GIS and Remote Sensing Based Watershed Program Impact Assessment of three Micro-watersheds in District Dhar, and four Micro-watersheds in District Seoni M.P.

Submitted To

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INTRODUCTION

Watershed is defined as "Natural Hydrologic entity that covers a specific area expanse of land surface from which the rainfall run-off flows to a defined drain, channel, stream or river at any point. Hence, all the basic natural resources viz. soil and water in the hydrological entity of the area should be managed. The integration of technologies, within the natural boundaries of a drainage area, for optimum development of land, water and plant resources to meet the basic need in sustainable manner is Integrated Watershed Management.

Thus Integrated Watershed Management planning is a comprehensive multi-resource management planning process, involving all stakeholders within the watershed, who together as a group, cooperatively work towards identifying the resource issues and concerns of the watershed, as well as develop and implement a watershed plan with solutions that are environmentally, socially and economically sustainable.

After review in 1999 by the Ministry of Rural Development and the Ministry of Agriculture, a common set of operational guidelines, objectives, strategies and expenditure norms were established for watershed development programmes in 2001. These are implemented through programmes such as DPAP (Drought-Prone Area Programme), DDP (Desert Development Programme) and IWDP (Integrated Watershed Development Programme). The guidelines encourage the active involvement of non-governmental organizations, semi-governmental institutions and private enterprises, universities and training institutions.

Integrated Watershed Management does not merely imply the amalgamation of different activities to be undertaken within a hydrological unit. It also requires the collation of relevant information so as to evaluate the cause and effect of all the proposed actions which would consider hydrological, demographic and socio-economic parameters.

Most of above mentioned agencies which implement these programmes claim that the results due to implementation of the watershed programmes are positive and highly productive. In order to confirm the results reported by these project implementing agencies (PIA) GIS and Remote Sensing is the most efficient and accurate tool to be used. These technologies enable us not only to do Impact Assessment but it can also be used to do continuous monitoring of the ongoing Watershed programmes. Remote Sensing helps us to get the temporal data for monitoring while GIS helps in creating maps that can be easily understood along with the Creation of geo-spatial database. Once GIS and Remote Sensing data are combined with the field data and surveyed data, it gives the most accurate assessment of the actual work done on the field by the relevant PIA.

OBJECTIVES

To assess the impact of the watershed programme activities in a given area based on Remote Sensing and GIS technique for given one Miliwatershed area of Dhar District of Madhya Pradesh.

STUDY AREA: - District Dhar (Nalchha Block)

Brief Description:

The study area includes three micro-watersheds Bhilbarkhera, Kothisodhpur and Shikarpura under the Nalchha block District Dhar.

Detailed Description

Dhar district is located in the western part of Madhya Pradesh. River Narmada flows on the southern side of Dhar district. The longitude of Dhar district is between 74 degrees 28 minutes and 74 degrees 42 minutes east. Its latitude is between 22degree 01 minutes and 23 degrees 10 minutes north.

Nalchha block is located in the south-eastern part of Dhar district. The total geographic area is 79, 506 hectares. The topography of Narwhal is mountainous. Narwhal district consist total of 200 populated villages which is divided into 68 villages panchromatic this area was full of dense forest until three decades but now due to heavy deforestation this area is struggling with the soil erosion which has become very widespread and is adversely impacting the agricultural productivity of Narwhal block. This block also has to deal with water shortage during summers. The average distance that needs to travel to fetch water is 2 to 3 mks.

Micro-Watershed / Village Kothisodhpur

Location

The total area of Kothisodhpur is 190 hectares. This village shares boundary with Jodhpurs in north, Mahendikhedi in the south, Gyanpur in the east and Bhilbarkhera in the west. Kothisodhpur is located at a distance of 6 km from the Narwhal headquarters.

Topography

There are two mountains namely Nai-Bayda and Pir-Bayda located on the south eastern direction of Kothisodhpur. There are approximately 7 channels which flow from these mountains in the north –western and then join Narwhal River. Thus the north-western part of the village consists of fertile agricultural land whereas the south-western part is barren and mountainous. Soil erosion is a major problem in these regions. There is very little vegetation on the mountains.

Micro-Watershed / Village Bhilbarkhera

This Micro-watershed consist of only one village which is Bhilbarkhera

Location

The total area of Bhilbarkhera is 581 hac. This village shares boundary with Kothisodhpur and Mehandikheri in east, Sulibardi in the south, Mograba in west and sodhpur in north. Bhilabarkhera is located at a distance of 6 km. from Nalchha headquarters.

Topography

There is mountain namely Hathaniya-Bayada located on the western direction of Bhilbarkhera. This mountain is origin of Karma River, its flow North westerns direction. There is drainage which flow from these mountain in the eastern direction and join Barkhera Talab. Thus north eastern parts of the village consist of fertile agricultural land whereas south-western part is barren and mountainous. Soil erosion is a major problem.

