MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

YSR KADAPA -38/2012-13
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

December-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**

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-38/2012-13, YSR Kadapa District of   Andhra Pradesh.   The total geographical area of the project is **6,877** ha. It comprises of 14 micro watersheds.

- In the project area 389 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.

- Water bodies have shown an increase by 35 ha , which correspond to the other land use classes that have been converted into various water bodies in this period..

- Major percentage i.e. 53 % is covered by the agriculture, 26.6% is scrubland, 9.5 % is forest area , 6.2 % is covered by horticulture area remaining by other land use classes.

- The study area falls in Lingala Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **6,877** ha. It comprises of 14 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2012-13 (T0) period (*Batch -1*) projects taking 2020-21 (T5) period satellite images
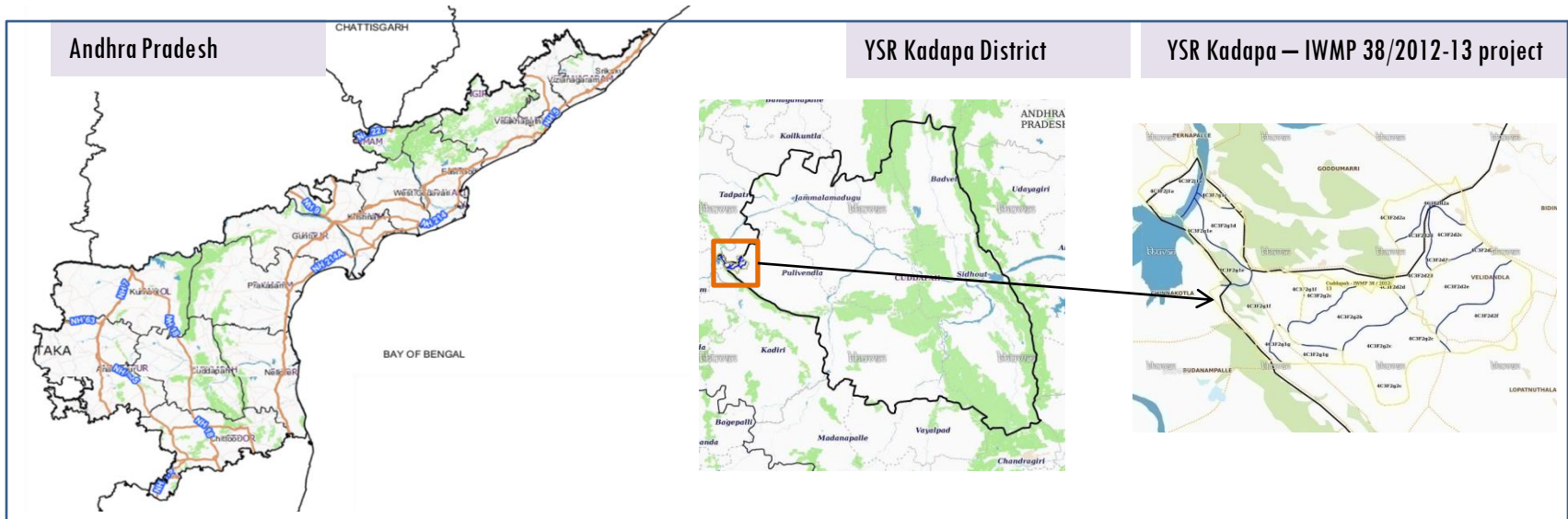
- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .

- 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.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2011-12	2020-21
LISS IV	2012-13		
SCENE 1			25-Sep-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			25-Sep-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	389
4	Detailed Project Report		

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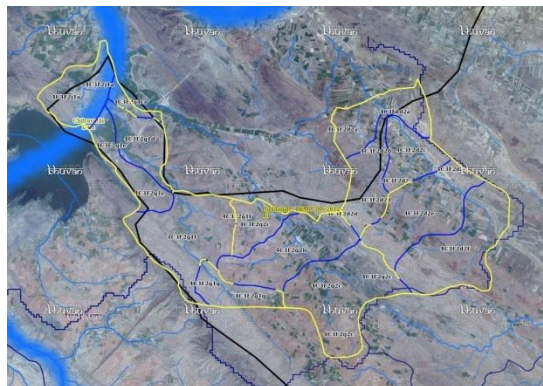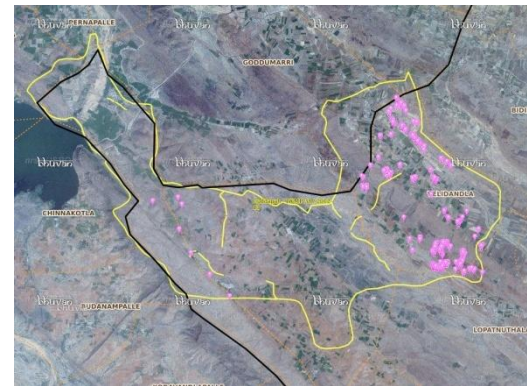

Legend

 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	25	20
2	Afforestation	0	0
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	9	9
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	56	40
11	Civil work-Check dams /Rock fill dam	19	19
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	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	0	0
18	Others	830	300
	TOTAL	**940**	**389**

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 (2012-13) and T5 is 2020-21 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-08th March 2012
Source: LISS-IV,NRSC
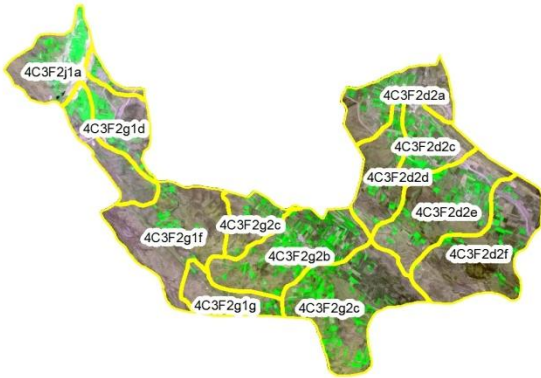
Natural Color Composite- 17th October 2016
Source:NCC,NRSC

