

MONITORING OF IWMP WATERSHED PROJECTS USING GEO-INFORMATION

SUMMARY REPORT

IWMP-Batch-V

WEST GODAVARI -03/2013-14

Andhra Pradesh

Submitted to NRSC, Balanagar, Hyderabad

February-2023

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



AGRICULTURE & SOIL
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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

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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, West Godavari District of Andhra Pradesh. The total geographical area of the project is **20,797 ha**. It comprises of 35 micro watersheds.
4. In the project area 75 Drishti photos were uploaded showing check dams/Rock fill dam, livelihood activities, and remaining showing other activities.
5. Water bodies have shown an decreased by 43.00 ha , which correspond to the various water bodies that have been converted into other land use classes in this period.
6. Major percentage i.e. 29.41 % is covered by the agriculture, 43.03 % is covered by forest, 11.30 % is covered by scrubland and remaining by other land use classes.

STUDY AREA

PROJECT : ALIVERU WATERSHED - IWMP-03/2013-14 DISTRICT : WEST GODAVARI , STATE : ANDHRA PRADESH

- The study area falls in Buttayagudem Mandal of West Godavari district of Andhra Pradesh state. The total geographical area of the project is **20,797 ha**. It comprises of 35 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.

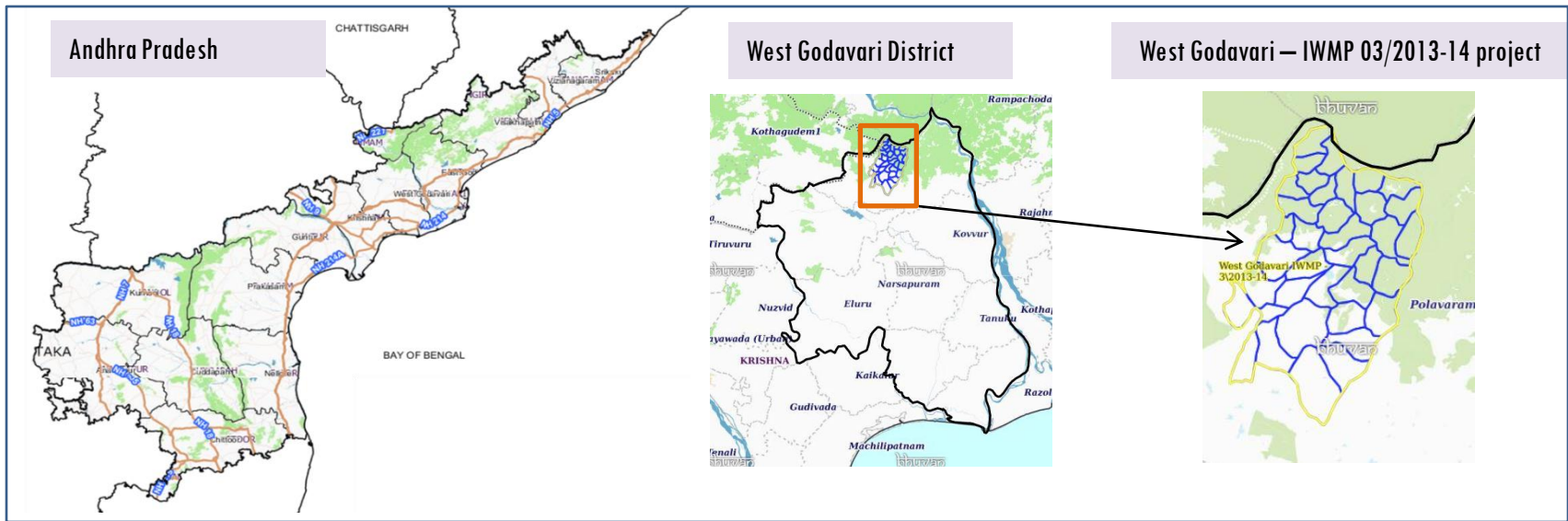


Fig.1. Location map of Aliveru Watershed (IWMP-03/2013-14) in West Godavari, A.P

- The region has a tropical climate similar to the rest of the Coastal Andhra region. The summers (March–June) are very hot and dry while the winters are fairly pleasant. The temperatures in the summers often rise over 50 degrees during the day. The rainy season (July–December).
- Mean rainfall receive over these district IS around 125-150 mm in June, 170-230 mm in July, 190-235 mm in August and 160-205 mm in September. The SW monsoon mean rainfall values for these district ranging from 695 mm to 775 mm.

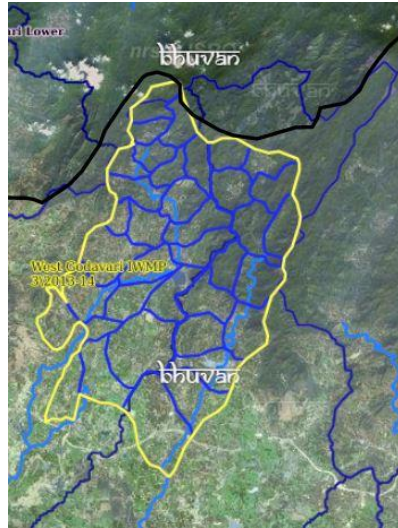
Table I. Satellite Data and Ancillary Data

| | | | |
|-----------------|---------|---------|-----------|
| Satellite data* | T0-A** | T0-B** | T5 |
| | 2013-14 | 2016-17 | 2021-22 |
| LISS IV | 2013-14 | | |
| SCENE 1 | | | 25-Dec-22 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |
| CARTO | 2013-14 | | |
| SCENE 1 | | | 25-Dec-22 |
| SCENE2 | | | |
| SCENE 3 | | | |
| SCENE 4 | | | |

Table2. 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 | Drishiti Photographs | | |
| | | Total | 75 |
| 4 | Detailed Project Report | | |

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



Legend




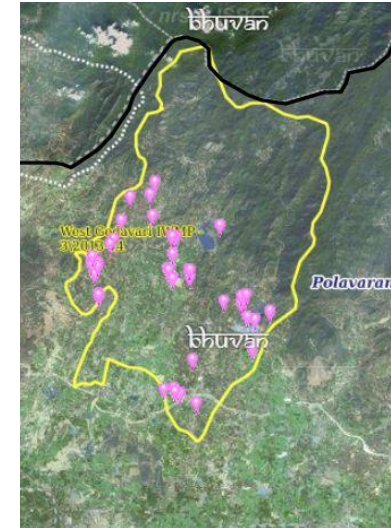
-  Drainage (1:10000 Scale)
-  MWS Boundary
-  Project Boundary

