MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

Chittoor-48/2012-13 Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
December-2022

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

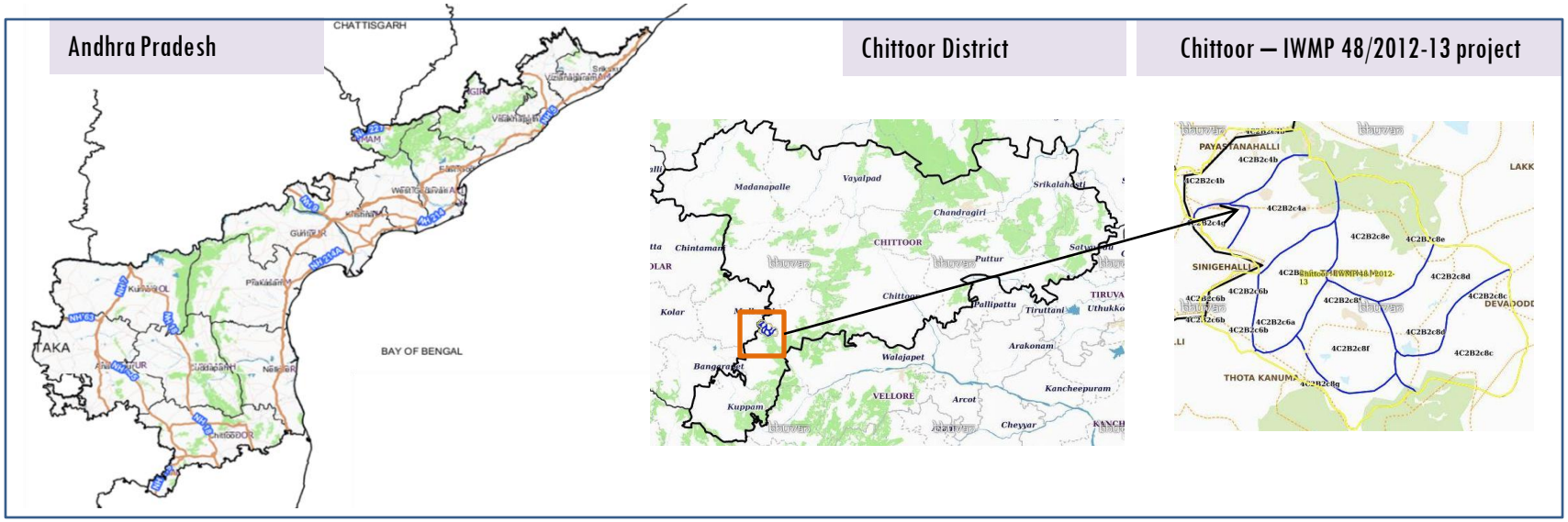
CONTENTS

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-48/2012-13, Chittoor District of Andhra Pradesh. The total geographical area of the project is **4,545** ha. It comprises of 11 micro watersheds.
- In the project area 189 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 0.54 hectares increase in the area.
- Major percentage i.e. 75 % is covered by the agriculture, 10.9 % is covered by forest and 5.4 % is covered by scrubland and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-48/2012-13
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Baireddipalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 4,545 ha. It comprises of 11 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2012-13 (T0) period (***Batch -1***) projects taking 2020-21 (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.

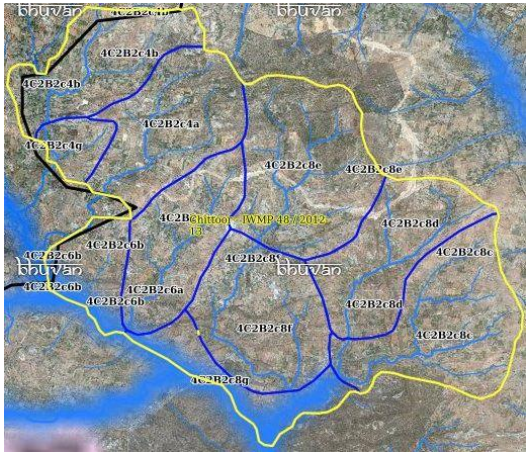
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2011-12	2020-21
LISS IV	2012-13		
SCENE 1			27-Feb-21
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			27-Feb-21
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	189
4	Detailed Project Report		

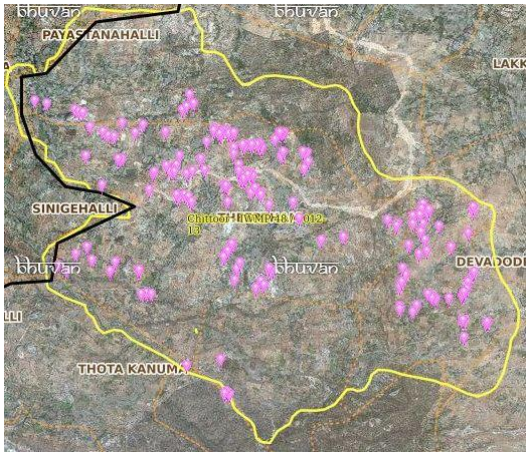
Natural Color Composite overlaid with Project boundaries and high detail stream network



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	4	4
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	1	1
11	Civil work-Check dams /Rock fill dam	23	23
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)	0	0
18	Others	163	160
	TOTAL	**192**	**189**

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 (2012-13) and T5 is 2020-21 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)

