

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

VISAKHAPATNAM -03/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

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T 0 - T 1 - T 2 - T 3 - T 4 - T 5



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Ministry of Rural Development
Government of India

C O N T E N T S

EXECUTIVE SUMMARY

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E X E C U T I V E S U M M A R Y

1. Integrated Watersheds Management Project (IWMP) is a flagship programme of Department of Land Resources (DoLR), Ministry of Rural Development (MRD).
2. 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).
3. Current summary report gives details of Project – IWMP-03/2013-14, Visakhapatnam District of Andhra Pradesh. The total geographical area of the project is 6,580 ha. It comprises of 16 micro watersheds.
4. Drishti points were not uploaded in Bhuvan.
5. Water bodies have shown an increased by 6.20 ha , which correspond to the other land use classes that have been converted into various water bodies in this period.
6. Major percentage i.e. 38.7 % is covered by the agriculture, 26.8 % is covered by forest, 32 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : BARADA WATERSHED- IWMP-03/2013-14

DISTRICT : VISAKHAPATNAM , STATE : ANDHRA PRADESH

- The study area falls in Munchingiputtu Mandal of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is 6,580 ha. It comprises of 16 micro watersheds. Location Map of the study area is shown in Figure 1. Analysis is done for 2013-14 (T0) period (Batch -1) projects taking 2021-22 (T5) period satellite images, seen in Table 1 & 2, Fig 04.

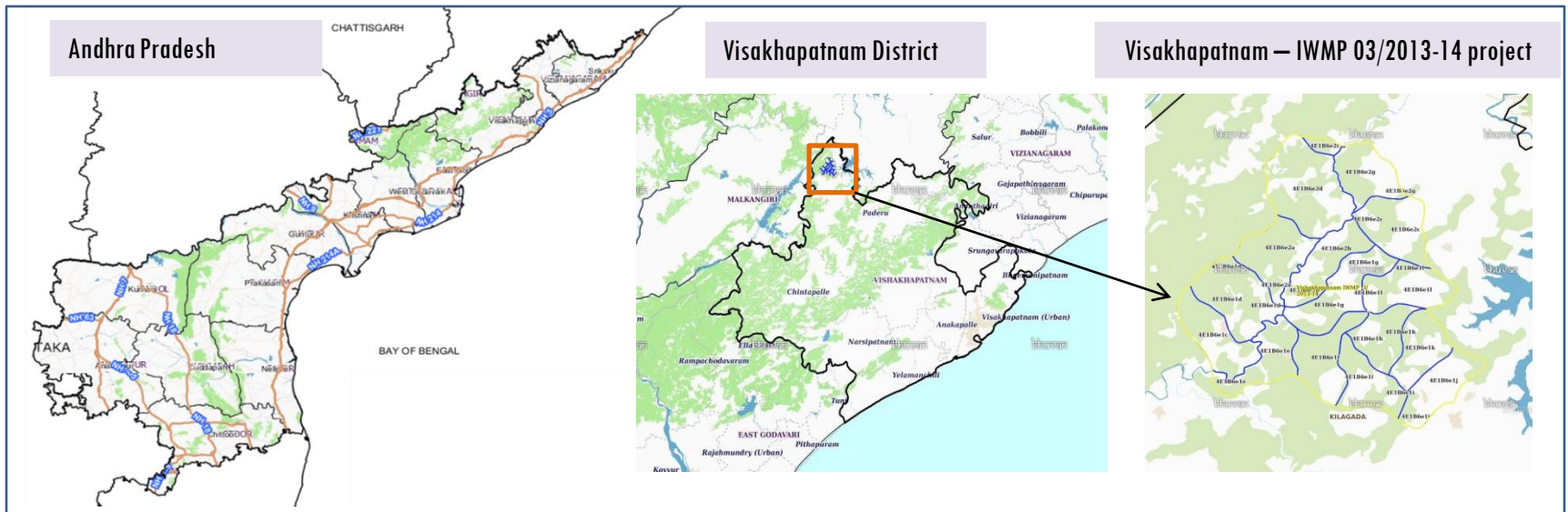


Fig.1. Location map of Barada Watershed (IWMP-03/2013-14) in Visakhapatnam District, A.P

- Visakhapatnam has a tropical wet and dry climate. The annual mean temperature ranges between 24.7 °C to 30.6 °C, with the maximum in the month of May and the minimum in January; the minimum temperatures ranges between 20-27 °C.
- The climate of the district is varied and has differing climate conditions in different parts. Near the coast the air is humid and moist and relaxing, but gets warmer towards the interior and cools down in the hilly areas on account of elevation and dense vegetation.

