MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -34/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-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

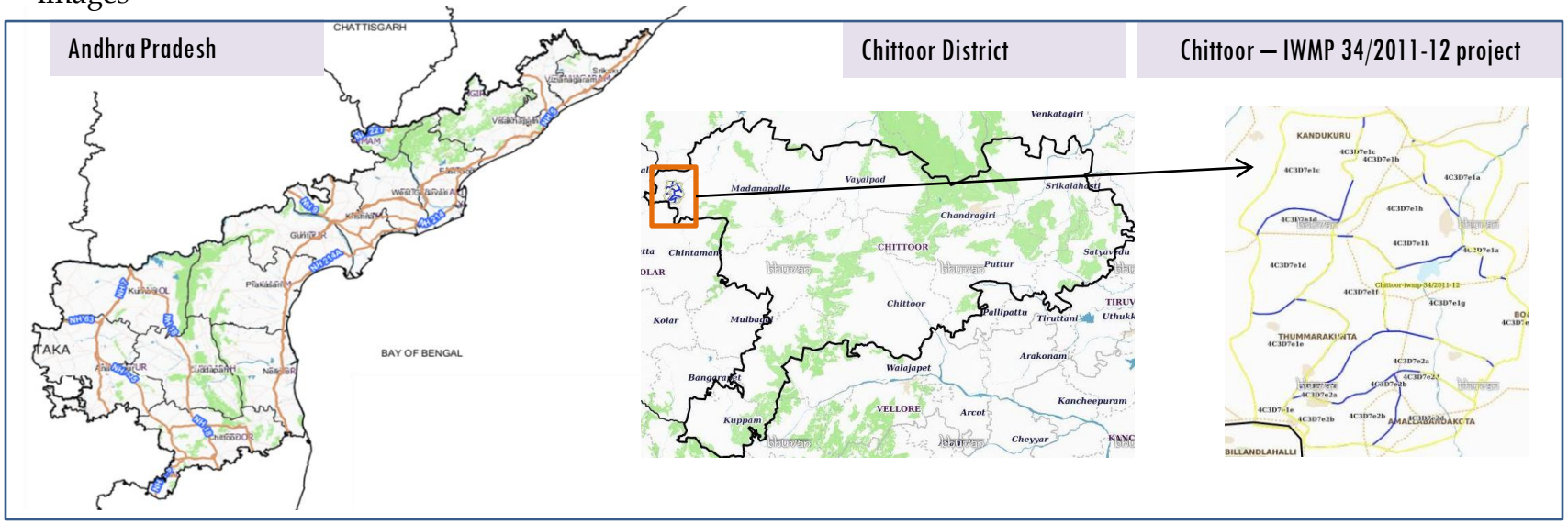
CONTENTS

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-34/2011-12, Chittoor District of Andhra Pradesh. The total geographical area of the project is **6995.24** ha. It comprises of 12 micro watersheds.
- In the project area 507 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 2.11 ha increase in the area.
- Major percentage i.e. 67.3 % is covered by the agriculture, 18 % is covered by scrubland and 5.6 % is covered by water body and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-34/2011-12
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Peddathippasamudram Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is **6995.24** ha. It comprises of 12 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2011-12 (T0) period (***Batch -1***) projects taking 2019-20 (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.

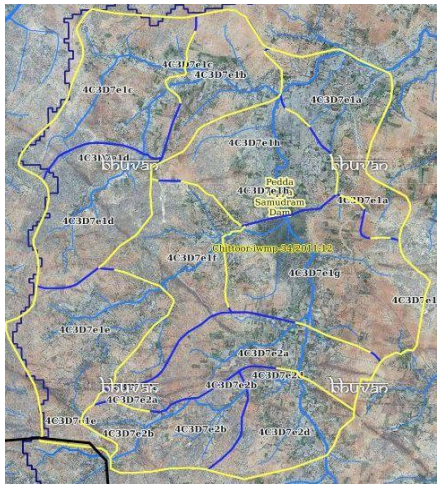
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2013-14	2019-20
LISS IV	2011-12		
SCENE 1			9-Jan-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			9-Jan-20
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	507
4	Detailed Project Report		

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



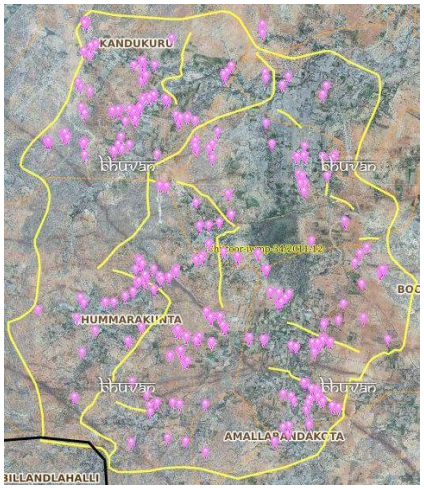
Legend

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	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	14	14
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	4	4
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams/Rock fill dam	98	91
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	5	5
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	65	61
18	Others	341	332
	TOTAL	**527**	**507**

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 (2011-12) and T5 is 2019-20 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 Color Composite

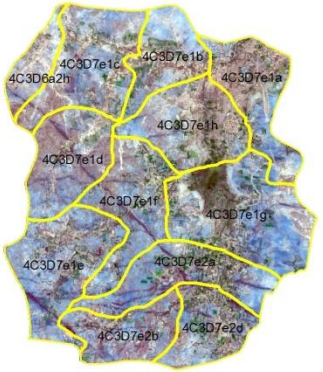
Natural Color Composite- 2011-12

Source:Fusion data,NRSC

Natural Color Composite-24th December 2015

Source:NCC,NRSC

Natural Color Composite- 1st April 2017



Source:NCC,NRSC

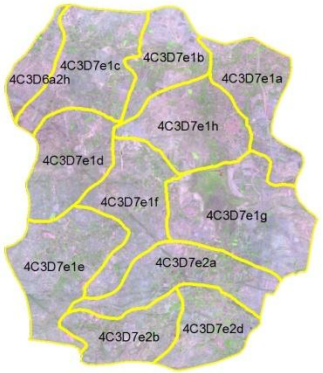
Natural Color Composite-9 th December 2017

