MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -38/2011-12
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

- 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-38/2011-12, Prakasam District of   Andhra Pradesh. The total geographical area of the project is **4822.01** ha. It comprises of 7 micro watersheds.

- In the project area 235 Drishti photos were uploaded showing 36 check dams, 11 Farm ponds/Percolation tanks, 2 entry point activity, 3 lively hood activities, 29 checks & plugins and 154 others.

- Major percentage i.e. 54.37% is covered by the agriculture, 30.04% is covered by scrub land, 6.12% covered by Plantation and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-38/2011-12
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Pamuru Mandal of Prakasam district of Andhra Pradesh state. The total geographical area of the project is **4822.01** ha. It comprises of 7 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.
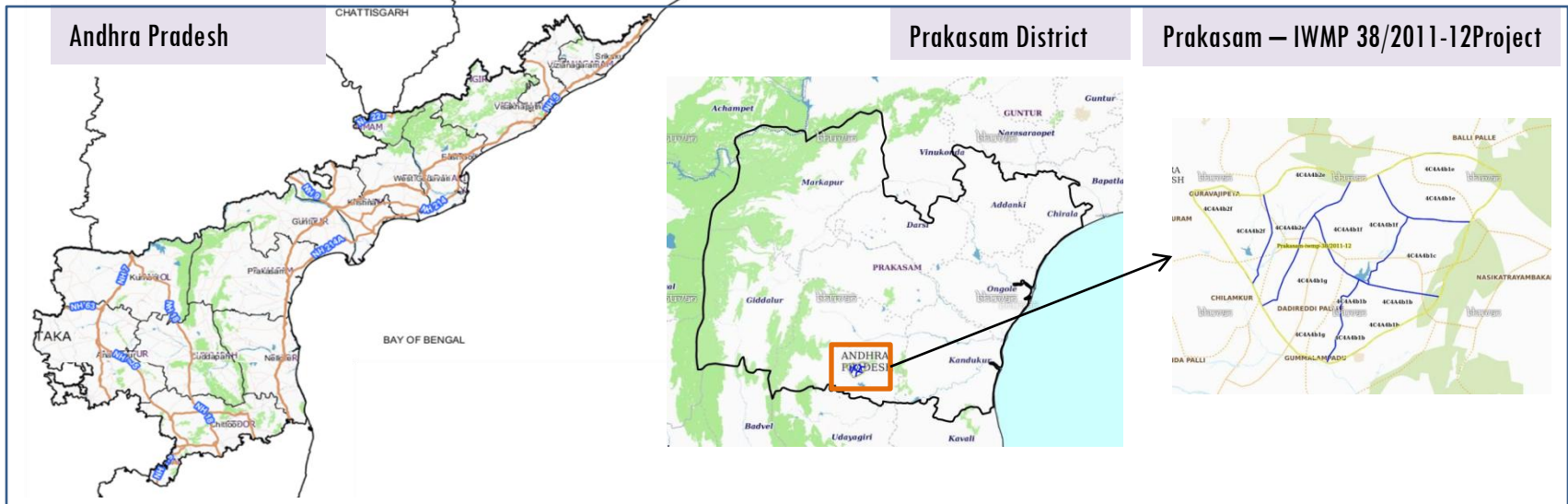
- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Prakasam has a record of reaching more than 46°C.

- The average annual rainfall of the district is 798.6 mm, monthly rainfall ranges from nil in March to 182.9 mm in October. October is the wettest month of the year. Southwest monsoon contributes significant rainfall in southern part of the district and Northeast monsoon contributes more than 70% of the rainfall.

- December is the coldest month with normal mean maximum temperature of about 27.1°c and mean minimum temperature of 19.2°C. Temperature begins to rise after February. May is the hottest month with mean daily maximum temperature of about 36.1°C and the mean daily minimum temperature of about 27.7°C. During May and early June the maximum temperature rises occasionally to 46°C and with the onset of SW monsoon by about second week of June, temperature begins to drop rapidly.

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Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2011-12	2012-13	2019-20
LISS IV	2011-12		
SCENE 1			05-Feb-19
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2011-12		
SCENE 1			05-Feb-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	235
4	Detailed Project Report		

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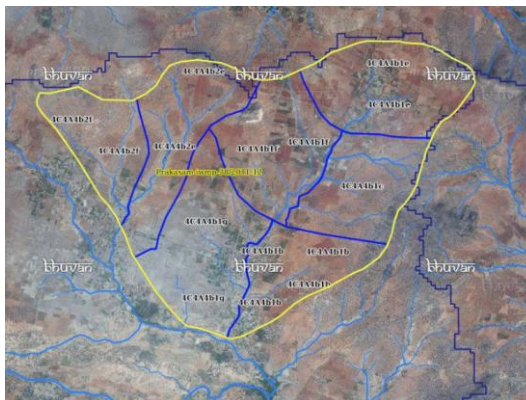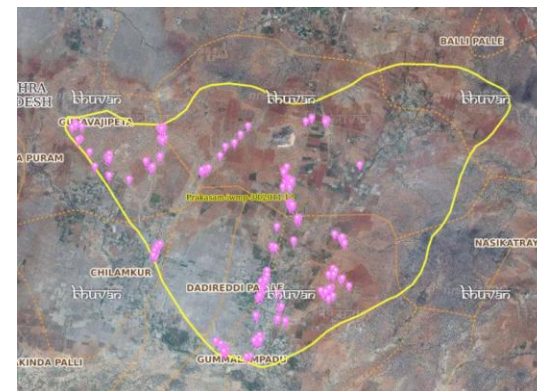

Legend

 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	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	11	11
10	Civil work-Check dams/Rock fill dam	36	36
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	3	3
15	Capacity Building Activities	0	0
16	Entry Point Activity	2	2
17	Others	159	154
	TOTAL	**240**	**235**

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.
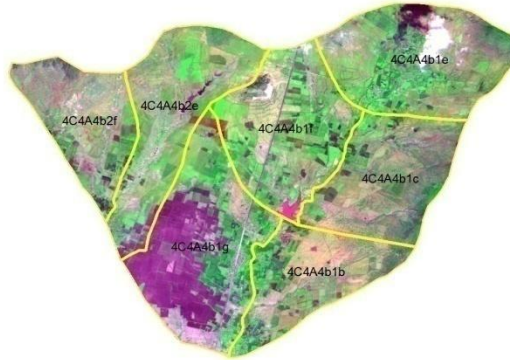
Natural Color Composite
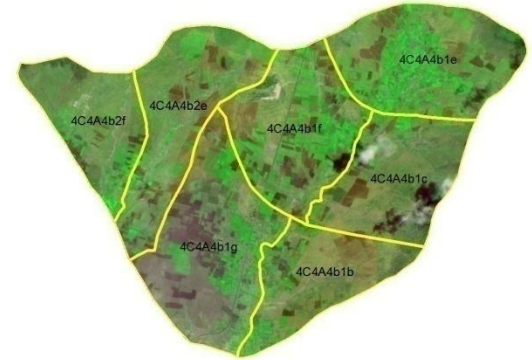

