

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

YSR KADAPA -15/2010-11  
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

# 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

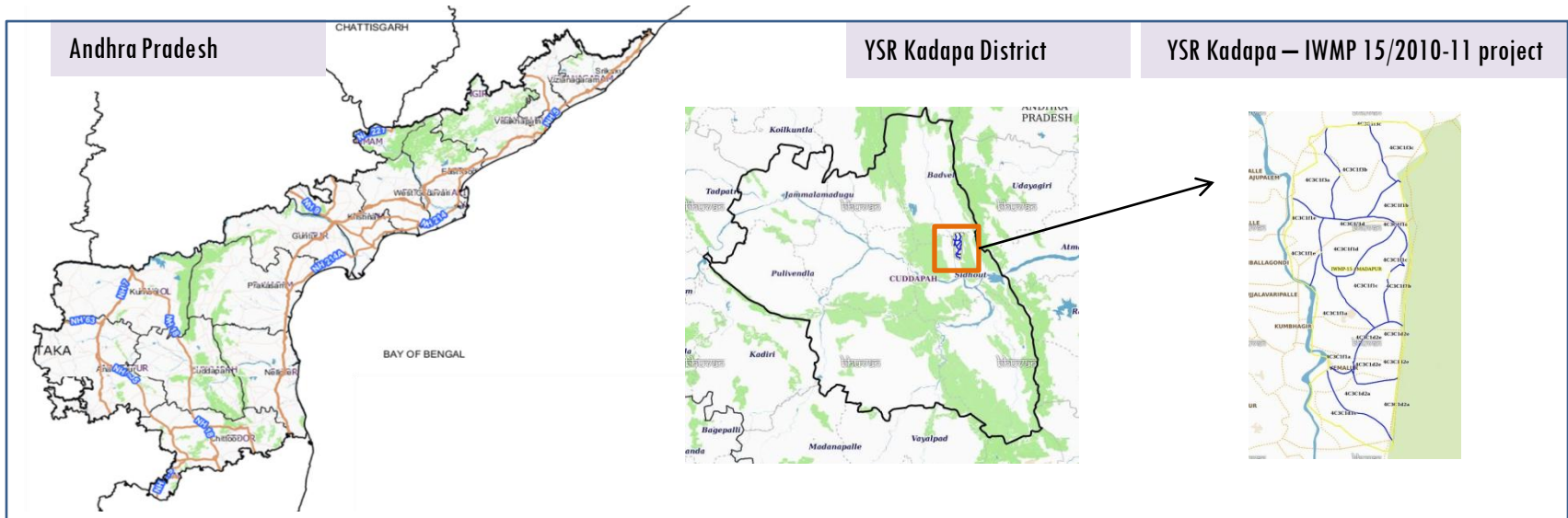
## **E X E C U T I V E   S U M M A R Y**

- 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-15/2010-11, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 5,344 ha. It comprises of 11 micro watersheds.
- In the project area 1001 Drishti photos were uploaded showing 170 check dams/Rock fill dam, 3 New activities of boulder removal, farm ponds, dug out pits etc, 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 10.71 ha increase in the area.
- Major percentage i.e. 38.11 % is covered by the agriculture, 44.13 % is covered by scrubland, 7.88 % is forest area and remaining by other land use classes.

# PROJECT : YSR KADAPA - IWMP-15/2010-11

## DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Thondur Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 5,344 ha. It comprises of 11 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.

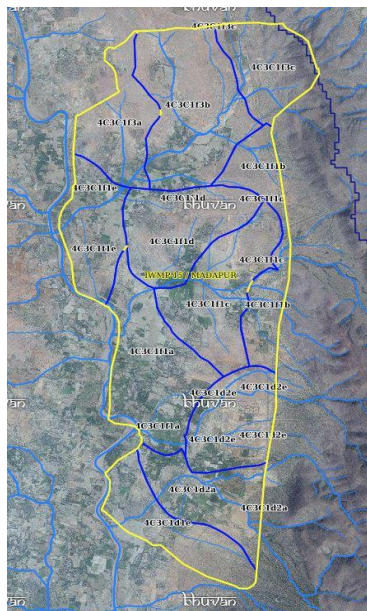
# Satellite Data and Ancillary Data

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	210
4	Detailed Project Report		

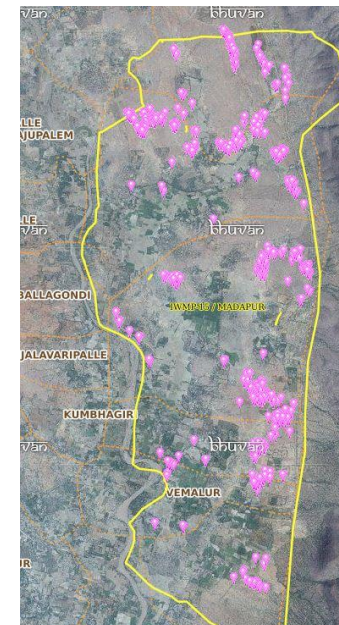
# Natural Color Composite overlaid with Project boundaries and high detail stream network



## Legend

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

# Natural Color Composite overlaid with Drishti Points



## Drishti Upload Status

## Classification of the Activities

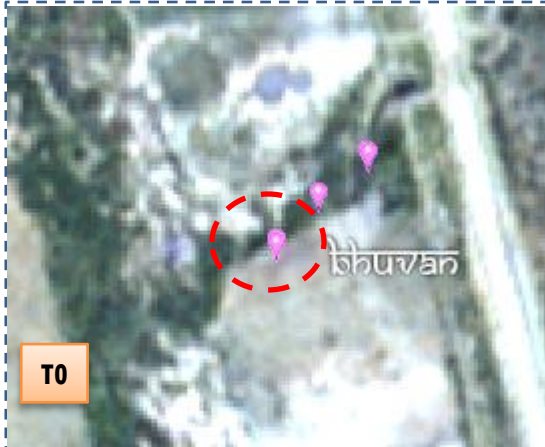
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Afforestation	21	15
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	8	8
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	7	7
11	Civil work-Check dams /Rock fill dam	0	0
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)	4	4
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	204	180
	<b>TOTAL</b>	<b>244</b>	<b>210</b>

## MONITORING IN THE PROJECT AREA

### Site Wise Changes in the Project

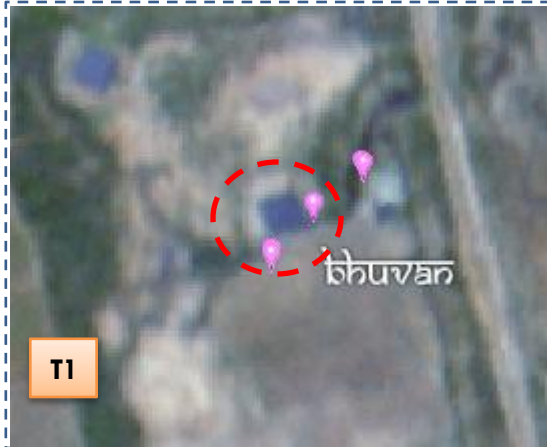
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2010-11) and T5 is 2018-19 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-15/2010-11



