MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

KURNOOL -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

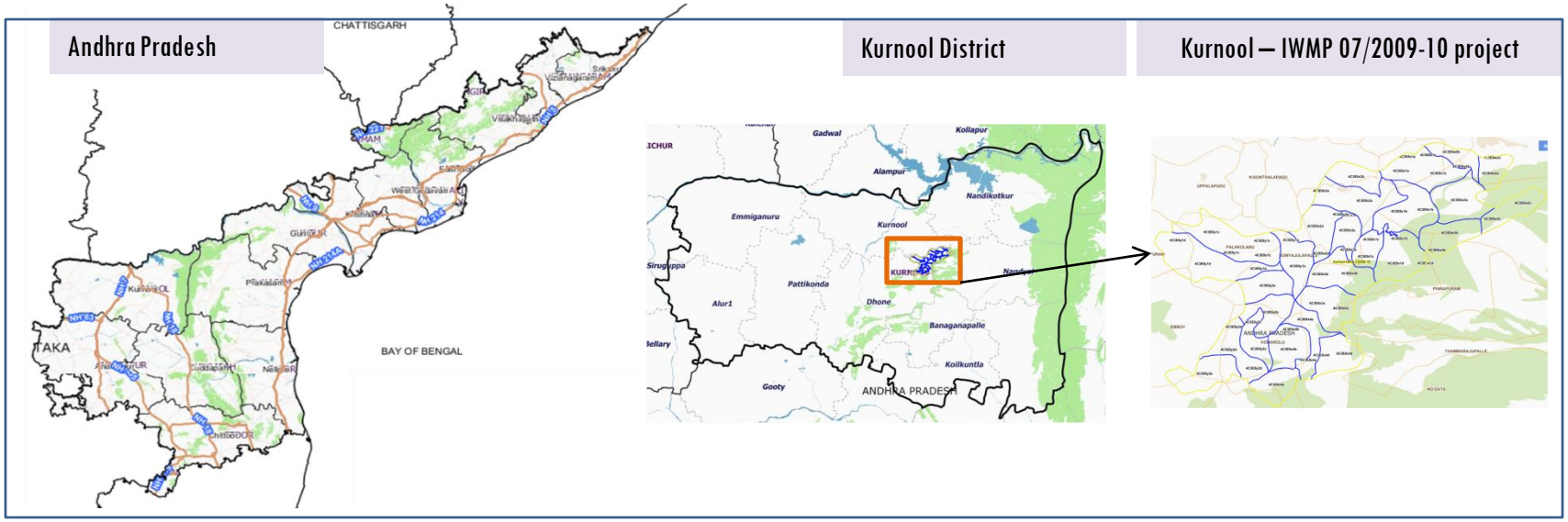
CONTENTS

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, Kurnool District of Andhra Pradesh. The total geographical area of the project is 13051 ha. It comprises of 27 micro watersheds.
- In the project area 273 Drishti photos were uploaded showing 109 check dams/Rock fill dam/tanks, 83 Farm ponds, 66 Drainage treatment and remaining showing others.
- Project area as per image analysis has witnessed distinguishable increase in farm ponds, showing 83 new farm ponds or dug out pits with 1.10 ha increase in the area.
- Major percentage i.e. 37.73% is covered by the agriculture, 26.75 % is covered by Scrub land, 17.54 % is covered by forest and remaining by other land use classes.

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

- The study area falls in Orvakal Mandal of Kurnool district of Andhra Pradesh state. The total geographical area of the project is 13051 ha. It comprises of 27 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 (T2) period satellite images



- The climate is tropical with temperatures ranging from 26 °C to 46 °C in the summer and 12 °C to 31 °C in the winter. The average annual rainfall is about 705 millimeters (28 in).
- The average annual rainfall of the district is 665.5mm, which ranges from nil rainfall in January and December to 139.6 mm in September. August and September are the wettest months. The mean seasonal rainfall distribution is 459.1mm in southwest monsoon (June September), 133.7mm in northeast monsoon (Oct-Dec), 1.9 mm rainfall in Winter (Jan Feb) and 70.8 mm in summer (March–May).

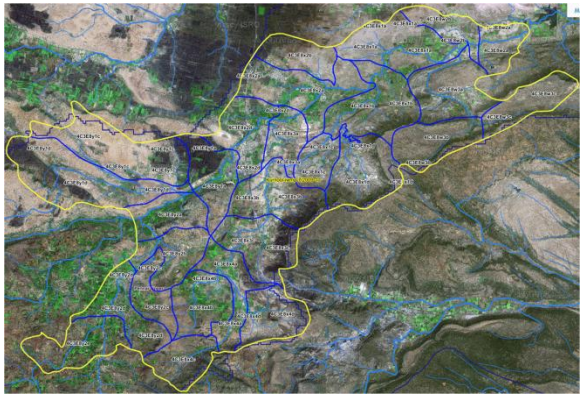
Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2009-10	2011-12	2017-18
LISS IV	2009-10		
SCENE 1			26-Mar-18
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2009-10		
SCENE 1			26-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	273
4	Detailed Project Report		

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



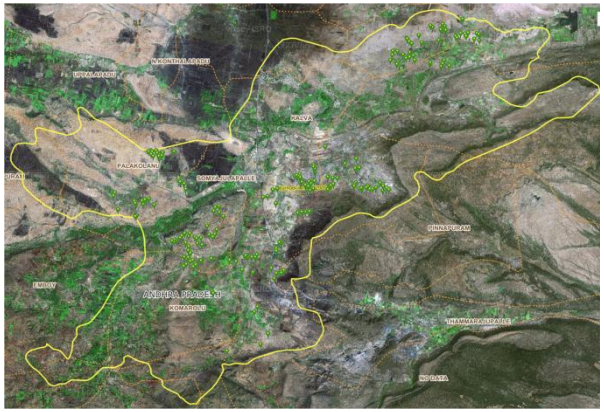
Legend

Drainage (1:10000 Scale)

MWS Boundary

Project Boundary

Natural Color Composite overlaid with Drishti Points



Drishti Upload Status

Classification of the Activities

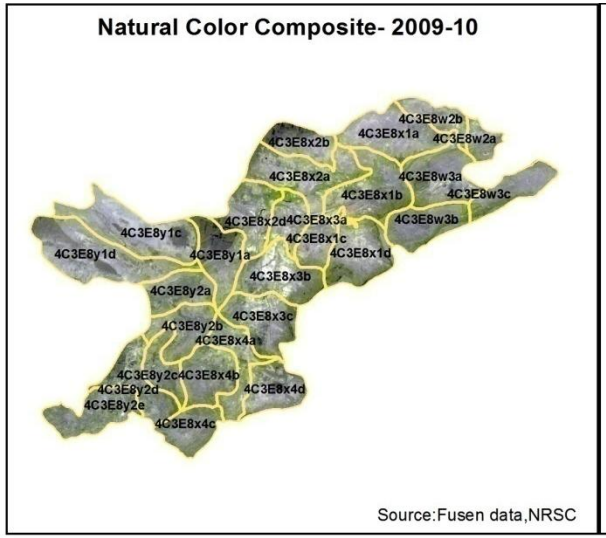
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Block planting	1	1
2	Horticulture	0	0
3	Agriculture	0	0
4	Bund planting	6	4
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	84	83
11	Civil works -Check dams/Rock fill dam/tank etc.,	117	109
12	Nallah Bunds/Drainage treatment	107	66
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities (LM)	9	9
16	Capacity Building Activities	0	0
17	Entry Point Activity	0	0
18	Others	1	1
	TOTAL	**325**	**273**

