MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -19/2010-11
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
July-2021

T 0 - T 1 - T 2 - T 3 - T 4 - T 5

APSAC

AGRICULTURE & SOIL DIVISION
Andhra Pradesh Space Applications Centre (APSAC)
ITE&C Department Govt. of Andhra Pradesh

इसरो ISRO

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**

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-19/2010-11, YSR Kadapa District of   Andhra Pradesh.   The total geographical area of the project is 5,680 ha. It comprises of 10 micro watersheds.

- In the project area 761 Drishti photos were uploaded showing check dams/Rock fill dam, New activities of boulder removal, farm ponds, dug out pits etc, and remaining showing other activities.

- Project area as per image analysis has witnessed Water bodies have shown an decrease by 0.82 ha , which correspond to the various bodies that have been converted into other land use classes in this period.

- Major percentage i.e. 61 % is covered by the agriculture, 24 % is covered by scrubland, 3.9 % is covered by water body area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-19/2010-11
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Galiveedu Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 5,680 ha. It comprises of 10 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
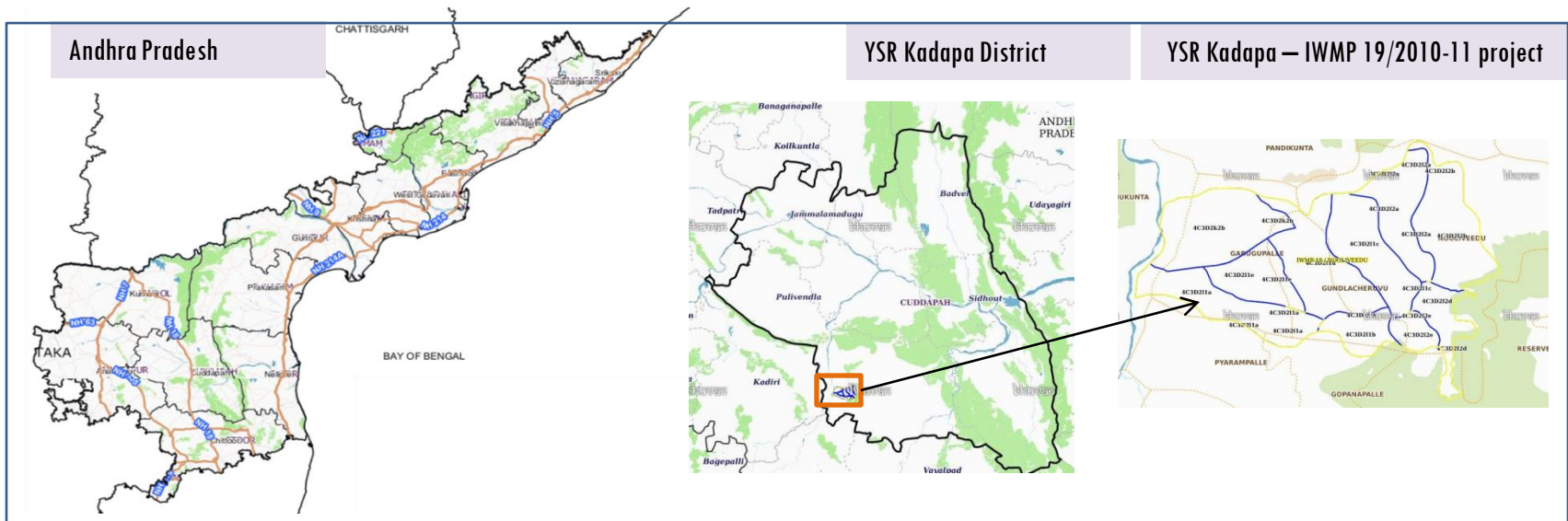
- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .

- 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	761
4	Detailed Project Report		

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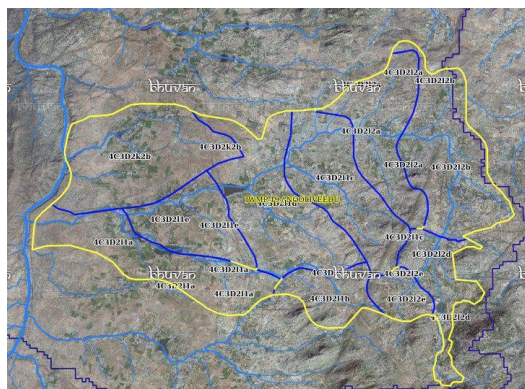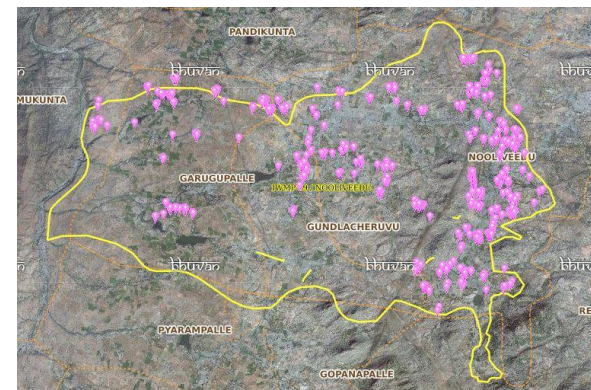

Legend

 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	Agronomic measures	160	160
2	Afforestation	6	6
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	82	82
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	3	3
11	Civil work-Check dams /Rock fill dam	364	350
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	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	152	120
18	Others	64	40
	TOTAL	**831**	**761**

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.

