MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -20/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
February-2021

T 0 - T 1 - T 2 - T 3 - T 4 - T 5

APSAC

AGRICULTURE & SOIL DIVISION
Andhra Pradesh Space Applications Centre (APSAC) ITE&C Department Govt. of Andhra Pradesh

इसरो ISRO

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

- 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-20/2010-11, Prakasam District of   Andhra Pradesh. The total geographical area of the project is 8763.32 ha. It comprises of 16 micro watersheds.

- In the project area 115 Drishti photos were uploaded showing 13 check dams, 33 Farm ponds/Percolation tanks, 9 entry point activities, 3 afforestation and 69 others.

- Major percentage i.e. 57.63% is covered by the agriculture, 33.49% is covered by scrub land, 3.89% is covered by water body and remaining by other land use classes.

- The study area falls in Peda Araveedu Mandal of Prakasam district of Andhra Pradesh state.   The total geographical area of the project is 8763.32 ha. It comprises of 16 micro watersheds. Location Map of the study area is shown in Figure below Analysis is done for 2010-11 (T0) period (*Batch -1*) projects taking 2018-19 (T5) period satellite images.

Andhra Pradesh — Prakasam District — Prakasam – IWMP 20/2009-10 Project
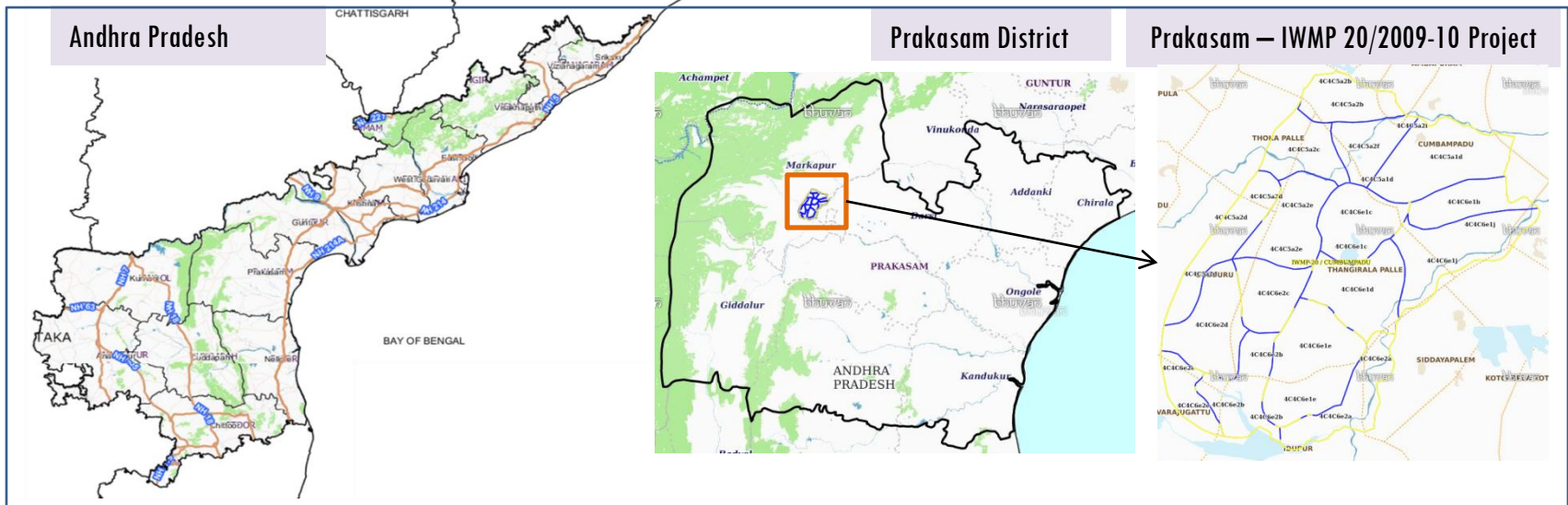
- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.

- The average annual rainfall of the district is 798.6 mm, monthly rainfall ranges from nil in March to 182.9 mm in October. October is the wettest month of the year. Southwest monsoon contributes significant rainfall in southern part of the district and Northeast monsoon contributes more than 70% of the rainfall.

- December is the coldest month with normal mean maximum temperature of about 27.1°c and mean minimum temperature of 19.2°C. Temperature begins to rise after February. May is the hottest month with mean daily maximum temperature of about 36.1°C and the mean daily minimum temperature of about 27.7°C. During May and early June the maximum temperature rises occasionally to 46°C and with the onset of SW monsoon by about second week of June, temperature begins to drop rapidly.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			2-Oct-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			2-Oct-18
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	115
4	Detailed Project Report		

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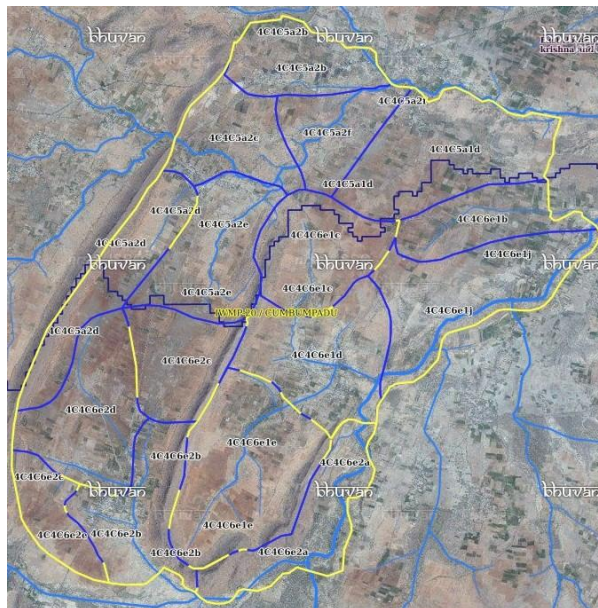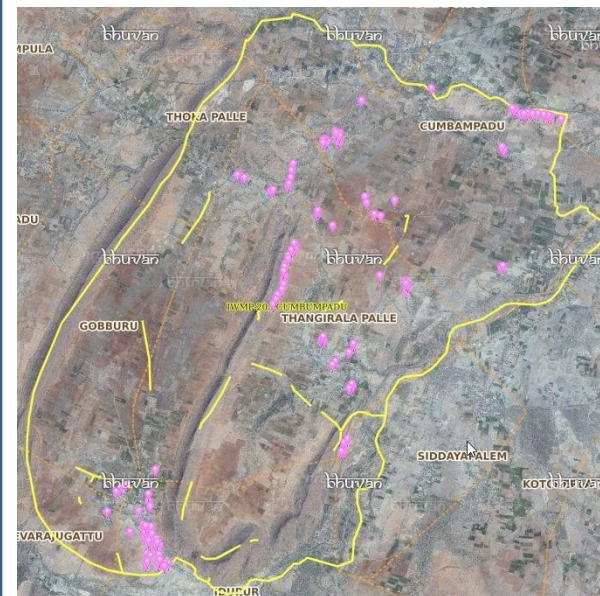

