MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -39/2011-12
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

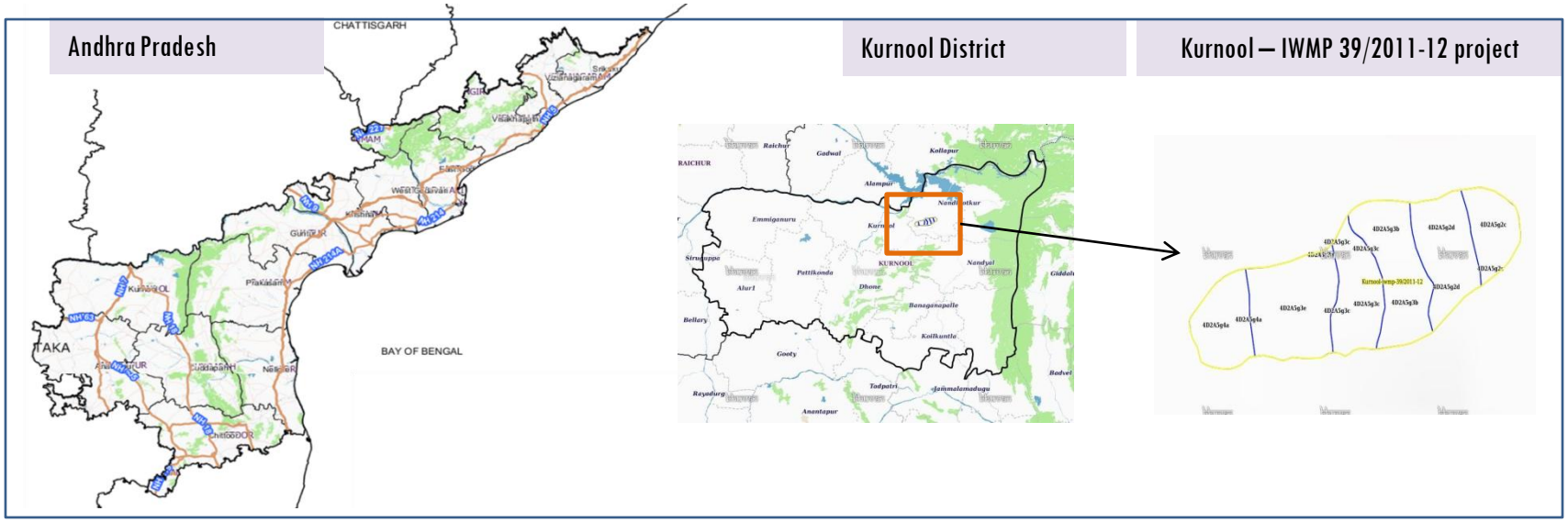
CONTENTS

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-39/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is **4,293** ha. It comprises of 6 micro watersheds.
- In the project area 385 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Water bodies have shown an increased by 33 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 87% is covered by the agriculture, 5.7 % is covered by barren rocky, 2.9 % is covered by scrub land and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-39/2011-12
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Midthur Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **4,293** ha. It comprises of 6 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).

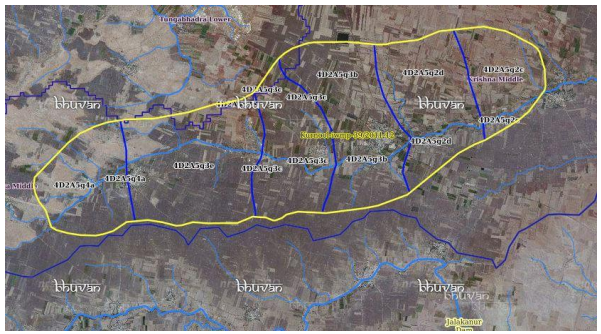
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2011-12	2019-20
LISS IV	2011-12		
SCENE 1			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	385
4	Detailed Project Report		

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



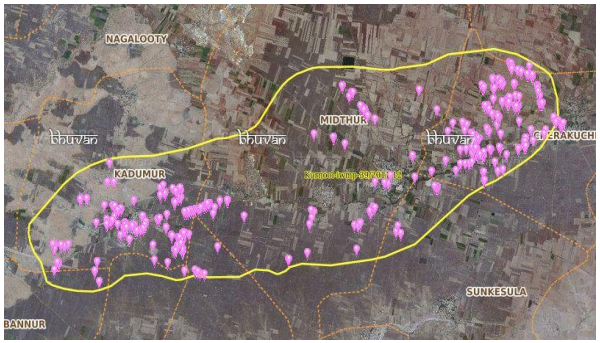
Legend

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	5	5
2	Agriculture/Horticulture	44	44
3	Blockplanting	0	0
4	Bund planting	0	0
5	Drainage Treatment	0	0
6	Farm ponds/Dug out pit	26	26
7	Check dams (Civil work)	77	69
8	Checks & plugins	155	125
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	10	10
17	Others	136	106
	TOTAL	**453**	**385**

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

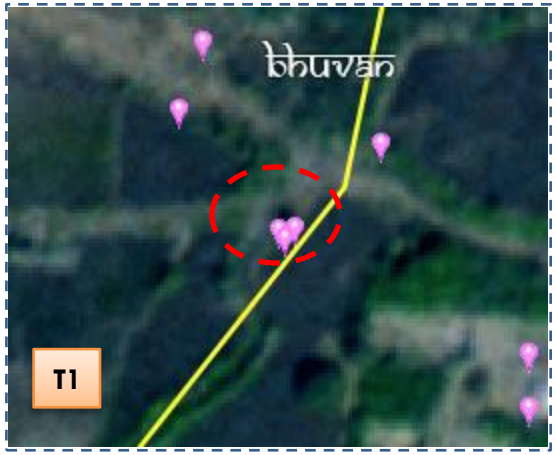
Natural Color Composite-04th January 2019

