MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -28/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
July-2021

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

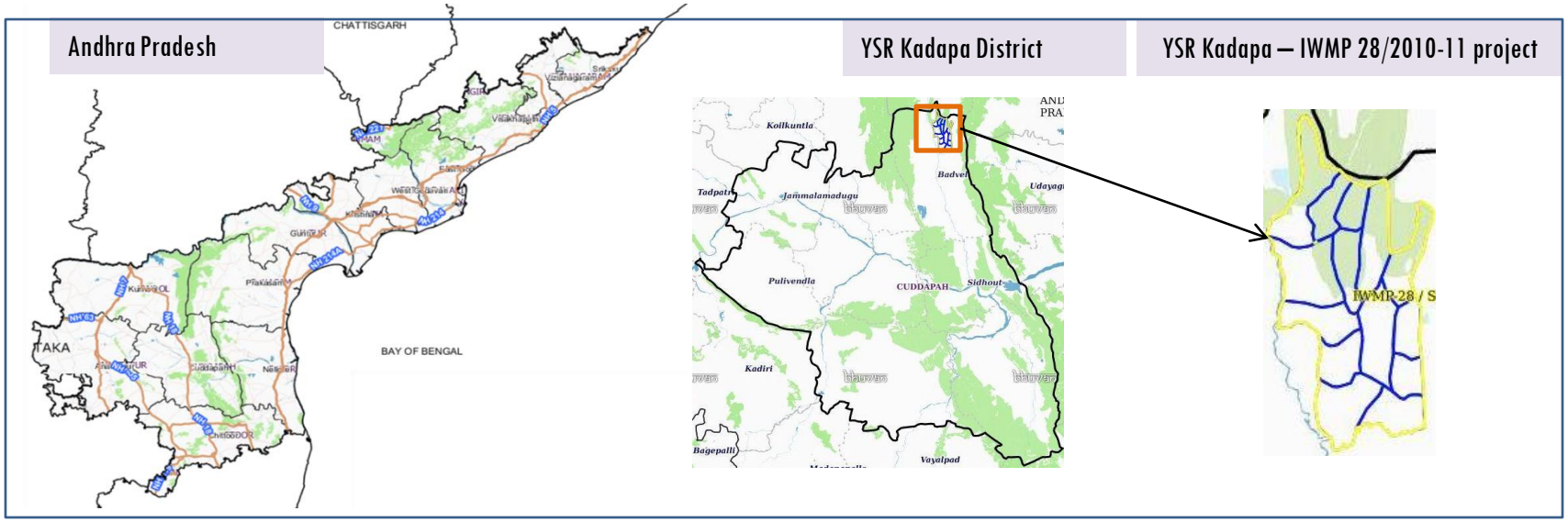
CONTENTS

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-28/2010-11, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 9,983 ha. It comprises of 15 micro watersheds.
- In the project area 455 Drishti photos were uploaded showing check dams/Rock fill dam, boulder removal, farm ponds, dug out pits etc, and remaining showing other activities.
- Water bodies have shown an decrease by 07 ha ,which correspond to the various bodies that have been
- converted into other land use classes in this period.
- Major percentage i.e. 40 % is covered by the agriculture, 32 % is covered by forest, 18 % is scrubland area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-28/2010-11
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Kalasapadu Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 9,983 ha. It comprises of 15 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (***Batch -1***) projects taking 2018-19 (T5) period satellite images



- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .
- The average annual rainfall of the YSR Kadapa District is 710 mm, which ranges from nil rainfall in January to 137 mm in October. October is the wettest month of the year. The mean seasonal rainfall distribution is 402.4 mm in southwest monsoon (June - September), 239.1 mm in northeast monsoon (October – December), distribution of rainfall in season wise 56.7 % in south west monsoon, 33.7 % in north east monsoon period.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			25-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			25-Mar-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	455
4	Detailed Project Report		

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

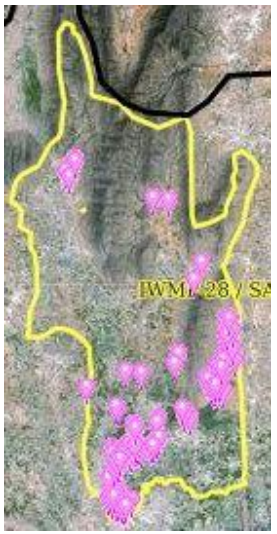
Legend

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/horticulture	3	3
2	Afforestation	2	2
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	12	10
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	29	20
11	Civil work-Check dams /Rock fill dam	27	20
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	0	0
18	Others	600	400
	TOTAL	**673**	**455**

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 (2010-11) and T5 is 2018-19 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 – 2010-11 to 2018-19

Natural Color Composite- 2009-10

Source:Fusion data,NRSC

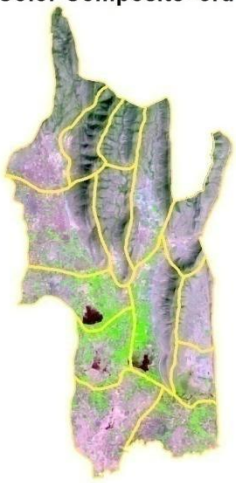
Natural Color Composite- 8th November 2012

Source:Liss IV,NRSC

Natural Color Composite- 5th April 2016

Source:Fusion data,NRSC

Natural Color Composite- 3rd February 2017



Sentinel-II Data

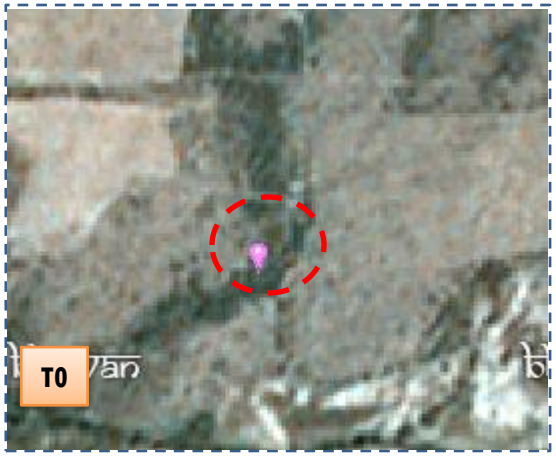
Natural Color Composite- 30th March 2018

Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019

Sentinel-II Data

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-28/2010-11



T0: 2010-11

T1: 05 June 2014

Drishti Sl no. 162884 MWS : 4C3C2h1e

Farm pond

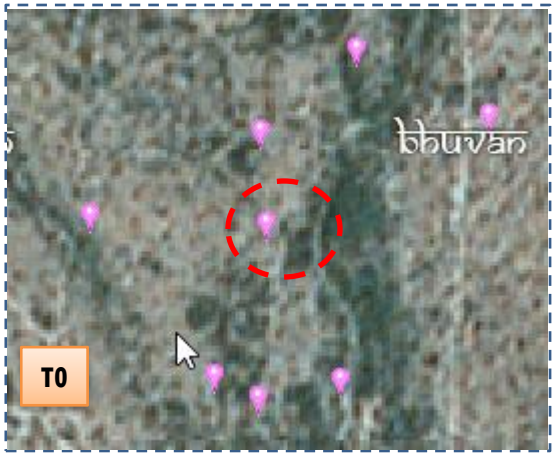
T0: 2010-11

T1: 05 June 2014

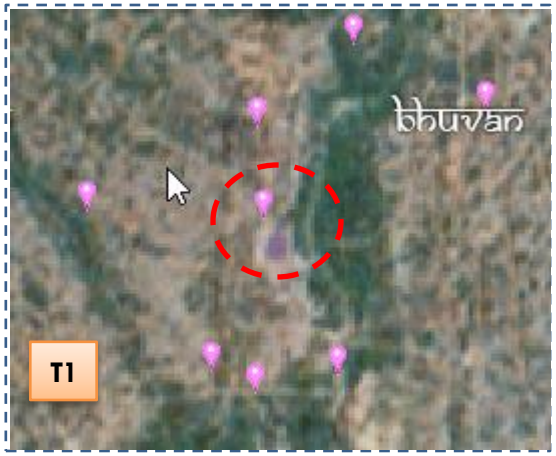
Drishti Sl no. 2040228 MWS :-4C3C2h2a

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-28/2010-11



T0: 2010-11



T1: 05 June 2014

Drishti Sl no. 1888498 MWS : 4C3C2h2a

Farm pond

T0: 2010-11

T1: 05 June 2014

Drishti Sl no. 162850 MWS : 4C3C2h2a

Farm pond

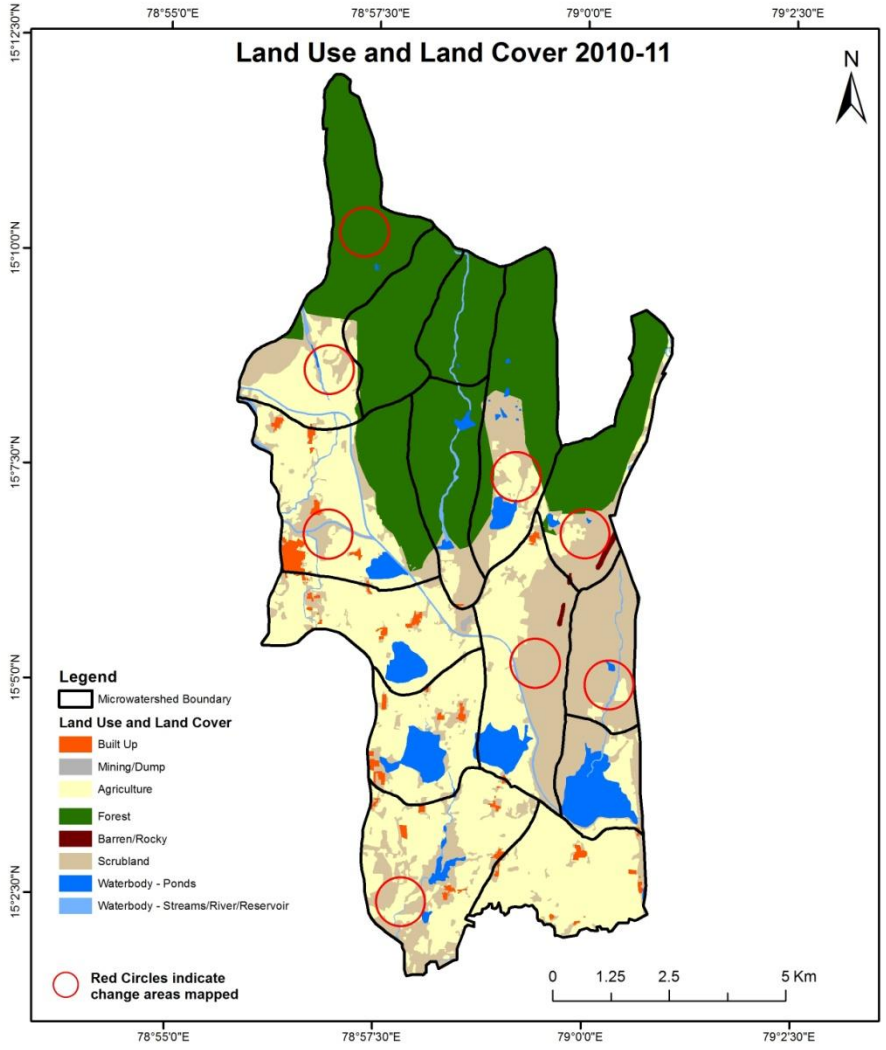
MONITORING IN THE PROJECT AREA

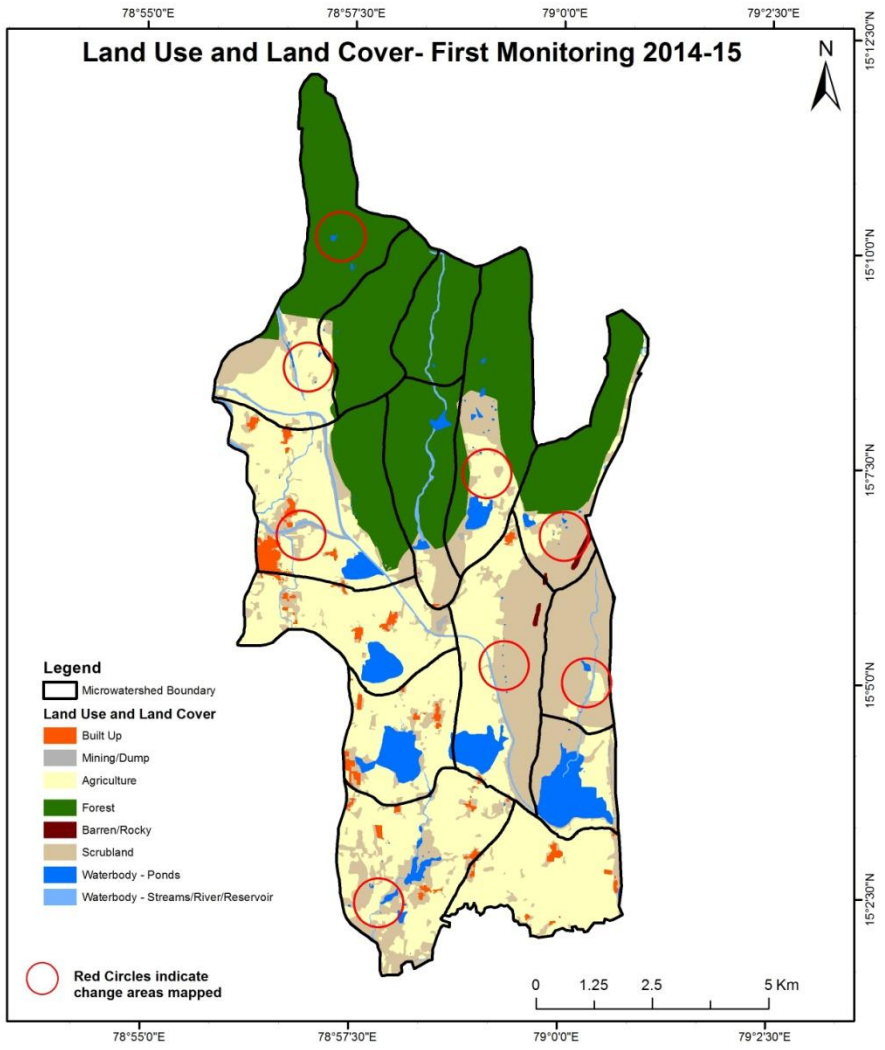
Land use and Land cover Changes in the Project

