

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -35/2011-12
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)
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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

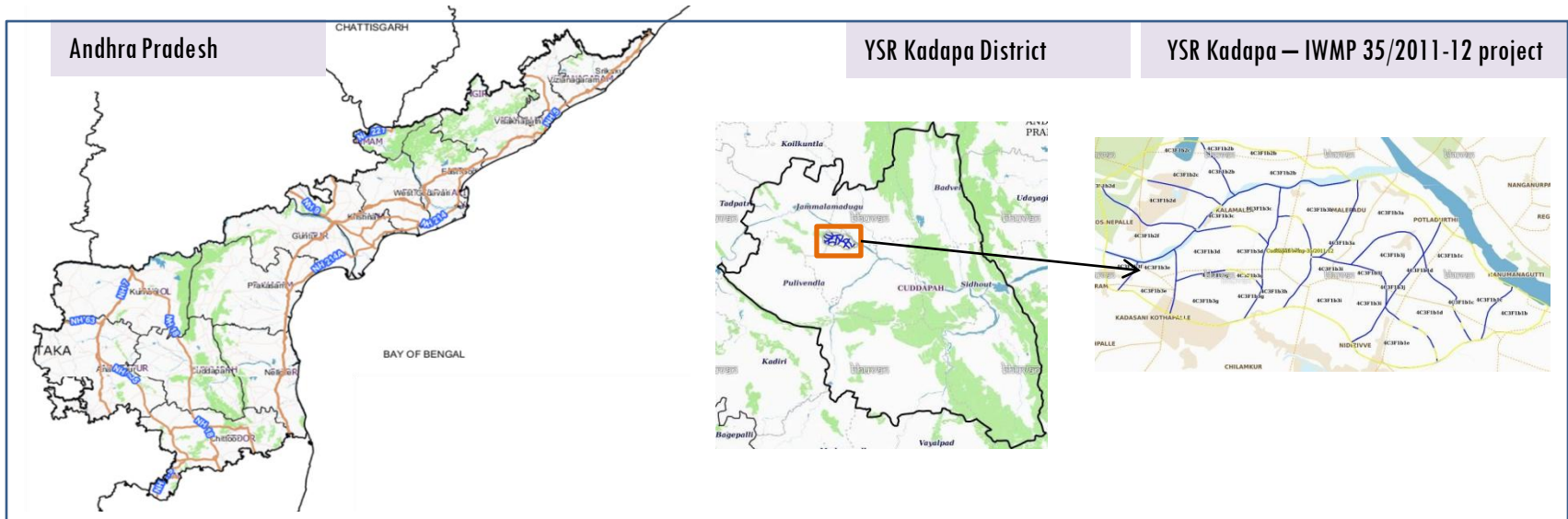
E X E C U T I V E S U M M A R Y

- 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-35/2011-12, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 9,888 ha. It comprises of 18 micro watersheds.
- In the project area 594 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Project area as per image analysis has witnessed, Water bodies have shown an increase by 144 ha, which correspond to the various bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 70 % is covered by the agriculture, 11 % is Scrub land, 5% is water body and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-35/2011-12

DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Yerraguntla Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 9,888. ha. It comprises of 18 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 2015-16 (T1) 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
	2011-12	2012-13	2019-20
LISS IV	2011-12		
SCENE 1			14-Jan-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			14-Jan-20
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	594
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	Agriculture/Horticulture	0	0
2	Afforestation	2	2
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	1	1
7	Terrace	0	0
8	Checks & Plugs	11	11
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	68	40
11	Civil work-Check dams /Rock fill dam	46	40
12	Production system and Micro-enterprises	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	0
18	Others	808	500
	TOTAL	936	594

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 T1 is 2015-16 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.