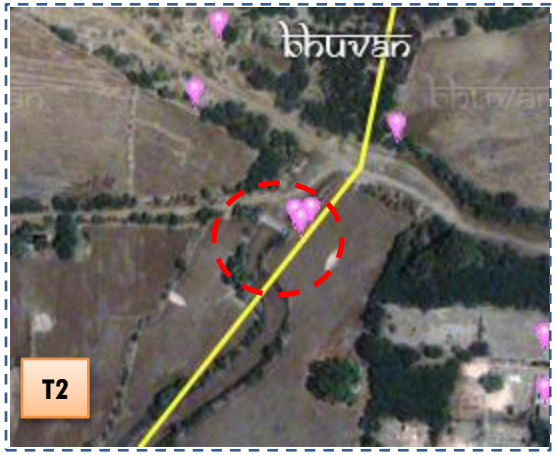
Source:Sentinel-2

Natural Color Composite- 03rd November 2019

Source:LISS-IV,NRSC

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-39/2011-12





T1: 14 November 2015

T2: 06 March 2018

Drishti SI no. 1797683 MWS :4D2A5g2c

Check dam

T1: 14 November 2015

T2: 06 March 2018

Drishti SI no. 2055297 MWS :4D2A5g2c

Check dam

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-39/2011-12

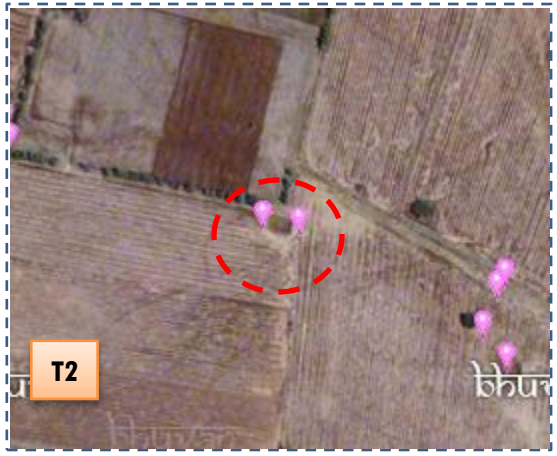
T1: 14 November 2015

T2: 06 March 2018

Drishti Sl no. 2466618 MWS : 4D2A5g2c

Farm pond

T1: 14 November 2015



T2: 06 March 2018

Drishti Sl no. 2501215 MWS : 4D2A5g2c

Farm pond

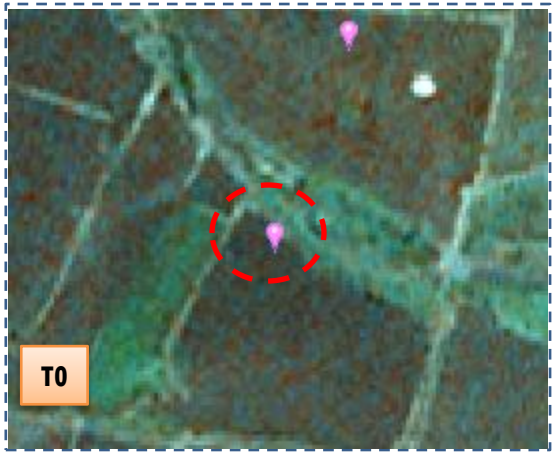
Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-39/2011-12

