

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -31/2011-12
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-2022

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

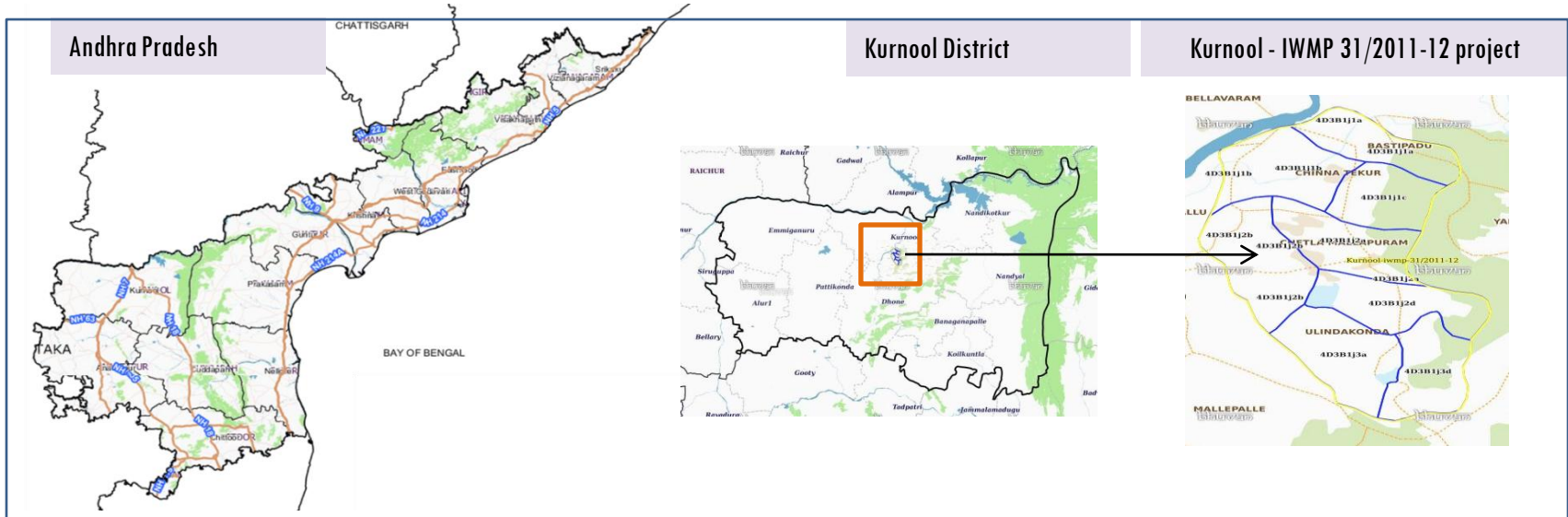
E X E C U T I V E S U M M A R Y

- 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-31/2011-12, Kurnool District of Andhra Pradesh. The total geographical area of the project is 4,130 ha. It comprises of 8 micro watersheds.
- In the project area 333 Drishti photos were uploaded showing check dams/checks & plugins, Farm ponds, Livelihood measures and remaining showing others.
- Major percentage i.e. 53% is covered by the agriculture, 16.6 % is covered by forest, 17 % is covered by scrub land and remaining by other land use classes.

PROJECT : KURNOOL - IWMP-31/2011-12

DISTRICT : KURNOOL , STATE : ANDHRA PRADESH

- The study area falls in Kallur Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 4,130 ha. It comprises of 8 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2011-12 (T0) period (*Batch -1*) projects taking 2019-20 (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
	2011-12	2011-12	2019-20
LISS IV	2011-12		
SCENE 1			3-Nov-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			3-Nov-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	333
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

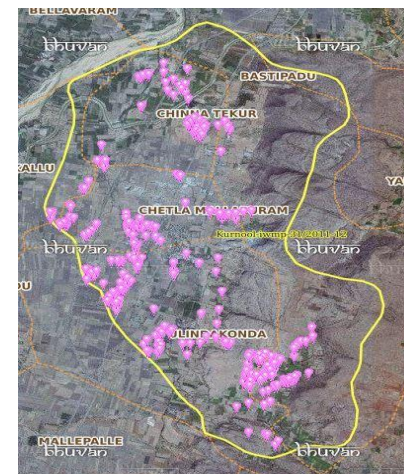


MWS Boundary



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	7	7
2	Agriculture/Horticulture	0	0
3	Blockplanting	0	0
4	Bund planting	0	0
5	Drainage Treatment	0	0
6	Farm ponds/Dug out pit	0	0
7	Check dams (Civil work)	0	0
8	Checks & plugins	99	79
9	Om (Other measurement)	0	0
10	LM (Livelihood Measures)	0	0
11	Nallah Bunds/Drainage treatment	0	0
12	Percolation tanks / Ground water recharge structure	0	0
13	Production System and Micro-Enterprises	0	0
14	Livelihood Activities	3	3
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	294	244
	TOTAL	403	333

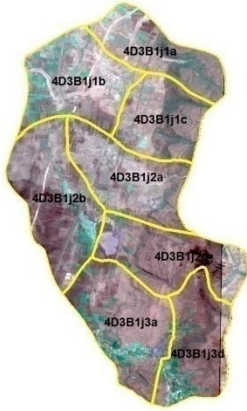
MONITORING IN THE PROJECT AREA

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 (2011-12) and T5 is 2019-20 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.

