MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -4/2009-10
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

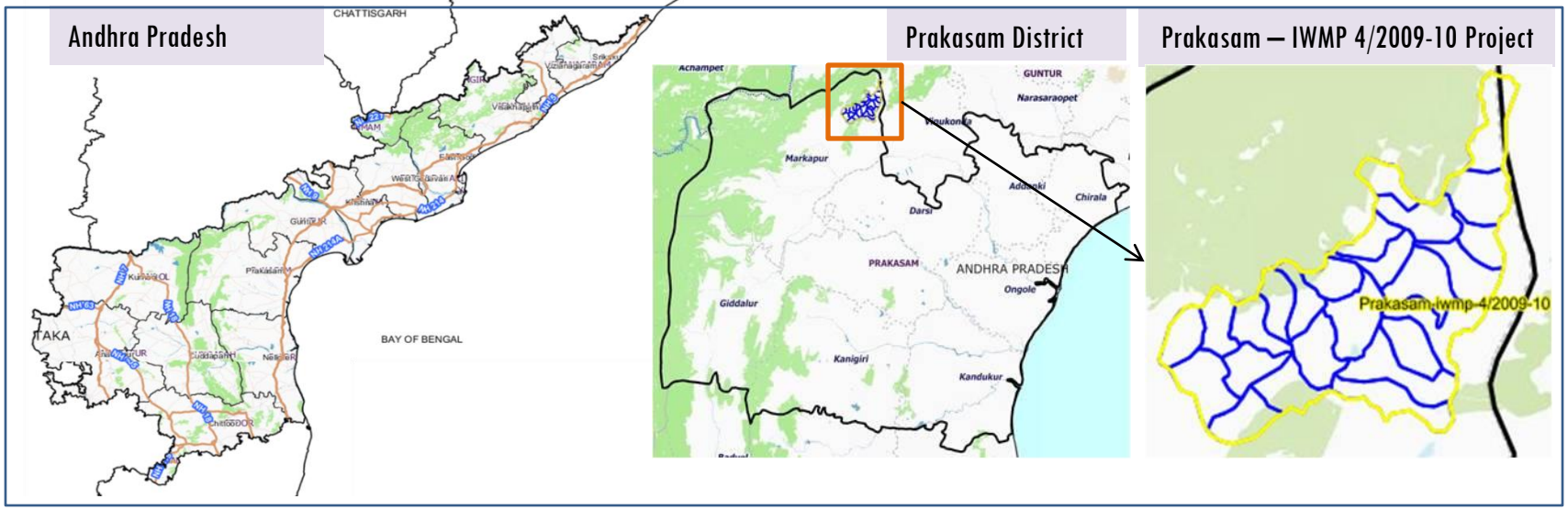
CONTENTS

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-04/2009-10, Prakasam District of Andhra Pradesh. The total geographical area of the project is 12,272.39 ha. It comprises of 25 micro watersheds.
- In the project area 31 Drishti photos were uploaded showing 31 Farm ponds.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 10 new farm ponds or dug out ponds with 22.21 ha increase in the area.
- Major percentage i.e. 47% is covered by the agriculture, 36% is covered by scrubland, 9% by forest and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-04/2009-10
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Pullalacheruvu Mandal of Prakasam district of Andhra Pradesh state. The total geographical area of the project is 12272.39 ha, it comprises of 25 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.

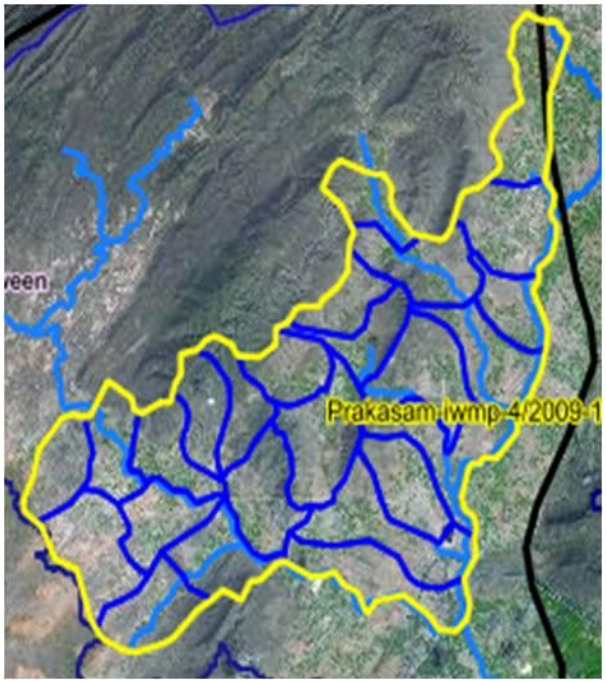
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2017-18
LISS IV	2013-14		
SCENE 1			2-Oct-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
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	33
4	Detailed Project Report		

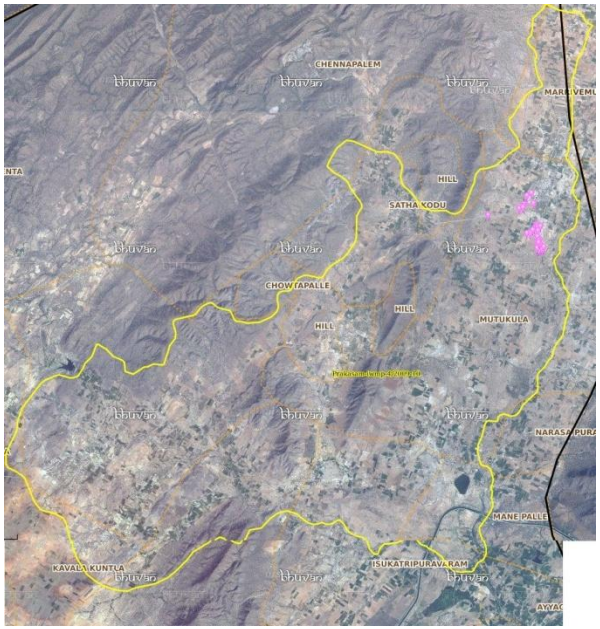
Natural Color Composite overlaid with Project boundaries and high detail stream network



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	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	3	3
11	Check dams	0	0
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	New Activity	30	25
18	Others	0	0
	TOTAL	**33**	**28**

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.

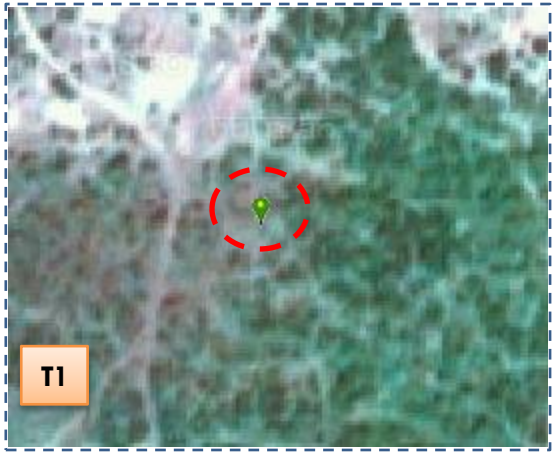
Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-04/2009-10

