MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -01/2009-10
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

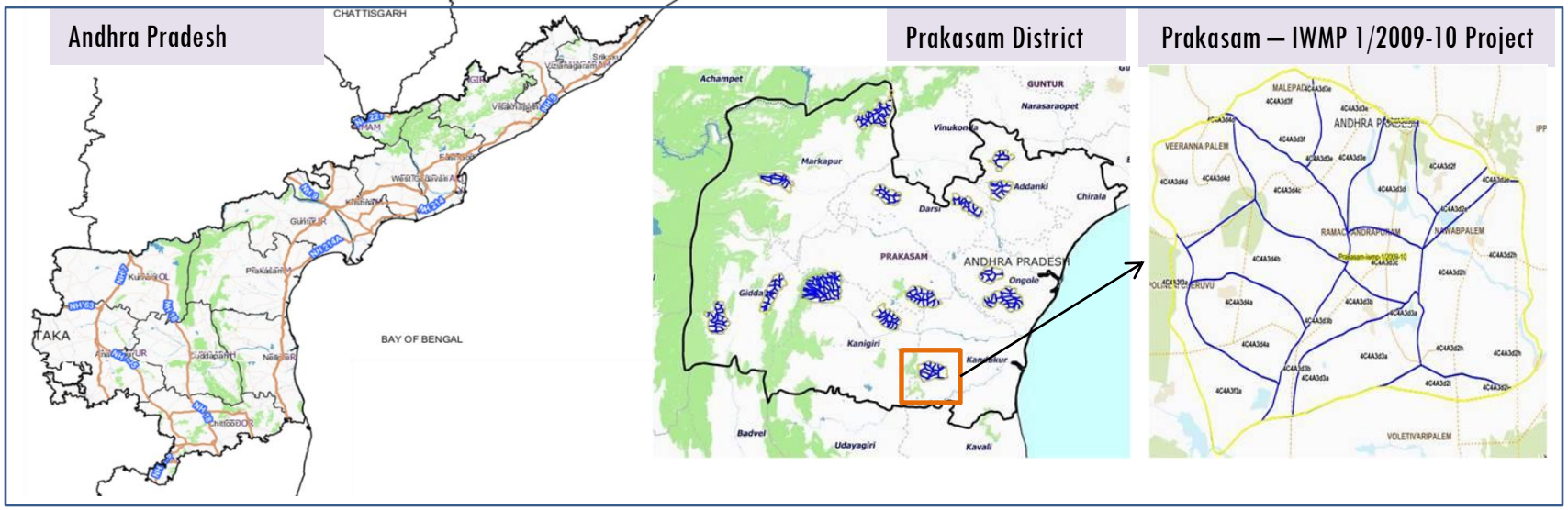
CONTENTS

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-01/2009-10, Prakasam District of Andhra Pradesh. The total geographical area of the project is 8052.14 ha. It comprises of 15 micro watersheds.
- In the project area 212 Drishti photos were uploaded showing 19 check dams, 146 Farm ponds/Percolation tanks, 14 Drainage treatment ,10 Horticulture and 24 others.
- Major percentage i.e. 68% is covered by the agriculture, 18% is covered by scrub land, 5% by plantation, 6 % by water body and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-01/2009-10
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Voletivaripalem Mandal of Prakasam district of Andhra Pradesh state. The total geographical area of the project is 8052.14 ha. It comprises of 15 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. Prakasam 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
	2013-14	2012-13	2017-18
LISS IV	2013-14		
SCENE 1			21-Jul-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			21-Jul-17
SCENE2			
SCENE 3			
SCENE 4			

Ancillary Data

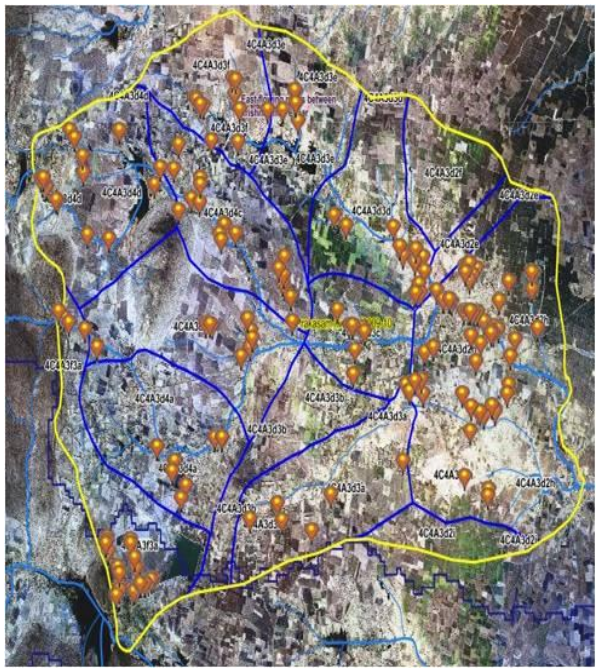
	Category	Sub category	Status
1	Thematic maps		
	LULC (1: 10 000)		
		DRAIANGE	YES
		SETTLEMENT	YES
		ROADS/RAILS	No
	LULC (1: 50 000)		
		2005-06	
		2008-09	
2	Activity Plan Maps		
3	Drishti Photographs		
		Total	212
4	Detailed Project Report		

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	0	0
2	Horticulture	11	10
3	Agriculture	0	0
4	Pasture	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	148	136
11	Check dams	23	18
12	Nallah Bunds	0	0
13	Percolation tanks / Ground water recharge structure	16	14
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	24	24
	TOTAL	**222**	**202**

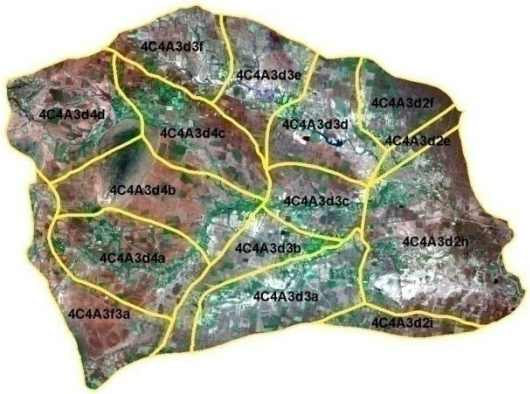
MONITORING IN THE PROJECT AREA

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.

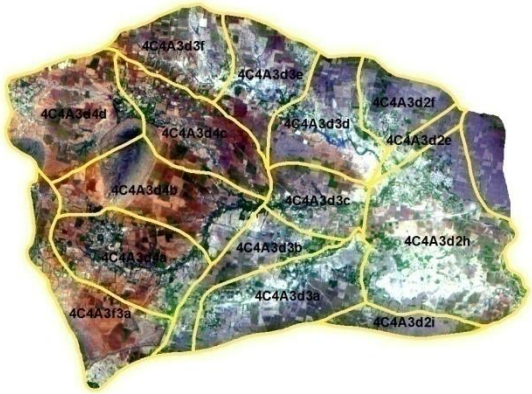
Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2009-10



