MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -23/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-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

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-23/2010-11, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is 6,126 ha. It comprises of 7 micro watersheds.

- In the project area 155 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 distinguishable increase in farm ponds, showing 53 new farm ponds or dug out pits with 24 ha increase in the area.

- Major percentage i.e. 54% is covered by the agriculture, 29 % is covered by forest, 3.5 % is covered by plantation and remaining by other land use classes.

PROJECT : ANANTAPURAMU – IWMP-23/2010-11
DISTRICT : ANANTAPURAMU , STATE : ANDHRA PRADESH

- The study area falls in Gudibanda Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 6,126 ha. It comprises of 7 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -II*) projects taking 2018-19 (T5) period satellite images
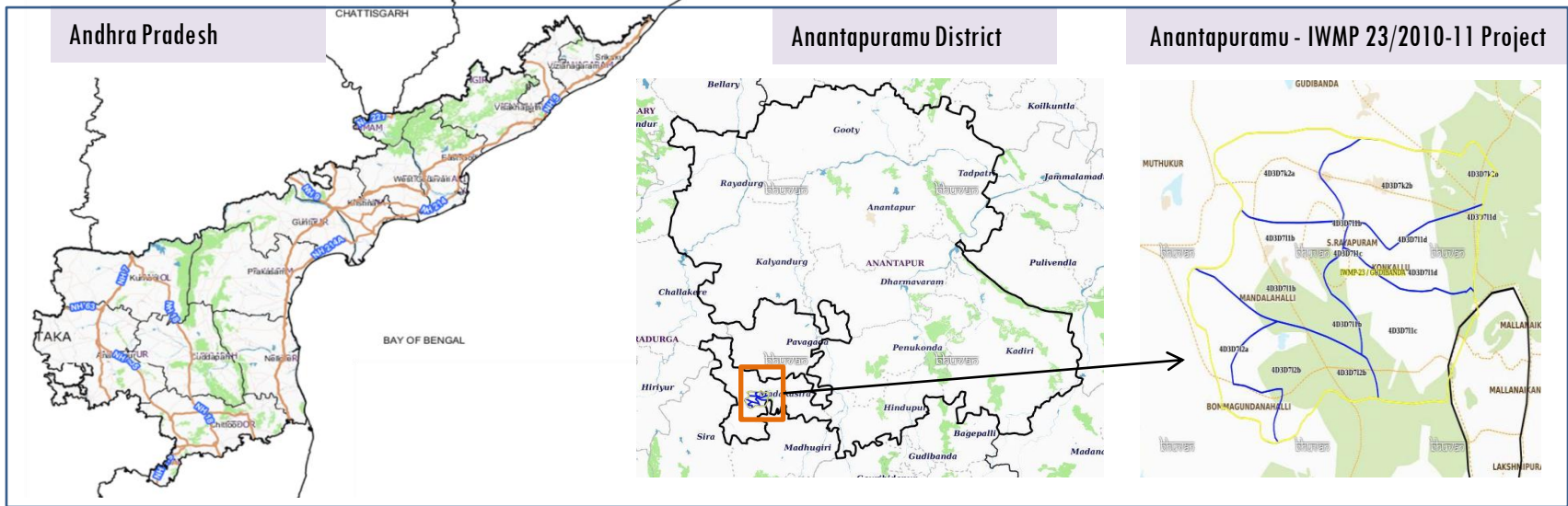
- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- 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.

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	155
4	Detailed Project Report		

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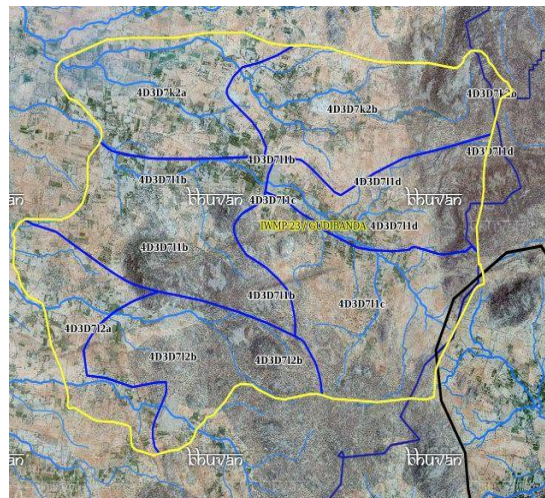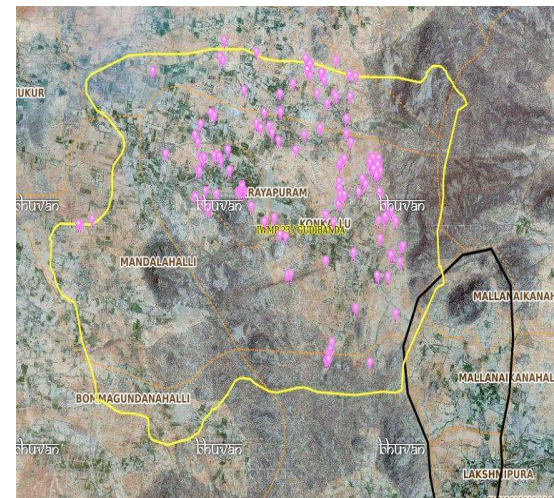

Legend

 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	19	19
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	9	9
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	0	0
10	Civil work-Check dams/Rock fill dam	53	50
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	1	1
14	Livelihood Activities-Plantation/Horticulture	21	15
15	Capacity Building Activities	0	0
16	Entry Point Activity	1	1
17	Others	84	60
	TOTAL	**188**	**155**

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 (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.
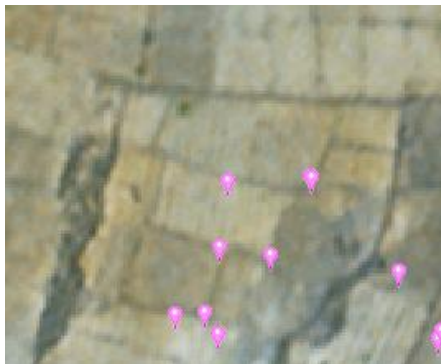
Anantapuramu–IWMP-23/2010-11

