

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

SRIKAKULAM -04/2009-10
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

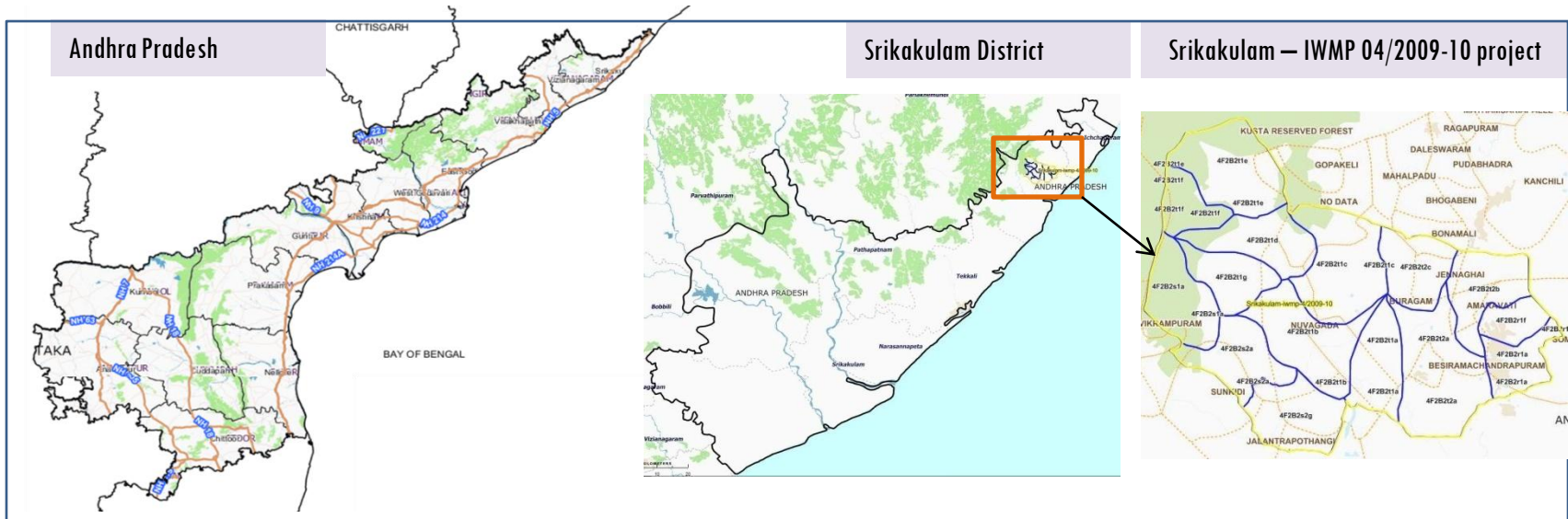
E X E C U T I V E S U M M A R Y

- 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-04/2009-10, Srikakulam District of Andhra Pradesh. The total geographical area of the project is 4,892 ha. It comprises of 13 micro watersheds.
- In the project area 36 Drishti photos were uploaded showing 4 check dams/Rock fill dam, 18 Drainage treatments of Nala Revetment, loose boulder structures etc, and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 18 new farm ponds or dug out pits and 4 check dams and drainage treatments with 14.92 ha increase in the area.
- Major percentage i.e. 57.49 % is covered by the agriculture, 13.31 % is covered by scrubland, 11.04 % is covered by plantation/horticulture and remaining by other land use classes.

PROJECT : SRIKAKULAM - IWMP-04/2009-10

DISTRICT : SRIKAKULAM , STATE : ANDHRA PRADESH

- The study area falls in Kanchili Mandal of Srikakulam district of Andhra Pradesh state. The total geographical area of the project is 4,892 ha. It comprises of 13 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.

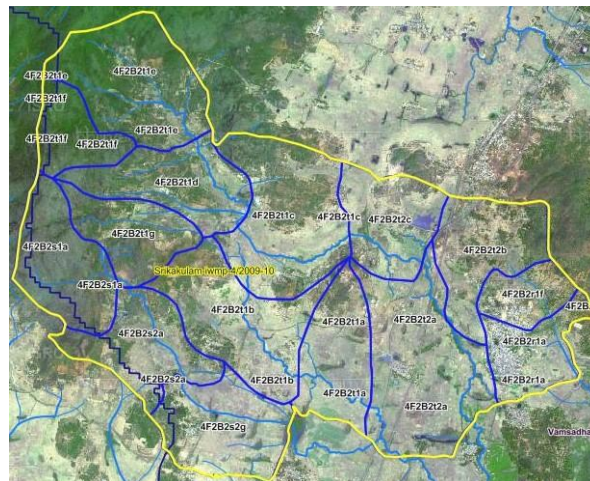
Satellite Data and Ancillary Data

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	36
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

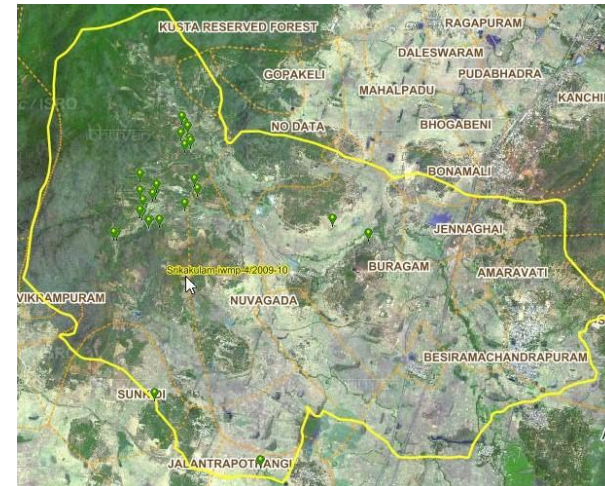


MWS Boundary



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	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	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	0	0
11	Civil work-Check dams /Rock fill dam	3	4
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	24	18
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm	13	10
15	Soil moisture conservation	0	0
16	Water harvesting structures (recharge pits and check dams)	0	0
17	Entry Point Activity	0	0
18	Others	2	0
	TOTAL	42	32

