

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

CHITTOOR -32/2011-12
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

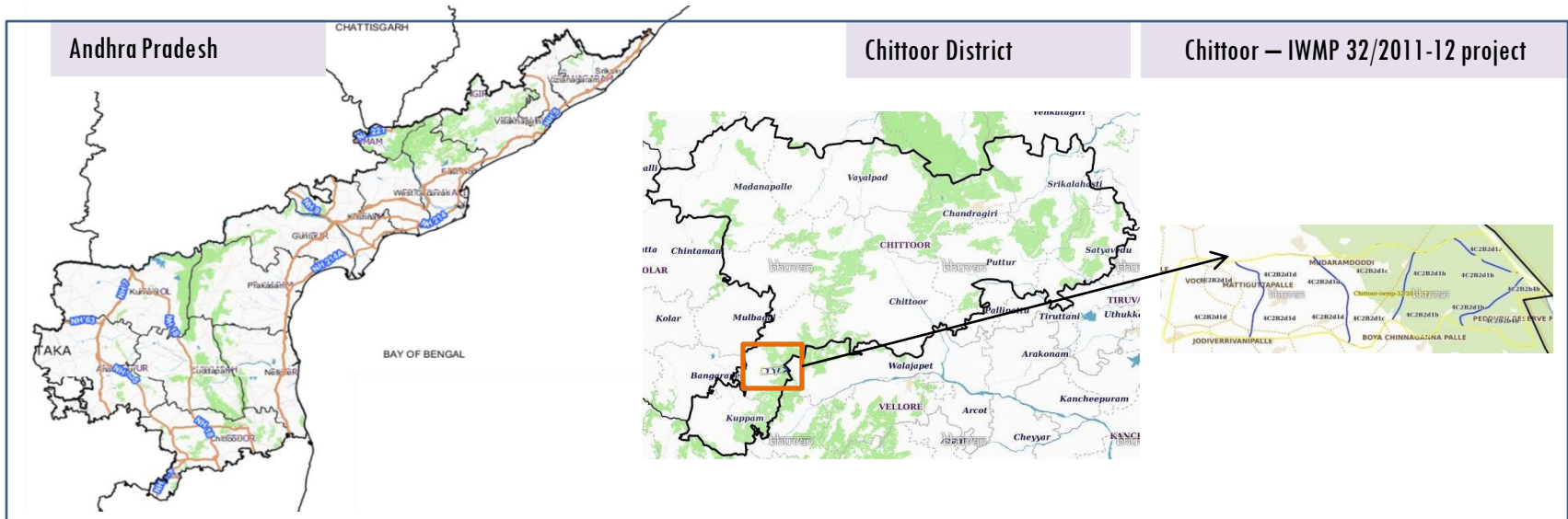
E X E C U T I V E S U M M A R Y

- 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-32/2011-12, Chittoor District of Andhra Pradesh. The total geographical area of the project is **3266.7** ha. It comprises of 6 micro watersheds.
- In the project area 750 Drishti photos were uploaded showing all water harvesting structures of check dams/Rock fill dam, recharge pits etc,.
- 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 9.2 ha increase in the area.
- Major percentage i.e. 45 % is covered by the forest, 39 % is covered by agriculture and 4 % is covered by scrubland and remaining by other land use classes.

PROJECT : CHITTOOR – IWMP-32/2011-12

DISTRICT : CHITTOOR , STATE : ANDHRA PRADESH

- The study area falls in Venkatagirikota Mandal of Chittoor district of Andhra Pradesh state. The total geographical area of the project is **3266.7** ha. It comprises of 6 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 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
	2011-12	2013-14	2019-20
LISS IV	2011-12		
SCENE 1			29-Feb-20
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			29-Feb-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	750
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

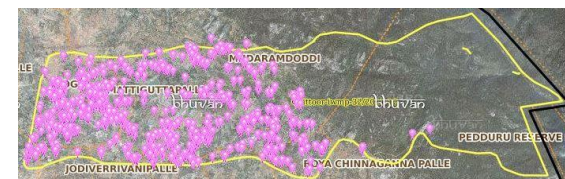


MWS Boundary



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	2	2
2	Horticulture	0	0
3	Agriculture	127	120
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	52	49
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	10	9
11	Civil work-Check dams/Rock fill dam	119	110
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	14	14
15	Livelihood Activities-Plantation/Horticulture	13	13
16	Capacity Building Activities	0	0
17	Entry Point Activity	23	22
18	Others	429	411
	TOTAL	789	750

