MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -27/2010-11
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**

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-27/2010-11, YSR Kadapa District of   Andhra Pradesh.   The total geographical area of the project is 6,156 ha. It comprises of 9 micro watersheds.

- In the project area 435 Drishti photos were uploaded showing 60 check dams/Rock fill dam, 40 New activities of boulder removal, farm ponds, dug out pits etc, and remaining showing other activities.

- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and 60 check dams and drainage treatments with 0.16 ha increase in the area.

- Major percentage i.e. 41 % is covered by the agriculture, 37 % is covered by scrubland, 4.5 % is forest area and remaining by other land use classes.

- The study area falls in T Sundupalle Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 6,156 ha. It comprises of 9 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
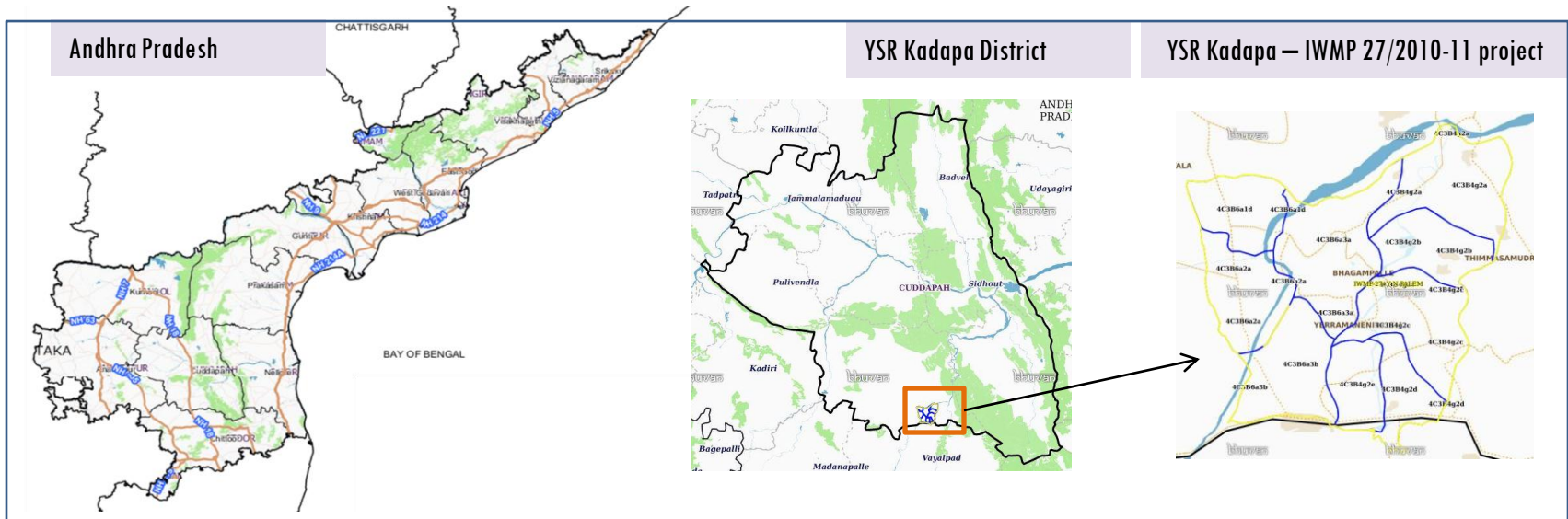
- YSR Kadapa has a semi-arid climate, with hot and dry conditions for most of the year. Summers start in late February and peak in May with average high temperatures around the 38 °C range and it reaches around 44 °C to 45 °C .

- 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	435
4	Detailed Project Report		

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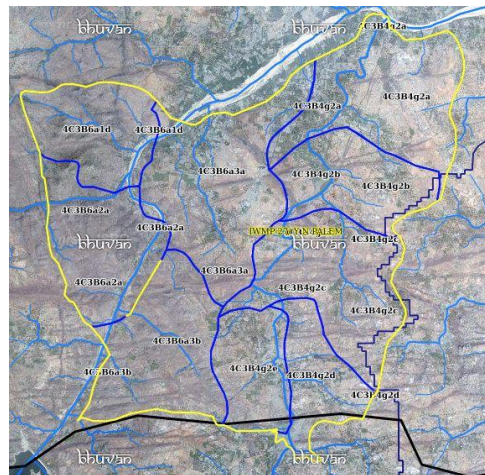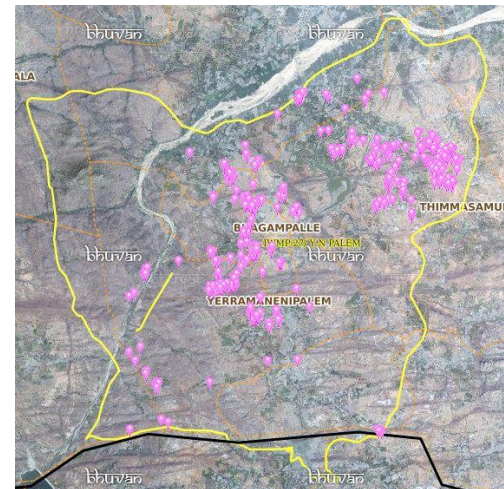

Legend

 Drainage (1:10000 Scale)

 MWS Boundary

 Project Boundary

Natural Color Composite overlaid with Drishti Points

Drishti Upload Status

Classification of the Activities

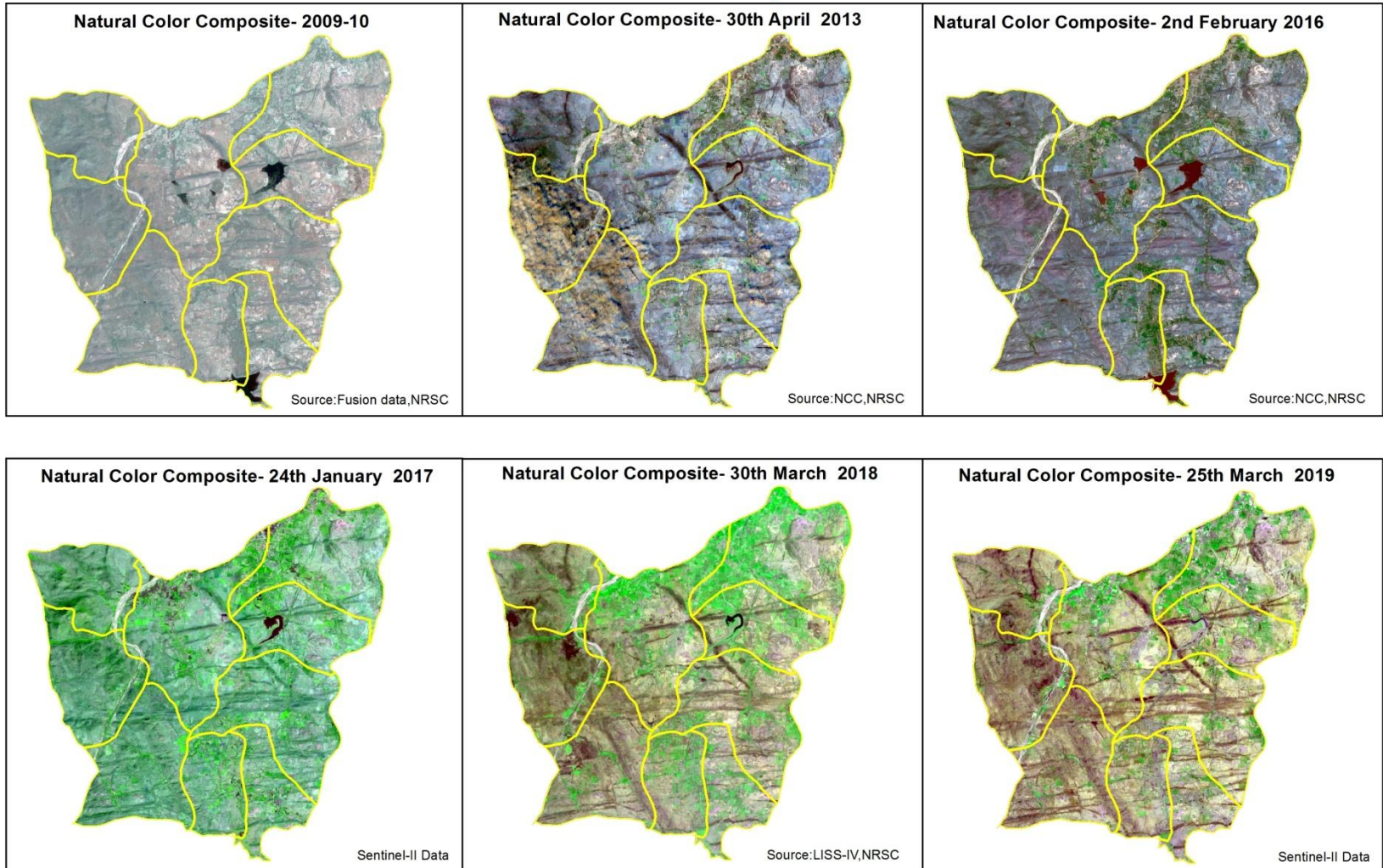| Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agriculture/horticulture	200	200
2	Afforestation	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	46	40
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	63	60
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	25	20
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	74	40
18	Others	100	75
	TOTAL	**538**	**435**

