GANGA CULTURAL DOCUMENTATION

RAEBARELI DISTRICT

[Natural Heritage]

May, 2022

National Mission for Clean Ganga

Indian National Trust for Art and Cultural Heritage

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Front Cover : Ganga River In Raebareli Distt.

Background : Loni River

Back Cover : Bara Tal, Raebareli Distt.

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Sponsored By:

NAMAMI GANGE

National Mission for Clean Ganga

Authored By:

INTACH Indian National Trust for Art and Cultural Heritage

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1.0 Introduction

1.1 Raebareli Distt. is a part of Lucknow Division in Uttar Pradesh state and is located between 25°49′ to 26°36′ north latitude and 80°41′ to 81°50′ east longitude. The elevation varies from about 120.4 Mtrs above sea level in the north west to 86.9 Mtrs above sea level in the extreme south east, on the banks of the Ganga. Raebareli Distt. was created by the British in 1858 A.D. as a separate Distt.. Traditionally it is believed that the town was founded by the Bhars and was known as Bharouli or Barouli which in course of time got changed into Bareli. The prefix, Rae, is said to be a corruption of Rahi, a village 5 Km west of the town. It is also said that the prefix, Rae represents Rae, the common of the Kayasths who were master of the town for a considerable period of time[1].

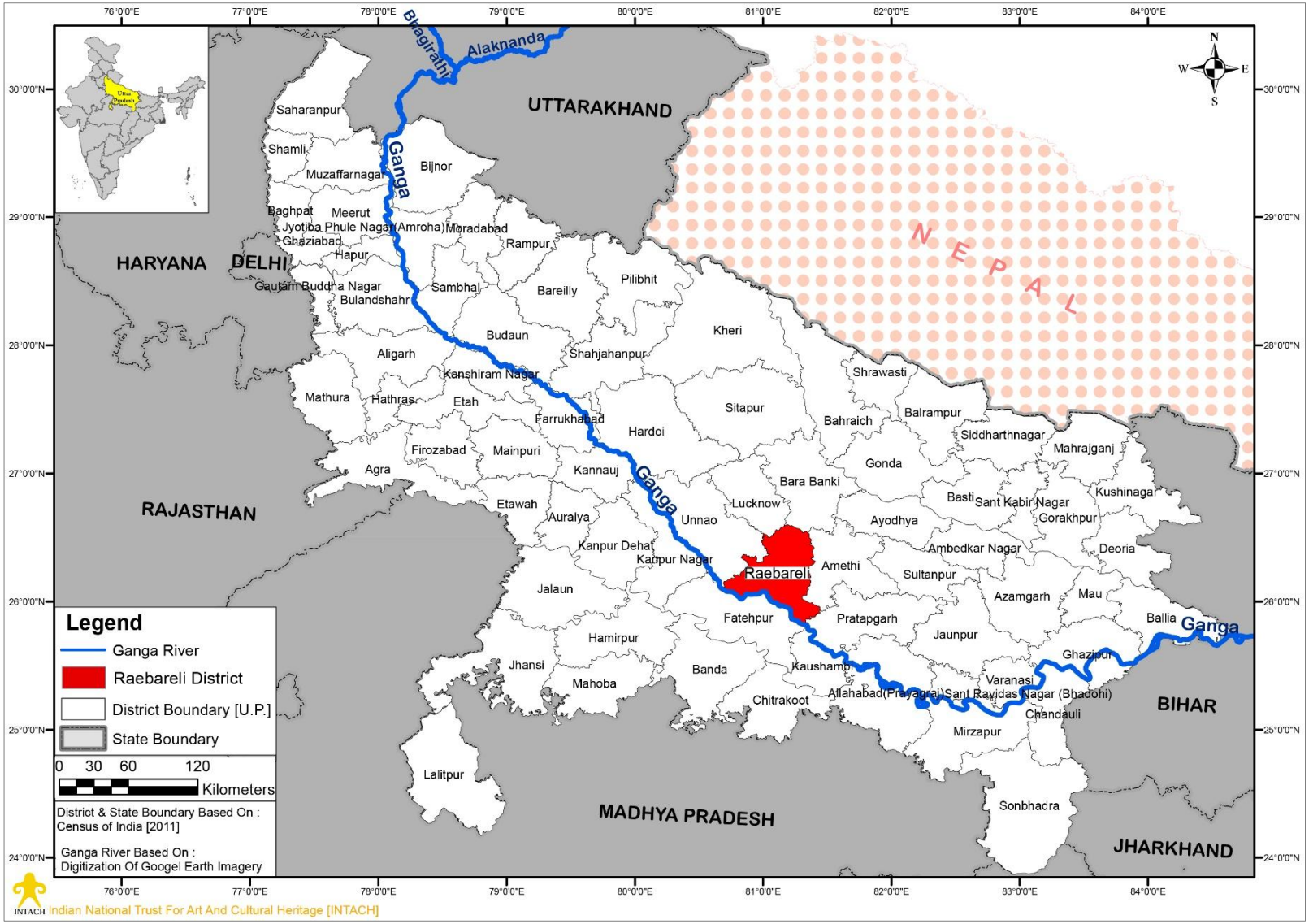
1.2 Raebareli Distt. is located between two important cities Prayagraj and Lucknow of Uttar Pradesh. It is well connected with those cities by rail and Road network. The distance from Prayagraj is 120 KM and 80 KM from Lucknow. The Distt. is bounded on the north by the Distt. of Lucknow and on the east by Amethi Distt. The southern boundary is formed by the Ganga which separates it from the Distt. of Fatehpur. While on the south-east Pratapgarh Distt. lies and on the west Distt. share the boundary with Unnao Distt.

1.3 Raebareli town is headquarter of the Distt. For administrative purpose the Distt. has been divided into 5 sub-divisions, these sub-divisions are further divided into 15 development blocks. There are 132 nyay Panchayats, 700 Gram Sabha and 1284 revenue villages as per 2011 census. After formation of Amethi Distt. in 2010 the Raebareli Distt. has an area of 3,291 square kilometers.

1.4 According to the Census 2011, the Distt. had a population of 34,05,559. Its population growth rate over the decade 2001-2011 was 18.51%. Raebareli had a sex ratio of 943 females for every 1000 males, and a literacy rate of 68.41%.

1.5 The elevation varies from about 120.4 Mtrs above sea level in the north west to 86.9 Mtrs above sea level in the extreme south east, on the banks of the Ganga. The highest points are the crowns of the watersheds of the different drainage channel which serve to divide the district in to five main physical units namely – (1) the Ganga khaddar, (2) the Ganga upland, (3) the southern clay tract, (4) the central tract on the sea upland and (5) the northern clay tract.

[1] http://dcmsme.gov.in/old/dips/DIP%20Raebareli.pdf



Map 1 : Location Of Raebareli Distt. On Left Bank of Ganga River

2.0 Ganga River In Raebareli District

2.1 Ganga River enters Raebareli Distt. at Latitude 26°7'4.35"N and Longitude 80°40'35.74"E near Sarhapur and Bhagwatganj Village (Lalganj Tehsil) after crossing Unnao Distt. [Left Bank] and Kanpur Distt. [Right Bank] [Refer Map No. 1 & 2 and Image No.1]. Length of Ganga River in Raebareli Distt. is approximately 81 km, while its width varies between 0.3 Km [Between Garhi and Dalmau] to 2.0 km [near Khargupur Bargala]. The active floodplain of Ganga River in the Distt. is under cultivation [mainly *Rabi and Zaid*] except few *Saccharum* and *babool* dominated riparian vegetation. The riverine islands are somehow intact having riparian grasses upto 2 metres.

2.2 The point where Ganga enters the Raebareli-Fatehpur stretch, it is joined by a river called Pandu Nadi from its right bank. Here, Ganga has shifted towards south. Flowing downwards, Ganga makes a slight concave turn further convex turn and reaches Dalmau [Left Bank]. Four Kilometers upstream to Dalmau a river named Loni Nadi joins Ganga near Chakwapur. Within this stretch the river continuously shifts its channel and forms fertile floodplain area having width of approximately 3.5 Km. Several riverine islands formed due to this fluvial action provides habitat to Nilgai [*Boselaphus tragocamelus]* and Indian wild boar [*Sus scrofa*]. Flowing easterly, the river makes few turns near Narulu Buzurg [26°0'23.38"N, 81°3'10.11"E], Budhera [25°55'51.84"N, 81°12'21.24"E], Naubasta [25°52'21.90"N, 81°12'48.94"E] and Manipuri Ghat [25°50'13.97"N, 81°16'22.46"E] and exits the distt. after crossing Milkipur Village.

2.3 There are few significant settlements like Gagaso, Dalmau, Kalyanpur Bainti, Nawada Patti, Gokana (Maharshi Gokarna Ghat), Badshahpur and Kotra situated along Ganga in the Distt.. These settlements are famous for temples complexes, sacred ghats, ashrams and are used for pilgrimage for Generations.

2.4 A branch of Sharda Canal named Purwa Branch [Sharda Canal] runs parallel to River throughout the distt. [Refer Image No. 2 & Map No. 2]. A rail network of Northern railway somehow depicts the floodplain limits of the River [Refer Map No. 2].

Image 1 : View Of Ganga River In Raebareli Distt.

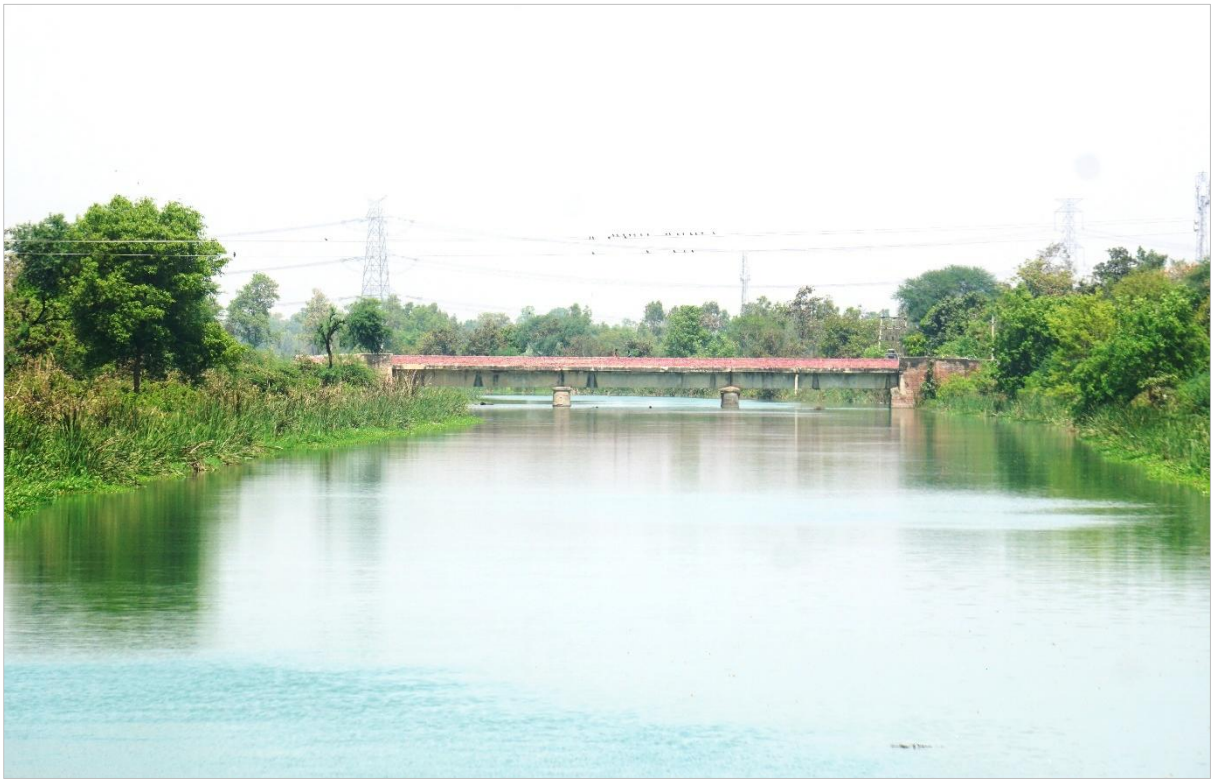
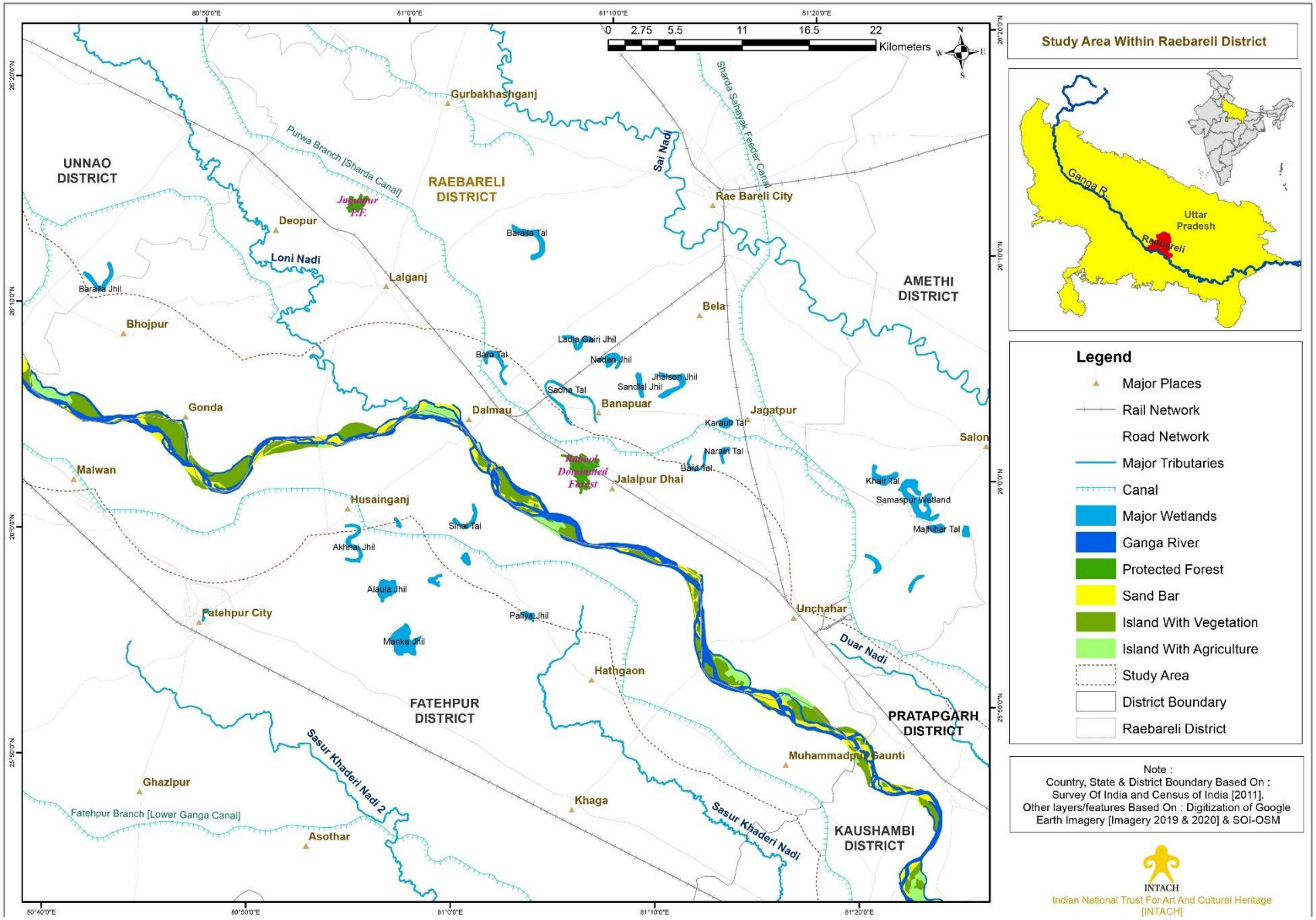


Image 2 : Purwa Branch [Sharda Canal]



Map 2 : Study Area In Raebareli Distt.

3.0 Methodology

3.1 For carrying out surveys, a 7 km buffer [study area] of Ganga River in Raebareli Distt. was marked having a total area of 619.44 sq.km. The study area was divided into grids of 5 × 5 km for field survey. Before carrying out surveys, the study area was analysed with the help of secondary literature, mythological records, available maps [Google Earth historical satellite data, SOI old toposheets, SOI-OSM sheets]. Based on that, key features were marked in Google Earth Pro and Kml files were generated. The Kml files were further transported to mobile based QGis field survey application. Key features were marked taking consideration of Natural Heritage documentation format.

3.2 The field survey in Raebareli Distt. was carried out in March 2022. Various sites were visited within the study area wherein field data was collected along with interactions with stakeholders. The co-ordinates of all localities were taken by Garmin handheld GPS eTrex30 and the representative images of various parameters were taken with the help of Sony Digital Camera Cyber-shot DSC-HX300 with 50X optical zoom. Pre-marked Google Earth's Kml files and Google Maps were used for navigation. Scanned maps of the topographic map series of Army Map Services, U.S. Army [Map NG44-6 & NG44-11], Survey of India [SOI] Open Series Maps [OSM] and Google Earth Historical Imagery were obtained and analysed for preparation of Maps.

3.3 Field guides were used for flora and fauna identification. 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 using IUCN Red Data List. Information regarding groundwater, agriculture, forest and wetland were obtained through informal/formal interviews and discussion with Govt. officials of Forest Department, and farmers, fishermen, boatmen and other stakeholders.

4.0 Tributaries of Ganga River

4.1 Major tributaries within the district are –Sai Nadi, Bakulahi Nadi and Loni Nadi. Loni Nadi is only river which flows through the study area [Refer Map No. 3]. Details of the minor and major tributaries are discussed in this section and its spatial distribution is provided in Map No. 3.

4.2 **Sai Nadi & Its Tributaries**

4.3.1 Sai Nadi is a tributary of Gomti River, originates from a pond in village Bijgwan near Pihani of Hardoi Distt., and joins Gomti Nadi after passing through Hardoi, Lucknow, Unnao, Raebareli, Pratapgarh and Jaunpur.[2] The river enters the Raebareli Distt. on the west of Rampur Sudauli Village, drains approximately 117 Km and exits the Distt. near Khorahti Village. In its journey in Raebareli Distt., the river is joined by **Sarhi Nala, Basaha Nala and Sonh Nala** from its right bank and **Naiya Nadi, Didauli Nala and Kalwanya Nala** from its left bank [Refer Map No. 3].