- 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 (2010-11) and row represents the T5 (2018-19)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

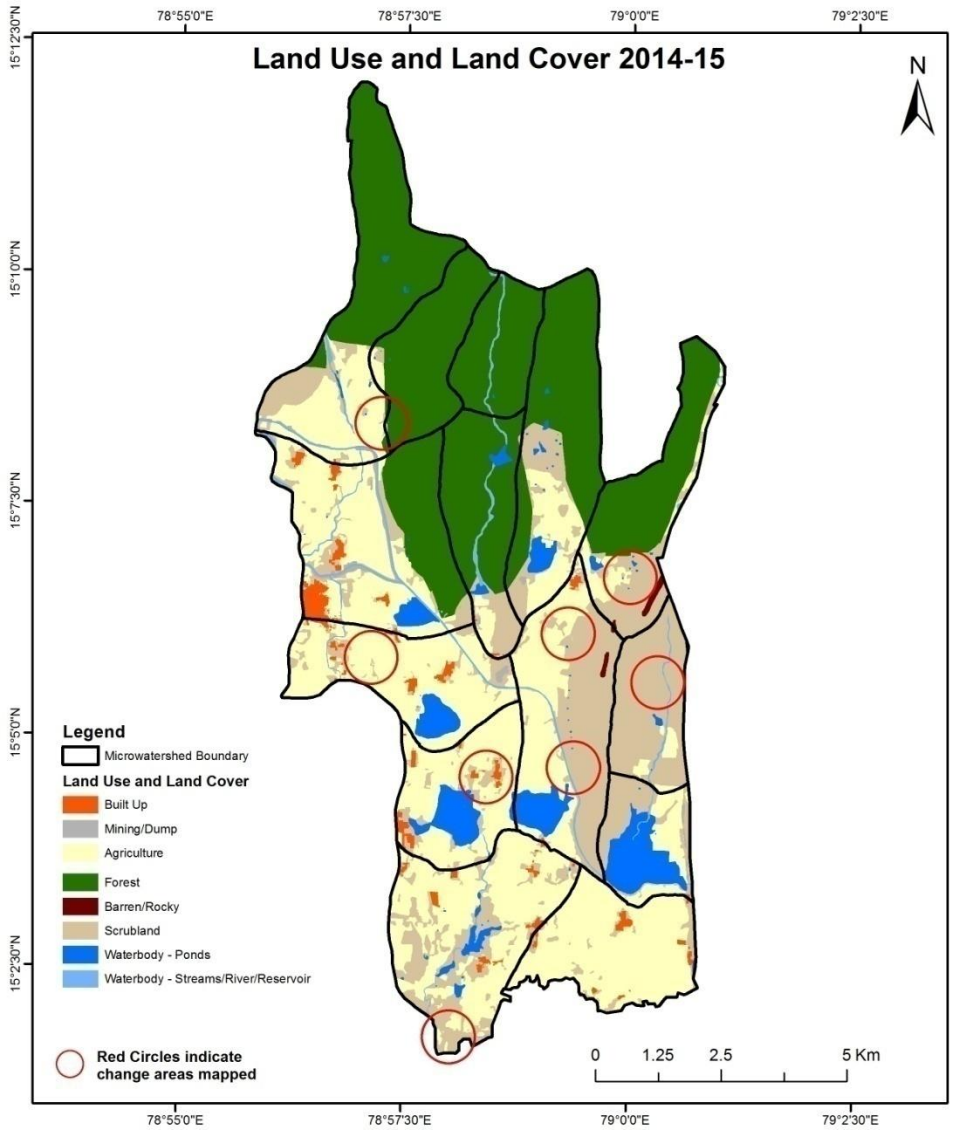
Scale: 1:10000

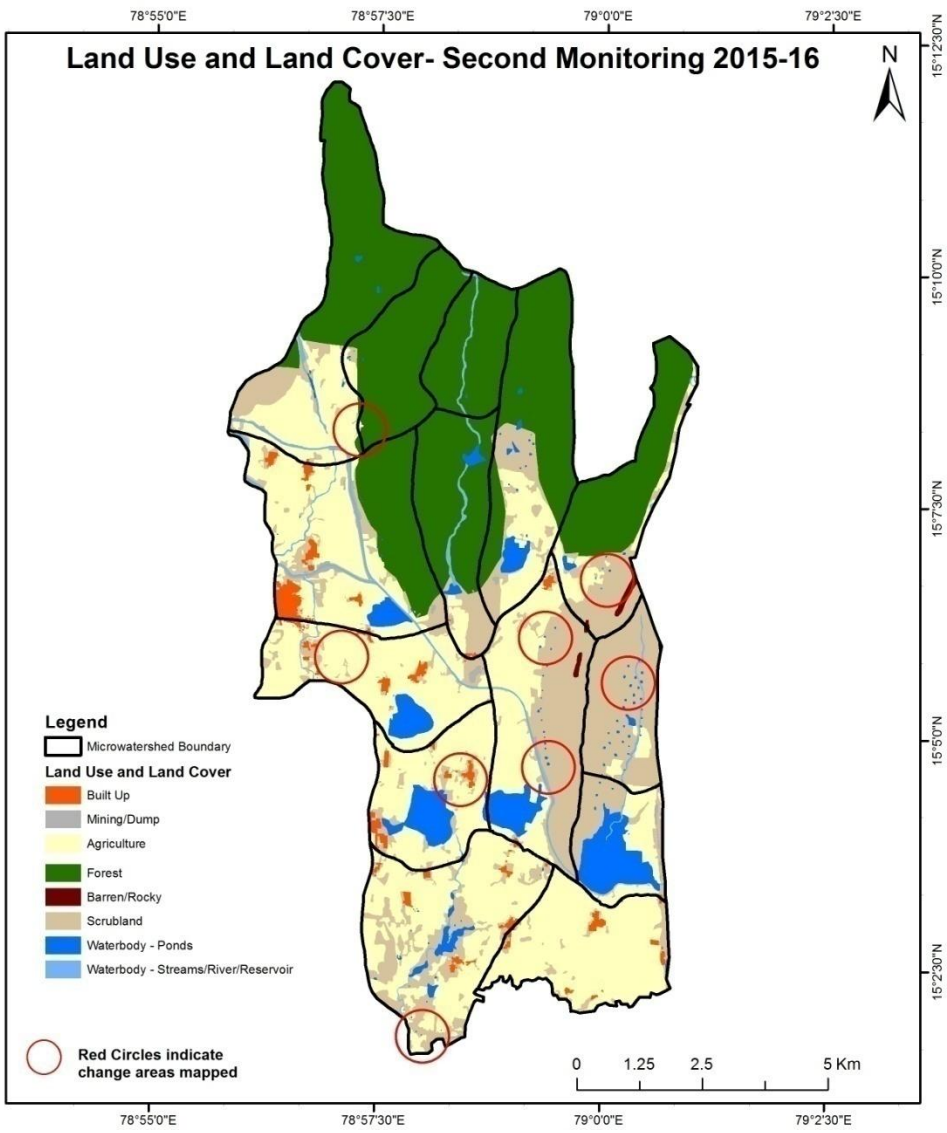




