Arth Ganga Project: District Buxar

Submitted to:

National Mission for Clean Ganga (NMCG)

Submitted by:

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EXECUTIVE SUMMARY

Buxar is a district located in the state of Bihar. The most important rivers traversing the district are the Ganga, the Thora, the Karamnasha and the Dharamawati.

The total geographical area of the district is 1672 km^2. The average annual growth rate of primary sector from 2007-08 to 2013-14 is only 0.02%, which is a cause of concern whereas its share decreased from 22.68% to 11.51%. The share of the secondary sector increased from 20.33% in 2007-08 to 28.22% in 2013-14, with an impressive average annual growth rate of 17.45%. The tertiary sector occupies, on average, 58.65% share in the district economy with growth of 12.18% per annum, and its share increased from 57% in 2007-08 to 60.27% in 2013-14. Overall, the district economy grew with an average annual growth rate of 11.16%.

The cropping intensity of the district is 138.56%. Buxar is categorized under Agro-climatic zone III B i.e. the Southern west zone. The district has sandy loam , clay loam, loam, clay types of soil with pH between 6.5-8.0. Major crop types are wheat, rice, maize, pulses like a variety of gram, etc. along with oilseeds, mustard, etc. The livestock consists of cattle (indigenous and crossbred), buffalos (indigenous and crossbred), pigs (indigenous and crossbred), goats; poultry, and fisheries. The district's percentage of the net and gross irrigated areas have shown a rise over the years, with an average of 63.32% and 89.67%, respectively.

The share of cultivable wasteland decreased slightly from 0.42% in 2011-12 to 0.36% in 2019-20, which is a good indicator of development. The share of barren and uncultivable land has remained constant (1.32%) over the years. The fallow land decreased from 4.61% in 2011-12 to 2.04% in 2019-20. Moreover, the net sown area increased from 82.69% in 2011-12 to 85.09% in 2019-20 whereas the area for non-agricultural use increased slightly from 10.54% to 10.72%. The area for non-agricultural use increased from 11.43% to 12.13% in 2018-19. In 2019-20, however, the nitrogen and potassium share decreased to 75.16% and 2.13%, respectively, while phosphorus share increased to 22.69%. The use of nitrogen is more than the recommended ratio, while the phosphorous and potassium usage is less than the recommended ratio. As the use of chemical fertilizers increased in the district from 131.20 kg/ ha GSA in 2013-14 to 226.50 kg/ ha GSA in 2019-20.

According to the 2021 Forest survey, forests cover of the district is 0.35% out of the total geographical area. With respect to 2019 forest assessment there has been no change in the forest area of the district. The area under trees and gardens remained constant (0.48%) over the years. The district has a total of 5.89 sq. km. under the forests out of which 2.94 sq. km. is under moderately dense forests and 2.95 sq. km under the open forests.

The district has rich historical heritage. Raja Bhoj Fort, Buxar Fort, Katkauli Ka Maidan, Ramrekha Ghat, Tadka Vadh, Siddhashram, Brahmeshwar Nath Temple, Ahilya Uddhar Temple, etc. are few of many places of tourist attraction. Around 80% of the lightning is obtained from kerosene or the major source of lightning in the district by the households. Then around 17.8% of the lightning is obtained from electricity, 1.1% is obtained from solar energy.58% of the households are dependent on cow dung cake for cooking, 22.10% are using firewood, and 10.4% are using LPG/PNG. Buxar district has the

total available biomass power potential of 0.3420. Biomass-based power plant by having a capacities of 1 MW, 12 MW, 2 MW, 7.5 MW of 2 biomass fuel based Thermal power plant are being worked upon. The total number of wetlands existing in the district is 158 consisting of both Man-made and Natural. Most of them are river/streams and waterlogged. The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover with 319 bird species and 20 threatened/rare species of bird in the district. Biogas potential from animal waste is calculated approximately as ninety eight lakh m3/year and two crores m3/year from agricultural waste. No hydropower plant exists in the district.

The active measures should be taken to support and promote sustainable economy and development. The monitoring and maintenance of touristic places, air and water pollution, seasonal conditions, etc. Creating awareness and strict implementation of laws along with the use of technologies, training, marketing needs and advisory services and conducting the research could aid in sustainable development. Various measures such as eco-tourism should be taken to improve tourism and enhance the use of renewable energy especially by creating awareness. Use of high-yielding seeds, micro-irrigation, constructing and maintaining harvesting structures, farm mechanization, adopting greenhouse farming with organic farming, and encouraging farmers for adapting different crop cultivation and various irrigation methods. Along with focusing on agriculture practices Bee culture, dairy, poultry, fisheries, sericulture etc. needs encouragement as they have high economic potential. Promoting micro and small units for horticulture products processing. Encouraging Jal Shakti Abhiyan, focusing more on the cultivation of staple crops , establishing high-quality rice mills, packaging, and export facilities to other states, Mushroom cultivation, High-value vegetable crops, off-season vegetables, seedling preparation and various orchids, medicinal crops such as mentha and saved musli, inter-culture (turmeric) in the fruit orchard, etc.

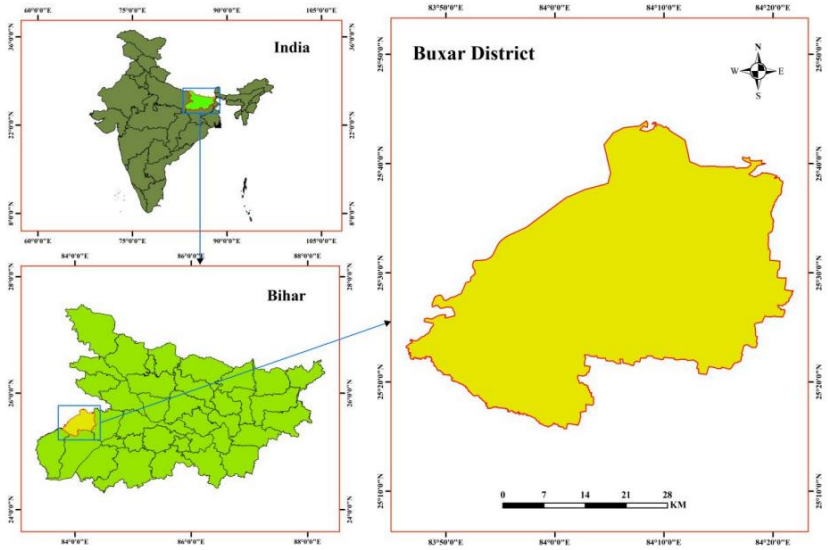
1. DISTRICT OVERVIEW

1.1 INTRODUCTION

Buxar district is located on global map between 25°33' North latitude and 83°58' East longitudes. The district occupies an area of 1,703 square kilometers. The rank of the district in comparison to other districts of Bihar in terms of area is 30th. The most important rivers traversing the district are the Ganga, the Thora, the Karamnasha and the Dharamawati. The Ganges forms the northern boundary of the district. The river Karmansa joins the Ganges near Chousa.

The district of Buxar with a population of 17,06,352 according to 2011 Census, is divided into 11 Community Development Blocks, Comprising 1133 villages and 2 towns. With 1.6 % of the total population of the state comprised within the district. Buxar is a small sized district and ranks 29th in the state in order of population. The work participation rate (WPR) in the district is 19.25 % for main workers and 12.29 % for marginal workers. Proportion of non-workers in the district is 68.45 %.