4.2.2 **Bakulahi Nadi** is a plain-fed river flowing from north-west to south-east direction with about 177-km length and about 841-km^2 catchment area [Shukla and Mishra, 2019]. Within its stretch, the river drains mainly in Pratapgarh Distt. (148 Km) and parts of Raibareli (19 Km) and Prayagraj Distt. (10 Km). The river originates from interconnected series of *tals* namely - Khair tal, Barna tal, Gaurhi tal, Panhi tal, Lal tal and Manjhihar tal. The river joins Sai Nadi near village Khajurni at latitude 25°53'4.49"N and longitude 82° 1'20.08"E in Pratapgarh Distt. [Refer Map No.3 and Image No. 3].

4.2.3 The Raebareli Gazetteer of 1905[3] describes the Sai Nadi and its tributaries as:

> *"It **(Sai)** flows in a very tortuous and irregular course along the western border of Bachhrawan and then enters the Raebareli District. The river is not navigable except during the rains, for in the hot weather its depth in many places is not more than two feet. The extreme flood discharge of the Sai is about 6,000 cubic feet per second. The banks of the Sai are high and, in many places, precipitous: the level of the water is a great distance below the surface of the country, and the river is therefore of little value for irrigation except for the small areas of alluvium land in its immediate neighbourhood."*

[2] UPPCB (2018), Action plan for restoration of polluted stretch of river Sai from Unnao to Jaunpur *http://www.uppcb.com/pdf/RIVER-SAI.pdf*

[3] Raebareli - A Gazetteer, District Gazetteers of the United Provinces of Agra and Audh, Volume XXXIX, Printed by f Lukes, Supdt. Govt. Press, United Provinces, 1905.

*"The **Basaha** begins in a series of swamps in paragana Khiron and then runs in a well-defined bed through the west of the Raebareli tehsil and joins Sai on the right bank near Purai, about 10 miles from district headquarters. The **Soh (Sonh)** is a small stream of a similar nature which has its orign in the large tanks in the south of Paragana Mauranwan of Unao (Unnao)."*

Image 3 : Bakulahi Nadi As Seen From NH-731A In Pratapgarh Distt. [Near Bihar]

4.3 **Loni Nadi :** Loni is the only tributary of River Ganga in the Distt [Refer Map No. 3 and Image 4 & 5]. It originates in Unnao Distt., and enters Raebareli distt. in the west Of Sareli Block near Deparmau village [26°14'25.35"N, 80°50'57.19"E]. After Deparmau, the river flows south-east in a very irregular course takes several turns and empties to River Ganga near Chak Village. In its short journey the river drains 55 Km.s covering the flat and erosion prone area of Sareni and Lalganj Block of Raebareli Distt. The river generally dries in hot summer however the inflow from canal makes it navigable. Three small streams namely **Padiyala Nala** and **Konti Nala** joins it from left bank near village Gaurankhera and Shahpur respectively and **Samrai Nala** from right bank near Gajju Purwa. The image 4 and 5 shows the agriculture dominated floodplain area of the Loni Nadi.

Image 4 : Loni Nadi As Seen From Lalganj-Sareni Road

Image 5 : Loni Nadi Near Ganga-Loni Confluence

4.4 There are 11 minor streams identified within the study area which drains to river Ganga. Details of minor streams are provided in Table No.1. The lengths of identified

streams range between 1.76 Km. to 20 Km. Documentation of these small streams is important because these streams serve as breeding ground to fishes. Dense riparian vegetation is still present along their banks and is continuously shrinking due to increasing anthropogenic activities.

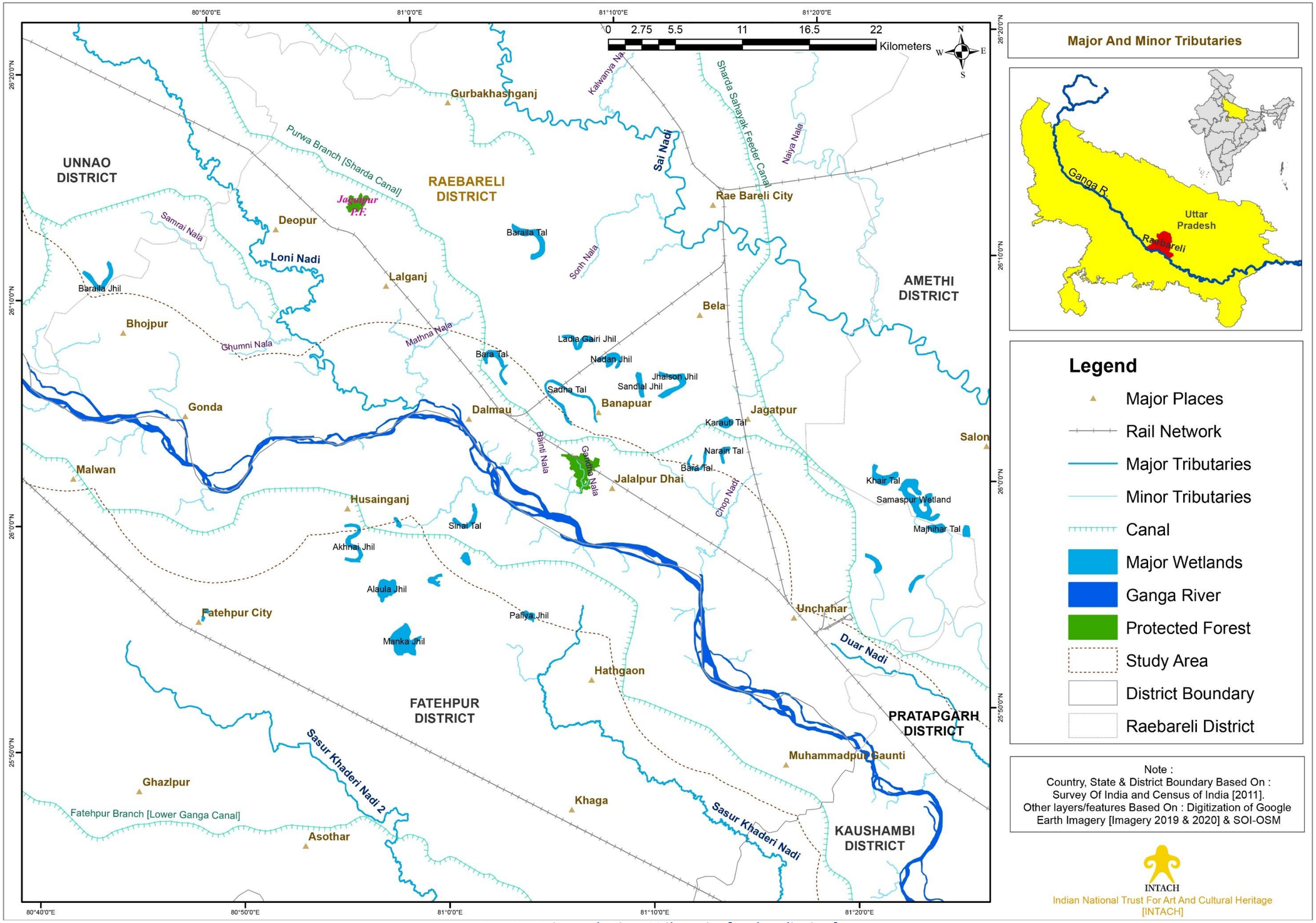
Table 1 : Streams Within The Study Area

Stream	Confluence	Orign	Length and Potential Threat
Nara/Nala [Refer Image No. 6]	Near Deomai Purwa [26°5'41.87"N, 80°43'9.50"E]	Lachhakhera Village [26°8'24.43"N, 80°44'2.92"E]	Stream Length approximately 10.5 Km. Potential Threat : Extensive Agricultural Practices
Bairaipur Nala	Near Gonda [26°4'23.82"N, 80°47'55.70"E]	Near Madakhera [26°7'25.23"N, 80°47'27.34"E]	Stream Length approximately 10.2 Km Potential Threat : Extensive Agricultural Practices
Nara/ Nala	Near Singhaurtara [26°3'26.81"N, 80°52'15.68"E]	Near Kurliya Kesoi [26°4'44.34"N, 80°52'21.48"E]	Stream Length approximately 3.42 Km Potential Threat : Extensive Agricultural Practices and constructions
Mathna Nala	Near Nawa Purwa [26°4'46.61"N, 80°59'38.61"E]	Near Dakuti [26°10'2.20"N, 81° 0'35.19"E]	Stream Length approximately 20.4 Km Potential Threat : Extensive Agricultural Practices
Nara/ Nala	Near Thakurdwara [26°2'6.00"N, 81° 2'51.73"E]	Near Murain [26°2'44.20"N, 81° 3'22.63"E]	Stream Length approximately 1.76 Km Potential Threat : Extensive Agricultural Practices
Nara/ Nala	Near Kalyanpur Bainti [26° 1'42.76"N, 81° 3'31.27"E]	Near Mirzapur [26° 2'17.09"N, 81° 3'57.77"E]	Stream Length approximately 1.93 Km. Potential Threat : Extensive Agricultural Practices & Loss of riparian vegetation
Nara/ Nala	Near Jamnipur	Near Rampur	Stream Length

	[26°1'12.69"N, 81° 3'50.62"E]	Barara [26°2'46.08"N, 81°5'3.96"E]	approximately 7.67 Km Potential Threat : Extensive Agricultural Practices and loss of vegetation
Gandha Nala	Near Narayanpur Barna [25°59'26.30"N, 81° 6'25.72"E]	Near Madhopur [25°59'3.52"N, 81° 3'28.50"E]	Stream Length approximately 6.93 Km. Potential Threat : Extensive Agricultural Practices
Chop Nadi [Refer Image No. 7]	Near Badshahpur [25°56'28.97"N, 81°13'3.83"E]	Near Relampur [26°0'50.58"N, 81°16'12.66"E]	Stream Length approximately 18 Km Potential Threat : Extensive Agricultural Practices and loss of vegetation
Nara/ Nala	Near Kharauli [25°55'0.69"N, 81°13'1.98"E]	Near Najepur [25°55'3.45"N, 81°13'46.43"E]	Stream Length approximately 1.40 Km Potential Threat : Extensive Agricultural Practices and loss of vegetation
Nara/ Nala	Near Gangagarh [25°52'26.72"N, 81°14'0.10"E]	Near Kandrawan [25°53'11.63"N, 81°15'27.67"E]	Stream Length approximately 3.22 Km Potential Threat : Extensive Agricultural Practices and loss of vegetation

Image 6 : Image Showing Nara/Nala Near Ganga Bridge [Ref. Table No.1]

Image 7: Image Showing Dried Chop Nadi [Ref. Table No.1]



Map 3 : Major and Minor Tributaries [Raebareli Distt.]

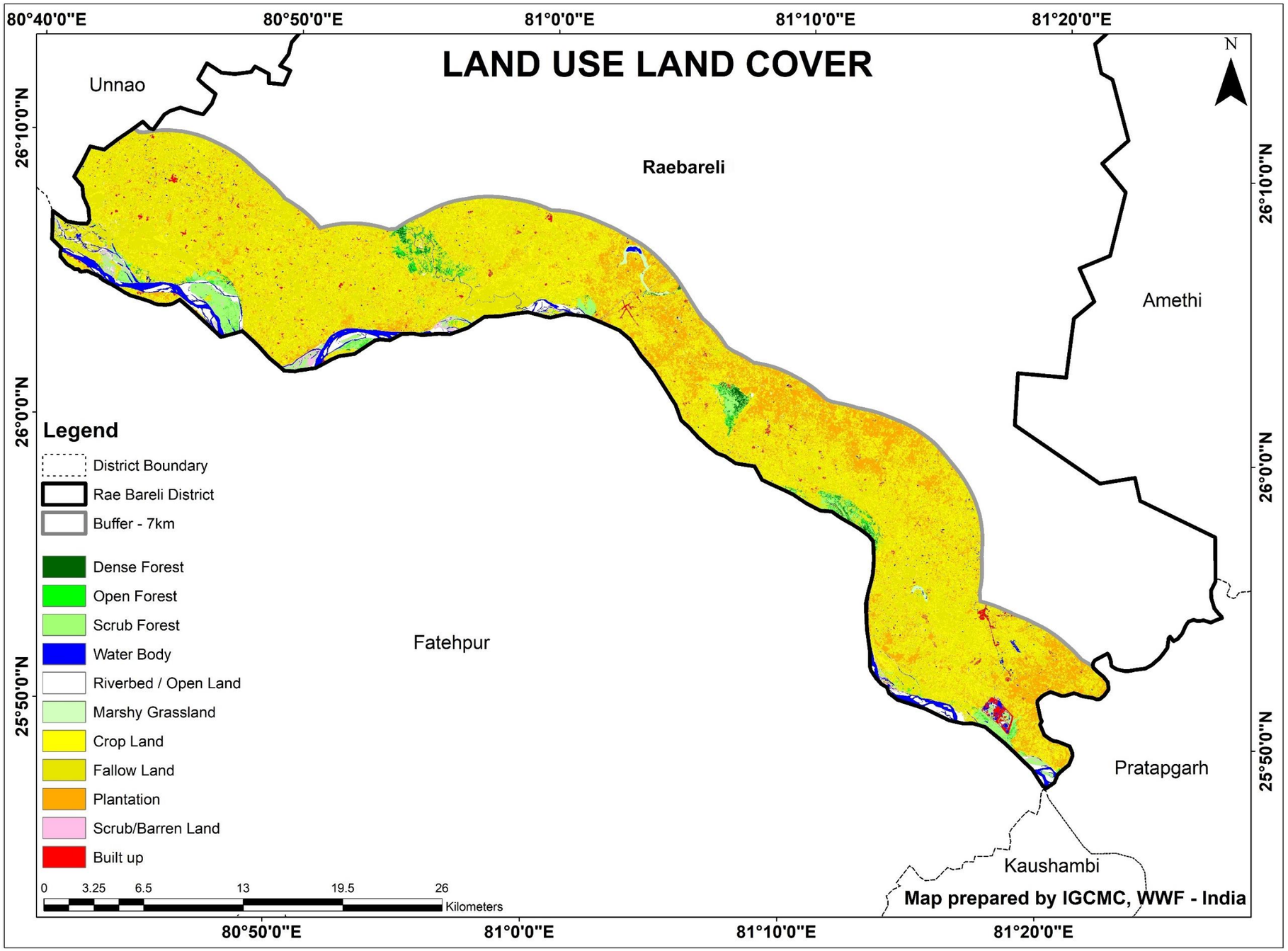
5.0 Land Use Land Cover [LULC]

5.1 Land Use Land Cover [LULC] map of the study area has been prepared from Landsat imagery for the year 2020 [Refer Table No. 2 & Map No. 4]. Using supervised classification system, 11 different classes were generated – Dense Forest, Open Forest, Scrub Forest, Water Body, Riverbed / Open Land, Marshy Grassland, Crop Land, Fallow Land, Plantation, Scrub/Barren Land and Built-up [Refer Map No. 4]. Study area constitutes 619.44 sq.km. covering Left bank of River Ganga for which the following observations were drawn based on this classification:

- Forest area constitutes 4.74% of the study area and is classified into Dense Forest, Open Forest and Scrub Forest. Forest area is found in patches along Ganga and Loni River and at riverine islands. Fallow land has a distribution of 42.20%, which also includes agricultural fallow land.
- Water body [2.82%] and marshy grassland [0.51%] constitutes 3.33% of the study area. It covers lentic and lotic system of the study area.
- The built-up land constitutes 0.87% of the total study area. This class covers scattered settlements, and newly developed settlements along National Highway.

Table 2 : Land Use Land Cover of Study Area In Raebareli Distt. [2020]

Class	Area (Ha)	Area (%)
Dense Forest	368.48	0.5949
Open Forest	542.4	0.8756
Scrub Forest	2035.11	3.2854
Water Body	1744.49	2.8162
Riverbed / Open Land	1134.88	1.8321
Marshy Grassland	316.81	0.5114
Crop Land	17426.4	28.1322
Fallow Land	26143.9	42.2053
Plantation	11088.7	17.9010
Scrub/Barren Land	603.71	0.9746
Built up	539.71	0.8713
Total	61944.59	100



Map 4 : Land Use Land Cover Map Of The Study Area [Raebareli Distt.]

6.0 Palaeochannels Within Study Area

6.1 Palaeochannels are the remnants or old channels of once active rivers or streams, some of which are lie buried under the cover of younger sediments. They are formed when the river or stream migrate their courses and form new ones. Palaeochannels are important to understand geology, old river routes, sediment deposition and are considered suitable areas for ground water recharge. In Raebareli Distt. factors such as encroachment, extensive agricultural practices, high silt load and loss of vegetation act as a catalyst for the fading of river channels and wetlands. Loss of vegetation allows the soil to erode easily, which finally ends up in filling of the wetlands and accelerate the rate of migration of river.

6.2 In order to identify paleo-channels, paleo-wetlands and threatened river channels in the study region, Survey of India (SOI) toposheets from 1925-1931 to 2005-2006 and Google Imagery upto November 2021 were analysed [Refer Map 5 & 6]. Further, ground truthing carried out in November 2021. Based on that, it has been found that :

- River channel of Ganga in Raebareli-Fatehpur stretch has migrated between 1925-1931 to 2005 - 2006 [Ref. Map No. 5].