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

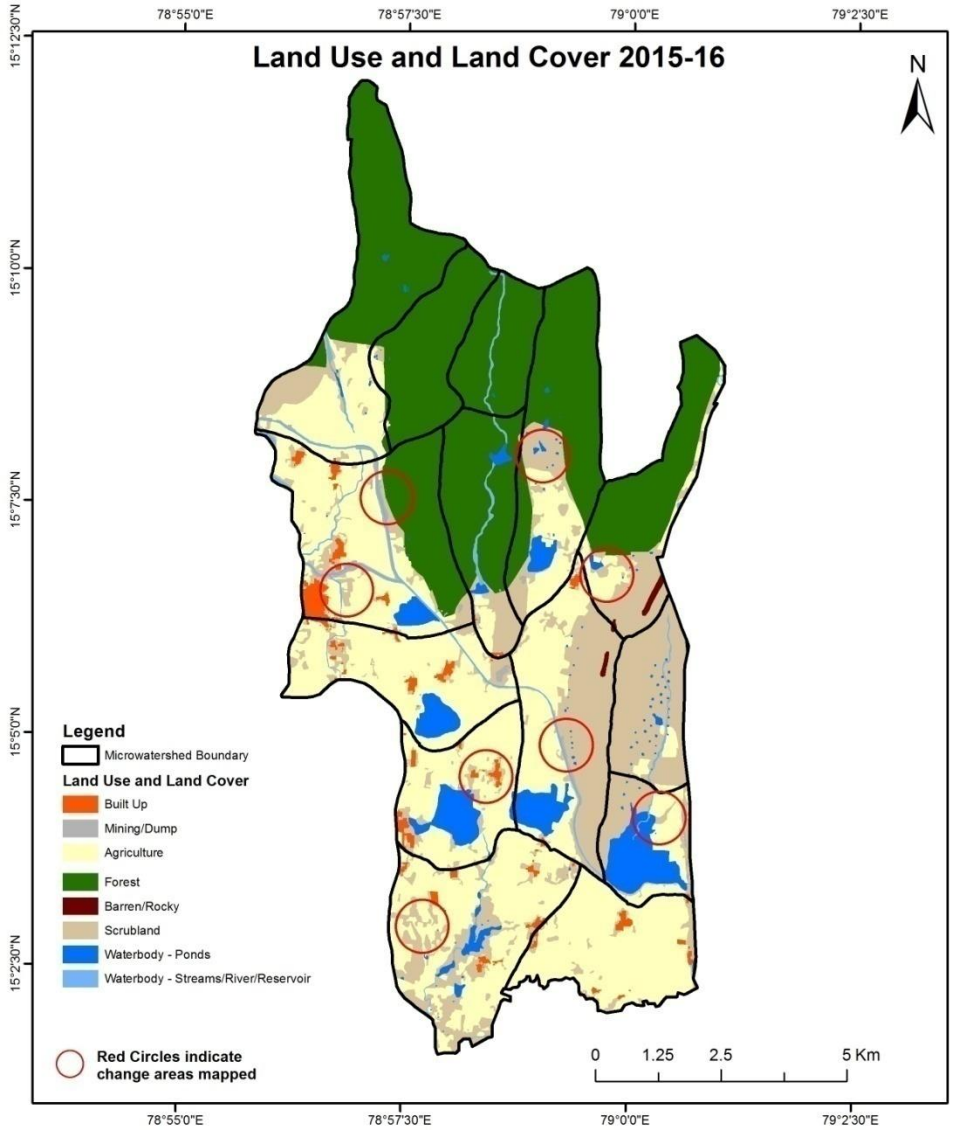
Scale: 1:10000

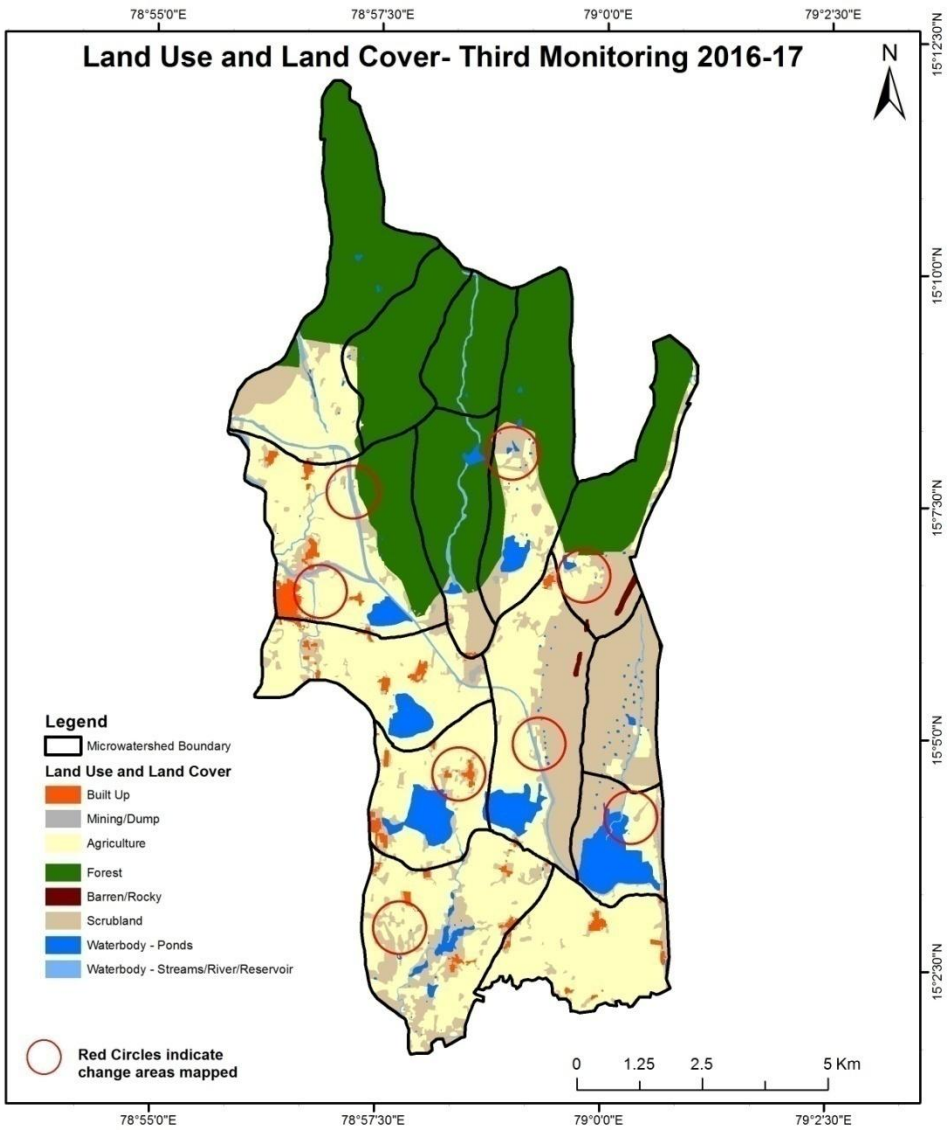




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

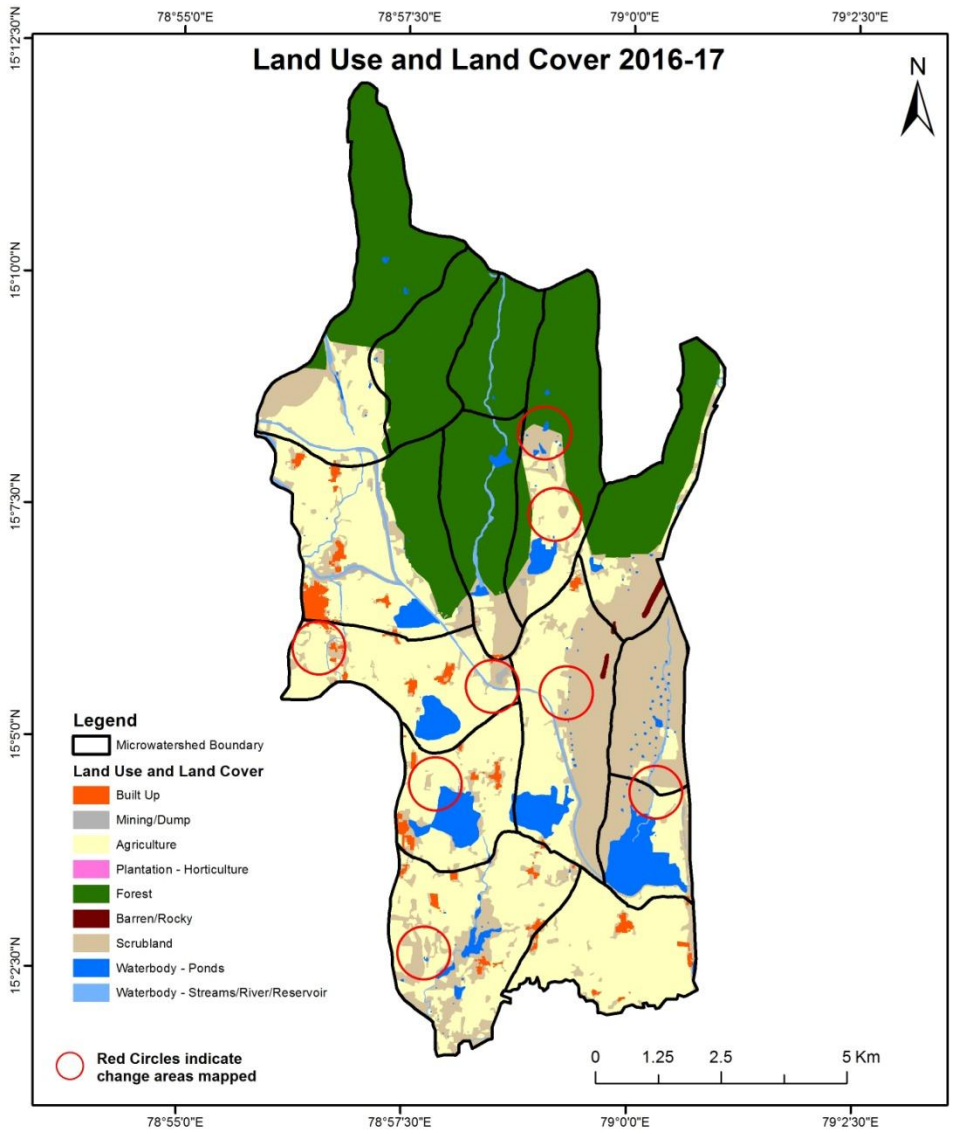
Scale: 1:10000

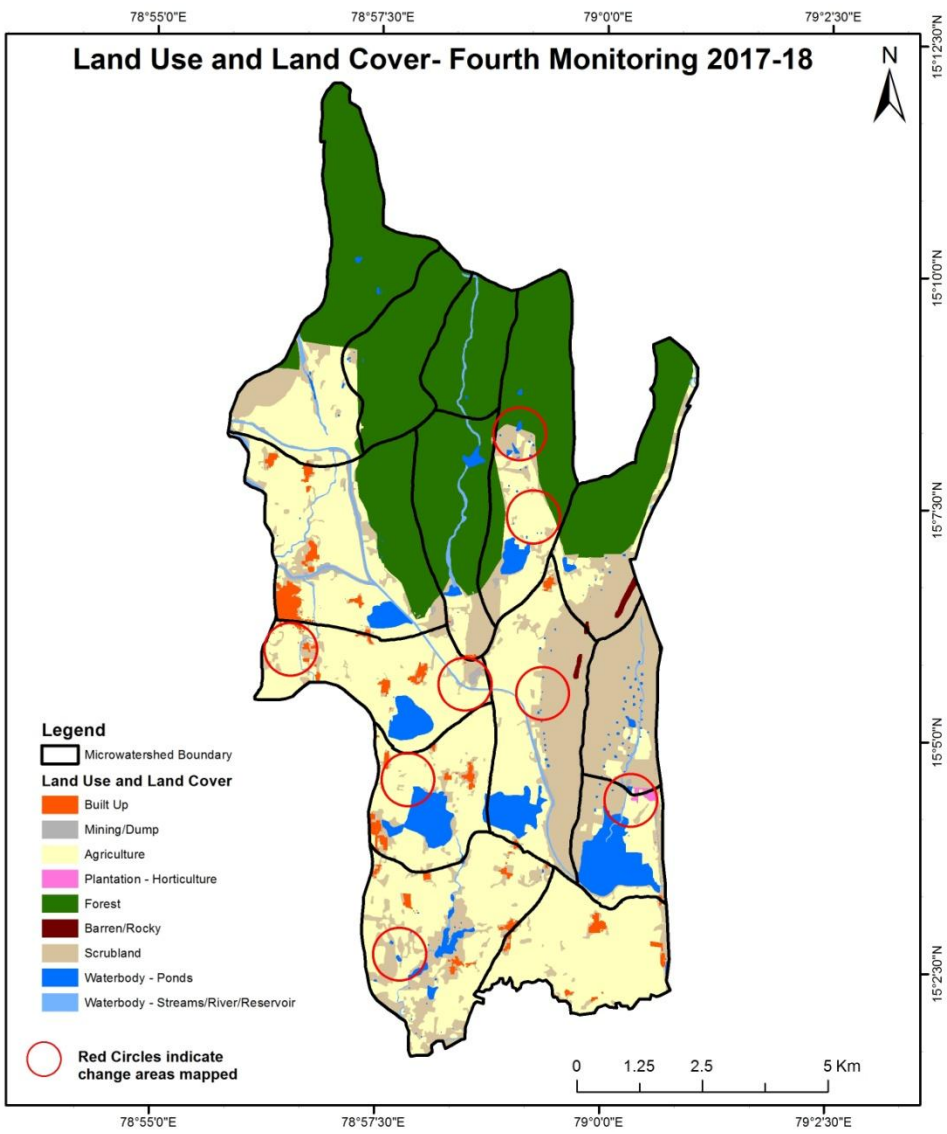