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-35/2011-12



T0: 2010-11



T1: 2 February 2016

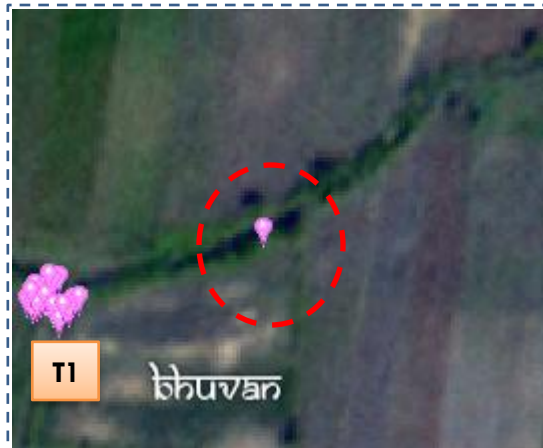


Drishti SI no. 2424724 MWS :4C3F1b3i

Check dam



T0: 2010-11



T1: 2 February 2016



Drishti SI no. 2468521 MWS :4C3F1b3b

Check dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-35/2011-12



T0: 2010-11

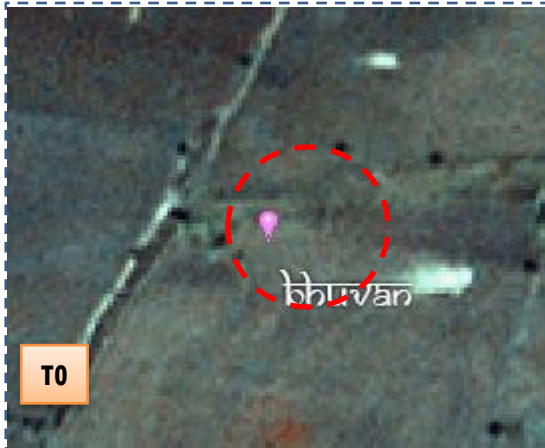


T1: 2 February 2016



Drishti Sl no. 2856785 MWS :4C3F1b2b

Check dam



T0: 2010-11



T1: 2 February 2016



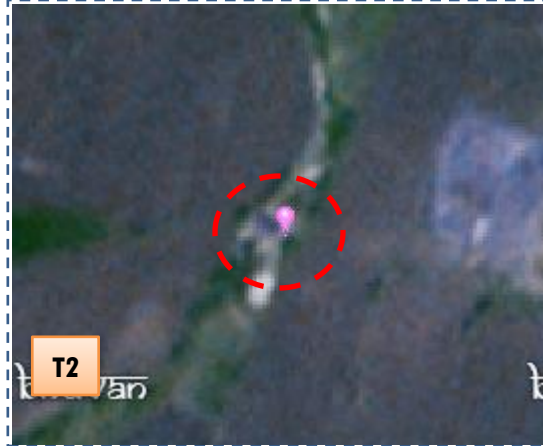
Drishti Sl no. 1778526 MWS :4C3F1b3h

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-35/2011-12



T1: 07 March 2015



T2: 05 January 2017



Drishti Sl no. 908663 MWS :4C3F1b3i

Check dam



T1: 07 March 2015



T2: 05 January 2017



Drishti Sl no. 2422245 MWS :4C3F1b3b

Check dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-35/2011-12



T1

T1: 07 March 2015



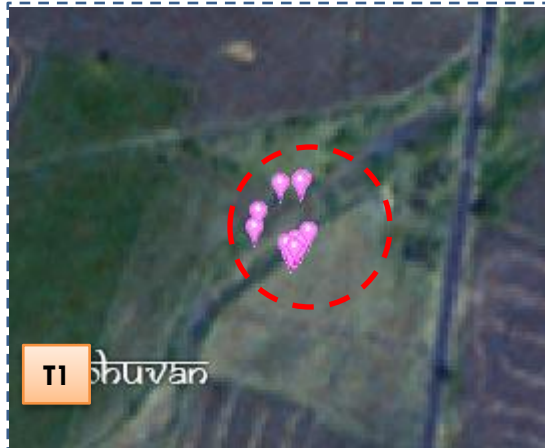
T2

T2: 05 January 2017



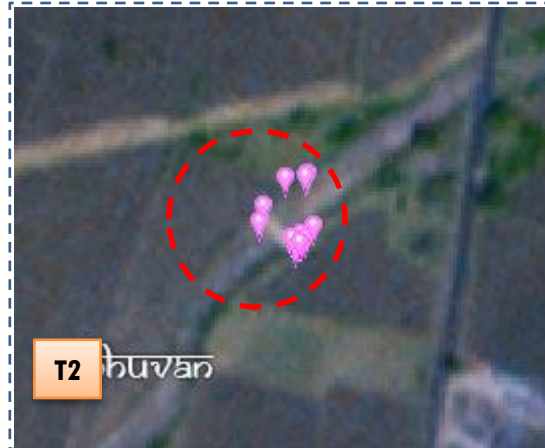
Drishti SI no. 2468526 MWS :4C3F1b3b

Check dam



T1

T1: 07 March 2015



T2

T2: 05 January 2017

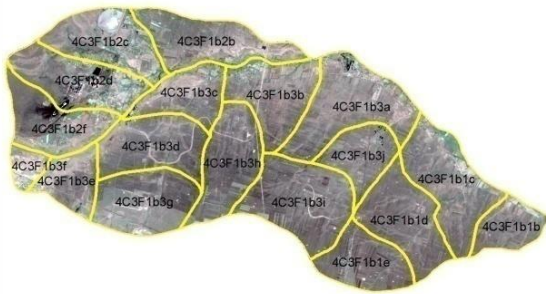


Drishti SI no. 3059125 MWS :4C3F1b3j

Check dam

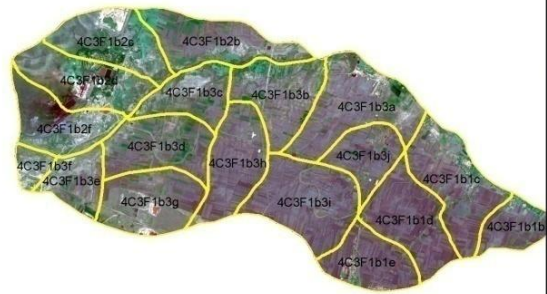
Natural Colour Composite (NCC)