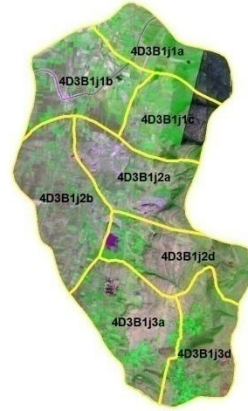
Natural Color Composite

Natural Color Composite- 2011-12



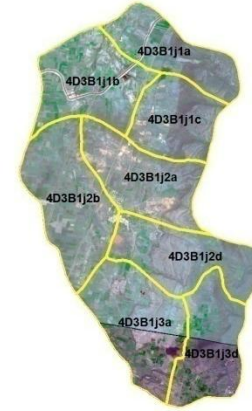
Source:Fusion data,NRSC

Natural Color Composite- 30th December 2015



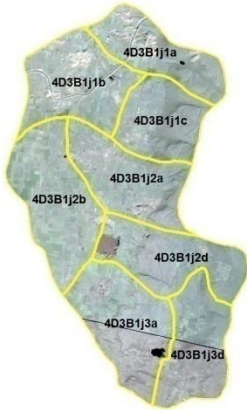
Source:LISS-IV,NRSC

Natural Color Composite- 17th October 2016



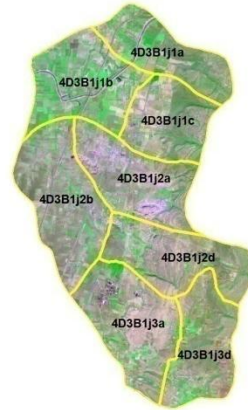
Source:NCC,NRSC

Natural Color Composite- 22nd November 2017



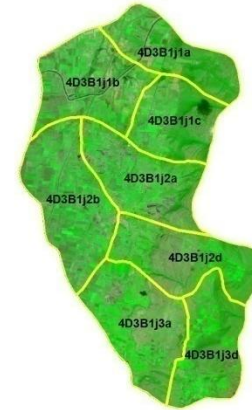
Source:NCC,NRSC

Natural Color Composite- 04th January 2019



Source:Sentinel,NRSC

Natural Color Composite- 03rd November 2019

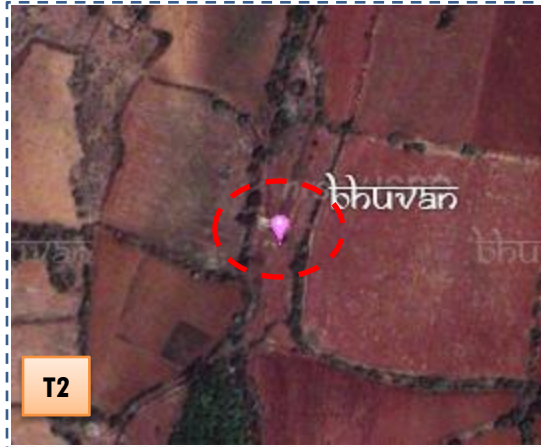


Source:LISS-IV,NRSC

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-31/2011-12



T1: 17 October 2016



T2: 22 November 2017



Drishti Sl no. 2448824 MWS : 4D3B1j3d

Check dam



T1: 17 October 2016



T2: 22 November 2017



Drishti Sl no. 137269 MWS :4D3B1j2d

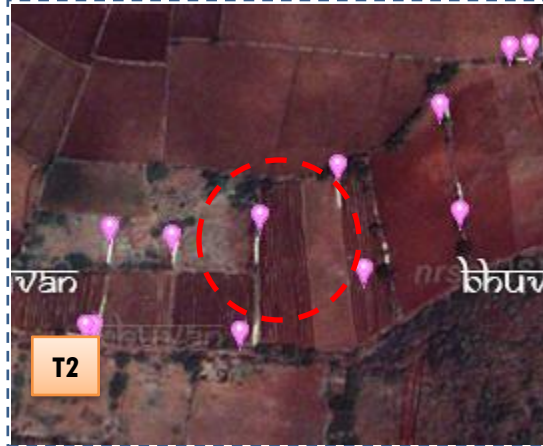
Horticulture

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-31/2011-12



T1

T1: 17 October 2016



T2

T2: 22 November 2017



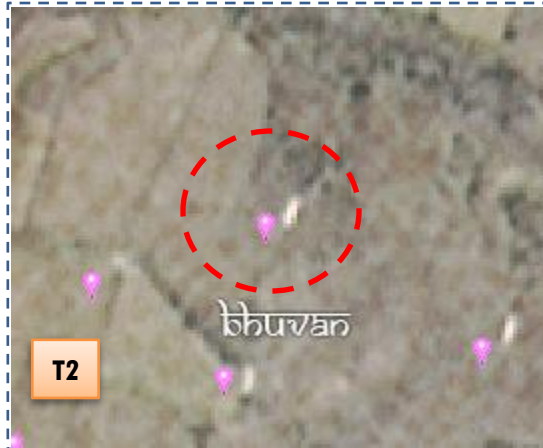