Micro-Watershed / Village Shikarpura

Location

The total area of Shikarpura is 378 hectares. This village shares boundary with Karondia in North, Jeerapur in East, Kakalpura in south, and Patdi in the west. Shikarpura is located at a distance of 10 km from the Nalchha headquarters.

Topography

There are ranges of mountain located on the south and north direction of Shikarpura. There is a Maan river flow towards east to west in the middle of the village. The ranges of mountain located in the north are much fellow land comparison south. There is very little vegetation on the mountains. Soil erosion is a major problem in these regions.

STUDY AREA: - District Seoni

Brief Description

The study area includes four micro-watersheds Khursipar, Chilachond, Marheti and Amai under the Lakhanadon block District Seoni

Detailed Description

Seoni district is located in the southern part of Madhya Pradesh. Geographically it is located between latitudes 21035' and 22058' N and longitudes 79012' and 80018' E and extends over an area of 8758 km2. It is bordered by Jabalpur, Narsinghpur and Mandla districts in North, Balaghat in East and Chhindwara in West and the Southern boundary of the district lies in juxtaposition to Nagpur (Maharashtra). National Highway No.7 connecting Kanyakumari-Banaras passes through district from north to south.

Lakhanadon is located in the north of Seoni; the district headquarters at a distance of 61 km. and in the southeast of Narsinghpur at a distance of 65 km, geographically the town is located between 22.6 degree North latitude and 79.6 degree East longitude at a height of 607 mt above msl. The town is strategically located at the meeting point of N H 7 and N H 26. The major attractions in and around the town are Mandla Fort, Kanha National Park and the Pench National Park.

Micro-Watershed / Village Khursipar

This micro-watershed consists of only one village which is Khursipar

Location

The total area of Khursipar is 355 hectares. This village shares boundary with seluwa in west, Bhilma in the north, Sarsdol in the east and Margaon Khurd in the south. Khursipar is located at a distance of 3 km from the Lakhanadon headquarters.

Topography

There are ranges of mountains located on the south direction of village. There is river flow towards south to west in the middle of the village. The range of mountain is much fellow land. There is very little vegetation in the mountains. Soil erosion is a major problem in this region.

Micro-Watershed / Village Chilachond

Location

The total area of Chilachond is 300 hectares. This village shares boundary with Sarsdol in north, Marheti in the east, Baglai in the south and Margaon Khurd in the west. Chilachond is located at a distance of 5 km from the Lakhanadon headquarters.

Topography

There is dam situated in the north side of the village and covered almost 60 % of the village. Soil erosion is the major problem in this area.

Micro-Watershed / Village Marheti

Location

The total area of Marheti is 227 hectares. This village shares boundary with Sarsdol in North, Batka in East, Pahargadh in south, and Mudapar in west in the west. Amai is located at a distance of 6 km from the Lakhanadon headquarters.

Topography

There is dam situated in the north west side of the village is called Chilachond Dam, and covered almost 20 % of the village. Soil erosion is a major problem in this area.

Micro-Watershed / Village Amai

Location

The total area of Amai is 356 hectares. This village shares boundary with Batka in North, Khamariya in East, Pahargadh in south, and Mudapar in the west. Shikarpura is located at a distance of 8 km from the Nalchha headquarters.

Topography

Amai micro-watershed is almost plain area. There is a small hilly range located in the north direction of the village. The drainage comes from Chilachond Dam and enters to the north direction of the village and flows towards south-east direction. The plantations are located in the hilly region. North eastern part is much fertile then other part of the area.

Material and Methods

Maps

The base maps and information such as the following has been used.

