MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

YSR KADAPA -07/2009-10
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

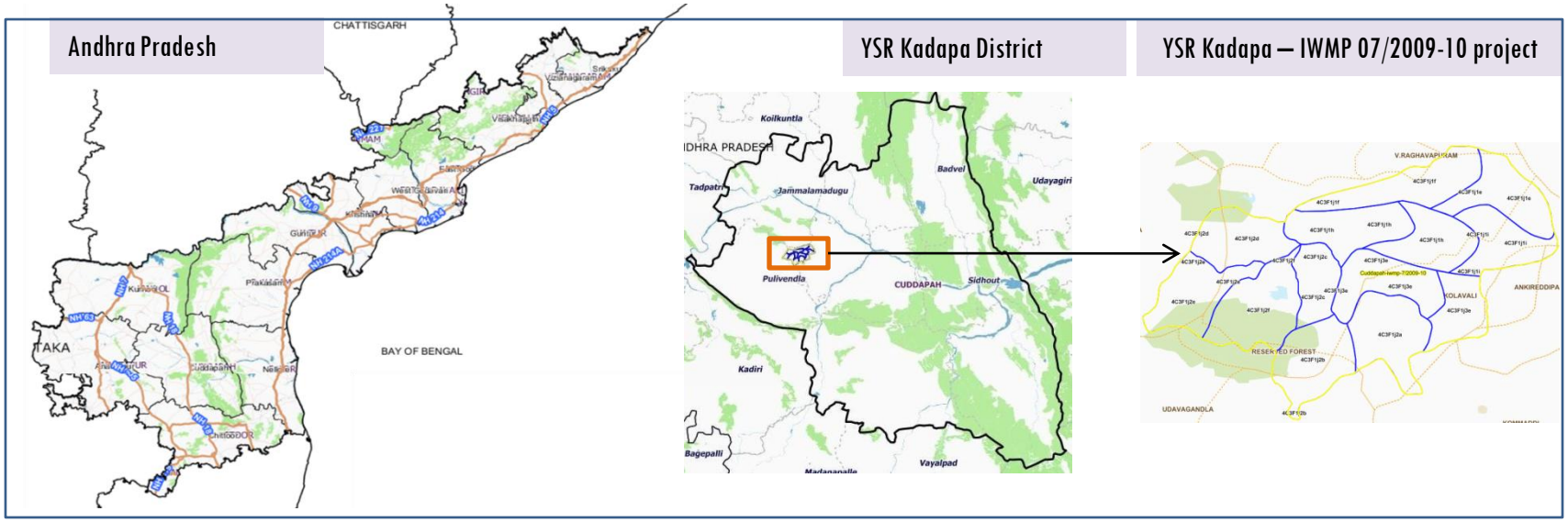
CONTENTS

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-07/2009-10, YSR Kadapa District of Andhra Pradesh. The total geographical area of the project is 6,335 ha. It comprises of 12 micro watersheds.
- In the project area 23 Drishti photos were uploaded showing 1 check dam and 22 22 Livelihood Measures of fodder developments, varmi compost, horticulture etc,.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing new farm ponds or dug out pits and 4 check dams and drainage treatments with 0.9 ha increase in the area.
- Major percentage i.e. 27.47 % is covered by the agriculture, 52.73 % is covered by scrubland, 11.75 % is forest area and remaining by other land use classes.

PROJECT : YSR KADAPA - IWMP-07/2009-10
DISTRICT : YSR KADAPA , STATE : ANDHRA PRADESH

- The study area falls in Muddanur Mandal of YSR Kadapa district of Andhra Pradesh state. The total geographical area of the project is 6,335 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.

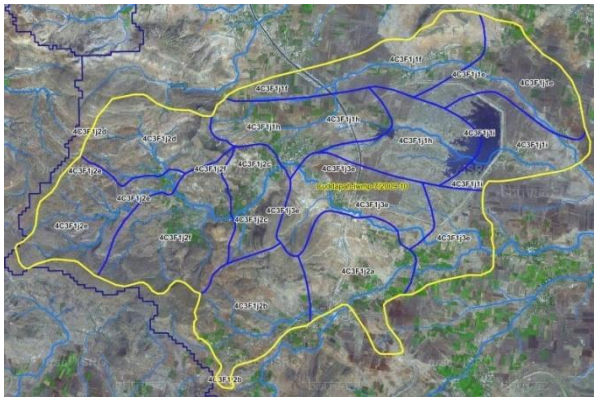
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			1-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
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	23
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

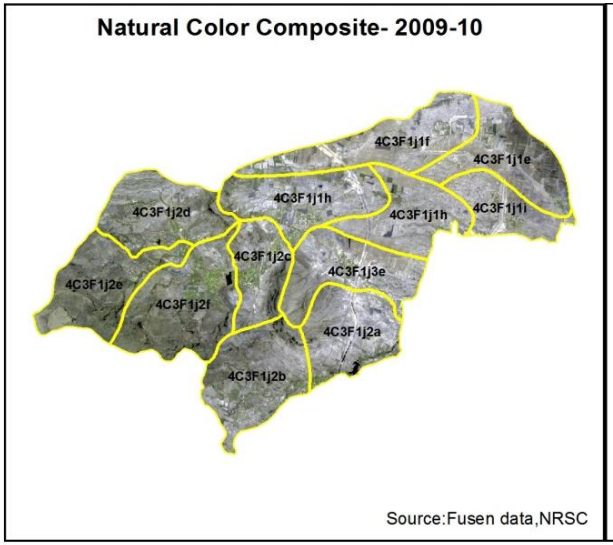
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Agronomic measures	0	0
2	Bunding	0	0
3	Black planting	0	0
4	Bund Planting/Horticulture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	New activity (boulder removal, farm ponds, dug out pits etc.,)	0	0
10	Farm ponds/Dug out pit	1	0
11	Civil work-Check dams /Rock fill dam	2	1
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)	31	22
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	**34**	**23**

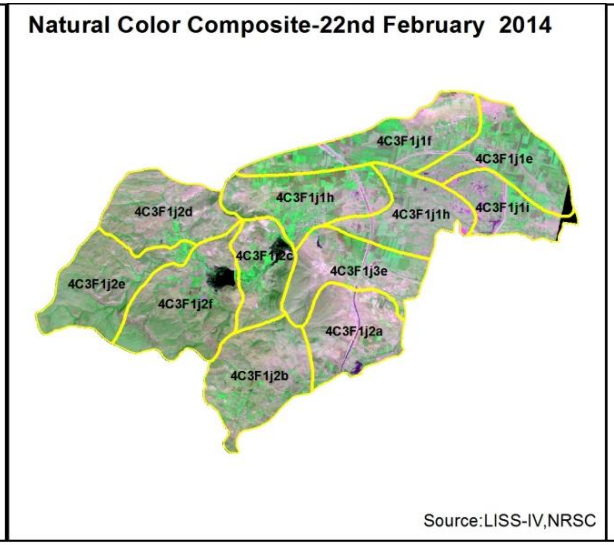
MONITORING IN THE PROJECT AREA

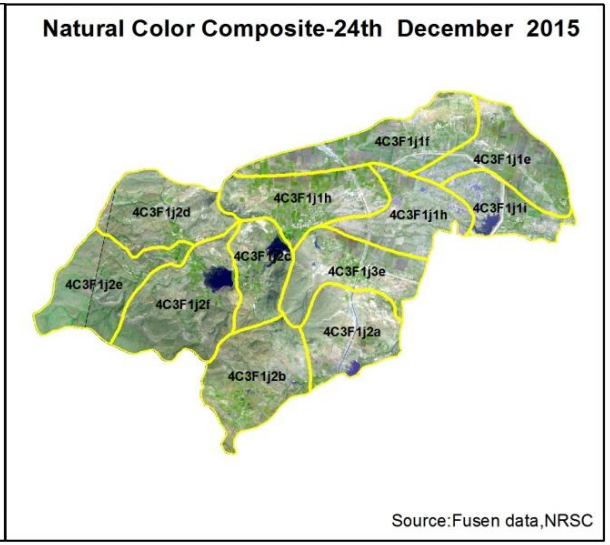
Site Wise Changes in the Project

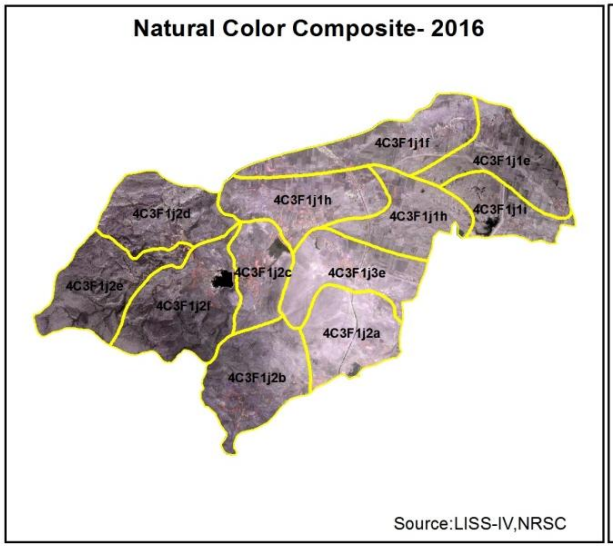
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match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

