

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -06/2009-10
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

- **EXECUTIVE SUMMARY**

01. STUDY AREA
02. SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS
03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

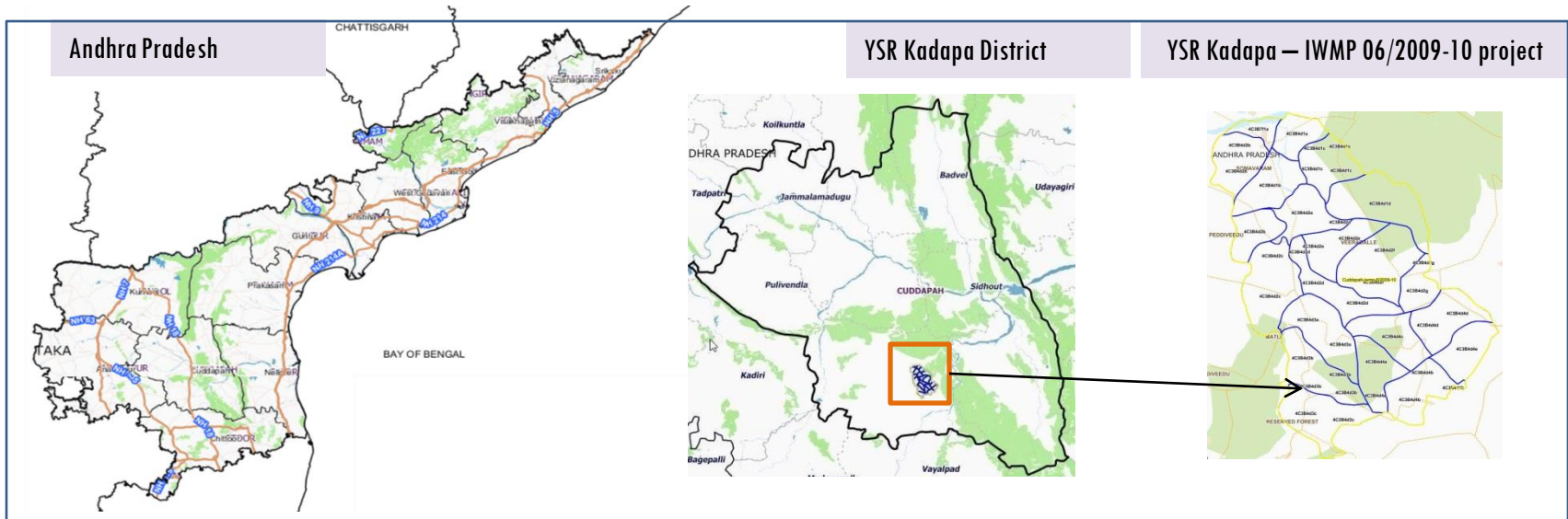
E X E C U T I V E S U M M A R Y

- 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-06/2009-10, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 10,041 ha. It comprises of 22 micro watersheds.
- In the project area 51 Drishti photos were uploaded showing 1 check dams/Rock fill dam, 13 Land developments of afforestation, horticulture and bund plantation of teak etc, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and 1 check dams and drainage treatments with 10.71 ha increase in the area.
- Major percentage i.e. 40.13 % is covered by the agriculture, 26.29 % is covered by scrubland, 17.58 % is covered by forest area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-06/2009-10

DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Veeraballe Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 10,041 ha. It comprises of 22 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



- YSR Kadapa 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 38 °C range and it reaches around 44 °C to 45 °C .
- The average annual rainfall of the YSR Kadapa District is 710 mm, which ranges from nil rainfall in January to 137 mm in October. October is the wettest month of the year. The mean seasonal rainfall distribution is 402.4 mm in southwest monsoon (June - September), 239.1 mm in northeast monsoon (October – December), distribution of rainfall in season wise 56.7 % in south west monsoon, 33.7 % in north east monsoon period.

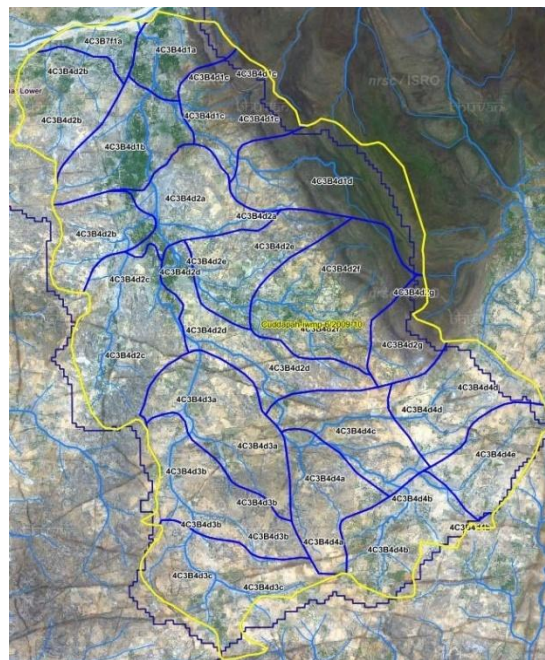
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			30-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			30-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	51
4	Detailed Project Report		

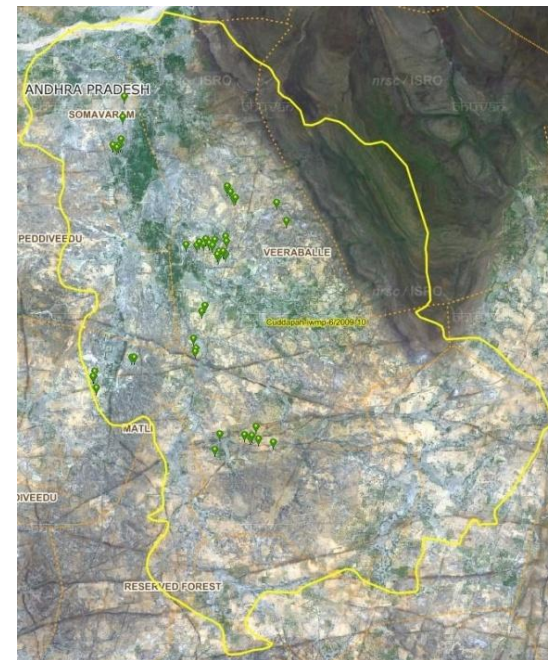
Natural Color Composite overlaid with Project boundaries and high detail stream network



