MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -11/2009-10
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

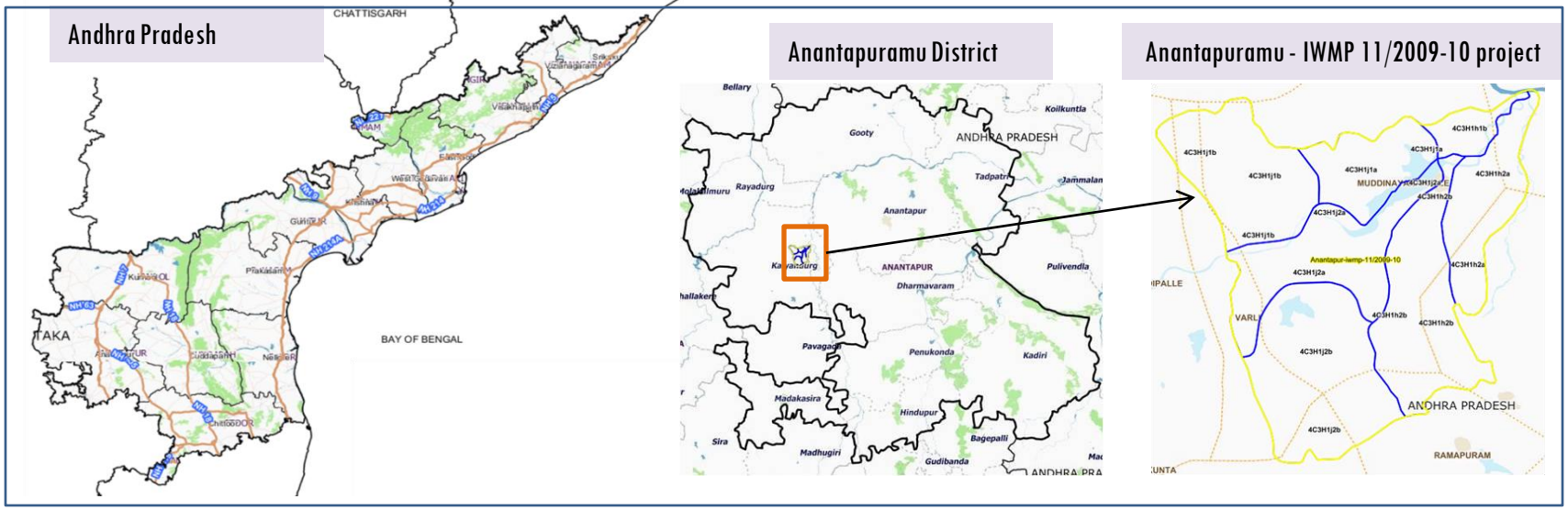
CONTENTS

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-11/2009-10, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 5,853.72 ha. It comprises of 7 micro watersheds.
- In the project area 25 Drishti photos were uploaded showing 3 check dams, 3 Farm ponds and 19 are showing others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 3 new farm ponds or dug out pits with 1.37 ha increase in the area.
- Major percentage i.e. 71.52% is covered by the agriculture, 18.03 % is covered by Scrub land and remaining by other land use classes.

PROJECT : ANANTAPURAMU - IWMP-11/2009-10
District : Anantapuramu , State : Andhra Pradesh

- The study area falls in Kalyandurg Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 5,853.72 ha. It comprises of 7 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



- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .
- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Total annual rainfall is about 22 inches (560 mm).
- Anantapuram district receives moderate to good rainfall from July to October month.

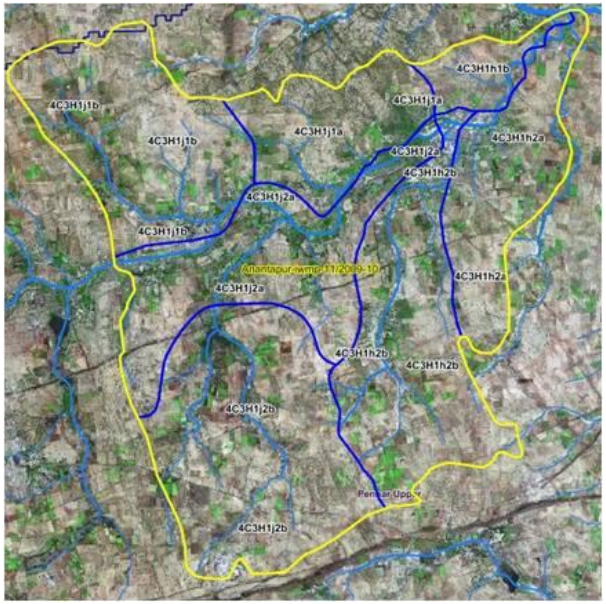
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			9-Jun-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			9-Jun-17
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	25
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/Plantation	0	0
3	Agriculture	0	0
4	Bunding	0	0
5	Drainage treatment	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	1	1
9	Gabion structure	0	0
10	Farm ponds /Dugout pit	5	4
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	Entry Point Activity	0	0
18	Others	19	15
	TOTAL	**25**	**20**

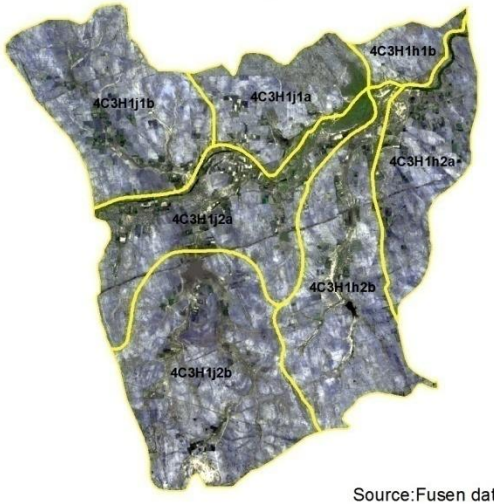
MONITORING IN THE PROJECT AREA

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

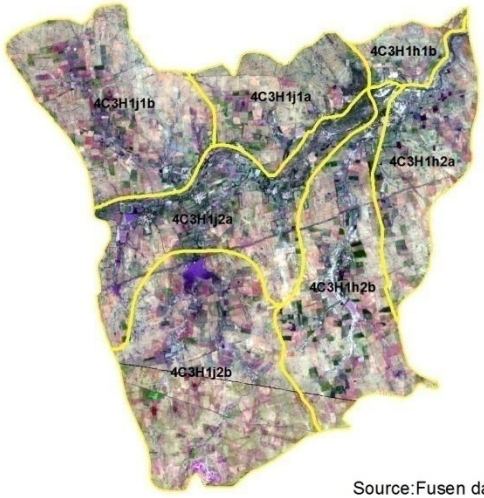
Natural Color Composite- 27th March 2013

