

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

KURNOOL -26/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
July-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

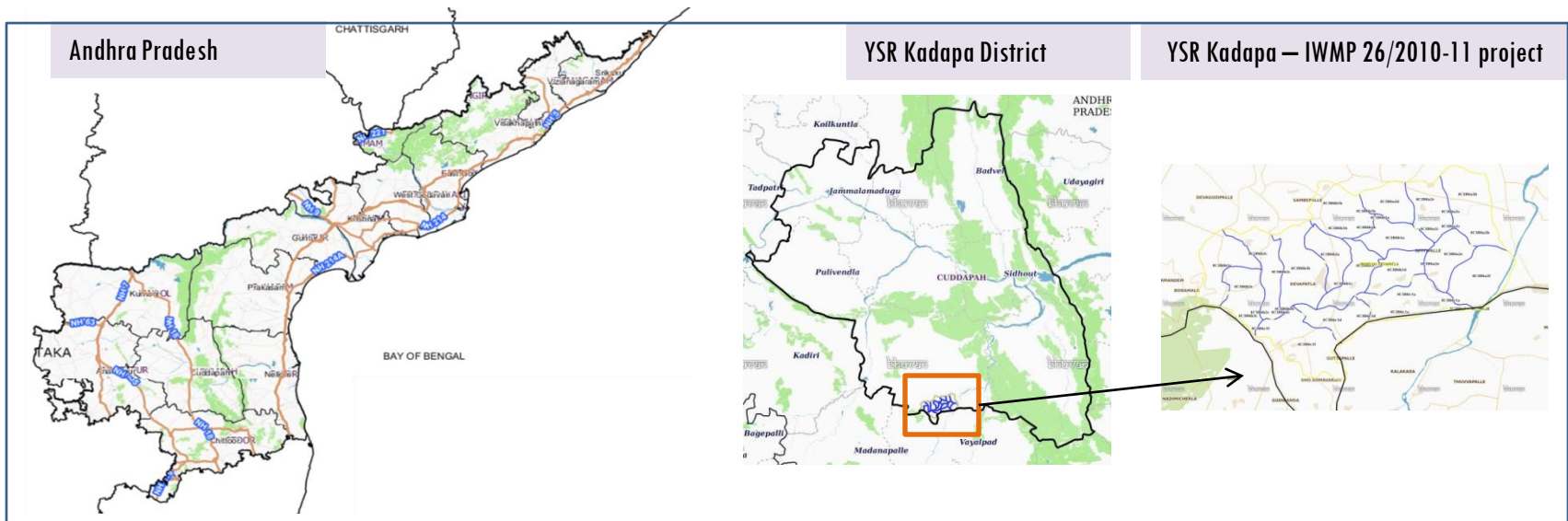
E X E C U T I V E S U M M A R Y

- 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-26/2010-11, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 12,302 ha. It comprises of 17 micro watersheds.
- In the project area 426 Drishti photos were uploaded showing check dams/Rock fill dam, boulder removal, farm ponds, dug out pits etc, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 8 new farm ponds or dug out pits and 13 check dams and drainage treatments with 113 ha increase in the area.
- Major percentage i.e. 59 % is covered by the agriculture, 19 % is covered by scrubland, 12 % is barren/rocky area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-26/2010-11

DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Sambepalle Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 12,302 ha. It comprises of 17 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -1*) projects taking 2018-19 (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.

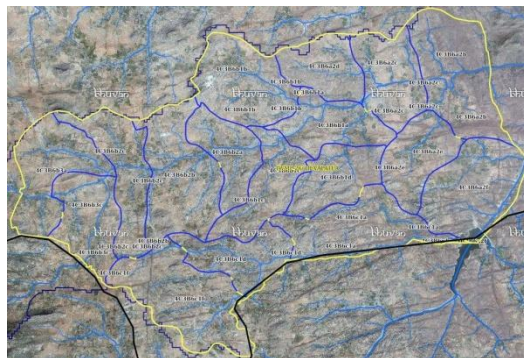
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			25-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			25-Mar-19
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	426
4	Detailed Project Report		

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



Natural Color Composite overlaid with Drishti Points



Legend



Drainage (1:10000 Scale)



MWS Boundary



Project Boundary

Drishti Upload Status

Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/Horticulture	15	15
2	Afforestation	9	9
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	44	30
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	13	13
12	Field Bunds	2	2
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	13	13
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	402	350
	TOTAL	507	426

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 (2010-11) and T5 is 2018-19 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 Colour Composite (NCC)-2010-11 to 2018-19

