MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

SRIKAKULAM -21/2013-14
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2023

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

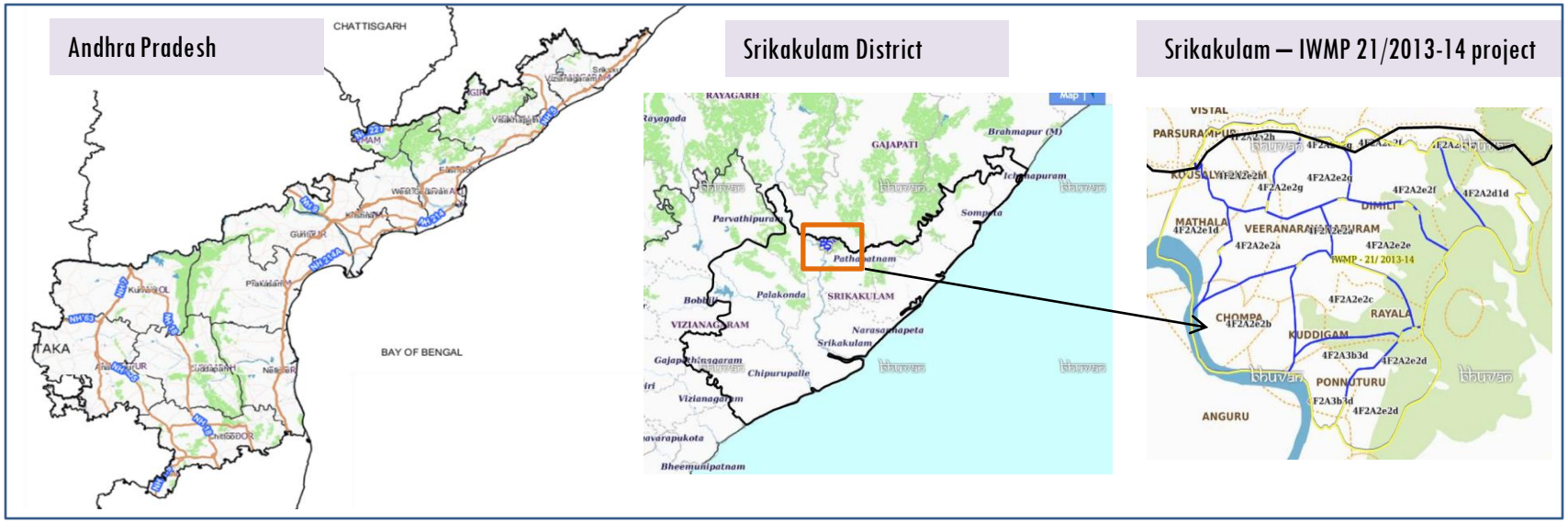
CONTENTS

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-21/2013-14, Srikakulam District of Andhra Pradesh. The total geographical area of the project is **3,478 ha**. It comprises of 11 micro watersheds.
- In the project area 119 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an increased by 32 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, 21 % is covered by Forest, 14 % is covered by scrubland and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-21/2013-14
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Kothuru Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is **3,478 ha**. It comprises of 11 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2013-14 (T0) period (***Batch -1***) projects taking 2021-22 (T5) period satellite images



- The Climate of the district is moderate and characterized by high humidity all through the year along with oppressive summer and good seasonal rainfall.

- The mean daily maximum temperature in the district is about 34 C in May and the mean daily minimum temperature is about 17.5 C in December/ January.

- The average annual rainfall of the district is 1067 mm, which ranges from nil rainfall in January and November 208 mm in September and October. The mean seasonal rainfall distribution is 745 mm in southwest monsoon (June-September).

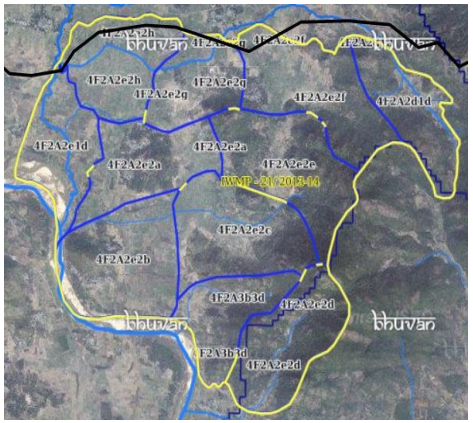
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			2-Feb-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			2-Feb-22
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	119
4	Detailed Project Report		

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



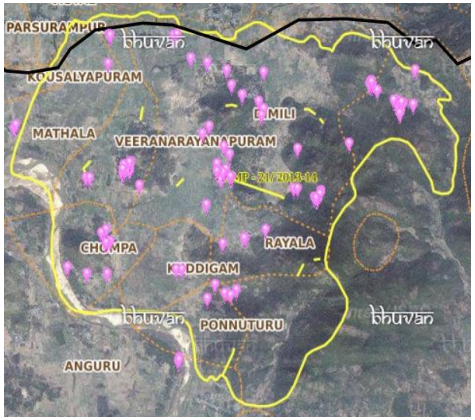
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

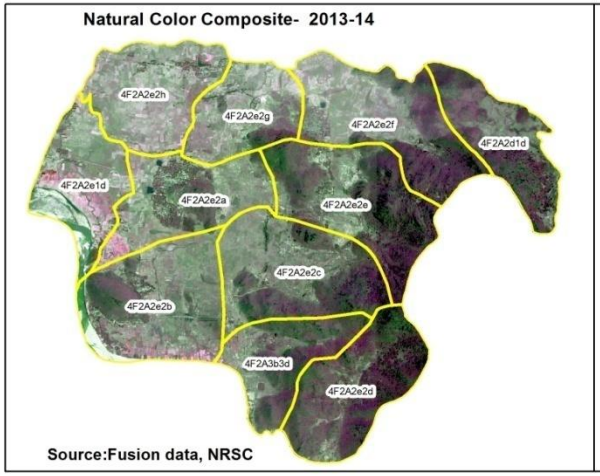
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	5	3
2	Horticulture	0	0
3	Agriculture	1	1
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	36	36
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	22	22
11	Civil work-Check dams/Rock fill dam	26	26
12	Nallah Bunds/Drainage 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	2	1
16	Capacity Building Activities	0	0
17	Entry Point Activity	6	6
18	Others	26	24
	TOTAL	**124**	**119**

