MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -61/2011-12
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**

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-61/2011-12, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is **6,054** ha.   It comprises of 9 micro watersheds.

- In the project area 165 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.

- Water bodies have shown an decreased by 45 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.

- Major percentage i.e. i.e. 56 % is covered by the agriculture, 20 % is covered by forest, 10 % by water body, 7 % by scrub land and remaining by other land use classes.

- The study area falls in Hindupur Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is **6,054** ha. It comprises of 9 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
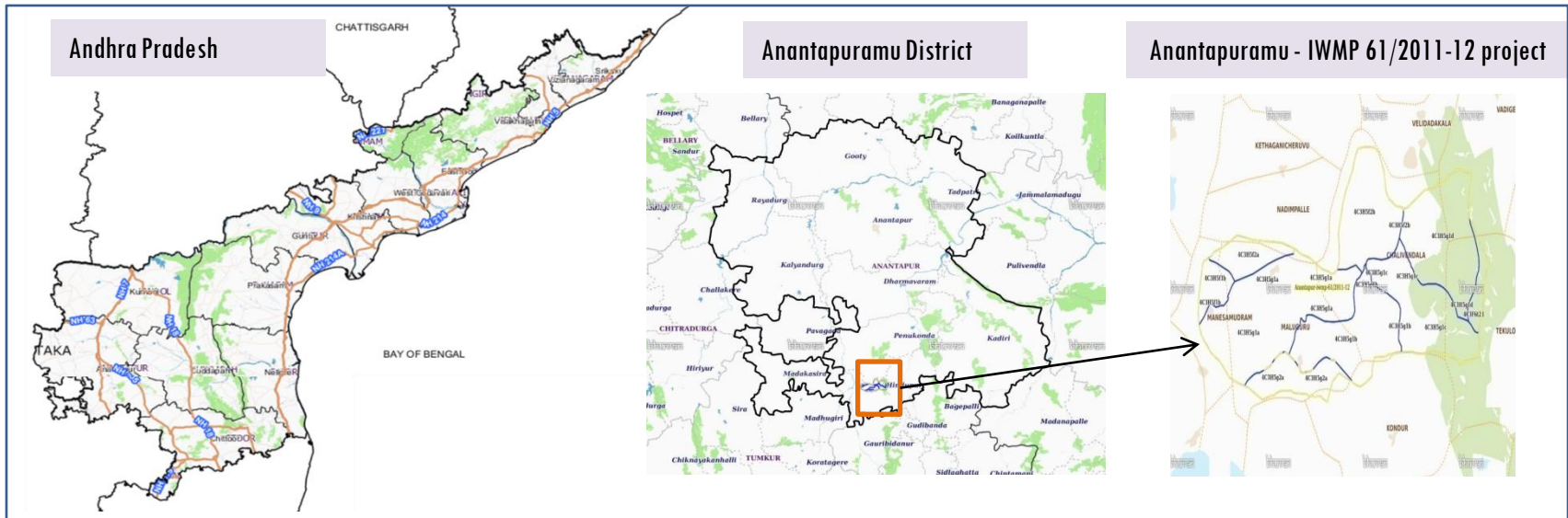
- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Total annual rainfall is about 22 in (560 mm).

- Anantapuram district receives moderate to good rainfall from July to October month.

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Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2013-14	2019-20
LISS IV	2011-12		
SCENE 1			24-Jan-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			24-Jan-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	165
4	Detailed Project Report		

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

Legend
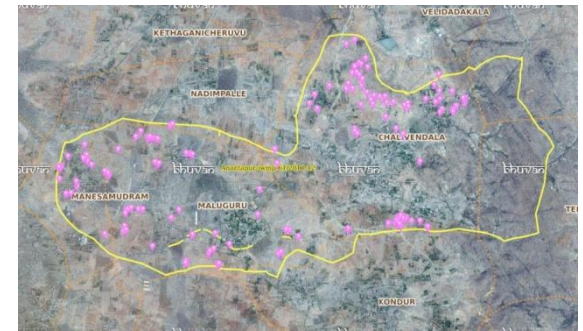
 Drainage (1:10000 Scale)

 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	2	2
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	23	23
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	10	9
11	Civil work-Check dams/Rock fill dam	0	0
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-Plantation/Horticulture	33	10
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	125	121
	TOTAL	**193**	**165**

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.

Natural Colour Composite (NCC)

Natural Color Composite - 2011-12
Source:Fusen data,NRSC
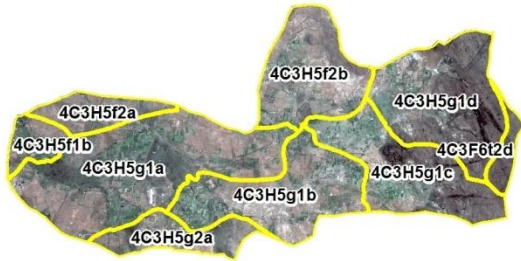
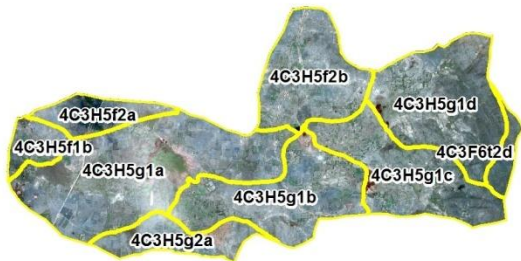Natural Color Composite - 10th January 2016
Source:Fusen data,NRSC

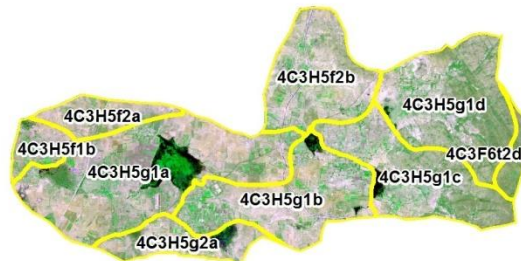Natural Color Composite - 22nd November 2017
Source:NCC,NRSC