Natural Color Composite- 2010-11



Source:Fusion data,NRSC

Natural Color Composite- 26th February 2013



Source:NCC,NRSC

Natural Color Composite- 05th April 2016



Source:NCC,NRSC

Natural Color Composite- 03rd October 2017



Source:Sentinel-2

Natural Color Composite- 30th March 2018



Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019



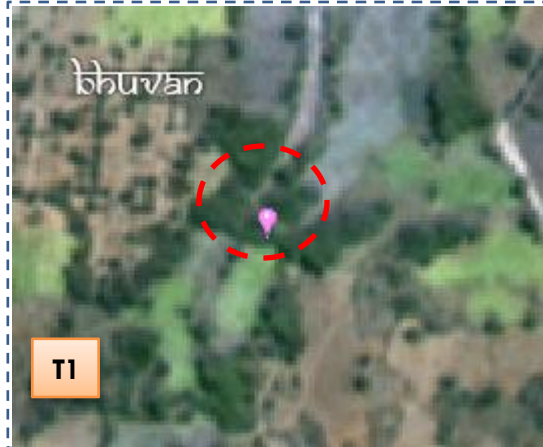
Source:Sentinel-2

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-26/2010-11



T0

T0: 2010-11



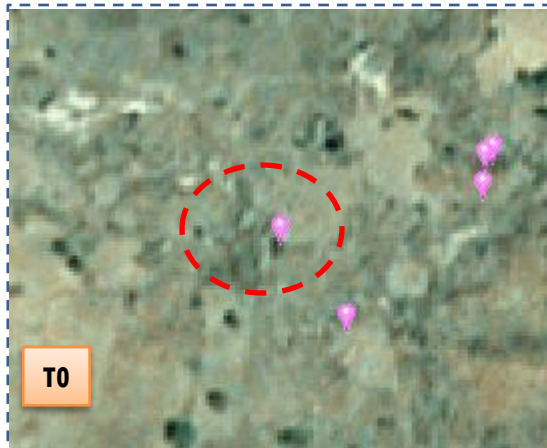
T1

T1: 02 February 2016



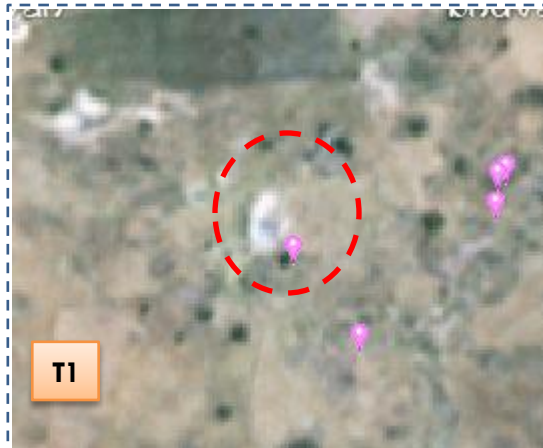
Drishti SI no. 783154 MWS :4C3B6b1a

Check dam



T0

