MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

KURNOOL -03/2009-10
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

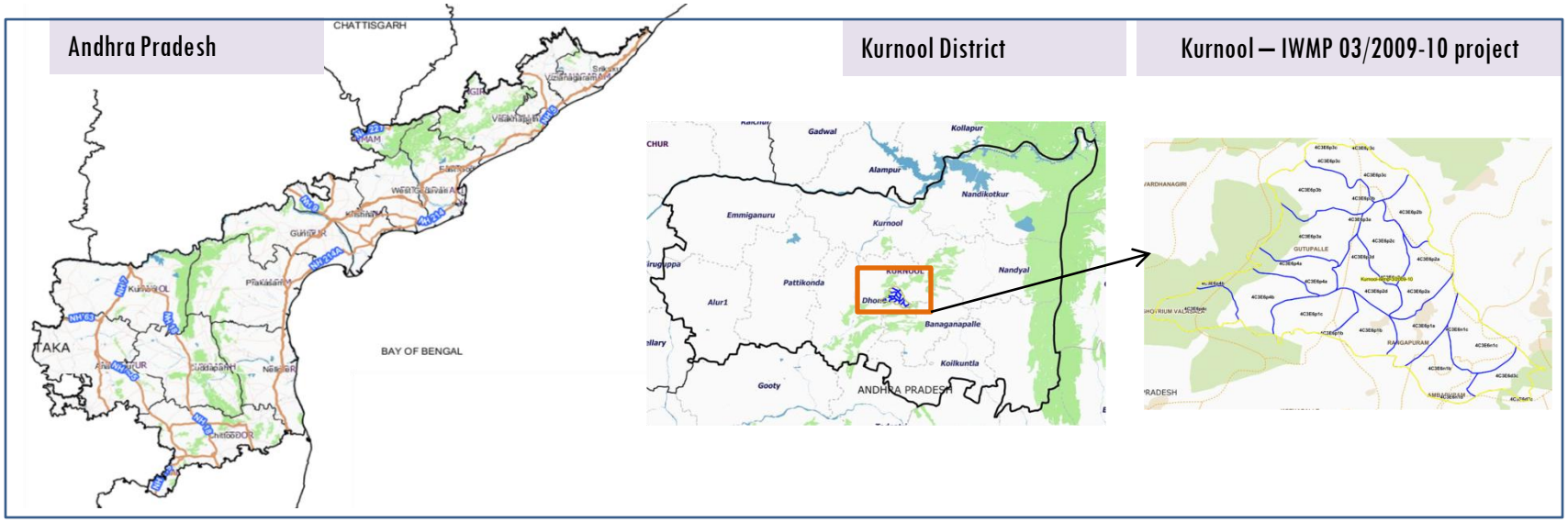
CONTENTS

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-03/2009-10, Kurnool District of Andhra Pradesh. The total geographical area of the project is 6,689 ha. It comprises of 16 micro watersheds.
- In the project area 202 Drishti photos were uploaded showing 18 check dams, 55 Farm ponds, 25 Horticulture and remaining showing others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 55 new farm ponds or dug out pits with 2.01 ha increase in the area.
- Major percentage i.e. 62.11% is covered by the agriculture, 19.54% is covered by Scrub land, 14.77 % is covered by forest and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-03/2009-10
DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Bethamcherla Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 6,689 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



- The climate is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).
- The average annual rainfall of the district is 665.5mm, which ranges from nil rainfall in January and December to 139.6 mm in September. August and September are the wettest months. The mean seasonal rainfall distribution is 459.1mm in southwest monsoon (June September), 133.7mm in northeast monsoon (Oct-Dec), 1.9 mm rainfall in Winter (Jan Feb) and 70.8 mm in summer (March–May).

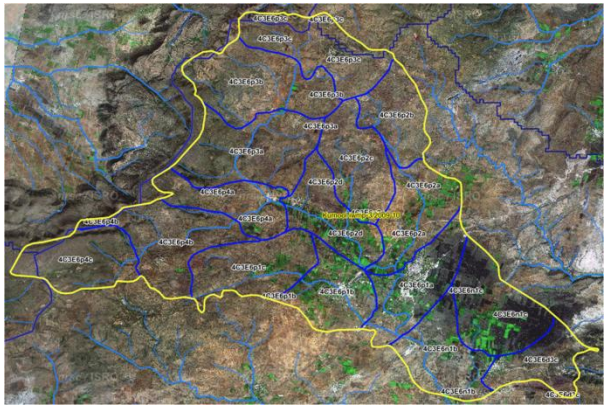
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			26-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			26-Mar-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	195
4	Detailed Project Report		

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



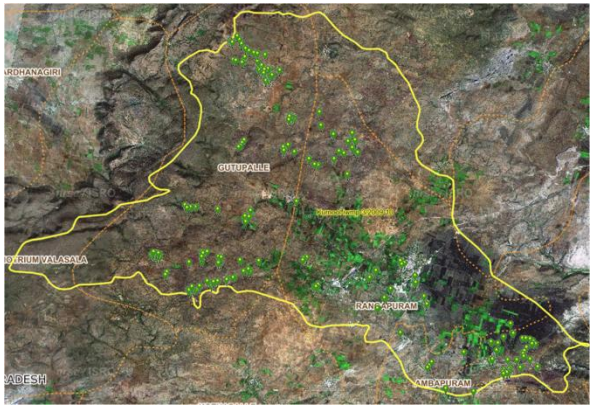
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

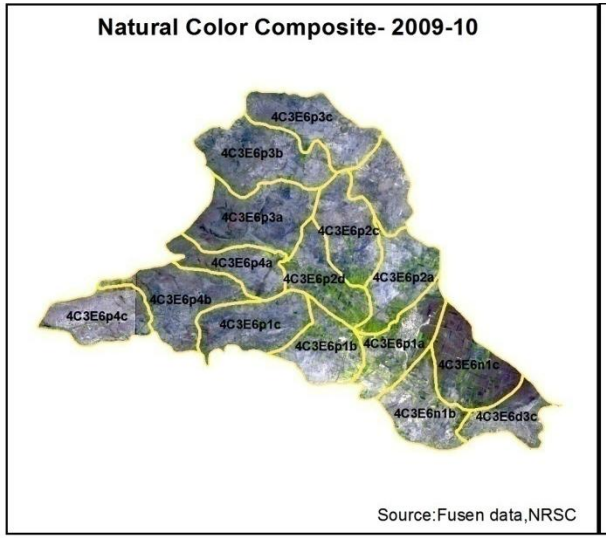
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Block Planting	4	4
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	15	14
11	Check dams	110	90
12	Nallah Bunds/Drainage treatment	115	109
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	49	47
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	39	35
	TOTAL	**332**	**302**