T0

T0: 2010-11



T1

T1: 21 December 2013



Drishti Sl no. 157570 MWS : 4C3C1f3c

Farm pond



T0

T0: 2010-11



T1

T1: 21 December 2013



Drishti Sl no. 1579445 MWS : 4C3C1f3c

Farm pond



Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-15/2010-11



T0

T0: 2010-11



T1

T1: 21 December 2013



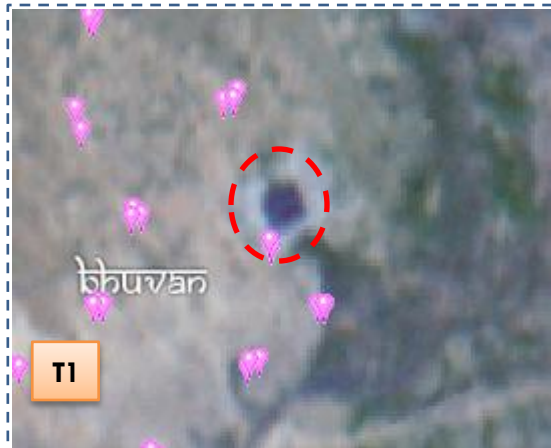
Drishti Sl no. 2369802 MWS :4C3C1f3b

Farm pond



T0

T0: 2010-11



T1

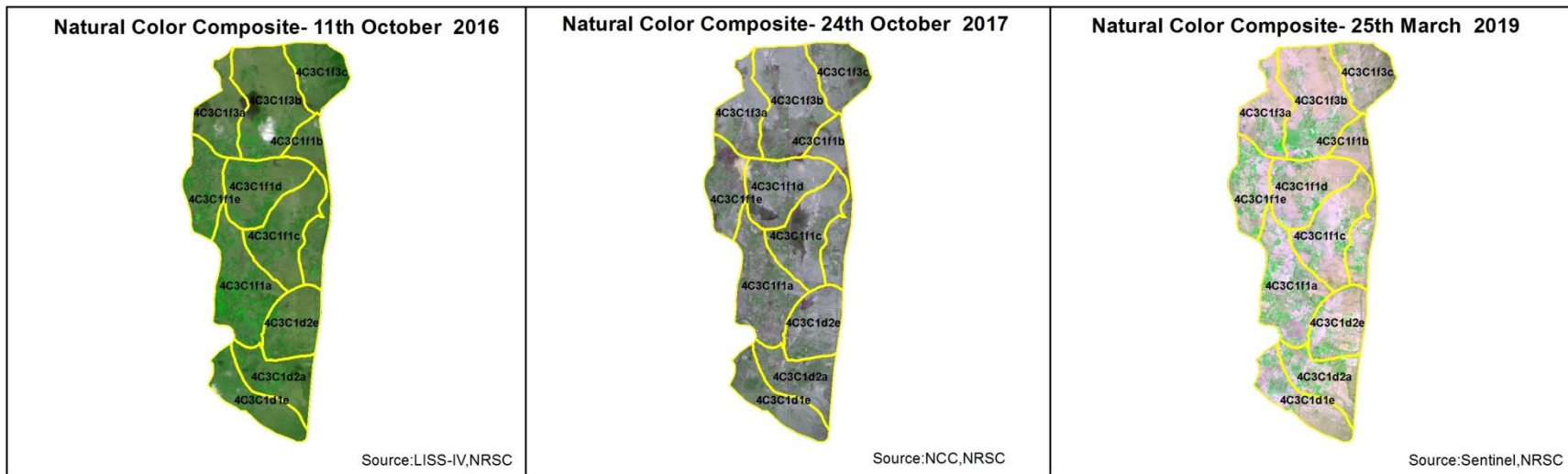
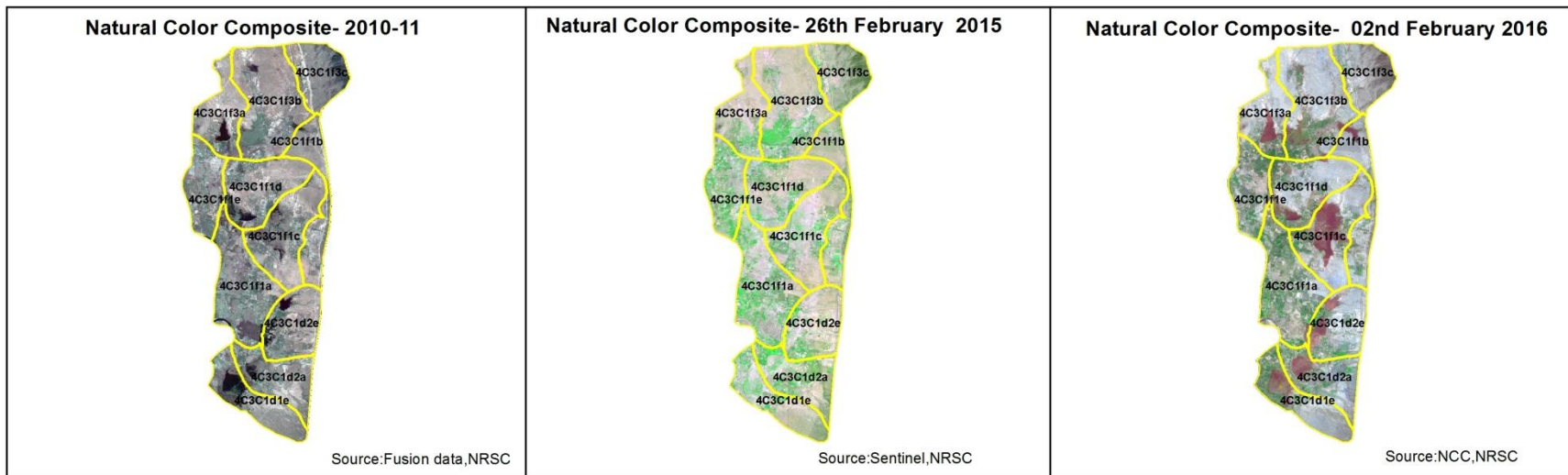
T1: 21 December 2013



