

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

SRIKAKULAM -03/2009-10
Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad
January-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

- **EXECUTIVE SUMMARY**

01. STUDY AREA
02. SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS
03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

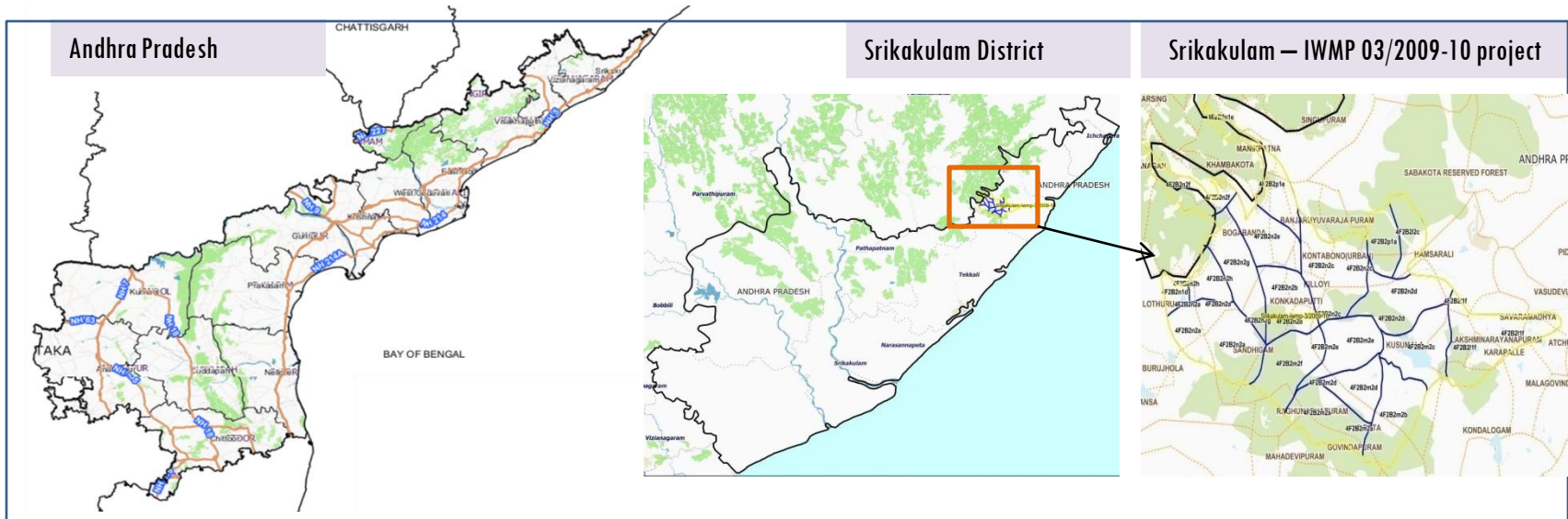
E X E C U T I V E S U M M A R Y

- 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-03/2009-10, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 5,091 ha. It comprises of 19 micro watersheds.
- In the project area 97 Drishti photos were uploaded showing 7 check dams/Rock fill dam, 13 Farm ponds, 2 Land developments of afforestation, horticulture/bund planting of teak, 22 block planting, 14 bund planting and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 13 new farm ponds or dug out pits and 7 check dams with 9.74 ha increase in the area.
- Major percentage i.e. 67.81 % is covered by the agriculture, 13.12 % is covered by plantation/horticulture, 7.97 % is covered by scrubland and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-03/2009-10

DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Mandasa Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 5091 ha. It comprises of 19 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2009-10 (T0) period (*Batch -1*) projects taking 2017-18 (T5) period satellite images



- The climate of the region is generally tropical, the mean maximum temperature is 30-40°C April-May and the mean minimum temperature is 17.4°C December-January during the summer season till the onset of the South-West monsoon the heat is oppressive and the day temperature is May sometimes go about 43°C.
- The rainfall in the region is considerably more in the hilly areas as compared to the plains, the annual normal rainfall is 1131 mm (i.e., 61% from South West monsoon and 2.2% from Northeast monsoon) is shared by summer showers and winter rains.

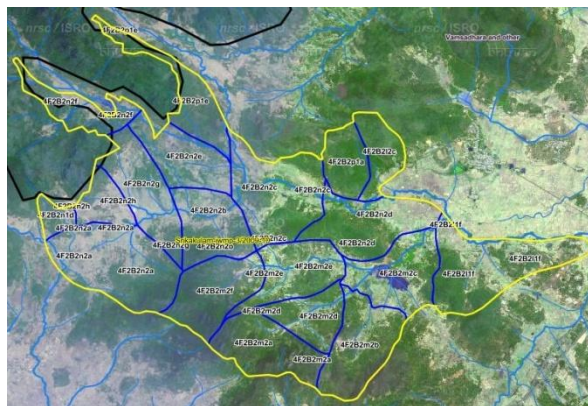
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			25-Dec-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-Dec-17
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	97
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

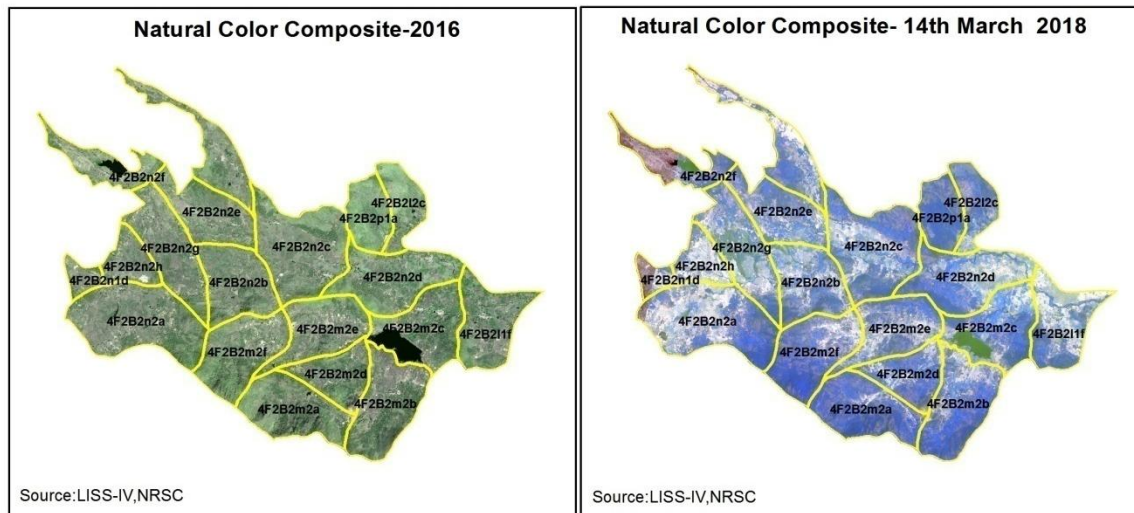
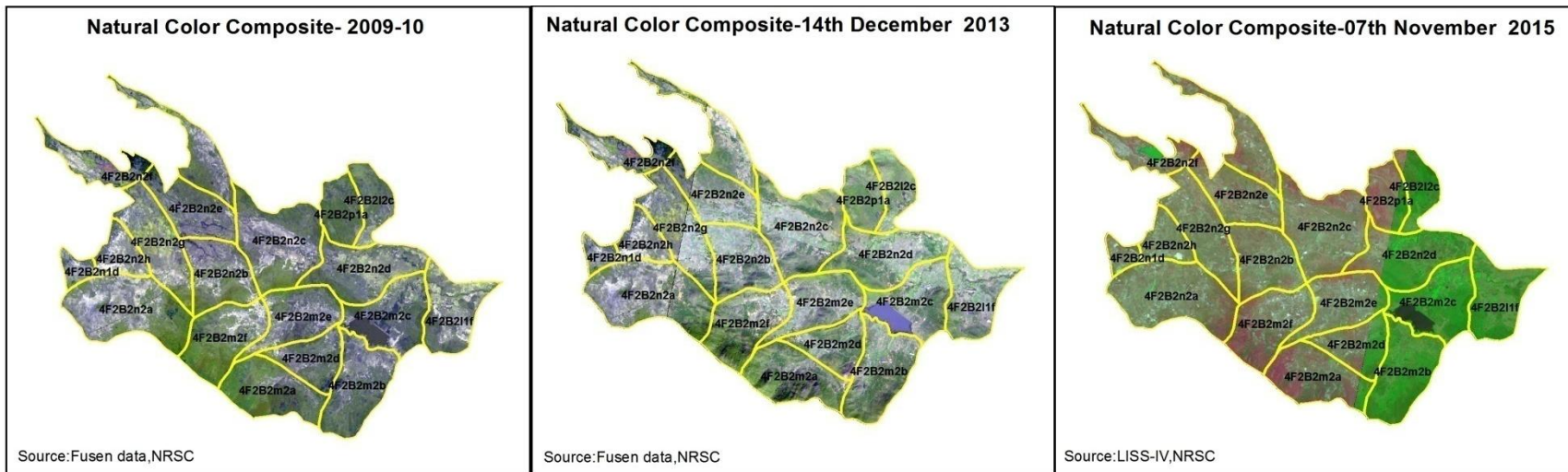
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Bunding	2	6
3	Block planting	23	15
4	Bund Planting/Horticulture	16	14
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	13	11
11	Civil work-Check dams /Rock fill dam	7	5
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	2	2
13	Land Developments (afforestation, horticulture and bund plantation of teak)	2	2
14	Production System and Micro-Enterprises	0	0
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	8	6
17	Entry Point Activity	0	0
18	Others	27	25
	TOTAL	100	86

