

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -04/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-20201

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

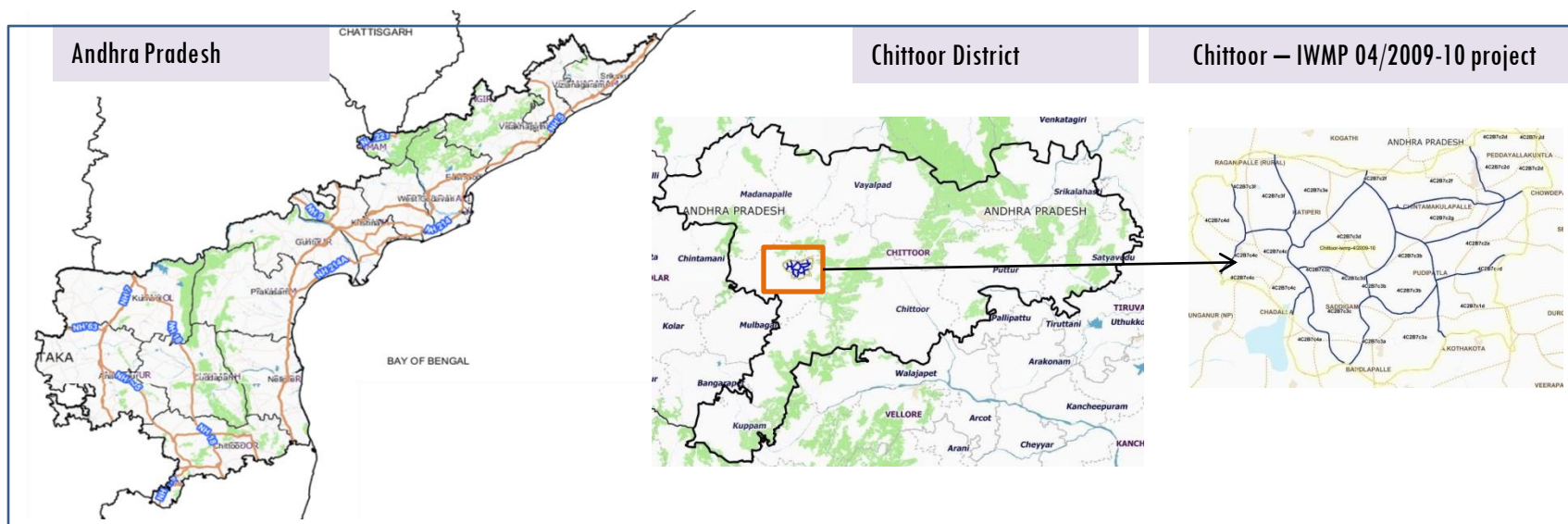
E X E C U T I V E S U M M A R Y

- 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-04/2009-10, Chittoor District of Andhra Pradesh. The total geographical area of the project is 8020.05 ha. It comprises of 14 micro watersheds.
- In the project area no Drishti photos were uploaded.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and check dams and drainage treatments with 5.17 ha increase in the area.
- Major percentage i.e. 65.08 % is covered by the agriculture, 11.96 % is covered by scrubland and 9.90 % is covered by water bodies and remaining by other land use classes.

PROJECT : CHITTOOR - IWMP-04/2009-10

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Chowdepalle Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is 8020.05 ha. It comprises of 14 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 district is dry and healthy. Out of 66 mandals in the district, 31 are upland mandals which are located in Madanapalle division and are comparatively cooler than the eastern mandals except Chittoor mandal where the climate is moderate. December and January are the coldest months when the mean maximum temperature will be around 26.40 °C, May is the hottest month with the mean daily maximum temperature rising above 40 °C.
- The district receive 83.62 percent of rainfall during South-West monsoon and North-West monsoon period, the rainfall is nominal in summer. On an average the district receives more than 50 percent of rainfall during North- East monsoon.

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	0
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 photos were not uploaded



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	Existing activity	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	0	0
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	Lm (fodder development, varmi compost)	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	0	
18	Others	0	0
	TOTAL	0	0

