MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

SRIKAKULAM -01/2009-10
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
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Remote Sensing Application Area,
National Remote Sensing Centre, ISRO

DEPARTMENT OF LAND RESOURCES
Ministry of Rural Development
Government of India

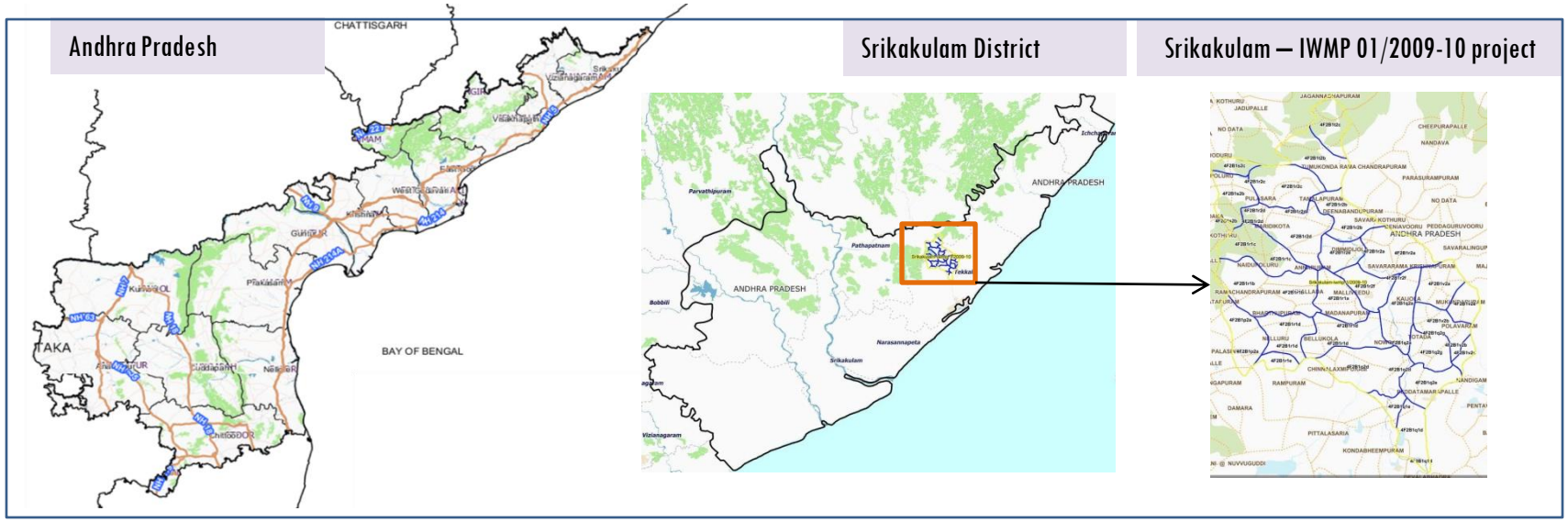
CONTENTS

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-01/2009-10, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 7,528 ha. It comprises of 26 micro watersheds.
- In the project area 56 Drishti photos were uploaded showing 4 check dams/Rock fill dam, 32 Farm ponds and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 32 new farm ponds or dug out pits and 4 check dams with 3.55 ha increase in the area.
- Major percentage i.e. 52.50 % is covered by the agriculture, 23.49 % is covered by scrub land, 6.17 % is covered by barren rocky area and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-01/2009-10
DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Nandigam Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 7528 ha. It comprises of 26 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



- The climate of the region is generally tropical, the mean maximum temperature is 30-40°C April-May and the mean minimum temperature is 17.4°C December-January during the summer season till the onset of the South-West monsoon the heat is oppressive and the day temperature is May sometimes go about 43°C.
- The rainfall in the region is considerably more in the hilly areas as compared to the plains, the annual normal rainfall is 1131 mm (i.e., 61% from South West monsoon and 2.2% from Northeast monsoon) is shared by summer showers and winter rains.

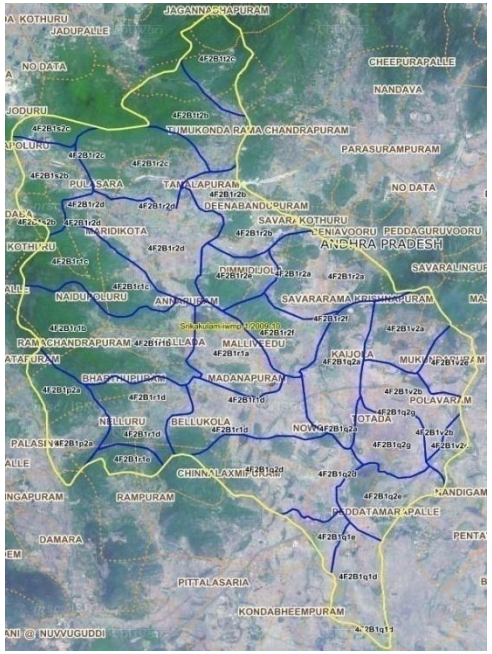
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			13-Apr-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			13-Apr-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	56
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	Agronomic measures	0	0
2	Bunding	14	10
3	Black planting	0	0
4	Bund Planting/Horticulture	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/Dug out pit	35	31
11	Civil work-Check dams /Rock fill dam	7	4
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	Production System and Micro-Enterprises	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	0	0
18	Others	19	5
	TOTAL	**75**	**49**