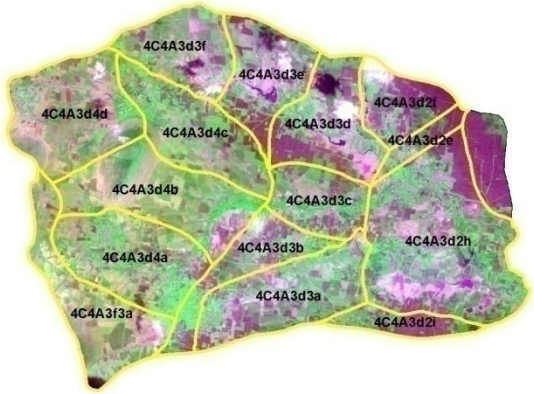
Source:Fusen data,NRSC

Natural Color Composite - 20th April - 2014



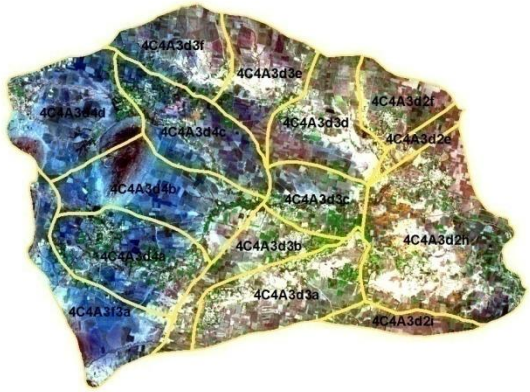
Source:Fusen data,NRSC

Natural Color Composite- 24th Oct-2015



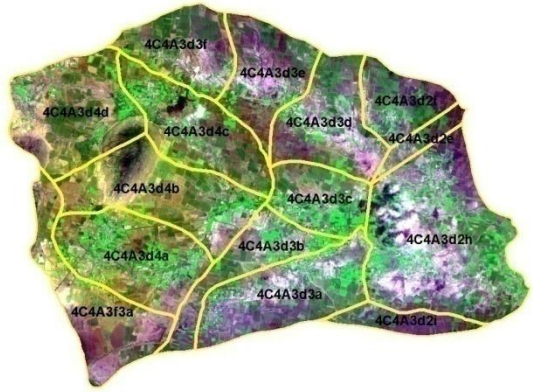
Source:LISS-IV,NRSC

Natural Color Composite- 03rd March 2017



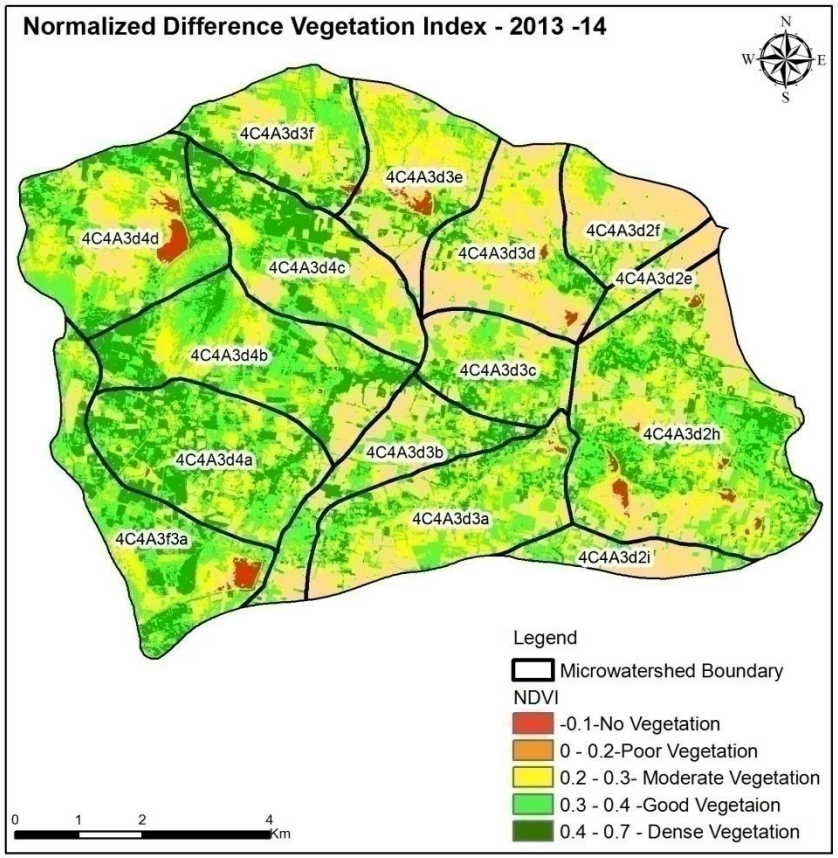
Source:Fusen data,NRSC

Natural Color Composite- 03rd December 2017

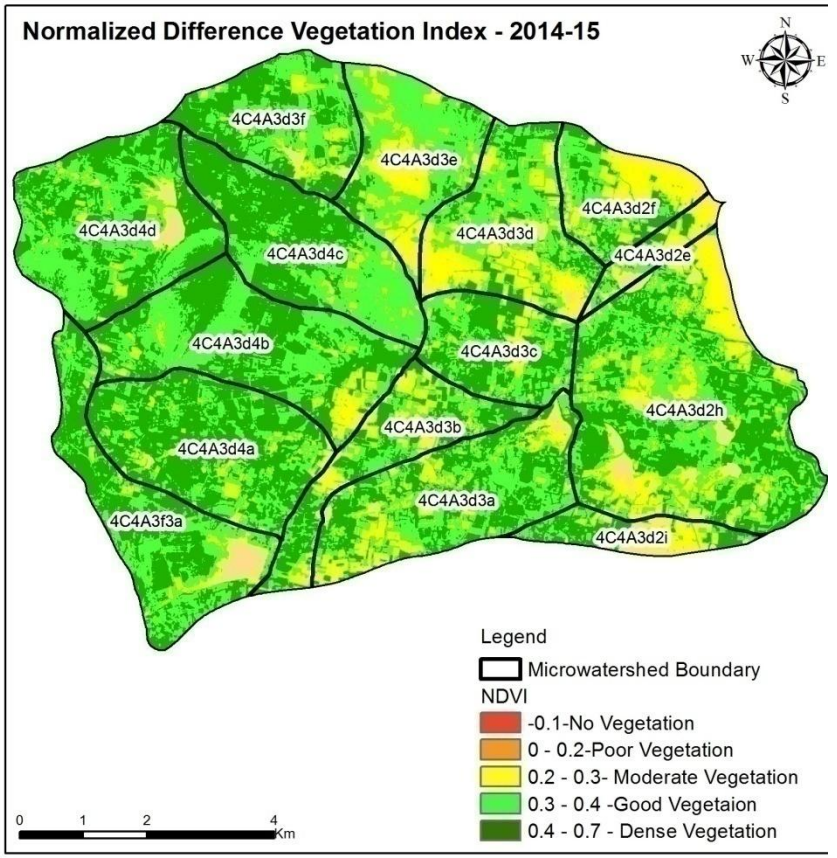


Source:LISS-IV,NRSC

Changes in Vegetation Cover

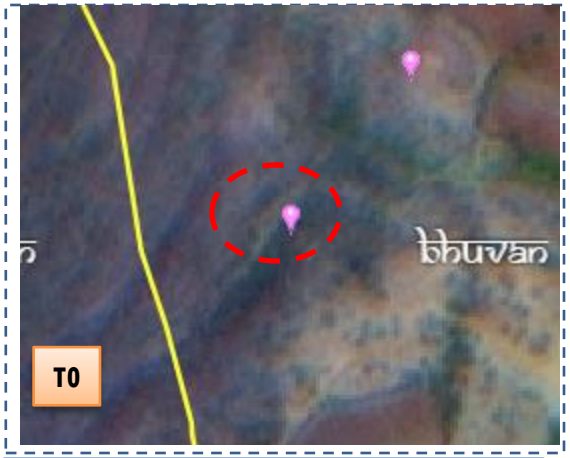


NDVI (2013-14)

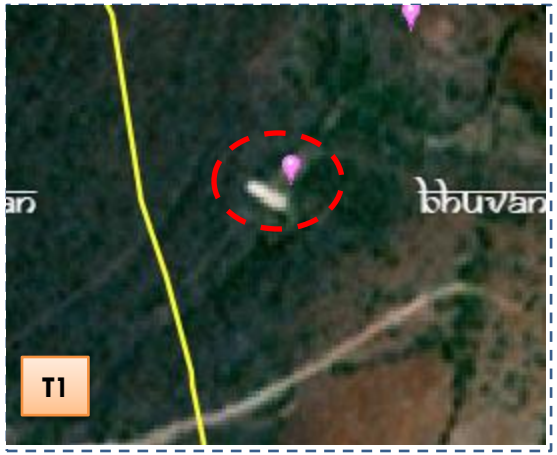


NDVI (2014-15)

