MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -37/2011-12
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

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

- 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-37/2011-12, YSR Kadapa District of   Andhra Pradesh.   The total geographical area of the project is **7,677** ha. It comprises of 16 micro watersheds.

- In the project area 1675 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 increase by 20 ha , which correspond to the various bodies that have been converted into other land use classes in this period.

- Major percentage i.e. 40 % is covered by the agriculture, 28 % is forest, 21 % is scrub land area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-37/2011-12
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Porumamilla Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **7,677** ha. It comprises of 16 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
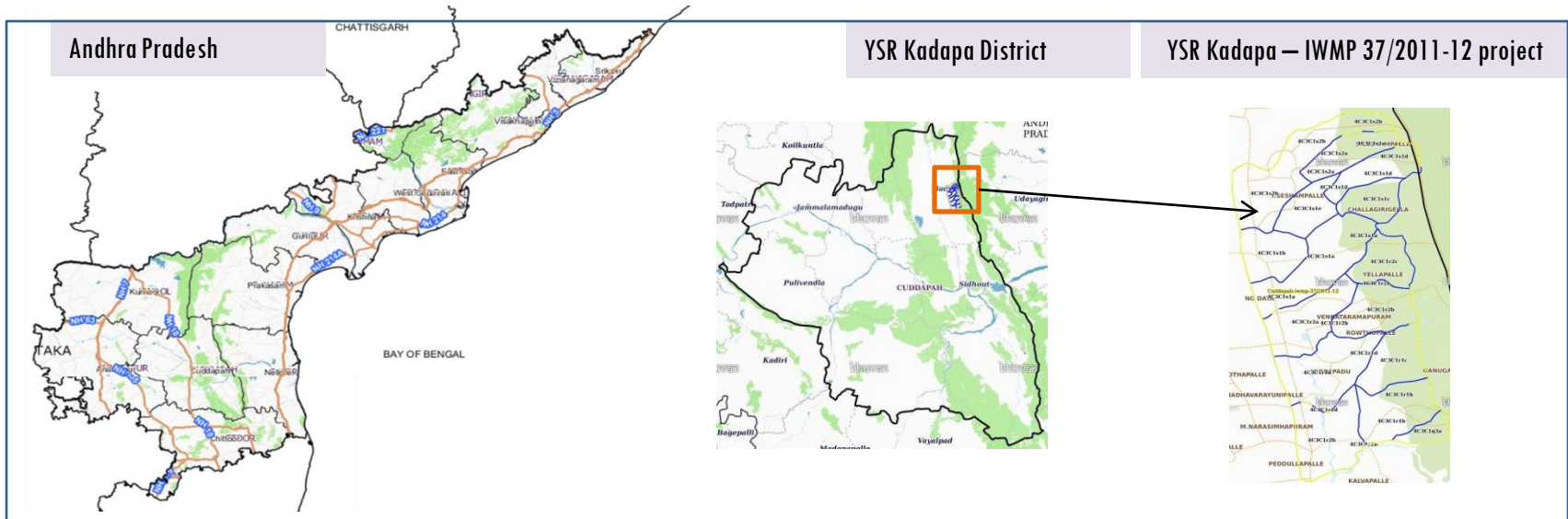
- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .

- 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.

4

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	1675
4	Detailed Project Report		

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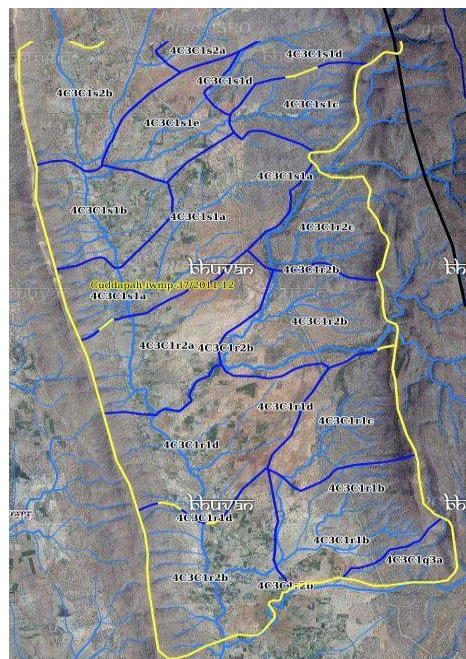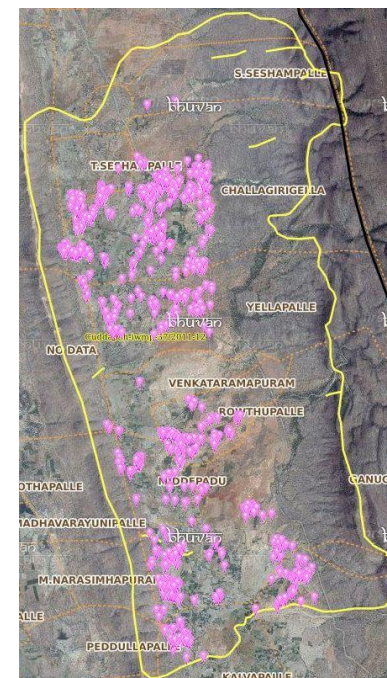

Legend

 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	224	150
2	Afforestation	8	8
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	34	30
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	26	20
11	Civil work-Check dams /Rock fill dam	889	600
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)	1	1
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	109	60
18	Others	**1227**	800
	TOTAL	**2518**	**1675**

