MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -37/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-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

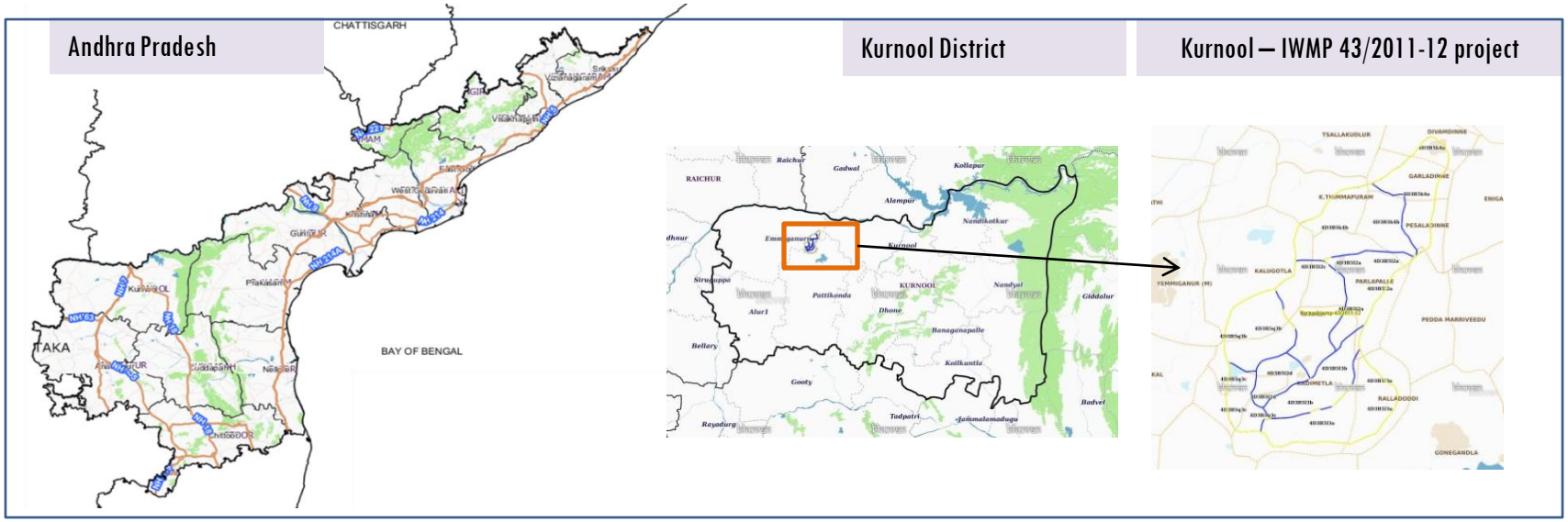
CONTENTS

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-43/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is **5,957** ha. It comprises of 9 micro watersheds.
- In the project area 250 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Major percentage i.e. 85% is covered by the agriculture, 7.5 % is covered by scrub land, 3 % is covered by water body and remaining by other land use classes.

PROJECT : KURNOOL – IWMP-43/2011-12
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Yemmiganur Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **5,957** ha. It comprises of 9 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 is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).
- The average annual rainfall of the district is 665.5mm, which ranges from nil rainfall in January and December to 139.6 mm in September. August and September are the wettest months. The mean seasonal rainfall distribution is 459.1mm in southwest monsoon (June September), 133.7mm in northeast monsoon (Oct-Dec), 1.9 mm rainfall in Winter (Jan Feb) and 70.8 mm in summer (March–May).

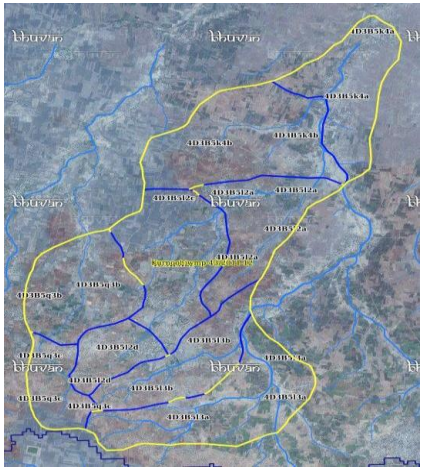
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2011-12	2019-20
LISS IV	2011-12		
SCENE 1			19-Feb-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			19-Feb-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	250
4	Detailed Project Report		

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



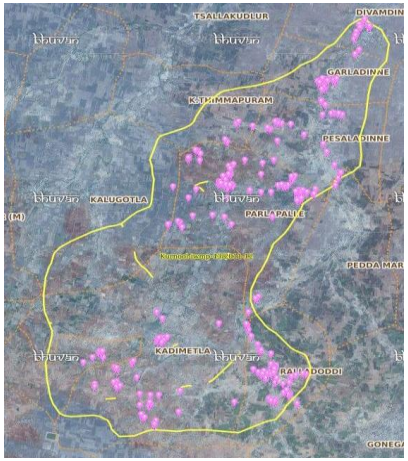
Legend

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	22	22
2	Agriculture/Horticulture	38	38
3	Blockplanting	0	0
4	Bund planting	0	0
5	Drainage Treatment	0	0
6	Farm ponds/Dug out pit	60	50
7	Check dams (Civil work)	3	3
8	Checks & plugins	28	28
9	Om (Other measurement)	0	0
10	LM (Livelihood Measures)	0	0
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	0	0
14	Livelihood Activities	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	129	109
	TOTAL	**280**	**250**

MONITORING IN THE PROJECT AREA

Site Wise Changes in the Project

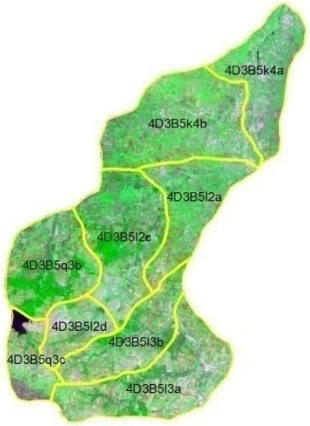
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2011-12) and T5 is 2019-20 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match 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-14 th October 2015

