

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

VISAKHAPATNAM -02/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

March-2023

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



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DIVISION
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Applications Centre (APSAC)
ITE&C Department Govt. of
Andhra Pradesh



RURAL DEVELOPMENT AND
WATERSHED MONITORING
DIVISION
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Remote Sensing Application Area,
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DEPARTMENT OF LAND
RESOURCES
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-02/2013-14, Visakhapatnam District of Andhra Pradesh. The total geographical area of the project is 5,316 ha. It comprises of 33 micro watersheds.
4. In the project area 7 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
5. Water bodies have shown an increased by 8.9 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. 31.7 % is covered by the agriculture, 1.6 % is covered by plantation/horticulture, 64 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : GEMMILI - IWMP-02/2013-14

DISTRICT : VISAKHAPATNAM , STATE : ANDHRA PRADESH

- The study area falls in G Madugula Mandal of Visakhapatnam district of Andhra Pradesh state. The total geographical area of the project is 5,316 ha. It comprises of 33 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.

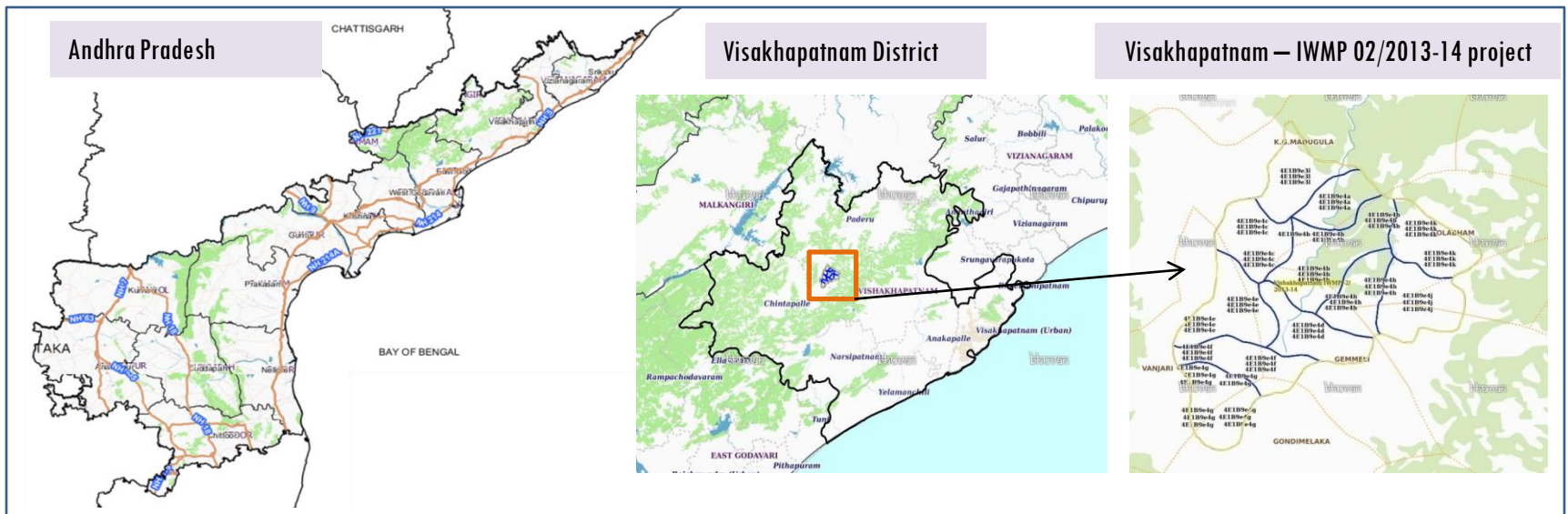


Fig.1. Location map of Gemmili Watershed (IWMP-02/2013-14) in Visakhapatnam, A.P

- 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.

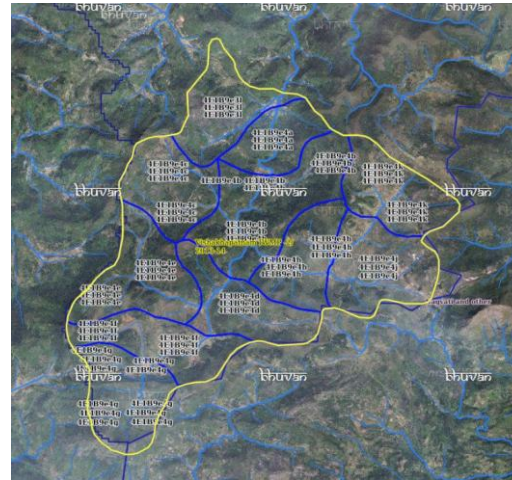
Table I. Satellite Data and Ancillary Data

Satellite data*	T0-A**	T0-B**	T5
	2013-14	2016-17	2021-22
LISS IV	2013-14		
SCENE 1			27-Jan-22
SCENE2			
SCENE 3			
SCENE 4			
CARTO	2013-14		
SCENE 1			27-Jan-22
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	7
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



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	7	7
	TOTAL	7	7

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. Gemmili Watershed (IWMP-02/2013-14) Natural Colour Composite (NCC)