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 2015-16 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-37/2011-12
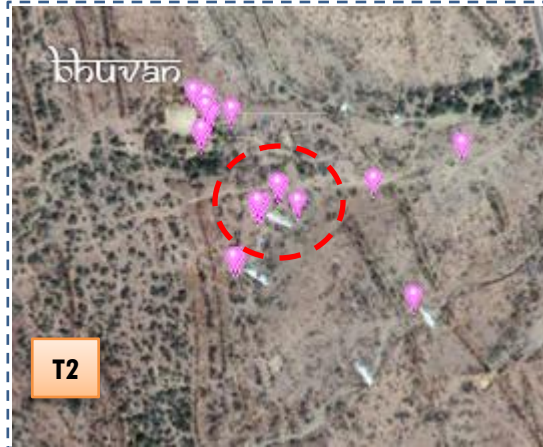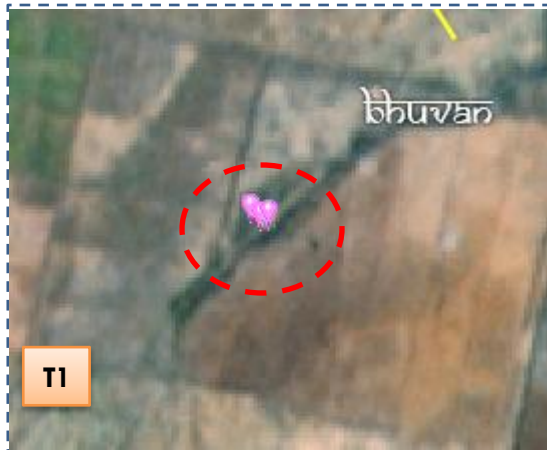

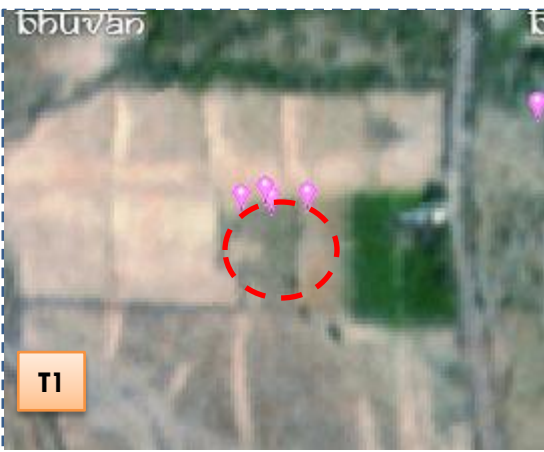| T1: 2016 | T2: 2017 | Drishti Sl no. 2470219   MWS :4C3C1r2b |

Check dam

| T1: 2016 | T2: 2018 | Drishti Sl no. 3127644   MWS :4C3C1s1e |

Check dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-37/2011-12

| T1: 2016 | T2: 2017 | Drishti Sl no. 2470172   MWS :4C3C1r2b |

Horticulture

| T1: 2016 | T2: 2017 | Drishti Sl no. 3089304   MWS :4C3C1r1b |

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-37/2011-12

T0: 2010-11
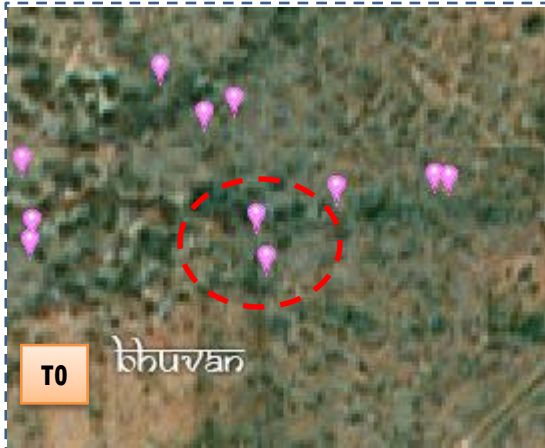
T1: 2 February 2016

Drishti Sl no. 1842814   MWS :4C3C1s1e

Check dam
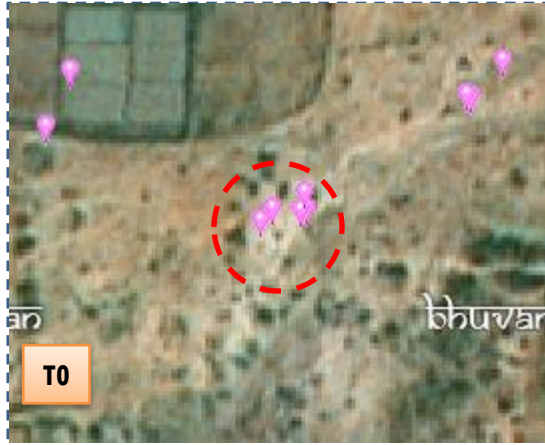

T0: 2010-11

T1: 2 February 2016

Drishti Sl no. 157429   MWS :4C3C1s1a

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-37/2011-12

| T0: 2010-11 | T1: 2 February 2016 | Drishti Sl no. 157467   MWS :4C3C1s1a |

Farm pond

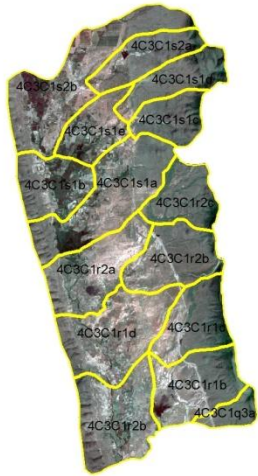

| T0: 2010-11 | T1: 2 February 2016 | Drishti Sl no. 3053490   MWS :4C3C1r2a |

Farm pond

Natural Colour Composite (NCC)

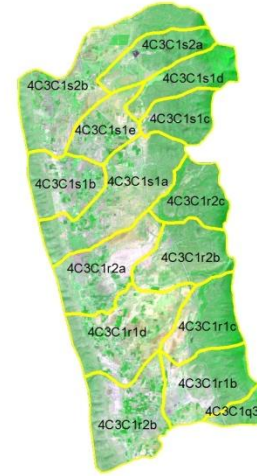Natural Color Composite - 2011-12
Source:Fusion data,NRSC

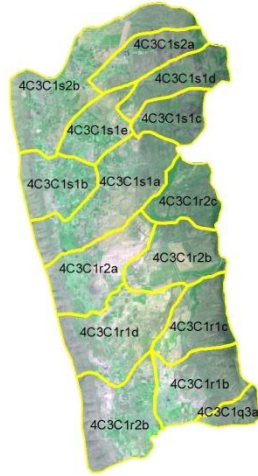Natural Color Composite-02nd February 2016
Source:NCC,NRSC