Natural Color Composite- 2011-12

4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b

Source:Fusion data,NRSC

Natural Color Composite- 24 th October 2015

4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b

Source:LISS-IV,NRSC

Natural Color Composite- 21St July 2017

4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b

Source:LISS-IV,NRSC

Natural Color Composite-26 th December 2017

4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b

Source:LISS-IV,NRSC

Natural Color Composite- 1St January 2019

4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b
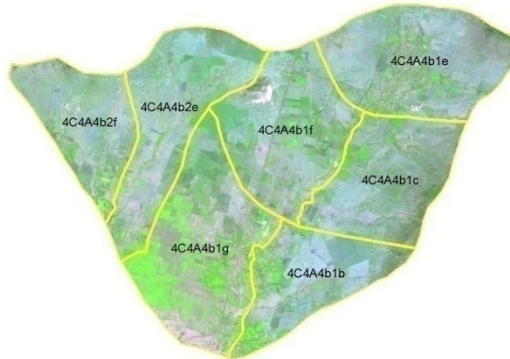
Source:Sentinel-2

Natural Color Composite- 5 th February 2020
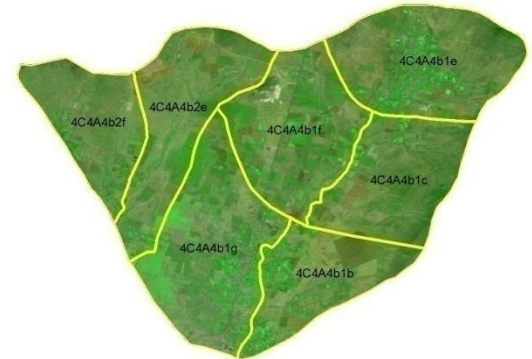
4C4A4b2f · 4C4A4b2e · 4C4A4b1f · 4C4A4b1e · 4C4A4b1c · 4C4A4b1g · 4C4A4b1b

Source:LISS-IV,NRSC

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Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-38/2011-12
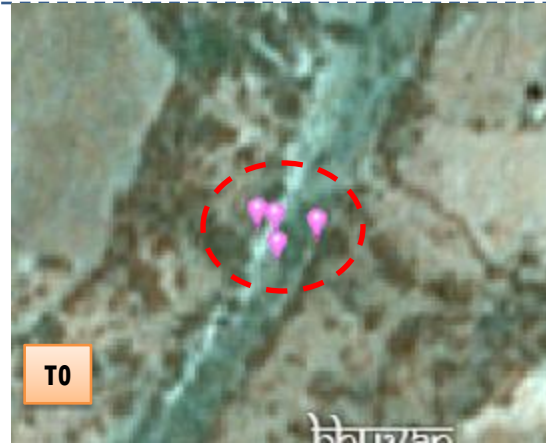
T0	T1	
T0:2011-12	T1: 24th Oct 2015	Drishti Sl no. 1305146__ MWS :4C4A4b1g

Check dam
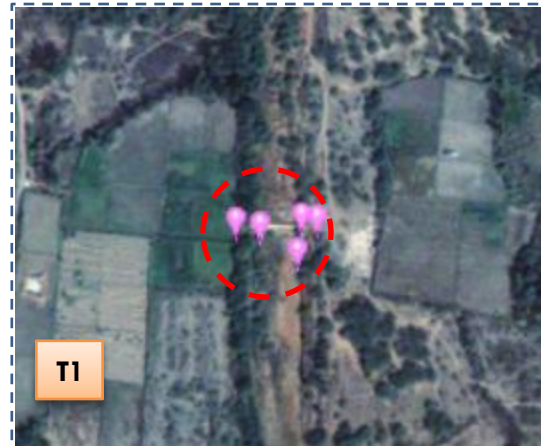
T0	T1	
T0:2011-12	T1: 24th Oct 2015	Drishti Sl no. 1305168 MWS : 4C4A4b1g

