MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

Srikakulam -12/2012-13
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**

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-12/2012-13, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **4,167** ha. It comprises of 10 micro watersheds.

- In the project area 115 Drishti photos were uploaded showing agriculture/horticulture, afforestation, check dams/checks & plugins, Drainage treatments of Nala Revetment, loose boulder structures etc, and remaining showing other activities.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 1 new farm ponds or dug out pits and 54 check dams and drainage treatments, Water bodies have shown an increase by 47 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.

- Major percentage i.e. 65 % is covered by the agriculture, 10 % is covered by forest, 5.4 % is covered by scrubland and remaining by other land use classes.

- The study area falls in Kothuru Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is **4,167** ha. It comprises of 10 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.
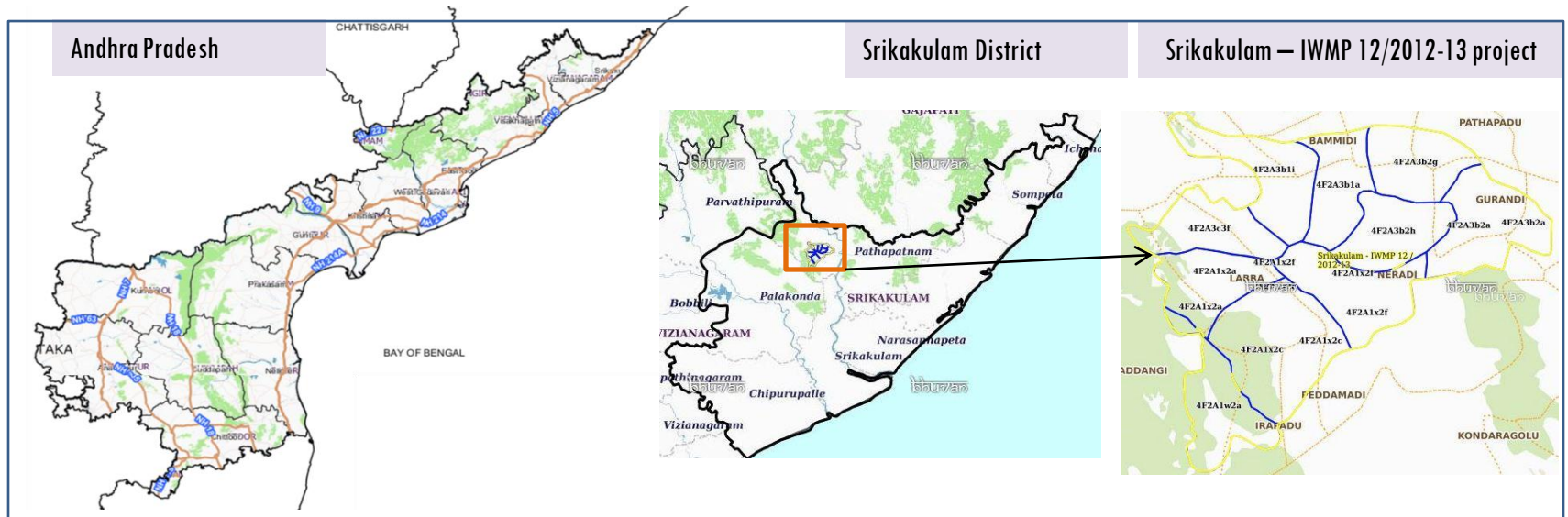
- The climate of the region is generally tropical, the mean maximum temperature is 30-40°C April-May and the mean minimum temperature is 17.4°C December-January during the summer season till the onset of the South-West monsoon the heat is oppressive and the day temperature is May sometimes go about 43°C.

- The rainfall in the region is considerably more in the hilly areas as compared to the plains, the annual normal rainfall is 1131 mm (i.e., 61% from South West monsoon and 2.2% from Northeast monsoon) is shared by summer showers and winter rains.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2011-12	2020-21
LISS IV	2012-13		
SCENE 1			12-Jan-21
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			12-Jan-21
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	36
4	Detailed Project Report		

Natural Color Composite overlaid with Project boundaries and high detail stream network
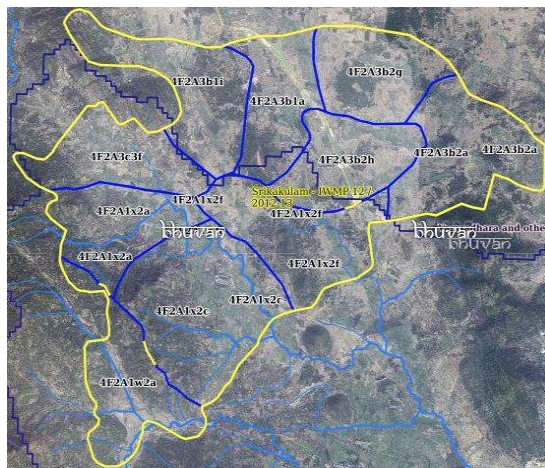
Legend
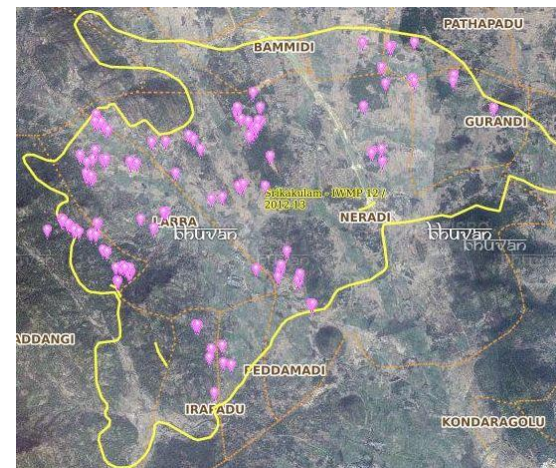
 Drainage (1:10000 Scale)

 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	7	7
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	Gabion structure	0	0
9	Checks & Plugs	28	20
10	Farm ponds/Dug out pit	1	1
11	Civil work-Check dams /Rock fill dam	34	34
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	0	0
15	Soil moisture conservation	0	0
16	Production system and micro-enterprises	1	1
17	Entry Point Activity	12	12
18	Others	54	40
	TOTAL	**137**	**115**

