MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -32/2011-12
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

- **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-32/2011-12, Kurnool District of   Andhra Pradesh.   The total geographical area of the project is 4,484 ha.   It comprises of 10 micro watersheds.

- In the project area 564 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.

- Major percentage i.e. 85% is covered by the agriculture, 9.5 % is covered by scrubland and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-32/2011-12
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Aspari Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 4,484 ha. It comprises of 10 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

| Andhra Pradesh | Kurnool District | Kurnool – IWMP 32/2011-12 project |
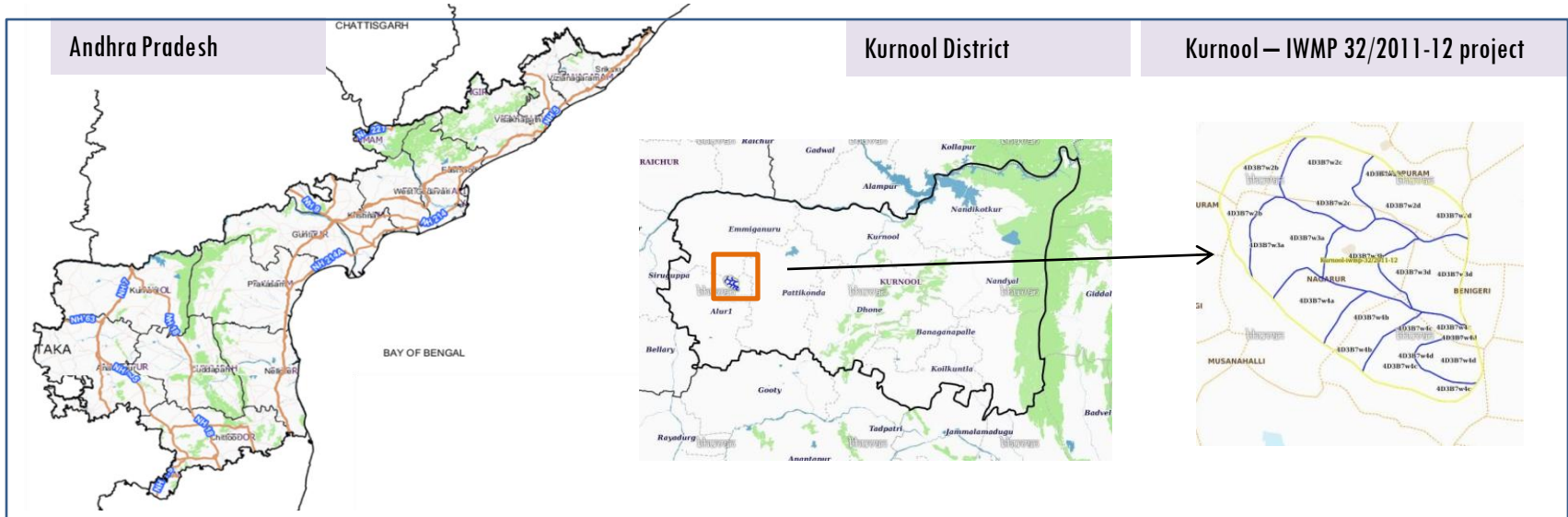
- The climate is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).

- 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-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			19-Feb-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	564
4	Detailed Project Report		

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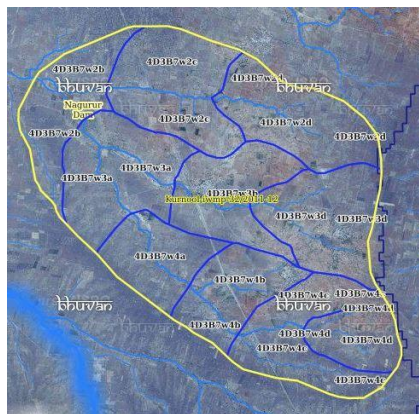
Legend

 Drainage (1:10000 Scale)
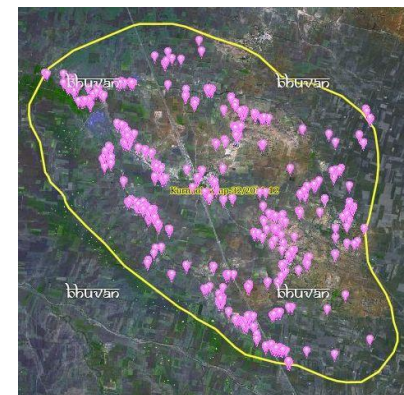
 MWS Boundary

 Project Boundary

Natural Color Composite overlaid with Drishti Points

Drishti Upload Status

Classification of the Activities
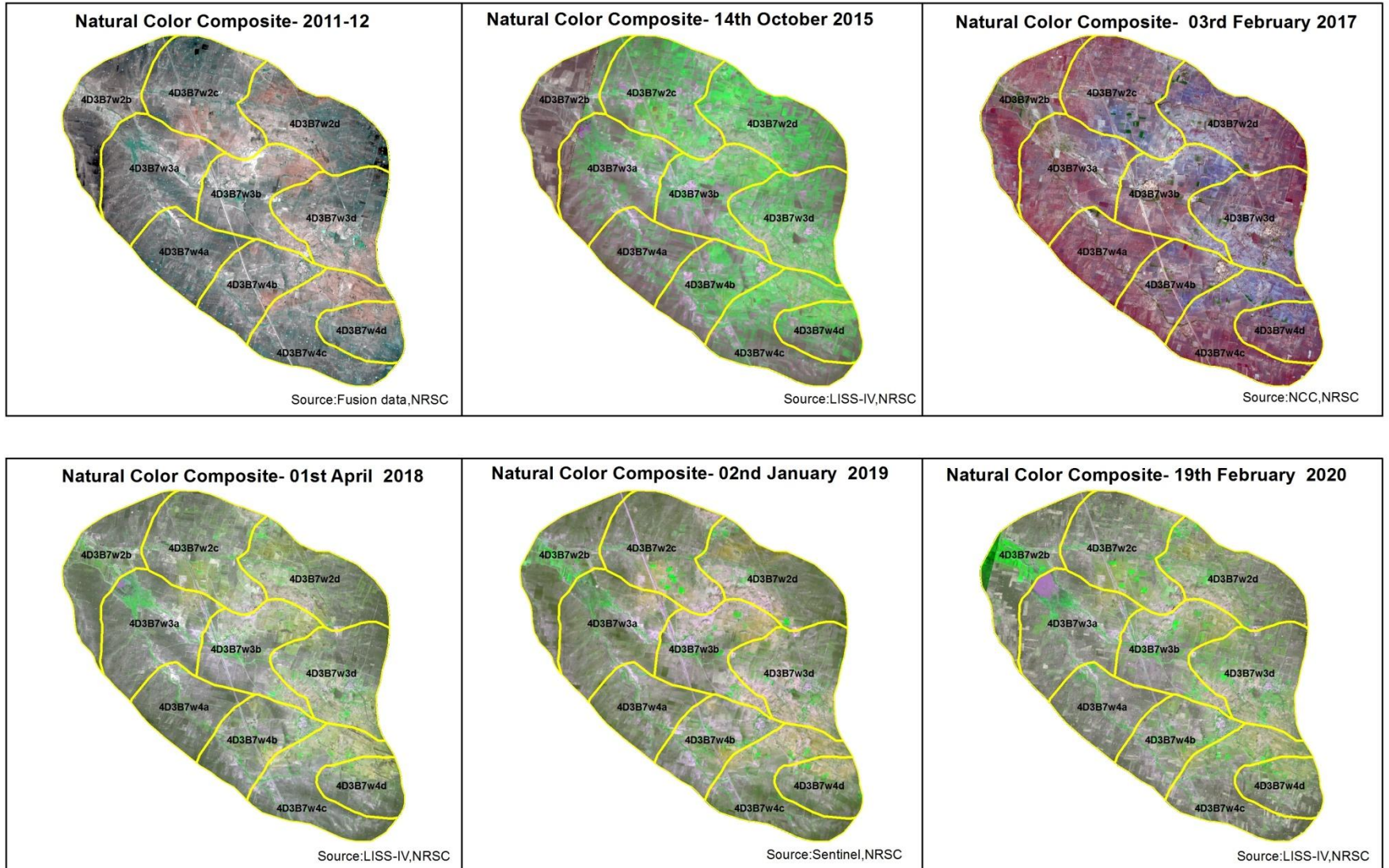
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	11	11
2	Agriculture/Horticulture	4	4
3	Blockplanting	0	0
4	Bund planting	0	0
5	Drainage Treatment	0	0
6	Farm ponds/Dug out pit	117	117
7	Check dams (Civil work)	1	1
8	Checks & plugins	28	23
9	Om (Other measurement)	0	0
10	LM (Livelihood 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	7	7
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	431	401
	TOTAL	**599**	**564**

