MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -7/2009-10
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-07/2009-10, Prakasam District of   Andhra Pradesh. The total geographical area of the project is 8484.72 ha.   It comprises of 16 micro watersheds.

- In the project area 81 Drishti photos were uploaded showing 8 check dams,44 Farm ponds, 28 Horticulture and 6 others drishti photos.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 10 new farm ponds or dug out ponds with 60.01 ha increase in the area.

- Major percentage i.e. 45.77% is covered by the agriculture, 40.39% is covered by scrub land, 5.77% by forest, 3.16% by water body and remaining by other land use classes.

- The study area falls in Bestawaripeta Mandal of Prakasam district of Andhra Pradesh state.   The total geographical area of the project is 8484.72 ha. It comprises of 16 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
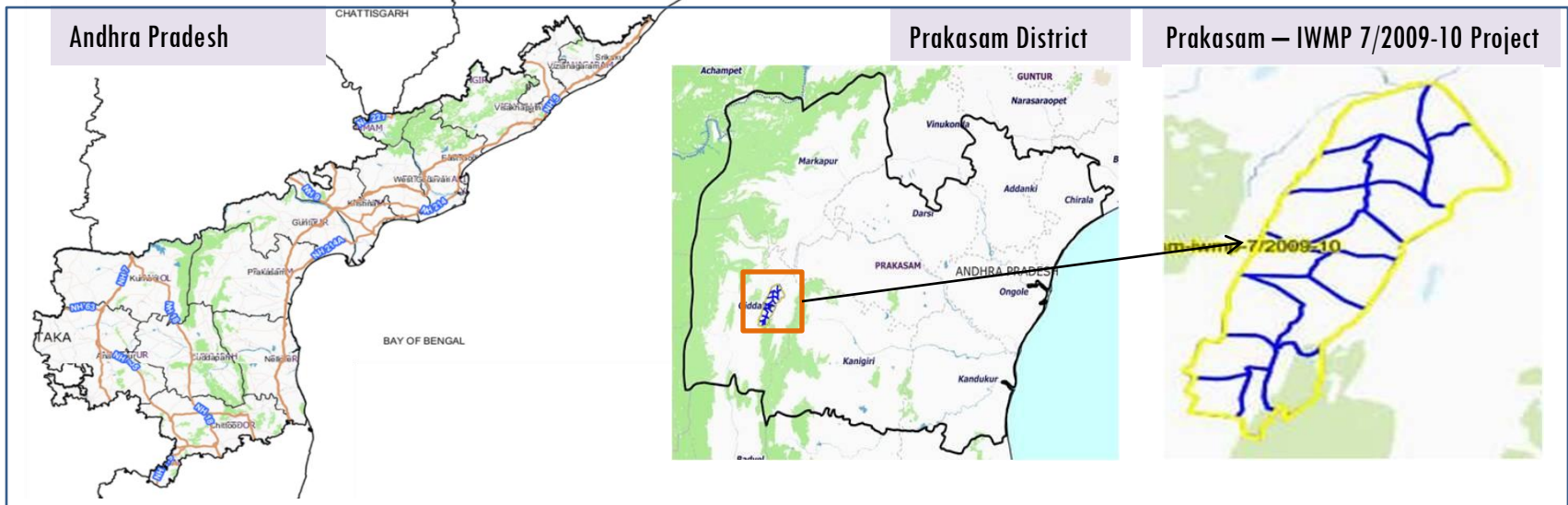
- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.

- 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.

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Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			25-Oct-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-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	81
4	Detailed Project Report		

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

Legend

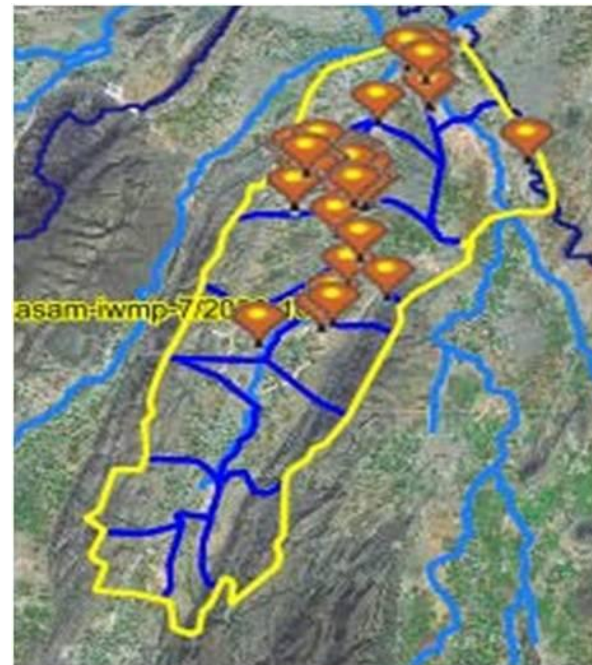 Drainage (1:10000 Scale)

 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	28	24
3	Agriculture	0	0
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	47	40
11	Check dams	8	8
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	0	0
18	Others	1	1
	TOTAL	**84**	**73**

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.

Natural Color Composite

Natural Color Composite- 2009-10

Source:Fusen data,NRSC

Natural Color Composite- 26th February 2013

Source:LISS-IV,NRSC

Natural Color Composite- 05th April 2016

Source:Fusen data,NRSC

Natural Color Composite- 18th October 2016

Source:LISS-IV,NRSC

Natural Color Composite- 14th February 2017

Source:LISS-IV,NRSC

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-07/2009-10

| T0:2009-10 | T1: 03 April 2014 | Drishti Sl no. 685831   MWS :4C4C7f1a |

Farm pond

| T0:2009-10 | T1: 03 April 2014 | Drishti Sl no.161204   MWS : 4C4C7f1i |

Rock fill dam

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-07/2009-10

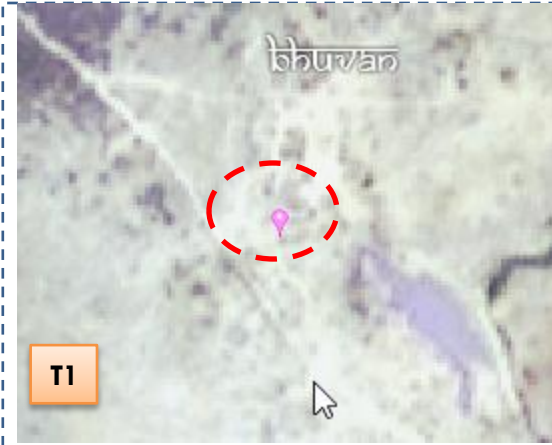| T0	T1	
T0: 2009-10	T1: 03 April 2014	Drishti Sl no. 88855 MWS : 4C4C7f1k