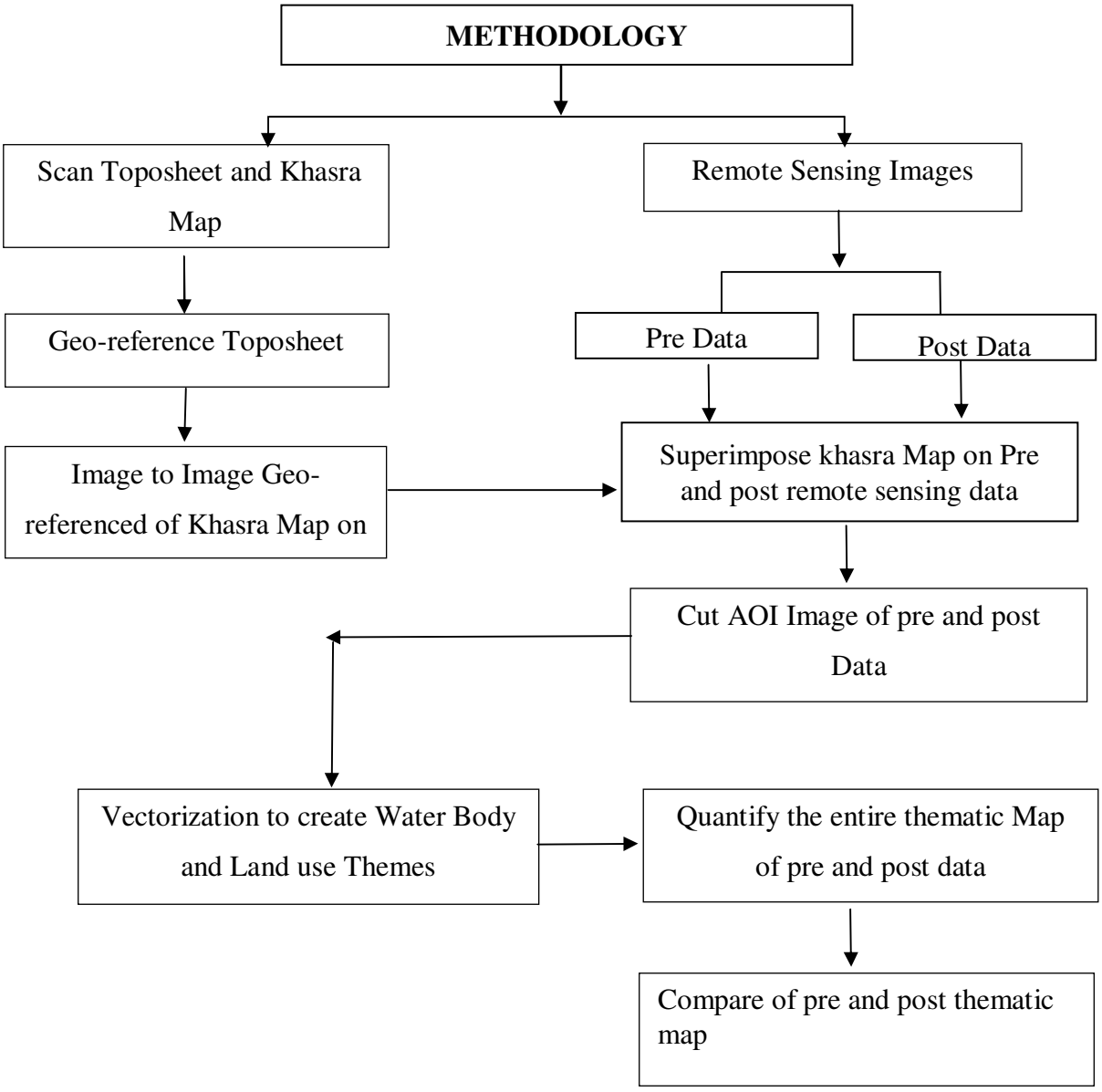
Toposheet acquired for the area of interest.
Khasra map (cadastral map) of all seven micro-watershed

Remote Sensing Data

For the post developed condition IRS P6 MSS images for October 2007-08 has been used obtained from NRSC, Hyderabad.

For the pre developed condition IRS P6 MSS images for October 2000-01 has been used obtained from NRSC, Hyderabad.

METHODOLOGY



RESULTS

District Dhar (Nalchha Block)

Village / Micro-watershed Kothisodhpur

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
1.	Agriculture Land	32	67	35
2.	Current Fellow Land	67	21	-46
3.	Scrub Land	13	5	-8
4.	Water Body		1	1

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 32 ha as compared to 67 ha in post developed conditioned. Total 35 ha Agriculture land is increase in the post developed conditioned. The total area under current fellow land is 67 ha in pre developed condition as compared to 21 ha in post developed condition and decrease 46 ha current fellow land.

It can also be noticed that there has been a decrease in the Scrub Land. In pre developed condition the total area was 13 ha whereas in post developed condition it has reduced to 5 ha which is approximately a reduction of 8 ha.

It should also be noted that three new water body (1 ha) was created due to the watershed development activities in this village.

Village / Micro-watershed Bhilbarkhera

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
1	Agriculture Land	70	170	100
2	Current Fellow Land	147	68	-79
3	Dense Forest	151	130	-21
4	Water Body	28	30	2

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 70 ha as compared to 170 ha in post developed conditioned. The total area under current fellow land is 147 ha in pre developed condition as compared to 68 ha in post developed condition.

It also decreases in the forest land. In pre developed condition the total area was 151 ha whereas in post developed condition it has reduced to 130 ha which is approximately a reduction of 60 ha (13 %).

In pre developed condition the total area under water body was 28 ha which has increased to 30 ha. Total 2 ha increase in water body.

