

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

YSR KADAPA -37/2011-12  
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

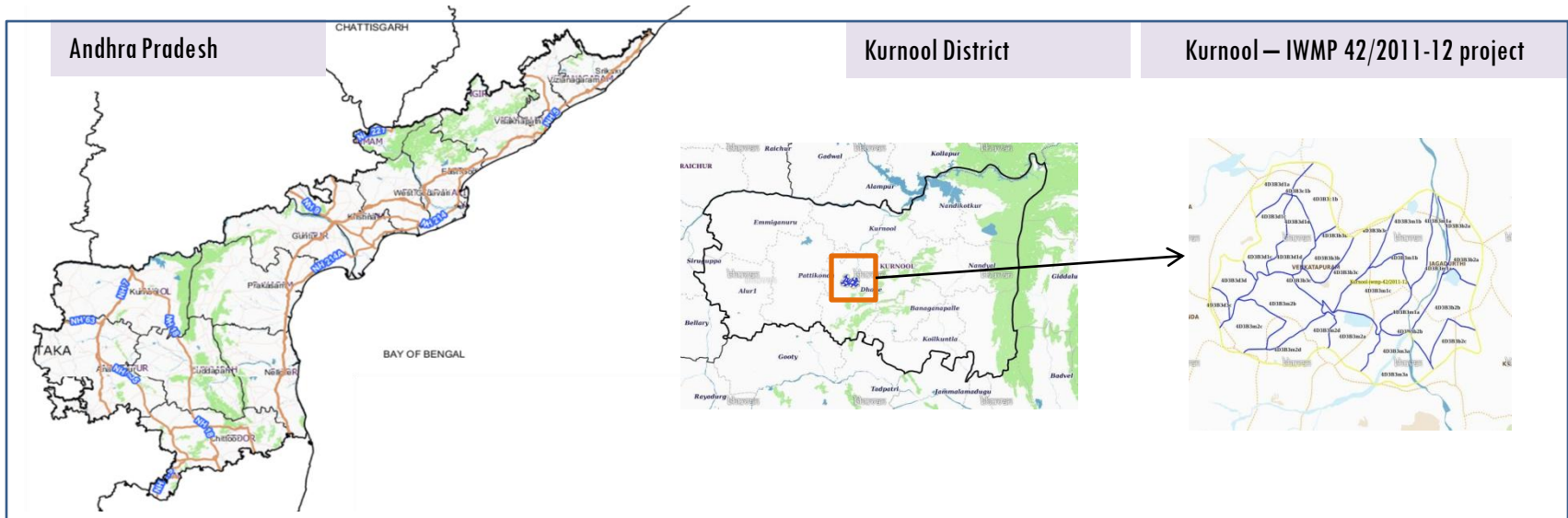
## **E X E C U T I V E   S U M M A R Y**

- 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-42/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is 7,141 ha. It comprises of 20 micro watersheds.
- In the project area 207 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Major percentage i.e. 70.3% is covered by the agriculture, 15.8 % is covered by scrub land, 5.2 % is covered by water body and remaining by other land use classes.

# PROJECT : KURNOOL – IWMP-42/2011-12

## DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Dhone Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 7,141 ha. It comprises of 20 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).

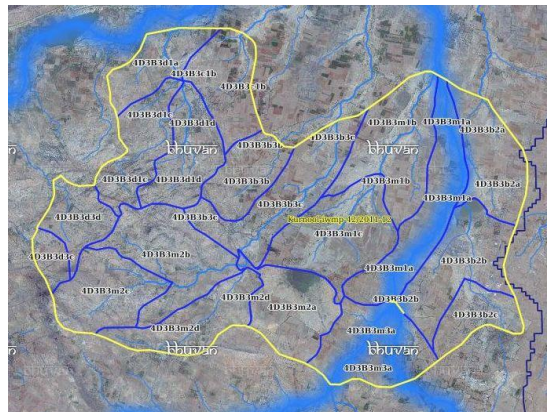
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2011-12	2019-20
LISS IV	2011-12		
SCENE 1			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	Drishiti Photographs		
		Total	207
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

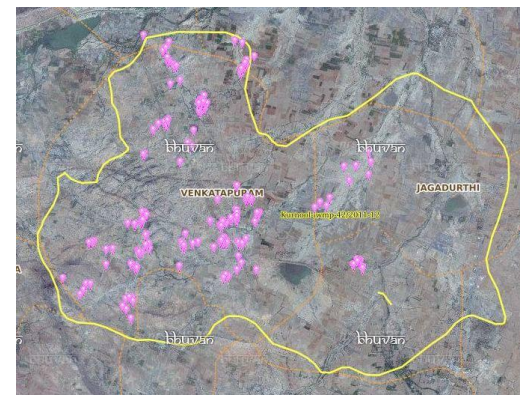


MWS Boundary



Project Boundary

## Natural Color Composite overlaid with Drishiti Points



### Drishiti Upload Status

## Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	8	8
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	11	11
7	Check dams (Civil work)	0	0
8	Checks & plugins	4	4
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	52	52
17	Others	152	132
	<b>TOTAL</b>	<b>227</b>	<b>207</b>

