MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -40/2011-12
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

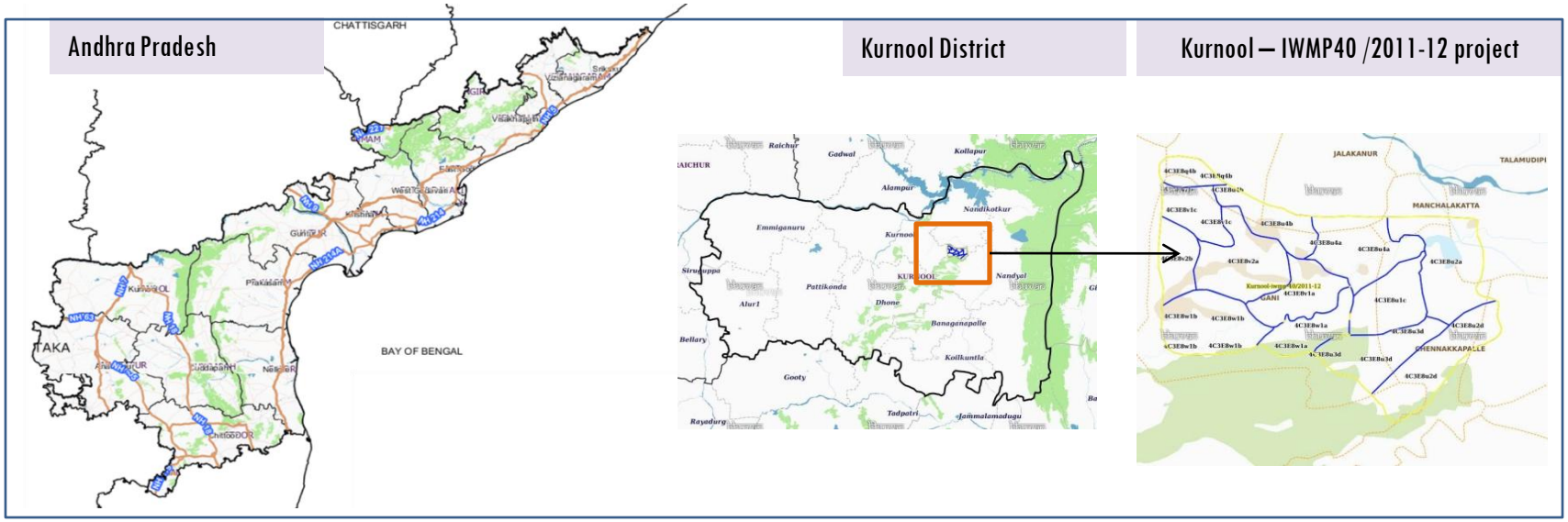
CONTENTS

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-40/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is 5,955 ha. It comprises of 13 micro watersheds.
- In the project area 815 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Water bodies have shown an increased by 192 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 47 % is covered by the agriculture, 26 % is mining/industrial area, 13 % is covered by scrub land, 5 % is covered by forest and remaining by other land use classes.

PROJECT : KURNOOL – IWMP-40/2011-12
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Gadivemula Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **5,955** ha. It comprises of 13 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 2015-16 (T1) 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).

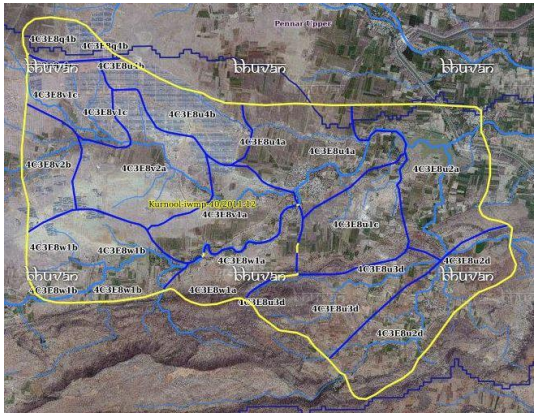
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2011-12	2019-20
LISS IV	2011-12		
SCENE 1			3-Nov-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			3-Nov-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	815
4	Detailed Project Report		

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



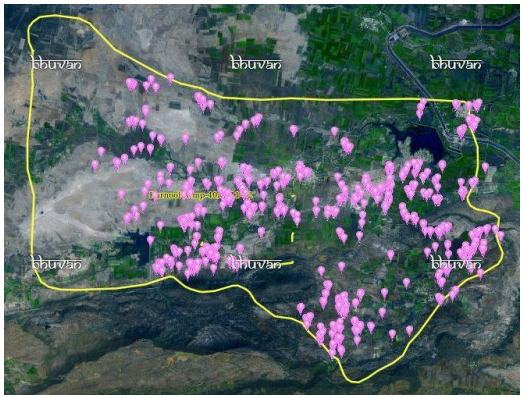
Legend

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	2	2
2	Agriculture/Horticulture	0	0
3	Blockplanting	0	0
4	Bund planting	0	0
5	Drainage Treatment	0	0
6	Farm ponds/Dug out pit	0	0
7	Check dams (Civil work)	0	0
8	Checks & plugins	337	287
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	596	526
	TOTAL	**935**	**815**

MONITORING IN THE PROJECT AREA

Site Wise Changes in the Project

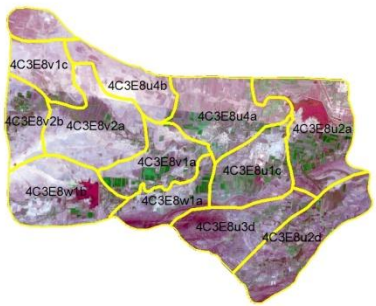
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2011-12) and T5 is 2019-20 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match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