Legend

 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	3	3
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	2	2
9	Gabion structure	0	0
10	Farm ponds	33	30
11	Check dams	11	11
12	Nallah Bunds	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	9	9
18	Others	69	60
	TOTAL	**127**	**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 (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.

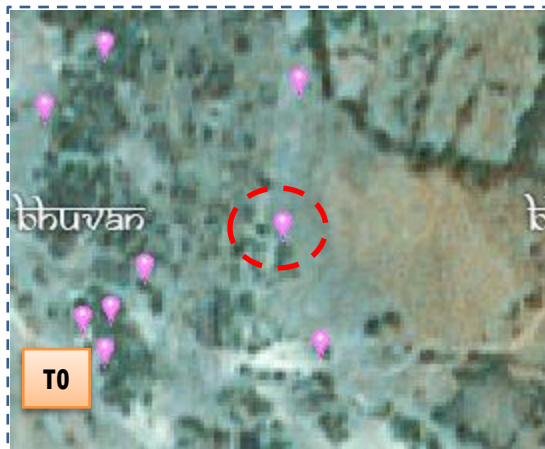# Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-20/2010-11

T0	T1	
T1:2010-11	T2: 26 May 2015	Drishti Sl no. 563673 MWS :4C4C6e2b

Farm pond

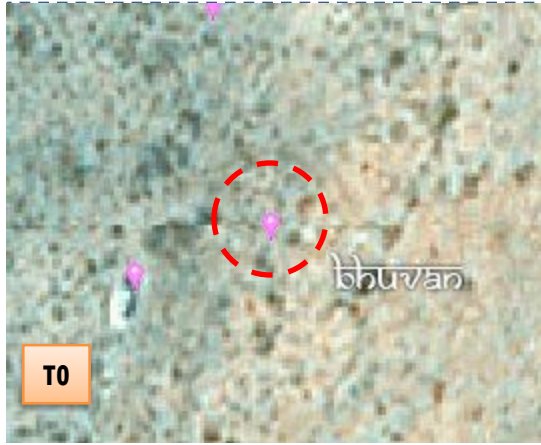| T0	T1	
T1:2010-11	T2: 26 May 2015	Drishti Sl no. 7032049 MWS :4C4C6e2b

Farm pond

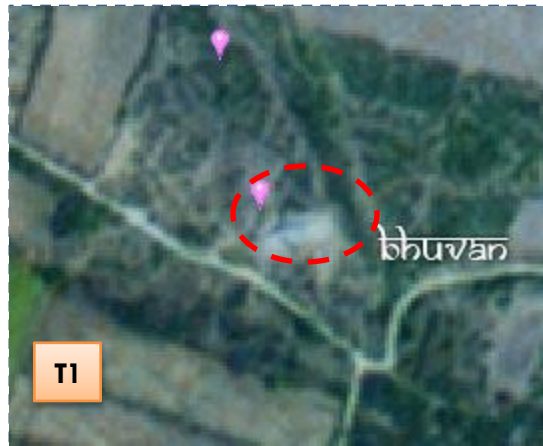# Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-20/2010-11

T0	T1	
T0: 2010-11	T1: 26 May 2015	Drishti Sl no. 7038449 MWS :4C4C6e1c

Farm pond

T0	T1	
T0: 2010-11	T2: 26 May 2015	Drishti Sl no. 7028395 MWS :4C4C5a1d

Farm pond

2009-10

June-2014

May-2015

February-2017

April-2018

Drishti Sl.No.: 563633

Activity : Dugout Pit

Natural Color Composite
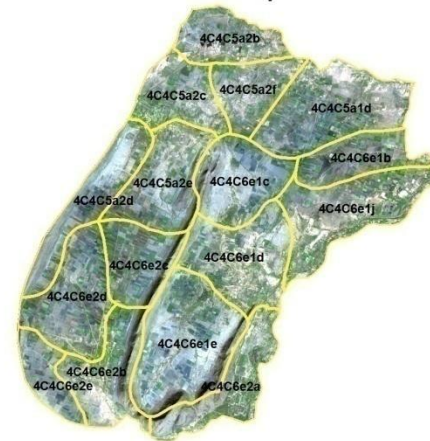

Natural Color Composite- 2010-11
Source:Fusion data,NRSC

Natural Color Composite- 26th May 2015
Source:NCC,NRSC
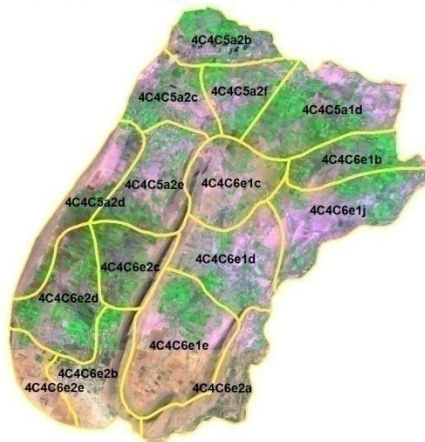
Natural Color Composite- 2016
Source:Fusion data,NRSC