Natural Color Composite-30th October 2017
Source:LISS-IV,NRSC

Natural Color Composite- 12thNovember 2018
Source:NCC,NRSC

Natural Color Composite-11thNovember 2019
Source:LISS-IV,NRSC

Natural Color Composite- 25th September 2020
Source:LISS-IV,NRSC

| T0 | Satellite data 2010 |

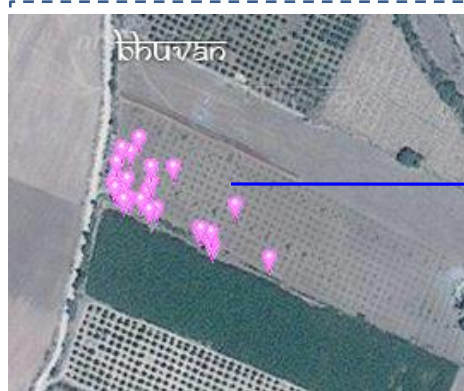| T1 | Satellite data 2013 |

| T2 | Satellite data 2015 |

| T3 | Satellite data 2017 |

| T4 | Satellite data 2018 |

| T5 | Satellite data 2020 |

Drishti Id. 2381138

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-38/2012-13

T0	T1	
T0: 2012-13	T1: 17 October 2016	Drishti Sl no. 1733618 MWS : 4C3F2d2e

Farm Pond

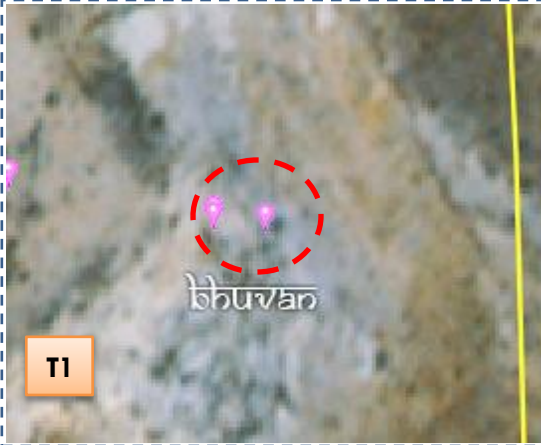| T0	T1	
T0: 2012-13	T1: 17 October 2016	Drishti Sl no. 1793452 MWS : 4C3F2d2e

Farm Pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-38/2012-13
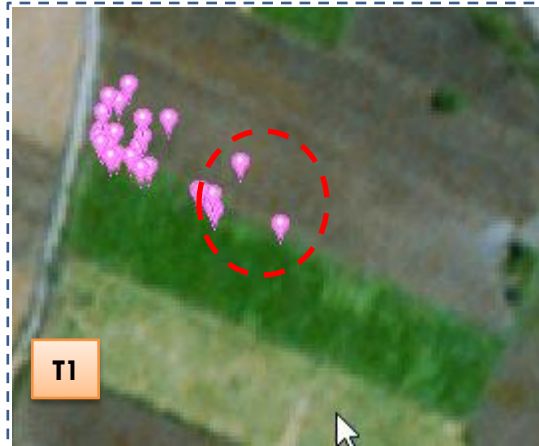

| T0: 2012-13 | T1: 17 October 2016 | Drishti Sl no. 2308183   MWS :4C3F2d2f |

Check Dam

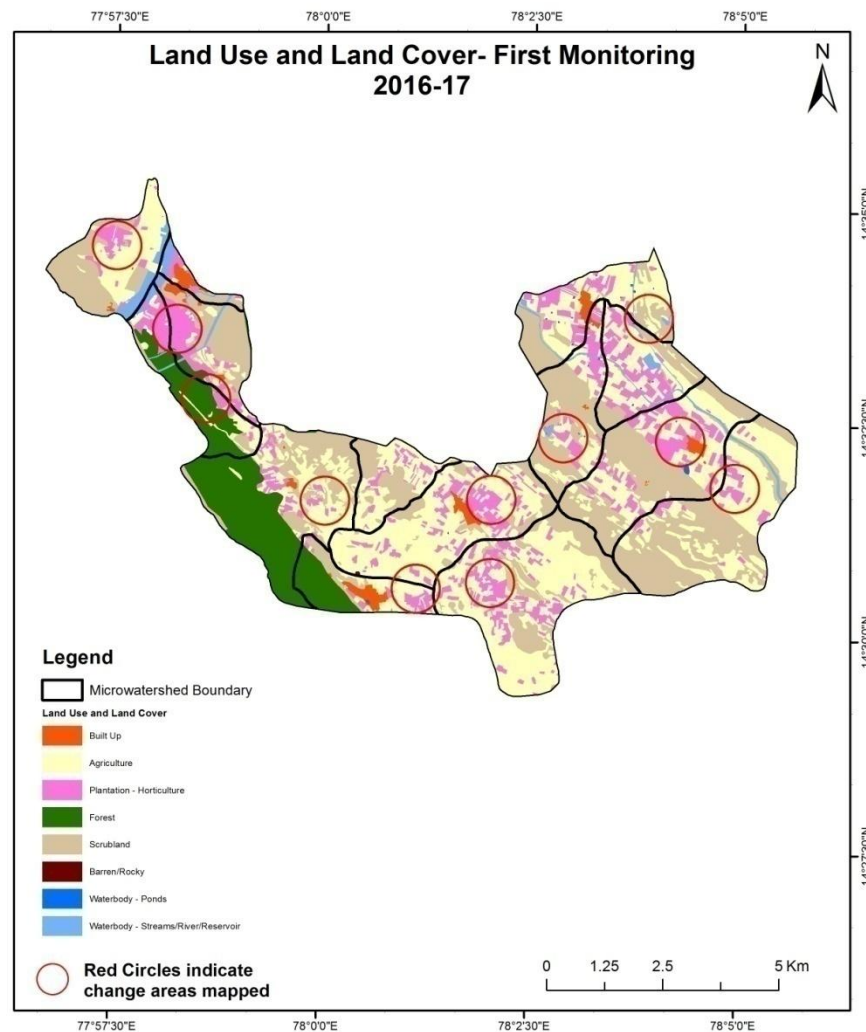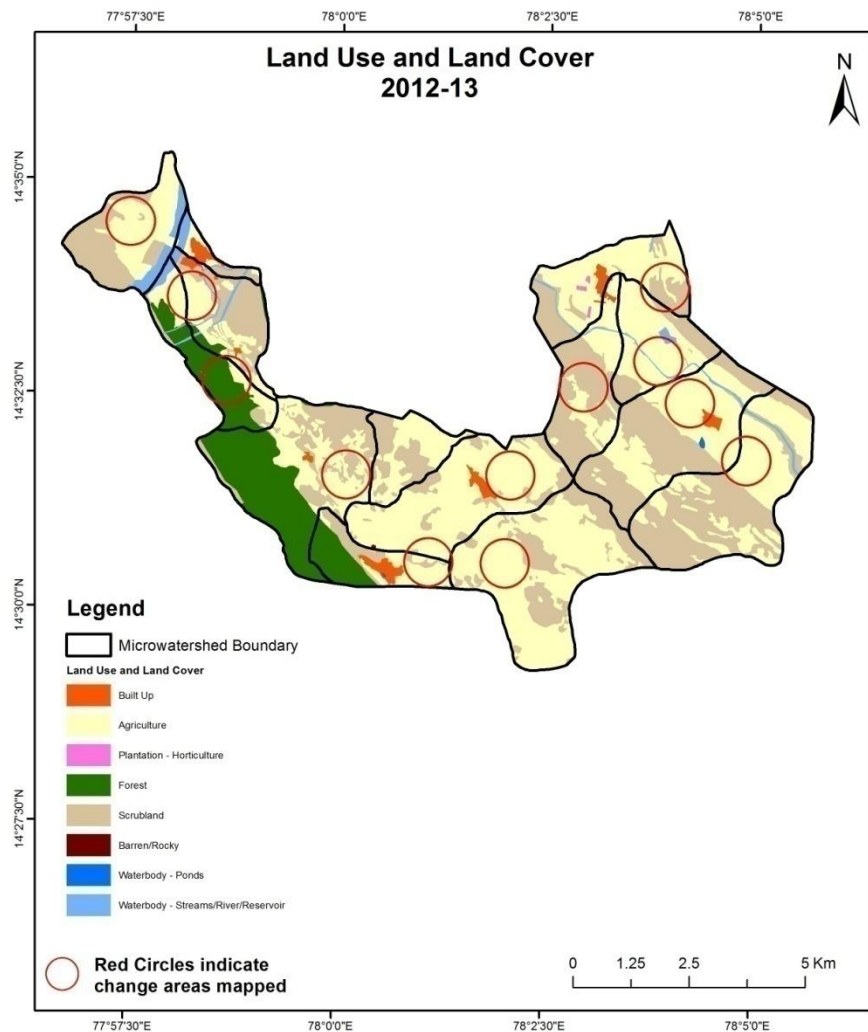| T0: 2012-13 | T1: 17 October 2016 | Drishti Sl no. 2477035   MWS : 4C3F2d2e |