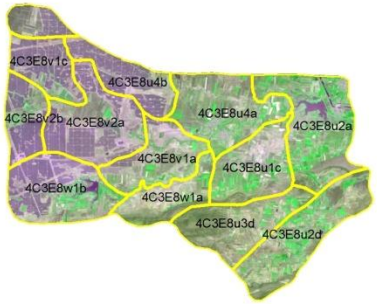


Source:NCC,NRSC

Natural Color Composite- 03rd June 2017

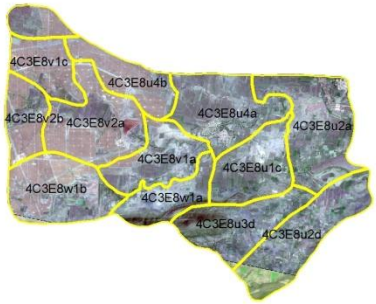
Source:NCC,NRSC

Natural Color Composite-26th March 2018



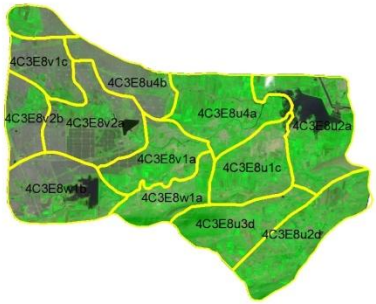
Source:LISS-IV,NRSC

Natural Color Composite-14th January 2019



Source:NCC,NRSC

Natural Color Composite- 03rd November 2019



Source:LISS-IV,NRSC

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-40/2011-12

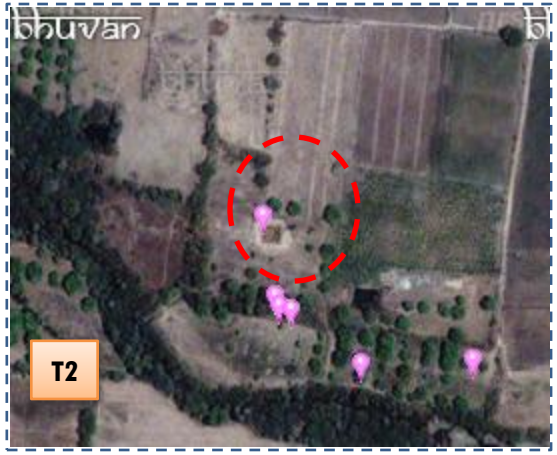
T1: 14 November 2015

T2: 06 March 2018

Drishti SI no. 1769031 MWS :4C3E8w1b

Check dam

T1: 14 November 2015



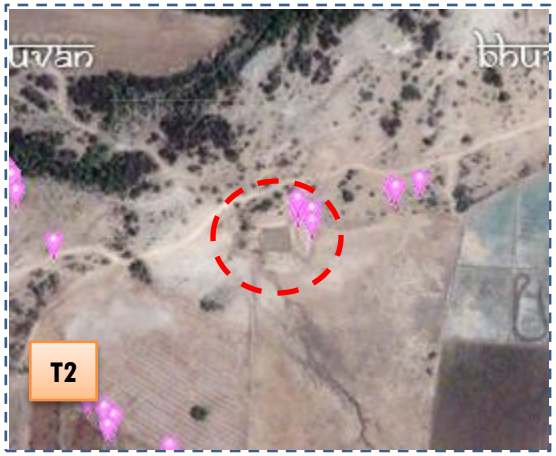
T2: 06 March 2018

Drishti SI no. 1783966 MWS :4C3E8w1b

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-40/2011-12

T1: 14 November 2015



T2: 06 March 2018

Drishti Sl no. 2463907 MWS : 4C3F8w1a

Farm pond