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-01/2009-10



T0:2013



T1: 05 June 2015

Drishti Sl no. 563751 MWS :4C4A3d4d

Check dam

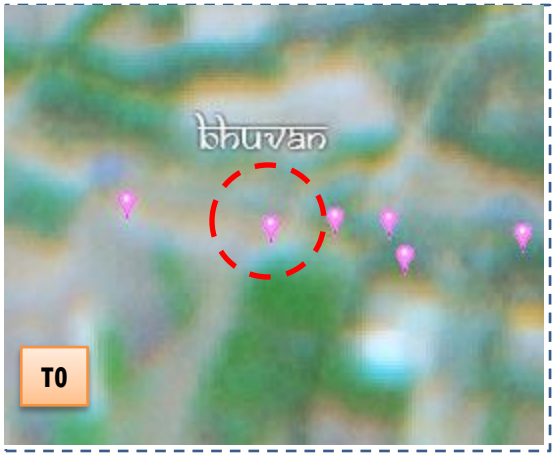
T0:2013

T1: 05 June 2015

Drishti Sl no. 89441 MWS : 4C4A3d3f

Dug out seepage pond

Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-01/2009-10

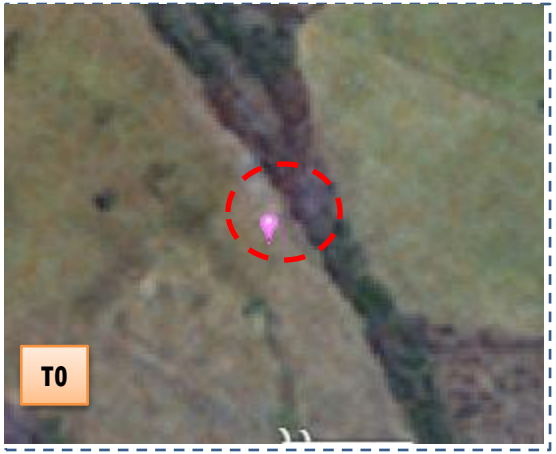


T0: 2013

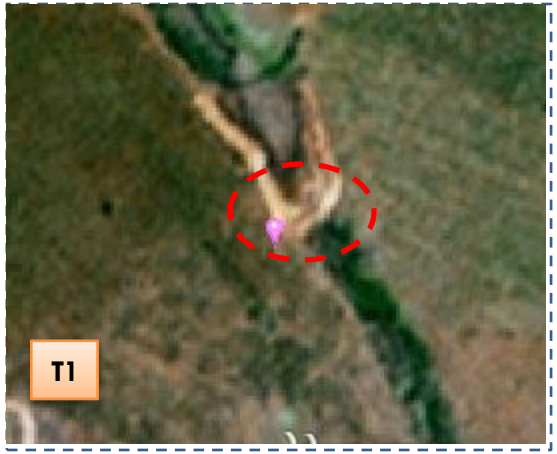
T1: 05 June 2015

Drishti Sl no. 562617 MWS :4C4A3f3a

Dug out seepage pond



T0: 2013



T1: 05 June 2015

Drishti Sl no. 564720 MWS :4C4A3f3a

Mini Percolation tank

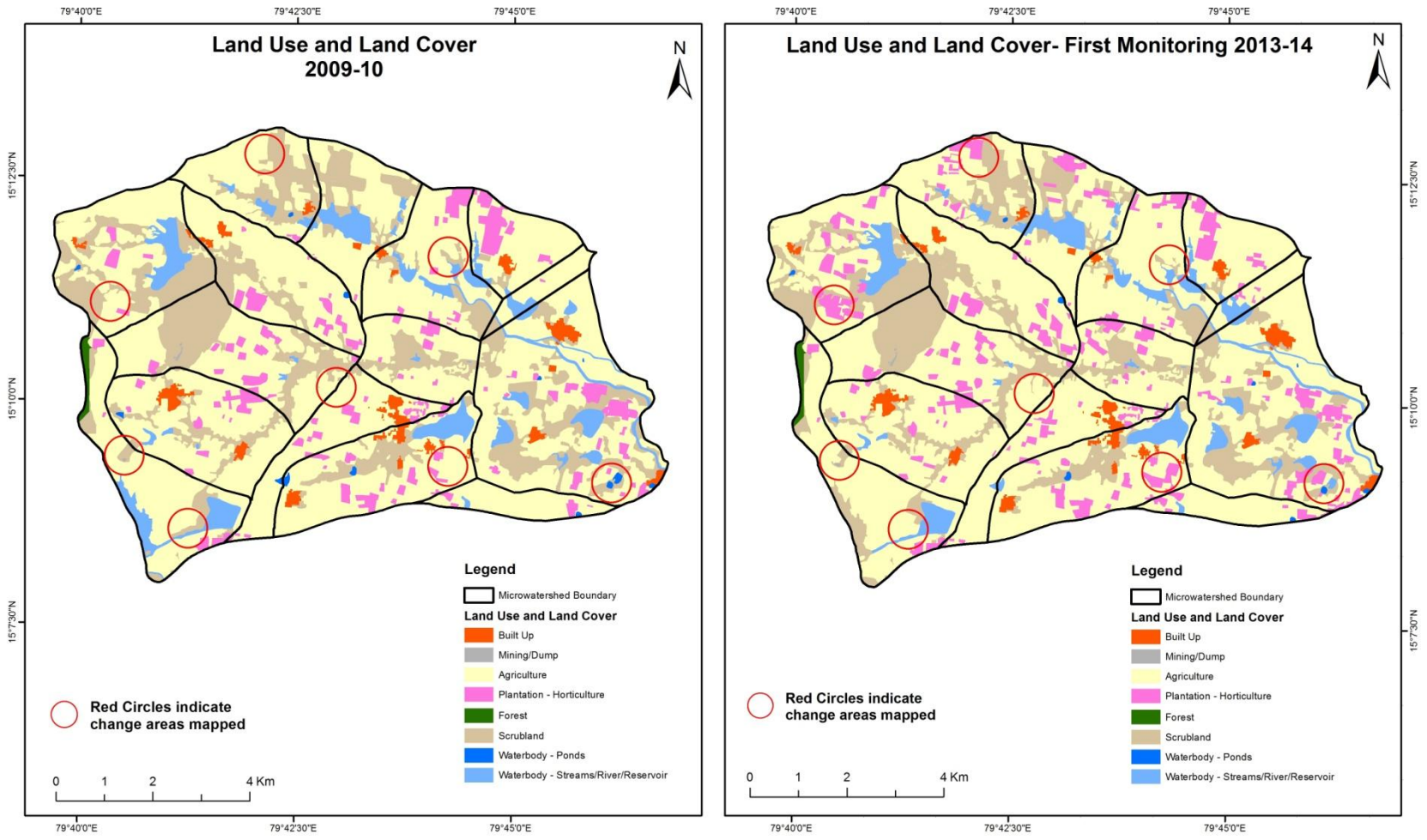
MONITORING IN THE PROJECT AREA

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 pre implementation period and row represents the post implementation period .