Source:NCC,NRSC

Natural Color Composite- 4th January 2019

Sentinel-2

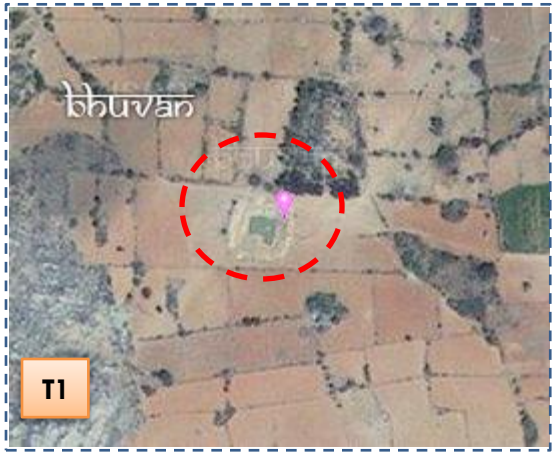
Natural Color Composite- 9th January 2020



Sentinel-2

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-34/2011-12

T0:2009-10

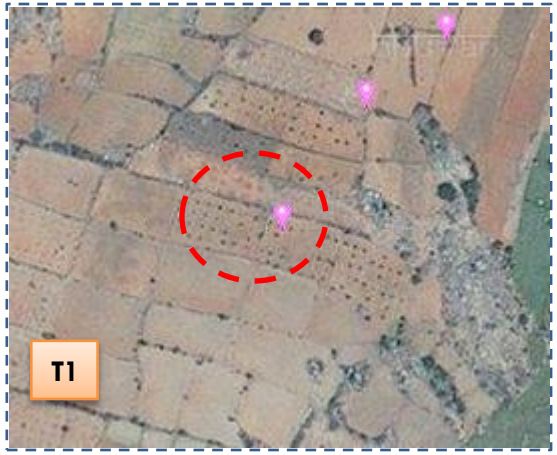


T1: 24 March 2017

Drishti SI no. 1911049 MWS :4C2B2d1c

Farm pond

T0:2009-10



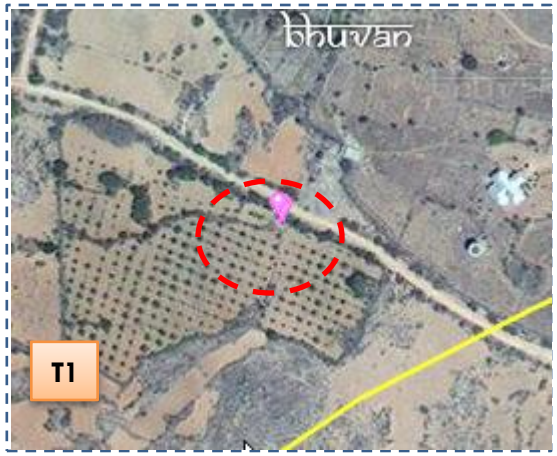
T1: 24 March 2017

Drishti SI no. 1789837 MWS :4C3D7e1c

Horticulture

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-34/2011-12

T0: 2009-10



T1: 24 March 2017

Drishti Sl no. 7015673 MWS :4C3D7e1b

Horticulture

T0: 2009-10

T1: 24 March 2017

Drishti Sl no. 7020451 MWS : 4C3D7e1g

Horticulture

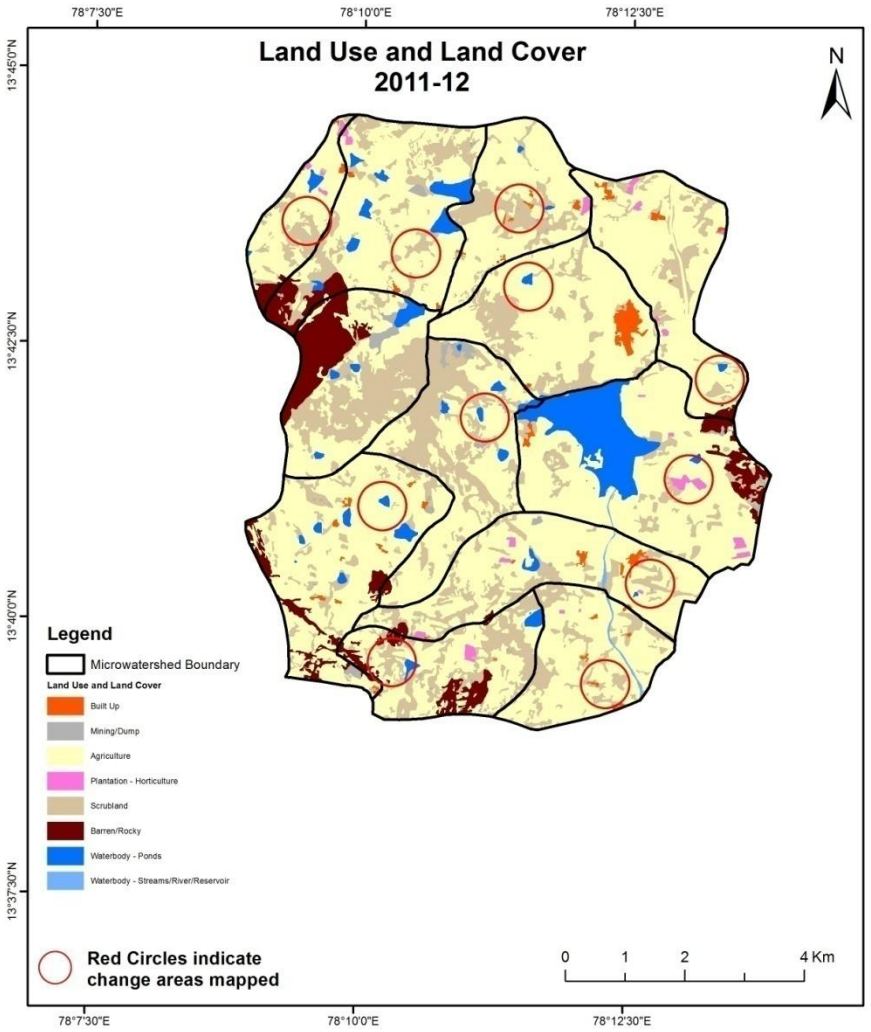
MONITORING IN THE PROJECT AREA

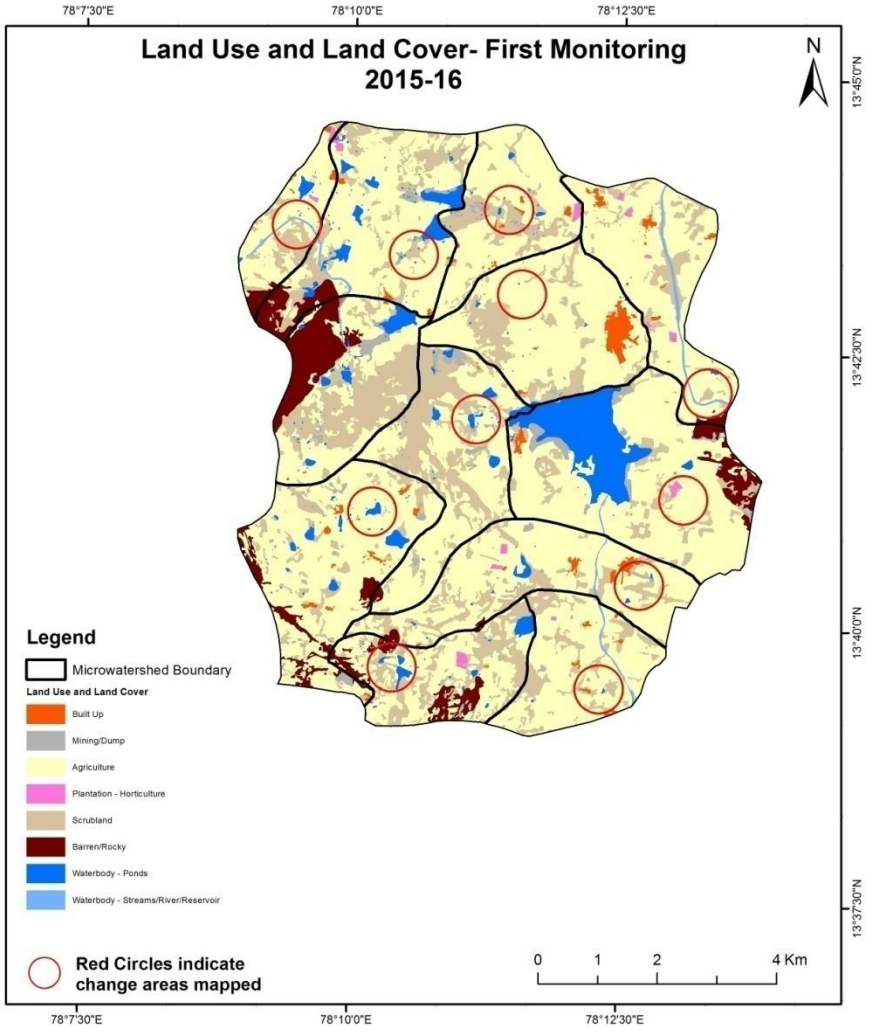
Land use and Land cover Changes in the Project

- 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 (2011-12) and row represents the T5 (2019-20)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

