

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -02/2009-10
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

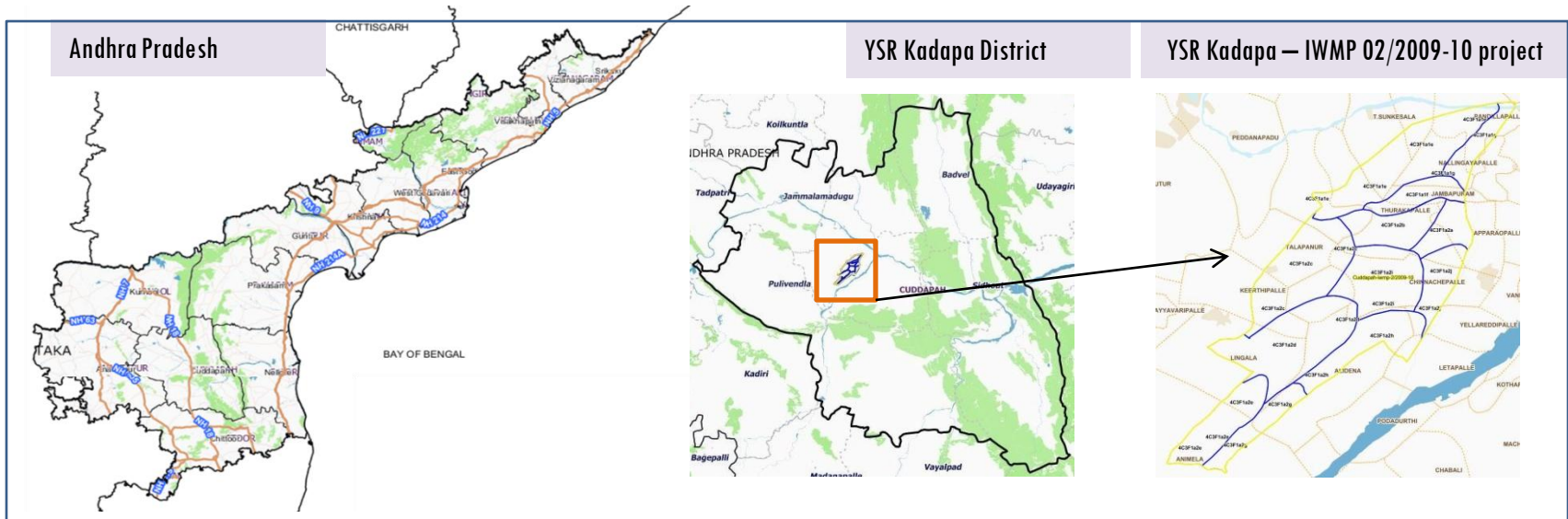
E X E C U T I V E S U M M A R Y

- 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-02/2009-10, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 6,472 ha. It comprises of 12 micro watersheds.
- In the project area 43 Drishti photos were uploaded showing 2 check dams/Rock fill dam, 46 farm ponds, tanks, percolation tanks, recharge pits and remaining showing other activities.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new 44 farm ponds or dug out pits and 2 check dams and drainage treatments with 5.21 ha increase in the area.
- Major percentage i.e. 67.22 % is covered by the agriculture, 22.75 % is covered by scrubland and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-02/2009-10

DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Kamalapuram Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 6,472 ha. It comprises of 12 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



- 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
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			9-Dec-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			9-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	133
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

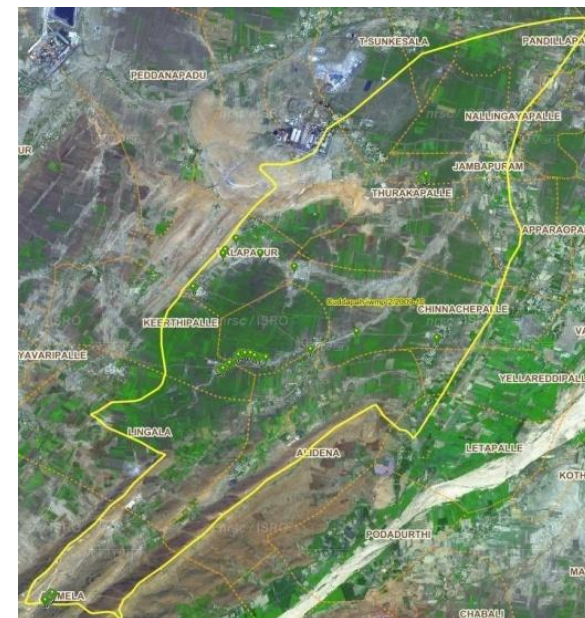


MWS Boundary



Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

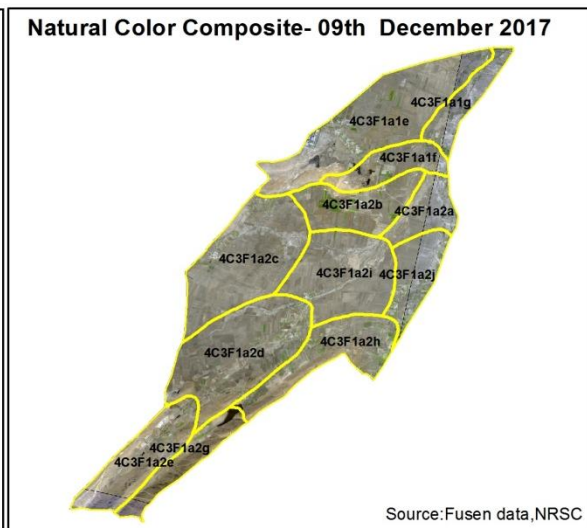
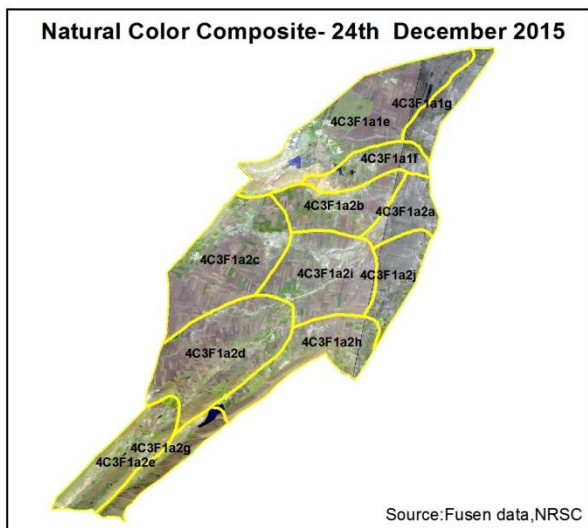
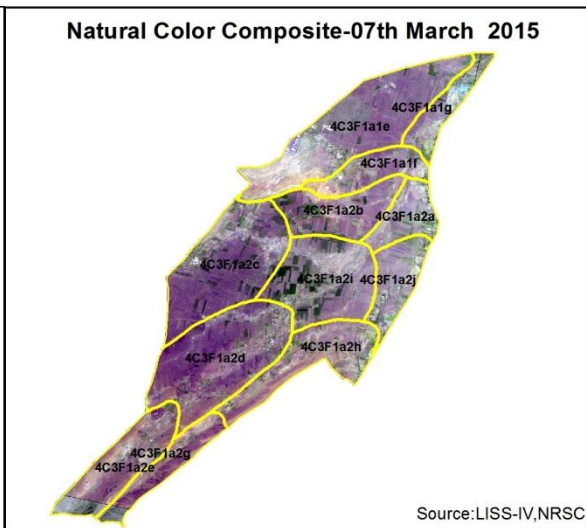
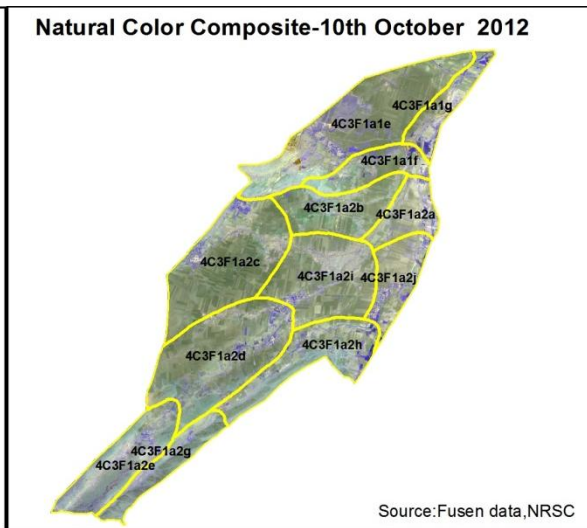
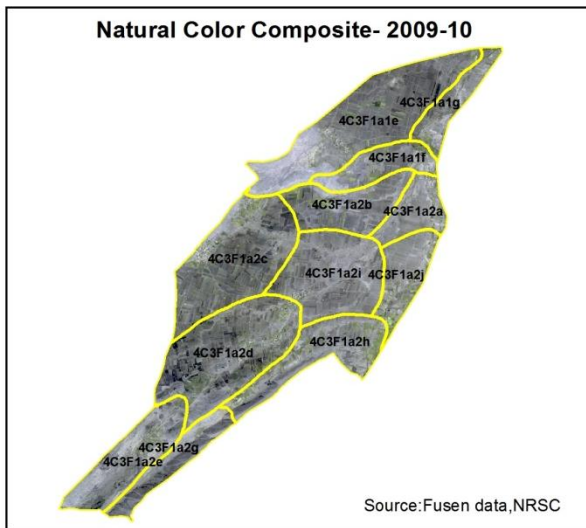
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Bunding	0	0
3	Black planting	1	1
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	46	40
11	Civil work-Check dams /Rock fill dam	2	2
12	Drainage treatment /Nala Revetment, loose boulder structure, gully check	0	0
13	Land Developments (afforestation, horticulture and bund plantation of teak)	0	0
14	Lm (fodder development, varmi compost)	0	0
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	0	0
	TOTAL	49	43