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.
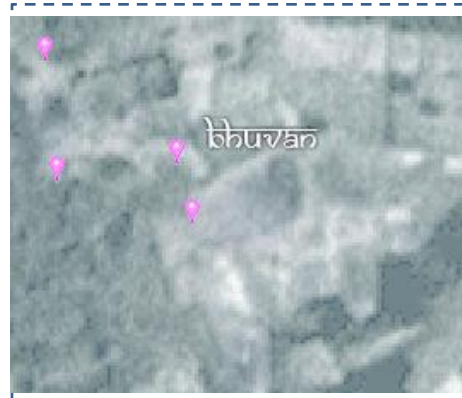
Natural Color Composite
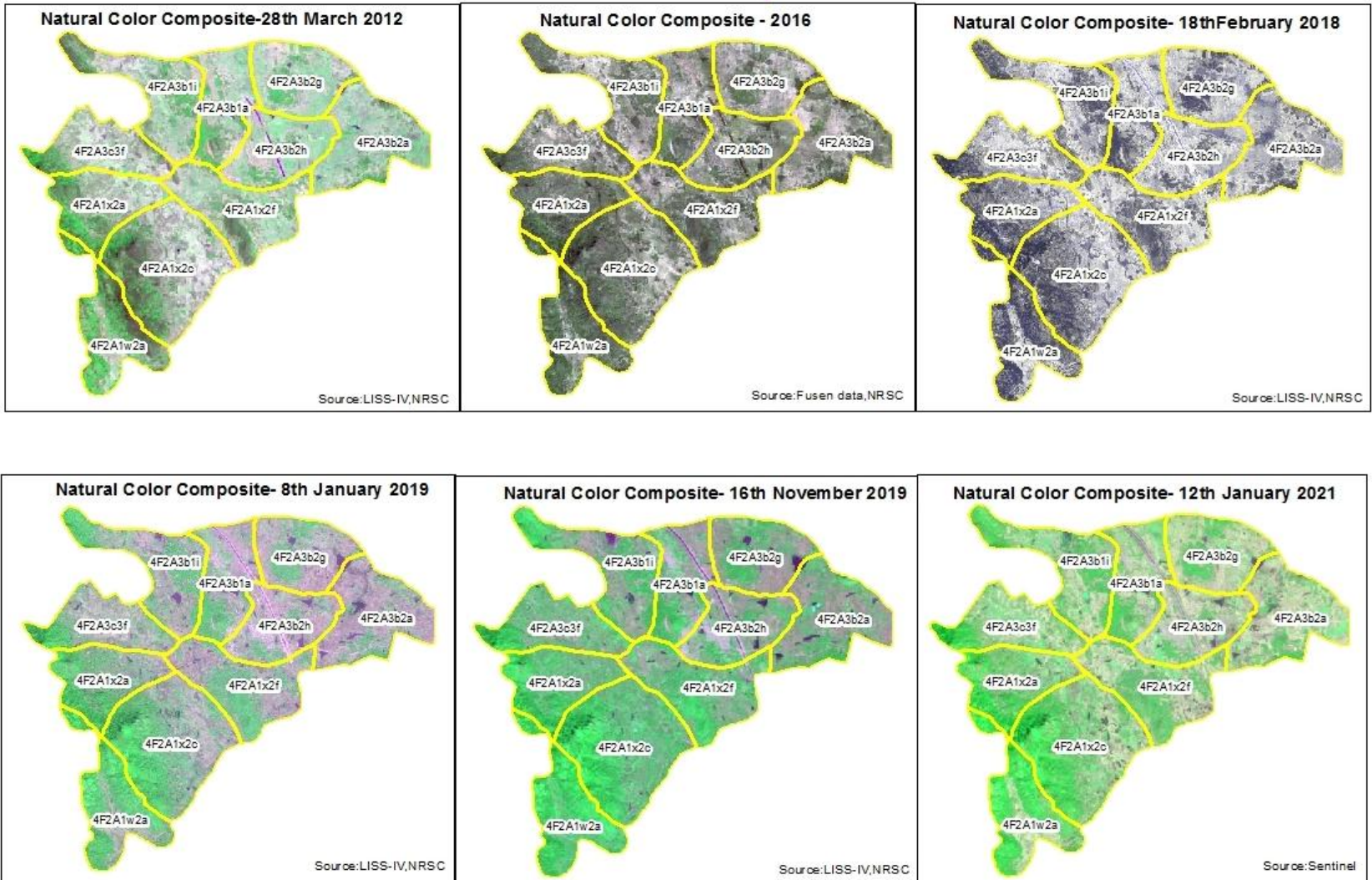
Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-12/2012-13

T0 Satellite data 2012

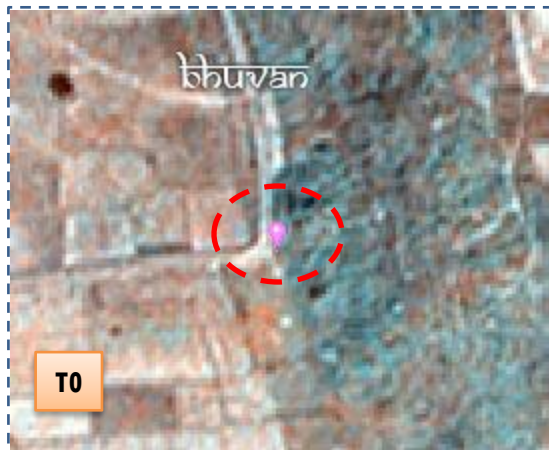**T1** Satellite data 2018

T2 Satellite data 2019

T3 Satellite data 2020

Drishti Id. 2123639

Percolation Tank

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-12/2012-13

| T0:2012-13 | T1: 13 February 2017 | Drishti Sl no. 2464203   MWS :4F2A3c3f |

Afforestation

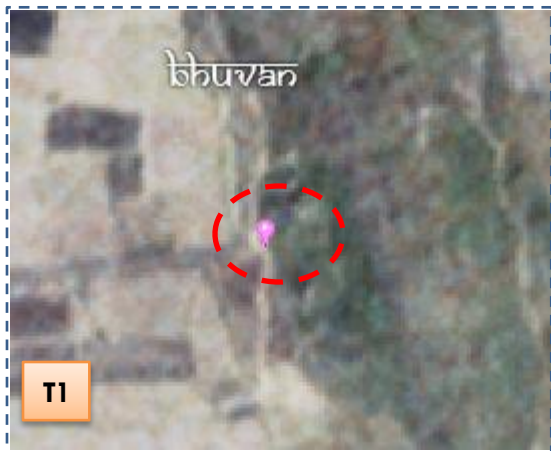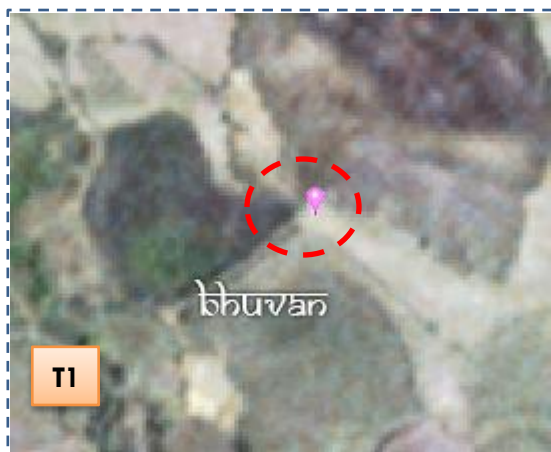| T0:2012-13 | T1: 13 February 2017 | Drishti Sl no. 5032818   MWS :4F2A3c3f |