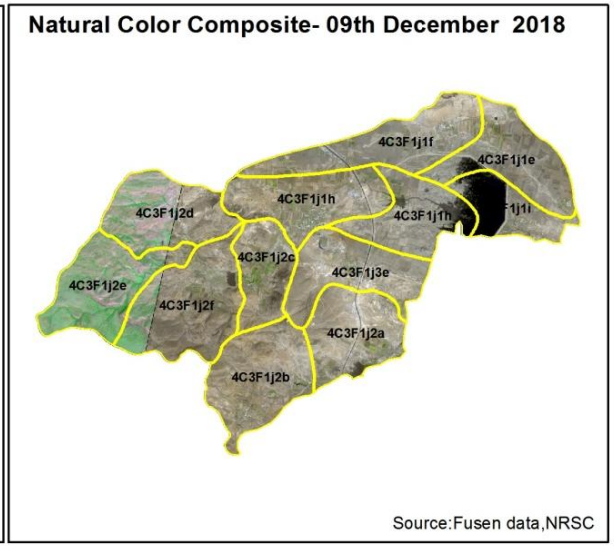
Natural Color Composite – 2009-10 to 2017-18



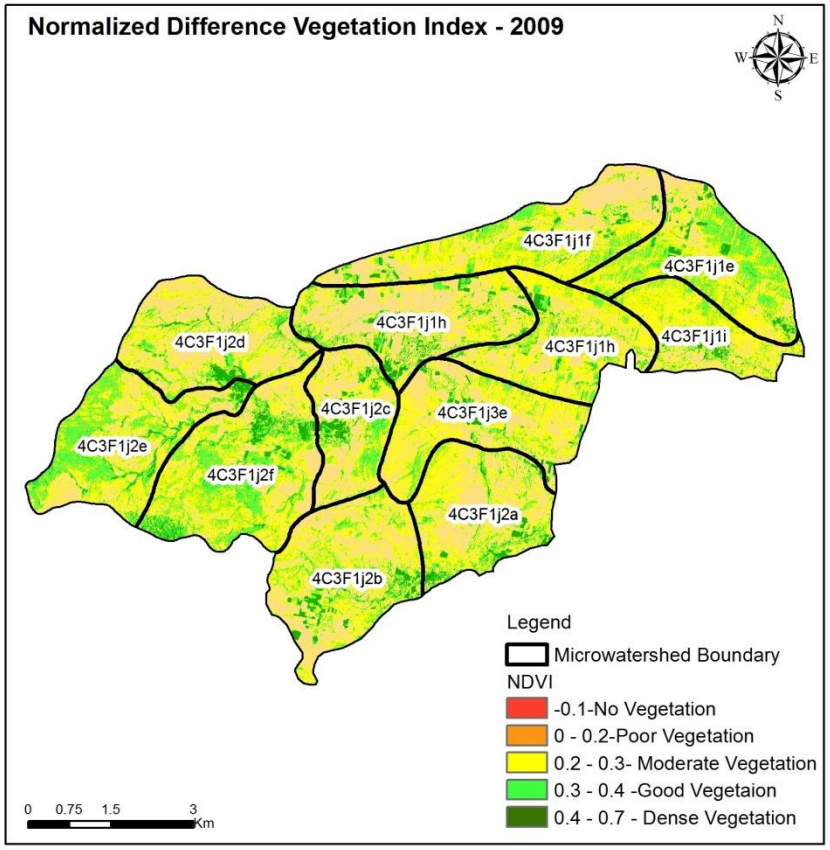




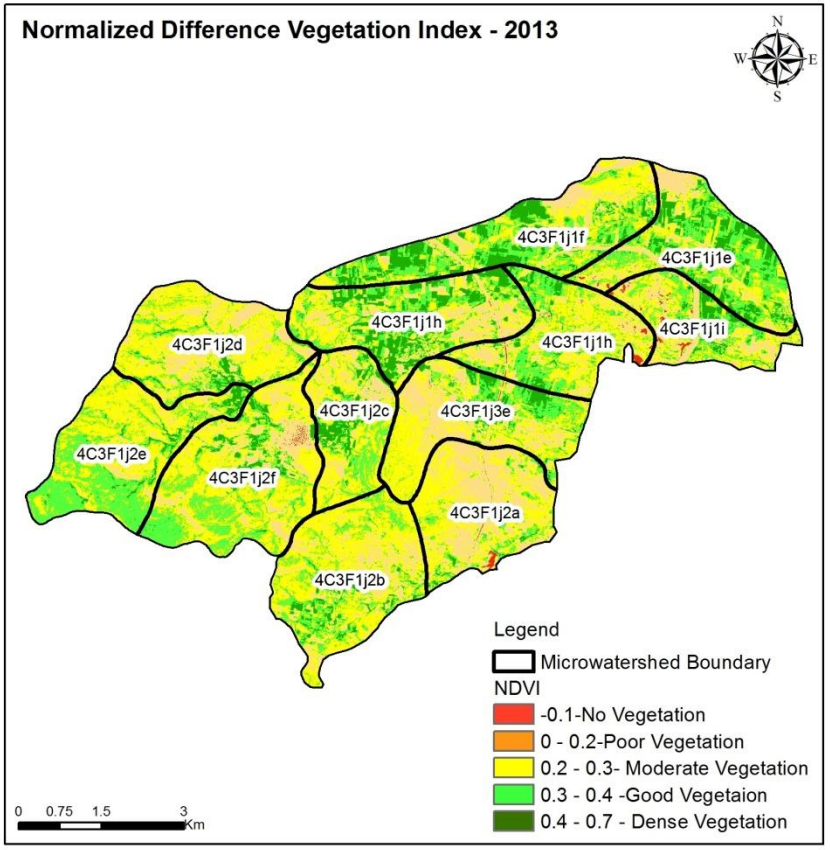




Changes in Vegetation Cover

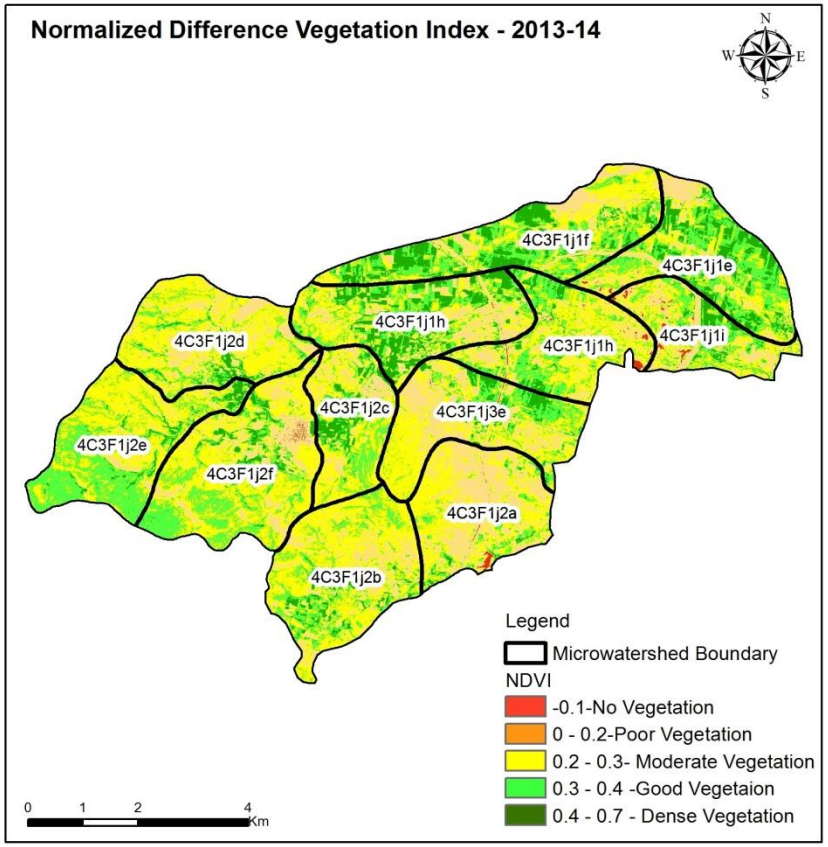


NDVI (2009-10)

