MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

KURNOOL -21/2010-11
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

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

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-21/2010-11, Kurnool District of   Andhra Pradesh. The total geographical area of the project is 4,716 ha. It comprises of 10 micro watersheds.

- In the project area 511 Drishti photos were uploaded showing 30 check dams/checks & plugins, 1 Livelihood measures and remaining showing others.

- Major percentage i.e. 95% is covered by the agriculture, 2.9 % is covered by built-up and remaining by other land use classes.

- The study area falls in Gospadu Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 4,716 ha. It comprises of 10 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
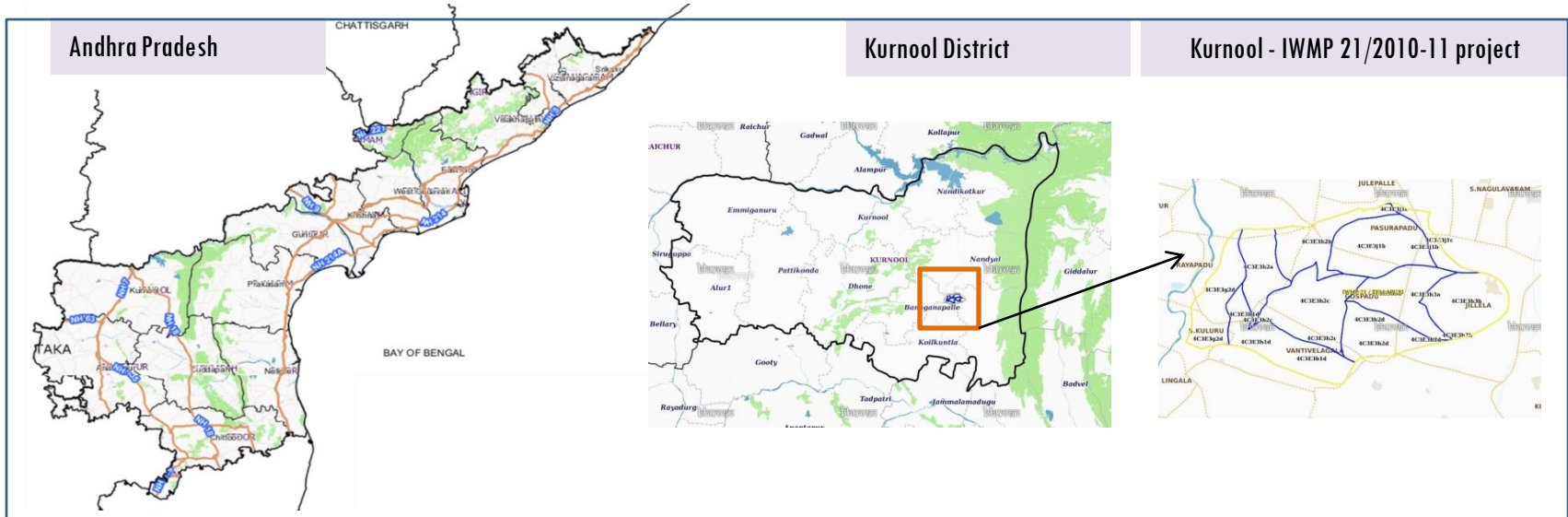
- The climate is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).

- 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
	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	341
4	Detailed Project Report		

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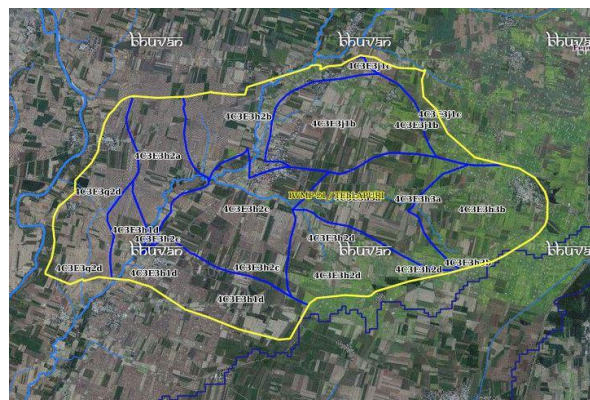
Legend

 Drainage (1:10000 Scale)
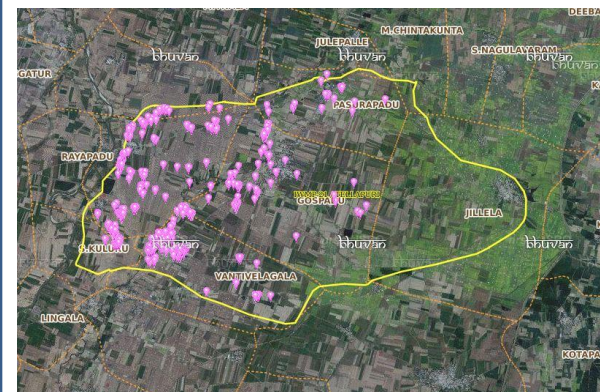
 MWS Boundary

 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	Horticulture	0	0
3	Agriculture	0	0
4	Blockplanting	0	0
5	Checks & plugins	35	30
6	Drainage Treatment	0	0
7	Farm ponds/Dug out pit	0	0
8	Check dams (Civil work)	0	4
9	New Activity	0	0
10	Om (Other measurement)	0	0
11	LM (Livelihood Measures)	1	1
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	475	310
	TOTAL	**511**	**341**

MONITORING IN THE PROJECT AREA

<div style="border:1px solid blue">

Site Wise Changes in the Project

</div>

- 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 Kurnool Dt Andhra Pradesh. IWMP-21/2010-11

| T0:2010-11 | T1: 19 May 2014 | Drishti Sl no. 1959055   MWS : 4C3E3h1d |

Check dam

| T0:2010-11 | T1: 19 May 2014 | Drishti Sl no. 1960634   MWS :4C3E3h1d |

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-21/2010-11

T0: 2010-11

T1: 19 May 2014

Drishti Sl no. 150824   MWS : 4C3E3h2c

Horticulture

T0: 2010-11

T1: 19 May 2014

Drishti Sl no. 441520   MWS :4C3E3h2a

Loose boulder structure

Natural Color Composite — 2010-11 to 2018-19

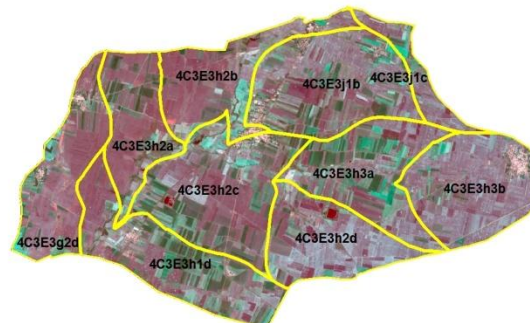Natural Color Composite- 2010-11
Source:Fusion data,NRSC