Fig 3. Natural Color Composite overlaid with Drishiti Points



Drishiti Upload Status

Table 3. Classification of the Activities

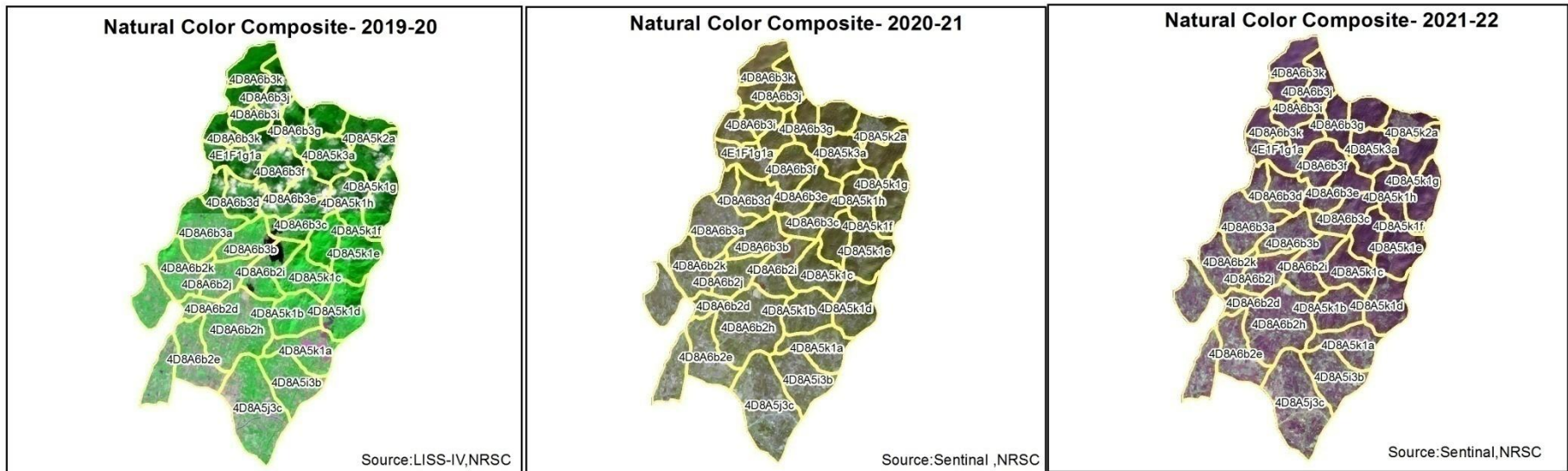
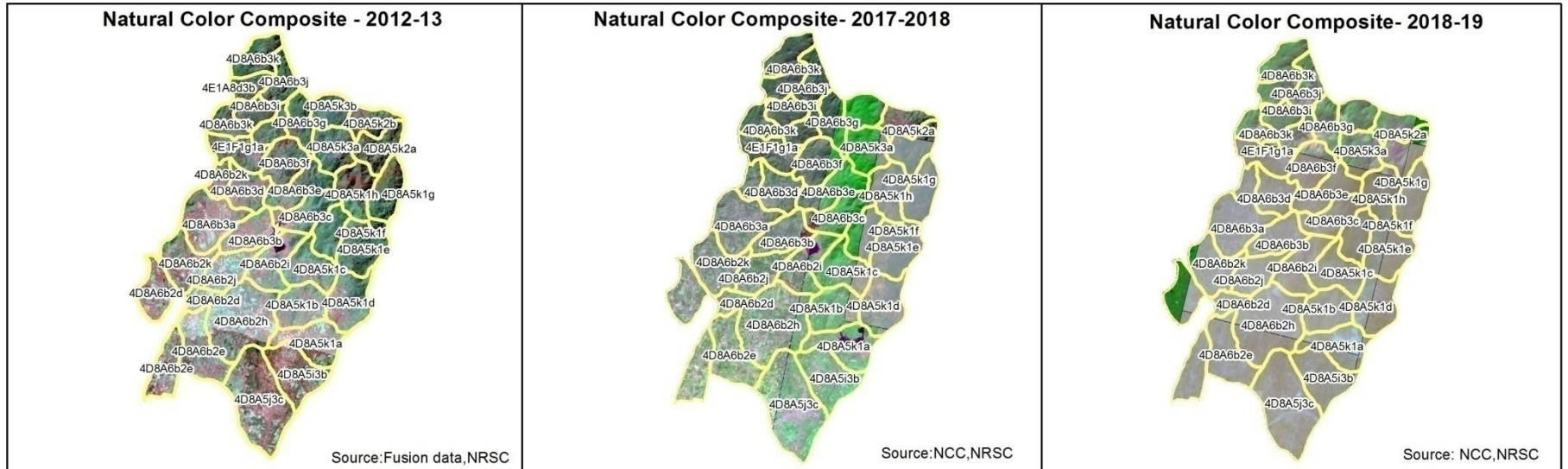
| Sr. No | Activity | Number of Photographs uploaded in Drishti Mobile Application | Visible on satellite Visible on satellite in Srishti Geoportal |
|---------------|---|---|---|
| 1 | Afforestation | 0 | 0 |
| 2 | Horticulture | 0 | 0 |
| 3 | Agriculture | 0 | 0 |
| 4 | Pasture | 0 | 0 |
| 5 | Trench | 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 | 8 | 8 |
| 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 | 47 | 46 |
| 18 | Others | 21 | 21 |
| | TOTAL | 76 | 75 |

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.

Aliveru Watershed (IWMP-03/2013-14) Natural Colour Composite (NCC)



Monitoring of activities in Aliveru Watershed (IWMP-03/2013-14), West Godavari District Andhra Pradesh



T0

T0:2013-14



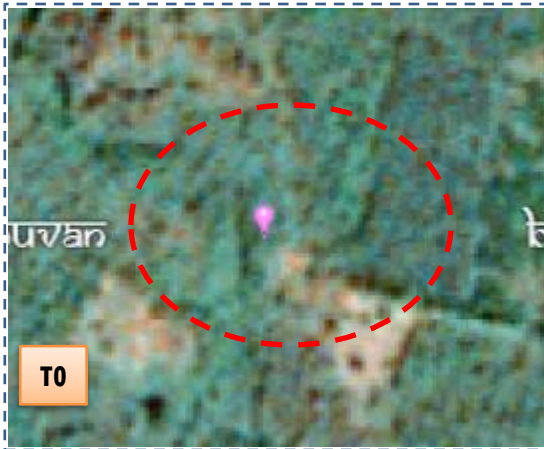
T1

T1: 10 April 2018



Drishti SI no. 2428810 MWS : 4D8A6b3a

Check dam



T0

T0:2013-14



T1

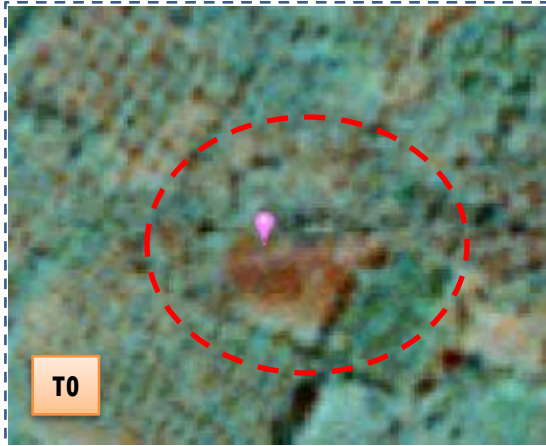
T1: 10 April 2018



Drishti SI no. 5053944 MWS : 4D8A6b2k

Check dam

Monitoring of activities in Aliveru Watershed (IWMP-03/2013-14), West Godavari District Andhra Pradesh