Natural Color Composite-08th November 2012

Source:LISS-IV,NRSC

Natural Color Composite- 2016

Source:NCC,NRSC,

Natural Color Composite- 22nd February 2018

Source:LISS-IV,NRSC

Natural Color Composite- 04th January 2019

Source:Sentinel

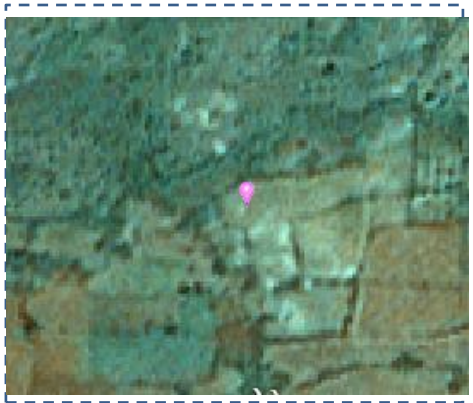
Natural Color Composite- 29th February 2020

Source:LISS-IV,NRSC

Natural Color Composite- 27th February 2021

Source:Sentinel

Monitoring of activities in Chittoor District Andhra Pradesh. IWMP-48/2012-13



T0 Satellite data 2010

T1 Satellite data 2013

T2 Satellite data 2014

T3 Satellite data 2016

T4 Satellite data 2019

T5 Satellite data 2017

Drishti Id. 139974

Dugout pond

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-48/2012-13

T0:2012-13

T1: 22 October 2015

Drishti Sl no. 565820 MWS : 4C2B2c8d

Check dam

T0:2012-13

T1: 22 October 2015

Drishti Sl no. 7024189 MWS :4C2B2c8d

Farm pond

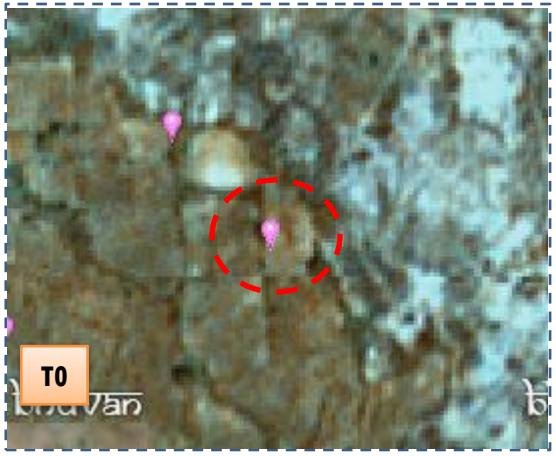
Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-48/2010-11

T0: 2012-13

T1: 22 October 2015

Drishti Sl no. 7003925 MWS : 4C2B2c4a

Farm pond



T0: 2012-13

T1: 22 October 2015

Drishti Sl no. 7024210 MWS :4C2B2c6a

Farm pond

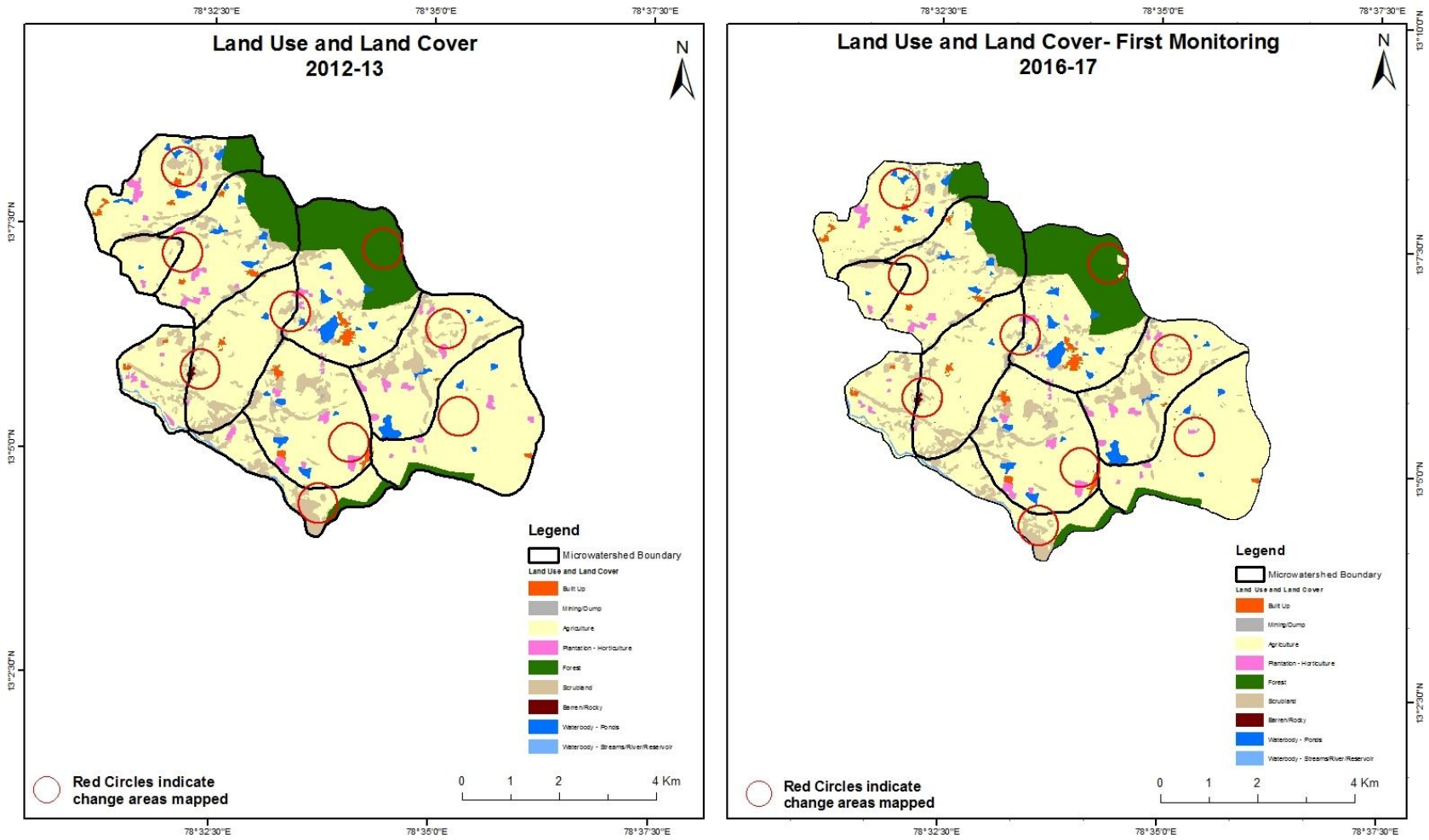
MONITORING IN THE PROJECT AREA

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 (2012-13) and row represents the T5 (2020-21)