Agriculture is the main occupation of the people of the district and also the main source of livelihood of the people. Rice, Wheat, Grams and pulses are grown here. In this district both the irrigated and un irrigated areas excepting the hills and forests are being exploited for cultivation. Horticulture is also spreading. Rice, wheat , barely, grams and pulses are the main crops of the district. The winter rice forms the greater part of this crop. Gram is by far the most important among the pulses grown in the district. The other pulses grown are arhar, khesari and masur. The important among the crops of the district other than rice and wheat are oil seed and sugar cane. The straw is used as fodder and for roofing the house.



Source: Prepared by Author

Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF BUXAR

In the year 1991, Buxar district was formed and it comprises of 2 sub-division namely, Buxar Sadar and Dumraon. Its headquarter and principal town is Buxar town. The district is surrounded by Ballia district of Uttar Pradesh in the north, Rohtas district of Bihar in the south, Ghazipur and Balli district of Uttar Pradesh in the west, and Bhojpur district of Bihar in the east. The district also consists of 11 blocks namely; Buxar, Itarhi, Chousa, Rajpur, Dumraon, Nawanagar, Brahmpur, Kesath, Chakki, Chougain, Simri, of which first four belongs to Buxar Sadar sub-division and last 7 belongs to Dumraon sub-division. The river Ganges is situated to the north of Buxar district, and Eastern Railways is situated to the south of the district, which is a low-lying alluvial place. And in Bihar, this is regarded as the leading region in the production of wheat.

The forest in the district is not dense, because of deforestation. Mango, Seasum, Mahua, and Bamboo trees are common. As the irrigation facilities in the district has improved, the forest area has reduced

in order to increase the farm lands. The everlasting source of surface water in the district are Son river and river Ganges, as they can irrigate the majority of the farm land.

For cultivation usage, the irrigated region as well as non-irrigated region have been utilized. The major crops grown in the district are rice, wheat, grams, and pulses. There have been insignificant mineral resources in the district. There are few small scale and cottage industries in the region for instance; soap industry is majorly located in Buxar and Dumraon, timer and furniture works are also present in Buxar and Dumraon, and leather industry is located all over the district. Shoe-making industry is also located in the sub-division Buxar Sadar in Khilafatpur village.

Buxar and Dumraon are the prominent areas for wholesale market in the district. Rice, mango, gur, paddy are the major exports and engineering goods and medicine are the major imports in the district. The crucial trade centre in the district is Buxar which is also a town; as railways, roadways and waterways are adequately available for the distribution of goods.

The total area of the district is 1624 sq.km., with an aggregate population of 1706352. The literacy rate of the district is 70.14%. According to Census 2011, out of the total population 1706352, 52.03% are males, which is around 8,87,977 males and 47.96% are females, which is around 8,18,375 females. Around 90.35% of the population in the district live in the rural areas and the rest 9.64% population live in the urban areas.

1.3 ECONOMIC PROFILE OF BUXAR

The primary sector contributes, on average, 16.76% to the district GDP. However, the average annual growth rate in this sector from 2007-08 to 2013-14 is only 0.02%, which is a cause of concern. Its share decreased from 22.68% in 2007-08 to 11.51% in 2013-14, as the other sectors grew faster than the primary sector. The share of the secondary sector increased from 20.33% in 2007-08 to 28.22% in 2013-14, with an impressive average annual growth rate of 17.45%. The tertiary sector occupies, on average, 58.65% share in the district economy. Moreover, the sector grew by12.18% per annum, and its share increased from 57% in 2007-08 to 60.27% in 2013-14. Overall, the district economy grew with an average annual growth rate of 11.16%. Steps should be taken to increase the productivity of the primary sector so that it may grow at a higher rate. The secondary and tertiary sectors have performed well during the study period.

Table 1: Trends in Gross District Domestic product in Buxar at Constant Prices (base 2004-05), Millions in Rs

Year	Sector-wise GDDP				Annual Growth Rates			
	PRIMARY SECTOR	SECONDARY SECTOR	TERTIARY SECTOR	TOTAL GDDP	PRIMARY SECTOR	SECONDARY SECTOR	TERTIARY SECTOR	TOTAL GDDP
2007 -08	3138	2812	7885	13834	-	-	-	-
	(22.68)	(20.33)	(57.00)	(100)				
2008-09	3134	3232	8862	15228	-0.13	14.94	12.39	10.08
	(20.58)	(21.22)	(58.20)	(100)				
2009 -10	2592	3834	10001	16426	-17.29	18.63	12.85	7.87

	(15.78)	(23.34)	(60.89)	(100)				
	3216	4841	11026	19083	24.07	26.26	10.25	16.18
2010-11	(16.85)	(25.37)	(57.78)	(100)				
	3318	5474	11943	20735	3.17	13.08	8.32	8.66
2011 -12	(16.00)	(26.40)	(57.60)	(100)				
	3321	6512	14031	23863	0.09	18.96	17.48	15.09
2012 -13	(13.92)	(27.29)	(58.80)	(100)				
	2995	7346	15689	26031	-9.82	12.81	11.82	9.09
2013-14	(11.51)	(28.22)	(60.27)	(100)				
Average Growth Rate					0.02	17.45	12.18	11.16

Source: http://data.icrisat.org/district-level-data/
Note: Figures in Parenthesis are percentage share of total GDDP

2. Quantative Data Analysis

2.1 Agriculture and Allied Activities

The total declared area of the district is 1672 sq. km². The share of cultivable wasteland decreased slightly from 0.42% in 2011-12 to 0.36% in 2019-20, which is a good indicator of development. The share of barren and uncultivable land has remained constant (1.32%) over the years. The fallow land decreased from 4.61% in 2011-12 to 2.04% in 2019-20. Moreover, the net sown area (NSA) increased from 82.69% in 2011-12 to 85.09% in 2019-20, which is a good sign for the district economy. The area for non-agricultural use increased slightly from 10.54% to 10.72% during the same period (Table 2). The area under trees and gardens remained constant (0.48%) over the years, which needs to be increased, keeping the sustainable development goals in mind. The land use pattern shows that the area under fallow land and cultivable wasteland land decelerated, while NSA increased over the years.

Table2: Trends in land use pattern in Buxar (as % of the total reported area)

YEAR	TOTAL REPORTED AREA (in 1000 Ha)	CULTIVABLE WASTELAND	TOTAL FALLOW	BARREN AND UNCULTIVABLE LAND	LAND OTHER THAN AGRICULTURE	AREA UNDER TREES AND GARDENS	NET SOWN AREA
1	2	3	4	5	6	7	8
2011-12	167	0.42	4.61	1.32	10.54	0.48	82.69
2012-13	167	0.42	4.61	1.32	10.54	0.48	82.69
2013-14	167	0.36	4.61	1.32	10.60	0.48	82.69
2014-15	167	0.36	0.66	1.32	10.48	0.48	86.65
2015-16	167	0.36	0.48	1.32	10.48	0.48	86.83
2016-17	167	0.36	0.66	1.32	10.48	0.48	86.65
2017-18	167	0.36	2.46	1.32	10.54	0.48	84.85

2018-19	167	0.36	0.66	1.32	10.54	0.48	86.65
2019-20	167	0.36	2.04	1.32	10.72	0.48	85.09
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/							

2.3.2 Trends in Operational Land Holdings

In Buxar district, the total number of operational farms increased from 177 thousand in 2010-11 to 181 thousand in 2015-16, a net increase of 2.26%. While in the state, their numbers increased from 16191 thousand in 2010-11 to 16412 thousand in 2015-16, a net increase of 1.36%. Most land positions in the district are marginal and small. These two size categories comprised 91.07% of the total holdings in the district in 2015-16, while the corresponding proportion in the state was 96.96% (Table 3). There is a slight decline in the percentage share of marginal, medium and large land holdings in the total operational holdings. In contrast, the share of the small and semi-medium landholdings increased between 2010-11 and 2015-16.