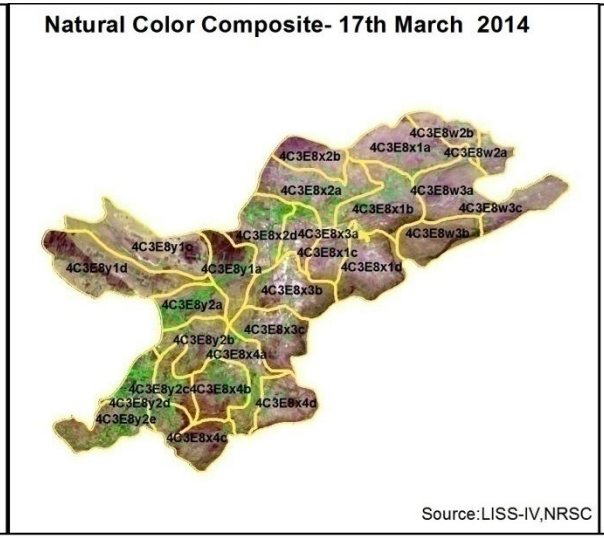
MONITORING IN THE PROJECT AREA

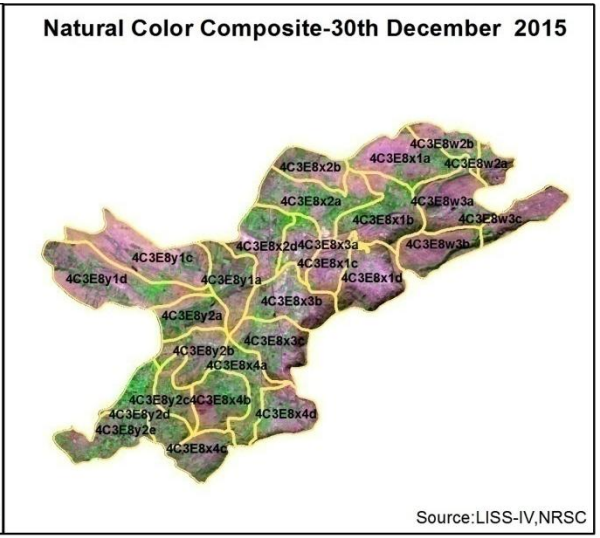
Site Wise Changes in the Project

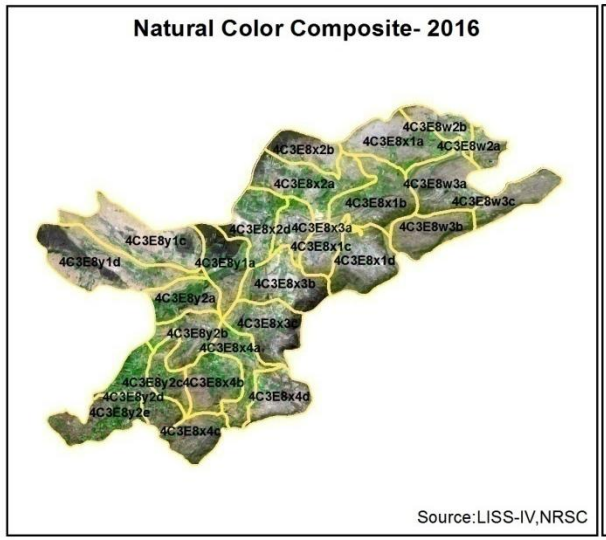
- Impacts of the activities carried out are presented through combination of Drishti and Srishti captures.
- T0 is the baseline period before implementation (2009-10) and T5 is 2017-18 period for monitoring.
- Captures are also provided wherever changes are observed in satellite images, that may match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

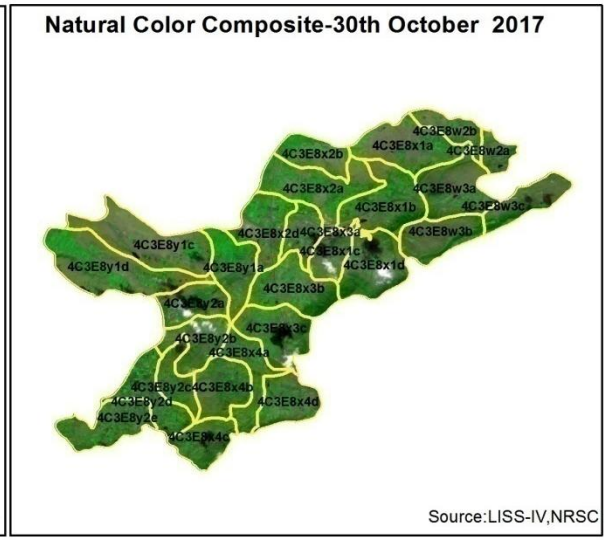
Natural Color Composite – 2009-10 to 2017-18