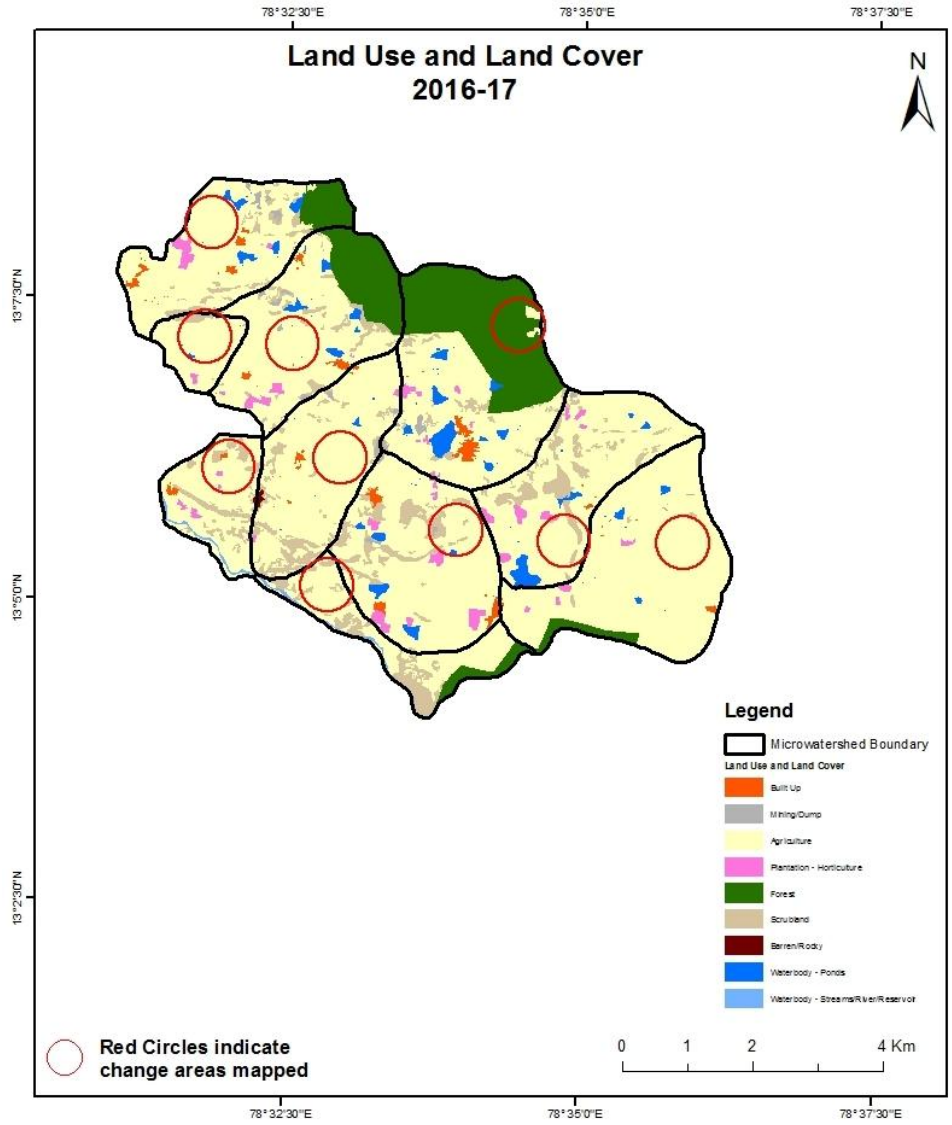
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2012-13 to 2016-17)