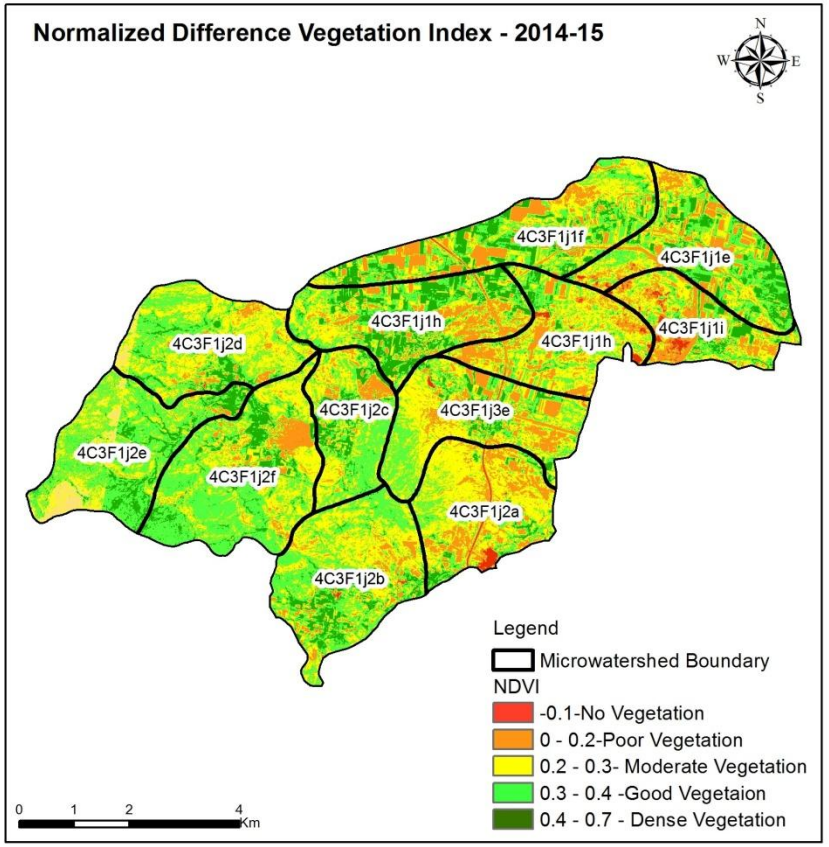


NDVI (2013-14)

Changes in Vegetation Cover

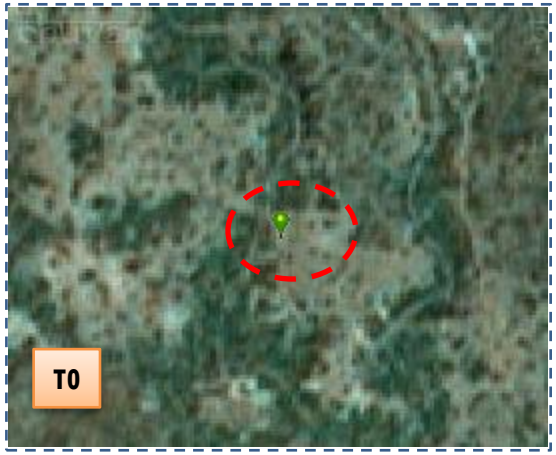


NDVI (2013-14)



NDVI (2014-15)

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-07/2009-10



T0:2009-10

T1: 22 February 2014

Drishti Sl no. 163073 MWS :4C3F1j2d

Check dam

T0:2009-10

T1: 22 February 2014

Drishti Sl no.155414 MWS : 4C3F1j2c

Horticulture

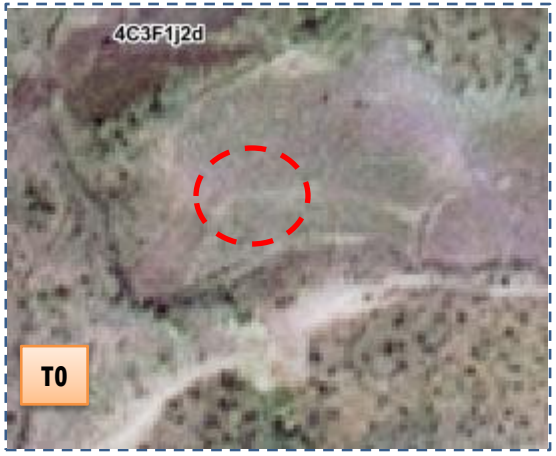
Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-07/2009-10