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 – 2009-10 to 2017-18

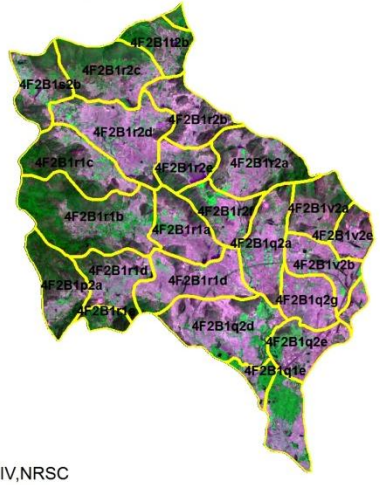
Natural Color Composite- 2009-10

Source:Fusen data,NRSC

Natural Color Composite-09th March 2012

Source:LISS-IV,NRSC

Natural Color Composite-09th January 2015



Source:LISS-IV,NRSC

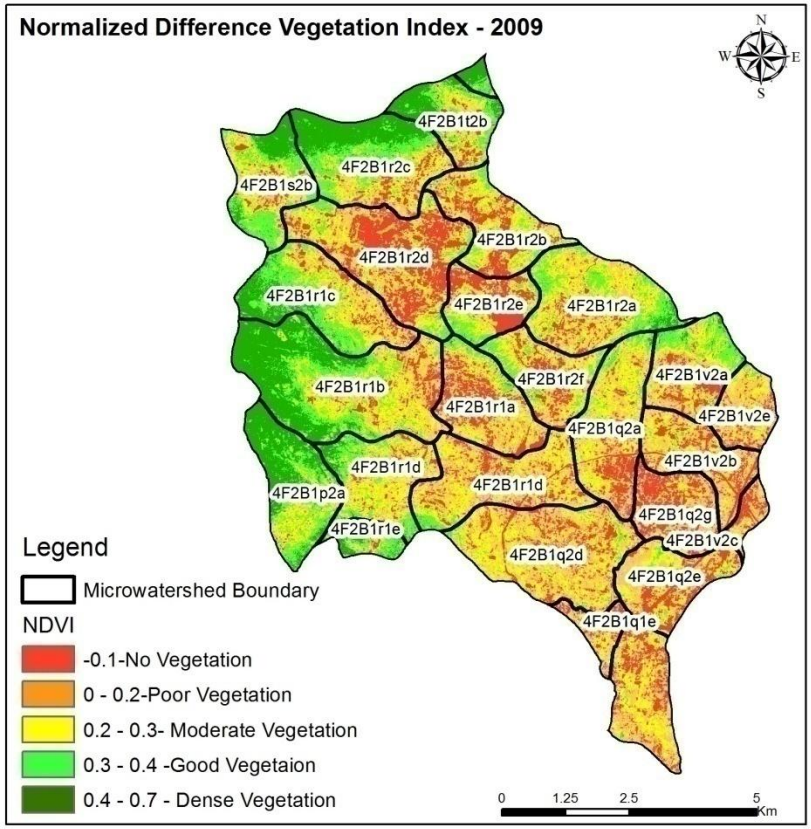
Natural Color Composite- 19th November 2016

Source:LISS-IV,NRSC

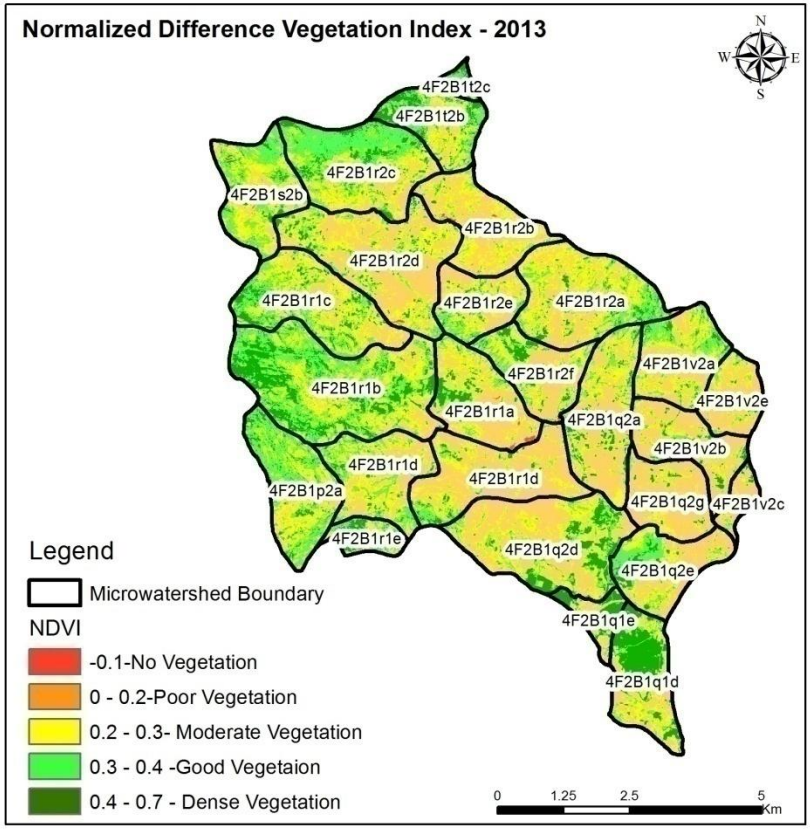
Natural Color Composite- 25th December 2017

Source:LISS-IV,NRSC

Changes in Vegetation Cover

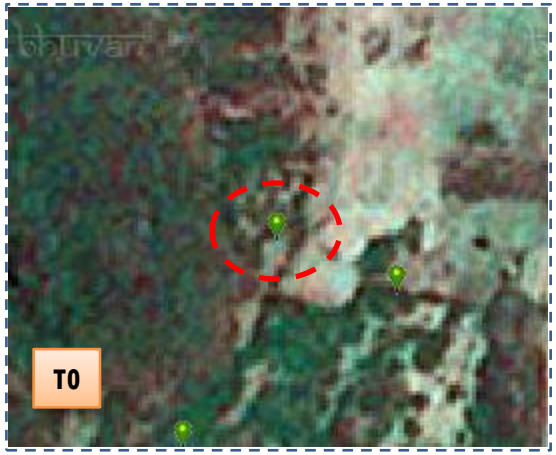


NDVI (2009-10)

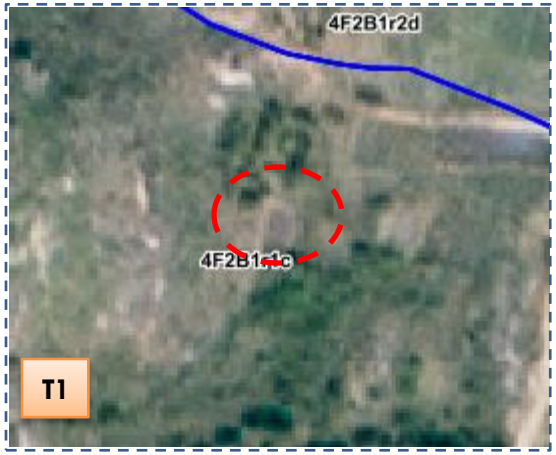


NDVI (12 October 2015)