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:NCC,NRSC

Natural Color Composite - 5th April 2016



Source:NCC,NRSC

Natural Color Composite - 24th January 2017



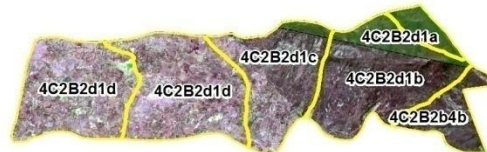
Source:LISS-IV,NRSC

Natural Color Composite - 22nd February 2018



Source:LISS IV,NRSC

Natural Color Composite - 23rd February 2019



Source:NCC,NRSC

Natural Color Composite - 29th February 2020



Source:LISS-IV,NRSC

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-32/2011-12



T0

T0:2009-10



T1

T1: 24 March 2017

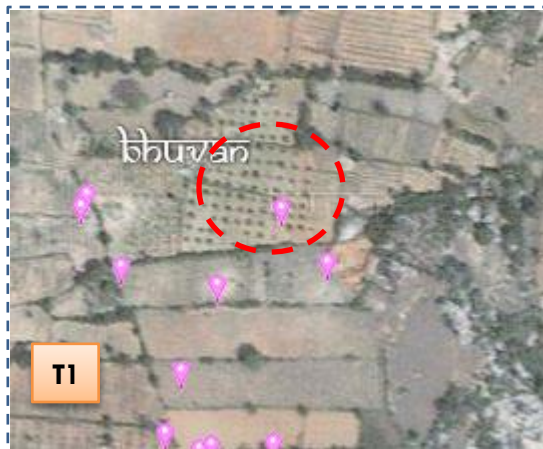


Drishti SI no. 1911049 MWS :4C2B2d1c

Farm pond



