

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

YSR KADAPA -41/2011-12  
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad  
February-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

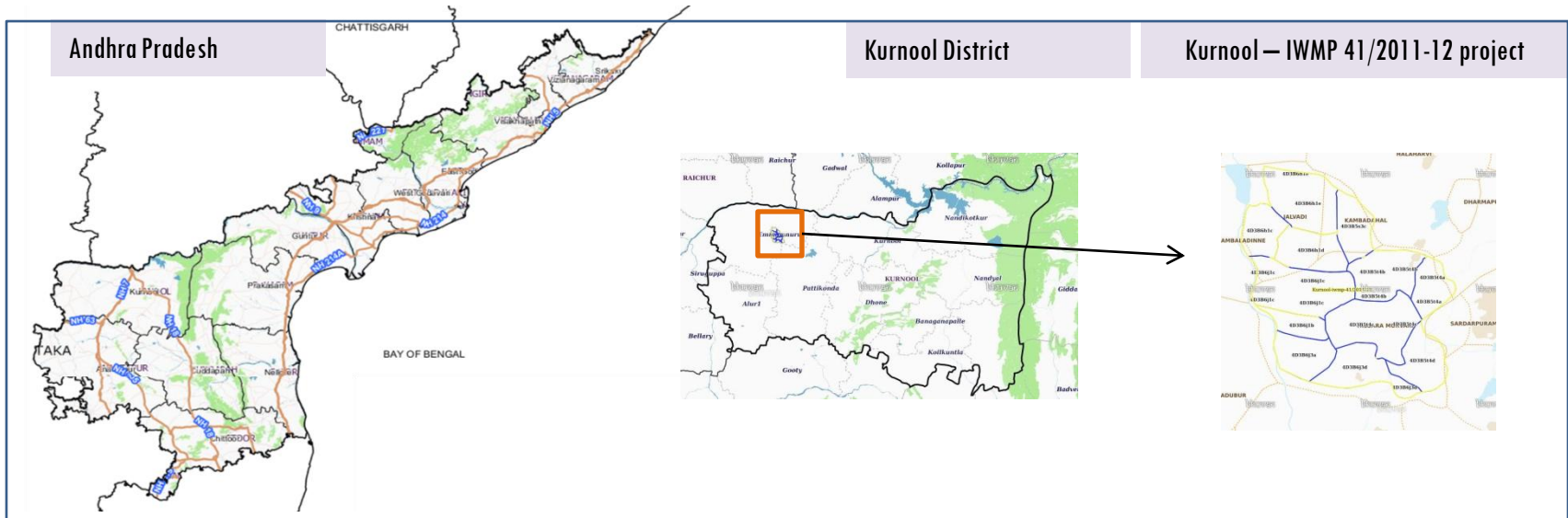
## EXECUTIVE SUMMARY

- 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-41/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is **5,640** ha. It comprises of 13 micro watersheds.
- In the project area 395 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Water bodies have shown an increased by 2.05 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
- Major percentage i.e. 87 % is covered by the agriculture, 7% is covered by scrub land, 2.3 % is covered by water body and remaining by other land use classes.

# PROJECT : KURNOOL – IWMP-41/2011-12

## DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Pedda Kadubur Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **5,640** 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



- 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).

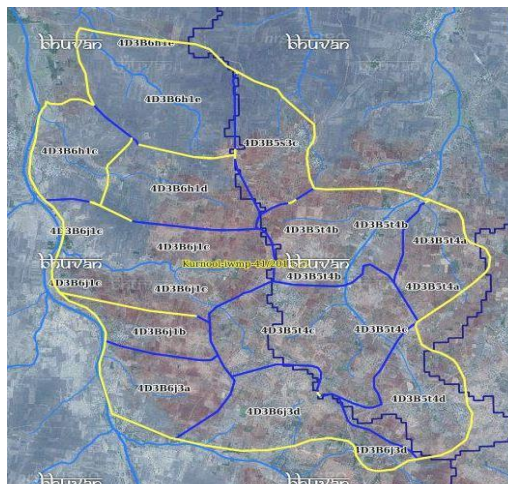
# Satellite Data and Ancillary Data

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	Drishti Photographs		
		Total	395
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

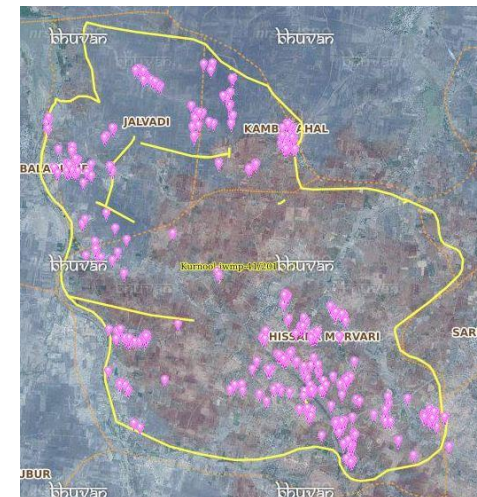


MWS Boundary



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	Afforestation	0	0
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	148	128
7	Check dams (Civil work)	0	0
8	Checks & plugins	38	38
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	0	0
17	Others	259	229
	<b>TOTAL</b>	<b>445</b>	<b>395</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 T1 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.