Percolation tank

T0	T1	
T0: 2009-10	T1: 03 April 2014	Drishti Sl no. 685731 MWS : 4C4C7f1d

Check dam

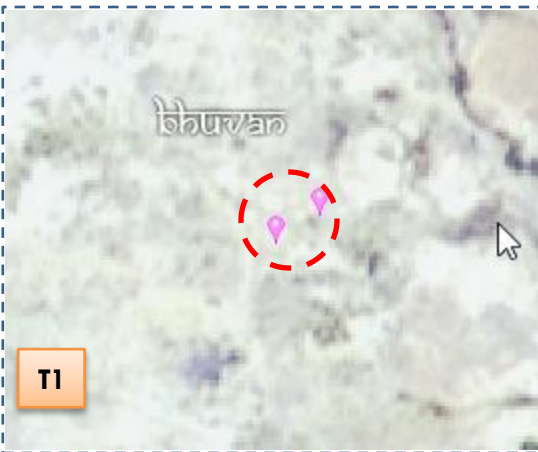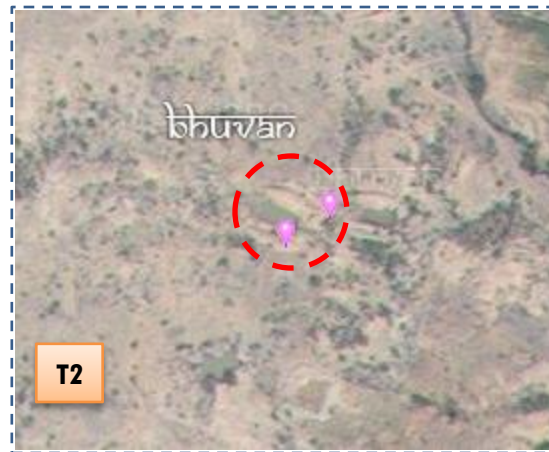# Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-07/2009-10

T1	T2	
T1:2013	T2: 05 June 2014	Drishti Sl no. 685764 MWS :4C4C7f1a

Farm pond

T1	T2	
T1:2013	T2: 05 June 2014	Drishti Sl no.161204 MWS : 4C4C7f1i

Groundwater Recharge structure

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-07/2009-10

| T1: 2013 | T2: 05 June 2014 | Drishti Sl no. 97353   MWS : 4C4C7f1k |

Percolation tank
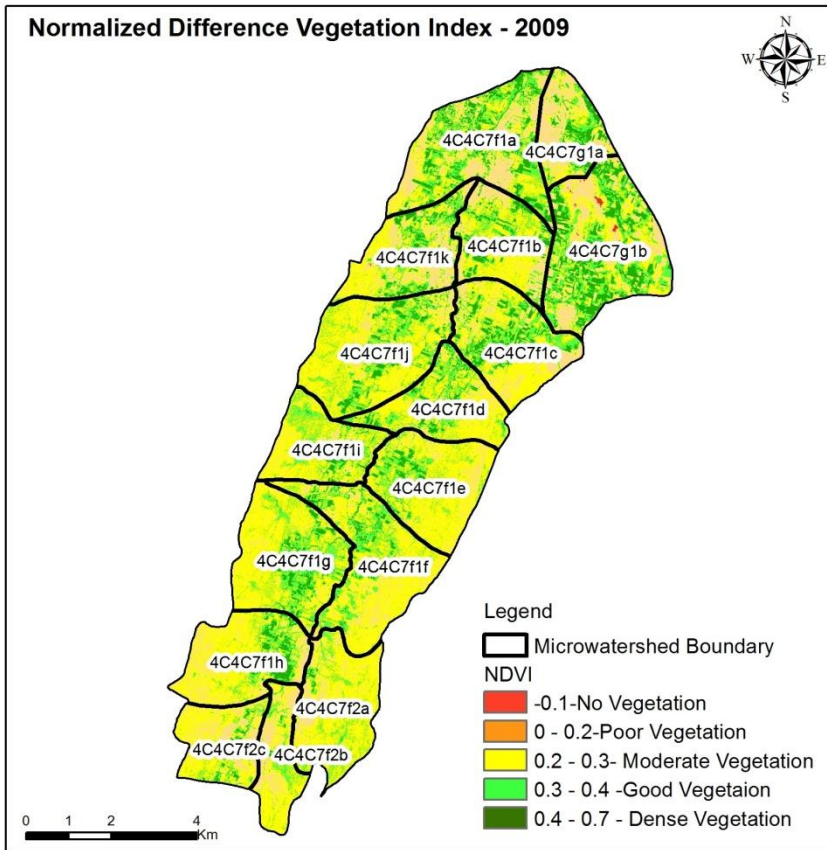

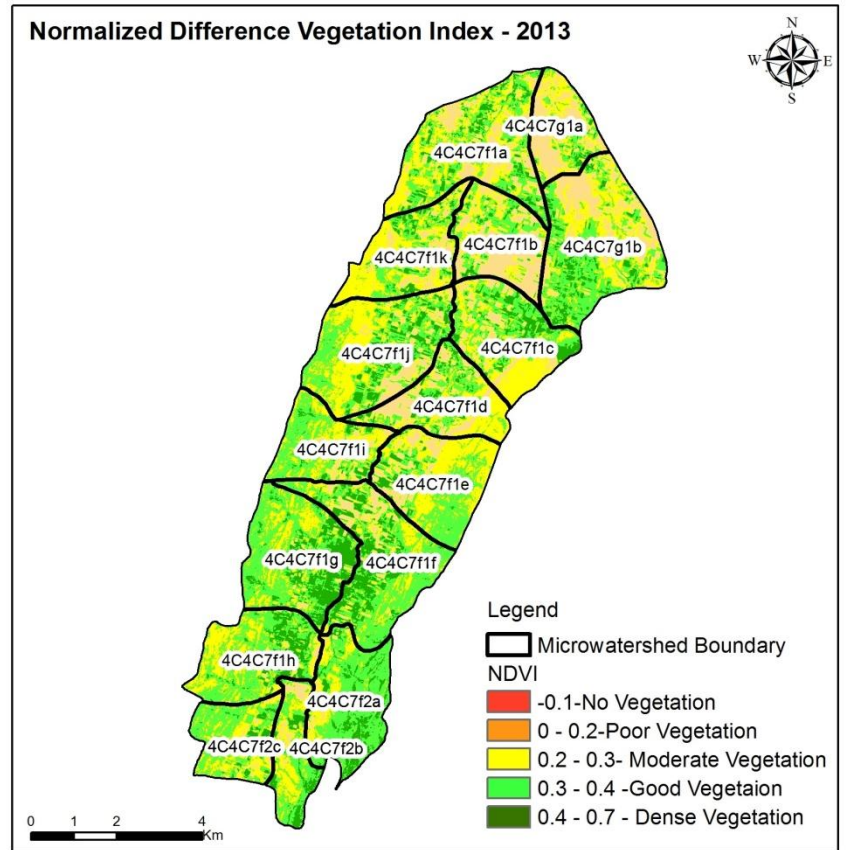| T1: 2013 | T2: 05 June 2014 | Drishti Sl no. 88855   MWS : 4C4C7f1d |

