MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -38/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
March-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

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

EXECUTIVE SUMMARY

- 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-38/2010-11, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is 9,495 ha. It comprises of 8 micro watersheds.

- In the project area 110 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.

- Water bodies have shown an increase by 28 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.

- Major percentage i.e. 59.75 % is covered by the agriculture, 14.94 % is covered by Scrub land, 19.34 % is covered by forest and remaining by other land use classes.

- The study area falls in D.Hirehal Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 9,495 ha. It comprises of 8 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2010-11 (T0) period (*Batch -II*) projects taking 2018-19 (T5) period satellite images
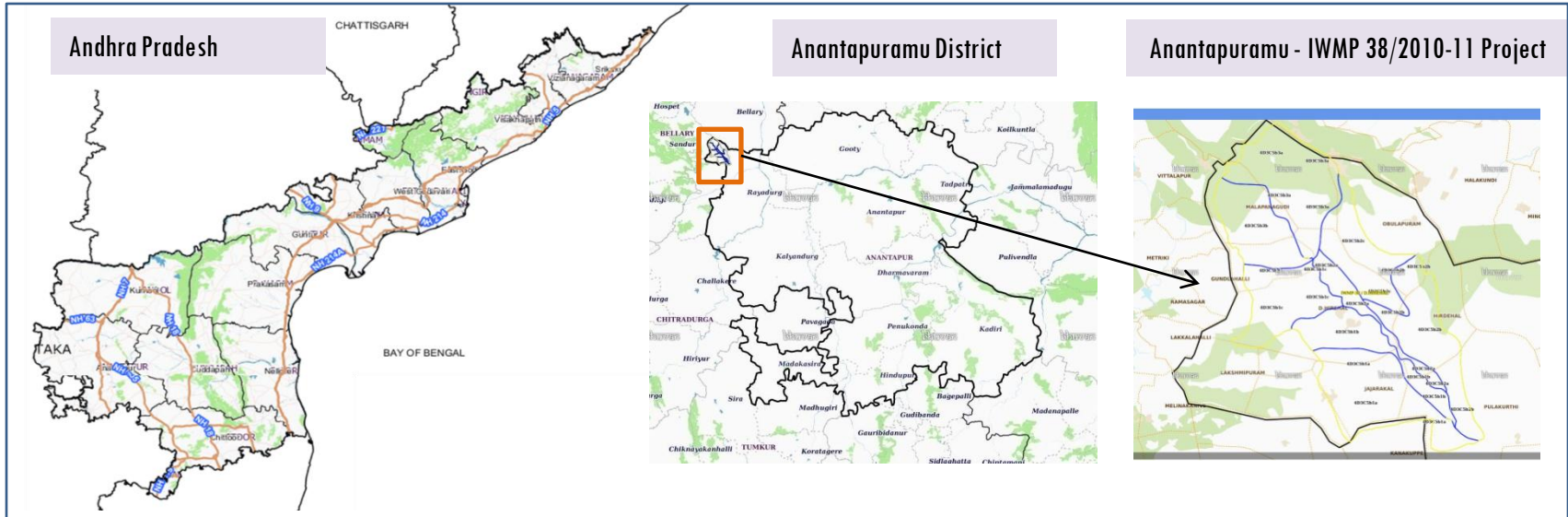
- Anantapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- Anantapuram gets pre-monsoon showers starting as early as March, mainly through north-easterly winds blowing in from Kerala. Monsoon arrives in September and lasts until early November with about 250 mm (9.8 in) of precipitation. A dry and mild winter starts in late November and lasts until early February; with little humidity and average temperatures in the 22–23 °C (72–73 °F) range. Total annual rainfall is about 22 in (560 mm).

- Anantapuram district receives moderate to good rainfall from July to October month.

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Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2010-11	2011-12	2018-19
LISS IV	2010-11		
SCENE 1			28-Mar-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2010-11		
SCENE 1			28-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	110
4	Detailed Project Report		

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

Legend
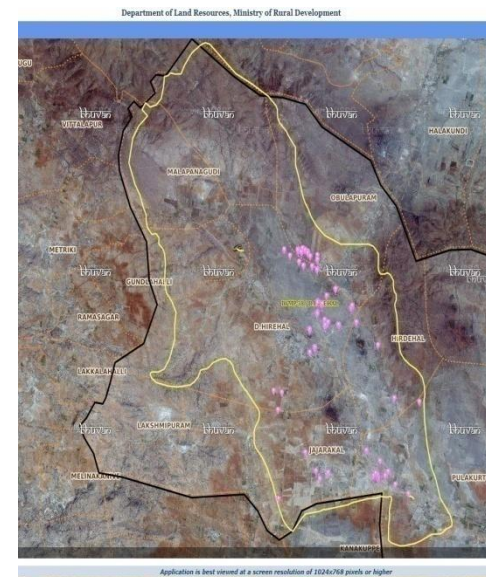
 Drainage (1:10000 Scale)

 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	0	0
2	Agriculture/Horticulture	0	0
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	0	0
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	7	7
10	Civil work-Check dams/Rock fill dam	103	103
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-Plantation/Horticulture	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	0	0
17	Others	0	0
	TOTAL	**110**	**110**

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.

Anantapuramu–IWMP-38/2010-11

2014-15

Feb-2016

March-2017

Jan-2019

Feb-2021

Drishti Sl.No.: 1061949
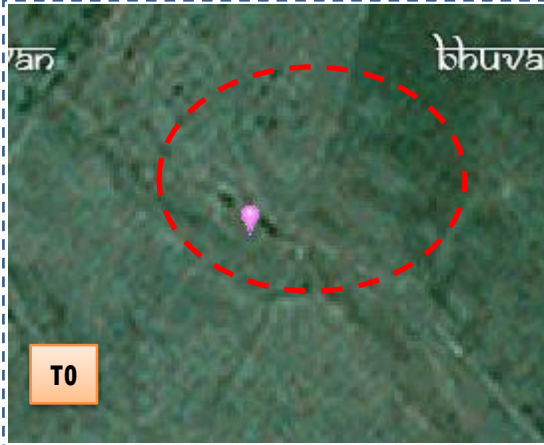M.No.: 9100986113
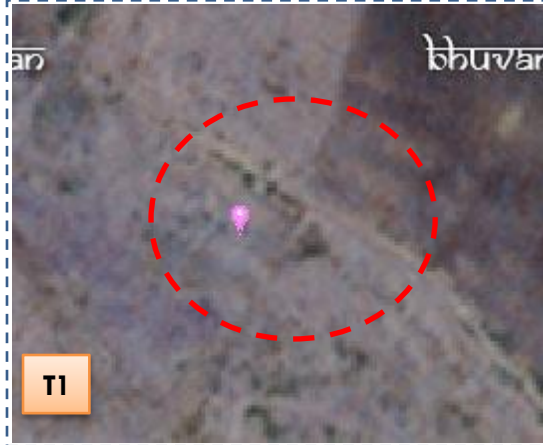Uuid: baeff42f6dc2c2d1