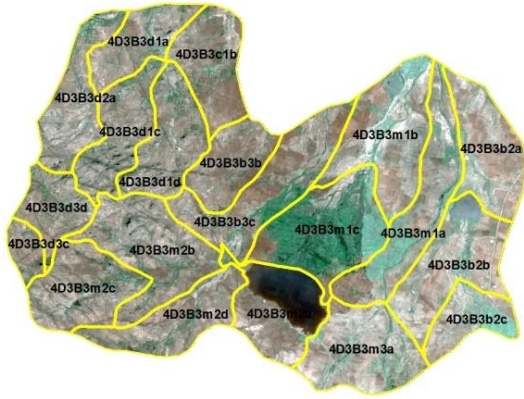
## MONITORING IN THE PROJECT AREA

### 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.

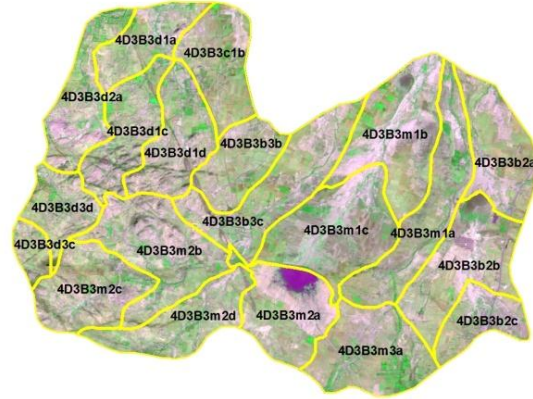
# Natural Color Composite

Natural Color Composite- 2011-12



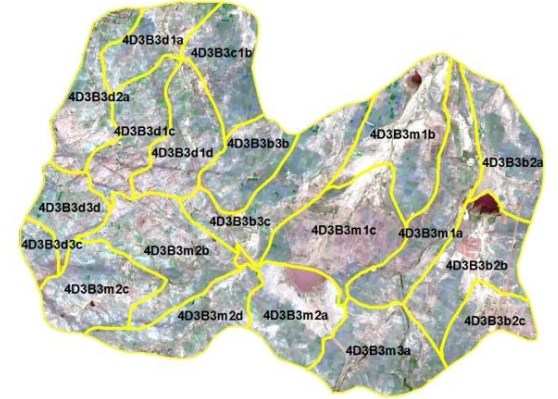
Source:Fusion data,NRSC

Natural Color Composite- 30th December 2015



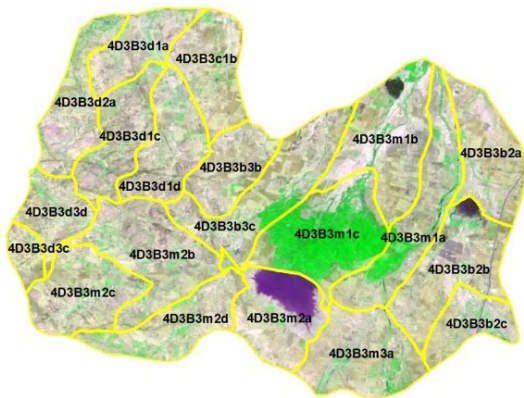
Source:LISS-IV,NRSC

Natural Color Composite- 17th October 2016



Source:NCC,NRSC

Natural Color Composite- 26th March 2018



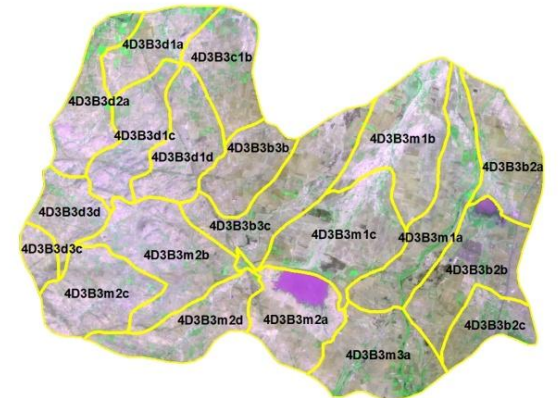
Source:LISS-IV,NRSC

Natural Color Composite- 04th January 2019



Source:Sentinel,NRSC

Natural Color Composite- 19th February 2020



Source:LISS-IV,NRSC



Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-42/2011-12



T1: 18 February 2015



T2: 30 April 2017



Drishti Sl no. 132444 MWS :4D3B3m1c

**Dug out Sunken pond**



T1: 18 February 2015



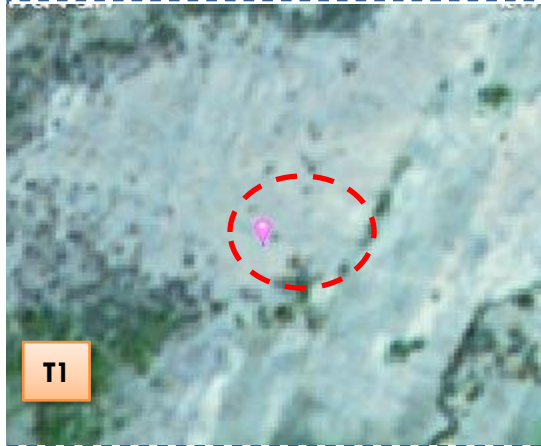
T2: 30 April 2017



Drishti Sl no. 132467 MWS :4D3B3m1c

**Dug out Sunken pond**

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-42/2011-12