Percolation tank

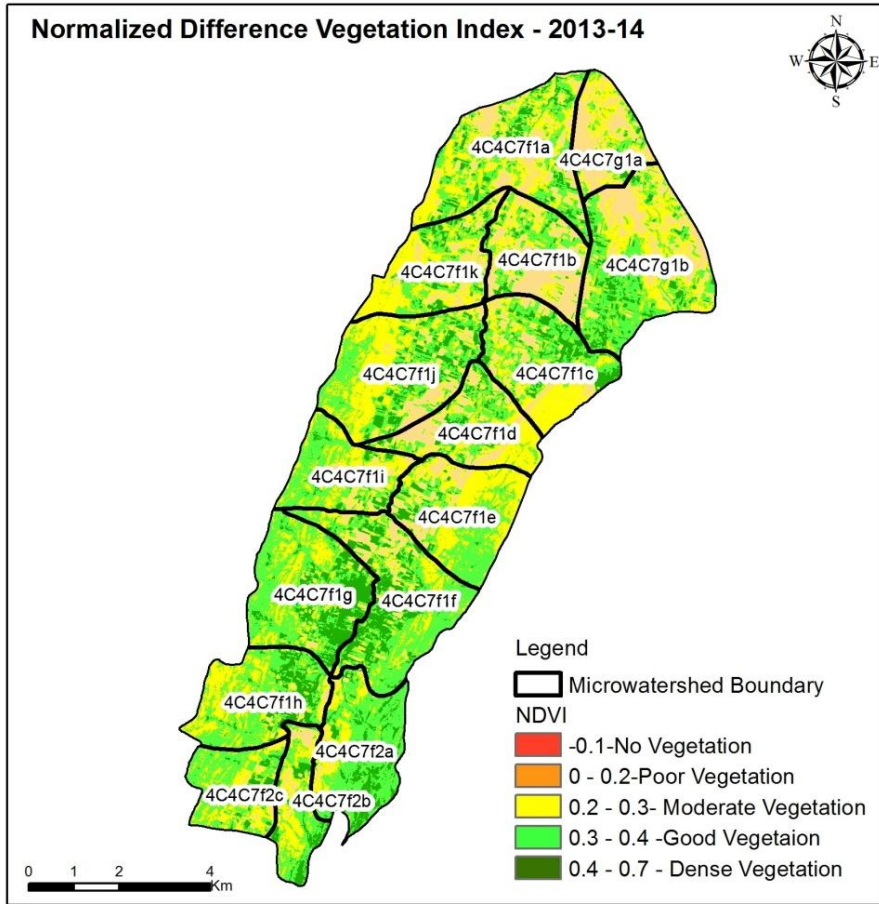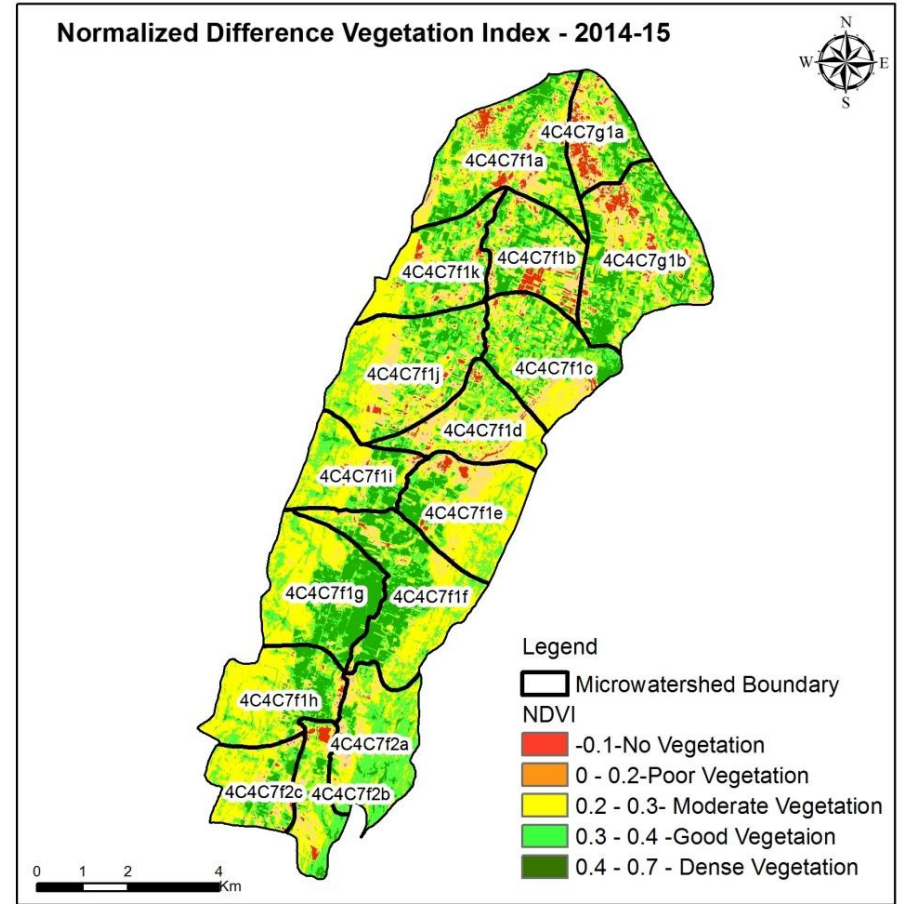# Changes in Vegetation Cover

NDVI (2009-10)

NDVI (2013-14)

Changes in Vegetation Cover
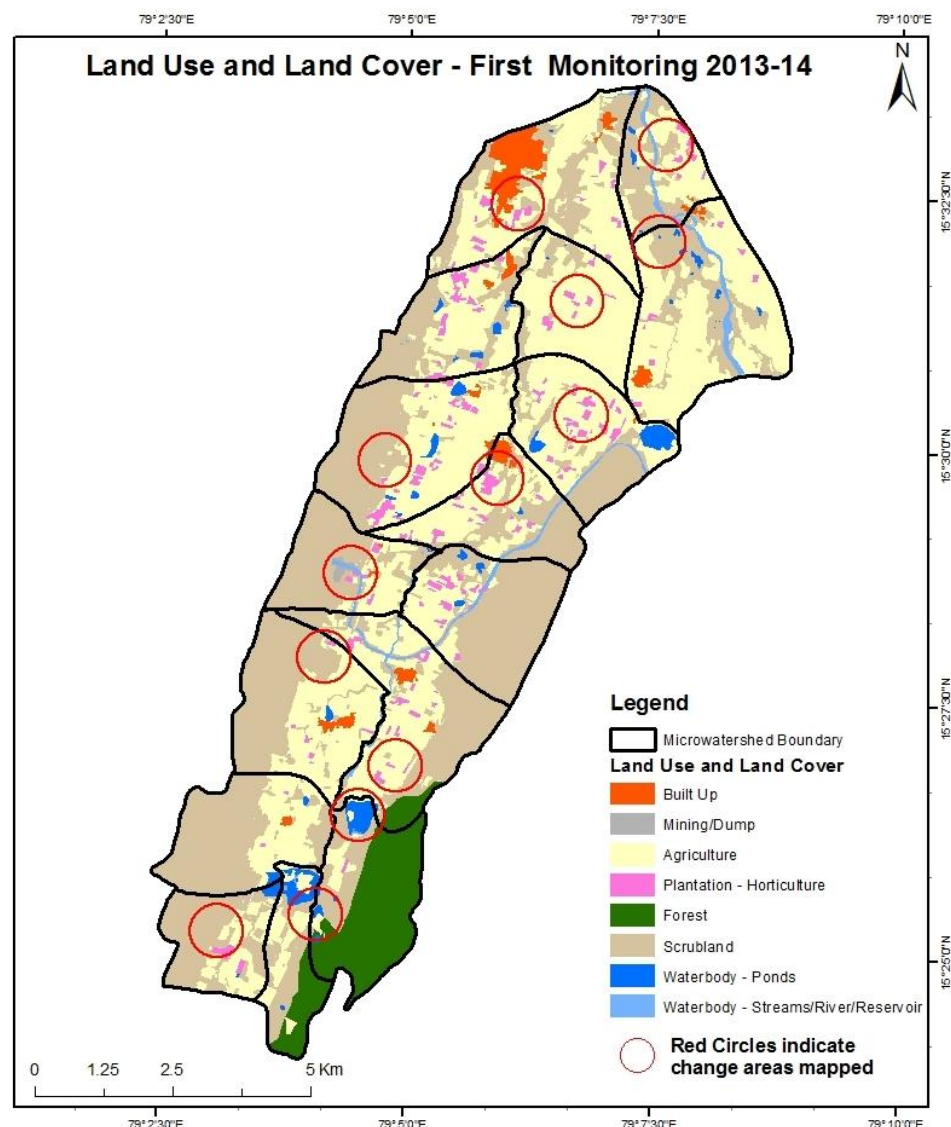

NDVI (2013-14)