Horticulture

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 (2012-13) and row represents the T5 (2020-21)
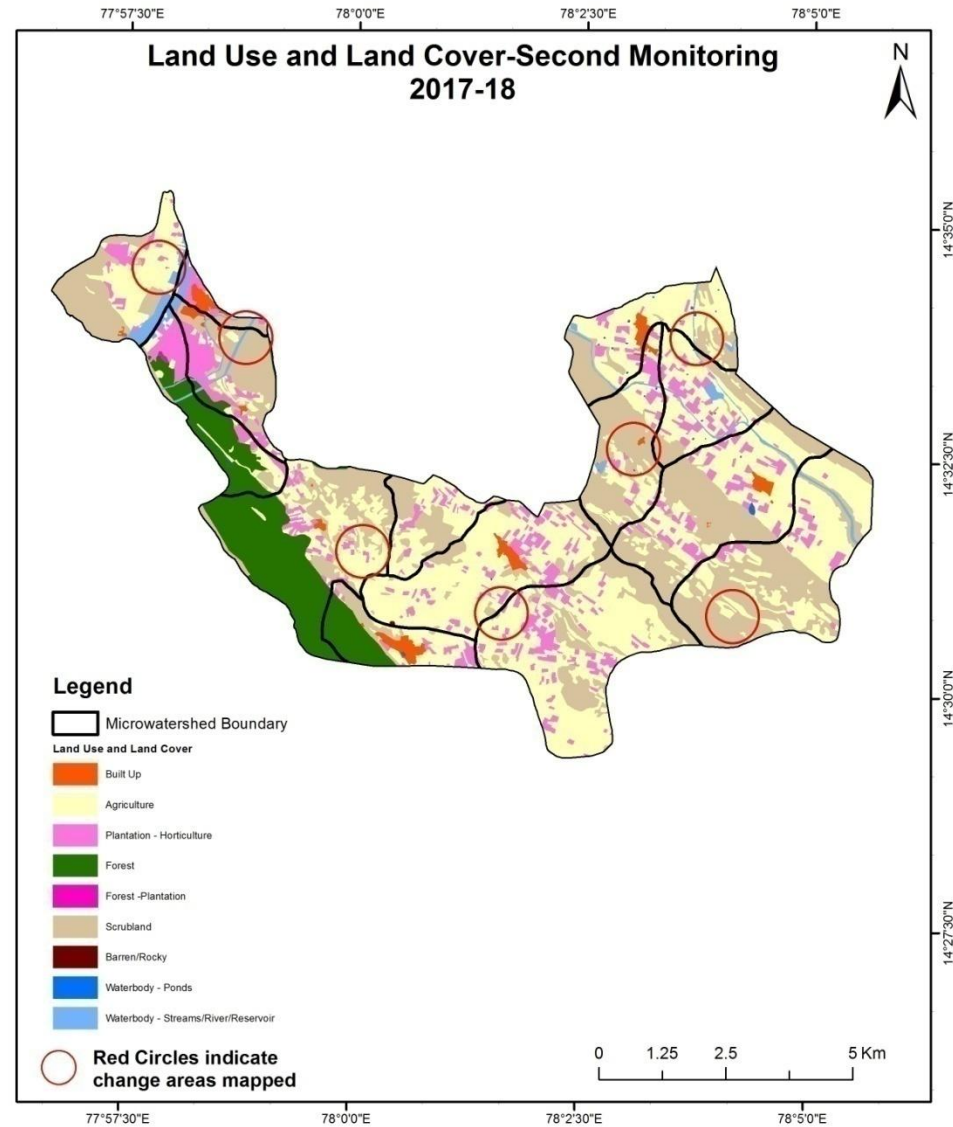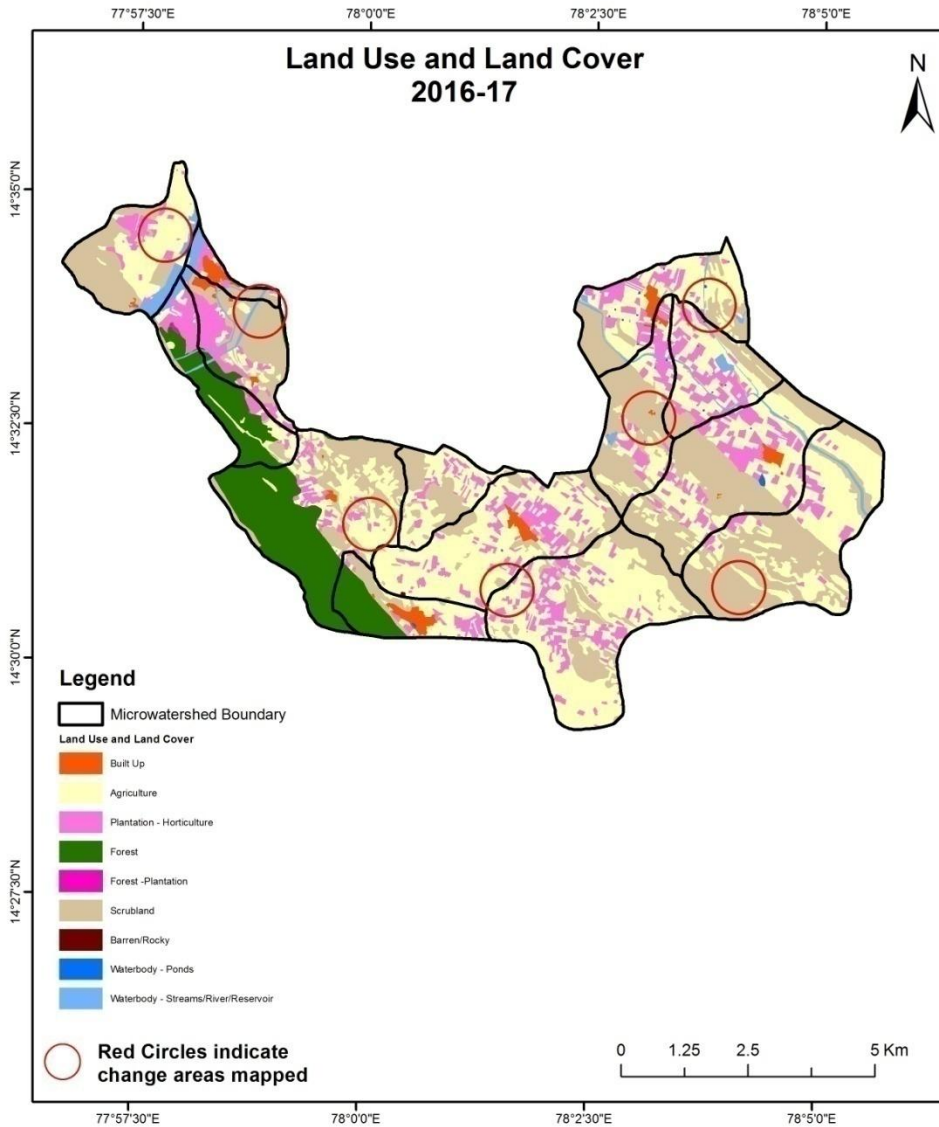
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2012-13 to 2016-17)

