

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

ANANTAPURAMU -47/2011-12  
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

# C O N T E N T S

- **EXECUTIVE SUMMARY**

01. STUDY AREA
02. SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS
03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

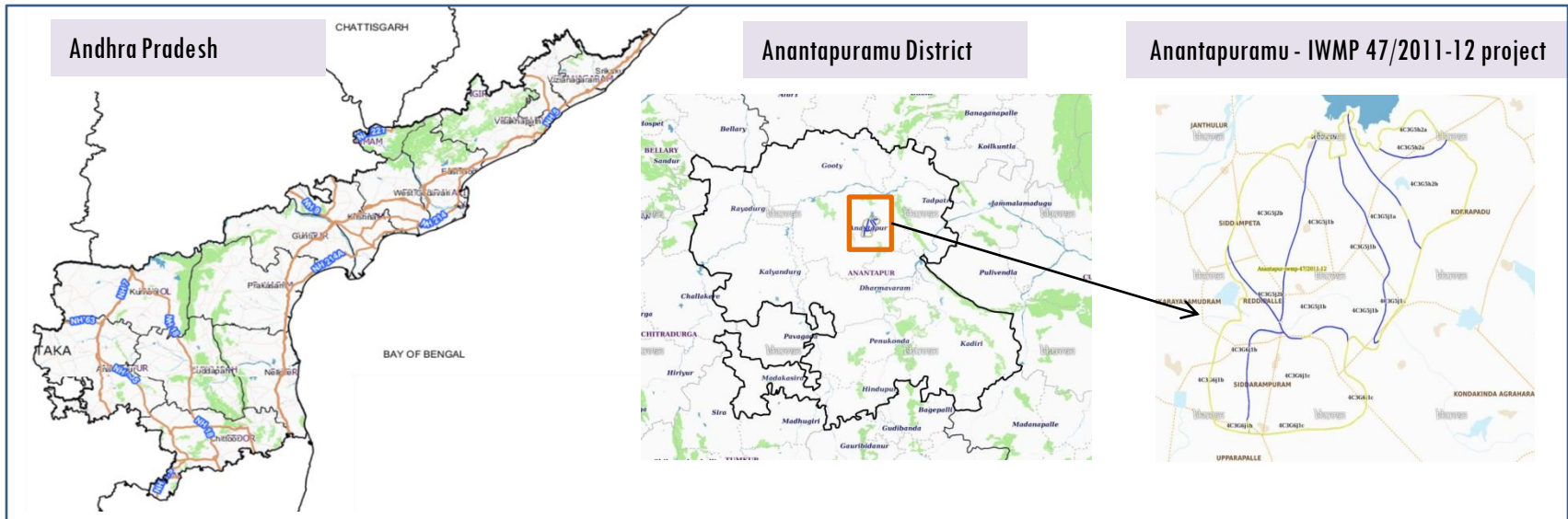
## **E X E C U T I V E   S U M M A R Y**

- 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-47/2011-12, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 7,179.9 ha. It comprises of 7 micro watersheds.
- In the project area 594 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an decreased by 4.05 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 83.6 % is covered by the agriculture, 8.6 scrubland, 2.5 % is covered by plantation and remaining by other land use classes.

# PROJECT : ANANTAPURAMU - IWMP-47/2011-12

## DISTRICT : ANANTAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Bukkaraya Samudram Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 7,179.9 ha. It comprises of 7 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



- Anantapuram 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 37 °C range and it reaches around 44 °C to 45 °C.
- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22-23 °C (72-73 °F) range. Total annual rainfall is about 22 in (560 mm).
- Anantapuram district receives moderate to good rainfall from July to October month.

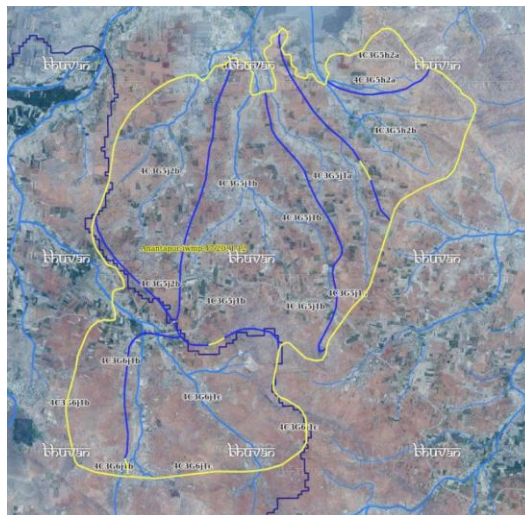
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2013-14	2019-20
LISS IV	2011-12		
SCENE 1			19-Feb-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			19-Feb-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	Drishhti Photographs		
		Total	594
4	Detailed Project Report		

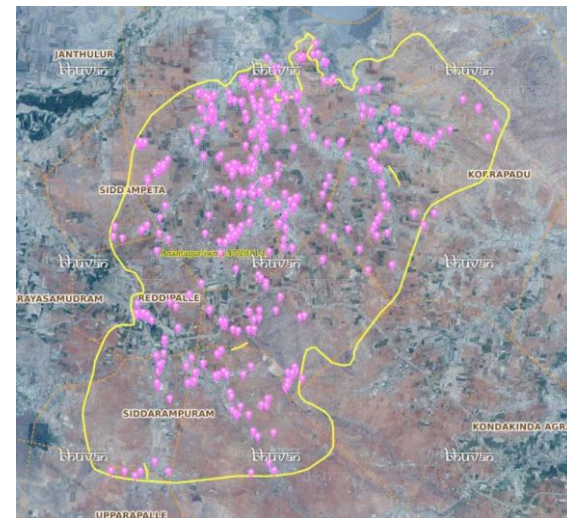
## Natural Color Composite overlaid with Project boundaries and high detail stream network



### Legend

-  Drainage (1:10000 Scale)
-  MWS Boundary
-  Project Boundary

## Natural Color Composite overlaid with Drishhti Points



### Drishhti Upload Status

## Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	4	4
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	13	13
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	44	44
11	Civil work-Check dams/Rock fill dam	341	320
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	19	19
15	Livelihood Activities-Plantation/Horticulture	14	14
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	160	156
	<b>TOTAL</b>	<b>619</b>	<b>594</b>