NDVI (2014-15)

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 (2009-10) and row represents the post implementation period as 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
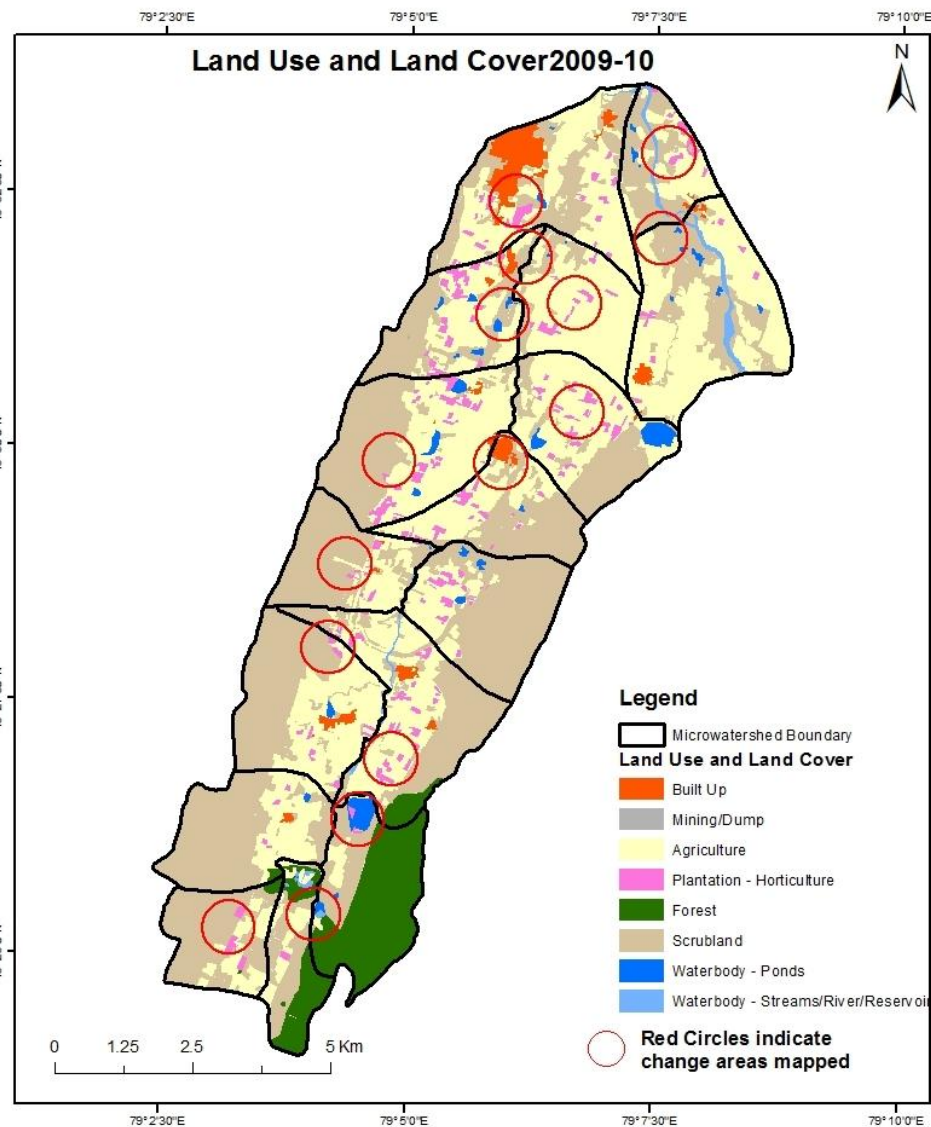
Land Use and Land Cover 2009-10