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.

Natural Colour Composite (NCC)-2010-11 to 2018-19

Natural Color Composite- 2009-10
Source:Fusion data,NRSC

Natural Color Composite- 30th April 2013
Source:NCC,NRSC

Natural Color Composite- 2nd February 2016
Source:NCC,NRSC

Natural Color Composite- 24th January 2017
Sentinel-II Data

Natural Color Composite- 30th March 2018
Source:LISS-IV,NRSC

Natural Color Composite- 25th March 2019
Sentinel-II Data

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-27/2010-11

| T0: 2010-11 | T1: 21 December 2013 | Drishti Sl no. 2258129   MWS :4C3B4g2a |

Afforestation
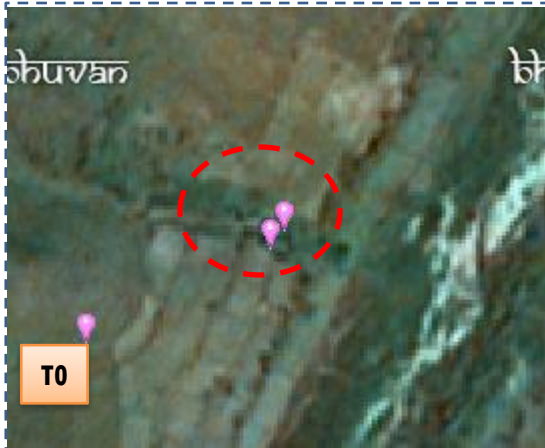
| T0: 2010-11 | T1: 21 December 2013 | Drishti Sl no. 2388572   MWS :4C3B6a2a |

Checkdam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-27/2010-11
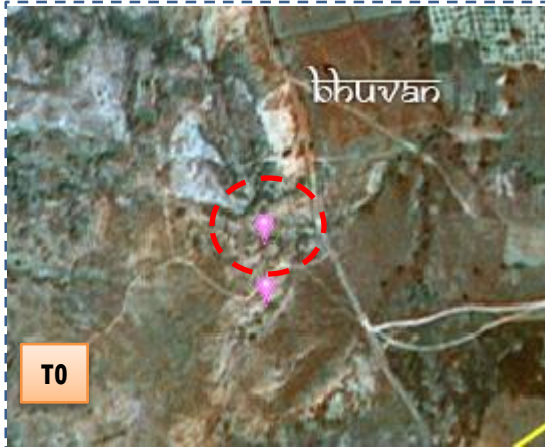

