MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -14/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-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

- 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-14/2009-10, Prakasam District of   Andhra Pradesh. The total geographical area of the project is 6828.89 ha. It comprises of 15 micro watersheds.

- In the project area 9 Drishti photos were uploaded showing 5 check dams, 1 Dug out pit, 1 Percolation tank and 2 plantations.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 5 new farm ponds or dug out ponds with 18.27 ha increase in the area.

- Major percentage i.e. 75.69% is covered by the agriculture, 9.49% is covered by scrubland, 5.43% by water bodies and remaining by other land use classes.

- The study area falls in Mundlamarru Mandal of Prakasam district of Andhra Pradesh state.   The total geographical area of the project is 6828.89 ha. It comprises of 15 micro watersheds. Location Map of the study area is shown in Figure below.

- Analysis is done for 2009-10 (T0) period (*Batch -1*) projects taking 2017-18 (T5) period satellite images.
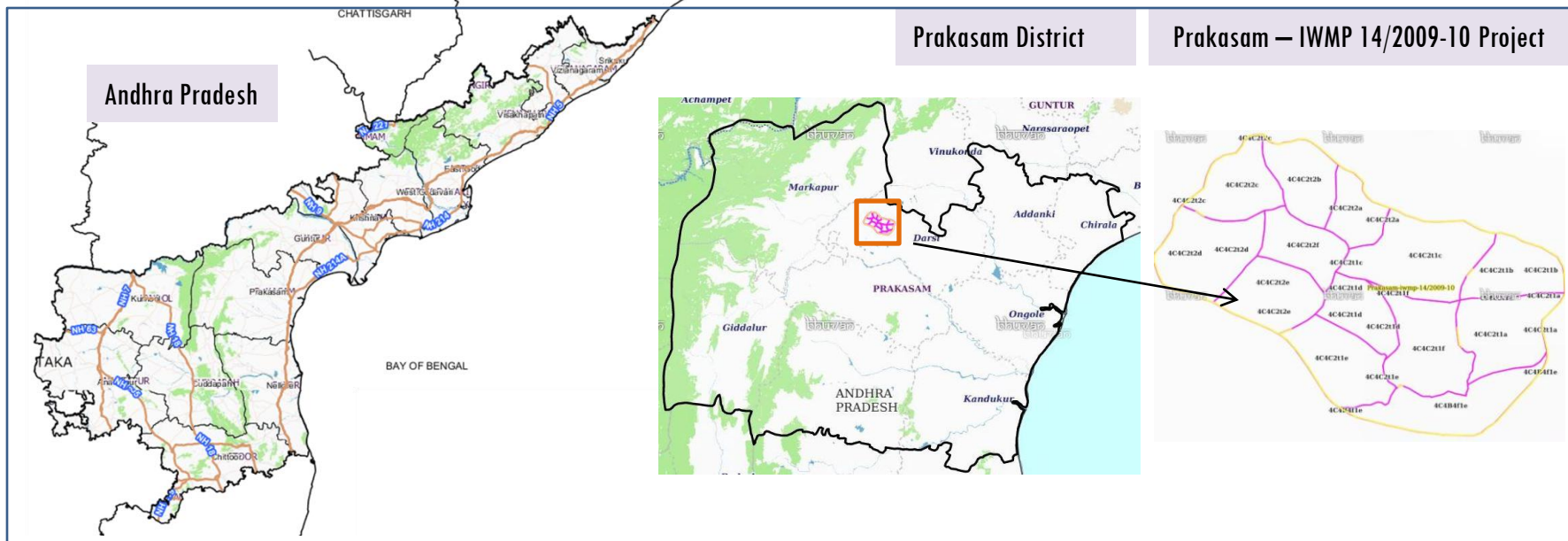
- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.

- 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
	2014-15	2014-15	2017-18
LISS IV	2014-15		
SCENE 1			26-Sep-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2014-15		
SCENE 1			26-Sep-18
SCENE2			
SCENE 3			
SCENE 4			

Ancillary Data

	Category	Sub category	Status
	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	9
4	Detailed Project Report		

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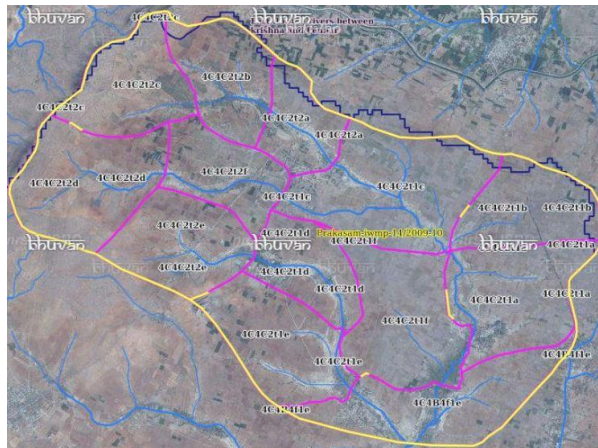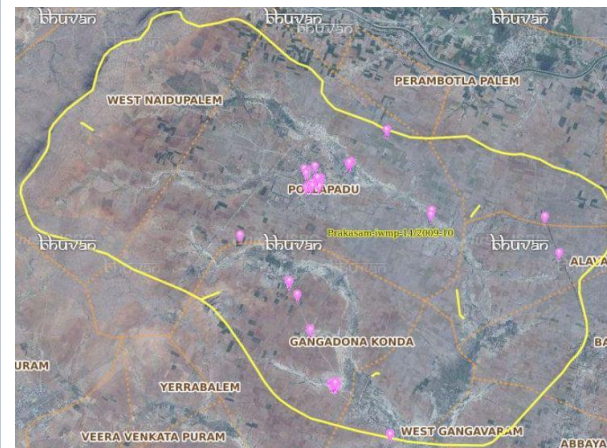

Legend

 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	0	0
2	Horticulture	0	0
3	Agriculture Plantation	4	2
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds /Dugout pit	1	1
11	Check dams	5	5
12	Nallah Bunds	0	0
13	Percolation tanks / Ground water recharge structure	1	1
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	5	0
	TOTAL	**16**	**9**

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 (2009-10) and T5 is 2017-18 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-14/2009-10
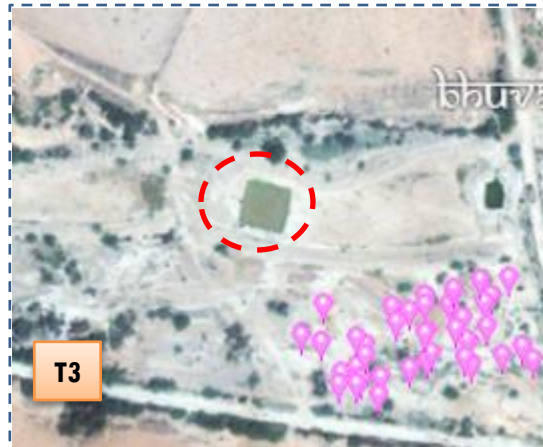

