

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

ANANTAPURAMU -05/2009-10
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**

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03. MONITORING IN THE PROJECT AREA : Site wise changes in the project
04. CONCLUSIONS

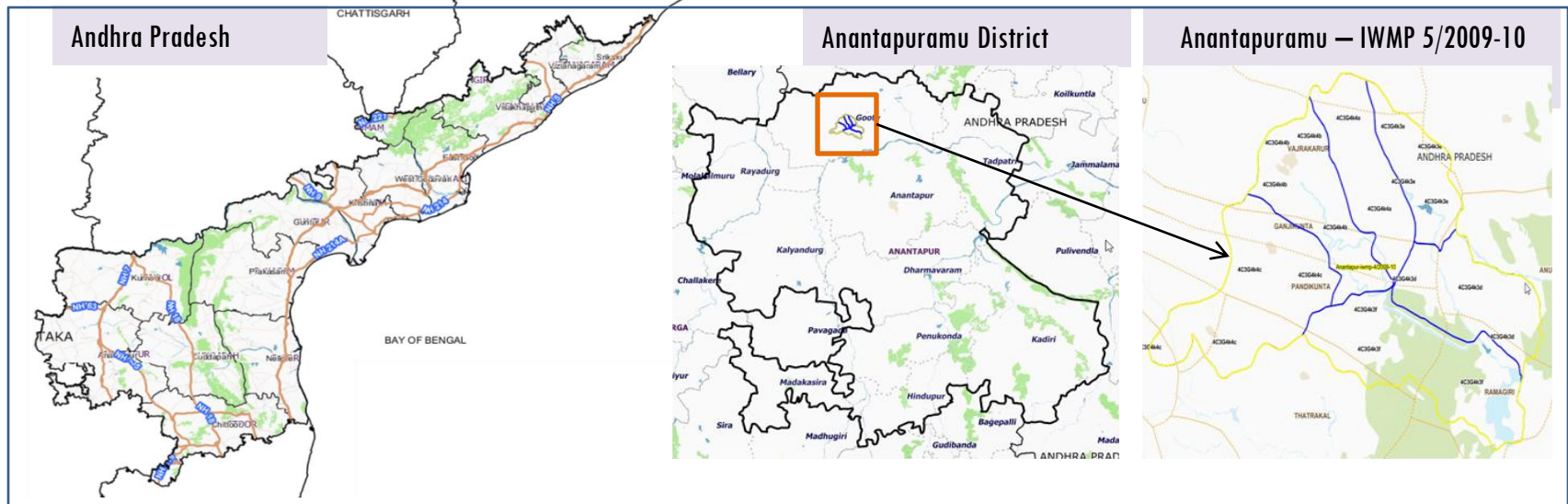
EXECUTIVE SUMMARY

- 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-05/2009-10, Anantapuramu District of Andhra Pradesh. The total geographical area of the project is 6569.49 ha. It comprises of 9 micro watersheds.
- In the project area 216 Drishti photos were uploaded showing 100 horticulture/plantation, 17 check dams, 79 Farm ponds/dugout pits, 11 Soil moisture conservation and remaining are others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 33 new farm ponds or dug out ponds with 19.31 ha increase in the area.
- Major percentage i.e. 53.30% is covered by the agriculture, 28.59% is covered by scrub land, 11.37% by forest and remaining by other land use classes.

PROJECT : ANANTAPURAMU - IWMP-05/2009-10

District : Anantapuramu, State : Andhra Pradesh

- The study area falls in Nallamada Mandal of Anantapuramu district of Andhra Pradesh state. The total geographical area of the project is 6569.49 ha. It comprises of 09 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.



- Project area witnesses tropical wet and dry climate characterized by year round high temperatures. Anantapur 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.

Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10		2017-18
LISS IV	2009-10		
SCENE 1			25-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			25-Mar-18
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	216
4	Detailed Project Report		

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



Legend



Drainage (1:10000 Scale)

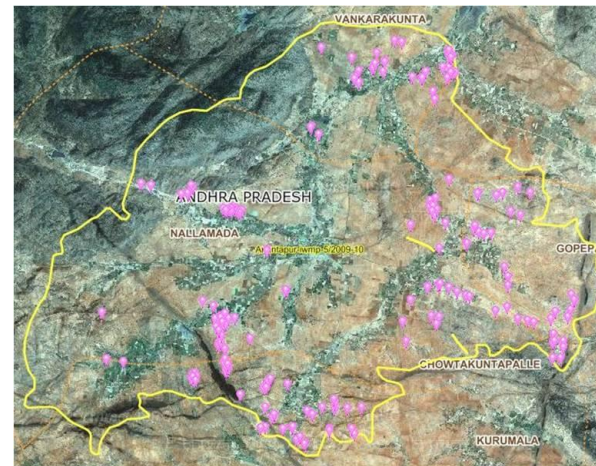


MWS Boundary



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	Afforestation	1	1
2	Horticulture	0	0
3	Agriculture	90	70
4	Block plantation	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	19	15
9	Gabion structure	0	0
10	Farm ponds /water harvesting structure	85	79
11	Check dams	17	15
12	Nallah Bunds	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	8	4
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	9	9
	TOTAL	229	193

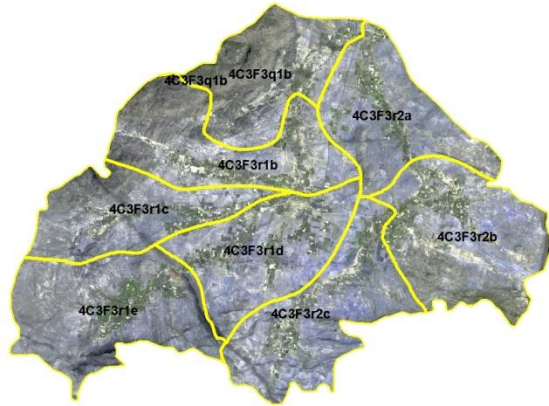
MONITORING IN THE PROJECT AREA

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.

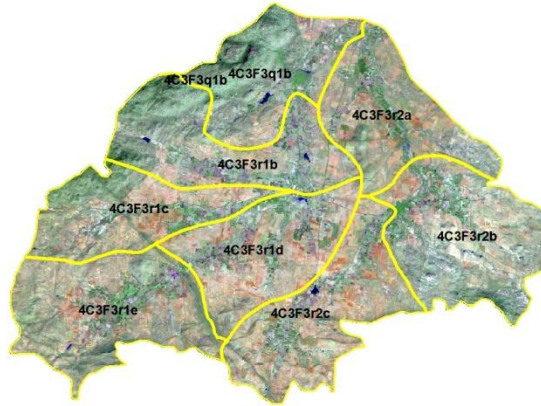
Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2009-10



