MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-IV

ANANTAPURAMU -73/2012-13
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
December-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

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-73/2012-13, Anantapuramu District of   Andhra Pradesh.   The total geographical area of the project is **7,981** ha.   It comprises of 10 micro watersheds.

- In the project area 188 Drishti photos were uploaded showing 07 check dams, 13 Farm ponds, 66 Horticulture and remaining showing others.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 13 new farm ponds or dug out pits with 20 ha increase in the area.

- Major percentage i.e. 56.7% is covered by the Agriculture, 17% is covered by Scrubland, 16% is covered by Forest remaining by other land use classes.

- The study area falls in Yadiki Mandal of Ananthapuramu district of Andhra Pradesh state. The total geographical area of the project is **7,981** ha. It comprises of 10 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2012-13 (T0) period (*Batch -1*) projects taking 2020-21 (T5) period satellite images
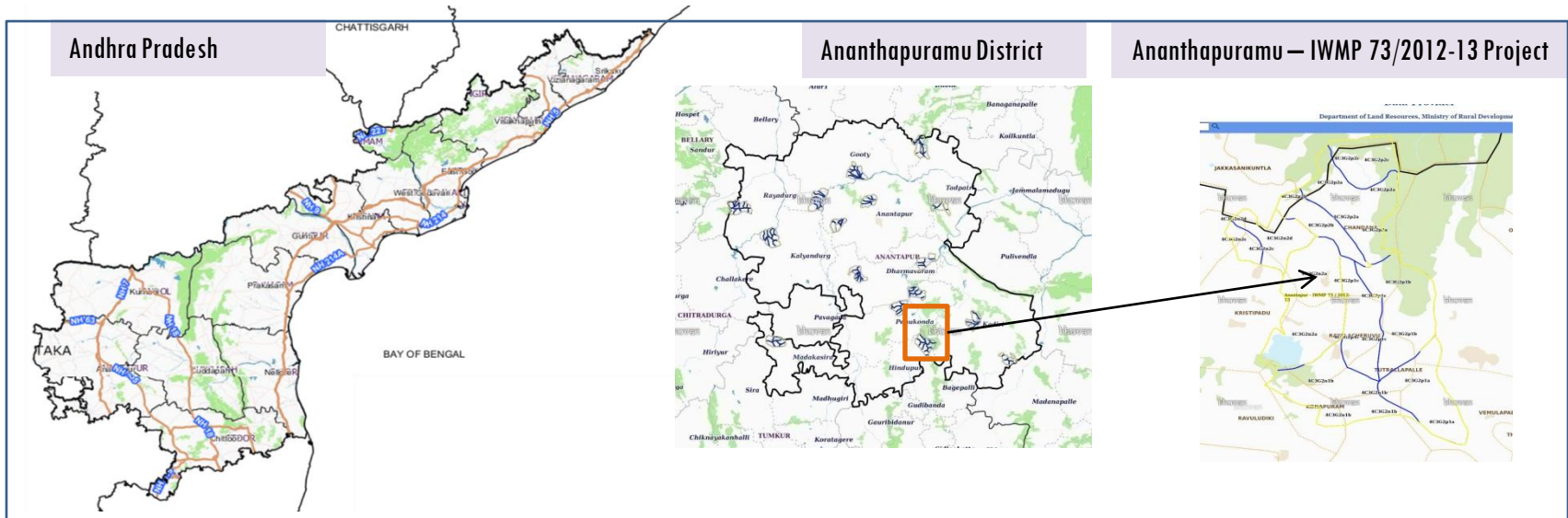
- Ananthapuram has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 37 °C range and it reaches around 44 °C to 45 °C .

- Ananthapuram 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).

- Ananthapuram 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
	2012-13	2012-13	2020-21
LISS IV	2012-13		
SCENE 1			27-Feb-21
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2012-13		
SCENE 1			27-Feb-21
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	188
4	Detailed Project Report		

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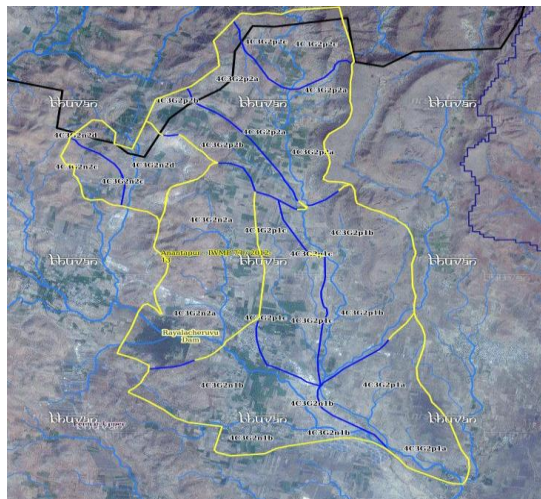
Legend

 Drainage (1:10000 Scale)

 MWS Boundary

 Project Boundary

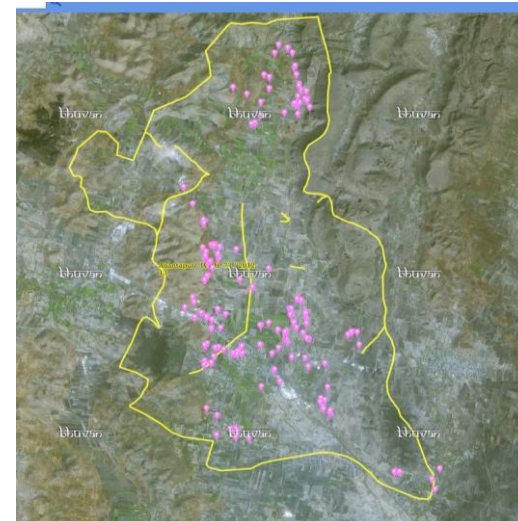# Natural Color Composite overlaid with Drishti Points