Drishti Sl no. 2414056 MWS : 4C3C1f3b

Farm pond

# Natural Color Composite – 2010-11 to 2018-19



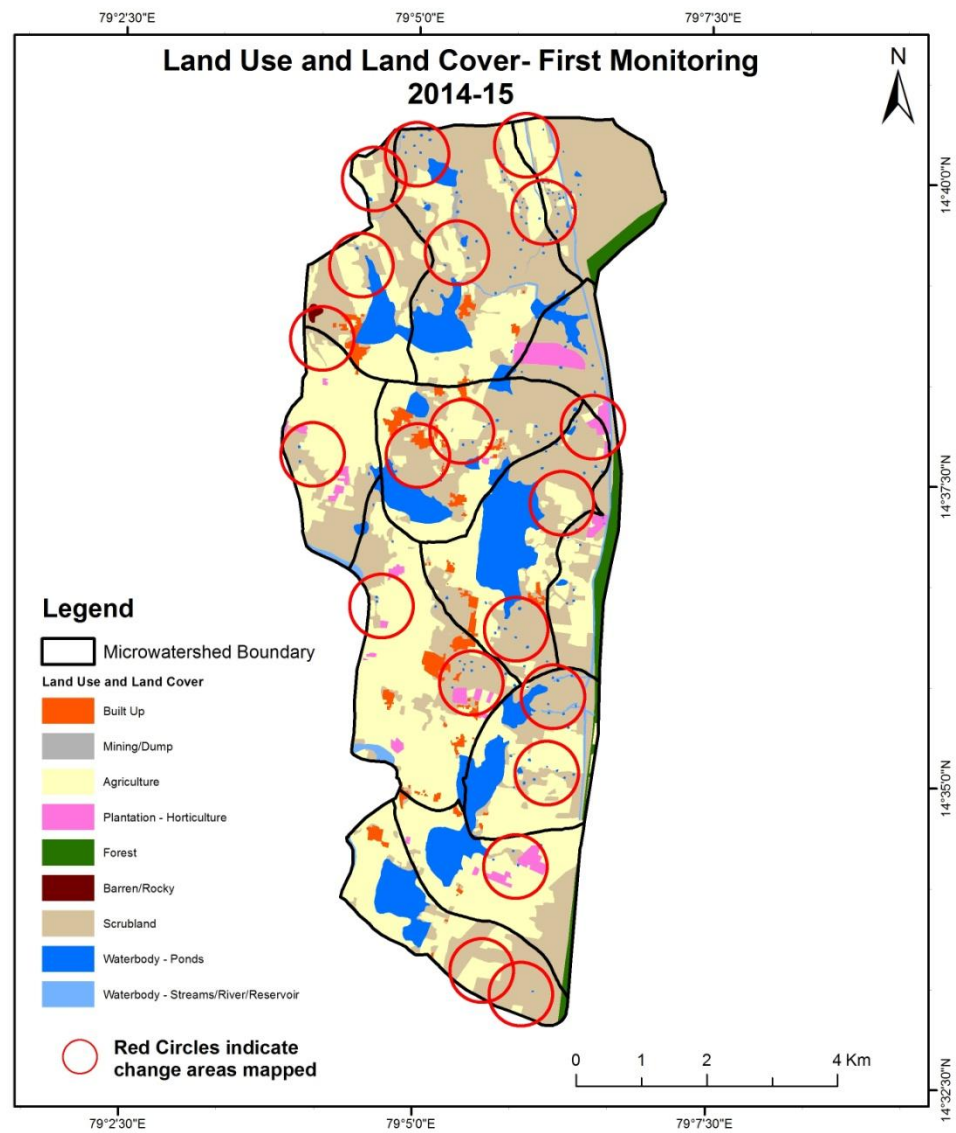
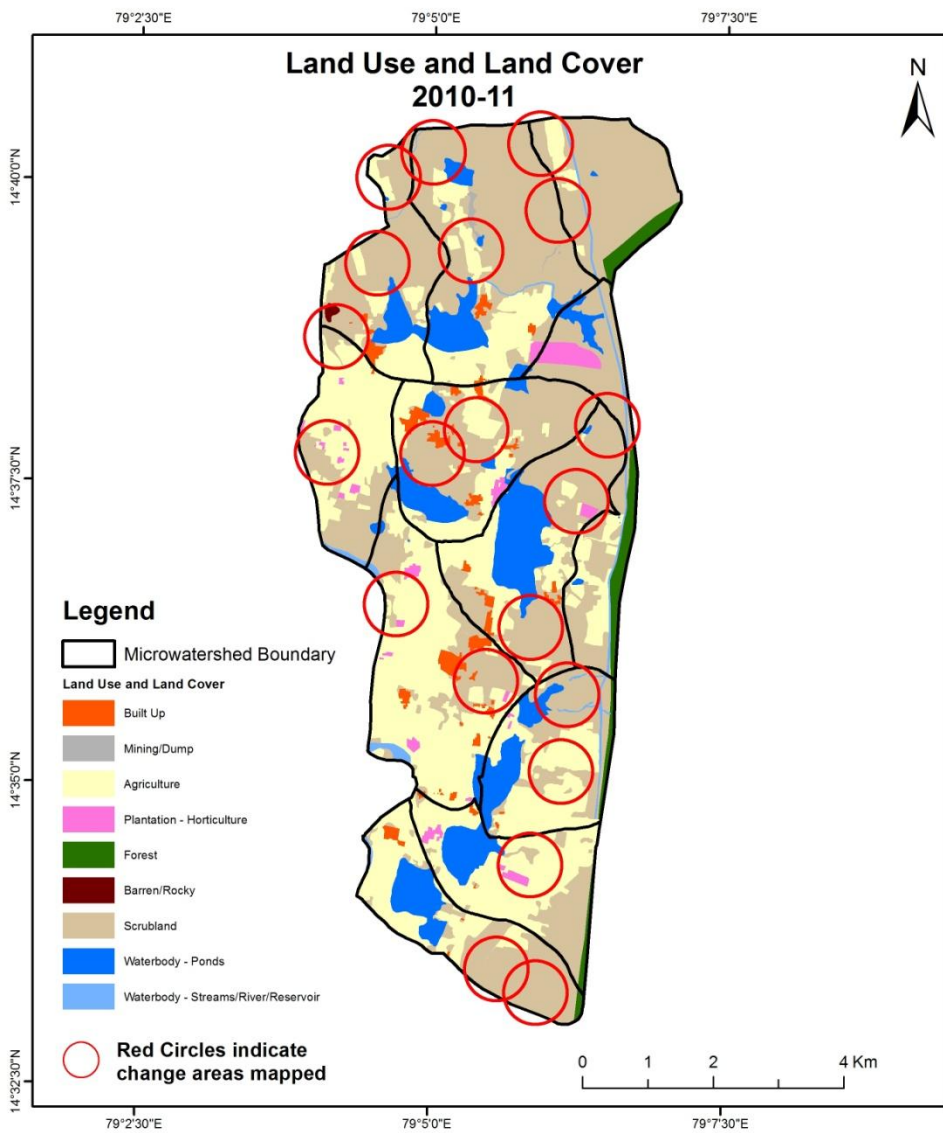
## MONITORING IN THE PROJECT AREA