T2:2009-10

T3: 17 April 2018

Drishti Sl no. 1810681   MWS :4C4C2t1c
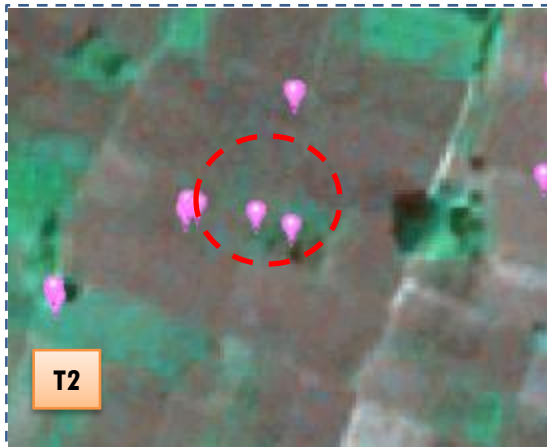
Farm pond

T2:2009-10

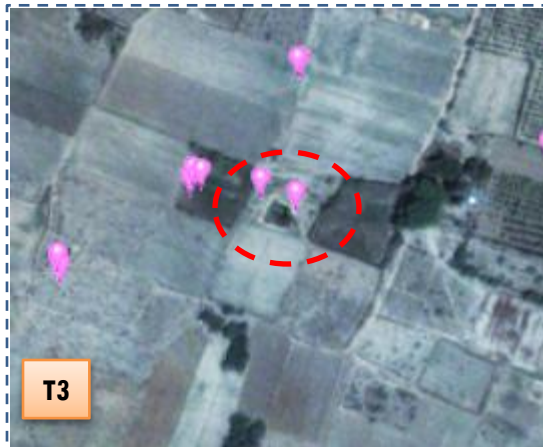T3: 17 April 2018

Drishti Sl no. 7023144   MWS : 4C4C1h2d

Farm pond

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-14/2009-10

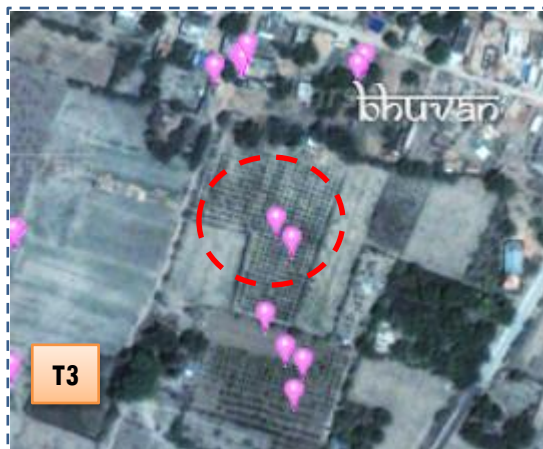| T2	T3	
T2:2009-10	T3: 17 April 2018	Drishti Sl no. 7025594 MWS :4C4C2t1c

Farm pond

T2	T3	
T2:2009-10	T3: 17 April 2018	Drishti Sl no. 7025109 MWS : 4C4C2t1c

Horticulture

Changes in Vegetation Cover

Normalized Difference Vegetation Index - 2013-14

4C4C2t2c
4C4C2t2b
4C4C2t2a
4C4C2t2d
4C4C2t2f
4C4C2t1c
4C4C2t1b
4C4C2t2e
4C4C2t1d
4C4C2t1a
4C4C2t1f
4C4C2t1e
4C4B4f1e

Legend
☐ Microwatershed Boundary
NDVI
■ -0.1-No Vegetation
■ 0 - 0.2-Poor Vegetation
■ 0.2 - 0.3- Moderate Vegetation
■ 0.3 - 0.4 -Good Vegetaion
■ 0.4 - 0.7 - Dense Vegetation

0   1   2   4 Km

Normalized Difference Vegetation Index - 2014-15

4C4C2t2c
4C4C2t2b
4C4C2t2a
4C4C2t2d
4C4C2t2f
4C4C2t1c
4C4C2t1b
4C4C2t2e
4C4C2t1d
4C4C2t1a
4C4C2t1f
4C4C2t1e
4C4B4f1e

Legend
☐ Microwatershed Boundary
NDVI
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■ 0.4 - 0.7 - Dense Vegetation

0   1   2   4 Km

NDVI (2014-15)   NDVI (2015-16)

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.