Check dam

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-12/2012-13

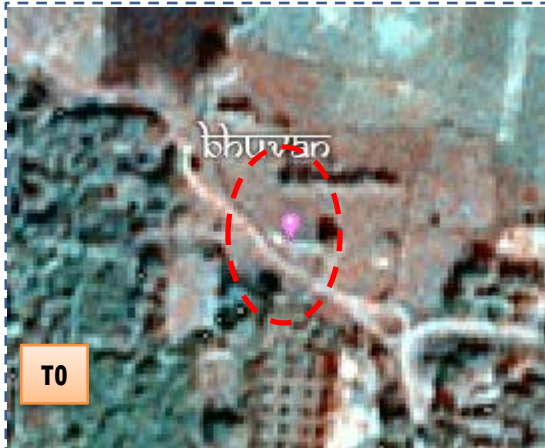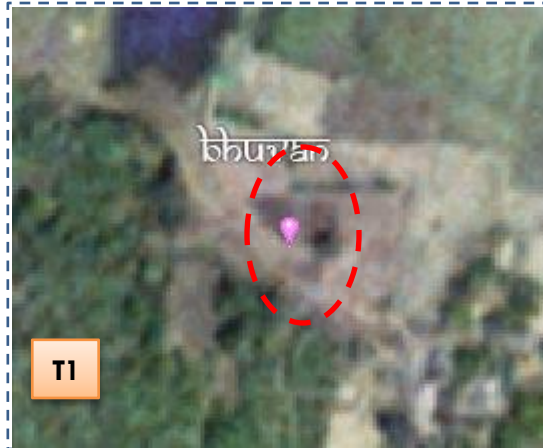| T0: 2012-13 | T1: 13 February 2017 | Drishti Sl no.2474290   MWS :4F2A1x2f |

Farm pond

| T0: 2012-13 | T1: 13 February 2017 | Drishti Sl no. 2464353   MWS :4F2A3b2g |

Groundwater Recharge structure

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- horiculture, 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
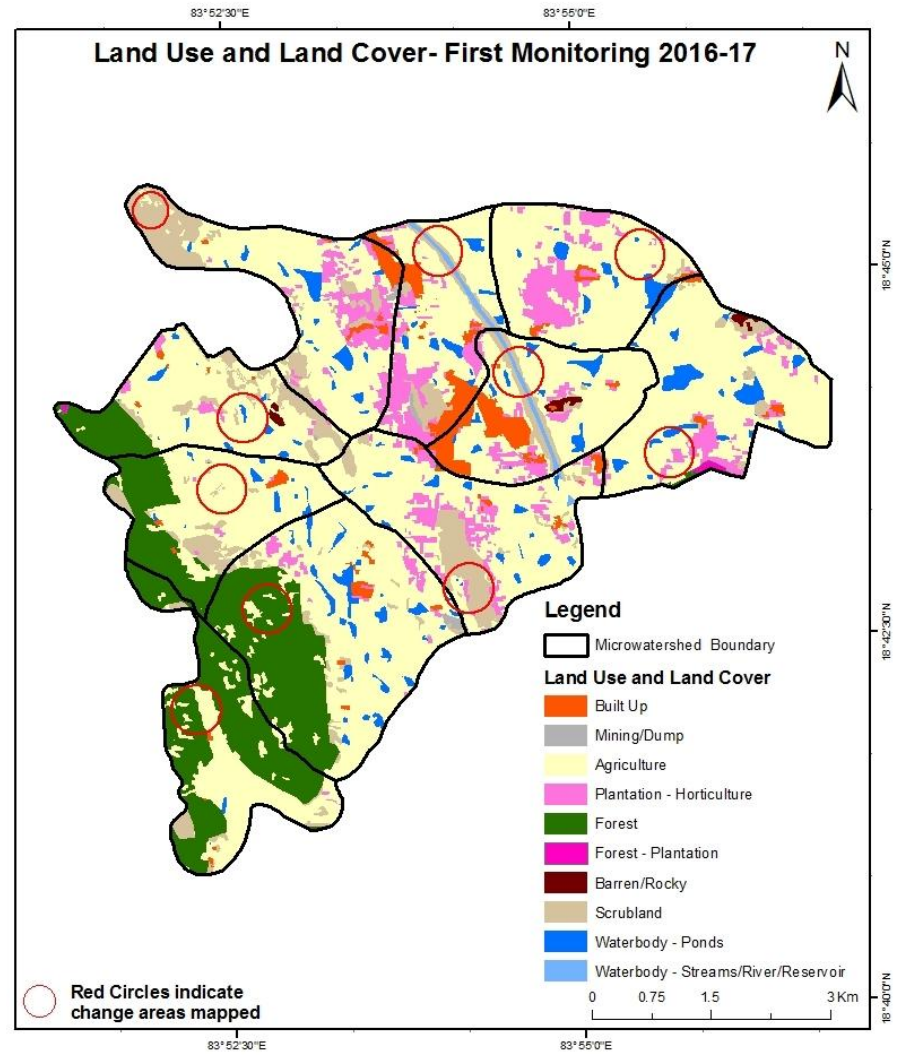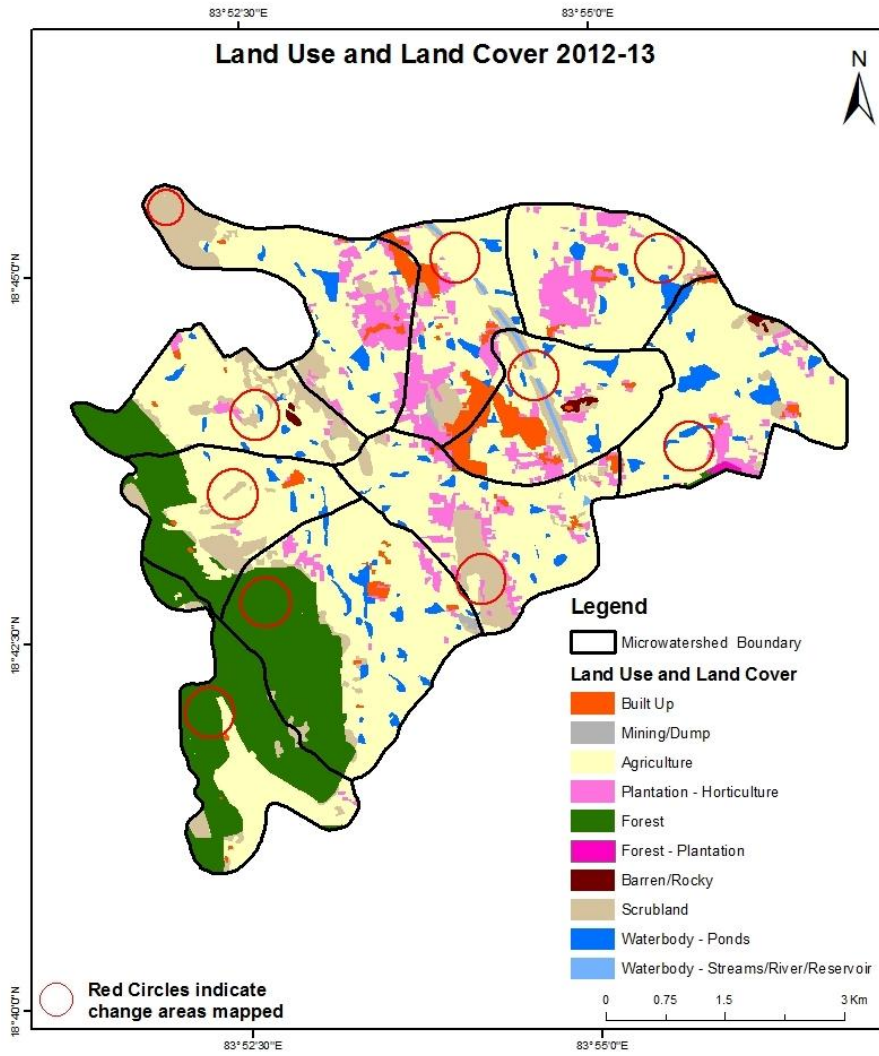
Land Use and Land Cover 2012-13