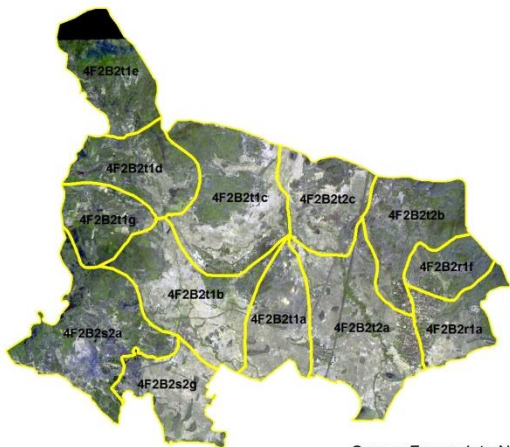
MONITORING IN THE PROJECT AREA

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

Natural Color Composite- 2009-10



Source:Fusen data,NRSC

Natural Color Composite-14th December 2013



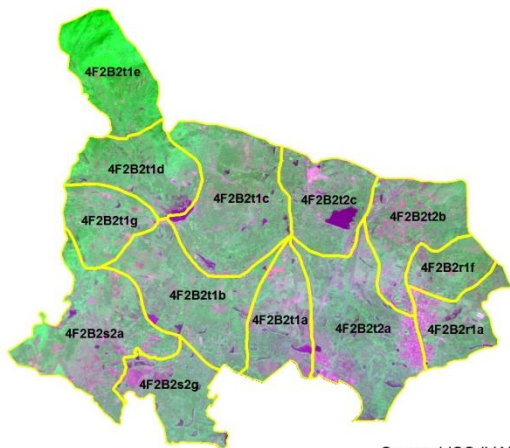
Source:LISS-IV,NRSC

Natural Color Composite-11th April 2015



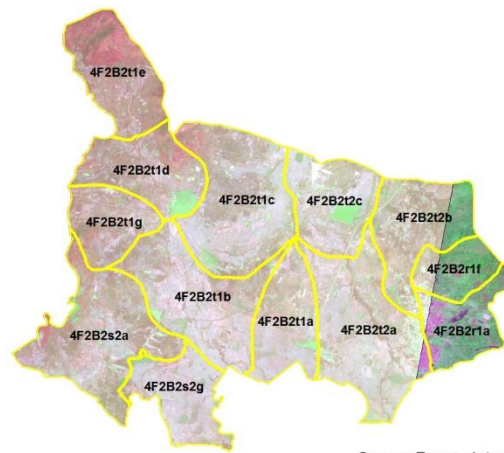
Source:LISS-IV,NRSC

Natural Color Composite- 07th November 2016