MONITORING IN THE PROJECT AREA

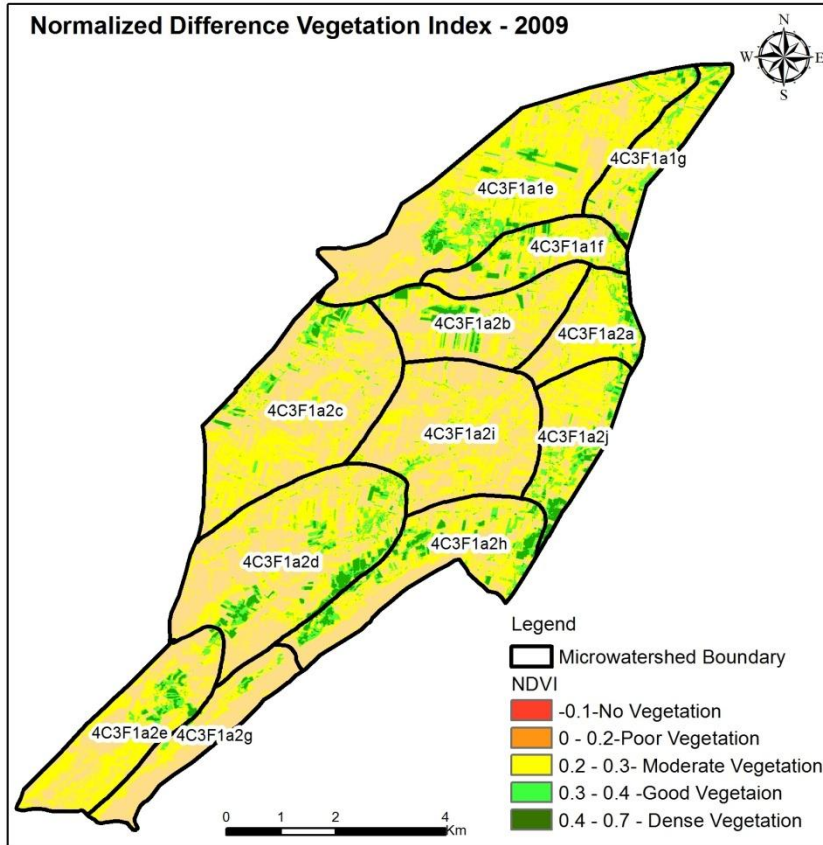
Site Wise Changes in the Project

- 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.

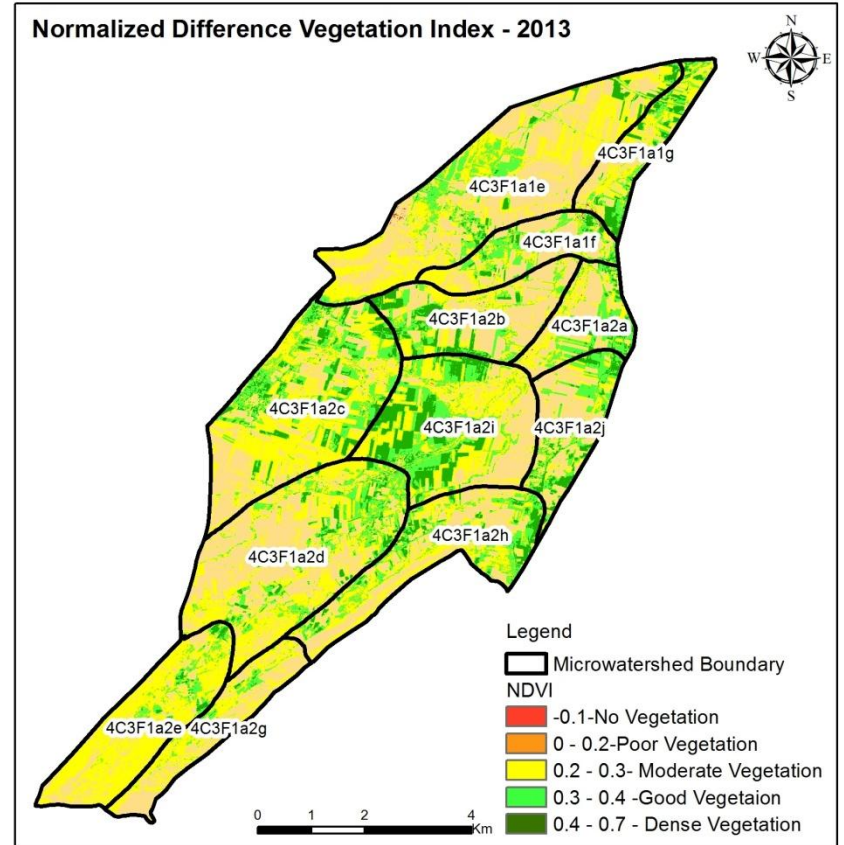
Natural Color Composite – 2009-10 to 2017-18