T1: 2013-14

T2: Feb 26 2015

Drishti Sl no. 68810 MWS :4C4C3c2c

Farm pond



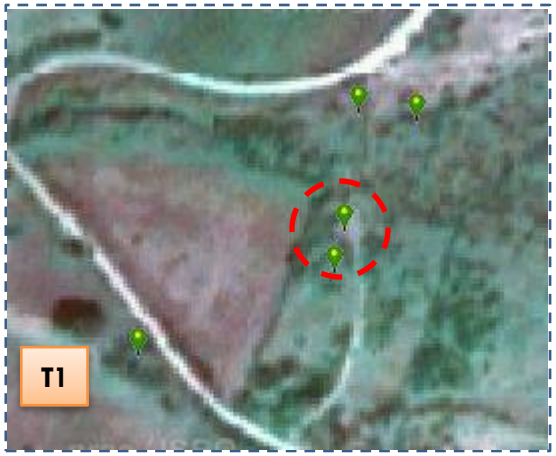
T1: 2013-14

T2: Feb 26 2015

Drishti Sl no.92170 MWS : 4C4C3c2c

Farm pond

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-04/2009-10



T1: 2013-14

T2: Feb 26 2015

Drishti Sl no. 1421314 MWS :4C4C3c2c

Farm pond

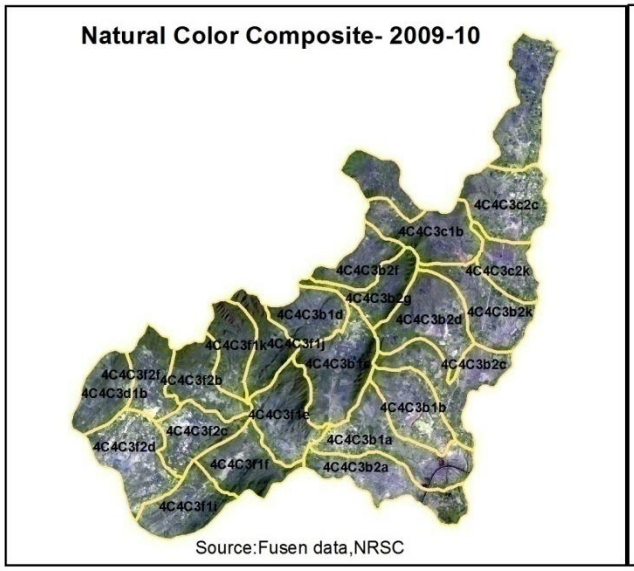
T1: 2013-14

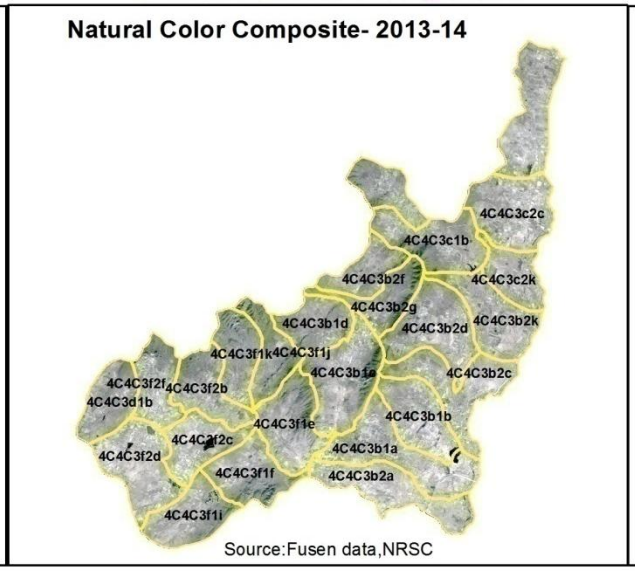
T2: Feb 26 2055

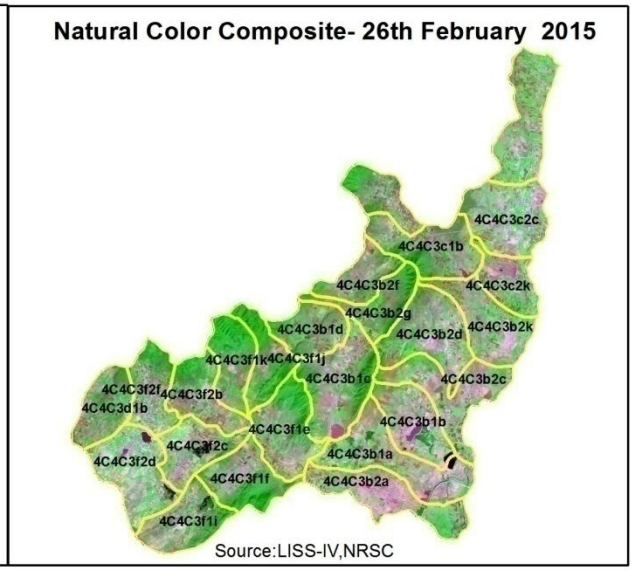
Drishti Sl no. 1421514 MWS : 4C4C3c2c

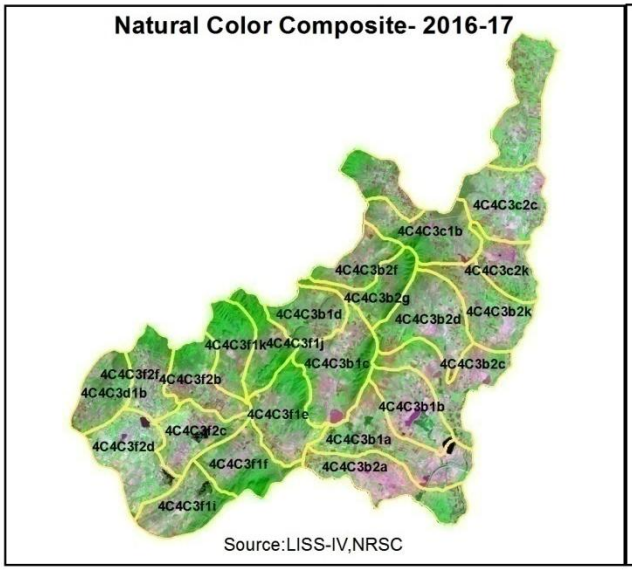
Farm pond

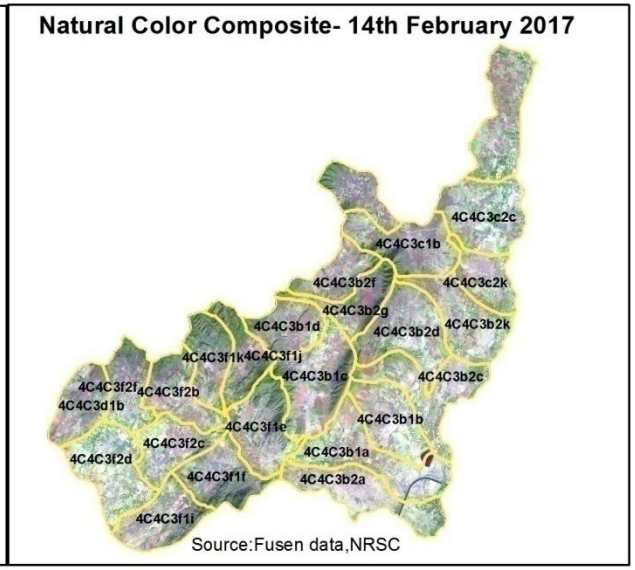
Natural Color Composite – 2009-10 to 2017-18