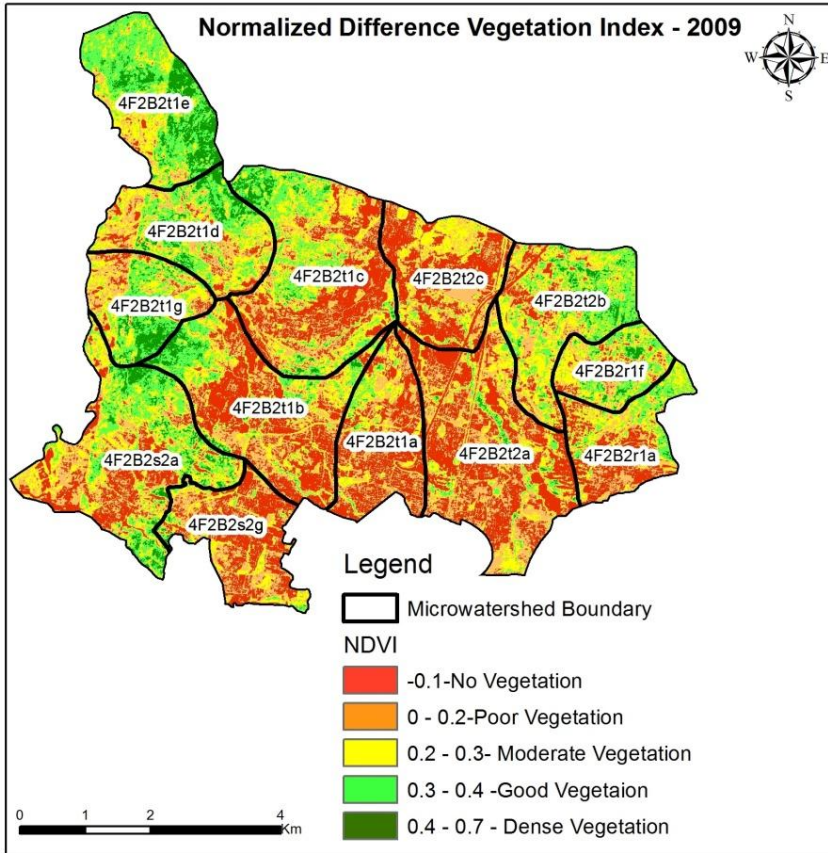
Source:LISS-IV,NRSC

Natural Color Composite- 25th November 2017

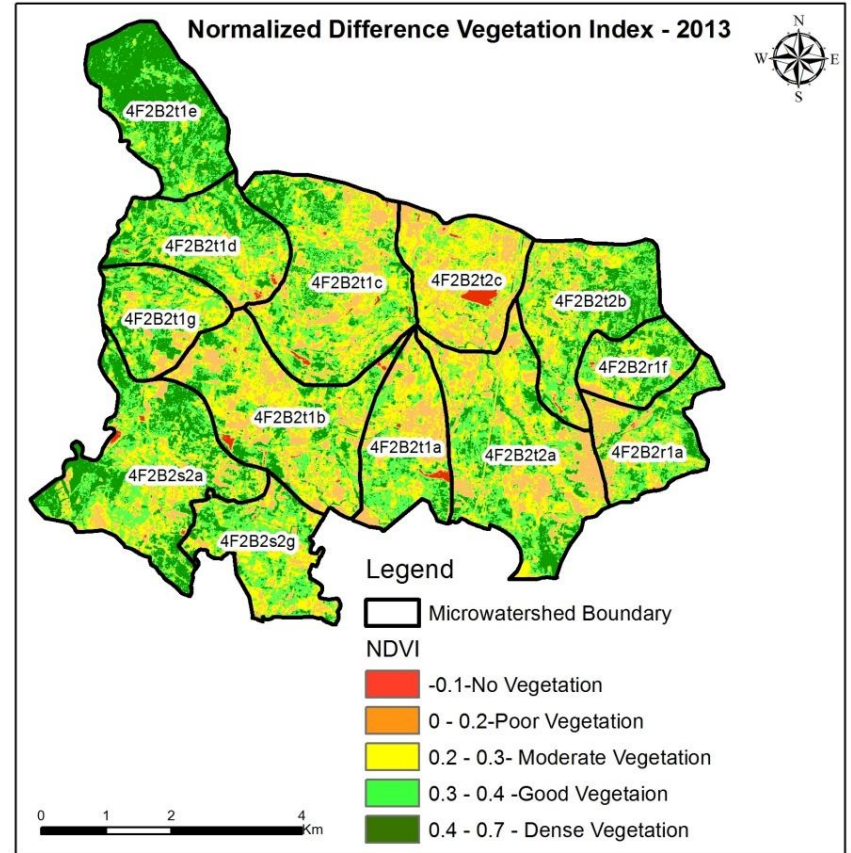


Source:Fusen data,NRSC

Changes in Vegetation Cover

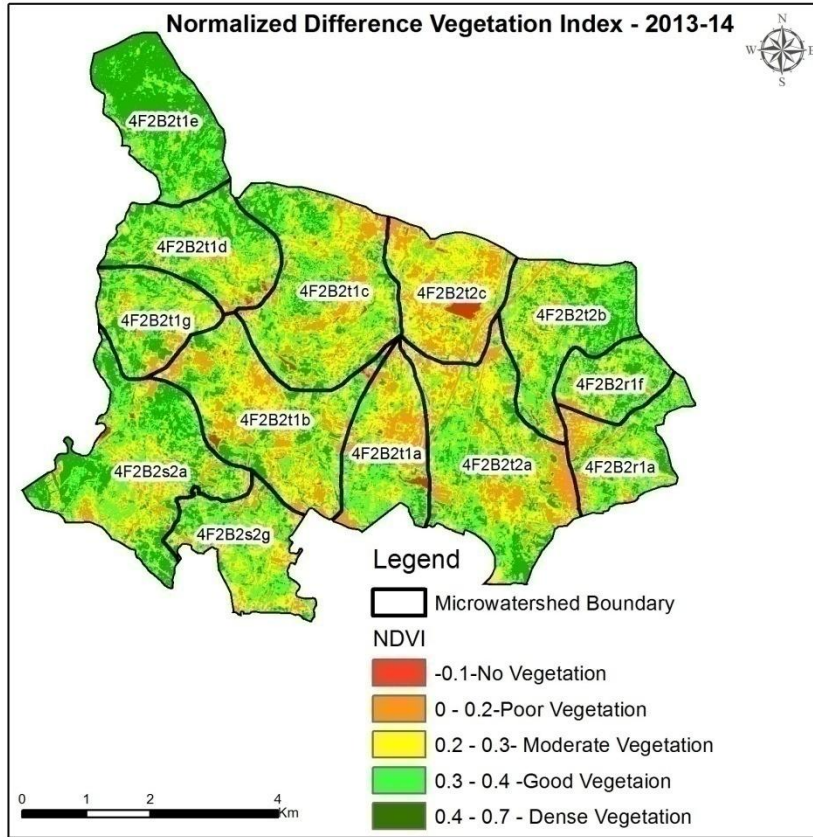


NDVI (2009-10)

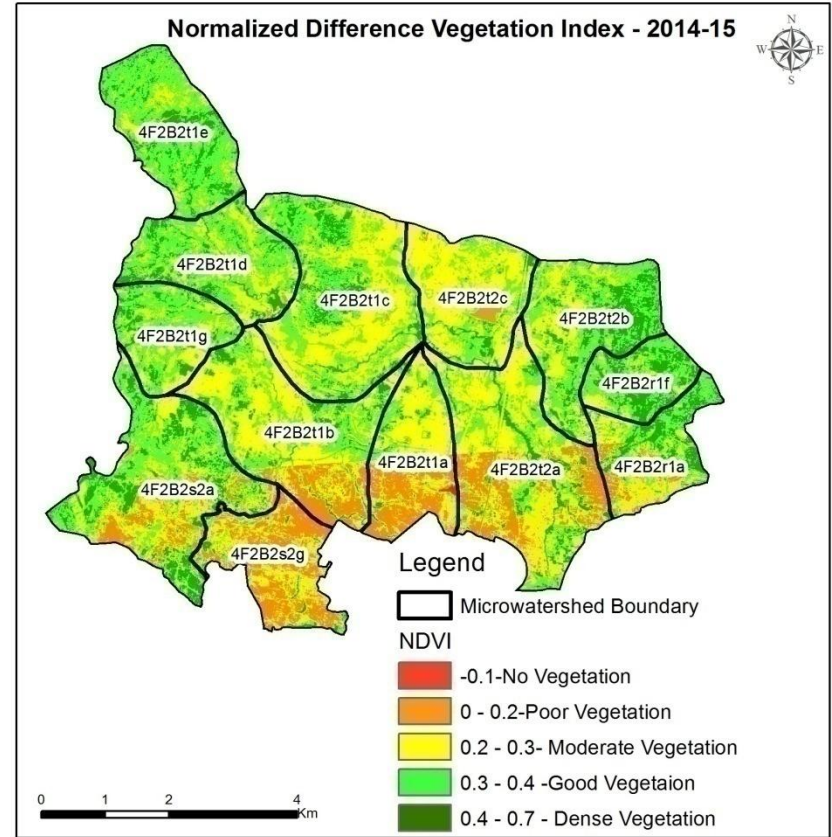


NDVI (12 October 2015)

Changes in Vegetation Cover

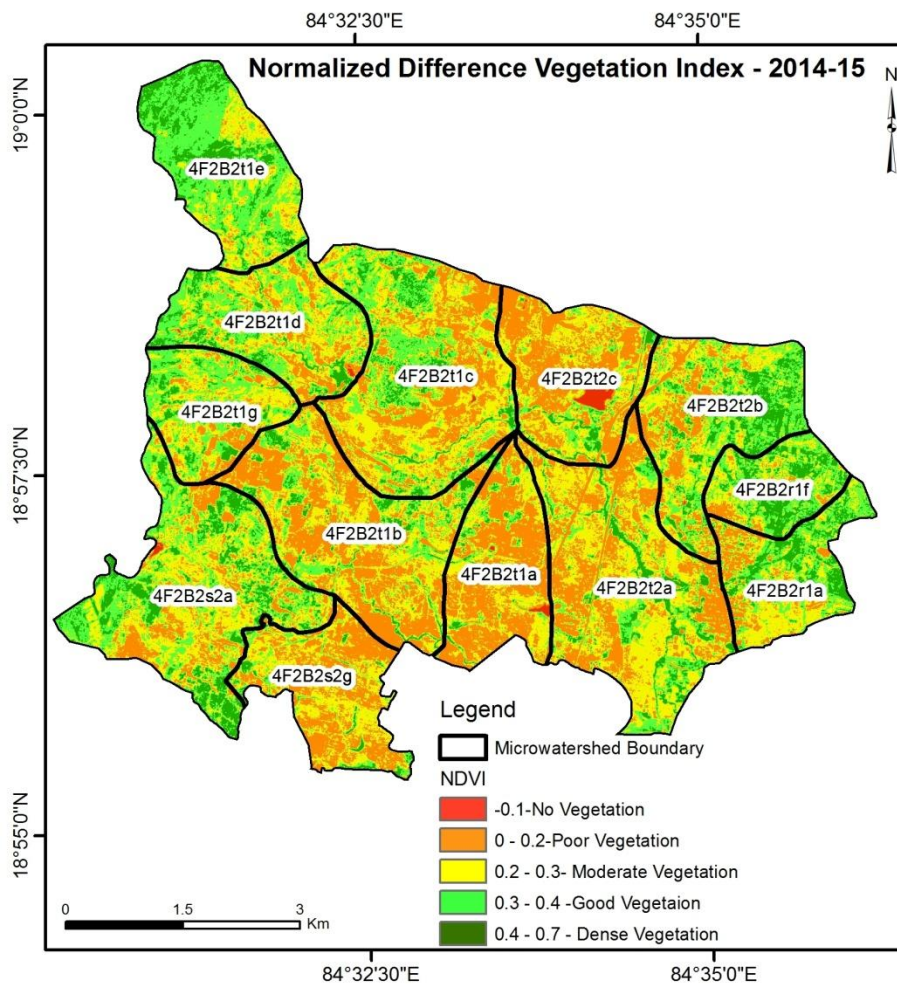


NDVI (2013-14)