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-2013-2014



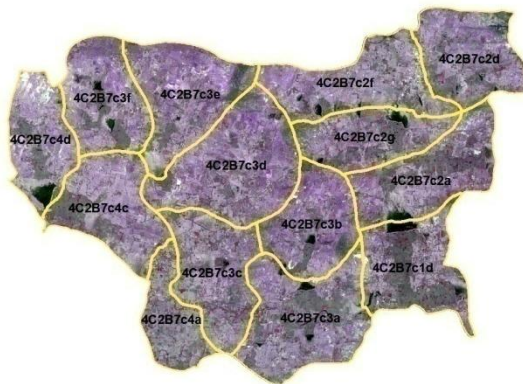
Source:LISS-IV,NRSC

Natural Color Composite- 07th January 2014



Source:LISS-IV,NRSC

Natural Color Composite-05th April 2016



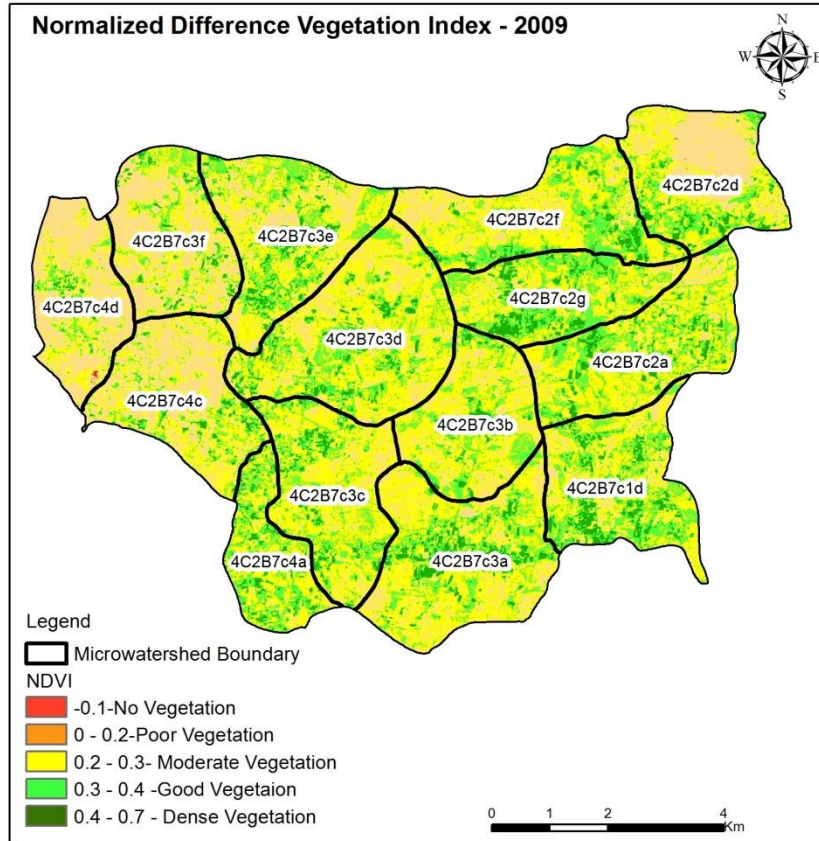
Source:LISS-IV,NRSC

Natural Color Composite- 2016-2017

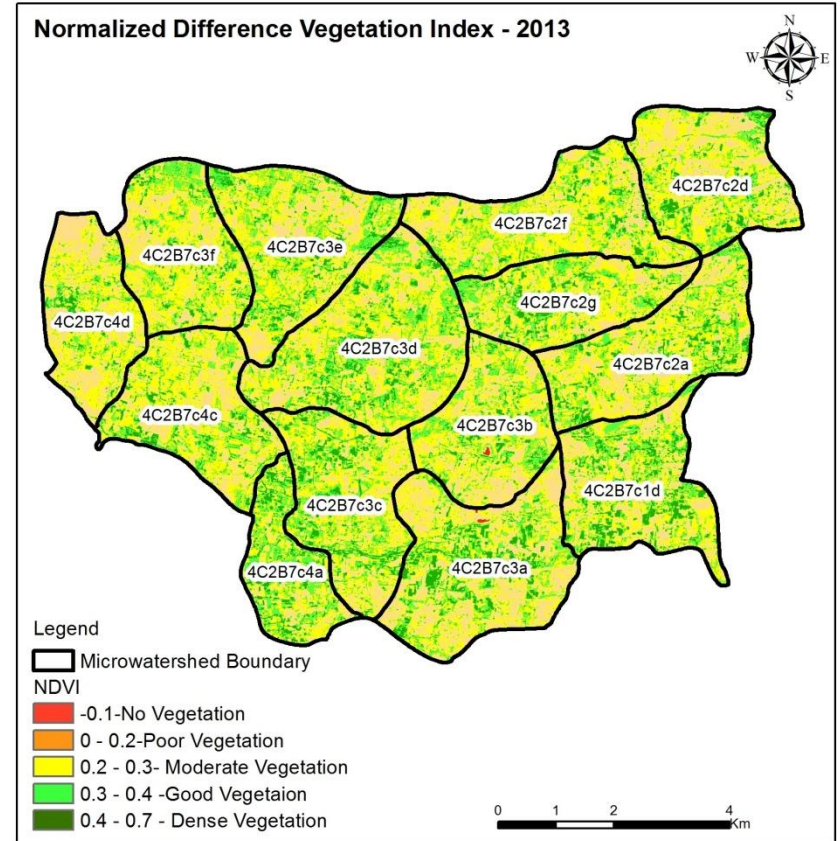


Source:LISS-IV,NRSC

Changes in Vegetation Cover

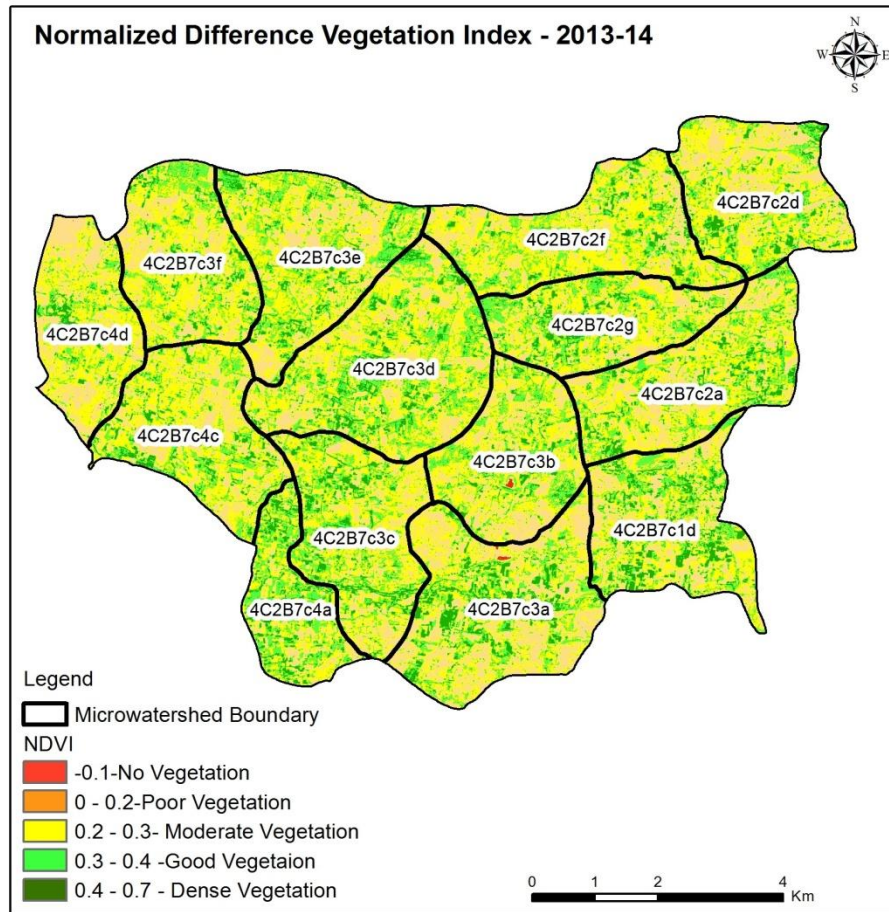


NDVI (2009-10)