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	0	0
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	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	1	1
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	17	13
14	Lm (fodder development, varmi compost)	21	14
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	36	23
	TOTAL	75	51

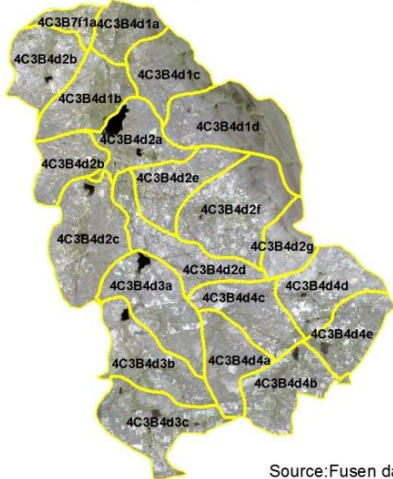
MONITORING IN THE PROJECT AREA

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



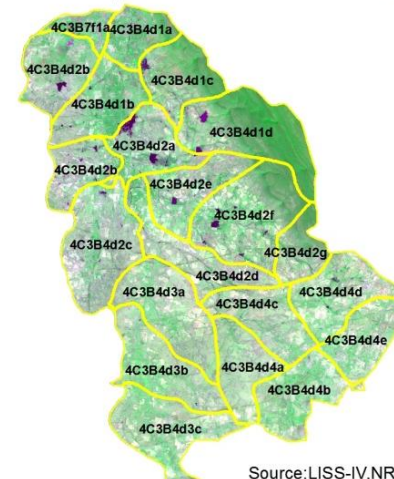
Source:Fusen data,NRSC

Natural Color Composite-26th February 2013