MONITORING IN THE PROJECT AREA

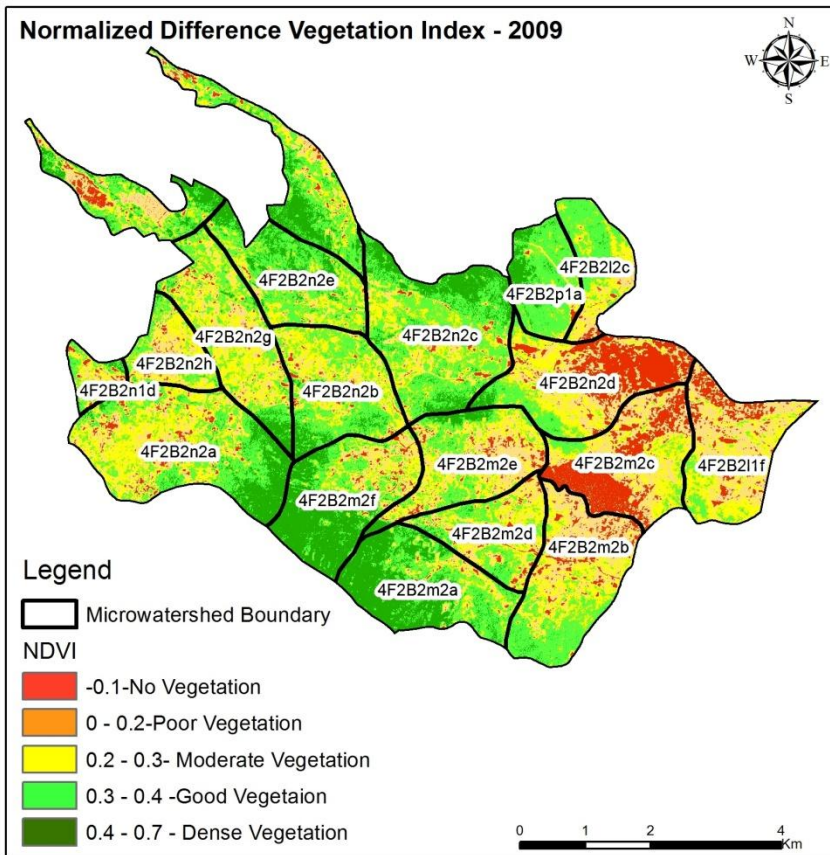
Site Wise Changes in the Project

- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 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.

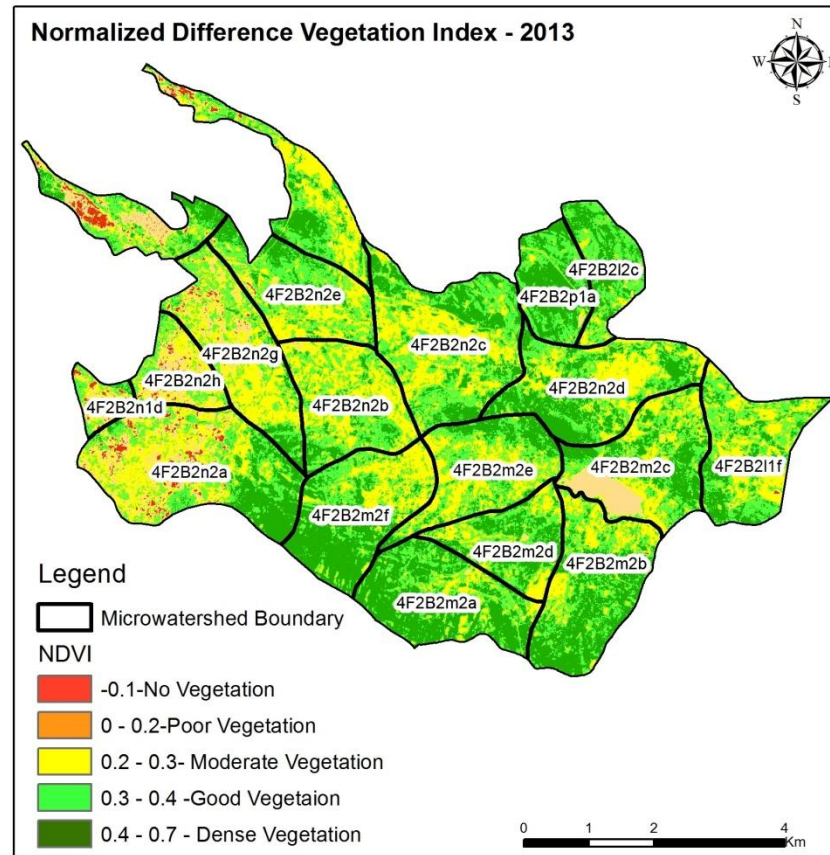
Natural Color Composite – 2009-10 to 2017-18



Changes in Vegetation Cover

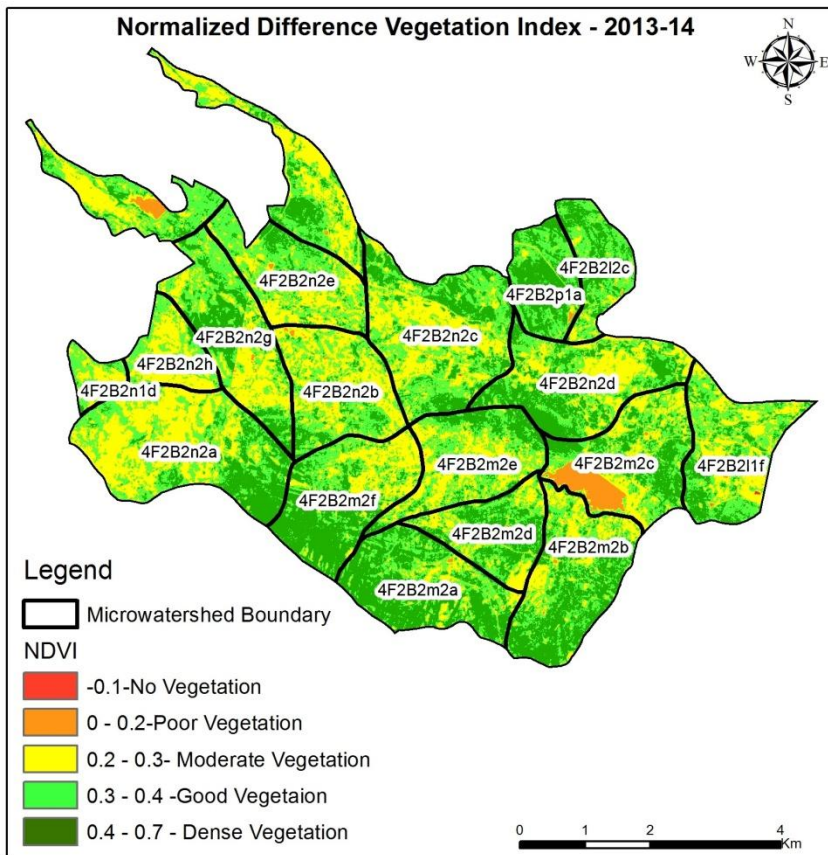


NDVI (2009-10)