Village / Micro-watershed Shikarpura

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
1	Agriculture Land	36	114	79
2	Current Fellow Land	178	93	-85
3	Forest Land	33	27	-6
4	Water Body		1	1

Based on the Remote Sensing data below mentioned observations

Agricultural Land in pre developed condition is 36 ha as compared to 114 ha in post developed conditioned and the total area 79 ha is increases. Current fellow land is 147 ha in pre developed condition as compared to 68 ha in post developed condition and total 85 ha area is decrease .

There has also been decrease in the forest land. In pre developed condition the total area was 33 ha whereas in post developed condition it has reduced to 27 ha which is approximately a reduction of 60 ha (19 %).

It should also be noted that one new water body (1 ha) is created due to the watershed development activities in this village.

District Seoni (Block Lakhanadon)

Village / Micro-watershed Khursipar

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
1	Agriculture Land	65	103	37
2	Current Fellow Land	59	18	-41
3	Plantation	2	15	13
4	Water Body		6	6

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 65 ha as compared to 103 ha in post developed conditioned. Total 37 ha Agriculture land is increase in the post developed conditioned. The total area under current fellow land is 59 ha in pre developed condition as compared to 18 ha in post developed condition and decrease 41 ha current fellow land.

There has also been increase in the Plantation. In pre developed condition the total area was only 2 ha whereas in post developed condition it has increased to 15 ha which is approximately a increase of 13 ha.

There are so many water bodies are created (total 6 ha) due to the watershed development activities in this village.

Village / Micro-watershed Chilachond

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
1.	Agriculture Land	95	163	69
2.	Current Fellow Land	211	113	-98
3.	Plantation	0	7	7
4.	Water Body	2	2	2

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 95 ha as compared to 163 ha in post developed conditioned. Total 69 ha Agriculture land is increase in the post developed conditioned. The total area under current fellow land is 211 ha in pre developed condition as compared to 113 ha in post developed condition and decrease 98 ha current fellow land.

There has also been introduced Plantation in the watershed activities. In pre developed condition the total area was 0 ha whereas in post developed condition it has increased to 7 ha.

There is no new water body (2 ha) was created in the watershed development activities in this village.

Village / Micro-watershed Marheti

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
5.	Agriculture Land	28	42	14
6.	Current Fellow Land	60	48	-12
7.	Fellow Land	18	16	-2
8.	Water Body	0	4	4

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 28 ha as compared to 42 ha in post developed conditioned. Total 14 ha Agriculture land is increase in the post developed conditioned. The total area under current fellow land is 60 ha in pre developed condition as compared to 48 ha in post developed condition and decrease 12 ha current fellow land.

There has also been decrease in the long term fellow land. In pre developed condition the total area is 18 ha whereas in post developed condition it has decreased to 16 ha which is approximately increased of 2 ha.

There are few water bodies are created (total 4 ha) due to the watershed development activities in this village.

Village / Micro-watershed Amai

Quantify and compare the entire thematic map of pre and post data

S. No	Themes	Pre Developed, Area (ha)	Post Developed Area (ha)	Area in Changes
9.	Agriculture Land	101	253	152
10.	Current Fellow Land	64	15	-49
11.	Plantation	0	25	25
12.	Water Body	0	1	1

Based on the Remote Sensing data observations

Agricultural Land in pre developed condition is 101 ha as compared to 253 ha in post developed conditioned. Total 152 ha Agriculture land is increase in the post developed conditioned. The total area under current fellow land is 64 ha in pre developed condition as compared to 15 ha in post developed condition and decrease 49 ha current fellow land.

There has also been introduced Plantation in the watershed activities. In pre developed condition the total area was 0 ha whereas in post developed condition it has increased to a large area of 25 ha.

There is one water body created (total 1 ha) due to the watershed development activities in this village.

ANEEXURE I –

Figure No. 1 Location Map of Dhar District (Nalchha Block)