T1

T1: 18 February 2015



T2

T2: 2018



Drishti Sl no. 146596 MWS : 4D3B3m1c

Farm pond



T1

T1: 18 February 2015



T2

T2: 30 April 2017



Drishti Sl no. 1786728 MWS : 4D3B3b3c

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-42/2011-12



T0

T0:2010-11



T1

T1: 30 December 2015



Drishti Sl no. 7014564 MWS :4D3B3b3c

Dugout pit



T0

T0:2010-11



T1

T1: 30 December 2015



Drishti Sl no. 146588 MWS :4D3B3b3c

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-42/2011-12



T0

T0: 2010-11



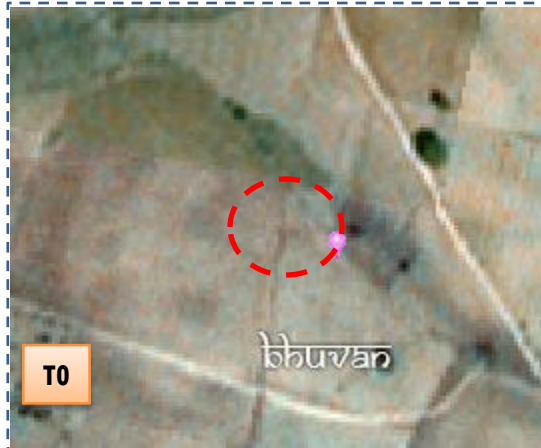
T1

T1: 30 December 2015



Drishti Sl no. 2706221b MWS : 4D3B3m2b

Horticulture



T0

T0: 2010-11



T1

T1: 30 December 2015



Drishti Sl no. 2707126 MWS : 4D3B3m2c

Horticulture

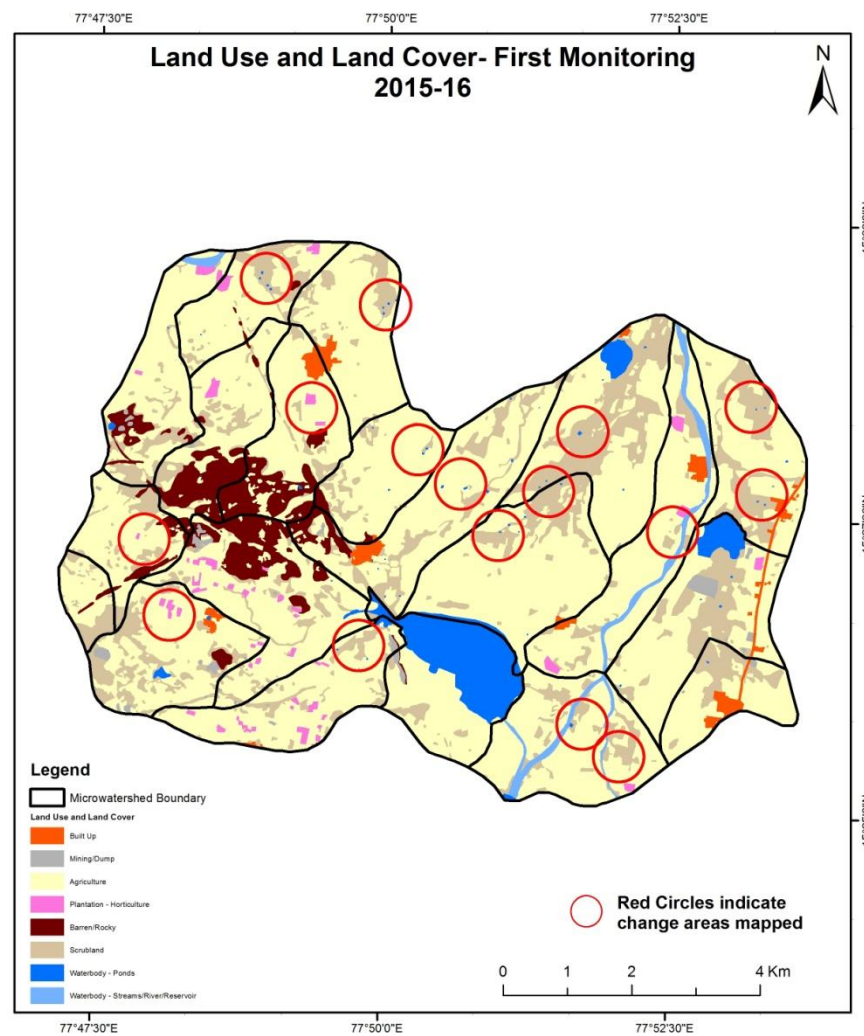
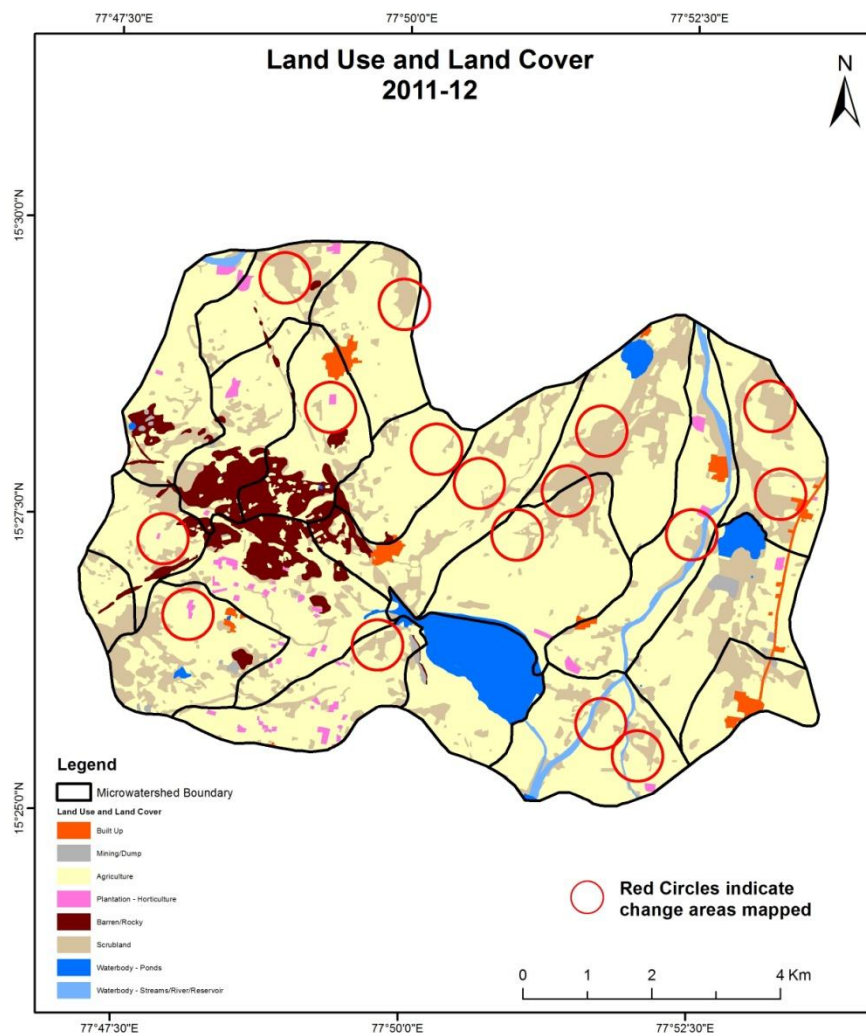
## MONITORING IN THE PROJECT AREA

### 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)

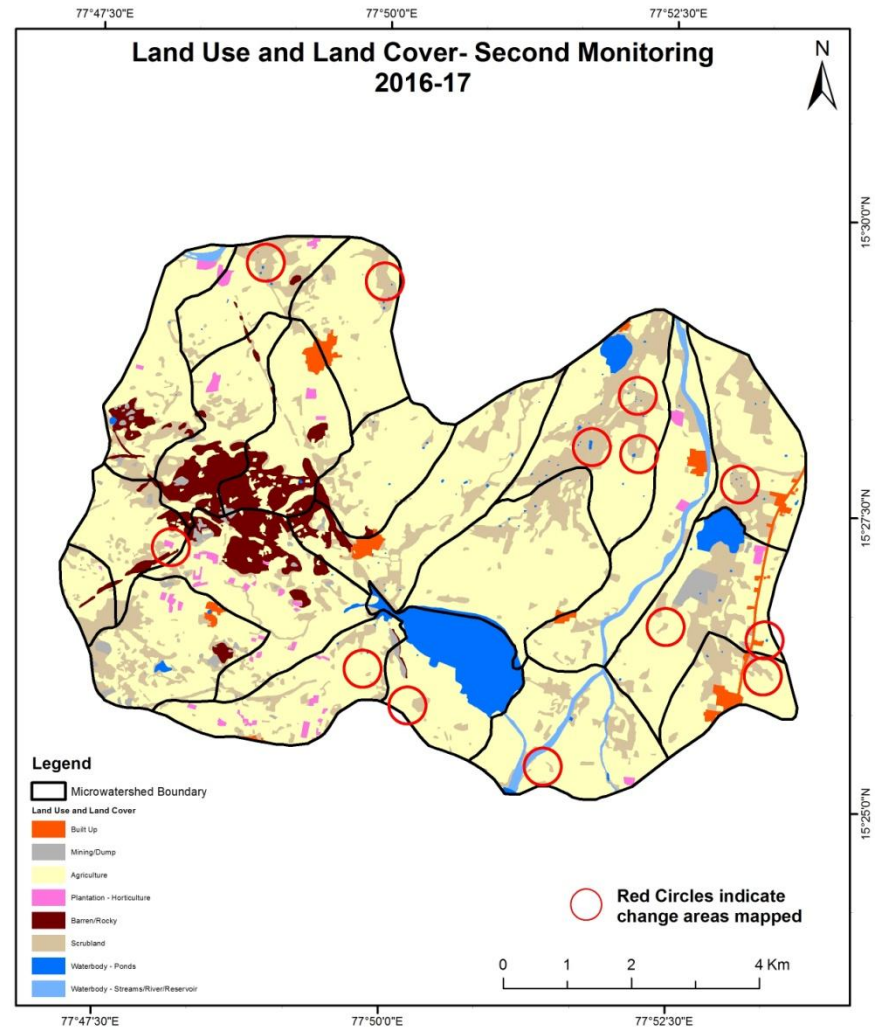
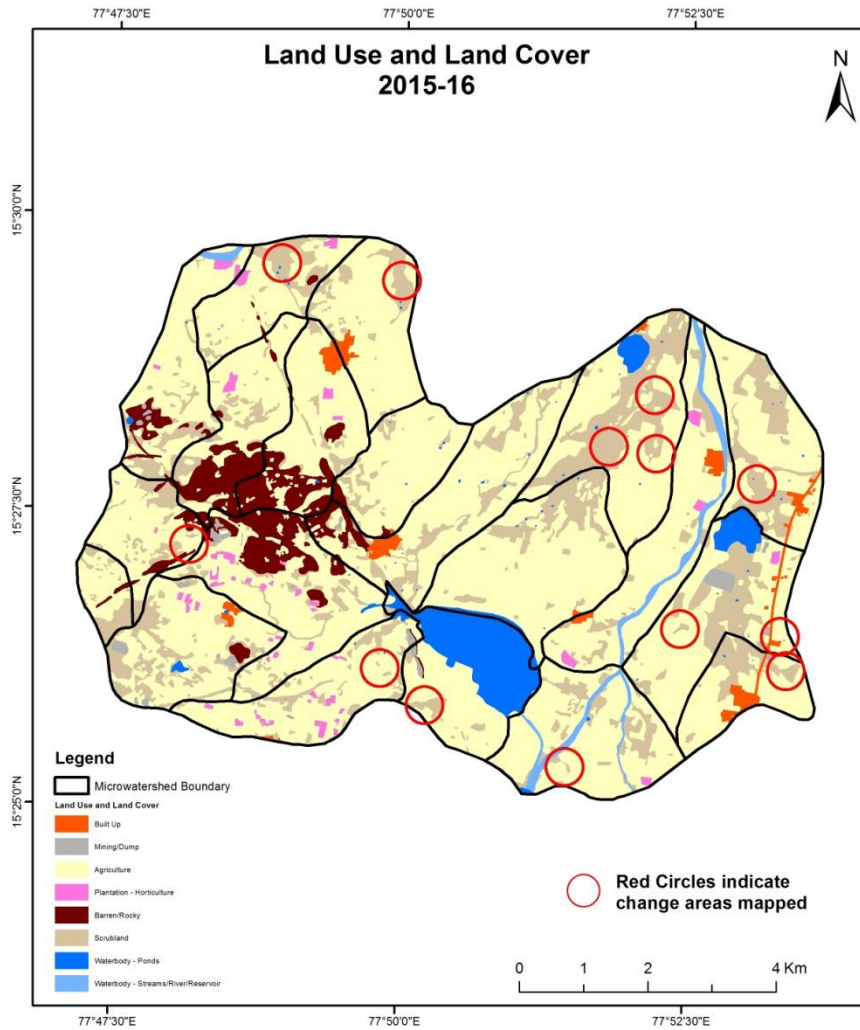
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