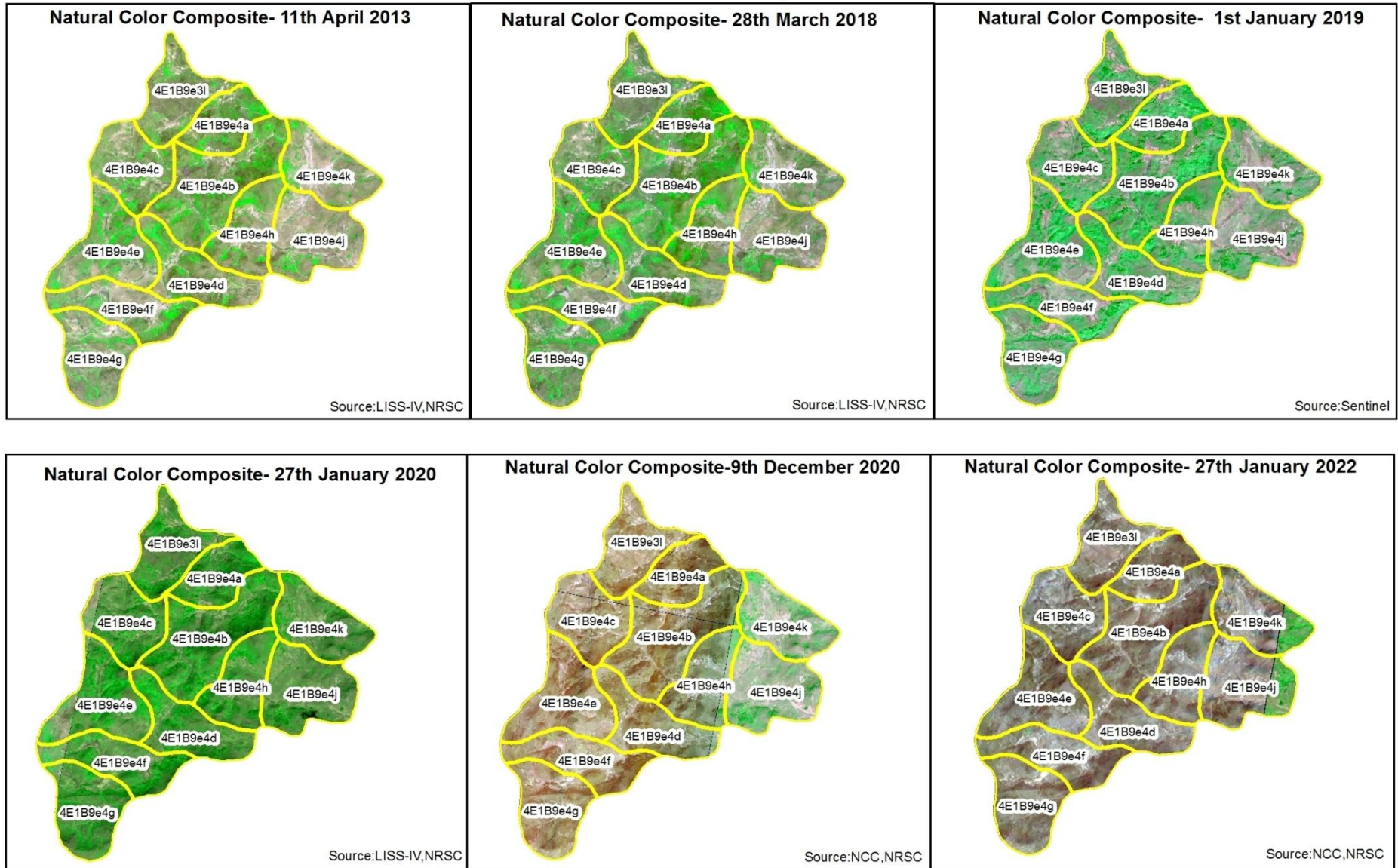


Fig 5. Monitoring of activities in Gemmili Watershed (IWMP-02/2013-14) Visakhapatnam District Andhra Pradesh



T0:2013-14



T1: 23 February 2018



Drishti SI no. 1684980 MWS : 4E1B9e4d

Afforestation



T0:2013-14



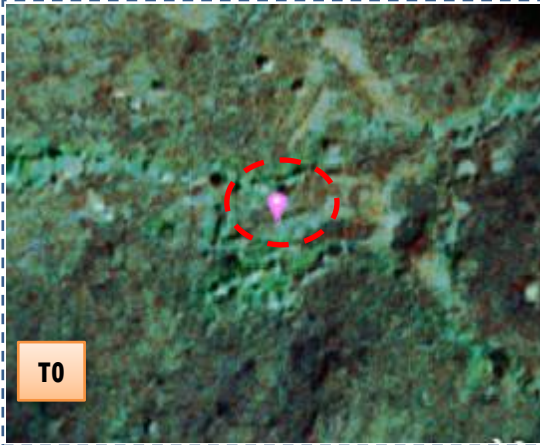
T1: 23 February 2018



Drishti SI no. 1685009 MWS : 4E1B9e4j

Entry point activity

Fig 6. Monitoring of activities in Gemmili Watershed (IWMP-02/2013-14) Visakhapatnam District Andhra Pradesh



T0

T0: 2013-14



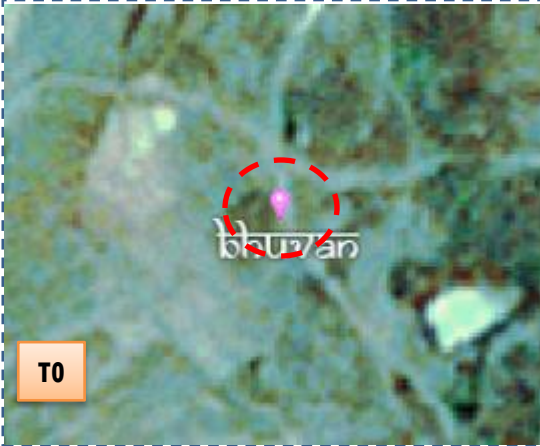
T1

T1: 23 February 2018



Drishti SI no. 1674768 MWS : 4E1B9e4g

Farm pond



T0

T0: 2013-14



T1

T1: 23 February 2018



Drishti SI no. 1695677 MWS : 4E1B9e4k

Farm pond

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 7. Gemmili Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000

