MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

KURNOOL -54/2012-13
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

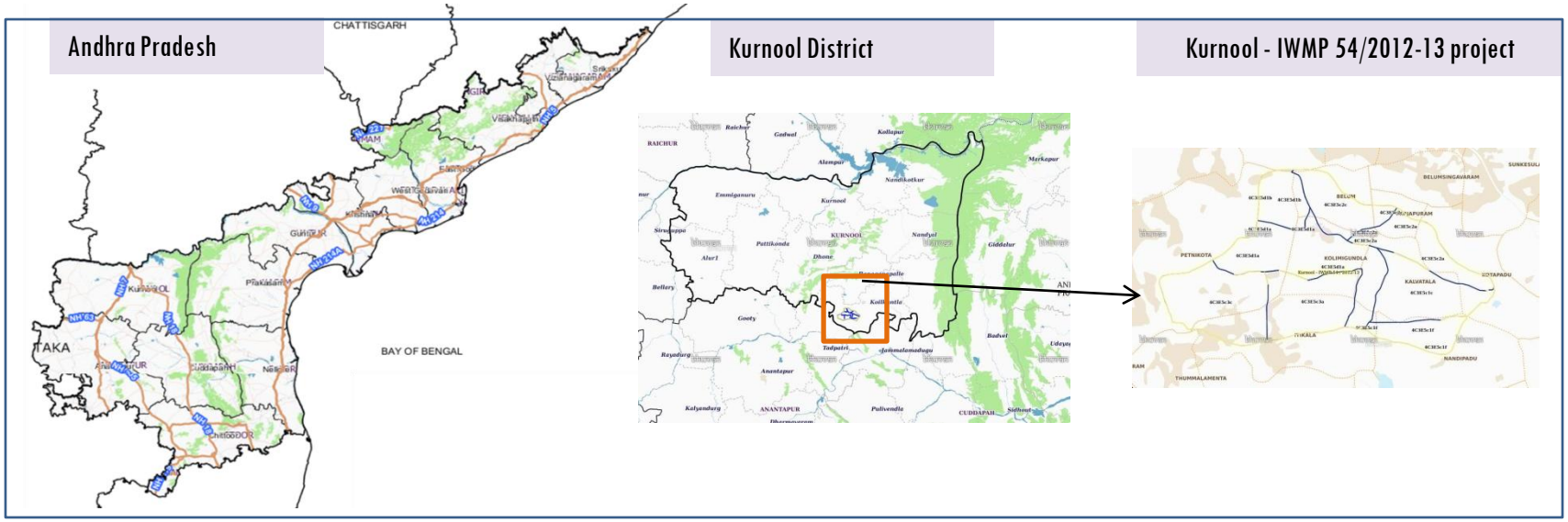
CONTENTS

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-54/2012-13, Kurnool District of Andhra Pradesh. The total geographical area of the project is **7,504** ha. It comprises of 14 micro watersheds.
- In the project area 335 Drishti photos were uploaded showing 69 checks & plugins, 3 Field bunds and remaining showing others.
- Water bodies have shown an increase by 58 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 48% is covered by the agriculture, 41 % is covered by scrubland, 5.1 % is covered by mining/dump area and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-54/2012-13
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Kolimigundla Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is **7,504** 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



- The climate is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).
- The average annual rainfall of the district is 665.5mm, which ranges from nil rainfall in January and December to 139.6 mm in September. August and September are the wettest months. The mean seasonal rainfall distribution is 459.1mm in southwest monsoon (June September), 133.7mm in northeast monsoon (Oct-Dec), 1.9 mm rainfall in Winter (Jan Feb) and 70.8 mm in summer (March–May).

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2012-13	2011-12	2019-20
LISS IV	2012-13		
SCENE 1			3-Nov-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			3-Nov-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	335
4	Detailed Project Report		

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

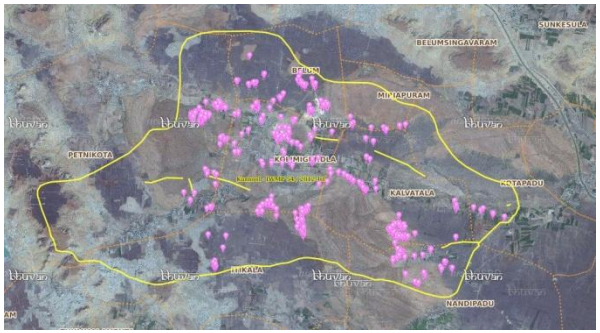
Legend

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	12	12
2	Checks & plugins	0	0
3	Agriculture	0	0
4	Blockplanting	0	0
5	Bund planting	0	0
6	Drainage Treatment	0	0
7	Farm ponds/Dug out pit	11	11
8	Check dams (Civil work)	6	6
9	Field bunds	0	0
10	Om (Other measurement)	0	0
11	LM (Livelihood Measures)	0	0
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	6	6
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	329	300
	TOTAL	**364**	**335**

