

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

KURNOOL -09/2009-10
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

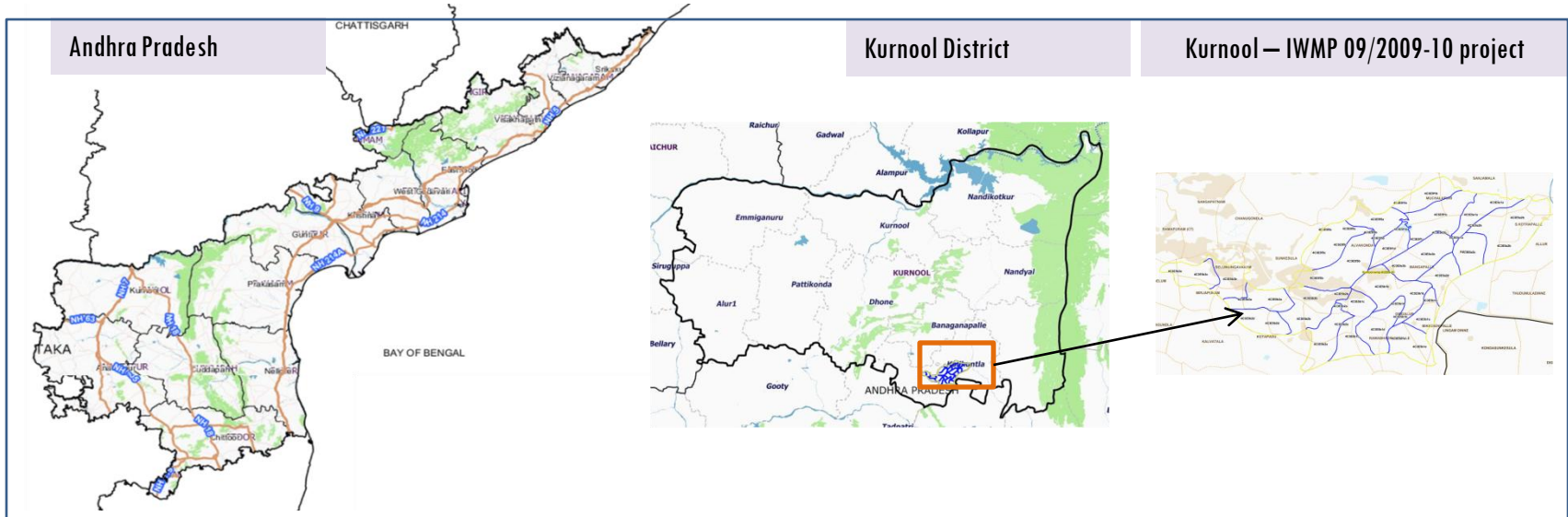
E X E C U T I V E S U M M A R Y

- 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-09/2009-10, Kurnool District of Andhra Pradesh. The total geographical area of the project is 13,246 ha. It comprises of 22 micro watersheds.
- In the project area 932 Drishti photos were uploaded showing 163 check dams, 163 Farm ponds, 428 drainage treatment remaining showing others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 163 new farm ponds or dug out pits with 2.99 ha increase in the area.
- Major percentage i.e. 69.51% is covered by the agriculture 25.57 % is covered by Scrub land and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-09/2009-10

DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Sanjamala Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 13,246 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



- 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).

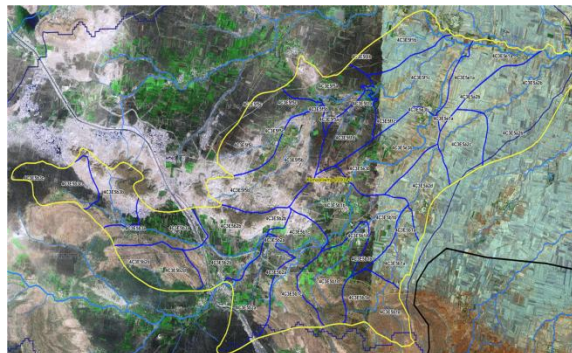
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			25-Dec-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-Dec-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	Drishiti Photographs		
		Total	882
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

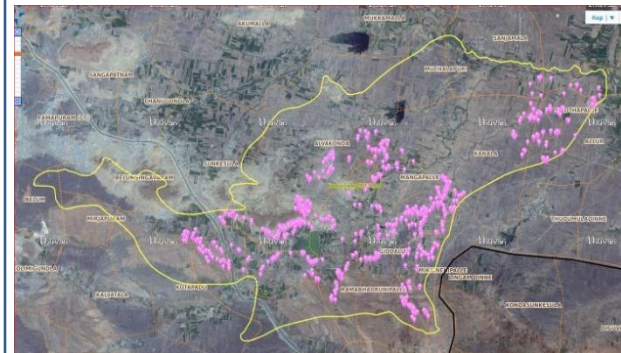


MWS Boundary



Project Boundary

Natural Color Composite overlaid with Drishiti Points



Drishiti Upload Status

Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Block planting/	2	2
2	Horticulture	0	0
3	Agriculture	0	0
4	Bund planting	11	10
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	165	163
11	Civil works of Check dams/Rockfill dam/Tanks etc.	171	163
12	Nallah Bunds/Drainage treatment	449	428
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Measures (Activities)	49	47
16	Water harvesting structures	0	0
17	New Activity	0	0
18	Others	76	69
	TOTAL	923	882