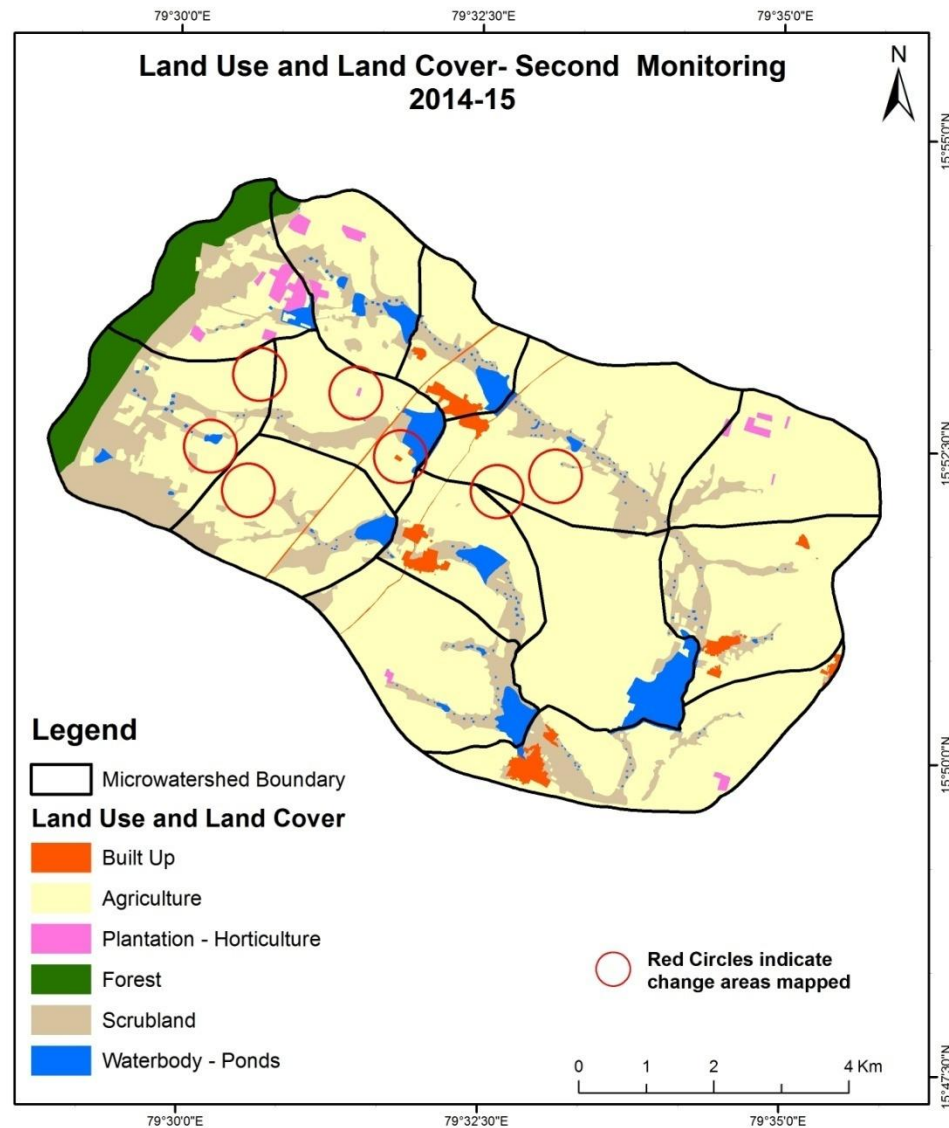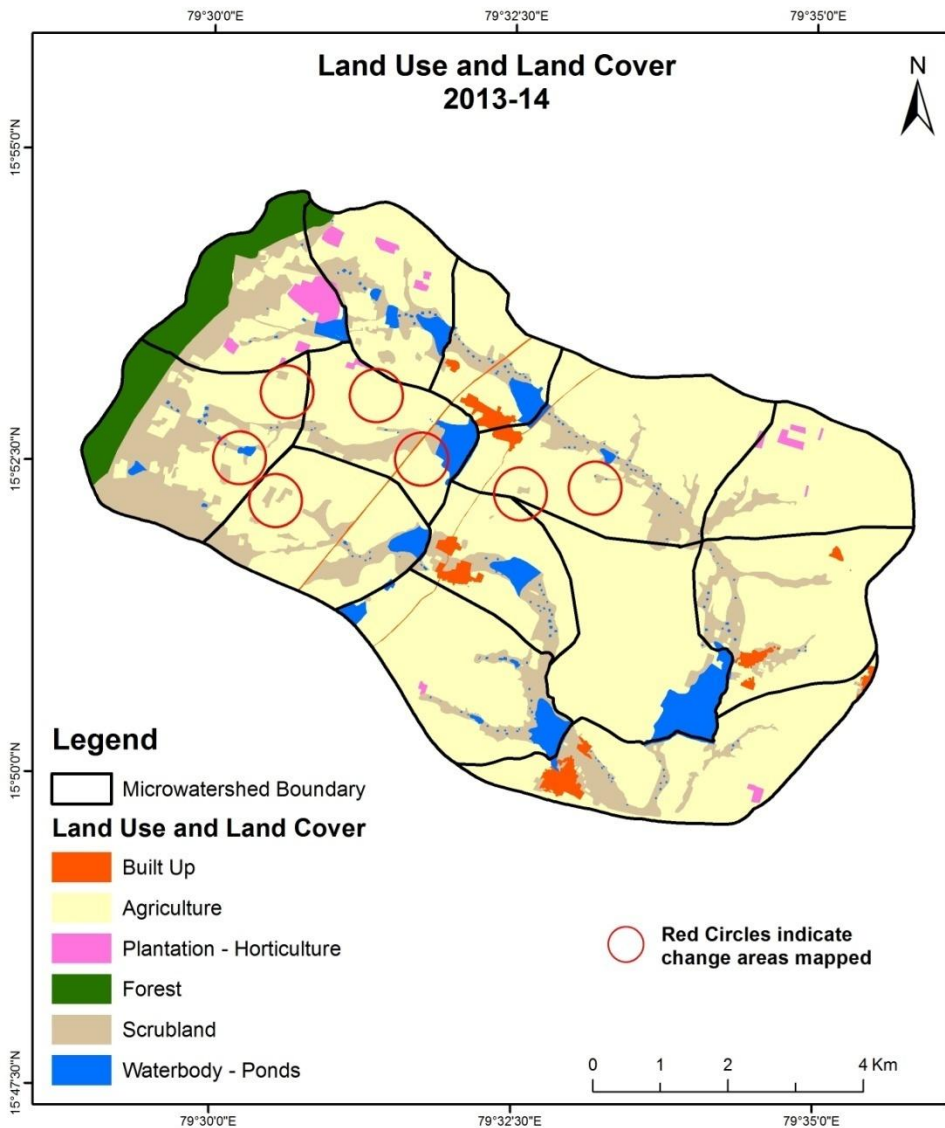- In matrix table column represents the T0 (2009-10) and row represents the T5 (2017-18)