Natural Color Composite- 04th October 2015
Source:NCC and Sentinel,NRSC

Natural Color Composite- 13th March 2016
Source:NCC,NRSC
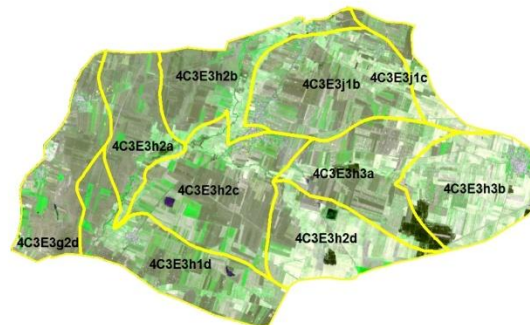
Natural Color Composite- 01st April 2017
Source:NCC,NRSC

Natural Color Composite- 01st March 2018
Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019
Source:Sentinel,NRSC

MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover form 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.

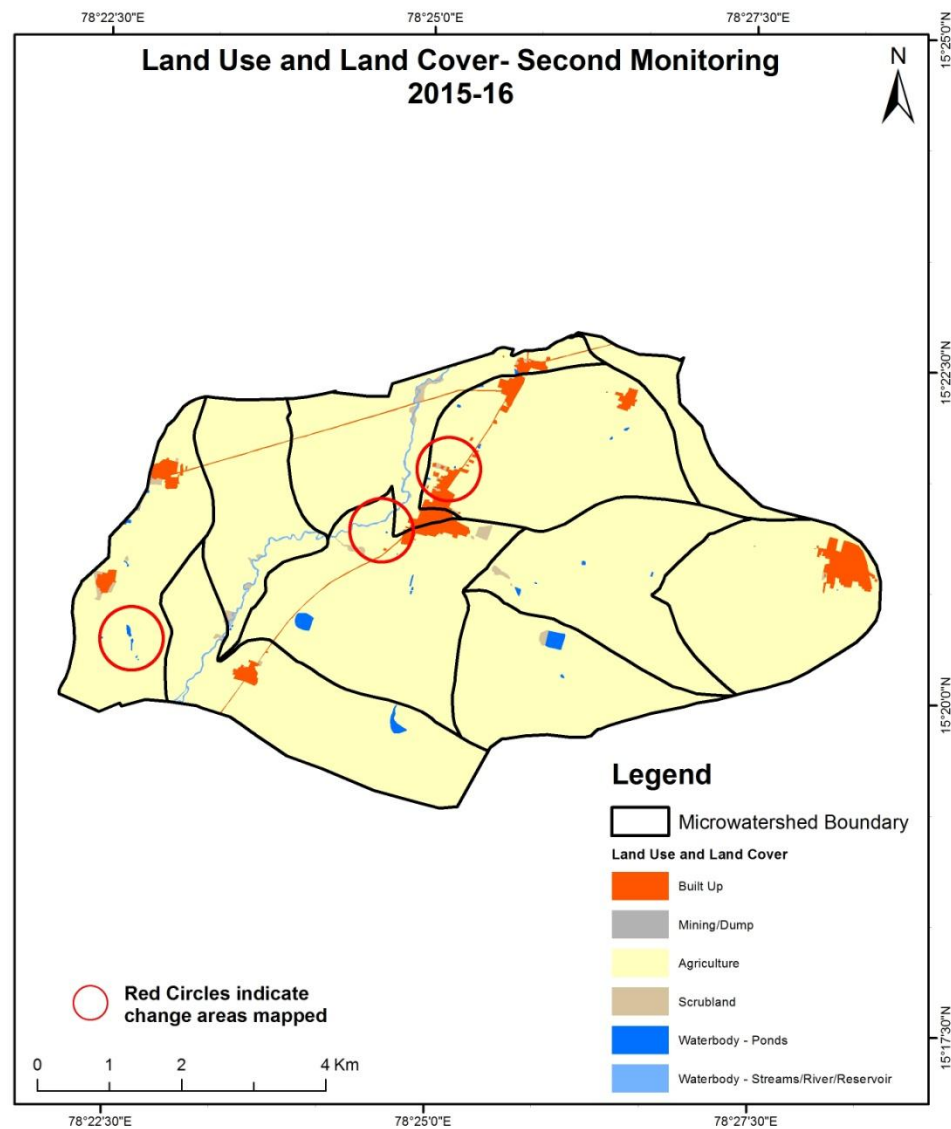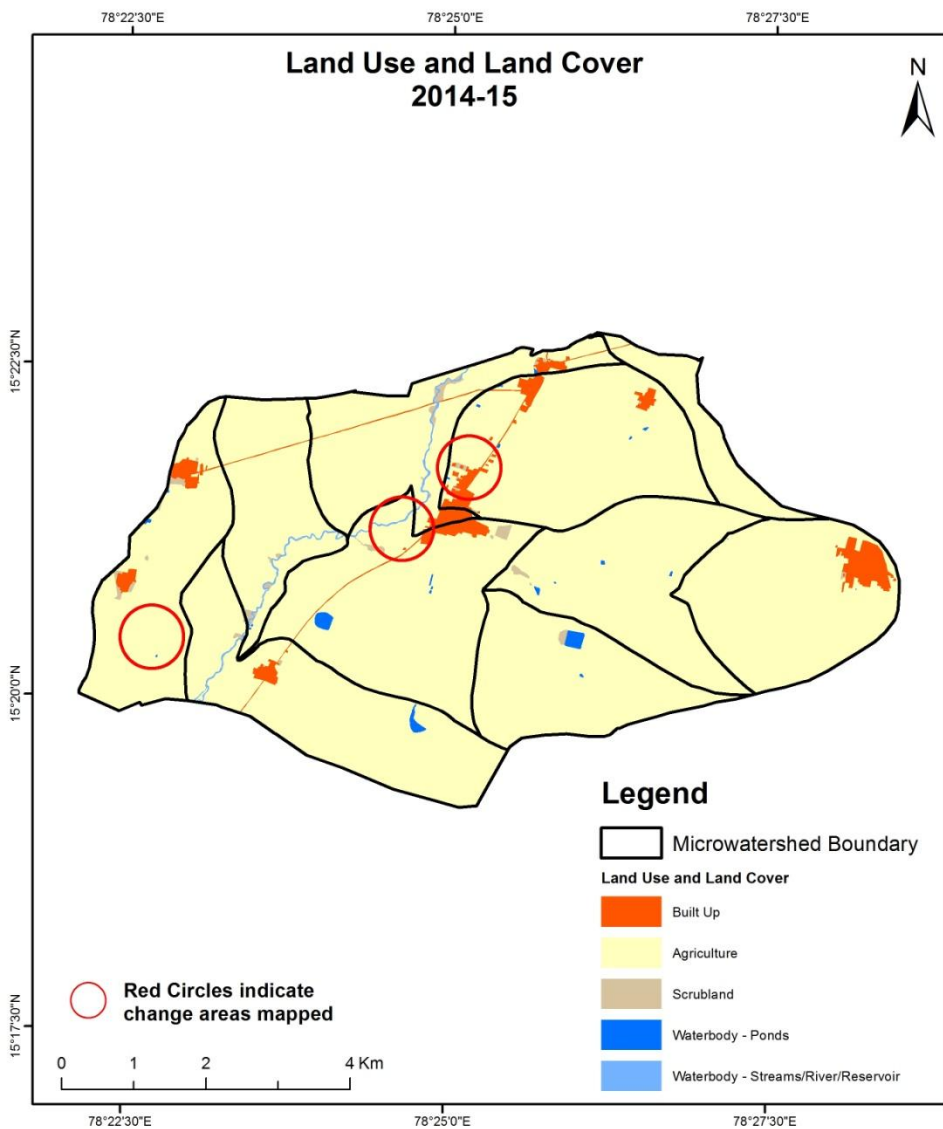- In matrix table column represents the T0 (2010-11) and row represents the T5 (2018-19)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)
Scale: 1:10000
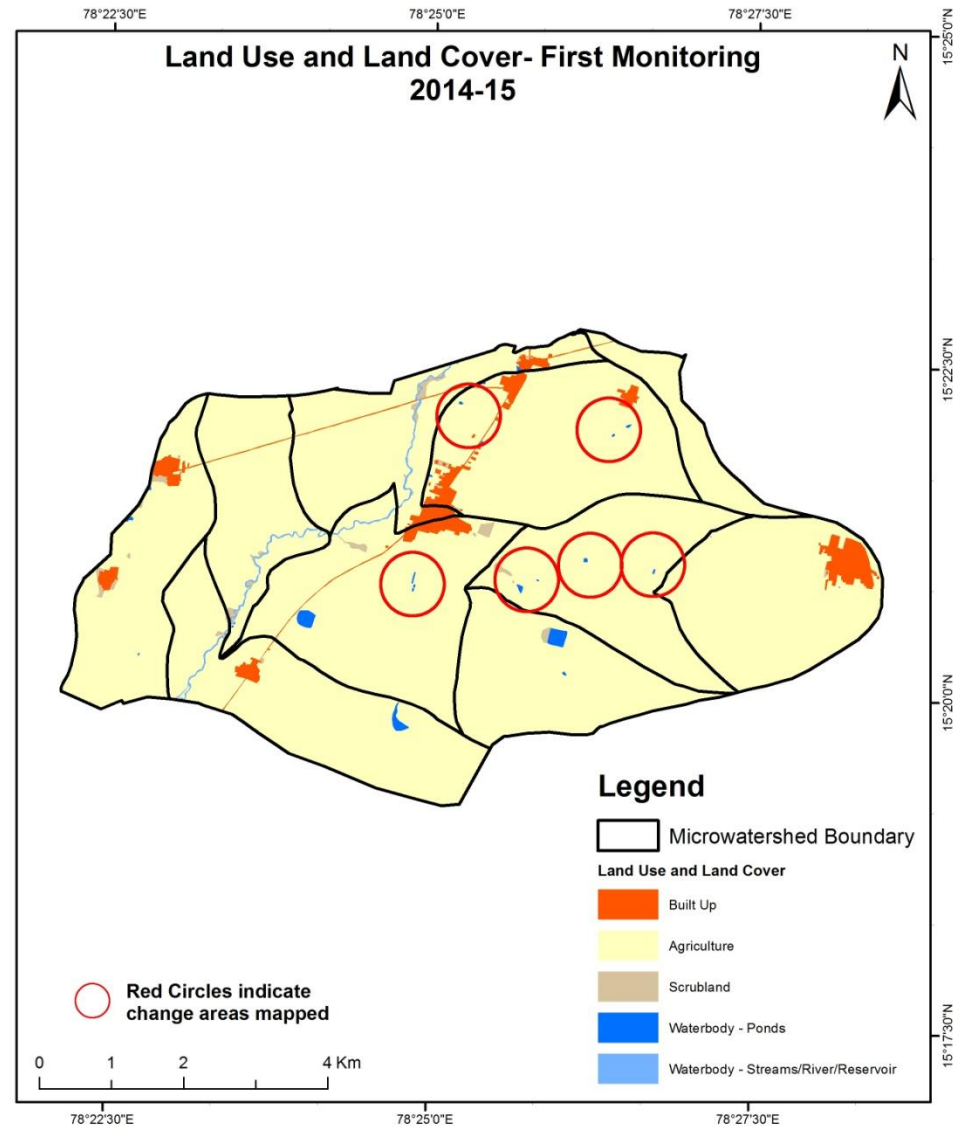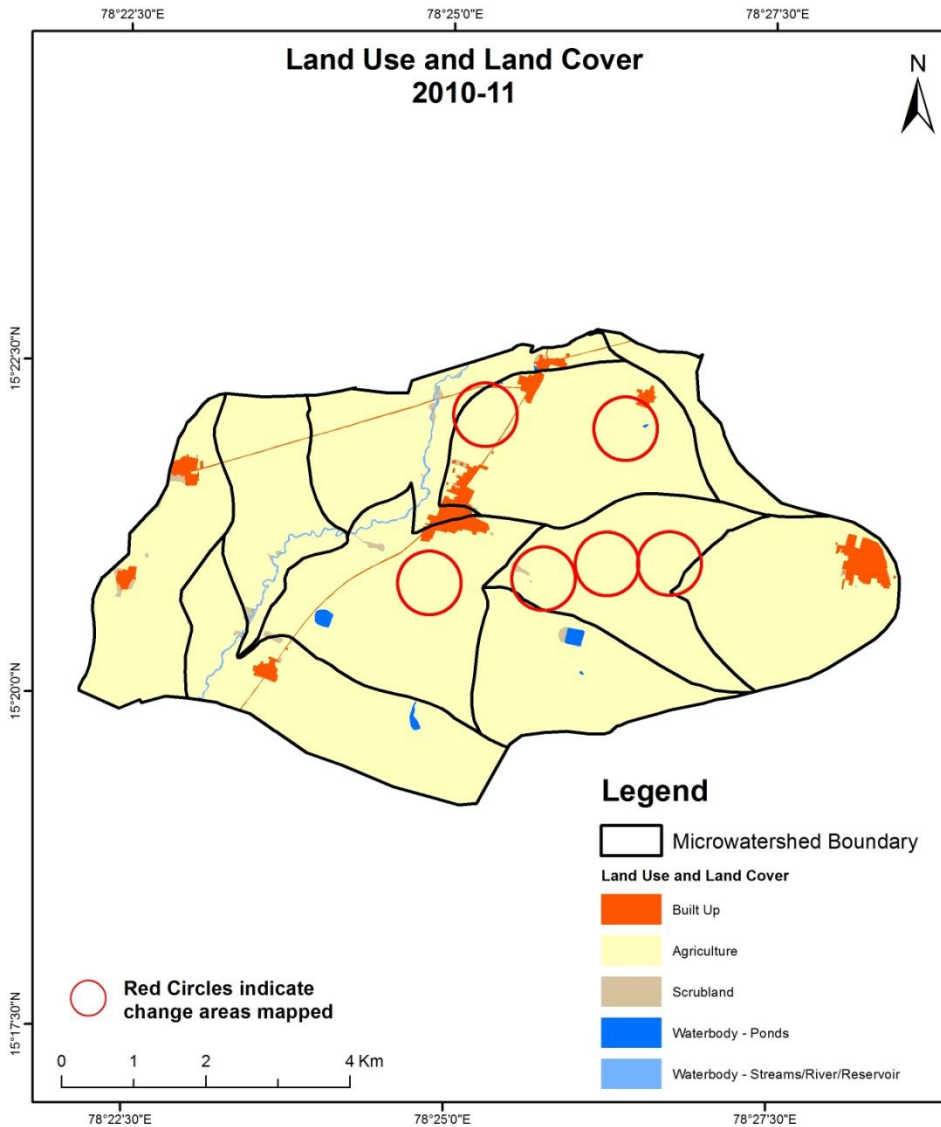
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)
Scale: 1:10000