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-2011-12 to 2019-20

Natural Color Composite- 2011-12

Source:Fusion data,NRSC

Natural Color Composite- 14th October 2015

Source:LISS-IV,NRSC

Natural Color Composite- 03rd February 2017

Source:NCC,NRSC

Natural Color Composite- 01st April 2018

Source:LISS-IV,NRSC

Natural Color Composite- 02nd January 2019

Source:Sentinel,NRSC

Natural Color Composite- 19th February 2020

Source:LISS-IV,NRSC

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-32/2011-12

| T1: 26 November 2016 | T2: 14 November 2018 | Drishti Sl no. 129495   MWS :4D3B7w3d |

Farm pond

| T1: 26 November 2016 | T2: 14 November 2018 | Drishti Sl no. 129587   MWS :4D3B7w3d |

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-32/2011-12
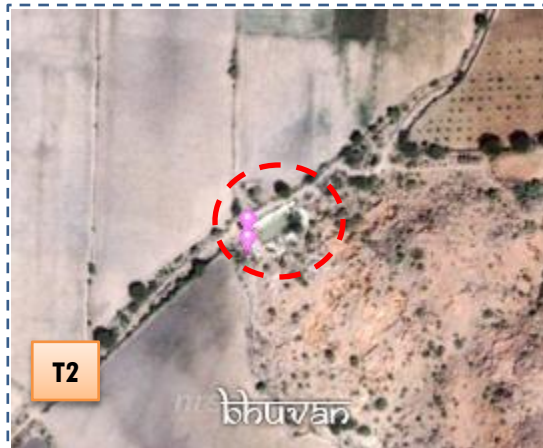

| T1: 2015 | T2: 14 November 2018 | Drishti Sl no. 1940473   MWS : 4D3B7w2c |

Farm pond

| T1: 2015 | T2: 14 November 2018 | Drishti Sl no. 2031427   MWS : 4D3B7w2c |

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-32/2011-12
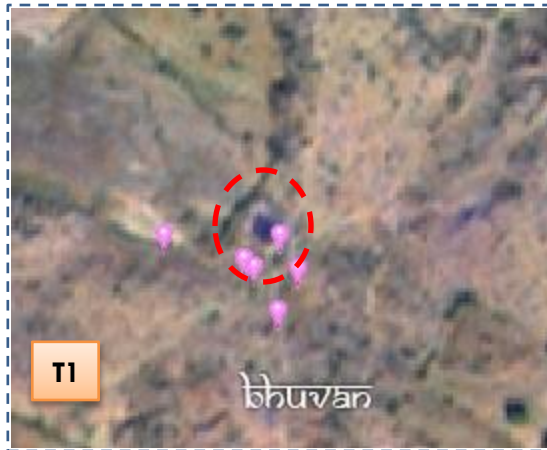

T0 | T0:2010-11

T1 | T1: 14 October 2015

Drishti Sl no. 132781   MWS :4D3B7w3d

Farm pond

T0 | T0:2010-11

T1 | T1: 14 October 2015

Drishti Sl no. 2457772   MWS :4D3B7w3d

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-32/2011-12
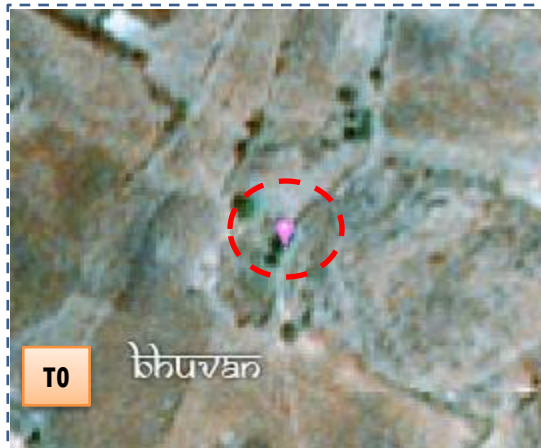