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000
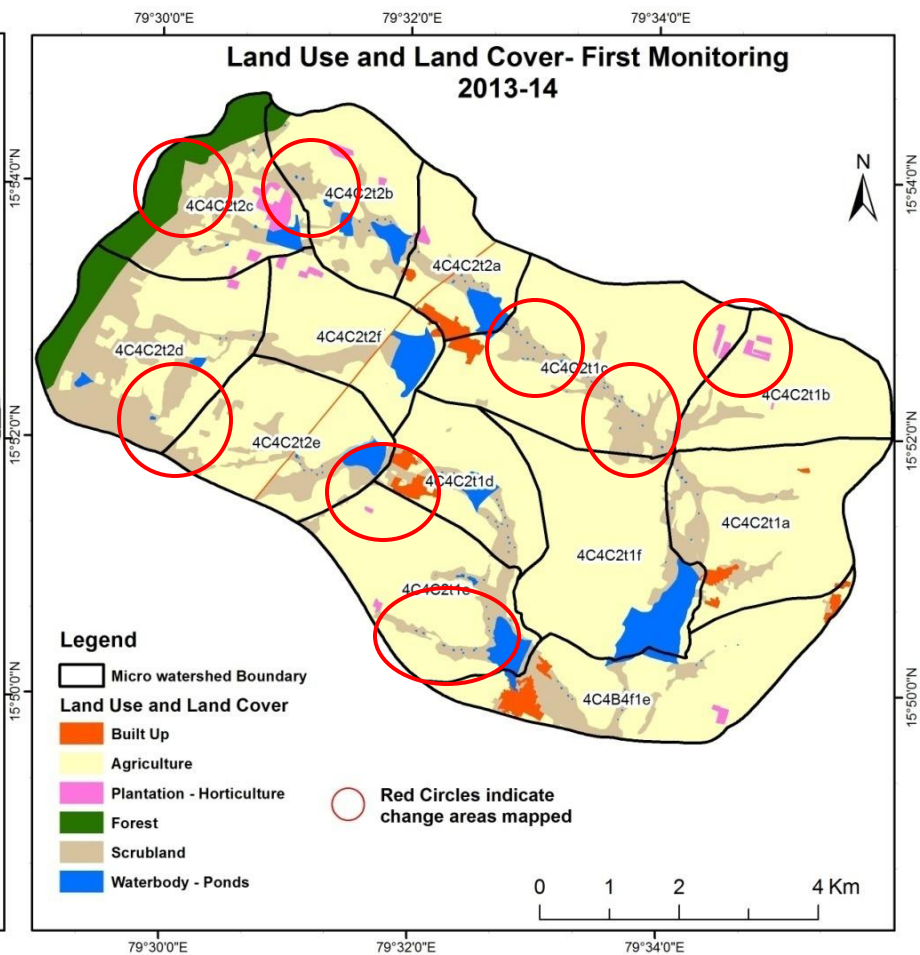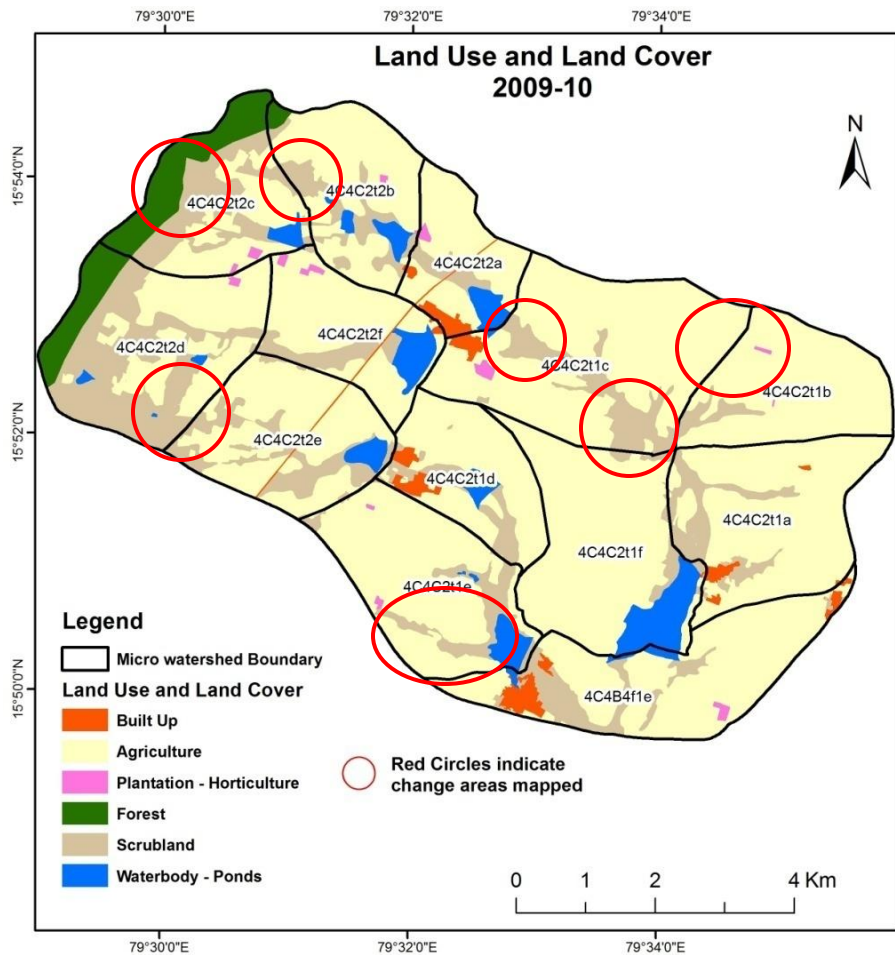
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)
Scale: 1:10000

