MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

PRAKASAM -9/2009-10
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

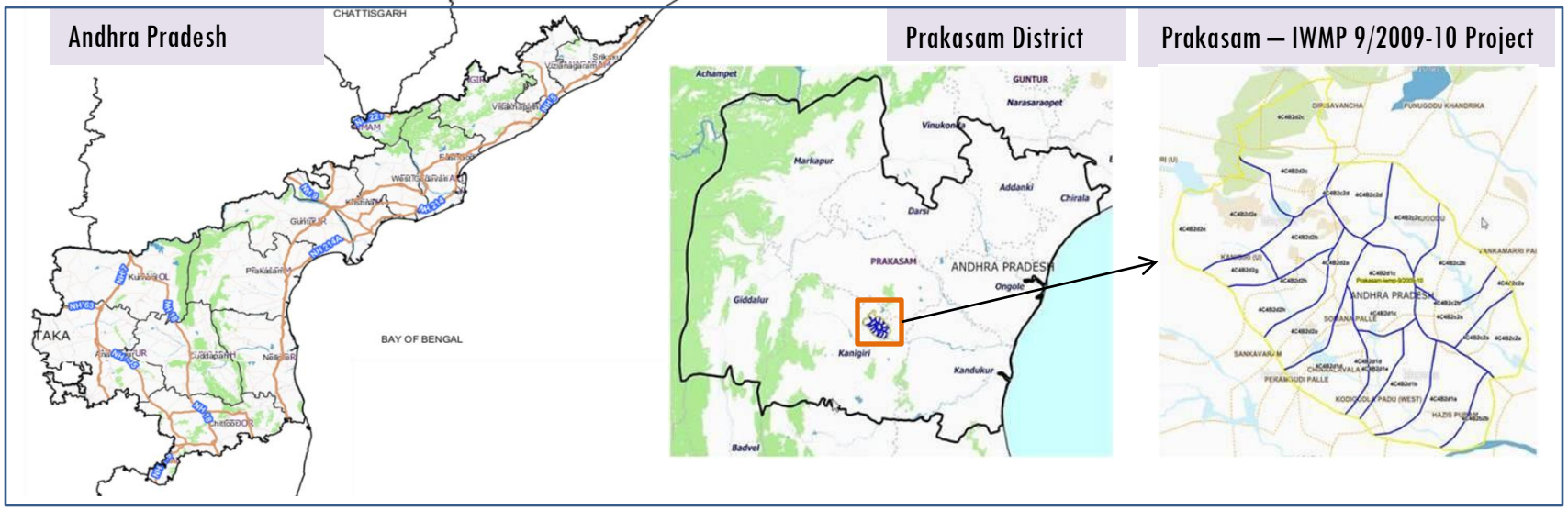
CONTENTS

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-09/2009-10, Prakasam District of Andhra Pradesh. The total geographical area of the project is 7637.21 ha. It comprises of 17 micro watersheds.
- In the project area 83 Drishti photos were uploaded showing 2 check dams, 75 Farm ponds/Percolation tanks, and 6 other drishti photos.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 75 new farm ponds or dug out ponds with 11.53 ha increase in the area.
- Major percentage i.e. 66.11% is covered by the agriculture, 12.86% is covered by scrubland, 6.11% by forest, 6.06% by Horticulture and remaining by other land use classes.

PROJECT : PRAKASAM - IWMP-09/2009-10
DISTRICT : PRAKASAM , STATE : ANDHRA PRADESH

- The study area falls in Kanigiri Mandal of Prakasam district of Andhra Pradesh state. The total geographical area of the project is 7637.21 ha. It comprises of 17 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.

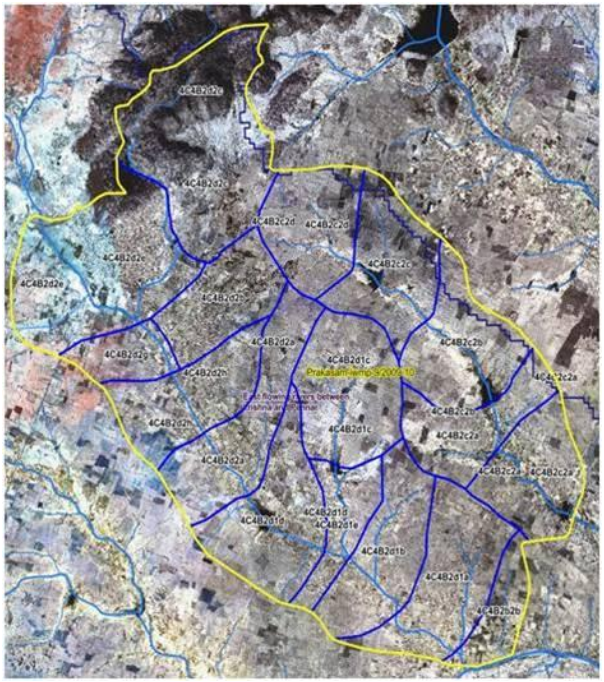
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			21-Jul-17
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
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	83
4	Detailed Project Report		

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



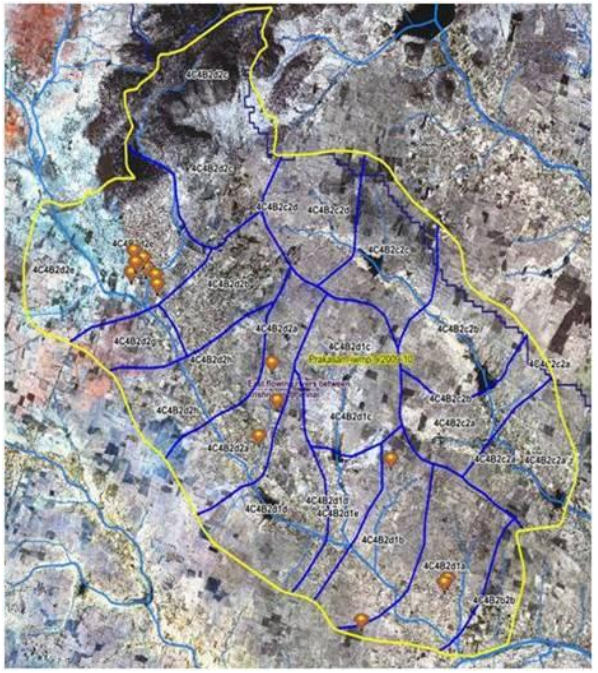
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

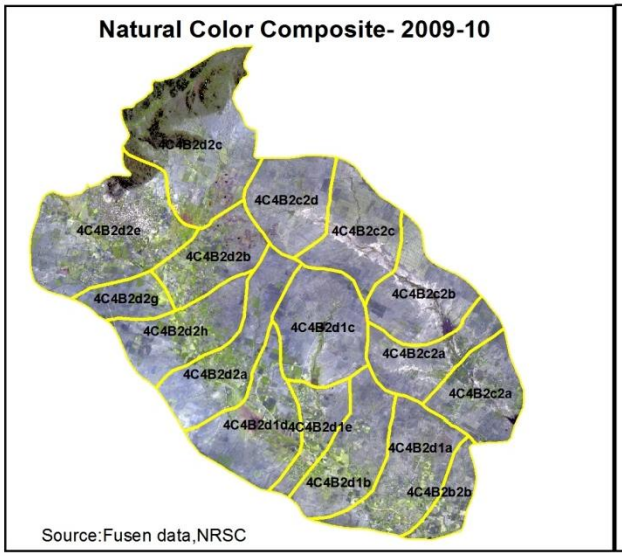
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dugout pit	76	65
11	Check dams	3	2
12	Nallah Bunds	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	7	6
	TOTAL	**86**	**73**

