Ganga Cultural Documentation

Natural Heritage
Of
MIRZAPUR DISTRICT

February, 2020

National Mission for Clean Ganga

INTACH

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Front Cover : Ganga River as seen from Chunar Fort

Background : Surveying in riparian vegetation Near Chak Semra Village

Back cover : Motiya Talab with an ancient Shiva temple

Formatting and Design by : Sumesh Dudani & Abhishek Kumar Upadhyay

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Recommendations For Mirzapur District

The riparian ecosystems are of high conservation priority owing to the large scale ecosystem services they provide. However, cultivation is being practiced upto the edge of the active lean season flow channel. Thus, there is hardly any riparian vegetation and thus no habitats for associated faunal diversity. **It is recommended that a belt of 30m width along the active channel may be reserved for riparian vegetation as a policy measure.**

Several dams on tributaries are diverting waters thereby negatively impacting flow in Ganga. Water conserving agricultural practices can reduce the storage requirement. **It is recommended to promote water conserving agricultural practices in the command areas of these dams.**

Man animal conflict regarding mass destruction of agricultural produce by Nilgai and Wild Boar is widespread. **This is an important issue in the study region that needs to be mitigated by creating awareness among the local people, ensuring sufficient compensation for their losses and incorporating non-violent techniques to keep these animals away from the fields.**

The riverine islands harbor native biodiversity including grasses (*Saccharum* sp.), wild ber (*Ziziphus nummularia*) and birds (example: cormorants & storks). **Hence, it is recommended to frame policies for the management of these islands as community reserves under Wildlife Act [2002].**

Most wetlands are in a dismal state Hence, it is necessary to take up initiatives for maintaining such water bodies which continue to support the local biodiversity and aquifer recharge and also play a pivotal role in overall cultural heritage of Mirzapur Distt. **The conservation plan for each wetland should be prepared**. Such a program would not only support the base flow of the river but also be in keeping with the Supreme Court directives [Feb., 2017] to conserve all wetlands noted in the National Wetland Atlas of 2010.

Many members of Mallah community expressed their concerns regarding the significant decline in fish catch from Ganga River. They also proclaimed that their livelihood was mainly focused on fish catching; making boats and fishing gears. It is imperative to carry out awareness cum training programs with these communities regarding fish availability, its importance and sustainable fishing. **The scientific determination of the causes of declining populations and size of individuals needs to be established as also a program of reviving such populations. Along with that alternate livelihoods need to be developed for such communities such as promoting slow riverine boating tourism by revival of the old budgerow boats.**

Ganga river in Mirzapur Distt. is also one of the important stretches for inhabiting Gangetic River Dolphin which is both an IUCN Endangered & Schedule I (Wildlife Protection Act, 1972) species. **It is recommended to carry out more surveys for identifying its tentative population and presence in the region.**

The several mining sites in this Distt. should have their decommissioning plans ready to be converted into wetlands and wildlife refuges.

The several sites vulnerable to serious erosion have been identified. The stabilization of some of these sites could be important and may be considered.

Several ancient trees have been identified along the corridor zone. These may be identified and marked as heritage trees and venerable citizens and witnesses of history and their protection legally ensured.

The use of riverine grasses as rapidly growing renewable biomass may be explored as a substitute for other exhaustible materials and for various craft designs. The use of these grasses as an innovative building material could retard the use of sand and bricks to some extent.

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1.0 Introduction

1.1 Mirzapur Distt. is one of the 75 Distt.s of Uttar Pradesh bounded by Bhadohi and Varanasi Distt.s in the north, Chandauli Distt. in the east, Sonbhadhra Distt. in the south and Allahabad in the north-west. With Mirzapur town as its headquarters, the Distt. covers an area of approx. 4522 sq. km. Ganga river covers a total distance of about 45 kms in Mirzapur Distt.

1.2 The Distt. is administratively divided into 4 tehsils namely Chunar, Marihan, Lalganj and Mirzapur Sadar which are further divided into 12 development blocks. The Distt. is popular for the renowned Vindhyavashini Devi temple (dedicated to Goddess Vindhyavashini) situated at about 8 kms from the Mirzapur town. This place is one of the most revered 'Shaktipeeths' of the presiding deity and every year lakhs of devotees from different corners of the country come here especially during Navratri.

- *It is locally believed that the town was founded by Raja Nanner when it was known as 'Girijapur', but in the course of time it changed to 'Mirzapur'. In the reign of Akbar, Mirzapur Distt. fell in the 'Subas' of Allahabad and Bihar along with 'Sarkars' of Allahabad, Benaras, Chunar and Rohtas.*
- *The Distt. of Mirzapur, with the exception of few villages, fell entirely within the tract of country once known as 'Province of Benaras'. This sovereignty of this province formally ceded to the East India Company in 1775 by the Nawab Wazir of Oudh, but the tract itself was included in Zamindari of the Raja of Benaras and remained in his actual possession until 1794. The British East India Company developed this area to fulfill the need of a trading centre between central and Western India (Census of India, 2011).*
- *Most of Mirzapur city was developed by British officers, but the starting development was founded by the most famous officer of British East India Company "Lord Marquess Wellesley".*
- *According to some evidence, the British construction was initiated from Burrier (Bariya) Ghat. Lord Wellesley had reconstructed the Burrier Ghat as a main entrance in Mirzapur by Ganga. Some of the places in Mirzapur was pronounced as per the name of Lord Wellesley, like Wellesleyganj (The first market in Mirzapur). The building of Municipal Corporation in Mirzapur is also a precious example of British constructions during that time.*

(Ref: https://mirzapur.nic.in/)

1.3 The physiography of Mirzapur Distt. is broadly characterized with hard rock as well as alluvial formations and table land topographic features. Hard rock area comprising Marihan, Rajgarh and Halia blocks reflects the uneven plains and dotted with hillocks. Geomorphologically, the Distt. can be divided into two distinct units :

i. Residual hills/Table lands
ii. Marginal Alluvial Plain

1.4 The topography of the Distt. is influenced or modified by the presence of rivers and streams including River Ganga – which is the main river of this Distt. along with several tributary streams and nallas. The general slope of tract in this region is North to South and the elevation of the area varies from 100 – 300 mamsl. The climate of the Distt. is sub-humid characterized by hot summer, pleasant monsoon and cold winters and the average annual rainfall in the Distt. is 1085 mm (Pandey, 2013).

Image 1 : Ganga River As Viewed Near Gogaon Village

2.0 Ganga River In Mirzapur

2.1 River Ganga enters Mirzapur Distt. near Chehara village from Allahabad Distt. and almost immediately forms a remarkable loop enclosing a peninsula of land which is approximately 6 kms wide [Ref Map No. 01]. Thereafter, it pursues a somewhat sinuous but generally easterly course past Vindhyanchal towards Mirzapur. Furthermore, towards the northern part of Mirzapur, the river flows northwards and shows a tendency to double back, but after a short distance, it regains its easterly direction continuing towards Chunar. After Chunar, the trend of Ganga becomes north-easterly and it finally exits the Distt. 4 km.s short of Varanasi city. The river covers a total distance of about 45 kms in Mirzapur Distt. The river bed of Ganga in the Distt. is mainly composed of sand and *kankar*.

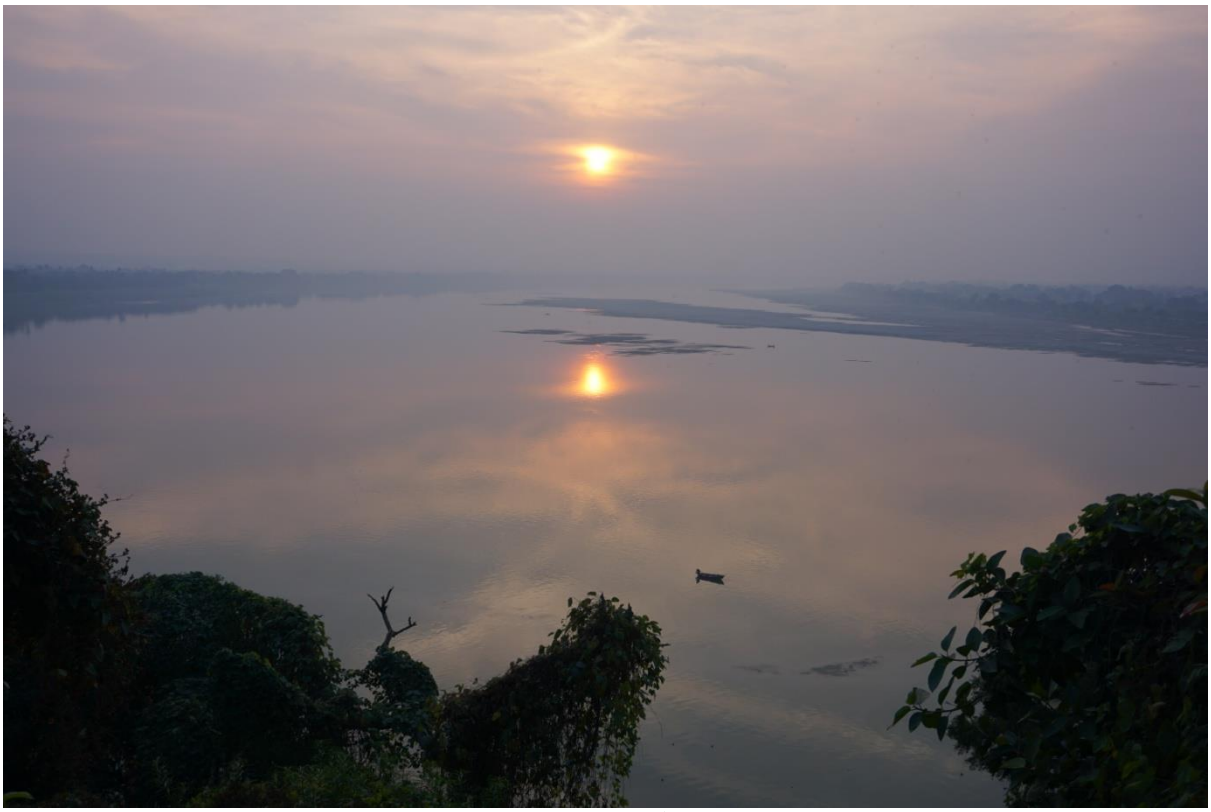


Image 2 : Ganga River As Seen From Chunar Fort In Mirzapur Distt.

3. 0 Methodology

3.1 For carrying out ground survey a 7 km of buffer zone on both the sides of river Ganga in Mirzapur Distt. was marked having a total area of 1137 sq. km. [left bank 315 sq. km. & right bank 822 sq. km.]. The study area was divided into different grids for field survey.

3.2 Based on the secondary information analyzed and the features noted on Google Earth imagery, plan for the field work was constituted to cover different elements of natural heritage in these grids. Special focus was laid on denoting the sites important for riparian biodiversity, riverine fishing, boatmaking communities, turtle sanctuary, river and stream confluences, important waterbodies, oxbow lakes. Furthermore, contacts were developed with various stakeholders and riparian communities in the Distt. for carrying out relevant interactions.

3.3 The field survey in Mirzapur Distt. was carried out from 27th November to 7th December, 2019. Various sites were visited within the study area (Ref. Map 01) wherein field data was collected along with interactions with stakeholders. The co-ordinates of all localities were noted aided by hand-held GPS device and representative images of various parameters were taken with the help of DSLR cameras. The information on cultural, social, religious and natural linkages of people with Ganga River and other elements in the study region was noted.

Image 3 : Interactions With The Fishermen Community In Mirzapur Distt.

4.0 Tributaries Of Ganga River

4.1a Tributaries of River Ganga in the study area fall under catchment 2A6 and 2B5 and sub-catchment 2A6D and 2B5A [Ref. Annexure 1]. Major tributaries joining River Ganga in the Distt. are as follows:

4.1 Karnawati Nala

4.2 Ojhala Nala or Ojhala River

4.3 Khajuri Nala or Khajuri River

4.4 Chatar Nadi

4.5 Jirgo Nadi

4.1 Karnawati Nala

4.1.1 Karnawati Nala or Karnavati Nala or Karnawati Nadi originates in Unch Dih Reserved Forest in Prayagraj (Allahabad) Distt. of Uttar Pradesh. A tributary named 'Rauniya Nala' emerges from Guraiyan R.F. and joins Karnawati Nala near village Godanpur (25° 7'49.37"N, 82°14'42.09"E).

4.1.2 Two Kilometers east to Godanpur, Karnawati Nala is joined by a seasonal stream called 'Karmahan Nala' near Village Rajapur (25°7'58.63"N, 82°16'1.56"E). Karmahan Nala drains through the Kosra and Manda Reserve Forests. After Godanpur Karnawati Nala enters the Mirzapur Distt. and drains 17 sq. km. area before joining Khajuri Nala near village Rampur (25° 8'51.87"N, 82°24'36.59"E).

4.1.3 Khajuri Nala originates from Lalganj Reserved Forest as Basahi Nala and is named as 'Khajuri' after joining a Nala at Rampur Basitali (25°2'19.72"N, 82°22'33.10"E).

4.1.4 Khajuri Nala flows through reserved forests like Dhasra R.F, Bami R.F and Vindyanchal R.F where it is joined by several seasonal streams and finally it merges with Karnawati Nala near village Rampur. After this, Karnawati flows northwards through Mahuwari and Vindyachal Reserved Forest before finally outflowing into river Ganga near village Akorhi (25°10'42.83"N, 82°27'18.02"E).

Image 4 : Karnawati Nala As Seen From NH 76 [Near Akrohi Village]

Image 5 : Karnawati Nala Near Mahodra Village [25° 9'57.18"N, 82°25'42.81"E]

4.2 Ojhala Nala or Ojhala River

4.2.1 Ojhala Nala originates as Lankonr Nala near Pathraur and Devri reserved forests of Mirzapur Distt.. Lankonr Nala drains the dense forests and is joined by a Nara in Tindua R.F; here the stream is popularly known as Piparawal Nala. Near Deori village (25° 0'52.39"N, 82°30'14.89"E), Piparawal Nala is joined by Balwa Nala and emerges as Harrai River.

4.2.2 Near Village Ishlampur (25° 2'29.13"N, 82°30'46.40"E) a constructed river structure named Tandadari Tal or Tanda Tal provides drinking and irrigation source to nearby settlements of the region. The scenic beauty of this region attracts tourists especially in monsoon and post-monsoon season.

4.2.3 After Tanda Tal, Harrai river flows northwards and is joined by a Nara from its left bank near Batasdandi Village (25° 6'41.91"N, 82°30'40.38"E). After village Batasdandi the river is named as Ojhala river.

4.2.4 Ojhala river is joined by several streams emerging from Barkachha R.F. and Bhiskuri R.F. It finally outflows in river Ganga near Gamhapur at 25° 9'21.29"N latitude and 82°31'30.39"E longitude.

Image 6 : Ojhala-Ganga Confuence [As Sighted From NH 76]
[Note Steep Bank Erosion]

4.3 Khajuri Nala or Khajuri River

4.3.1 Khajuri Nala flows through the pristine forests of Danti R.F, Barkachha R.F, Mirzapur R.F, Karundha R.F and Newaria R.F before outflowing into River Ganga Near Chauhanpatti Village at 25°10'11.10"Nlatitude and 82°41'34.27"E longitude.

4.3.2 Dams named Lower Khajuri and Upper Khajuri built on the river provides drinking and irrigation water source to Mirzapur city and educational institutions like BHU south campus. Near BHU campus a waterfall called 'Wyndham Falls or Windom falls' attracts tourists to the region [Ref. Map No. 01].

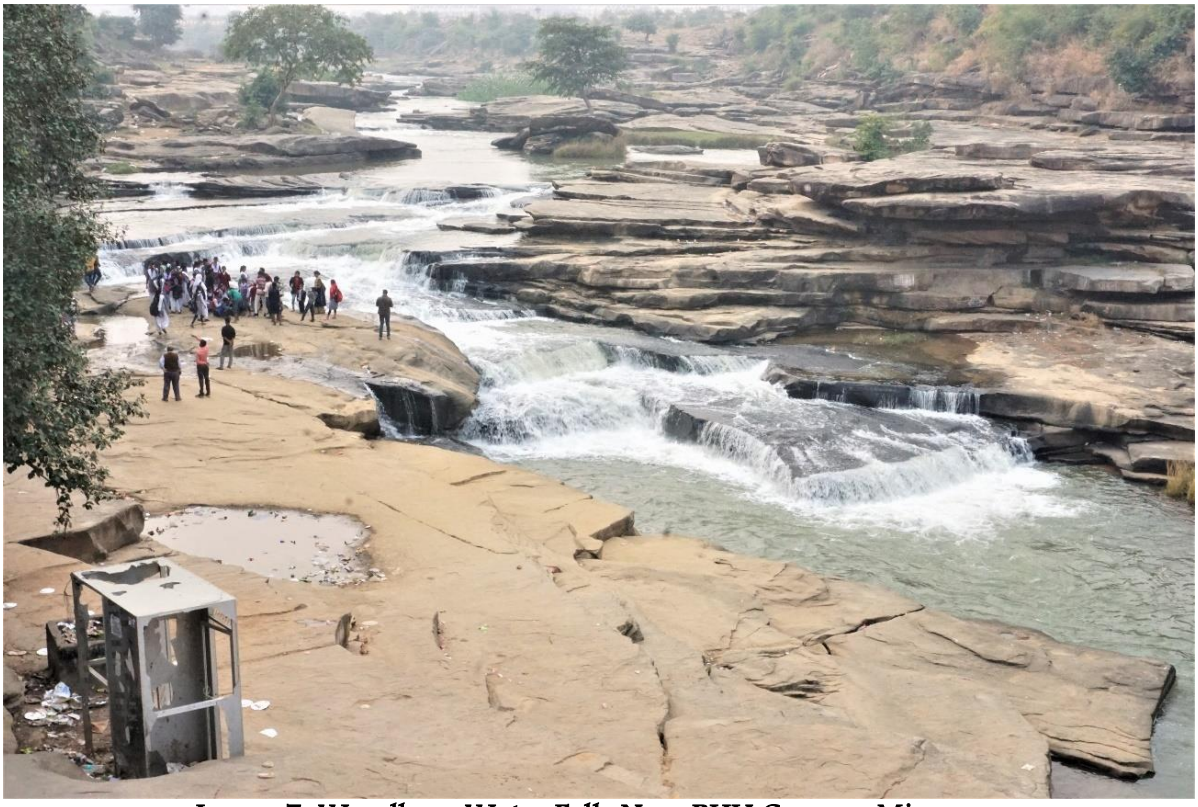


Image 7 :Wyndham Water Falls Near BHU Campus Mirzapur
[Note the Vindhyan Rock Strata Exposed by the River Flow]

4.4 Chatar Nadi

4.4.1 Chatar Nadi is a small tributary, which outflows to Ganga River near village Nanhupur (25° 8'13.88" N, 82°44'53.19" E).