Land Use and Land Cover 2013-14

Land Use and Land Cover- Second Monitoring 2014-15

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds

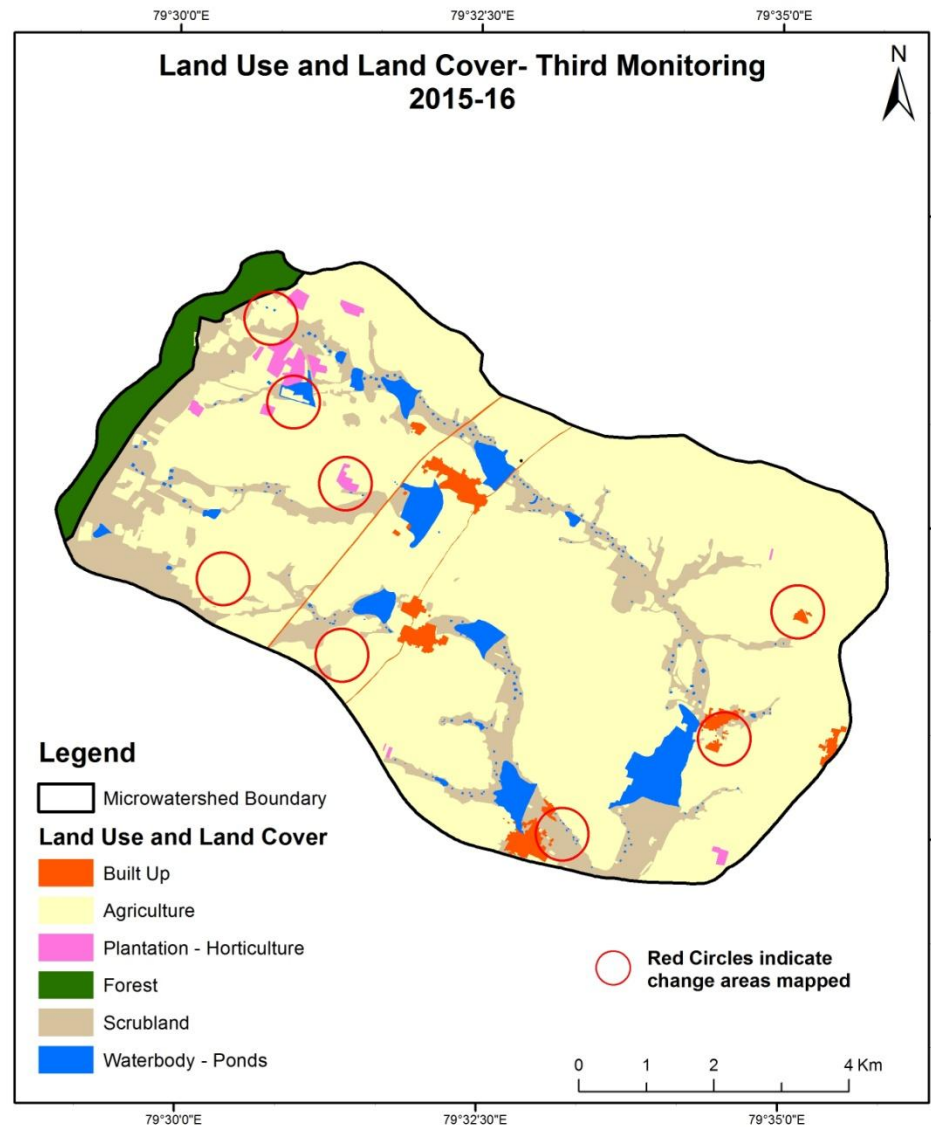Red Circles indicate change areas mapped

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

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds

○ Red Circles indicate change areas mapped

0 1 2 4 Km

Land Use and Land Cover- Third Monitoring 2015-16

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
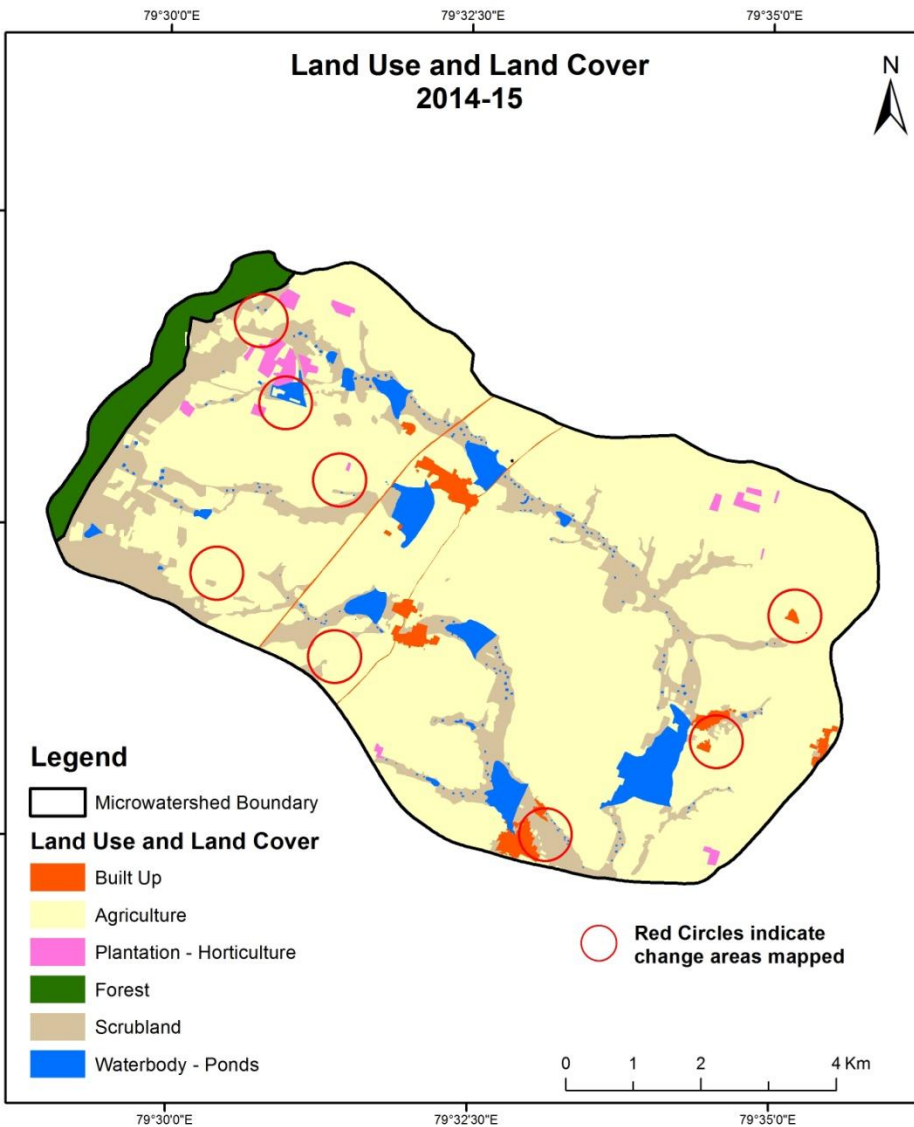- Waterbody - Ponds