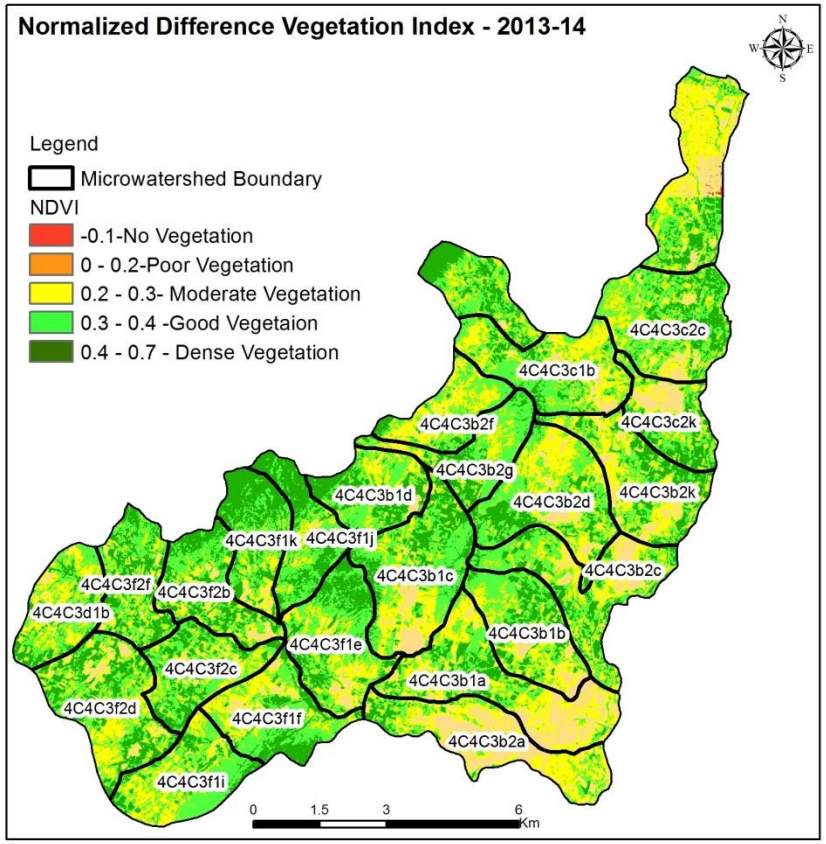




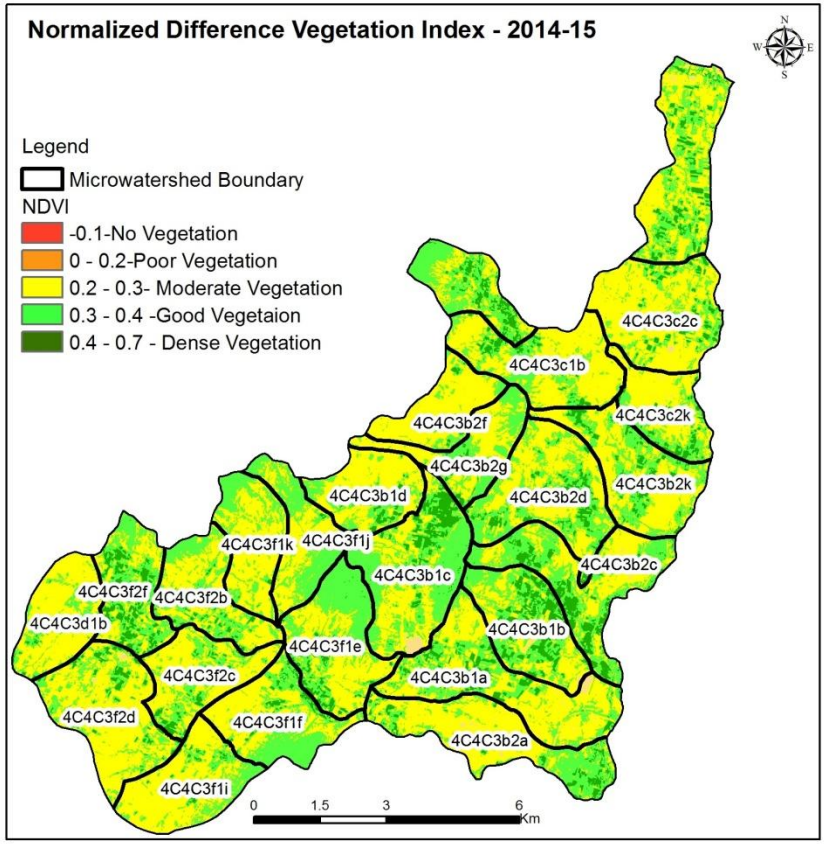




Changes in Vegetation Cover



NDVI (2013-14)



NDVI (2014-15)