4.4.2 Jamtihwa, Jogiadari and Pahiti Nadi are the major tributaries of river Chatar. They join Chatar River near Khutaha Village (25° 2'30.86" N, 82°41'17.05" E).

Image 8 : Kuardari Nala/Khajuri Nala Before Lower Khajuri Dam

Image 9 : Chatar Nadi At Ganga-Chatar Confluence [Near Nanhupur Village]

4.5 Jirgo Nadi

4.5.1 Jirgo Nadi originates in dense forest of Jaugarh RF in Mirzapur Distt. Magardaha Nala emerges from Dadra Rampur Reserve Forest and joins river Jigro near Semri village of Mirzapur Distt. After flowing few kilometres in northward direction, the river turns eastwards and is joined by Khamwa Nadi near village Samdawa.

4.5.2 Bajahur Nadi and Barhi Nadi are two major tributaries of the Jirgo Nadi originating in the pristine forests of Khamwa RF, Nikarka RF, Bhawanipur RF and Jungle Mahal RF respectively. Both rivers join Jigro River near Patihata (25° 2'55.75" N, 82°57'45.72" E). Here, a reservoir named Jigro Dam or Jigro Jhil was constructed to fulfil the agricultural demands. Downstream to Jigro dam, the river flows northwards upto Chunar and finally turns eastwards before outflowing into river Ganga near Shivpur Village. Another channel of the river goes12 km east to Shivpur and joins river Ganga Near ChakJhori Village.

Image 10 : Jirgo Nadi As Sighted From Jirgo Nadi Bridge [25°11'32.49"N, 82°58'22.07"E]

Image 11 : Jirgo Nadi Before Jirgo-Ganga Confluence

Image 12 : Kalkalia Nala A Tributary Of Jirgo Nadi [As Sighted From NH7]

5.0 Land Use And Land Cover

5.1 Land Use Land Cover (LULC) Map of the study corridor has been prepared from Landsat imagery. Using supervised classification system, 7 classes were generated viz. Vegetation, Agriculture, Fallow land, Open/Barren, Built-up, Water Area.

5.2 The study area constitutes 1137.02 sq. km covering right and left bank of River Ganga, riverine islands and urban areas like Mirzapur city and Chunar. Based on the classification, following observations are noted :

- Agriculture class is largest among all classes and covers 68.67% of the study area.
- Fallow land has a distribution of 7.41%. This includes agricultural fallow area.
- Vegetation cover has a distribution of 7.41% of the total area. This includes vegetation of Vindhyachal Reserve Forest, Mahuwari Reserve Forest, Bhiskuri Reserve Forest, riparian vegetation on riverine island and vegetation along river banks.
- Open/Barren area has a distribution of 9.24% of total study area. It covers parts of hilly tracts of Vindyanchal RF, Bhiskuri RF, mining areas particularly in Chunar, dry river bed and brick kiln area.
- Water area constitutes 3.49% of the study area. It covers lentic and lotic water systems within the study area.
- The built-up land covers 3.15%. This includes urban areas of Mirzapur city, Chunar and other settlements

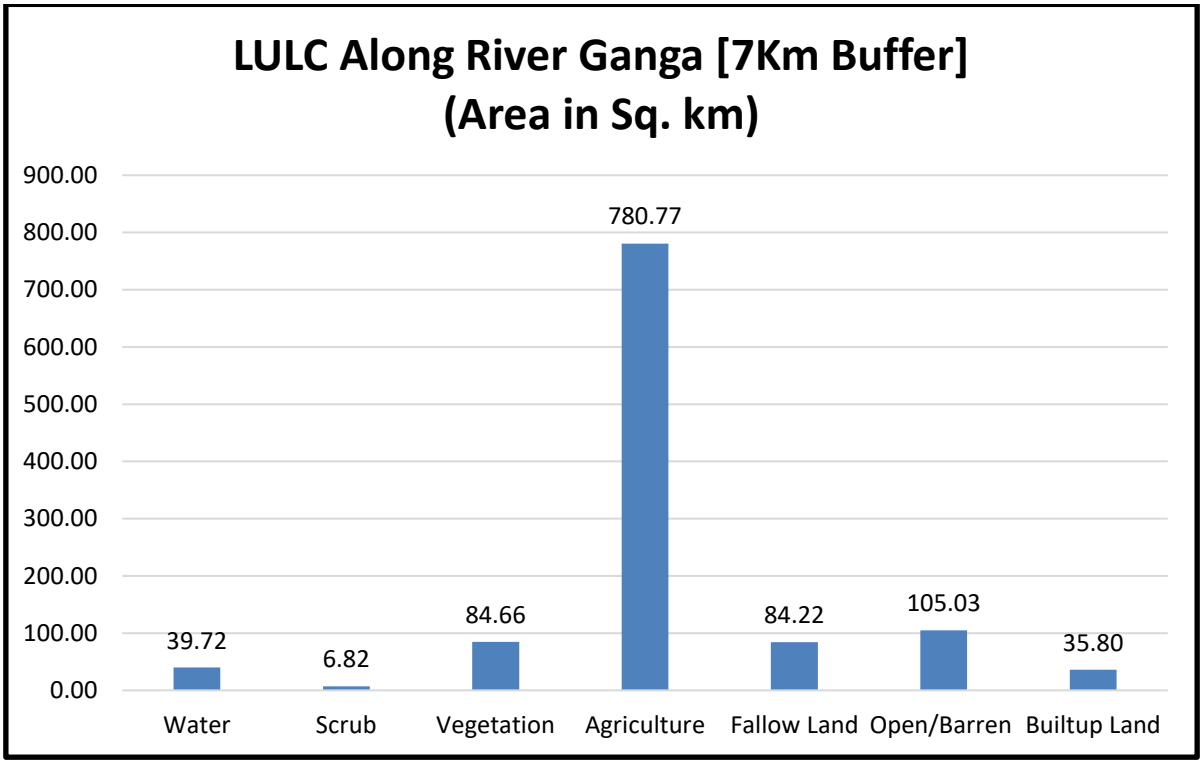


Figure 1 : Land Use And Land Cover [LULC] Along River Ganga

6.0 Paleochannels Of River Ganga

6.1 Decline in natural flow of a river or stream decreases the sediment flushing ability. It may be a reason behind the disappearance of minor river channels in Ganga River basin. In Distt.s like Mirzapur there are other factors which act as a catalyst for the disappeared river channels. These factors are – stone quarrying, mining, change in land use pattern, extensive agricultural practices, brick kilns and river structures (dam/weir/barrages) [Ref. Map No. 3, 4 & 5].

6.2 The comparative study of Survey of India (SOI) maps from 1925-1930 to 2005 and Google Imagery upto April, 2019 shows that the river channel of Ganga in Mirzapur Distt. has shifted during this period. Major shift of the river is observed near Majhilipatti (25°13'28.75"N, 82°29'26.16"E) and Aebakpur Mohana (25° 9'4.90"N, 82°54'1.27"E) (ref. Map No. 06).

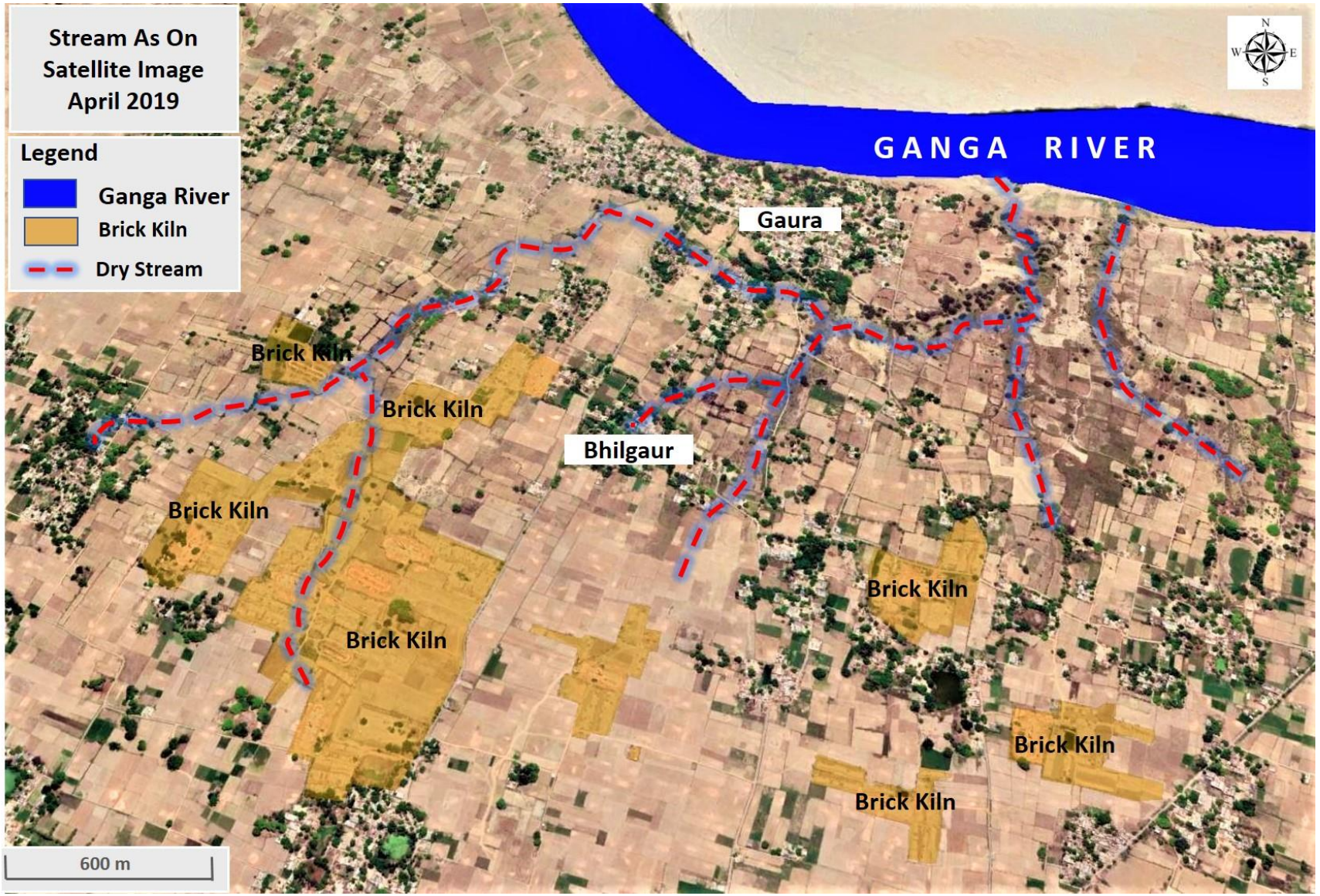
6.3 The study of SoI map series, Google Imagery (in time series) and ground survey highlighted four small streams whose courses have faded or disappeared altogether. The details are provided in table below. Sindhora a major mining site near Chunar is one of the reasons behind the disappearing of river channels between 2000 and 2019 [Ref. Map No. 5]. The disappearing channels are small and seasonal but are equally important because they directly drain to River Ganga. During field visits, it was observed that water flows through these streams is turbid as compared to channels of Khajuri and Belan river (Ref. Image 13&14).

Table 1 : Current/Potential Threats On Small Streams

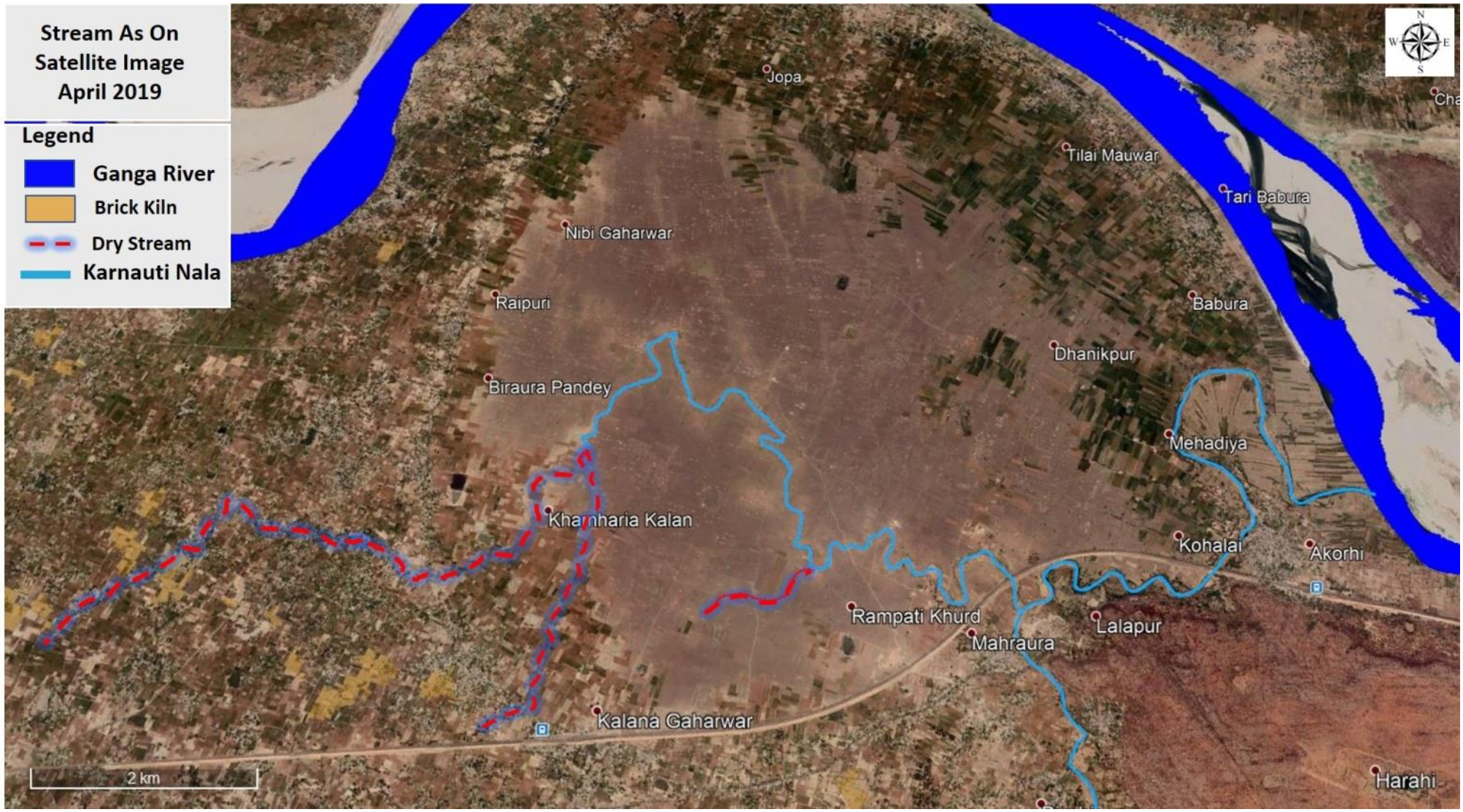
Name	Coordinates and Settlements Near Stream	Current/Potential Threats
Nala	25°12'26.37"N, 82°20'11.40"E Settlements – Gaura and Bhilgaur Village	Agricultural Activities Brick Kilns Loss of Vegetation
Basgurwa Nala	25°10'28.83"N, 82°24'39.06"E Settlements – Khamaria Kalan	Agricultural Activities Siltation Brick Kiln
Nala	25° 6'34.72"N, 82°49'20.01"E Settlements – Sindhora [Near Chunar]	Mining/Stone quarrying Brick Kilns Loss of Vegetation
Nala	25°6'49.56"N, 82°48'27.77"E Settlements – Sindhora [Near Chunar]	Mining/Stone quarrying Brick Kilns Loss of Vegetation
Distributary of Jirgo Nadi	25°10'24.69"N, 82°54'59.84"E Settlements – Jalalpur Mafi	Loss of Vegetation Agricultural Activities Siltation

Image 13 : Turbid Water Inflow From Sindhora Mining Site [Near Chunar]