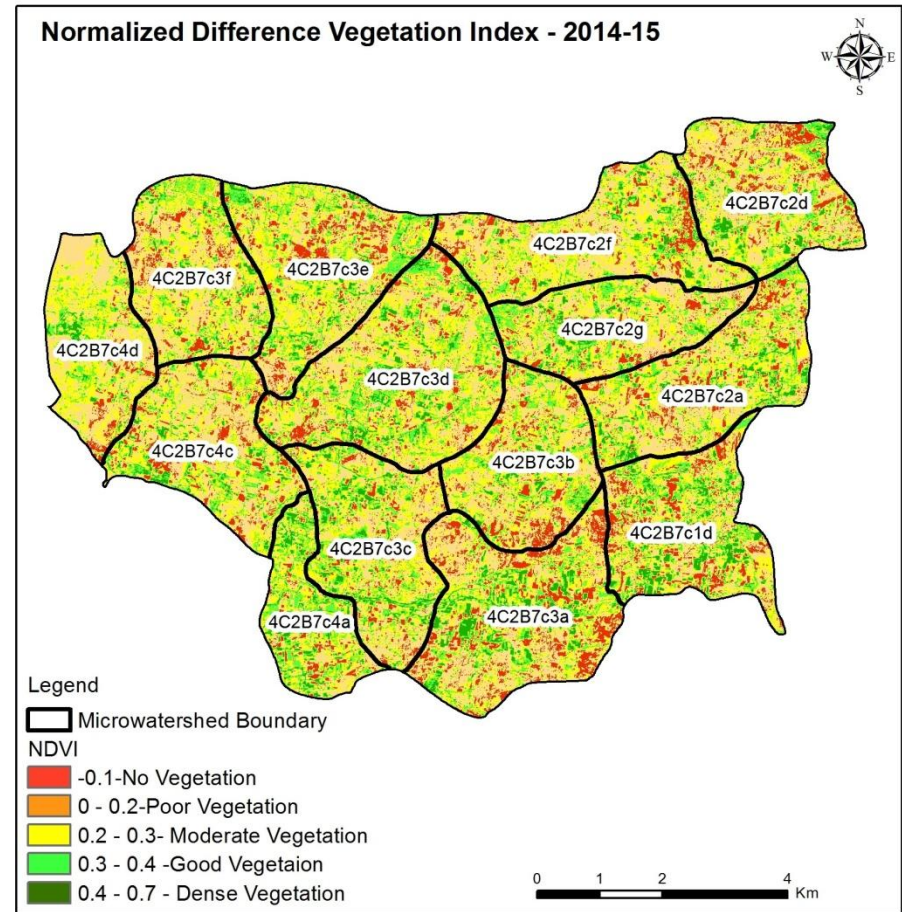


NDVI (2013-14)

Changes in Vegetation Cover







NDVI (2013-14)



NDVI (2014-15)

Drishti points were not uploaded in Bhuvan

		
T0:	T1:	Drishti Sl no MWS :

		
T0:	T1:	Drishti Sl no. MWS :

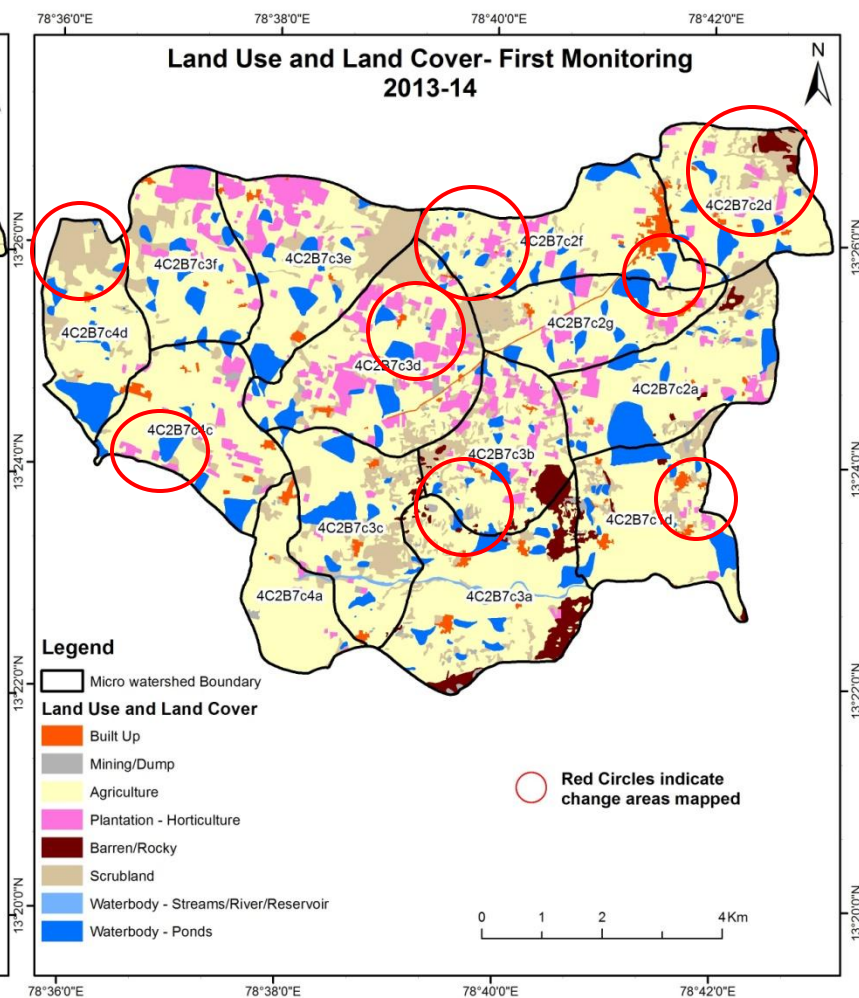
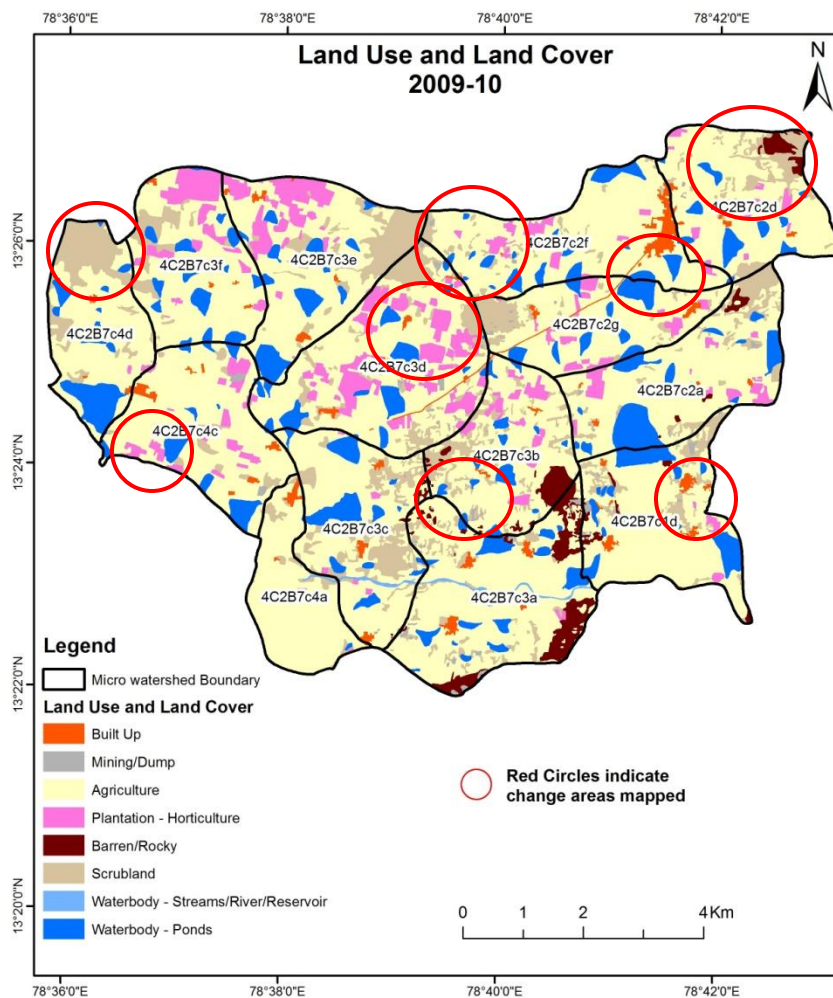
MONITORING IN THE PROJECT AREA

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)