Activity : check dam

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-38/2010-11
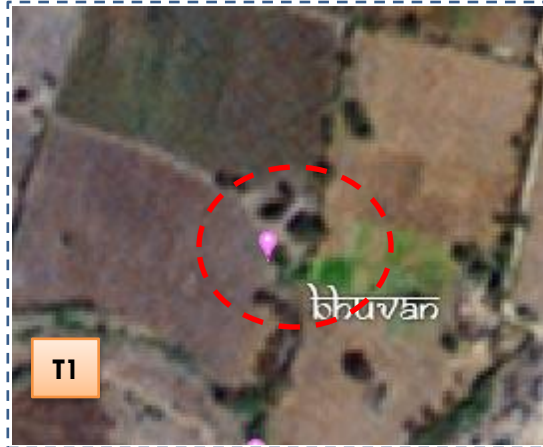

| T0:2010-11 | T1: 01 February 2015 | Drishti Sl no. 1061909   MWS : 4D3C5b2c |

Check dam

| T0:2010-11 | T1: 01 February 2015 | Drishti Sl no. 1062771   MWS : 4D3C5b2c |

Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-38/2010-11

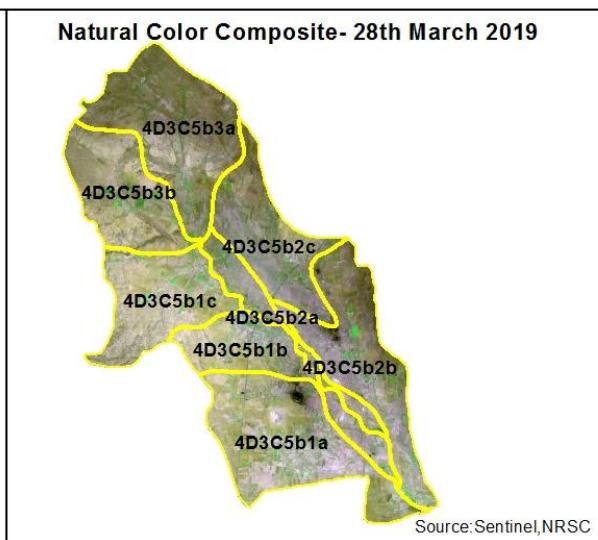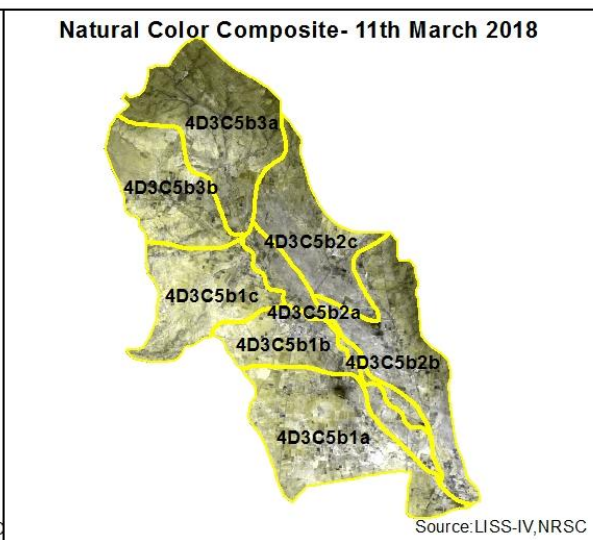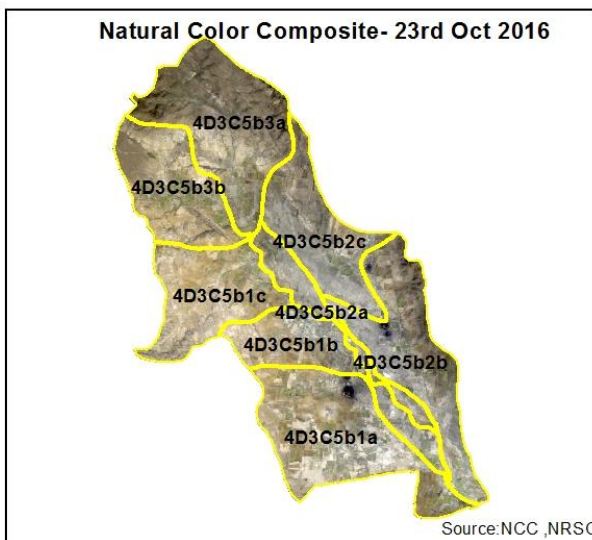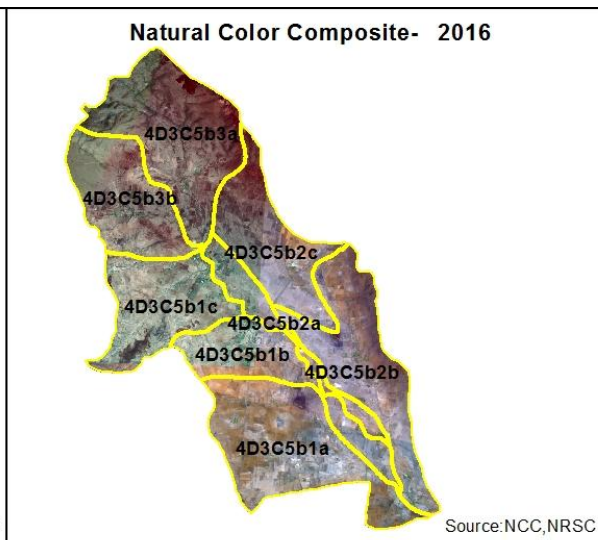| T0:2010-11 | T1: 01 February 2015 | Drishti Sl no. 1637890 MWS : 4D3C5b2c |

Check dam

| T0:2010-11 | T1: 01 February 2015 | Drishti Sl no. 637793 MWS : 4D3C5b2c |

Farm pond

Natural Color Composite – 2010-11 to 2018-19

Natural Color Composite- 2010-11

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:Fusion,NRSC

Natural Color Composite- 2014-15

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:NCC,NRSC

Natural Color Composite- 2016

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:NCC,NRSC

Natural Color Composite- 23rd Oct 2016

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:NCC ,NRSC

Natural Color Composite- 11th March 2018

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:LISS-IV,NRSC

Natural Color Composite- 28th March 2019

4D3C5b3a
4D3C5b3b
4D3C5b2c
4D3C5b1c
4D3C5b2a
4D3C5b1b
4D3C5b2b
4D3C5b1a

Source:Sentinel,NRSC

MONITORING IN THE PROJECT AREA

> **Land use and Land cover Changes in the Project**

- Change in land use and land cover form 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.