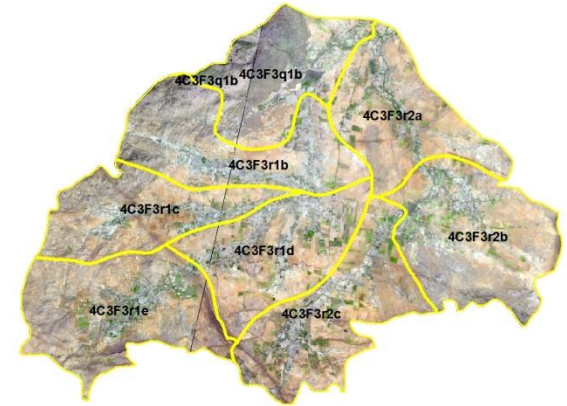
Source:Fusen data,NRSC

Natural Color Composite- 21st December 2013



Source:Fusen data,NRSC

Natural Color Composite- 26th January 2015



Source:Fusen data,NRSC

Natural Color Composite- 2016



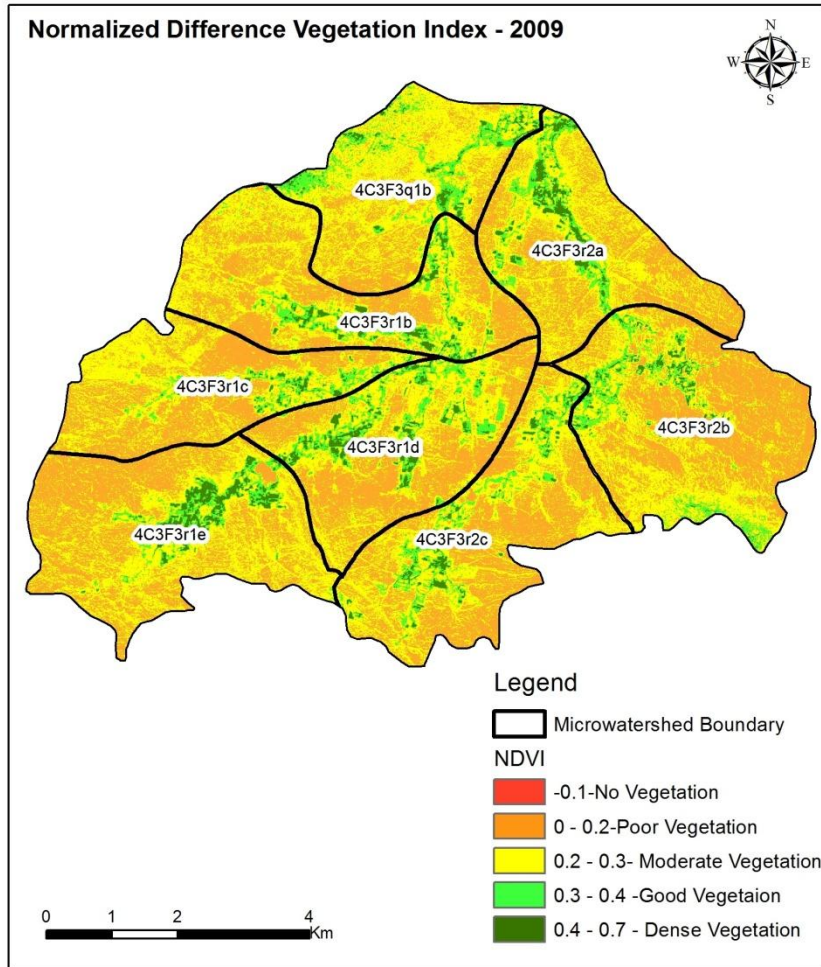
Source:Fusen data,NRSC

Natural Color Composite- 03rd June 2017

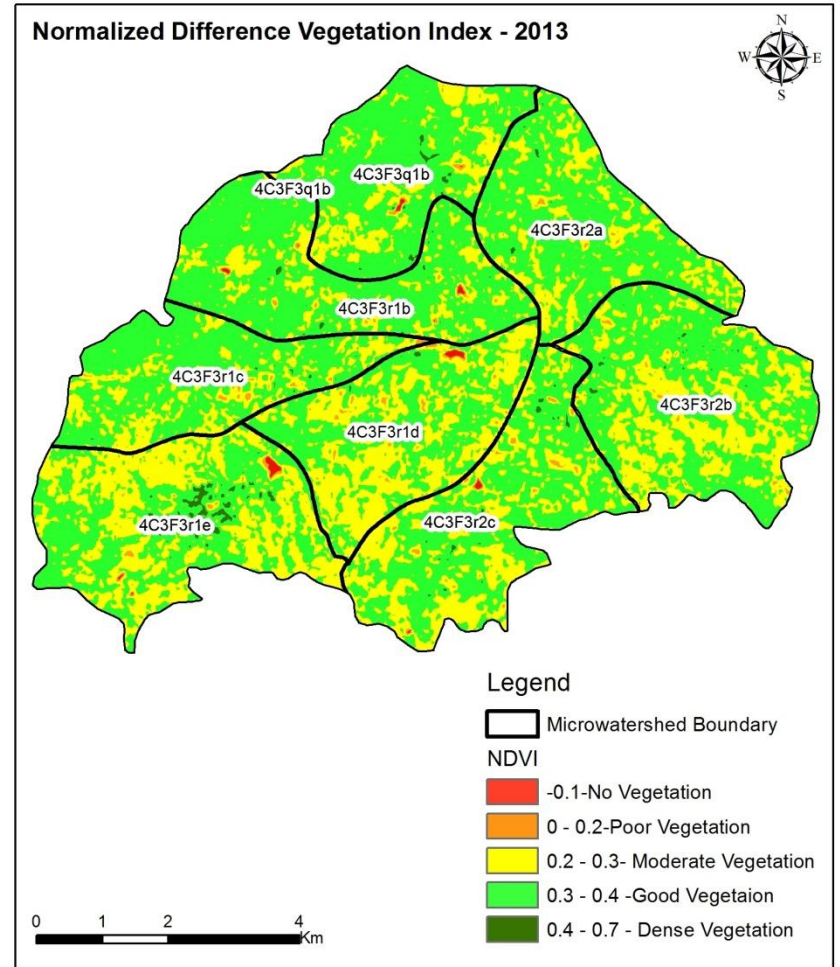


Source:Fusen data,NRSC

Changes in Vegetation Cover

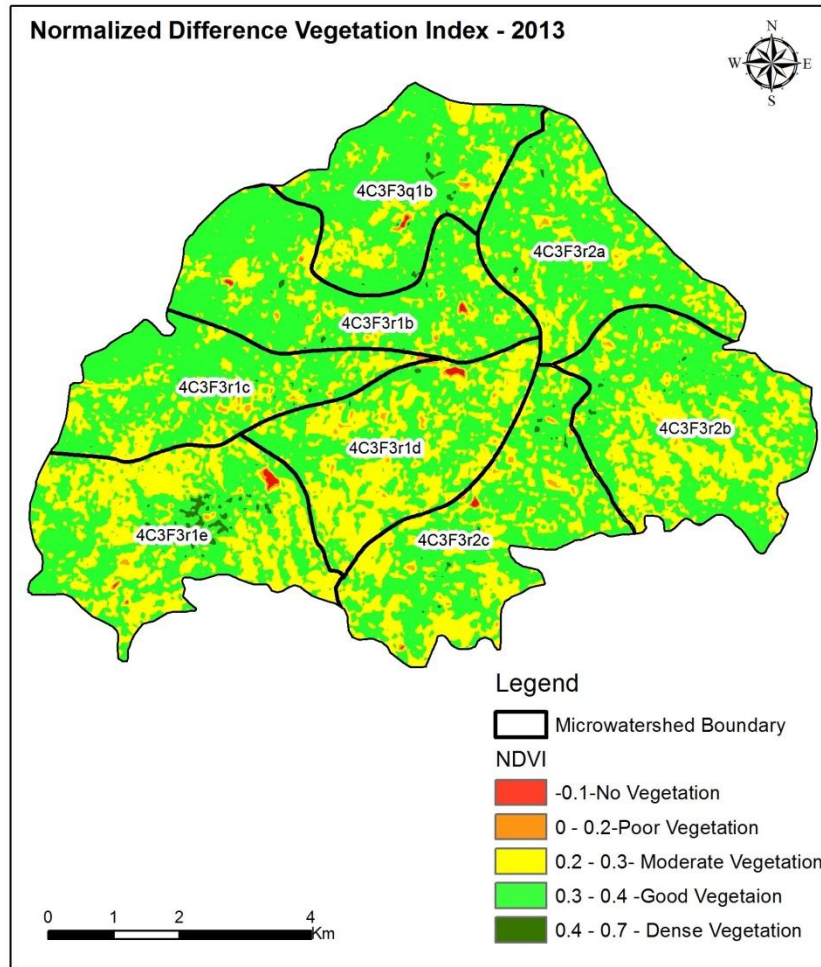


NDVI (2009-10)