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-19/2010-11

| T0: 2010-11 | T1: 22 October 2015 | Drishti Sl no. 2442072   MWS :4C3D2l2b |

Horticulture

| T0: 2010-11 | T1: 22 October 2015 | Drishti Sl no. 1864559   MWS :4C3D2l2b |

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-19/2010-11

T0	T1	
T0: 2010-11	T1: 22 October 2015	Drishti Sl no. 2412818 MWS :4C3D2l1e

Check dam

T0	T1	
T0: 2010-11	T1: 22 October 2015	Drishti Sl no. 2471632 MWS :4C3D2l1d

Check dam

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

Land Use and Land Cover 2010 -11

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

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

○ **Red Circles indicate change areas mapped**

0   1   2   4 Km

Land Use and Land Cover- First Monitoring 2014 -15

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Forest - Plantation
- Barren/Rocky
- 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 (2014-15 to 2015-16)
Scale: 1:10000

Land Use and Land Cover 2014 -15

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Forest - Plantation
- Barren/Rocky
- 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

Legend

Microwatershed Boundary

Land Use and Land Cover

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

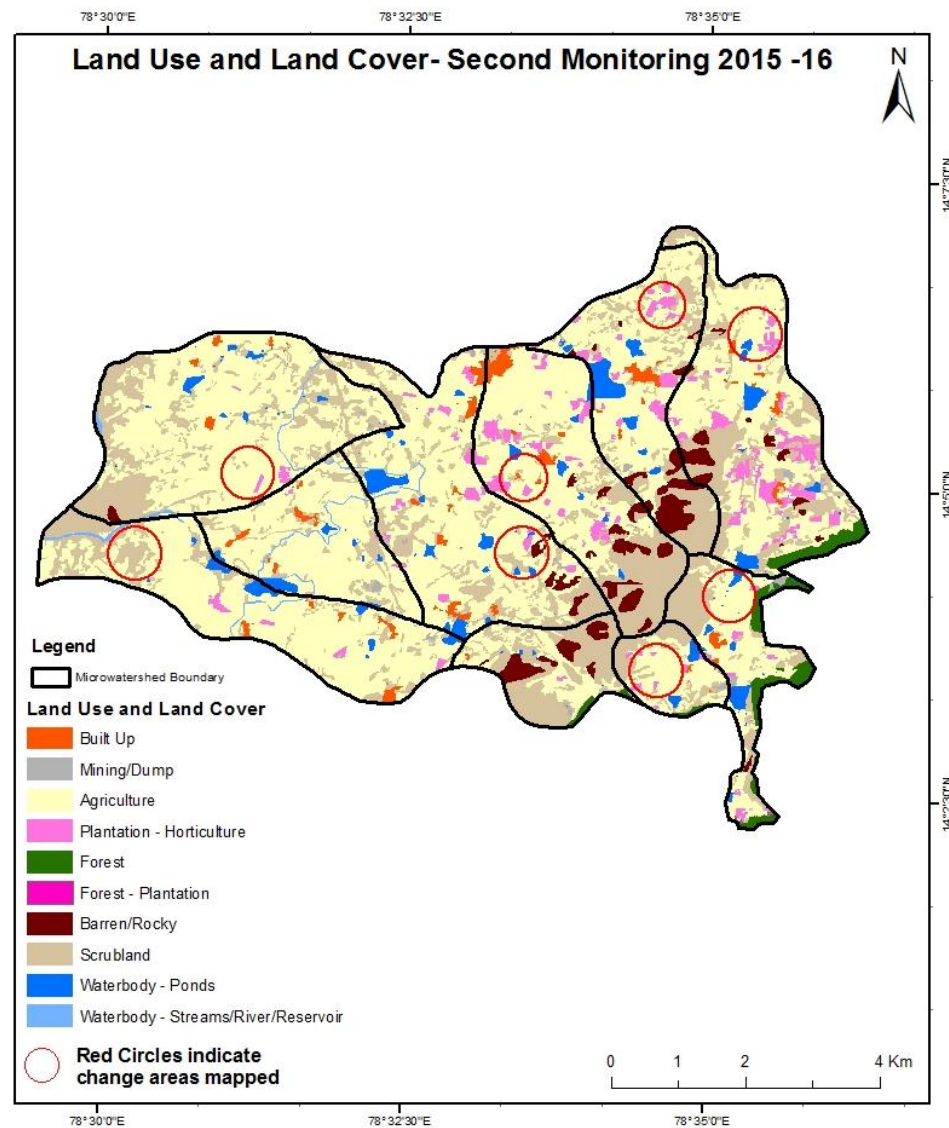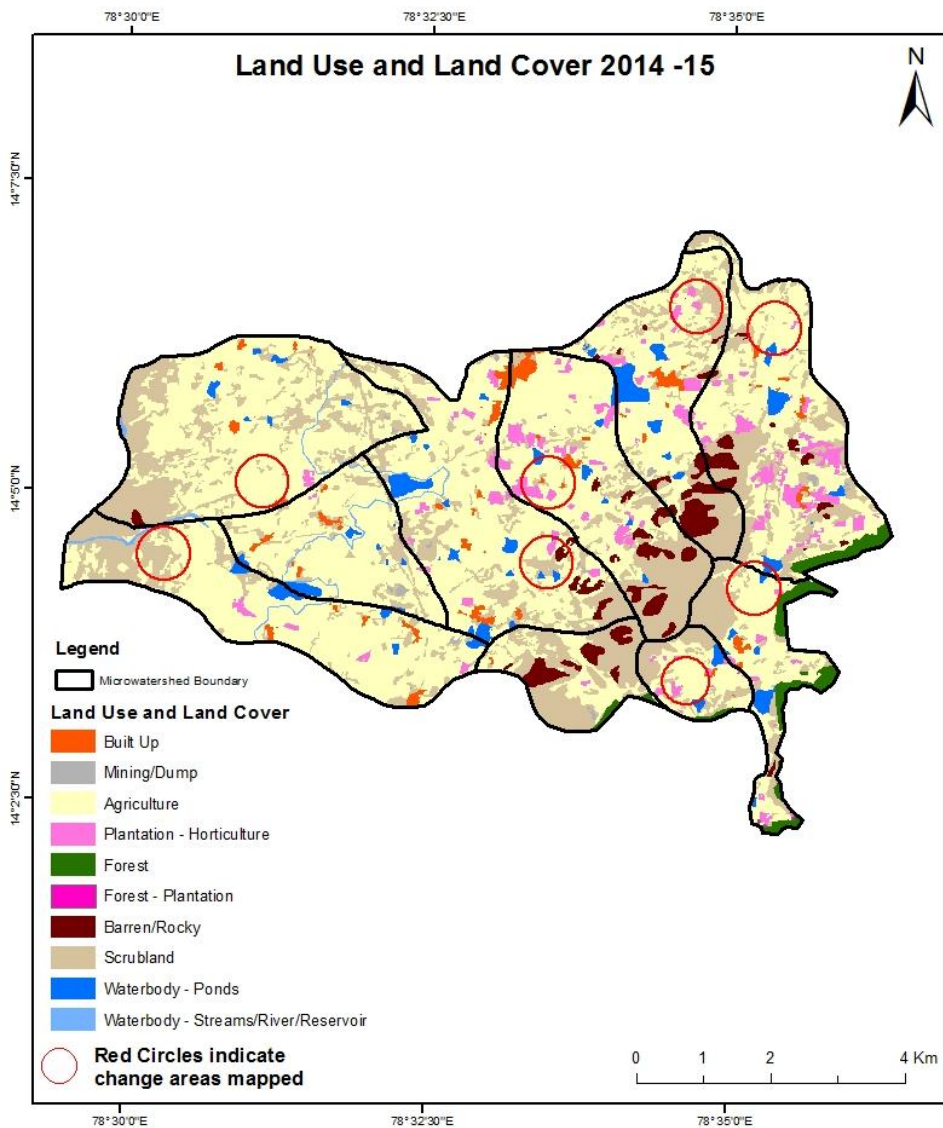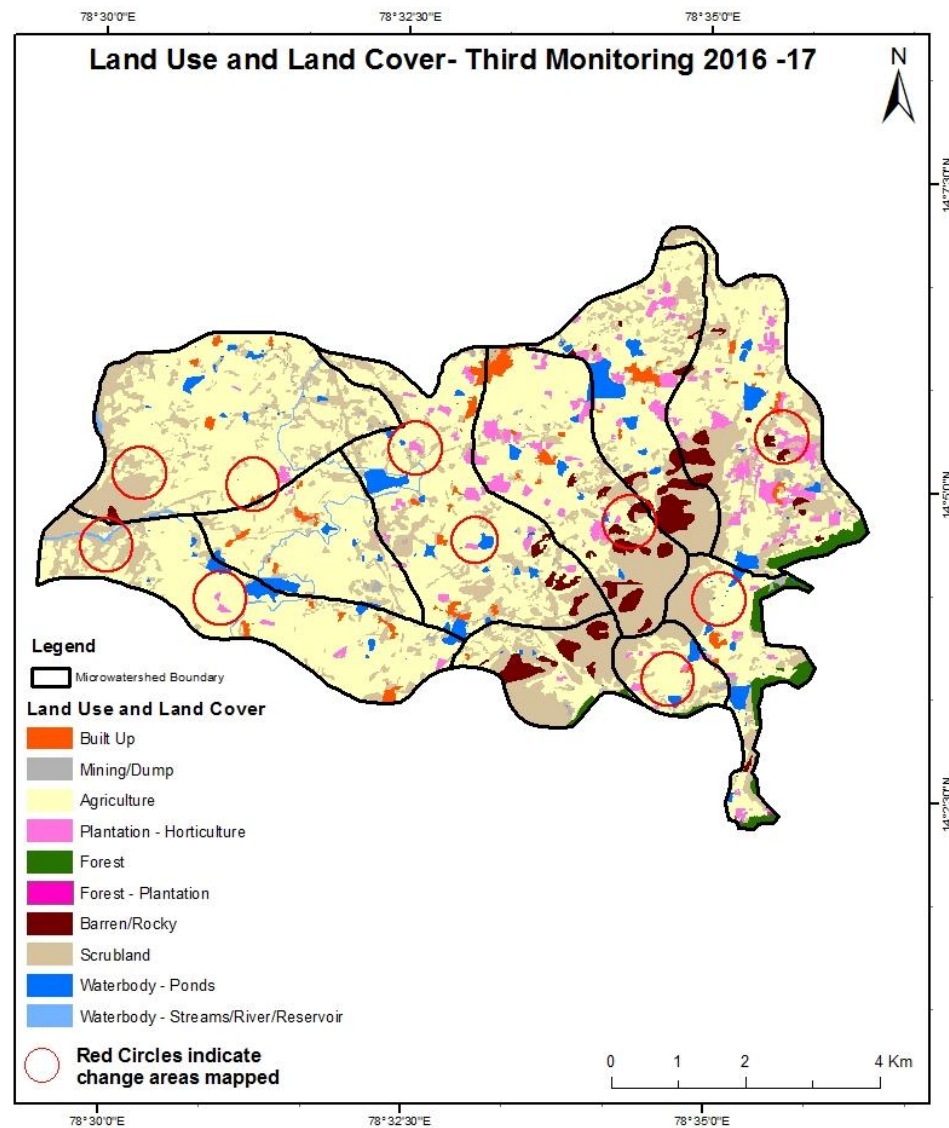◯ **Red Circles indicate change areas mapped**