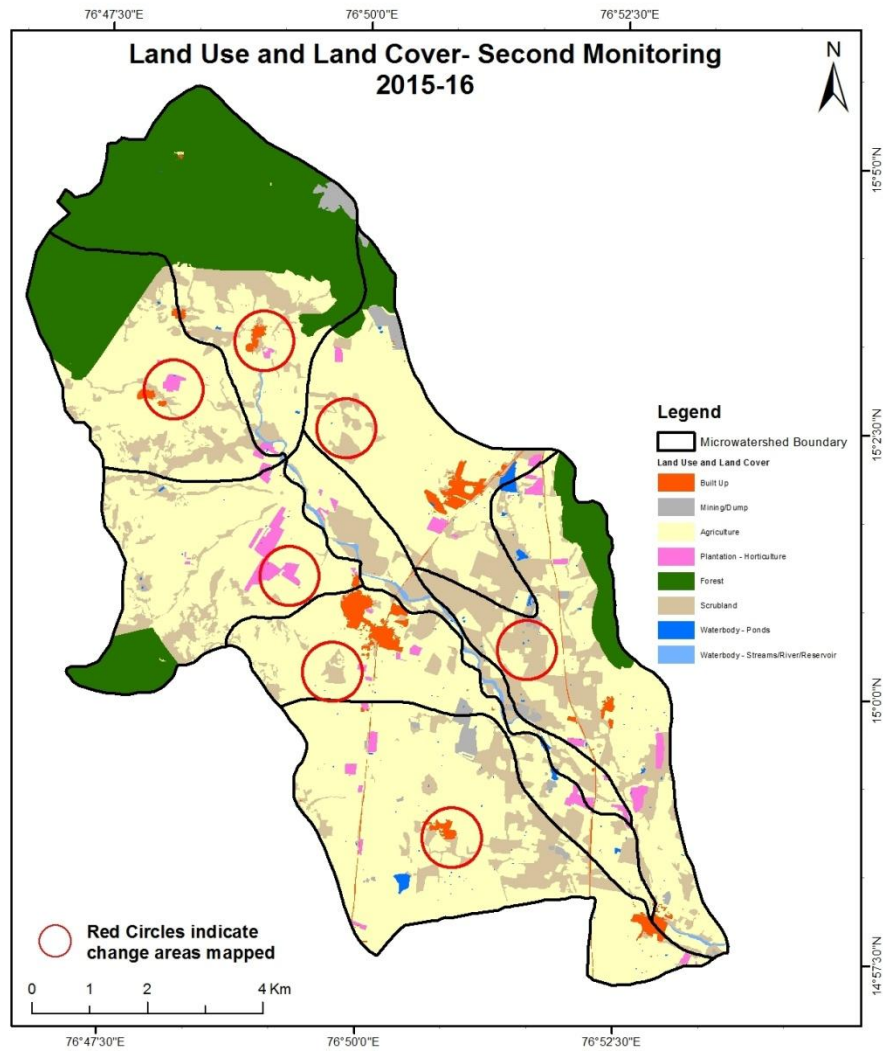- In matrix table column represents the T0 (2010-11) and row represents the T5 (2018-19)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)
Scale: 1:10000
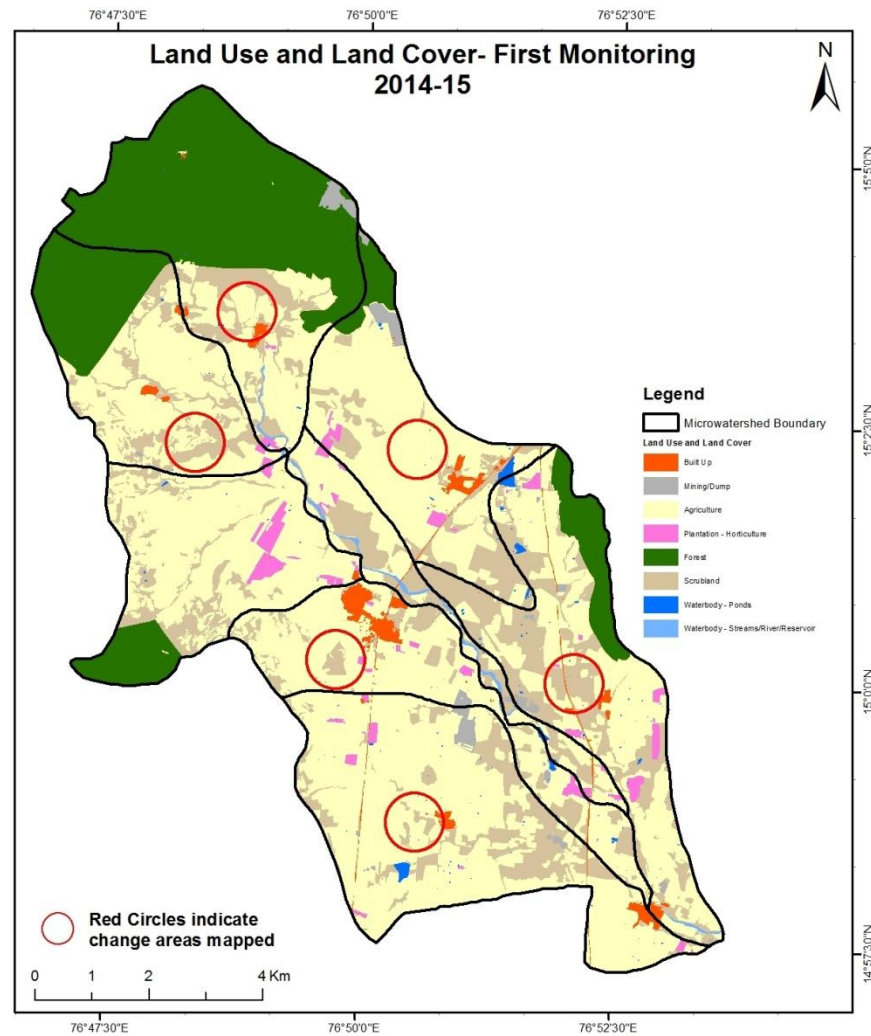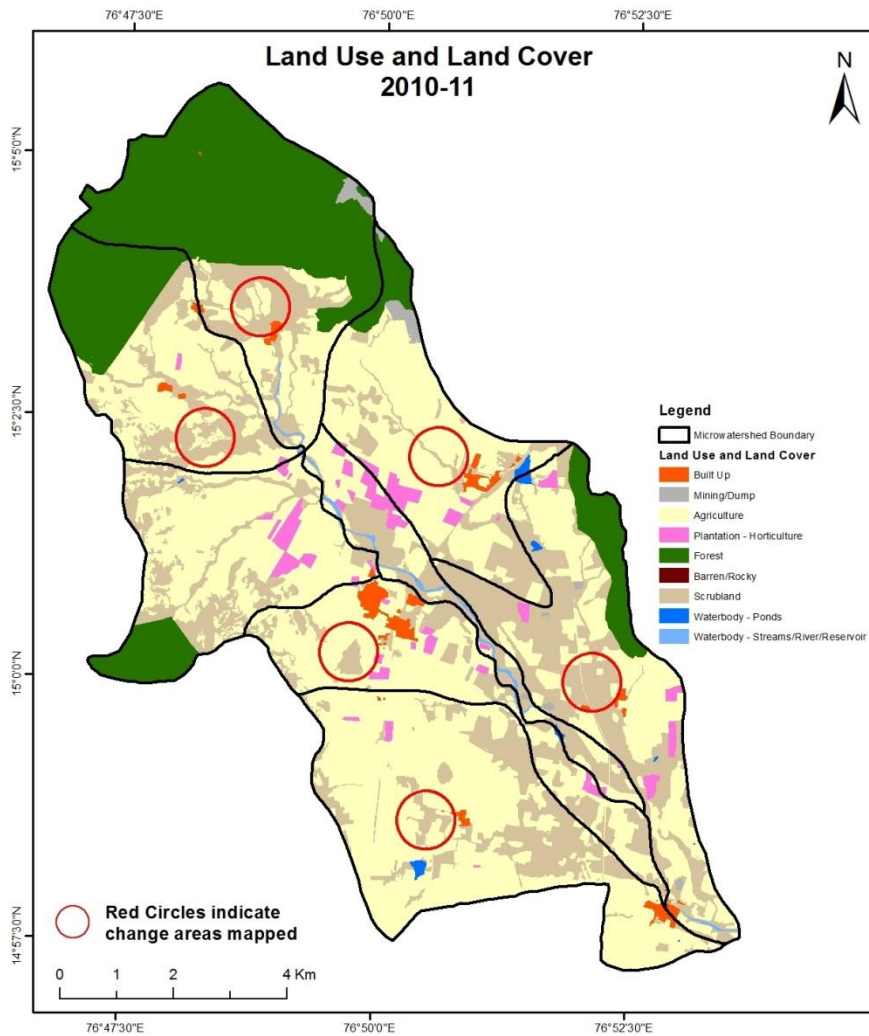
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)
Scale: 1:10000