| T0: 2010-11 | T1: 14 October 2015 | Drishti Sl no. 2501959   MWS : 4D3B7w3d |

Farm pond

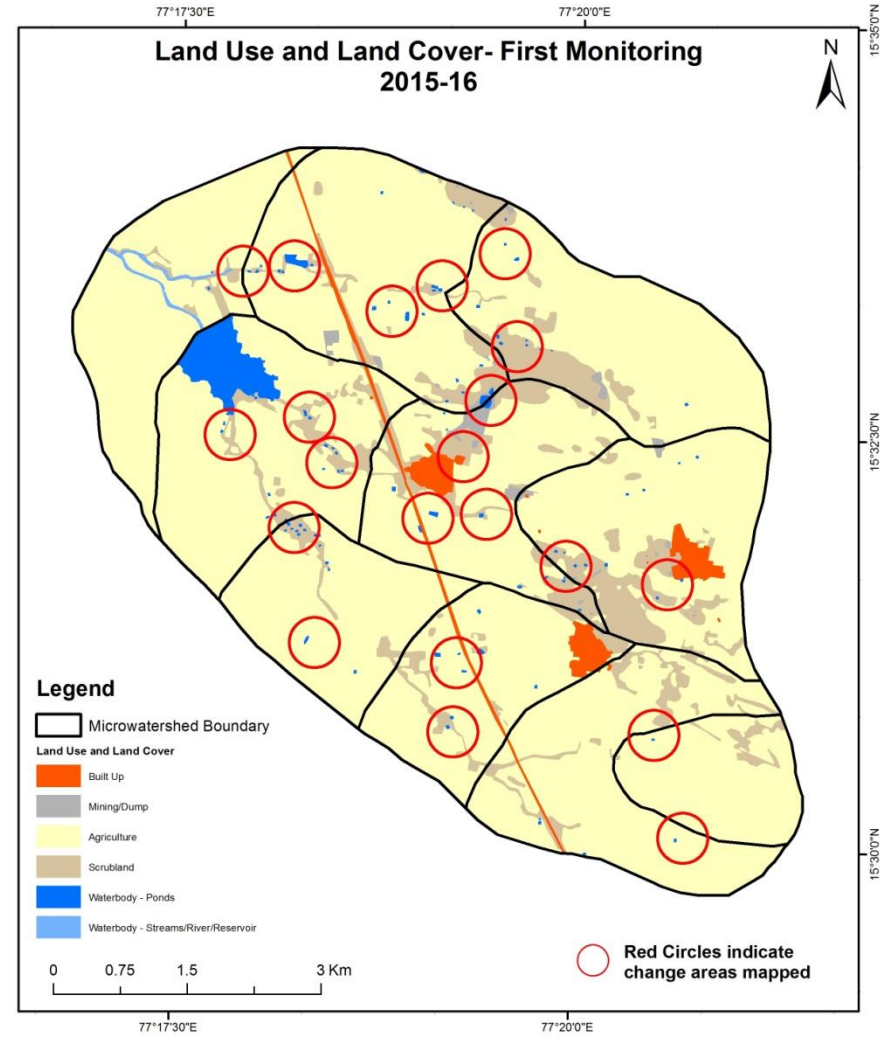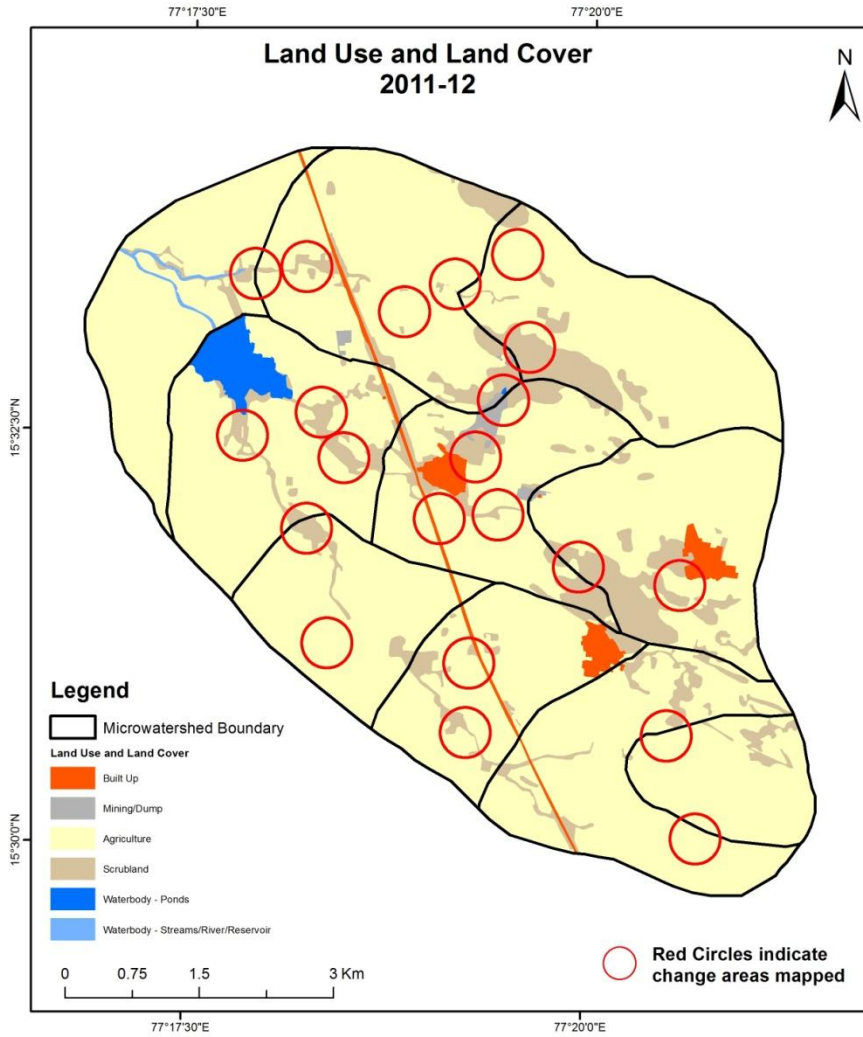| T0: 2010-11 | T1: 14 October 2015 | Drishti Sl no. 2457781-   MWS : 4D3B7w3d |

Farm pond

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.