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

Natural Color Composite- 2012-13

Source:Fusen data,NRSC

Natural Color Composite- 2016

Source:Fusen data,NRSC

Natural Color Composite- 30th October 2017

Source:LISS-IV,NRSC

Natural Color Composite- 4th January 2019

Source:Sentinel

Natural Color Composite- 3rd November 2019

Source:LISS-IV,NRSC

Natural Color Composite- 27th February 2021

Source:Sentinel

Monitoring of activities in Kurnool District Andhra Pradesh. IWMP-54/2012-13

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. 1882974

Check dam

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-54/2012-13

T0:2012-13

T1: 19 December 2016

Drishti SI no. 1719036 MWS : 4C3E5d1a

Check dam

T0:2012-13

T1: 19 December 2016

Drishti SI no. 1719038 MWS :4C3E5d1a

Check dam

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-54/2010-11

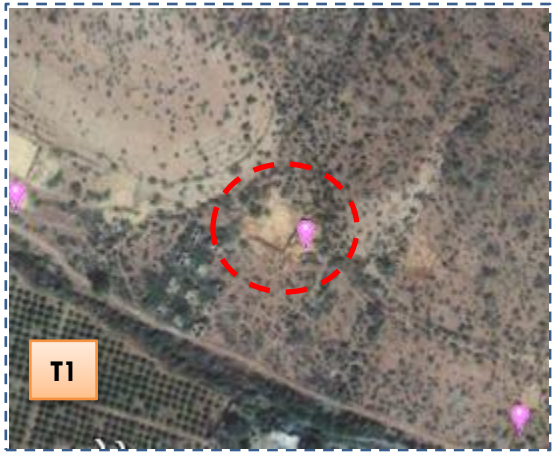
T0: 2012-13

T1: 19 December 2016

Drishti Sl no. 173672 MWS : 4C3E5c3a

Farm pond

T0: 2012-13



T1: 19 December 2016

Drishti Sl no. 1829746 MWS : 4C3E5d1a

Farm pond

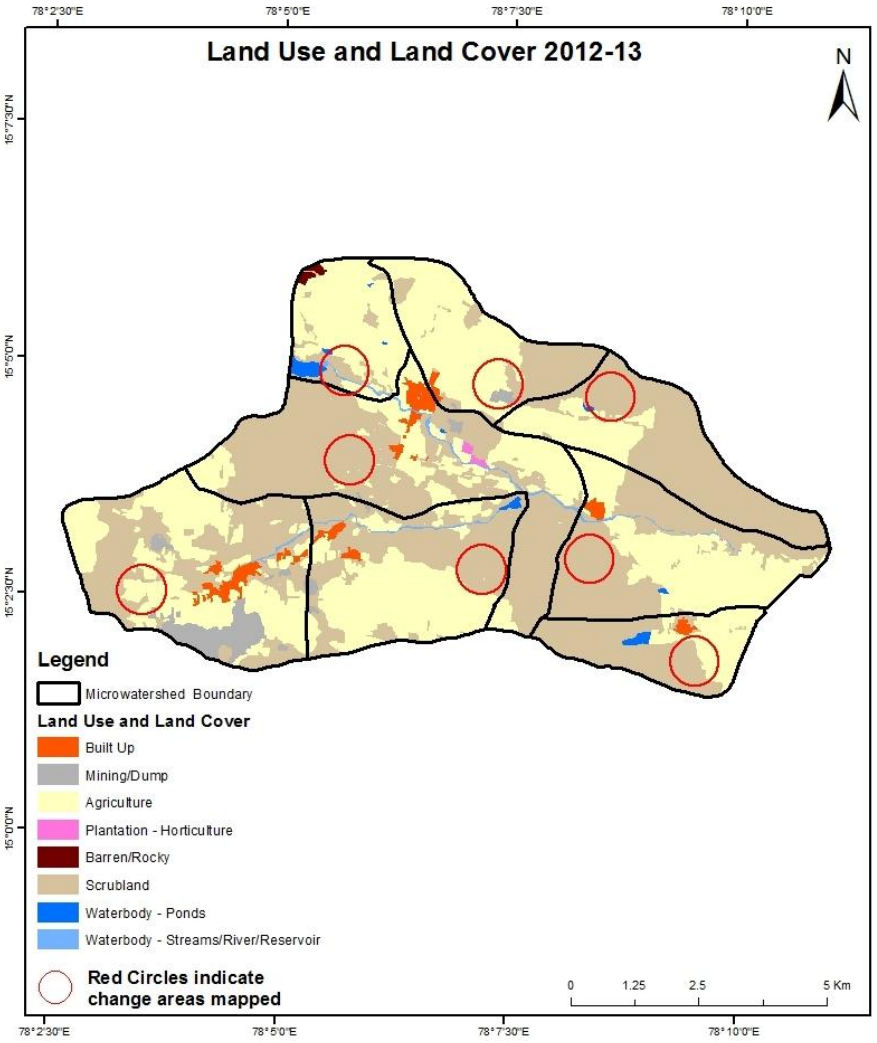
MONITORING IN THE PROJECT AREA

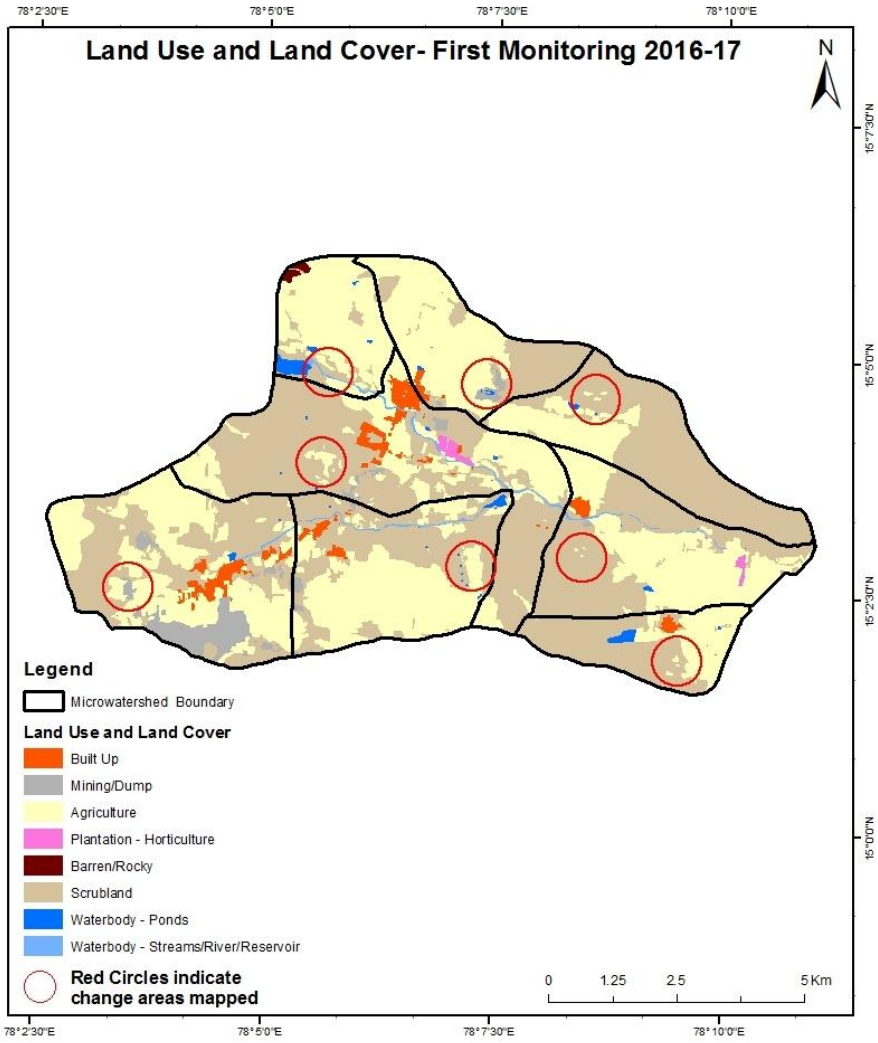
Land use and Land cover Changes in the Project