Land Use and Land Cover- First Monitoring 2016-17

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Forest - Plantation
- 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 (2016-17 to 2017-18)

Scale: 1:10000

Land Use and Land Cover 2016-17

Land Use and Land Cover- Second Monitoring 2017-18

Legend

Microwatershed Boundary

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

Red Circles indicate change areas mapped

14

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)
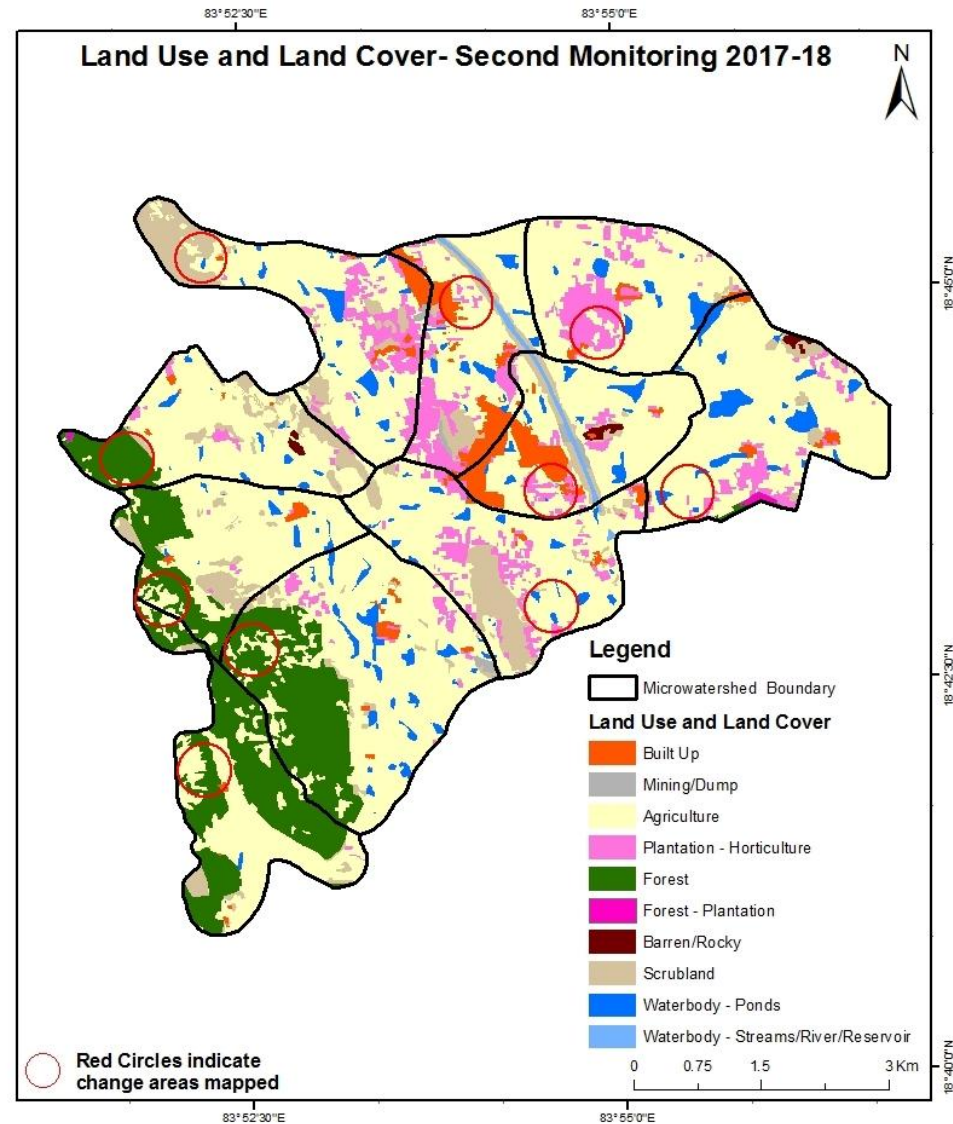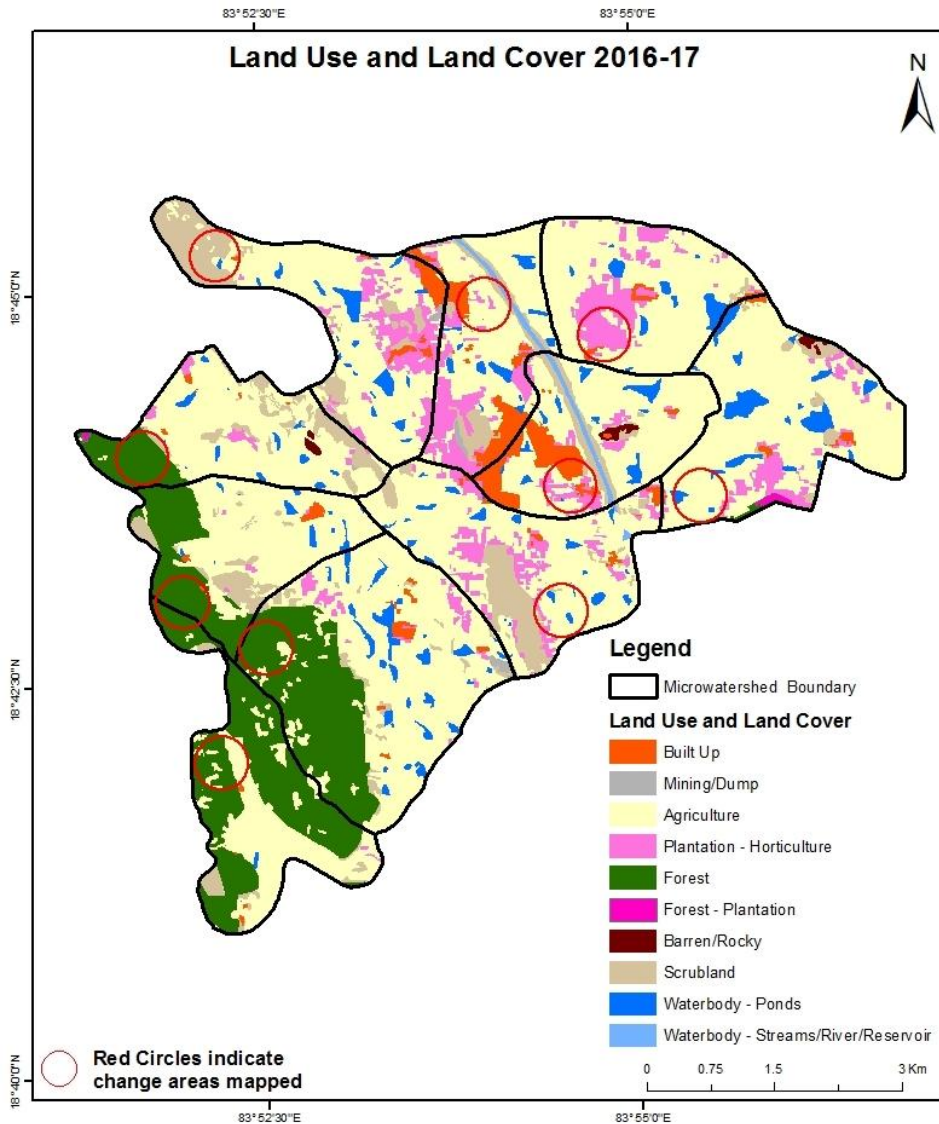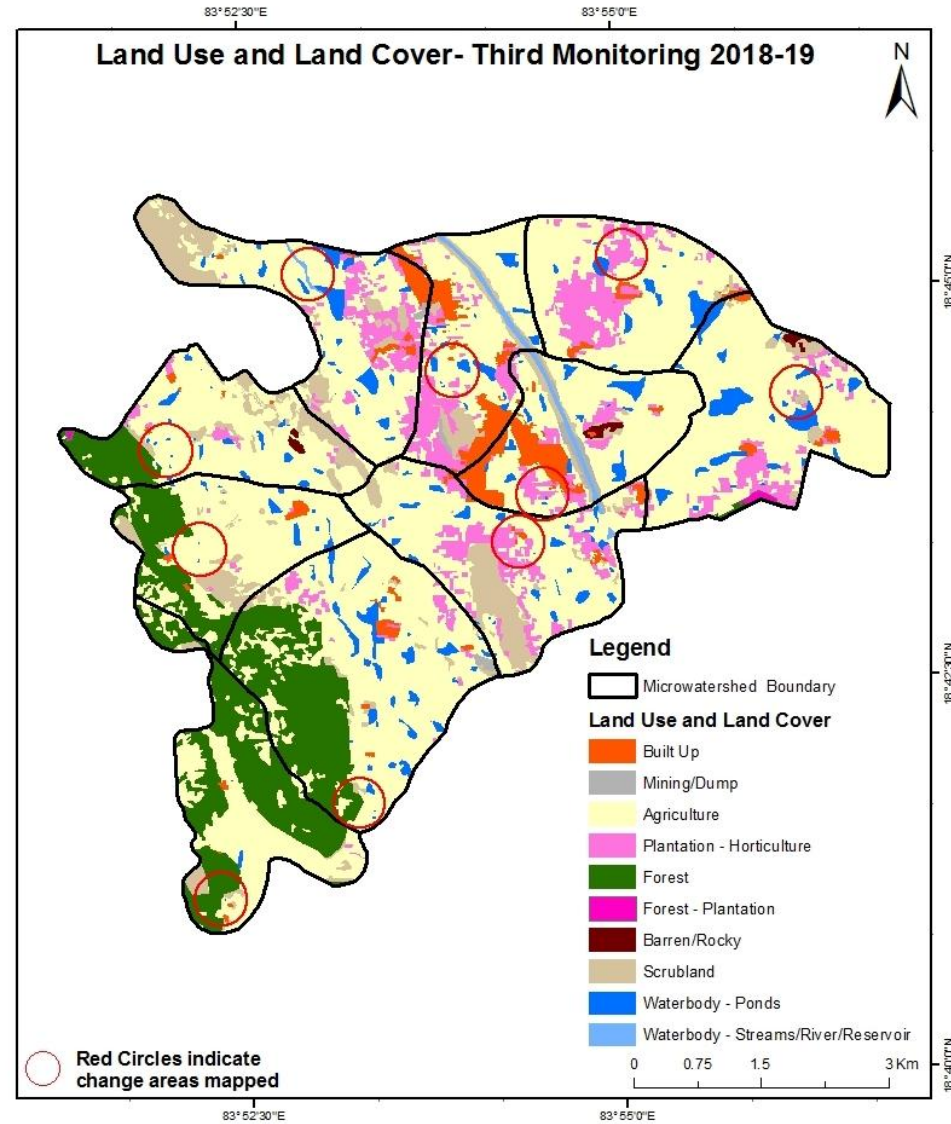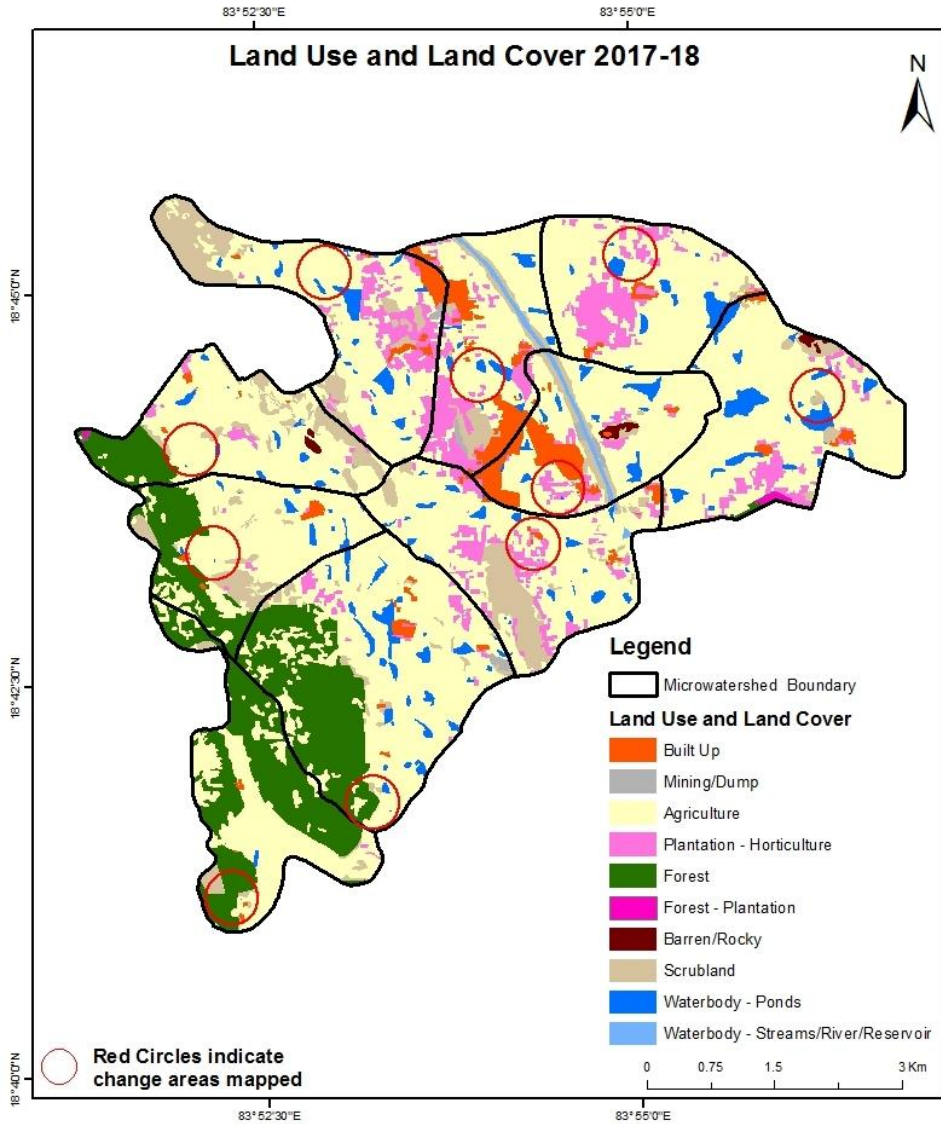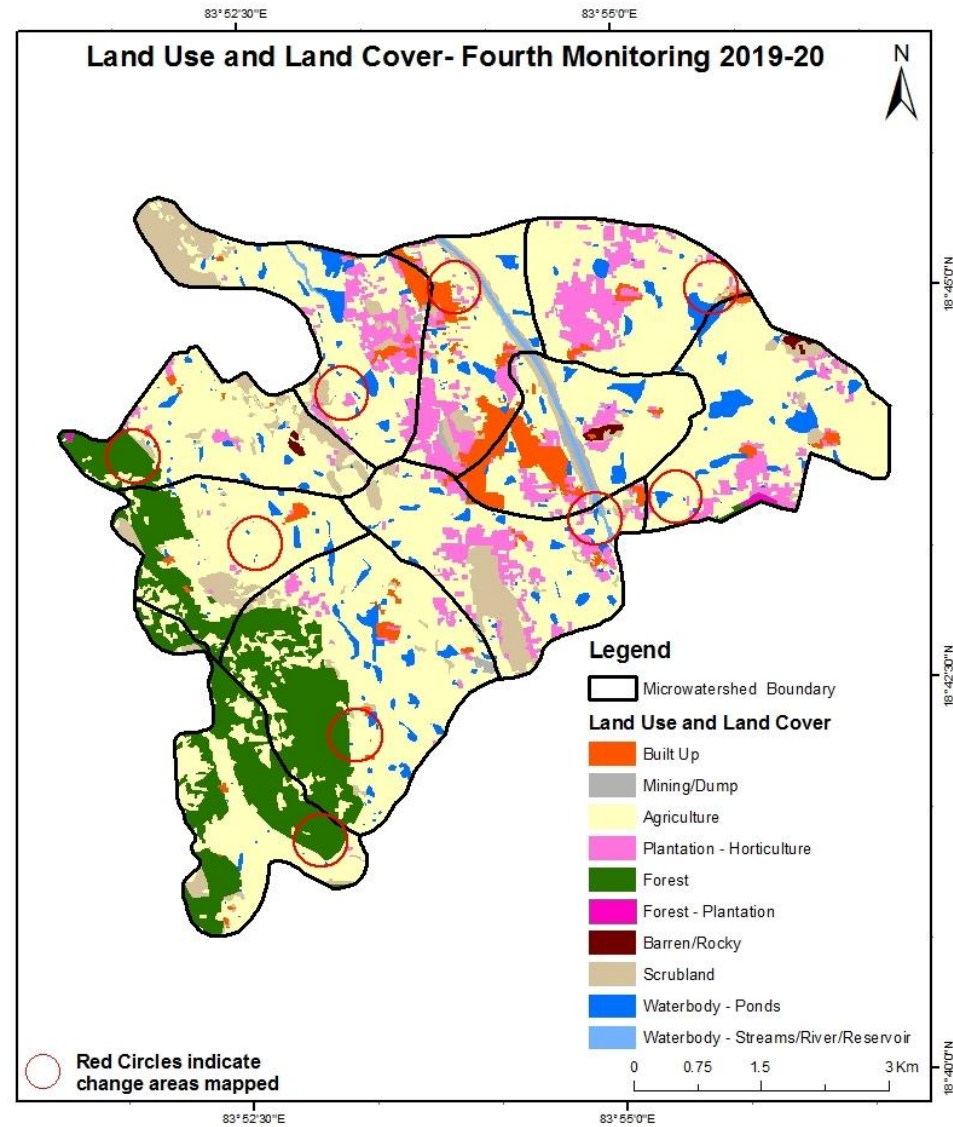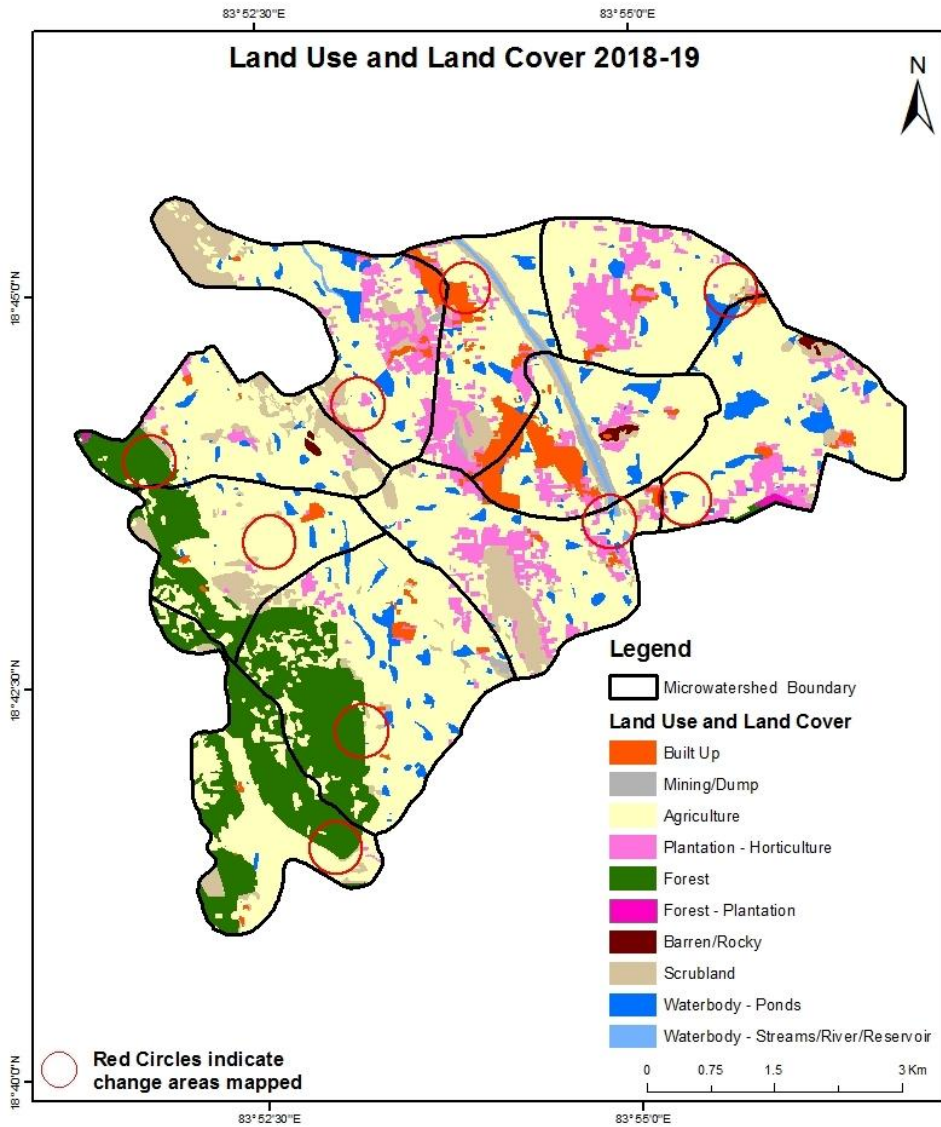
Scale: 1:10000