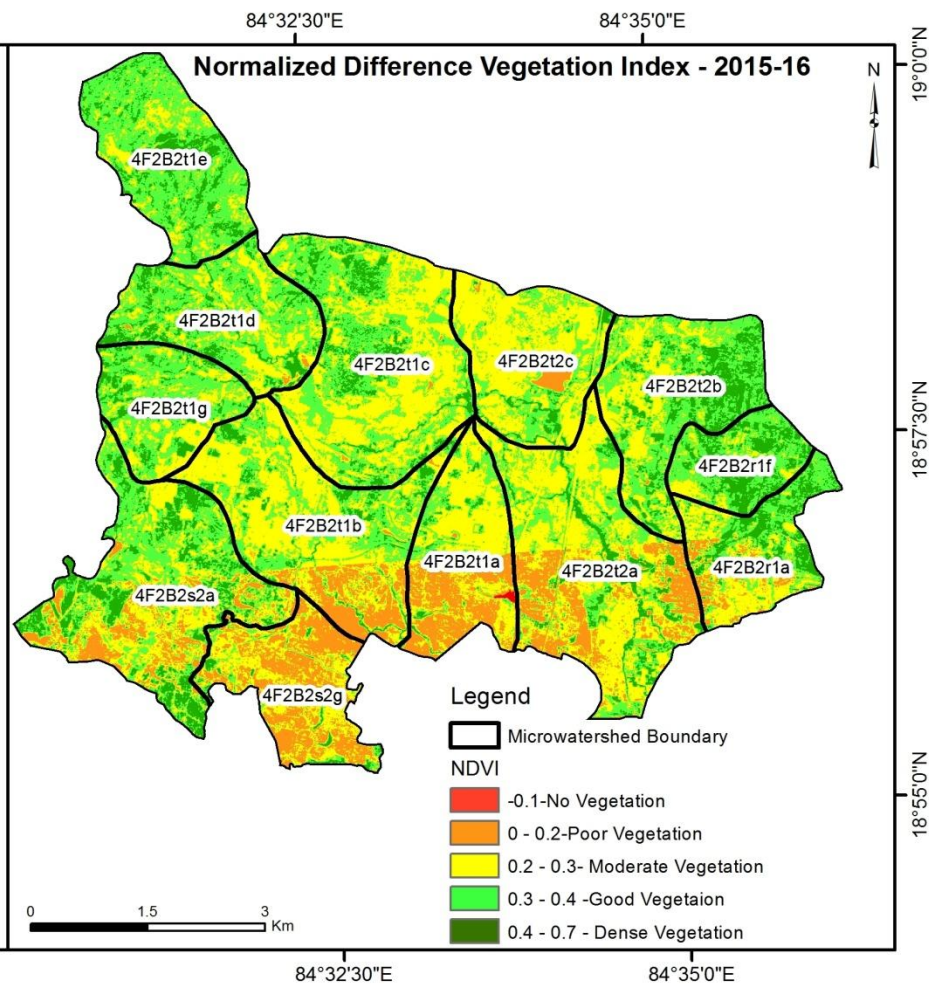


NDVI (12 October 2015)

Changes in Vegetation Cover



NDVI (2014-15)



NDVI (12 October 2015)