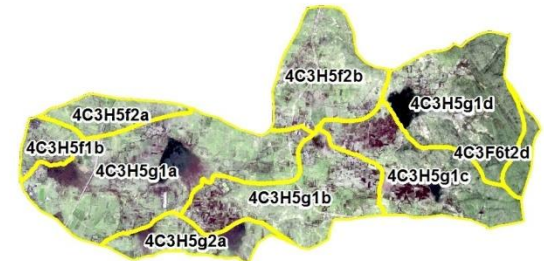Natural Color Composite - 5th December 2018
Source:NCC,NRSC

Natural Color Composite - 4th January 2019
Source:Sentinel,NRSC

Natural Color Composite - 24th January 2020
Source:Sentinel,NRSC

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-61/2011-12

T0:2011-12

T1: 07 January 2017

Drishti Sl no. 7012768   MWS : 4C3H5f1b

Farm pond

T0:2011-12
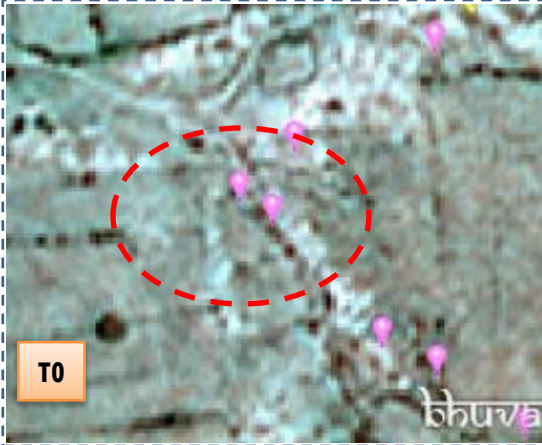
T1: 07 January 2017

Drishti Sl no. 7018691   MWS : 4C3H5f2a

Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-61/2011-12
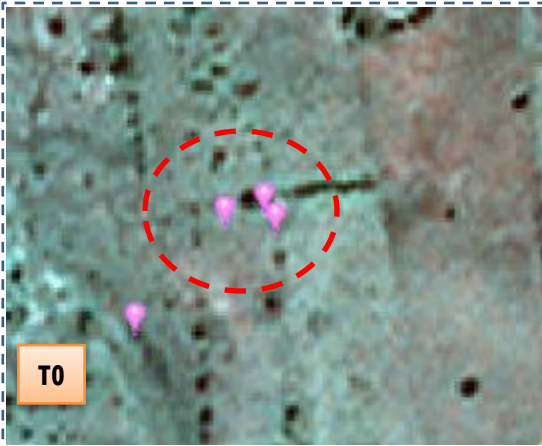

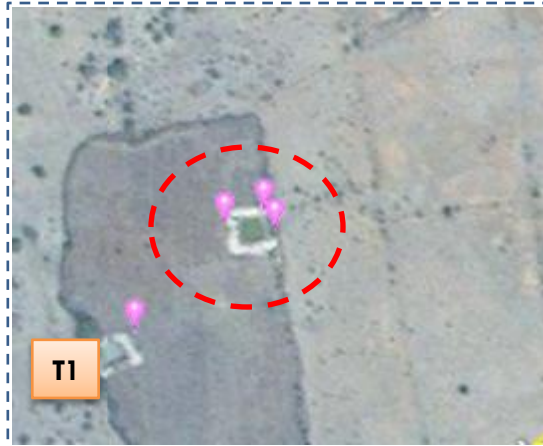|		
T0:2011-12	T1: 07 January 2017	Drishti Sl no. 702384 MWS : 4C3H5g1b

Farm pond

T0:2011-12	T1: 07 January 2017	Drishti Sl no. 7026563 MWS : 4C3H5g2a

Farm pond

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 (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**

N

**Land Use and Land Cover - First Monitoring
2015-16**

N

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

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

○ **Red Circles indicate change areas mapped**

0   1   2   4 Km

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- ■ Built Up
- ■ Mining/Dump
- ■ Agriculture
- ■ Plantation - Horticulture
- ■ Forest
- ■ 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 (2015-16 to 2016-17)

Scale: 1:10000

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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 - Third Monitoring 2017-18

