MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -51/2011-12
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

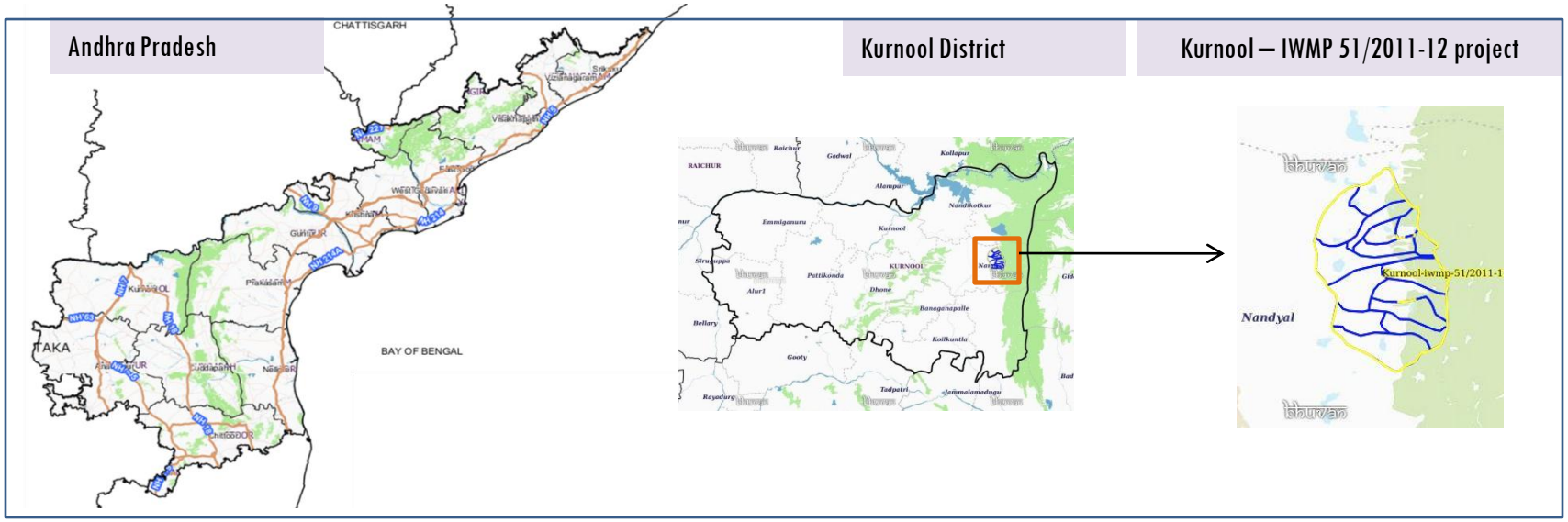
CONTENTS

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-51/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is **11,149** ha. It comprises of 15 micro watersheds.
- In the project area 242 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Project area as per image analysis has witnessed, Water bodies have shown an increase by 6.1 ha , which correspond to the various bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 60.8% is covered by the agriculture, 30 % is covered by forest, 3.5 % is covered by water body and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-51/2011-12
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Bandi Atmakur Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **11,149** ha. It comprises of 15 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	2015-16
LISS IV	2011-12		
SCENE 1			14-Jan-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			14-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	242
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	1	1
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	2	2
7	Check dams (Civil work)	0	0
8	Checks & plugins	23	23
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	16	16
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	219	200
	TOTAL	**261**	**242**

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.