Source:LISS-IV,NRSC

Natural Color Composite- 02nd May 2014

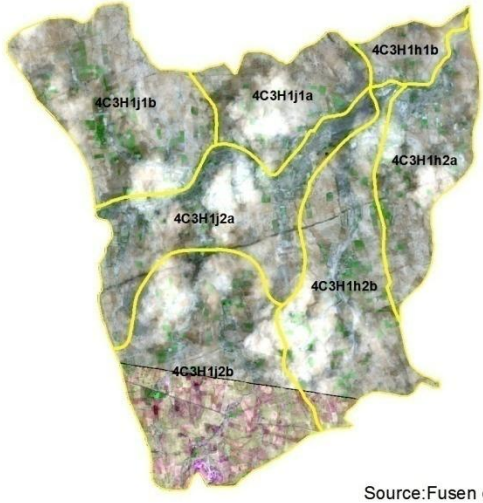
Source:LISS-IV,NRSC

Natural Color Composite-28th October 2015



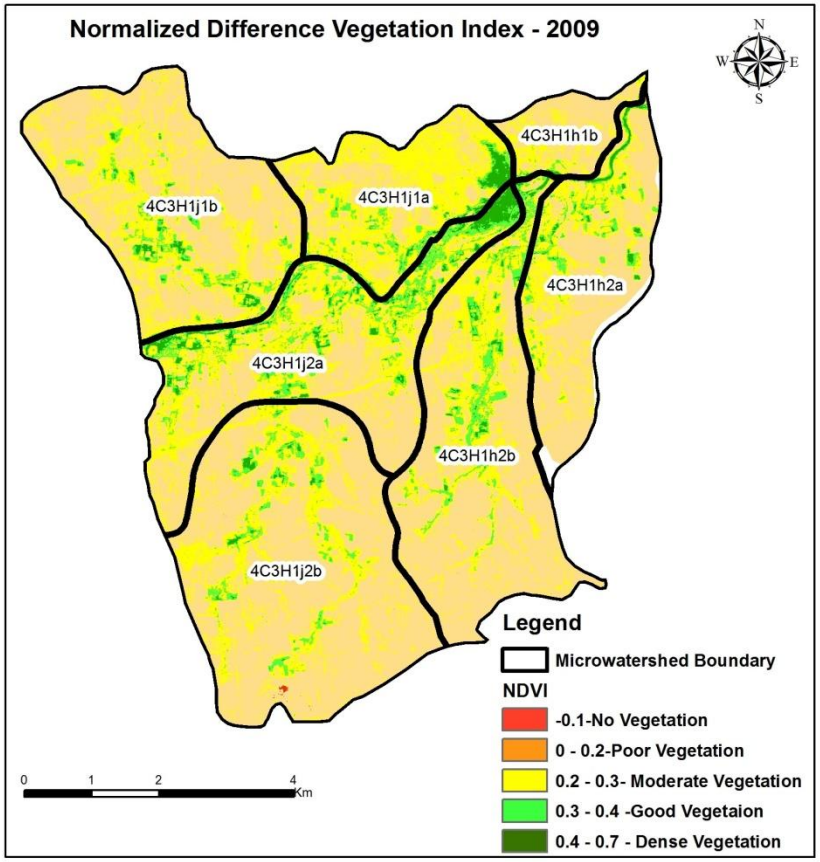
Source:Fusen data,NRSC

Natural Color Composite- 09th June 2017

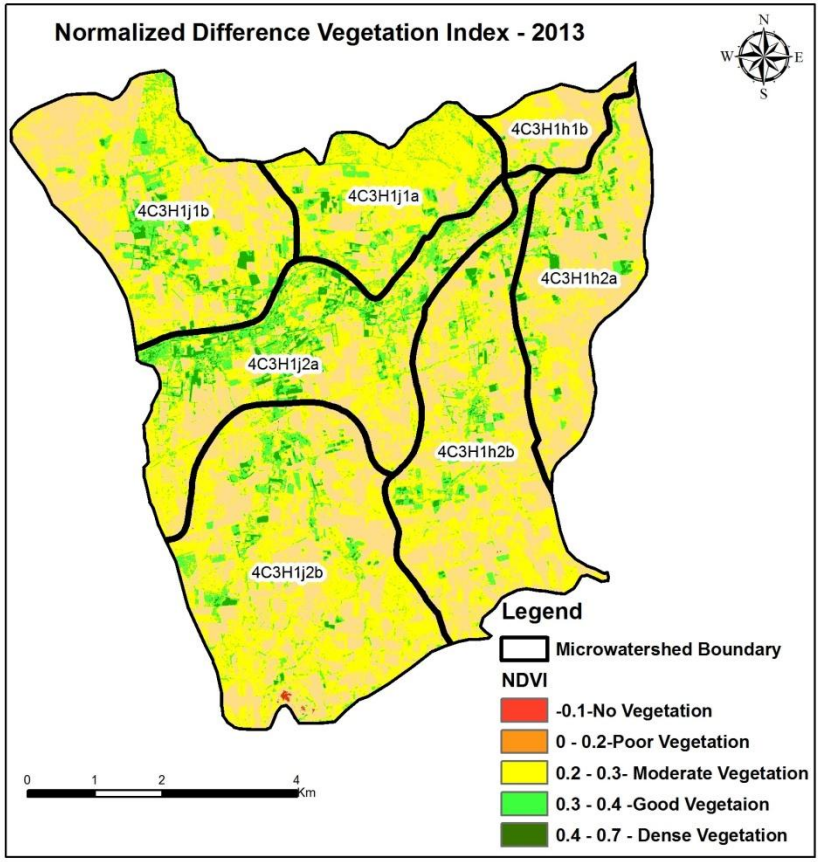


Source:Fusen data,NRSC

Changes in Vegetation Cover

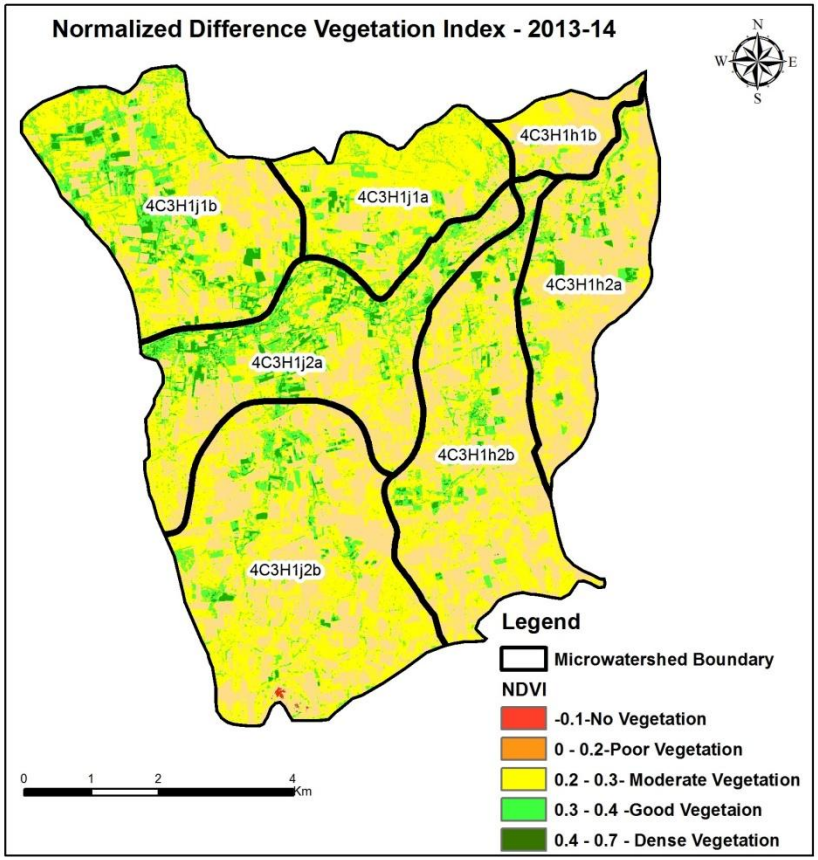


NDVI (2009-10)