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

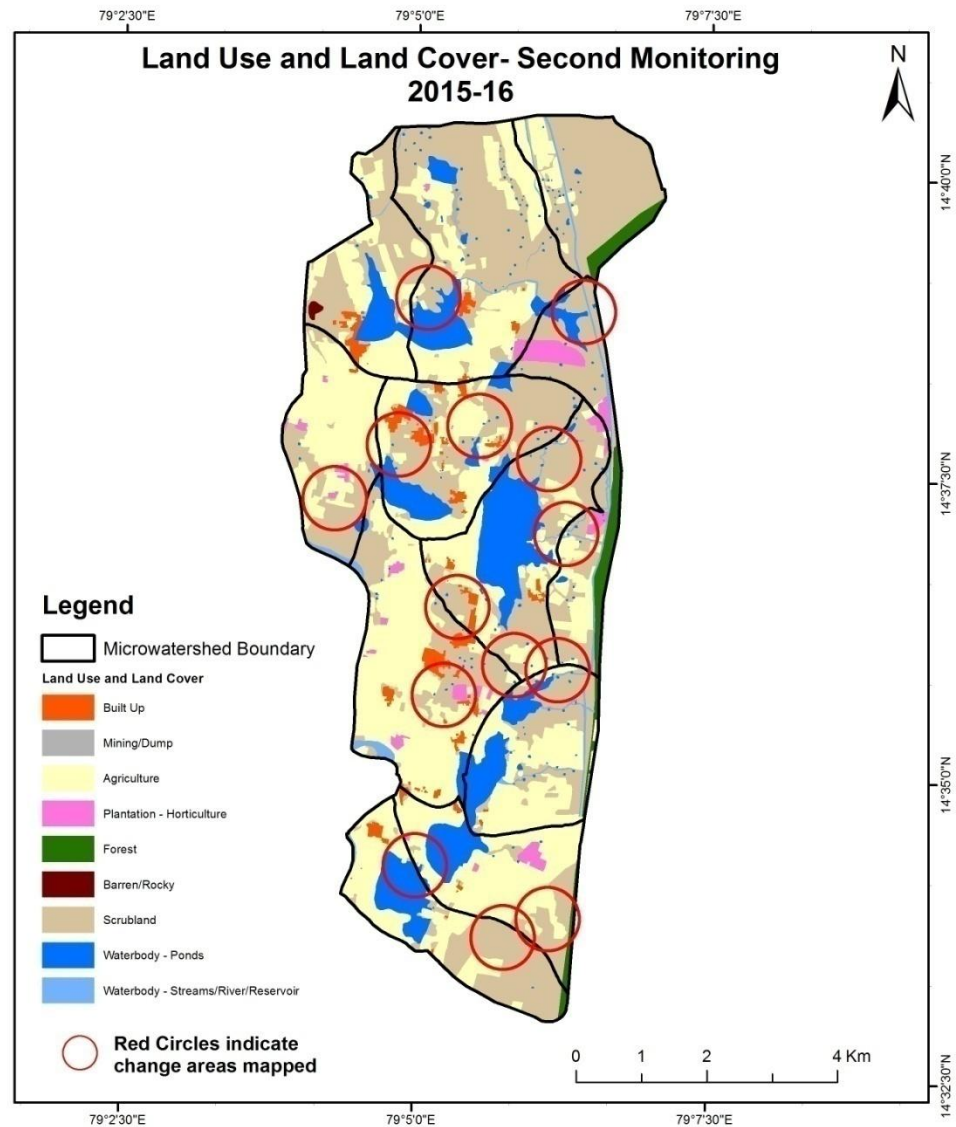
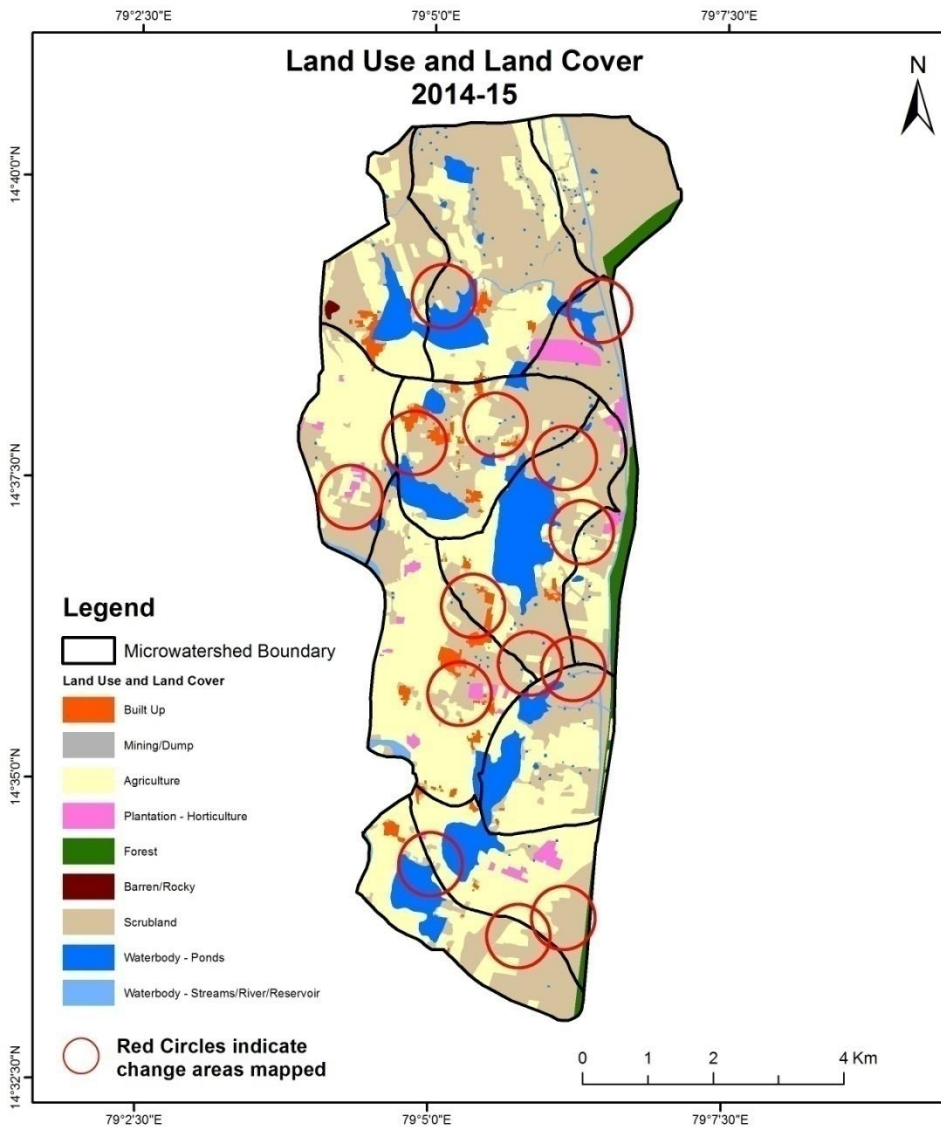
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