Changes in Vegetation Cover

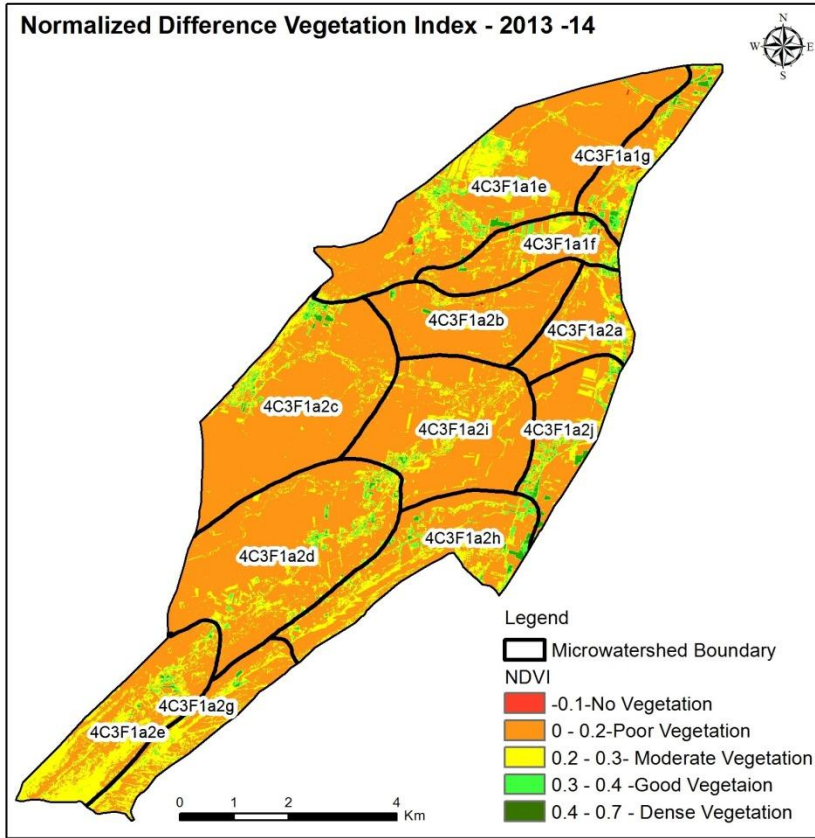


NDVI (2009-10)

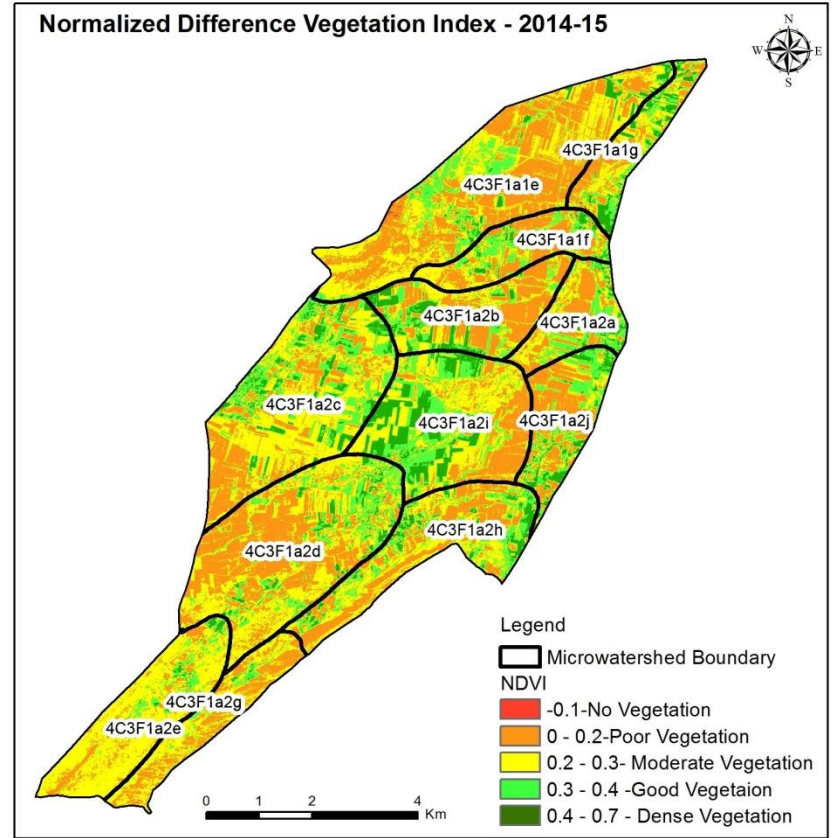


NDVI (2013-14)

Changes in Vegetation Cover

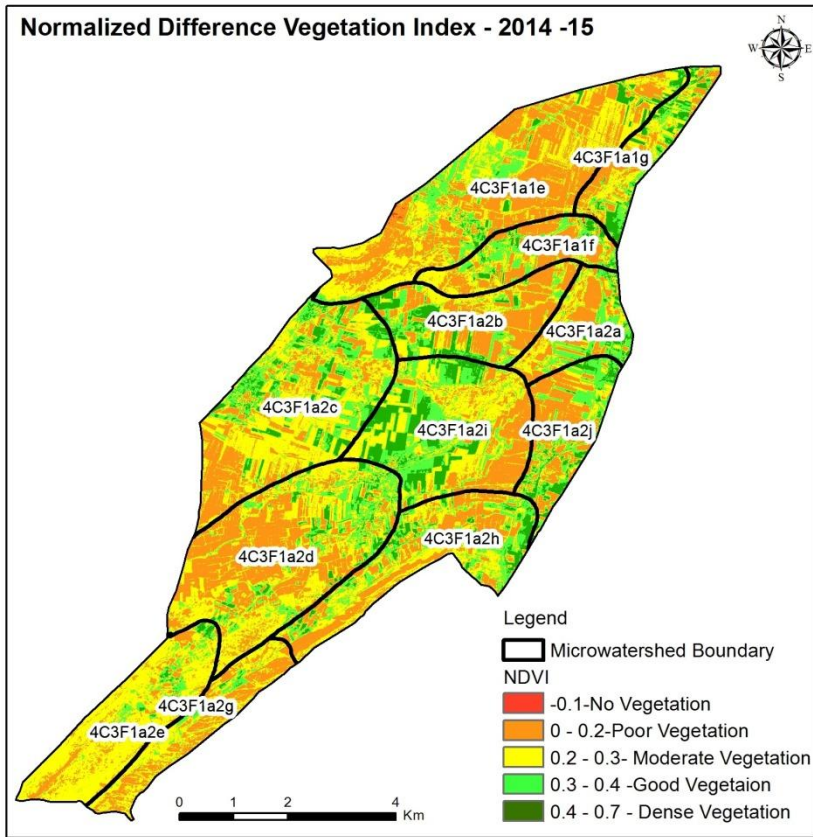


NDVI (2013-14)

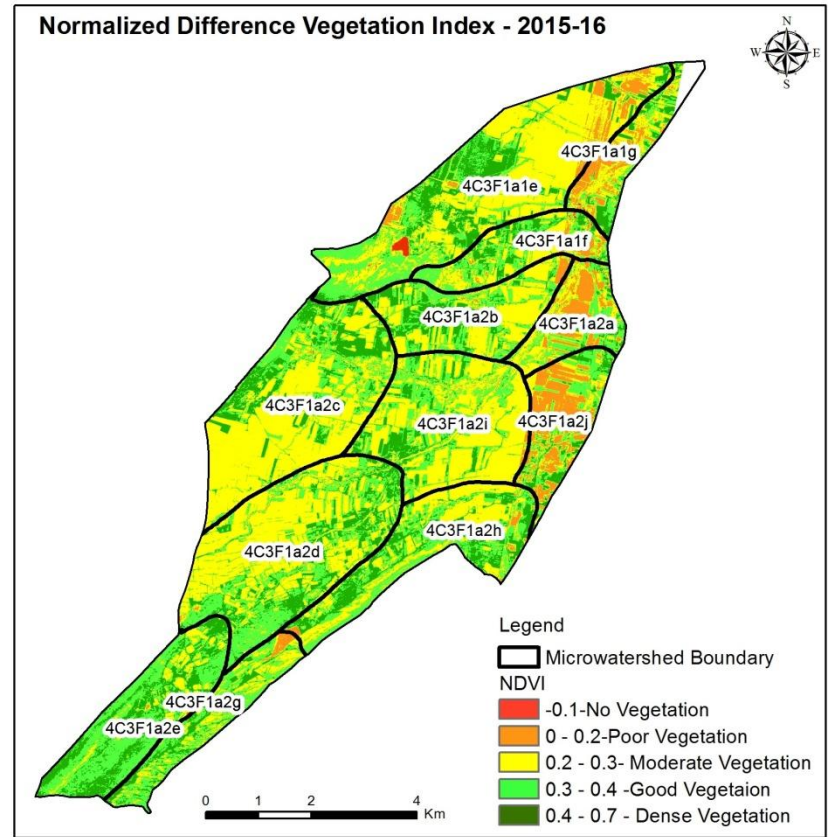


NDVI (2014-15)