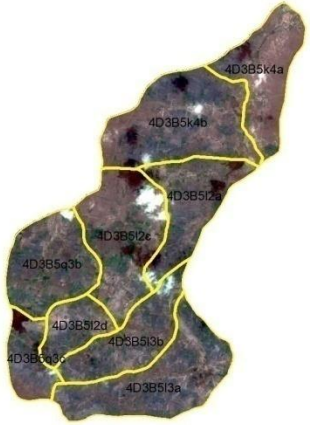


Source:LISS-IV,NRSC

Natural Color Composite- 09thNovember 2016

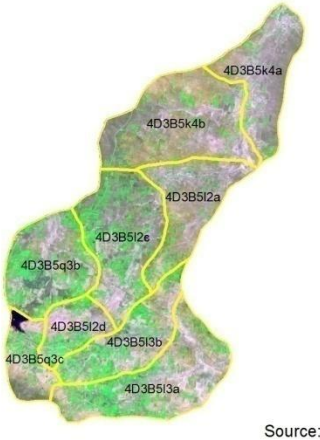
Source:NCC,NRSC

Natural Color Composite-15th December 2017



Source:NCC,NRSC

Natural Color Composite-04th January 2019

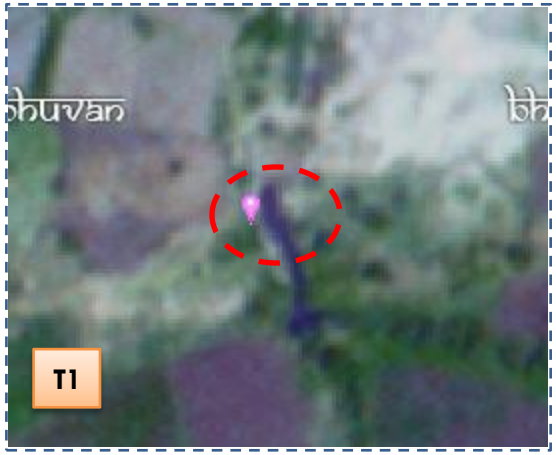


Source:Sentinel-2

Natural Color Composite- 19th February 2020

Source:LISS-IV,NRSC

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-43/2011-12



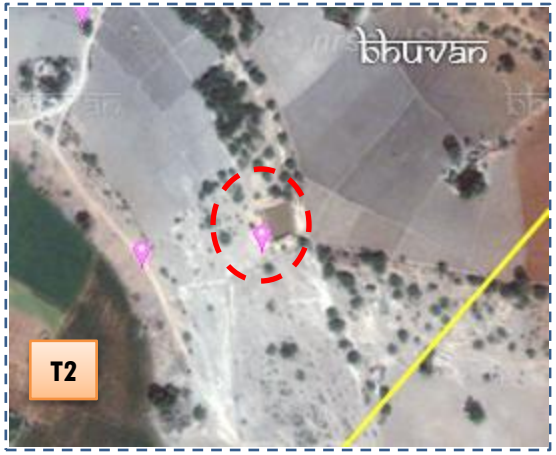
T1: 09 January 2015

T2: 15 December 2017

Drishti SI no. 7007198 MWS :4D3B5I3a

Check dam

T1: 09 January 2015



T2: 15 December 2017

Drishti SI no. 2430879 MWS :4D3B5I3a

Farm pond

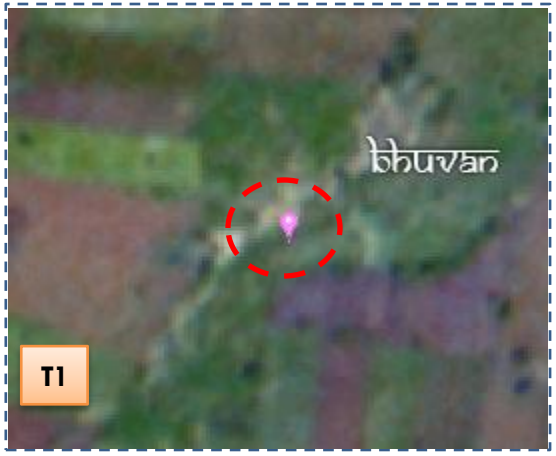
Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-43/2011-12