Natural Color Composite - 2011-12



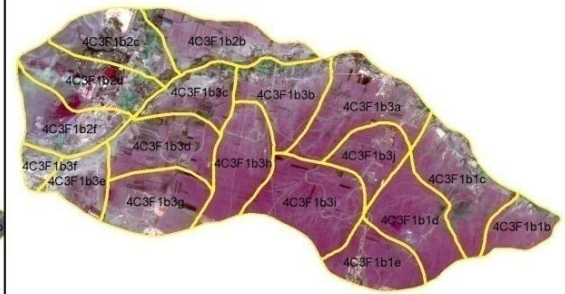
Source:Fusion data,NRSC

Natural Color Composite-24 th December 2015



Source:NCC,NRSC

Natural Color Composite- 05th January 2017



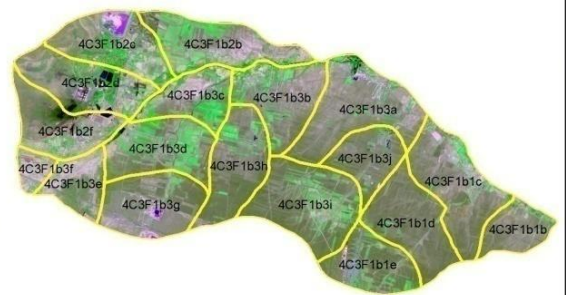
Source:NCC,NRSC

Natural Color Composite- 09th December 2017



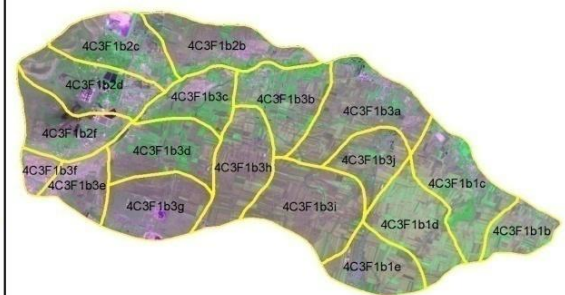
Source:NCC,NRSC

Natural Color Composite- 04th January 2019



Source:Sentinel-2

Natural Color Composite- 14 th January 2020



Source:LISS-IV,NRSC

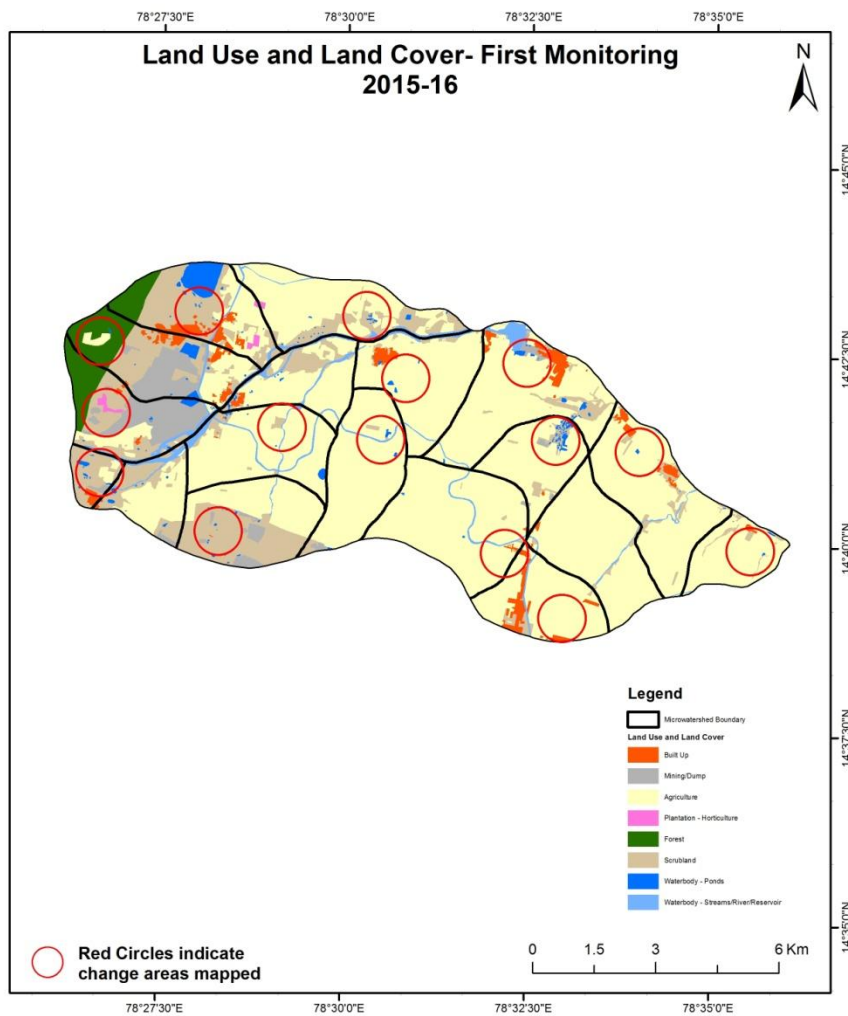
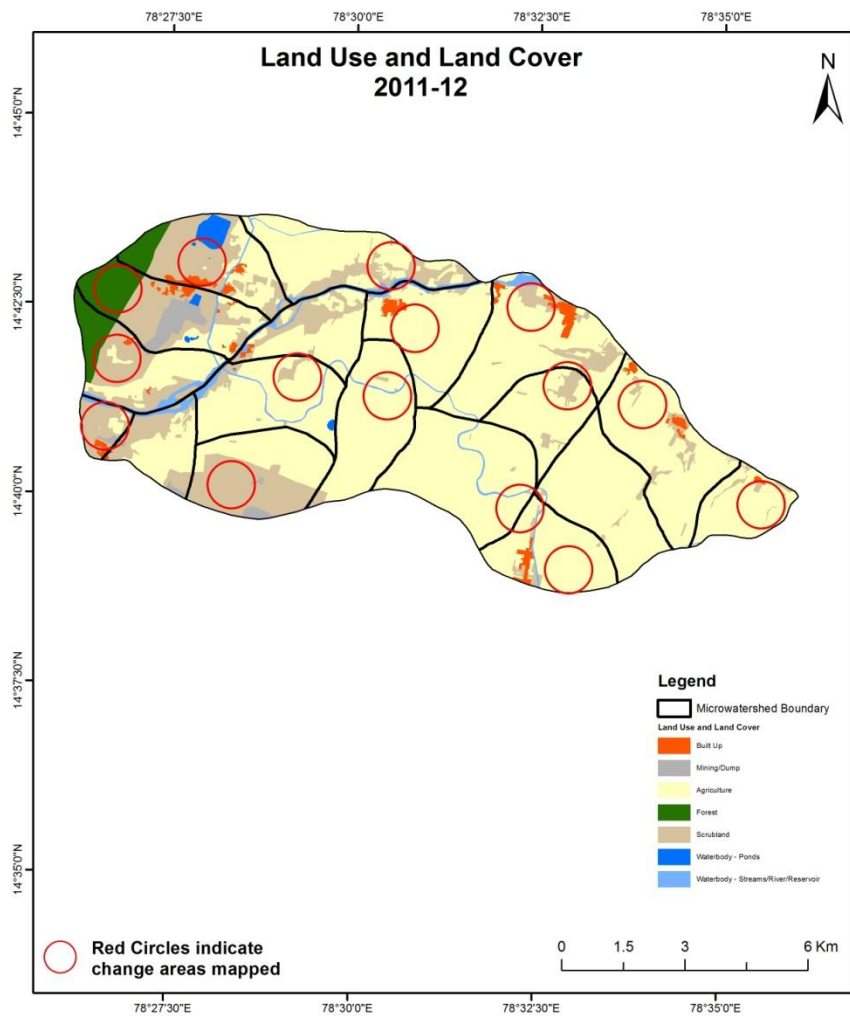
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover from T0 to T1 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 T1 are given in the change matrix table.
- In matrix table column represents the T0 (2011-12) and row represents the T1 (2015-16)

