MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -27/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-2021

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-27/2010-11, Chittoor District of   Andhra Pradesh. The total geographical area of the project is 10,724 ha. It comprises of 15 micro watersheds.

- In the project area 97 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 11 ha increase in the area.

- Major percentage i.e. 39.97 % is covered by the agriculture, 28.52 % is covered by scrubland 15.39 % is covered by forest and 9.74 % is covered by plantation and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-27/2010-11
DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Ramachandrapuram Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 10,724 ha. It comprises of 15 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -II*) projects taking 2018-19 (T5) period satellite images

| Andhra Pradesh | Chittoor District | Chittoor – IWMP 27/2010-11 project |
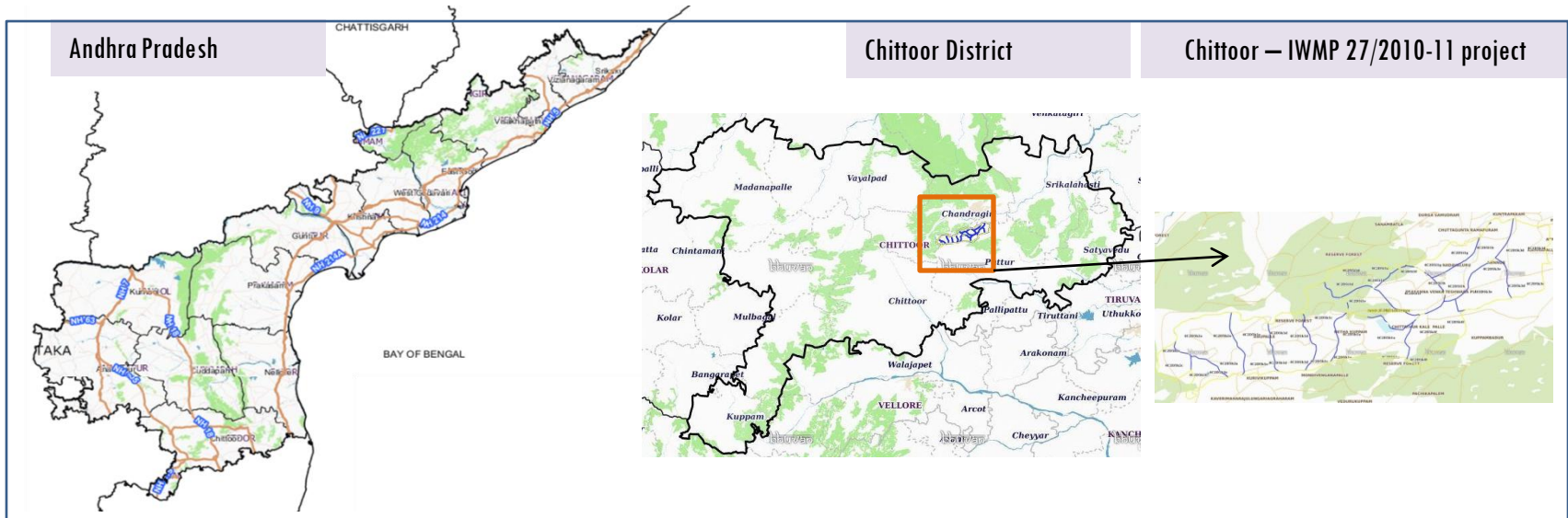
- The climate of the district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.

- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2018-19
LISS IV	2009-10		
SCENE 1			23-Feb-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			23-Feb-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	97
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	17	17
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	Existing activity	0	0
8	Checks & Plugs	0	0
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	47	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	Livelihood Activities (	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity (Cattle thought)	29	20
18	Others	21	20
	TOTAL	**114**	**97**

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 (2010-11) and T5 is 2018-19 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.
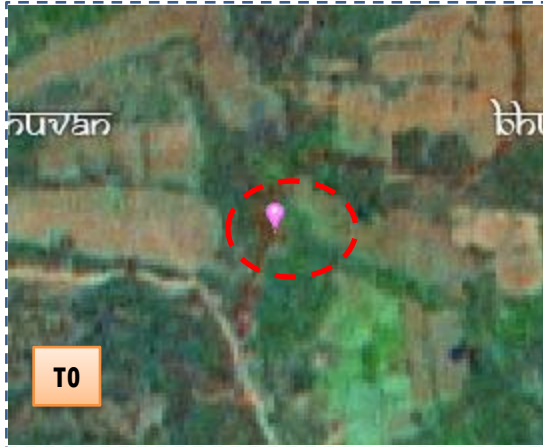
Chittoor–IWMP-27/2010-11

2009-10	Jan-2016	March-2017

Nov-2018

Drishti Sl.No.: 717553
M.No.:
Uuid:

Activity : Check dam

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-27/2010-11

T0	T1	
T0:2010-11	T1: 26 February 2015	Drishti Sl no. 717553 MWS :4C2D5h2c

Check dam

T1		
T0:2010-11	T1: 26 February 2015	Drishti Sl no. 827523 MWS : 4C2D5h1a

Check dam

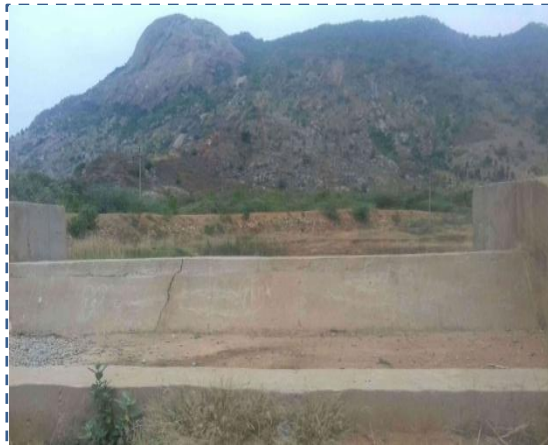# Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-27/2010-11
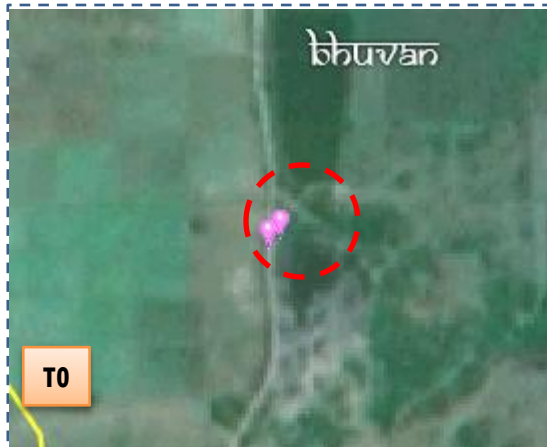
T0	T1	
T0: 2010-11	T1: 26 February 2015	Drishti Sl no. 1658777 MWS :4C2D5k3d

