

# MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

## SUMMARY REPORT

**IWMP-Batch-V**

**EAST GODAVARI -14/2013-14**

**Andhra Pradesh**

**Submitted to NRSC, Balanagar, Hyderabad**

**January-2023**

**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

# C O N T E N T S

- **EXECUTIVE SUMMARY**

01.           STUDY AREA

02.           SATELLITE & ANCILLARY DATA INCLUDING DRISHTI STATUS

03.           MONITORING IN THE PROJECT AREA : Site wise changes in the project

04.           CONCLUSIONS

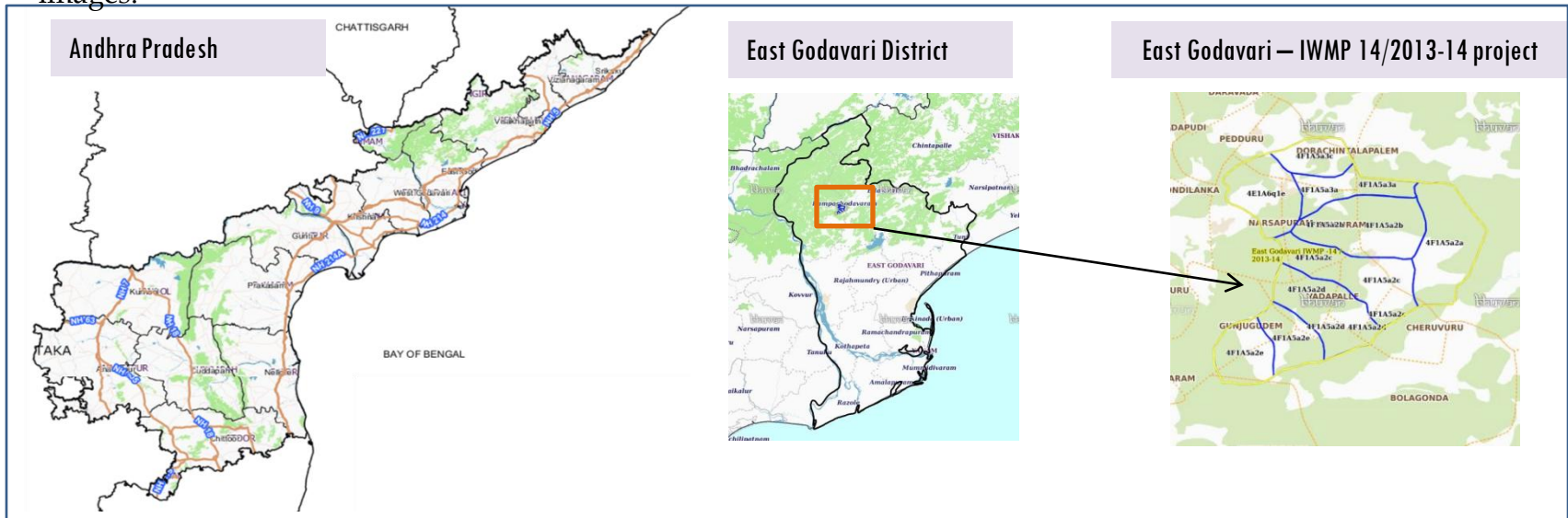
## EXECUTIVE SUMMARY

- 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-14/2013-14, East Godavari District of Andhra Pradesh. The total geographical area of the project is **2,930 ha**. It comprises of 9 micro watersheds.
- In the project area 68 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
- Water bodies have shown an decreased by 7.8 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
- Major percentage i.e. 45 % is covered by the agriculture, 18 % is covered by forest, 21.9 % is covered by scrubland , 9 % is covered by plantation/horticulture and remaining by other land use classes.

# PROJECT : EAST GODAVARI - IWMP-14/2013-14

## DISTRICT : EAST GODAVARI , STATE : ANDHRA PRADESH

- The study area falls in Rampachodavaram Mandal of East Godavari district of Andhra Pradesh state. The total geographical area of the project is **2,930 ha**. It comprises of 9 micro watersheds. Location Map of the study area is shown in Figure below. Analysis is done for 2013-14 (T0) period (*Batch -1*) projects taking 2021-22 (T5) period satellite images.



- The Climate is Comparatively moderate throughout the year except during the months of April to June when the temperature reaches a maximum of 48 deg. Centigrade.
- The normal rainfall of the district is 1280 mm. More than half of the rainfall is brought by south-west monsoon while a large portion of the rest of the district receives rainfall from the North-East Monsoon also, during October and November.

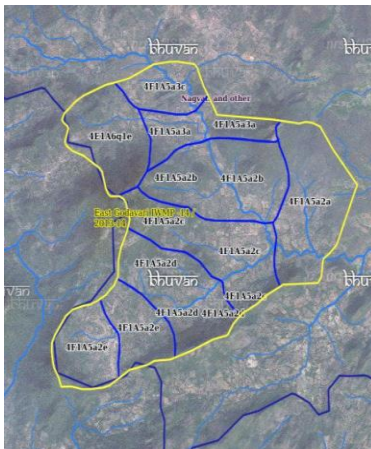
# Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			6-Mar-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			6-Mar-22
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	68
4	Detailed Project Report		

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



### Legend



Drainage (1:10000 Scale)