T0:2009-10



T1

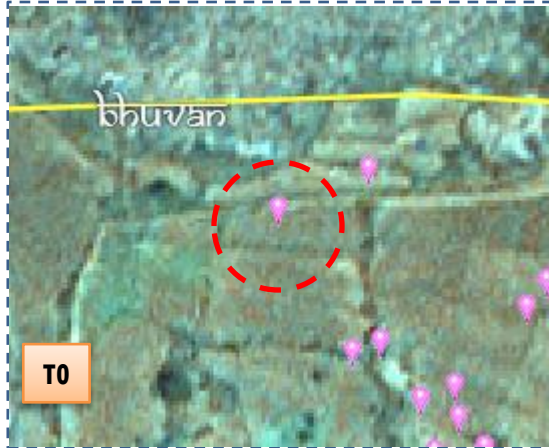
T1: 24 March 2017



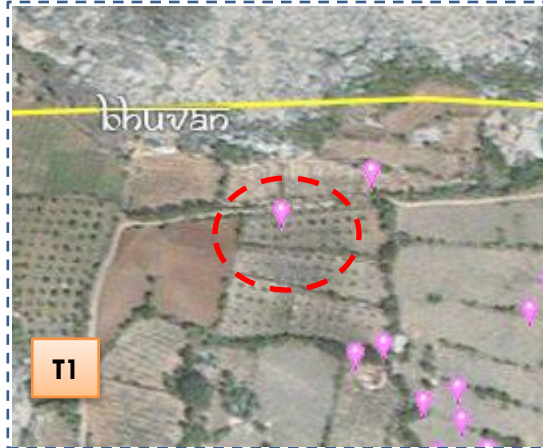
Drishti SI no. 7037412 MWS :4C2B2d1d

Horticulture

Monitoring of activities in Chittoor Dt Andhra Pradesh. IWMP-32/2011-12



T0: 2009-10



T1: 24 March 2017

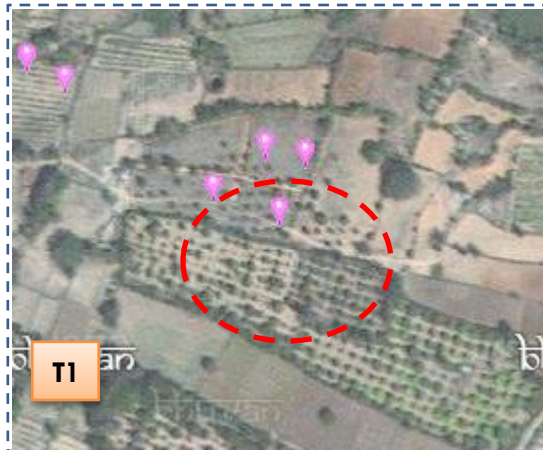


Drishti Sl no. 7045534 MWS : 4C2B2d1d

Horticulture



T0: 2009-10



T1: 24 March 2017



Drishti Sl no. 7142657 MWS :4C2B2d1d

Horticulture

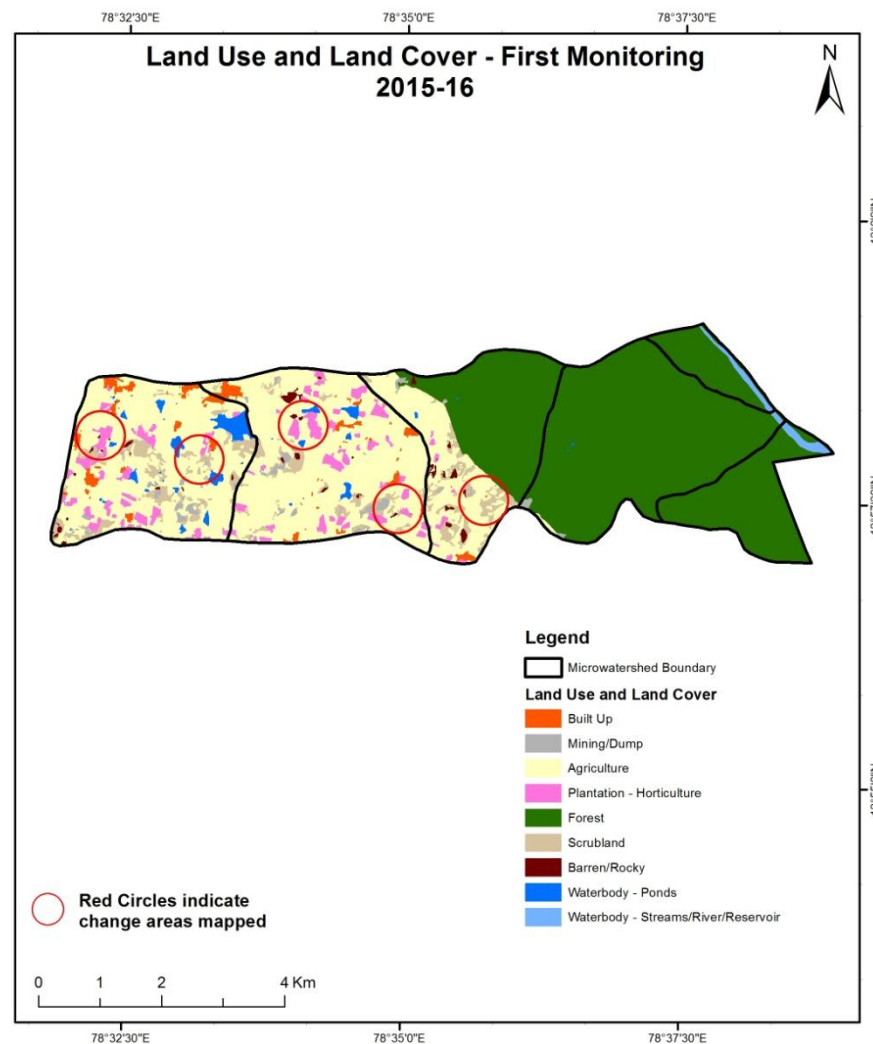
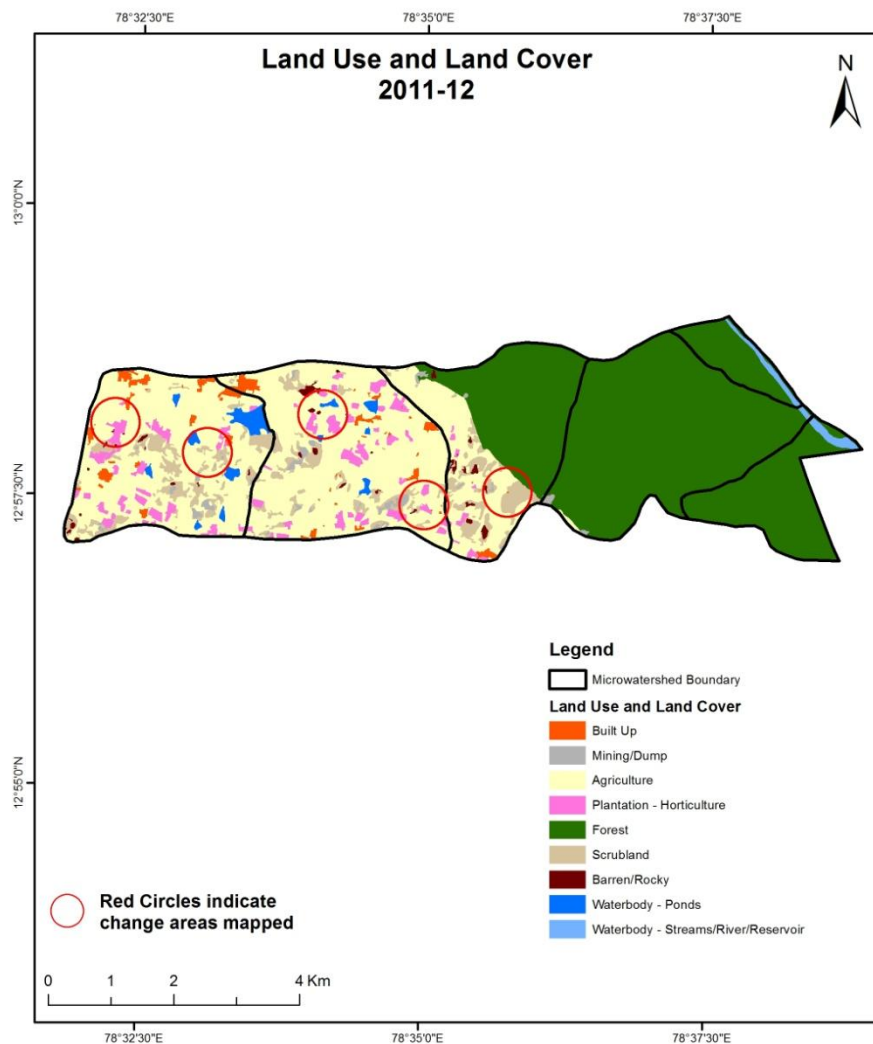
MONITORING IN THE PROJECT AREA

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)