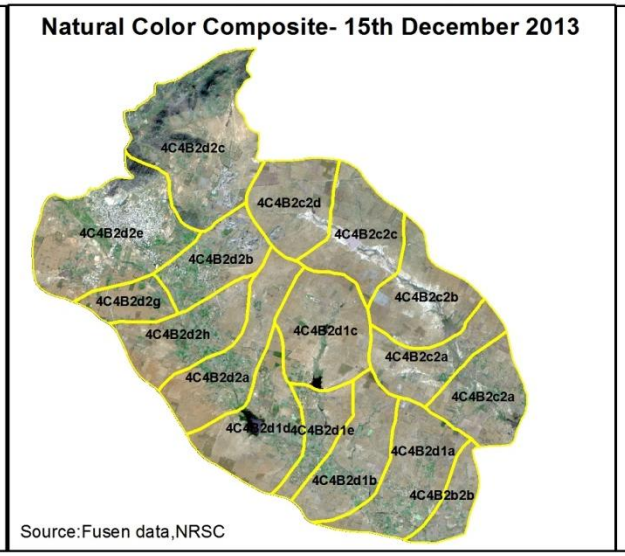
MONITORING IN THE PROJECT AREA

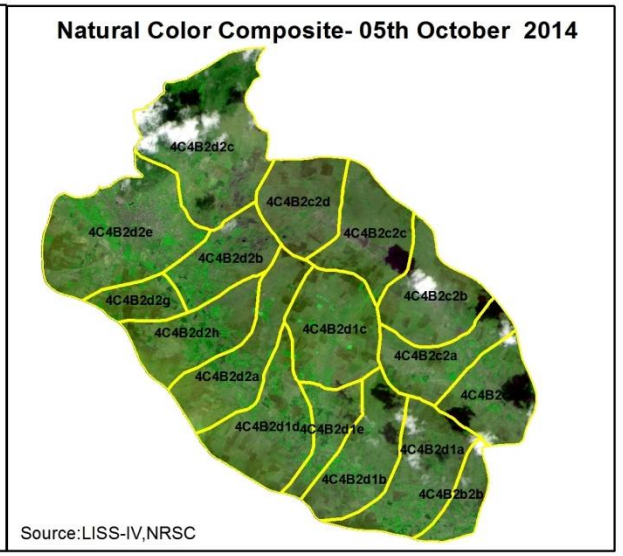
Site Wise Changes in the Project

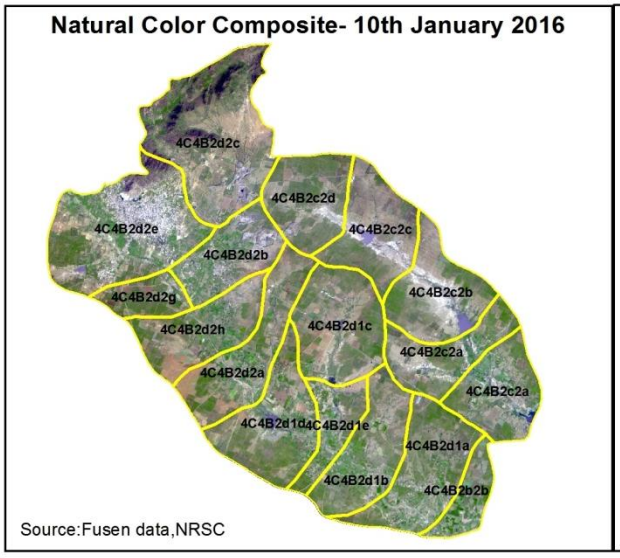
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring
- Captures are also provided wherever changes are observed in satellite images, that may match expected activity related impact, even though they don't have Drishti report yet.

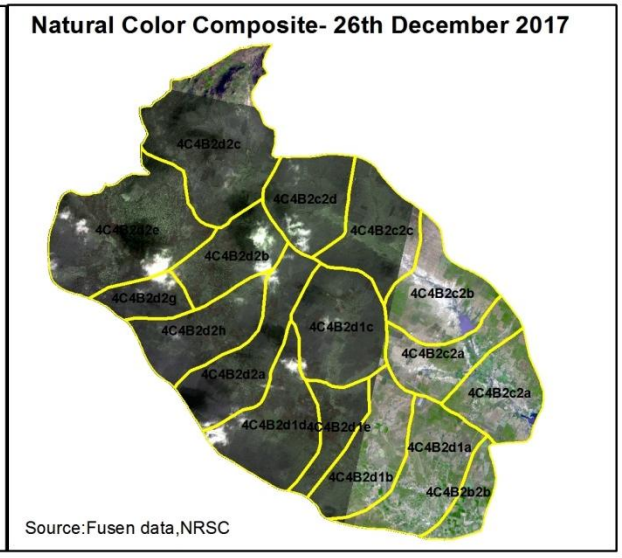
Natural Color Composite- 2009-10 to 2017-18