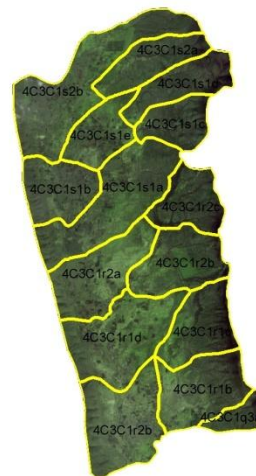Natural Color Composite- 18th October 2016
Source:LISS-IV,NRSC

Natural Color Composite- 30th March 2018
Source:LISS-IV,NRSC

Natural Color Composite-25th November 2018
Source:Sentinel-2

Natural Color Composite- 29th February 2020
Source:LISS-IV,NRSC
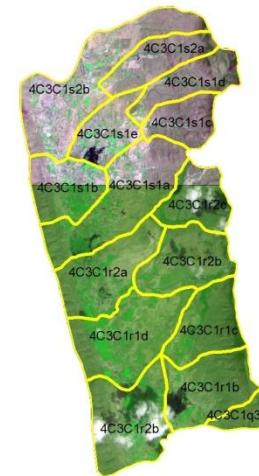
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover 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

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

■ Built Up

☐ Agriculture

■ Plantation - Horticulture

■ Forest

■ Scrubland

■ Waterbody - Ponds

■ Waterbody - Streams/River/Reservoir

○ Red Circles indicate change areas mapped

0   1.5   3   6 Km

Land Use and Land Cover- First Monitoring
2015-16

N

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

■ Built Up

☐ Agriculture

■ Plantation - Horticulture

■ Forest

■ Scrubland

■ Waterbody - Ponds

■ Waterbody - Streams/River/Reservoir

○ Red Circles indicate change areas mapped

0   1.5   3   6 Km

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

Legend

Microwatershed Boundary

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

Red Circles indicate change areas mapped

0   1.5   3   6 Km

Land Use and Land Cover- Second Monitoring
2016-17

Legend

Microwatershed Boundary

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

Red Circles indicate change areas mapped
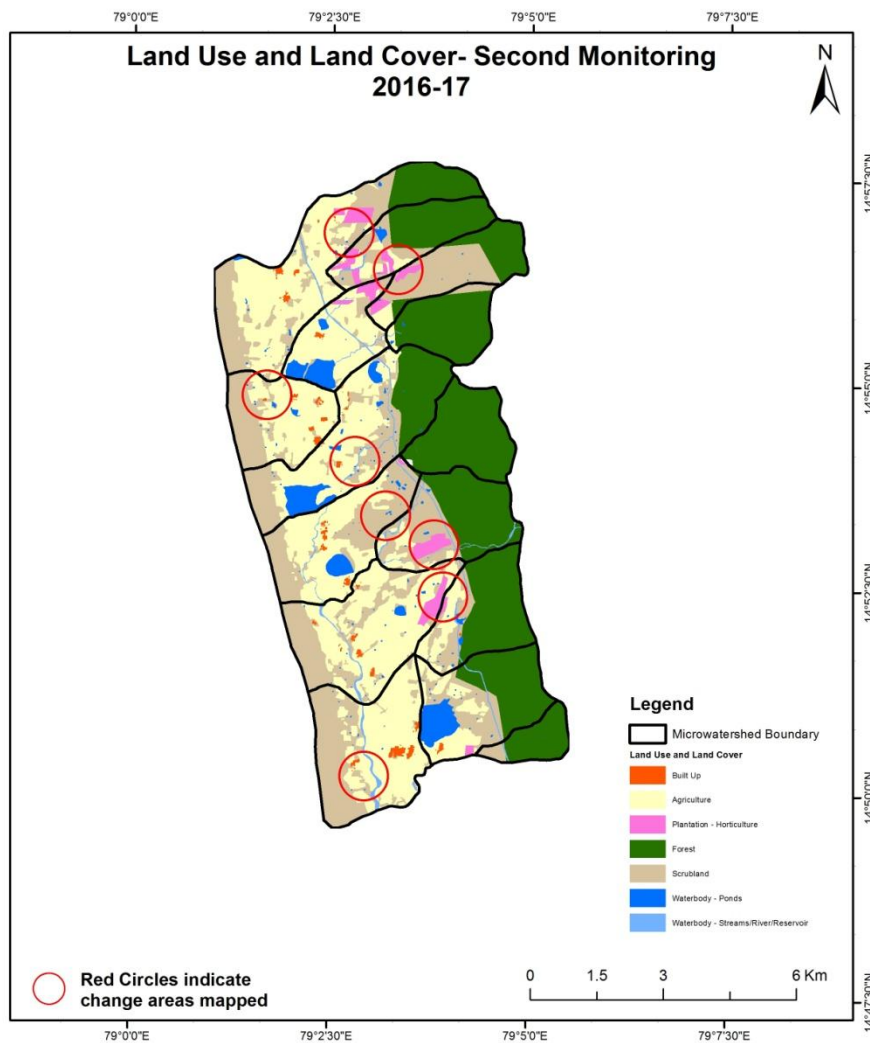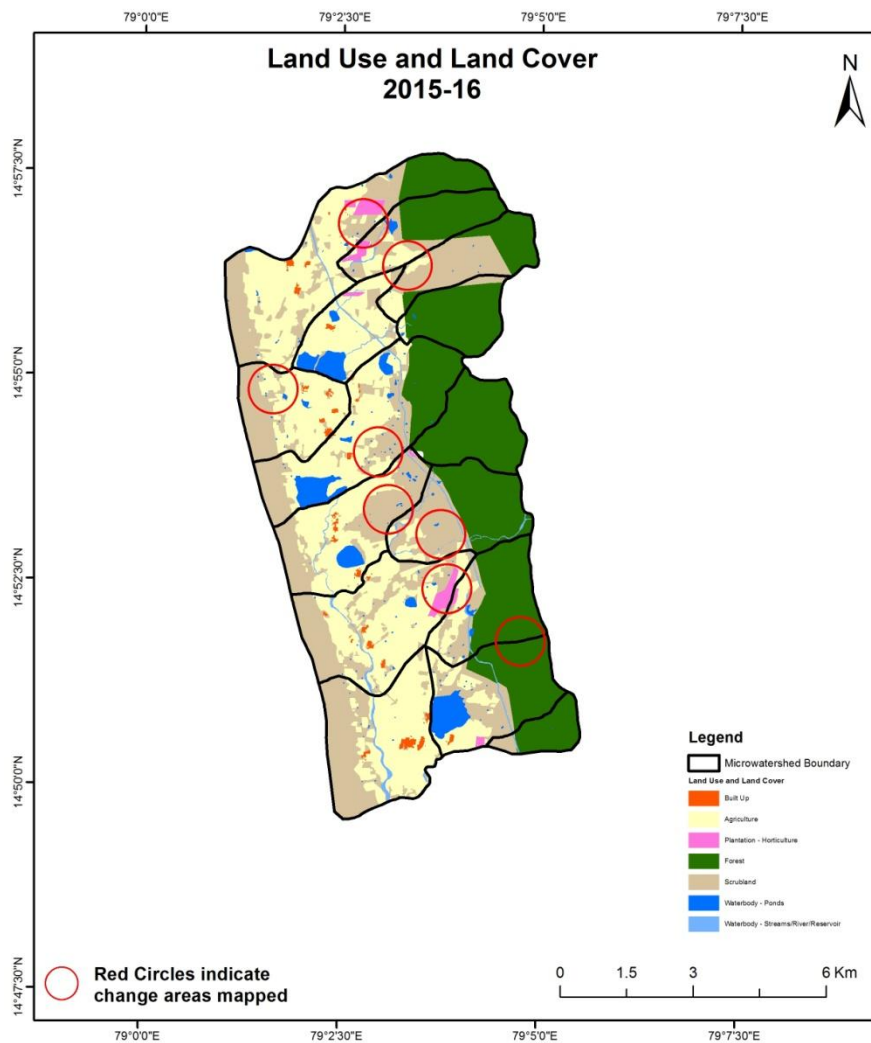
0   1.5   3   6 Km