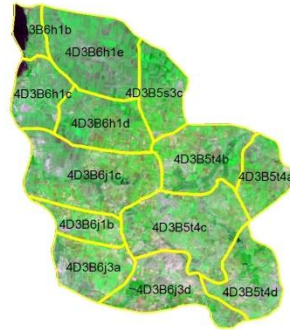
# Natural Color Composite

**Natural Color Composite- 2011-12**



Source:Fusion data,NRSC

**Natural Color Composite-14 th October 2015**



Source:LISS-IV,NRSC

**Natural Color Composite- 03rd February 2017**



Source:NCC,NRSC

**Natural Color Composite-1st April 2018**



Source:NCC,NRSC

**Natural Color Composite-02nd February 2019**



Source:Sentinel-2

**Natural Color Composite- 19th February 2020**



Source:LISS-IV,NRSC



Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-41/2011-12



T1

T1: 28 October 2015



T2

T2: 14 November 2018



Drishti Sl no. 136931

MWS :4D3B5t4c

Farm pond



T1

T1: 28 October 2015



T2

T2: 14 November 2018



Drishti Sl no. 647562

MWS :4D3B6j3d

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-41/2011-12



T1

T1: 28 October 2015



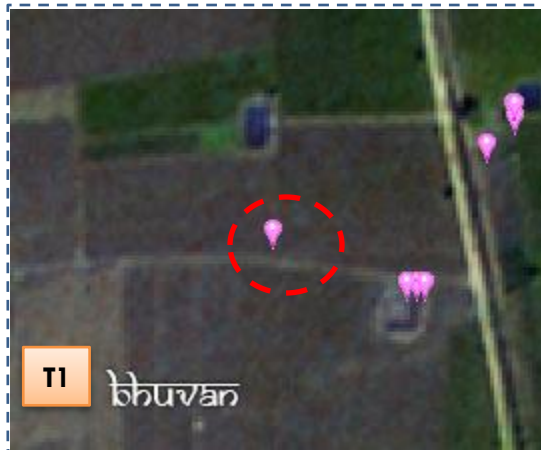
T2

T2: 14 November 2018



Drishti SI no. 2449418 MWS :4D3B5t4d

Farm pond



T1

T1: 28 October 2015



T2

T2: 14 November 2018



Drishti SI no. 2475956 MWS : 4D3B6h1e

Farm pond



Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-41/2011-12



T0:2010-11

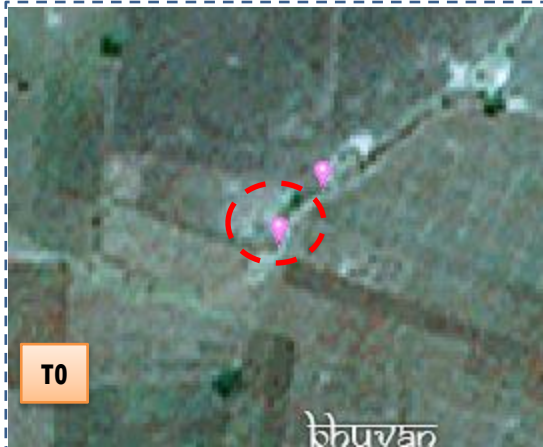


T1: 14 October 2015



Drishti Sl no. 135398- MWS :4D3B6h1e

Farm pond



T0:2010-11



T1: 14 October 2015



Drishti Sl no. 135421 MWS :4D3B6h1d

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-41/2011-12



T0

T0: 2010-11



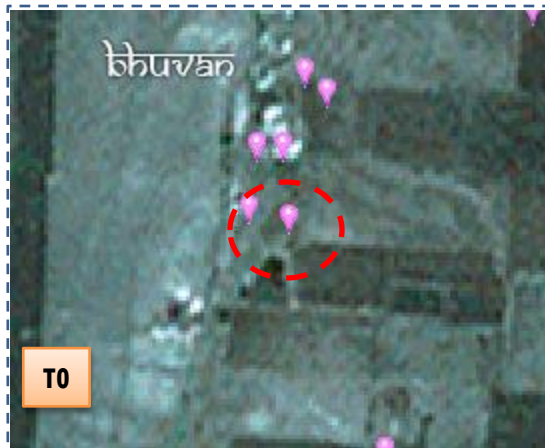
T1

T1: 14 October 2015



Drishti Sl no. 137062 MWS : 4D3B6h1d

Farm pond



T0

T0: 2010-11



T1

T1: 14 October 2015



Drishti Sl no. 2494713 MWS : 4D3B6h1e

Farm pond

## MONITORING IN THE PROJECT AREA

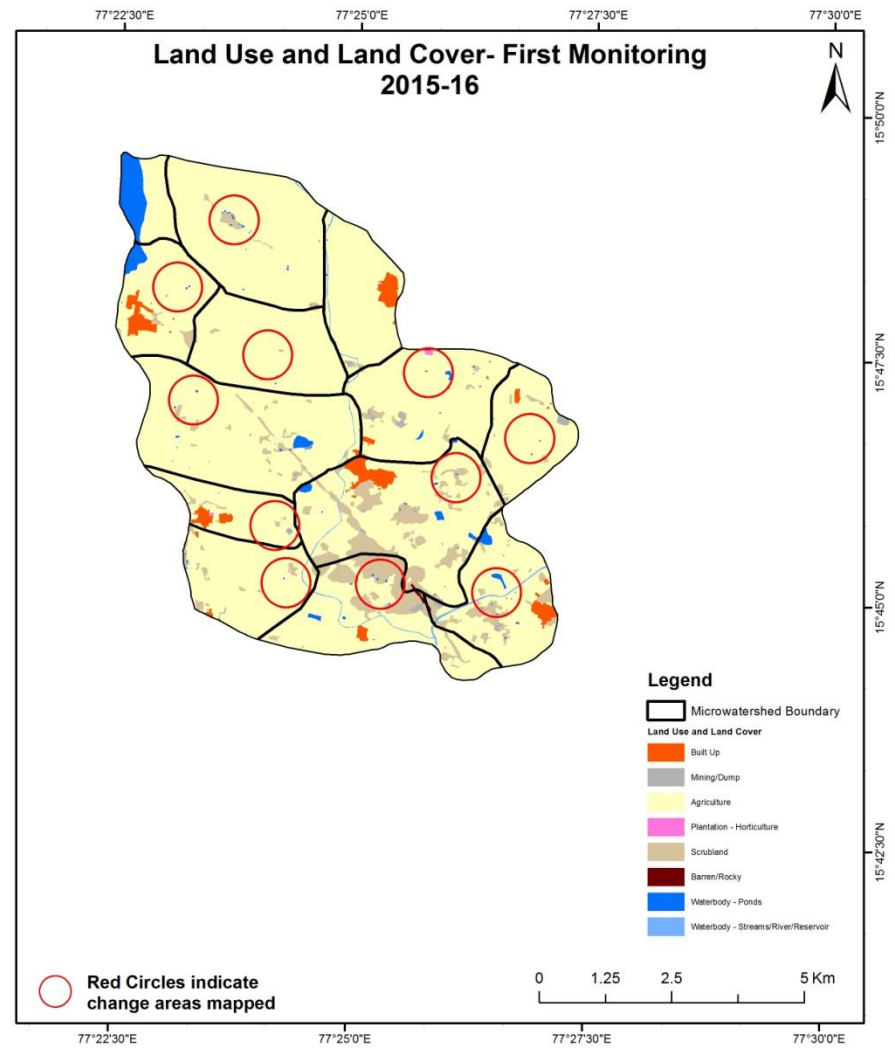
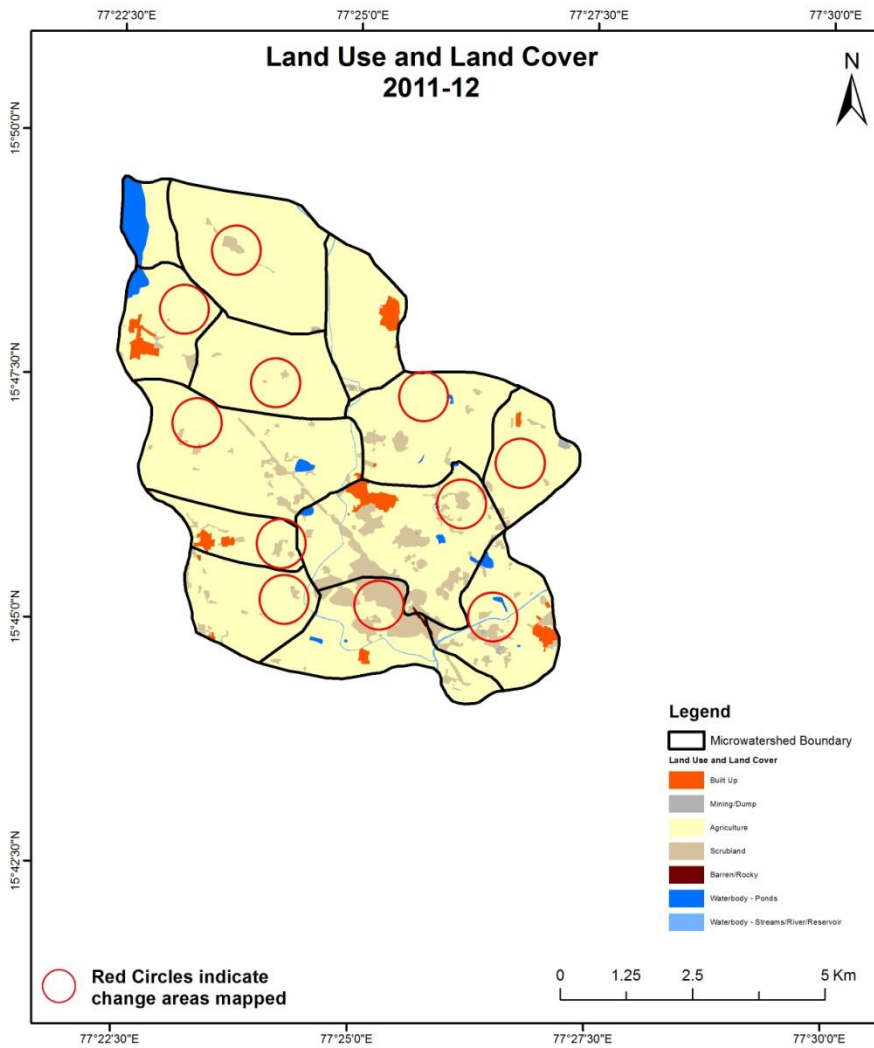
### Land use and Land cover Changes in the Project