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- 13th April 2013



Source:LISS-IV,NRSC

Natural Color Composite-19th May 2014



Source:LISS-IV,NRSC

Natural Color Composite- 2016



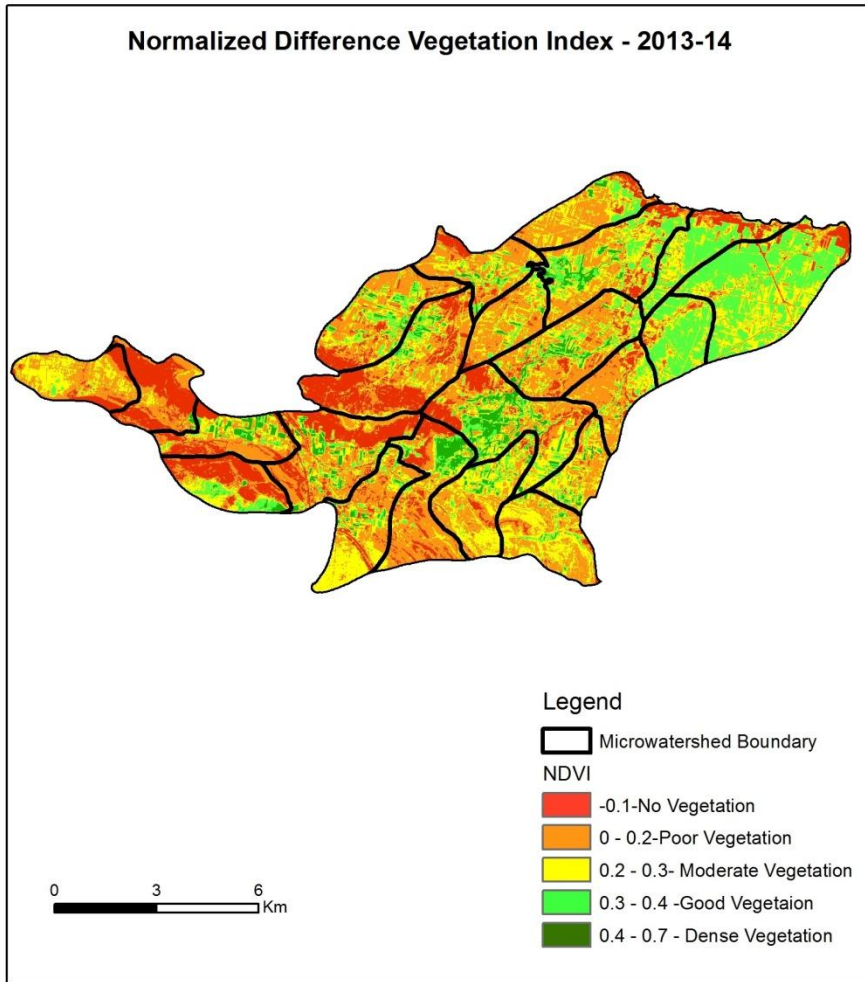
Source:LISS-IV,NRSC

Natural Color Composite-03rd June 2017

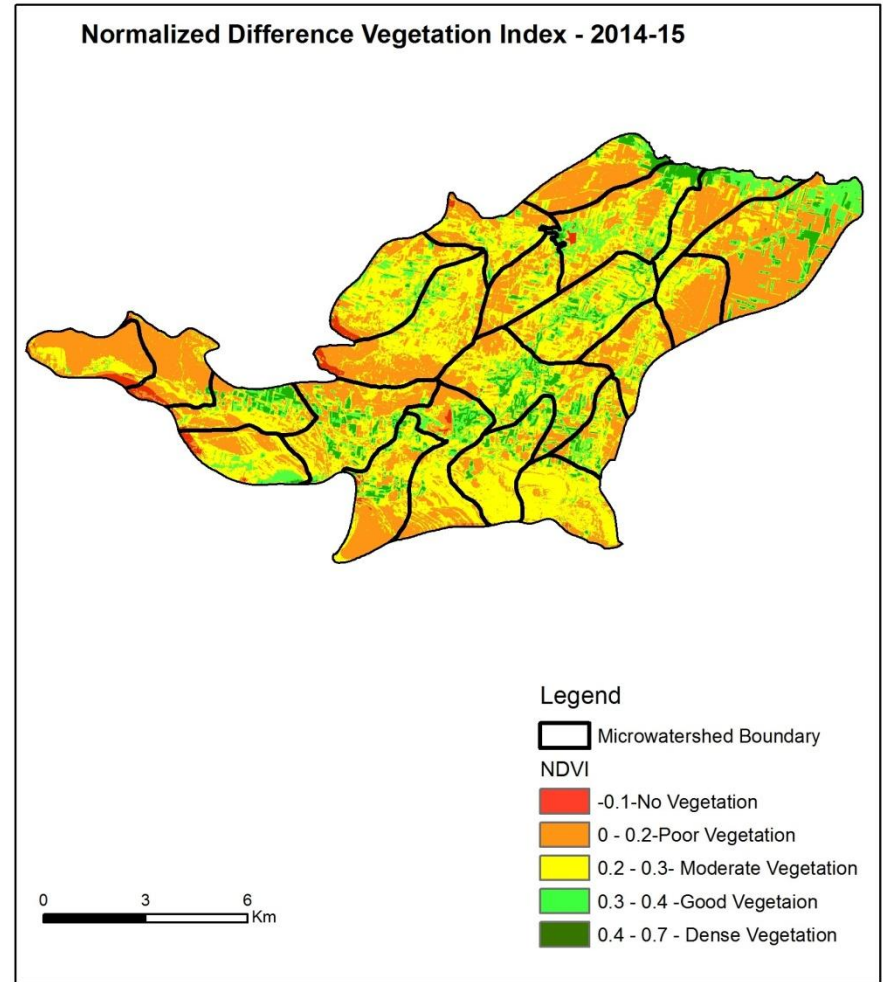


Source:Fusen data,NRSC

Changes in Vegetation Cover

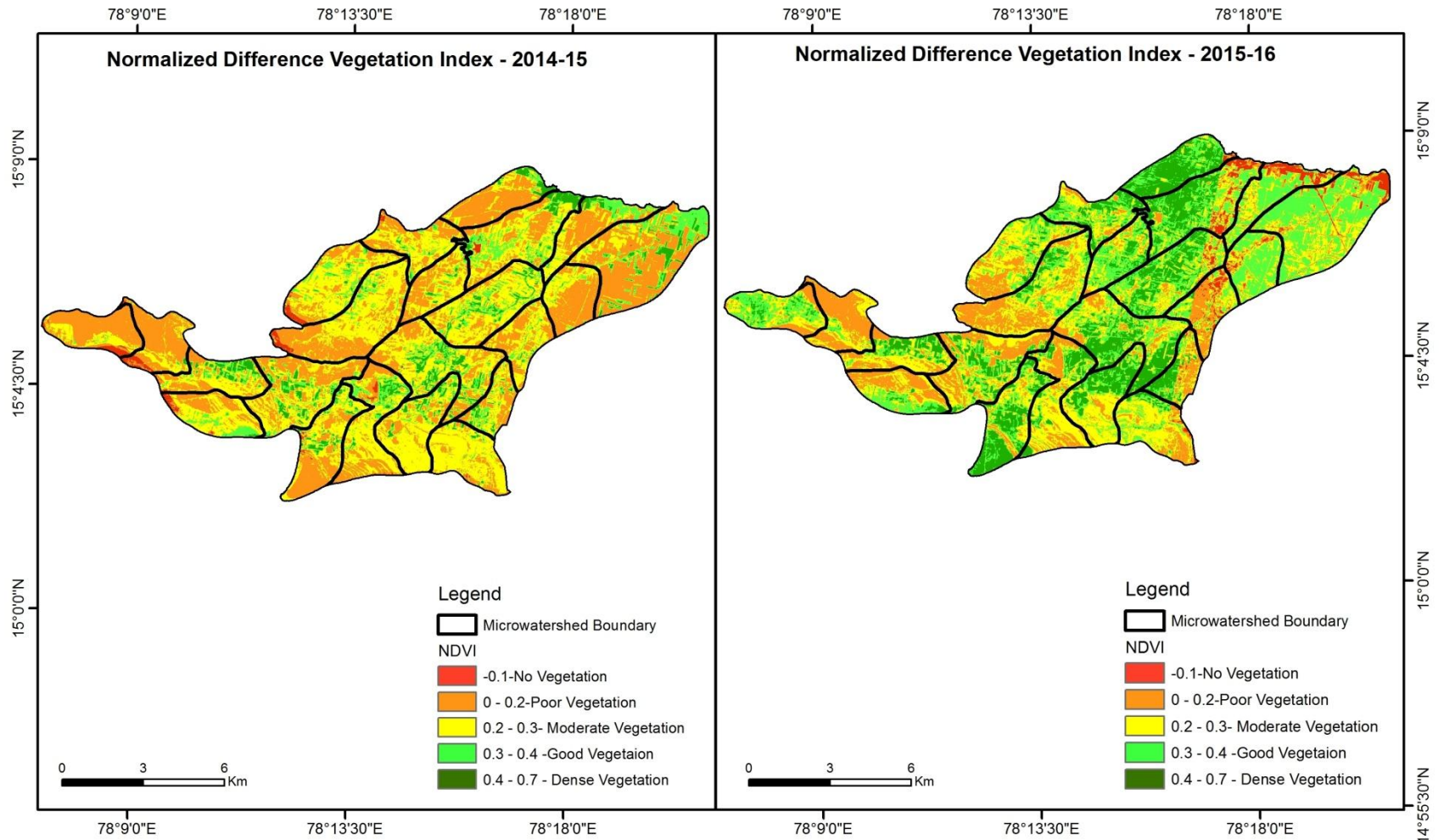


NDVI (2013-14)