Check dam

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-38/2011-12

| T0: 2011-12 | T1: 24th Oct 2015 | Drishti Sl no. 1305193_   MWS :4C4A4b1b |

Percolation tank

| T0: 2011-12 | T1: 24th Oct 2015 | Drishti Sl no. 1305222   MWS :4C4A4b1b |

Percolation tank

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 pre implementation period as T0 (2011-12) and row represents the post implementation period as 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
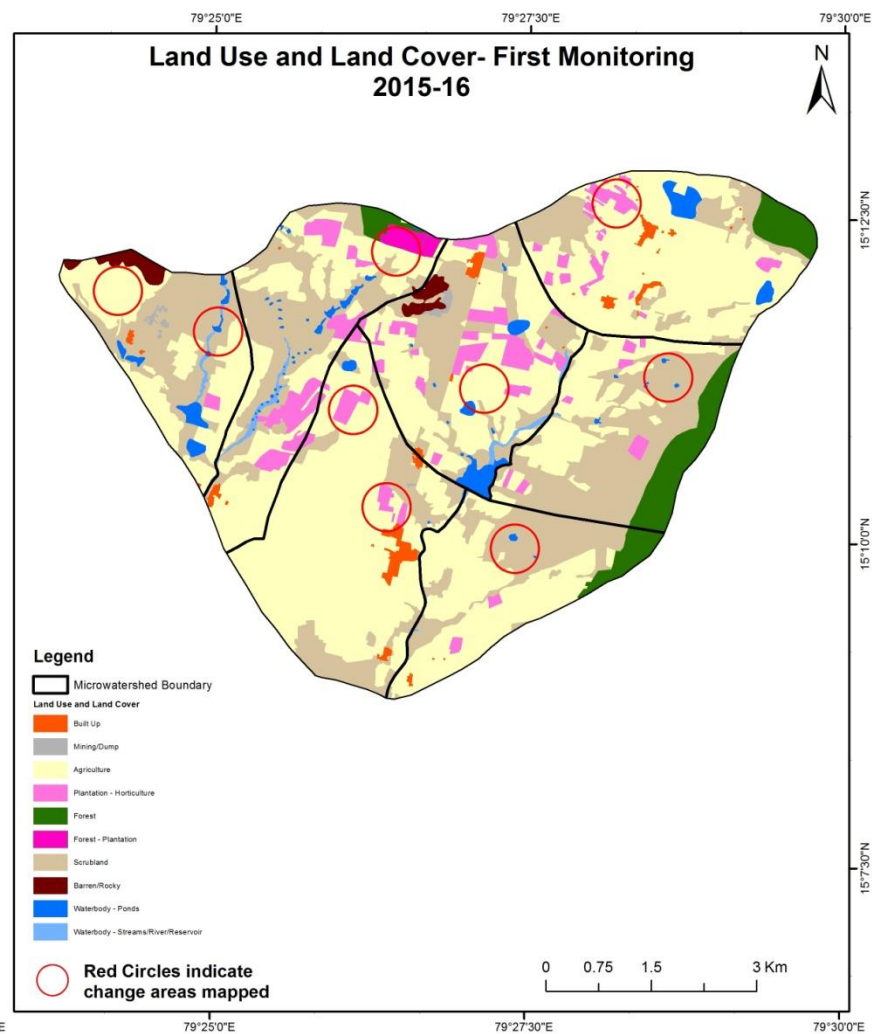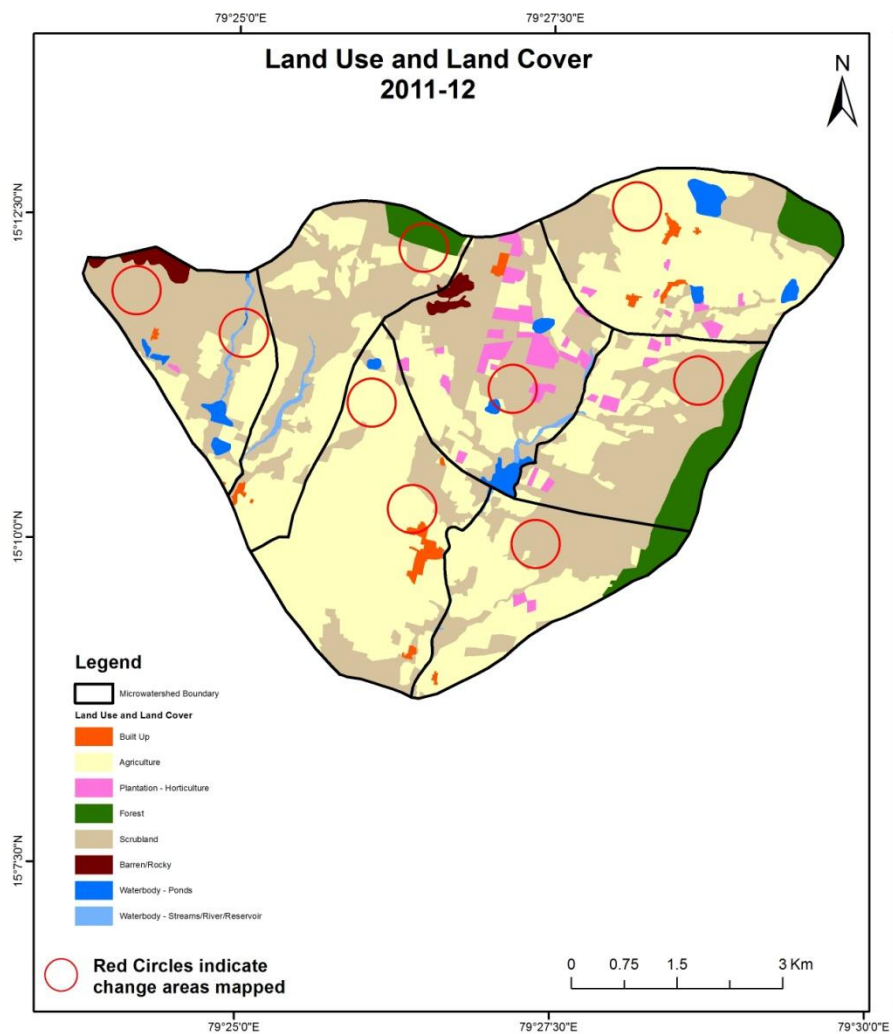
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
Scale: 1:10000