Legend
- Microwatershed Boundary

Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

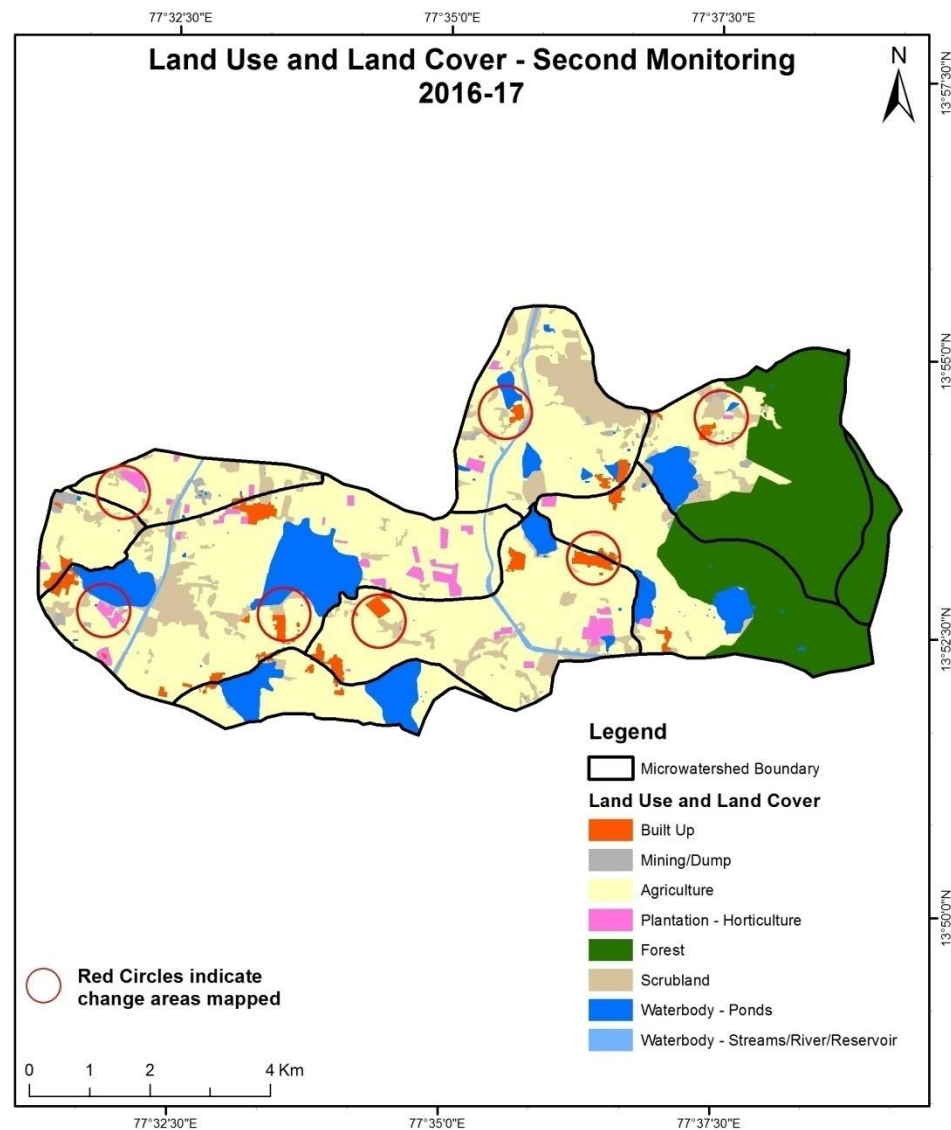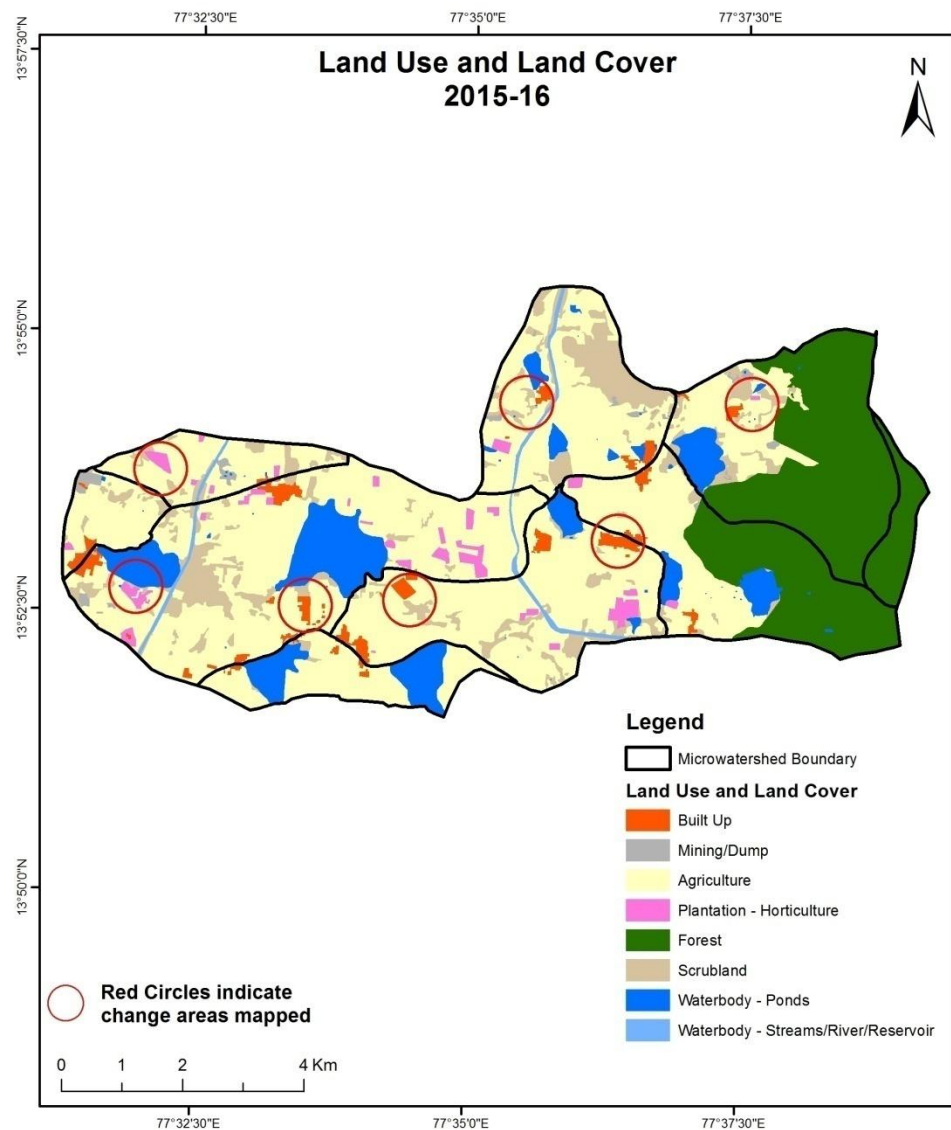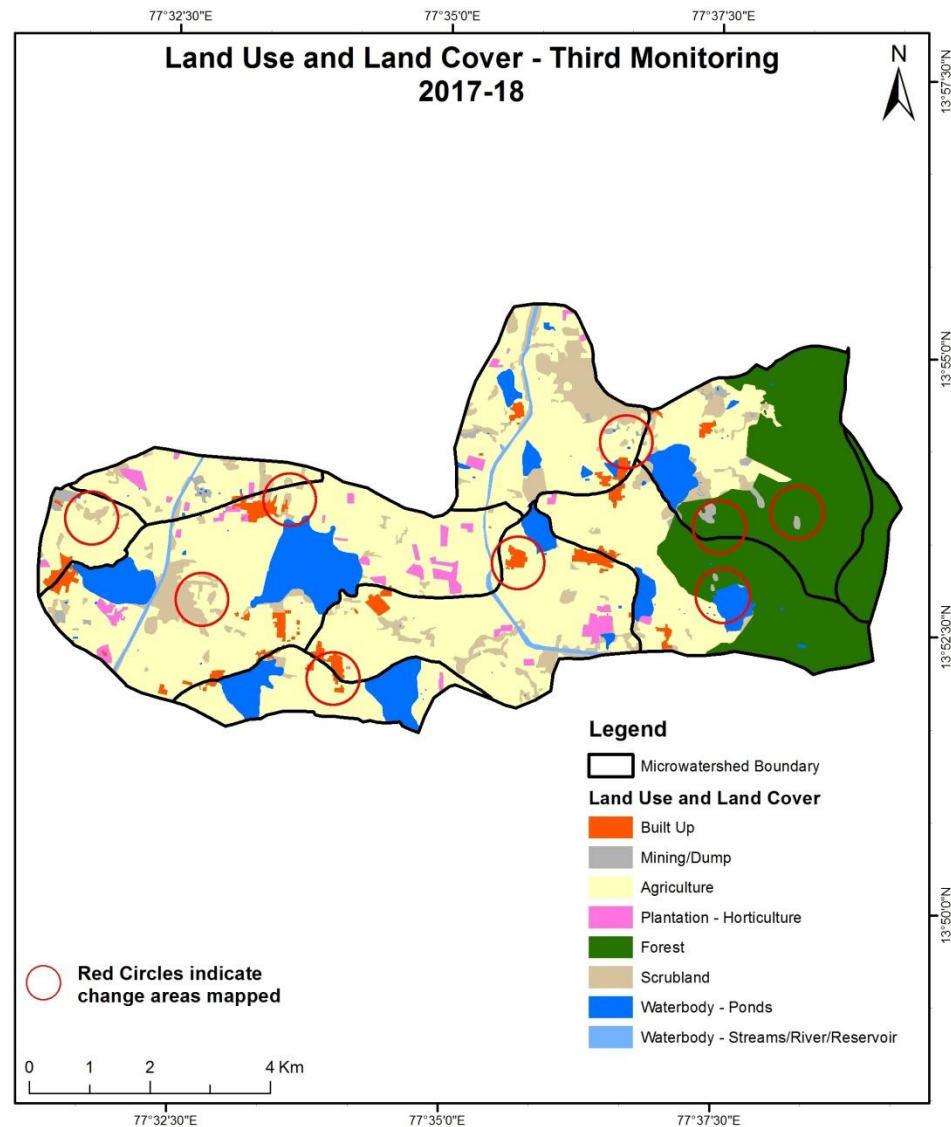Red Circles indicate change areas mapped