Changes in Vegetation Cover



NDVI (2014-15)



NDVI (2015-16)

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-02/2009-10



T0:2009-10



T1: 17 March 2015



Drishti Sl no. 1969047 MWS :4C3F1a2d

Check dam



T0:2009-10



T1: 17 March 2015



Drishti Sl no.127321 MWS : 4C3F1a2d

Farm pond

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-02/2009-10



T0

T0: 2009-10



T1

T1: 17 March 2015



Drishti Sl no. 771782 MWS : 4C3F1a2d

Farm pond



T0

T0: 2009-10



T1

T1: 17 March 2015



Drishti Sl no. 808765 MWS : 4C3F1a2d

Farm pond

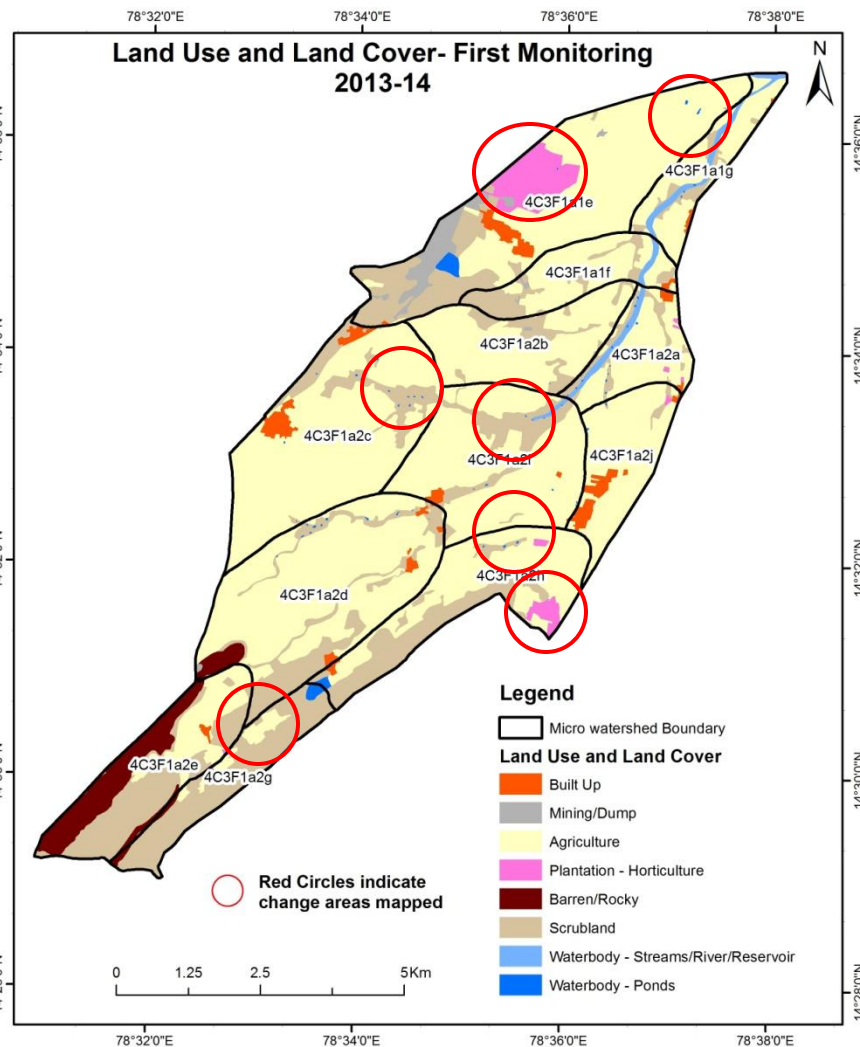
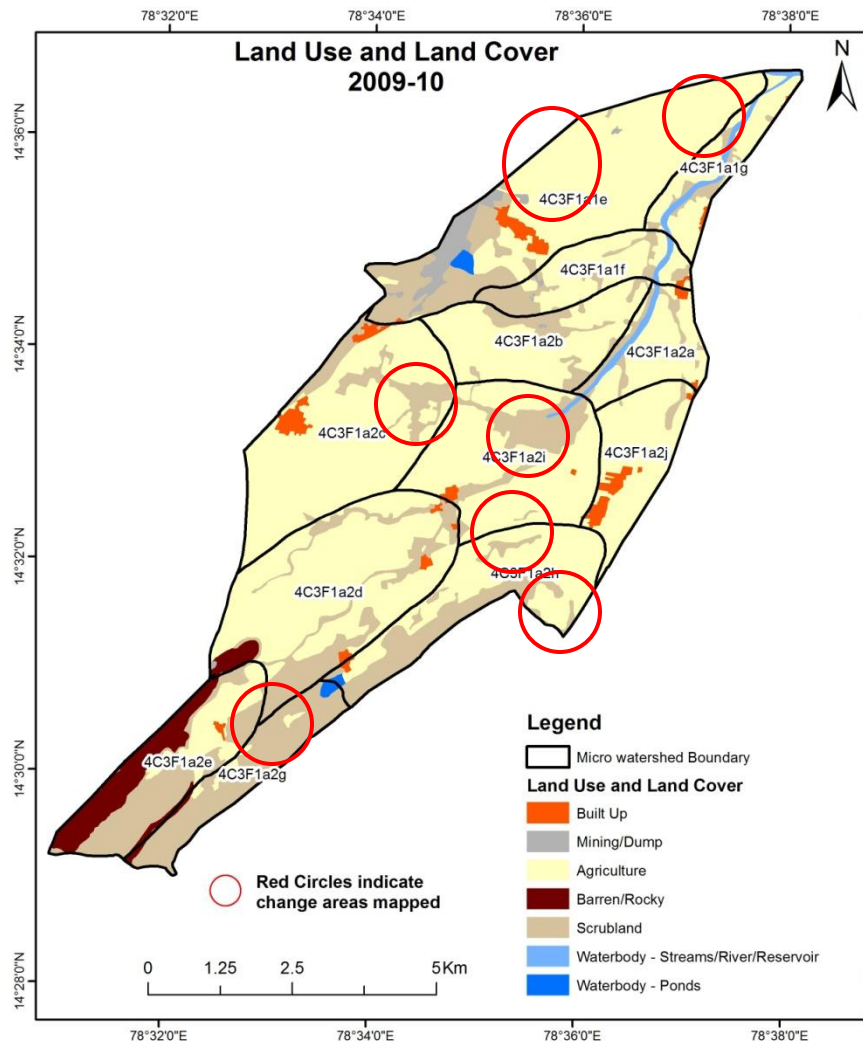
MONITORING IN THE PROJECT AREA

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)