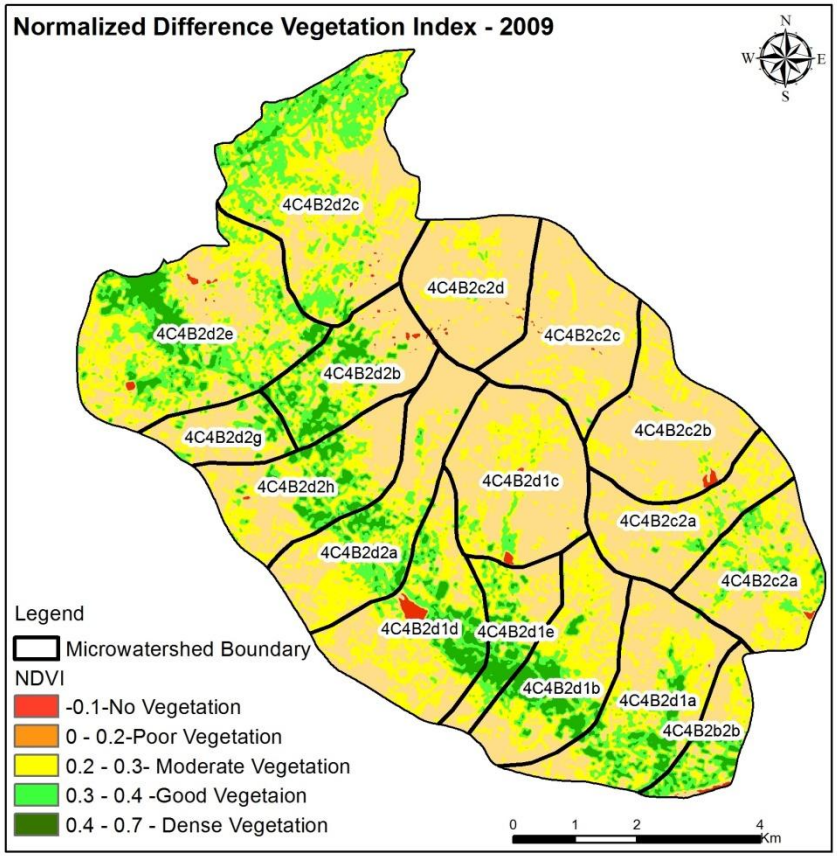




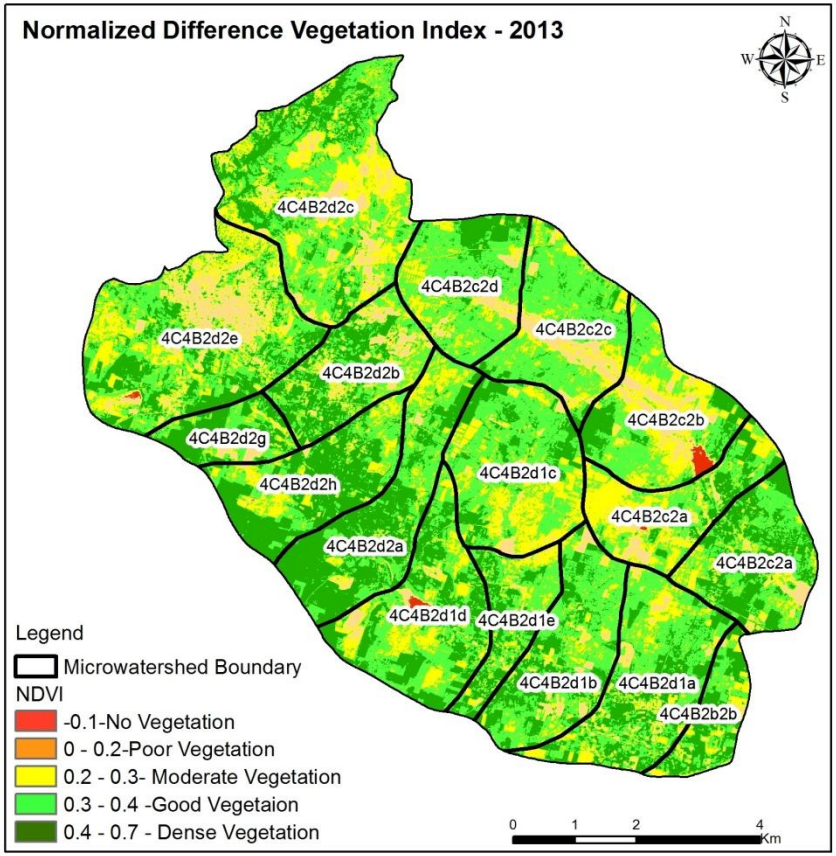




Changes in Vegetation Cover

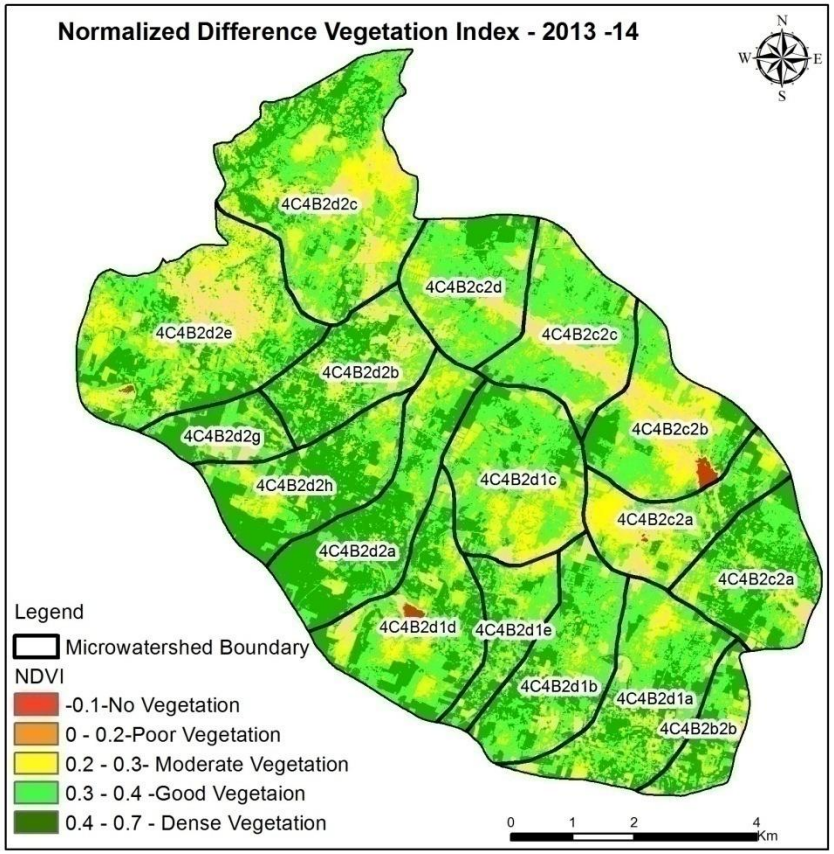


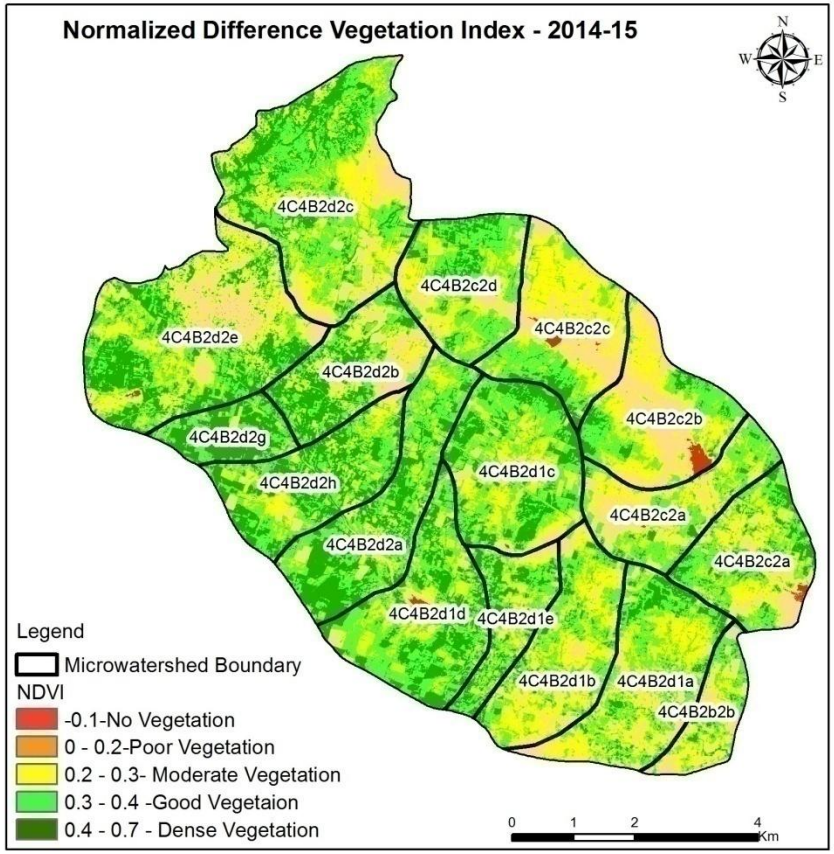
NDVI (2009-10)



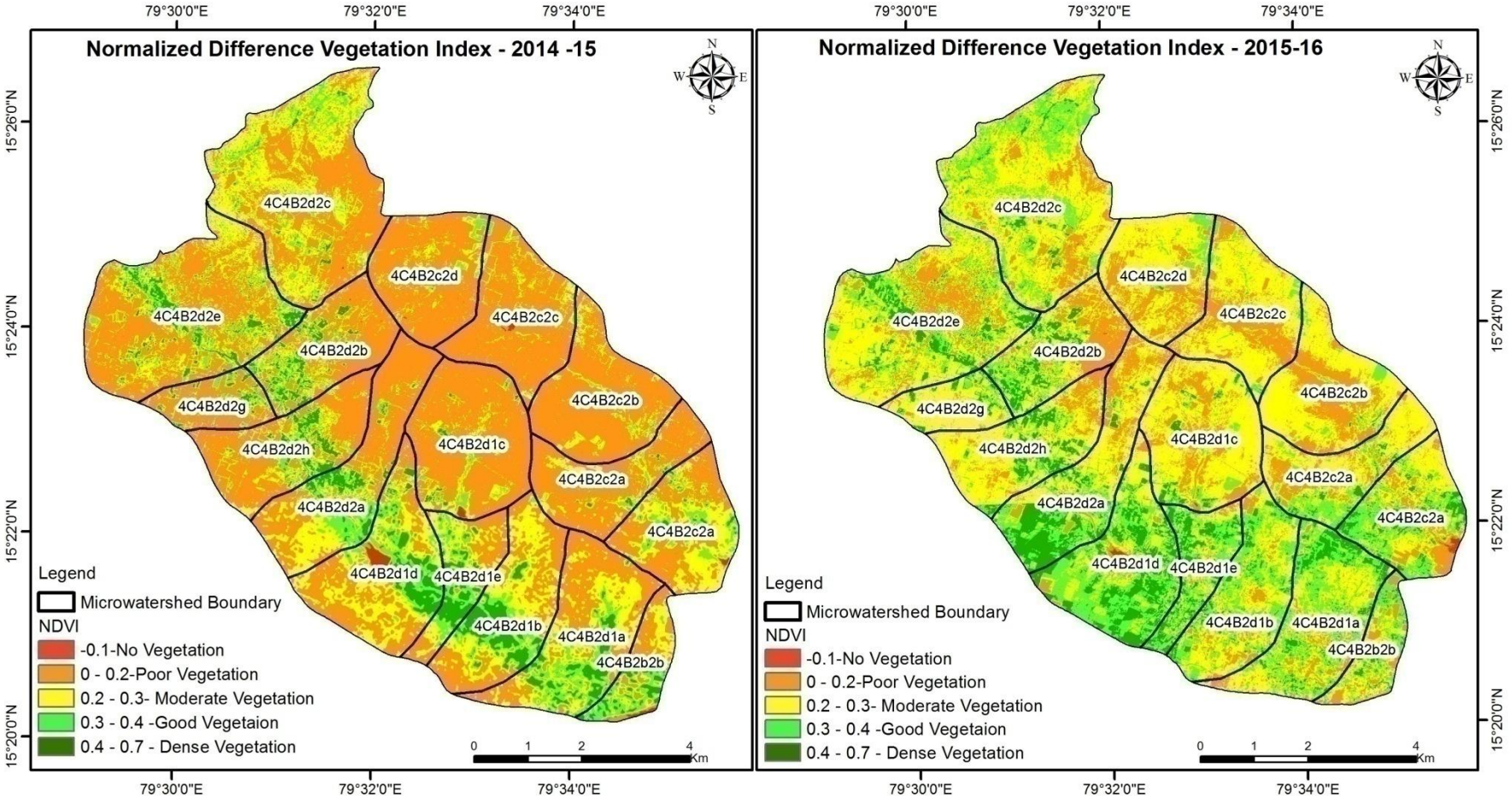
NDVI (2013-14)

Changes in Vegetation Cover

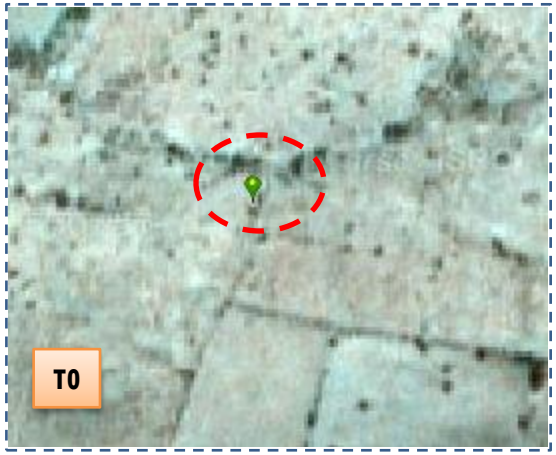




Changes in Vegetation Cover



Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-09/2009-10



T0:2009-10

T1: 15 December 2013

Drishti Sl no. 103615 MWS :4C3C3i1g

Check Dam

T0:2009-10

T1: 15 December 2013

Drishti Sl no.701277 MWS : 4C4B2d1b

Farm pond

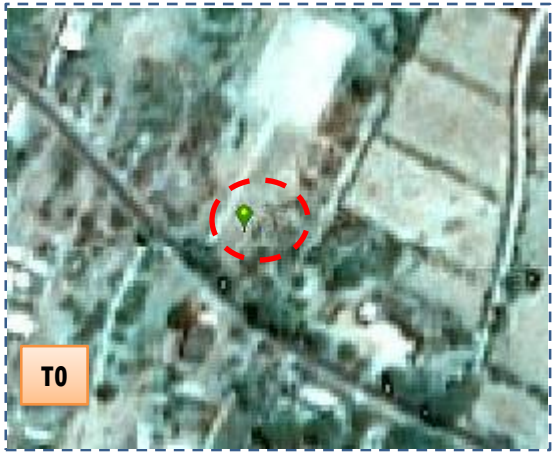
Monitoring of activities in Prakasam District Andhra Pradesh. IWMP-09/2009-10