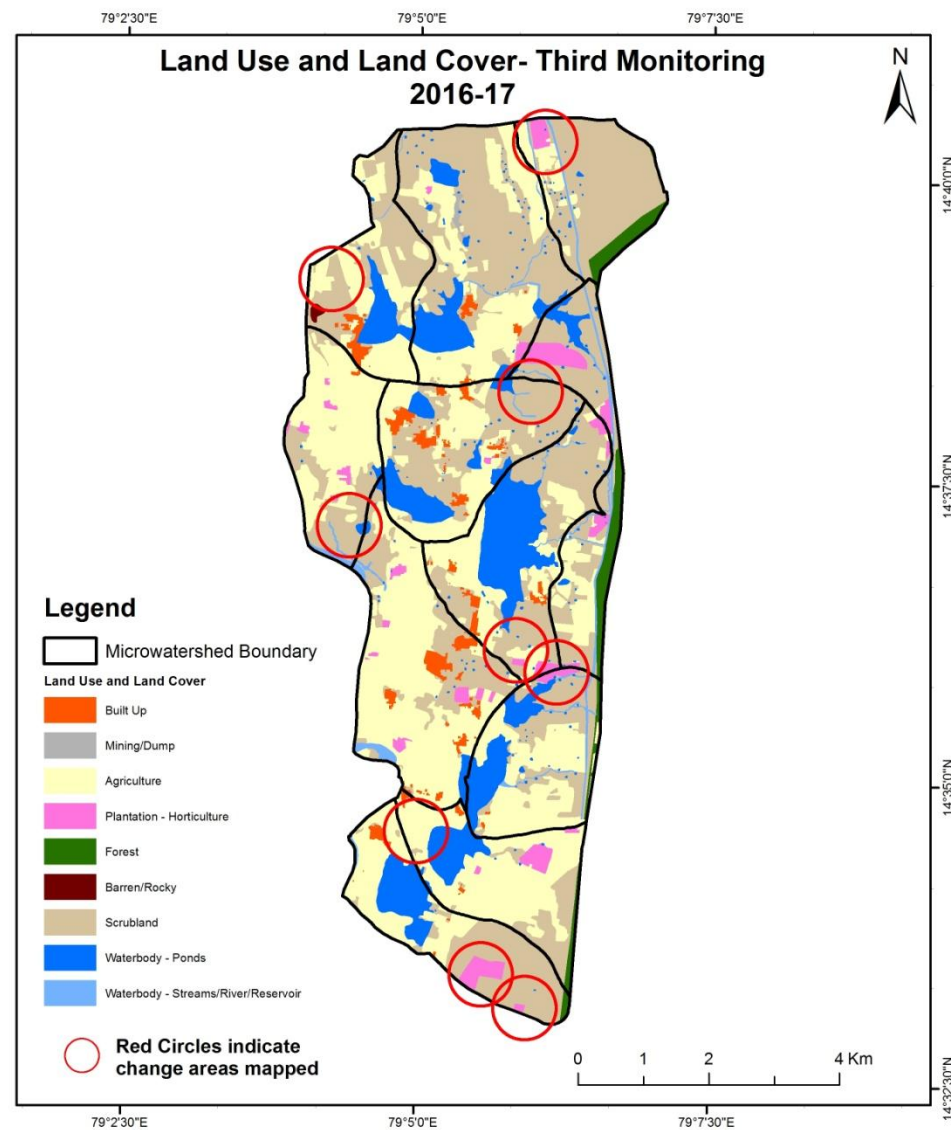
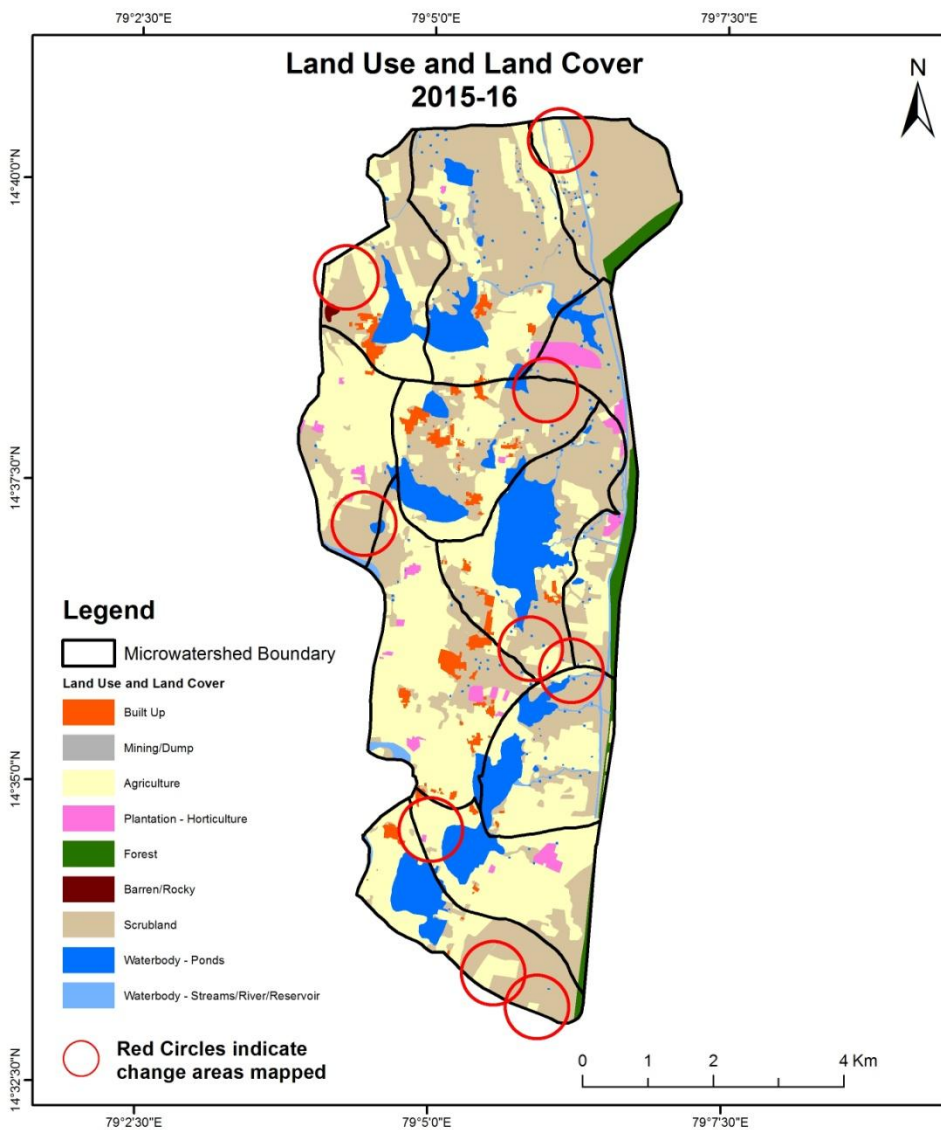
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