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-01/2009-10



T0:2009-10



T1: 19 January 2015

Drishti Sl no. 134618 MWS :4F2B1r1c

Farm pond

T0:2009-10

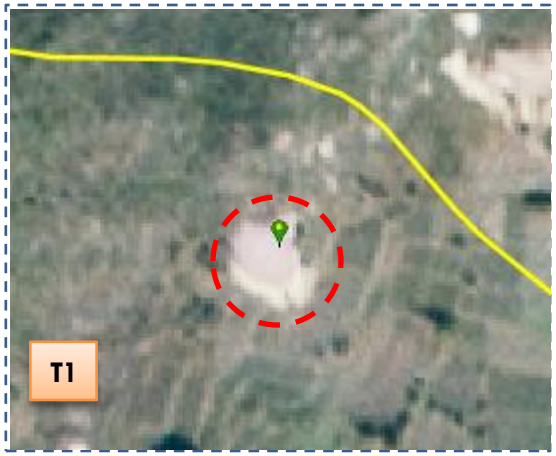
T1: 19 January 2015

Drishti Sl no.145422 MWS : 4F2B1s2c

Farm pond

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-01/2009-10

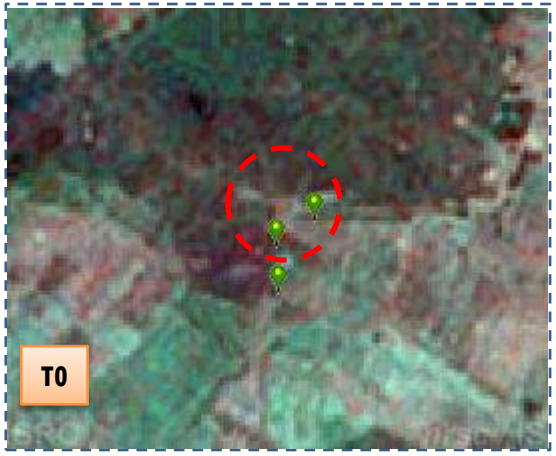
T0: 2009-10



T1: 19 January 2015

Drishti Sl no. 155498 MWS : 4F2B1r1a

Mini Percolation Tank



T0: 2009-10

T1: 19 January 2015

Drishti Sl no. 2536394 MWS : 4F2B1r1a

Water harvesting Structure

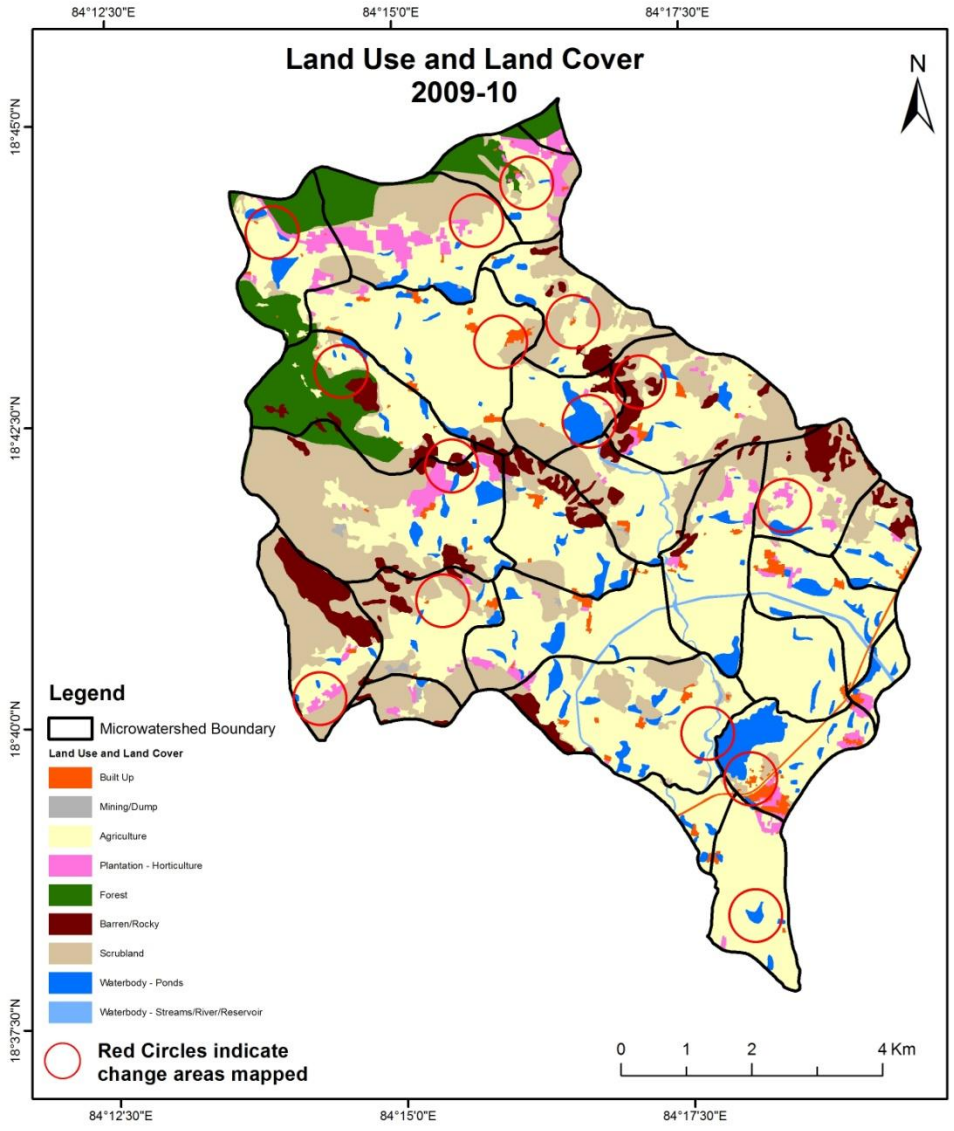
MONITORING IN THE PROJECT AREA

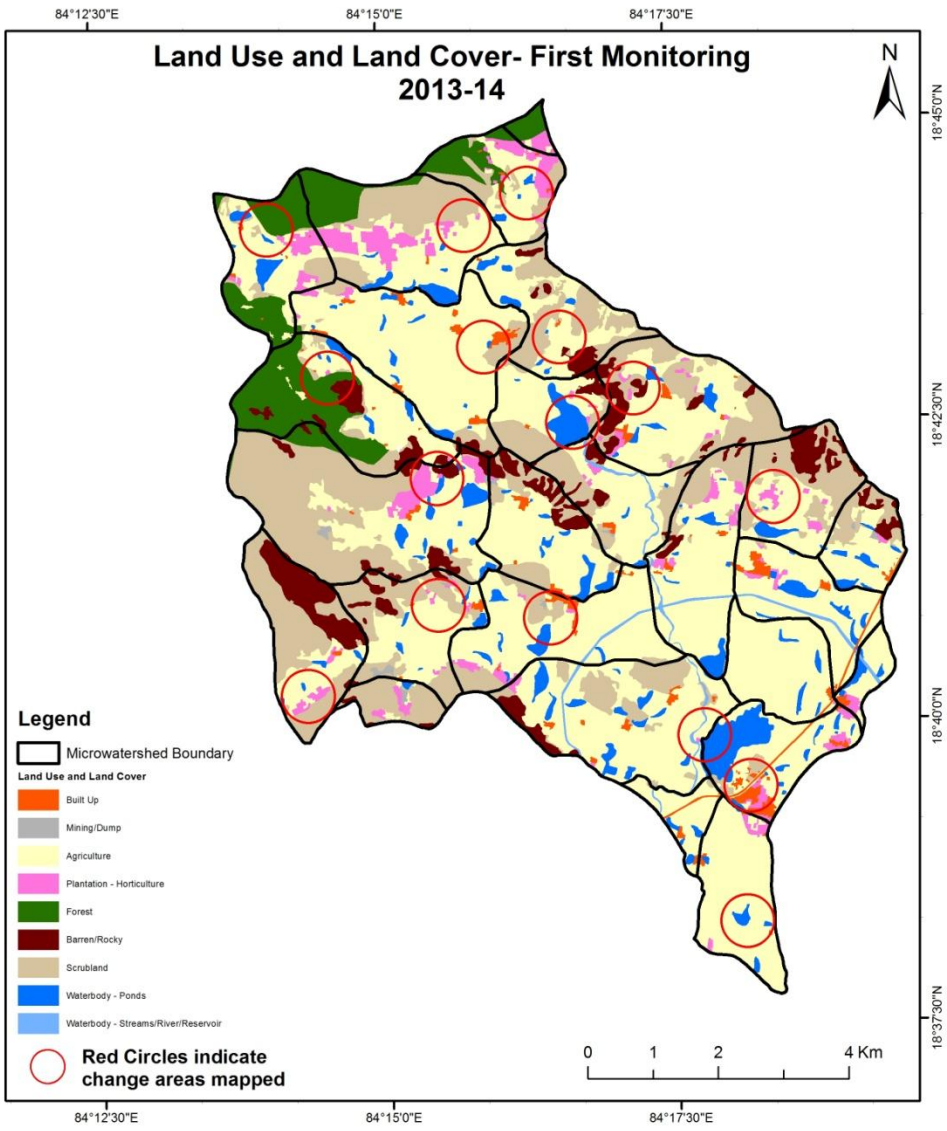
Land use and Land cover Changes in the Project