Land Use and Land Cover
2014-15

Land Use and Land Cover- Second Monitoring
2015-16

Legend

Microwatershed Boundary

Land Use and Land Cover

Built Up

Agriculture

Scrubland

Waterbody - Ponds

Waterbody - Streams/River/Reservoir

Red Circles indicate change areas mapped

Legend

Microwatershed Boundary

Land Use and Land Cover

Built Up

Mining/Dump

Agriculture

Scrubland

Waterbody - Ponds

Waterbody - Streams/River/Reservoir

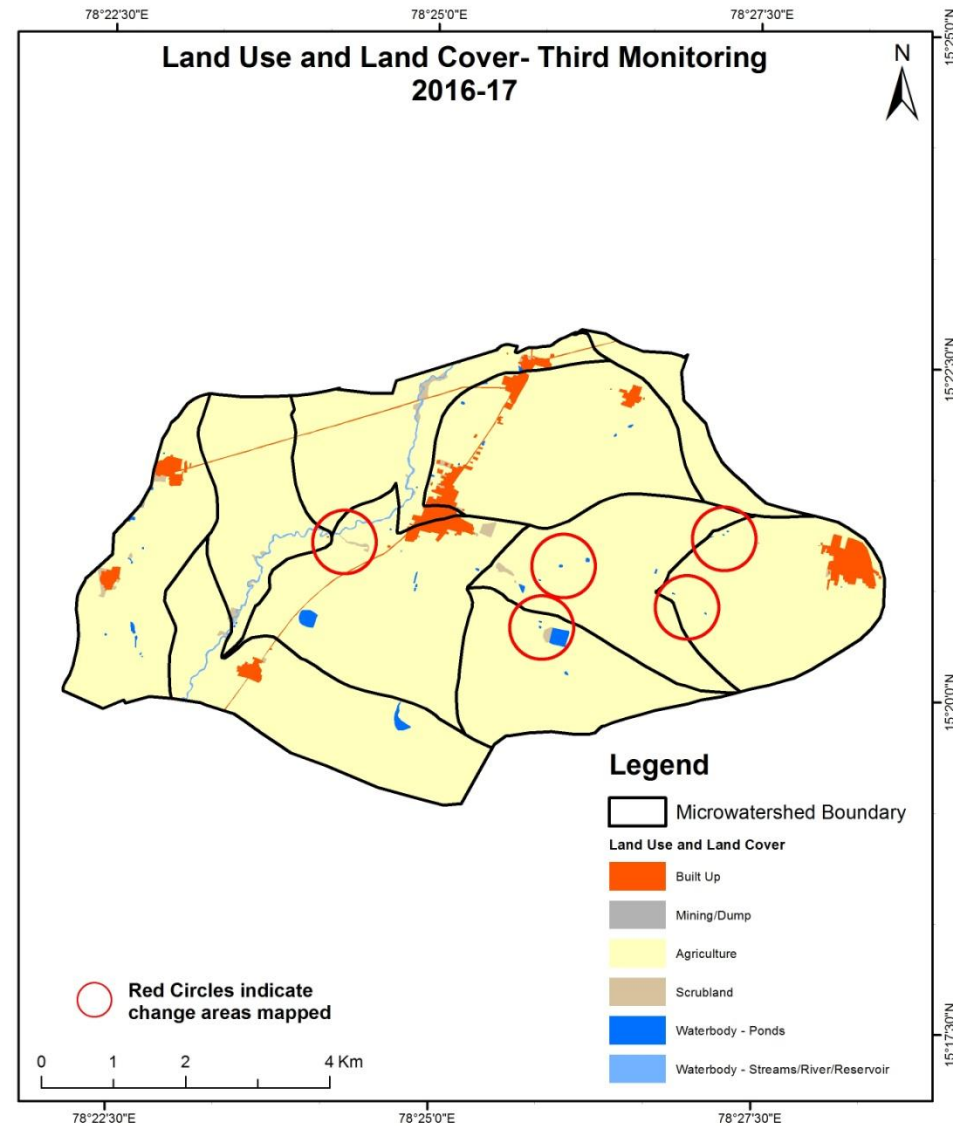Red Circles indicate change areas mapped

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

Scale: 1:10000

Land Use and Land Cover
2015-16

Land Use and Land Cover- Third Monitoring
2016-17

Legend

Microwatershed Boundary

Land Use and Land Cover

Built Up
Mining/Dump
Agriculture
Scrubland
Waterbody - Ponds
Waterbody - Streams/River/Reservoir
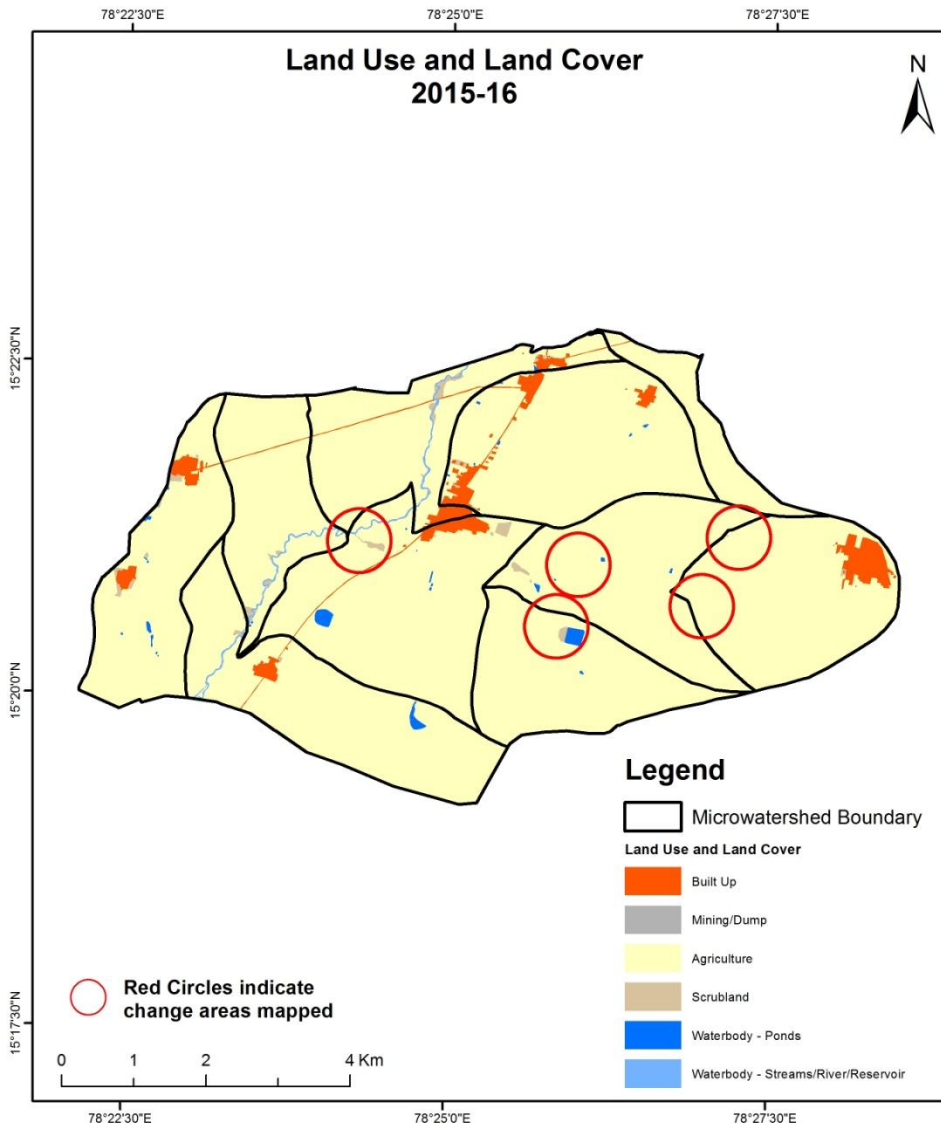
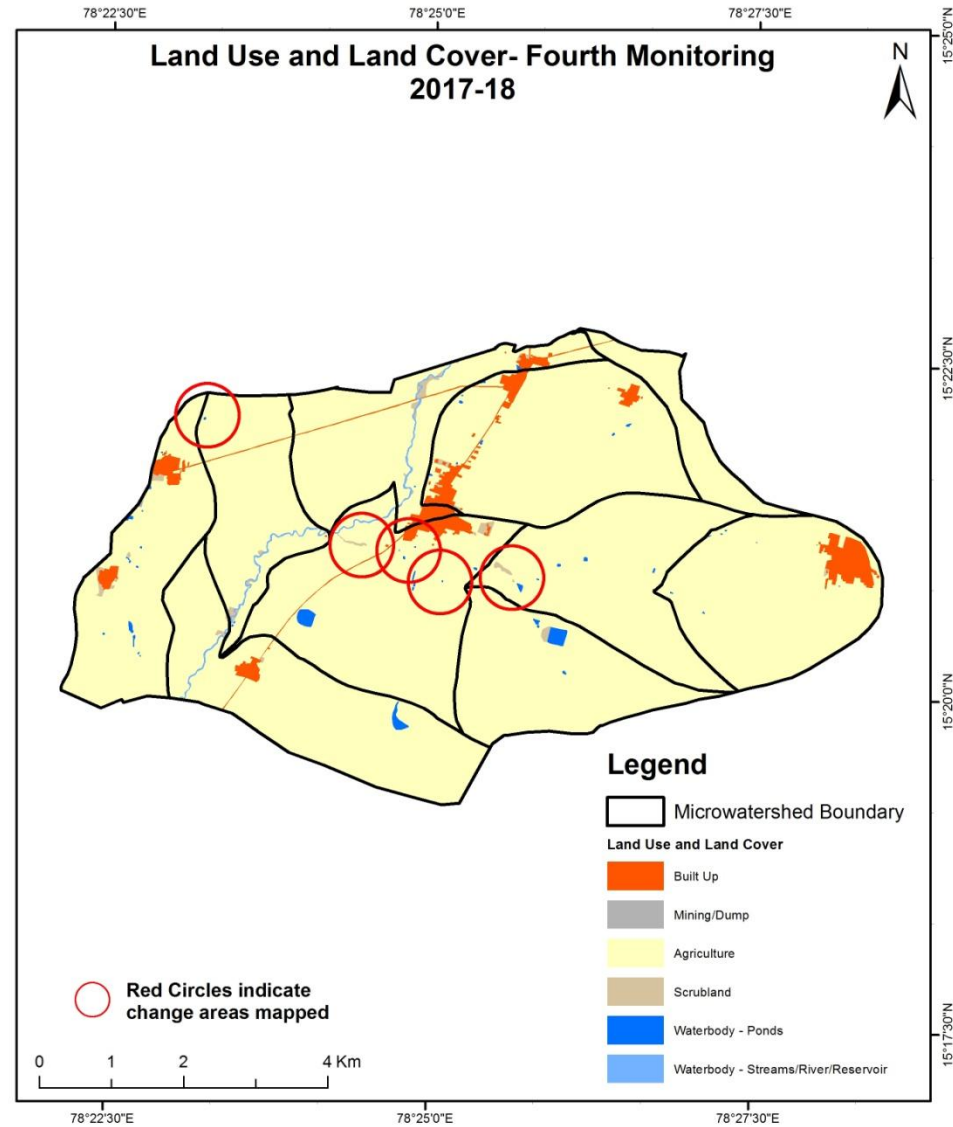Red Circles indicate change areas mapped