Land Use and Land Cover
2014-15

N

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

⭕ **Red Circles indicate change areas mapped**

0   1   2   4 Km

Land Use and Land Cover- Second Monitoring
2015-16

N

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

⭕ **Red Circles indicate change areas mapped**
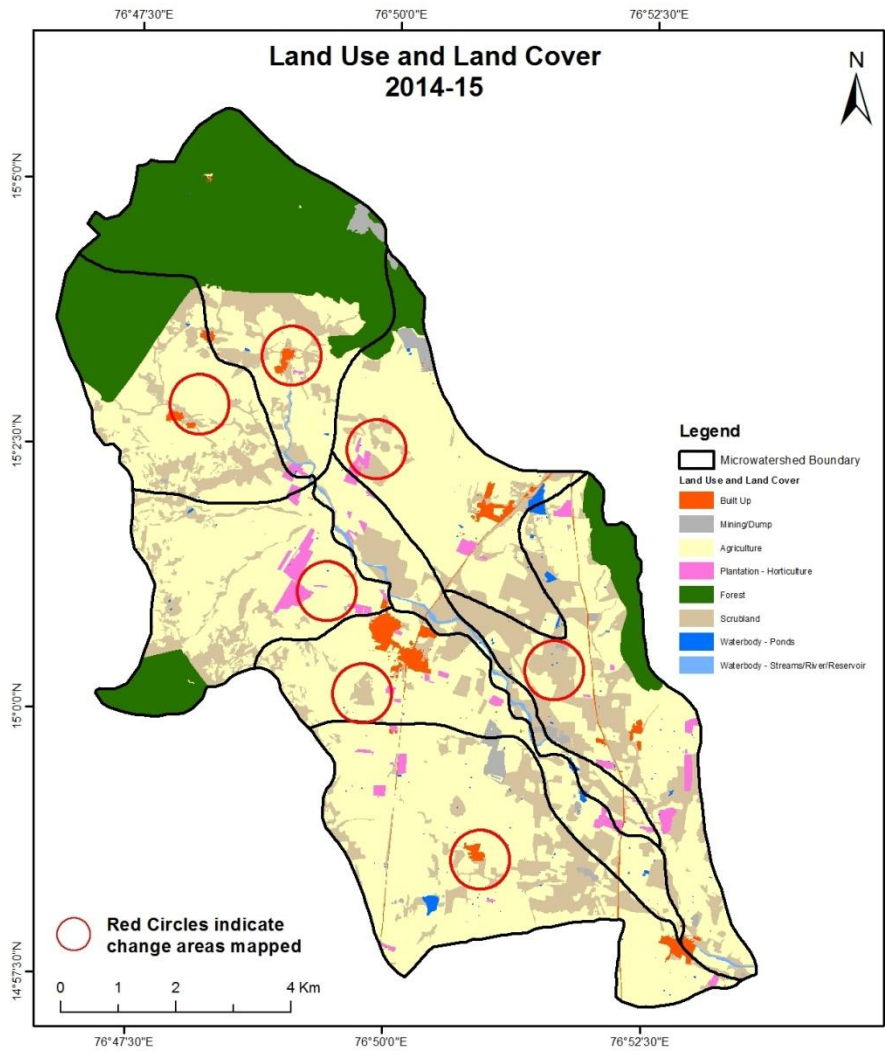
0   1   2   4 Km