Drishti Sl no. 2085793 MWS :4D3B1j3d

New activity



T1

T1: 17 October 2016



T2

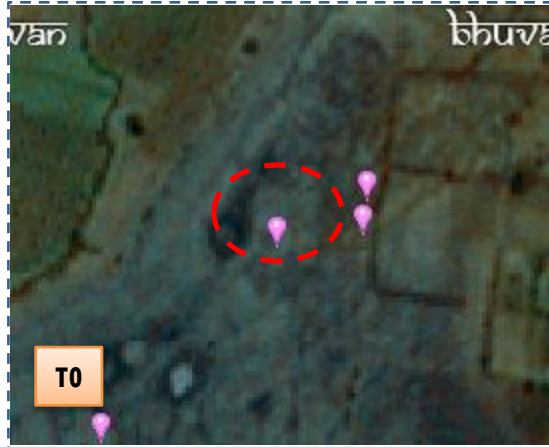
T2: 22 November 2017



Drishti Sl no. 2087362 MWS : 4D3B1j3a

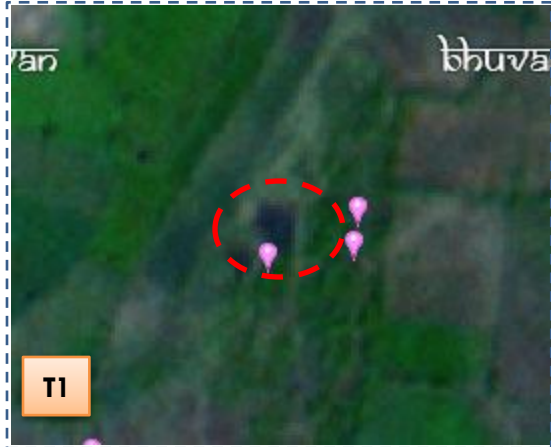
New activity

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-31/2011-12



T0

T0:2010-11



T1

T1: 30 December 2015



Drishti SI no. 7011802 MWS : 4D3B1j3a

Farm pond



T0

T0:2010-11



T1

T1: 30 December 2015



Drishti SI no. 137263 MWS :4D3B1j3a

Horticulture

Monitoring of activities in Kurnool Dt Andhra Pradesh. IWMP-31/2011-12



T0

T0: 2010-11



T1

T1: 30 December 2015



Drishti Sl no. 143362 MWS : 4D3B1j3a

Horticulture



T0

T0: 2010-11



T1

T1: 30 December 2015



Drishti Sl no. 1723266 MWS : 4D3B1j3d

Horticulture

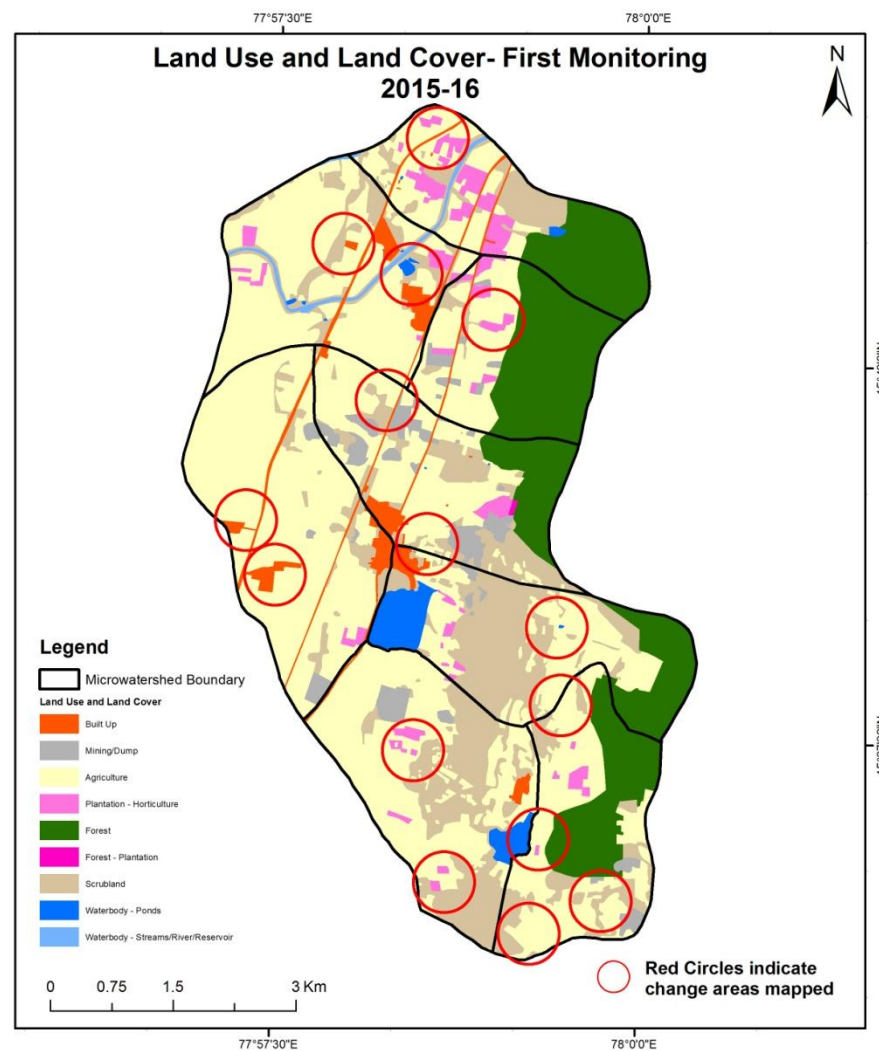
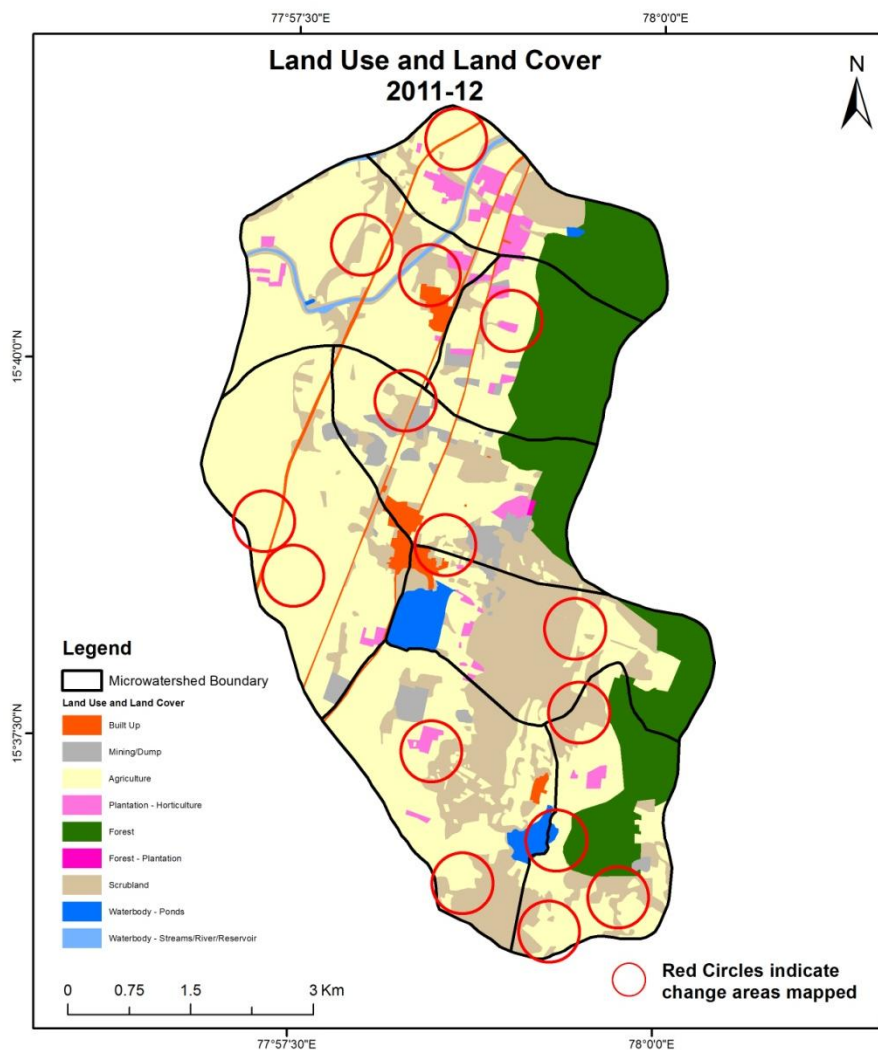
MONITORING IN THE PROJECT AREA

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 (2011-12) and row represents the T5 (2019-20)

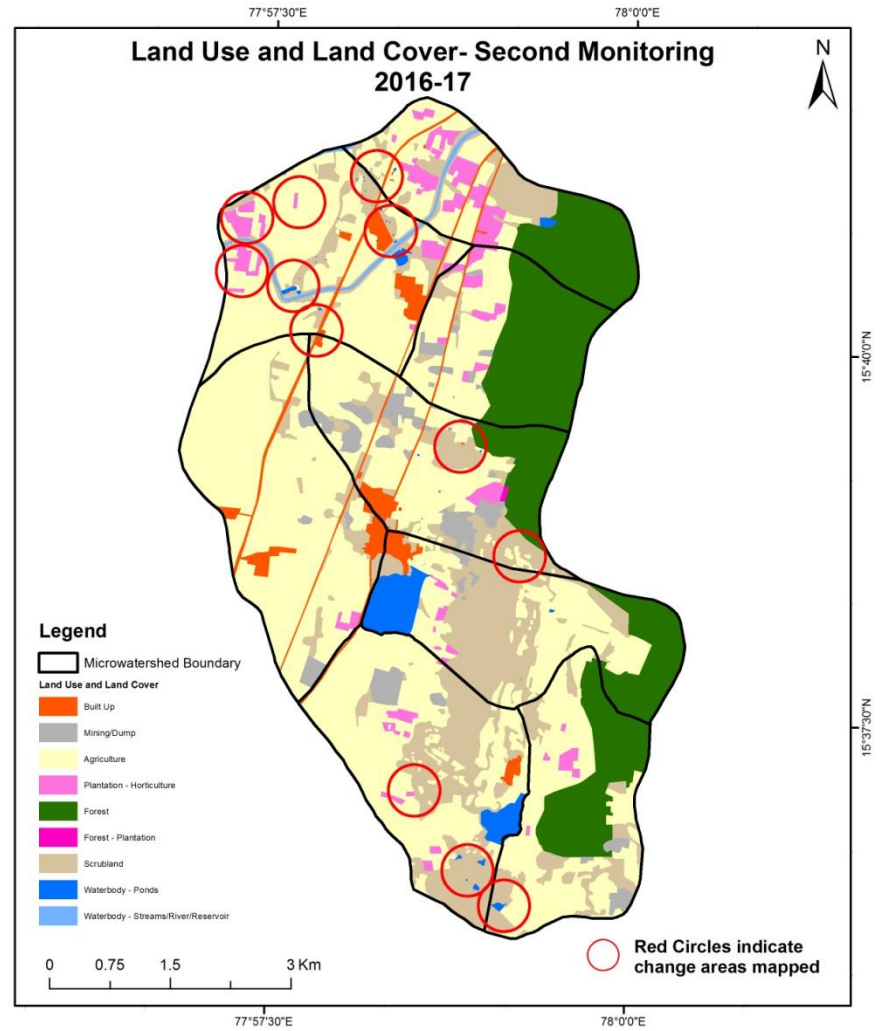
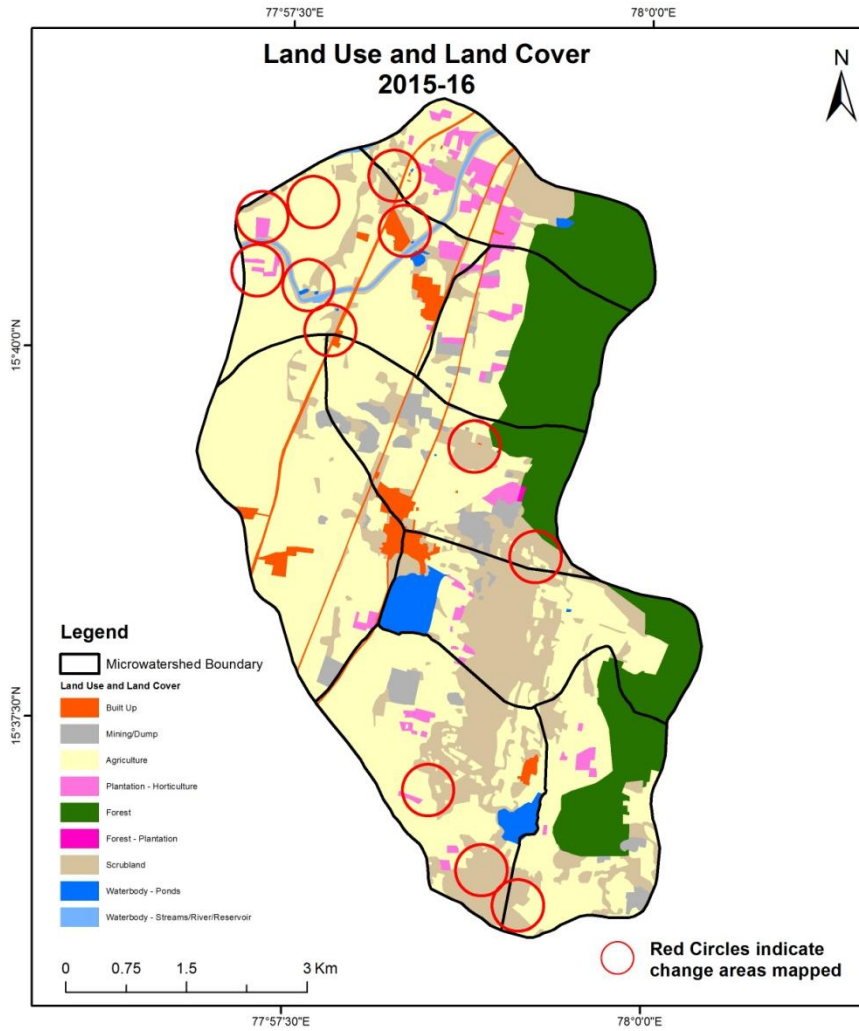
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