T0: 2009-10

T1: 15 December 2013

Drishti Sl no. 840002 MWS :4C4B2d1d

Pipe line distribution



T0: 2009-10

T1: 15 December 2013

Drishti Sl no. 713428 MWS :4C4B2d2e

Dug out pit

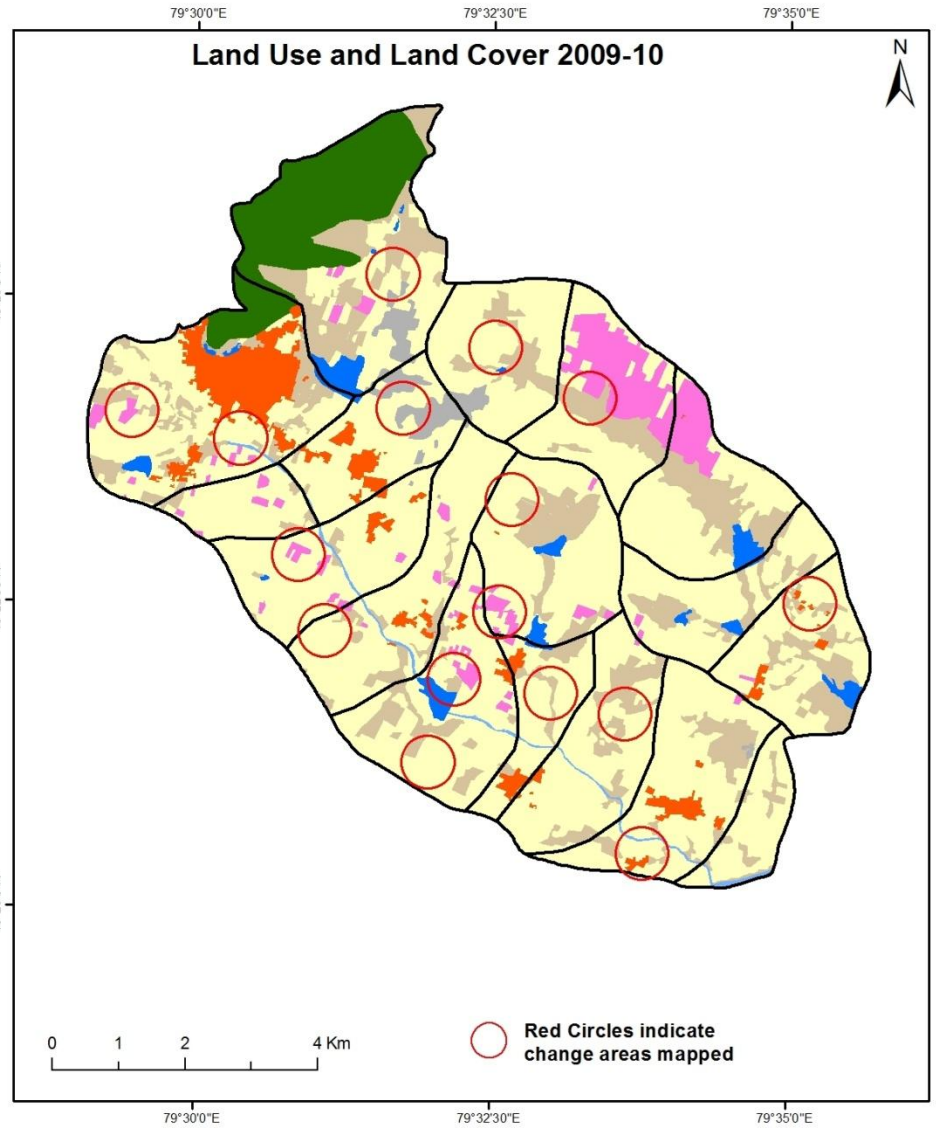
MONITORING IN THE PROJECT AREA

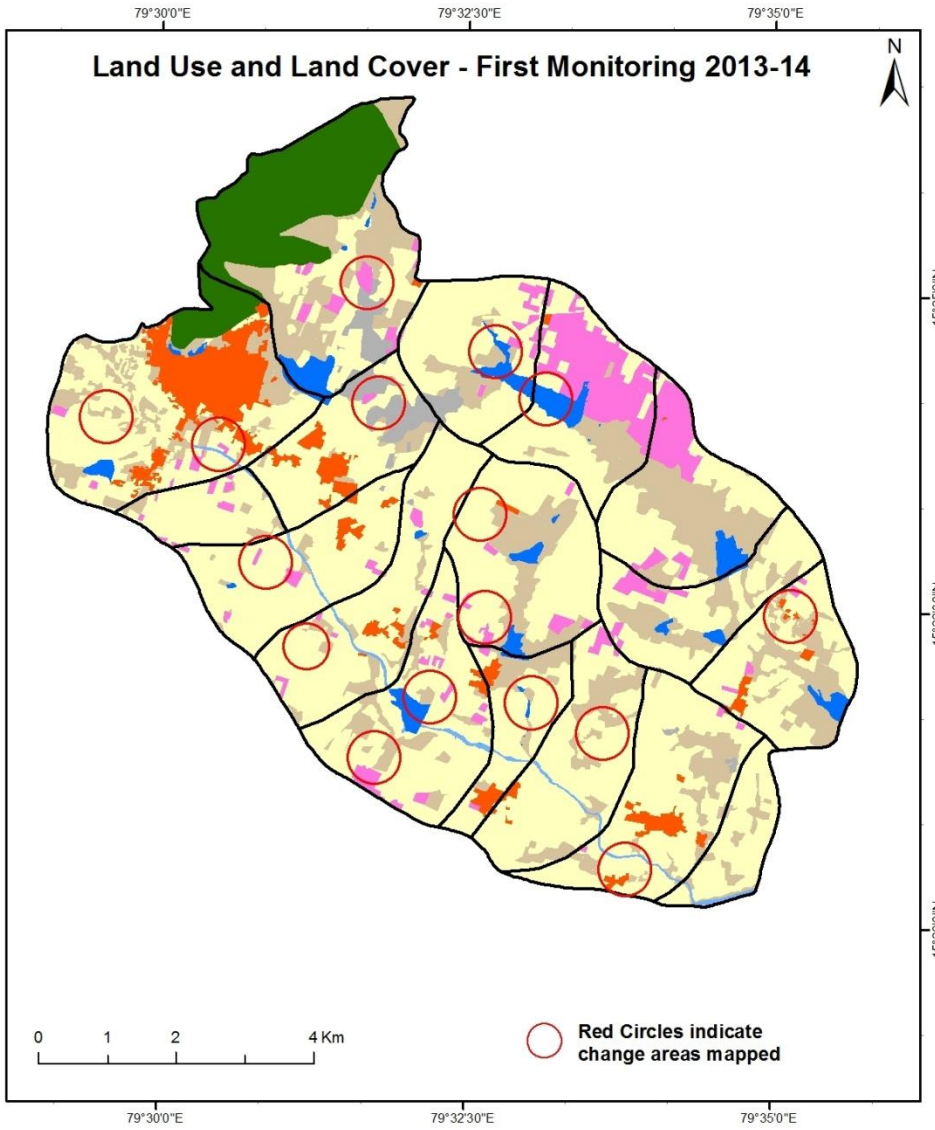
Land use and Land cover Changes in the Project

- 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 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)