T0

T0:2013-14



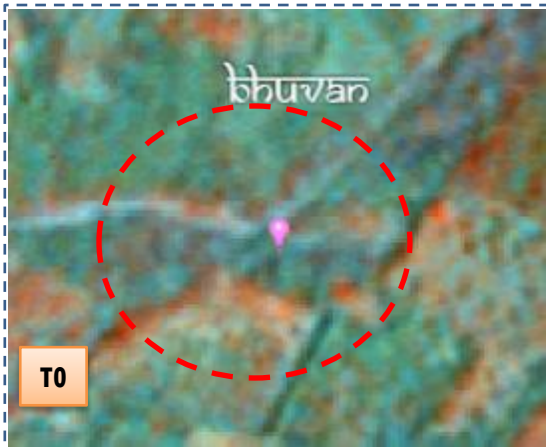
T1

T1: 10 April 2018



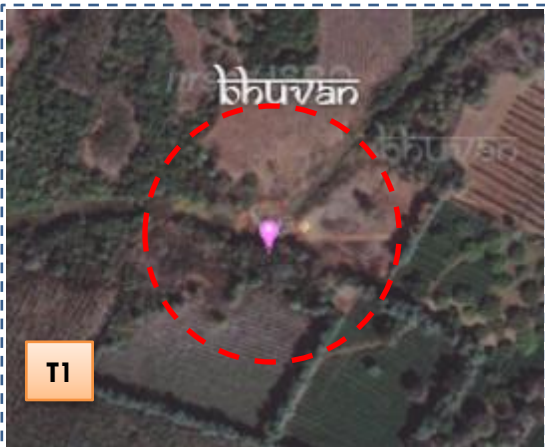
Drishti Sl no. 5053955 MWS : 4D8A6b3a

Check dam



T0

T0:2013-14



T1

T1: 10 April 2018



Drishti Sl no. 7012089 MWS : 4D8A5k1b

Check dam

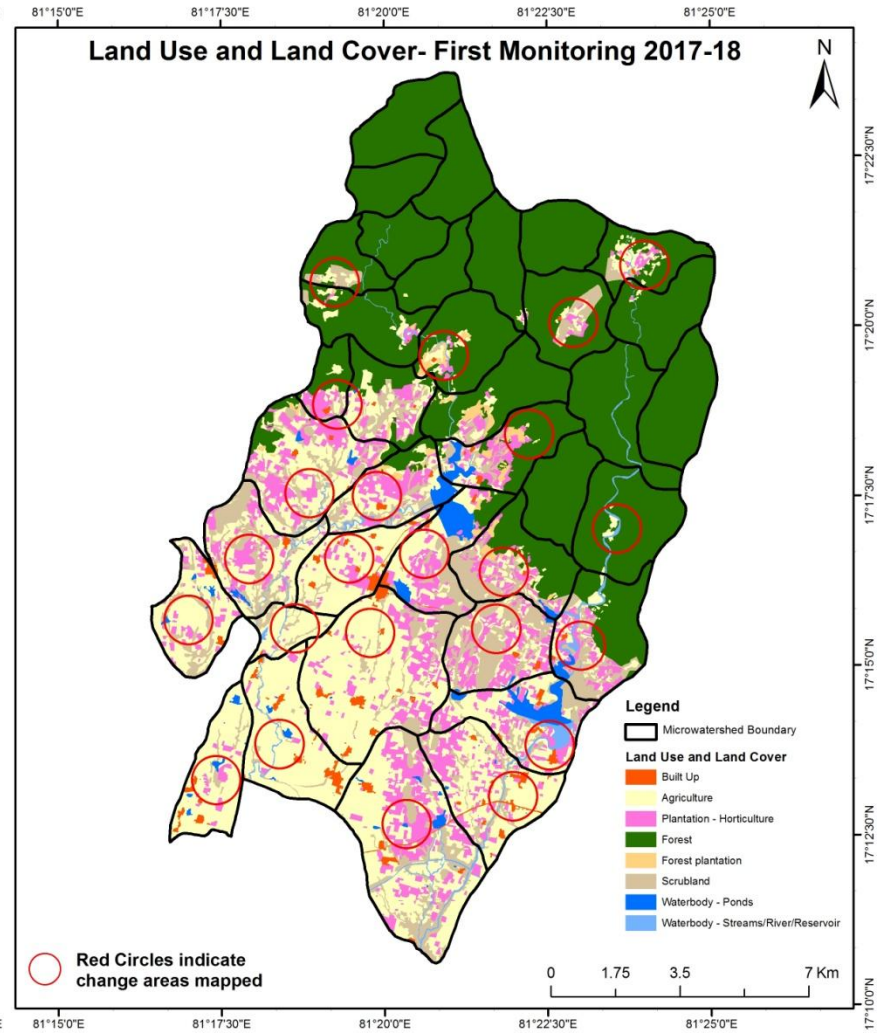
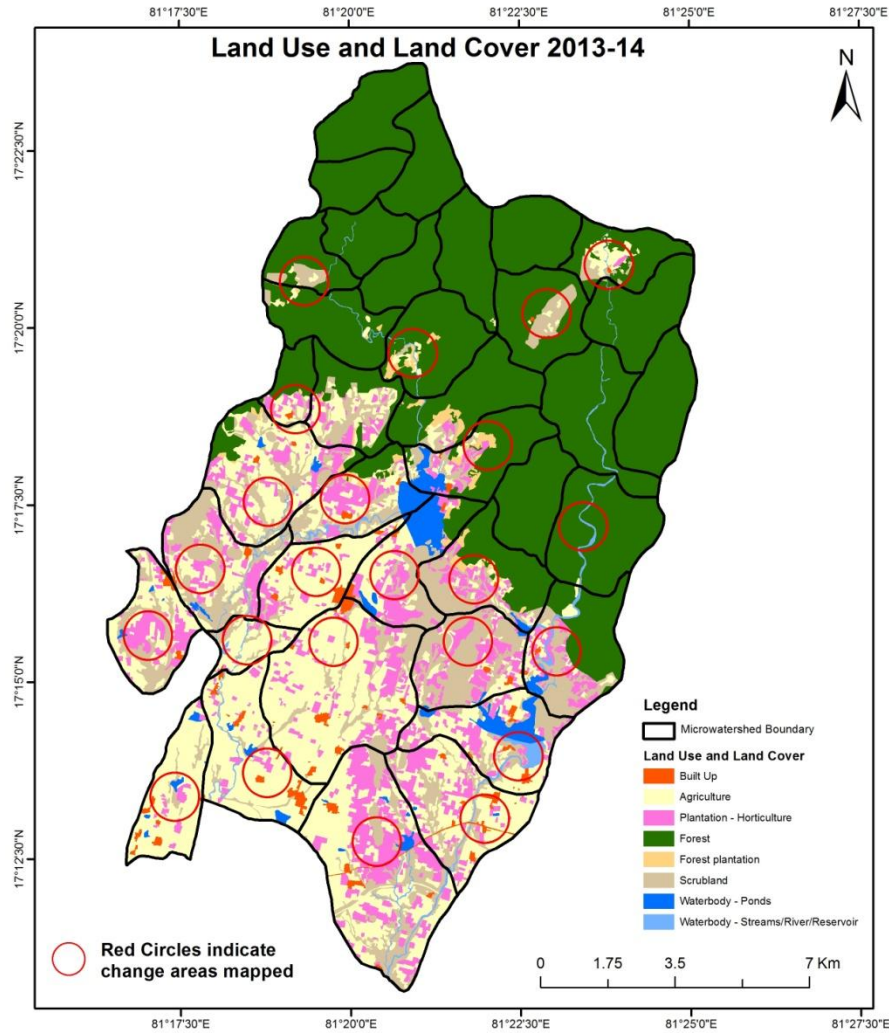
03. MONITORING IN THE PROJECT AREA

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)