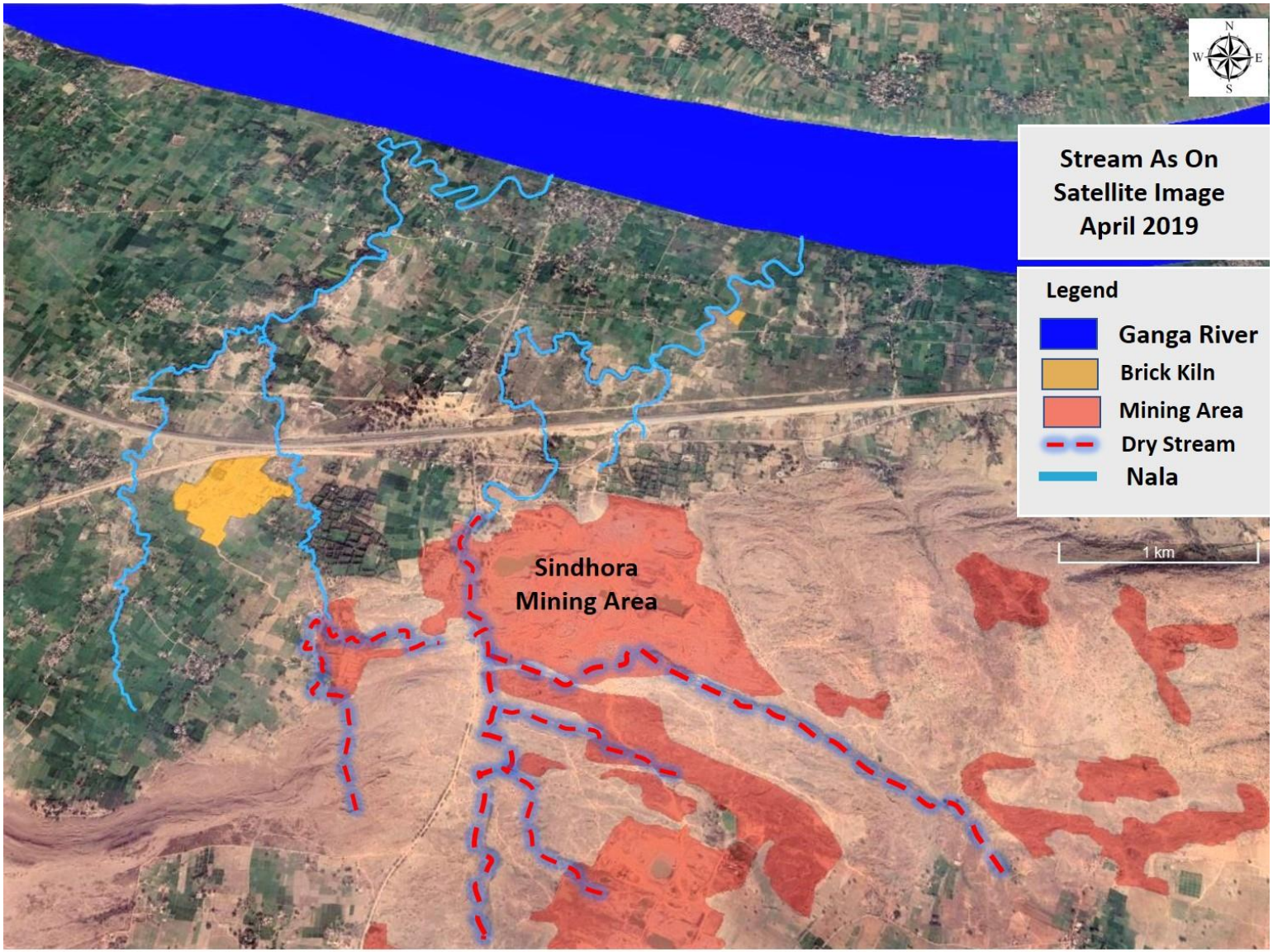
Image 14 : Mine Overburden Obstructing Nala Flow From Sindhora Mining Site
[Sighted From NH 7, Near Chunar]



Map 1 : Based On Satellite Image Of April, 2019 Showing Dry Stream Bed (Nala) Near Gaura And Bhilgaur Village



Map 2 : Satellite Image (April, 2019) Of Dry Stream Bed Of Basgurwa Nala



Map 3 : Satellite Image (April, 2019) Of Dry Stream In Sindhora Mining Area

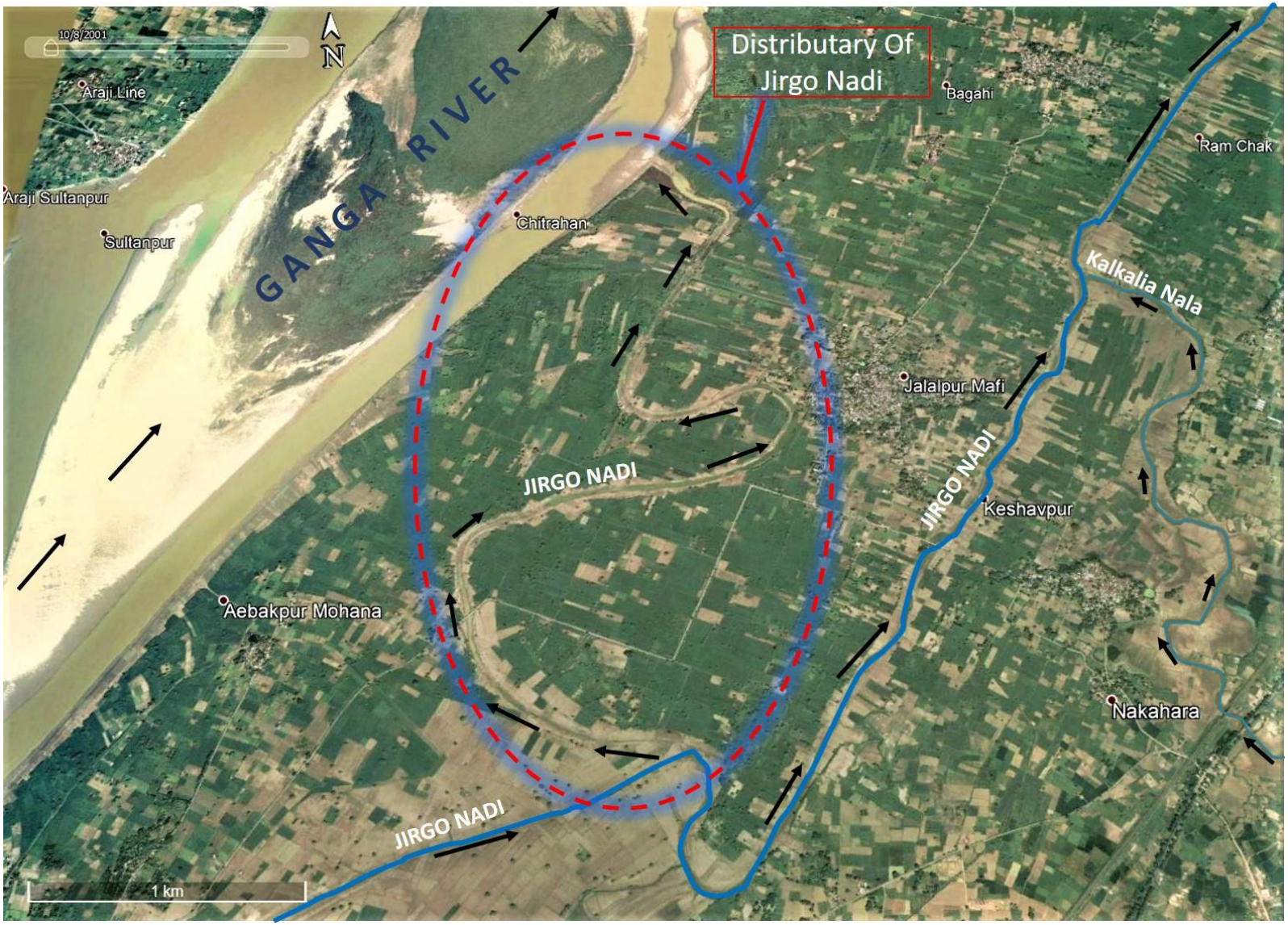


Image 15 : Satellite Image Showing Distributary of Jirgo Nadi [Image dated 2001]

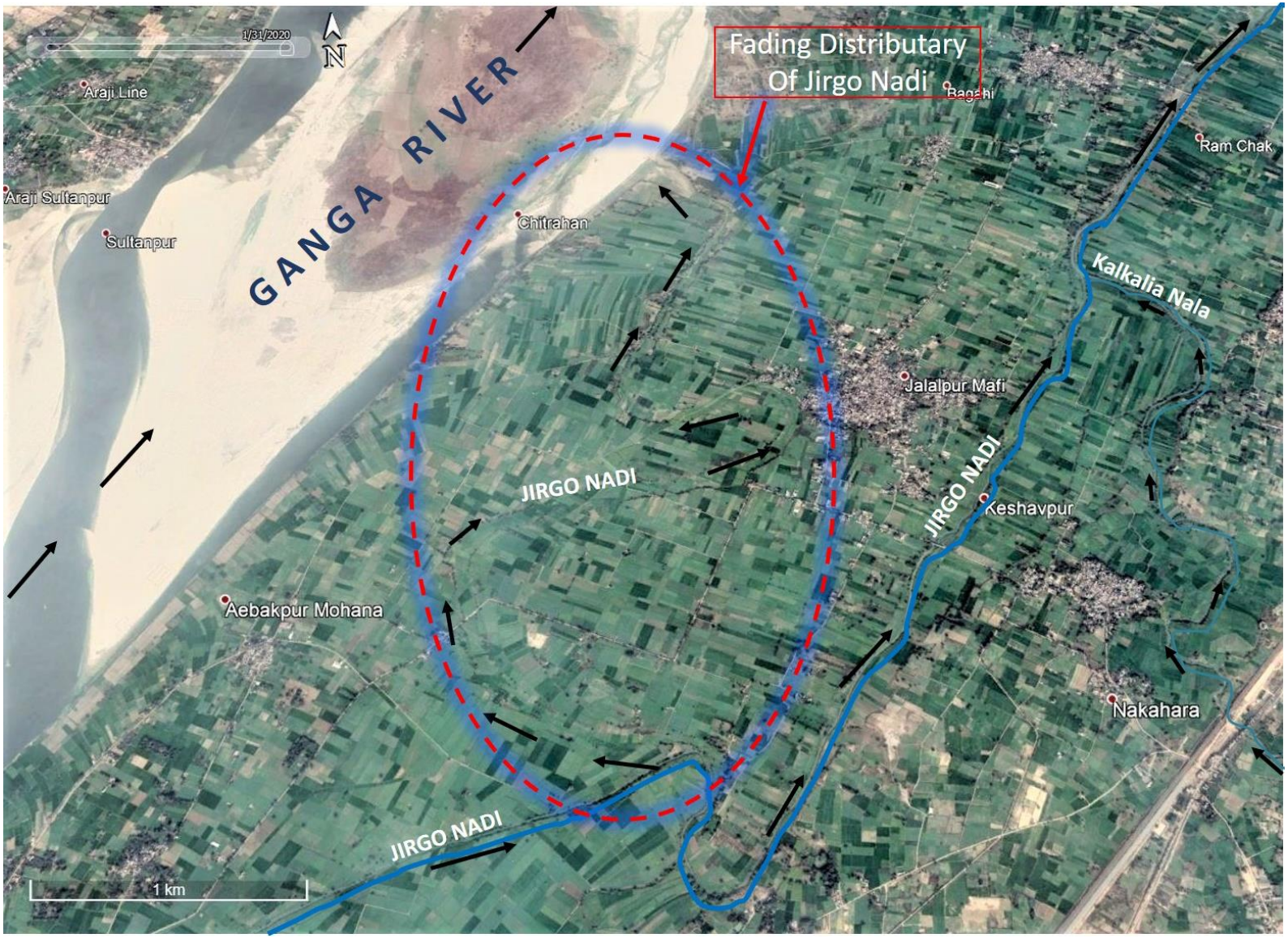


Image 16 : Satellite Image Showing Fading Distributary Of Jirgo Nadi 20 Years Later [Image dated 2020]

7.0 Floodplain Of River Ganga In Mirzapur

7.1 The active flood plain of a river is defined as an area on either side of the river channel with regular flooding on a periodic basis. Maintaining active flood plain of a river is critical for assuring equilibrium in ecosystem. The floodplains harbour rich biodiversity including riparian vegetation as well as many other groups of organisms which help in maintaining fertility of this region. Along with this the floodplains have been of great cultural and economic importance with many early civilizations having risen in these fertile lands. As the rivers naturally meander through the landscape over time, they deposit sand, silt and other soil forming materials in the floodplain region which make the floodplain ideal for agricultural production. Throughout history, people have learned to cultivate the fertile floodplains and use their rich resources for sustaining livelihoods. Even today, in most of the riverine regions especially in India, the floodplains have been occupied by local farmers for carrying out their agricultural activities especially in the non-monsoon season. Ganga River floodplain is one such important floodplain in India which has been extensively utilized in almost all the Distt.s, where it passes through, for agricultural purposes.

Image 17 : Ganga Floodplain In Mirzapur With Cultivation Upto Active Channel

7.2 Mirzapur Distt., lying in the Middle Gangetic plain, is predominantly agrarian with agriculture as the main occupation. The active floodplain in this Distt. mostly comprises of deep sandy soils and deep stratified loamy soils associated with slight or moderate flooding. Almost all villages situated close to Ganga River that are surveyed, largely depended on agriculture with major portion of fields lying in the active Ganga floodplain. In fact, in many villages the fields extended to the edge of the active channel leaving no space for riparian vegetation thus eliminating riparian habitat. Crops are also being cultivated in the wet soils of nallas having limited water flow upto the confluence of these nallas with Ganga River. The farmers of these villages also claimed that most of their fields remained inundated in the flood period.

Image 18 : Crops Cultivated In The Riparian Area Of Current Ganga River Channel Near Basera Kalan Village

Image 19 : Crop Cultivation In A Nallah Bed Near Jagdishpur Village

7.3 The major food grain cultivated in the floodplain fields of Mirzapur was rice followed by wheat and bajra. Among the floodplain vegetables, green peas comprised of a major portion followed by other vegetables such as onion, potato, tomato, radish, cabbage and cauliflower. Pulses such as *toor daal, urad daal* and fruits such as – melon, watermelon were also cultivated during different seasons in floodplain. At some sites intermittently, the cultivation of Marigold flowers was also observed in the Distt. The villages surveyed for the floodplain agriculture along with their produce is provided in Table 02. Images 20-21 depict some of the floodplain fields as observed in the field survey.

Table 2 : Floodplain Agricultural Produce Of Different Villages In Mirzapur Distt.

Sr. no.	Village	Floodplain produce
1	LohiyaTalaab village	Potato, Tomato, Brinjal, Cauliflower
2	Chehra village	Mustard, Rice, Wheat, Chana, Vegetables
3	Kohrakpura village	Rice, Wheat, Arhar, Bajra
4	BaseraKalaan village	Jowar, Mustard, Castor, Peanuts
5	Majhlipatti village	Bitter gourd, Green peas, Watermelon, Mustard, Arhar
6	Itawa village	Arhar, Mustard, Bajara
7	Kakraha village	Wheat, Arhar, Green peas
8	Nanhupur village	Wheat, Chana, Green peas
9	Keotabir village	Potato, Gourd, Green peas, Watermelon, Snake gourd

Image 20 : Mustard Grown In A Floodplain Agricultural Field Of Itawa Village

Image 21 : Arhar Crops Being Grown In Ganga Floodplain Of Majhli Patti Village

7.4 Floodplain Grass

7.4.1 The grass species - *Saccharum spontaneum* L. (commonly known as 'Kaans' in the Distt.) was the most widespread grass in the floodplain region of Mirzapur Distt. This species is a tall and perennial grass growing naturally in the alluvial plains, swamps and riparian areas of north India.

7.4.2 Owing to the deep roots and rhizomes, this grass successfully colonizes the floodplains and grows rapidly spreading in huge areas with its height reaching 3-4 m in some places. In most of the villages this grass was found growing luxuriantly with large patches along rivers, streams and roadsides. Upon interaction, the respondents revealed that they use the dried *Saccharum* grass for thatching the roofs of their houses and for making temporary huts in the fields for resting. In some cases, respondents mentioned the use of this dried grass for fuel purposes.

Image 22 : Saccharum Spontaneum (Kaans) Grass In Mirzapur Distt.

8.0 Wetlands In The Study Region

8.1 Wetlands are the most productive and unique ecosystems which play a crucial role in maintaining many natural cycles as well as support a wide range of biodiversity. They have also served as important resources for many eco-system services such as fishing, farming, water purification and bird habitats. During this study, **434 wetlands** were identified with the help of Google imagery (April, 2019). The details of these wetlands are presented in Table 03 and their locations are depicted in Map 07. The total area occupied by these water bodies is 528.13 ha which is 0.46% of the total study area.