Source:LISS-IV,NRSC

Natural Color Composite-13th December 2015



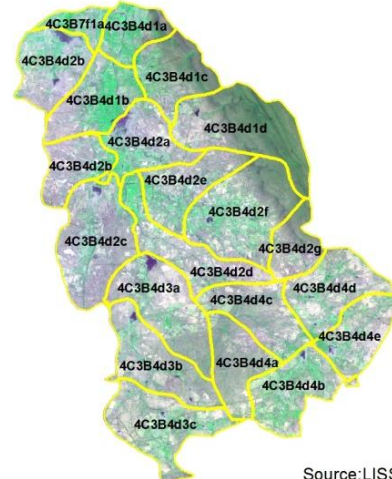
Source:LISS-IV,NRSC

Natural Color Composite- 18th October 2016



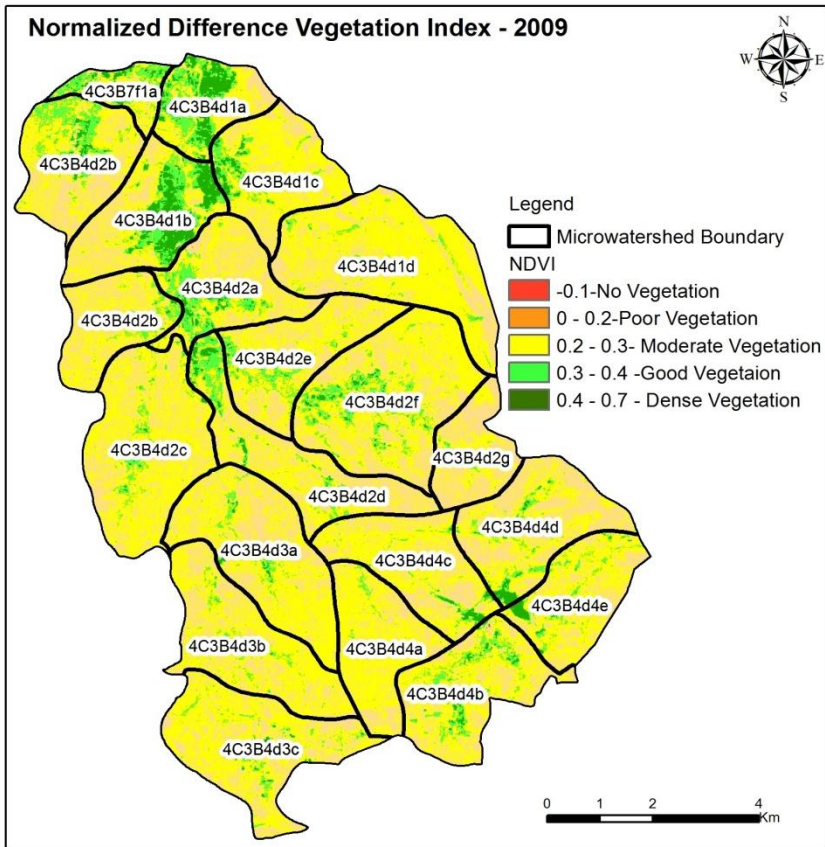
Source:LISS-IV,NRSC

Natural Color Composite- 30th March 2018

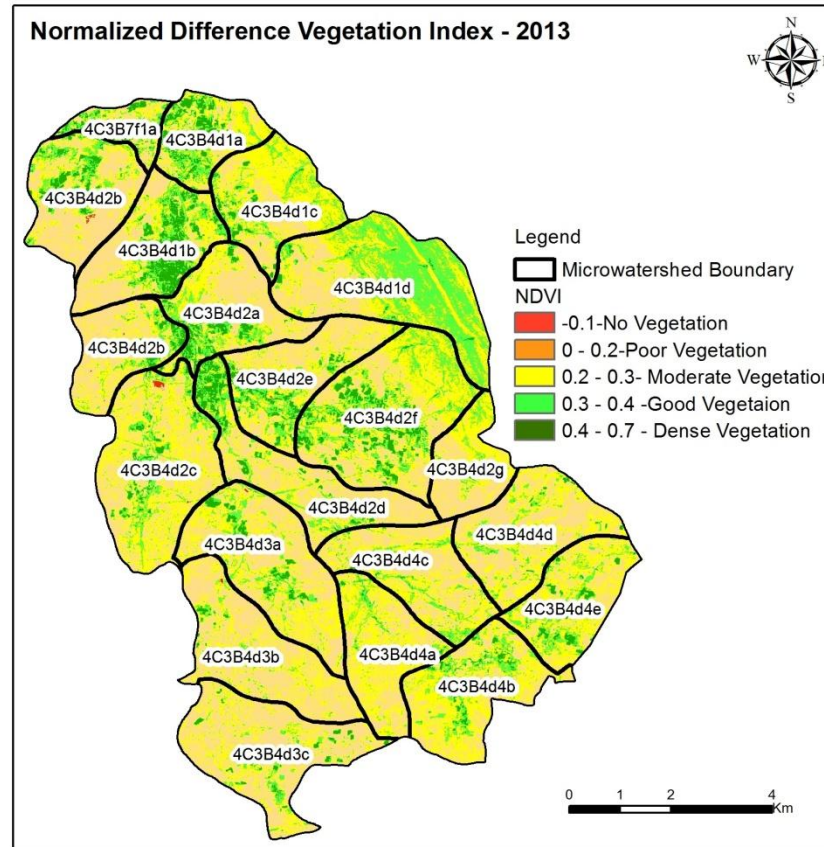


Source:LISS-IV,NRSC

Changes in Vegetation Cover

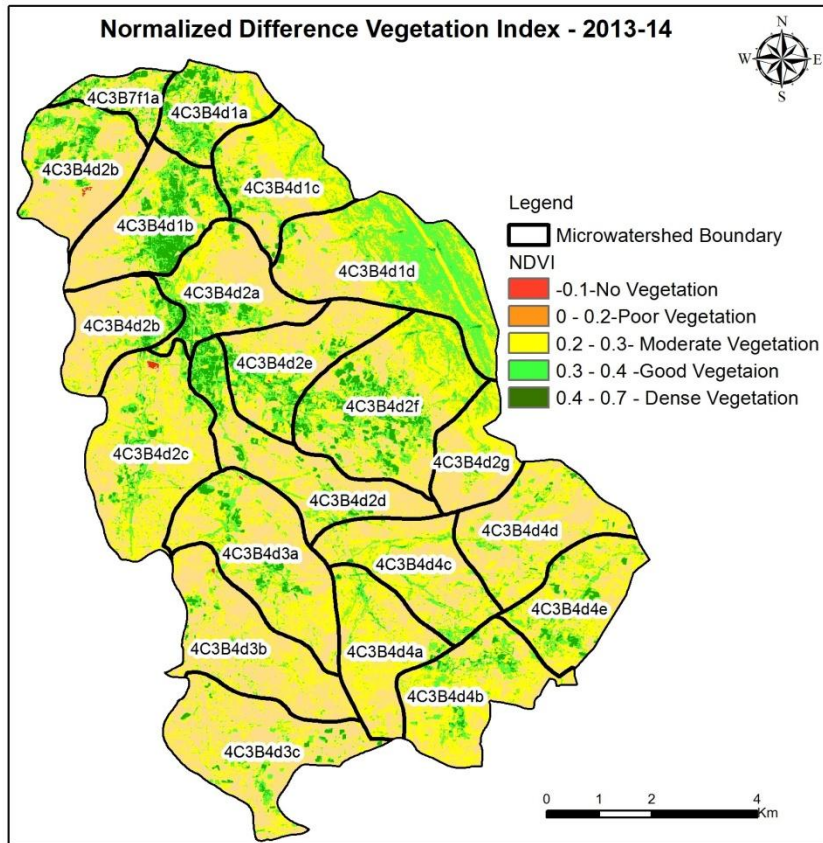


NDVI (2009-10)

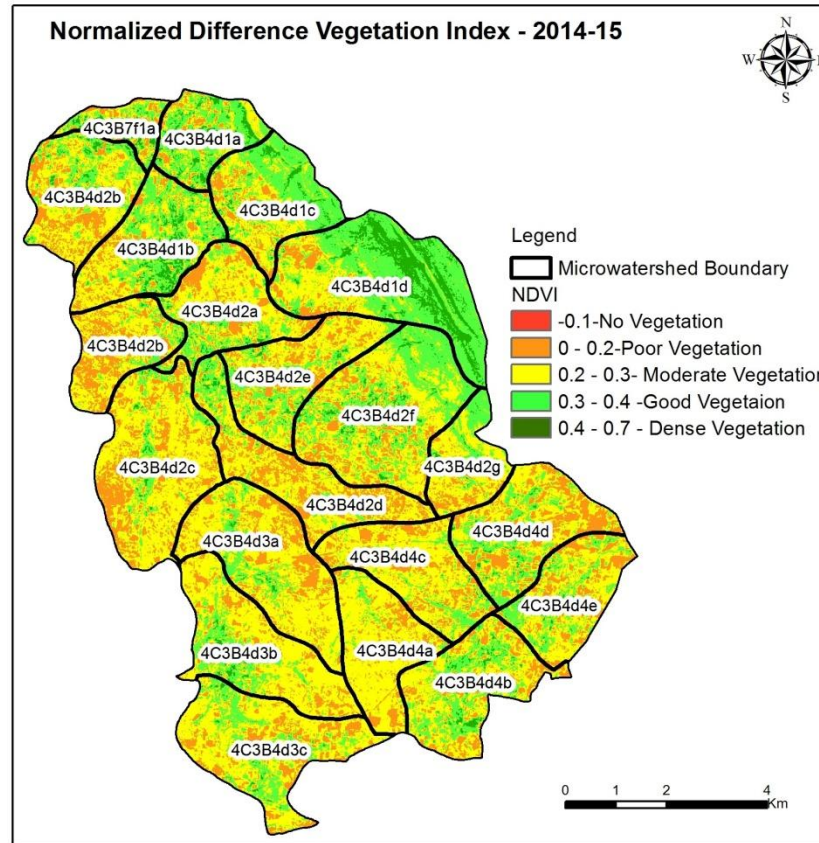


NDVI (2013-14)

Changes in Vegetation Cover



NDVI (2013-14)



NDVI (2014-15)