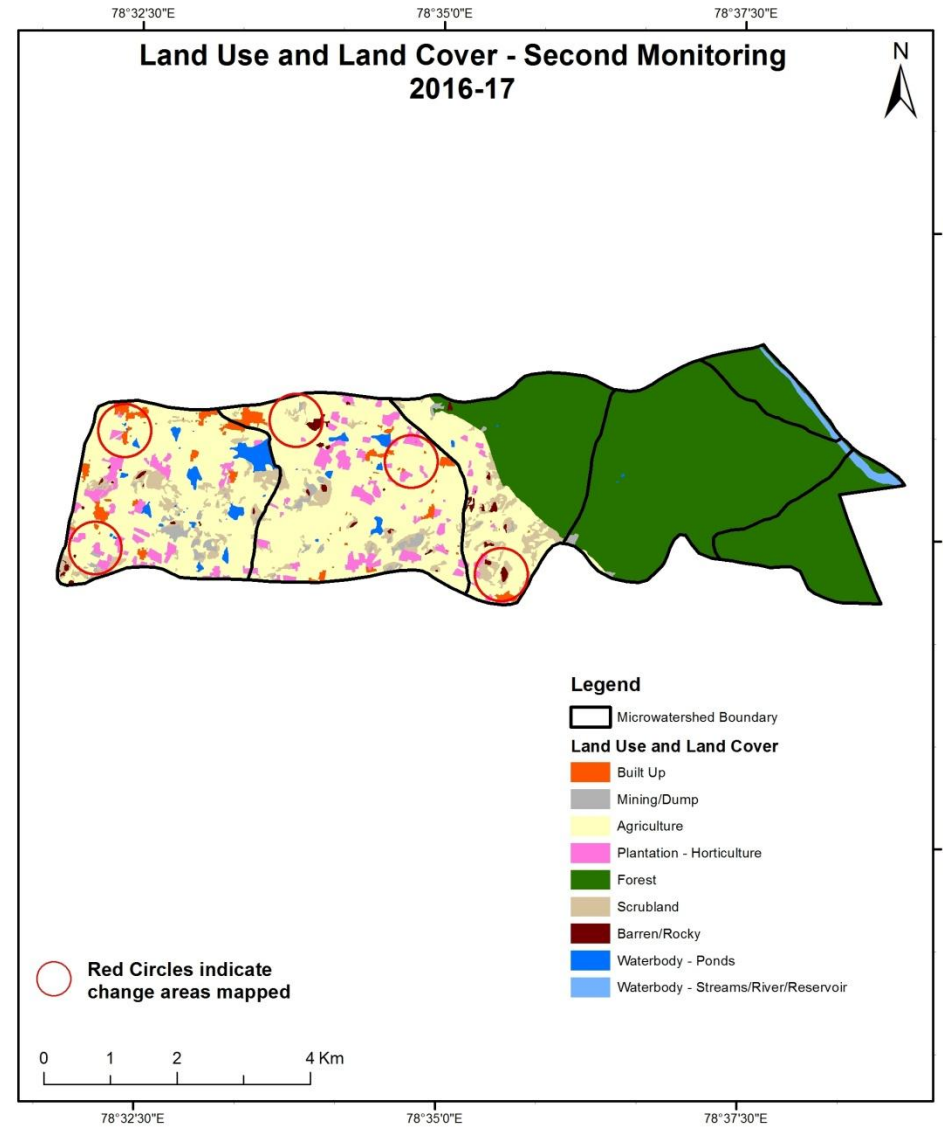
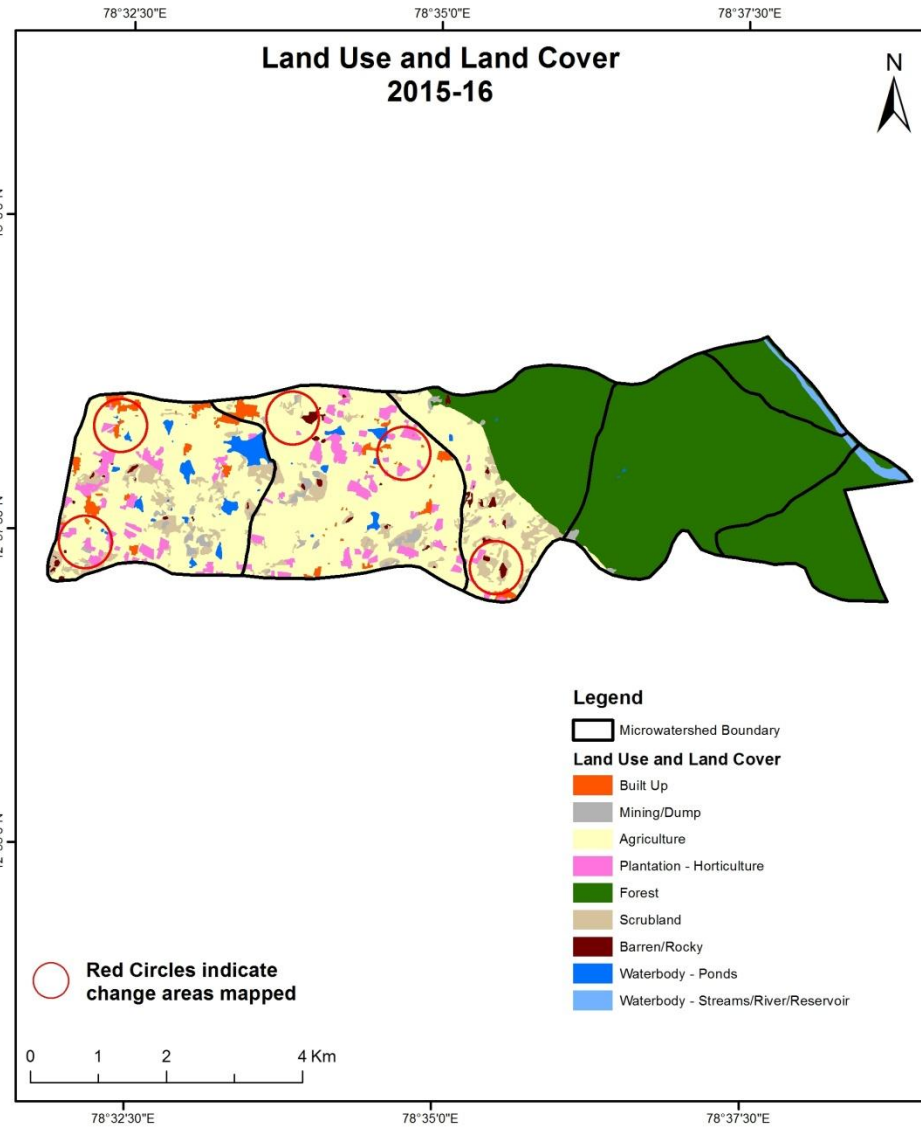
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2011-12 to 2015-16)