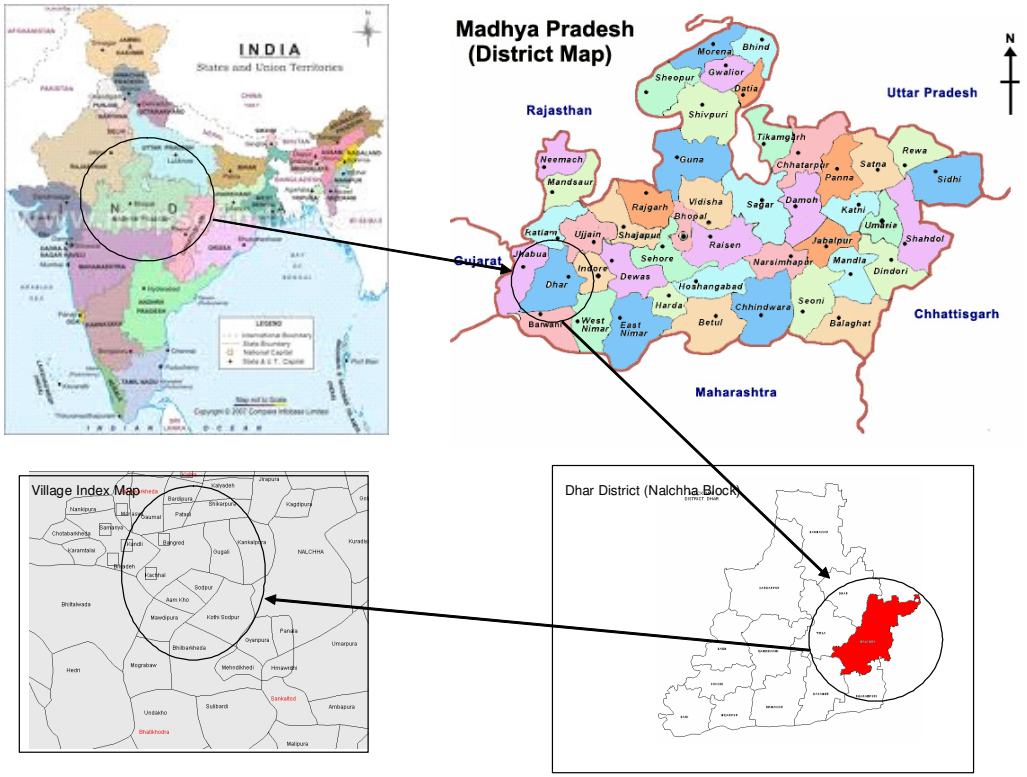


Figure No. 2 Study area marked on the IRS LISS III image (Kothisodhpur, Bhilbarkhera and Shikarpura)

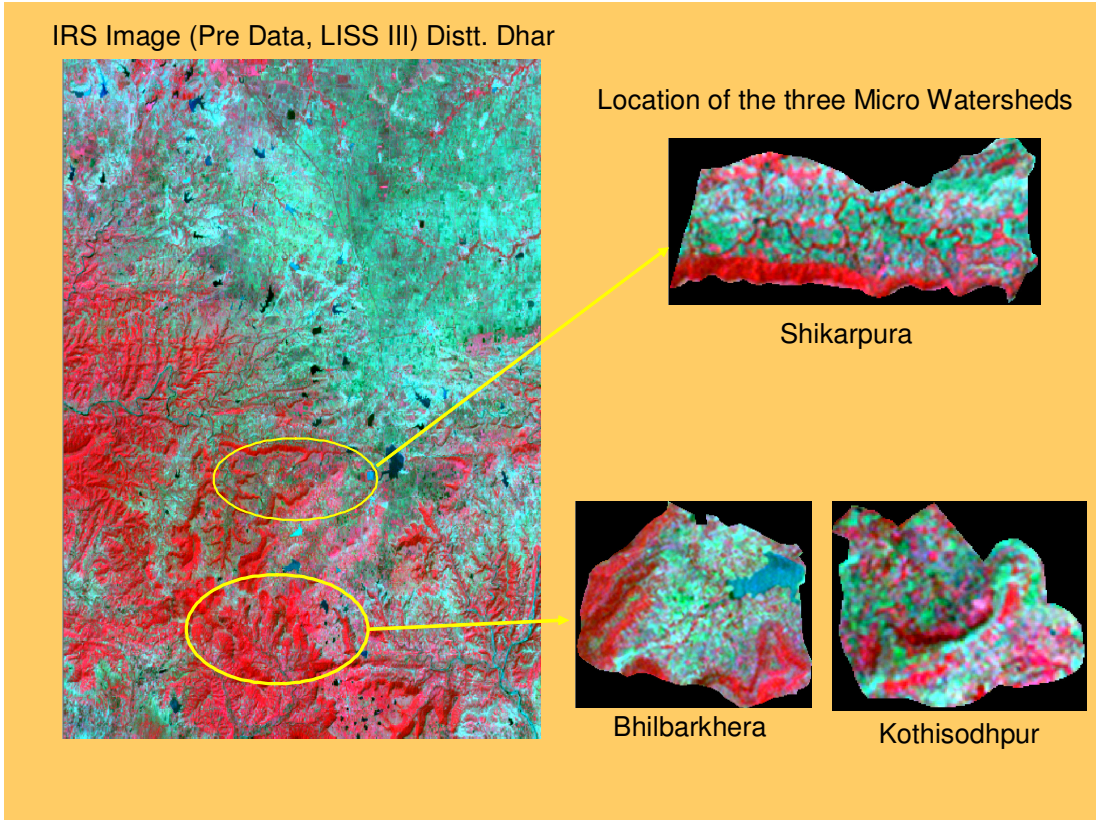


Figure No. 3 Study area marked on the IRS LISS IV image (Kothisodhpur, Bhilbarkhera and Shikarpura)