Land Use and Land Cover 2015-16

Land Use and Land Cover- Second Monitoring 2016-17

Legend
- Microwatershed Boundary

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

Red Circles indicate change areas mapped

0   0.75   1.5   3 Km

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
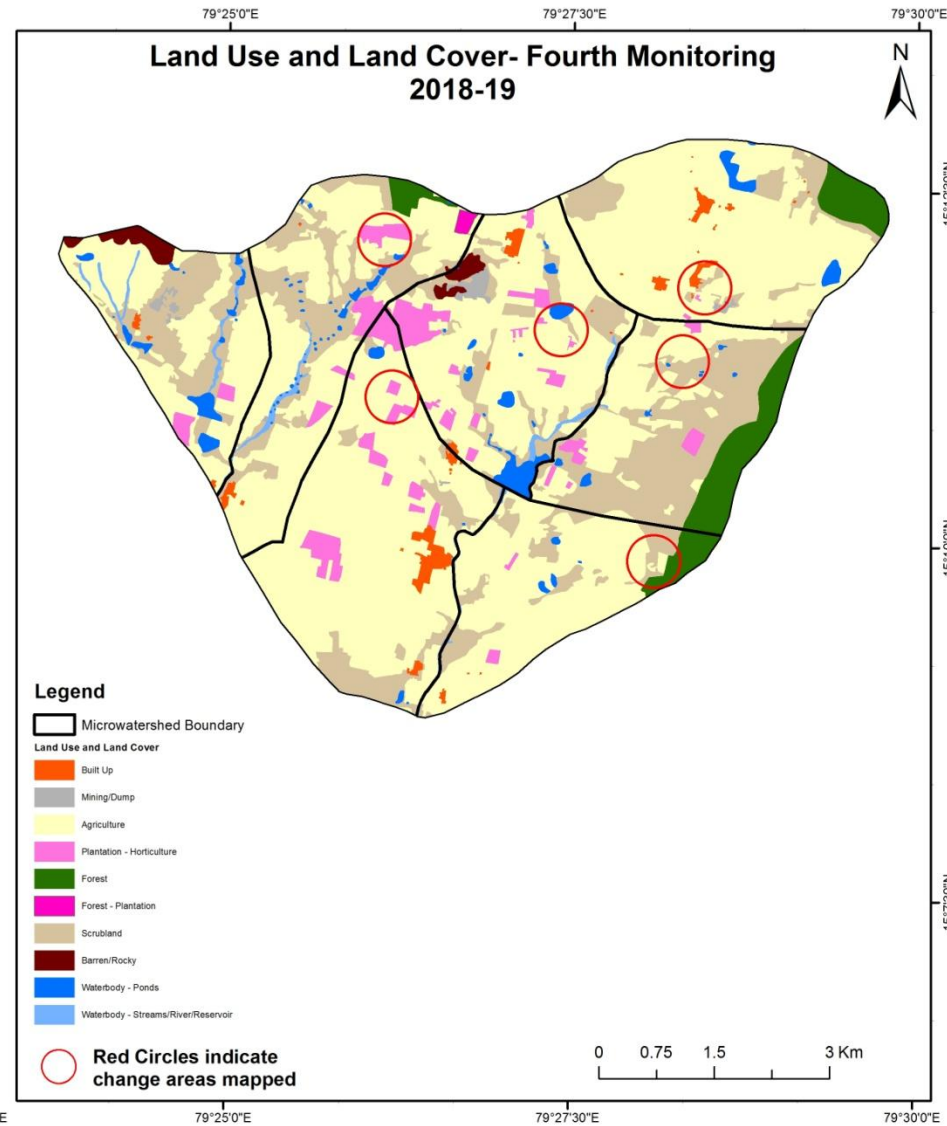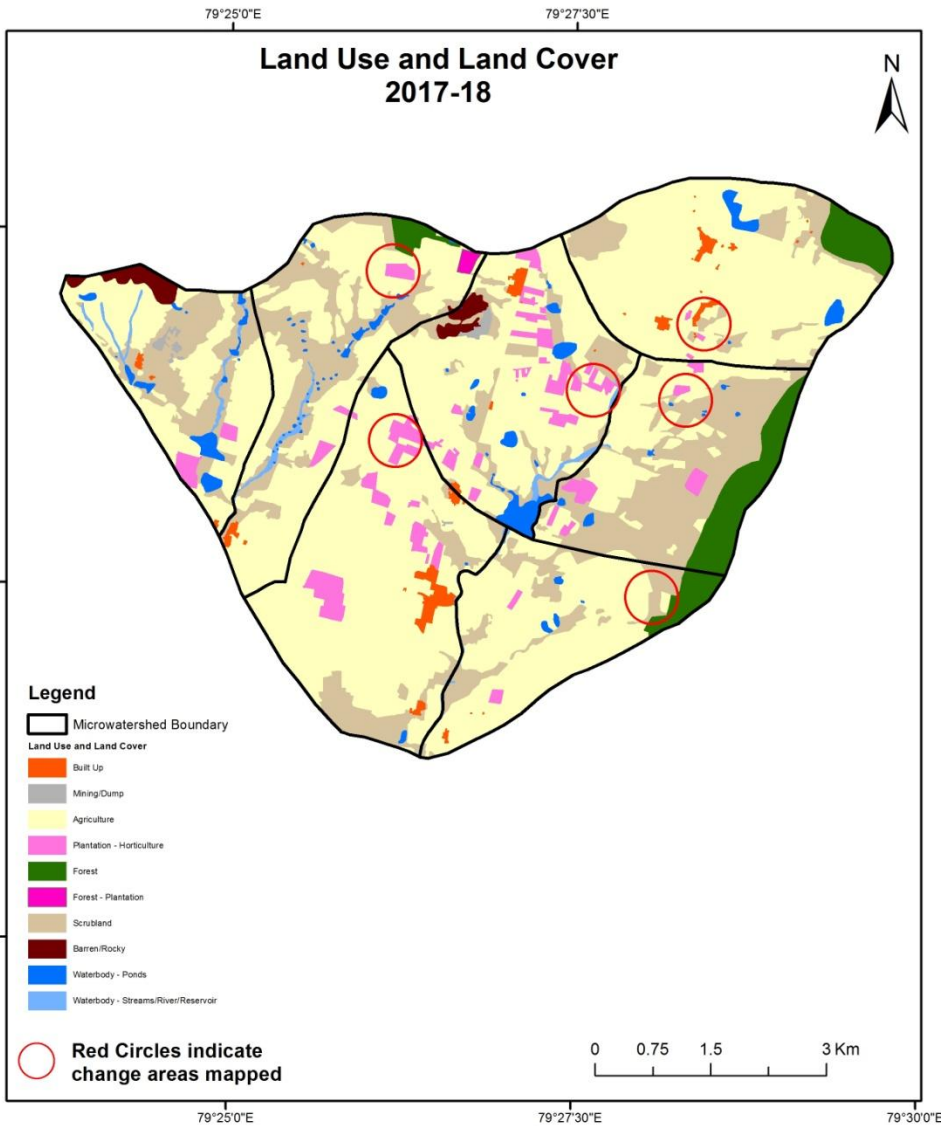
Land Use and Land Cover
2017-18