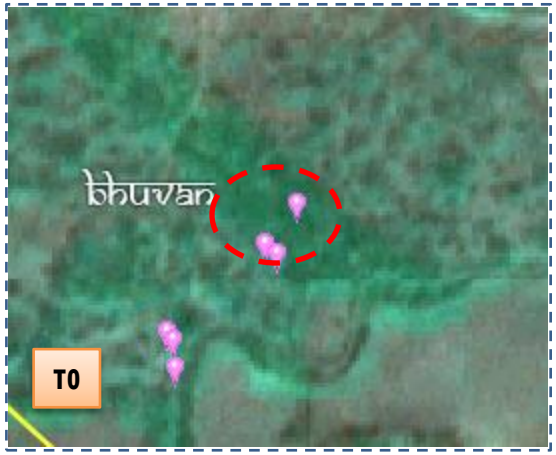
T1: 14 November 2015

T2: 06 March 2018

Drishti Sl no. 146212 MWS : 4C3E8u2d

Horticulture

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-40/2011-12



T0:2010-11

T1: 14 November 2015

Drishti Sl no. 1763446 MWS :4C3E8u2d

Check dam

T0:2010-11

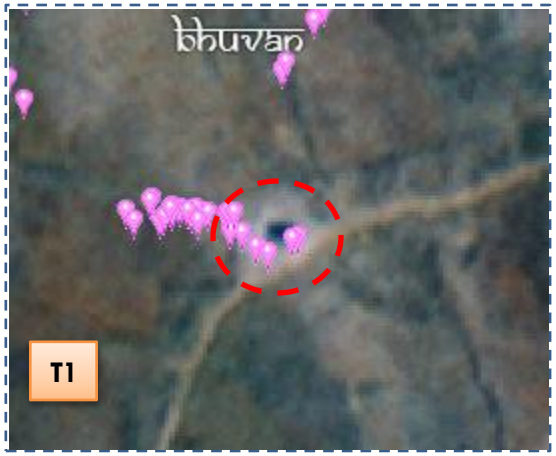
T1: 14 November 2015

Drishti Sl no. 199373 MWS :4C3E8u2a

Civil work

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-40/2011-12

T0: 2010-11



T1: 14 November 2015

Drishti Sl no. 145376 MWS : 4C3E8u3d

Farm pond

T0: 2010-11

T1: 14 November 2015

Drishti Sl no. 145783 MWS : 4C3E8u2d

Farm pond

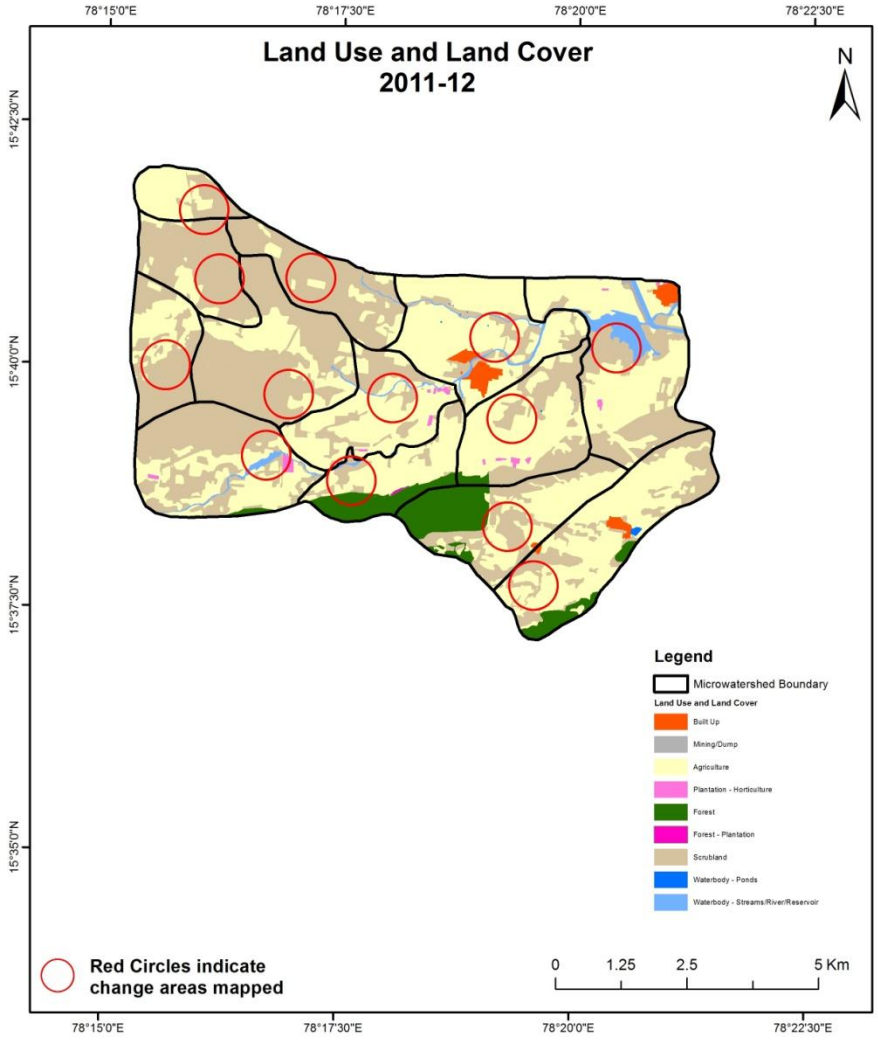
MONITORING IN THE PROJECT AREA

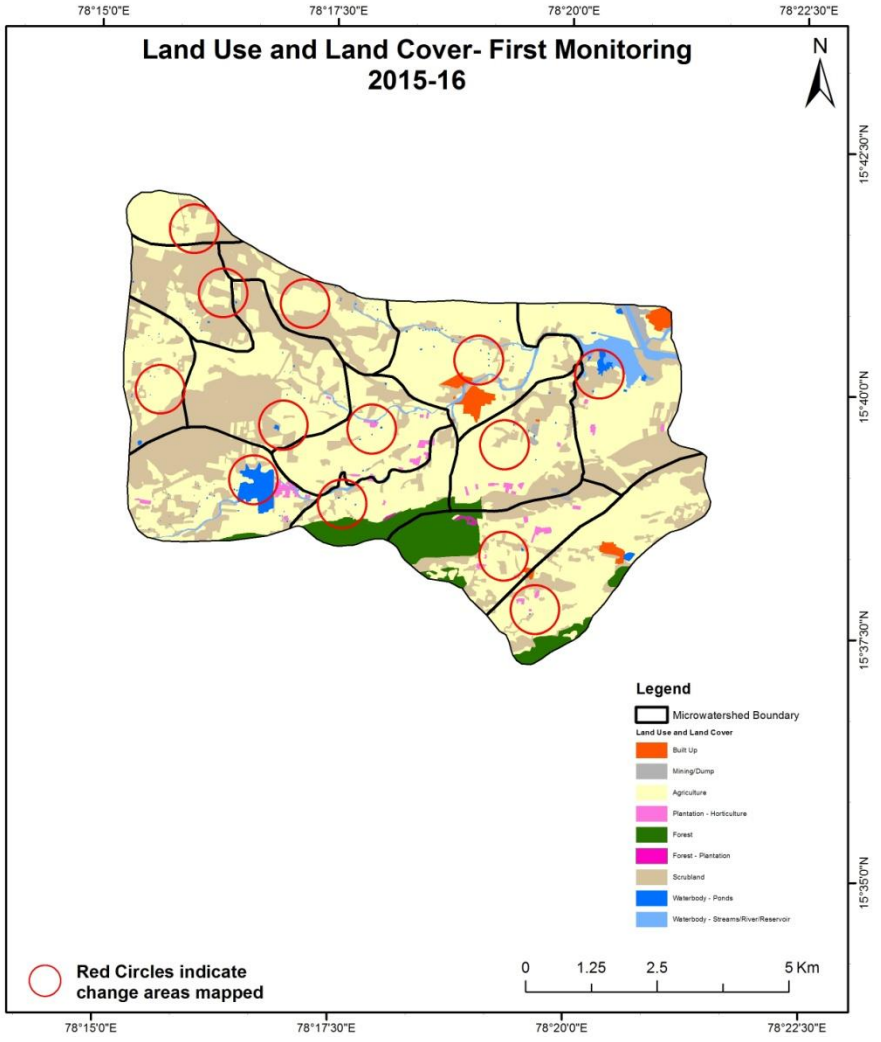
Land use and Land cover Changes in the Project

- 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)