Check dam

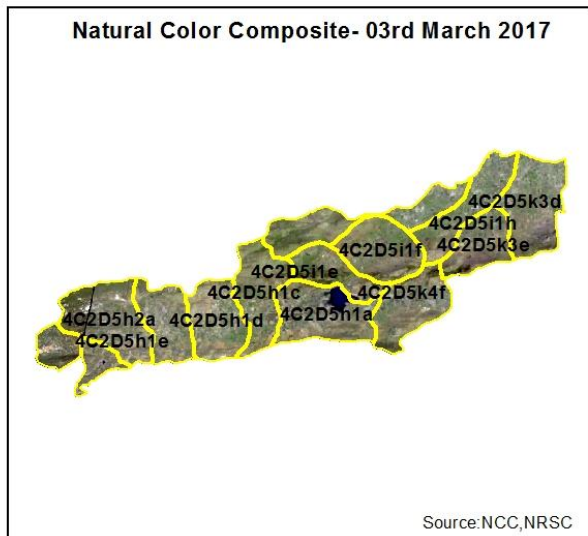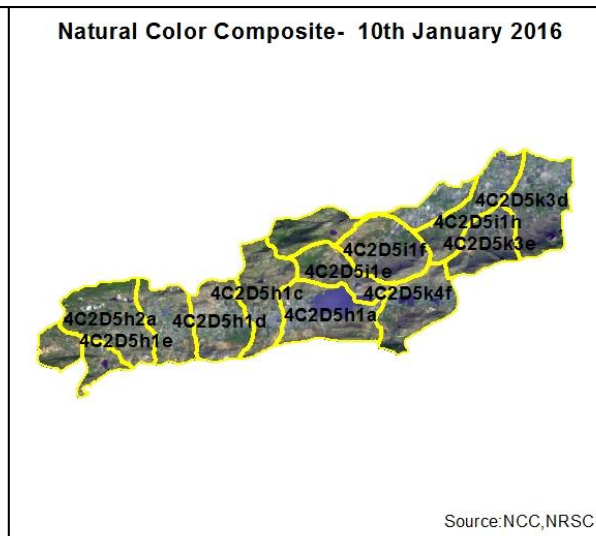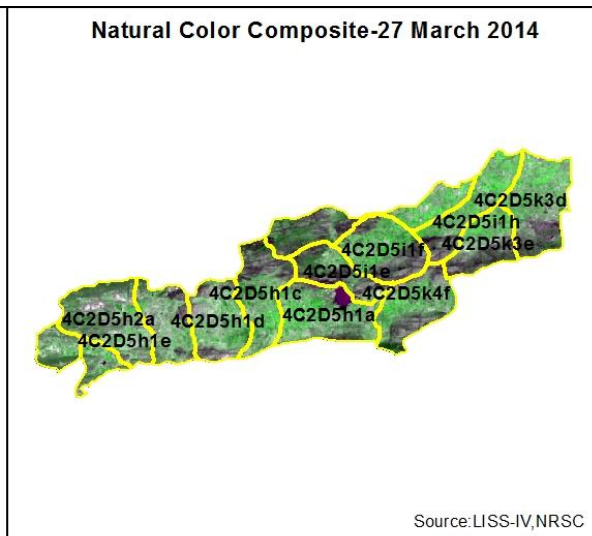| T0	T1	
T0: 2010-11	T1: 26 February 2015	Drishti Sl no. 7061733 MWS : 4C2D5l1g

Horticulture

Natural Color Composite — 2010-11 to 2018-19

Natural Color Composite- 2010-11

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:NCC,NRSC

Natural Color Composite-27 March 2014

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:LISS-IV,NRSC

Natural Color Composite- 10th January 2016

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:NCC,NRSC

Natural Color Composite- 03rd March 2017

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:NCC,NRSC

Natural Color Composite- 06th March 2018

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:LISS-IV,NRSC

Natural Color Composite- 23rd February 2019

4C2D5k3d
4C2D5i1h
4C2D5i1f 4C2D5k3e
4C2D5i1e
4C2D5h1c 4C2D5k4f
4C2D5h2a 4C2D5h1d 4C2D5h1a
4C2D5h1e

