MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

YSR KADAPA -43/2012-13
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
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Remote Sensing Application Area,
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DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

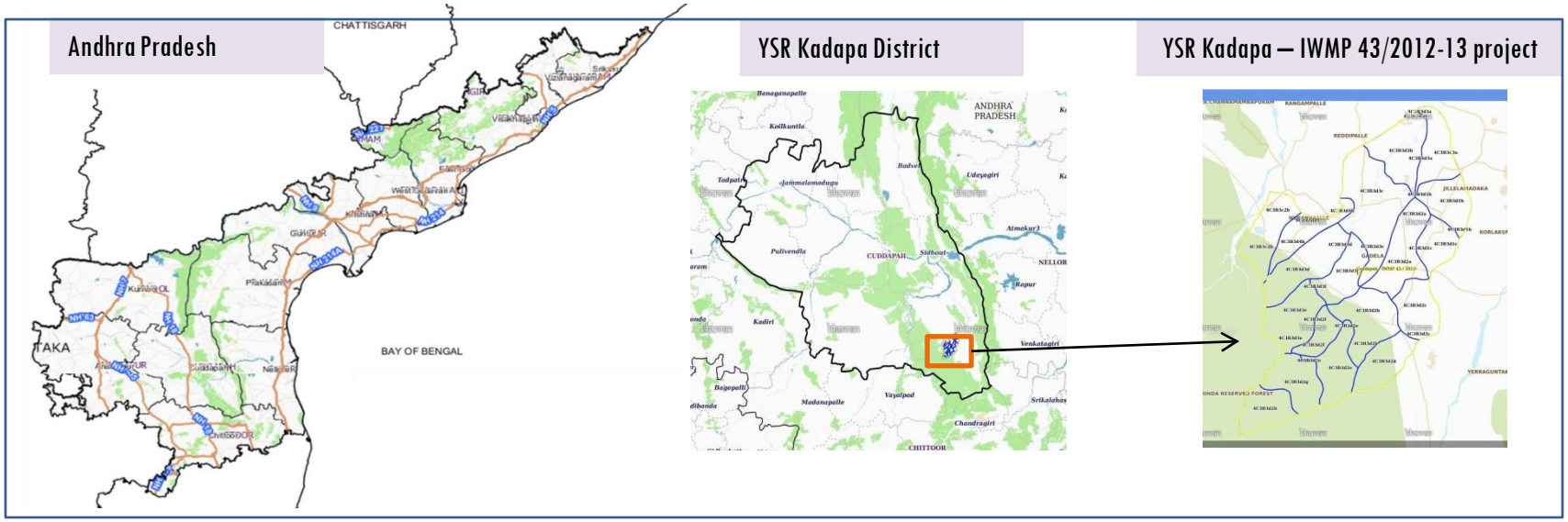
CONTENTS

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-43/2012-13, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 9,062 ha. It comprises of 18 micro watersheds.
- In the project area 462 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 8 new farm ponds or dug out pits and 42 check dams and drainage treatments.
- Major percentage i.e. 40 % is covered by the agriculture area, 36 forest, 13 % is covered by plantation/horticulture and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-43/2012-13
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Obulavaripalle Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is **9,062** ha. It comprises of 18 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			30-Oct-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			30-Oct-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	462
4	Detailed Project Report		

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

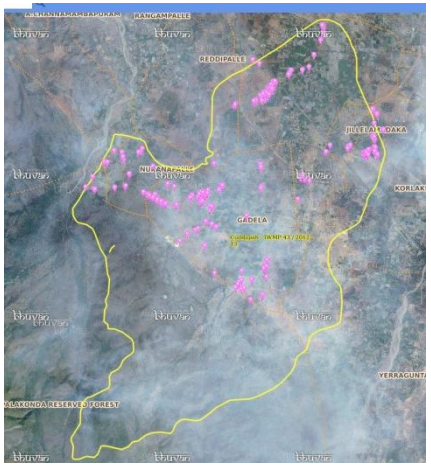
Legend

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	3	3
2	Afforestation	3	3
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	2	2
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	8	8
11	Civil work-Check dams /Rock fill dam	42	40
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)	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	6	6
18	Others	649	400
	TOTAL	**713**	**462**

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)

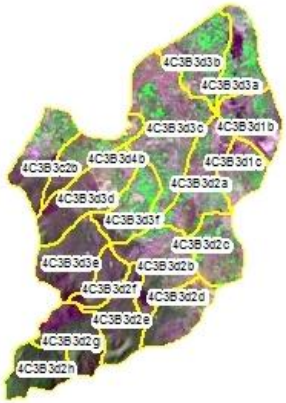
Natural Color Composite-18th February 2012