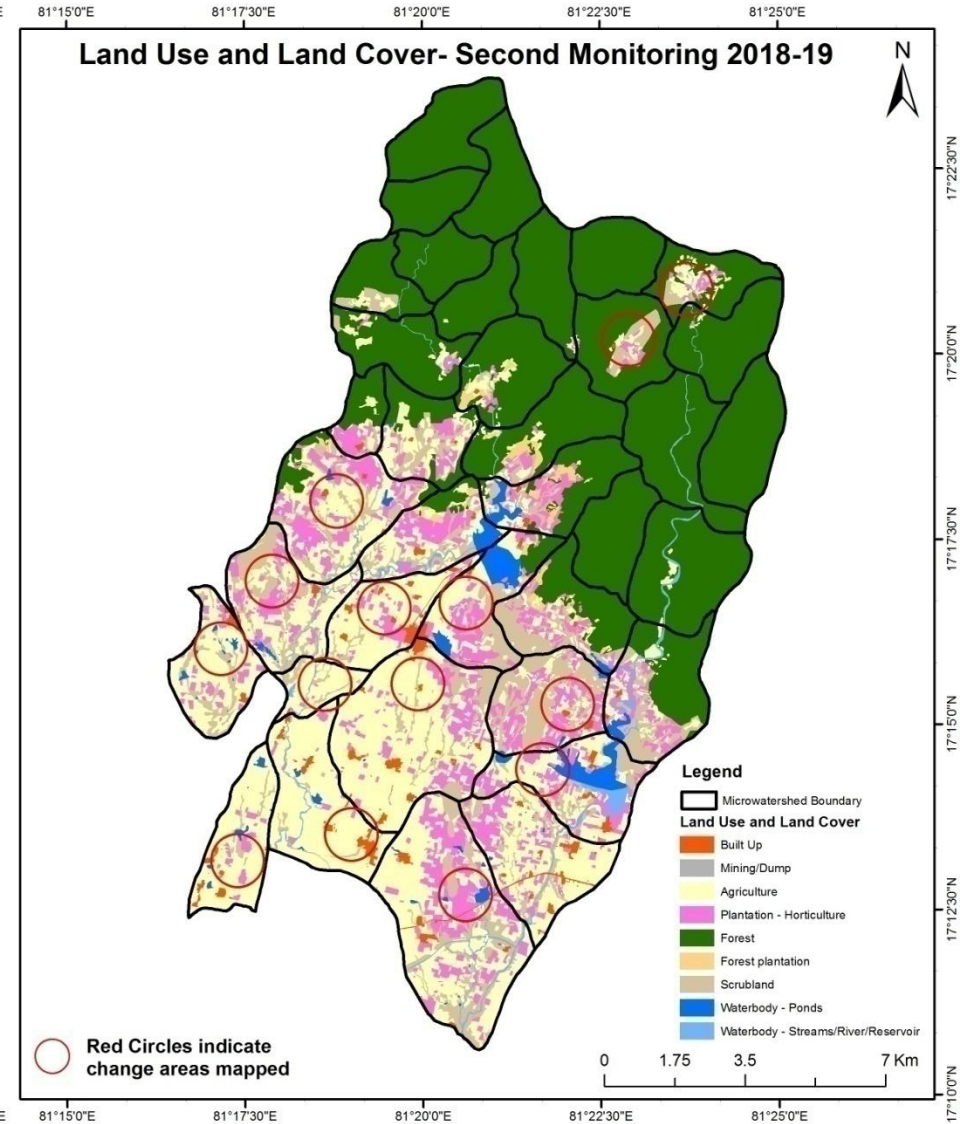
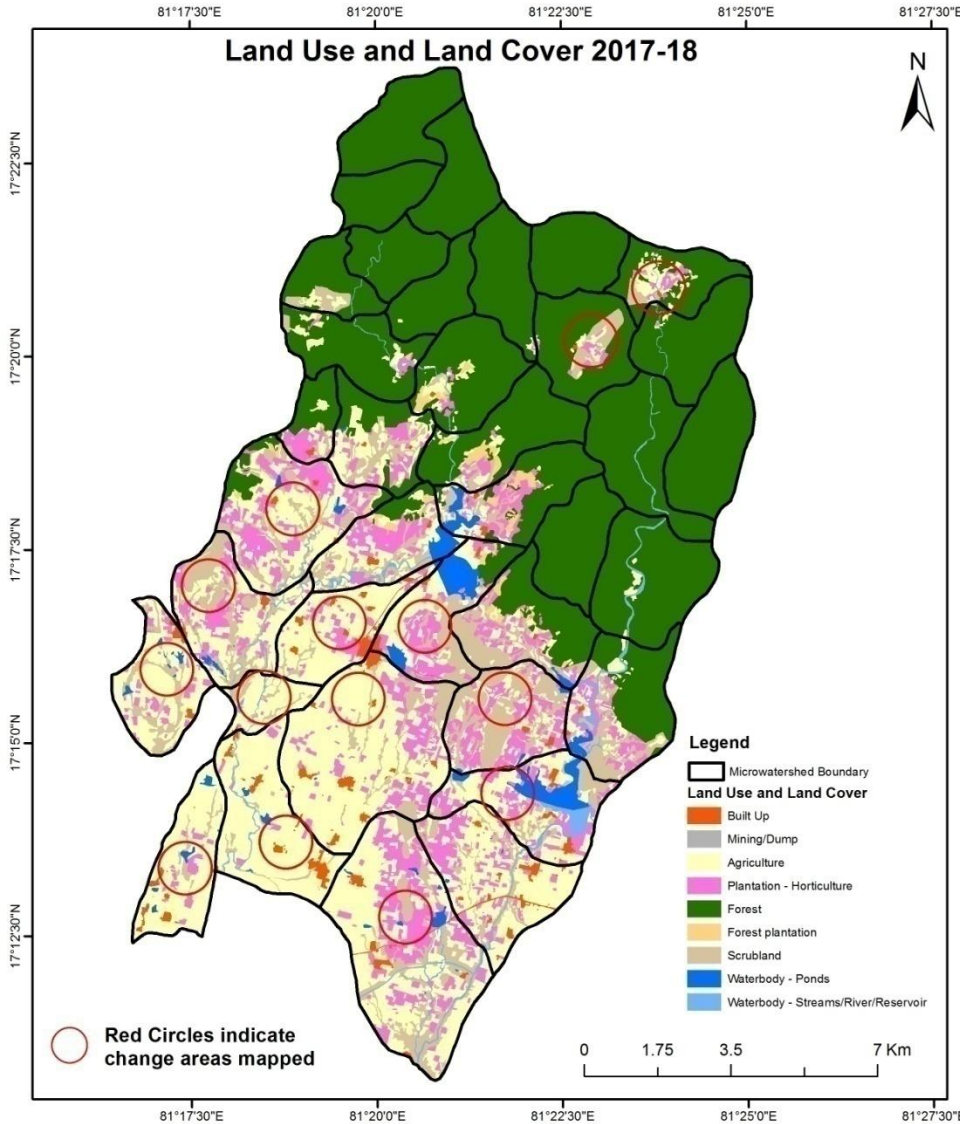
Aliveru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2013-14 to 2017-18)