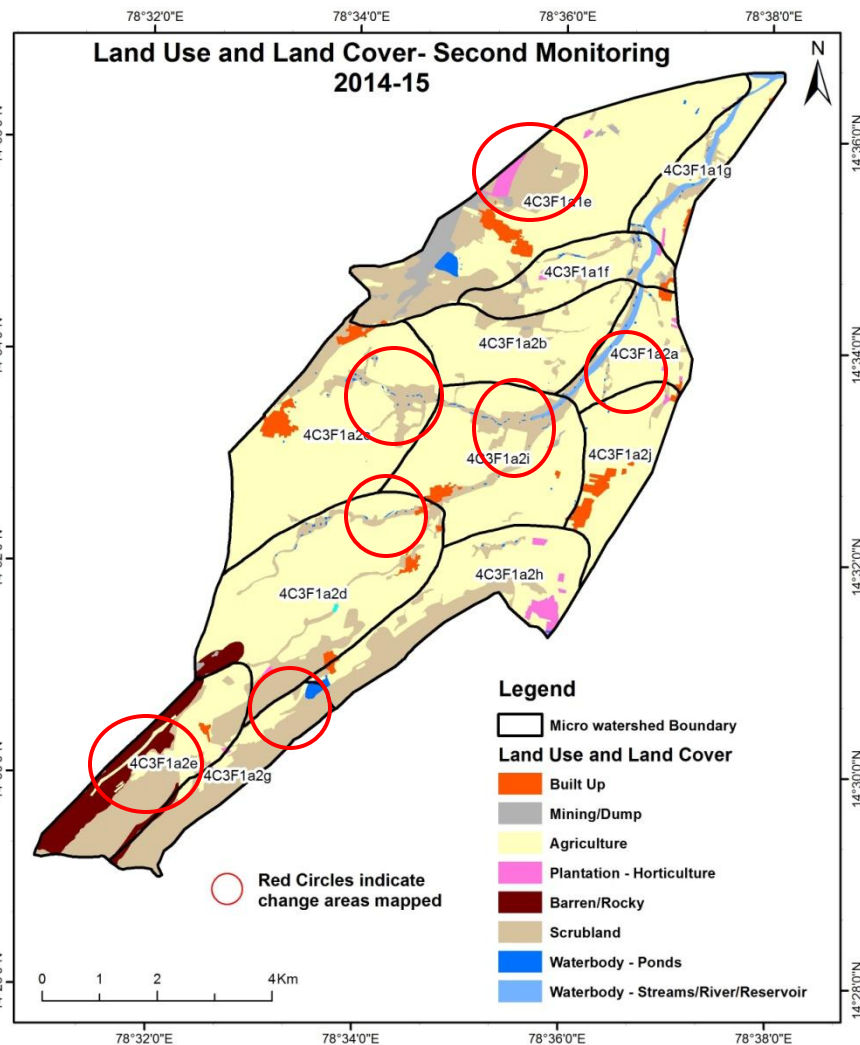
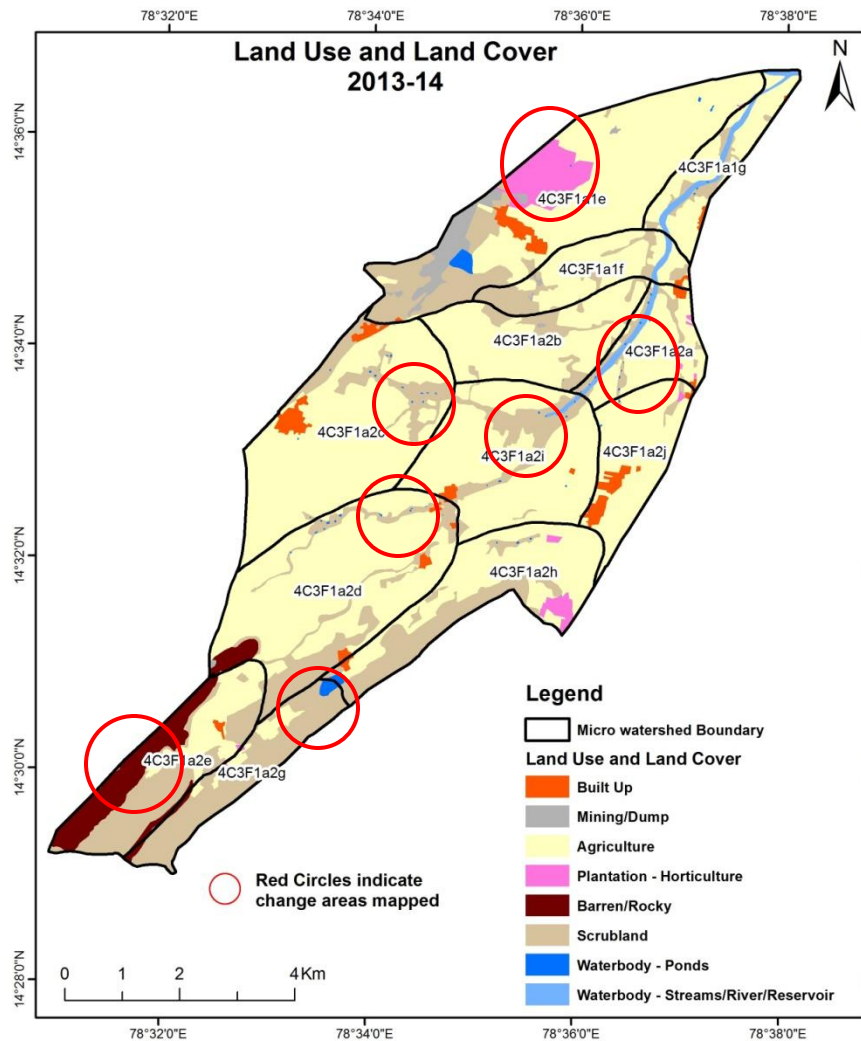
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



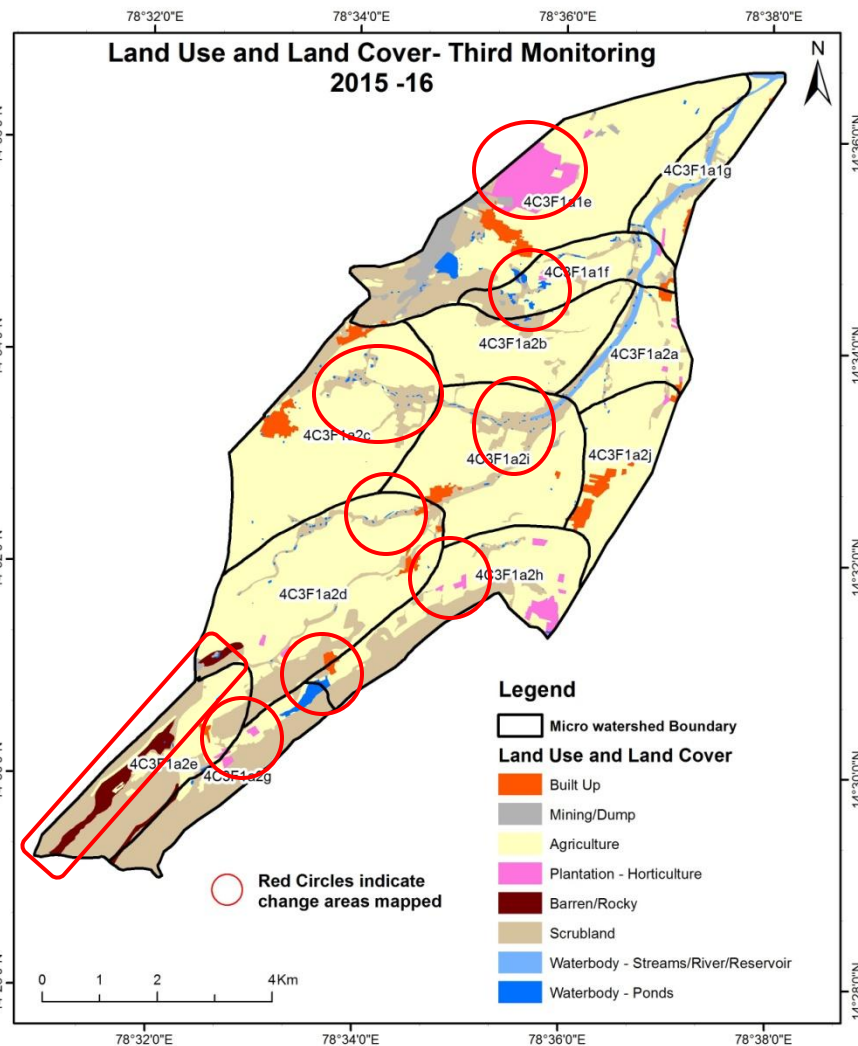
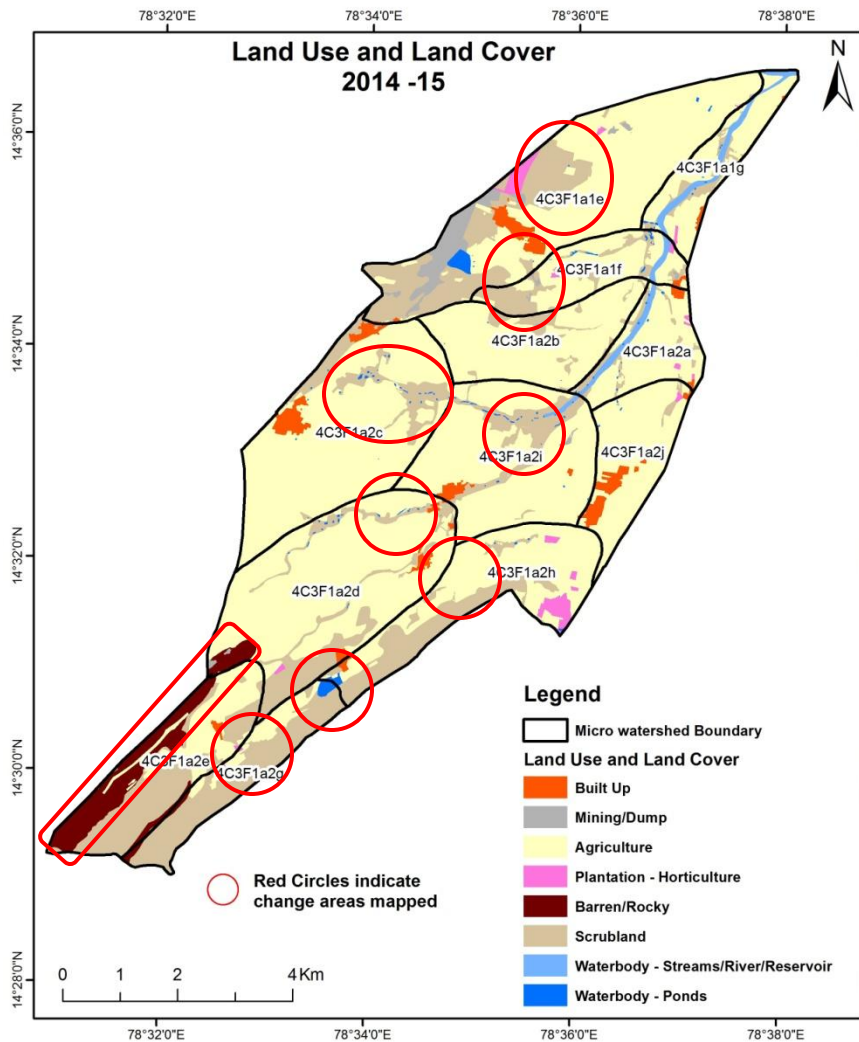
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