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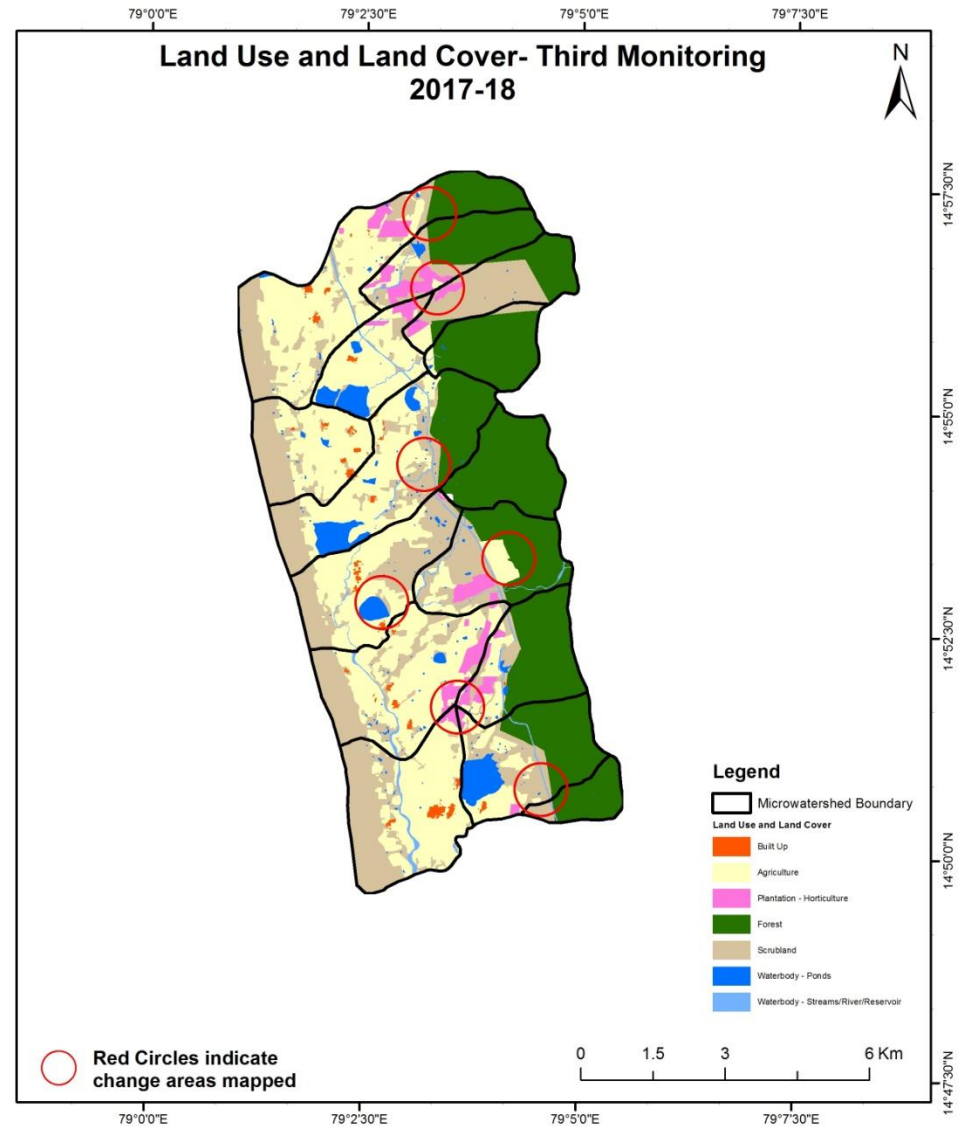