Drishti Upload Status

Classification of the Activities

Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/Horticulture	66	66
2	Afforestation	1	1
3	Pasture	0	0
4	Trench	0	0
5	Field Bunds	0	0
6	Terrace	0	0
7	Checks & Plugs	1	1
8	Gabion structure	0	0
9	Farm ponds/Dug out pit	13	13
10	Civil work-Check dams/Rock fill dam	6	6
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	0	0
15	Capacity Building Activities	0	0
16	Entry Point Activity	25	20
17	Others	104	80
	TOTAL	**217**	**188**

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 (2012-13) and T5 is 2020-21 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 Colour Composite (NCC)

Natural Color Composite- 2012-13
Source: LISS-IV, NRSC
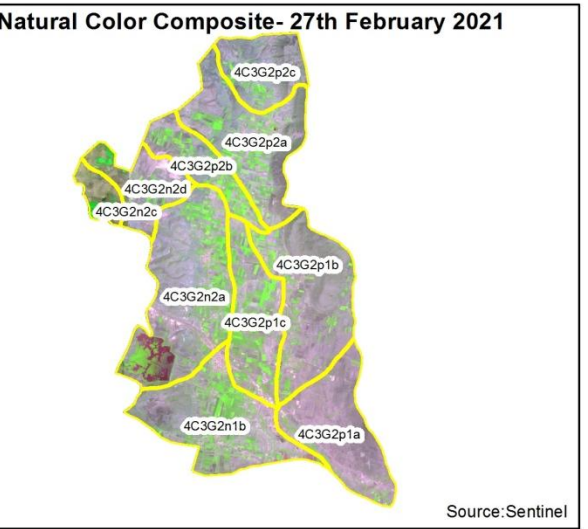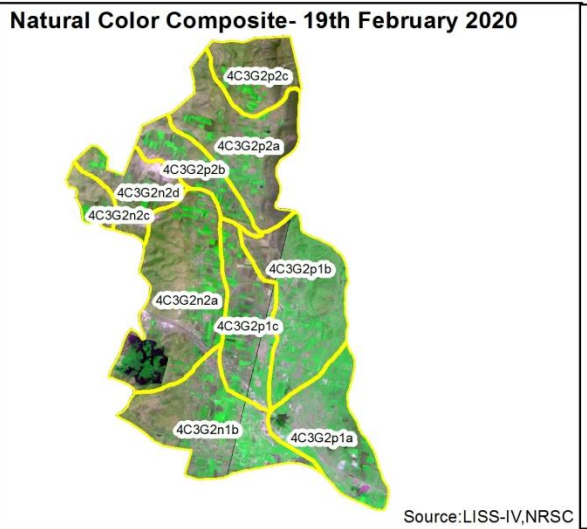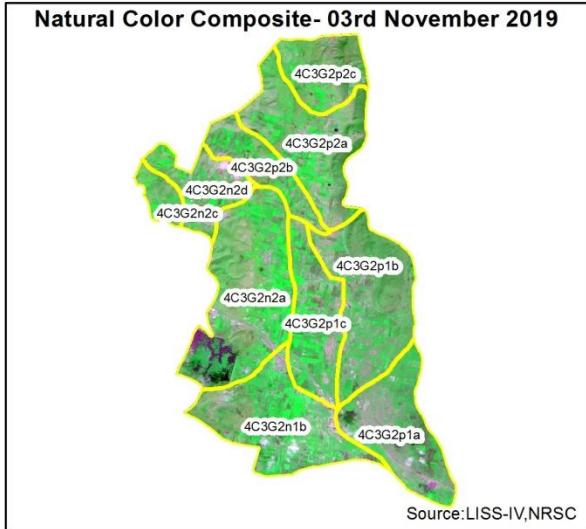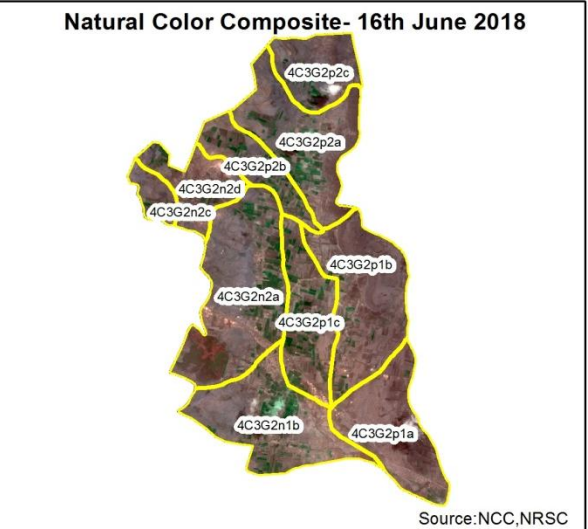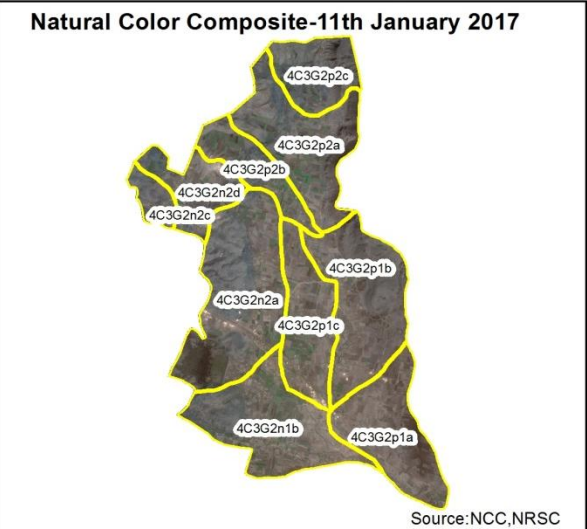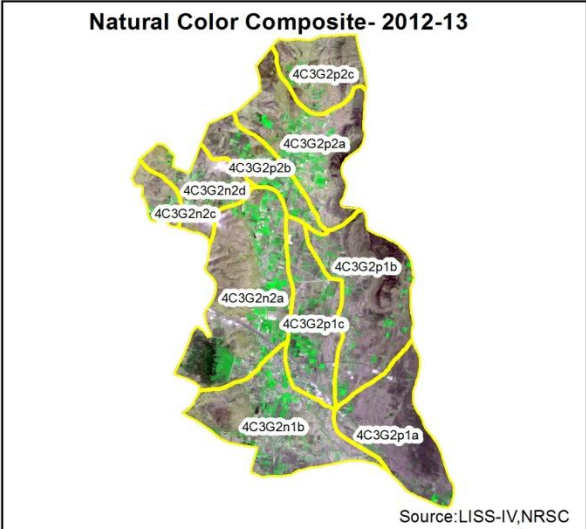
Natural Color Composite-11th January 2017
Source: NCC, NRSC