Source:LISS-IV,NRSC

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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 (2010-11) and row represents the T5 (2018-19)
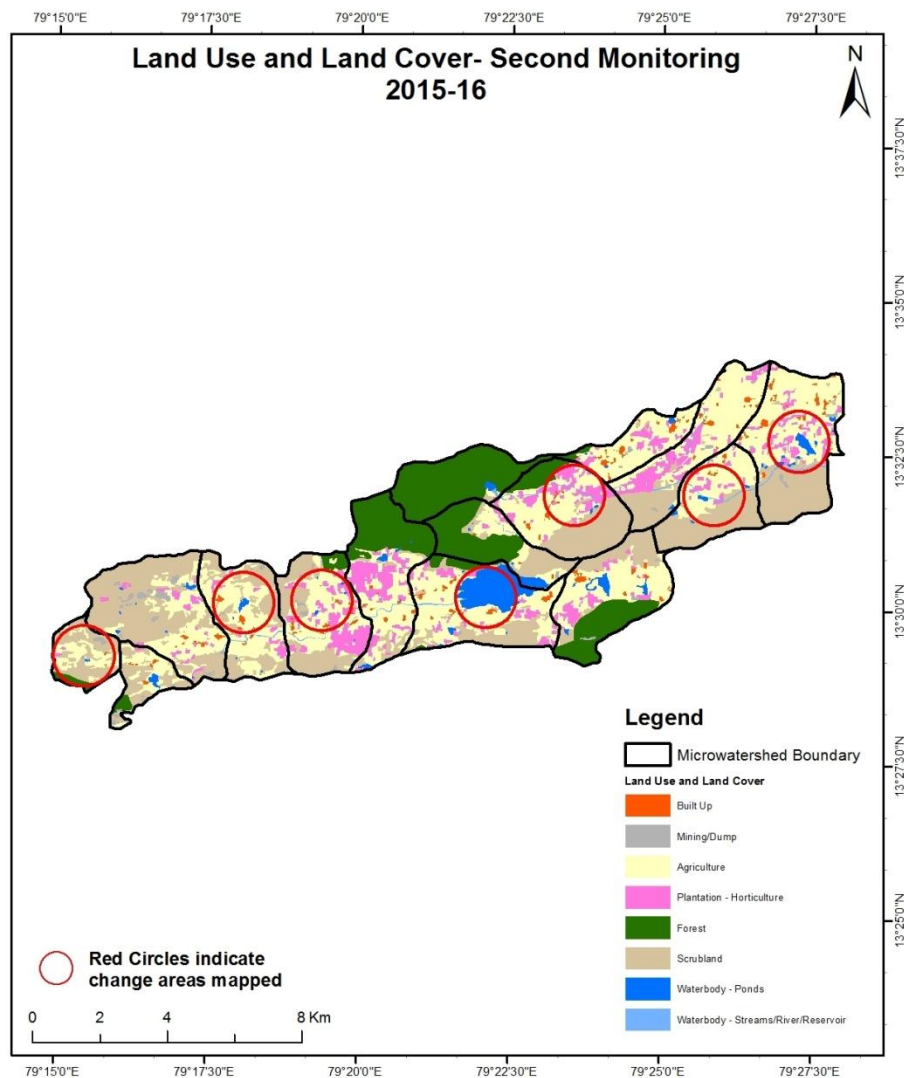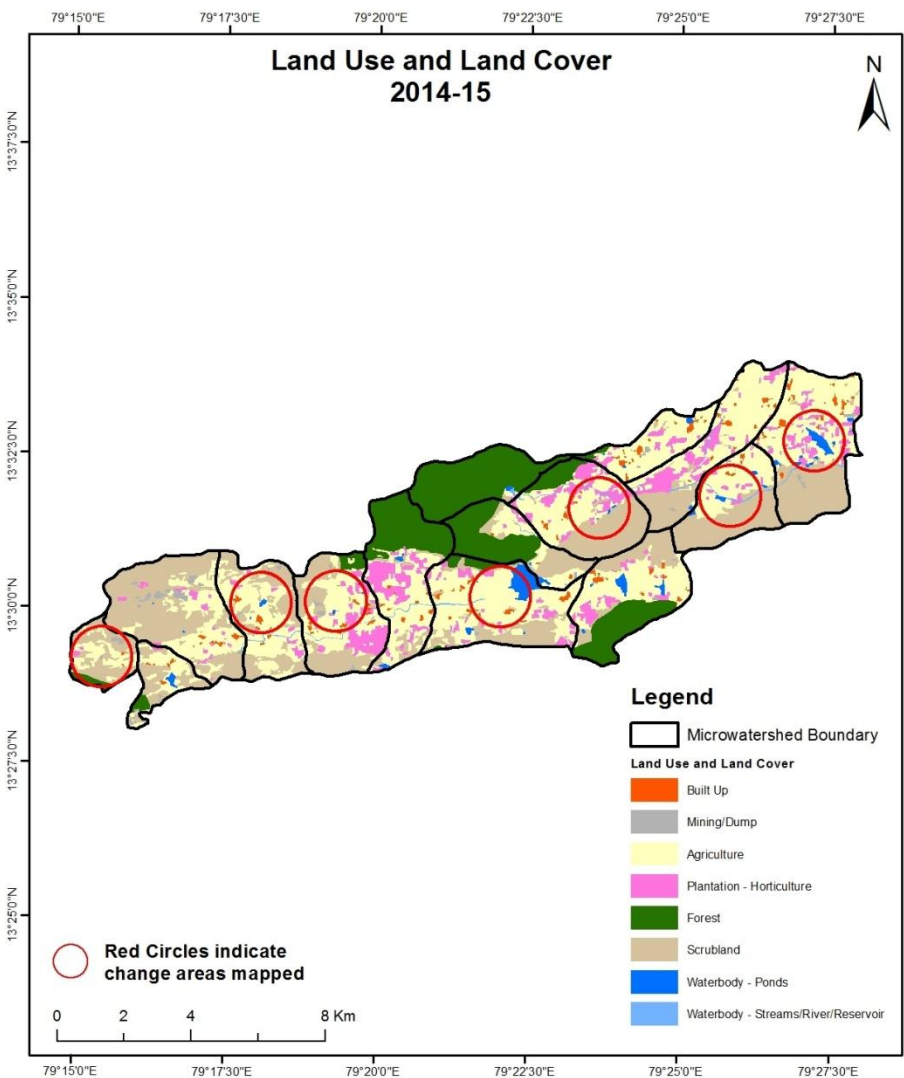