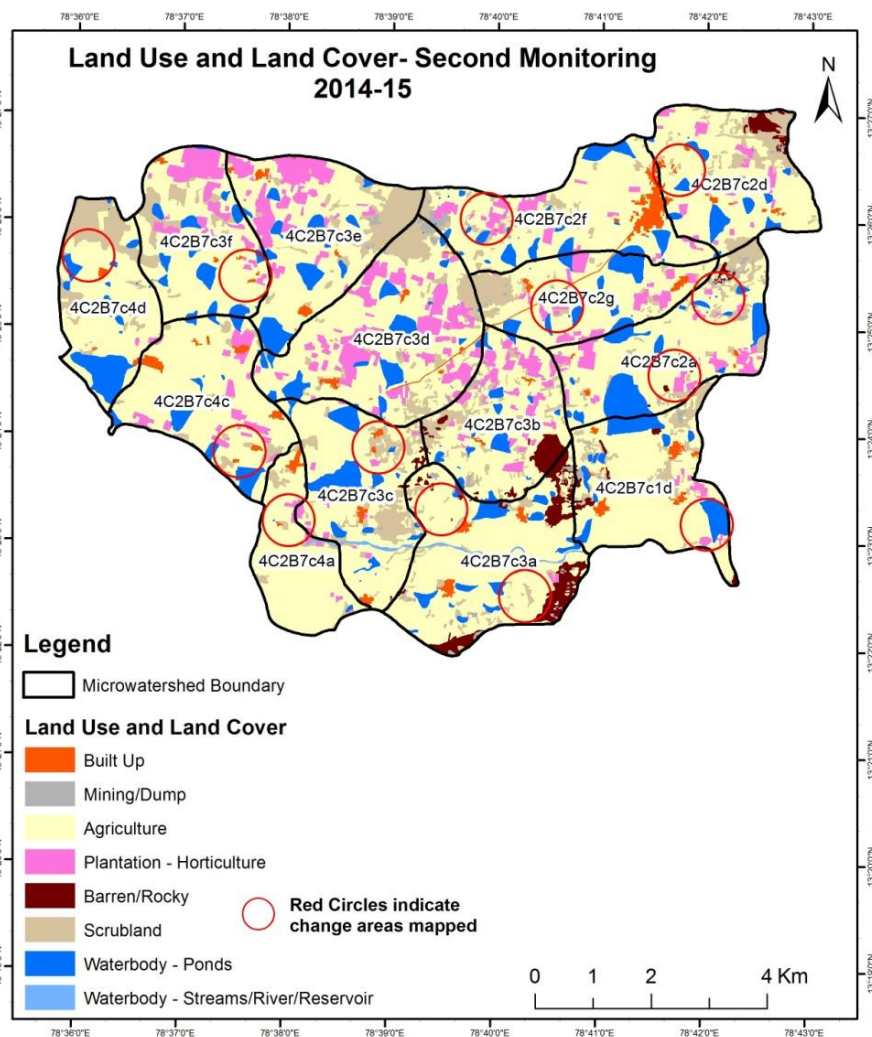
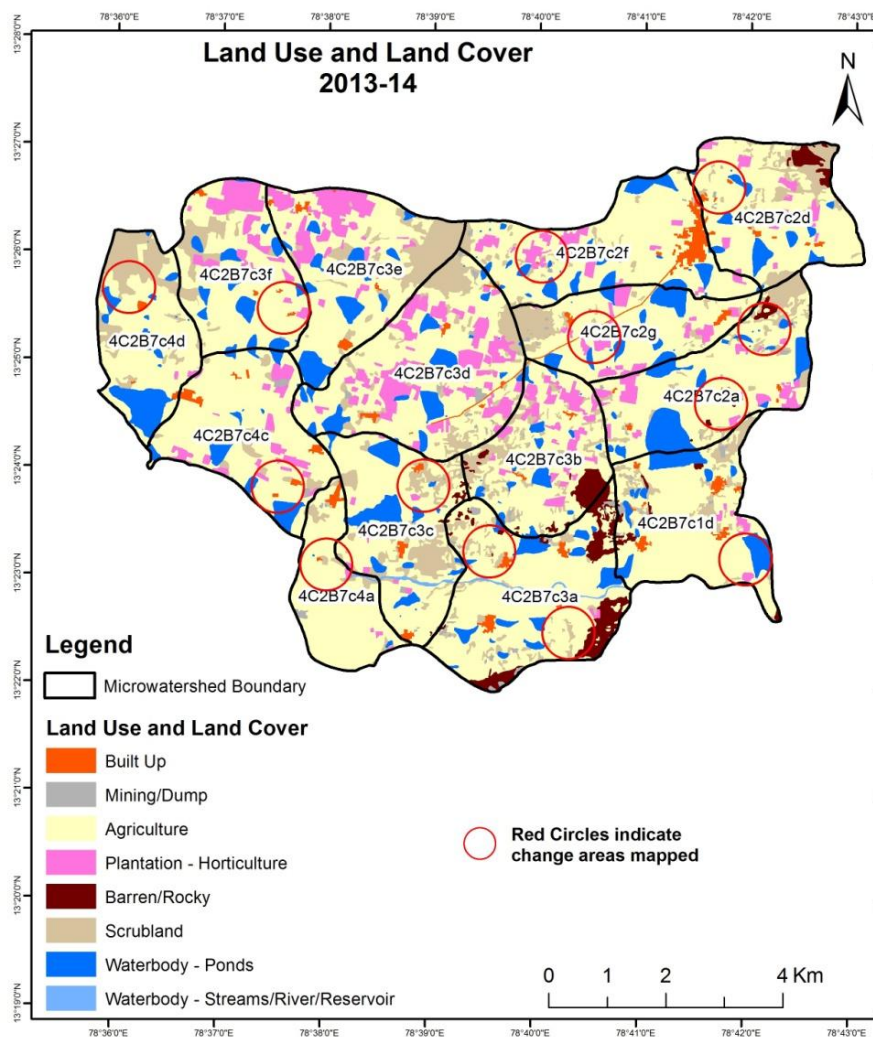
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