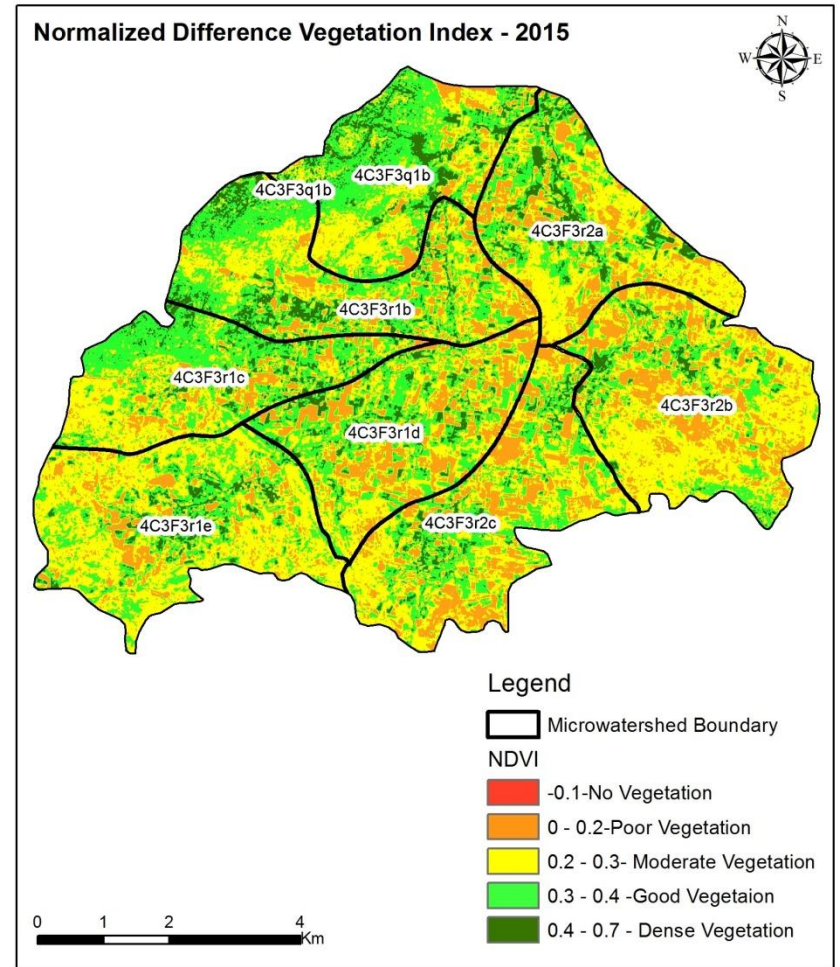


NDVI (12 October 2015)

Changes in Vegetation Cover

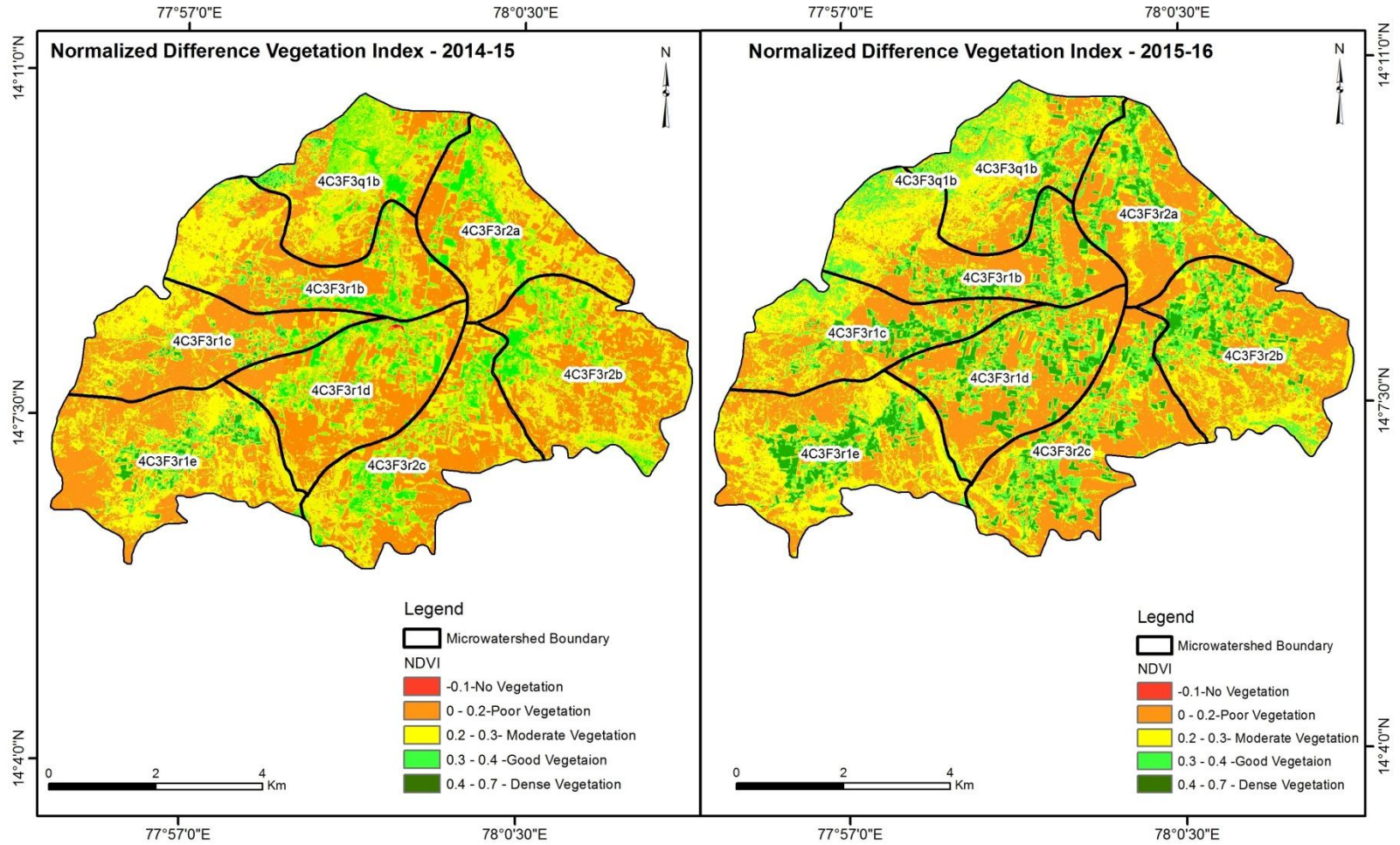


NDVI (2013-14)



NDVI (12 October 2015)

