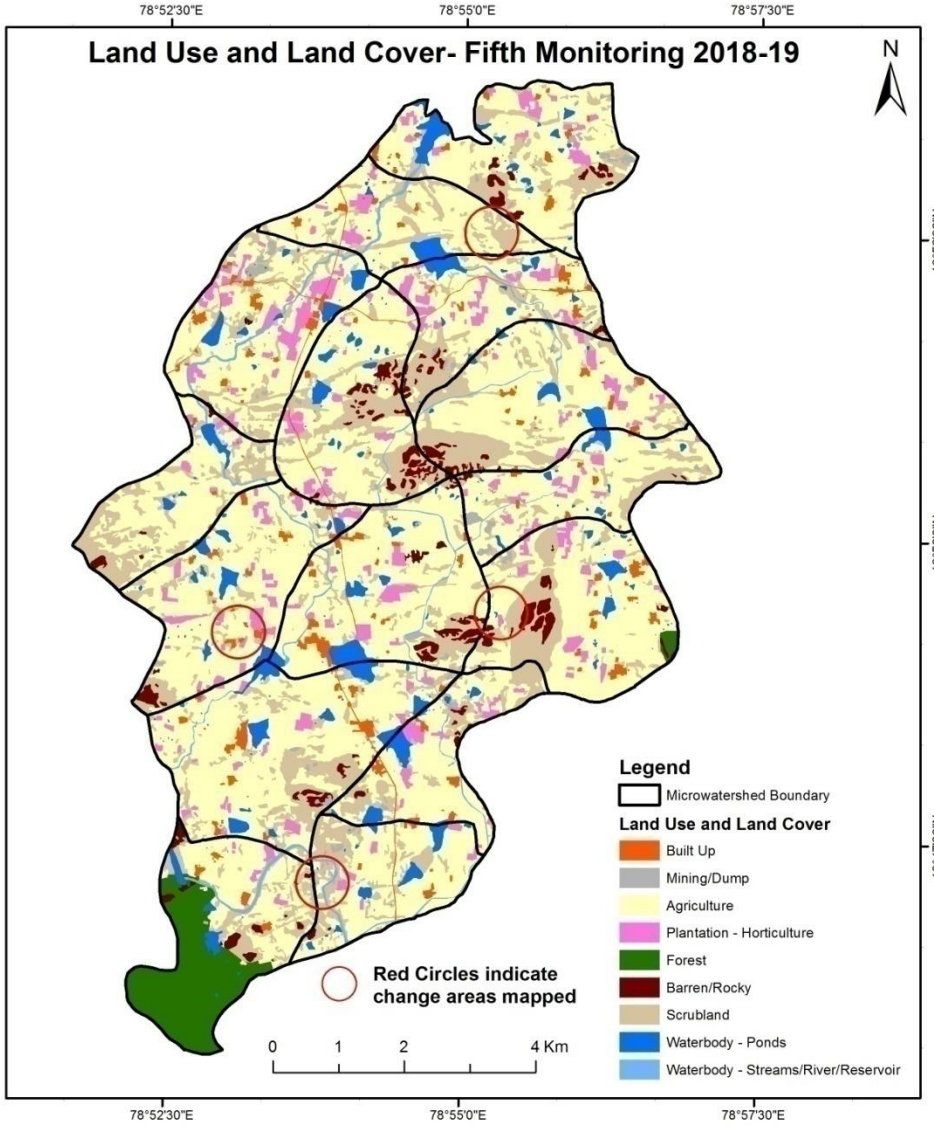




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

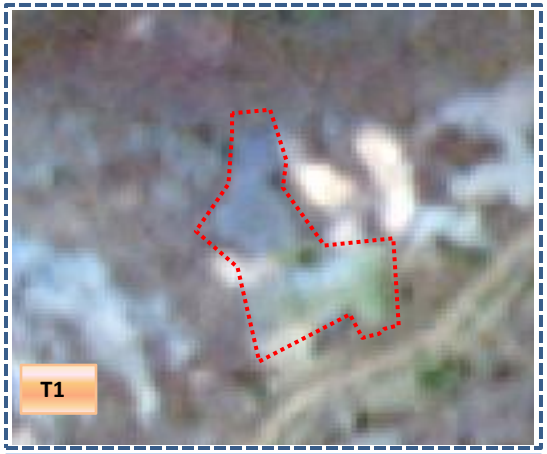




Land Use and Land Cover changes for Pre and Post treatment dates

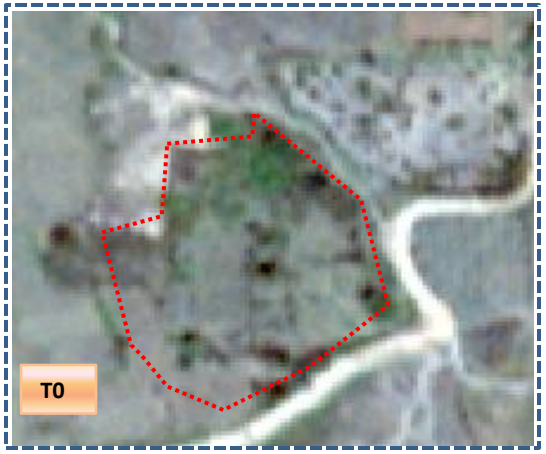
Scrub to Agriculture

T0: 2012-13(78°52'15.151E 13°49'49.808N)

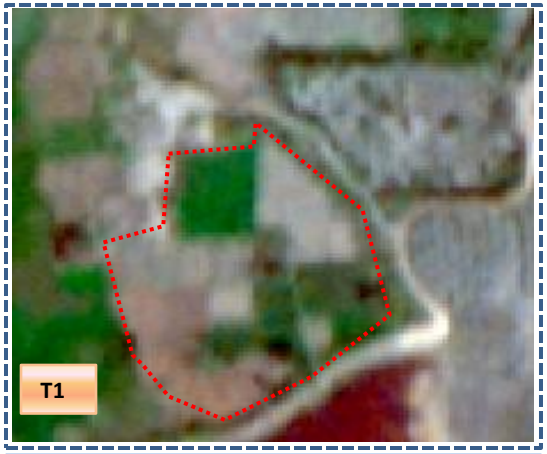


T1: 02 Feb 2016

Scrub to Agriculture