- Major migration was recorded between Benikhera [26°12'53.25"N, 80°34'36.32"E (Near Kanpur-Fatehpur border)] and Semraha Purwa [26° 7'53.64"N, 80°37'59.86"E] and between Deomai Purwa [26° 5'50.23"N, 80°43'8.78"E] and Sarai [26° 5'17.84"N, 80°47'7.95"E]. [Refer Map No. 5]

- In recent years it has been observed that the channel of Ganga River is faded between Senpur [26°3'28.90"N, 80°59'44.73"E], Firozpur [26°2'43.87"N, 81°0'23.91"E] Deoranar [26°1'59.72"N, 81°1'16.19"E] and Narauli Buzurg [26°0'20.07"N, 81°2'45.83"E] in Fatehpur Distt. [Right Bank] [Refer Image No. 10]. Also, near Raebareli-Unnao border area [Left Bank] the river channel is dried between Baksar [26° 8'14.84"N, 80°40'1.78"E], Gahrauli [26° 6'58.62"N, 80°43'57.45"E] and Gonda [26° 4'29.18"N, 80°47'55.51"E] [Refer Image No. 11]. The drying of river channel may trigger lateral erosion at opposite banks.
- Apart from this there are several wetlands which are completely faded and converted into agricultural fields in the Distt.. Lack of riparian vegetation and siltation are main reason behind the faded wetlands. A wetland named Barhat Tal is located at 26°3'32.89"N, 81°3'34.24"E [near Pakhrauli Village] is under threat due to siltation and

conversion of wetland area in agricultural fields. **The wetland has once water spread area of 63.6 Hectares has now decreased to 12.5 Hectares only i.e. decreased in 80.3% [Refer Image No. 8 & 9].**

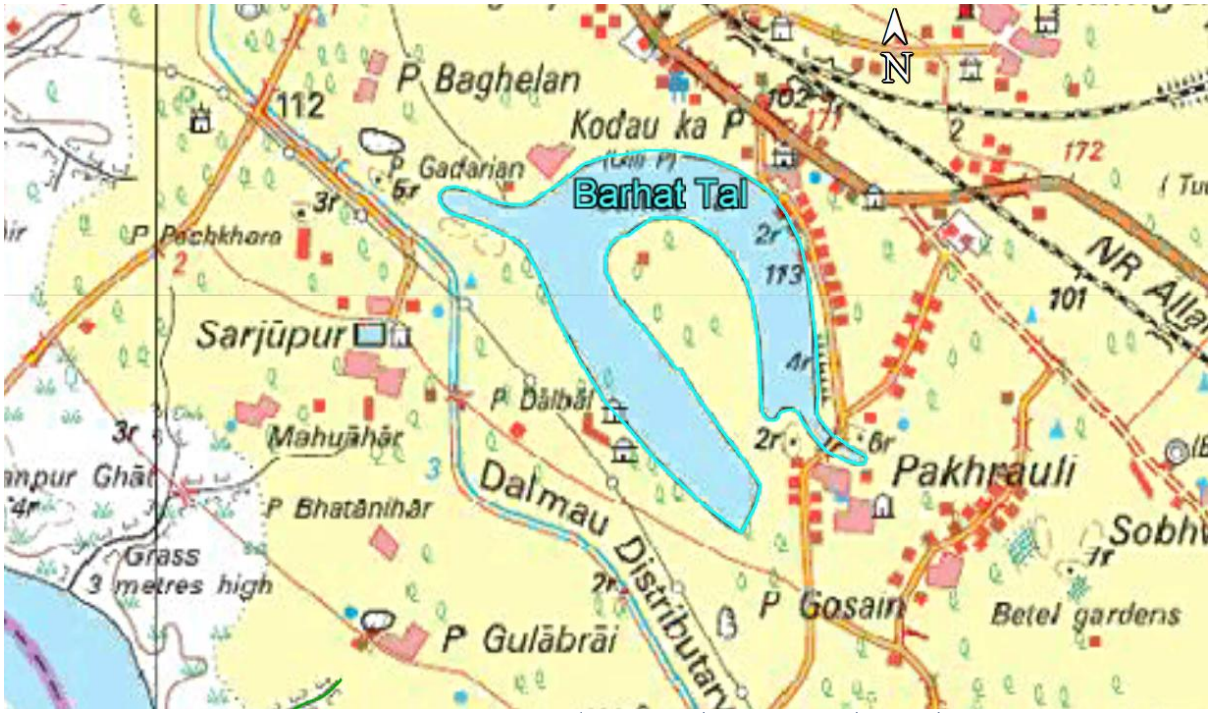


Image 8 : Survey Of India Map Showing Barhat Tal
[Source : SOI-OSM [G44J4] of the year 2010 based on the modern survey 1971-1972 and Major Updates in the year 2005-2006, Scale-1:50,000]

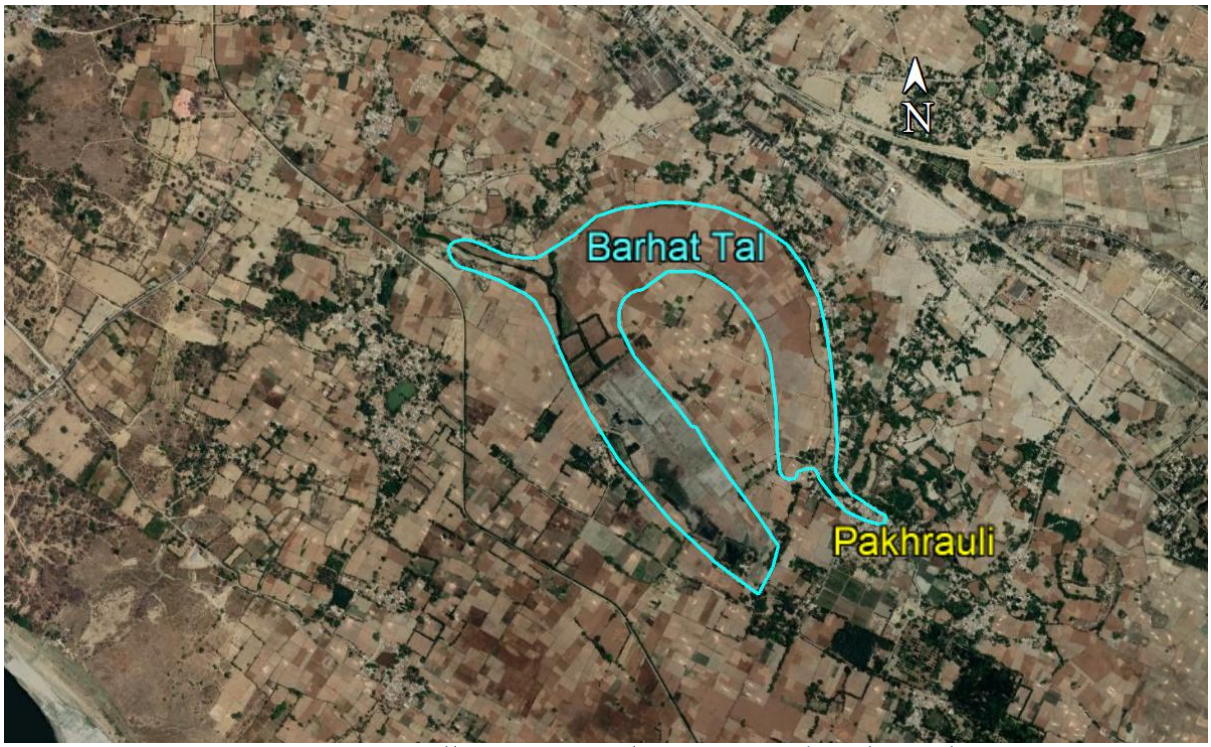


Image 9 : Satellite Imagery Showing Dried Barhat Tal
[Source : Google Earth Pro, Imagery Dated, April 2021]

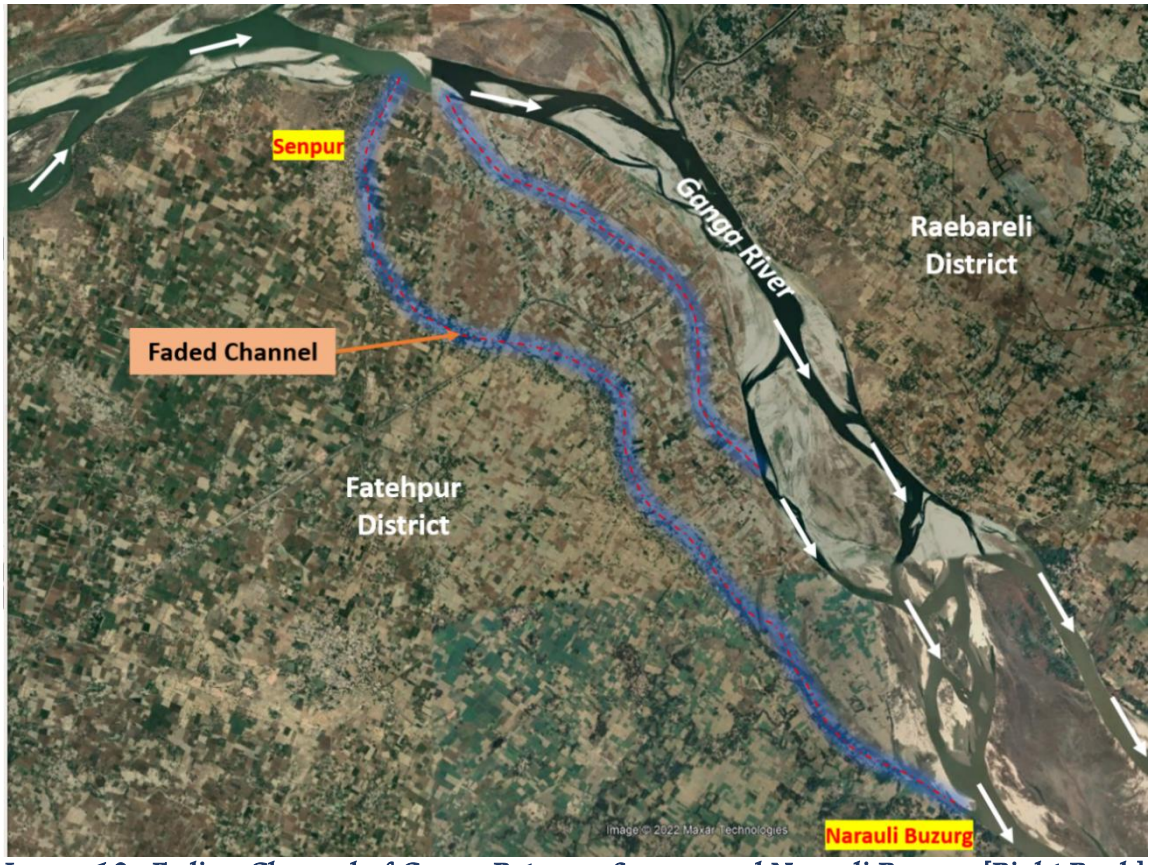


Image 10 : Fading Channel of Ganga Between Senpur and Narauli Buzurg [Right Bank]
[Source : Google Earth Pro, Imagery Dated, December 2021]

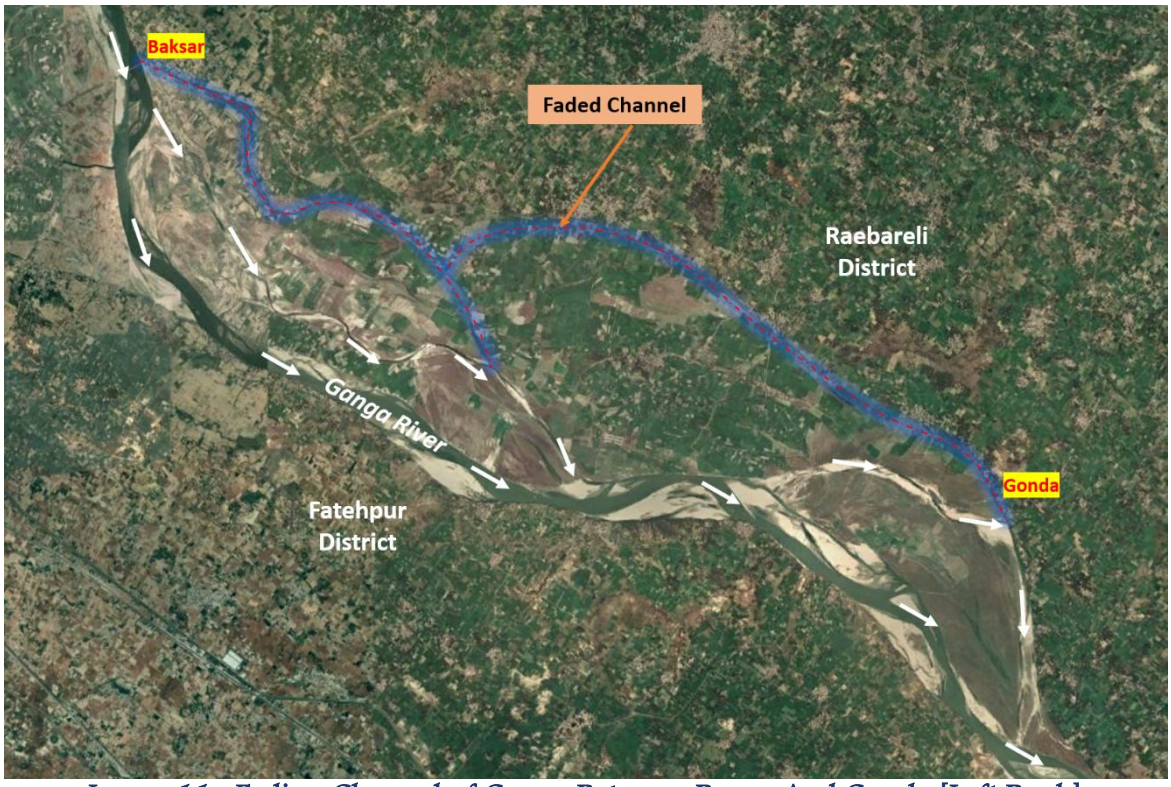
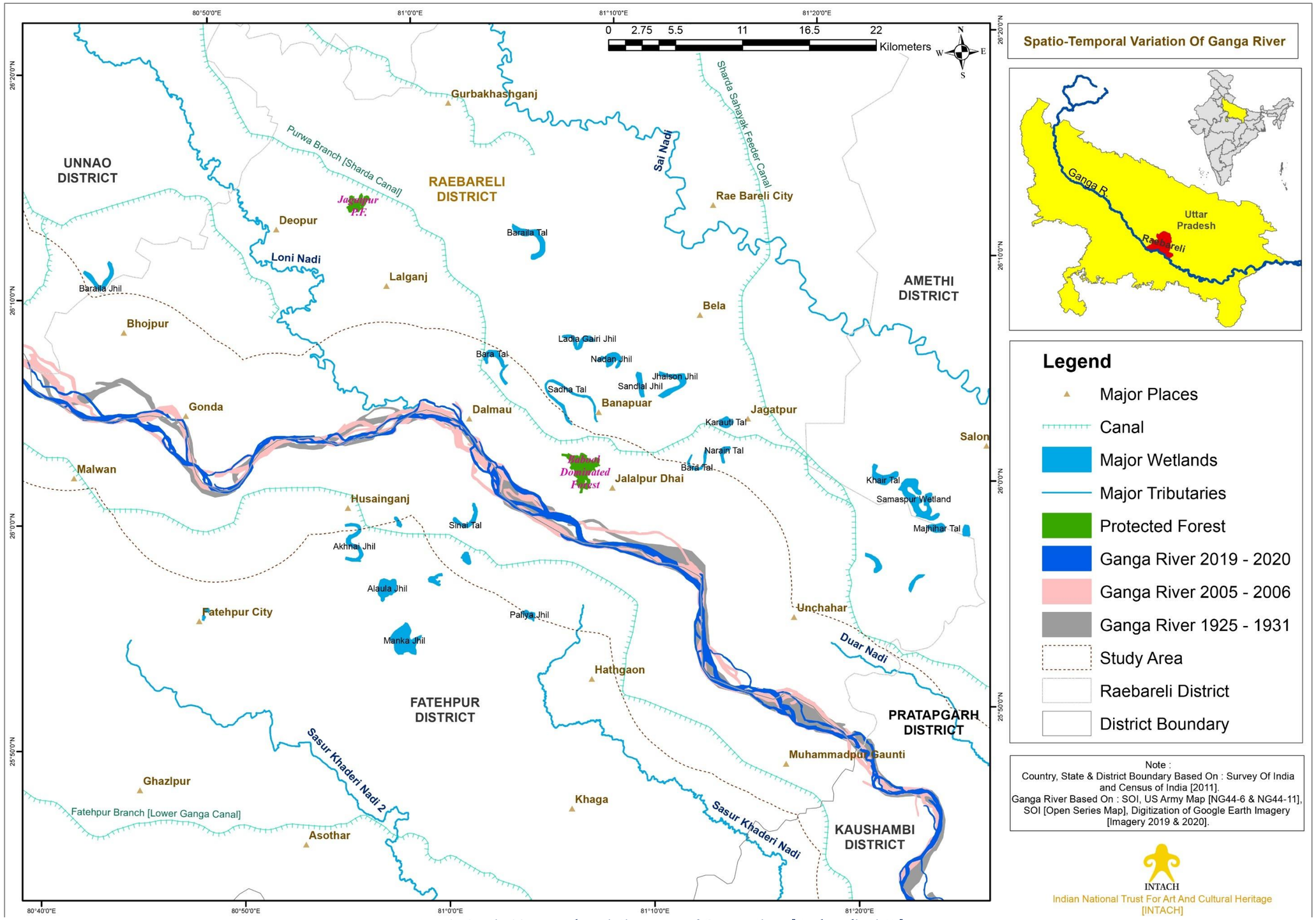
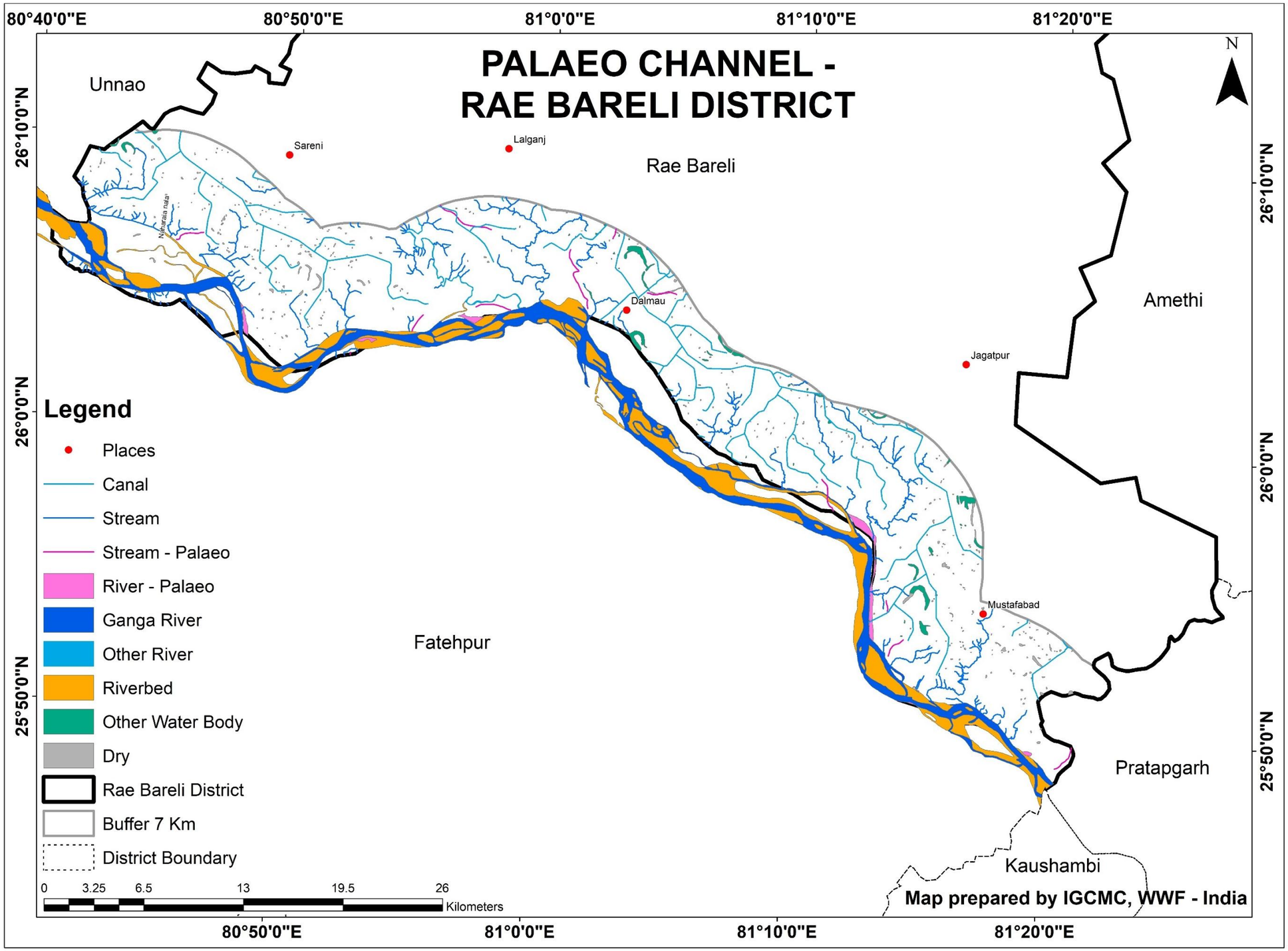


Image 11 : Fading Channel of Ganga Between Buxar And Gonda [Left Bank]
[Source : Google Earth Pro, Imagery Dated, December 2021]



Map 5 : Spatio-Temporal Variation Map of Ganga River [Raebareli Distt.]