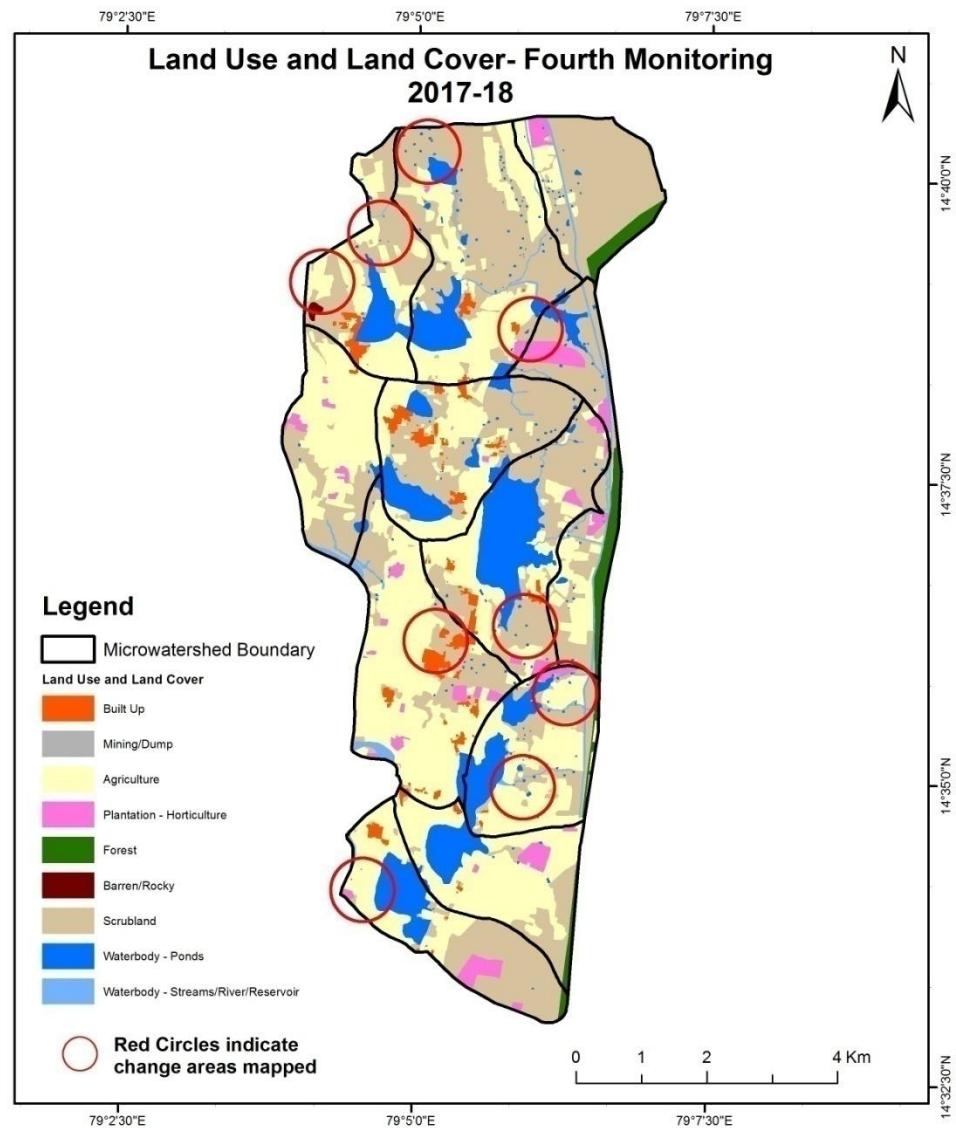
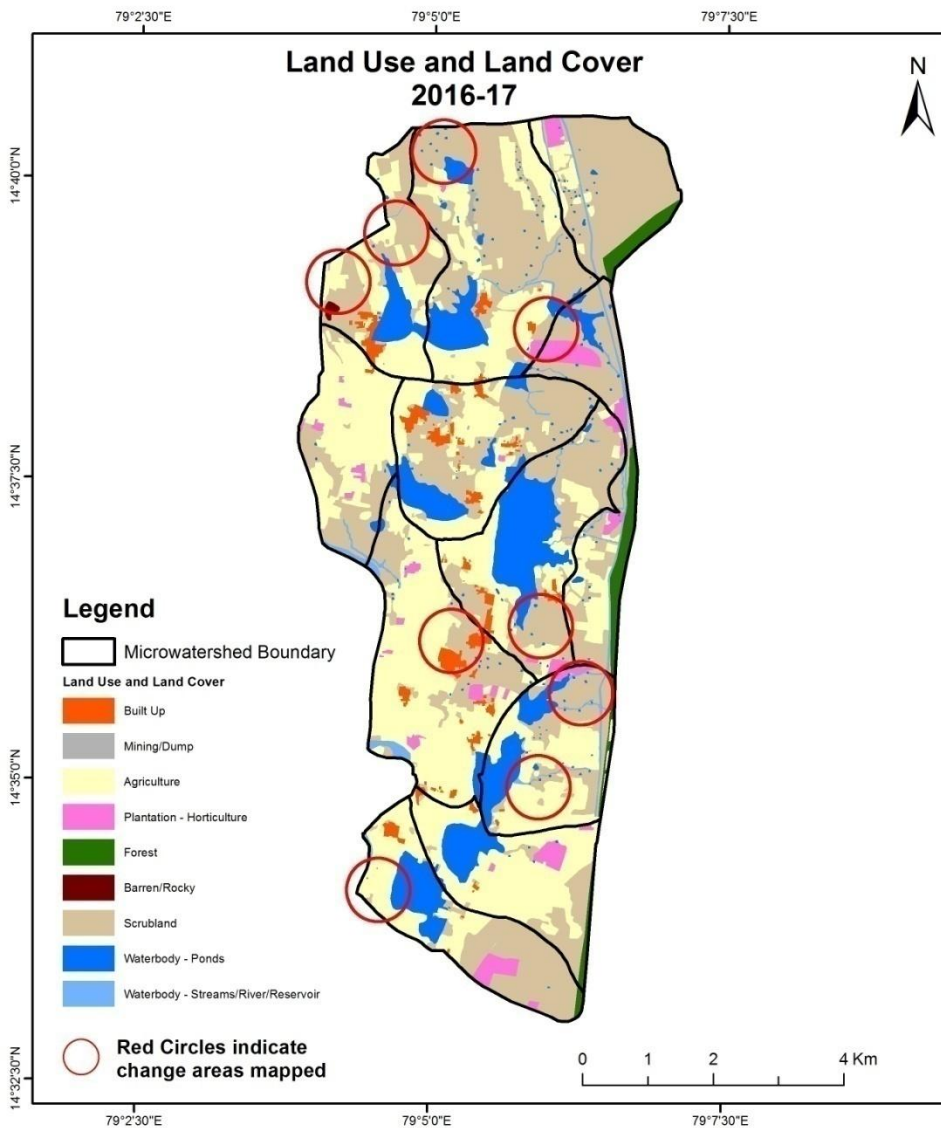
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