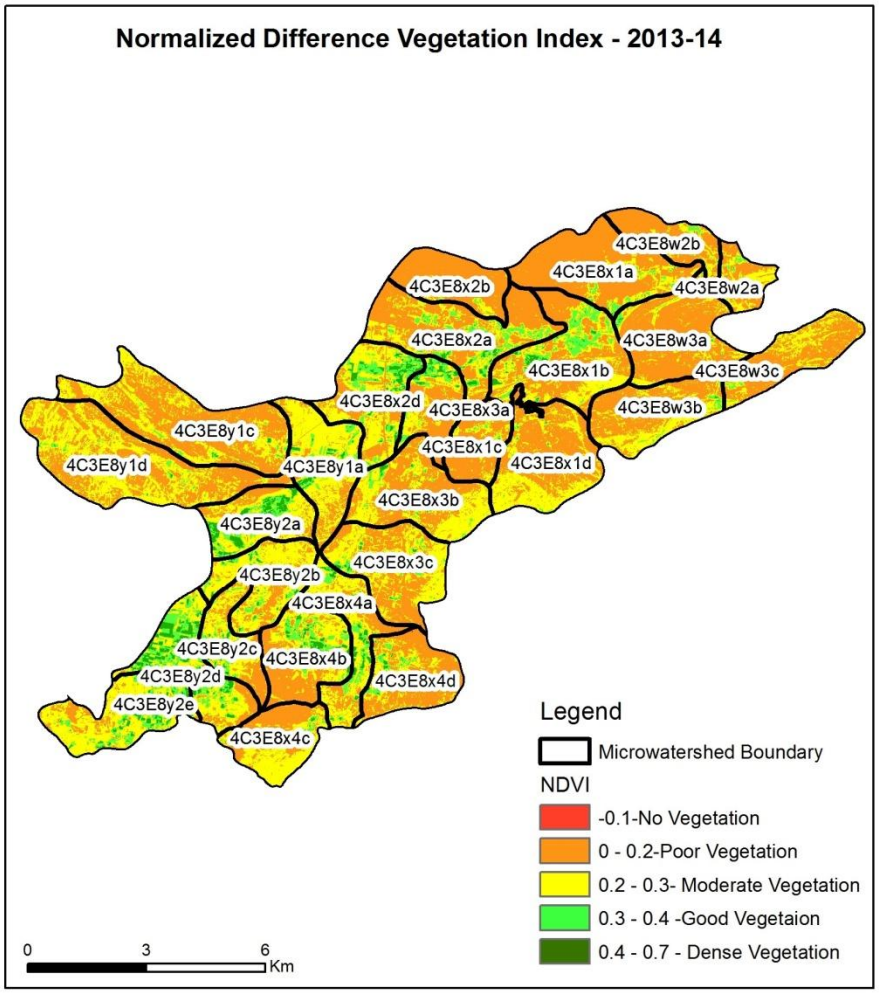




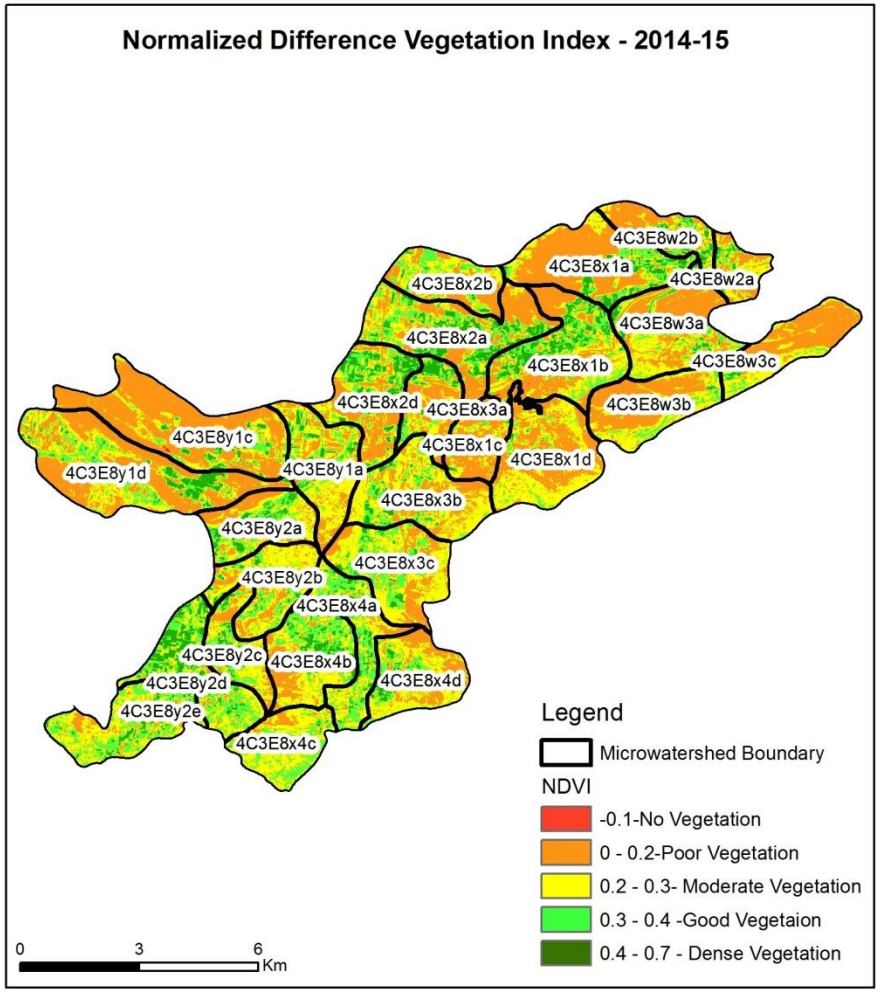




Changes in Vegetation Cover

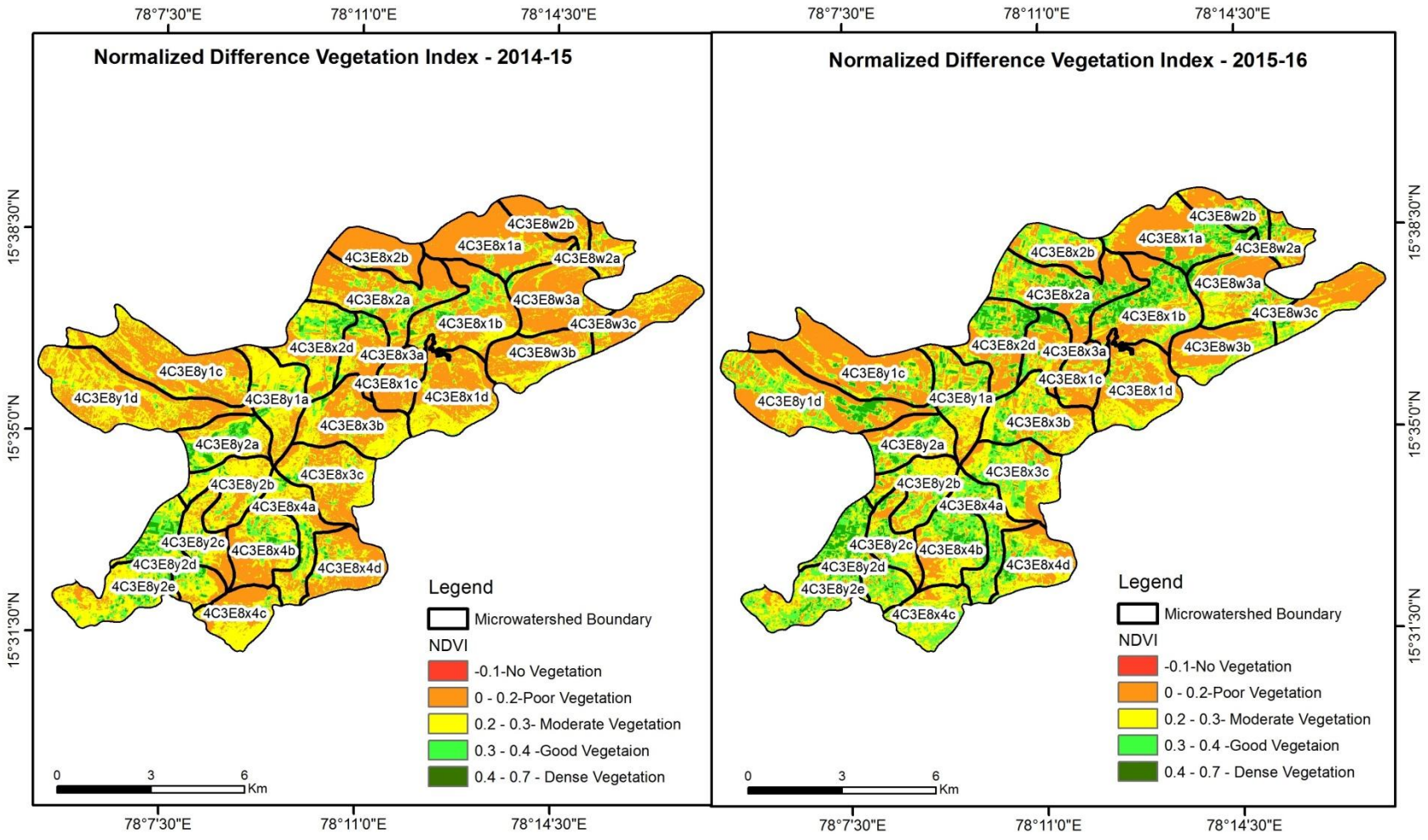


NDVI (2013-14)



NDVI (2014-15)

Changes in Vegetation Cover



NDVI (2014-15)

NDVI (2015-16)