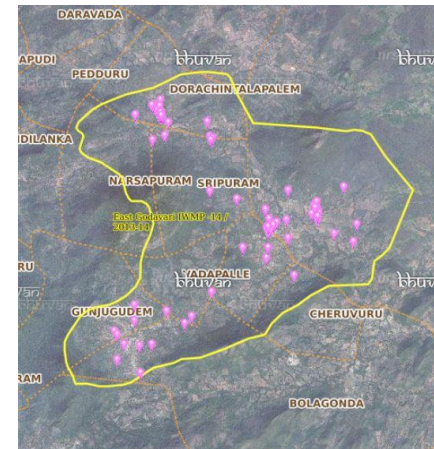


MWS Boundary



Project Boundary

## Natural Color Composite overlaid with Drishti Points



### Drishti Upload Status

## Classification of the Activities

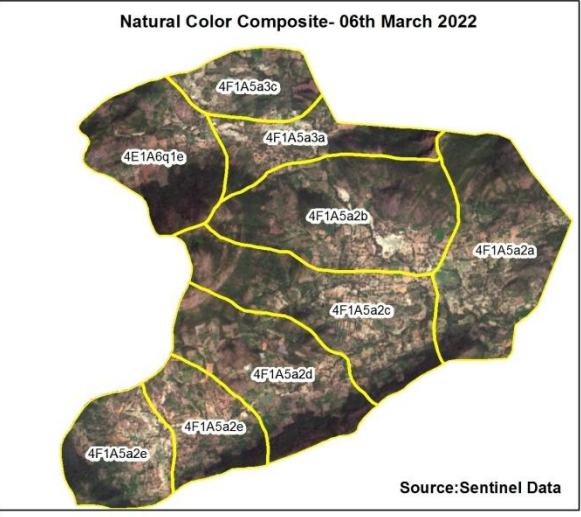
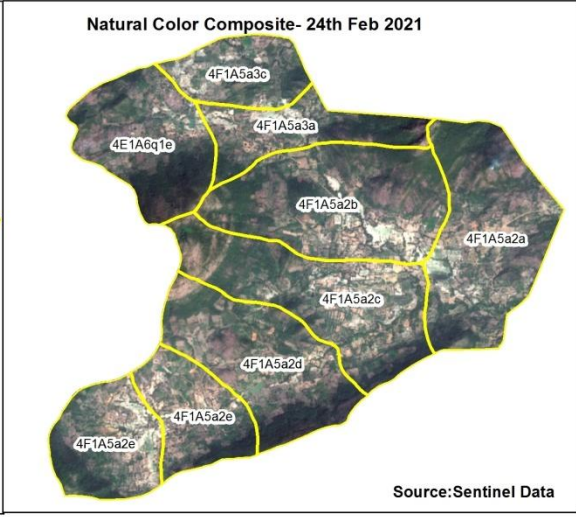
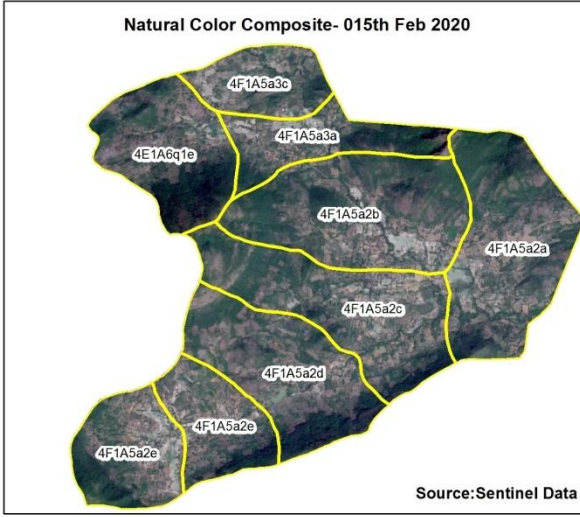
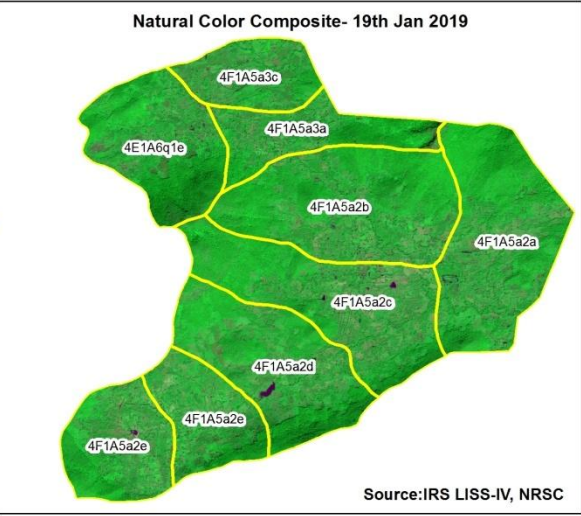
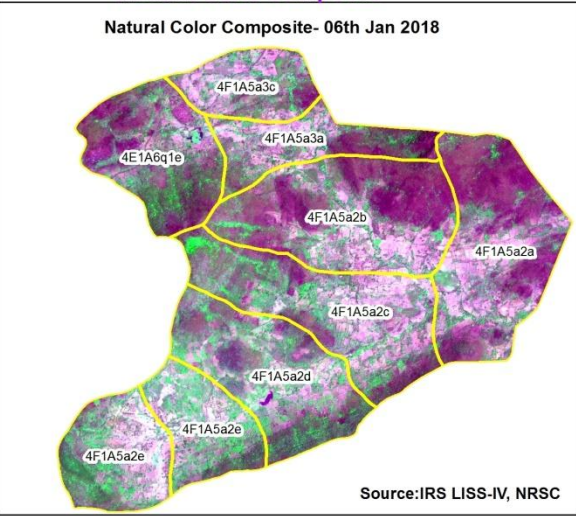
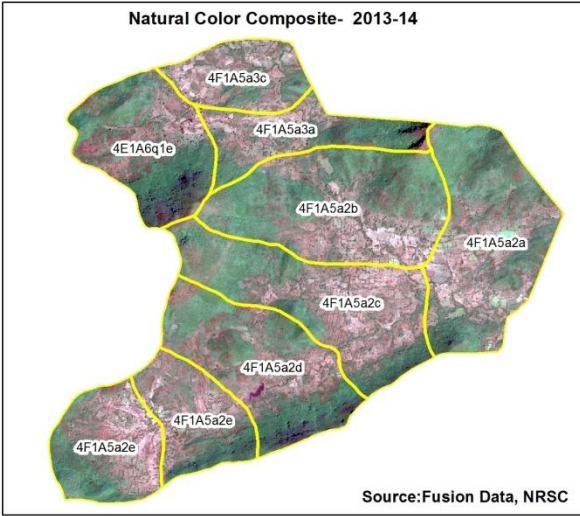
Sr. No	Activity	Drishti Photo	Visible on satellite
1	Afforestation	0	0
2	Horticulture	0	0
3	Agriculture	0	0
4	Pasture	0	0
5	Trench	0	0
6	Field Bunds	0	0
7	Terrace	0	0
8	Checks & Plugs	0	0
9	Gabion structure	0	0
10	Farm ponds/Dug out pit	7	7
11	Civil work-Check dams/Rock fill dam	7	7
12	Nallah Bunds/Drainage treatment	0	0
13	Percolation tanks / Ground water recharge structure	0	0
14	Production System and Micro-Enterprises	0	0
15	Livelihood Activities-Plantation/Horticulture	0	0
16	Capacity Building Activities	0	0
17	Entry Point Activity	35	35
18	Others	19	19
	<b>TOTAL</b>	<b>68</b>	<b>68</b>

## 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 (2013-14) and T5 is 2021-22 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 Colour Composite (NCC)





Monitoring of activities in East Godavari District, Andhra Pradesh. IWMP-14/2013-14