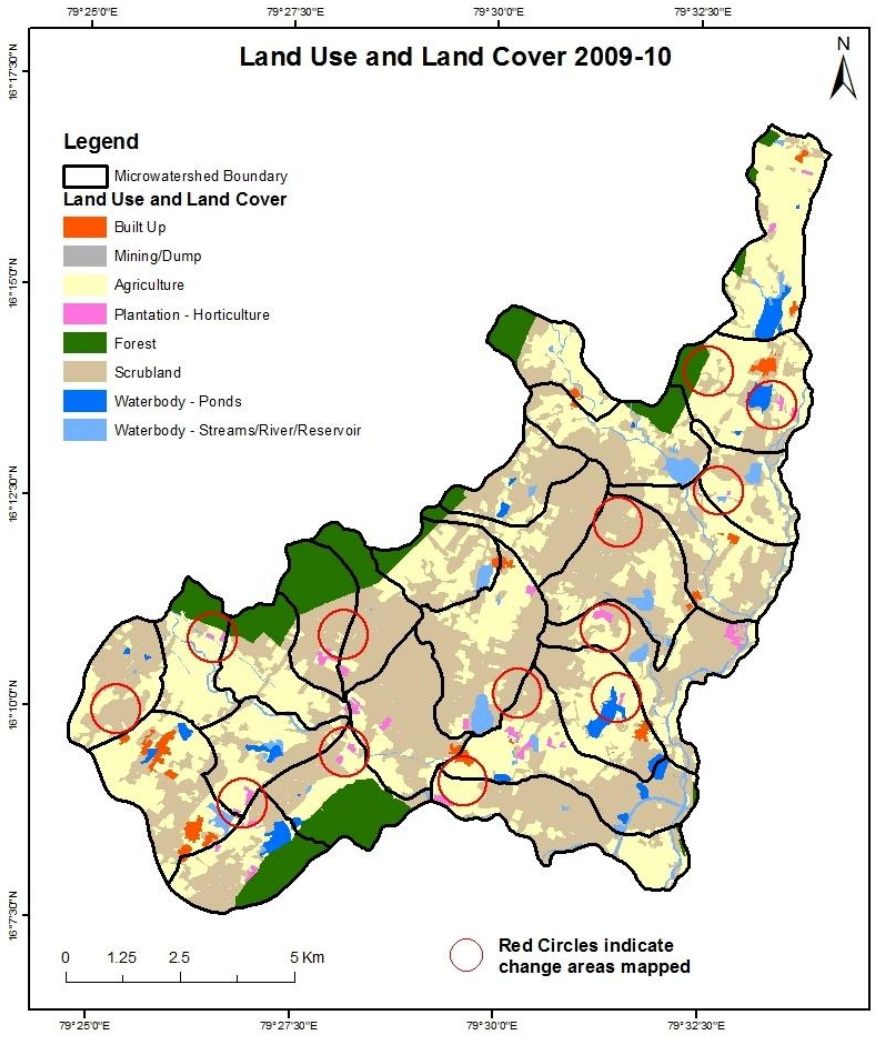
MONITORING IN THE PROJECT AREA

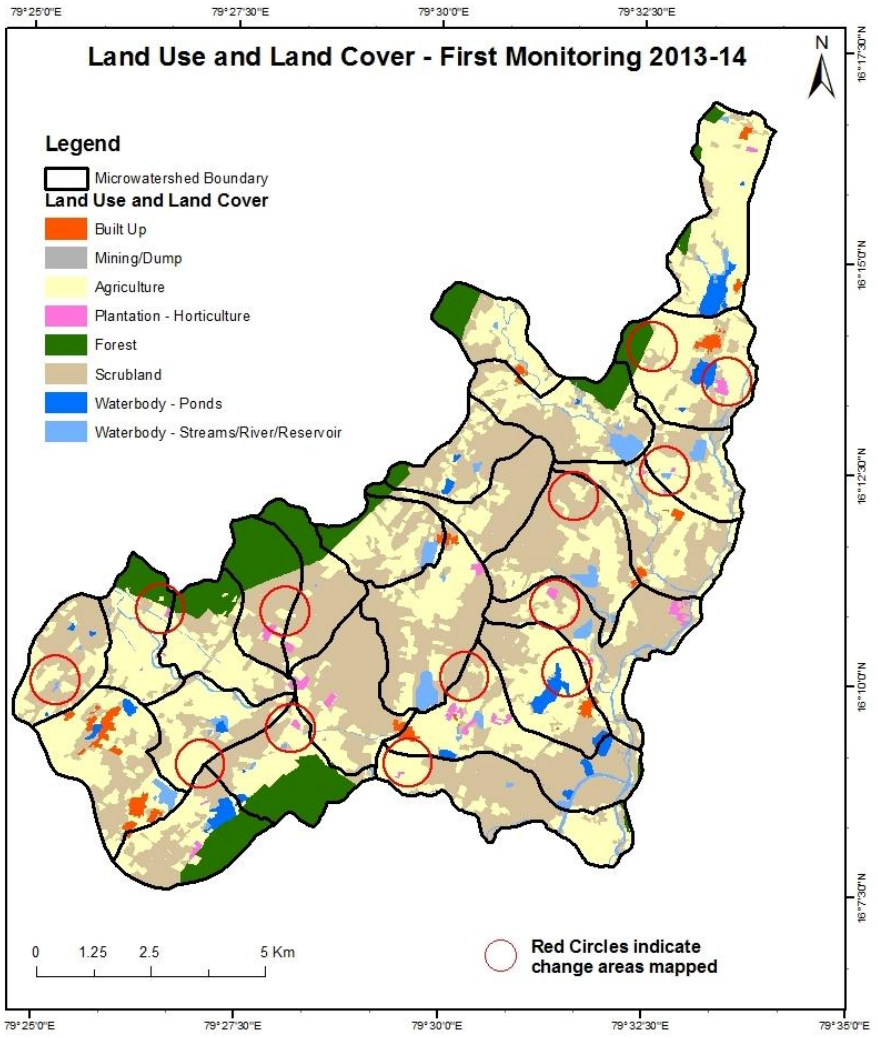
Land use and Land cover Changes in the Project

- 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 (2013-14 to 2014-15)