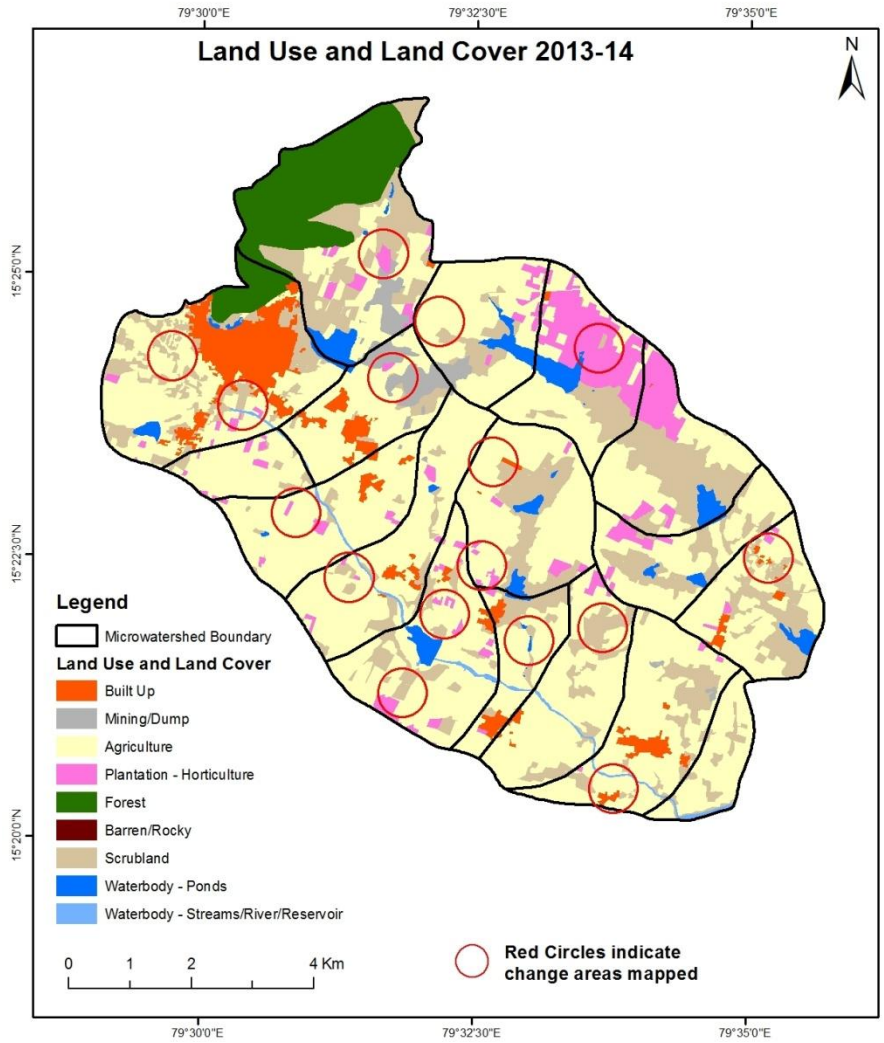
Scale: 1:10000

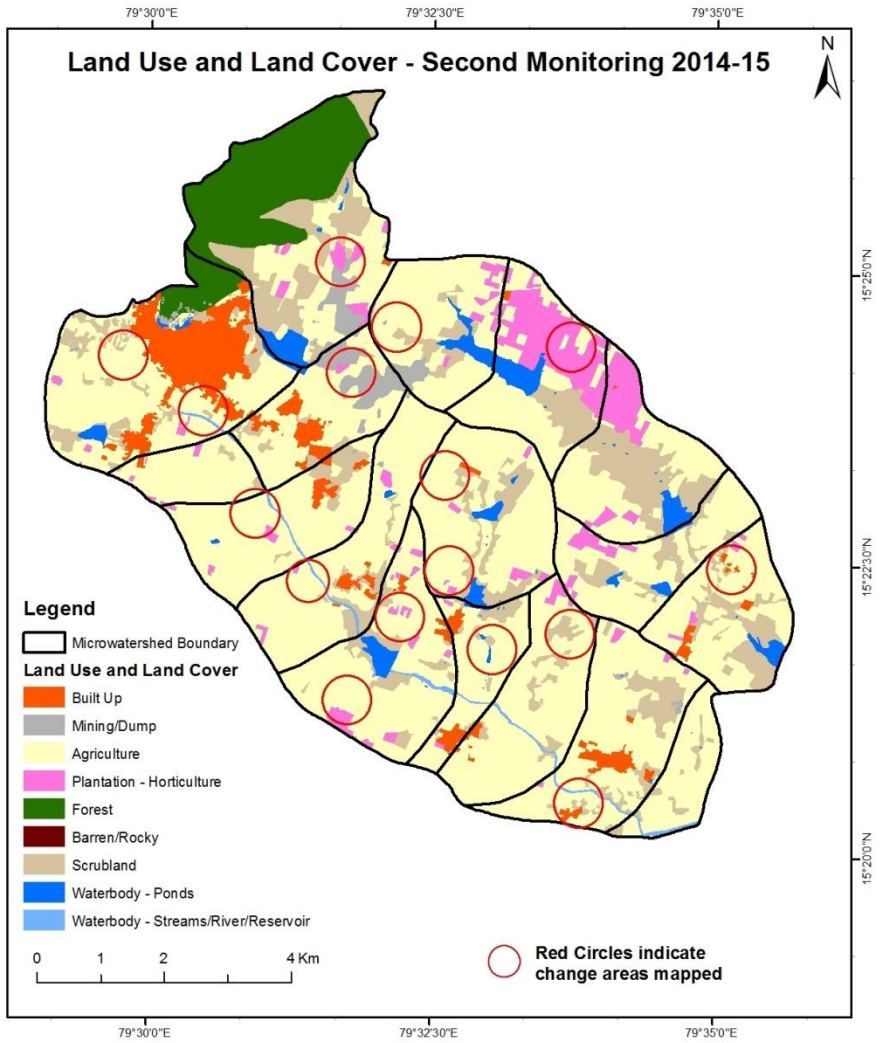




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

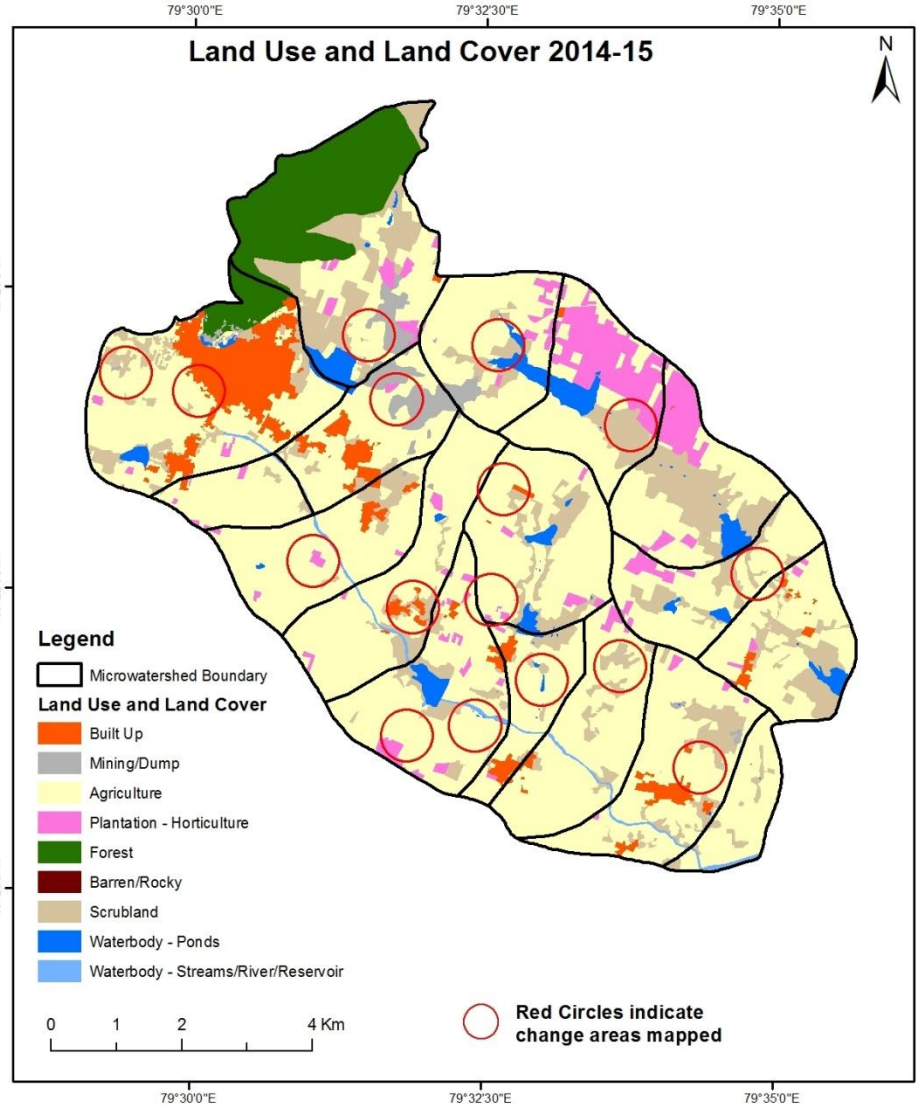
Scale: 1:10000

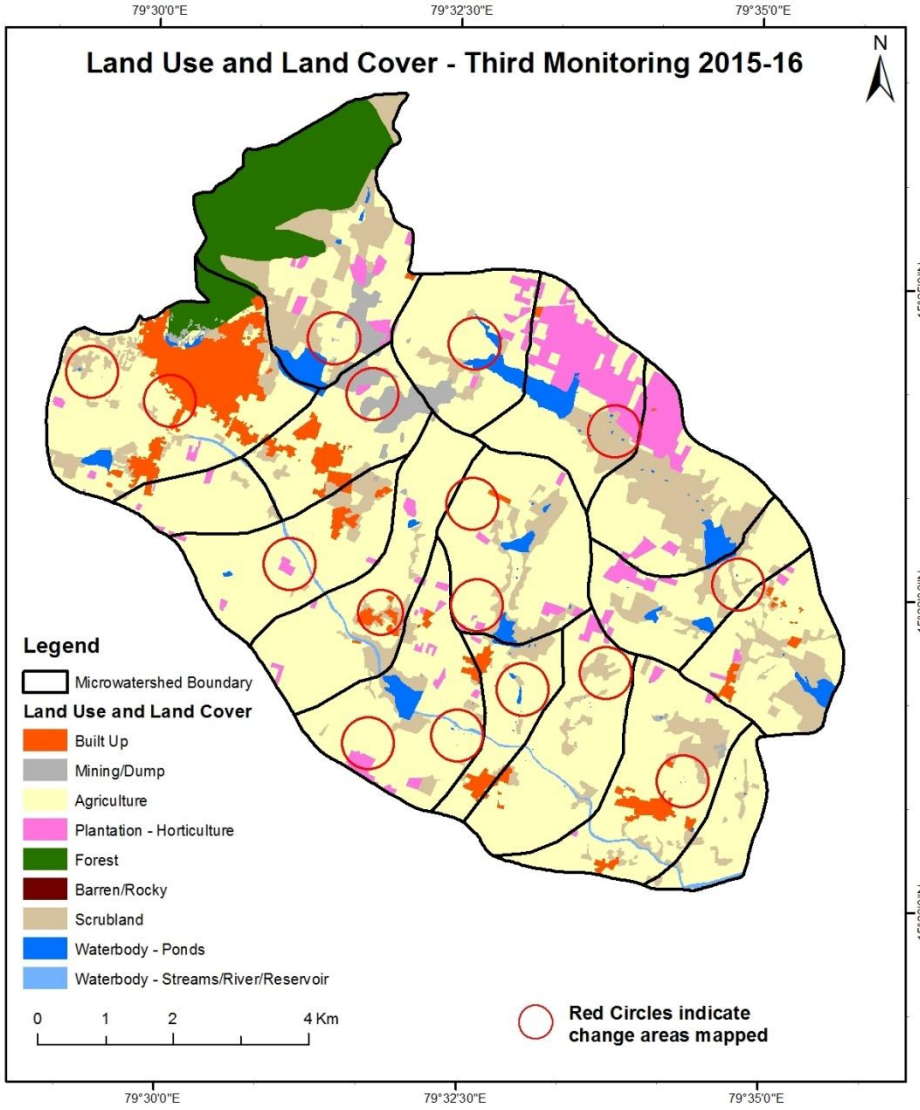




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

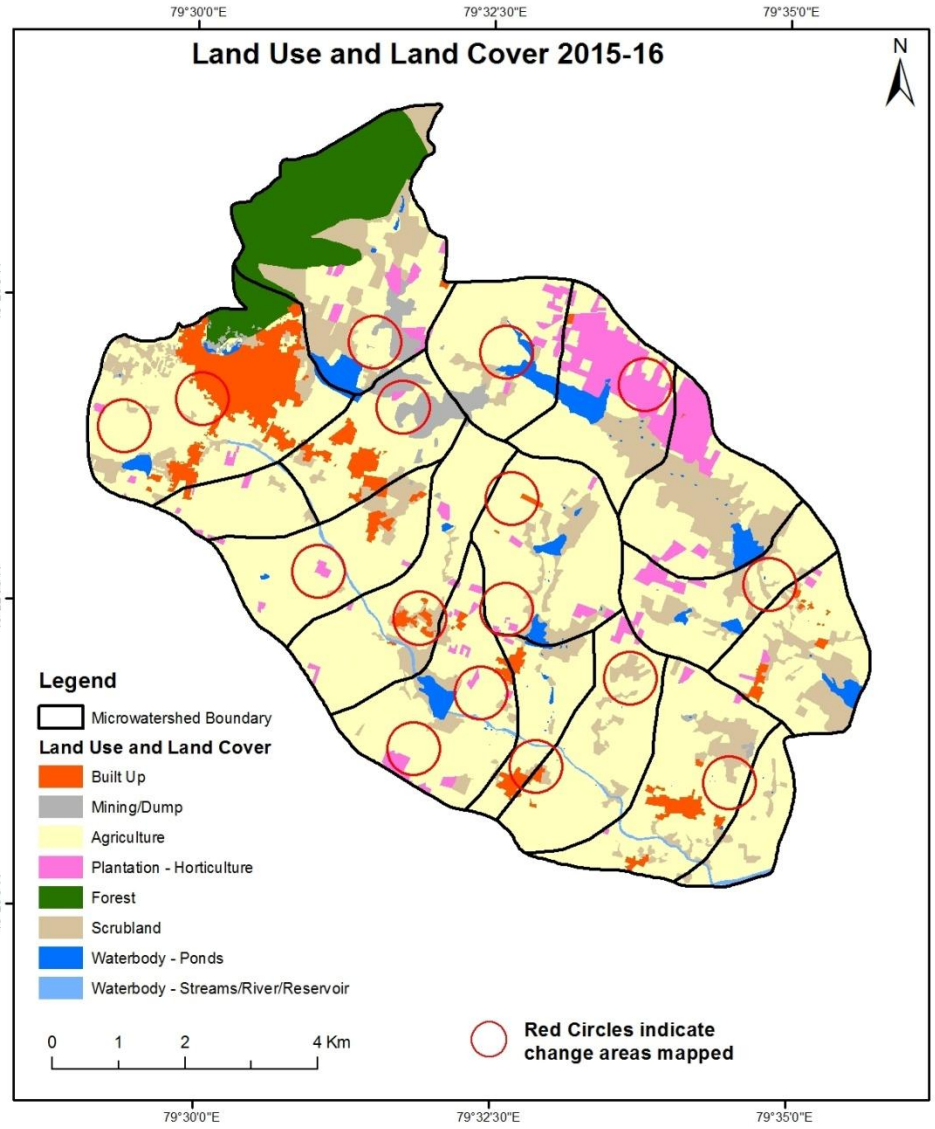
Scale: 1:10000

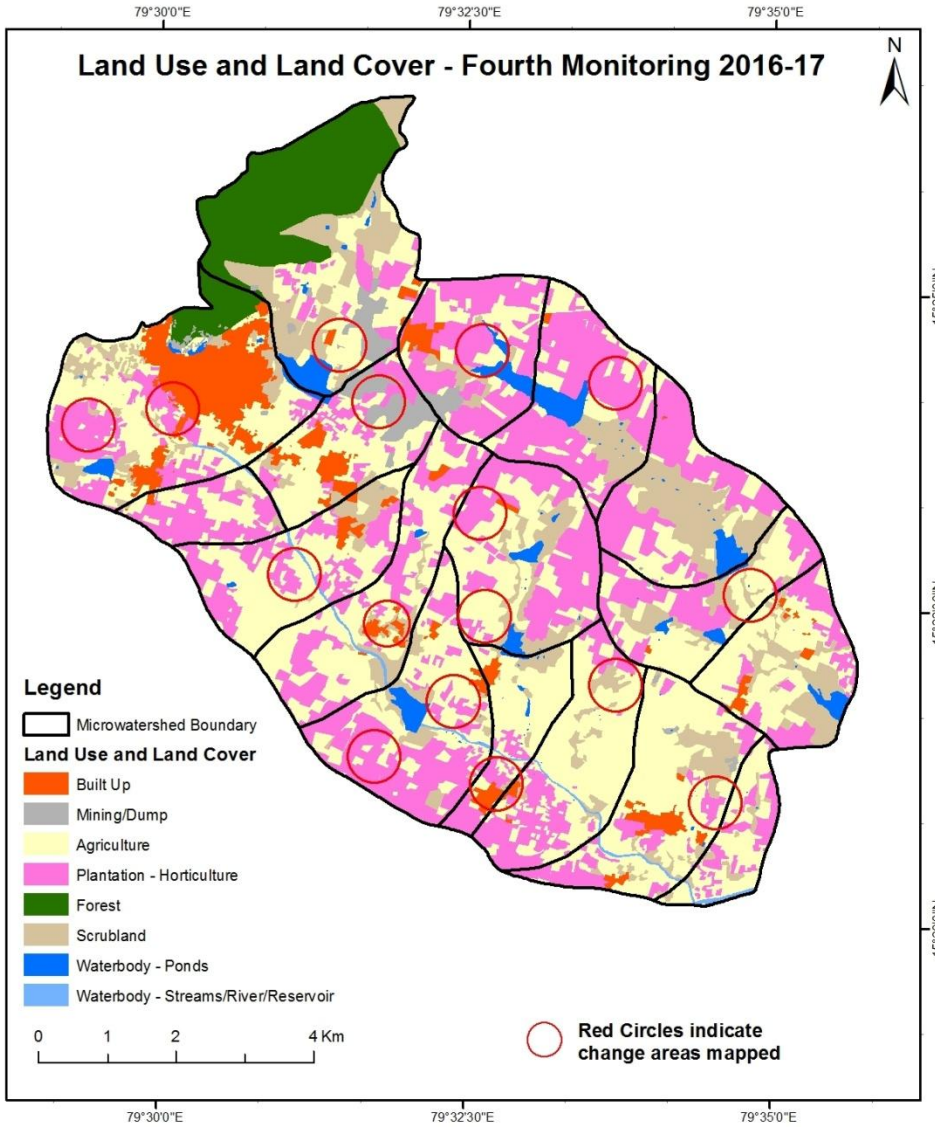




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

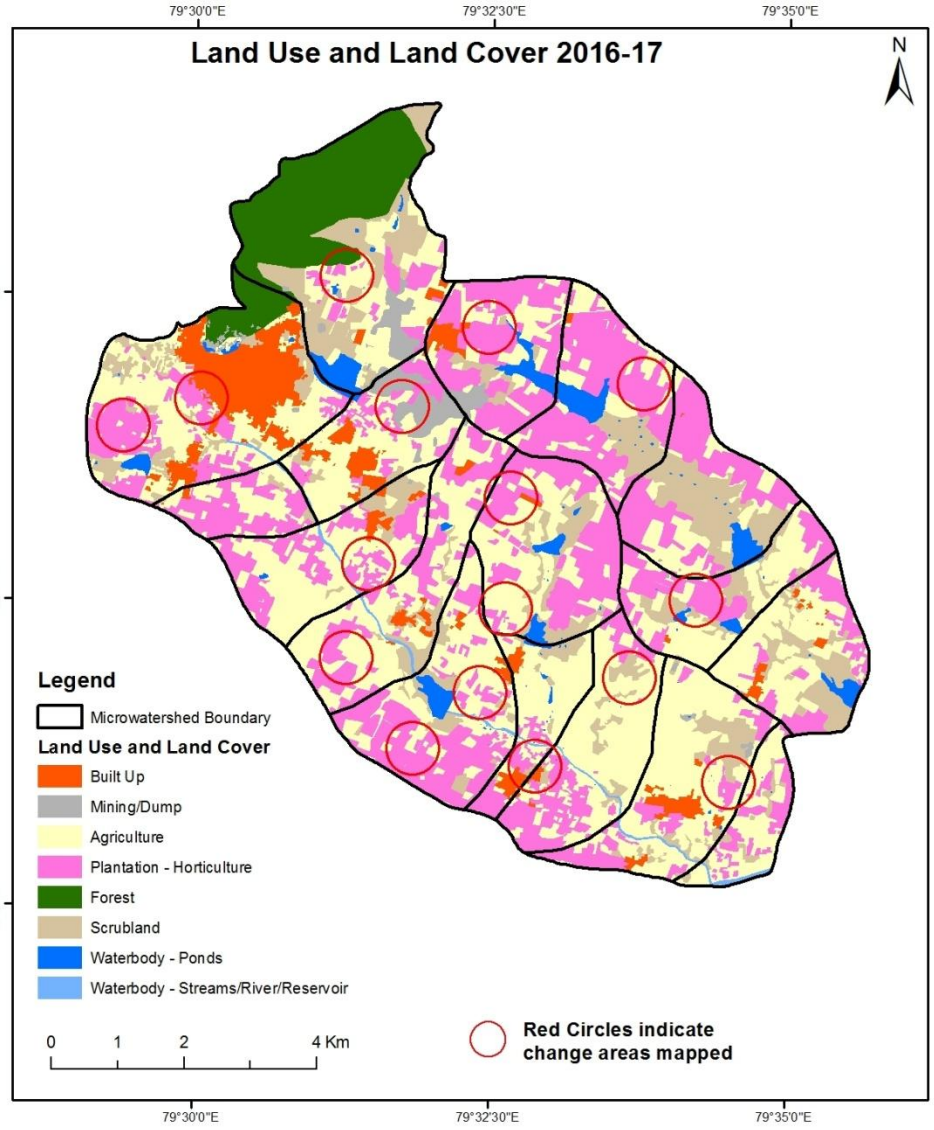
Scale: 1:10000

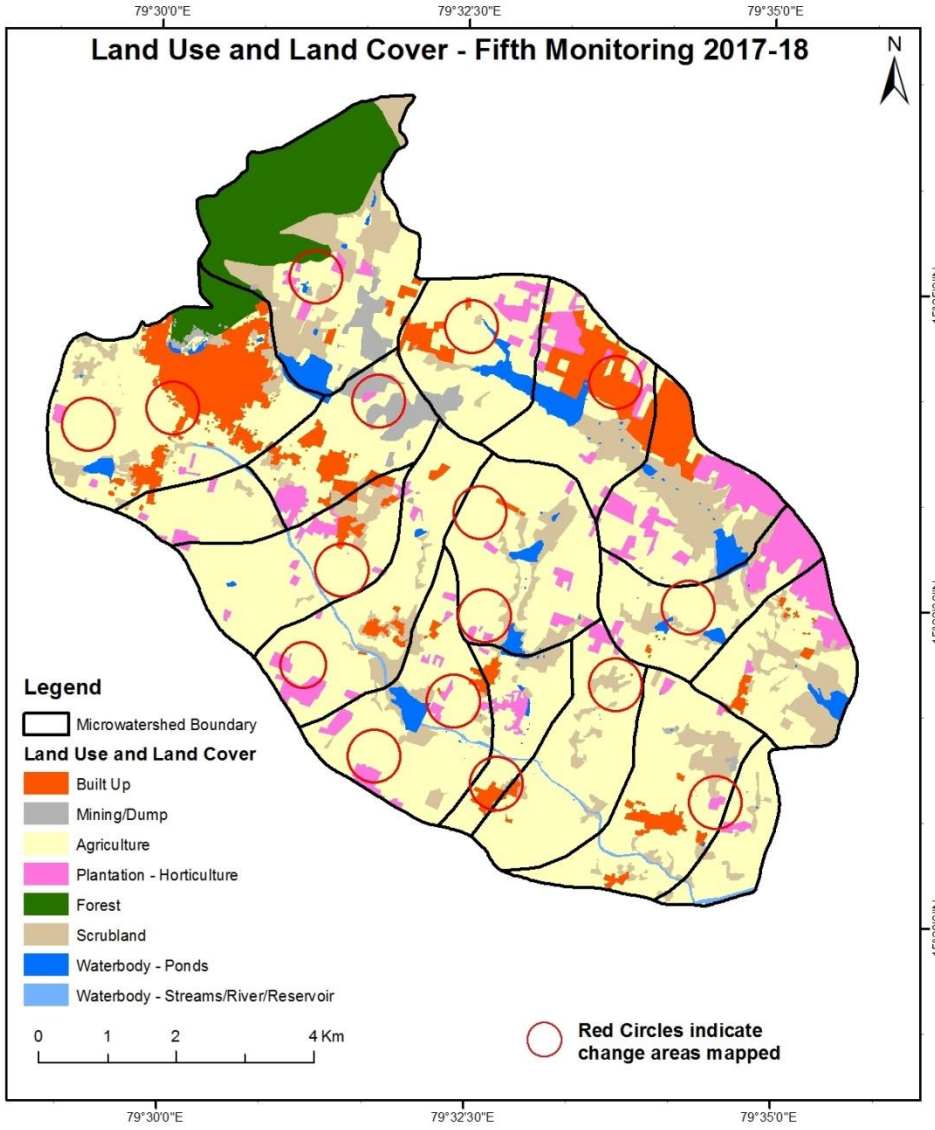




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

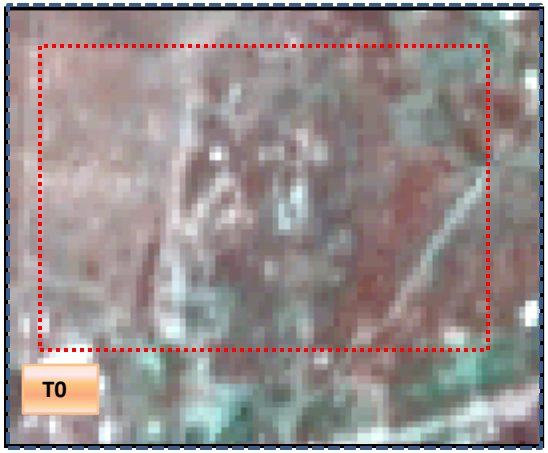
Scale: 1:10000



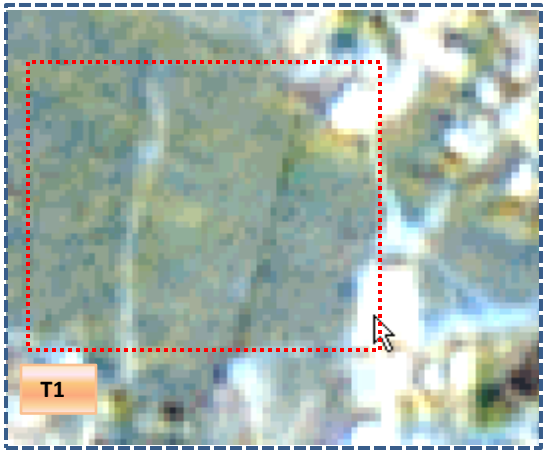


Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

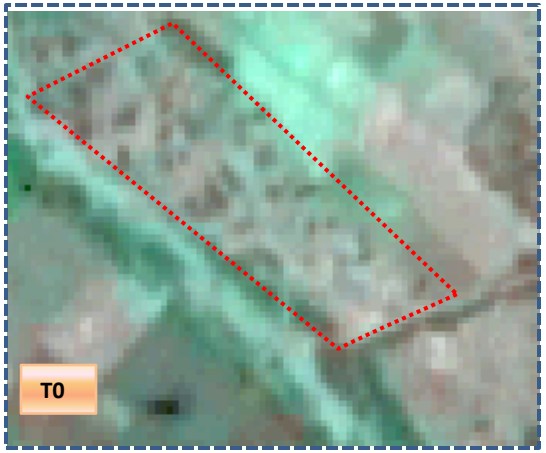


T0: 2009-10

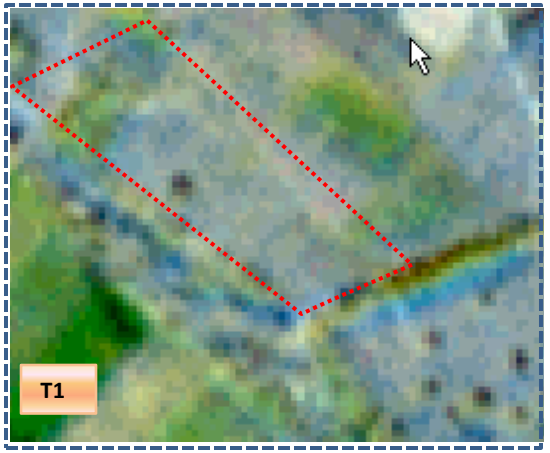


T1: 15 December 2013

Scrub to Agriculture



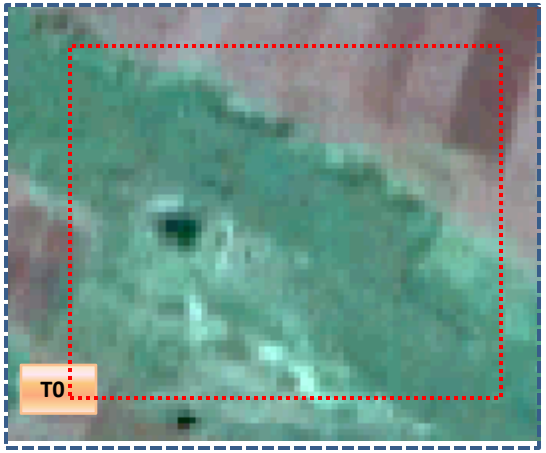
T0: 2009-10



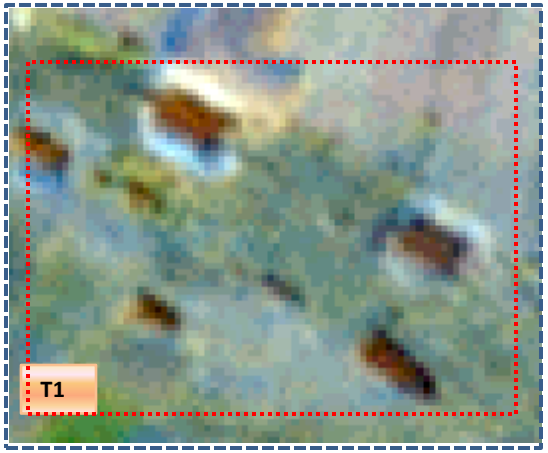
T1: 15 December 2013

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

Scrub to Water body

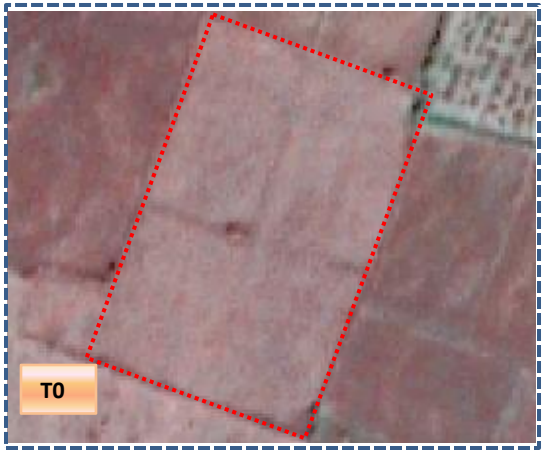


T0: 2009-10

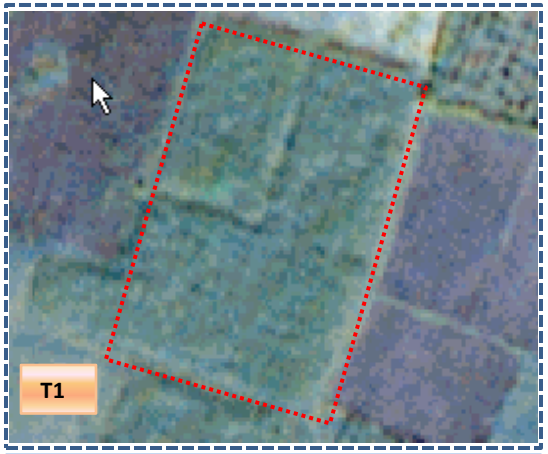


T1: 15 December 2013

Agriculture to Plantation



T0: 2009-10



T1: 15 December 2013

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

Land cover	Monitoring period (T1)										
T0	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	324.33										**324.33**
Mining/dump		115.48	0.77					5.67			**121.92**
Agriculture	19.27	14.50	4458.13	134.42				317.44	3.87	1.55	**4949.18**
Plantation Horticulture			41.12	303.52				5.75			**350.40**
Forest	0.45				466.87						**467.32**