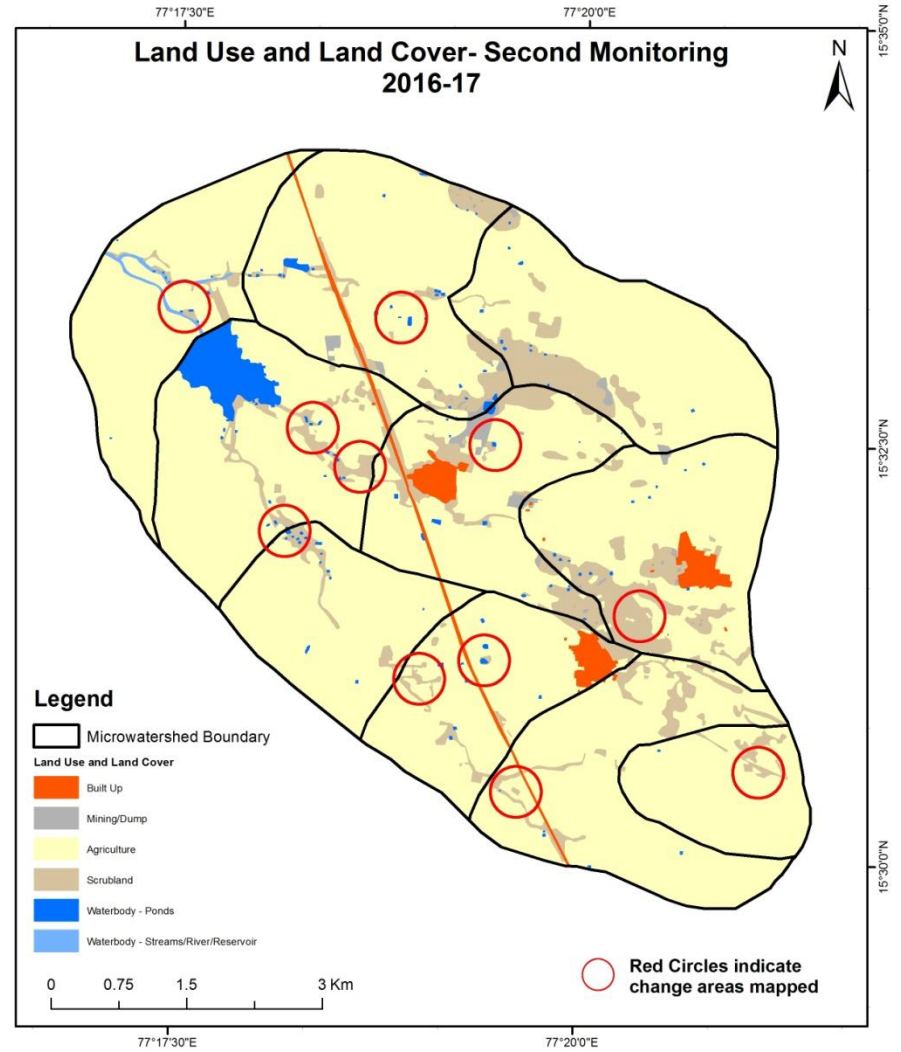- In matrix table column represents the T0 (2011-12) and row represents the T5 (2019-20)
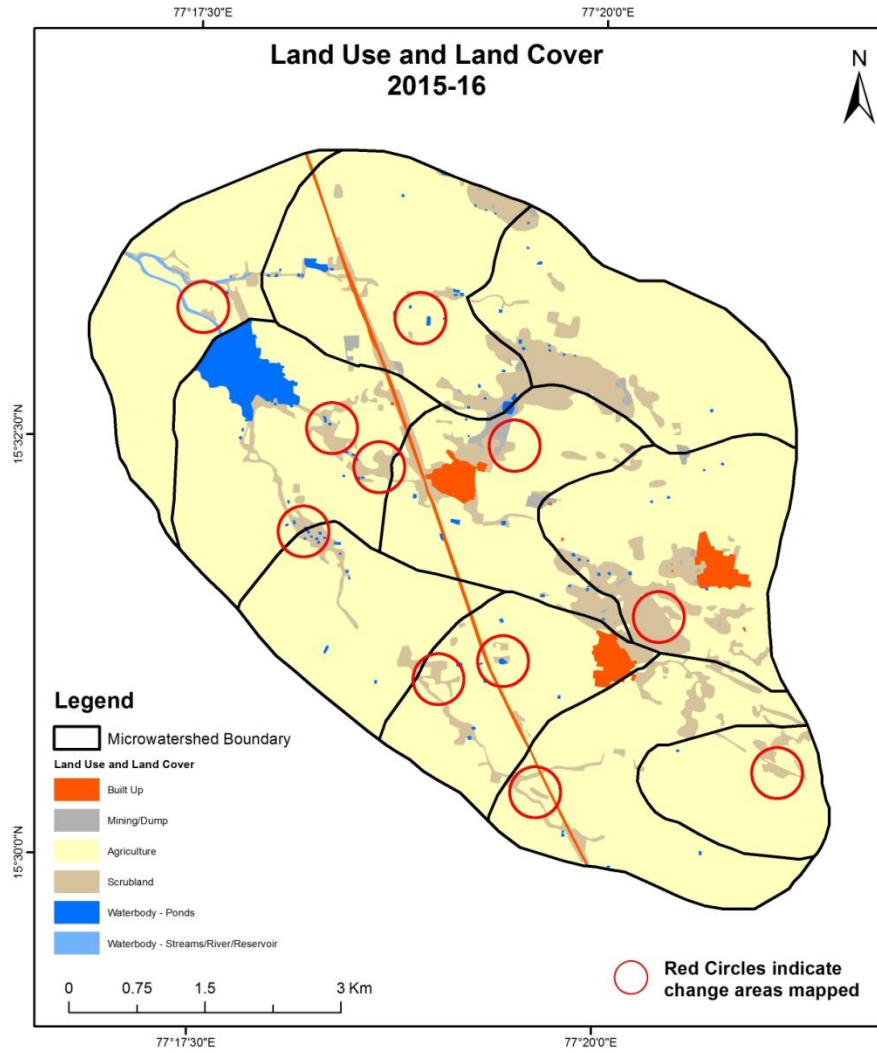
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)
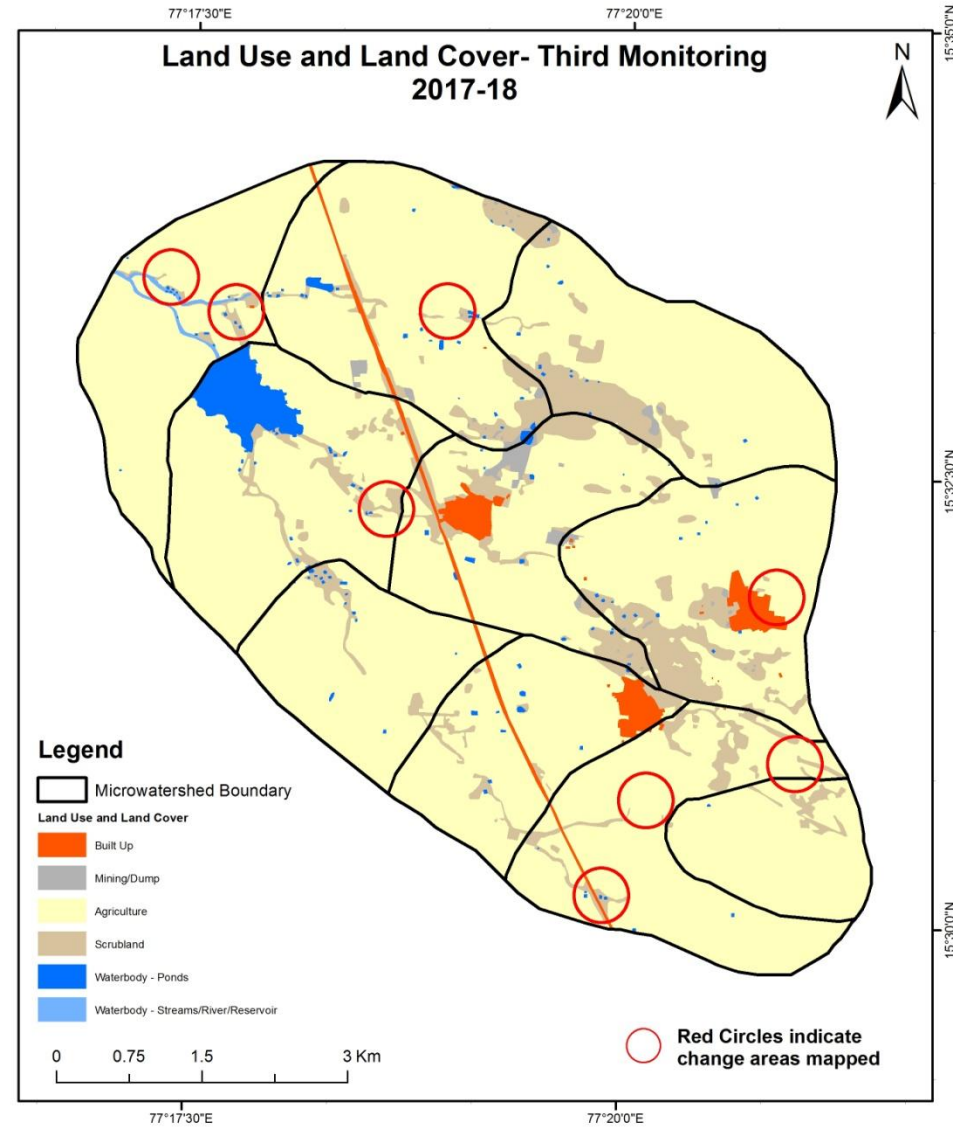## Scale: 1:10000

Land Use and Land Cover 2011-12

Land Use and Land Cover- First Monitoring 2015-16

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

0   0.75   1.5   3 Km

○ 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

N

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- ■ Built Up
- ■ Mining/Dump
- ■ Agriculture
- ■ Scrubland
- ■ Waterbody - Ponds
- ■ Waterbody - Streams/River/Reservoir

0   0.75   1.5   3 Km

◯ **Red Circles indicate change areas mapped**

Land Use and Land Cover- Second Monitoring 2016-17

N

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- ■ Built Up
- ■ Mining/Dump
- ■ Agriculture
- ■ Scrubland
- ■ Waterbody - Ponds
- ■ Waterbody - Streams/River/Reservoir