T0: 2010-11	T1: 21 December 2013	Drishti Sl no. 2250395 MWS :4C3B4g2b

Bund Plantation (Land Development)
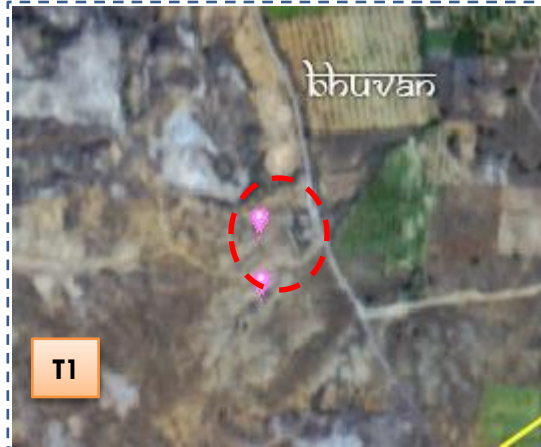
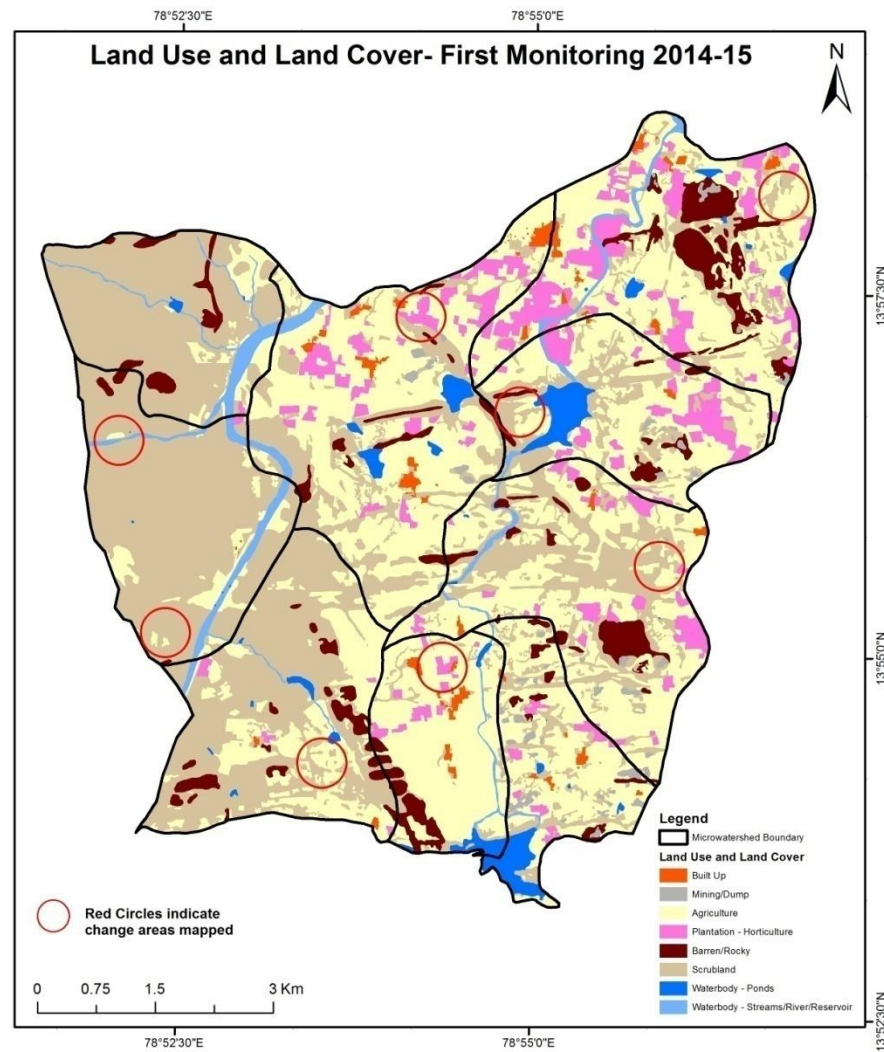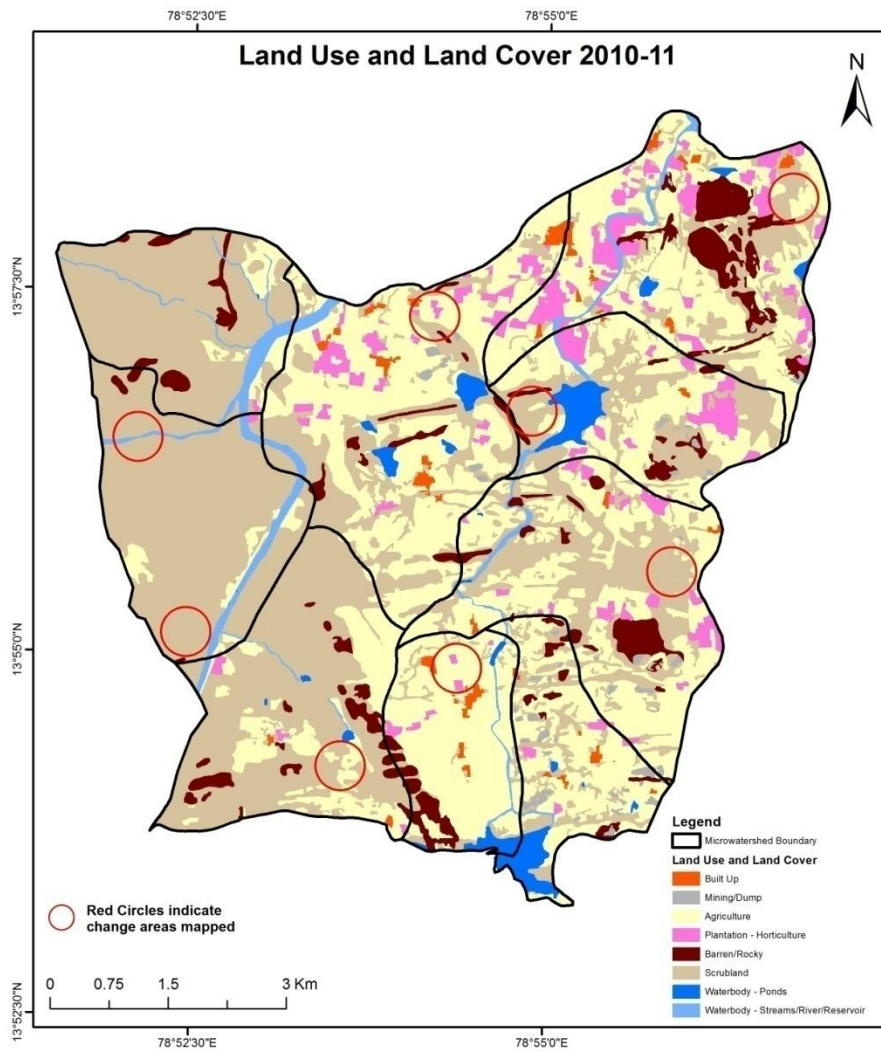|		
T0: 2010-11	T1: 21 December 2013	Drishti Sl no. 2121518 MWS : 4C3B4g2b

