

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

YSR KADAPA -36/2011-12  
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

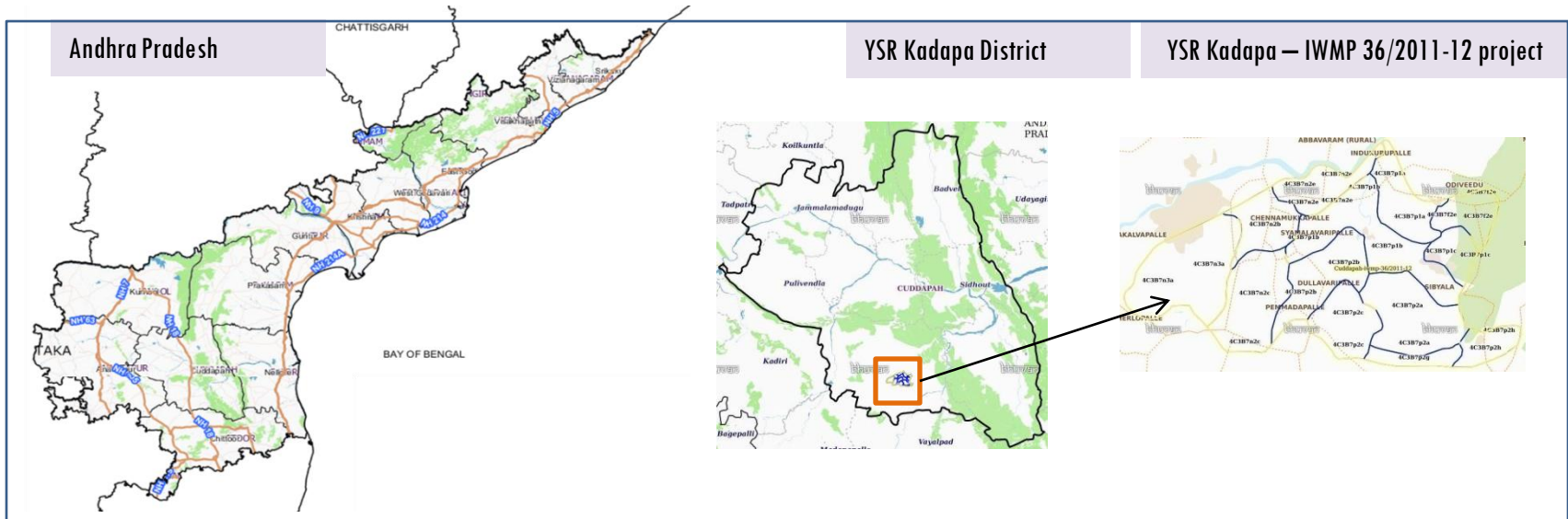
## EXECUTIVE SUMMARY

- 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-36/2011-12, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is **6,313** ha. It comprises of 13 micro watersheds.
- In the project area 322 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, Water bodies have shown an decrease by 15 ha , which correspond to the various bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 67 % is covered by the agriculture, 14 % is Scrub land, 4.4 % is water body and remaining by other land use classes.

# PROJECT : YSR KADAPA - IWMP-36/2011-12

## DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Rayachoti Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **6,313** ha. It comprises of 13 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



- 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 46 °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.

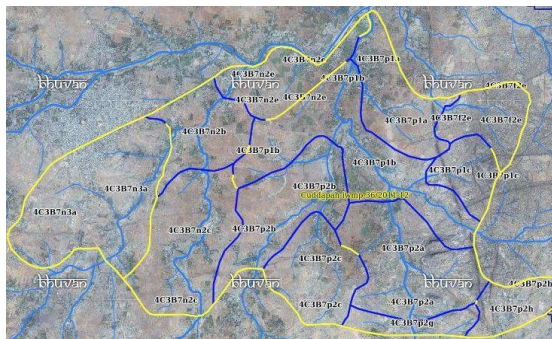
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2012-13	2019-20
LISS IV	2011-12		
SCENE 1			29-Feb-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			29-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	Drishti Photographs		
		Total	322
4	Detailed Project Report		

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



## Legend



Drainage (1:10000 Scale)

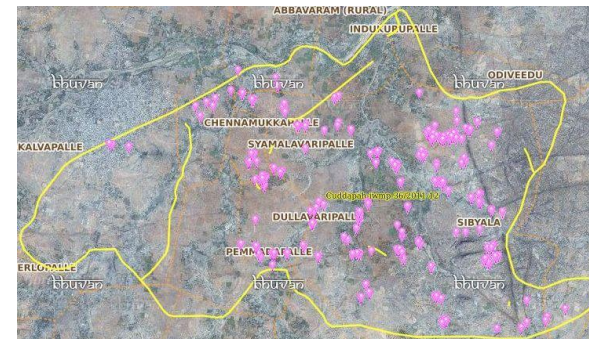


MWS Boundary



Project Boundary

# Natural Color Composite overlaid with Drishti Points



## Drishti Upload Status

## Classification of the Activities

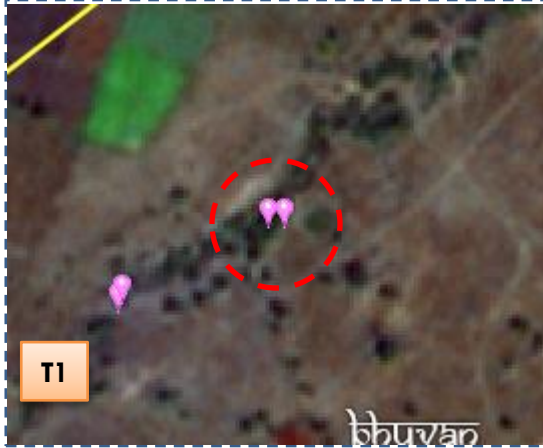
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/Horticulture	26	15
2	Afforestation	6	6
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	41	41
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	54	40
11	Civil work-Check dams /Rock fill dam	50	50
12	Production system and Micro-enterprises	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	39	30
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	104	80
18	Others	<b>117</b>	60
	<b>TOTAL</b>	<b>437</b>	<b>322</b>

## MONITORING IN THE PROJECT AREA

### Site Wise Changes in the Project

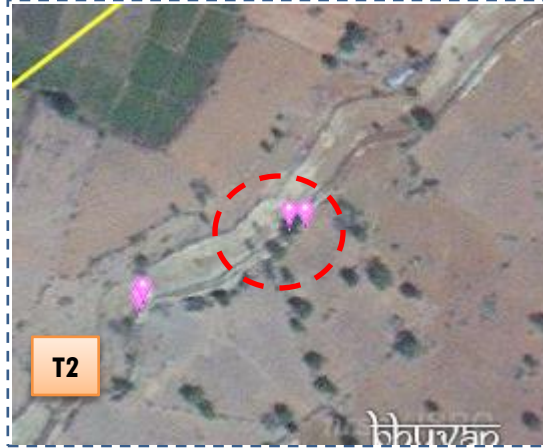
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2011-12) and T5 is 2019-20 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-36/2011-12



