MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -30/2011-12
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

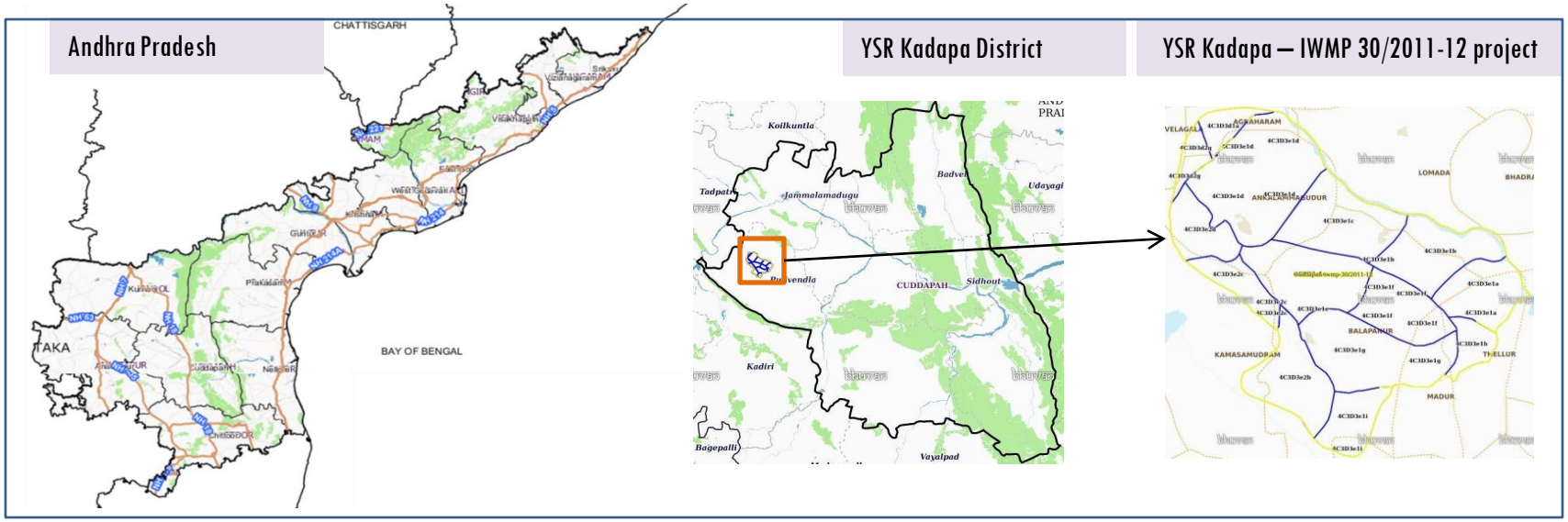
CONTENTS

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-30/2011-12, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 7,803 ha. It comprises of 14 micro watersheds.
- In the project area 540 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and 4 check dams and drainage treatments with 163 ha increase in the area.
- Major percentage i.e. 78 % is covered by the agriculture, 7.6 % is plantation, 6.5 % is covered by scrubland area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-30/2011-12
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Simhadripuram Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **7,803** ha. It comprises of 14 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



- 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.

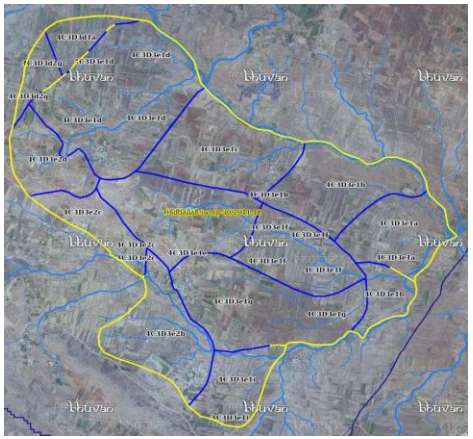
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T1
	2011-12	2012-13	2019-20
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	540
4	Detailed Project Report		

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



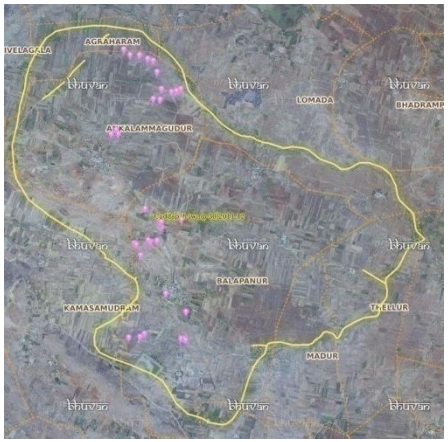
Legend

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	1	1
2	Afforestation	29	29
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	39	30
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	154	120
11	Civil work-Check dams /Rock fill dam	93	60
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture 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	504	300
	TOTAL	**820**	**540**

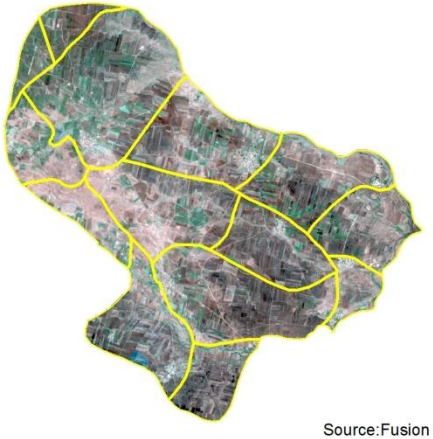
MONITORING IN THE PROJECT AREA

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 T1 is 2015-16 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 Colour Composite (NCC)

Natural Color Composite - 2011



Source:Fusion data,NRSC

Natural Color Composite-16 th January 2016

Source:NCC,NRSC

Natural Color Composite- 03 rd June 2017

Source:LISS-IV,NRSC

Natural Color Composite- March 2018

Source:LISS-IV,NRSC

Natural Color Composite- 04th January 2019

Source:Sentinel-2

Natural Color Composite- 14 th January 2020

Source:LISS-IV,NRSC

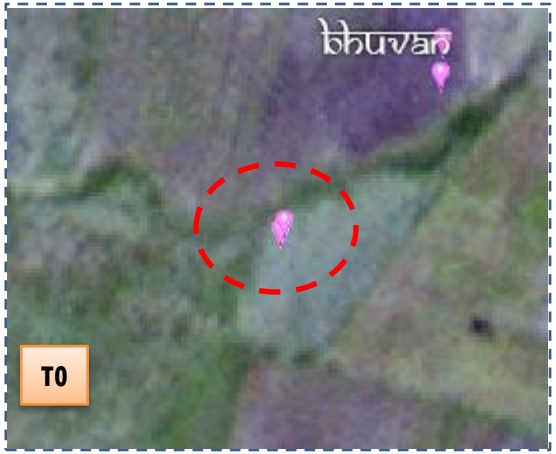
Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-30/2011-12