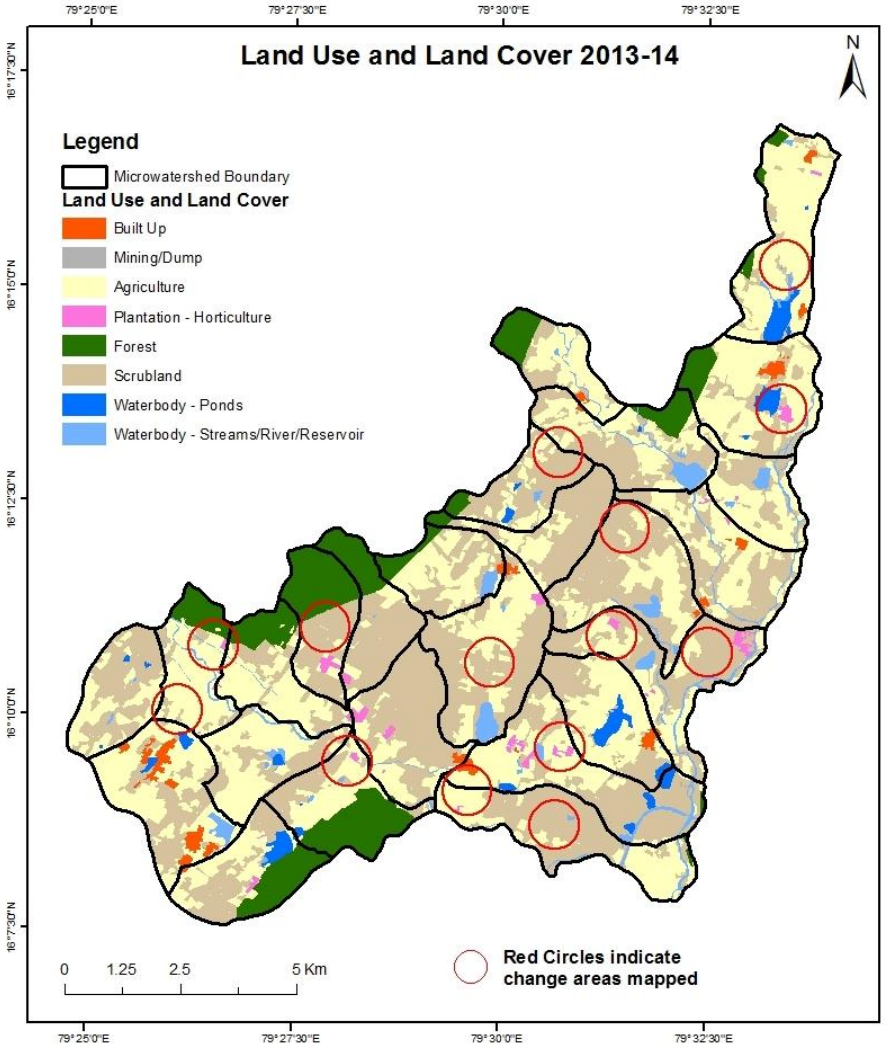
Scale: 1:10000

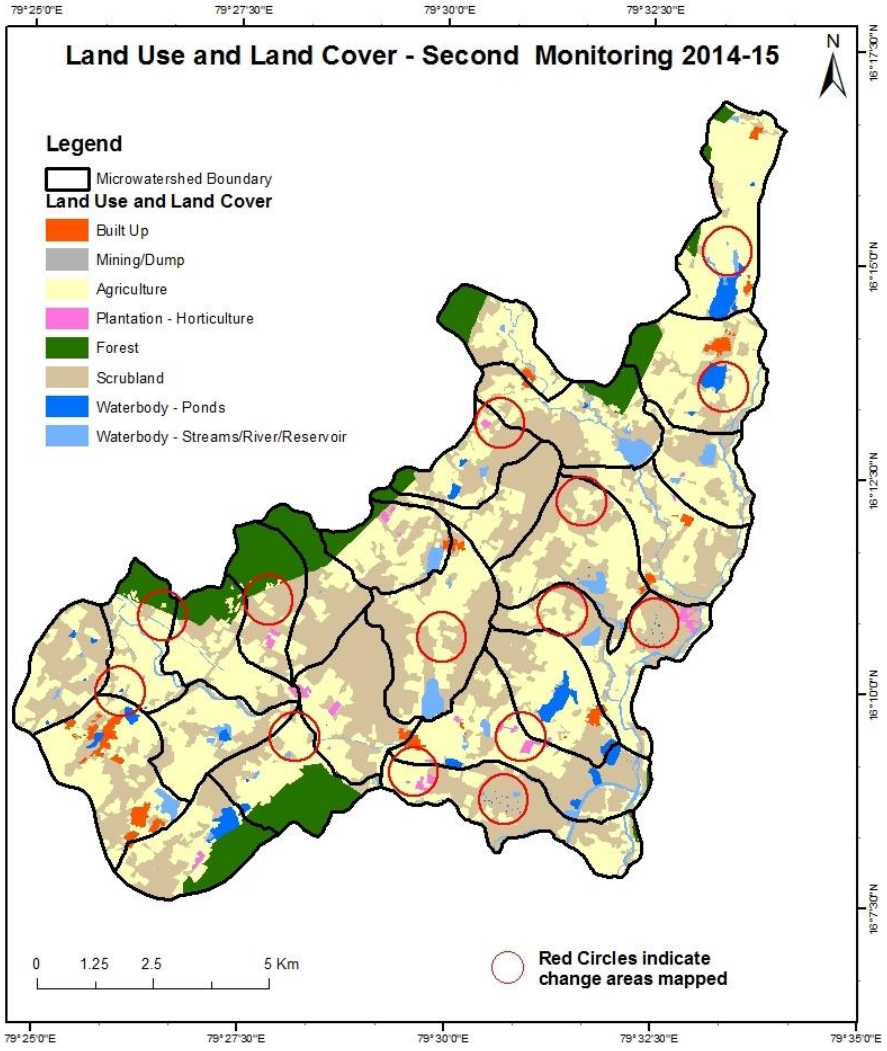




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

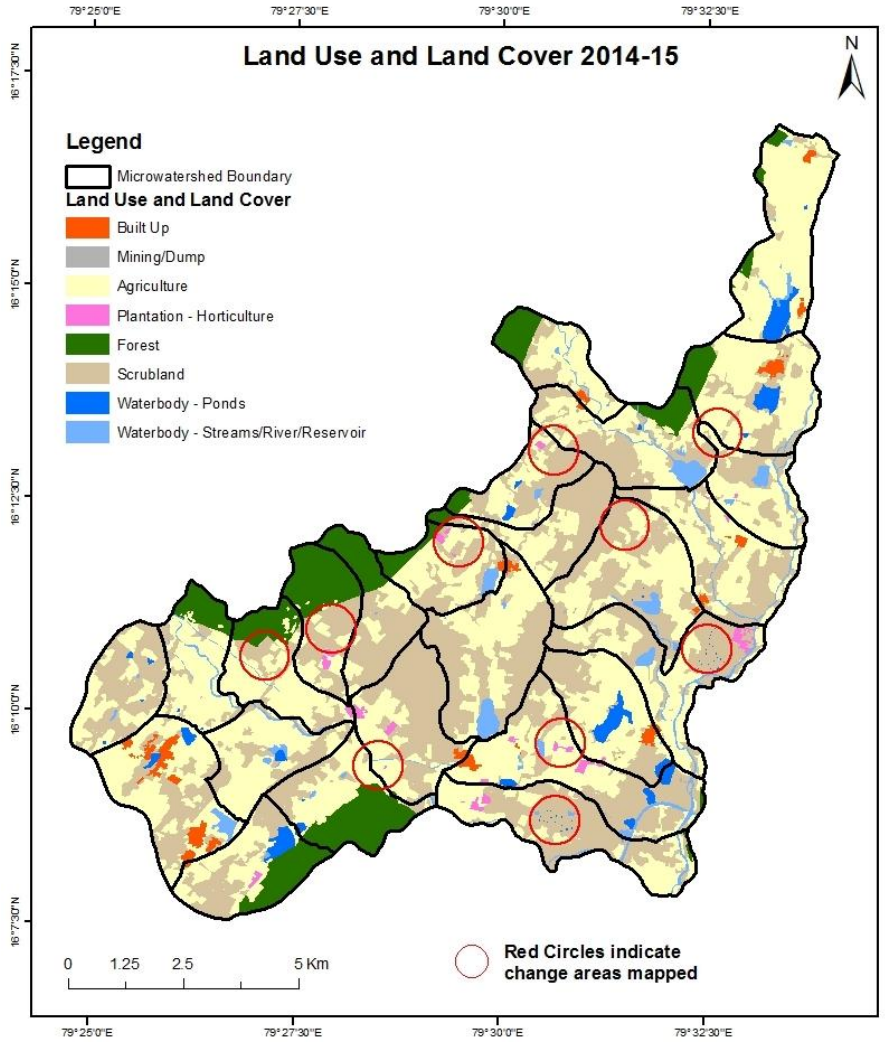
Scale: 1:10000

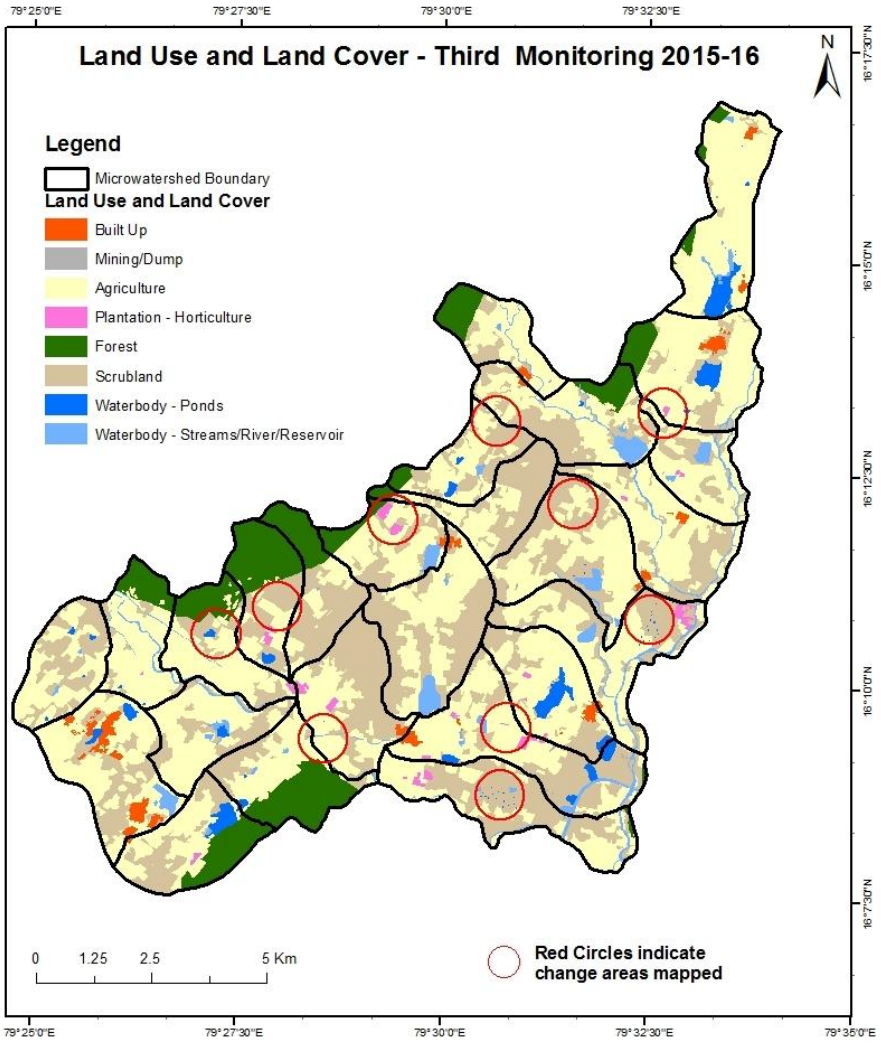




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

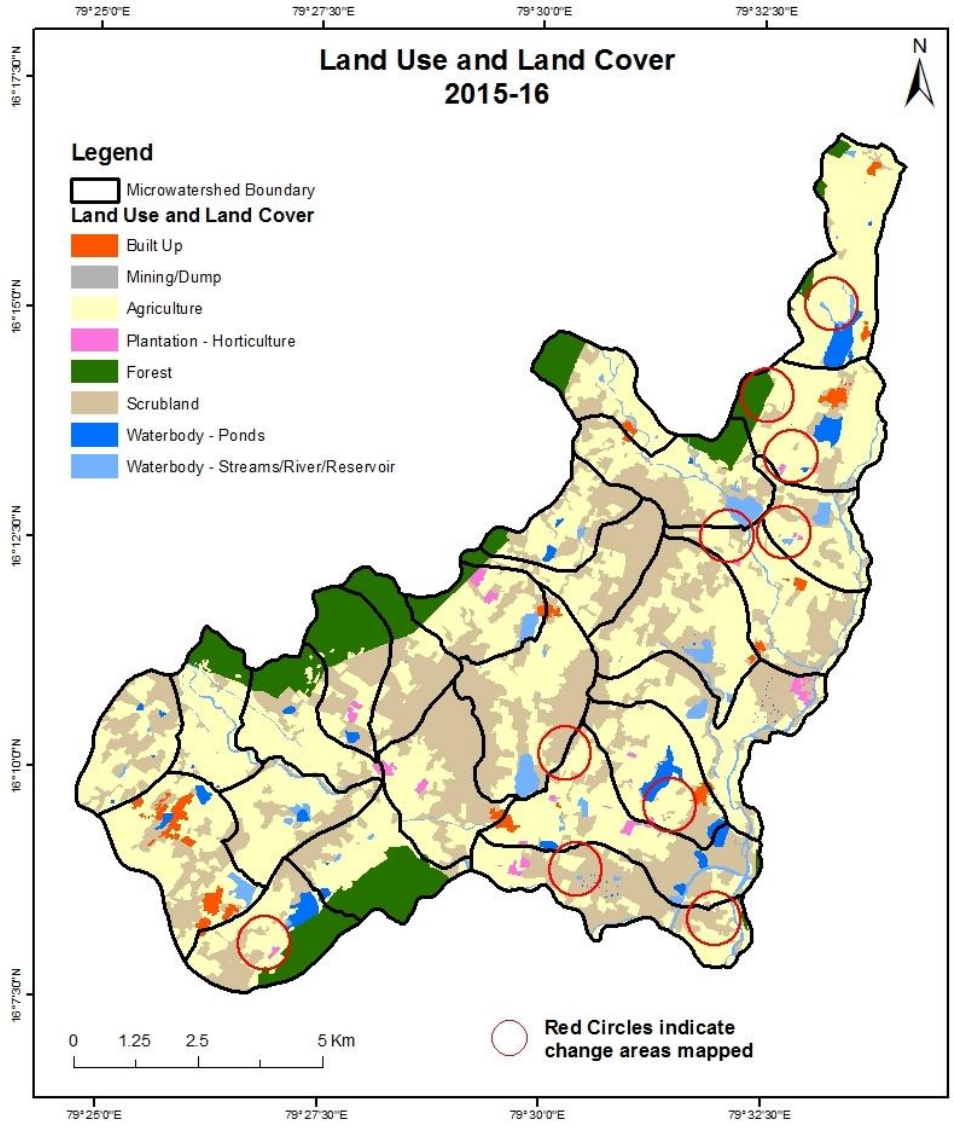
Scale: 1:10000

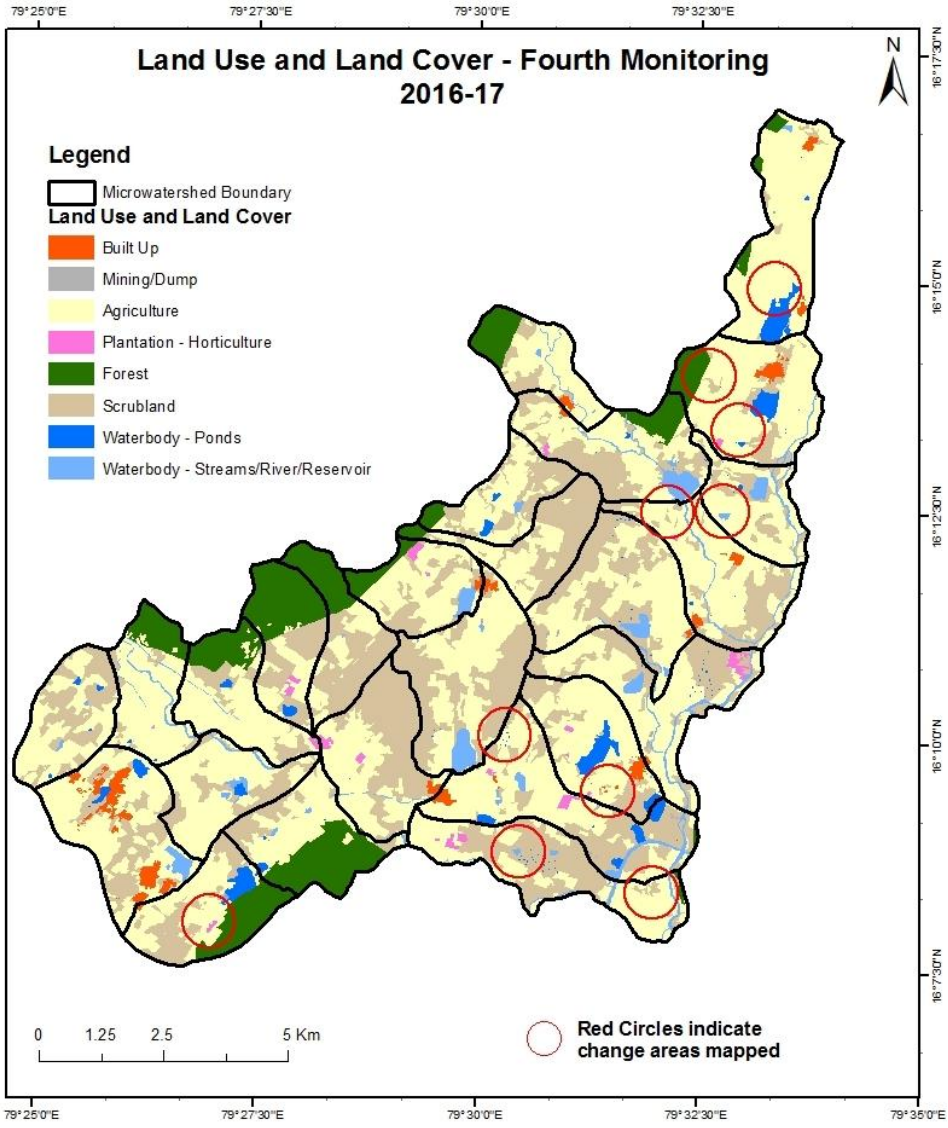




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

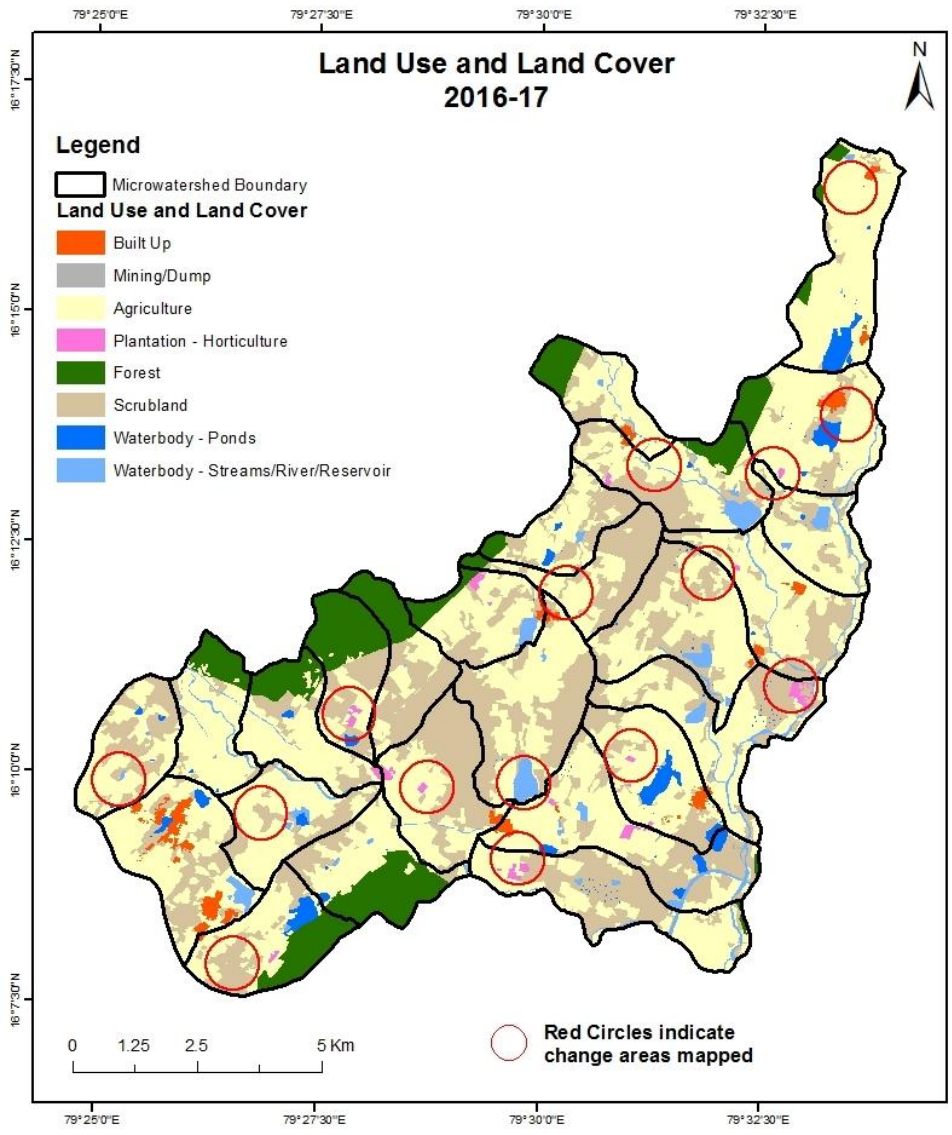
Scale: 1:10000

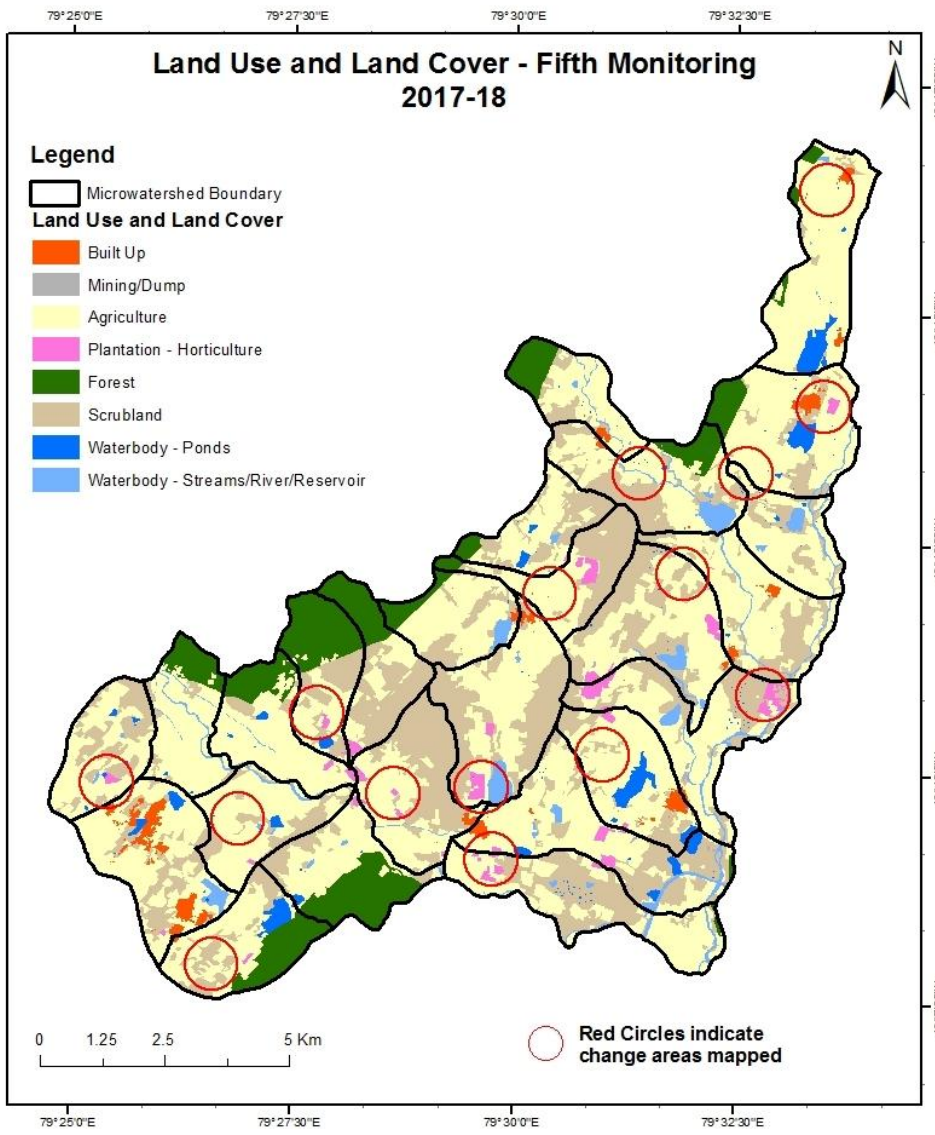




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

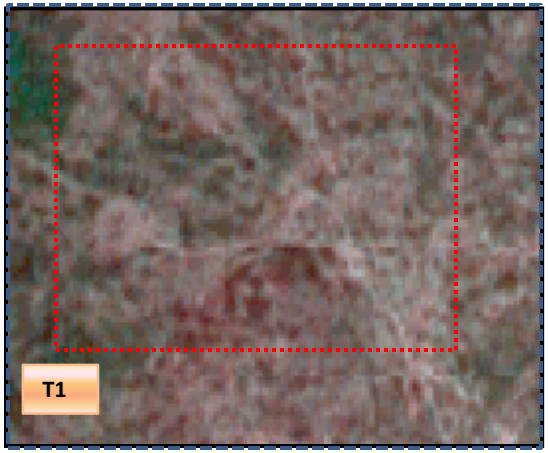
Scale: 1:10000





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

Scrub to Agriculture

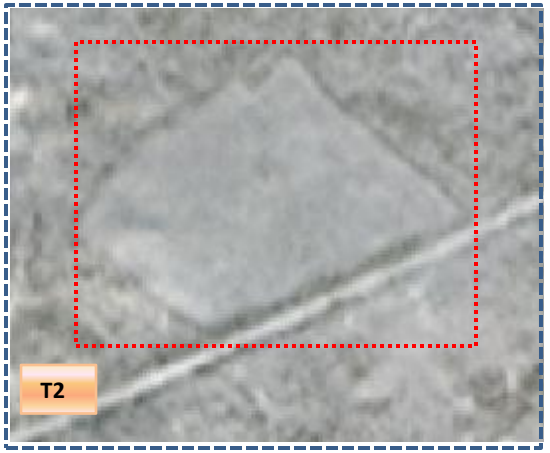


T1: 2013-14

T2: Feb 26 2015

Scrub to Agriculture

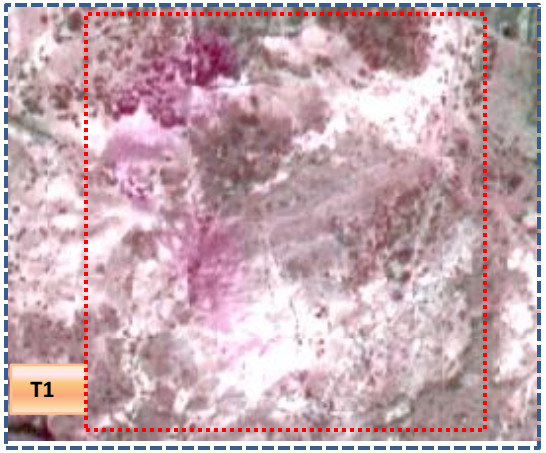
T1: 2013-14



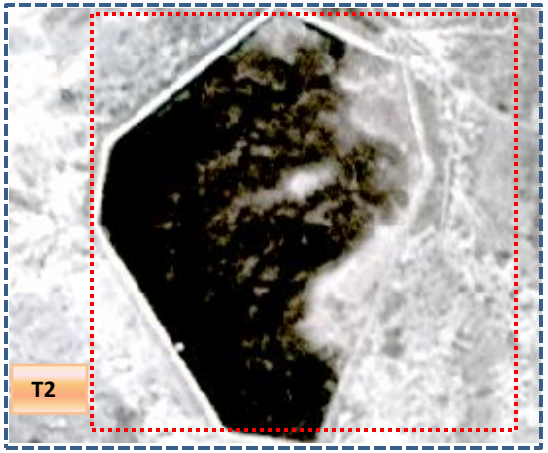
T2: Feb 26 2015

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

Scrub to Water body

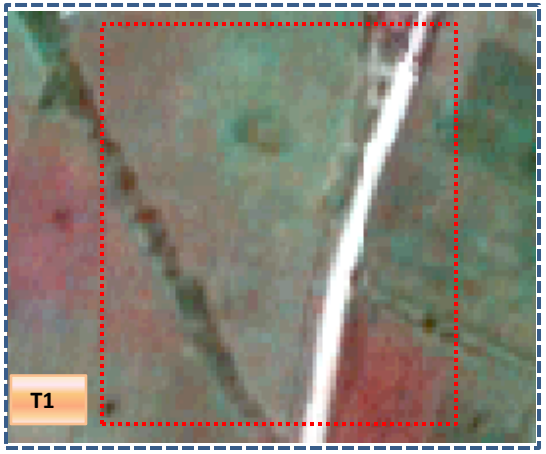


T1: 2013-14

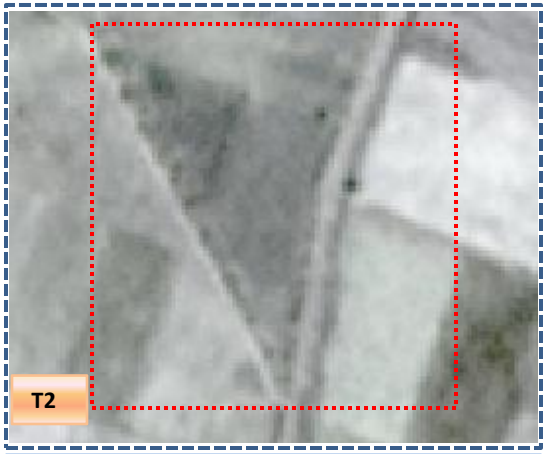


T2: Feb 26 2015

Agriculture to Plantation



T1: 2013-14



T2: Feb 26 2015

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	138.33										**138.33**
Mining/dump		5.73									**5.73**
Agriculture	3.24	0.38	4810.94	20.50				19.50	0.19	0.57	**4855.32**
Plantation Horticulture			43.03	77.46							**120.49**
Forest			22.65		1127.76						**1150.41**