0 1 2 4 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)
Scale: 1:10000

Land Use and Land Cover
2016-17

Land Use and Land Cover- Fourth Monitoring
2017-18

Legend

Microwatershed Boundary

Land Use and Land Cover

Built Up
Mining/Dump
Agriculture
Scrubland
Waterbody - Ponds
Waterbody - Streams/River/Reservoir
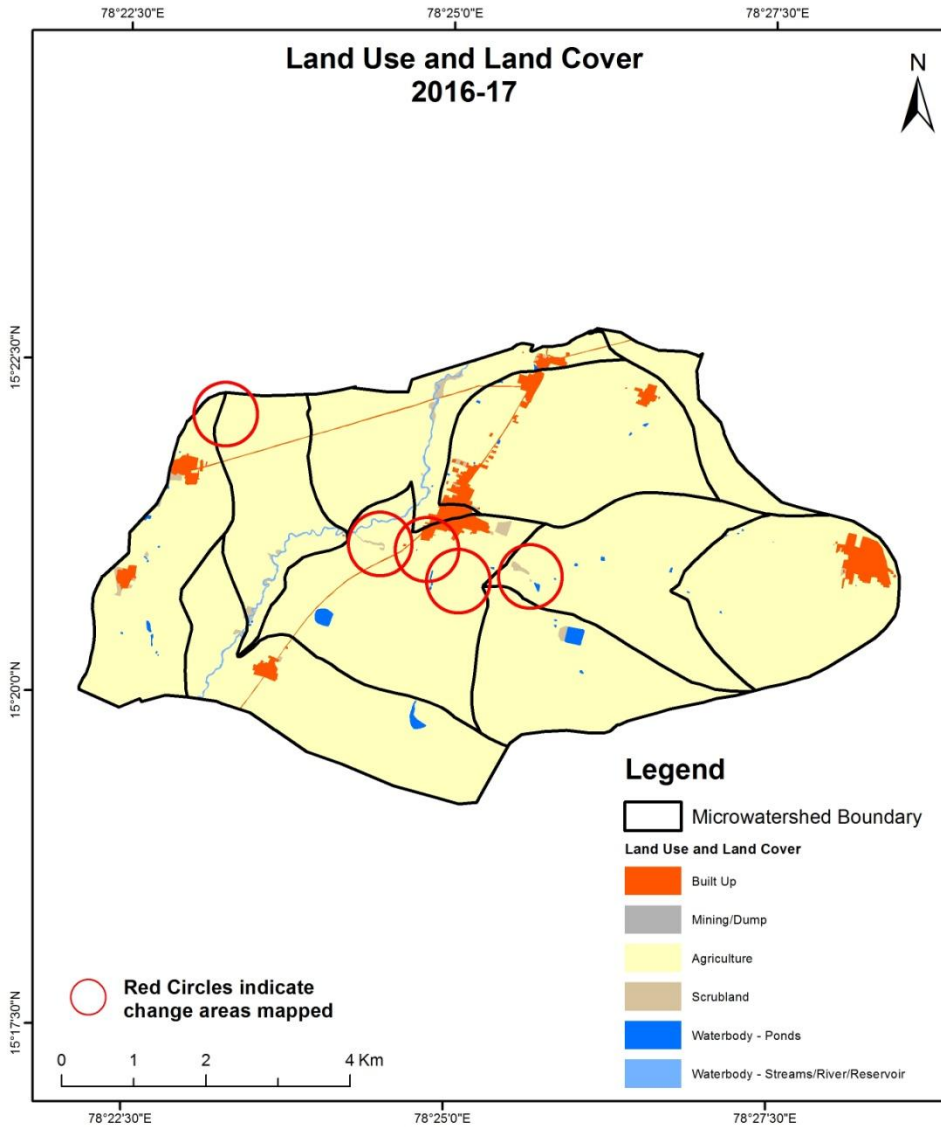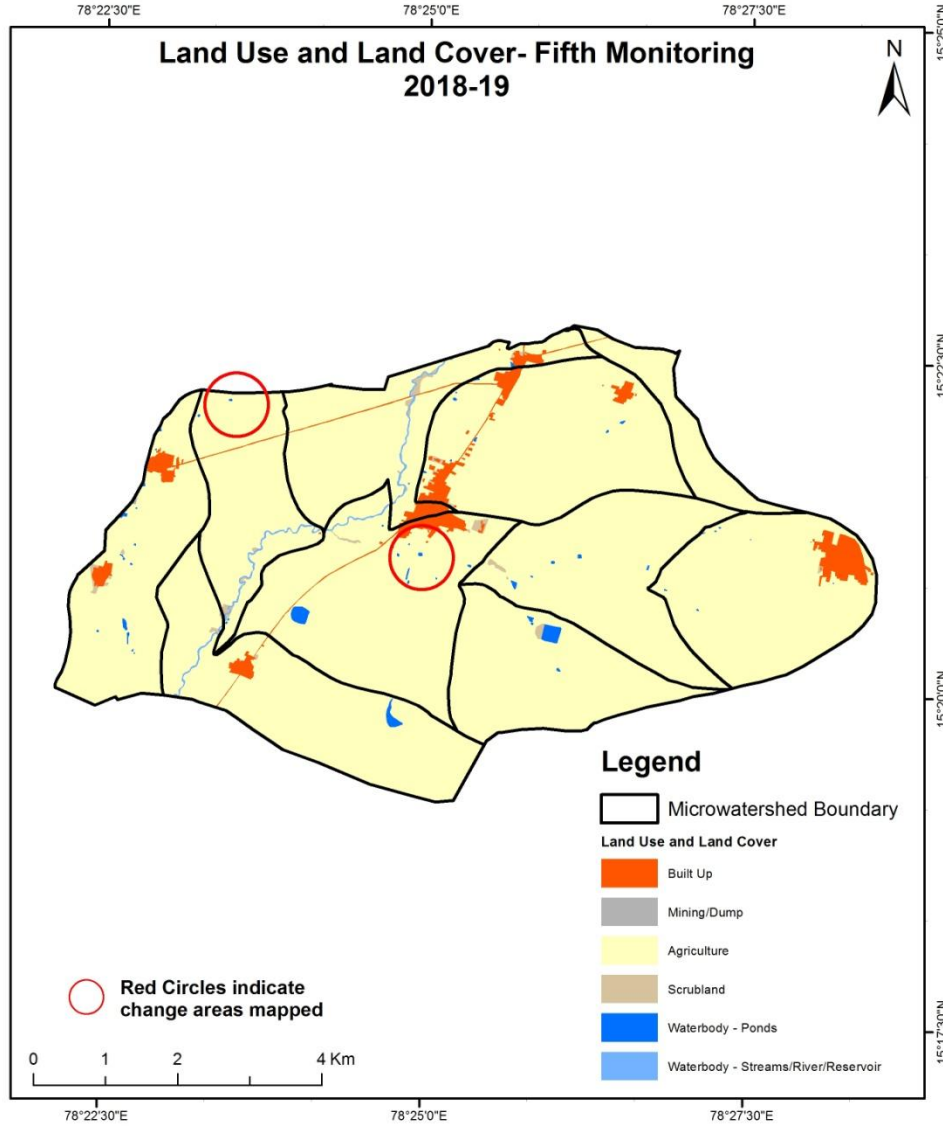
Red Circles indicate change areas mapped