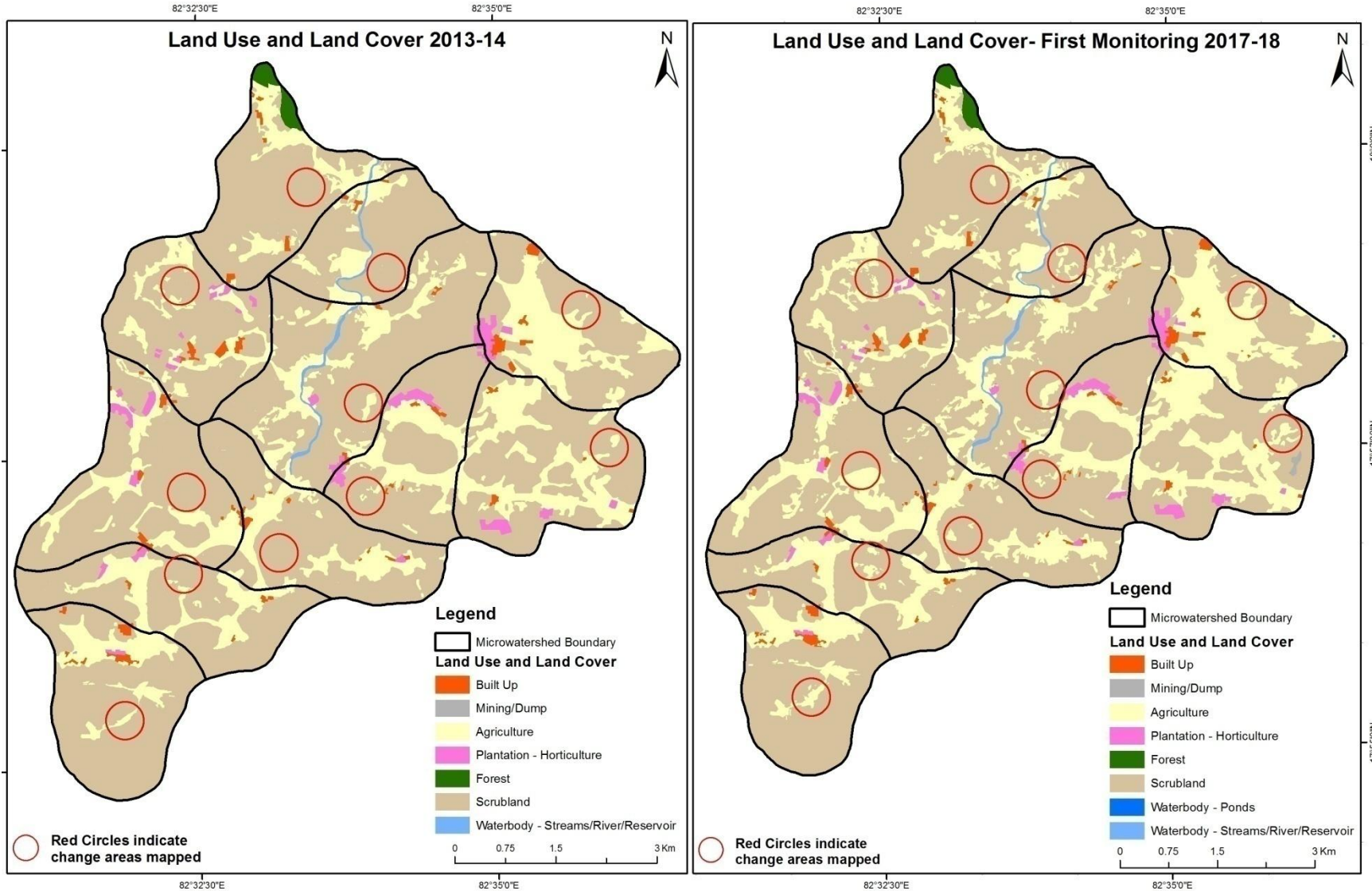


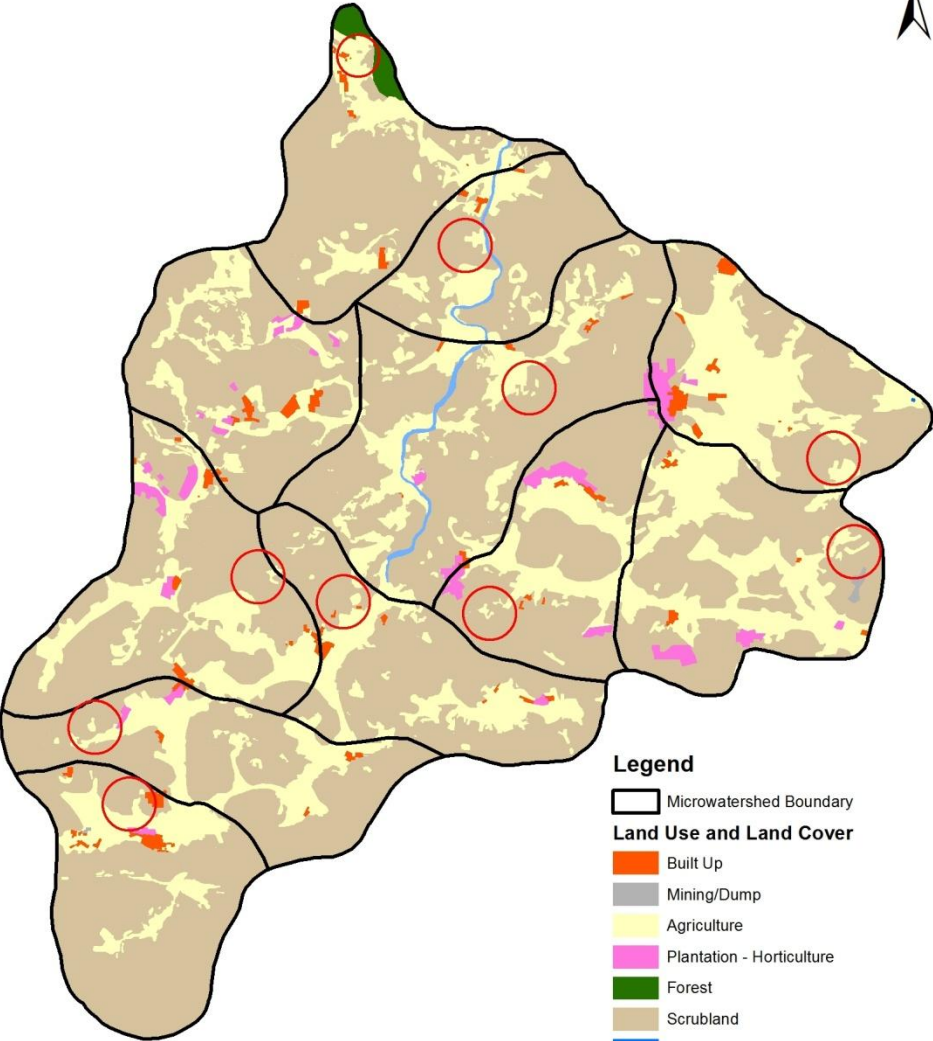
Fig 8. Gemmili Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000

82°32'30"E

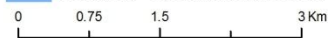
82°35'0"E

Land Use and Land Cover 2017-18



Legend

- Microwatershed Boundary
- Land Use and Land Cover**
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir



Red Circles indicate change areas mapped

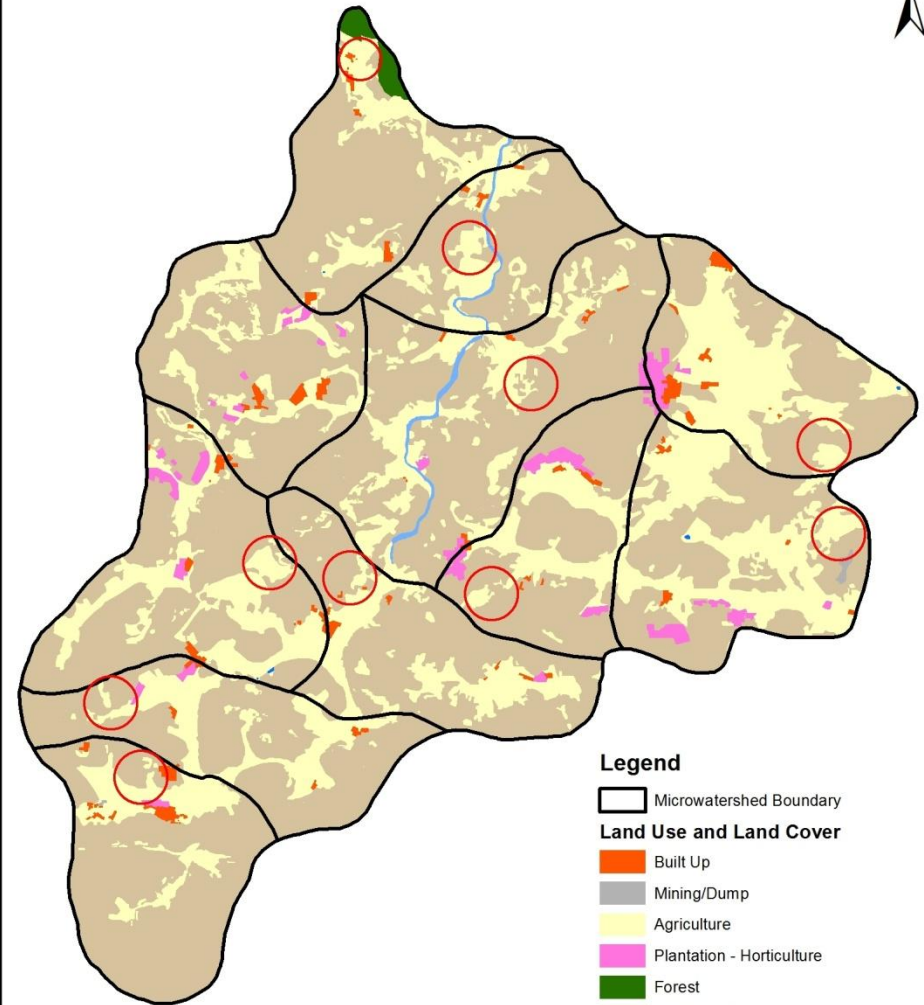
82°32'30"E

82°35'0"E

82°32'30"E

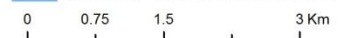
82°35'0"E

Land Use and Land Cover- Second Monitoring 2018-19



Legend

- Microwatershed Boundary
- Land Use and Land Cover**
- Built Up
- Mining/Dump
- Agriculture
- Plantation - Horticulture
- Forest
- Scrubland
- Waterbody - Ponds
- Waterbody - Streams/River/Reservoir