Scale: 1:10000

**Land Use and Land Cover
2012-13**

N

Legend

Microwatershed Boundary

Land Use and Land Cover

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

⭕ **Red Circles indicate change areas mapped**

0   1.25   2.5   5 Km

**Land Use and Land Cover- First Monitoring
2016-17**

N

Legend

Microwatershed Boundary

Land Use and Land Cover

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

⭕ **Red Circles indicate change areas mapped**
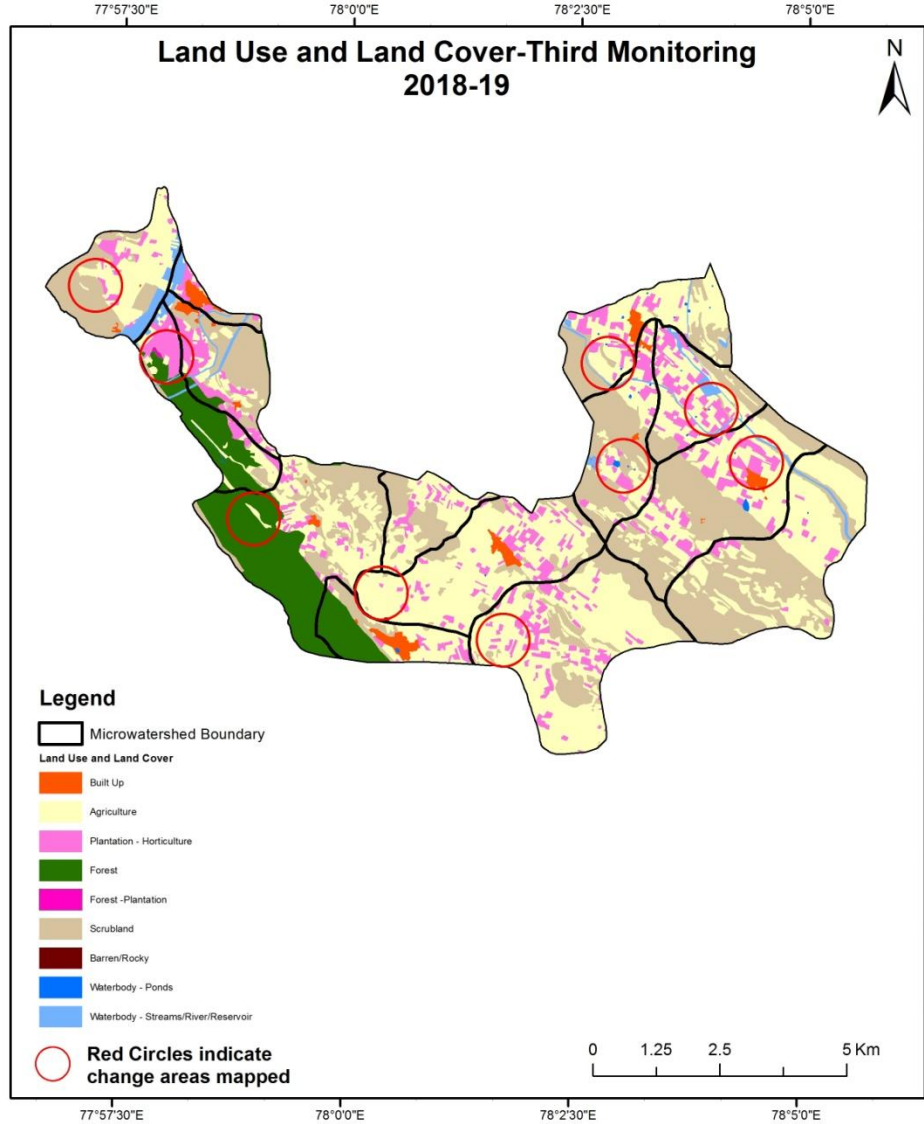
0   1.25   2.5   5 Km