Source:LISS-IV,NRSC

Natural Color Composite- 22nd January 2017

Source:LISS-IV,NRSC

Natural Color Composite-06th March 2018



Source:LISS-IV,NRSC

Natural Color Composite-05th June 2019

Source:NCC,NRSC

Natural Color Composite- 05th February 2020

Source:LISS-IV,NRSC

Natural Color Composite- 30th October 2020

Source-Sentinel

Monitoring of activities in YSR Kadapa District Andhra Pradesh. IWMP-43/2012-13

T0 Satellite data 2014

T1 Satellite data 2016

T2 Satellite data 2017

T3 Satellite data 2018

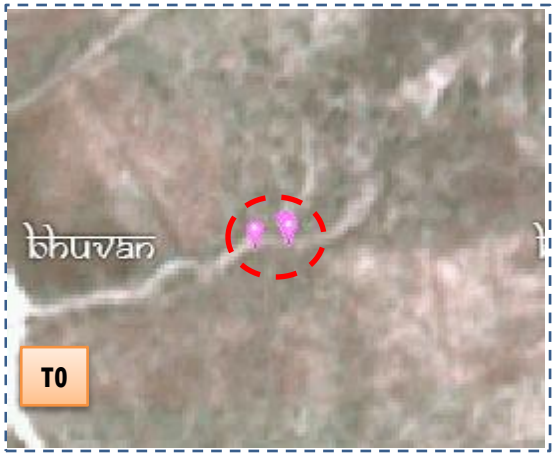
T4 Satellite data 2019

T5 Satellite data 2020

Drishti Id. 2605039

Check Dams

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-43/2012-13

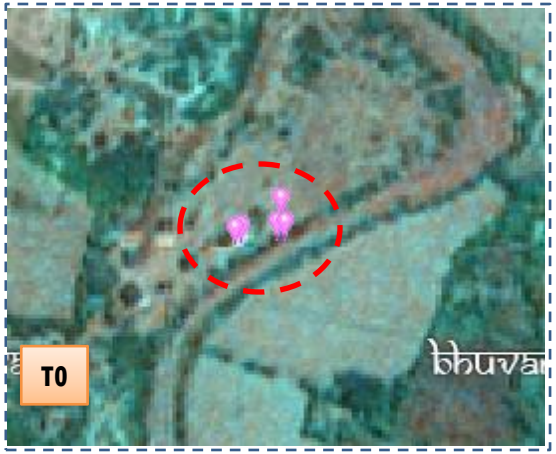


T0: 2012-13

T1: 22 January 2017

Drishti Sl no. 1629849 MWS : 4C3B3d3f

Check Dam



T0: 2012-13

T1: 22 January 2017

Drishti Sl no. 2565057 MWS : 4C3B3d3d

Check Dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-43/2012-13

T0: 2012-13

T1: 22 January 2017

Drishti Sl no. 2441670 MWS : 4C3B3c2b

Horticulture

T0: 2012-13

T1: 22 January 2017

Drishti Sl no. 2441727 MWS : 4C3B3c2b

Horticulture

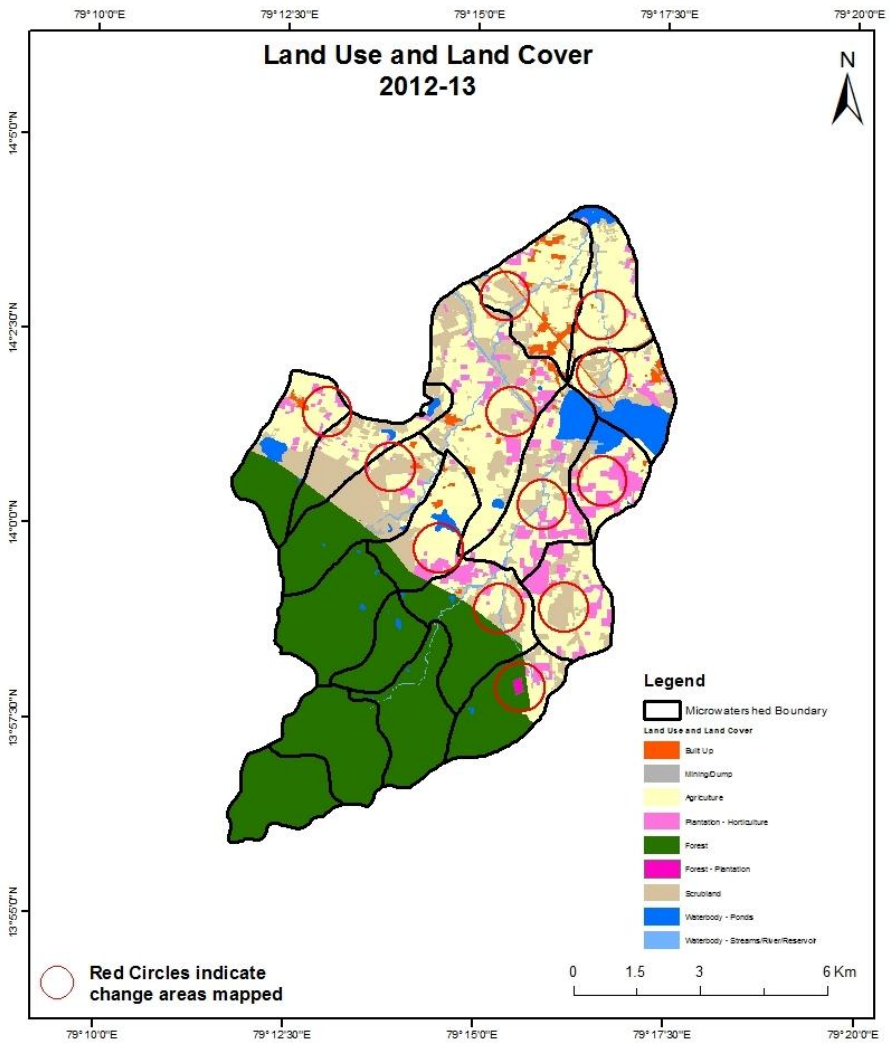
MONITORING IN THE PROJECT AREA

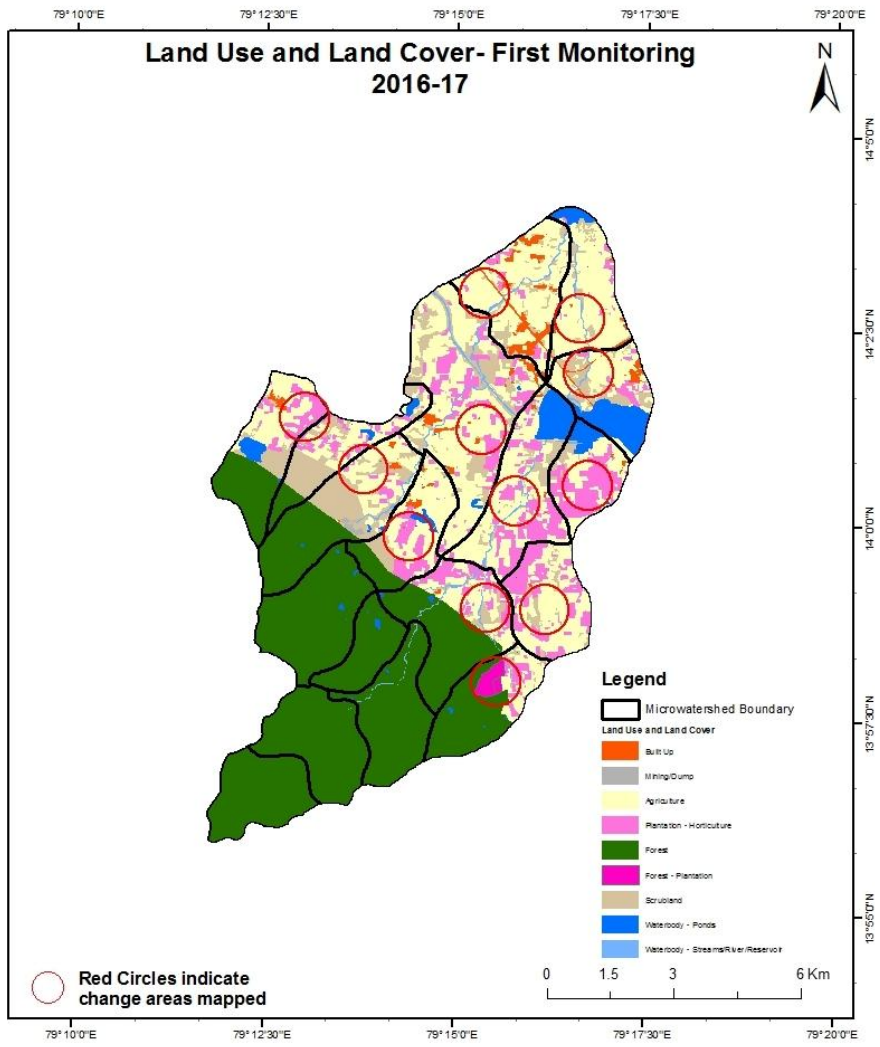
Land use and Land cover Changes in the Project