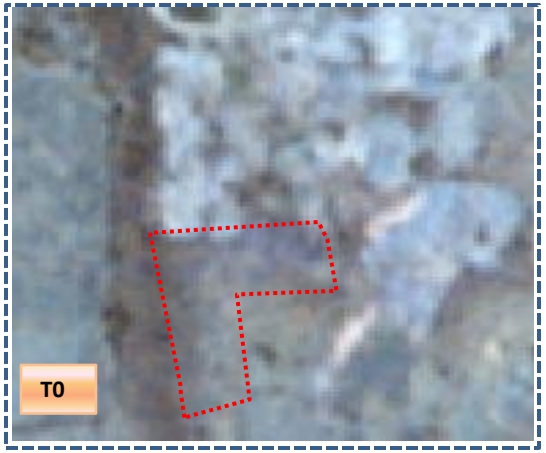
T0: 2012-13 (78°54'25.089E 13°48'31.402N)



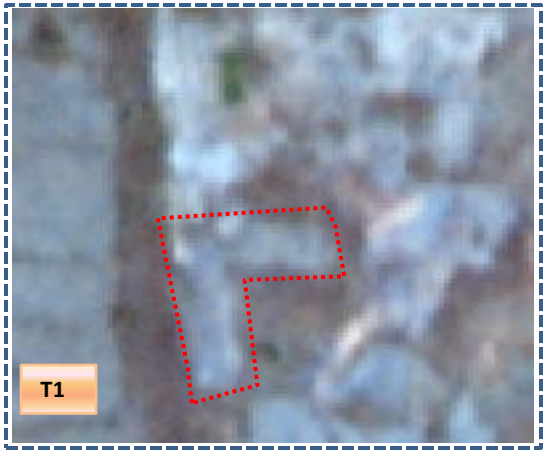
T1: 02 Feb 2016

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

Scrub to Agriculture



T0: 2012-13(78°53'32.717E 13°47'16.35N)



T1: 02 Feb 2016

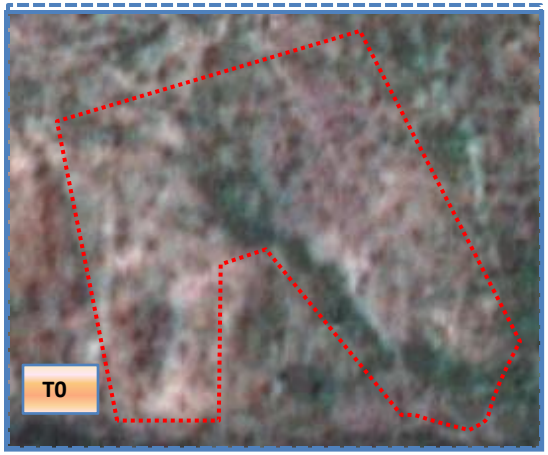
Scrub to Agriculture

T0: 2012-13(78°54'3.719E 13°47'0.429N)