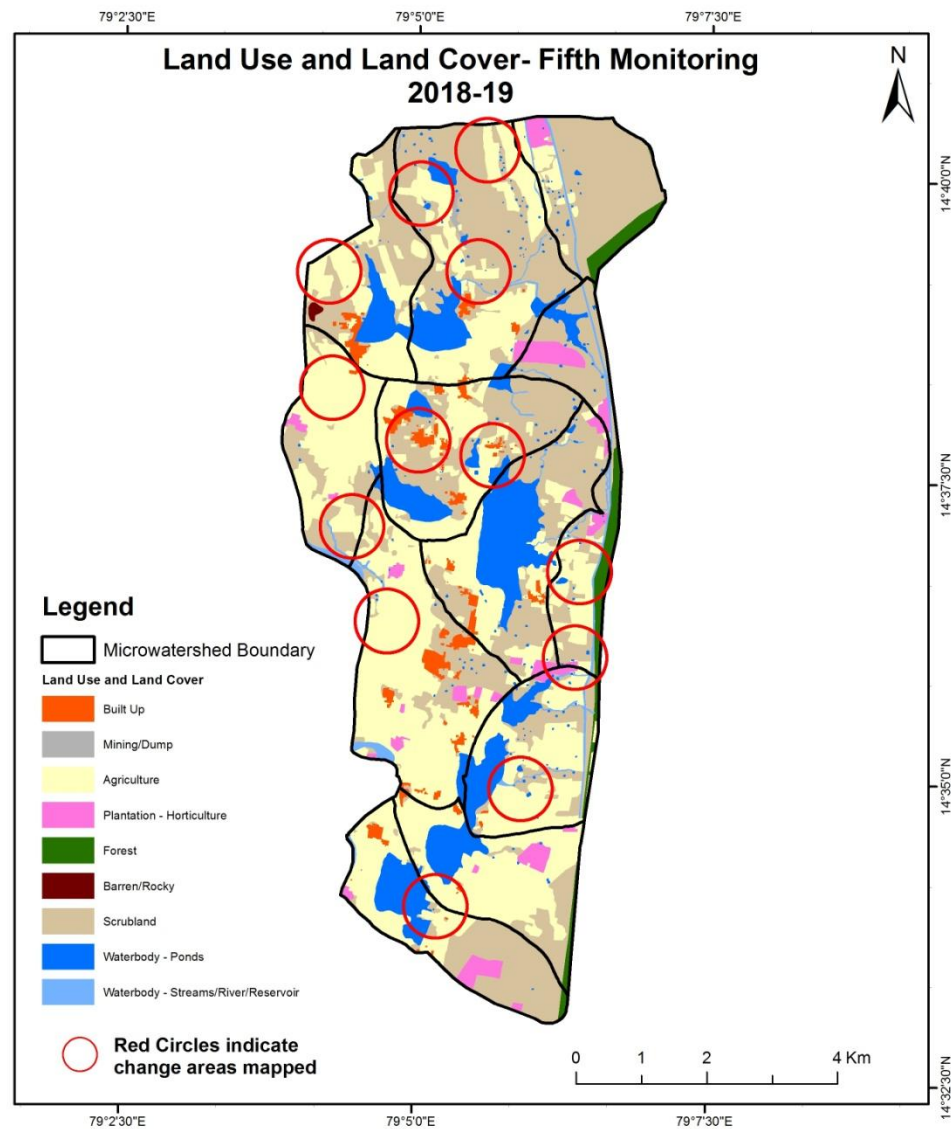
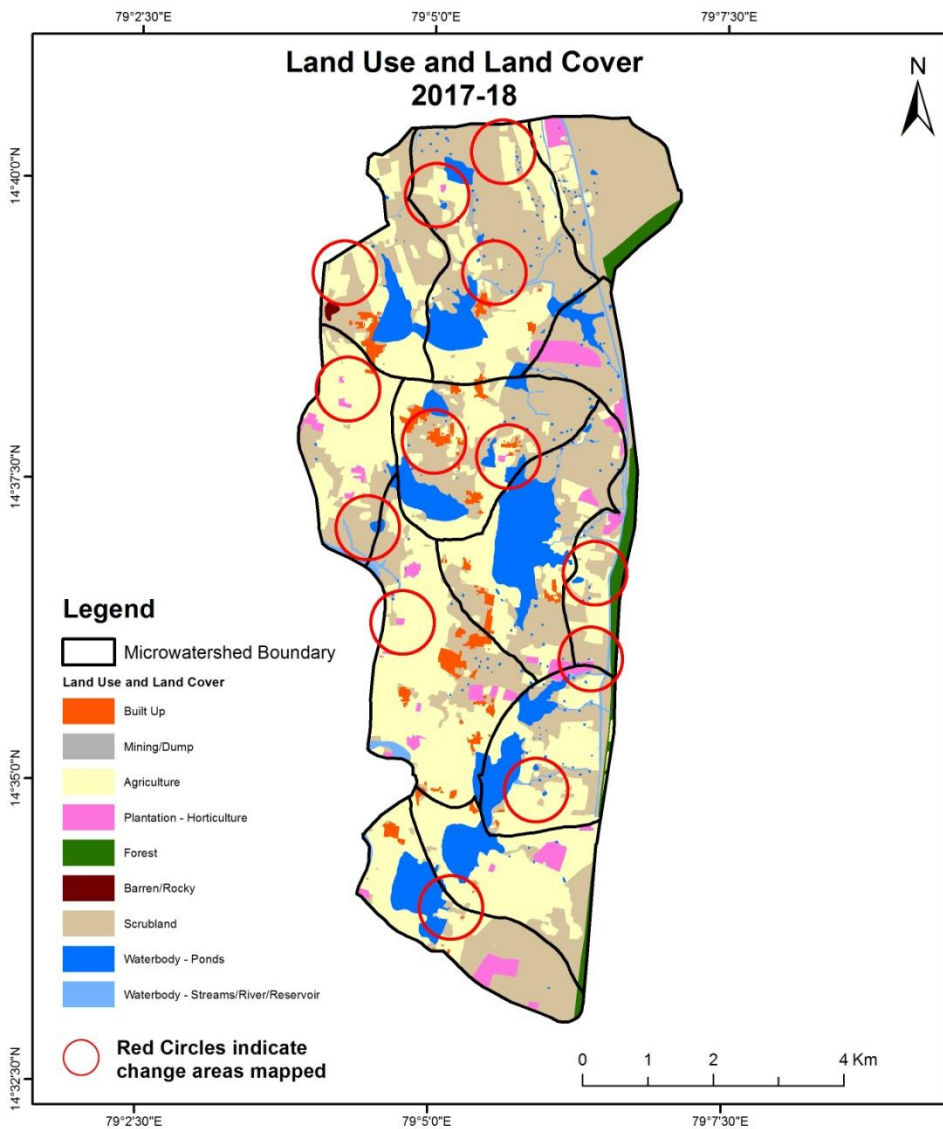
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



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

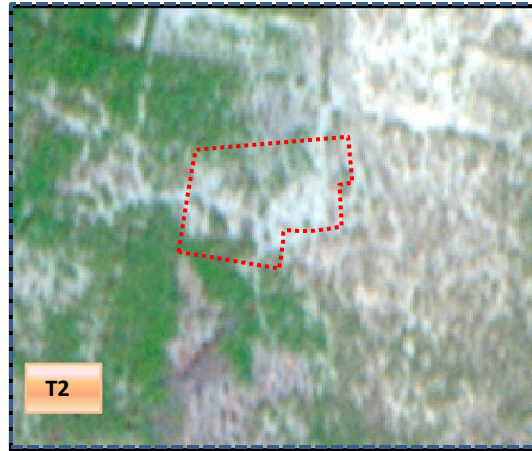
Scale: 1:10000





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

### Scrub to Agriculture

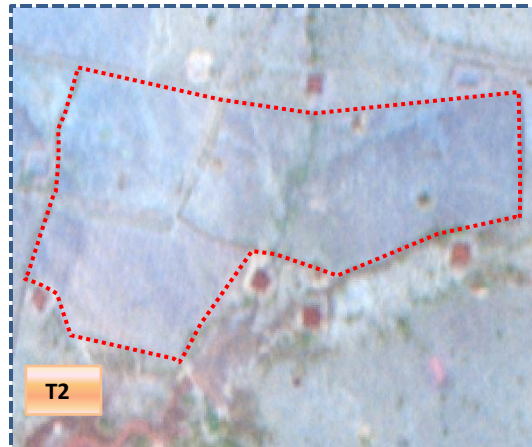


T2: 2015-16 (79°4'25.983"E 14°37'12.013"N )



T3: 11 October 2016

### Agriculture to Plantation



T2: 2015-16 (79°6'9.95"E 14°35'57.165"N )



T3: 11 October 2016

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

Agriculture to Water body



T0: 2010-11

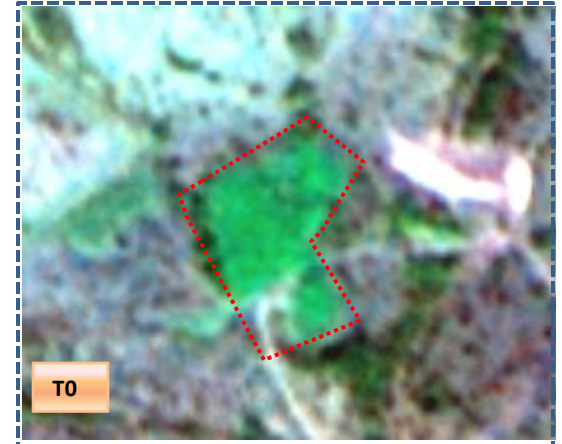


T0: 21 December 2013

Scrub to Agriculture



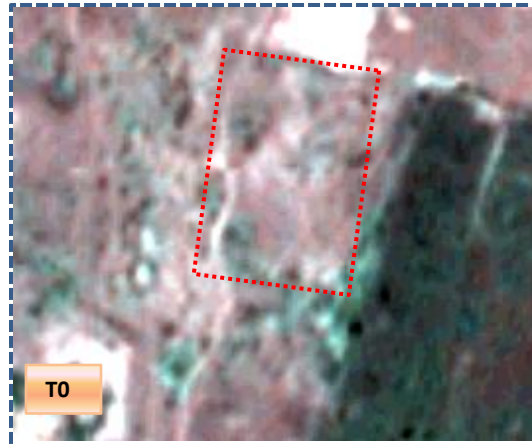
T0: 2010-11



T0: 21 December 2013

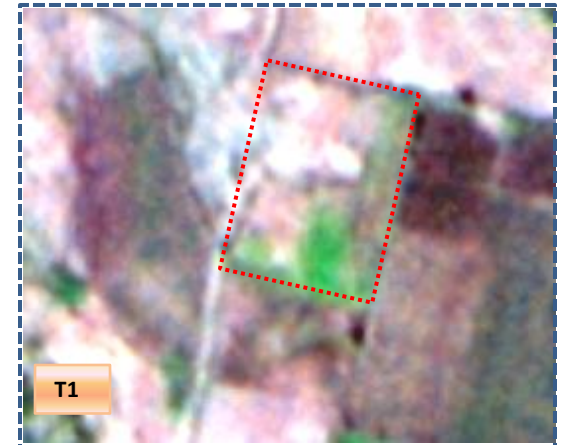
## Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0