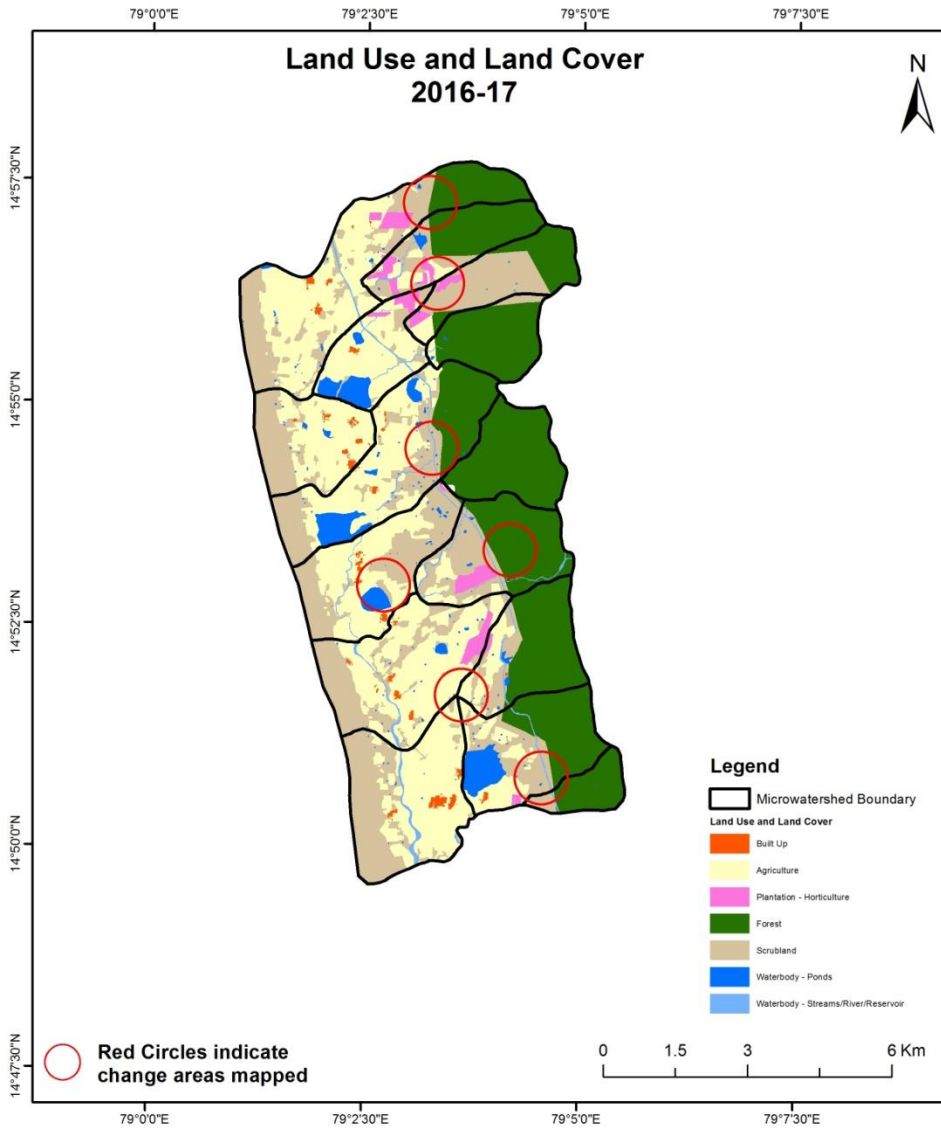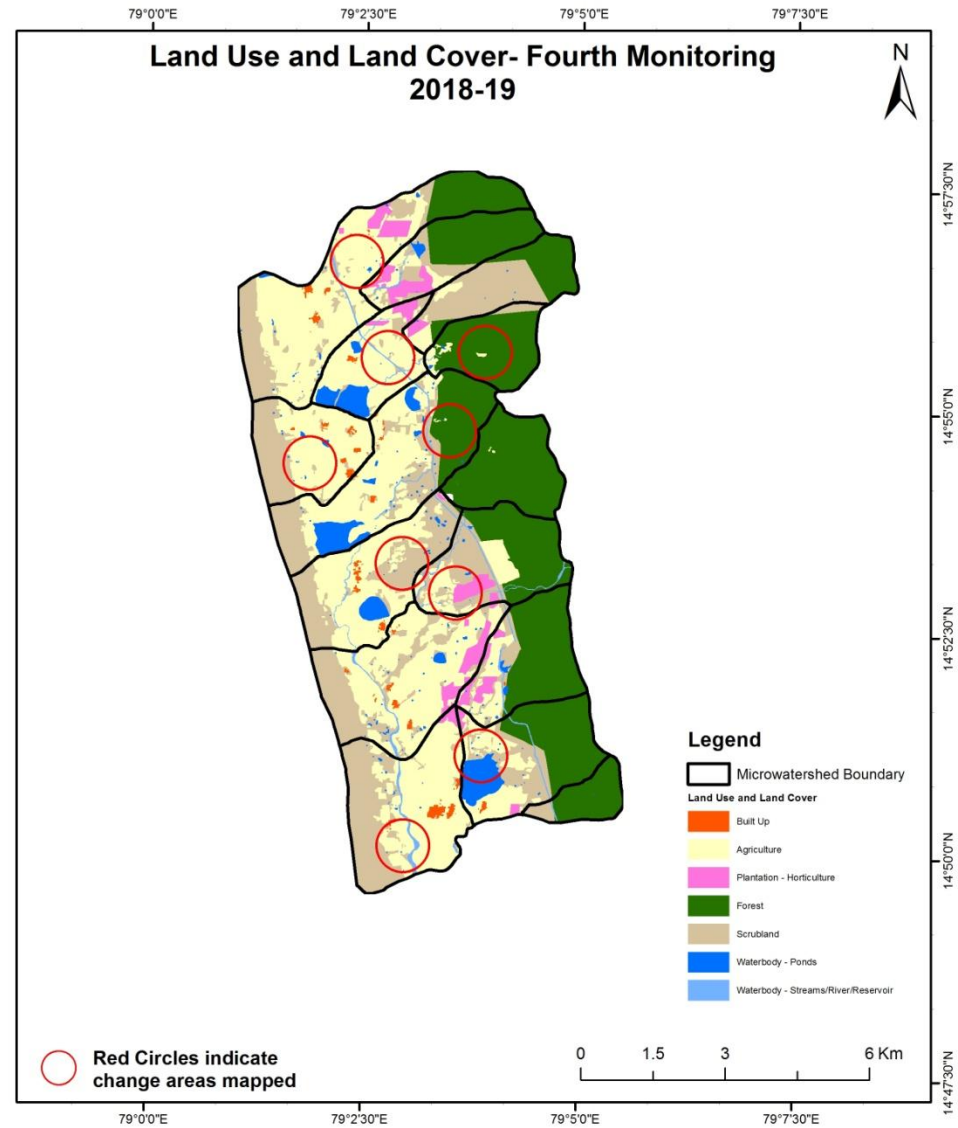
Scale: 1:10000
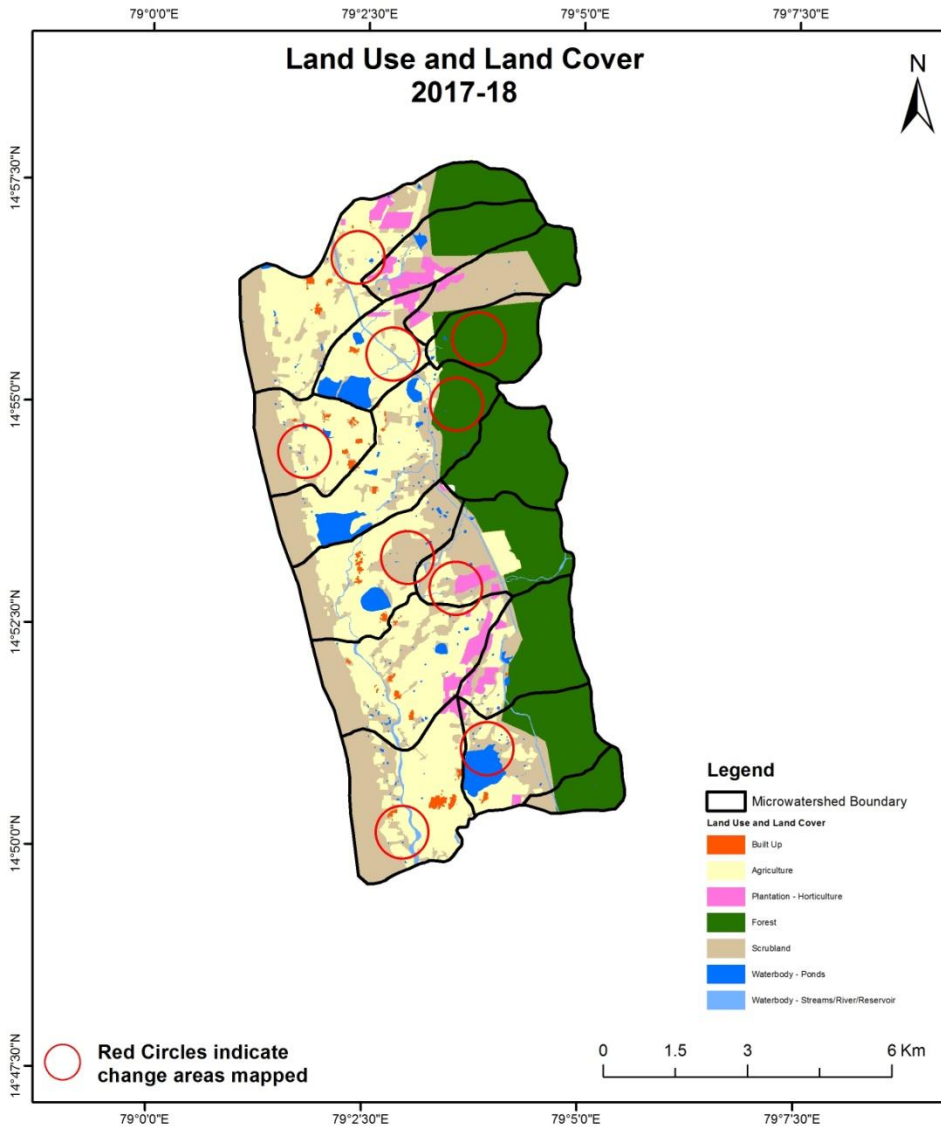