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-51/2011-12

T1: 09 May 2015

T2: 01 April 2017

Drishti Sl no. 1834706 MWS : 4C3E9k1e

Check dam

T1: 09 May 2015

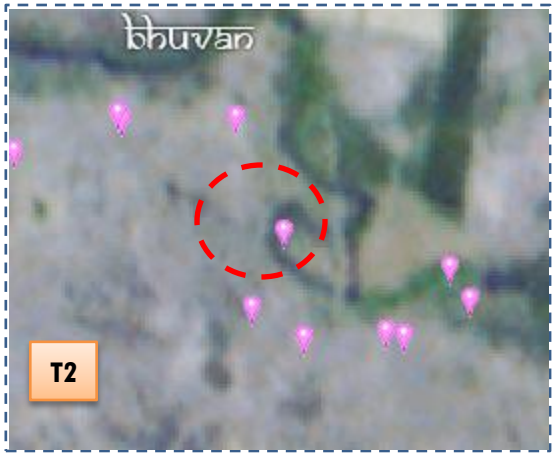
T2: 01 April 2017

Drishti Sl no. 1834730 MWS : 4C3E9k1e

Check dam

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-51/2011-12

T1: 09 May 2015



T2: 01 April 2017

Drishti Sl no. 7005756 MWS : 4C3E9k1e

Check dam

T1: 09 May 2015

T2: 01 April 2017

Drishti Sl no. 1834709 MWS : 4C3E9k1e

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-51/2011-12

T0:2010-11

T1: 09 May 2015

Drishti Sl no. 2444296- MWS : 4C3E9h2a

Afforestation

T0:2010-11

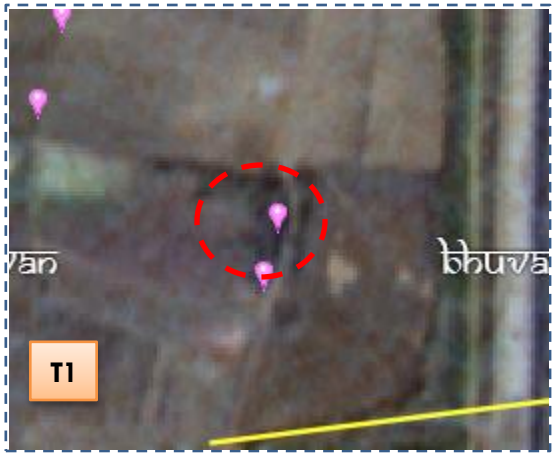
T1: 09 May 2015

Drishti Sl no. 1845253 MWS : 4C3E9j1b

Check dam

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-51/2011-12

T0: 2010-11



T1: 09 May 2015

Drishti Sl no. 2456268 MWS : 4C3E9h3a

Farm pond

T0: 2010-11

T1: 09 May 2015

Drishti Sl no. 3064846 MWS : 4C3E9k1c

Farm pond

Natural Color Composite

Natural Color Composite- 2011-12

Source:Fusion data,NRSC

Natural Color Composite- 09 th May 2015

Source:NCC,NRSC

Natural Color Composite- 28th January 2017

Source:NCC,NRSC

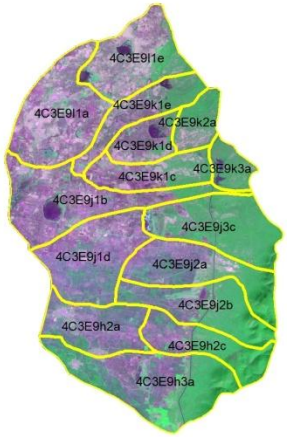
Natural Color Composite-1st March 2018

Source:LISS-IV,NRSC

Natural Color Composite-04th January 2019

Source:Sentinel-2

Natural Color Composite- 14th January 2020



Source:LISS-IV,NRSC

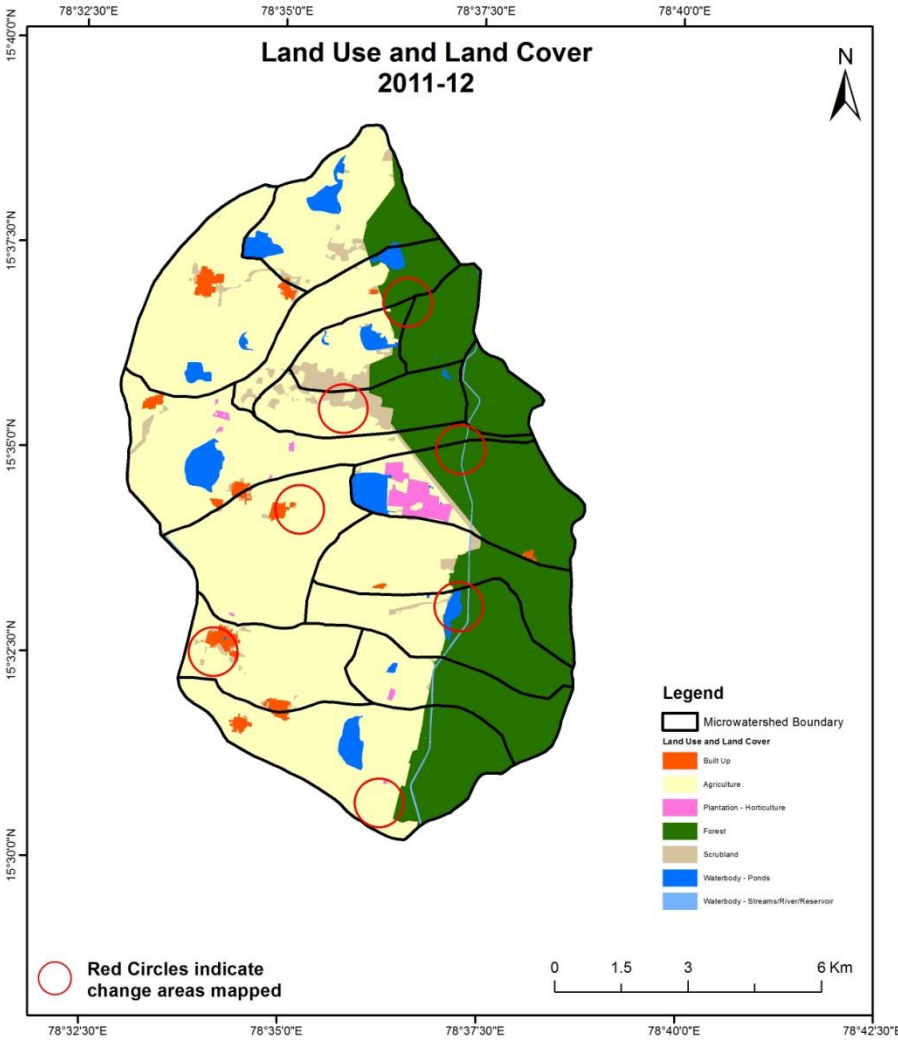
MONITORING IN THE PROJECT AREA

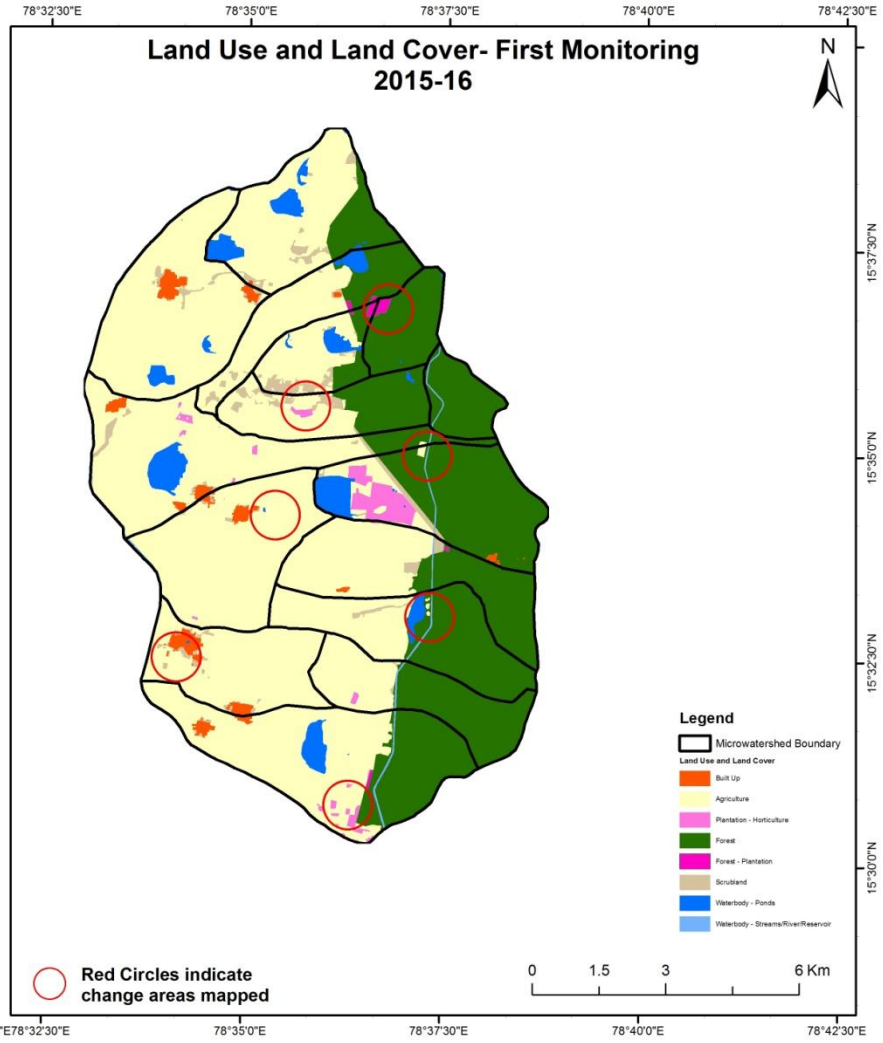
Land use and Land cover Changes in the Project

- Change in land use and land cover form T0 to T1 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)