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
2017-18

Land Use and Land Cover - Fourth Monitoring
2018-19

Legend

Microwatershed Boundary

Land Use and Land Cover

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

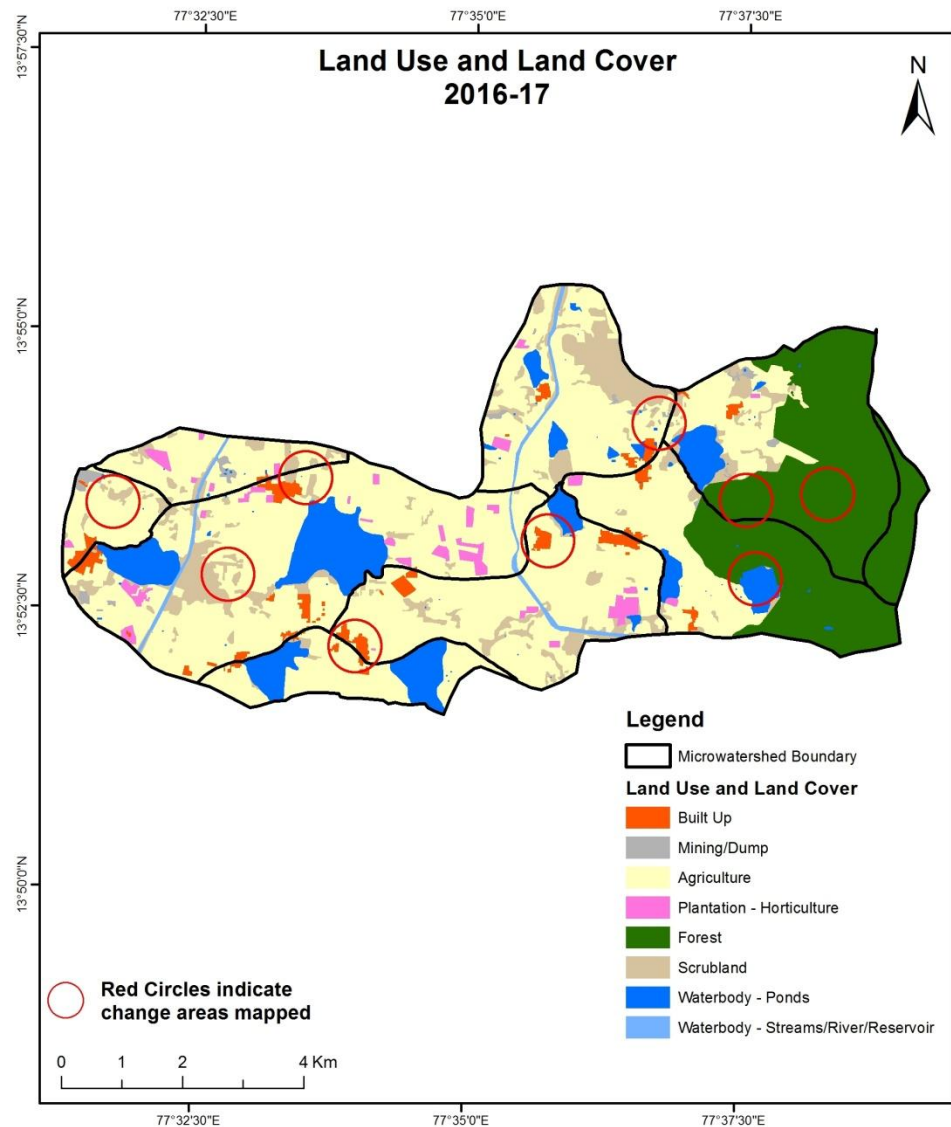**Red Circles indicate change areas mapped**
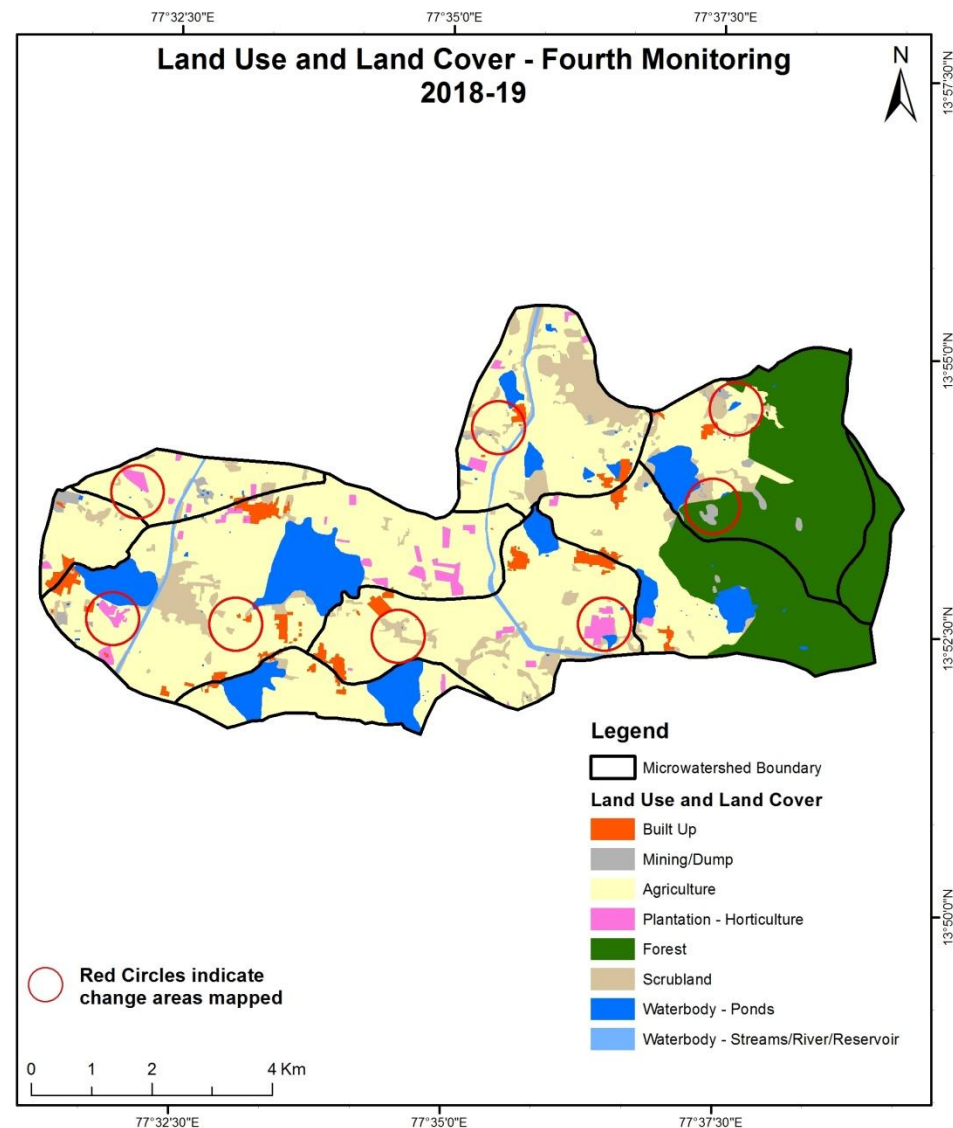
0 1 2 4 Km