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-04/2009-10



T0:2009-10



T1: 14 December 2013



Drishti SI no. 125247 MWS :4F2B2t1d

Check dam



T0:2009-10



T1: 14 December 2013



Drishti SI no.129457 MWS : 4F2B2t1g

Farm pond

Monitoring of activities in Srikakulam Dt Andhra Pradesh. IWMP-04/2009-10



T0: 2009-10



T1: 14 December 2013



Drishti Sl no. 125181 MWS : 4F2B2n2c

Farm pond



T0: 2009-10



T1: 14 December 2013



Drishti Sl no. 129511 MWS : 4F2B2t1d

Farm pond

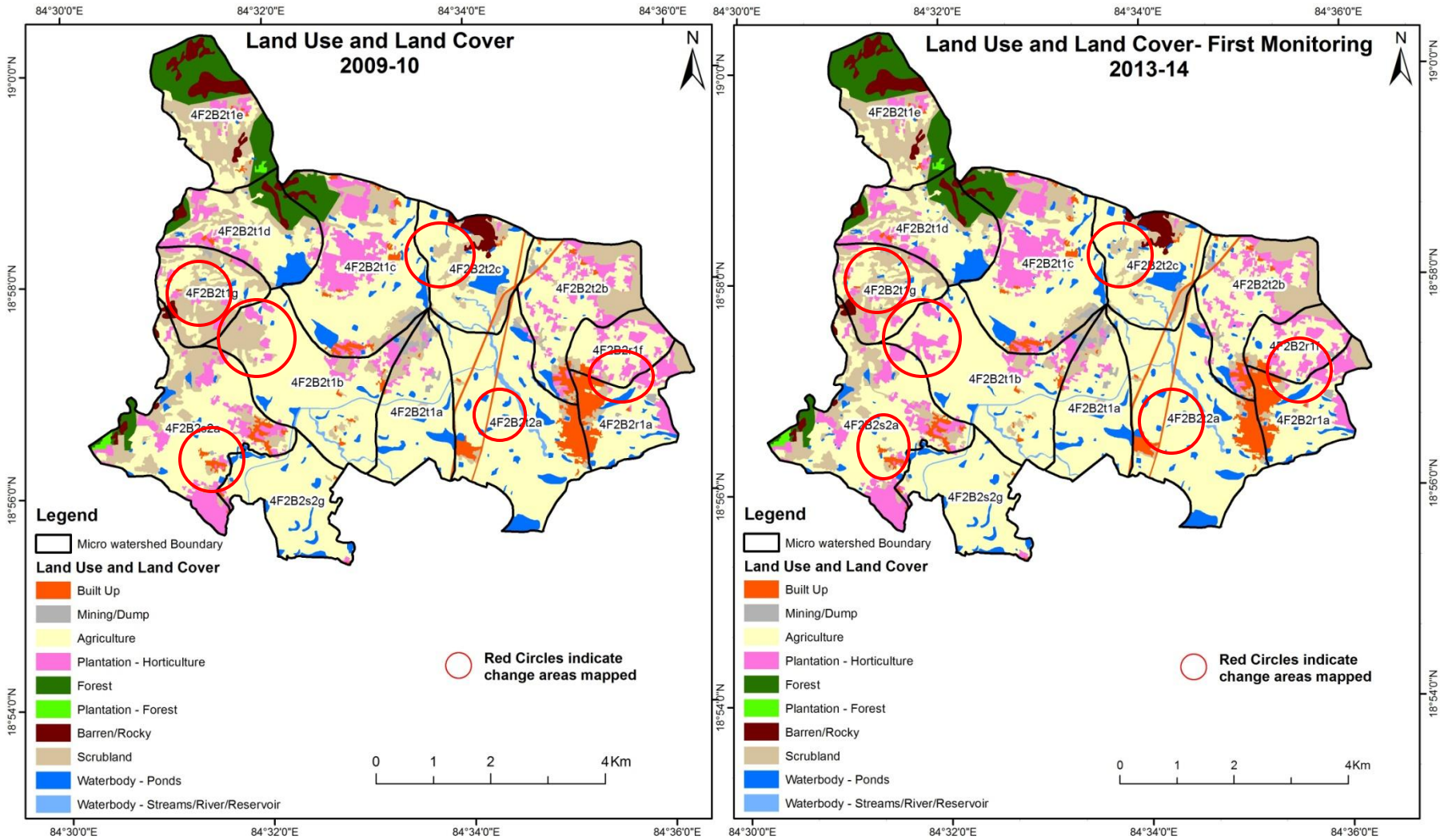
MONITORING IN THE PROJECT AREA

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)

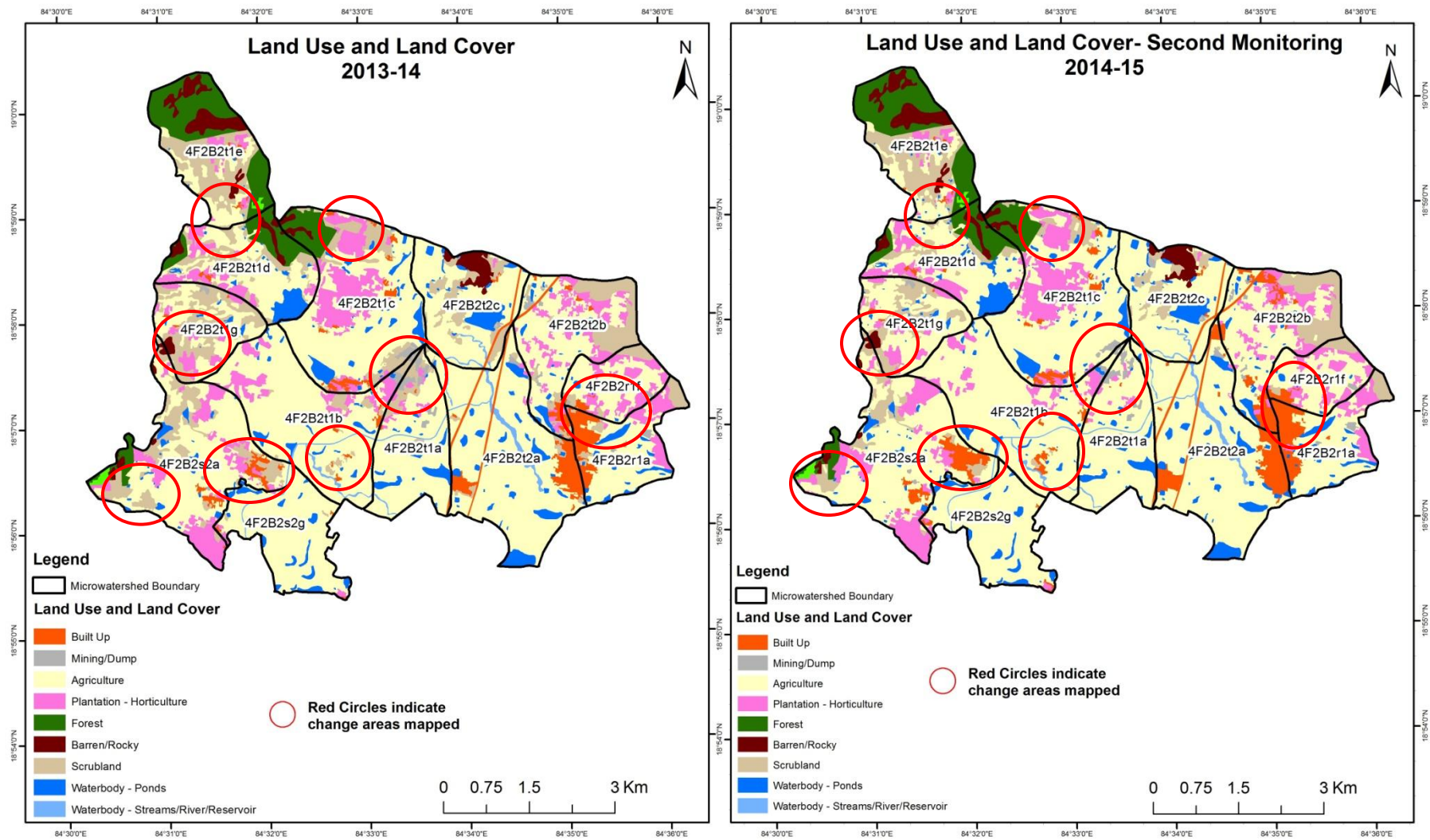
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