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)
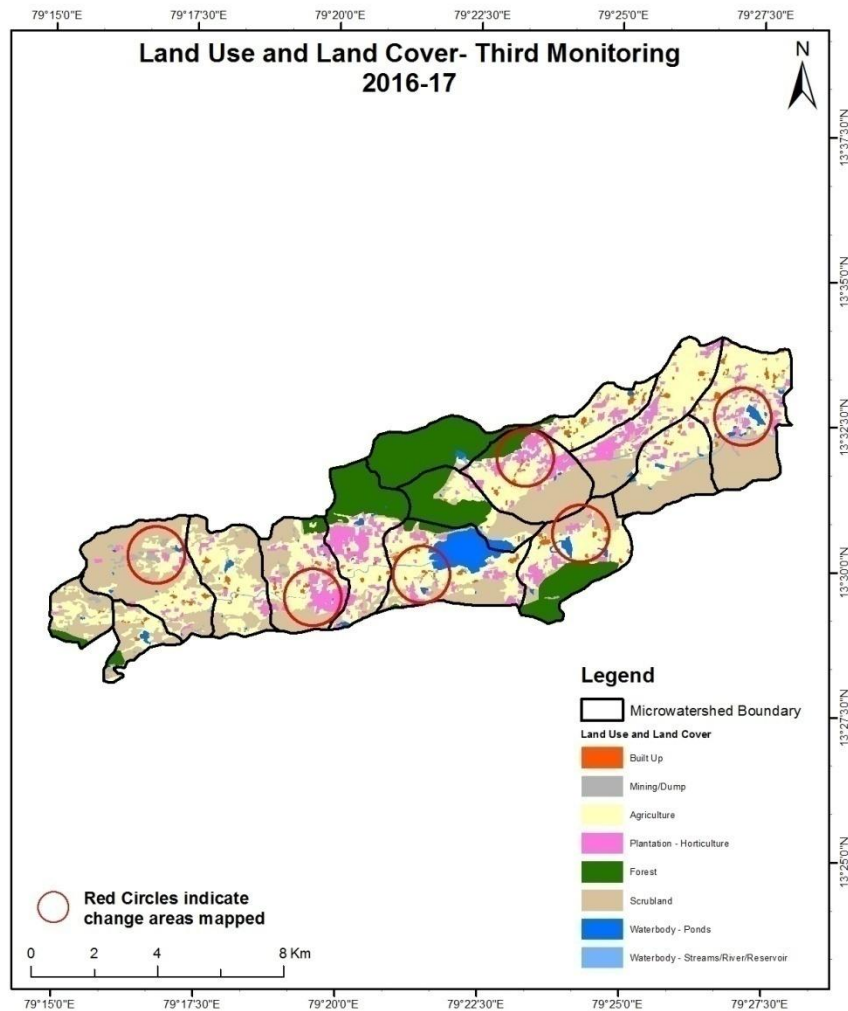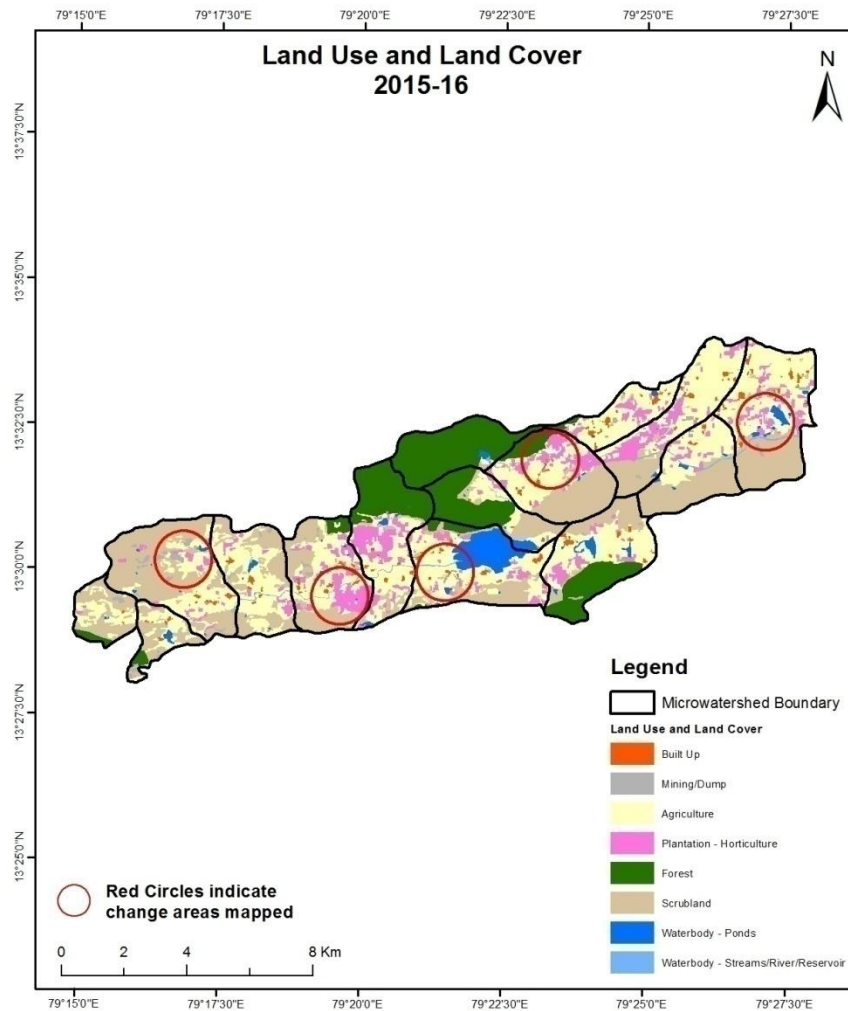
Scale: 1:10000
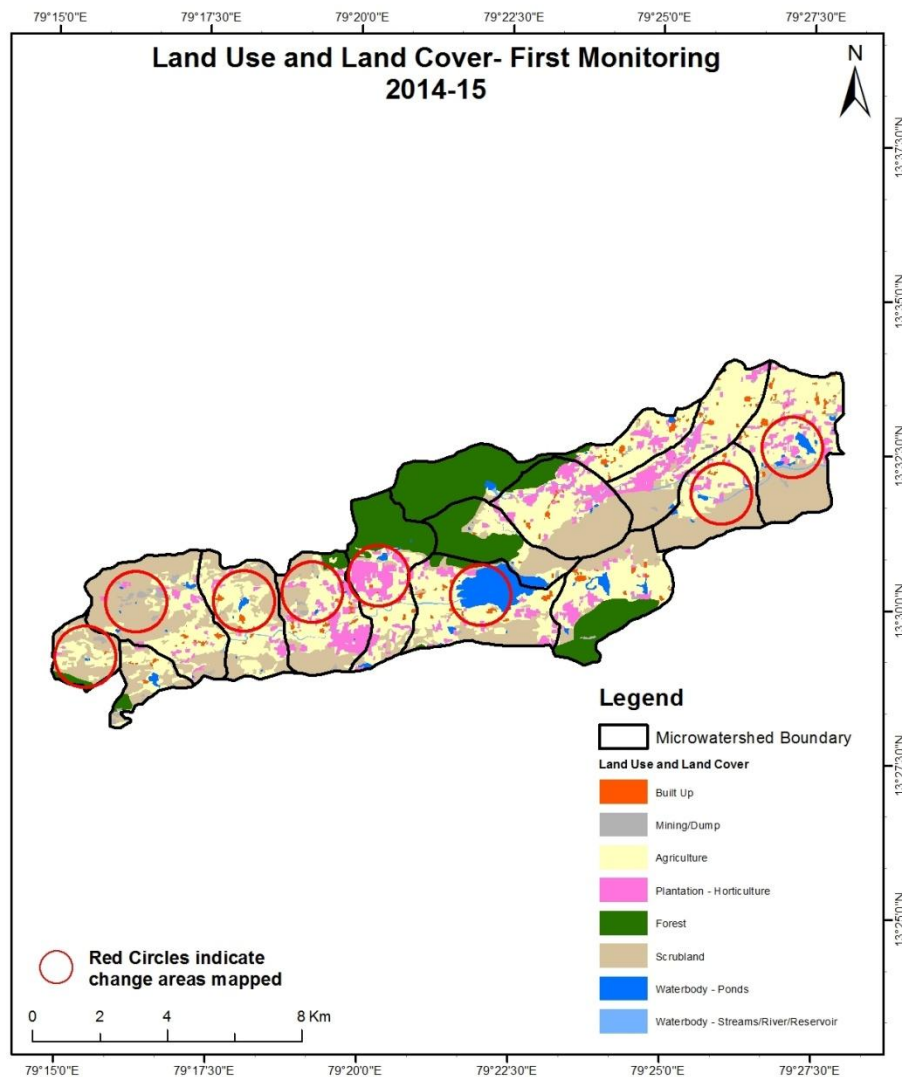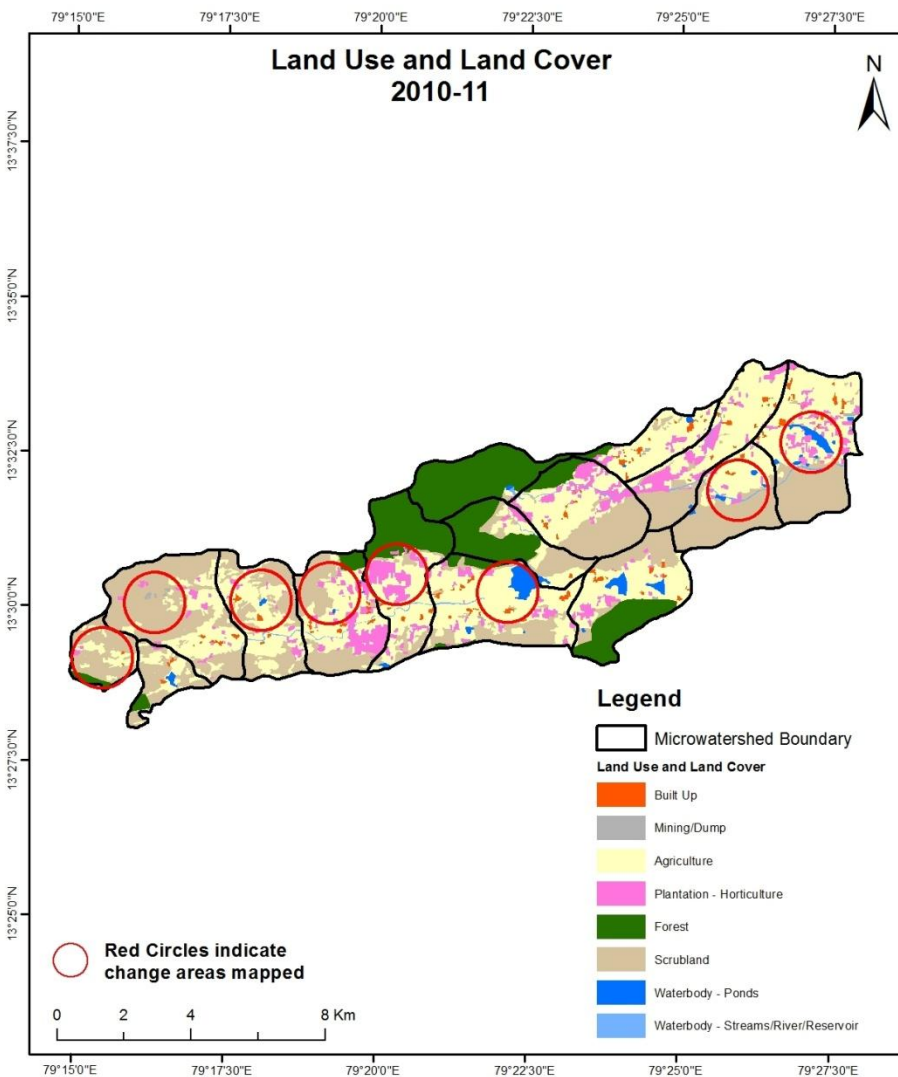
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)
Scale: 1:10000