NDVI (2014-15)

Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-09/2009-10



T0:2009-10

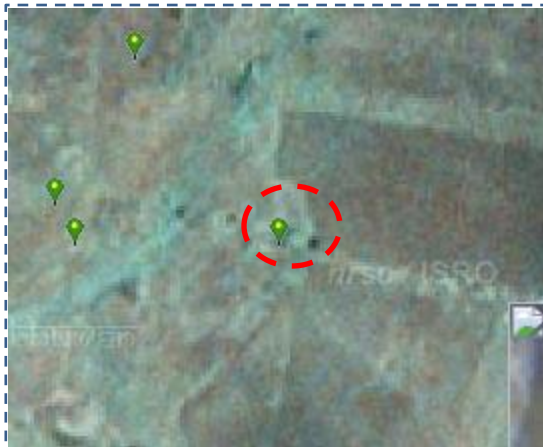


T1: 13 April 2013



Drishti SI no. 2574102 MWS :4G

Check dam



T0:2009-10



T1: 13 April 2013



Drishti SI no.147369 MWS : 4C3G5e2a

Farm pond

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-09/2009-10



T0: 2009-10



T1: 13 April 2013



Drishti Sl no. 144510 MWS :4C3E5b3a

Farm pond



T0: 2009-10



T1: 13 April 2013



Drishti Sl no. 144606 MWS :4C3E5b3a

Farm pond

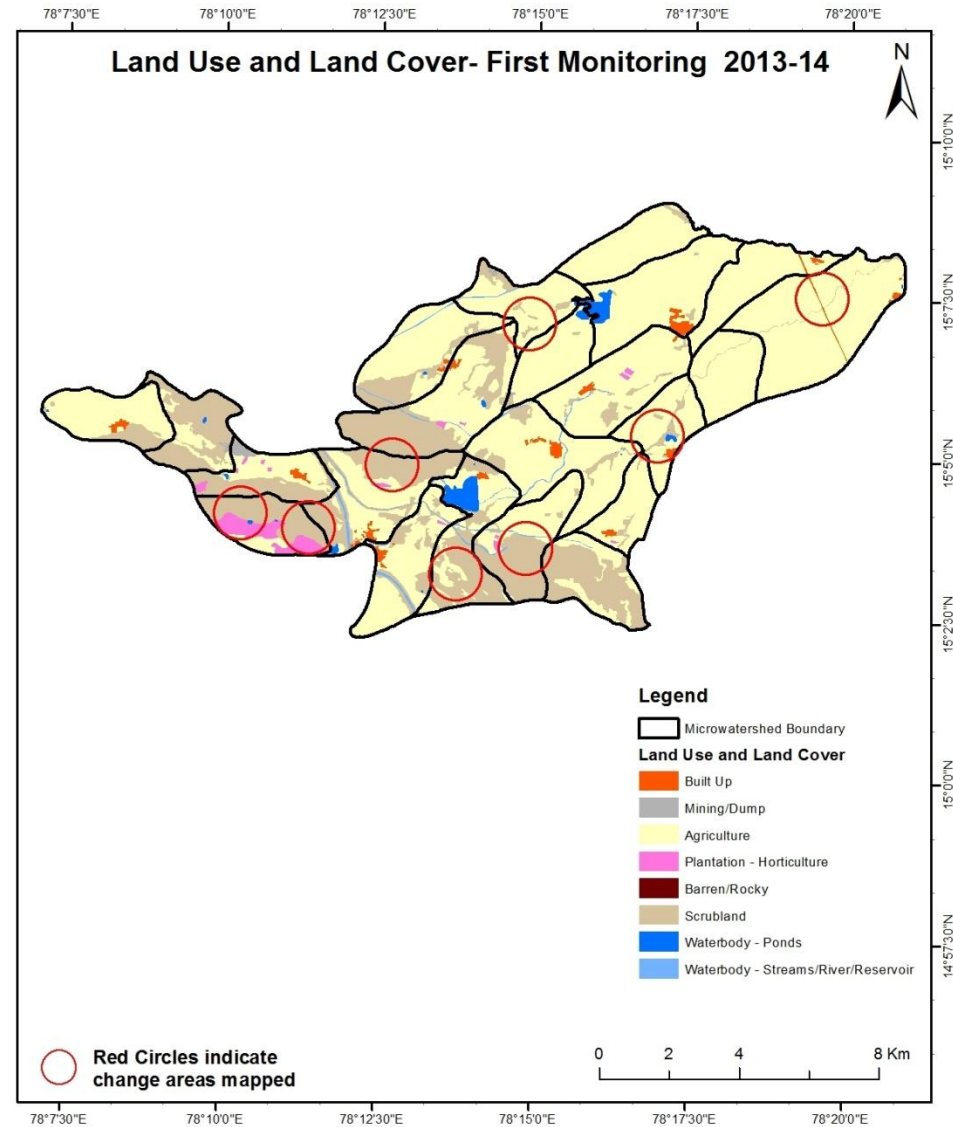
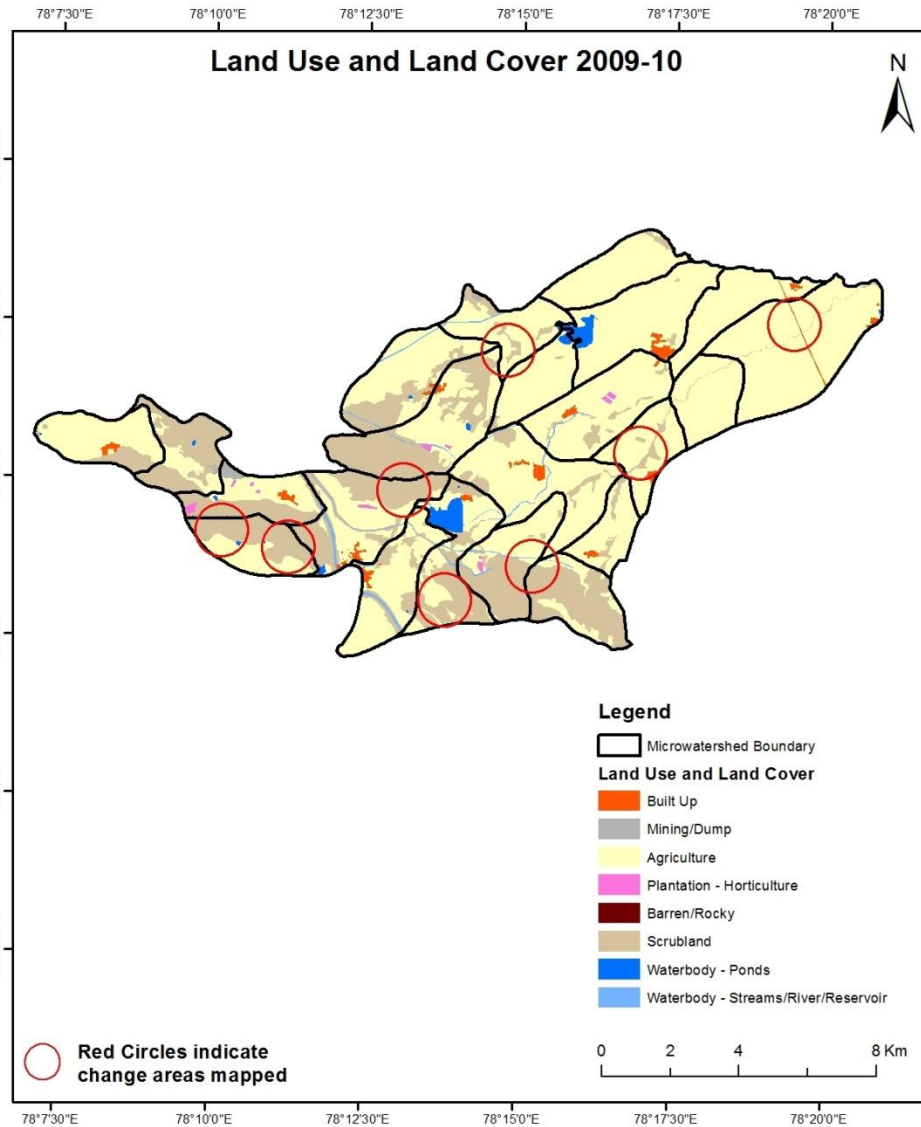
MONITORING IN THE PROJECT AREA