15

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)
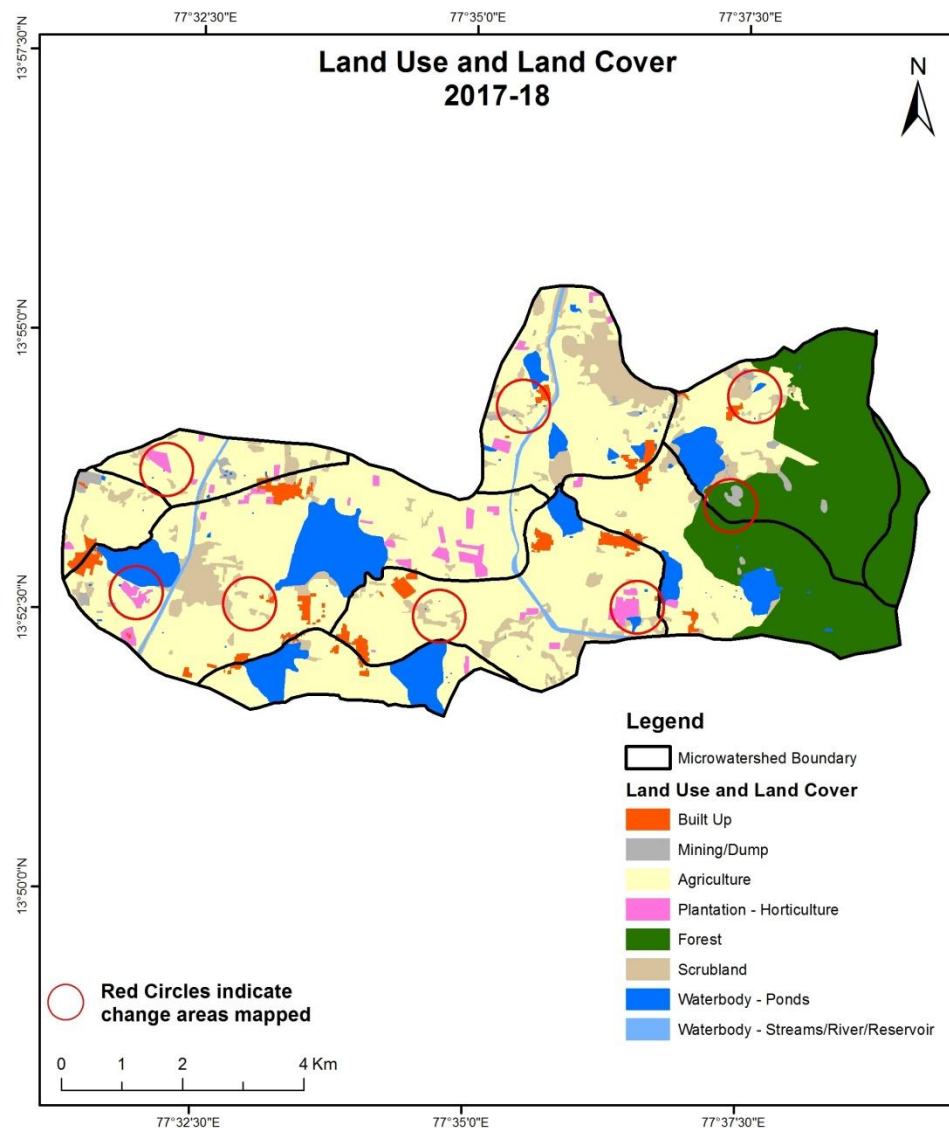
Scale: 1:10000

16