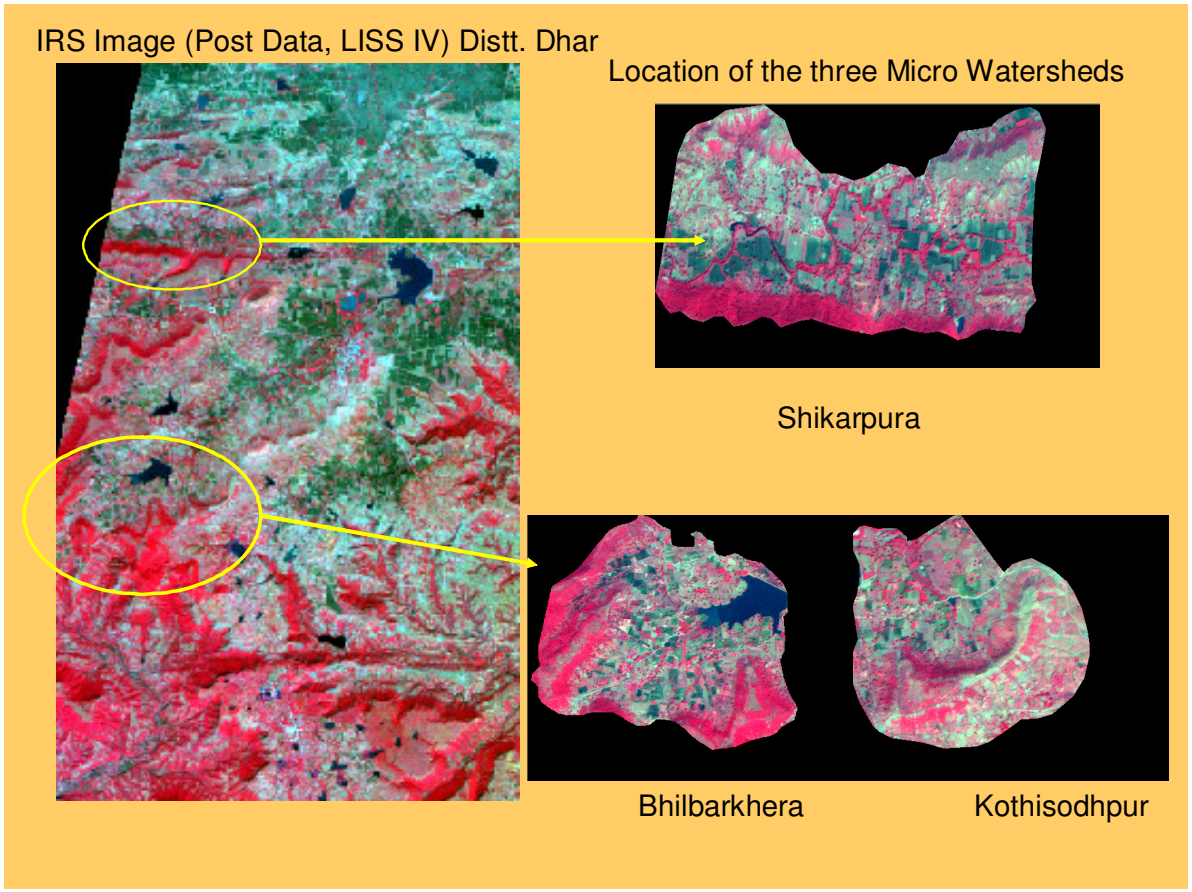


Figure No. 4 Location Map of Seoni District (Lakhanadon Block)

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Figure No. 5 Study area marked on the IRS LISS III image (Khursipar, Chilachond, Marheti and Amai)

(This image is similar to one as for Dhar and is available in original document)

Figure No. 6 Study area marked on the IRS LISS IV image (Khursipar, Chilachond, Marheti and Amai)