Scale: 1:10000



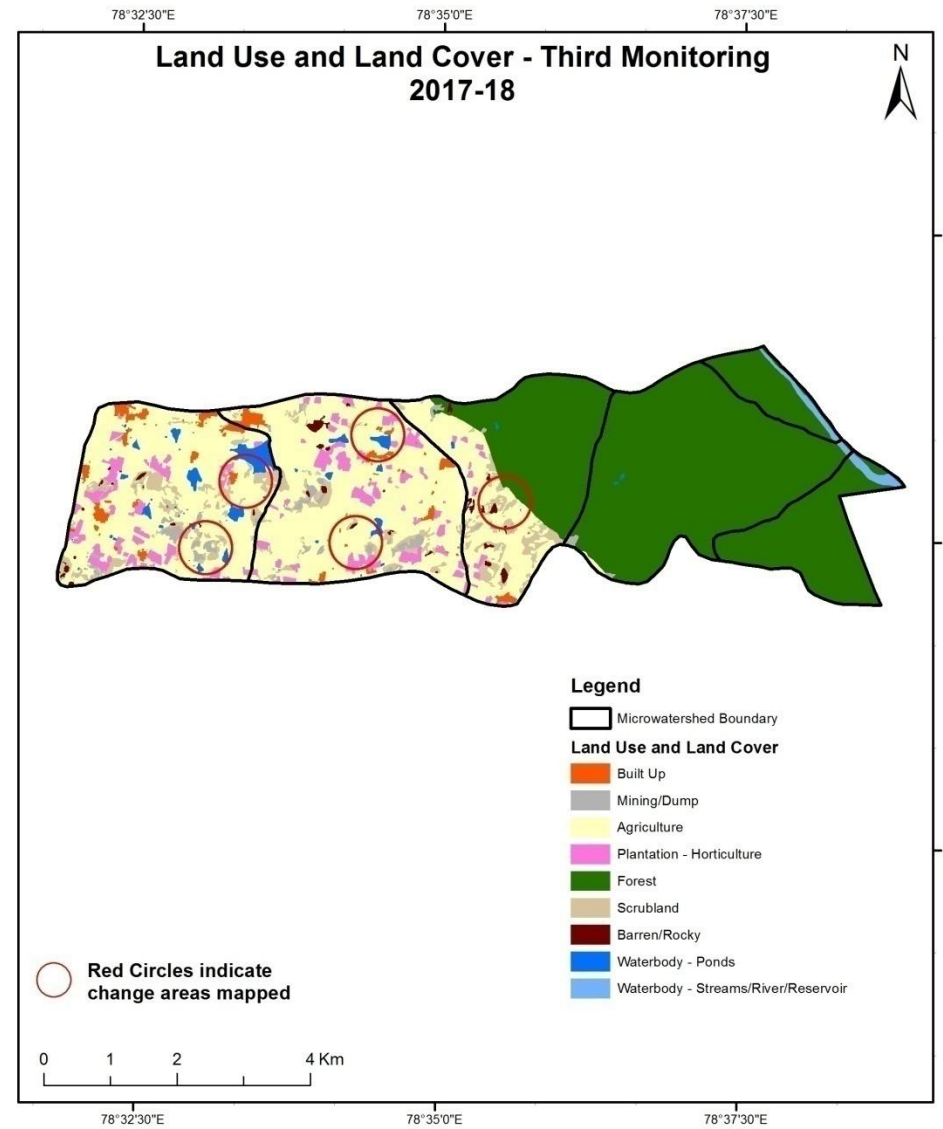
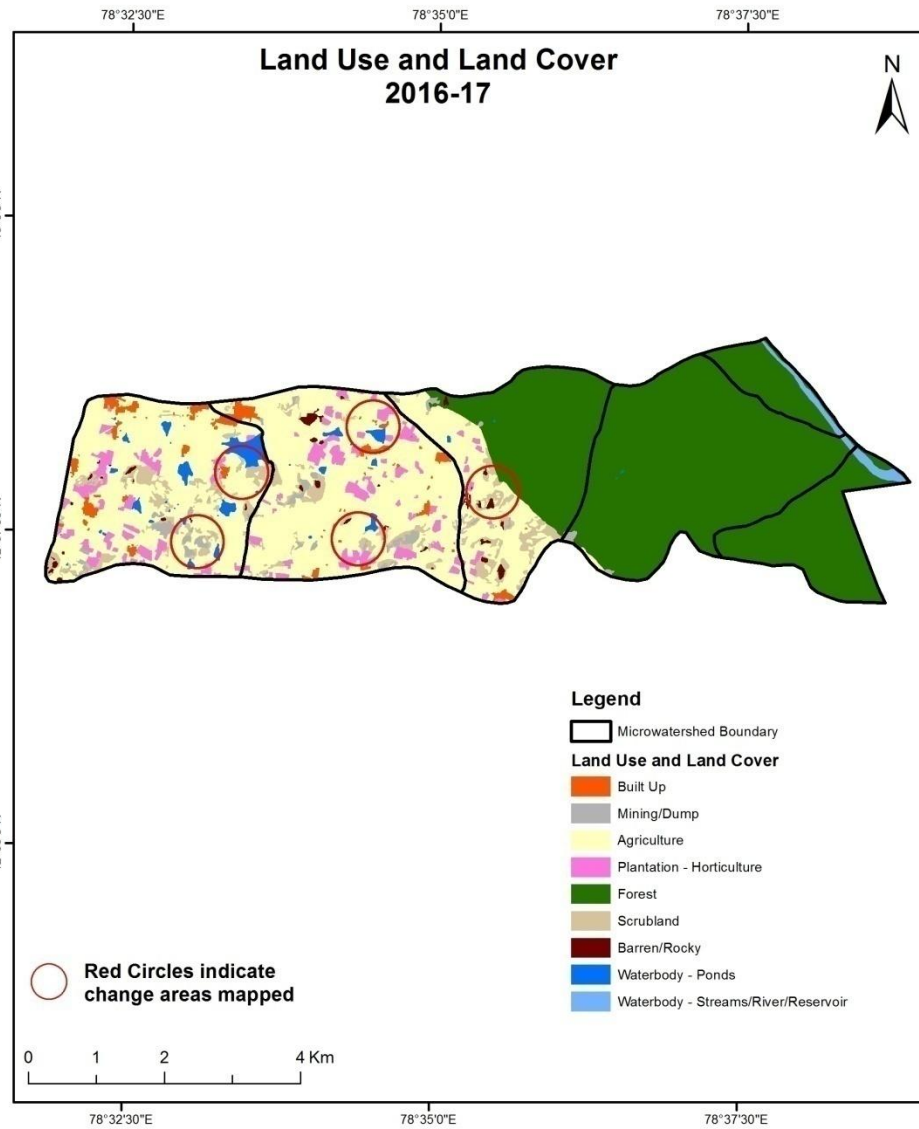
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