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

T0:2009-10

T1: 17 March 2014

Drishti Sl no. 134276 MWS :4C3E8x4d

Check dam

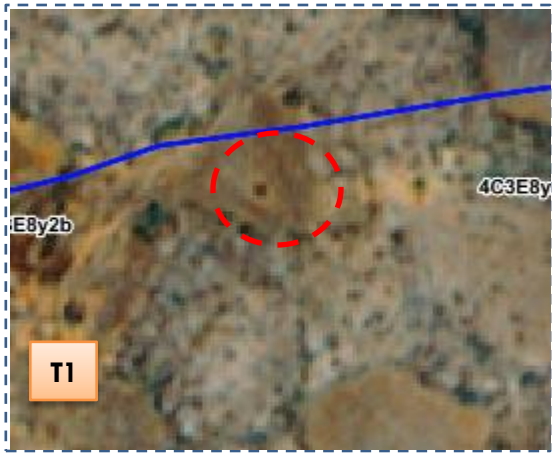
T0:2009-10

T1: 17 March 2014

Drishti Sl no.166734 MWS : 4C3E8x4d

Drainage treatment

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



T0: 2009-10

T1: 17 March 2014

Drishti Sl no. 166841 MWS :4C3E8y2b

Rockfill dam

T0: 2009-10

T1: 17 March 2014

Drishti Sl no. 166750 MWS :4C3E8x3c

Rockfill dam

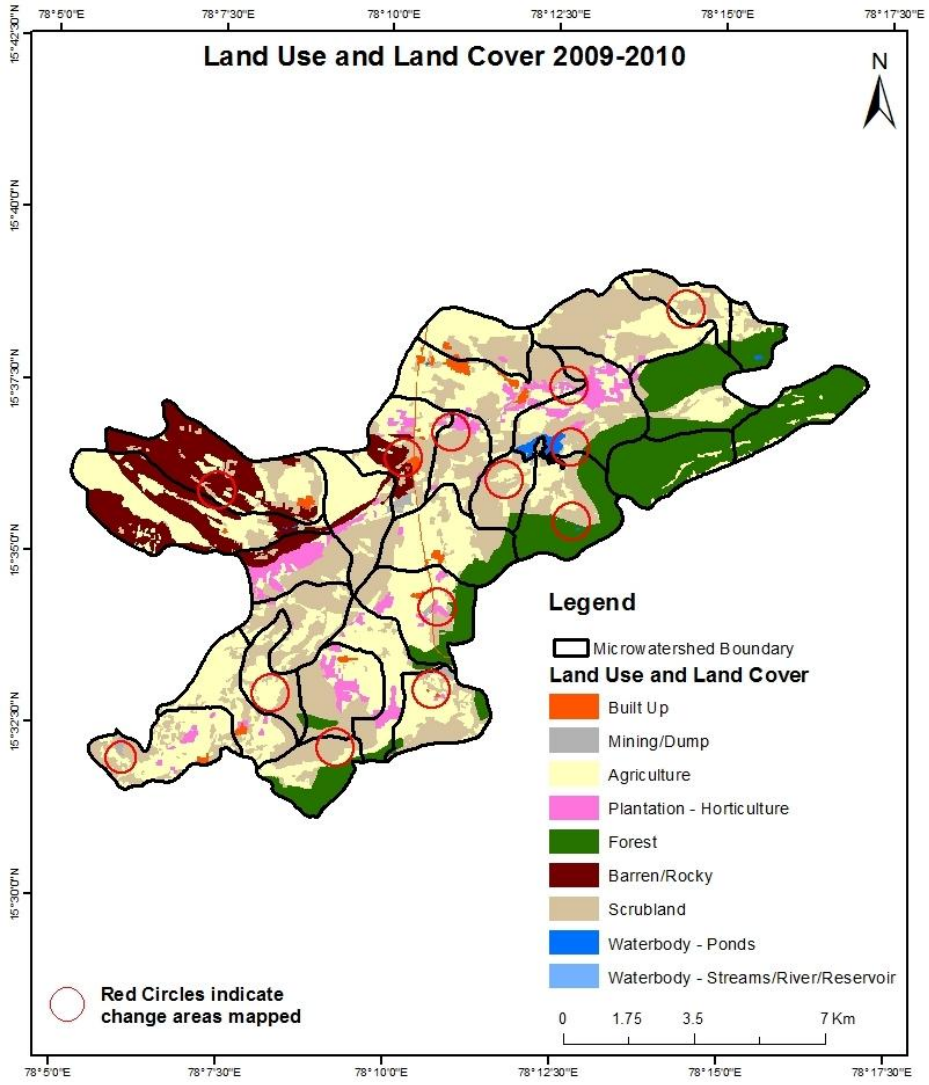
MONITORING IN THE PROJECT AREA

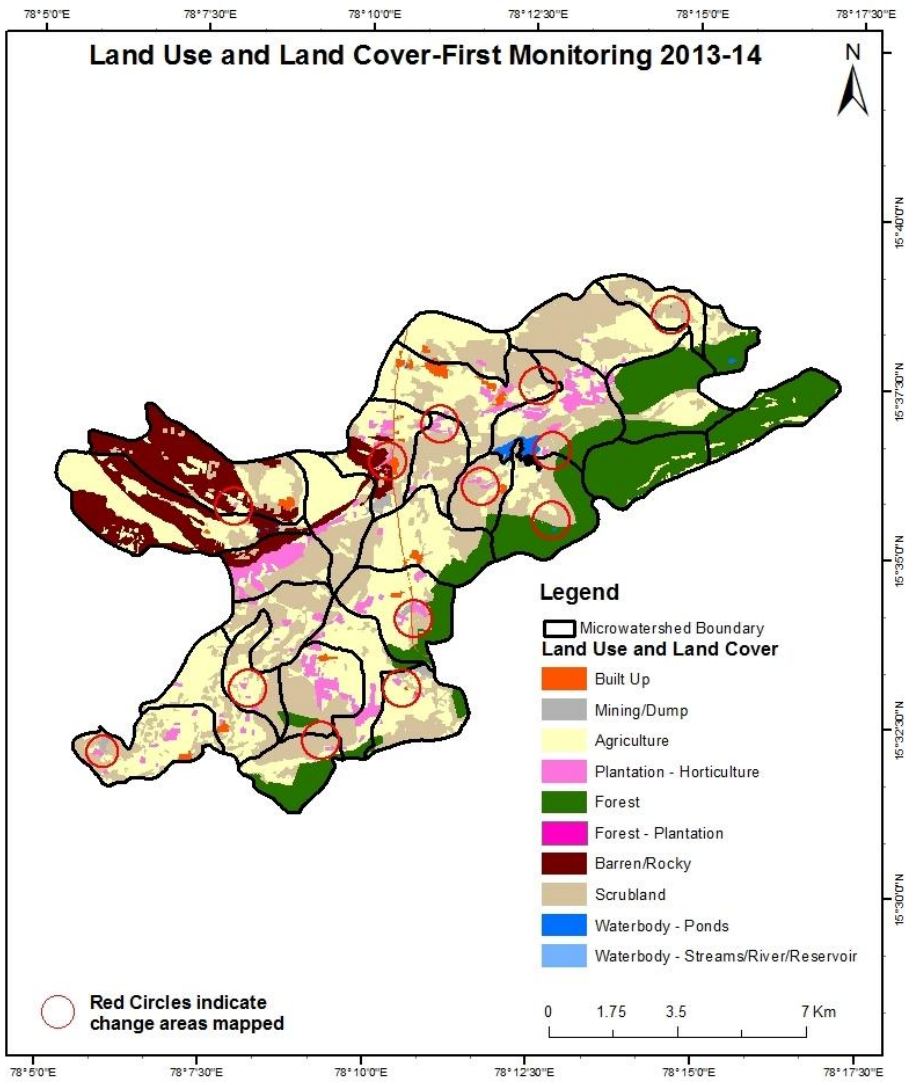
Land use and Land cover Changes in the Project

- 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)