Scale: 1:10000



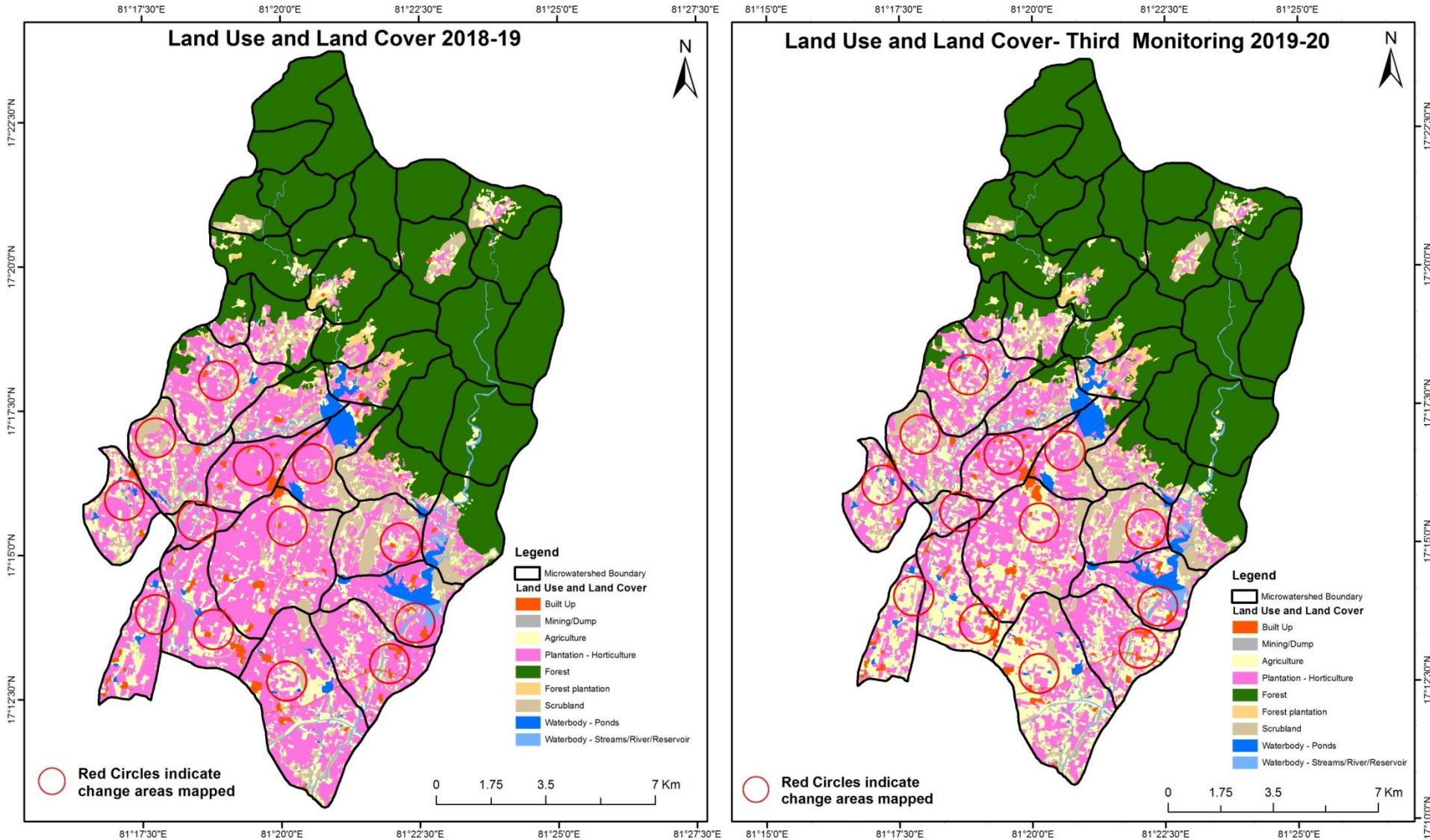
Aliveru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2017-18 to 2018-19)

Scale: 1:10000



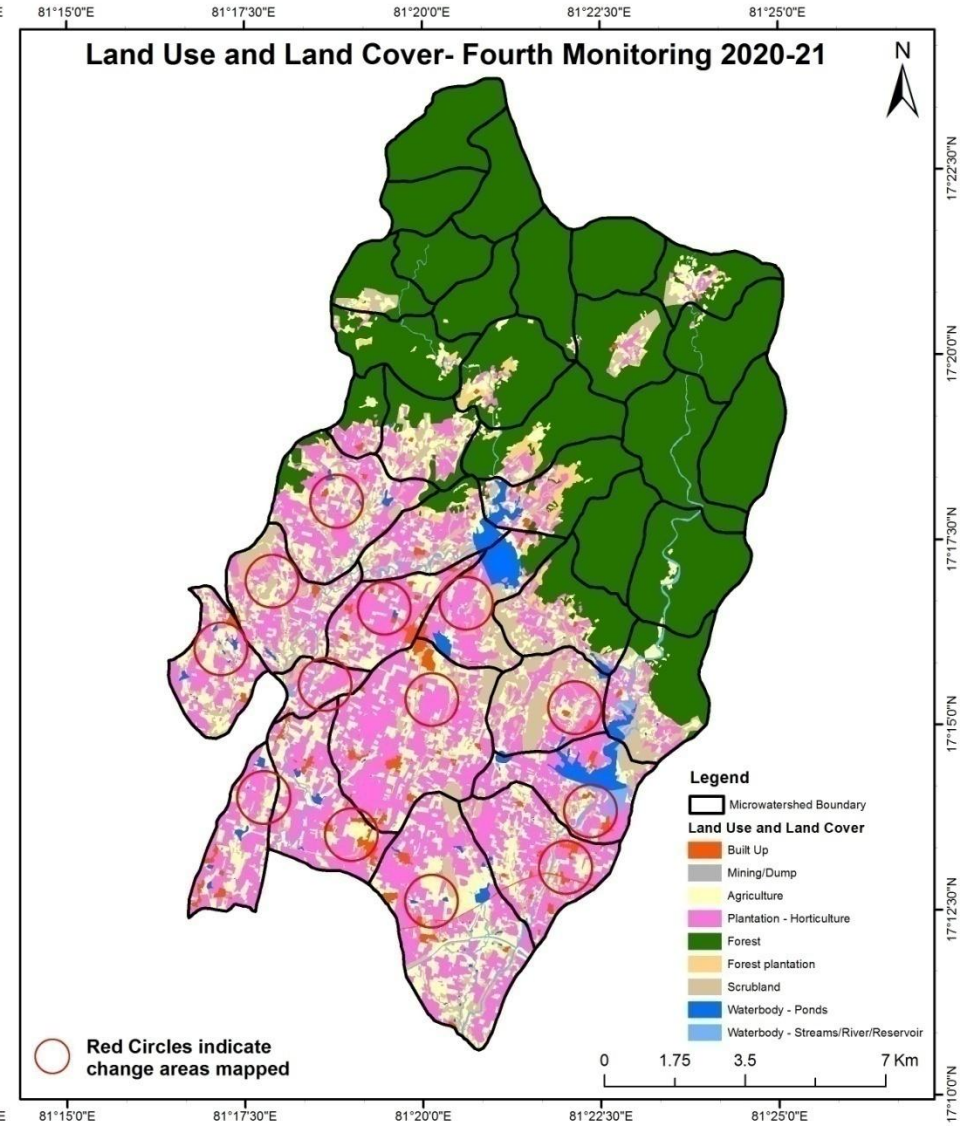
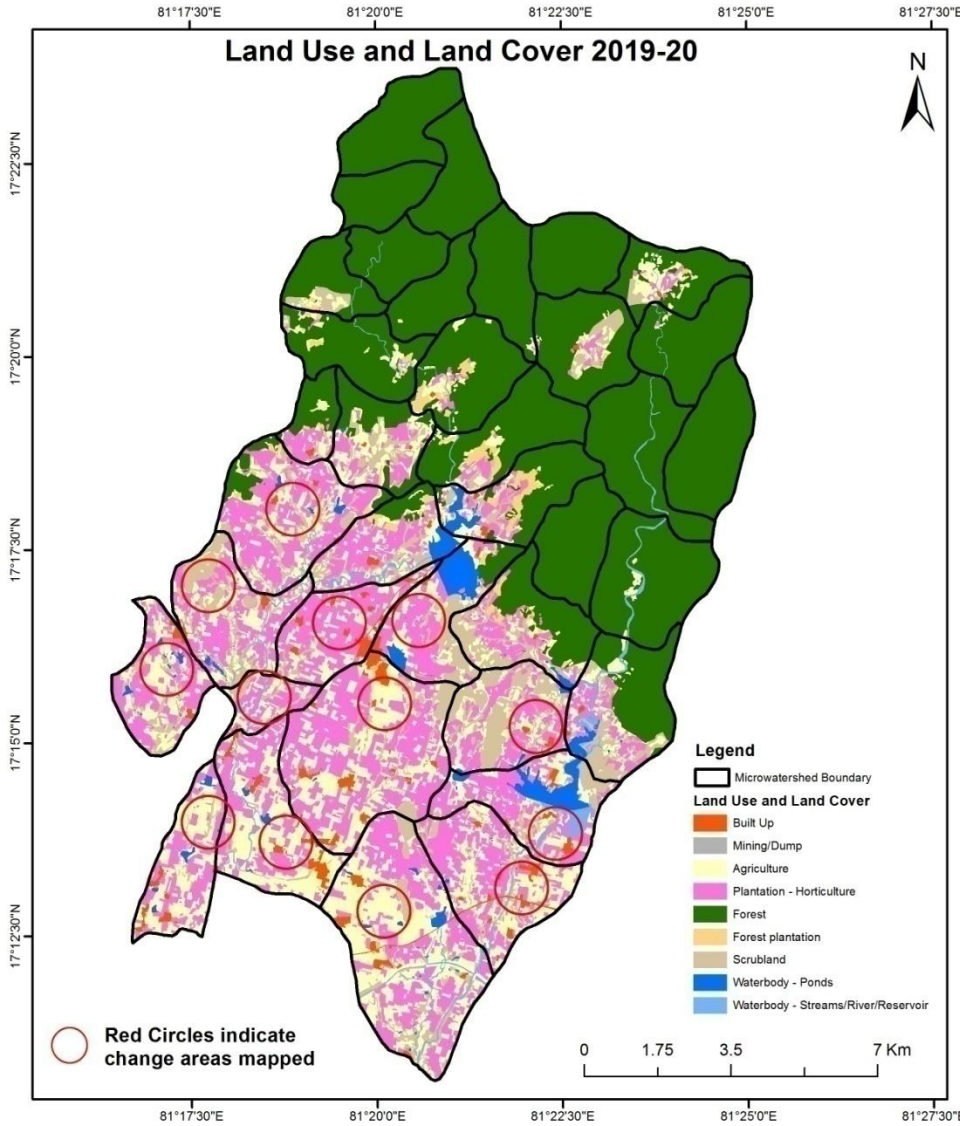
Aliveru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2018-19 to 2019-20)