T0:2010-11

T1: 14 November 2015

Drishti Sl no. 2055491 MWS :4D2A5g2d

Check dam



T0:2010-11

T1: 14 November 2015

Drishti Sl no. 149536 MWS :4D2A5g3e

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-39/2011-12

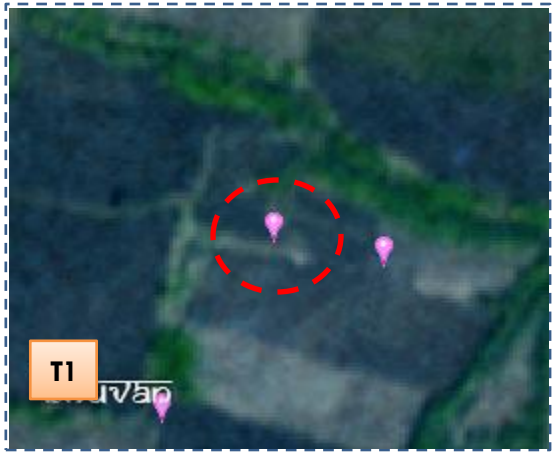
T0: 2010-11

T1: 14 November 2015

Drishti Sl no. 2495606 MWS : 4D2A5g2c

Farm pond

T0: 2010-11



T1: 14 November 2015

Drishti Sl no. 143482 MWS : 4D2A5g3e

Rockfill dam

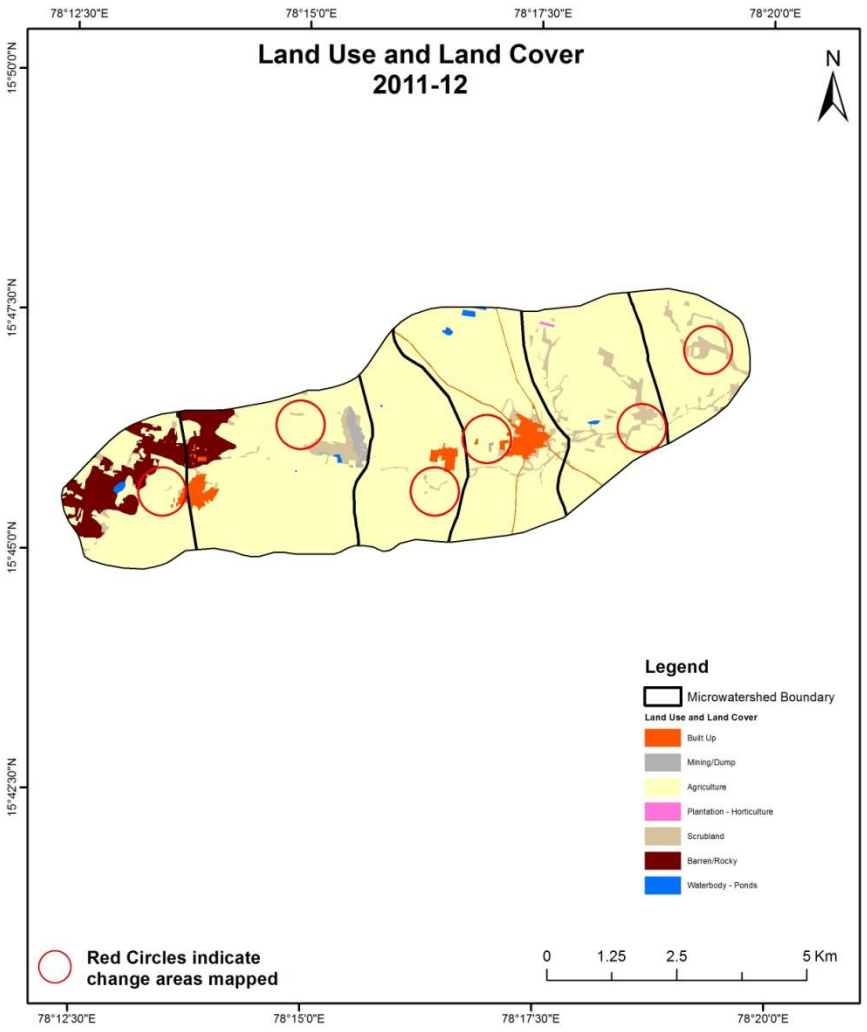
MONITORING IN THE PROJECT AREA

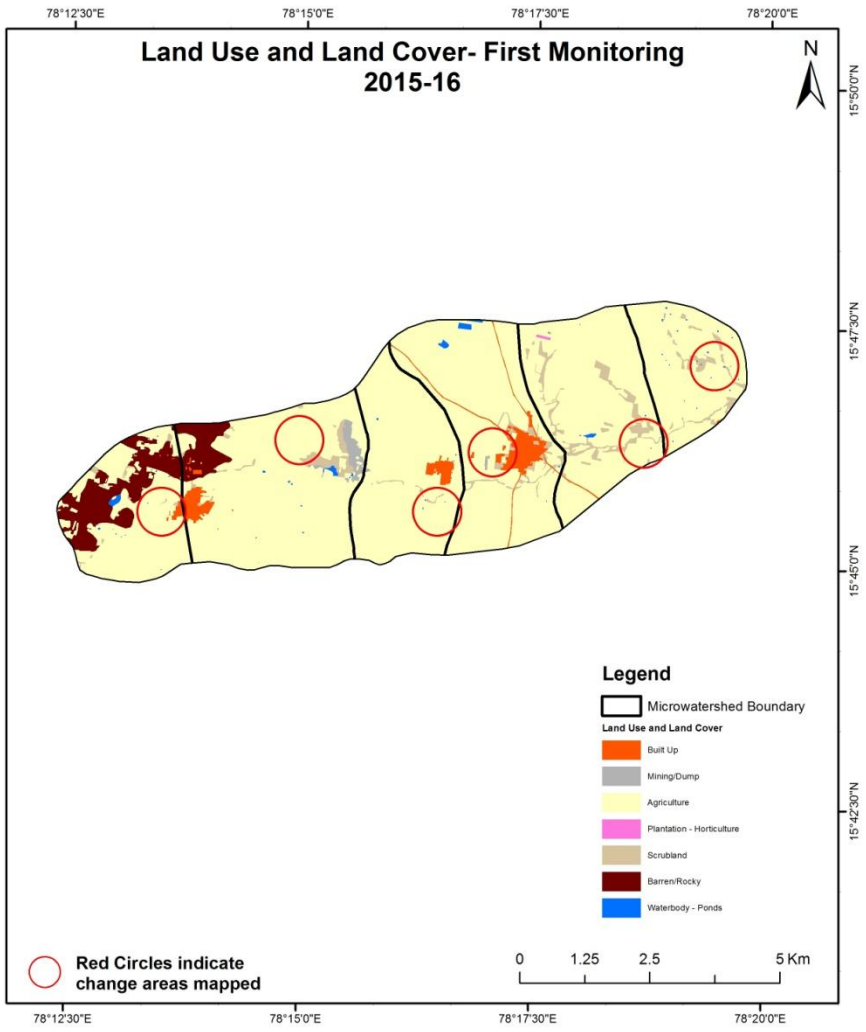
Land use and Land cover Changes in the Project

- 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)