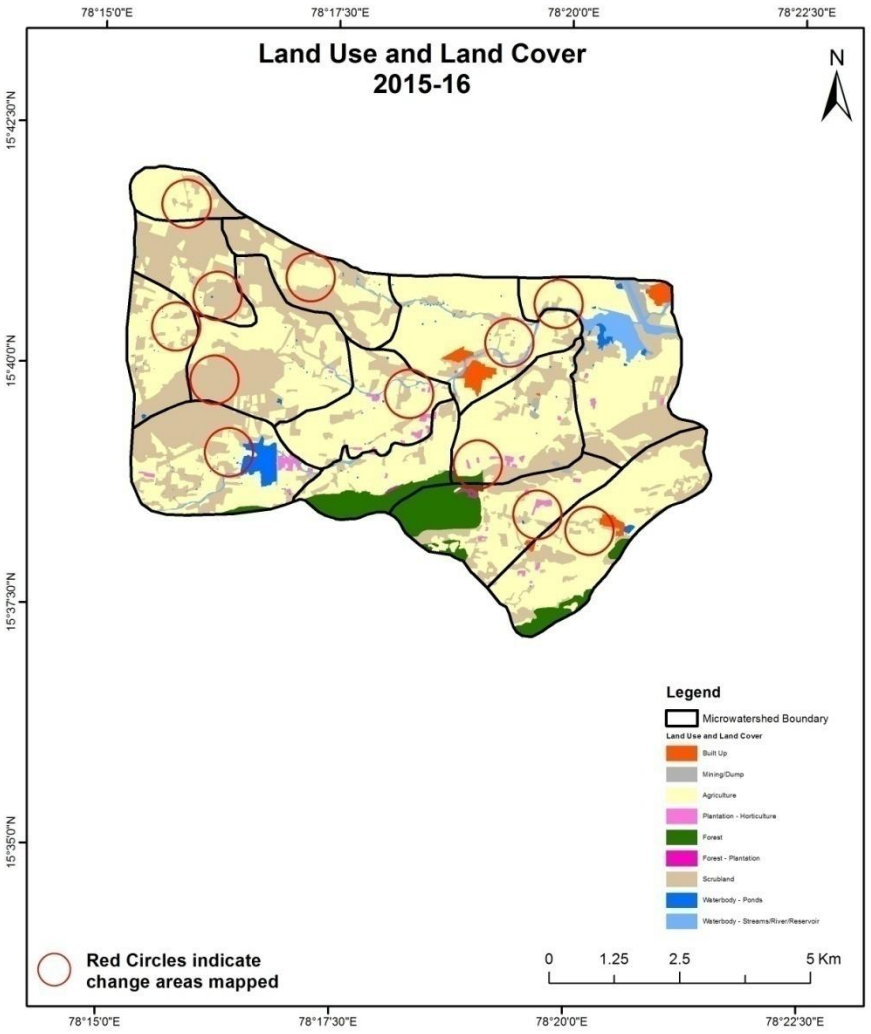
Scale: 1:10000

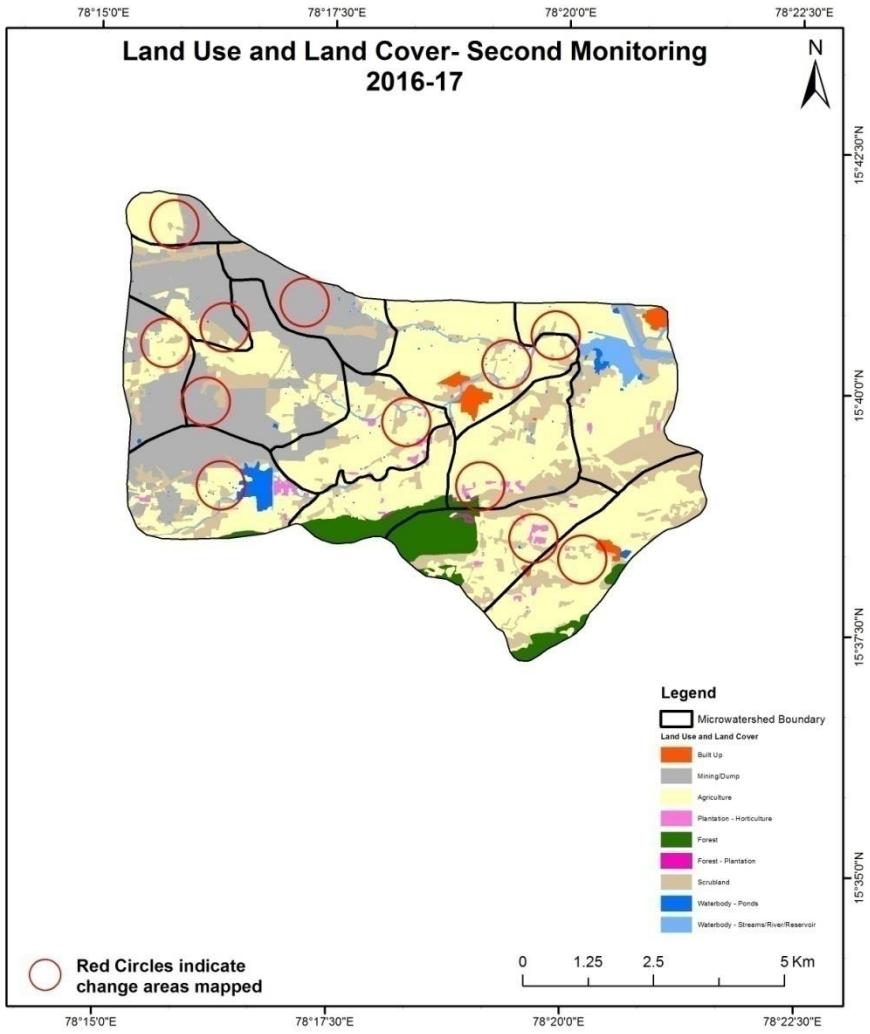




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

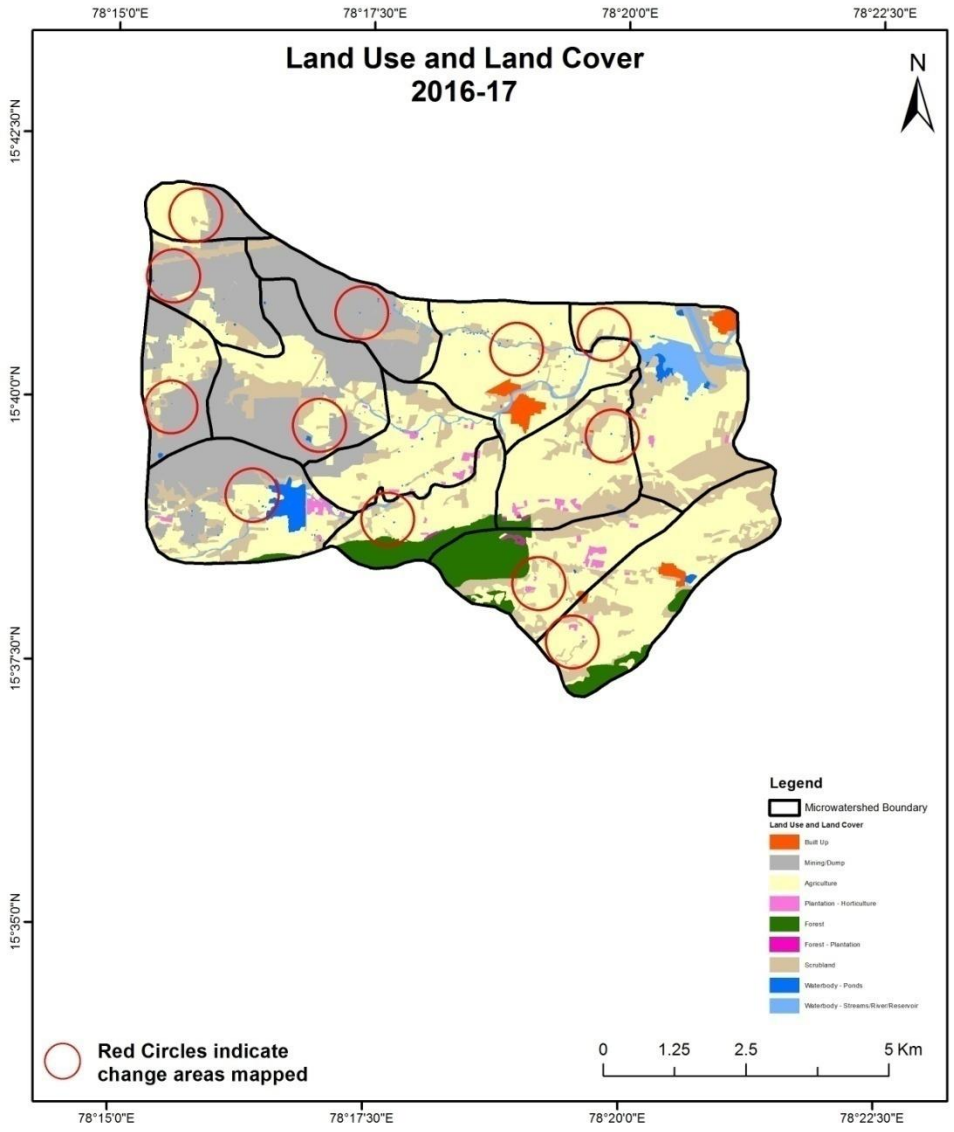
Scale: 1:10000

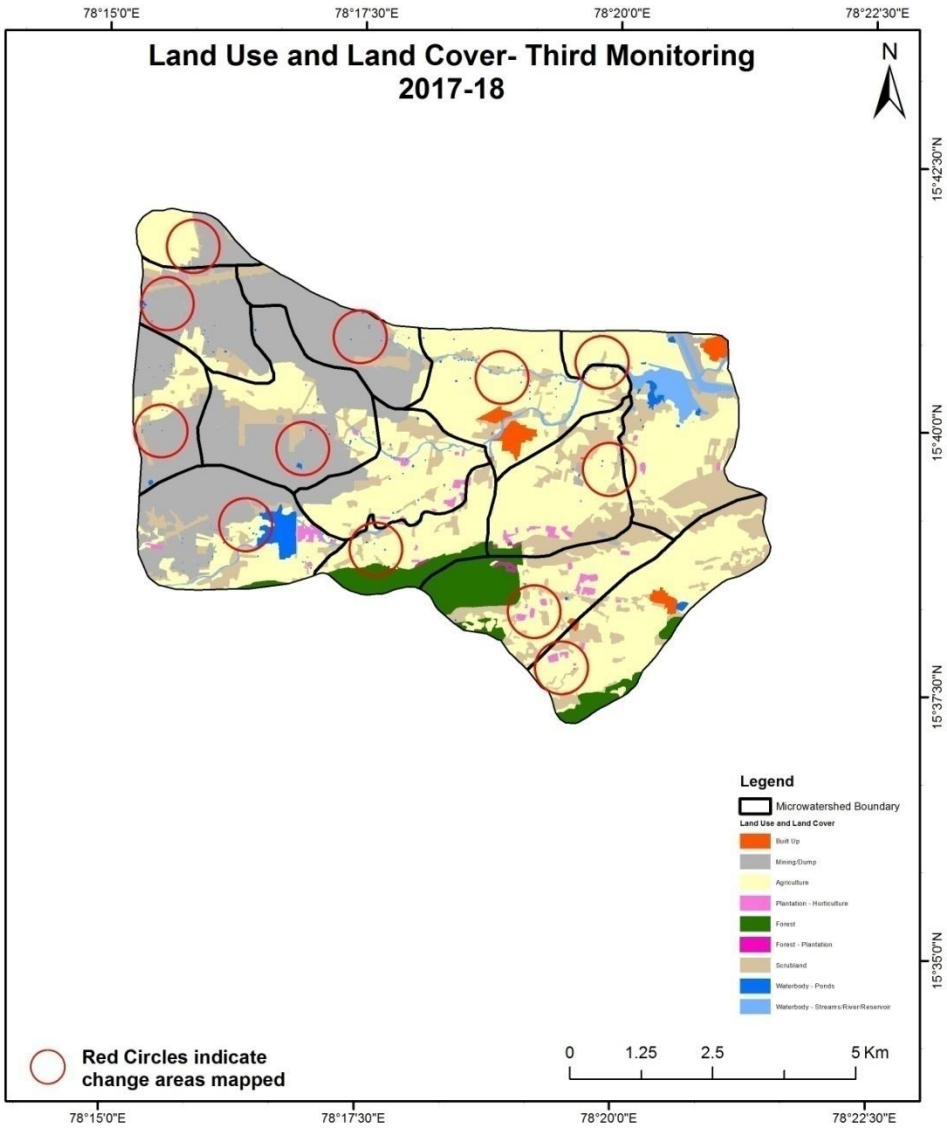




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

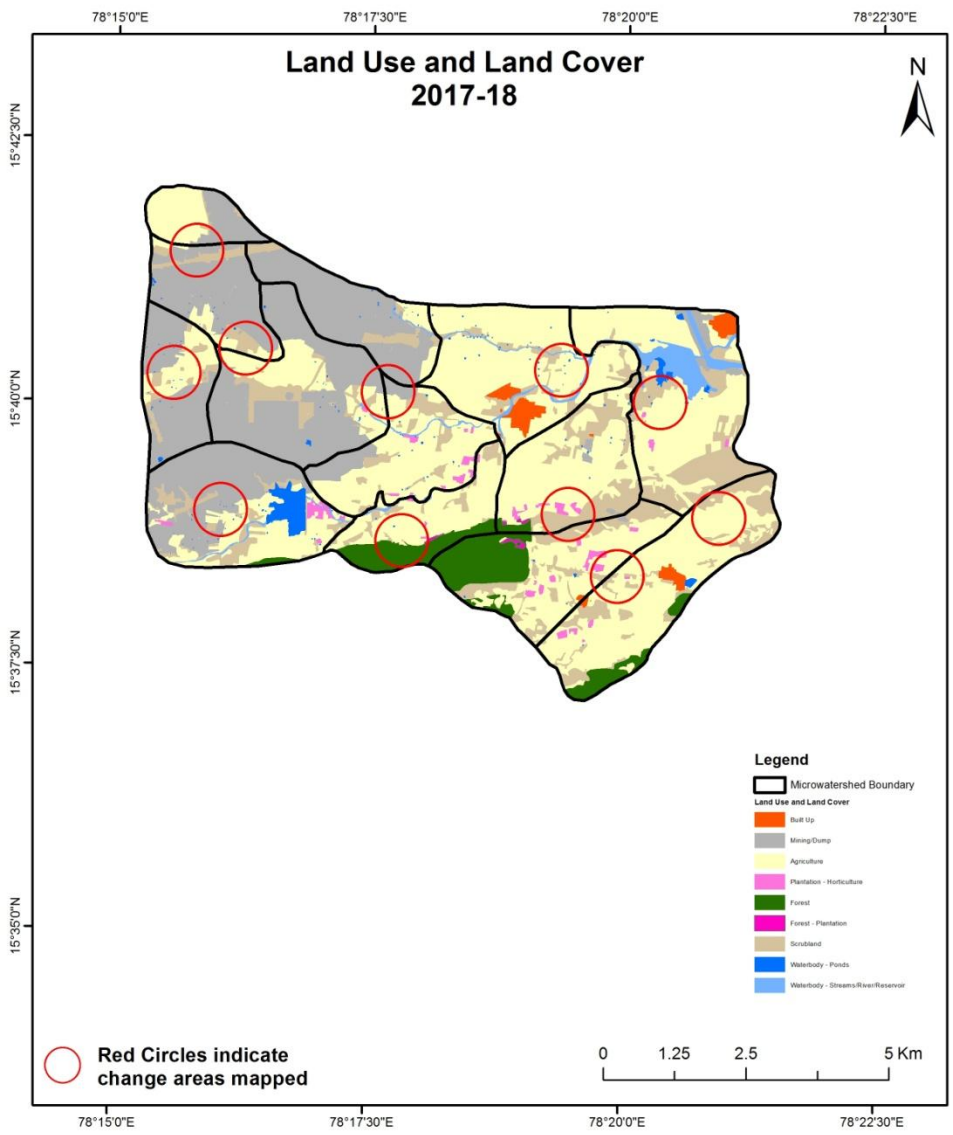
Scale: 1:10000

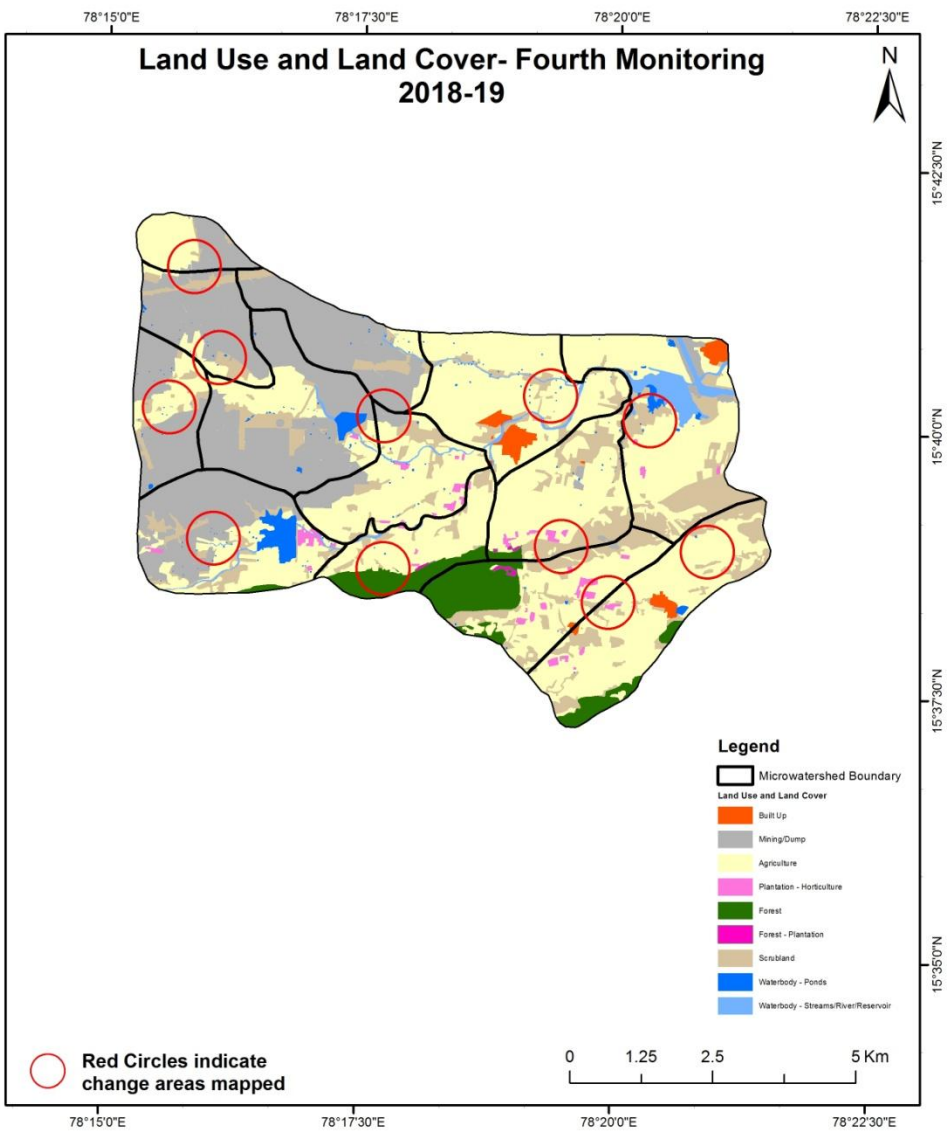