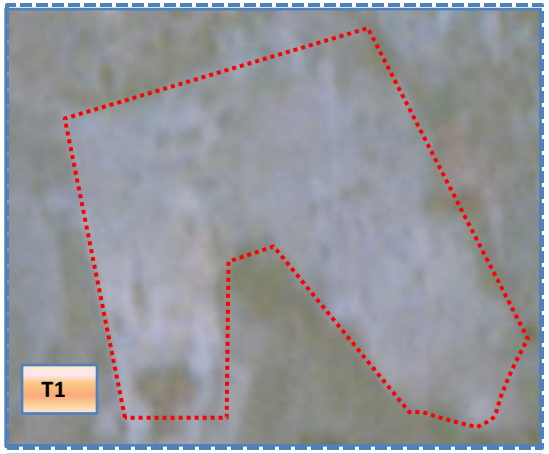
T1: 02 Feb 2016

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

Scrub to Agriculture

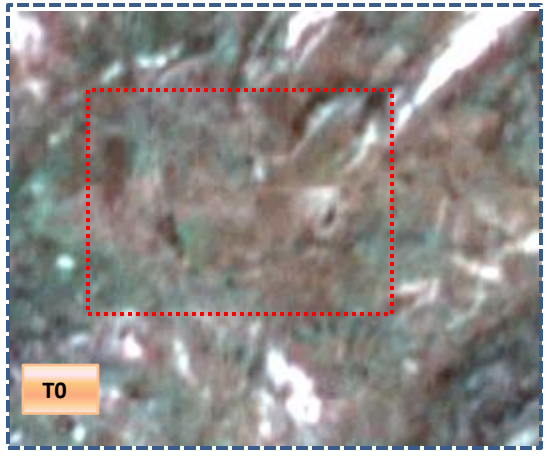


T0: 2010-11

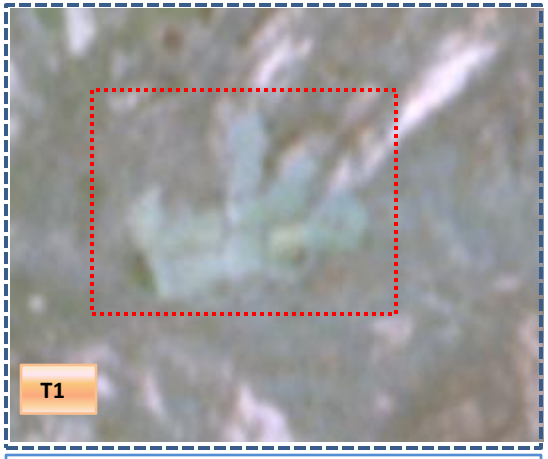


T1: 2 February 2016

Scrub to Agriculture



T0: 2010-11

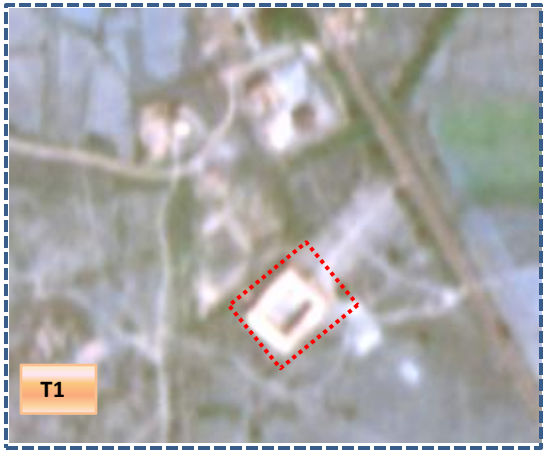


T1: 2 February 2016

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

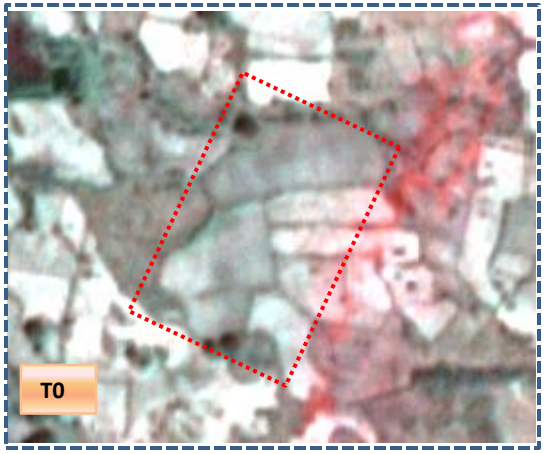
Agriculture to Water body

T0: 2010-11



T1: 2 February 2016

Agriculture to Plantation



T0: 2010-11

T1: 2 February 2016

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	167.69		0.97								**168.66**
Mining/dump		42.88								0.13	**43.01**
Agriculture	24.42	2.41	4754.93	185.22						9.79	**4976.77**
Plantation Horticulture	0.72		4.07	170.31							**175.09**
Forest			1.66		268.18						**269.84**
Forest Plantation											
Barren Rocky		8.75					185.92				**194.68**
Scrub	1.54	14.07	60.04	1.41				1708.38		2.67	**1788.11**
Waterbody-Streams/River									88.61		**88.61**
Waterbody – Ponds			0.46							332.42	**332.88**
Grand Total	**194.36**	**68.12**	**4822.14**	**356.93**	**268.18**		**185.92**	**1708.38**	**88.61**	**345.00**	**8037.65**