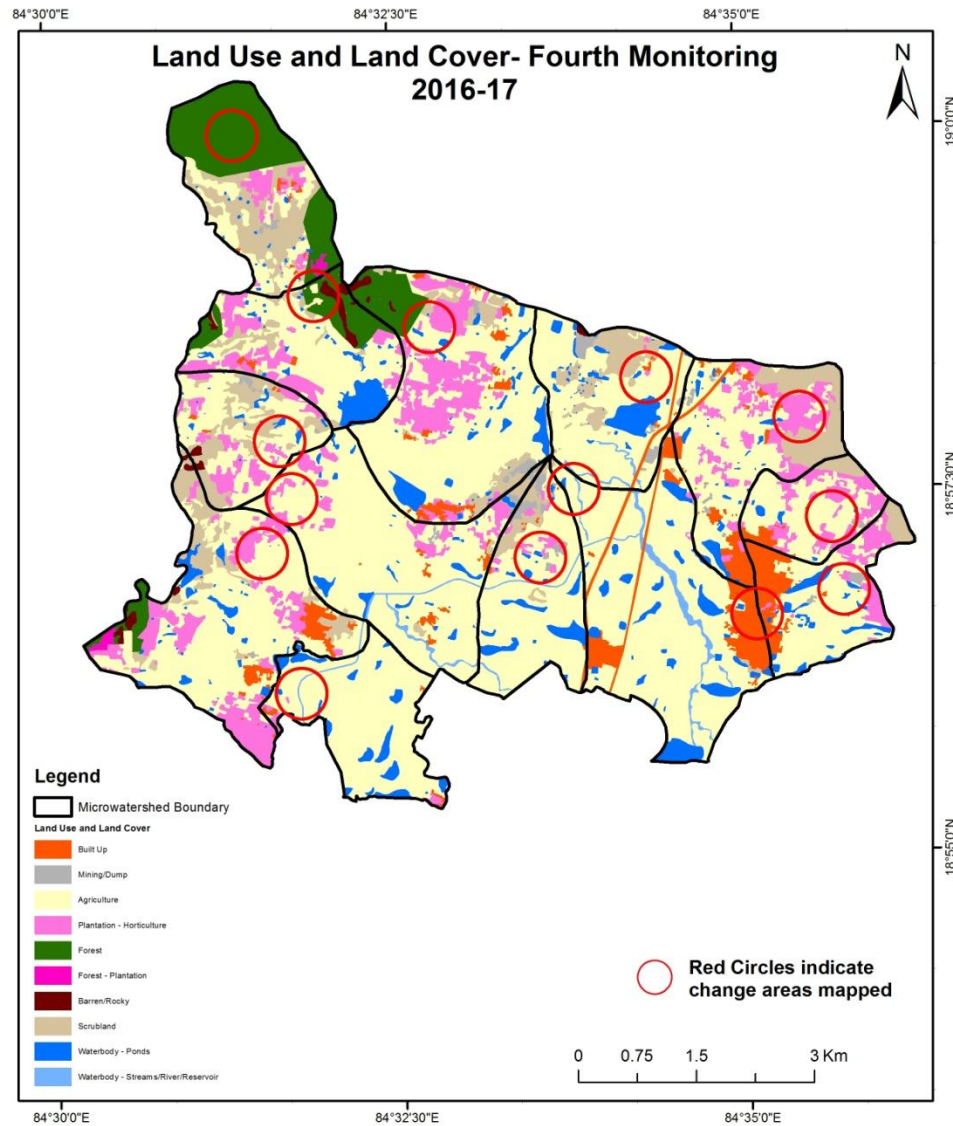
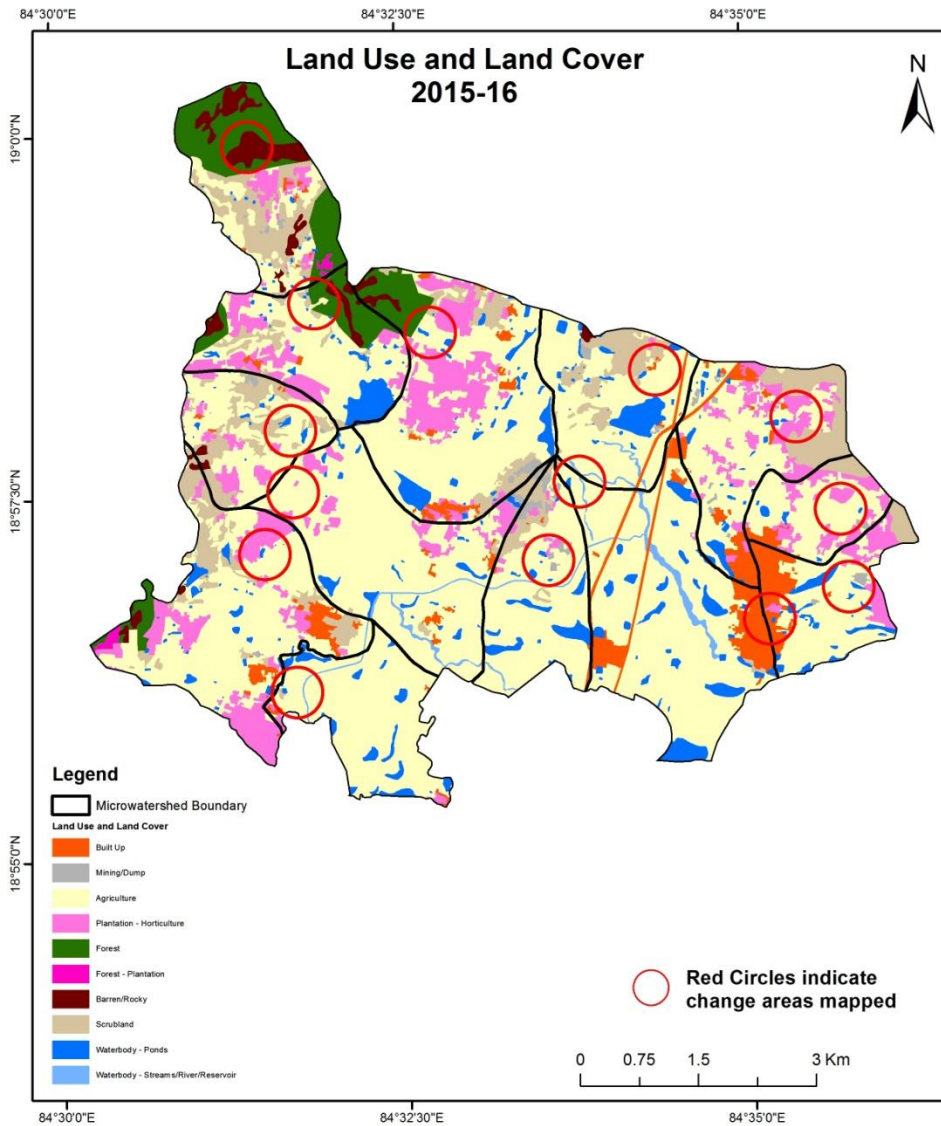
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