- 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)



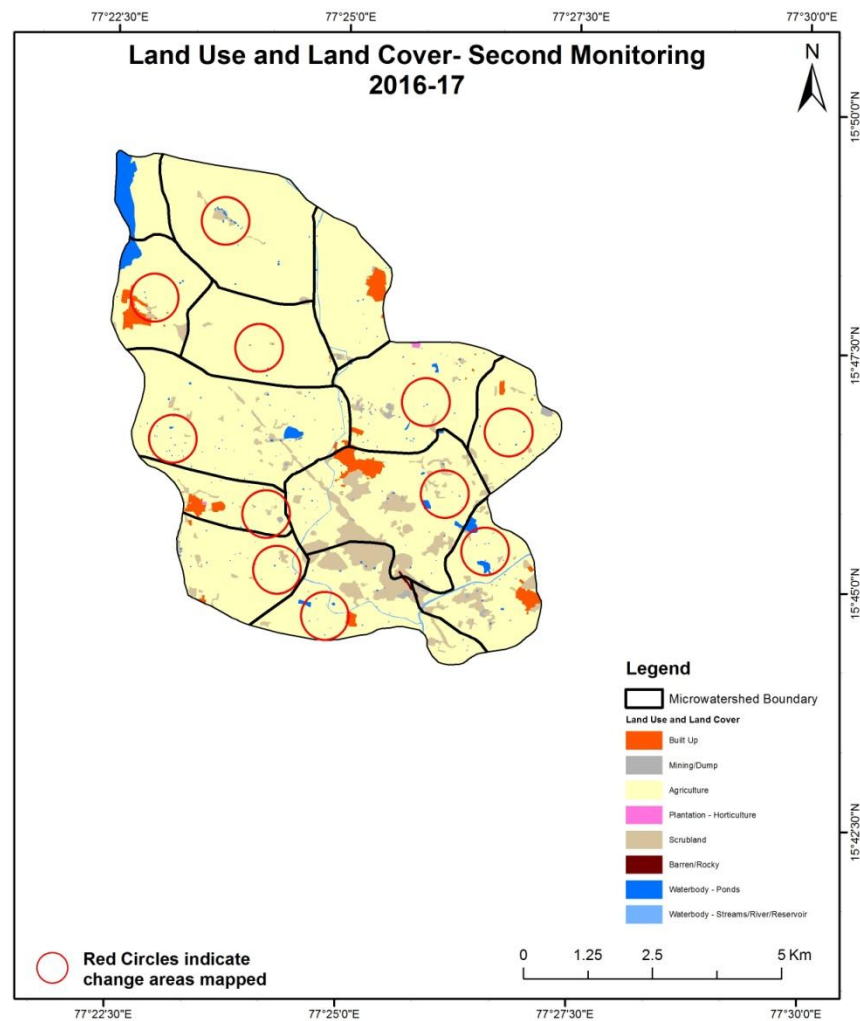
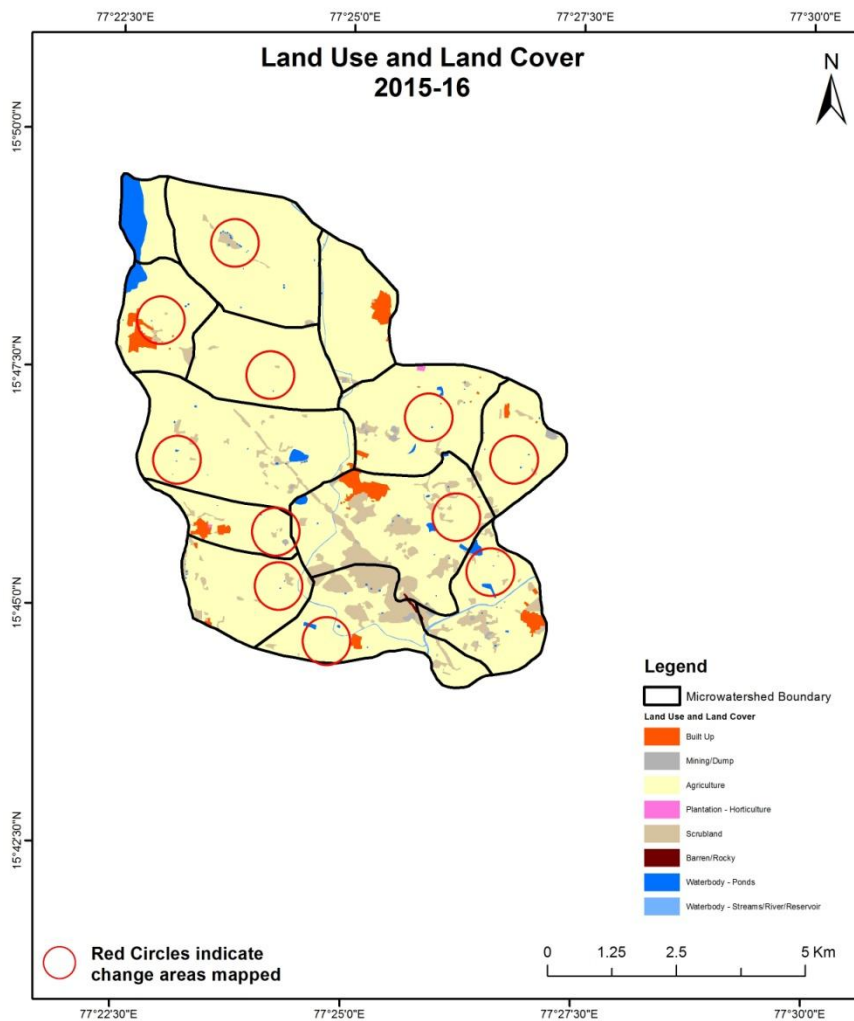
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