T1

T1: 26 February 2013



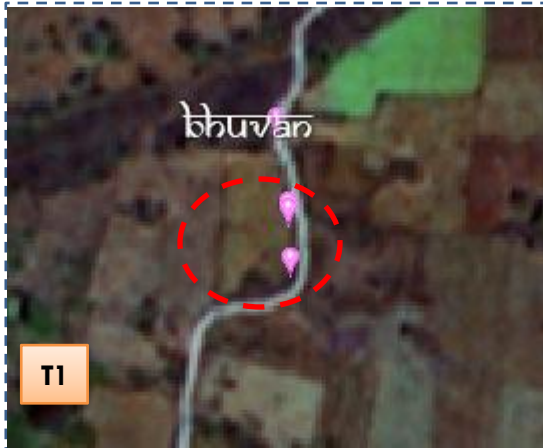
T2

T2: 21 April 2018



Drishti Sl no. 2006853 MWS : 4C3B7p1b

Check dam



T1

T1: 26 February 2013



T2

T2: 21 April 2018

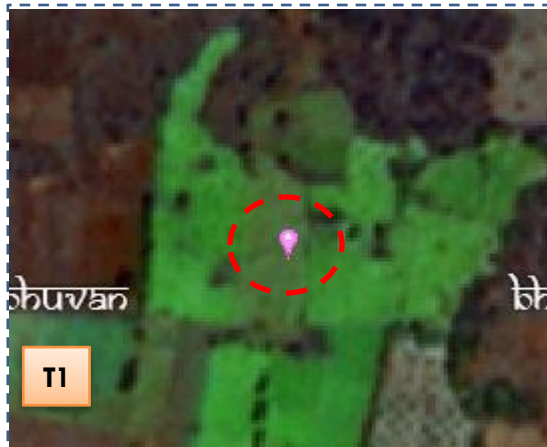


Drishti Sl no. 1806573 MWS :4C3B7p2b

Horticulture



Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-36/2011-12



T1

T1: 26 February 2013



T2

T2: 21 April 2018



Drishti Sl no. 1877852 MWS :4C3B7p2a

Horticulture



T1

T1: 2016



T2

T2: 21 April 2018



Drishti Sl no. 1891320 MWS :4C3B7p1b

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-36/2011-12



T0

bhuvan

T0: 2010-11



T1

bhuvan

T1: 2 February 2016



Drishti Sl no. 2383707 MWS : 4C3B7p1b

Check dam



T0

bhuvan

T0: 2010-11



T1

T1: 2 February 2016



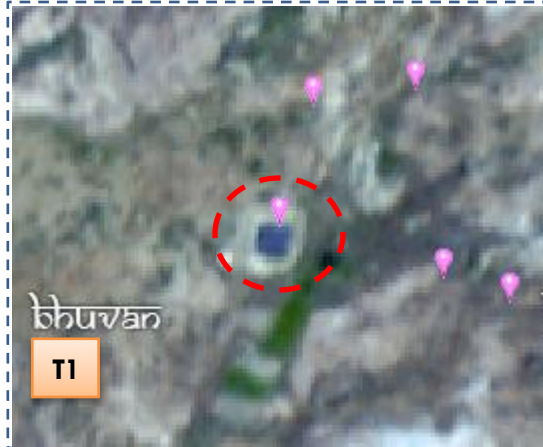
Drishti Sl no. 1891264 MWS :4C3B7p1b

Farm pond

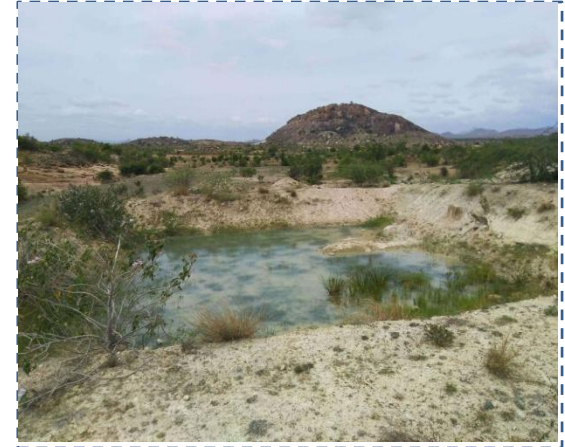
Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-36/2011-12



T0: 2010-11



T1: 2 February 2016



Drishti Sl no. 2058105 MWS :4C3B7p2a

Farm pond



T0: 2010-11



T1: 2 February 2016

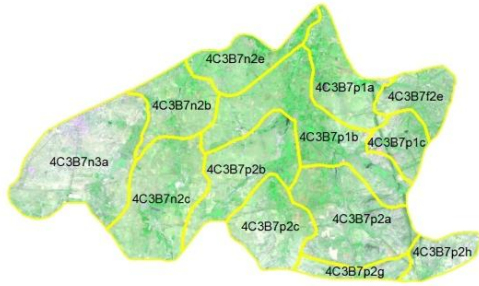


Drishti Sl no. 2007886 MWS :4C3B7p2a

Staggered Trenching

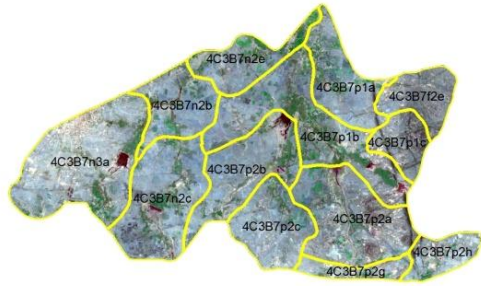
# Natural Colour Composite (NCC)