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-06/2009-10



T0:2009-10



T1: 26 February 2013



Drishti SI no. 185047 MWS :4C3B4d3a

Check dam



T0:2009-10



T1: 26 February 2013



Drishti SI no.157318 MWS : 4C3B4d3a

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-06/2009-10



T0: 2009-10



T1: 26 February 2013

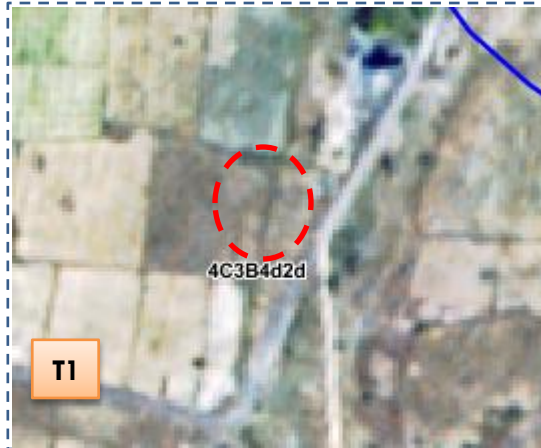


Drishiti SI no. 157345 MWS : 4C3B4d3a

Horticulture



T0: 2009-10



T1: 26 February 2013



Drishiti SI no. 1682697 MWS : 4C3B4d2d

Horticulture

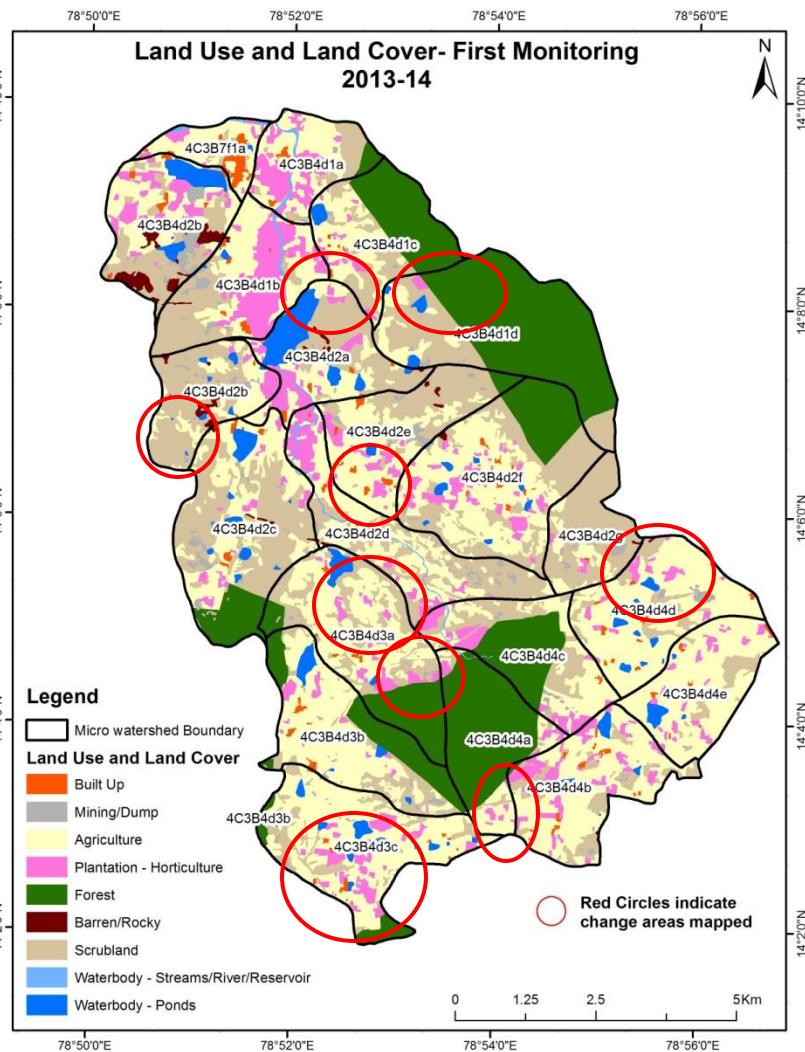
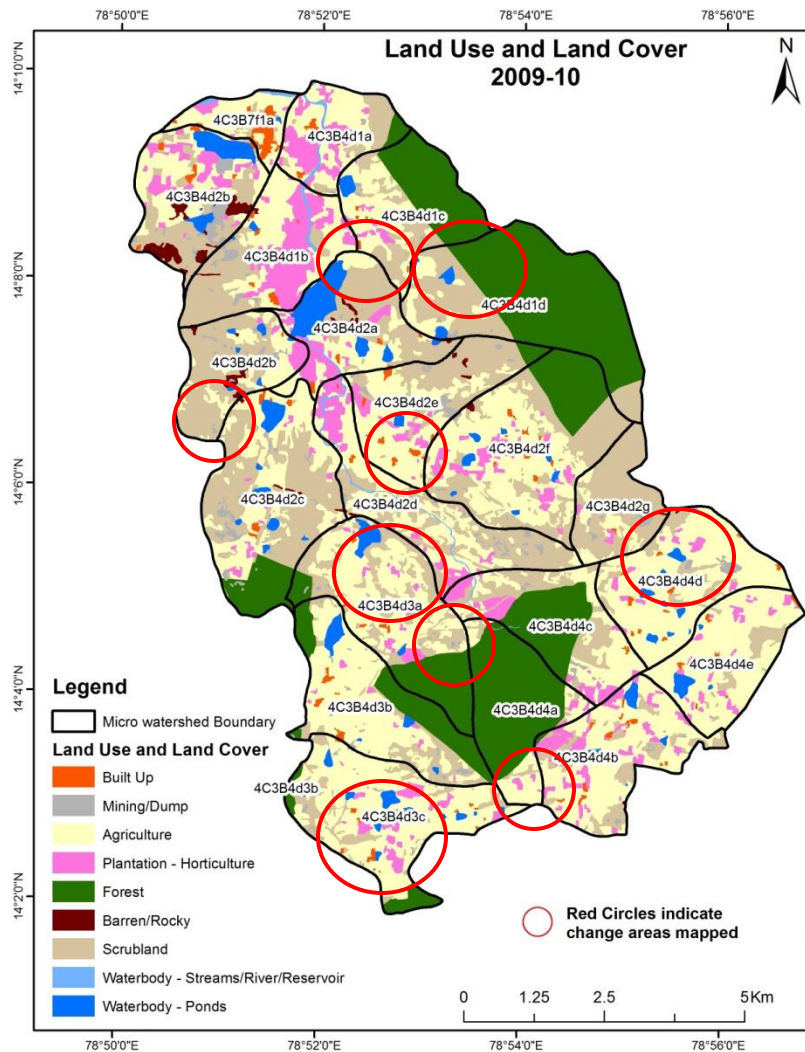
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover from 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)