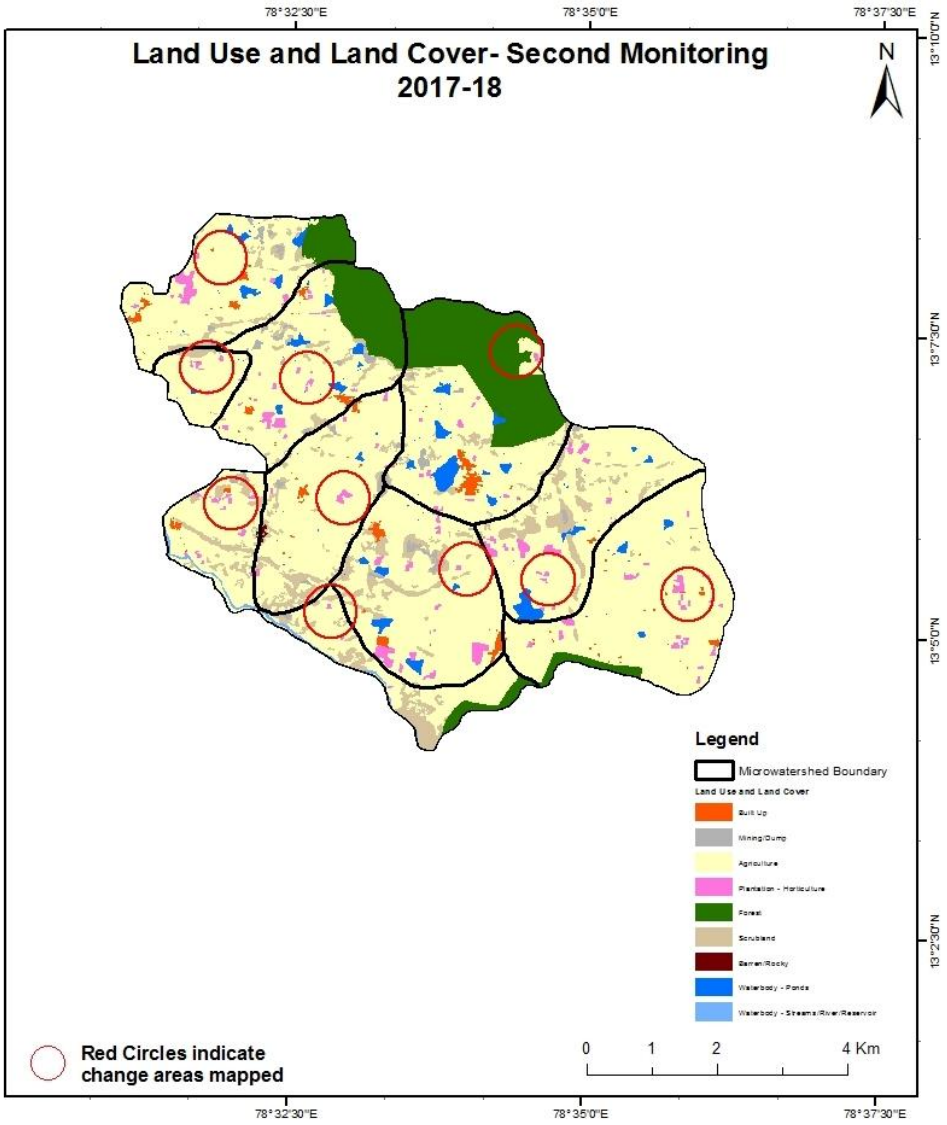
Scale: 1:10000



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

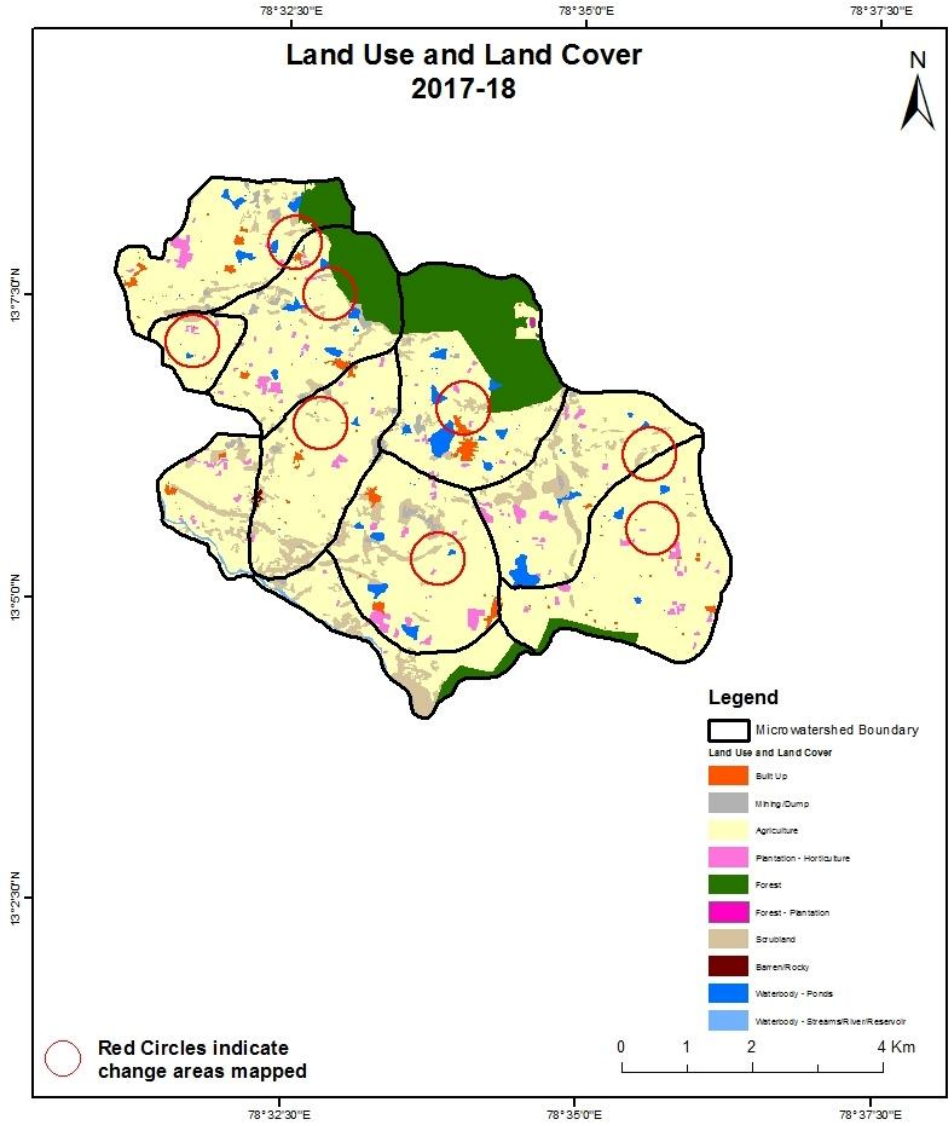
Scale: 1:10000