Forest Plantation											
Barren Rocky											
Scrub	3.29	0.46	325.24	4.02				5102.58	4.00		**5439.59**
Waterbody-Streams/River									351.31		**351.31**
Waterbody – Ponds								8.78		195.04	**203.81**
Grand Total	**144.86**	**6.57**	**5201.86**	**101.98**	**1127.76**			**5130.85**	**355.50**	**195.61**	**12264.99**

- 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 44 ha of agriculture are decreased and it is converted into Built-up, mining, plantation, scrub and water body and in T1.
- In T1 390 ha of agriculture are increased from plantation, forest 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-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	144.86										**144.86**
Mining/dump		6.57									**6.57**
Agriculture	4.44		5064.30	28.85				103.02		1.25	**5201.86**
Plantation Horticulture			56.43	45.26						0.30	**101.98**
Forest			25.79		1101.96						**1127.76**
Forest Plantation											
Barren Rocky											
Scrub			648.61					4476.60	1.88	3.76	**5130.85**
Waterbody-Streams/River									355.50		**355.50**
Waterbody – Ponds										195.61	**195.61**
Grand Total	**149.30**	**6.57**	**5795.13**	**74.11**	**1101.96**			**4579.63**	**357.38**	**200.91**	**12264.99**

- 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 137 ha of agriculture are decreased and it is converted into plantation, Built-up, scrub and water body in T2.
- In T2 730 ha of agriculture are increased from plantation, scrub land and forest 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	149.30										**149.30**