Map 6 : Paleochannels Within Study Area [Raebareli Distt.]

7.0 Floodplain Of Ganga River In Raebareli District

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 floodplain 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 a period, they deposit sand, silt and other soil forming materials in the floodplain region, which make them ideal for agricultural production. Throughout history, people have learned to cultivate in 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.

7.2 Raebareli Distt. is part of Upper Indo-Gangetic Plains and the distt. As a whole is a fairly compact tract of gentle undulating land. The general slope is from north-west to south-east. Topographically three physical units namely – (1) Ganga Khadar, (2) the Ganga upland and (3) southern clay tract dominates the study area. The Ganga upland area covers the entire Sareni Block, except a few depressions where water accumulates during the rainy season. Upland area gradually narrows near Dalmau and becomes prominent near Chop Nadi and its surrounding areas. To the north of southern clay tract there is a belt of stiff clay interspersed with broad and shallow swamps and usar lands. This clay belt extends upto Unchahar Block. Ganga Khadar is also known as Kachhar, consists of low-lying alluvium land. *Zaid and rabi* crops are mainly cultivated in Ganga Khadar area [Refer Image No. 12]. The Raebareli Gazetteer of 1976[4] describes the Khadar along Ganga River as :

"The old channels of the river, partially silted up or carrying some water, divide the khadar into two parts. The portion, lying between the river and the old channels, is a series of alluvium flat lands. The surface soil changes from time to time. Cultivation is

[4] Baghel Amar Singh; State Editor (District Gazetteers), 1976, Uttar Pradesh District Gazetteers – Raebareli, Published by Govt. of Uttar Pradesh (Department of District Gazetteers, U.P, Lucknow) and Government Press Allahabad, U.P.

possible for the Rabi crops. The annual inundation by the river sometimes covers what was previously excellent land with a deposit of poor sand and what was uncultivable land with a thick layer of clay. A portion of the land with good soil remains for a number of successive years, and the fresh deposit can seldom be cultivated until, as a result of several seasonal floods, the soil has been bound together by the roots of the tamarisk which grows there as soon as ground can support any vegetation."

Image 12 : Agricultural Activities In Active floodplain Of Ganga River
[Image showing Rabi (mainly wheat-mustard) Zaid crops protected with Saccharum grass]

7.4 Agricultural produce of the Distt. include-

- **Cereals and Millets :** Bajra (Spiked Millet), Barley, Jowar (Great Millet), Maize, Ragi (Finger Millet), Paddy, Sawan, Wheat.
- **Pulses :** Arhar (Tur), Cowpea (Lobia), Gram (Chikpea), Masoor (Lentil), Moong (Green Gram), Peas, Urad (Black Gram).
- **Oilseeds :** Linseeds (Flaxseed), Mustard and Sesamum.
- **Vegetables :** Ash Gourd (Petha/Bhatua), Bitter Gourd, Bottle Gourd, Brinjal, Cabbage, Carrot, Couliflower, Green Chillies, Guar Seed, Jhigni or Tori (Ridge Gourd), Okra, Onion, Parwal, Pumpkin, Tomato and Potato.
- Gooseberry (Amla), Lemon, Banana, Guava, Jackfruit, Muskmelon, Watermelon [Refer Image No. 13], Ber, monkey jack (Badhar), Papaya and Mango [Refer Image No. 14].

Image 13 : Watermelon Field In Active Floodplain Area

Image 14 : A Mango Orchard In Unchahar

8.0 Wetlands Within Study Area In Raebareli District

As per the Wetlands (Conservation and Management) Rules, 2017 - "Wetland means an area of marsh, fen, peatland or water; whether natural or artificial, permanent or temporary, with water that is static or flowing, fresh, brackish or salt, including areas of marine water the depth of which at low tide does not exceed six meters, but does not include river channels, paddy fields, human-made water bodies/ tanks Specifically constructed tor drinking water purposes and structures specifically constructed for aquaculture, salt production, recreation and irrigation purposes.''

8.1 Wetlands are highly productive ecosystems and help in maintaining ecological balance by providing food and habitat to large number of living organisms. They also help in controlling floods, recharging groundwater, nutrient recycling, climate stabilization and carbon sequestration. According to National Wetland Atlas [Uttar Pradesh], Wetlands constitute 5.16% geographic area of the Uttar Pradesh state and 8.36% area of the Raebareli district. River/stream constitutes 28.87% area while remaining 71.13% area is covered by Lakes/Ponds [11.49%], Ox-bow lakes/Cut-off meanders [14.17%], Riverine wetlands [1.50%], Waterlogged [34.33%], Tanks/Ponds [4.04%] and Reservoirs/Barrages [0.31%].

8.2 In the current exercise, 122 wetlands have been mapped in the study area with the help of Google Earth satellite imagery and SOI-OSM available maps. Total area of the mapped wetlands is 526.29 ha i.e., 0.85% of the study area. The area of identified wetlands ranges between 0.35 ha to 128.85 ha. Out of 122 wetlands, the area of 69 wetlands is less than 1 ha, 37 wetlands have area between 1 ha and 2.5 ha and 16 wetlands have area greater than 2.5 ha. Area of the five largest wetlands constitutes 65% of the total study area. The list of identified wetlands is provided in Table No. 3 and their spatial distribution is shown in Map No. 7.

Table 3 : Wetland Within The Study Area

Sr. No.	Wetland Name/ Number	Coordinates		Area [Hectares]
		Latitude	Longitude	
1	1	26.14885	80.705588	1.875721
2	2	26.150048	80.724521	0.824012

3	3	26.146609	80.711838	0.453906
3	3	26.139896	80.70252	0.617036
4	4	26.110698	80.702674	2.361222
5	5	26.105806	80.704617	3.394205
6	6	26.110267	80.708534	2.096076
7	7	26.137246	80.73116	0.81
8	8	26.144292	80.747111	0.67
9	9	26.114165	80.733923	0.56
10	10	26.130818	80.749546	1.27
11	11	26.140483	80.748396	1.40
12	12	26.144059	80.755675	1.18
13	13	26.149002	80.757177	0.83
14	14	26.1448	80.769662	2.10
15	15	26.137236	80.779193	0.80
16	16	26.136504	80.785769	0.57
17	17	26.101017	80.760698	3.57
18	18	26.130631	80.813661	1.22
19	19	26.120562	80.803356	1.44
20	20	26.102372	80.802319	0.66
21	21	26.110122	80.807858	1.20
22	22	26.098754	80.813491	1.12
23	23	26.089842	80.809646	0.94
24	24	26.087682	80.812998	0.91
25	25	26.094604	80.836934	0.58
26	26	26.092062	80.838803	1.01
27	27	26.061826	80.817546	0.62
28	28	26.113415	80.86293	0.67
29	29	26.088527	80.844047	0.84
30	30	26.077363	80.839541	2.081
31	31	26.050313	80.829115	1.43
32	32	26.09952	80.868382	0.74
33	33	26.110976	80.874681	1.05
34	34	26.085232	80.863584	0.76
35	35	26.082148	80.865686	0.36
36	36	26.114589	80.89201	0.77

37	37	26.102912	80.890133	1.10
38	38	26.071778	80.879571	0.64
39	39	26.081431	80.883184	0.83
40	40	26.090205	80.890502	0.72
41	41	26.100378	80.899299	0.61
42	42	26.076653	80.893232	0.55
43	43	26.062056	80.885216	0.75
44	44	26.081935	80.90523	0.80
45	45	26.133805	80.94376	0.41
46	46	26.129383	80.946094	1.27
47	47	26.125774	80.947019	1.64
48	48	26.109554	80.94144	0.80
49	49	26.112332	80.939344	0.40
50	50	26.083772	80.940584	0.47
51	51	26.112003	80.946321	1.68
52	52	26.115715	80.955475	1.14
53	53	26.120862	80.95786	0.83
54	54	26.138105	80.969355	0.73
55	55	26.099959	80.960167	1.06
56	56	26.100487	80.957537	0.78
57	57	26.085839	80.954261	0.88
58	58	26.087316	80.95543	0.37
59	59	26.122527	80.972379	0.46
60	60	26.120631	80.976544	0.64
61	61	26.121978	80.978292	1.31
62	62	26.122978	80.982553	0.56
63	63	26.085165	80.989143	0.64
64	64	26.085266	80.983796	0.65
65	65	26.092036	80.984254	0.65
66	66	26.101421	80.993652	0.61
67	67	26.090635	81.012093	0.38
68	68	26.089426	81.026335	0.70
69	69	26.109202	81.041723	1.53
70	70	26.08444	81.032557	0.84
71	Bara Tal	26.103933	81.057256	110.11

72	72	26.103073	81.052556	1.29
73	73	26.098964	81.05166	1.05
74	74	26.088025	81.065187	2.96
75	75	26.080071	81.069374	0.85
76	76	26.168037	80.739315	4.60
77	77	26.033235	81.071976	0.42
78	78	26.083051	81.092177	1.03
79	79	26.063424	81.093716	0.82
80	80	26.052977	81.106068	5.74
81	81	26.048623	81.103806	10.15
82	82	26.034322	81.10067	1.50
83	83	26.026044	81.102123	0.64
84	84	26.01733	81.094373	0.75
85	85	26.00941	81.101908	0.55
86	86	26.03529	81.138806	1.25
87	87	26.037079	81.139083	0.64
88	88	25.996765	81.14338	0.93
89	89	25.999494	81.141401	0.65
90	90	26.014007	81.157092	1.01
91	91	26.036885	81.159344	6.62
92	92	26.005685	81.1582	0.65
93	93	26.015579	81.185682	2.95
94	94	25.997183	81.182226	0.68
95	95	25.996006	81.183038	0.53
96	96	26.018761	81.192707	1.54
97	Sadha Tal	26.074666	81.115783	128.84
98	Bara Tal	26.025327	81.218526	45.94
99	99	25.981793	81.223494	0.88
100	100	25.980963	81.246369	1.06
101	101	25.944309	81.23687	0.58
102	102	25.940531	81.231177	0.81
103	103	25.915888	81.234176	0.53
104	104	25.973666	81.273802	18.40
105	105	25.972177	81.278969	19.37
106	Bakwa Tal	25.91731	81.250278	41.73

107	107	25.896829	81.253218	13.53
108	108	25.910006	81.291616	0.70
109	109	25.884627	81.313906	0.44
110	110	25.882752	81.32046	0.81
111	111	25.875749	81.324515	1.77
112	112	25.874143	81.324742	1.35
113	113	25.873087	81.321341	0.85
114	114	25.87496	81.311407	1.85
115	115	25.866318	81.316656	1.17
116	116	25.86748	81.310368	0.45
117	117	25.869119	81.312121	0.56
118	118	25.866193	81.323723	0.60
119	119	25.888189	81.337525	6.01
120	120	25.886392	81.340455	1.11
121	121	25.887361	81.343256	1.53
122	122	25.861626	81.332511	4.11
Total Area [Hectares]				**526.29**

8.3 Bara Tal : It is a huge wetland located near Saistabad and Simauri village at latitude 26° 6'39.67"N and longitude 81° 3'19.36"E [Refer Map 7, Table No. 3 (Wetland No. 71) & Image No. 15-18]. As per the satellite imagery of 2020-2021, the water spread area of Bara Tal is around 110 hectares. The depth of the wetland is around 18-20 feet and is 4.5 Km long having width maximum width of around 0.43 Km. The wetland is probably a remnant of Bakulahi Nadi which once flows through this area. The northern and southern edge of the wetland is dried for around 2.18 Km and 0.45 Km respectively. The dried northern part of the wetland is named as Baburia Tal and is currently under cultivation [Refer Image No. 15]. The edges of the wetland are covered with reeds and water hyacinth [*Eichhornia crassipes*]. Currently, wetland is used for fishing only.

The wetland is a major site for the migratory, local migratory and the resident avian species. However, their number and diversity has decreased in recent years due to lack of fishes, eutrophication and hunting.

Image 15 : Survey Of India Map Showing Bara Tal

[Source : SOI-OSM [G44J4] of the year 2010 based on the modern survey 1971-1972 and Major Updates in the year 2005-2006, Scale-1:50,000]

Image 16 : Satellite Imagery Showing Bara Tal

[Source : Google Earth Pro, Imagery Dated, December 2021]

Image 17 : Vara Tal [Looking North]

Image 18 : Flock Of Lesser Whistling Ducks In Bara Tal

8.3.2 Barhat Tal : Wetland is located near Kodau Ka Purwa and Pakhrauli Village at latitude 26° 3'23.91"N and longitude 81° 3'27.56"E [Refer Image No.19]. As per the satellite imagery of 2020-2021, the water spread area of Barhat Tal is around 12.5 hectares which shows a sharp decrease of 80.3% water spread area from 2005-2006 [Analysed from SOI-OSM (2005-06) and satellite imagery 2020-21]. The wetland is completely filled up and the current water spread area is maintained by constructed ponds for fish farming. Part of wetland area is on lease for agricultural activities and for fish farming.

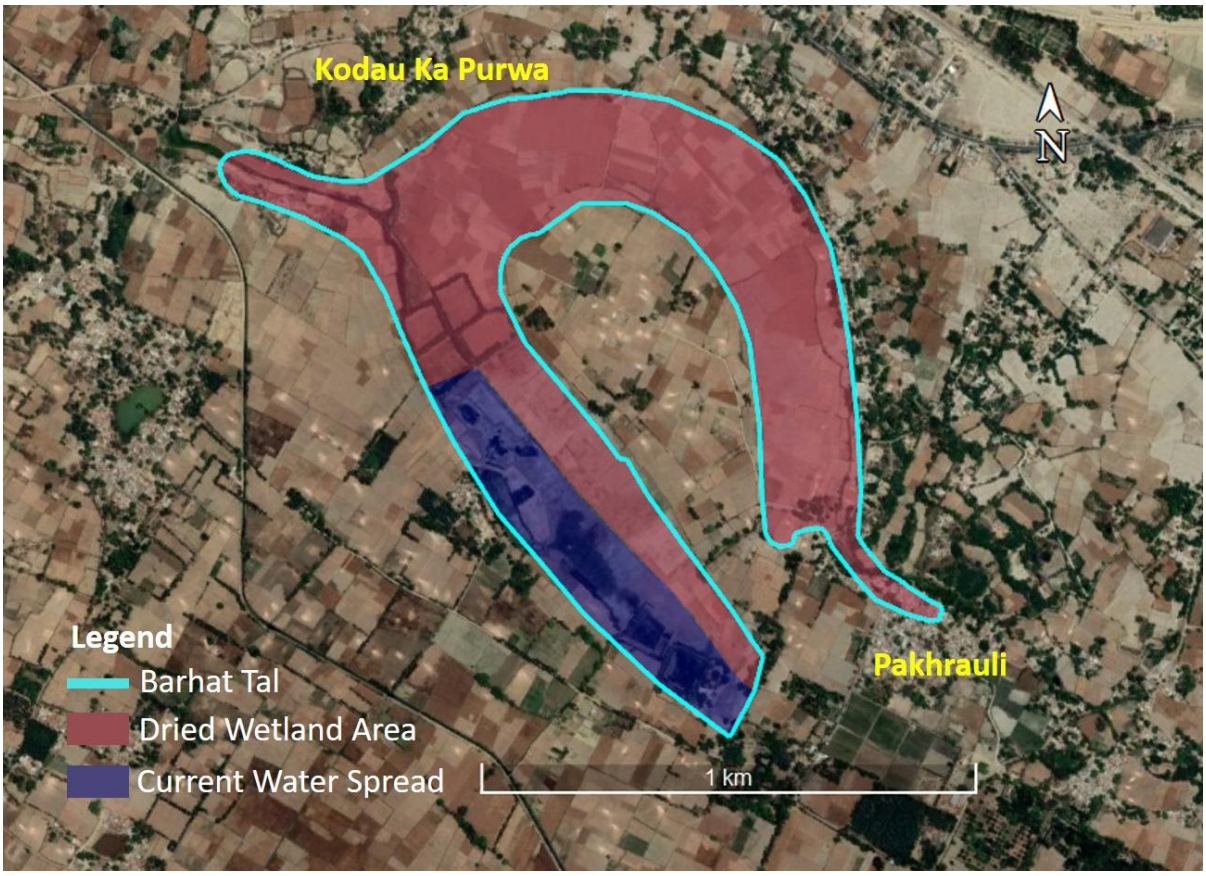


Image 19 : Satellite Imagery Showing Barhat Tal

[Source : Google Earth Pro, Imagery Dated, December 2021]

Image 20 : Dried Barhat Tal [Looking North]

Image 21 : Fish Pond At Barhat Tal

8.3.3 Baraila Tal : Wetland is a huge wetland located outside the study area near Barauli village (Raebareli Distt.) and Jahanganj (Unnao Distt.) at latitude 26°10'42.43"N and longitude 80°44'36.90"E; forms the boundary between Unnao and Raebareli Distt.[Refer Image No. 22]. As per the satellite imagery of 2020-2021, the water spread area of Barhat Tal is around 56.9 Hectares which is reduced from 134 Hectares i.e. decrease of 42.46% water spread area from 2005-2006 (Analysed from SOI-OSM (2005-06) and satellite imagery 2020-21]. The wetland area is gradually decreasing due to encroachment of wetland area for agricultural activities. Lack of riparian vegetation has induced the siltation in the wetland. The depth of the wetland is around 5-7 feet.