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

Land Use and Land Cover 2015 -16

Land Use and Land Cover- Third Monitoring 2016 -17

Legend

Microwatershed Boundary

Land Use and Land Cover

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

○ **Red Circles indicate change areas mapped**

0 1 2 4 Km

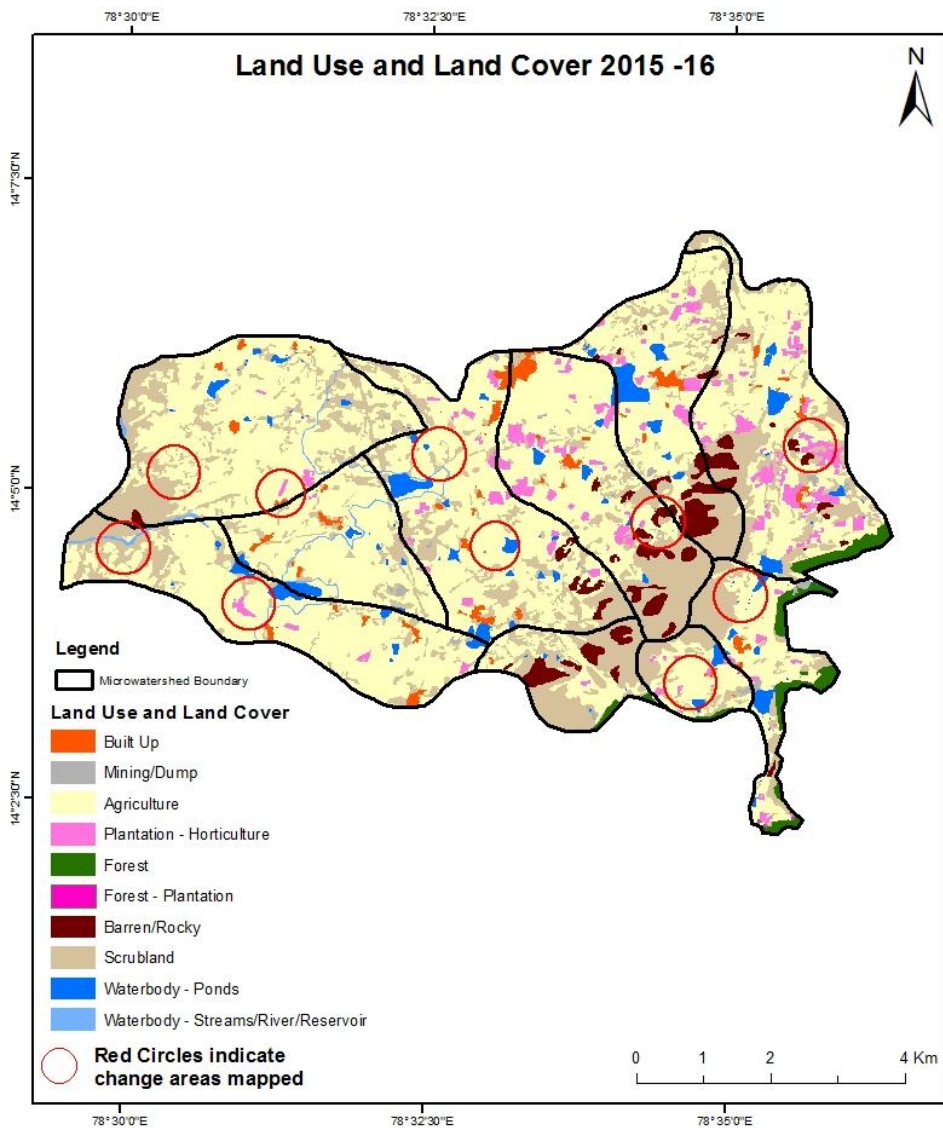# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)
Scale: 1:10000