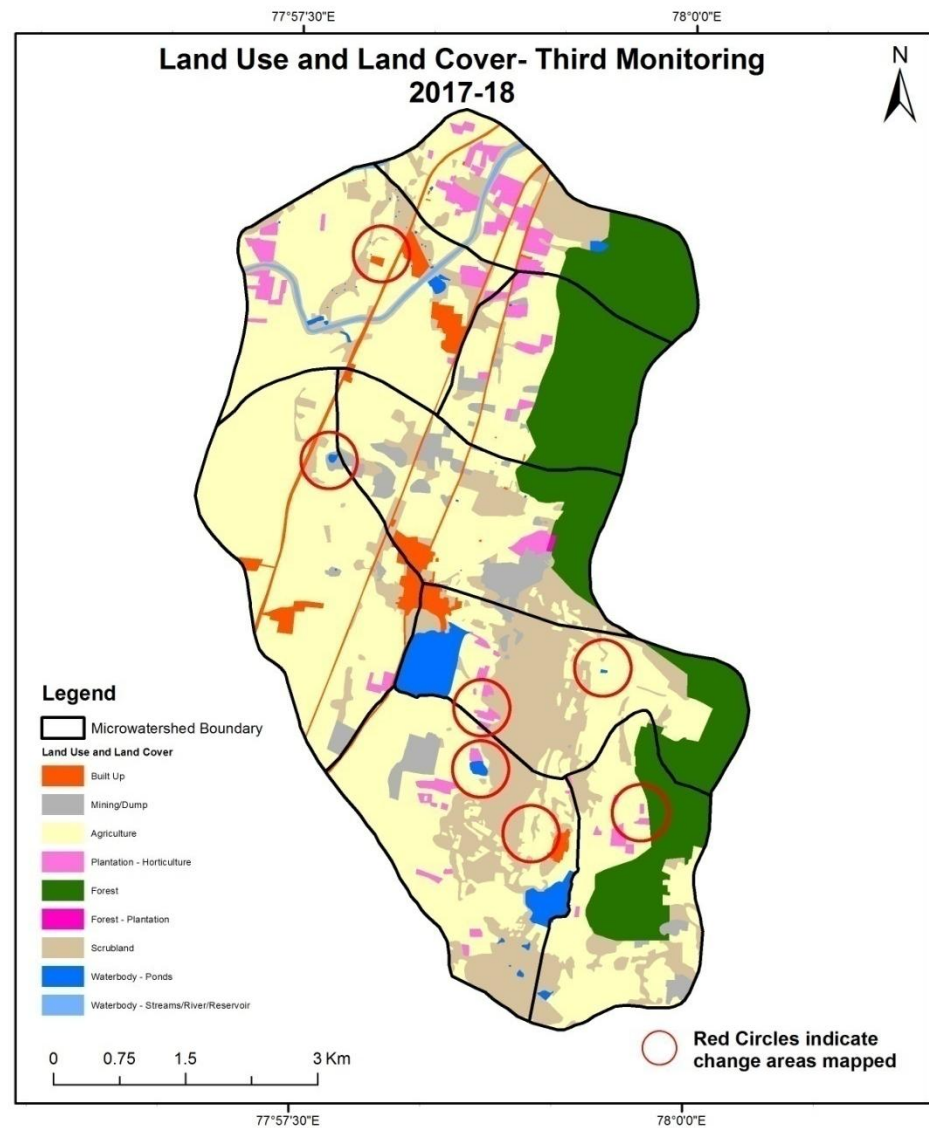
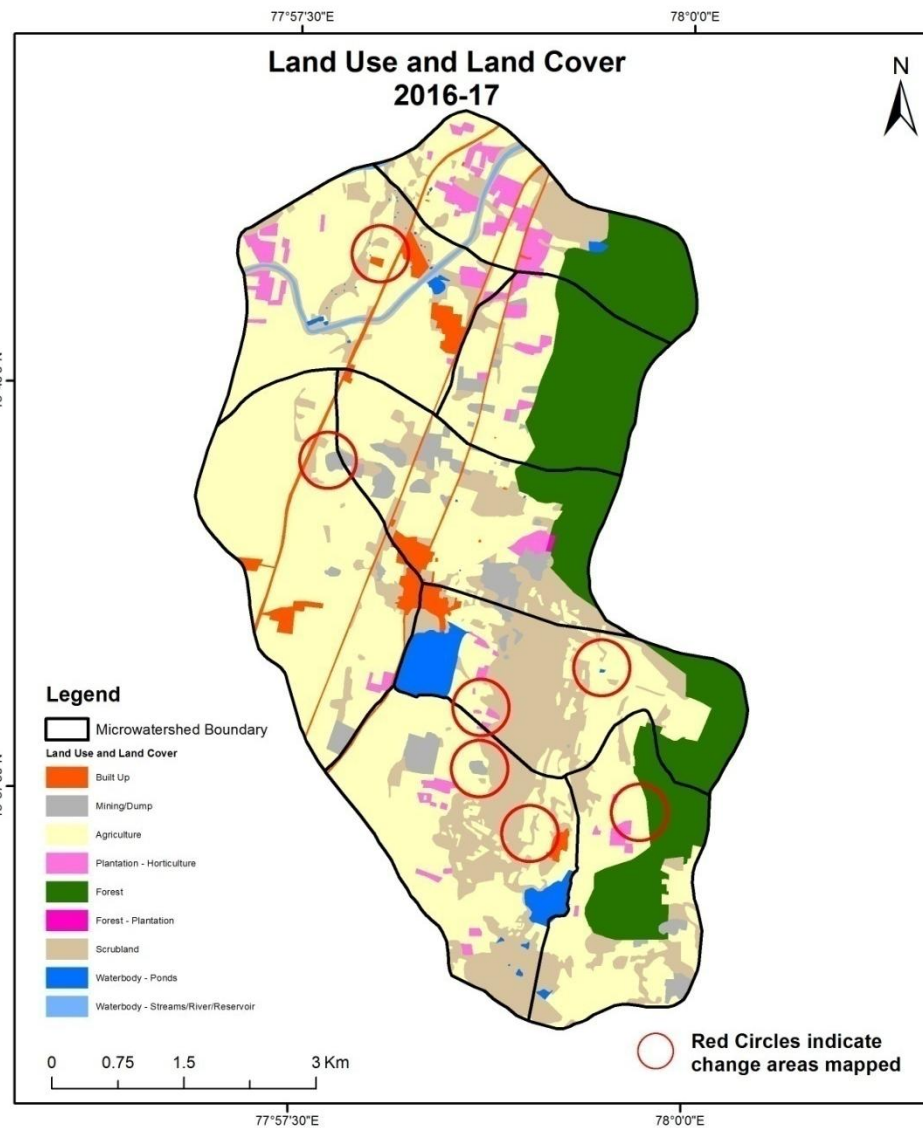
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