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

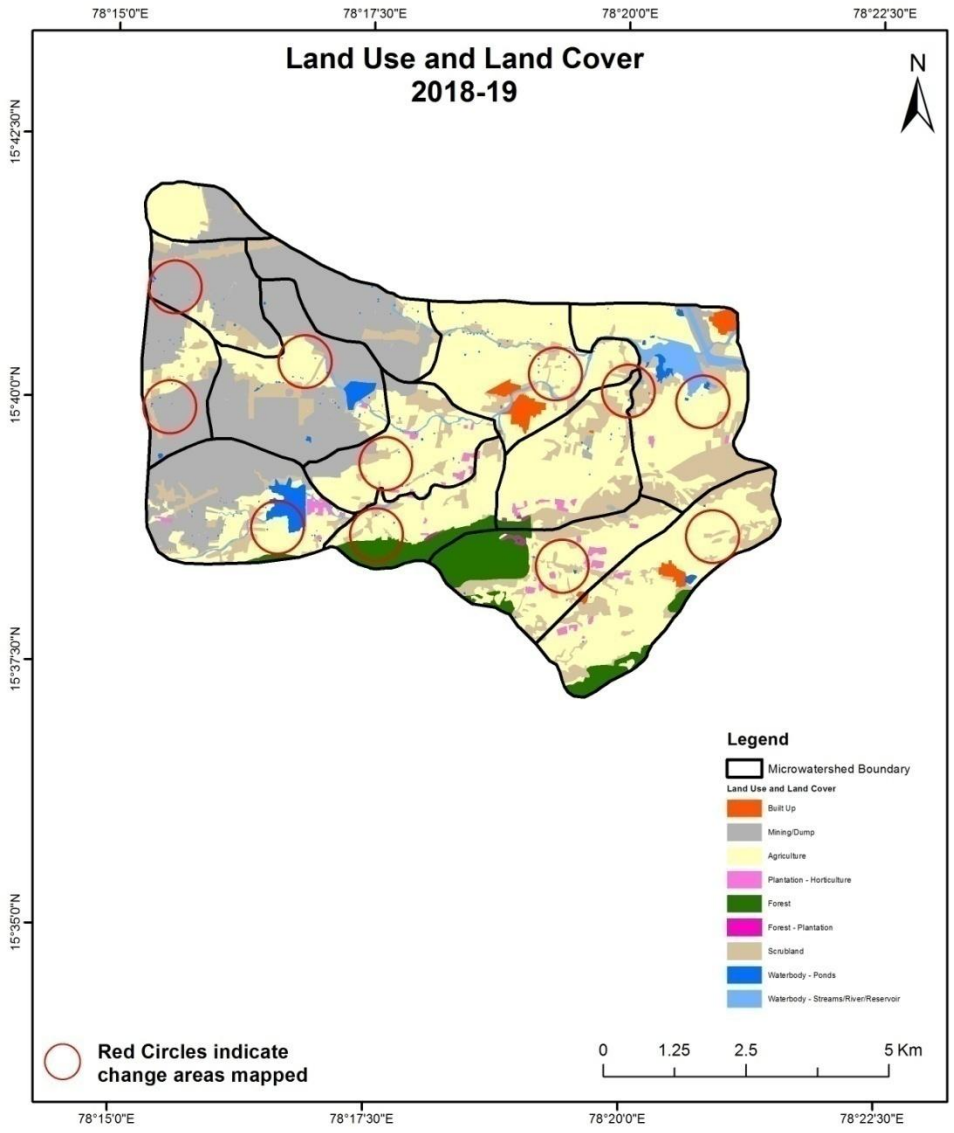
Scale: 1:10000

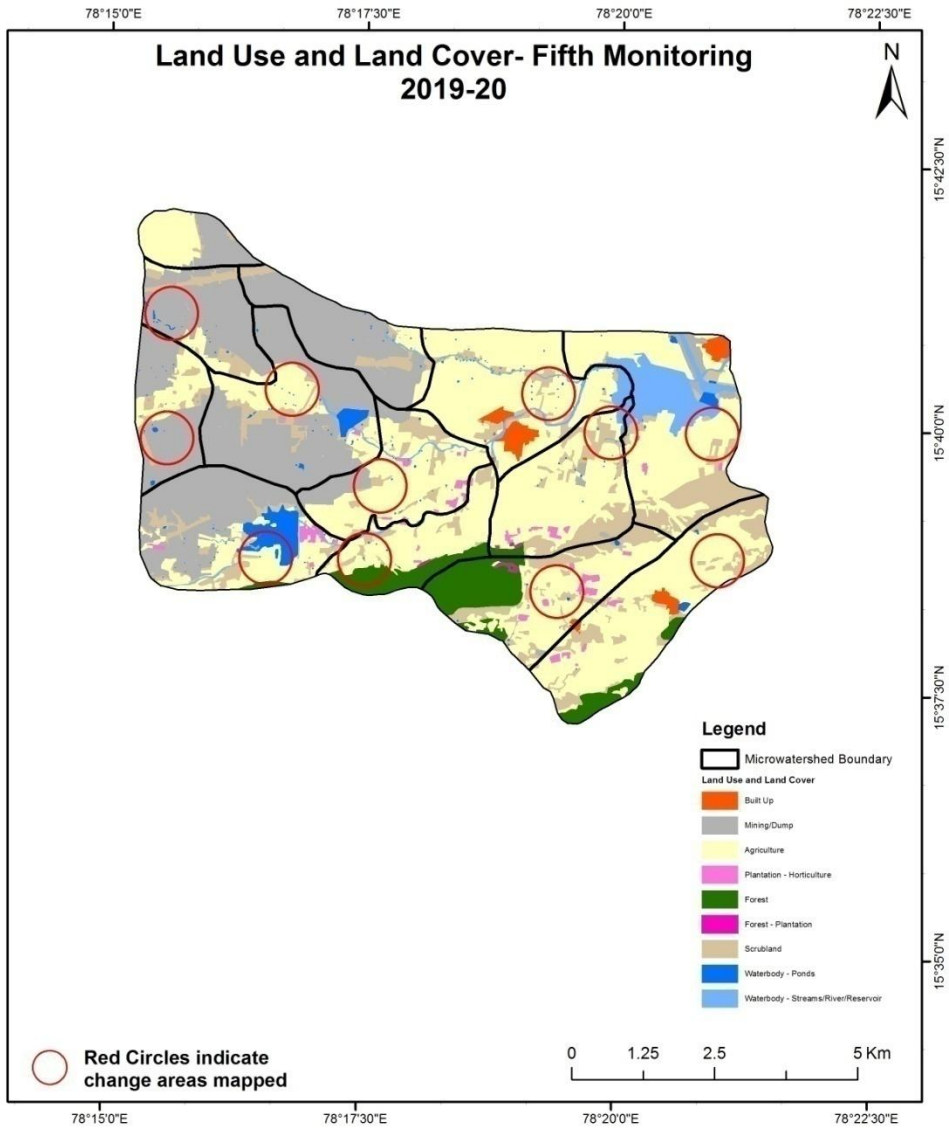




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

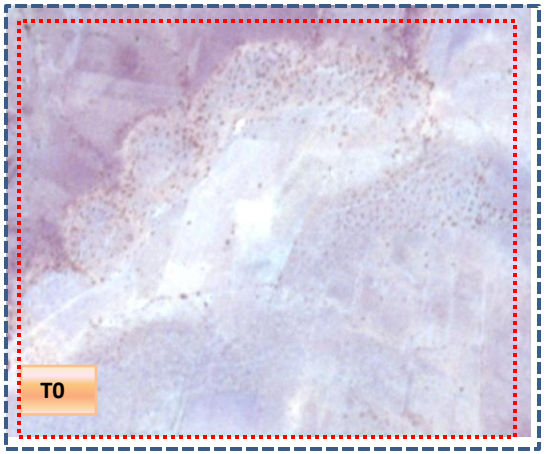
Scale: 1:10000



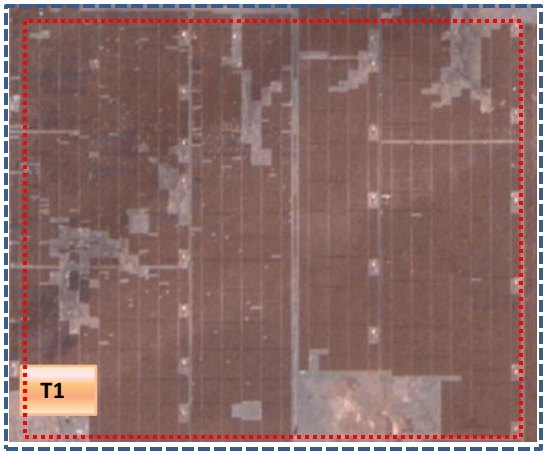


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Mining/Industrial (Solar Park)