T0: 2010-11



T1

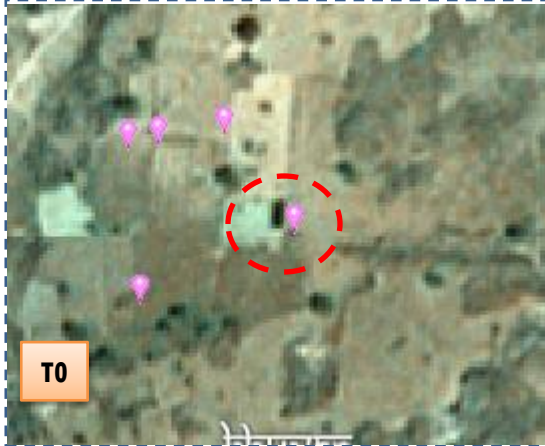
T1: 02 February 2016



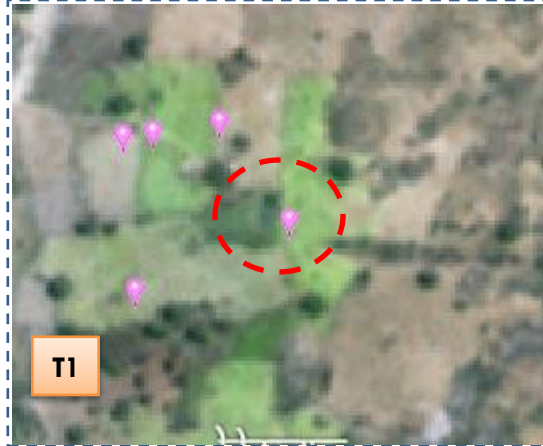
Drishti SI no. 7020571 MWS :4C3B6b2a

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-26/2010-11



T0: 2010-11

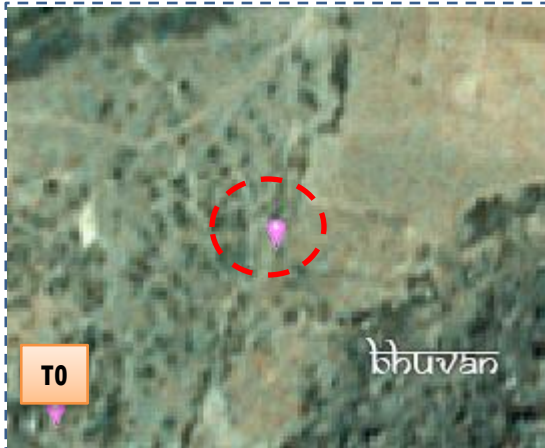


T1: 02 February 2016



Drishti SI no. 235725 MWS :4C3B6b2a

Horticulture



T0: 2010-11



T1: 02 February 2016



Drishti SI no. 7012600 MWS : 4c3b6B2B

Farm pond

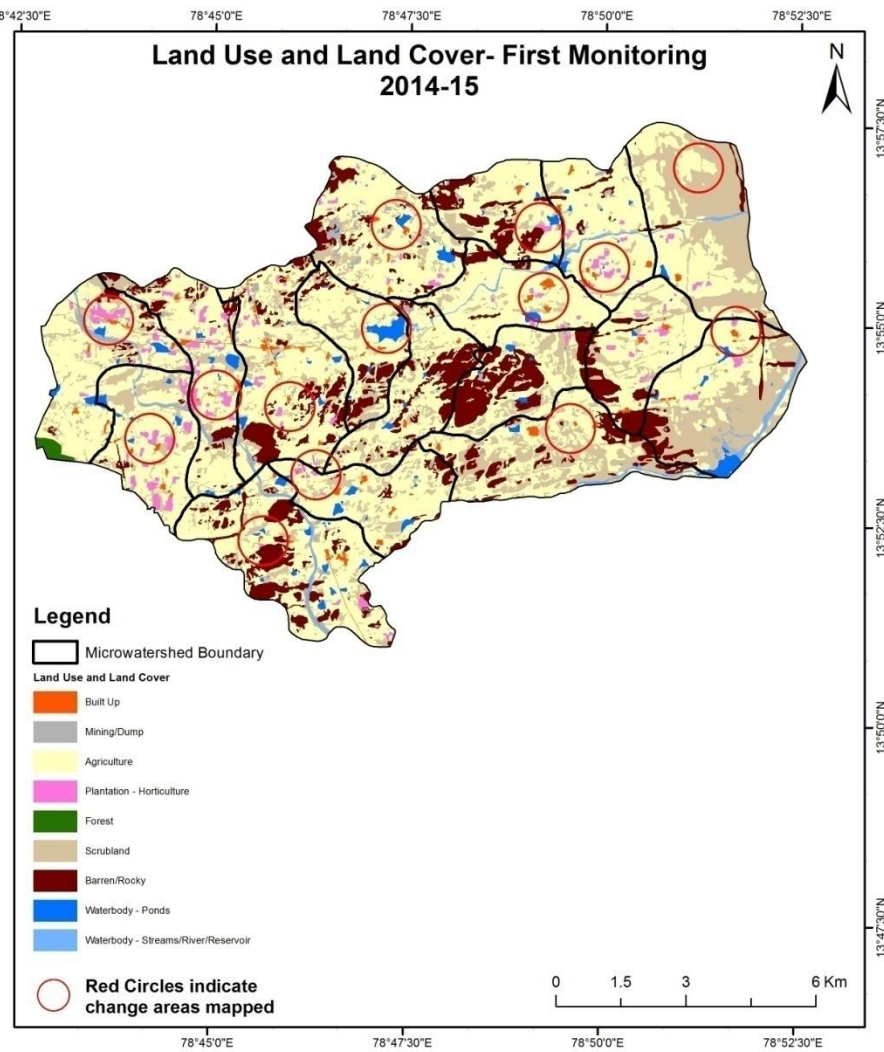
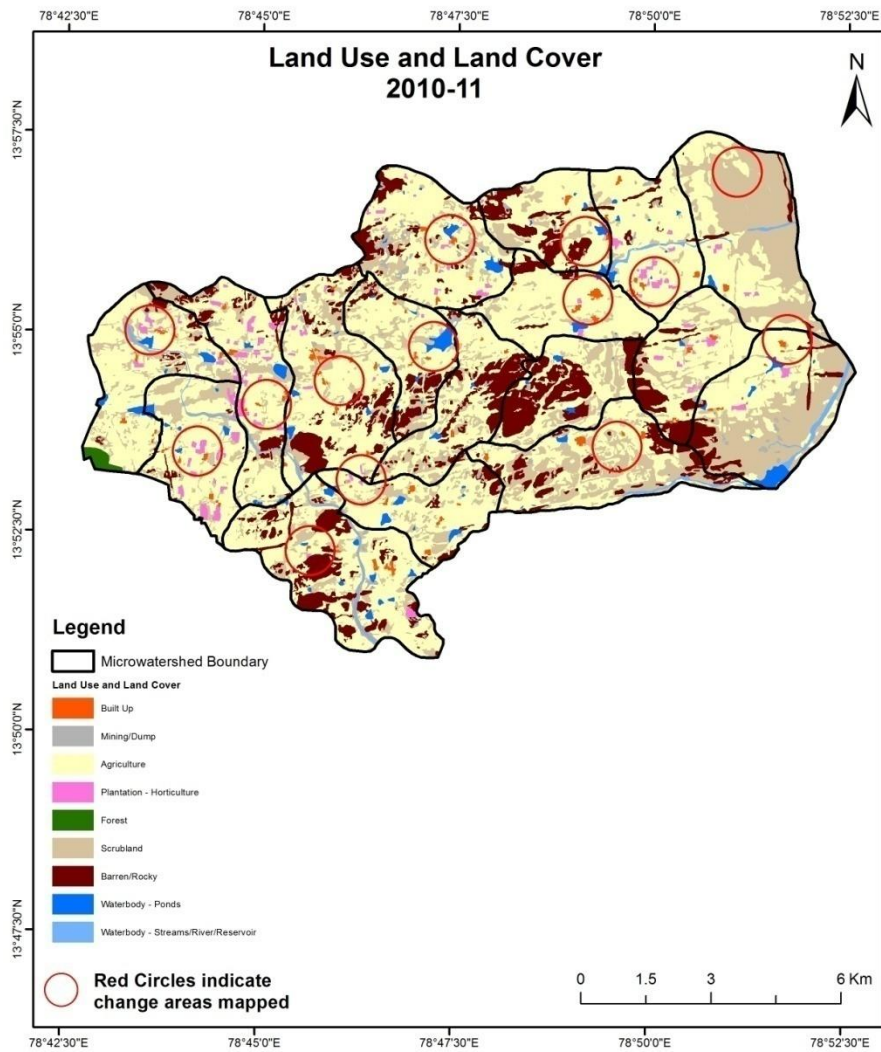
MONITORING IN THE PROJECT AREA

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 (2010-11) and row represents the T5 (2018-19)