Land Use and Land Cover 2014-15

79°15'0"E 79°17'30"E 79°20'0"E 79°22'30"E 79°25'0"E 79°27'30"E

13°37'30"N 13°35'0"N 13°32'30"N 13°30'0"N 13°27'30"N 13°25'0"N

N

Legend

▭ Microwatershed Boundary

Land Use and Land Cover

■ Built Up
■ Mining/Dump
■ Agriculture
■ Plantation - Horticulture
■ Forest
■ Scrubland
■ Waterbody - Ponds
■ Waterbody - Streams/River/Reservoir

◯ **Red Circles indicate change areas mapped**

0   2   4   8 Km

Land Use and Land Cover- Second Monitoring 2015-16

79°15'0"E 79°17'30"E 79°20'0"E 79°22'30"E 79°25'0"E 79°27'30"E

13°37'30"N 13°35'0"N 13°32'30"N 13°30'0"N 13°27'30"N 13°25'0"N

N

Legend

▭ Microwatershed Boundary

Land Use and Land Cover

■ Built Up
■ Mining/Dump
■ Agriculture
■ Plantation - Horticulture
■ Forest
■ Scrubland
■ Waterbody - Ponds
■ Waterbody - Streams/River/Reservoir

◯ **Red Circles indicate change areas mapped**

0   2   4   8 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
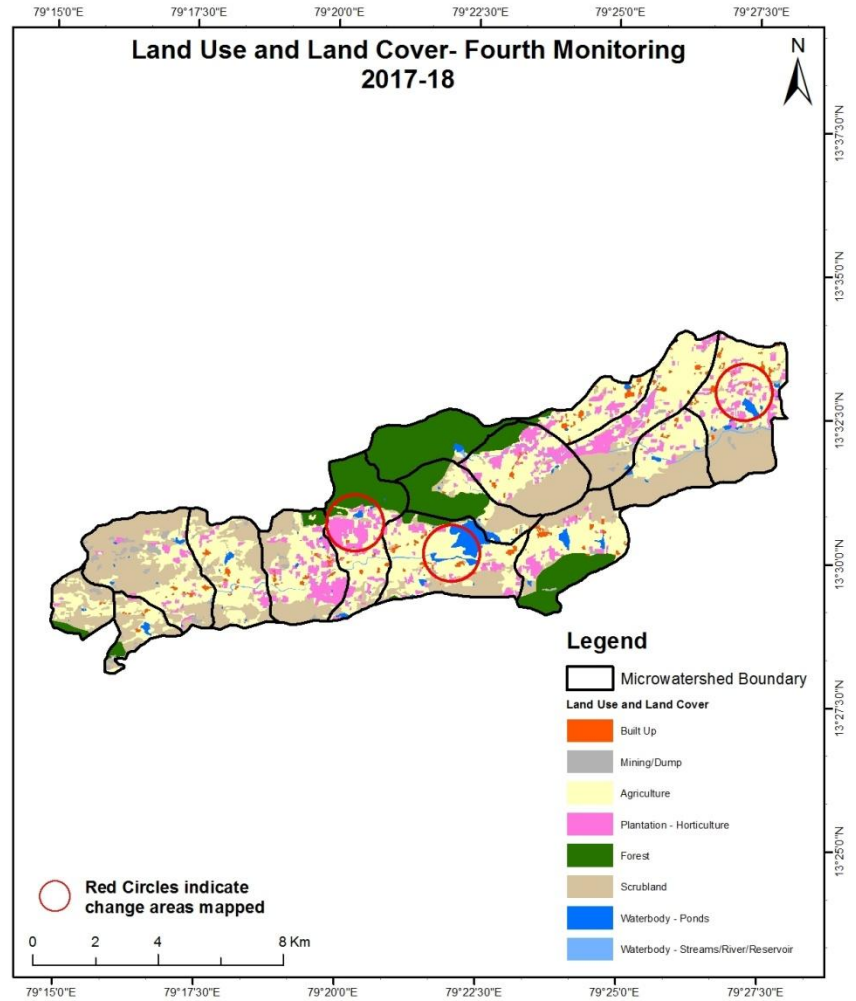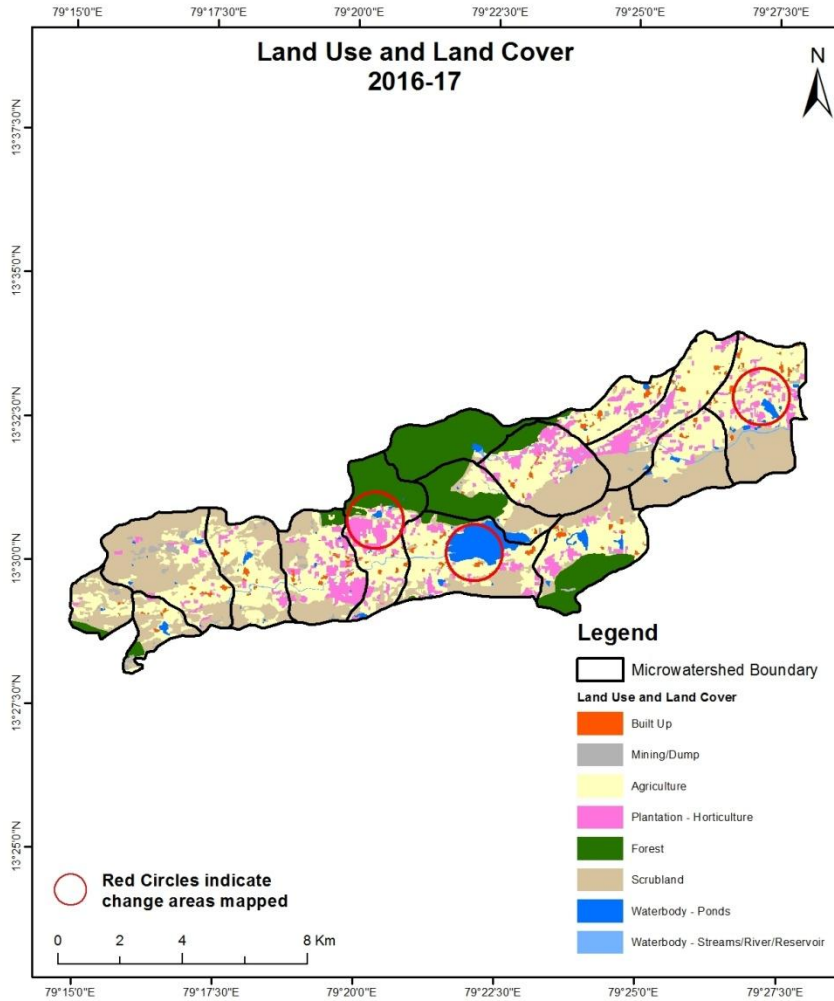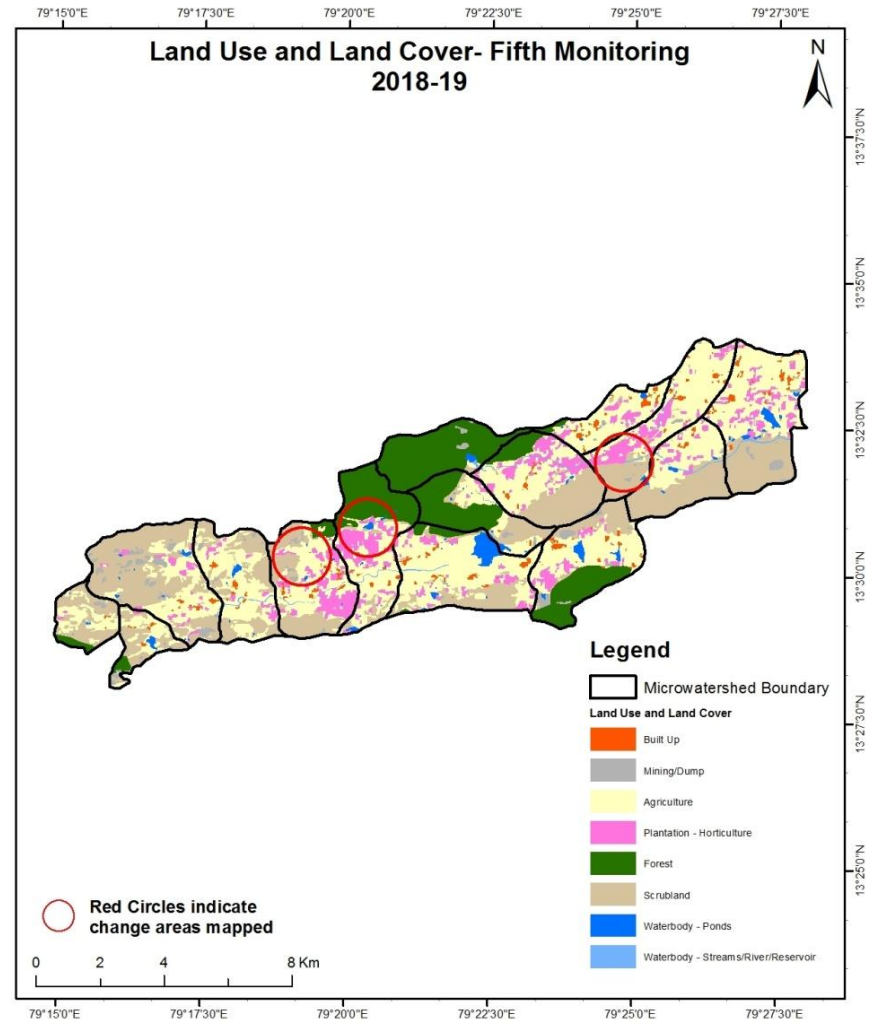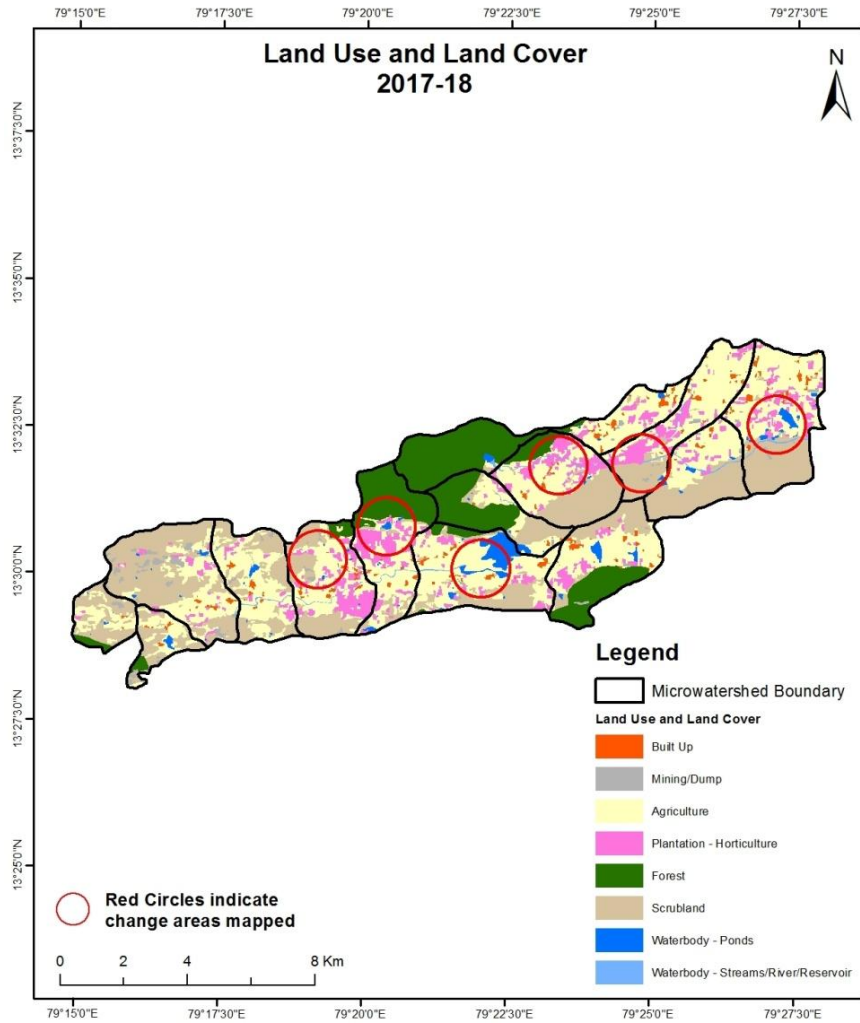
Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
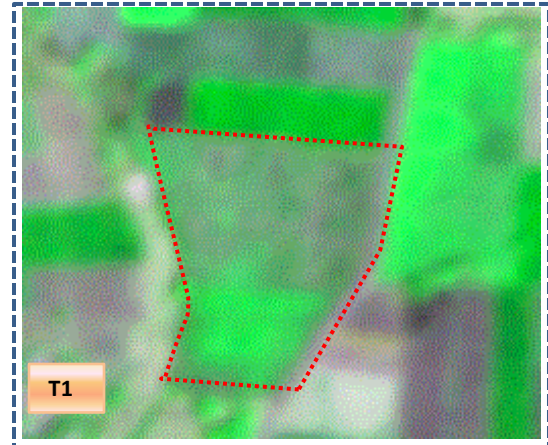## Scale: 1:10000