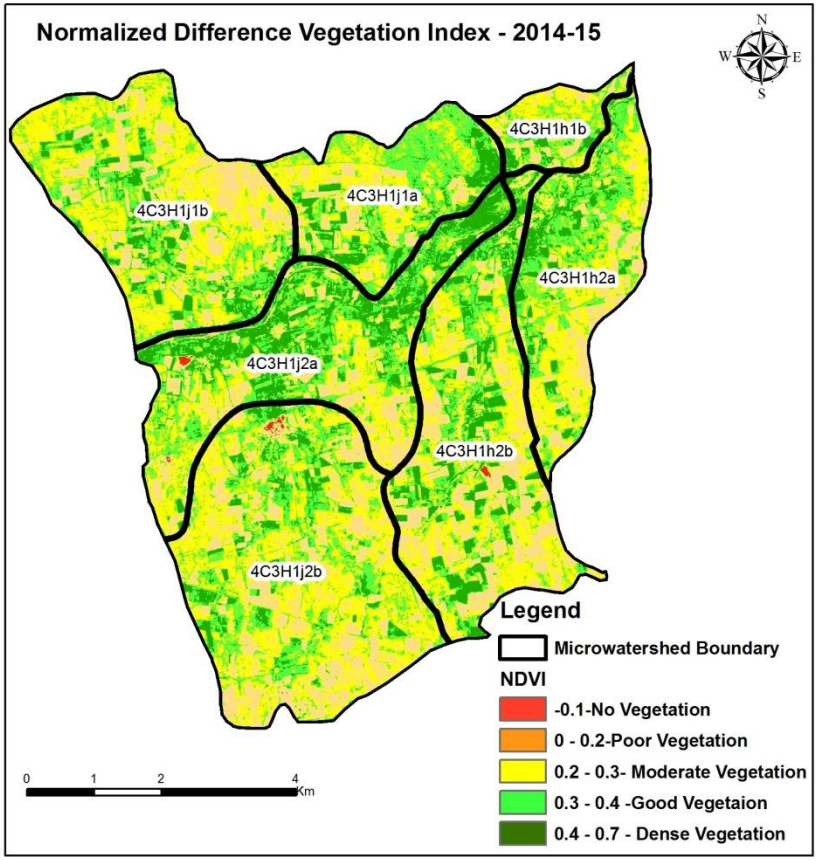


NDVI (27 March 2013)

Changes in Vegetation Cover



NDVI (2013-14)



NDVI (28 October 2015)