T0 Satellite data 2013



T1 Satellite data 2015



T2 Satellite data 2016



T3 Satellite data 2017



T4 Satellite data 2018



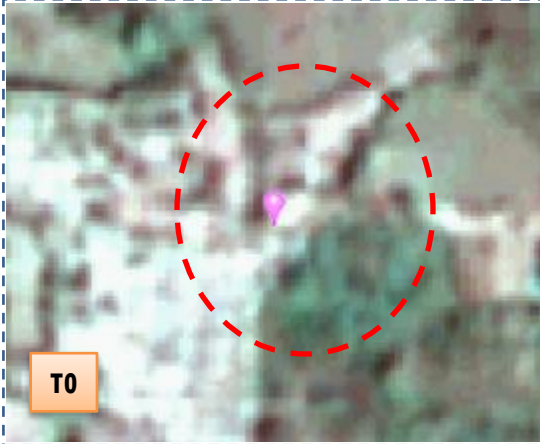
T5 Satellite data 2020



Drishti Id. 1704995

Horticulture

Monitoring of activities in East Godavari Dt Andhra Pradesh. IWMP-14/2013-14



T0:2013-14



T1: 08 January 2018



Drishti Sl no. 1702566 MWS : 4F1A5a3c

Farm pond



T0:2013-14



T1: 08 January 2018



Drishti Sl no. 204415 MWS : 4F1A5a2e

Percolation Tank

Monitoring of activities in East Godavari Dt Andhra Pradesh. IWMP-14/2013-14



T0:2013-14



T1: 08 January 2018



Drishti SI no. 204436 MWS : 4F1A5a2c

Percolation tank



T0:2013-14



T1: 08 January 2018



Drishti SI no. 5033494 MWS : 4F1A5a2c

Percolation tank

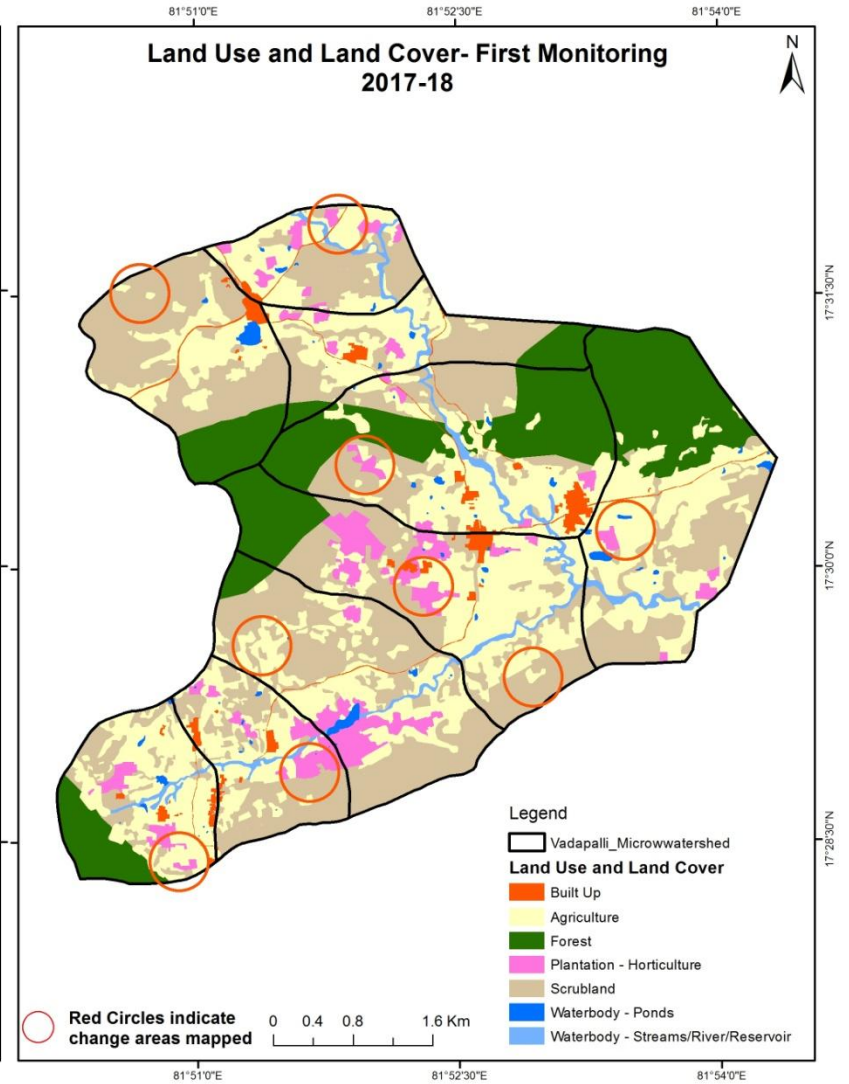
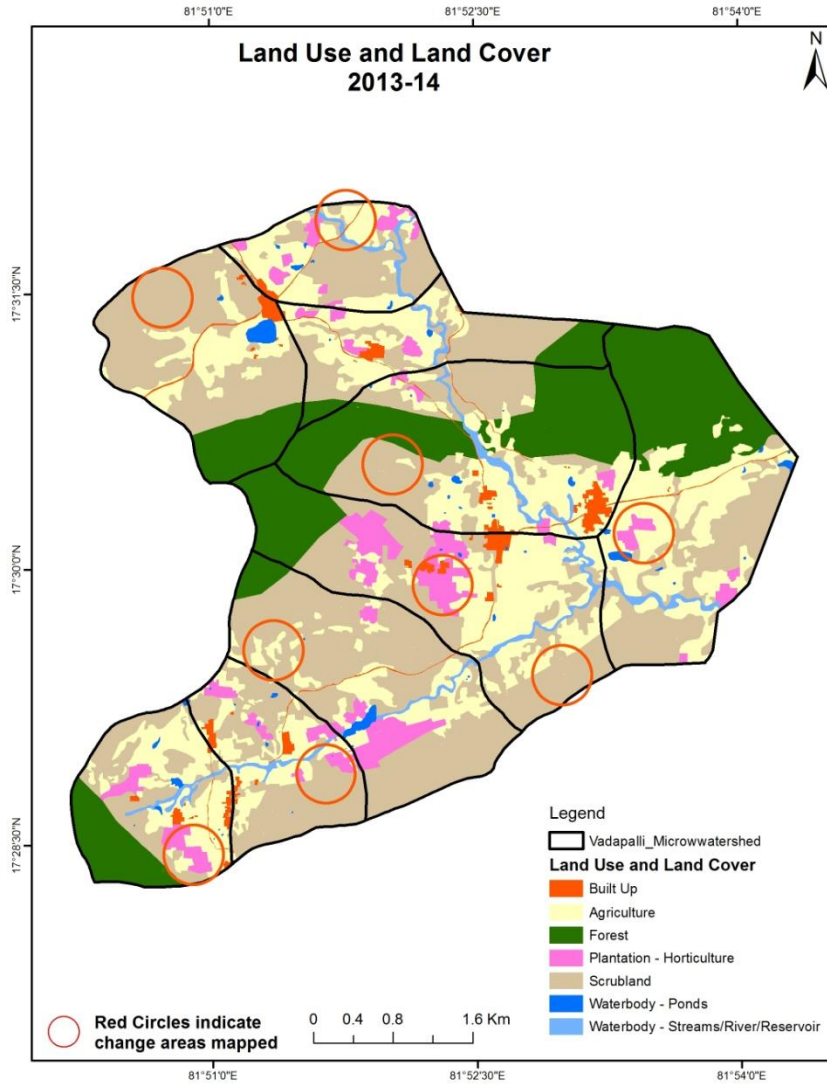
## MONITORING IN THE PROJECT AREA