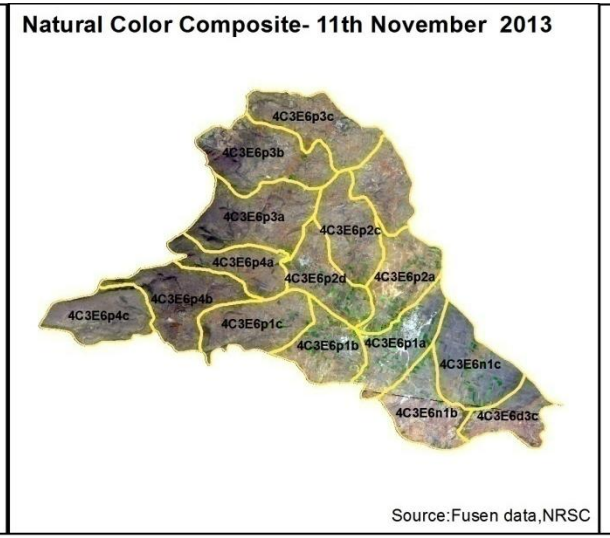
MONITORING IN THE PROJECT AREA

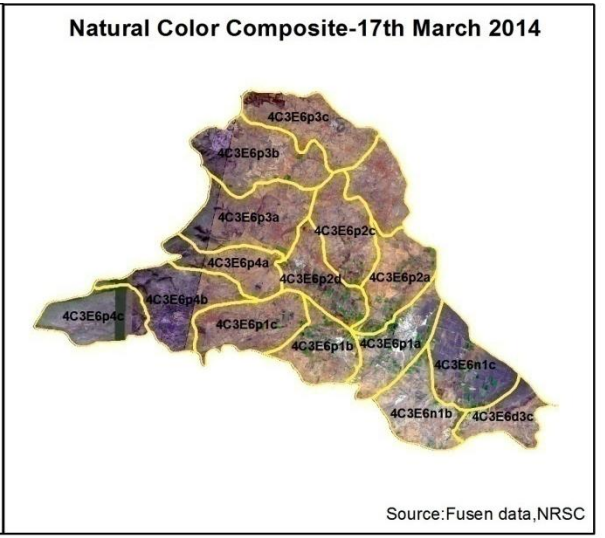
Site Wise Changes in the Project

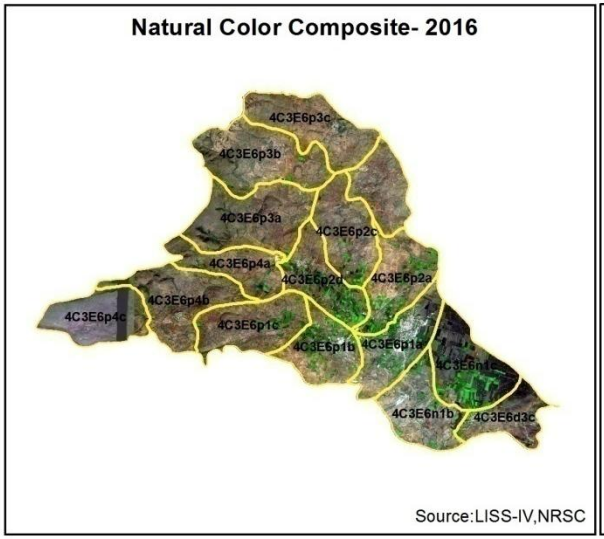
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

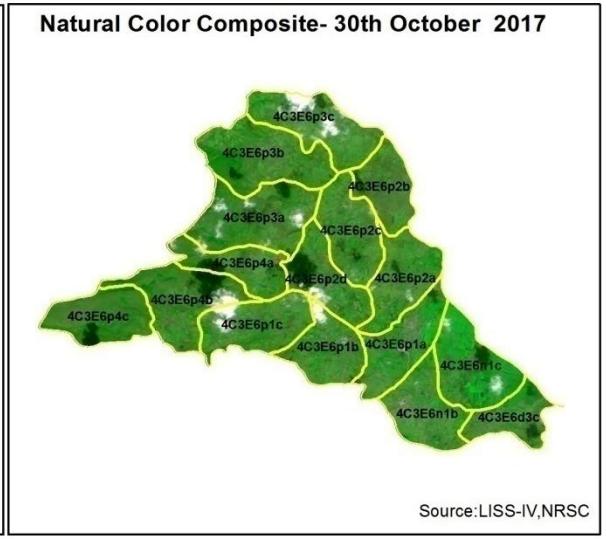
Natural Color Composite – 2009-10 to 2017-18