Natural Color Composite- 16th June 2018
Source: NCC, NRSC

Natural Color Composite- 03rd November 2019
Source: LISS-IV, NRSC

Natural Color Composite- 19th February 2020
Source: LISS-IV, NRSC

Natural Color Composite- 27th February 2021
Source: Sentinel

| T0 | Satellite data 2013 |

| T1 | Satellite data 2015 |

| T2 | Satellite data 2016 |

| T3 | Satellite data 2017 |

| T4 | Satellite data 2018 |

| T5 | Satellite data 2020 |

Drishti Id. 2506701

Farm pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-73/2012-13

| T0:2012-13 | T1: 17 Oct 2016 | Drishti Sl no 1745215- -   MWS :4C3G2p2c |

Check dam
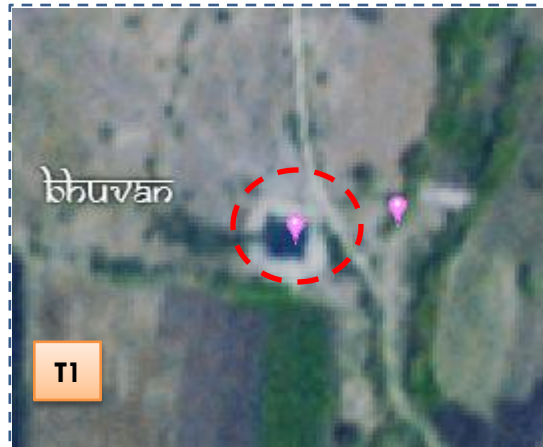
| T0:2012-13 | T1: 17 Oct 2016 | Drishti Sl no2487973-MWS : 4C3G2p1c |

Farm Pond

Monitoring of activities in Anantapuram Dt Andhra Pradesh. IWMP-73/2010-11
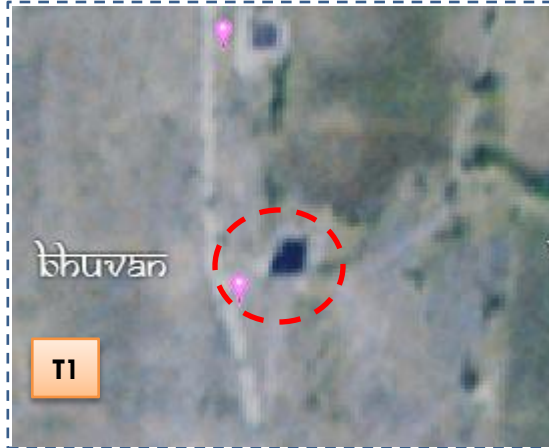
| T0: 2012-13 | T1: 17 Oct 2016 | Drishti Sl no2487978-   MWS 4C3G2p1c |

Farm Pond

| T0: 2012-13 | T1: 17 Oct 2016 | Drishti Sl no2518729-MWS :4C3G2n2a |

Farm Pond

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 (2012-13) and row represents the T5 (2021-21)

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2012-13 to 2016-17)

Scale: 1:10000

Land Use and Land Cover 2012-13

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir
- Red Circles indicate change areas mapped

Land Use and Land Cover- First Monitoring 2016-17

Legend

Microwatershed Boundary

Land Use and Land Cover

- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir
- Red Circles indicate change areas mapped

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

Land Use and Land Cover- First Monitoring 2017-18

Legend
Microwatershed Boundary
Land Use and Land Cover
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Barren/Rocky
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