- 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)

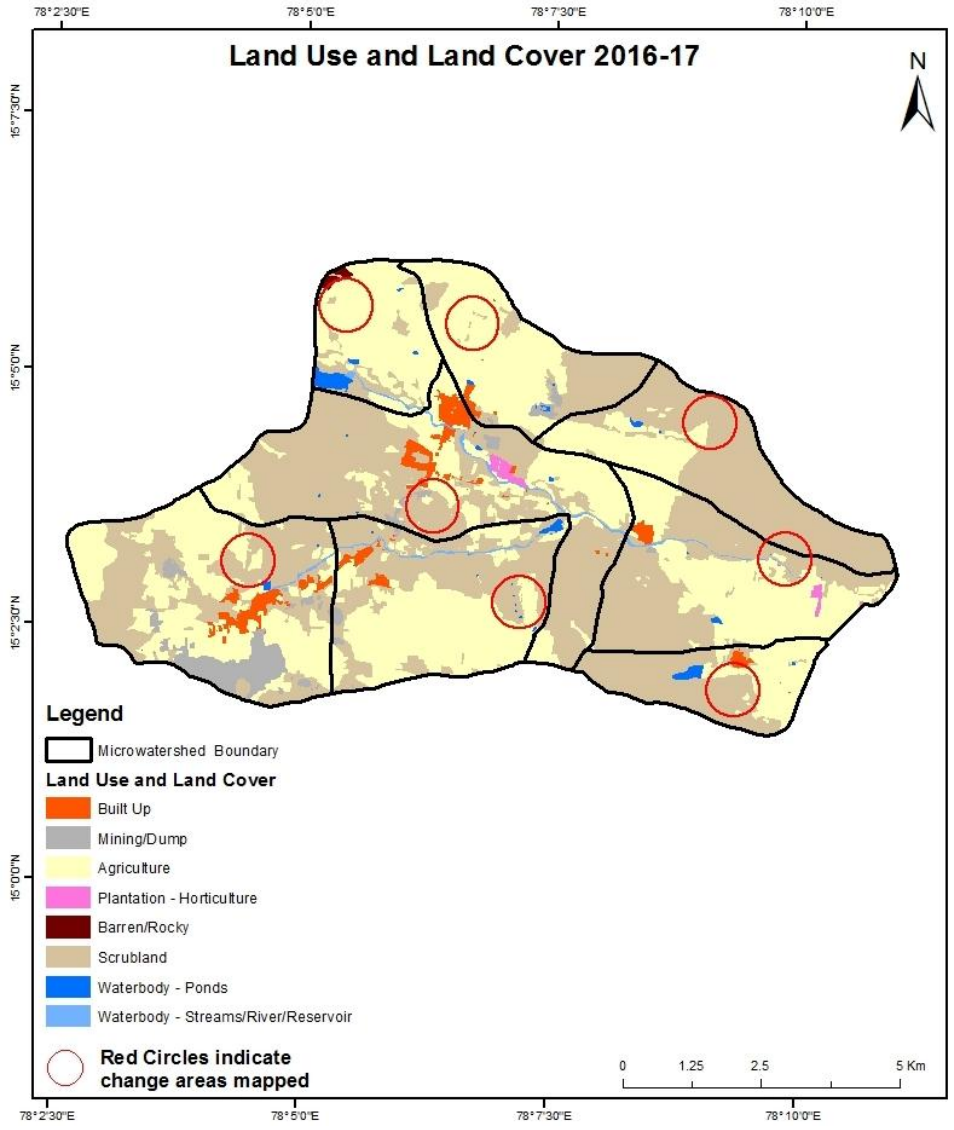
Scale: 1:10000

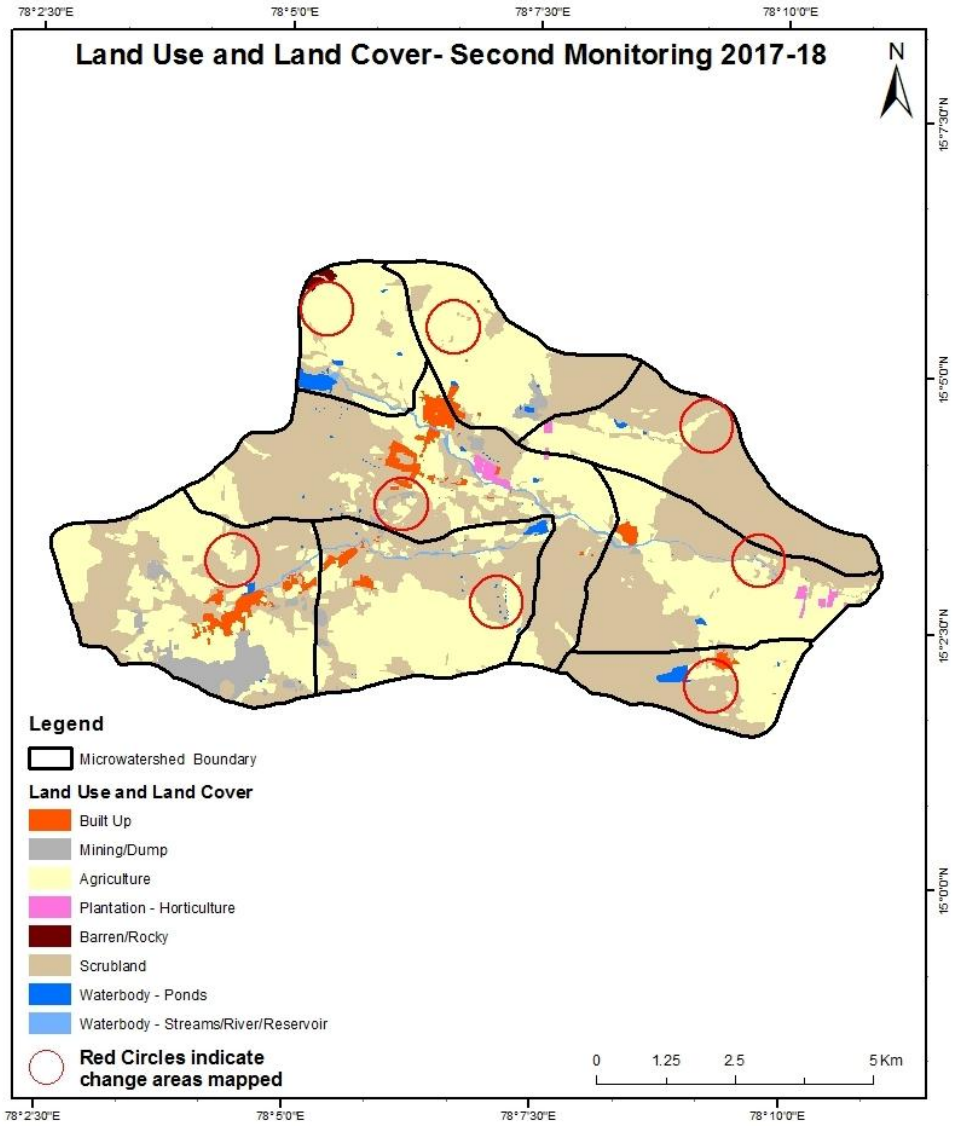




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

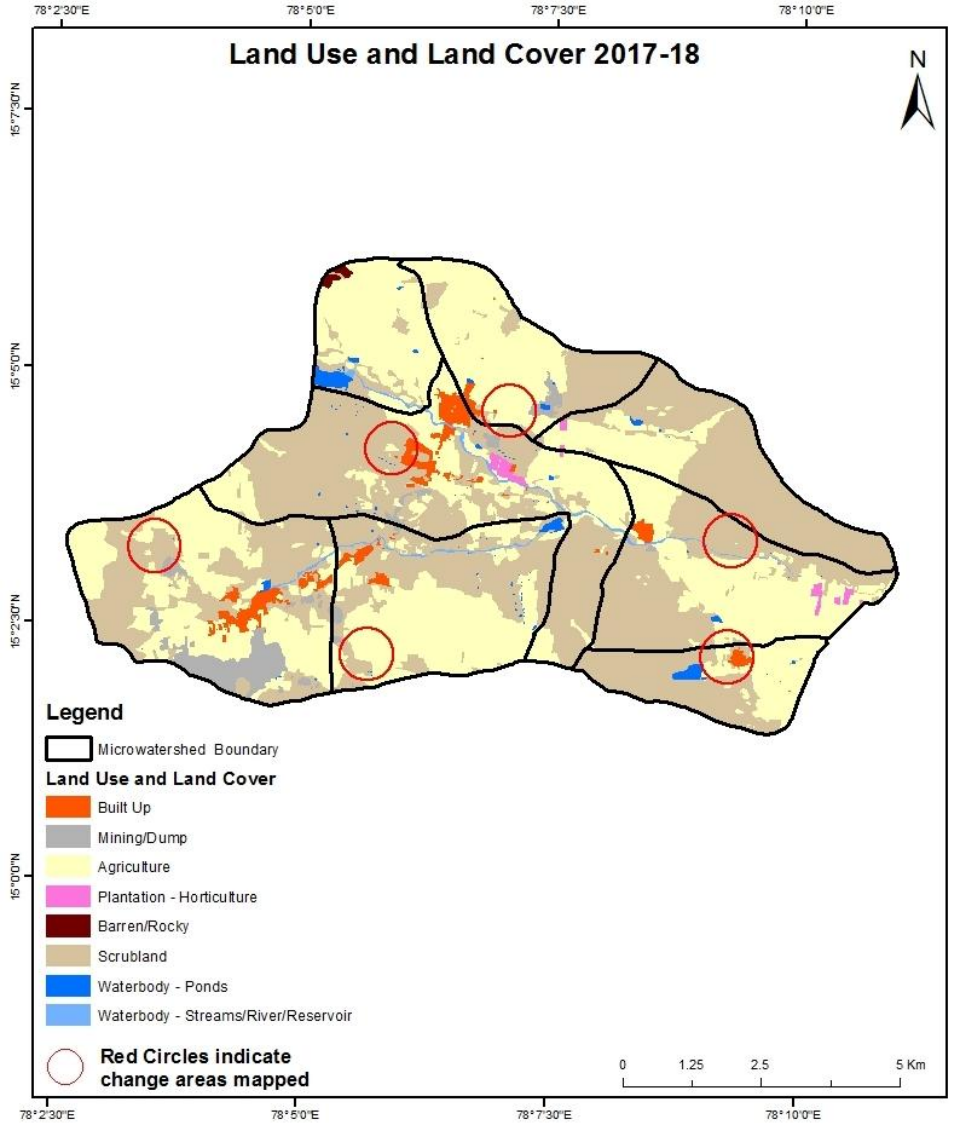
Scale: 1:10000

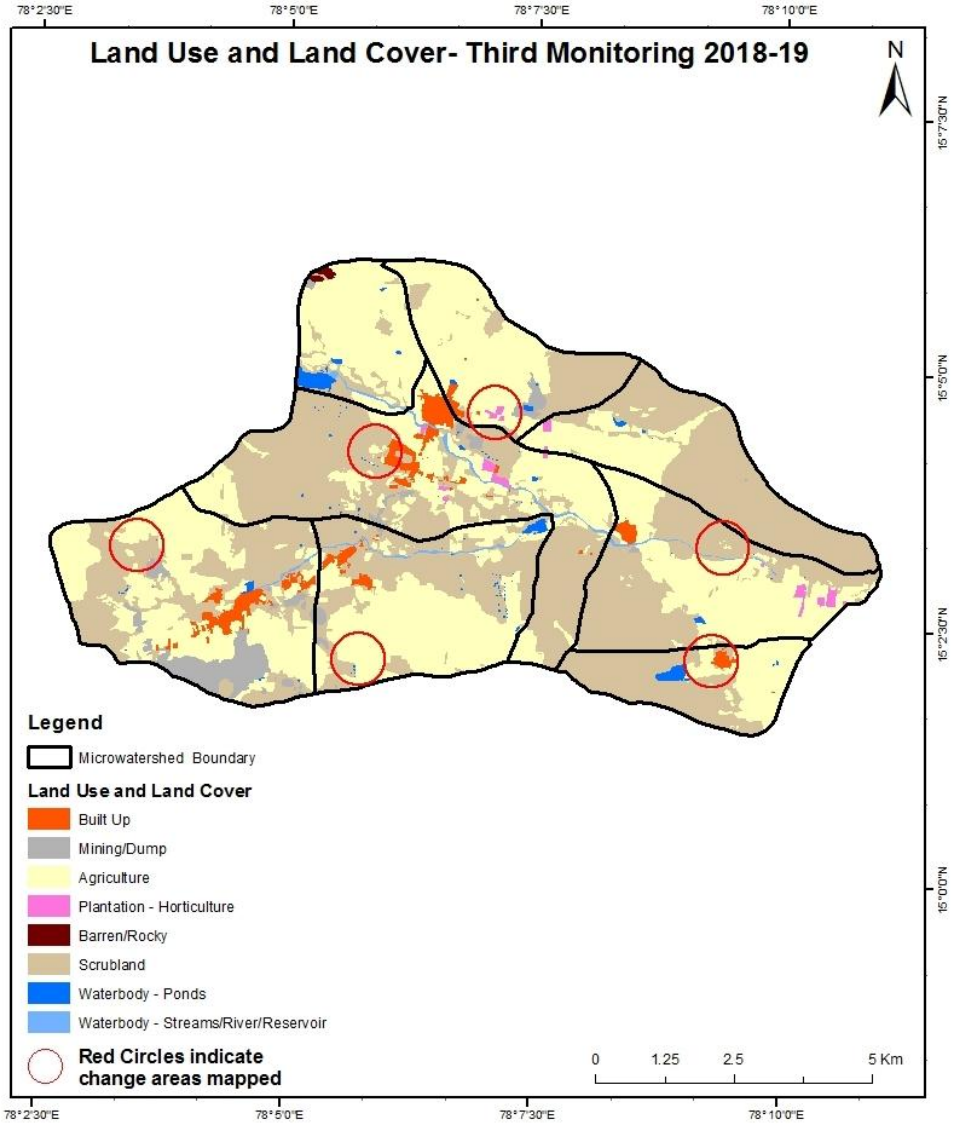




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

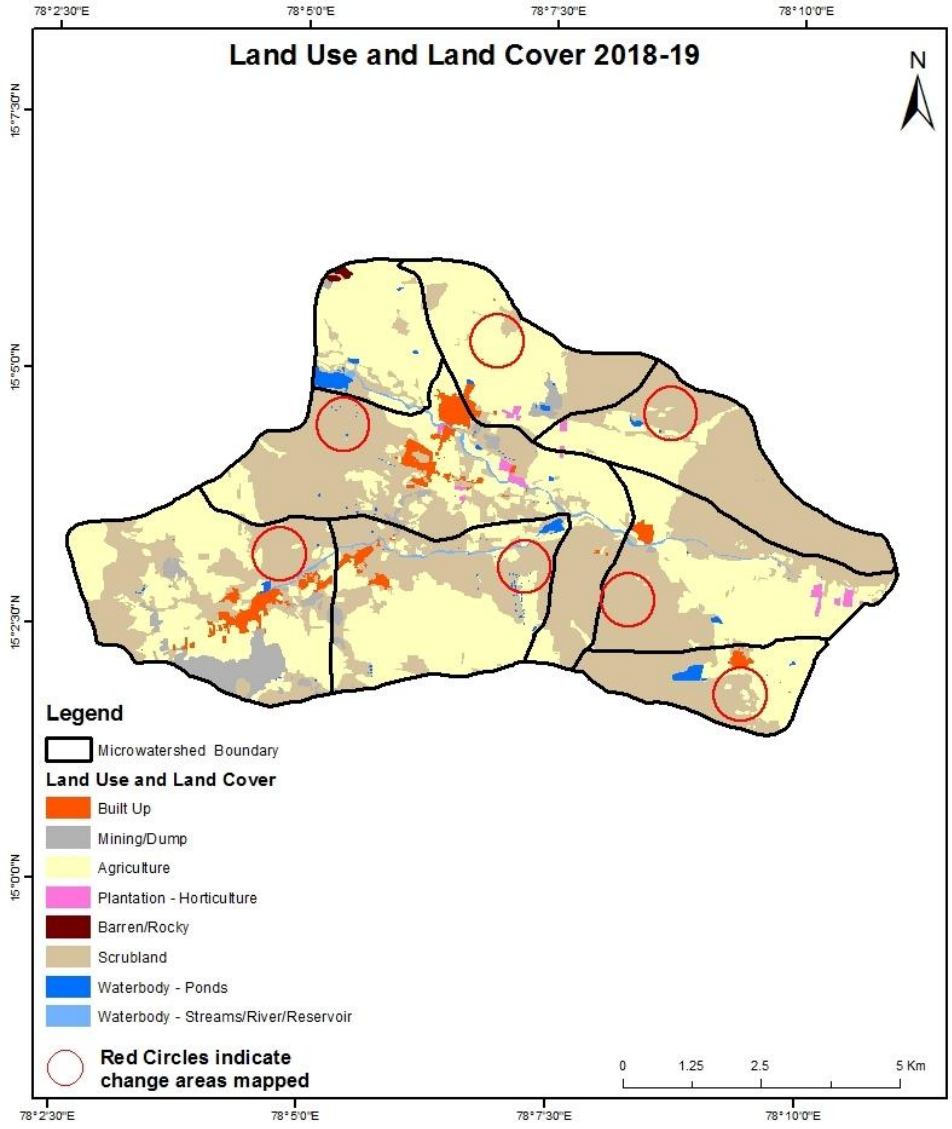
Scale: 1:10000

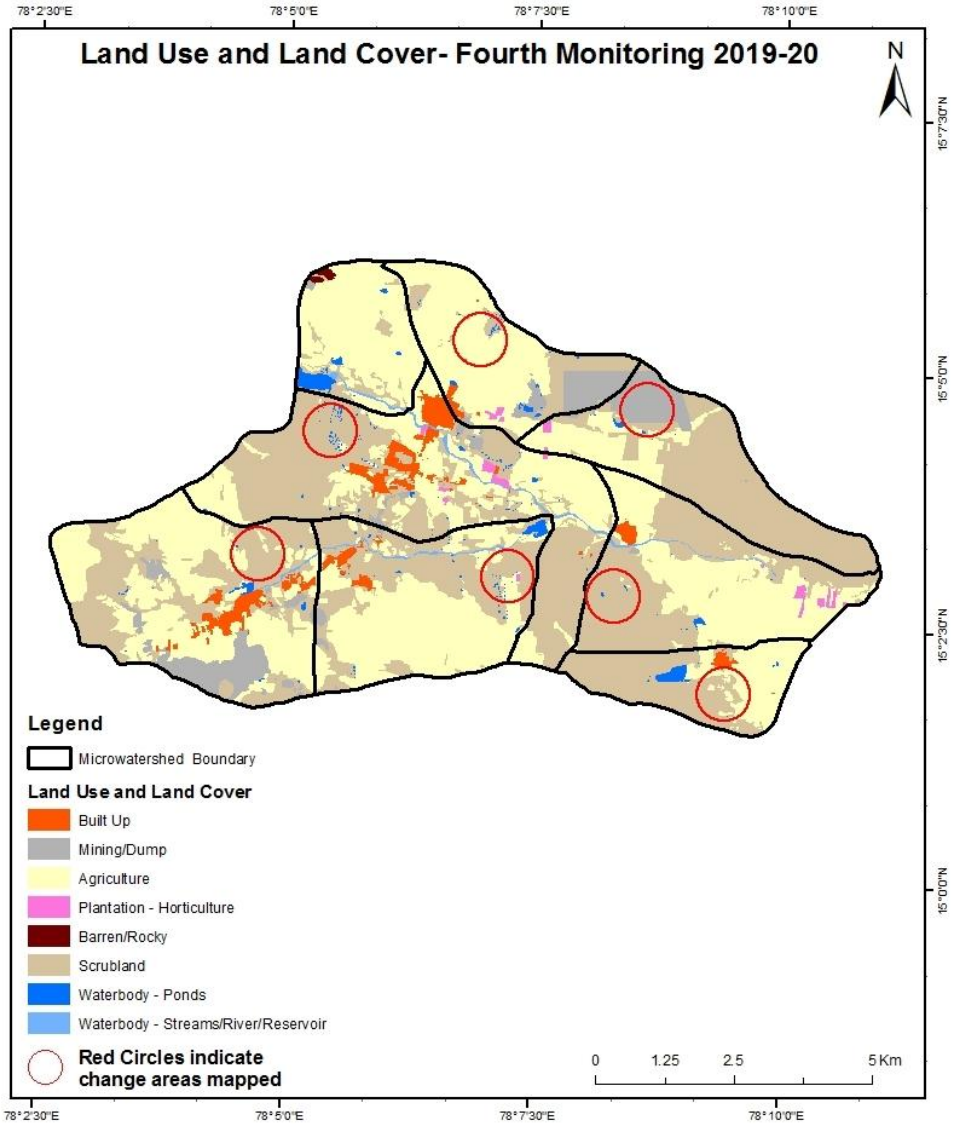




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

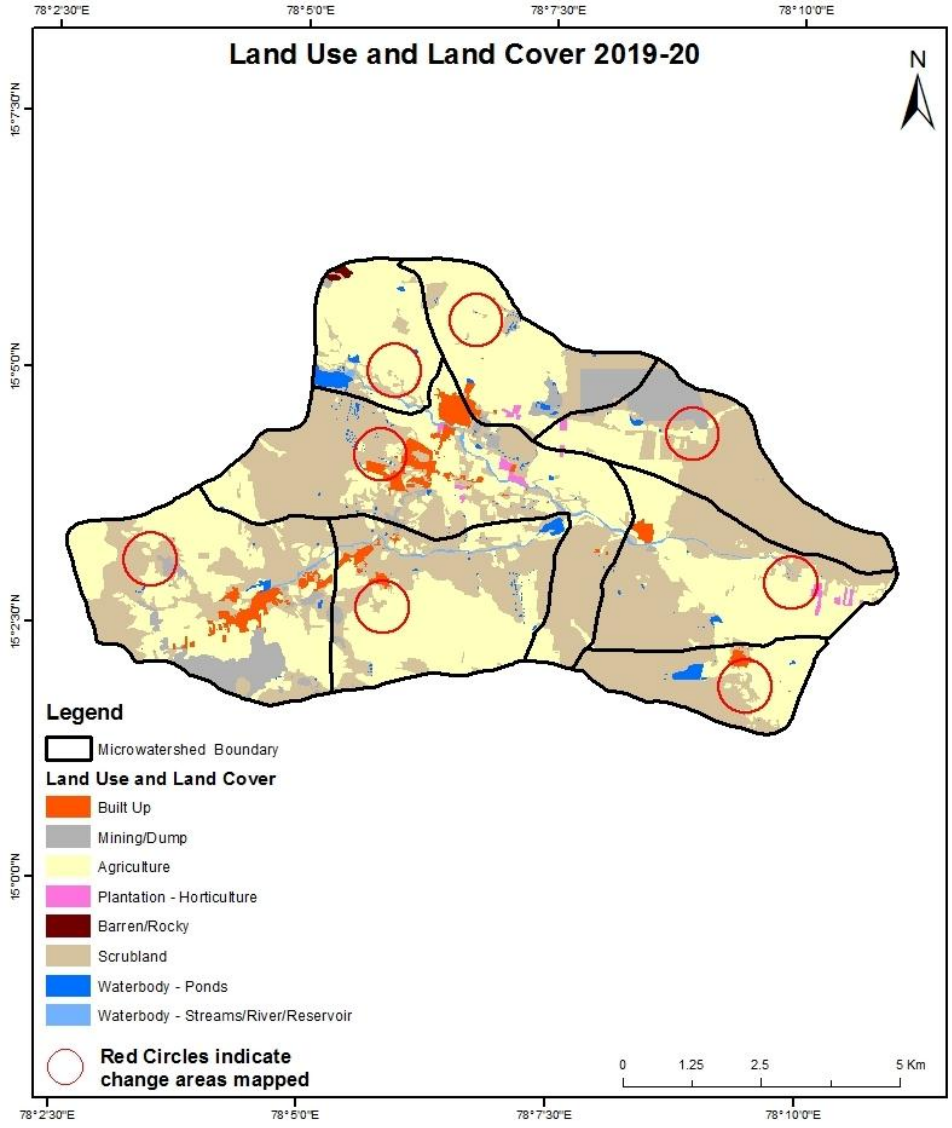
Scale: 1:10000

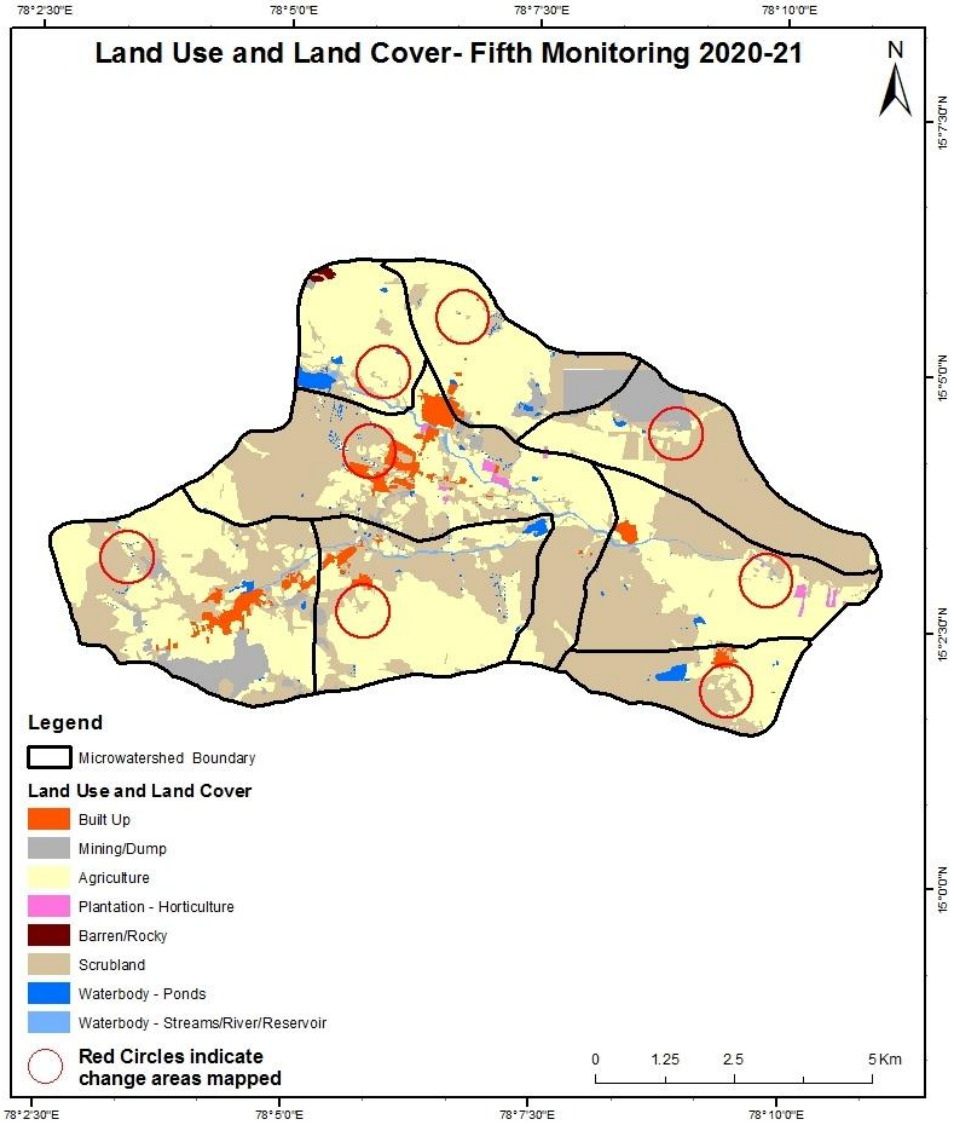




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

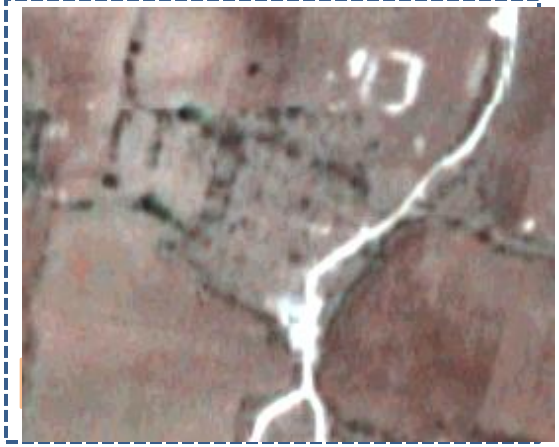
Scale: 1:10000



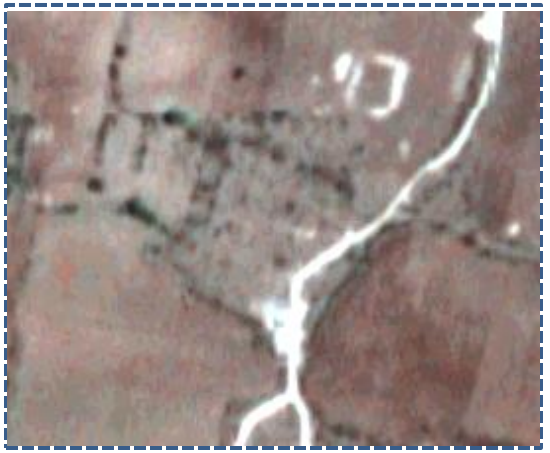


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

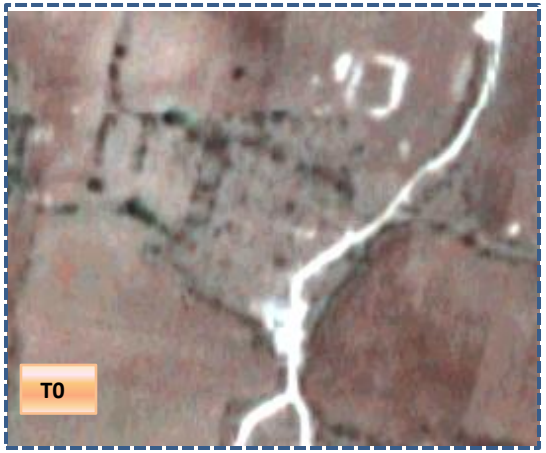


T0: 2012-13



T1: 19 December2016

Scrub to Agriculture

