MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -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

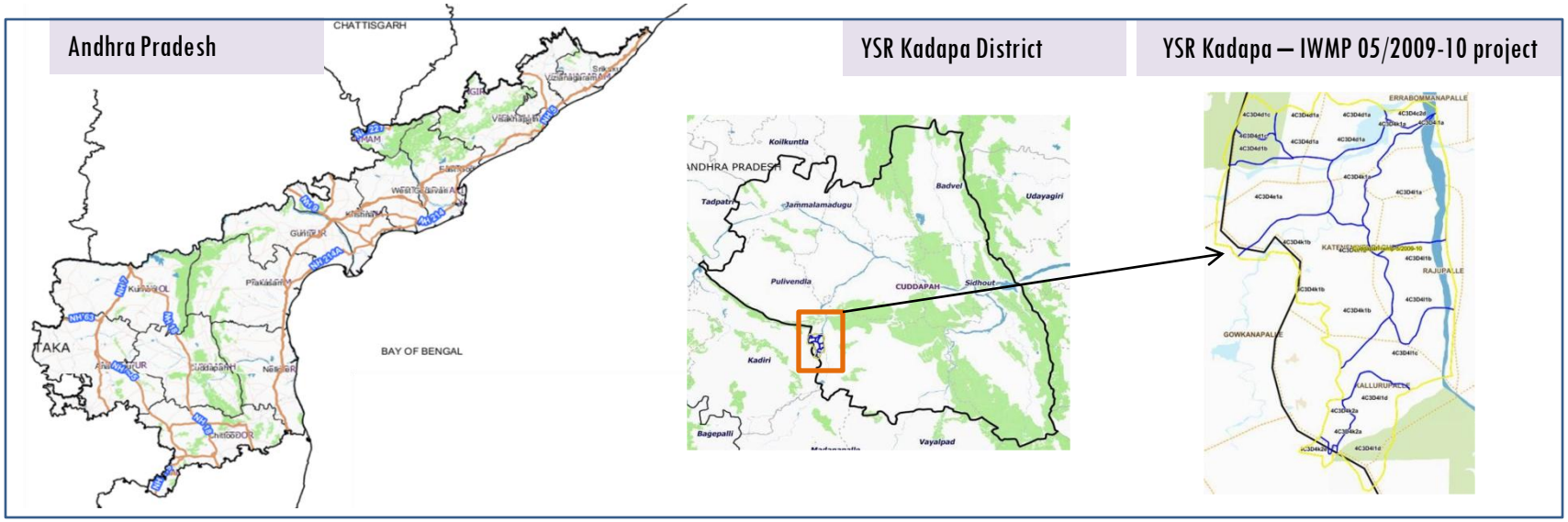
CONTENTS

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-05/2009-10, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 6,098 ha. It comprises of 13 micro watersheds.
- In the project area 25 Drishti photos were uploaded showing 12 check dams/Rock fill dam, 7 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 7 farm ponds or dug out pits and 12 check dams and drainage treatments with 17.41 ha increase in the area.
- Major percentage i.e. 35.72 % is covered by the agriculture, 45.47 % is covered by scrubland, 9.06 is covered by forest area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-05/2009-10
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Chakrayapet Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 6,098 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



- 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.

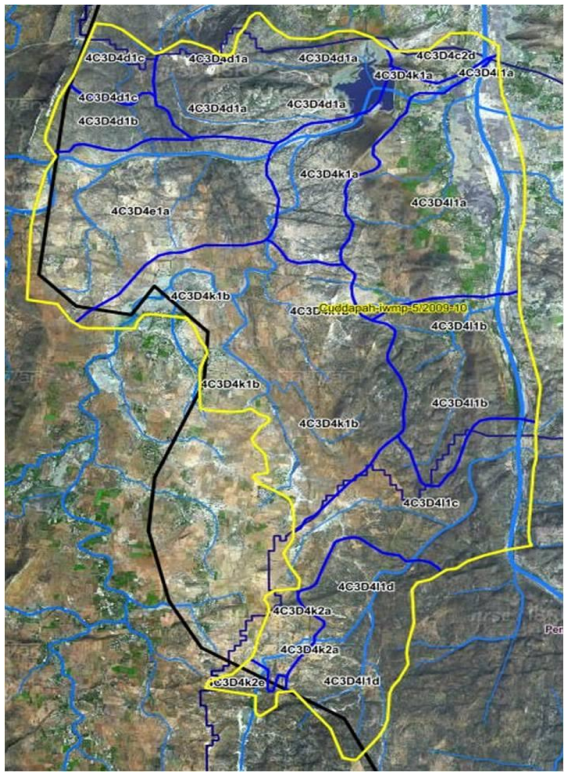
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2013-14	2014-15
LISS IV	2013-14		
SCENE 1			1-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			1-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	25
4	Detailed Project Report		

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



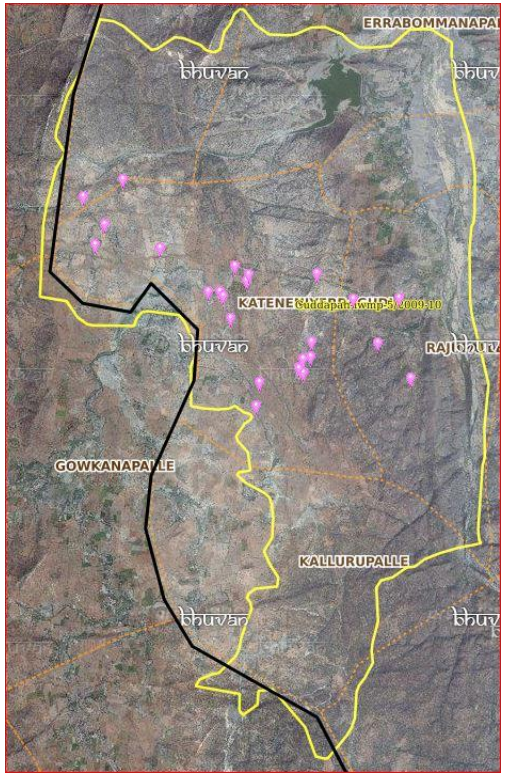
Legend

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	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	7	7
11	Civil work-Check dams /Rock fill dam	12	12
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	6	5
	TOTAL	**25**	**24**

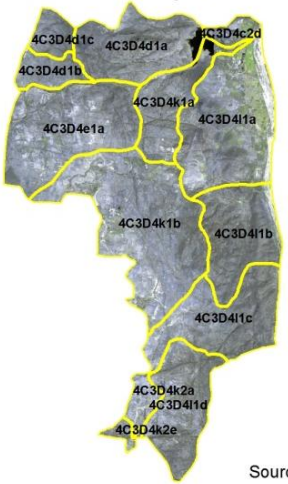
MONITORING IN THE PROJECT AREA

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.