- 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 (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)

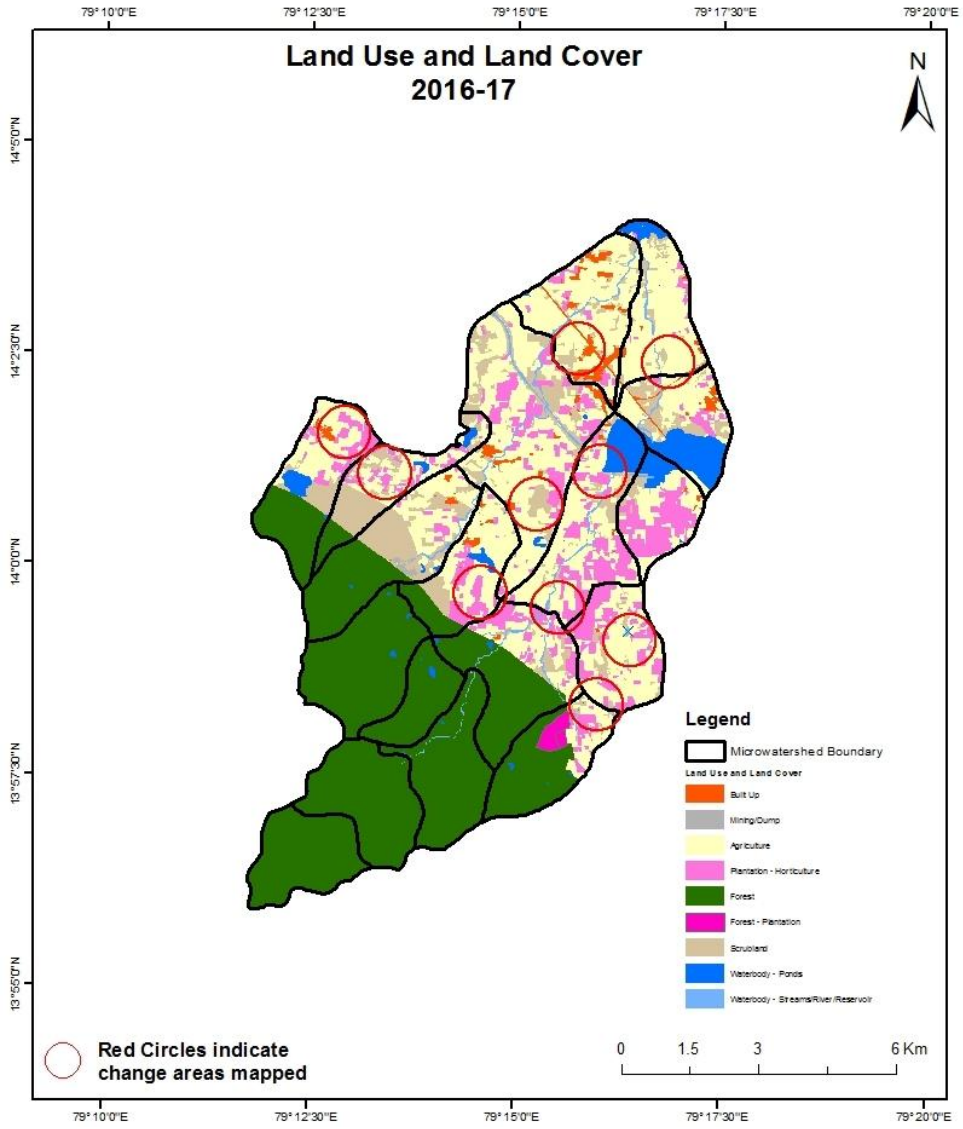
Scale: 1:10000

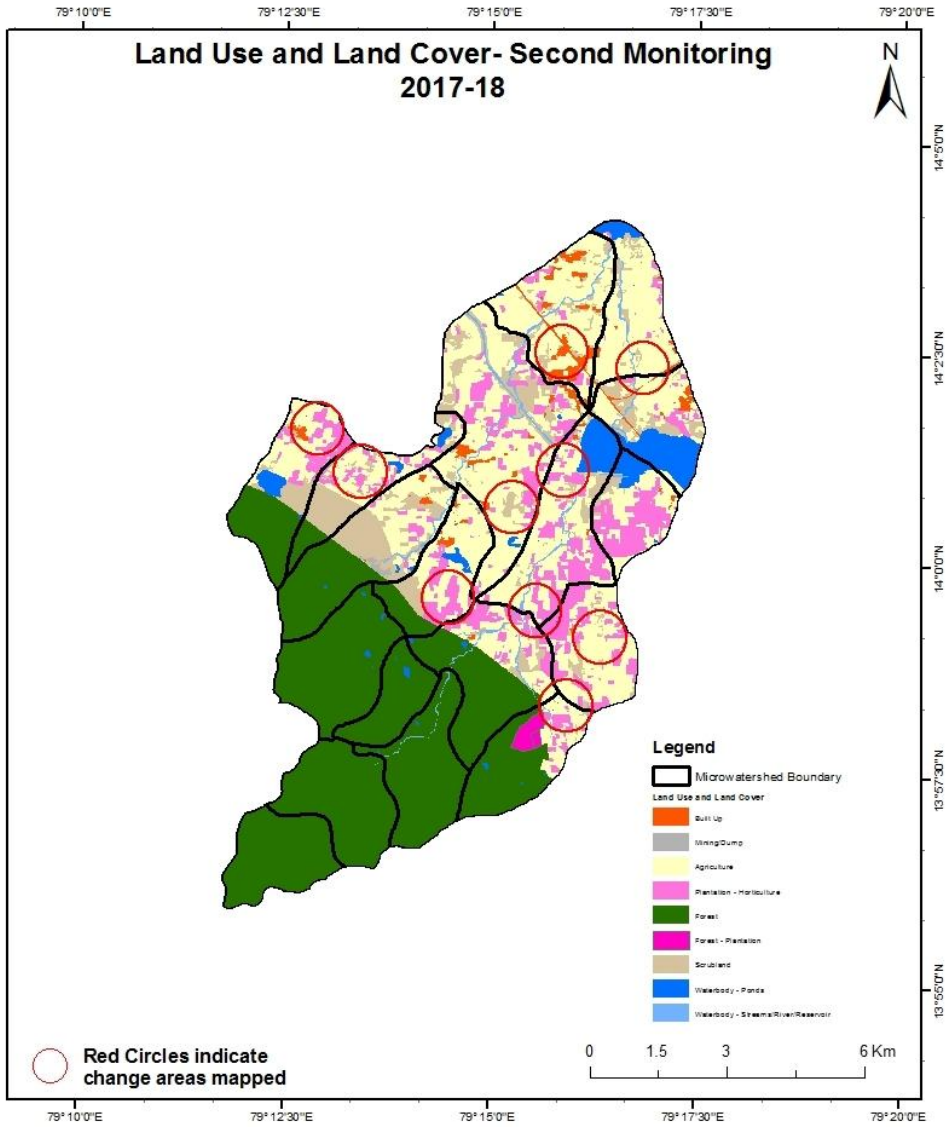