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

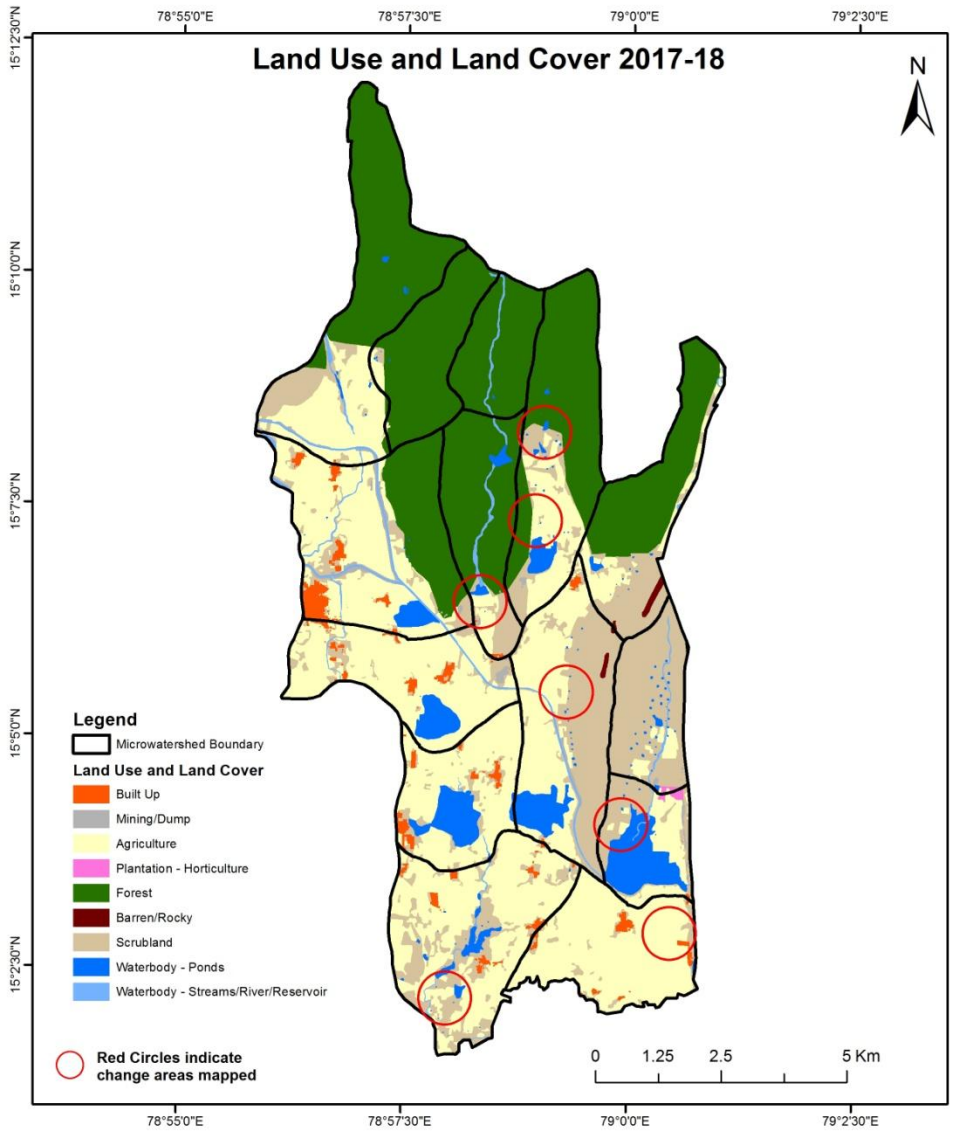
Scale: 1:10000

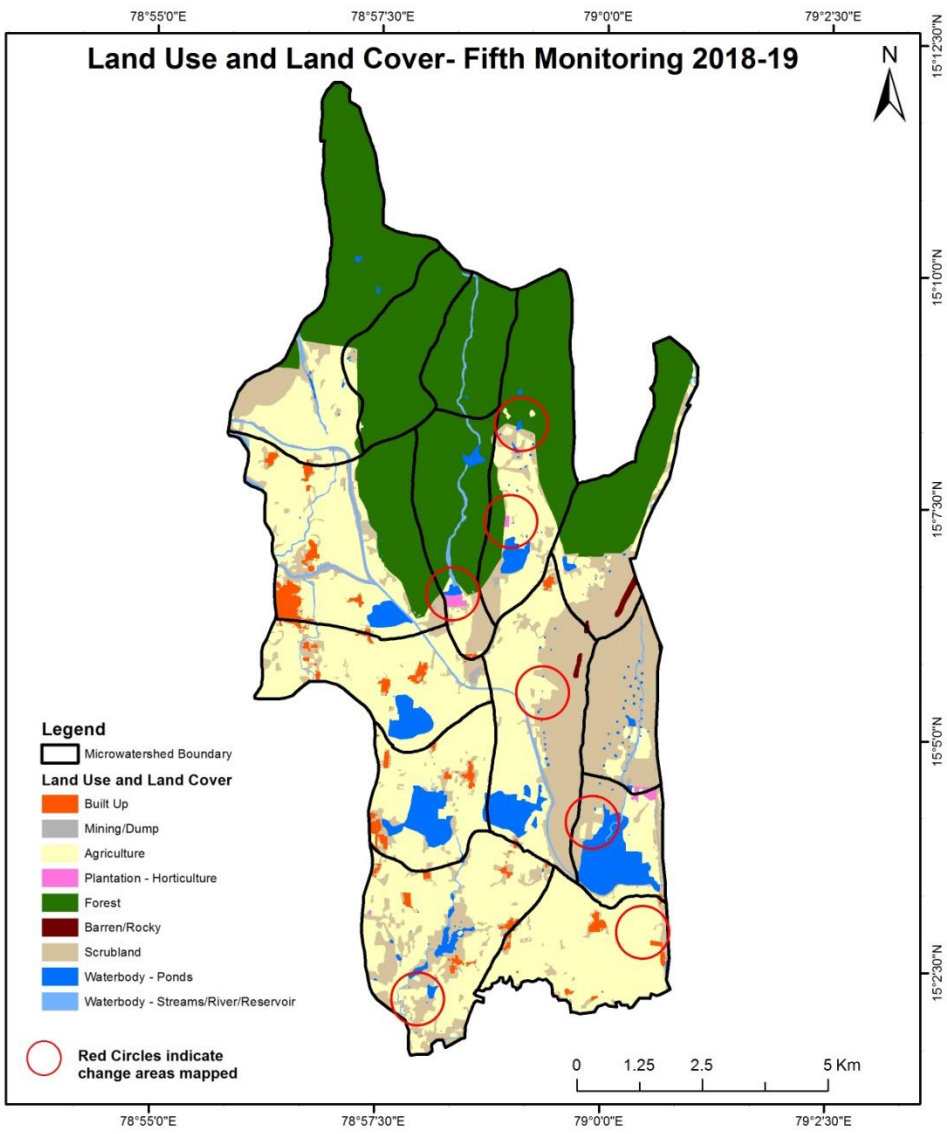




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

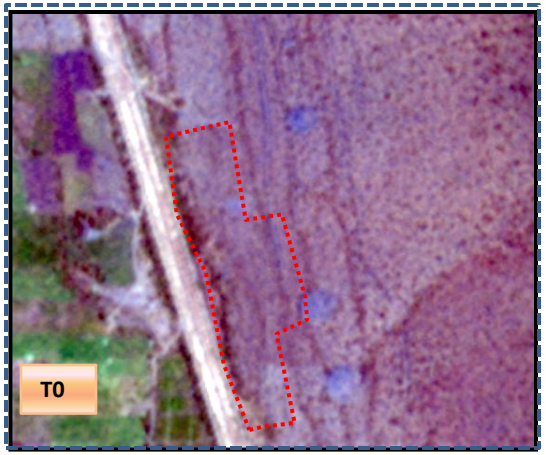