Land Use and Land Cover - First Monitoring 2013-14

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   1.25   2.5   5 Km

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

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   1.25   2.5   5 Km

Land Use and Land Cover - Second Monitoring 2014-15

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   1.25   2.5   5 Km

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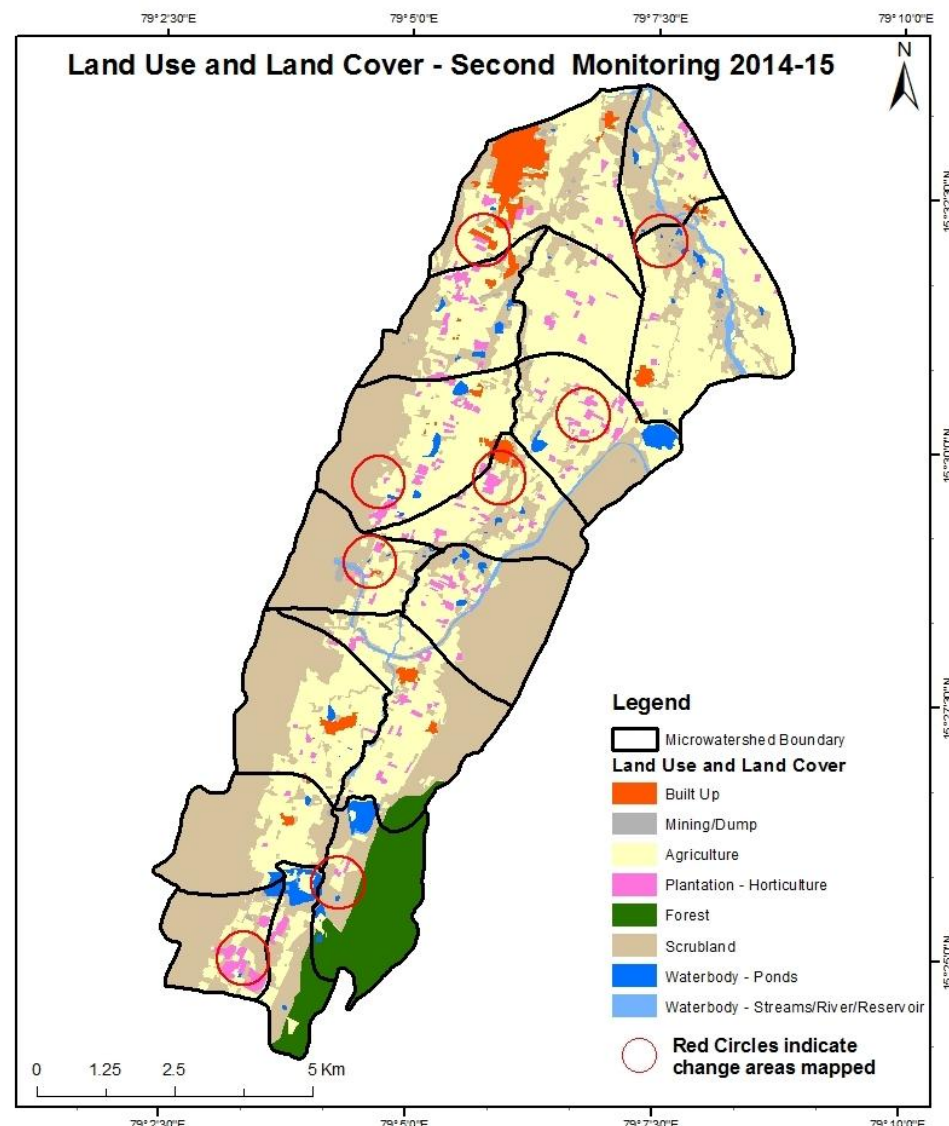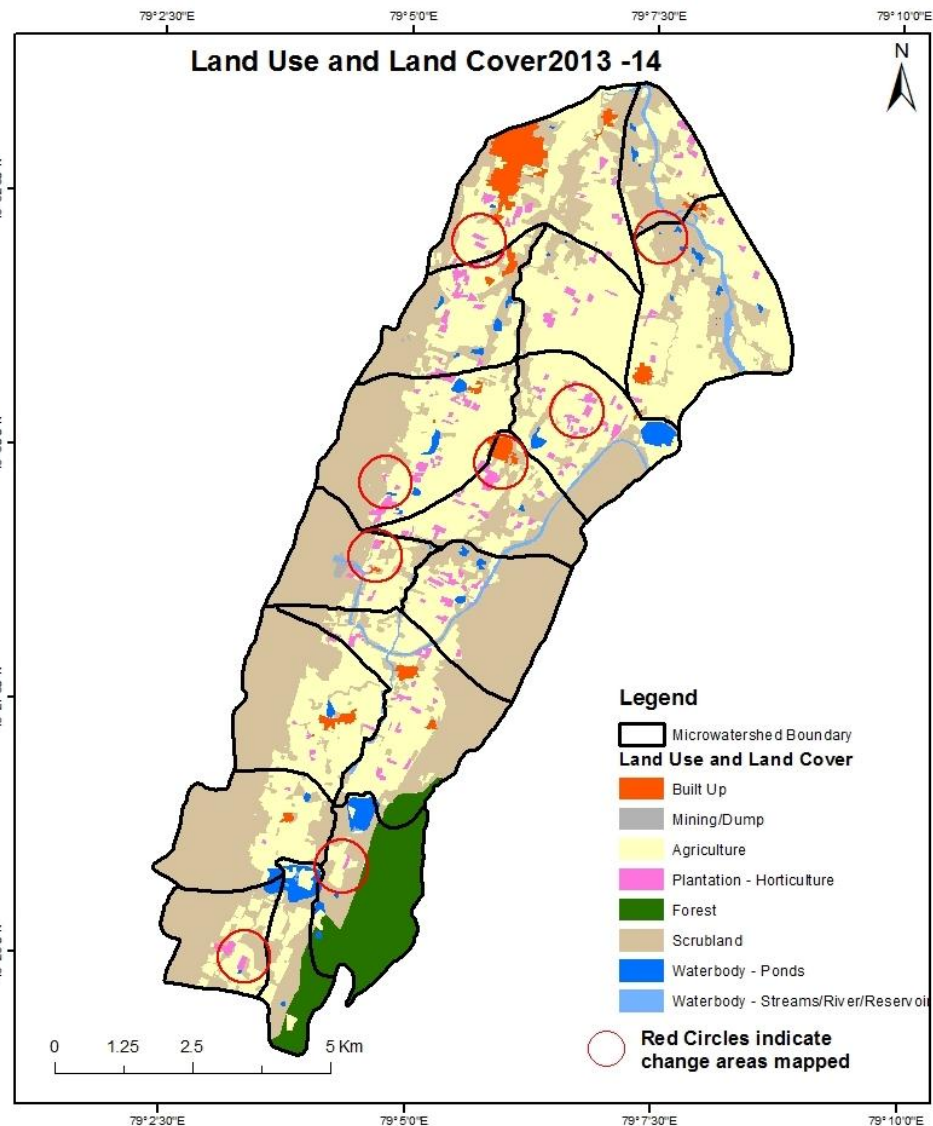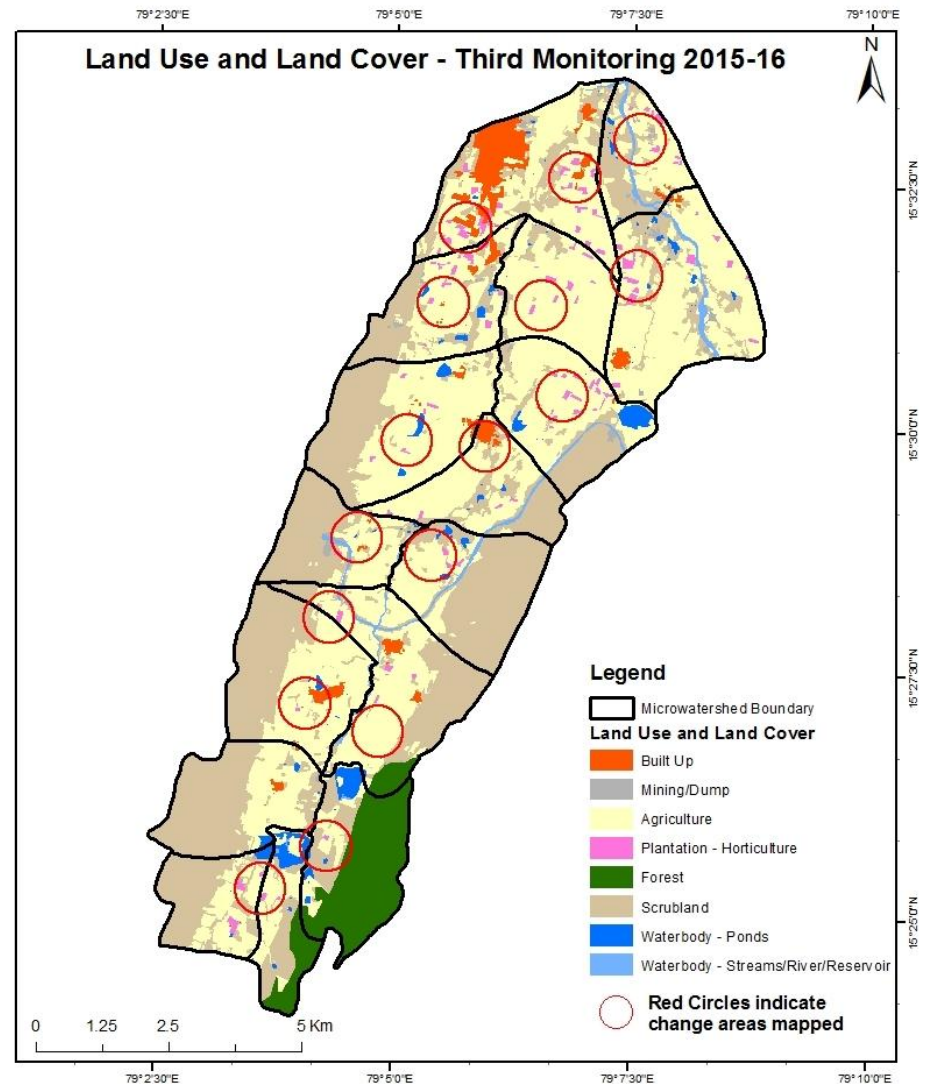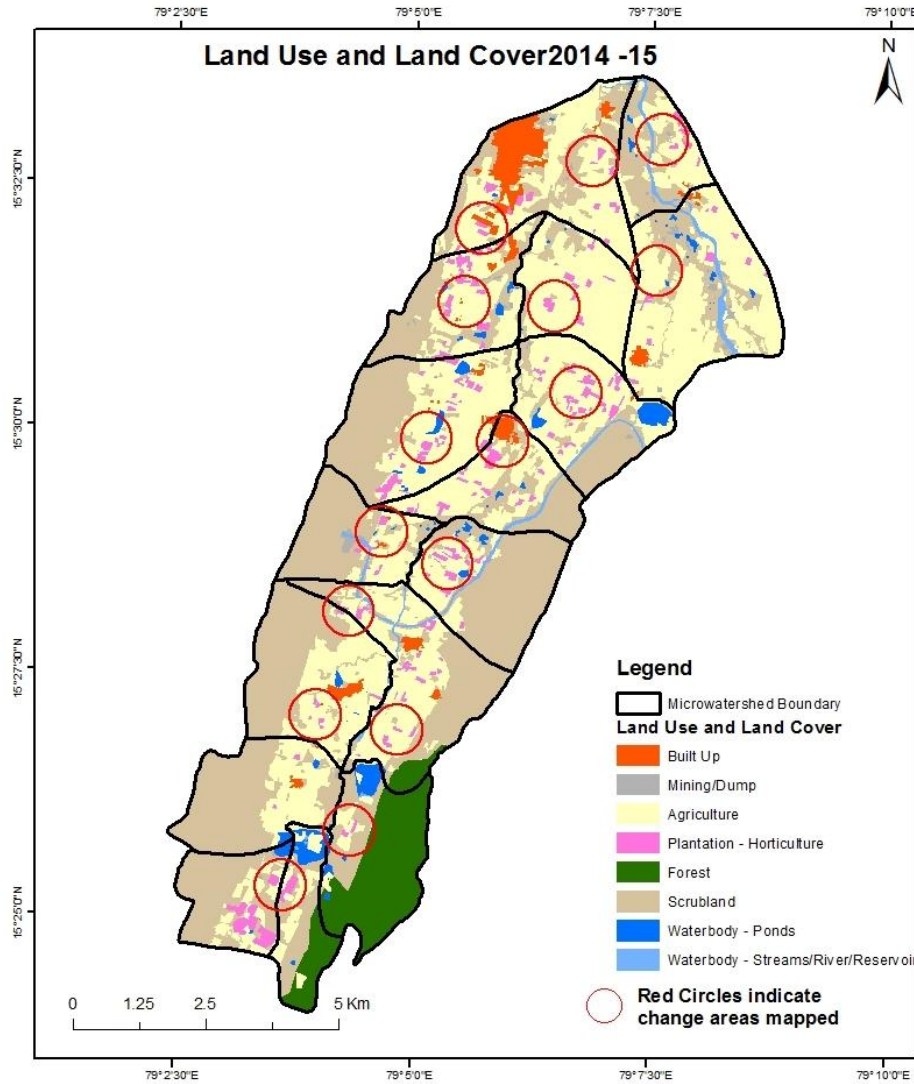## Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