0   0.75   1.5   3 Km

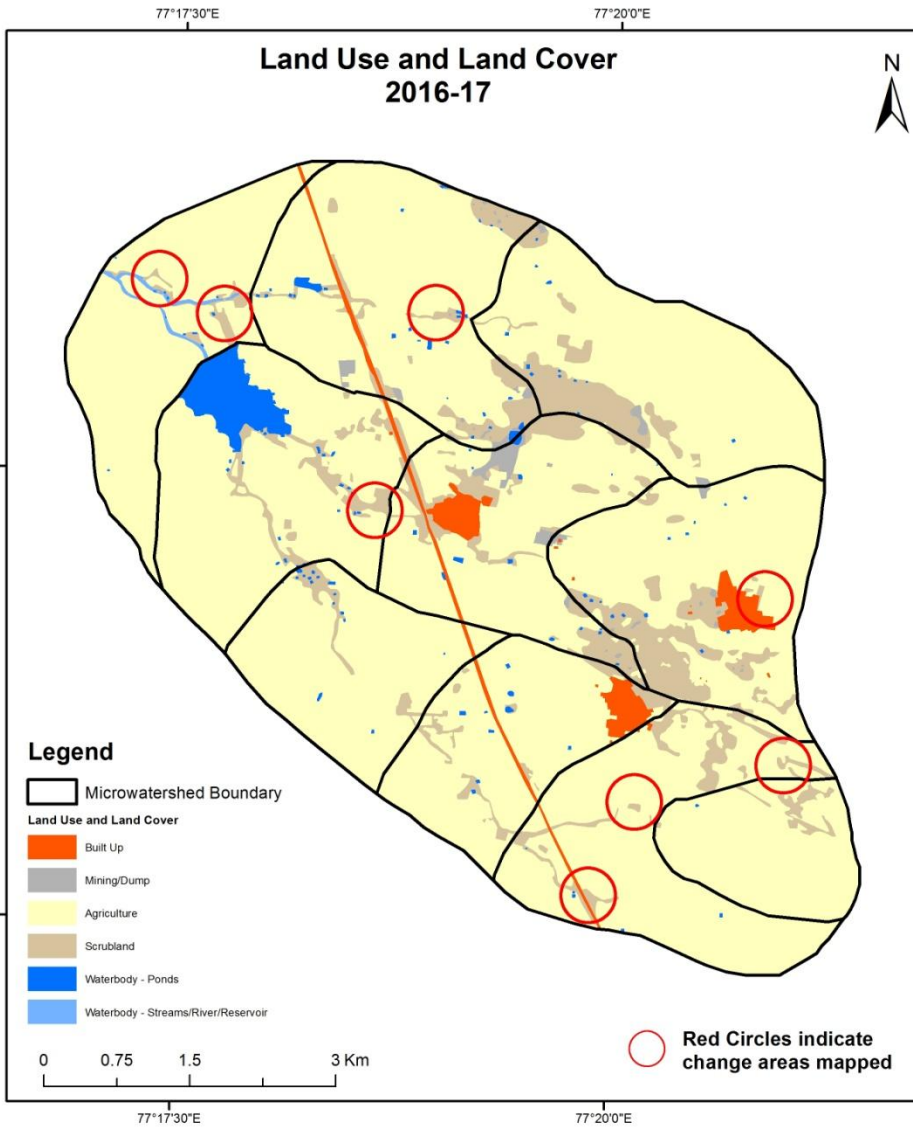◯ **Red Circles indicate change areas mapped**