- 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)

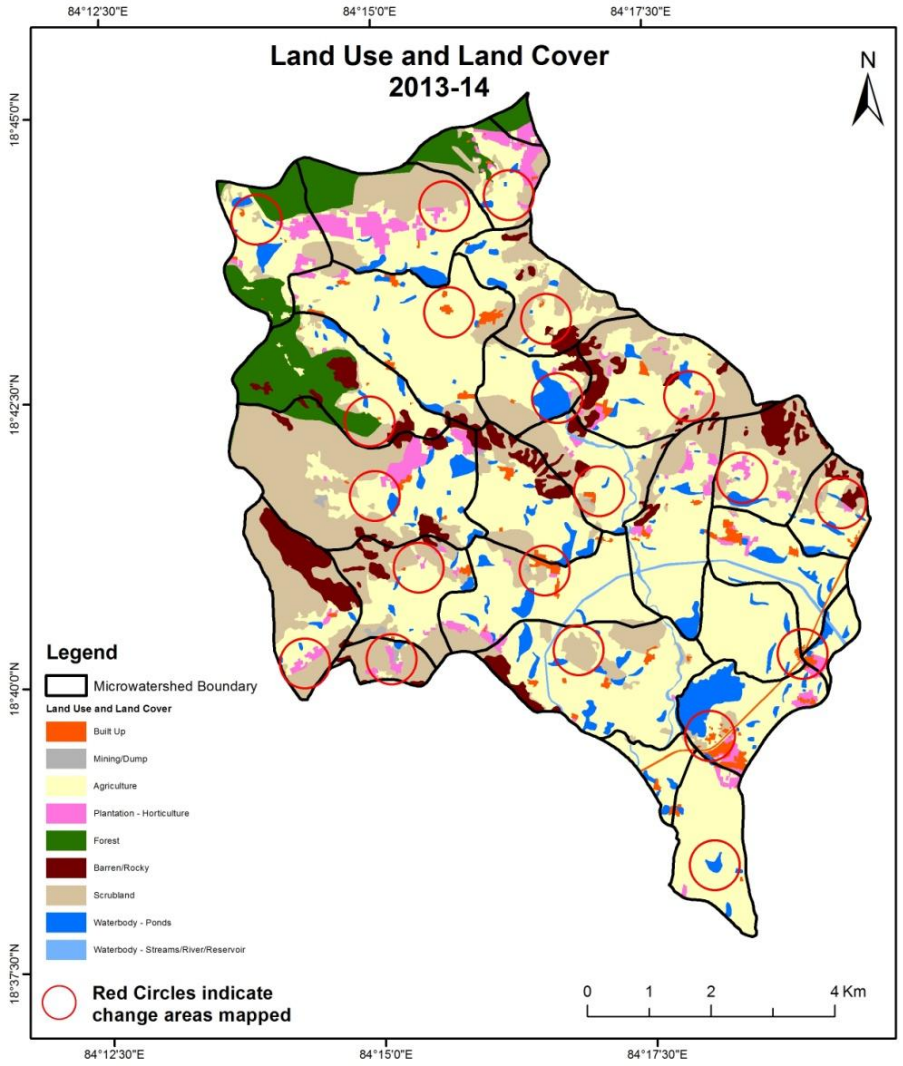
Scale: 1:10000

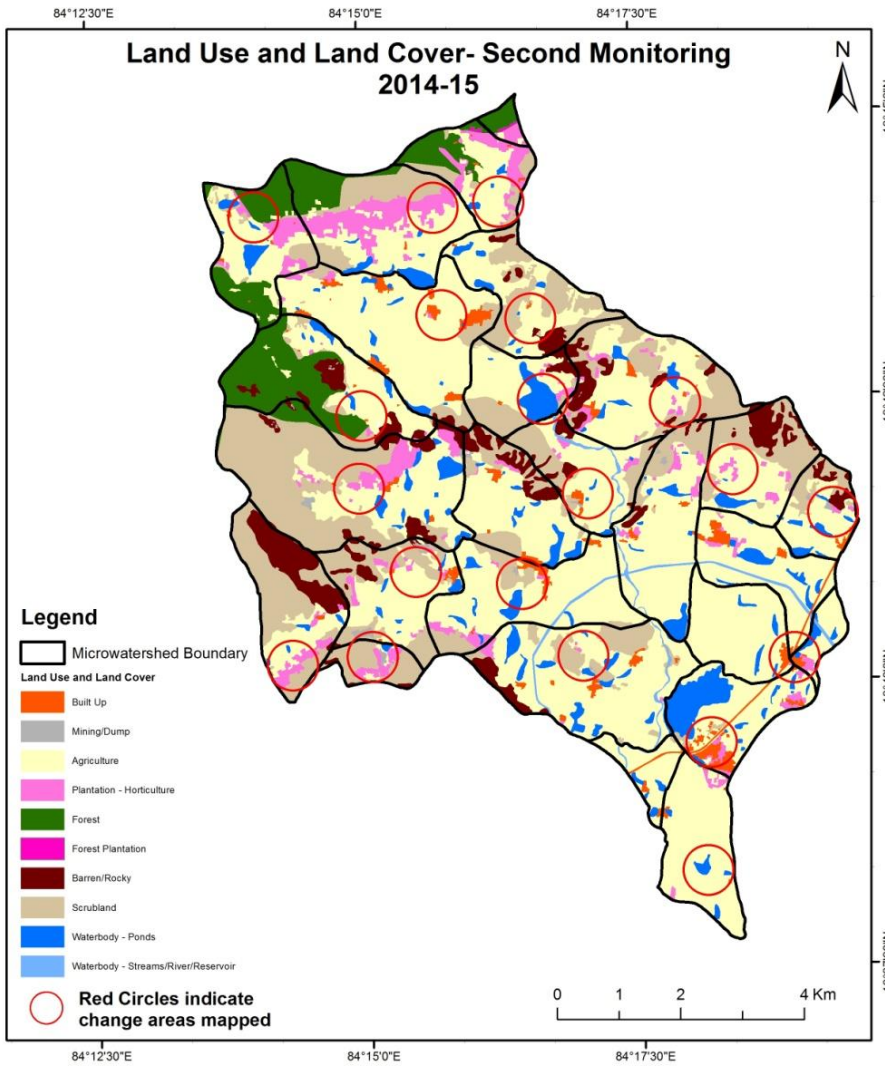




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

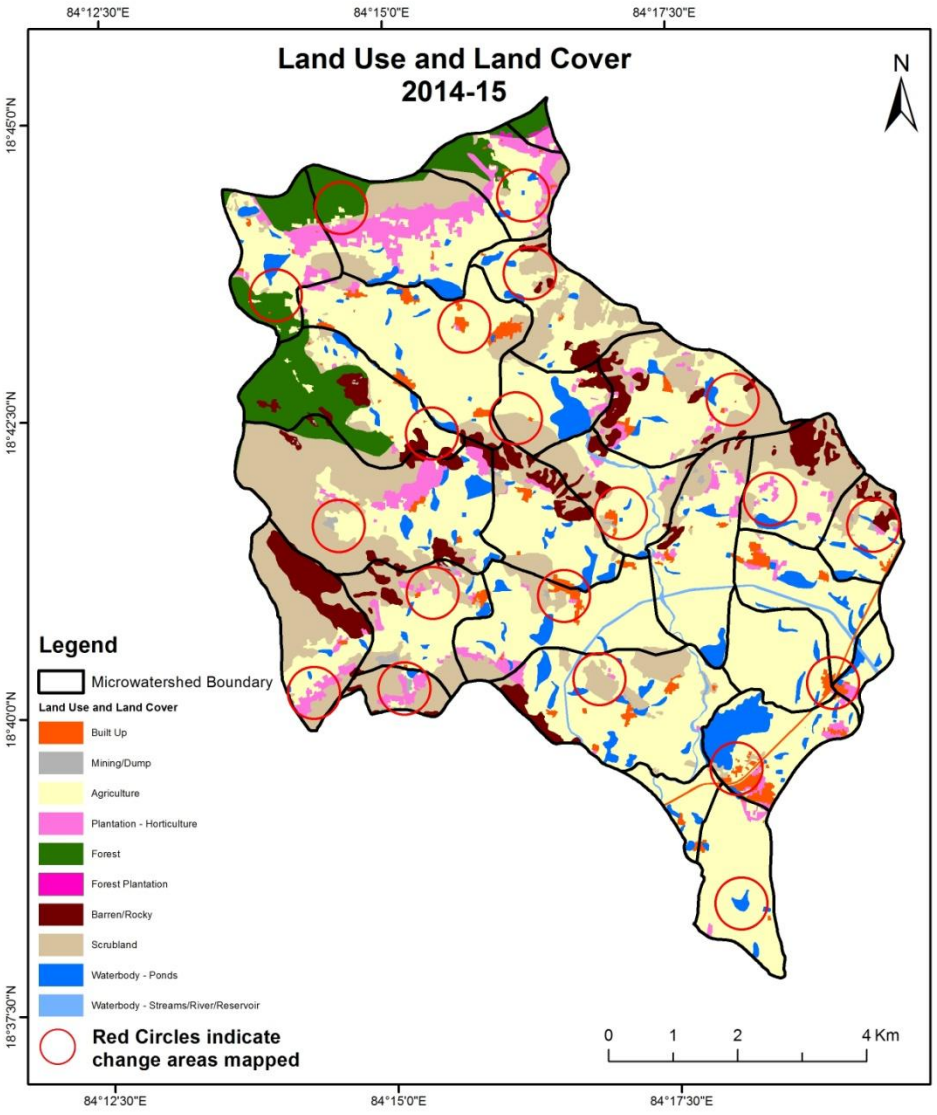
Scale: 1:10000

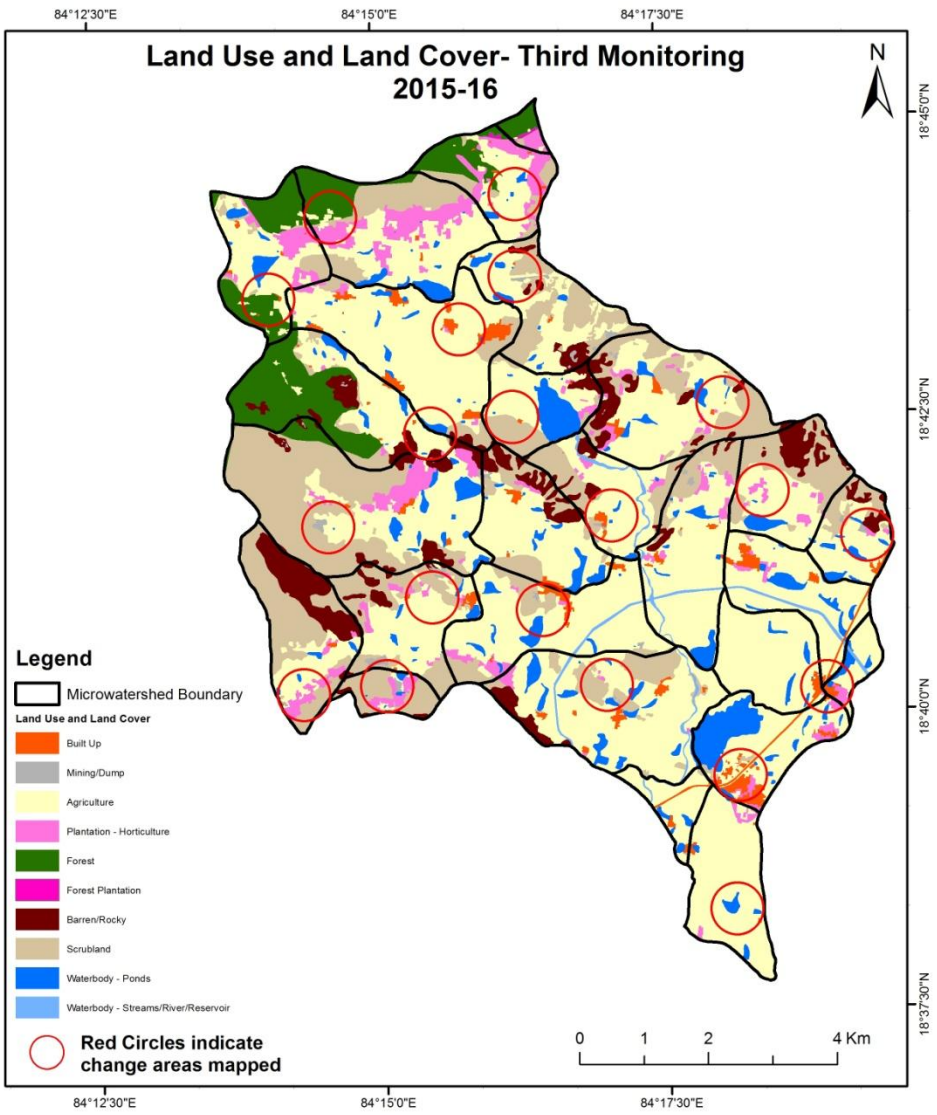




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

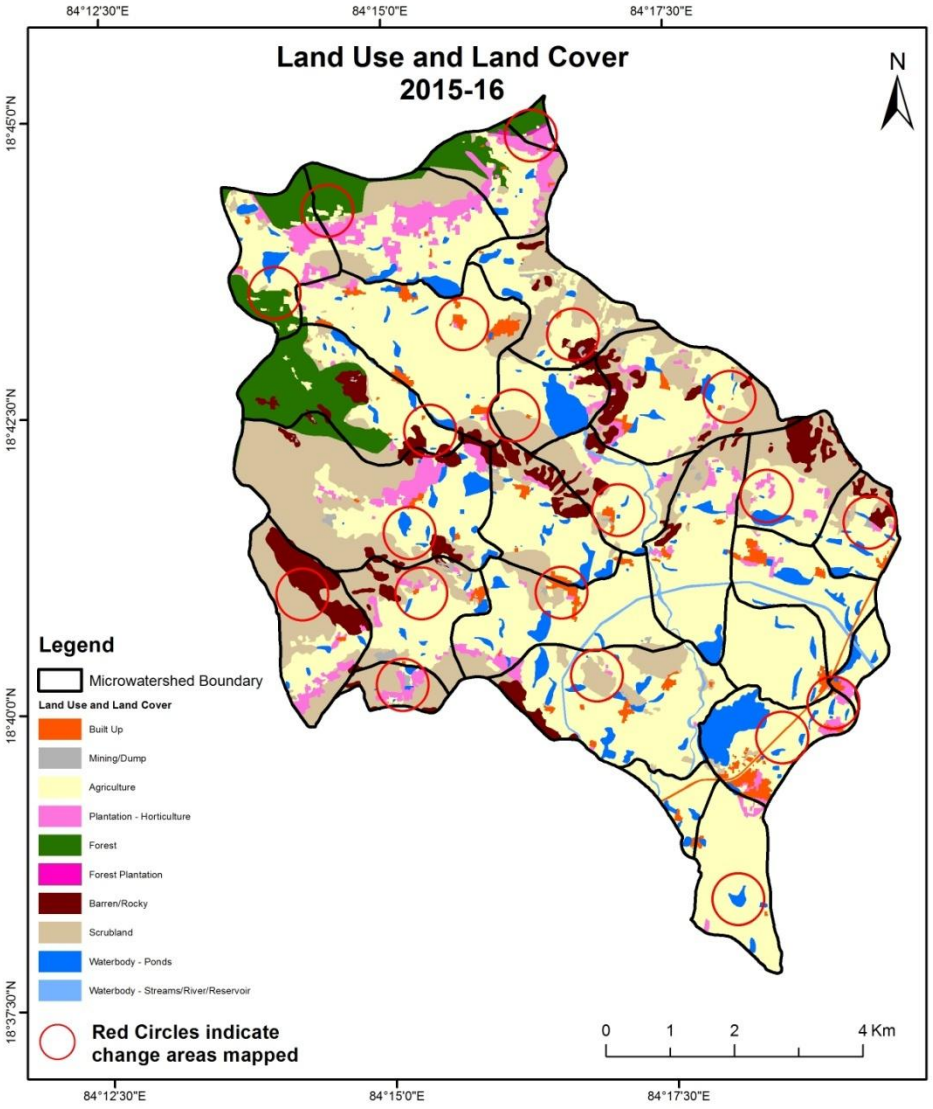
Scale: 1:10000

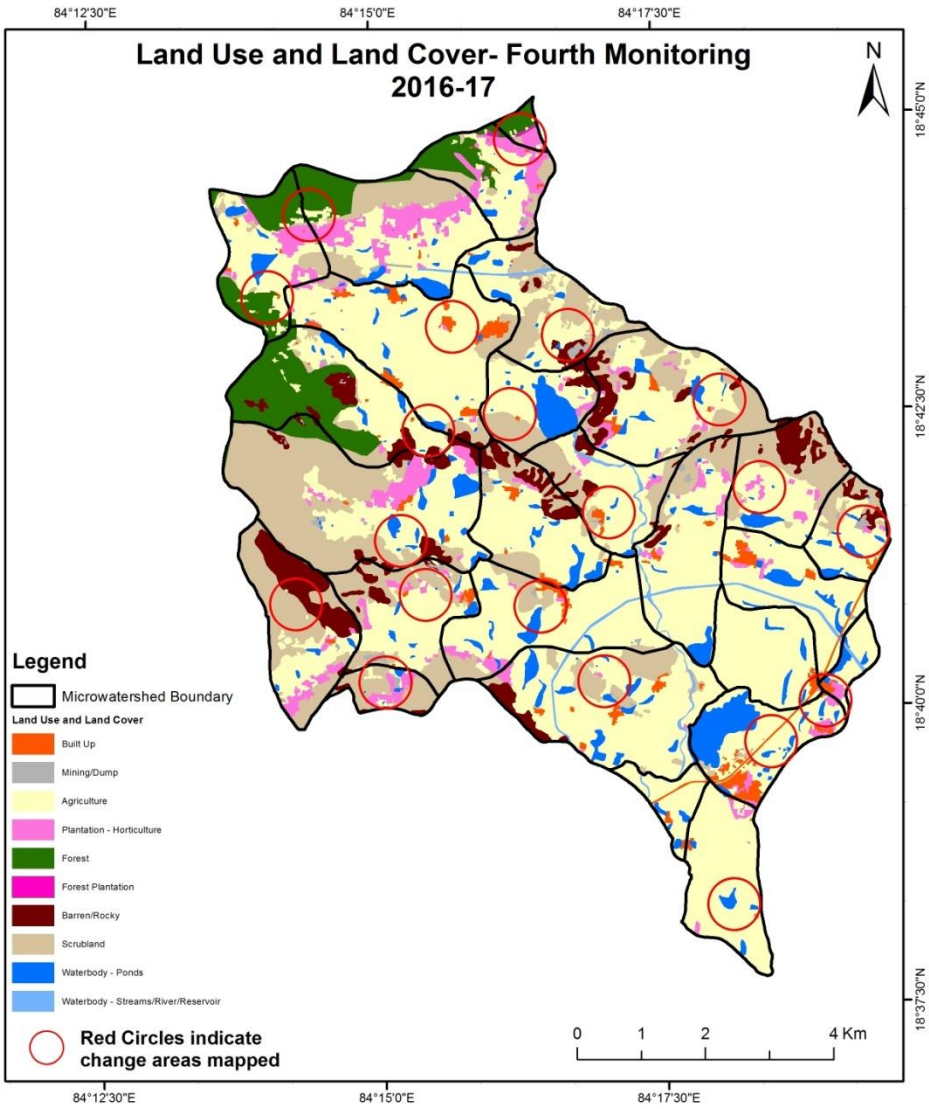




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

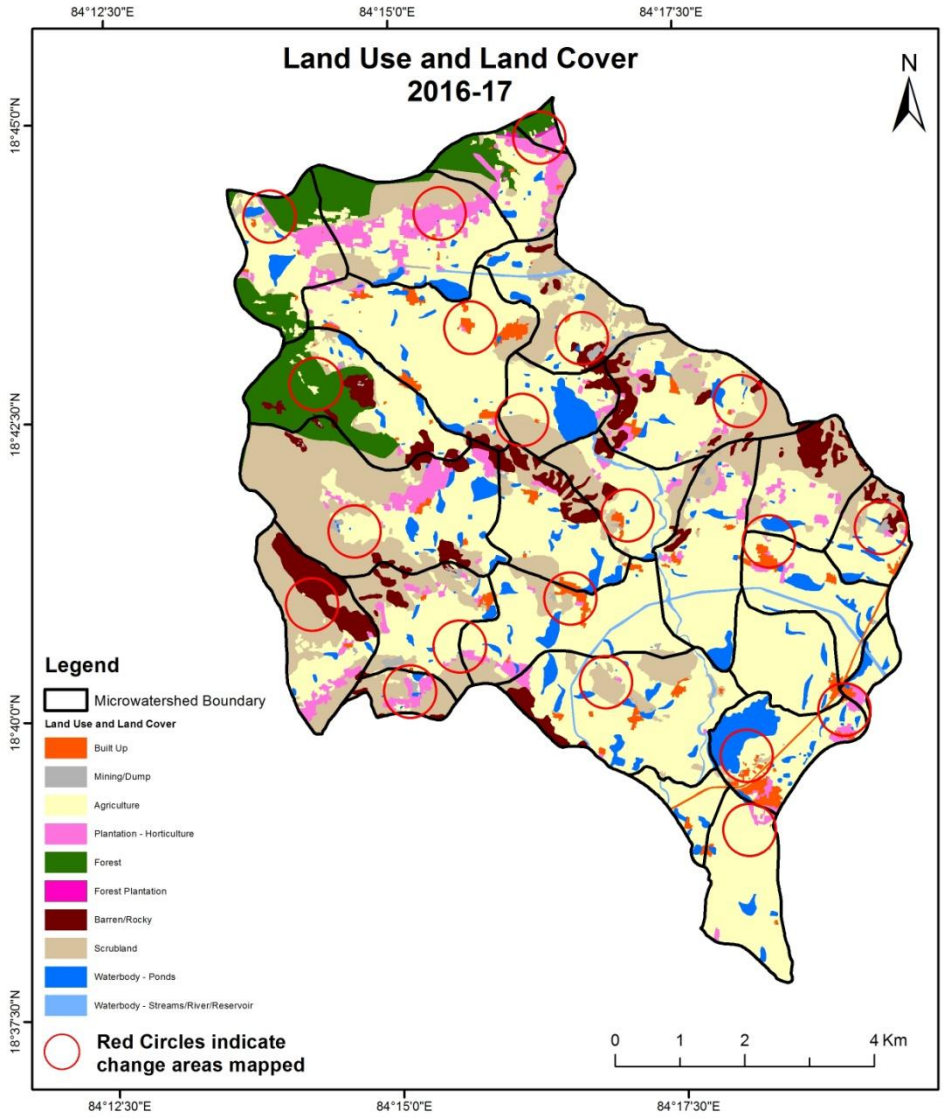
Scale: 1:10000

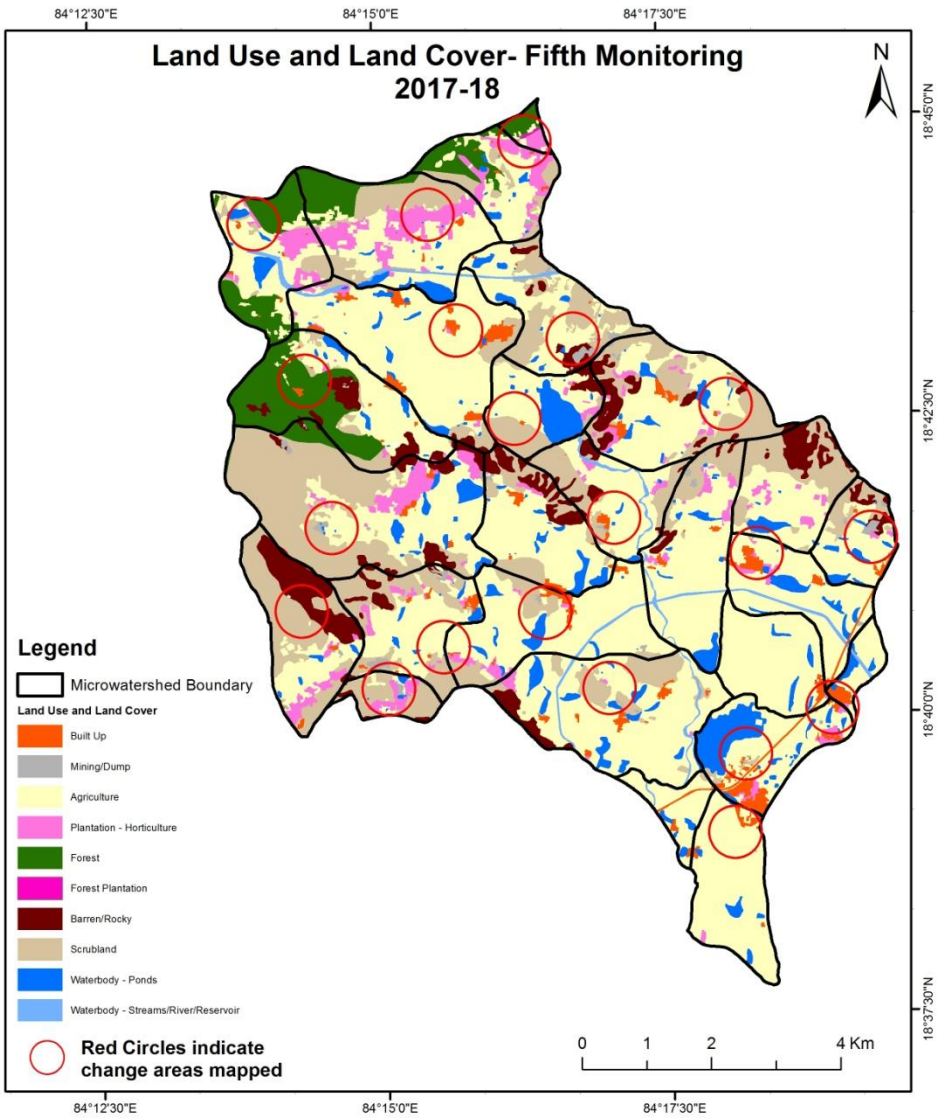




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

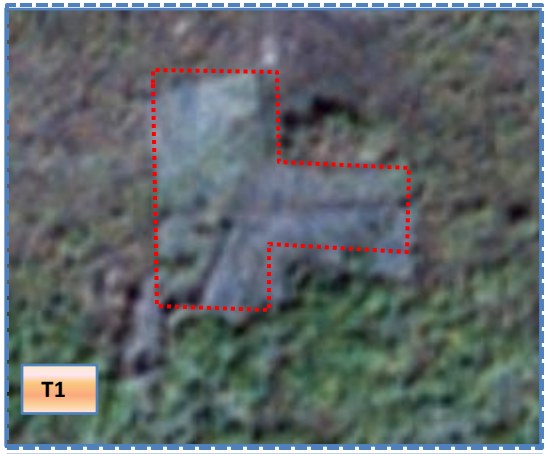




Land Use and Land Cover changes for Pre and Post treatment dates

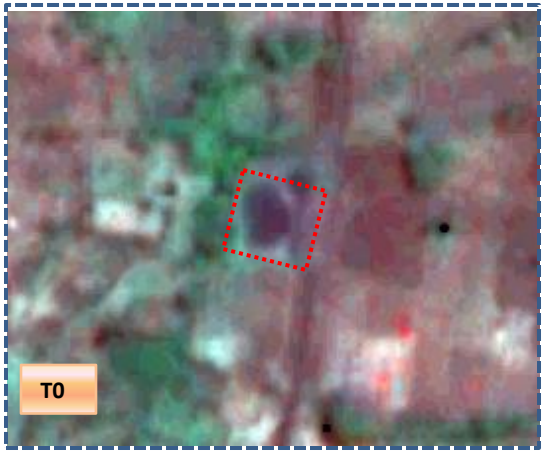
Scrub to Agriculture

T0: 2009-10



T1: 19 January 2015

Agriculture to Water body

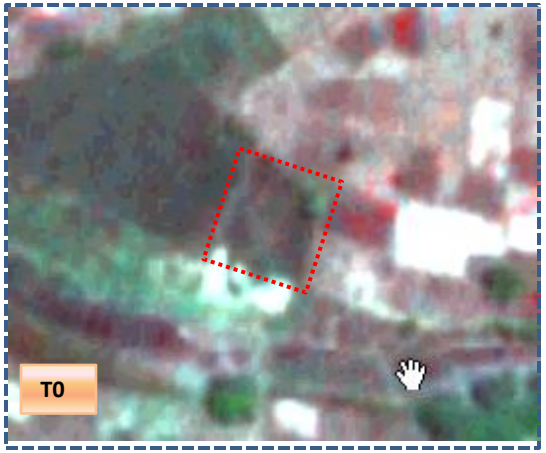


T0: 2009-10

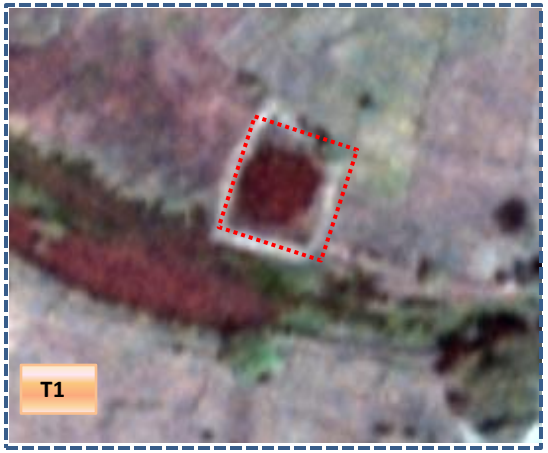
T1: 19 January 2015

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

Agriculture to Water body

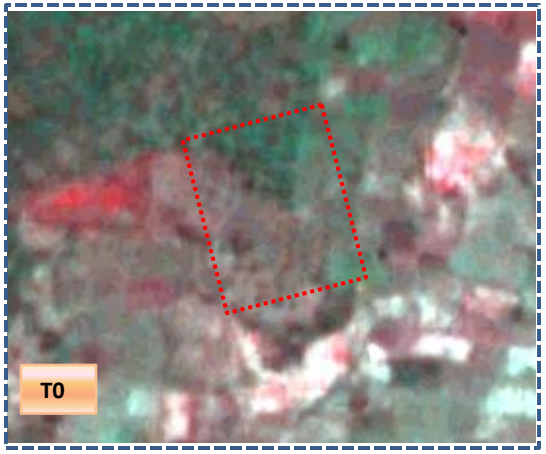


T0: 2009-10



T1: 14 December 2013

Scrub to Plantation