2009-10
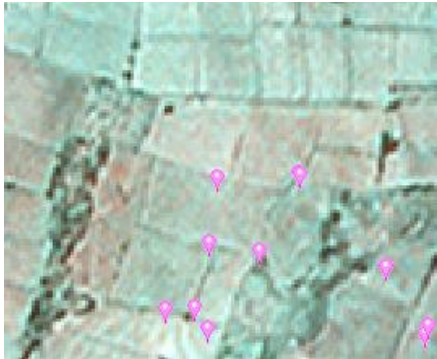
May-2014

November-2016

December-2017

Feb-2018

Drishti Sl.No:129692

Activity : Horticulture

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-23/2010-11

T0	T1	
T0:2010-11	T1: 02 May 2014	Drishti Sl no. 1654056 MWS : 4D3D7l1d

Check dam
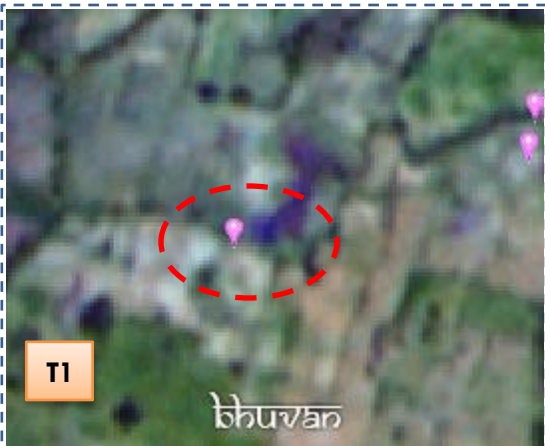
T0	T1	
T0:2010-11	T1: 02 May 2014	Drishti Sl no. 654095 MWS : 4D3D7l1d

Check dam

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-23/2010-11
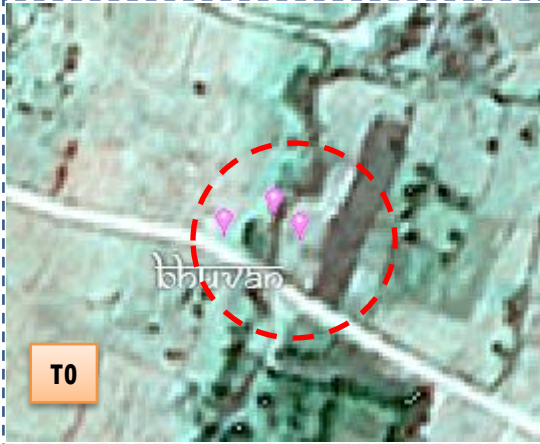
T0:2010-11	T1: T1: 02 May 2014	Drishti Sl no. 1654095 MWS : 4D3D7l1d

Check dam
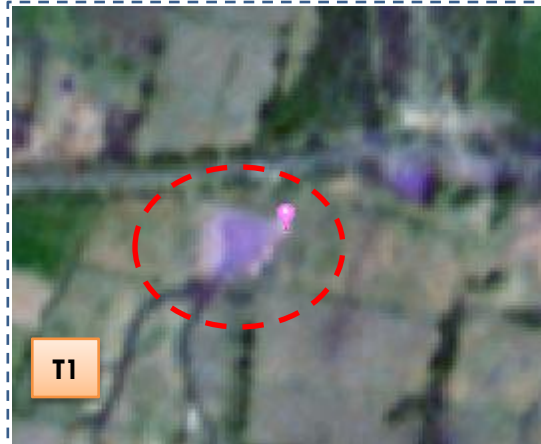
T0:2010-11	T1: 02 May 2014	Drishti Sl no. 1803894 MWS : 4D3D7k2a