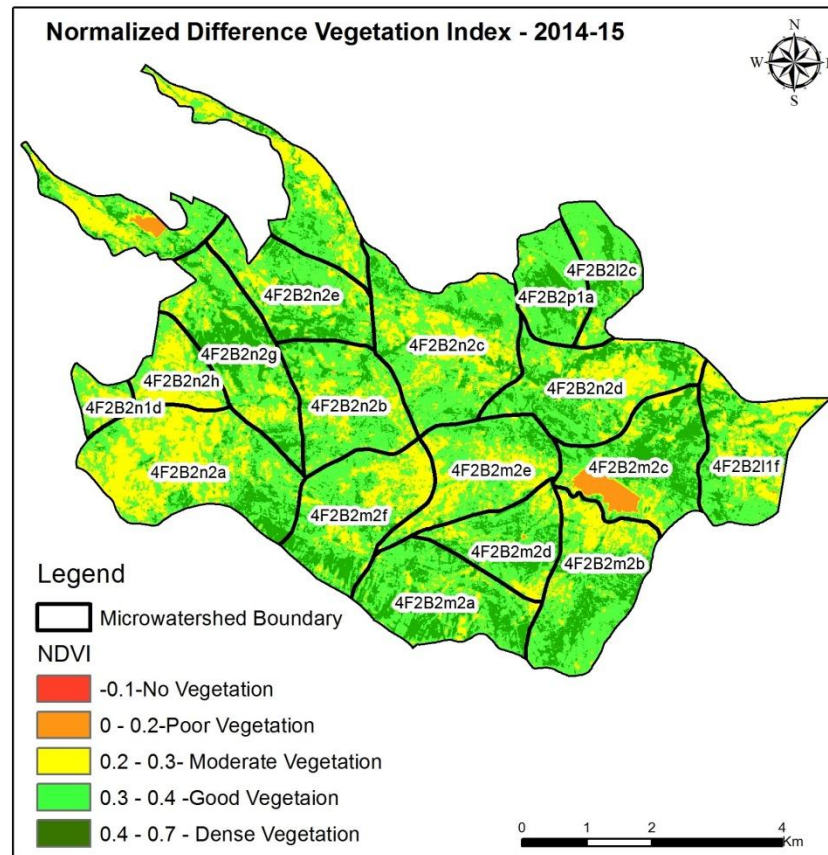


NDVI (12 October 2015)

Changes in Vegetation Cover



NDVI (2013-14)



NDVI (12 October 2015)