T0: 16th January 2016

T1: 21st February 2018

Drishti Sl no.1806373 MWS:4C3D3e1c

Check dam



T0: 16th January 2016

T1: 21st February 2018

Drishti Sl no. 3023741 MWS :4C3D3e1c

Check dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-30/2011-12

T0: 16th January 2016

T1: 21st February 2018

Drishti Sl no. 734524 MWS:4C3D3e1d

Horticulture

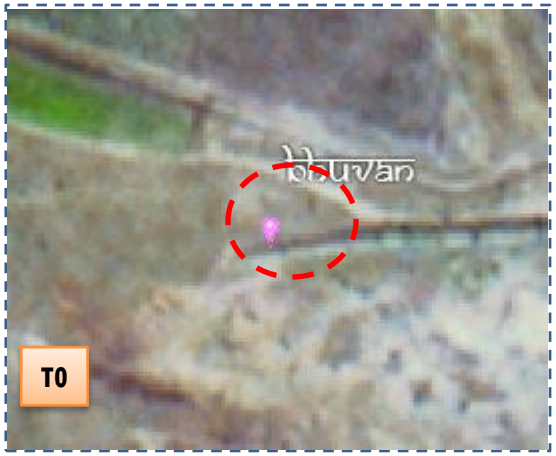
T0: 16th January 2016

T1: 21st February 2018

Drishti Sl no. 1897455 MWS :4C3D3e2d

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-30/2011-12



T0: 2010-11

T1: 16 January 2016

Drishti Sl no. 174122 MWS :4C3D3e1e

Farm pond

T0: 2010-11

T1: 16 January 2016

Drishti Sl no. 406243 MWS : 4C3D3e1g

Farm pond

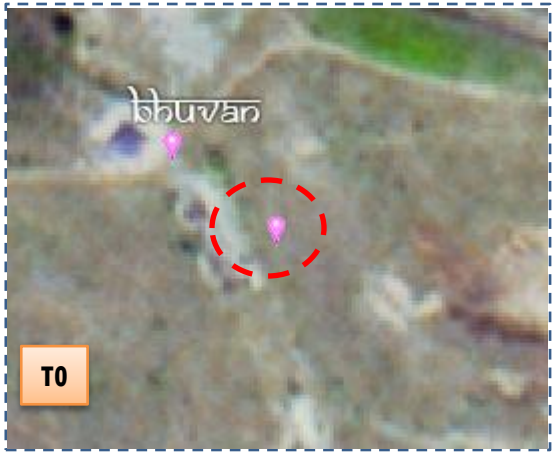
Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-30/2011-12