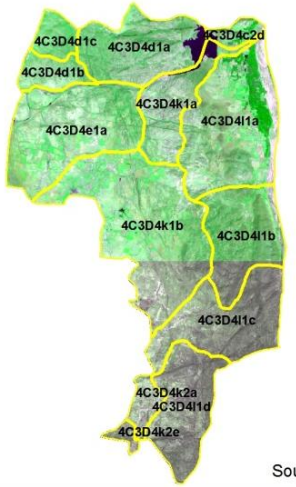
Natural Color Composite – 2009-10 to 2017-18

Natural Color Composite- 2009-10



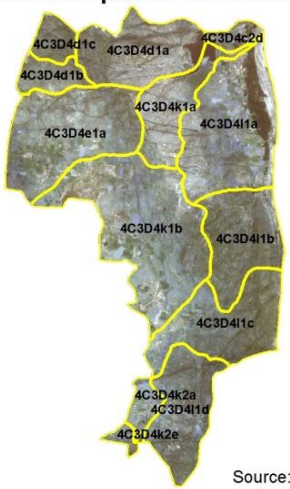
Source:Fusen data,NRSC

Natural Color Composite-10th October 2012



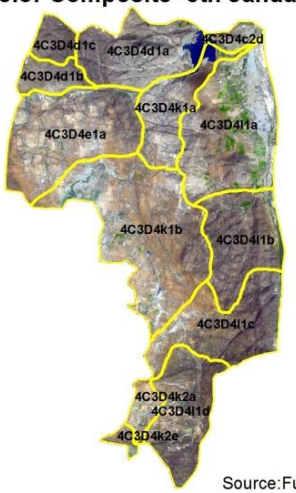
Source:LISS-IV,NRSC

Natural Color Composite-13th December 2015



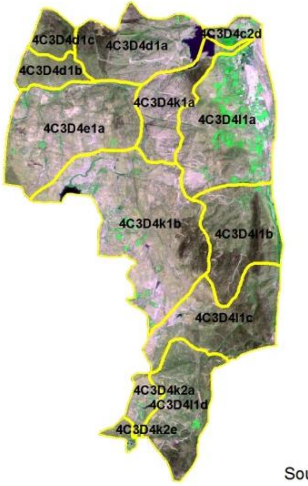
Source:Fusen data,NRSC

Natural Color Composite- 5th January 2017



Source:Fusen data,NRSC

Natural Color Composite- 1st March 2018



Source:LISS-IV,NRSC

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-05/2009-10

T1:2013

T2: 24 December 2015