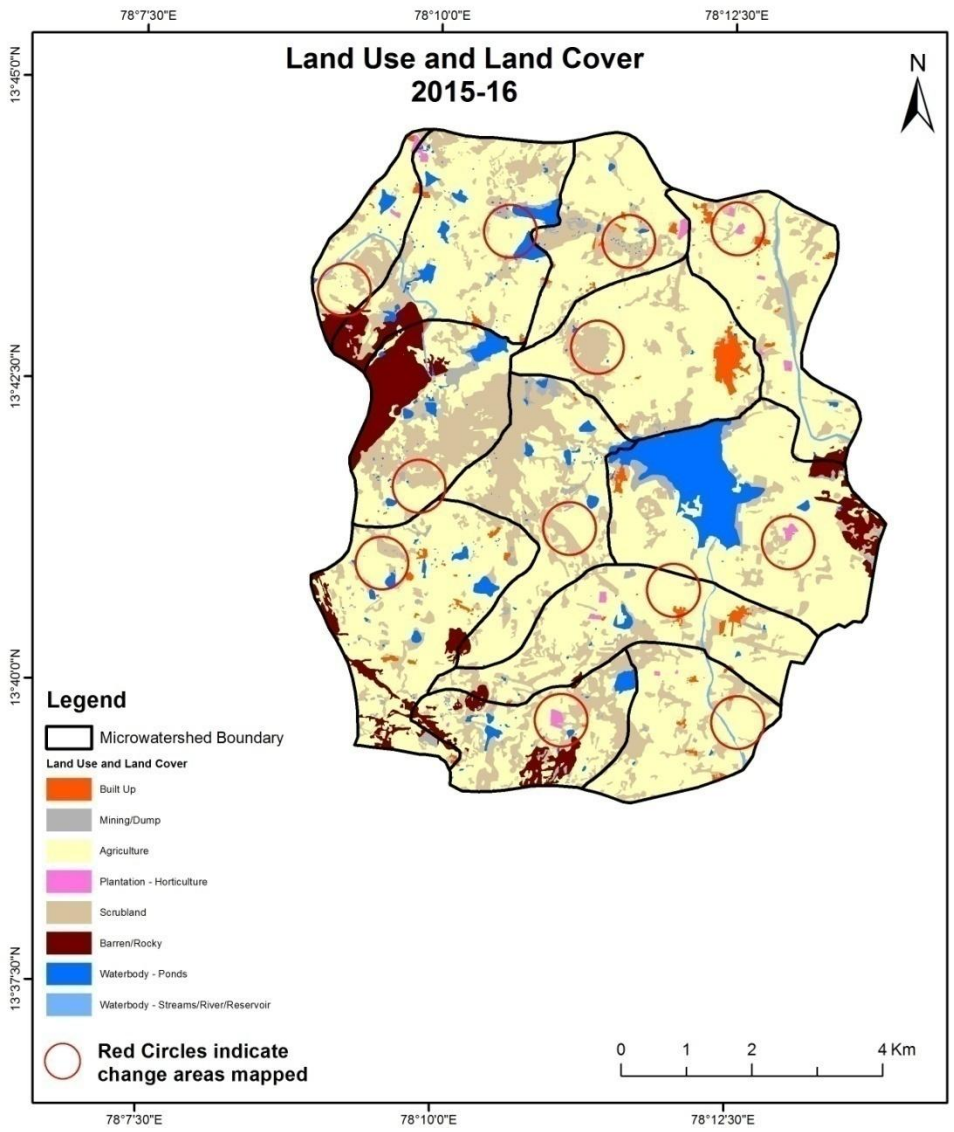
Scale: 1:10000

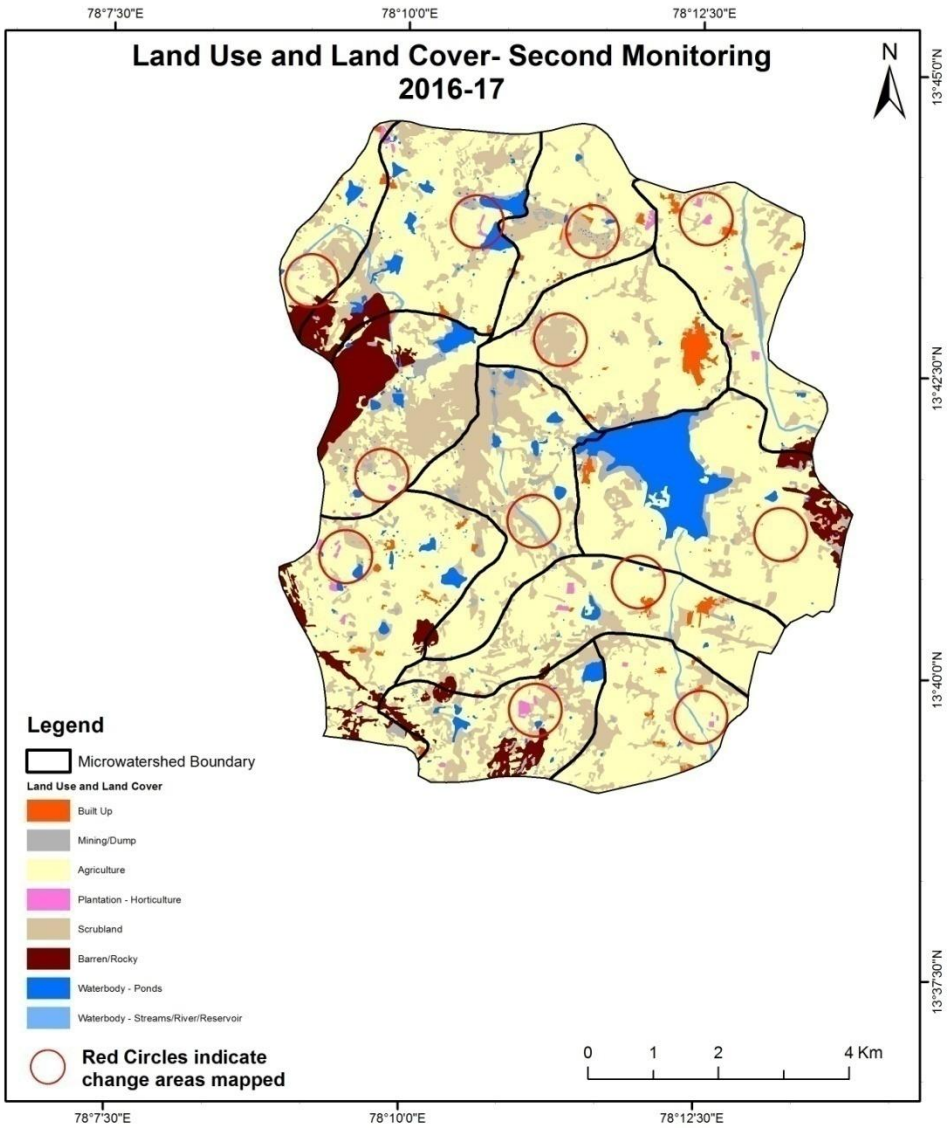




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

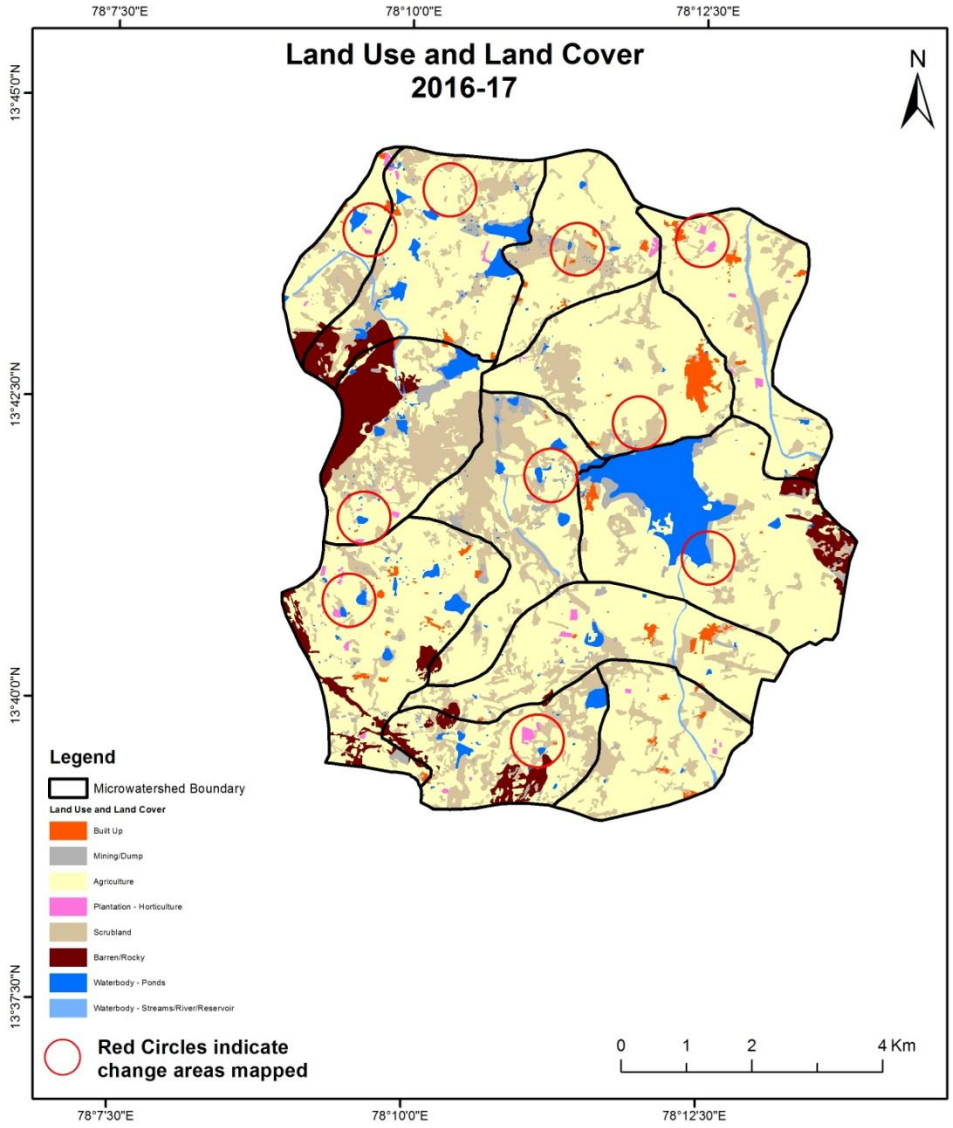