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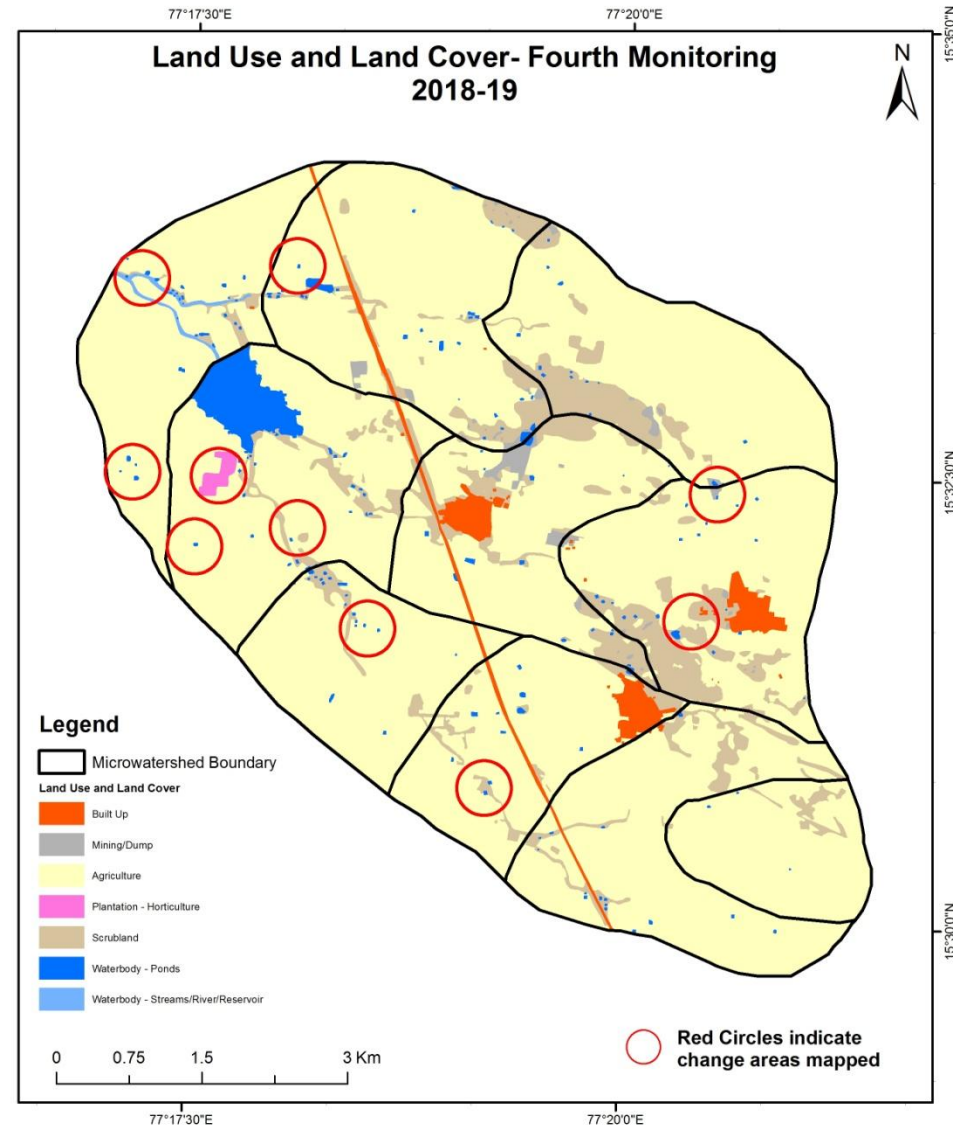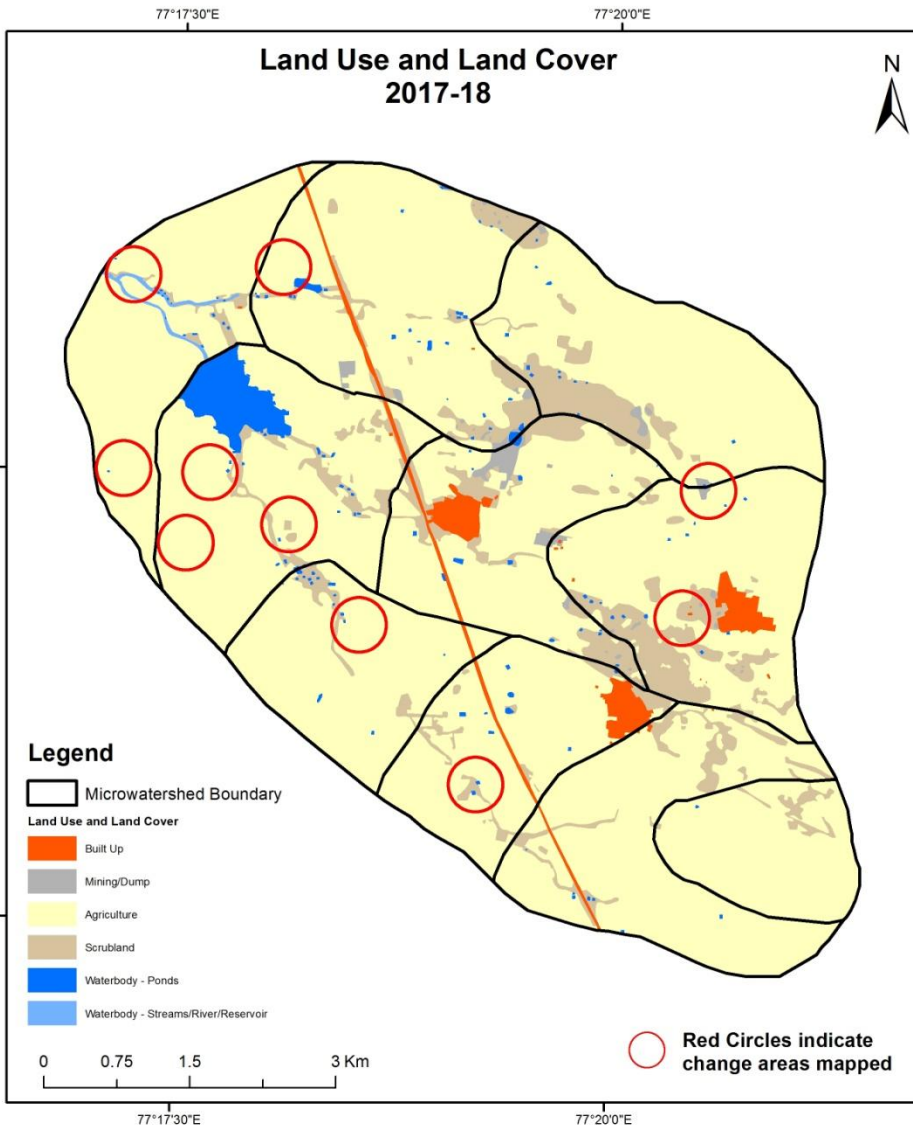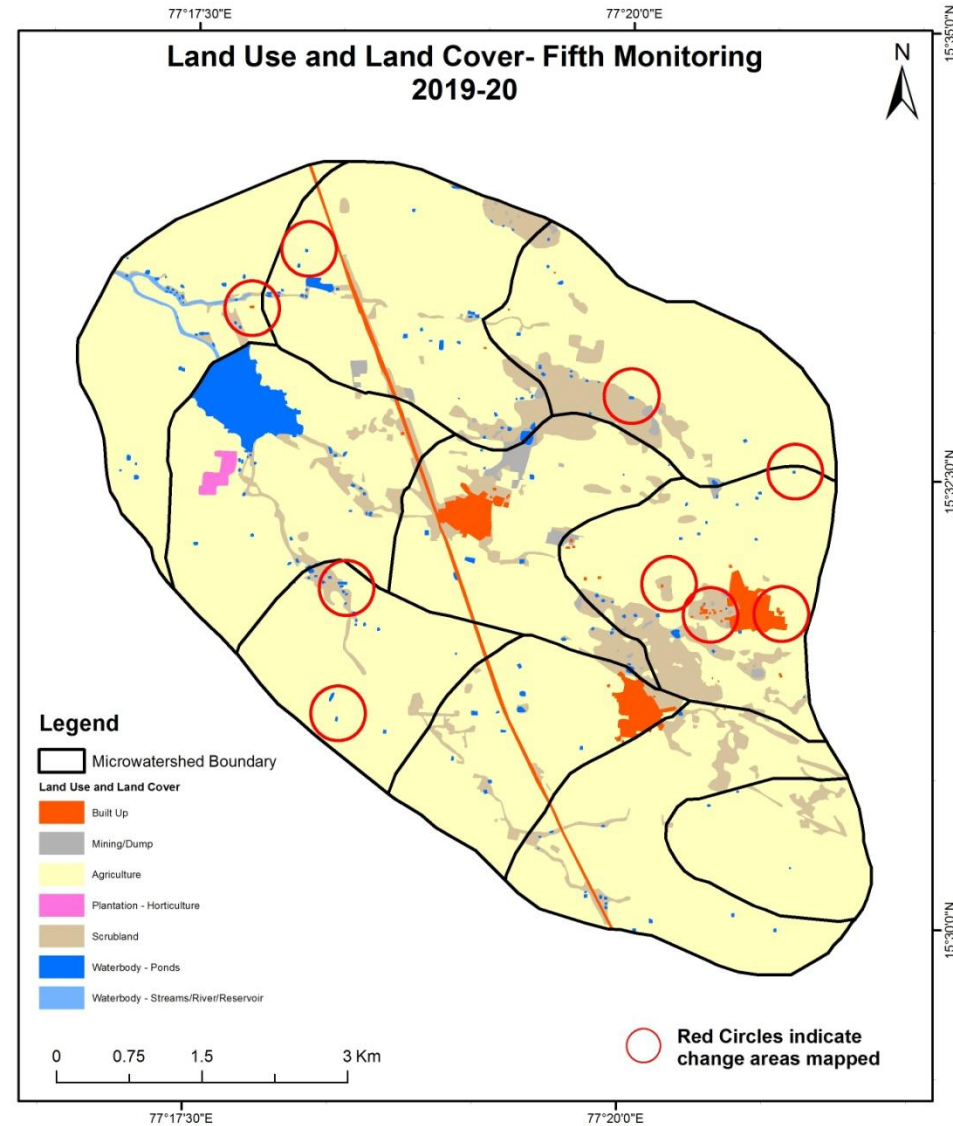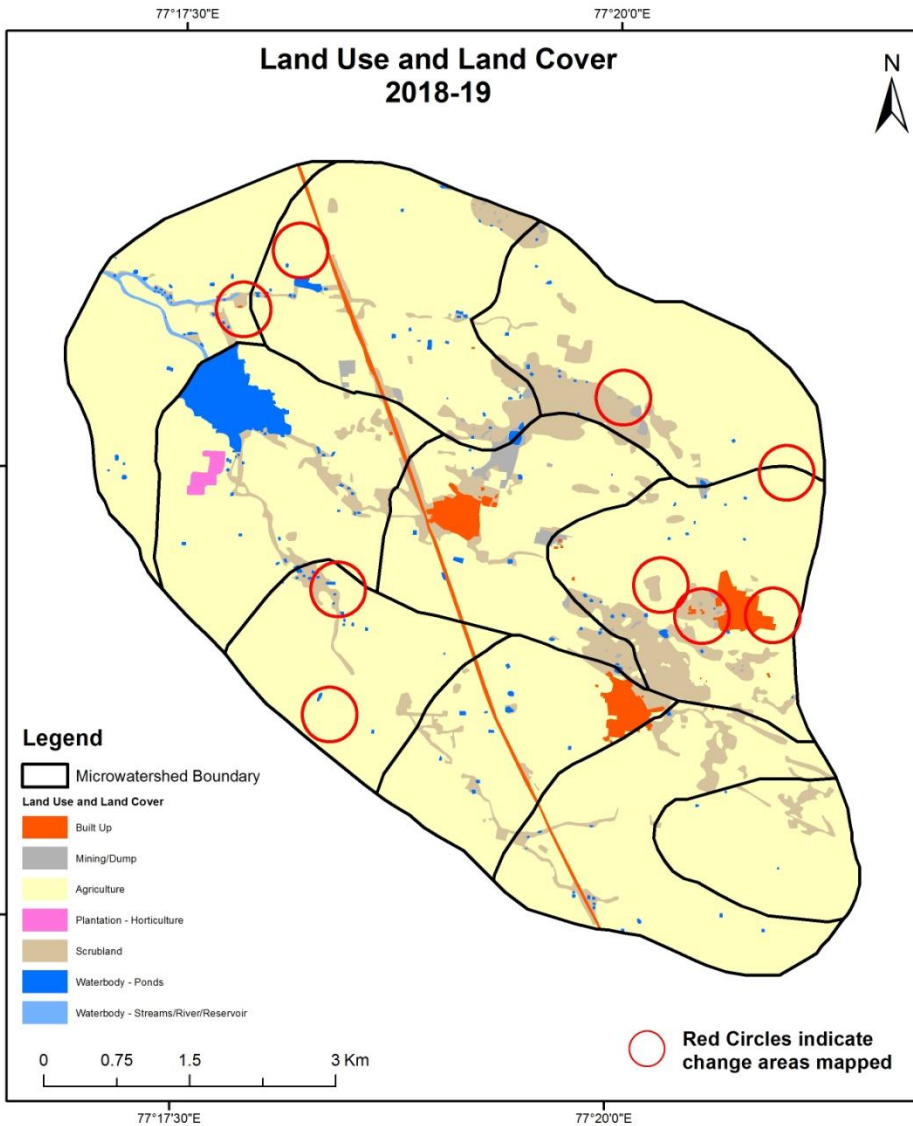## Scale: 1:10000