Mining/dump		6.57									**6.57**
Agriculture			5784.05	1.81						9.27	**5795.13**
Plantation Horticulture			9.78	64.33							**74.11**
Forest					1101.96						**1101.96**
Forest Plantation											
Barren Rocky											
Scrub	1.55		685.97	12.60				3879.40		0.11	**4579.63**
Waterbody-Streams/River									357.38		**357.38**
Waterbody – Ponds										200.91	**200.91**
Grand Total	**150.84**	**6.57**	**6479.79**	**78.75**	**1101.96**			**3879.40**	**357.38**	**210.30**	**12264.99**

- 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 11 ha of agriculture are decreased and it is converted into plantation and water body in T3.
- In T3 695 ha of agriculture are increased from scrub land and plantation 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	150.84										**150.84**
Mining/dump		6.57									**6.57**
Agriculture	4.02		6470.42	2.97						2.39	**6479.79**
Plantation Horticulture	0.04		13.98	64.73							**78.75**
Forest			5.82		1096.15						**1101.96**
Forest Plantation											
Barren Rocky											
Scrub	5.40		253.71					3615.15	0.61	4.52	**3879.40**
Waterbody-Streams/River			9.81						347.57		**357.38**
Waterbody – Ponds										210.30	**210.30**
Grand Total	**160.31**	**6.57**	**6753.73**	**67.70**	**1096.15**			**3615.15**	**348.18**	**217.21**	**12264.99**

- 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 9.3 ha of agriculture are decreased and it is converted into plantation, Built-up and water body in T4.