Land Use and Land Cover- Fourth Monitoring
2018-19

Legend

Microwatershed Boundary

Land Use and Land Cover

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

Red Circles indicate
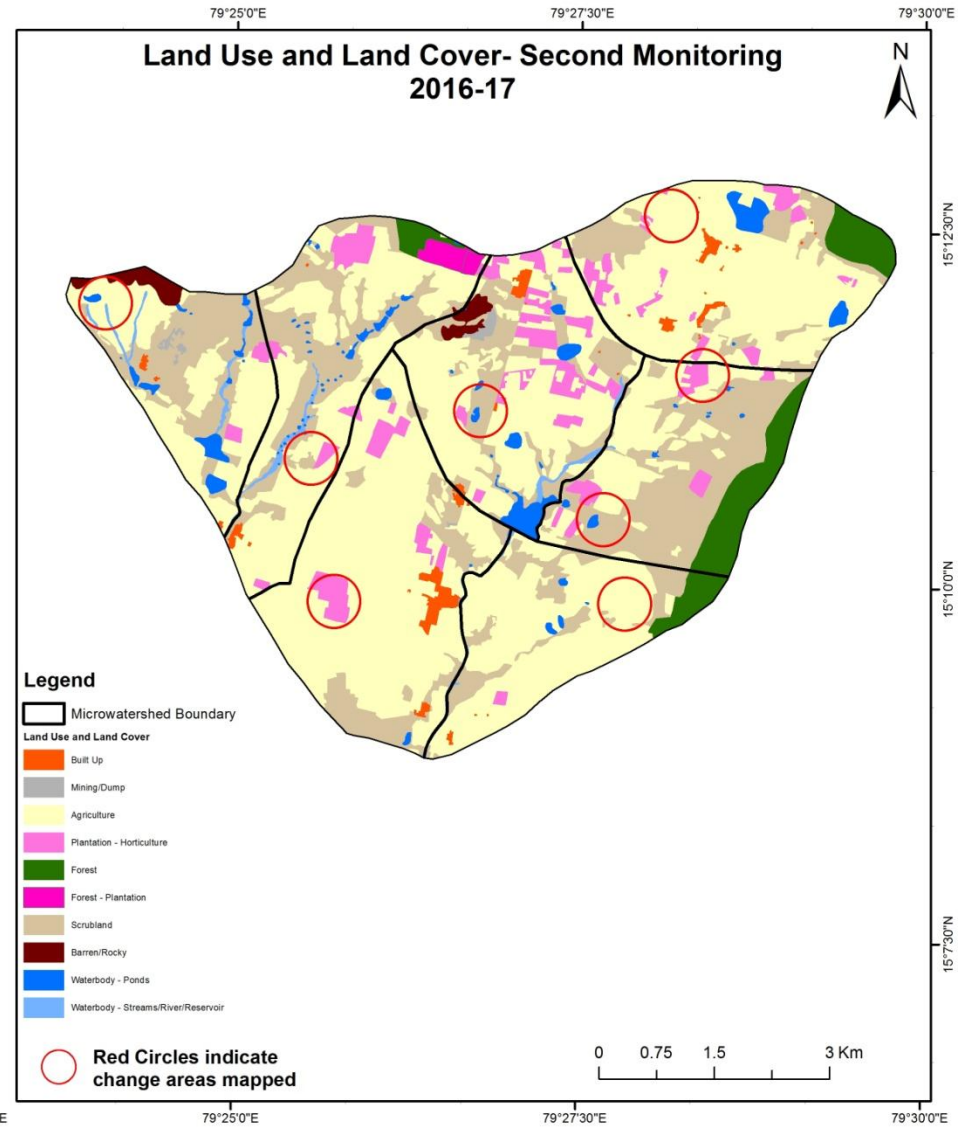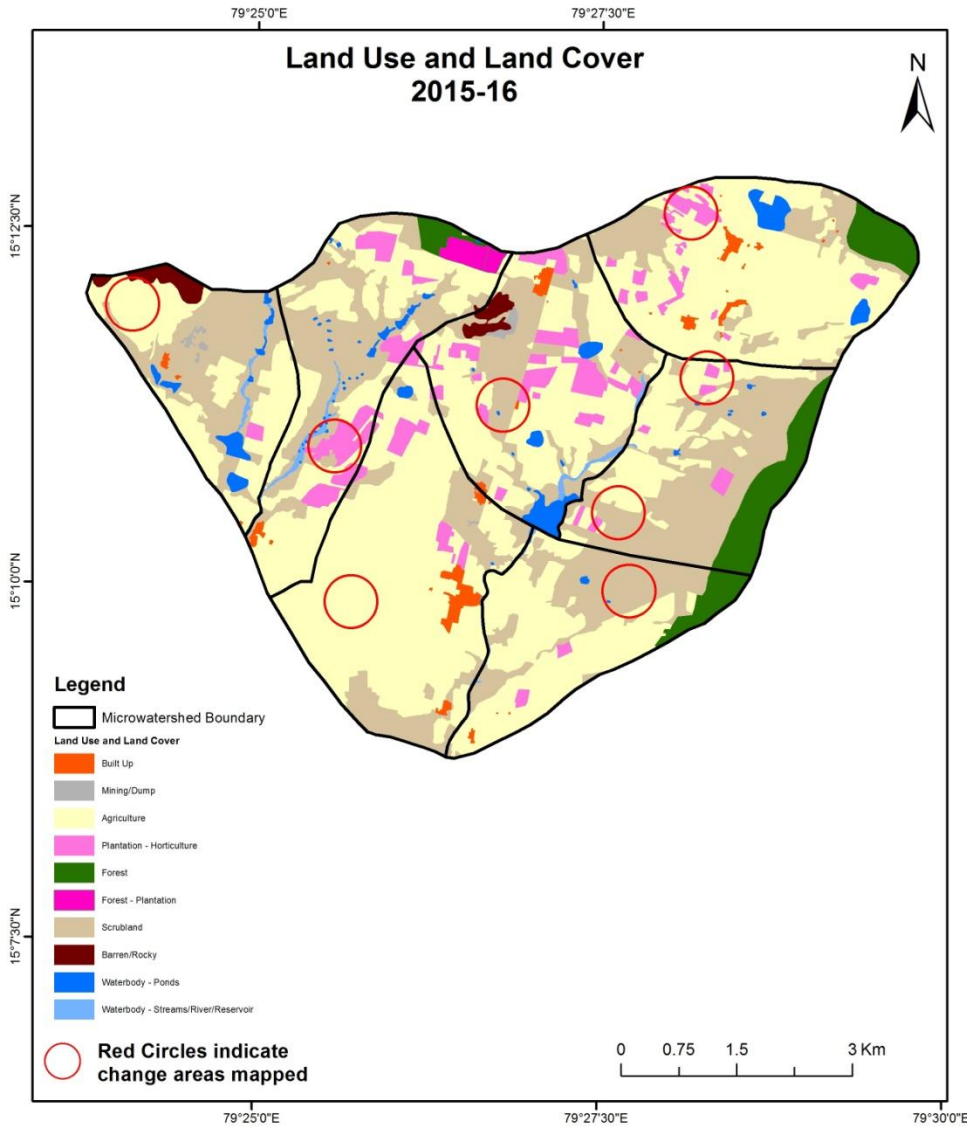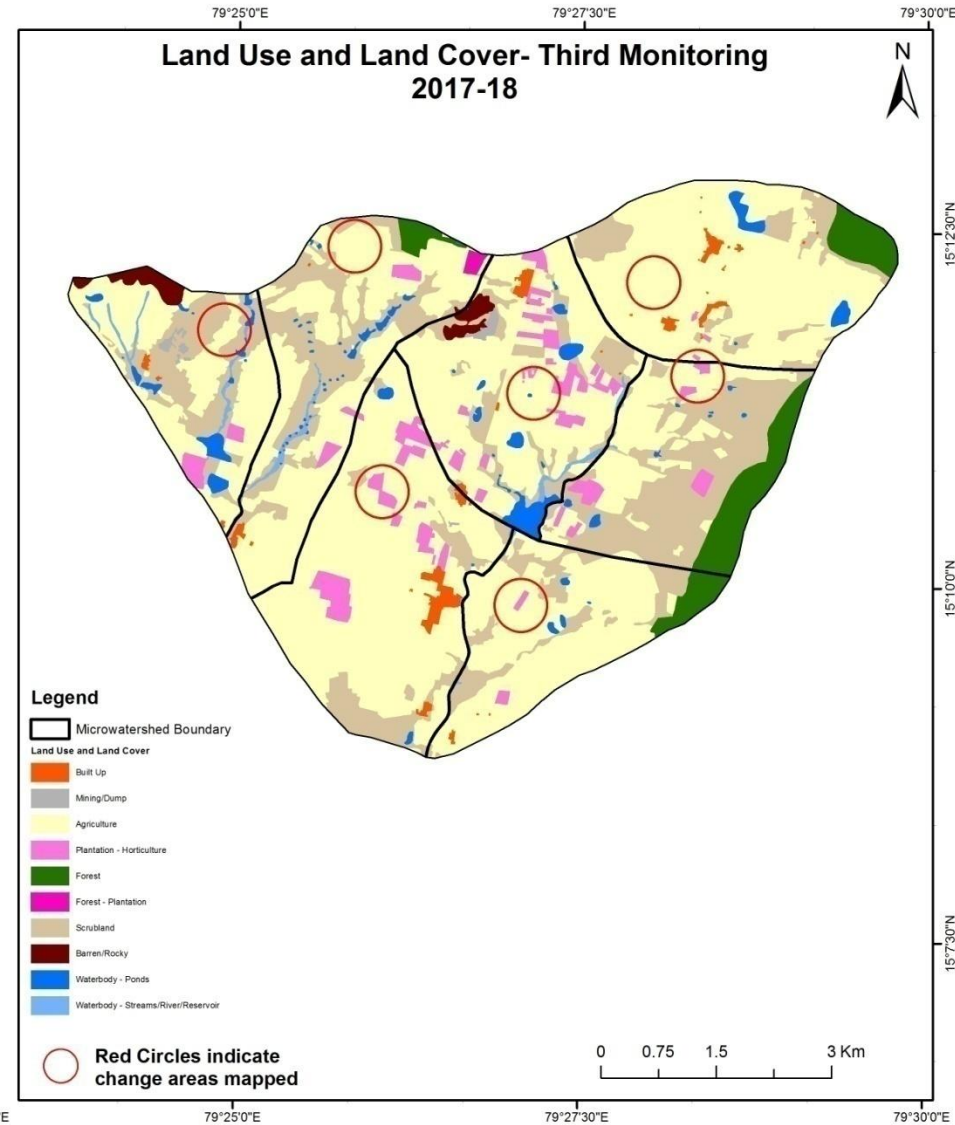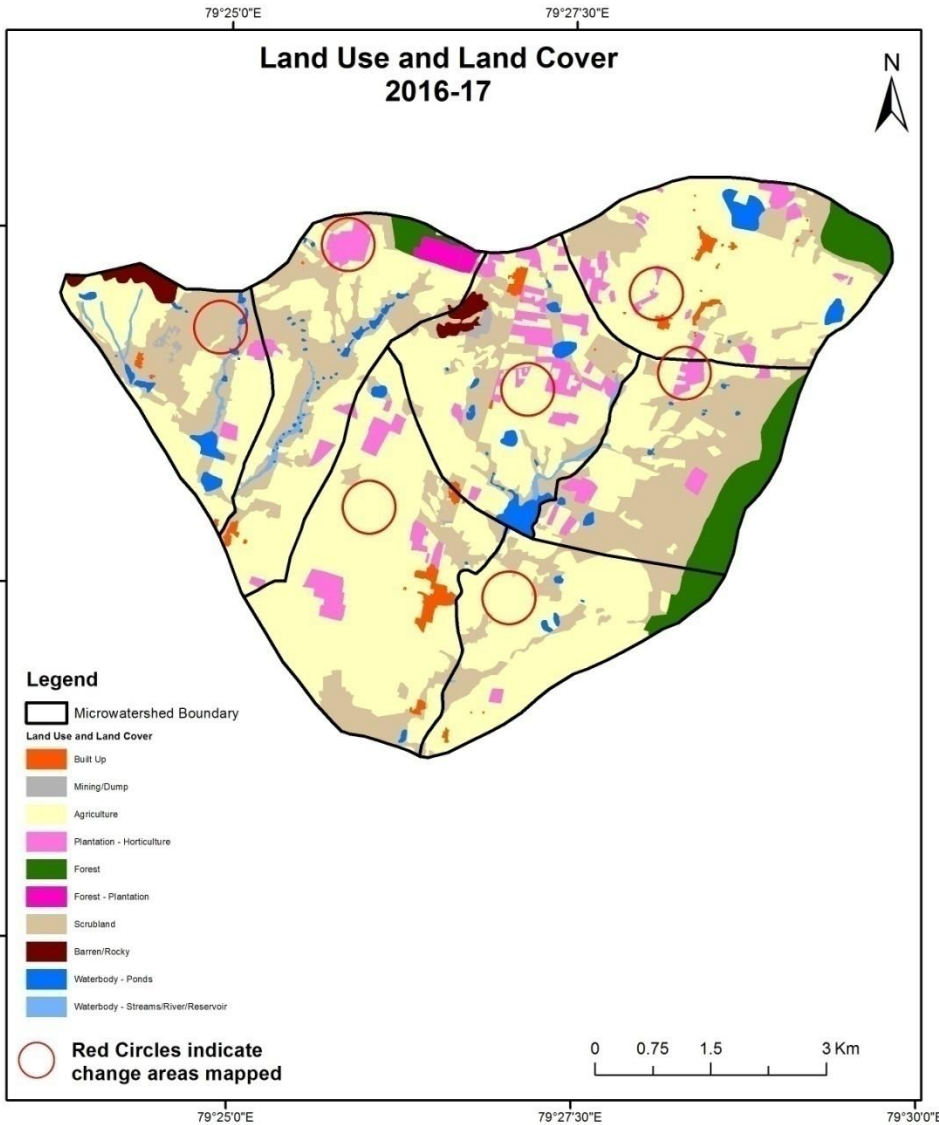change areas mapped