### Land use and Land cover Changes in the Project

- Change in land use and land cover from 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 (2013-14) and row represents the T5 (2021-22)

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000



# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

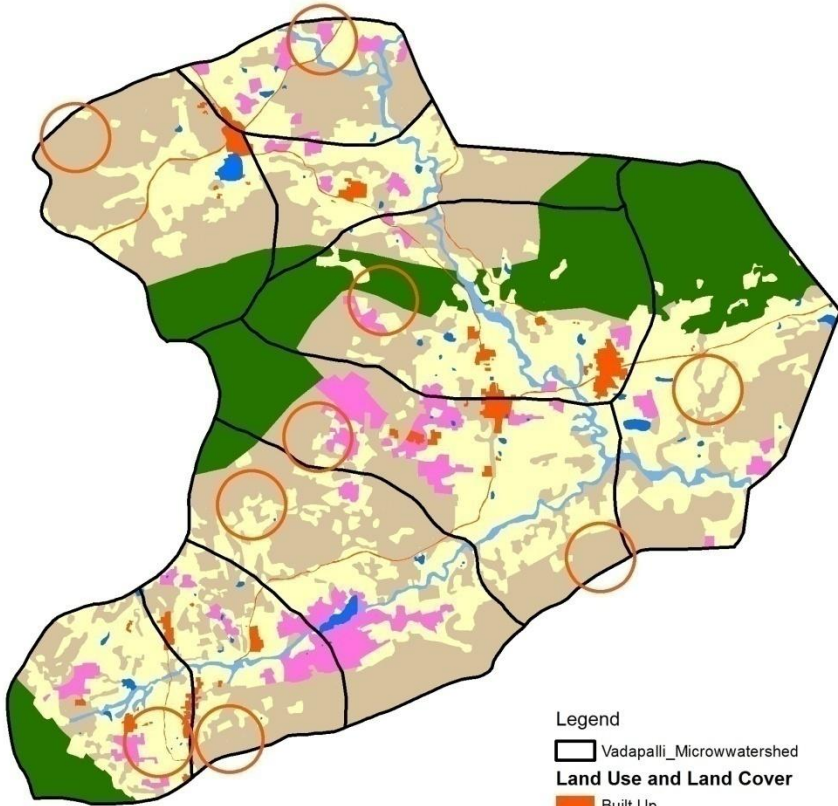
Scale: 1:10000

81°51'0"E

81°52'30"E

81°54'0"E

## Land Use and Land Cover 2017-18



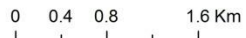
Legend

□ Vadapalli\_Microwatershed

**Land Use and Land Cover**

- Built Up
- Agriculture
- Forest
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped



81°51'0"E

81°52'30"E

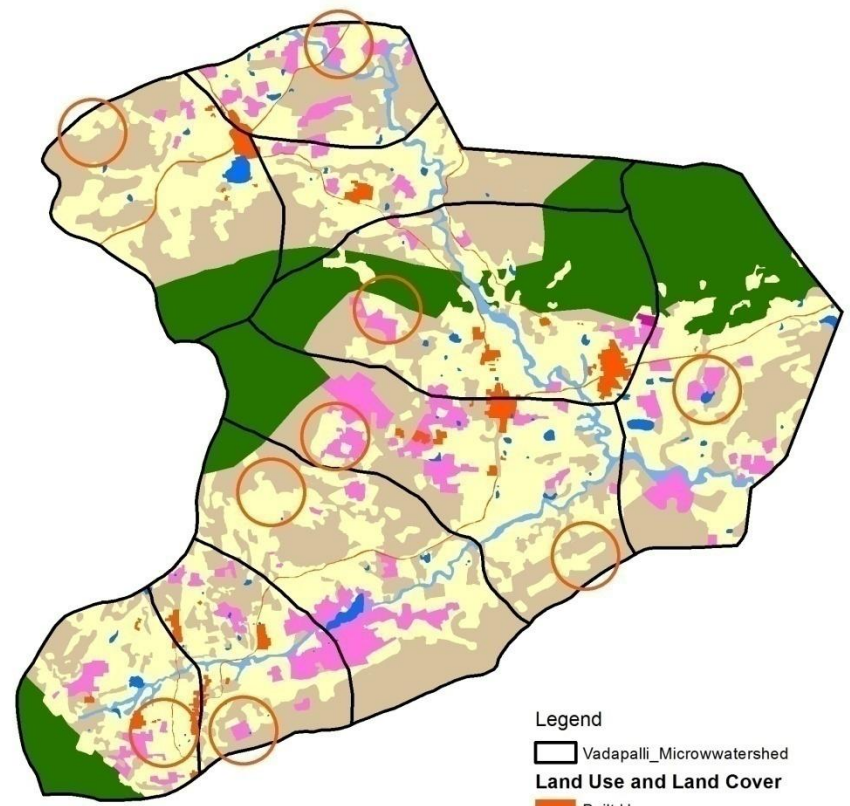
81°54'0"E

81°51'0"E

81°52'30"E

81°54'0"E

## Land Use and Land Cover- Second Monitoring 2018-19



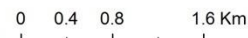
Legend

□ Vadapalli\_Microwatershed

**Land Use and Land Cover**

- Built Up
- Agriculture
- Forest
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped



81°51'0"E

81°52'30"E

81°54'0"E

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

81°51'0"E

81°52'30"E

81°54'0"E

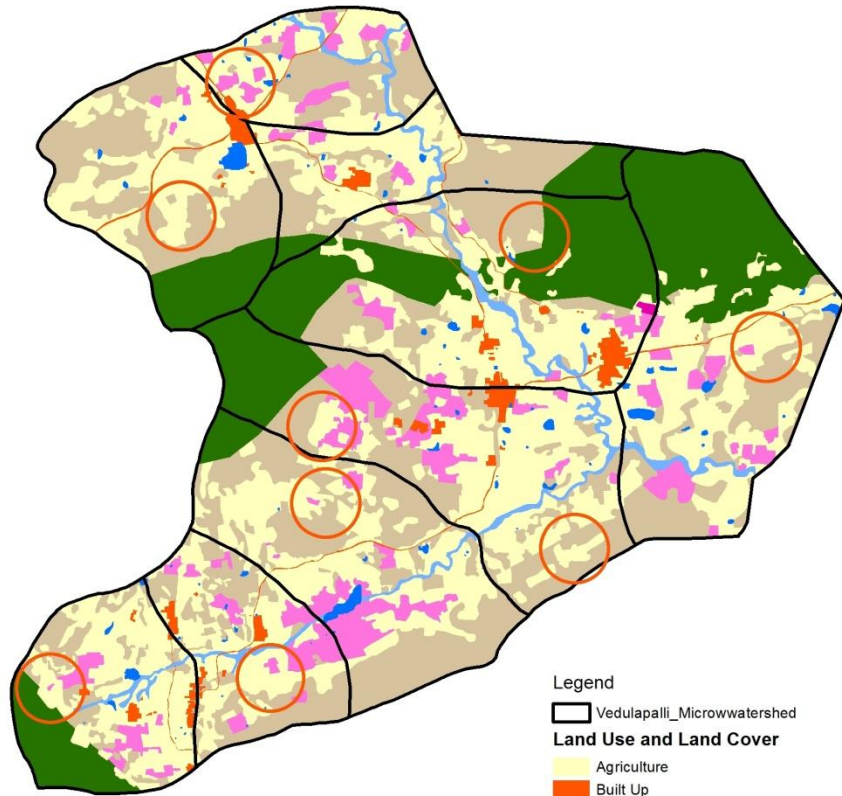
## Land Use and Land Cover 2018-19



17°31'30"N

17°30'0"N

17°28'30"N



Legend

▭ Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- ▭ Agriculture
- ▭ Built Up
- ▭ Forest
- ▭ Forest Plantation
- ▭ Plantation - Horticulture
- ▭ Scrubland
- ▭ Waterbody - Ponds
- ▭ Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped

0 0.4 0.8 1.6 Km

81°51'0"E

81°52'30"E

81°54'0"E

81°51'0"E

81°52'30"E

81°54'0"E

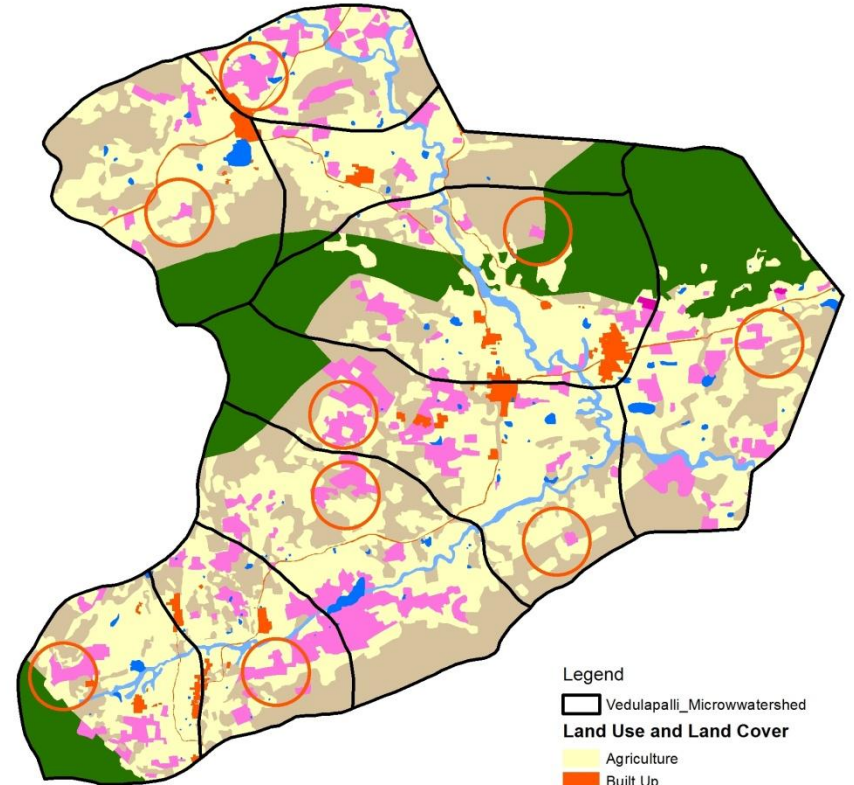
## Land Use and Land Cover- Third Monitoring 2019-20



17°31'30"N

17°30'0"N

17°28'30"N



Legend

▭ Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- ▭ Agriculture
- ▭ Built Up
- ▭ Forest
- ▭ Forest Plantation
- ▭ Plantation - Horticulture
- ▭ Scrubland
- ▭ Waterbody - Ponds
- ▭ Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped

0 0.4 0.8 1.6 Km

81°51'0"E

81°52'30"E

81°54'0"E

# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

81°51'0"E

81°52'30"E

81°54'0"E

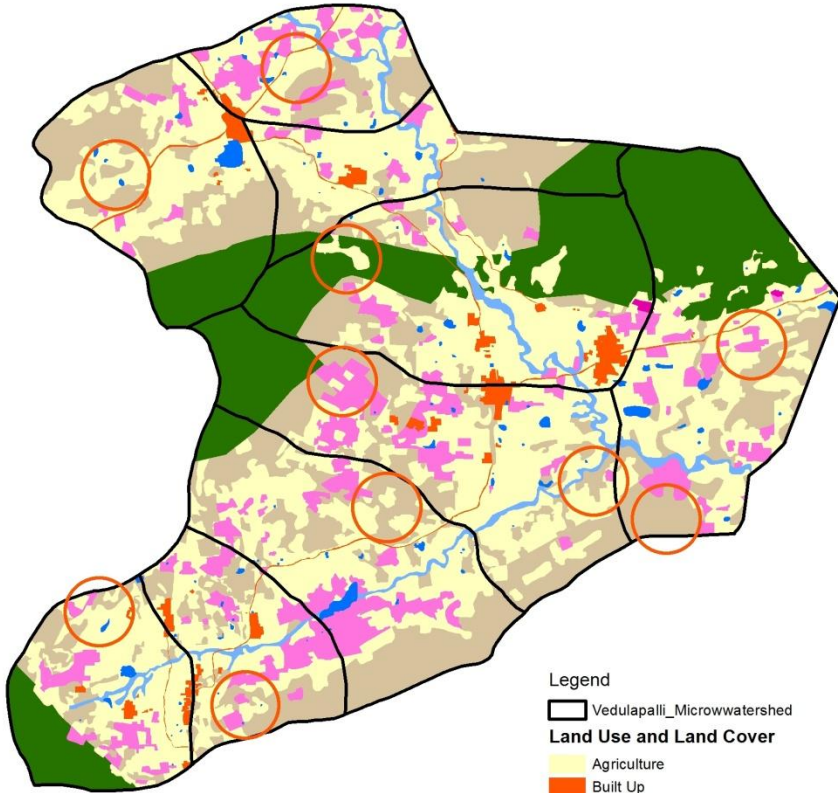
## Land Use and Land Cover 2019-20



17°31'30"N

17°30'0"N

17°28'30"N



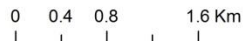
Legend

▭ Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- Agriculture
- Built Up
- Forest
- Forest Plantation
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped



81°51'0"E

81°52'30"E

81°54'0"E

81°51'0"E

81°52'30"E

81°54'0"E

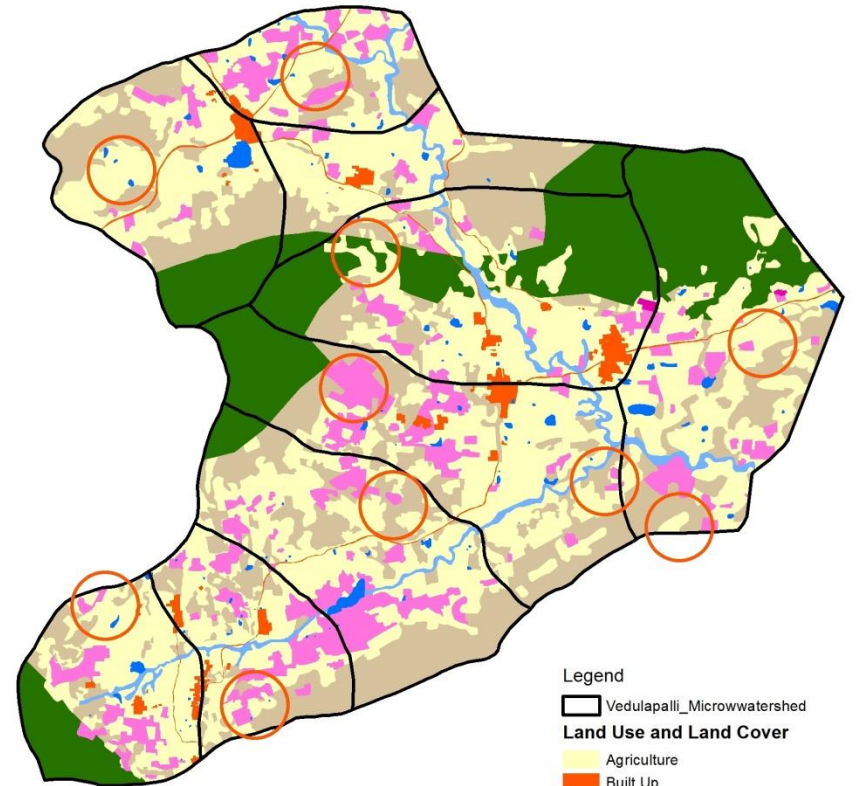
## Land Use and Land Cover- Forth Monitoring 2020-21



17°31'30"N

17°30'0"N

17°28'30"N



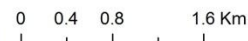
Legend

▭ Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- Agriculture
- Built Up
- Forest
- Forest Plantation
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

○ Red Circles indicate  
change areas mapped



81°51'0"E

81°52'30"E

81°54'0"E



# Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

81°51'0"E

81°52'30"E

81°54'0"E

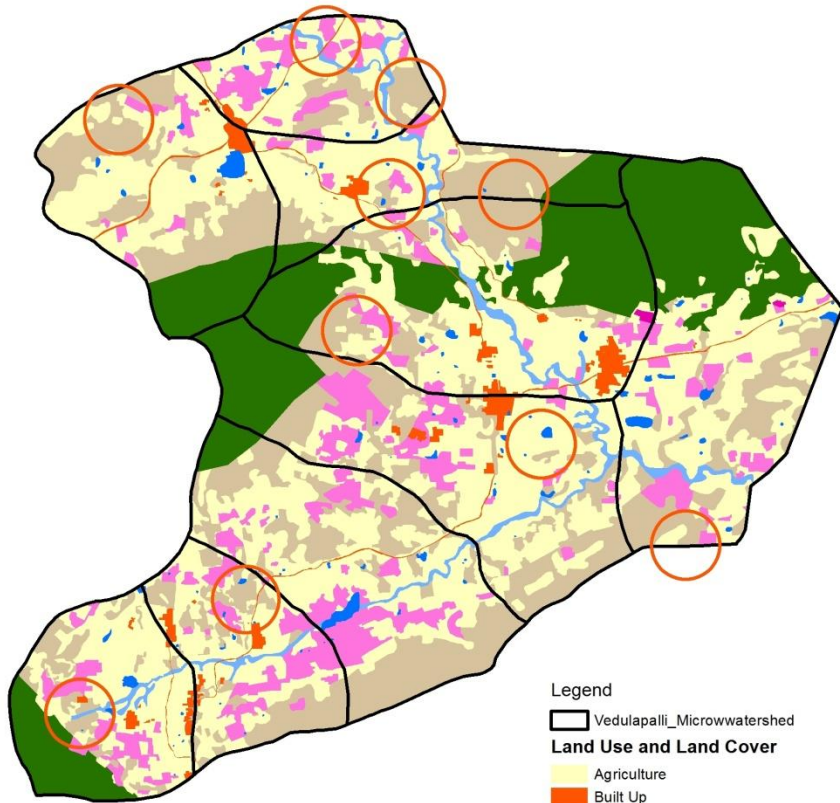
## Land Use and Land Cover 2020-21



17°31'30"N

17°30'0"N

17°28'30"N



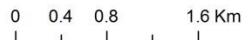
Legend

Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- Agriculture
- Built Up
- Forest
- Forest Plantation
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