Drishti Sl no. 15760 MWS : 4C3D4k1b

Check dam

T1:2013

T2: 24 December 2015

Drishti Sl no. 162053 MWS : 4C3D4k1b

Check dam

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-05/2009-10

T1:2013

T2: 24 December 2015

Drishti Sl no. 570525 MWS : 4C3D4l1b

Check dam

T1:2013

T2: 24 December 2015

Drishti Sl no. 834979 MWS : 4C3D4k1b

Percolation Tank

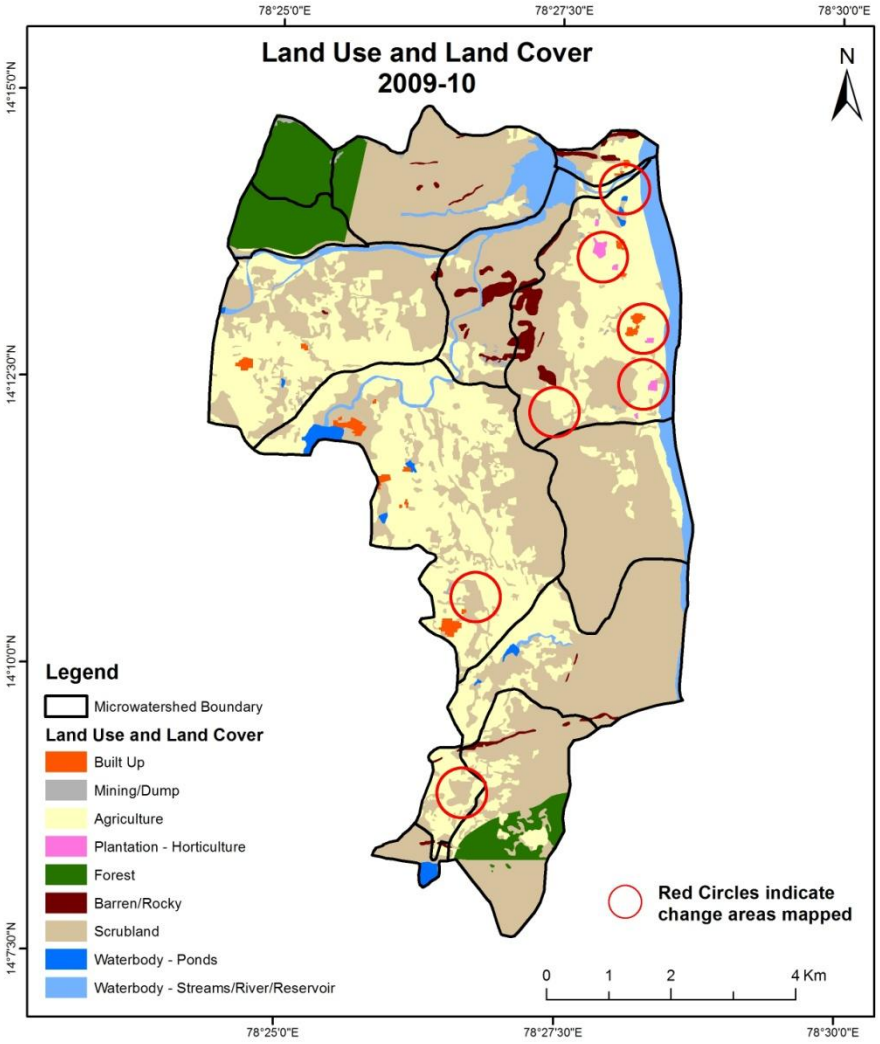
MONITORING IN THE PROJECT AREA

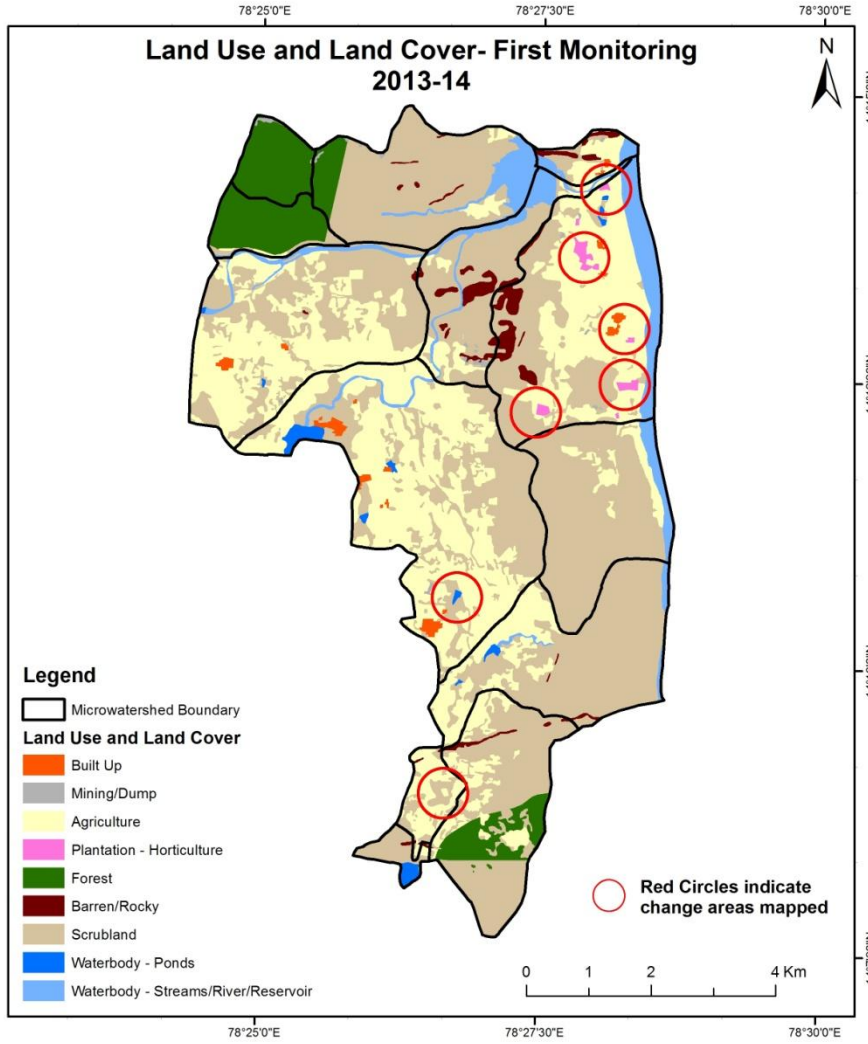
Land use and Land cover Changes in the Project

- 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 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)