Natural Color Composite - 2011-12



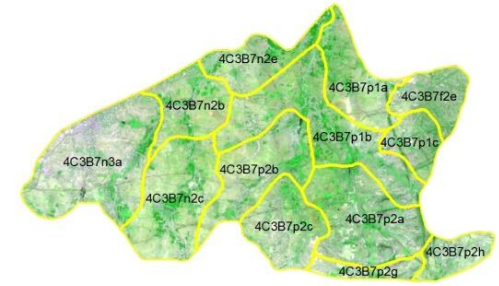
Source:LISS-IV,NRSC

Natural Color Composite-05 th April 2016



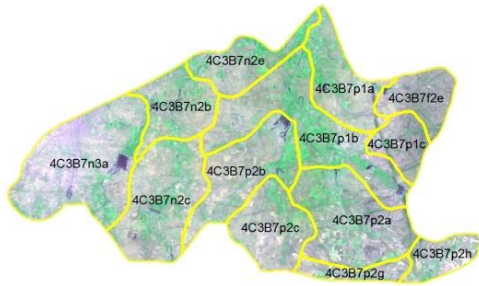
Source:NCC,NRSC

Natural Color Composite- 18th October 2016



Source:LISS-IV,NRSC

Natural Color Composite- 30th March 2018



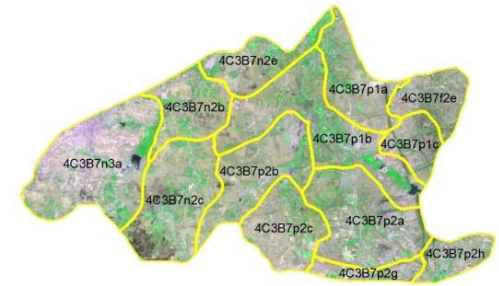
Source:LISS-IV,NRSC

Natural Color Composite-23rd February 2019



Source:Sentinel-2

Natural Color Composite- 29th February 2020



Source:LISS-IV,NRSC

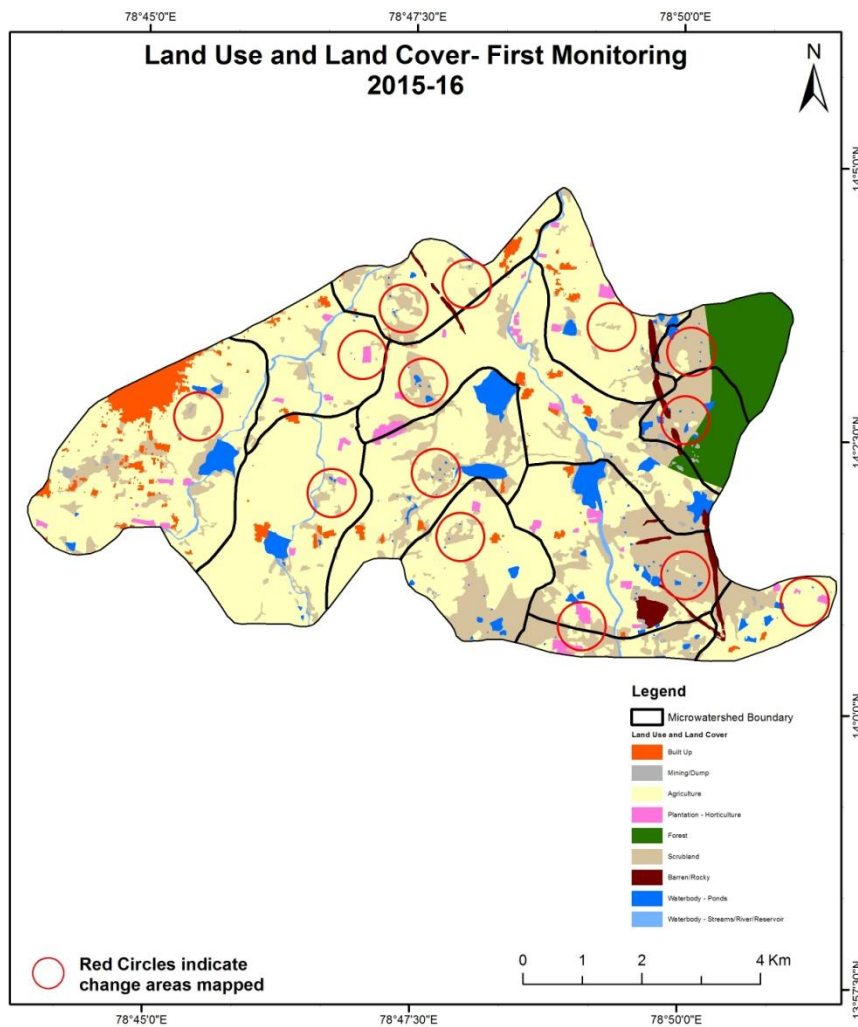
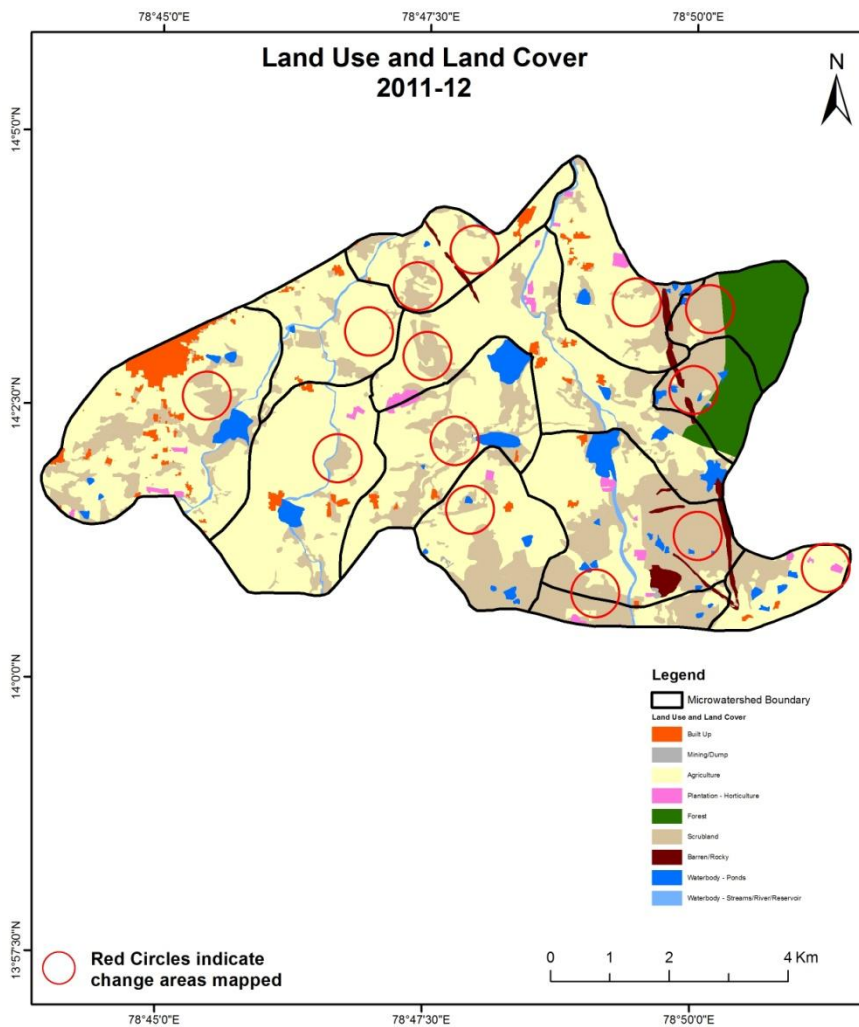
## MONITORING IN THE PROJECT AREA

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

- Change in land use and land cover 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)