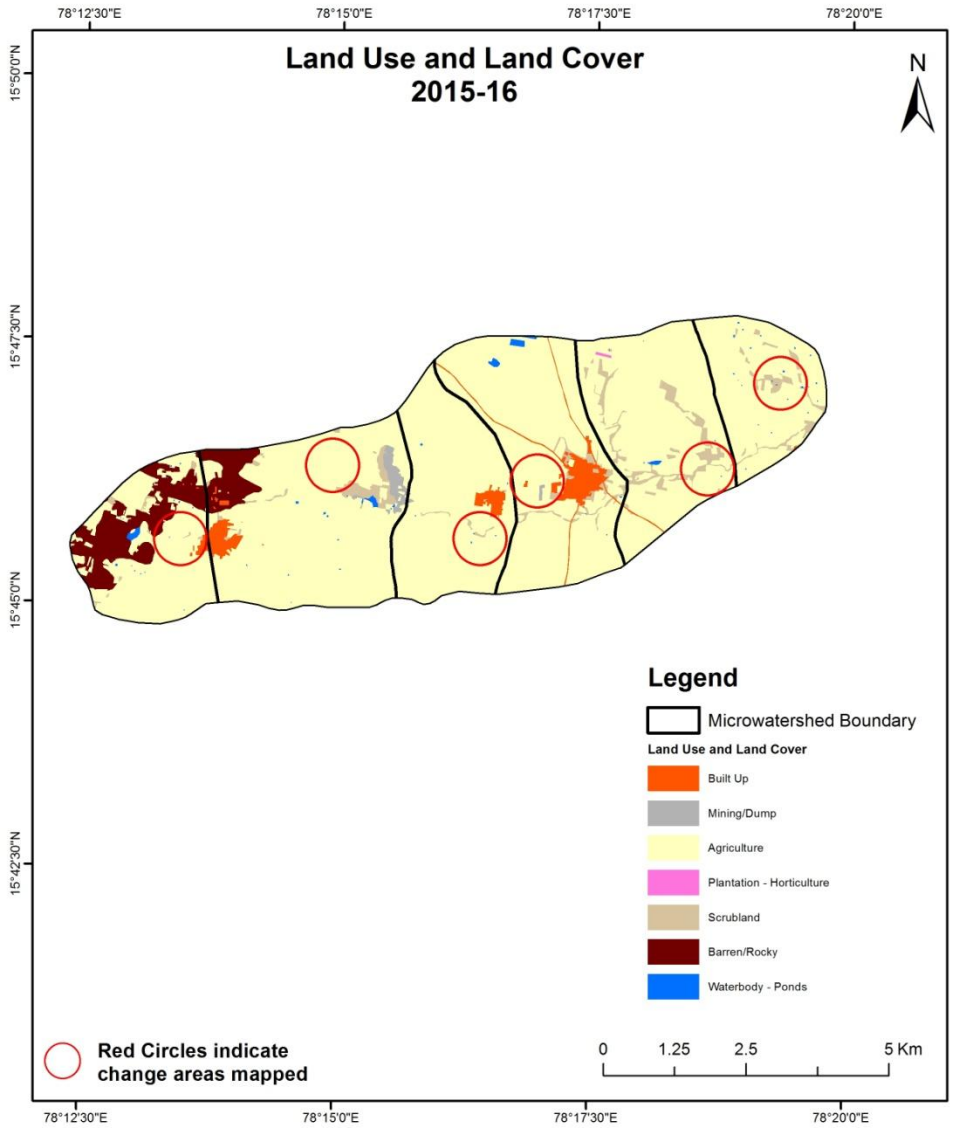
Scale: 1:10000

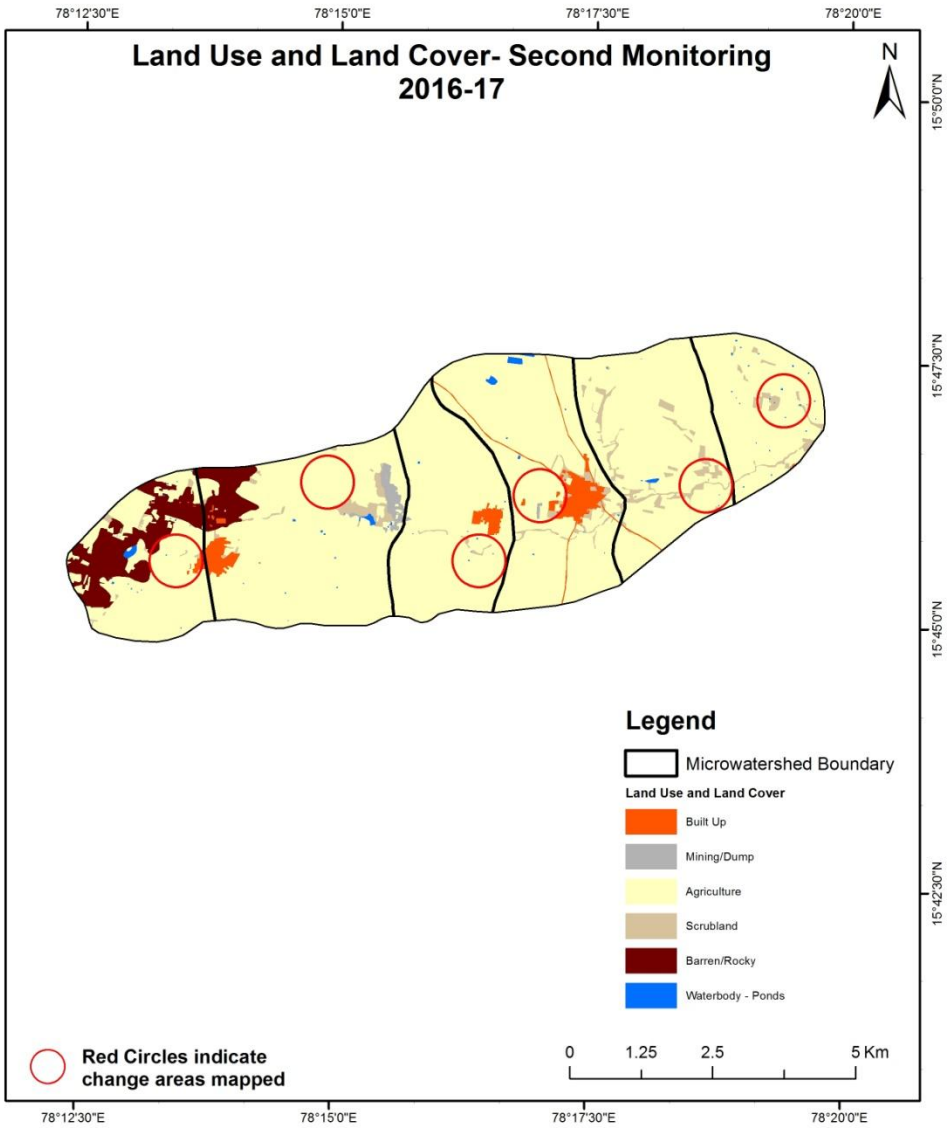




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

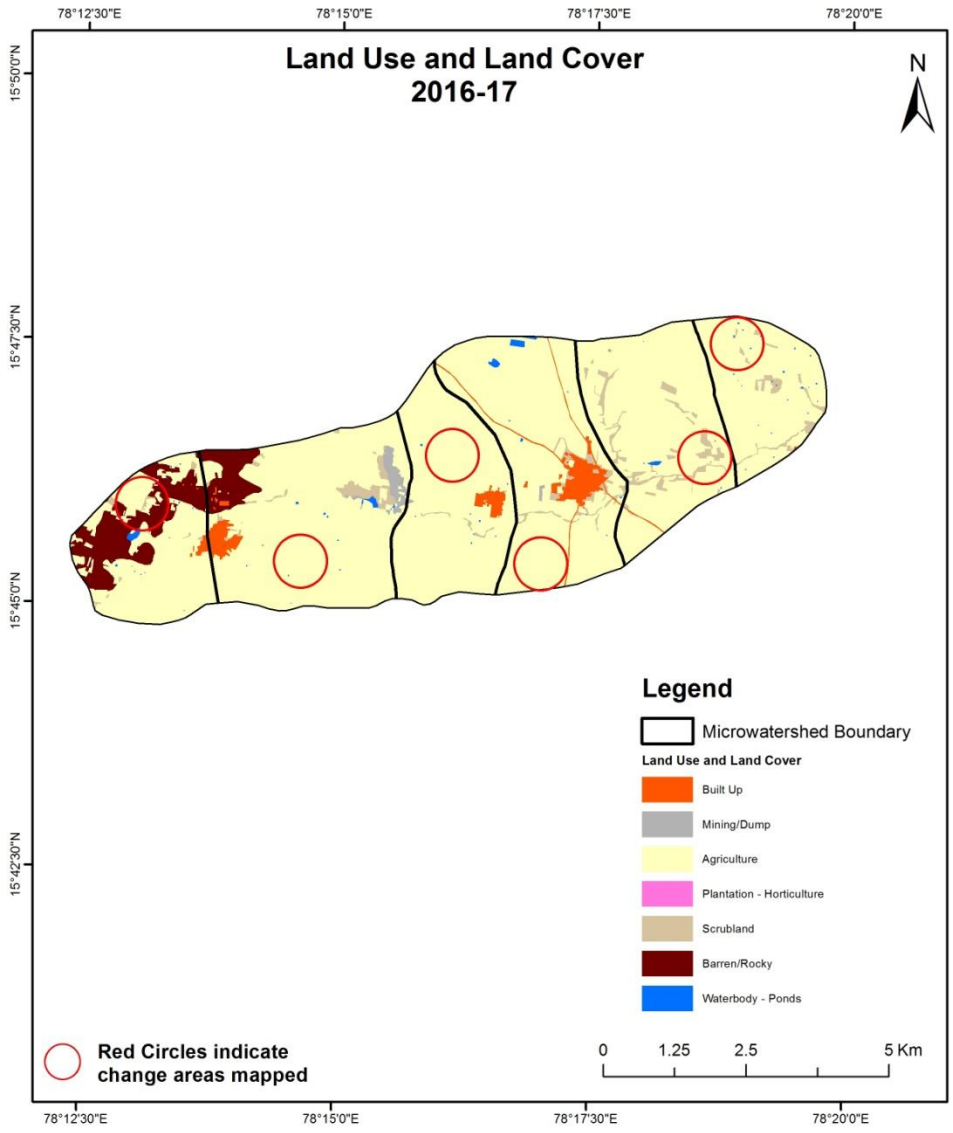
Scale: 1:10000

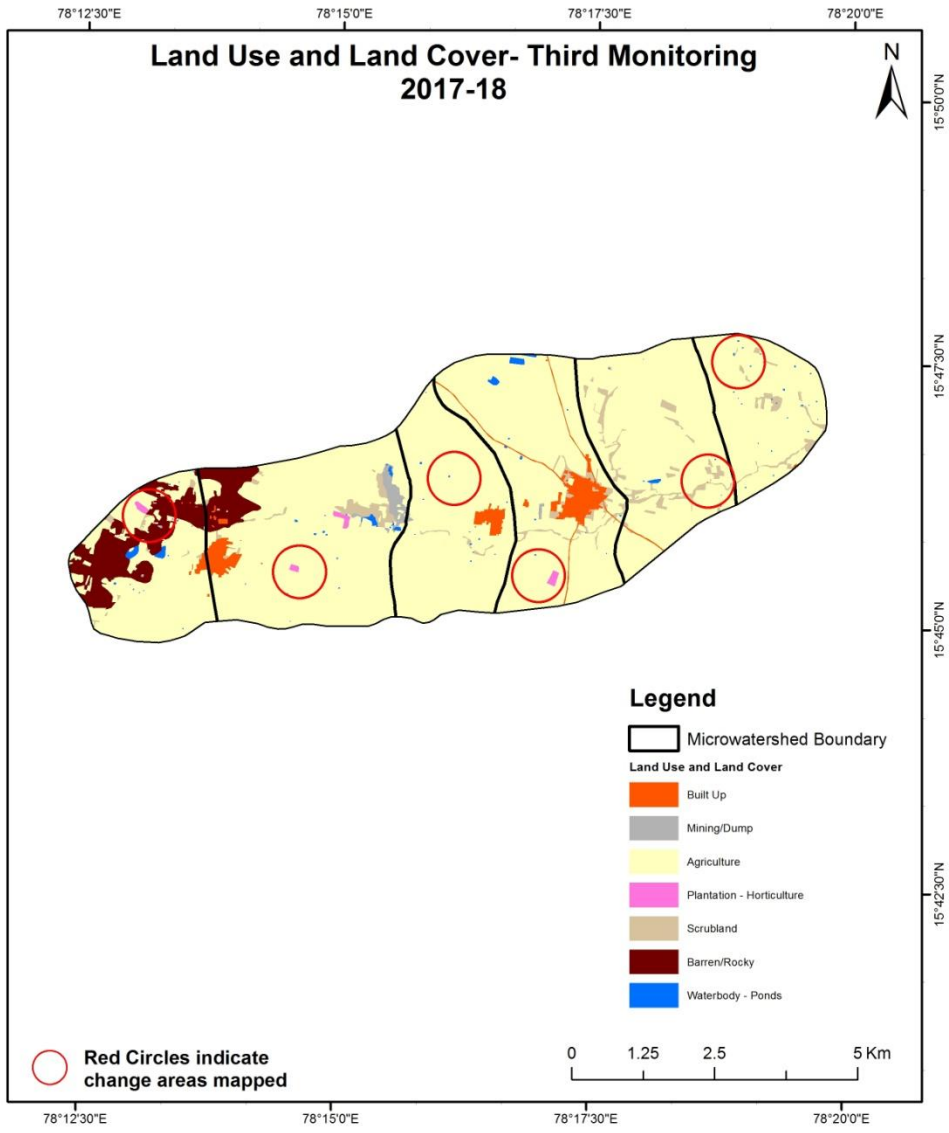




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