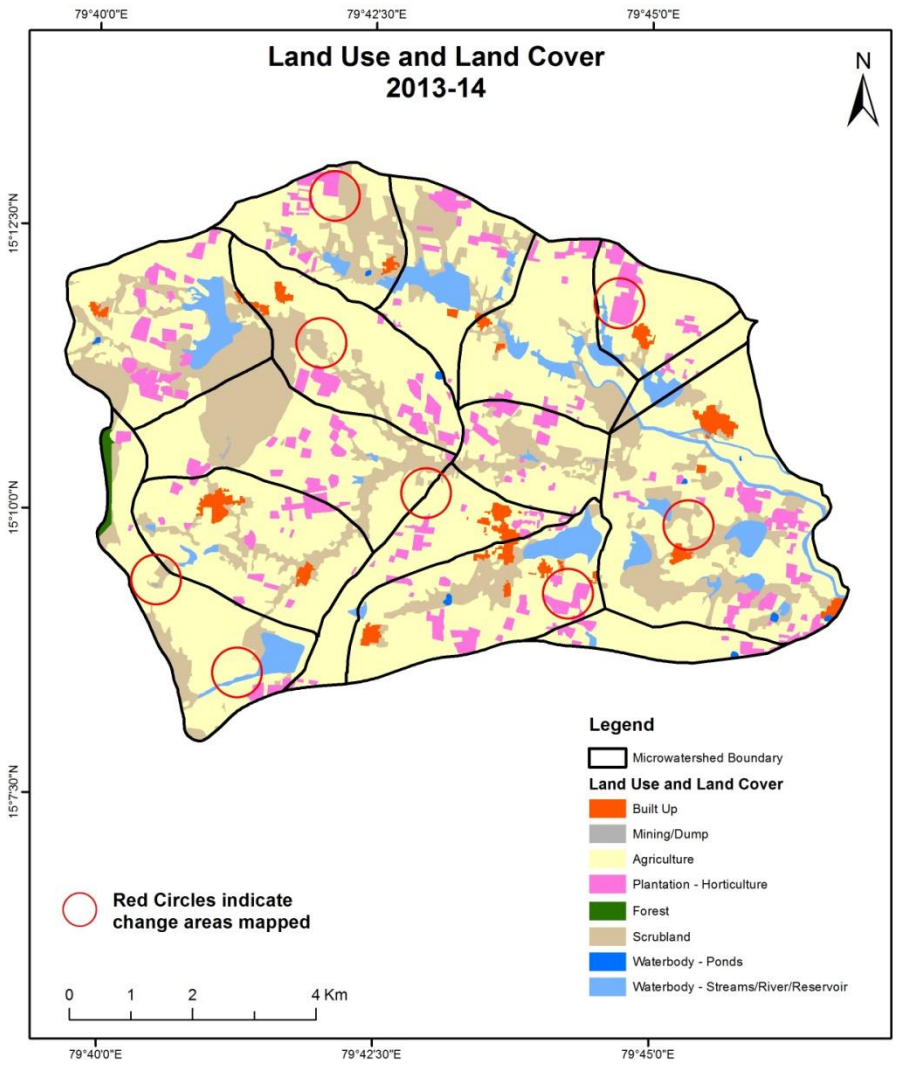
Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2009-10 to 2013-14)