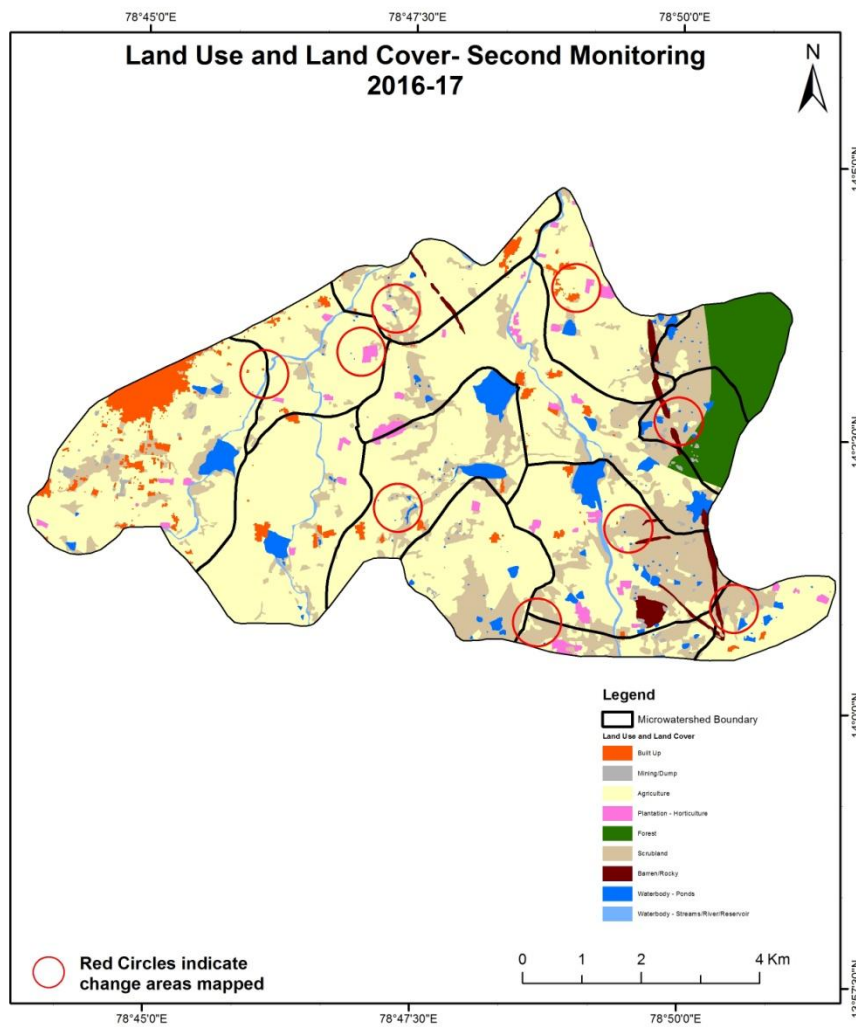
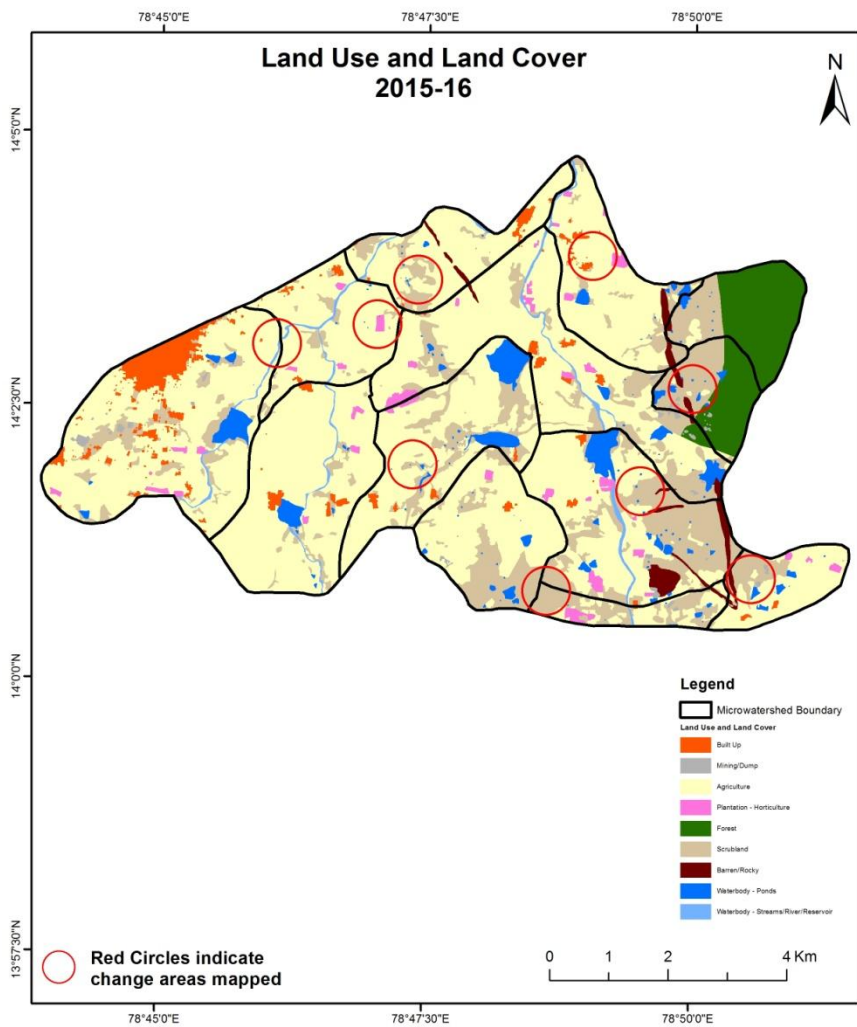
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