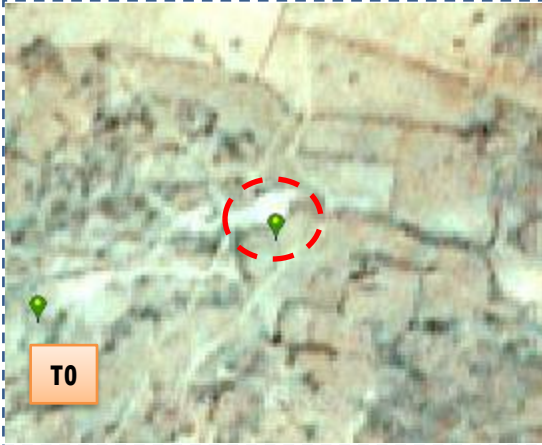
Changes in Vegetation Cover



NDVI (2014-15)

NDVI (16 February 2016)

Monitoring of activities in Anantapuramu District Andhra Pradesh. IWMP-05/2009-10



T0:2009-10

Farm pond



T1: 21 December 2013



Drishti SI no. 586640 MWS :4C3F3r2a



T0:2009-10

Farm pond



T1: 21 December 2013



Drishti SI no.586654 MWS : 4C3F3r2b

Monitoring of activities in Anantapuramu District Andhra Pradesh. IWMP-05/2009-10



T0: 2009-10

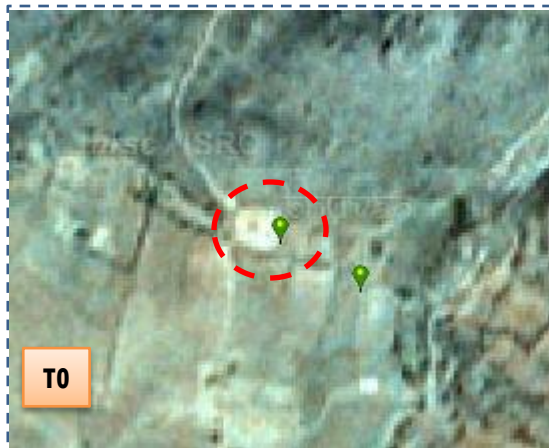


T1: 21 December 2013



Drishti Sl no. 611218 MWS:4C3F3r1e

Horticulture/Plantation



T0: 2009-10



T1: 21 December 2013



Drishti Sl no. 611313 MWS:4C3F3r1b

Horticulture/Plantation

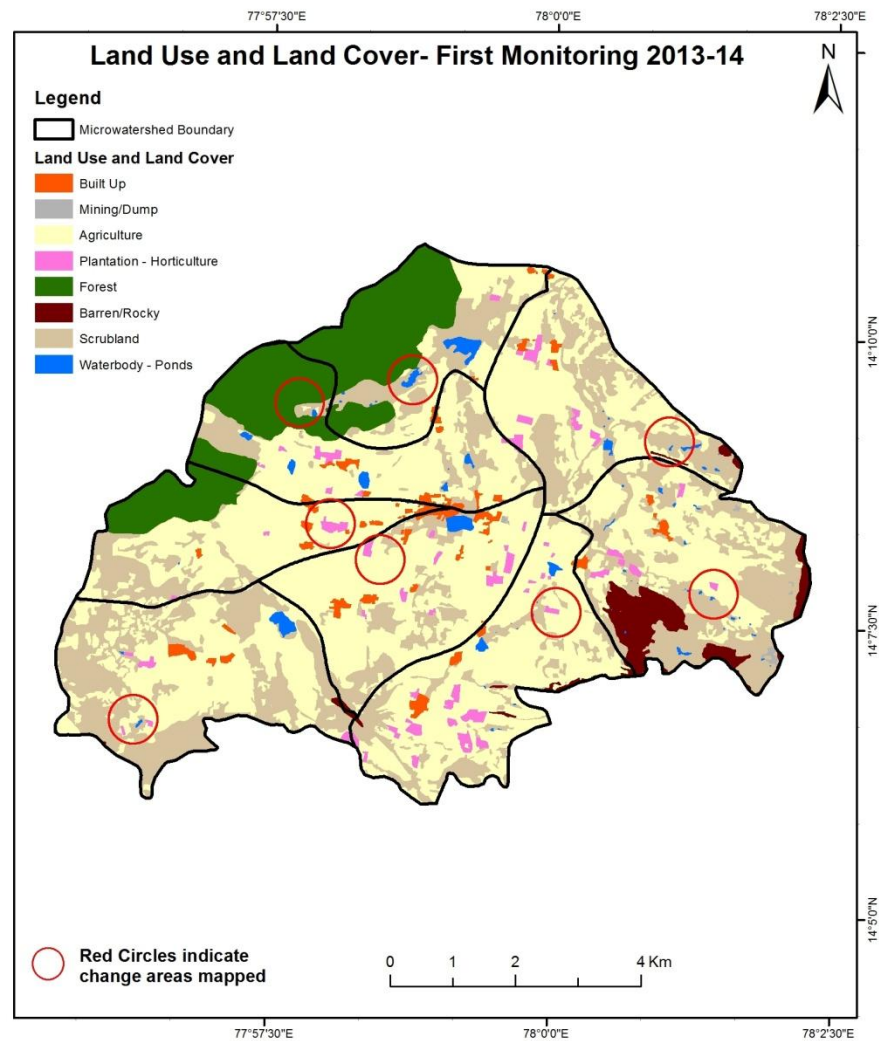
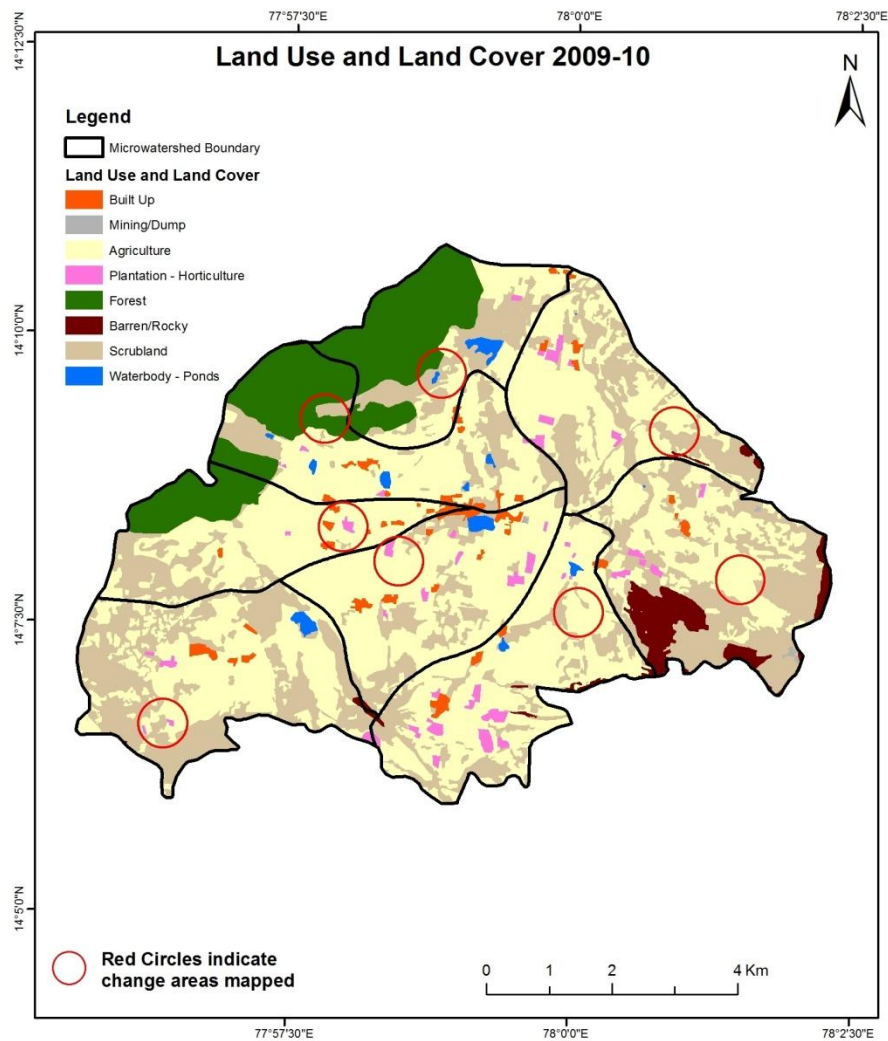
MONITORING IN THE PROJECT AREA

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 pre implementation period as T0 (2009-10) and row represents the post implementation period as T5 (2017-18) .