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)

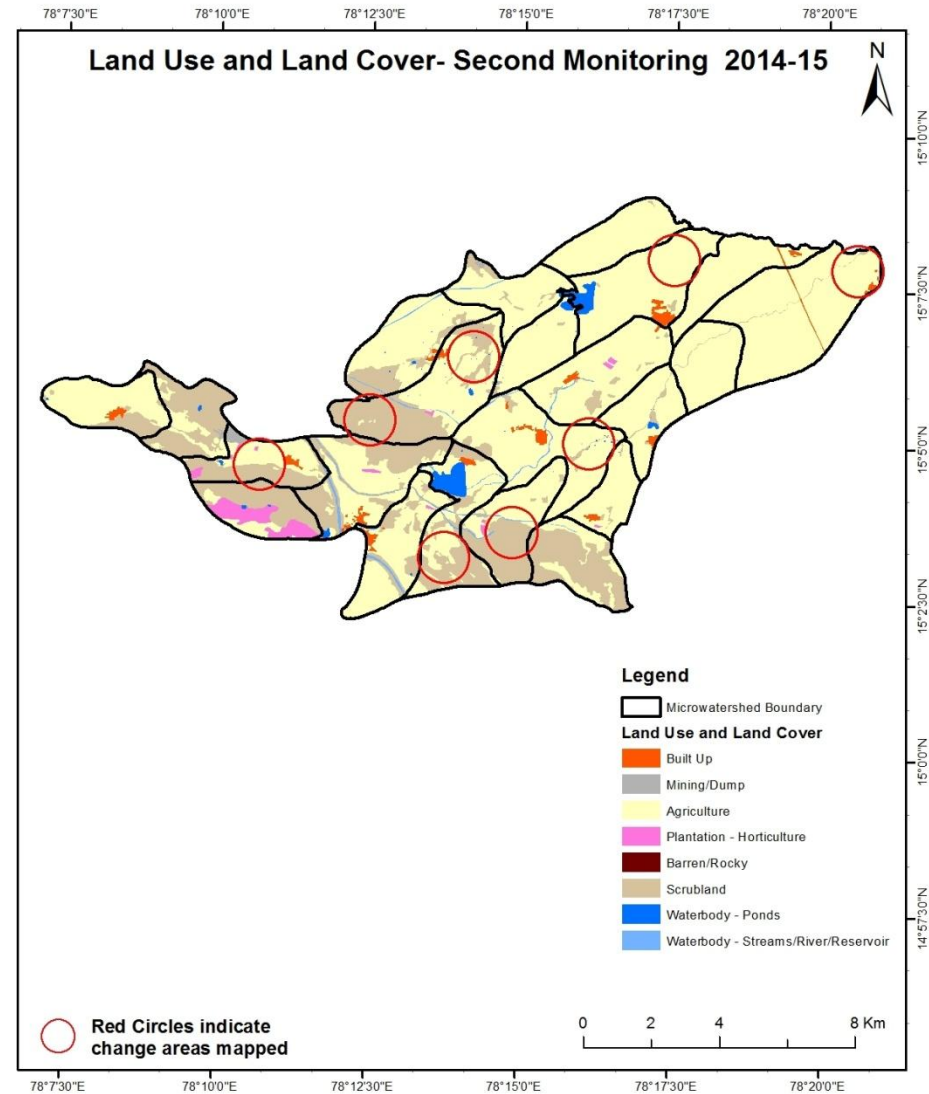
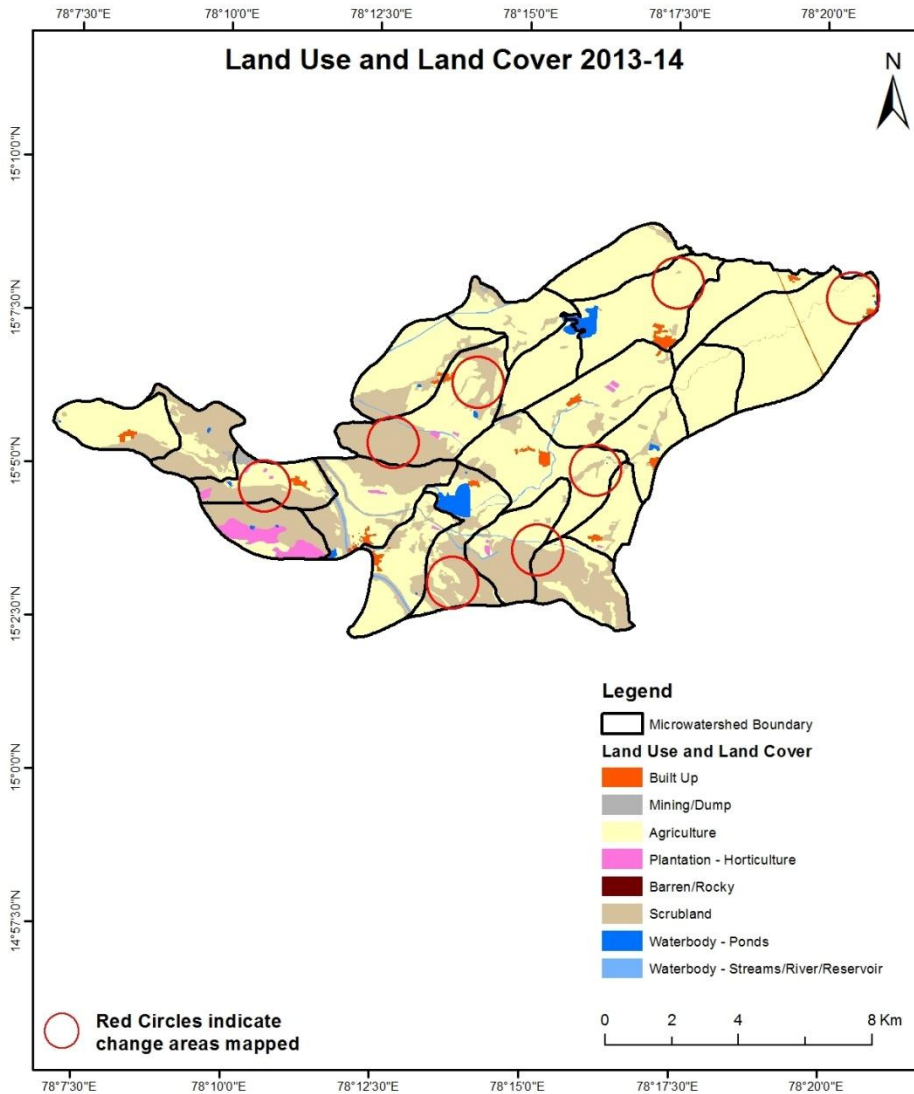
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