Table 3 : List Of Wetlands Recorded In The Study Area

Sr. No.	Wetland	Latitude	Longitude	Area (ha.)
1	Kajrahwa Pokhara	25.14738833	82.58277357	0.91
2	2	25.15683183	82.58763751	1.17
3	3	25.15327705	82.58540335	1.83
4	4	25.14718161	82.57822382	5.67
5	5	25.13846197	82.56238551	1.11
6	6	25.13008788	82.58875774	0.93
7	7	25.12602169	82.57898534	0.69
8	8	25.13083956	82.56931263	1.28
9	9	25.13303552	82.56700829	0.35
10	10	25.13654154	82.57996859	3.85
11	11	25.13942205	82.57942749	0.78
12	12	25.1407698	82.57981208	1.21
13	13	25.14445009	82.58673981	0.67
14	14	25.14813197	82.58612605	0.8
15	15	25.14227023	82.59056056	0.83
16	16	25.15005068	82.5393252	0.47
17	17	25.16222965	82.50377736	0.62
18	18	25.16527799	82.50006571	0.16
19	19	25.15838369	82.50974609	4.97
20	20	25.15676973	82.50926326	5.46
21	21	25.14642913	82.54827691	0.21
22	22	25.11109449	82.56237277	0.86
23	23	25.18900437	83.05790043	0.68
24	24	25.19801044	83.00930909	0.34
25	25	25.19299655	83.0159162	1.61
26	26	25.18965716	83.01062072	1.58
27	27	25.19207084	83.00447125	1.49
28	28	25.18697731	83.00501161	1.25
29	29	25.16751678	83.01697769	1.91
30	30	25.17188198	83.01598236	0.21
31	31	25.16788798	83.00373554	0.27
32	32	25.17990179	83.00153027	0.34

33	33	25.19019462	83.00006313	2.35
34	34	25.18502671	82.98836527	0.44
35	35	25.18146367	82.99290146	2.17
36	36	25.17629801	82.98744527	0.61
37	37	25.16716394	82.97613419	2.85
38	38	25.16648523	82.97819341	0.93
39	39	25.16772182	82.97077682	0.28
40	40	25.15297907	82.97500019	0.81
41	41	25.15179354	82.97303363	0.21
42	42	25.14935141	82.97647189	0.26
43	43	25.17202388	82.97055305	1.03
44	44	25.15888584	82.96114532	1.12
45	45	25.15412978	82.94442785	0.67
46	46	25.15078061	82.94434333	0.46
47	47	25.19757733	83.06329233	0.79
48	48	25.21375218	83.04079066	2.16
49	49	25.21161572	83.04407427	1.55
50	50	25.20731639	83.06000362	0.76
51	51	25.22165381	83.06667007	1.59
52	52	25.220095	83.06348187	2.54
53	53	25.22783124	83.06219193	1.19
54	54	25.22297905	83.04968066	1.84
55	55	25.22321563	83.05999782	1.01
56	56	25.22995499	83.04711677	1.11
57	57	25.22581301	83.03171267	0.95
58	58	25.22504912	83.03264477	0.71
59	59	25.2273267	83.03491654	0.57
60	60	25.22657816	83.03649245	4.35
61	61	25.22758865	83.0385683	2.28
62	62	25.22303494	83.03698257	0.97
63	63	25.22317958	83.03832179	0.17
64	64	25.22432905	83.03857582	0.35
65	65	25.22503137	83.03793116	0.11
66	66	25.2295373	83.03424273	0.92
67	67	25.2349963	83.03511943	1.12
68	68	25.23206146	83.03863492	1.16
69	69	25.23125413	83.03320912	0.58
70	70	25.22180108	83.04295232	1.14
71	71	25.21651174	83.04576221	2.46
72	72	25.21640213	83.03946041	2.32
73	73	25.19499027	83.0465672	1.36
74	74	25.197845	83.05056699	1.31
75	75	25.20018121	83.04361895	0.77
76	76	25.18975438	83.04234612	0.22
77	77	25.18665952	83.04372039	0.38

78	78	25.18812495	83.0434524	0.25
78	78	25.1893214	83.03870591	0.2
79	79	25.18936295	83.03499741	0.17
80	80	25.18374322	83.03539713	0.29
81	81	25.18256635	83.0355815	0.65
82	82	25.17620294	83.03046652	0.43
83	83	25.16985991	83.02616877	0.34
84	84	25.1927206	83.02528588	2.67
85	85	25.20176163	83.02693856	0.74
86	86	25.20773312	83.02470683	0.75
87	87	25.2113108	83.02441183	1.15
88	88	25.21366438	83.0254794	0.22
89	89	25.21009121	83.01894335	2.29
90	90	25.11550517	82.55071084	1.74
91	Gerua/Garua Talab	25.15750691	82.47621236	0.18
92	92	25.16595257	82.47479793	0.75
93	Motiya Talab	25.15609233	82.4618084	2.82
94	94	25.11579756	82.58756067	3.86
95	95	25.14223684	82.58433203	0.12
96	Gosai Talab	25.15802124	82.59074748	0.79
97	97	25.15929324	82.5989394	0.97
98	98	25.15986628	82.59553631	0.54
99	99	25.1632909	82.59784728	0.69
100	100	25.16395668	82.59897515	0.42
101	101	25.16658582	82.60027517	0.36
102	102	25.16737997	82.60181435	1.03
103	103	25.1664568	82.60261356	0.59
104	104	25.16370353	82.60819078	0.74
105	105	25.15883576	82.60569402	0.93
106	106	25.15686376	82.61311591	0.74
107	107	25.1552344	82.61281705	0.47
108	108	25.15199217	82.62201655	0.39
109	109	25.14761125	82.62354794	0.61
110	110	25.14471463	82.6171245	1.33
111	111	25.15014069	82.60372332	1.49
112	112	25.14680055	82.58034346	0.64
113	113	25.1486065	82.5797547	0.59
114	114	25.11252507	82.55097495	1.44
115	115	25.10125177	82.58068338	1.85
116	116	25.10288583	82.5843288	1.54
117	117	25.10541806	82.58852841	3.98
118	Pahari Pokhara	25.09351518	82.57283449	0.67
119	119	25.0988668	82.5903463	0.71
120	120	25.09498956	82.58910045	0.54
121	121	25.10196481	82.55612971	0.07

122	122	25.10608657	82.56357477	0.56
123	123	25.10737408	82.56118148	1.07
124	124	25.10204616	82.57068924	1.58
125	125	25.16400912	82.48660864	1.18
126	126	25.16497709	82.48014659	1.26
127	127	25.18513183	83.0818568	0.94
128	128	25.18735894	83.08085807	0.91
129	129	25.19152107	83.07531066	2.64
130	130	25.1689809	82.46531254	0.82
131	131	25.14489817	83.00759194	0.13
132	132	25.15074406	82.59054105	0.56
133	133	25.14898879	82.59034682	0.4
134	134	25.14489879	83.00913378	0.44
135	135	25.13514028	82.55668753	0.98
136	136	25.14155917	83.00295438	0.85
137	137	25.16657143	83.06138971	1.82
138	138	25.17545639	83.05587072	2.04
139	139	25.17406665	83.0499198	0.87
140	140	25.15306706	83.03684597	1.19
141	141	25.15503298	83.04413302	0.49
142	142	25.16375268	83.05245307	0.35
143	143	25.16321591	83.04951537	0.15
144	144	25.17237337	83.03410574	0.89
145	145	25.17603341	83.07514596	0.87
146	146	25.18399295	83.02450526	0.4
147	147	25.18473877	83.01994944	0.55
148	148	25.16547306	82.96019469	2.94
149	149	25.11443111	82.92713771	1.67
150	150	25.1087951	82.91720778	1.14
151	151	25.11891759	82.91148694	1.86
152	152	25.12194552	82.91041863	0.43
153	153	25.13079727	82.91020886	0.65
154	154	25.12640117	82.90392161	0.89
155	155	25.12375344	82.90437187	0.43
156	156	25.12855298	82.90761772	0.24
157	157	25.12591824	82.89479586	0.35
158	158	25.10603477	82.88429582	1.82
159	159	25.11024466	82.89137347	0.41
160	160	25.12163175	82.89035865	0.09
161	161	25.10088622	82.89702076	0.82
162	162	25.05745513	82.84712747	0.41
163	163	25.11082494	82.87991397	0.94
164	164	25.11221436	82.87961523	0.33
165	165	25.12267492	82.87828645	0.85
166	166	25.11408742	82.86957957	1.42

167	167	25.06941429	82.87585689	2.98
168	168	25.09975503	82.85247961	0.54
169	169	25.07846026	82.81441462	1.06
170	170	25.07556038	82.81441476	0.76
171	171	25.09184989	82.80702773	2.23
172	172	25.08989693	82.81459041	1.85
173	173	25.05420429	82.78951372	24.6
174	174	25.1069356	82.77607022	0.61
175	175	25.11354044	82.76153494	0.26
176	176	25.12029948	82.75084003	1.57
177	177	25.13455581	82.72851062	2.44
178	178	25.14306307	82.72746211	0.78
179	179	25.14340451	82.73896313	0.48
180	180	25.11615874	82.71439563	1.68
181	181	25.11774557	82.71641386	1.34
182	182	25.1165788	82.72252466	3.05
183	183	25.13425146	82.71197303	0.84
184	184	25.0679314	82.74561995	1.55
185	185	25.1110525	82.72490853	0.22
186	186	25.11190801	82.72408875	0.49
187	187	25.11287129	82.7216011	1.11
188	188	25.11432906	82.72304574	0.92
189	189	25.10893567	82.69217191	2.08
190	190	25.1600121	82.66154468	0.33
191	191	25.15954922	82.65029415	0.68
192	192	25.1592408	82.64923721	0.23
193	193	25.14588582	82.65064384	0.41
194	194	25.12353893	82.629311	0.52
195	195	25.1234818	82.63161119	0.91
196	196	25.123686	82.62571787	0.79
197	197	25.16444899	82.6369866	1.45
198	198	25.16099616	82.63965252	0.69
199	199	25.16384668	82.64500825	1.87
200	200	25.17373227	82.63367752	0.63
201	201	25.17914681	82.63077132	0.91
202	202	25.17926498	82.6354259	0.94
203	203	25.1791813	82.64053707	0.92
204	204	25.17487274	82.65272284	1.28
205	205	25.18489119	82.6393889	0.58
206	206	25.1847257	82.64120532	0.47
207	207	25.18507227	82.6438518	0.41
208	208	25.18499629	82.64608693	1.63
209	209	25.18563886	82.64781293	0.28
210	210	25.18124905	82.64826	0.98
211	211	25.18579951	82.65478036	0.56

212	212	25.18592258	82.65163377	0.75
213	213	25.18869574	82.64856474	0.64
214	214	25.19188388	82.6456601	0.53
215	215	25.20343034	82.64273035	0.66
216	216	25.19616853	82.65708399	0.88
217	217	25.21072519	82.62934179	0.66
218	218	25.20968187	82.62774729	0.22
219	219	25.20758353	82.6459962	0.71
220	220	25.17123016	82.64412331	0.58
221	221	25.16867309	82.64861254	0.29
222	222	25.20789795	82.6396422	0.61
223	223	25.19036252	82.62561782	0.53
224	224	25.19288201	82.62840896	1.25
225	225	25.19303573	82.63671519	0.33
226	226	25.19037211	82.6366911	0.38
227	227	25.19121282	82.61925916	1.14
228	228	25.18645458	82.61940161	1.01
229	229	25.18541351	82.61693245	0.25
230	230	25.18387781	82.61407842	1.25
231	231	25.18707032	82.61033888	0.43
232	232	25.19908629	82.6046226	0.71
233	233	25.19722043	82.61438165	1.47
234	234	25.196035	82.60234163	1.26
235	235	25.19343784	82.59089836	1.52
236	236	25.17328056	82.60759317	0.4
237	237	25.16992809	82.6063359	0.63
238	238	25.17101527	82.60681187	0.63
239	239	25.16783133	82.60527198	0.15
240	240	25.16450506	82.6174332	1.29
241	241	25.16757056	82.59852863	0.43
242	242	25.17538827	82.60042914	0.27
243	243	25.20132855	82.5808502	0.15
244	244	25.20988519	82.58155461	0.37
245	245	25.14495615	82.59362468	0.61
246	246	25.14079817	82.59792974	0.26
247	247	25.13591847	82.60104556	0.78
248	248	25.13086415	82.59920747	1.63
250	250	25.12362981	82.60404846	0.53
251	251	25.11900398	82.58768785	0.81
252	252	25.0982831	82.57061962	0.9
253	253	25.0903694	82.54888282	1.62
254	254	25.09113061	82.54566913	1.02
255	255	25.10509405	82.55675173	0.57
256	256	25.1231307	82.54248044	0.21
257	257	25.1251172	82.54294422	3.89

258	258	25.11592939	82.54162205	0.99
259	259	25.12564971	82.55495223	0.49
260	260	25.12482166	82.55825496	0.57
261	261	25.1323642	82.52934814	0.78
262	262	25.1289319	82.53046954	0.83
263	263	25.12025771	82.52761347	3.58
264	264	25.11780981	82.53381418	1.32
265	265	25.10183867	82.54046786	0.87
166	166	25.09597504	82.54010023	1.04
267	267	25.13313607	82.51170773	0.86
268	268	25.10714899	82.53198013	0.17
269	269	25.13268018	82.50001881	0.77
270	270	25.13442525	82.5026434	0.82
271	271	25.11491133	82.465778	2.65
272	272	25.12435845	82.45898508	8.12
273	273	25.11990948	82.47230161	1.41
274	274	25.11668275	82.47031445	1.32
275	275	25.1425732	82.45196538	3.98
276	276	25.17371497	82.45511533	1.64
278	278	25.15626503	82.43094668	0.67
279	279	25.16794058	82.41385358	1.89
280	280	25.18210799	82.3771617	5.99
281	281	25.20280246	82.41493854	2.94
282	282	25.16450623	82.42920869	0.42
283	283	25.15682837	82.39708061	1.92
284	284	25.15637565	82.45976655	1.64
285	285	25.23551252	82.42408833	0.24
286	286	25.23394367	82.41727115	0.57
287	287	25.24556674	82.39306736	0.84
288	288	25.23502512	82.38130927	1.19
289	289	25.23340741	82.38343167	0.64
290	290	25.23040676	82.37145906	2.83
291	291	25.20487125	82.36021023	0.99
292	292	25.20246533	82.35934507	1.08
293	293	25.19990685	82.36752034	1.46
294	294	25.19432131	82.36786557	1.23
295	295	25.1911679	82.36728188	1.27
296	296	25.19661503	82.36440735	0.74
297	297	25.19245821	82.36029724	0.95
298	298	25.18780738	82.36275853	4.49
299	299	25.16551645	82.35857623	1.27
300	300	25.17045722	82.35825226	0.66
301	301	25.16743071	82.36664548	0.24
302	302	25.21335517	82.36787389	0.84
303	303	25.2077508	82.37205302	0.76

304	304	25.20866189	82.37968802	0.58
305	305	25.17788052	82.37981593	2.17
306	306	25.17331336	82.3830155	1.17
307	307	25.17187785	82.38205088	0.48
307	307	25.17026287	82.38508879	1.12
308	308	25.16576578	82.39007408	1.24
309	309	25.16601479	82.39518269	0.84
310	310	25.16899257	82.40198502	1.38
311	311	25.17270562	82.39624745	0.66
312	312	25.18125067	82.40137463	2.32
313	313	25.21880694	82.39962076	1.66
314	314	25.15672577	82.3952339	2.08
315	315	25.15881066	82.38995839	1.07
316	316	25.16358545	82.40050704	3.27
317	317	25.15203311	82.37652975	1.11
318	318	25.15238873	82.38390427	1.14
319	319	25.14689399	82.3596409	1.49
320	320	25.14843651	82.35507376	3.79
321	321	25.14814058	82.34670428	0.81
322	322	25.143383	82.34672455	0.51
323	323	25.14790701	82.35211237	0.87
324	324	25.14482304	82.35506388	0.94
325	325	25.14617207	82.34056465	1.03
326	326	25.14360063	82.33954216	0.39
327	327	25.20133486	82.3514913	0.61
328	328	25.1985925	82.34571444	2.07
329	329	25.19089404	82.34969832	1.28
330	330	25.18921281	82.35484802	0.85
331	331	25.18797913	82.35369436	1.27
332	332	25.19910098	82.37379251	0.54
333	333	25.19113724	82.37293129	0.91
334	334	25.18313994	82.33697218	1.32
335	335	25.19800282	82.34054338	1.21
336	336	25.18230921	82.33163378	0.81
337	337	25.14123443	82.32382698	1.72
338	338	25.13763546	82.31997487	0.65
339	339	25.15097338	82.32996435	2.21
340	340	25.15066613	82.32465294	0.94
341	341	25.18818223	82.31723547	0.58
342	342	25.1450825	82.30625028	1.12
345	345	25.15885934	82.30747045	3.06
343	343	25.16084048	82.30606142	1.32
344	344	25.17330009	82.30198897	1.92
345	345	25.16830598	82.30434808	1.25
346	346	25.1683831	82.31662923	0.51

347	347	25.17153157	82.32369752	0.42
348	348	25.174161	82.32028266	0.36
349	349	25.15525003	82.32319269	1.66
350	350	25.12764928	82.3129606	0.47
351	351	25.1318711	82.30989567	0.83
352	352	25.14674098	82.3219823	1.06
353	353	25.15587682	82.29318759	1.77
354	354	25.16008691	82.29073377	1.24
355	355	25.16597757	82.29659678	0.49
356	356	25.1901341	82.30445928	1.16
357	357	25.20968821	82.31634561	0.81
358	358	25.19570831	82.30846724	1.18
359	359	25.18981033	82.32540085	0.48
360	360	25.20586588	82.2842715	0.81
361	361	25.20597316	82.28275199	0.99
362	362	25.19226114	82.29720467	0.48
363	363	25.19578854	82.29970543	0.84
364	364	25.16066864	82.2724965	1.19
365	365	25.17808024	82.29609584	0.76
366	366	25.17832132	82.31430317	0.68
367	367	25.20194057	82.29821862	0.98
368	368	25.20044757	82.44944543	0.98
369	369	25.23156388	82.42474099	0.89
370	370	25.23057968	82.49412175	1.08
371	371	25.22630707	82.51080701	0.96
372	372	25.24175609	82.51809004	0.82
372	372	25.21410585	82.54496957	0.54
373	373	25.22597621	82.54944281	1.35
374	374	25.18588067	82.53876383	2.49
375	375	25.23477898	82.55866339	3.95
376	376	25.23662461	82.56960585	0.99
377	377	25.23968764	82.57276569	0.32
378	378	25.23575222	82.57602099	0.76
379	379	25.24945443	82.59154755	1.04
380	380	25.24644336	82.59762261	0.53
381	381	25.23814889	82.60247069	0.53
382	382	25.24933549	82.65200289	0.82
383	383	25.25506943	82.66313702	1.32
384	384	25.25334993	82.69897413	1.44
385	385	25.25446774	82.70126765	1.97
386	386	25.25286489	82.70469103	1.54
387	387	25.21557147	82.71241543	1.19
388	388	25.21635632	82.71574695	1.77
389	389	25.24702357	82.67093995	0.91
390	390	25.24803751	82.6797008	0.46