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 T0 (2010-11) and row represents the T5 (2018-19)
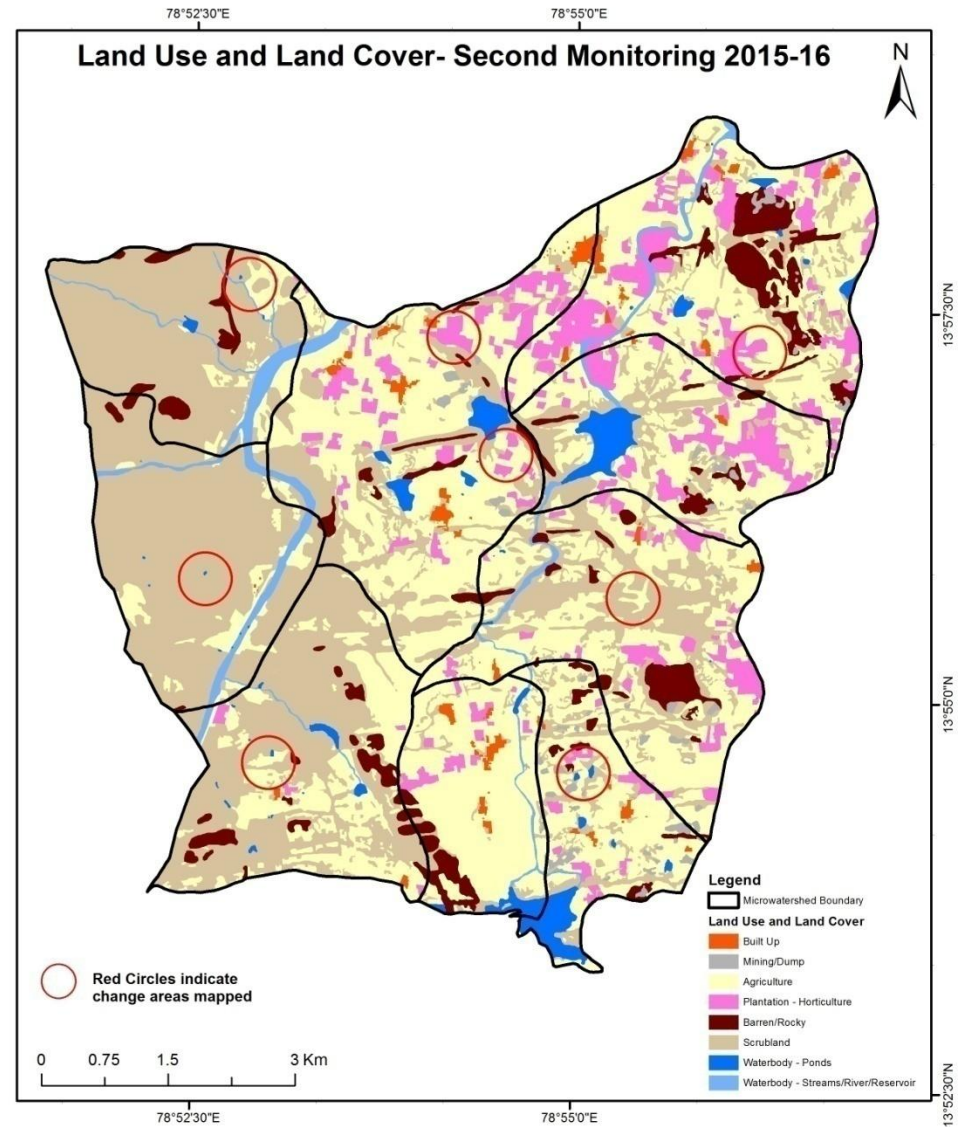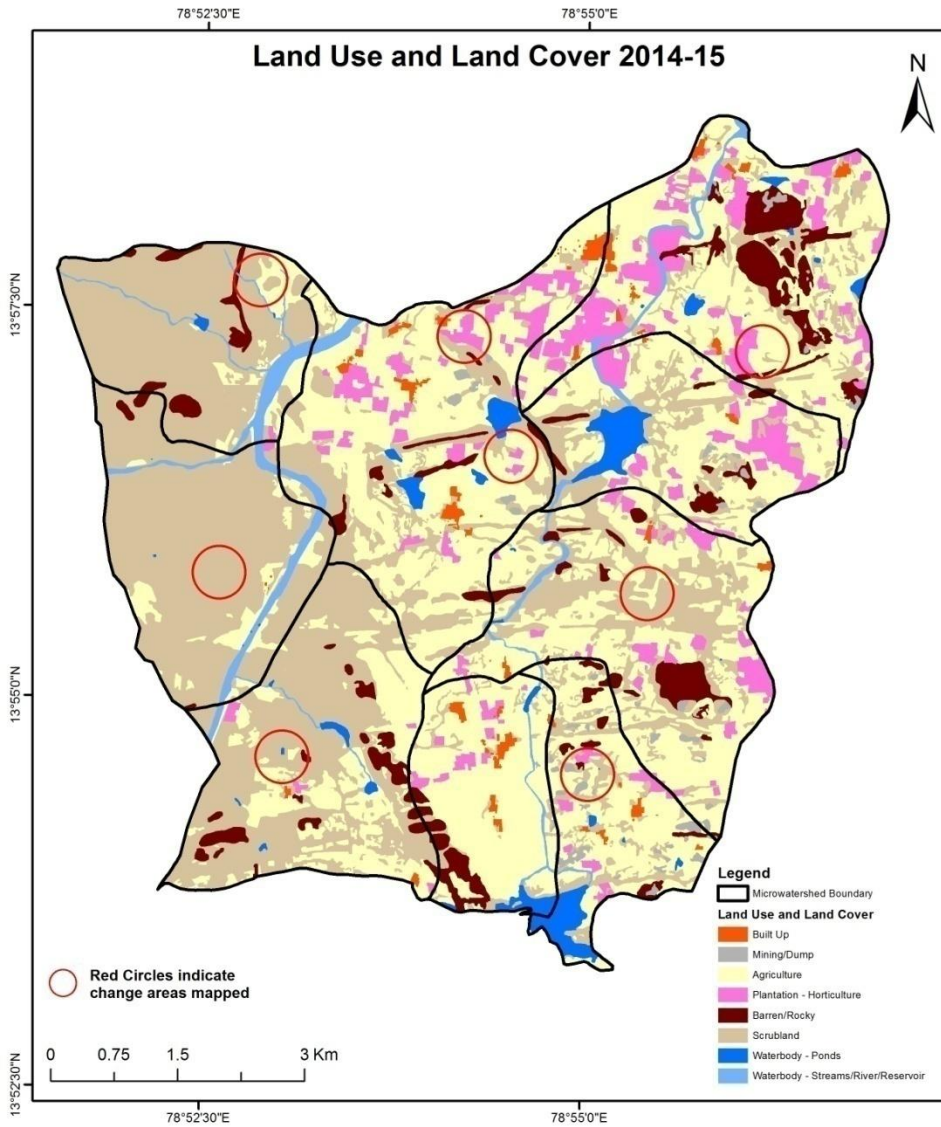
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2010-11 to 2014-15)
Scale: 1:10000