Natural Color Composite- 14th February 2017
Source:NCC,NRSC

Natural Color Composite- 24th October 2017
Source:LISS-IV,NRSC

Natural Color Composite- 02nd October 2018
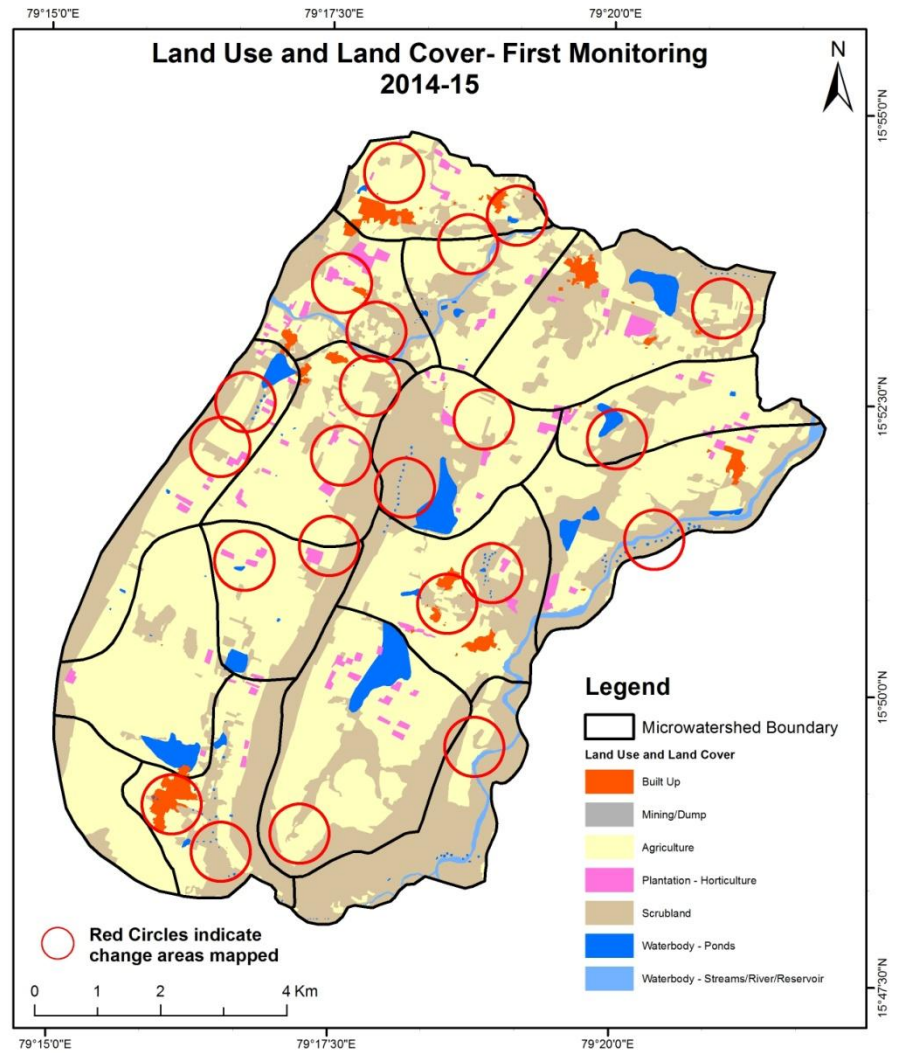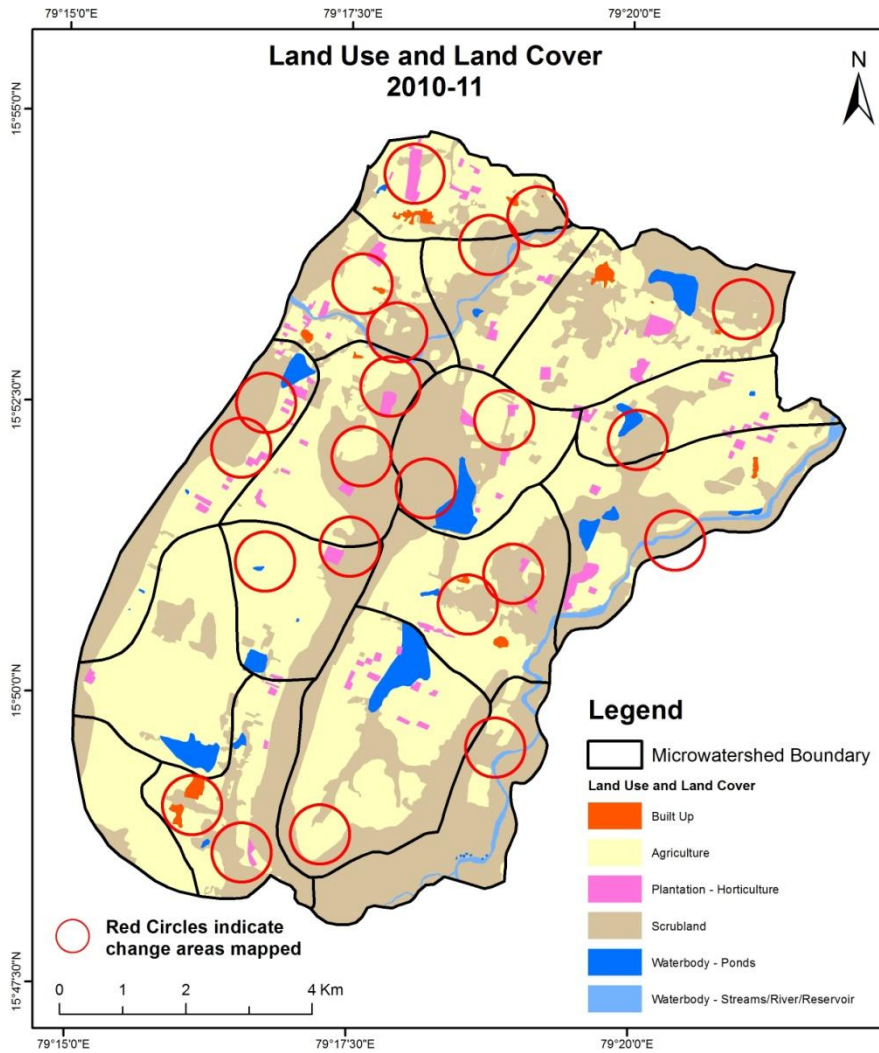Source:LISS-IV,NRSC