391	391	25.22333526	82.68664862	1.13
392	392	25.23026823	82.68523451	1.26
393	393	25.23505378	82.68856524	1.08
394	394	25.23703621	82.69371316	2.27
395	395	25.2390584	82.6975986	2.68
396	396	25.25521977	82.71284424	1.13
397	397	25.24054549	82.72136781	1.75
398	398	25.2488955	82.72511156	1.68
399	399	25.19701843	82.72058568	12.7
400	400	25.20085513	82.72149559	0.47
401	401	25.20270558	82.72985778	1.26
402	402	25.22207649	82.74402507	3.29
403	403	25.22768873	82.74927608	1.75
404	404	25.23099488	82.75092882	1.03
405	405	25.23130705	82.75570937	0.41
406	406	25.2275865	82.75499904	0.35
407	407	25.22968432	82.75845153	0.49
408	408	25.22624279	82.76654266	1.13
409	409	25.22074713	82.76679473	0.74
410	410	25.20693051	82.76595367	1.31
411	411	25.20063898	82.76653465	1.92
412	412	25.23934503	82.74101923	0.66
413	413	25.19633996	82.77136243	1.84
414	414	25.12782085	82.82038731	1.14
415	415	25.17545436	82.78201763	2.66
416	416	25.18136904	82.81829925	1.73
417	417	25.17638035	82.82062022	1.65
418	418	25.15544293	82.83320801	1.58
419	419	25.15603272	82.87047152	0.82
420	420	25.17472334	82.87702901	0.49
421	421	25.17248853	82.87540067	0.61
422	422	25.18602102	82.87654089	0.98
423	423	25.19995849	82.87344375	0.76
424	424	25.2004286	82.87849262	1.92
425	425	25.19683204	82.87717286	0.68
426	426	25.1998973	82.8931878	0.54
428	428	25.20609412	82.89129874	0.83
429	429	25.20418326	82.89620057	0.82
430	430	25.20883864	82.89973432	1.71
431	431	25.20397611	82.90043125	0.57
432	432	25.19942545	83.03986907	0.69
433	433	25.19862048	83.04098104	0.23
434	434	25.14738833	82.58277357	0.91

8.2 Among these, some wetlands were selected for sample survey having varying ecological conditions and socio-economic practices. While wetlands such as Motiya Talab, Gerua Talab and Naag Kund are found to be associated with religious beliefs, other wetlands in Mirzapur town such as Ramaipatti ka pokhara and Kajari pokhara are found to be in a dismal state owing to neglect. The details of water bodies surveyed in Mirzapur are provided below :

8.3 **Motiya Talab :** This is one of the important sacred water bodies in Mirzapur Distt. located on the way from Kali Khoh temple to Ashtabhuja temple. This pond is associated with an ancient temple of Lord Shiva known locally as Mukteshwar Mahadev Mandir. There is a strong belief among the devotees that by praying at this temple and bathing in this holy water body, they will attain salvation. Another popular and strong belief attached to this pond is that dog bites infections can be cured with this pond water. This belief was reiterated by many respondents visiting this temple and pond.

The name of this pond has an interesting story behind it. According to the version of the pujaris of this temple, many decades ago there was a tribal group which roamed around in the region with their faithful dog named 'Moti'. One day the tribal group left their dog with a rich man in exchange for a loan. However, there was a theft at the rich man's house after which he released the dog with a letter tied to his collar. When the tribal group spotted their dog returning to them, they got angry and shot an arrow at him thinking that their dog had unfaithfully left the rich man's house. Subsequently the dog died of the injury, but when they read the letter tied to the dog's collar, they felt guilty and came to this pond to seek pardon of their mistake. The rich man also came to this pond and found his stolen wealth hidden here. Upon knowing the story of the dog's fate, he too felt bad and used his wealth to develop this pond and its surroundings along with naming this place as the 'Motiya Talab' after the deceased dog Moti.

[Based on conversation with priest of Mukteshwar Mahadev Mandir]

Image 23 : Location Of Motiya Talab

Image 24 : Motiya Talab Along With Mukteshwar Mahadev Mandir In Mirzapur

8.4 **Gerua Talab/Garua Talab :** This sacred water body lies a little before Motiya talab on the way from Kali Khoh to Ashtabhuja temple in Mirzapur. This pond also forms an important part of the famous 'Trikona Yatra' undertaken by thousands of pilgrims every year. This pond was once believed to be a stronghold for Tantra Sadhana owing

to its major religious significance as described by the Puranas. Owing to the strong beliefs, Shakti Sadhana was undertaken by many sadhus and tantriks at this site and the nearby areas as they believed this to bear remarkable fruits (Tigunait, 1999). However, despite its religious significance, the pond is in a dismal state today. The water has become filthy and not being used by the locals anymore.

Image 25 : Location Of Gerua Talab

Image 26 : Gerua Talab Situated On Way From Kali Khoh Temple To Ashtabhuja Temple

8.5 **Kajari Pokhara :** A rectangular shaped pond is situated on the way to Ashtabhuja temple close to the National Highway 35. The locals refer to this pond as 'Kajari Pokhara' and use its water mainly for bathing. A person, who rears fish in this pond, revealed the presence of mainly *Rohu, Bhakur* and *Kawai* fish here which are sold in the nearby markets. People from nearby areas also visit this pond during Chhat Puja in April and Kajari Puja in July/August.

Image 27 : Location Of Kajari Pokhara

Image 28 : Kajari Pokhara

8.6 **Pahari/Pahadi Pokhara** : A large wetland is found to be present about 4 kms away from Mirzapur town near the State Highway No. 5 (Mirzapur-Ghorawal Marg) which is known as 'Pahadi pokhara' by the locals. Spread over 3 hectares, the water of this pond is mainly used by the local communities for bathing, cleaning clothes and utensils. Apart from this, many people are seen to be fishing from this pond using Hook and Line method. Upon interacting, they revealed that mostly *Bhakur/Katla* and *Rohu* fish are caught for local consumption.

Image 29 : Location of Pahadi Pokhara

Image 30 : Pahadi Pokhara

8.7 **Kajarahwa Pokhara** : Located in the heart of Mizapur town, this pond is densely surrounded by settlements. People residing in these settlements have dumped solid and liquid waste in and around the pond due to which it is infested with algal bloom and emitted foul smell.

Image 31 : Location Of Kajarahwa Pokhara

Image 32 : Kajarahwa Pokhara

8.8 **Ramaipatti ka Pokhara** : This pond is also situated in the Mirzapur town. Waste dumping is the bane of this pond resulting in prolific algal growth and foul smell.

Image 33 : Location Of Ramaipatti Ka Pokhara

Image 34 : Ramaipatti Ka Pokhara

8.9 **Ancient Naag Kund** : This historic step well is located on a road opposite Lal Bhairav Temple close to Ganga river in Vindhyanchal region. It is an ancient heritage structure believed to be built by the Nagvanshi King about two and half thousand years ago when this region was under the kingdom of Naga dynasty (Mishra, 2018). A large fair is organized at this Kund on Naag Panchami when several devotees visit this Kund to offer their prayers. Despite its religious and historical importance, the Kund is in a neglected state today with its water condition deteriorating and encroachments nibbling at the edges.

Image 35 : Location Of Ancient Naag Kund

Image 36 : Ancient Naag Kund

9.0 Forest Biodiversity In The Study Region

9.1 According to the State of Forest Report (FSI, 2013), there is no dense forest present in Mirzapur Distt. and only medium dense/open forests are to be found. These forests are classified as Tropical Dry Deciduous Type as per Champion & Seth, 1968. Three reserve forest [RF] areas namely – Vindhyanchal Reserve Forest, Mahuwari Reserve Forest and Bhiskuri Reserve Forest are present in the study area. All these reserve forests fall under the Mirzapur Forest Division of Uttar Pradesh. The Vindhyanchal Reserve forest mainly covers the Vindhyanchal Range where holy places such as Ashtabhujha Temple, Motiya Talab and Gerua Talab are located. The slope of these mountains has medium to low dense dry deciduous forests while the upper sections of the mountains are covered by open scrub and degraded forests with sparse tree cover. The Bhiskuri RF also comprises of low altitude hilly tracts covered with open degraded forests having very low density of trees and other plants. In interactions with local respondents, it was found that till about 20-25 years ago, these areas had higher density of flora which provided habitat for several faunal species such as leopards, cheetahs and sloth bears. However, due to increasing fragmentation of habitat and over exploitation of forest resources, these populations have diminished to a state of near local extinction. A study conducted by Goparaju & Sinha (2015) has highlighted considerable land use/land cover changes in the forests of Mirzapur and attributed that to the increased urbanization and agricultural expansion in the Distt. The plant species in these RFs are recorded in Table 04 and a few pictorial representations are depicted in Images 37-38.

Table 4 : Plant species recorded from reserve forests in the study area

S. No.	Species	Family	Common name
1.	*Acacia leucophloea* (Roxb.) Willd.	Fabaceae	
2.	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bili Patra
3.	*Azadirachtaindica*A. Juss	Meliaceae	Neem
4.	*Bombax ceiba* L.	Bombacaceae	Silk Cotton
5.	*Butea monosperma* (Lamb.) Taub.	Fabaceae	Palas
6.	*Cassia fistula* L.	Fabaceae	
7.	*Eucalyptus globulus* Labill.	Myrtaceae	Nilgiri
8.	*Ficus religiosa* L.	Moraceae	Peepal
9.	*Holoptelea integrifolia* Planch.	Ulmaceae	Chilbil
10.	*Madhuca longifolia var. latifolia* (Roxb.) A. Chev.	Sapotaceae	Mahua
11.	*Mangifera indica* L.	Anacardiaceae	Aam
12.	*Peltophorum pterocarpum* (DC.) K. Heyne	Fabaceae	
13.	*Phyllanthus emblica* Linn.	Euphorbiaceae	Aamla
14.	*Pongamia pinnata* (L.) Pierre	Fabaceae	Karanj
15.	*Shorea robusta* Gaertn.	Dipterocarpaceae	Sal
16.	*Syzygium cumini* (L.) Skeels	Myrtaceae	Jamun
17.	*Tamarindus indicus* Linn.	Fabaceae	Imli
18.	*Tectona grandis* L.f.	Lamiaceae	Teak
19.	*Balanites aegyptiaca* (L.) Delile	Zygophyllaceae	Hingpet
20.	*Carissa spinarum* L.	Apocynaceae	Karonda

21.	*Calotropis procera* (Aiton) Dryand.	Apocynaceae	Aak
22.	*Lantana camara* L.	Verbenaceae	Lantana
23.	*Ziziphus nummularia* (Burm.f.) Wight & Arn.	Rhamnaceae	Wild ber

Image 37 : Medium Dense Dry Deciduous Forest At Foothills Of Vindhyanchal Mountains As Seen From Ashtabhujha Temple

Image 38 : Open Dry Scrub Forest Near Motiya Talab, Vindhyanchal

10.0 Riparian Flora Along Ganga River In Mirzapur

10.1 The riparian areas, lying between the aquatic and the terrestrial habitats, serve as functional interfaces within the landscapes, mediating energy and matter between these two ecosystems. With dynamic environmental conditions and ecological processes, these areas tend to harbor rich biodiversity. A major component of this biodiversity is the plant communities growing along the river bank which are interacting with both terrestrial and aquatic ecosystems. The riparian vegetation is significant in the overall ecology and environmental aspects of the region owing to its important roles in soil conservation, harboring faunal diversity and providing livelihood resources (Groffman*et al.*, 1990; Castelle*et al.,* 1994).

10.2 Till some time ago, no systematic sampling had been undertaken or record had been maintained for the riparian plant diversity all along Ganga river. There are however, some scattered but significant works of Pallis (1934), Auden (1941), Sahai (1953), Gupta (1960), Bhattacharyya and Goel (1982), Groffman*et al.* (1990), Krishanmurti (1991), Castelle*et al. (*1994), Shyam (2008), Gangwar and Joshi (2006) and Gangwar and Gangwar (2011), which have explored the biodiversity of Ganga river basin. Also, a detailed study published in the form of a book titled – "The Ganga – A Scientific Study" edited by Krishnamurti (1991) documents 475 riparian plant species from Rishikesh to Chinasura [Bengal]. The vegetation in Mirzapur – Ballia region was studied by Tripathi (1991) who reported 38 plant species present along Ganga river which included species like *Ruellia prostrata, Amaranthus spinosus, Calotropis procera* and *Polygonum plebeium.*

10.3 The interaction with local forest department officials in Mirzapur did not reveal any significant riparian forest patch in the Distt. However, during field survey we encountered a very large patch of riparian vegetation located on the right bank of River Ganga near Majhara village in the Distt. (Image 38) [Ref. Map No. 01]. Spanning in an area of approximately 6.5 sq.km., this roughly semi-circular patch was dominated by two species – *Saccharum spontaneum* (Kaans grass) and *Ziziphus nummularia* (Wild Ber). The neighboring villagers were found to be using the dried grass for roof thatching and collected the wild *ber* for consumption. The presence of this habitat may be connected with rising number of wild boars visiting the agricultural fields according to the villagers in the vicinity.

Image 39 : Riparian Vegetation Near Majhara Village Dominated By *Saccharum Sp.* And *Ziziphus Sp.*

10.4 Apart from this, the riparian vegetation occurred in patches in different parts of the Distt. Barring few places such as Basera Kalaan village, most of the riparian regions had sparse tree cover including mostly *Acacia nilotica*, *Azadirachta indica*, *Madhuca* sp. and *Mangifera indica*. The rich tree cover observed in Basera Kalaan village was due to plantation by villagers who also ensured protection of these trees (Image 40).

10.5 Total 39 different riparian plant species were recorded along Ganga River in Mirzapur Distt. Amongst these, the trees and herbs were well represented with 14 species each followed by shrubs which were represented by 9 species and grassers which were represented by 2 species. Plants such as – *Parthenium* sp., *Calotropis* sp., *Tridax* sp., *Leucas* sp. and *Saccharum* sp. were widespread throughout the surveyed sites while *Polygonum* sp., *Solanum* sp. and *Malvastrum* sp. were present only in some riparian areas surveyed.

10.6 Some of these plant species were utilized by the locals for their medicinal properties. An example was *Ocimum sp.* (Wild Tulsi) and *Tridax procumbens* (Kanphuli) which are used for treating injuries and stopping blood loss. Another commonly found riparian shrub – *Calotropis procera* produces white colored milky exudates which are reportedly beneficial in treating fever and snake bites. The riparian plant species recorded in this survey are presented in Table 05 and some of the significant species are depicted in Images 41-44.

Image 40 : Rich Growth Of Trees Along Ganga River In Basera Kalaan Village

Table 5 : Riparian Plant Species Recorded In Mirzapur Distt.

Sr. No.	Botanical Name	Family	Common Name
01	*Acacia nilotica* (L.) Delile	Fabaceae	Babool
02	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bili Patra
03	*Azadirachta indica* A. Juss.	Meliaceae	Neem
04	*Bombax ceiba* L.	Bombacaceae	Semal
05	*Dalbergia sissoo* DC.	Fabaceae	Shisham
06	*Delonix regia* (Hook.) Raf.	Fabaceae	Gulmohar
07	*Ficus benghalensis* L.	Moraceae	Banyan
08	*Ficus religiosa* L.	Moraceae	Peepal
09	*Ficus virens* Aiton	Moraceae	Pakad
10	*Holoptelea integrifolia* Planch.	Ulmaceae	Chilbil
11	*Madhuca longifolia* var. *latifolia* (Roxb.) A.Chev.	Sapotaceae	Mahua
12	*Peltophorum pterocarpum* (DC.) K.Heyne	Fabaceae	Peela Gulmohar
13	*Polyalthia longifolia* (Sonn.) Thwaites	Annonaceae	False Ashok
14	*Tectona grandis* L.f.	Lamiaceae	Teak
15	*Calotropis gigantea* (L.) Dryand.	Apocynaceae	Safed Aak
16	*Calotropis procera* (Aiton) Dryand.	Apocynaceae	Aak

17	*Lantana camara* L.	Verbenaceae	~~~~~
18	*Lippia alba* (Mill.) N.E.Br. ex Britton &P.Wilson	Verbenaceae	~~~~~
19	*Malvastrum coromandelianum* (L.) Garcke	Malvaceae	False Mallow
20	*Ocimum tenuiflorum* L.	Lamiaceae	Tulsi
21	*Polygonum glabrum* Willd.	Polygonaceae	Common marsh buckwheat
22	*Ricinus communis* L.	Euphorbiaceae	Arandi
23	*Ziziphus nummularia* (Burm.f.) Wight &Arn.	Rhamnaceae	Wild Ber
24	*Achyranthes aspera* L.	Amaranthaceae	Chirchira
25	*Amaranthus spinosus* L.	Amaranthaceae	Prickly Amaranth
26	*Ammania baccifera* L.	Lythraceae	
27	*Croton bonplandianus* Baill.	Euphoriaceae	Ban Tulsi
28	*Justicia* sp.	Acanthaceae	~~~~~
29	*Leucas aspera* (Willd.) Link	Lamiaceae	~~~~~
30	*Parthenium hysterophorus* L.	Asteraceae	Congress grass
31	*Rumex dentatus* L.	Polygonaceae	Jungli Palak
32	*Solanum xanthocarpum* Schrad. & H. Wendl.	Solanaceae	Kateli
33	*Tephrosia purpurea* (L.) Pers.	Fabaceae	Sharpunkha
34	*Tridax procumbens* (L.) L.	Asteraceae	~~~~~
35	*Xanthium strumarium* L.	Asteraceae	Chhota Dhatura
36	*Cyperus difformis* L.	Cyperaceae	~~~~~
37	*Cyperus rotundus* L.	Cyperaceae	Nut grass
38	*Dicanthium annulatum*	Poaceae	~~~~~
39	*Saccharum spontaneum* L.	Poaceae	Kaans

Image 41 : *Polygonum glabrum*

Image 42 : *Ocimum tenuiflorum*

Image 43 : *Ziziphus nummularia*

Image 44 : *Cyperus difformis*

11.0 Faunal Diversity In Mirzapur Distt.

11.1 Mirzapur was once amongst the richest wildlife areas of India and was known for its rich wildlife heritage. The forests of Mirzapur used to be free hunting ground for British officers and landed gentry. A fine description of this heritage can be found in the book 'In the Districts of the Raj' by Gundevia (1992). Following is an important mention from the book:

> *"Mirzapur had the reputation of being a first-rate shikar District. All over the Vindhyan plateau if one traversed by car from Mirzapur to Robertsganj, there was plenty of game. There was any amount of sambar and cheetal, any amount of wild boar and everything else in the antelope family. As one reached the Kaimur ranges one even came upon the black sloth bear here and there."*

11.2 Today, the deciduous forests spread over hilly terrain falling in the study corridor harbor animals such as hyena, monitor lizard, jungle cat, mongoose, civet and langur. The respondents from this region reported that this area had a dense forest cover teeming with leopards, tigers and sloth bears till about two decades earlier. However, due to vast changes in land-use and land-cover of this area these faunal populations are greatly diminished locally.