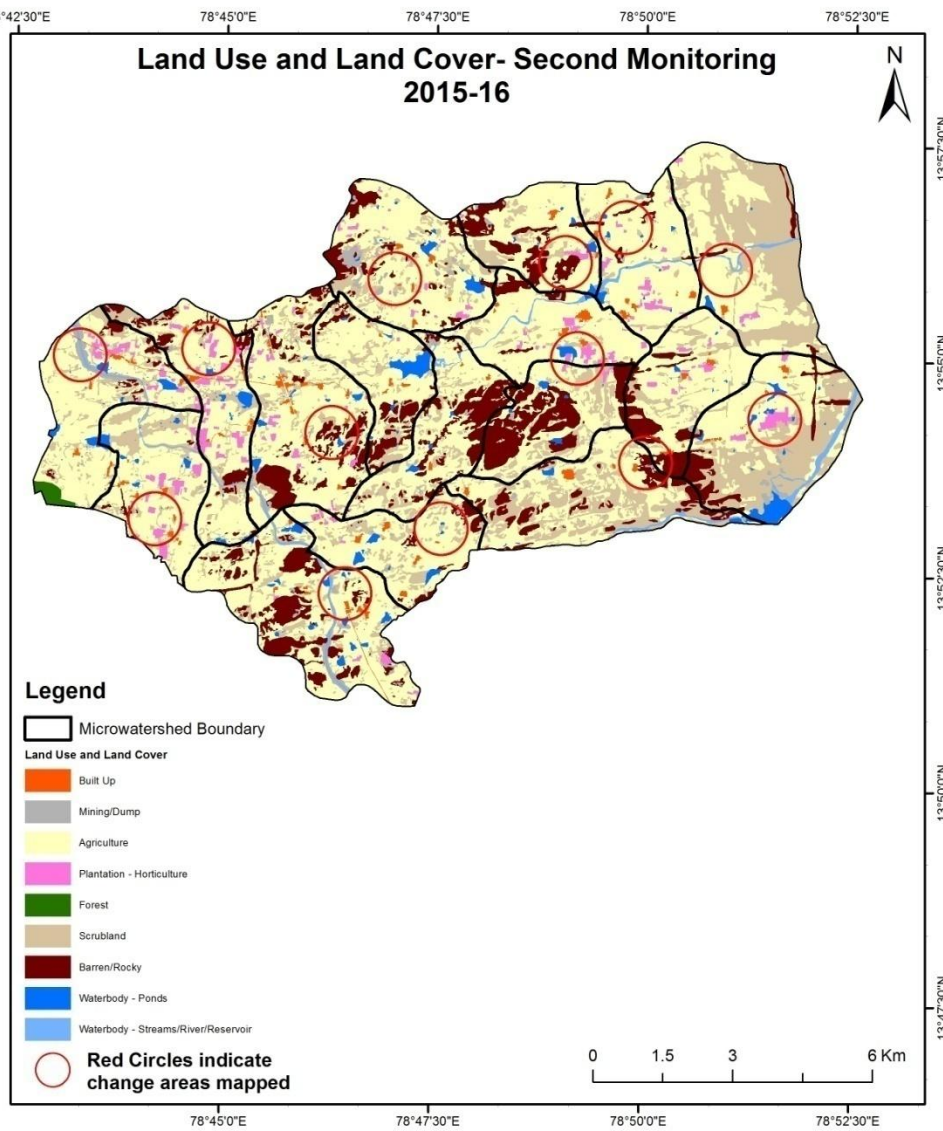
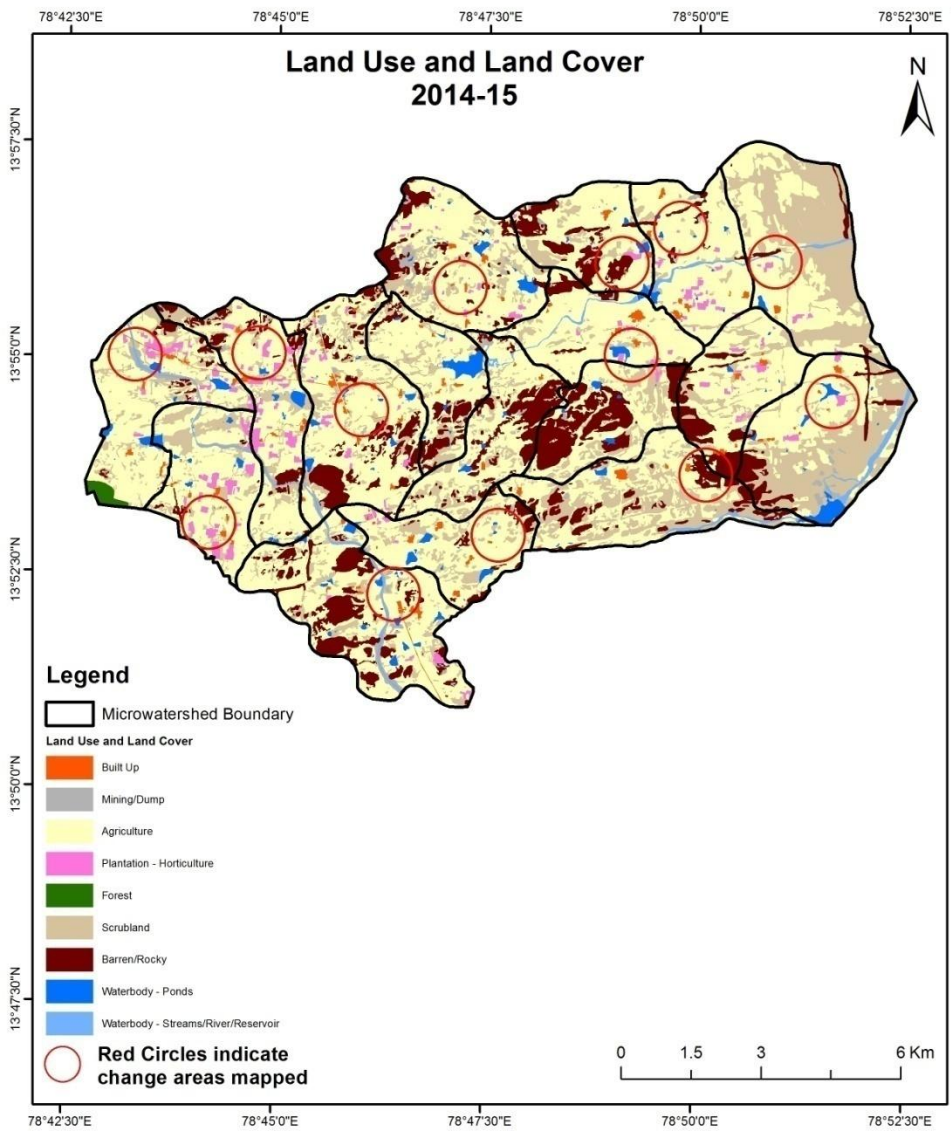
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)