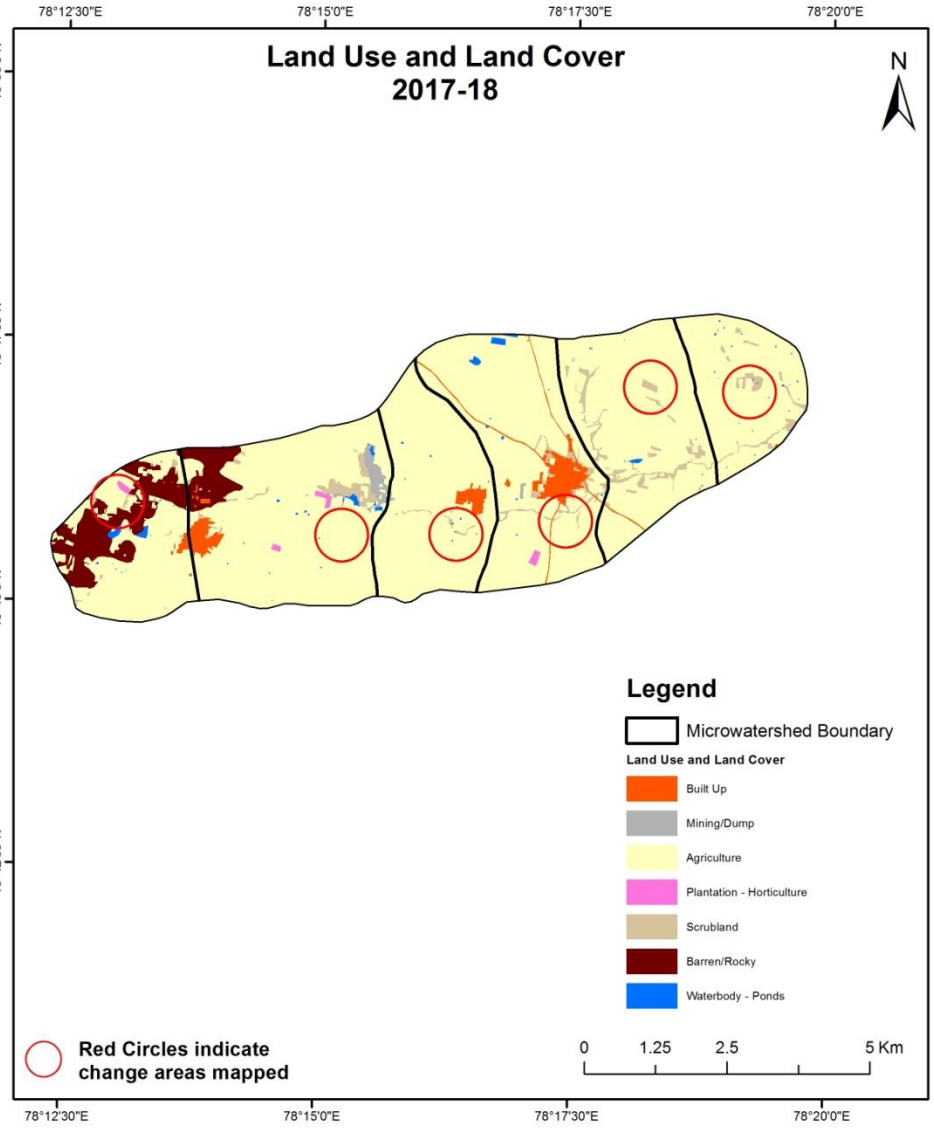
Scale: 1:10000

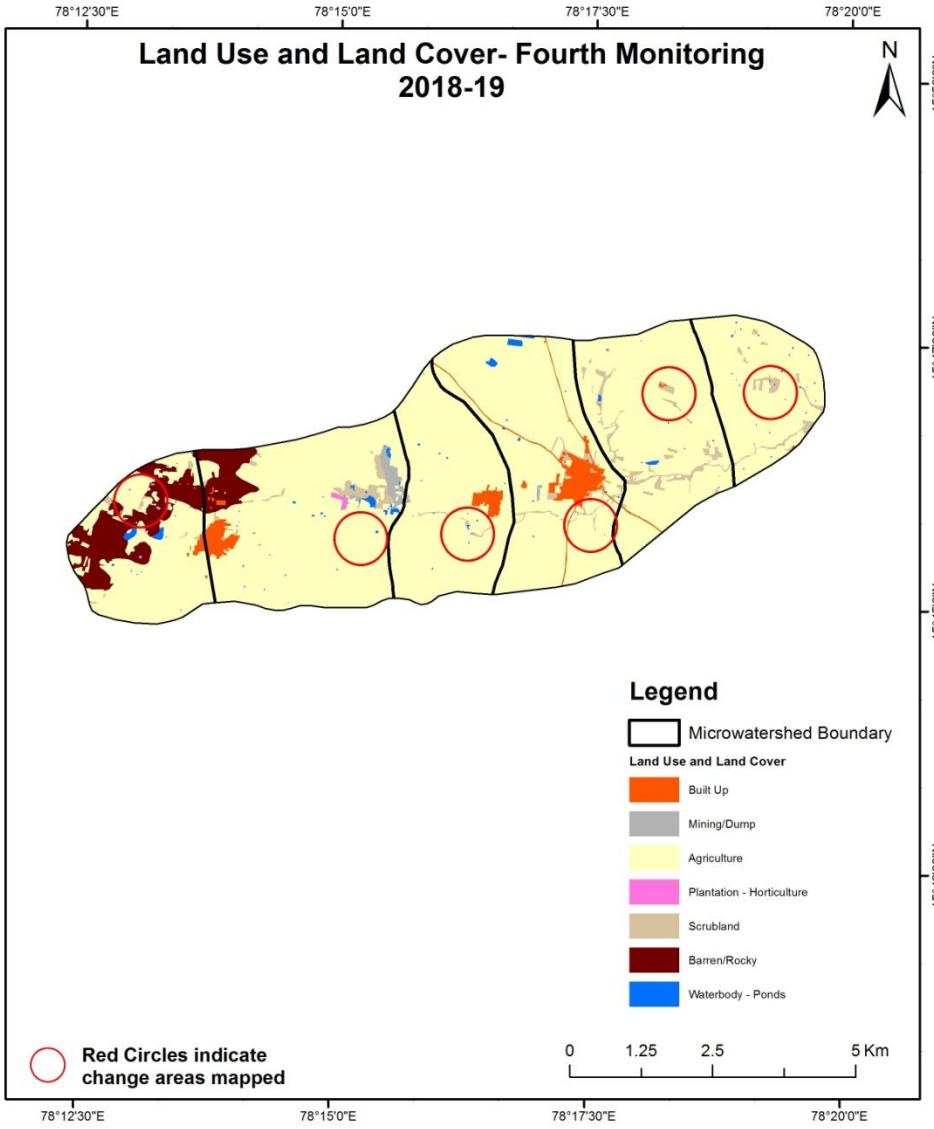




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

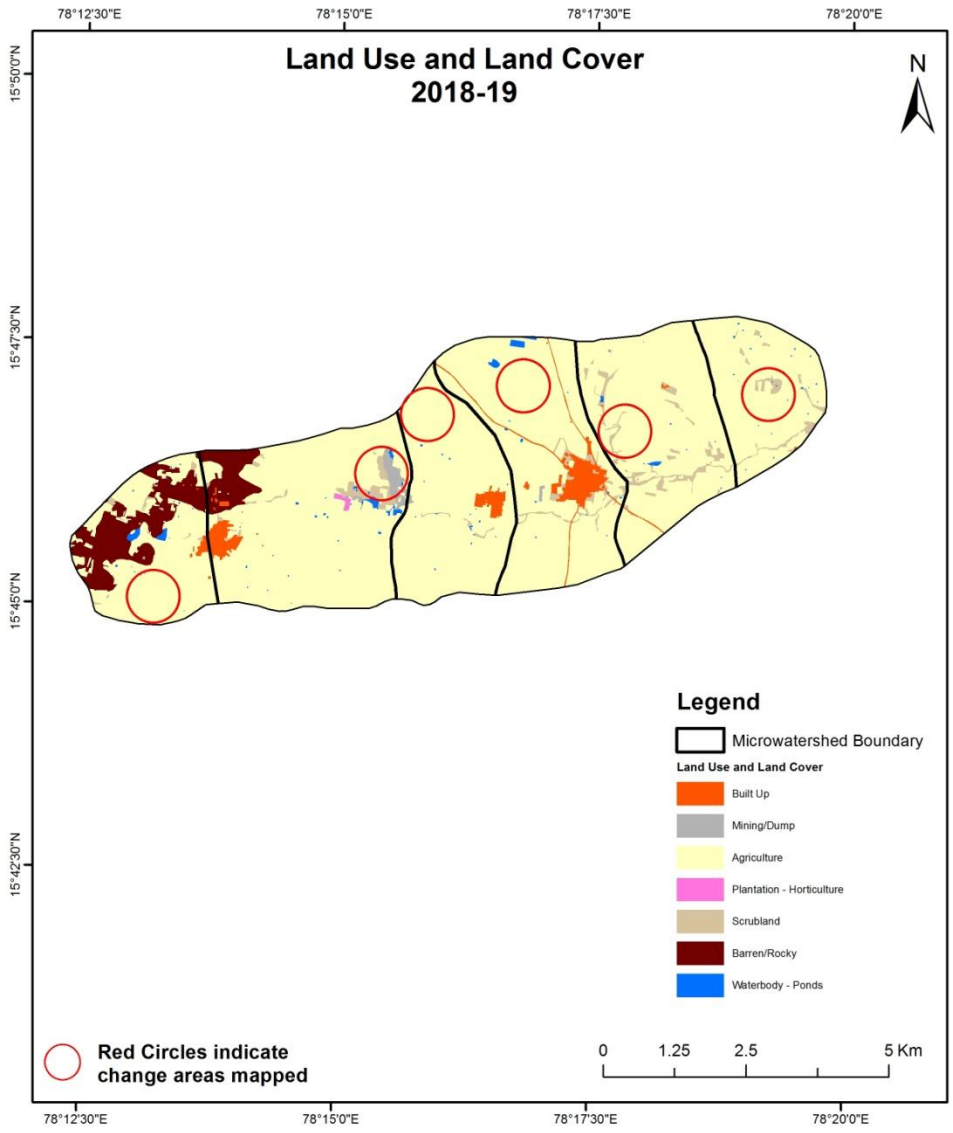
Scale: 1:10000

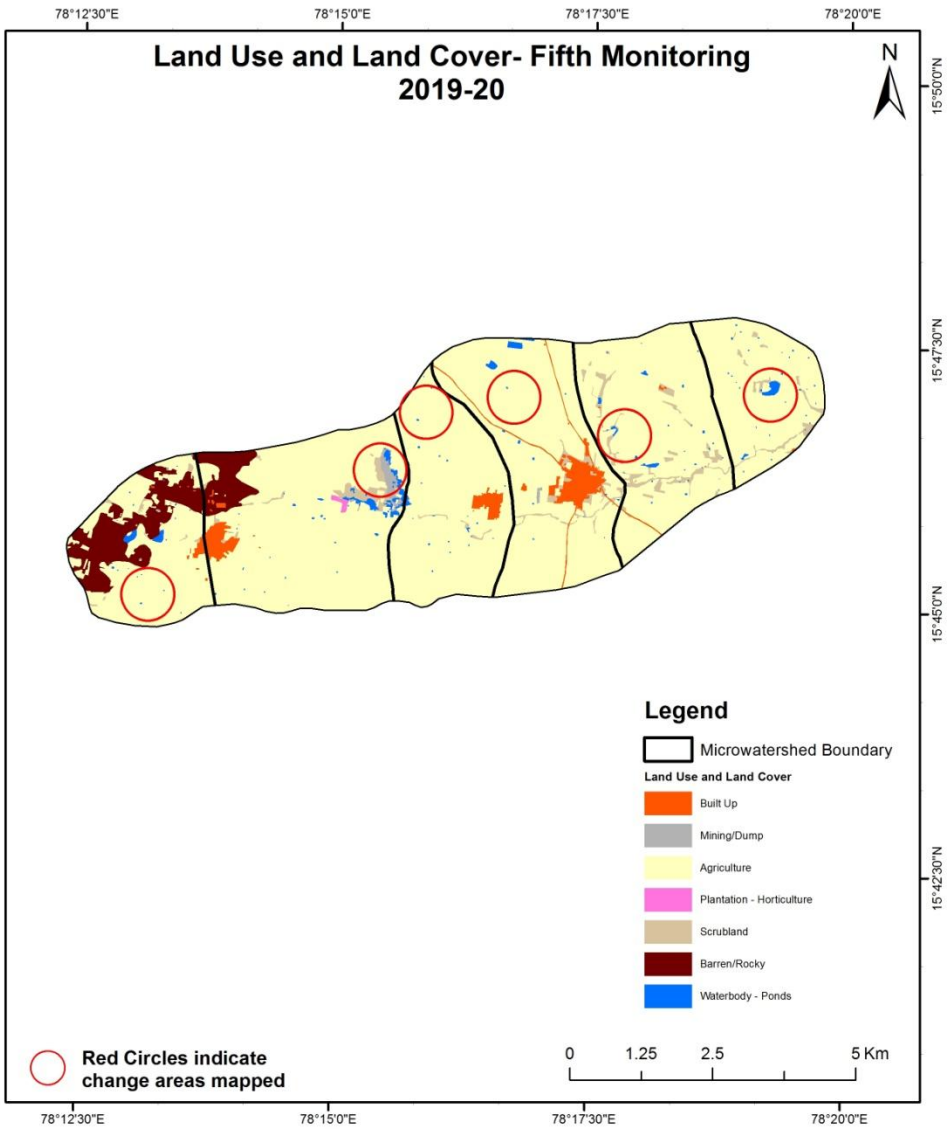