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)
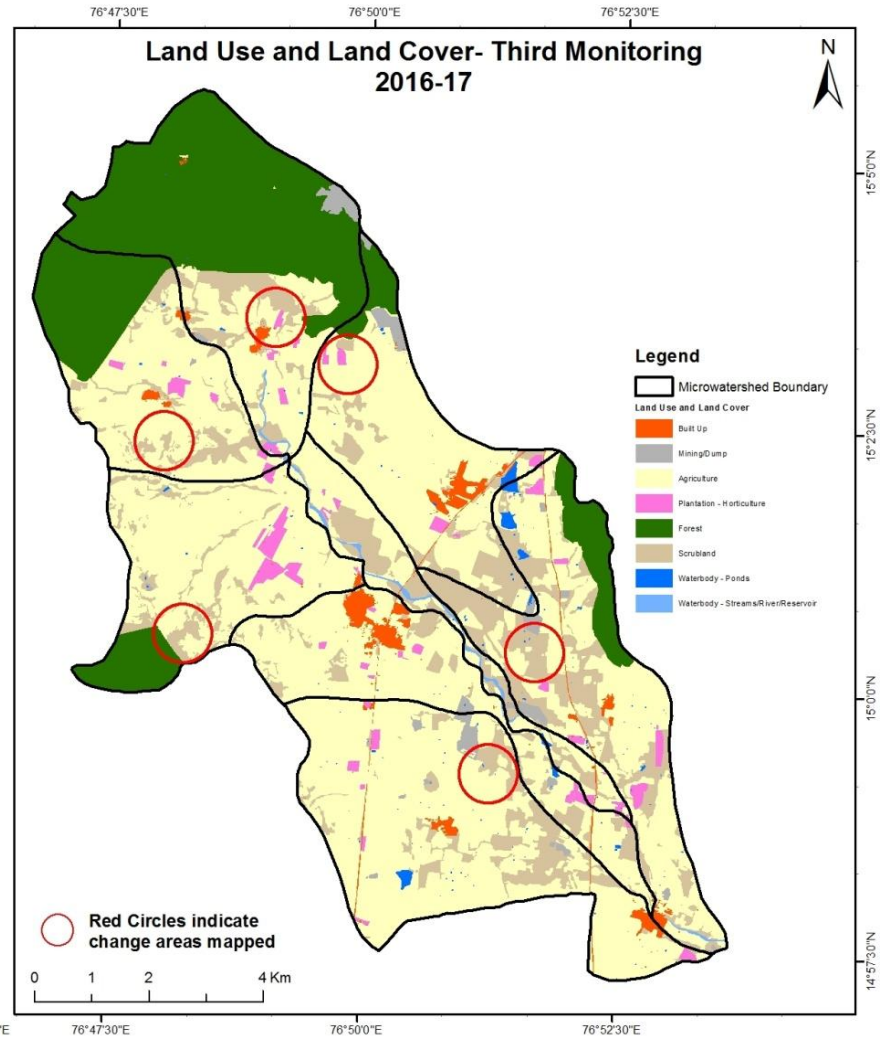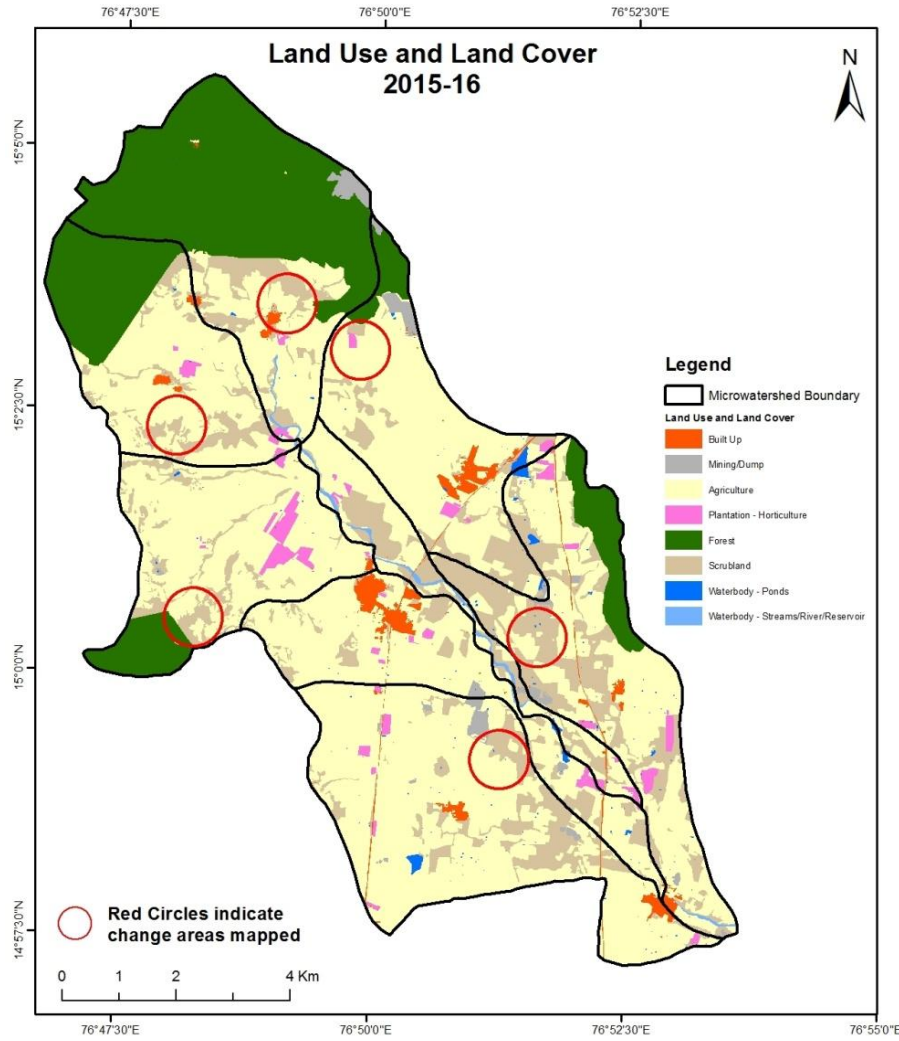
Scale: 1:10000