Scale: 1:10000



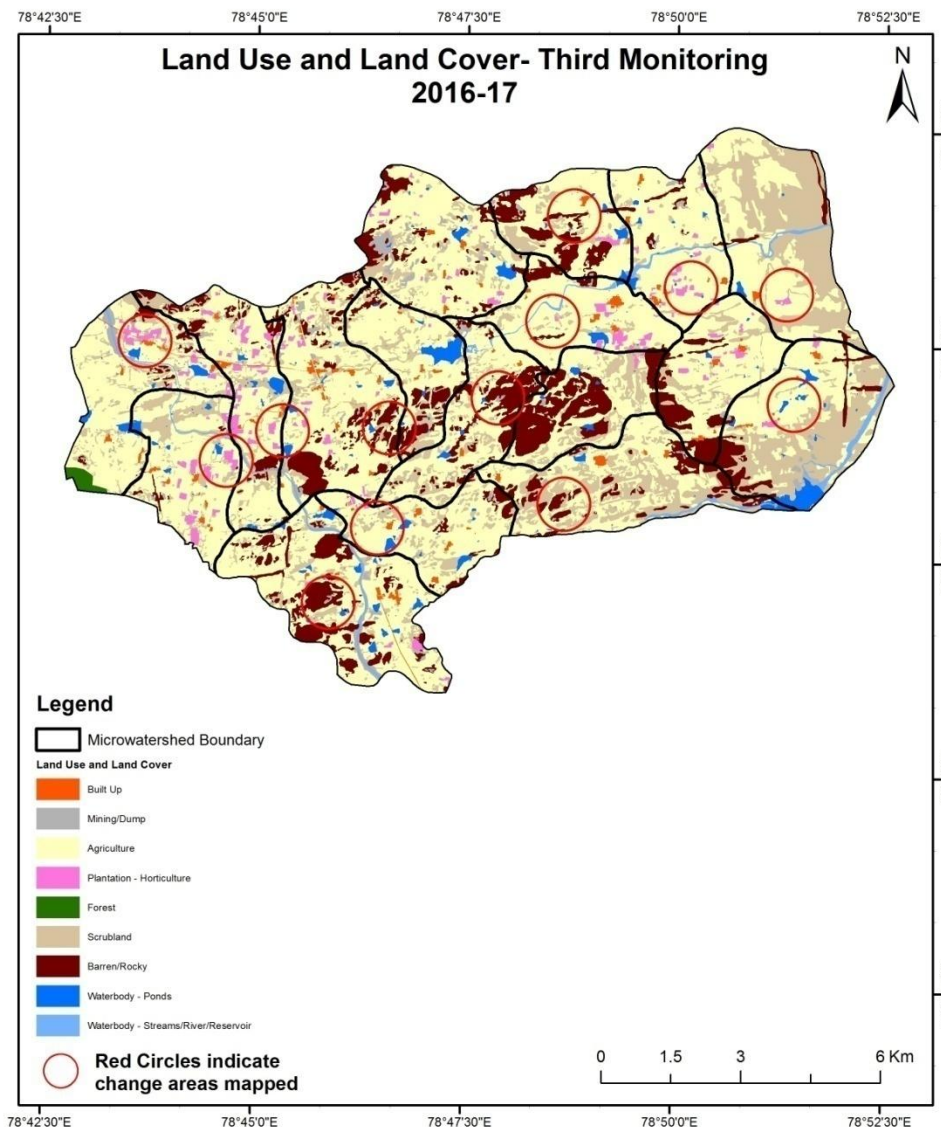
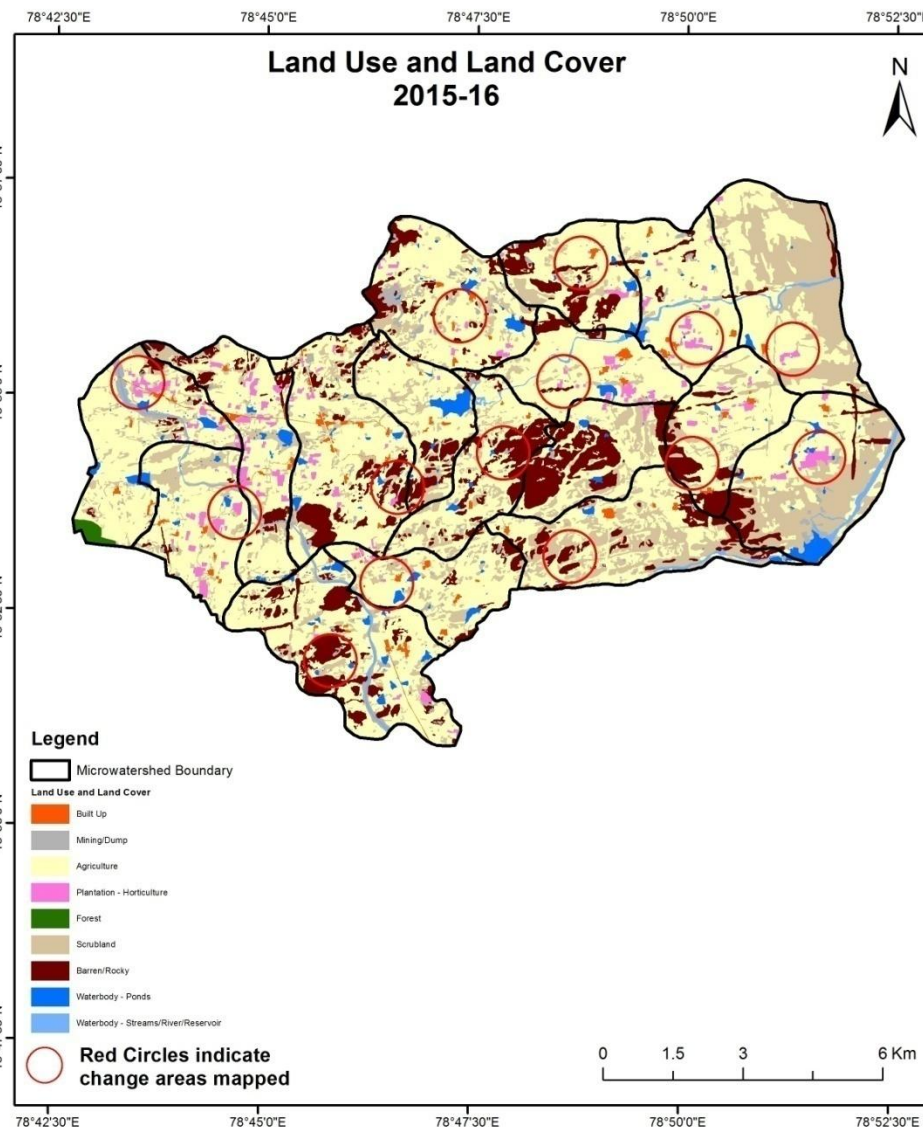
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