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-11/2009-10

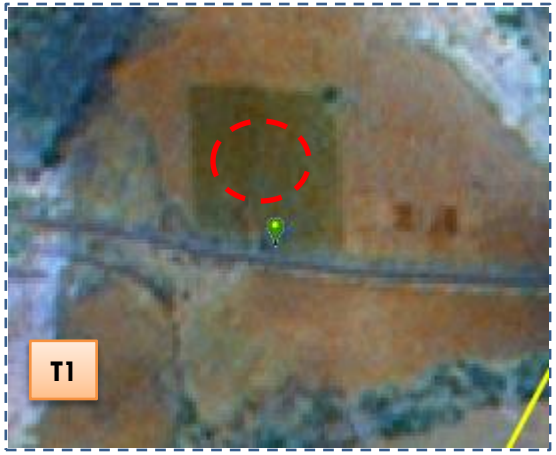
T0:2009-10

T1: 27 March 2013

Drishti Sl no. 139615 MWS :4C3H1j2a

Checkdam

T0:2009-10



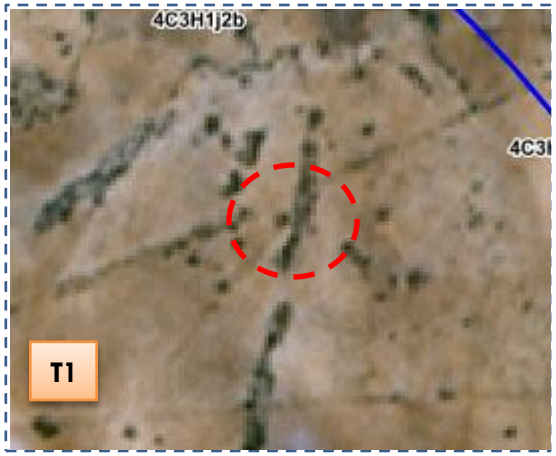
T1: 27 March 2013

Drishti Sl no.129002 MWS : 4C3H1j1a

Horticulture

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-11/2009-10

T0: 2009-10

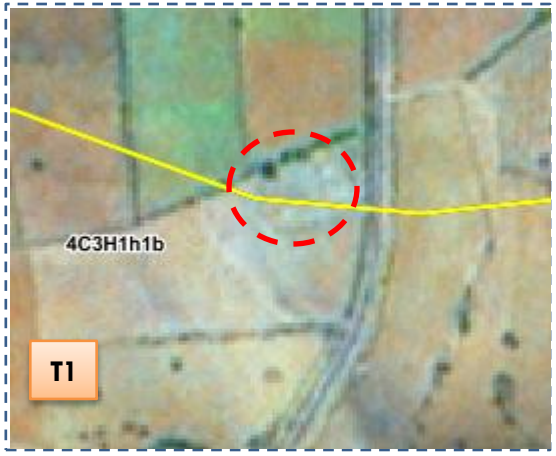


T1: 27 March 2013

Drishti Sl no. 143978 MWS :4C3H1j2b

Percolation tank

T0: 2009-10



T1: 27 March 2013

Drishti Sl no. 129201 MWS :4C3H1h1b

Land development

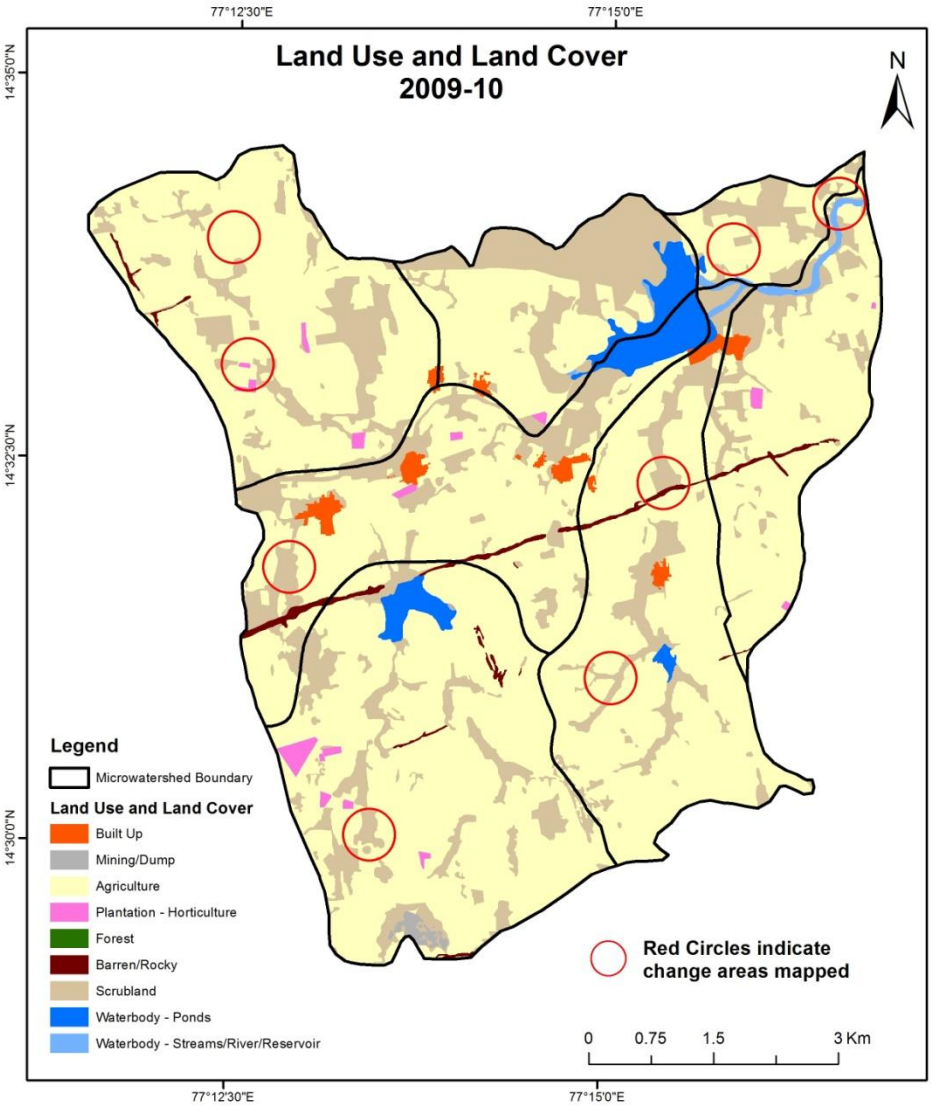
MONITORING IN THE PROJECT AREA

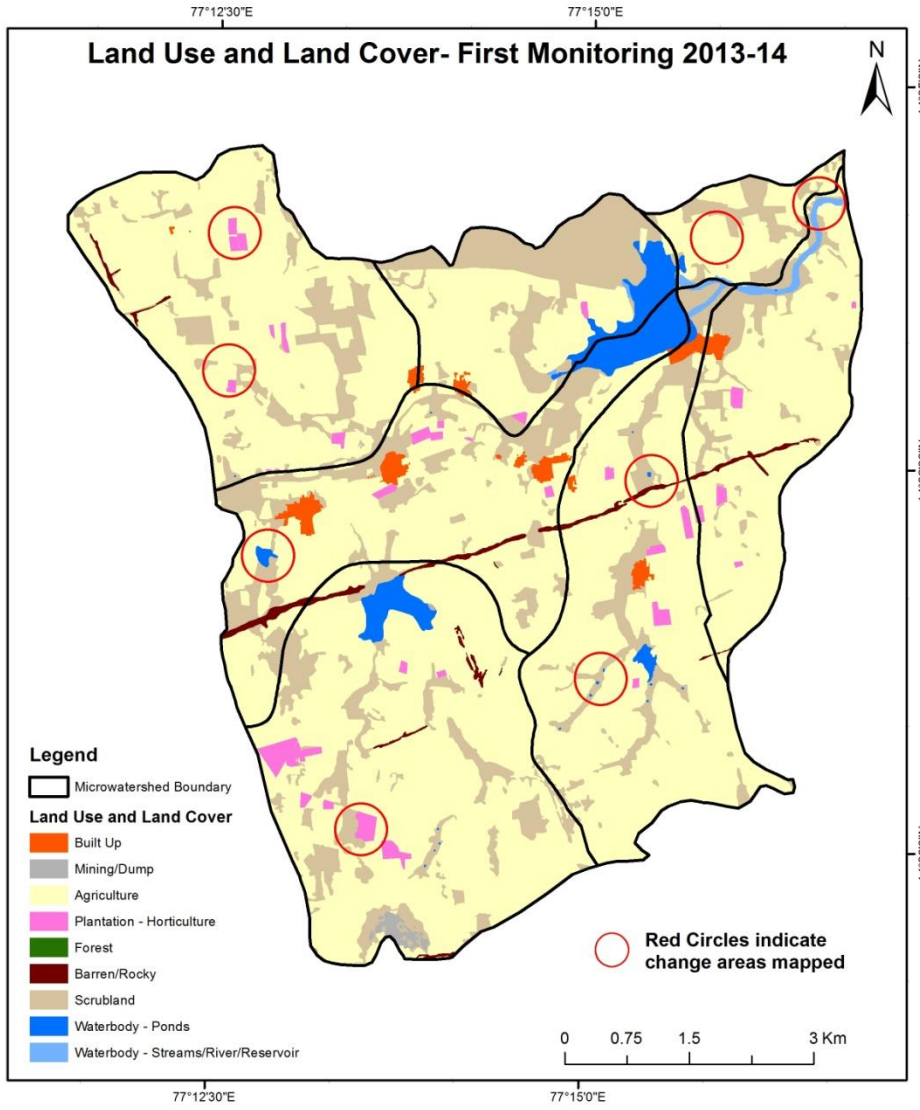
Land use and Land cover Changes in the Project

- 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)