T1: 09 January 2015

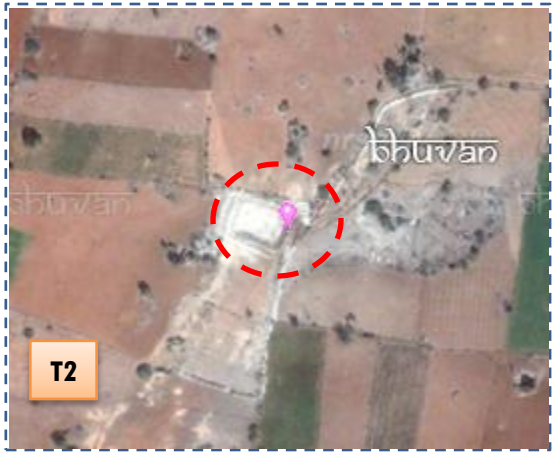
T2: 15 December 2017

Drishti Sl no. 2451551 MWS : 4D3B5k4b

Farm pond



T1: 09 January 2015

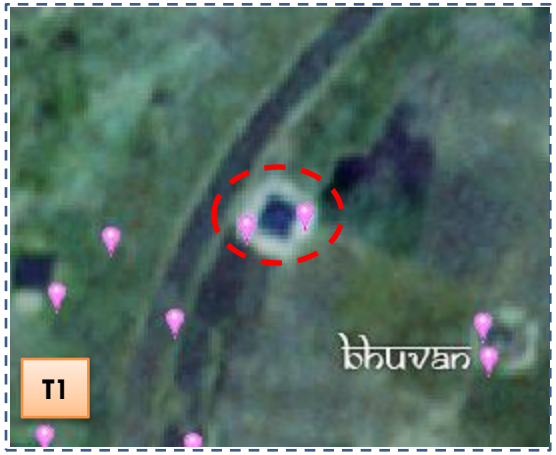


T2: 15 December 2017

Drishti Sl no. 7007145 MWS : 4D3B5l3a

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-43/2011-12



T0:2010-11

T1: 14 October 2015

Drishti Sl no. 136760 MWS :4D3B5l2a

Dug out

T0:2010-11

T1: 14 October 2015

Drishti Sl no. 136742 MWS :4D3B5l2a

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-43/2011-12

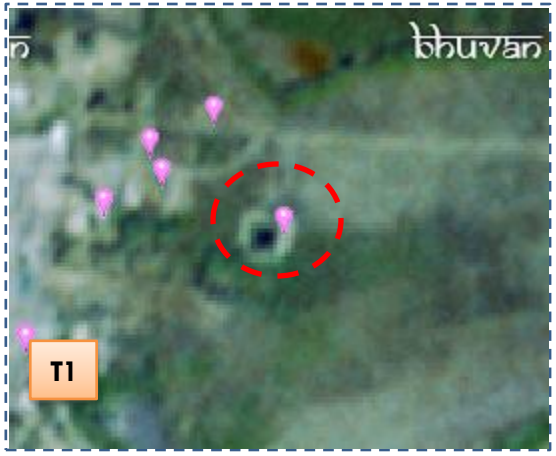
T0: 2010-11

T1: 14 October 2015

Drishti Sl no. 141209 MWS : 4D3B5q3b

Farm pond

T0: 2010-11



T1: 14 October 2015

Drishti Sl no. 2451668 MWS : 4D3B5l2a

Farm pond

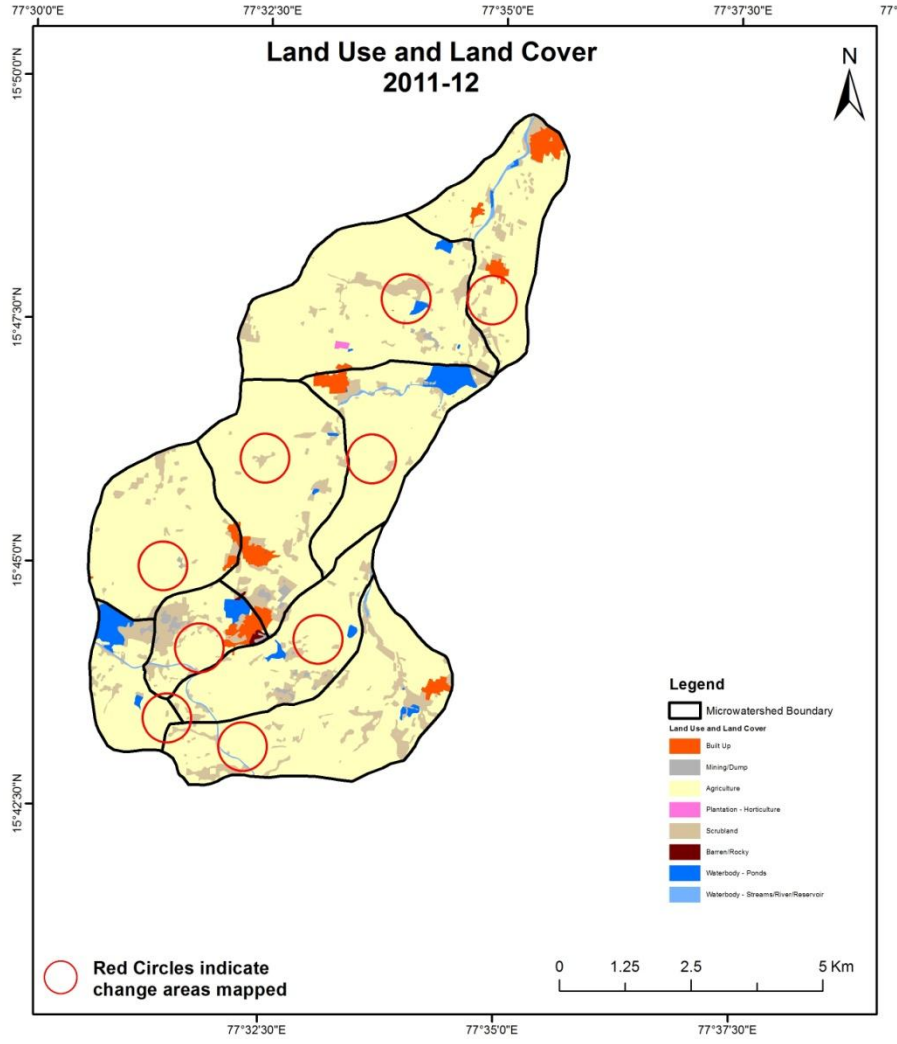
MONITORING IN THE PROJECT AREA

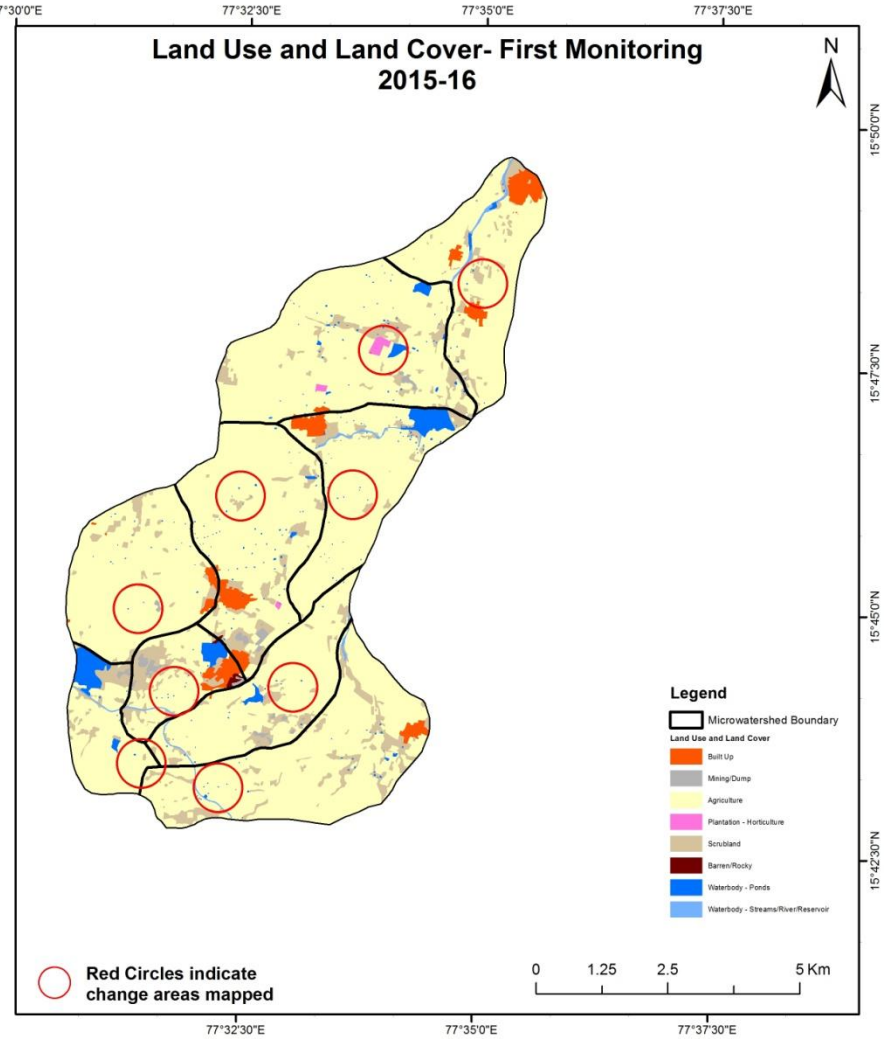
Land use and Land cover Changes in the Project

- 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 (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)