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-03/2009-10



T0:2009-10

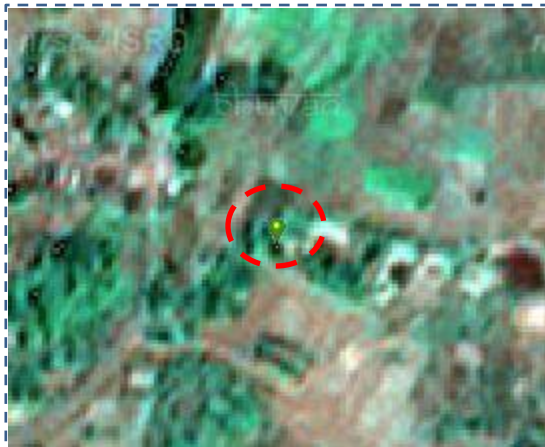


T1: 14 December 2013



Drishti SI no. 1643144 MWS :4F2B2n2c

Check dam



T0:2009-10



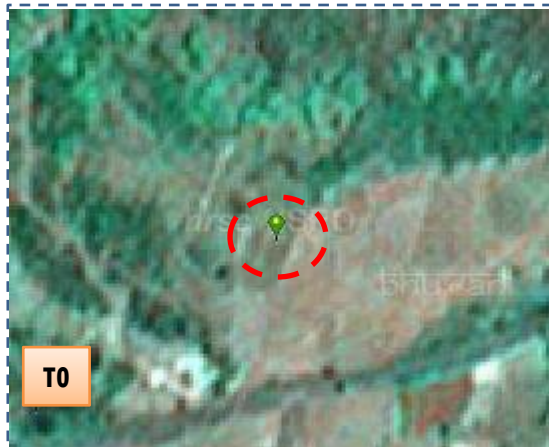
T1: 14 December 2013



Drishti SI no.2425574 MWS : 4F2B2m2e

Check dam

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-03/2009-10



T0

T0: 2009-10



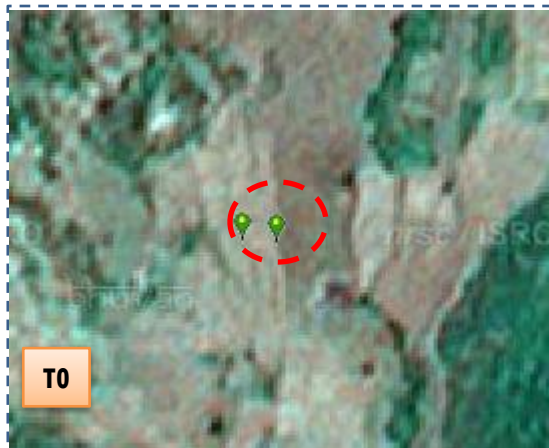
T1

T1: 14 December 2013



Drishti Sl no. 125181 MWS : 4F2B2n2c

Farm pond



T0

T0: 2009-10



T1

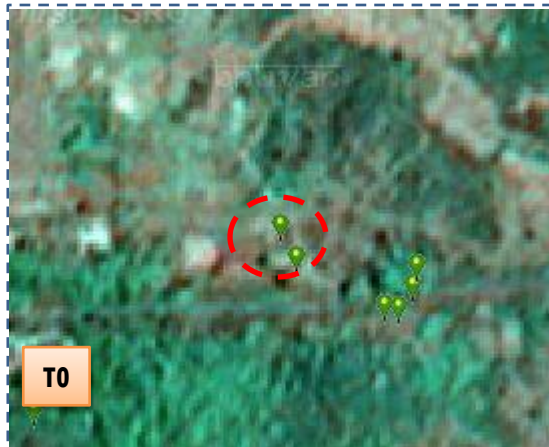
T1: 14 December 2013



Drishti Sl no. 2425597 MWS : 4F2B2n2d

Farm pond

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-03/2009-10



T0: 2009-10

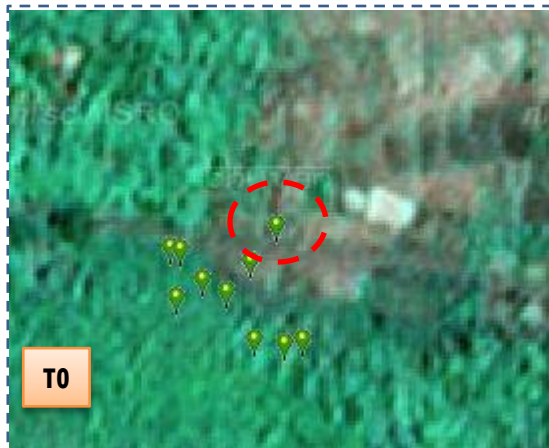


T1: 14 December 2013



Drishti Sl no. 2446861 MWS : 4F2B2n2b

Farm pond



T0: 2009-10



T1: 14 December 2013



Drishti Sl no. 2446861 MWS : 4F2B2m2e

Horticulture

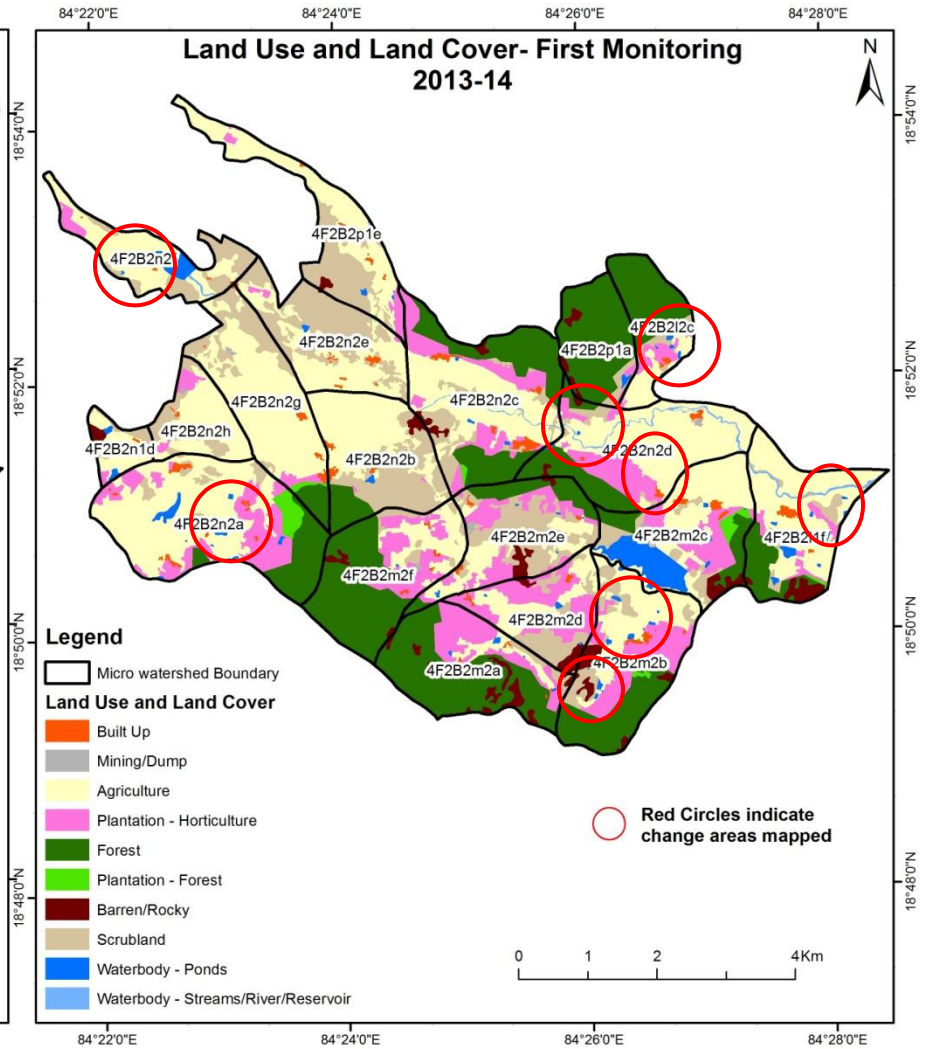
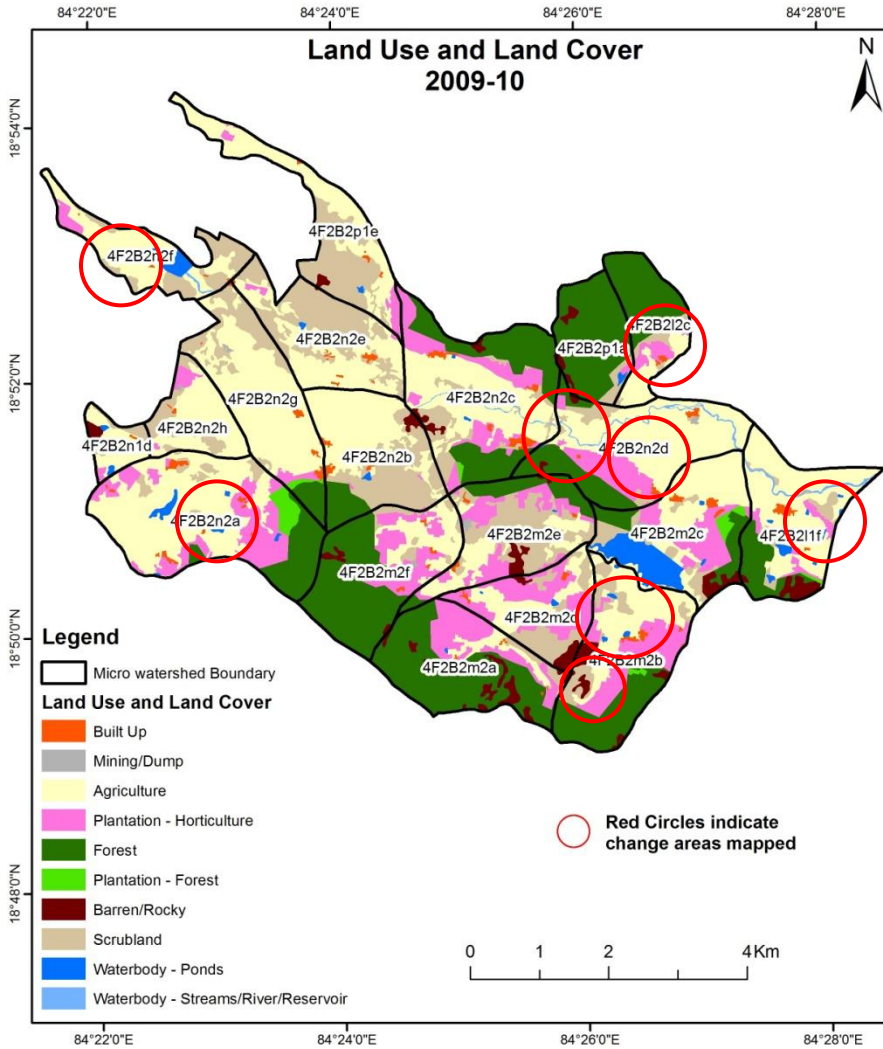
MONITORING IN THE PROJECT AREA

Land use and Land cover Changes in the Project

- Change in land use and land cover from 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 (2009-10) and row represents the T5 (2017-18)