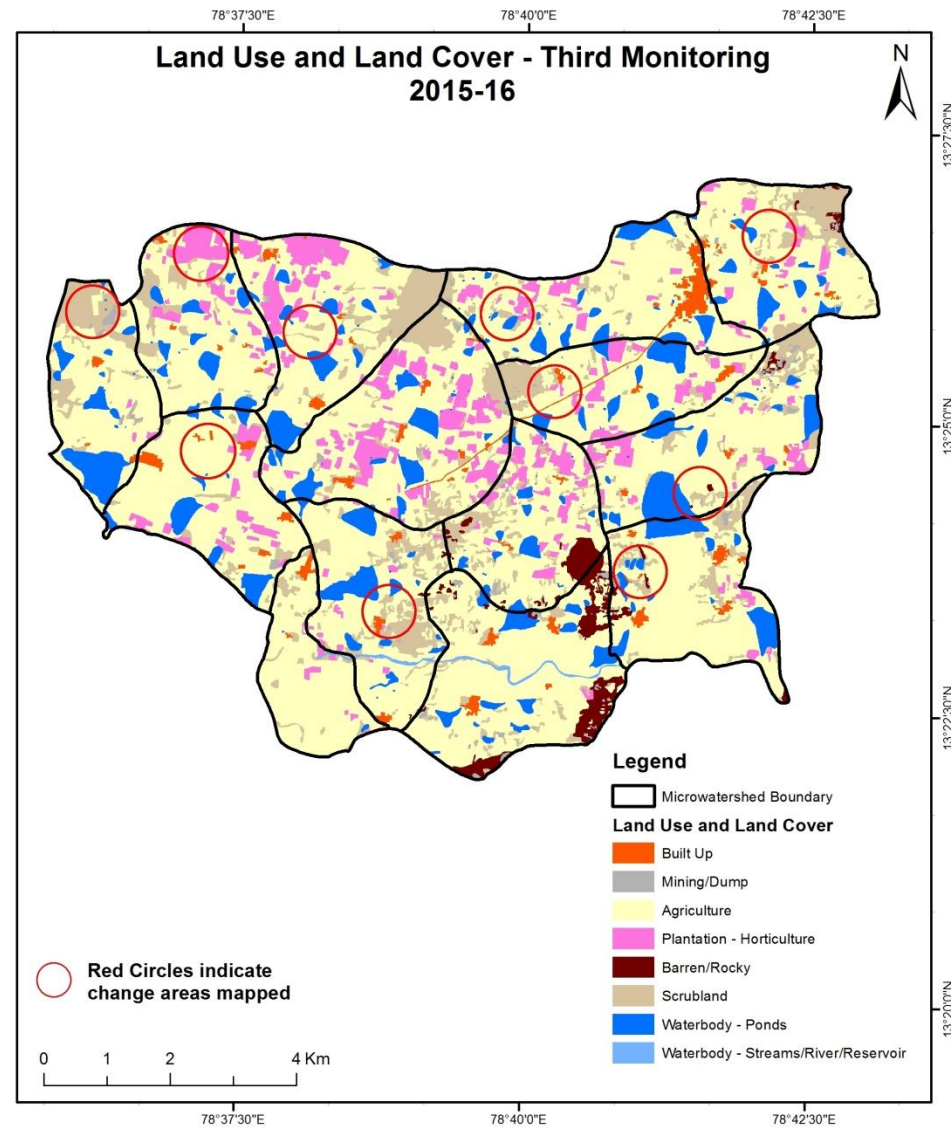
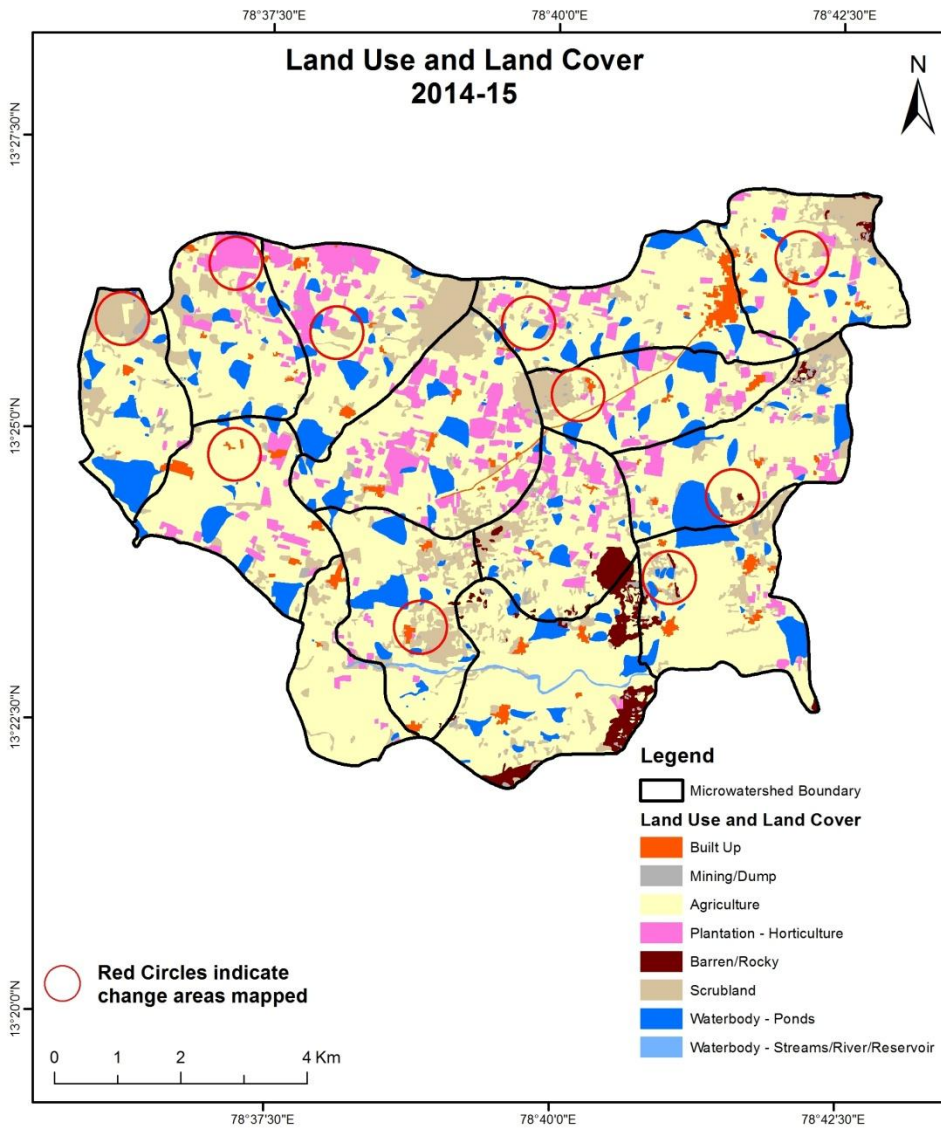
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