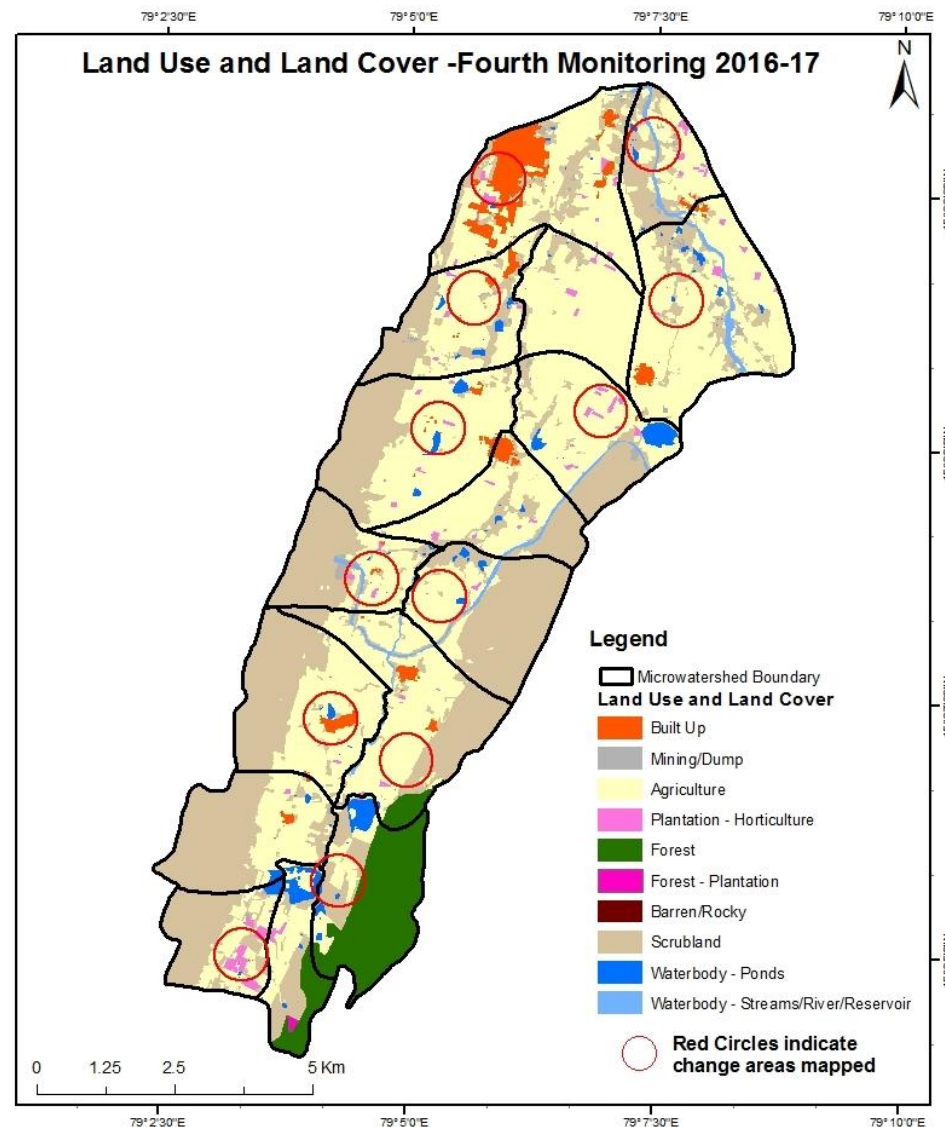## Scale: 1:10000
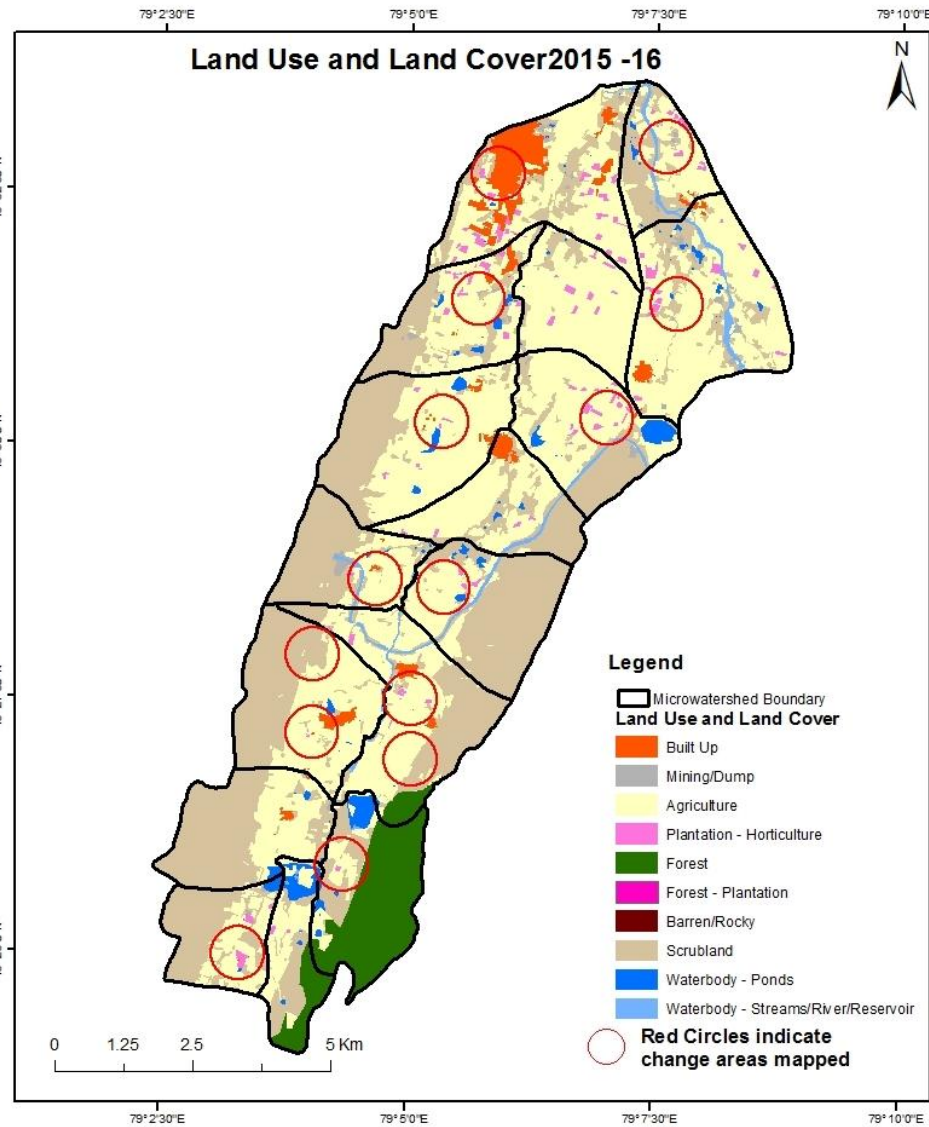
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)
Scale: 1:10000
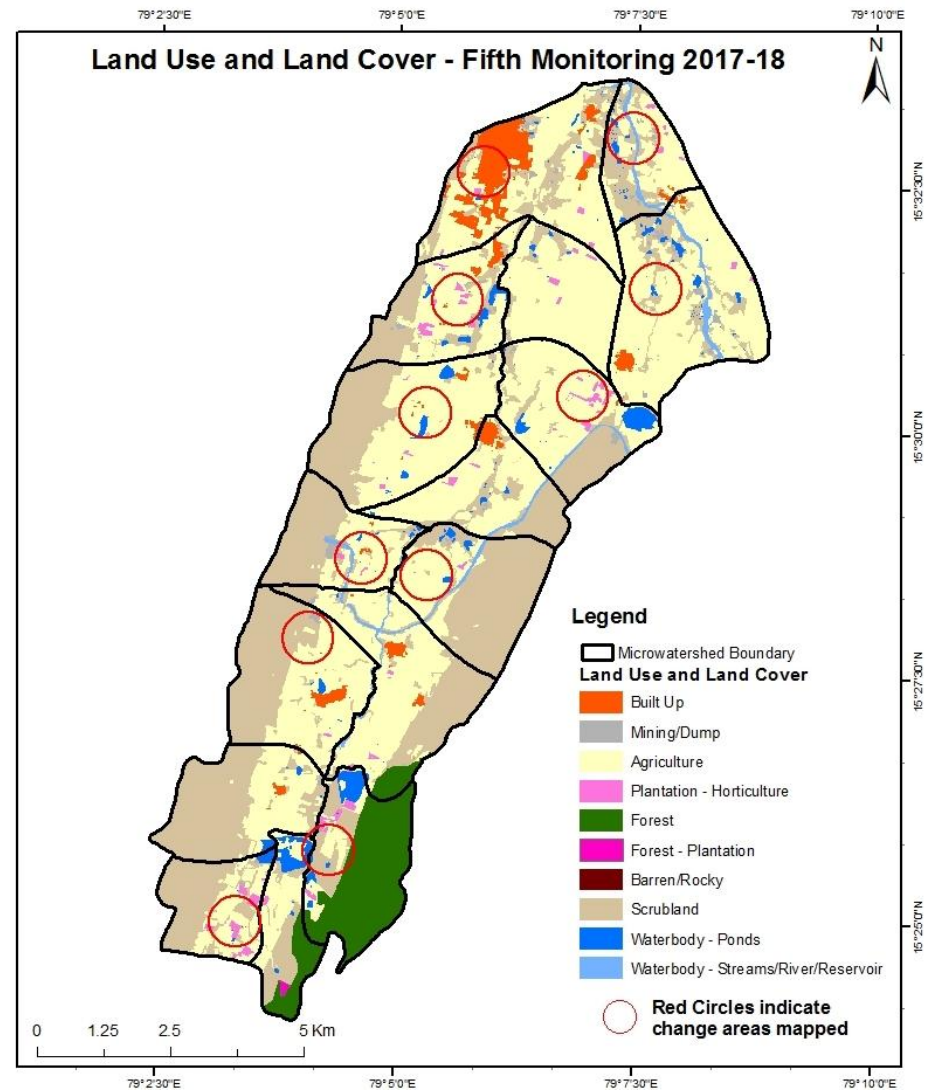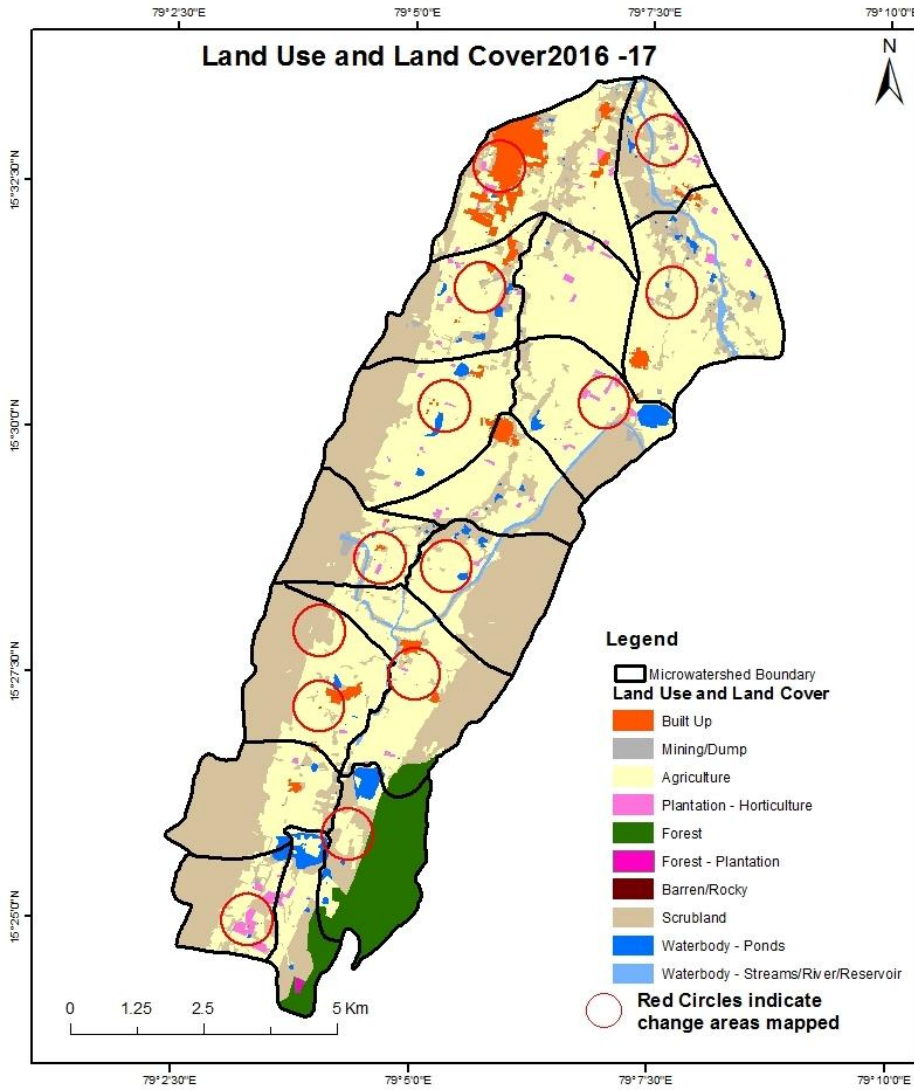
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0