0 1 2 4 Km
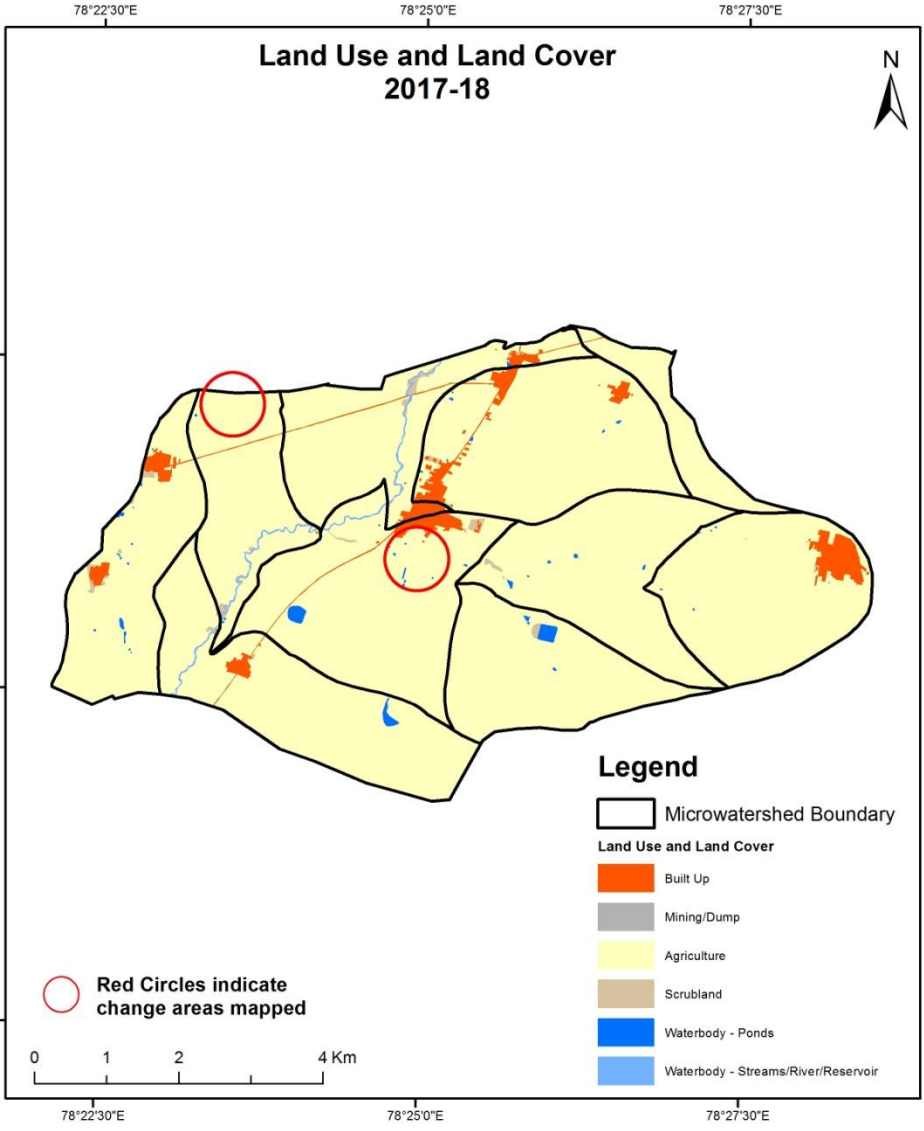
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
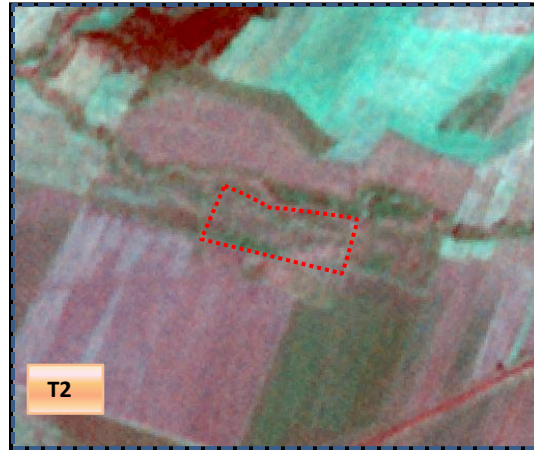## Scale: 1:10000

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

Scrub to Agriculture

T2: 2015-16 (78°24'25.088"E 15°21'6.947"N)
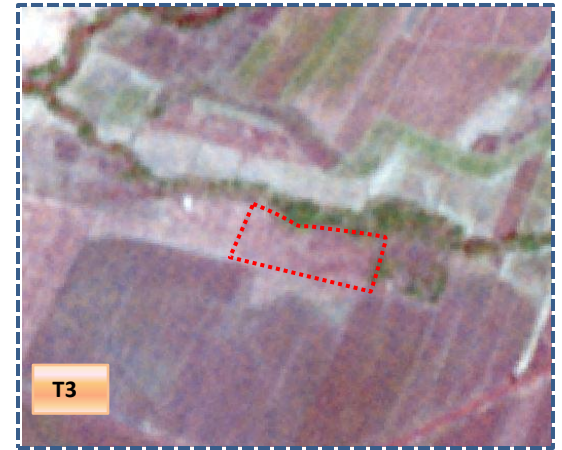
T3: 01 April 2017

Agriculture to Water body

T2: 2015-16 (78°27'16.585"E 15°21'15.951"N)