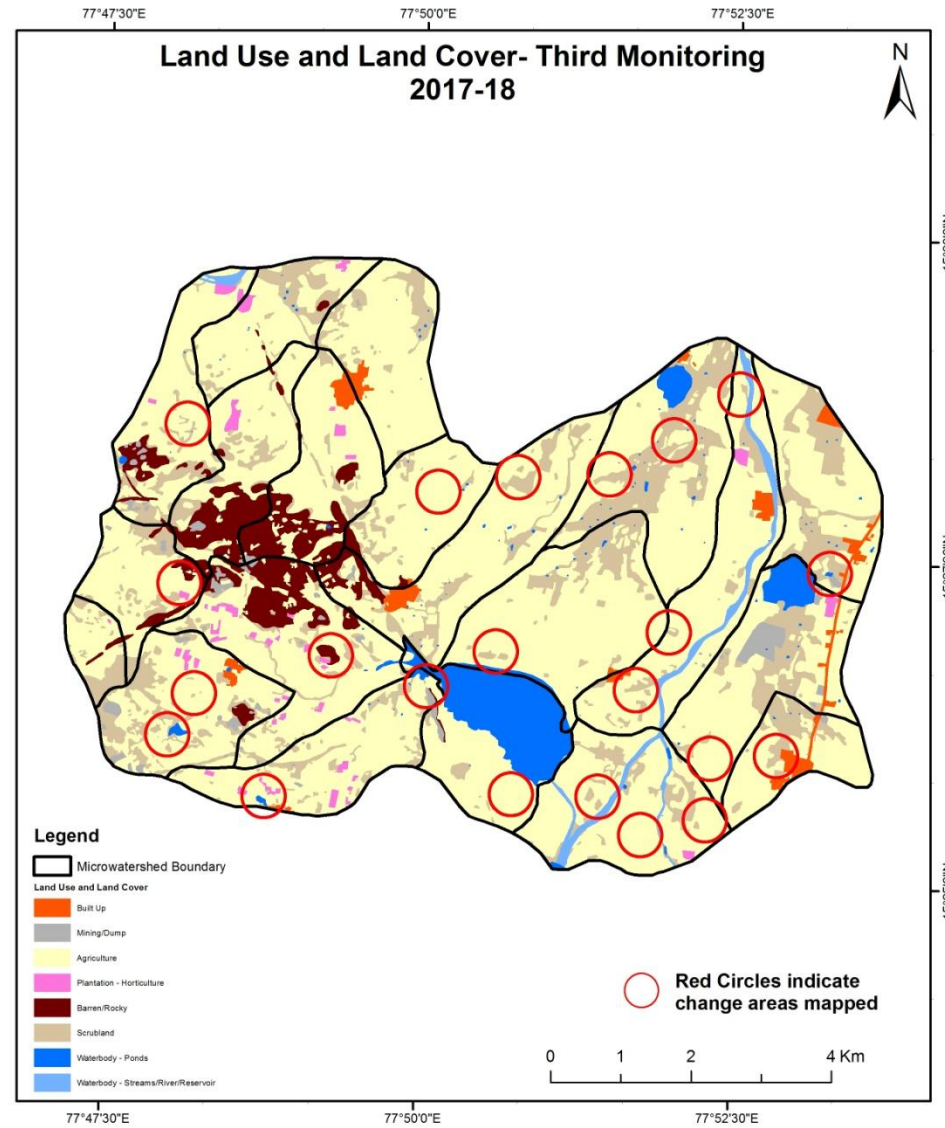
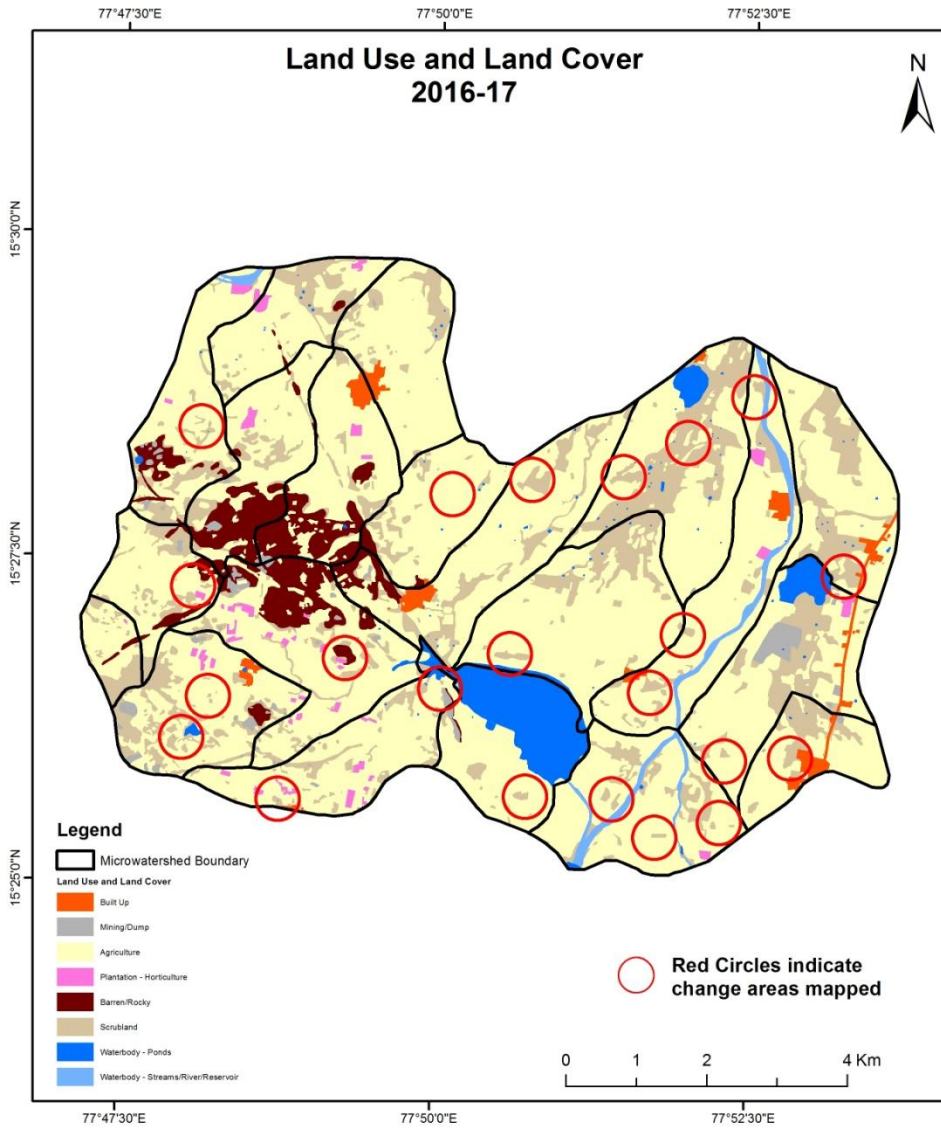
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