Scale: 1:10000



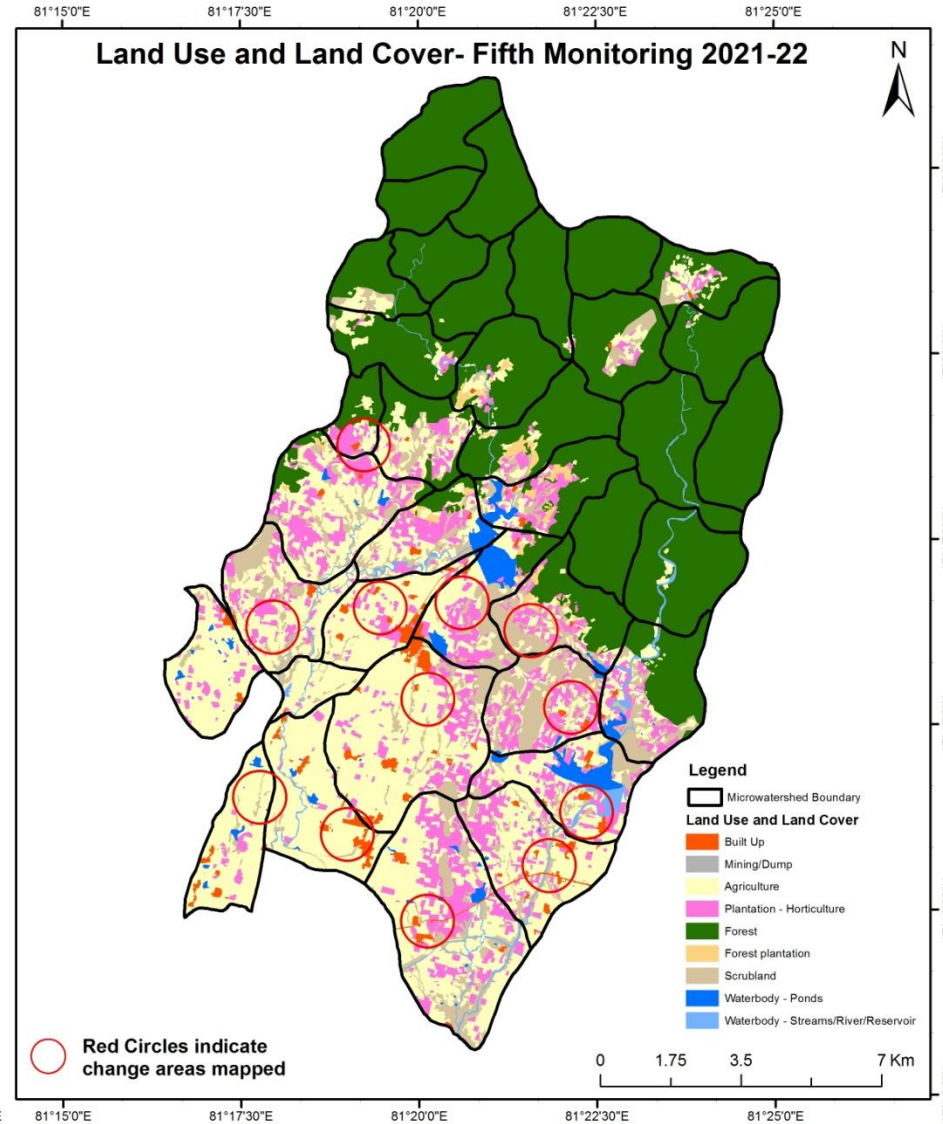
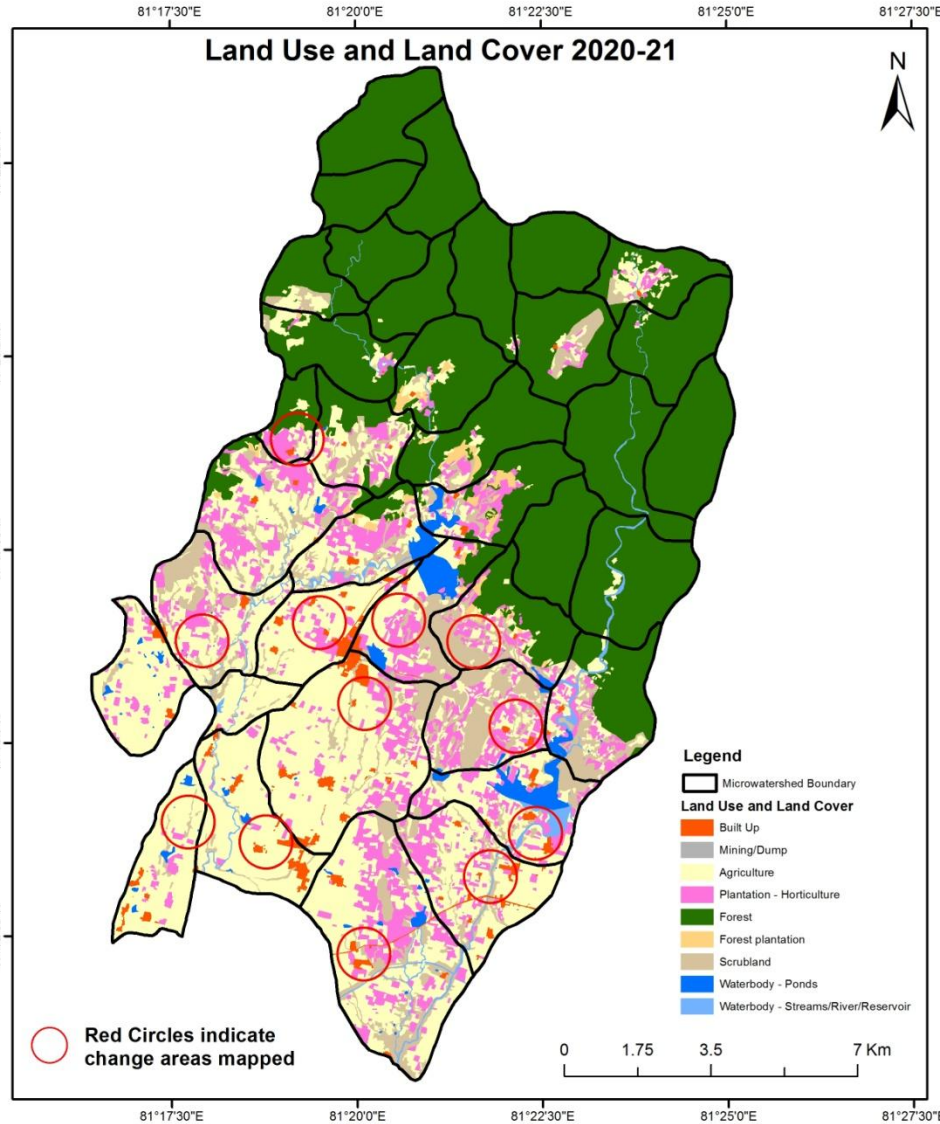
Aliveru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2019-20 to 2020-21)