## 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 Colour Composite (NCC)

Natural Color Composite-08 th February 2012



Source:LISS-IV,NRSC

Natural Color Composite- 07 th December 2015



Source:LISS-IV,NRSC

Natural Color Composite- 11th January 2017



Source:NCC,NRSC

Natural Color Composite-24th January 2018



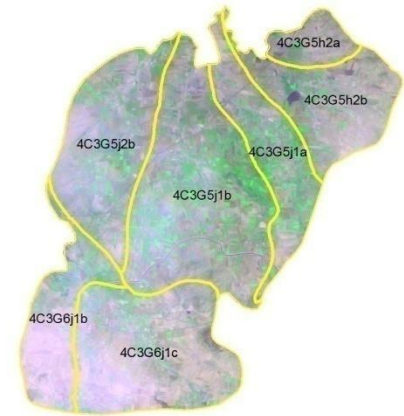
Source:LISS-IV,NRSC

Natural Color Composite- 23rd February 2019



Source:Sentinel-2

Natural Color Composite- 19 th February 2020



Source:LISS-IV,NRSC



Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-47/2011-12



T0

T0: 2011-12



T1

T1: 14 April 2017



Drishti Sl no. 1661276 MWS : 4C3G5j1a

Farm pond



T0

T0: 2011-12



T1

T1: 14 April 2017



Drishti Sl no. 2537010 MWS : 4C3G5j2b

Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-47/2011-12



T0

T0: 2011-12



T1

T1: 14 April 2017



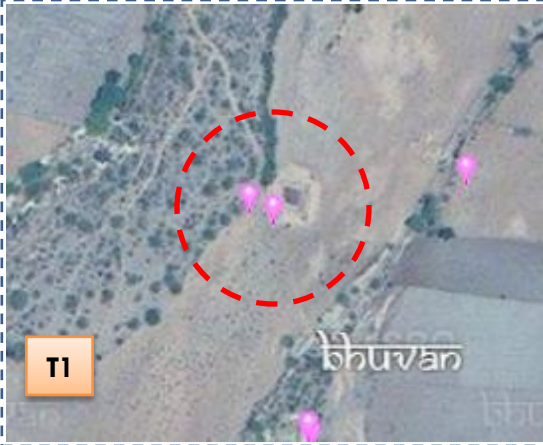
Drishti SI no. 1646337 MWS : 4C3G6j1c

Farm pond



T0

T0: 2011-12



T1

T1: 14 April 2017



Drishti SI no. 1027119 MWS : 4C3G5j1b

Farm pond

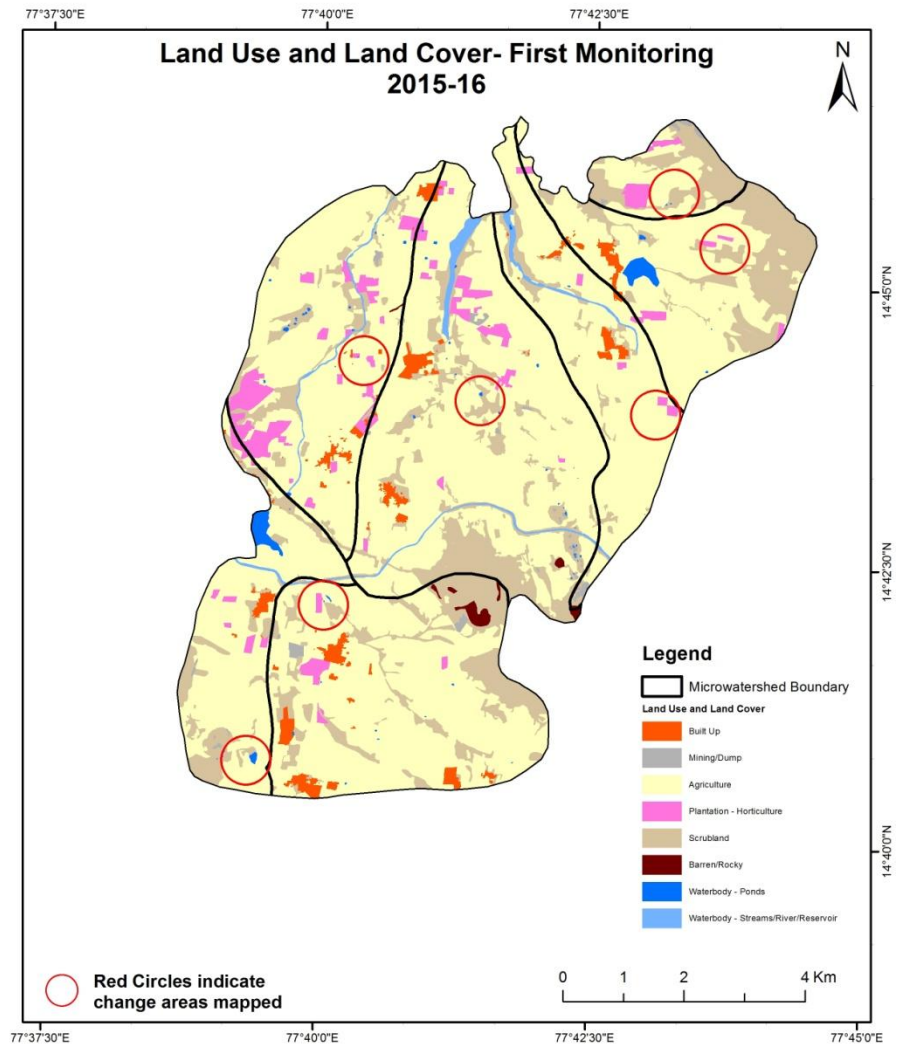
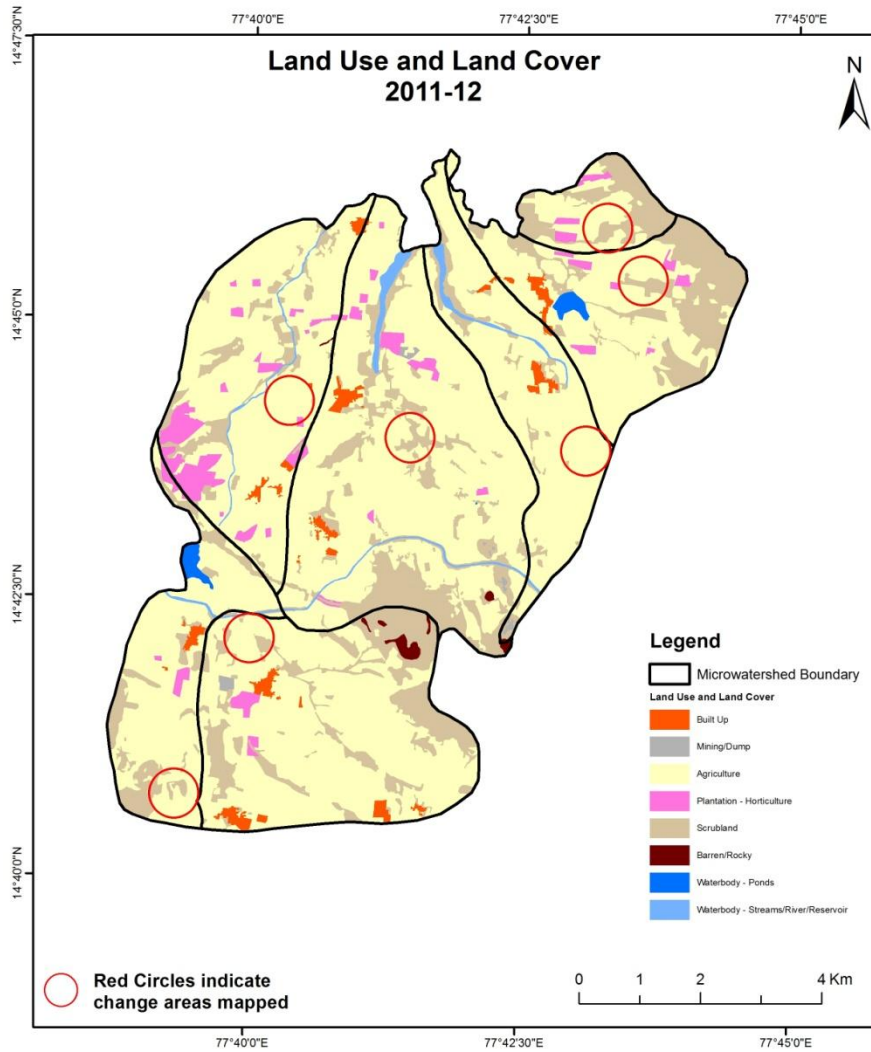
## MONITORING IN THE PROJECT AREA