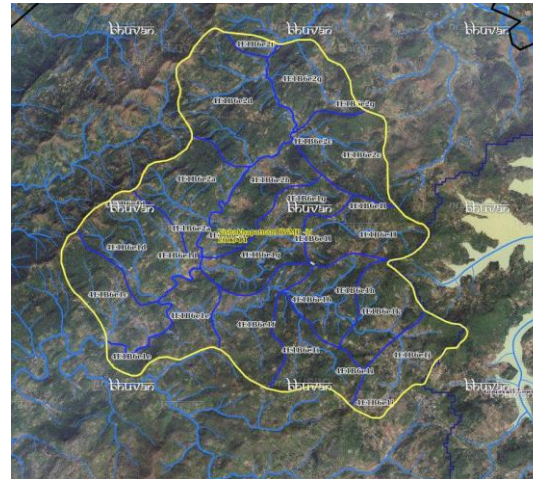
Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2011-12	2021-22
LISS IV	2013-14		
SCENE 1			25-Dec-21
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			25-Dec-21
SCENE2			
SCENE 3			
SCENE 4			

Table 2. 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	0
4	Detailed Project Report		

Fig 2. Natural Color Composite overlaid with Project boundaries and high detail stream network



Legend



Drainage (1:10000 Scale)



MWS Boundary



Project Boundary

Fig 3. Natural Color Composite overlaid with Drishti Points

No Drishti Points
Uploaded

Drishti Upload Status

Table 3. Classification of the Activities

Sr. No	Activity	Number of Photographs uploaded in Drishti Mobile Application	Visible on satellite in Srishti Geoportal
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	0	0
11	Civil work-Check dams/Rock fill dam	0	0
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	0	0
18	Others	0	0
	TOTAL	0	0

03. MONITORING IN THE PROJECT AREA

3.1 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, figure 05 & 06.

Fig 4. Barada Watershed (IWMP-03/2013-14) Natural Colour Composite (NCC) -2013-14 to 2021-22

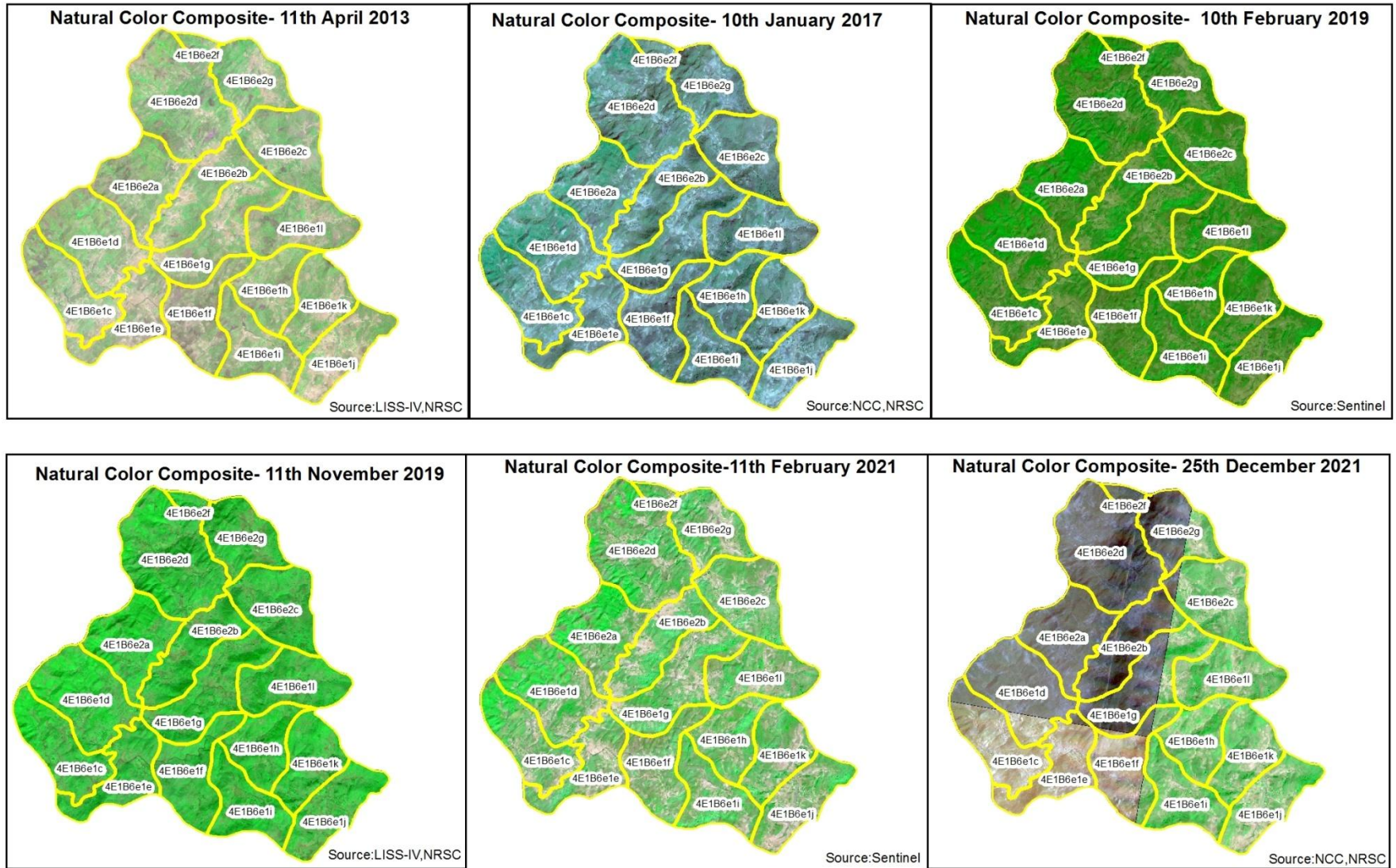


Fig 5. Barada Watershed (IWMP-03/2013-14) Drishti points were not uploaded in Bhuvan