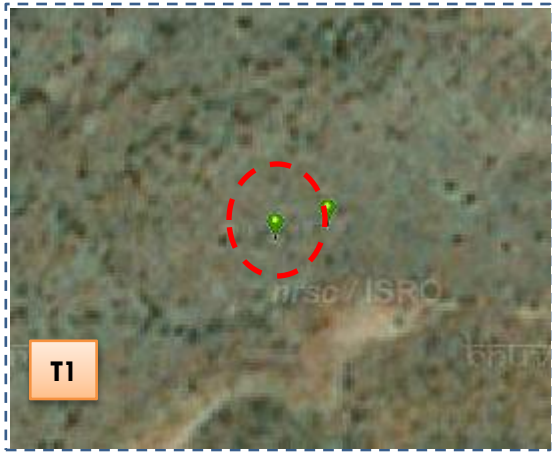
T0: 2009-10

T1: 22 February 2014

Drishti Sl no. 155599 MWS : 4C3F1j2d

Horticulture





T0: 2009-10

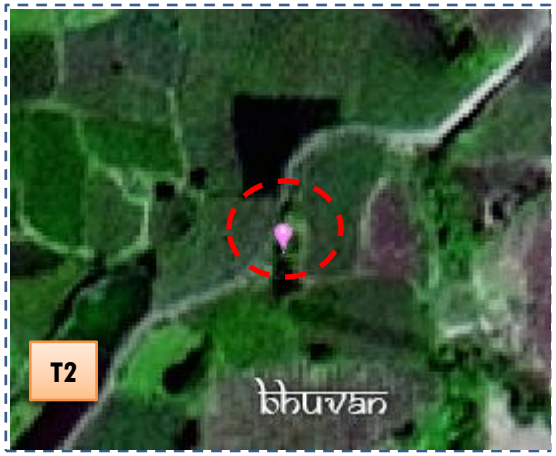
T1: 22 February 2014

Drishti Sl no. 165130 MWS : 4C3F1j2d

Horticulture

Monitoring of activities in YSR Kadapa Dt Andhra Pradesh. IWMP-07/2009-10

T1: 2013

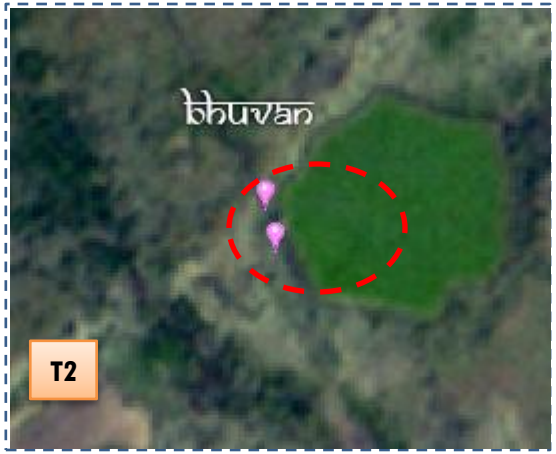


T2: 24 December 2015

Drishti Sl no. 88534 MWS : 4C3F1j2d

Horticulture

T2: 2013



T2: 24 December 2015

Drishti Sl no. 163070 MWS : 4C3F1j2d

Horticulture

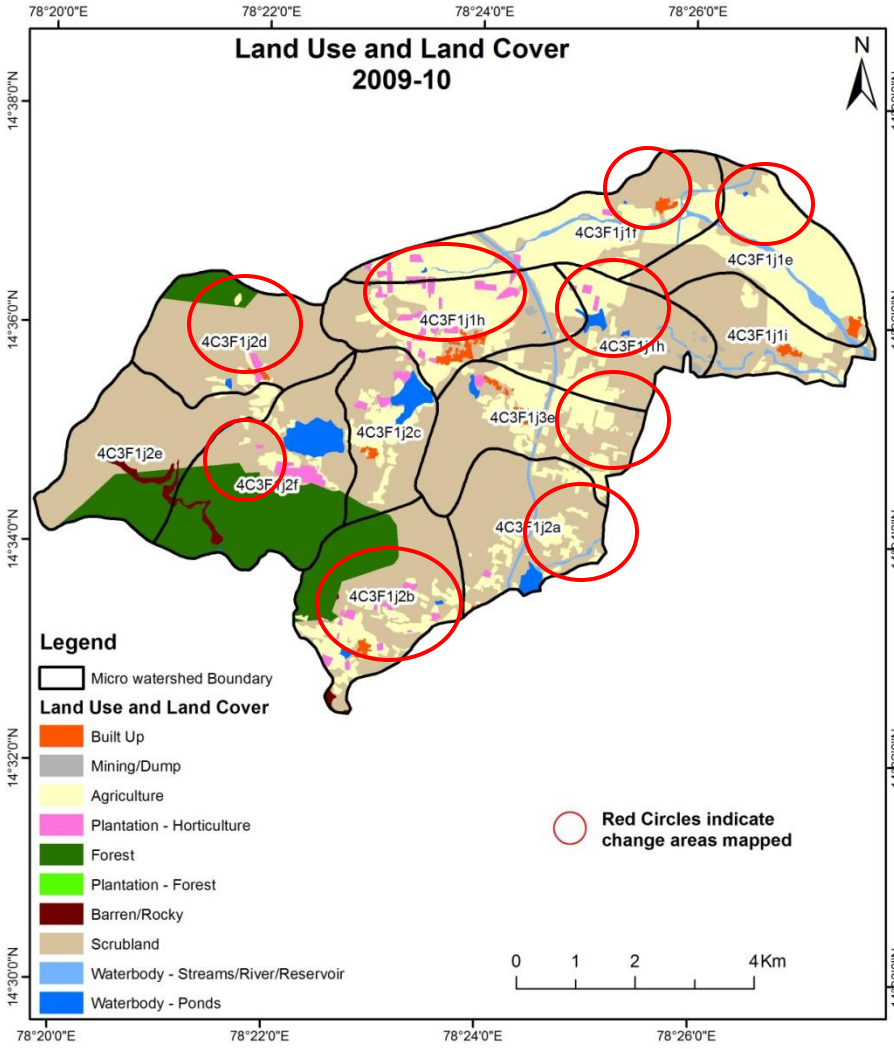
MONITORING IN THE PROJECT AREA

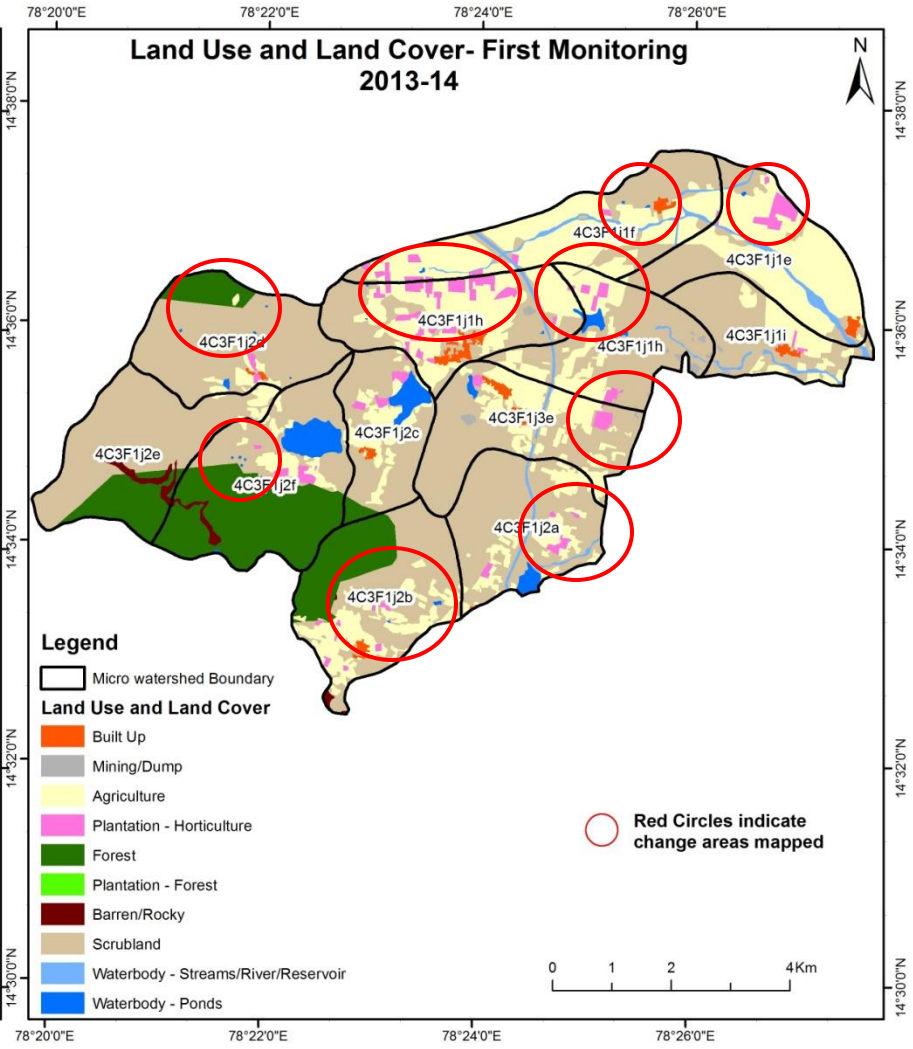
Land use and Land cover Changes in the Project

- 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)