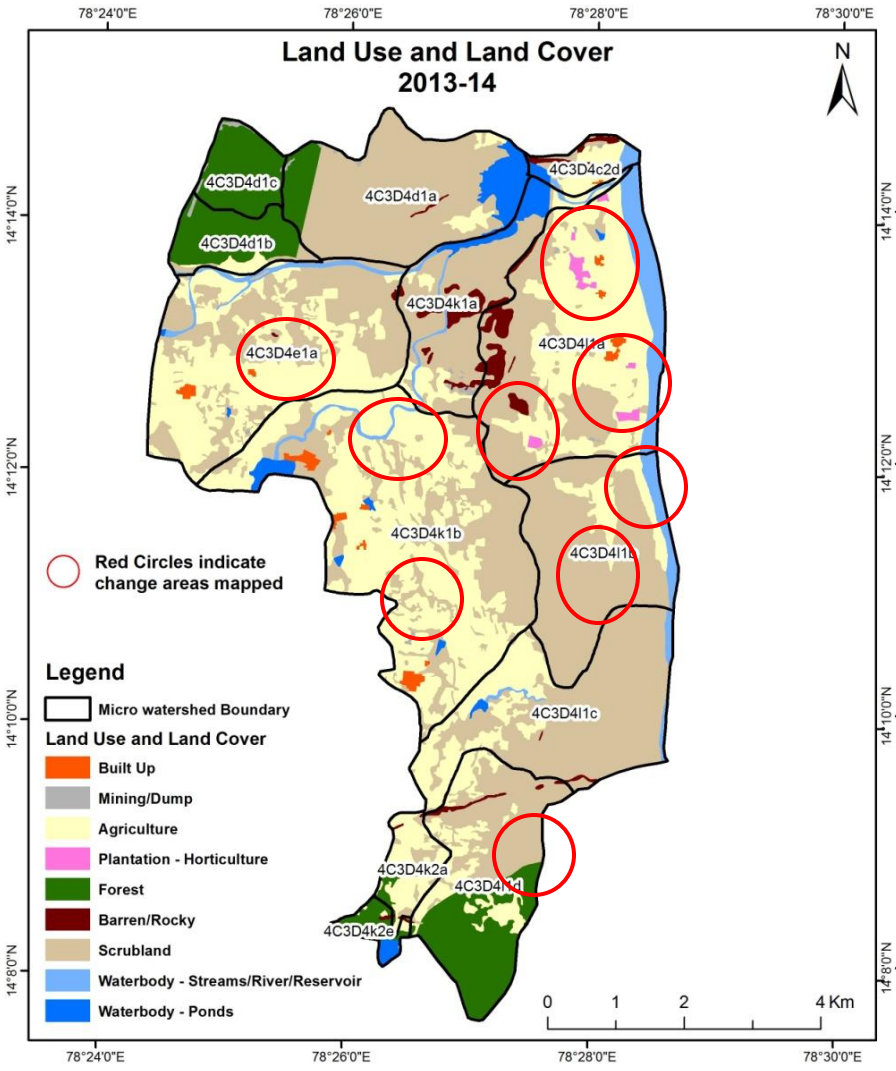
Scale: 1:10000

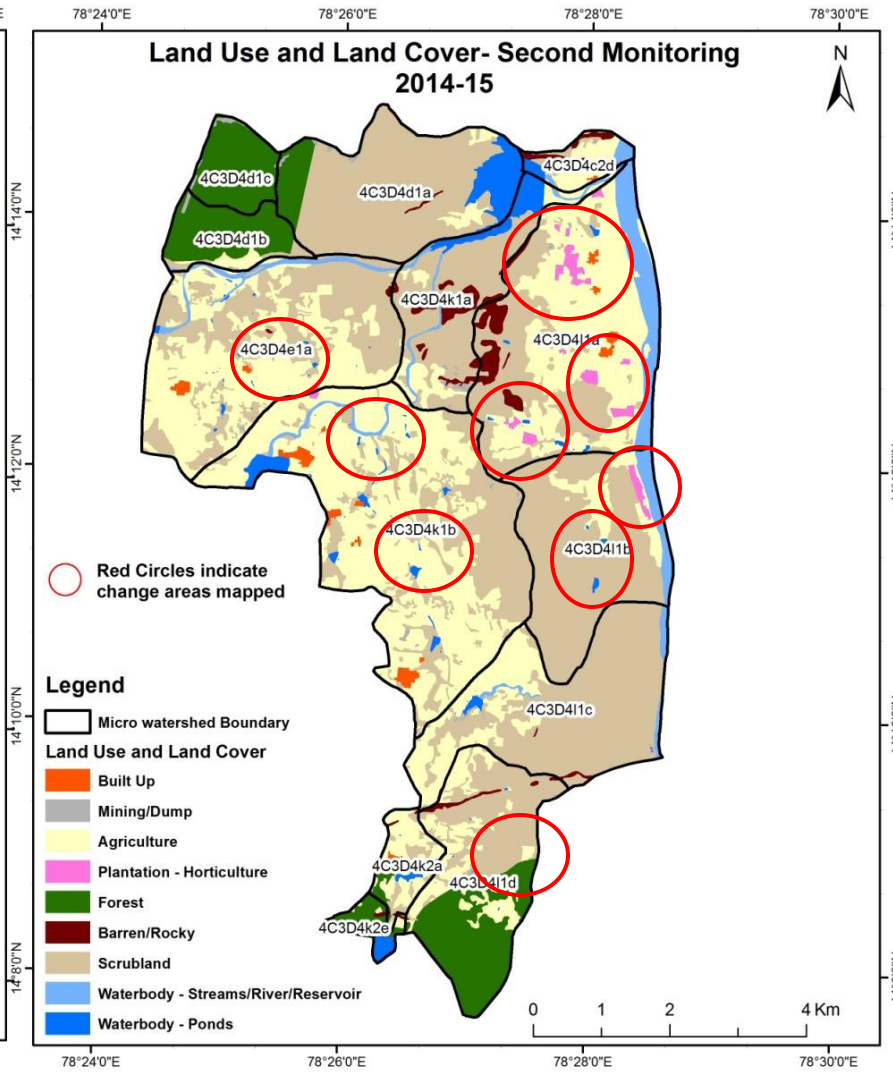




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

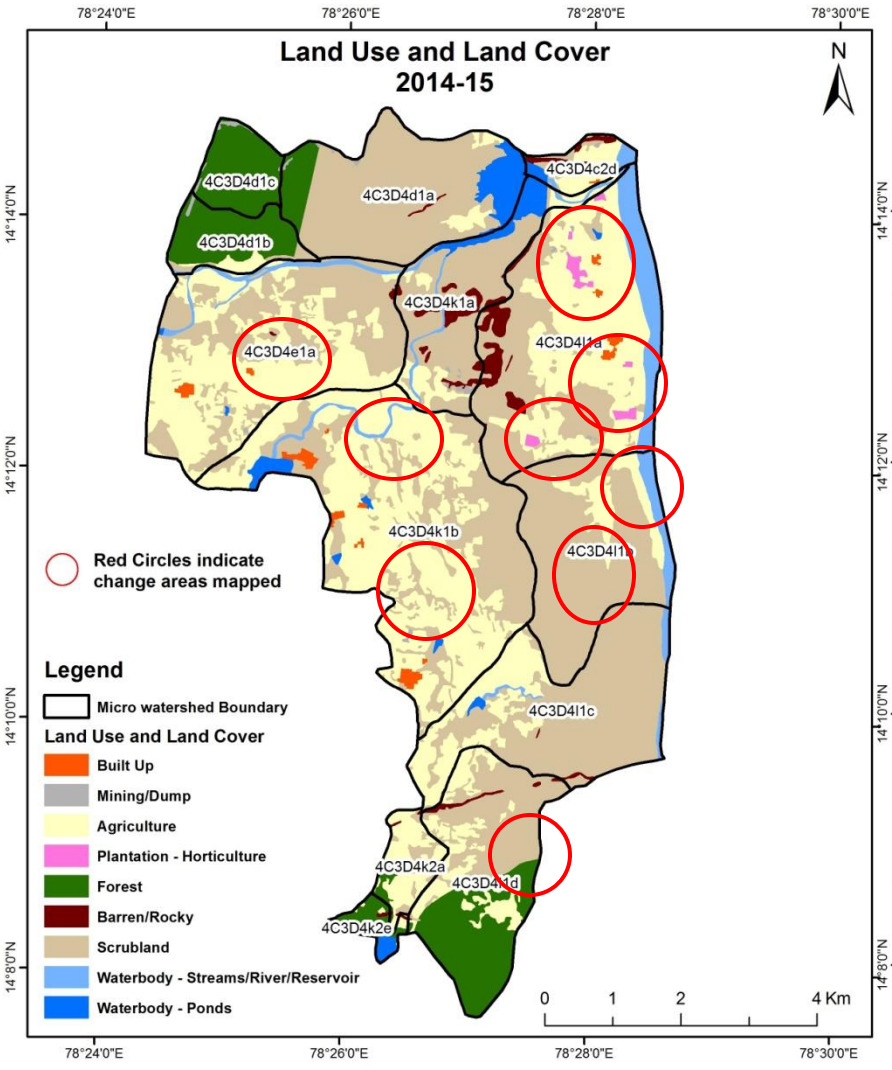
Scale: 1:10000

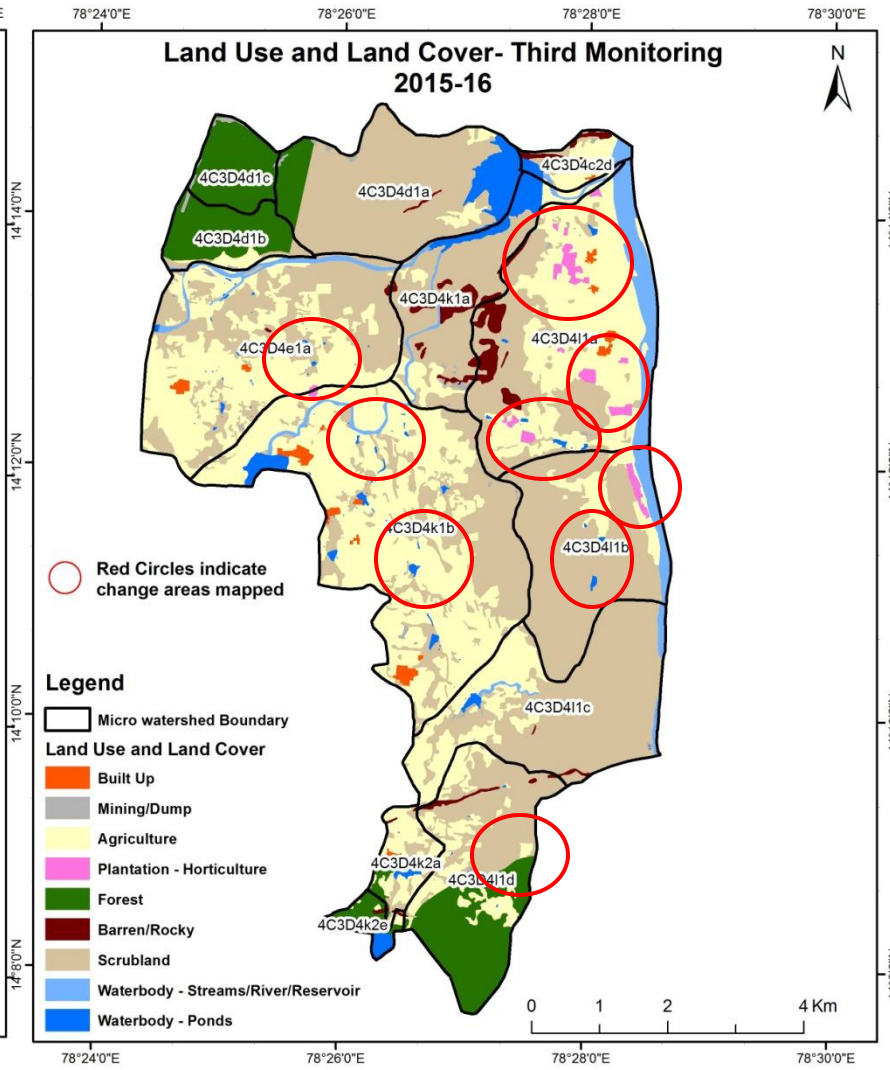




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

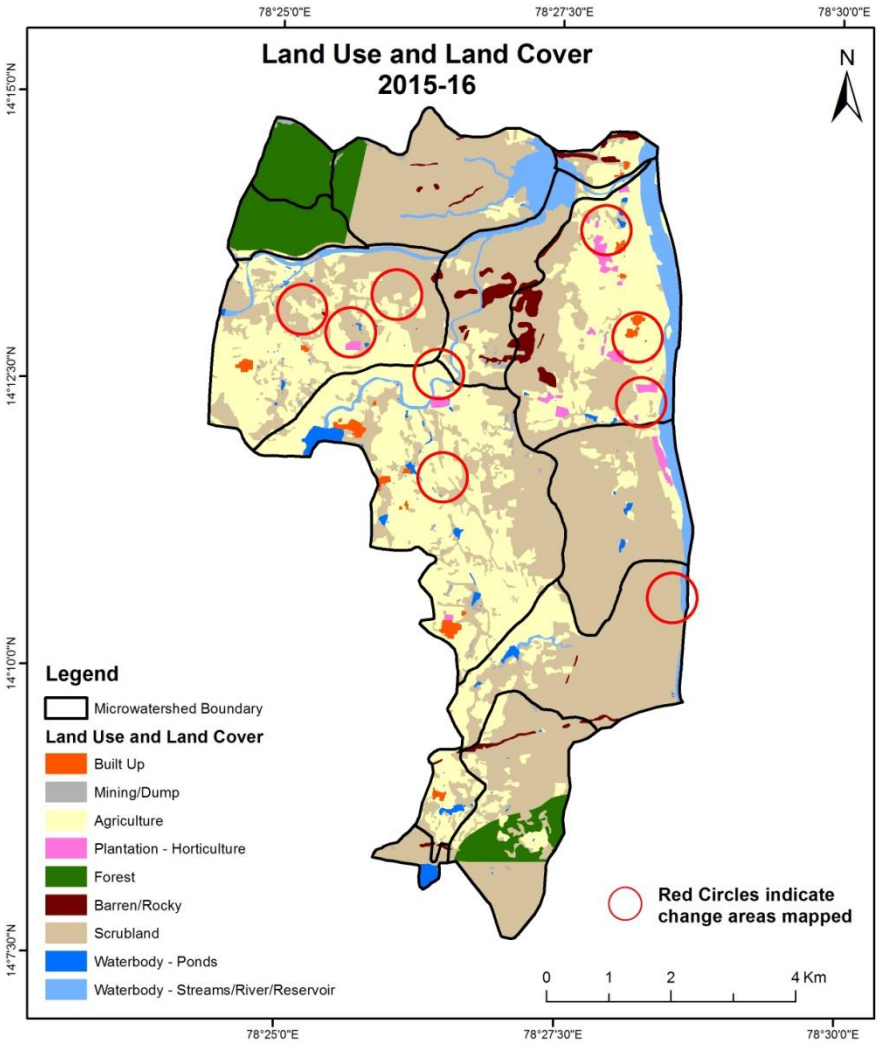
Scale: 1:10000

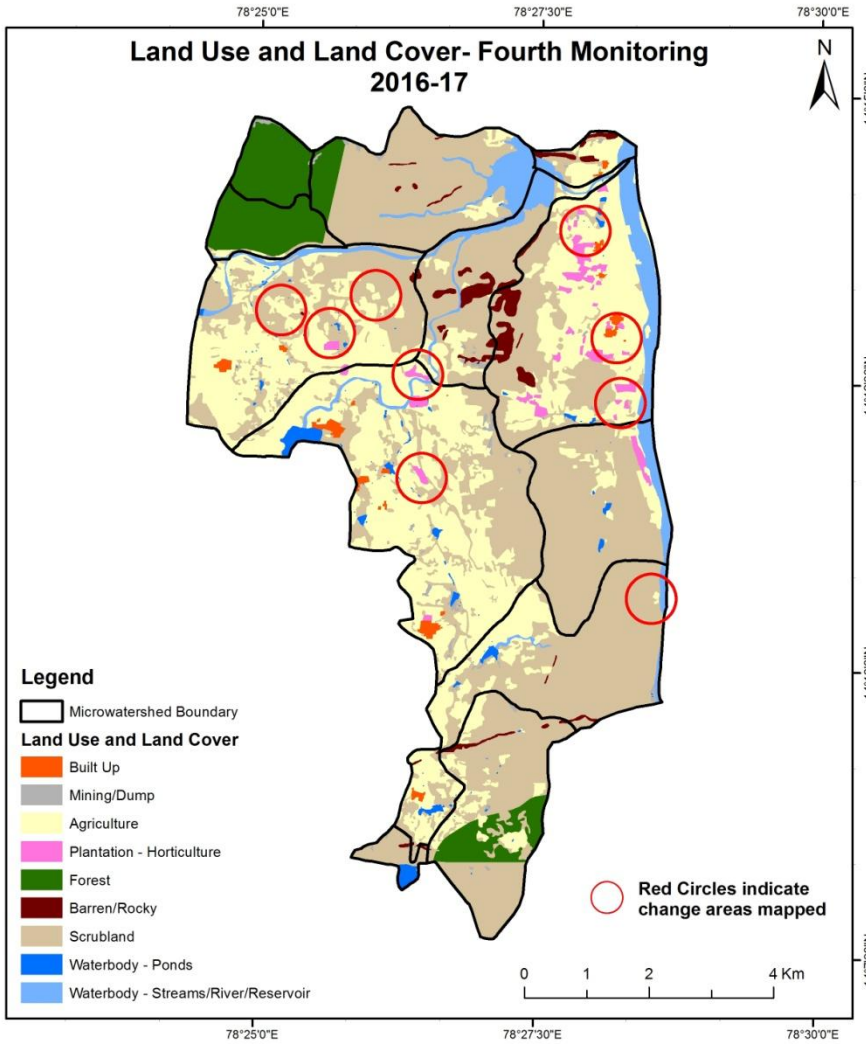




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

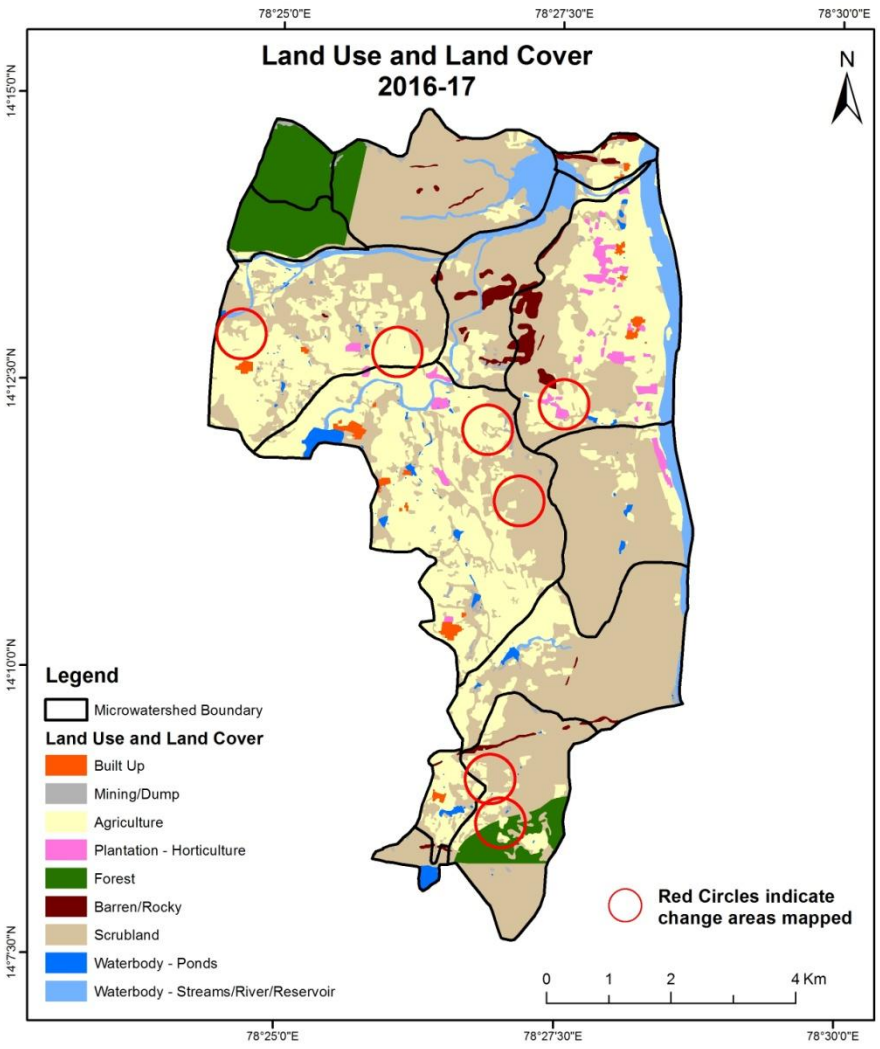
Scale: 1:10000

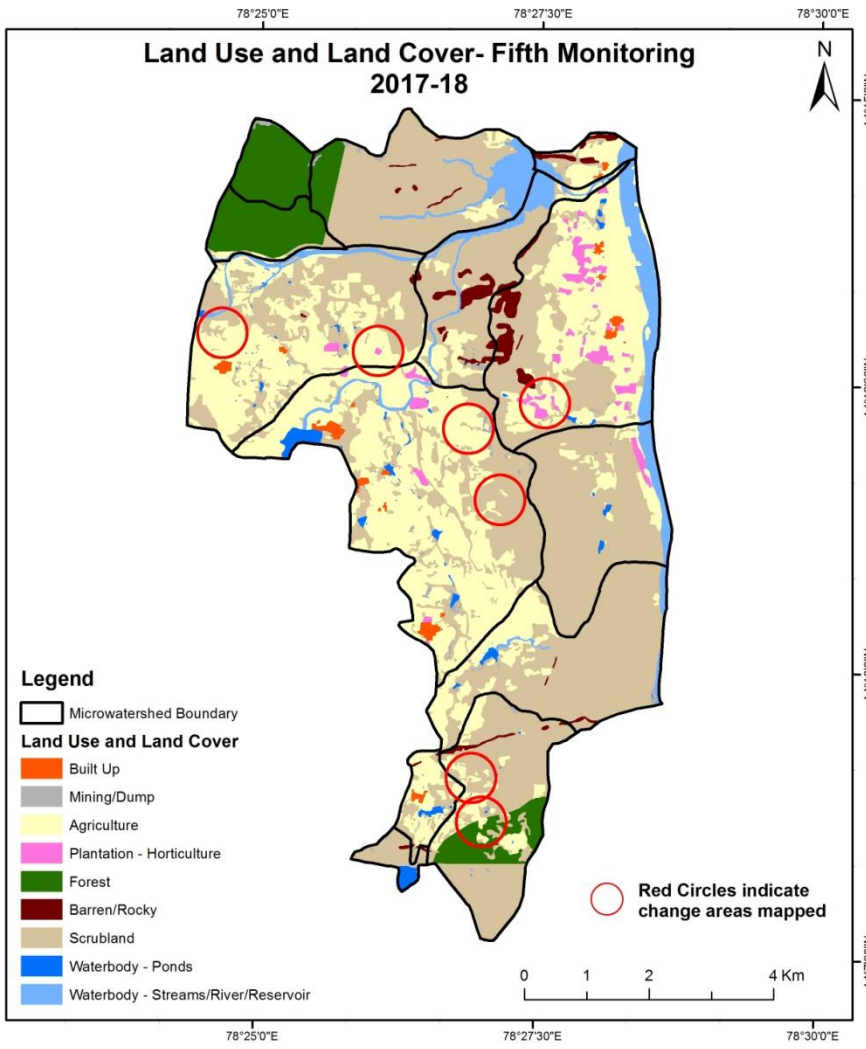




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

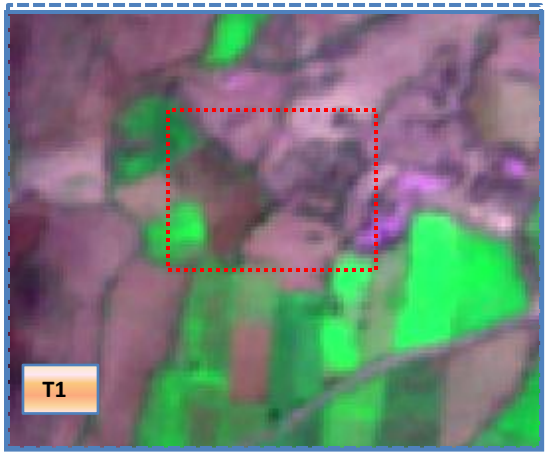
Scale: 1:10000





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

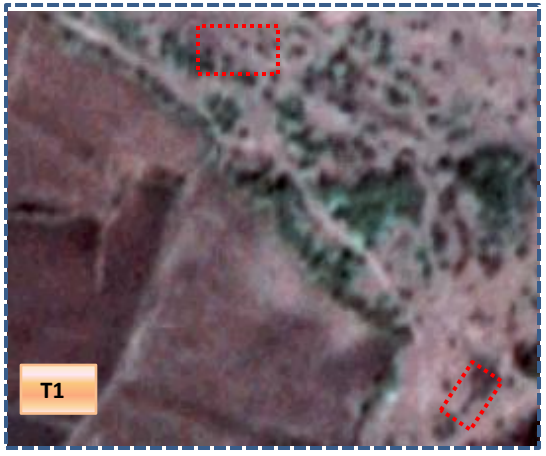
Agriculture to Plantation



T1: 2013

T2: 07 March 2015

Scrub to Water body

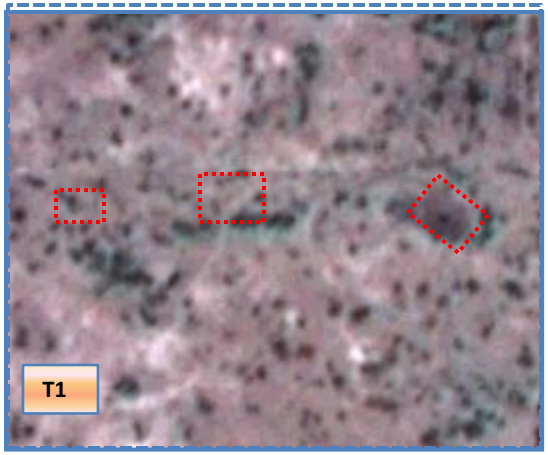


T1: 2013

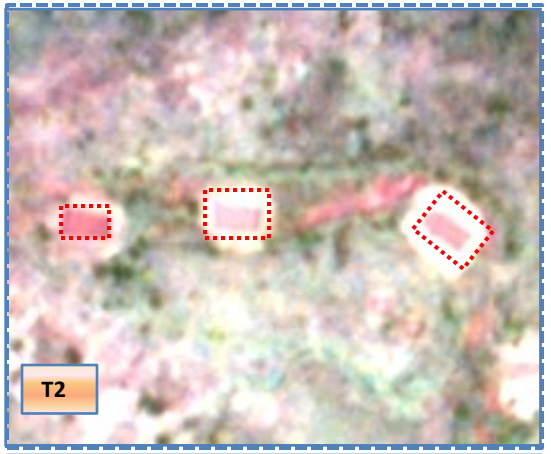
T2: 07 March 2015

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

Scrub to Water body

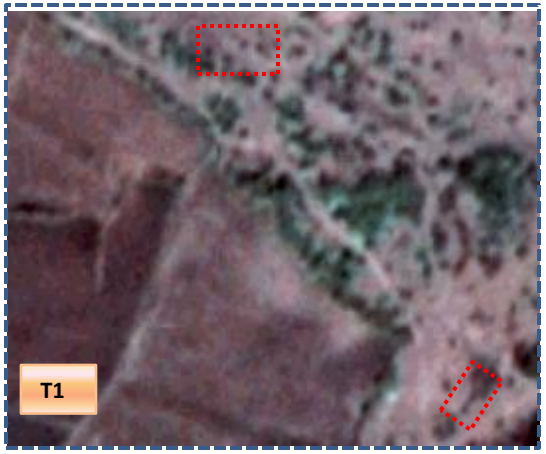


T1: 2013



T2: 07 March 2015

Scrub to Water body



T1: 2013

T2: 07 March 2015

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	35.57										**35.57**