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)
Scale: 1:10000
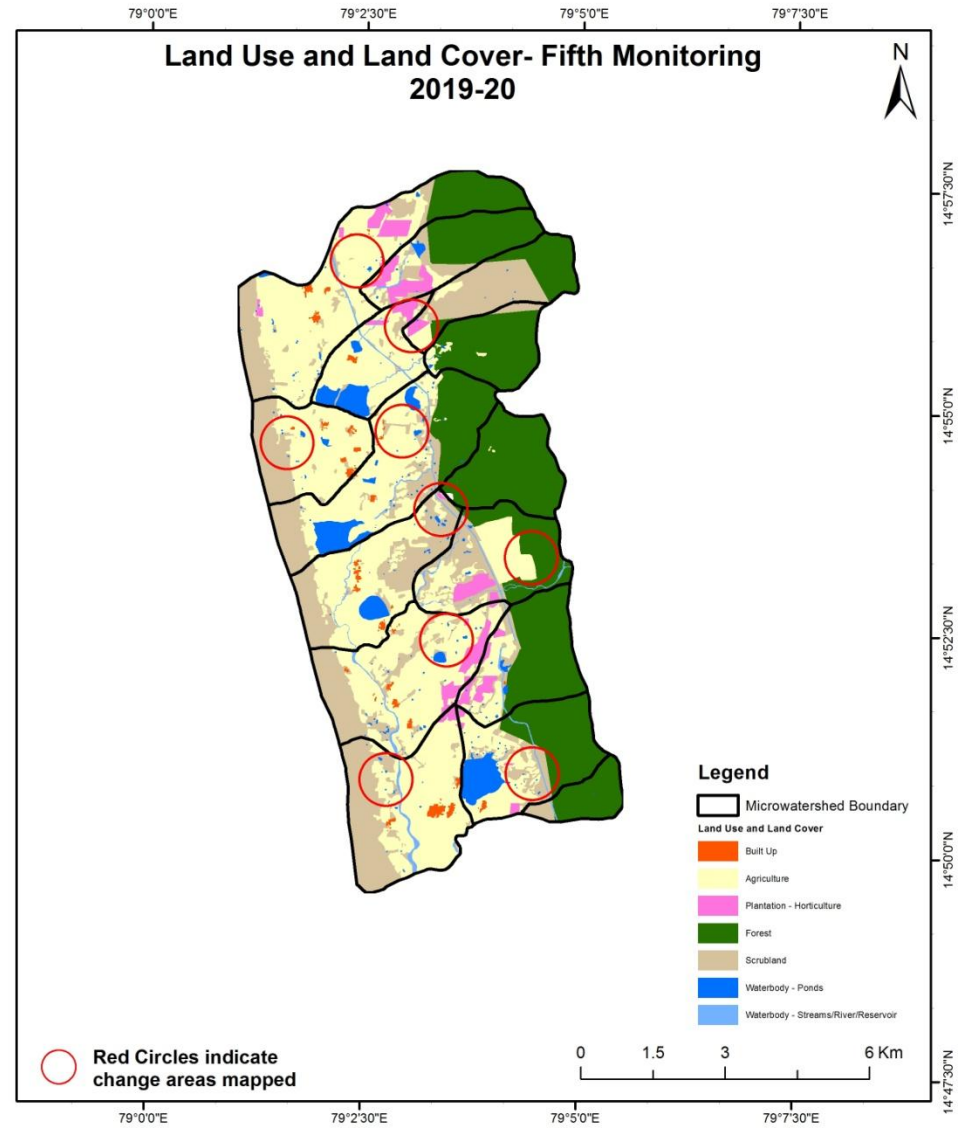