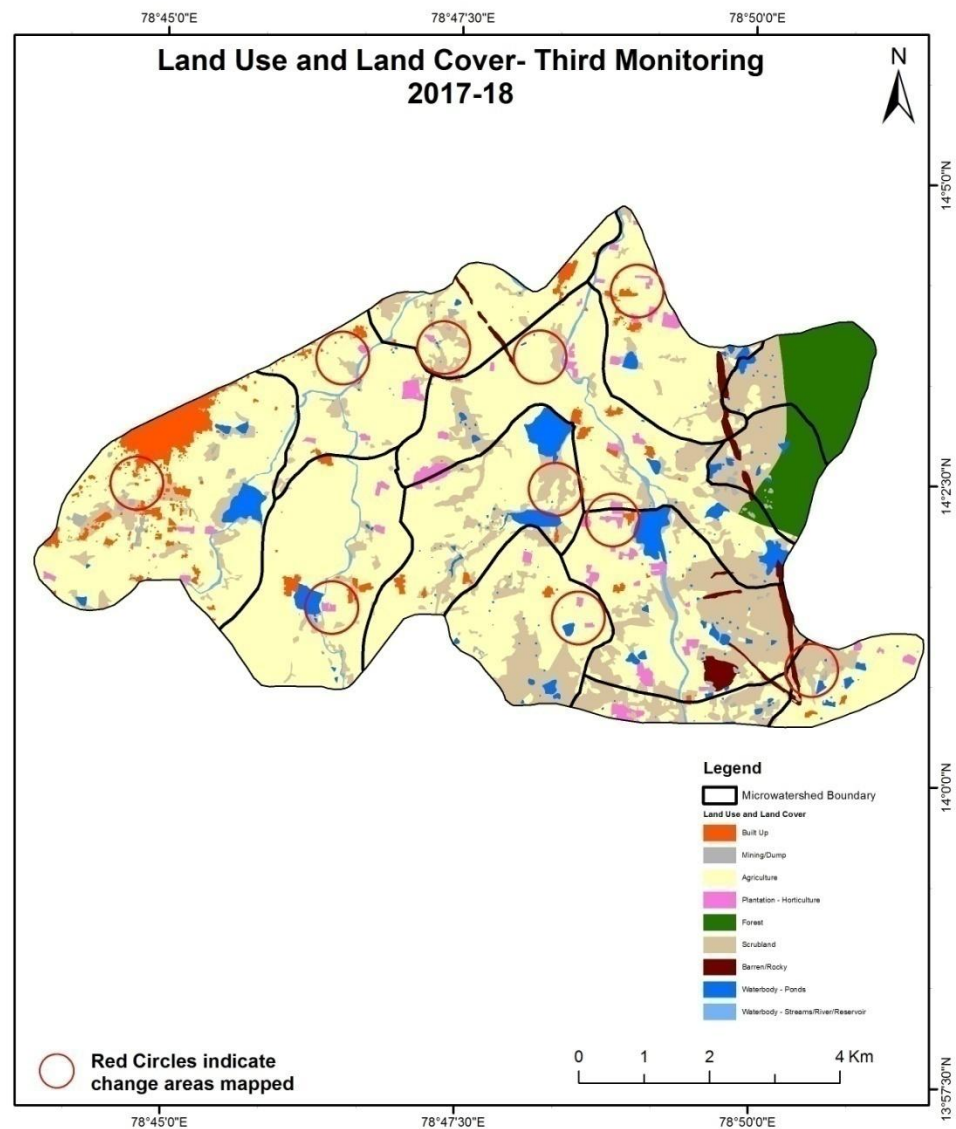
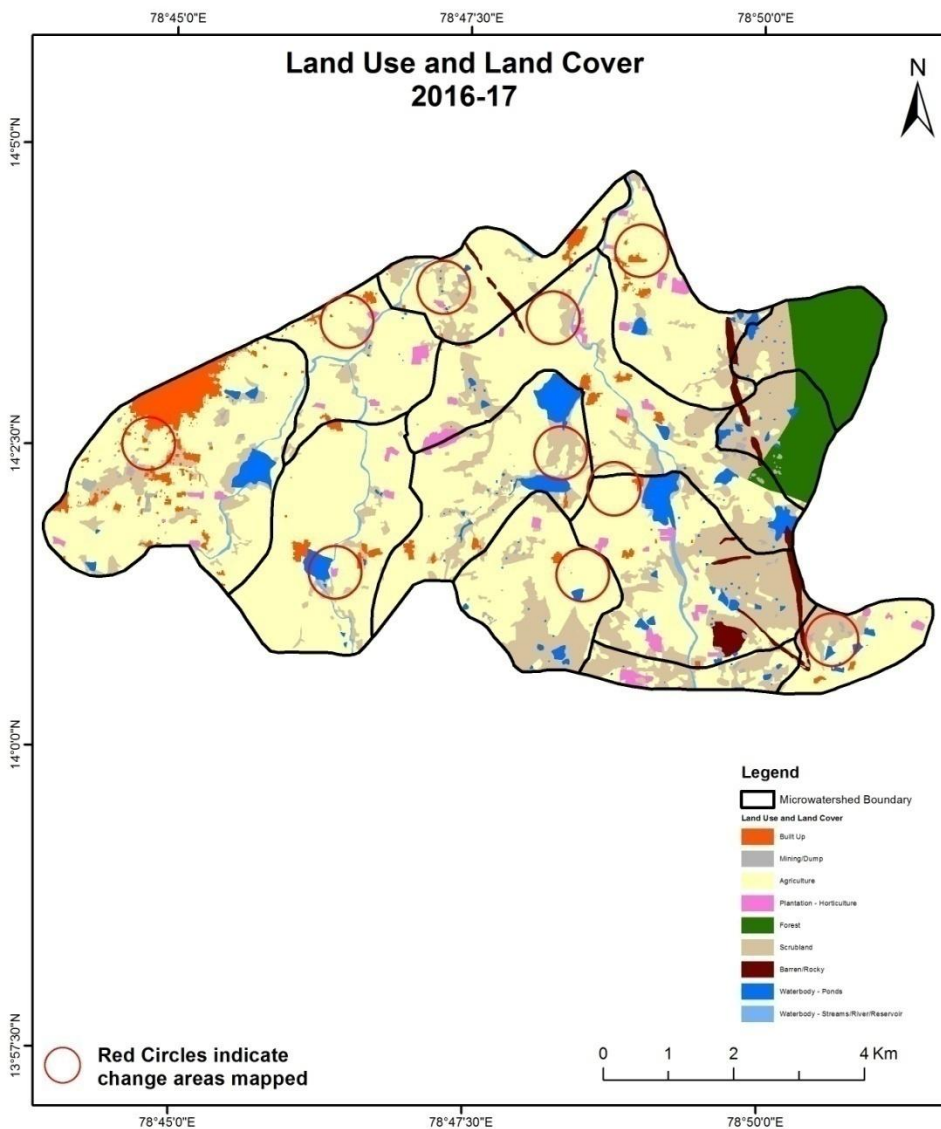
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