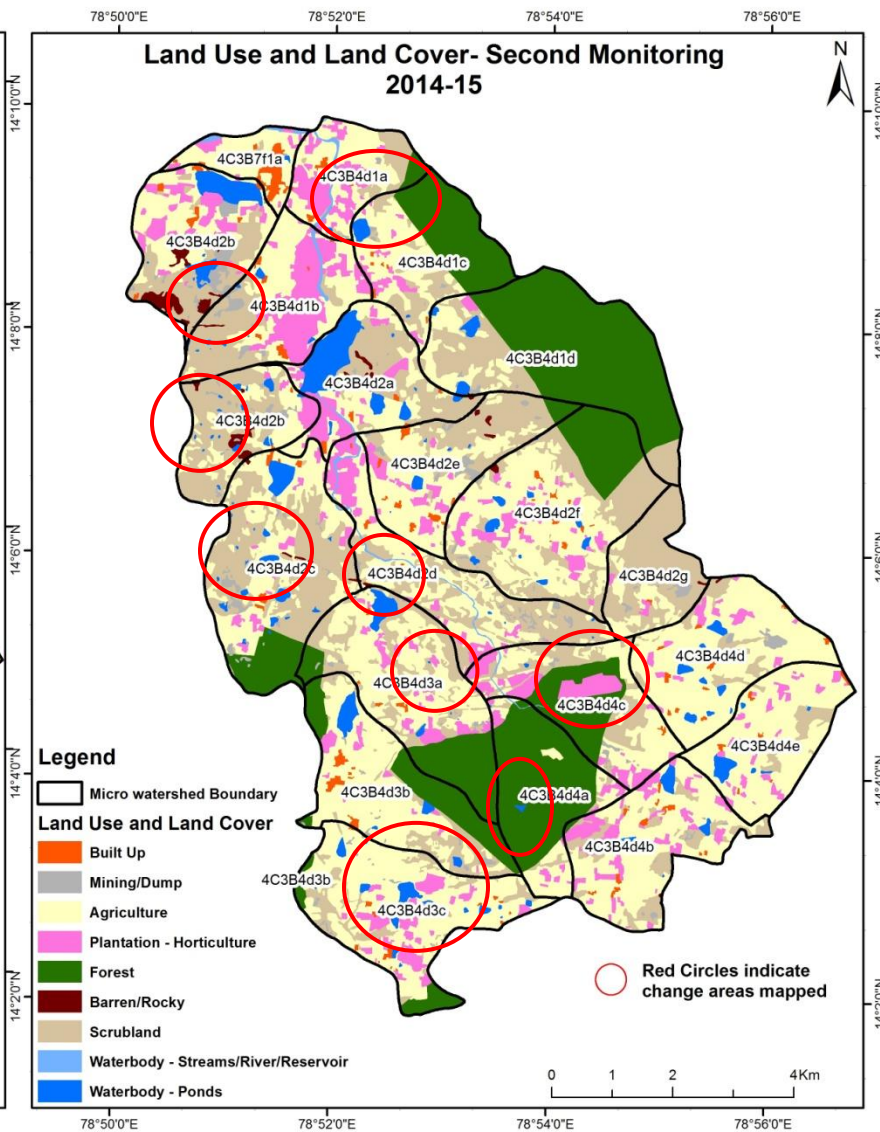
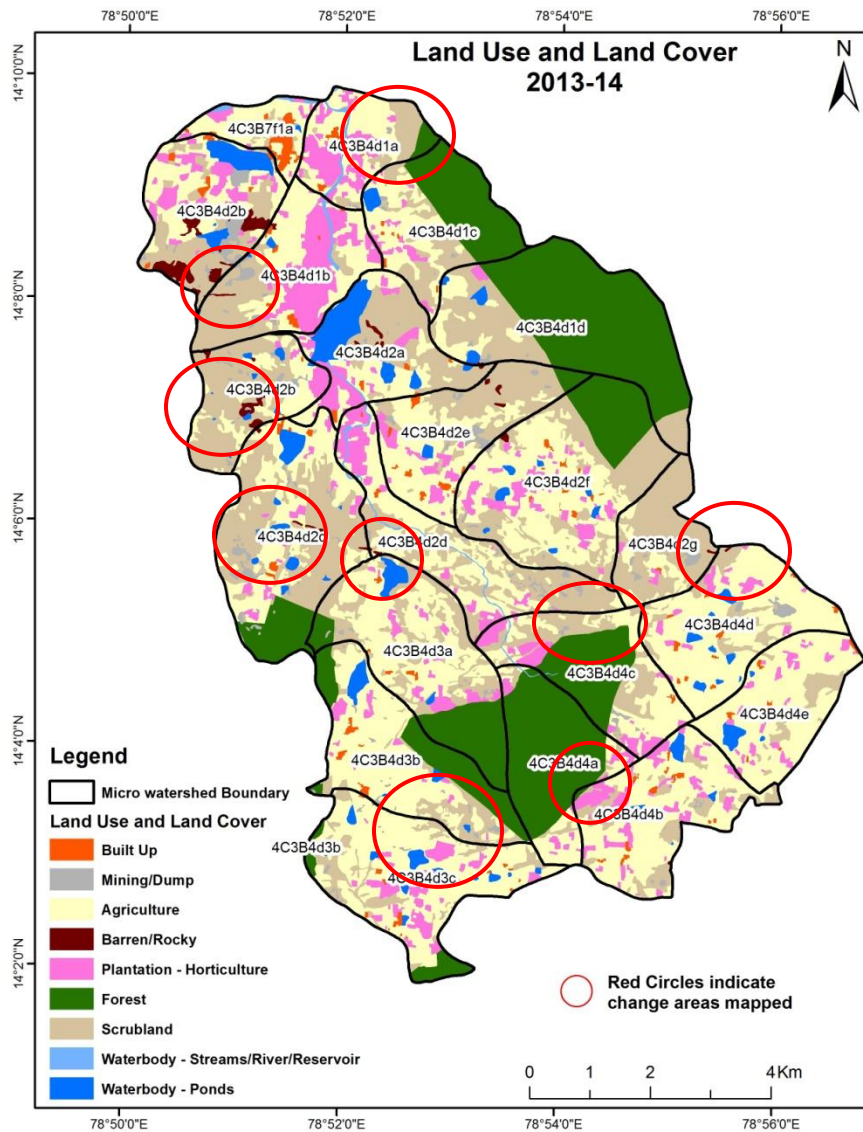
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