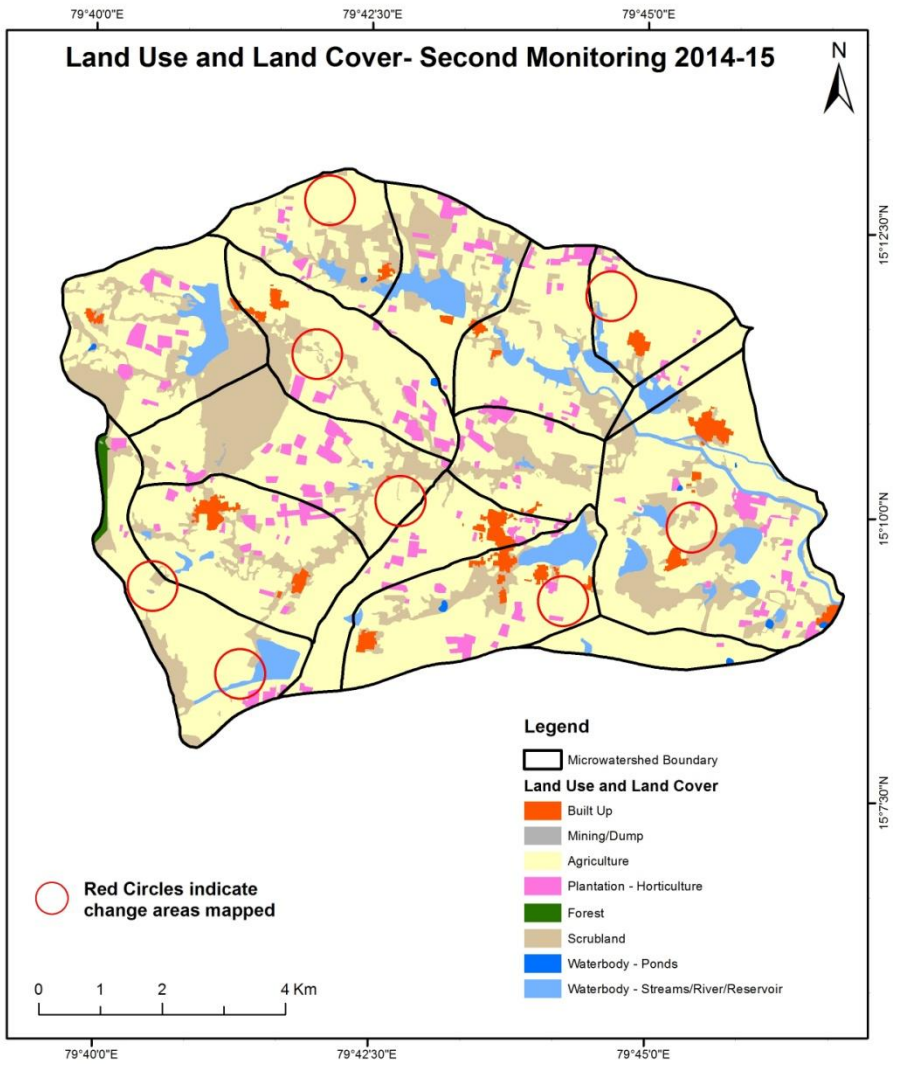
Scale: 1:10000



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

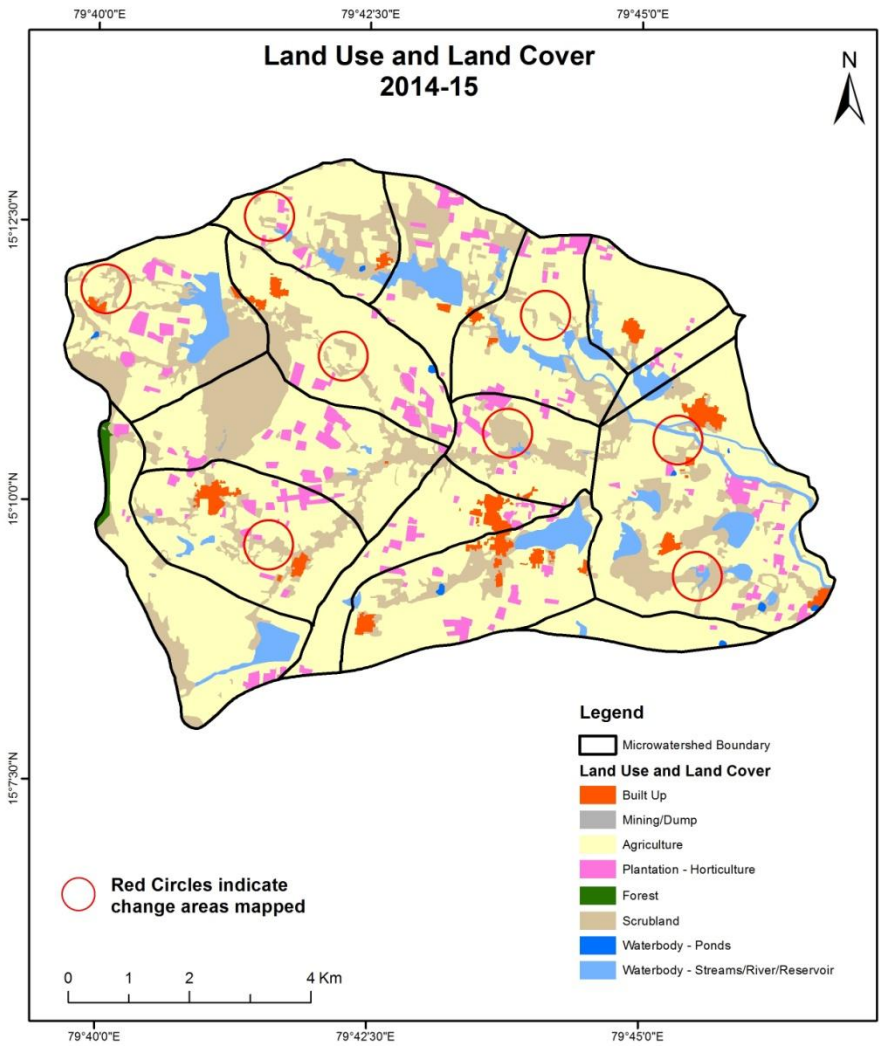
Scale: 1:10000

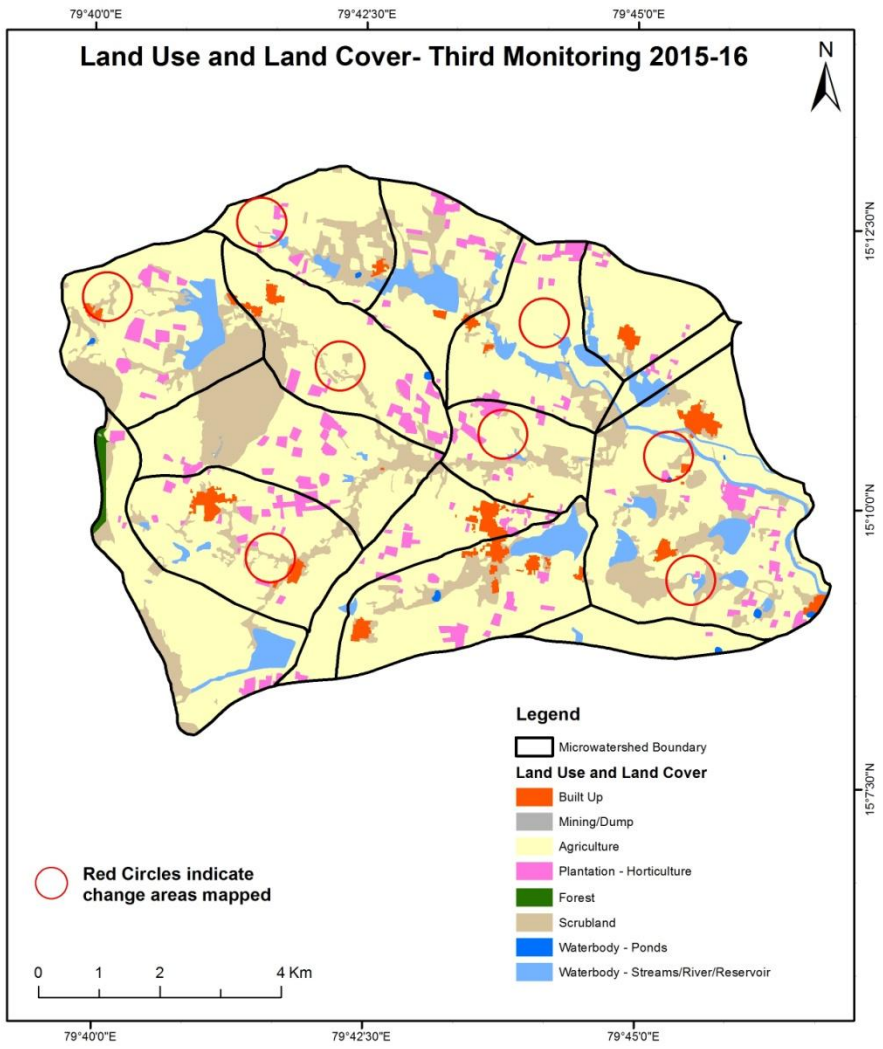




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

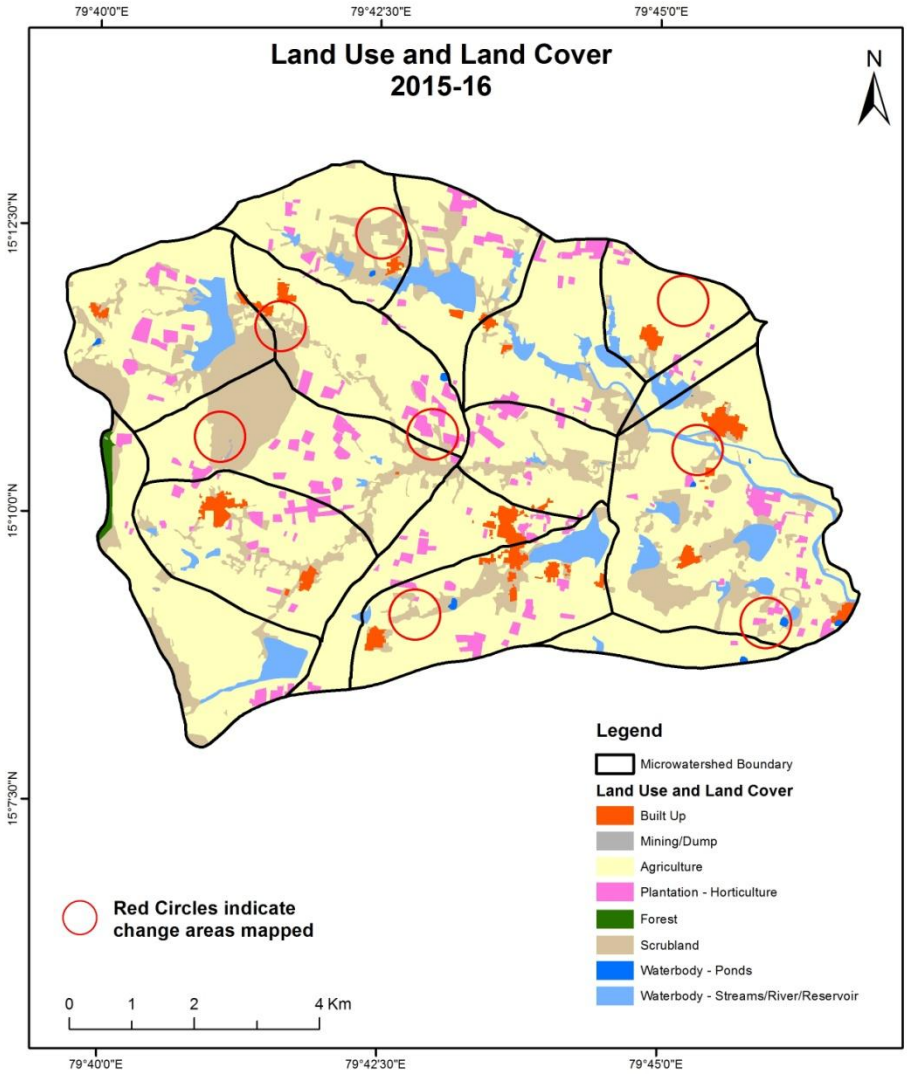
Scale: 1:10000

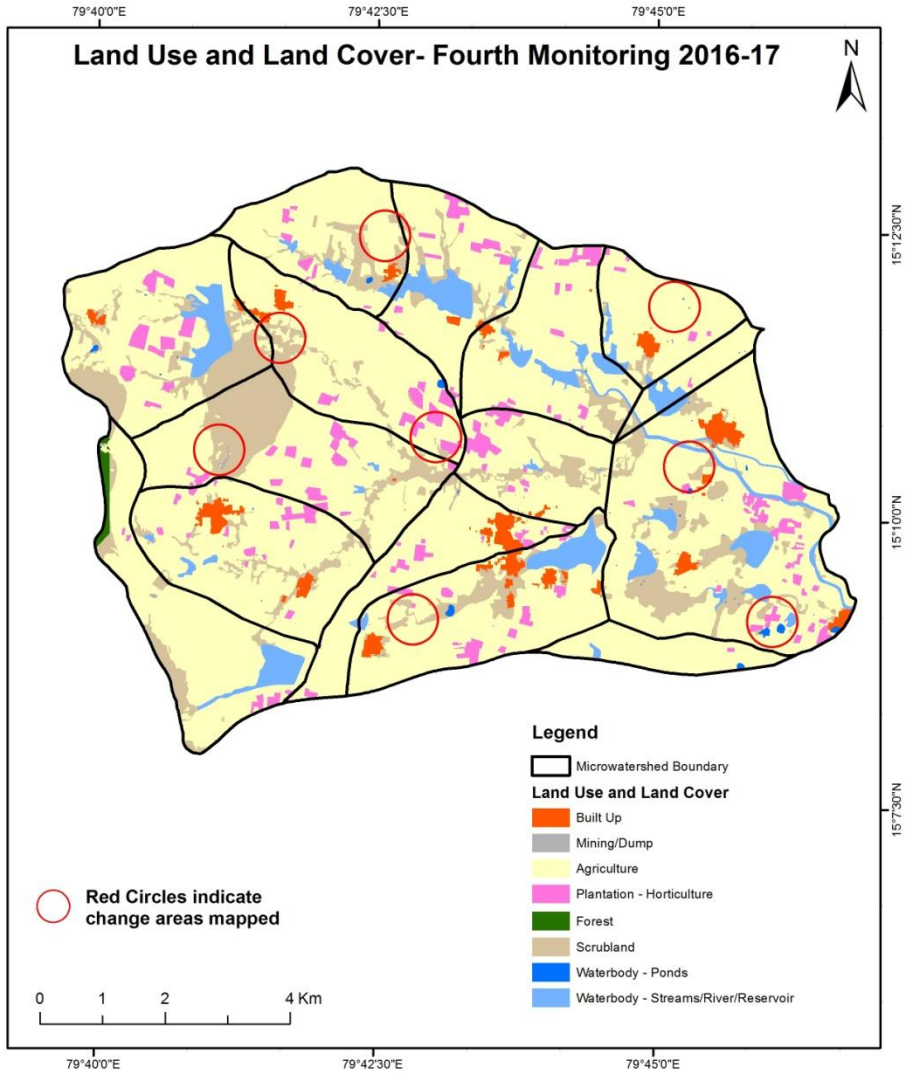




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

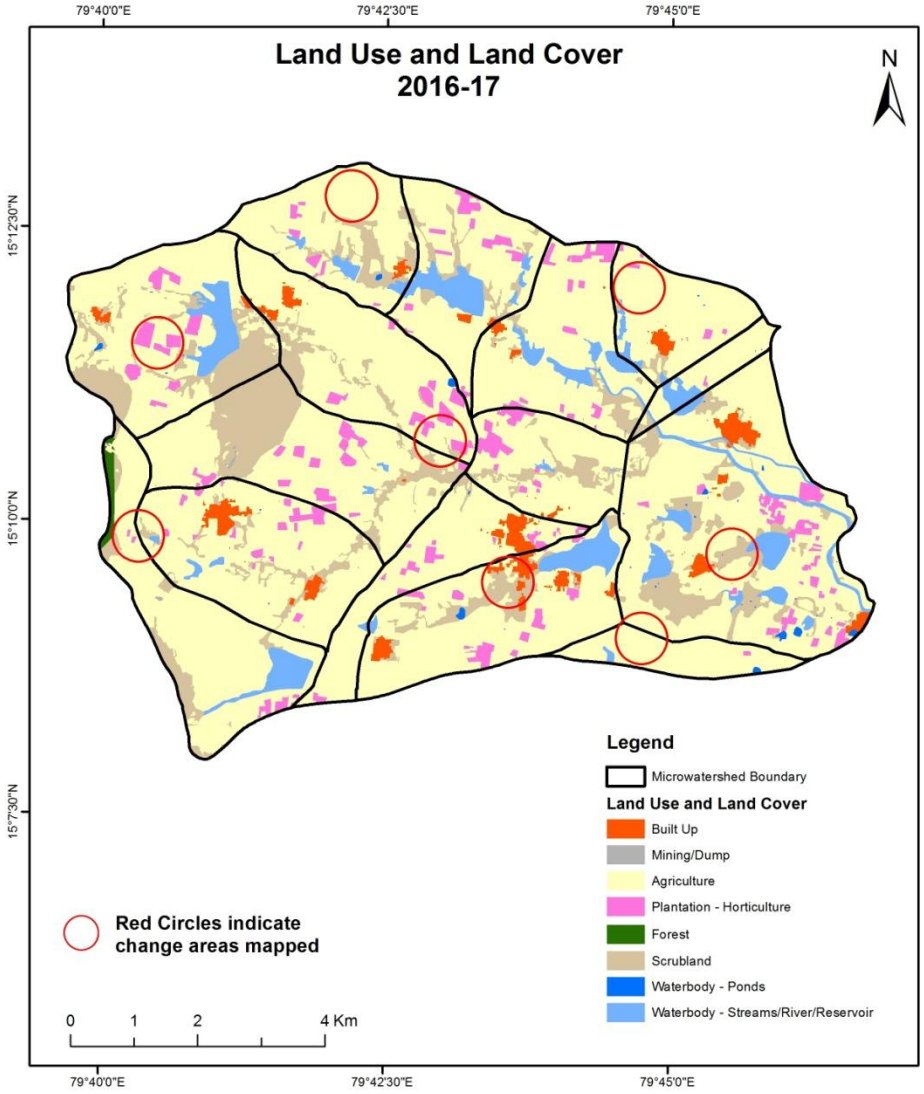
Scale: 1:10000

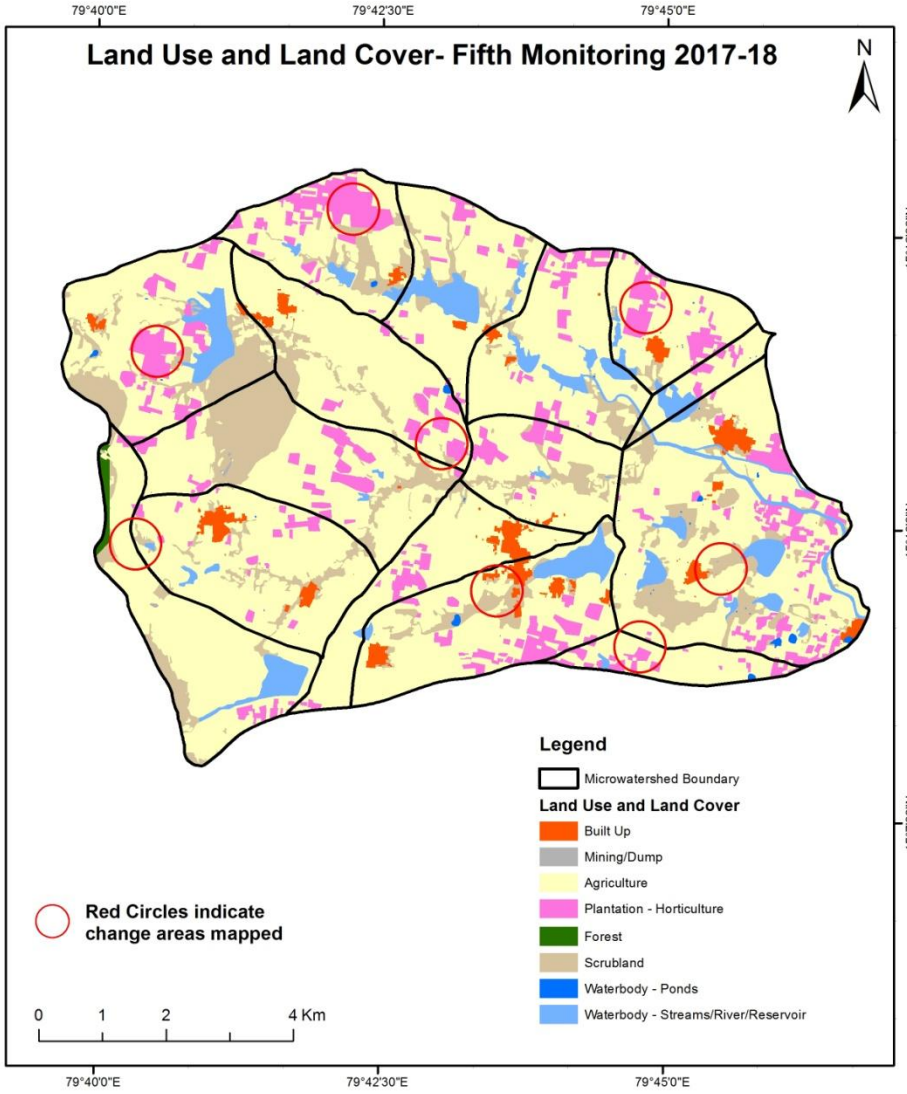




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000

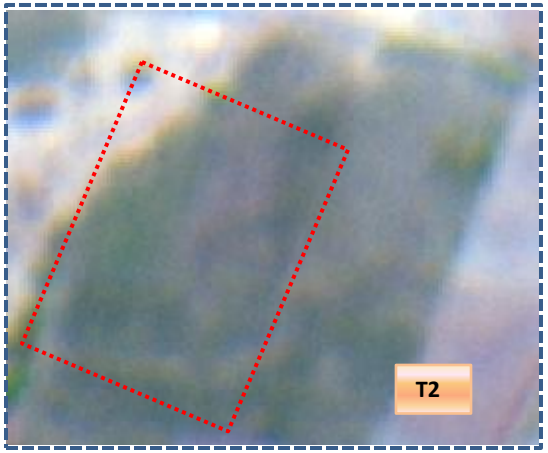




Land Use and Land Cover changes for Pre and Post treatment dates

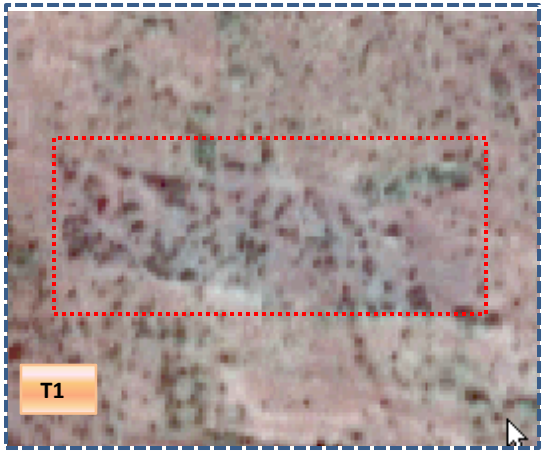
Agriculture to Plantation

T1: 2009-10

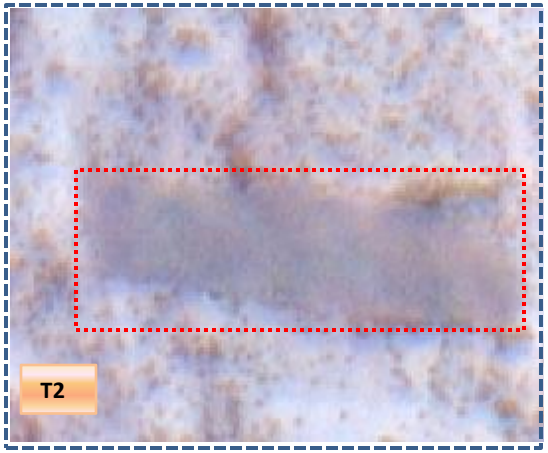


T2: 20 April 2014

Scrub to Agriculture



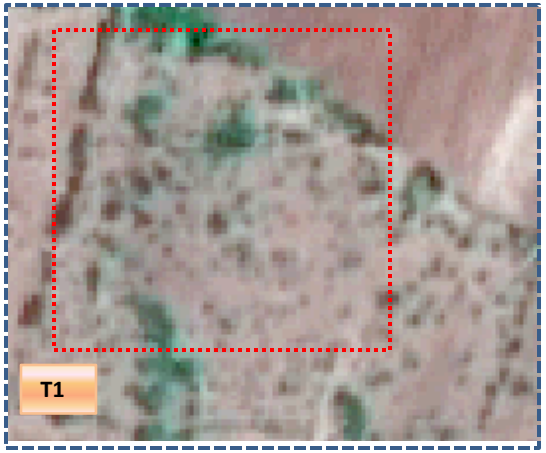
T1: 2009-10



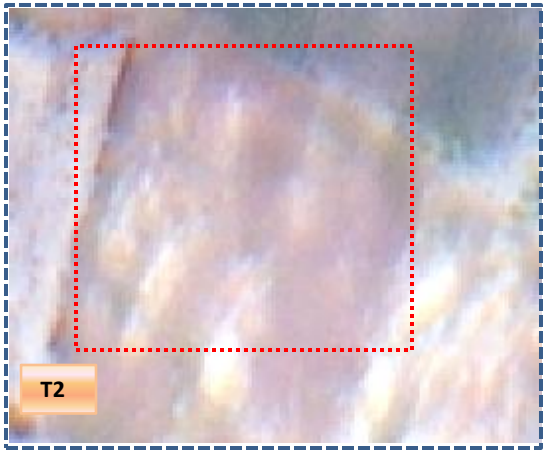
T2: 20 April 2014

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

Scrub to Agriculture

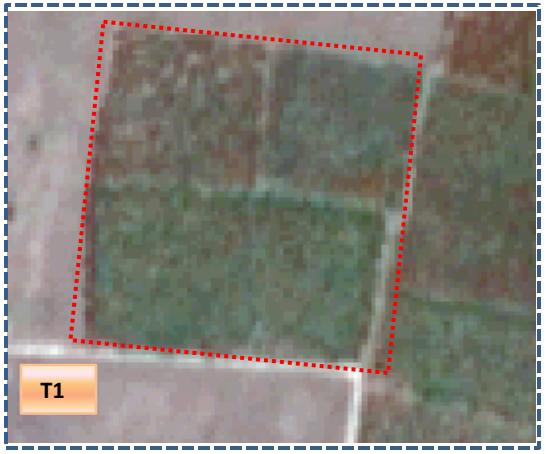


T1: 2009-10

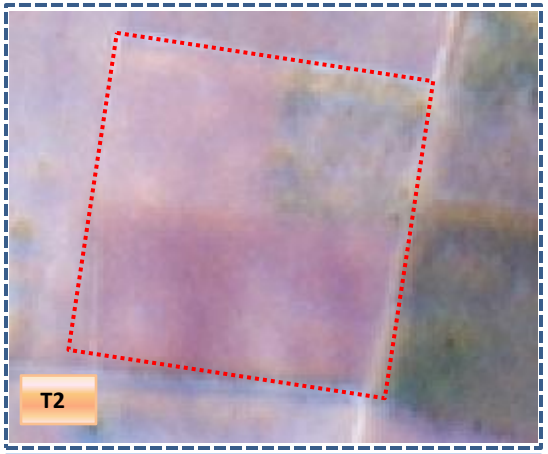


T2: 20 April 2014

Plantation to Agriculture



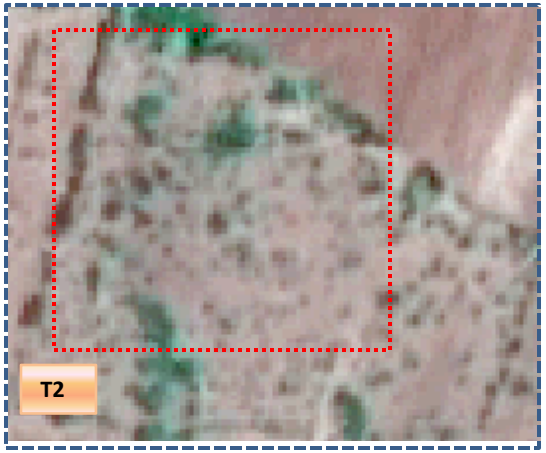
T1: 2009-10



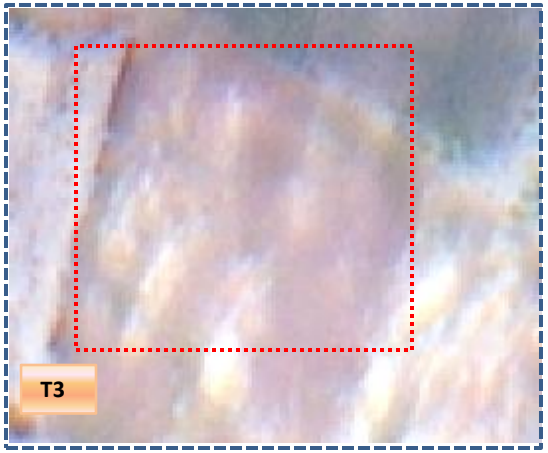
T2: 20 April 2014

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

Scrub to Agriculture



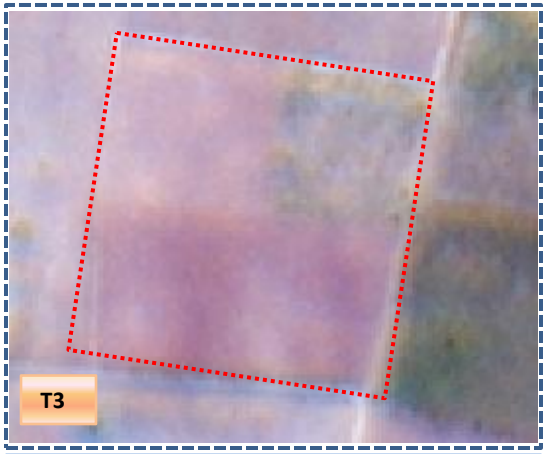
T2: 2013



T3: 07 May 2015

Plantation to Agriculture

T2: 2013



T3: 07 May 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