Table3: Distribution of Operational Holdings by Size-categories of farms (in %) in Buxar

	Agri Census	Marginal Holdings (0-1 Ha)	Small Holdings (1-2 Ha)	Semi-Medium Holdings (2-4 Ha)	Medium Holdings (4-10 Ha)	Large Holdings (10 & above Ha)	Total Holdings ('000 No.)
Buxar	2010-11	79.09	11.22	7.62	1.95	0.13	177
	2015-16	78.19	12.88	7.64	1.2	0.1	181
							2.26
Bihar	2010-11	91.06	5.86	2.56	0.5	0.02	16191
	2015-16	91.21	5.75	2.52	0.5	0.02	16412
							1.36
Source: Compiled from https://agcensus.nic.in/. Figures in [] are percentage increase/decrease in 2015-16 over 2010-11.							

2.3.3 Trends in Area, Production, and Yield of Principal Crops

2.3.3.1 The Trend in Cropping Patterns

Wheat and Rice dominate the agriculture of the district. Table 4 shows the area devoted to various crops over the last seven years. In 2019-20, Wheat made up the highest share of GCA (42.97%), followed by Rice (42.81%). These two crops constituted 85.78% of the GCA in 2019-20. The main pulses produced are Gram and Masoor (Lentil). The total pulse acreage declined from 4.95% in 2013-14 to 3.15% in 2019-20. However, the food grain acreage increased from 89.59% in 2013-14 to 92.28% in 2019-20. Mustard is the only major oilseeds crop produced; the total oilseed acreage declined over the years. In general, there is no significant change in the cultivation pattern in the district during the study period. The average cropping intensity is 140.25.

Table 4: Trends in cropping pattern (as % GSA) and cropping intensity							
Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	41.94	40.98	40.00	41.60	44.06	43.47	42.81
Wheat	39.52	39.63	43.20	40.25	39.68	39.79	42.97
Other Cereals	3.19	3.34	3.10	3.52	3.47	4.97	3.35
Total Cereals	84.65	83.95	86.30	85.37	87.21	88.23	89.13
Gram	1.24	1.30	1.05	1.06	1.11	0.84	0.91
Masoor (Lentil)	2.06	1.84	1.58	1.59	1.71	1.14	1.37
Other Pulses	1.65	2.99	1.34	1.42	1.01	0.79	0.86
Total Pulses	4.95	6.13	3.96	4.07	3.83	2.78	3.15
Total Food Grains	89.59	90.08	90.26	89.44	91.04	91.01	92.28
Mustard	0.93	0.65	0.91	0.82	0.91	0.84	0.76
Other Oilseeds	0.26	0.15	0.19	0.14	0.10	0.10	0.05
Total Oilseeds	1.18	0.80	1.10	0.96	1.01	0.94	0.81
Net Sown area	71.15	72.13	69.21	71.28	71.35	71.88	72.17
Gross Sown Area (in 1000 Ha)	194.10	200.60	209.50	203.00	198.60	201.30	196.90
Cropping Intensity	140.55	138.63	144.48	140.29	140.16	139.12	138.56
Source: Compiled from http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/							

2.3.3.2 Trends in per hectare yield of principal crops

Table 5 shows that the per hectare yield of most crops varies yearly. Rice and Wheat are the major crops, and their per hectare yields, 31.97 qtls and 27.40 qtls, respectively, in 2019-20, are quite low. Per hectare yield of total cereals slightly decreased from 29.68 qtls in 2013-14 to 29.03 qtls in 2019-20. Per hectare yield of total pulses shows high variability across years, ranging from 5.77 qtls/ha to 14.21 qtls/ha. The yield of total food grains also varies across years, showing instability. The yield of total oilseeds also shows a high variability across years. It was as low as 8.13 qtls/ha in 2014-15 and as high as 13.16 qtls/ha in 201-19. In summary, all crop yields show year-over-year fluctuations, with a sudden fall observed in the yield of pulses in the latter years of the study. The volatility in crop yields makes farmers' income riskier and more unstable, requiring solid insurance protection measures.

Table 5: Trends in yield of Principal Crops in Buxar District (in Qtl per Ha)							
Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	30.74	27.85	30.86	29.85	34.97	22.78	31.97
Wheat	29.92	15.76	27.14	27.95	34.54	33.15	27.40
Total Cereals	29.68	21.48	28.32	28.31	34.02	27.20	29.03
Gram	12.50	6.92	9.09	10.23	11.82	14.71	7.22
Masoor (Lentil)	14.00	4.59	9.39	10.15	12.06	13.91	7.41
Total Pulses	13.75	5.77	9.40	10.38	14.21	13.75	7.90
Total Food Grains	28.80	20.41	27.49	27.49	33.19	26.79	28.30
Mustard	9.44	7.69	12.11	11.10	11.11	13.53	12.00

Total Oilseeds	9.13	8.13	11.74	10.85	11.00	13.16	11.88
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/							

2.3.3.3 Trends in Production of Principal Crops

Table 6 shows the trends in the production of the main crops over the years. Rice and Wheat dominate the production. In 2019-20, Rice (269.5 thousand tons) and Wheat (231.8 thousand tons) formed a major part of the total cereal production (509.4 thousand tons). Moreover, there is a significant increase in the production of total cereals from 487.7 thousand tons in 2013-14 to 509.4 thousand tons in 2019-20. Coming to pulses, Gram and Masoor (Lentil) occupied the highest production, with their production being 1.3 thousand tons and 2 thousand tons, respectively, in 2019-20. Although these pulses show a decline in production across the years, they still represent around 67.34% of the total pulse production. Mustard production was 1.8 thousand tons, representing 94.73% of the total oilseed production in 2019-20. Looking at the annual production data of various crops, we find that the production fluctuated over the years, partly due to weather changes and market conditions. Proper insurance arrangements are needed to get assured income, take more risks, and diversify production.

Table 6: Trends in Production of Principal Crops in Buxar District (in 1000 Tons)

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	250.2	228.9	258.6	252.1	306	199.3	269.5
Wheat	229.5	125.3	245.6	228.3	272.2	265.5	231.8
Other Cereals	8	7.5	7.9	10.2	11.1	18.3	8.1
Total Cereals	487.7	361.7	512.1	490.6	589.3	483.1	509.4
Gram	3	1.8	2	2.2	2.6	2.5	1.3
Masoor (Lentil)	5.6	1.7	3.1	3.3	4.1	3.2	2
Other Pulses	4.6	3.6	2.7	3.1	4.1	2	1.6
Total Pulses	13.2	7.1	7.8	8.6	10.8	7.7	4.9
Total Food Grains	500.9	368.8	519.9	499.1	600.1	490.8	514.3
Mustard	1.7	1	2.3	1.9	2	2.3	1.8
Other Oilseeds	0.4	0.3	0.4	0.3	0.2	0.2	0.1
Total Oilseeds	2.1	1.3	2.7	2.1	2.2	2.5	1.9
Source: Compiled from http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/							

2.3.3.4 Variability assessment in the area, production, and yield

To understand the variability across the years (Table 7), we calculated the mean, standard deviation (SD), and coefficient of variation (COV) of the area, production, and yield of the main crops. Among different crops, the lowest variability in the area is observed in Rice (2.79%), followed by Wheat (5.62%), and the highest in Masoor (17.83%). The variability in the area under total pulses (26.99%) is much higher than in the area under total cereals (3.20%). Since Rice and Wheat dominate the production, the variability in the area under total food grains is, therefore, also relatively low (2.46%).