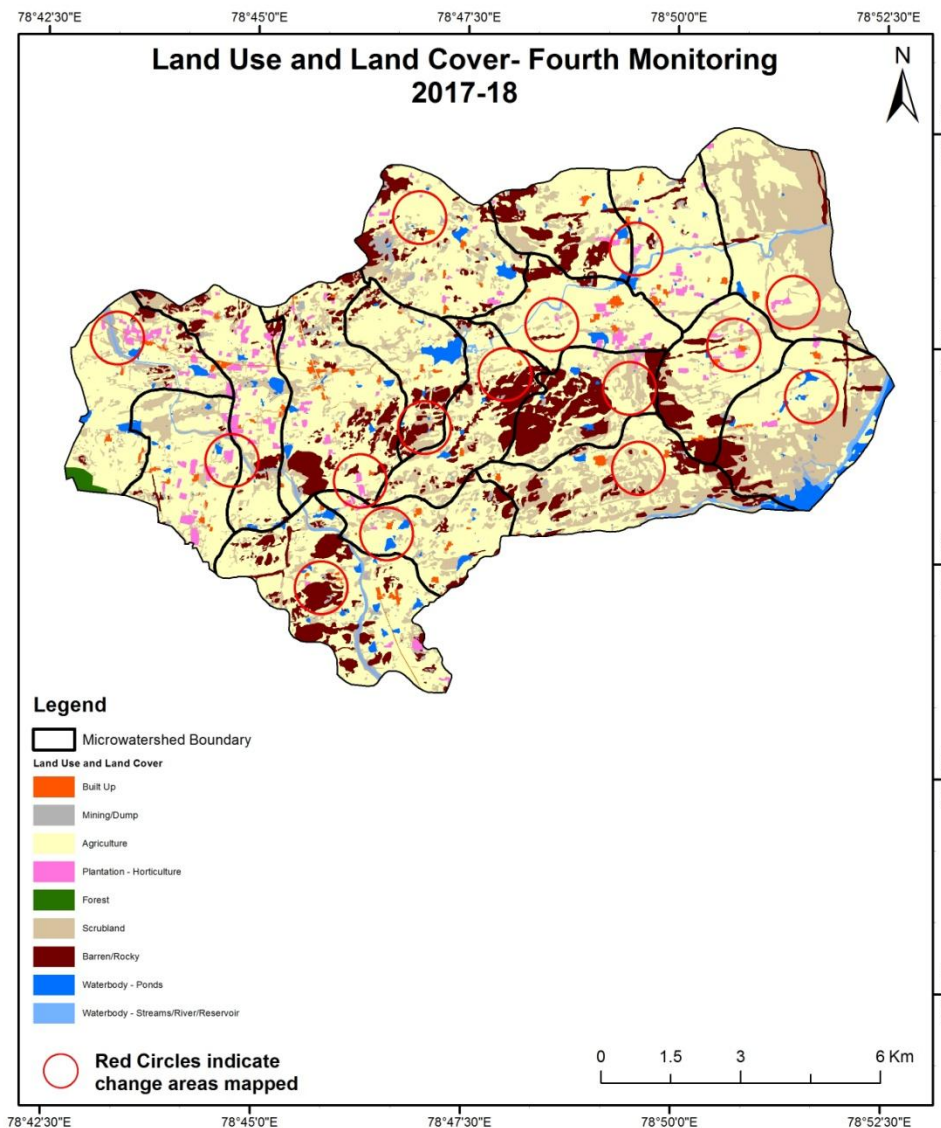
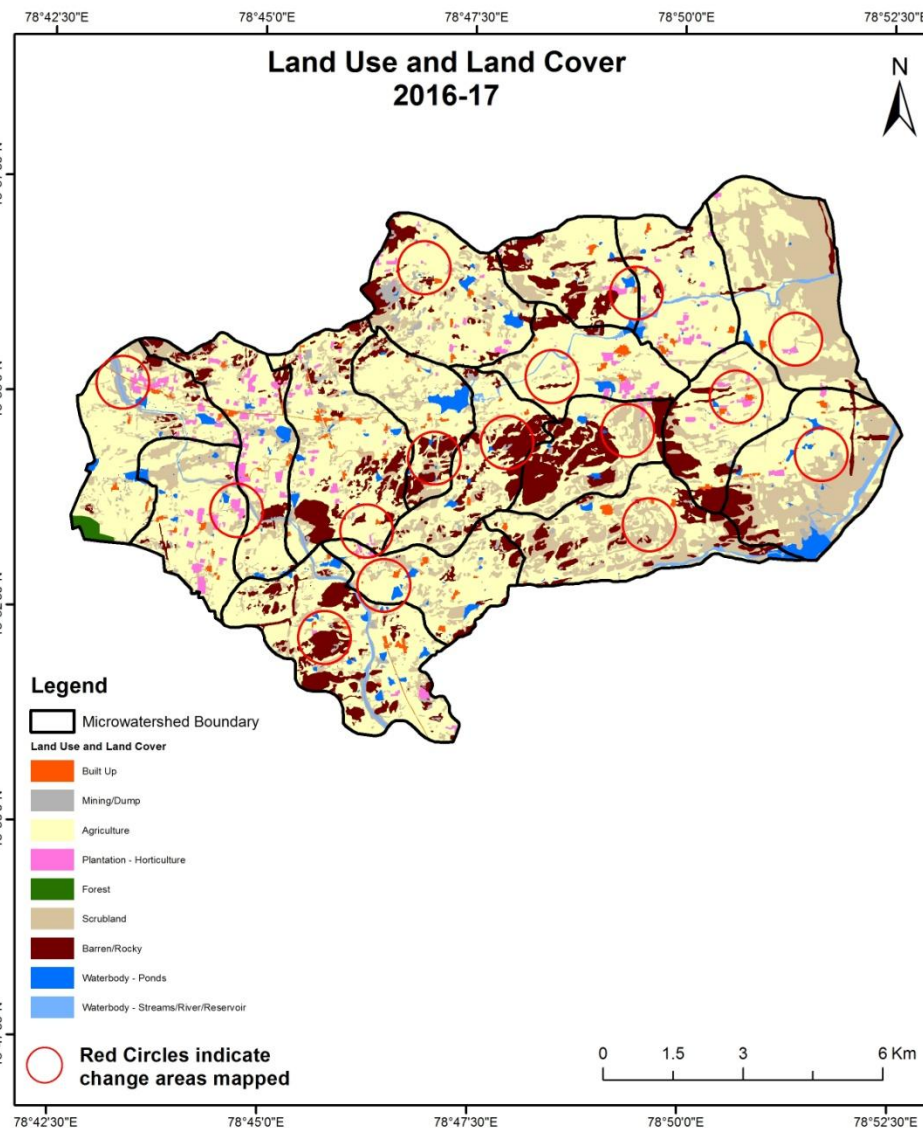
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