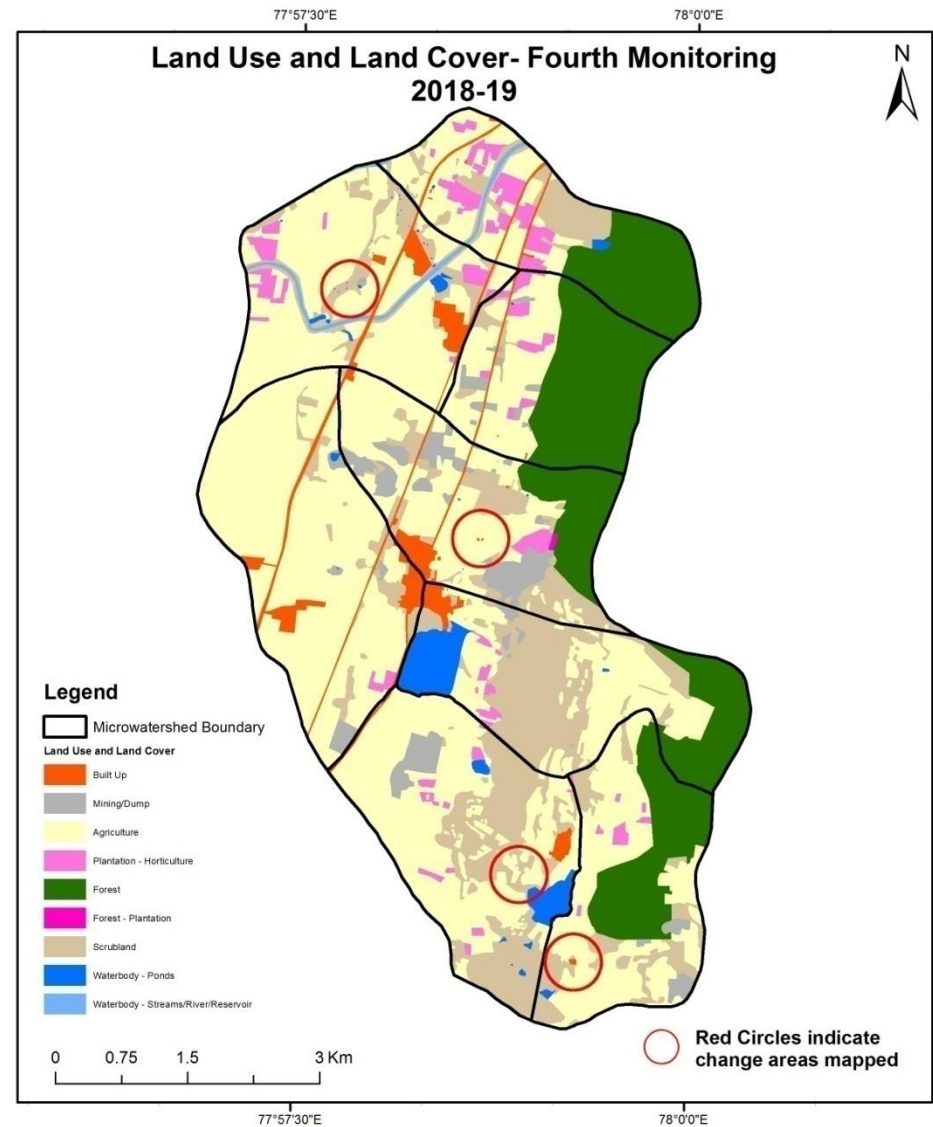
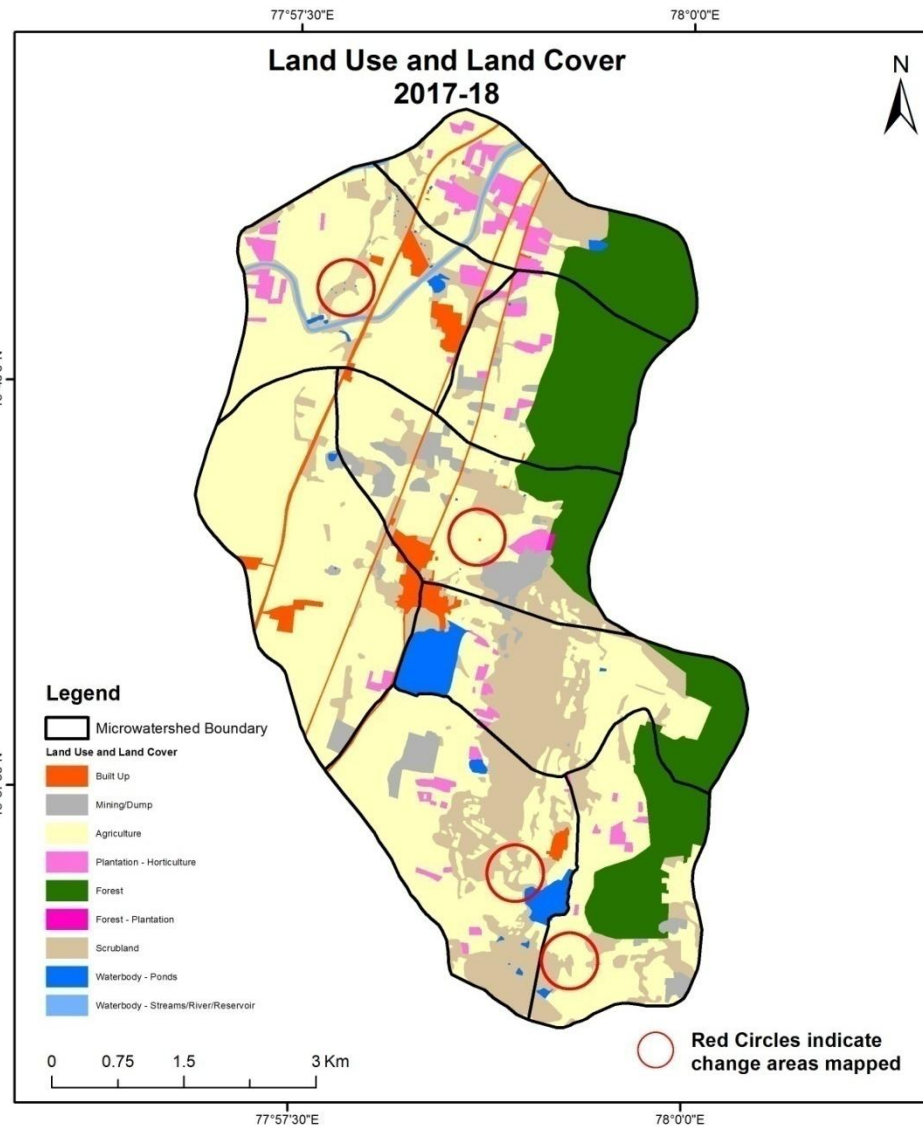
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