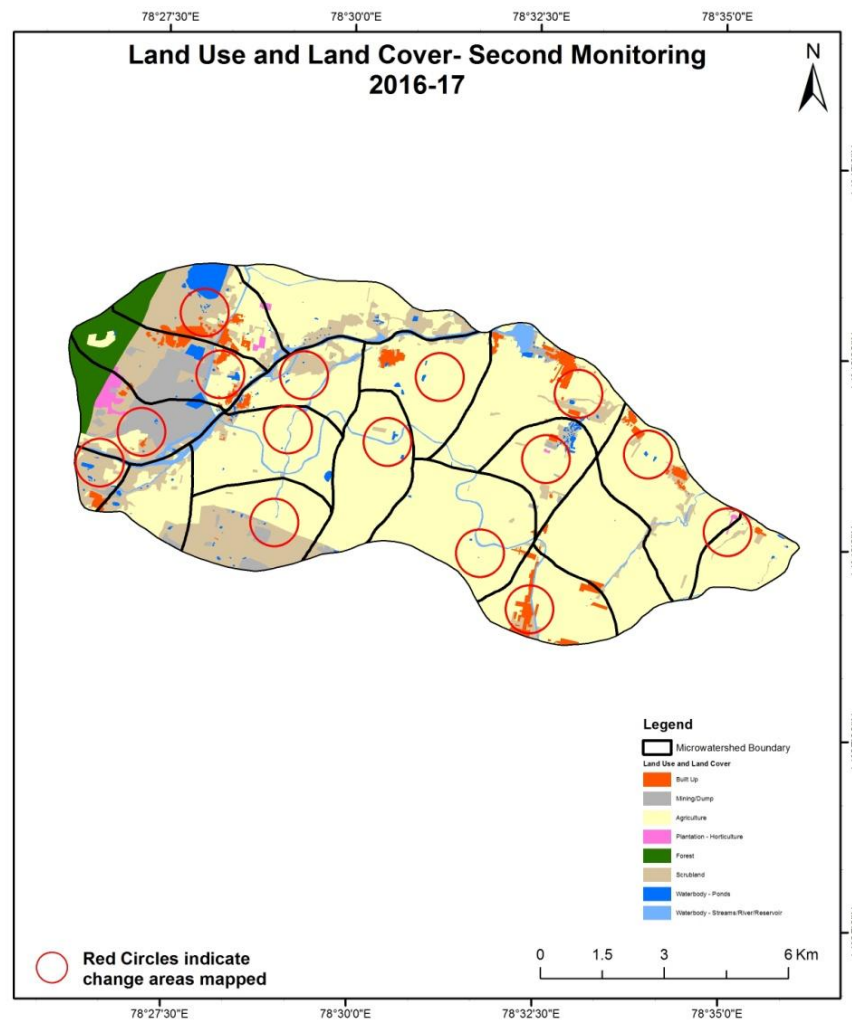
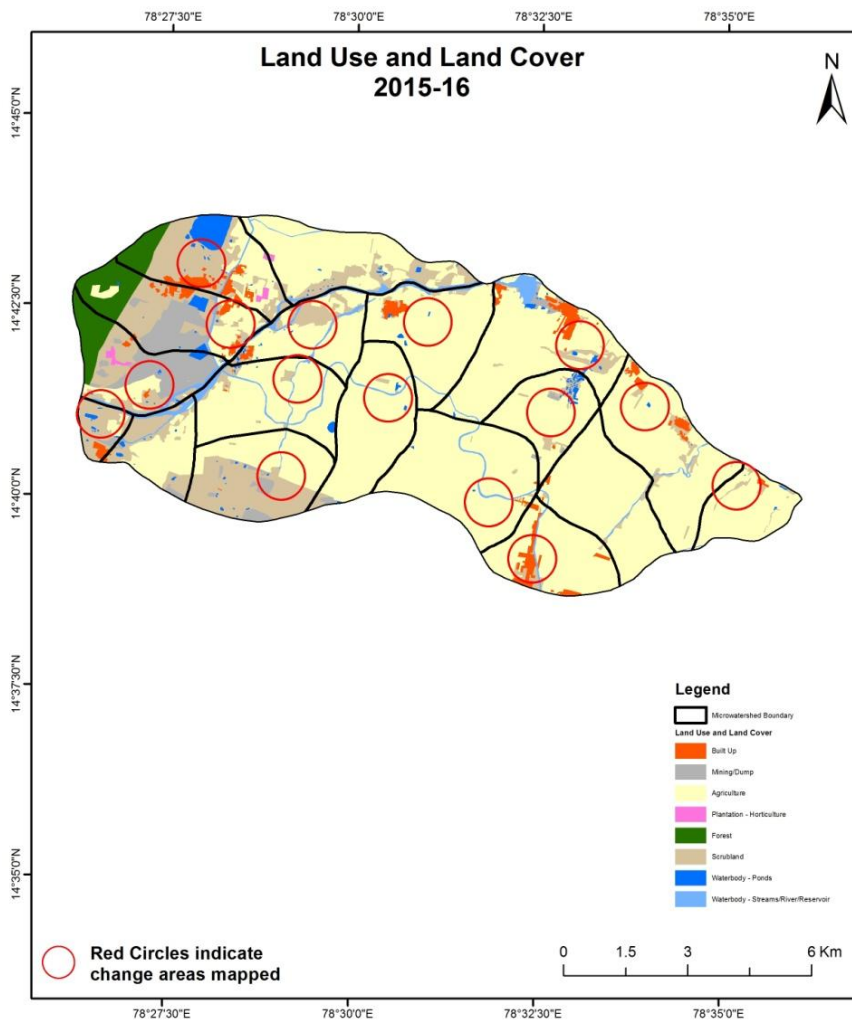
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