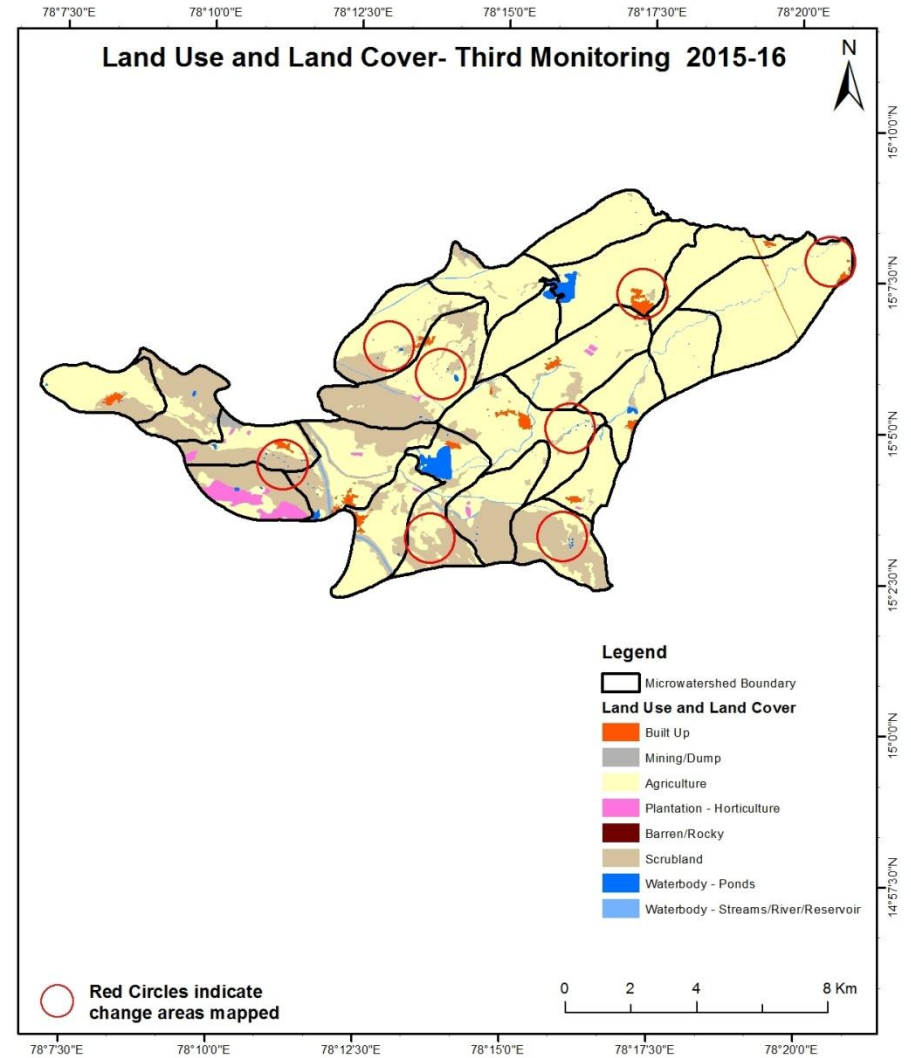
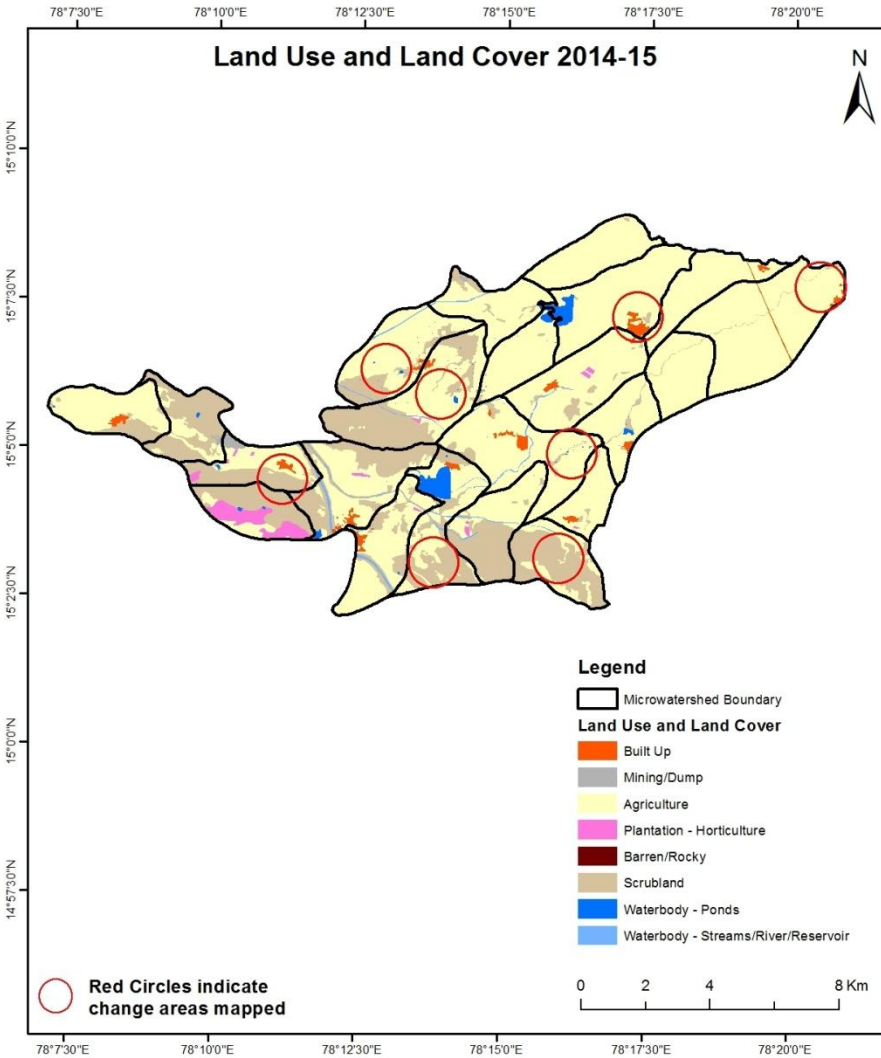
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