### Land use and Land cover Changes in the Project

- Change in land use and land cover from 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)

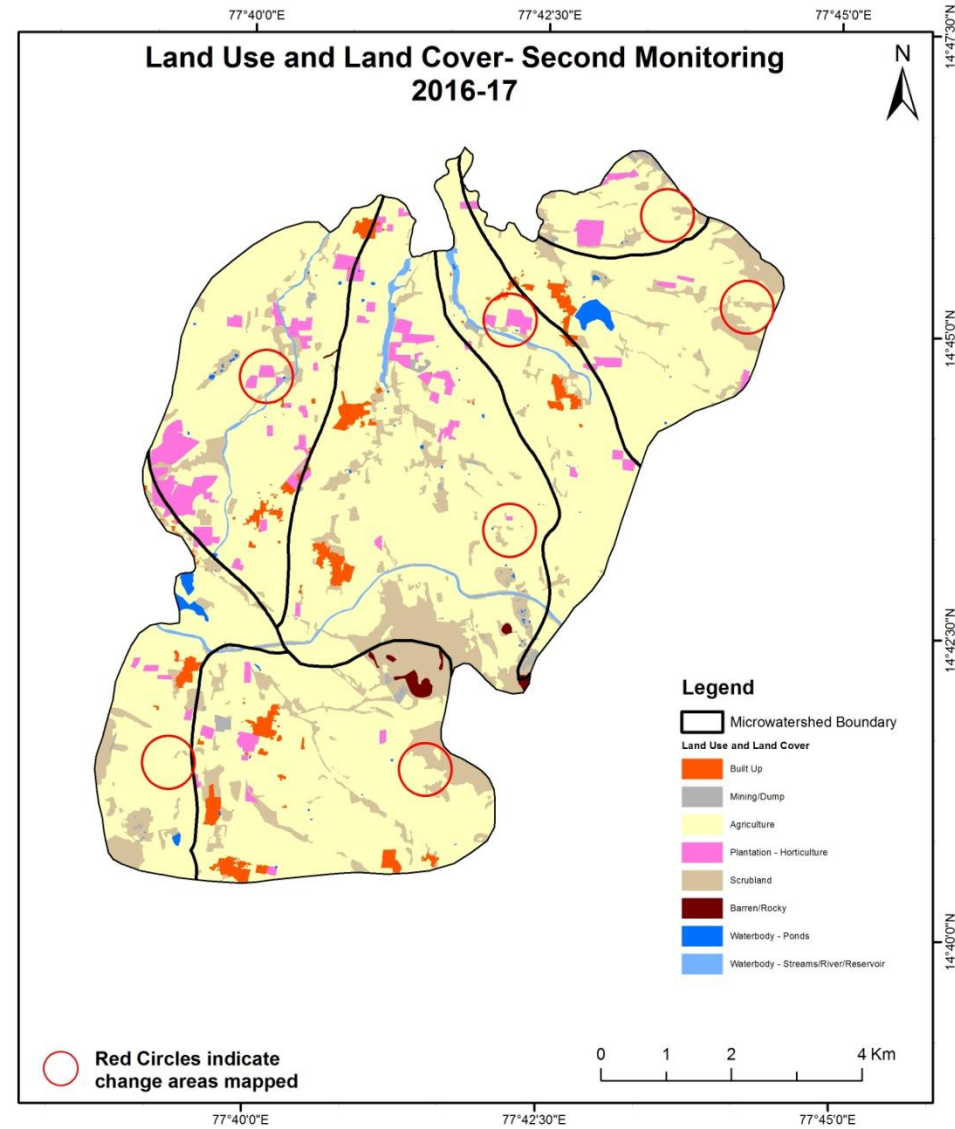
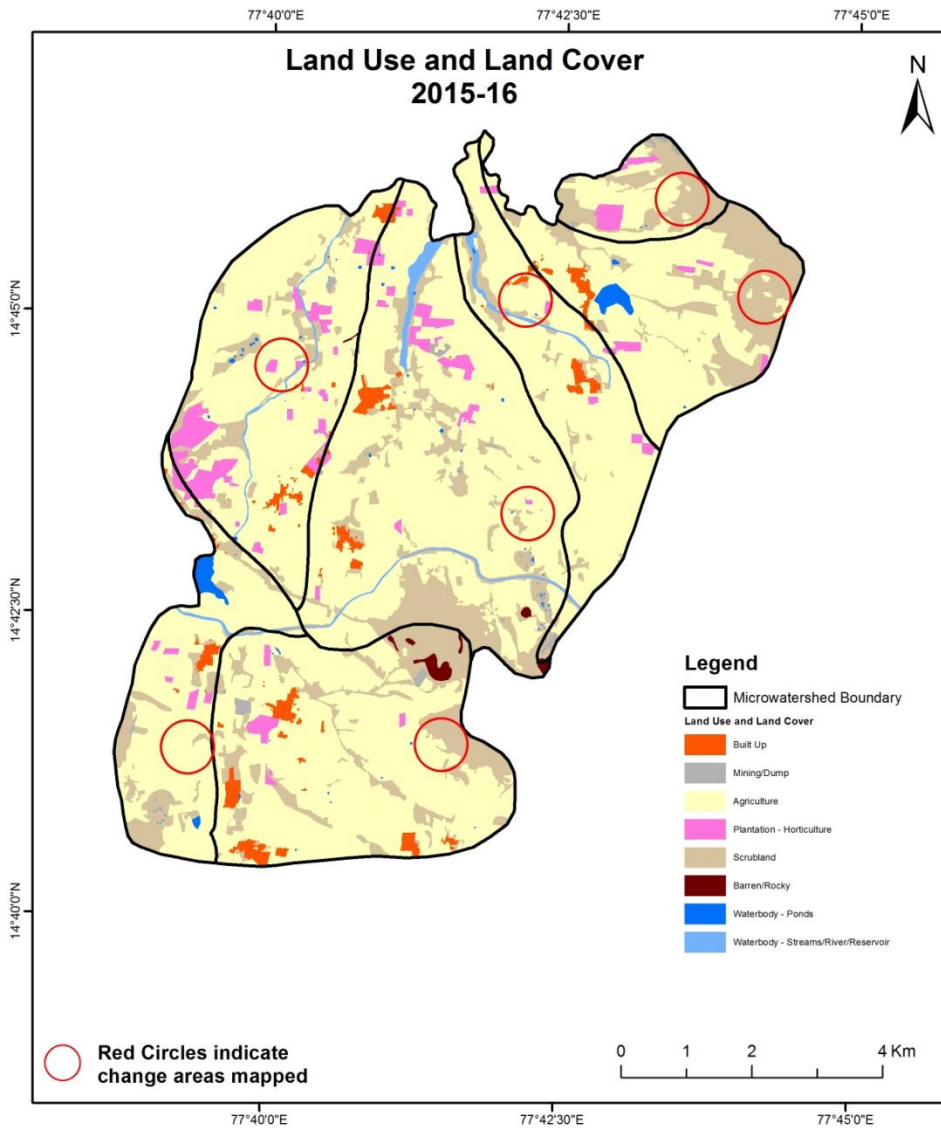
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