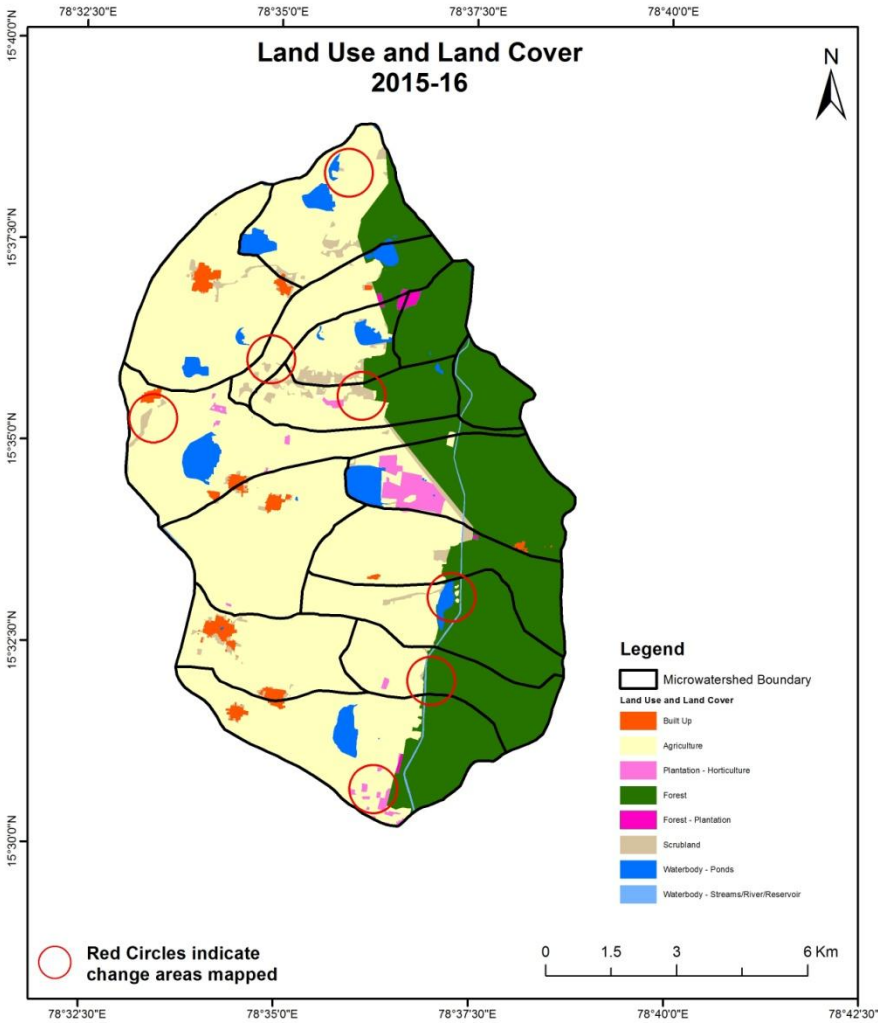
Scale: 1:10000

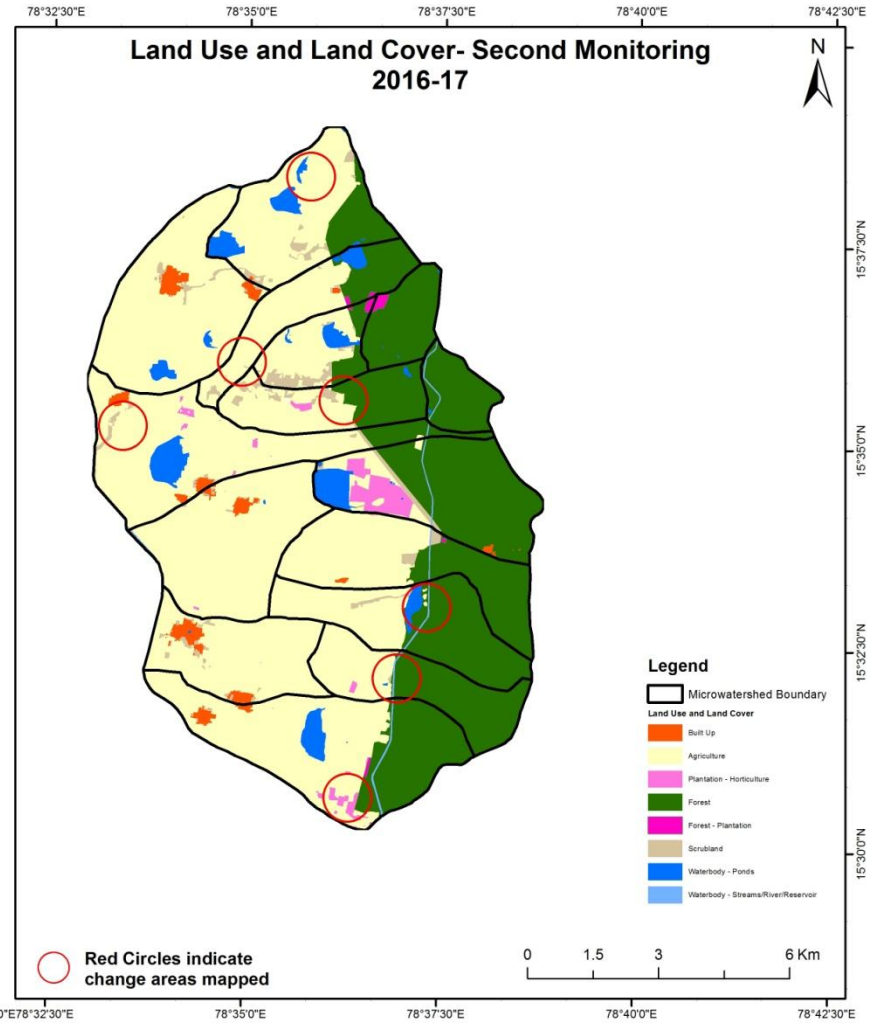




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

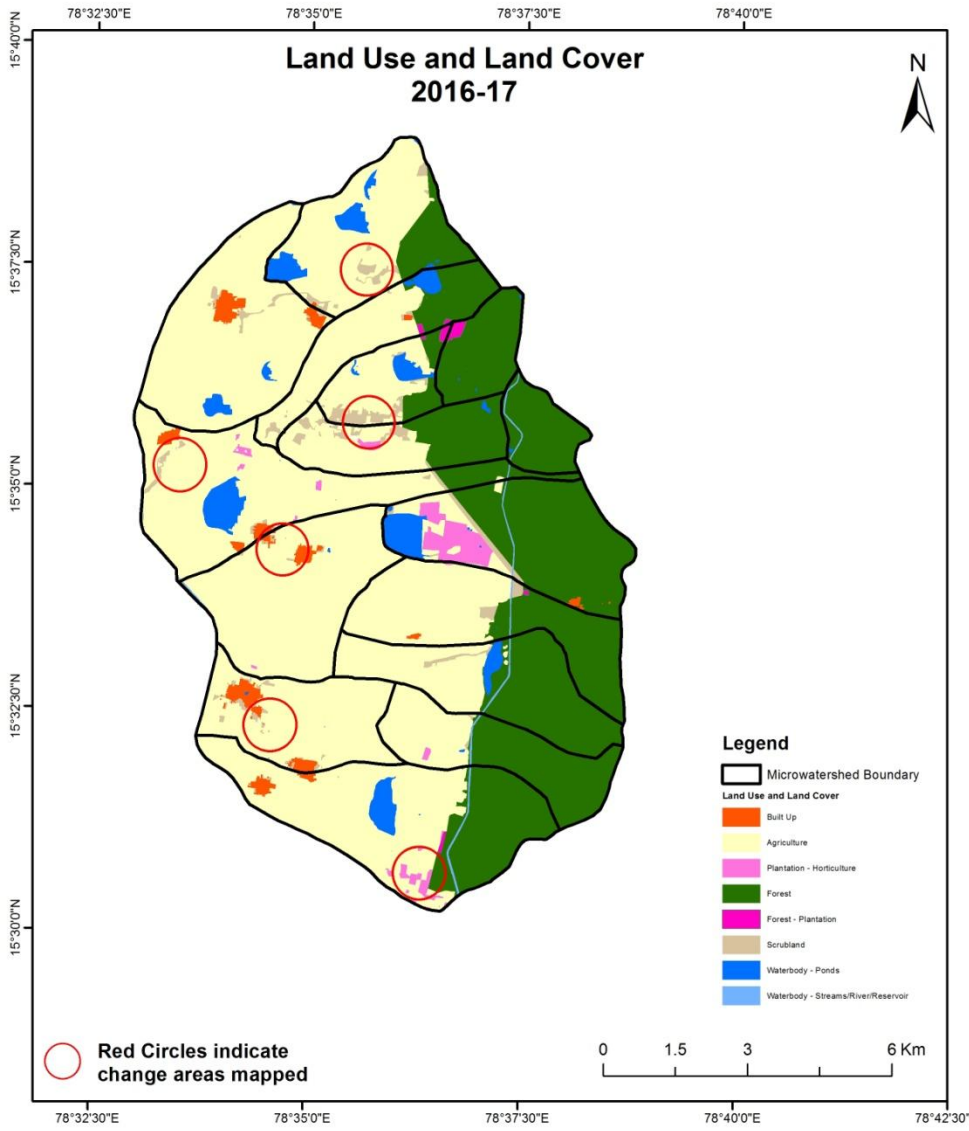
Scale: 1:10000

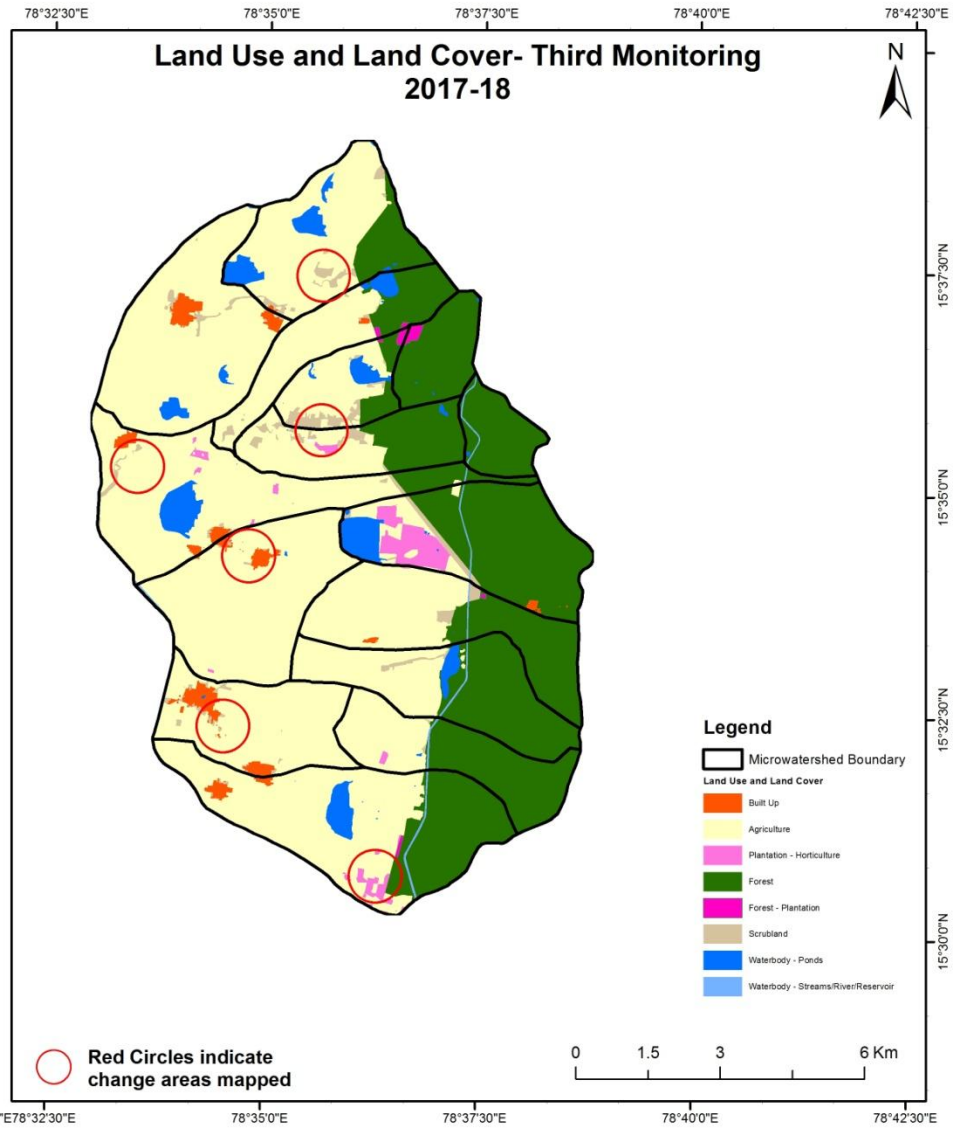




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