T0: 2010-11

T1: 16 January 2016

Drishti Sl no. 174165 MWS :4C3D3e2b

Horticulture



T0: 2010-11

T1: 16 January 2016

Drishti Sl no. 406428 MWS : 4C3D3e1g

Farm pond

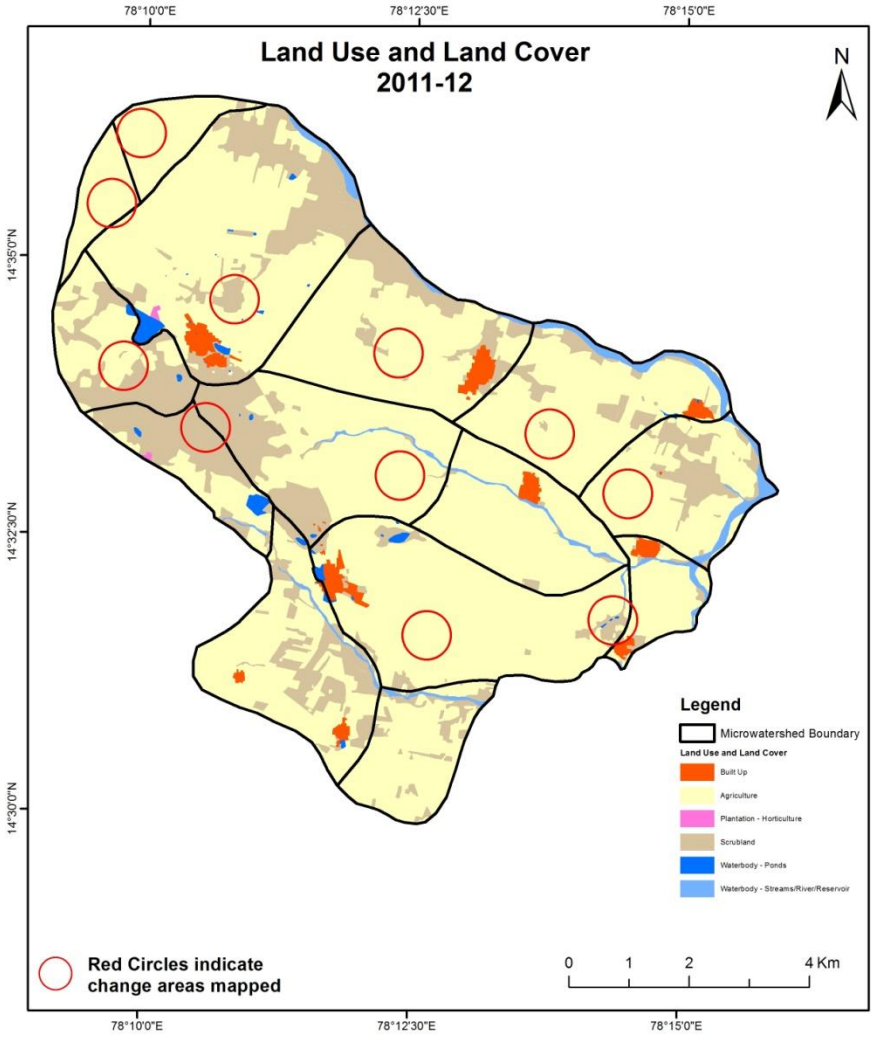
MONITORING IN THE PROJECT AREA

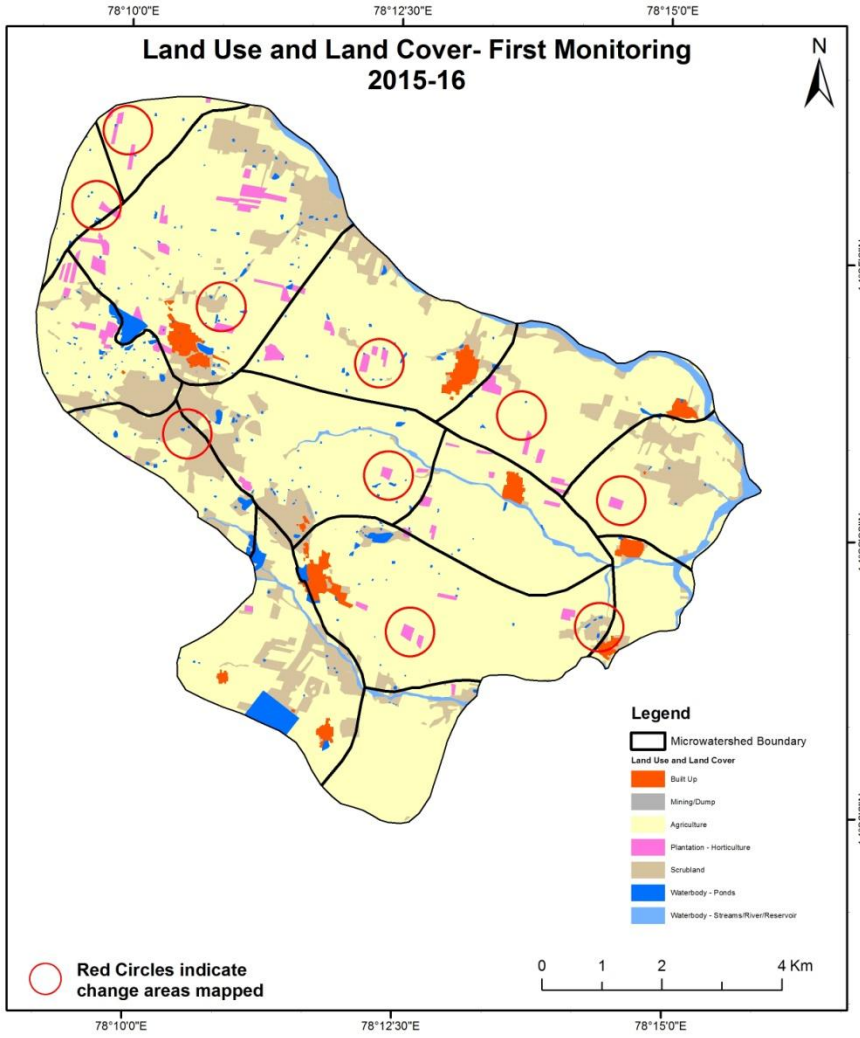
Land use and Land cover Changes in the Project

- Change in land use and land cover form T0 to 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 T1 are given in the change matrix table.
- In matrix table column represents the T0 (2011-12) and row represents the T1 (2015-16)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