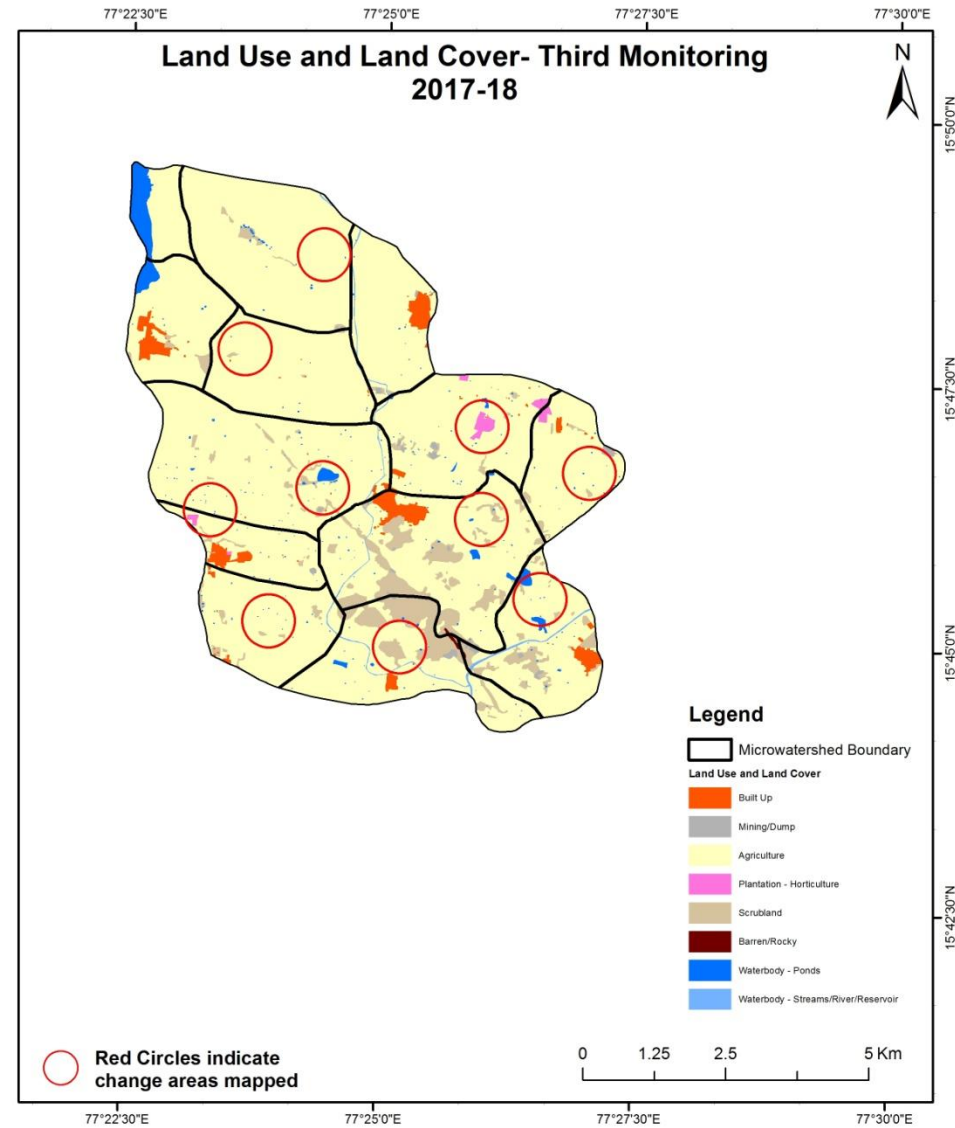
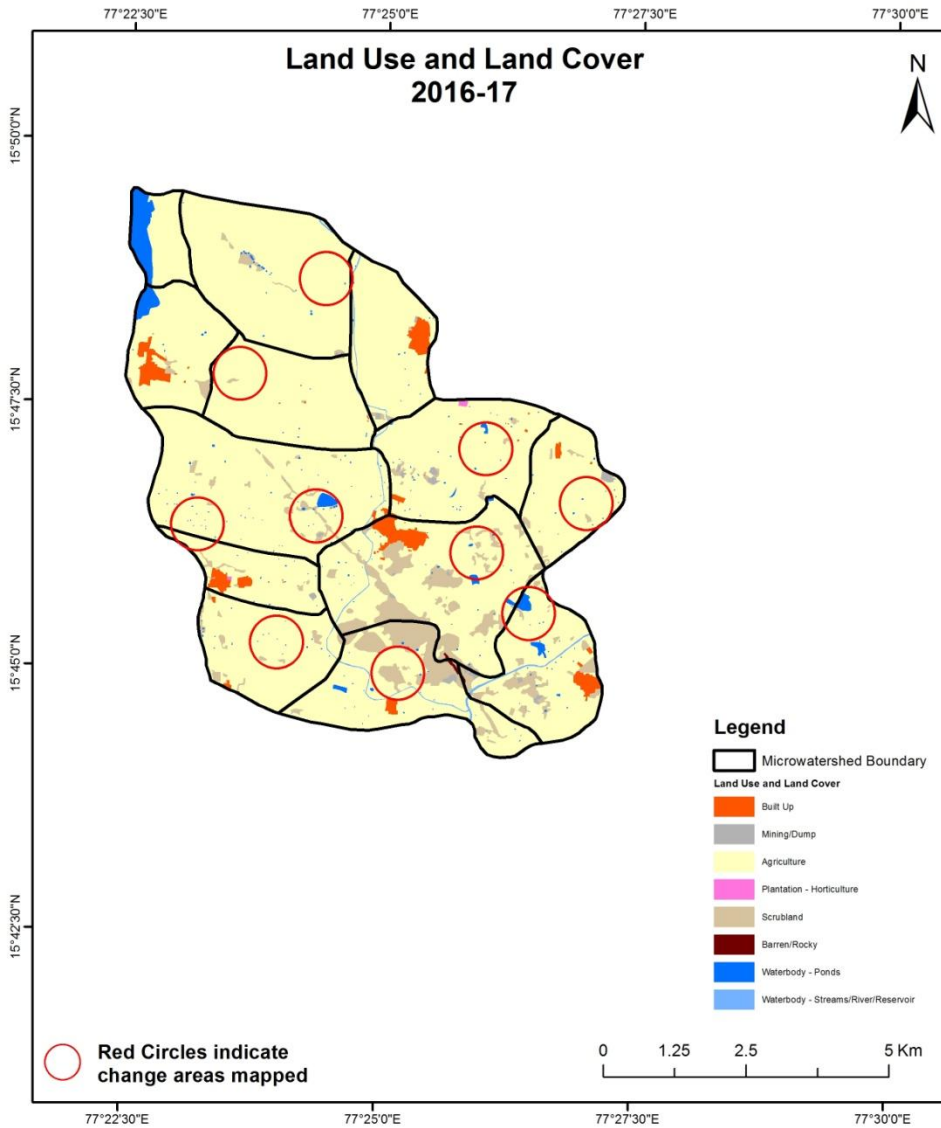
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