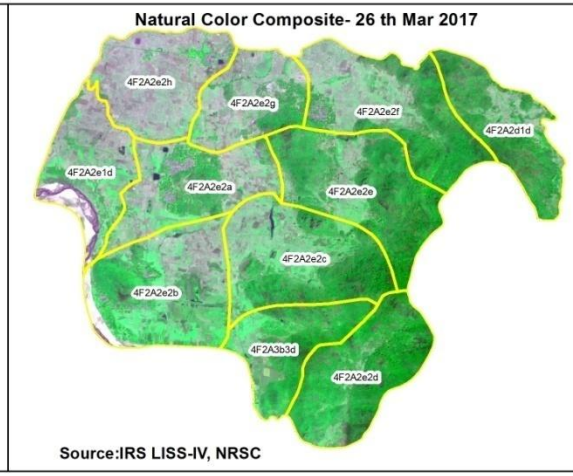
MONITORING IN THE PROJECT AREA

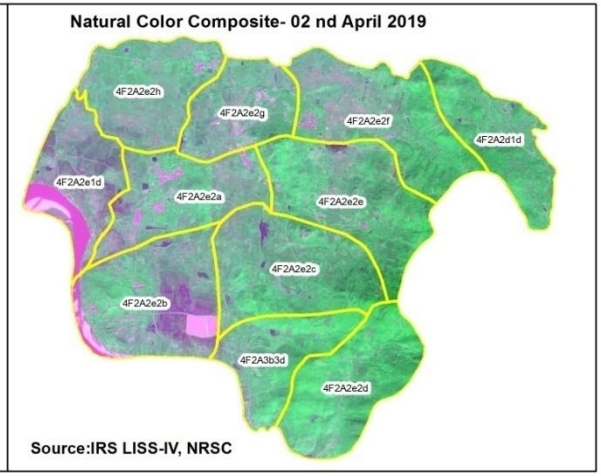
Site Wise Changes in the Project

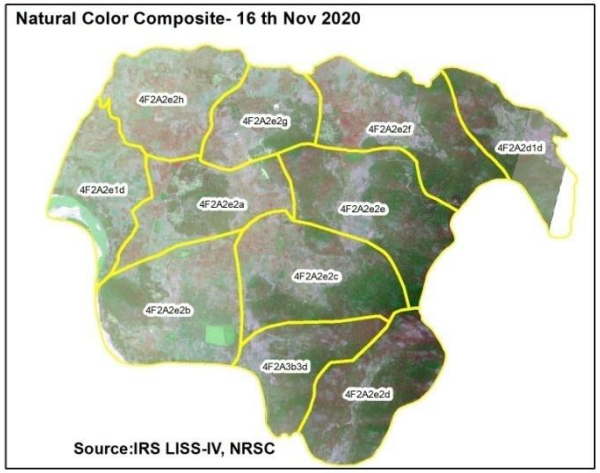
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2013-14) and T5 is 2021-22 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

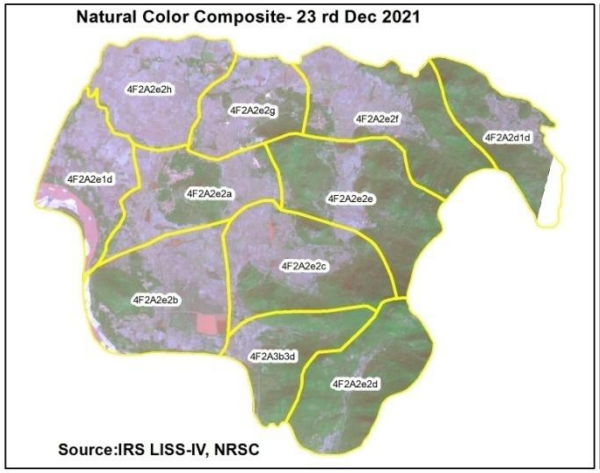
Natural Colour Composite (NCC)

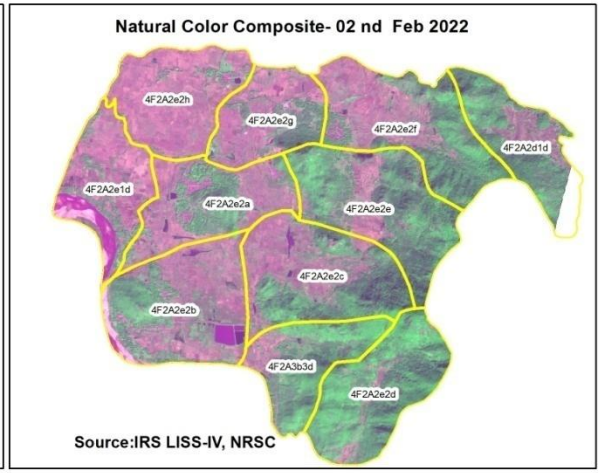








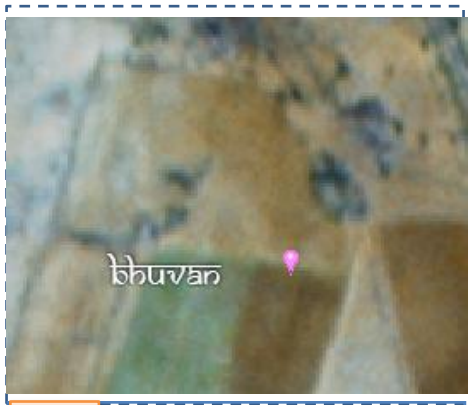




Monitoring of activities in Srikakulam District, Andhra Pradesh. IWMP-21/2013-14

T0 Satellite data 2013

T1 Satellite data 2015



T2 Satellite data 2016

T3 Satellite data 2017

T4 Satellite data 2018

T5 Satellite data 2020

Drishti Id. 1704995

Horticulture

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-21/2013-14

T0:2013-14

T1: 06 October 2018

Drishti Sl no. 2329066 MWS : 4F2A2e2g

Check dam

T0:2013-14

T1: 06 October 2018

Drishti Sl no. 2329099 MWS : 4F2A2e2c

Farm pond

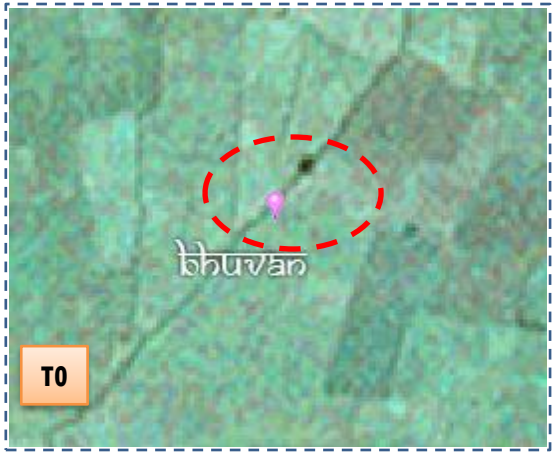
Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-21/2013-14