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 2019-20
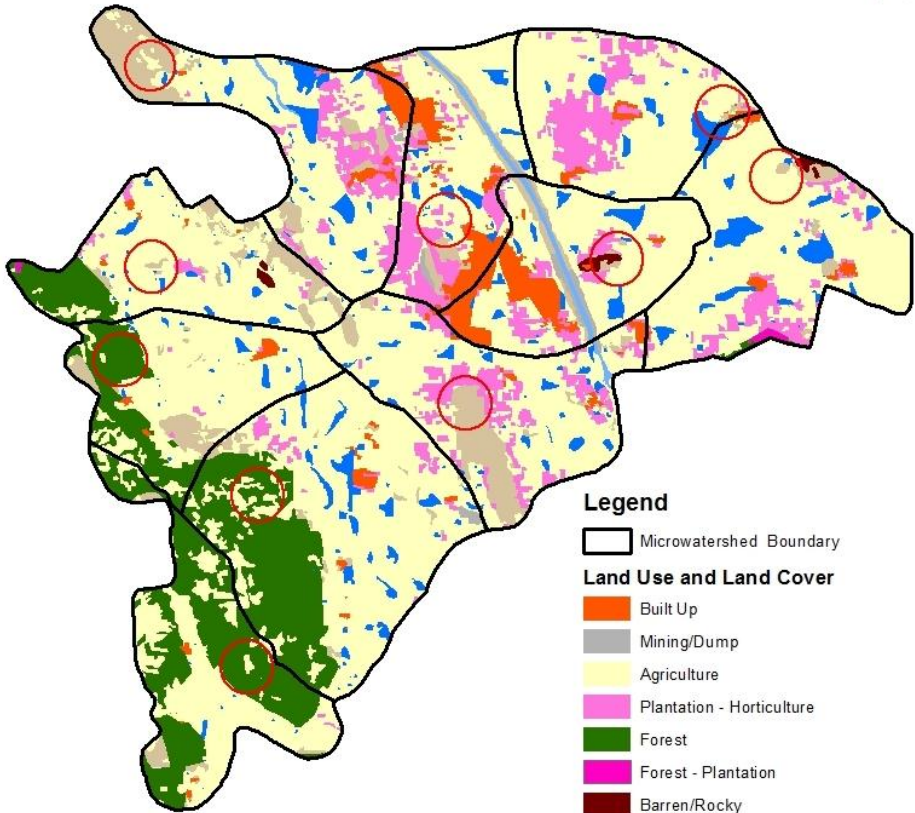
N