Land Use and Land Cover 2010-11

N

78°52'30"E   78°55'0"E

13°57'30"N
13°55'0"N
13°52'30"N

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

0   0.75   1.5   3 Km

Land Use and Land Cover- First Monitoring 2014-15

N

78°52'30"E   78°55'0"E

13°57'30"N
13°55'0"N
13°52'30"N

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

0   0.75   1.5   3 Km

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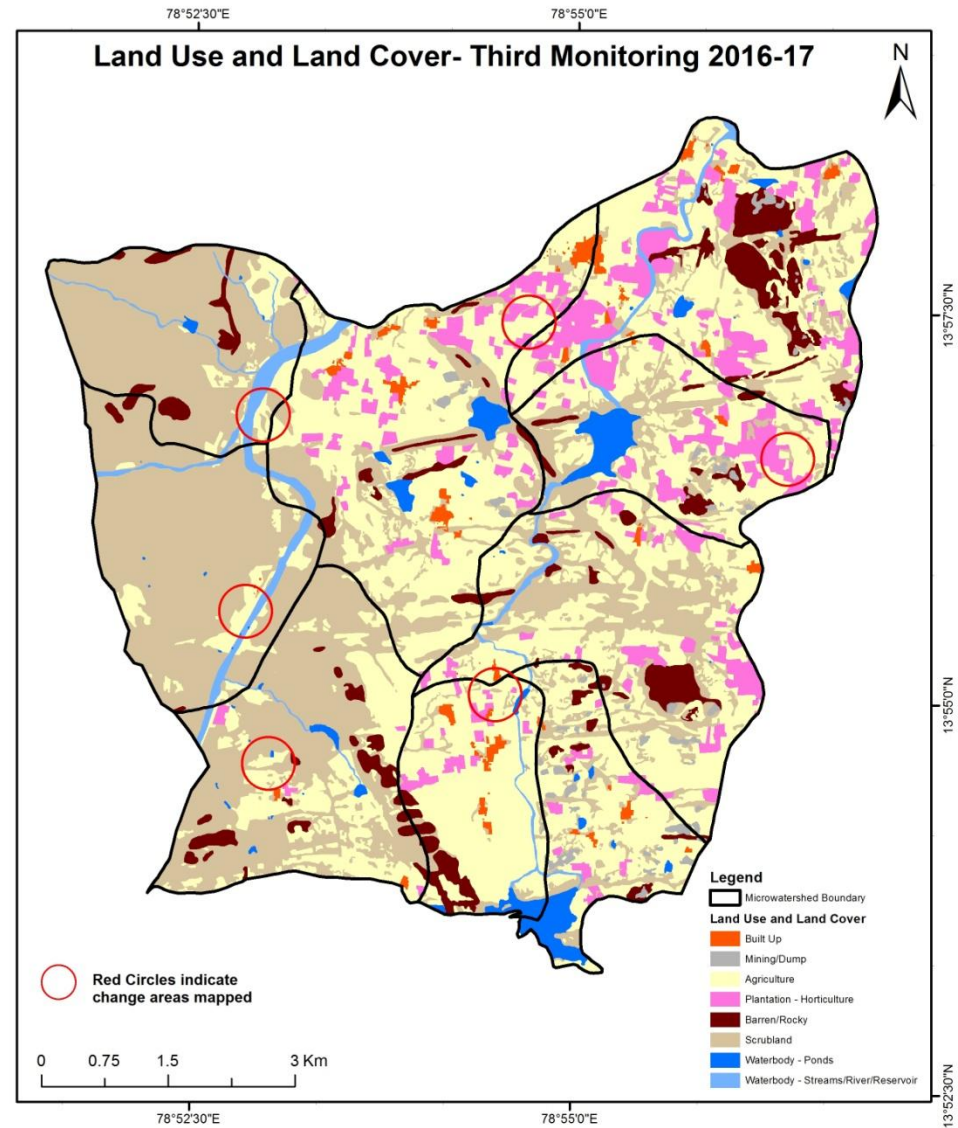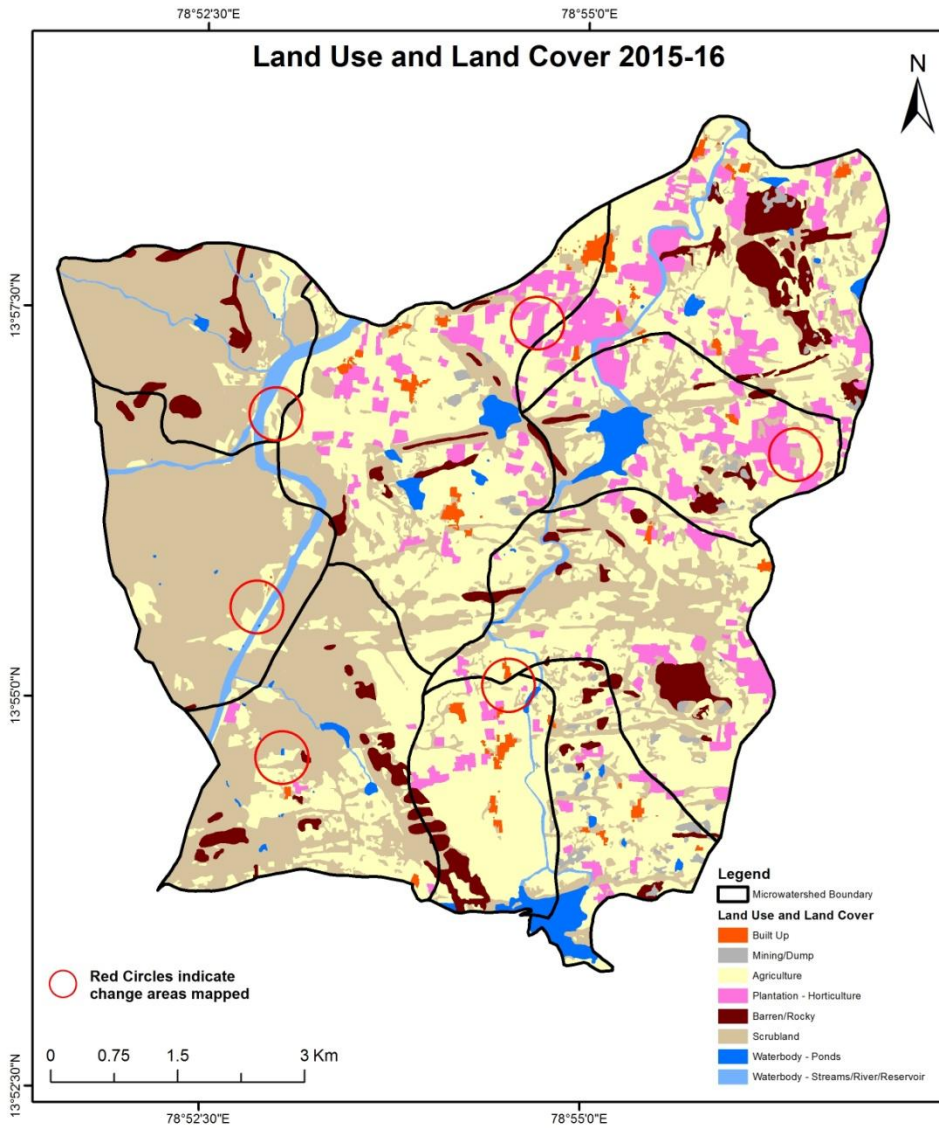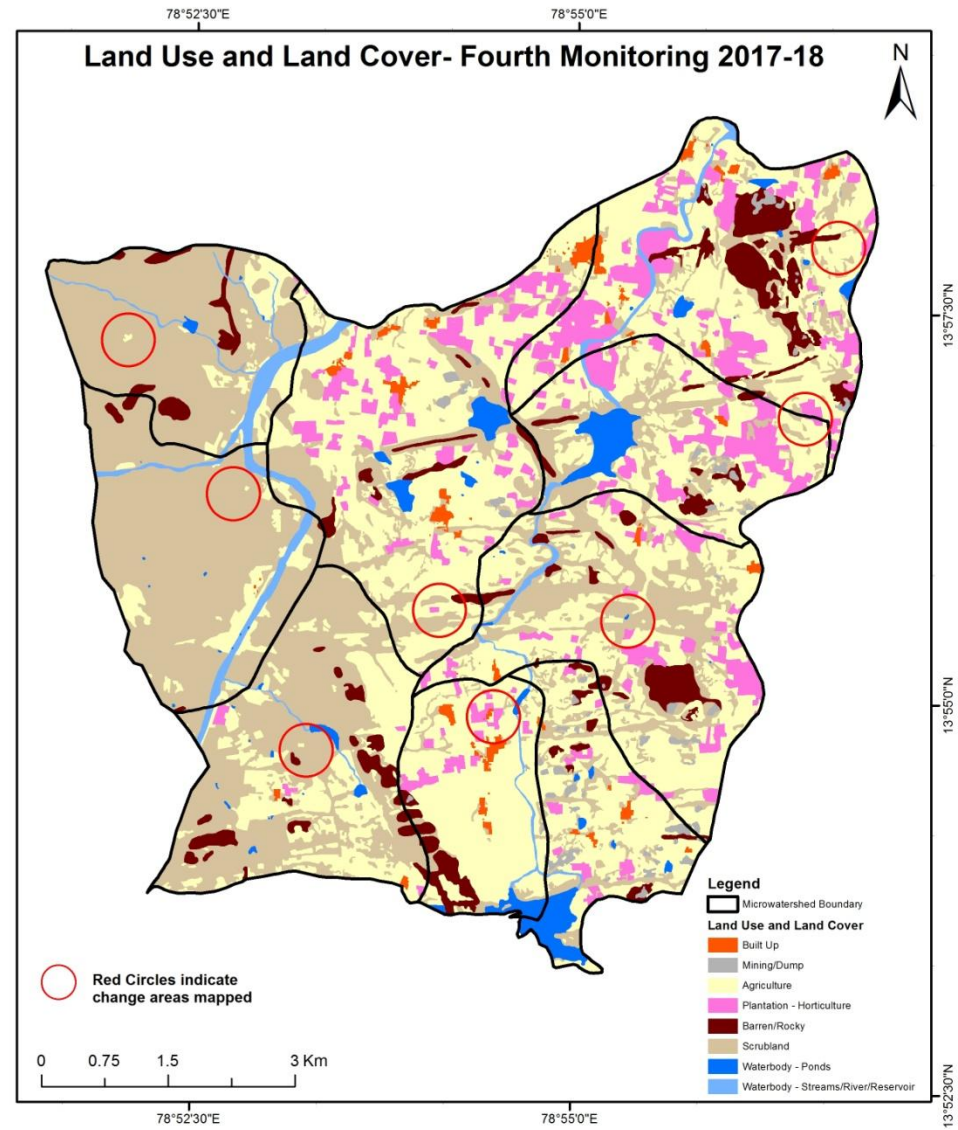## Scale: 1:10000

Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)
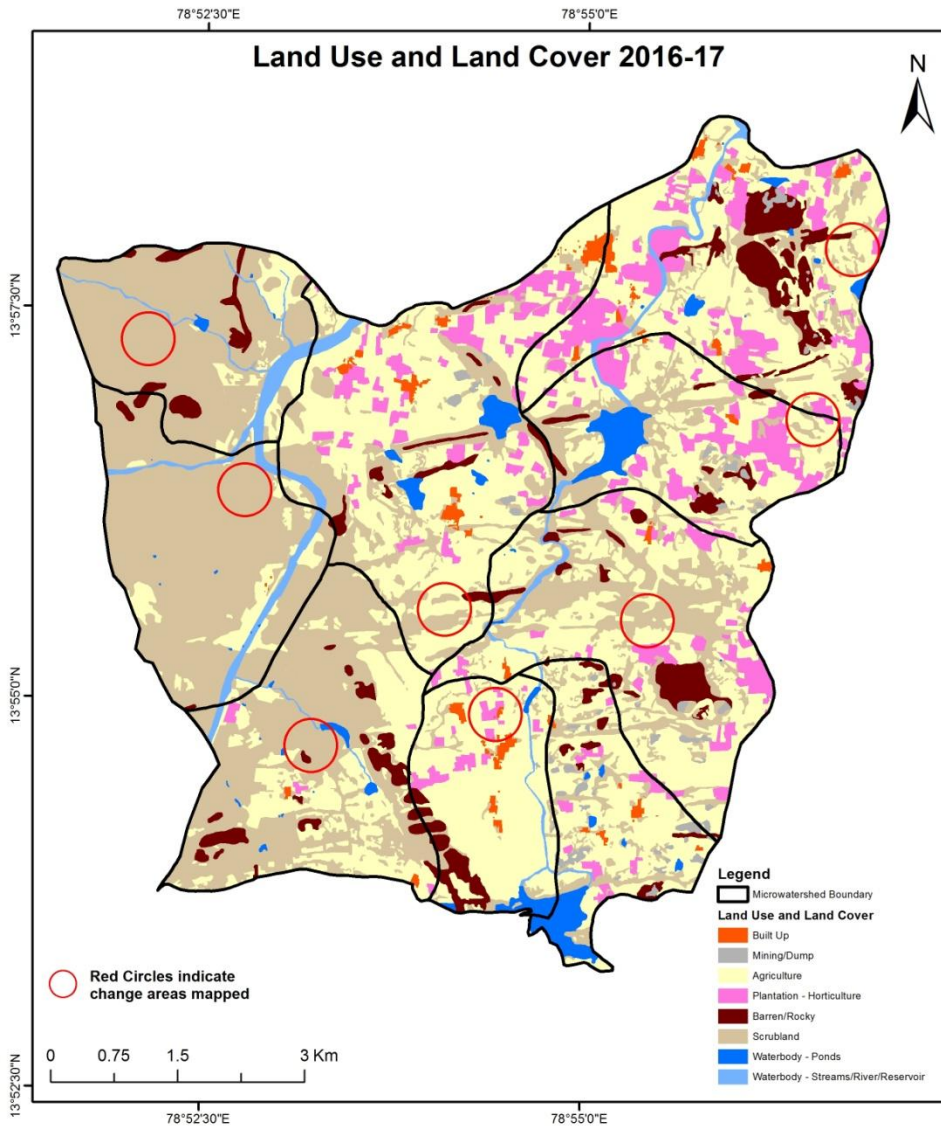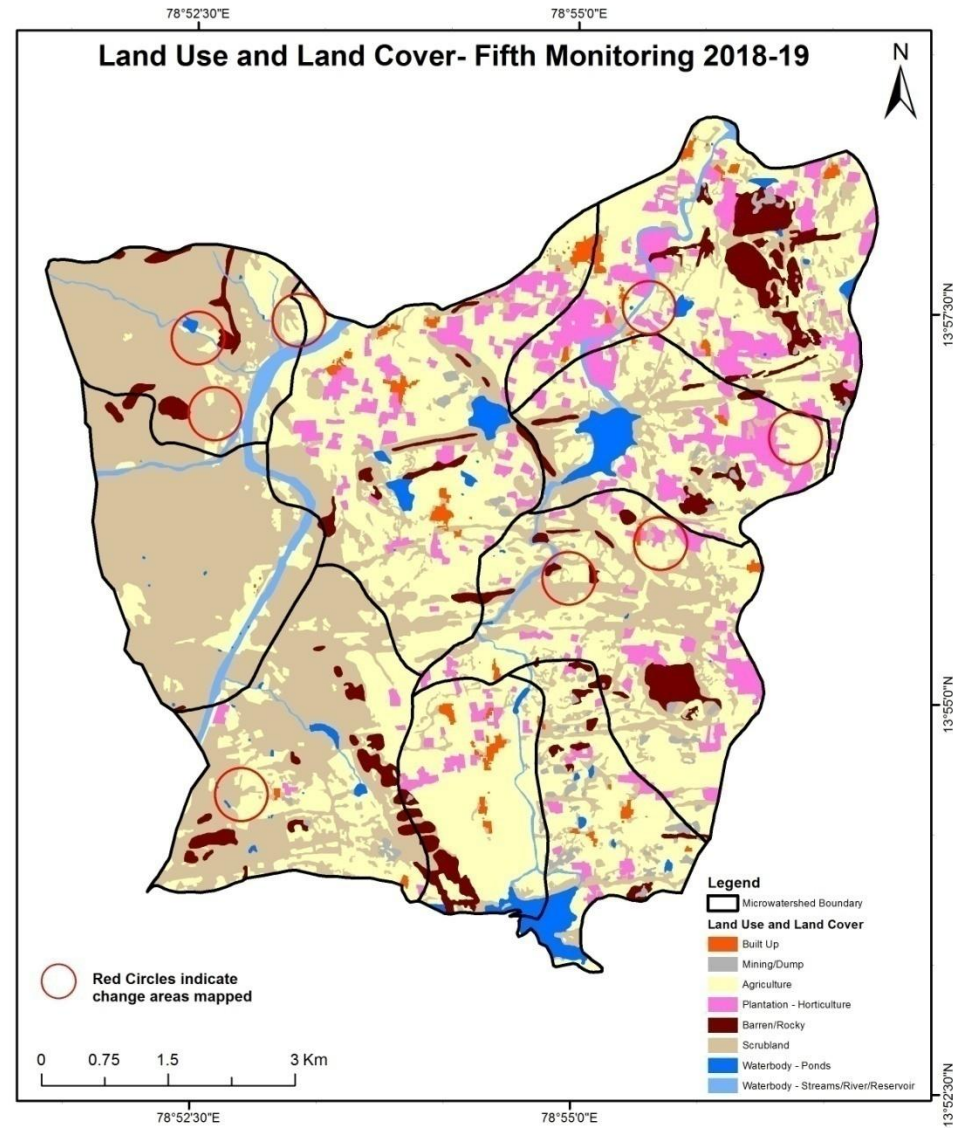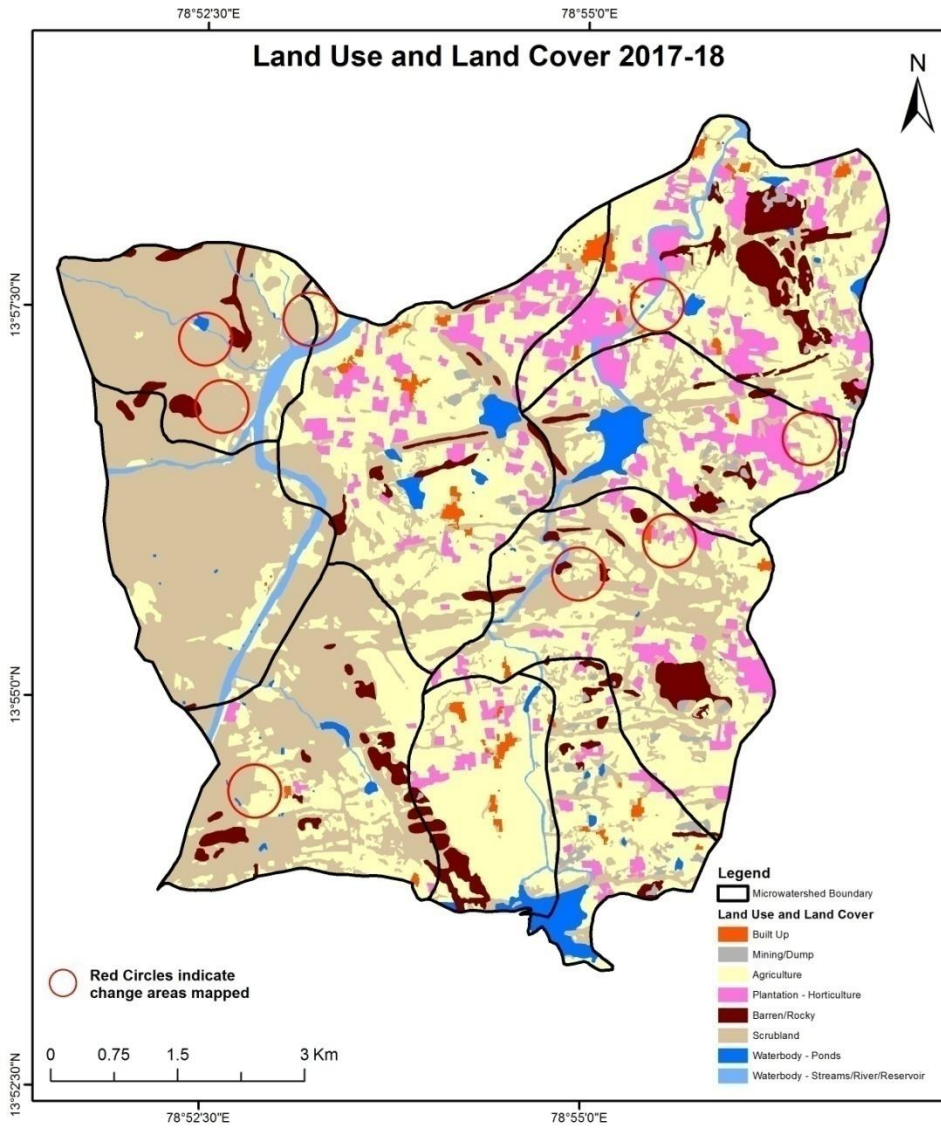## Scale: 1:10000