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

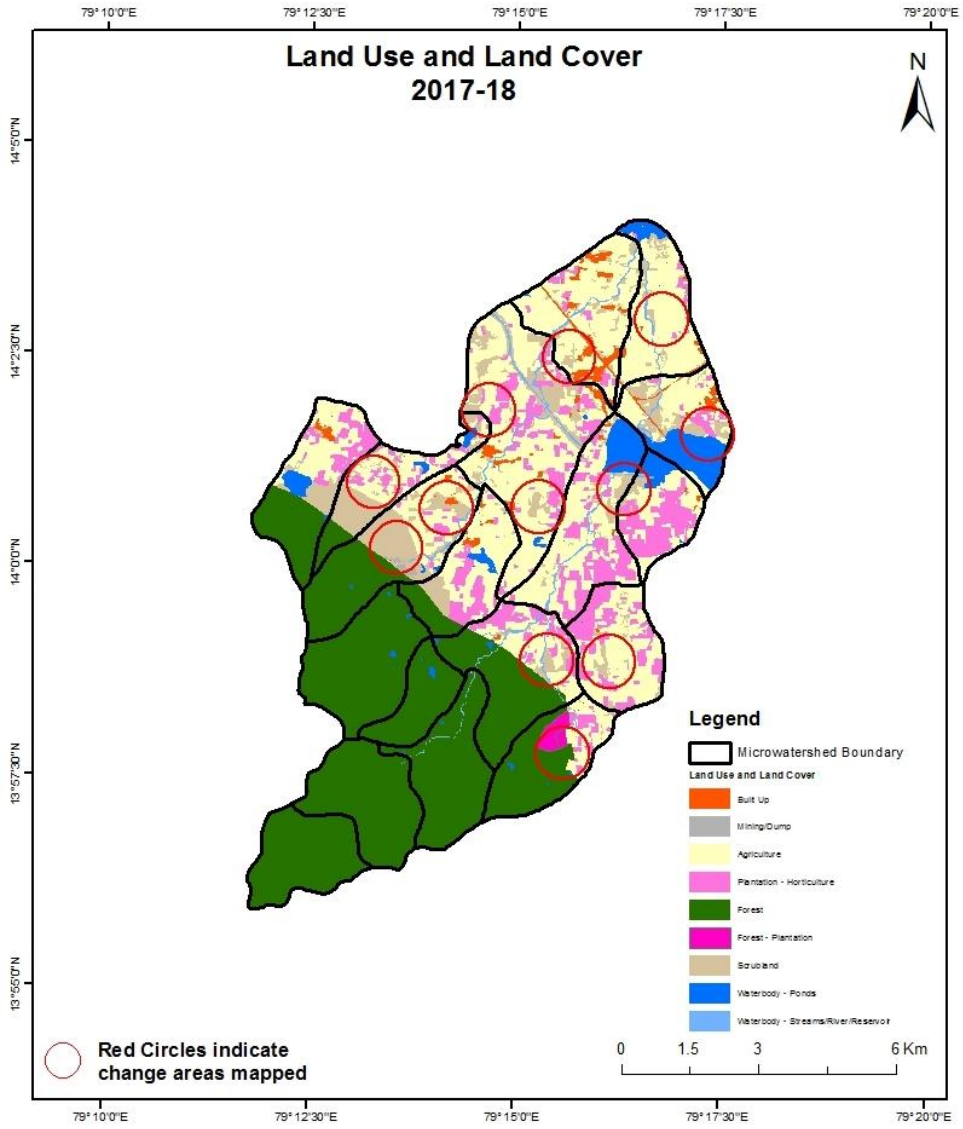
Scale: 1:10000

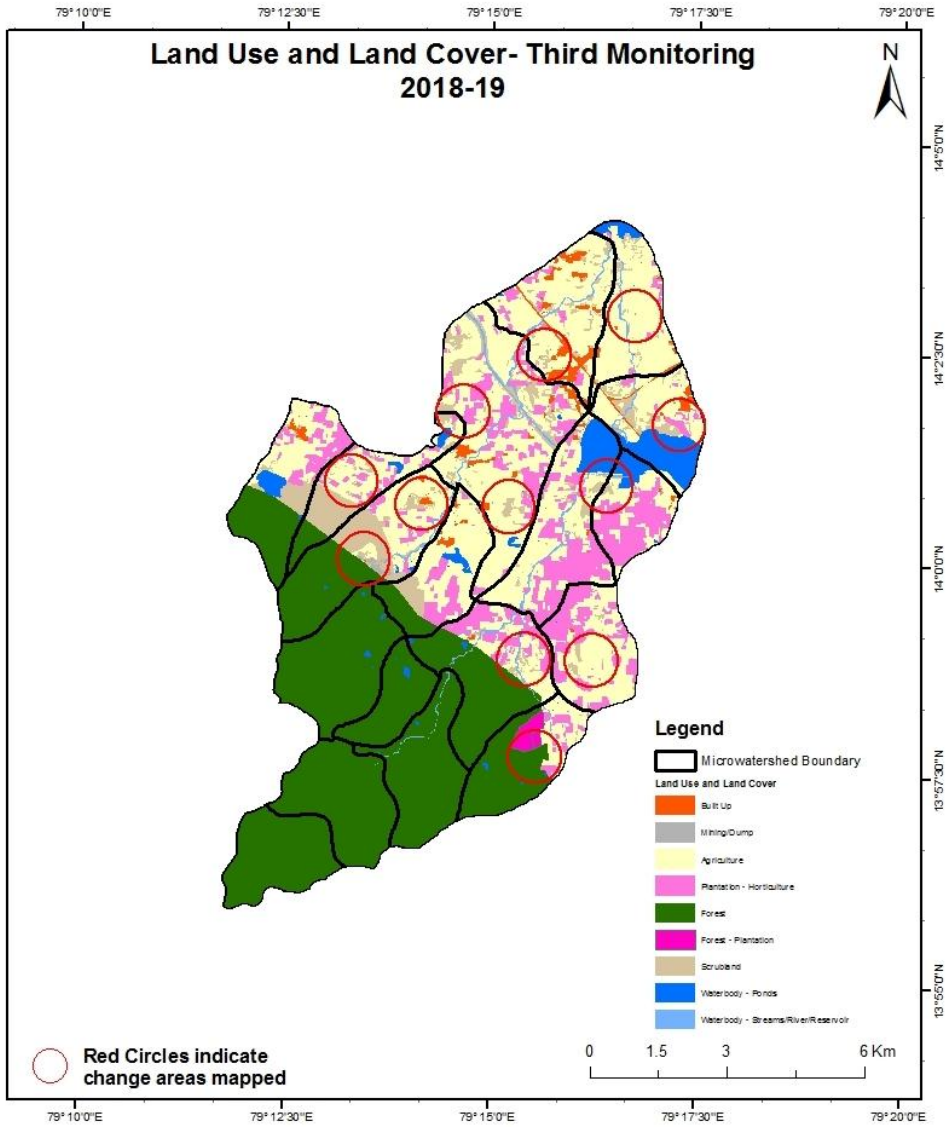




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