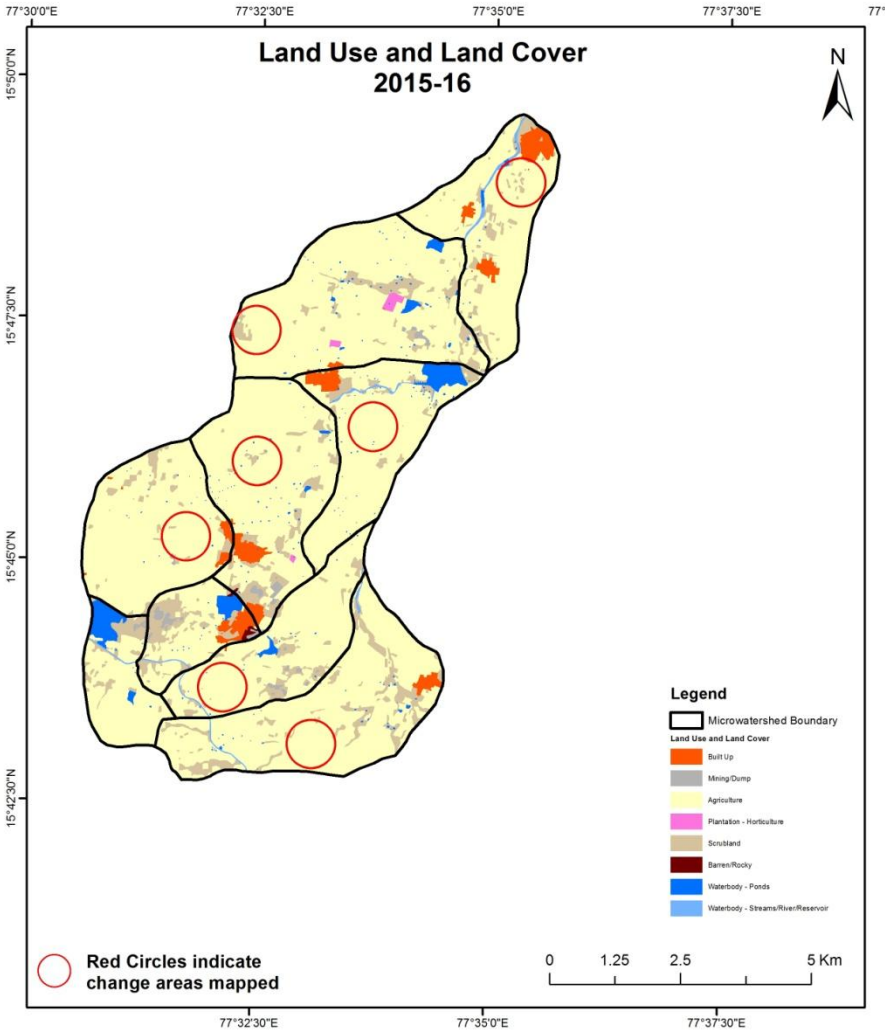
Scale: 1:10000

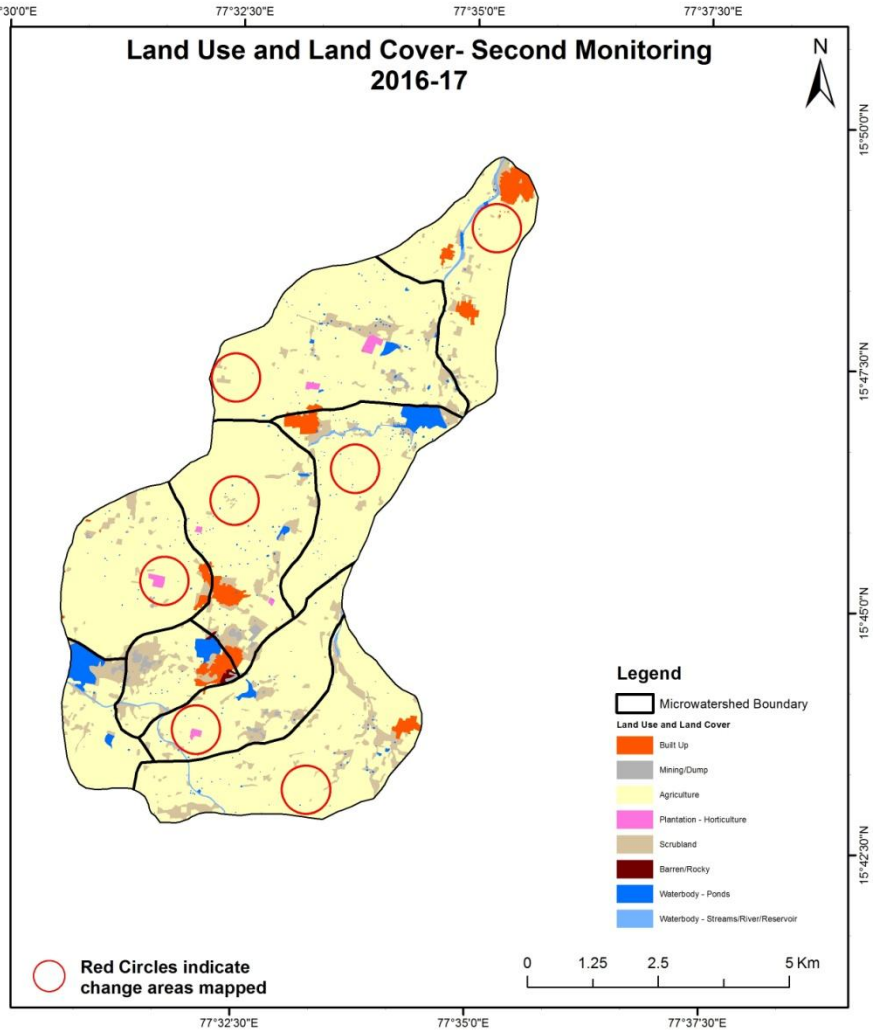




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

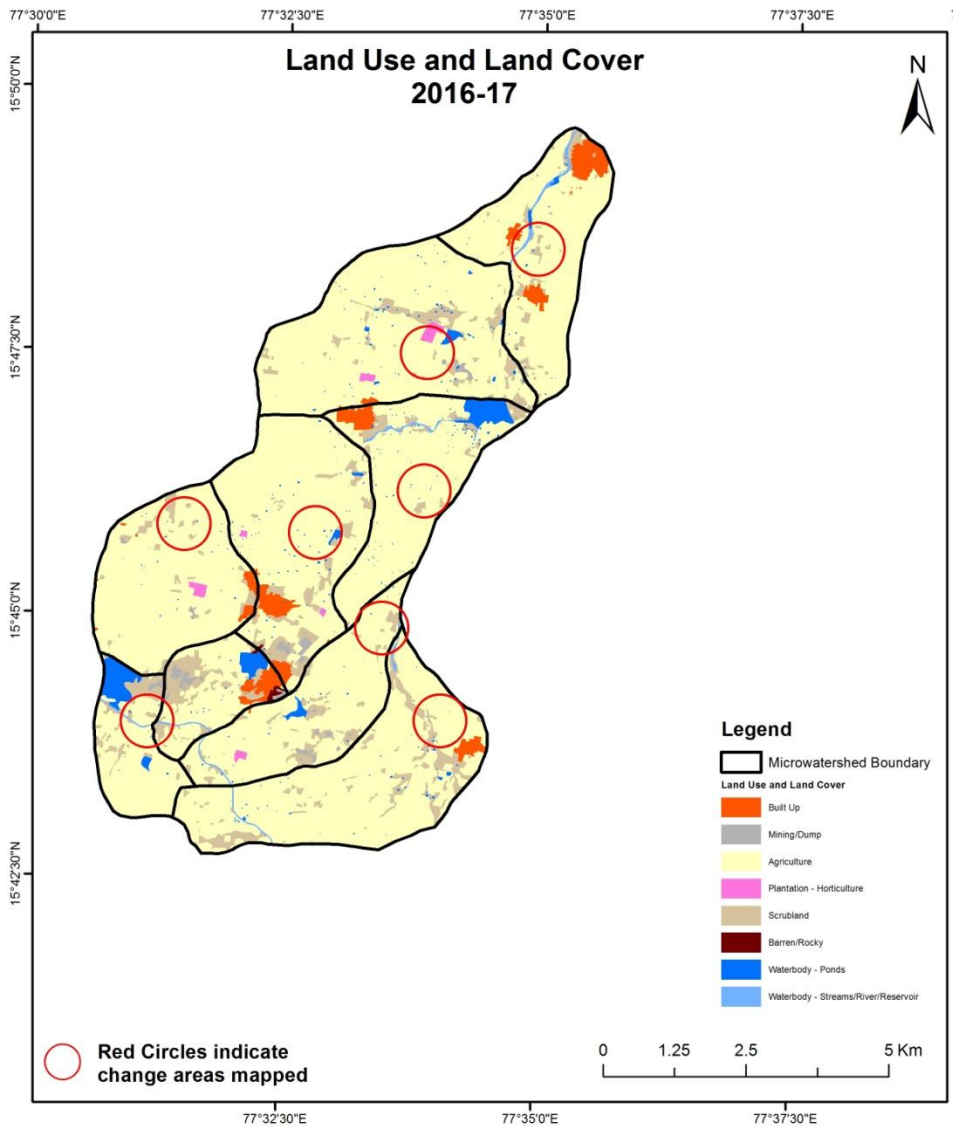
Scale: 1:10000

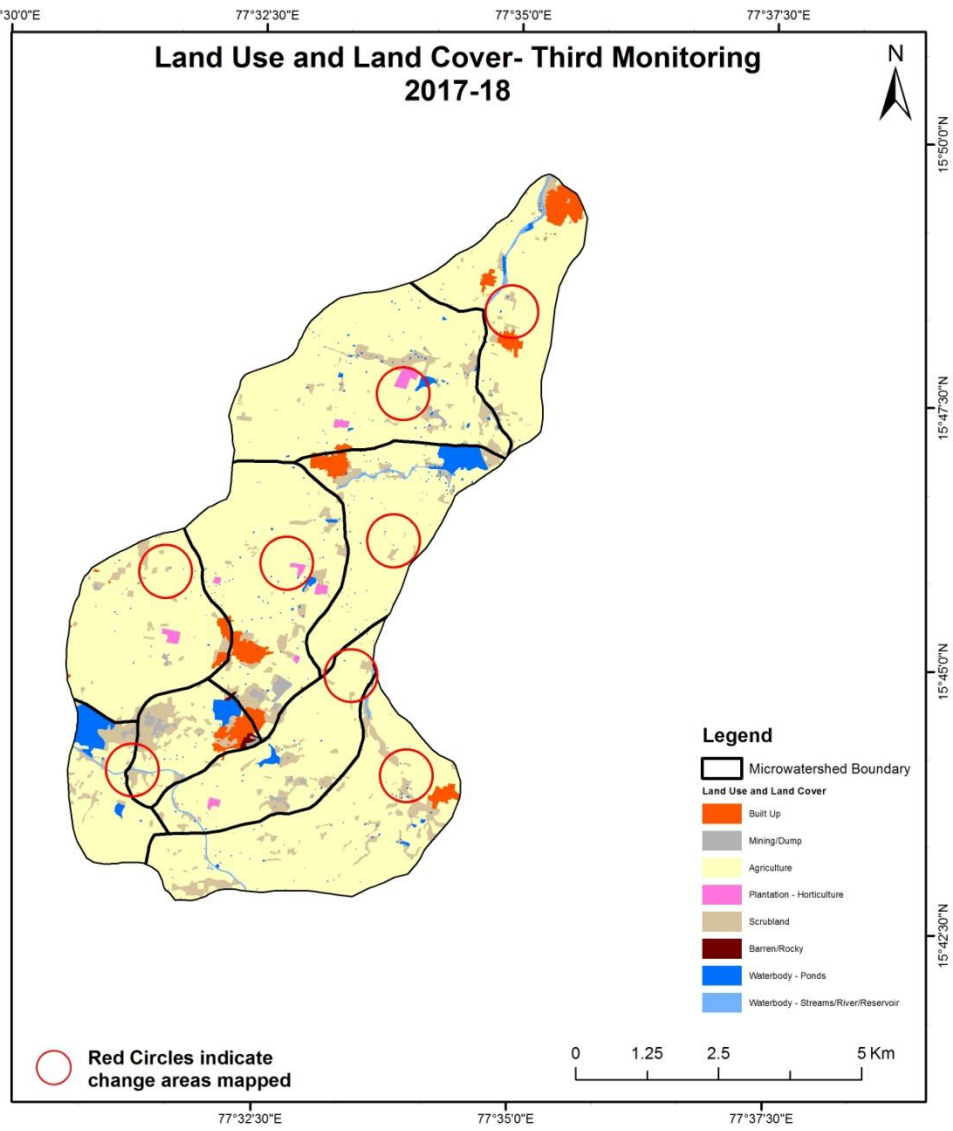




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