Percolation tank

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

Natural Color Composite- 02nd May 2014
Source:NCC,NRSC

Natural Color Composite- 28th October 2015
Source:NCC,NRSC

Natural Color Composite- 03rd February 2017
Source:NCC, LISS-IVNRSC

Natural Color Composite-01St April 2018
Source:LISS-IV,NRSC

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

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
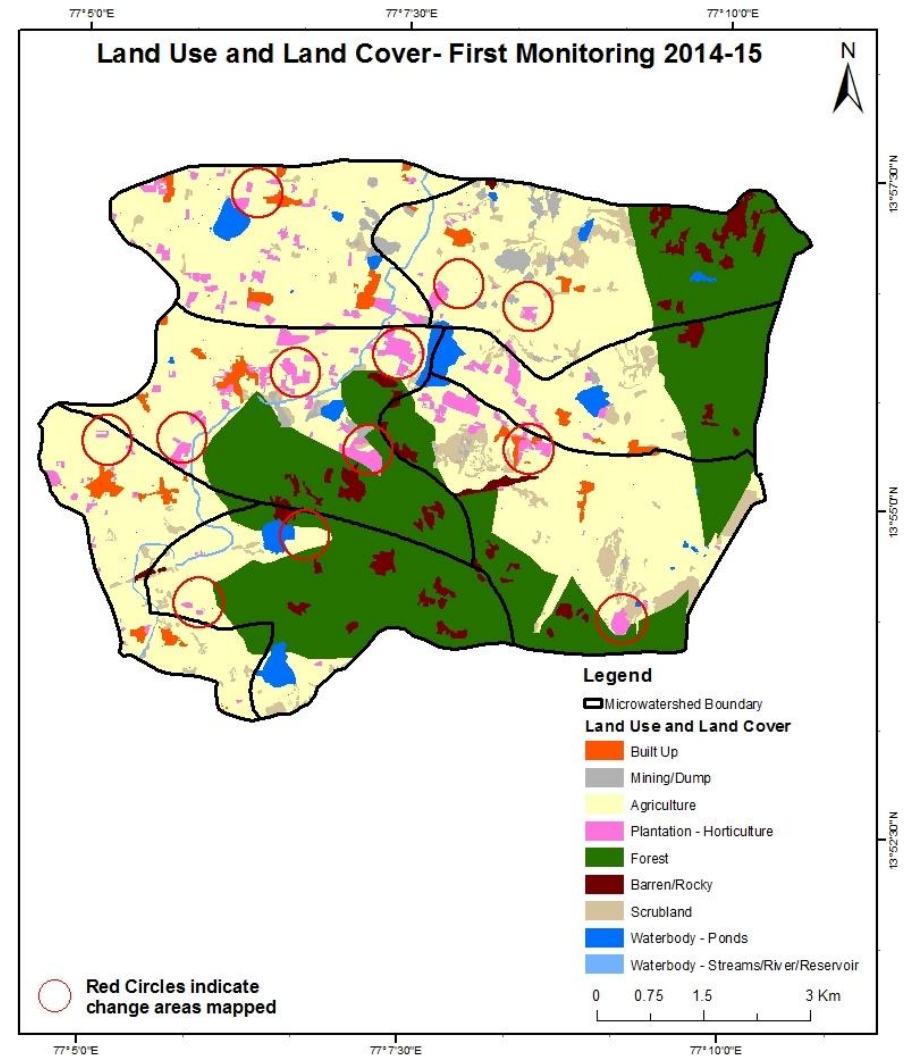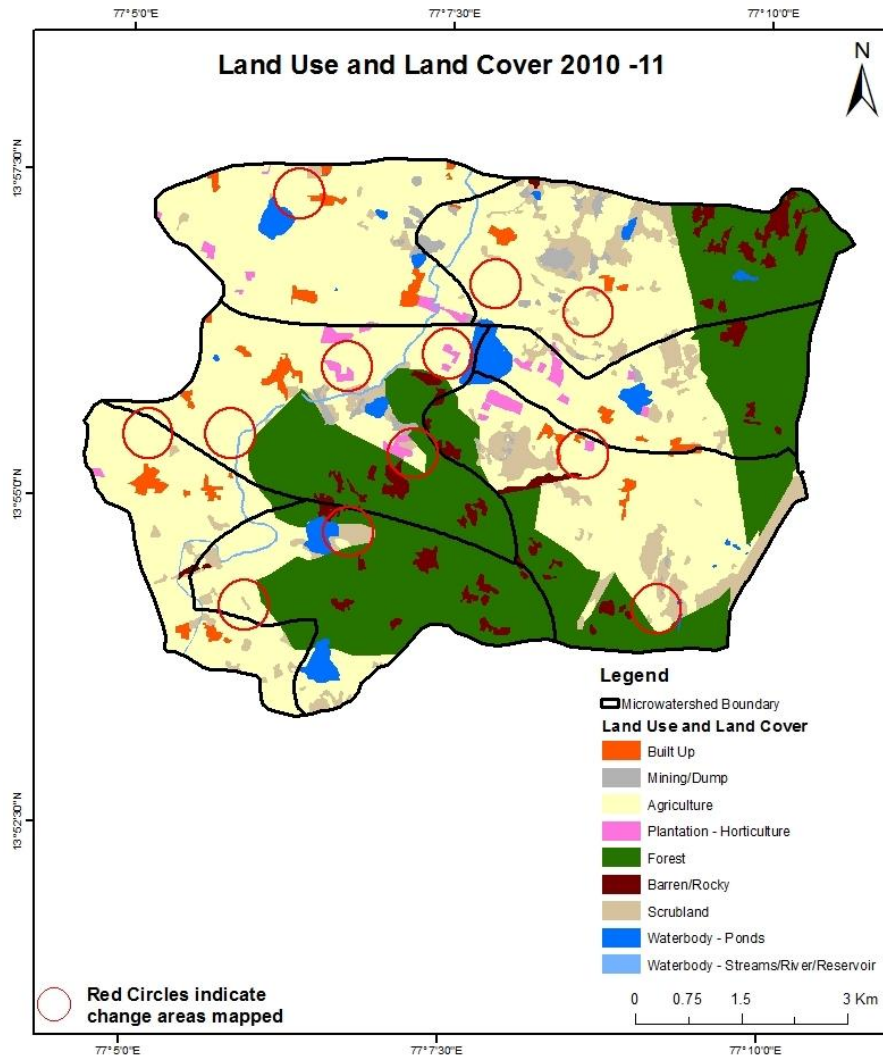
Land Use and Land Cover 2010 -11

Land Use and Land Cover- First Monitoring 2014-15

N

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

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

Red Circles indicate change areas mapped

0   0.75   1.5   3 Km

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
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