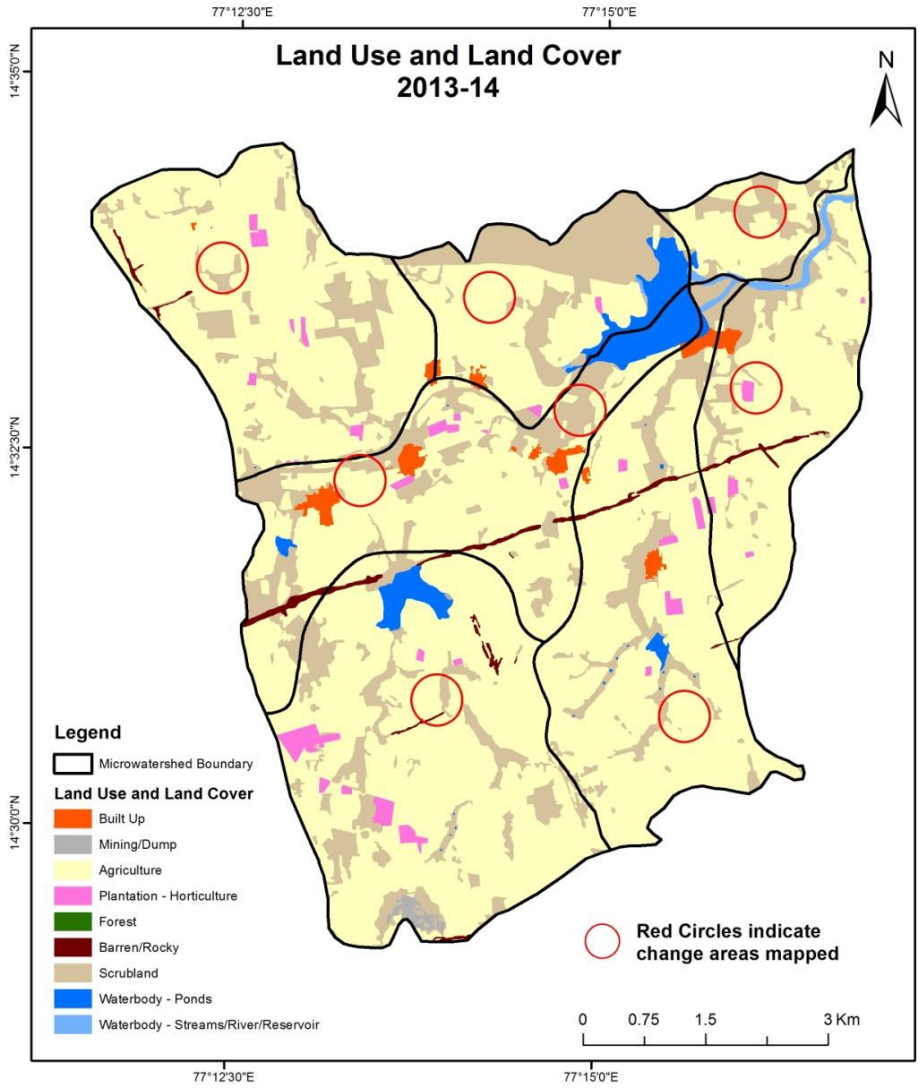
Scale: 1:10000

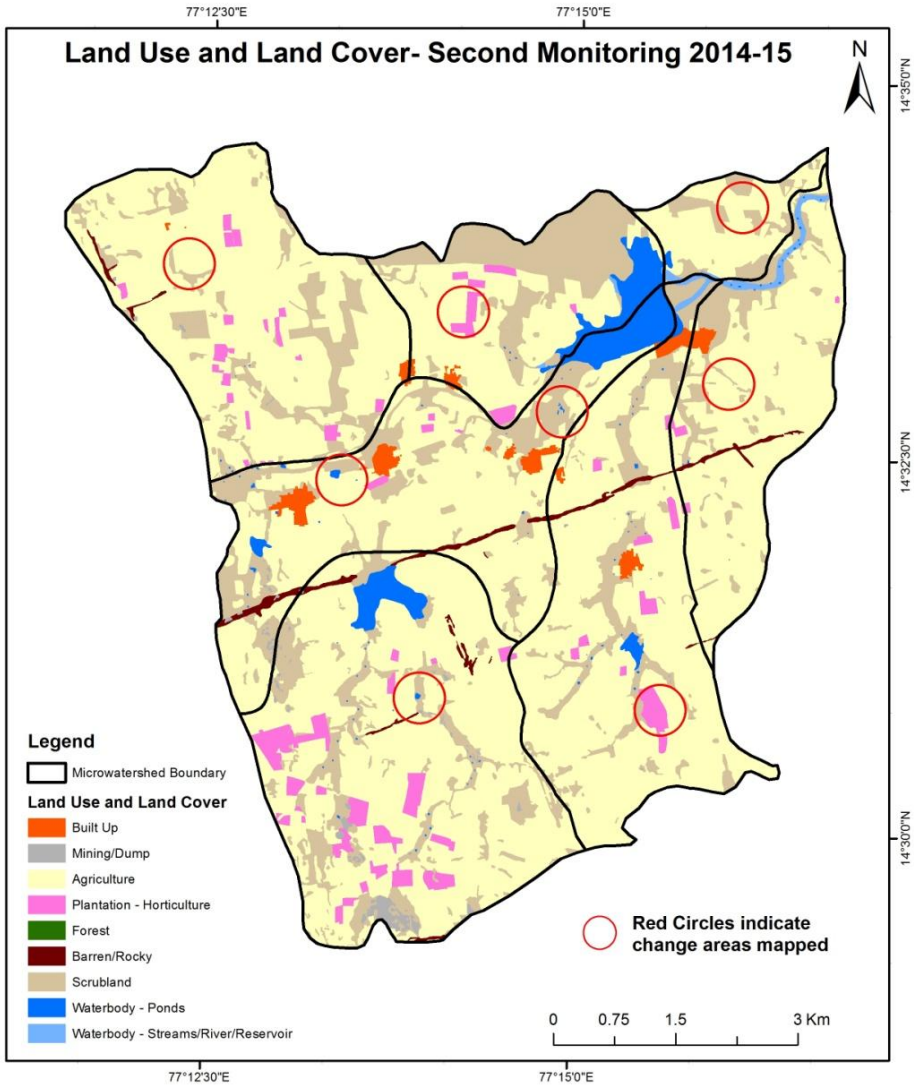




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

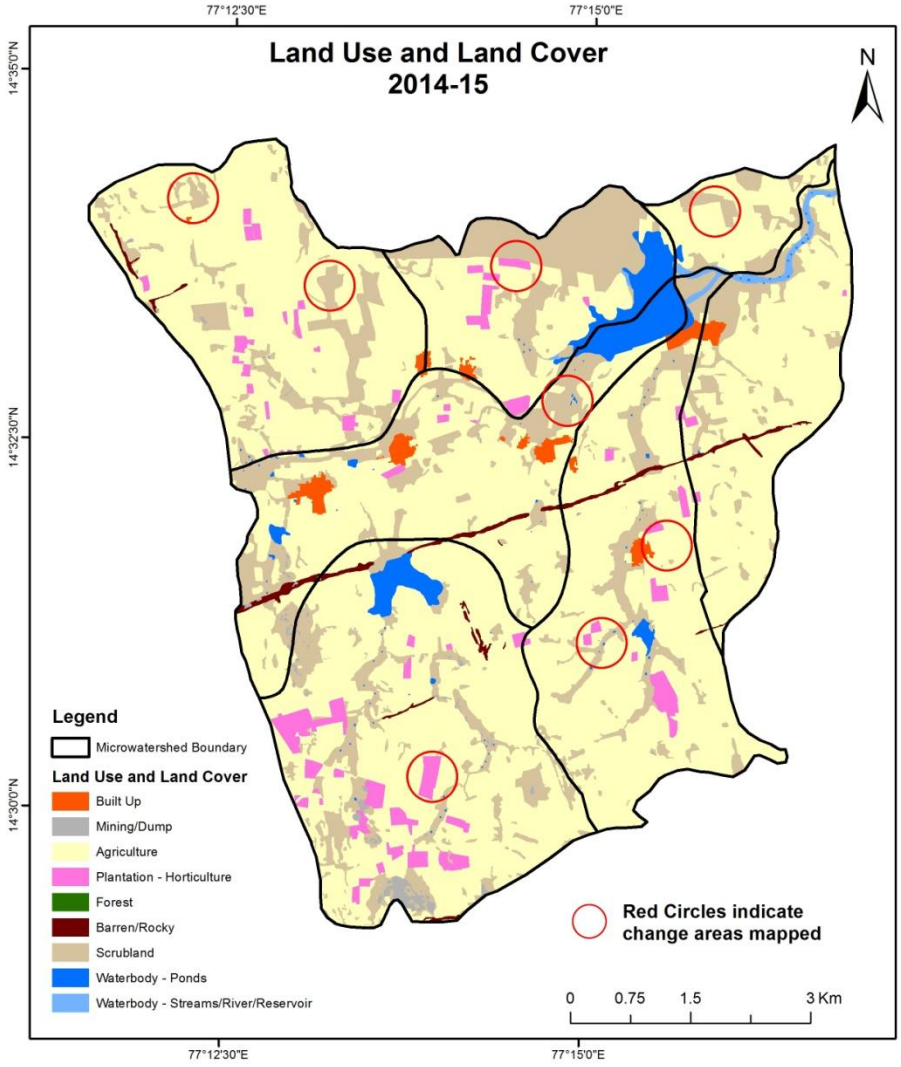
Scale: 1:10000

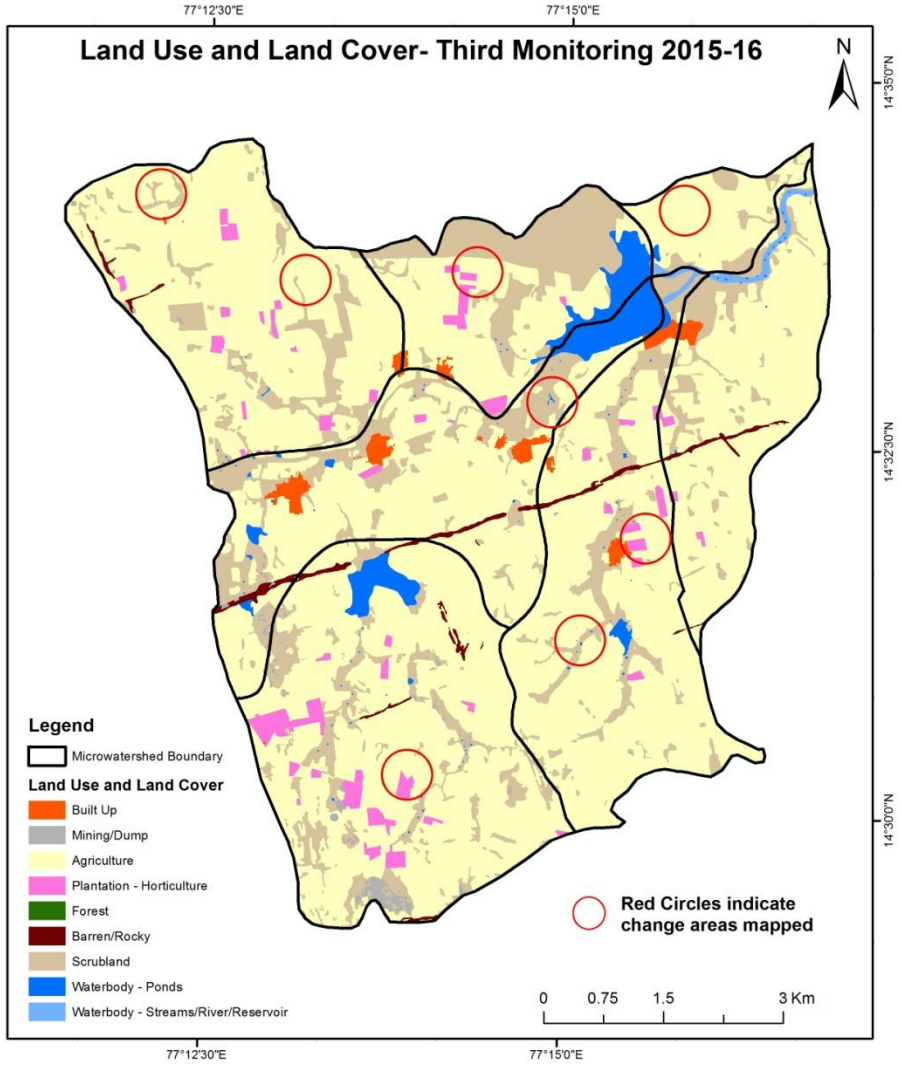




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

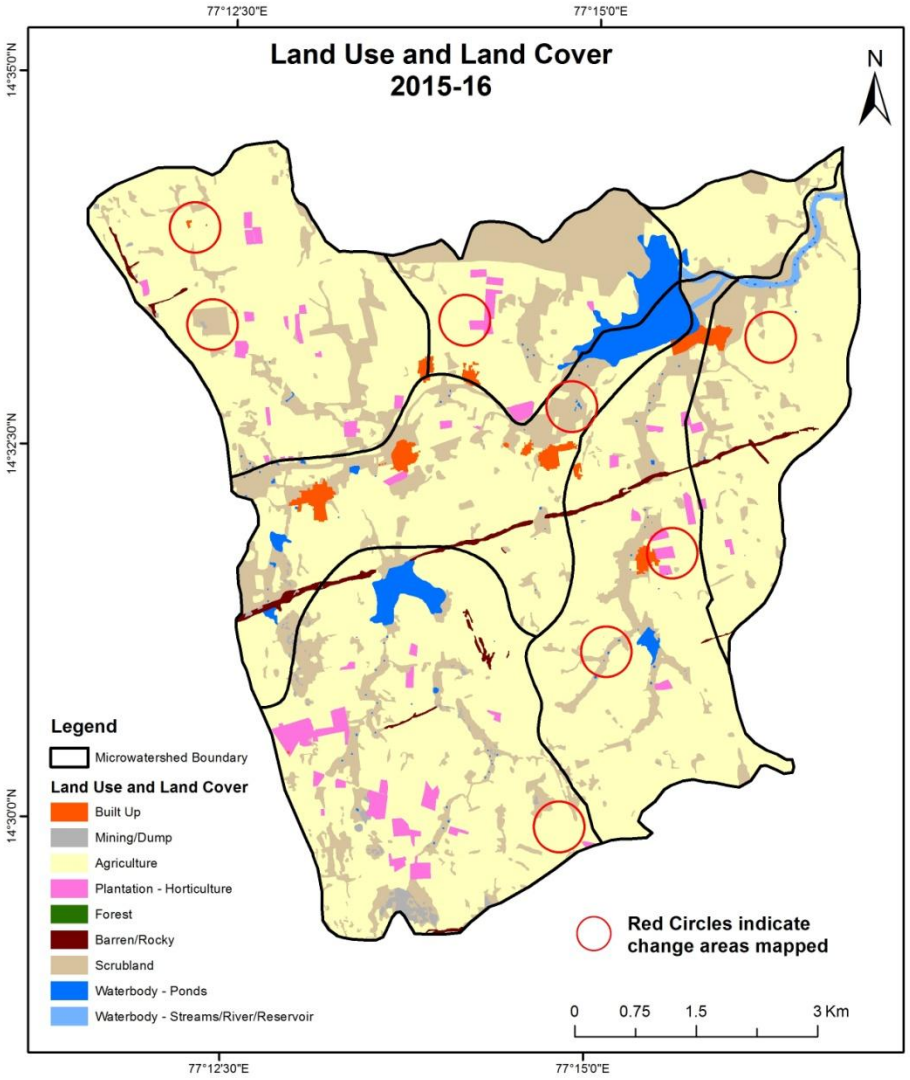
Scale: 1:10000

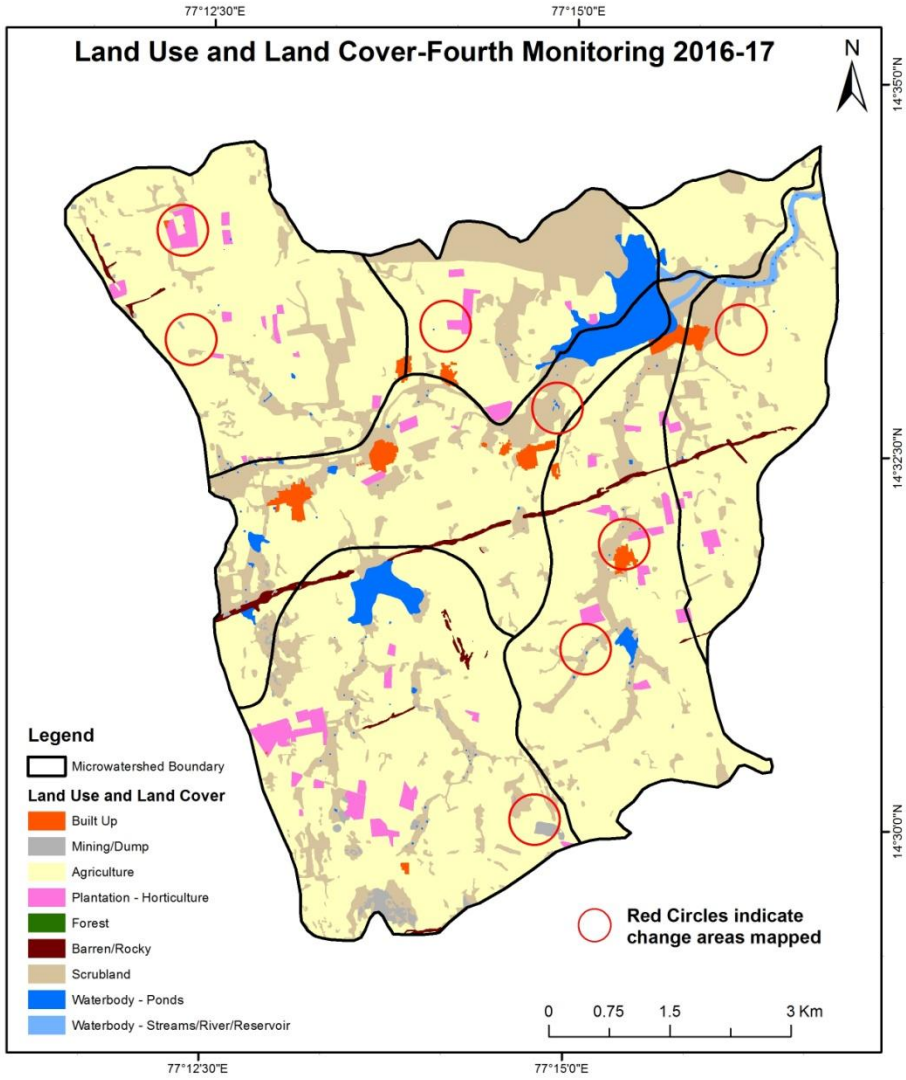




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

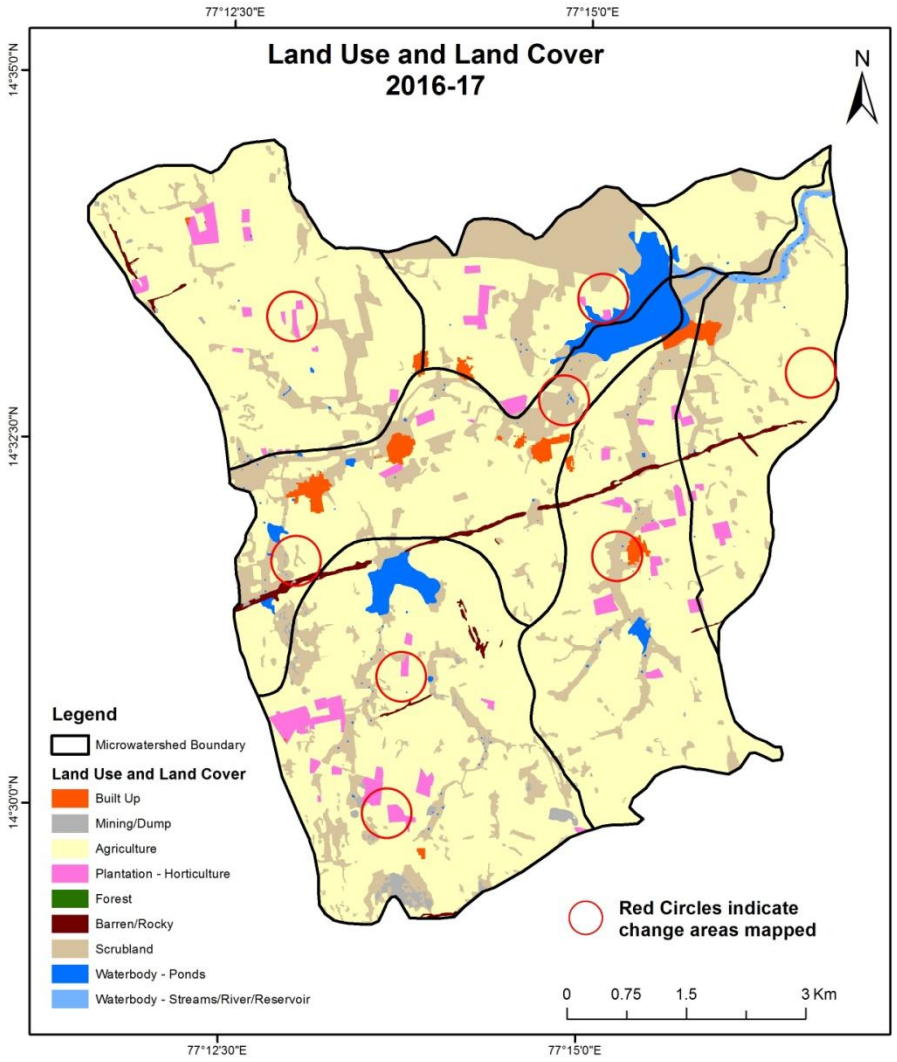
Scale: 1:10000

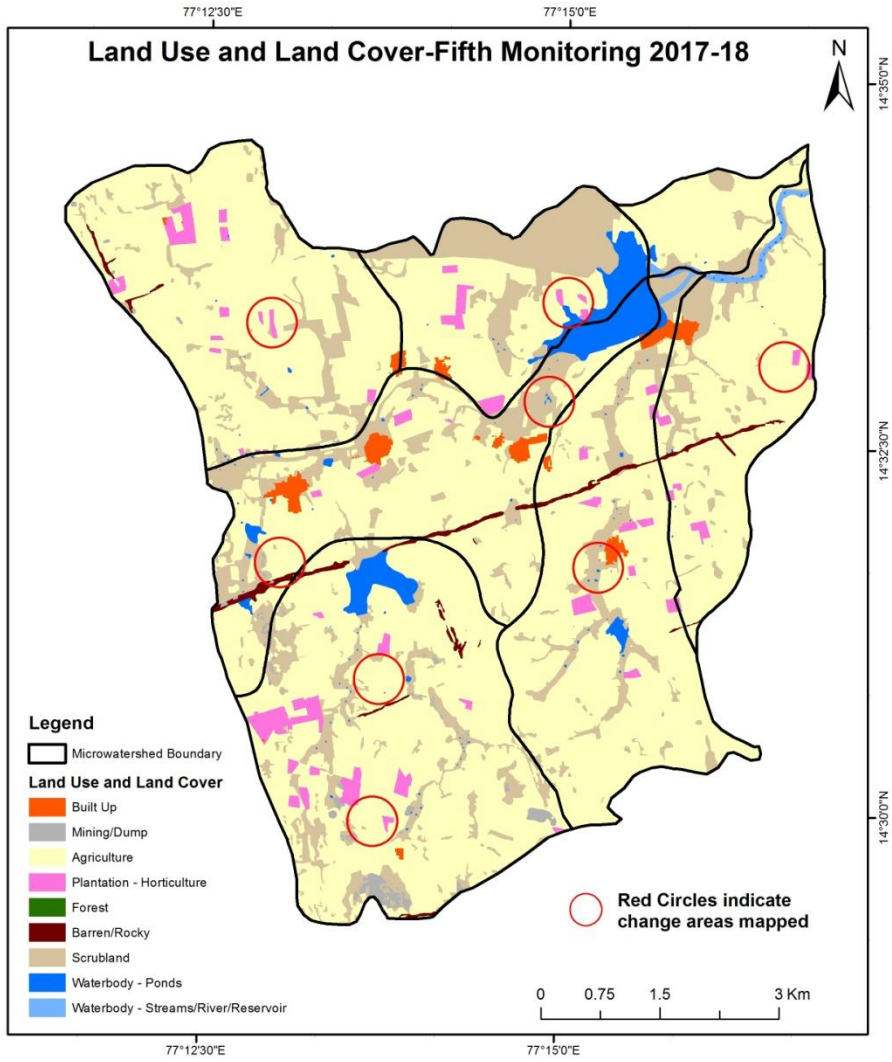




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

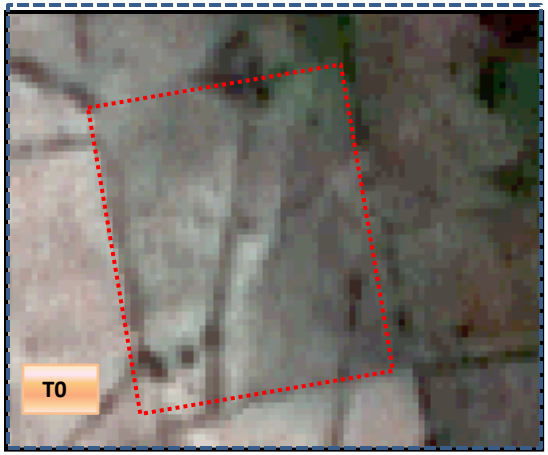
Scale: 1:10000



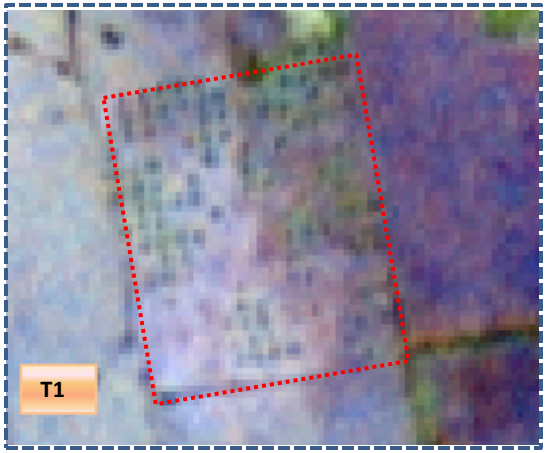


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Plantation

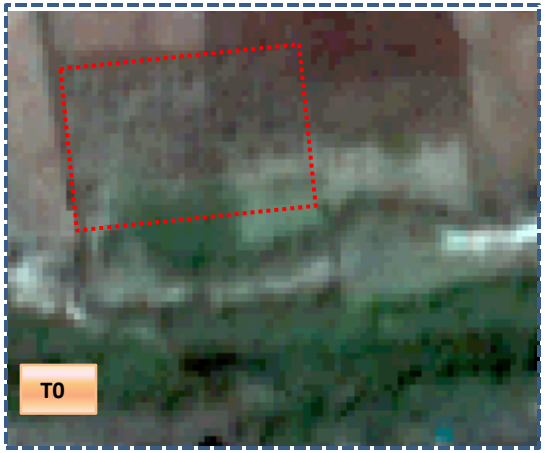


T0: 2009-10

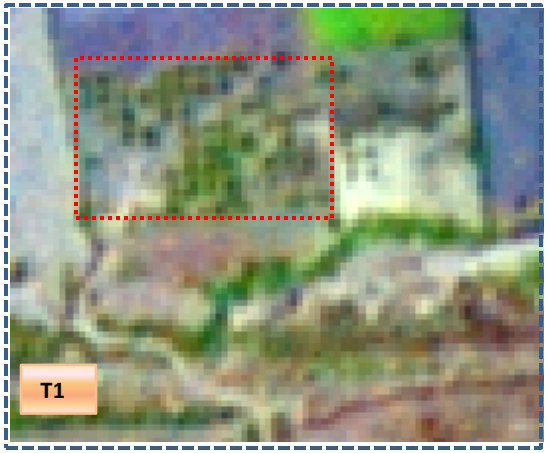


T1: 27 March 2013

Agriculture to Plantation



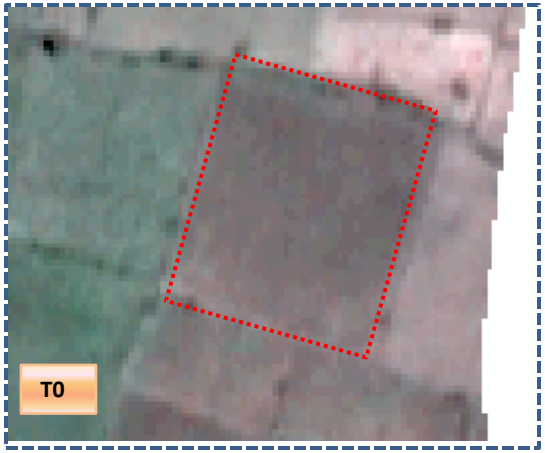
T0: 2009-10



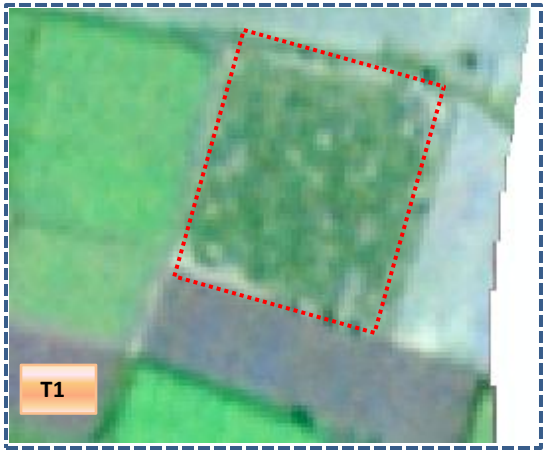
T1: 27 March 2013

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

Agriculture to Plantation

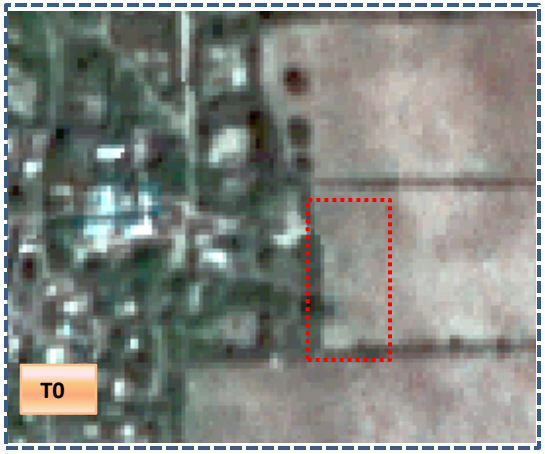


T0: 2009-10

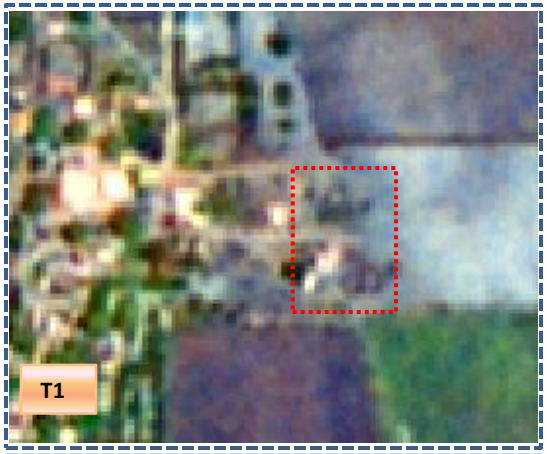


T1: 27 March 2013

Agriculture to Built-up



T0: 2009-10



T1: 27 March 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	62.48										62.48
Mining/dump		13.24									13.24