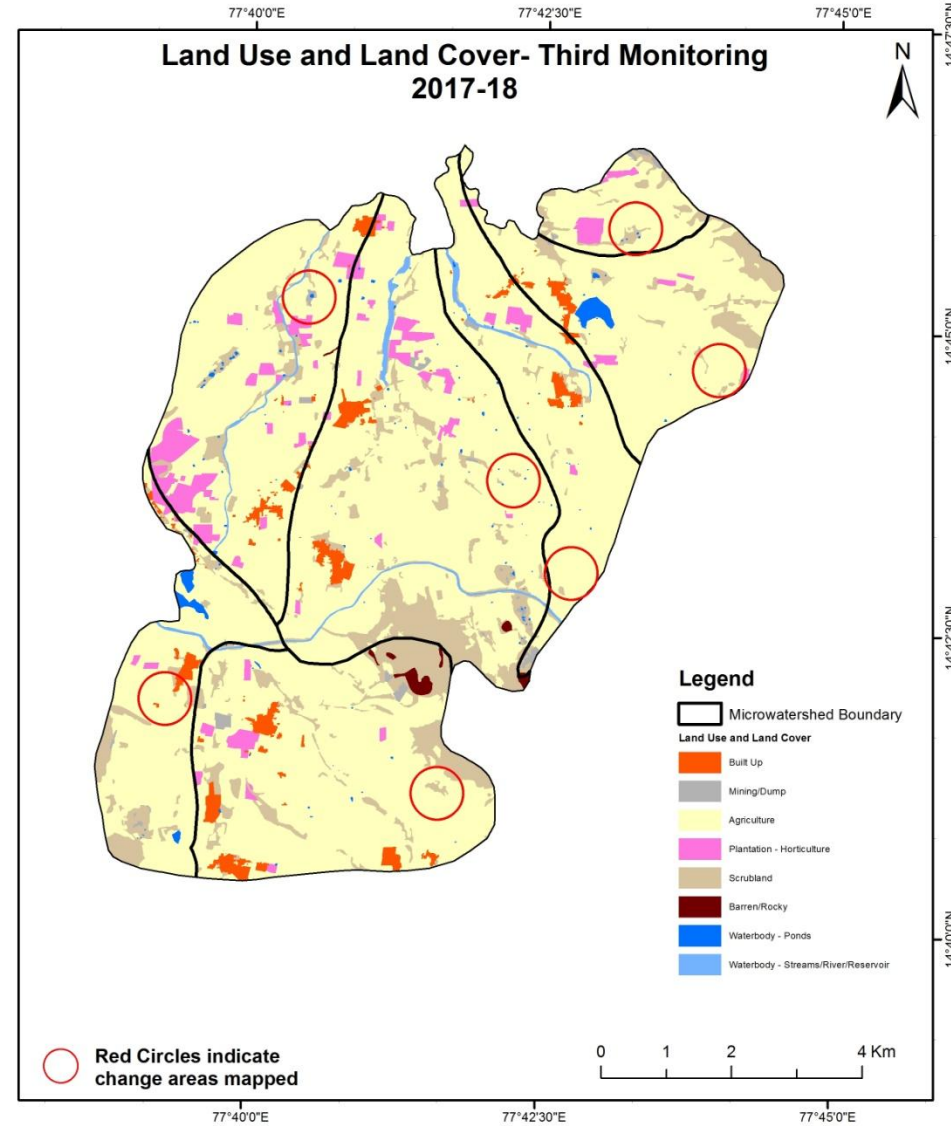
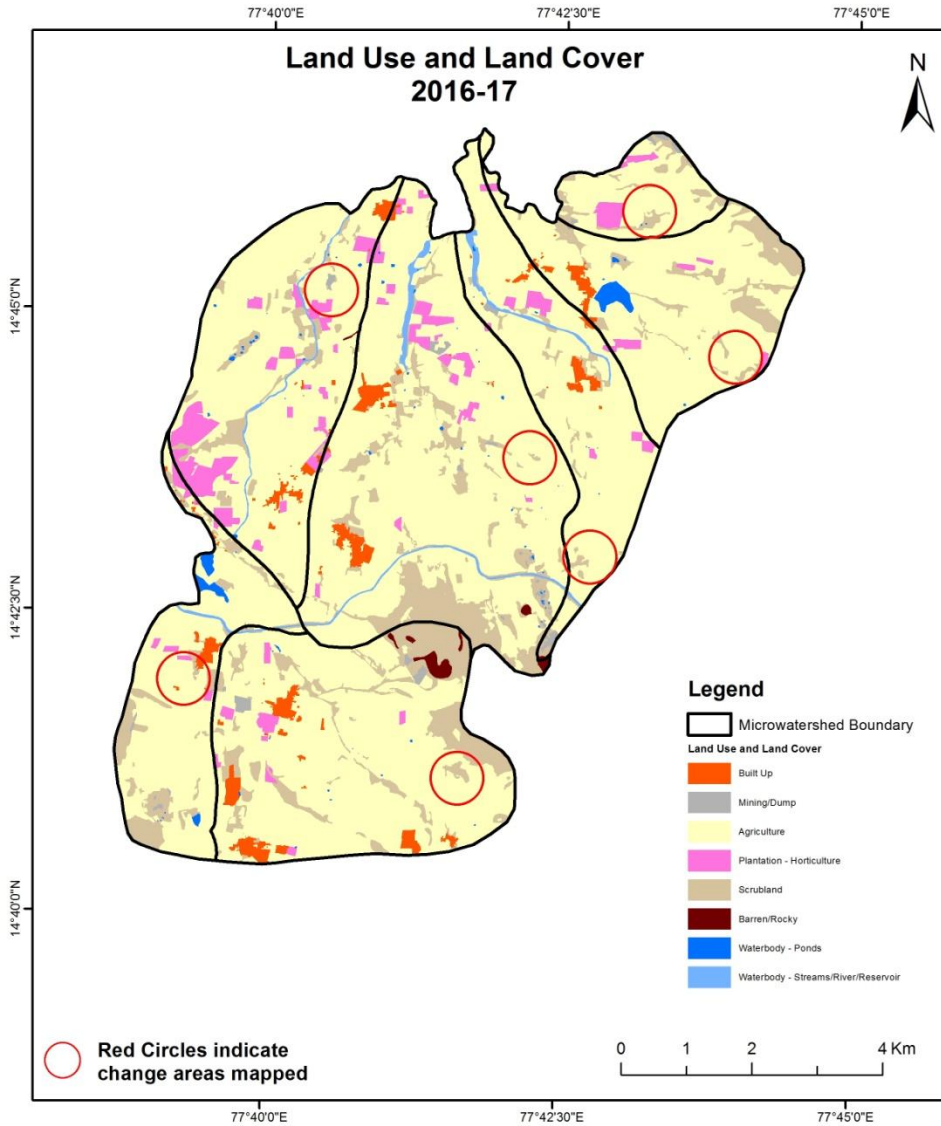
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