Currently wetland is used for fish farming. Few Fish ponds are also constructed at the edges. Fish species found in the wetland includes – Rohu [*Labeo rohita]*, Catla [*Labeo catla]*, Brigid, Silver carp, Padhina, Bhakur and Tengra [*Mystus tengara].*

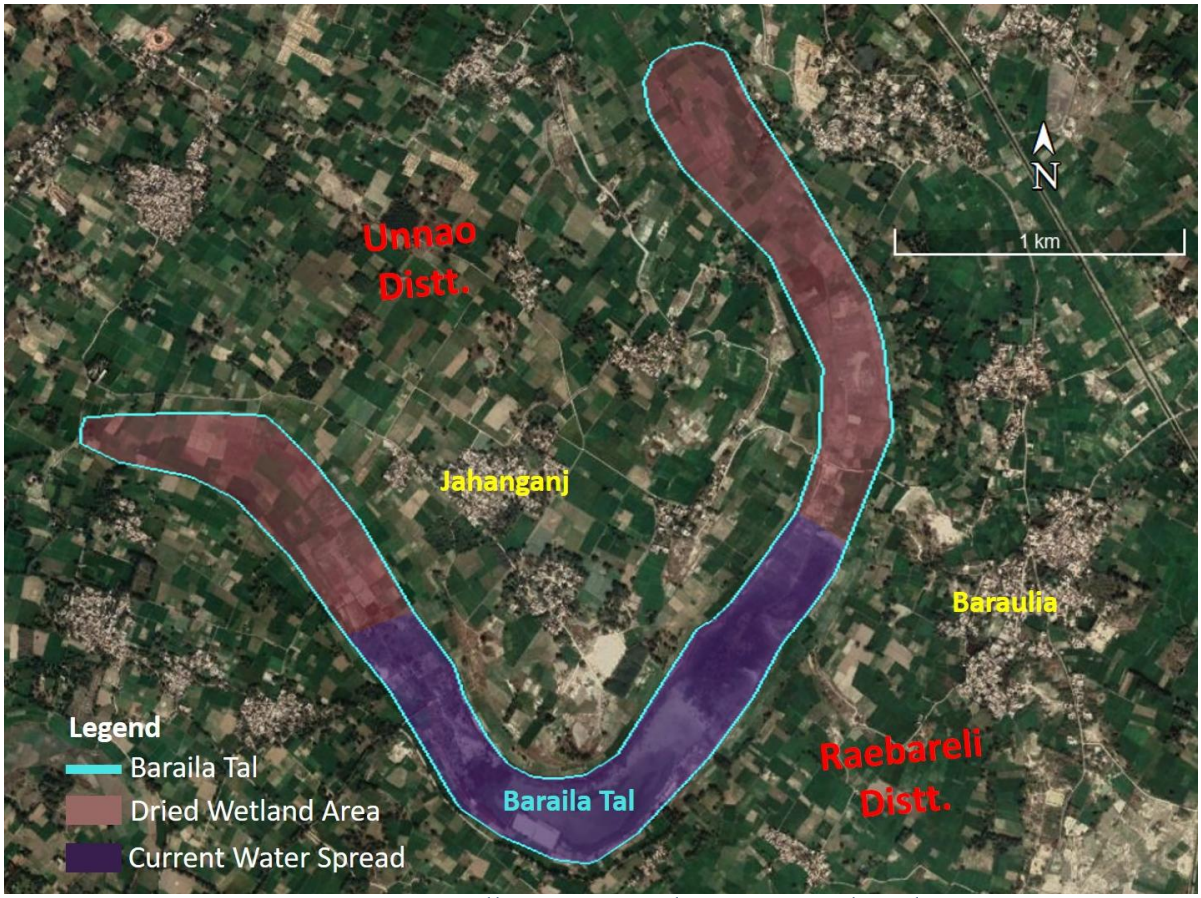
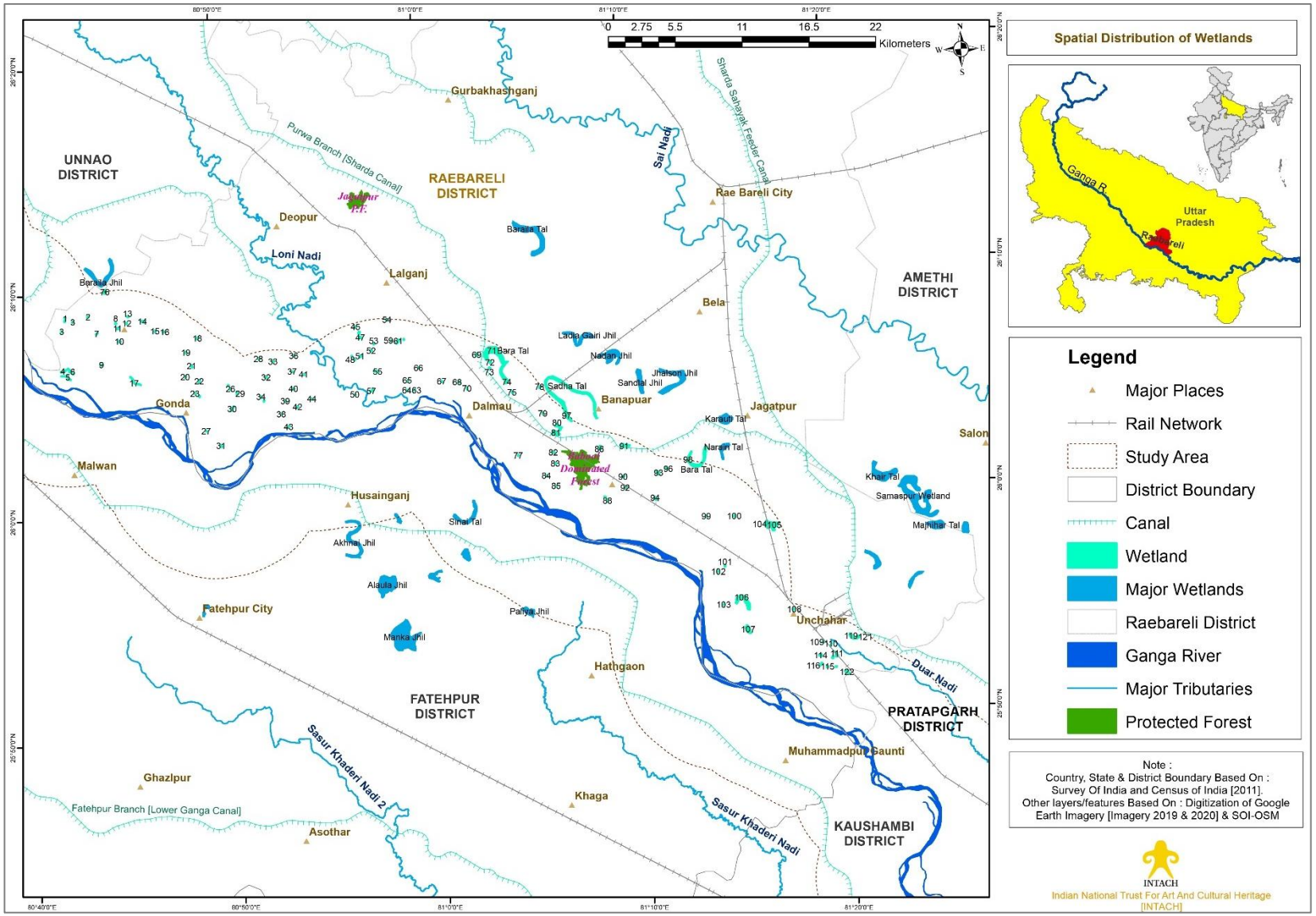


Image 22 : Satellite Imagery Showing Baraila Tal

[Source : Google Earth Pro, Imagery Dated, December 2021]

Image 23 : Eichhornia spp. Infested Baraila Tal [Looking North West]

Image 24 : Traditional Fishing Activity At Baraila Tal



Map 7 : Spatial Distribution Of Wetlands [Raebareli Distt.]

9.0 Riparian Flora Along Ganga River In Raebareli District

9.1 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 harbour 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, harbouring faunal diversity and providing livelihood resources [Groffman et al., 1990; Castelle al., 1994].

9.2 Till some time ago, no proper 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 Auden [1941], Gupta [1960], Bhattacharyya and Goel [1982], Groffman et al. [1990], Krishanmurti [1991], Castelle al. [1994], Shyam [2008], Gangwar and Joshi [2006] and Gangwar and Gangwar [2011] which have explored the biodiversity of Ganga River basin. In addition, 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].

9.3 The pattern of riparian vegetation in Raebareli distt. is similar to the adjoining districts – Unnao, Fatehpur, Pratapgarh and Kaushambi. The Fatehpur Gazetteer of 1900 describes the Vegetation within the study area as –

"Patches of dhak jungle occur in places throughout the stiff soil tracts, and there is also some along the bank of the Sai, but the total area is insignificant. The dense jungles which in former days surrounded the strongholds of the taluqdars were in almost every case destroyed after the mutiny. The trees of the district are the same as those which occur throughout the southern Oudh. Besides the mango and mahua, which are chiefly confined to the groves, the commonest are the nim, babul, bargad or banyan, pipal, tamrisk and jamun. The shisam is rarely seen in this district. Attempts have been made to introduce the sal, but they have all ended in failure."

9.4 Currently the *Dhak* dominated jungle has been mostly transformed into the agricultural fields. The babool dominated few dense patches including Shahabad Reserve Forest still present in the study region. The existing patches of riparian vegetation along Ganga River is mostly dominated by *Saccharum spontaneum* L, *Saccharum munja* Roxb., Babool [*Acacia nilotica*], Wild Ber [*ziziphus mauritiana]* and opportunistic & invasive species like *Prosopis juliflora* and *Lantana camara*. This grass dominated patches at elevated areas constitutes scarce vegetation of dhak/palas [Butea Monosperma] and wild ber. The plantation area mainly dominated by – Mango [Mangifera indica], Mahua [*Madhuca longifolia], Teak [Tectona Grandis]*, Eucalyptus [*Eucalyptus alba*], Banyan [*Ficus benghalensis*] and Peepal [*Ficus religiosa*].

9.5 Significant riparian sites are located in Bishundaspur [26°1'28.71"N, 81°7'29.12"E], Garhi [25°58'54.27"N, 81°14'45.24"E], at 26° 6'25.93"N, 80°41'49.65"E, at 26°6'18.51"N, 80°44'48.30"E], at 26°7'14.15"N, 80°42'39.13"E, at 26°7'59.25"N, 80°42'47.51"E, Along Naharania Nala [26° 7'0.75"N, 80°45'7.88"E], Along Bariarpur Nala [26° 5'43.77"N, 80°47'15.35"E], Purwa Lalsahib [26° 4'48.47"N, 80°48'2.75"E], Purwa Baidi [26° 2'14.84"N, 80°49'6.35"E], Abepur [26° 2'43.35"N, 80°50'48.76"E], Singhaurtara [26° 3'41.39"N, 80°52'18.02"E], Shivpur [26° 3'29.11"N, 80°53'57.20"E], Nawada Patti [26° 0'3.79"N, 81° 5'27.33"E], Shahzadpur [25°57'9.32"N, 81°12'50.19"E], Pure Lodi [25°53'3.74"N, 81°13'47.90"E] and at 25°49'16.53"N, 81°20'35.02"E.

Image 25 : Babool And Kikar Dominated Riparian Patch

Image 26 : Satellite Image Showing Location Of Babool Dominated Jungle & Shahabad R. F.
[Source : Google Earth Pro, Imagery Dated, December 2021]

Image 27 : A Riparian Jungle Along Ganga River

9.6 Some riparian grasses are economically valuable in the district. *Saccharum spontaneum* and Saccharum *munja* are used for making huts, basket and ropes. Ropes [locally called Juda] made of Saccharum *spontaneum* are more durable. A bundle of rope of nearly 1.5 Kg weight costs around 30 rupees and is sold at local market.

Image 28 : Bundles of Munj Piled Up For Making Of Ropes And Baskets

9.7 During the survey, total 48 species were recorded throughout the study corridor and is provided in Table No. 4.

Table 4 : Recorded Riparian Plant Species Within Study Area

Sr. No.	Botanical Name	Family	Common Name
01	*Acacia nilotica* (L.) Delile	Fabaceae	Babool
02	*Aegle marmelos* (L.) Corrêa	Rutaceae	Bel 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* Wild.	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
40	*Saccharum munja* Roxb.	Poaceae	Munj
41	*Cynodon dactylon*	Poaceae	Dhoob/Durva grass
42	*Ipomea aquatica Forsk.*	Convolvulaceae	Water Morning Glory
43	*Butea monosperma*	Fabaceae	Pal
44	*Cassia fistula*	Fabaceae	Amaltas
45	*Bauhinia variegata*	Fabaceae	Kachnar
46	Tamarix gallica var. indica *(Willd.) Ehrenb*	*Tamaricaceae*	*Jhau or Tamarisk*
47	*Tamarindus indica*	Fabaceae	Emli
48	*Melia azedarach*	Meliaceae	Bakain

Mahua [*Madhuca longifolia*]

Mahua [*Madhuca longifolia*], native to the Indian subcontinent is found endemic to the North Indian plains. Globally, the species is found distributed in India, Sri Lanka and possibly, Myanmar. In India, the species is mainly found distributed across the peninsular region in the states of Chhattisgarh, Jharkhand, Uttar Pradesh, Bihar, Madhya Pradesh, Kerala, Gujarat and Odisha (Chatterjee and Pakrashi 2003; Patel and Naik 2010).

Central region of Uttar Pradesh, Distt.s such as Raebareli & Pratapgarh have enormous numbers of plantation patches. Area covered by these patches varies from 1 Hectare to 10 Hectare roughly. Mahua plantation in these patches are on an average 30-40 years old, which has thick black trunk and a large canopy covering 8-10 meters of diameter with attending the 15-20 meters hight.

Flower bearing period of Mahua is in month of March-April, as it is an annual bearing tree. Flower sheds when it gets mature at dawn. Fresh Mahua flowers are sweet in taste and contain different photochemical. Traditionally, the fresh flowers are collected and dried under direct sunlight for 2-3 days and stored in gunny bags in normal environment. Apart from this, flowers are likewise utilized as cattle feed which helps in improvement of health of cattle and increase in milk production[5].

In term of fermented products, flowers are also used as crude material for production of alcohol and alcoholic beverages. Local communities collect and dry the Mahua flowers for preparation of "Mahua Daaru (Wine)" which contains 20-40 (%) alcohol. Mahua flowers are mixed with water and kept aside for fermentation. During the fermentation Navshar (Ammonium chloride) and jaggery are added. Sometime black pepper is added to develop a strong hot flavour. After fermentation, the mixture is kept in a container having traditional distillation setup. It is reported that one kilogram of dried flowers yields 300-400 ml of mahua daaru by this method[6].

In Ayurveda, mahua flowers are considered as to be cooling agent, carminative, galactagogue, and astringent. Traditionally, Mahua flowers are used to cure many diseases by tribal people. Fresh juice of the flower is utilized as tonic and also cures skin diseases, eye diseases, *rakta pitta* and headache due to *pitta*. Roasted flowers are consumed to cure

[5] Sinha J, Singh V, Singh J and Rai A K. Phytochemistry, Ethnomedical Uses and Future Prospects of Mahua (*Madhuca longifolia*) as a Food: *A Review J Nutr Food Sci.,* 2017, ***1***.

[6] Kumari A, Pandey A, Ann A, Raj A, Gupta A, Chauhan A, *et al.,* Indigenous Alcoholic Beverages of South Asia, in: Joshi, V.K. (Ed.), Indigenous Alcoholic Beverages of South Asia. CRC Press, New York, 2016, pp. 501-566.

cough and bronchitis. Fried flowers (in ghee) used as a cooling agent and help to cure piles[1].

The lack of modern technologies for the storage of post-harvest of Mahua flowers are major factors affecting the quality of Mahua flowers and their traditional food production. As a result, traditional and medicinal uses and practices are disappearing from the modern society.

Image 29 : Mahua Grove

Image 30 : Local Communities Collecting Mahua Flower

10.0 Faunal Diversity Along Ganga River In Raebareli District

10.1 *Saccharum* and *babool* dominated riparian vegetation along Ganga, Loni and Chop and Shahabad Reserve Forest provides the habitat to Fox [*Vulpes bengalensis*], Hare [*Lepus ruficaudatus*], Indian Porcupine [Hystrix leucura], Golden Jackal [*Canis aureus*], Nilgai [*Boselaphus tragocamelus],* Indian wild boar [*Sus scrofa*], Indian mole rat [*Bandicota bengalensis],* Common mongoose [*Herpestes edwardsii*], *Rhesus macaque* [*Macaca mulatta*] and Langur [*Semnopithecus spp.*]. Raebareli Distt. Gazetteer [1905] mentioned the presence of wolves, Hyenas, Deer, Black Buck, Nilgai and Jackals in the jungles and swamps in the distt.

Image 31 : Langur [*Semnopithecus spp.*] In A Mahua Field

10.2 Details of faunal species sighted within the study corridor are provided below :

10.2.1 Turtles: River Ganga is home to 13 freshwater turtle species of total 24 species found in the freshwaters of India. Turtles are unique reptilian creatures having distinct ecological niche, adapted to specialized environmental conditions, slight alteration in the habitat can make the species extinct from the region. Poaching, habitat loss, pollution and over fishing are major threats to the turtles. Pristine riverine islands in the distt. provides favourable habitat to the turtles. Upon interaction with members of Mallah Community, they reveal that the **Brown Roofed Turtle** [*Pangshura smithi*] which

falls under "**Near Threatened**" Category and **Indian Soft-shell Turtle** [*Nilssonia gangetica]* under **"Endangered"** by IUCN are randomly sighted on riverine islands and sand bars.

10.2.2 **Nilgai :** Nilgai [*Boselaphus tragocamelus*] or Blue bull has become one of the major threats in crop production, leading to human-wildlife conflict in various regions of the country. Usually prefer open grasslands, open scrublands, woodlands and agricultural fields as habitat. The population of Nilgai has increased drastically over the years due to prolonged breeding activity and lack of potential predators and has become locally overabundant in states of Gujarat, Bihar, Uttar Pradesh, Haryana, Punjab, Rajasthan, Madhya Pradesh and Delhi (Meena, 2017). The entire Gangetic plain is prone to crop raiding by the animal creating human-wildlife conflict across the region. During the survey, significant population was spotted across the district [Refer Image No.32].