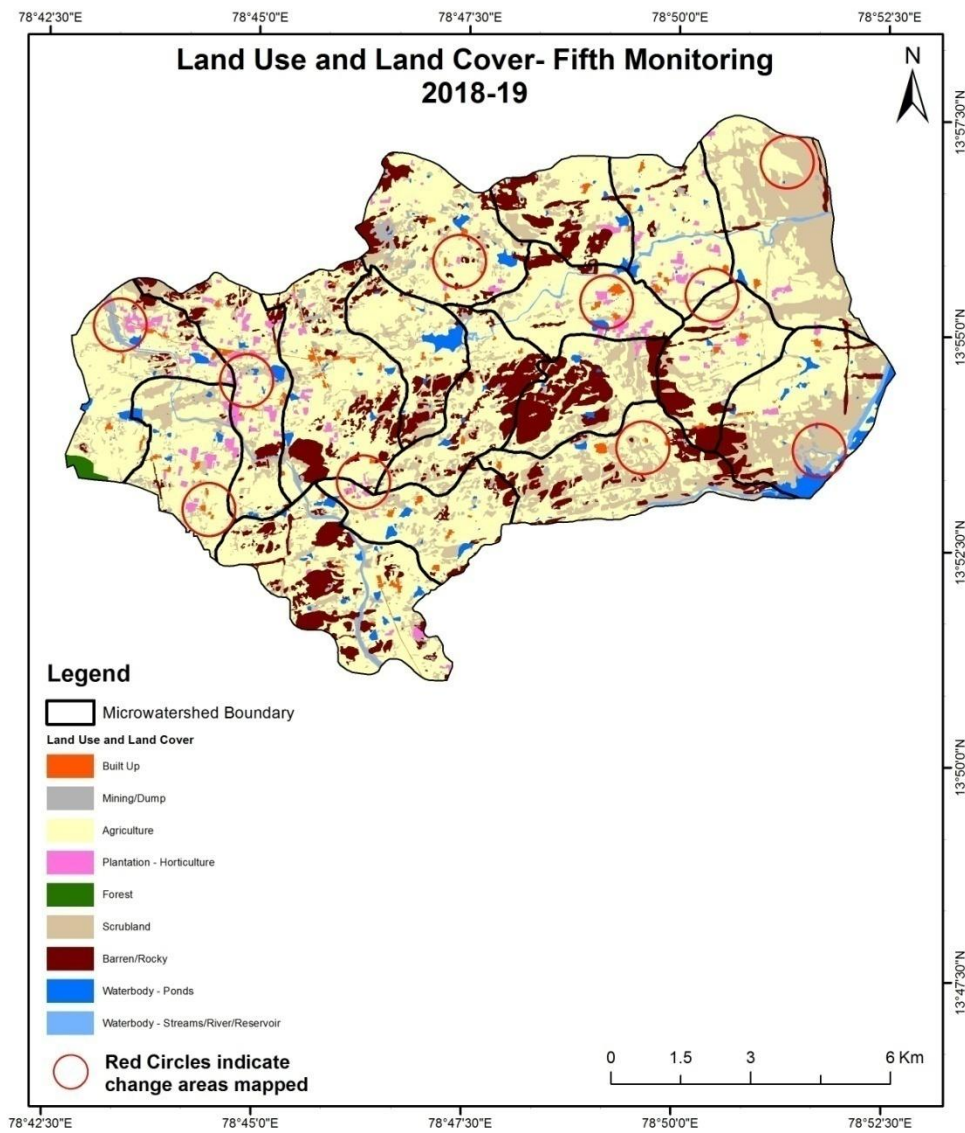
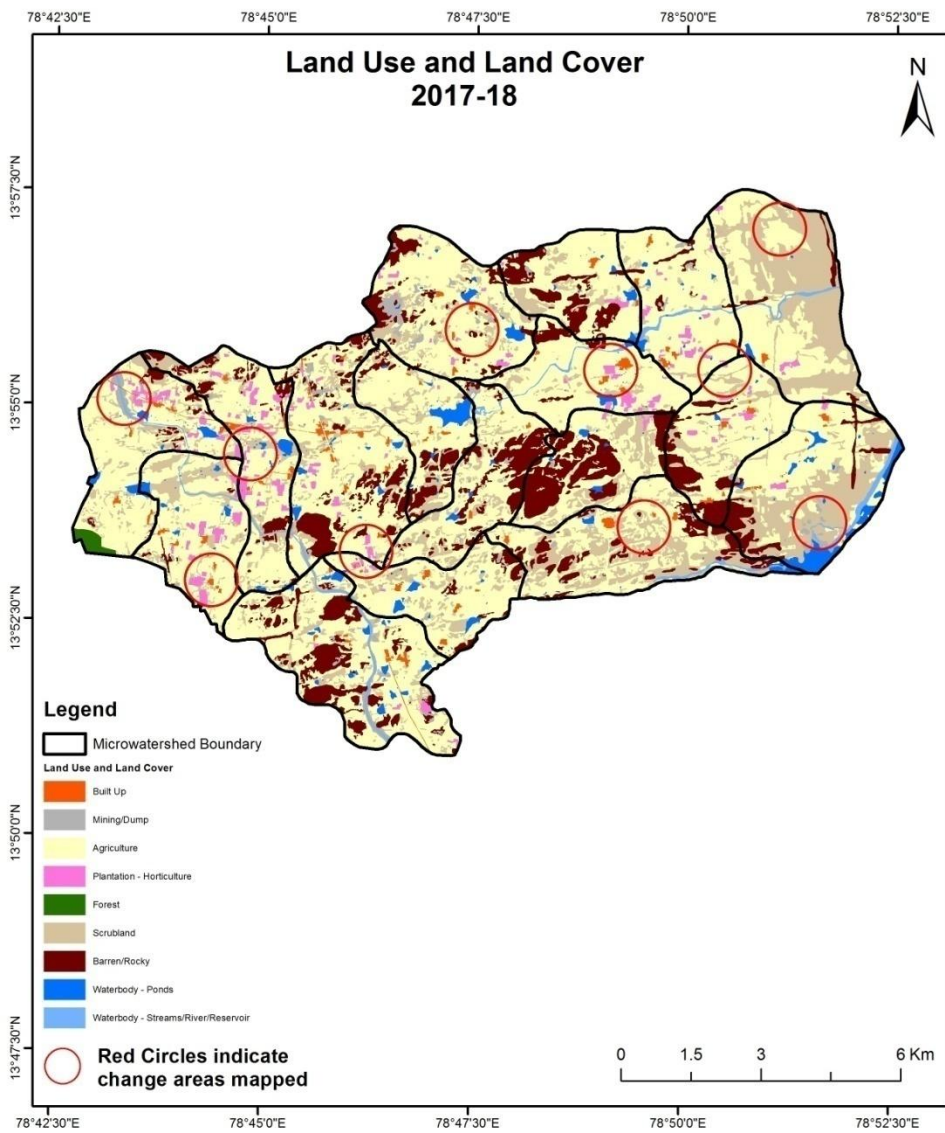
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