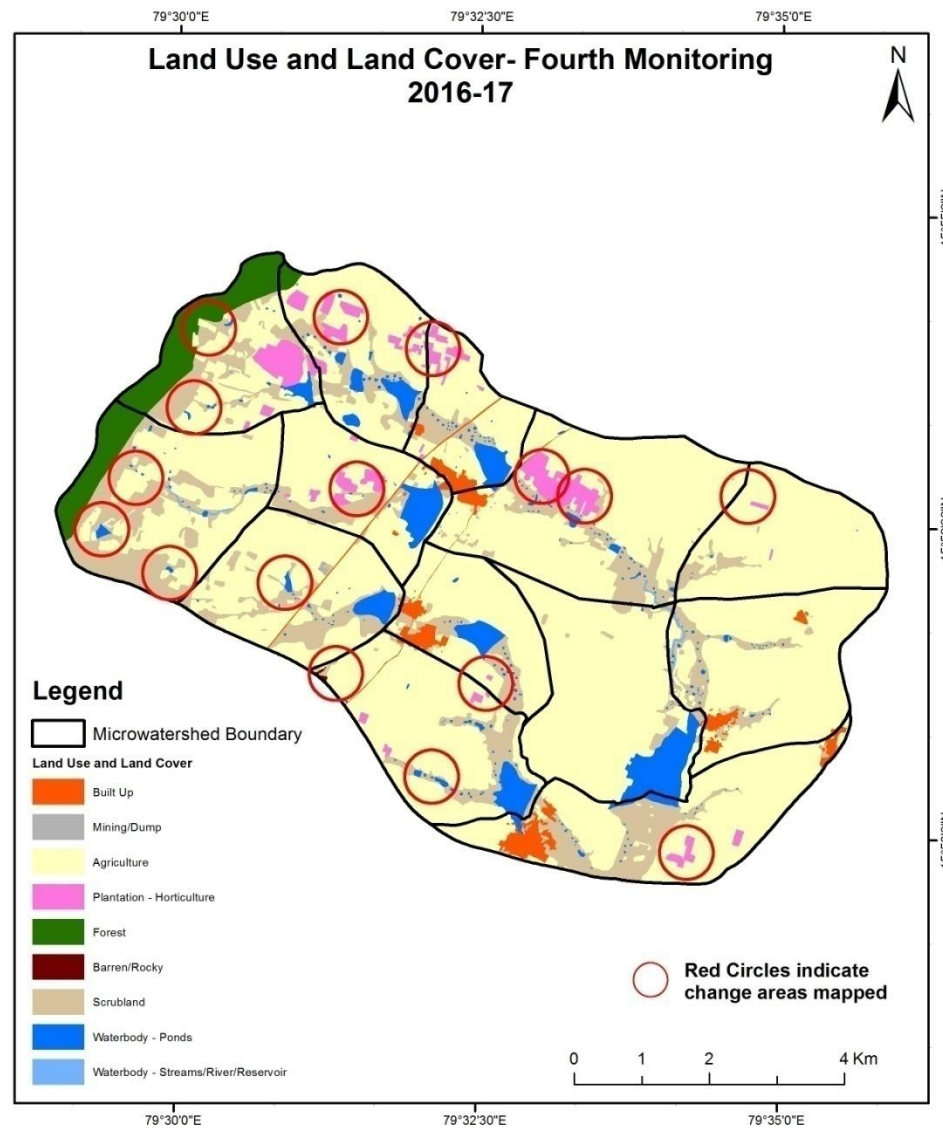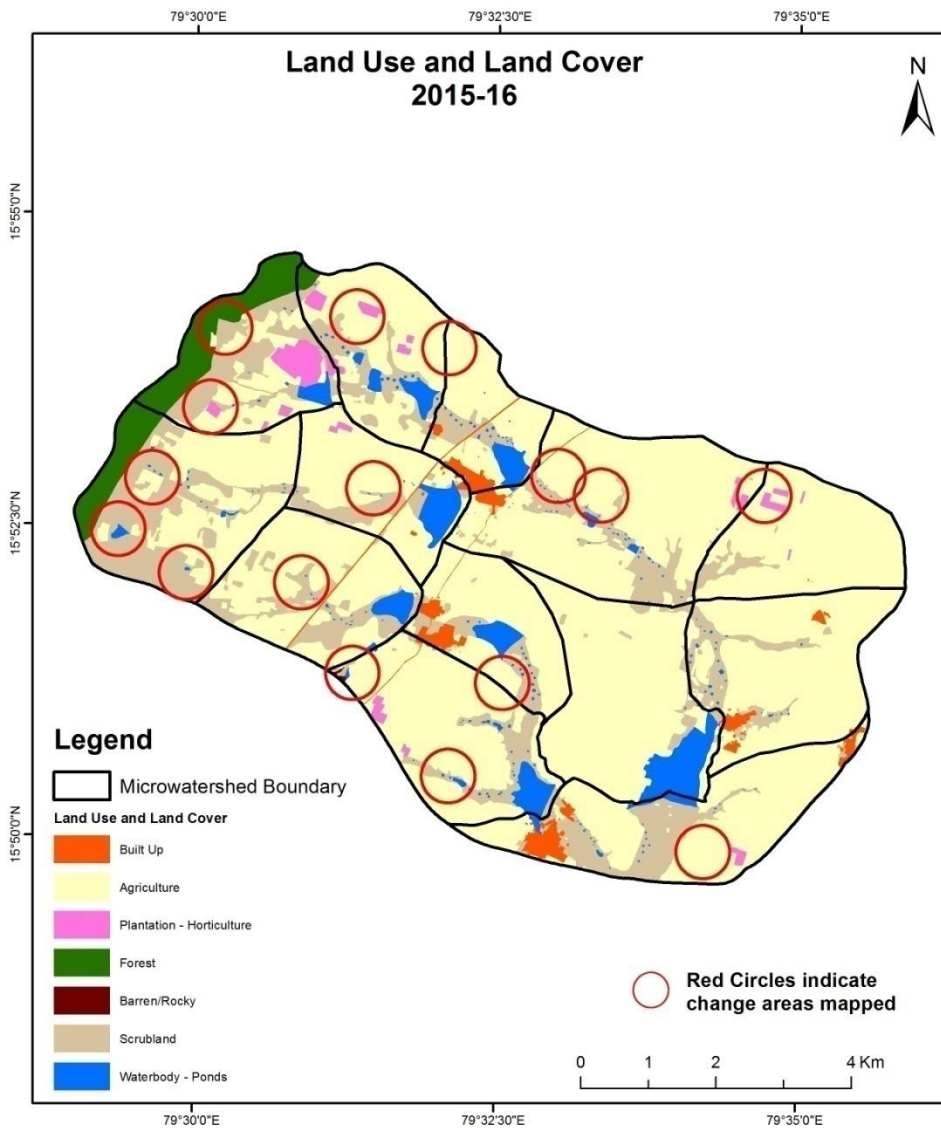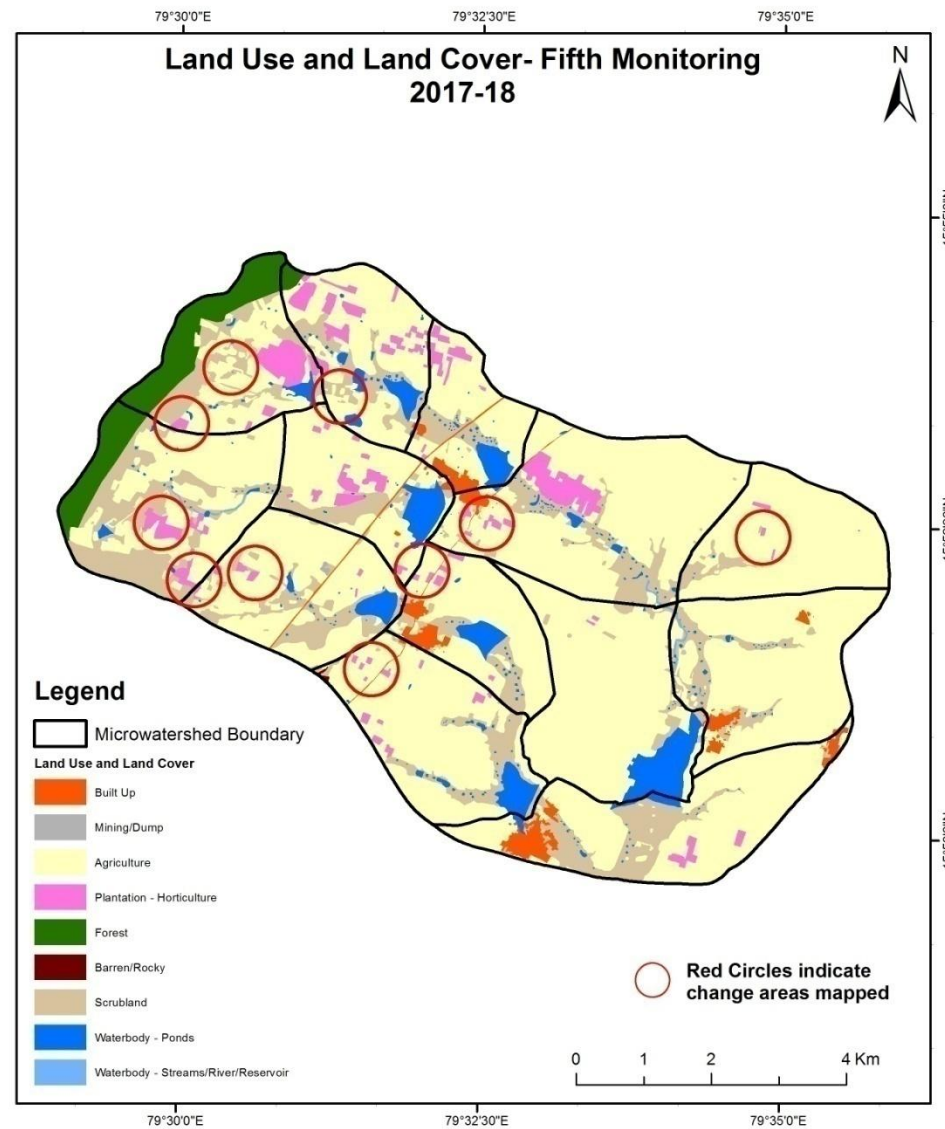○ Red Circles indicate change areas mapped