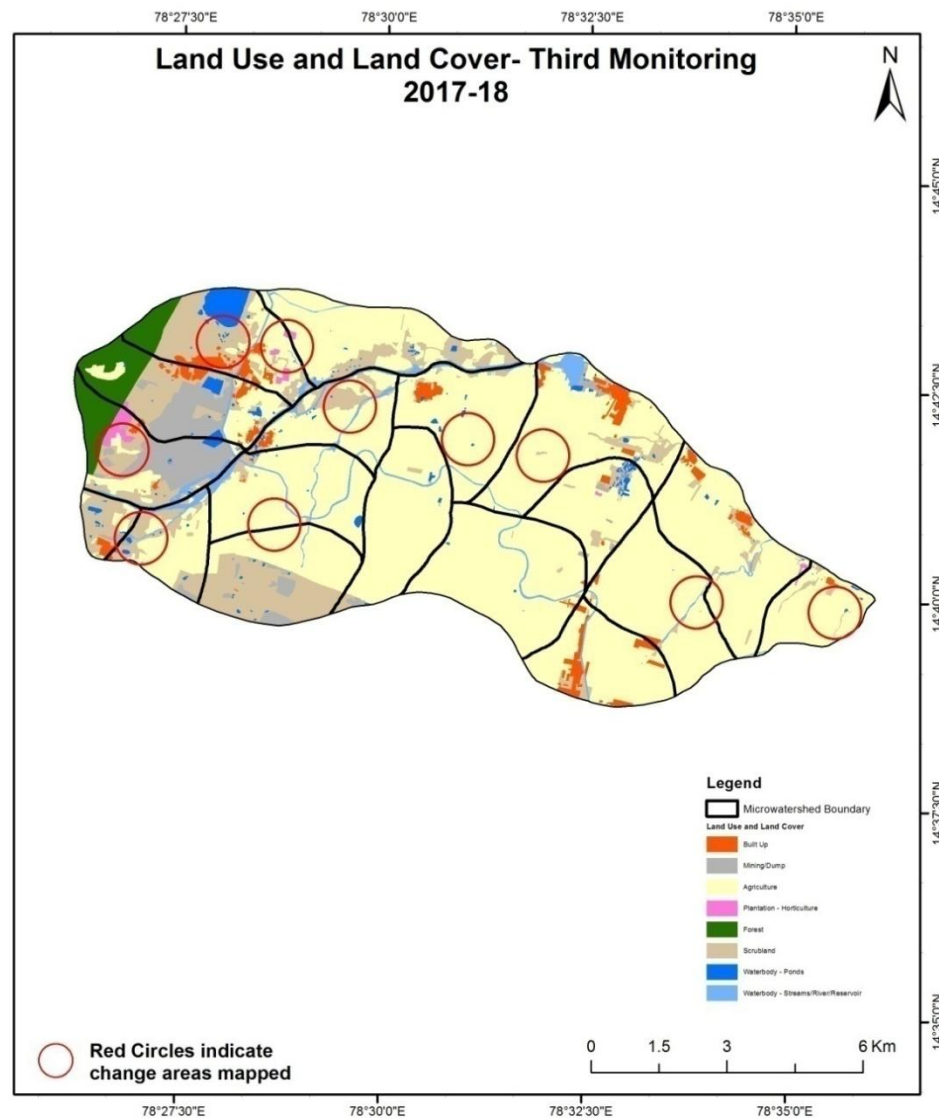
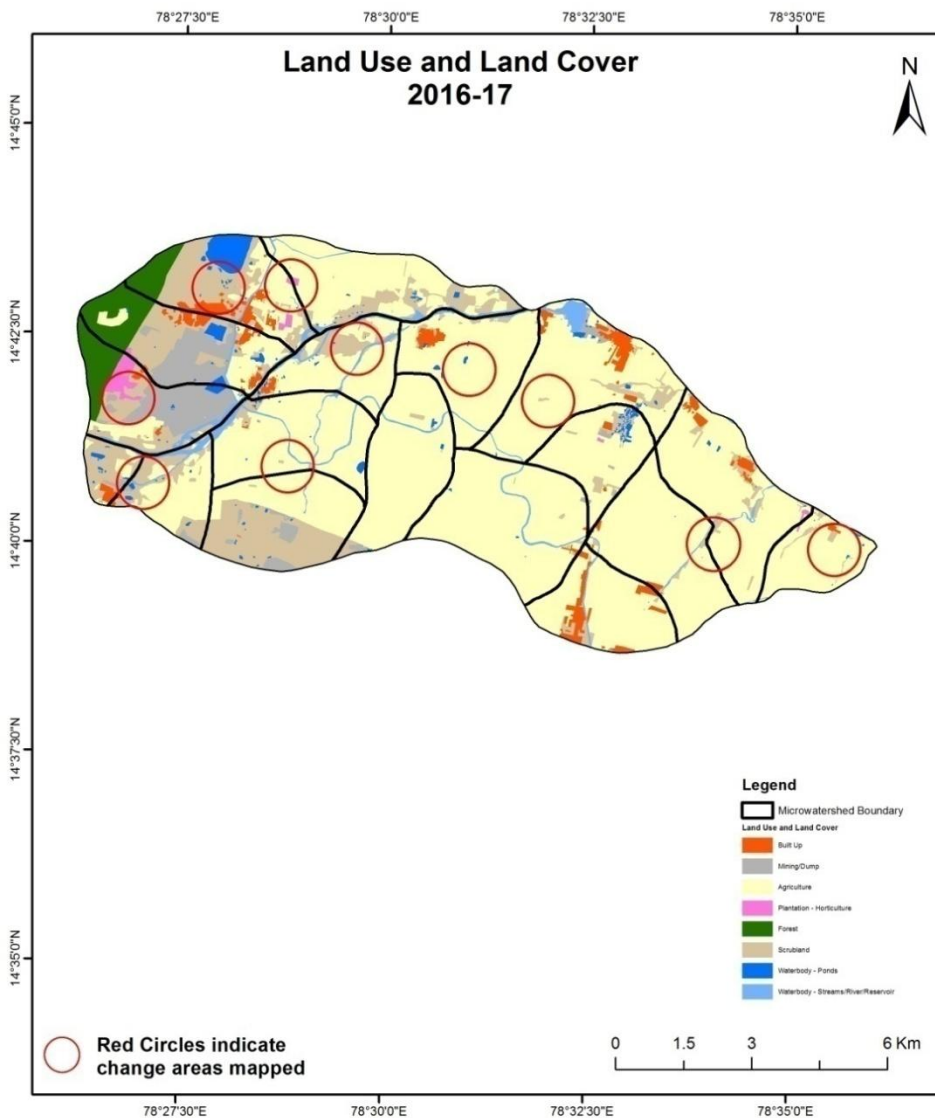
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