Table 7: Variability in Area, Production and Yield of Principal Crops (2013-14 to 2019-20)									
	Area (1000 Ha)			Production (1000 Ha)			Yield (Qtl/Ha)		
Crop/Year	Average	SD	COV	Average	SD	COV	Average	SD	COV
Rice	84.45	2.36	2.79	252.08	33.12	13.14	29.86	3.80	12.72
Wheat	81.70	4.59	5.62	228.32	48.70	21.33	27.98	6.11	21.83
Total Cereals	173.30	5.55	3.20	490.55	67.38	13.73	28.29	3.72	13.14
Gram	2.15	0.31	14.65	2.20	0.56	25.58	10.36	2.85	27.56
Masoor (Lentil)	3.23	0.58	17.83	3.28	1.31	39.77	10.22	3.45	33.80
Total Pulses	8.27	2.23	26.99	8.58	2.69	31.33	10.74	3.29	30.61
Total Food Grains	181.57	4.46	2.46	499.13	68.21	13.67	27.50	3.78	13.73
Mustard	1.67	0.21	12.33	1.85	0.44	23.92	11.00	1.91	17.41
Total Oilseeds	1.95	0.29	14.73	2.12	0.45	21.20	10.84	1.71	15.79
Source: Compiled from http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/									

The variability of production depends on the variability of the cultivated area and the variability of the yield. Therefore, the variability in the production of different crops is higher than in the cultivated area of all crops. The highest variability in production is observed in Masoor (39.77%), followed by Gram (25.58%), mustard (23.92%), and Wheat (21.33%). The variability in the production of total oilseeds is 21.20%, which is partly due to variation in the land area under them and partly due to the high rate of oilseeds and non-availability of hybrid oilseeds. Improvement in crop insurance conditions and better market accessibility can lower this variation. Variability is lowest in Rice (13.14%).

In the case of yield, the highest variability is estimated in Masoor (33.80%), Gram (27.56%), and Wheat (21.83%). Yield variabilities in total cereals (13.14%), total food grains (13.73%), and total oilseeds (15.79%) are lower than that in total pulses (30.61%). Several factors, such as climate change, market prices, rainfall patterns, etc., influence the variability in agricultural production.

2.3.4 Consumption of Chemical Fertilizers

Table 8 shows the trends in the use of chemical fertilizers in agriculture. The recommended nitrogen to phosphorus and potassium ratio is 4:2:1, which is not maintained in the district. For example, in 2013-14, nitrogen represented 86.68% of the total fertilizers used, while the proportions of phosphorus and potassium were 11.14% and 2.17%, respectively. In 2019-20, however, the nitrogen and potassium share decreased to 75.16% and 2.13%, respectively, while phosphorus share increased to 22.69%. The use of nitrogen is more than the recommended ratio, while the phosphorous and potassium usage is less than the recommended ratio. The table also shows that fertilizer consumption varies yearly, which can be due to several factors such as rainfall patterns, cultivation patterns, etc. As the use of chemical fertilizers increased in the district from 131.20 kg/ ha GSA in 2013-14 to 226.50 kg/ ha GSA in 2019-20, the authorities should take steps toward agriculture sustainability, as the chemicalization of agriculture degrades soils and water resources. There is a need to incentivize the farmers to use organic and bio fertilizers.

Table 8: Trends in Use of Chemical Fertilizers in Agriculture (Kgs/per ha GSA)							
Fertilizers/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Nitrogen	113.73	107.29	145.01	130.43	163.40	153.71	170.25
Phosphorous	14.62	20.82	28.51	22.03	46.79	49.49	51.41
Potassium	2.85	3.27	1.86	2.06	4.57	4.47	4.83
Total	131.20	131.38	175.37	154.52	214.76	207.81	226.50
GSA (1000 Ha)	194.1	200.6	209.5	203	198.6	201.3	196.9
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/							

2.3.5 Irrigation Structure and Status

2.3.5.1 Source-wise area under irrigation

Canals and groundwater (GW) both are the main sources of irrigation in the district. The canal's share in the NIA (average, 43.72%) and the share of wells and tube wells in NIA (average, 49.60%) remained almost consistent over the years. The district's percentage of the net and gross irrigated areas have shown a rise over the years, with an average of 63.32% and 89.67%, respectively.

Table 9: Source-wise Area under Irrigation in Buxar (in % of NIA)									
Source/Year	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Canals (Surface Irri.)	43.52	43.50	43.51	43.51	43.51	44.00	44.00	43.99	43.96
Wells and Tube Wells	49.63	49.61	49.62	49.62	49.63	49.60	49.59	49.57	49.55
Other Sources	6.86	6.88	6.87	6.88	6.87	6.40	6.41	6.44	6.49
NIA (1000 Ha)	82.98	86.59	86.32	87.85	97.43	92.38	92.88	93.20	89.40
GIA (1000 Ha)	162.6	168.1	172.7	177.67	190.38	186.23	180.17	179.20	180.80
% of NIA	60.09	62.70	62.51	60.71	67.19	63.84	65.55	64.41	62.91
% of GIA	87.06	88.21	89.00	88.57	90.87	91.74	90.72	89.02	91.82
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/									

2.3.6 Status of Organic Farming

To promote sustainable agricultural practices and improve the farmers' livelihood, the Government of India launched PKVY and Namami Gange schemes. Under these schemes, farmers are incentivized to form groups to do organic farming and sell their products with PGS certification. Under the programme, the beneficiary farmers get Rs.12000, Rs. 10000, and Rs.9000 per hectare, respectively, in the first, second and third year of the conversion period.

The transition period for the full conversion from conventional to organic is considered three years. During this period, crop-yield, on average, is expected to decline by 10—15 percent. However, after three years, it may reach its original level. Financial assistance received by the beneficiary farmers seems to be adequate to compensate for the yield losses and motivate them to do organic farming. There is a need to set up an integrated processing unit for organic products. Monitoring of the project should be periodically done through MIS, Geo-tagging, and monthly physical and financial reports.

There may be a possibility that in the absence of the regulatory framework, the beneficiary farmers may revert to conventional farming. In this context, two things need to be thought of—a well-designed regulatory and monitoring framework and the introduction of payments for ecosystem services for the organic farmers after the transition period so that they may carry on the activity sustainably. Organic and zero-budget farming will provide ecological services in terms of soil health, human and animal health, water-saving, biodiversity protection, etc. To sustain the organic farming initiative, a long-term system of payments for ecological services may be evolved to retain the existing farmers and motivate others to move towards this sustainable farming system. There is no assured market for these products, and farmers do not get premium prices. They sell their products at the same prices their conventional counterparts do. Certification and quality check and monitoring mechanisms are yet to be set up.

Table 10 shows the details of the establishment of organic clusters under the Paramparagat Krishi Vikas Yojana and Namami Gange scheme in the district. The district has 89 groups in five development blocks. The highest number of groups are in Simri (39), followed by Buxar (20). Significantly high variation can be seen in the number of farmers per group in the district. It is reported that the maximum limit of land under a cluster per farmer is 2.00 hectares. Hence, the majority of the beneficiary farmers are small and marginal. More groups need to be added under the Paramparagat Krishi Vikas Yojana (PKVY), and further groups should be encouraged in other development blocks.