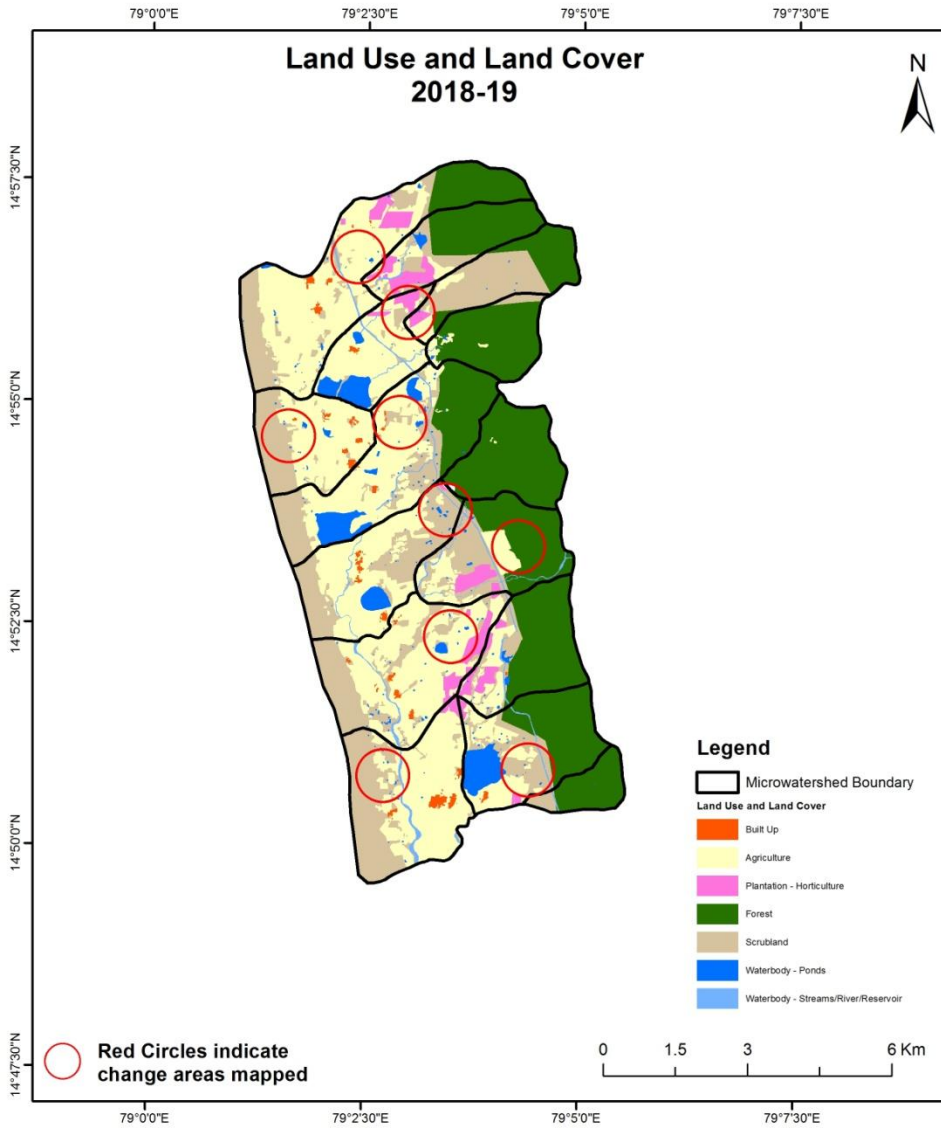
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