Red Circles indicate  
change areas mapped



81°51'0"E

81°52'30"E

81°54'0"E

81°51'0"E

81°52'30"E

81°54'0"E

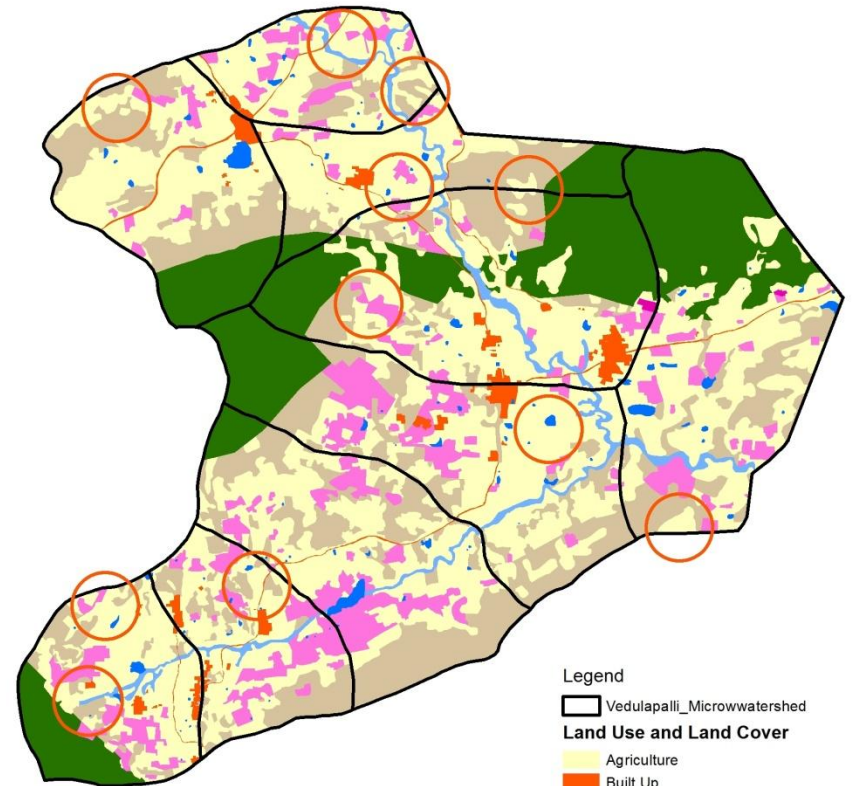
## Land Use and Land Cover- Fifth Monitoring 2021-22



17°31'30"N

17°30'0"N

17°28'30"N



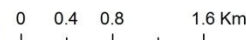
Legend

Vedulapalli\_Microwatershed

**Land Use and Land Cover**

- Agriculture
- Built Up
- Forest
- Forest Plantation
- Plantation - Horticulture
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir

Red Circles indicate  
change areas mapped



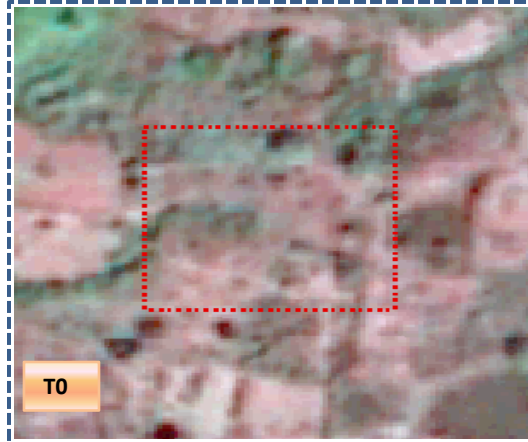
81°51'0"E

81°52'30"E

81°54'0"E

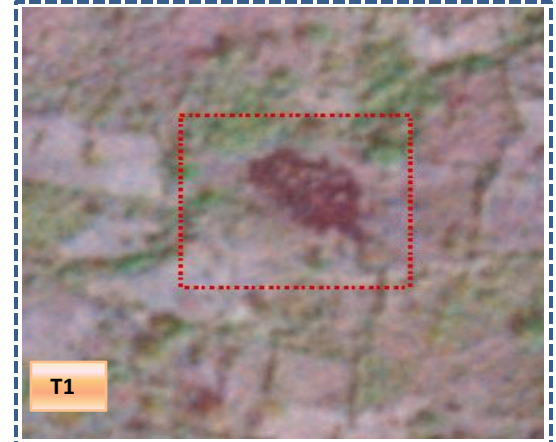
## Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Water body



T0

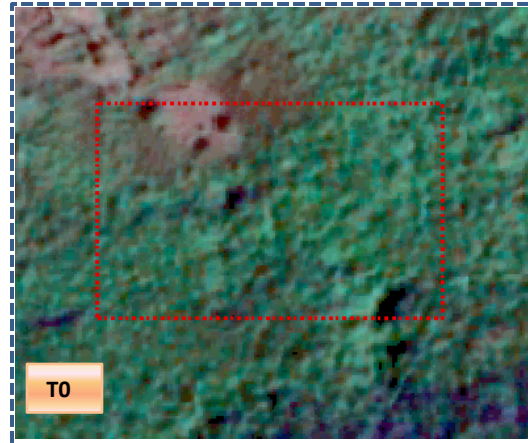
T0: 2013-14 (81°52'23.183"E 17°30'28.836"N)



T1

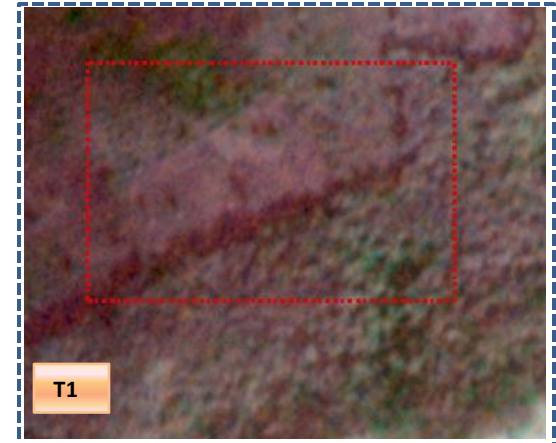
T1: 06 January 2018

Scrubland to Agriculture



T0

T0: 2013-14 (81°52'2.758"E 17°28'58.519"N)

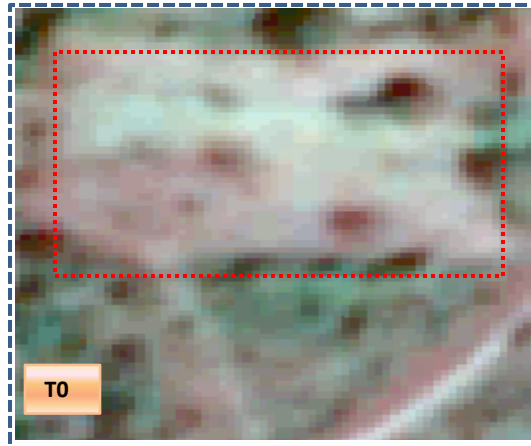


T1

T1: 06 January 2018

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

### Agriculture to Plantation

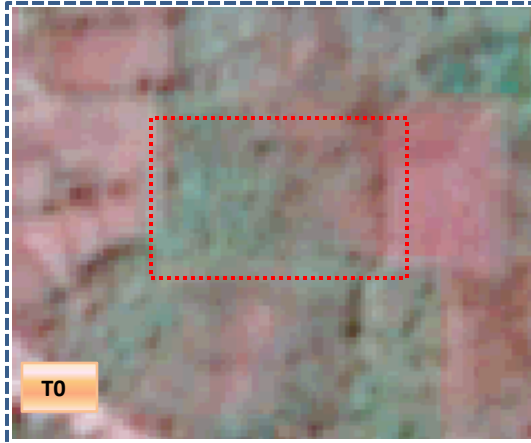


T0: 2013-14 (81°51'46.427"E 17°31'56.471"N)