Image 32 : Group of Nilgai [Boselaphus tragocamelus] Crossing A Temporary Road In A Riparian Patch

10.2.3 **Gangetic Dolphin** : Declared as National declared as the National Aquatic Animal by the Govt. of India in 2010, the Gangetic Dolphin [*Platanista gangetica*] is one of the three fresh water dolphins found in the world. Found in Ganga-Brahmaputra- Meghna and Sangu–Karnaphuli river systems in India, Nepal, and Bangladesh. The Gangetic Dolphin falls under "Endangered" category of IUCN's Red Data List, the population of these species has been decreased since the last century due to habitat loss, habitat fragmentation, diversion of water, over fishing and hunting (Sinha & Kannan, 2014;

Abdul Wakid, 2005). During the survey, we did not have any direct sighting of the mammalian creature. Upon interaction with the Mallah community, it is found that there is a sparse population of dolphin present between Ganga-Pandu and Ganga Loni Confluence. Most of the fishermen stated that the dolphins are commonly sighted in monsoon and post monsoon season.

10.2.4 **Wild Boar :** Wild Boars [*Sus scrofa* L.] are one of the most widely distributed species in the world. Their highly adaptive behaviour and wide range of habitat have led the species' population to flourish. In recent years, wild boar has become a regular menace for farmers, causes crop damage right from planting till the maturity of the crop [Vasudeva Rao et. al., 2015]. Famous for attacks on human, the wild boars are usually nocturnal species. During the survey, the locals stated that the boars are responsible for destroying the Zaid crops at river bank. The tall riparian grasses serve as habitat for them, during the night the wild boars use to come out and feed on the crops and vegetables. Historically the *Dhak* dominated Jungles along the river were reported as habitat of wild boars.

10.3 **Avian Diversity :** Fatehpur Distt. has a rich diversity of avian species yet is relatively understudied. The avian diversity survey was conducted in March-April 2022. The diversity 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 using IUCN Red Data List. List of 82 recorded avian species is provided in Table Below -

Table 5 : List Of Recorded Avian Species Within Raebareli Distt.

Sr. No.	Common Name	Scientific Name	Conservation Status
1.	White throated Kingfisher	*Halcyon smyrnensis*	Least Concern
2.	Pied Kingfisher	*Ceryle rudis*	Least Concern
3.	Cattle Egret	*Bubulcus ibis*	Least Concern
4.	Little Egret	*Egretta garzetta*	Least Concern
5.	Intermediate Egret	*Ardea intermedia*	Least Concern
6.	Great Egret	*Ardea alba*	Least Concern
7.	Indian Pond Heron	*Ardeola grayii*	Least Concern
8.	Grey Heron	*Ardea cinerea*	Least Concern
9.	Purple Heron	*Ardea purpurea*	Least Concern
10.	Common Sandpiper	*Actitishy poleucos*	Least Concern

11.	Asian Openbill	*Anastomus oscitans*	Least Concern
12.	Little Cormorant	*Microcarbo niger*	Least Concern
13.	Indian Cormorant	*Phalacrocorax fuscicollis*	Least Concern
14.	Great Cormorant	*Phalacrocorax carbo*	Least Concern
15.	White breasted - Waterhen	*Amaurornis phoenicurus*	Least Concern
16.	Black-headed Gull	*Larus ridibundus*	Least Concern
17.	Brown-headed Gull	*Larus brunnicephalus*	Least Concern
18.	Purple Swamphen	*Porphyrio porphyrio*	Least Concern
19.	**River Tern**	***Sterna aurantia***	**Vulnerable**
20.	African Comb Duck	*Sarkidiornis melanotos*	Least Concern
21.	Lesser Whistling Duck	*Dendrocygna javanica*	Least Concern
22.	Whiskered Tern	*Chlidonias hybrida*	Least Concern
23.	Common Greenshank	*Tringa nebularia*	Least Concern
24.	Black-winged Stilt	*Himantopus himantopus*	Least Concern
25.	Bronze-winged Jacana	*Metopidius indicus*	Least Concern
26.	**River Lapwing**	***Vanellus duvaucelii***	**Near Threatened**
27.	Red-wattled Lapwing	*Vanellus indicus*	Least Concern
28.	Black Drongo	*Dicrurus macrocercus*	Least Concern
29.	Common Myna	*Acridotheres tristis*	Least Concern
30.	Bank Myna	*Acridotheres ginginianus*	Least Concern
31.	Asian Pied Starling	*Gracupica contra*	Least Concern
32.	Brahminy Starling	*Sturnia Pagodarum*	Least Concern
33.	Paddyfield Pipit	*Anthus rufulus*	Least Concern
34.	Common Stonechat	*Saxicola torquatus*	Least Concern
35.	Pied Bushchat	*Saxicola caprata*	Least Concern
36.	Oriental Skylark	*Alauda gulgula*	Least Concern
37.	Common Babbler	*Argya caudata*	Least Concern
38.	Jungle Babbler	*Argya striata*	Least Concern

39.	Large Grey Babbler	*Argya malcolmi*	Least Concern
40.	White Wagtail	*Motacilla alba*	Least Concern
41.	White-browed Wagtail	*Motacilla maderaspatensis*	Least Concern
42.	Indian Silverbill	*Euodice malabarica*	Least Concern
43.	Common Tailorbird	*Orthotomus sutorius*	Least Concern
44.	**Alexandrine Parakeet**	***Palaeornis eupatria***	**Near Threatened**
45.	Rose-ringed Parakeet	*Psittacula krameri*	Least Concern
46.	House Sparrow	*Passer domesticus*	Least Concern
47.	Indian Jungle Crow	*Corvus culminatus*	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.	Barn Swallow	*Hirundo rustica*	Least Concern
52.	Asian Plain Martin	*Riparia chinensis*	Least Concern
53.	Brown-headed Barbet	*Psilopogon zeylanicus*	Least Concern
54.	Coppersmith Barbet	*Psilopogon haemacephalus*	Least Concern
55.	Ashy Prina	*Prinia socialis*	Least Concern
56.	Plain Prinia	*Prinia inornata*	Least Concern
57.	Asian Koel	*Eudynamys scolopaceus*	Least Concern
58.	Greater Coucal	*Centropus sinensis*	Least Concern
59.	Red-whiskered Bulbul	*Pycnonotus jocosus*	Least Concern
60.	Red-vented Bulul	*Pycnonotus cafer*	Least Concern
61.	Shikra	*Accipiter badius*	Least Concern
62.	Common Kaestral	*Falco tinnunculus*	Least Concern
63.	Black-winged kite	*Elanus caeruleus*	Least Concern
64.	Green Bee-eater	*Merops orientalis*	Least Concern

65.	**Pallas's Fish Eagle**	***Haliaeetus leucoryphus***	**Endangered**
66.	Scaly-breasted Munia	*Lonchura punctulata*	Least Concern
67.	Indian Peafowl	*Pavo cristatus*	Least Concern
68.	Spotted Dove	*Spilopelia chinesis*	Least Concern
69.	Eurasian Collared Dove	*Streptopelia decaocto*	Least Concern
70.	Laughing Dove	*Spilopelia senegalensis*	Least concern
71.	Red Collared Dove	*Streptopelia tranquebarica*	Least concern
72.	Yellow-crowned Woodpecker	*Leiopicus mahrattensis*	Least concern
73.	Black Redstart	*Phoenicurus ochruros*	Least concern
74.	Grey Fancolin	*Ortygornis pondicerianus*	Least concern
75.	Yellow-footed Green-pigeon	*Treron phoenicopterus*	Least concern
76.	Rufous Treepie	*Dendrocitta vagabunda*	Least concern
77.	Purple Sunbird	*Cinnyris asiaticus*	Least concern
78.	Indian Roller	*Coracias benghalensis*	Least concern
79.	Indian Grey Hornbill	*Ocyceros birostris*	Least Concern
80.	Black Headed Ibis	*Threskiornis melanocephalus*	**Near Threatened**
81.	Red Naped Ibis	Pseudibis papillosa	Least Concern
82.	Sarus Crane	*Grus Antigone*	**Vulnerable**

Image 33 : Group of Sarus Crane *[Grus Antigone]*

Image 34 : Group Of Asian Openbill Stork [*Anastomus oscitans*]

Grey Francolin Fight. [*Teetar ki Ladai*]

Grey Francolin *[Francolinus pondicerianus]* is a medium-sized grassland bird native to the Indian-subcontinent and Southern Iran. The bird prefers dry grasslands, scrublands and open agricultural lands as habitat, having a status of Least Concern in IUCN's Red List of Threatened Species.

In some of the Districts of Uttar Pradesh which includes Pratapgarh, Raebareli, Kaushambi, Fatehpur, Kanpur, Unnao, Farrukhabad and Shahjahanpur, Grey Francolin fight is a common practice being held illegally for the entertainment purpose. These birds in the region are captured and kept in compact cages, where in stress their behaviour becomes more aggressive, which eventually make them better in fighting. During the fight, two individuals of the species of their respective owners are encountered against each other. The birds use their claws while fighting. Therefore, razor sharp blades are tied in both the claws of each bird so the fight could become blood-stained and entertaining to the audience. The audience pays to see the fights, even betting is done. The birds may die during the fights or can get fatal wounds owing to their death in a few days. The birds who are lucky to escape from the death and life-threatening wounds, may suffer from life time injuries or disabilities.

According to a report published in The Times of India, a total of 18 people were arrested who were involved in organizing and betting on Gray Francolin fights in Unnao District. A total of 24 Gray Francolin were rescued by the police. The population of the species has declined by 50% in 15-20 years in the area due to habitat loss and depleted food resources [TOI, Sept. 2014].

Image 35 Caged Grey Francolin

11.0 Ganga Riverine Islands In Raebareli District

The riverine fluvial islands are present in many major rivers and are defined as 'land masses within a river channel that are separated from the floodplain by water on all sides and exhibiting some kind of stability' [Osterkamp, 1998]. Islands may not be permanent on the geologic time scale owing to the river meandering, climate change, etc. but can remain in place over decadal or century time scales and hence exhibit stability [Wyrick & Klingeman, 2011].

11.1 Riverine Island is present throughout the stretch of River Ganga Within Fatehpur-Raebareli Distt.. There are five major islands identified and documented within the district. Jurisdiction of the riverine islands lies in Raebareli and Fatehpur Distt.. The species – *Saccharum spontaneum*, Saccharum munja and Ziziphus spp. dominates the riparian flora of the island. Details of the riverine island are provided in Table No. 6.

Table 6 : Details Of The Riverine Island In Raebareli-Fatehpur Ganga Stretch

Sr. No.	Nearest Settlement	Coordinates		Status
		Latitude	Longitude	
1	Near Akhri and Tahirpur [Left Bank] [Refer Image No. 37]	25°57'28.68"N	81°10'15.13"E	Area approx. 2.11 Sq. Km. Jurisdiction : Fatehpur and Raebareli Distt. Land Use : Agriculture Vegetation: Mainly *Saccharum spontaneum*, Saccharum munja
2	Near Ikdala [Left Bank] and Narauli Buzurg [Right Bank] [Refer Image No. 38]	26° 0'16.71"N	81° 4'5.55"E	Area approx. 4.33 Sq. Km. Jurisdiction : Fatehpur and Raebareli Distt. Land Use : Nil. Vegetation : Mainly *Saccharum spontaneum*, Saccharum munja
3	Near Dalmau [Left Bank] and Senpur [Right Bank]	26° 4'10.80"N	81° 0'51.83"	Area approx. 2.53 Sq. Km. Jurisdiction : Fatehpur and Raebareli Distt.

	[Refer Image No. 39]			Land Use : Agriculture Vegetation : Mainly *Saccharum spontaneum*, Saccharum munja
4	Near Sardarganj [Left Bank] and Haji Ganj [Right Bank] [Refer Image No. 40]	26° 1'43.69"N	80°50'10.98"E	Area approx. 4.73 Sq. Km. Jurisdiction : Fatehpur and Raebareli Distt. Land Use : Nil Vegetation : Mainly *Saccharum spontaneum*, Saccharum munja
5	Near Datpura [Left Bank] and Dubkhi [Right Bank] [Refer Image No. 41]	26° 3'55.31"N	80°47'20.57"E	Area approx. 6.0 Sq. Km. Jurisdiction : Fatehpur and Raebareli Distt. Land Use : Agriculture has started recently Vegetation : Mainly *Saccharum spontaneum*, Saccharum munja

11.2 Apart from the identified islands there are several sand bars and emerging islands present within the district [Refer Image No. 34]. These islands are not stable and changes continuously. Area of most of the sand bar is under cultivation for *Zaid crops* and vegetables and wheat [in few areas].

Image 36 : Emerging Island Near Rawatpur

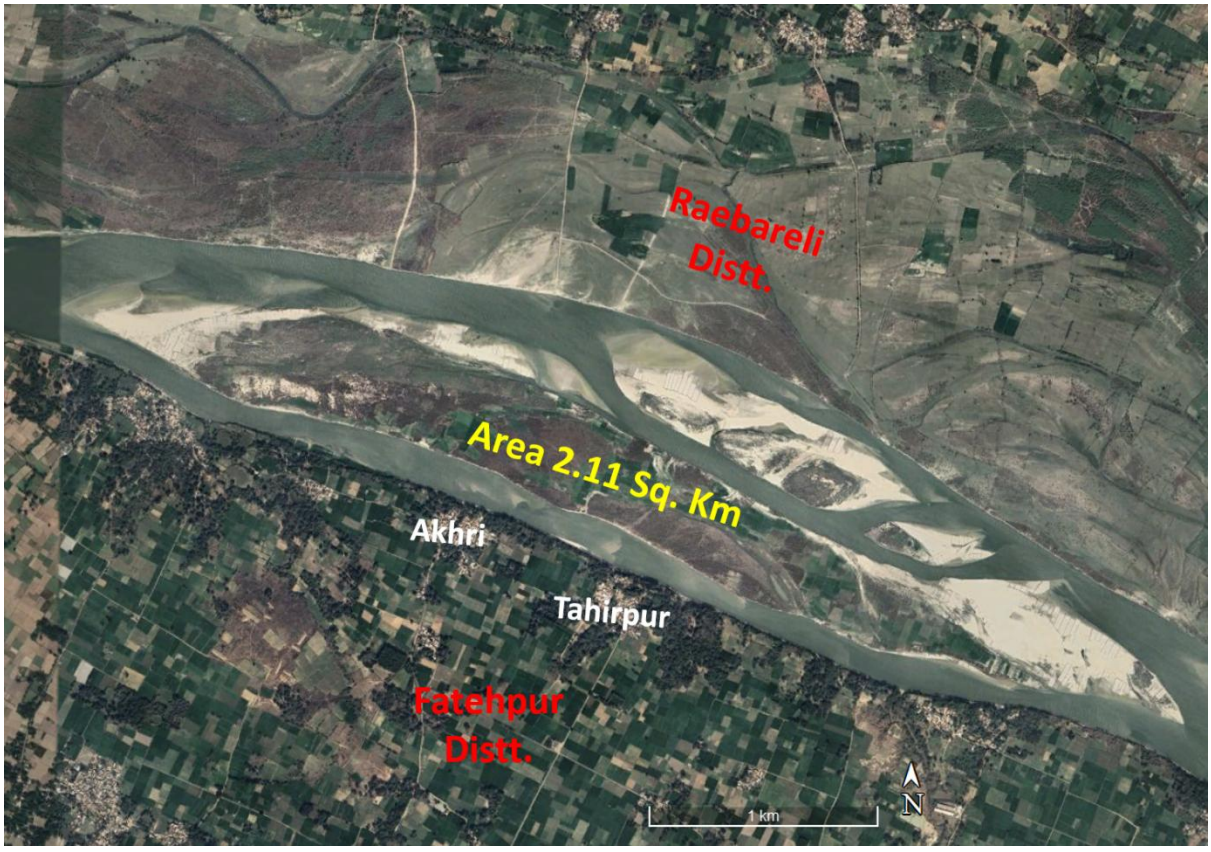


Image 37 : Satellite Imagery Showing Riverine Island Near Akhri And Tahirpur

[Source : Google Earth Imagery, December 2021]

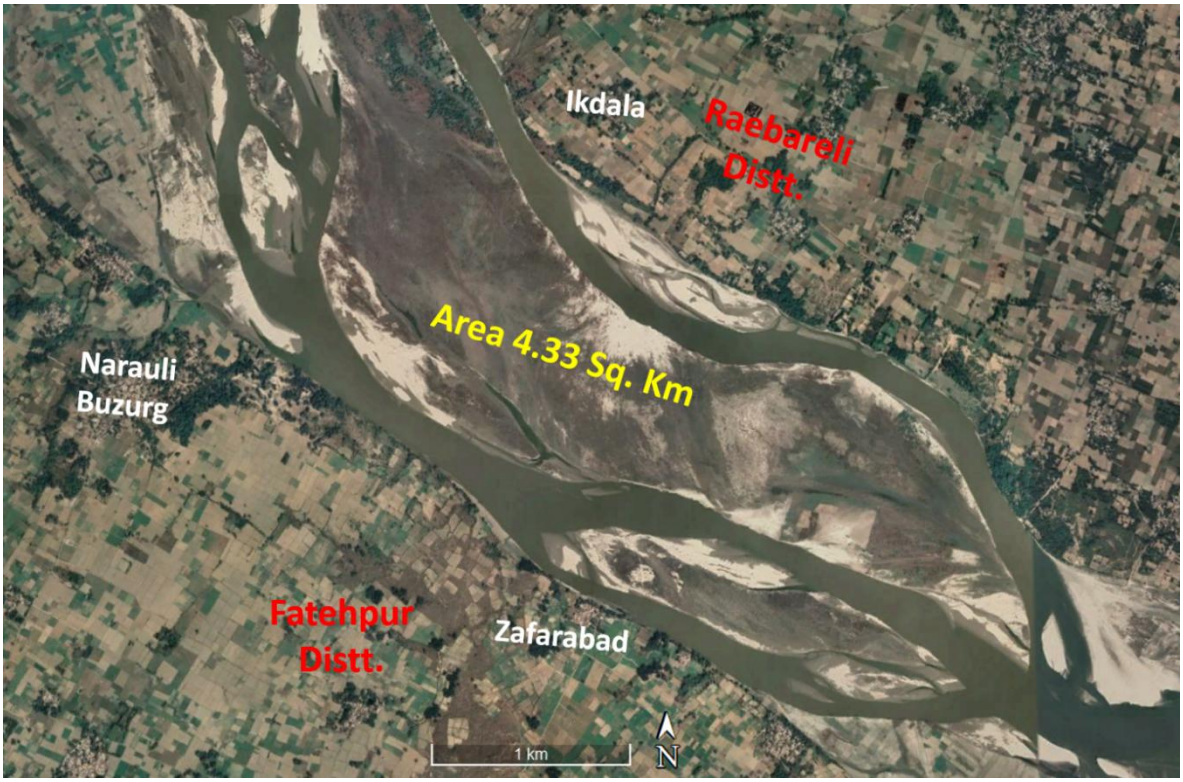


Image 38 : Riverine Islands Near Ikadala And Narauli Buzurg

[Source : Google Earth Imagery, December 2021]