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 pre implementation period as T0 (2010-11) and row represents the post implementation period as T5 (2018-19) .
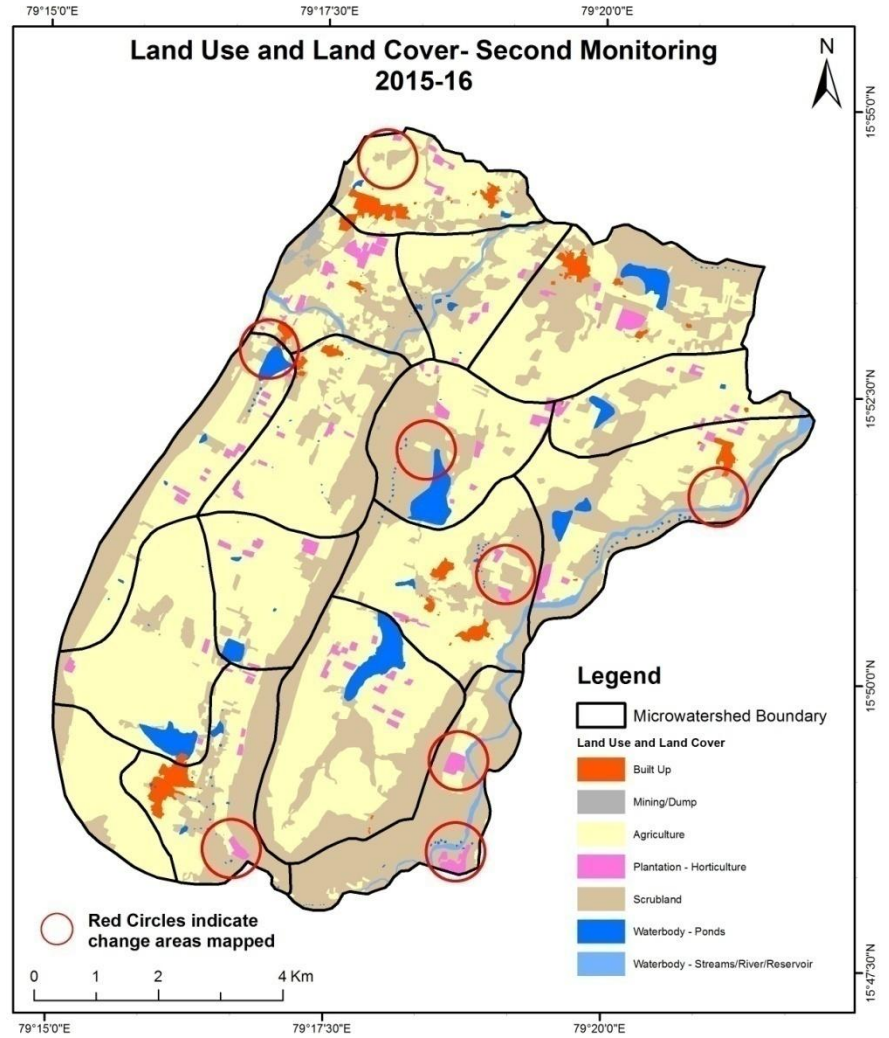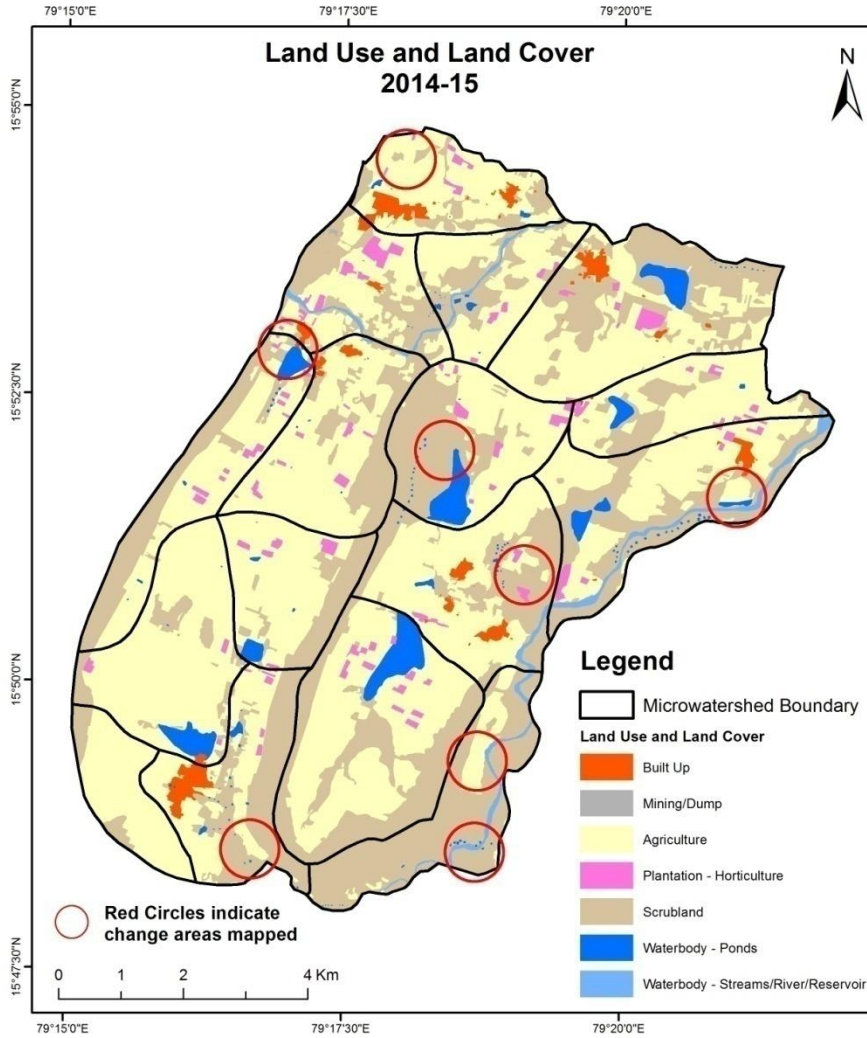
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)
Scale: 1:10000