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	144.50										**144.50**
Mining/dump		2.03									**2.03**
Agriculture	3.08		4963.62	241.75				28.99	3.47		**5240.90**
Plantation Horticulture			87.98	364.96							**452.94**
Forest					20.36						**20.36**
Forest Plantation											
Barren Rocky											
Scrub	2.49	0.19	179.30	27.24				1419.07	2.04		**1630.33**
Waterbody-Streams/River			6.50					40.74	432.65		**479.89**
Waterbody – Ponds									8.91	10.51	**19.42**
Grand Total	**150.07**	**2.22**	**5237.40**	**633.95**	**20.36**			**1488.80**	**447.07**	**10.51**	**7990.37**

- 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 277 ha of agriculture are decreased and it is converted into Built-up, plantation, scrub and water body and in T1.
- In T1 273 ha of agriculture are 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	150.07										**150.07**
Mining/dump		2.22									**2.22**
Agriculture	13.94		5051.00	24.00				148.47			**5237.40**
Plantation Horticulture		0.40	248.40	384.84				0.28		0.03	**633.95**
Forest		0.22			20.14						**20.36**
Forest Plantation											
Barren Rocky											
Scrub	5.76		205.07	3.30				1274.62		0.05	**1488.80**
Waterbody-Streams/River								3.13	443.94		**447.07**
Waterbody – Ponds										10.51	**10.51**
Grand Total	**169.77**	**2.83**	**5504.46**	**412.15**	**20.14**			**1426.50**	**443.94**	**10.58**	**7990.37**

- 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 186 ha of agriculture are decreased and it is converted into plantation, Built-up, scrub and water body in T2.