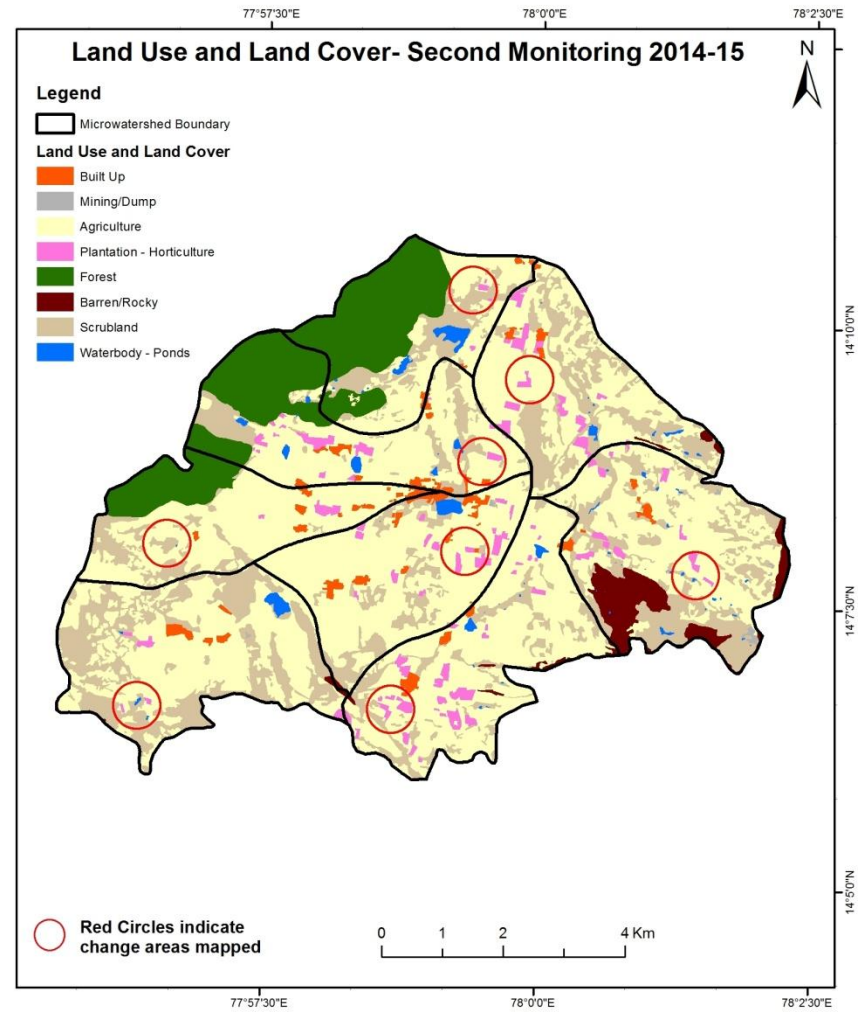
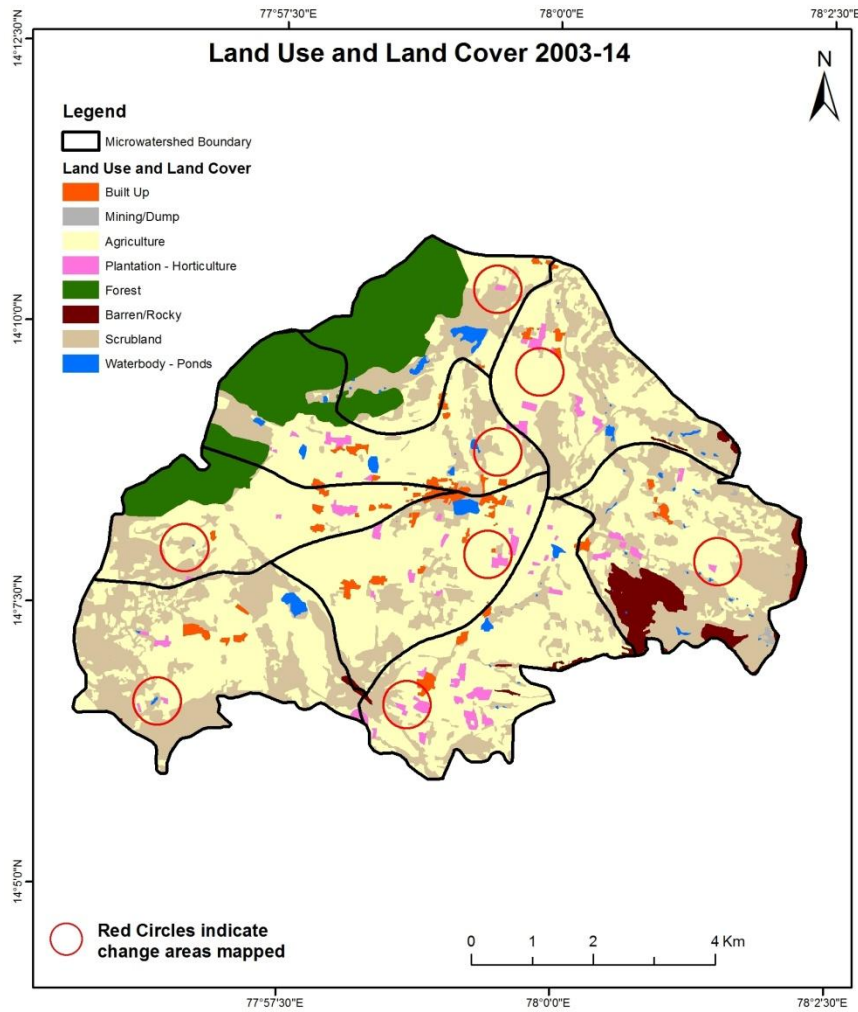
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