Land Use and Land Cover
2010-11

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

◼ Built Up

☐ Agriculture

◼ Plantation - Horticulture

◼ Scrubland

◼ Waterbody - Ponds

◼ Waterbody - Streams/River/Reservoir

◯ Red Circles indicate change areas mapped

0   1   2   4 Km

Land Use and Land Cover- First Monitoring
2014-15

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

◼ Built Up

◼ Mining/Dump

☐ Agriculture

◼ Plantation - Horticulture

◼ Scrubland

◼ Waterbody - Ponds

◼ Waterbody - Streams/River/Reservoir

◯ Red Circles indicate change areas mapped

0   1   2   4 Km

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)
Scale: 1:10000

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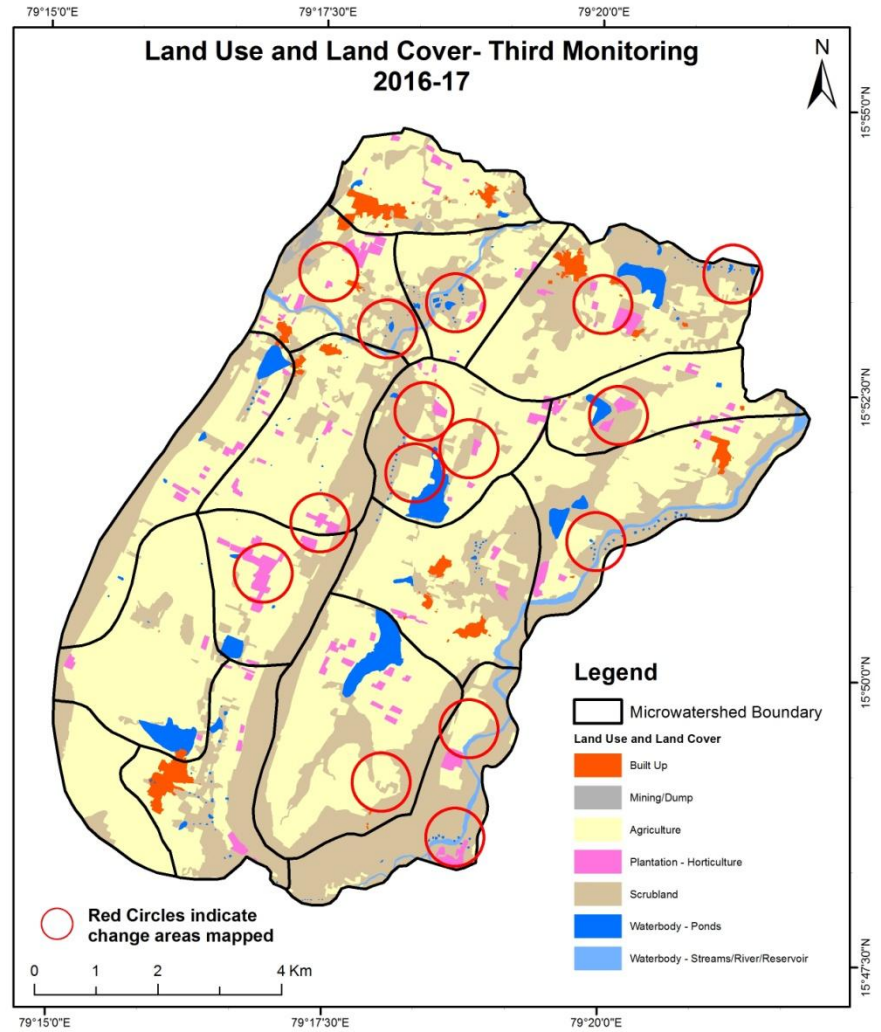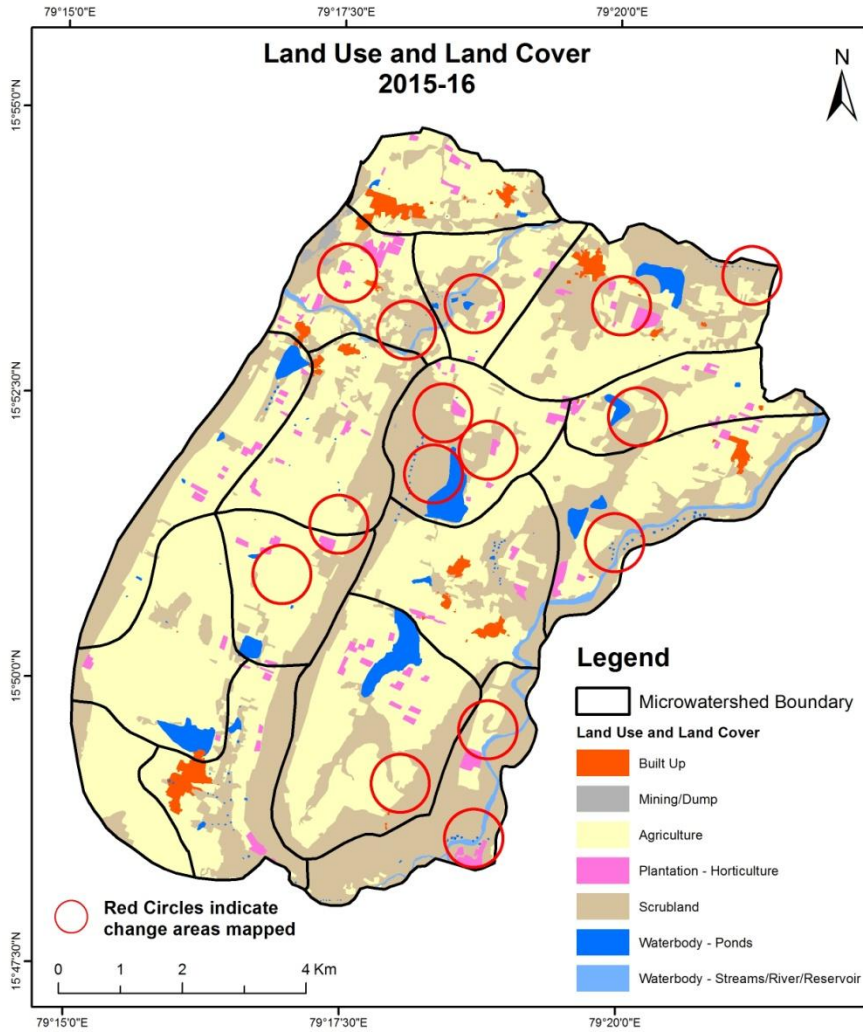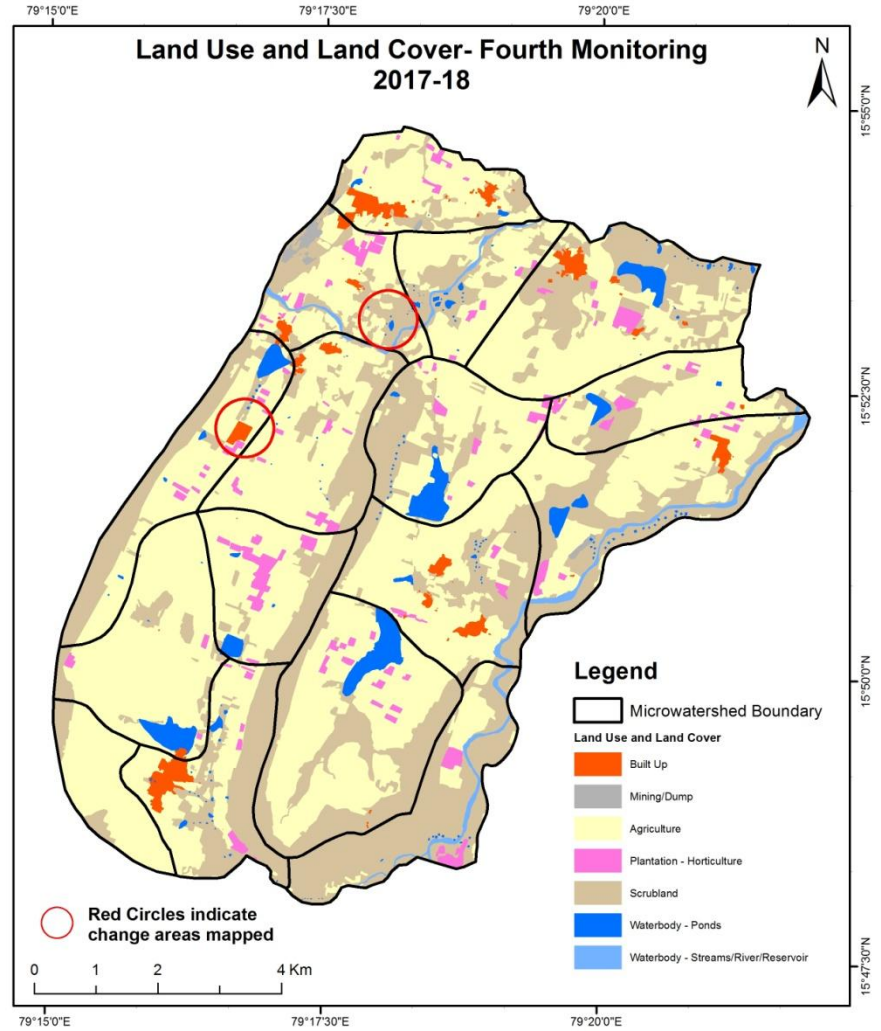
Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)
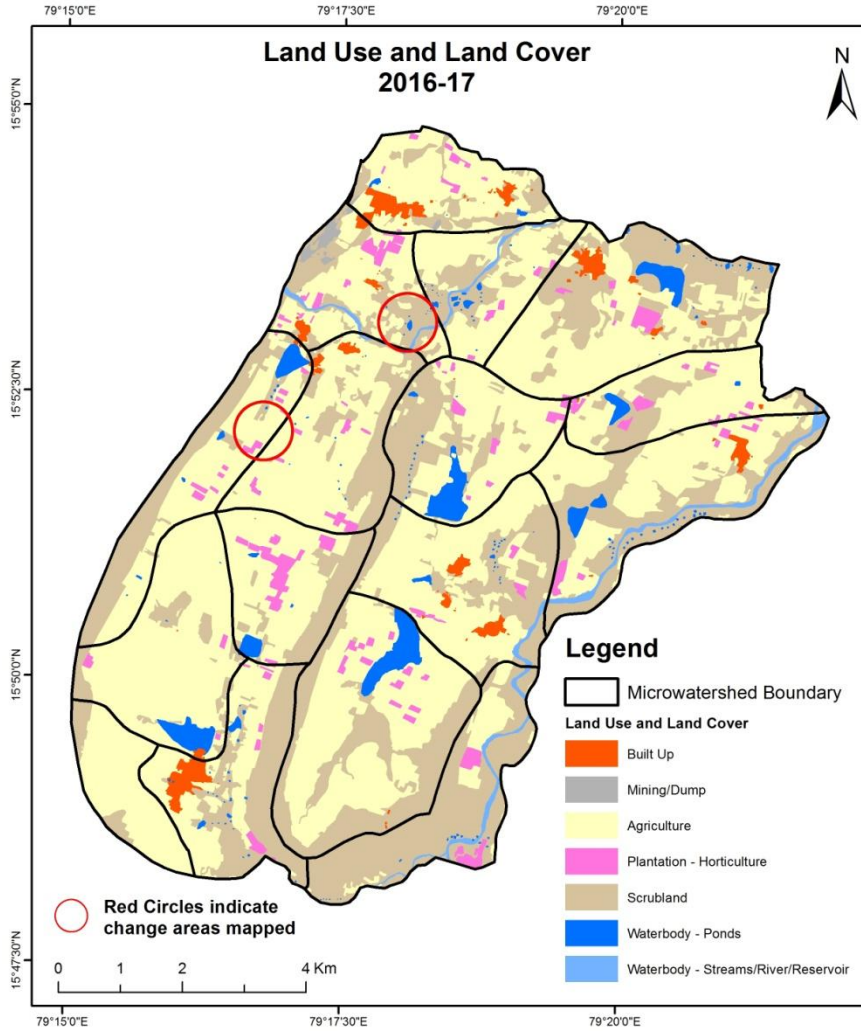## Scale: 1:10000