Forest Plantation											
Barren Rocky											
Scrub	4.73	1.69	72.34	6.26	5.30			1101.17		55.23	**1246.72**
Waterbody-Streams/River									44.24		**44.24**
Waterbody – Ponds										133.60	**133.60**
Grand Total	**348.78**	**131.67**	**4572.37**	**444.21**	**472.17**			**1430.03**	**48.11**	**190.38**	**7637.71**

- 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 491 ha of agriculture are decreased and it is converted into Plantation, Built-up, Mining/dump, Scrub and water body/pond in T1.
- In T1 114 ha of agriculture are increased from scrubland, plantation, mining dump and waterbody 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)										
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	348.58									0.20	**348.78**
Mining/dump		131.67									**131.67**
Agriculture	14.45	0.82	4405.87	8.82				142.20		0.20	**4572.37**
Plantation Horticulture			39.35	394.76				10.06		0.03	**444.21**
Forest		4.24			467.93						**472.17**
Forest Plantation											
Barren Rocky											
Scrub	8.41	2.86	507.27	0.53				909.56		1.40	**1430.03**
Waterbody-Streams/River			0.57						47.47	0.07	**48.11**
Waterbody – Ponds		0.19	1.68							188.52	**190.38**
Grand Total	**371.45**	**139.77**	**4954.75**	**404.11**	**467.93**			**1061.82**	**47.47**	**190.42**	**7637.71**

- 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 166 ha of agriculture are decreased and it is converted into Plantation, Built-up, Mining/dump, Scrub and water body/pond in T2.
- In T2 548 ha of agriculture are has increased from scrubland, plantation and water body of T1. The additional agriculture are coming from water body 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)										