Red Circles indicate change areas mapped

0   0.75   1.5   3 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
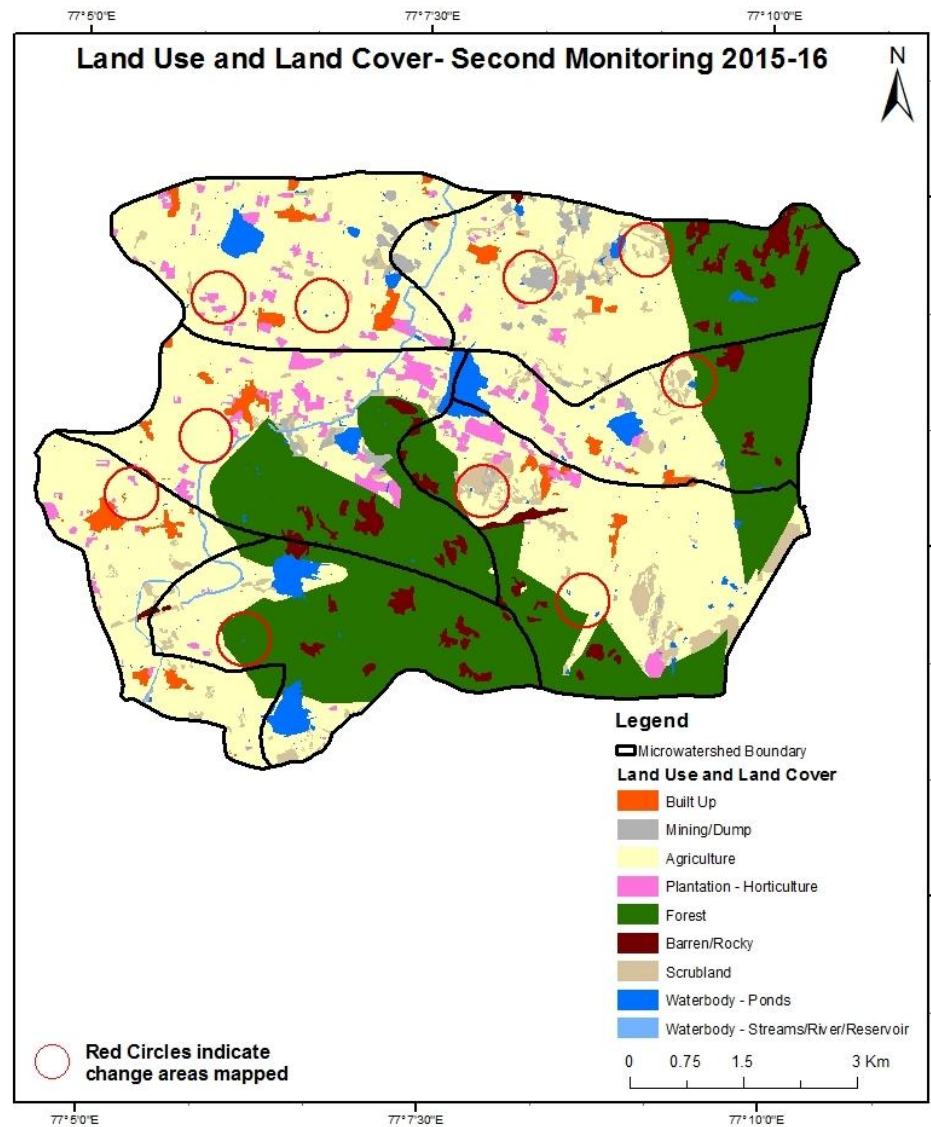