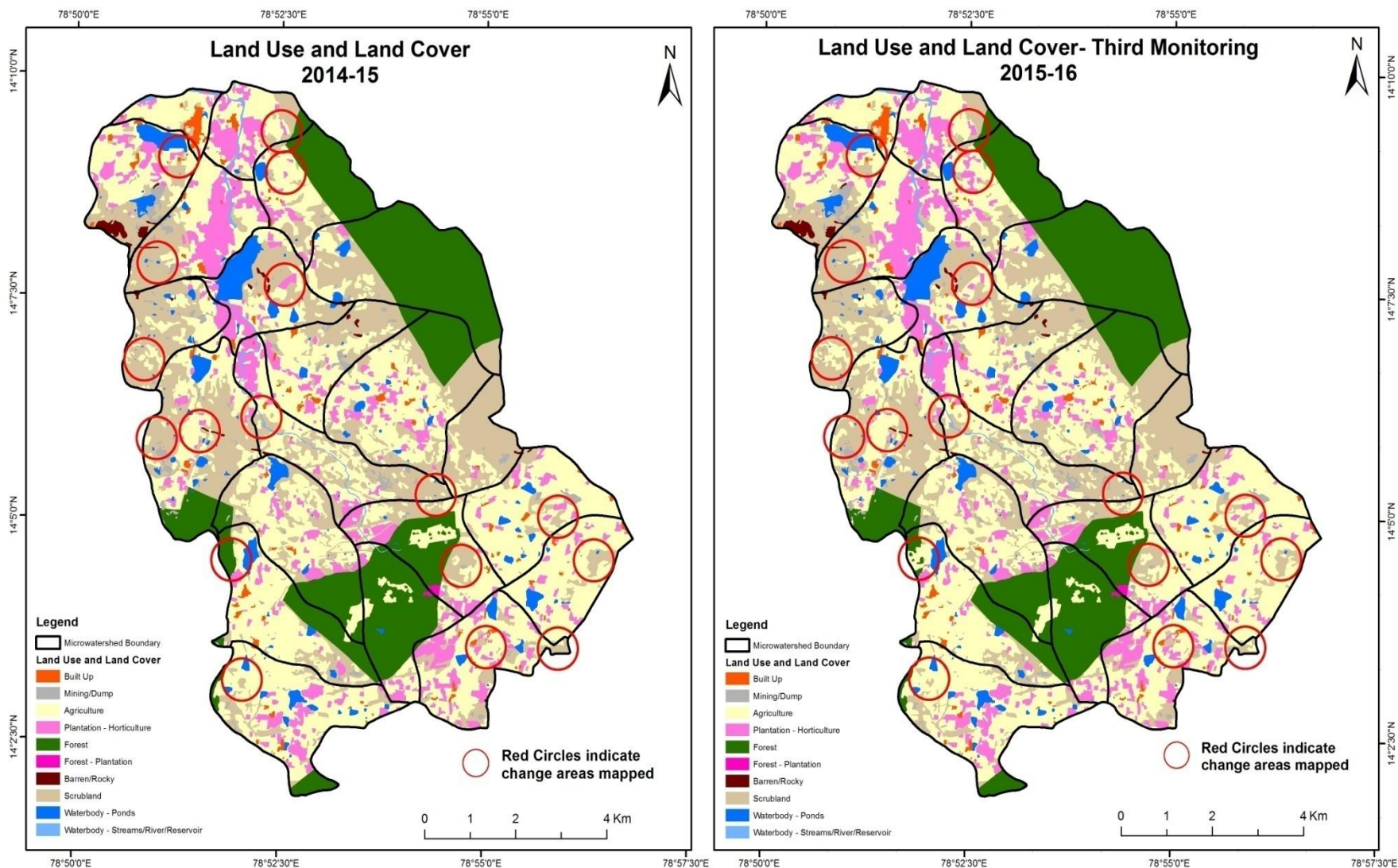
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