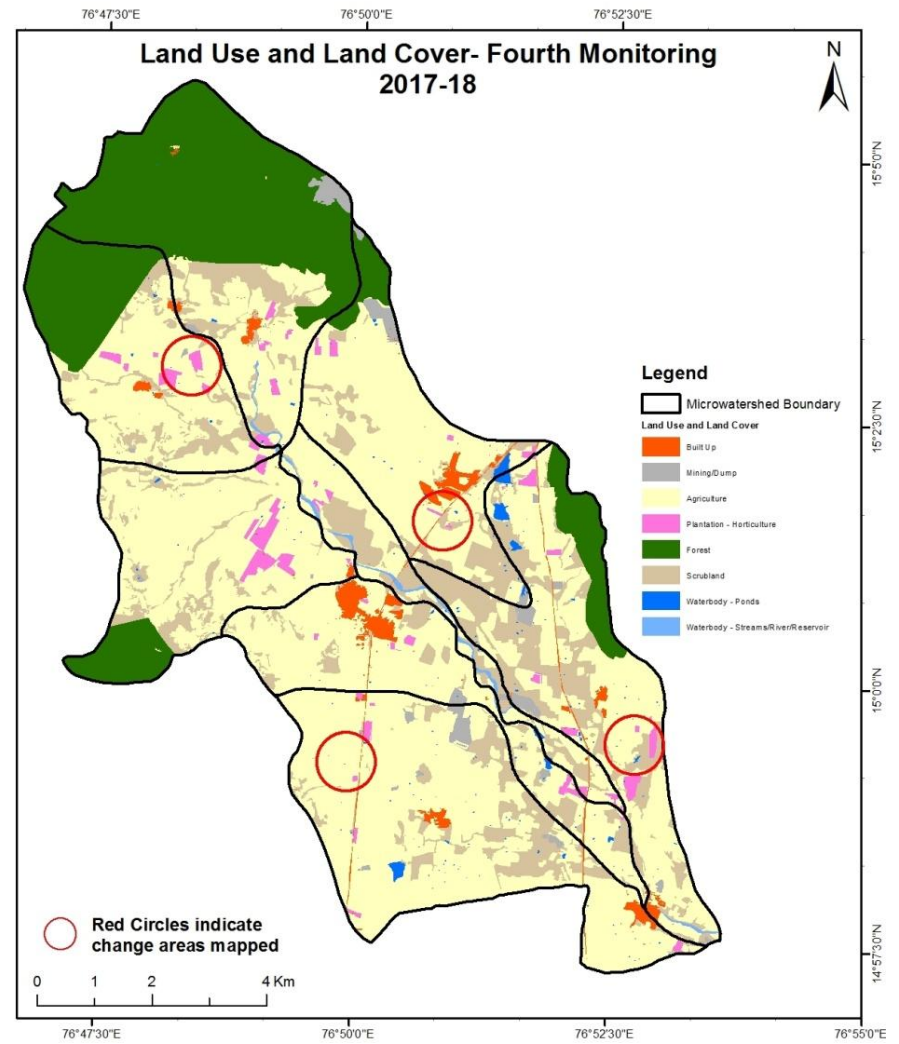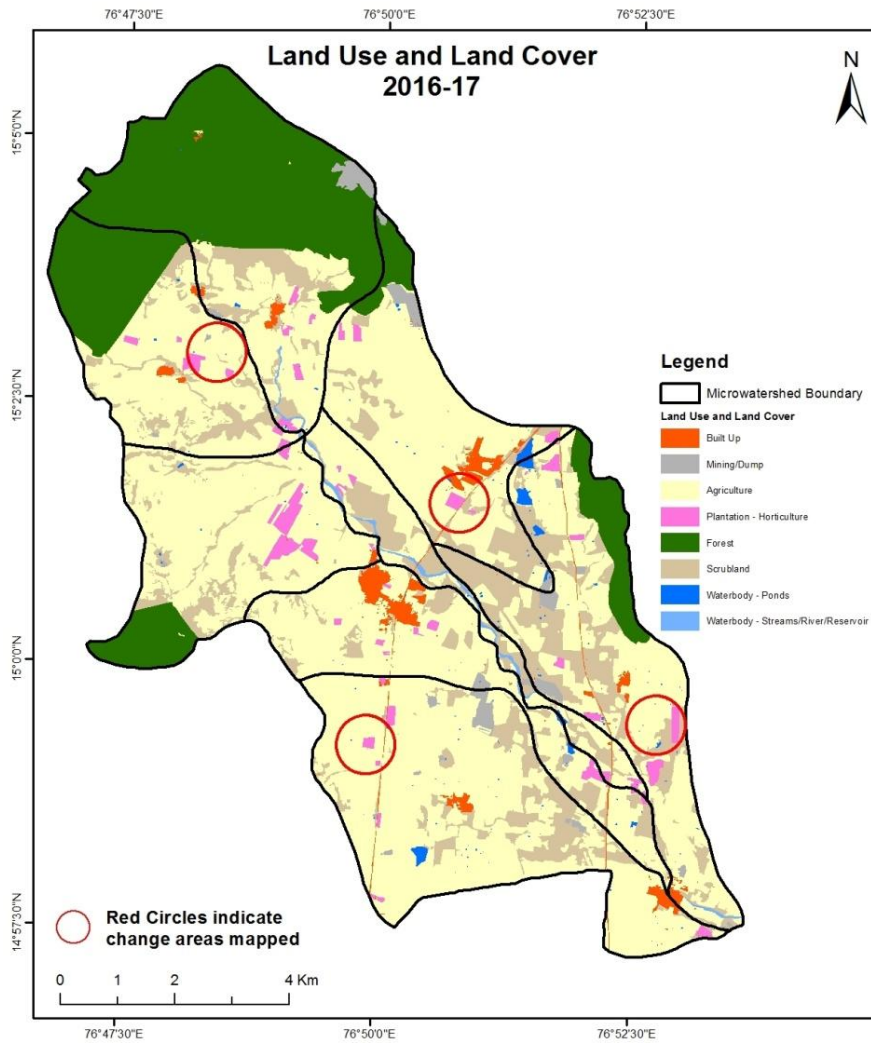16