Red Circles indicate change areas mapped

82°32'30"E

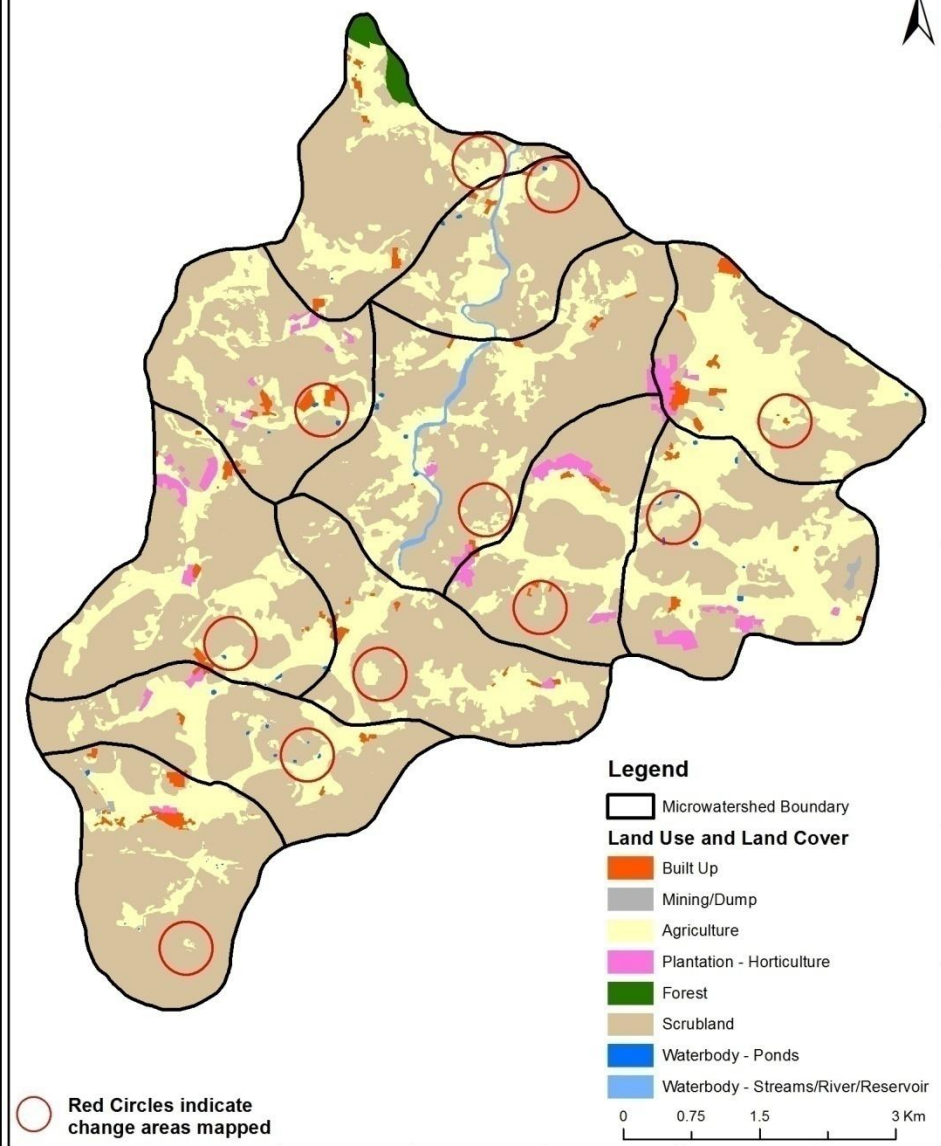
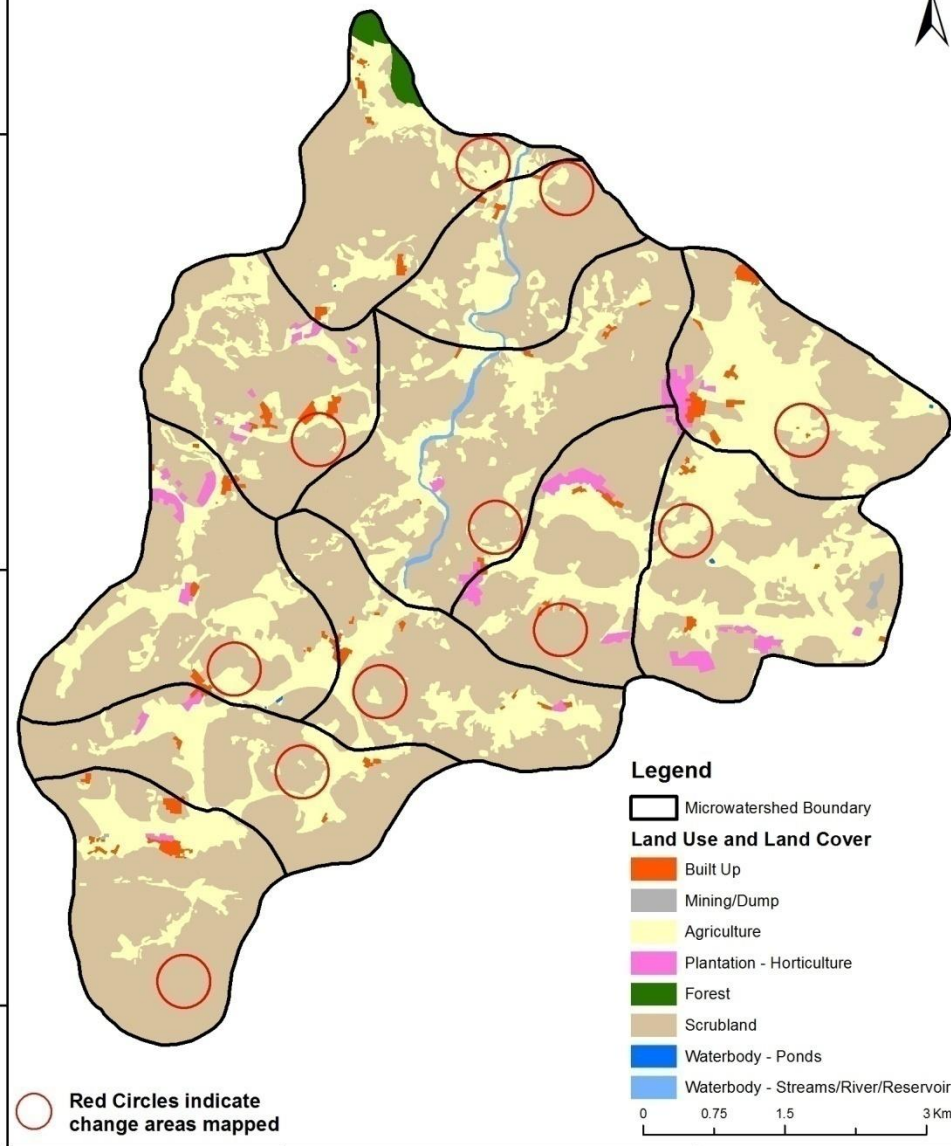
82°35'0"E