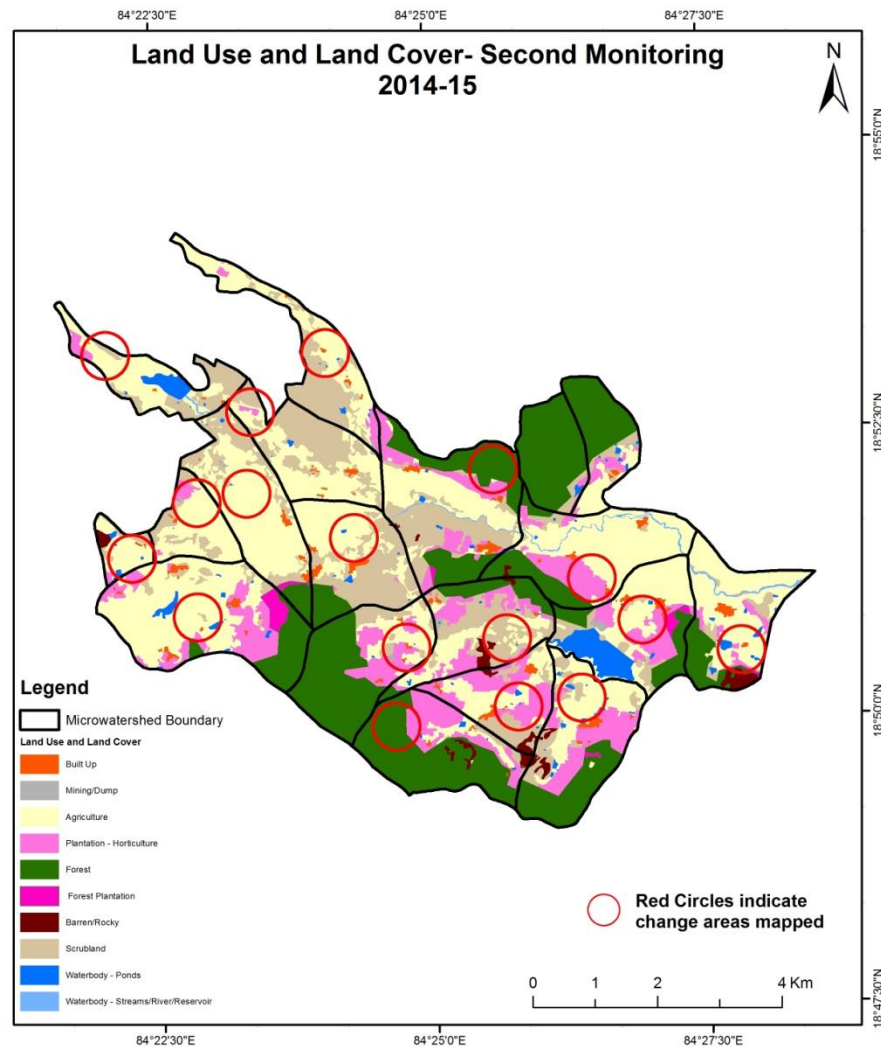
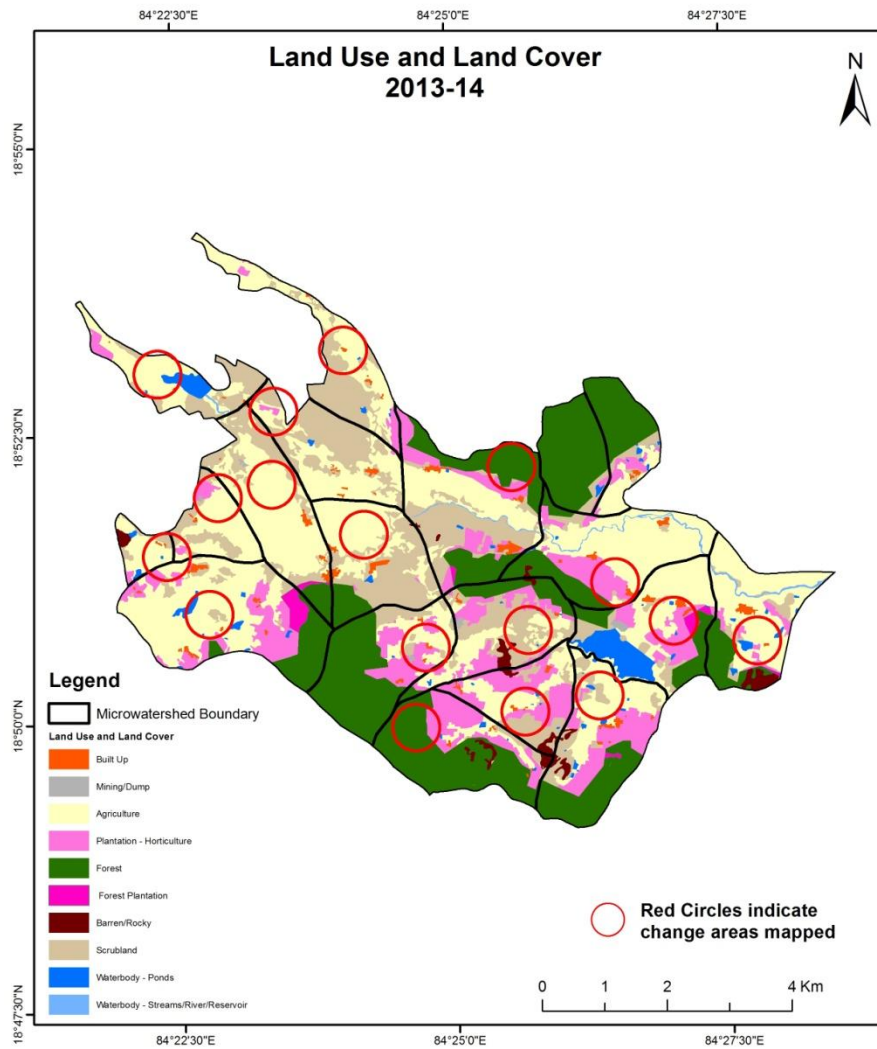
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



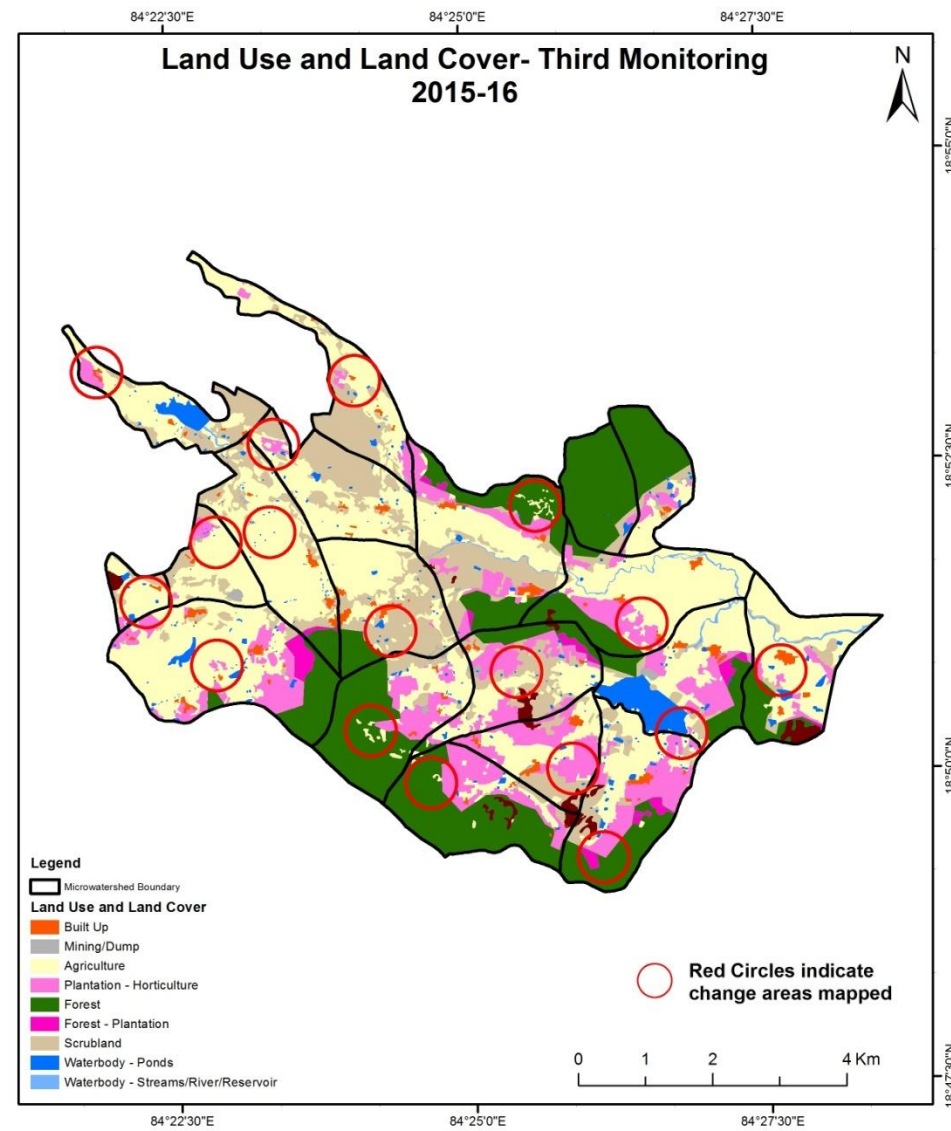
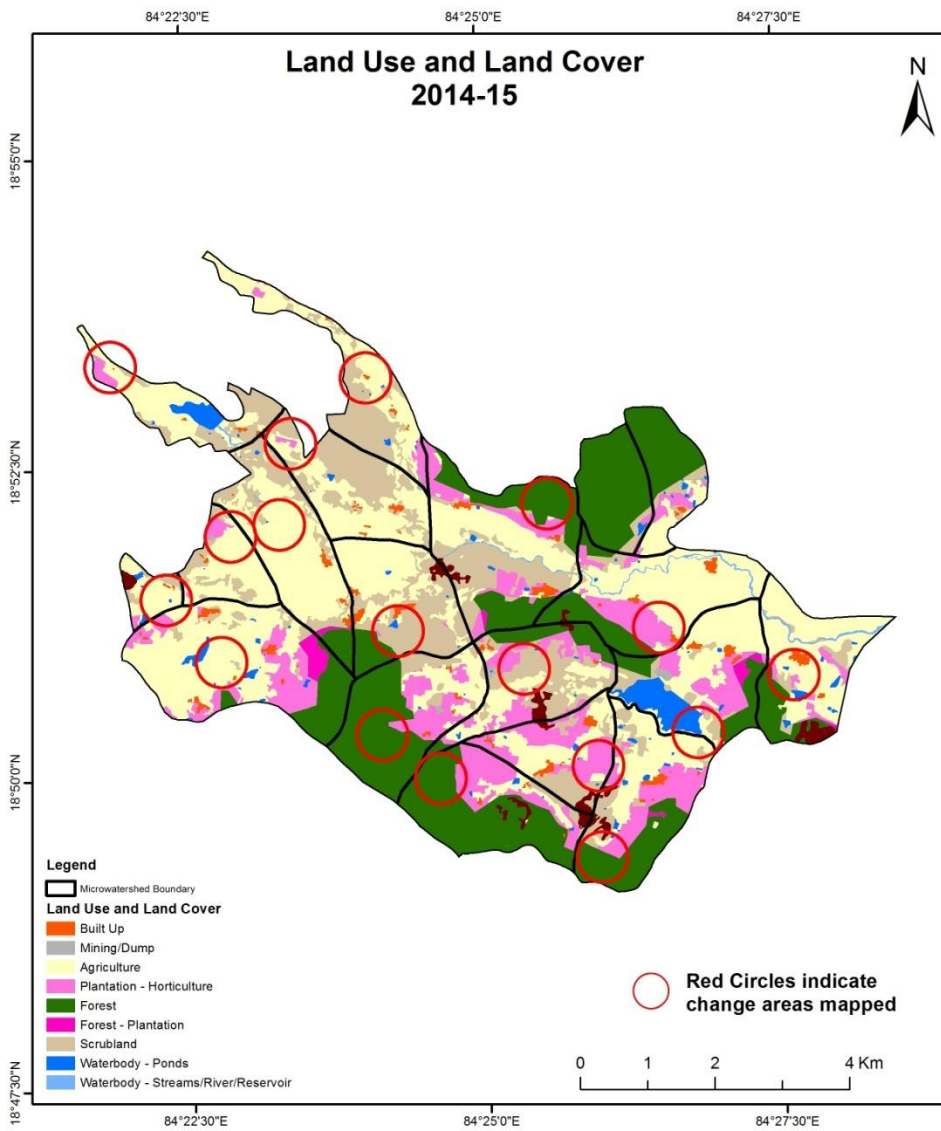
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