Table 10: Status of Organic Farming PGS Groups under PKVY and Namami Gange Schemes in Buxar (as on May 30, 2022)

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	Buxar	PKVY	5	152	30.4	30	3.04
		Namami Gange	15	287	19.13	20	3.66
2	Chakki	PKVY	1	40	40	40	0
		Namami Gange	12	250	20.83	22.5	7.68
3	Chausa	PKVY	2	57	28.5	28.5	2.12
		Namami Gange	12	166	13.83	16	6.82
4	Rajpur	Namami Gange	3	16	5.33	5	0.57
5	Simri	PKVY	9	358	39.77	36	8.78
		Namami Gange	30	245	8.16	5	7.2
6	District Total	PKVY	17	607	35.7	33	8.18
		Namami Gange	72	964	13.38	15.5	8.41
		Total	89	1571	17.65	20	12.13

Source: Compiled from https://pgsindia-ncof.gov.in/

A gradual shift of farmers from conventional to organic farming systems can positively impact water quality and soil health along with farming sustainability. However, being a knowledge-intensive farming system, farmers need proper training to know the practical details of the integrated sustainable farming system. Since economies of scale in both production and marketing matter in organic farming, some institutional framework may be needed in the forms of SHGs/ farm cooperatives/PFOs/contract farming, etc. Organic farming could be an economically viable option in the district if the government

builds strong marketing networks linking farmers, processors, and distributors with the easy certification process and minimizes farmers' risk by protecting their farm income through payments of ecosystem services. A long-term system of incentives and regulation needs to evolve to retain the existing farmers and motivate others to move toward a sustainable farming system in the district.

The major problem for the growth of organic farming observed are:

1. The major problem of the farmers was poor marketing of the organic products and their inability to get premium prices. The problem of marketing is even more severe in the case of perishable vegetable crops. Contract farming companies and Farmer Producers' companies can be encouraged.
2. Scaling up the organic production is another problem. Farmers practice organic farming only on a small part of their land (less than one ha) to get the scheme's benefit.
3. Although organic farming clusters are formed, the farmers allocated a part of their lands to organic farming and practiced conventional farming in the rest of the area, which fails the purpose of the cluster approach.
4. The knowledge and awareness level regarding practices under organic farming was inadequate among farmers.

2.3.7 Trends in Livestock Sector

The total number of cattle increased in the district from 134 thousand in 2003 to 203 thousand in 2019, a net increase of 51.59%. However, the number of adult male cattle decreased from 16 thousand to 3 thousand in the same period, indicating farm mechanization and the declining role of animal power in agriculture. The increase in total cattle is due to an increase in adult female cattle (from 58 thousand to 105 thousand) and young cattle (from 59 thousand to 95 thousand) in the same period. Cattle represent 48.71% of the total large ruminants. Moreover, cattle's share in large ruminants increased from 45.29% in 2003 to 54.18% in 2019. Similarly, total buffaloes have increased from 162 thousand in 2003 to 172 thousand in 2019, a net increase of 6.14%. This increase is largely driven by an increase in young buffaloes from 74 thousand in 2003 to 89 thousand in 2019. Buffaloes represent around 51.28% of the total large ruminants. On the other hand, total sheep decreased from 20.01 thousand in 2003 to 14.12 thousand in 2019, a net decrease of 29.43%. Total goats have decreased from 71 thousand in 2003 to 54 thousand in 2019, a net decrease of 23.62%. Total pigs declined from 8.46 thousand in 2003 to 3.66 thousand in 2019, a net decrease of 56.73%. The total livestock population went up from 397 thousand in 2003 to 447 thousand in 2019, a net increase of 12.53%.

Notably, the number of female cattle has substantially increased over the period, indicating the growth of livestock products, including milk. The substantial decline in the number of male cattle and male buffalo also shows the rising farm mechanization and declining relevance of animal power, mainly because of the high maintenance cost of livestock.

Table 11: Trends in Livestock population (in 1000 numbers) in Buxar

Category	2003	2007	2012	2019
CATTLE TOTAL	133.97	177.65	161.74	203.09
CATTLE ADULT MALE	16.47	6.17	4.46	2.95
CATTLE ADULT FEMALE	58.36	89.67	98.07	105.35

CATTLE YOUNG TOTAL	59.15	81.81	59.2	94.79
CATTLE SHARE IN LARGE RUMINANT (Percent)	45.29	48.41	46.98	54.18
BUFFALO TOTAL	161.81	189.29	182.55	171.75
BUFFALO ADULT MALE	0.58	0.51	2.63	0.3
BUFFALO ADULT FEMALE	87.33	104.97	118.84	81.87
BUFFALO YOUNG TOTAL	73.9	83.82	61.09	89.58
BUFFALO SHARE IN LARGE RUMINANT (Percent)	54.71	51.59	53.02	45.82
SHEEP TOTAL	20.01	22.49	15.57	14.12
SHEEP SHARE IN SMALL RUMINANT (Percent)	22.04	24.05	16.15	20.71
GOATS TOTAL	70.76	71.03	80.84	54.04
GOATS SHARE IN SMALL RUMINANT (Percent)	77.96	75.95	83.85	79.29
PIGS TOTAL	8.46	12.5	8.26	3.66
LIVESTOCK TOTAL	396.91	478.41	453.23	446.65
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/				

2.3.8 Trends in Fishery Production

Table 12 shows the trends in fish production in Buxar compared to the total fish production in Bihar. Fish production was 5.98 thousand tons in 2011-12 in Buxar which increased to 6.69 thousand tons in 2017-18. Buxar constituted 1.73% share in the total fish production in Bihar in 2011-12. However, its share decreased to 1.13% in 2017-18.

Table12: Trends in fish production (1000 tons) in Buxar				
District/Year	**2011-12**	**2013-14**	**2015-16**	**2017-18**
Buxar	5.98	8.8	6.91	6.69
Bihar	344.47	432.29	506.88	587.85
Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/				

2.2 FORESTRY

Baseline Data

According to the Forest Survey 2021, the total Forest Cover in the State is 7380.79 sq. km which is 7.84 % of the State's geographical area. The state has 333.42 sq. km. under very dense forests, 3285.83 sq. km. under moderately dense forests and 3761.54 sq. km. under open forests. In recent years, massive plantation programs have been taken up in the State to increase the forest & tree cover.

According to the 2021 Forest survey, forests cover of the district is 0.35% out of the total geographical area which is 1703 sq. km. With respect to 2019 forest assessment there has been no change in the forest area of the district.

The district has a total of 5.89 sq. km. under the forests out of which 2.94 sq. km. is under moderately dense forests and 2.95 sq. km under the open forests. The district does not has any land area under very dense forests and scrubs as depicted in Fig. 1.

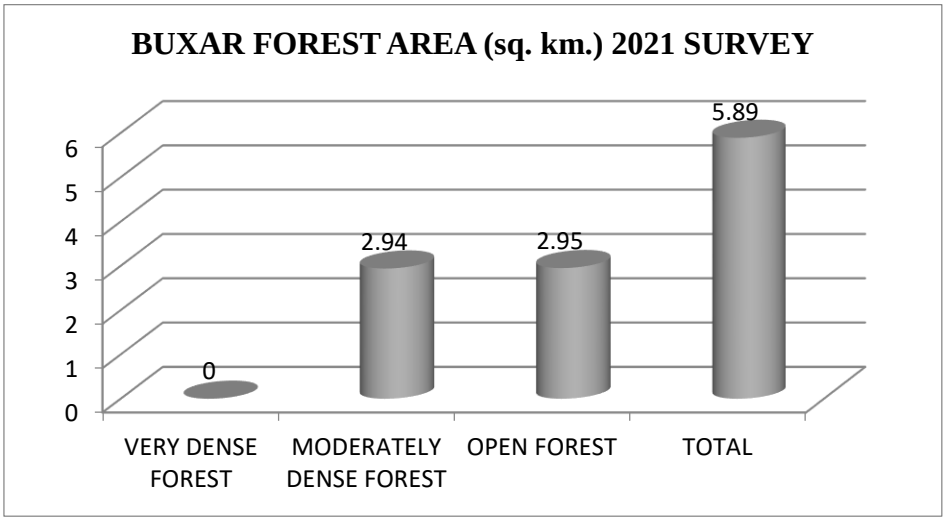


Fig. 1

The district has 570 ha of cultivable wasteland,3430 ha of land current fallow and 620 ha under other fallow.