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/ River	Water body Ponds	Grand Total
Built up	371.45										**371.45**
Mining/dump		139.66								0.11	**139.77**
Agriculture			4954.15							0.59	**4954.75**
Plantation Horticulture			9.27	394.82						0.02	**404.11**
Forest					467.93						**467.93**
Forest Plantation											
Barren Rocky											
Scrub	0.42		58.02					1002.62		0.77	**1061.82**
Waterbody-Streams/River			3.23						44.24		**47.47**
Waterbody – Ponds										190.42	**190.42**
Grand Total	**371.87**	**139.66**	**5024.67**	**394.82**	**467.93**			**1002.62**	**44.24**	**191.91**	**7637.71**

- 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 0.59 ha of agriculture are decreased and it is converted into water body/pond in T3.
- In T3 70 ha of agriculture are has increased from scrubland, plantation, mining dump and water body of T2.
- The additional agriculture are coming from water body 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 (T5)										
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	371.87										**371.87**
Mining/dump		139.66									**139.66**
Agriculture	37.66	2.46	3058.02	1924.67						1.86	**5024.67**
Plantation Horticulture			8.72	386.10							**394.82**
Forest		0.41			467.52						**467.93**
Forest Plantation											
Barren Rocky											
Scrub	0.36	3.14	1.23					997.23		0.66	**1002.62**
Waterbody-Streams/River									44.24		**44.24**
Waterbody – Ponds										191.91	**191.91**
Grand Total	**409.89**	**145.67**	**3067.97**	**2310.77**	**467.52**			**997.23**	**44.24**	**194.42**	**7637.71**

- 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 1966 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body/pond in T3.