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)
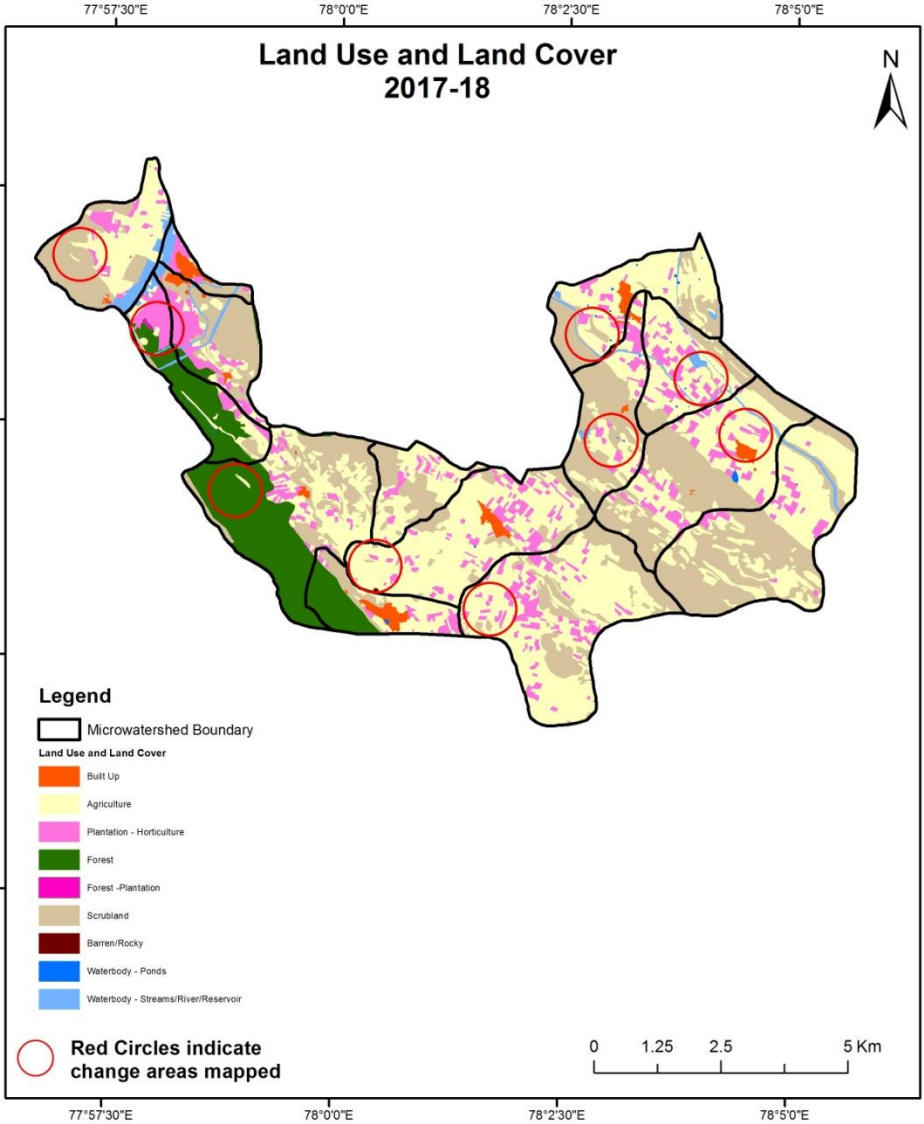