<div>T0</div>	<div>T1</div>	
T0:	T1:	Drishti Sl no MWS :

<div>T0</div>	<div>T1</div>	
T0:	T1:	Drishti Sl no. MWS :

03. MONITORING IN THE PROJECT AREA

3.2 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, seen in fig 07 to fig 11.
- 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, seen in fig 12 & 13 .
- The result obtained for the period T0 to T5 are given in the change matrix table, seen in table 04 to table 08.
- In matrix table column represents the T0 (2013-14) and row represents the T5 (2021-22)

Fig 6. Barada Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

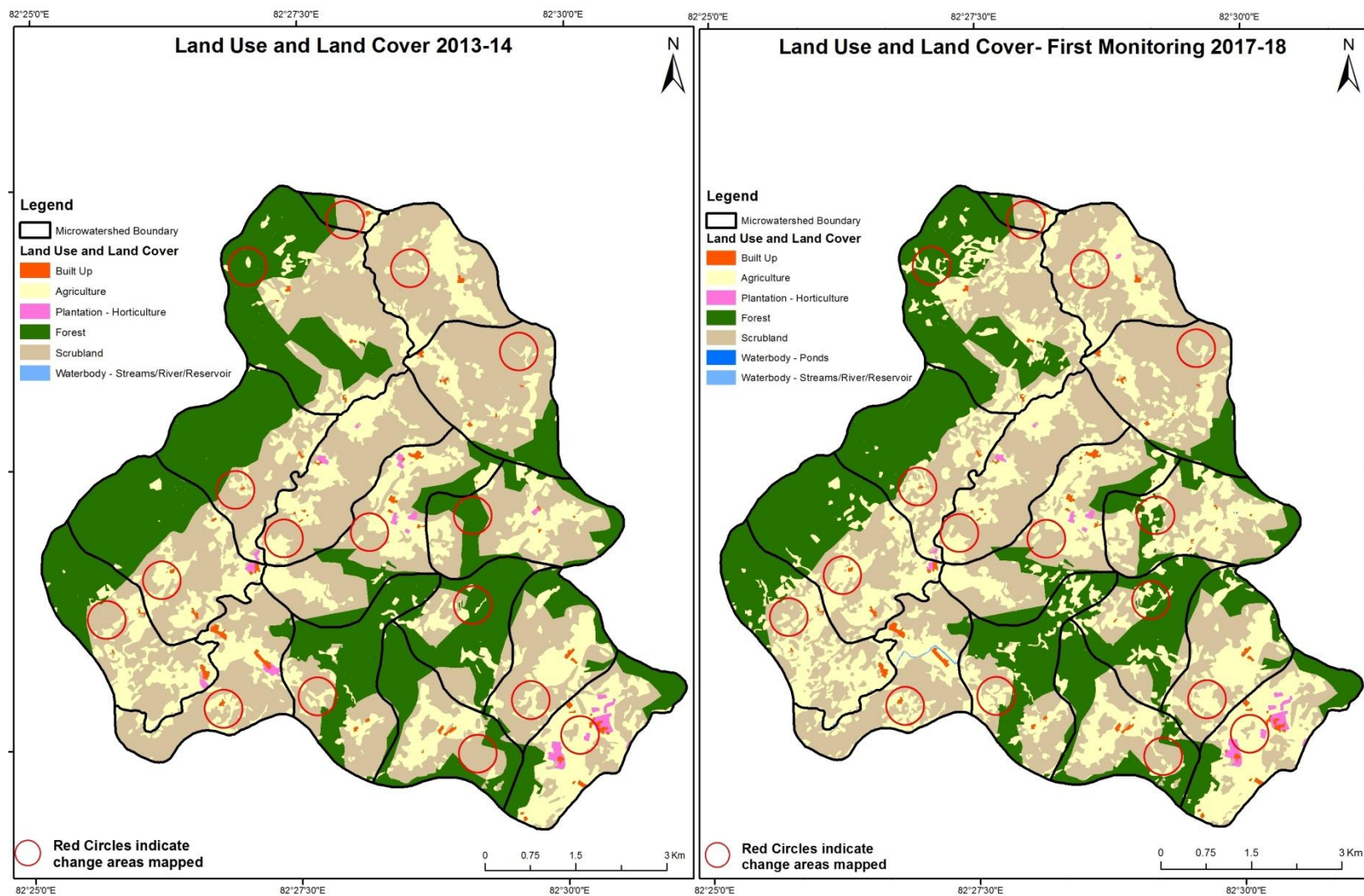


Fig 7. Barada Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

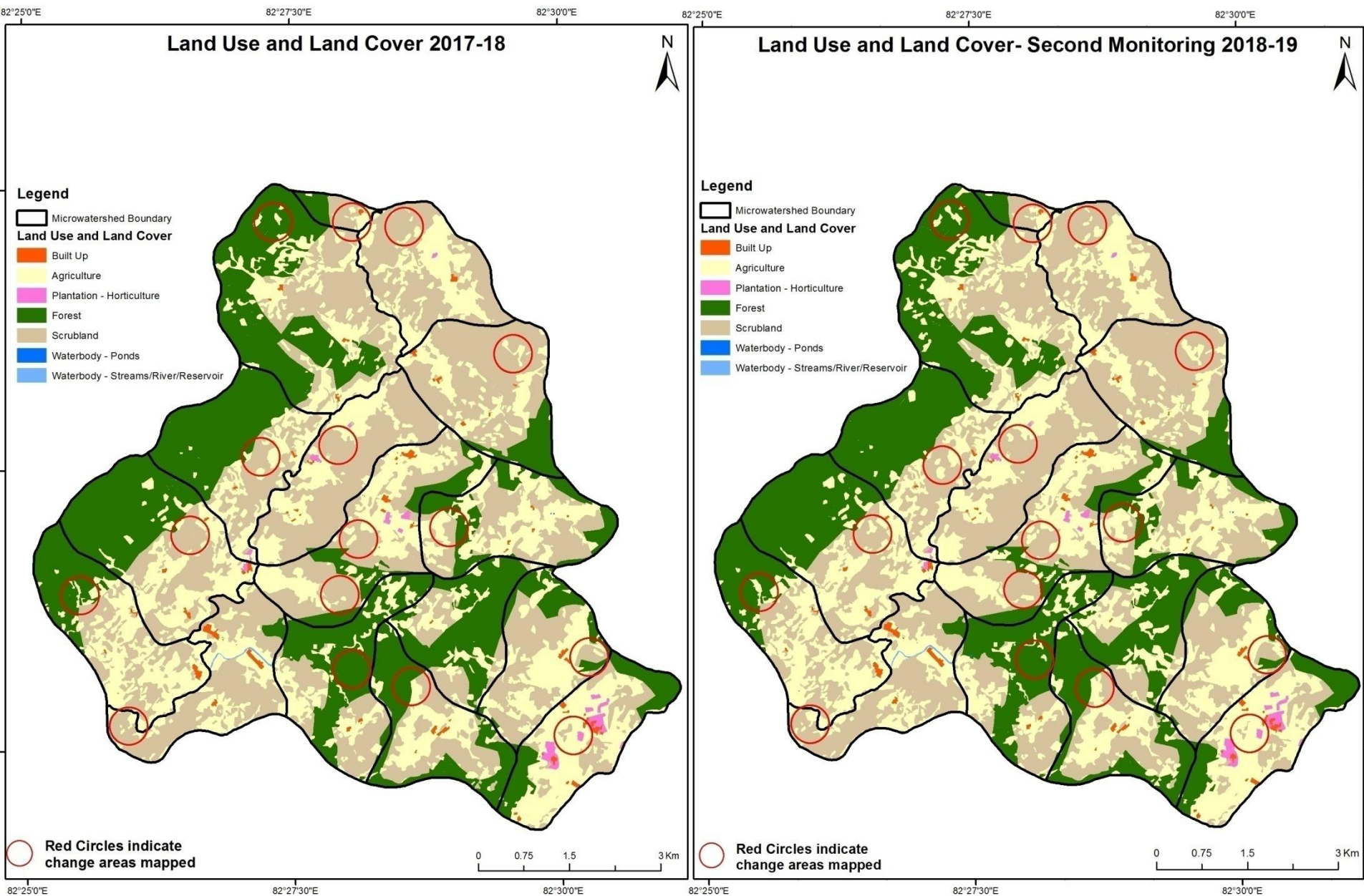


Fig 8. Barada Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

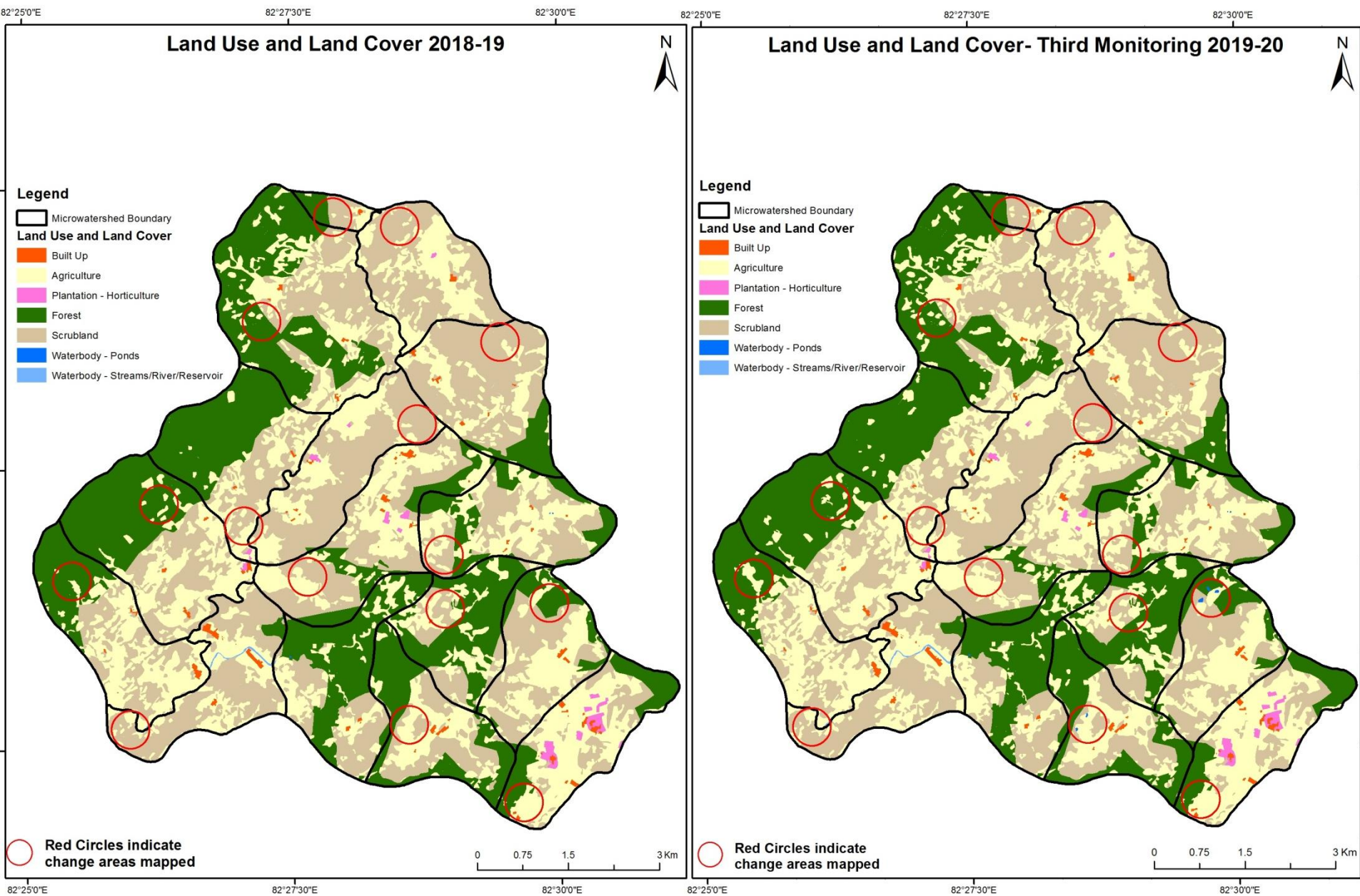