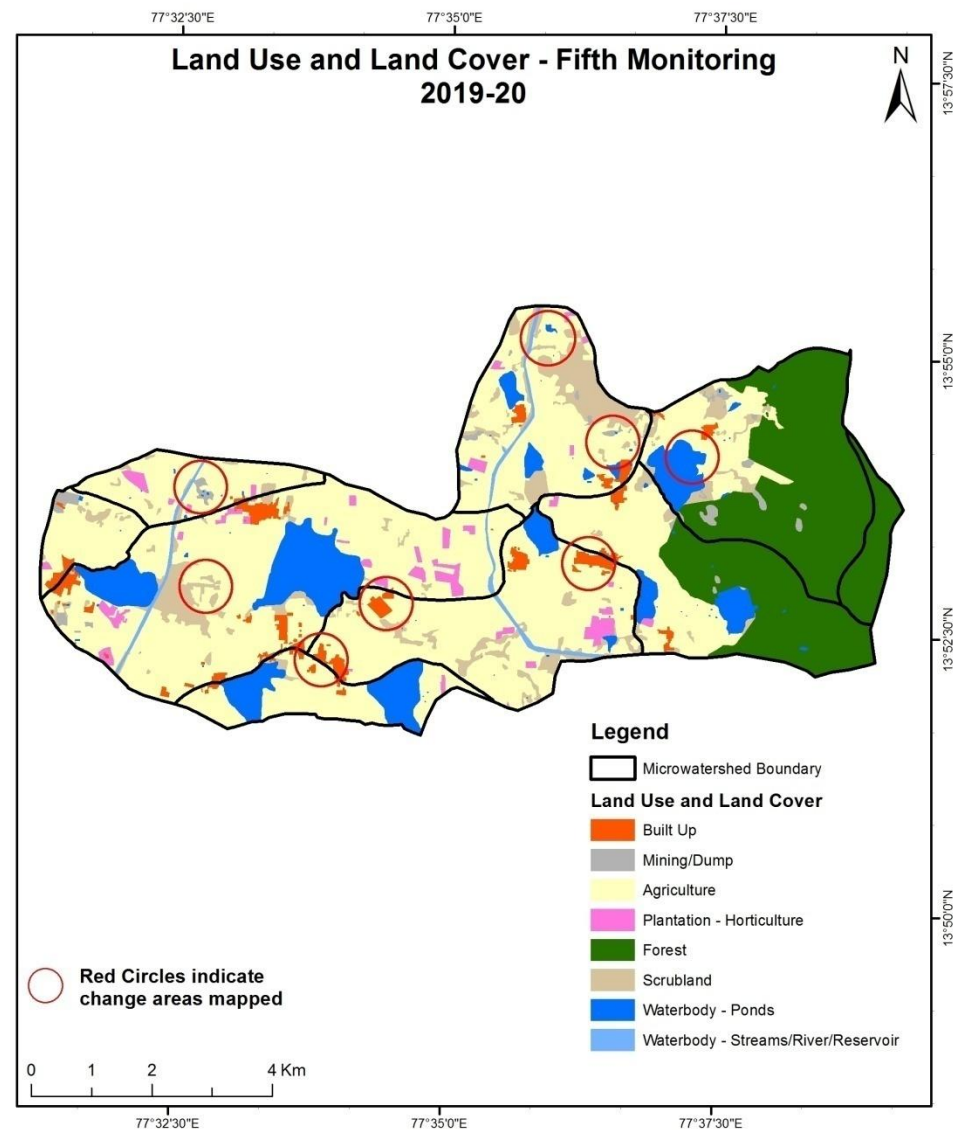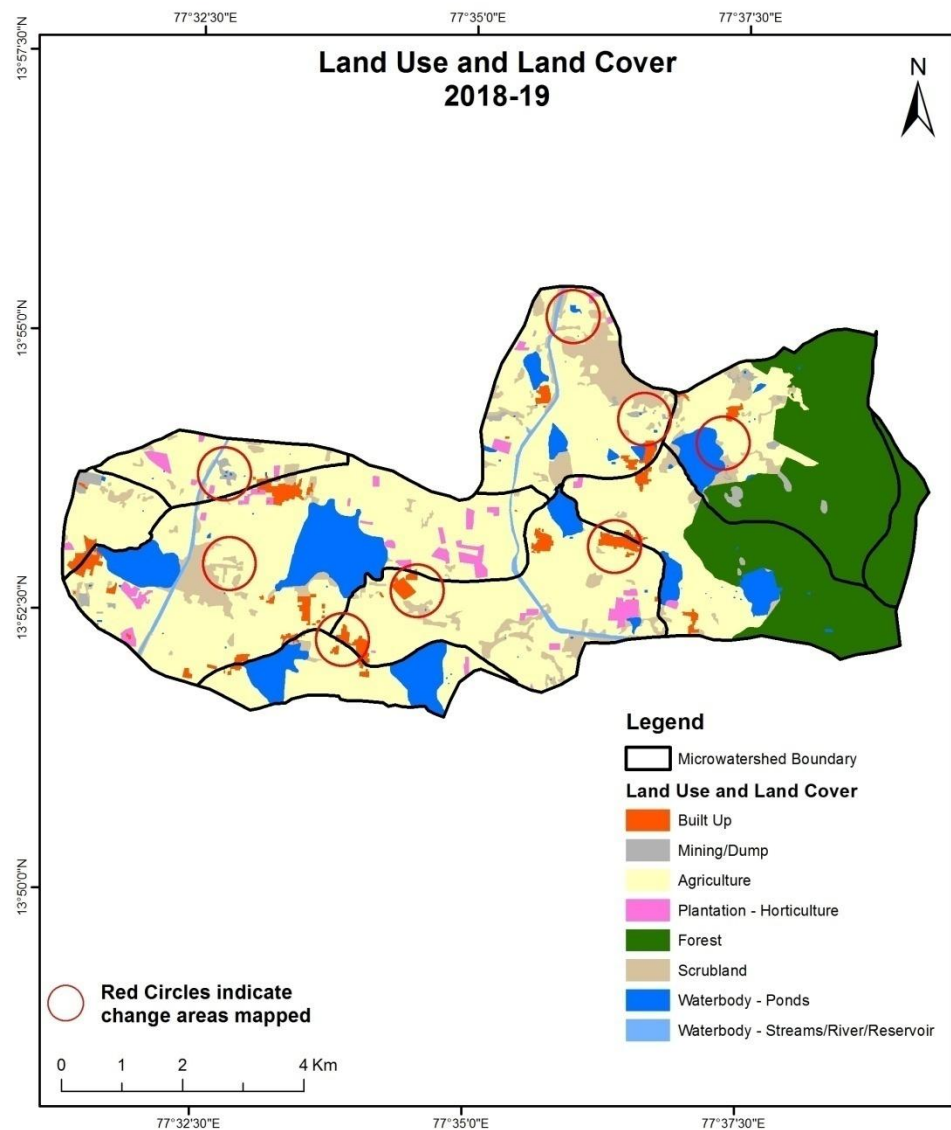
Increasing the Cropland and Plantation Establishment showing increased in NDVI