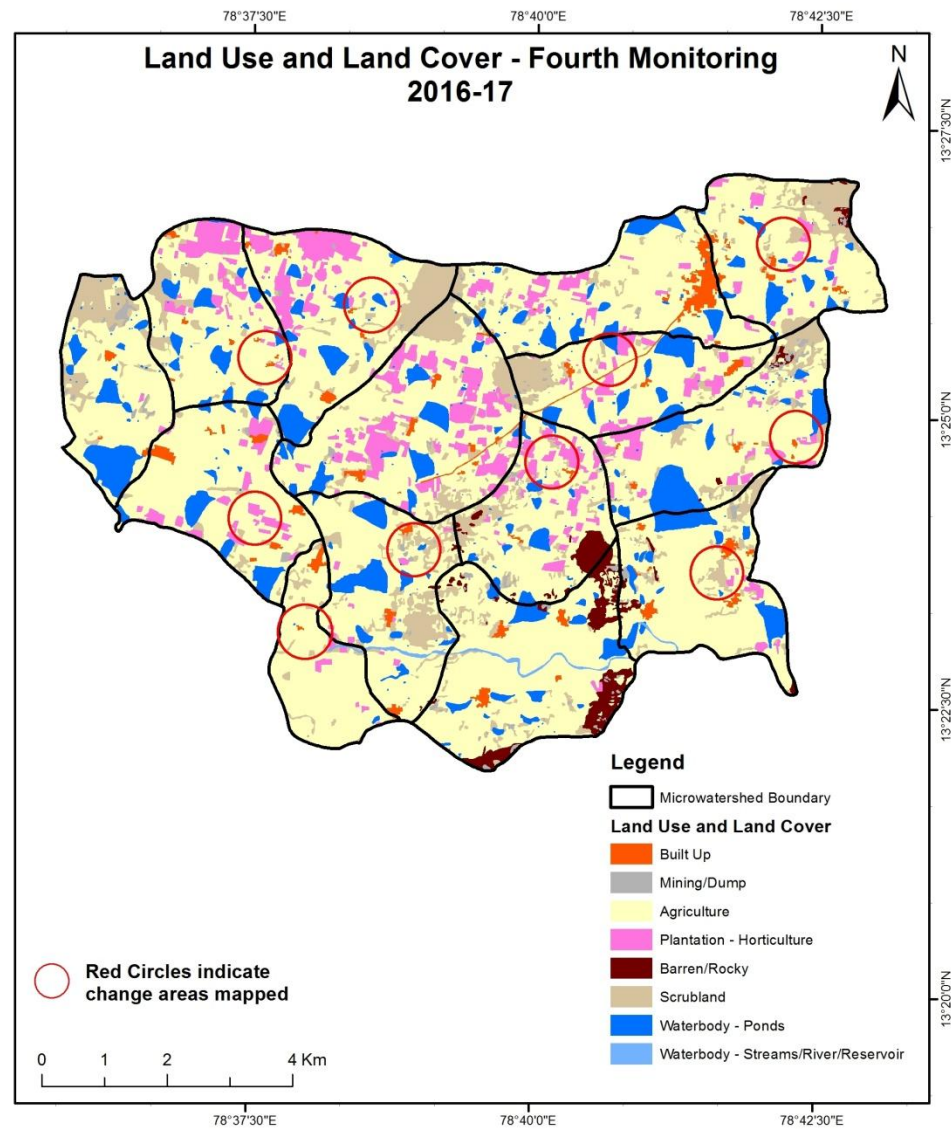
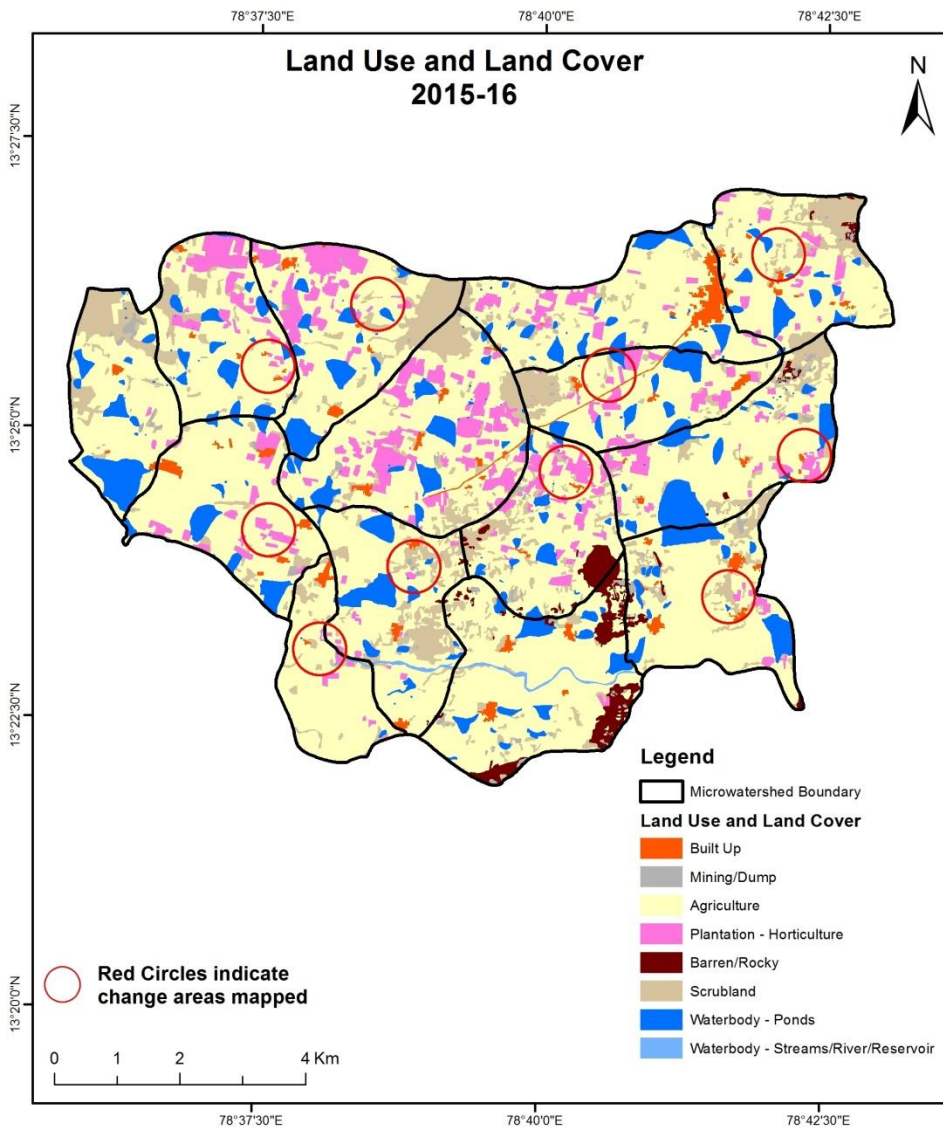
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