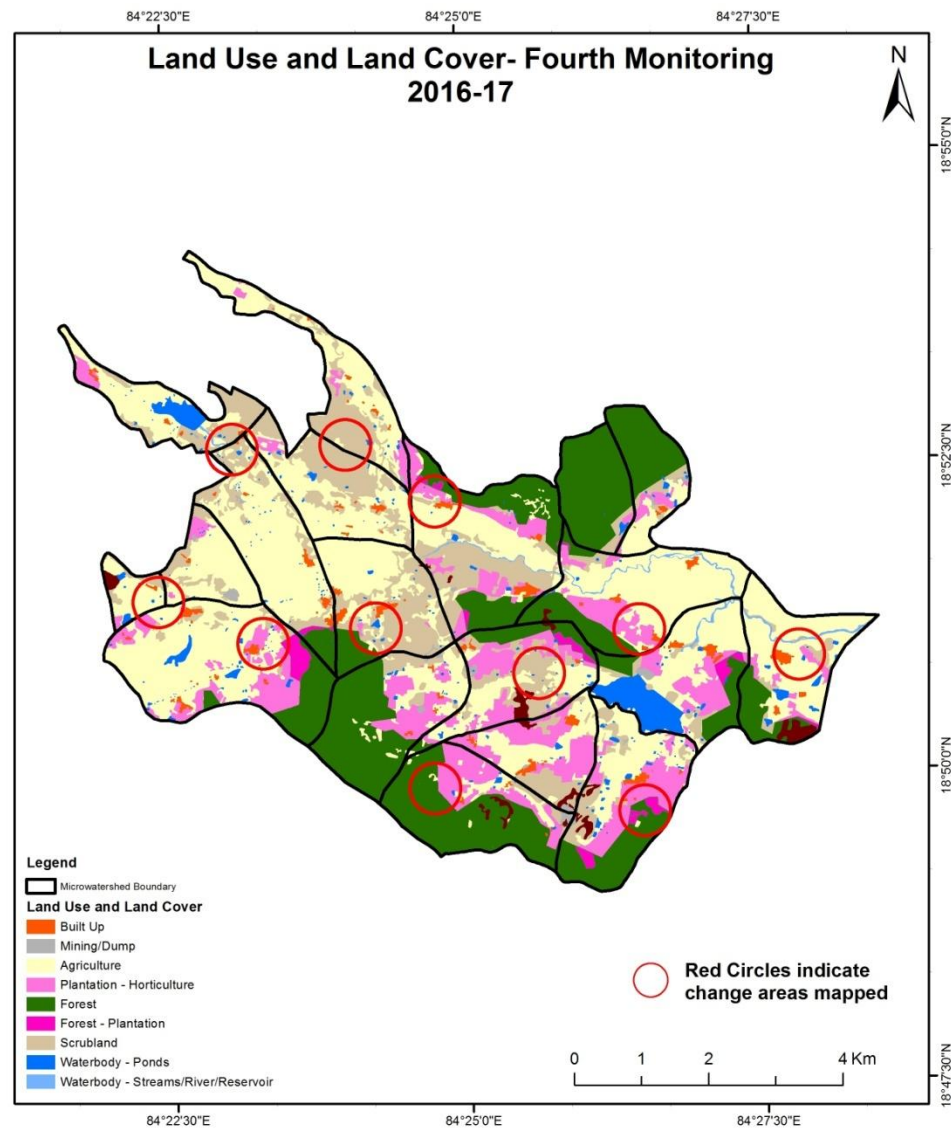
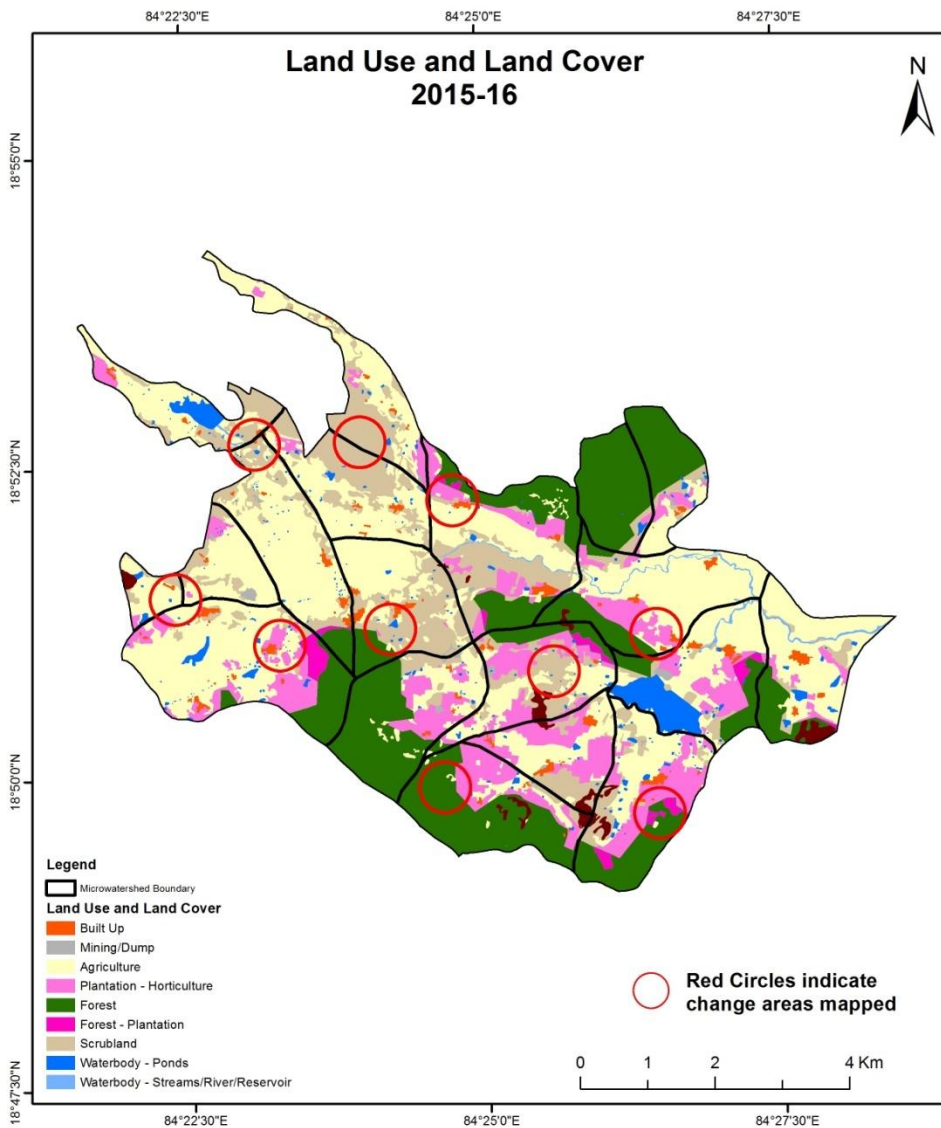
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