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

Land Use and Land Cover 2017-18

Land Use and Land Cover- Fifth Monitoring 2018-19

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

0   0.75   1.5   3 Km

Land Use and Land Cover changes for Pre and Post treatment dates
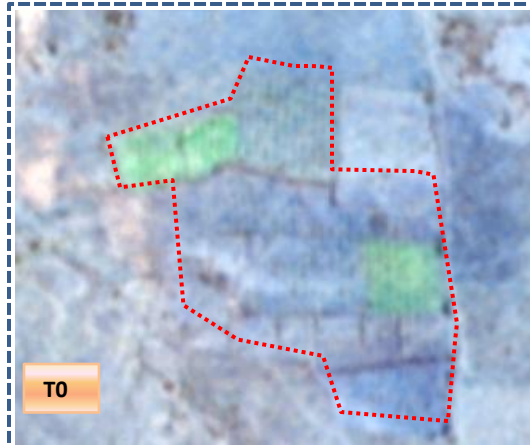
Agriculture to Plantation
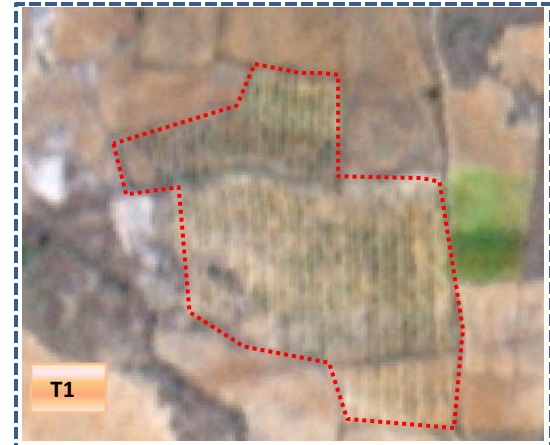

T0: 2014-15(78°56'9.558"E 13°57'16.493"N)
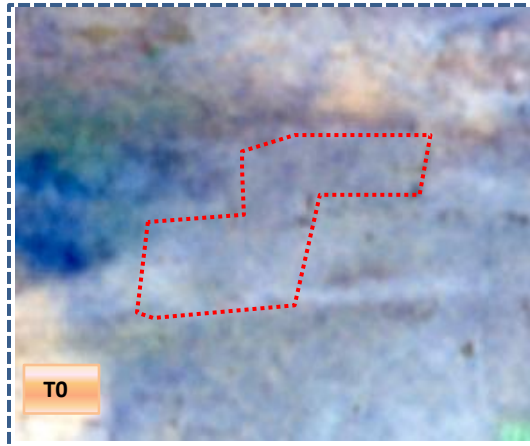
T1: 02 February 2016

Agriculture to Plantation

T0: 2014-15 (78°56'34.4"E 13°56'51.737"N)

T1: 02 February 2016

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

Scrub to Agriculture

T0

T1

T0: 2014-15(78°55'49.844"E 13°55'36.543"N)

T1: 02 February 2016

Scrub to Agriculture

T0

T1

T0: 2014-15(78°56'46.718"E 13°57'52.712"N)