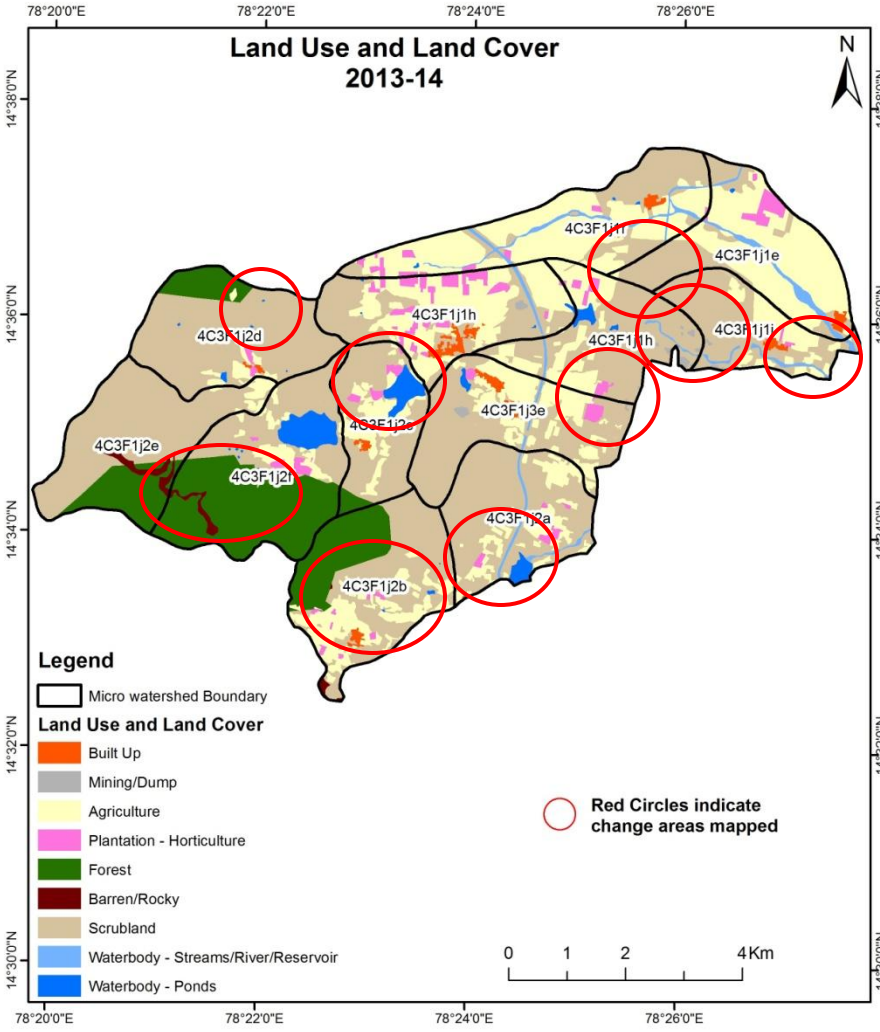
Scale: 1:10000

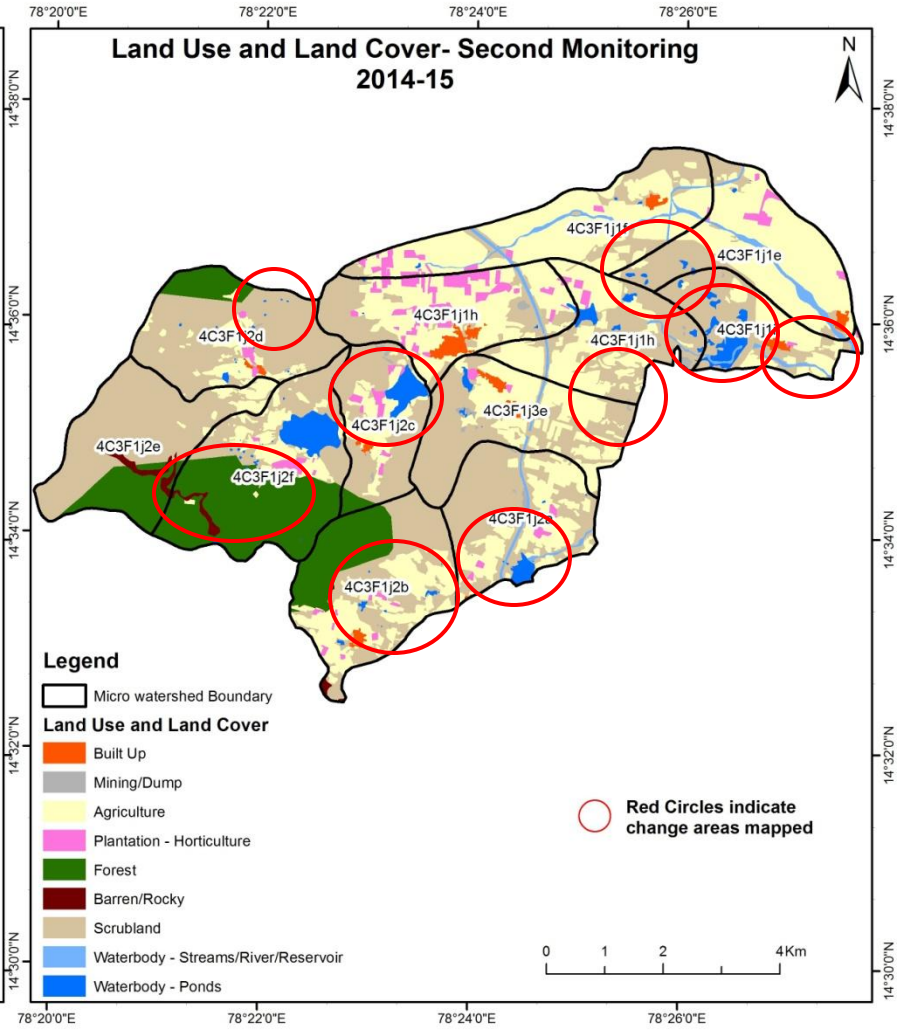




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

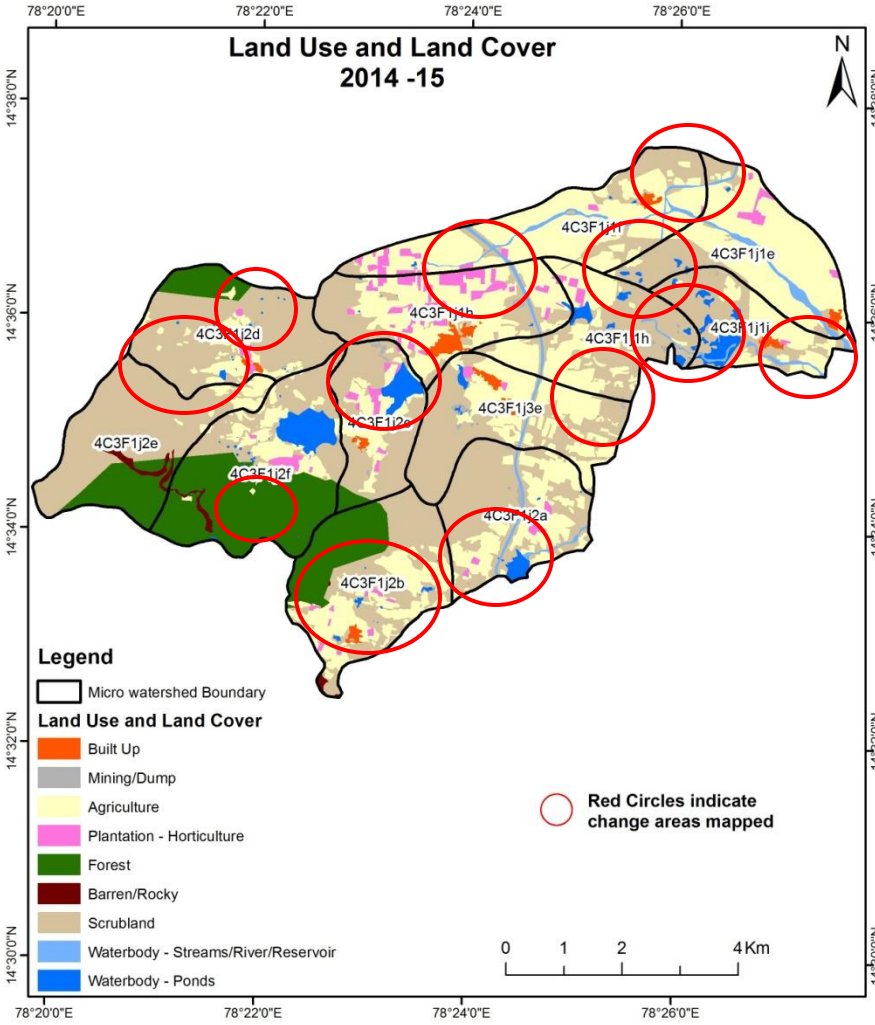
Scale: 1:10000

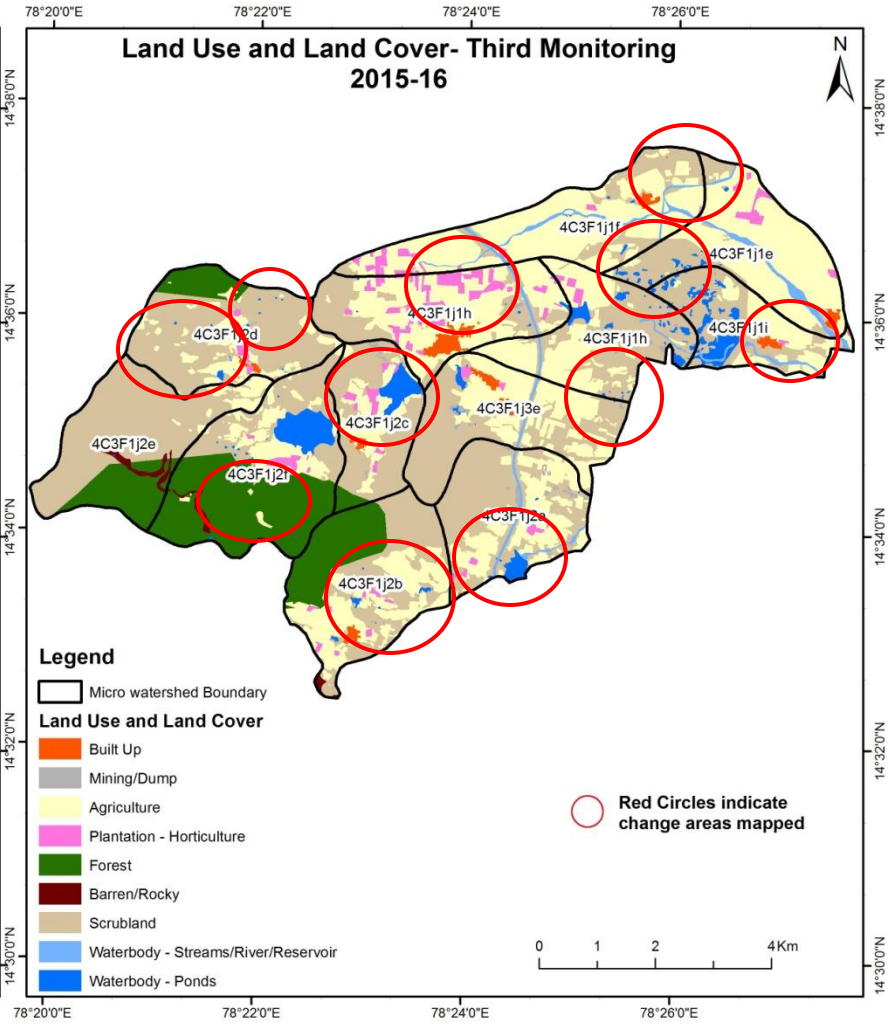




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014 -15 to 2015-16)