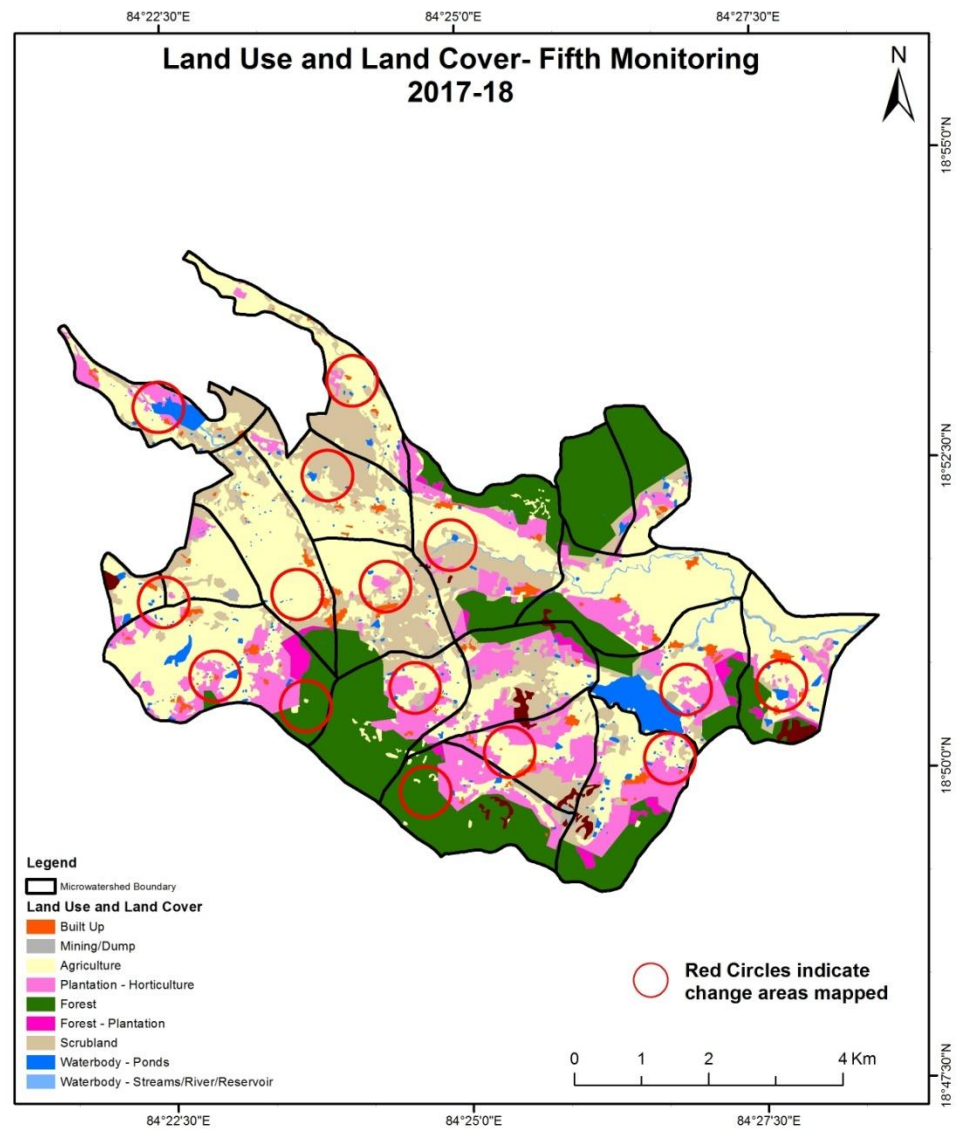
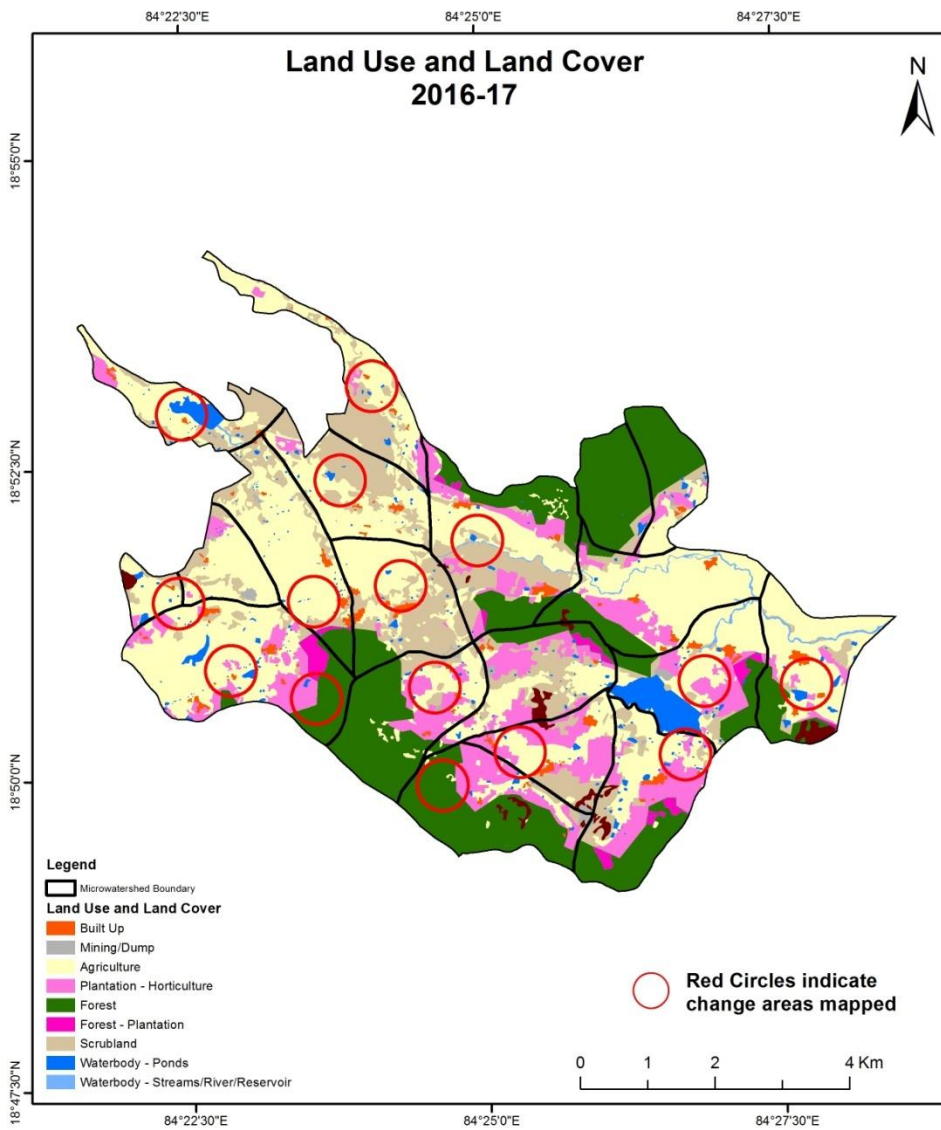
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



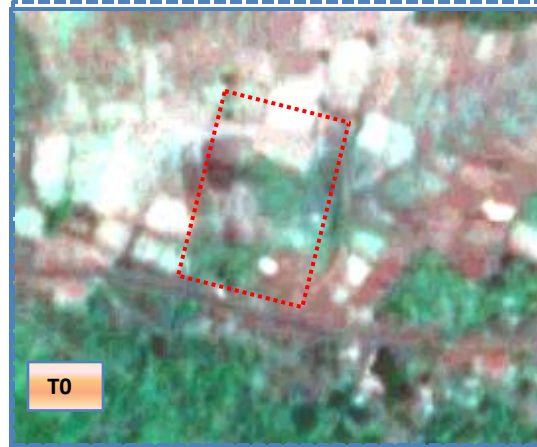
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