11.3 **Sloth Bear :** Mirzapur is well known for the presence of sloth bears (*Melursus ursinus*) which are flagship species of forests in this Distt. The hilly terrain covered with dry deciduous forests has been known to be inhabited by sloth bears. Classified as 'Vulnerable' in the IUCN Red List, these bears are endemic to the Indian sub-continent (Garshelis, 2008) and have been accorded protection under Schedule-I of Wildlife (Protection) Act, 1972. The interaction with temple priests near Motiya talab revealed that this region was an important habitat for the Sloth Bears till about 20 years back. However, the habitat changes coupled with other anthropogenic factors led to decline in their population so much so that they are not found to be present here now.

11.4 **Gangetic Dolphin :** The Ganges River Dolphin (*Platanista gangetica gangetica*) is one of the three freshwater dolphin species in the world and is distributed in the Ganges–Brahmaputra–Meghna and Sangu–Karnaphuli River systems in India, Nepal, and Bangladesh (Sinha & Kannan, 2014). It is commonly known as 'sos/sus' in the middle Ganga stretch and is classified as 'Endangered' in the IUCN Red List owing to the decrease in its population in the last few decades. Its presence in the middle Ganga stretch has been mentioned in a couple of research papers and reports. However, there has been no specific record/site of dolphins in the Mirzapur Distt. stretch of Ganga River. During the survey, many respondents including fishermen were emphatic about the presence of dolphins at different sites. The sightings of dolphins in this survey is likely at two sites – confluence of Ojhala nala with Ganga River near Mirzapur town and confluence of an unnamed nala with Ganga River in Itawa village

(actual Image 45). In some sites such as Keotabir village, the respondents claimed to have spotted the dolphins during monsoon season.

Image 45 : Gangetic Dolphin Sighted Near Confluence Of An Unnamed Naala With Ganga River In Itawa Village

11.5 **Golden Jackal :** The golden jackal (*Canis aureus*) is a wolf-like canid that is native to Southeast Europe, South-west Asia, South Asia, and regions of Southeast Asia. It is of 'Least Concern' in the IUCN Red List with their population trend increasing in the last couple of years owing to their widespread distribution, availability of shelter and food in good quantity and they being generalist foragers.

11.6 **Nilgai :** The Nilgai antelope – *Boselaphus tragocamelus* is widely distributed throughout the country. However, due to prolonged breeding activity and lack of predators, the numbers of Nilgai have increased considerably and become locally overabundant in states of Gujarat, Uttar Pradesh, Haryana, Punjab, Rajasthan, Madhya Pradesh and Delhi (Meena, 2017).In course of time, this species has been successful in adjusting to the human-altered landscapes and in many places has become a serious pest of agricultural crops. During survey in Mirzapur, a large herd of Nilgai was spotted foraging and trampling the floodplain agricultural fields in Chehara village (Ref. Image 46). Furthermore, the presence of Nilgai was also seen and recorded from people's feedback in different villages such as – Gaura, Basera Kalaan and Majhara. During interaction, the villagers voiced their concern over the large-scale crop damages by Nilgai in the Distt. They have made use of electric fences to cordon off their fields from Nilgai.

Image 46 : A Herd Of Nilgai Foraging On An Agricultural Field In Chehara Village

11.7 **Wild Boars :** The Indian wild boar (*Sus scrofa* L.) also known as the wild pig is one of the widespread animals throughout the world. In recent times, wild boar has become a regular menace for farmers as it generally causes damage right from planting till the maturity of the crop (Vasudeva Rao et al., 2015). Respondents from all villages visited during this survey confirmed the presence of many wild boars in the region and expressed their concerns about destruction caused by these boars in agricultural fields. Some respondents in villages such as Chehara, Itawa and Majhara village also claimed that local residents indulged in killing these boars for protection of fields indicating the presence of man-wild boar conflict in this Distt..

11.8 **Avian Diversity** : Mirzapur Distt. has a rich diversity of avifauna which is relatively understudied so far. During the field survey in November and December, 2019, the diversity of avian species was recorded using binoculars and identified using field guides (Salim Ali, 2012; Grimmett et al., 2016). The conservation status of the species was listed by referring IUCN Red Data List. A total of 76 species of birds were sighted during the field visits and list of the species are provided in table below :

Table 6 : List of Avian Species Sighted Within Study Corridor

Sr. No.	Common Name	Scientific Name	Conservation Status
1	Lesser Whistling Duck	*Dendrocygna javanica*	Least Concern
2	White throated Kingfisher	*Halcyon smyrnensis*	Least Concern

3	Pied kingfisher	*Cerylerudis*	Least Concern
4	Cattle Egret	*Bubulcus ibis*	Least Concern
5	Little Egret	*Egretta garzetta*	Least Concern
6	Intermediate Egret	*Ardea intermedia*	Least Concern
7	Great Egret	*Ardea alba*	Least Concern
8	Indian Pond Heron	*Ardeola grayii*	Least Concern
9	Purple Heron	*Ardea purpurea*	Least Concern
10	Painted Stork	*Mycteria leucocephala*	Least Concern
11	Asian Openbill Stork	*Anastomus oscitans*	Least concern
12	Red-Naped Ibis (Black Ibis)	*Pseudibis papillosa*	Least concern
13	Common Sandpiper	*Actitis hypoleucos*	Least Concern
14	Little Cormorant	*Microcarbo niger*	Least Concern
15	Indian Cormorant	*Phalacrocorax fuscicollis*	Least Concern
16	Great Cormorant	*Phalacrocorax carbo*	Least Concern
17	Bronze-winged Jacana	*Metopidius indicus*	Least Concern
18	White breasted – Waterhen	*Amaurornis phoenicurus*	Least Concern
19	Purple Swamhen	*Porphyrio porphyrio*	Least Concern
20	Common Moorhen	*Gallinula chloropus*	Least Concern
21	Eurasian Coot	*Fulica atra*	Least Concern
22	**River Lapwing**	***Vanellus duvaucelii***	**Near Threatened**
23	Yellow-wattled Lapwing	*Vanellus malabaricus*	Least Concern
24	Red-wattled Lapwing	*Vanellus indicus*	Least Concern
25	Black Drongo	*Dicrurus macrocercus*	Least Concern
26	Oriental Skylark	*Alauda gulgula*	Least Concern
27	Common Myna	*Acridotherestristis*	Least Concern
28	Bank Myna	*Acridotheres ginginianus*	Least Concern
29	Brahmany Starling	Sturnus pagodarum	Least Concern
30	Asian Pied Starling	*Gracupica contra*	Least Concern
31	Paddyfield Pipit	*Anthu srufulus*	Least Concern
32	Jungle Babbler	*Turdoides striata*	Least Concern
33	Common Babbler	*Argya caudata*	Least Concern
34	Large Grey Babbler	*Argya malcolmi*	Least Concern
35	Baya Weaver	*Ploceus philippinus*	Least Concern
36	Rufous Treepie	*Dendrocitta vagabunda*	Least Concern
37	White Wagtail	*Motacilla alba*	Least Concern
38	Indian Peafowl	*Pavo cristatus*	Least Concern
39	Indian Silver Bill	*Euodice malabarica*	Least Concern
40	Asian Plain Martin	*Riparia chinensis*	Least Concern
41	Common Tailorbird	*Orthotomus sutorius*	Least Concern
42	**Alexandrine Parakeet**	***Psittacula eupatria***	**Near Threatened**
43	Rose-ringed Parakeet	*Psittacula krameri*	Least Concern

44	Indian Grey Hornbill	*Ocyceros birostris*	Least Concern
45	House Sparrow	*Passer domesticus*	Least Concern
46	Indian Jungle Crow	*Corvus culminatus*	Least Concern
47	House Crow	*Corvus splendens*	Least Concern
48	Oriental Magpie Robin	*Copsychus saularis*	Least Concern
49	Indian Robin	*Saxicoloides fulicatus*	Least Concern
50	Common Pigeon	*Columba livia*	Least Concern
51	Indian Roller	*Coracias benghalensis*	Least Concern
52	Green Bee-eater	*Merops orientalis*	Least Concern
53	Brown Shrike	*Lanius cristatus*	Least Concern
54	Brown-headed Barbet	*Psilopogon zeylanicus*	Least Concern
55	Coppersmith Barbet	*Psilopogon haemacephalus*	Least Concern
56	Ashy Prina	*Prinia socialis*	Least Concern
57	Grey-breasted Prinia	*Prinia hodgsonii*	Least Concern
58	Plain Prinia	*Prinia inornata*	Least Concern
59	Asian Koel	*Eudynamys scolopaceus*	Least Concern
60	Greater Coucal	*Centropus sinensis*	Least Concern
61	Red-whiskered Bulbul	*Pycnonotus jocosus*	Least Concern
62	Red-vented Bulul	*Pycnonotus cafer*	Least Concern
63	Common Hoopoe	*Upupa epops*	Least Concern
64	Black Kite	*Milvus migrans*	Least Concern
65	**Indian Spotted Eagle**	***Clanga hastata***	**Vulnerable**
66	Shikra	*Accipiter badius*	Least Concern
67	Common Kaestral	*Falco tinnunculus*	Least Concern
68	**Pallas's Fish Eagle**	***Haliaeetus leucoryphus***	**Endangered**
69	Red Necked Falcon	*Falco chicquera*	Least Concern
70	Scaly Breasted Munia	*Lonchura punctulata*	Least Concern
71	Indian Golden Oriole	*Oriolus kundoo*	Least Concern
72	Spotted Dove	*Stretopelia chinesis*	Least Concern
73	Oriental Turtle Dove	*Streptopelia orientalis*	Least Concern
74	Eurasian Collared Dove	*Streptopelia decaocto*	Least Concern
75	Red Collared Dove	*Streptopelia tranquebarica*	Least Concern
76	Laughing Dove	*Spilopelia senegalensis* (as on IUCN red data list 2018)	Least concern
77	Brahminy Starling	*Sturnus pagodarum*	Least concern

Image 47 : Asian Openbill – Stork *(Anastomus oscitans)*

Image 48 : Brahminy Starling *(Sturnus pagodarum)*

12.0 Ganga Riverine Islands In Mirzapur

12.1 River islands are typically exposed land parts bounded by river channels. These islands generally result from changes in the course of a river such as interactions with a tributary or the opposing fluvial actions of deposition and/or erosion such as forming a natural cut and meander. These islands exhibit various shapes and varying surface areas but are generally elongated along the course of the flow. The islands also divide the river into multiple channels and form the connection of interrelation and interaction between two channels (Sun et al., 2018).

12.2 Two riverine islands [Ref. Map No. 09] in Ganga River are present in Mirzapur Distt. The bigger among these two was a roughly oval shaped island of approximately 3 km length and 1.5 km width. It is located towards left bank of Ganga River close to Bagahi village in Mirzapur Distt. (Image 46), about 48 kms away from Mirzapur town. The island was mainly covered with riparian grass – *Saccharum spontaneum* (Kaans) along with a few trees of *Acacia nilotica* (Babool) and *Azadirachta indica* (Neem). No specific name is accorded to this island. However, agriculture is being practiced on the fringes of this island by inhabitants of nearby villages and the fields were bordered by electric fences to prevent damage from potential pests. Small resting places had been constructed in the fields with thatched roofs made with the dried Kaans grass.

Image 49 : Riverine Island Near Bagahi Village In Mirzapur Distt. With Sparse Trees And Crops Planted On The Fringes

Image 50 : Luxuriant Growth Of Kaans Grass On Riverine Island Near Bagahi Village
[Note : Hut Having Roof Thatched With Dried Kaans Grass]

12.3 Another roughly oval shaped riverine island [Ref. Map No. 09] is present near Kewatabir village towards the right bank of Ganga River at about 20 kms from Mirzapur town. The local community refers to this island as 'Kewatabir ka Reta' and access it from the right bank in small boats. The major part of this island had almost negligible vegetation cover while some part of it had luxurious growth of Kaans grass. Similar to the other island, the locals had planted vegetables such as *lauki, turai* and tomato on the fringes of this island too. Dried Kaans grass from the island is used for roof thatching.

Image 51 : 'Kewatabir Ka Reta' Riverine Island

Image 52 : People On 'Kewatabir Ka Reta' For Planting Crops And Collecting Dried Kaans Grass (In The Background)

13.0 Fishing In Mirzapur

13.1 Ganga River supports a rich diversity of fishes including Indian Major Carps, other Carps, Mullets, Clupeids, Feather backs, large / small Catfishes and miscellaneous fishes which form an important source of livelihood for many fishermen throughout its stretch. In Mirzapur Distt. too, fishermen (mainly belonging to Mallah community) were found to be involved in fish catching in almost all the surveyed sites along Ganga River. The most common fishing gear employed by the locals was hook and line (Ref. Image 53) with which they catch fish for their own consumption or local village markets. Another important fishing gear employed by the fishermen in this Distt. was drag nets. This method of fish catching was observed in various places such as Gogawan, Bhaurupur, Ojhala-Ganga confluence and near Chunar Fort (Ref. Image 54).

Image 53 : Hook And Line Fishing Observed At Ojhala Nala-Ganga River Confluence

Image 54 : Drag Net Fishing Observed Near Chunar Fort

13.2 **Most of the fishermen interacted with in different localities emphasized that the overall fish catch had declined by 60-90 %, especially in the last couple of decades.** The commonly found *Mrigal* and *Tengara* fishes are now rarely found while the common carp (*Cyprinus carpio*) comprises major portion of fish catch from Ganga River in the Distt. This introduced species has become invasive in most part of Ganga River and is known to feed on offspring of other fish species in the river according to the fishermen's observations. Other species such as Rohu and Catla are caught in good numbers only during monsoon season whereas the catch decreased during the rest of the year. The fishermen also claimed that owing to pollution the fish size and weight had also decreased. The important fish species caught from Ganga River in the Distt. are as following :

- *Cyprinus carpio* (Common carp)
- *Labeo rohita* (Roi/Rui/Rohu)
- Sidhari fish
- *Labeo catla* (Bhakur/Catla)
- *Heteropneustes fossilis* (Singhi)
- *Mystus tengara* (Tengara fish)
- *Wallago attu* (Padhin)
- *Cirrhinus mrigala* (Mrigal)

Image 55 : Common Carp Caught From Ganga River Near Ojhala-Ganga Confluence

14.0 Boat Making In Mirzapur

14.1 There has been no previous study on boat making in Mirzapur Distt.. However, some people belonging to Mallah community were found to be involved in boat making at the Chunar Ghat near Chunar Fort. It was observed that two different kinds of boats – a large sized boat and a small sized boat (locally known as *Dongi*) were being made. These boats are mainly used for fishing activity and in some cases for tourists and transportation of materials across the river. The boats were mainly made up of Sal or Sekua wood (*Shorea robusta*) as it is very durable. However, the smaller dongis were also made from Babool (*Acacia nilotica*) and mango (*Mangifera indica*) wood which was readily available throughout the Distt.

Image 56 : Mallah Community Involved In Boatmaking At Chunar Ghat In Mirzapur Distt.

Image 57 : A Small Boat (Locally Called Dongi) Made From Babool Wood Near Chunar Ghat

15.0 Groundwater

15.1 Ground water characteristics of a particular area are subject to several natural factors like precipitation, drainage, topography, lithology and hydrogeological conditions of the region. It is also influenced by human induced factors like groundwater withdrawal and changes in land use pattern. The geological setup of the study area [7 Km Buffer] within Mirzapur Distt. is characterized by Vindhyan and Quaternary Alluvium formations. Hydro-geologically, the groundwater conditions in the study area are greatly influenced by the unconsolidated sediments called **'Marginal Alluvium'** and hard rock formations. Marginal alluvium is spatially distributed throughout the study area while hard rock formations comprising of upper Vindhyan sandstone and shale are found near Chunar and surrounding areas.