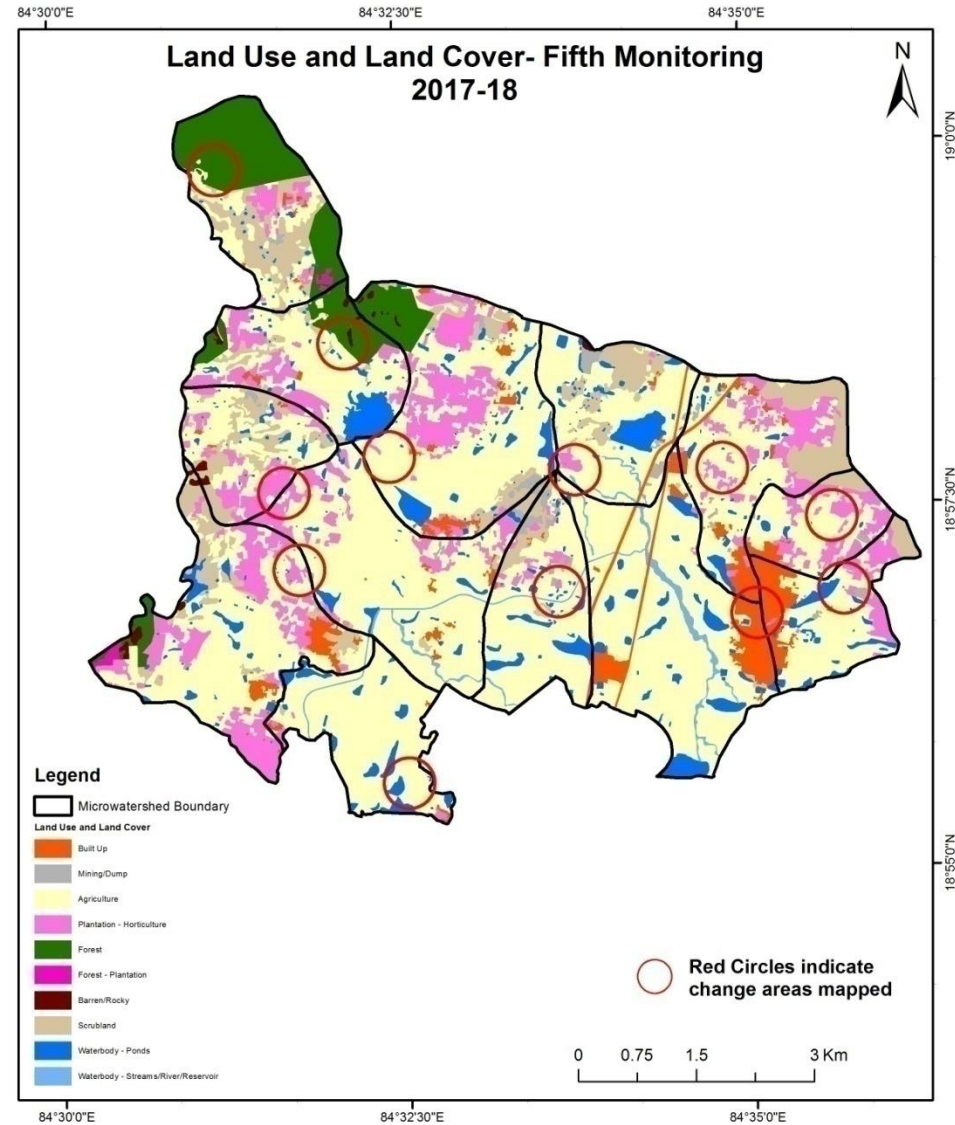
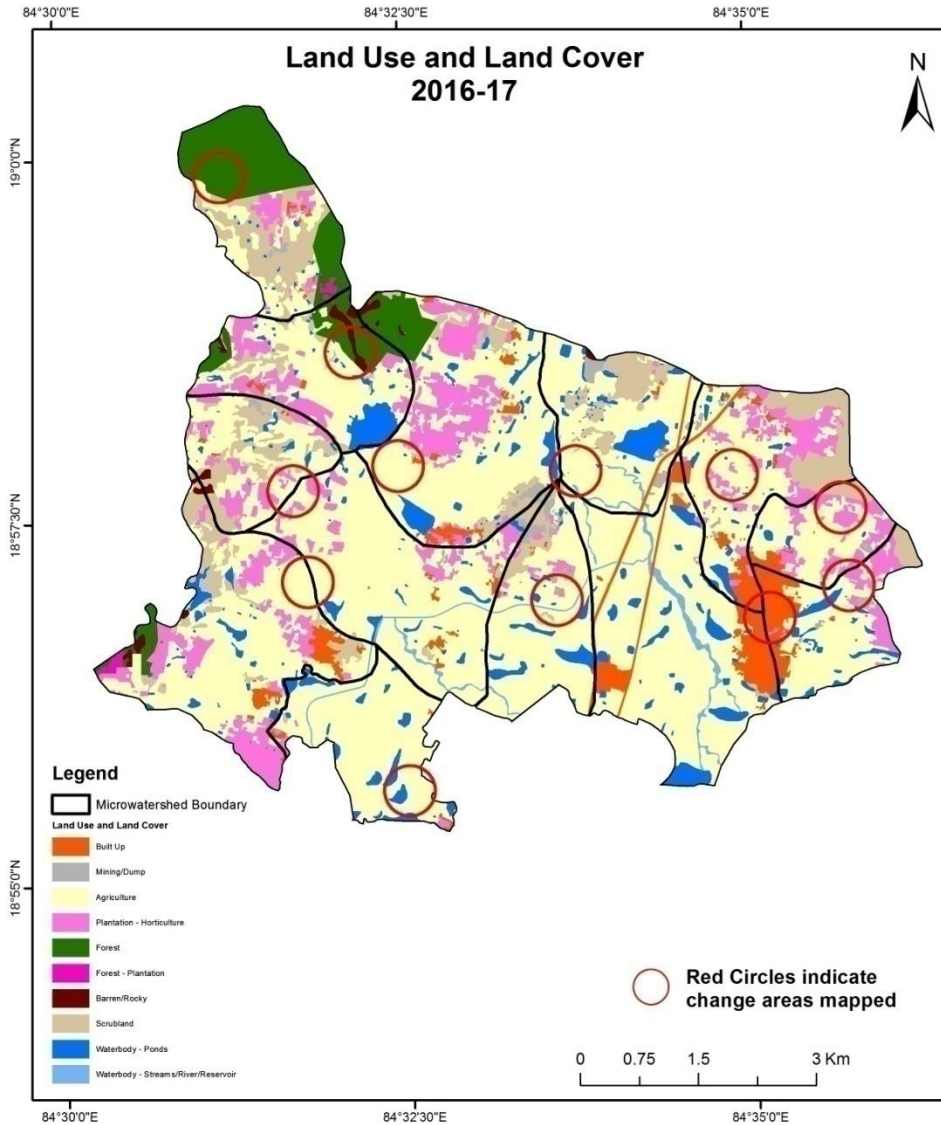
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