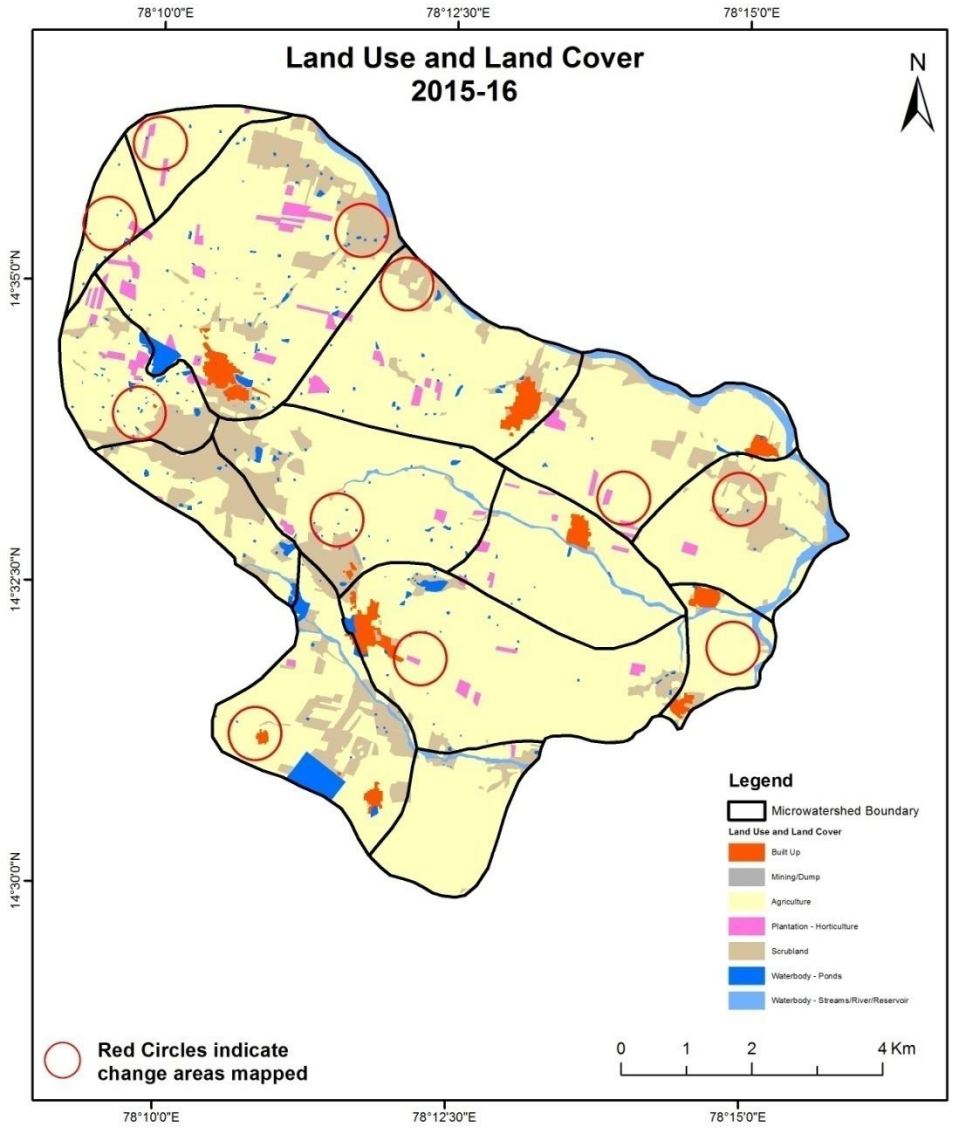
Scale: 1:10000

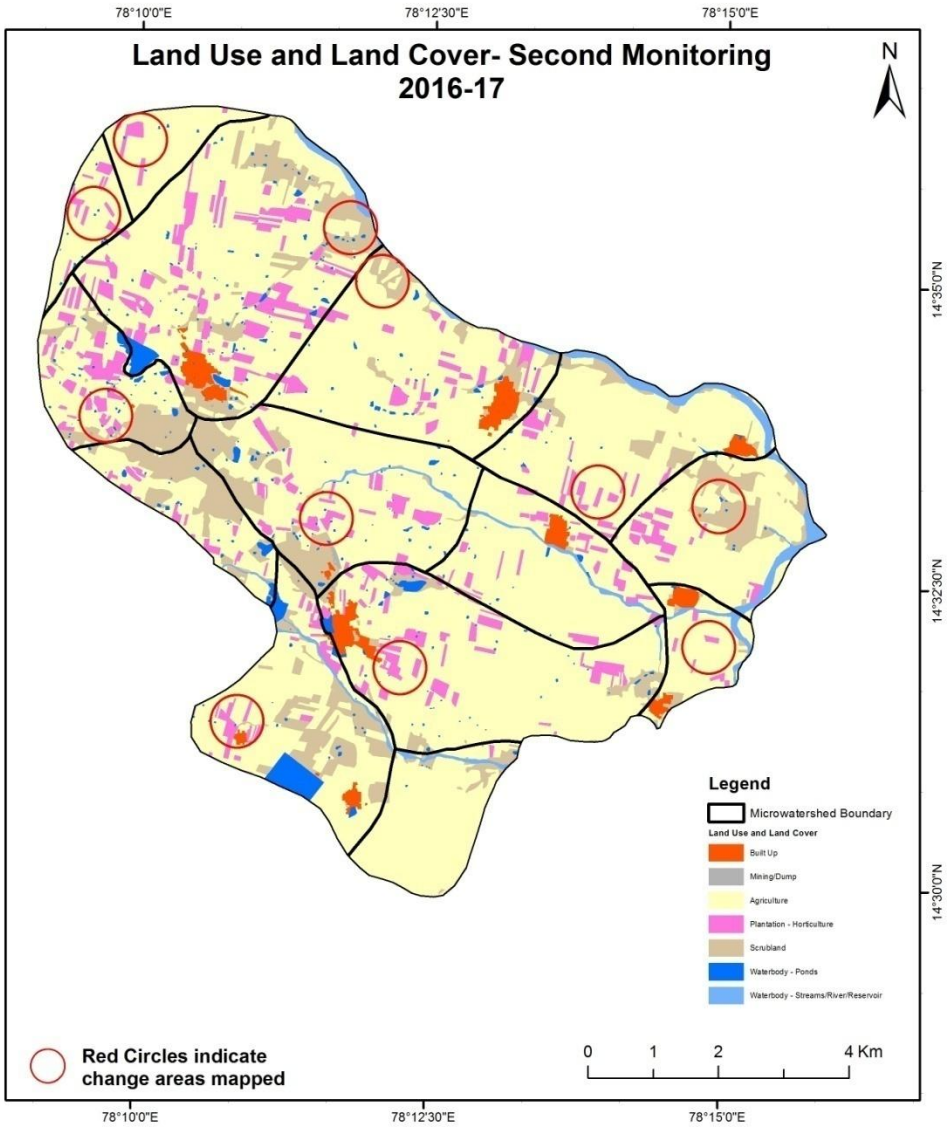




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

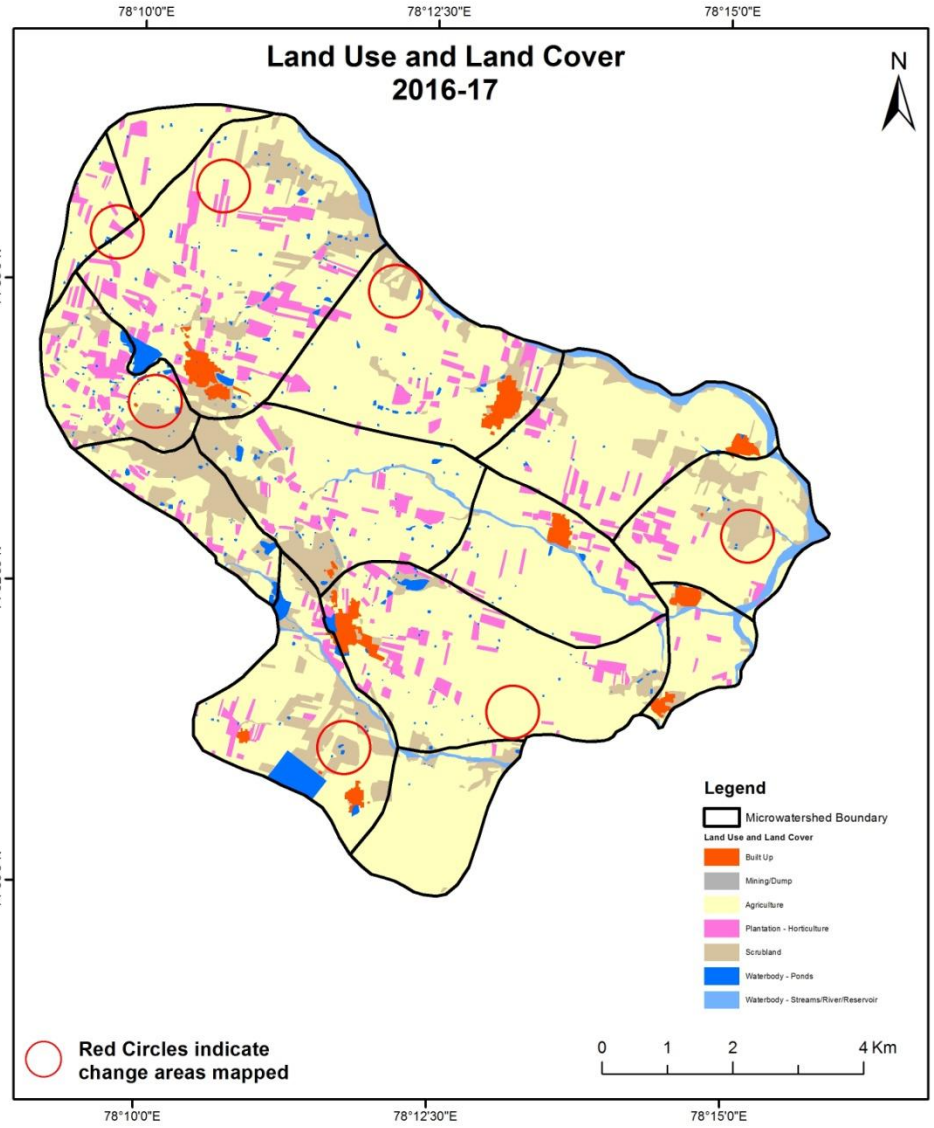
Scale: 1:10000

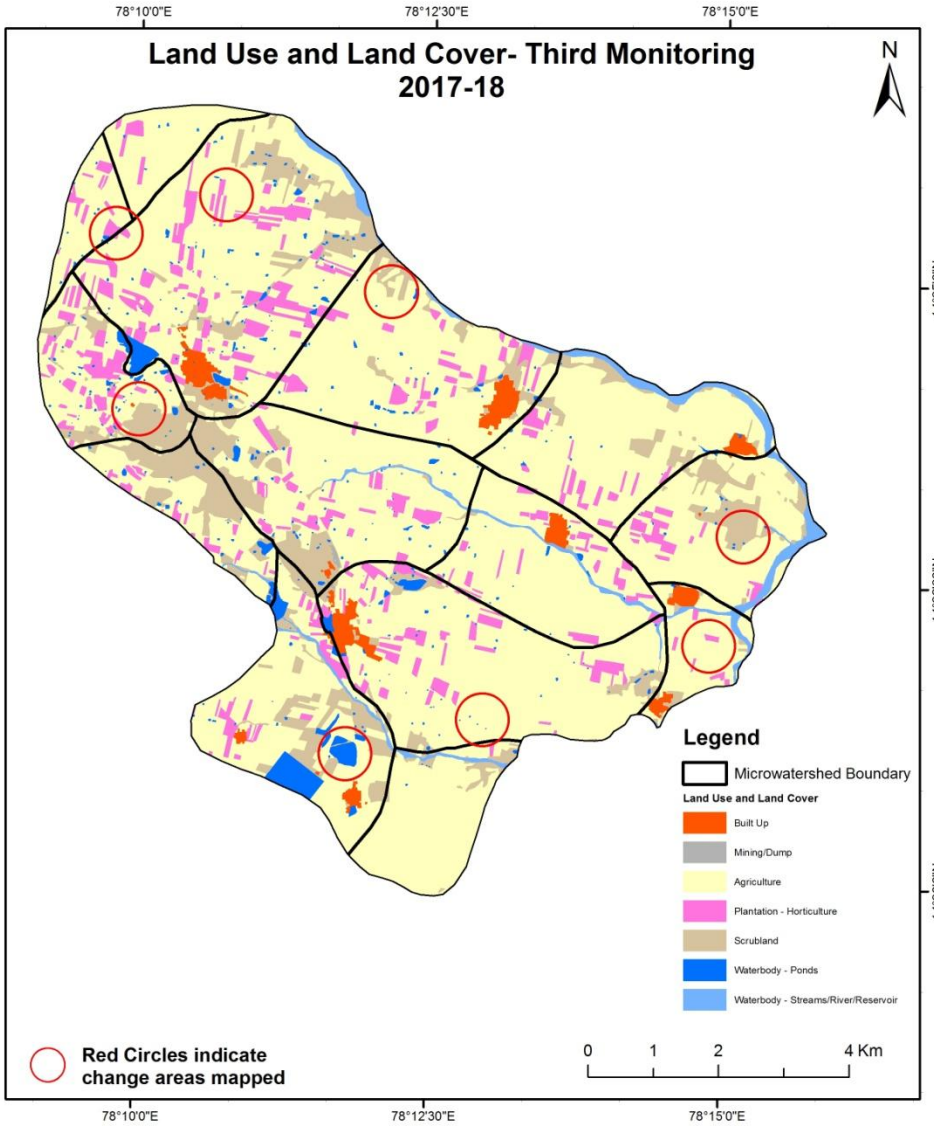




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

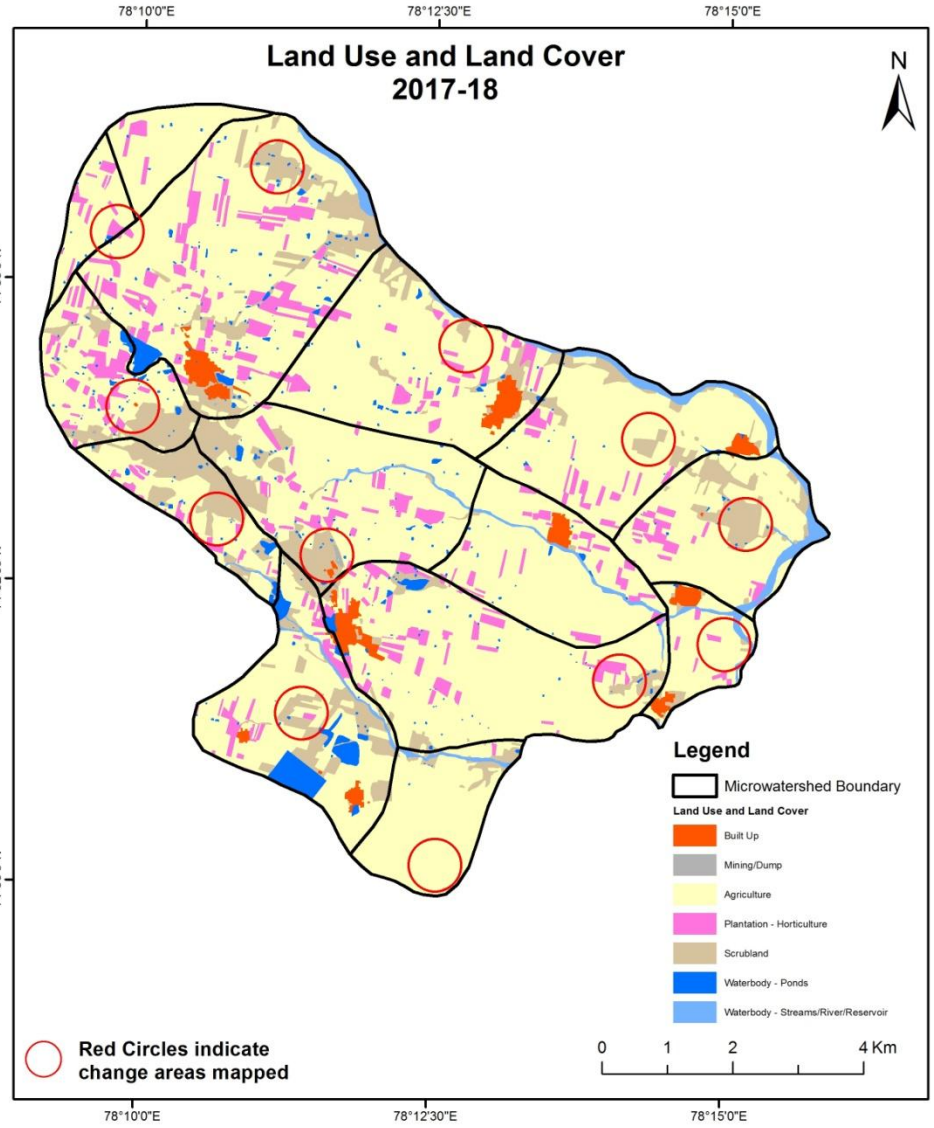