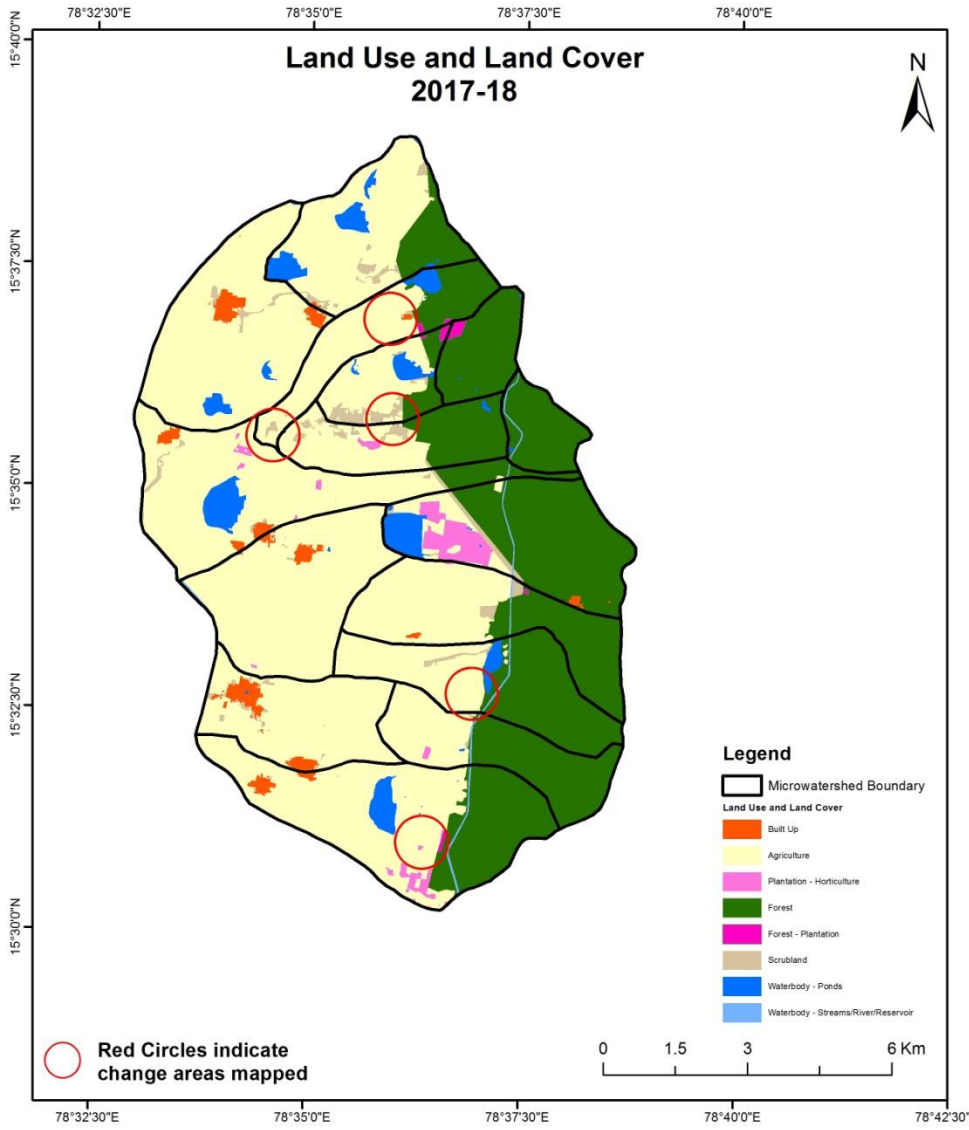
Scale: 1:10000

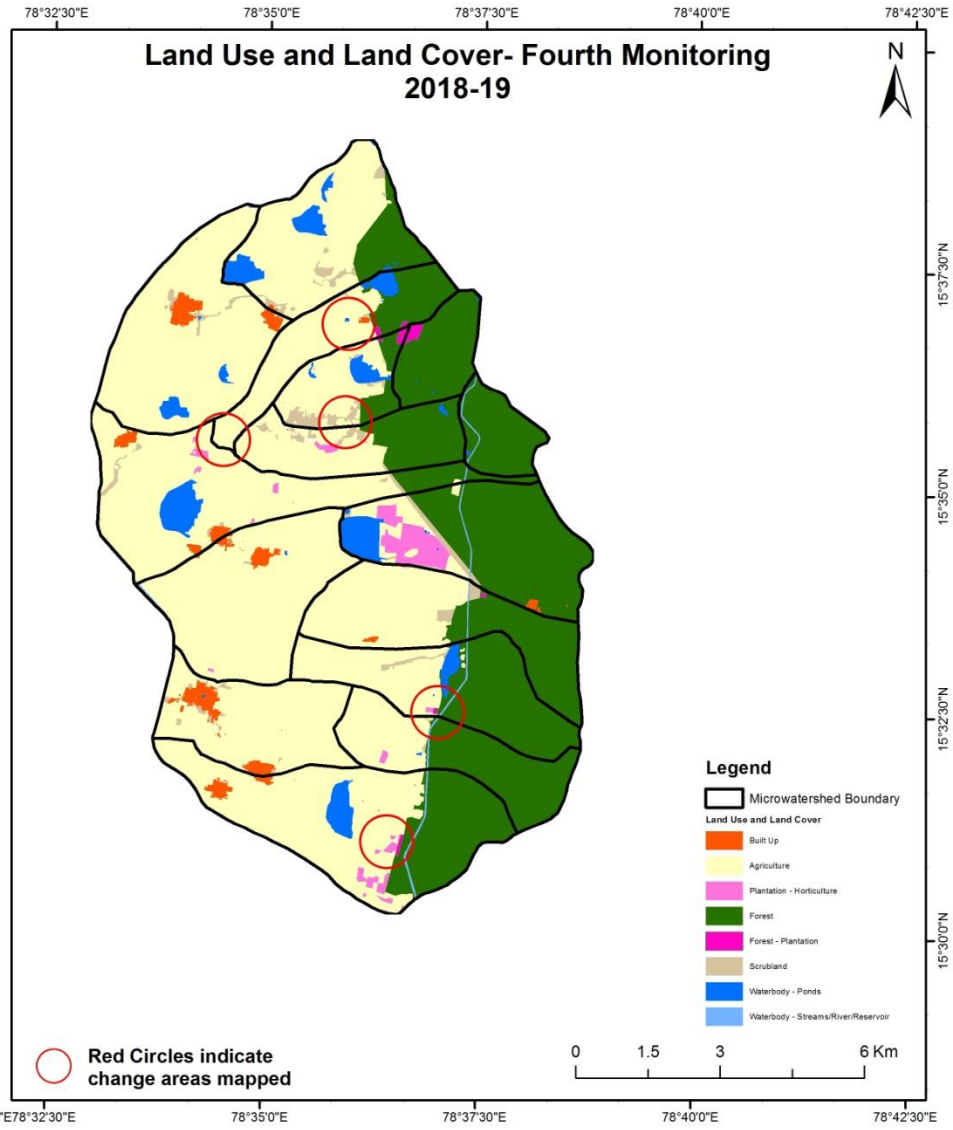




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

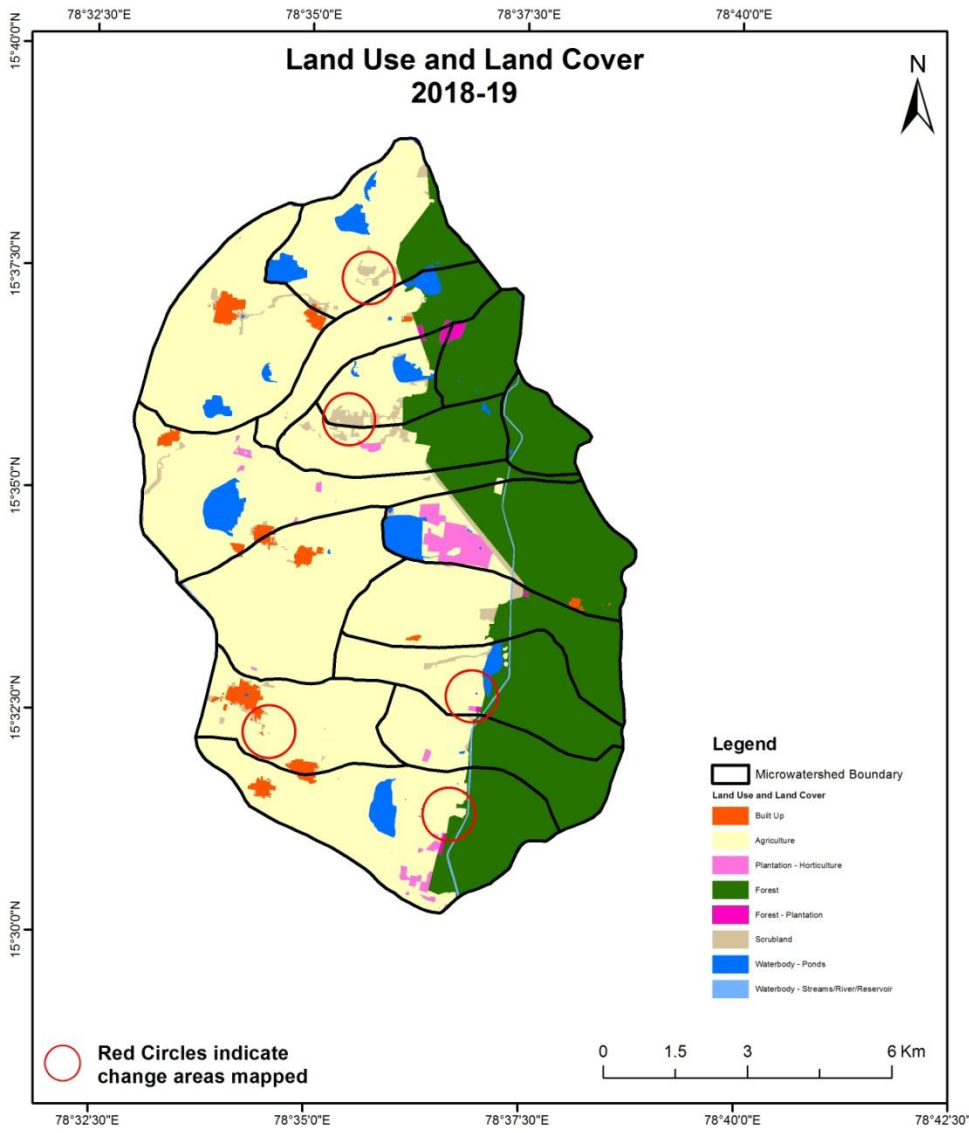
Scale: 1:10000

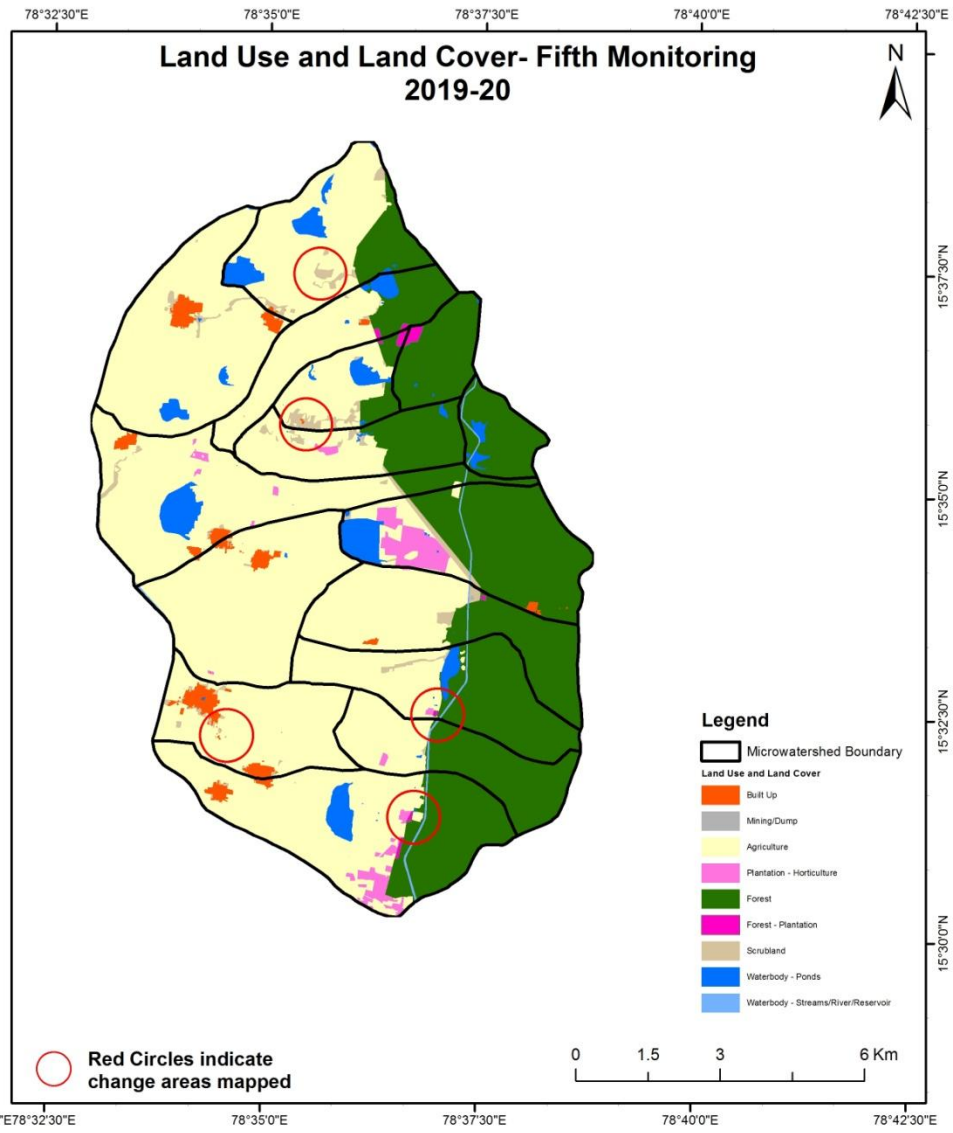




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