Scale: 1:10000

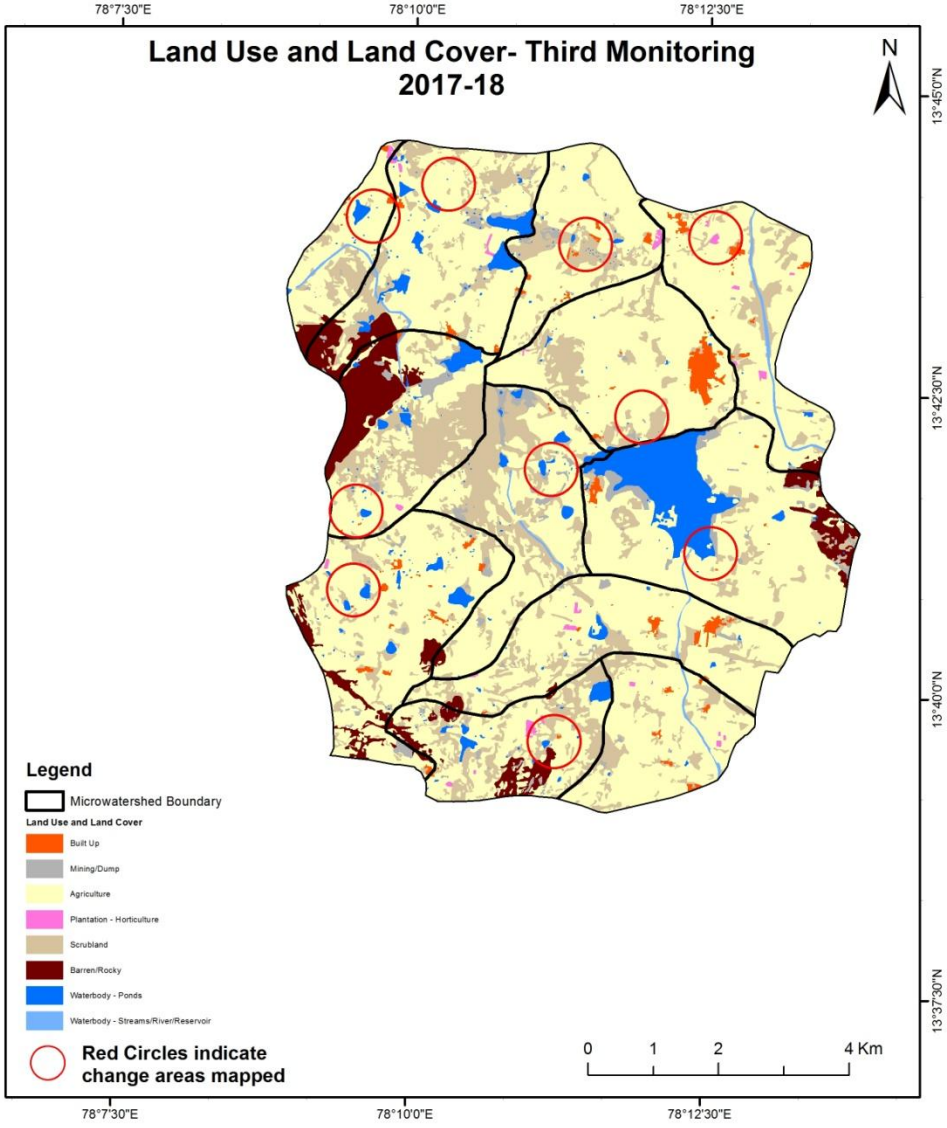




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

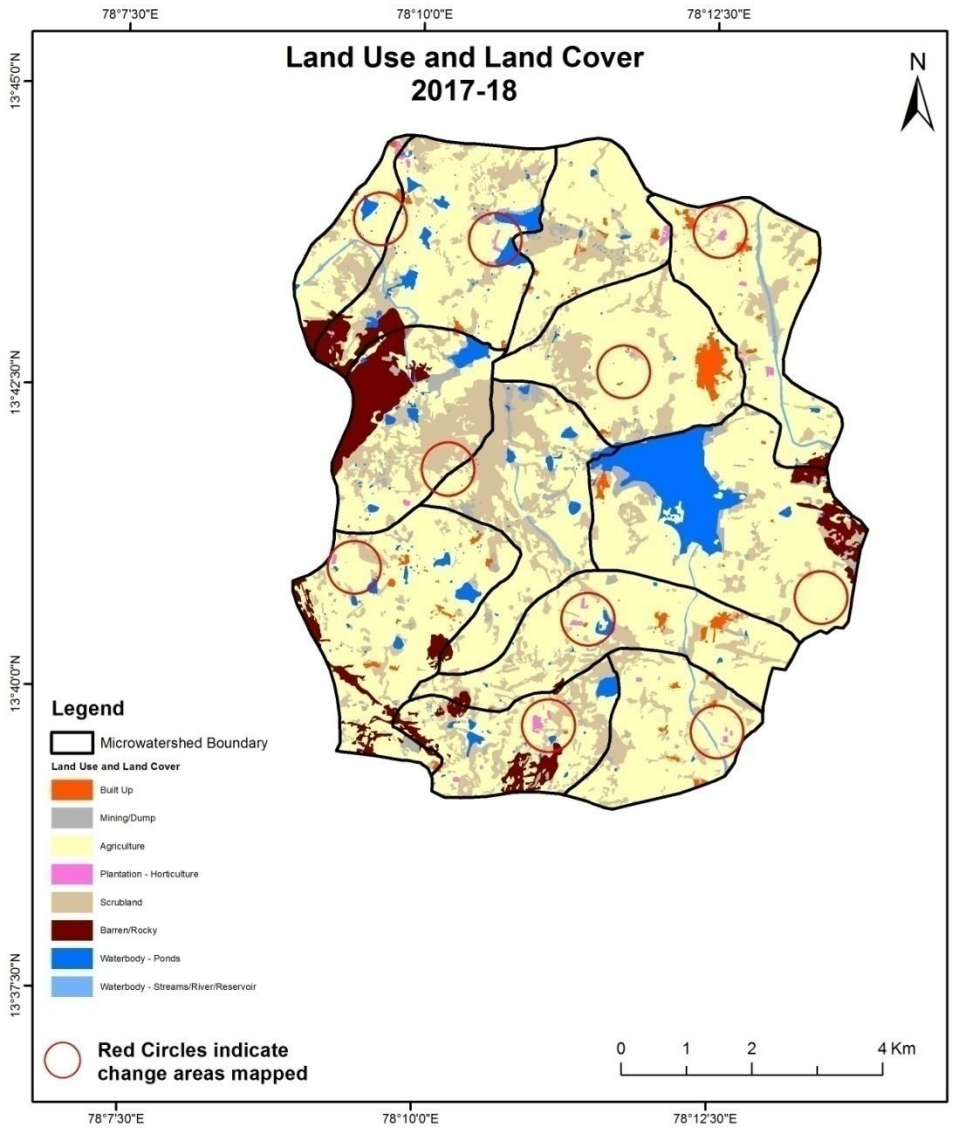