Red Circles indicate change areas mapped

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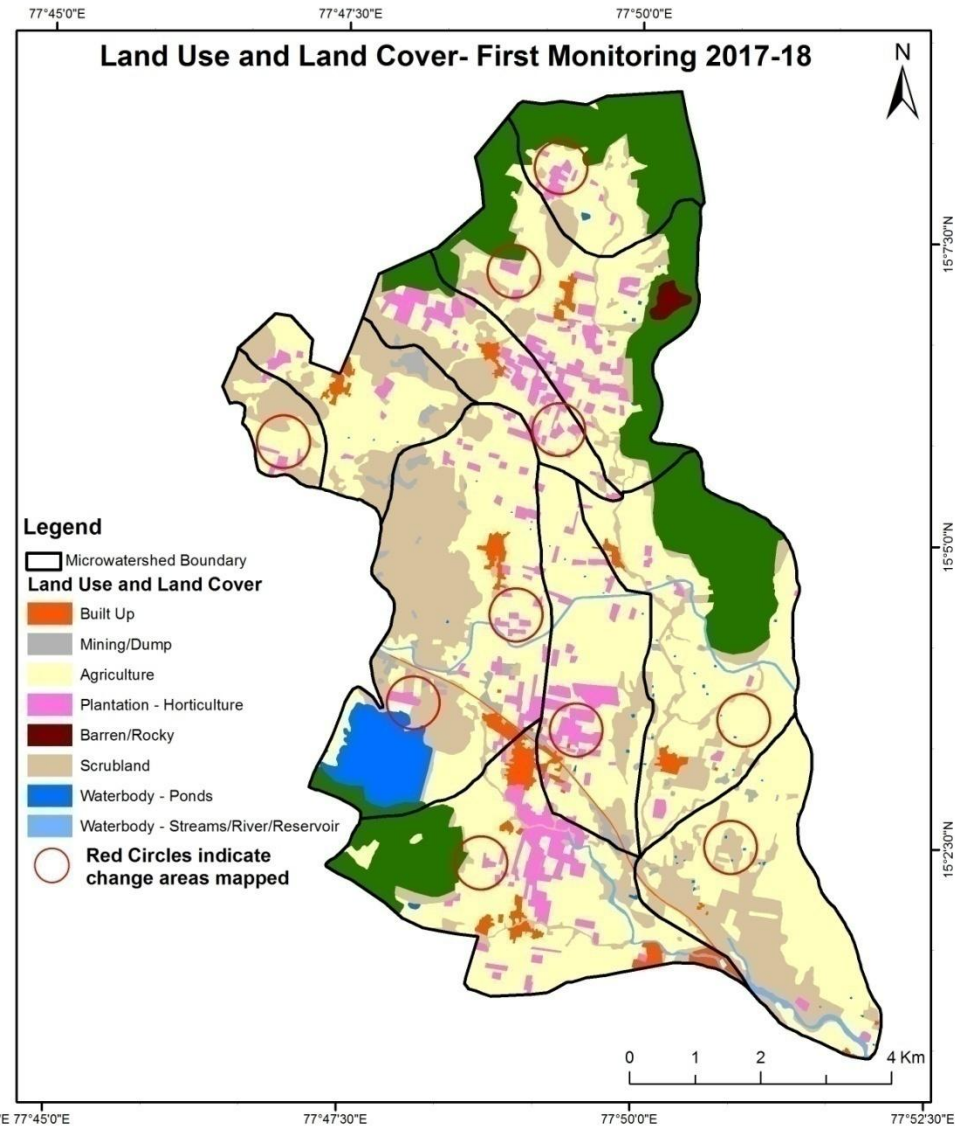## Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)
Scale: 1:10000
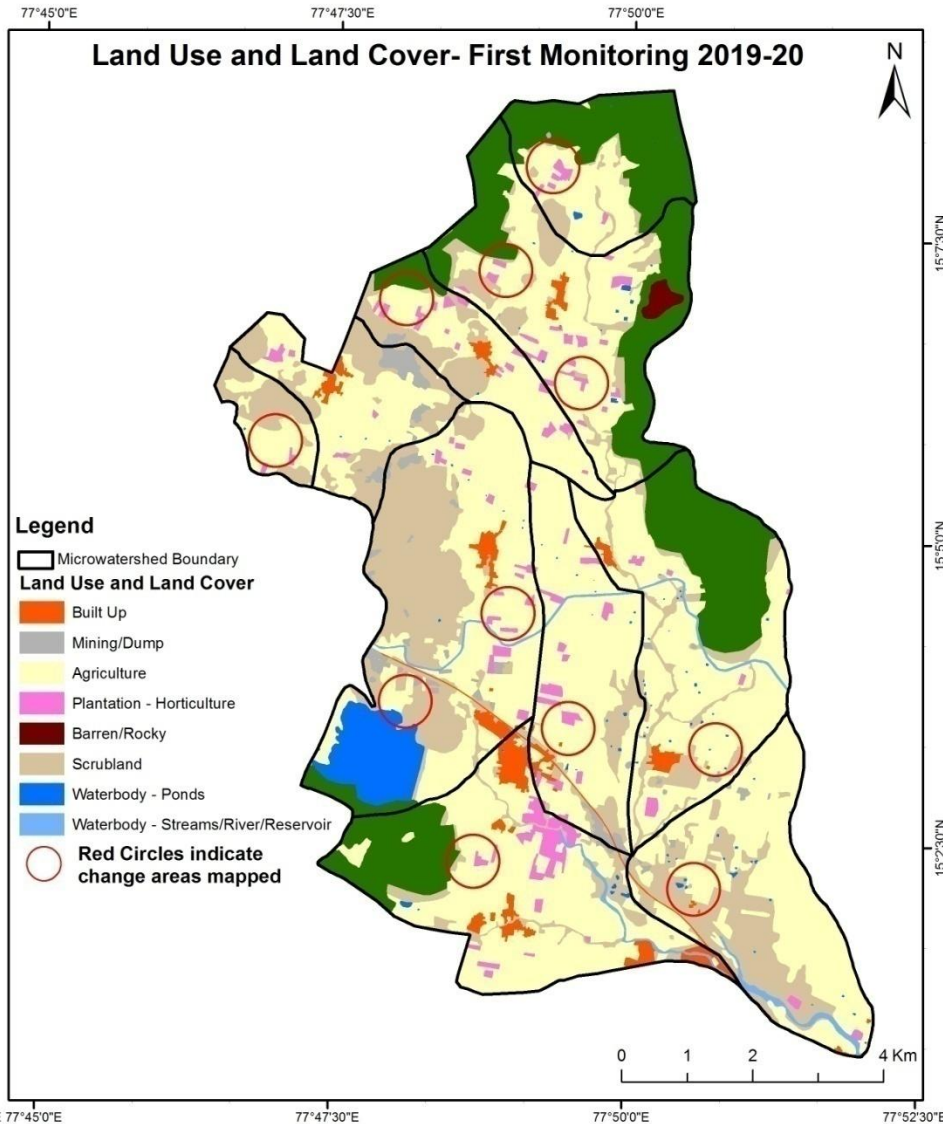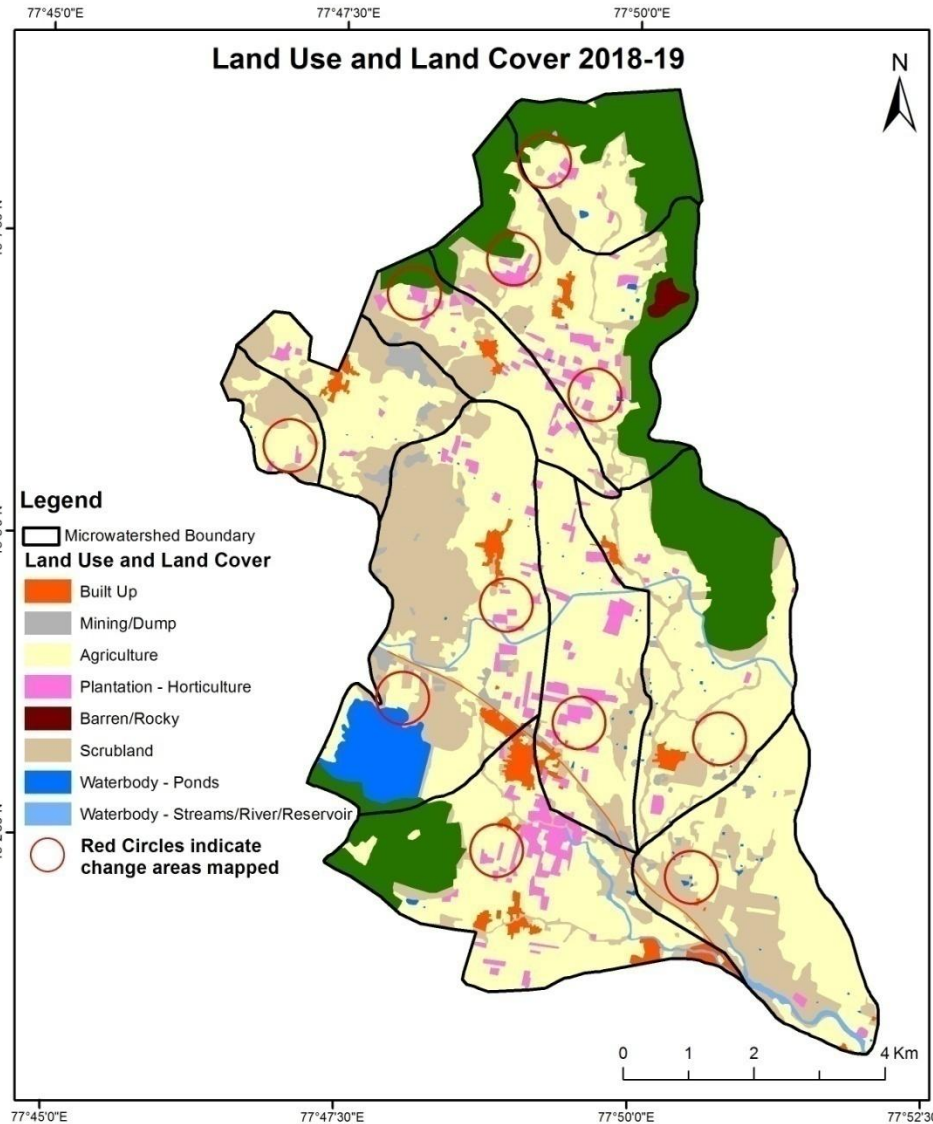
Land Use and Land Cover 2018-19