15.2 The soil resource of the study area falls under soils of Gangetic plain and Vindhyan Scraplands. which is further divided into :

- **Gangetic Plain**

  Soils of recent alluvial plain :

  - Deep, well-drained soil, fine loamy soils with loamy surface and slight erosion [Fluventic Ustopchrepts]

  Soils of active flood plain :

  - Deep, well drained soils with sandy surface and moderate flooding [Typic Ustipsamments].
  - Deep, excessively drained, coarse loamy soil with sandy surface and severe flooding

- **Vindhyan Scarplands**

  Soils on plateau :

  - Moderately shallow, well drained, fine loamy soils with loamy surface and moderate erosion
  - Deep, moderately well drained, fine, montmorillonitic soils with clayey surface and moderate erosion

15.3 The soils of active flood plain cover the left and right bank and surrounding area of river Ganga. However, alluvial soil belt becomes narrow near Chunar [right bank]. Soils of active flood plain fall under well to excessively drained area and facilitate significant recharge to aquifer. Well drained moderately eroded soils of plateau cover the Chhanwe/Chhanbey area and are spread upto Karnauti Nala [Ref. Map No. 01].

15.4 According to Central Ground Water Board (CGWB), the ground water availability of the Distt. is 58198.14 Ham and the stage of ground water development is 58.87%. Based on groundwater resource availability, Uttar Pradesh Ground Water Department (UPGWD) has categorised the different blocks of Mirzapur Distt. The

Chhanwe/Chhanbey, Kon and City block has been categorised as semi-critical; Majhaw, Sikhar block [left Bank] as critical and Pahari, Rajgarh, Narainpur and Jamalpur as safe block [Ref. Annexure 2].

15.5 Major interaction sites for groundwater observations are - Lohiya Talab and Narghat of Mirzapur city, Chehra, Kohrakar [Purvi Gogaon], Parmanpur, Gaura Khas, Nadni, Bhilgaur, Majhlipatti, Kali Khoh and Ashtabhuja Temple area [near Vindyanchal R.F.]. The groundwater observations were noted and are presented in Table 07.

15.6 The farmers of village Parmanpur, Gaura Khas and Majhlipatti claimed that the handpumps usually dry up in summer season. So, they generally bore handpumps to a depth of 40 m while the range goes upto 70-80m for mechanical borewells used for irrigation purposes. The farmers shared that the water level is decreasing annually. This may be due to the overexploitation of groundwater for irrigation purposes. But surely such decline would have an impact on river baseflow.

Table 7 : Water Levels In Dug Wells (Based on local interaction)

Location	Coordinates	Ground Water Level (in mbgl)	
		Post-Monsoon	Pre-Monsoon
Lohiya Talab [Mirzapur city]	25° 8'58.76"N, 82°32'17.96"E	~~~~~	25-27
Chehra Village	25°10'9.71"N, 82°16'44.15"E	27-30	33-35
Kohrakar [Purvi Gogaon]	25°12'35.68"N, 82°16'56.38"E	27-30	33-35
Parmanpur	25°13'28.20"N, 82°19'1.08"E	27-30	35-40
Gaura Khas	25°12'25.51"N, 82°19'39.84"E	27-30	36-45
Bhilgaur	25°11'58.15"N, 82°19'59.20"E	18-24	32-36
Majhlipatti	25°13'28.24"N, 82°29'25.78"E	18-24	27-30
Kali Khoha Temple	25° 9'13.95"N, 82°29'3.71"E	12-15	……..
Narghat	25° 9'0.61"N, 82°33'33.55"E	18-24	36-40

15.7 During the visit we also observed that the use of open wells is decreasing in the region. This is due to drying of wells, lack of maintenance and availability of handpumps and tube wells. However, wells are still operational in areas like Motiya Talab, Barkachha, Belhara and Gerua Talab area. This is because the terrain of these areas is rocky and boring handpumps is costly and tedious.

Image 58 : Old Sacred Well In Kali Khoh Temple Complex

Image 59 : An Old Well In Kakraha Village

16.0 Erosion

16.1 Weathering of soils by natural forces is both constructive and destructive. Erosion is the chief agent responsible for the natural topographic cycles as it wears down higher elevations, banks (lateral erosion) and deposits the sediments in the plains. However, the erosion gets aggravated due to human interventions through change in land use, excessive grazing, extensive farming, cultivation without taking proper conservation measures, destruction of forest and riparian vegetation. It is well known that exposed soil may erode rapidly (Singh et. Al).

16.2 The study area [7km Buffer] witnesses slight to moderate erosion (Singh et. al). However, the ongoing mining activities, increasing number of brick kilns (Ref. Map No. 10), decrease in riparian vegetation area and change in land use may increase the rate of erosion. Decline in riparian vegetation and extensive agricultural practices are major anthropogenic reason behind the lateral erosion of banks of River Ganga and its tributaries. The action of forceful water flow on the left and right banks of the River Ganga could be easily observed throughout the study area. The lateral erosion of the banks occurs under intense rainfall, torrential flow in rivulets and river transports large volumes of sediment downstream.

16.3 There are 127 lateral erosion sites marked within the study area and provided in **Table 08.** The major eroded sites are found near villages – Hargarh, Gogaon, Bankat, Kurhwa, Kalinjara, Gopalpur, Naragda, Jhilwar, Babura, Akrohi, Bisundharpur and Nanhupur (Ref. Image 60-65 and Map No. 10).

Table 8 : Erosion Prone Sites

Sr. No.	Latitude [N]	Longitude [E]	Nearest Settlement
1	25.20036806	82.28695361	Between Village Hargarh and Gogaon [Right Bank]
2	25.20123267	82.28629128	
3	25.20196092	82.28563721	
4	25.20294128	82.28452503	
5	25.20422142	82.28292021	
6	25.20350278	82.28380366	
7	25.20477558	82.28153227	
8	25.20550674	82.28011454	
9	25.20590526	82.27902736	
10	25.20622714	82.27789249	
11	25.20637027	82.27612911	
12	25.20625828	82.274793	
13	25.20630095	82.27380425	
14	25.20660819	82.2728365	
15	25.20705769	82.27210219	
16	25.2399965	82.24707915	Katra Village [Left Bank]

17	25.26661719	82.25847136	Between Village Bankat, Kurhwa, Kalinjara, Gopalpur and Naragda [Left Bank]
18	25.27005757	82.26458341	
19	25.27058608	82.2654984	
20	25.27111617	82.2661789	
21	25.27127777	82.266804	
22	25.27156951	82.26789406	
23	25.27299221	82.27105556	
24	25.27474662	82.27802692	
25	25.27434961	82.27575506	
26	25.273699	82.27286465	
27	25.27459166	82.2802615	
28	25.27453373	82.28081182	
29	25.27460487	82.28250965	
30	25.27475778	82.28520934	
31	25.27468261	82.28347294	
32	25.274662	82.28856352	
33	25.27283521	82.29853742	
34	25.27315187	82.29782264	
35	25.27332874	82.29723383	
36	25.27366735	82.29489043	
37	25.27097815	82.30285671	
38	25.27031456	82.30417831	
39	25.26961724	82.30481076	
40	25.26878078	82.30591228	
41	25.26818554	82.30656197	
42	25.26766414	82.30702478	
43	25.26693745	82.307604	
44	25.26475535	82.31004913	
45	25.26316092	82.31140231	
46	25.26101877	82.31289002	
47	25.26032517	82.31321195	
48	25.25940203	82.31356698	
49	25.25825489	82.31436429	
50	25.25457319	82.31738408	
51	25.24966243	82.31374623	Dugauli Village [Right Baank]
52	25.24478046	82.31609882	Danghar Village [Right Bank]
53	25.21058252	82.32693129	Gaura Khas Village [Right Bank]
54	25.20784037	82.33255187	
55	25.20672822	82.35623209	Between Village Jhilwar and Arjunpur [Right Bank]
56	25.20855061	82.35993443	
57	25.21108234	82.36266666	
58	25.21196287	82.36346175	
59	25.21407998	82.36495852	
60	25.21513286	82.36547201	

61	25.21616568	82.36578116	
62	25.21955516	82.36645492	
63	25.23047973	82.36833988	Dharmapuri [Right Bank]
64	25.2573675	82.40592471	GulauriVillage [Left Bank]
65	25.22286544	82.4477171	Babura Village [Right Bank]
66	25.2186319	82.4506994	
67	25.2150772	82.46943096	Simra Chaudharian [Left Bank]
68	25.1790425	82.46534051	Along Karnauti Nala (Near Ganga-Karnauti Confluence) [Right Bank]
69	25.17457426	82.46873648	
70	25.17408163	82.47052777	
71	25.1723218	82.48199502	Gopalpur Village [Right Bank]
72	25.15549141	82.52785419	Along Ojhala Nala (Near Ganga-Ojhala Confluence) [Right Bank]
73	25.15454503	82.52775946	
74	25.1547006	82.52838419	
75	25.1539183	82.52783114	
76	25.15271025	82.52839864	
77	25.15167285	82.5433574	Pakka Pul [Right Bank]
78	25.15117928	82.55079452	Surekapuram Colony [Right Bank]
79	25.15107689	82.55297807	
80	25.15135988	82.55967388	Narghat [Right Bank]
81	25.15183802	82.5645373	Between Pakka Ghat and Baria Ghat [Right Bank]
82	25.15245263	82.56946105	
83	25.15417557	82.57530343	
84	25.16299027	82.592686	Between Sakhaura and Bisundharpur [Right Bank]
85	25.1686203	82.59598797	
86	25.17120284	82.59698062	
87	25.17327817	82.59775024	
88	25.17916797	82.5911753	SahKolhua [Left Bank]
89	25.17573713	82.59775945	Bisundharpur [Right Bank]
90	25.18399115	82.59277934	PipraDand [Right Bank]
91	25.18546902	82.59137715	
92	25.22850165	82.57296279	Pachaura [Left Bank]
93	25.22945066	82.58242095	
94	25.2232694	82.66313443	Khamaria [Left Bank]
95	25.20002349	82.67278673	Bhatauli [Right Bank]
96	25.14998387	82.72924665	Between Vllage Kanaura, Nanhupur and Kathinai [Right Bank]
97	25.14782772	82.73309298	
98	25.14599866	82.73625968	
99	25.14500632	82.73785108	Between Vllage Kanaura, Nanhupur and Kathinai [Right Bank]
100	25.14377872	82.7394656	
101	25.14273812	82.74237568	
102	25.13943412	82.74881008	
103	25.13330008	82.75883094	
104	25.1297117	82.76493431	

105	25.12318273	82.77815104	
106	25.12071628	82.78642401	
107	25.11947026	82.79058146	
108	25.10883936	82.84761799	Near Chunar [Right Bank]
109	25.1101291	82.85222971	
110	25.12780132	82.86909703	Tammanpatti [Left Bank]
111	25.18878162	82.9179737	Shivpur [Right Bank]
112	25.19128182	82.91741623	
113	25.17457297	82.89169865	Adalpura [Left Bank]
114	25.20403134	82.91110214	Near Churamanpur Village [Left Bank]
115	25.20544608	82.91577278	
116	25.20637399	82.91786229	
117	25.20647567	82.918746	
118	25.20707821	82.92262156	
119	25.20778579	82.92461178	
120	25.2077668	82.92560978	
121	25.20810832	82.92744323	
122	25.23197568	83.03122113	Between Muzaffarpur and Bishesharpur Village [Right Bank]
123	25.22966178	83.03011324	
124	25.21745889	83.02144544	
125	25.21263548	83.01750244	
126	25.2097137	83.01461368	
127	25.2016635	83.00441604	

Image 60 : Satellite Image Showing Lateral Erosion Near Banpur Village Left Bank]
(Image Dated : 02/03/2019)

[Source : Google Earth Pro]

Image 61 : Lateral Erosion Near Hargarh [Right Bank]

Image 62 : Eroded Bank Near Satanpatti [Right Bank]

Image 63 : Eroded Bank Of Ojhala Nala Near Ganga-Ojhala Confluence [Left Bank]

Image 64 : Eroded Bank Near Gaura Khas Village [Right Bank]

Image 65 : Eroded Bank In Nanhupur Village

17.0 Dams, Barrages And Weirs In And Near Study Area

17.1 Groundwater resources of Mirzapur Distt. are insufficient to fulfil the growing agricultural and domestic water demand. Also, most of area of the Distt. is reported as semi-critical with reference to groundwater. In order to meet the demand several water structures have been constructed in the Distt. on various streams. Out of those, 24 structures are major water structures [20 Dams, 1 Barrage and 3 Weirs] and their location [Ref. Map No. 10] is provided in the table below :

Table 9 : List Of Dams, Barrages And Weirs Of The Distt.

Sr. No.	Dam	Latitude [N]	Longitude [E]
1	Jirgo Dam	25° 2'57.97"N	82°57'7.14"E
2	Hinauti Dam	25° 3'7.63"N	82°47'12.91"E
3	Kuba Khurd Dam	25° 1'41.16"N	82°48'32.43"E
4	Lower Khajuri Dam	25° 4'48.69"N	82°36'15.10"E
5	Bhonka Dam	25° 4'6.10"N	82°34'30.73"E
6	Dhenkwan Dam	25° 0'8.00"N	82°44'42.14"E
7	Nanauti Dam	24°59'11.27"N	82°46'43.49"E
8	Ahraura Dam	25° 0'0.96"N	83° 2'8.37"E
9	Dongia Dam	24°54'14.04"N	83° 0'31.45"E
10	Ghori Dam	24°56'9.64"N	82°25'40.26"E
11	Meja Dam	24°51'59.34"N	82°24'0.26"E
12	Adwa Dam	24°47'8.30"N	82°18'45.96"E
13	Banjari Kalan Dam	24°49'11.17"N	82°12'50.75"E
14	Sirsi Dam	24°50'1.73"N	82°29'50.72"E
15	Sukhra	24°47'39.29"N	82°16'39.61"E
16	Upper Khajuri	24°59'45.76"N	82°36'31.27"E
17	Berbita	25° 6'32.31"N	82°18'31.60"E
18	Simri	24°55'43.83"N	82°49'47.64"E
19	Tanda Tal	25° 3'12.50"N	82°31'9.48"E
20	Bela	24°59'57.05"N	82°34'3.69"E
Sr. No.	**Barrage**	**Latitude**	**Longitude**
1	Adwa Barrage	24°40'32.90"N	82°17'51.54"E
Sr. No.	**Weir**	**Latitude**	**Longitude**
1	Baraundha Pickup Weir	24°56'45.42"N	82°15'20.37"E
2	Husainpur Weir	25° 2'23.00"N	83° 3'59.37"E
3	Lkhaniya Dari Weir	24°57'33.28"N	83° 0'29.98"E

Source: WRIS-WIKI & UP Irrigation Department

17.2 Out of the 24 river structures, some dams are in proximity to the study area boundary. These dams are Lower Khajuri Dam, Upper Khajuri Dam and Jirgo Dam and their details are provided below :

17.2.1 **Lower Khajuri Dam** :

Table 10 : Basic features of Lower Khajuri Dam

Name of Dam	Lower Khajuri Dam
River	Kuardari Nala/ Kuardari Nadi
Nearest City	Mirzapur
Purpose of Dam	Irrigation
Year of Completion	1949
Operating &Maintenance Agency	Irrigation Dept., Govt. of UP
Seismic Zone	Seismic Zone-II
Type of Dam	Earthen/ Gravity & Masonry
Length of Dam (m)	640

Source : WRIS-WIKI

17.2.2 **Upper Khajuri Dam** :

Table 11 : Basic features of Upper Khajuri Dam

Name of Dam	Upper Khajuri Dam
River	Tributaruy Of Khajuri River
Nearest City	Mirzapur
Purpose of Dam	Irrigation
Year of Completion	1958
Operating &Maintenance Agency	Irrigation Dept., Govt. of UP
Seismic Zone	Seismic Zone-II
Type of Dam	Earthen
Length of Dam (m)	2313

Source : WRIS-WIKI

17.2.3 **Jirgo Dam** :

Table 12 : Basic features of Jirgo Dam

Name of Dam	Jirgo Dam
River	Jirgo
Nearest City	Chunar

Purpose of Dam	Irrigation
Year of Completion	1958
Operating & Maintenance Agency	Irrigation Dept., Govt. of UP
Seismic Zone	Seismic Zone-III
Length of Dam (m)	6704
Max Height above Foundation (m)	29.88

Source : WRIS-WIKI

Image 66 : Satellite Image Showing Jirgo Dam [Image Dated : 02/03/2019]

[Source : Google Earth Pro]

18.0 Mining And Brick Kilns Within Study Area

18.1 Mining is a major activity in Mirzapur Distt. with the major mining areas being :

- Sand mining in Ganga River : Five sand mining sites are reported in river Ganga [Based on surveys November-December, 2019]. These sites are located near village Gogaon [25°12'59.82"N, 82°15'16.84"E], Khaira [25°13'37.64"N, 82°15'5.34"E] (Ref. Image 68), Ghunghati [25°16'0.91"N, 82°17'53.15"E], Dugauli [25°15'42.95"N, 82°18'19.72"E] and Niphra [25°15'8.44"N, 82°23'50.47"E].

- Stone mining in Lalganj, Chunar, Madihan and Sadar Tahasil of Mirzapur. About 92% mining in the Distt. is open cast (with stone, aggregate, boulder contributing 67% and sand, moorum contributing 33%) while 8% of the mining is contributed from Ganga River sand mining (Ref Map No. 11).

18.2 **Chunar Sandstone :** Chunar Sandstone (commonly known as 'Chunar Stone' or 'Balua Pathar') is a reddish or buff-colored, finely grained, hard sandstone quarried in Chunar region of Mirzapur Distt. This stone has been used in the construction of many historical and architectural structures including the famous Ashoka Pillars. **Chunar stone has been accorded Geographical Indication (GI) tag in March, 2019 making it only the second GI tag under the natural goods section.** The use of Chunar stone has a long history which can be related to the recent archaeological investigations carried out by Vidula Jayaswal at Chunar during 1990-93. These investigations revealed the process of sandstone chiselling, including their quarrying from Chunar hills and transport through the River Ganges and its tributaries, starting from 3rd century BCE to the late medieval times (Jayaswal, 1998).