Fig 9. Barada Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

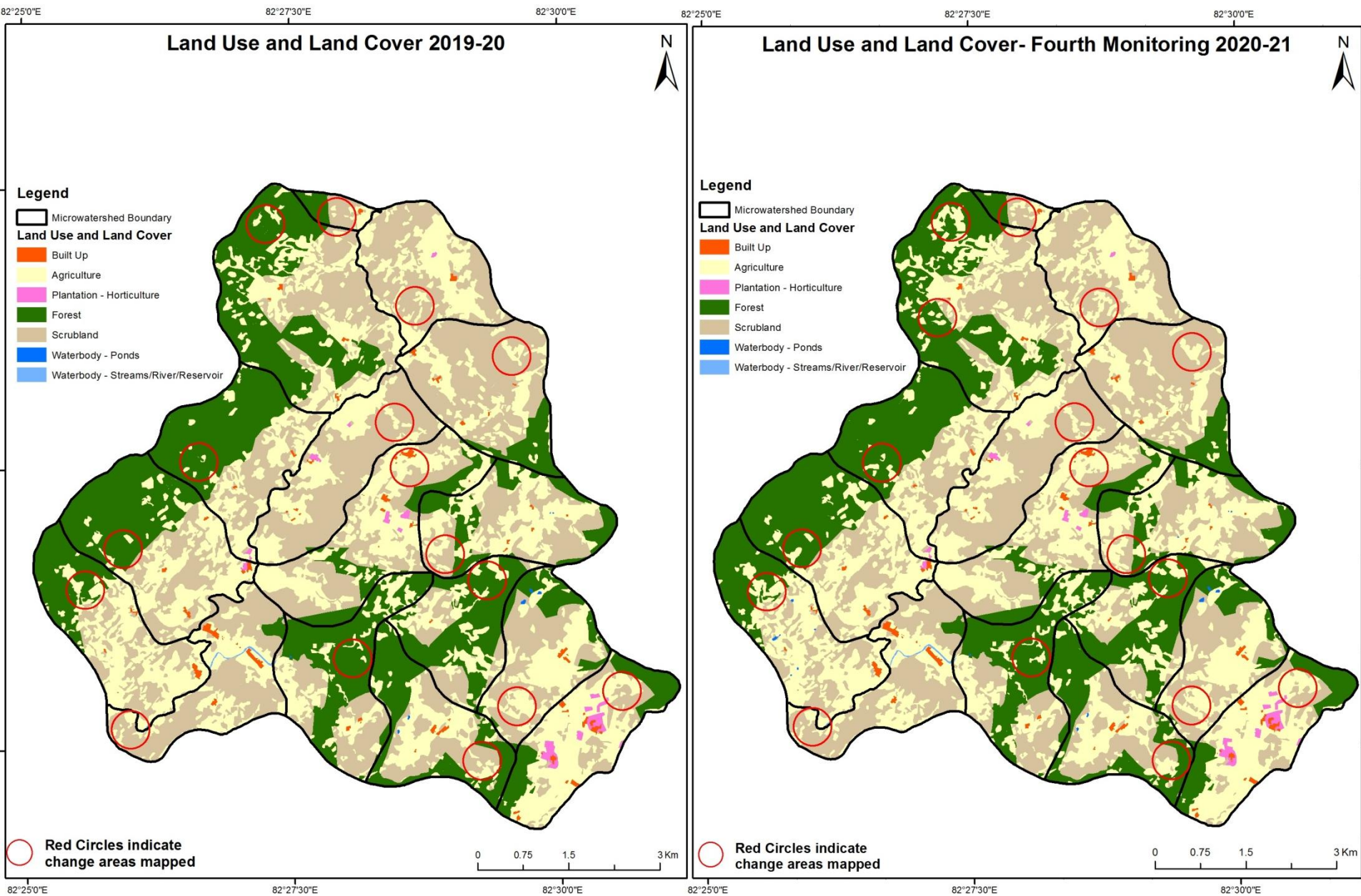


Fig 10. Barada Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000

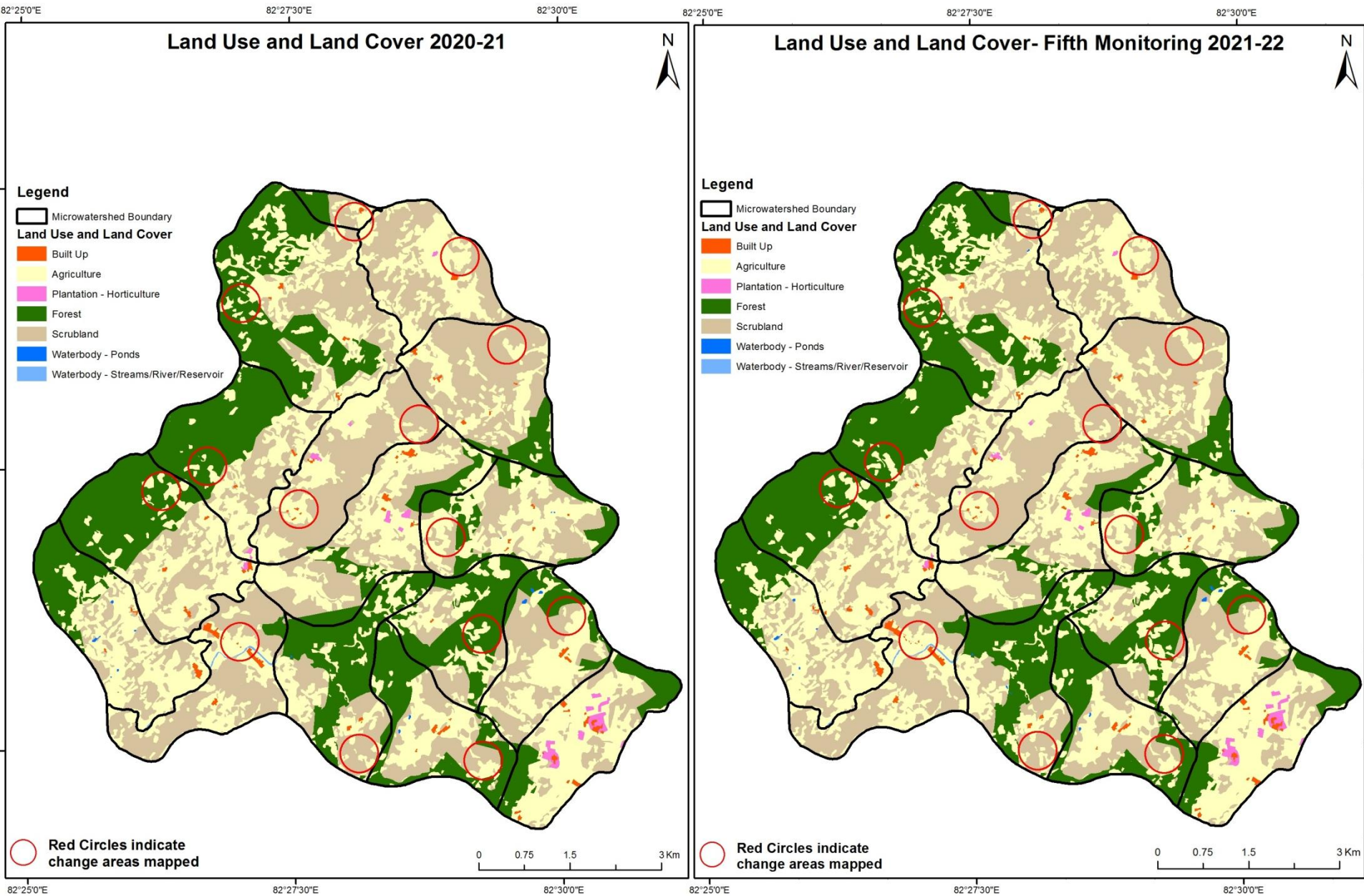
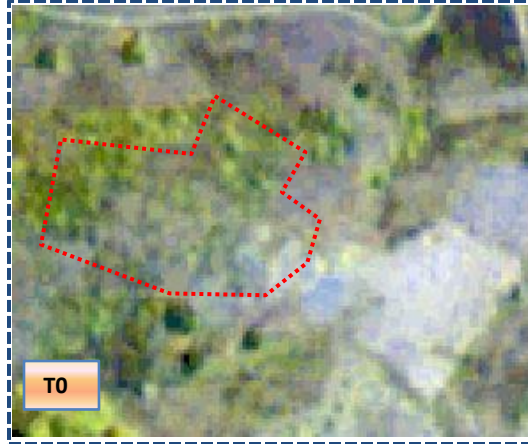