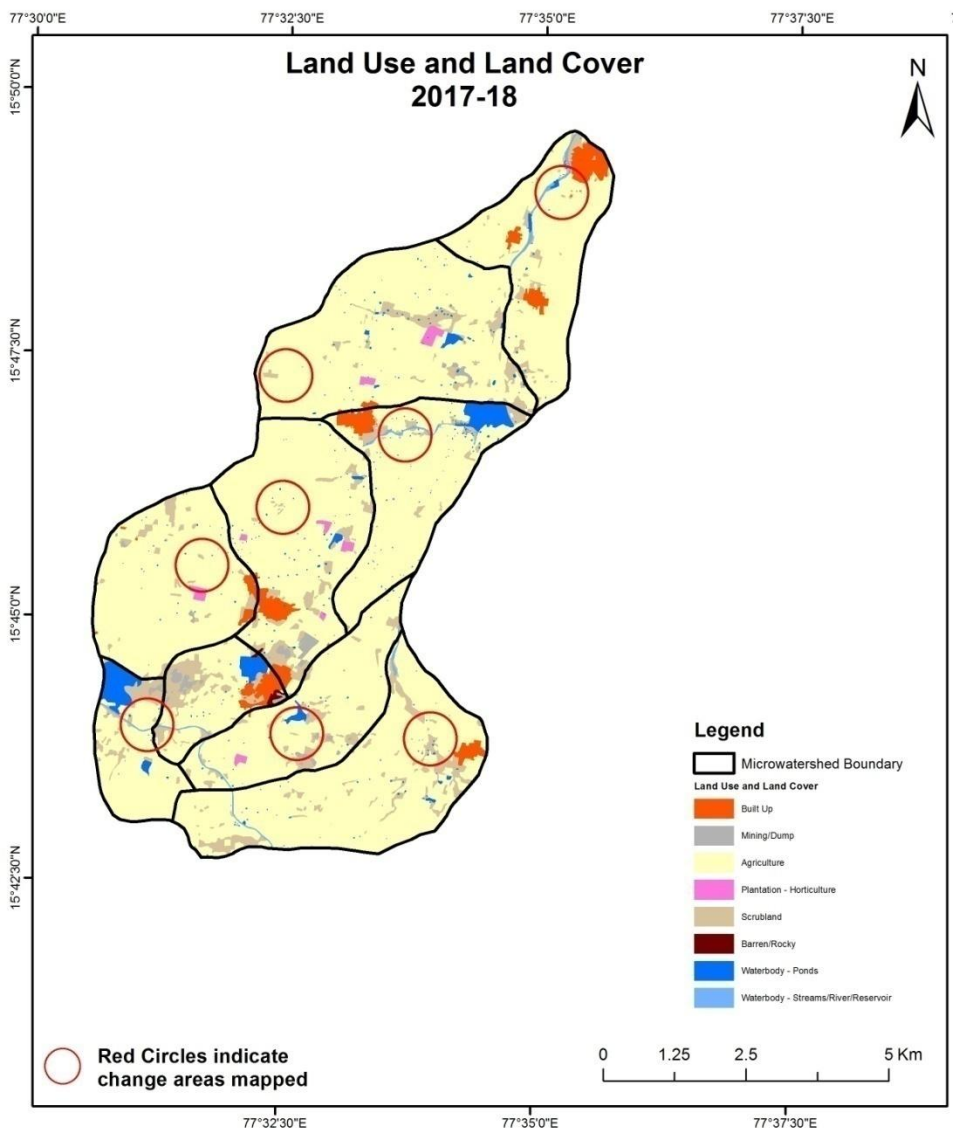
Scale: 1:10000

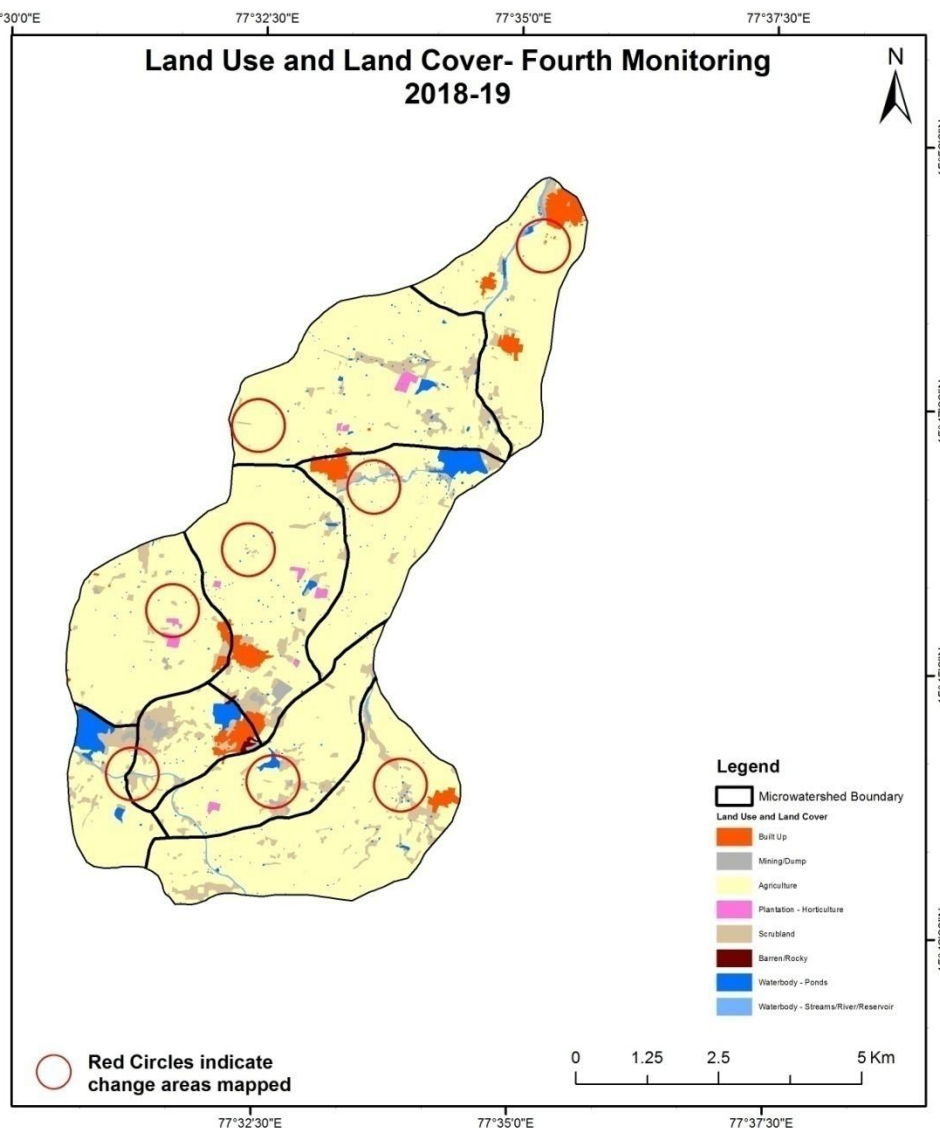




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

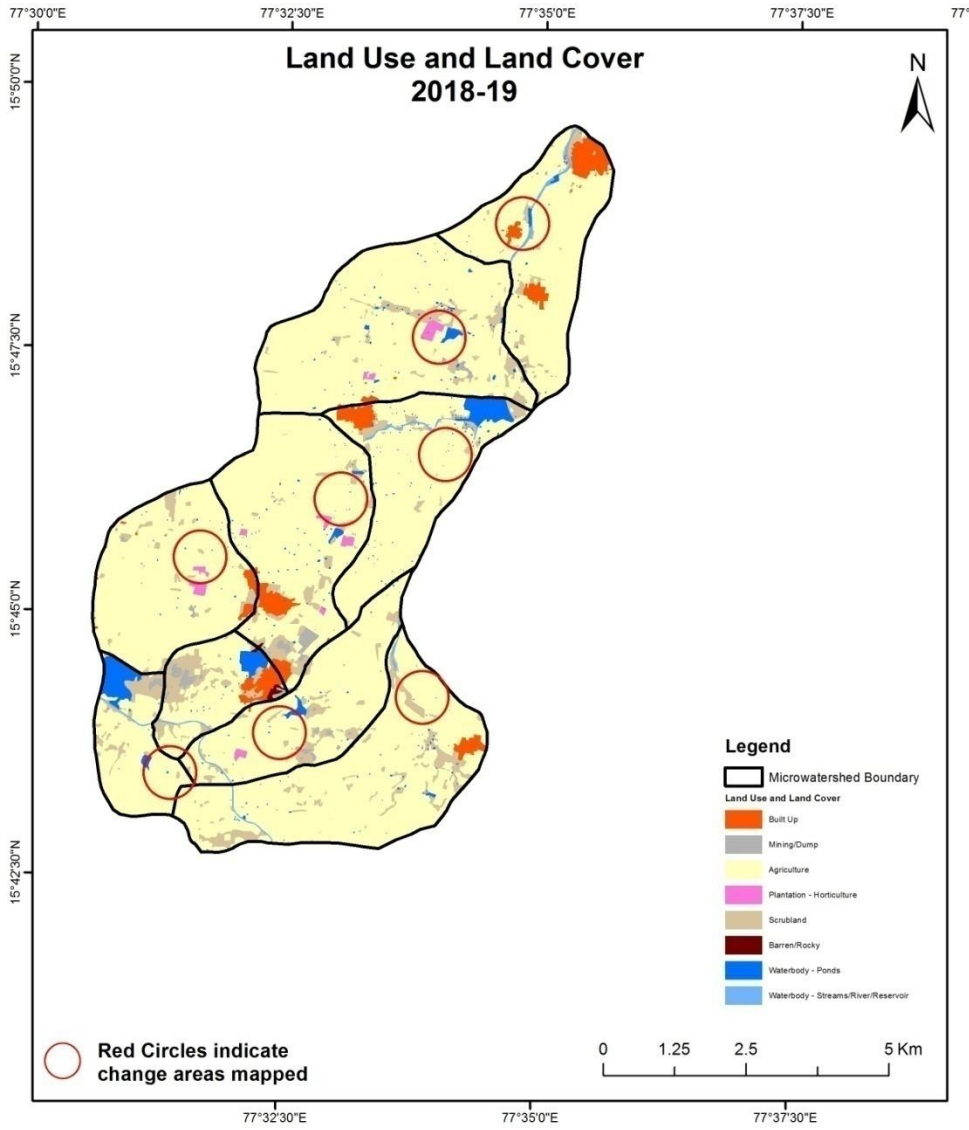
Scale: 1:10000

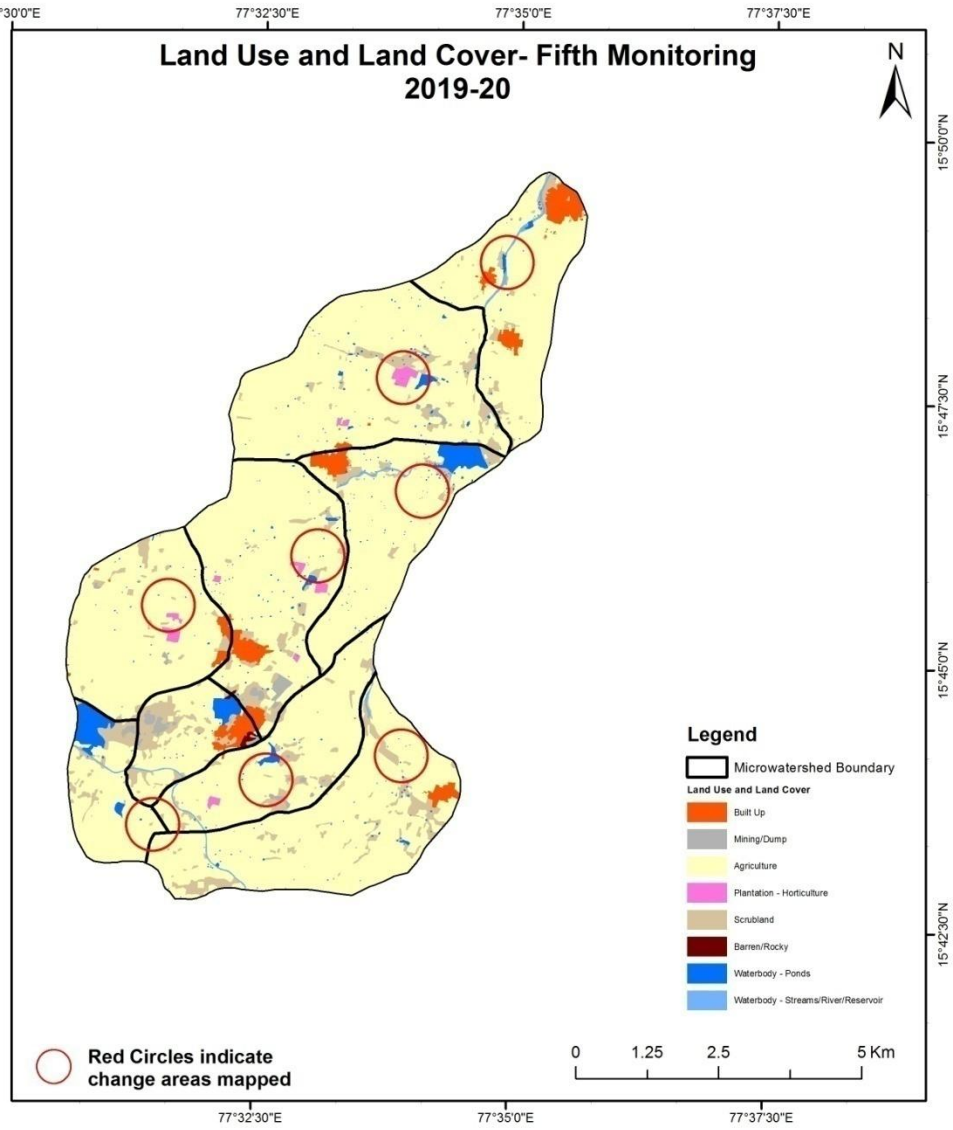




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