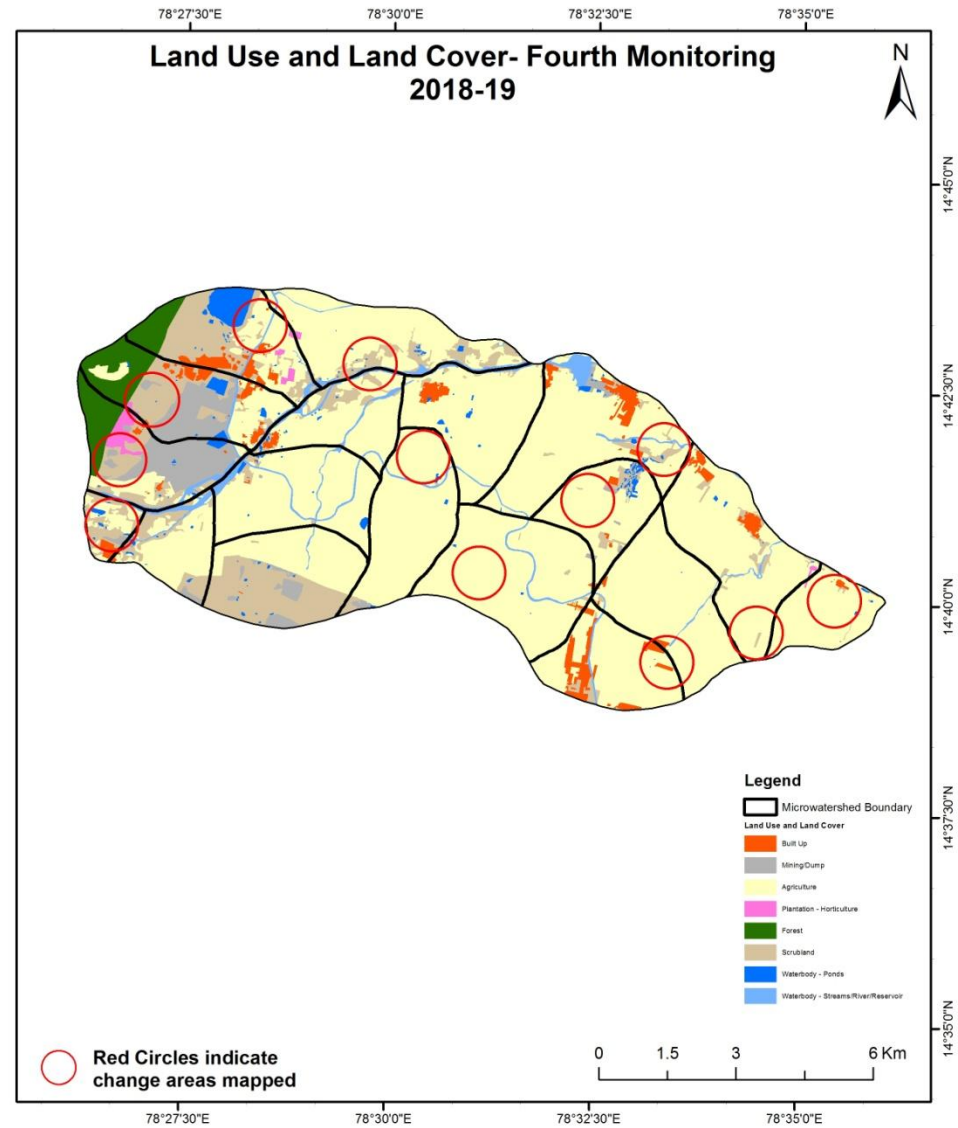
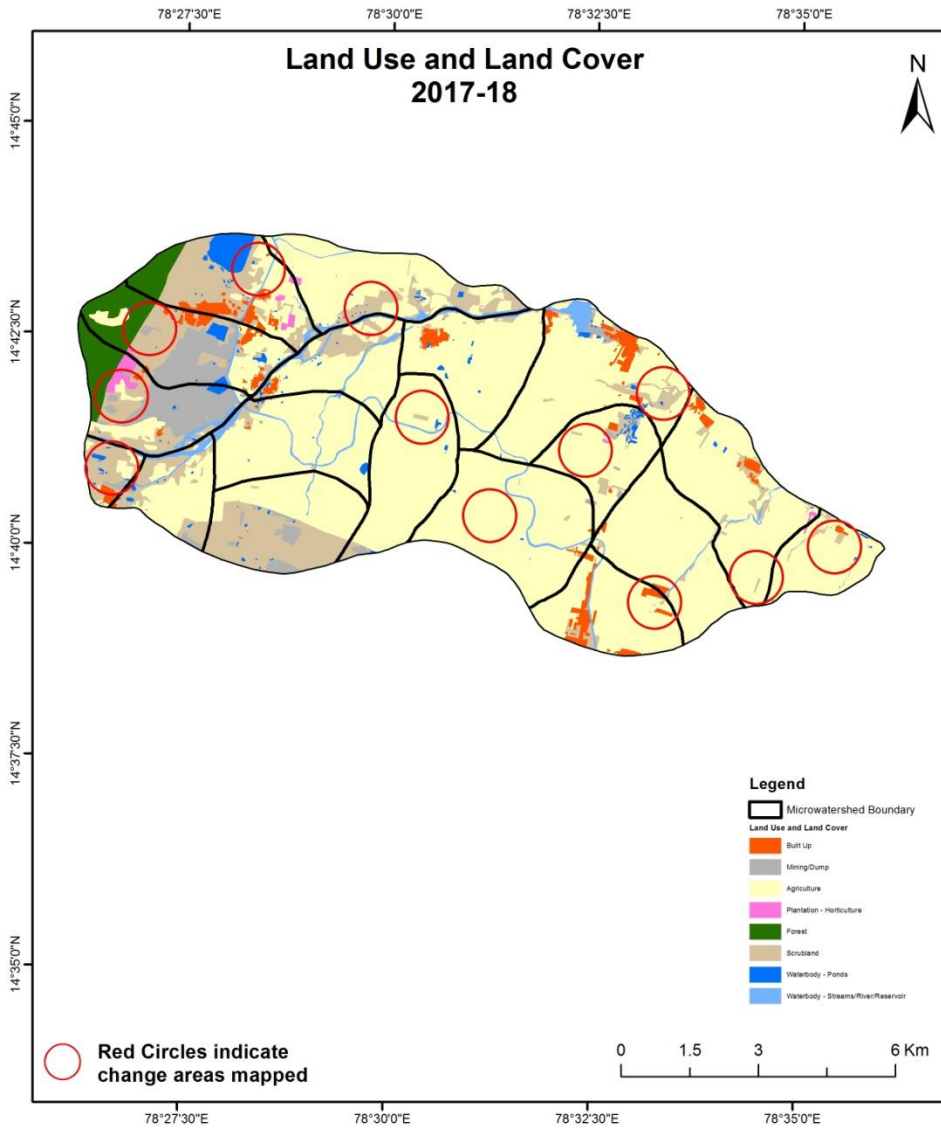
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