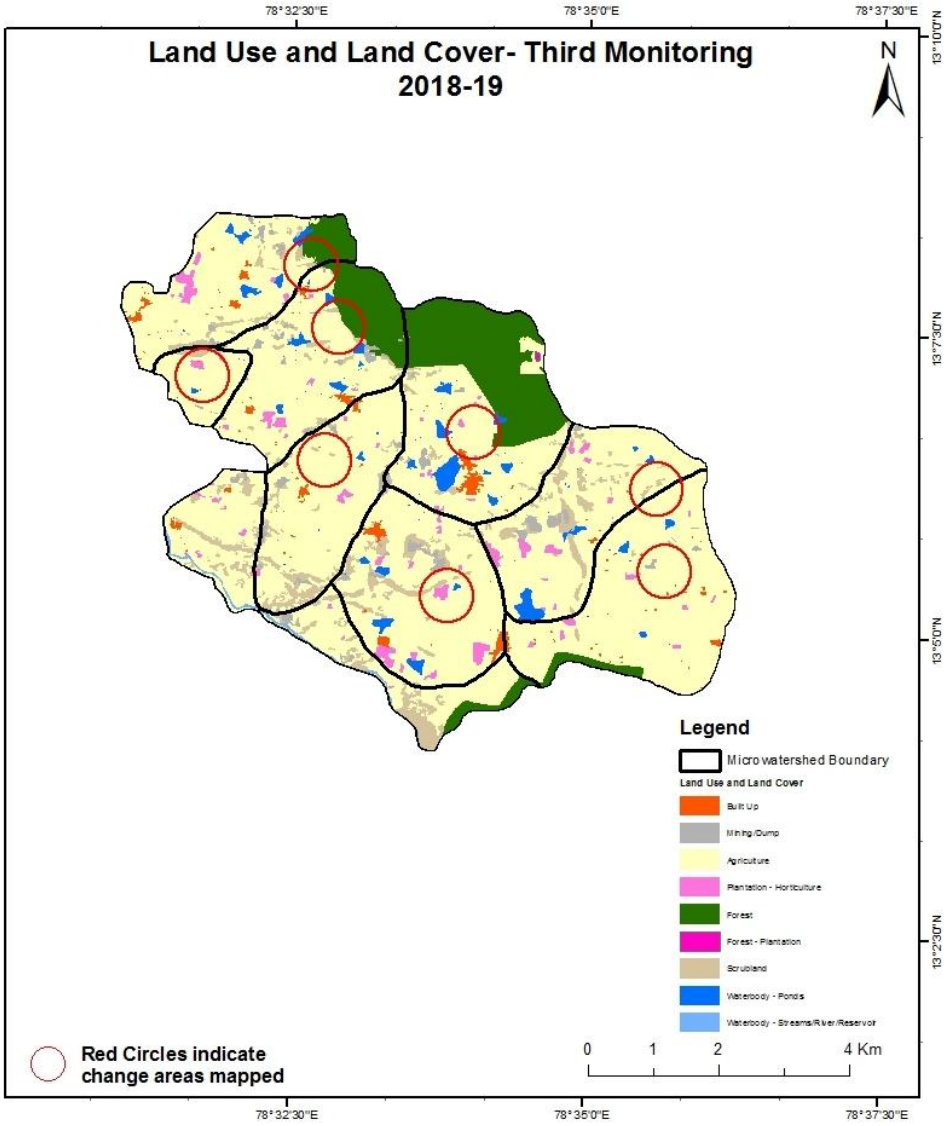




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

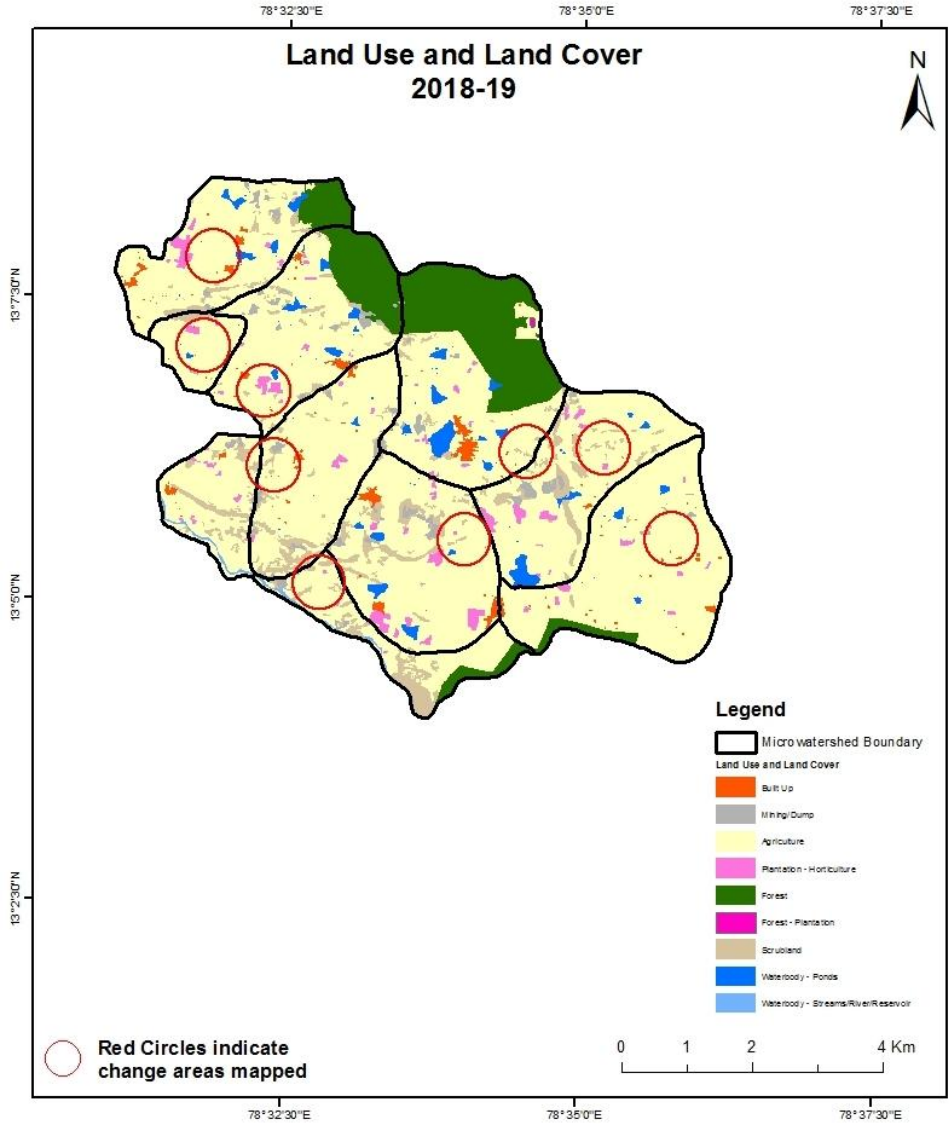
Scale: 1:10000

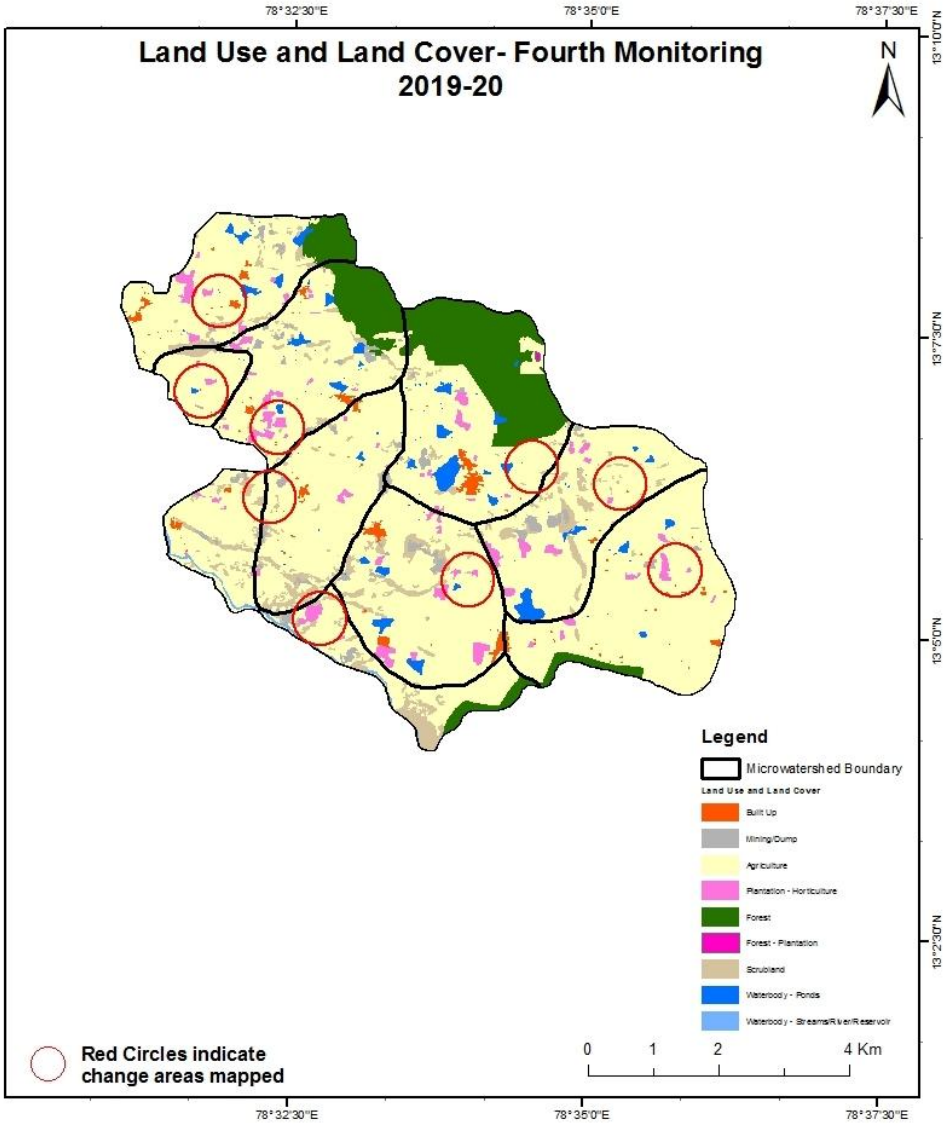