Scale: 1:10000



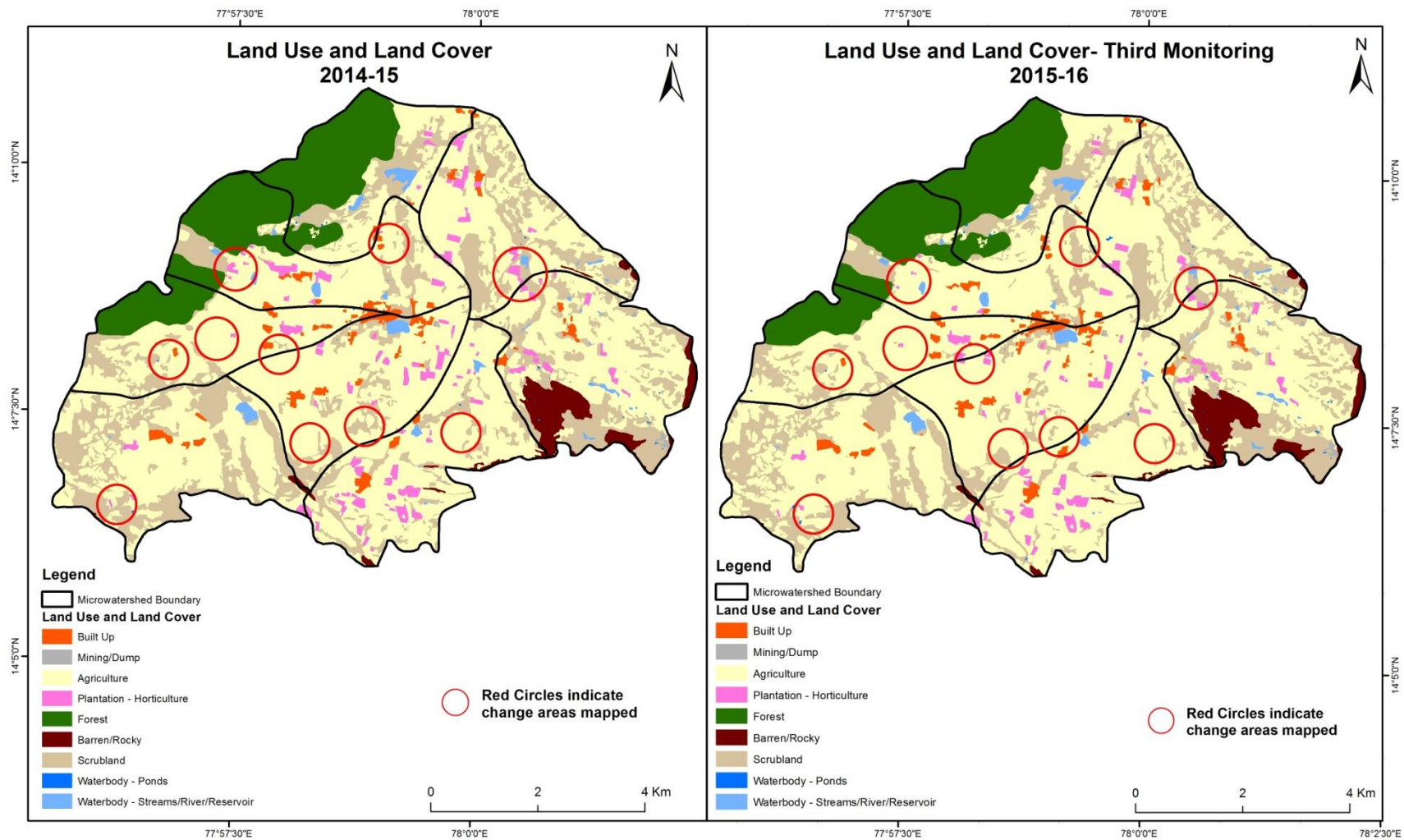
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

Scale: 1:10000



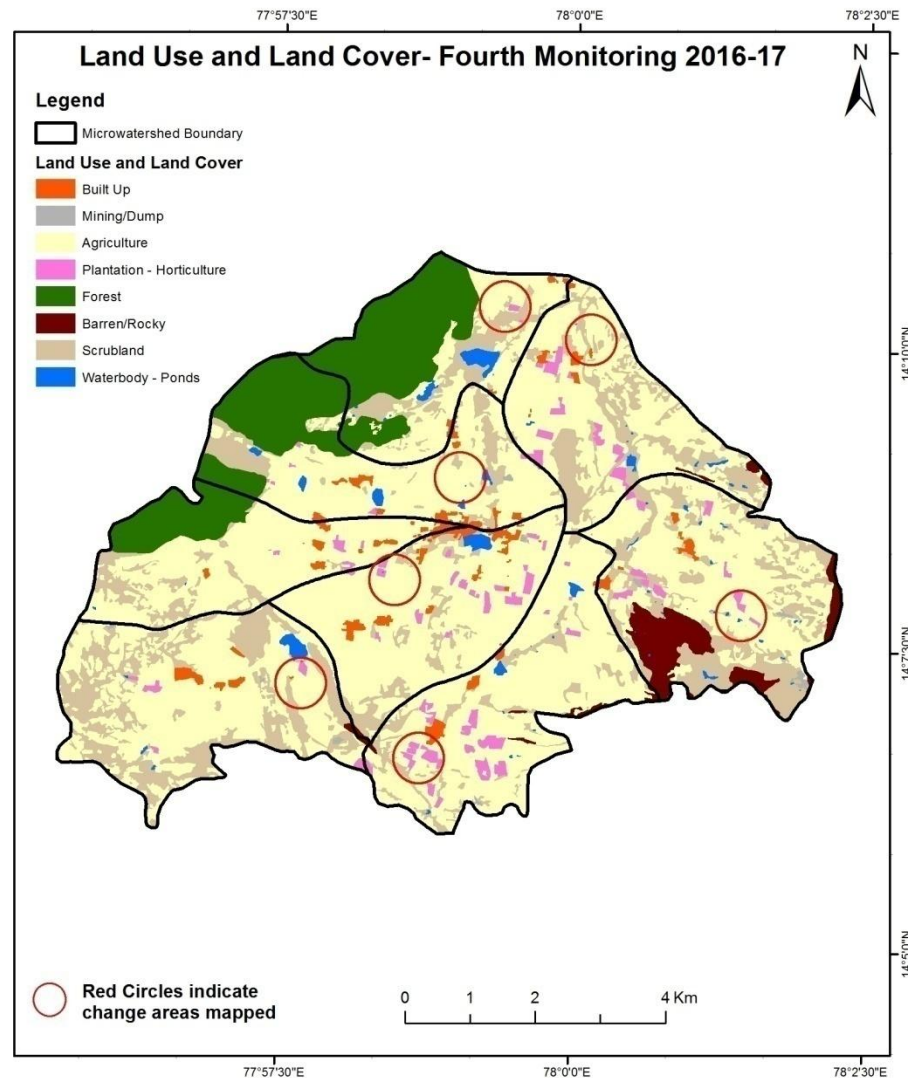
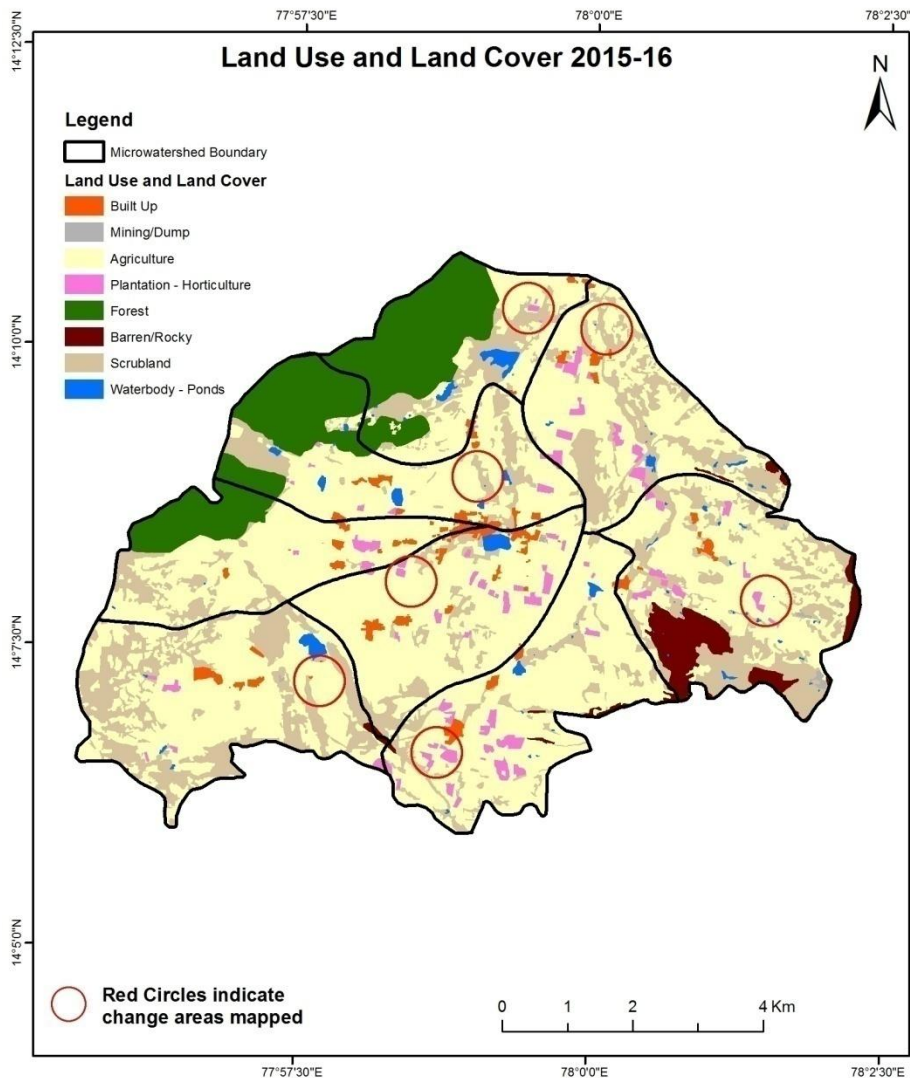
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