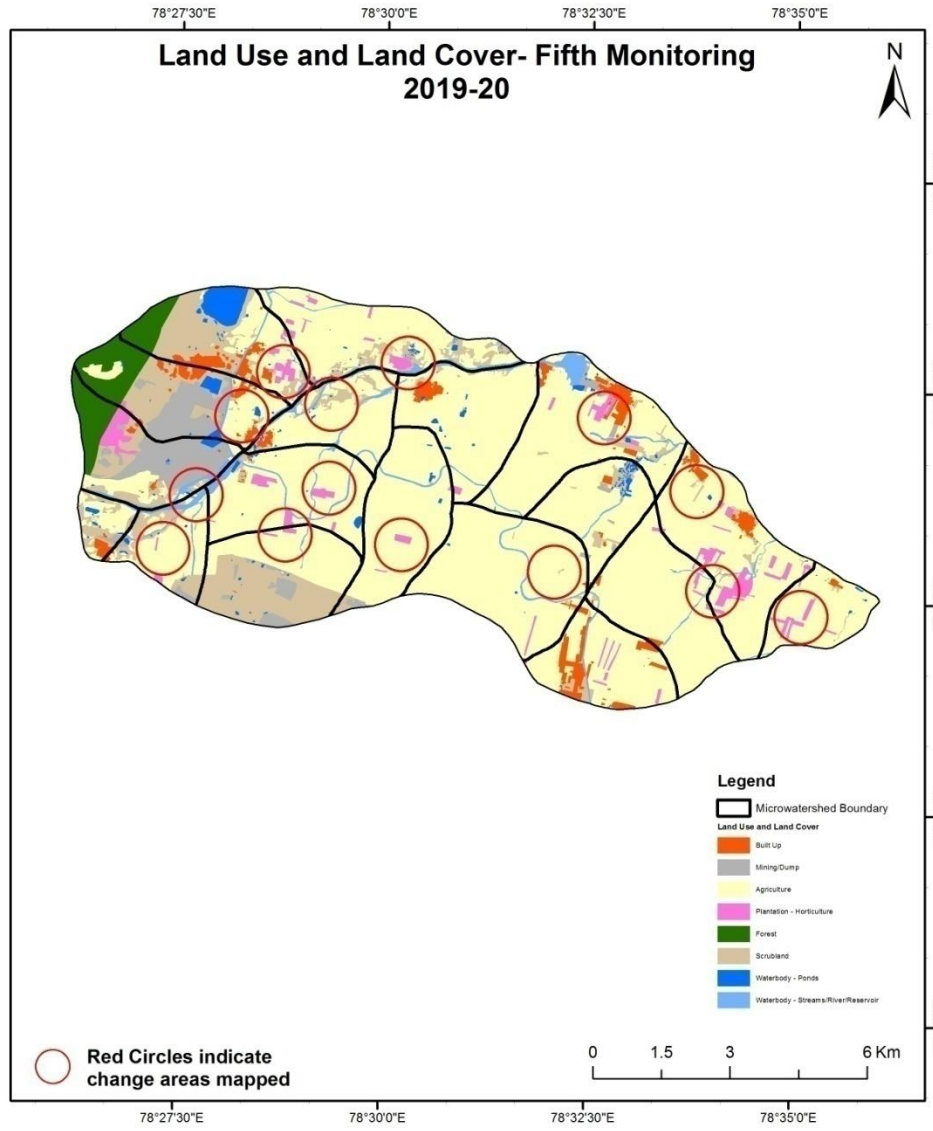
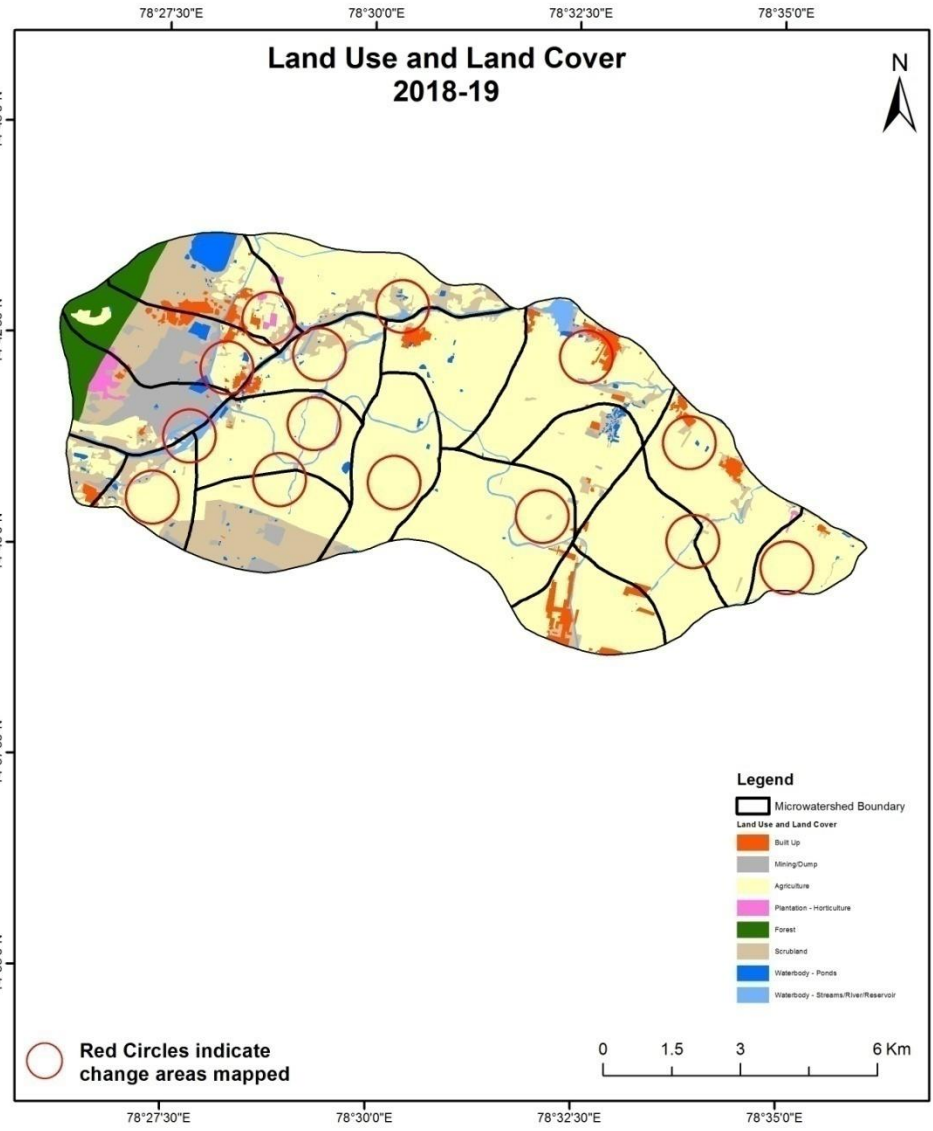
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

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

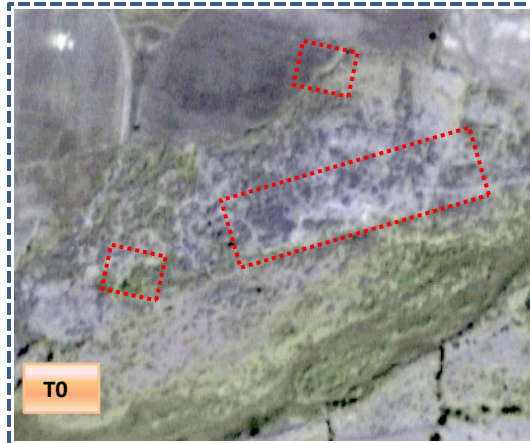


T0: 2011-12 (78°28'49.607"E 14°43'8.458"N)



T0: 02 February 2016

Scrub to Water body



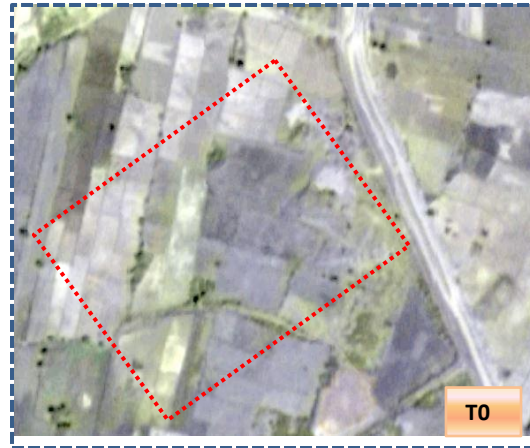
T0: 2011-12 (78°29'31.923"E 14°42'44.106"N)