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

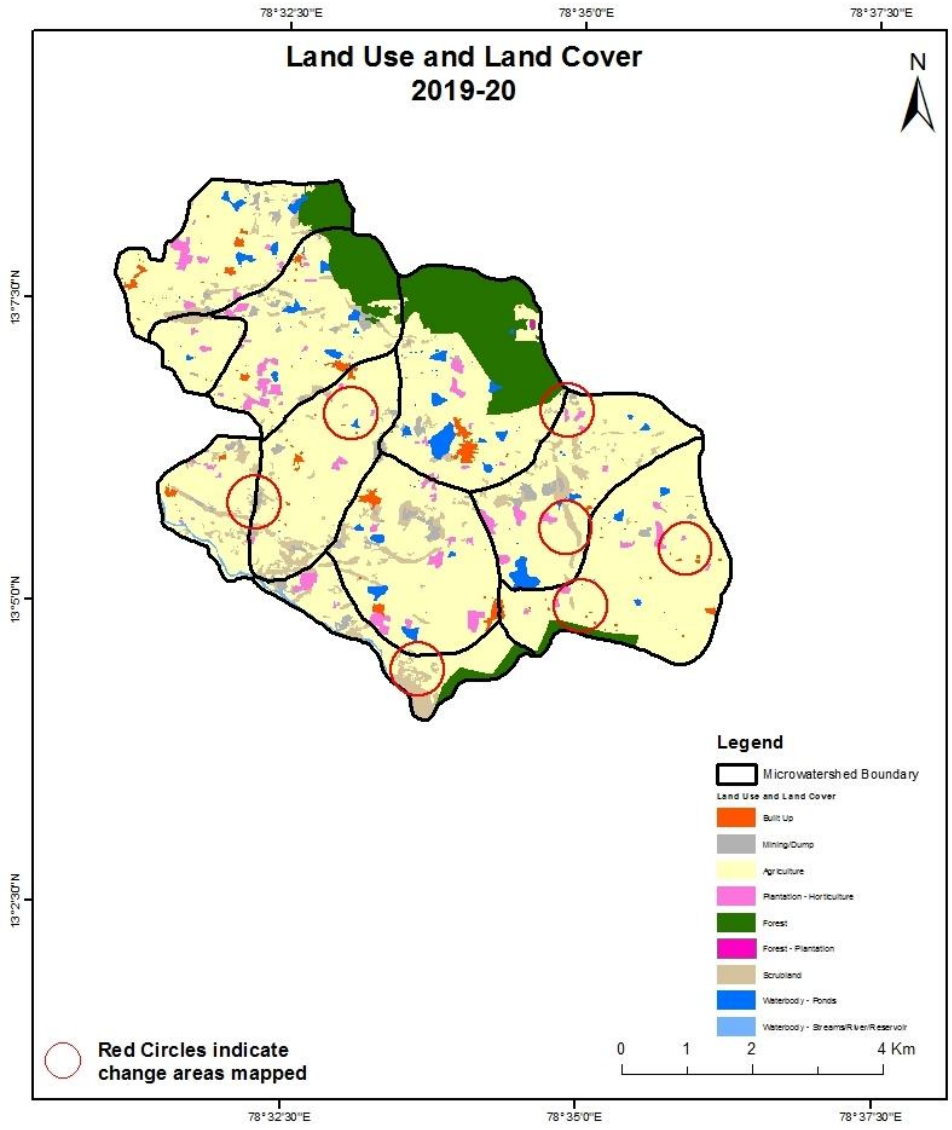
Scale: 1:10000

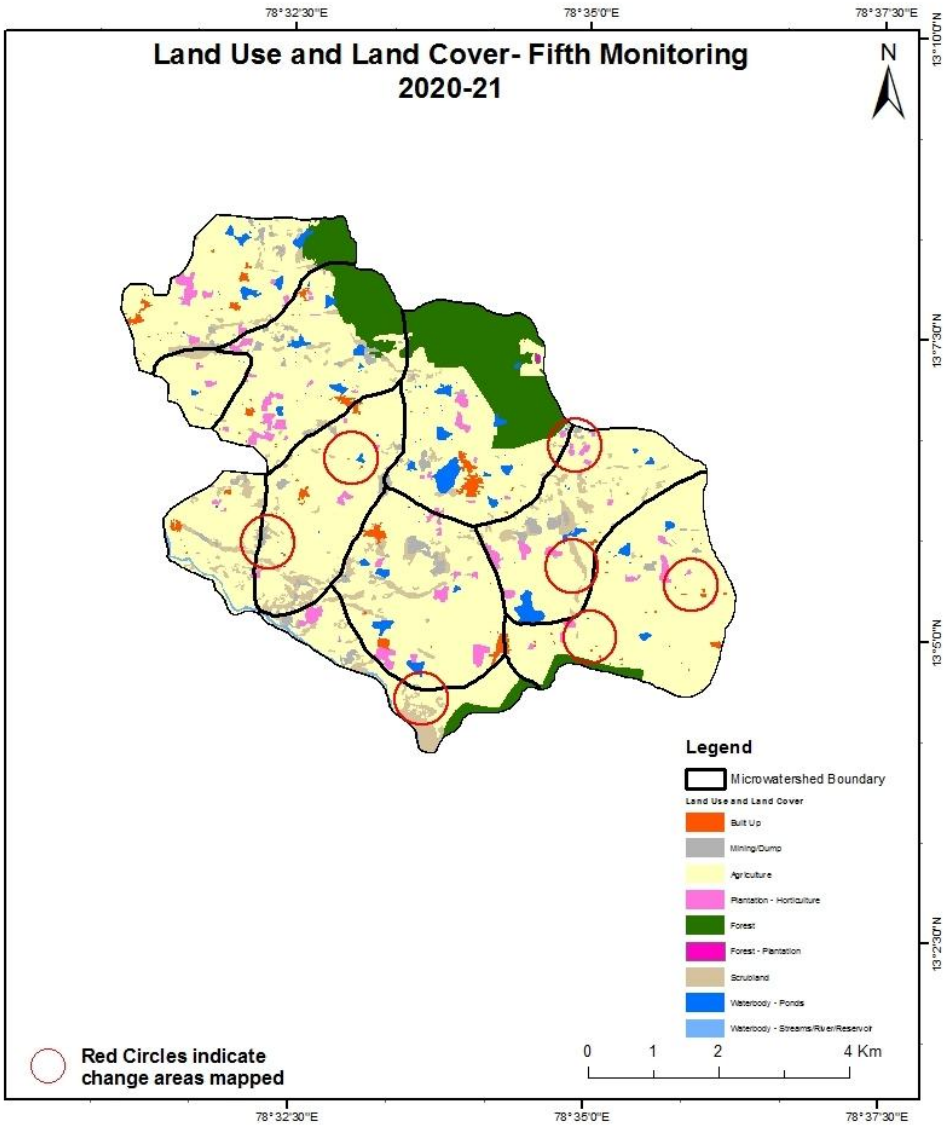




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000





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

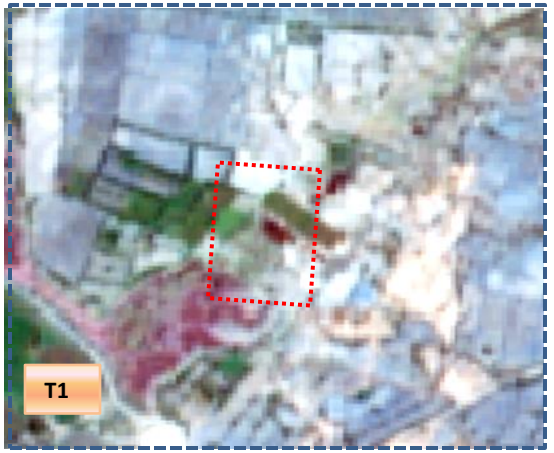
Agriculture to Plantation

T0: 2012-13 (78°35'0.06"E 13°6'28.469"N)