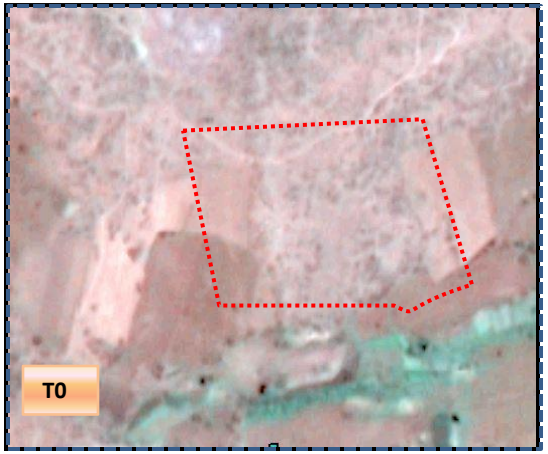
Scale: 1:10000



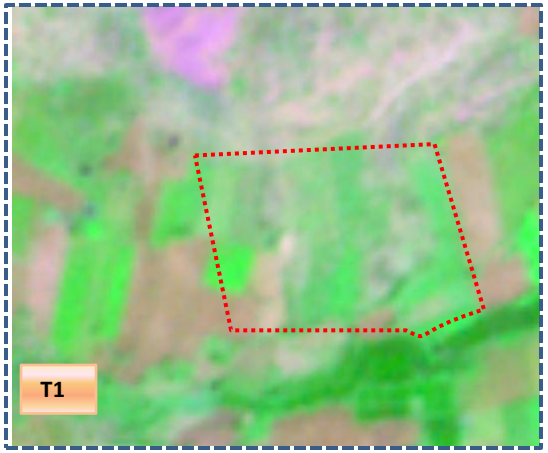


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



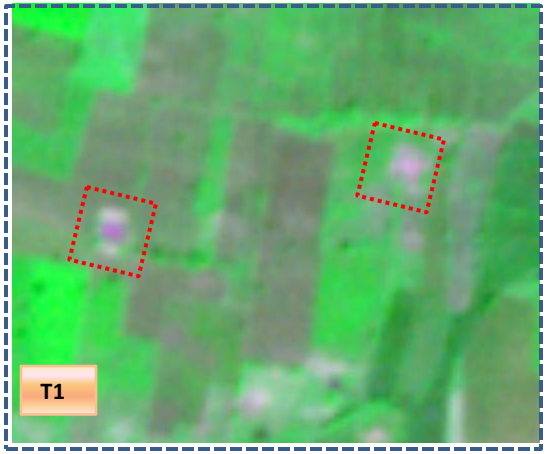
T0: 2011-12 (77°31'25.244"E 15°44'5.897"N)



T1: 14 Oct 2015

Agriculture to water body