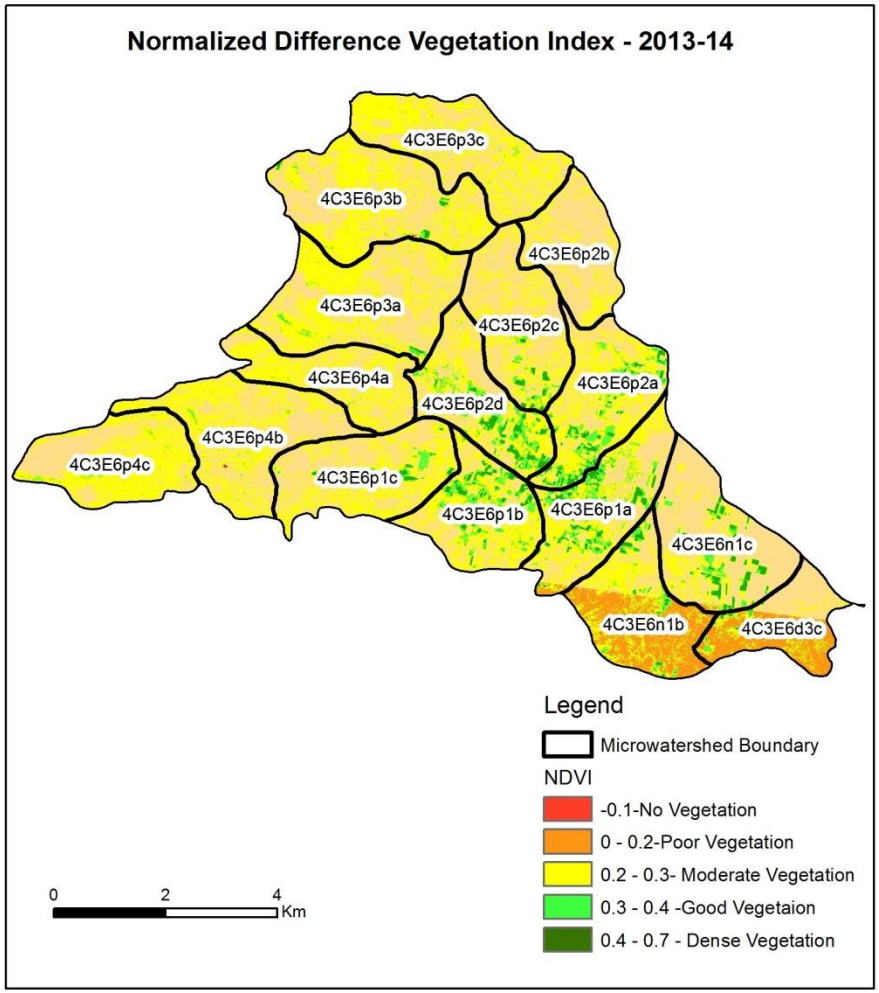




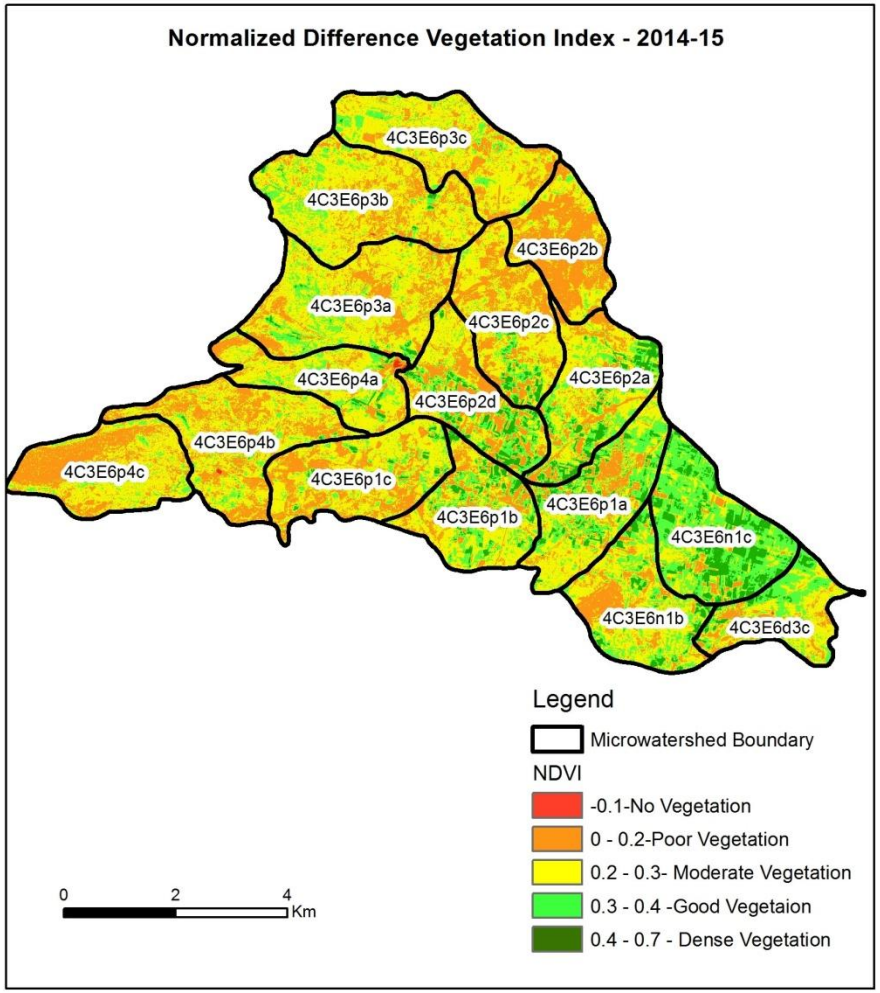




Changes in Vegetation Cover

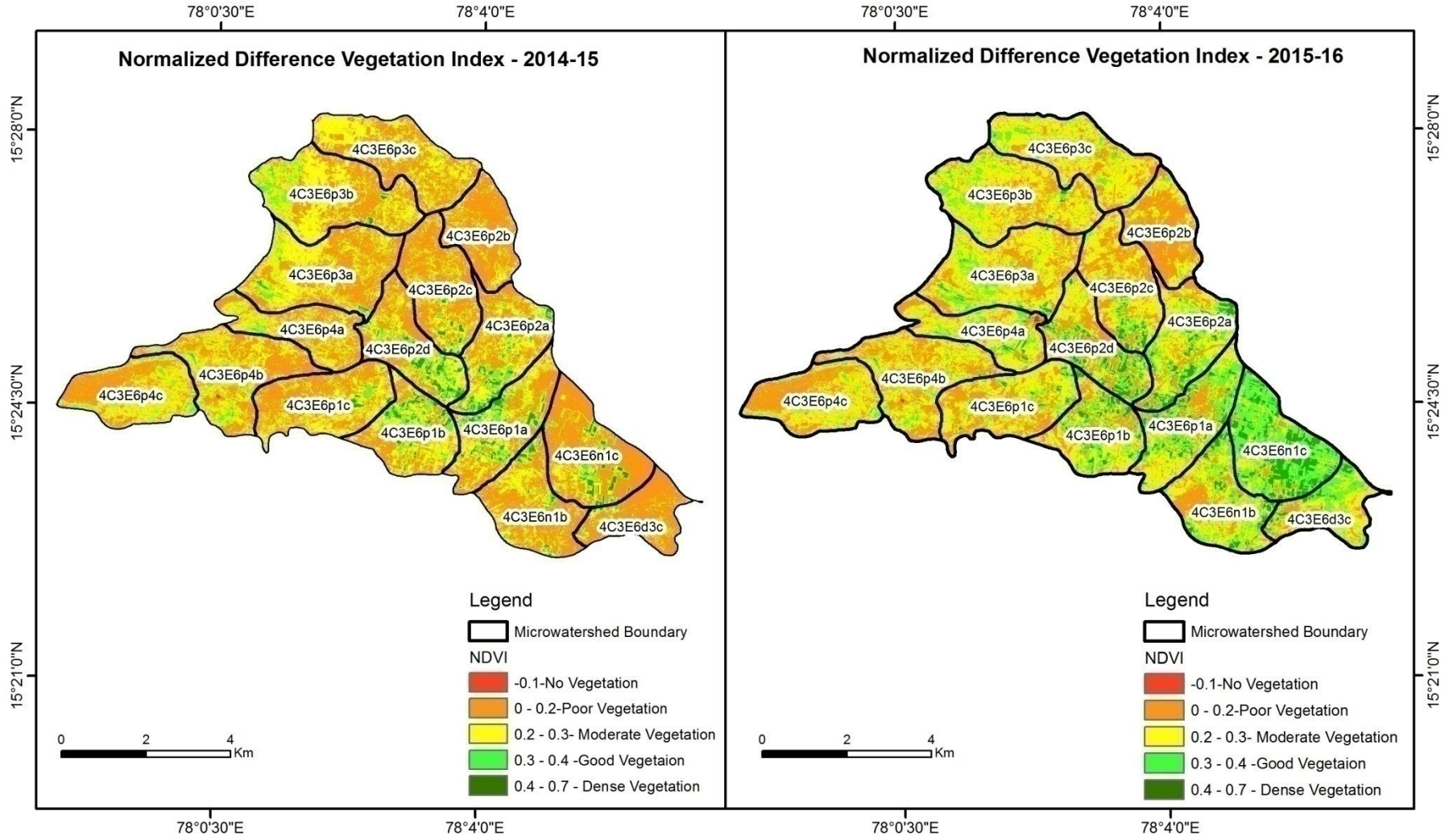


NDVI (2013-14)



NDVI (2014-15)

Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

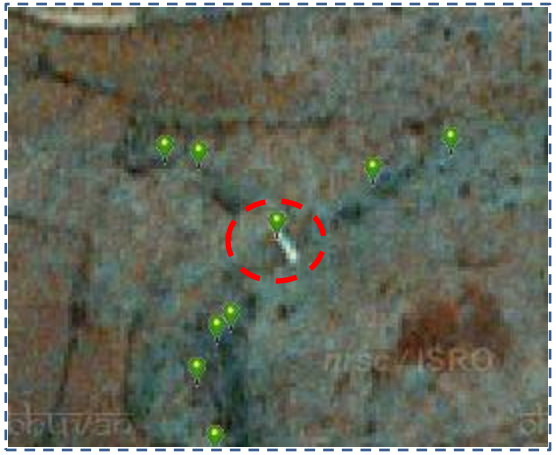
Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-03/2009-10