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

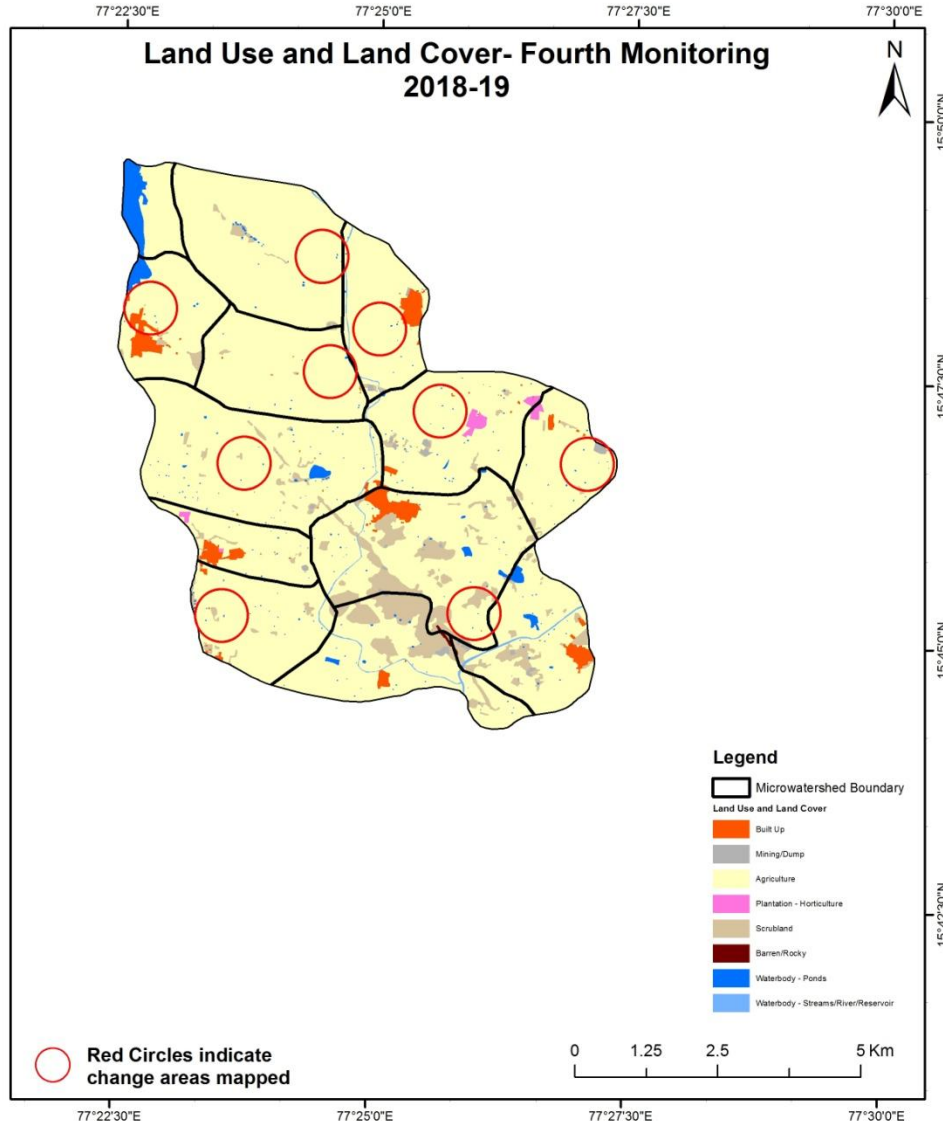
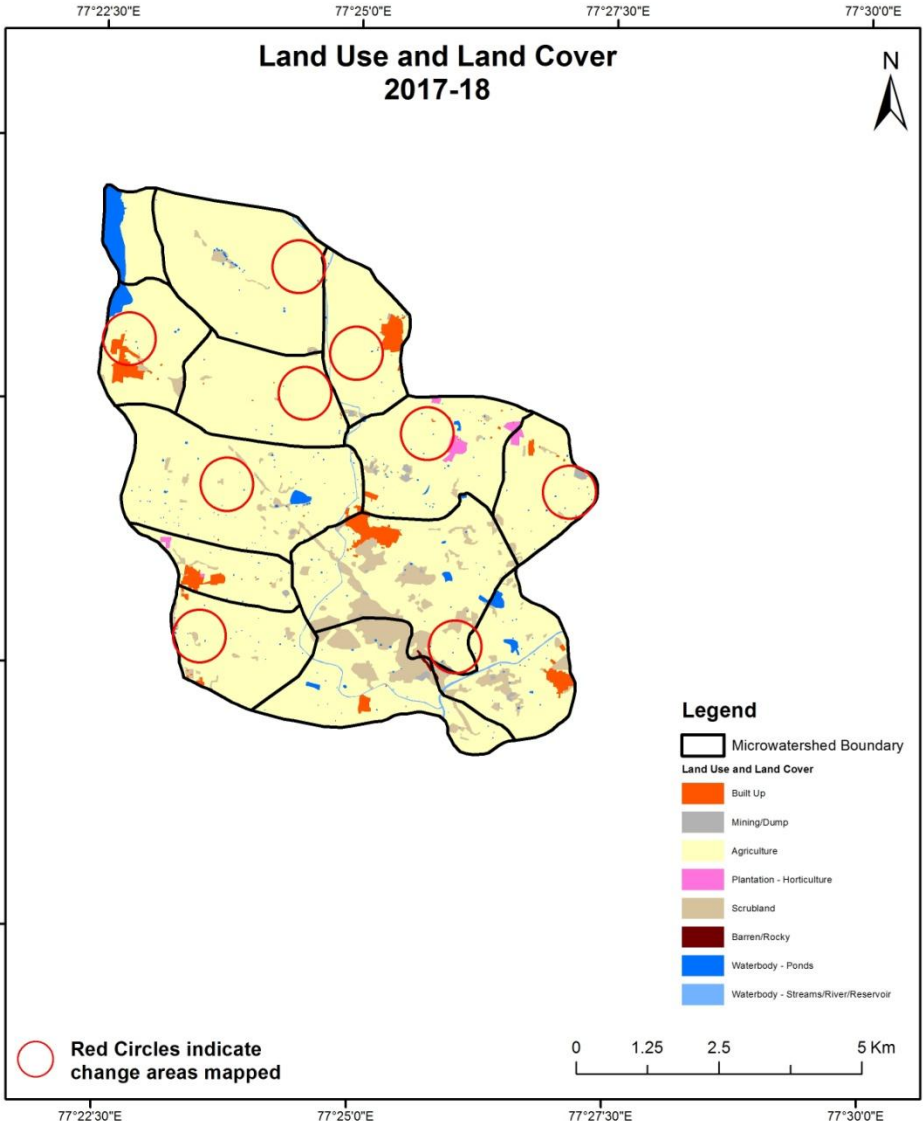
Scale: 1:10000