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

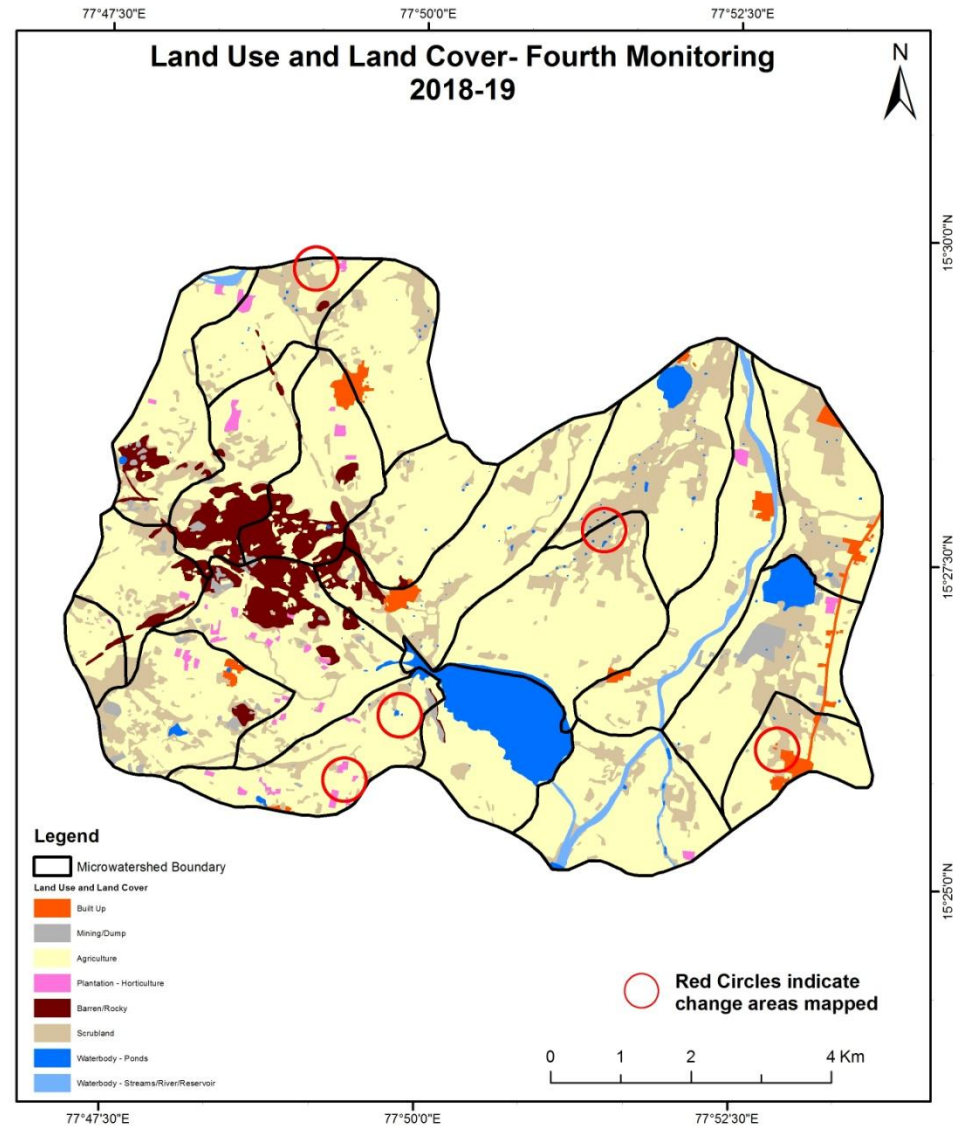
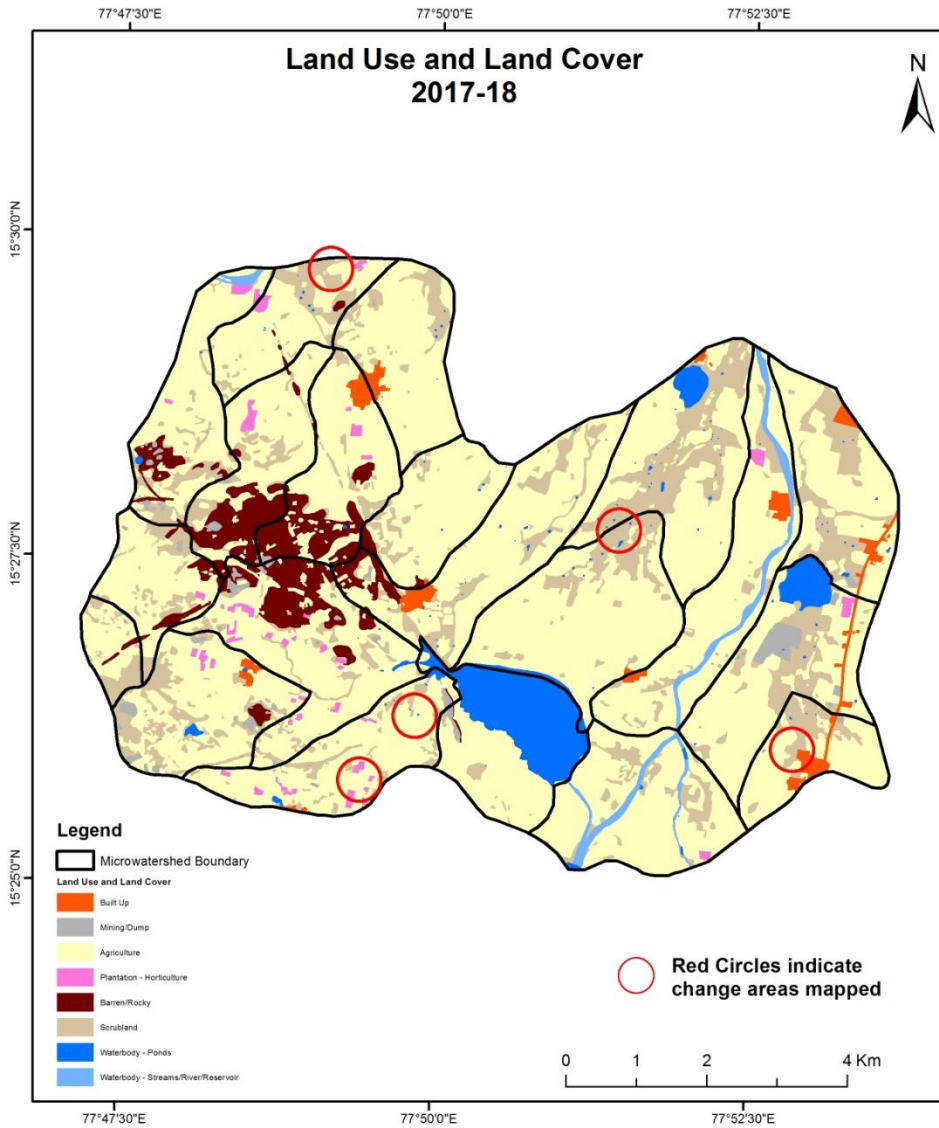
Scale: 1:10000