Scale: 1:10000



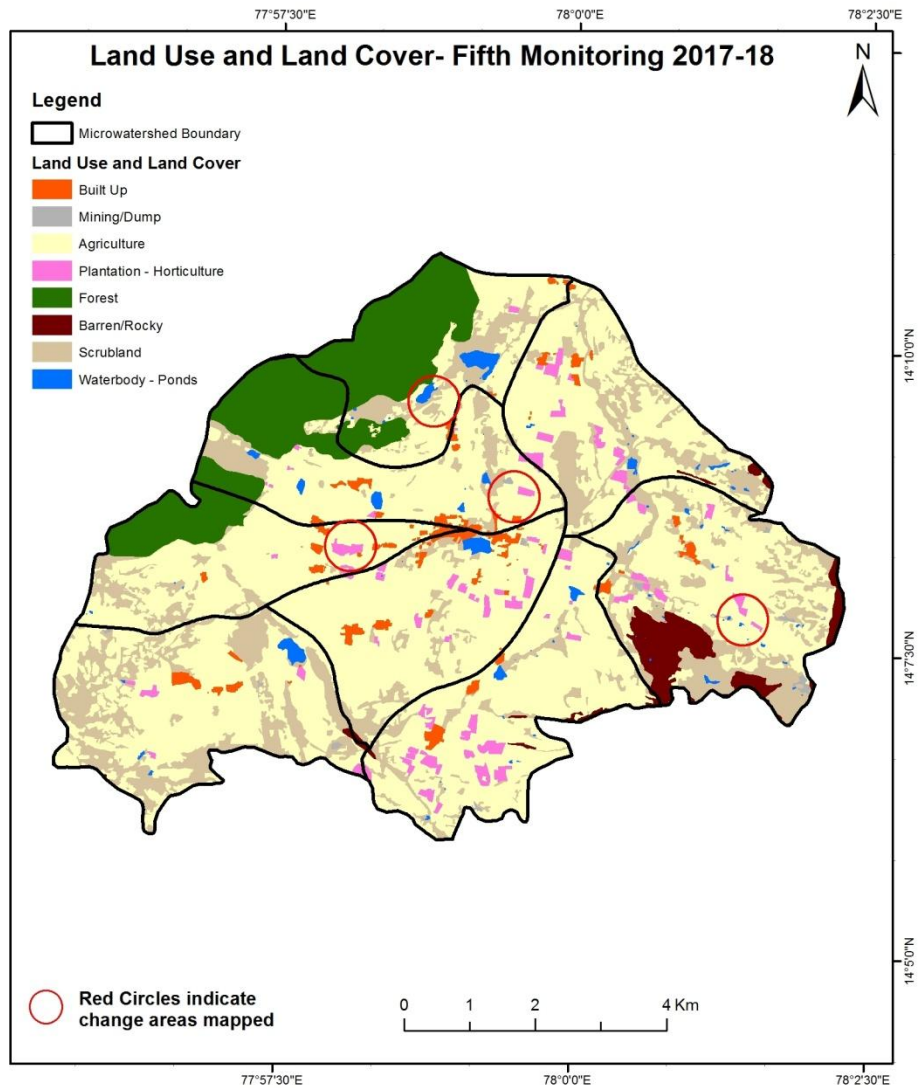
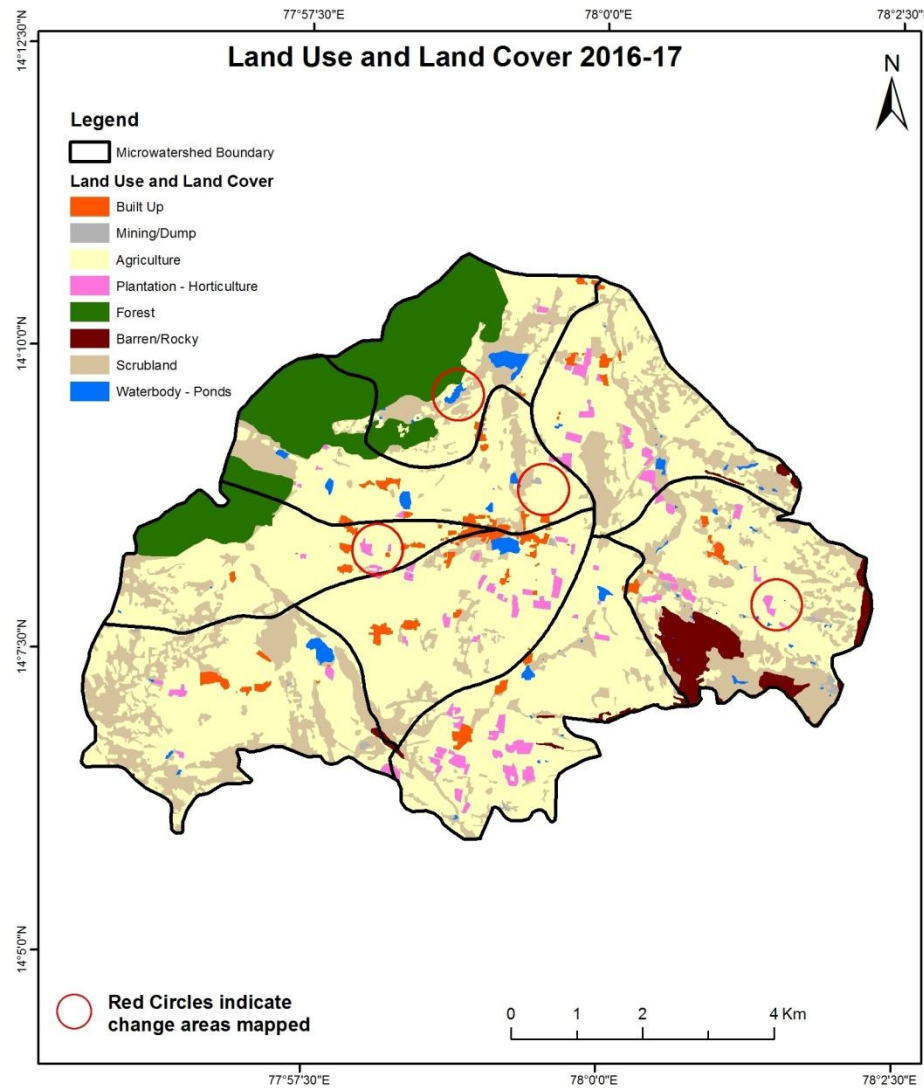
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