Scale: 1:10000

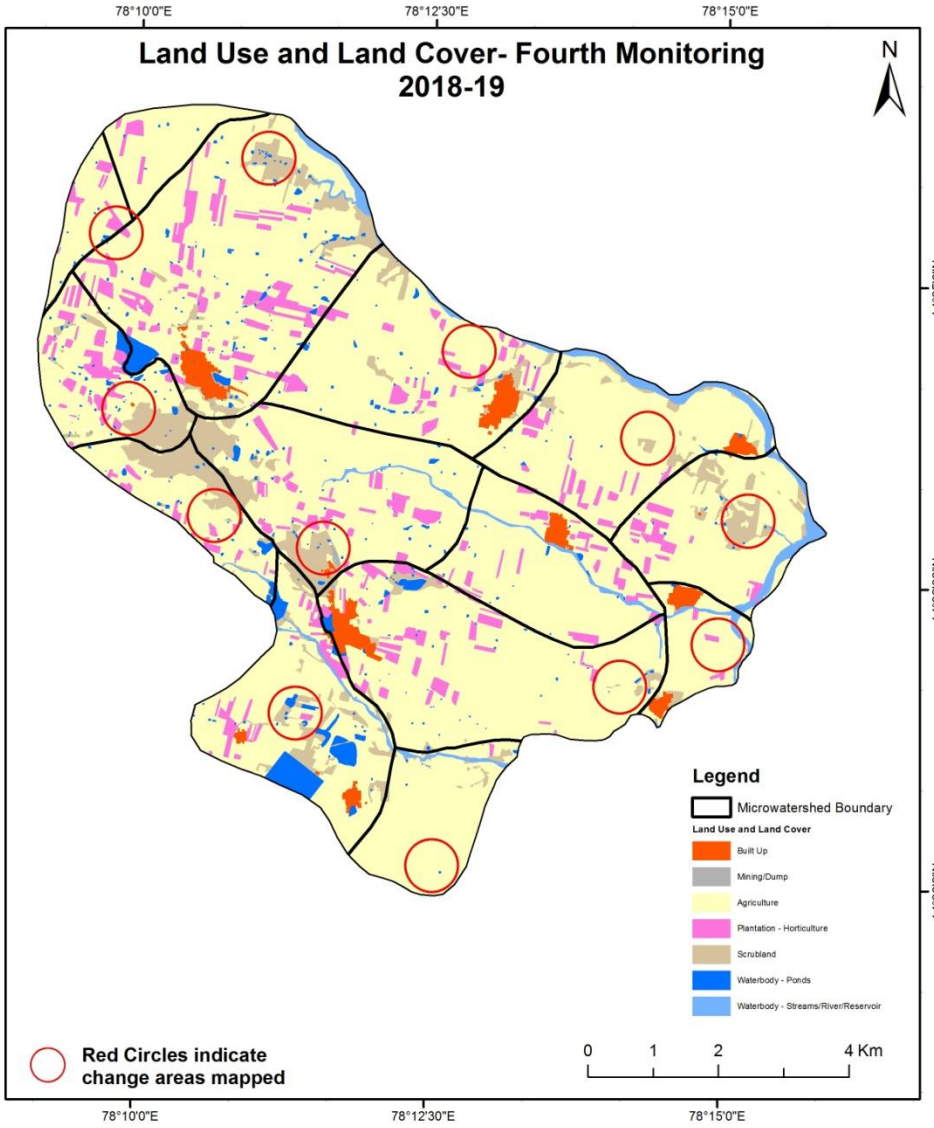




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

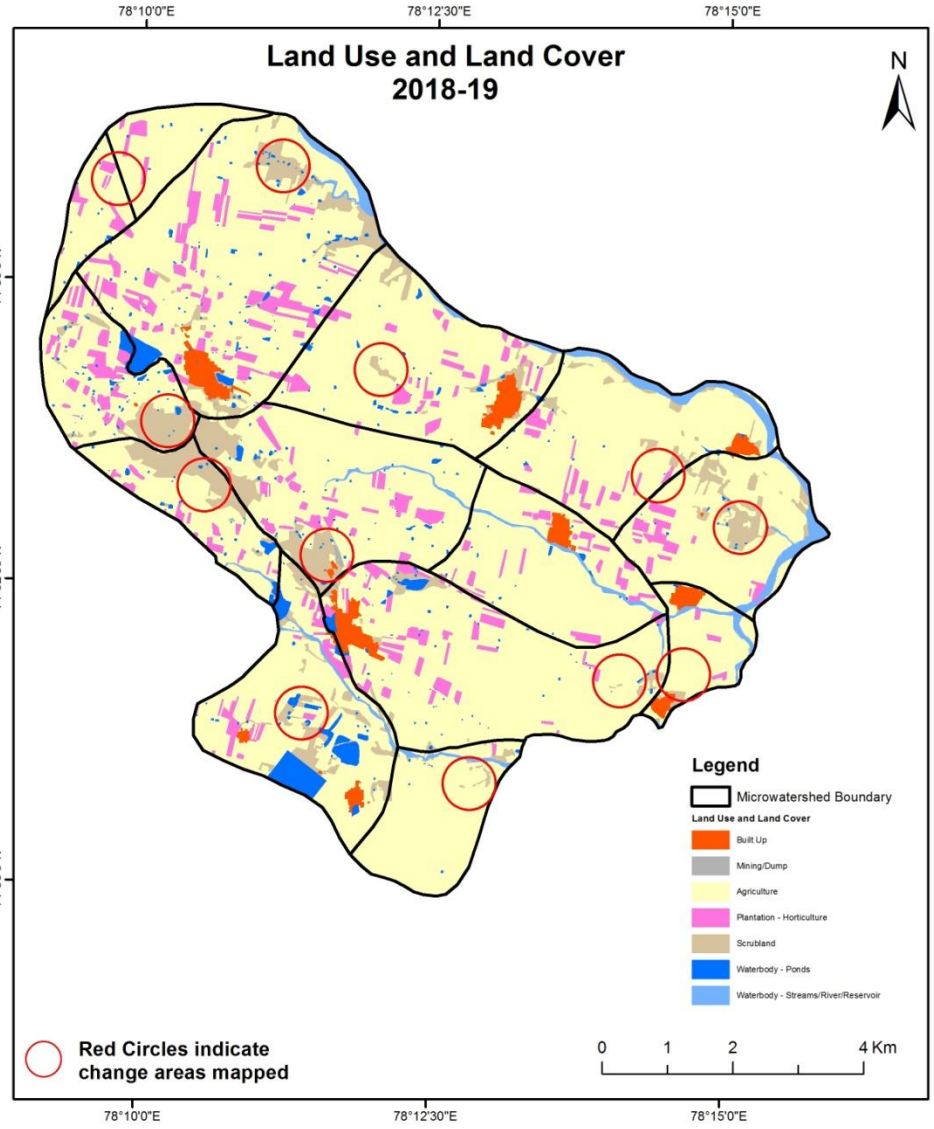
Scale: 1:10000

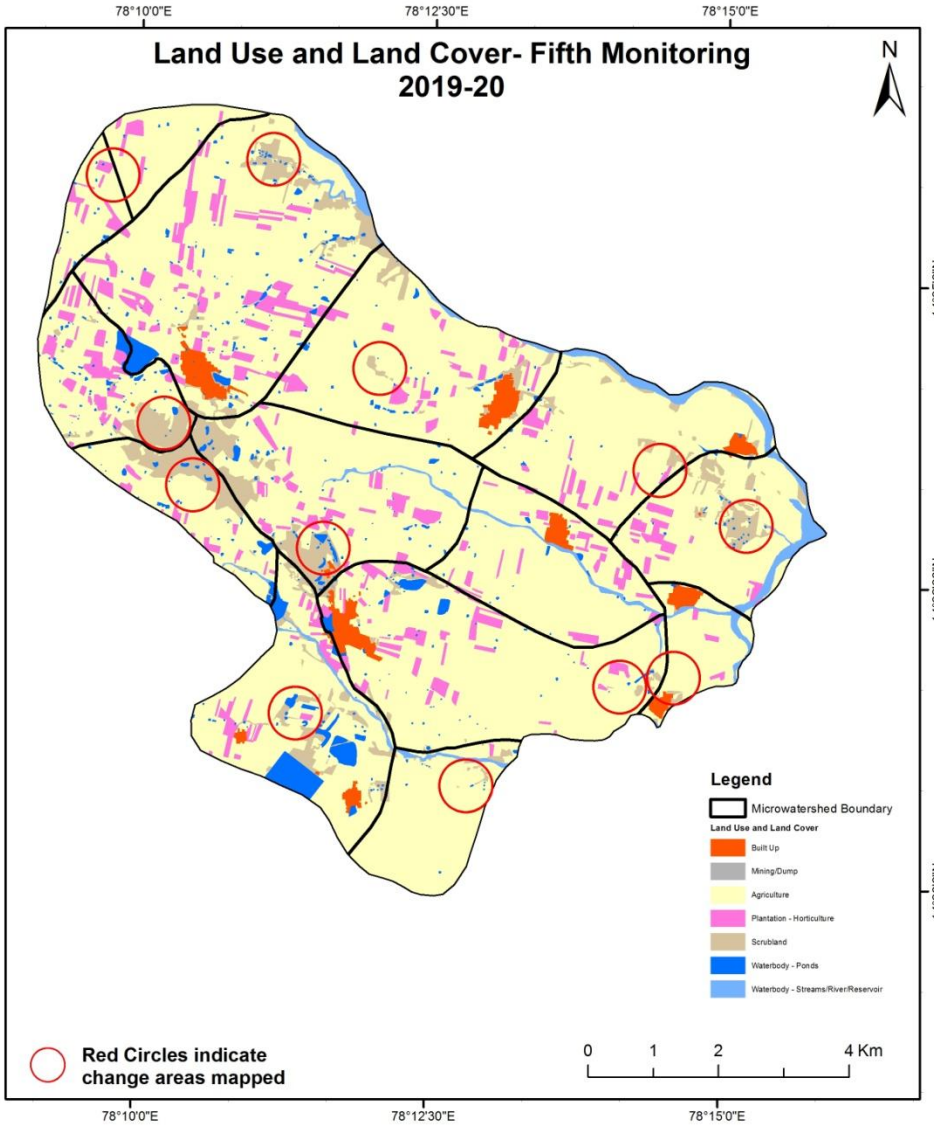




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000





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

Agriculture to Plantation