T0: 02 February 2016

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

Agriculture to Water body

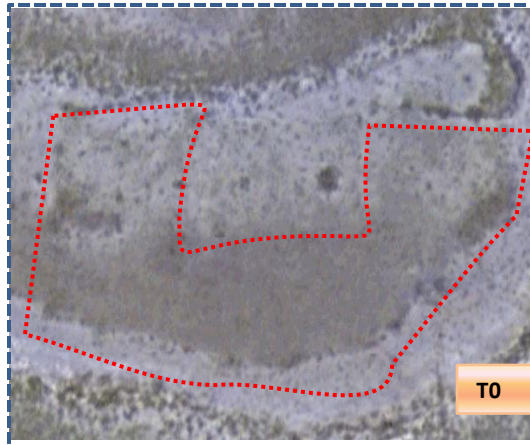


T0: 2011-12 (78°27'57.271"E 14°41'54.008"N)



T1: 02 February 2016

Scrub to Built-up



T0: 2011-12 (78°26'38.943"E 14°42'37.387"N)



T1: 02 February 2016

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

Agriculture to Water body



T1: 2015-16(78°28'27.36"E 14°42'13.276"N)

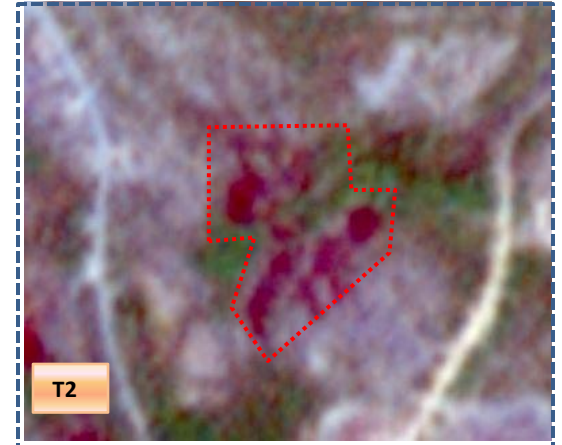


T2: 05 January 2017

Scrub to Water body



T1: 2015-16 (78°28'3.431"E 14°43'8.048"N)



T2: 05 January 2017

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

Scrub to Agriculture



T1: 2015-16(78°26'44.566"E 14°42'45.971"N)



T2: 05 January 2017

Scrub to Agriculture



T1: 2015-16(78°28'19.741"E 14°43'6.678"N)



T2: 05 January 2017

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	170.09												170.09
Mining/dump		119.29										1.27	120.56
Agriculture	49.89	139.23	6798.05	19.69					18.83		28.83		7054.52
Plantation Horticulture													
Forest			14.48		312.33						0.44		327.25
Forest Plantation													
Barren Rocky													
Scrub	33.44	141.14	105.36					1489.21	32.45		61.53		1863.12
Waterbody- Streams/River	0.09	1.55	10.46					14.62	262.52		0.76		290.00
Waterbody – Ponds		2.95									60.09		63.04
Grand Total	253.51	404.16	6928.36	19.69	312.33			1503.82	313.79		152.92		9888.58

- 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 256 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T1.
- In T1 119 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-2015-16 to 2016-17

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	253.51										253.51
Mining/dump		404.16									404.16
Agriculture	22.87	12.00	6879.66	4.26				2.83	1.31	5.43	6928.36
Plantation Horticulture				19.69							19.69
Forest			1.68		310.64						312.33
Forest Plantation											
Barren Rocky											
Scrub	2.16	9.23	51.33	30.80				1402.84	4.80	2.66	1503.82
Waterbody- Streams/River			4.09						309.70		313.79
Waterbody – Ponds			3.40						0.34	149.17	152.92
Grand Total	278.55	425.39	6940.17	54.74	310.64			1405.67	316.16	157.26	9888.58

- 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 45 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 53 ha of the agriculture area has increased from 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 (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	278.55												278.55
Mining/dump		425.39											425.39
Agriculture	0.13		6937.15	2.30							0.60		6940.17
Plantation Horticulture			9.46	45.29									54.74
Forest			3.22		307.42								310.64
Forest Plantation													
Barren Rocky													
Scrub	0.08		16.42					1388.13	0.94		0.10		1405.67
Waterbody- Streams/River			0.68					1.31	314.16				316.16
Waterbody – Ponds											157.26		157.26
Grand Total	278.76	425.39	6966.93	47.58	307.42			1389.44	315.10		157.96		9888.58

- 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 03 ha of the agriculture area has decreased and it is converted into Built-up , plantations and water body in T3.
- In T3 29 ha of the agriculture area has increased from plantations, forest, 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		
T3													
Built up	278.76												278.76
Mining/dump	0.34	425.06											425.39
Agriculture	13.47		6943.45	9.46						0.55			6966.93
Plantation Horticulture			1.02	46.56									47.58
Forest					307.42								307.42
Forest Plantation													
Barren Rocky													
Scrub	9.71	2.31	165.27					1199.74	9.94	2.46			1389.44
Waterbody- Streams/River			2.23						312.87				315.10
Waterbody – Ponds			3.11							154.84			157.96
Grand Total	302.28	427.36	7115.08	56.02	307.42			1199.74	322.82	157.86			9888.58

- 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 23 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T4 166 ha of the agriculture area has increased from plantations, 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-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	302.28										302.28	
Mining/dump		427.36									427.36	
Agriculture	3.55	4.24	6896.08	197.78				12.33	1.10		7115.08	
Plantation Horticulture			0.87	55.15							56.02	
Forest					307.33				0.09		307.42	
Forest Plantation												
Barren Rocky												
Scrub	3.54	4.51	80.88					1106.98	2.03	1.81	1199.74	
Waterbody- Streams/River			0.13					322.69			322.82	
Waterbody – Ponds		0.82							157.04		157.86	
Grand Total	309.37	436.93	6977.95	252.93	307.33			1106.98	337.04	160.04	9888.58	

- 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 219 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T5.
- In T5 81 ha of the agriculture area has increased from plantations, 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 144 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2018-19 (T5) years.
4. There is an increase of 11, 26 & 148 Hectares From T1 to T2, T2-T3 & T3-T4 respectively, there is a decrease of 126 & 137 ha from T0-T1 & T4-T5 and overall decrease of 76 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2018-19 (T5) years.
5. There is an **increase of 252 ha of the Plantation/Horticulture** area has been increased between 2011-12 (T0) & 2018-19 (T5) years.
6. There is a decrease of 756 Hectares in Scrubland area as compared between 2011-12 (T0) & 2018-19 (T5) years.
7. Farm ponds (40) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (68) verified from the portal.