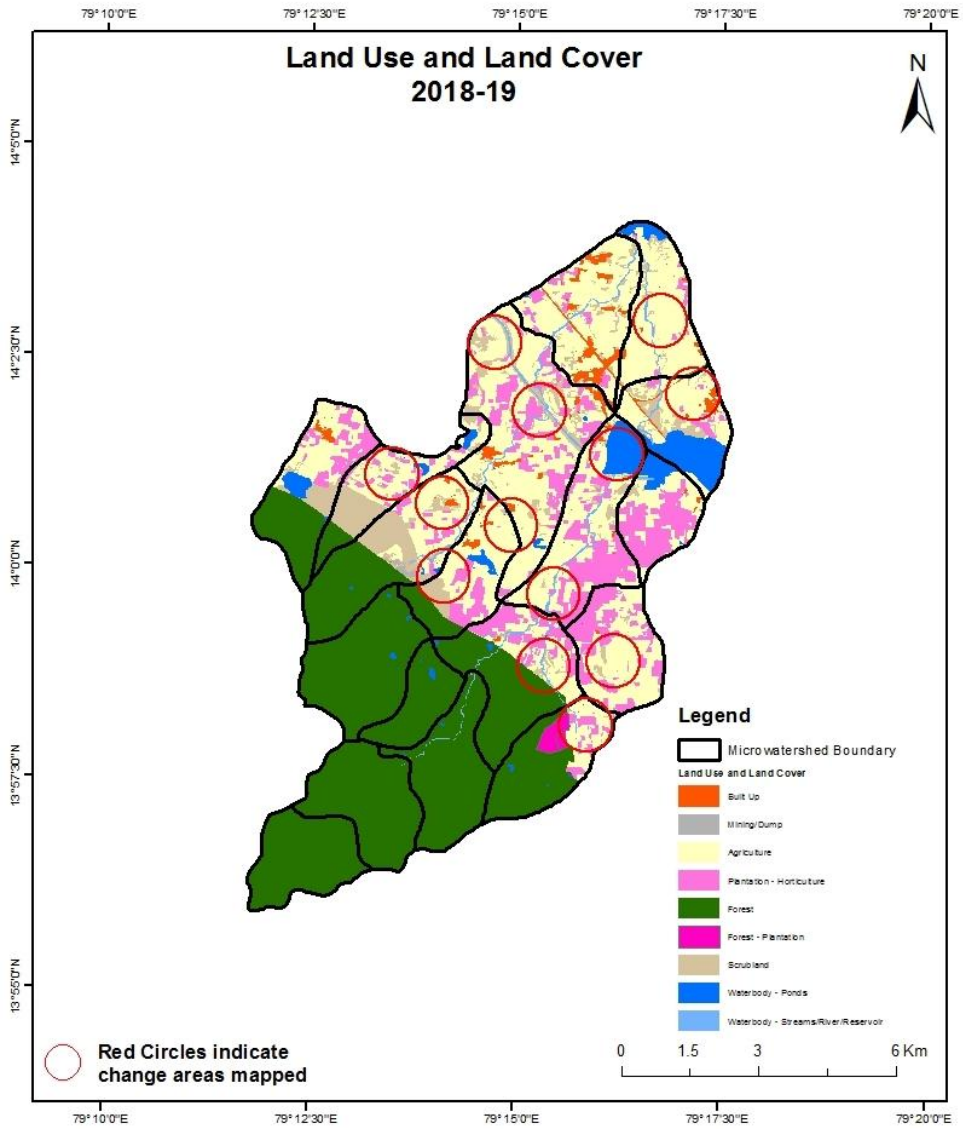
Scale: 1:10000

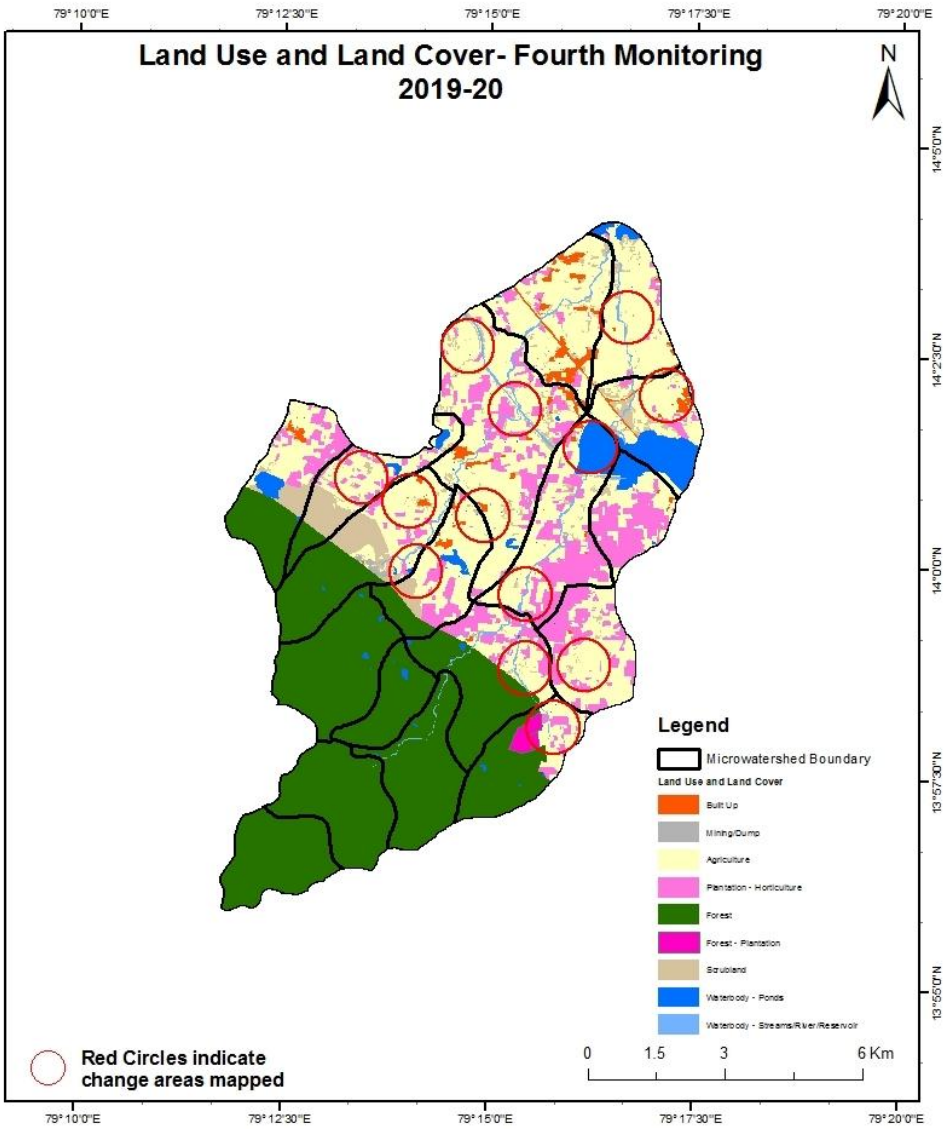




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

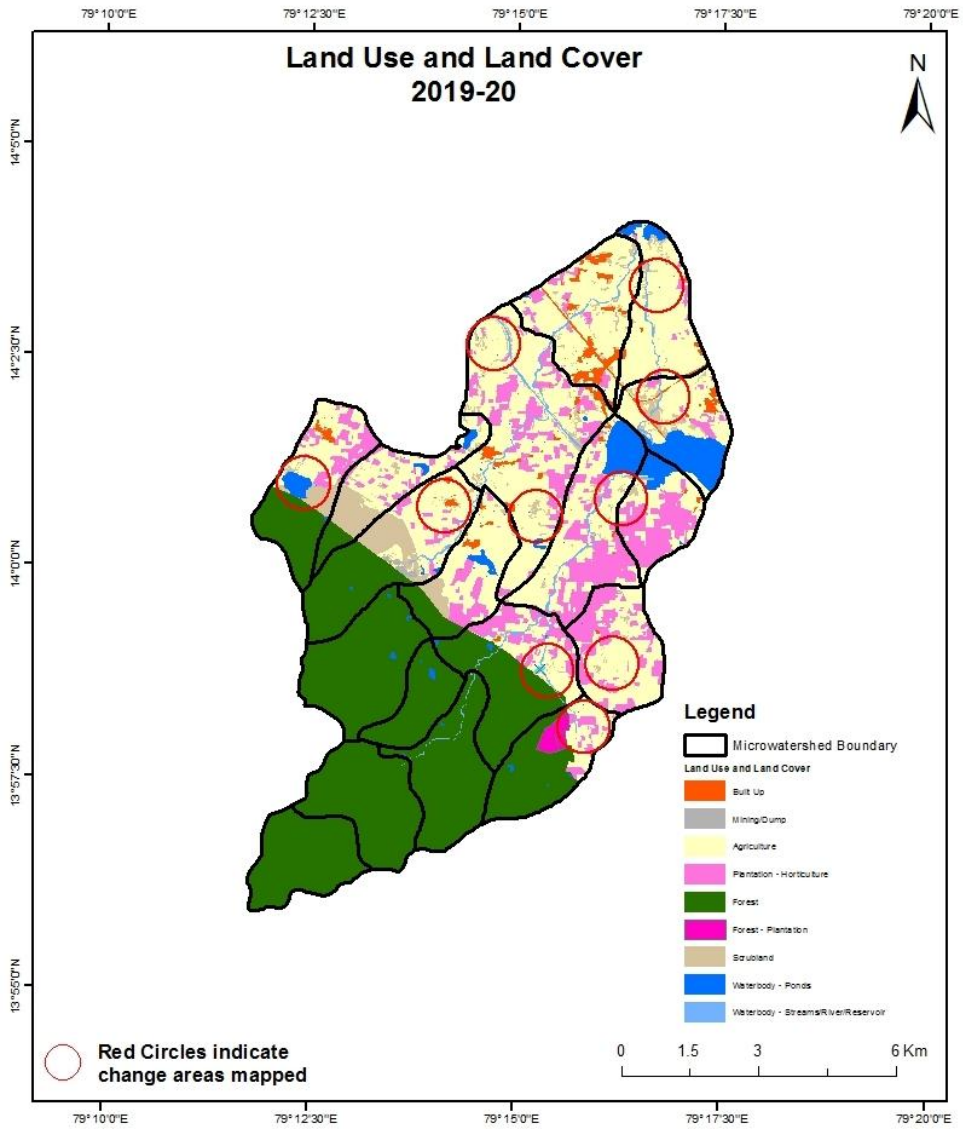