Agriculture	0.83	0.15	4226.41	47.52							4274.91
Plantation Horticulture			3.09	33.71							36.80
Forest											
Forest Plantation											
Barren Rocky							51.84				51.84
Scrub	0.97	0.22	91.80	2.18				1138.02		4.91	1238.10
Waterbody-Streams/River									29.04		29.04
Waterbody – Ponds										147.30	147.30
Grand Total	**64.29**	**13.61**	**4321.30**	**83.41**			**51.84**	**1138.02**	**29.04**	**152.21**	**5853.72**

- 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 48.50 ha of the agriculture area has decreased and it is converted into built up, mining/dump and plantation in T1.
- In T1 94.89 ha of the agriculture area has increased from plantations 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	64.29										64.29
Mining/dump		13.07								0.54	13.61
Agriculture	0.57	1.23	4112.68	104.81				100.69		1.32	4321.30
Plantation Horticulture			13.15	70.26							83.41
Forest											
Forest Plantation											
Barren Rocky		1.06					50.79				51.84
Scrub		12.79	78.44	7.70				1035.20		3.89	1138.02
Waterbody-Streams/River									28.32	0.72	29.04
Waterbody – Ponds		0.07						0.19		151.95	152.21
Grand Total	**64.85**	**28.23**	**4204.28**	**182.77**			**50.79**	**1136.07**	**28.32**	**158.42**	**5853.72**

- 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 208.62 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation, scrub and water body in T2.