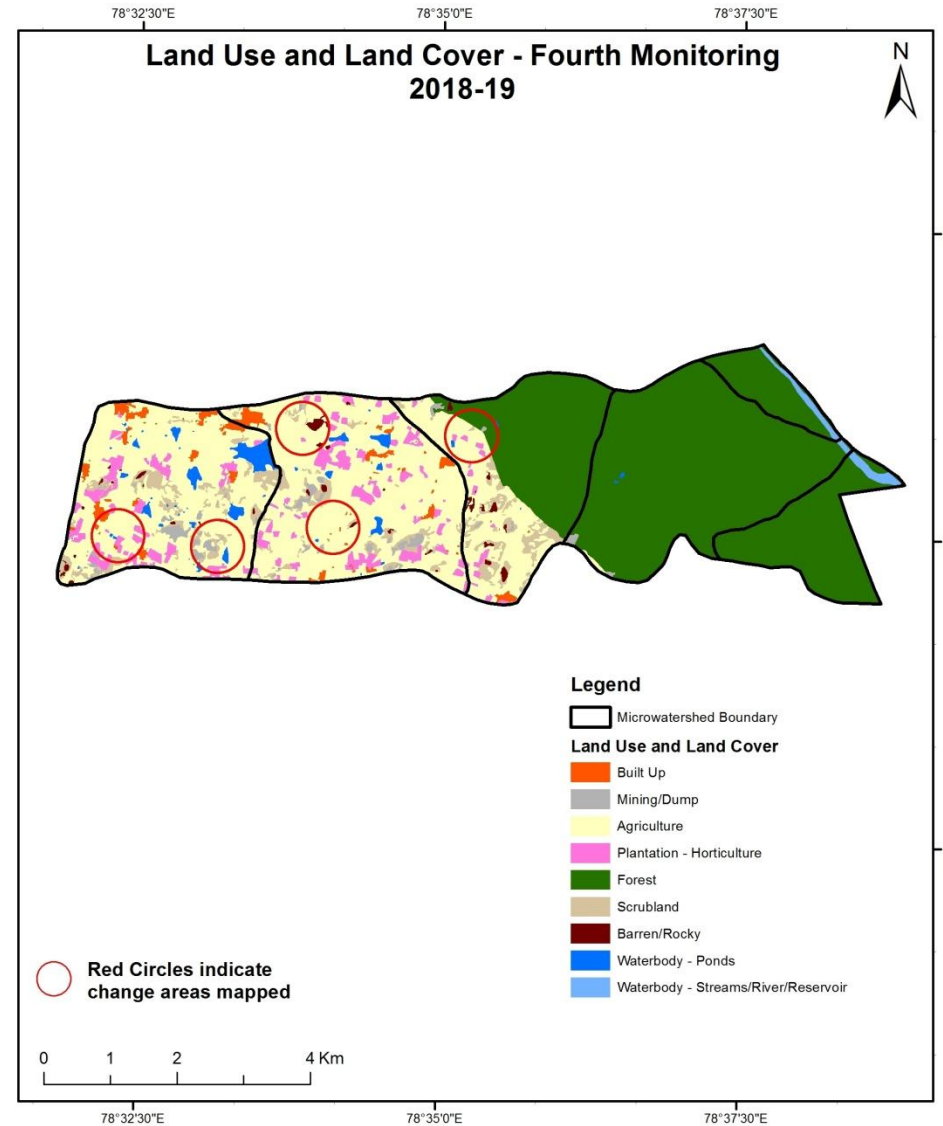
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



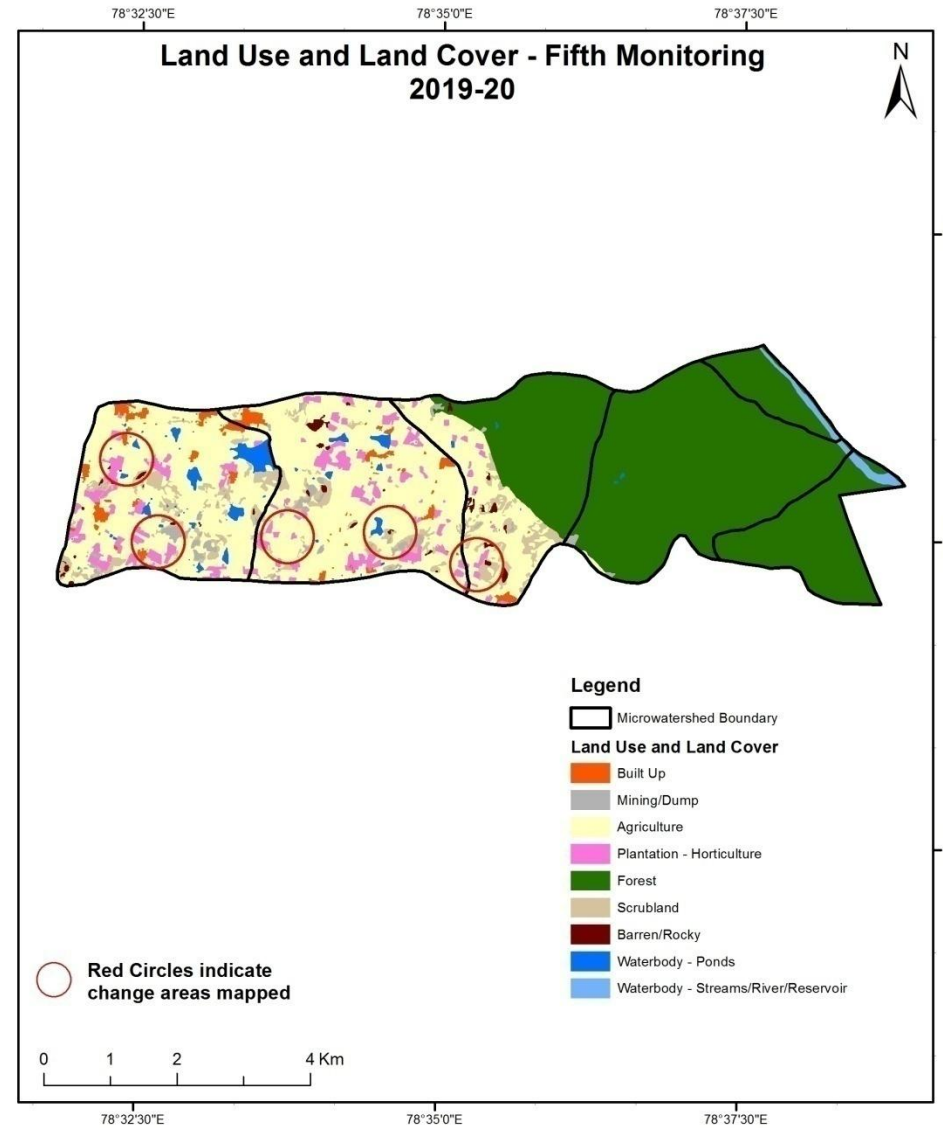
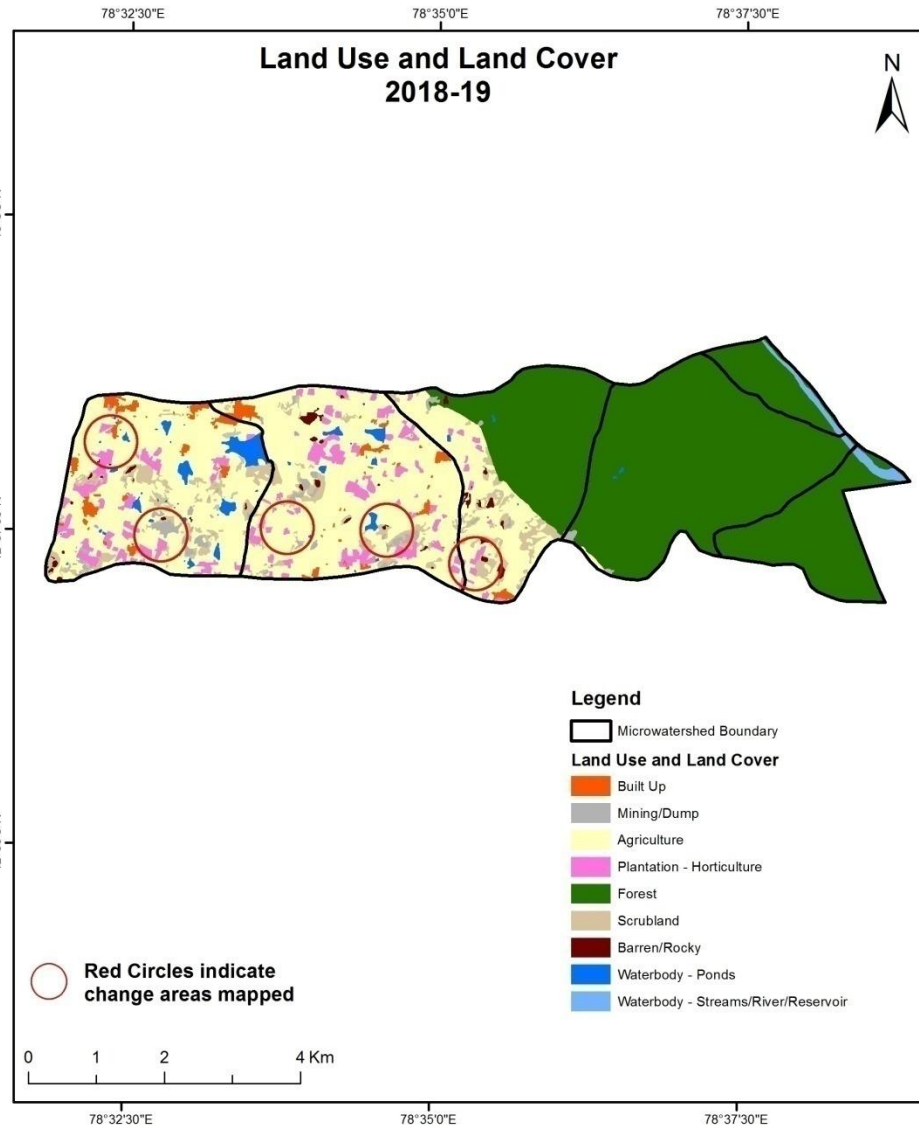
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