Scale: 1:10000



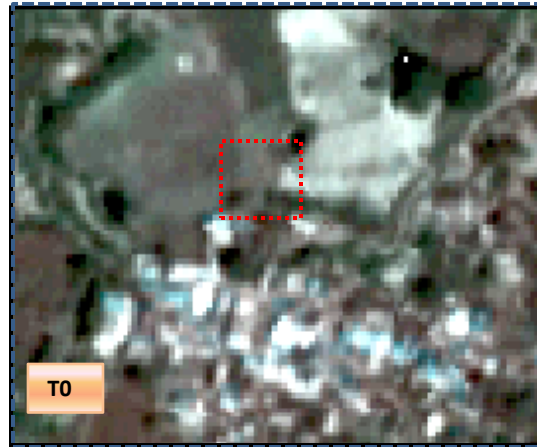
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000



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

Agriculture to Built up



T0

T0: 2009-10



T1

T1: 21 December 2013

Agriculture to Plantaion



T0

T0: 2009-10

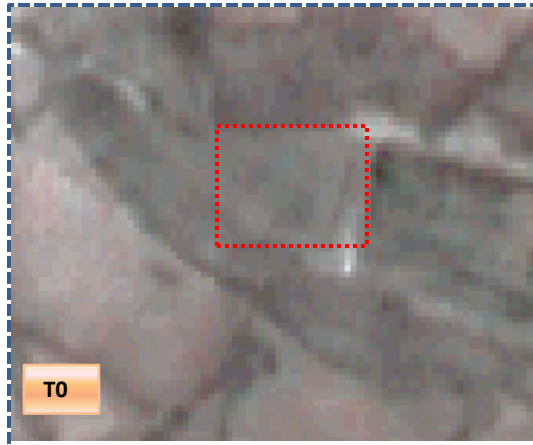


T1

T1: 21 December 2013

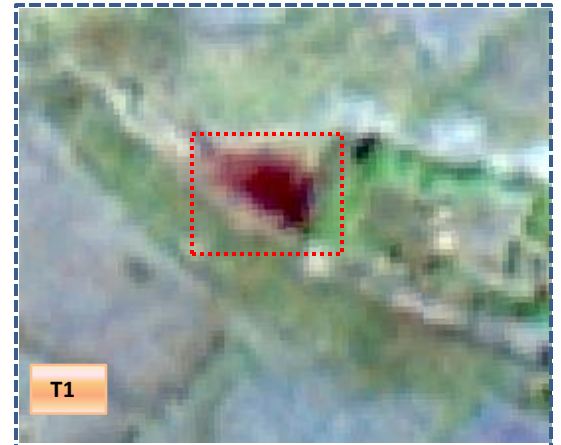
Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Waterbody



T0

T0: 2009-10



T1

T1: 23 May 2013

Agriculture to Waterbody



T0

T0: 2009-10



T1

T1: 23 May 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	105.28										105.28
Mining/dump		3.92									3.92
Agriculture	6.63	0.13	3375.64	22.96						0.38	3405.74
Plantation Horticulture	0.17		1.36	94.05							95.58
Forest					747.38					0.03	747.41
Forest Plantation											
Barren Rocky							155.24				155.24
Scrub	6.72	1.59	87.22	0.75				1894.97		17.03	2008.28
Waterbody- Streams/River											
Waterbody – Ponds										48.03	48.03
Grand Total	118.80	5.64	3464.22	117.76	747.38		155.24	1894.97		65.48	6569.49

- 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 30.10 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body in T1.
- In T1 88.58 ha of agriculture are 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										
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
Built up	118.80										118.80
Mining/dump		5.64									5.64
Agriculture	2.33		3401.07	60.33				0.17		0.33	3464.22
Plantation Horticulture			2.20	115.56							117.76
Forest			1.63		745.66					0.09	747.38
Forest Plantation											
Barren Rocky							155.24				155.24
Scrub		0.48	371.97	0.47				1521.85		0.20	1894.97
Waterbody- Streams/River											
Waterbody – Ponds										65.48	65.48
Grand Total	121.13	6.12	3776.87	176.35	745.66		155.24	1522.02		66.09	6569.49

- 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 63.15 ha of agriculture are decreased and it is converted into built up, plantation, scrubland and water body in T2.
- In T2 375.80 ha of agriculture are increased from plantation, 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- 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	121.13										121.13
Mining/dump		6.12									6.12
Agriculture	1.55	1.45	3768.07	4.26				0.85		0.69	3776.87
Plantation Horticulture			34.28	142.07							176.35
Forest					745.66						745.66
Forest Plantation											
Barren Rocky							155.24				155.24
Scrub	1.95		133.71					1385.69		0.67	1522.02
Waterbody- Streams/River											
Waterbody – Ponds			0.20		0.03					65.86	66.09
Grand Total	124.63	7.57	3936.26	146.34	745.70		155.24	1386.53		67.22	6569.49

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents changes in between the classes.
- In T2 8.80 ha of agriculture area has decreased and it is converted into built-up, mining/dump, plantation, scrubland and water body area in T3.
- In T3 168.19 ha of agriculture area has been increased from plantation, 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- 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	124.63										124.63
Mining/dump		7.57									7.57
Agriculture	0.54		3929.22	6.50							3936.26
Plantation Horticulture			10.33	135.95						0.06	146.34
Forest			2.85		742.85						745.70
Forest Plantation											
Barren Rocky							155.24				155.24
Scrub	0.18	6.07	97.48					1281.22		1.59	1386.53
Waterbody- Streams/River											
Waterbody – Ponds			1.81		0.09					65.33	67.22
Grand Total	125.35	13.64	4041.68	142.45	742.93		155.24	1281.22		66.98	6569.49

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents changes in between the classes.
- In T3 7.05 ha of agriculture area has decreased and it is converted into built-up and plantation area in T4.
- In T4 112.46 ha of agriculture area has been increased from plantation, forest, scrubland 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- 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	125.35										125.35
Mining/dump		13.64									13.64
Agriculture	1.14		4025.21	14.26						1.07	4041.68
Plantation Horticulture			1.10	141.36							142.45
Forest					742.93						742.93
Forest Plantation											
Barren Rocky							155.24				155.24
Scrub			9.48					1271.31		0.42	1281.22
Waterbody- Streams/River											
Waterbody – Ponds										66.98	66.98
Grand Total	126.49	13.64	4035.79	155.62	742.93		155.24	1271.31		68.47	6569.49

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents changes in between the classes.
- In T4 16.47 ha of agriculture area has decreased and it is converted into built-up, plantation and water body area in T5.
- In T5 10.58 ha of agriculture area has been 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 20.44 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 58.48, 312.65, 159.40 & 105.42 Hectares From T0-T1, T1-T2, T2-T3 & T3-T4 respectively and overall increase of 630.05 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is a decrease of 736.96 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (79) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (85) verified from the portal.