0 1 2 4 Km

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

Land Use and Land Cover
2016-17

Land Use and Land Cover- Fifth Monitoring
2017-18

Legend

Microwatershed Boundary

Land Use and Land Cover

Built Up

Mining/Dump

Agriculture

Plantation - Horticulture

Forest

Barren/Rocky

Scrubland

Waterbody - Ponds

Waterbody - Streams/River/Reservoir

Red Circles indicate change areas mapped

0   1   2   4 Km
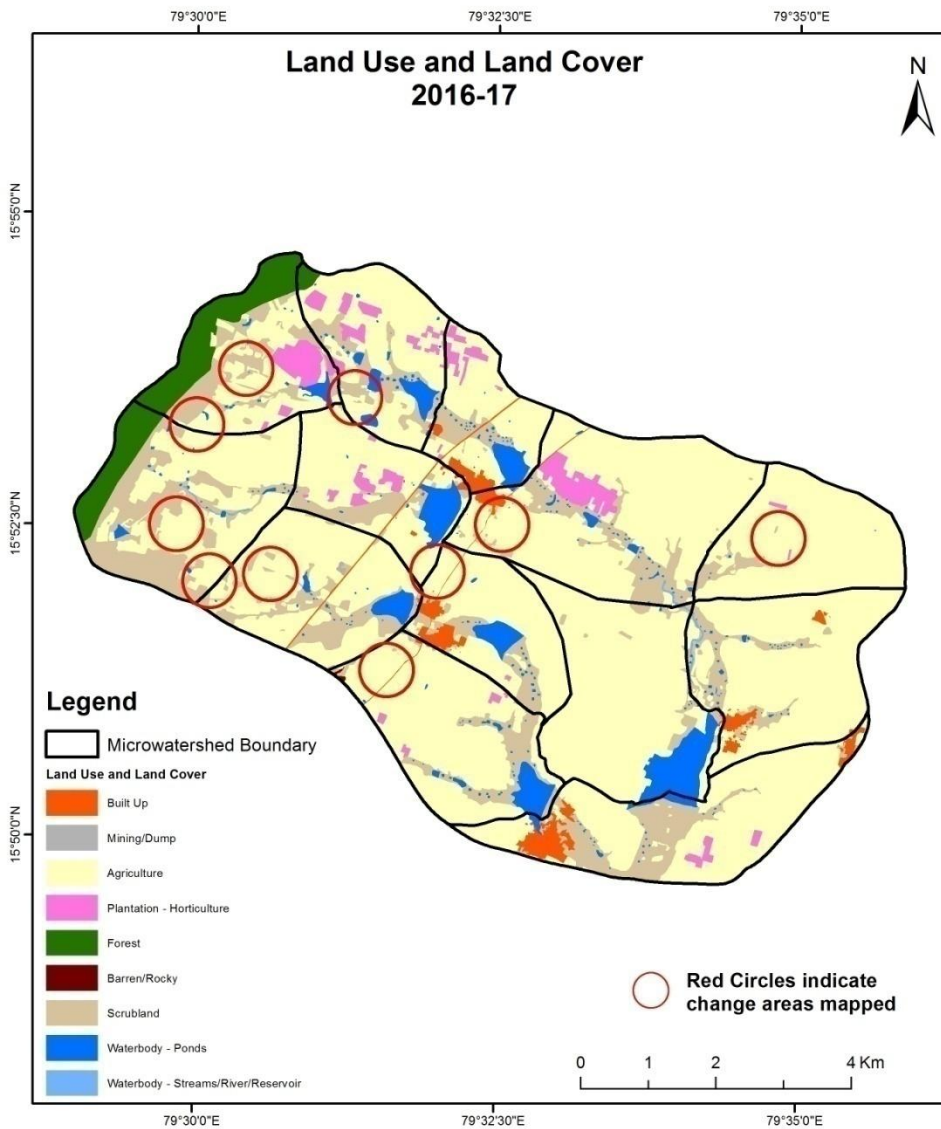
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T2: 2014

T3: 26 January 2016

Agriculture to Plantation
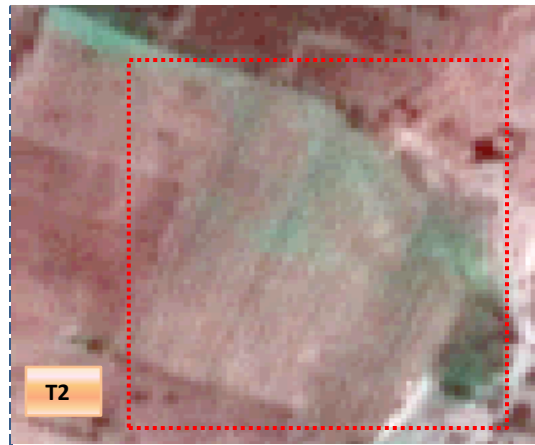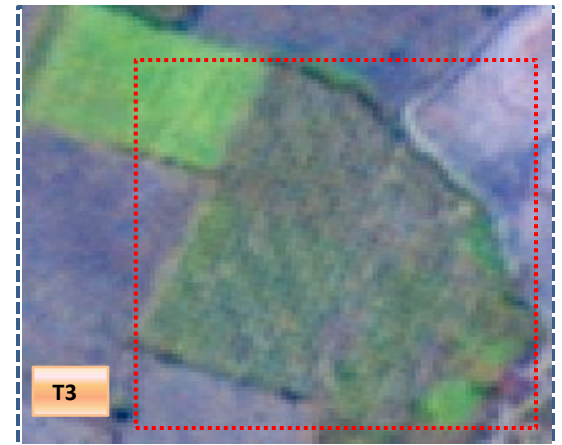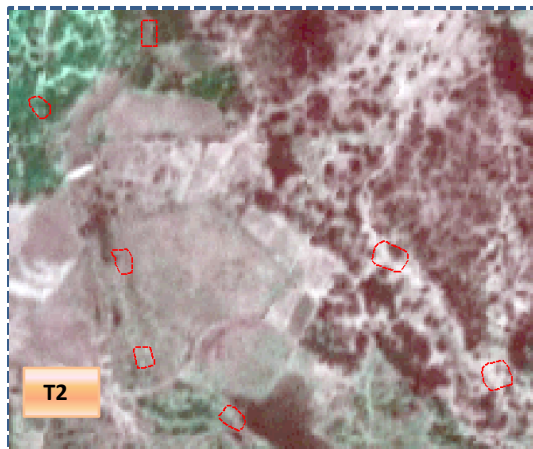