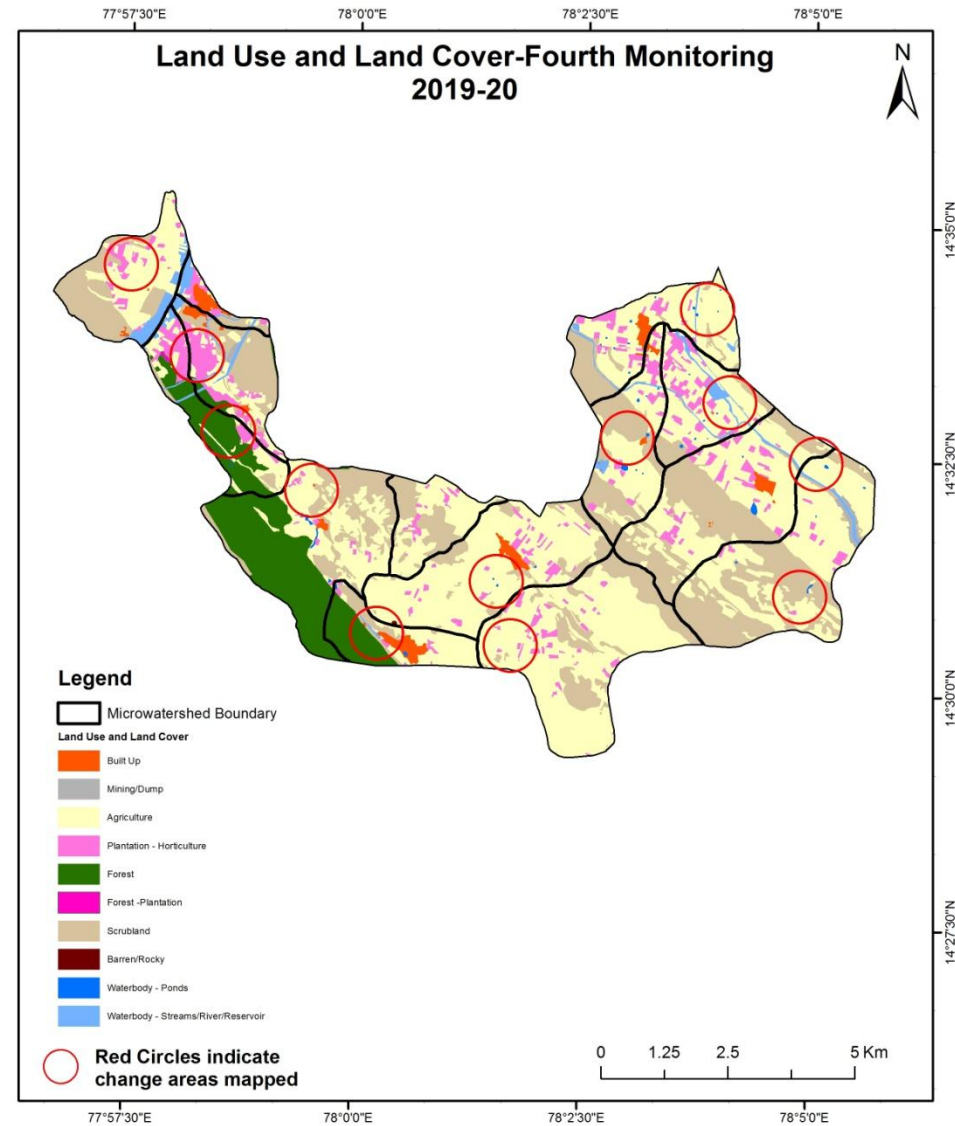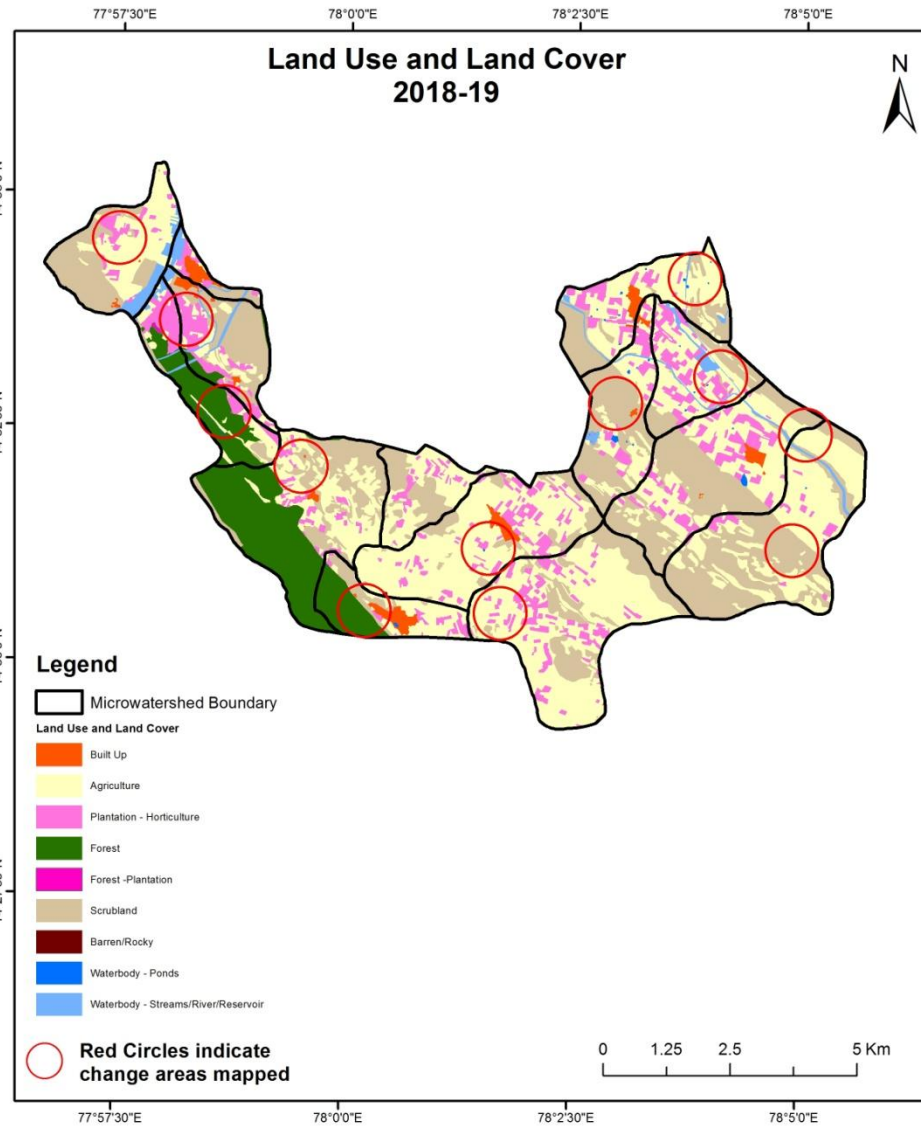## Scale: 1:10000