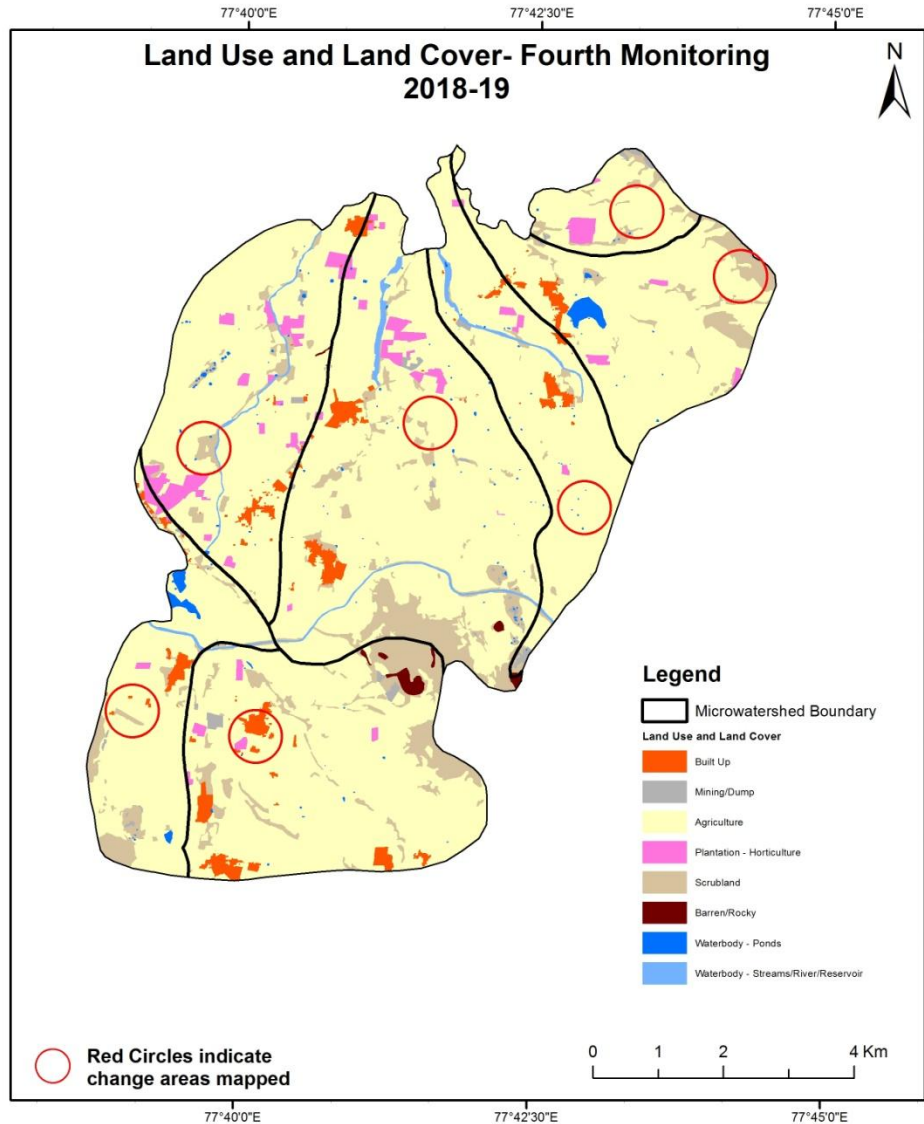
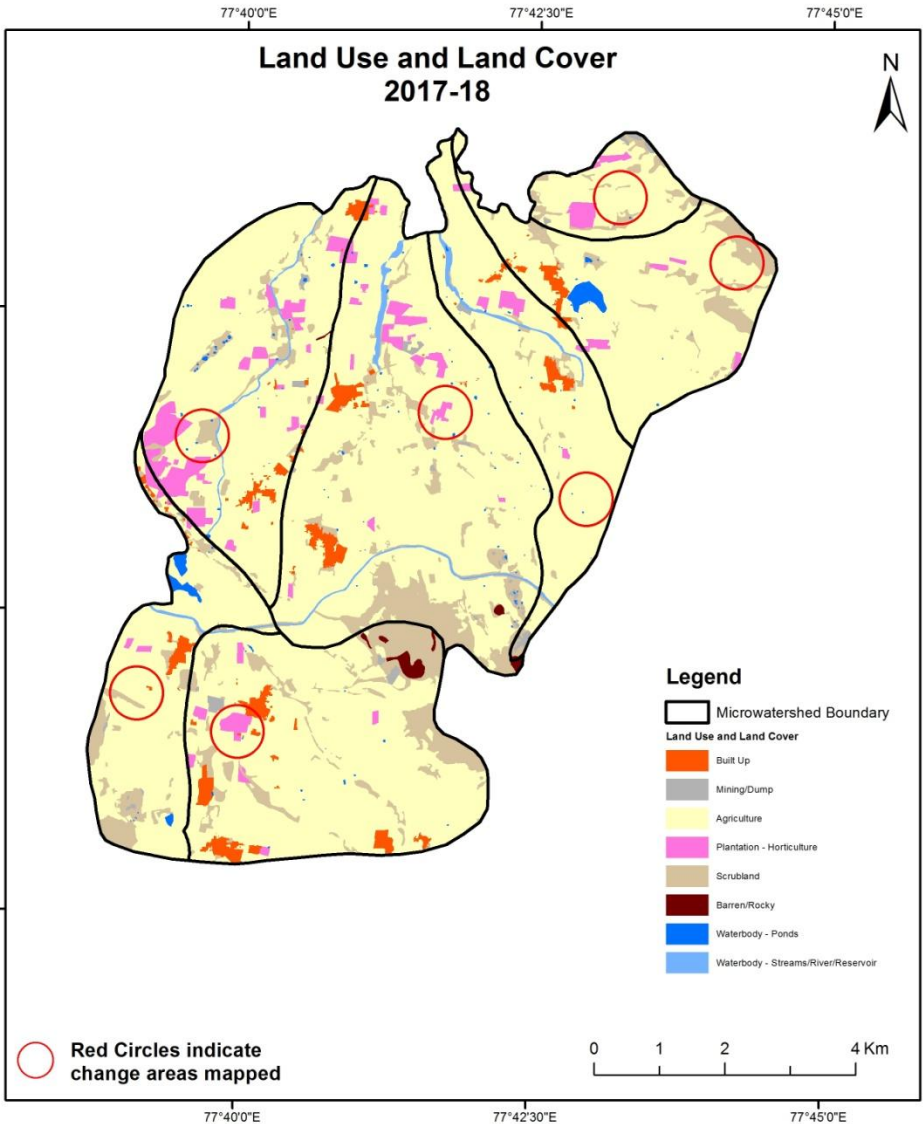
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