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000





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

Agriculture to water body

T1: 2015-16(78°16'23.039"E 15°45'48.777"N)

T2: 03 June 2017

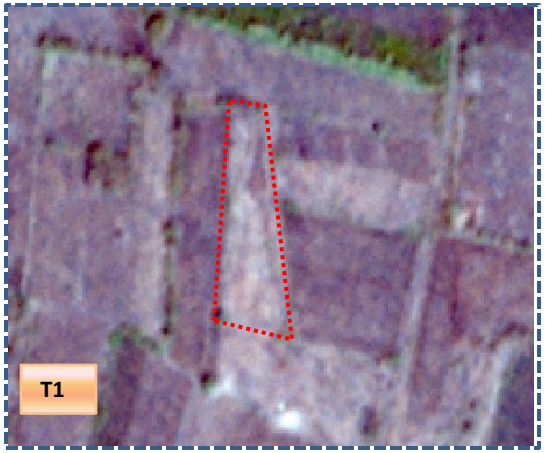
Agriculture to water body

T1: 2015-16 (78°16'56.302"E 15°45'39.999"N)

T2: 03 June 2017

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

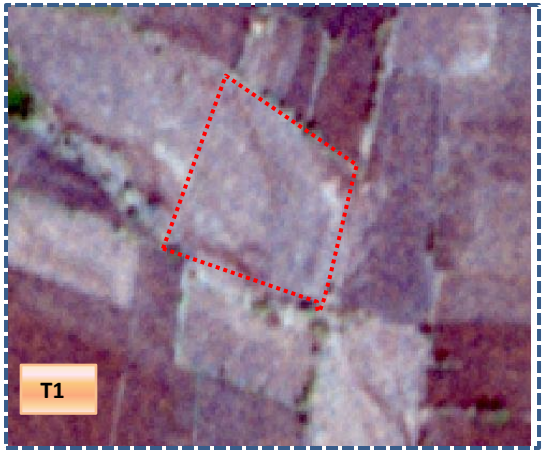
Scrub to Agriculture



T1: 2015-16(78°17'32.755"E 15°47'17.735"N)

T2: 03 June 2017

Scrub to Agriculture



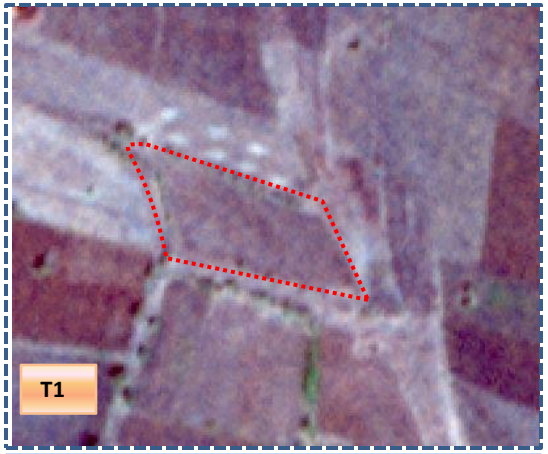
T1: 2015-16(78°18'31.304"E 15°46'46.941"N)