Scale: 1:10000

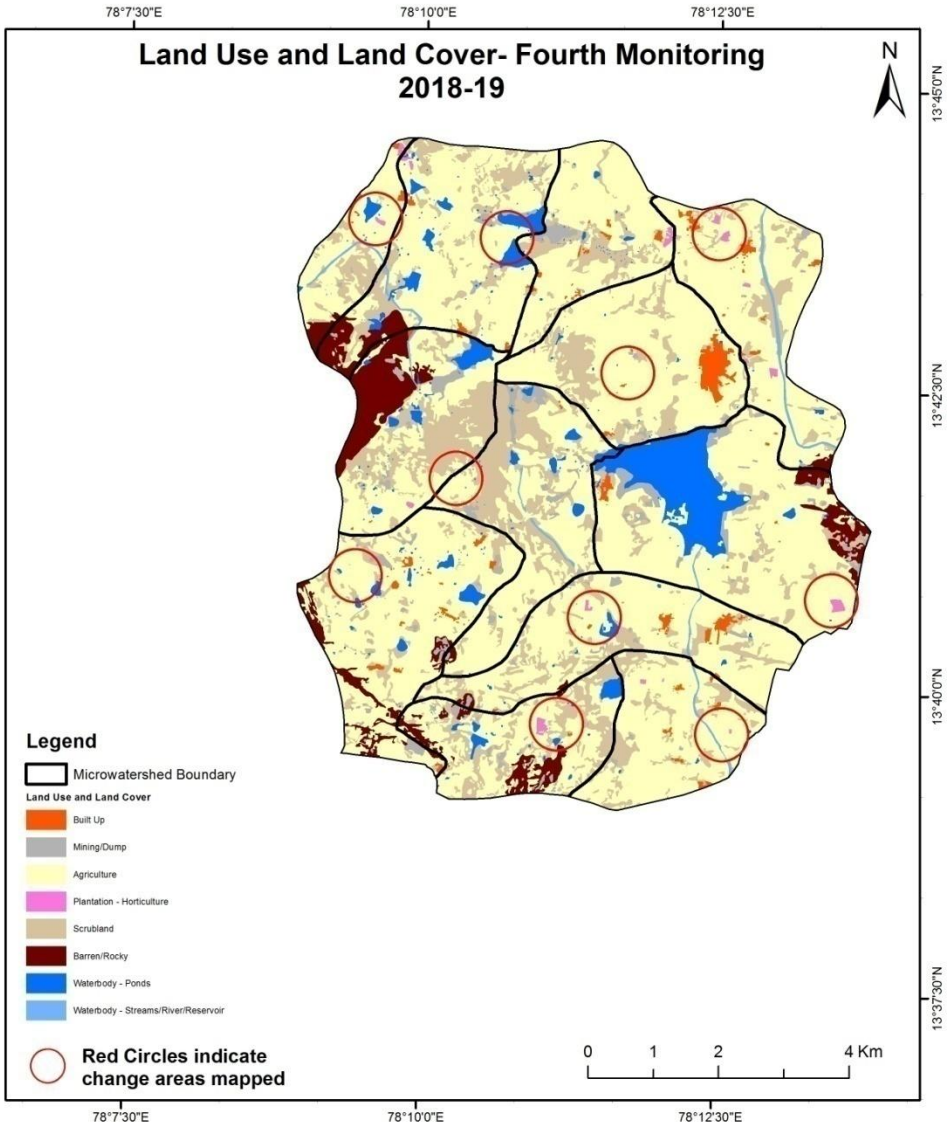




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

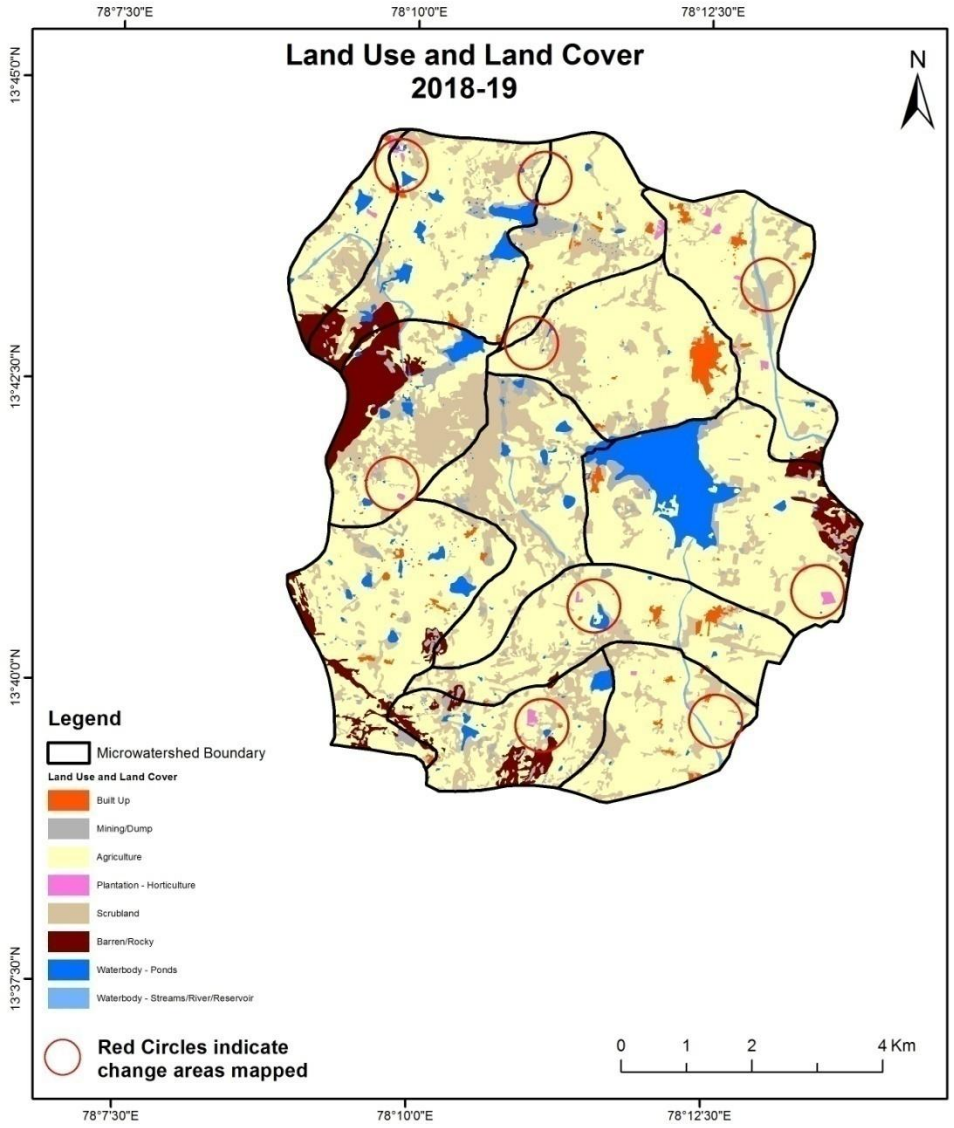
Scale: 1:10000