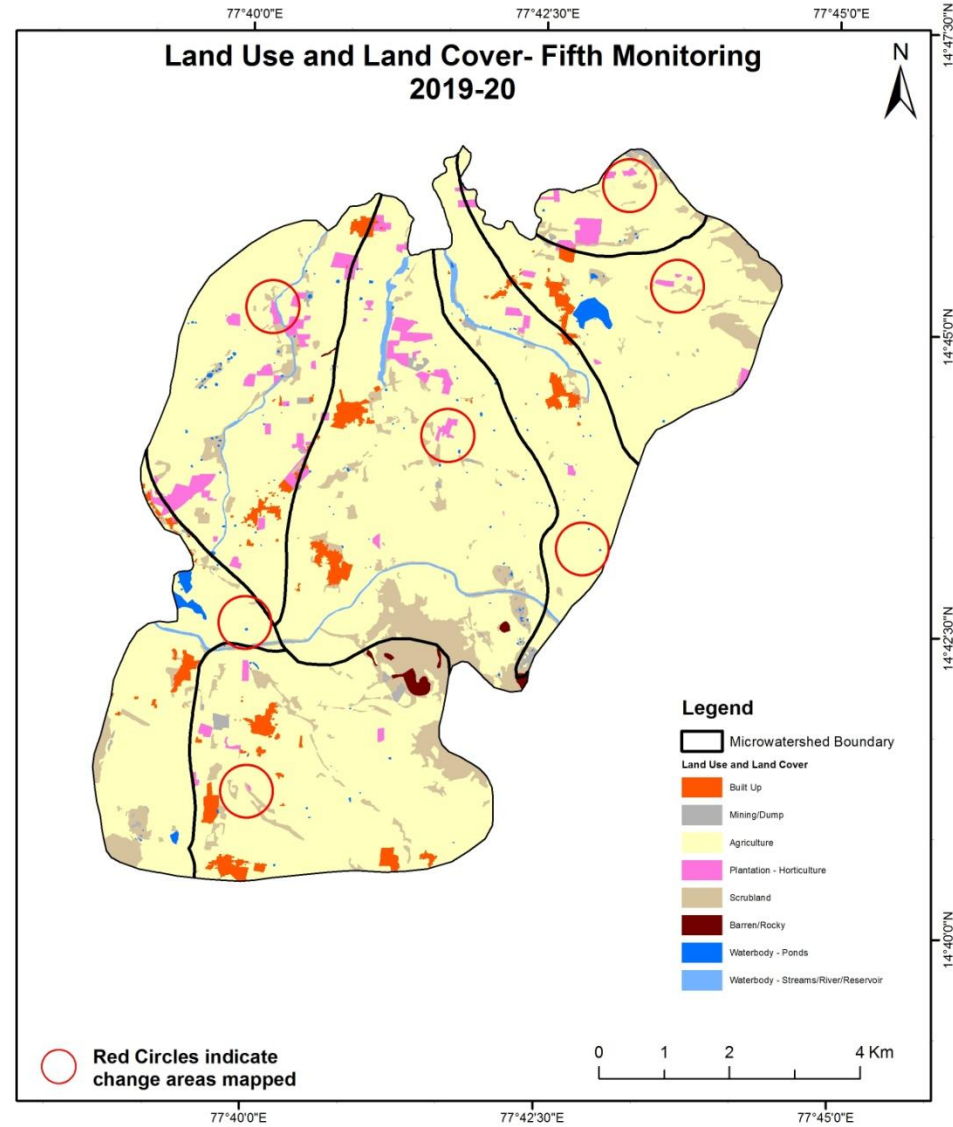
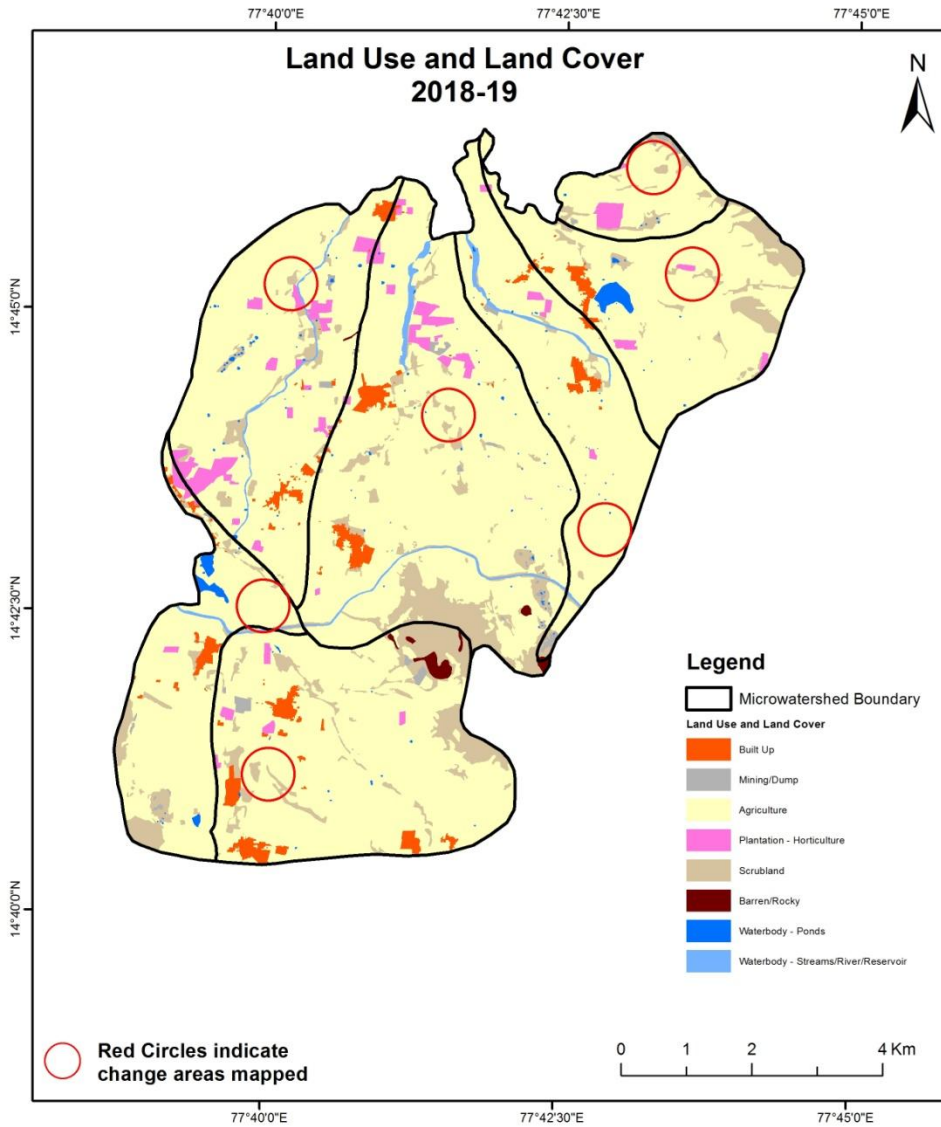
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