2.2.1. Biodiversity

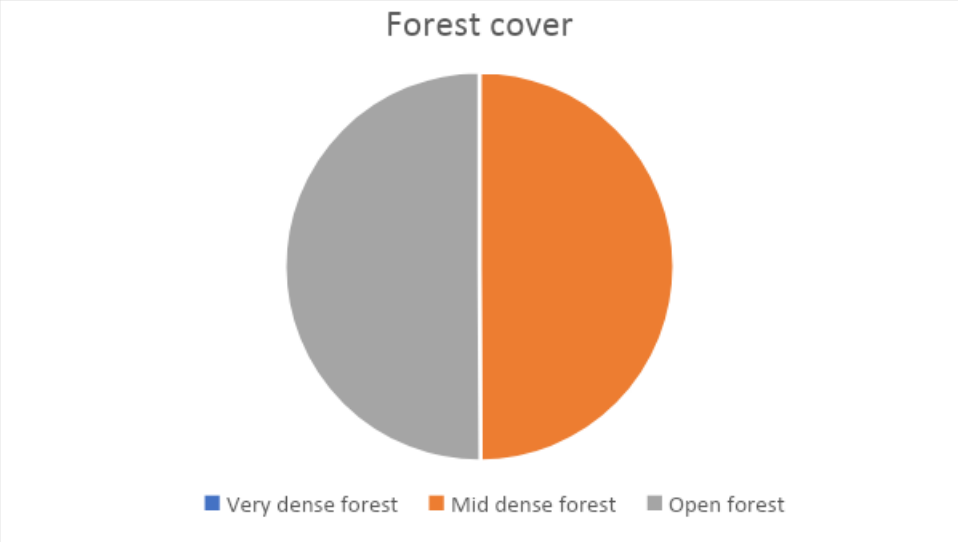
The district's biodiversity data includes crop production, livestock population, bird species, and forest cover. The district has a forest area of 5.89 square km, in which 50% area is mid-dense forest, and 50% area is open forest.

Table 1 Bird species recorded in the district.

Number of species	319
Number of rare/accidental species	20

Forest cover (in sq. km.)

Geographical area	Very dense forest	Mid dense forest	Open forest	Total	% of Geographical area `	Change with respect to 2017 assessment	Scrub
1703	0	2.94	2.95	5.89	0.26	-0.11	0



2.3 TOURISM

Tourism is one of the latest growing industries in the state of Bihar. The tourism influx is very irregular in terms of Domestic as well as of Foreign in the Bihar. In one year region witnessed a very huge tourist influx and in very next year number of tourists decreased suddenly owing to prediction of heavy flood, Crime and poor infrastructure facilities. Tourism has been worst hit in **2020 covid Pandamic** ravaged Bihar, caused a steep fall of **-83.03%** in tourist traffic.

- ***Table: 2 Bihar: Year Wise Tourists Arrivals (2001 to 2020)***

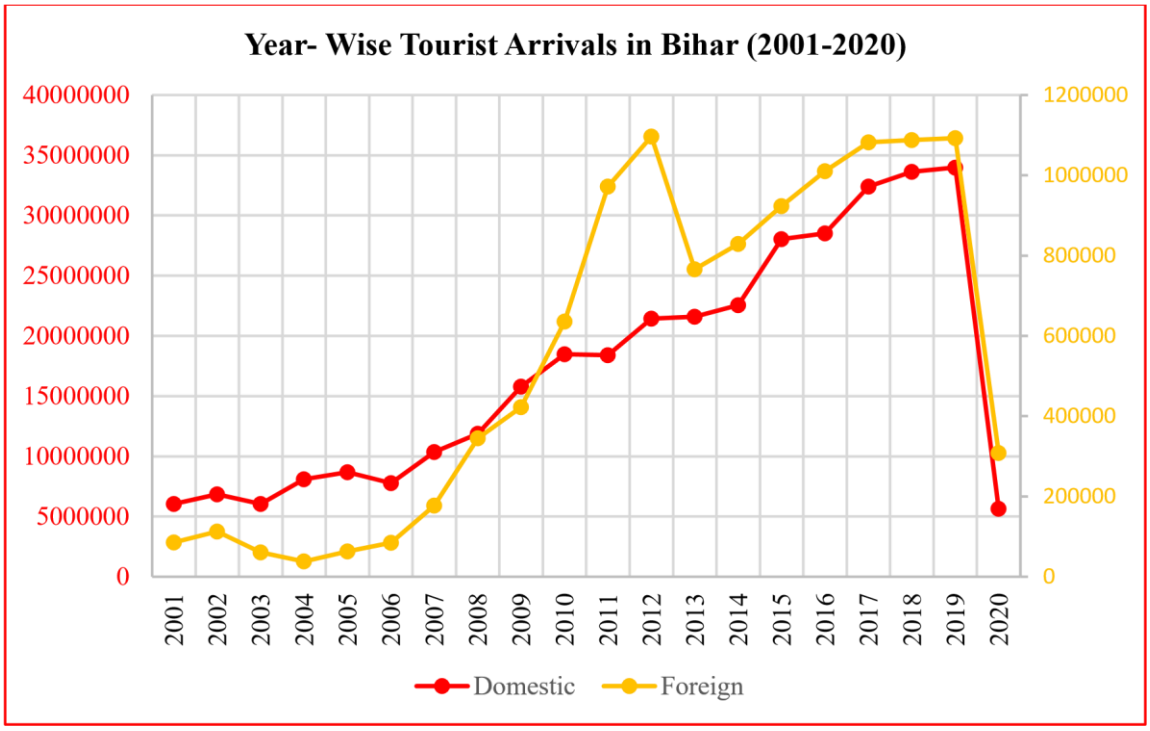
Year	Domestic	Growth	Foreign	Growth	Total	Overall Growth
2001	6061168	0.00%	85673	0.00%	6146841	0.00%
2002	6860207	13.18%	112873	31.75%	6973080	13.44%
2003	6044710	-11.89%	60820	-46.12%	6105530	-12.44%
2004	8097456	33.96%	38118	-37.33%	8135574	33.25%
2005	8687220	7.28%	63321	66.12%	8750541	7.56%
2006	7774732	-10.50%	84942	34.15%	7859674	-10.18%
2007	10352887	33.16%	177362	108.80%	10530249	33.98%
2008	11889611	14.84%	345572	94.84%	12235183	16.19%
2009	15784679	32.76%	423042	22.42%	16207721	32.47%

2010	18491804	17.15%	635722	50.27%	19127526	18.01%
2011	18397490	-0.51%	972487	52.97%	19369977	1.27%
2012	21447099	16.58%	1096933	12.80%	22544032	16.39%
2013	21588306	0.66%	765835	-30.18%	22354141	-0.84%
2014	22544377	4.43%	829508	8.31%	23373885	4.56%
2015	28029118	24.33%	923737	11.36%	28952855	23.87%
2016	28516127	1.74%	1010531	9.40%	29526658	1.98%
2017	32414063	13.67%	1082705	7.14%	33496768	13.45%
2018	33621613	3.73%	1087971	0.49%	34709584	3.62%
2019	33990038	1.10%	1093141	0.48%	35083179	1.08%
2020	5644524	-83.39%	308080	-71.82%	5952604	-83.03%

Source: Data Compiled from dse.bihar.gov.in

In Bihar there was an increase of **33.96% of Domestic Tourists in 2004**. This growth sharply declined in **2006** and accounts **-10.50%.** However, it again increases up to **33.16%** in **2007**. Talking about Foreign tourist arrival in Bihar, **Foreign Tourists** increase up to **31.75%** in **2002** and **108.80%** in **2007.** However, we witnessed a very huge decreased in the number of foreign tourists suddenly owing to prediction of natural catastrophe, poor infrastructure and experieces of tourists. Like in the year **2013 and 2020** Foreign Tourist decline -**30.18% and -71.82** respectively.