• 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 221 ha of the agriculture area has decreased and it is converted into built-up, mining/dump, plantation and water body in T1.

• In T1 66 ha of the agriculture area has increased from built-up, plantation, forest, scrubland and water body of T0, overall 154 ha of the agriculture area has been decreased. he 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	194.36										**194.36**
Mining/dump		68.12									**68.12**
Agriculture	0.86		4810.23	6.39						4.67	**4822.14**
Plantation Horticulture			5.83	351.10							**356.93**
Forest					268.18						**268.18**
Forest Plantation											
Barren Rocky		0.24					185.68				**185.92**
Scrub	0.30	0.52	52.25					1652.87		2.44	**1708.38**
Waterbody-Streams/River									88.61		**88.61**
Waterbody – Ponds										345.00	**345.00**
Grand Total	**195.51**	**68.88**	**4868.32**	**357.49**	**268.18**		**185.68**	**1652.87**	**88.61**	**352.11**	**8037.65**

• 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 11 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body in T2.

• In T2 58 ha of the agriculture area has increased from plantation and scrubland of T1, overall 46 ha of the agriculture area has been increased. he 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	195.51										**195.51**
Mining/dump		68.85								0.03	**68.88**
Agriculture	0.33	0.86	4849.33	16.07						1.71	**4868.32**
Plantation Horticulture	0.04		0.88	356.54						0.04	**357.49**
Forest			0.45		267.38					0.36	**268.18**
Forest Plantation											
Barren Rocky							185.68				**185.68**
Scrub		1.36	28.77					1621.50		1.23	**1652.87**
Waterbody-Streams/River									88.61		**88.61**
Waterbody – Ponds			2.26							349.85	**352.11**
Grand Total	**195.88**	**71.07**	**4881.70**	**372.61**	**267.38**		**185.68**	**1621.50**	**88.61**	**353.22**	**8037.65**

• 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 18 ha of the agriculture area has decreased and it is converted into built-up, mining/dump, plantation and water body in T3.

• In T3 32 ha of the agriculture area has increased from built-up, plantation, forest, scrubland and water body of T2, overall 13 ha of the agriculture area has been increased. he 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	195.88										**195.88**
Mining/dump		71.00								0.07	**71.07**
Agriculture	5.30		4810.71	64.74						0.95	**4881.70**
Plantation Horticulture			6.07	366.55							**372.61**
Forest		0.32	0.84		266.22						**267.38**
Forest Plantation											
Barren Rocky							185.68				**185.68**
Scrub	2.43	0.50	21.42					1596.82		0.34	**1621.50**
Waterbody-Streams/River									88.61		**88.61**
Waterbody – Ponds										353.22	**353.22**
Grand Total	**203.61**	**71.82**	**4839.03**	**431.28**	**266.22**		**185.68**	**1596.82**	**88.61**	**354.58**	**8037.65**

• 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 70 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body in T4.

• In T4 28 ha of the agriculture area has increased from plantation, forest and scrubland of T3, overall 42 ha of the agriculture area has been decreased. he 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	203.61										**203.61**
Mining/dump		71.82									**71.82**
Agriculture	1.04		4837.99								**4839.03**
Plantation Horticulture			10.42	420.87							**431.28**
Forest					266.22						**266.22**
Forest Plantation											
Barren Rocky							185.68				**185.68**
Scrub	0.95		17.19					1578.68			**1596.82**
Waterbody-Streams/River									88.61		**88.61**
Waterbody – Ponds			0.16							354.42	**354.58**
Grand Total	**205.60**	**71.82**	**4865.76**	**420.87**	**266.22**		**185.68**	**1578.68**	**88.61**	**354.42**	**8037.65**

• 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 01 ha of the agriculture area has decreased and it is converted into built-up area in T5.

• In T5 27 ha of the agriculture area has increased from plantation, scrubland and water body of T4, overall 26 ha of the agriculture area has been increased. he 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 21 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 46, 13, & 26 Hectares From T1 to T2, T2-T3, & T4-T5 respectively and overall decrease of 111 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is an increase of 245 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 209 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (16) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (16) verified from the portal.