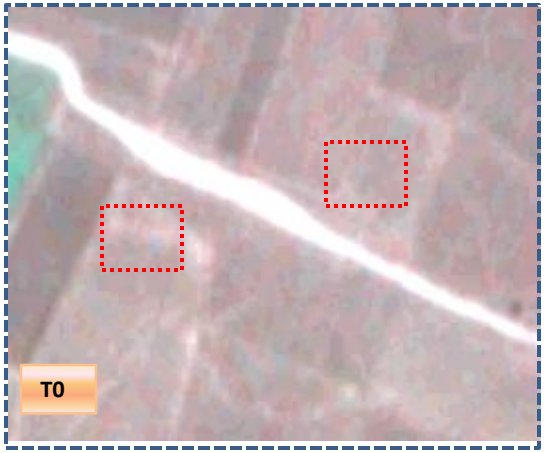


T0: 2012-13

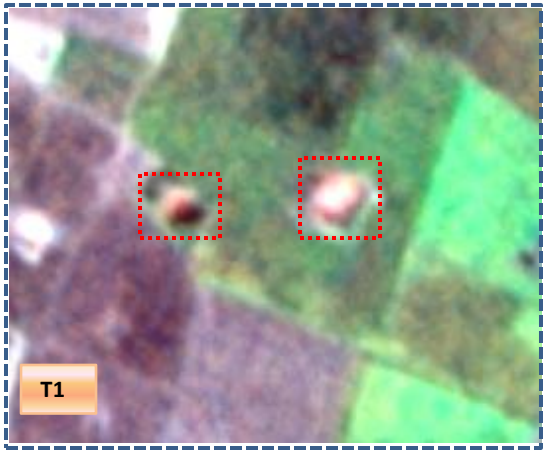
T1: 19 December2016

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

Scrub to Water body

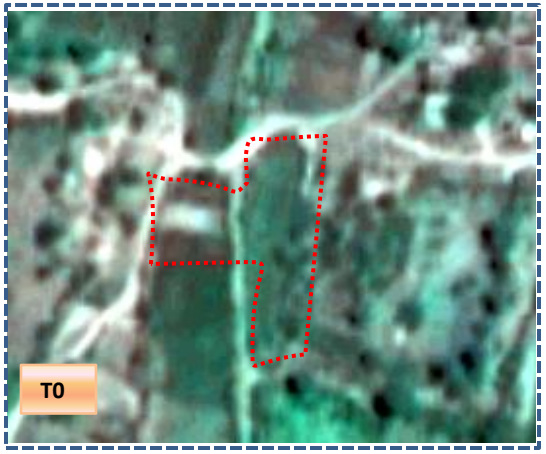


T0: 2012-13



T1: 19 December2016

Increased water spread area



T0: 2012-13

T1: 19 December2016

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	131.92										**131.92**
Mining/dump		163.12								1.04	**164.16**
Agriculture	8.77	5.70	3186.11	14.26				24.55		3.92	**3243.31**
Plantation Horticulture				9.11							**9.11**
Forest											
Forest Plantation											
Barren Rocky							11.58				**11.58**
Scrub	22.98	23.87	141.09					3664.05		3.55	**3855.55**
Waterbody-Streams/River									47.46		**47.46**
Waterbody – Ponds										41.90	**41.90**
Grand Total	**163.67**	**192.70**	**3327.20**	**23.37**			**11.58**	**3688.60**	**47.46**	**50.41**	**7504.98**