T0: 2011-12 (79°3'6.542"E 14°55'53.019"N)

T0: 02 February 2016

Scrub to Water body

T0: 2011-12 (79°1'47.185"E 14°53'51.851"N)
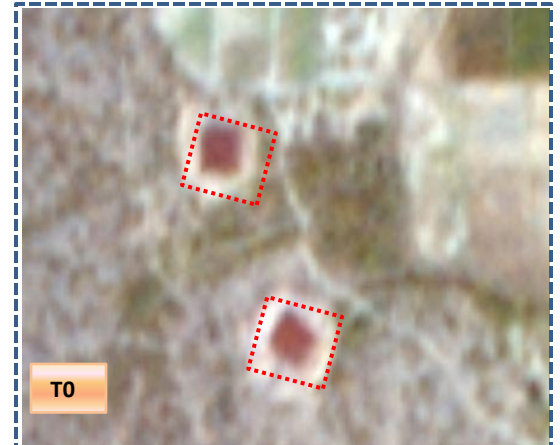
T0: 02 February 2016

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

Agriculture to Built-up

T0: 2011-12 (79°3'32.801"E 14°50'33.911"N)

T0: 02 February 2016

Scrub to Agriculture

T0: 2011-12 (79°1'47.369"E 14°54'1.11"N)

T0: 02 February 2016

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

Scrub to Agriculture

T1

T2

T1: 2015-16 (79°3'6.542"E 14°55'53.019"N)

T2: 02 February 2016

Scrub to Water body

T1

T2

T1: 2015-16 (79°1'47.185"E 14°53'51.851"N)

T2: 02 February 2016

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

Agriculture to Built-up

T1: 2015-16 (79°3'32.801"E 14°50'33.911"N)

T2: 02 February 2016

Scrub to Agriculture

T1: 2015-16 (79°1'47.369"E 14°54'1.11"N)

T2: 02 February 2016

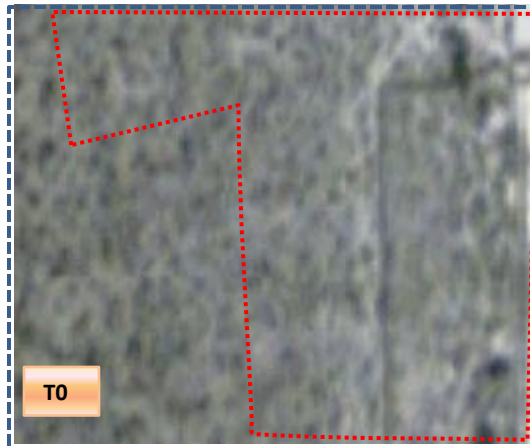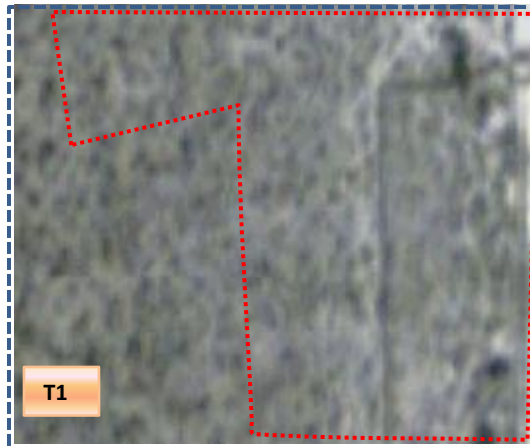# Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

Land cover / T0	Monitoring period (T1) 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	37.93										37.93
Mining/dump											
Agriculture	7.96		1947.43	7.97				1.24	6.07	1.74	1972.41
Plantation Horticulture				24.87							24.87
Forest			2.57		2303.57				0.69	0.53	2307.35
Forest Plantation						2.88					2.88
Barren Rocky											
Scrub	3.56		751.17	46.43				2170.79	9.41	12.06	2993.43
Waterbody-Streams/River									78.46		78.46
Waterbody – Ponds			18.98					4.70	0.06	236.86	260.59
Grand Total	49.44		2720.15	79.27	2303.57	2.88		2176.73	94.69	251.19	7677.91

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

• In T1 770 ha of the agriculture area has increased from forest, 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
T1	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	49.44										**49.44**
Mining/dump											
Agriculture	1.54		2664.86	52.25					1.15	0.35	**2720.15**
Plantation Horticulture				79.27							**79.27**
Forest					2303.57						**2303.57**
Forest Plantation						2.88					**2.88**
Barren Rocky											
Scrub	0.77		51.14	27.35				2092.93	3.11	1.43	**2176.73**
Waterbody-Streams/River									94.69		**94.69**
Waterbody – Ponds			0.48							250.70	**251.19**
Grand Total	**51.75**		**2716.48**	**158.88**	**2303.57**	**2.88**		**2092.93**	**98.94**	**252.48**	**7677.91**

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

• In T2 51 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 / 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 (Units in Hectares)
Built up	51.75										51.75
Mining/dump											
Agriculture	1.00		2617.17	96.90						1.42	2716.48
Plantation Horticulture			1.26	157.62							158.88
Forest			36.77		2266.80						2303.57
Forest Plantation						2.88					2.88
Barren Rocky											
Scrub	0.87		99.23	6.13				1983.61		3.10	2092.93
Waterbody-Streams/River									98.94		98.94
Waterbody – Ponds										252.48	252.48
Grand Total	53.62		2754.43	260.64	2266.80	2.88		1983.61	98.94	257.00	7677.91

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

- In T3 100 ha of the agriculture area has increased from plantations, forest 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	53.62										53.62
Mining/dump											
Agriculture	0.16		2753.80	0.47							2754.43
Plantation Horticulture			16.66	243.98							260.64
Forest			9.26		2257.54						2266.80
Forest Plantation						2.88					2.88
Barren Rocky											
Scrub	0.30		164.88					1818.44			1983.61
Waterbody-Streams/River									98.94		98.94
Waterbody – Ponds										257.00	257.00
Grand Total	54.07		2944.60	244.45	2257.54	2.88		1818.44	98.94	257.00	7677.91

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

- In T4 181 ha of the agriculture area has increased from plantations, forest and 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-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
Built up	54.07										54.07
Mining/dump											
Agriculture	0.97		2932.32	10.15						1.15	2944.60
Plantation Horticulture			1.93	242.52							244.45
Forest			61.57		2195.97						2257.54
Forest Plantation						2.88					2.88
Barren Rocky											
Scrub			139.08					1677.35	0.37	1.64	1818.44
Waterbody-Streams/River									98.94		98.94
Waterbody – Ponds										257.00	257.00
Grand Total	55.04		3134.90	252.67	2195.97	2.88		1677.35	99.31	259.79	7677.91

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

•In T5 141 ha of the agriculture area has increased from plantations, forest 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 20 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 747, 37, 190 & 190 Hectares From T0 to T1, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 1162 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 227 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2018-19 (T5) years.

6. There is a decrease of 1316 Hectares in Scrubland area as compared between 2011-12 (T0) & 2018-19 (T5) years.

7. Farm ponds (20) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (26) verified from the portal.