T1: 02 February 2016

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

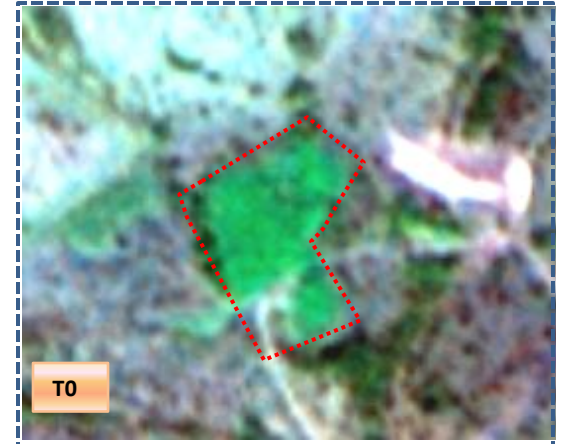Agriculture to Water body

T0

T0: 2009-10

T0

T0: 21 December 2013

Scrub to Agriculture

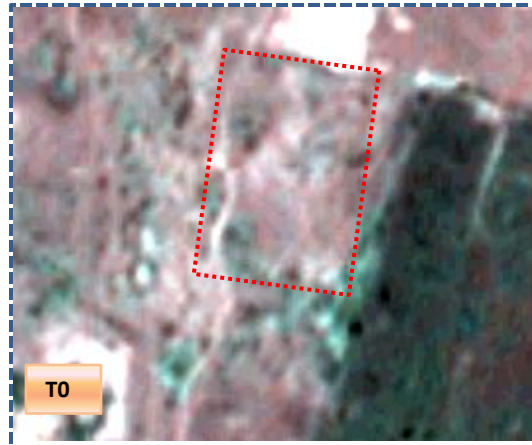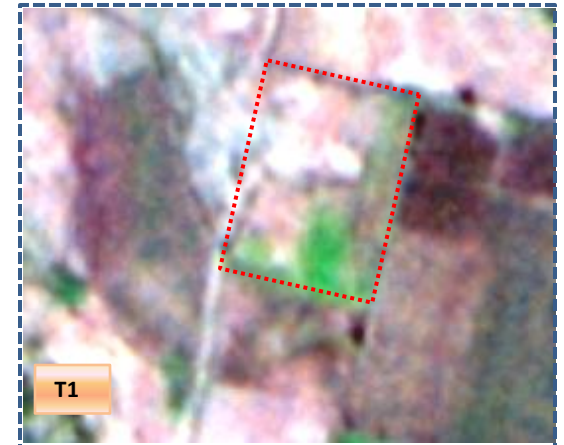T0

T0: 2009-10

T0

T0: 21 December 2013

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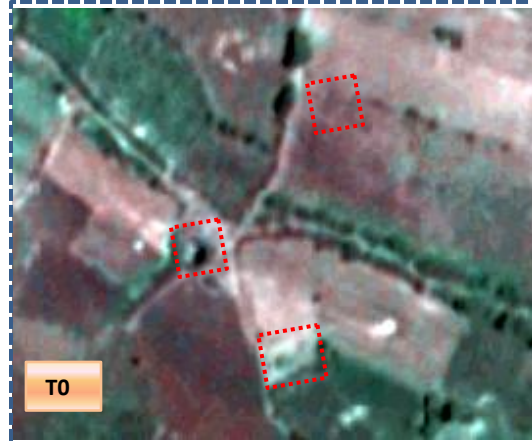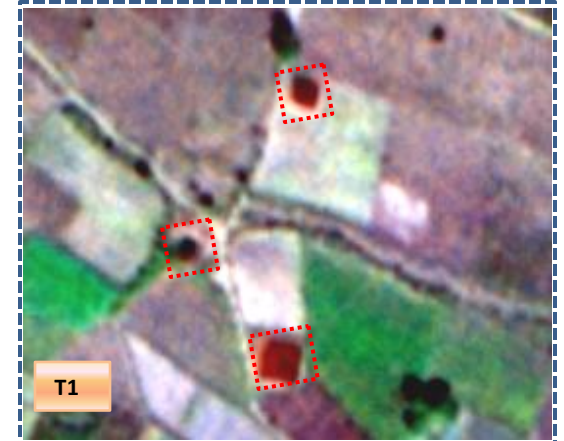

Scrub to Agriculture

T0

T1

T0: 2009-10

T1:21 December 2013

Agriculture to Water body

T0

T1

T0: 2009-10

T1: 21 December 2013

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

Land cover T0	Monitoring period (T1) 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	62.04										62.04
Mining/dump		45.47									45.47
Agriculture	4.53	0.80	2275.23	136.49						0.18	2417.23
Plantation Horticulture	0.10		9.06	289.07						0.15	298.39
Forest											
Forest Plantation											
Barren Rocky		3.53					330.67				334.21
Scrub	0.72	0.91	326.90	0.87				2397.59		7.46	2734.45
Waterbody- Streams/River									140.55	0.07	140.63
Waterbody – Ponds								0.44		123.91	124.35
Grand Total	67.39	50.71	2611.20	426.44			330.67	2398.02	140.55	131.78	6156.77

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

• In T1 335 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-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	67.39										**67.39**
Mining/dump		50.71									**50.71**
Agriculture	1.71		2515.97	89.85						3.67	**2611.20**
Plantation Horticulture	0.61		16.81	409.02							**426.44**
Forest											
Forest Plantation											
Barren Rocky		1.10					329.57				**330.67**
Scrub	0.12	1.81	22.09					2371.58		2.42	**2398.02**
Waterbody-Streams/River			0.32						140.23		**140.55**
Waterbody – Ponds										131.78	**131.78**
Grand Total	**69.83**	**53.62**	**2555.19**	**498.87**			**329.57**	**2371.58**	**140.23**	**137.88**	**6156.77**

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

- In T2 39 ha of the agriculture area has increased from plantation, scrubland and water body 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 (Units in Hectares)
Built up	69.83										69.83
Mining/dump		53.62									53.62
Agriculture	0.01		2548.59	6.58							2555.19
Plantation Horticulture			5.56	493.31							498.87
Forest											
Forest Plantation											
Barren Rocky		0.86					328.71				329.57
Scrub		0.33	5.91					2365.33			2371.58
Waterbody-Streams/River									140.23		140.23
Waterbody – Ponds										137.88	137.88
Grand Total	69.84	54.81	2560.07	499.89			328.71	2365.33	140.23	137.88	6156.77

• 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 06 ha of the agriculture area has decreased and it is converted into Built-up and plantation in T3.

• In T3 11 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)									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	69.84										**69.84**
Mining/dump		54.81									**54.81**
Agriculture	0.15		2527.65	29.48				2.76		0.03	**2560.07**
Plantation Horticulture	0.04		0.49	499.36							**499.89**
Forest											
Forest Plantation											
Barren Rocky		1.16					327.55				**328.71**
Scrub	0.03	0.68	25.95					2338.33		0.34	**2365.33**
Waterbody-Streams/River									140.23		**140.23**
Waterbody – Ponds										137.88	**137.88**
Grand Total	**70.07**	**56.65**	**2554.10**	**528.84**			**327.55**	**2341.09**	**140.23**	**138.25**	**6156.77**

- 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 32 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrubland and water body in T4.

- In T4 26 ha of the agriculture area has 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

T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	70.07										70.07
Mining/dump		56.65									56.65
Agriculture			2530.64	23.35						0.11	2554.10
Plantation Horticulture			3.84	525.00							528.84
Forest											
Forest Plantation											
Barren Rocky		1.32					326.23				327.55
Scrub	0.16	3.96	38.62					2298.28		0.06	2341.09
Waterbody-Streams/River									140.23		140.23
Waterbody – Ponds										138.25	138.25
Grand Total	70.23	61.94	2573.10	548.35			326.23	2298.28	140.23	138.41	6156.77

Monitoring period (T5), 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 23 ha of the agriculture area has decreased and it is converted into plantation and water body in T4.

• In T5 42 ha of the agriculture area has increased from plantation 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 13 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 193, 04 & 19 Hectares From T0 to T1, T2-T3 & T4-T5 respectively and overall increase of 155 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 249 ha of the Plantation/Horticulture area has been increased between 2010-11 (T0) & 2018-19 (T5) years.

6. There is a decrease of 436 Hectares in Scrubland area as compared between 2010-11 (T0) & 2018-19 (T5) years.

7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.