Fig 11. Barada Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

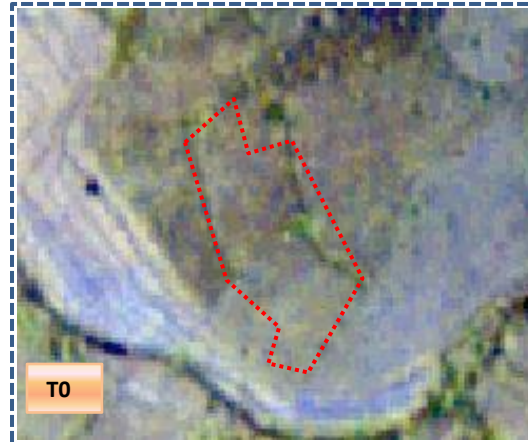


T0: 2013-14 (82°29'38.729"E 18°22'39.868"N)



T1: 10 January 2017

Scrub to Agriculture



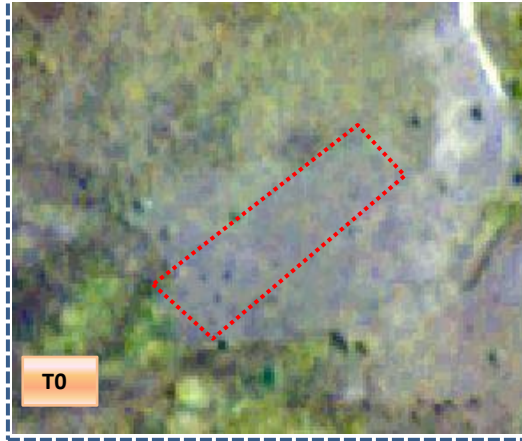
T0: 2013-14 (82°27'50.389"E 18°23'53.068"N)



T1: 10 January 2017

Fig 12. Barada Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Forest to Agriculture



T0: 2013-14 (82°28'56.681"E 18°23'18.032"N)

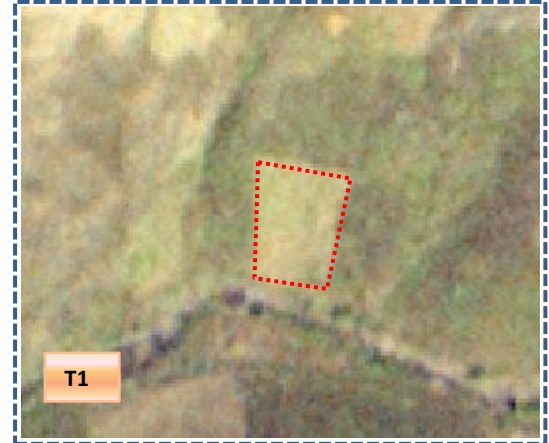


T1: 10 January 2017

Forest to Agriculture



T0: 2013-14 (82°27'41.767"E 18°23'24.93"N)



T1: 10 January 2017

Table 4. showing change matrix depicting Land cover transitions for Barada Watershed (IWMP-03/2013-14) during study period-2013-14 to 2017-18

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	36.7										36.7
Mining/dump											
Agriculture	1.79		1543.82	0.92					3.12	0.1	1549.75
Plantation Horticulture	0.25		9.91	25.25							35.41
Forest			156.32		1948.95			0.35			2105.62
Forest Plantation											
Barren Rocky											
Scrub			331.72					2482.21			2813.93
Waterbody- Streams/River									39.2		39.2
Waterbody – Ponds											
Grand Total	38.74		2041.77	26.17	1948.95			2482.56	42.32	0.1	6580.61

Interpretation:The example of “Agriculture” Land cover for the period 2013-14 to 2021-22