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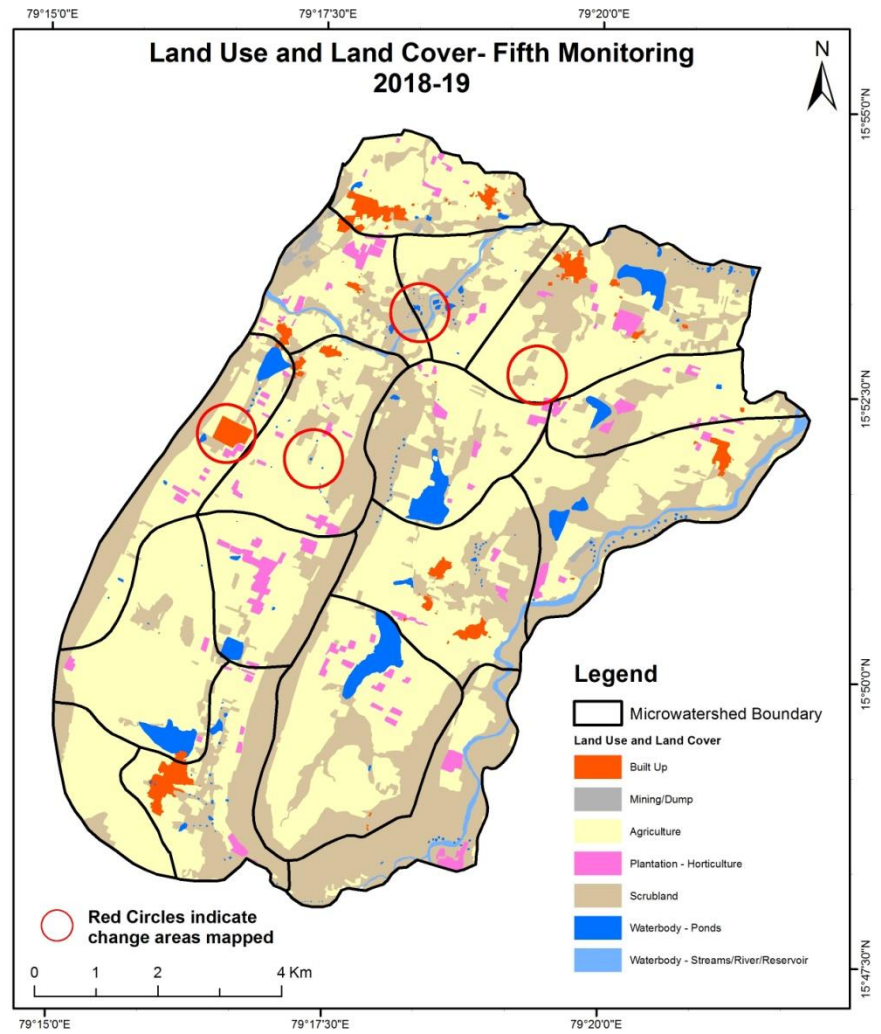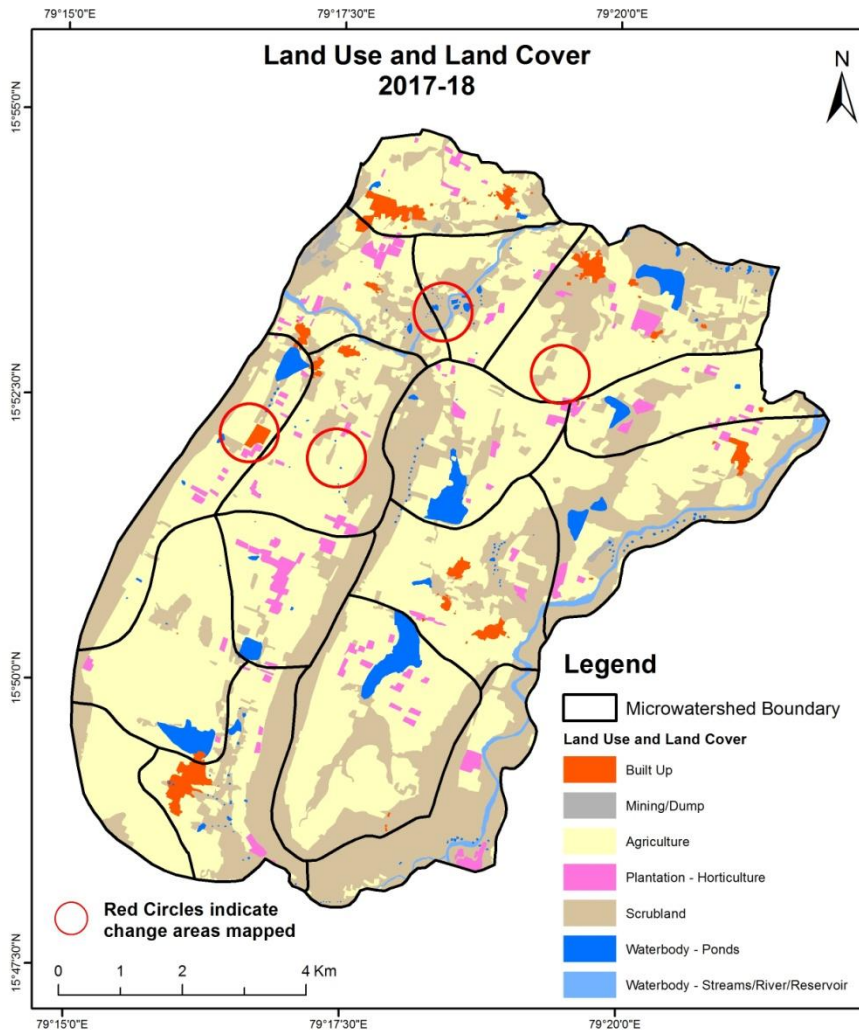
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Built-up

T0

T1

T1: 2010-11

T2: 26 May 2014

Agriculture to Plantation

T0

T1

T1: 2010-11

T2: 26 May 2014

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

Agriculture to Water body

T0

T1

T0: 2010-11

T1: 26 May 2014

Agriculture to Water body

T0

T1

T0: 2010-11

T1: 26 May 2014

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

Scrub to water body

T2: 2015-16 (79°21'22.667"E 15°53'36.312"N)

T3: 29 October 2017

Scrub to Agriculture

T2: 2015-16 (79°18'16.559"E 15°51'44.674"N)