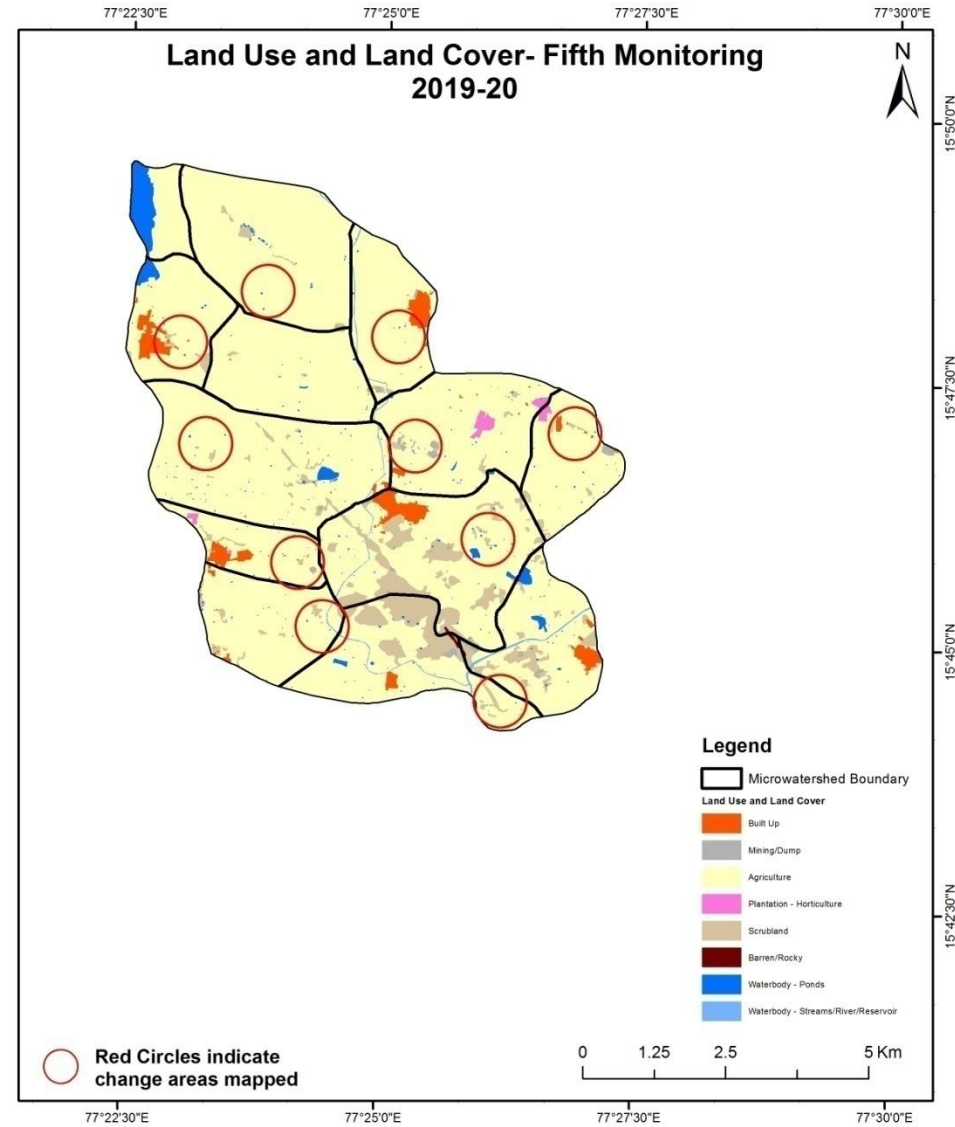
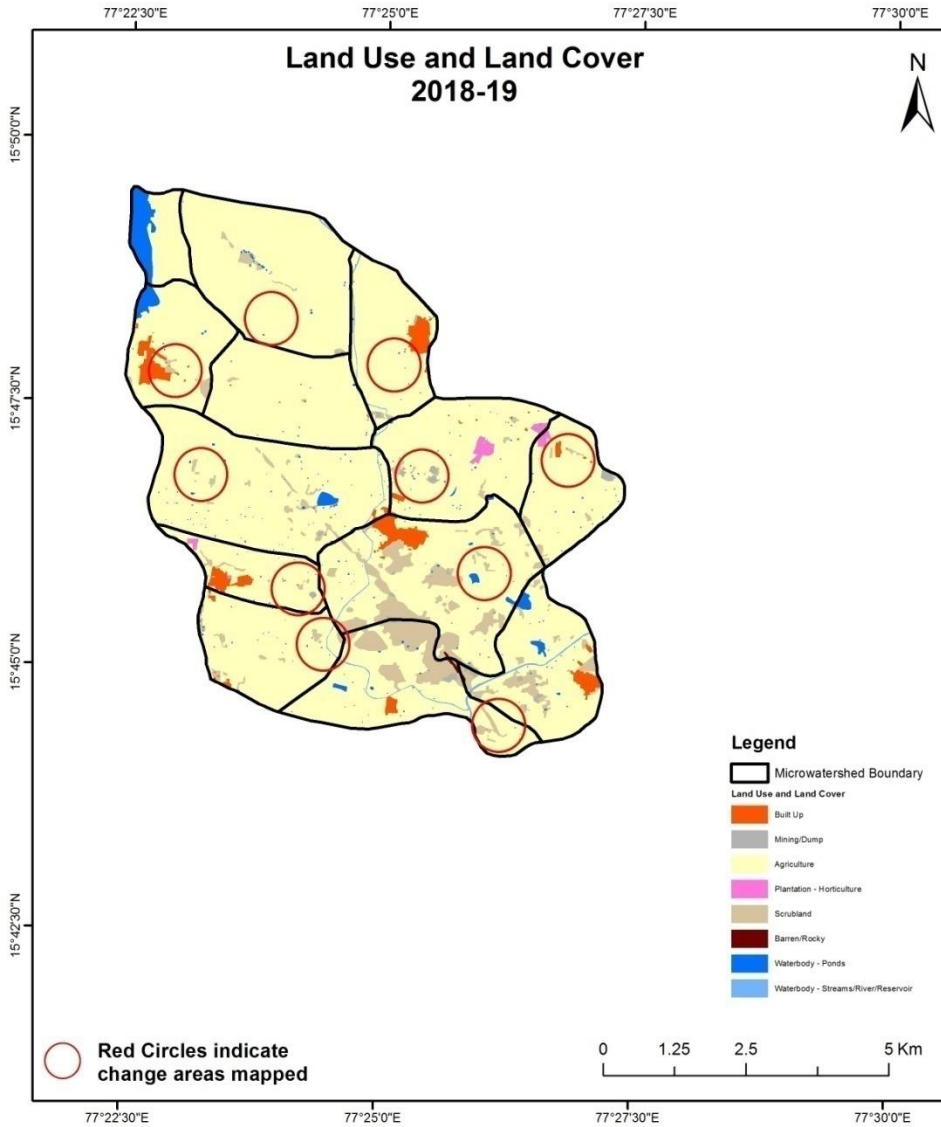
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