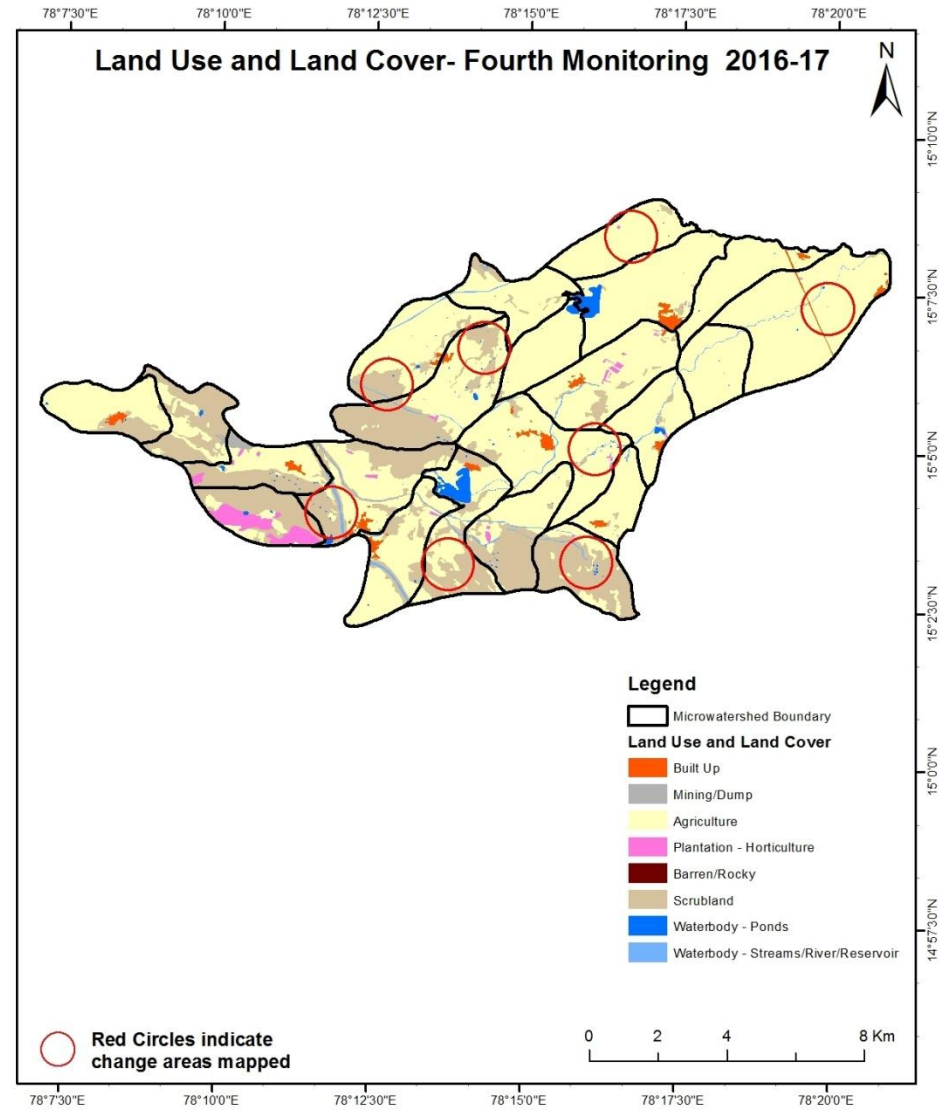
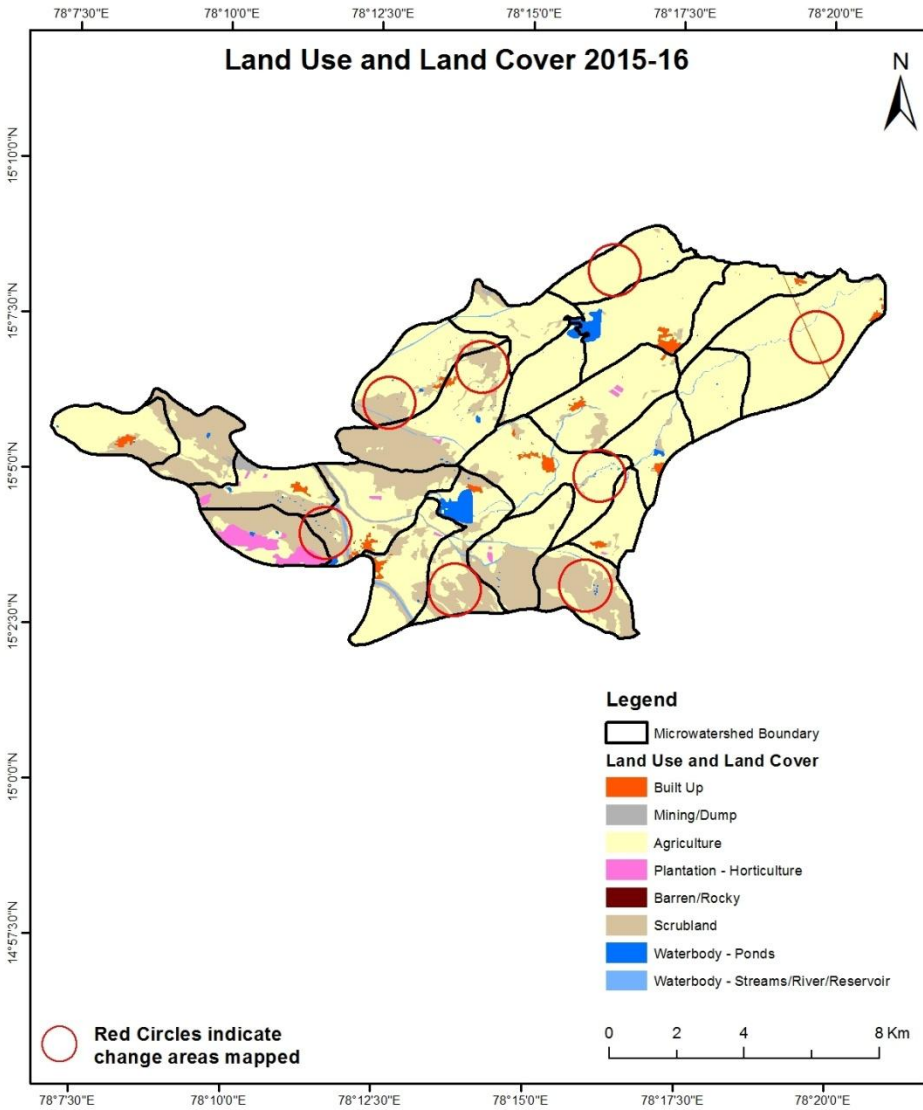
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