- In T2 91.59 ha of the agriculture area has increased from plantations 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	64.85										64.85
Mining/dump		27.98								0.25	28.23
Agriculture			4184.48	13.10				6.64		0.05	4204.28
Plantation Horticulture	0.11		63.66	118.97						0.03	182.77
Forest											
Forest Plantation											
Barren Rocky							50.79				50.79
Scrub	0.15	0.41	93.59	0.96				1039.09		1.87	1136.07
Waterbody-Streams/River			1.62						26.70		28.32
Waterbody – Ponds										158.42	158.42
Grand Total	**65.11**	**28.39**	**4343.36**	**133.03**			**50.79**	**1045.73**	**26.70**	**160.61**	**5853.72**

- 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 19.80 ha of the agriculture area has decreased and it is converted into plantation, scrubland and water body in T3.
- In T3 158.88 ha of the agriculture area has increased from plantations , 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- 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	65.11										65.11
Mining/dump		28.39									28.39
Agriculture	1.44	6.18	4295.61	39.60						0.52	4343.36
Plantation Horticulture	1.15		25.49	106.33						0.06	133.03
Forest											
Forest Plantation											
Barren Rocky							50.79				50.79
Scrub	0.04	0.12	38.72					1006.27		0.59	1045.73
Waterbody-Streams/River									26.70		26.70
Waterbody – Ponds			0.23							160.39	160.61
Grand Total	**67.75**	**34.69**	**4360.05**	**145.92**			**50.79**	**1006.27**	**26.70**	**161.56**	**5853.72**

• 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 47.74 ha of the agriculture area has decreased and it is converted into built up, mining, plantation and water body in T4.

• In T4 64.44 ha of the agriculture area has increased from plantations , scrubland and water body 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	67.75										67.75
Mining/dump		34.69									34.69
Agriculture			4344.66	15.17						0.22	4360.05
Plantation Horticulture			17.20	128.72							145.92
Forest											
Forest Plantation											
Barren Rocky							50.79				50.79
Scrub	0.22		8.76					996.89		0.40	1006.27
Waterbody-Streams/River									26.70		26.70
Waterbody – Ponds										161.56	161.56
Grand Total	**67.96**	**34.69**	**4370.62**	**143.89**			**50.79**	**996.89**	**26.70**	**162.18**	**5853.72**

• 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 15.40 ha of the agriculture area has decreased and it is converted into plantation and water body in T5.

• In T5 25.96 ha of the agriculture area has increased from plantations 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 12.54 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 46.39, 139.08, 16.69 & 10.56 Hectares From T0-T1,T2-T3, T3-T4 & T4-T5 respectively and overall increase of 212.73 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 241.21 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (4) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (5) verified from the portal.