Scale: 1:10000

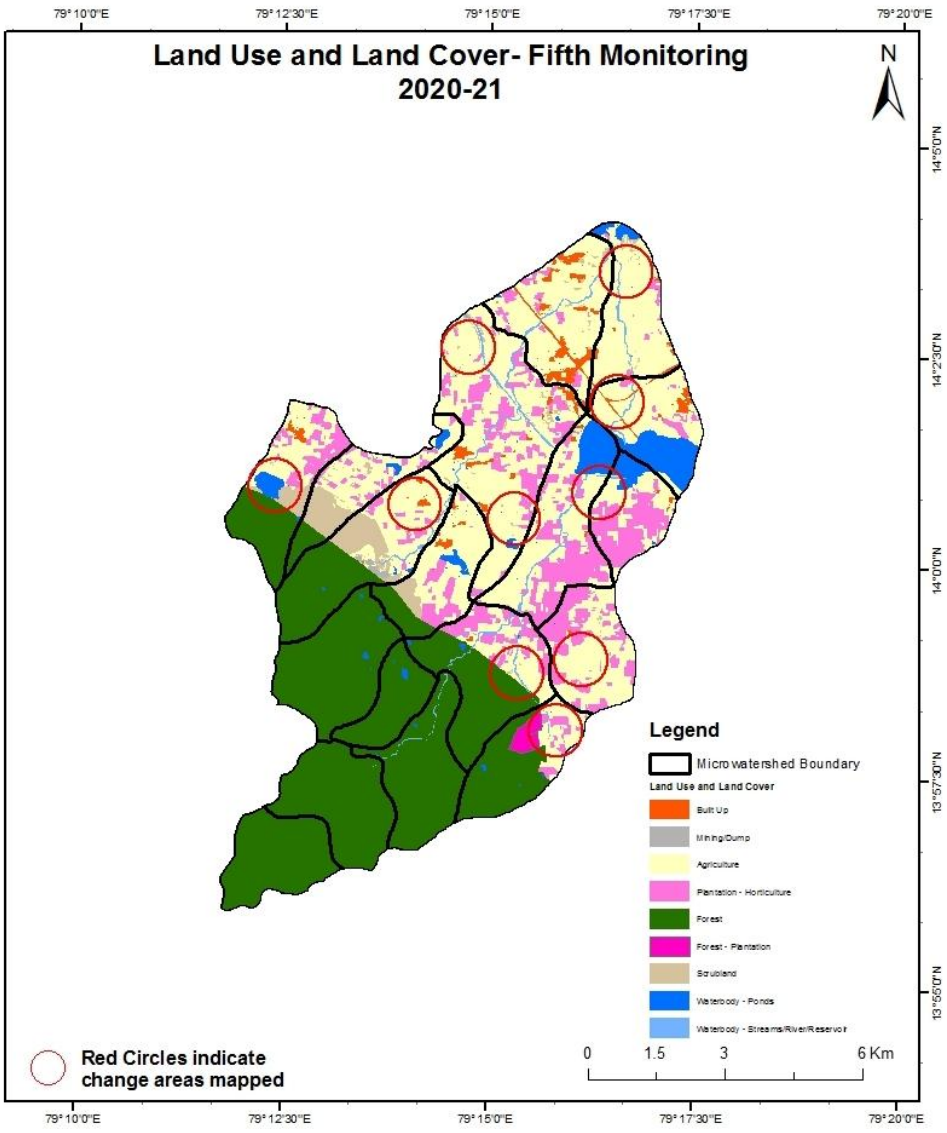




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000





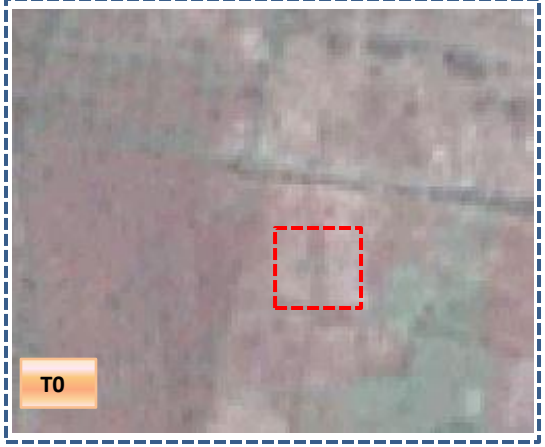
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0:2012-213 (79°13'14.172"E 14°1'25.916"N)

T0: 17 Oct 2016

Agriculture to Farm Pond

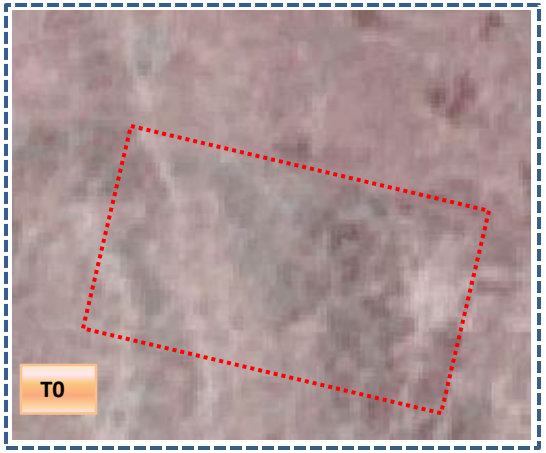


T0: 2012-13 (79°16'39.47"E 13°58'58.969"N)