T0: 2009-10

T1

T1: 03 April 2014

Scrub to Agriculture

T0

T0: 2009-10

T1

T1: 03 April 2014

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

Scrub to Agriculture

T0

T1

T0: 2009-10

T1: 03 April 2014

Agriculture to Waterbody

T0

T1

T0: 2009-10

T1: 03 April 2014

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

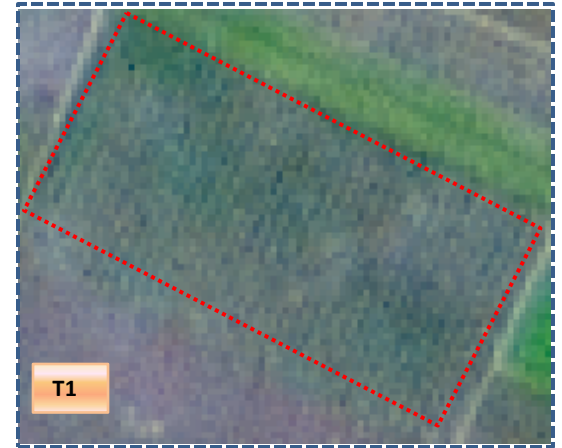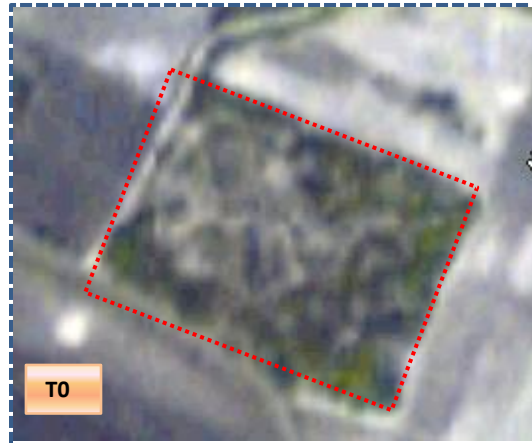| Land cover / T0	Monitoring period (T1) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	178.49										**178.49**
Mining/dump		0.28									**0.28**
Agriculture	3.10		3407.38	38.47				14.49	12.67	2.38	**3478.49**
Plantation Horticulture	0.02		99.95	182.78				6.34	0.48		**289.56**
Forest			4.04		491.54					40.84	**536.42**
Forest Plantation											
Barren Rocky											
Scrub	1.22	9.66	200.65	5.21				3562.91	33.96	0.98	**3814.59**
Waterbody-Streams/River			9.15					0.01	67.55		**76.71**
Waterbody – Ponds			2.83	1.91				0.00		104.02	**108.76**
Grand Total	**182.83**	**9.94**	**3723.99**	**228.37**	**491.54**			**3583.75**	**114.66**	**148.22**	**8483.30**

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 T1 71 ha of agriculture are decreased and it is converted into built-up, plantation, scrub and water body in T2.
- In T2 316 ha of agriculture are increased from scrubland, plantation, forest 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-2013-14 to 2014-15

Land cover	Monitoring period (T2)										
T1	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	182.83										**182.83**
Mining/dump		9.94									**9.94**
Agriculture	28.76	1.64	3628.62	53.77				9.79		1.41	**3723.99**
Plantation Horticulture			0.75	227.63							**228.37**
Forest					491.54						**491.54**
Forest Plantation											
Barren Rocky											
Scrub	1.22	25.29	113.39					3439.12		4.72	**3583.75**
Waterbody-Streams/River									114.66		**114.66**
Waterbody – Ponds			0.20							148.02	**148.22**
Grand Total	**212.81**	**36.87**	**3742.97**	**281.39**	**491.54**			**3448.91**	**114.66**	**154.15**	**8483.30**

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

• In T2 114 ha of agriculture are increased from scrubland, plantation 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-2014-15 to 2015-16

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	212.81										**212.81**
Mining/dump		36.87									**36.87**
Agriculture	16.13		3675.55	50.39						0.90	**3742.97**
Plantation Horticulture	0.13		208.54	72.73							**281.39**
Forest			12.54		466.19			12.81			**491.54**
Forest Plantation											
Barren Rocky											
Scrub	3.73	8.55	350.65					3083.57		2.41	**3448.91**
Waterbody-Streams/River			2.80						111.86		**114.66**
Waterbody – Ponds			2.75							151.40	**154.15**
Grand Total	**232.79**	**45.42**	**4252.83**	**123.12**	**466.19**			**3096.38**	**111.86**	**154.72**	**8483.30**

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

• In T2 577 ha of agriculture are increased from scrubland, plantation, forest 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	Monitoring period (T4)										
T3	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	232.79										**232.79**
Mining/dump		45.42									**45.42**
Agriculture	7.80		4187.05	45.15		4.04		8.51		0.27	**4252.83**
Plantation Horticulture	0.30		71.50	51.31							**123.12**
Forest					466.19						**466.19**
Forest Plantation											
Barren Rocky											
Scrub	1.35		101.27	2.38				2991.18		0.21	**3096.38**
Waterbody-Streams/River			2.73						109.13		**111.86**
Waterbody – Ponds										154.72	**154.72**
Grand Total	**242.24**	**45.42**	**4362.55**	**98.83**	**466.19**	**4.04**		**2999.69**	**109.13**	**155.20**	**8483.30**

- 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 65 ha of agriculture are decreased and it is converted into built-up, plantation, forest, scrub and water body in T2.
- In T2 175 ha of agriculture are increased from scrubland, plantation 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	242.24										**242.24**
Mining/dump		45.42									**45.42**
Agriculture	6.71	2.93	4306.36	40.99						5.57	**4362.55**
Plantation Horticulture			48.48	50.35							**98.83**
Forest					466.19						**466.19**
Forest Plantation						4.04					**4.04**
Barren Rocky											
Scrub	2.69	5.73	67.46					2901.24		22.57	**2999.69**
Waterbody-Streams/River									109.13		**109.13**
Waterbody – Ponds										155.20	**155.20**
Grand Total	**251.64**	**54.08**	**4422.31**	**91.34**	**466.19**	**4.04**		**2901.24**	**109.13**	**183.34**	**8483.30**

- 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 56 ha of agriculture are decreased and it is converted into plantation, built-up, mining and water body in T2.
- In T2 115 ha of agriculture are increased from built-up, scrubland and plantation 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 107 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 245, 18, 509, 109 & 59 Hectares From T0-T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 943 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.

5. There is a decrease of 913 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.

6. Farm ponds (40) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (47) verified from the portal.