Scale: 1:10000



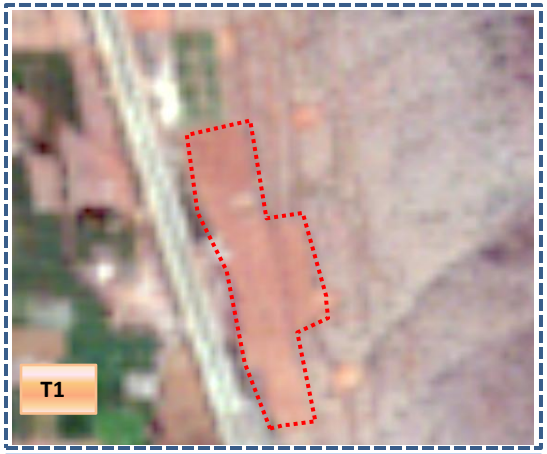


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

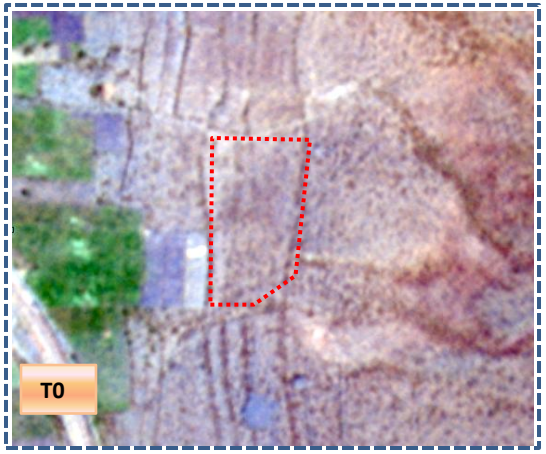


T0: 2015-16(78°59'19.374"E 15°4'49.017"N)

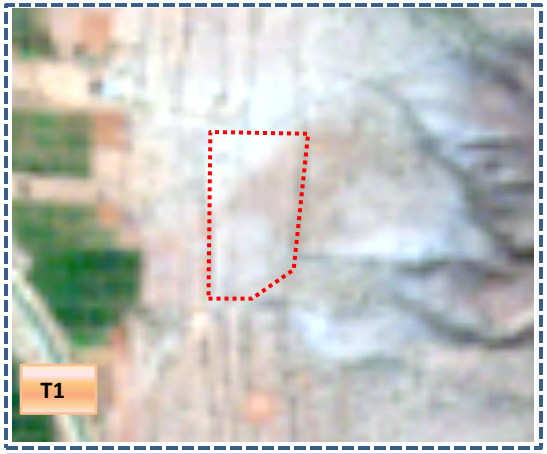


T1: 03 Feb 2017

Scrub to Agriculture