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



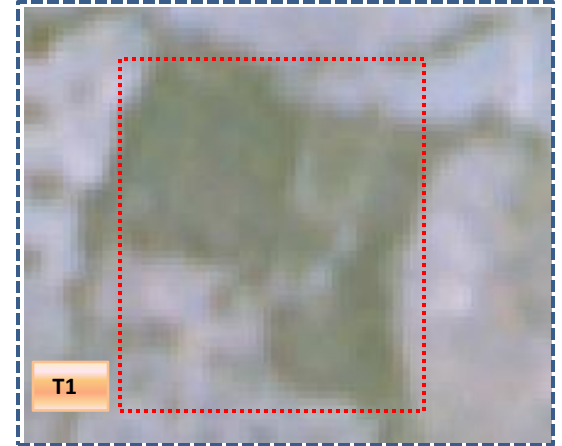
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

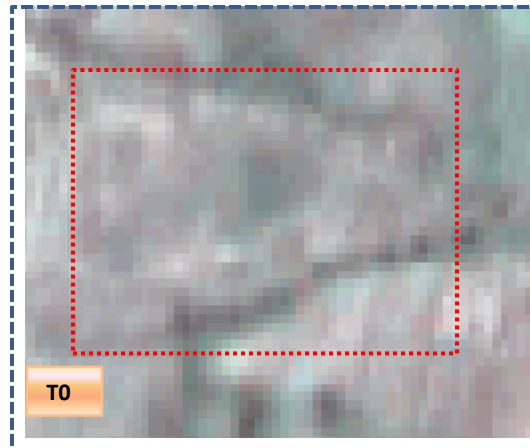
T0: 2011-12 (78°32'20.949"E 12°58'10.566"N)



T1

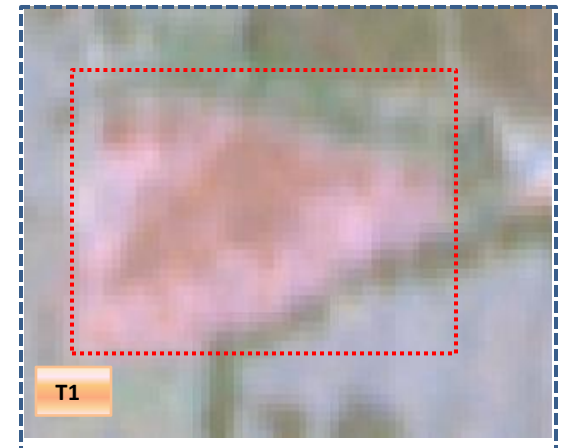
T1: 05 April 2016

Agriculture to Waterbody



T0

T0: 2011-12 (78°32'23.934"E 12°57'58.37"N)