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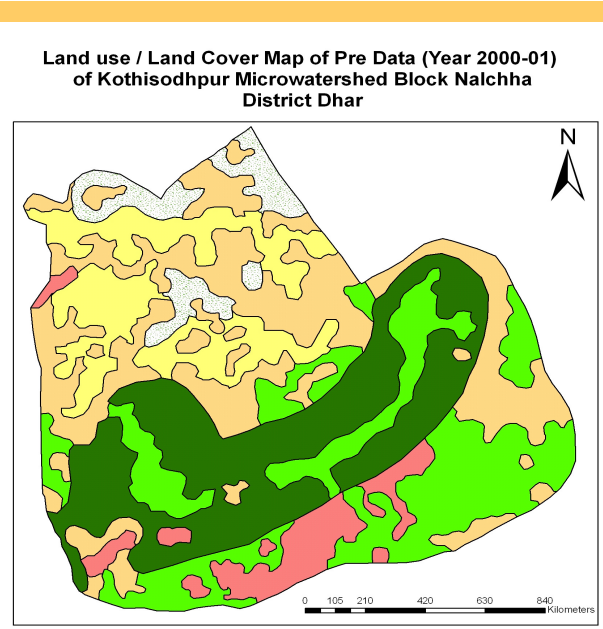
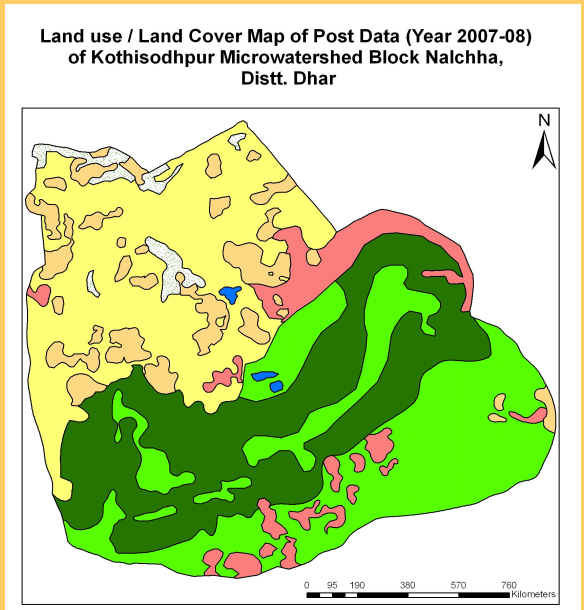
NNEXURE II Dhar District (Nalchha Block)

Figure No. 7. Pre development and post development of Kothisodhpur Micro-watershed