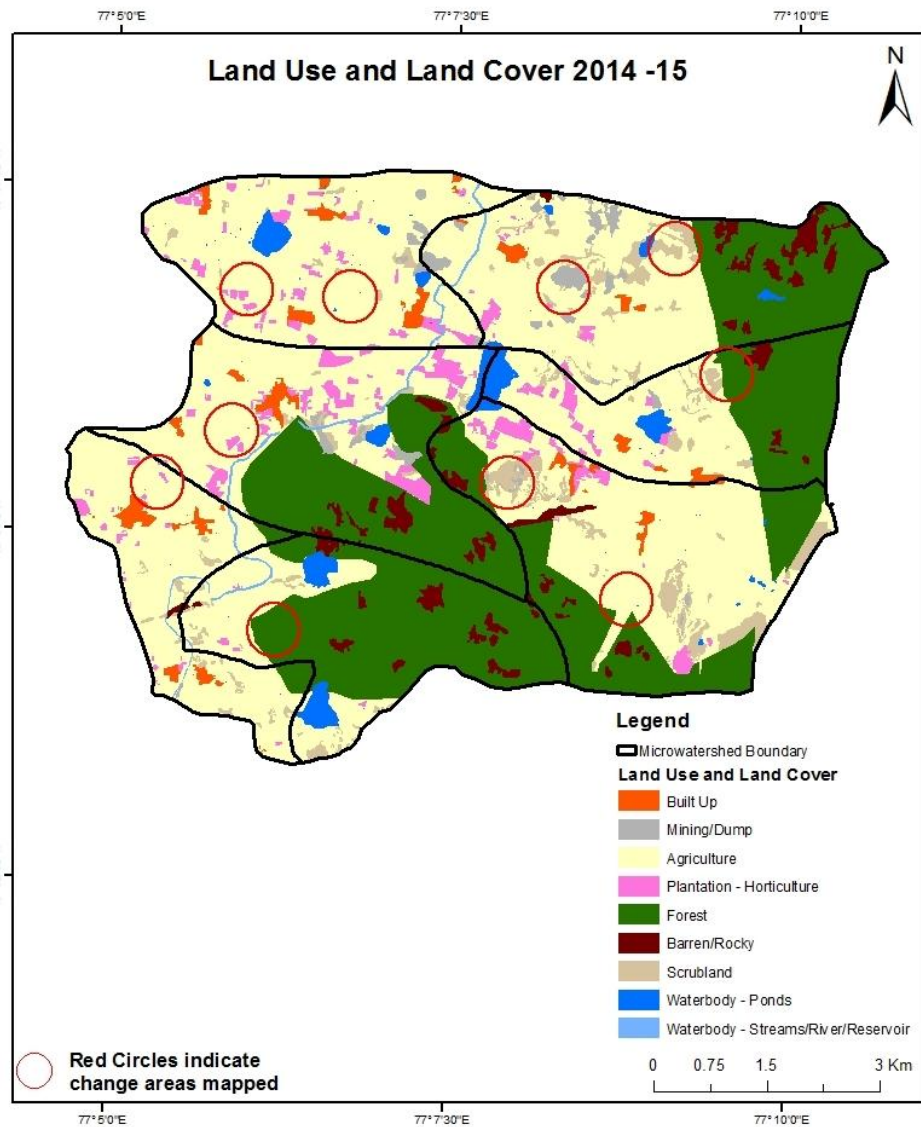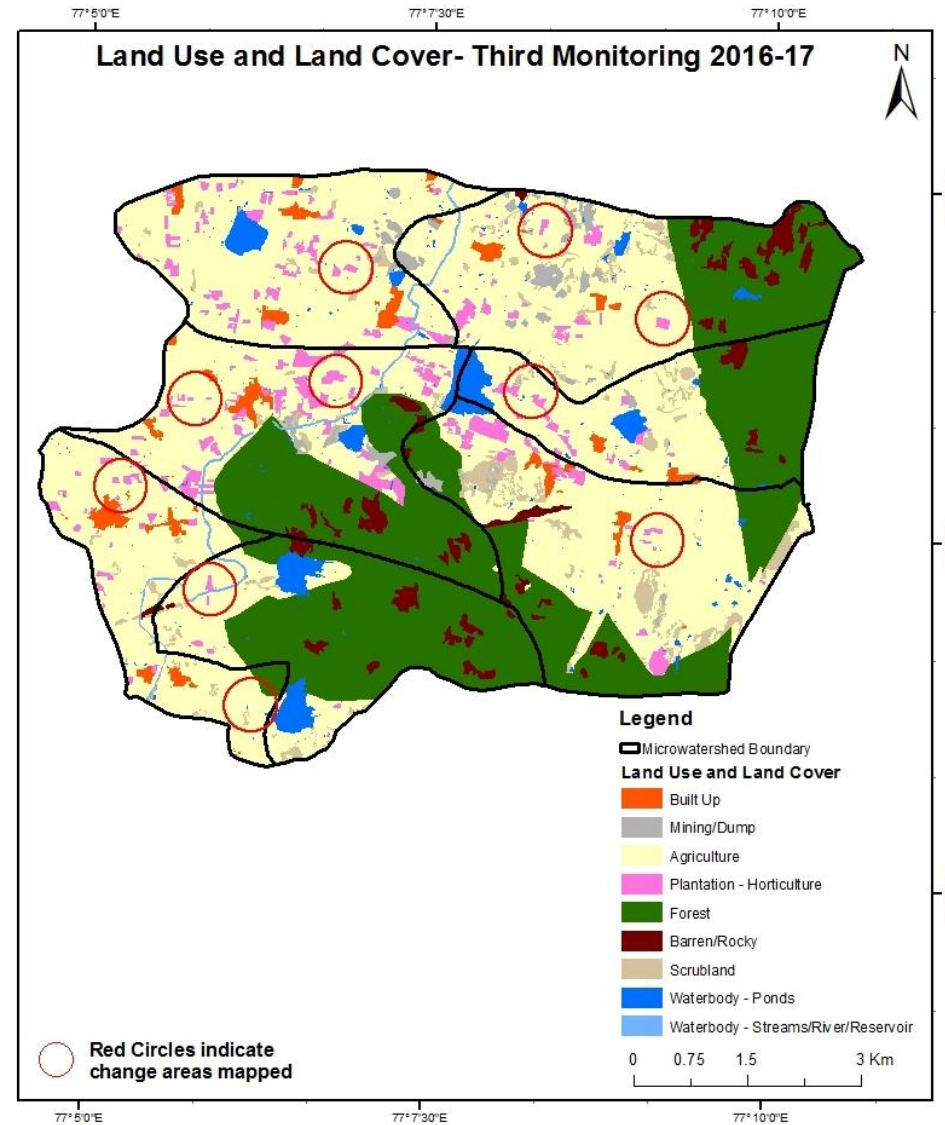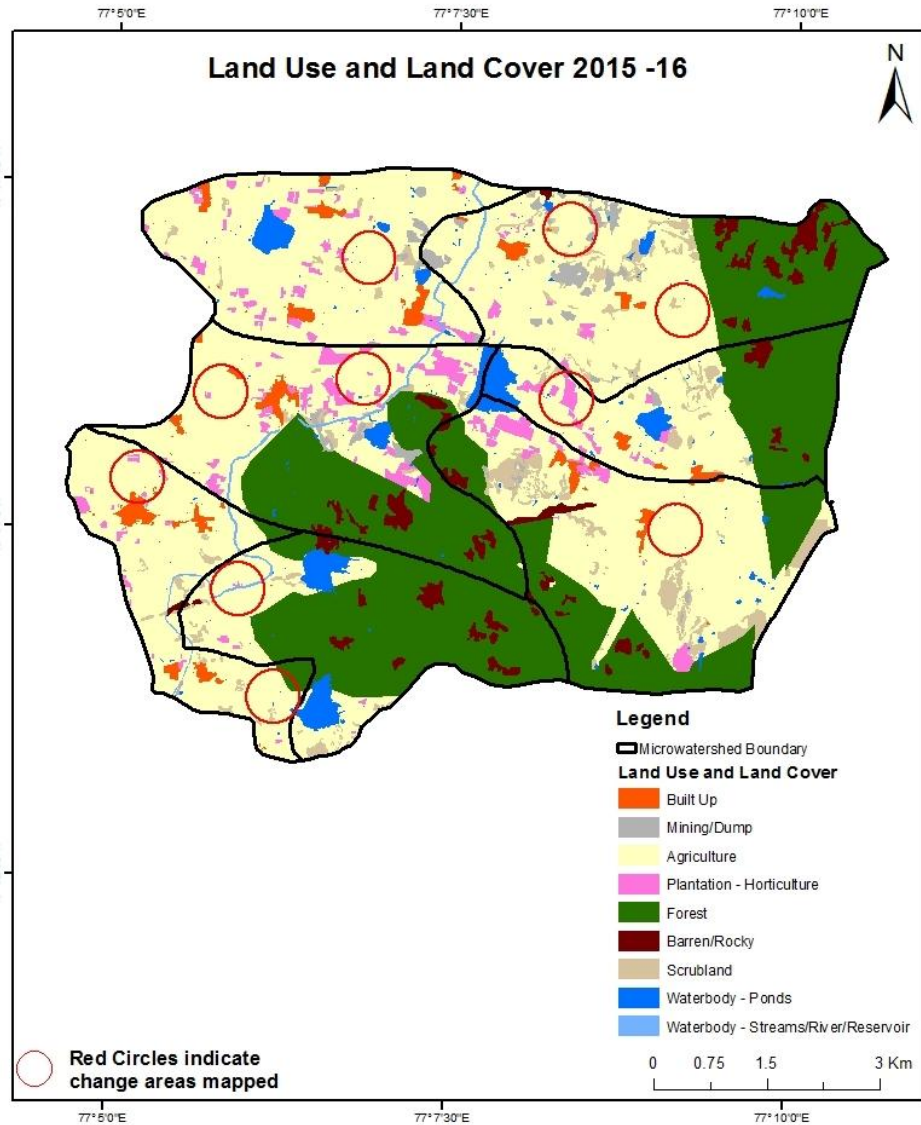## Scale: 1:10000