- In T4 283 ha of agriculture are increased from scrub land, plantation , forest and waterbody 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	160.31										**160.31**
Mining/dump		6.57									**6.57**
Agriculture	7.81		6637.22	103.16						5.54	**6753.73**
Plantation Horticulture			22.15	45.54							**67.70**
Forest			22.69		1073.28					0.18	**1096.15**
Forest Plantation											
Barren Rocky											
Scrub	0.83		341.02	22.82				3250.19		0.29	**3615.15**
Waterbody-Streams/River			8.02						340.16		**348.18**
Waterbody – Ponds										217.21	**217.21**
Grand Total	**168.95**	**6.57**	**7031.10**	**171.53**	**1073.28**			**3250.19**	**340.16**	**223.21**	**12264.99**

- 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 116 ha of agriculture are decreased and it is converted into plantation, Built-up and water body in T5.
- In T5 393 ha of agriculture are increased from scrub land, plantation , forest and waterbody 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 8.2 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 346, 593, 684, 273 & 277 Hectares From T0-T1, T1-T2, T2-T3 & T4-T5 respectively and overall increase of 2175 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 51 ha of the Plantation/Horticulture area has been increased between 2009-10 (t0) & 2017-18 (T5) years.
6. There is a decrease of 2189 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (3) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (3) verified from the portal.