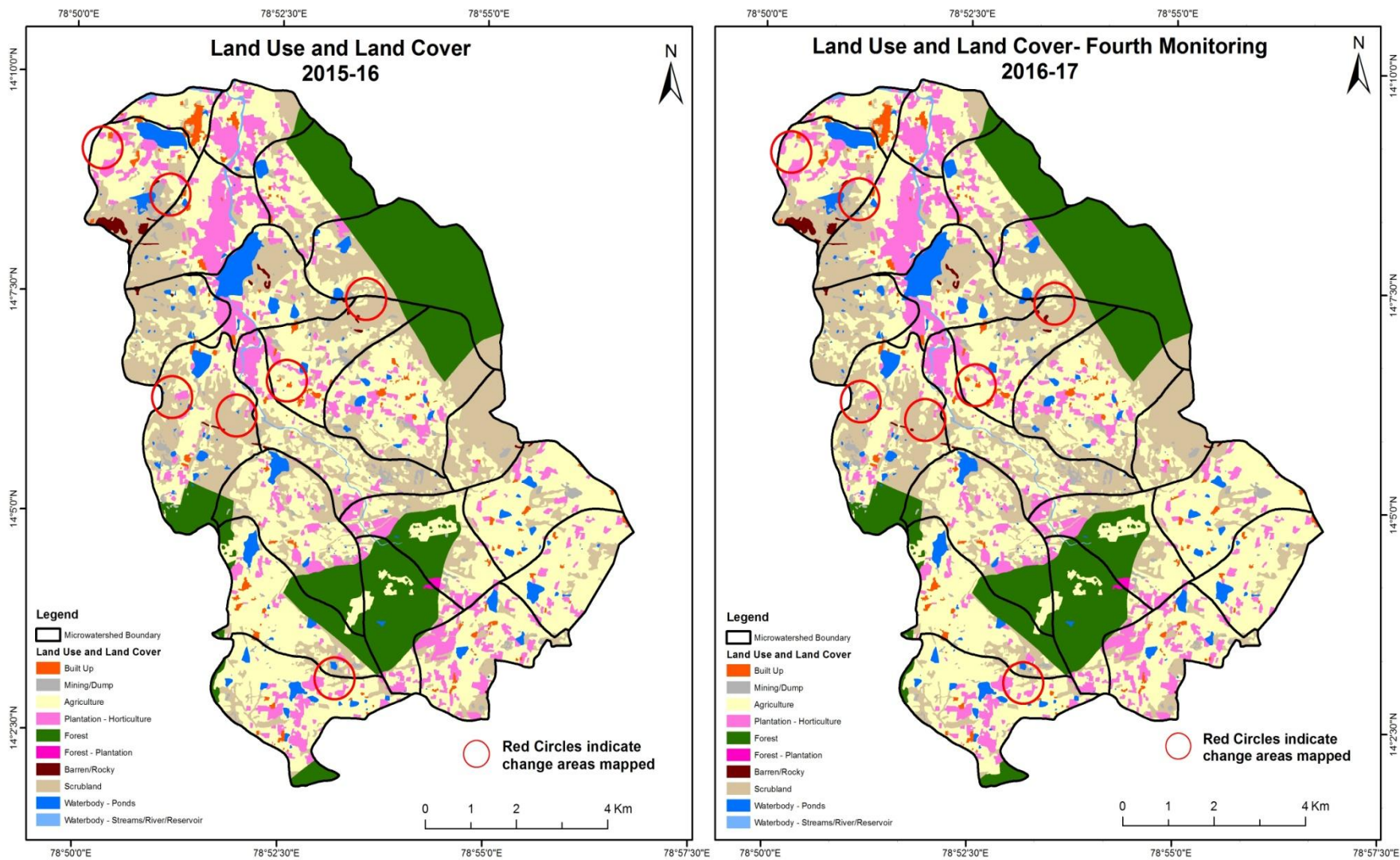
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



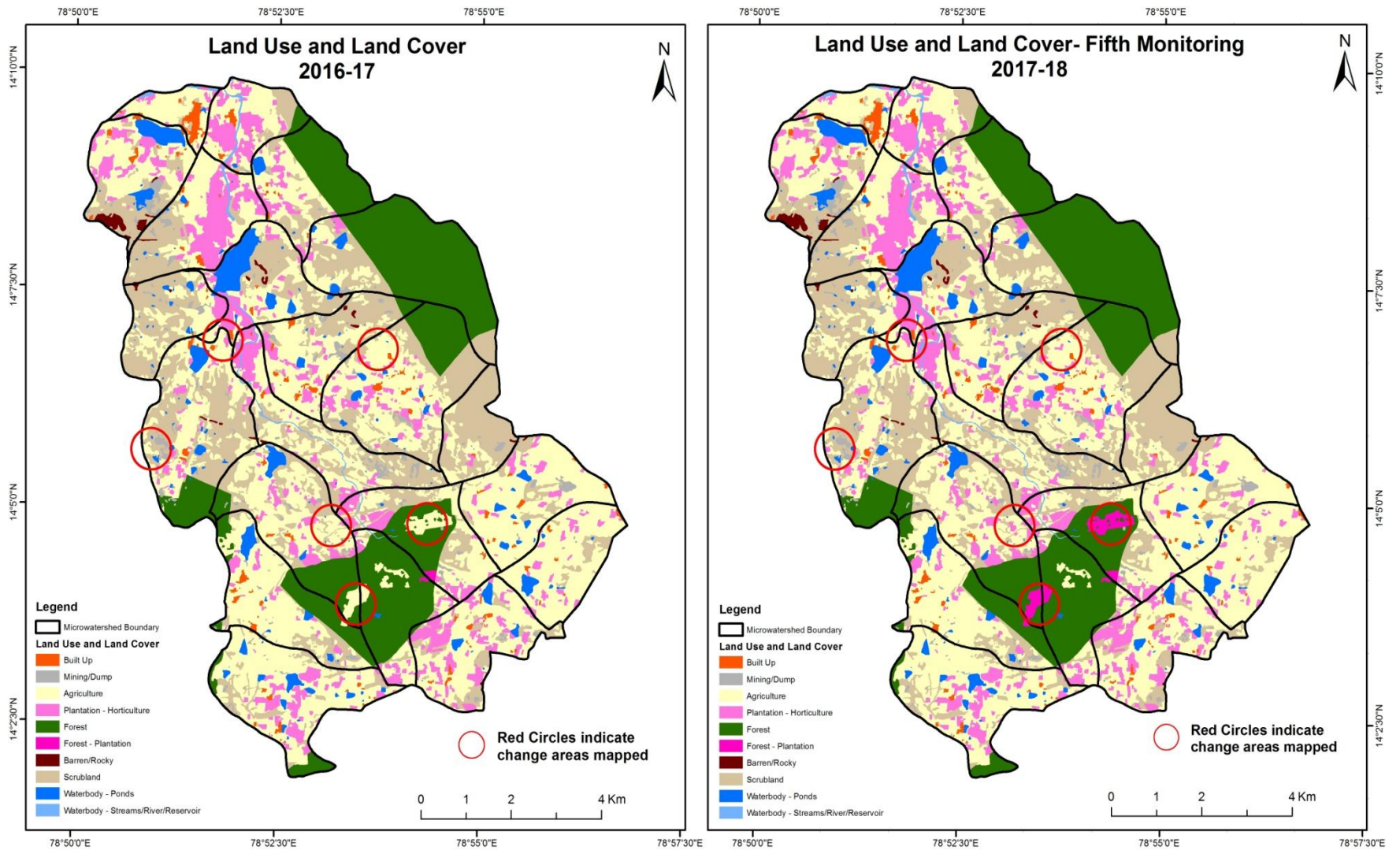
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