Legend

◻ Microwatershed Boundary

Land Use and Land Cover

- 🟧 Built Up
- 🟫 Mining/Dump
- 🟨 Agriculture
- 🟪 Plantation - Horticulture
- 🟩 Forest
- 🟥 Forest - Plantation
- 🟤 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- Fifth Monitoring 2020-21
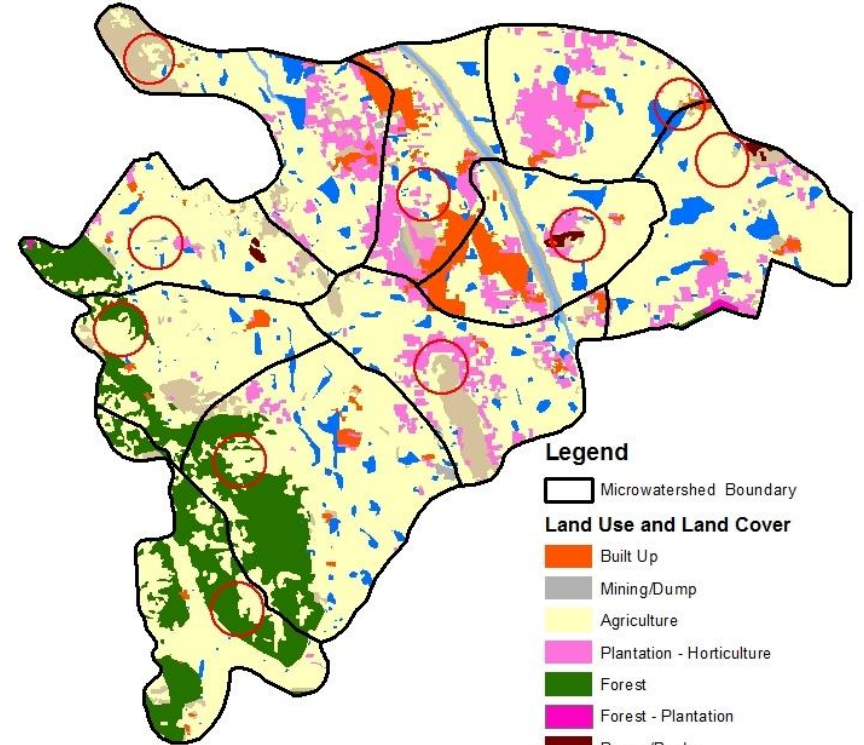
N

Legend

◻ Microwatershed Boundary

Land Use and Land Cover

- 🟧 Built Up
- 🟫 Mining/Dump
- 🟨 Agriculture
- 🟪 Plantation - Horticulture
- 🟩 Forest
- 🟥 Forest - Plantation
- 🟤 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

T0

T1

T0: 2012-13(83°55'36.135"E 18°43'37.321"N)
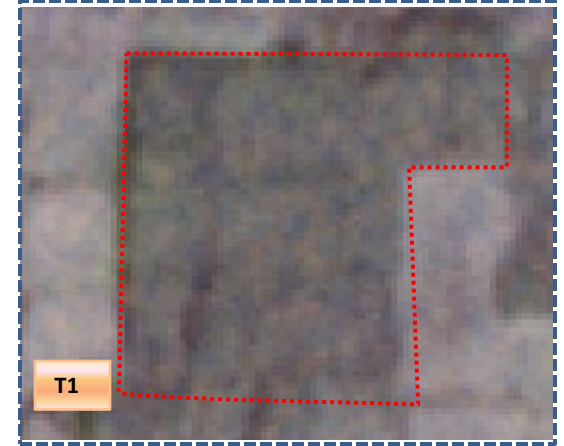
T1: 13 February 2017

Agriculture to water body

T0

T1

T0: 2012-13 (83°52'11.155"E 18°43'17.378"N)