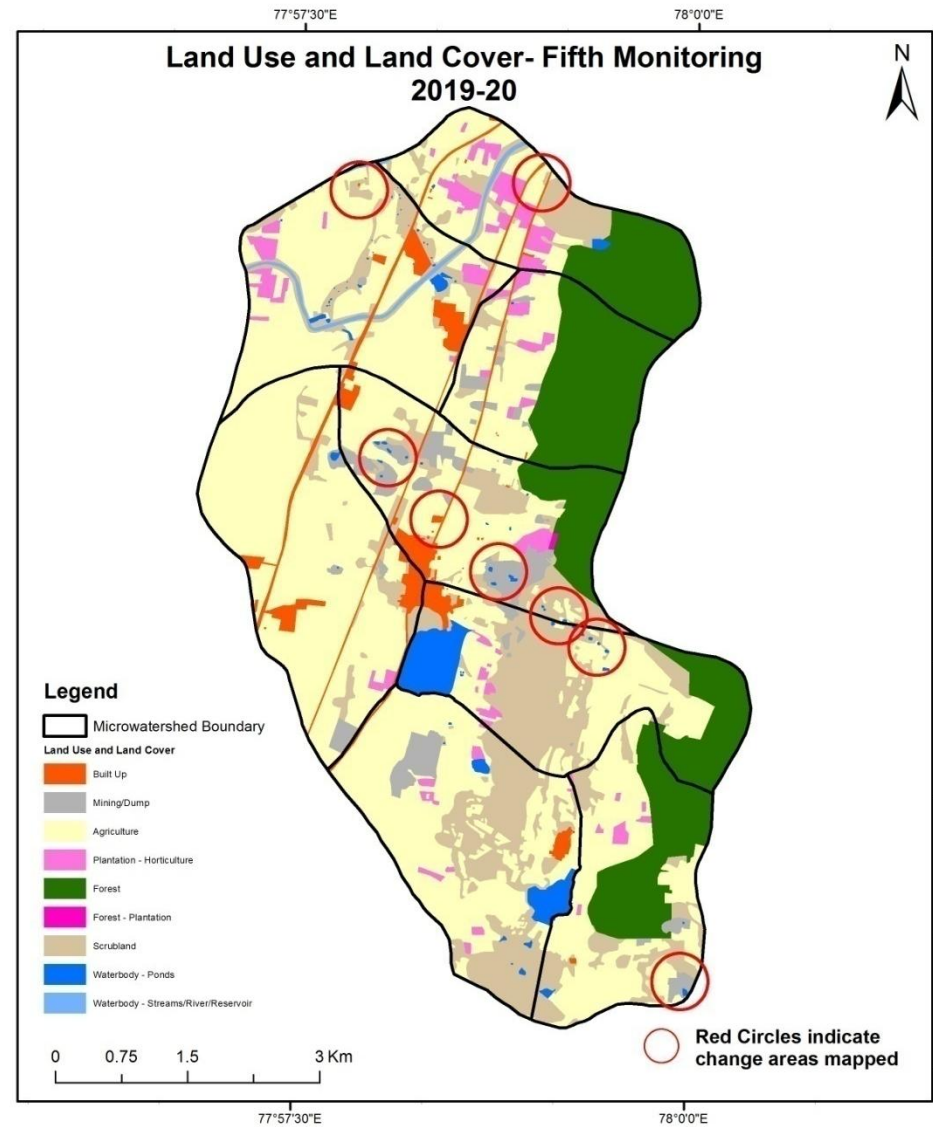
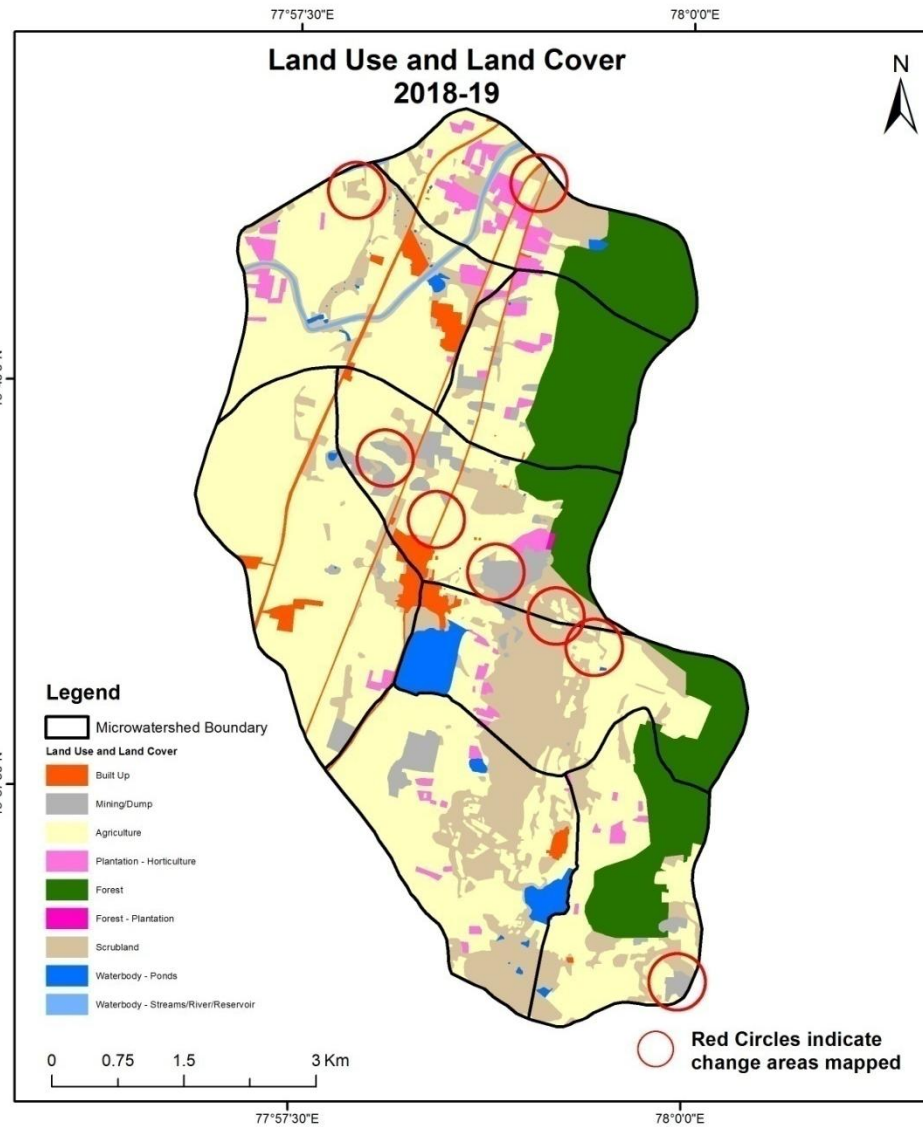
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000