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
Scale: 1:10000
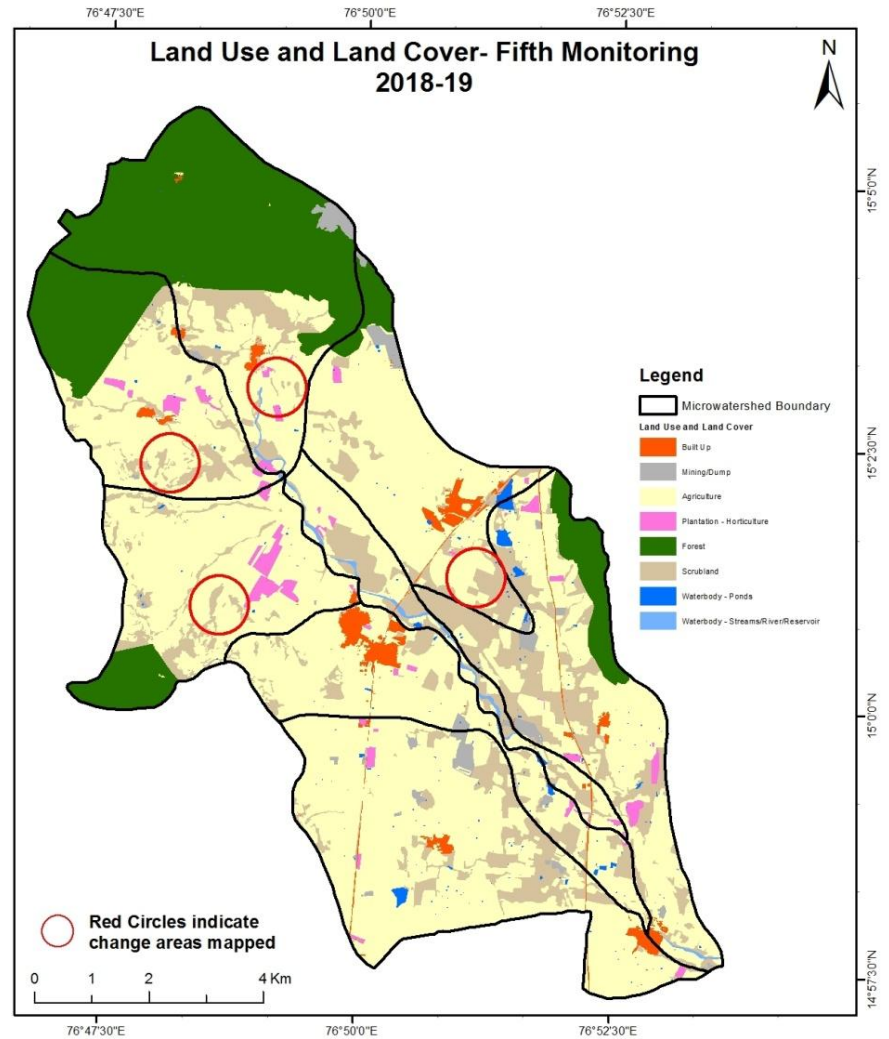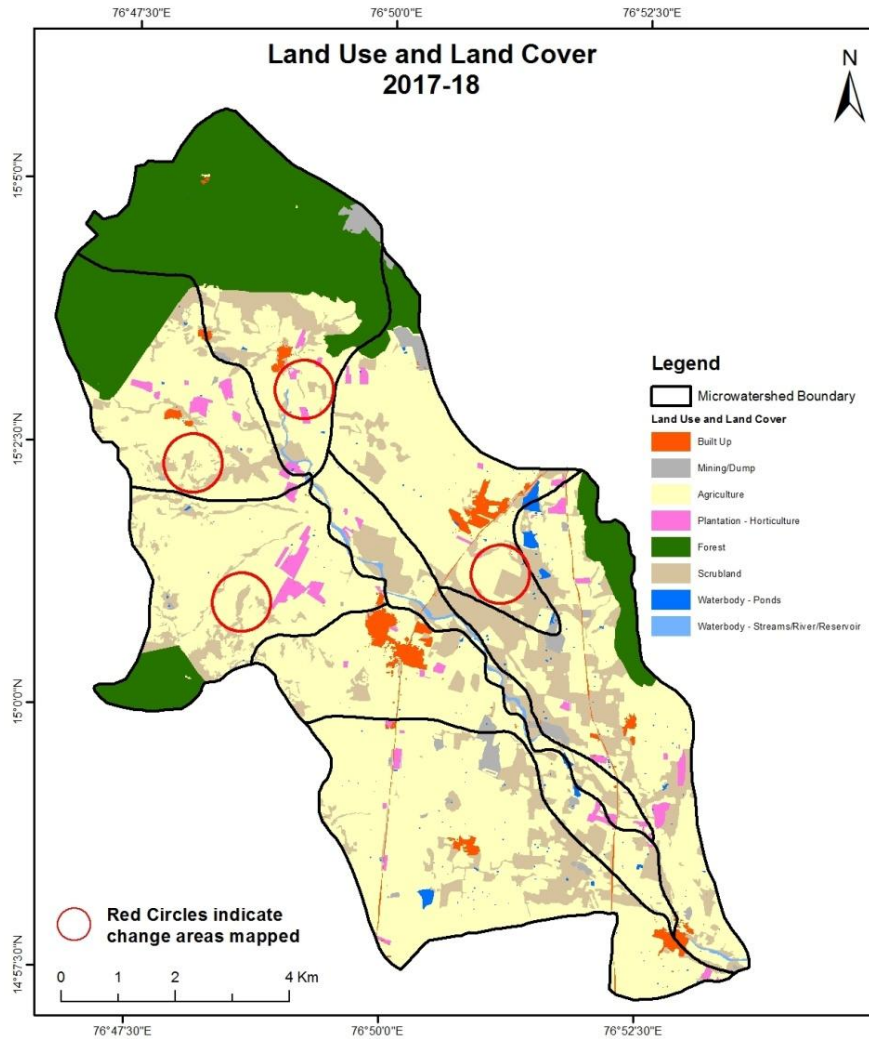
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body

T4

T5
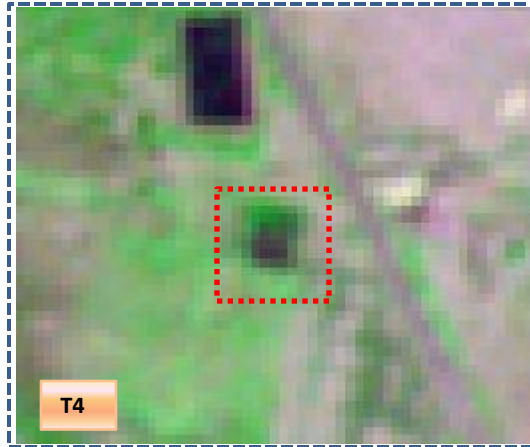
T4: 2017-18(76°52'13.451"E14°59'29.353"N)
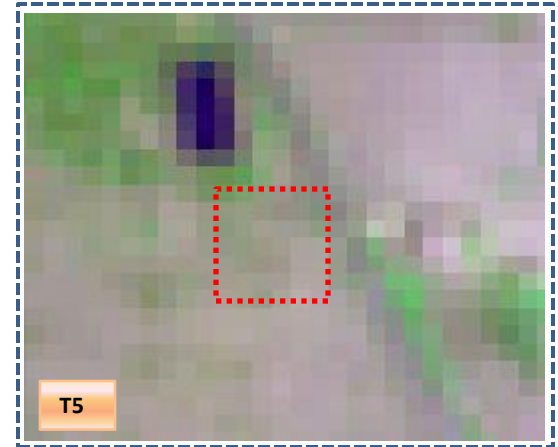
T5: 28 March 2019