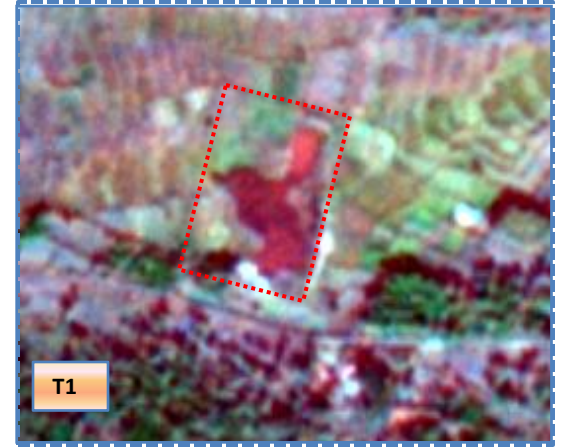


Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



T0: 2009-10



T1: 14 December 2013

Agriculture to Water body



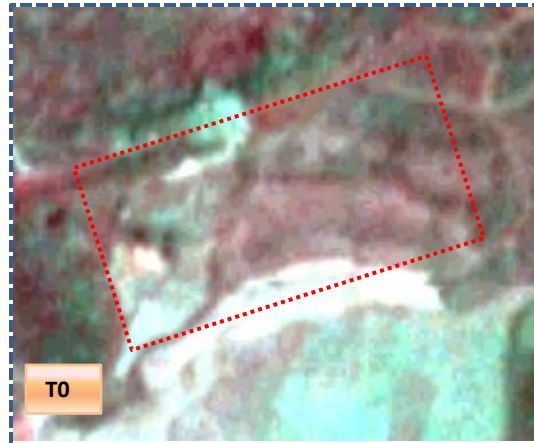
T0: 2009-10



T1: 14 December 2013

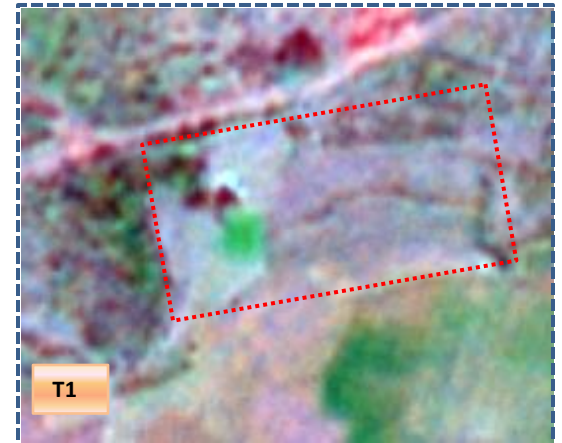
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture



T0

T0: 2009-10



T1

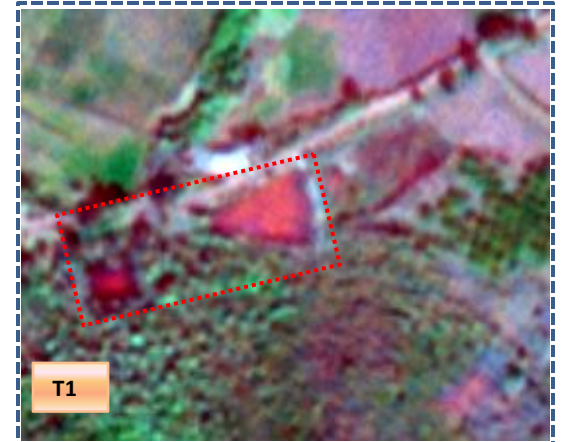
T1: 14 December 2013

Scrub to Water body



T0

T0: 2009-10



T1

T1: 14 December 2013

Table showing change matrix depicting Land cover transitions during study period-2009-10 to 2013-14

Land cover	Monitoring period (T1)										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	59.93												59.93
Mining/dump		8.61											8.61
Agriculture			1928.37	6.06							6.45		1940.87
Plantation Horticulture			0.53	660.82							0.99		662.33
Forest					1189.69								1189.69
Forest Plantation						33.62					0.07		33.69
Barren Rocky							55.99						55.99
Scrub	0.49		21.56	5.54				992.88			2.56		1023.03
Waterbody- Streams/River									20.43				20.43
Waterbody – Ponds											97.04		97.04
Grand Total	60.43	8.61	1950.46	672.41	1189.69	33.62	55.99	992.88	20.43	107.11			5091.64

- 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 12.51 ha of the agriculture area has decreased and it is converted into plantation and water body in T1.
- In T1 22.09 ha of the agriculture area has increased from plantation 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-2013-14 to 2014-15

Land cover	Monitoring period (T2)										Units in Hectares	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
T1												
Built up	60.43										60.43	
Mining/dump		8.52								0.10	8.61	
Agriculture	3.81		1943.57							3.08	1950.46	
Plantation Horticulture	5.89	1.70	7.08	657.64						0.10	672.41	
Forest			1.69		1188.00						1189.69	
Forest Plantation						33.62					33.62	
Barren Rocky							55.99				55.99	
Scrub	1.50		46.64	0.57				942.52		1.65	992.88	
Waterbody- Streams/River									20.43		20.43	
Waterbody – Ponds			0.54							106.58	107.11	
Grand Total	60.43										60.43	

- 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 6.89 ha of the agriculture area has decreased and it is converted into built up and water body in T2.
- In T2 55.95 ha of the agriculture area has increased from plantation, forest, 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-2014-15 to 2015-16

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	71.62										71.62
Mining/dump		10.22									10.22
Agriculture	8.05	2.16	1946.23	19.59					3.62	19.88	1999.52
Plantation Horticulture	1.09	0.22	14.78	640.39						1.73	658.21
Forest			12.80		1153.66	20.84				0.69	1188.00
Forest Plantation						33.45				0.17	33.62
Barren Rocky							55.99				55.99
Scrub	1.49	5.36	50.56	19.87				853.85	0.80	10.59	942.52
Waterbody- Streams/River									20.43		20.43
Waterbody – Ponds	0.17									111.33	111.50
Grand Total	82.43	17.96	2024.37	679.84	1153.66	54.29	55.99	853.85	24.85	144.39	5091.64

- 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 53.29 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation and water body in T3.
- In T3 78.15 ha of the agriculture area has increased from plantation, forest 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-2015-16 to 2016-17

Land cover	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	82.43												82.43
Mining/dump		17.96											17.96
Agriculture	0.34		2023.36								0.67		2024.37
Plantation Horticulture	0.15		5.78	673.73							0.19		679.84
Forest					1152.70	0.96							1153.66
Forest Plantation						54.29							54.29
Barren Rocky		5.73					50.26						55.99
Scrub			9.72	1.30				842.83					853.85
Waterbody- Streams/River									24.85				24.85
Waterbody – Ponds											144.39		144.39
Grand Total	82.92	23.69	2038.86	675.03	1152.70	55.25	50.26	842.83	24.85	145.25			5091.64

- 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 1.01 ha of the agriculture area has decreased and it is converted into built up and water body in T4.
- In T4 15.50 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-2016-17 to 2017-18

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	82.92										82.92
Mining/dump		23.25	0.43								23.69
Agriculture	0.69		1981.68	54.92						1.57	2038.86
Plantation Horticulture	0.16		4.41	670.38						0.08	675.03
Forest			2.49		1143.38	6.83					1152.70
Forest Plantation						55.25					55.25
Barren Rocky							50.26				50.26
Scrub	0.37	0.57	9.21	6.35				826.11		0.23	842.83
Waterbody- Streams/River									24.85		24.85
Waterbody – Ponds										145.25	145.25
Grand Total	84.13	23.82	1998.22	731.64	1143.38	62.09	50.26	826.11	24.85	147.13	5091.64

- 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 57.18 ha of the agriculture area has decreased and it is converted into built up, plantation and water body in T5.
- In T5 16.11 ha of the agriculture area has increased from mining/dump, plantation, 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 54.51 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
4. There is an increase of 9.59, 49.06, 24.86 & 14.49 Hectares From T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 97.99 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a increase of 69 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 196.92 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (11) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (13) verified from the portal.