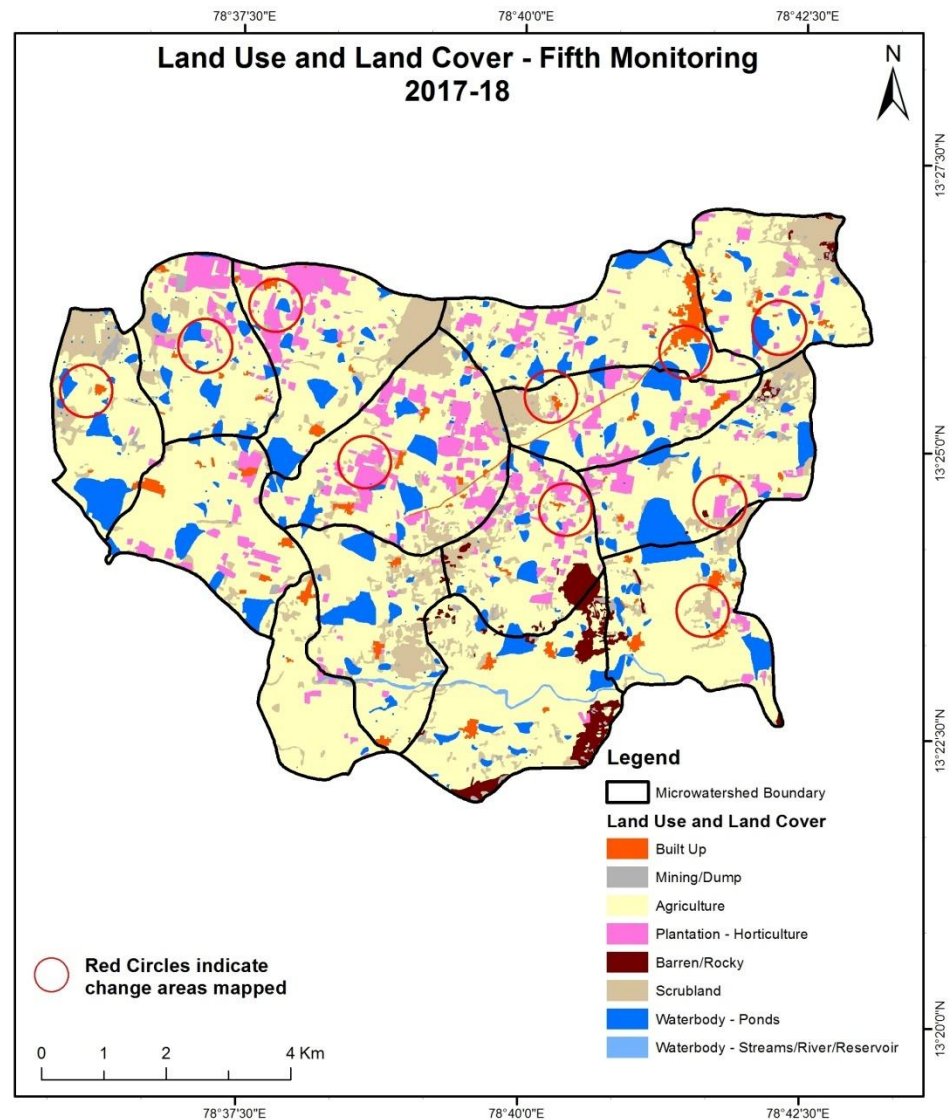
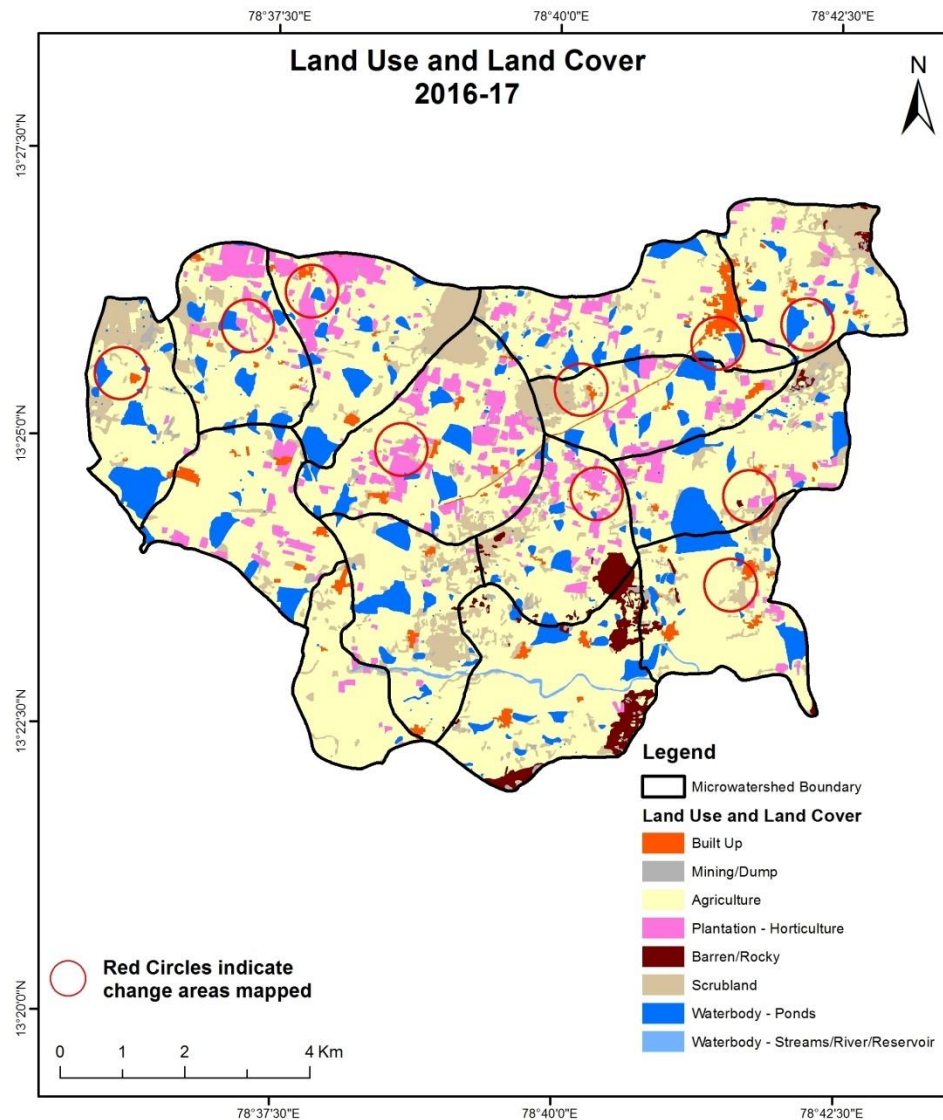
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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