T0: 2009-10

T1: 14 December 2013

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	123.68										123.68
Mining/dump		14.85									14.85
Agriculture	5.56	1.21	3933.67	14.20				11.07		4.18	3969.89
Plantation Horticulture			4.65	254.19							258.85
Forest					454.52						454.52
Forest Plantation											
Barren Rocky							420.73				420.73
Scrub	0.47	0.60	3.46	2.41				1805.58		1.34	1813.86
Waterbody-Streams/River									52.87		52.87
Waterbody – Ponds			2.00	0.11						417.00	419.11
Grand Total	**129.71**	**16.66**	**3943.79**	**270.92**	**454.52**		**420.73**	**1816.65**	**52.87**	**422.52**	**7528.35**

- 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 36.22 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation and water body area in T1.
- In T1 10.12 ha of the agriculture area has increased from plantations, scrubland and water body 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-2013-14 to 2014-15

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	129.71										129.71
Mining/dump		16.66									16.66
Agriculture	27.28		3871.33	43.93						1.24	3943.79
Plantation Horticulture	1.39		20.86	248.67							270.92
Forest			5.03		446.63	2.86					454.52
Forest Plantation											
Barren Rocky		2.50					418.23				420.73
Scrub	4.65	3.04	73.17	102.53				1633.18		0.08	1816.65
Waterbody-Streams/River									52.87		52.87
Waterbody – Ponds										422.52	422.52
Grand Total	**163.03**	**22.19**	**3970.40**	**395.14**	**446.63**	**2.86**	**418.23**	**1633.18**	**52.87**	**423.84**	**7528.35**

- 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 72.46 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body area in T2.
- In T2 99.06 ha of the agriculture area has increased from plantation, forest 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-2014-15 to 2015-16

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	163.03										163.03
Mining/dump		21.91								0.28	22.19
Agriculture	0.28	3.27	3941.85	3.49				6.00		15.50	3970.40
Plantation Horticulture	0.62		19.54	374.66						0.31	395.14
Forest	0.43		3.88		442.32						446.63
Forest Plantation						2.86					2.86
Barren Rocky		1.39					416.85				418.23
Scrub	0.91	2.88	7.66					1620.30		1.42	1633.18
Waterbody-Streams/River									52.87		52.87
Waterbody – Ponds										423.84	423.84
Grand Total	**165.26**	**29.45**	**3972.94**	**378.16**	**442.32**	**2.86**	**416.85**	**1626.31**	**52.87**	**441.35**	**7528.35**