2012   T0

2016   T1

(Lat longs)

2012   T0

2016   T1

(Lat longs)

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

Agriculture to Water body

T0: 2011-12 (77°31'38.575"E 13°53'38.367"N)
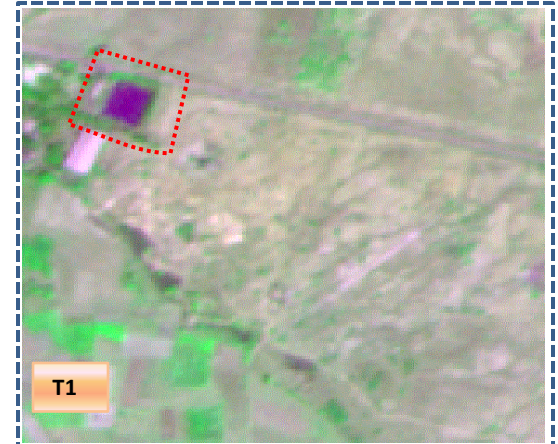
T1: 16 February 2016

Agriculture Water body

T0: 2011-12 (77°36'37.47"E 13°52'43.445"N)

T1: 16 February 2016

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

Scrub to Agriculture

T0

T1

T0: 2011-12(77°34'49.673"E 13°52'32.513"N)