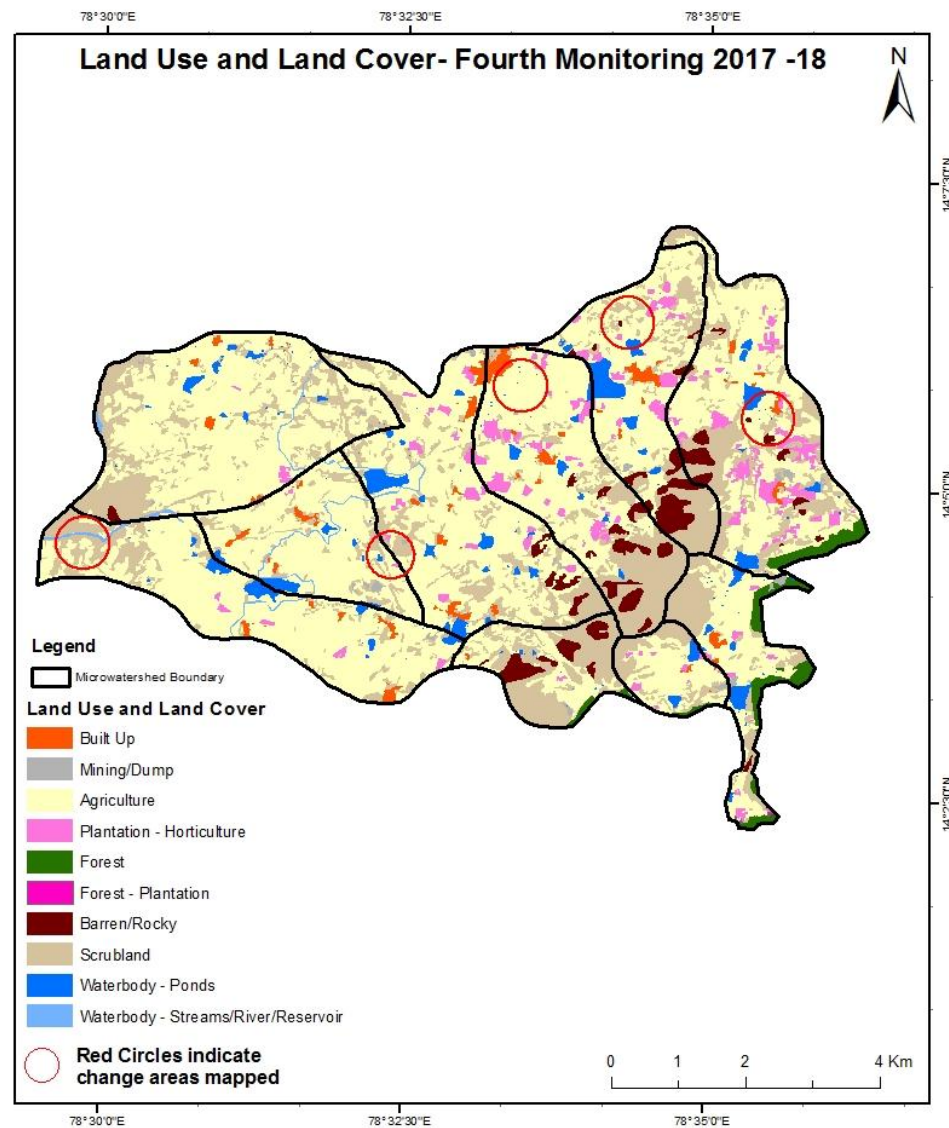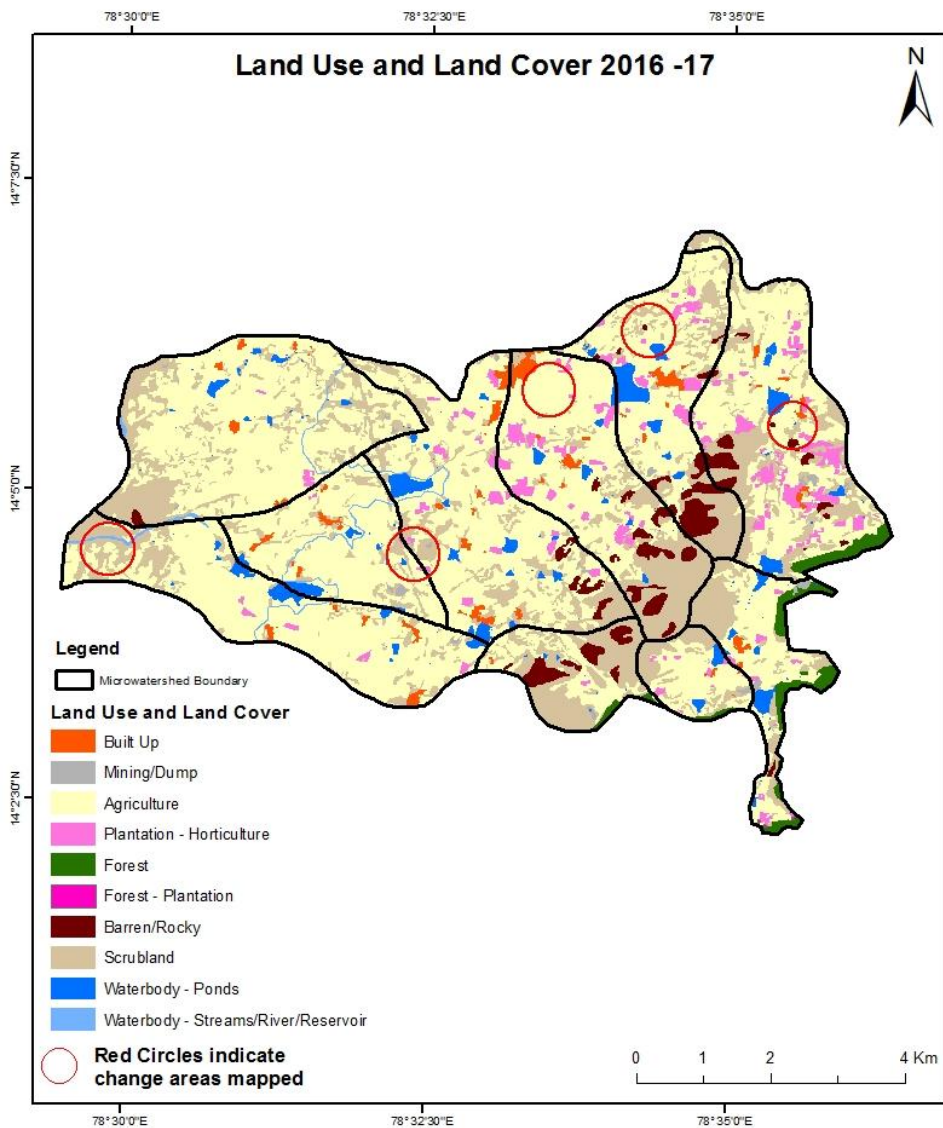## Land Use and Land Cover 2016 -17