T0:2013-14

T1: 06 October 2018

Drishti Sl no. 5032821 MWS : 4F2A2e2e

Percolation tank



T0:2013-14

T1: 06 October 2018

Drishti Sl no. 5032825 MWS : 4F2A2e2h

Percolation tank

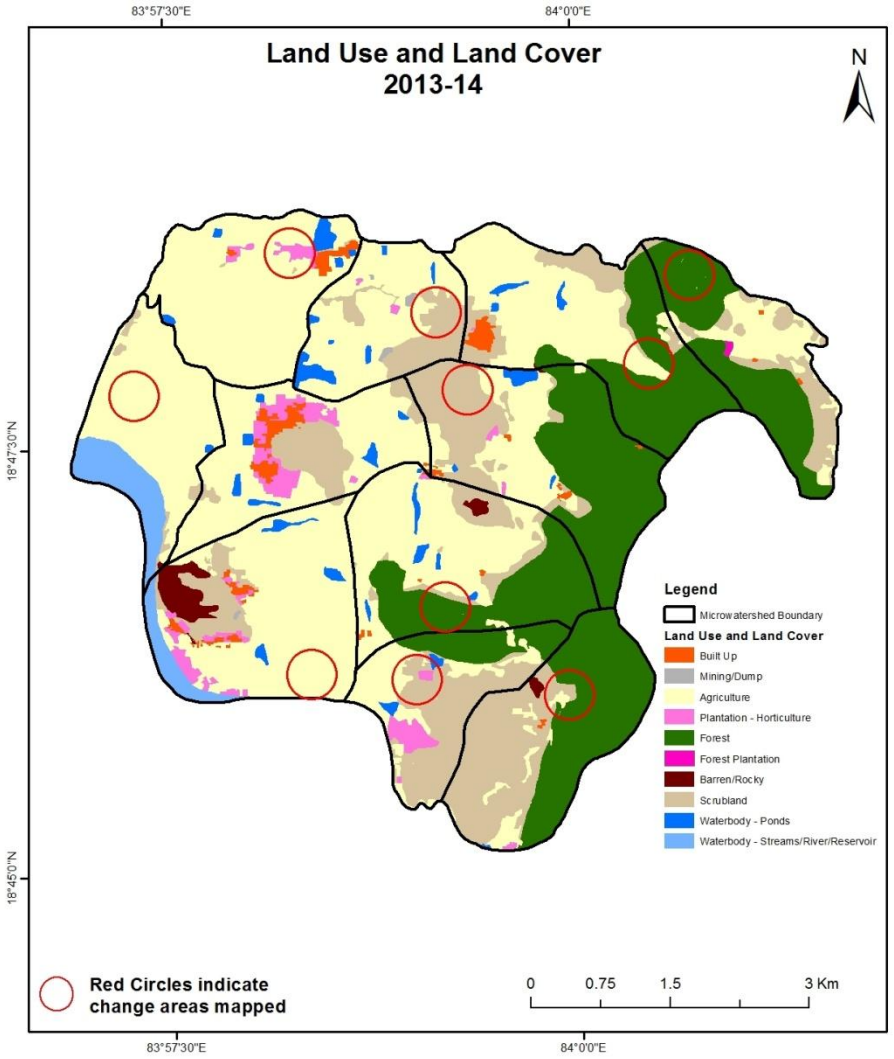
MONITORING IN THE PROJECT AREA

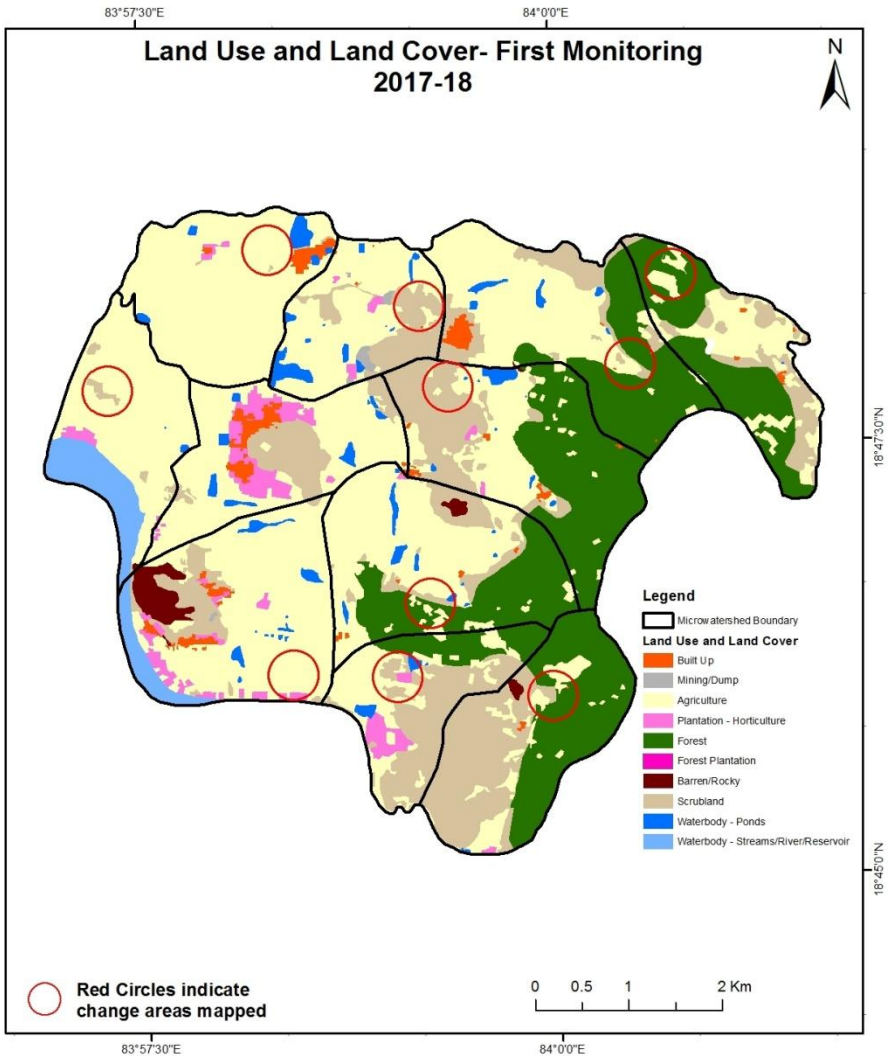
Land use and Land cover Changes in the Project

- 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 (2013-14) and row represents the T5 (2021-22)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