18.3 According to Mani et al (2015), huge blocks of Chunar Sandstone were found during explorations in Sarnath which are believed to have been transported here during medieval times. The archaeological experts have opined that cylindrical stone blocks were rolled down from Chunar Hills to Ganga River and then mounted on suitable rafts which carried these stones to various destinations.

18.4 Brick Kilns : With development picking up pace brick has become one of the important building materials for construction activities. Brick kilns in the study area are a major economic activity the region. However, this industry has posed current and potential future threats to the soil, air, biota and water system of the region. The clay digging process deteriorates the soil quality and productivity of the soil because the bricks are made from the top soil. During field visits, farmers claimed that the eroded land may filled up in few years, either by sediments transported during rainy season or during flood pulsing. However, it has been found that brick kiln sites in flood plain areas contribute to soil erosion during flood.

18.5 Location of brick kilns, clay and river sand mining sites have initially been identified from Google imagery (April, 2019) and thereafter verified during field surveys

conducted in November-December, 2019. The spatial distribution of brick kilns in the study area is delineated in Map 17. After identification of sites, it was found that:

- In Mirzapur Distt. brick kilns are situated near rivers and water bodies to meet their water requirement and also to use alluvial soil.
- In the study corridor the brick kilns are distributed throughout the Distt. and are mainly clustered near village Khaira, Gogaon, Bhatewara [Left bank of Karnawati Nala], Narayanpur, Jalalpur Mafi and Sherpur.
- Some kiln units were located very close to the streams and are adversely impacting the course of these streams [Ref. section 6].

Image 67 : Brick Kiln Near Narayanpur

Image 68 : Sand Mining In River Ganga Near Khaira Village

Image 69 : Sindhora Mining Site Near Chunar

19.0 Old And Sacred Trees In Mirzapur Distt.

19.1 Old and sacred trees are found along river banks. These venerable denizens of nature are a fixture of the riparian zones augmenting the timeless reverence owed to the river deity. A sacred banyan tree (*Ficus benghalensis*) was found associated with Shiva temple near Ojhala-Ganga confluence in Gopalpur area of Mirzapur. The locals tie threads and offer worship to this tree while visiting this temple especially during festivities.

Image 70 : A Sacred Banyan Tree Associated With Shiva Temple In Gopalpur

19.2 An old and large *peepal* tree (*Ficus religiosa*) is located at Lal Bhairav temple on the Vindhyanchal Main Road in Mirzapur Distt (Ref. Image 71).

Image 71 : An Old Peepal Tree Associated With Lal Bhairav Temple In Vindhyanchal

19.3 Another old and sacred *Peepal* tree is found growing on the roadside in Mirzapur town with a small temple at its base dedicated to *Shani Dev*. The local community offers prayers at this site on every Saturday for seeking blessings.

Image 72 : A Sacred Tree Associated With Shani Dev Temple In Mirzapur Town

19.4 A sacred Imli tree (*Tamarindus indica*) was found growing near Kajarahwa Pokhara in Mirzapur town and is associated with Lord Hanuman's Temple.

Image 73 : Sacred Imli Tree Associated With Hanuman Temple In Mirzapur Town

19.5 An old and sacred peepal tree having a wide canopy was found growing in Kakraha Village of Mirzapur Distt. Situated on the village road, surrounded with temples and houses, this tree was protected by the villagers and worshipped during festivities and on auspicious occasions. The women used to offer their prayers by tying threads around this tree and pouring water for seeking God's blessings.

19.6 Furthermore, two old Mahua trees (*Madhuca indica*) were found growing in the Kakrahan Village which was believed to be planted by the elders of the current residents. According to them, there were few more mahua trees which failed to survive with the passage of time and only two individuals remain, which are believed to be more than 80-90 years old.

Image 74 : An Old And Sacred Peepal Tree In Kakraha Village

Image 75 : Old Mahua Trees In Kakraha Village

20.0 Climate Change Impact Observations

20.1 Climate change has emerged as a global challenge as it has led to average global temperature being warmed by 0.5 C in the last century and also affected spacio-temporal patterns of precipitation. Almost all the ecosystems of the world are under the brunt of climate change. Among these, the rivers are one of the most vulnerable ecosystems and are considered as most sensitive of all ecosystems to the impacts of climate change, both directly and indirectly by combination of various other stressors (Durance & Ormerod, 2007, 2009). In India, Ganga river is one of the most important rivers supporting livelihoods of millions of people and harboring rich biodiversity. However, the increasing temperatures, changing discharge patterns and rainfall variations coupled with anthropogenic factors will have considerable impacts on the dynamics of this river which in turn will affect a major portion of northern India which depends on the river for meeting domestic, agricultural and industrial water needs (Jain & Singh, 2018).

20.2 Among the different states in India, Uttar Pradesh is considered most vulnerable to climate change impacts. The State climate action plan warns of erratic climate patterns in future on the basis of climate projections including the temperature predictions which are not favourable too. There is a predicted temperature rise of 1.8°C to 2.1°C during the same period. Moreover, Uttar Pradesh falls under frequent drought prone zone (probability of occurrence of drought 10-20%) as per time series (1875-2009) delineation done by Indian Meteorological Dept. (Attri & Tyagi, 2010). This climatic variability in the state is likely to have cascading effects on region's biodiversity, water resources, food productivity and dependent livelihoods.

20.3 **Impact on Fish Resources :** Vass et al. (2009) studied in detail the impact of climate change on fisheries in Ganga river system. Their study pointed out factors such as increased flood magnitude and frequency owing to intense precipitation events and low flows at other times owing to increased evaporation would have significant impact on the fish resources of Ganga river. They also analysed the monthly rainfall data at Allahabad site of the middle stretch of river Ganga from 1974-2003 which revealed that the rainfall had declined by 5% in the peak breeding season of fisheries while it had increased by 7% in the post breeding period when tissue development in the eggs of Indian Major Carps begins. The fish production in the middle stretch of Ganga River was also severely impacted by the decrease in fish spawn availability and continued deterioration of Indian Major Carps seed coupled with increase of minor carps and catfish seed. Such factors are the chief reasons why fish such as *Mrigal* and *Tengara* have decreased in the last two decades at the Mirzapur stretch of Ganga river. Besides, fish such as *Rohu* and *Catla*, which used to be available throughout the year are now caught only during monsoon months and are mostly of smaller size as stated by the fishermen during the survey. They also blamed the increasing water pollution and changing hydrological conditions for the decline in

fish populations in the region during last decade. The livelihoods of communities such as the Mallahs, which are totally dependent on fishing as the main source of income, have been drastically affected in the Distt.

20.4 **Impact on Ganges River Dolphin :** The National Aquatic Animal i.e. Gangetic Dolphin (*Platanista gangetica gangetica*) is an indicator species for the river ecosystem and is at the apex of the food chain. Already classified as 'Endangered' by IUCN and with its population declining, this species is further threatened by climate change which impacts Ganga River and its tributaries. Other anthropogenic factors such as increasing pollution due to large-scale discharge of industrial and municipal waste, siltation, mechanised boats and overfishing have also affected the distribution and survival of dolphins in Ganga. The respondents in this survey claimed that dolphin sightings were common throughout Ganga River stretch in Mirzapur Distt. However, now visual sightings occur only at a few sites, especially near the confluences of streams and nallahs with Ganga River in the Distt. In other stretches the respondents claimed to witness the presence of dolphins only during monsoon season. The changing currents of water, increased turbidity, increased surface water temperatures and decreasing availability of fish resources for food are some of the chief reasons for their habitat and population shift in Mirzapur Distt.

20.5 **Impact on Water Quality :** The increased temperatures and global warming can have colossal changes in water quality of the rivers (Rehana & Majumdar, 2011; Todd et al., 2012). Increased temperature of the river water will influence the growth rate of phytoplanktons, macrophytes, aquatic organisms, and other species as many of the chemical and biological processes run at a faster pace at high temperatures. Further, irregular and intense rainfalls may also result in higher run-off from the catchment area, thus resulting in higher loads of suspended solids and sediments, contaminants, and increased soil erosion (Leemans & Kleidon, 2002; Lane et al., 2007). The respondents in Mirzapur claimed to have witnessed the changes in color and odor of Ganga river in the last few decades. They also fortified the fact that the water of Ganga was an important source of drinking water for many villages but now nobody wants to drink it owing to the changes in its water quality.

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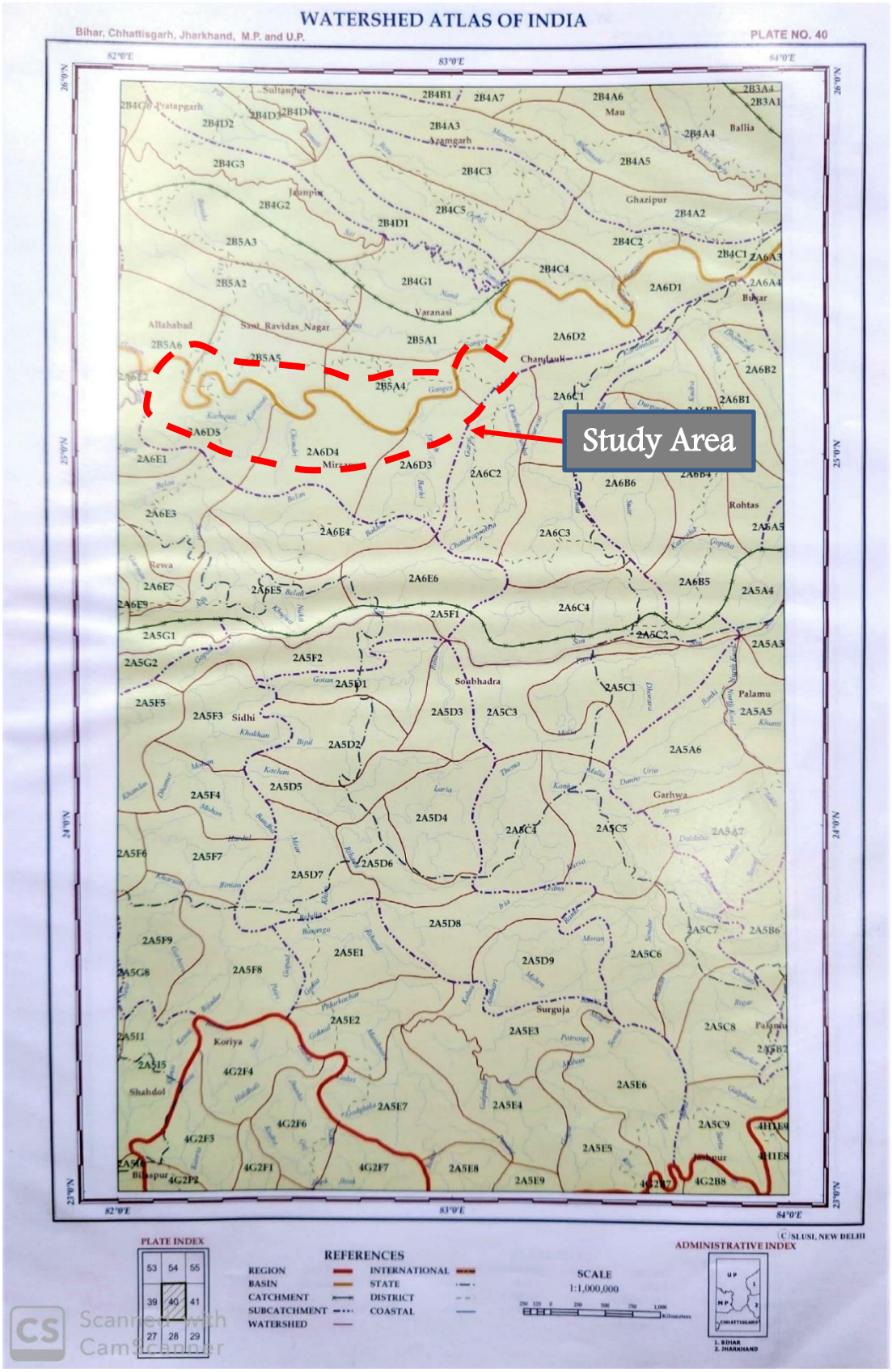
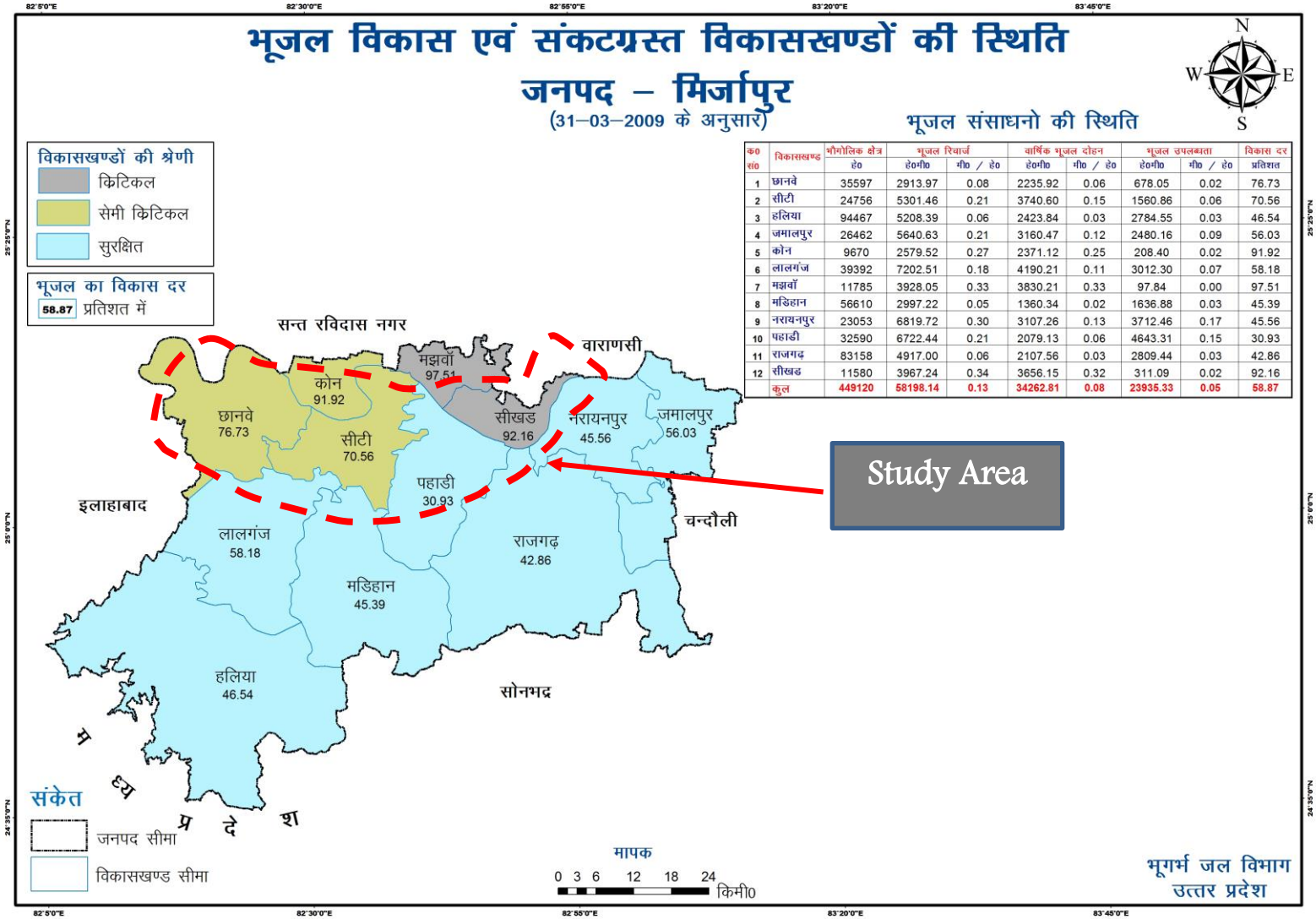
Annexure

Annexure 1: Catchment of Rivers Within Study Area



Source : Watershed Atlas of India

Annexure 2: Groundwater Resource Of Mirzapur District



क्र0 सं0	विकासखण्ड	भौगोलिक क्षेत्र	भूजल रिचार्ज		वार्षिक भूजल दोहन		भूजल उपलब्धता		विकास दर
		हे0	हे0मी0	मी0 / हे0	हे0मी0	मी0 / हे0	हे0मी0	मी0 / हे0	प्रतिशत
1	छानवे	35597	2913.97	0.08	2235.92	0.06	678.05	0.02	76.73
2	सीटी	24756	5301.46	0.21	3740.60	0.15	1560.86	0.06	70.56
3	हलिया	94467	5208.39	0.06	2423.84	0.03	2784.55	0.03	46.54
4	जमालपुर	26462	5640.63	0.21	3160.47	0.12	2480.16	0.09	56.03
5	कोन	9670	2579.52	0.27	2371.12	0.25	208.40	0.02	91.92
6	लालगंज	39392	7202.51	0.18	4190.21	0.11	3012.30	0.07	58.18
7	मझवॉ	11785	3928.05	0.33	3830.21	0.33	97.84	0.00	97.51
8	मडिहान	56610	2997.22	0.05	1360.34	0.02	1636.88	0.03	45.39
9	नरायनपुर	23053	6819.72	0.30	3107.26	0.13	3712.46	0.17	45.56
10	पहाडी	32590	6722.44	0.21	2079.13	0.06	4643.31	0.15	30.93
11	राजगढ़	83158	4917.00	0.06	2107.56	0.03	2809.44	0.03	42.86
12	सीखड	11580	3967.24	0.34	3656.15	0.32	311.09	0.02	92.16
	कुल	449120	58198.14	0.13	34262.81	0.08	23935.33	0.05	58.87

Source : Uttar Pradesh Groundwater Board