- 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 32 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 141 ha of the agriculture area has increased from scrubland area of T1. The additional agriculture are coming from waterbody in T0 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	163.67										**163.67**
Mining/dump		190.97	1.10							0.63	**192.70**
Agriculture	2.72	1.74	3310.82	10.20				0.39		1.33	**3327.20**
Plantation Horticulture				23.37							**23.37**
Forest											
Forest Plantation											
Barren Rocky							11.58				**11.58**
Scrub	2.88	3.64	71.16					3603.34		7.58	**3688.60**
Waterbody-Streams/River									47.46		**47.46**
Waterbody – Ponds										50.41	**50.41**
Grand Total	**169.27**	**196.35**	**3383.08**	**33.57**			**11.58**	**3603.73**	**47.46**	**59.94**	**7504.98**

- 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 15 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T2.
- In T2 71 ha of the agriculture area has increased from mining/dump 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	169.27										**169.27**
Mining/dump	2.60	192.27	1.47								**196.35**
Agriculture	1.35	0.79	3370.81	10.14							**3383.08**
Plantation Horticulture			7.50	26.07							**33.57**
Forest											
Forest Plantation											
Barren Rocky		3.30					8.27				**11.58**
Scrub	3.47	12.62	100.46					3485.24		1.94	**3603.73**
Waterbody-Streams/River									47.46		**47.46**
Waterbody – Ponds										59.94	**59.94**
Grand Total	**176.70**	**208.98**	**3480.24**	**36.21**			**8.27**	**3485.24**	**47.46**	**61.88**	**7504.98**

- 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 12 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and plantations in T3.
- In T3 107 ha of the agriculture area has increased from mining/dump, 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	176.70										**176.70**
Mining/dump		206.10	0.18							2.69	**208.98**
Agriculture	2.79	5.51	3443.34	0.83				22.58		5.19	**3480.24**