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



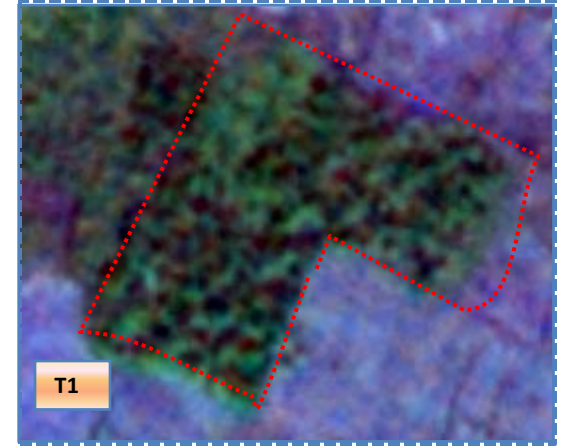
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

T0: 2009-10



T1

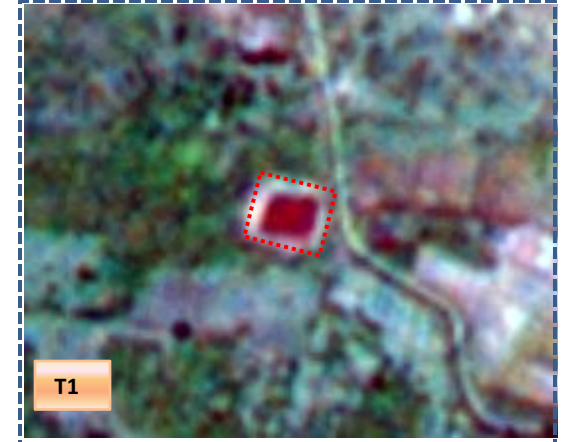
T1: 14 December 2013

Agriculture to Water body



T0

T0: 2009-10



T1

T1: 14 December 2013

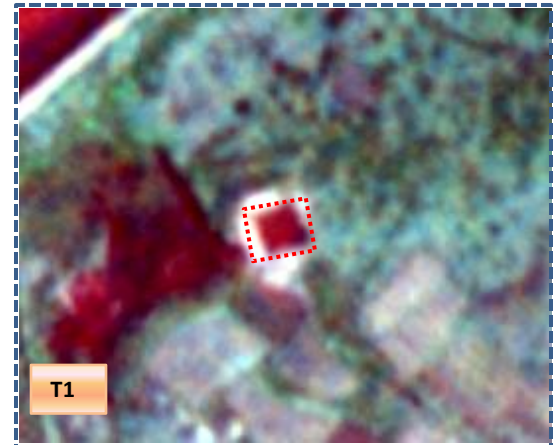
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



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										
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	176.01										176.01
Mining/dump		30.89									30.89
Agriculture		1.34	2728.08	10.98				1.12		14.34	2755.87
Plantation Horticulture			1.03	500.88						0.14	502.04
Forest					300.24					0.04	300.28
Forest Plantation						7.72					7.72
Barren Rocky							18.30				18.30
Scrub			68.78	21.62				719.92		2.44	812.76
Waterbody- Streams/River									43.29		43.29
Waterbody – Ponds			1.85							254.81	256.67
Grand Total	176.01	32.23	2799.75	533.48	300.24	7.72	18.30	721.05	43.29	271.76	4903.84

- 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 27.88 ha of the agriculture area has decreased and it is converted into mining/dump, plantation, scrubland and water body, in T1.
- In T1 71.66 ha of the agriculture area has increased from plantation, 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-2013-14 to 2014-15

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	176.01										176.01
Mining/dump		31.62								0.62	32.23
Agriculture	22.06	1.99	2749.17	18.13						8.39	2799.75
Plantation Horticulture	5.82		33.29	494.35						0.02	533.48
Forest					299.52	0.73					300.24
Forest Plantation						7.72					7.72
Barren Rocky							18.30				18.30
Scrub	23.96	0.59	154.77	11.30				525.47		4.95	721.05
Waterbody- Streams/River									43.29		43.29
Waterbody – Ponds				0.23						271.54	271.76
Grand Total	227.86	34.20	2937.22	524.01	299.52	8.45	18.30	525.47	43.29	285.52	4903.84

- 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 50.58 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation and water body in T2.
- In T2 188.05 ha of the agriculture area has increased from plantation 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-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	227.86										227.86
Mining/dump		33.86	0.34								34.20
Agriculture	0.12	0.52	2934.40	2.02						0.17	2937.22
Plantation Horticulture				523.83						0.17	524.01
Forest					299.52						299.52
Forest Plantation						8.45					8.45
Barren Rocky							18.30				18.30
Scrub	0.20	2.13	43.72	8.91				469.94		0.56	525.47
Waterbody- Streams/River									43.29		43.29
Waterbody – Ponds	0.30									285.22	285.52
Grand Total	228.47	36.52	2978.46	534.77	299.52	8.45	18.30	469.94	43.29	286.12	4903.84

- 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 2.82 ha of the agriculture area has decreased and it is converted into built-up, mining/dump, plantation and water body in T3.
- In T3 44.06 ha of the agriculture area has increased from mining/dump and scrubland area 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										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	228.47										228.47
Mining/dump		35.20	0.61							0.71	36.52
Agriculture	2.97	7.52	2902.99	43.90					5.37	15.71	2978.46
Plantation Horticulture	1.21		18.32	514.88						0.35	534.77
Forest			1.86		297.66						299.52
Forest Plantation						8.45					8.45
Barren Rocky		1.18					17.12				18.30
Scrub	0.50	4.16	5.77	3.66				454.27		1.59	469.94
Waterbody- Streams/River									43.29		43.29
Waterbody – Ponds			0.56							285.55	286.12
Grand Total	233.15	48.06	2930.11	562.44	297.66	8.45	17.12	454.27	48.66	303.91	4903.84

- 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 75.47 ha of the agriculture area has decreased and it is converted into built-up, mining/dump, plantation and water body in T4.
- In T4 27.12 ha of the agriculture area has increased from mining/dump, plantation, forest, scrubland and water body area 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	233.15										233.15
Mining/dump		47.50	0.51							0.05	48.06
Agriculture	0.16	0.54	2844.79	69.78						14.84	2930.11
Plantation Horticulture	0.10		1.72	560.56						0.06	562.44
Forest			1.30		296.13					0.22	297.66
Forest Plantation						8.45					8.45
Barren Rocky							17.12				17.12
Scrub	0.07	0.29	6.22	2.24				443.42		2.02	454.27
Waterbody- Streams/River									48.66		48.66
Waterbody – Ponds			0.24							303.68	303.91
Grand Total	233.49	48.32	2854.79	632.58	296.13	8.45	17.12	443.42	48.66	320.87	4903.84

- 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 85.32 ha of the agriculture area has decreased and it is converted into built-up, mining/dump, plantation and water body in T5.
- In T5 10.00 ha of the agriculture area has increased from mining/dump, plantation, forest, scrubland and water body area 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 69.57 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 43.88, 137.47 & 41.24 Hectares From T0-T1, T1-T2 & T2-T3 respectively and overall increase of 222.59 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 130 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 369.34 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.