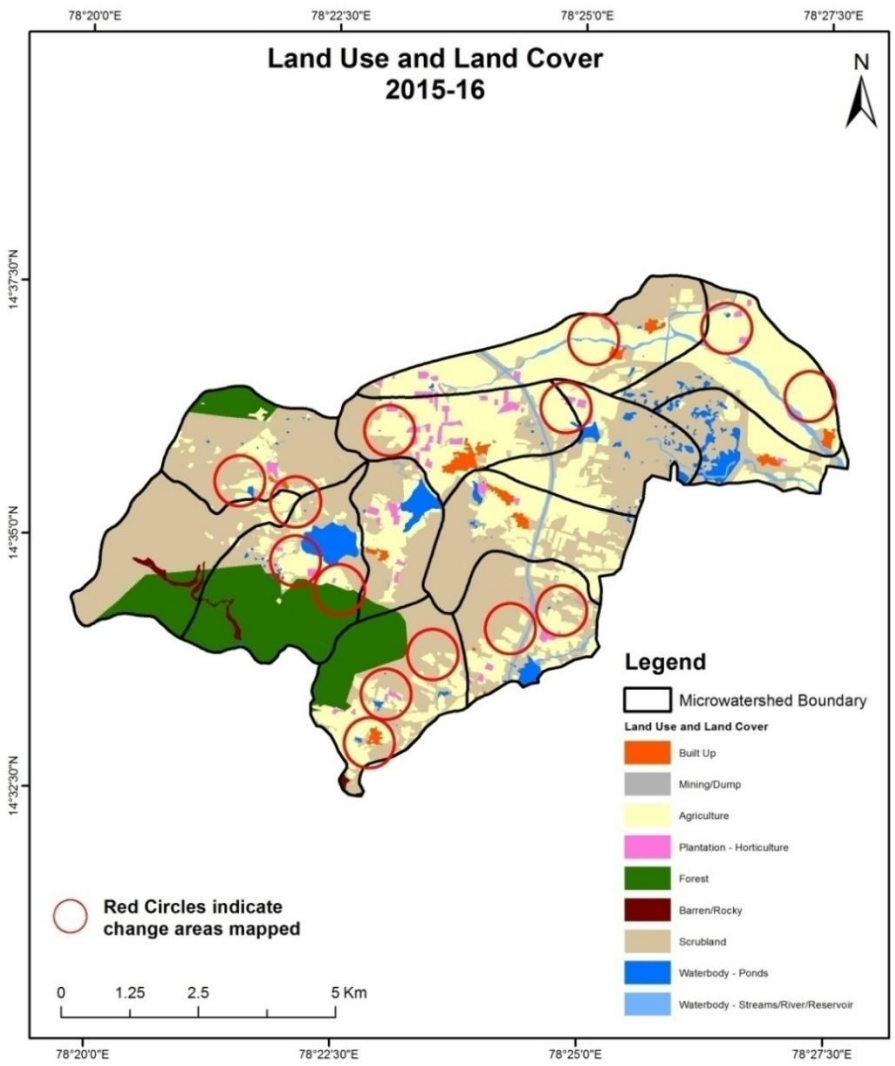
Scale: 1:10000

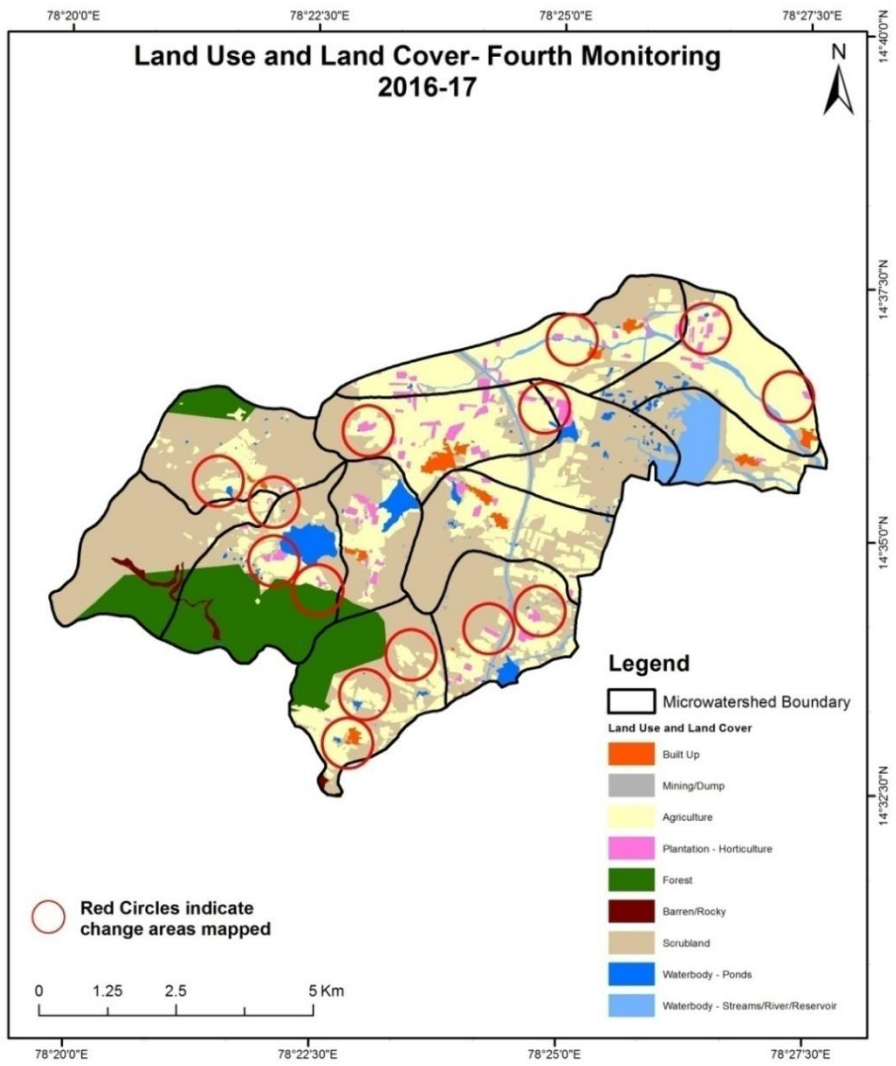




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015 -16 to 2016-17)