T0: 2011-12 (78°13'48.353"E 14°33'14.35"N)

T0: 16 January 2016

Scrub to Plantation

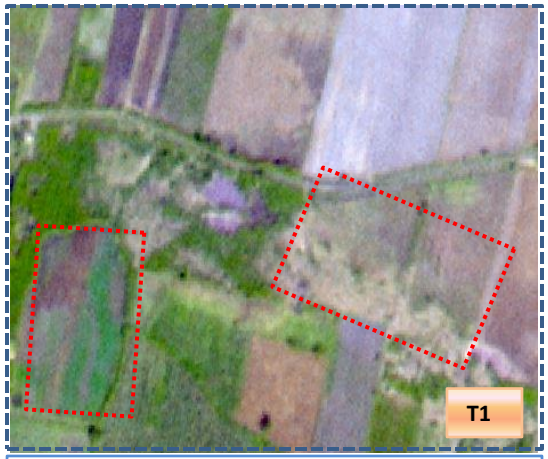
T0: 2011-12 (78°15'1.419"E 14°32'45.178"N)

T0: 16 January 2016

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

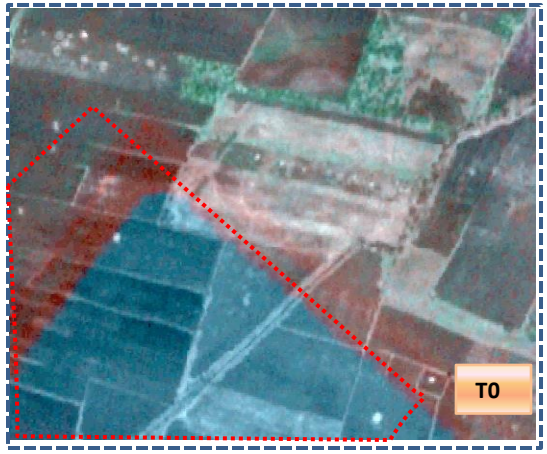
Scrub to Agriculture

T0: 2011-12 (78°13'16.328"E 14°33'59.165"N)