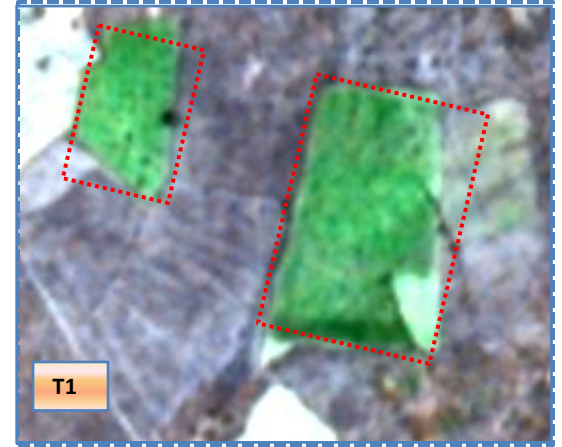


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0: 2009-10



T1: 26 February 2013

Agriculture to Plantation



T0: 2009-10



T1: 26 February 2013

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

Agriculture to Plantation



T0

T0: 2009-10



T1

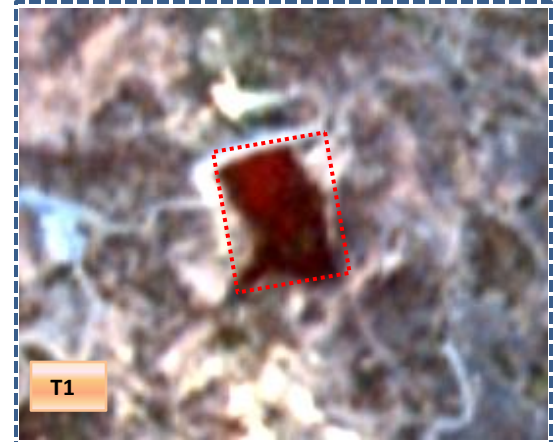
T1: 26 February 2013

Scrub to Water body



T0

T0: 2009-10



T1

T1: 26 February 2013

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

Land cover	Monitoring period (T1)										
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	120.90										120.90
Mining/dump		135.82									135.82
Agriculture	3.57		3888.49	228.01						0.09	4120.16
Plantation Horticulture			3.64	758.03						0.03	761.69
Forest			24.64		1742.63						1767.28
Forest Plantation											
Barren Rocky							39.18				39.18
Scrub		0.16	15.67	13.55				2715.08		1.30	2745.75
Waterbody- Streams/River				1.35					43.10		44.45
Waterbody – Ponds										313.81	313.81
Grand Total	124.47	135.98	3932.43	1000.94	1742.63		39.18	2715.08	43.10	315.22	10049.03

- 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 231 ha of the agriculture area has decreased and it is converted into built-up, water body and plantation in T1.
- In T1 43 ha of the agriculture area has increased from plantations, 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)										
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T1											
Built up	124.47										124.47
Mining/dump		133.21								2.77	135.98
Agriculture	1.21		3884.13	37.39						9.70	3932.43
Plantation Horticulture			6.24	994.55						0.16	1000.94
Forest			42.24		1692.63	6.35				1.41	1742.63
Forest Plantation											
Barren Rocky							39.18				39.18
Scrub	0.25	5.09	205.01	1.64				2486.87		16.22	2715.08
Waterbody- Streams/River									43.10		43.10
Waterbody – Ponds										315.22	315.22
Grand Total	125.93	138.30	4137.63	1033.57	1692.63	6.35	39.18	2486.87	43.10	345.48	10049.03

- 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 48 ha of the agriculture area has decreased and it is converted into built-up, plantation and water body in T2.
- In T2 253 ha of the agriculture area has increased from plantations , 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)										
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	125.93										125.93
Mining/dump		138.30									138.30
Agriculture	1.83	1.21	4070.44	63.33						0.81	4137.63
Plantation Horticulture	0.12		29.62	1003.62						0.22	1033.57
Forest			12.31		1680.32						1692.63
Forest Plantation						6.35					6.35
Barren Rocky							39.18				39.18
Scrub	0.31	10.88	105.11	3.80				2366.56		0.21	2486.87
Waterbody- Streams/River									43.10		43.10
Waterbody – Ponds										345.48	345.48
Grand Total	128.20	150.39	4217.48	1070.74	1680.32	6.35	39.18	2366.56	43.10	346.72	10049.03

- 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 the agriculture area has decreased and it is converted into built-up, mining, plantation and water body in T2.
- In T2 147 ha of the agriculture area has increased from plantations, 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-2015-16 to 2016-17

Land cover	Monitoring period (T4)										
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T3											
Built up	128.20										128.20
Mining/dump		150.39									150.39
Agriculture	1.56		4199.30	16.26						0.37	4217.48
Plantation Horticulture	0.05		16.58	1054.08						0.04	1070.74
Forest			3.52		1676.80						1680.32
Forest Plantation						6.35					6.35
Barren Rocky							39.18				39.18
Scrub			14.36					2352.06		0.14	2366.56
Waterbody- Streams/River									43.10		43.10
Waterbody – Ponds			0.26							346.46	346.72
Grand Total	129.80	150.39	4234.02	1070.34	1676.80	6.35	39.18	2352.06	43.10	347.00	10049.03

- 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 18 ha of the agriculture area has decreased and it is converted into built-up, mining, plantation and water body in T2.
- In T2 34 ha of the agriculture area has increased from plantations, forest, scrubland and water body 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-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	129.80										129.80
Mining/dump		150.39									150.39
Agriculture			4167.52	12.21		53.39		0.70		0.20	4234.02
Plantation Horticulture			0.56	1069.78							1070.34
Forest					1676.80						1676.80
Forest Plantation						6.35					6.35
Barren Rocky							39.18				39.18
Scrub		0.90	7.76	0.04				2343.23		0.13	2352.06
Waterbody- Streams/River									43.10		43.10
Waterbody – Ponds										347.00	347.00
Grand Total	129.80	151.29	4175.84	1082.03	1676.80	59.74	39.18	2343.93	43.10	347.33	10049.03

- 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 66 ha of the agriculture area has decreased and it is converted into plantation and water body in T2.
- In T2 8 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.

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 32 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 205, 79 & 16 Hectares From T1-T2, T2-T3 & T3-T4 respectively and overall increase of 55 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 320 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 401 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.