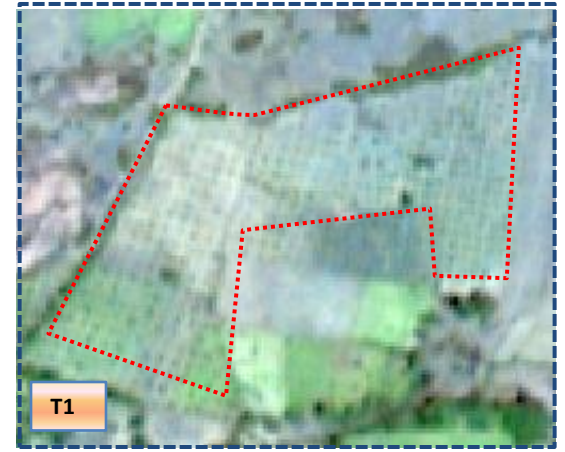


Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0: 2010-11 (78°44'8.431"E 13°54'38.416"N)



T1: 26 February 2013

Agriculture to Plantation



T0: 2010-11 (78°44'15.734"E 13°54'48.51"N)



T1: 26 February 2013

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

Agriculture to Plantation



T0: 2010-11 ($78^{\circ}43'47.011''\text{E}$ $13^{\circ}55'6.575''\text{N}$)



T1: 26 February 2013

Agriculture to Plantation



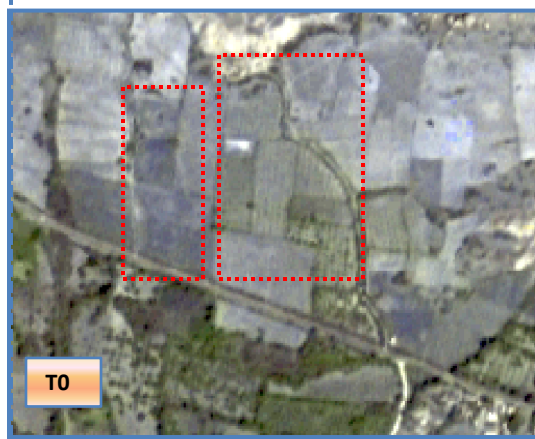
T0: 2010-11($78^{\circ}44'11.529''\text{E}$ $13^{\circ}52'57.188''\text{N}$)



T1: 26 February 2013

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

Agriculture to Plantation



T0: 2010-11



T0: 02 January 2016

Agriculture to Plantation



T0: 2010-11



T0: 02 January 2016

Table showing change matrix depicting Land cover transitions during study period-2010-11 to 2014-15

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	117.91												117.91
Mining/dump	1.29	147.97	4.93						6.80	0.03			161.03
Agriculture	20.00	10.17	6884.85	75.28				7.41	18.16	10.96			7026.83
Plantation Horticulture	1.01		5.05	187.87									193.93
Forest					27.06								27.06
Forest Plantation													
Barren Rocky							1512.64						1512.64
Scrub	5.18	12.24	275.21					2632.16	1.29	17.07			2943.15
Waterbody- Streams/River			0.83						102.02				102.85
Waterbody – Ponds		0.94	0.87							214.80			216.61
Grand Total	145.39	171.31	7171.74	263.15	27.06		1512.64	2639.57	128.27	242.86			12302.00

- 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 123 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T1.
- In T1 281 ha of the agriculture area has increased from plantations, scrubland and water body 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-2014-15 to 2015-16

Land cover	Monitoring period (T2)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
T1													
Built up	145.39												145.39
Mining/dump		161.67	0.36					9.22			0.06		171.31
Agriculture	2.54	7.55	7091.90	54.89				0.13			14.74		7171.74
Plantation Horticulture			34.06	229.06							0.03		263.15
Forest					27.06								27.06
Forest Plantation													
Barren Rocky		14.31					1498.33						1512.64
Scrub	0.97	12.51	81.32					2529.76	4.15		10.86		2639.57
Waterbody- Streams/River			1.10						127.17				128.27
Waterbody – Ponds											242.86		242.86
Grand Total	148.90	196.03	7208.74	283.95	27.06		1498.33	2539.11	131.32		268.56		12302.00

- 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 79 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation, scrubland and water body in T2.
- In T2 116 ha of the agriculture area has increased from 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 (T3)										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	148.90										148.90	
Mining/dump		188.44	7.07					0.52			196.03	
Agriculture		2.25	7195.57	6.17						4.76	7208.74	
Plantation Horticulture			42.64	241.31							283.95	
Forest					27.06						27.06	
Forest Plantation												
Barren Rocky		2.90					1495.43				1498.33	
Scrub		0.57	37.66					2500.89			2539.11	
Waterbody- Streams/River									131.32		131.32	
Waterbody – Ponds										268.56	268.56	
Grand Total	148.90	194.15	7282.94	247.48	27.06		1495.43	2501.41	131.32	273.32	12302.00	

- 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 13 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T3.
- In T3 80 ha of the agriculture area has increased from scrubland 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-2016-17 to 2017-18

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	148.90												148.90
Mining/dump		194.15											194.15
Agriculture	0.72	1.23	7255.16	25.54				0.03			0.25		7282.94
Plantation Horticulture			6.25	241.08							0.15		247.48
Forest					27.06								27.06
Forest Plantation													
Barren Rocky		2.46					1492.97						1495.43
Scrub	0.44	1.38	15.05					2456.00			28.54		2501.41
Waterbody- Streams/River									131.32				131.32
Waterbody – Ponds											273.32		273.32
Grand Total	150.06	199.22	7276.46	266.62	27.06		1492.97	2456.04	131.32		302.26		12302.00

- 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 27 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrubland and water body in T4.
- In T4 21 ha of the agriculture area has increased from scrubland 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-2017-18 to 2018-19

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	150.06										150.06	
Mining/dump		199.22									199.22	
Agriculture	0.36		7265.51	9.35				1.10	0.14		7276.46	
Plantation Horticulture			13.91	252.71							266.62	
Forest					27.06						27.06	
Forest Plantation												
Barren Rocky		1.76					1491.22				1492.97	
Scrub		1.61	29.17					2425.26			2456.04	
Waterbody- Streams/River			2.34						128.98		131.32	
Waterbody – Ponds										302.26	302.26	
Grand Total	150.42	202.59	7310.93	262.07	27.06		1491.22	2425.26	130.08	302.39	12302.00	

- 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 9 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T4.
- In T5 45 ha of the agriculture area has increased from plantation 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 113 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
4. There is an increase of 144, 37, 74 & 34 Hectares From T0 to T1, T1-T2, T2 – T3 & T4-T5 respectively and overall increase of 289 Hectares in Crop land area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.
5. There is an increase of 68 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.
6. There is a decrease of 517 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.
7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.