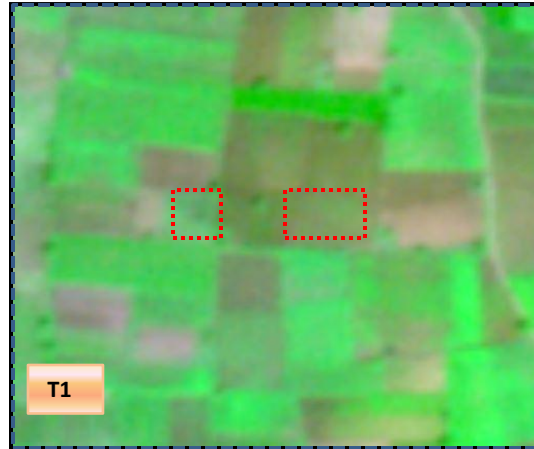
# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

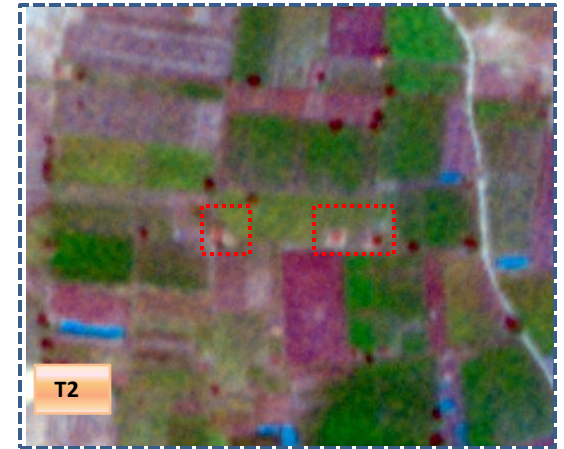


## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to water body



T1: 2015-16(77°22'53.186"E 15°46'32.011"N )



T2: 03 February 2017

Agriculture to water body



T1: 2015-16 (77°24'34.913"E 15°46'58.569"N )



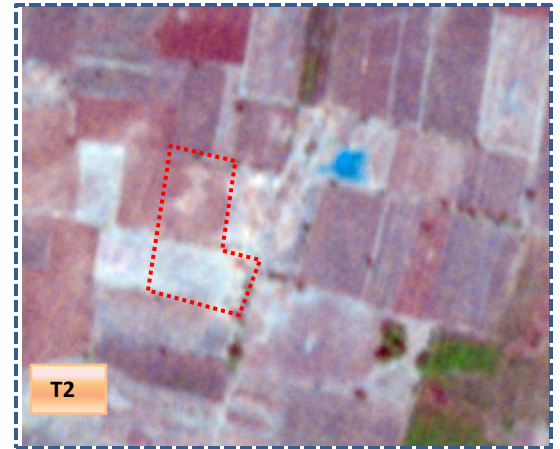
T2: 03 February 2017

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

Scrub to Agriculture



T1: 2015-16(77°23'17.053"E 15°46'42.687"N )



T2: 03 February 2017

Scrub to Agriculture



T1: 2015-16(77°23'17.19"E 15°45'41.036"N )



T2: 03 February 2017



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

Scrub to Agriculture

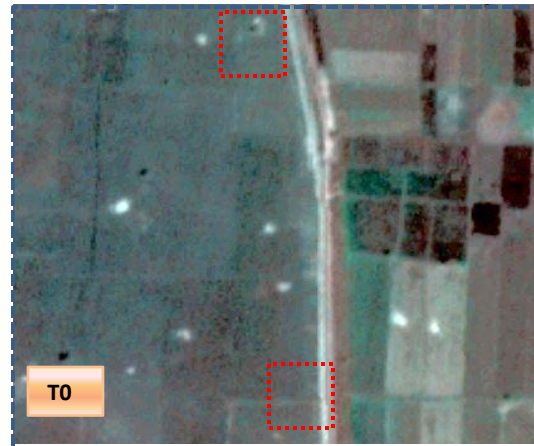


T0: 2011-12 (77°23'47.919"E 15°45'49.172"N )

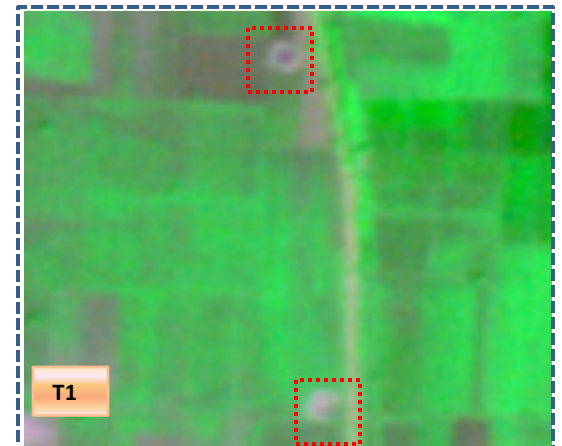


T1: 14 Oct 2015

Agriculture to water body



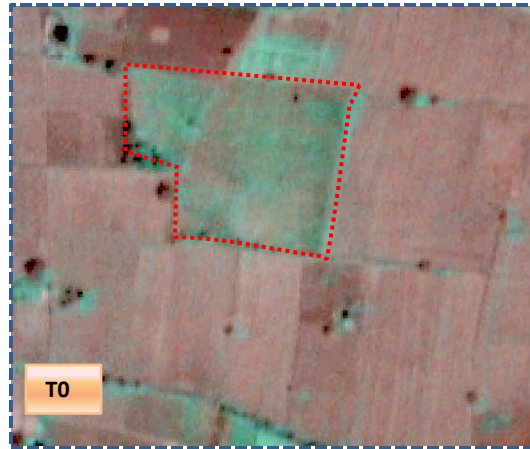
T0: 2011-12 (77°24'39.512"E 15°48'30.213"N )