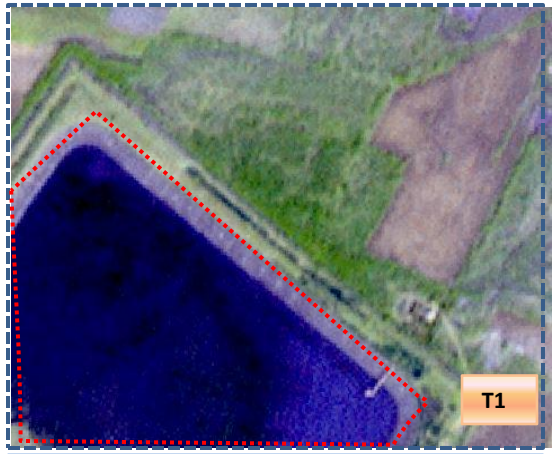


T1: 16 January 2016

Agriculture to Water body



T0: 2011-12 (78°11'19.331"E 14°30'57.491"N)

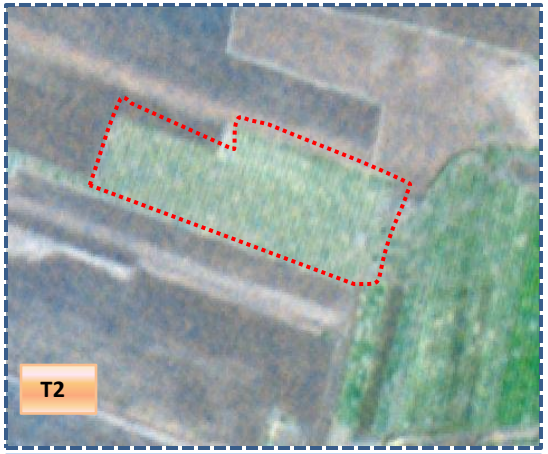


T1: 16 January 2016

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

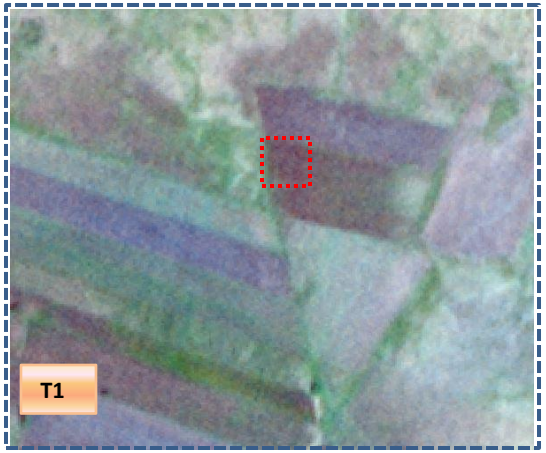
Agriculture to Plantation

T1: 2015-16(78°11'10.984"E 14°34'12.326"N)