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

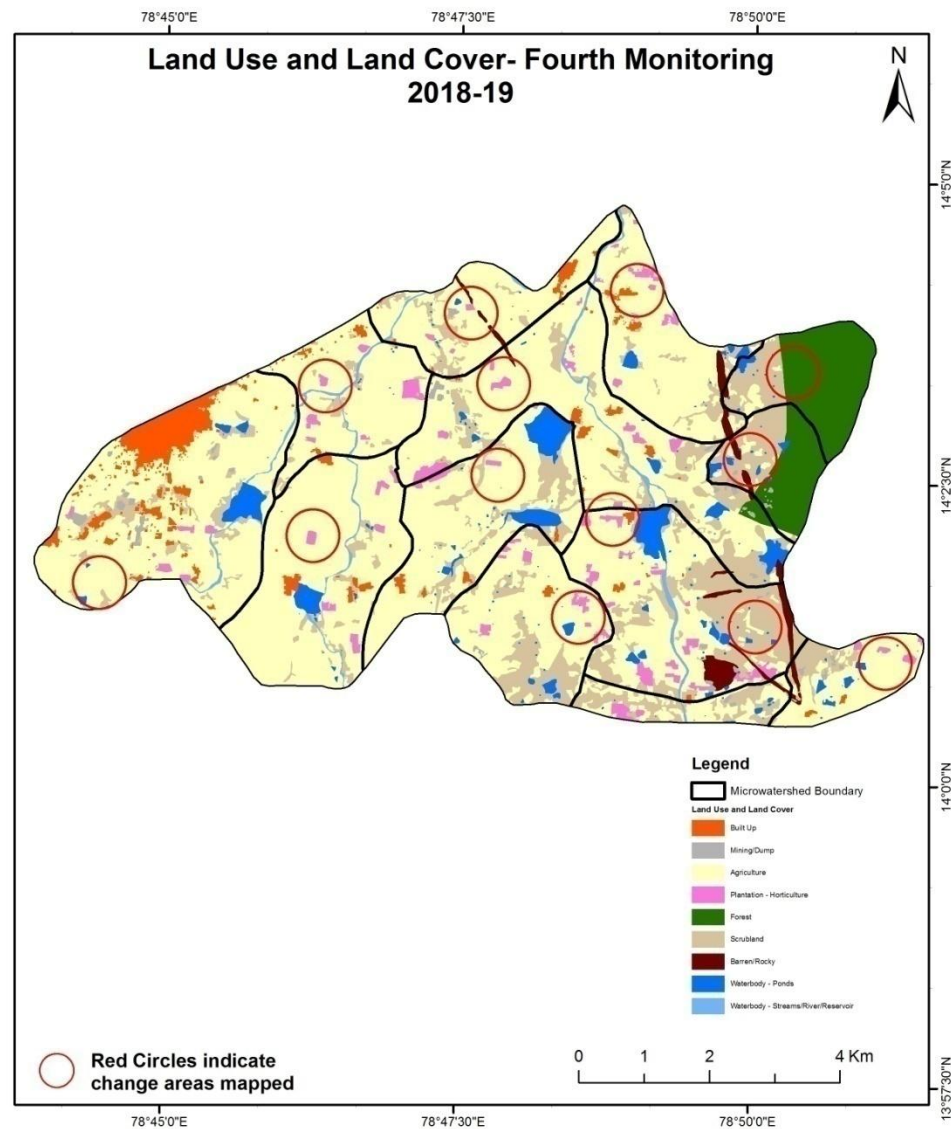
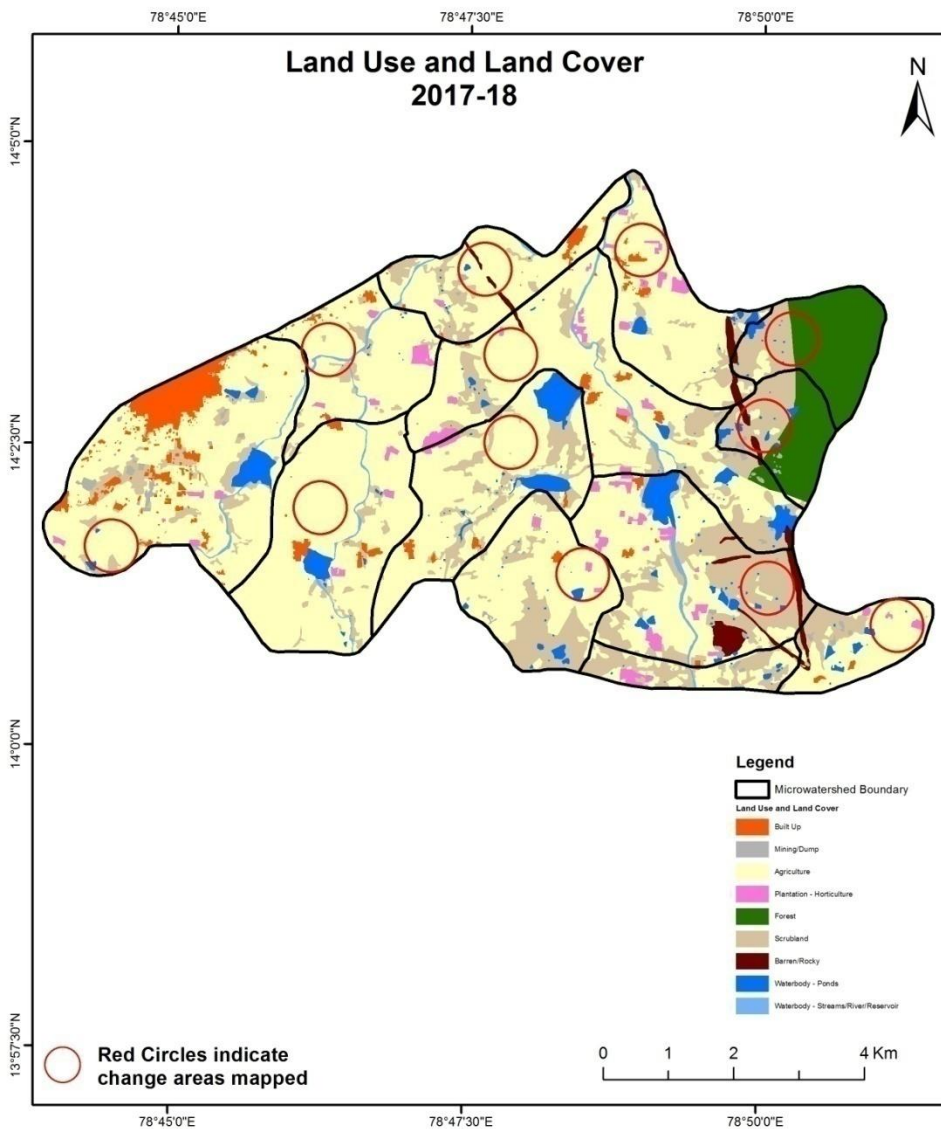
Scale: 1:10000