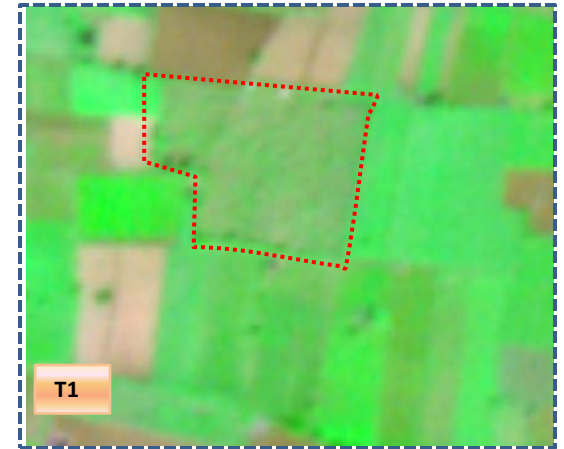
T1: 14 Oct 2015

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

### Agriculture to Plantation



T0: 2011-12 (77°25'45.914"E 15°47'32.161"N )

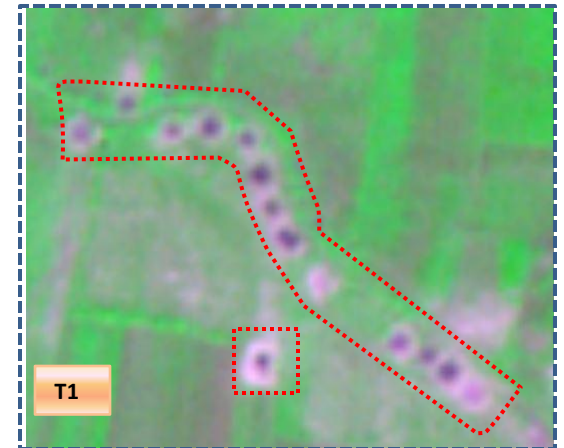


T1: 14 Oct 2015

### Scrub to water body



T0: 2011-12 (77°23'41.491"E 15°48'51.952"N )



T1: 14 Oct 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>T0</b>													
<b>Built up</b>	112.49												112.49
<b>Mining/dump</b>		8.24											8.24
<b>Agriculture</b>	2.86		4905.15	2.51							4.67		4915.19
<b>Plantation Horticulture</b>													
<b>Forest</b>													
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							3.03						3.03
<b>Scrub</b>	2.07	12.64	39.26					416.15			2.63		472.75
<b>Waterbody- Streams/River</b>									27.03				27.03
<b>Waterbody – Ponds</b>			0.12								102.11		102.23
<b>Grand Total</b>	117.42	20.88	4944.53	2.51			3.03	416.15	27.03		109.41		5640.96

- 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 10 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T1.
- In T1 39 ha of the agriculture area has increased from 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>	117.42										<b>117.42</b>	
<b>Mining/dump</b>		20.88									<b>20.88</b>	
<b>Agriculture</b>	2.36	0.49	4933.08							8.61	<b>4944.53</b>	
<b>Plantation Horticulture</b>				2.51							<b>2.51</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							3.03				<b>3.03</b>	
<b>Scrub</b>	1.26	0.96	19.22					393.55		1.16	<b>416.15</b>	
<b>Waterbody- Streams/River</b>									27.03		<b>27.03</b>	
<b>Waterbody – Ponds</b>			16.26							93.14	<b>109.41</b>	
<b>Grand Total</b>	<b>121.04</b>	<b>22.33</b>	<b>4968.57</b>	<b>2.51</b>			<b>3.03</b>	<b>393.55</b>	<b>27.03</b>	<b>102.91</b>	<b>5640.96</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 11.4 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.
- In T2 35 ha of the agriculture area has increased from 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>	121.04										<b>121.04</b>	
<b>Mining/dump</b>		22.33									<b>22.33</b>	
<b>Agriculture</b>	3.79		4942.83	21.52						0.43	<b>4968.57</b>	
<b>Plantation Horticulture</b>				2.51							<b>2.51</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							3.03				<b>3.03</b>	
<b>Scrub</b>	2.29	1.54	13.46					376.20		0.05	<b>393.55</b>	
<b>Waterbody- Streams/River</b>									27.03		<b>27.03</b>	
<b>Waterbody – Ponds</b>			1.18							101.73	<b>102.91</b>	
<b>Grand Total</b>	<b>127.11</b>	<b>23.88</b>	<b>4957.47</b>	<b>24.03</b>			<b>3.03</b>	<b>376.20</b>	<b>27.03</b>	<b>102.21</b>	<b>5640.96</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 25 ha of the agriculture area has decreased and it is converted into Built-up , plantations and water body in T3.
- In T3 14 ha of the agriculture area has increased from 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>	127.11										<b>127.11</b>	
<b>Mining/dump</b>		23.88									<b>23.88</b>	
<b>Agriculture</b>	0.88	0.16	4954.01							2.42	<b>4957.47</b>	
<b>Plantation Horticulture</b>			2.03	22.00							<b>24.03</b>	
<b>Forest</b>												
<b>Forest Plantation</b>												
<b>Barren Rocky</b>							3.03				<b>3.03</b>	
<b>Scrub</b>	0.29							375.80		0.12	<b>376.20</b>	
<b>Waterbody- Streams/River</b>									27.03		<b>27.03</b>	
<b>Waterbody – Ponds</b>			2.14							100.06	<b>102.21</b>	
<b>Grand Total</b>	<b>128.28</b>	<b>24.03</b>	<b>4958.18</b>	<b>22.00</b>			<b>3.03</b>	<b>375.80</b>	<b>27.03</b>	<b>102.61</b>	<b>5640.96</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 3.4 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T4.
- In T4 2.03 ha of the agriculture area has increased from plantations 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		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>T4</b>													
<b>Built up</b>	128.28												<b>128.28</b>
<b>Mining/dump</b>		24.03											<b>24.03</b>
<b>Agriculture</b>	1.11		4951.44							5.63			<b>4958.18</b>
<b>Plantation Horticulture</b>				22.00									<b>22.00</b>
<b>Forest</b>													
<b>Forest Plantation</b>													
<b>Barren Rocky</b>							3.03						<b>3.03</b>
<b>Scrub</b>	0.38		6.00					369.31		0.10			<b>375.80</b>
<b>Waterbody- Streams/River</b>									27.03				<b>27.03</b>
<b>Waterbody – Ponds</b>			4.07							98.54			<b>102.61</b>
<b>Grand Total</b>	<b>129.77</b>	<b>24.03</b>	<b>4961.52</b>	<b>22.00</b>			<b>3.03</b>	<b>369.31</b>	<b>27.03</b>	<b>104.27</b>			<b>5640.96</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 6.7 ha of the agriculture area has decreased and it is converted into Built-up and water body in T5.
- In T5 10.08 ha of the agriculture area has increased from 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 1.6 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 29, 24, 0.7 & 3.3 Hectares From T0 to T1, T1-T2, T3-T4 & T4-T5 respectively and overall increase of 46 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is an increase of 22 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 103 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (128) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (148) verified from the portal.