T3: 29 October 2017

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

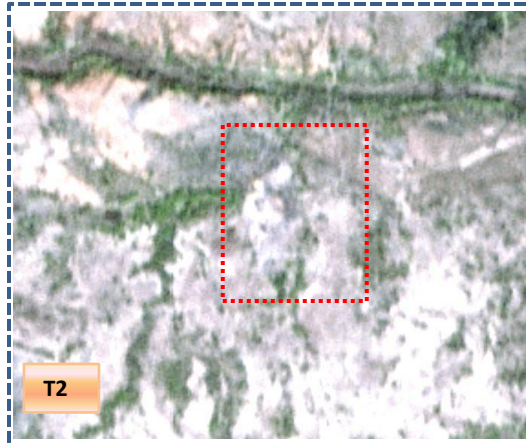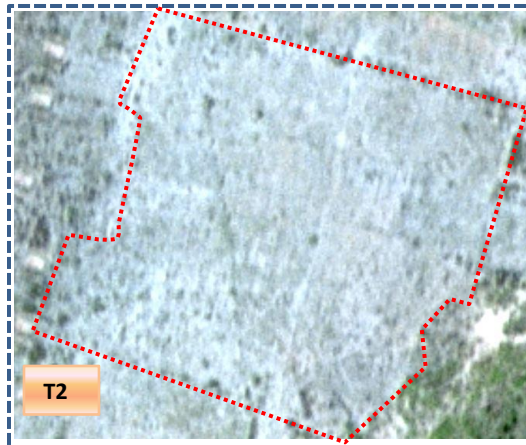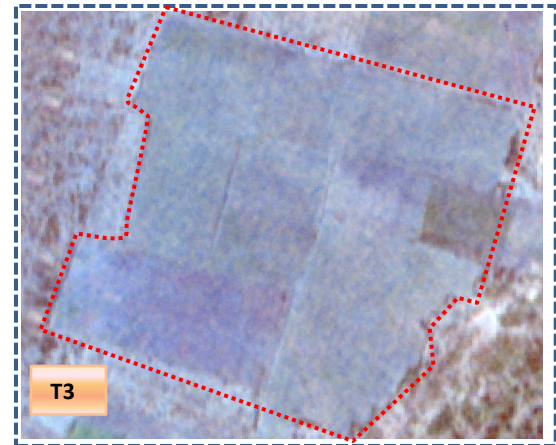| Land cover T0	Monitoring period (T1) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	46.96										46.96
Mining/dump											
Agriculture	83.24		4448.18	53.86				109.97		2.55	4697.80
Plantation Horticulture			61.63	131.51							193.14
Forest											
Forest Plantation											
Barren Rocky											
Scrub	10.99	1.20	461.92	0.26				3007.31		11.56	3493.23
Waterbody-Streams/River									104.76		104.76
Waterbody – Ponds	0.90									226.52	227.43
Grand Total	**142.09**	**1.20**	**4971.73**	**185.63**				**3117.28**	**104.76**	**240.63**	**8763.32**

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 T0 249.63 ha of agriculture are decreased and it is converted into built-up, plantation, scrubland and water body of T1.

- In T1 523.56 ha of agriculture are increased from plantation 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-2014-15 to 2015-16

Land cover / T1	Monitoring period (T2) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total (Units in Hectares)
Built up	142.09										142.09
Mining/dump		1.20									1.20
Agriculture	1.94		4943.29	22.51				3.91		0.08	4971.73
Plantation Horticulture			9.37	176.20						0.06	185.63
Forest											
Forest Plantation											
Barren Rocky											
Scrub	1.90	16.32	28.69	11.57				3057.45		1.35	3117.28
Waterbody-Streams/River									104.76		104.76
Waterbody – Ponds			14.42							226.21	240.63
Grand Total	145.94	17.52	4995.76	210.28				3061.37	104.76	227.69	8763.32

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

• In T2 38.06 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	145.94										145.94
Mining/dump		17.52									17.52
Agriculture	0.50	1.53	4947.11	45.52						1.11	4995.76
Plantation Horticulture			3.70	206.58							210.28
Forest											
Forest Plantation											
Barren Rocky											
Scrub	0.54	1.68	111.98					2938.26		8.90	3061.37
Waterbody- Streams/River									104.76		104.76
Waterbody – Ponds			3.82							223.87	227.69
Grand Total	**146.98**	**20.73**	**5066.61**	**252.10**				**2938.26**	**104.76**	**233.88**	**8763.32**

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

• In T3 115.68 ha of agriculture are increased from plantation, 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	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	146.98										146.98
Mining/dump		20.73									20.73
Agriculture	8.81	4.83	5051.92	1.06							5066.61
Plantation Horticulture			0.77	251.32							252.10
Forest											
Forest Plantation											
Barren Rocky											
Scrub			2.52					2935.74			2938.26
Waterbody-Streams/River									104.76		104.76
Waterbody – Ponds										233.88	233.88
Grand Total	155.79	25.56	5055.21	252.38				2935.74	104.76	233.88	8763.32

• 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 9.86 ha of agriculture are decreased and it is converted into built-up, mining/dump and plantation of T4.

• In T4 3.29 ha of agriculture are increased from plantation 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-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	155.79										155.79
Mining/dump		25.56									25.56
Agriculture	12.58		5041.70							0.93	5055.21
Plantation Horticulture			8.55	243.83							252.38
Forest											
Forest Plantation											
Barren Rocky											
Scrub								2934.73		1.01	2935.74
Waterbody-Streams/River									104.76		104.76
Waterbody – Ponds										233.88	233.88
Grand Total	168.37	25.56	5050.25	243.83				2934.73	104.76	235.82	8763.32

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 13.52 ha of agriculture are decreased and it is converted into built-up and water body of T5.

• In T5 8.55 ha of agriculture are increased from plantation 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 8.40 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 273.93, 24.03 & 70.85Hectares From T0 to T1, T1 to T2 & T2 to T3 and there is an decrease of 11.40 & 4.96 Hectares From T3 to T4 & T4 to T5. The overall increase of 352.45 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

5. There is increase of 50.68 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.

6. There is a decrease of 558.50 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.

7. Farm ponds (127) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (115) verified from the portal.