Fig 9. Gemmili Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000

Land Use and Land Cover 2018-19

Land Use and Land Cover- Third Monitoring 2019-20



82°32'30"E

82°35'0"E

82°32'30"E

82°35'0"E

Fig 10. Gemmili Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000

Land Use and Land Cover 2019-20

Land Use and Land Cover- Fourth Monitoring 2020-21

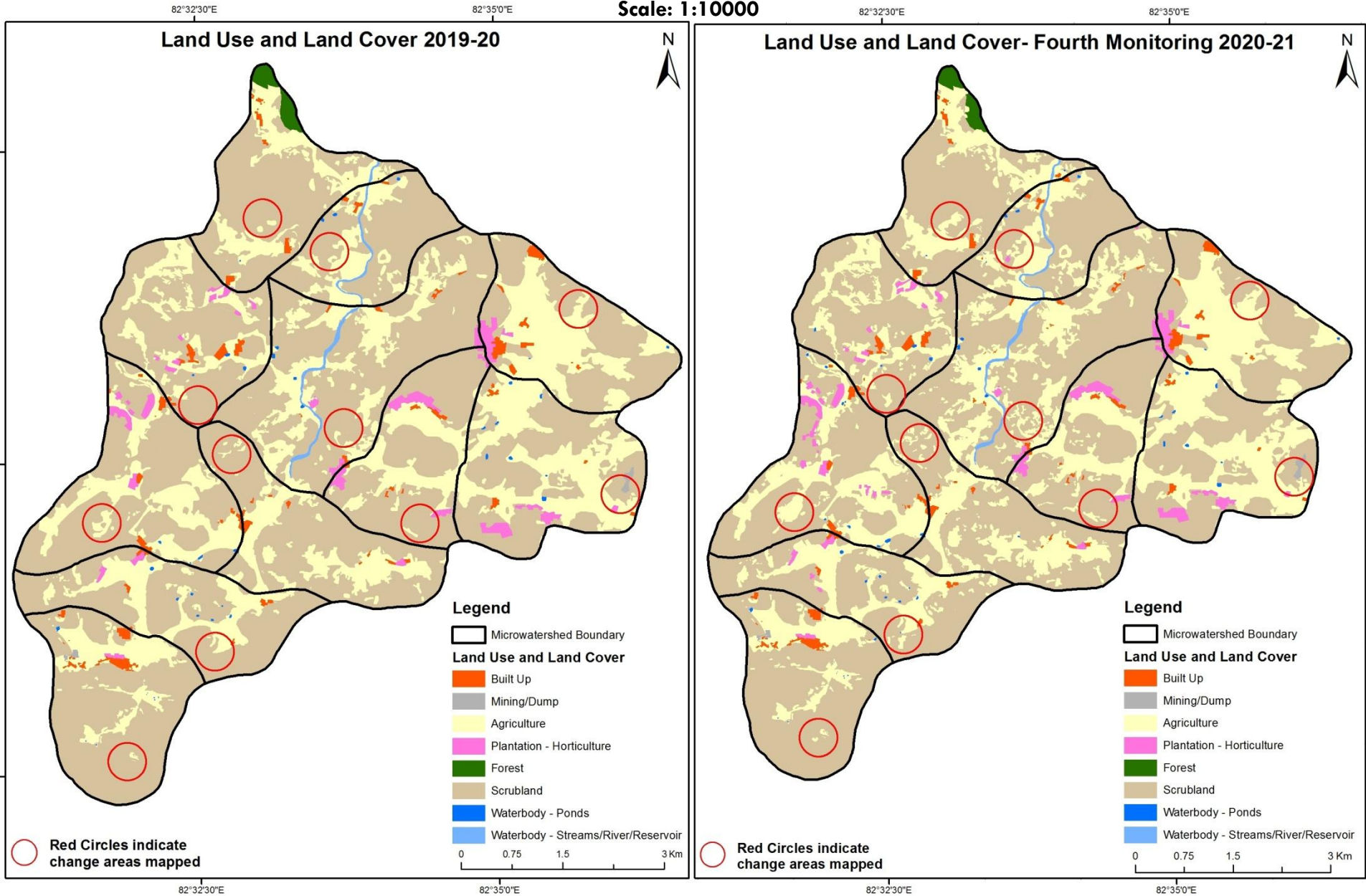


Fig 11. Gemmili Watershed (IWMP-02/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020 -21 to 2021-22)

Scale: 1:10000

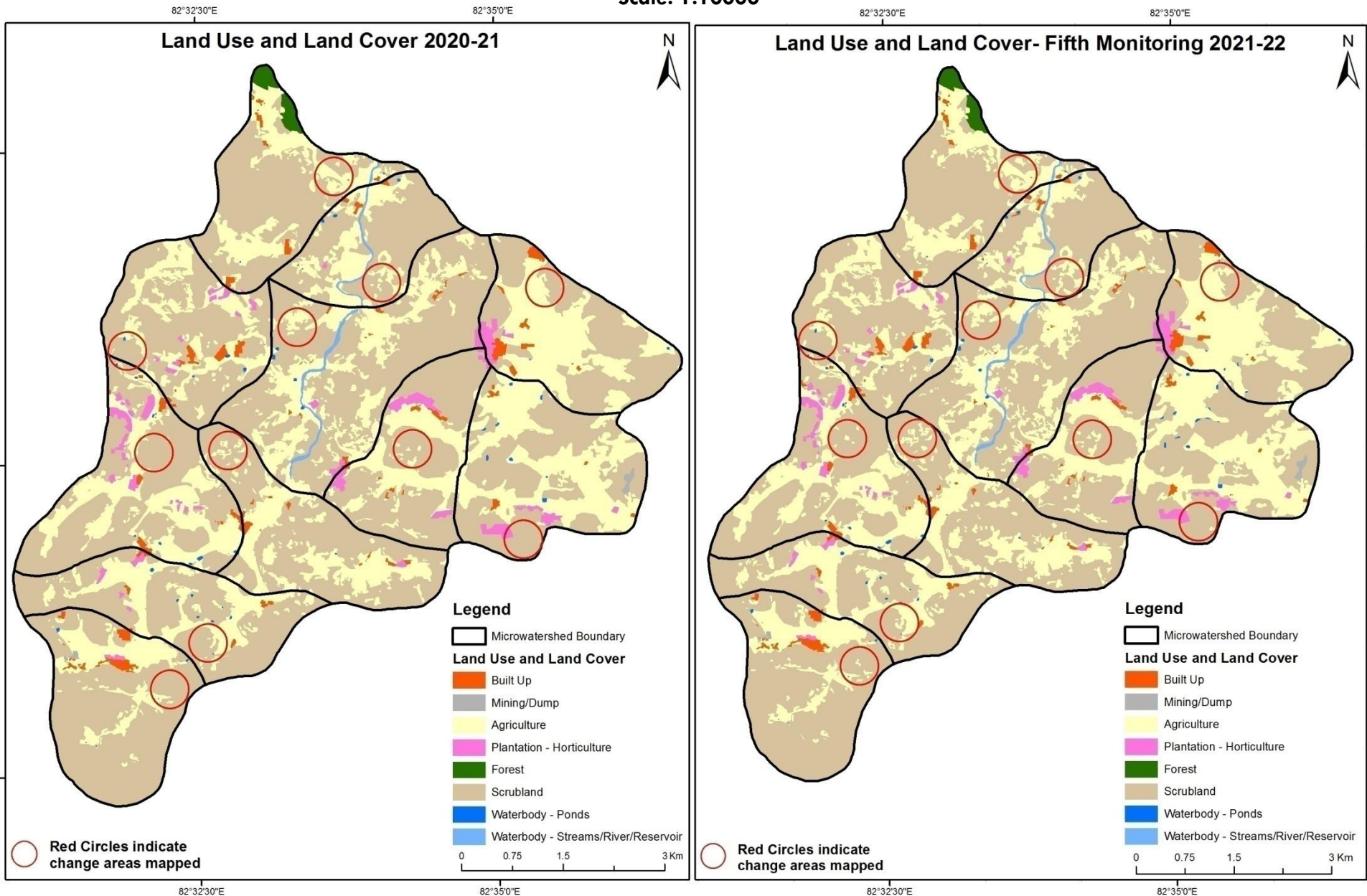
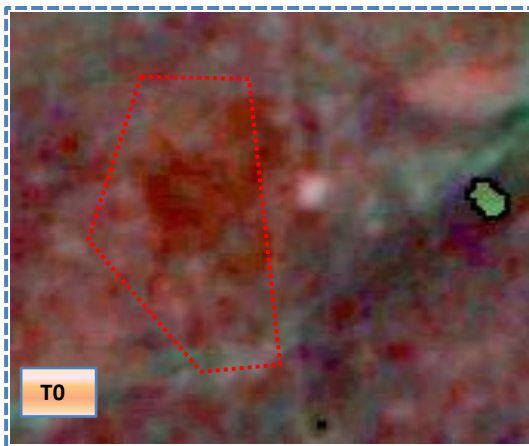
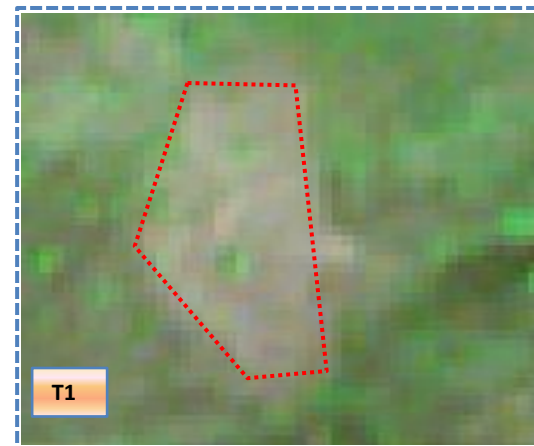