- ***Figure: 1 Bihar: Year Wise Tourists Arrivals (2001 to 2020)***



- ***Figure: 2 Bihar: Year Wise Domestic Tourists Arrivals (2001 to 2020)***

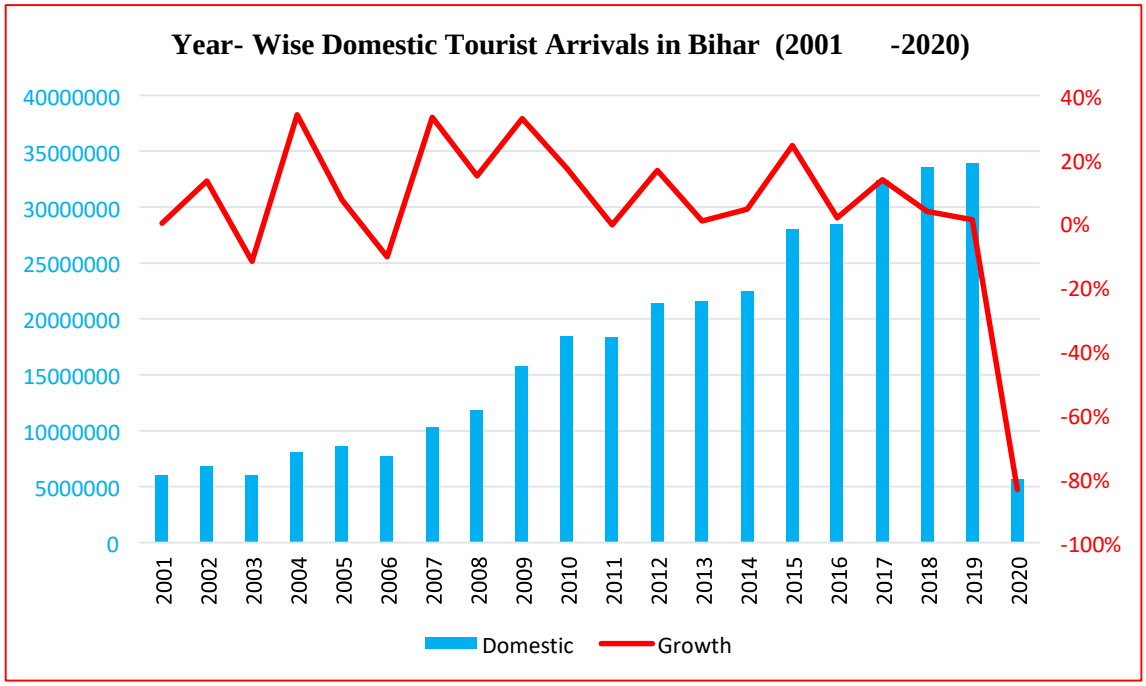


Figure: 3 Bihar: Year Wise Foreign Tourists Arrivals in Bihar (2001 to 2020)

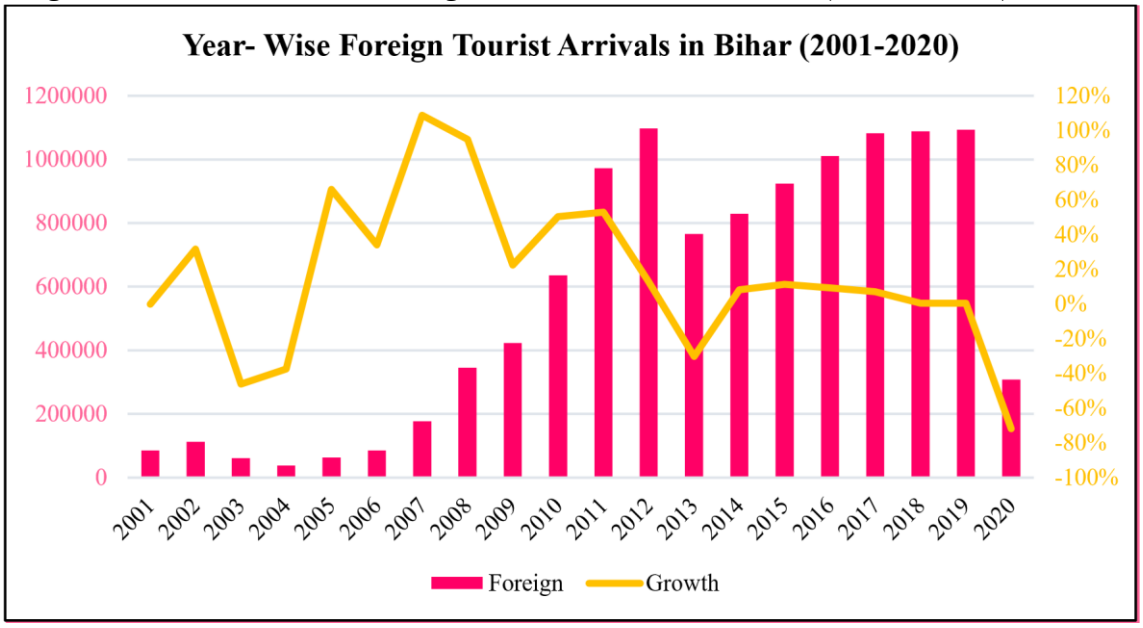
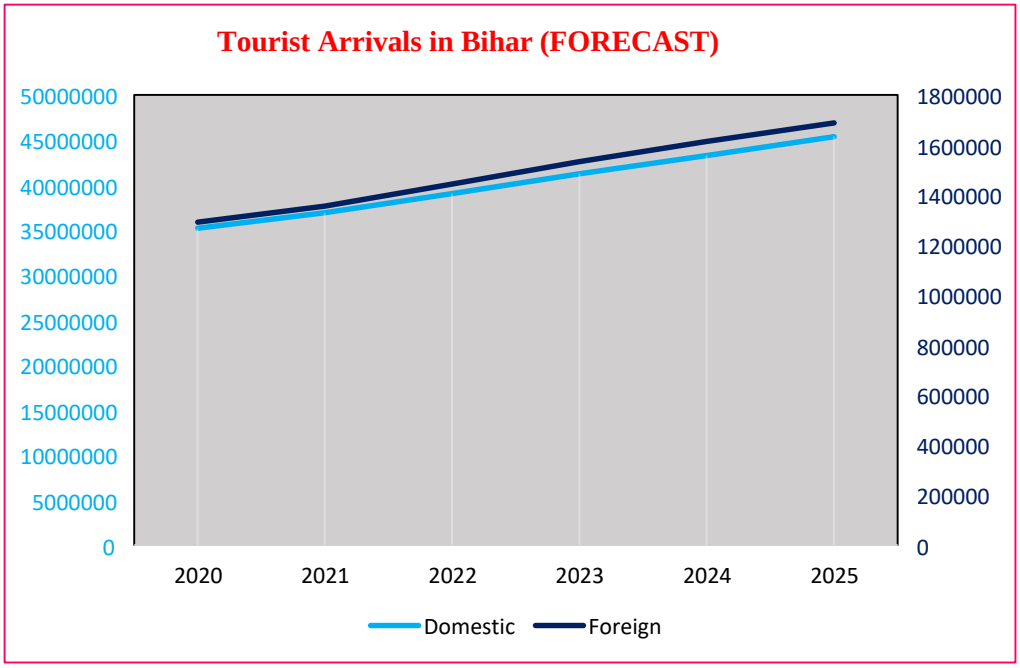