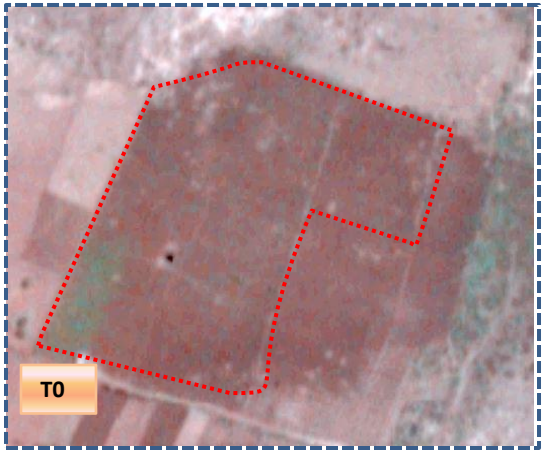
T0: 2011-12 (77°32'37.216"E 15°46'15.582"N)



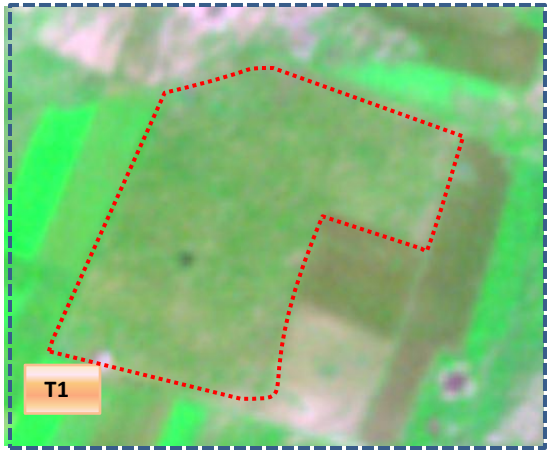
T1: 14 Oct 2015

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

Agriculture to Plantation



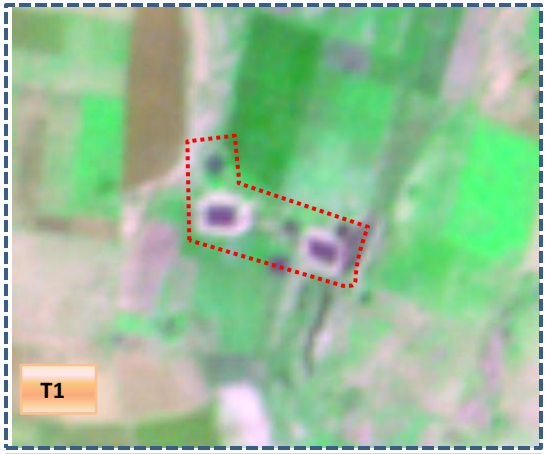
T0: 2011-12 (77°33'54.552"E 15°47'43.293"N)