Mining/dump		15.64									**15.64**
Agriculture			2009.00	10.91							**2019.91**
Plantation Horticulture				9.90							**9.90**
Forest					410.47						**410.47**
Forest Plantation											
Barren Rocky							103.68				**103.68**
Scrub			1.17					3119.02		1.80	**3121.99**
Waterbody-Streams/River									344.00		**344.00**
Waterbody – Ponds										37.01	**37.01**
Grand Total	**35.57**	**15.64**	**2010.18**	**20.80**	**410.47**		**103.68**	**3119.02**	**344.00**	**38.81**	**6098.17**

• 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 10 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 1.1 ha of the agriculture area has increased from plantation, forest, scrubland and water bodies of T1.

• Overall 62.74 ha of the agriculture area has been increased. The additional agriculture are coming from waterbody in T2 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	35.57										**35.57**
Mining/dump		15.64									**15.64**
Agriculture	2.20	1.97	1933.46	17.48				43.46		11.60	**2010.18**
Plantation Horticulture				20.80							**20.80**
Forest					410.45					0.02	**410.47**
Forest Plantation											
Barren Rocky							103.68				**103.68**
Scrub	1.16	7.00	76.34					3023.60	2.49	8.43	**3119.02**
Waterbody-Streams/River			8.09						335.91		**344.00**
Waterbody – Ponds										38.81	**38.81**
Grand Total	**38.92**	**24.61**	**2017.89**	**38.28**	**410.45**		**103.68**	**3067.06**	**338.40**	**58.87**	**6098.17**

• 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 76 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 84 ha of the agriculture area has increased from scrubland and water bodies of T1.

• Overall 7 ha of the agriculture area has been increased. 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)										
T2	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	38.92										**38.92**
Mining/dump		24.61									**24.61**
Agriculture	0.27	3.18	1976.95	11.46				25.78		0.25	**2017.89**
Plantation Horticulture			1.00	37.29							**38.28**
Forest		0.74	0.27		409.35					0.10	**410.45**
Forest Plantation											
Barren Rocky							103.68				**103.68**
Scrub		7.73	49.87					3005.26	4.02	0.19	**3067.06**
Waterbody-Streams/River			1.89						336.51		**338.40**
Waterbody – Ponds										58.87	**58.87**
Grand Total	**39.19**	**36.26**	**2029.98**	**48.75**	**409.35**		**103.68**	**3031.04**	**340.52**	**59.40**	**6098.17**