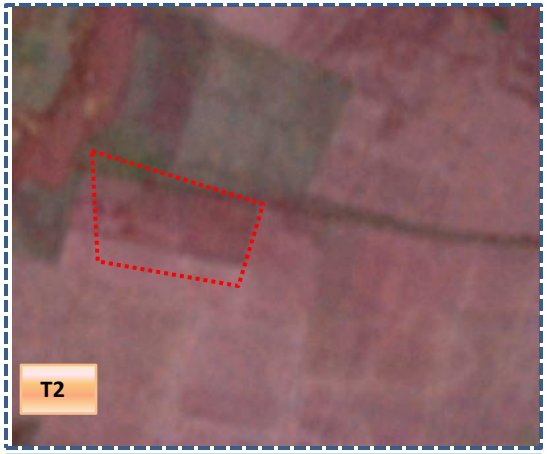




Land Use and Land Cover changes for Pre and Post treatment dates

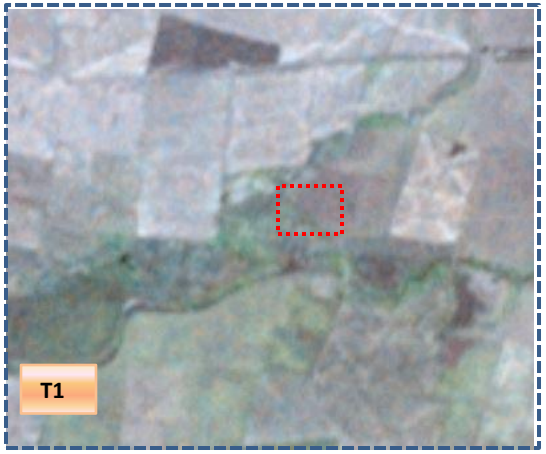
Scrub to Agriculture

T1: 2015-16(78°35'45.374"E 15°38'23.136"N)

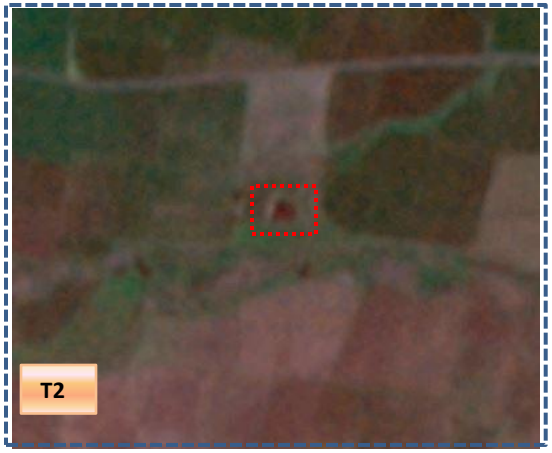


T2: 28 January 2017

Agriculture to water body



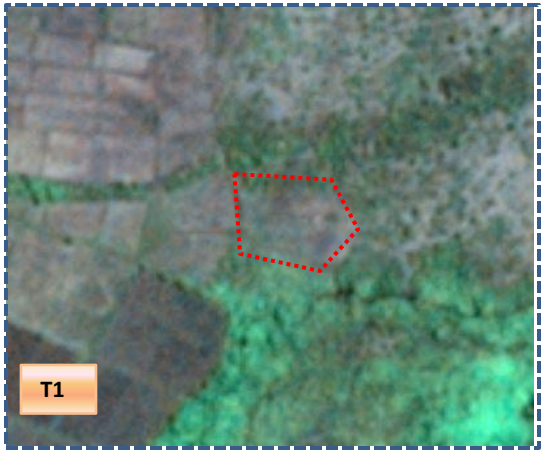