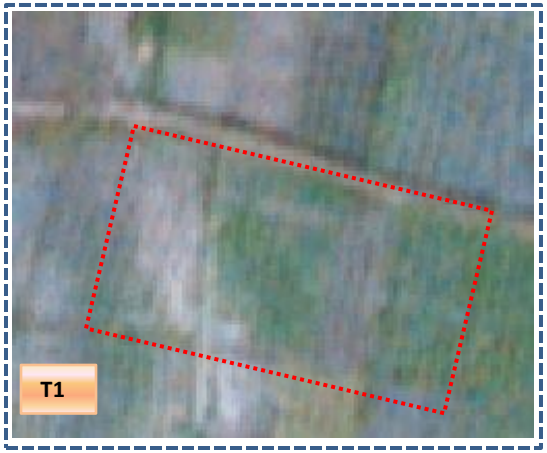
T0: 17 Oct 2016

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

Scrub to Plantation

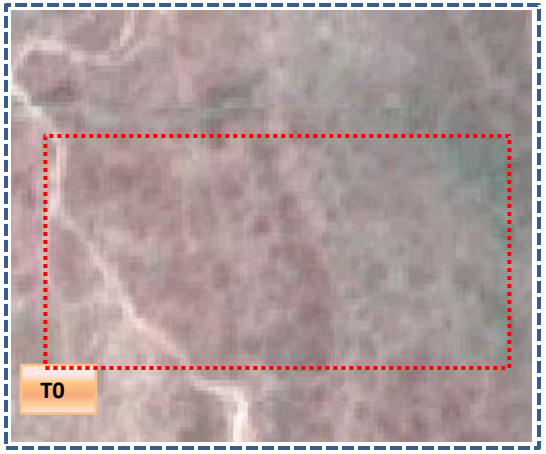


T0: 2012-13(79°15'34.102"E 13°59'13.834"N)

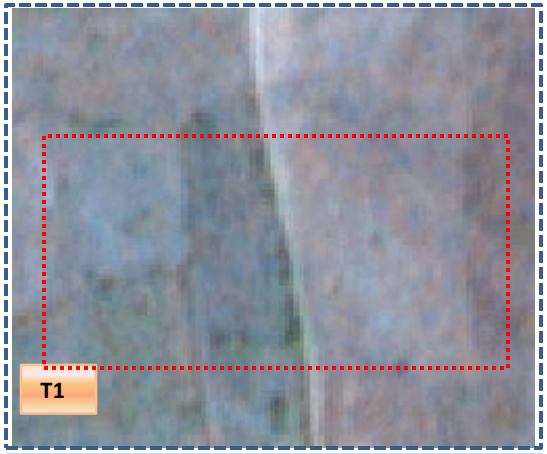


T1: 17 Oct 2016

Scrub to Agriculture



T0: 2012-13 (79°15'27.886"E 13°58'59.227"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	152.70										**152.70**
Mining/dump		5.52									**5.52**
Agriculture	11.33		2515.12	448.26						0.48	**2975.19**
Plantation Horticulture	0.27		30.47	597.18						0.13	**628.05**
Forest			5.36		3333.91	31.79				0.62	**3371.67**
Forest Plantation						6.81					**6.81**
Barren Rocky											
Scrub	2.47	3.09	482.87	17.21				937.46		0.29	**1443.38**
Waterbody-Streams/River									112.89		**112.89**
Waterbody – Ponds			11.76							354.66	**366.42**
Grand Total	**166.77**	**8.61**	**3045.57**	**1062.64**	**3333.91**	**38.61**		**937.46**	**112.89**	**356.17**	**9062.63**

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

• In T1 525 ha of the agriculture area has increased from plantations, 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	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	166.77										**166.77**
Mining/dump		8.61									**8.61**
Agriculture	1.49		3021.10	22.88						0.11	**3045.57**
Plantation Horticulture			16.44	1046.18						0.02	**1062.64**
Forest					3333.91						**3333.91**
Forest Plantation						38.61					**38.61**
Barren Rocky											
Scrub	0.27	1.08	94.84	1.79				839.44		0.05	**937.46**
Waterbody-Streams/River									112.87	0.03	**112.89**
Waterbody – Ponds										356.17	**356.17**
Grand Total	**168.52**	**9.69**	**3132.37**	**1070.86**	**3333.91**	**38.61**		**839.44**	**112.87**	**356.38**	**9062.63**

- 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 24 ha of the agriculture area has decreased and it is converted into Built-up , plantations and water body in T2.
- In T2 111 ha of the agriculture area has increased from plantations 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	168.52										**168.52**
Mining/dump		9.69									**9.69**
Agriculture	2.53		2919.42	210.02						0.41	**3132.37**
Plantation Horticulture	0.18		83.72	986.96							**1070.86**
Forest					3333.91						**3333.91**
Forest Plantation						38.61					**38.61**
Barren Rocky											
Scrub	0.92		215.23	5.14				618.15			**839.44**
Waterbody-Streams/River									112.87		**112.87**
Waterbody – Ponds			4.84							351.54	**356.38**
Grand Total	**172.14**	**9.69**	**3223.21**	**1202.12**	**3333.91**	**38.61**		**618.15**	**112.87**	**351.95**	**9062.63**

- 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 212 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T3.
- In T3 303 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-2018-19 to 2019-20

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	172.14										**172.14**
Mining/dump		9.69									**9.69**
Agriculture	0.70		3221.50							1.01	**3223.21**
Plantation Horticulture			19.32	1182.75						0.04	**1202.12**
Forest					3333.91						**3333.91**
Forest Plantation						38.61					**38.61**
Barren Rocky											
Scrub	0.08	1.14	159.52					456.99		0.42	**618.15**
Waterbody-Streams/River									112.87		**112.87**
Waterbody – Ponds			1.14							350.81	**351.95**
Grand Total	**172.91**	**10.83**	**3401.49**	**1182.75**	**3333.91**	**38.61**		**456.99**	**112.87**	**352.28**	**9062.63**

• 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 1.7 ha of the agriculture area has decreased and it is converted into Built-up and water body in T4.

•In T4 179 ha of the agriculture area has increased from plantations, scrubland and water body 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	172.91										**172.91**
Mining/dump		10.83									**10.83**
Agriculture			3401.49								**3401.49**
Plantation Horticulture			1.77	1180.98							**1182.75**
Forest					3333.91						**3333.91**
Forest Plantation						38.61					**38.61**
Barren Rocky											
Scrub	0.15	0.10	171.12					285.59		0.02	**456.99**
Waterbody-Streams/River									112.87		**112.87**
Waterbody – Ponds										352.28	**352.28**
Grand Total	**173.07**	**10.93**	**3574.38**	**1180.98**	**3333.91**	**38.61**		**285.59**	**112.87**	**352.30**	**9062.63**

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

•In T5 172 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 decrease of 14 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 70, 86, 90, 178 & 172 Hectares from T0-T1, T1 to T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 599 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.
5. There is a **increase of 552 Hectares in plantation/horticulture area** as compared between 2012-13 (T0) & 2020-21 (T5) years.
6. There is a decrease of 1,157 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.