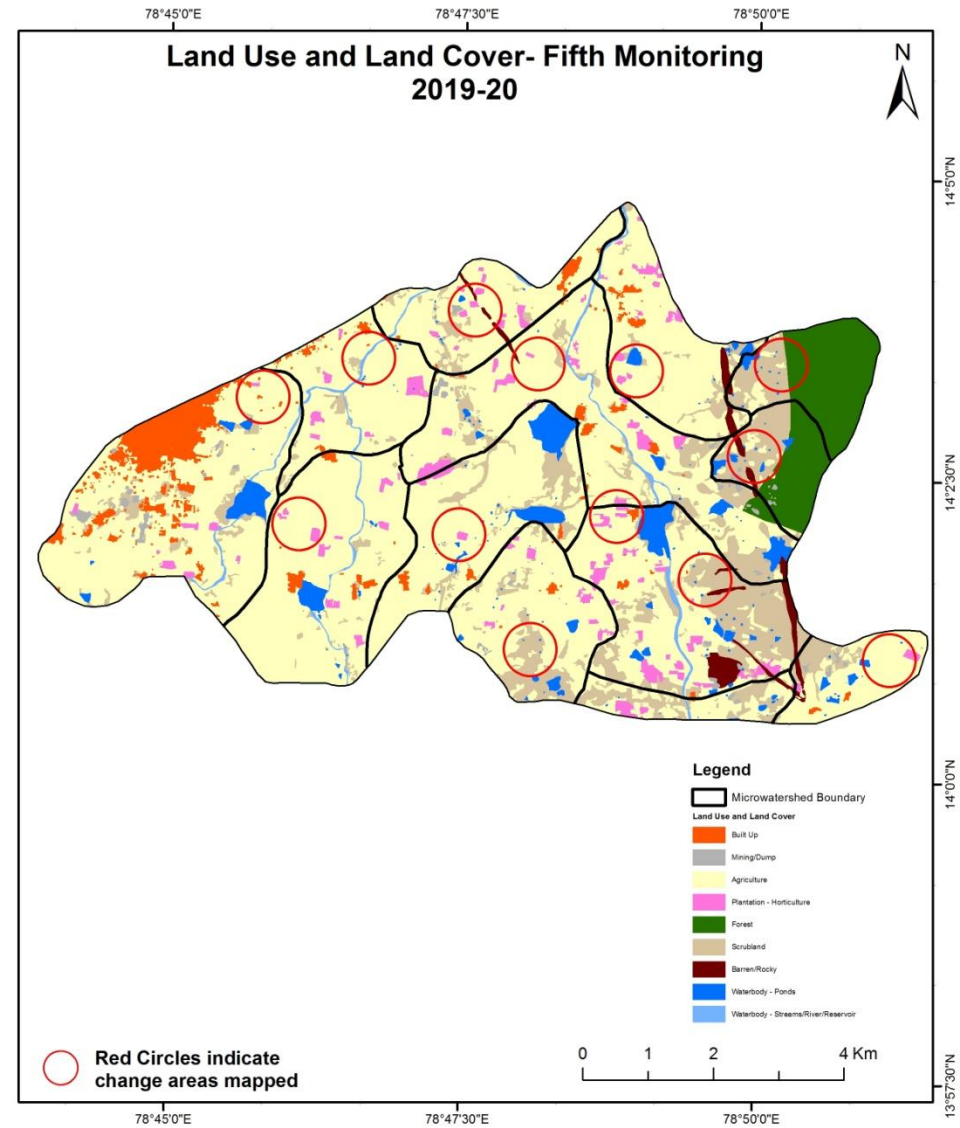
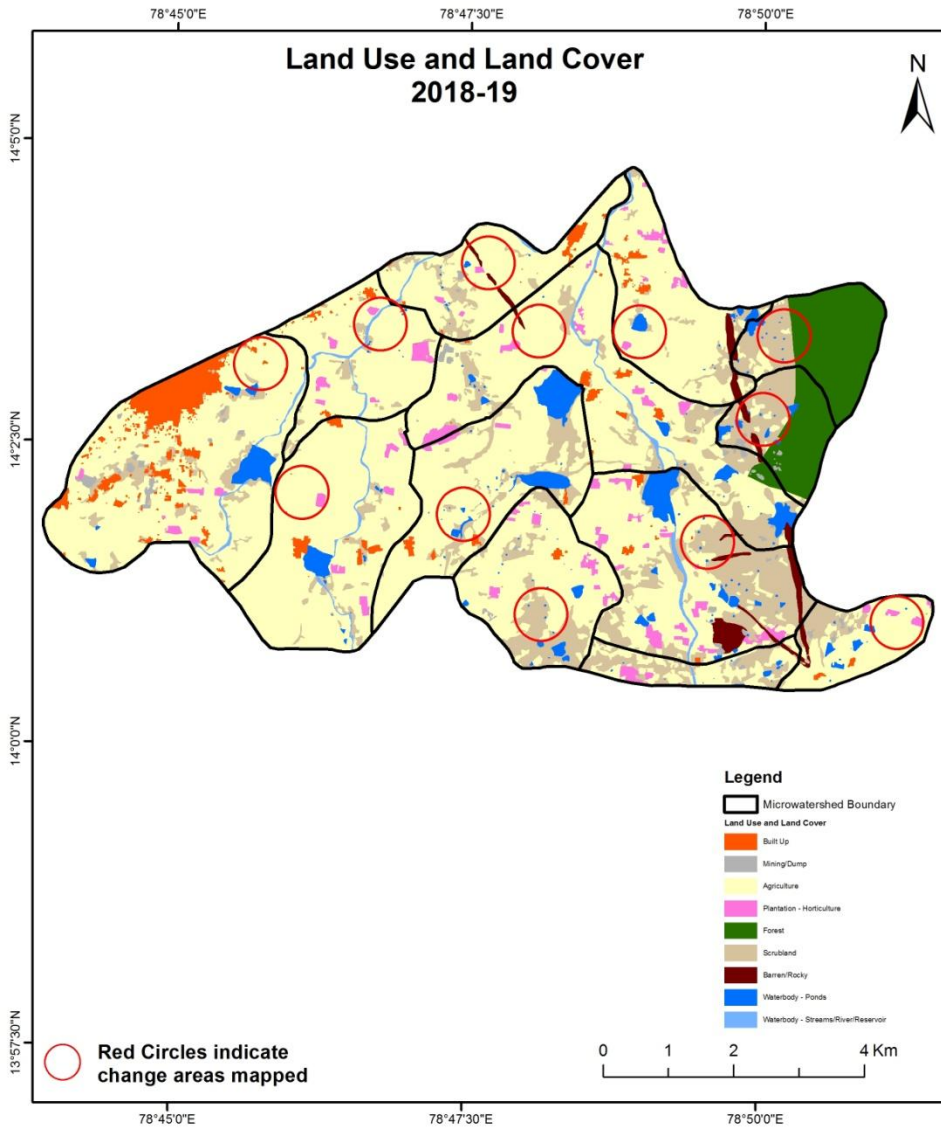
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