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

Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)
Scale: 1:10000
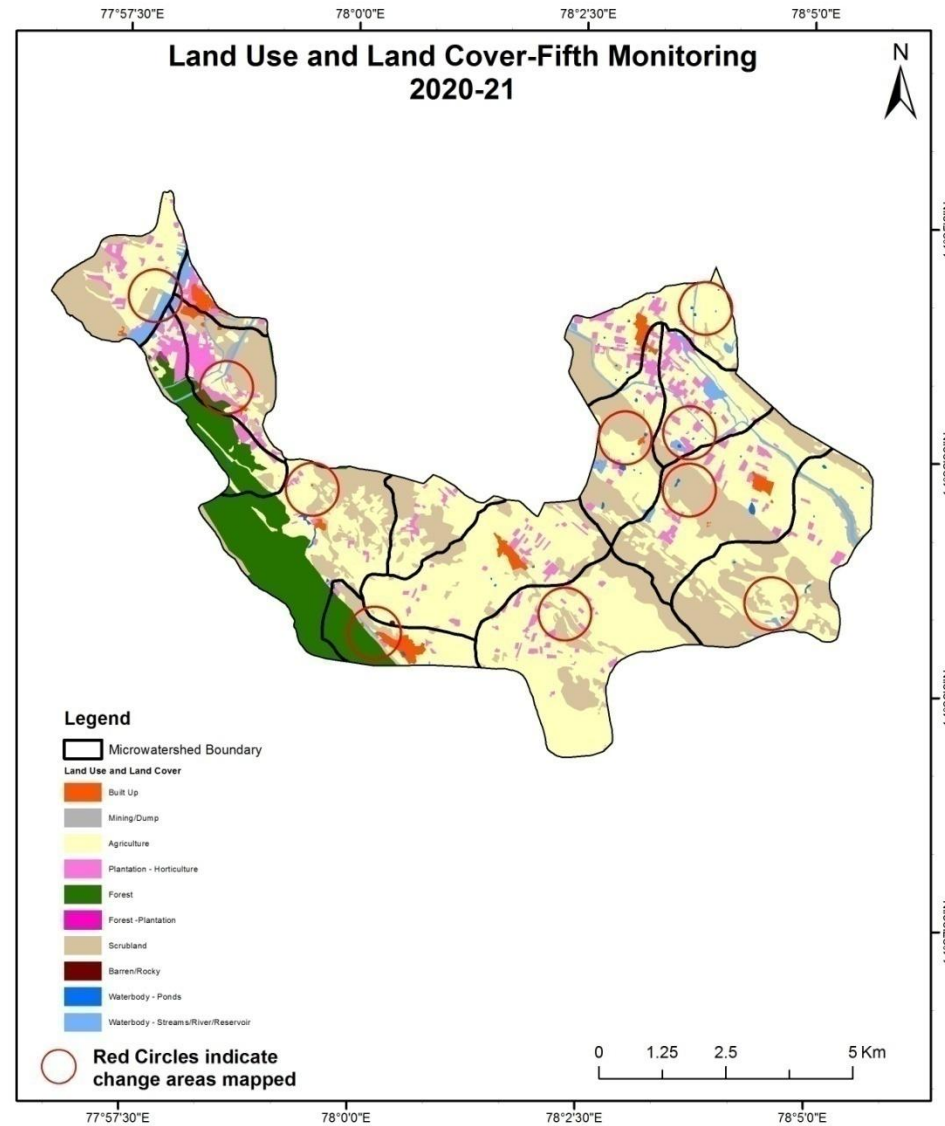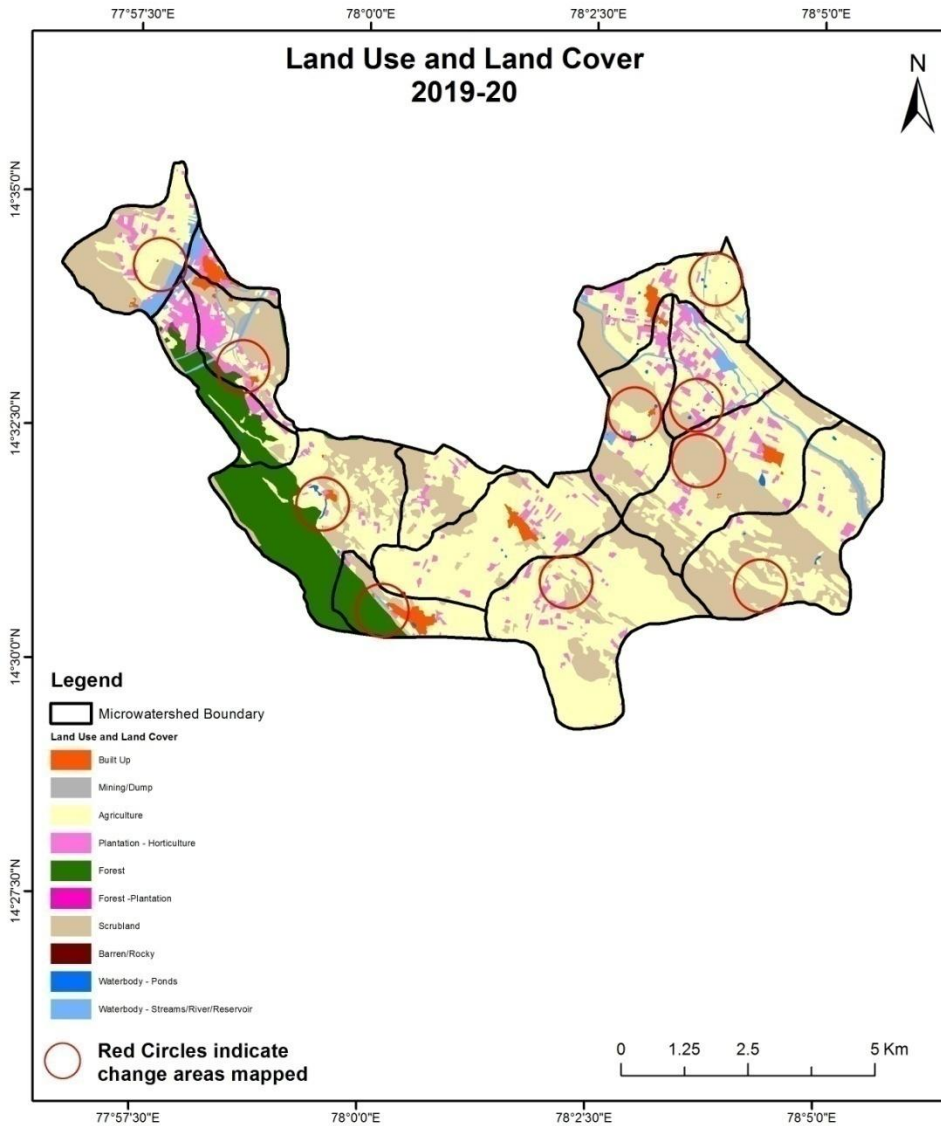
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0:2012-213 (77°58'53.647"E 14°32'36.668"N)

T0: 17 Oct 2016

Agriculture to Farm Pond

T0: 2012-13 (78°2'58.892"E 14°33'59.496"N)

T0: 17 Oct 2016

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

Scrub to Plantation

T0: 2012-13(77°59'50.167"E 14°31'8.933"N)

T1: 17 Oct 2016

Water body to Agriculture
(Inside Chitravati River)

T0: 2012-13 (77°58'3.008"E 14°34'48.345"N)

T1: 17 Oct 2016

Table showing change matrix depicting Land cover transitions during study period-2012-13 to 2016-17