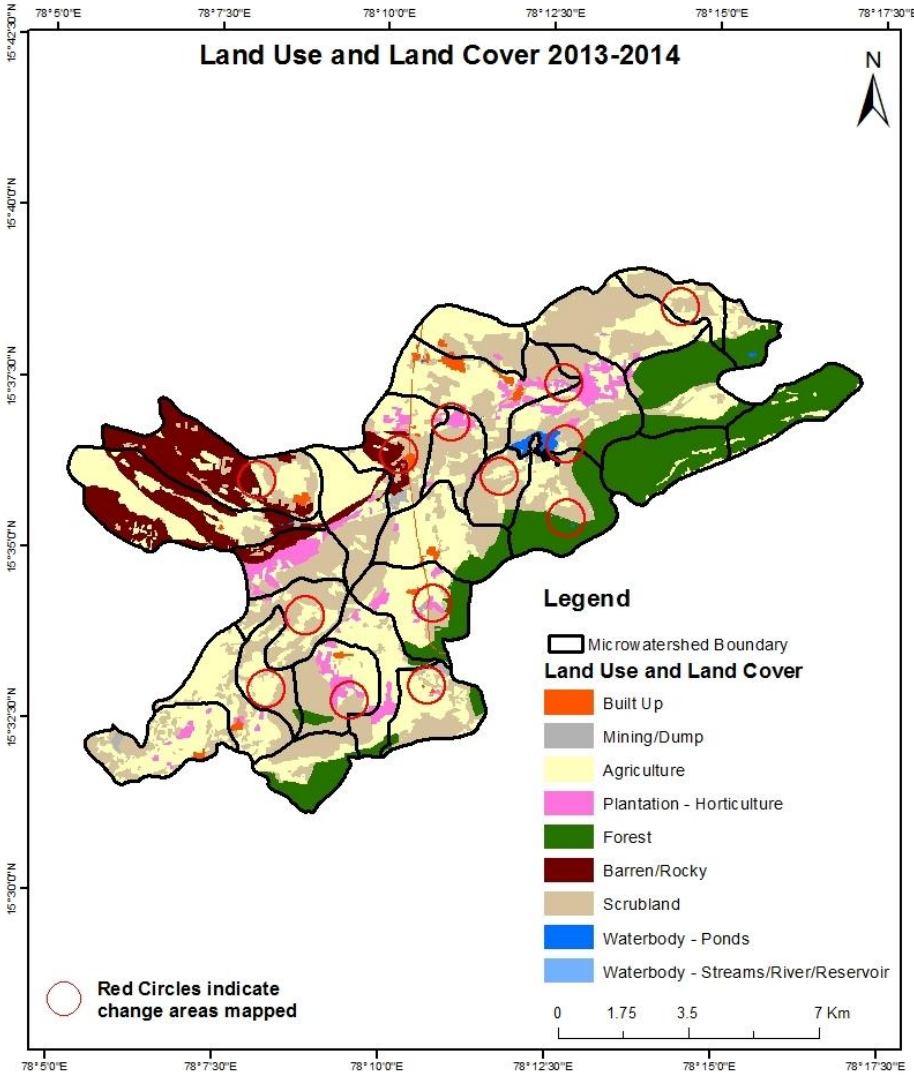
Scale: 1:10000

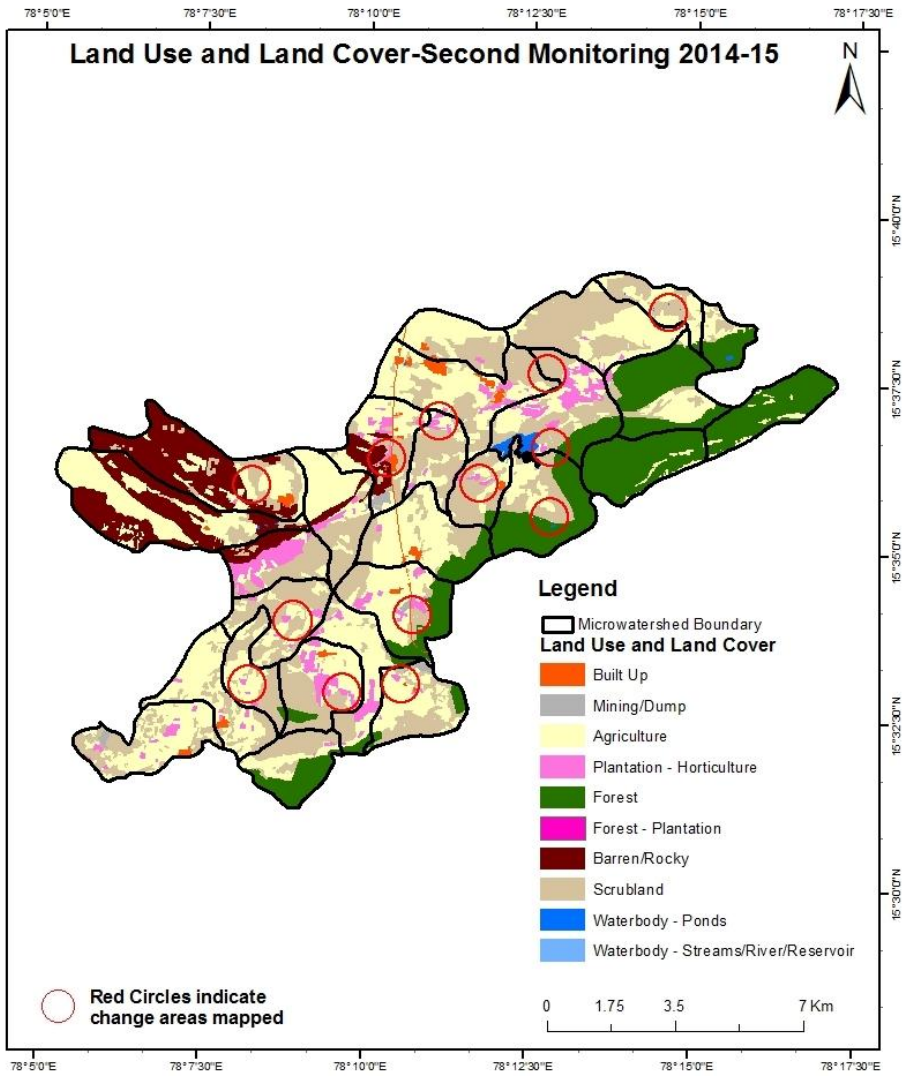




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2014-15)

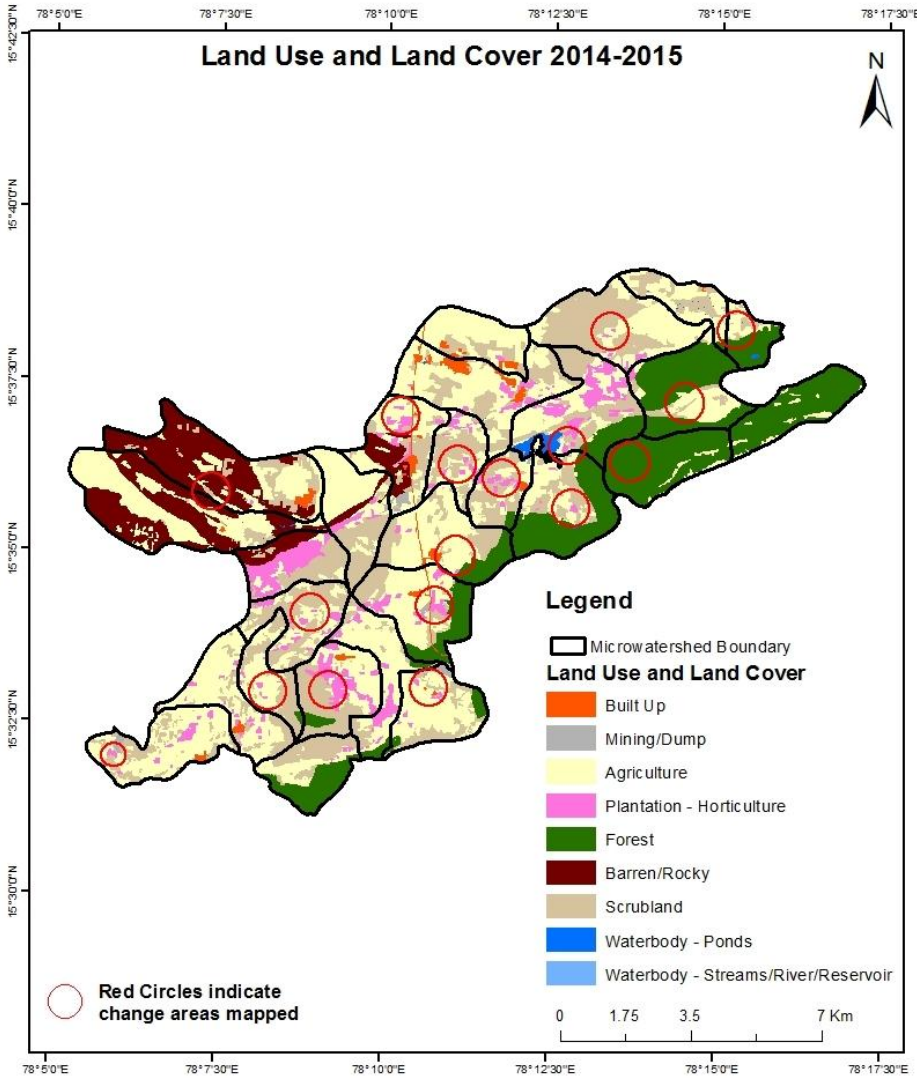
Scale: 1:10000

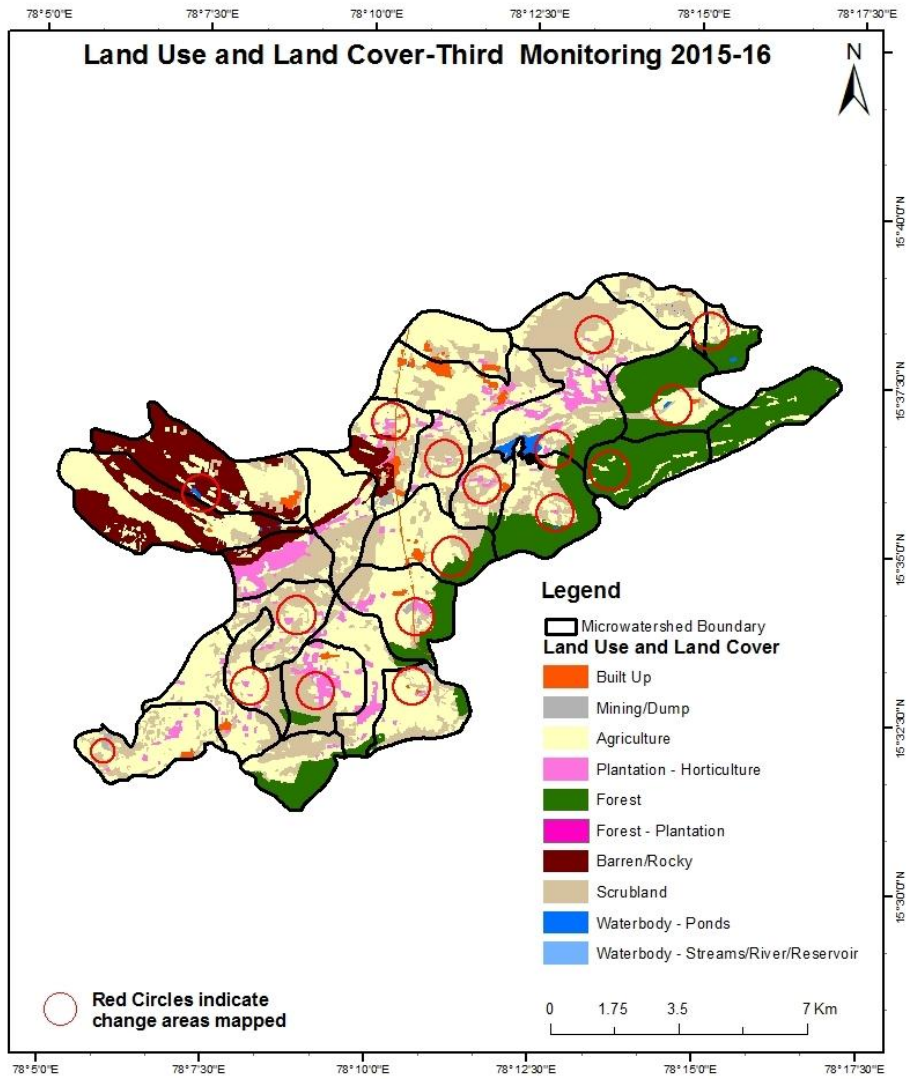




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2014-15 to 2015-16)