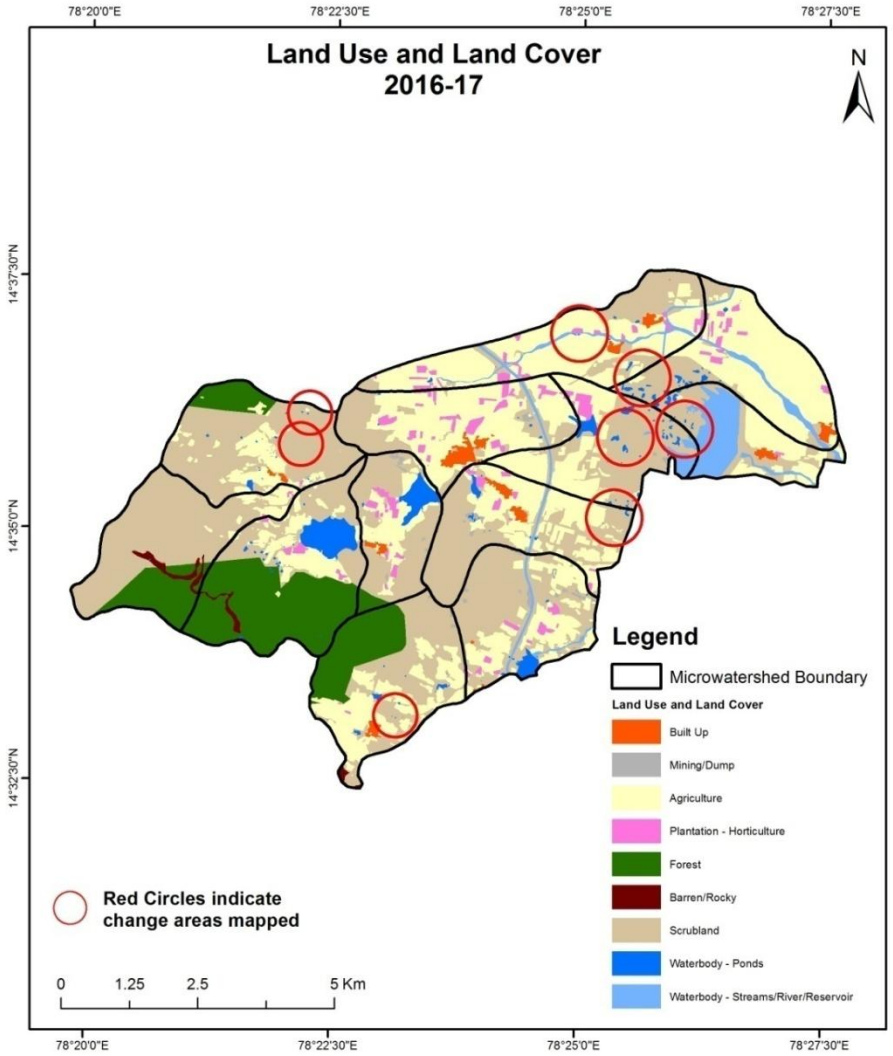
Scale: 1:10000

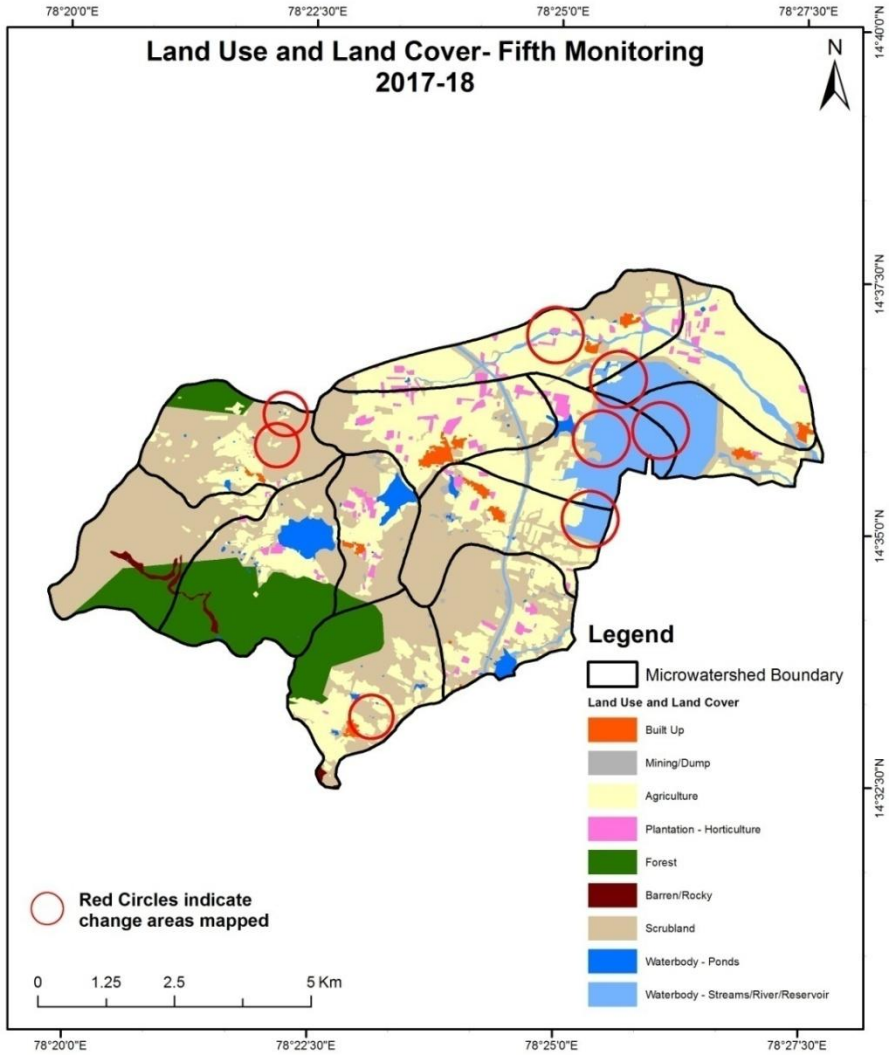




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016 -17 to 2017-18)