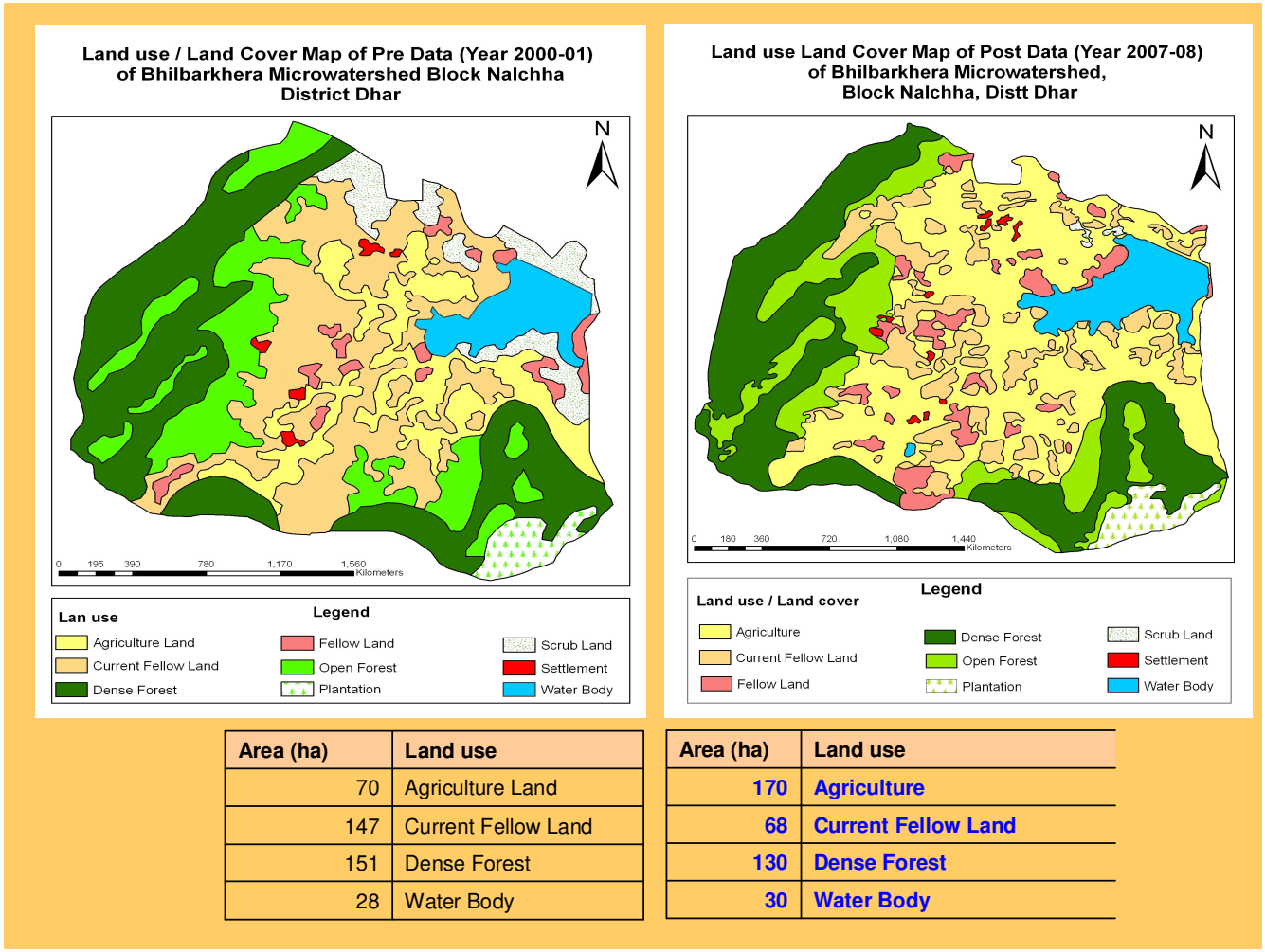




Area (ha)	Land use
32	Agriculture Land
67	Current Fellow Land

Area (ha)	Land use
67	Agriculture Land
21	Current Fellow Land
1	Water Body

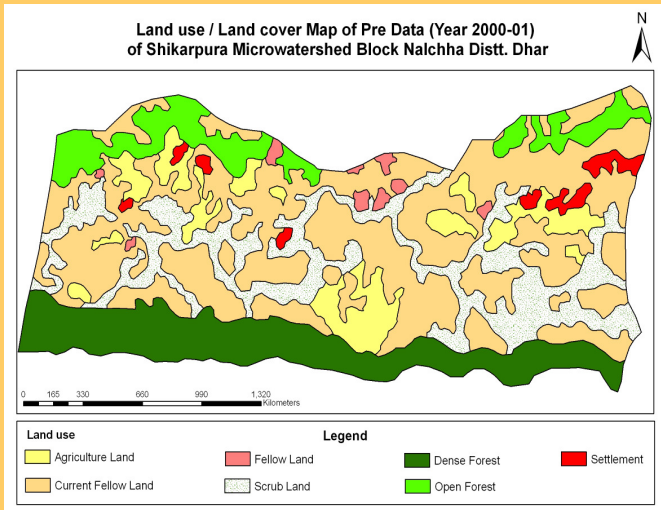
Figure No. 8. Pre development and post development of Bhilbarkhera Micro-watershed

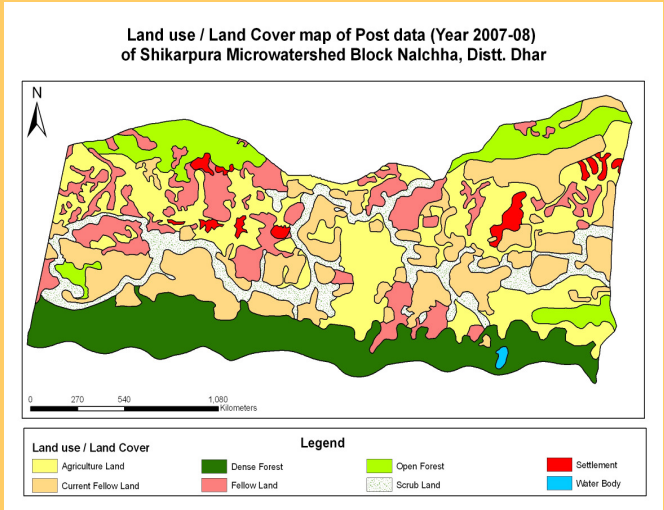


Area (ha)	Land use
70	Agriculture Land
147	Current Fellow Land
151	Dense Forest
28	Water Body

Area (ha)	Land use
170	Agriculture
68	Current Fellow Land
130	Dense Forest
30	Water Body

Figure No. 9. Pre development and post development of Shikarpura Micro-watershed





Area (ha)	Land use
36	Agriculture Land
178	Current Fellow Land
33	Forest Land

Area (ha)	Land use
114	Agriculture Land
93	Current Fellow Land
27	Forest Land
1	Water Body

ANNEXURE II - Seoni District (Lakhandon Block)

Figure No. 10. Pre development and post development of Khursipar Micro-watershed

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Figure No. 11. Pre development and post development of Chilachond Micro-watershed

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Figure No. 12 Pre development and post development of Marheti Micro-watershed

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Figure No. 13. Pre development and post development of Amai Micro-watershed

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