Fig 12. Gemmili Watershed (IWMP-02/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

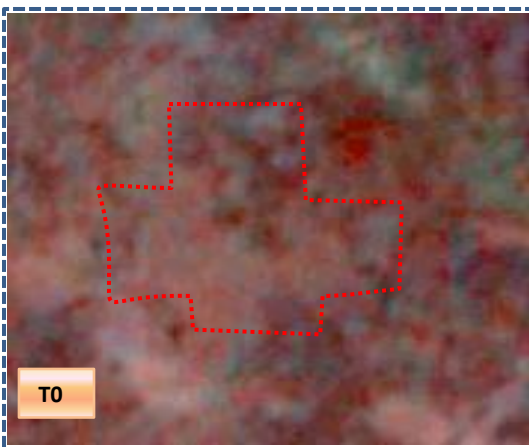


T0: 2013-14 (82°33'28.355"E 17°59'43.657"N)

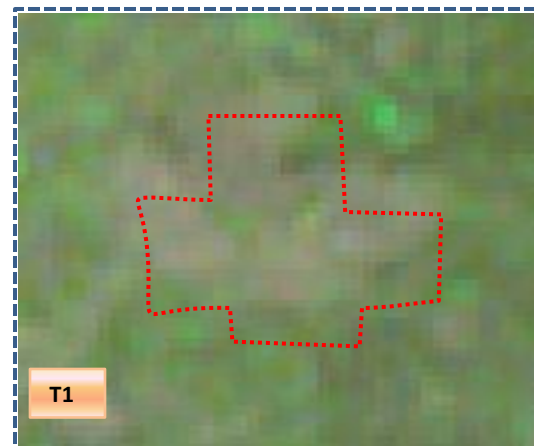


T1: 20 March 2018

Scrub to Agriculture



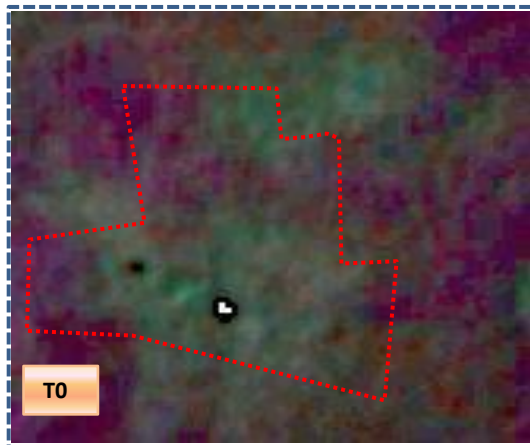
T0: 2013-14 (82°33'7.304"E 17°59'25.439"N)



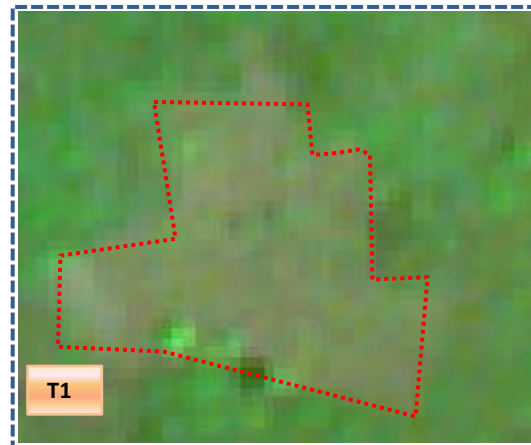
T1: 20 March 2018

Fig 13. Gemmili Watershed (IWMP-02/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Agriculture

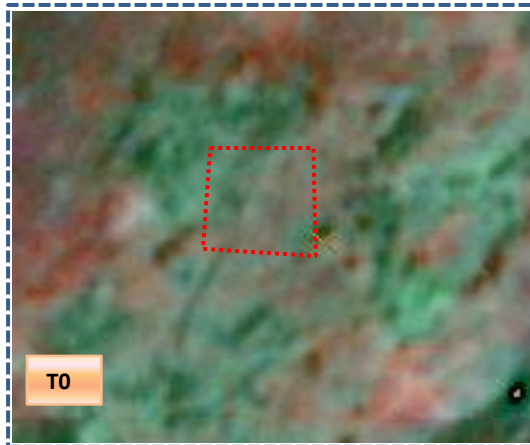


T0: 2013-14 (82°33'4.607"E 17°56'45.71"N)

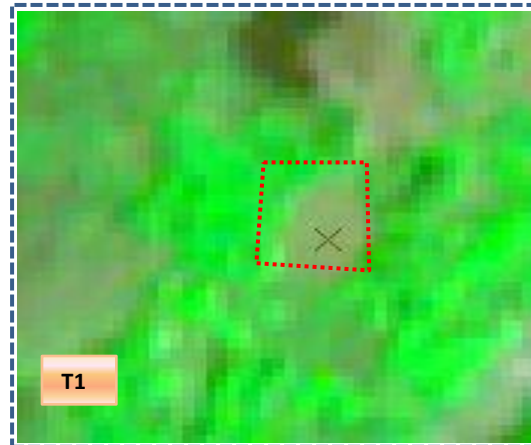


T1: 20 March 2018

Scrub to Agriculture



T0: 2013-14 (82°31'58.16"E 17°57'4.904"N)