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

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

◯ **Red Circles indicate change areas mapped**

0 1 2 4 Km

Land Use and Land Cover- Fourth Monitoring 2017 -18

Legend

☐ Microwatershed Boundary

Land Use and Land Cover

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

◯ **Red Circles indicate change areas mapped**

0 1 2 4 Km
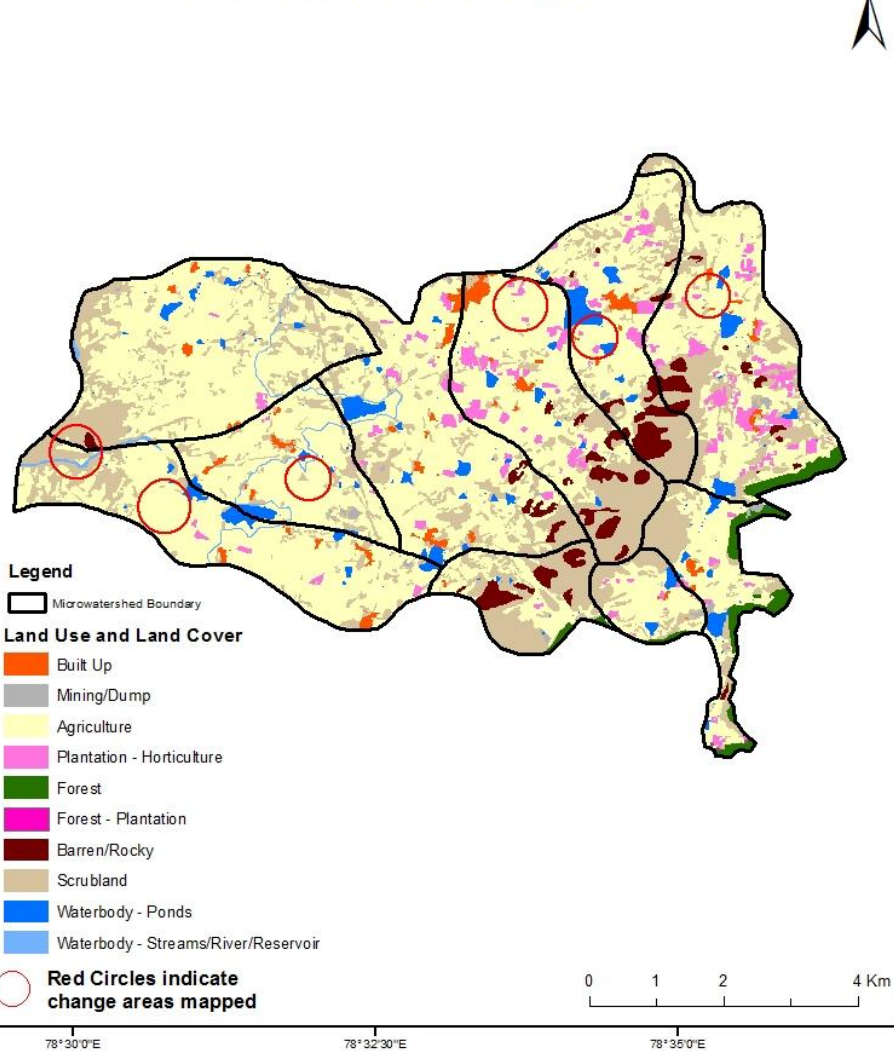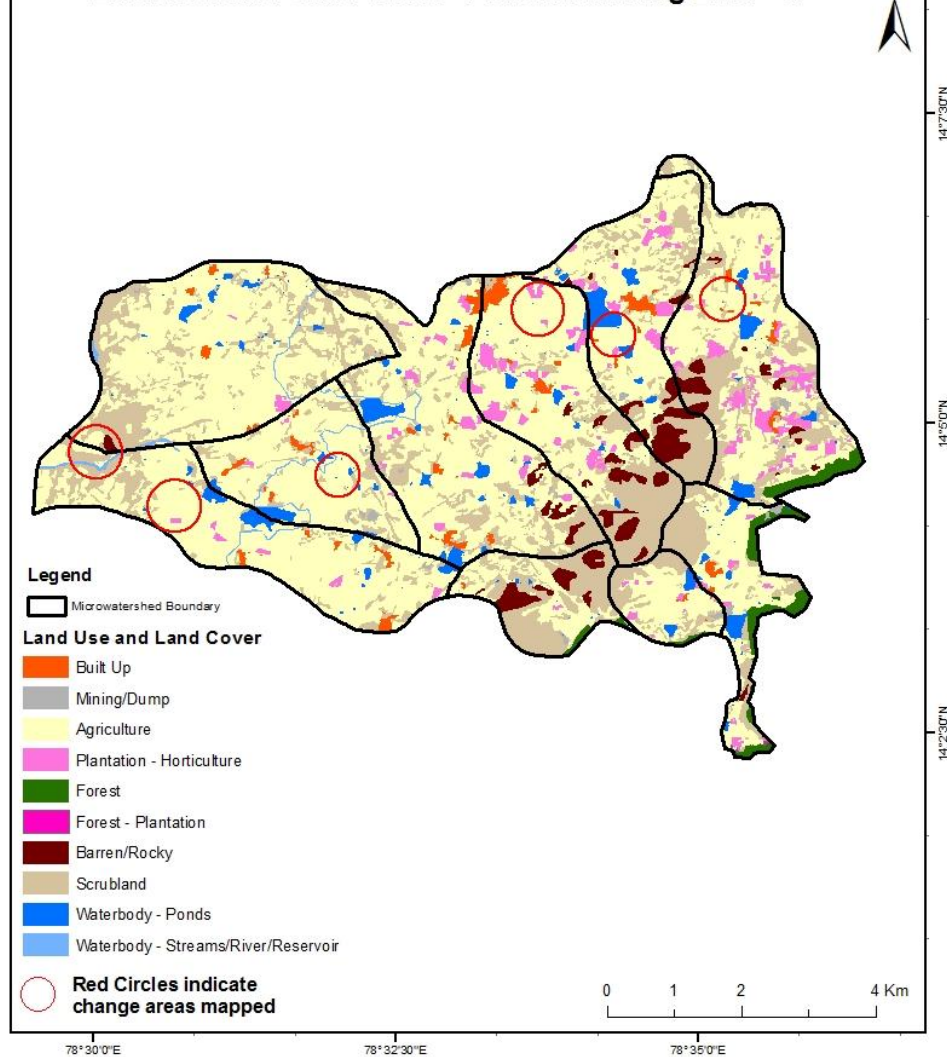
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)
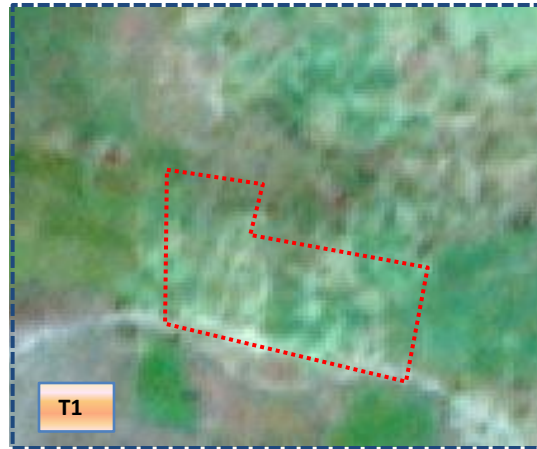## Scale: 1:10000