T1: 06 January 2018

### Scrubland to Agriculture



T0: 2013-14 (81°51'12.235"E 17°29'21.474"N)



T1: 06 January 2018

**Table showing change matrix depicting Land cover transitions during study period-2013-14 to 2017-18**

Land cover	Monitoring period (T1)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>Built up</b>	58.28												<b>58.28</b>
<b>Mining/dump</b>													
<b>Agriculture</b>	1.79		778.15	15.78				1.09			1.44		<b>798.24</b>
<b>Plantation Horticulture</b>			26.73	129.10									<b>155.83</b>
<b>Forest</b>			17.03		549.54								<b>566.57</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>													
<b>Scrub</b>			188.75	10.77				1071.68			0.80		<b>1272.00</b>
<b>Waterbody- Streams/River</b>									59.21				<b>59.21</b>
<b>Waterbody – Ponds</b>			1.53								19.26		<b>20.78</b>
<b>Grand Total</b>	<b>60.07</b>		<b>1012.19</b>	<b>155.65</b>	<b>549.54</b>			<b>1072.77</b>	<b>59.21</b>		<b>21.50</b>		<b>2930.92</b>

- In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
- In T0 20 ha of the agriculture area has decreased and it is converted into Built-up, plantation, scrubland and water body in T1.
- In T1 232 ha of the agriculture area has increased from plantations, forest, 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-2017-18 to 2018-19**

Land cover	Monitoring period (T2)										Units in Hectares		
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total		
<b>T1</b>													
<b>Built up</b>	60.07												<b>60.07</b>
<b>Mining/dump</b>													
<b>Agriculture</b>	0.23		966.17	41.58		1.37					2.83		<b>1012.19</b>
<b>Plantation Horticulture</b>				155.65									<b>155.65</b>
<b>Forest</b>			1.44		548.10								<b>549.54</b>
<b>Forest Plantation</b>													
<b>Barren Rocky</b>													
<b>Scrub</b>	0.10		157.69	11.13				901.77			2.08		<b>1072.77</b>
<b>Waterbody- Streams/River</b>	0.05								59.17				<b>59.21</b>
<b>Waterbody – Ponds</b>											21.50		<b>21.50</b>
<b>Grand Total</b>	<b>60.45</b>		<b>1125.30</b>	<b>208.36</b>	<b>548.10</b>	<b>1.37</b>		<b>901.77</b>	<b>59.17</b>		<b>26.40</b>		<b>2930.92</b>

- 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 44 ha of the agriculture area has decreased and it is converted into Built-up, plantations, forest-plantation and water body in T2.
- In T2 159 ha of the agriculture area has increased from 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-2018-19 to 2019-20**

Land cover	Monitoring period (T3)										Units in Hectares	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
<b>Built up</b>	60.45										<b>60.45</b>	
<b>Mining/dump</b>												
<b>Agriculture</b>			1055.09	68.65		0.43				1.13	<b>1125.30</b>	
<b>Plantation Horticulture</b>			2.20	205.96						0.20	<b>208.36</b>	
<b>Forest</b>			4.61		543.49						<b>548.10</b>	
<b>Forest Plantation</b>						1.37					<b>1.37</b>	
<b>Barren Rocky</b>												
<b>Scrub</b>			121.92	13.46				766.20		0.19	<b>901.77</b>	
<b>Waterbody- Streams/River</b>									59.17		<b>59.17</b>	
<b>Waterbody – Ponds</b>										26.40	<b>26.40</b>	
<b>Grand Total</b>	<b>60.45</b>		<b>1183.82</b>	<b>288.07</b>	<b>543.49</b>	<b>1.80</b>		<b>766.20</b>	<b>59.17</b>	<b>27.92</b>	<b>2930.92</b>	

- 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 69 ha of the agriculture area has decreased and it is converted into plantations, forest-plantation and water body in T3.
- In T3 128 ha of the agriculture area has increased from plantations, forest and scrubland 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-2019-20 to 2020-21**

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	60.45												60.45
Mining/dump													
Agriculture			1170.49	13.11							0.22		1183.82
Plantation Horticulture			6.87	280.93							0.26		288.07
Forest			20.67		522.82								543.49
Forest Plantation						1.80							1.80
Barren Rocky													
Scrub			44.96	3.70				717.55					766.20
Waterbody- Streams/River									59.17				59.17
Waterbody – Ponds											27.92		27.92
<b>Grand Total</b>	<b>60.45</b>		<b>1243.00</b>	<b>297.74</b>	<b>522.82</b>	<b>1.80</b>		<b>717.55</b>	<b>59.17</b>		<b>28.40</b>		<b>2930.92</b>

- 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 13 ha of the agriculture area has decreased and it is converted into plantations and water body in T4.
- In T4 72 ha of the agriculture area has increased from plantations, forest and scrubland 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-2020-21 to 2021-22**

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	60.45											60.45
Mining/dump												
Agriculture			1241.25	1.50						0.25		1243.00
Plantation Horticulture			12.46	285.28								297.74
Forest			0.51		522.31							522.82
Forest Plantation						1.80						1.80
Barren Rocky												
Scrub			73.90					643.65				717.55
Waterbody- Streams/River									59.17			59.17
Waterbody – Ponds										28.40		28.40
<b>Grand Total</b>	<b>60.45</b>		<b>1328.12</b>	<b>286.78</b>	<b>522.31</b>	<b>1.80</b>		<b>643.65</b>	<b>59.17</b>	<b>28.66</b>		<b>2930.92</b>

- 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 1.7 ha of the agriculture area has decreased and it is converted into plantations and water body in T5.
- In T5 86 ha of the agriculture area has increased from plantations, forest and scrubland 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 increase of 7.8 Hectares in Reservoir / Tanks area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 213, 113, 58, 59 & 85 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 529 Hectares in Crop land area as compared between baseline LU/LC data 2013-14 (T0) & 2021-22 (T5) years.
5. About **130 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2013-14 (T0) to 2021-22 (T5) years.
6. There is a decrease of 628 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
7. Farm ponds (07) are visible on IWMP Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (07) verified from the portal.