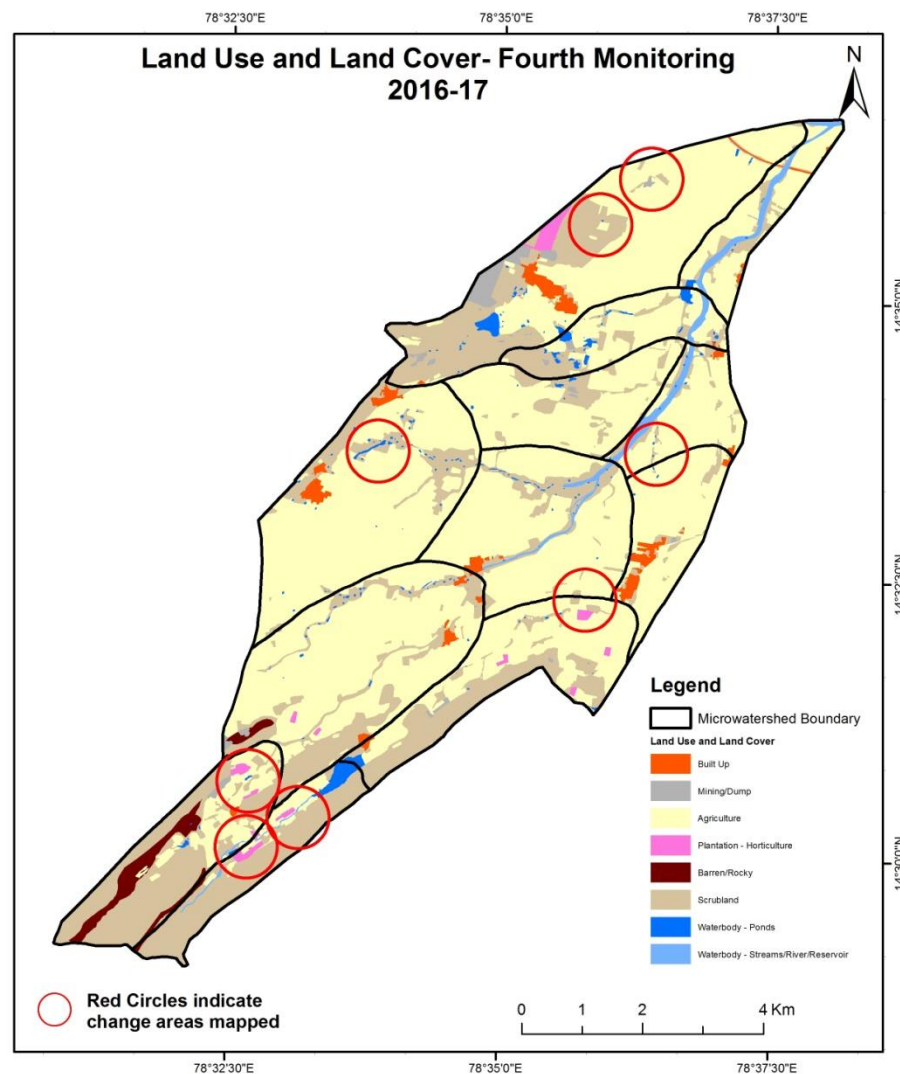
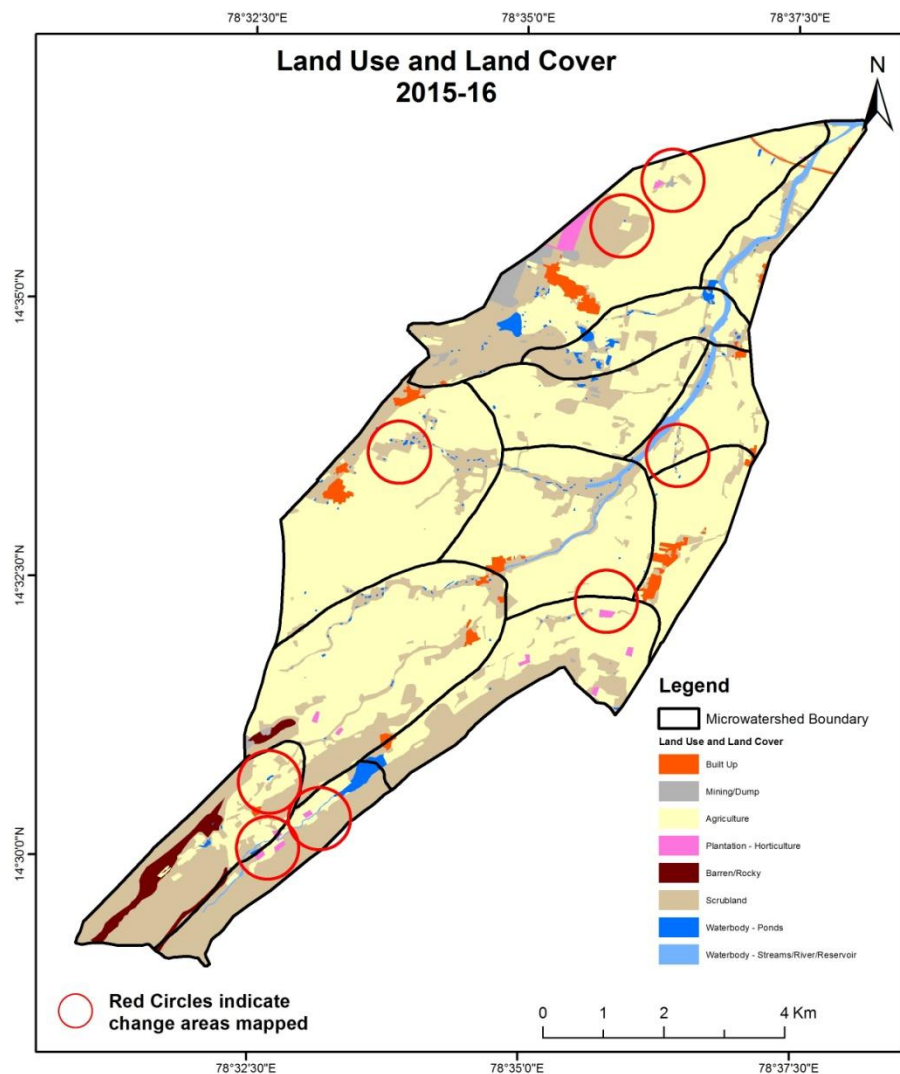
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