1. In matrix table diagonal elements represent the both periods in the same class and off diagonal elements represents the changes in between the classes.
2. In T0 5.9 ha of the agriculture area has decreased and it is converted into Built-up,(1.7 ha), plantation/horticulture (0.92 ha) and water body (3.13 ha) in T1.
3. In T1 498 ha of the agriculture area has increased from plantations/horticulture (9.9 ha), forest (156 ha) and scrubland (331 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Barada Watershed (IWMP-03/2013-14) during study period-2017-18 to 2018-19

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	38.74										38.74
Mining/dump											
Agriculture			2036.3					5.35		0.12	2041.77
Plantation Horticulture				26.17							26.17
Forest			50.91		1898.04						1948.95
Forest Plantation											
Barren Rocky											
Scrub			60.31					2422.25			2482.56
Waterbody- Streams/River									42.32		42.32
Waterbody – Ponds										0.1	0.1
Grand Total	38.74		2147.52	26.17	1898.04			2427.6	42.32	0.22	6580.61

4. In T1 5.4 ha of the agriculture area has decreased and it is converted into scrub (5.3 ha) and water body (0.12 ha) in T2.

5. In T2 111 ha of the agriculture area has increased from forest (50.9 ha) and scrubland (60.3 ha) of T1.

**Table 6. showing change matrix depicting Land cover transitions for Barada Watershed (IWMP-03/2013-14)
during study period-2018-19 to 2019-20**

Land cover	Monitoring period (T3)									Units in Hectares	
		Mining/ dump		Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	
T2	Built up		Agriculture								Grand Total
Built up	38.74										38.74
Mining/dump											
Agriculture	0.34		2146.53							0.65	2147.52
Plantation Horticulture				26.17							26.17
Forest			46.67		1851.07					0.3	1898.04
Forest Plantation											
Barren Rocky											
Scrub			95.91					2331.21		0.48	2427.6
Waterbody- Streams/River									42.32		42.32
Waterbody – Ponds										0.22	0.22
Grand Total	39.08		2289.11	26.17	1851.07			2331.21	42.32	1.65	6580.61

6. In T2 0.99 ha of the agriculture area has decreased and it is converted into Built-up (0.34 ha) and water body (0.65 ha) in T3.

7. In T3 142.5 ha of the agriculture area has increased from forest (46.6 ha) and scrubland (95.9 ha) of T2.

**Table 7. showing change matrix depicting Land cover transitions for Barada Watershed (IWMP-03/2013-14)
during study period-2019-20 to 2020-21**

Land cover	Monitoring period (T4)										Units in Hectares
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total
T3	Built up										
Built up	39.08										39.08
Mining/dump											
Agriculture			2288.7							0.41	2289.11
Plantation Horticulture			0.68	25.49							26.17
Forest			54.69		1796.38						1851.07
Forest Plantation											
Barren Rocky											
Scrub			116.67					2214.02		0.52	2331.21
Waterbody- Streams/River									42.32		42.32
Waterbody – Ponds										1.65	1.65
Grand Total	39.08		2460.74	25.49	1796.38			2214.02	42.32	2.58	6580.61

8. In T3 0.4 ha of the agriculture area has decreased and it is converted into water body (0.41 ha) in T4.

9. In T4 172 ha of the agriculture area has increased from plantations/horticulture (0.68 ha), forest (54.6 ha) and scrubland (116.6 ha) of T3.

**Table 8. showing change matrix depicting Land cover transitions for Barada Watershed (IWMP-03/2013-14)
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	39.08										39.08
Mining/dump											
Agriculture	1.05		2459.05	0.21						0.43	2460.74
Plantation Horticulture			0.94	24.55							25.49
Forest			30.12		1766.26						1796.38
Forest Plantation											
Barren Rocky											
Scrub	0.84		59.36					2153.75		0.07	2214.02
Waterbody- Streams/River									42.32		42.32
Waterbody – Ponds										2.58	2.58
Grand Total	40.97		2549.47	24.76	1766.26			2153.75	42.32	3.08	6580.61

10. In T4 1.6 ha of the agriculture area has decreased and it is converted into built-up (1 ha), plantations/horticulture (0.21 ha) and water body (0.43 ha) in T5.

11. In T5 90.4 ha of the agriculture area has increased from plantations/horticulture (0.94 ha), forest (30.12 ha) and scrubland (59.3 ha) of T4.

Conclusion

1. The Land Use/Land Cover 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.
2. There is an increase of 6.20 Hectares in Reservoir / Tanks area as compared between baseline
3. Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 492, 105, 141, 171 & 88 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 999 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
5. There is a decrease of 660 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
6. Farm ponds (0) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (0) verified from the portal.

Abbreviations

- IWMP -Integrated Watershed Management Programme
- LU/LC-Land Use/Land Cover
- DRISHTI- a mobile based android application
- SHRISTI- a web GIS interface on Bhuvan
- LISS – Linear Image Self Scanner
- PAN - Panchromatic Image
- FCC – False Colour Composite
- NCC – Natural Colour Composite
- NRSC – National Remote Sensing Centre
- DoLR – Department of Land Records