T1: 14 Oct 2015

Scrub to water body

T0: 2011-12 (77°33'59.827"E 15°43'17.287"N)

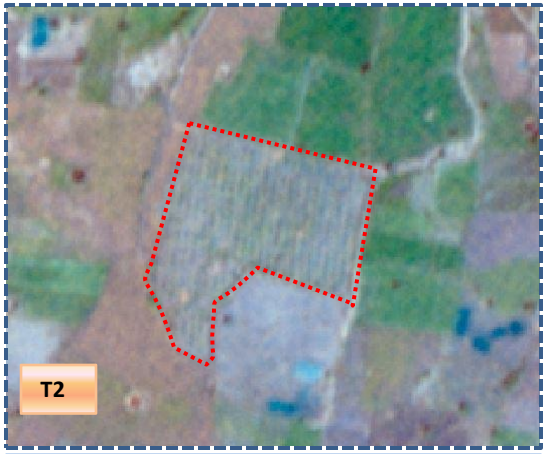


T1: 14 Oct 2015

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

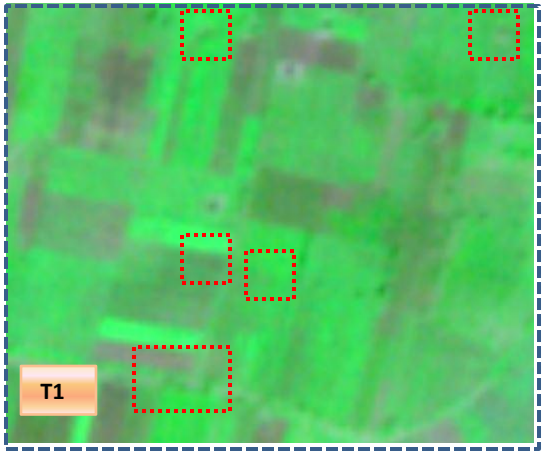
Agriculture to Plantation

T1: 2015-16(77°32'6.233"E 15°43'39.916"N)



T2: 09 November 2016

Agriculture to water body

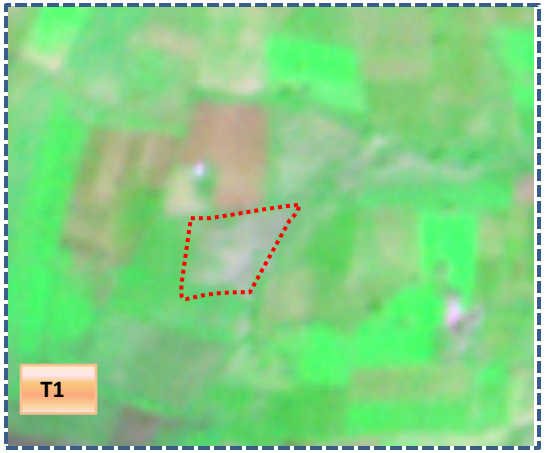


T1: 2015-16(77°34'8.436"E 15°46'36.913"N)

T2: 09 November 2016

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

Scrub to Agriculture



T1: 2015-16(77°31'32.112"E 15°43'13.956"N)

T2: 09 November 2016

Scrub to Agriculture

T1: 2015-16(77°33'35.198"E 15°43'19.495"N)

T2: 09 November 2016

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	152.79										**152.79**
Mining/dump		37.46									**37.46**
Agriculture	4.05	0.14	4941.64	9.43						11.72	**4966.98**
Plantation Horticulture			0.80	2.57							**3.37**
Forest											
Forest Plantation											
Barren Rocky							5.90				**5.90**
Scrub		0.27	29.10					586.55		5.26	**621.18**
Waterbody-Streams/River									43.98		**43.98**
Waterbody – Ponds			11.86							113.88	**125.74**
Grand Total	**156.84**	**37.87**	**4983.41**	**12.00**			**5.90**	**586.55**	**43.98**	**130.87**	**5957.41**

- 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 25 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 41 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	156.84										**156.84**
Mining/dump		37.69								0.18	**37.87**
Agriculture	1.07		4967.01	11.08						4.25	**4983.41**
Plantation Horticulture				12.00							**12.00**
Forest											
Forest Plantation											
Barren Rocky							5.90				**5.90**
Scrub	1.95	1.37	61.33					520.59		1.32	**586.55**
Waterbody-Streams/River									43.98		**43.98**
Waterbody – Ponds			6.79							124.08	**130.87**
Grand Total	**159.85**	**39.05**	**5035.12**	**23.08**			**5.90**	**520.59**	**43.98**	**129.84**	**5957.41**

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

• In T2 68 ha of the agriculture area has increased from 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	159.85										**159.85**
Mining/dump		39.05									**39.05**
Agriculture	0.70	0.22	5027.16	6.53						0.50	**5035.12**
Plantation Horticulture				23.08							**23.08**
Forest											
Forest Plantation											
Barren Rocky							5.90				**5.90**
Scrub	0.23	4.25	40.79					474.03		1.29	**520.59**
Waterbody-Streams/River									43.98		**43.98**
Waterbody – Ponds			0.49							129.35	**129.84**
Grand Total	**160.79**	**43.53**	**5068.44**	**29.61**			**5.90**	**474.03**	**43.98**	**131.14**	**5957.41**

- 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 07 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.
- In T3 41 ha of the agriculture area has increased from 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	160.79										**160.79**
Mining/dump		43.53									**43.53**
Agriculture	1.92	0.24	5063.04	2.46						0.79	**5068.44**
Plantation Horticulture			1.17	28.44							**29.61**
Forest											
Forest Plantation											
Barren Rocky							5.90				**5.90**
Scrub	0.71	1.37	16.22					455.05		0.67	**474.03**
Waterbody-Streams/River									43.98		**43.98**
Waterbody – Ponds			1.31							129.83	**131.14**
Grand Total	**163.41**	**45.14**	**5081.74**	**30.89**			**5.90**	**455.05**	**43.98**	**131.30**	**5957.41**

- 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 05 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 18 ha of the agriculture area has increased from plantation, 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-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	163.41										**163.41**
Mining/dump		45.14									**45.14**
Agriculture	0.34		5079.14	1.91					0.05	0.29	**5081.74**
Plantation Horticulture				30.89							**30.89**
Forest											
Forest Plantation											
Barren Rocky							5.90				**5.90**
Scrub	0.25		7.20					447.44		0.15	**455.05**
Waterbody-Streams/River									43.98		**43.98**
Waterbody – Ponds			0.05							131.25	**131.30**
Grand Total	**164.00**	**45.14**	**5086.39**	**32.81**			**5.90**	**447.44**	**44.02**	**131.70**	**5957.41**

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

•In T5 07 ha of the agriculture area has increased from 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 06 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 16, 51, 33, 13 & 4 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 119 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is an increase of 29 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 173 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (50) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (60) verified from the portal.