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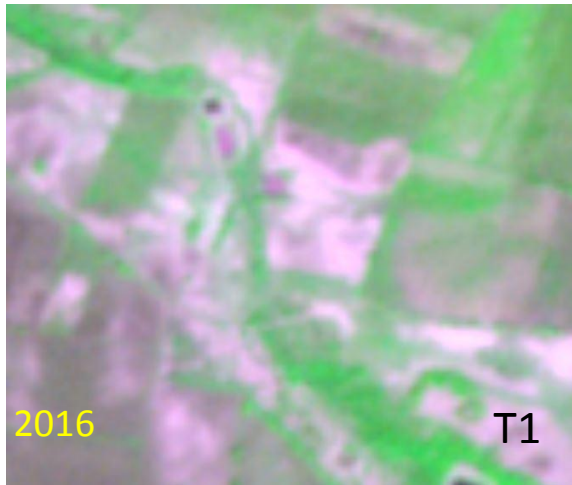## Scale: 1:10000

# 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
2018-19

Land Use and Land Cover- Fifth Monitoring
2019-20

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

0   0.75   1.5   3 Km

Red Circles indicate change areas mapped

Increasing the Cropland and Plantation Establishment showing increased in NDVI

(77°18'19.992"E 15°32'34.081"N)
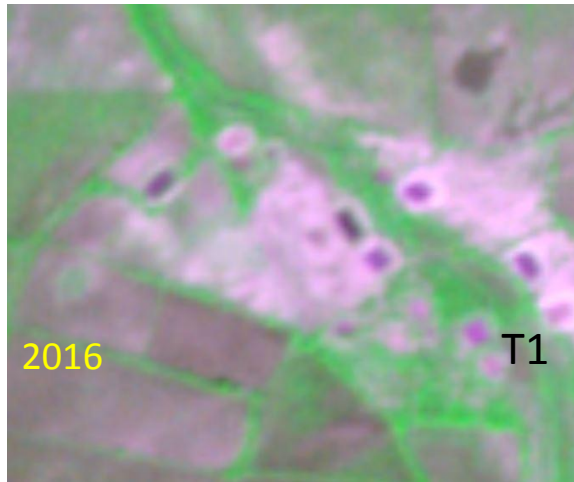
(77°18'8.813"E 15°31'57.271"N)

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

Scrub to Agriculture

T2

T3

T2: 2016-17(77°20'51.207"E 15°31'53.275"N)

T3: 01 April 2018

Scrub to Agriculture

T2

T3

T2: 2016-17 (77°18'58.64"E 15°33'22.926"N)

T3: 01 April 2018

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

Scrub to Agriculture

T2

T3

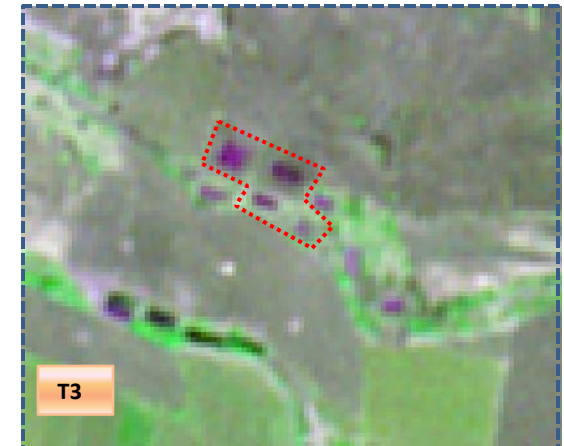T2: 2016-17 (77°20'8.666"E 15°30'39.34"N)
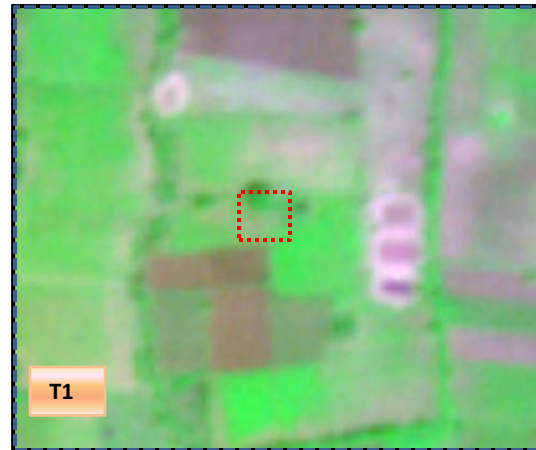
T3: 01 April 2018

Scrub to water body

T2

T3

T2: 2016-17 (77°17'20.617"E 15°33'30.59"N)

T3: 01 April 2018

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

Agriculture to water body

T1

T2

T1: 2015-16(77°18'51.558"E 15°33'14.293"N)

T2: 03 February 2017

Scrub to Agriculture

T1

T2

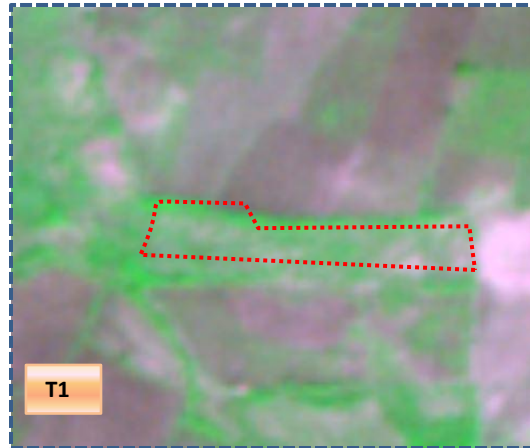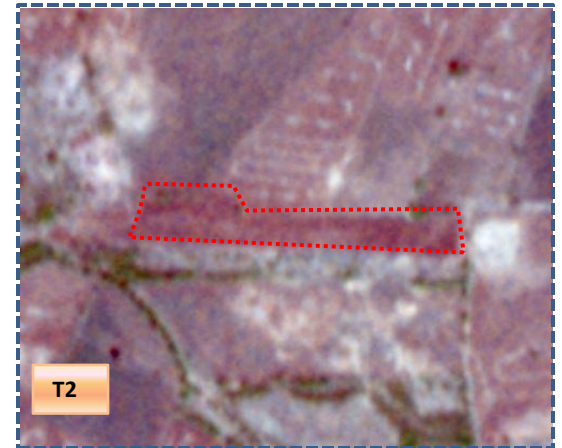T1: 2015-16 (77°17'55.535"E 15°32'42.176"N)

T2: 03 February 2017

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

Scrub to Agriculture

T1: 2015-16(77°18'55.77"E 15°31'10.414"N)

T2: 03 February 2017

Scrub to Agriculture

T1: 2015-16(77°19'22.541"E 15°31'11.923"N)

T2: 03 February 2017

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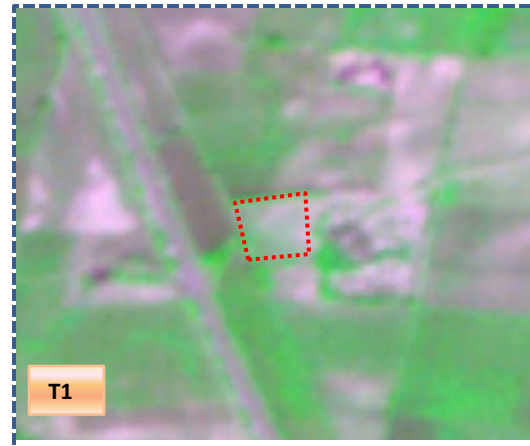