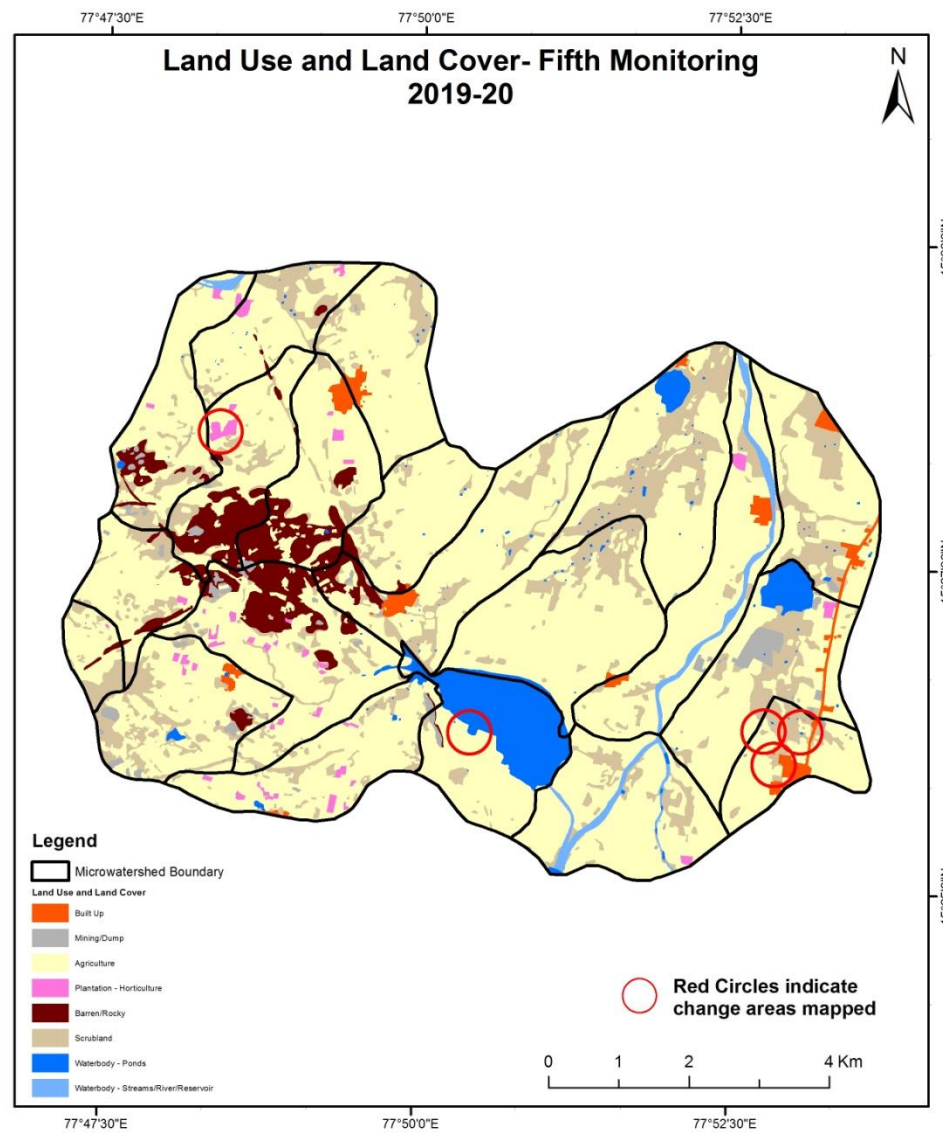
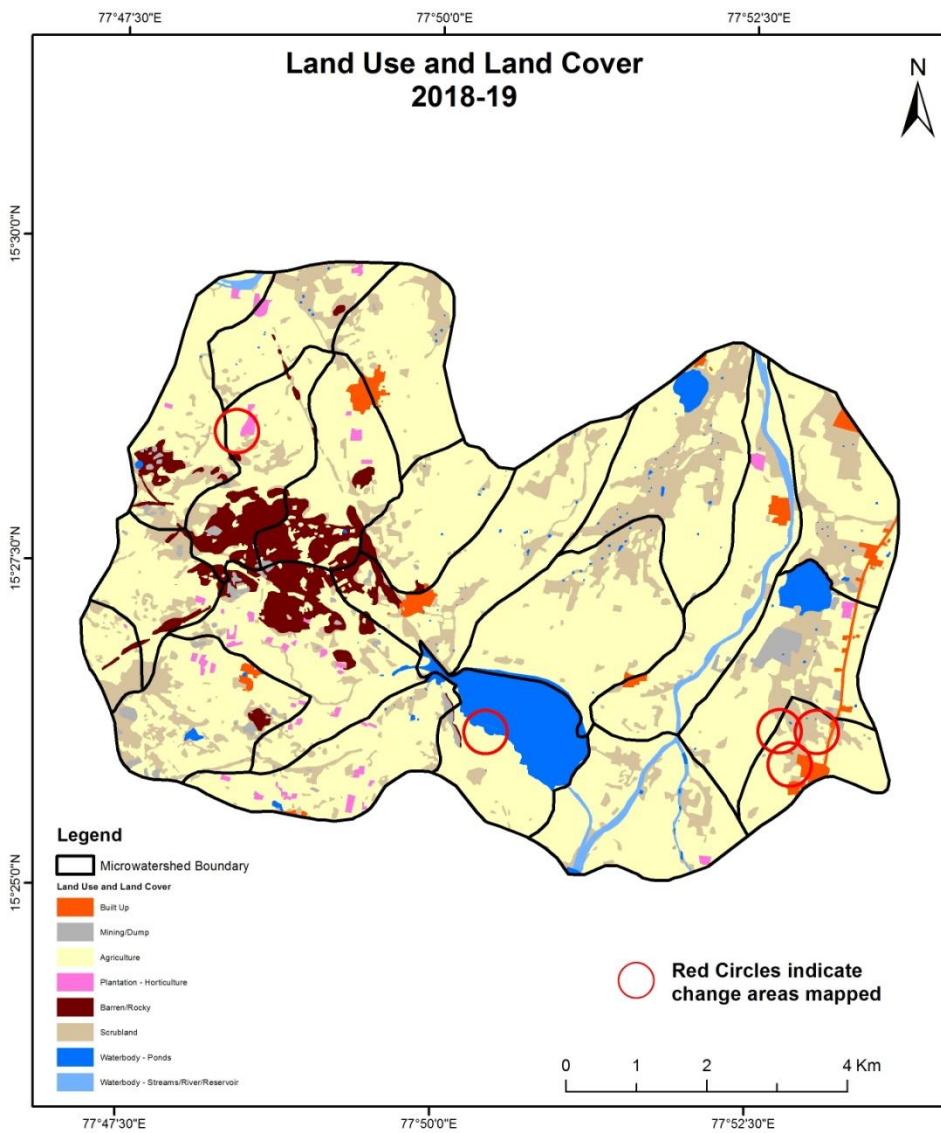
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