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

Agriculture to Plantation

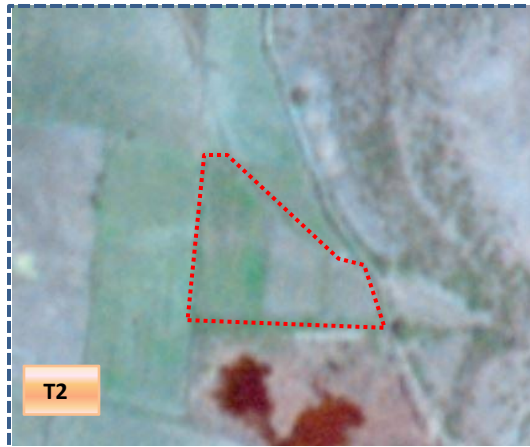


T2: 2016-17(77°59'43.489"E 15°37'24.985"N)

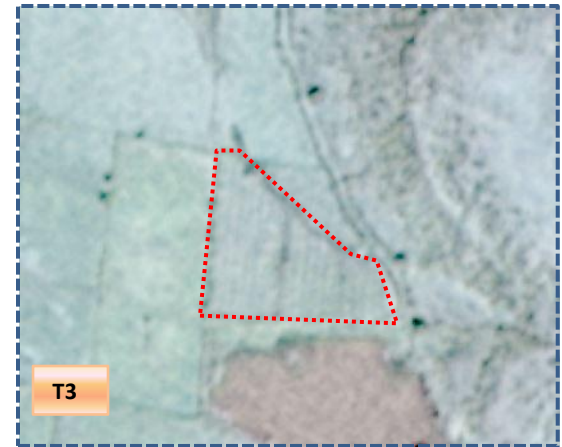


T3: 22 November 2017

Agriculture to Plantation



T2: 2016-17 (77°58'38.955"E 15°37'44.021"N)



T3: 22 November 2017

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

Agriculture to Plantation



T2: 2016-17 (77°58'44.086"E 15°38'7.939"N)

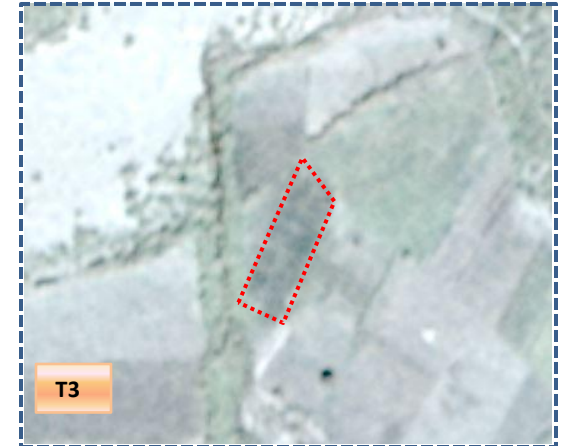


T3: 22 November 2017

Scrub to Agriculture



T2: 2016-17 (77°58'4.812"E 15°41'22.448"N)



T3: 22 November 2017

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

Scrub to Agriculture

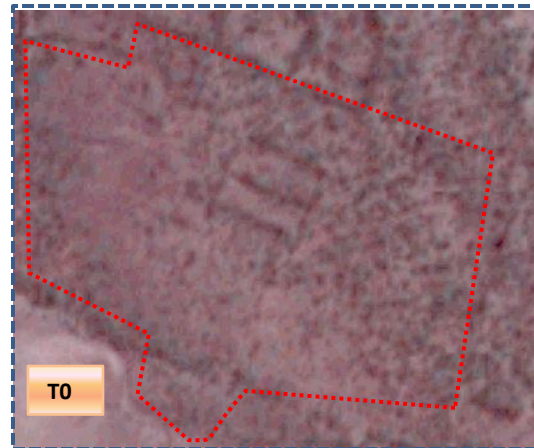


T0: 2011-12 (77°59'32.761"E 15°38'26.053"N)



T1: 30 December 2015

Scrub to Agriculture



T0: 2011-12 (77°59'29.432"E 15°37'42.831"N)



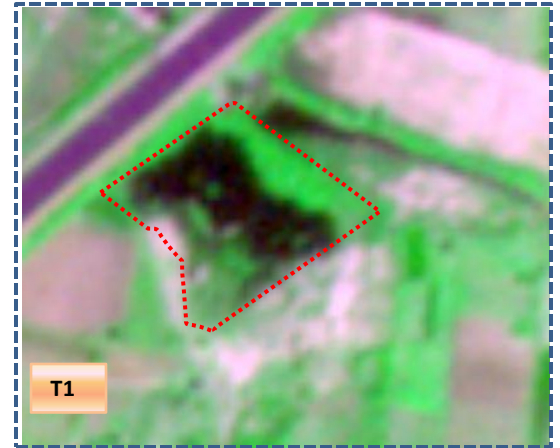
T1: 30 December 2015

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

Scrub to Water body



T0: 2011-12 (77°58'22.554"E 15°40'37.77"N)



T1: 30 December 2015

Agriculture to Plantation



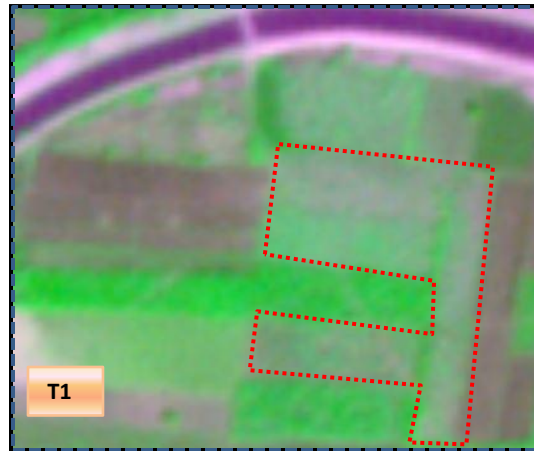
T0: 2011-12 (77°58'35.855"E 15°41'28.662"N)



T1: 30 December 2015

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

Agriculture to Plantation

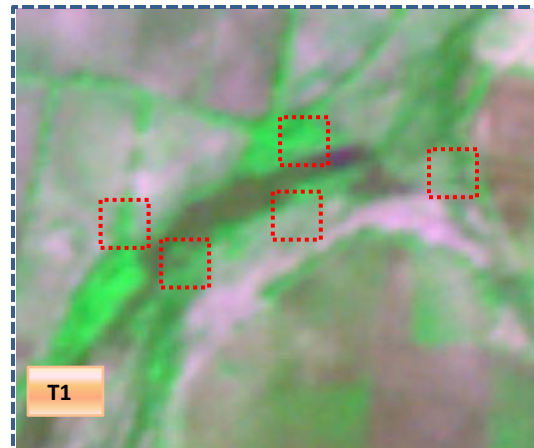


T1: 2015-16(77°57'17.851"E 15°40'38.418"N)