T1: 2015-16 (78°35'12.706"E 15°32'18.09"N)



T2: 28 January 2017

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

Scrub to Agriculture



T1: 2015-16(78°36'23.344"E 15°38'15.165"N)

T2: 28 January 2017

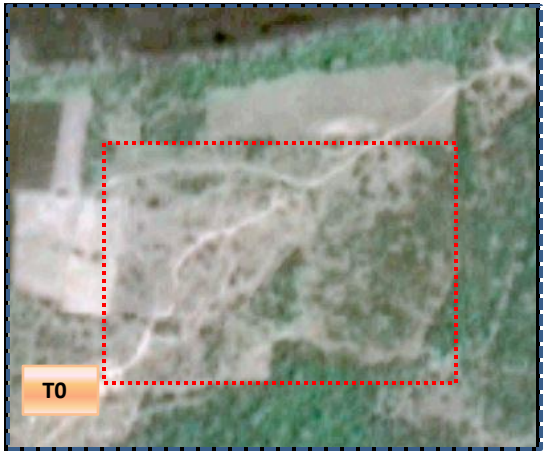
Scrub to Agriculture

T1: 2015-16(78°35'56.806"E 15°37'28.391"N)

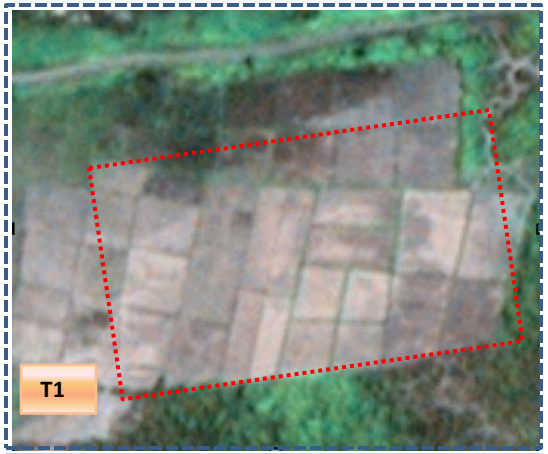
T2: 28 January 2017

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

Scrub to Agriculture



T0: 2011-12 (78°36'16.851"E 15°36'6.867"N)



T1: 09 May 2015

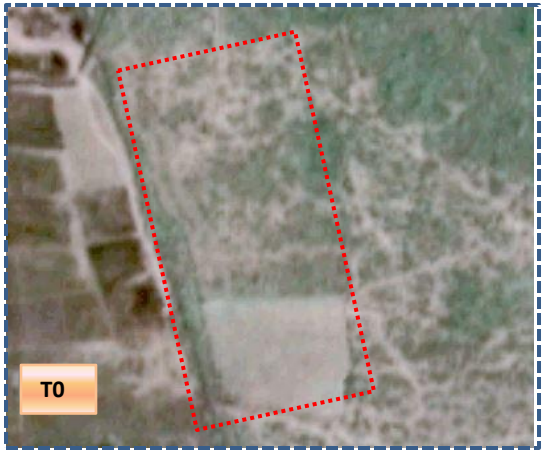
Agriculture to water body

T0: 2011-12 (78°35'14.184"E 15°34'17.814"N)