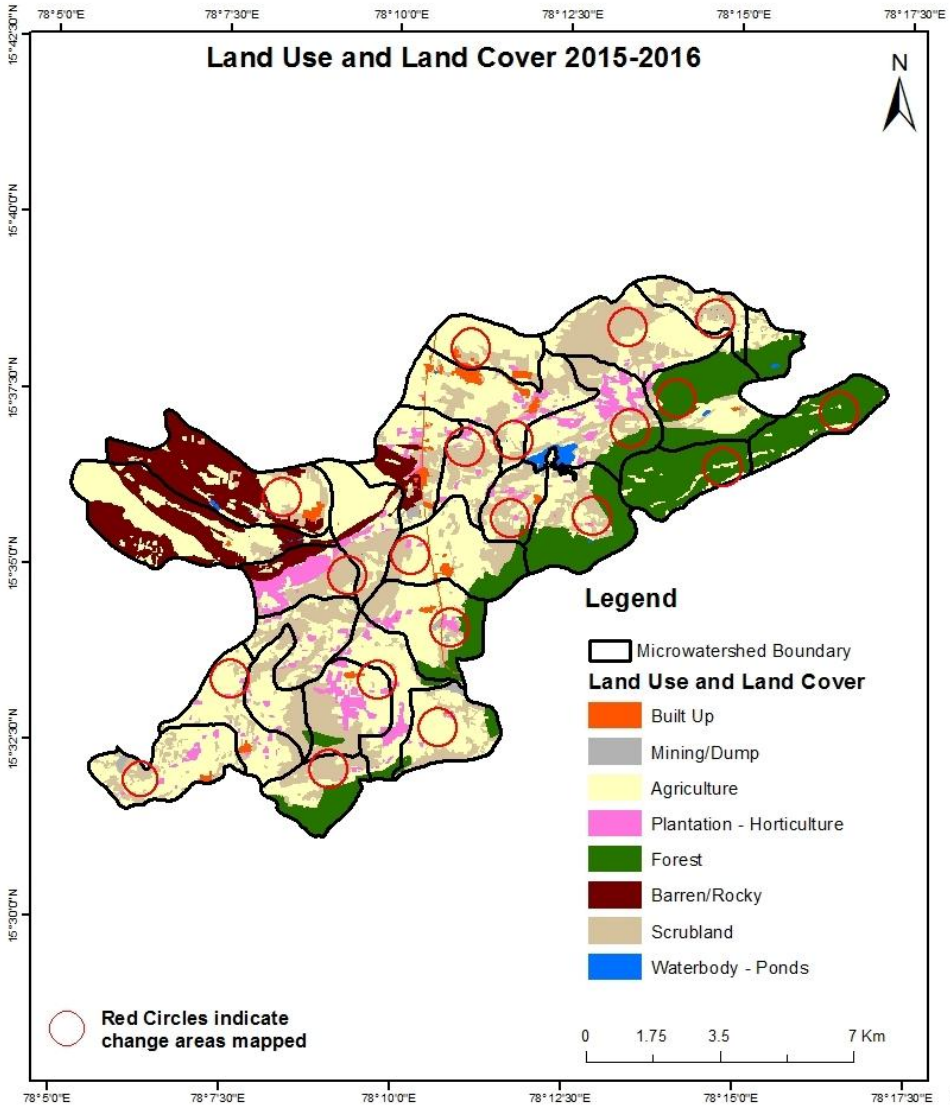
Scale: 1:10000

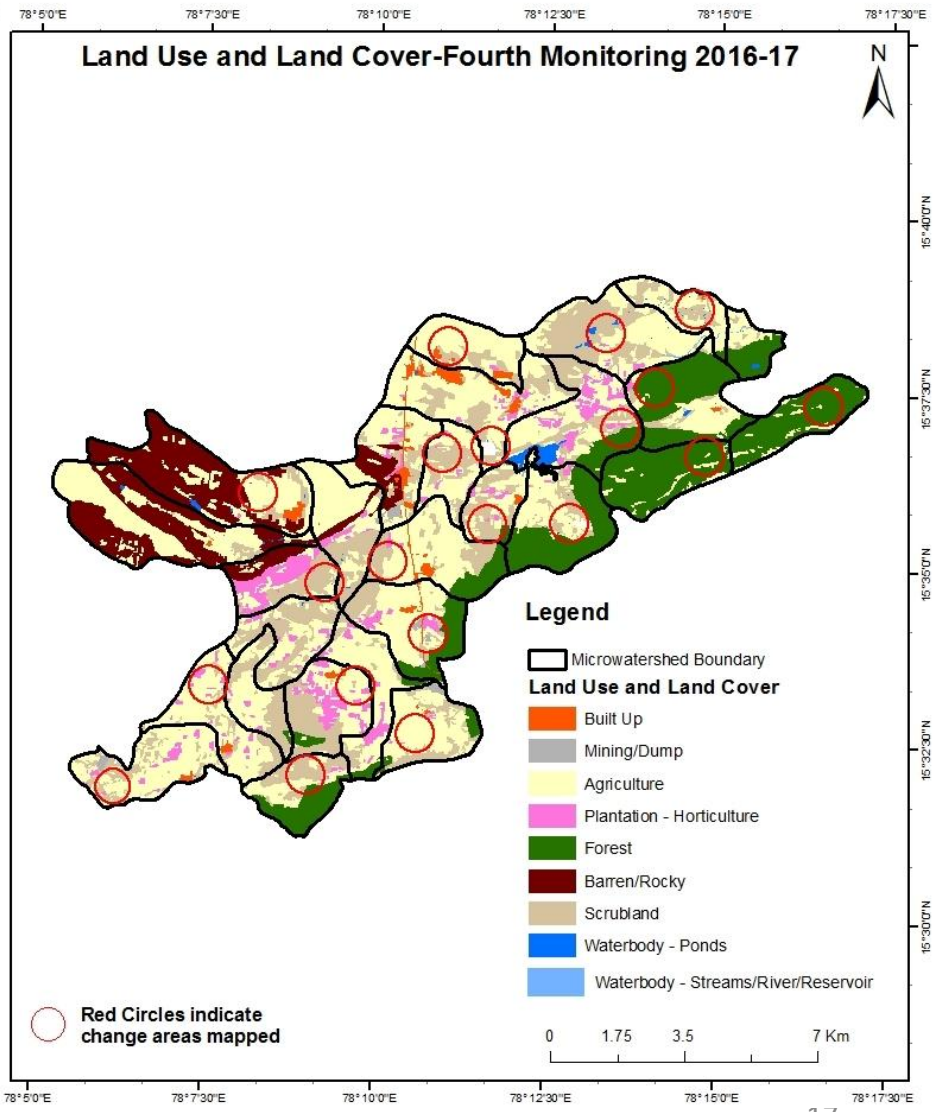




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2015-16 to 2016-17)