T0:2009-10

T1: 11 November 2013

Drishti Sl no. 13068 MWS :4C3E6p1c

Farm pond



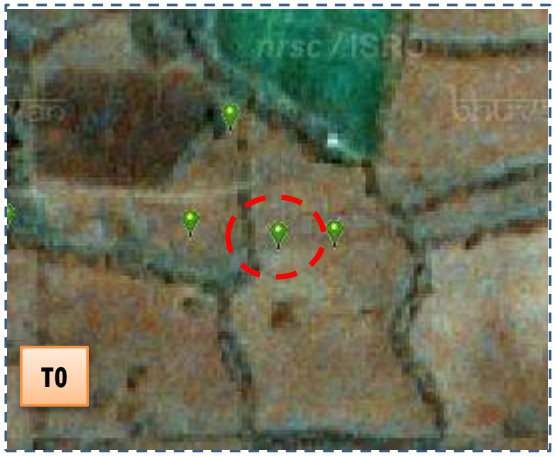
T0:2009-10

T1: 11 November 2013

Drishti Sl no.162388 MWS : 4C3E6p1c

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-03/2009-10



T0: 2009-10

T1: 11 November 2013

Drishti Sl no. 161464 MWS :4C3E6p1c

Rock fill Dam

T0: 2009-10

T1: 11 November 2013

Drishti Sl no. 568675 MWS :4C3E6p1c

Rock fill Dam

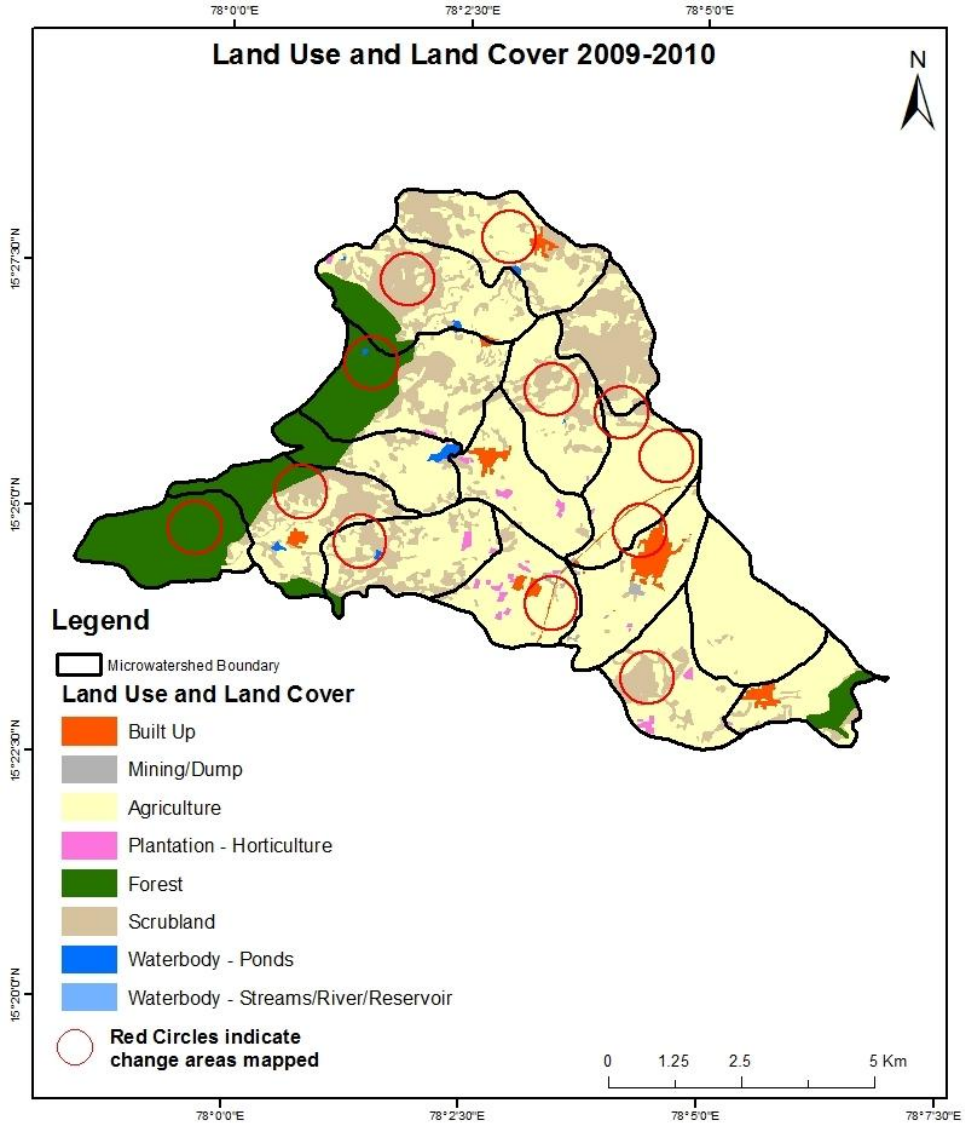
MONITORING IN THE PROJECT AREA

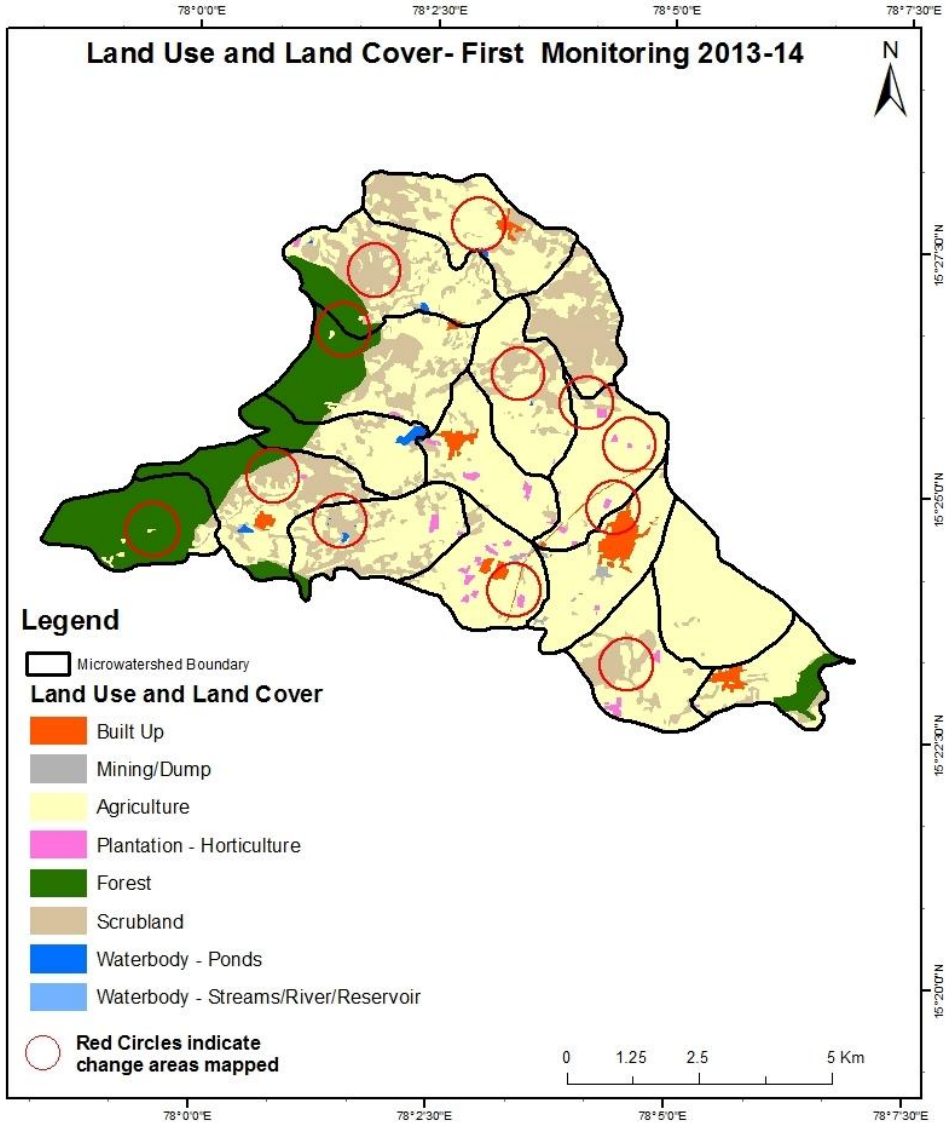
Land use and Land cover Changes in the Project

- 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)