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

Land Use and Land Cover 2016 -17

Legend
☐ Microwatershed Boundary
Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

◯ **Red Circles indicate change areas mapped**

0   0.75   1.5   3 Km

Land Use and Land Cover- Fourth Monitoring 2017-18

Legend
☐ Microwatershed Boundary
Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

◯ **Red Circles indicate change areas mapped**

0   0.75   1.5   3 Km
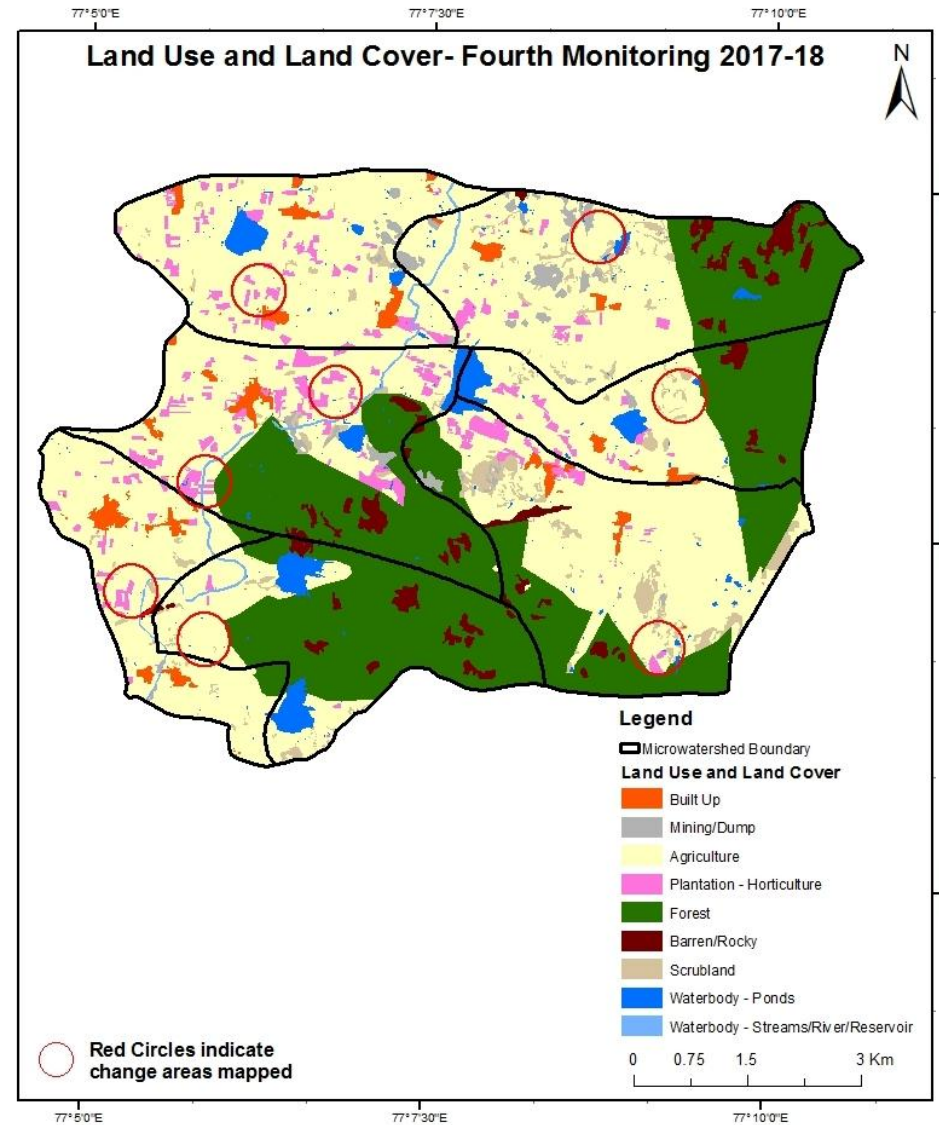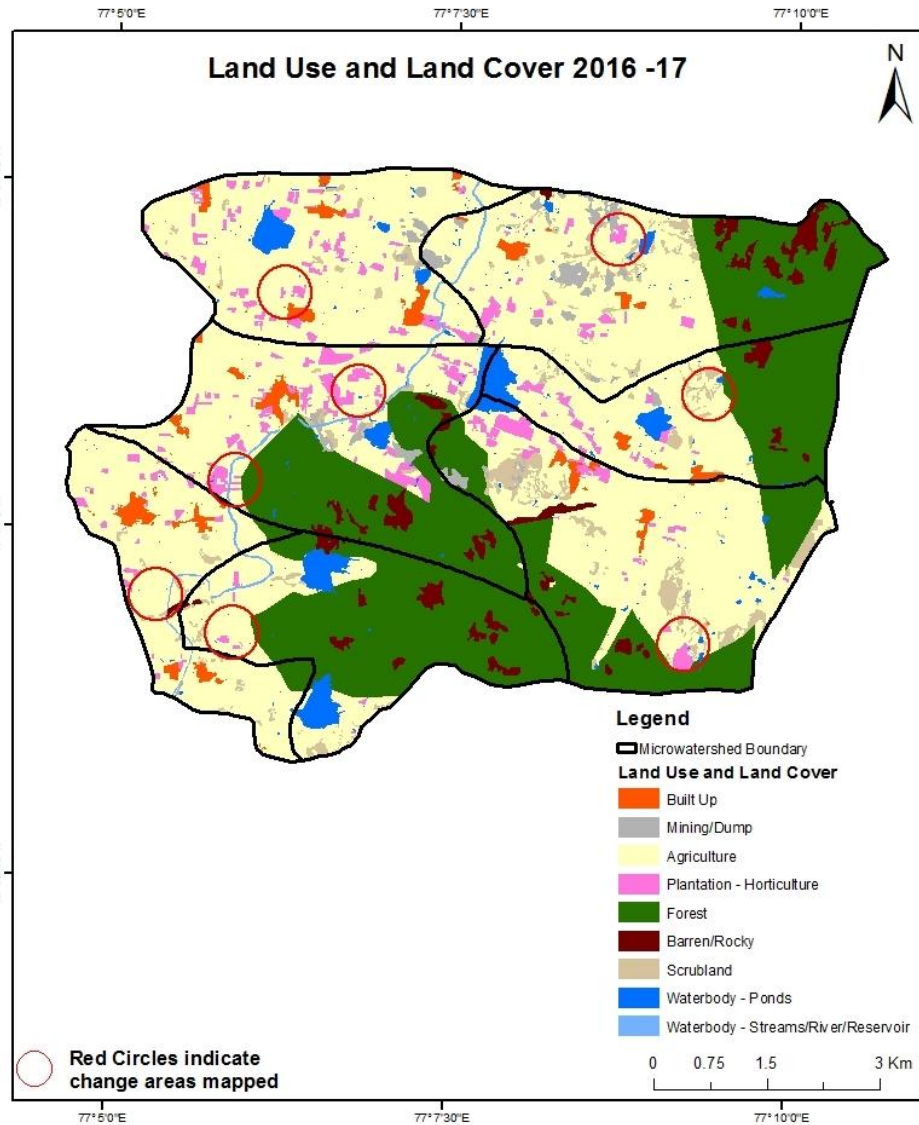
16