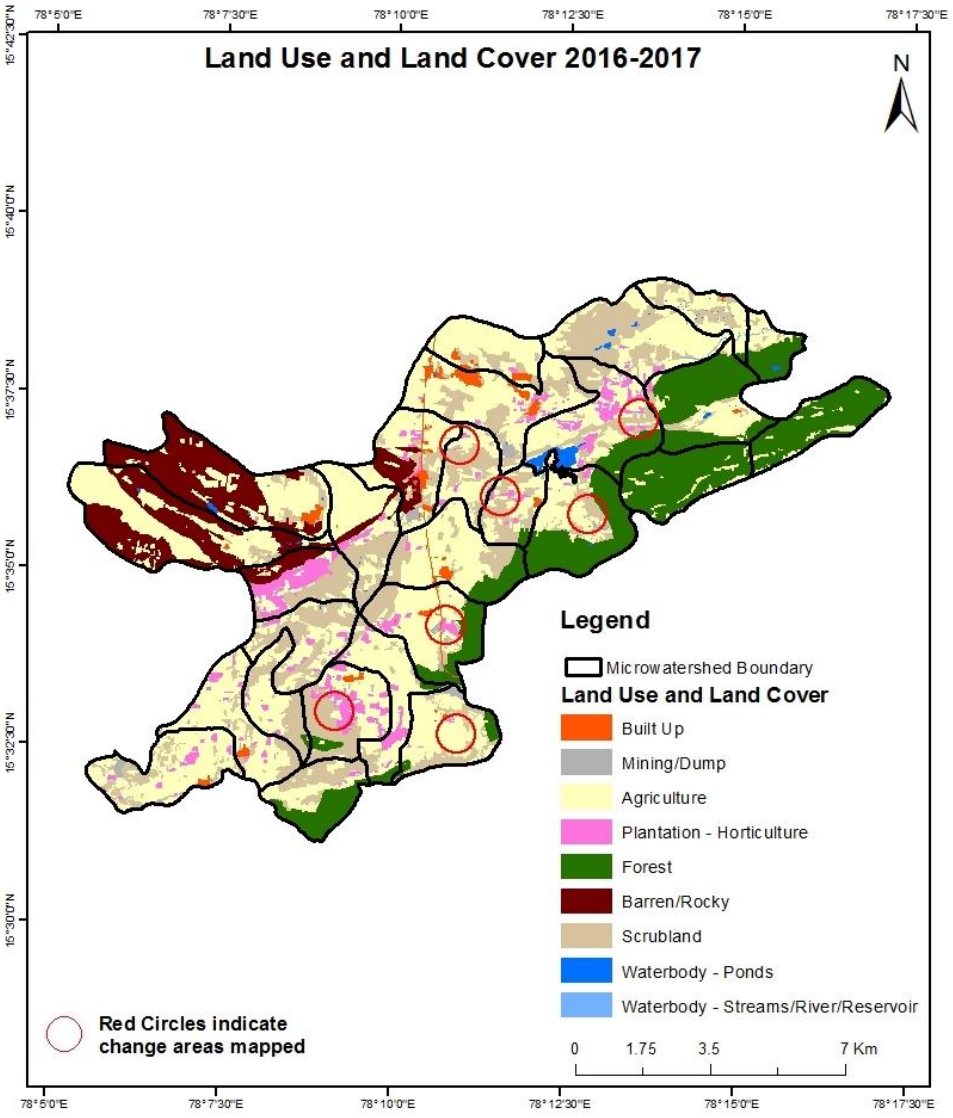
Scale: 1:10000

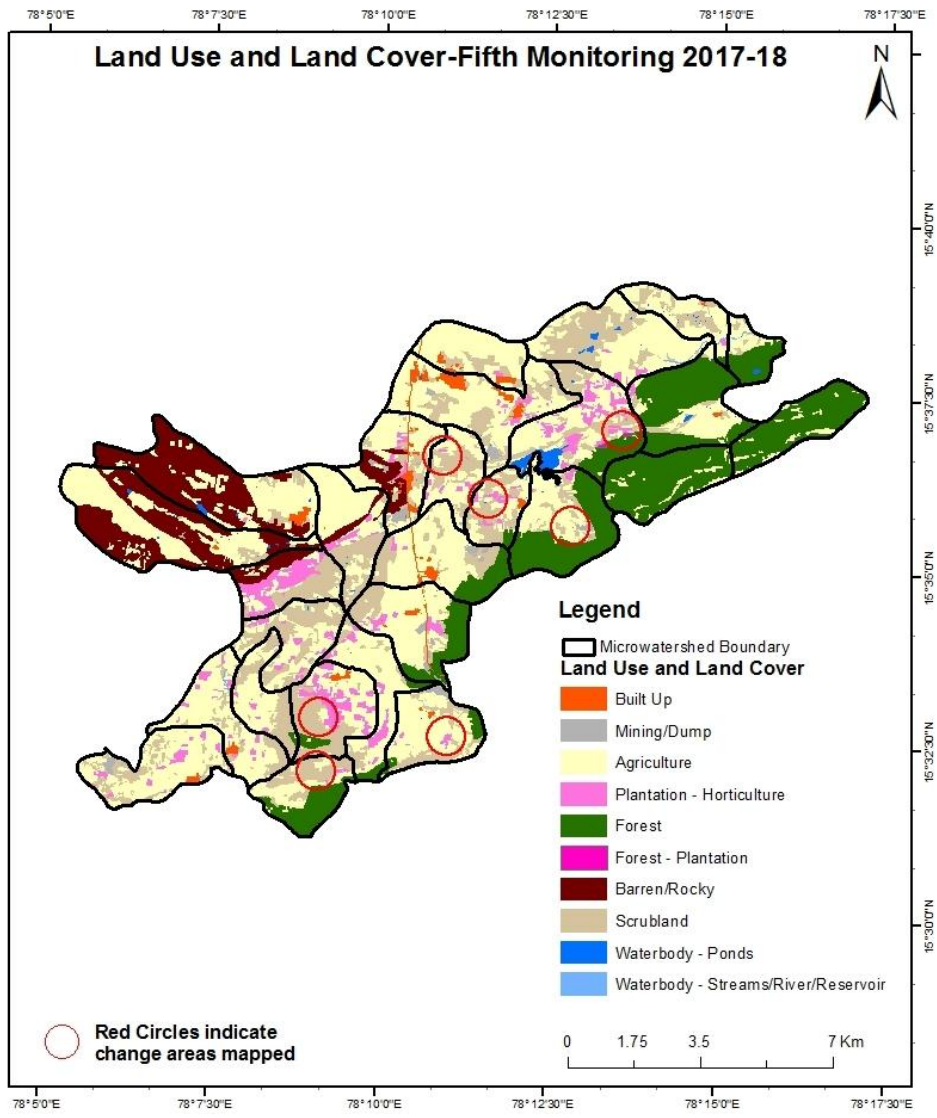




Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2016-17 to 2017-18)

Scale: 1:10000





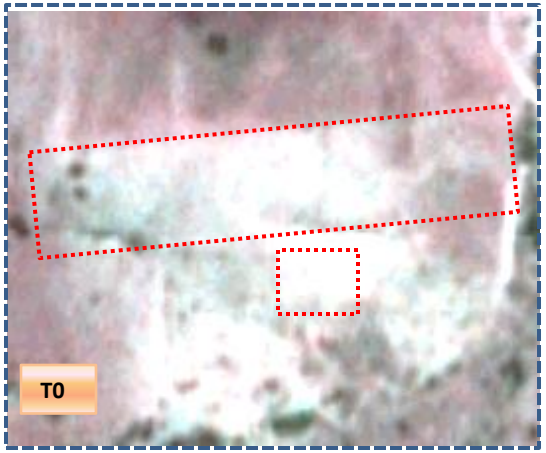
Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation

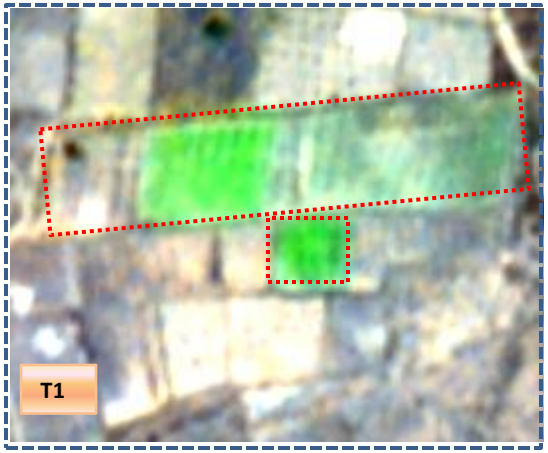
T0: 2009-10

T1: 17 March 2014

Scrub to Agriculture



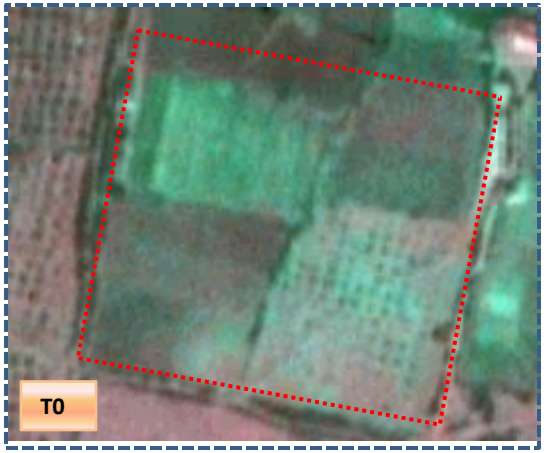
T0: 2009-10



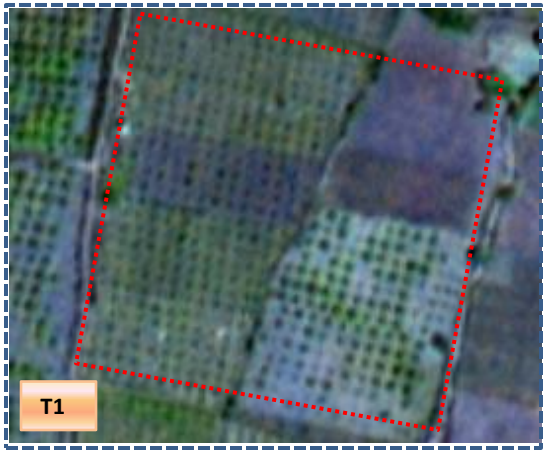
T1: 17 March 2014

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

Agriculture to Plantation

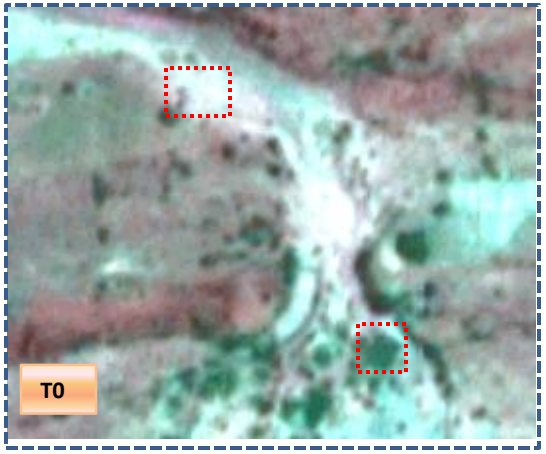


T0: 2009-10

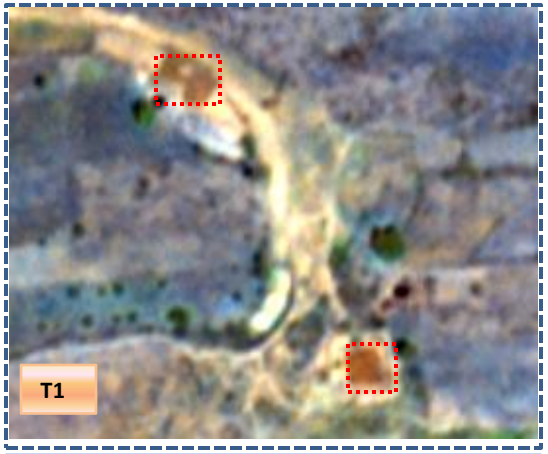


T1: 17 March 2014

Scrub to Water body



T0: 2009-10



T1: 17 March 2014

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	148.11										148.11
Mining/dump		56.29									56.29
Agriculture	1.35		4599.96	80.23				1.62		0.13	4683.29
Plantation Horticulture			66.02	510.08							576.10
Forest			3.94		2285.19						2289.13
Forest Plantation											
Barren Rocky							1215.35				1215.35
Scrub	4.18		80.26	12.68				3922.30		0.83	4020.24
Waterbody-Streams/River											
Waterbody – Ponds										62.77	62.77
Grand Total	**153.64**	**56.29**	**4750.18**	**602.99**	**2285.19**		**1215.35**	**3923.91**		**63.72**	**13051.28**

- 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 83.33 ha of the agriculture area has decreased and it is converted into built up, plantation, scrubland and water body in T1.
- In T1 150.22 ha of the agriculture area has increased from plantation, forest 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	153.64										153.64
Mining/dump		50.26	6.02								56.29
Agriculture	8.41		4634.67	106.25						0.85	4750.18
Plantation Horticulture			1.56	601.43							602.99
Forest			17.94		2267.07	0.18					2285.19
Forest Plantation											
Barren Rocky							1215.35				1215.35
Scrub	16.75		655.54	62.81				3188.04		0.76	3923.91
Waterbody-Streams/River											
Waterbody – Ponds										63.72	63.72
Grand Total	**178.81**	**50.26**	**5315.73**	**770.50**	**2267.07**	**0.18**	**1215.35**	**3188.04**		**65.34**	**13051.28**

• 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 115.52 ha of the agriculture area has decreased and it is converted into built up, plantation and water body in T2.

• In T2 681.06 ha of the agriculture area has been increased from mining/dump, 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	178.81										178.81
Mining/dump		44.95	5.32								50.26
Agriculture	9.50	2.20	5293.03	3.08	0.74			4.10		3.07	5315.73
Plantation Horticulture	0.24		131.24	639.02							770.50
Forest		1.32	16.53		2249.23						2267.07
Forest Plantation			0.18								0.18
Barren Rocky							1215.35				1215.35
Scrub	5.44	1.34	239.11	0.74				2937.98		3.43	3188.04
Waterbody-Streams/River											
Waterbody – Ponds										65.34	65.34
Grand Total	**193.98**	**49.81**	**5685.40**	**642.85**	**2249.97**		**1215.35**	**2942.08**		**71.84**	**13051.28**

• 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 22.70 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation, forest, scrubland and water body in T3.

• In T3 392.37 ha of the agriculture area has been increased from mining/dump, plantation, forest, forest plantation and scrubland area 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	193.98										193.98
Mining/dump		49.81									49.81
Agriculture	7.49	12.26	5590.11	66.27				1.59	4.47	3.20	5685.40
Plantation Horticulture			77.23	565.62							642.85
Forest			20.90		2229.07						2249.97
Forest Plantation											
Barren Rocky		1.05					1214.29				1215.35
Scrub	1.85	13.66	178.77	3.40				2729.08	2.70	12.63	2942.08
Waterbody-Streams/River											
Waterbody – Ponds			2.59							69.25	71.84
Grand Total	**203.32**	**76.78**	**5869.59**	**635.30**	**2229.07**		**1214.29**	**2730.67**	**7.17**	**85.08**	**13051.28**

• 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 90.43 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation, scrubland and water body in T5.

• In T5 209.33 ha of the agriculture area has been increased from plantation, forest, scrubland and water body area of T4. The additional agriculture are coming from waterbody in T5 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	203.32										203.32
Mining/dump		76.78									76.78
Agriculture	1.38	12.59	5779.16	64.47	0.49			6.47	1.91	3.11	5869.59
Plantation Horticulture	1.60		42.73	590.90						0.07	635.30
Forest		1.64	8.07		2214.83	4.47				0.06	2229.07
Forest Plantation											
Barren Rocky		6.00					1208.30				1214.29
Scrub	0.97	24.80	158.53	0.29				2544.74	0.84	0.49	2730.67
Waterbody-Streams/River									7.17		7.17
Waterbody – Ponds										85.08	85.08
Grand Total	**207.27**	**121.82**	**5988.49**	**655.66**	**2215.32**	**4.47**	**1208.30**	**2551.22**	**9.92**	**88.80**	**13051.28**

• 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 95.29 ha of the agriculture area has decreased and it is converted into built up, mining/dump, plantation, scrubland and water body in T4.

• In T4 279.49 ha of the agriculture area has been increased from plantation, forest, scrubland and water body area of T3. The additional agriculture are coming from waterbody in T4 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 35.96 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 66.89, 565.54, 369.67, 184.20 & 118.90 Hectares From T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1305.20 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 79 Hectares in Plantation/Horticulture area as compared between 2009-10 (T0) & 2017-18 (T5) years.
6. There is a decrease of 1469.03 Hectares in Scrubland area as compared between 2009-10 (T0) & 2017-18 (T5) years.
7. Farm ponds (83) is visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (84) verified from the portal.