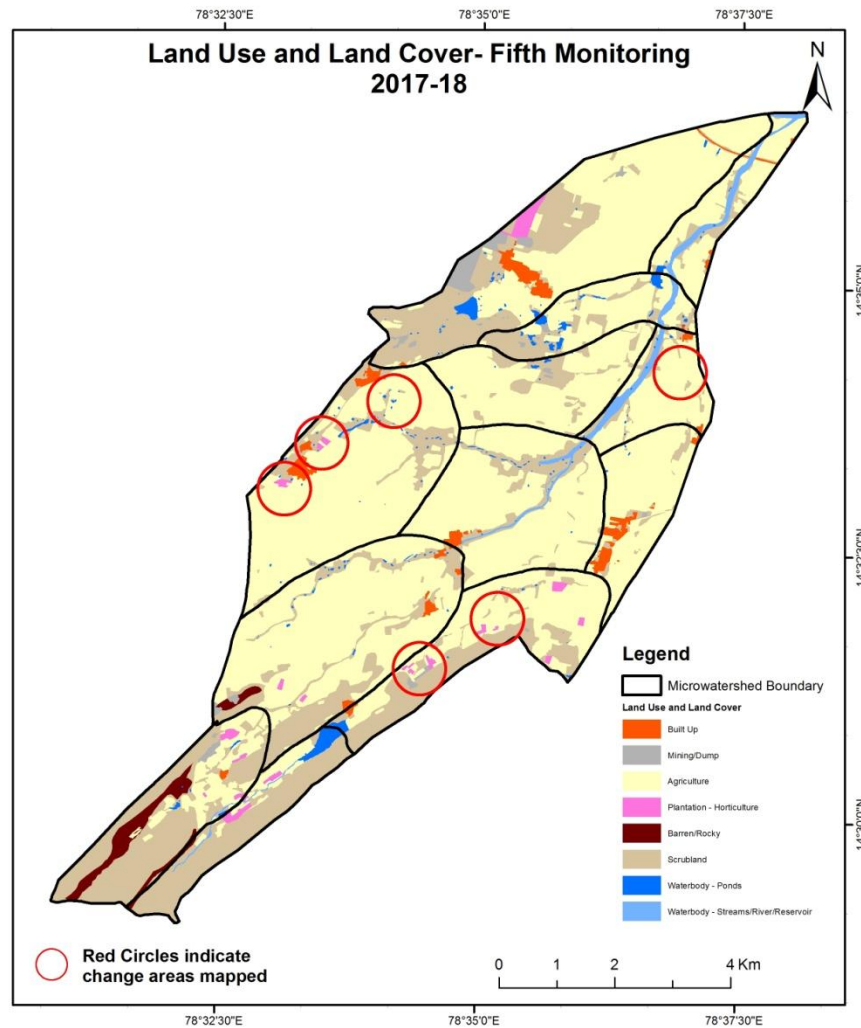
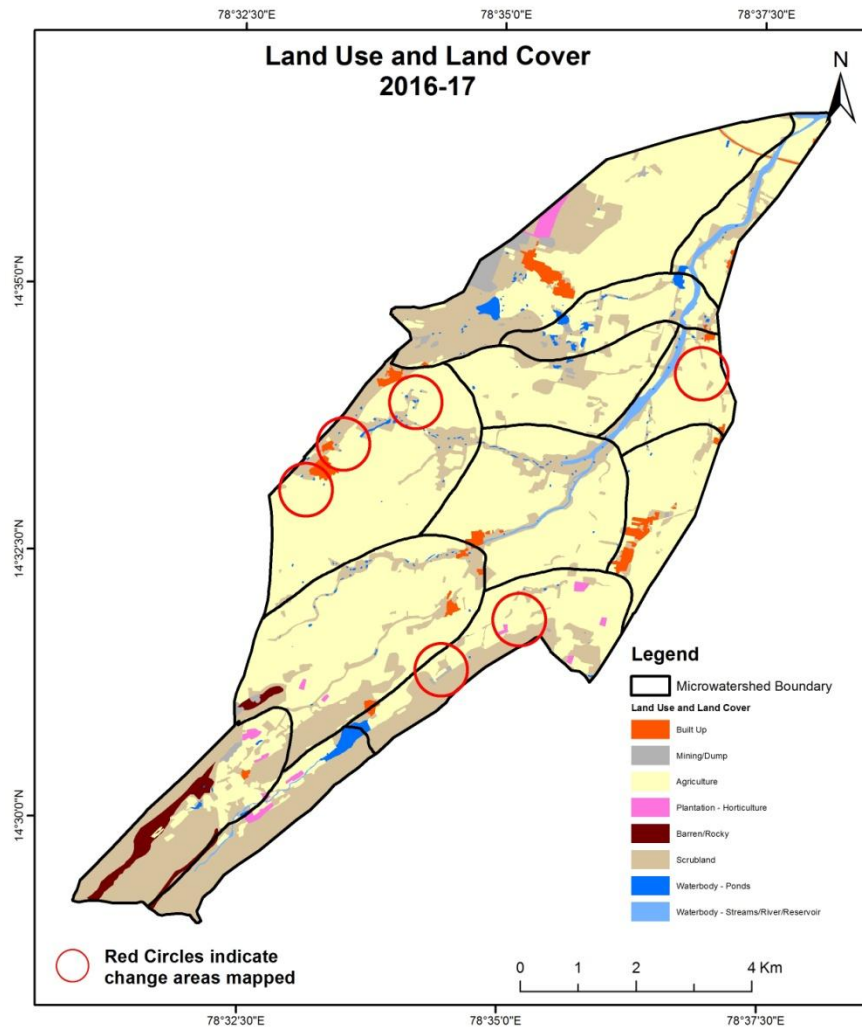
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



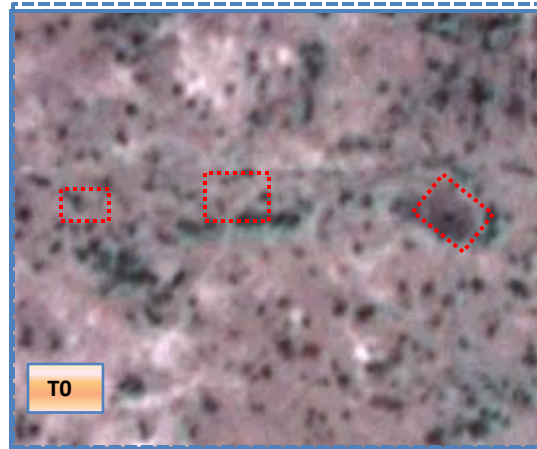
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