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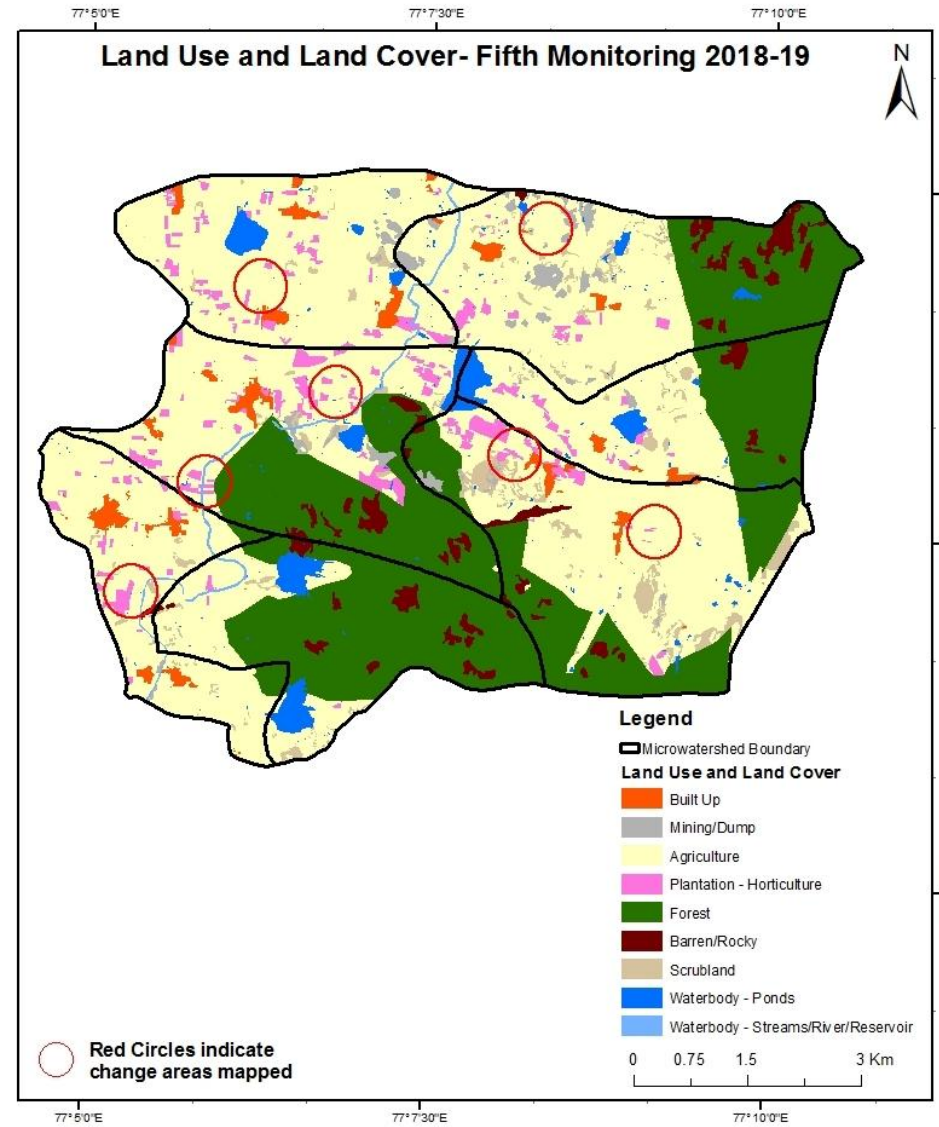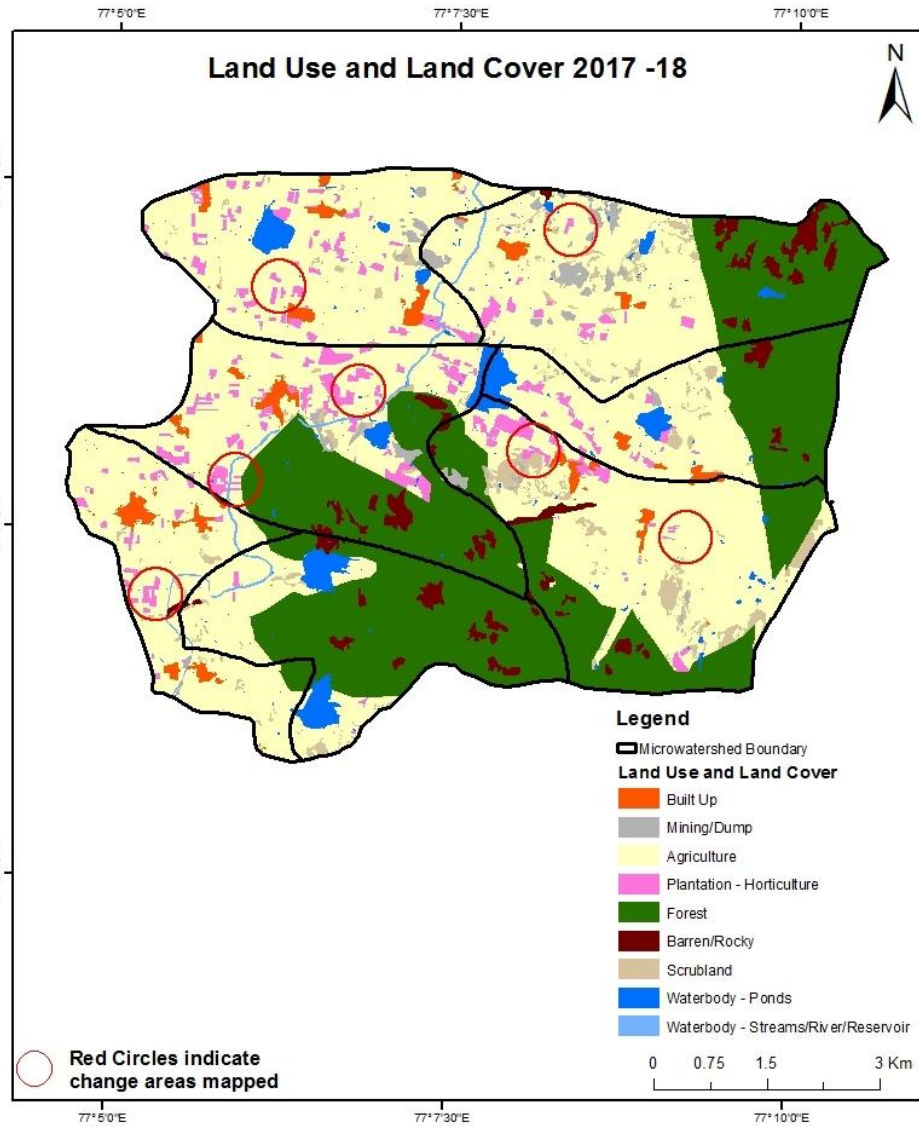
Land Use and Land Cover 2017 -18

Land Use and Land Cover- Fifth Monitoring 2018-19

Legend
- Microwatershed Boundary

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

Red Circles indicate change areas mapped

0   0.75   1.5   3 Km

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

Agriculture to Plantation

T2

T3

T2: 2015-16 (77°5'33.325"E 13°55'51.286"N)

T3: 03 February 2017

Agriculture to Plantation

T2

T3

T2: 2015-16 (77°5'53.161"E 13°55'37.558"N)

T3: 03 February 2017

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

Agriculture to Plantation

T2

T2: 2015-16 (77°6'46.169"E 13°56'7.054"N)