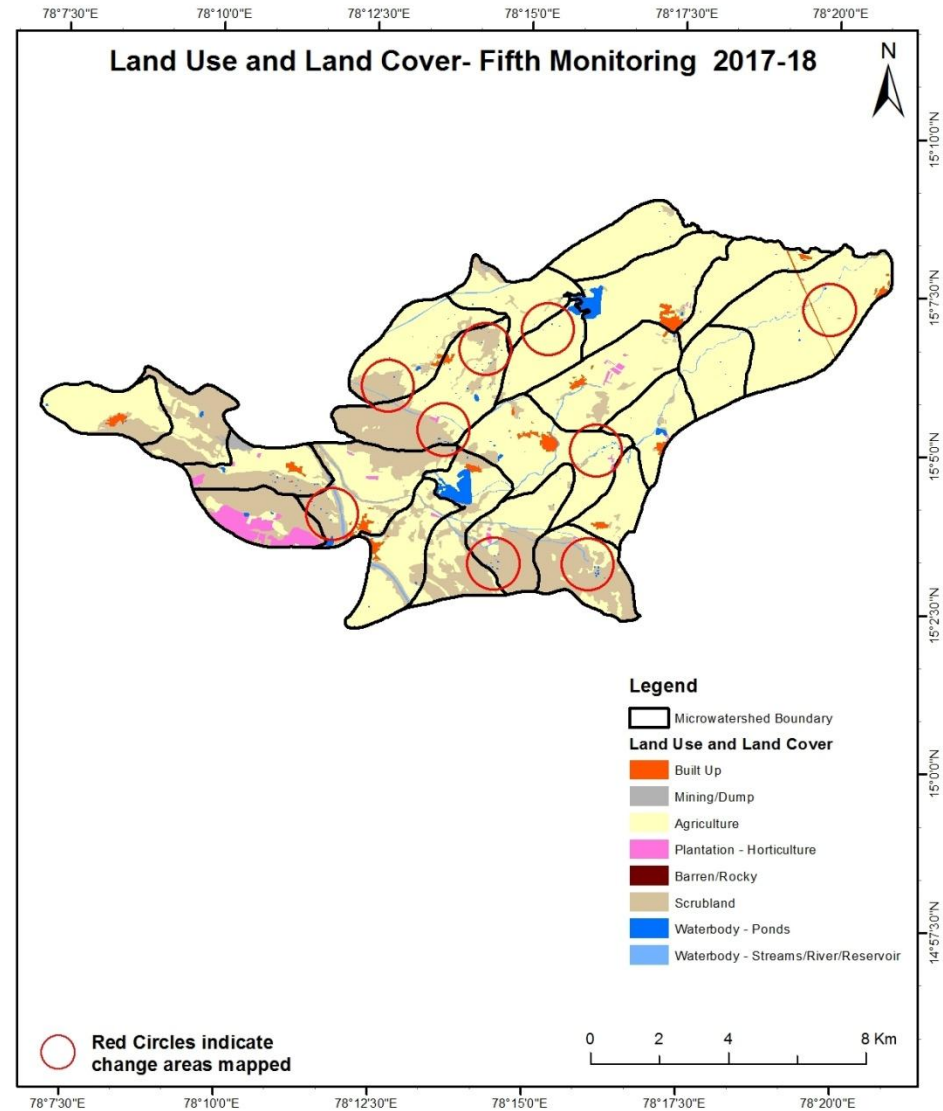
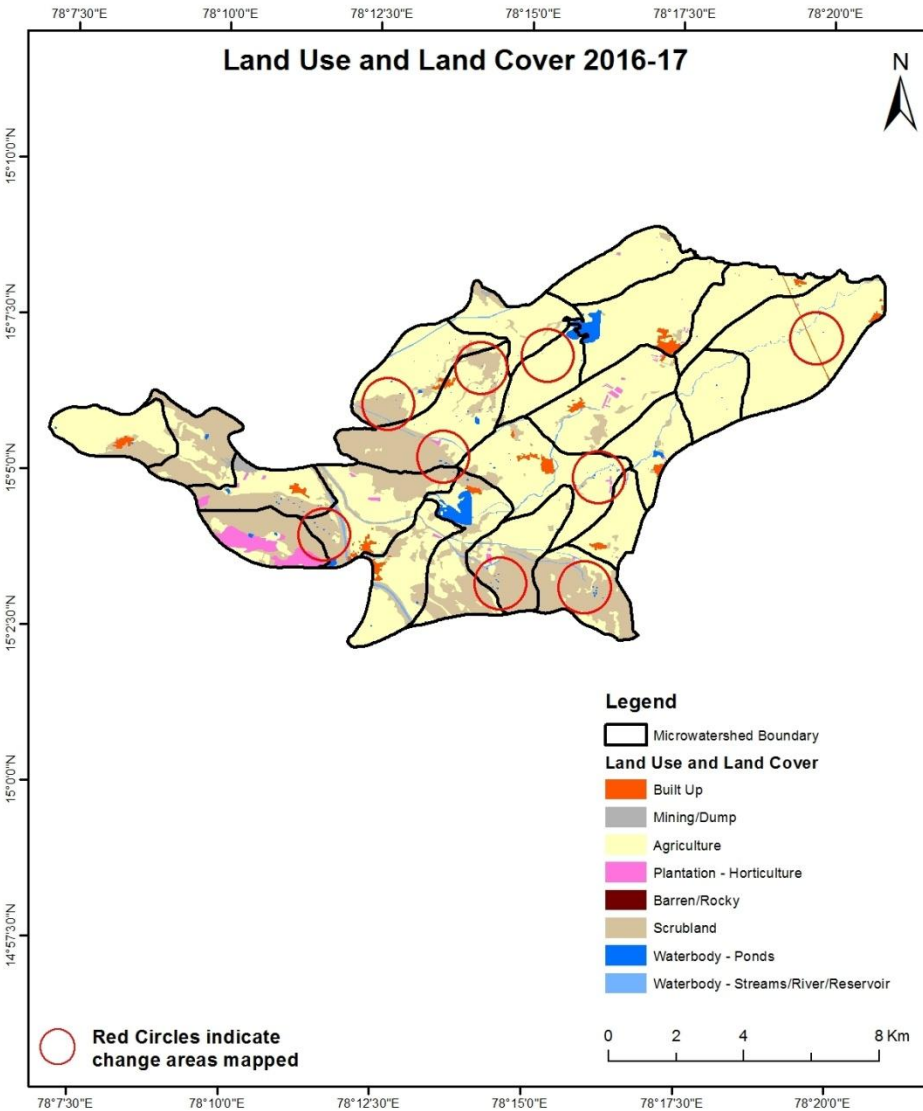
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



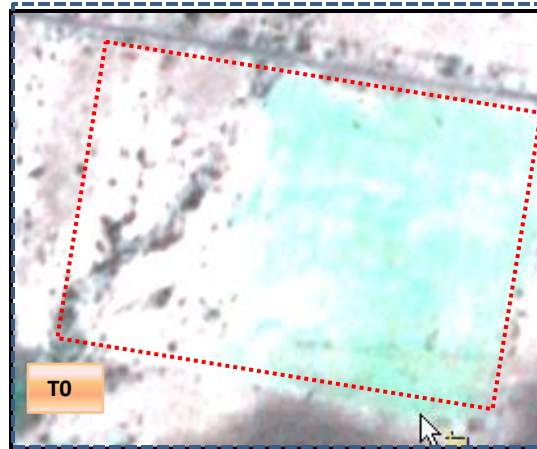
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