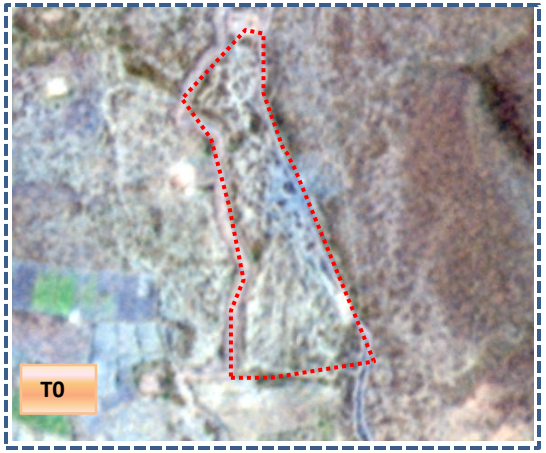
T0: 2015-16(78°59'15.434"E 15°5'26.579"N)



T1: 03 Feb 2017

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

Scrub to Agriculture

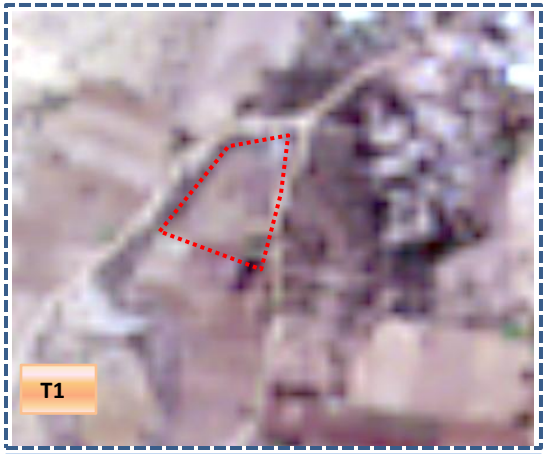


T0: 2015-16(78°59'11.416"E 15°7'52.989"N)