Land Use and Land Cover- First Monitoring 2019-20

Legend

Microwatershed Boundary

Land Use and Land Cover

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

Red Circles indicate change areas mapped
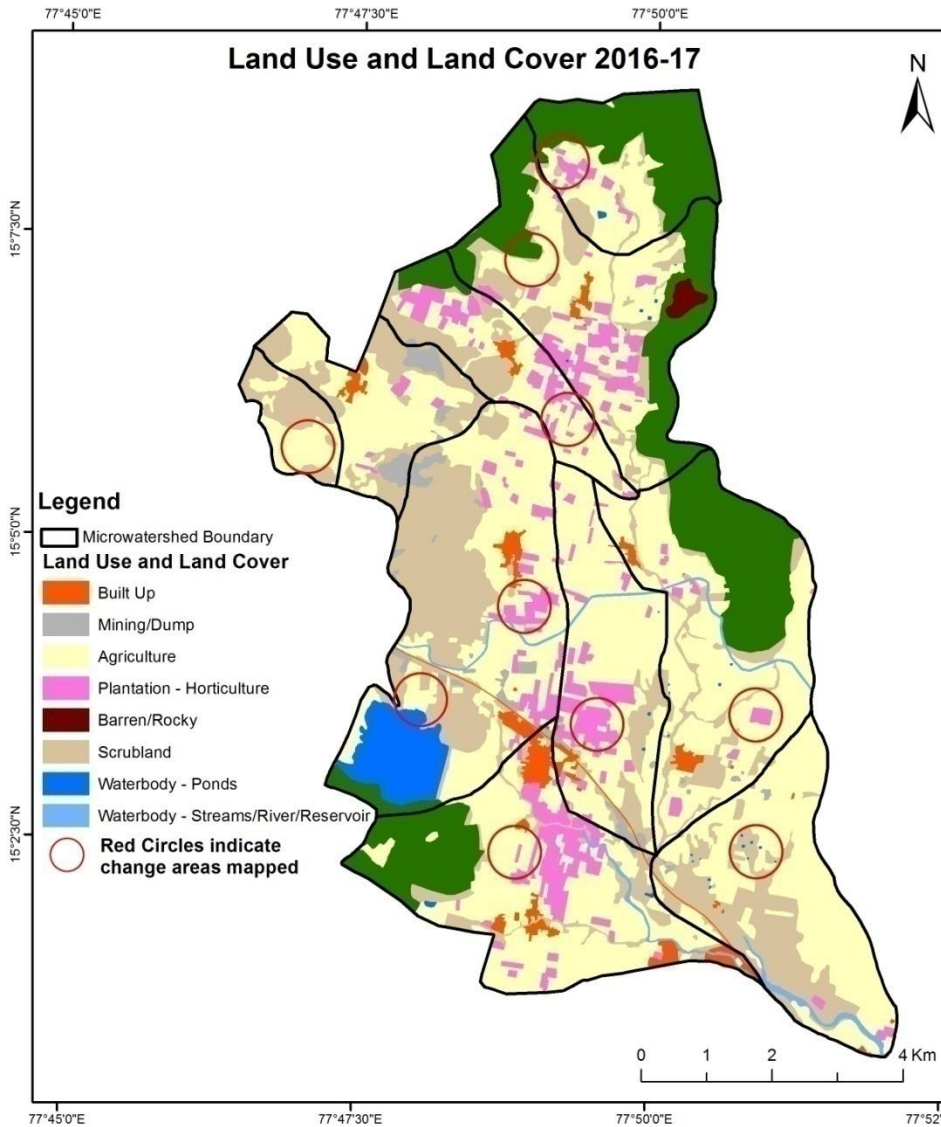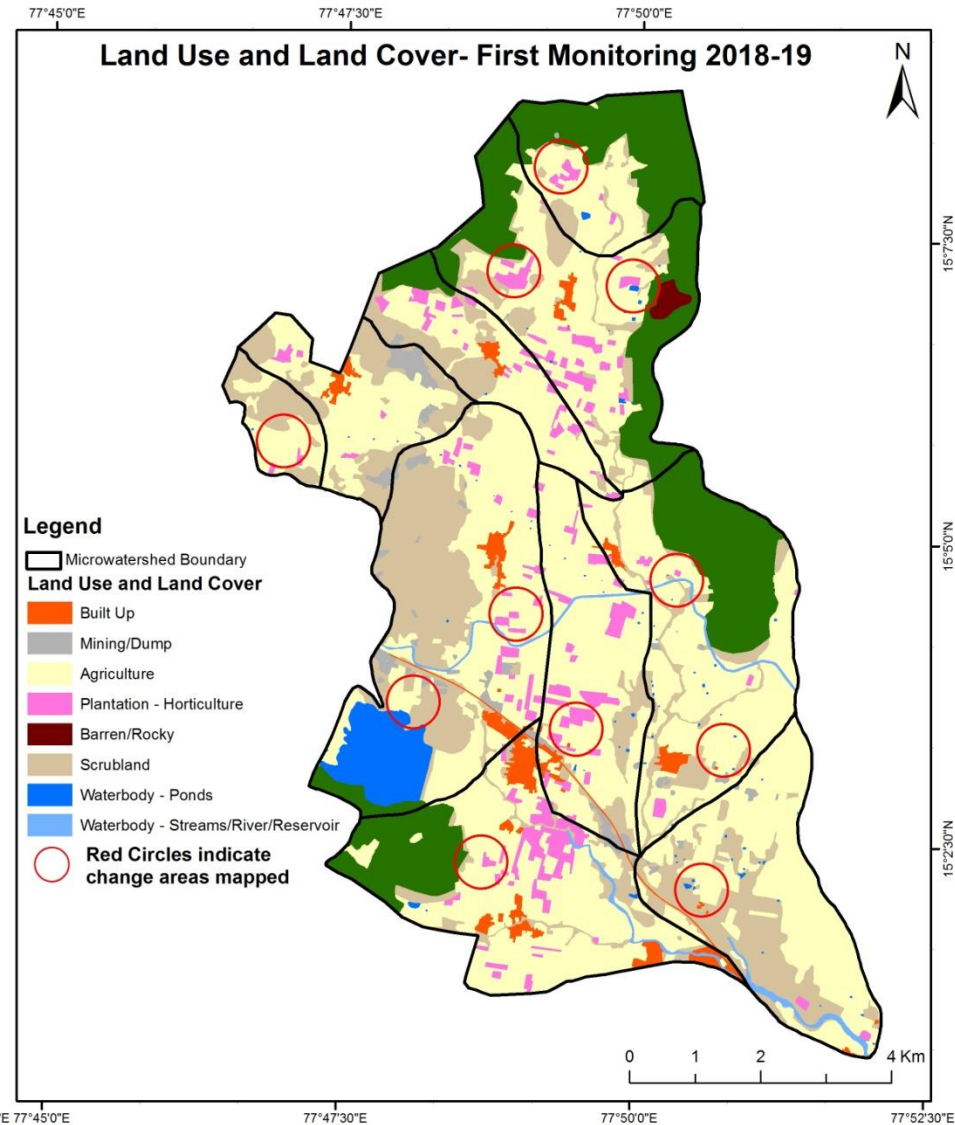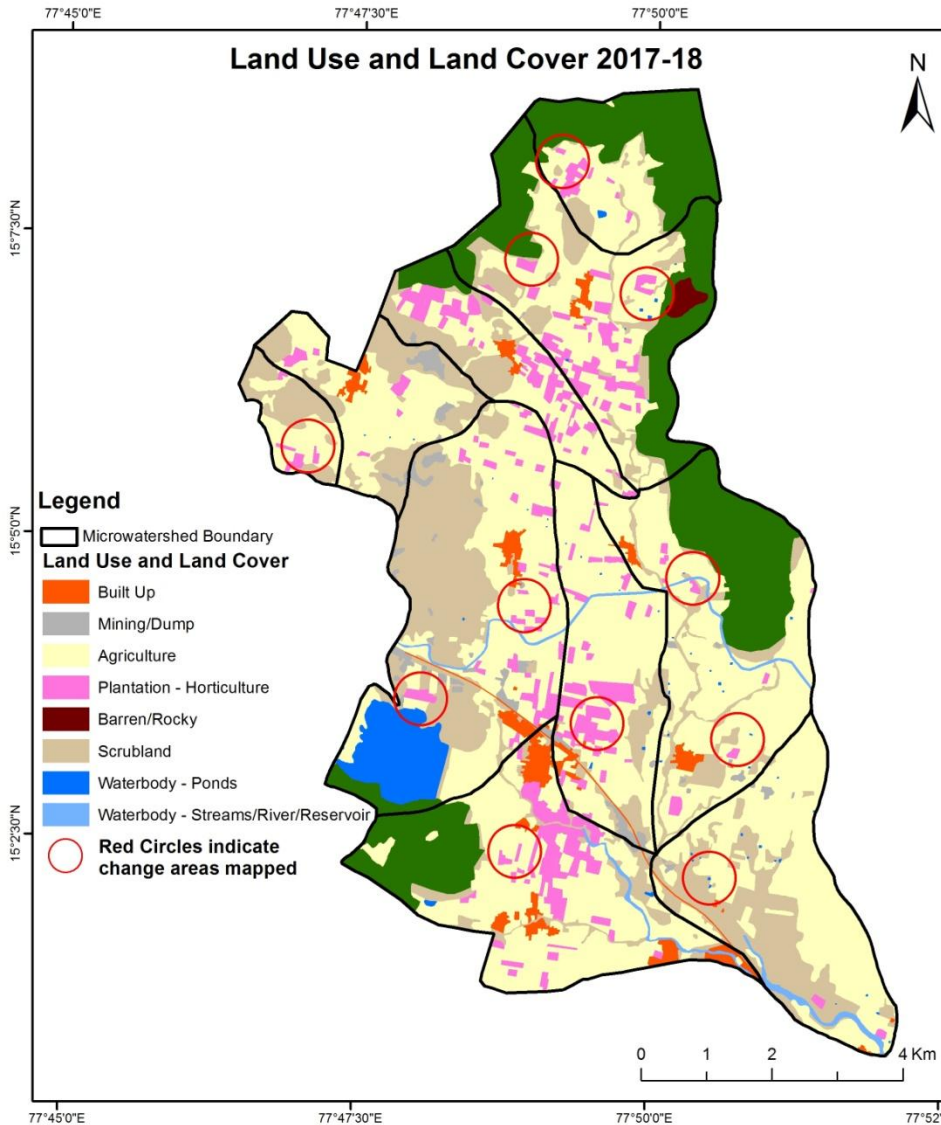
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)
Scale: 1:10000