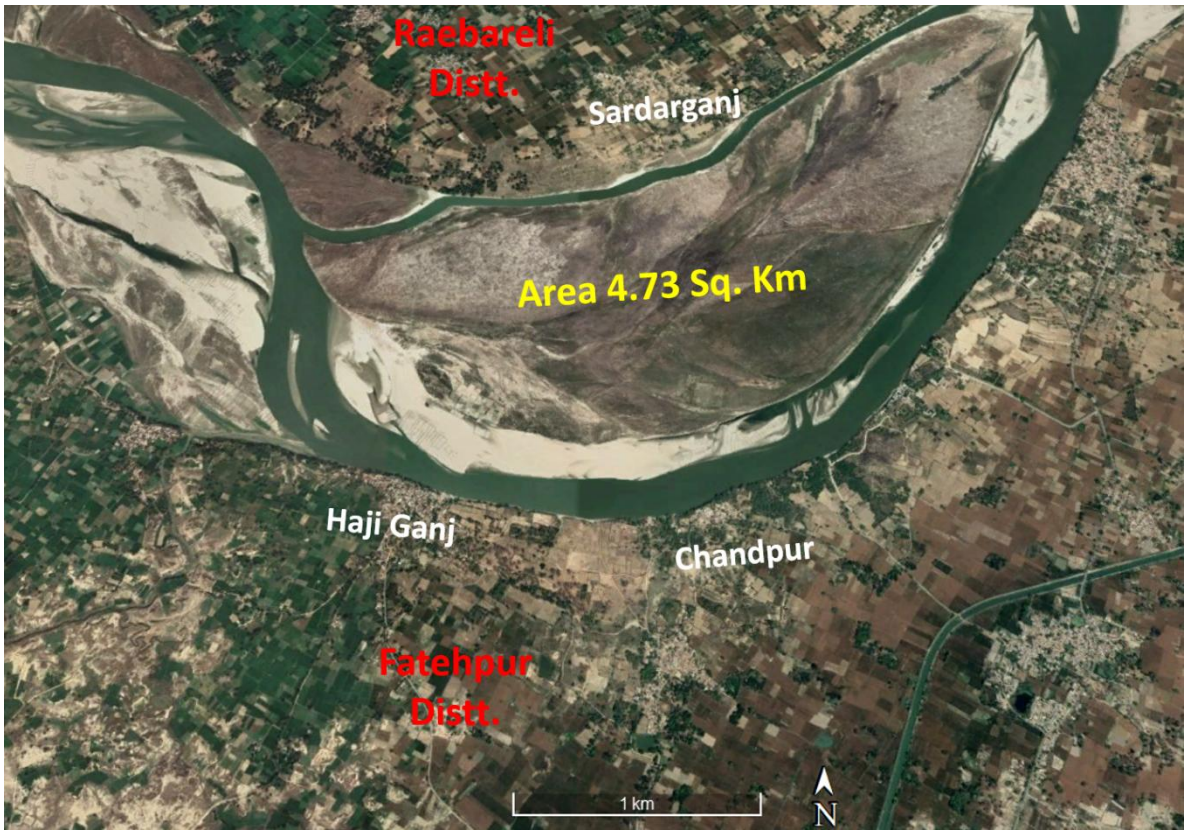


Image 39 : Satellite Imagery Showing Riverine Island Near Dalmau And Senpur

[Source : Google Earth Imagery, December 2021]

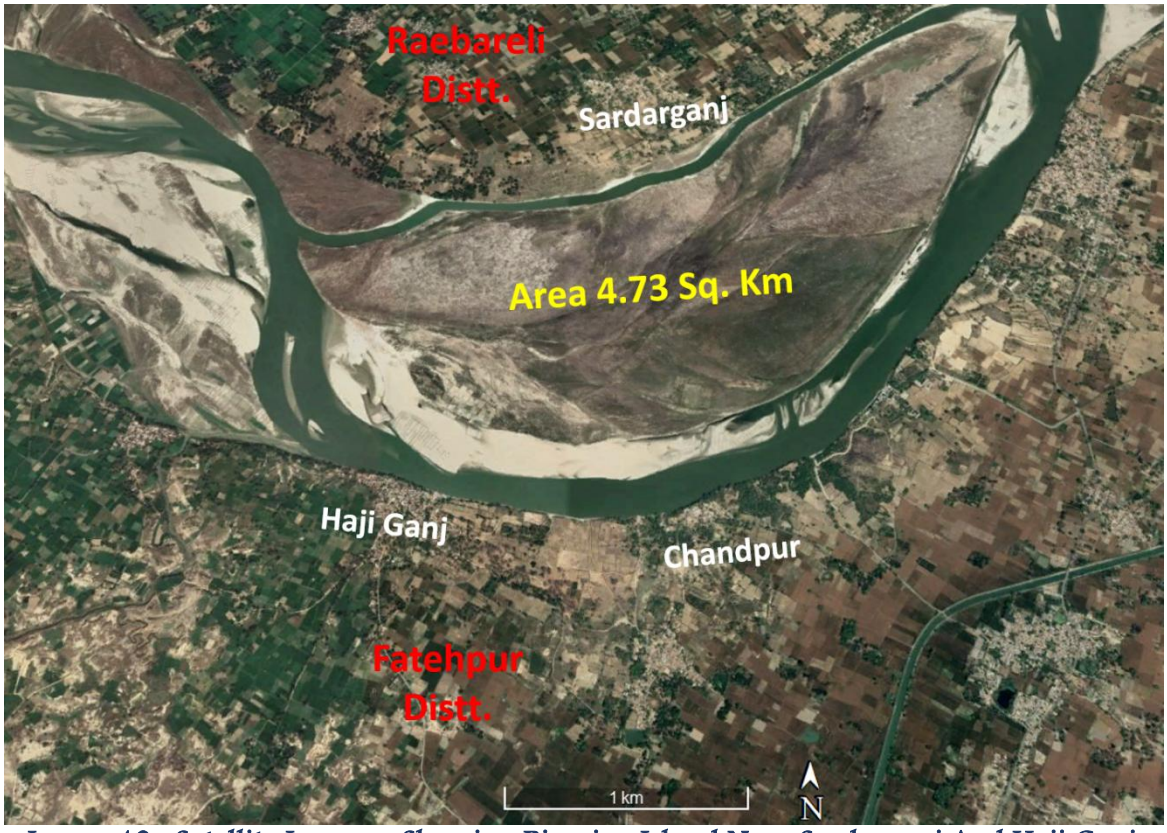


Image 40 : Satellite Imagery Showing Riverine Island Near Sardarganj And Haji Ganj

[Source : Google Earth Imagery, December 2021]

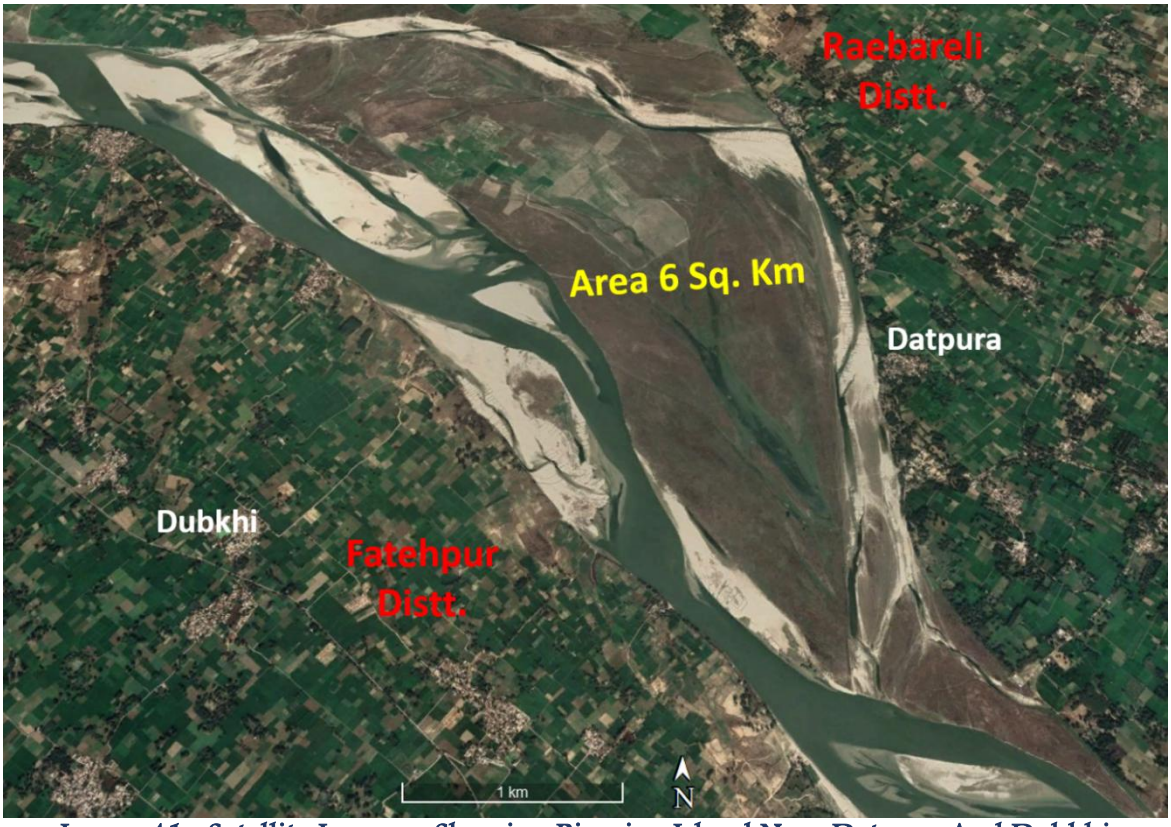


Image 41 : Satellite Imagery Showing Riverine Island Near Datpura And Dubkhi

[Source : Google Earth Imagery, December 2021]

12.0 Fishing In Raebareli District

12.1 Fish resources of Ganga River have been an important source of livelihood and food security for millions of people residing along its banks. Ganga river supports a diverse fish fauna with about 260 species reported for Indian waters (Sinha and Khan, 2001) among which about 35 species have been identified as having highest commercial value including carps (Cyprinidae), snakeheads (Channidae) and catfish (Siluriformes) (Islam et al., 2006). In recent years, the diversity and population of the fish resources have declined due to various anthropogenic factors. The factors are – deterioration of water quality, damming, introduction of exotic species, alternation in migratory routes of fishes and use of small mesh sizes of fishing nets.

12.2 In the district, the Mallah community is mainly involved in the fishing activity throughout the Ganga stretch [Refer Image No. 42 & 43]. The hook and line, drag net and cast net is common fishing gears among fishermen in the region. According to fishermen community they get a good catch in post- monsoon season. Fishing activity mainly stops during pre-monsoon. This is because of the decrease in fish catch and for sowing of Zaid crops. Most of the fishermen in the distt. stated that the fish population has decreased drastically in the last 15-20 years by 60% to 70%. This significant decrease in fish population has adversely affected the livelihood of the Mallah community forcing them to seek alternate source of income. During the survey total 15 species of fishes were recorded which are listed below.

Table 7 : List of Fish Species Recorded In Stretch Of Ganga River Falls In Jurisdiction Of Fatehpur-Raebareli Distt.

Scientific Name	Common Name
Labeo rohita	Rohu
Labeo catla	Catla/Bhakur
Wallago attu	Buari/Barari
Mystus tengara	Tengara
Cyprinus carpio	Common/Chinese carp
Channa punctata	Garai
Eutropiichthys vacha	Bachwa
Anguilla bengalensis	Baam
Cirrhinus mrigala	Naini

Mastacembelus armatus	Gaichi
Cabdio morar	Chepua
Heteropneustes fossilis	Singhi
Bagarius yarrelli	Goonch
Puntius chola	Pothiya
Sperata seenghala	Singhara

Image 42 : Fishing In Ganga River

Image 43 : Fishing In Baraila Tal

13.0 Groundwater Conditions In Raebareli District

13.1 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. Raebareli Distt. occupies a part of Central Ganga Alluvium Plain and is underlain by alluvial sediments of quaternary age. As per C.G.W.B., there a four-tier aquifer system found in the distt. which goes down to the depth of 600 mbgl. The depth of the different aquifers is- Aquifer-1 is down to 100 mbgl, Aquifer-2 exists between the depth of 100-250 mbgl, Aquifer-3 exists below 140 / 250 mbgl and extends down to 410 / 420 mbgl and Aquifer-4 exists below 410 / 420 m and continues down to 550 / 600 mbgl [Groundwater Brochure, Raebareli (2013)].

13.2 Based on groundwater resource utilization, Central Ground Water Board (CGWB) has assessed the block wise ground water resource throughout the country. The assessment for year 2009, 2011, 2013, 2017, and 2020 for the blocks of Fatehpur district, which lies within study area is provided in the Table No.8. According to partially ground water contaminated area study of CGWB, ground water of Fatehpur distt. is contaminated with Lead (above 0.01 mg/l) and Nitrate (above 45 mg/l). Also, the groundwater is saline i.e. EC above 3000 micro mhos/ cm[7].

Table 8 : Block Wise Groundwater Resource Assessment [Study Area Only]

Block Within Study Area	2009 Assessment[8]	2011 Assessment[9]	2013 Assessment[10]	2017 Assessment[11]
Sareni	Critical	Critical	Critical	Critical
Lalganj	Semi-Critical	Safe	Safe	Safe
Dalmau	Safe	Safe	Safe	Safe
Deen Shah	Safe	Safe	Safe	Safe

[7] States Wise Details of Partly Affected Districts with Select Contaminants in Ground Water of India, CGWB, http://cgwb.gov.in/WQ/Districts%20contamination.pdf
[8] Dynamic Ground Water Resources of India, CGWB (As on 31 March 2009).
[9] Dynamic Ground Water Resources of India, CGWB (As on 31 March 2011).
[10] Dynamic Ground Water Resources of India, CGWB (As on 31 March 2013).
[11] Dynamic Ground Water Resources of India, CGWB (As on 31 March 2017).

Gaura				
Jagatpur	Safe	Safe	Safe	Safe
Unchahar	Safe	Safe	Safe	Safe

13.3 During field visits, the survey team has interacted with local communities throughout the study corridor. The situation is similar to the ground water conditions of study area within adjoining districts. It has been observed that the use of dug well is declined in last few years. One major cause of this is drying of dug wells in summer season and lack of maintenance and increase in number of hand pumps. The abandoned dug wells should be restored and may be used for groundwater recharge. Major interaction sites for groundwater observations are – Mathurpur, Singhaurtara, Dalmau, Bhojpur and Nawada Patti. The groundwater observations were noted and are presented in Table No. 9.

Table 9 : Water Levels In Dug Wells (Based on interactions with local communities)

Location	Coordinates	GW Level (in feet)	
		Post-Monsoon	Pre-Monsoon
Mathurpur Village	26°03'55.7"N, 80°48'10.6"E	85-90	100
Singhaurtara Village	26°03'29.4"N, 80°52'40.0"E	80-85	90
Dalmau	26° 3'47.18"N, 81°1'52.78"E	~~~~	90
Bhojpur	26° 8'31.43"N, 80°45'16.96"E	100	80-90
Nawada Patti	25°59'54.94"N, 81° 5'52.28"E	~~~~	80-90

14.0 Ganga River Bank In Raebareli District

14.1 Ganga River bank in Fatehpur district may be classified on the basis of land use and land cover. The possible classes could be – Built-up area [Settlements, Temple Complexes, cremation sites and burial ground], Vegetation [Plantation and riparian vegetation patches] and agricultural fields. Out of three classes, the vegetation area especially the riparian vegetation area along the River Ganga and streams/ Nara are decreasing day by day due to conversion of riparian zone into the agricultural fields and cutting of trees and shrubs for fuel wood and for cremation. During interaction with the local communities, it has been observed that the river bank area which has riparian vegetation is now provided to the farmers on lease [locally called patta] for agricultural activities. Illegal occupation is also a major concern. The newly developed agricultural fields can be easily seen along Ganga River near Sardarganj, Ralpur, and Gagason [Refer Image No. 44]. River bank area, which has recently converted into agricultural fields, is prone to lateral erosion. Rills and gullies may also develop in such areas. The river bank which is vegetated is stable compared to agriculture and built-up dominated area.

Image 44 : Satellite Image Showing Recently Developed Agricultural Fields In Riparian Patch In Ralpur
[Source : Google Earth Pro, Imagery Dated, December 2021]

14.3 Strong local beliefs and rituals act as catalyst for the protection of riparian patches in some areas. Apart from the riparian patches, there are several temple complexes and ghats along the river bank which play a vital role in the bank stability as there are several trees found to be associated with these temples [Refer Image No. 45].

Image 45 : Temples Along River Bank

14.4 Cremation Ground Along Ganga River Bank In Raebareli District

14.4.1 Ganga River Banks are used for cremation and burial ground for generations. There is one major cremation sites reported during field visit which is located in Dalmau at 26°03'15.9"N 81°01'59.9"E. Burial in Hindu religion is common in Raebareli Distt.. However there is no dedicated Hindu burial site along Ganga in the Distt.. As burial ground is not restricted to particular site; it can be done at any sand bar of the Ganga River. This is because Ganga River and its active floodplain is considered as sacred and burial within the region is equivalent to the cremation.

14.4.2 For cremation of a body requires approximately 250-300 kg wood depending on the body weight. The wood of mango *[Mangifera indica]* is preferred for the cremation. During unavailability of mango wood use of *acacia nilotica, prosopis juliflora, Saccharum munja Saccharum spontaneum, Desmostachya bipinnata* and cow

dung cake is common. Depending upon the availability, other riparian grasses are also used to cremate. The cost of the wood ranges Rs. 300-400 per quintal. The overall cost of each cremation goes upto 1500-2000 rupee. The cost of cremation maybe higher for the poor families belongs to local communities. Thus, some of them prefer to go for burial rather than cremation. Burials are also done to the dead bodies of kids, teens and sages. Burials are usually done at Ganga River sand at a depth of 5-6 feet.