- In T2 453 ha of agriculture are increased from plantation and scrub land 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	169.77										**169.77**
Mining/dump		2.44						0.40			**2.83**
Agriculture			5501.44	3.02							**5504.46**
Plantation Horticulture			4.83	407.32							**412.15**
Forest					20.14						**20.14**
Forest Plantation											
Barren Rocky											
Scrub	0.44		270.90					1155.08		0.07	**1426.50**
Waterbody-Streams/River									443.94		**443.94**
Waterbody – Ponds										10.58	**10.58**
Grand Total	**170.21**	**2.44**	**5777.17**	**410.34**	**20.14**			**1155.48**	**443.94**	**10.66**	**7990.37**

- 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 3.2 ha of agriculture are decreased and it is converted into mining and scrub land in T3.
- In T3 275 ha of agriculture are increased from scrub land and plantation 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	170.21										**170.21**
Mining/dump		2.44									**2.44**
Agriculture	2.80		5738.46	34.40				0.37		1.14	**5777.17**
Plantation Horticulture	0.09		82.64	327.61							**410.34**
Forest			1.53		18.61						**20.14**
Forest Plantation											
Barren Rocky											
Scrub	0.48		140.58					1012.47		1.94	**1155.48**
Waterbody-Streams/River	0.09		3.04						440.81		**443.94**
Waterbody – Ponds										10.66	**10.66**
Grand Total	**173.68**	**2.44**	**5966.24**	**362.01**	**18.61**			**1012.84**	**440.81**	**13.74**	**7990.37**

- 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 38 ha of agriculture are decreased and it is converted into plantation, Built-up and water body in T4.
- In T4 227 ha of agriculture are increased from scrub land, plantation , forest and waterbody 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	173.68										**173.68**
Mining/dump		2.44									**2.44**
Agriculture	1.14		5455.99	509.11							**5966.24**
Plantation Horticulture	0.04		54.95	307.02							**362.01**
Forest					18.61						**18.61**
Forest Plantation											
Barren Rocky											
Scrub	1.31		13.24	1.98				996.31			**1012.84**
Waterbody-Streams/River			1.19						439.62		**440.81**
Waterbody – Ponds										13.74	**13.74**
Grand Total	**176.18**	**2.44**	**5525.37**	**818.11**	**18.61**			**996.31**	**439.62**	**13.74**	**7990.37**

- 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 510 ha of agriculture are decreased and it is converted into plantation area in T5.
- In T5 69 ha of agriculture are increased from scrub land, plantation and waterbody 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 decrease of 45 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 267, 272 & 189 Hectares From T1-T2, T2-T3 & T3-T4 respectively and overall increase of 284 Hectares in Crop land area as compared between baseline LU/LC data 2009-10 (T0) & 2017-18 (T5) years.
5. There is an increase of 365 ha of the Plantation/Horticulture area has been increased between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 634 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (3) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (3) verified from the portal.