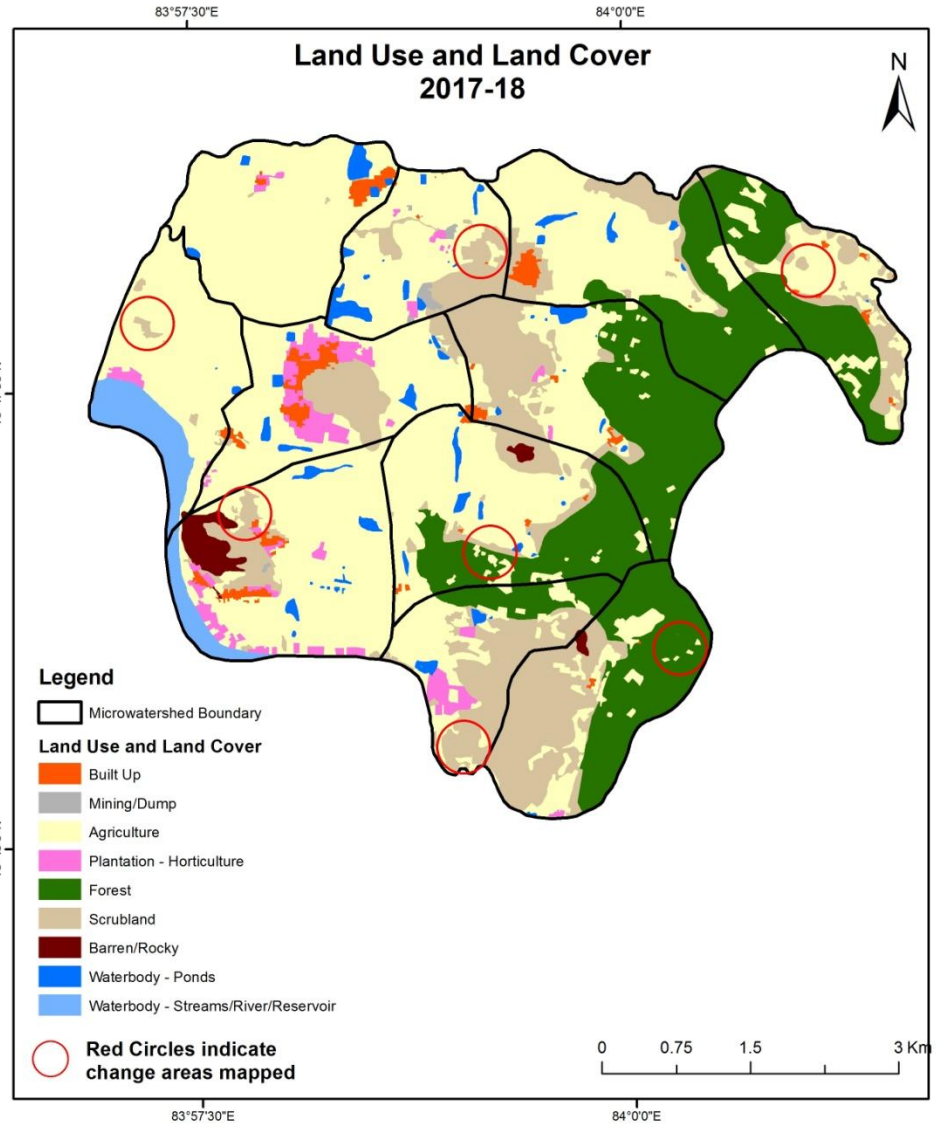
Scale: 1:10000

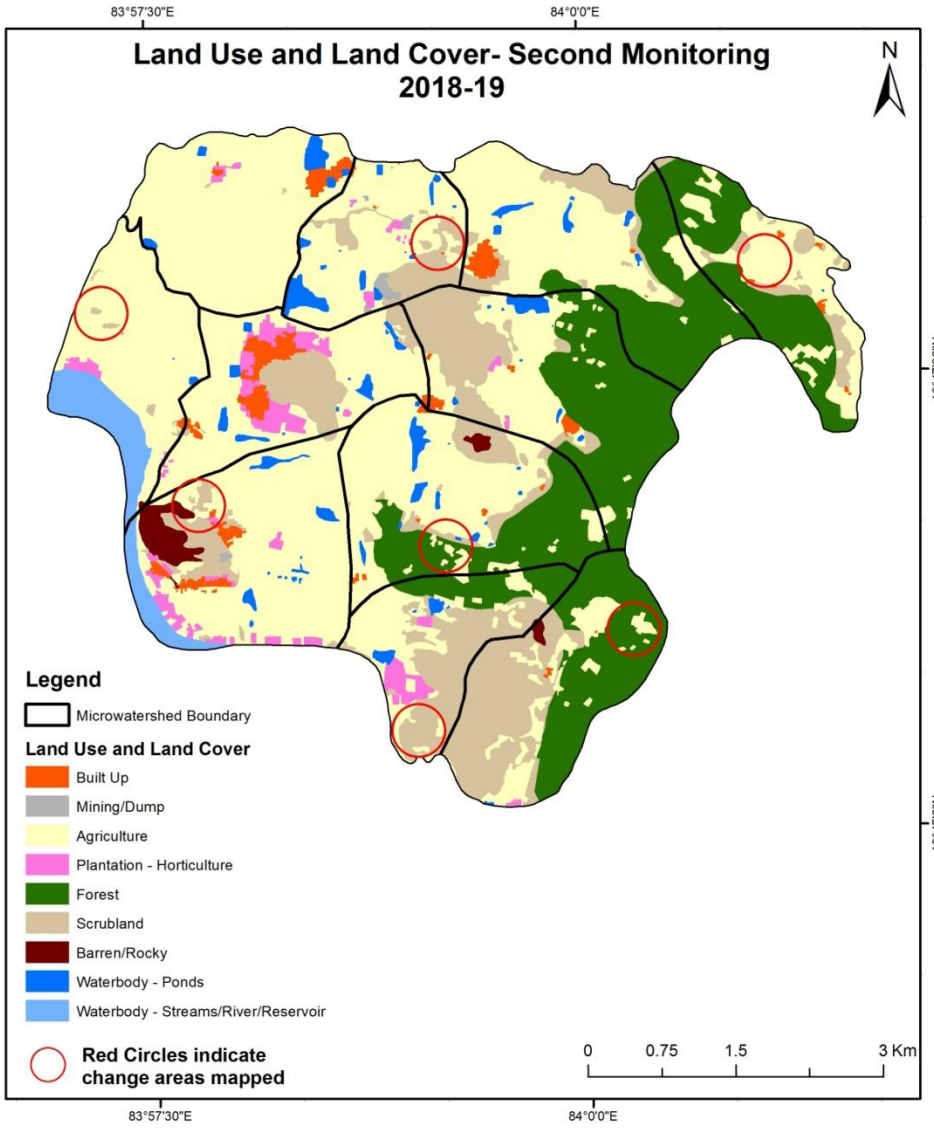




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

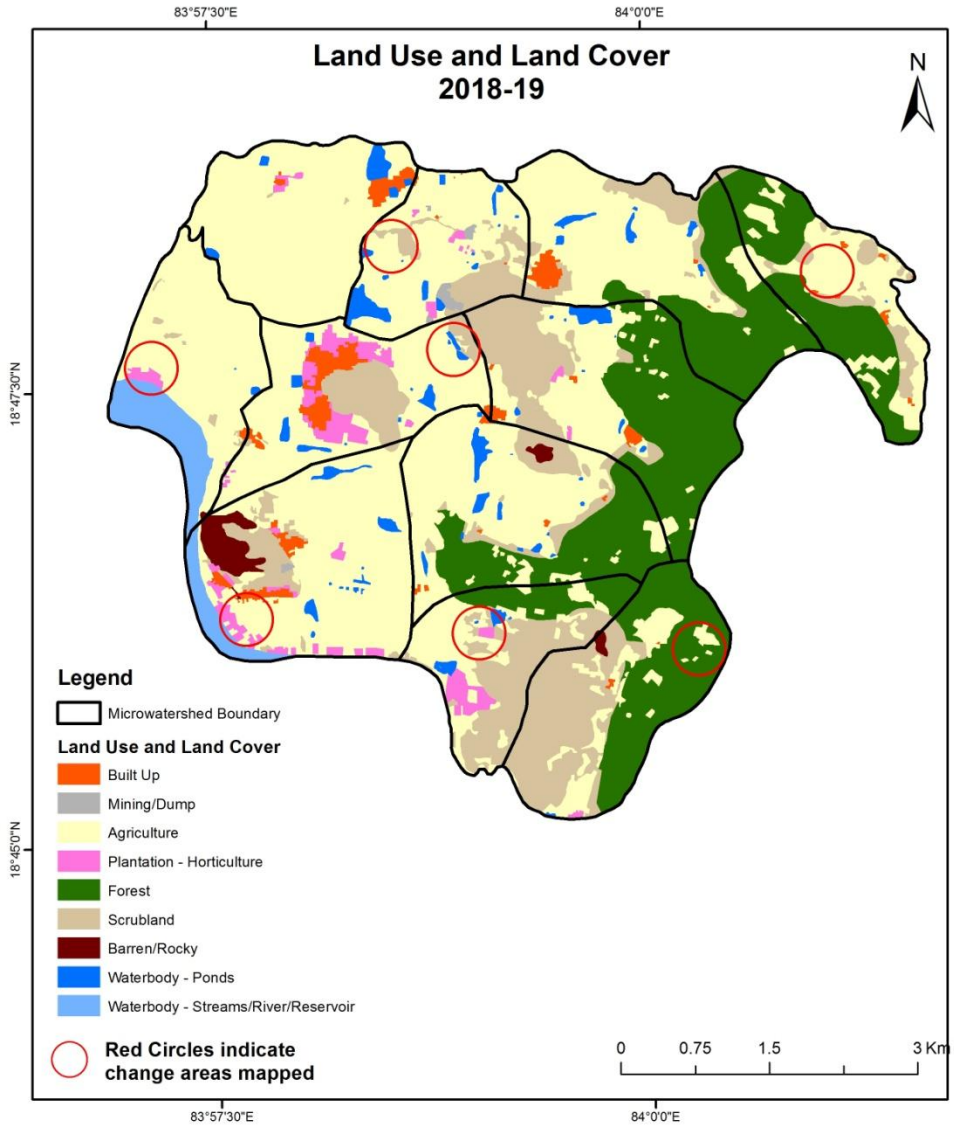