T3: 01 April 2017

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

Agriculture to Water body

T0

T1

T0: 2010-11

T1: 30 November 2014
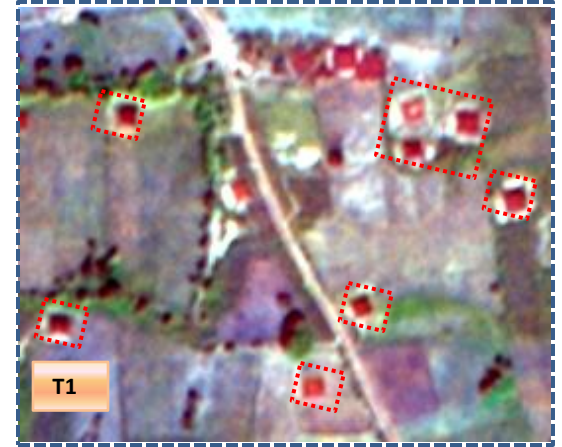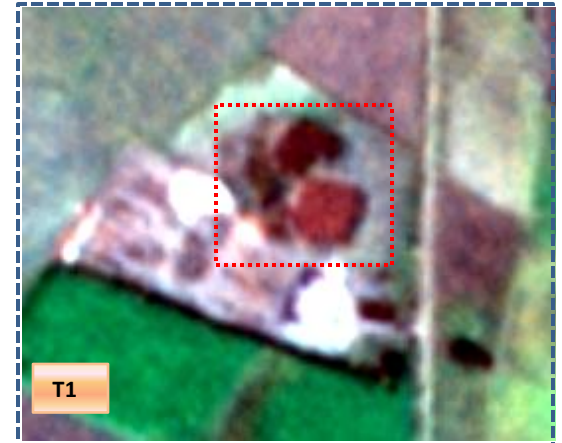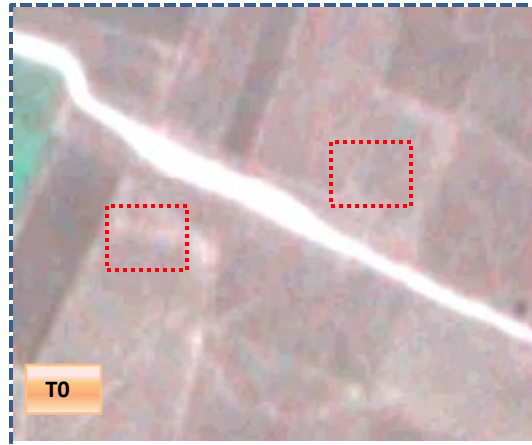
Scrub to water body
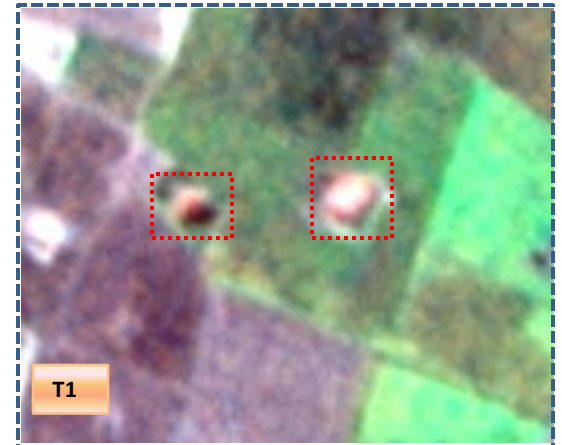

T0

T1

T0: 2010-11

T1: 30 November 2014

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

Scrub to Water body

T0

T1

T0: 2010-11

T1: 30 November 2014

Agriculture to Plantation

T0

T1

T0: 2010-11

T1: 30 November 2014

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

Land cover	Monitoring period (T1)									Units in Hectares	
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	136.17										**136.17**
Mining/dump											
Agriculture	4.35		4507.42					5.92	0.42	4.09	**4522.21**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.10		2.33					22.49			**24.91**
Waterbody-Streams/River									18.57		**18.57**
Waterbody – Ponds										14.26	**14.26**
Grand Total	**140.61**		**4509.75**					**28.41**	**18.99**	**18.35**	**4716.11**

- 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 14 ha of the agriculture area has decreased and it is converted into Built-up, scrubland and water body in T1.

- In T1 02 ha of the agriculture area has increased from scrubland area 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
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	140.61										**140.61**
Mining/dump											
Agriculture	0.33		4507.77							1.64	**4509.75**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub		0.79	0.57					27.05			**28.41**
Waterbody-Streams/River									18.99		**18.99**
Waterbody – Ponds										18.35	**18.35**
Grand Total	**140.95**	**0.79**	**4508.34**					**27.05**	**18.99**	**19.99**	**4716.11**

- 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 1.97 ha of the agriculture area has decreased and it is converted into built-up and water body in T2.

- In T2 0.57 ha of the agriculture area has been increased from scrubland area 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

T2	Monitoring period (T3) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	140.95										**140.95**
Mining/dump		0.79									**0.79**
Agriculture	2.52		4504.64							1.19	**4508.34**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub			1.61					25.44			**27.05**
Waterbody-Streams/River			0.42						18.57		**18.99**
Waterbody – Ponds										19.99	**19.99**
Grand Total	**143.46**	**0.79**	**4506.68**					**25.44**	**18.57**	**21.18**	**4716.11**

Units in Hectares

• 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 3.7 ha of the agriculture area has decreased and it is converted into built-up and water body in T3.

• In T3 2.04 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-2016-17 to 2017-18

Land cover	Monitoring period (T4)										Units in Hectares
T3	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	143.46										**143.46**
Mining/dump		0.79									**0.79**
Agriculture	1.06		4504.76						0.86		**4506.68**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.65		1.63					23.16			**25.44**
Waterbody-Streams/River										18.57	**18.57**
Waterbody – Ponds									21.18		**21.18**
Grand Total	**145.17**	**0.79**	**4506.39**					**23.16**	**22.04**	**18.57**	**4716.11**

- 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 1.06 ha of the agriculture area has decreased and it is converted into Built-up and water body in T4.

- In T4 1.63 ha of the agriculture area has increased from 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-2017-18 to 2018-19

Land cover T4	Monitoring period (T5) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Units in Hectares Grand Total
Built up	145.17										145.17
Mining/dump		0.79									0.79
Agriculture	0.24		4505.62							0.52	4506.39
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.36		1.90					20.91			23.16
Waterbody-Streams/River									18.57		18.57
Waterbody – Ponds										22.04	22.04
Grand Total	145.77	0.79	4507.52					20.91	18.57	22.56	4716.11

- 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 0.7 ha of the agriculture area has decreased and it is converted into Built-up and water body in T5.

- In T5 1.90 ha of the agriculture area has increased from 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 increase of 8.3 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 1.13 Hectares From T4 -T5 and there is a decrease of 12, 1.4, 1.6 and 0.2 hectares from T0 to T1, T1-T2, T2-T3 and T3 to T4 respectively and overall decrease of 14 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

5. There is a decrease of 4 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.