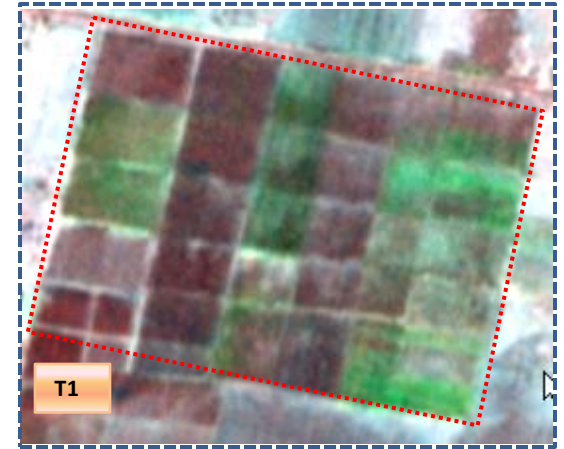


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

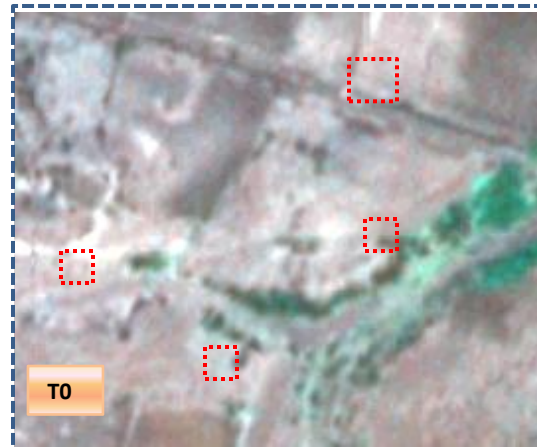


T0: 2009-10

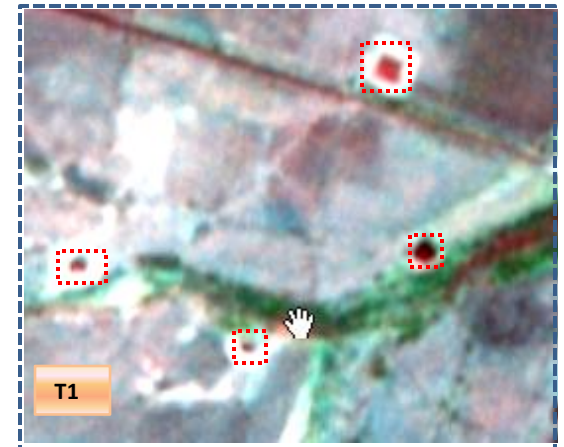


T1: 13 April 2013

Scrub to water body



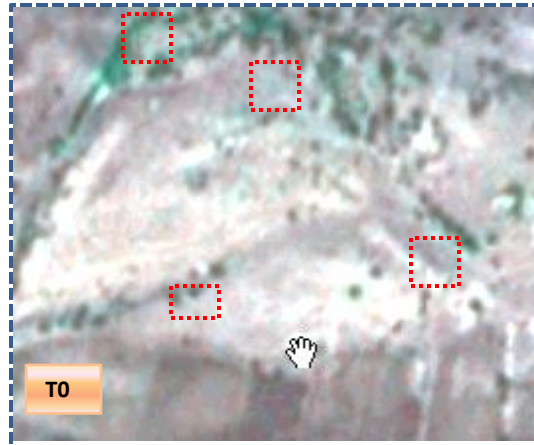
T0: 2009-10



T1: 13 April 2013

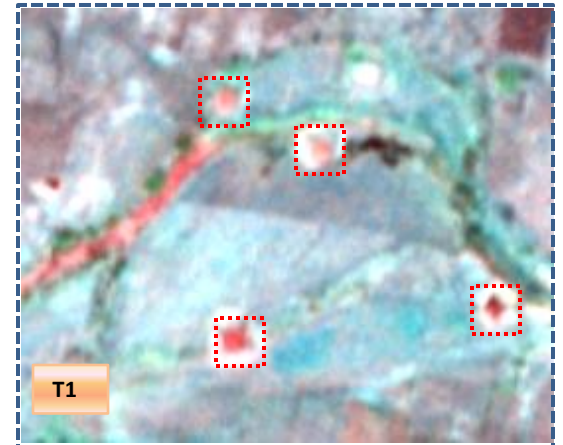
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Water body



T0

T0: 2009-10



T1

T1: 13 April 2013

Scrub to Agriculture



T0

T0: 2009-10



T1

T1: 13 April 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		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	164.31												164.31
Mining/dump		34.67											34.67
Agriculture			9052.02	151.23				57.84			5.34		9266.43
Plantation Horticulture				35.93									35.93
Forest													
Forest Plantation													
Barren Rocky							0.00						0.00
Scrub			121.91					3355.53			0.43		3477.87
Waterbody- Streams/River									118.13				118.13
Waterbody – Ponds											149.59		149.59
Grand Total	164.31	34.67	9173.93	187.16			0.00	3413.37	118.13		155.36		13246.94

- 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 214.41 ha of the agriculture area has decreased and it is converted into plantation, scrubland and water body in T1.
- In T1 121.91 ha of the agriculture area has increased from 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	164.31										164.31
Mining/dump		34.67									34.67
Agriculture	7.71		9152.97					10.54		2.70	9173.93
Plantation Horticulture			6.74	180.42							187.16
Forest											
Forest Plantation											
Barren Rocky							0.00				0.00
Scrub	2.51		290.05					3119.08		1.72	3413.37
Waterbody- Streams/River									118.13		118.13
Waterbody – Ponds	0.70									154.66	155.36
Grand Total	175.24	34.67	9449.77	180.42			0.00	3129.62	118.13	159.09	13246.94

- 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 20.96 ha of the agriculture area has decreased and it is converted into Built up, scrubland and water body in T2.
- In T2 296.80 ha of the agriculture area has increased from plantation 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	175.24										175.24
Mining/dump		32.20	2.47								34.67
Agriculture	12.00		9363.08	0.57				68.13	3.63	2.38	9449.77
Plantation Horticulture			9.55	170.86							180.42
Forest											
Forest Plantation											
Barren Rocky							0.00				0.00
Scrub			91.33					3006.45	24.37	7.46	3129.62
Waterbody- Streams/River									118.13		118.13
Waterbody – Ponds			2.61							156.48	159.09
Grand Total	187.23	32.20	9469.04	171.43			0.00	3074.59	146.13	166.31	13246.94

- 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 86.70 ha of the agriculture area has decreased and it is converted into Built up, plantation, scrubland and water body in T3.
- In T3 105.97 ha of the agriculture area has been increased from mining/dump, plantation, 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
T3												
Built up	187.23										187.23	
Mining/dump		32.20									32.20	
Agriculture	0.05		9351.52	17.86				97.73		1.88	9469.04	
Plantation Horticulture			1.50	169.94							171.43	
Forest												
Forest Plantation												
Barren Rocky							0.00				0.00	
Scrub	0.22		71.20					2994.44	7.61	1.12	3074.59	
Waterbody- Streams/River									146.13		146.13	
Waterbody – Ponds			11.10							155.22	166.31	
Grand Total	187.50	32.20	9435.31	187.79			0.00	3092.17	153.74	158.22	13246.94	

- 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 117.52 ha of the agriculture area has decreased and it is converted into Built up, plantation, scrubland and water body in T4.
- In T4 83.79 ha of the agriculture area has been increased from plantation, 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		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
Built up	187.50												187.50
Mining/dump		32.20											32.20
Agriculture	8.23		9389.82	28.17				5.93			3.15		9435.31
Plantation Horticulture			7.56	180.23									187.79
Forest													
Forest Plantation													
Barren Rocky							0.00						0.00
Scrub	0.22		26.22					3062.76			2.98		3092.17
Waterbody- Streams/River									153.74				153.74
Waterbody – Ponds			1.23								156.99		158.22
Grand Total	195.95	32.20	9424.83	208.40			0.00	3068.69	153.74		163.12		13246.94

- 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 45.48 ha of the agriculture area has decreased and it is converted into Built up, plantation, scrubland and water body in T5.
- In T5 35.01 ha of the agriculture area has been increased from plantation, scrubland and water body 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 49.14 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 275.84 & 19.27 Hectares From T1-T2 & T2-T3 respectively and overall increase of 382.23 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 172 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 409.18 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (163) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (165) verified from the portal.