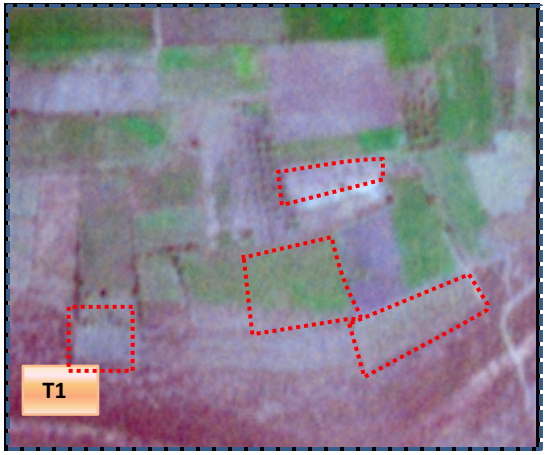
T0: 2015-16(78°15'42.447"E 15°39'48.965"N)



T1: 03 June 2017

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

Agriculture to Plantation



T1: 2015-16(78°18'57.237"E 15°38'55.473"N)

T2: 03 June 2017

Agriculture to water body

T1: 2015-16 (78°18'7.642"E 15°39'41.184"N)

T2: 03 June 2017

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

Scrub to Agriculture

T1: 2015-16(78°19'54.371"E 15°40'16.797"N)

T2: 03 June 2017

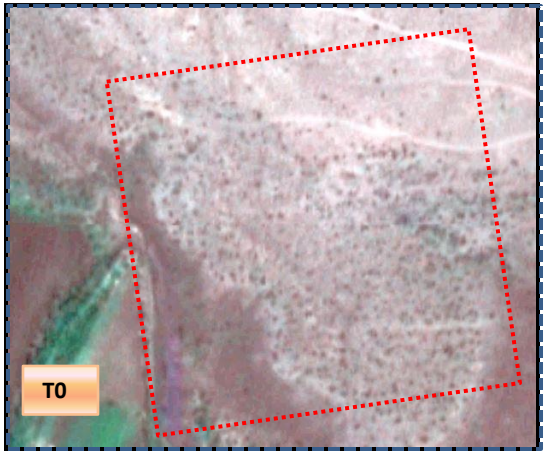
Scrub to Agriculture

T1: 2015-16(78°19'24.621"E 15°39'53.132"N)

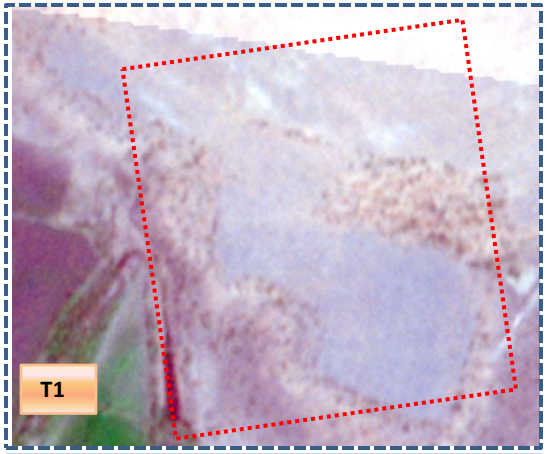
T2: 03 June 2017

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

Scrub to Agriculture



T0: 2011-12 (78°17'10.668"E 15°40'22.72"N)