T2: 03 June 2017

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

Scrub to Agriculture

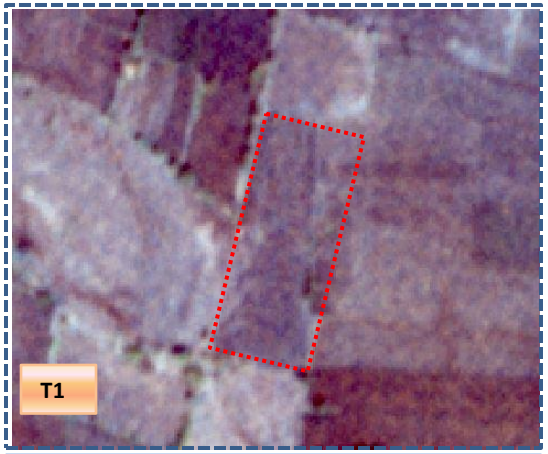
T0: 2011-12 (78°19'28.411"E 15°47'9.199"N)



T1: 14 November 2015

Scrub to Agriculture

T0: 2011-12 (78°18'35.875"E 15°46'47.16"N)



T1: 14 November 2015

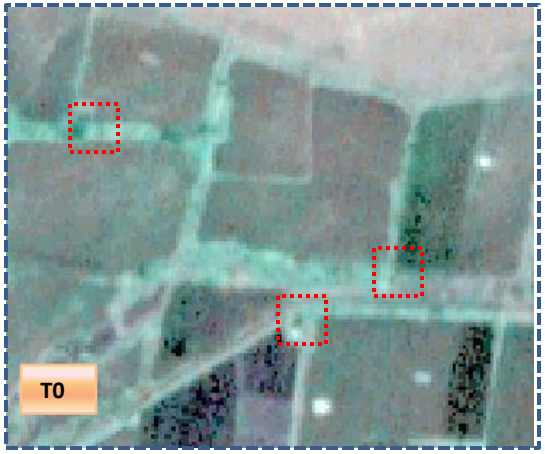
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to water body

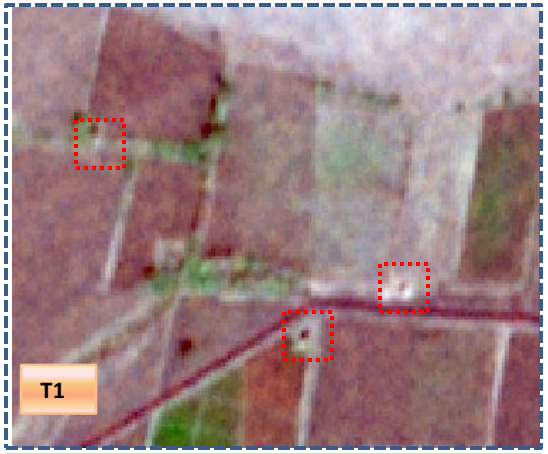
T0: 2011-12 (78°19'14.374"E 15°47'10.114"N)

T1: 14 November 2015

Agriculture to water body



T0: 2011-12 (78°13'0.74"E 15°45'17.883"N)



T1: 14 November 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	106.53										106.53
Mining/dump		24.25									24.25
Agriculture	4.50	2.57	3683.68							3.01	3693.76
Plantation Horticulture				1.35							1.35
Forest											
Forest Plantation											
Barren Rocky							247.68				247.68
Scrub	1.46		36.49					168.11		1.64	207.69
Waterbody-Streams/River											
Waterbody – Ponds			0.43							12.02	12.45
Grand Total	112.48	26.81	3720.60	1.35			247.68	168.11		16.67	4293.70

- 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 10 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T1.
- In T1 36 ha of the agriculture area has increased from 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	112.48										**112.48**
Mining/dump		26.81									**26.81**
Agriculture	0.03		3719.90							0.67	**3720.60**
Plantation Horticulture			1.35								**1.35**
Forest											
Forest Plantation											
Barren Rocky							247.68				**247.68**
Scrub			17.44					150.67			**168.11**
Waterbody-Streams/River											
Waterbody – Ponds										16.67	**16.67**
Grand Total	**112.51**	**26.81**	**3738.69**				**247.68**	**150.67**		**17.33**	**4293.70**

- 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 0.7 ha of the agriculture area has decreased and it is converted into Built-up and water body in T2.
- In T2 18.7 ha of the agriculture area has increased from plantations 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-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	112.51										**112.51**
Mining/dump		25.13								1.68	**26.81**
Agriculture	0.98	0.55	3722.26	11.10				0.58		3.22	**3738.69**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky		0.52					247.16				**247.68**
Scrub	1.21	0.04	8.48	0.16				140.76		0.03	**150.67**
Waterbody-Streams/River											
Waterbody – Ponds										17.33	**17.33**
Grand Total	**114.70**	**26.24**	**3730.74**	**11.26**			**247.16**	**141.34**		**22.27**	**4293.70**

- 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 15 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations, scrubland and water body in T3.
- In T3 8.4 ha of the agriculture area has increased from scrubland area 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	114.70										**114.70**
Mining/dump		25.52								0.72	**26.24**
Agriculture	0.15	0.71	3728.54							1.34	**3730.74**
Plantation Horticulture			7.57	3.69							**11.26**
Forest											
Forest Plantation											
Barren Rocky		0.12					247.04				**247.16**
Scrub	0.95		4.49					134.18		1.71	**141.34**
Waterbody-Streams/River											
Waterbody – Ponds										22.27	**22.27**
Grand Total	**115.80**	**26.35**	**3740.60**	**3.69**			**247.04**	**134.18**		**26.04**	**4293.70**

- 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 2.2 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T4.
- In T4 12 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	115.80										**115.80**
Mining/dump		17.88								8.47	**26.35**
Agriculture	0.24		3734.87							5.50	**3740.60**
Plantation Horticulture				3.69							**3.69**
Forest											
Forest Plantation											
Barren Rocky							247.04				**247.04**
Scrub	0.24		2.81					124.72		6.42	**134.18**
Waterbody-Streams/River											
Waterbody – Ponds										26.04	**26.04**
Grand Total	**116.28**	**17.88**	**3737.68**	**3.69**			**247.04**	**124.72**		**46.42**	**4293.70**

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

•In T5 2.8 ha of the agriculture area has increased from scrubland area 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 33 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 26, 18 & 09 Hectares from T0 to T1, T1-T2 & T3-T4 respectively, there is a decrease of 7.9 & 2 hectares from T2-T3 & T4-T5 and overall increase of 43 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 2.3 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 82 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (26) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (26) verified from the portal.