T1: 13 February 2017

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

Scrub to Agriculture

T0

T1

T0: 2012-13(83°51'55.546"E 18°45'34.119"N)
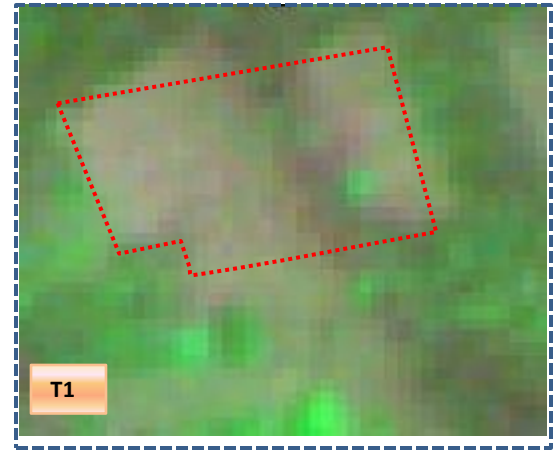
T1: 13 February 2017

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

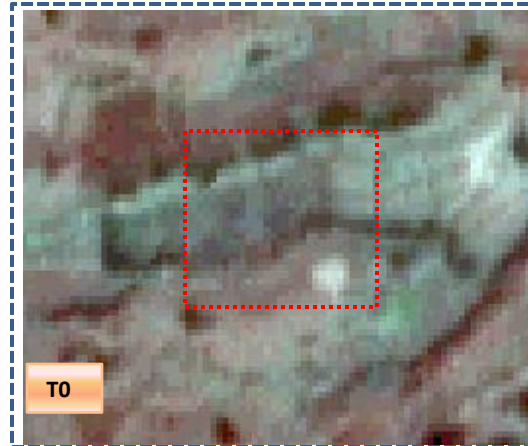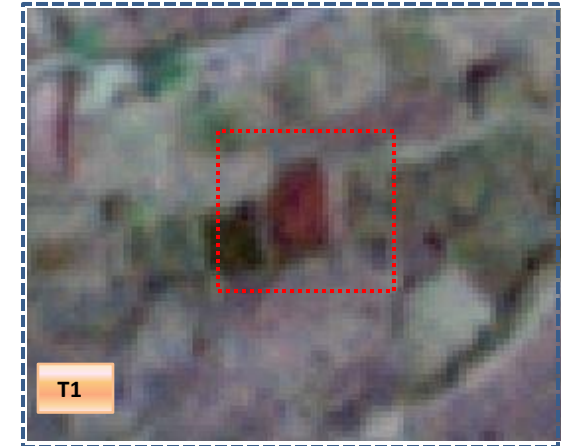| Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	135.35										**135.35**
Mining/dump		6.54									**6.54**
Agriculture	2.61	1.63	2421.53	27.75				25.18	5.88	7.40	**2492.02**
Plantation Horticulture	1.04	1.06	12.38	315.02				2.75		0.10	**332.34**
Forest	0.04		46.87		603.22	1.03					**651.16**
Forest Plantation						4.10					**4.10**
Barren Rocky							10.96				**10.96**
Scrub	0.30	0.21	37.80	1.65				319.33	0.53	0.69	**360.52**
Waterbody-Streams/River									13.46		**13.46**
Waterbody – Ponds										160.91	**160.91**
Grand Total	**139.33**	**9.44**	**2518.58**	**344.42**	**603.22**	**5.13**	**10.96**	**347.26**	**19.87**	**169.11**	**4167.31**

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

• In T1 97 ha of the agriculture area has increased from plantations, forest and scrubland 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	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	139.33										**139.33**
Mining/dump		9.44									**9.44**
Agriculture	5.92		2497.44	11.84				1.91		1.47	**2518.58**
Plantation Horticulture	1.90		18.84	323.68							**344.42**
Forest	0.51		71.38		531.33						**603.22**
Forest Plantation						5.13					**5.13**
Barren Rocky							10.96				**10.96**
Scrub	1.31	4.27	11.62					329.93		0.13	**347.26**
Waterbody-Streams/River									19.87		**19.87**
Waterbody – Ponds										169.11	**169.11**
Grand Total	**148.97**	**13.71**	**2599.27**	**335.52**	**531.33**	**5.13**	**10.96**	**331.84**	**19.87**	**170.70**	**4167.31**

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

- In T2 101 ha of the agriculture area has increased from plantations, forest and 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-2017-18 to 2018-19

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	148.97										**148.97**
Mining/dump		13.71									**13.71**
Agriculture	2.95		2530.07	49.49				0.51	2.86	13.40	**2599.27**
Plantation Horticulture	0.55		1.64	333.09						0.24	**335.52**
Forest	0.08		0.41		530.85						**531.33**
Forest Plantation						5.13					**5.13**
Barren Rocky							10.96				**10.96**
Scrub	0.24	8.37	2.70	0.42				318.32	0.33	1.47	**331.84**
Waterbody-Streams/River									19.87		**19.87**
Waterbody – Ponds										170.70	**170.70**
Grand Total	**152.79**	**22.08**	**2534.82**	**383.00**	**530.85**	**5.13**	**10.96**	**318.83**	**23.06**	**185.81**	**4167.31**

- 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 69 ha of the agriculture area has decreased and it is converted into Built-up and plantations and water body in T3.
- In T3 4.7 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-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
Built up	152.79										**152.79**
Mining/dump		20.86	1.22								**22.08**
Agriculture	3.16	0.12	2519.14	1.49					0.96	9.94	**2534.82**
Plantation Horticulture	0.32		6.49	375.92						0.27	**383.00**
Forest			16.12		514.62					0.10	**530.85**
Forest Plantation						5.13					**5.13**
Barren Rocky							10.96				**10.96**
Scrub	0.53		25.69	5.66				286.23		0.72	**318.83**
Waterbody-Streams/River									23.06		**23.06**
Waterbody – Ponds										185.81	**185.81**
Grand Total	**156.81**	**20.99**	**2568.65**	**383.07**	**514.62**	**5.13**	**10.96**	**286.23**	**24.02**	**196.84**	**4167.31**

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 15 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.

•In T4 49 ha of the agriculture area has increased from mining/dump, 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	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	156.76										156.76
Mining/dump		20.97									20.97
Agriculture	2.01	0.08	2560.18	3.89						1.23	2567.39
Plantation Horticulture	0.39		14.4	369.55							384.34
Forest			86.42		428.16					0.1	514.68
Forest Plantation						5.13					5.13
Barren Rocky							10.96				10.96
Scrub			58.44	0.53				227.18		0.1	286.25
Waterbody- Streams/River									24.02		24.02
Waterbody – Ponds										196.8	196.8
Grand Total	159.16	21.05	2719.44	373.97	428.16	5.13	10.96	227.18	24.02	198.23	4167.3

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

•In T5 159 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 47 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 26, 80 & 33 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively, there is a decrease of Hectares from T2-T3 and overall increase of 227 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.

5. About **41 Hectares of the plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) to 2020-21 (T5).

6. There is a decrease of 133 Hectares in Scrubland area as compared between 2012-13 (T0) & 2020-21 (T5) years.

7. Farm ponds (13) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (13) verified from the portal.