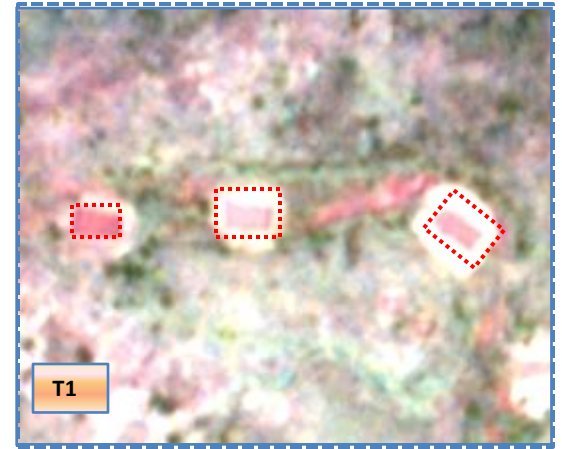


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Water body



T0: 2009-10



T1: 17 March 2015

Scrub to Water body



T0: 2009-10



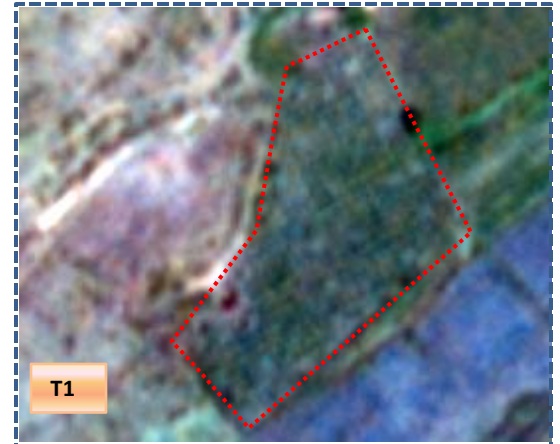
T1: 17 March 2015

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

Agriculture to Plantation

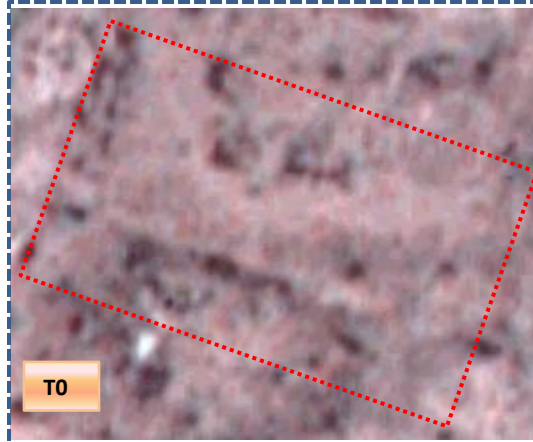


T0: 2009-10

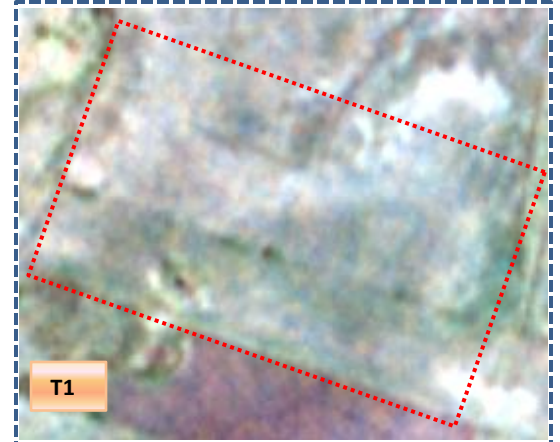


T1: 17 March 2015

Scrub to Agriculture



T0: 2009-10



T1: 17 March 2015

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	103.71												103.71
Mining/dump		43.44											43.44
Agriculture	0.52		4134.61	35.46				90.52			1.32		4262.44
Plantation Horticulture													
Forest													
Forest Plantation													
Barren Rocky							80.65						80.65
Scrub		0.37	106.06	0.42				1762.48			3.85		1873.18
Waterbody- Streams/River			0.23						90.21		0.27		90.71
Waterbody – Ponds											18.85		18.85
Grand Total	104.23	43.81	4240.90	35.88			80.65	1853.00	90.21		24.29		6472.97

- 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 127 ha of the agriculture area has decreased and it is converted into built-up, plantation, scrub land and water body in T1.
- In T1 106 ha of the agriculture area has increased from plantations and water body of T0 and Overall 21 ha of the agriculture area has been decreased.
- 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	104.23												104.23
Mining/dump		43.81											43.81
Agriculture	3.00	0.11	4202.78	4.46				29.00			1.55		4240.90
Plantation Horticulture	0.04		2.97	29.52				2.97			0.38		35.88
Forest													
Forest Plantation													
Barren Rocky		0.99						79.66					80.65
Scrub	1.21	2.34	79.50					1754.72			15.23		1853.00
Waterbody- Streams/River									90.21				90.21
Waterbody – Ponds											24.29		24.29
Grand Total	108.48	47.25	4285.24	33.97				79.66	1786.69	90.21	41.46		6472.97

- 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 38 ha of the agriculture area has decreased and it is converted into plantation, scrub, mining dump water body and built up in T2.
- In T2 82 ha of the agriculture area has increased from plantations and scrubland of T1.
- Overall 44 ha of the agriculture area has been decreased. 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	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
Built up	108.48										108.48	
Mining/dump		46.86								0.38	47.25	
Agriculture		0.57	4262.66	7.06				3.88	2.41	8.67	4285.24	
Plantation Horticulture			4.55	29.42							33.97	
Forest												
Forest Plantation												
Barren Rocky		1.01					78.65				79.66	
Scrub		5.65	29.78					1728.16	4.30	18.80	1786.69	
Waterbody- Streams/River									90.21		90.21	
Waterbody – Ponds										41.46	41.46	
Grand Total	108.48	54.10	4296.99	36.48			78.65	1732.04	96.92	69.31	6472.97	

- 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 22 ha of the agriculture area has decreased and it is converted into plantation, scrub, mining dump and water body in T3.
- In T3 34 ha of the agriculture area has increased from plantations and scrubland of T2.
- Overall 11 ha of the agriculture area has been increased. 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	108.48										108.48	
Mining/dump		54.10									54.10	
Agriculture	0.10	4.91	4271.55	10.63				9.29		0.50	4296.99	
Plantation Horticulture			1.96	34.52							36.48	
Forest												
Forest Plantation												
Barren Rocky		0.24					78.41				78.65	
Scrub	0.36	3.38	12.69					1713.11		2.49	1732.04	
Waterbody- Streams/River									96.92		96.92	
Waterbody – Ponds										69.31	69.31	
Grand Total	108.95	62.64	4286.20	45.15			78.41	1722.40	96.92	72.30	6472.97	

- 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 25 ha of the agriculture area has decreased and it is converted into plantation, scrub, mining dump and water body in T3.
- In T3 14 ha of the agriculture area has increased from plantations and scrubland of T2.
- Overall 10 ha of the agriculture area has been decreased. 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	Monitoring period (T5)										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	108.95												108.95
Mining/dump		62.64											62.64
Agriculture	0.30	0.36	4274.24	10.53							0.77		4286.20
Plantation Horticulture				45.15									45.15
Forest													
Forest Plantation													
Barren Rocky		0.17					78.24						78.41
Scrub		1.86	27.12					1693.18			0.24		1722.40
Waterbody- Streams/River			0.72						96.19				96.92
Waterbody – Ponds											72.30		72.30
Grand Total	109.26	65.02	4302.08	55.68			78.24	1693.18	96.19		73.31		6472.97

- 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 11 ha of the agriculture area has decreased and it is converted into plantation, scrub, mining dump and water body in T3.
- In T3 27 ha of the agriculture area has increased from scrubland and water body of T2.
- Overall 15 ha of the agriculture area has been increased. The additional agriculture are coming from waterbody in T3 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 60 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 44, 11 & 15 Hectares From T1-T2, T2-T3 & T4-T5 respectively and overall increase of 40 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 55 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 180 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (40) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (46) verified from the portal.