Scale: 1:10000



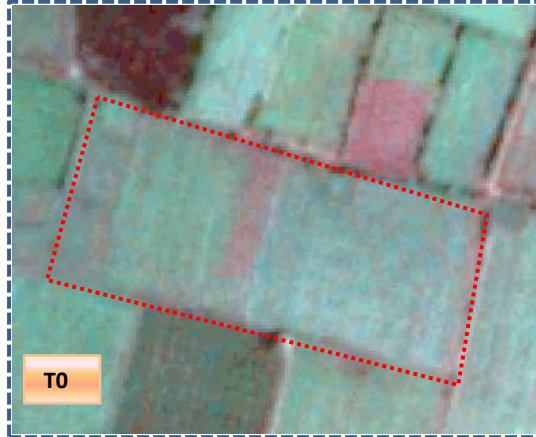
Aliveru Watershed (IWMP-03/2013-14) Comparative assessment of Land Use and Land Cover for Pre and Post IWMP implementation (2020-21 to 2021-22)

Scale: 1:10000



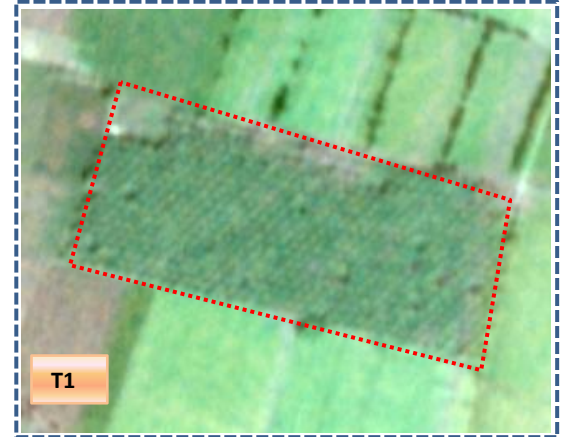
Aliveru Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Agriculture to Plantation



T0

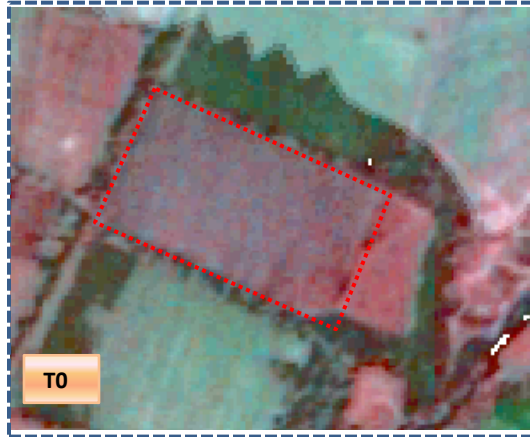
T0: 2013-14 (81°19'32.144"E 17°12'46.128"N)



T1

T1: 27 November 2017

Agriculture to Plantation



T0

T0: 2013-14 (81°19'49.481"E 17°14'23.793"N)

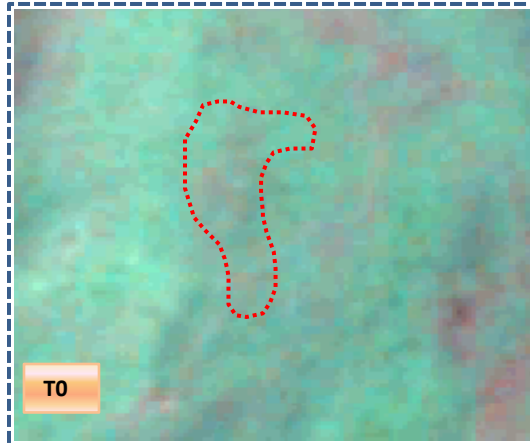


T1

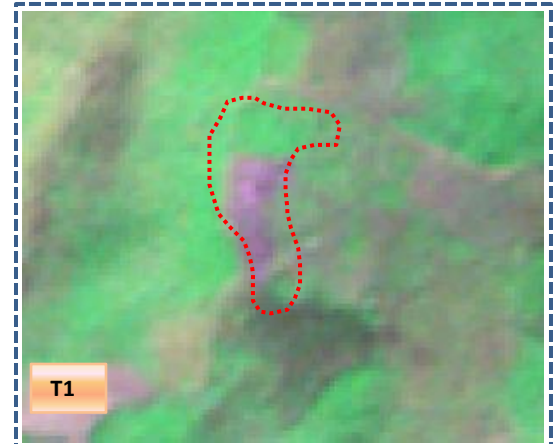
T1: 27 November 2017

Aliveru Watershed (IWMP-03/2013-14) Land Use and Land Cover changes for Pre and Post treatment dates

Scrub to Water body

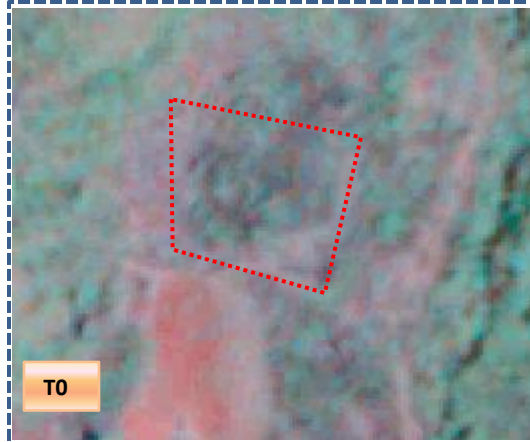


T0: 2013-14 (81°21'14.134"E 17°16'1.403"N)