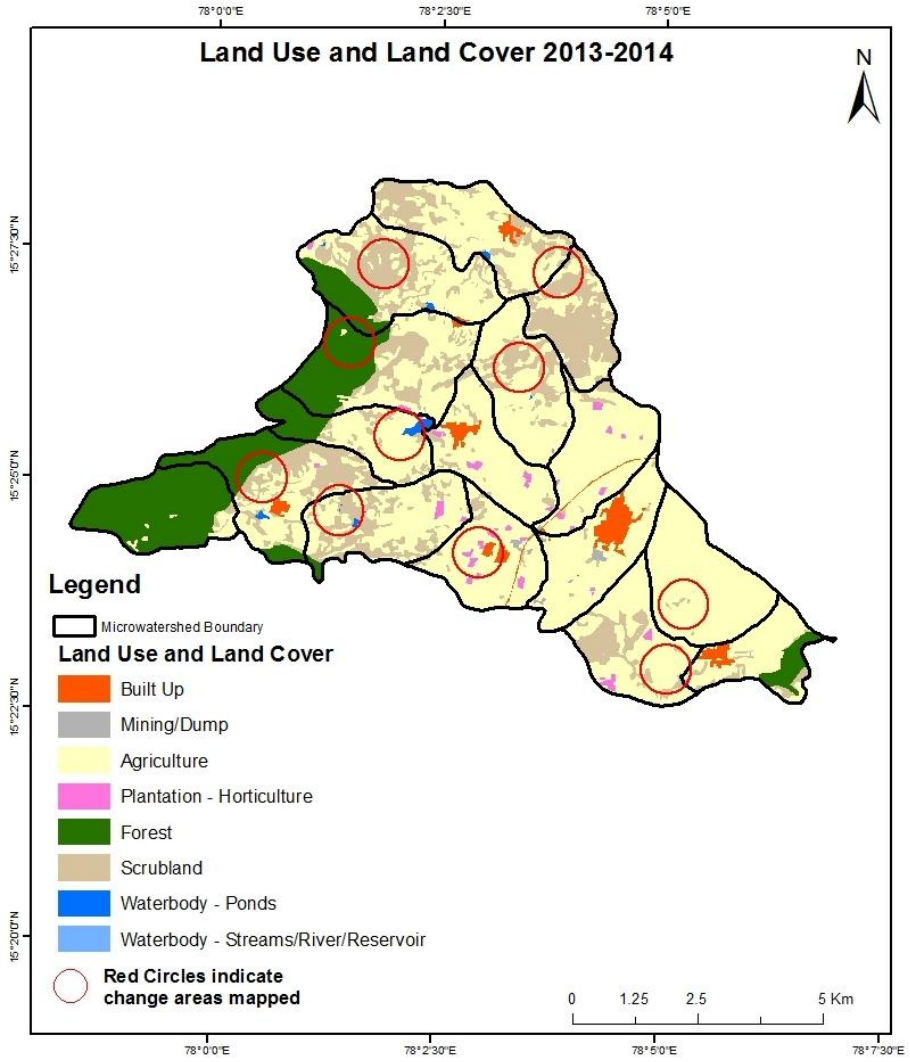
Scale: 1:10000

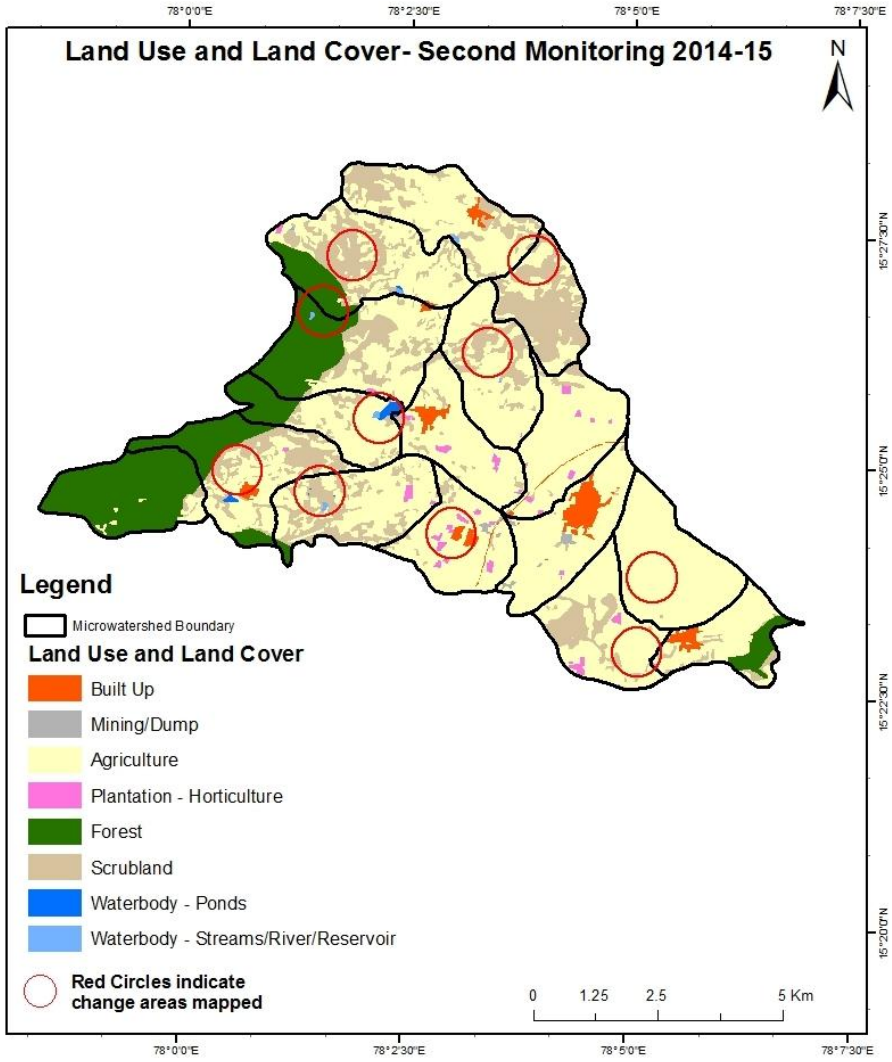




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

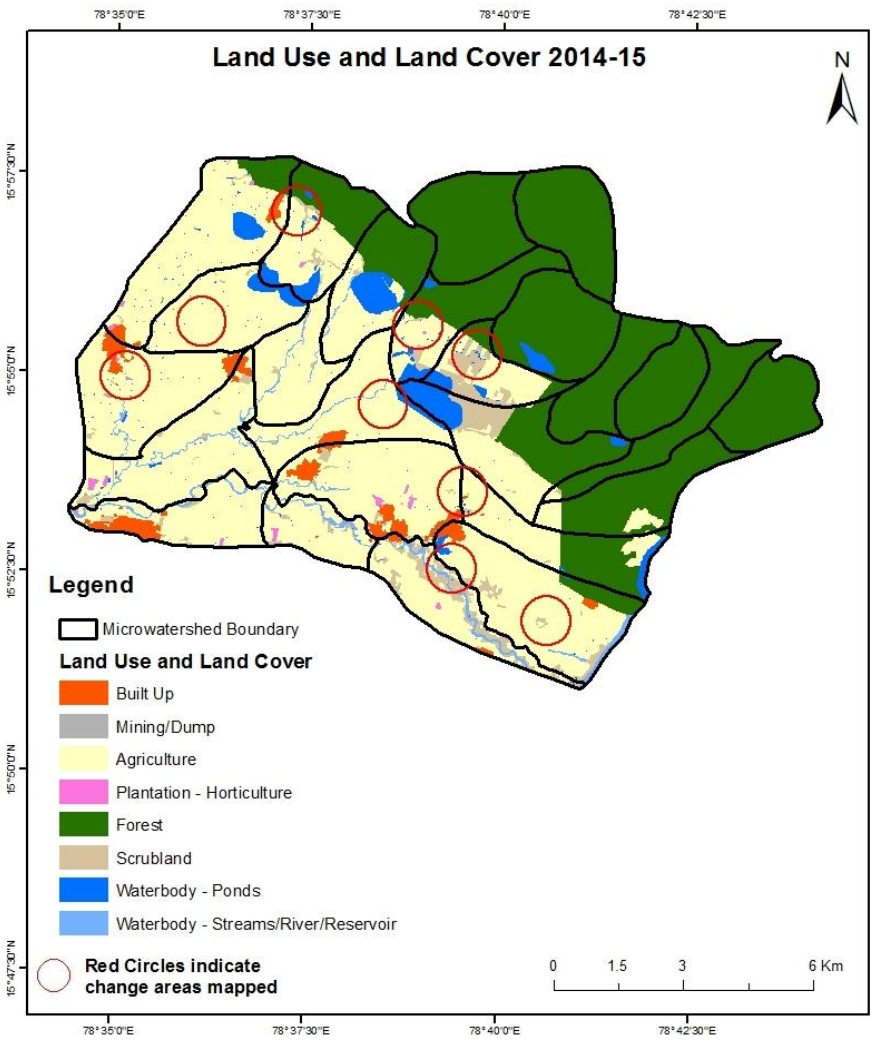
Scale: 1:10000

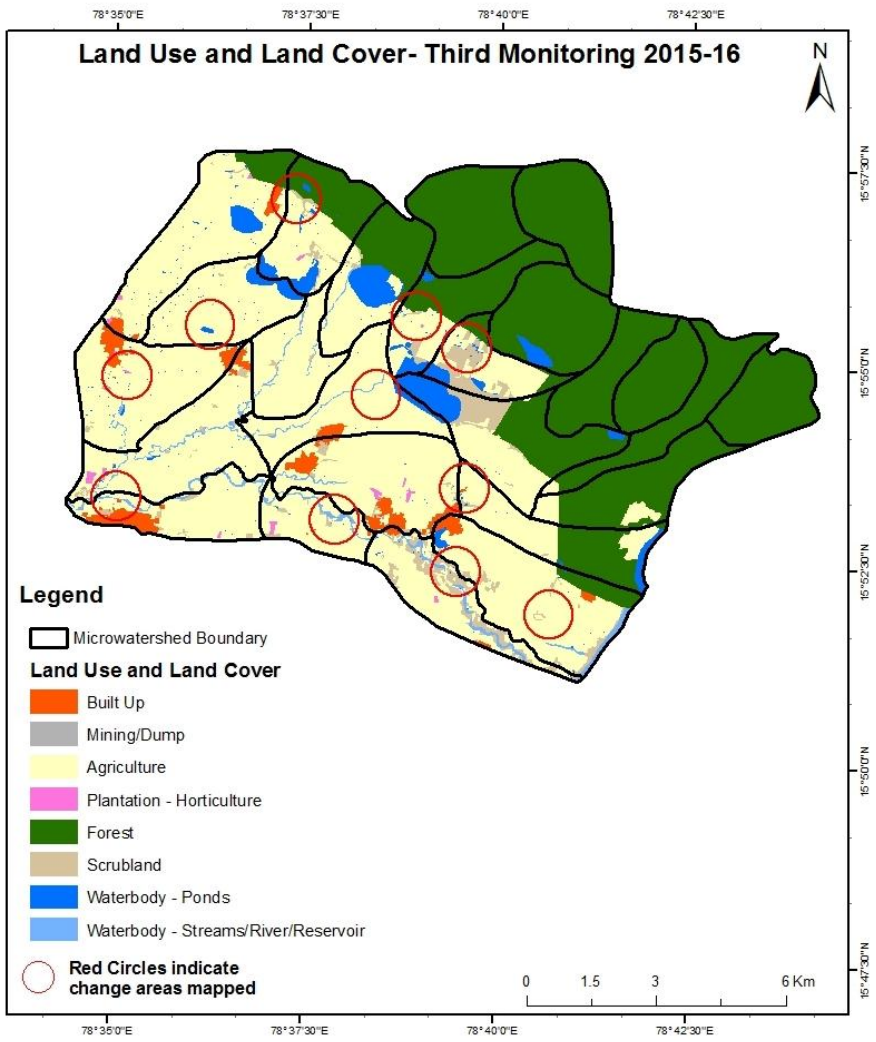




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

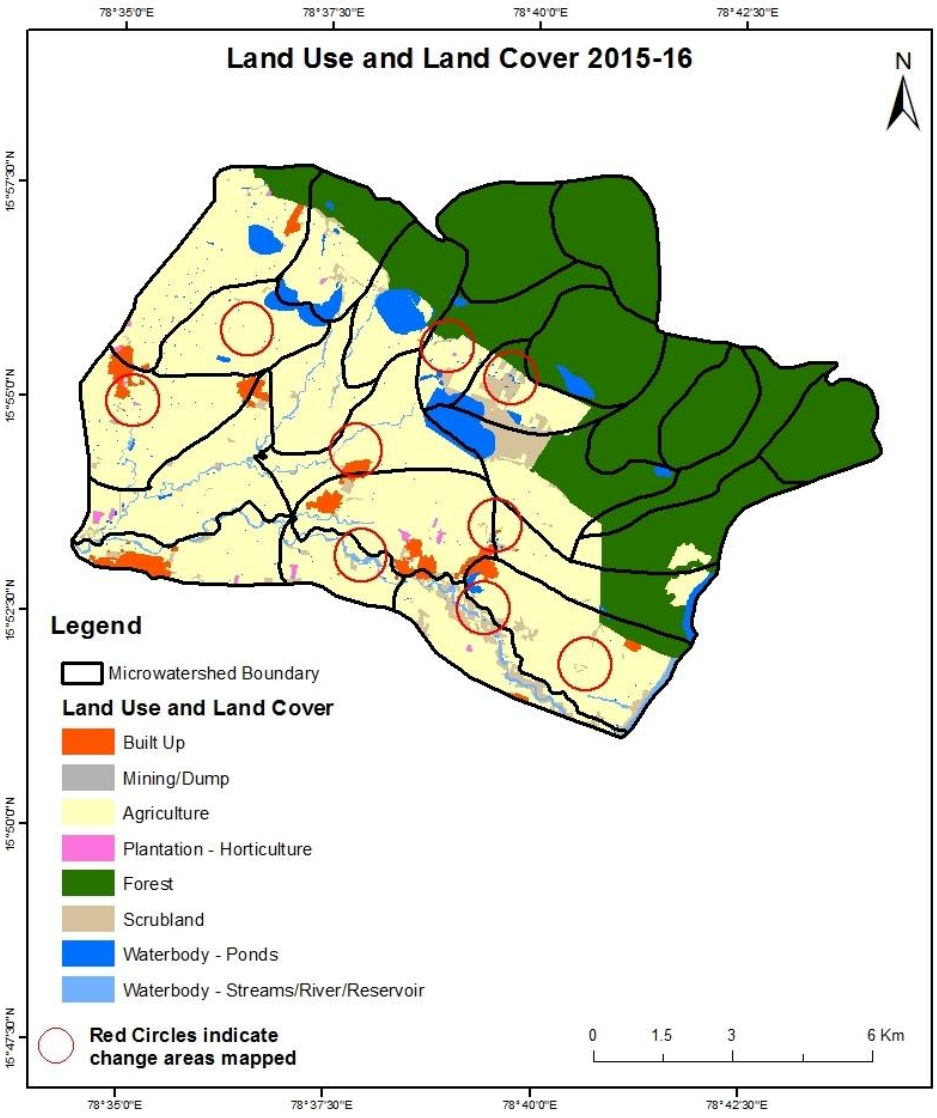
Scale: 1:10000

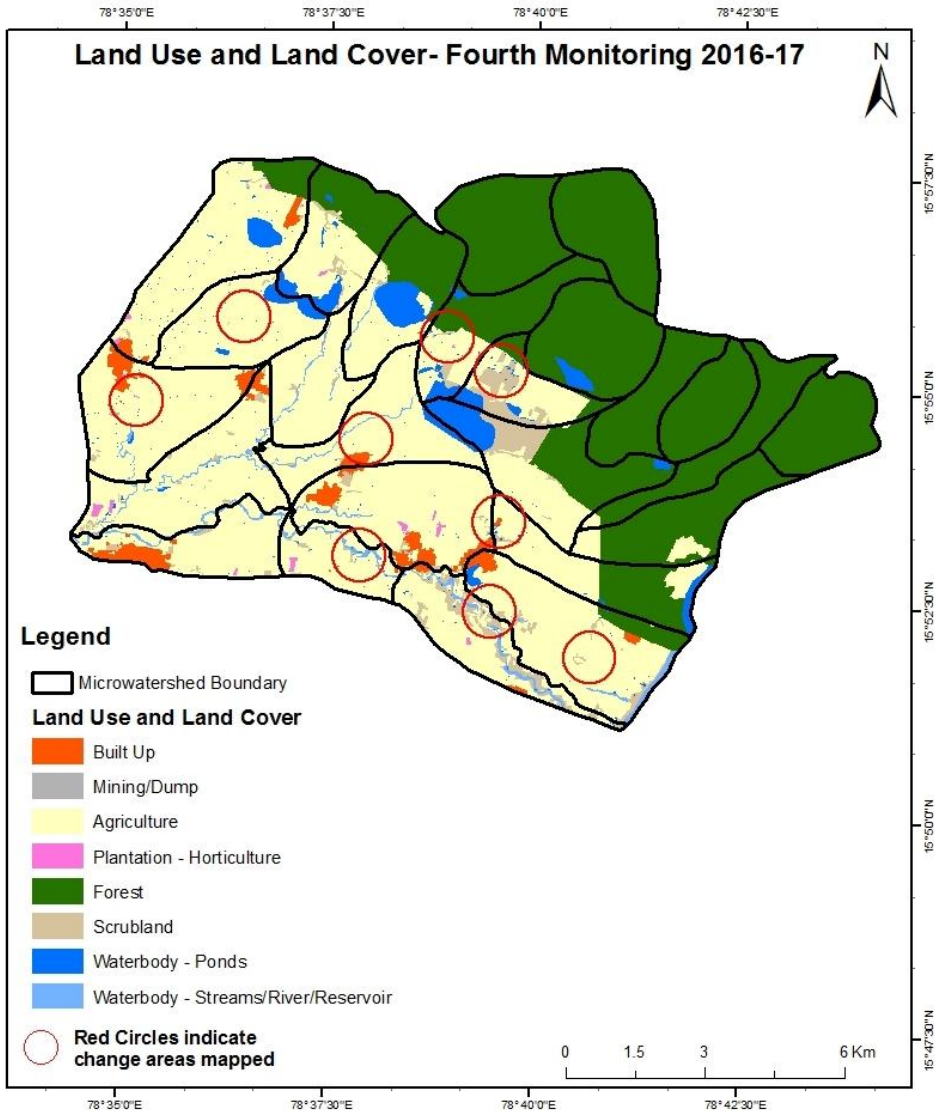




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

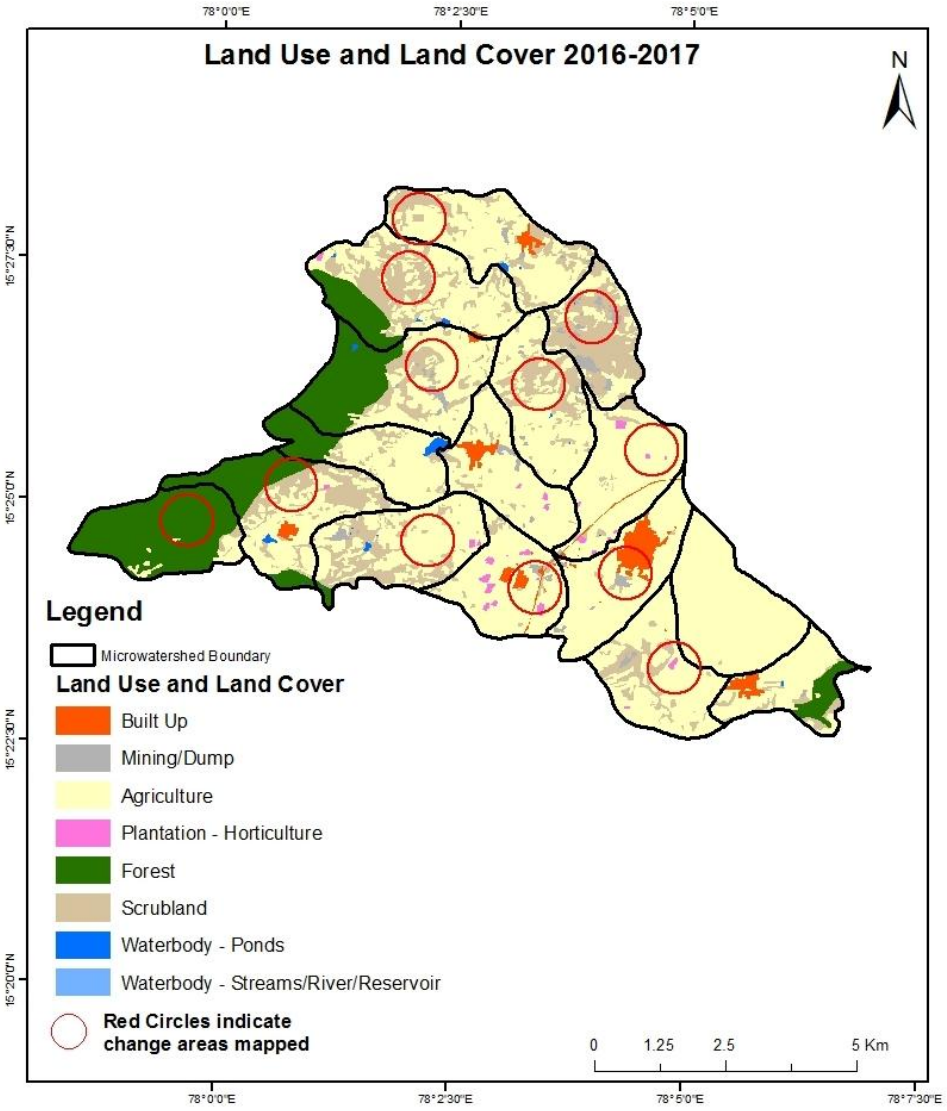
Scale: 1:10000

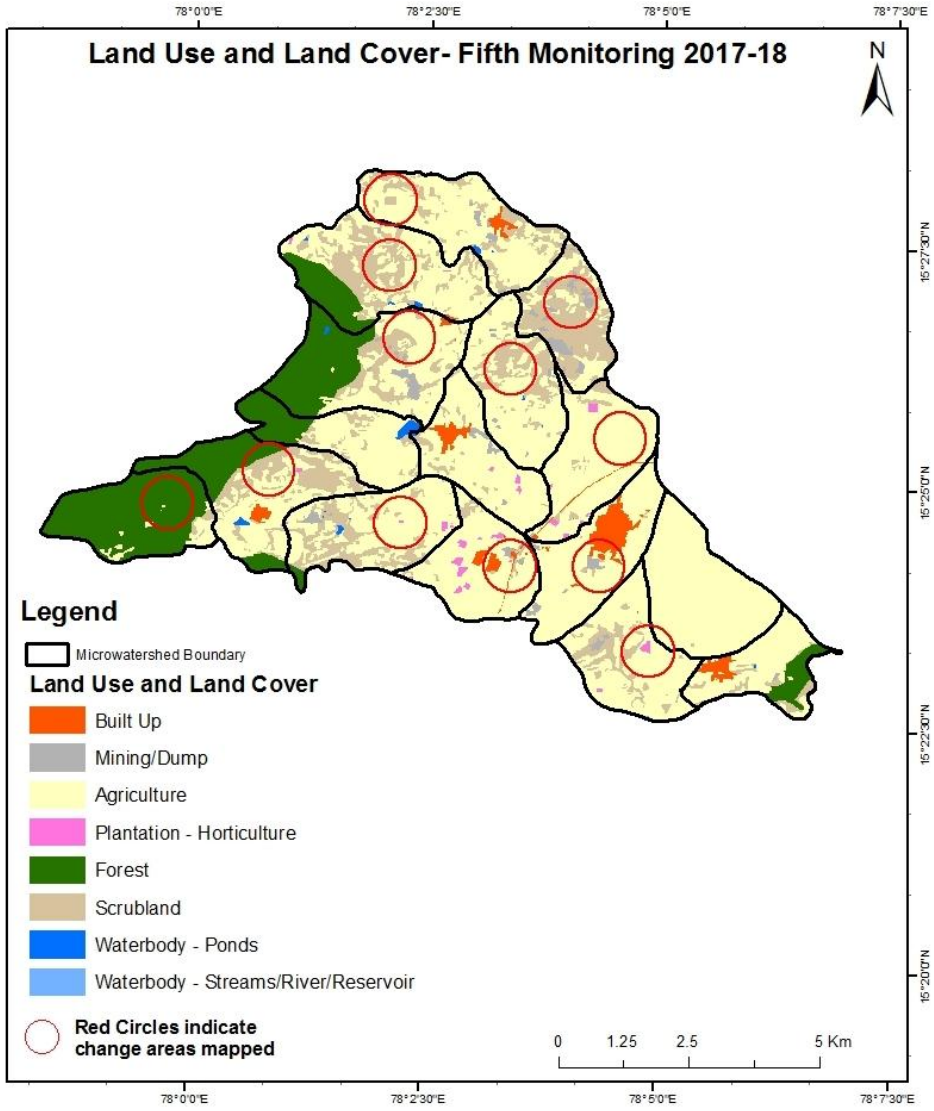




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

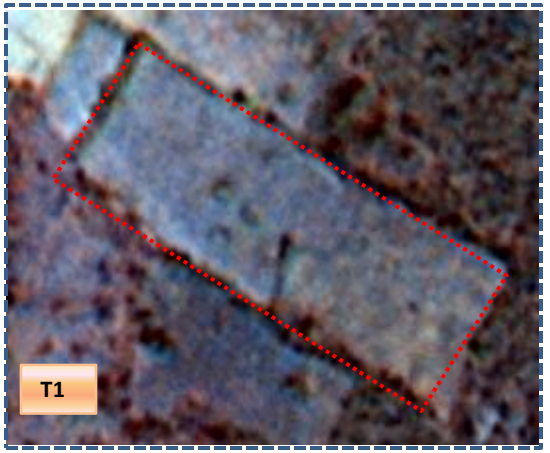




Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

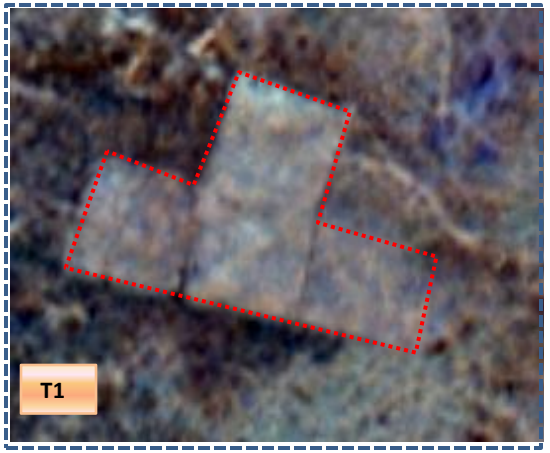
T0: 2009-10



T1: 11 November 2013

Scrub to Agriculture

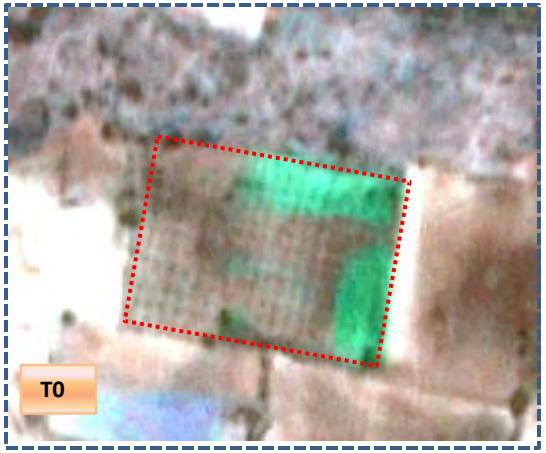
T0: 2009-10



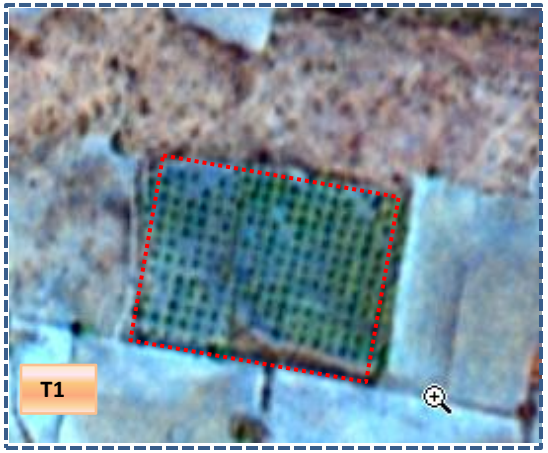
T1: 11 November 2013

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

Agriculture to Plantation

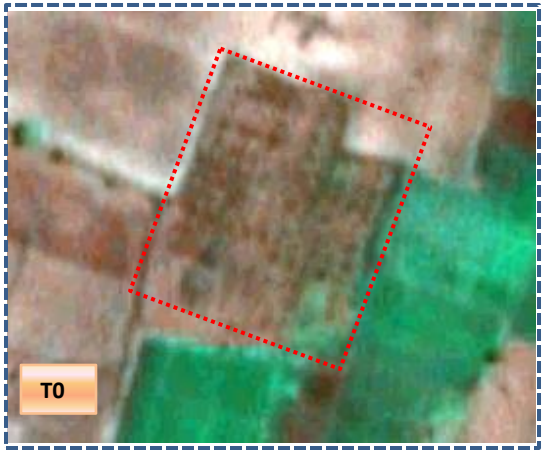


T0: 2009-10

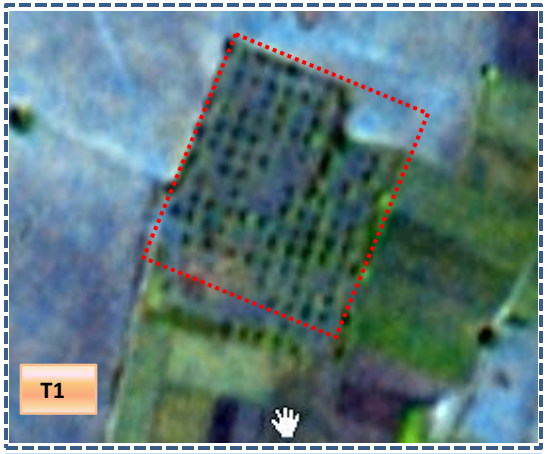


T1: 11 November 2013

Agriculture to Plantation



T0: 2009-10



T1: 11 November 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	143.84										143.84
Mining/dump		15.37									15.37
Agriculture			4259.05	15.33				0.53			4274.90
Plantation Horticulture			2.18	45.46							47.64
Forest			8.32		1032.29						1040.61