T1: 16 February 2016

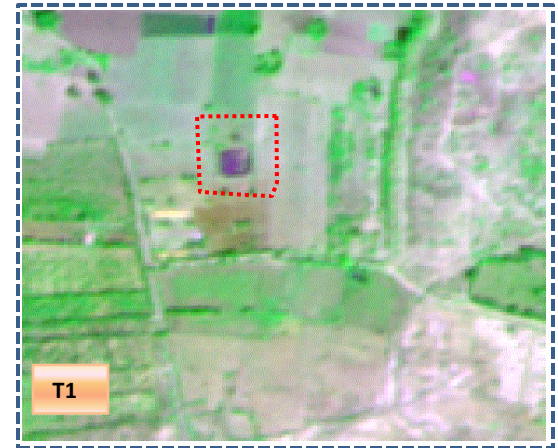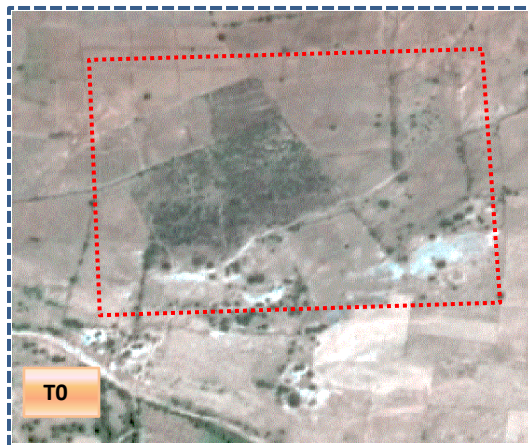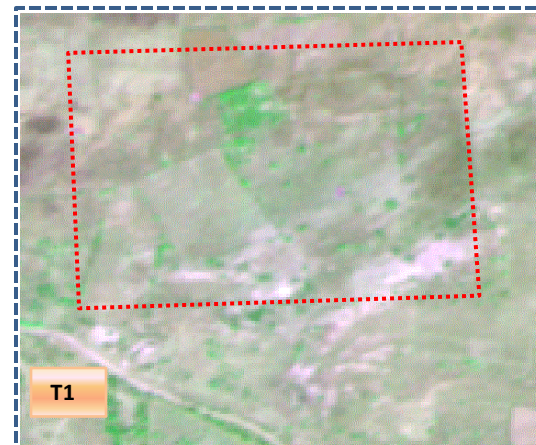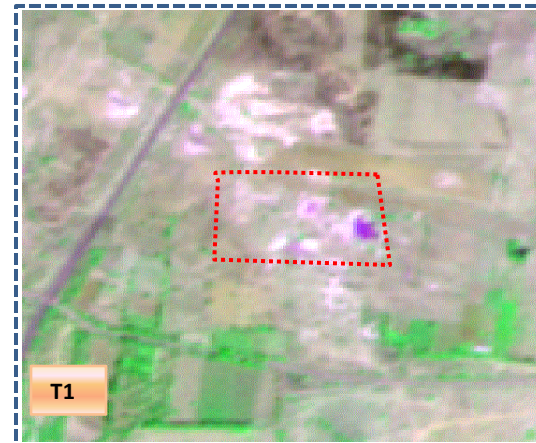Scrub to Water body

T0

T1

T0: 2011-12(77°32'44.186"E 13°53'45.437"N)

T1: 16 February 2016

Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	124.09										**124.09**
Mining/dump		18.73									**18.73**
Agriculture	14.18	8.14	3210.31	8.71						5.52	**3246.86**
Plantation Horticulture	0.28		42.92	102.70						0.17	**146.07**
Forest					1231.65					0.42	**1232.07**
Forest Plantation											
Barren Rocky											
Scrub	3.77	11.18	84.04					581.21	20.38	2.22	**702.80**
Waterbody-Streams/River									41.28		**41.28**
Waterbody – Ponds	0.37									541.82	**542.19**
Grand Total	**142.69**	**38.05**	**3337.27**	**111.41**	**1231.65**			**581.21**	**61.66**	**550.16**	**6054.11**

Units in Hectares. Monitoring period (T1).

- 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 36 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.
- In T1 126 ha of the agriculture area has increased from plantations and scrubland 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 / T1	Monitoring period (T2) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	142.69										**142.69**
Mining/dump		38.05									**38.05**
Agriculture	0.61	0.07	3333.16	2.31						1.14	**3337.27**
Plantation Horticulture				111.41							**111.41**
Forest					1231.51					0.14	**1231.65**
Forest Plantation											
Barren Rocky											
Scrub			15.91					564.44	0.38	0.48	**581.21**
Waterbody-Streams/River									61.66		**61.66**
Waterbody – Ponds										550.16	**550.16**
Grand Total	**143.29**	**38.11**	**3349.07**	**113.72**	**1231.51**			**564.44**	**62.04**	**551.92**	**6054.11**

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 T1 04 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T2.

- In T2 15 ha of the agriculture area has increased from 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-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	143.29										**143.29**
Mining/dump		38.11									**38.11**
Agriculture	4.46	0.16	3338.72	5.67						0.06	**3349.07**
Plantation Horticulture	0.24		3.07	110.31						0.10	**113.72**
Forest		15.01			1216.50						**1231.51**
Forest Plantation											
Barren Rocky											
Scrub	2.00	1.02	72.88					488.39		0.16	**564.44**
Waterbody-Streams/River									62.04		**62.04**
Waterbody – Ponds										551.92	**551.92**
Grand Total	**149.99**	**54.31**	**3414.67**	**115.97**	**1216.50**			**488.39**	**62.04**	**552.24**	**6054.11**

• In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents change in between the classes.

• In T2 10 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.

• In T3 75 ha of the agriculture area has increased from plantations and 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
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	149.99										149.99
Mining/dump		54.31									54.31
Agriculture	3.33		3410.91	0.43							3414.67
Plantation Horticulture				115.97							115.97
Forest					1216.50						1216.50
Forest Plantation											
Barren Rocky											
Scrub	0.17		30.60					456.93		0.69	488.39
Waterbody-Streams/River									62.04		62.04
Waterbody – Ponds										552.24	552.24
Grand Total	153.49	54.31	3441.51	116.40	1216.50			456.93	62.04	552.93	6054.11

- 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 03 ha of the agriculture area has decreased and it is converted into Built-up and plantations in T4.

- In T4 30 ha of the agriculture area has increased from scrubland area 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
Built up	153.49										**153.49**
Mining/dump		54.31									**54.31**
Agriculture	6.78		3424.66	1.90						8.16	**3441.51**
Plantation Horticulture			1.17	115.23							**116.40**
Forest		1.00			1215.27					0.23	**1216.50**
Forest Plantation											
Barren Rocky											
Scrub	1.38	0.91	7.40					441.37		5.86	**456.93**
Waterbody- Streams/River									62.04		**62.04**
Waterbody – Ponds										552.93	**552.93**
Grand Total	**161.66**	**56.22**	**3433.24**	**117.12**	**1215.27**			**441.37**	**62.04**	**567.18**	**6054.11**

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 T4 16 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T5.

•In T5 08 ha of the agriculture area has increased from plantations and 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 45 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 90, 11, 65 & 26 Hectares From T0 to T1, T1-T2, T2-T3 &T3-T4 respectively and overall increase of 186 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.

5. There is a decrease of 261 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.

6. Farm ponds (10) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (09) verified from the portal.