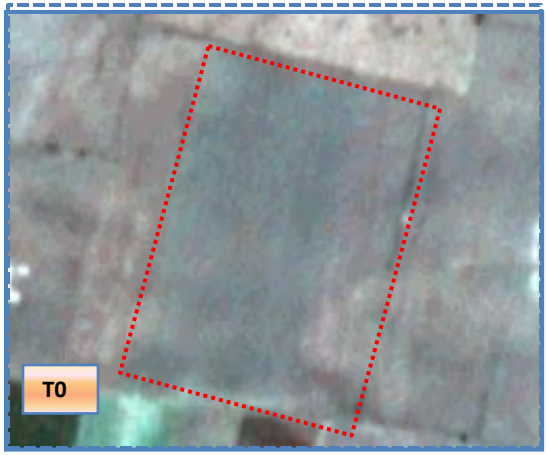
Scale: 1:10000



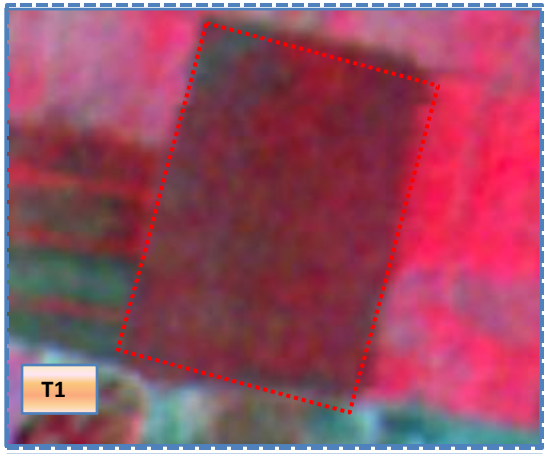


Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

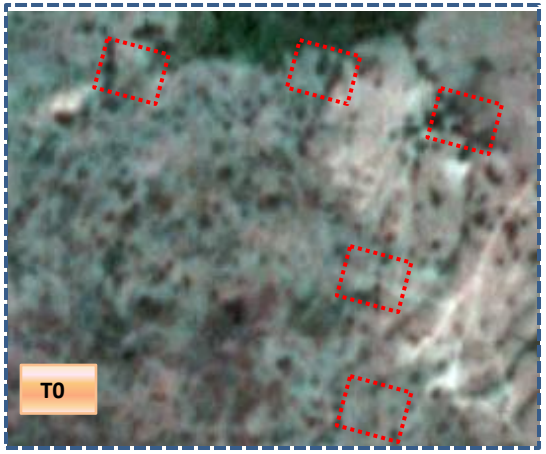


T0: 2009-10

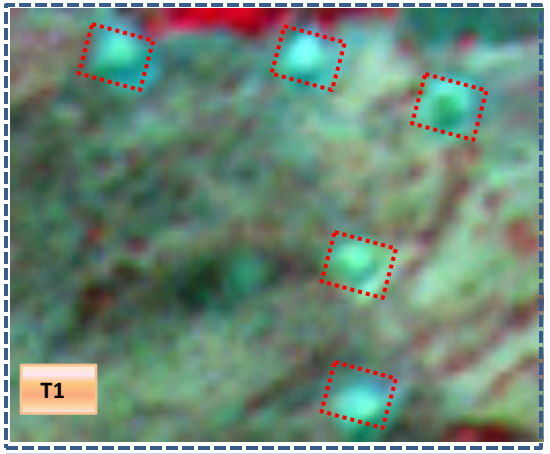


T1: 22 February 2014

Scrub to Water body



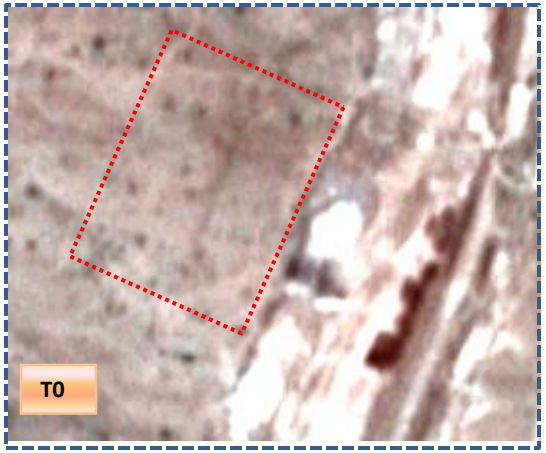
T0: 2009-10



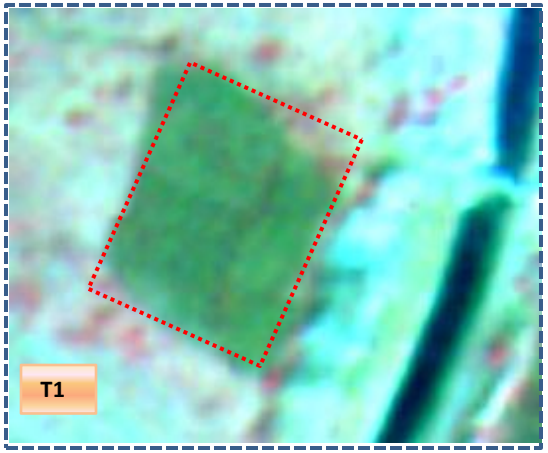
T1: 22 February 2014

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

Scrub to Agriculture

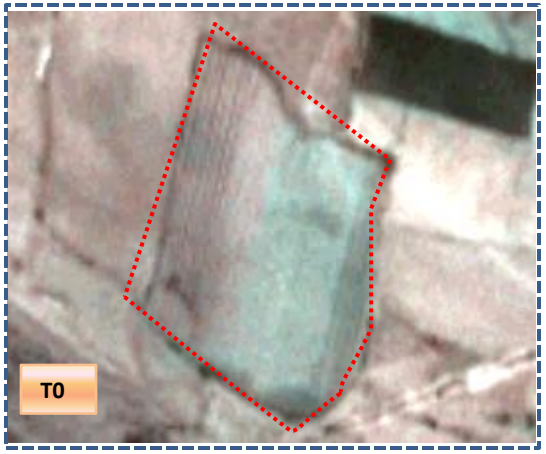


T0: 2009-10

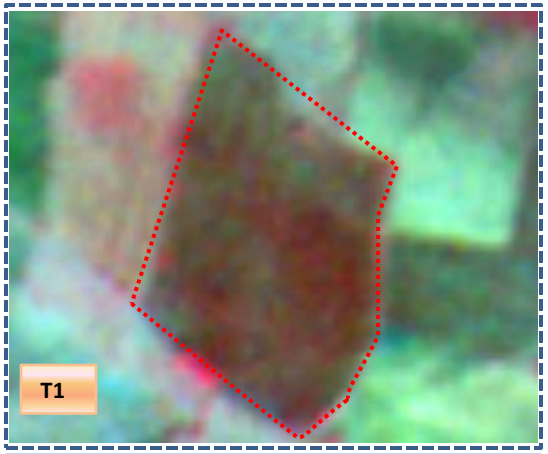


T1:21 December 2013

Agriculture to Plantation



T0: 2009-10



T1: 21 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	60.54										**60.54**
Mining/dump		2.35									**2.35**
Agriculture			1709.63	36.86				7.76		0.09	**1754.34**
Plantation Horticulture			26.15	93.44							**119.59**
Forest					751.35						**751.35**
Forest Plantation											
Barren Rocky							30.16				**30.16**
Scrub	3.36	3.39	29.59	12.76				3352.67		2.90	**3404.67**
Waterbody-Streams/River									109.40		**109.40**
Waterbody – Ponds										116.81	**116.81**
Grand Total	**63.90**	**5.74**	**1765.37**	**143.06**	**751.35**		**30.16**	**3360.43**	**109.40**	**119.80**	**6349.20**

- 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 44 ha of the agriculture area has decreased and it is converted into plantation, scrub and water body in T1.
- In T1 55 ha of the agriculture area has increased from plantations 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)										
T1	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody-Streams/River	Water body Ponds	Grand Total
Built up	63.90										**63.90**
Mining/dump		4.96								0.78	**5.74**
Agriculture	0.32		1735.63	25.01				2.93		1.48	**1765.37**
Plantation Horticulture			42.12	100.94							**143.06**
Forest			2.74		748.25					0.36	**751.35**
Forest Plantation											
Barren Rocky							30.16				**30.16**
Scrub	6.58	10.18	386.54					2908.16		48.96	**3360.43**
Waterbody-Streams/River									109.40		**109.40**
Waterbody – Ponds										119.80	**119.80**
Grand Total	**70.79**	**15.14**	**2167.03**	**125.95**	**748.25**		**30.16**	**2911.09**	**109.40**	**171.39**	**6349.20**

- 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 29 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrub and water body in T2.
- In T2 431 ha of the agriculture area has increased from plantations, forest and scrubland of T1.
- The additional agriculture area is 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	70.79										**70.79**
Mining/dump		15.14									**15.14**
Agriculture		1.20	2160.92	4.67						0.24	**2167.03**
Plantation Horticulture			31.44	94.51							**125.95**
Forest			1.30		746.94						**748.25**
Forest Plantation											
Barren Rocky							30.07			0.09	**30.16**
Scrub	1.73	3.84	68.91					2809.37		27.23	**2911.09**
Waterbody-Streams/River			1.22						108.18		**109.40**
Waterbody – Ponds										171.39	**171.39**
Grand Total	**72.53**	**20.19**	**2263.79**	**99.18**	**746.94**		**30.07**	**2809.37**	**108.18**	**198.95**	**6349.20**

- 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 mining-dump, plantation and water body in T3.
- In T3 102 ha of the agriculture area has increased from plantations, forest, scrubland and mining dump of T2.
- And overall 96 ha of the agriculture area has been increased from T2 to T3.
- The additional agriculture area is 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	72.53										**72.53**
Mining/dump		20.19									**20.19**
Agriculture	1.54		2145.93	106.67					9.48	0.16	**2263.79**
Plantation Horticulture			42.78	56.41							**99.18**
Forest					746.94						**746.94**
Forest Plantation											
Barren Rocky							30.07				**30.07**
Scrub	0.12	5.21	33.29					2700.00	70.48	0.27	**2809.37**
Waterbody-Streams/River									108.18		**108.18**
Waterbody – Ponds			0.75						45.98	152.22	**198.95**
Grand Total	**74.19**	**25.40**	**2222.76**	**163.07**	**746.94**		**30.07**	**2700.00**	**234.13**	**152.65**	**6349.20**

• 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 117 ha of the agriculture area has decreased and it is converted into mining-dump, plantation and water body in T3.

• In T3 76 ha of the agriculture area has increased from plantations, forest, scrubland and mining dump of T2.

•And overall 41 ha of the agriculture area has been decreased from T2 to T3.

• The additional agriculture area is 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	74.19										**74.19**
Mining/dump		25.40									**25.40**
Agriculture	0.22		2207.54	7.69					7.16	0.14	**2222.76**
Plantation Horticulture				163.07							**163.07**
Forest					746.94						**746.94**
Forest Plantation											
Barren Rocky							30.07				**30.07**
Scrub		3.28	16.11					2337.94	342.53	0.15	**2700.00**
Waterbody-Streams/River									234.13		**234.13**
Waterbody – Ponds									23.00	129.65	**152.65**
Grand Total	**74.41**	**28.68**	**2223.65**	**170.76**	**746.94**		**30.07**	**2337.94**	**606.82**	**129.94**	**6349.20**

- 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 15 ha of the agriculture area has decreased and it is converted into mining-dump, plantation and water body in T3.
- In T3 16 ha of the agriculture area has increased from plantations, forest, scrubland and mining dump of T2.
- And overall 41 ha of the agriculture area has been decreased from T2 to T3.
- The additional agriculture area is 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 510 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 11, 401, 96 & 0.8 Hectares From T0-T1, T1-T2, T2-T3, & T4-T5 respectively and overall increase of 469 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 51 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 1066 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (0) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (1) verified from the portal.