Agriculture to Plantation

T4

T5

T4: 2017-18 (76°48'23.507"E 15°3'3.601"N)

T5: 28 March 2019

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

Agriculture to Built up

T0: 2010-11(76°49'1.452E 15°3'13.945N)

T1: 01 February 2015

Agriculture to Plantation
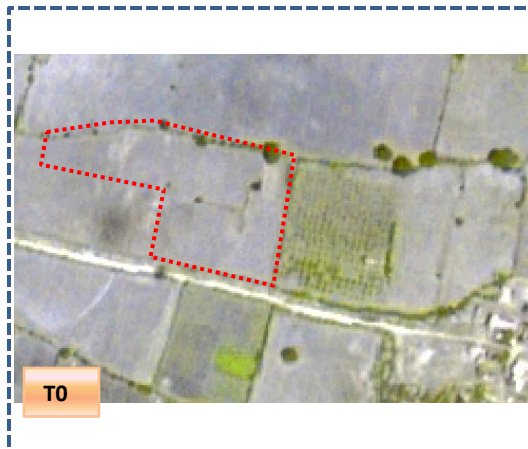
T0: 2010-11(76°49'44.995E 15°0'58.417N)

T1: 01 February 2015

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

Agriculture to Farm pond

T0

T1

T0: 2010-11(76°49'3.633E 15°2'16.265N)

T1: 01 February 2015

Agriculture to Farm pond

T0

T0: 2010-11(76°51'29.162"E 15°1'17.21"N)

T1: 01 February 2015

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

| T0	Monitoring period (T1) Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	106.62										**106.62**
Mining/dump		52.78									**52.78**
Agriculture	31.90	20.48	4667.32	43.46						7.05	**4770.21**
Plantation Horticulture	0.98		102.87	107.83						0.19	**211.88**
Forest	0.26	3.45	21.66		1846.86					0.12	**1872.34**
Forest Plantation											
Barren Rocky											
Scrub	9.29	22.21	617.73	8.80				1754.48		6.51	**2419.03**
Waterbody-Streams/River			0.20						40.15		**40.35**
Waterbody – Ponds			0.06							22.54	**22.60**
Grand Total	**149.06**	**98.92**	**5409.84**	**160.10**	**1846.86**			**1754.48**	**40.15**	**36.42**	**9495.82**

Units in Hectares

• 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 102.90 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T1.

• In T1 742.52 ha of agriculture are increased from plantation, forest, scrubland and water body of T0. The additional agriculture are coming from water body in T1 represents seasonal agriculture.

Table showing change matrix depicting Land cover transitions during study period-2014-15 to 2015-16

Land cover / T1	Monitoring period (T2) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	149.06										**149.06**
Mining/dump		98.92									**98.92**
Agriculture	18.58	0.87	5353.52	36.51						0.36	**5409.84**
Plantation Horticulture	0.59	0.08	35.55	123.87							**160.10**
Forest		5.87	0.17		1840.82						**1846.86**
Forest Plantation											
Barren Rocky											
Scrub	5.04	13.42	234.88					1501.02		0.13	**1754.48**
Waterbody-Streams/River									40.15		**40.15**
Waterbody – Ponds										36.42	**36.42**
Grand Total	**173.26**	**119.16**	**5624.11**	**160.39**	**1840.82**			**1501.02**	**40.15**	**36.91**	**9495.82**

Units in Hectares

- 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 56.33 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T2.

- In T2 270.59 ha of agriculture are increased from plantation, forest 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-2015-16 to 2016-17

Land cover / T2	Monitoring period (T3) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	173.26										**173.26**
Mining/dump		119.16									**119.16**
Agriculture	1.69	3.41	5581.04	28.37				5.09		4.52	**5624.11**
Plantation Horticulture			5.91	154.47							**160.39**
Forest	0.39				1840.43						**1840.82**
Forest Plantation											
Barren Rocky											
Scrub	0.72	13.48	42.96					1441.44		2.42	**1501.02**
Waterbody-Streams/River									40.15		**40.15**
Waterbody – Ponds										36.91	**36.91**
Grand Total	**176.06**	**136.05**	**5629.91**	**182.84**	**1840.43**			**1446.53**	**40.15**	**43.85**	**9495.82**

Units in Hectares

- 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 43.07 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T3.

- In T3 48.87 ha of agriculture are increased from plantation 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-2016-17 to 2017-18

Land cover	Monitoring period (T4)										Units in Hectares
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	175.81										175.81
Mining/dump		136.05									136.05
Agriculture	1.87	1.04	5612.30	11.84				1.24		1.88	5630.17
Plantation Horticulture			21.57	161.21						0.06	182.84
Forest					1840.43						1840.43
Forest Plantation											
Barren Rocky											
Scrub		0.33	8.07					1436.98		1.15	1446.53
Waterbody- Streams/River									40.15		40.15
Waterbody – Ponds										43.85	43.85
Grand Total	177.68	137.42	5641.94	173.05	1840.43			1438.21	40.15	46.95	9495.82

• 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 17.87 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body of T4.

• In T4 29.64 ha of agriculture are increased from plantation 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-2017-18 to 2018-19

Land cover	Monitoring period (T5)										Units in Hectares
T4	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	177.68										**177.68**
Mining/dump		137.42									**137.42**
Agriculture	5.11	4.05	5625.64	2.82						4.32	**5641.94**
Plantation Horticulture			30.12	142.85						0.08	**173.05**
Forest			4.12		1836.31						**1840.43**
Forest Plantation											
Barren Rocky											
Scrub	2.43	2.57	13.88					1418.90		0.43	**1438.21**
Waterbody-Streams/River									40.15		**40.15**
Waterbody – Ponds			0.15							46.79	**46.95**
Grand Total	**185.21**	**144.04**	**5673.91**	**145.67**	**1836.31**			**1418.90**	**40.15**	**51.63**	**9495.82**

• 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 16.29 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body of T5.

• In T5 48.27 ha of agriculture are increased from plantation, forest, 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 28.83 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 639.63, 214.27, 5.80, 11.77 & 31.98 Hectares From T0 to T1, T1 to T2, T2 to T3, T3 to T4 & T4 toT5 and overall increase of 903.45 Hectares in cropland area as compared between baseline LU/LC data 2010-11 (T0) & 2018-19 (T5) years.

5. There is decrease of 66.21 ha of the Plantation/Horticulture area has been decreased between 2010-11 (T0) & 2018-19 (T5) years.

6. There is a decrease of 1000.13 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (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.