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

Agriculture to Plantation

T0

T1

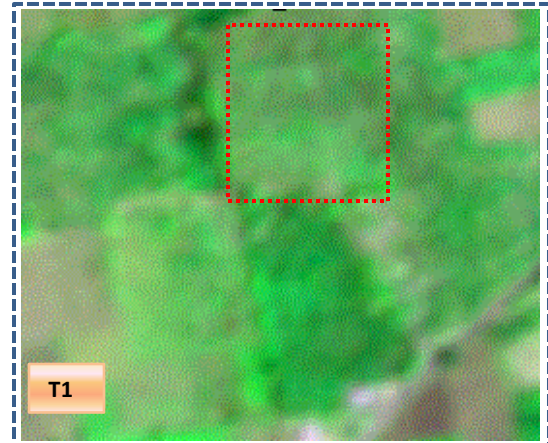T0: 2010-11(79°25'43.176"E 13°33'14.976"N)

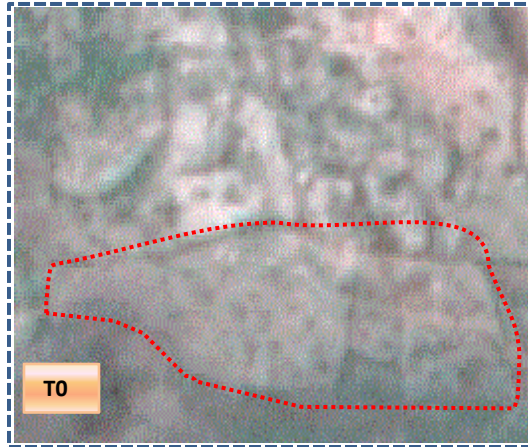T1: 27March 2014

Agriculture to Plantation

T0

T1

T0: 2010-11 (79°23'12.999"E 13°31'58.351"N)

T1: 27 March 2014

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

Scrub to Agriculture

T0

T0: 2010-11(79°21'3.767"E 13°29'24.893"N)

T1
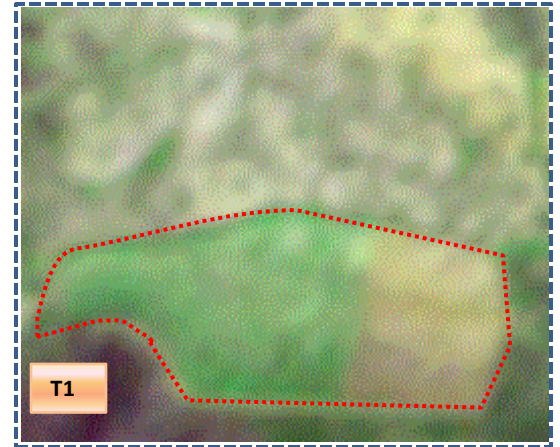
T1: 27 March 2014

Scrub to Agriculture

T0

T0: 2010-11(79°15'5.085"E 13°29'4.249"N)
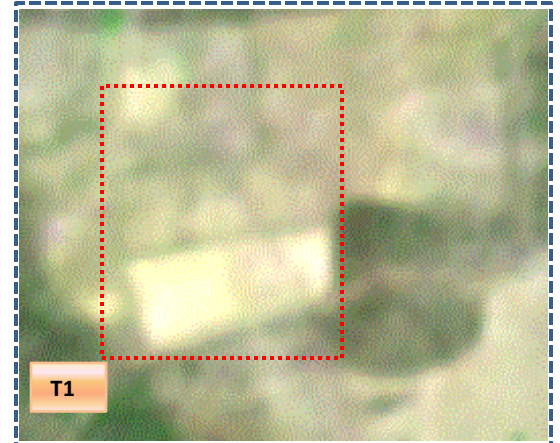
T1