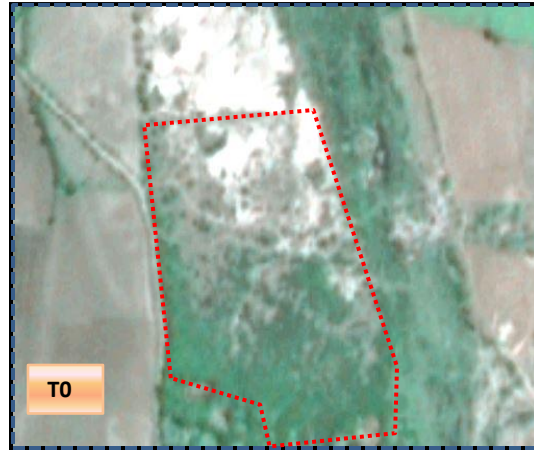
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

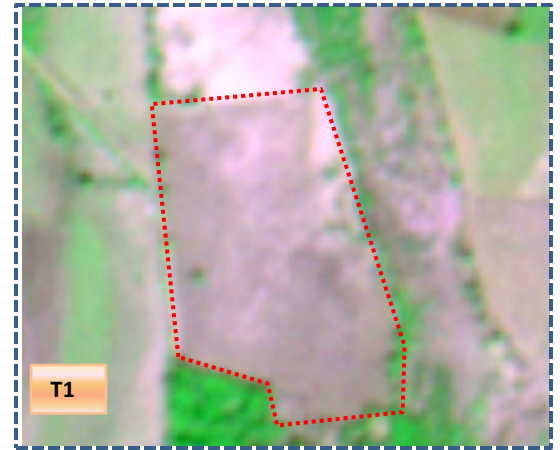


## Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0: 2011-12 (77°52'42.829"E 15°28'9.614"N )



T1: 30 December 2015

Agriculture to water body



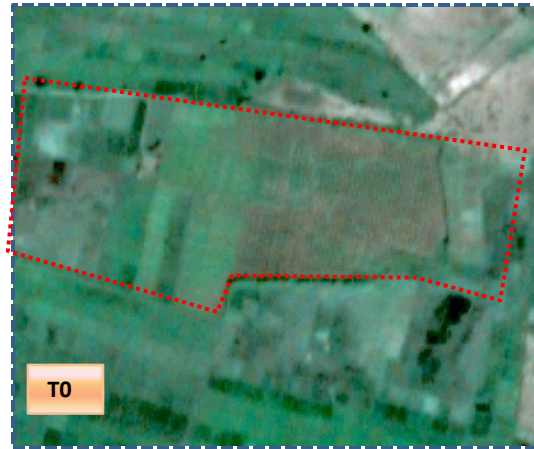
T0: 2011-12 (77°50'29.722"E 15°27'45.699"N )



T1: 30 December 2015

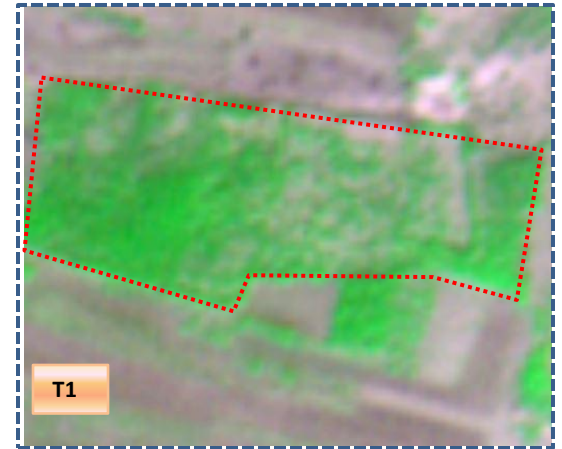
## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

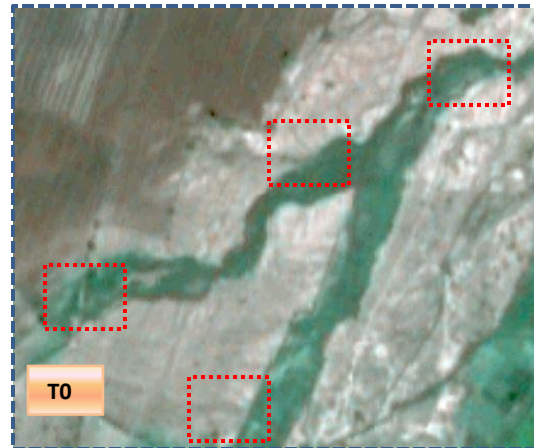
T0: 2011-12 (77°50'55.623"E 15°27'20.463"N )



T1

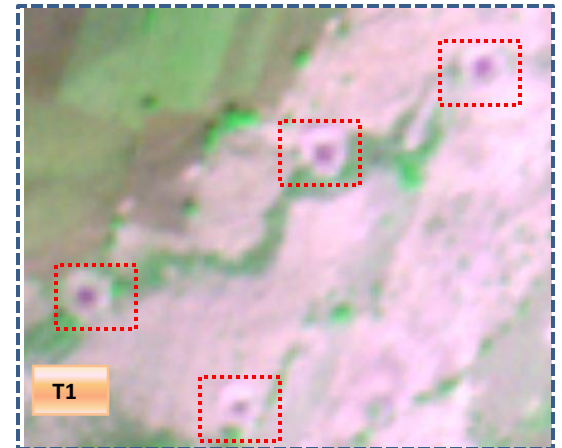
T1: 30 December 2015

Scrub to water body



T0

T0: 2011-12 (77°51'5.369"E 15°27'26.867"N )