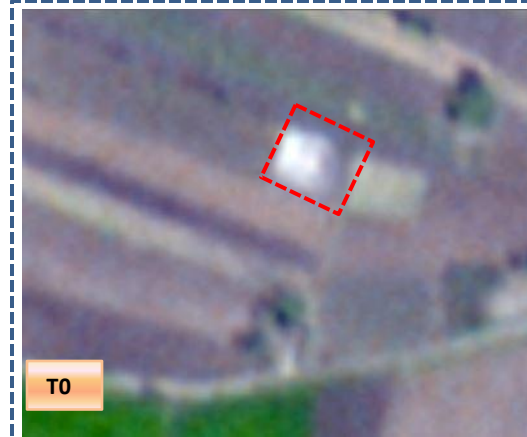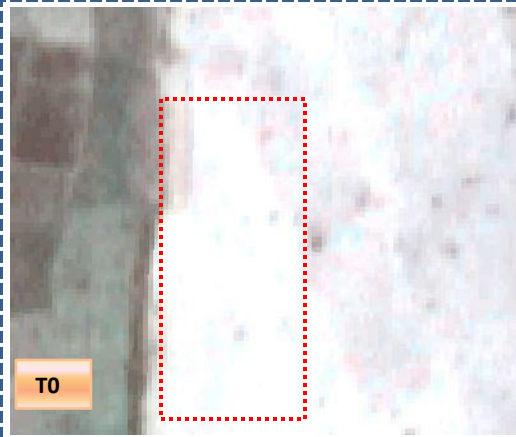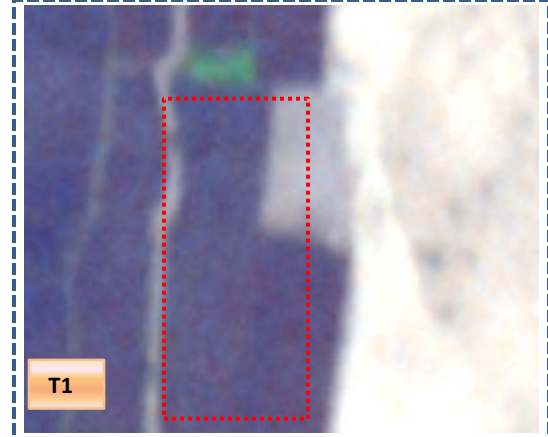| Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	102.34										**102.34**
Mining/dump											
Agriculture	1.43		2569.69	977.38					5.18	3.41	**3557.09**
Plantation Horticulture				5.04							**5.04**
Forest			12.01		668.98	1.89					**682.88**
Forest Plantation											
Barren Rocky							0.92				**0.92**
Scrub	3.83		164.45	11.12				2196.69	7.26	0.22	**2383.57**
Waterbody-Streams/River			7.96	2.67					131.75		**142.38**
Waterbody – Ponds										3.48	**3.48**
Grand Total	**107.60**		**2754.10**	**996.22**	**668.98**	**1.89**	**0.92**	**2196.69**	**144.19**	**7.12**	**6877.69**

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

• In T1 176 ha of the agriculture area has increased from forest, scrubland and water body of T2. The additional agriculture are coming from waterbody in T1 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

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	Units in Hectares Grand Total
Built up	107.60										107.60
Mining/dump											
Agriculture			2604.01	146.57				0.64			2751.23
Plantation Horticulture			393.85	607.65							1001.50
Forest				0.44	667.33					0.80	668.57
Forest Plantation											
Barren Rocky							0.92				0.92
Scrub	0.74		6.56	0.77				2190.10			2198.16
Waterbody-Streams/River			5.99						136.72		142.71
Waterbody – Ponds										7.01	7.01
Grand Total	108.34		3010.41	755.43	667.33		0.92	2190.74	136.72	7.81	6877.69

• 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 147 ha of the agriculture area has decreased and it is converted into plantations and water body in T2.

• In T2 400 ha of the agriculture area has increased from plantations, 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-2017-18 to 2018-19

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	Units in Hectares Grand Total
Built up	108.34										**108.34**
Mining/dump											
Agriculture			2886.83	113.56					8.23	1.79	**3010.41**
Plantation Horticulture			59.24	695.46					0.73		**755.43**
Forest			6.83		660.49						**667.33**
Forest Plantation											
Barren Rocky							0.92				**0.92**
Scrub			29.94					2159.24	1.35	0.20	**2190.74**
Waterbody-Streams/River			0.78	0.70					135.23		**136.72**
Waterbody – Ponds										7.81	**7.81**
Grand Total	**108.34**		**2983.64**	**809.72**	**660.49**		**0.92**	**2159.24**	**145.54**	**9.81**	**6877.69**

• 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 123 ha of the agriculture area has decreased and it is converted into plantations and water body in T3.

• In T3 96 ha of the agriculture area has increased from plantations, forest, 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-2018-19 to 2019-20

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 (Units in Hectares)
Built up	108.34										108.34
Mining/dump											
Agriculture			2973.16	5.87						4.61	2983.64
Plantation Horticulture			343.62	465.91						0.19	809.72
Forest			5.23		655.27						660.49
Forest Plantation											
Barren Rocky							0.92				0.92
Scrub		19.07	240.97					1893.33	4.23	1.65	2159.24
Waterbody-Streams/River									145.54		145.54
Waterbody – Ponds										9.81	9.81
Grand Total	108.34	19.07	3562.98	471.78	655.27		0.92	1893.33	149.77	16.26	6877.69

• 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 10 ha of the agriculture area has decreased and it is converted into plantations and water body in T4.

• In T4 589 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-2019-20 to 2020-21

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	108.34										**108.34**
Mining/dump		19.07									**19.07**
Agriculture			3541.48	3.32					8.15	1.24	**3554.19**
Plantation Horticulture			43.93	424.80							**468.73**
Forest					655.27						**655.27**
Forest Plantation						1.89					**1.89**
Barren Rocky							0.92				**0.92**
Scrub			60.02					1834.88	5.54	0.89	**1901.33**
Waterbody-Streams/River			1.73	0.51					149.20		**151.44**
Waterbody – Ponds										16.54	**16.54**
Grand Total	**108.34**	**19.07**	**3647.16**	**428.62**	**655.27**	**1.89**	**0.92**	**1834.88**	**162.90**	**18.66**	**6877.69**

• 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 plantations and water body in T5.

•In T5 103 ha of the agriculture area has increased from plantations, scrubland and water body 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 35 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.

4. There is an increase of 259, 579 & 92 Hectares from T1-T2, T3-T4 & T4-T5 and there is a decrease of 802 & 26 Hectares from T0-T1 & T2-T3 respectively and overall increase of 90 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.

5. There is an **increase of 423 Hectares in plantation/horticulture area** from 2012-13 (T0) & 2020-21 (T5) years.

6. There is a decrease of 548 Hectares in Scrubland area as compared between 2012-13 (T0) & 2020-21 (T5) years.

7. Farm ponds (40) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (56) verified from the portal.