T1: 03 Feb 2017

Scrub to Agriculture

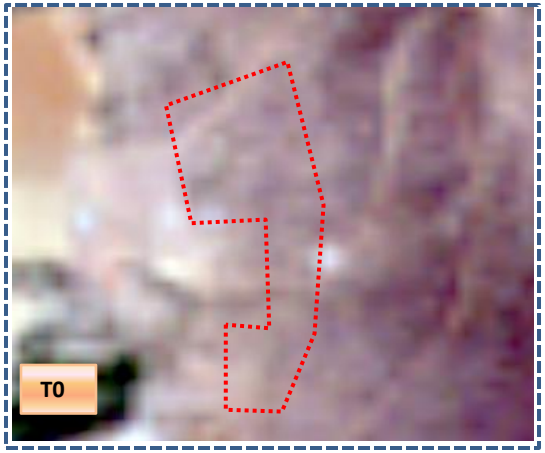
T0: 2015-16(78°58'14.495"E 15°2'29.658"N)



T1: 03 Feb 2017

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

Scrub to Agriculture

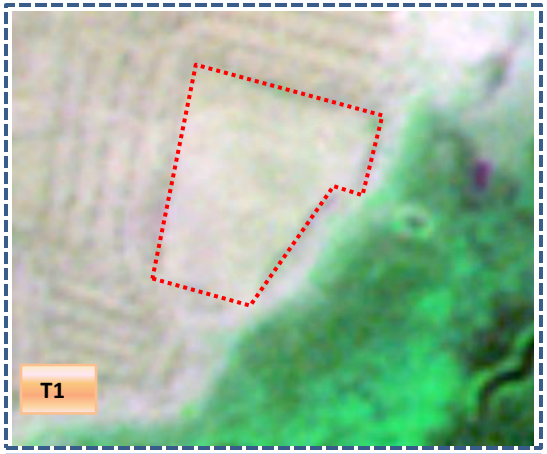


T0: 2016-17(78°58'29.764"E 15°6'26.686"N)

T1: 30 March 2018

Scrub to Agriculture

T0: 2016-17(78°59'55.98"E 15°4'2.468"N)



T1: 30 March 2018

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

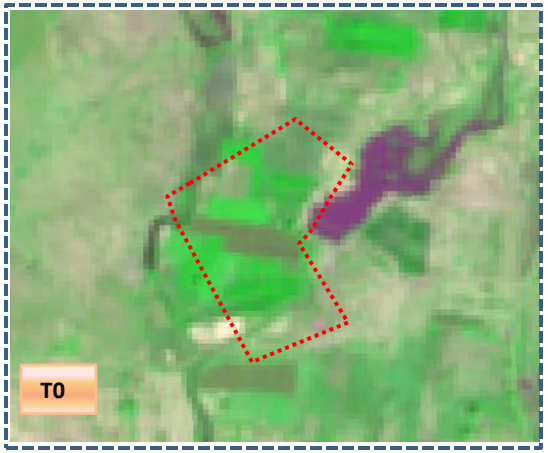
Scrub to Agriculture

T0: 2010-11

T0: 05 June 2014

Agriculture to Water body

T0: 2010-11



T0: 05 June 2014

Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15

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	132.43										**132.43**
Mining/dump		5.49									**5.49**
Agriculture	12.58	14.51	3699.00					0.71		5.45	**3732.25**
Plantation Horticulture											
Forest			5.34		3223.88					2.04	**3231.26**
Forest Plantation											
Barren Rocky							16.75				**16.75**
Scrub	8.20	17.46	111.44					2076.31		5.66	**2219.07**
Waterbody-Streams/River									148.28		**148.28**
Waterbody – Ponds			12.62							485.64	**498.26**
Grand Total	**153.21**	**37.46**	**3828.40**		**3223.88**		**16.75**	**2077.03**	**148.28**	**498.79**	**9983.80**

- 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 33 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, scrubland and water body in T1.
- In T1 129 ha of the agriculture area has increased from forest, 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-2014-15 to 2015-16

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	153.21										**153.21**
Mining/dump		37.46									**37.46**
Agriculture	1.32		3826.71							0.37	**3828.40**
Plantation Horticulture											
Forest		0.15	0.91		3222.75					0.08	**3223.88**
Forest Plantation											
Barren Rocky							16.75				**16.75**
Scrub	3.37	10.32	47.03					2007.92		8.39	**2077.03**
Waterbody-Streams/River									148.28		**148.28**
Waterbody – Ponds			4.53							494.26	**498.79**
Grand Total	**157.90**	**47.92**	**3879.18**		**3222.75**		**16.75**	**2007.92**	**148.28**	**503.10**	**9983.80**

- 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 1.6 ha of the agriculture area has decreased and it is converted into Built-up and water body in T2.
- In T2 52 ha of the agriculture area has increased from 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-2015-16 to 2016-17

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	157.90										**157.90**
Mining/dump		47.77	0.15								**47.92**
Agriculture	2.95		3876.24								**3879.18**
Plantation Horticulture											
Forest			6.39		3216.36						**3222.75**
Forest Plantation											
Barren Rocky							16.75				**16.75**
Scrub	2.42		72.31					1933.06		0.12	**2007.92**
Waterbody-Streams/River									148.28		**148.28**
Waterbody – Ponds										503.10	**503.10**
Grand Total	**163.27**	**47.77**	**3955.09**		**3216.36**		**16.75**	**1933.06**	**148.28**	**503.22**	**9983.80**

- 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 2.9 ha of the agriculture area has decreased and it is converted into Built-up in T3.
- In T3 78 ha of the agriculture area has increased from mining/dump, 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-2016-17 to 2017-18

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	163.27										**163.27**
Mining/dump		47.77									**47.77**
Agriculture	0.18		3941.92	9.46						3.53	**3955.09**
Plantation Horticulture											
Forest					3216.32					0.04	**3216.36**
Forest Plantation											
Barren Rocky							16.75				**16.75**
Scrub	0.78	2.84	39.69					1888.56		1.19	**1933.06**
Waterbody-Streams/River			0.09						148.19		**148.28**
Waterbody – Ponds			0.68							502.54	**503.22**
Grand Total	**164.23**	**50.61**	**3982.38**	**9.46**	**3216.32**		**16.75**	**1888.56**	**148.19**	**507.30**	**9983.80**

- 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 13 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T4.
- In T4 40 ha of the agriculture area has increased from 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-2017-18 to 2018-19

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	164.23										**164.23**
Mining/dump		50.61									**50.61**
Agriculture	0.77	0.75	3968.93	11.93							**3982.38**
Plantation Horticulture				9.46							**9.46**
Forest			4.78		3211.54						**3216.32**
Forest Plantation											
Barren Rocky							16.75				**16.75**
Scrub	0.27		54.58					1833.71			**1888.56**
Waterbody-Streams/River									148.19		**148.19**
Waterbody – Ponds			16.85							490.45	**507.30**
Grand Total	**165.27**	**51.36**	**4045.14**	**21.39**	**3211.54**		**16.75**	**1833.71**	**148.19**	**490.45**	**9983.80**

• 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 13 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and plantation in T4.

•In T5 76 ha of the agriculture area has increased from 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 decrease of 7 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 96, 50, 75, 27 & 62 Hectares From T0 to T1, T1-T2, T2 –T3, T3-T4 & T4-T5 respectively and overall increase of 312 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is a decrease of 385 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
6. Farm ponds (20) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (29) verified from the portal.