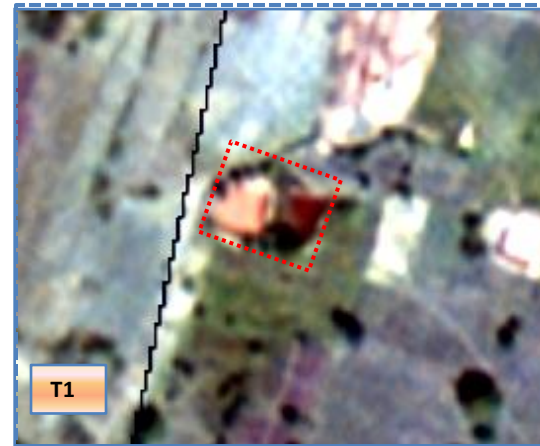


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Water body



T0: 2009-10



T1: 26 February 2013

Scrub to Water body



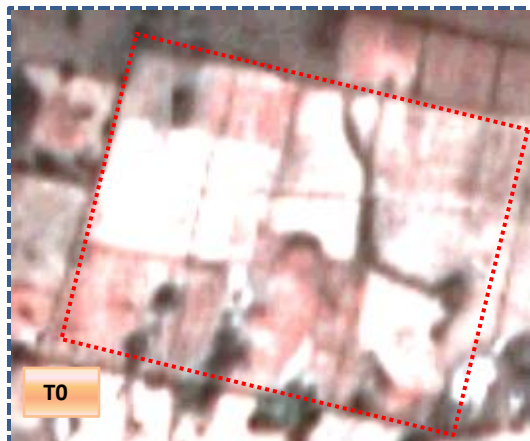
T0: 2009-10



T1: 26 February 2013

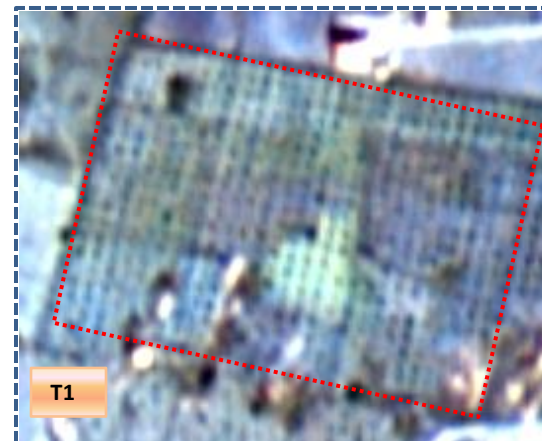
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

T0: 2009-10



T1

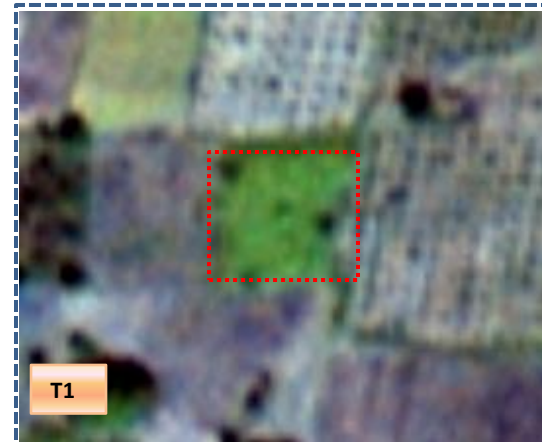
T1: 26 February 2013

Scrub to Agriculture



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) 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	139.67										139.67
Mining/dump		46.15	0.54								46.69
Agriculture	9.44	1.90	5083.20	102.94						5.61	5203.08
Plantation Horticulture			12.66	545.67						0.17	558.49
Forest											
Forest Plantation											
Barren Rocky							147.13				147.13
Scrub	2.20	7.26	31.02	0.57				1069.17		0.71	1110.92
Waterbody- Streams/River									20.92		20.92
Waterbody – Ponds										793.13	793.13
Grand Total	151.31	55.31	5127.41	649.18			147.13	1069.17	20.92	799.61	8020.05

- 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 119.88 ha of the agriculture area has decreased and it is converted into built-up land, mining/dump, plantation and water body in T1.
- In T1 43.67 ha of the agriculture area has increased from plantations, Mining /dump and scrubland of T0.
- Overall 75.67 ha of the agriculture area has been decreased. 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	151.31										151.31
Mining/dump	3.12	45.22						6.97			55.31
Agriculture	6.67	2.00	5067.50	49.16				2.04		0.05	5127.41
Plantation Horticulture			17.12	632.03						0.04	649.18
Forest											
Forest Plantation											
Barren Rocky		7.82					139.31				147.13
Scrub	0.47	7.40	96.48	1.61				963.16		0.05	1069.17
Waterbody- Streams/River									20.92		20.92
Waterbody – Ponds			13.30							786.32	799.61
Grand Total	161.56	62.43	5194.39	682.80			139.31	972.17	20.92	786.46	8020.05

- 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 59.92 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 126.90 ha of the agriculture area has increased from, plantations scrubland and water body of T1.
- Overall 66.98 ha of the agriculture area has been Increased. 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										
		Mining/ dump		Plantation		Forest	Barren		Waterbody- Streams/River	Water body	
T2	Built up		Agriculture	Horticulture	Forest	Plantation	Rocky	Scrub		Ponds	Grand Total
Built up	161.56										161.56
Mining/dump		62.43									62.43
Agriculture	0.09	0.63	5185.04	6.72						1.92	5194.39
Plantation Horticulture			3.38	678.93						0.48	682.80
Forest											
Forest Plantation											
Barren Rocky							139.31				139.31
Scrub		2.00	26.71					942.75		0.71	972.17
Waterbody- Streams/River									20.92		20.92
Waterbody – Ponds			0.34							786.12	786.46
Grand Total	161.65	65.06	5215.47	685.66			139.31	942.75	20.92	789.22	8020.05

- 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 9.35 ha of the agriculture area has decreased and it is converted into built-up , mining/dump plantation and water body in T3.
- In T3 30.43 ha of the agriculture area has increased from, plantations scrubland and water body of T2.
- Overall 21.08 ha of the agriculture area has been Increased. 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
		Mining/ dump		Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T3	Built up		Agriculture								
Built up	161.65										161.65
Mining/dump		65.03								0.03	65.06
Agriculture	1.97		5163.67	23.03					2.59	24.21	5215.47
Plantation Horticulture			42.10	643.29						0.26	685.66
Forest											
Forest Plantation											
Barren Rocky							139.31				139.31
Scrub		1.19	84.02					854.97		2.56	942.75
Waterbody- Streams/River									20.92		20.92
Waterbody – Ponds	0.25		34.35							754.63	789.22
Grand Total	163.87	66.22	5324.14	666.32			139.31	854.97	23.51	781.70	8020.05

- 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 51.80 ha of the agriculture area has decreased and it is converted into built-up , plantation and water body in T4.
- In T4 160.47 ha of the agriculture area has increased from plantations scrubland and water body of T3.
- Overall 108.67 ha of the agriculture area has been Increased. 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
		Mining/ dump		Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T4	Built up		Agriculture								
Built up	163.87										163.87
Mining/dump		66.22									66.22
Agriculture	0.12	0.68	5304.24	18.05						1.05	5324.14
Plantation Horticulture		3.77	5.71	656.81						0.02	666.32
Forest											
Forest Plantation											
Barren Rocky							139.31				139.31
Scrub		1.15	0.16					853.14		0.53	854.97
Waterbody- Streams/River									23.51		23.51
Waterbody – Ponds			3.65							778.05	781.70
Grand Total	163.99	71.82	5313.76	674.86			139.31	853.14	23.51	779.66	8020.05

- 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 19.90 ha of the agriculture area has decreased and it is converted into built-up ,mining, plantation and waterbody in T5.
- In T5 9.52 ha of the agriculture area has increased from plantations, scrubland and waterbody of T4.
- Overall 10.38 ha of the agriculture area has been decreased. 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 a decrease of 10.89 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 66.98, 21.08, 108.67, Hectares From T1-T2, T2-T3 and T3-T4 respectively and overall increase of 196.73 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 257.79 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.