0   0.75   1.5   3 Km

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- Fifth Monitoring
2019-20

Legend

Microwatershed Boundary

Land Use and Land Cover

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

Red Circles indicate change areas mapped

0   0.75   1.5   3 Km
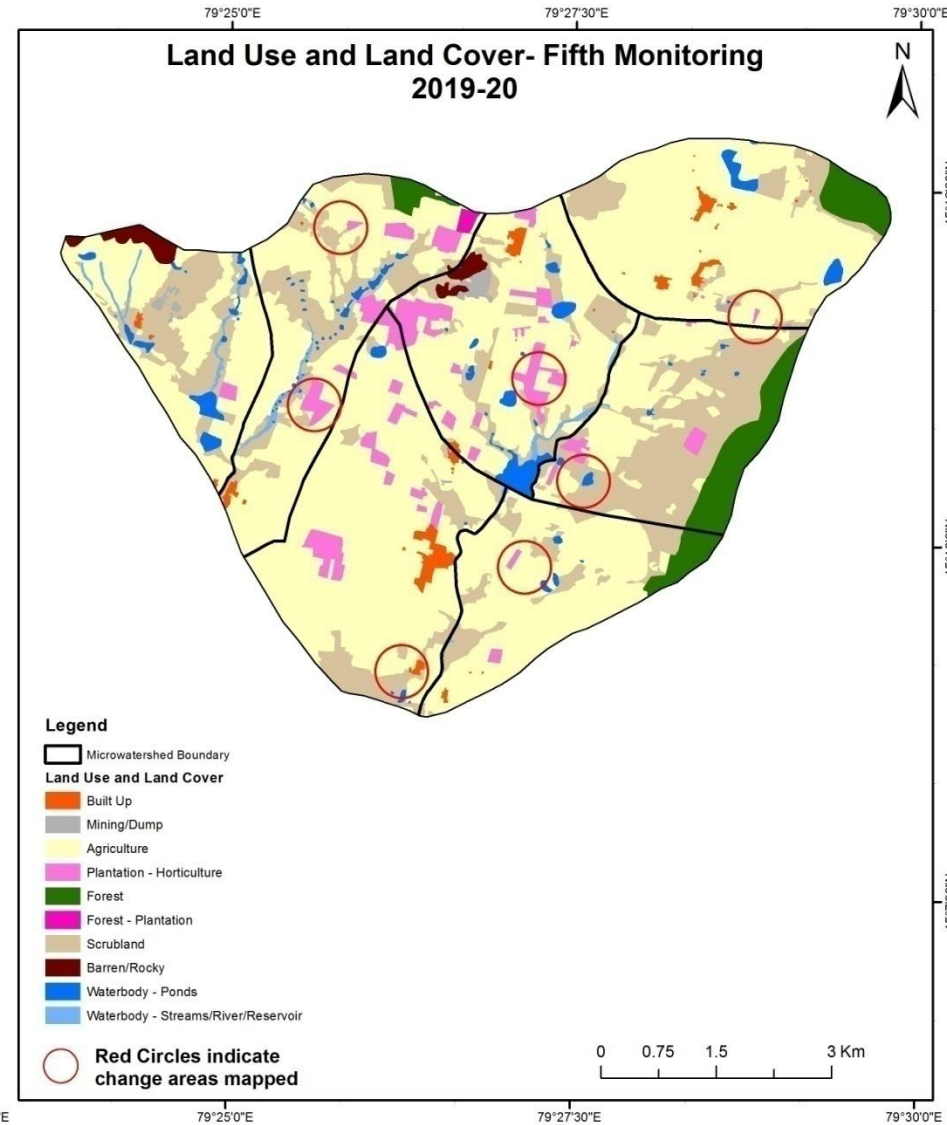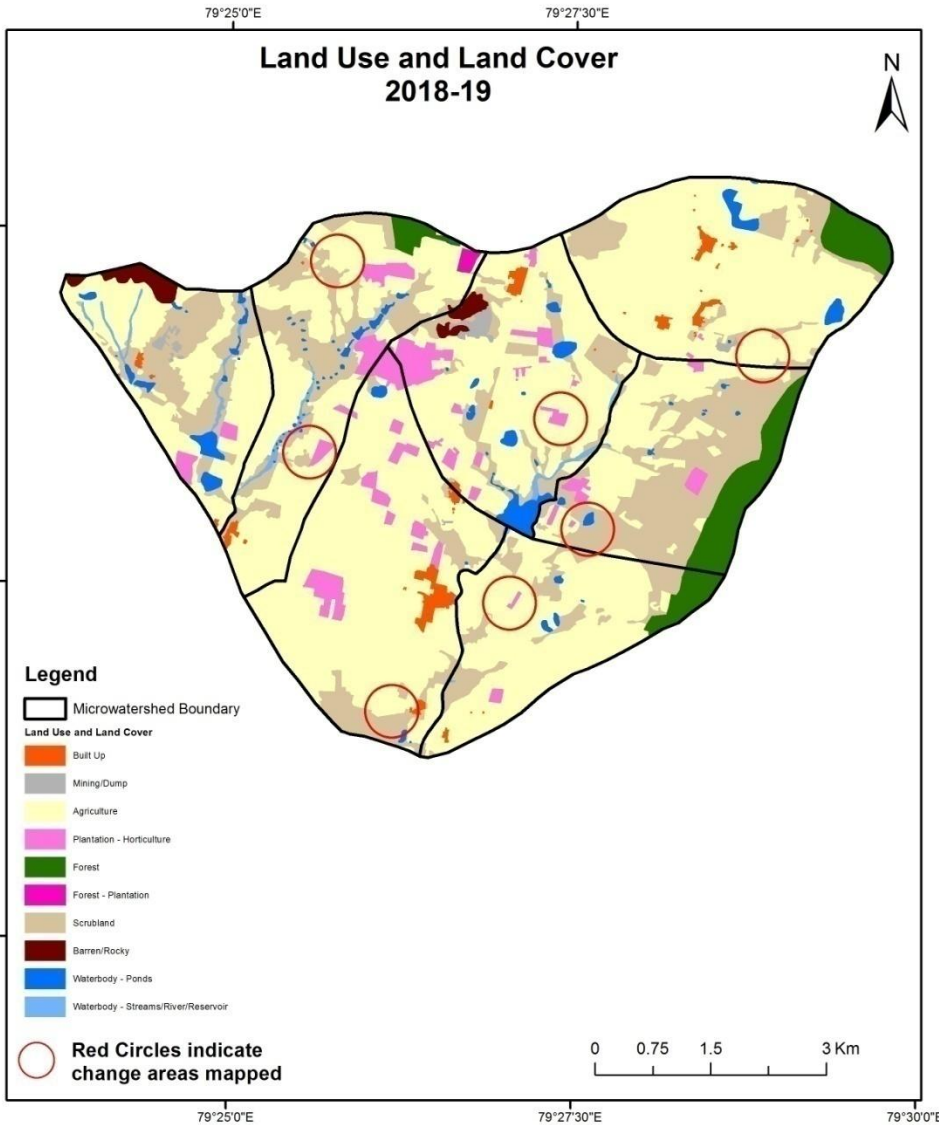
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

T0: 2011-12(79°25'28.679"E 15°10'38.042"N)
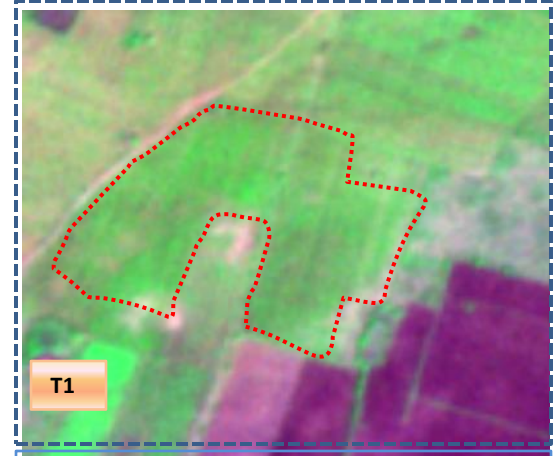
T1: 24th October 2015

Scrub to water body
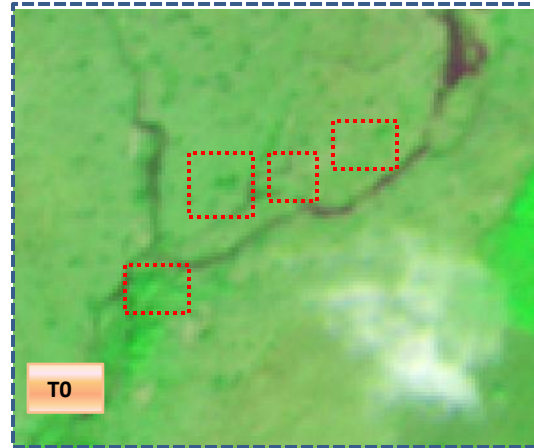
T0: 2011-12 (79°25'40.252"E 15°11'23.11"N)