Land Use and Land Cover 2017 -18

Legend

Microwatershed Boundary

Land Use and Land Cover

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

○ **Red Circles indicate change areas mapped**

0 1 2 4 Km

Land Use and Land Cover- Fifth Monitoring 2018 -19

Legend

Microwatershed Boundary

Land Use and Land Cover

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

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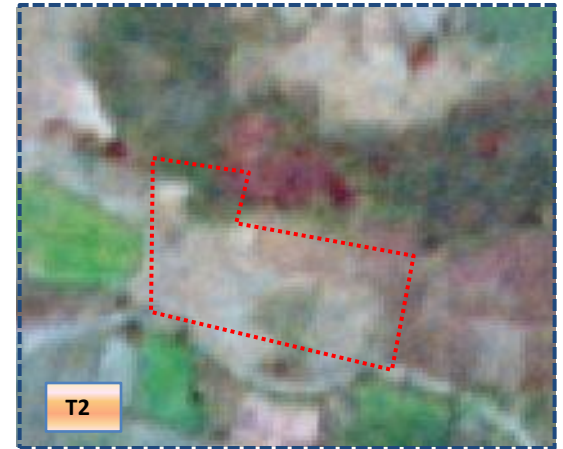
0 1 2 4 Km

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

Scrub to Agriculture

T1

T2

T1: 2015-16 (78°30'45.582"E 14°4'24.644"N)

T2: 05 January 2017

Agriculture to Waterbody

T1

T2

T1: 2015-16 (78°31'40.209"E 14°4'11.007"N)

T2: 05 January 2017

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

Agriculture to Waterbody

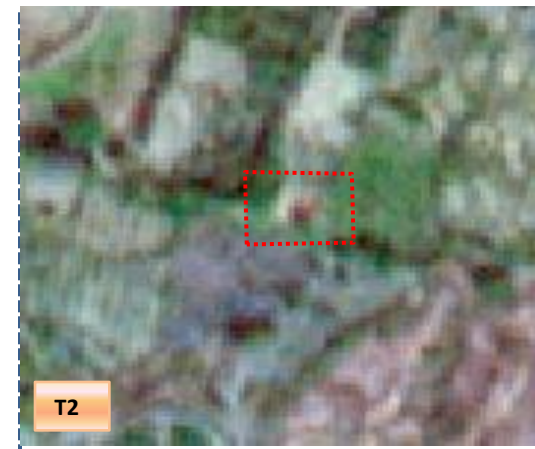T1: 2015-16 (78°33'18.95"E 14°4'56.37"N)

T2: 05 January 2017

Agricultureto Waterbody

T1: 2015-16(78°34'11.531"E 14°4'44.673"N)

T2: 05 January 2017

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

Agriculture to Plantation

T0: 2010-11

T0: 22 October 2015
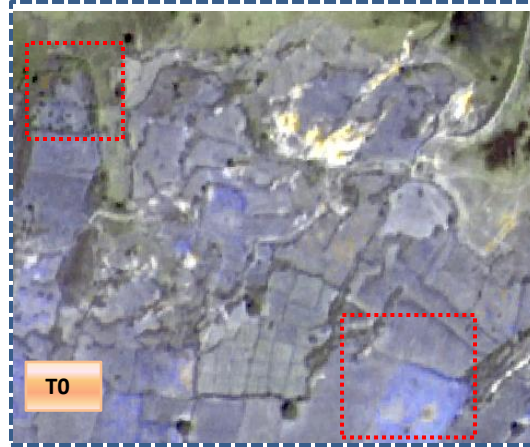
Agriculture to Plantation