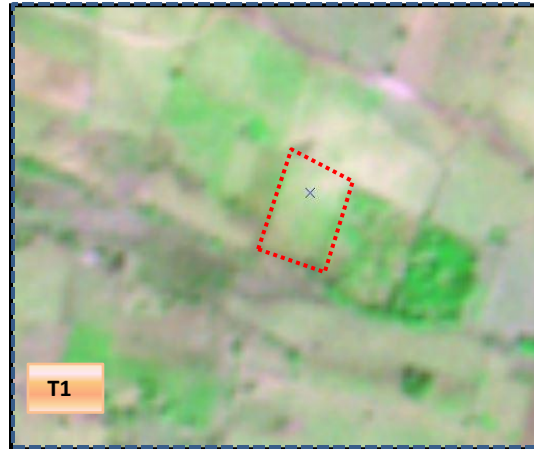


T1

T1: 30 December 2015

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

Agriculture to Plantation



T1: 2015-16(77°48'33.187"E 15°25'43.689"N )



T2: 17 October 2016

Agriculture to water body



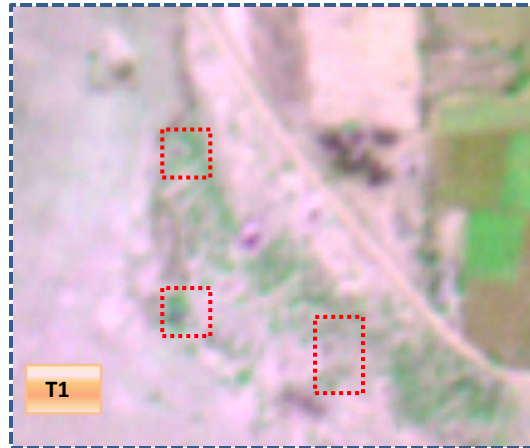
T1: 2015-16 (77°49'46.669"E 15°29'29.85"N )



T2: 17 October 2016

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

Scrub to water body



T1: 2015-16(77°53'1.357"E 15°27'46.758"N )



T2: 17 October 2016

Scrub to Agriculture



T1: 2015-16(77°53'11.855"E 15°28'42.594"N )



T2: 17 October 2016

**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>	96.66										<b>96.66</b>	
<b>Mining/dump</b>		30.61									<b>30.61</b>	
<b>Agriculture</b>	2.95	4.48	4858.17	4.78				60.53		2.85	<b>4933.75</b>	
<b>Plantation Horticulture</b>	0.25		5.11	64.03				0.41		0.07	<b>69.86</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>		6.58						365.41			<b>372.00</b>	
<b>Scrub</b>		6.42	54.82					1204.43		3.13	<b>1268.80</b>	
<b>Waterbody- Streams/River</b>									88.58		<b>88.58</b>	
<b>Waterbody – Ponds</b>			12.39							268.75	<b>281.13</b>	
<b>Grand Total</b>	<b>99.86</b>	<b>48.09</b>	<b>4930.48</b>	<b>68.81</b>				<b>365.41</b>	<b>1265.36</b>	<b>88.58</b>	<b>7141.40</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 75.59 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T1.
- In T1 72.3 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>	99.86										<b>99.86</b>	
<b>Mining/dump</b>		48.09									<b>48.09</b>	
<b>Agriculture</b>	0.64	3.45	4912.94	3.19				9.23		1.04	<b>4930.48</b>	
<b>Plantation Horticulture</b>			7.49	61.31							<b>68.81</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>		8.25					357.17				<b>365.41</b>	
<b>Scrub</b>	0.92	17.13	49.12					1195.97		2.22	<b>1265.36</b>	
<b>Waterbody- Streams/River</b>			0.51					87.70		0.37	<b>88.58</b>	
<b>Waterbody – Ponds</b>			0.55							274.25	<b>274.80</b>	
<b>Grand Total</b>	<b>101.43</b>	<b>76.92</b>	<b>4970.62</b>	<b>64.50</b>			<b>357.17</b>	<b>1205.19</b>	<b>87.70</b>	<b>277.87</b>	<b>7141.40</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 17.5 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 57.1 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	101.43												<b>101.43</b>
Mining/dump		76.92											<b>76.92</b>
Agriculture	4.87	1.19	4955.82	2.25				0.40		6.08			<b>4970.62</b>
Plantation Horticulture	0.05		2.86	61.59									<b>64.50</b>
Forest													
Forest Plantation													
Barren Rocky							357.17						<b>357.17</b>
Scrub	2.25	3.24	47.15					1144.06		8.51			<b>1205.19</b>
Waterbody- Streams/River									86.83	0.87			<b>87.70</b>
Waterbody – Ponds										277.87			<b>277.87</b>
<b>Grand Total</b>	<b>108.60</b>	<b>81.34</b>	<b>5005.82</b>	<b>63.85</b>			<b>357.17</b>	<b>1144.46</b>	<b>86.83</b>	<b>293.33</b>			<b>7141.40</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 14.8 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 50 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		
	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>	108.60												<b>108.60</b>
<b>Mining/dump</b>		81.34											<b>81.34</b>
<b>Agriculture</b>	0.31	2.69	5002.29	0.30							0.23		<b>5005.82</b>
<b>Plantation Horticulture</b>			5.70	58.15									<b>63.85</b>
<b>Forest</b>													
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							357.17						<b>357.17</b>
<b>Scrub</b>	0.47	0.79	2.13					1139.96			1.10		<b>1144.46</b>
<b>Waterbody- Streams/River</b>									86.21		0.62		<b>86.83</b>
<b>Waterbody – Ponds</b>											293.33		<b>293.33</b>
<b>Grand Total</b>	<b>109.39</b>	<b>84.82</b>	<b>5010.12</b>	<b>58.45</b>			<b>357.17</b>	<b>1139.96</b>	<b>86.21</b>		<b>295.28</b>		<b>7141.40</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 3.5 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 7.8 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	109.39												109.39
Mining/dump		84.82											84.82
Agriculture	0.18	1.61	5004.59	3.64							0.10		5010.12
Plantation Horticulture			2.24	56.21									58.45
Forest													
Forest Plantation													
Barren Rocky							357.17						357.17
Scrub	0.29	1.31	8.42					1129.51			0.43		1139.96
Waterbody- Streams/River									86.21				86.21
Waterbody – Ponds			5.66								289.62		295.28
<b>Grand Total</b>	<b>109.85</b>	<b>87.74</b>	<b>5020.91</b>	<b>59.85</b>			<b>357.17</b>	<b>1129.51</b>	<b>86.21</b>		<b>290.15</b>		<b>7141.40</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 5.5 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T5.
- In T5 16.3 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 6.6 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 40, 35, 04 & 10 Hectares from T1 to T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 87 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 139 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
6. Farm ponds (11) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (11) verified from the portal.