• 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 40 ha of the agriculture area has decreased and it is converted into plantation, scrub, water body and built up in T3.

• In T3 53 ha of the agriculture area has increased from plantation, scrubland and water body of T2. Overall 12 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)										
T3	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	39.19										**39.19**
Mining/dump		36.26									**36.26**
Agriculture	0.11		1999.47	28.95				1.35		0.11	**2029.98**
Plantation Horticulture				48.75							**48.75**
Forest		0.04			409.30						**409.35**
Forest Plantation											
Barren Rocky							103.68				**103.68**
Scrub		1.36	14.48					3015.05		0.15	**3031.04**
Waterbody-Streams/River									340.52		**340.52**
Waterbody – Ponds										59.40	**59.40**
Grand Total	**39.30**	**37.66**	**2013.95**	**77.70**	**409.30**		**103.68**	**3016.39**	**340.52**	**59.66**	**6098.17**

• 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 30 ha of the agriculture area has decreased and it is converted into plantation, scrub, water body and built up in T3.

• In T3 14 ha of the agriculture area has increased from scrubland of T2. Overall 16 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)										
T4	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	39.30										**39.30**
Mining/dump		37.66									**37.66**
Agriculture	0.24		2007.90	5.81							**2013.95**
Plantation Horticulture				77.70							**77.70**
Forest					409.30						**409.30**
Forest Plantation											
Barren Rocky							103.68				**103.68**
Scrub			18.45					2997.94			**3016.39**
Waterbody-Streams/River			0.98						339.54		**340.52**
Waterbody – Ponds										59.66	**59.66**
Grand Total	**39.54**	**37.66**	**2027.33**	**83.51**	**409.30**		**103.68**	**2997.94**	**339.54**	**59.66**	**6098.17**

• 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 6 ha of the agriculture area has decreased and it is converted into plantation, scrub, water body and built up in T3.

• In T3 19 ha of the agriculture area has increased from scrubland and water body of T2. Overall 13 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 18 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 7, 12 & 13 Hectares From T1-T2, T2-T3 & T4-T5 respectively and overall increase of 7.4 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 124 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. Farm ponds (7) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (7) verified from the portal.