T1: 22 October 2015

Agriculture to Water body

T0: 2012-13(78°32'7.471"E 13°8'22.663"N)



T1: 22 October 2015

Table showing change matrix depicting Land cover transitions during study period-2012-13 to 2016-17

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	44.54									0.03	**44.57**
Mining/dump		16.16	0.30								**16.46**
Agriculture	3.94	0.62	3264.23	2.36						2.10	**3273.26**
Plantation Horticulture	0.03		27.23	74.14							**101.41**
Forest			7.49		538.63						**546.12**
Forest Plantation											
Barren Rocky							2.50				**2.50**
Scrub		9.34	64.30					374.42		0.13	**448.19**
Waterbody-Streams/River									19.49		**19.49**
Waterbody – Ponds			7.14							86.15	**93.29**
Grand Total	**48.52**	**26.13**	**3370.69**	**76.50**	**538.63**		**2.50**	**374.42**	**19.49**	**88.41**	**4545.28**

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

• In T1 106 ha of the agriculture area has increased from mining/dump, plantations, forest, scrubland and water body of T0. The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

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	48.52										**48.52**
Mining/dump		30.75									**30.75**
Agriculture	8.56	5.14	3305.49	50.47				1.61		1.49	**3372.76**
Plantation Horticulture	0.04		22.21	54.54							**76.79**
Forest	0.08	3.61	10.11		519.10	0.86					**533.75**
Forest Plantation											
Barren Rocky		0.62					1.88				**2.50**
Scrub	0.16	17.62	1.29	0.04				355.29			**374.41**
Waterbody-Streams/River											
Waterbody – Ponds										86.31	**86.31**
Grand Total	**57.35**	**57.75**	**3339.10**	**105.06**	**519.10**	**0.86**	**1.88**	**356.89**	**19.49**	**87.80**	**4545.28**

- 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 65 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations, scrubland and water body in T2.
- In T2 33 ha of the agriculture area has increased from plantations , 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-2017-18 to 2018-19

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	57.35										**57.35**
Mining/dump		57.68								0.07	**57.75**
Agriculture	1.43	1.98	3327.96	7.73							**3339.10**
Plantation Horticulture			23.32	81.74							**105.06**
Forest		15.87	0.46		501.85					0.92	**519.10**
Forest Plantation						0.86					**0.86**
Barren Rocky		1.88									**1.88**
Scrub	1.40	22.57	42.38					290.49		0.05	**356.89**
Waterbody-Streams/River									19.49		**19.49**
Waterbody – Ponds										87.80	**87.80**
Grand Total	**60.18**	**99.97**	**3394.13**	**89.47**	**501.85**	**0.86**		**290.49**	**19.49**	**88.84**	**4545.28**

- 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 11 ha of the agriculture area has decreased and it is converted into Built-up and plantations in T3.
- In T3 66 ha of the agriculture area has increased from plantations, 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-2018-19 to 2019-20

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	60.18										**60.18**
Mining/dump		99.97									**99.97**
Agriculture		1.00	3345.98	46.71						0.44	**3394.13**
Plantation Horticulture			11.95	77.52							**89.47**
Forest			25.71		475.69					0.45	**501.85**
Forest Plantation						0.86					**0.86**
Barren Rocky											
Scrub		3.56	30.01					256.88		0.04	**290.49**
Waterbody-Streams/River									19.49		**19.49**
Waterbody – Ponds			2.83							86.02	**88.84**
Grand Total	**60.18**	**104.53**	**3416.48**	**124.23**	**475.69**	**0.86**		**256.88**	**19.49**	**86.95**	**4545.28**

• 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 48 ha of the agriculture area has decreased and it is converted into mining/dump, plantations and water body in T4.

•In T4 70 ha of the agriculture area has increased from plantations, forest, 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-2019-20 to 2020-21

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	60.18										**60.18**
Mining/dump		83.15									**83.15**
Agriculture	0.39	0.52	3409.91	1.93						1.52	**3414.27**
Plantation Horticulture			1.59	119.74							**121.33**
Forest					496.81					0.52	**497.33**
Forest Plantation						0.86					**0.86**
Barren Rocky											
Scrub	0.33	5.92	4.82					245.82			**256.89**
Waterbody-Streams/River									19.49		**19.49**
Waterbody – Ponds										91.79	**91.79**
Grand Total	**60.90**	**89.59**	**3416.32**	**121.67**	**496.81**	**0.86**		**245.82**	**19.49**	**93.83**	**4545.28**

• 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 04 ha of the agriculture area has decreased and it is converted into mining/dump, plantations and water body in T5.

•In T5 06 ha of the agriculture area has increased from plantations, forest, 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 increase of 0.54 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2012-13 (T0) & 2019-20 (T4) years.
4. There is an increase of 97, 55, 22 & 2.05 Hectares from T0 to T1, T2-T3, T3-T4 & T4-T5 respectively, there is a decrease of 33.6 Hectares from T1 to T2 and overall increase of 143 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2019-20 (T4) years.
5. **About 20 ha of the agriculture plantation area has been increased** in during the monitoring period of 2012-13 (T0) to 2019-20 (T4) years.
6. There is a decrease of 202 Hectares in Scrubland area as compared between 2012-13 (T0) & 2019-20 (T4) years.
7. Farm ponds (1) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.