Scrub to Agriculture

T0

T1
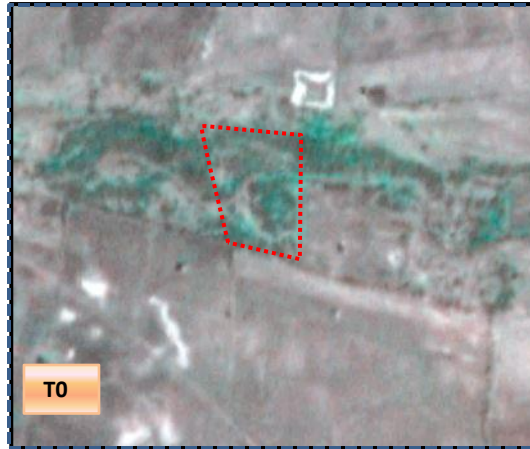
T0: 2011-12 (77°18'14.482"E 15°33'27.688"N)
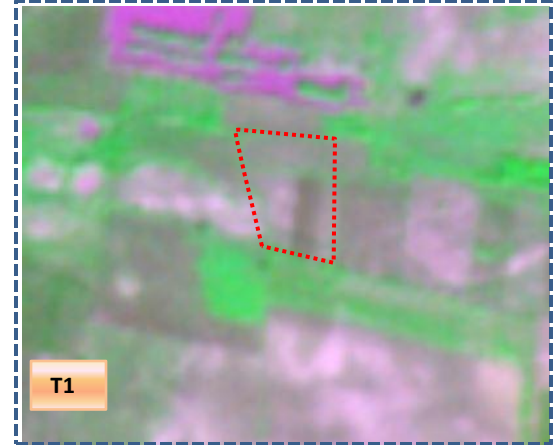
T1: 14 October 2015

Scrub to water body

T0

T1

T0: 2011-12 (77°17'47.301"E 15°32'34.624"N)
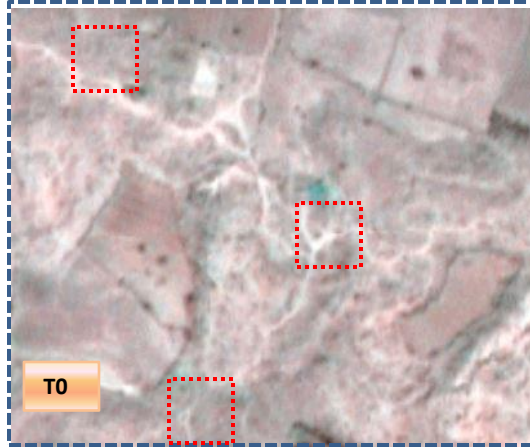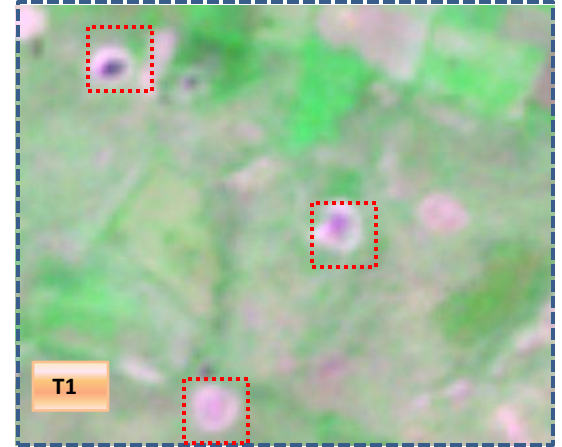
T1: 14 October 2015

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

Scrub to water body
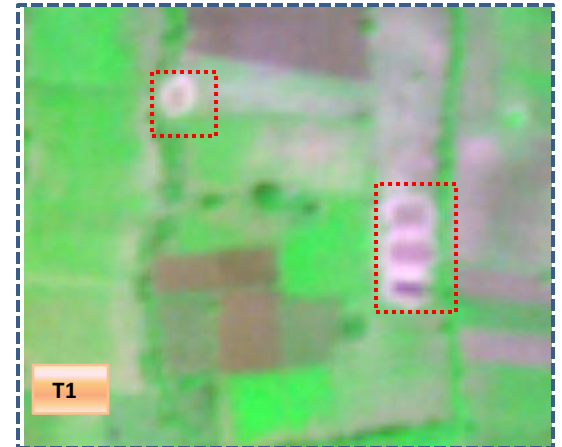

T0: 2011-12 (77°20'0.515"E 15°31'43.223"N)

T1: 14 October 2015

Agriculture to water body

T0: 2011-12 (77°18'55.533"E 15°33'13.046"N)

T1: 14 October 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	
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	87.71										**87.71**
Mining/dump		19.68							1.58		**21.26**
Agriculture	0.51	2.87	3771.81					7.53	6.65		**3789.37**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	1.06	7.18	24.50					474.90	9.21		**516.85**
Waterbody-Streams/River										9.43	**9.43**
Waterbody – Ponds									60.29		**60.29**
Grand Total	**89.28**	**29.74**	**3796.31**					**482.43**	**77.73**	**9.43**	**4484.92**

• 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 17.5 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, scrubland and water body in T1.

• In T1 24.5 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-2015-16 to 2016-17

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	89.28										**89.28**
Mining/dump		29.74									**29.74**
Agriculture	0.67	0.36	3794.25					0.27		0.76	**3796.31**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.06	1.41	25.40					454.16		1.40	**482.43**
Waterbody-Streams/River									9.43		**9.43**
Waterbody – Ponds			0.39							77.34	**77.73**
Grand Total	**90.01**	**31.50**	**3820.04**					**454.43**	**9.43**	**79.50**	**4484.92**

- 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 2.06 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.

- In T2 25.7 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	
T2	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	90.01										**90.01**
Mining/dump		31.43								0.07	**31.50**
Agriculture	0.48	0.17	3819.13							0.26	**3820.04**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.76	0.40	7.03					445.45		0.80	**454.43**
Waterbody-Streams/River									9.43		**9.43**
Waterbody – Ponds										79.50	**79.50**
Grand Total	**91.25**	**32.00**	**3826.16**					**445.45**	**9.43**	**80.63**	**4484.92**

• 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 0.91 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T3.

• In T3 7.03 ha of the agriculture area has increased from scrubland area 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 / T3	Monitoring period (T4) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	91.25										**91.25**
Mining/dump		31.70								0.30	**32.00**
Agriculture	0.82		3811.78	9.41						4.14	**3826.16**
Plantation Horticulture											
Forest											
Forest Plantation											
Barren Rocky											
Scrub	1.49	0.16	3.19					437.52		3.10	**445.45**
Waterbody- Streams/River									9.43		**9.43**
Waterbody – Ponds										80.63	**80.63**
Grand Total	**93.56**	**31.85**	**3814.97**	**9.41**				**437.52**	**9.43**	**88.19**	**4484.92**

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 T3 14.3 ha of the agriculture area has decreased and it is converted into Built-up, plantations, scrubland and water body in T4.

- In T4 3.1 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 T4	Monitoring period (T5) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total (Units in Hectares)
Built up	93.56										93.56
Mining/dump		31.70								0.16	31.85
Agriculture	0.92		3813.29							0.76	3814.97
Plantation Horticulture				9.41							9.41
Forest											
Forest Plantation											
Barren Rocky											
Scrub	1.35	1.00	3.34					429.90		1.92	437.52
Waterbody- Streams/River									9.43		9.43
Waterbody – Ponds										88.19	88.19
Grand Total	95.83	32.70	3816.62	9.41				429.90	9.43	91.03	4484.92

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

•In T5 3.34 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 30.7 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 6.9, 23, 6.12 & 1.6 Hectares From T0 to T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 27 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 9.4 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.

6. There is a decrease of 86.9 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (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.