Image 46 : Cremation Site In Dalmau

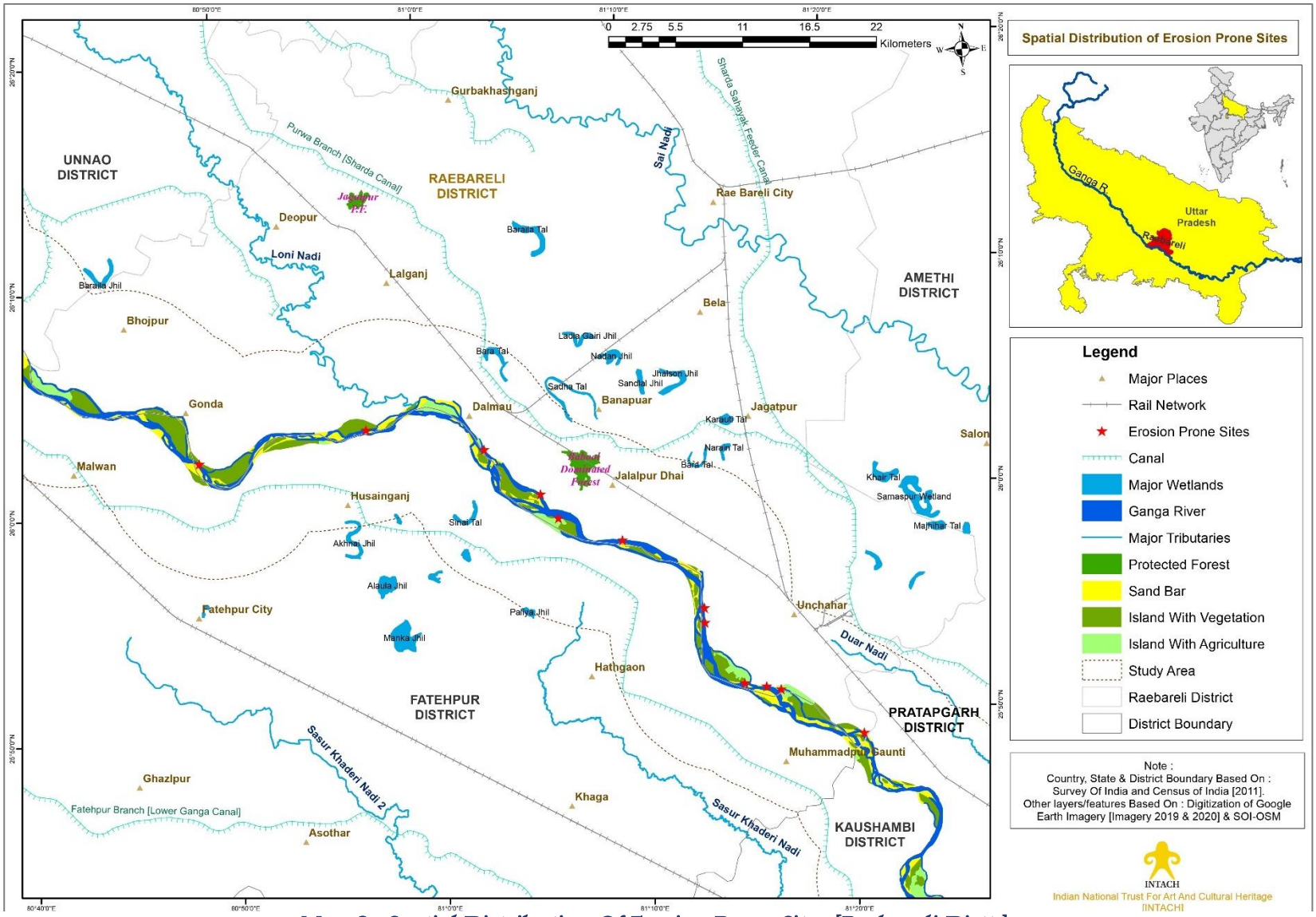
14.5 Ganga Bank Erosion In Raebareli Distt.

14.5.1 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 sediments in the plains. However, erosion gets aggravated due to human interventions through land use change, excessive grazing and farming, removal of riparian vegetation and construction brick kilns in flood plain area. It is well known that exposed soil may erode rapidly (Singh et al., 2004).

14.5.3 There are 12 lateral erosion sites marked within the study area with the help of satellite imagery [2020-2021]. lateral erosion sites are found near – Raebareli-

Pratapgarh Border [25°49'0.76"N, 81°20'35.99"E], at 25°51'7.00"N, 81°16'38.33"E, Kalyani [25°51'16.59"N, 81°15'56.76"E], Gangagarh [25°51'27.80"N, 81°14'52.92"E], Near Kharauli [25°54'12.97"N, 81°13'4.05"E], Near Kharauli [25°54'52.73"N, 81°13'4.34"E], at 25°58'3.05"N, 81°9'13.28"E, at [81°6'7.95"E, 81° 6'7.95"E, Near Kakora [26°0'15.08"N, 81°5'18.02"E], at 26°3'26.93"N, 81°2'38.30"E, and at 26° 2'16.03"N, 80°48'38.32"E.

Image 47 : Eroded Ganga River Bank



Map 8 : Spatial Distribution Of Erosion Prone Sites [Raebareli Distt.]

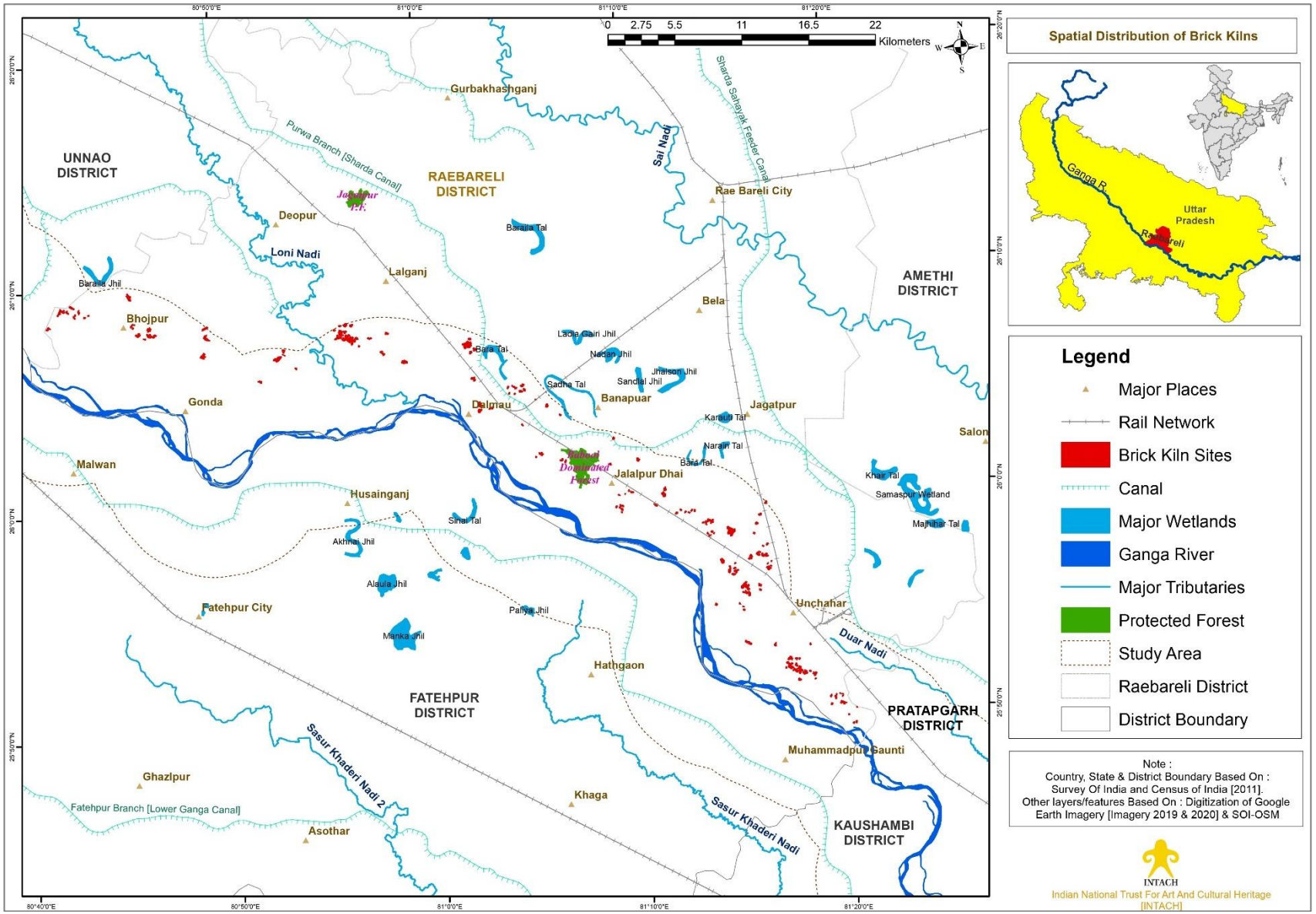
15.0 Sand Mining And Brick Kilns Within Study Area

15.1 **Sand Mining :** Sand is one of the major minerals resource extracted from the Ganga River and its tributaries. The demand is ever increasing due to rapid expansion of settlements and their upgradation across the country. Often carried out illegally and excessively to earn large profits, sand mining is altering rivers' overall health. Excessive sand mining results in the destruction of aquatic and riparian habitats and poses threat to bridges, river banks and nearby structures[12]. Sand mining from Ganga River within the district is not reported during the field visit.

15.2 **Brick Kilns:** With rapid development bricks have become one of the important building materials for construction activities. Brick kilns in the study area provide livelihood opportunity to the local community. 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. It has been found that brick kiln sites in floodplain areas increases the rate of soil erosion.

15.3 Brick kiln sites within study area are located in – Chahotar, Santkhera, Habatpur, Bhojpur, Chimnkhera, Gobindpur, Jhakthera, Pure Gopal, Lakhangaon, Ambara Paschim, Bajpeipur, Balbhadrapur, Chamrauli, Dalmau, Salempur, Kandharpur, Isalmpur and Bisnudaspur. Brick kiln sites are one of the reasons behind shrinkage of riparian vegetation in the region. Spatial distribution of brick kiln sites along Ganga River is depicted in Map No. 9.

[12] Impacts of Sand Mining, ENVIS Centre on Environmental Problems of Mining, IIT Dhanbad, Jharkhand



Map 9 : Spatial Distribution Of Brick kiln Sites [Raebareli Distt.]

16.0 Boatmaking In Raebareli District

16.1 Boat making is not a popular or a profit-making profession in Raebareli or nearby districts. Small sized boats (locally known as *Dongi*) are common for fishing activities. Medium sized boats having capacity of 10-15 people are used for ferry. Boats are mainly made up of Sal (locally known as Sekhua) 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. Now these days, iron boats are taking place of traditional boats. This is because iron boats area cheaper than traditional boats and are leak proof and easy to repair.

16.2 Boat making expenditures are same in Pratapgarh, Fatehpur, Raebareli, Kaushambi and Prayagraj District. Small boats [Dongi] made from iron costs around 60,000-70,000 and Similar sized iron boat with motor costs around 1,00,000-1,50,000. Traditional Dongi without motor costs around 2,00,000-2,50,000. Medium sized tradition boats cost around 7,00,000-8,00,000.

17.0 Inland Navigation Within Study Area In Raebareli District

17.1 National Waterway [NW-1] is restricted upto Prayagraj District. The river is not navigable for major boats. However, ferrying is a crucial livelihood activity of the Mallah community within the distt.. People of Mallah community in Raebareli District have been ferrying passengers for generations. There are 9 ferry sites reported between different villages of Raebareli and Fatehpur Distt.. Out of 9 sites, there are 2 site where pontoon bridge has been constructed and ferry service is operated only during removal of pontoon bridge [Monsoon season]. Details of Ferrying sites are provided in the table no. 10.

Table 10 : Ferry Sites Within Study Area In Raebareli-Fatehpur Ganga Stretch

Latitude	Longitude	Nearest Settlements	No. of Boat & Ferry Season
25°51'10.29"N	81°14'33.60"E	Between Ajaura Khurd and Kalyani	Two Boats (October to June)
25°53'17.15"N	81°12'24.07"E	Between Pure Gangapur and Tirka Purwa	Four Boats (October to June) **Ferry service operates only during removal of**

			pontoon bridge
25°52'20.69"N	81°22'3.25"E	Between Naubasta and Tirka Purwa	Two Boats **Ferry service operates only during removal of pontoon bridge**
25°56'49.48"N	81°11'30.84"E	Between Paharpur and Manjhlepur	Two Boats (October to June)
25°57'39.99"N	81° 8'59.20"E	Between Samopur and Chandanihan	Two Boats (October to June)
25°58'52.49"N	81° 5'28.46"E	Between Kotla and Jaihi Ka Purwa	Two Boats (October to June)
26° 2'19.49"N	80°51'21.71"E	Between Bhitaura and Babatpura	~~~~~~~
26° 4'21.10"N	80°45'31.92"E	Between Rawatpura and Shukarwa Ka Purwa	Two Boats (October to June)
26° 4'17.41"N	80°44'2.93"E	Between Kutia and Devmai Purwa	Two Boats (October to June)

Image 48 : Ferrying Between Naubasta and Tirka Purwa

18.0 Old And Sacred Trees In Raebareli District

18.1 Plant species *Ficus benghalensis* [Bargad], Ficus *religiosa* [Peepal], *Ficus virens* [Pakad] *Mangifera indica* [Aam] and *Azadirachta indica* [Neem] are considered as sacred and is found in association with ashrams, ghats, cremation sites and temple complexes across the study corridor. Out of all sacred trees, Ficus *religiosa* [Peepal] is most sighted species, generally found to be associated with temple. Peepal tree is also used to perform different rituals after cremation. List of sacred and old trees recorded within the study area are provided in Table No. 11.

Table 11 : List of Sacred And Old Trees Recorded Within The Study Area

Plant Species	Location and Nature of Tree	Coordinates	
		Latitude	Longitude
Peepal *[Ficus religiosa]*	Old Peepal Tree along wetland	26°09'59.8"N	80°44'09.5"E
Peepal *[Ficus religiosa], Neem [Azadirachta indica],* Bargad *[Ficus benghalensis]*	Group of sacred trees in a temple complex	26°07'44.0"N	80°46'12.5"E
Peepal *[Ficus religiosa]*	Old Peepal Tree in Tiwaripur Khurd	26°07'11.3"N	80°45'58.3"E
Pakad *[Ficus virens]*	Old Pakad Tree	26°06'37.0"N	80°54'12.4"E
Peepal *[Ficus religiosa]*	Two old and sacred Peepal tree associated with village temple in Gasagaon	26°03'37.4"N	80°53'59.2"E
Peepal *[Ficus religiosa], Neem [Azadirachta indica],* Bargad *[Ficus benghalensis],* Pakad *[Ficus virens],* Mahua [*Madhuca longifolia]*	Group of Sacred Trees at Barkhandeshwar Baba Temple Complex	25°59'34.8"N	81°06'10.5"E
Peepal *[Ficus religiosa], Neem [Azadirachta indica],* Bargad *[Ficus benghalensis],* Pakad *[Ficus virens]*	Ram Janki Temple Complex in Badshahpur	25°56'20.51"N	81°13'5.18"E

Image 49 : Old Bargad Or Banyan Tree

Image 50 : Old Peepal Tree Associated With Temple

19.0 Key Observation & Recommendation

19.1 Fading of Stream/Nara : Small stream/ Nara which directly drain to River Ganga are under threat due to removal of riparian vegetation, agriculture activities on stream bank and encroachment. Minor streams in the region holds the vulnerable riparian zone, which protect from erosion, provides habitat to riparian fauna and serve as migratory routes to fish species in monsoon season. Disappearing of streams may damage local biota.

19.2 Conversion of riparian vegetation into agricultural fields : Products and finished products manufactured from *Saccharum* and *bamboo* are sources of income to the local communities. During the field visits, it has been reported that local administration provides riparian land to local communities for agricultural activities. The newly developed agricultural fields accelerate the runoff and trigger lateral erosion.

19.3 Paleo-Streams and Paleo-Wetlands : Paleo-streams and wetlands are currently used for agricultural activities. The study area is under semi-critical category and groundwater is showing a decline trend. In order to recharge the groundwater, the depression areas may be provided to Mallah community on lease for fishing activities. Also, proper demarcation of such areas is required. Plantation of native species on such area may increase the overall forest cover in the district. It will provide the addition habitat to fauna of the region and will further lower the man-animal conflict.

19.4 Threats to Wetlands : Wetland like Barhat Tal and Baraila Tal is facing serious threat due to loss of riparian vegetation, high silt load, encroachment, conversion of wetland area into agricultural field and dumping of solid waste. The wetland area is shrinking gradually. The shrinking of wetland area is still in progress due to above mentioned threats. Below-mentioned points may be a path for the conservation of the wetlands in the study area :

- Inventory of wetlands should be maintained with the details highlighting the current land use, ownership and values of the wetland.
- Currently, most of the wetlands are under revenue department and are on lease for agricultural activities. There is a need to transfer those wetlands to Uttar Pradesh State Wetland Authority constituted under the provisions of the Wetlands (Conservation and Management) Rules, 2017.

- ❖ A Comprehensive Management and Action Plan (CMAP) should be prepared for each wetland or group of wetlands. CMAP should focus on the ecological, hydrological, social, and economic and tourism aspects of the wetland.
- ❖ Local communities should be encouraged and their participation in wetland conservation should be fixed.
- ❖ Lease of wetland to fishermen community maybe an alternative to maintain water level.
- ❖ Forest department and concerned agencies should plant native riparian flora along the wetland.
- ❖ Developmental activities may be restricted at least 500 m from the wetland area.

19.5 Groundwater Conditions : Groundwater in the distt. Shows a declining trend. To arrest the decline of water level, artificial recharge technique should be adopted. To minimize the decline of water level, in urban areas, roof top rain water harvesting, with structures such as recharges pits/shafts/trenches of suitable design, should be made mandatory for all government buildings, schools etc. having large roof top area.

Some area of the distt. has higher level of TDS. There is urgent need of Quality assessment of shallow and deeper groundwater and its relationship with the lithological behaviour.

19.6 Protection for River Islands : Riverine Island is present throughout the stretch of River Ganga Within Raebareli Distt.. Jurisdiction of the riverine islands lies in Raebareli and Fatehpur Distt.. Emerging islands under cultivation are mainly susceptible to erosion. Agricultural activities at the edge of stable islands erode the banks. There is requirement of comprehensive management plan [CAMP] for conservation, management and sustainable utilization of riverine islands.

19.7 Cremation and Burial : Cremation of dead bodies and immersion of their remains is reported throughout the stretch. Lack of cremation infrastructure, their maintenance and lack of awareness are reason behind such ongoing practices. Burial at sand bar is common. Proper site should be provided and area should be demarcated.

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