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

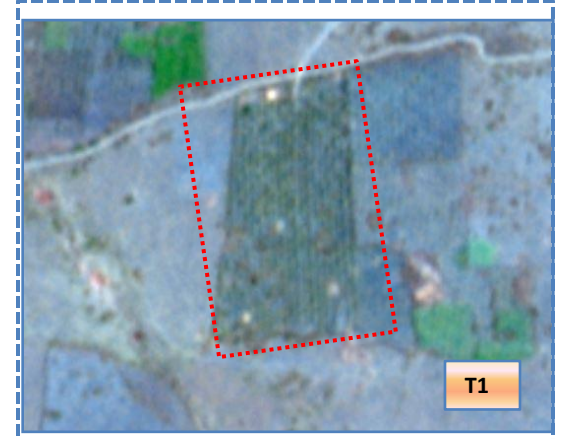


## Land Use and Land Cover changes for Pre and Post treatment dates

### Agriculture to Plantation

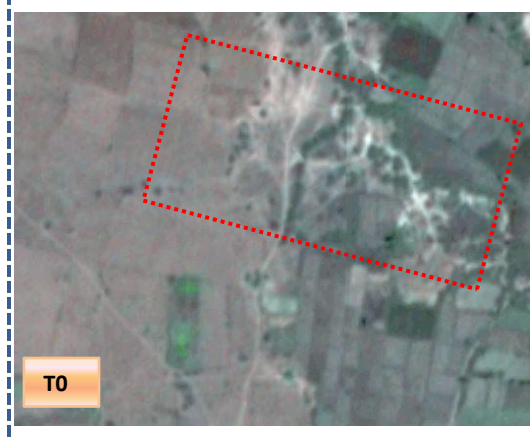


T0: 2011-12 (78°47'3.013"E 14°3'15.916"N )



T0: 02 February 2016

### Scrub to Agriculture



T0: 2011-12 (78°47'49.128"E 14°4'8.415"N )



T0: 02 February 2016

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

Scrub to Water body



T0

T0: 2011-12 (78°50'1.747"E 14°3'26.435"N )



T1

T1: 02 February 2016

Scrub to Built-up



T0

T0: 2011-12 (78°44'48.717"E 14°2'42.478"N )



T1

T1: 02 February 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>	152.10												<b>152.10</b>
<b>Mining/dump</b>		3.15											<b>3.15</b>
<b>Agriculture</b>	26.72	3.77	3736.87	33.06					0.43	6.74			<b>3807.60</b>
<b>Plantation Horticulture</b>			3.74	53.48									<b>57.21</b>
<b>Forest</b>		2.40			336.93								<b>339.33</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							78.57						<b>78.57</b>
<b>Scrub</b>	4.93	15.07	367.34	5.42				1199.77		14.86			<b>1607.39</b>
<b>Waterbody- Streams/River</b>			6.16						67.85				<b>74.02</b>
<b>Waterbody – Ponds</b>			5.63					0.90		187.25			<b>193.78</b>
<b>Grand Total</b>	<b>183.75</b>	<b>24.39</b>	<b>4119.74</b>	<b>91.96</b>	<b>336.93</b>		<b>78.57</b>	<b>1200.67</b>	<b>68.29</b>	<b>208.85</b>			<b>6313.14</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 70 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 382 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>	183.75										<b>183.75</b>	
<b>Mining/dump</b>		24.39									<b>24.39</b>	
<b>Agriculture</b>	3.74	3.12	4104.51	8.29					0.07		<b>4119.74</b>	
<b>Plantation Horticulture</b>			3.94	88.03							<b>91.96</b>	
<b>Forest</b>					336.93						<b>336.93</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>		0.61					77.95				<b>78.57</b>	
<b>Scrub</b>	2.72	6.32	30.09					1160.89		0.65	<b>1200.67</b>	
<b>Waterbody- Streams/River</b>									68.29		<b>68.29</b>	
<b>Waterbody – Ponds</b>										208.85	<b>208.85</b>	
<b>Grand Total</b>	<b>190.21</b>	<b>34.45</b>	<b>4138.54</b>	<b>96.32</b>	<b>336.93</b>		<b>77.95</b>	<b>1160.89</b>	<b>68.29</b>	<b>209.57</b>	<b>6313.14</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 15 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 34 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>	190.21										<b>190.21</b>	
<b>Mining/dump</b>		34.45									<b>34.45</b>	
<b>Agriculture</b>	6.59	1.57	4106.74	22.13				0.15		1.36	<b>4138.54</b>	
<b>Plantation Horticulture</b>				96.32							<b>96.32</b>	
<b>Forest</b>					336.93						<b>336.93</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							77.95				<b>77.95</b>	
<b>Scrub</b>	3.75	0.16	4.99					1149.31		2.68	<b>1160.89</b>	
<b>Waterbody- Streams/River</b>									68.29		<b>68.29</b>	
<b>Waterbody – Ponds</b>										209.57	<b>209.57</b>	
<b>Grand Total</b>	<b>200.55</b>	<b>36.18</b>	<b>4111.73</b>	<b>118.44</b>	<b>336.93</b>		<b>77.95</b>	<b>1149.45</b>	<b>68.29</b>	<b>213.61</b>	<b>6313.14</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 31 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 04 ha of the agriculture area has increased from 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>Built up</b>	200.55												<b>200.55</b>
<b>Mining/dump</b>		36.18											<b>36.18</b>
<b>Agriculture</b>	2.16	4.29	4042.96	61.61							0.72		<b>4111.73</b>
<b>Plantation Horticulture</b>			22.54	95.90									<b>118.44</b>
<b>Forest</b>					336.93								<b>336.93</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							77.95						<b>77.95</b>
<b>Scrub</b>	1.47	0.34	150.53					996.43			0.68		<b>1149.45</b>
<b>Waterbody- Streams/River</b>									68.29				<b>68.29</b>
<b>Waterbody – Ponds</b>											213.61		<b>213.61</b>
<b>Grand Total</b>	<b>204.18</b>	<b>40.81</b>	<b>4216.03</b>	<b>157.51</b>	<b>336.93</b>		<b>77.95</b>	<b>996.43</b>	<b>68.29</b>		<b>215.01</b>		<b>6313.14</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 68 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 173 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-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	
<b>Built up</b>	204.18										<b>204.18</b>	
<b>Mining/dump</b>		40.81									<b>40.81</b>	
<b>Agriculture</b>	31.23		4141.29	43.19						0.32	<b>4216.03</b>	
<b>Plantation Horticulture</b>	0.15		20.59	136.72						0.05	<b>157.51</b>	
<b>Forest</b>					336.93						<b>336.93</b>	
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							77.95				<b>77.95</b>	
<b>Scrub</b>	3.51		108.97					883.55		0.39	<b>996.43</b>	
<b>Waterbody- Streams/River</b>									68.29		<b>68.29</b>	
<b>Waterbody – Ponds</b>			0.48							214.53	<b>215.01</b>	
<b>Grand Total</b>	<b>239.06</b>	<b>40.81</b>	<b>4271.34</b>	<b>179.92</b>	<b>336.93</b>		<b>77.95</b>	<b>883.55</b>	<b>68.29</b>	<b>215.29</b>	<b>6313.14</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 74 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T5.
- In T5 129 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 15 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 312, 18, 104 & 55 Hectares from T0 to T1, T1-T2, T3 to T4 & T4-T5 respectively and overall increase of 463 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 122 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2018-19 (T5) years.
6. There is a decrease of 723 Hectares in Scrubland area as compared between 2011-12 (T0) & 2018-19 (T5) years.
7. Farm ponds (54) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (40) verified from the portal.