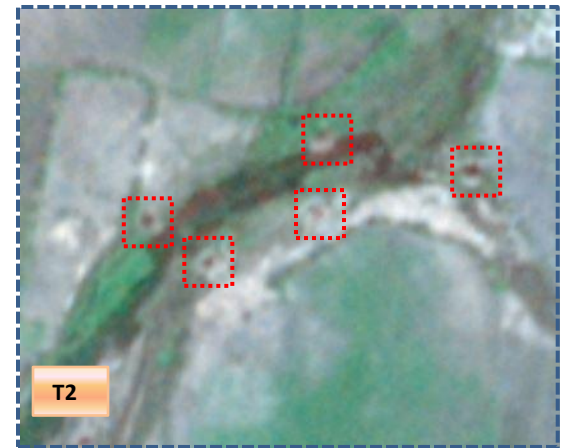


T2: 17 October 2016

Scrub to water body



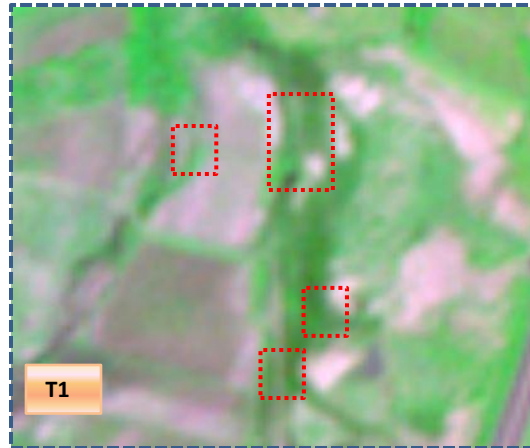
T1: 2015-16 (77°57'42.563"E 15°40'35.069"N)



T2: 17 October 2016

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

Scrub to water body



T1: 2015-16(77°58'7.188"E 15°41'8.697"N)



T2: 17 October 2016

Scrub to Agriculture

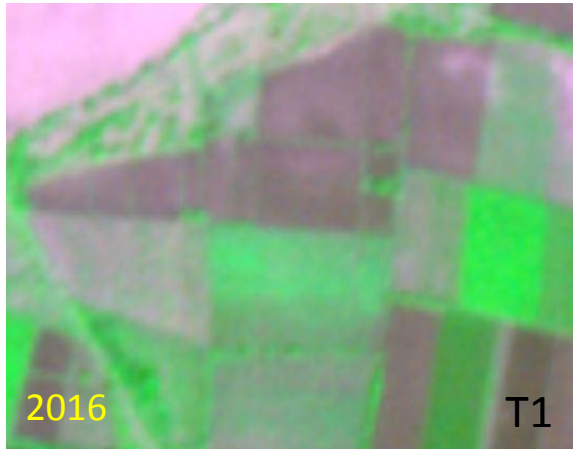


T1: 2015-16(77°57'47.074"E 15°40'7.502"N)

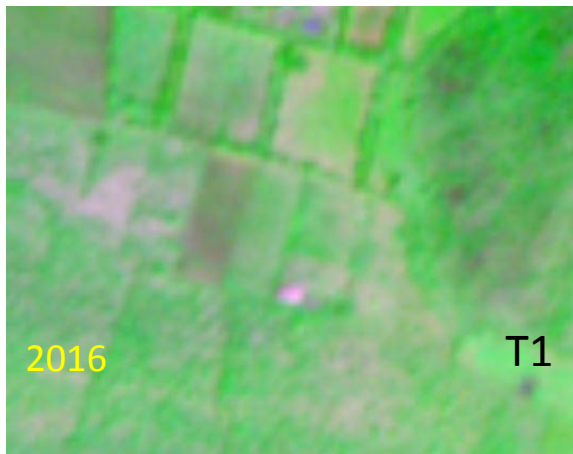


T2: 17 October 2016

Increasing the Cropland and Plantation Establishment showing increased in NDVI



(77°57'17.158"E 15°40'51.653"N)



(77°58'49.791"E 15°39'24.663"N)

Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

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	108.65										108.65	
Mining/dump		111.48									111.48	
Agriculture	17.25	10.09	2073.49	20.46				14.37		0.67	2136.33	
Plantation Horticulture	0.08		2.49	103.59							106.16	
Forest			2.09		691.56						693.65	
Forest Plantation						1.22					1.22	
Barren Rocky												
Scrub	8.35	3.28	93.38					770.75		3.69	879.45	
Waterbody- Streams/River									22.24		22.24	
Waterbody – Ponds			3.24							68.38	71.61	
Grand Total	134.33	124.85	2174.68	124.05	691.56	1.22		785.12	22.24	72.74	4130.78	

- 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 62 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 101 ha of the agriculture area has increased from plantations, forest, 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-2015-16 to 2016-17

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	134.33										134.33	
Mining/dump		124.85									124.85	
Agriculture	0.03	1.27	2156.87	15.71						0.80	2174.68	
Plantation Horticulture			1.26	122.79							124.05	
Forest					691.56						691.56	
Forest Plantation						1.22					1.22	
Barren Rocky												
Scrub		1.10	16.44	0.46				764.71		2.41	785.12	
Waterbody- Streams/River							0.66	21.57			22.24	
Waterbody – Ponds										72.74	72.74	
Grand Total	134.36	127.22	2174.57	138.95	691.56	1.22		765.38	21.57	75.95	4130.78	

- 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 17 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 17 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.

Table showing change matrix depicting Land cover transitions during study period-2016-17 to 2017-18

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	134.36										134.36	
Mining/dump		123.69								3.53	127.22	
Agriculture	0.56	1.35	2165.08	7.47						0.11	2174.57	
Plantation Horticulture			6.31	132.56						0.08	138.95	
Forest			0.16		691.41						691.56	
Forest Plantation						1.22					1.22	
Barren Rocky												
Scrub	0.13	9.64	13.72					741.49		0.40	765.38	
Waterbody- Streams/River									21.57		21.57	
Waterbody – Ponds			0.18							75.77	75.95	
Grand Total	135.05	134.68	2185.44	140.03	691.41	1.22		741.49	21.57	79.89	4130.78	

- 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 9.4 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.
- In T3 20.3 ha of the agriculture area has increased from plantations, 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-2017-18 to 2018-19

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		
Built up	135.05												135.05
Mining/dump		134.68											134.68
Agriculture	0.68	3.24	2181.42								0.10		2185.44
Plantation Horticulture			4.60	135.43									140.03
Forest			1.77		689.64								691.41
Forest Plantation						1.22							1.22
Barren Rocky													
Scrub	1.39	2.85	2.87					734.36			0.02		741.49
Waterbody- Streams/River									21.57				21.57
Waterbody – Ponds											79.89		79.89
Grand Total	137.12	140.77	2190.67	135.43	689.64	1.22		734.36	21.57		80.00		4130.78

- 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 04 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.
- In T4 09 ha of the agriculture area has increased from plantations, forest and 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-2018-19 to 2019-20

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	
T4												
Built up	137.12										137.12	
Mining/dump		138.55								2.21	140.77	
Agriculture	7.31	2.16	2180.10	0.32						0.78	2190.67	
Plantation Horticulture			5.31	130.12							135.43	
Forest			0.20		689.43						689.64	
Forest Plantation						1.22					1.22	
Barren Rocky												
Scrub	0.31		3.74					728.97		1.34	734.36	
Waterbody- Streams/River									21.57		21.57	
Waterbody – Ponds										80.00	80.00	
Grand Total	144.73	140.72	2189.36	130.44	689.43	1.22		728.97	21.57	84.34	4130.78	

- 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 10.5 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T5.
- In T5 9.26 ha of the agriculture area has increased from plantations, forest 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 12 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
4. There is an increase of 38, 10 & 05 Hectares From T0 to T1, T2-T3 & T3 to T4 respectively and overall increase of 53 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2019-20 (T5) years.
5. There is an increase of 24 ha of the Plantation/Horticulture area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 150 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (7) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (7) verified from the portal.