Forest Plantation											
Barren Rocky											
Scrub			28.98					1395.99		0.26	1425.24
Waterbody-Streams/River									0.56		0.56
Waterbody – Ponds			1.13							24.24	25.37
Grand Total	**143.84**	**15.37**	**4299.66**	**60.79**	**1032.29**			**1396.52**	**0.56**	**24.50**	**6973.52**

- 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 15.86 ha of the agriculture area has decreased and it is converted into plantation and scrubland in T1.
- In T1 40.61 ha of the agriculture area has increased from plantation, forest, scrubland and water body up 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	143.84										143.84
Mining/dump		15.37									15.37
Agriculture			4294.50					4.03	1.13		4299.66
Plantation Horticulture				60.79							60.79
Forest					1032.29						1032.29
Forest Plantation											
Barren Rocky											
Scrub			98.67					1297.85			1396.52
Waterbody-Streams/River									0.56		0.56
Waterbody – Ponds									9.73	14.78	24.50
Grand Total	**143.84**	**15.37**	**4393.18**	**60.79**	**1032.29**			**1301.87**	**11.41**	**14.78**	**6973.52**

- 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 5.16 ha of the agriculture area has decreased and it is converted into scrubland and water body in T2.
- In T2 98.67 ha of the agriculture area has increased from scrubland up 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	143.84										143.84
Mining/dump		15.37									15.37