T0: 2010-11

T0: 22 October 2015

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

Agriculture to Plantation
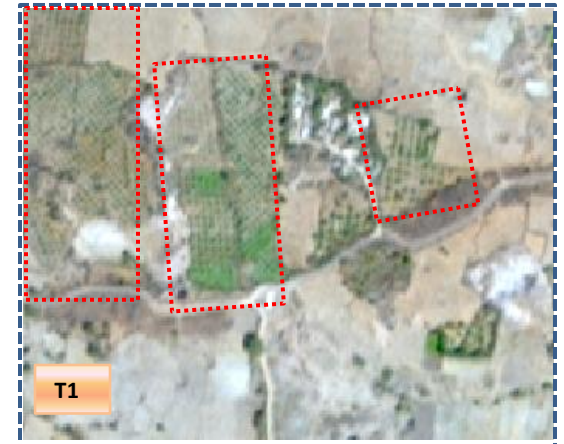

T0

T1

T0: 2010-11

T1: 22 October 2015

Agriculture to Plantation

T0

T1

T0: 2010-11

T1: 22 October 2015

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

Land cover	Monitoring period (T1)									Units in Hectares	
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	89.52										89.52
Mining/dump		10.77									10.77
Agriculture	2.51		3186.66	104.64				1.55		0.40	3295.76
Plantation Horticulture	0.03		0.27	99.14							99.45
Forest			2.41		93.55						95.96
Forest Plantation						0.87					0.87
Barren Rocky							175.12				175.12
Scrub	2.09	3.72	184.00					1518.62		0.47	1708.91
Waterbody-Streams/River									35.78		35.78
Waterbody – Ponds			3.66							164.33	167.99
Grand Total	94.15	14.49	3377.01	203.78	93.55	0.87	175.12	1520.18	35.78	165.21	5680.14

• 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 109 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrubland and water body in T1.

• In T1 190 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-2014-15 to 2015-16

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	94.15										94.15
Mining/dump		14.49									14.49
Agriculture			3311.61	14.16				42.11		9.13	3377.01
Plantation Horticulture			5.36	198.36						0.06	203.78
Forest		2.78			90.54					0.23	93.55
Forest Plantation						0.87					0.87
Barren Rocky							175.12				175.12
Scrub	0.02	3.66	90.55					1422.83		3.13	1520.18
Waterbody-Streams/River									35.78		35.78
Waterbody – Ponds										165.21	165.21
Grand Total	94.17	20.93	3407.51	212.52	90.54	0.87	175.12	1464.94	35.78	177.76	5680.14

• 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 65 ha of the agriculture area has decreased and it is converted into plantation, scrubland and water body in T2.

• In T2 95 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-2015-16 to 2016-17

Land cover	Monitoring period (T3)										Units in Hectares
T2	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	94.17										94.17
Mining/dump		20.93									20.93
Agriculture	0.01		3398.37	5.34						3.80	3407.51
Plantation Horticulture			4.32	208.20							212.52
Forest					90.54						90.54
Forest Plantation						0.87					0.87
Barren Rocky							175.12				175.12
Scrub		2.83	40.50					1419.74		1.87	1464.94
Waterbody-Streams/River									35.78		35.78
Waterbody – Ponds										177.76	177.76
Grand Total	94.18	23.76	3443.19	213.54	90.54	0.87	175.12	1419.74	35.78	183.43	5680.14

- 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 09 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T3.

- In T3 44 ha of the agriculture area has 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 T3	Monitoring period (T4) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total (Units in Hectares)
Built up	94.18										94.18
Mining/dump		23.58	0.18								23.76
Agriculture	0.18		3441.39	0.33						1.29	3443.19
Plantation Horticulture			1.52	212.02							213.54
Forest					90.54						90.54
Forest Plantation						0.87					0.87
Barren Rocky							175.12				175.12
Scrub	0.03	0.50	5.84					1412.26		1.11	1419.74
Waterbody-Streams/River									35.78		35.78
Waterbody – Ponds										183.43	183.43
Grand Total	94.39	24.08	3448.92	212.35	90.54	0.87	175.12	1412.26	35.78	185.83	5680.14

• 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 1.8 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.

• In T4 7.3 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-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	94.39										**94.39**
Mining/dump		24.08									**24.08**
Agriculture	0.05		3440.94	6.34				0.90		0.68	**3448.92**
Plantation Horticulture			2.17	210.18							**212.35**
Forest			1.04		89.50						**90.54**
Forest Plantation						0.87					**0.87**
Barren Rocky							175.12				**175.12**
Scrub	0.07		36.43					1375.61		0.15	**1412.26**
Waterbody- Streams/River									35.78		**35.78**
Waterbody – Ponds										185.83	**185.83**
Grand Total	**94.51**	**24.08**	**3480.59**	**216.52**	**89.50**	**0.87**	**175.12**	**1376.51**	**35.78**	**186.67**	**5680.14**

• 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 7.9 ha of the agriculture area has decreased and it is converted into Built-up, plantations and water body in T4.

•In T5 39 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 18 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 81, 30, 35, 5 & 31 Hectares From T0 to T1, T2-T3, T3 to T4 & T4-T5 respectively and overall increase of 182 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 117 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.

6. There is a decrease of 332 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.

7. Farm ponds (3) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (3) verified from the portal.