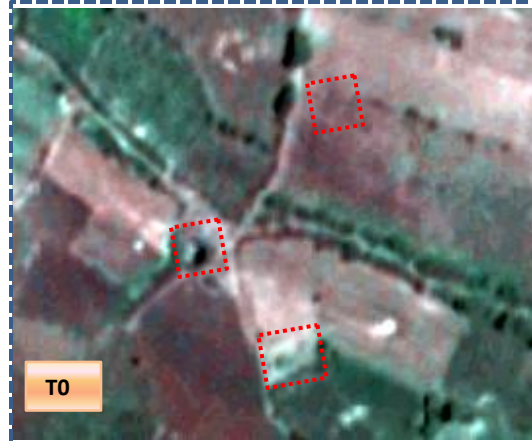
T0: 2010-11



T1

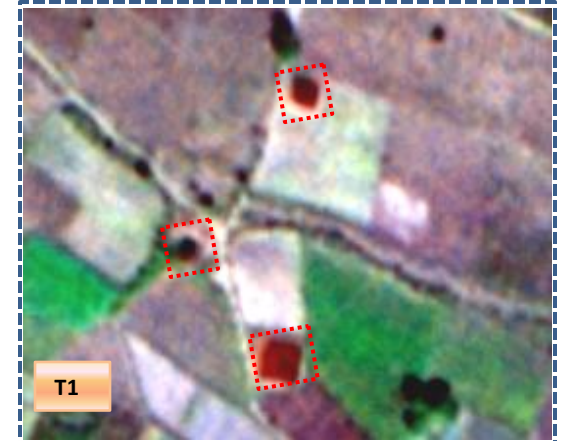
T1: 21 December 2013

Agriculture to Water body



T0

T0: 2010-11



T1

T1: 21 December 2013

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

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>	94.94										<b>94.94</b>	
<b>Mining/dump</b>		6.33								0.42	<b>6.74</b>	
<b>Agriculture</b>	3.77	0.19	1837.19	34.82				16.37		2.03	<b>1894.37</b>	
<b>Plantation Horticulture</b>			23.46	52.09						0.09	<b>75.64</b>	
<b>Forest</b>			4.82		109.31						<b>114.14</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							4.19				<b>4.19</b>	
<b>Scrub</b>	10.83	0.11	269.61	12.69				2209.38	2.69	43.61	<b>2548.92</b>	
<b>Waterbody- Streams/River</b>									63.94		<b>63.94</b>	
<b>Waterbody – Ponds</b>			2.33							539.33	<b>541.66</b>	
<b>Grand Total</b>	<b>109.54</b>	<b>6.63</b>	<b>2137.42</b>	<b>99.60</b>	<b>109.31</b>		<b>4.19</b>	<b>2225.74</b>	<b>66.63</b>	<b>585.48</b>	<b>5344.54</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 57.1 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 300.2 ha of the agriculture area has increased from plantations, 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		
	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>	109.54												<b>109.54</b>
<b>Mining/dump</b>		6.63											<b>6.63</b>
<b>Agriculture</b>	0.83		2098.86	1.80				1.34	19.60		14.99		<b>2137.42</b>
<b>Plantation Horticulture</b>			7.08	92.45							0.06		<b>99.60</b>
<b>Forest</b>					109.31								<b>109.31</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							4.19						<b>4.19</b>
<b>Scrub</b>	0.41		63.10					9.96	2130.68		21.59		<b>2225.74</b>
<b>Waterbody- Streams/River</b>								66.63					<b>66.63</b>
<b>Waterbody – Ponds</b>											585.48		<b>585.48</b>
<b>Grand Total</b>	<b>110.78</b>	<b>6.63</b>	<b>2169.04</b>	<b>94.25</b>	<b>109.31</b>		<b>4.19</b>	<b>77.93</b>	<b>2150.27</b>		<b>622.12</b>		<b>5344.54</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 18 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrubland and water body in T2.
- In T2 70 ha of the agriculture area has increased from plantations and scrubland 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		
	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>	110.78												<b>110.78</b>
<b>Mining/dump</b>		5.83							0.79				<b>6.63</b>
<b>Agriculture</b>	0.07		2110.74	57.83					0.40				<b>2169.04</b>
<b>Plantation Horticulture</b>			1.57	92.68									<b>94.25</b>
<b>Forest</b>					109.31								<b>109.31</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							4.19						<b>4.19</b>
<b>Scrub</b>	0.25		12.97					2126.61	10.27	0.17			<b>2150.27</b>
<b>Waterbody- Streams/River</b>									77.93				<b>77.93</b>
<b>Waterbody – Ponds</b>			2.64								619.49		<b>622.12</b>
<b>Grand Total</b>	<b>111.10</b>	<b>5.83</b>	<b>2127.92</b>	<b>150.52</b>	<b>109.31</b>		<b>4.19</b>	<b>2126.61</b>	<b>89.40</b>		<b>619.65</b>		<b>5344.54</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 57.9 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T3.
- In T3 17.1 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-2016-17 to 2017-18**

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>	111.10												<b>111.10</b>
<b>Mining/dump</b>		5.83											<b>5.83</b>
<b>Agriculture</b>	0.34		2112.67	13.98							0.94		<b>2127.92</b>
<b>Plantation Horticulture</b>			0.36	150.16									<b>150.52</b>
<b>Forest</b>					109.31								<b>109.31</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							4.19						<b>4.19</b>
<b>Scrub</b>	2.26		35.36	2.37				2084.95			1.66		<b>2126.61</b>
<b>Waterbody- Streams/River</b>									89.40				<b>89.40</b>
<b>Waterbody – Ponds</b>			2.04								617.61		<b>619.65</b>
<b>Grand Total</b>	<b>113.70</b>	<b>5.83</b>	<b>2150.43</b>	<b>166.51</b>	<b>109.31</b>		<b>4.19</b>	<b>2084.95</b>	<b>89.40</b>		<b>620.22</b>		<b>5344.54</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 15.2 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T4 37.7 ha of the agriculture area has increased from plantations, 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	113.70											113.70
Mining/dump		5.83										5.83
Agriculture	0.67		2147.58	1.79						0.38		2150.43
Plantation Horticulture			11.48	155.03								166.51
Forest					109.31							109.31
Forest Plantation												
Barren Rocky							4.19					4.19
Scrub	1.03		84.59					1998.87		0.47		2084.95
Waterbody- Streams/River									89.40			89.40
Waterbody – Ponds			4.01							616.20		620.22
<b>Grand Total</b>	<b>115.40</b>	<b>5.83</b>	<b>2247.67</b>	<b>156.82</b>	<b>109.31</b>		<b>4.19</b>	<b>1998.87</b>	<b>89.40</b>	<b>617.05</b>		<b>5344.54</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 2.8 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T5 100 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 100 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 243, 31, 22 & 97 Hectares From T0-T1, T1-T2, T3-T4 & T4-T5 respectively and overall increase of 393 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is an increase of about 80 ha of the plantations area from 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 550 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (7) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (7) verified from the portal.