Scale: 1:10000

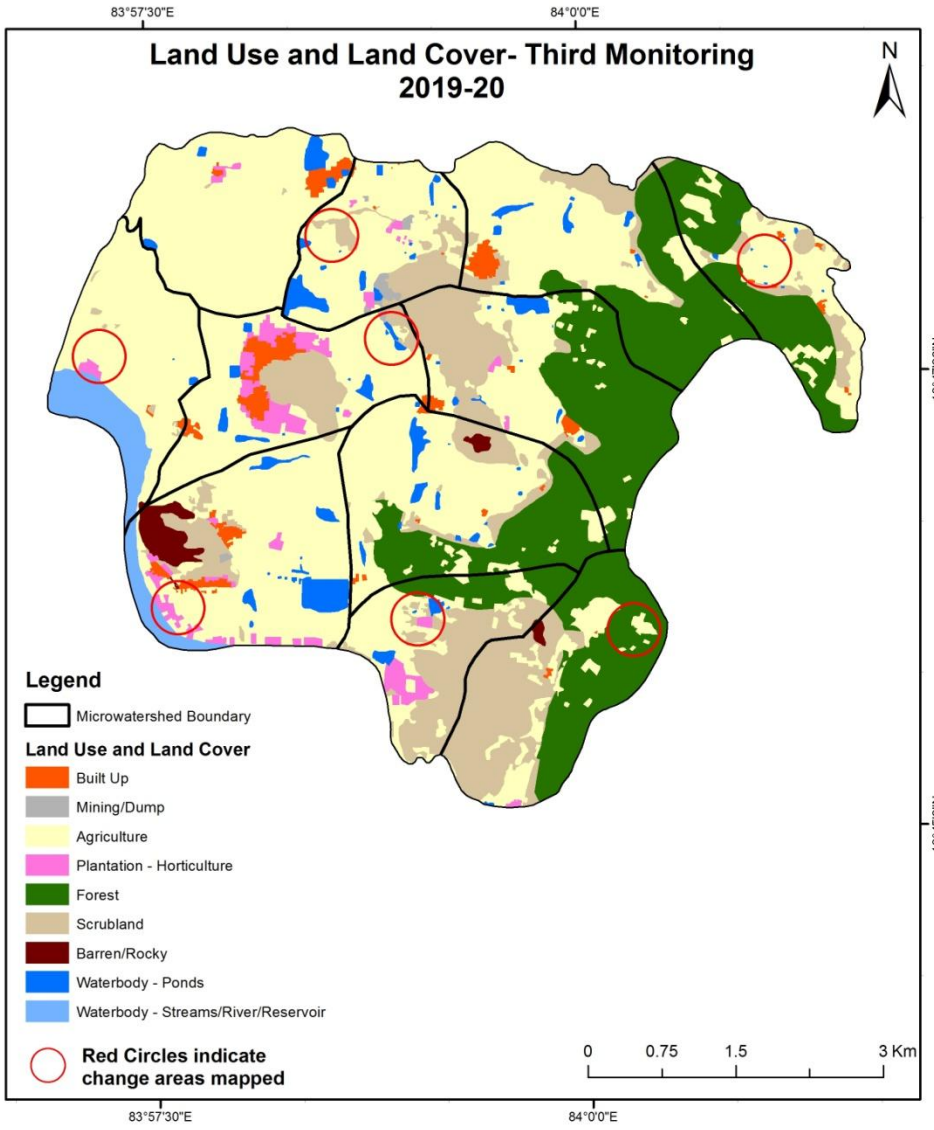




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

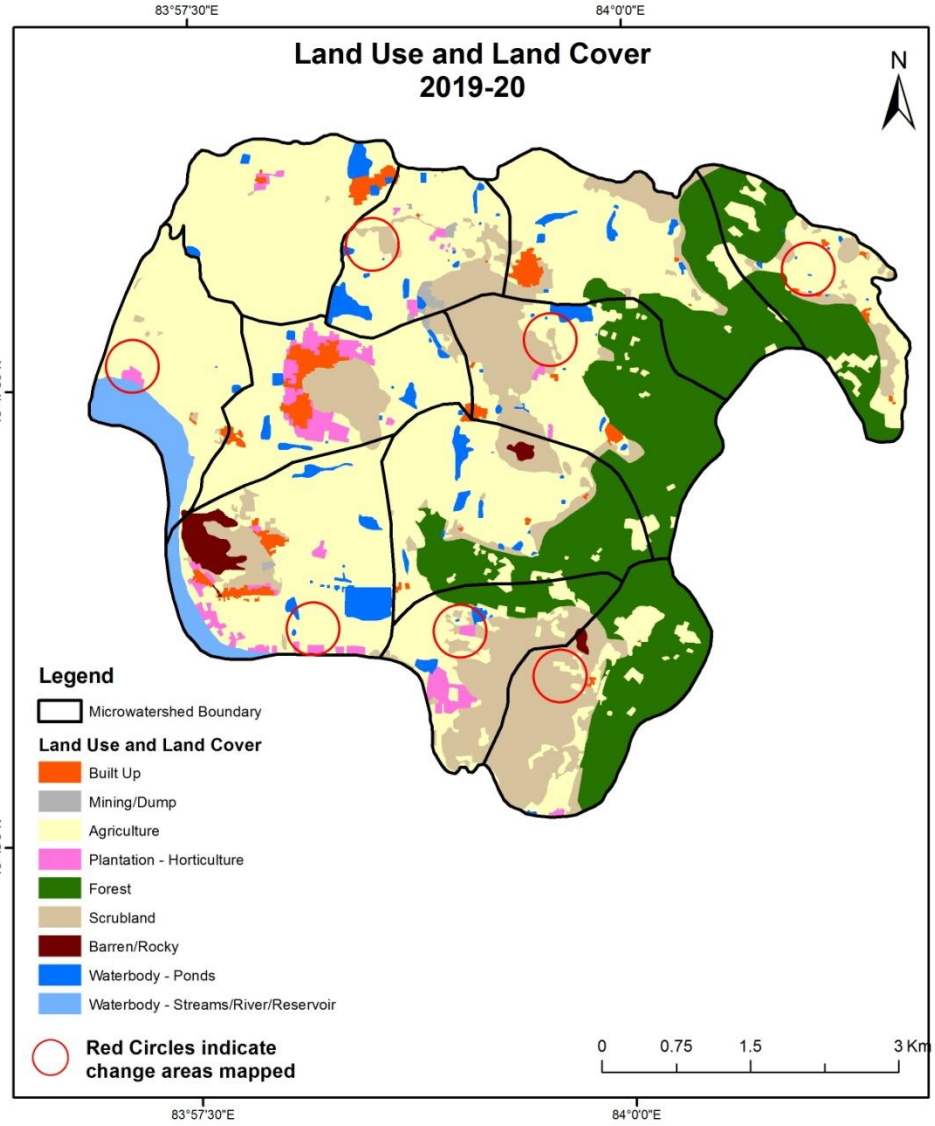
Scale: 1:10000