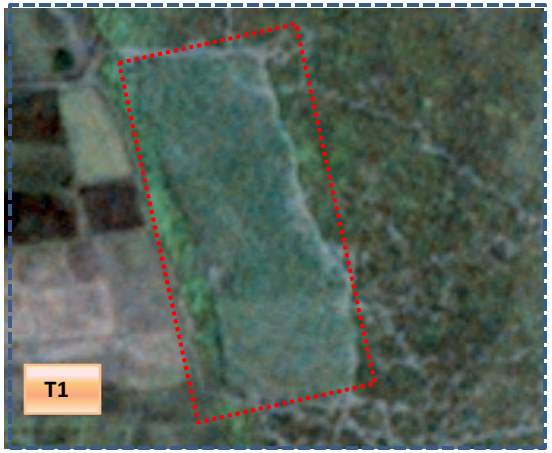
T1: 09 May 2015

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

Forest to Plantation

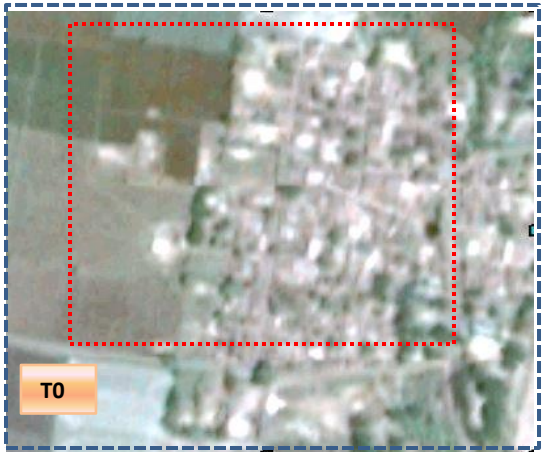


T0: 2011-12 (78°36'17.211"E 15°36'45.794"N)

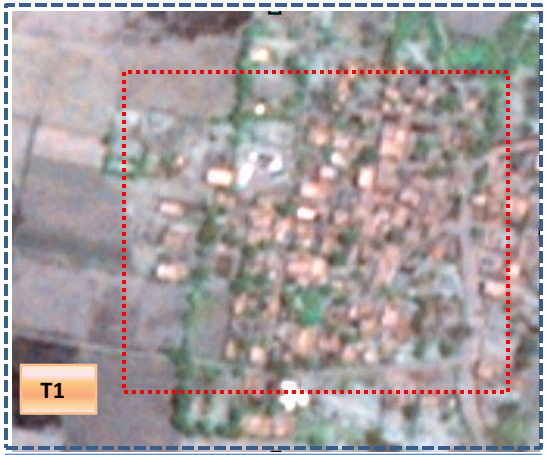


T1: 09 May 2015

Agriculture to Built-up



T0: 2011-12 (78°34'23.329"E 15°31'39.729"N)



T1: 09 May 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	152.00										**152.00**
Mining/dump											
Agriculture	1.99		6642.33	33.94		4.24				0.79	**6683.28**
Plantation Horticulture	0.02			110.50							**110.52**
Forest	0.38		25.22		3389.79	21.30				0.41	**3437.09**
Forest Plantation											
Barren Rocky											
Scrub			83.84					248.36			**332.20**
Waterbody-Streams/River									45.93		**45.93**
Waterbody – Ponds			11.37							376.82	**388.19**
Grand Total	**154.38**		**6762.76**	**144.44**	**3389.79**	**25.54**		**248.36**	**45.93**	**378.01**	**11149.21**

- 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 36 ha of the agriculture area has decreased and it is converted into Built-up, plantation, forest plantation and water body in T1.
- In T1 120 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-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	154.38										**154.38**
Mining/dump											
Agriculture	2.26		6752.79	5.49				0.36	1.86		**6762.76**
Plantation Horticulture			2.24	142.20							**144.44**
Forest	0.15		0.57		3388.10				0.98		**3389.79**
Forest Plantation						25.54					**25.54**
Barren Rocky											
Scrub	1.94		17.35					229.02	0.06		**248.36**
Waterbody-Streams/River										45.93	**45.93**
Waterbody – Ponds			7.60						370.41		**378.01**
Grand Total	**158.72**		**6780.54**	**147.69**	**3388.10**	**25.54**		**229.38**	**373.31**	**45.93**	**11149.21**

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

• In T2 27 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	158.72										**158.72**
Mining/dump											
Agriculture	2.41		6774.18	2.56				1.22		0.17	**6780.54**
Plantation Horticulture			1.10	146.60							**147.69**
Forest	0.55		1.01		3386.39					0.15	**3388.10**
Forest Plantation						25.54					**25.54**
Barren Rocky											
Scrub	9.02		6.14					214.22			**229.38**
Waterbody-Streams/River									45.93		**45.93**
Waterbody – Ponds										373.31	**373.31**
Grand Total	**170.70**		**6782.43**	**149.15**	**3386.39**	**25.54**		**215.44**	**45.93**	**373.63**	**11149.21**

• 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 6.3 ha of the agriculture area has decreased and it is converted into Built-up , plantations, scrubland and water body in T3.

• In T3 8.2 ha of the agriculture area has increased from plantations, 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	170.70										**170.70**
Mining/dump											
Agriculture	1.41		6772.25	6.24		0.97				1.57	**6782.43**
Plantation Horticulture			7.70	141.45							**149.15**
Forest			0.56		3385.83						**3386.39**
Forest Plantation						25.54					**25.54**
Barren Rocky											
Scrub	0.52		15.31					199.09		0.52	**215.44**
Waterbody-Streams/River									45.93		**45.93**
Waterbody – Ponds										373.63	**373.63**
Grand Total	**172.62**		**6795.82**	**147.69**	**3385.83**	**26.51**		**199.09**	**45.93**	**375.73**	**11149.21**

- 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 9.2 ha of the agriculture area has decreased and it is converted into Built-up, plantations, forest plantation and water body in T4.
- In T4 23.5 ha of the agriculture area has increased from plantations, forest 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	172.62										**172.62**
Mining/dump											
Agriculture	1.64		6755.74	36.95		1.33				0.15	**6795.82**
Plantation Horticulture	0.05		6.93	140.71							**147.69**
Forest			4.89		3362.57	0.41				17.96	**3385.83**
Forest Plantation						26.51					**26.51**
Barren Rocky											
Scrub	2.15	0.58	13.09					182.07		1.20	**199.09**
Waterbody-Streams/River									45.93		**45.93**
Waterbody – Ponds			0.66							375.06	**375.73**
Grand Total	**176.47**	**0.58**	**6781.32**	**177.65**	**3362.57**	**28.25**		**182.07**	**45.93**	**394.37**	**11149.21**

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

•In T5 25.5 ha of the agriculture area has increased from plantations, 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 6.1 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 79, 17, 1.8 & 13 Hectares From T0 to T1, T1-T2, T2 –T3 & T3-T4 respectively and overall increase of 98 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 67 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 150 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (2) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (2) verified from the portal.