T1: 14 Nov 2015

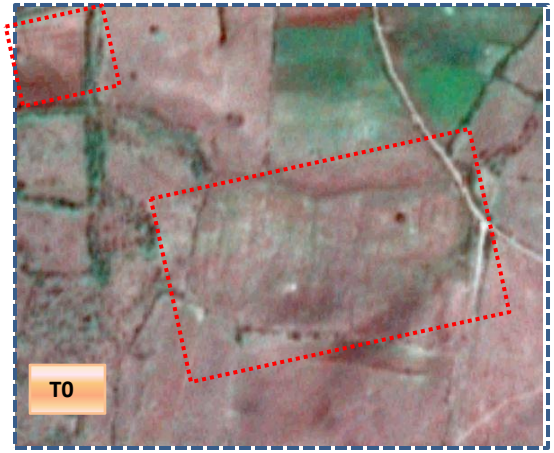
Agriculture to water body

T0: 2011-12 (78°19'8.274"E 15°40'20.689"N)

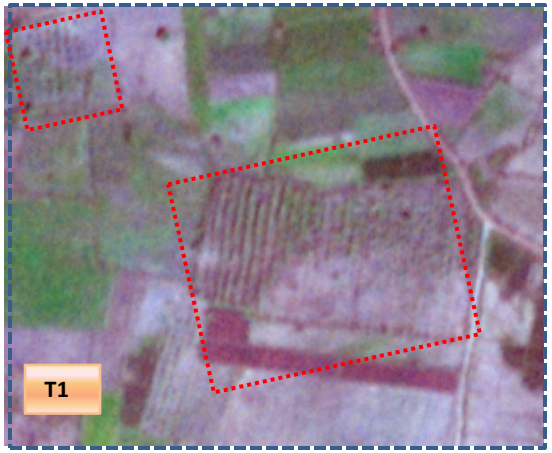
T1: 14 Nov 2015

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

Agriculture to Plantation



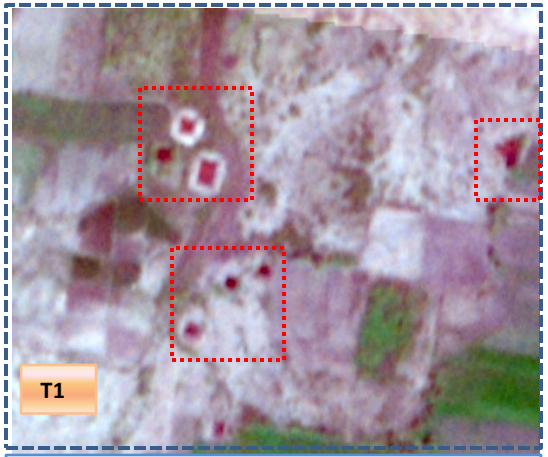
T0: 2011-12 (78°19'42.415"E 15°38'35.743"N)



T1: 14 Nov 2015

Scrub to water body

T0: 2011-12 (78°20'4.411"E 15°39'56.135"N)



T1: 14 Nov 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	63.42										**63.42**
Mining/dump		6.68									**6.68**
Agriculture	0.56	12.96	2744.30	27.36					1.48	22.72	**2809.37**
Plantation Horticulture			5.92	15.26							**21.18**
Forest			6.42		302.46	3.02					**311.90**
Forest Plantation						1.40					**1.40**
Barren Rocky											
Scrub	0.99	9.12	698.17	2.83				1856.15	3.66	30.56	**2601.49**
Waterbody-Streams/River									128.24	8.53	**136.77**
Waterbody – Ponds										3.26	**3.26**
Grand Total	**64.97**	**28.75**	**3454.81**	**45.46**	**302.46**	**4.42**		**1856.15**	**133.37**	**65.07**	**5955.47**

- 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 65 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 12 ha of the agriculture area has increased from plantations, forest and scrubland 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	64.97										**64.97**
Mining/dump		28.75									**28.75**
Agriculture	0.12	555.79	2889.94	6.79		1.52				0.65	**3454.81**
Plantation Horticulture			0.53	44.93							**45.46**
Forest			0.79		301.67						**302.46**
Forest Plantation						4.42					**4.42**
Barren Rocky											
Scrub		842.26	35.88					977.99		0.02	**1856.15**
Waterbody-Streams/River			0.05						133.32		**133.37**
Waterbody – Ponds			1.59							63.48	**65.07**
Grand Total	**65.09**	**1426.80**	**2928.78**	**51.72**	**301.67**	**5.94**		**977.99**	**133.32**	**64.15**	**5955.47**

• 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 563 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, forest plantation and water body in T2.

• In T2 1.3 ha of the agriculture area has increased from plantations, 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-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	65.09										**65.09**
Mining/dump		1426.42								0.38	**1426.80**
Agriculture	0.37	115.76	2806.33	5.73						0.60	**2928.78**
Plantation Horticulture		0.18		51.54							**51.72**
Forest			1.27		300.40						**301.67**
Forest Plantation						5.94					**5.94**
Barren Rocky											
Scrub	0.66	29.63	15.16	0.52				931.65		0.37	**977.99**
Waterbody-Streams/River									133.32		**133.32**
Waterbody – Ponds										64.15	**64.15**
Grand Total	**66.12**	**1571.99**	**2822.76**	**57.79**	**300.40**	**5.94**		**931.65**	**133.32**	**65.50**	**5955.47**

- 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 122 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.
- In T3 1.2 ha of the agriculture area has increased from 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-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	66.12										**66.12**
Mining/dump		1568.82							3.02	0.14	**1571.99**
Agriculture	0.37	0.67	2806.13	1.77					0.64	13.18	**2822.76**
Plantation Horticulture			1.13	56.66							**57.79**
Forest			2.27		298.13						**300.40**
Forest Plantation						5.94					**5.94**
Barren Rocky											
Scrub		0.18	14.43					912.30	0.22	4.51	**931.65**
Waterbody-Streams/River			0.27						133.05		**133.32**
Waterbody – Ponds										65.50	**65.50**
Grand Total	**66.48**	**1569.67**	**2824.23**	**58.43**	**298.13**	**5.94**		**912.30**	**136.94**	**83.34**	**5955.47**

- 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 16 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 03 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-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	66.48										**66.48**
Mining/dump		1566.64								3.03	**1569.67**
Agriculture	0.63	0.95	2765.01						41.22	16.41	**2824.23**
Plantation Horticulture			1.28	57.15							**58.43**
Forest			3.35		294.77						**298.13**
Forest Plantation						5.94					**5.94**
Barren Rocky											
Scrub	0.36	11.03	22.93					826.37	41.19	10.41	**912.30**
Waterbody-Streams/River									136.94		**136.94**
Waterbody – Ponds									9.85	73.49	**83.34**
Grand Total	**67.47**	**1578.63**	**2792.58**	**57.15**	**294.77**	**5.94**		**826.37**	**229.20**	**103.34**	**5955.47**

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

•In T5 04 ha of the agriculture area has increased from plantations, 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 192 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 645 & 1.4 Hectares from T0 to T1 & T3-T4, there is a decrease of 526, 106 & 31 hectares from T1-T2, T2-T3 & T4-T5 and overall decrease of 16 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 35 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. **About 1571 hectares of Industrial area (Solar Park)** has been increased in during the monitoring period in the watershed area.
7. There is a decrease of 1,775 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.