T2: 2014
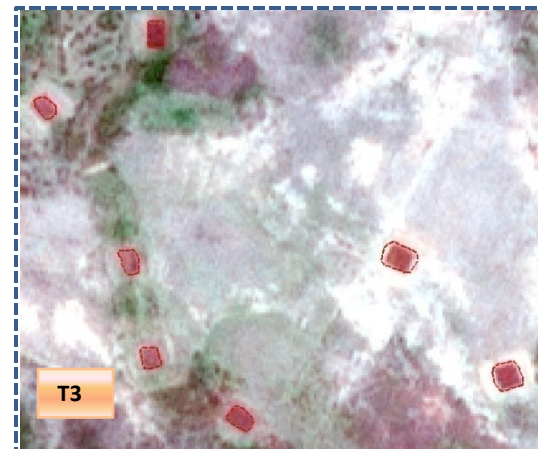
T3: 26 January 2016

Scrub to Water body
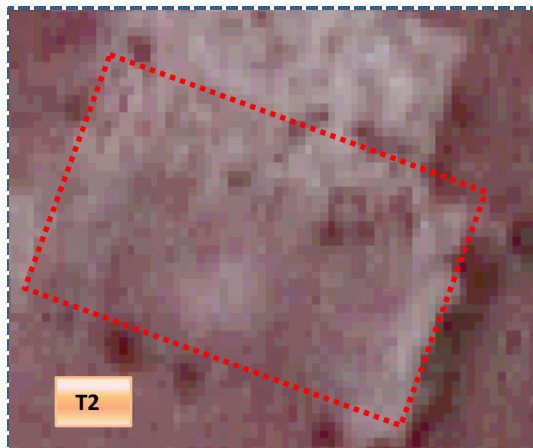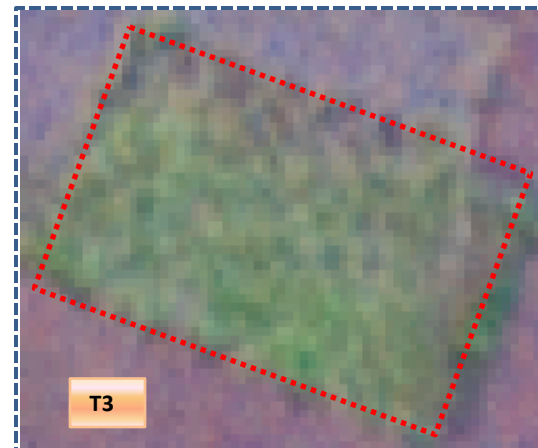

T2: 2014

T3: 26 January 2016

Agriculture to Plantation

T2: 2014

T3: 26 January 2016

Table showing change matrix depicting Land cover transitions during study period-2009-10 to 2013-14

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	115.04										115.04
Mining/dump											
Agriculture			4755.46	50.95							4806.41
Plantation Horticulture				34.32							34.32
Forest					228.80						228.80
Forest Plantation											
Barren Rocky							1.43				1.43
Scrub			27.67					1175.90			1203.57
Waterbody-Streams/River											
Waterbody – Ponds										282.56	282.56
Grand Total	115.04		4783.13	85.27	228.80		1.43	1175.90		282.56	6672.14

• 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 50 ha of agriculture are decreased and it is converted into Plantations in T2.

• In T2 27 ha of agriculture are increased from scrubland of T0.

• The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2013-14 to 2014-15

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
Built up	115.04										**115.04**
Mining/dump											
Agriculture	1.31		4781.82								**4783.13**
Plantation Horticulture				85.27							**85.27**
Forest			1.27		227.53						**228.80**
Forest Plantation											
Barren Rocky							1.43				**1.43**
Scrub			1.91					1173.78		0.22	**1175.90**
Waterbody-Streams/River											
Waterbody – Ponds										282.56	**282.56**
Grand Total	**116.35**		**4785.00**	**85.27**	**227.53**		**1.43**	**1173.78**		**282.78**	**6672.14**

- 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 1.3 ha of agriculture are decreased and it is converted into Built-up in T2.

- In T2 3.1 ha of agriculture are increased from scrubland and forest area of T0.

- The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

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

Land cover	Monitoring period (T3)										
T2	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	116.35										**116.35**
Mining/dump											
Agriculture	5.77		4769.18	6.27				0.15		3.63	**4785.00**
Plantation Horticulture				85.27							**85.27**
Forest					227.53						**227.53**
Forest Plantation											
Barren Rocky							1.43				**1.43**
Scrub	0.23		5.61					1165.89		2.05	**1173.78**
Waterbody-Streams/River											
Waterbody – Ponds			4.44							278.34	**282.78**
Grand Total	**122.35**		**4779.24**	**91.54**	**227.53**		**1.43**	**1166.04**		**284.02**	**6672.14**

- 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 agriculture are decreased and it is converted into Built-up, plantation, scrub and water body in T2.

- In T2 10 ha of agriculture are increased from scrubland and water body of T0.

- 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 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	120.31		2.04								**122.35**
Mining/dump											
Agriculture	1.09	1.53	4652.12	119.02				1.02	0.23	4.22	**4779.24**
Plantation Horticulture			30.14	61.39							**91.54**
Forest			0.25		227.28						**227.53**
Forest Plantation											
Barren Rocky							1.43				**1.43**
Scrub	7.19		99.86					1035.65	7.74	15.60	**1166.04**
Waterbody-Streams/River											
Waterbody – Ponds			7.93						0.53	275.56	**284.02**
Grand Total	**128.59**	**1.53**	**4792.35**	**180.42**	**227.28**		**1.43**	**1036.67**	**8.49**	**295.38**	**6672.14**

- 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 127 ha of agriculture are decreased and it is converted into Built-up, mining, plantation, scrub and water body in T2.

- In T2 140 ha of agriculture are increased from built-up, plantation, scrubland and water body of T0.

- The additional agriculture are coming from waterbody in T2 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

| Land cover | Monitoring period (T5) | | | | | | | | | | |
T4	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	128.59										**128.59**
Mining/dump		1.53									**1.53**
Agriculture			4716.45	75.69						0.22	**4792.35**
Plantation Horticulture				180.42							**180.42**
Forest			1.52		225.76						**227.28**
Forest Plantation											
Barren Rocky							1.43				**1.43**
Scrub			19.49	0.19				1015.18	0.75	1.06	**1036.67**
Waterbody-Streams/River									8.49		**8.49**
Waterbody – Ponds			0.70							294.68	**295.38**
Grand Total	**128.59**	**1.53**	**4738.15**	**256.29**	**225.76**		**1.43**	**1015.18**	**9.24**	**295.96**	**6672.14**

- 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 75 ha of agriculture are decreased and it is converted into Plantation and water body in T2.

- In T2 21 ha of agriculture are increased from forest, scrubland and water body of T0.

- The additional agriculture are coming from waterbody in T2 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 22 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.

4. There is an increase of 1.8 & 13 Hectares From T1-T2 & T3-T4 respectively and there is a decrease of 23, 5.7 & 54 Hectares from T0-T1, T2-T3 & T4-T5 and overall decrease of 68 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.

5. There is an increase of 221 ha of the Plantation/Horticulture area has been increased between 2009-10 (t0) & 2017-18 (T5) years.

6. There is a decrease of 188 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.

7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.