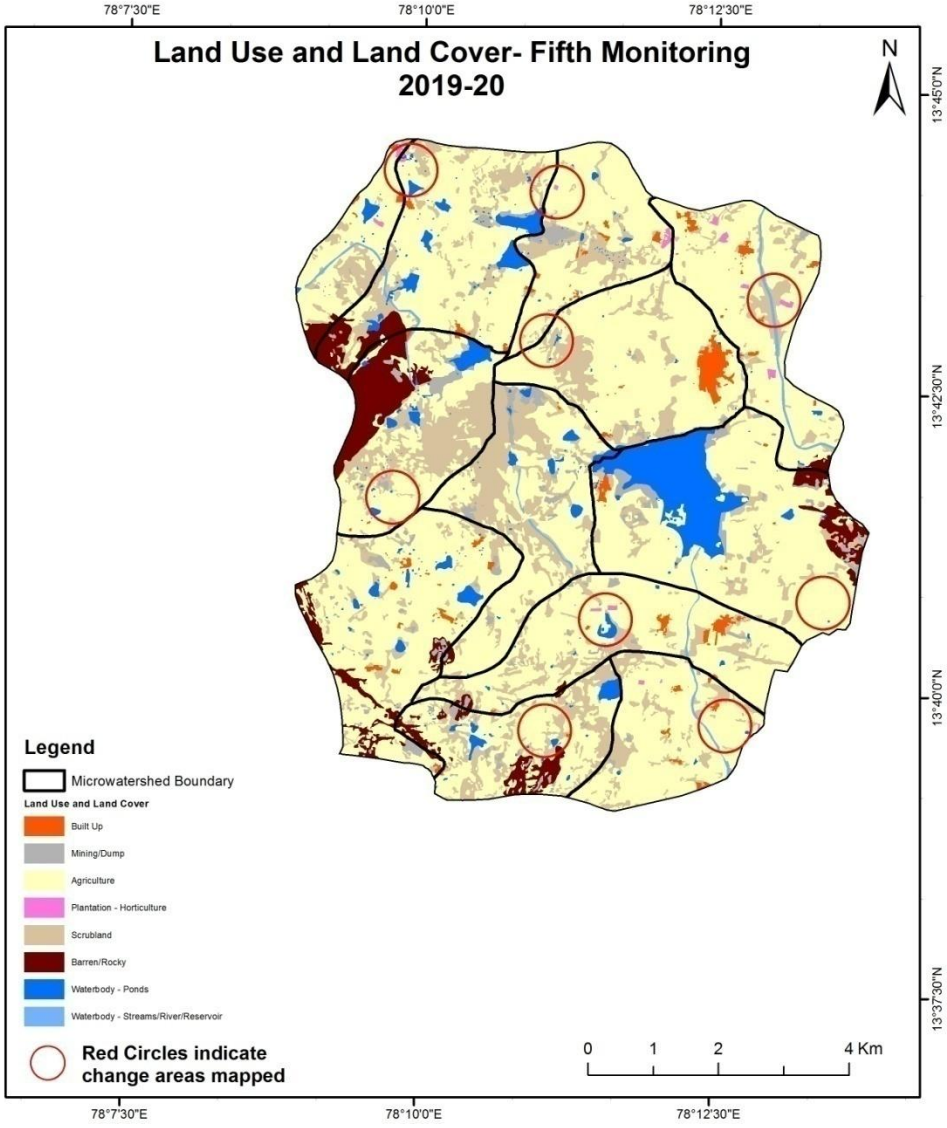




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000





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

Agriculture to Plantation

T0: 2009-10(78°12'58.195"E 13°42'40.282"N)

T1: 24 December 2015

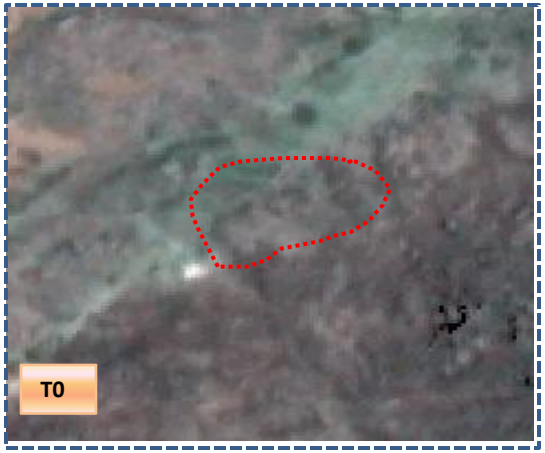
Agriculture to water body

T0: 2009-10 (78°12'8.796"E 13°42'47.087"N)