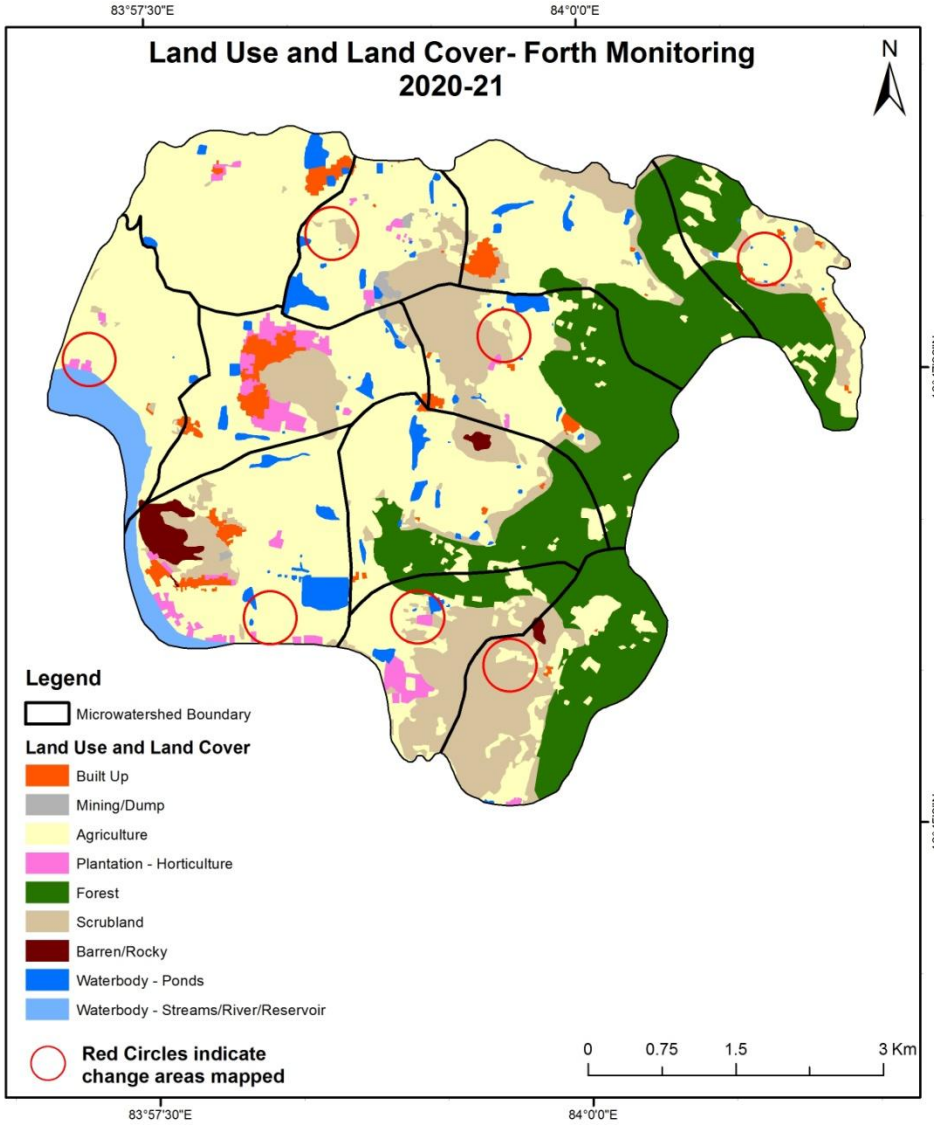




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

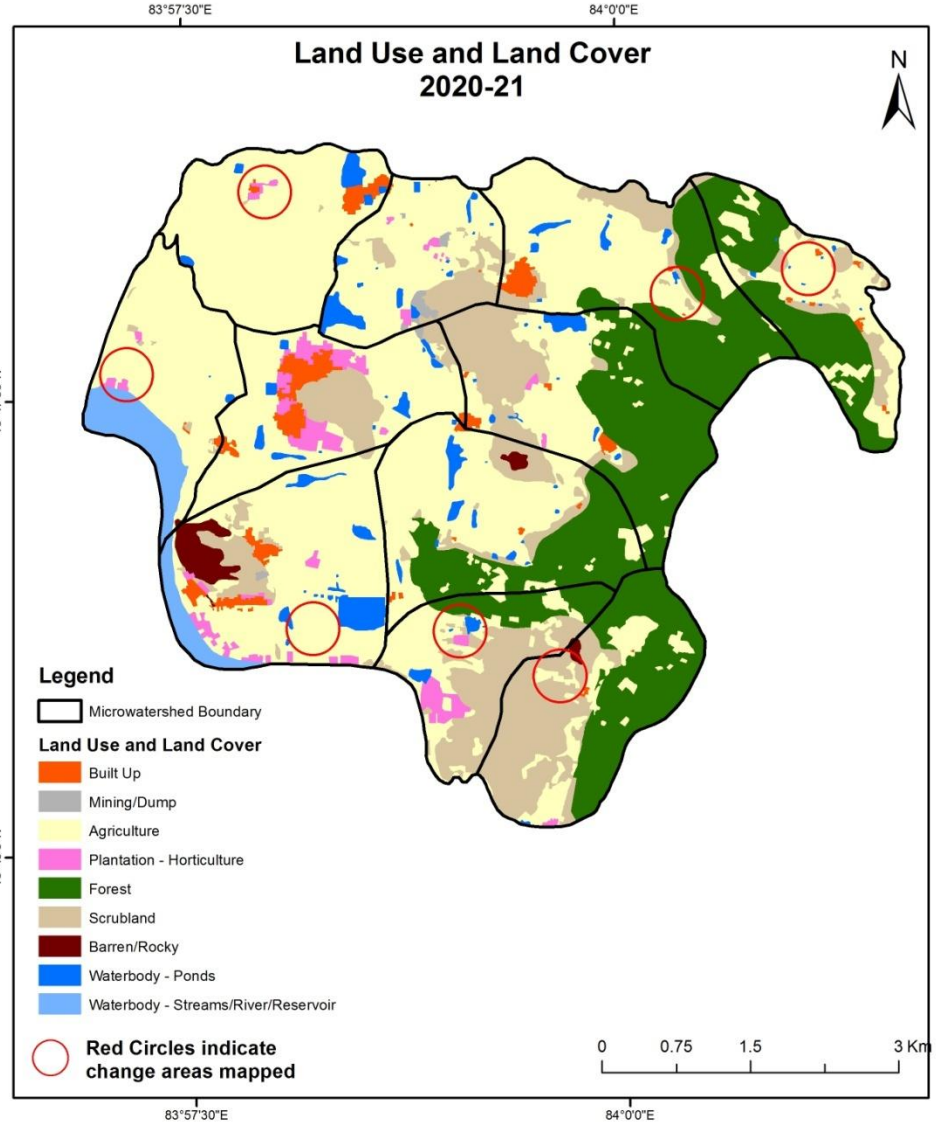
Scale: 1:10000

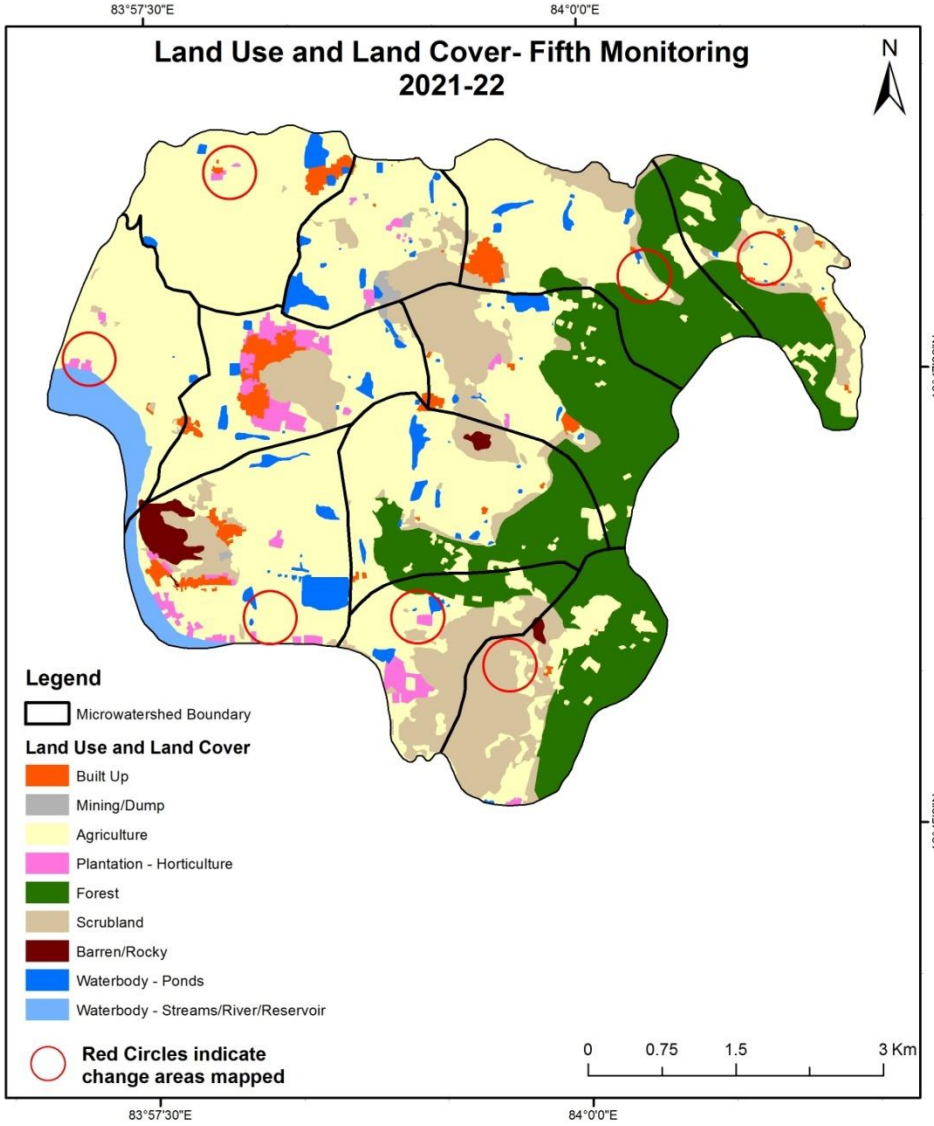




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000





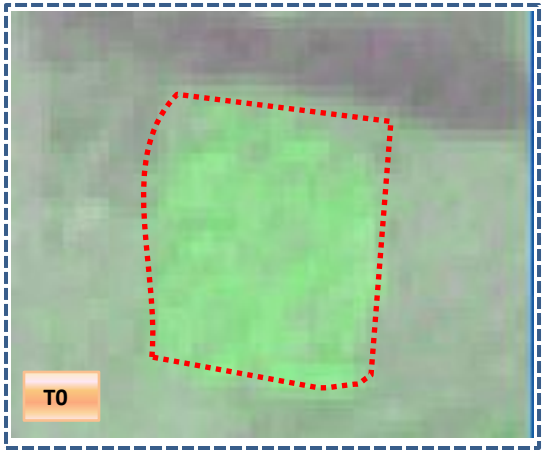
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0: 2013-14 (83°58'53.429"E 18°45'43.961"N)