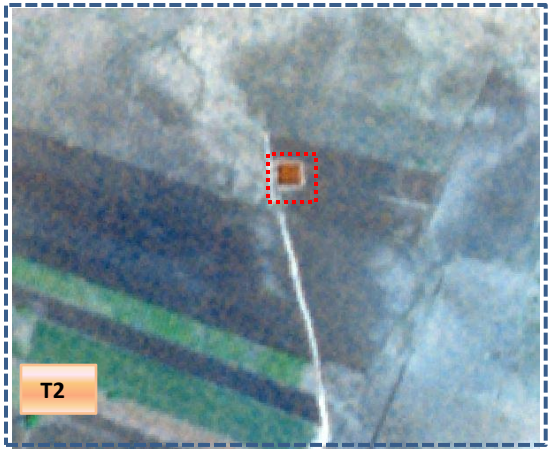


T2: 01 April 2017

Agriculture to water body



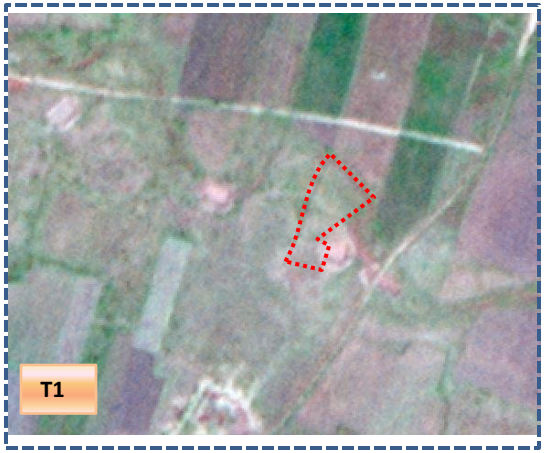
T1: 2015-16 (78°11'49.375"E 14°35'12.832"N)



T2: 01 April 2017

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

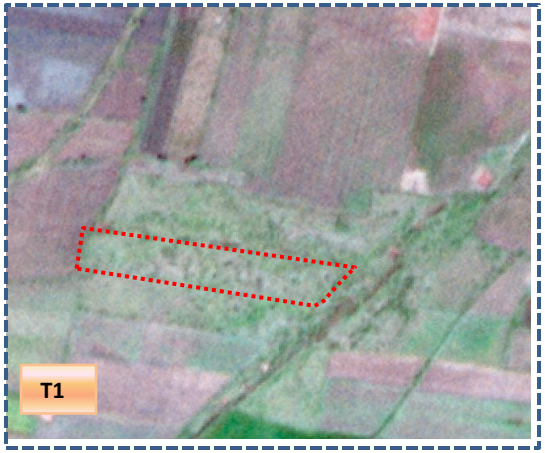
Scrub to Agriculture



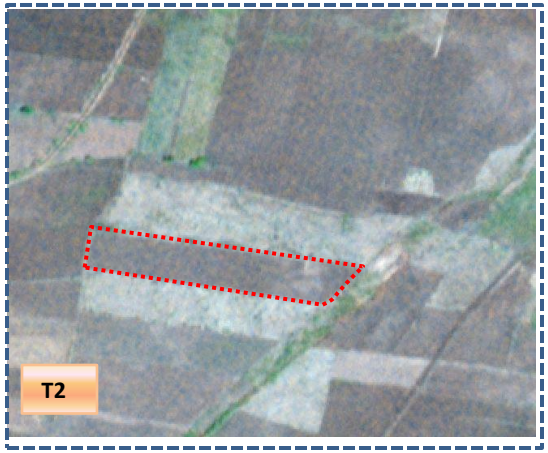
T1: 2015-16 (78°11'25.912"E 14°35'53.573"N)

T2: 01 April 2017

Scrub to Agriculture



T1: 2015-16 (78°11'15.756"E 14°35'9.865"N)



T2: 01 April 2017

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	141.98										**141.98**
Mining/dump											
Agriculture	4.46	0.15	5655.12	156.24						66.89	**5882.87**
Plantation Horticulture			1.69	2.65							**4.34**
Forest											
Forest Plantation											
Barren Rocky											
Scrub	4.25	2.31	507.02	0.03				992.67	1.31	28.29	**1535.88**
Waterbody-Streams/River			2.17					0.00	182.81		**184.99**
Waterbody – Ponds			4.64					6.63		41.81	**53.08**
Grand Total	**150.70**	**2.46**	**6170.64**	**158.93**				**999.31**	**184.12**	**137.00**	**7803.15**

- 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 227 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 515 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	150.70										**150.70**
Mining/dump		2.46									**2.46**
Agriculture	0.79	0.33	5642.70	509.22				4.96	2.17	10.48	**6170.64**
Plantation Horticulture			17.85	140.89						0.18	**158.93**
Forest											
Forest Plantation											
Barren Rocky											
Scrub		1.04	83.52					912.93	0.00	1.83	**999.31**
Waterbody-Streams/River									184.12		**184.12**
Waterbody – Ponds			1.37							135.62	**137.00**
Grand Total	**151.49**	**3.82**	**5745.44**	**650.11**				**917.89**	**186.30**	**148.11**	**7803.15**

- 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 522 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T2.
- In T2 102 ha of the agriculture area has increased from plantations, 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	151.49										**151.49**
Mining/dump		3.82									**3.82**
Agriculture			5731.34	9.82						4.27	**5745.44**
Plantation Horticulture			8.46	641.62						0.03	**650.11**
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.09		13.41					885.38	0.86	18.15	**917.89**
Waterbody-Streams/River									186.30		**186.30**
Waterbody – Ponds										148.11	**148.11**
Grand Total	**151.58**	**3.82**	**5753.21**	**651.44**				**885.38**	**187.15**	**170.56**	**7803.15**

- 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 14 ha of the agriculture area has decreased and it is converted into plantations and water body in T3.
- In T3 21 ha of the agriculture area has increased from plantations 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	151.58										**151.58**
Mining/dump		3.82									**3.82**
Agriculture	2.49		5732.78	11.12						6.82	**5753.21**
Plantation Horticulture			67.16	584.28							**651.44**
Forest											
Forest Plantation											
Barren Rocky											
Scrub	6.83		280.85					585.94	4.16	7.61	**885.38**
Waterbody-Streams/River									187.15		**187.15**
Waterbody – Ponds										170.56	**170.56**
Grand Total	**160.90**	**3.82**	**6080.79**	**595.40**				**585.94**	**191.31**	**184.99**	**7803.15**

- 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 20 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T4 348 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	160.90										**160.90**
Mining/dump		2.69								1.14	**3.82**
Agriculture	0.30	1.13	6048.91	23.15					0.97	6.33	**6080.79**
Plantation Horticulture			20.92	574.28						0.20	**595.40**
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.17		56.32					512.50	3.75	13.20	**585.94**
Waterbody-Streams/River									191.31		**191.31**
Waterbody – Ponds										184.99	**184.99**
Grand Total	**161.37**	**3.81**	**6126.15**	**597.43**				**512.50**	**196.03**	**205.86**	**7803.15**

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

•In T5 77 ha of the agriculture area has increased from plantations 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 163 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2018-19 (T5) years.
4. There is an increase of 287, 07, 327 & 45 Hectares From T0 to T1, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 243 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2018-19 (T5) years.
5. There is an increase of 593 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2018-19 (T5) years.
6. There is a decrease of 1,023 Hectares in Scrubland area as compared between 2011-12 (T0) & 2018-19 (T5) years.
7. Farm ponds (120) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (154) verified from the portal.