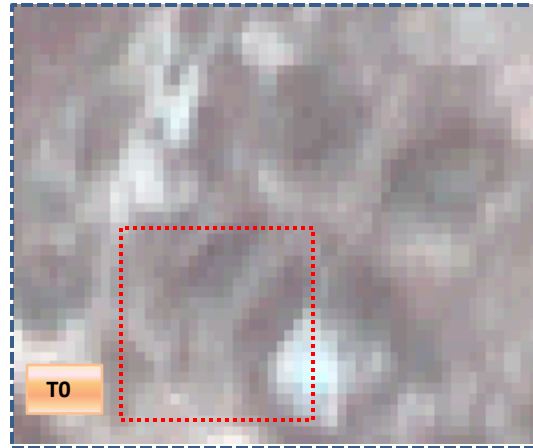


T1

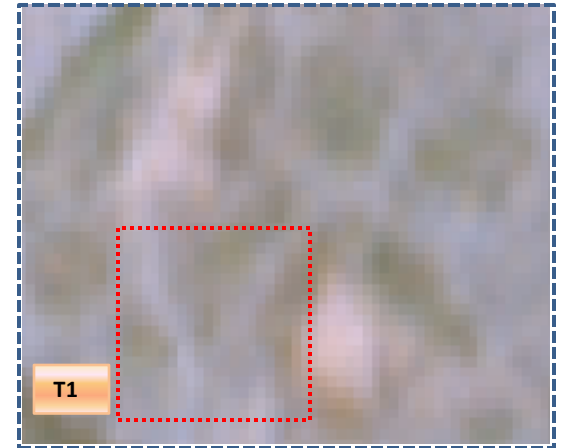
T1: 05 April 2016

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

Scrubland to Plantation



T0: 2011-12 (78°32'6.1"E 12°57'9.185"N)



T1: 05 April 2016

Scrubland to Agriculture



T0: 2011-12 (78°32'39.857"E 12°57'26.128"N)



T1: 05 April 2016

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
T0											
Built up	53.67										53.67
Mining/dump		30.25									30.25
Agriculture	2.37	1.35	1253.97	15.11						6.02	1278.82
Plantation Horticulture			2.52	117.87							120.40
Forest					1479.62					0.42	1480.04
Forest Plantation											
Barren Rocky							20.14				20.14
Scrub		4.03	42.84					170.12		0.58	217.56
Waterbody- Streams/River									25.04		25.04
Waterbody – Ponds			0.16							40.61	40.76
Grand Total	56.04	35.64	1299.49	132.99	1479.62		20.14	170.12	25.04	47.62	3266.70

- 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 24.8 ha of the agriculture area has decreased and it is converted into plantation, Built-up, mining/dump, plantation and water body in T1. In T1 45.3 ha of the agriculture area has increased from scrubland, plantation and water body of T0.
- Overall 20.6 ha of the agriculture area has been increased. 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	56.04												56.04
Mining/dump		35.64											35.64
Agriculture	0.91		1287.56	10.94							0.08		1299.49
Plantation Horticulture			2.33	130.66									132.99
Forest					1479.62								1479.62
Forest Plantation													
Barren Rocky							20.14						20.14
Scrub		6.98	1.99					161.15					170.12
Waterbody- Streams/River									25.04				25.04
Waterbody – Ponds											47.62		47.62
Grand Total	56.95	42.62	1291.88	141.59	1479.62		20.14	161.15	25.04		47.71		3266.70

- 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 11.9 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.
- In T2 4.3 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	56.95												56.95
Mining/dump		42.62											42.62
Agriculture	0.88	0.13	1278.86	10.97							1.05		1291.88
Plantation Horticulture	0.08		1.63	139.88									141.59
Forest					1478.93						0.69		1479.62
Forest Plantation													
Barren Rocky							20.14						20.14
Scrub		1.66	0.73					158.56			0.19		161.15
Waterbody- Streams/River									25.04				25.04
Waterbody – Ponds											47.71		47.71
Grand Total	57.90	44.41	1281.22	150.85	1478.93		20.14	158.56	25.04		49.64		3266.70

- 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, plantations and water body in T3.
- In T3 2.3 ha of the agriculture area has increased from plantations and 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-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	57.90												57.90
Mining/dump		44.41											44.41
Agriculture	0.39		1272.29	8.36							0.18		1281.22
Plantation Horticulture	0.20		1.78	148.87									150.85
Forest					1478.93								1478.93
Forest Plantation													
Barren Rocky							20.14						20.14
Scrub			1.40					157.16					158.56
Waterbody- Streams/River									25.04				25.04
Waterbody – Ponds											49.64		49.64
Grand Total	58.50	44.41	1275.47	157.23	1478.93		20.14	157.16	25.04		49.82		3266.70

- 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 8.9 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.
- In T4 3.1 ha of the agriculture area has increased from plantations 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	58.50												58.50
Mining/dump		44.41											44.41
Agriculture	0.15	0.93	1273.08	1.08						0.22			1275.47
Plantation Horticulture			2.27	154.96									157.23
Forest					1478.93								1478.93
Forest Plantation													
Barren Rocky							20.14						20.14
Scrub			1.64					155.52					157.16
Waterbody- Streams/River									25.04				25.04
Waterbody – Ponds										49.82			49.82
Grand Total	58.65	45.34	1276.98	156.05	1478.93		20.14	155.52	25.04	50.04			3266.70

- 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 2.3 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T5.
- In T5 3.9 ha of the agriculture area has increased from plantations 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 9.2 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 20 & 1.5 Hectares from T0 to T1 & T4 & T4-T5 and there is a decrease of 07,10 & 05 Hectares from T1 to T2, T2-T3, T3-T4 respectively and overall decrease of 1.8 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 **35 ha of the Plantation/Horticulture** area has been increased between 2011-12 (T0) & 2019-20 (T5) years.
6. There is a decrease of 62 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (T5) years.
7. Farm ponds (9) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (10) verified from the portal.