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 Plantation



T0: 2011-12 (77°40'48.756"E 14°45'30.804"N)

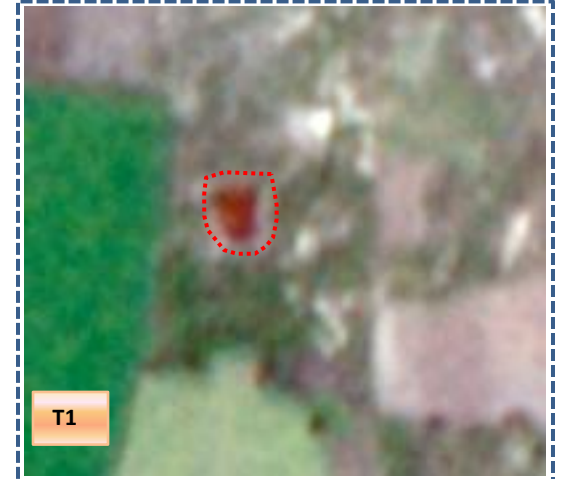


T1: 07 December 2015

Scrub to water body



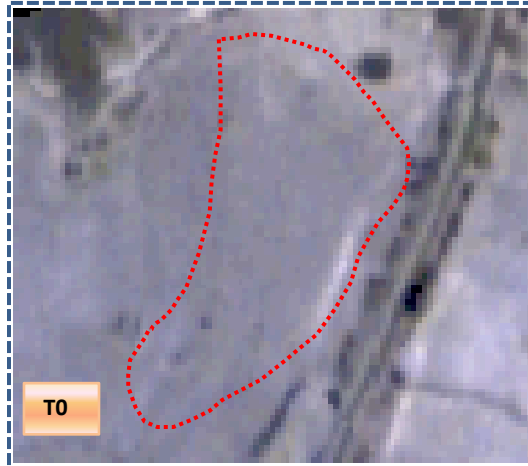
T0: 2011-12 (77°40'13.949"E 14°44'47.895"N)



T1: 07 December 2015

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

Agriculture to Water body



T0: 2011-12 (77°42'48.609"E 14°46'6.869"N)



T1: 07 December 2015

Scrub to Agriculture



T0: 2011-12 (77°41'58.333"E 14°44'12.058"N)



T1: 07 December 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		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>Built up</b>	111.73												<b>111.73</b>
<b>Mining/dump</b>		14.09									0.25		<b>14.33</b>
<b>Agriculture</b>	19.44	5.36	5148.03	99.64							5.03		<b>5277.50</b>
<b>Plantation Horticulture</b>	1.43		67.31	147.87									<b>216.61</b>
<b>Forest</b>													
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							21.14						<b>21.14</b>
<b>Scrub</b>	15.45	16.14	55.68	0.05				1324.57			4.54		<b>1416.42</b>
<b>Waterbody- Streams/River</b>			3.34						83.68		0.25		<b>87.27</b>
<b>Waterbody – Ponds</b>											34.93		<b>34.93</b>
<b>Grand Total</b>	<b>148.04</b>	<b>35.58</b>	<b>5274.36</b>	<b>247.57</b>			<b>21.14</b>	<b>1324.57</b>	<b>83.68</b>		<b>45.01</b>		<b>7179.94</b>

- 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 129 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 126 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>T1</b>												
<b>Built up</b>	148.04										<b>148.04</b>	
<b>Mining/dump</b>		35.58									<b>35.58</b>	
<b>Agriculture</b>	10.36		5221.04	42.46						0.49	<b>5274.36</b>	
<b>Plantation Horticulture</b>	0.13		13.48	233.96							<b>247.57</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							21.14				<b>21.14</b>	
<b>Scrub</b>	4.77	3.33	408.94					907.41		0.11	<b>1324.57</b>	
<b>Waterbody- Streams/River</b>			9.83						73.75	0.10	<b>83.68</b>	
<b>Waterbody – Ponds</b>			5.69							39.31	<b>45.01</b>	
<b>Grand Total</b>	<b>163.31</b>	<b>38.91</b>	<b>5658.98</b>	<b>276.42</b>			<b>21.14</b>	<b>907.41</b>	<b>73.75</b>	<b>40.02</b>	<b>7179.94</b>	

- 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 53 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 422 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>Built up</b>	163.31										<b>163.31</b>	
<b>Mining/dump</b>		38.61								0.30	<b>38.91</b>	
<b>Agriculture</b>	3.54	1.95	5639.84	10.93						2.71	<b>5658.98</b>	
<b>Plantation Horticulture</b>			26.85	249.57							<b>276.42</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							21.14				<b>21.14</b>	
<b>Scrub</b>	4.55	0.70	111.16					789.96		1.04	<b>907.41</b>	
<b>Waterbody- Streams/River</b>			2.53						71.21		<b>73.75</b>	
<b>Waterbody – Ponds</b>			0.29							39.73	<b>40.02</b>	
<b>Grand Total</b>	<b>171.40</b>	<b>41.25</b>	<b>5780.67</b>	<b>260.51</b>			<b>21.14</b>	<b>789.96</b>	<b>71.21</b>	<b>43.79</b>	<b>7179.94</b>	

- 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 19 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.
- In T3 138 ha of the agriculture area has increased from plantations, scrubland and water body 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>T3</b>												
<b>Built up</b>	171.40										<b>171.40</b>	
<b>Mining/dump</b>		41.20								0.05	<b>41.25</b>	
<b>Agriculture</b>	4.62	0.10	5773.15	1.49						1.30	<b>5780.67</b>	
<b>Plantation Horticulture</b>	0.28		91.48	168.75							<b>260.51</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							21.14				<b>21.14</b>	
<b>Scrub</b>	0.91		128.64					660.12		0.29	<b>789.96</b>	
<b>Waterbody- Streams/River</b>									71.21		<b>71.21</b>	
<b>Waterbody – Ponds</b>										43.79	<b>43.79</b>	
<b>Grand Total</b>	<b>177.21</b>	<b>41.31</b>	<b>5993.27</b>	<b>170.24</b>			<b>21.14</b>	<b>660.12</b>	<b>71.21</b>	<b>45.44</b>	<b>7179.94</b>	

- 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 07 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 220 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	177.21											177.21
Mining/dump		41.31										41.31
Agriculture	8.19	0.53	5940.67	43.12						0.75		5993.27
Plantation Horticulture	0.14		27.06	143.04								170.24
Forest												
Forest Plantation												
Barren Rocky							21.14					21.14
Scrub	0.20		35.48					624.02		0.41		660.12
Waterbody- Streams/River									71.21			71.21
Waterbody – Ponds										45.44		45.44
<b>Grand Total</b>	<b>185.74</b>	<b>41.84</b>	<b>6003.22</b>	<b>186.16</b>			<b>21.14</b>	<b>624.02</b>	<b>71.21</b>	<b>46.60</b>		<b>7179.94</b>

- 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 52 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T5.
- In T5 62 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 decrease of 04 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 384, 121, 212 & 09 Hectares From T1 to T2, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 725 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is a decrease of 792 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
6. Farm ponds (44) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (44) verified from the portal.