- In T3 9.9 ha of agriculture are has increased from scrubland, plantation and scrub land of T2.
- The additional agriculture are coming from water body 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 (T4)										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	409.59		0.29								**409.89**
Mining/dump		142.15	0.67					2.66	0.19		**145.67**
Agriculture	14.82	0.27	2927.52	124.05				0.93	0.39		**3067.97**
Plantation Horticulture	175.13		1764.37	371.26							**2310.77**
Forest		1.51			466.01						**467.52**
Forest Plantation											
Barren Rocky											
Scrub	3.53	1.46	106.26					882.88	3.09		**997.23**
Waterbody-Streams/River										44.24	**44.24**
Waterbody – Ponds			0.31					0.66	193.45		**194.42**
Grand Total	**603.08**	**145.40**	**4799.43**	**495.32**	**466.01**			**887.12**	**197.12**	**44.24**	**7637.71**

- 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 140 ha of agriculture are decreased and it is converted into built-up, mining/dump, plantation and water body/pond in T3.
- In T3 1871 ha of agriculture are has increased from scrubland, plantation, mining dump and water body of T2.
- The additional agriculture are coming from water body 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 63 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 382, 69 & 1731 Hectares From T1-T2, T2-T3 & T4-T5 respectively and overall decrease of 149 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 144 ha of the Plantation/Horticulture area has been increased between 2009-10 (t0) & 2017-18 (T5) years.
6. There is a decrease of 359 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (65) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (76) verified from the portal.