T1: 24th October 2015

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

Scrub to water body

T0: 2011-12(79°26'7.181"E 15°11'55.68"N)

T1: 24th October 2015

Scrub to Agriculture

T0: 2011-12(79°28'4.269"E 15°11'14.62"N)

T1: 24th October 2015

Table showing change matrix depicting Land cover transitions during study period-2011-12 to 2015-16

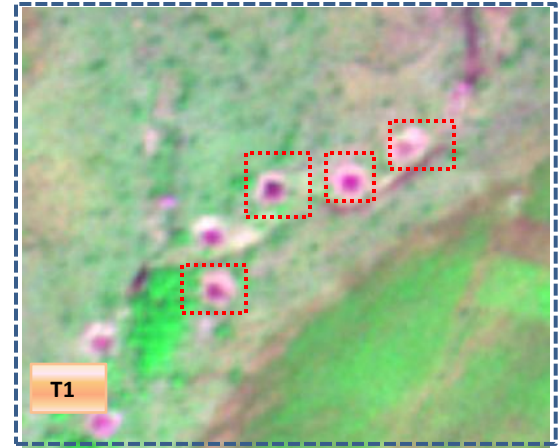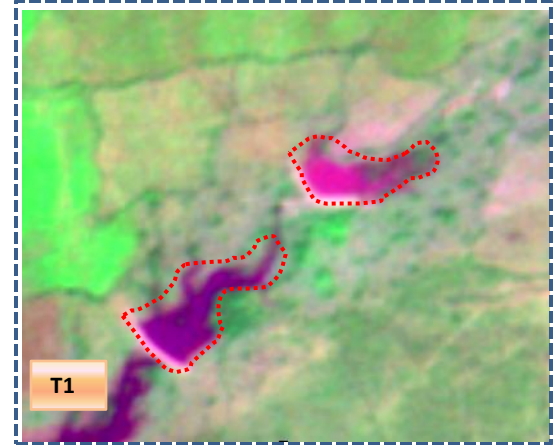| Land cover	Monitoring period (T1)										Units in Hectares
T0	Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	44.30										44.30
Mining/dump											
Agriculture	5.05		2176.96	156.13						0.36	2338.51
Plantation Horticulture	0.06		27.08	89.59							116.72
Forest			0.44		209.91	24.40				0.36	235.11
Forest Plantation											
Barren Rocky		0.23					44.43				44.66
Scrub	3.40	11.01	385.39	25.42				1460.69		18.43	1904.34
Waterbody-Streams/River									42.21	2.77	44.98
Waterbody – Ponds			6.37							71.76	78.13
Grand Total	52.80	11.24	2596.24	271.14	209.91	24.40	44.43	1460.69	42.21	93.68	4806.74

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

- In T1 419 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 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	52.80										52.80
Mining/dump		11.24									11.24
Agriculture	0.41		2472.81	113.45					5.04	4.52	2596.24
Plantation Horticulture			134.50	136.63							271.14
Forest			2.95		206.96						209.91
Forest Plantation						24.40					24.40
Barren Rocky		0.97					43.46				44.43
Scrub		0.40	236.92	7.31				1204.04	1.88	10.13	1460.69
Waterbody-Streams/River									42.21		42.21
Waterbody – Ponds										93.68	93.68
Grand Total	53.21	12.62	2847.19	257.40	206.96	24.40	43.46	1204.04	49.13	108.34	4806.74

• 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 123 ha of the agriculture area has decreased and it is converted into Built-up, plantation and water body in T2.

• In T2 377 ha of the agriculture area has increased from plantations, 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-2016-17 to 2017-18

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	Units in Hectares Grand Total
Built up	53.21										53.21
Mining/dump		12.62									12.62
Agriculture			2792.10	54.85						0.24	2847.19
Plantation Horticulture			132.79	124.61							257.40
Forest					206.96						206.96
Forest Plantation			18.21			6.19					24.40
Barren Rocky							43.46				43.46
Scrub		1.22	117.91					1084.90			1204.04
Waterbody-Streams/River									49.13		49.13
Waterbody – Ponds			7.29							101.05	108.34
Grand Total	53.21	13.84	3068.30	179.46	206.96	6.19	43.46	1084.90	49.13	101.28	4806.74

• 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 55 ha of the agriculture area has decreased and it is converted into plantations and water body in T3.

• In T3 258 ha of the agriculture area has increased from plantations, forest 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-2017-18 to 2018-19

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
Built up	53.21										**53.21**
Mining/dump		13.84									**13.84**
Agriculture	1.48	1.45	3002.38	62.41						0.58	**3068.30**
Plantation Horticulture			53.38	126.08							**179.46**
Forest					206.96						**206.96**
Forest Plantation						6.19					**6.19**
Barren Rocky		2.47					40.99				**43.46**
Scrub	1.01	3.86	41.04					1038.65		0.34	**1084.90**
Waterbody-Streams/River									49.13		**49.13**
Waterbody – Ponds										101.28	**101.28**
Grand Total	**55.71**	**21.62**	**3096.81**	**188.48**	**206.96**	**6.19**	**40.99**	**1038.65**	**49.13**	**102.21**	**4806.74**

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 T3 65 ha of the agriculture area has decreased and it is converted into Built-up, mining/dump, plantations and water body in T4.

• In T4 94 ha of the agriculture area has increased from plantations 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 T4	Monitoring period (T5) Built up	Mining/dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	55.71										55.71
Mining/dump		21.62									21.62
Agriculture	0.11		3053.76	42.94							3096.81
Plantation Horticulture			35.22	153.26							188.48
Forest					206.96						206.96
Forest Plantation						6.19					6.19
Barren Rocky							40.99				40.99
Scrub		1.28	29.55					1007.67		0.15	1038.65
Waterbody-Streams/River									49.13		49.13
Waterbody – Ponds										102.21	102.21
Grand Total	55.82	22.90	3118.52	196.20	206.96	6.19	40.99	1007.67	49.13	102.36	4806.74

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 T4 43 ha of the agriculture area has decreased and it is converted into Built-up and plantations in T5.

•In T5 64 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 73 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 257, 250, 221, 28 & 21 Hectares From T0 to T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 780 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 79 ha of the Plantation/Horticulture area in between 2011-12 (T0) & 2019-20 (T5) years.

6. There is a decrease of 896 Hectares in Scrubland area as compared between 2011-12 (T0) & 2019-20 (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.