T1: 27 March 2014

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

Agriculture to Plantation

T0

T1

T0: 2010-11

T1: 26 February 2015

Agriculture to Plantation

T0

T1

T0: 2010-11

T1: 26 February 2015

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

Agriculture to Built-up

T0

T1

T0: 2010-11

T1: 26 February 2015
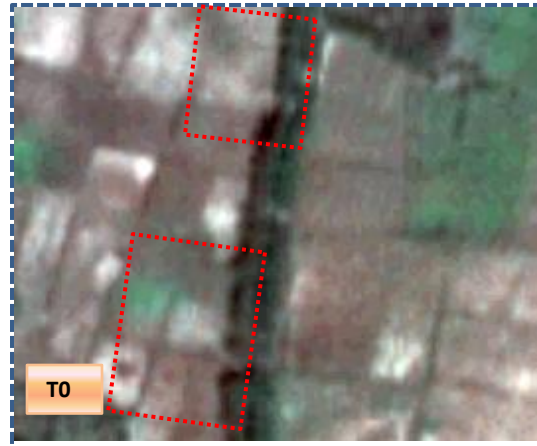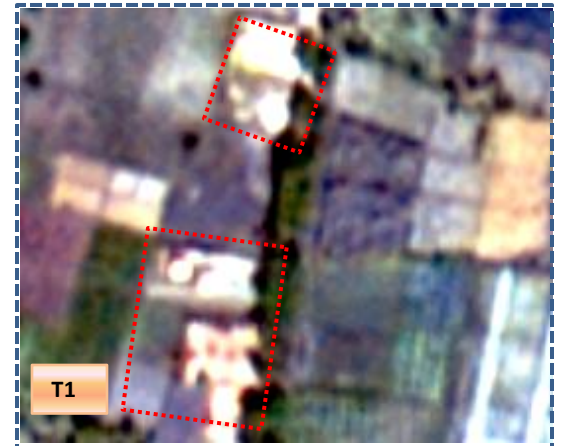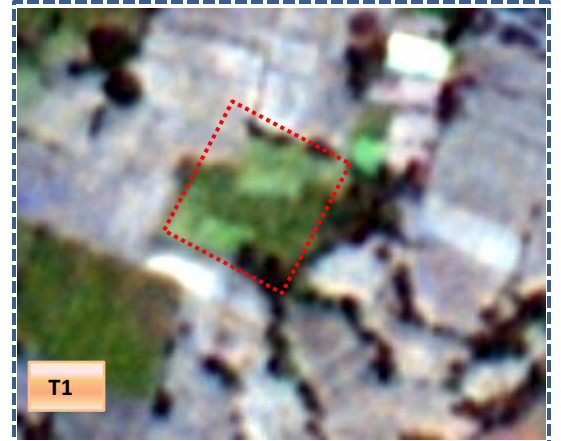

Agriculture to Plantation

T0

T1

T0: 2010-11

T1: 26 February 2015

Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15

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	146.44										**146.44**
Mining/dump		17.17									**17.17**
Agriculture	18.74	8.93	4039.38	108.88						9.53	**4185.46**
Plantation Horticulture	1.37		66.12	821.66							**889.15**
Forest		1.50	28.87		1671.07					0.53	**1701.97**
Forest Plantation											
Barren Rocky											
Scrub	1.02	62.18	221.00	3.19				3252.34		1.34	**3541.08**
Waterbody-Streams/River									59.80		**59.80**
Waterbody – Ponds			21.80	0.84						161.24	**183.88**
Grand Total	**167.57**	**89.78**	**4377.16**	**934.57**	**1671.07**			**3252.34**	**59.80**	**172.64**	**10724.94**

• 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 146.08 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T1.

• In T1 337.79 ha of agriculture are increased from plantation, forest, scrubland and water body of T0. The additional agriculture are coming from water body in T5 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2014-15 to 2015-16

Land cover T1	Monitoring period (T2)										Units in Hectares
	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	167.57										**167.57**
Mining/dump		89.78									**89.78**
Agriculture	1.59	7.54	4043.93	148.44				2.00		173.66	**4377.16**
Plantation Horticulture	0.45		20.97	912.48						0.68	**934.57**
Forest		2.98			1663.24					4.84	**1671.07**
Forest Plantation											
Barren Rocky											
Scrub		13.05	21.54					3205.84		11.92	**3252.34**
Waterbody-Streams/River									59.80		**59.80**
Waterbody – Ponds			9.29							163.35	**172.64**
Grand Total	**169.61**	**113.36**	**4095.72**	**1060.91**	**1663.24**			**3207.84**	**59.80**	**354.45**	**10724.94**

• 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 333.23 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T2.

• In T2 51.79 ha of agriculture are increased from plantation, 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-2015-16 to 2016-17

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	Grand Total
Built up	169.61										**169.61**
Mining/dump		113.36									**113.36**
Agriculture	4.25	0.28	4043.18	38.97				8.10		0.94	**4095.72**
Plantation Horticulture	0.49		19.80	1040.32				0.15		0.15	**1060.91**
Forest			0.60		1662.64						**1663.24**
Forest Plantation											
Barren Rocky											
Scrub	1.17	1.09	7.72					3197.35		0.50	**3207.84**
Waterbody-Streams/River									59.80		**59.80**
Waterbody – Ponds			0.13	0.09						354.23	**354.45**
Grand Total	**175.52**	**114.74**	**4071.44**	**1079.38**	**1662.64**			**3205.60**	**59.80**	**355.82**	**10724.94**

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 T2 52.54 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T3.

- In T3 28.25 ha of agriculture are increased from plantation, 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-2016-17 to 2017-18

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	175.52										175.52
Mining/dump		114.74									114.74
Agriculture	9.48	2.62	4036.49	20.40				1.12		1.34	4071.44
Plantation Horticulture	0.51		20.68	1057.39				0.81			1079.38
Forest			0.74		1661.91						1662.64
Forest Plantation											
Barren Rocky											
Scrub	1.43	25.02	24.30					3154.85			3205.60
Waterbody-Streams/River									59.80		59.80
Waterbody – Ponds			117.96							237.86	355.82
Grand Total	186.93	142.37	4200.16	1077.79	1661.91			3156.78	59.80	239.20	10724.94

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 34.95 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T4.

• In T4 163.67 ha of agriculture are increased from plantation, forest, 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-2017-18 to 2018-19

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
Built up	186.87		0.03					0.04			**186.93**
Mining/dump		142.01	0.37								**142.37**
Agriculture	3.57	2.86	4192.89							0.84	**4200.16**
Plantation Horticulture			33.27	1044.52							**1077.79**
Forest		10.96			1650.95						**1661.91**
Forest Plantation											
Barren Rocky											
Scrub		82.63	15.70					3058.45			**3156.78**
Waterbody-Streams/River									59.80		**59.80**
Waterbody – Ponds			44.92							194.28	**239.20**
Grand Total	**190.44**	**238.45**	**4287.17**	**1044.52**	**1650.95**			**3058.49**	**59.80**	**195.12**	**10724.94**

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 T4 7.27 ha of agriculture are decreased and it is converted into built-up, mining/dump and water body of T5.

• In T5 94.26 ha of agriculture are increased from plantation, 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 11.24 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

4. There is an increase of 191.70, 128.72 & 87.01 Hectares From T0 to T1, T3 to T4 & T4 toT5 and There is an decrease of 281.44 & 24.28 Hectares From T1 to T2, T2 to T3 . The overall increase of 101.71 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

5. There is increase of 155.37 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.

6. There is a decrease of 482.58 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.

7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.