- 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 28.55 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body area in T3.
- In T3 31.09 ha of the agriculture area has increased from plantation, forest 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-2015-16 to 2016-17

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	165.26										165.26
Mining/dump		29.06								0.39	29.45
Agriculture		8.18	3947.29	0.42				2.15	7.46	7.43	3972.94
Plantation Horticulture		0.28	2.71	374.39					0.33	0.45	378.16
Forest			7.81		434.51						442.32
Forest Plantation						2.86					2.86
Barren Rocky		4.07					412.77				416.85
Scrub		3.96	13.44					1606.89	1.09	0.93	1626.31
Waterbody-Streams/River									52.87		52.87
Waterbody – Ponds			1.15							440.20	441.35
Grand Total	**165.26**	**45.55**	**3972.41**	**374.81**	**434.51**	**2.86**	**412.77**	**1609.04**	**61.75**	**449.39**	**7528.35**

- 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 25.65 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body area in T4.
- In T4 25.12 ha of the agriculture area has increased from plantation, forest 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-2016-17 to 2017-18

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	165.26										165.26
Mining/dump		45.55									45.55
Agriculture	6.23	0.32	3927.68					24.50	11.07	2.62	3972.41
Plantation Horticulture	16.08		4.10	353.86					0.77		374.81
Forest			11.30		423.20						434.51
Forest Plantation			1.34			1.52					2.86
Barren Rocky		2.38					410.39				412.77
Scrub	2.02	1.20	29.51					1574.56	1.75		1609.04
Waterbody-Streams/River									61.75		61.75
Waterbody – Ponds			2.11						1.00	446.27	449.39
Grand Total	**189.60**	**49.45**	**3976.04**	**353.86**	**423.20**	**1.52**	**410.39**	**1599.06**	**76.34**	**448.89**	**7528.35**

- 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 44.73 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body area in T5.
- In T5 48.36 ha of the agriculture area has increased from plantation, forest 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 53.25 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 26.60, 2.54 & 3.63 Hectares From T1-T2, T2-T3 & T4-T5 respectively and overall increase of 32.77 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 95 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 214.80 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (35) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (31) verified from the portal.