Agriculture	4.43	21.31	4266.91	4.07				95.16		1.29	4393.18
Plantation Horticulture			25.43	35.35							60.79
Forest					1032.29						1032.29
Forest Plantation											
Barren Rocky											
Scrub	0.17	5.70	129.45					1166.52		0.04	1301.87
Waterbody-Streams/River									2.27	9.14	11.41
Waterbody – Ponds										14.78	14.78
Grand Total	**148.43**	**42.38**	**4421.80**	**39.42**	**1032.29**			**1261.68**	**2.27**	**25.25**	**6973.52**

- 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 126.26 ha of the agriculture area has been decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T3.
- In T3 154.88 ha of the agriculture area has been increased from plantation and scrubland from 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	148.23	0.20									148.43
Mining/dump		41.97	0.41								42.38
Agriculture	3.13	20.37	4383.18	8.54	0.50			5.73		0.35	4421.80
Plantation Horticulture			12.42	27.00							39.42
Forest			6.11		1025.69					0.49	1032.29
Forest Plantation											
Barren Rocky											
Scrub		28.19	32.83					1200.57		0.08	1261.68
Waterbody-Streams/River			1.71						0.56		2.27
Waterbody – Ponds			0.97							24.28	25.25
Grand Total	**151.36**	**90.73**	**4437.63**	**35.54**	**1026.19**			**1206.30**	**0.56**	**25.20**	**6973.52**

- 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 38.62 ha of the agriculture area has been decreased and it is converted into built-up, mining/dump, plantation, forest, scrubland and water body of T4.
- In T4 54.04 ha of the agriculture area has been increased from mining/dump, plantation, forest, scrubland and water body from 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	151.36										151.36
Mining/dump		90.73									90.73
Agriculture	0.57	10.06	4425.13	1.38				0.50			4437.63
Plantation Horticulture			4.85	30.69							35.54
Forest			3.47		1022.73						1026.19
Forest Plantation											
Barren Rocky											
Scrub		6.73	59.82					1139.75			1206.30
Waterbody-Streams/River										0.56	0.56
Waterbody – Ponds										25.20	25.20
Grand Total	**151.93**	**107.52**	**4493.26**	**32.07**	**1022.73**			**1140.24**		**25.76**	**6973.52**

- 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 12.50 ha of the agriculture area has been decreased and it is converted into built-up, mining/dump, plantation and scrubland of T5.
- In T5 68.14 ha of the agriculture area has been increased from plantation, forest and scrubland from 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 decrease of 0.16 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 24.76, 93.51, 28.62, 15.83 & 55.63 Hectares From T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 218.36 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 284.99 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (15) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (14) verified from the portal.