T3
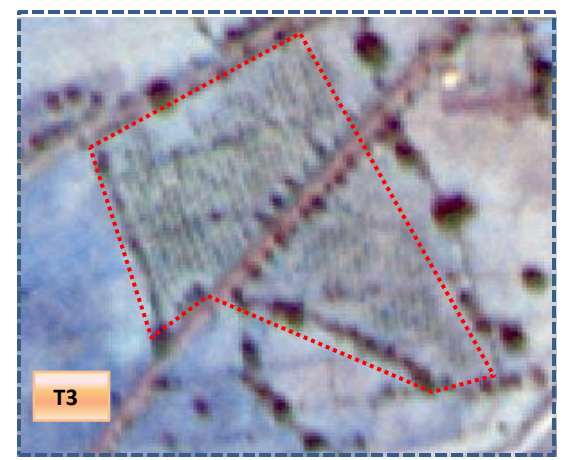
T3: 03 February 2017

Agriculture to Plantation

T2
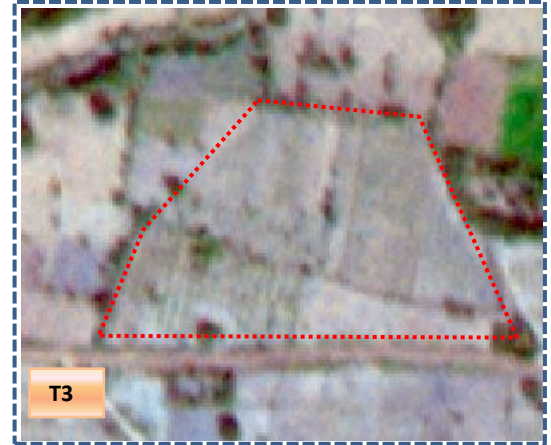
T2: 2015-16(77°6'46.13"E 13°56'7.527"N)

T3

T3: 03 February 2017

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

Agriculture to Plantation

T0: 2010-11(77°5'36.29E 13°55'48.755N)

T1: 02 May 2014

Agriculture to Plantation

T0: 2010-11(77°5'52.067E 13°56'42.348N)

T1: 02 May 2014

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

Agriculture to Water body

T0: 2010-11(77°5'39.742E 13°57'7.465N)

T1: 18 February 2015

Scrub to Agriculture

T0: 2010-11(77°5'39.14E 13°54'33.535N)

T1: 18 February 2015

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

T0	Monitoring period (T1) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	110.61									**110.61**
Mining/dump		74.39	0.29							**74.67**
Agriculture	4.75	1.30	3124.60	144.47			21.09		1.79	**3298.00**
Plantation Horticulture			0.32	72.19					0.03	**72.54**
Forest					1827.60				0.28	**1827.88**
Forest Plantation										
Barren Rocky						172.67				**172.67**
Scrub		7.12	163.98	3.82			224.26		0.09	**399.26**
Waterbody-Streams/River								32.08		**32.08**
Waterbody – Ponds			10.99	0.44					127.23	**138.66**
Grand Total	**115.37**	**82.81**	**3300.18**	**220.91**	**1827.60**	**172.67**	**245.34**	**32.08**	**129.41**	**6126.36**

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 T0 173 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation, scrubland and water body and in T1.

- In T1 175 ha of the agriculture area has increased from plantations, scrub land and water body of T0 and overall 2 ha of the agriculture area has been increased. 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	115.37										115.37
Mining/dump		80.35	1.95							0.51	82.81
Agriculture	3.30	0.71	3253.16	6.77						36.25	3300.18
Plantation Horticulture	1.76		22.20	195.99						0.96	220.91
Forest			1.88		1820.04					5.68	1827.60
Forest Plantation											
Barren Rocky							172.67				172.67
Scrub	0.67	0.51	15.61					226.27		2.28	245.34
Waterbody- Streams/River									32.08		32.08
Waterbody – Ponds			3.95							125.47	129.41
Grand Total	121.09	81.58	3298.74	202.76	1820.04		172.67	226.27	32.08	171.13	6126.36

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

• In T2 45 ha of the agriculture area has increased from plantations, scrub land and water body of T1 and overall 01 ha of the agriculture area has been decreased. 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

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
Built up	121.09										**121.09**
Mining/dump		81.24	0.34								**81.58**
Agriculture	0.83	1.07	3228.48	66.66						1.70	**3298.74**
Plantation Horticulture			20.15	181.33				1.00		0.28	**202.76**
Forest					1820.04						**1820.04**
Forest Plantation											
Barren Rocky		5.78					166.89				**172.67**
Scrub		0.57	34.29					191.35		0.05	**226.27**
Waterbody-Streams/River									32.08		**32.08**
Waterbody – Ponds			2.33					0.23		168.57	**171.13**
Grand Total	**121.92**	**88.66**	**3285.59**	**247.99**	**1820.04**		**166.89**	**192.58**	**32.08**	**170.61**	**6126.36**

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 70 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation and water body and in T3.

- In T3 57 ha of the agriculture area has increased from plantations, scrub land and water body of T2 and overall 13 ha of the agriculture area has been decreased. 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	121.92										**121.92**
Mining/dump		87.16	1.45							0.05	**88.66**
Agriculture	0.87	0.63	3259.89	23.68				0.28		0.23	**3285.59**
Plantation Horticulture			22.31	225.68							**247.99**
Forest			0.68		1819.36						**1820.04**
Forest Plantation											
Barren Rocky							166.89				**166.89**
Scrub			22.45					170.13			**192.58**
Waterbody-Streams/River									32.08		**32.08**
Waterbody – Ponds			6.14							164.47	**170.61**
Grand Total	**122.79**	**87.80**	**3312.93**	**249.36**	**1819.36**		**166.89**	**170.41**	**32.08**	**164.75**	**6126.36**

• 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 25 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation, scrubland and water body and in T4.

• In T4 53 ha of the agriculture area has increased from plantations, scrub land and water body of T3 and overall 27 ha of the agriculture area has been increased. 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

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	122.79										**122.79**
Mining/dump		87.80									**87.80**
Agriculture			3300.70	11.95				0.28			**3312.93**
Plantation Horticulture			47.14	202.22							**249.36**
Forest					1819.36						**1819.36**
Forest Plantation											
Barren Rocky							166.89				**166.89**
Scrub			7.66					162.76			**170.41**
Waterbody-Streams/River									32.08		**32.08**
Waterbody – Ponds			2.02							162.73	**164.75**
Grand Total	**122.79**	**87.80**	**3357.51**	**214.17**	**1819.36**		**166.89**	**163.04**	**32.08**	**162.73**	**6126.36**

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 12 ha of the agriculture area has decreased and it is converted into plantation and scrubland in T5.

- In T5 56 ha of the agriculture area has increased from plantations, scrub land and water body of T4 and overall 44 ha of the agriculture area has been increased. 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 24 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 02, 27 & 44 Hectares From T0 to T1, T3-T4 & T4-T5 respectively and overall increase of 59 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

5. There is an increase of 141 ha of the Plantation/Horticulture area has been increased between 2010-11 (t0) & 2018-19 (T5) years.

6. There is a decrease of 236 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.

7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.