Land Use and Land Cover 2019-20

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- Fifth Monitoring 2020-21

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 changes for Pre and Post treatment dates

Agriculture to Water body

T0

T1

T0: 2012-13(77°55'55.16"E 14°45'16.396"N)

T1: 17 Oct 2016

Agriculture to Plantation

T0

T1

T0: 2012-13 (77°56'21.09"E 14°46'3.377"N)

T1: 17 Oct 2016

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

Plantation to Agriculture

T0

T1

T0: 2012-13(77°55'35.337"E 14°44'25.206"N)

T1: 17 Oct 2016

Scrubland to Water body

T0

T1

T0: 2012-13(77°56'30.507"E 14°46'27.684"N)

T1: 17 Oct 2016

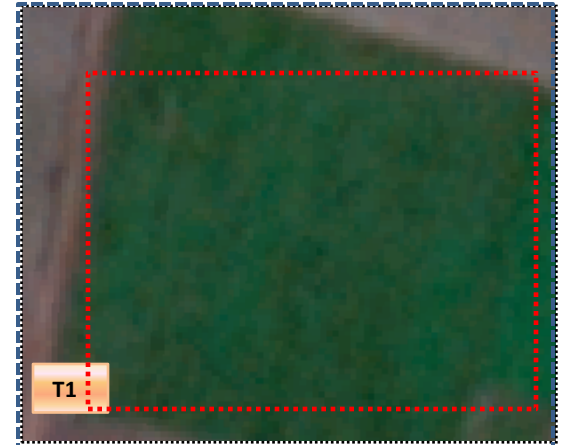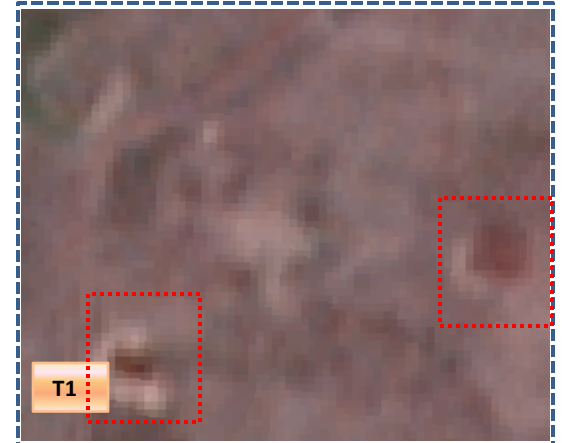# Table showing change matrix depicting Land cover transitions during study period-2012-13 to 2016-17

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	153.34										**153.34**
Mining/dump		74.64									**74.64**
Agriculture	3.10	7.41	3702.06	426.04						2.03	**4140.64**
Plantation Horticulture			110.41	146.57							**256.98**
Forest					1284.81						**1284.81**
Forest Plantation											
Barren Rocky											
Scrub	1.30	59.59	114.25	8.91				1636.01		2.95	**1823.00**
Waterbody-Streams/River									73.95		**73.95**
Waterbody – Ponds										174.00	**174.00**
Grand Total	**157.74**	**141.63**	**3926.72**	**581.52**	**1284.81**			**1636.01**	**73.95**	**178.98**	**7981.35**

- 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 438 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantation and water body in T1.

- In T1 224 ha of the agriculture area has increased from plantations and scrubland 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-2016-17 to 2017-18

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 (Units in Hectares)
Built up	180.36	0.75									181.11
Mining/dump		90.11	0.65					25.24			116.00
Agriculture	4.00	6.28	3826.58	81.95				5.61		2.60	3927.00
Plantation Horticulture			128.62	452.90							581.52
Forest					1263.41						1263.41
Forest Plantation											
Barren Rocky							21.39				21.39
Scrub	0.78	6.86	34.19					1595.90		0.42	1638.16
Waterbody- Streams/River									73.95		73.95
Waterbody – Ponds								0.34		178.47	178.81
Grand Total	185.14	104.00	3990.03	534.85	1263.41		21.39	1627.09	73.95	181.49	7981.35

- 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 94 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 162 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-2017-18 to 2018-19

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	185.14										185.14
Mining/dump		100.19	0.41					3.40			104.00
Agriculture	5.47	6.59	3909.35	65.88						2.73	3990.03
Plantation Horticulture			253.11	281.52						0.22	534.85
Forest		0.57			1262.84						1263.41
Forest Plantation											
Barren Rocky							21.39				21.39
Scrub		16.23	10.86	0.95				1596.82		2.23	1627.09
Waterbody-Streams/River									73.95		73.95
Waterbody – Ponds			0.08							181.40	181.49
Grand Total	190.61	123.58	4173.82	348.35	1262.84		21.39	1600.22	73.95	186.59	7981.35

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 80 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T3.

• In T3 264 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-2018-19 to 2019-20

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	190.61										**190.61**
Mining/dump		108.85						14.74			**123.58**
Agriculture		0.65	4168.79	3.78						0.59	**4173.82**
Plantation Horticulture			137.68	210.66							**348.35**
Forest					1262.66					0.18	**1262.84**
Forest Plantation											
Barren Rocky							21.39				**21.39**
Scrub	2.88	2.51	14.98					1578.69		1.17	**1600.22**
Waterbody- Streams/River									73.95		**73.95**
Waterbody – Ponds			0.05							186.53	**186.59**
Grand Total	**193.49**	**112.01**	**4321.50**	**214.45**	**1262.66**		**21.39**	**1593.42**	**73.95**	**188.47**	**7981.35**

• 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 05 ha of the agriculture area has decreased and it is converted into mining/dump, plantations and water body in T4.

• In T4 294 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
T4	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	172.03										**172.03**
Mining/dump		139.55									**139.55**
Agriculture	0.16		4314.58	5.26						0.95	**4320.95**
Plantation Horticulture			3.45	210.99							**214.45**
Forest			5.45		1278.69						**1284.13**
Forest Plantation											
Barren Rocky											
Scrub		4.44	208.39					1369.30		1.64	**1583.78**
Waterbody-Streams/River									77.43		**77.43**
Waterbody – Ponds			0.44							188.60	**189.04**
Grand Total	**172.19**	**143.99**	**4532.31**	**216.25**	**1278.69**			**1369.30**	**77.43**	**191.19**	**7981.35**

- 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 6.3 ha of the agriculture area has decreased and it is converted into plantations and water body in T5.

- In T5 212 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 20 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2011-12 (T0) & 2020-21 (T5) years.

4. There is an increase of 63, 183, 147 & 211 Hectares from T1-T2, T2-T3, T3-T4 & T4-T5 respectively and there is a decrease of 213 Hectares from T0 to T1 and overall increase of 391 Hectares in Crop land area as compared between baseline LU/LC data 2011-12 (T0) & 2020-21 (T5) years.

5. There is a decrease of 453 Hectares in Scrubland area as compared between 2011-12 (T0) & 2020-21 (T5) years.

6. Farm ponds (13) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (13) verified from the portal.