T1: 20 March 2018

Table 4. showing change matrix depicting Land cover transitions for Gemmili Watershed (IWMP-02/2013-14) 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		
Built up	59.81												b
Mining/dump		0.22											0.22
Agriculture	1.95	0.18	1163.76	2.62				4.07			0.16		1172.74
Plantation Horticulture	0.52		2.37	72.97									75.86
Forest					21.97								21.97
Forest Plantation													
Barren Rocky													
Scrub	1.74	3.25	210.68	1.7				3747.2					3964.57
Waterbody- Streams/River									21.78				21.78
Waterbody – Ponds													
Grand Total	64.02	3.65	1376.81	77.29	21.97			3751.27	21.78		0.16		5316.95

Interpretation: The example of “Agriculture” Land cover for the period 2013-14 to 2017-18

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 8.9 ha of the agriculture area has decreased and it is converted into Built-up (1.9 ha), mining/dump (0.18 ha), plantation/horticulture (2.6 ha), scrubland (4 ha) and water body (0.16 ha) in T1.
3. In T1 213 ha of the agriculture area has increased from plantations/horticulture (2.3 ha) and scrubland (210 ha) of T0.

Table 5. showing change matrix depicting Land cover transitions for Gemmili Watershed (IWMP-02/2013-14) 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		
T1													
Built up	64.02												64.02
Mining/dump		3.65											3.65
Agriculture	0.76		1375.46								0.59		1376.81
Plantation Horticulture				77.29									77.29
Forest					21.97								21.97
Forest Plantation													
Barren Rocky													
Scrub			78.5	1.99				3670.78					3751.27
Waterbody- Streams/River									21.78				21.78
Waterbody – Ponds											0.16		0.16
Grand Total	64.78	3.65	1453.96	79.28	21.97			3670.78	21.78		0.75		5316.95

- In T1 1.3 ha of the agriculture area has decreased and it is converted into Built-up (0.7 ha) and water body (0.5 ha) in T2
- In T2 78.5 ha of the agriculture area has increased from scrubland (78 ha) of T1.

Table 6. showing change matrix depicting Land cover transitions for Gemmili Watershed (IWMP-02/2013-14) 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		
Built up	64.4	0.38											64.78
Mining/dump		3.65											3.65
Agriculture	1.59	0.67	1448.02								3.68		1453.96
Plantation Horticulture				79.28									79.28
Forest					21.97								21.97
Forest Plantation													
Barren Rocky													
Scrub	0.09	0.08	58.17					3610.27			2.17		3670.78
Waterbody- Streams/River									21.78				21.78
Waterbody – Ponds											0.75		0.75
Grand Total	66.08	4.78	1506.19	79.28	21.97			3610.27	21.78		6.6		5316.95

- In T2 5.2 ha of the agriculture area has decreased and it is converted into Built-up (1.5 ha) and water body (3.6 ha) in T3.
- In T3 58 ha of the agriculture area has increased from Built-up (0.3 ha), mining/dump (3.6 ha) and scrubland (0.08 ha) of T2.

Table 7. showing change matrix depicting Land cover transitions for Gemmili Watershed (IWMP-02/2013-14) 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	66.08										66.08
Mining/dump		4.78									4.78
Agriculture	3.51	0.17	1499.56	1.82						1.13	1506.19
Plantation Horticulture			0.48	78.8							79.28
Forest			0.98		20.99						21.97
Forest Plantation											
Barren Rocky											
Scrub	0.29		150.26	7.36				3452.12		0.24	3610.27
Waterbody-Streams/River										6.6	6.6
Waterbody – Ponds									21.78		21.78
Grand Total	69.88	4.95	1651.28	87.98	20.99			3452.12	21.78	7.97	5316.95

•In T3 6.4 ha of the agriculture area has decreased and it is converted into built-up (3.5 ha), mining/dump (0.17 ha), plantations/horticulture (1.8 ha) and water body (1.1 ha) in T4.

•In T4 151 ha of the agriculture area has increased from plantations/horticulture (0.4 ha), forest (0.9 ha) scrubland (150 ha) of T3.

Table 8. showing change matrix depicting Land cover transitions for Gemmili Watershed (IWMP-02/2013-14) during study period-2020-21 to 2021-22

Land cover	Monitoring period (T5)										Units in Hectares	
	Built up	Mining/ dump	Agriculture	Plantation Horticulture	Forest	Forest Plantation	Barren Rocky	Scrub	Waterbody- Streams/River	Water body Ponds	Grand Total	
Built up	69.88										69.88	
Mining/dump		4.95									4.95	
Agriculture	1.41		1645.07					4.2		0.6	1651.28	
Plantation Horticulture	0.24			87.74							87.98	
Forest					20.99						20.99	
Forest Plantation												
Barren Rocky												
Scrub	0.89		44.05					3406.82		0.36	3452.12	
Waterbody- Streams/River									21.78		21.78	
Waterbody – Ponds										7.97	7.97	
Grand Total	72.42	4.95	1689.12	87.74	20.99			3411.02	21.78	8.93	5316.95	

•In T4 6.2 ha of the agriculture area has decreased and it is converted into built-up (1.4 ha), scrubland (4.2 ha) and water body (0.6 ha) in T5.

•In T5 44 ha of the agriculture area has increased from scrubland (44 ha) of T4.

Conclusion

1. DPR of the project is uploaded on to Bhuvan Portal.
2. The Land Use/Land Covershow 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 8.9 Hectares in Reservoir / Tanks area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. There is an increase of 204, 77, 52, 145 & 37 Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 516 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2012-13 (T0) & 2021-22 (T5) years.
5. About **11 ha of the plantation/horticulture area has been increased** in during the monitoring period of 2012-13 (T0) to 2021-22 (T5) years.
6. There is a decrease of 553 Hectares in Scrubland area as compared between 2012-13 (T0) & 2021-22 (T5) years.
7. Farm ponds (09) is visible on IWMP (Integrated Watershed Management Programme) Bhuvan Srishti portal out of Bhuvan Drishti photo of Farm ponds (09) 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