T1: 13 February 2017

Plantation to Agriculture

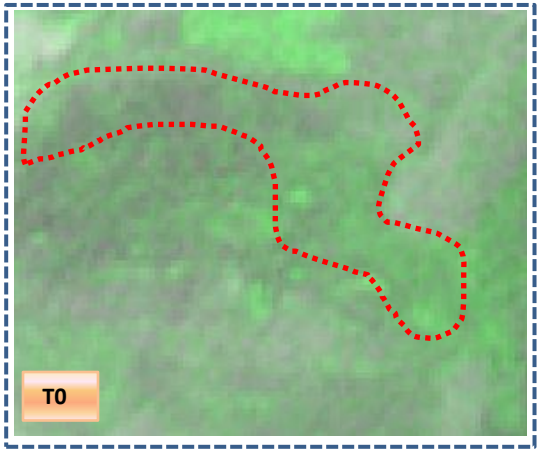


T0: 2013-14 (83°58'58.65"E 18°45'48.263"N)

T1: 13 February 2017

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

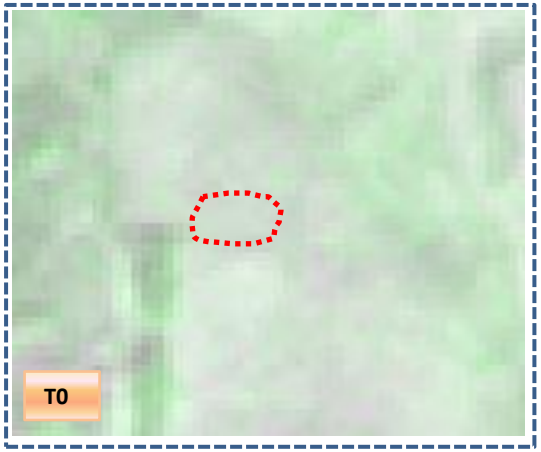
Scrub to Agriculture



T0: 2013-14 (83°59'3.512"E 18°46'6.643"N)

T1: 13 February 2017

Agriculture to Waterbody



T0: 2013-14 (83°59'39.05"E 18°47'34.954"N)

T1: 13 February 2017

Table showing change matrix depicting Land cover transitions during study period-2013-14 to 2017-18

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	43.97										**43.97**
Mining/dump		3.21									**3.21**
Agriculture	3.14	0.52	1641.86	20.84				28.85		7.06	**1702.27**
Plantation Horticulture	2.57		11.21	61.71							**75.49**
Forest	0.07		62.71		767.95			4.09			**834.82**
Forest Plantation											
Barren Rocky							31.48				**31.48**
Scrub	5.47	2.33	64.27					565.65	0.72	0.15	**638.59**
Waterbody-Streams/River									86.33		**86.33**
Waterbody – Ponds										62.11	**62.11**
Grand Total	**55.22**	**6.06**	**1780.05**	**82.55**	**767.95**		**31.48**	**598.59**	**87.05**	**69.32**	**3478.27**

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

• In T0 60 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 138 ha of the agriculture area has increased from plantations, forest 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-2017-18 to 2018-19

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	55.22										**55.22**
Mining/dump		6.06									**6.06**
Agriculture	0.86		1772.23							6.96	**1780.05**
Plantation Horticulture	5.77			76.78							**82.55**
Forest			12.14		755.69					0.12	**767.95**
Forest Plantation											
Barren Rocky							31.48				**31.48**
Scrub	2.5	0.74	38.77					555.85		0.73	**598.59**
Waterbody-Streams/River									87.05		**87.05**
Waterbody – Ponds										69.32	**69.32**
Grand Total	**64.35**	**6.8**	**1823.14**	**76.78**	**755.69**		**31.48**	**555.85**	**87.05**	**77.13**	**3478.27**

- 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 7.8 ha of the agriculture area has decreased and it is converted into Built-up and water body in T2.
- In T2 50.9 ha of the agriculture area has increased from 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-2018-19 to 2019-20

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	64.35										**64.35**
Mining/dump		6.8									**6.8**
Agriculture		1.44	1805.22							16.48	**1823.14**
Plantation Horticulture			4.05	72.73							**76.78**
Forest					755.61					0.08	**755.69**
Forest Plantation											
Barren Rocky							31.48				**31.48**
Scrub	0.86		3.34					551.11		0.54	**555.85**
Waterbody-Streams/River									87.05		**87.05**
Waterbody – Ponds										77.13	**77.13**
Grand Total	**65.21**	**8.24**	**1812.61**	**72.73**	**755.61**		**31.48**	**551.11**	**87.05**	**94.23**	**3478.27**

- 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 18 ha of the agriculture area has decreased and it is converted into mining/dump and water body in T3.
- In T3 7.3 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-2019-20 to 2020-21

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	65.21										**65.21**
Mining/dump		8.24									**8.24**
Agriculture	0.82		1809.98	1.81							**1812.61**
Plantation Horticulture	3.48		3.3	65.95							**72.73**
Forest					755.61						**755.61**
Forest Plantation											
Barren Rocky							31.48				**31.48**
Scrub	1.23		10.41					539.47			**551.11**
Waterbody-Streams/River									87.05		**87.05**
Waterbody – Ponds										94.23	**94.23**
Grand Total	**70.74**	**8.24**	**1823.69**	**67.76**	**755.61**		**31.48**	**539.47**	**87.05**	**94.23**	**3478.27**

- 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 2.6 ha of the agriculture area has decreased and it is converted into agriculture, plantations in T4.
- In T4 13.7 ha of the agriculture area has increased from plantations 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-2020-21 to 2021-22

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	70.74										**70.74**
Mining/dump		8.24									**8.24**
Agriculture			1821.97					1.72			**1823.69**
Plantation Horticulture			0.93	66.83							**67.76**
Forest					755.61						**755.61**
Forest Plantation											
Barren Rocky							31.48				**31.48**
Scrub	2.96	0.93	30.07					505.51			**539.47**
Waterbody-Streams/River									87.05		**87.05**
Waterbody – Ponds										94.23	**94.23**
Grand Total	**73.7**	**9.17**	**1852.97**	**66.83**	**755.61**		**31.48**	**507.23**	**87.05**	**94.23**	**3478.27**

- 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 1.17 ha of the agriculture area has decreased and it is converted into scrubland in T5.
- In T5 31 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 32.8 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 77, 43, 11 & 29 Hectares from T0-T1, T1-T2, T3-T4 & T4-T5 respectively and overall increase of 150 Hectares in Crop land area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
5. There is a decrease of 131 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. Farm ponds (22) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (22) verified from the portal.