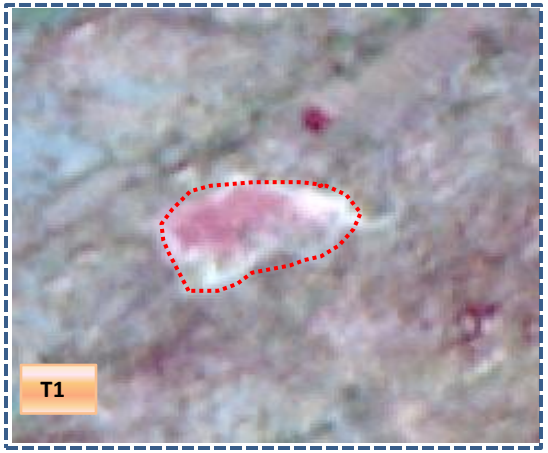
T1: 24 December 2015

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

Scrub to Water body

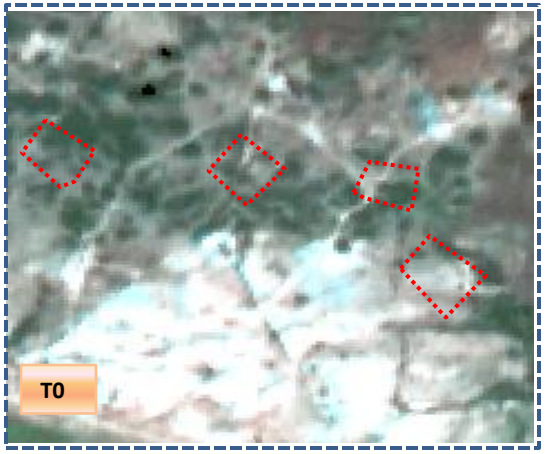


T0: 2009-10(78°9'29.873"E 13°42'43.957"N)



T1: 16 January 2016

Scrub to Agriculture



T0: 2009-10(78°10'29.273"E 13°43'58.07"N)

T1: 24 December 2015

Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

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	74.45										**74.45**
Mining/dump		58.65								3.21	**61.86**
Agriculture	17.42	38.83	4522.71	2.77					29.20	25.05	**4635.98**
Plantation Horticulture	0.28		18.58	24.61						0.37	**43.84**
Forest											
Forest Plantation											
Barren Rocky		2.18					344.64				**346.81**
Scrub	3.98	17.48	28.31					1441.80		7.30	**1498.87**
Waterbody-Streams/River			1.32						11.04		**12.36**
Waterbody – Ponds		3.62	9.31							308.14	**321.07**
Grand Total	**96.12**	**120.76**	**4580.23**	**27.38**			**344.64**	**1441.80**	**40.24**	**344.07**	**6995.24**

- 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 84 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 46 ha of the agriculture area has increased from plantations, scrubland and water body 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-2015-16 to 2016-17

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	96.12										**96.12**
Mining/dump		120.69								0.07	**120.76**
Agriculture	1.06	0.88	4561.50	13.16					1.69	1.93	**4580.23**
Plantation Horticulture			7.61	19.77							**27.38**
Forest											
Forest Plantation											
Barren Rocky		3.64					341.00				**344.64**
Scrub	1.19	17.46	79.65					1339.79	3.21	0.50	**1441.80**
Waterbody-Streams/River											
Waterbody – Ponds			0.65							343.42	**344.07**
Grand Total	**98.36**	**142.67**	**4649.42**	**32.94**			**341.00**	**1339.79**	**45.15**	**345.92**	**6995.24**

- 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 17 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 87 ha of the agriculture area has increased from plantations, 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-2016-17 to 2017-18

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	98.36										**98.36**
Mining/dump		142.59								0.08	**142.67**
Agriculture	0.09	1.20	4647.02	0.84						0.25	**4649.42**
Plantation Horticulture			8.58	24.35							**32.94**
Forest											
Forest Plantation											
Barren Rocky		2.25					338.75				**341.00**
Scrub	1.02	2.86	31.14					1304.77			**1339.79**
Waterbody-Streams/River									45.15		**45.15**
Waterbody – Ponds			0.98							344.94	**345.92**
Grand Total	**99.47**	**148.90**	**4687.73**	**25.20**			**338.75**	**1304.77**	**45.15**	**345.27**	**6995.24**

- 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 2.3 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.
- In T3 40.7 ha of the agriculture area has increased from plantations, 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-2017-18 to 2018-19

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	99.47										**99.47**
Mining/dump		148.90									**148.90**
Agriculture	0.82	0.81	4680.69	5.10						0.29	**4687.73**
Plantation Horticulture			8.11	17.08							**25.20**
Forest											
Forest Plantation											
Barren Rocky		11.33					327.41				**338.75**
Scrub	0.12	22.54	10.90					1271.22			**1304.77**
Waterbody-Streams/River									45.15		**45.15**
Waterbody – Ponds										345.27	**345.27**
Grand Total	**100.41**	**183.59**	**4699.71**	**22.19**			**327.41**	**1271.22**	**45.15**	**345.56**	**6995.24**

- 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 07 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 19 ha of the agriculture area has increased from plantations 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-2018-19 to 2019-20

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	100.41										**100.41**
Mining/dump		182.87								0.72	**183.59**
Agriculture	1.67	1.03	4692.42	4.25						0.35	**4699.71**
Plantation Horticulture			9.94	12.25							**22.19**
Forest											
Forest Plantation											
Barren Rocky							327.41				**327.41**
Scrub	0.08		10.81					1260.11		0.21	**1271.22**
Waterbody-Streams/River									45.15		**45.15**
Waterbody – Ponds										345.56	**345.56**
Grand Total	**102.17**	**183.90**	**4713.17**	**16.49**			**327.41**	**1260.11**	**45.15**	**346.84**	**6995.24**

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

•In T5 20.7 ha of the agriculture area has increased from plantations 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 58 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
4. There is an increase of 69, 38, 11 & 13 Hectares From T1 to T2, T2- T3, T3-T4 & T4-T5 respectively and overall increase of 77 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is a decrease of 238 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.