Plantation Horticulture			1.54	34.67							**36.21**
Forest											
Forest Plantation											
Barren Rocky							8.27				**8.27**
Scrub	19.45	176.41	85.34					3191.64		12.42	**3485.24**
Waterbody-Streams/River									47.46		**47.46**
Waterbody – Ponds			0.09							61.80	**61.88**
Grand Total	**198.93**	**388.02**	**3530.48**	**35.50**			**8.27**	**3214.21**	**47.46**	**82.10**	**7504.98**

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

•In T4 86 ha of the agriculture area has increased from mining/dump , 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	198.58										**198.58**
Mining/dump		385.64	1.76								**387.39**
Agriculture	2.07	0.63	3509.72							1.23	**3513.65**
Plantation Horticulture			9.45	25.23							**34.67**
Forest											
Forest Plantation											
Barren Rocky							8.27				**8.27**
Scrub	1.99	1.15	87.54					3140.53		1.78	**3232.99**
Waterbody-Streams/River									47.23		**47.23**
Waterbody – Ponds										82.11	**82.11**
Grand Total	**202.64**	**387.42**	**3608.46**	**25.23**			**8.27**	**3140.53**	**47.23**	**85.13**	**7504.90**

- 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 3.9 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump and water body in T5.
- In T5 89 ha of the agriculture area has increased from mining, plantation 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 58 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 83, 55, 97, 50 & 94 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 368 Hectares in Crop land area as compared between baseline LU/LC data 2012-13 (T0) & 2020-21 (T5) years.
5. About **16 Hectares of plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) & 2020-21 (T5) years.
6. There is a decrease of 734 Hectares in Scrubland area as compared between 2012-13 (T0) & 2020-21 (T5) years.
7. Farm ponds (11) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (11) verified from the portal.