T1: 27 November 2017

Scrub to Agriculture



T0: 2013-14 (81°19'42.734"E 17°19'15.424"N)



T1: 27 November 2017

Table showing change matrix depicting Land cover transitions for Aliveru Watershed (IWMP-03/2013-14) 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 | 261.81 | | | | | | | | | | 261.81 | |
| Mining/dump | | | | | | | | | | | | |
| Agriculture | 24.96 | 1.32 | 4726.46 | 550.44 | | | | 2.07 | 9.8 | 8.11 | 5323.16 | |
| Plantation Horticulture | 2.76 | | 721.19 | 1586.48 | | | | | 1.42 | 1.77 | 2313.62 | |
| Forest | 1.7 | | 154.68 | 65.86 | 8948.79 | | | | | | 9171.03 | |
| Forest Plantation | | | 15.89 | | | 156.33 | | | | | 172.22 | |
| Barren Rocky | | | | | | | | | | | | |
| Scrub | 3.6 | 0.33 | 431.55 | 111.23 | | | | 2342.89 | 1.61 | 6.76 | 2897.97 | |
| Waterbody- Streams/River | | | | | | | | | 240.46 | | 240.46 | |
| Waterbody – Ponds | | | 70.53 | 1.48 | | | | | | 345.32 | 417.33 | |
| Grand Total | 294.83 | 1.65 | 6120.3 | 2315.49 | 8948.79 | 156.33 | | 2344.96 | 253.29 | 361.96 | 20797.6 | |

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 588 ha of the agriculture area has decreased and it is converted into Built-up (24.9 ha), plantation/horticulture (550 ha), scrub (2 ha) and water body (17.9 ha) in T1.
3. In T1 1,393 ha of the agriculture area has increased from plantations/horticulture (721 ha), forest (154 ha), forest plantation (15 ha) and scrubland (431 ha) and water body (70 ha) of T0.

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 | | |
| T1 | | | | | | | | | | | | | |
| Built up | 294.83 | | | | | | | | | | | | 294.83 |
| Mining/dump | | 1.65 | | | | | | | | | | | 1.65 |
| Agriculture | | | 6119.92 | | | | | | | | 0.38 | | 6120.3 |
| Plantation Horticulture | | | | 2315.49 | | | | | | | | | 2315.49 |
| Forest | | | 4.42 | | 8944.37 | | | | | | | | 8948.79 |
| Forest Plantation | | | | | | 156.33 | | | | | | | 156.33 |
| Barren Rocky | | | | | | | | | | | | | |
| Scrub | | | 57.84 | | | | | 2284.66 | | | 2.46 | | 2344.96 |
| Waterbody- Streams/River | | | | | | | | | 253.29 | | | | 253.29 |
| Waterbody – Ponds | | | | | | | | | | | 361.96 | | 361.96 |
| Grand Total | 294.83 | 1.65 | 6182.18 | 2315.49 | 8944.37 | 156.33 | | 2284.66 | 253.29 | | 364.8 | | 20797.6 |

4. In T2 62 ha of the agriculture area has increased from forest (4.4 ha) and scrubland (57.8 ha) of T1.

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 | |
| Built up | 294.83 | | | | | | | | | | 294.83 | |
| Mining/dump | | 1.65 | | | | | | | | | 1.65 | |
| Agriculture | | | 6182.18 | | | | | | | | 6182.18 | |
| Plantation Horticulture | | | | 2315.49 | | | | | | | 2315.49 | |
| Forest | | | | | 8944.37 | | | | | | 8944.37 | |
| Forest Plantation | | | | | | 156.33 | | | | | 156.33 | |
| Barren Rocky | | | | | | | | | | | | |
| Scrub | 1.11 | | 67.04 | | | | | 2214.41 | | 2.1 | 2284.66 | |
| Waterbody- Streams/River | | | | | | | | | 253.29 | | 253.29 | |
| Waterbody – Ponds | | | | | | | | | | | | |
| Grand Total | 295.94 | 1.65 | 6249.22 | 2315.49 | 8944.37 | 156.33 | | 2214.41 | 253.29 | 366.9 | 20797.6 | |

5. In T3 67 ha of the agriculture area has increased from scrubland (67 ha) of T2.

Table showing change matrix depicting Land cover transitions 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 | 295.94 | | | | | | | | | | | | 295.94 |
| Mining/dump | | 1.65 | | | | | | | | | | | 1.65 |
| Agriculture | 37.68 | | 6211.54 | | | | | | | | | | 6249.22 |
| Plantation Horticulture | 7.79 | | | 2307.7 | | | | | | | | | 2315.49 |
| Forest | | | 25.82 | | 8918.55 | | | | | | | | 8944.37 |
| Forest Plantation | | | | | | 156.33 | | | | | | | 156.33 |
| Barren Rocky | | | | | | | | | | | | | |
| Scrub | 0.51 | | 179.25 | | | | | 2034.65 | | | | | 2214.41 |
| Waterbody- Streams/River | | | | | | | | | 253.29 | | | | 253.29 |
| Waterbody – Ponds | | | 6.39 | | | | | | | | 360.51 | | 366.9 |
| Grand Total | 341.92 | 1.65 | 6423 | 2307.7 | 8918.55 | 156.33 | | 2034.65 | 253.29 | | 360.51 | | 20797.6 |

6. In T3 37 ha of the agriculture area has decreased and it is converted into built-up (37.6 ha) in T4.

7. In T4 211 ha of the agriculture area has increased from forest (25.8 ha), scrubland (179 ha) and water body (6.3 ha) of T3.

Table showing change matrix depicting Land cover transitions 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 | 341.92 | | | | | | | | | | 341.92 | |
| Mining/dump | | 1.65 | | | | | | | | | 1.65 | |
| Agriculture | | | 6423 | | | | | | | | 6423 | |
| Plantation Horticulture | | | 18 | 2289.7 | | | | | | | 2307.7 | |
| Forest | | | 8.06 | | 8910.49 | | | | | | 8918.55 | |
| Forest Plantation | | | | | | 156.33 | | | | | 156.33 | |
| Barren Rocky | | | | | | | | | | | | |
| Scrub | | | 83.25 | | | | | 1951.27 | | 0.13 | 2034.65 | |
| Waterbody- Streams/River | | | | | | | | 253.29 | | | 253.29 | |
| Waterbody – Ponds | | | 1.11 | | | | | | | 359.4 | 360.51 | |
| Grand Total | 341.92 | 1.65 | 6533.42 | 2289.7 | 8910.49 | 156.33 | | 1951.27 | 253.29 | 359.53 | 20797.6 | |

8. In T5 110 ha of the agriculture area has increased from plantations/horticulture (18 ha), forest (8 ha), scrubland (83 ha) and water body (1.1 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 decrease of 05 Hectares in Reservoir / Tanks area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
3. There is an increase of 797, 61, 67, 173 & 110Hectares from T0-T1, T1-T2, T2-T3, T3-T4 & T4-T5 respectively and overall increase of 1,210 Hectares in Crop land area as compared between baseline Land Use/Land Cover data 2013-14 (T0) & 2021-22 (T5) years.
4. There is a decrease of 946 Hectares in Scrubland area as compared between 2013-14 (T0) & 2021-22 (T5) years.
5. 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