Table: 3 Bihar: Year Wise Tourists Arrivals (2020 to 2025) Forecast

Year	Domestic	Foreign	Total
2020	35185067	1291658	36476724
2021	36910980	1355501	38266481
2022	39061662	1444141	40505803
2023	41247899	1533826	42781725
2024	43268513	1614654	44883168
2025	45375097	1688413	47063510

Source: Data Compiled from Tourism Department of Bihar

Figure: 4 Bihar: Year Wise Tourists Arrivals (2020 to 2025) Forecast



11. Bihar: Sectoral Contribution to GSDP (1999-2000 to 2006-2007)

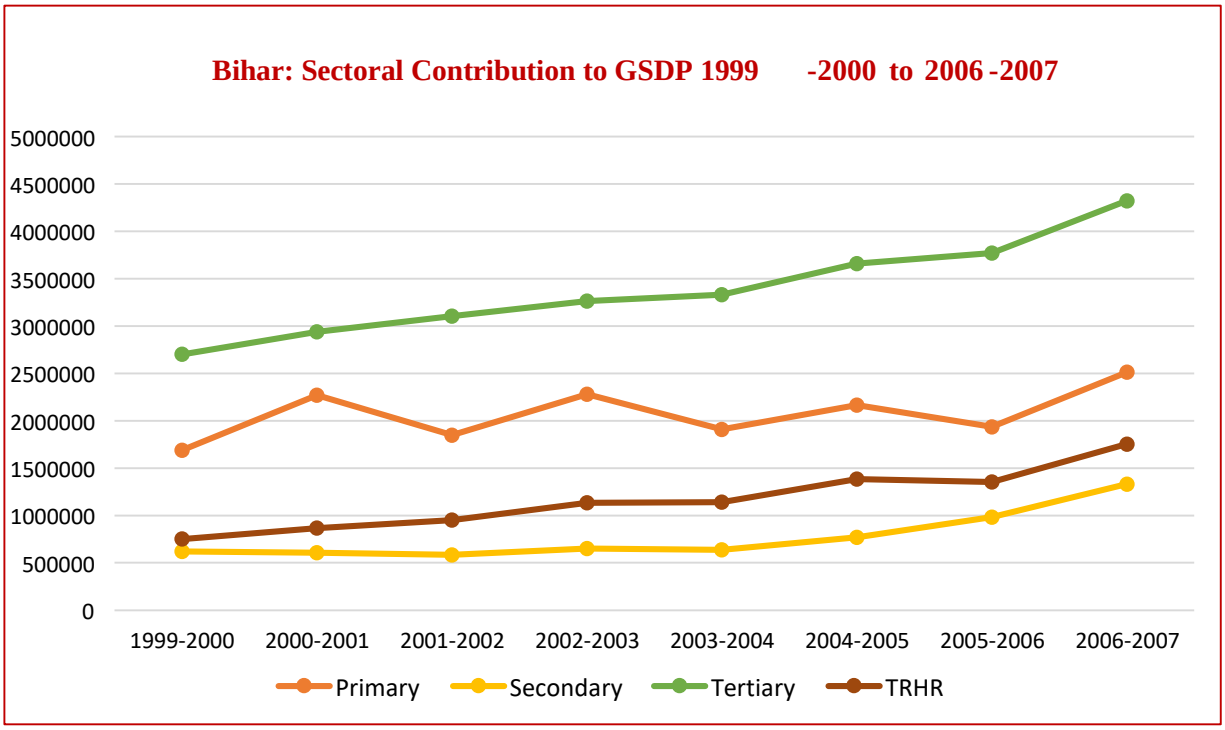
Bihar is one of the fastest growing economies in India. It is largely service based, with a significant share of agricultural and industrial sectors. The sectoral contribution to the state GDP, the contribution of tertiary sector accounts **(53.88%)** in **1999-2000** increases to **(56.65%)** in **2003-2004**. The contribution of Primary sector is accounts between **(33.69%)** in **1999-2000** to **(36.80%)** in **2002-2003** and again decrease to **(30.77%)** in **2006-2007**. Meanwhile, contribution of Secondary sector is **(12.43%)** in **1999-2000** to **(16.31%)** in **2006-2007**. Moreover, the contribution of Trade, repair, hotel, and restaurant to tertiary Sector accounts **(27.89%)** in **1999-2000** while crossed **(40.62%)** in **2006-07**. Therefore, Bihar has great potential to contribute to the economy, Tourism and Hospitality sector in the state can further be promoted to harness its growth through providing world class infrastructure facilities, establishing tourism centres across the state, adopting disaster management policy, Law and Order.

- ***Table: 4 Sectoral Contribution to GSDP Bihar 1999-2000 to 2006-2007***

Year	Primary	Secondary	Tertiary	TRHR as % of Tertiary
1999-2000	1690440 (33.69%)	623589 (12.43%)	2703347 (53.88%)	754097 (27.89%)
2000-2001	2272675 (39.03%)	609252 (10.46%)	2940338 (50.50%)	870083 (29.59%)
2001-2002	1850242 (33.36%)	587654 (10.59%)	3108764 (56.05%)	952986 (30.65%)
2002-2003	2282622 (36.80%)	654300 (10.55%)	3265587 (52.65%)	1135730 (34.78%)
2003-2004	1911225 (32.49%)	639591 (10.87%)	3332491 (56.64%)	1142426 (34.28%)
2004-2005	2167878 (32.85%)	770771 (11.68%)	3660900 (55.47%)	1388261 (37.92%)
2005-2006	1937233 (28.92%)	986505 (14.73%)	3774182 (56.35%)	1356901 (35.95%)
2006-2007	2514504 (30.77%)	1332672 (16.31%)	4324459 (52.92%)	1756746 (40.62%)

Source: Data Compiled from dse.bihar.gov.in

Figure: 5 Sectoral Contribution to GSDP Bihar 1999-2000 to 2006-2007



12. Buxar: Sectoral Contribution to GSDP (1999-2000 to 2006-2007)

Like Bihar as a state, the District of Buxar has potential for Historical, Religious, Spiritual, Adventure, Ghat and Ecotourism etc. and has scope to develop niche markets. Comparing the sectoral contribution to the state GDP, the contribution of tertiary sector in Buxar is **(38.09%)**, whereas for the state it is **(53.88%)** in **1999-2000** while Buxar exceeds to **(43.24%)** and Bihar **(55.47%)** in **2004-2005**. Moreover, the contribution of Trade, repair, hotel, and restaurant **(9.29%)** outperforms in comparison to the state counterpart **(27.89%)** in **1999-2000**, however this gap further strengthen during **20062007** were Buxar accounts **(12.60%)** that of state (**40.62%)**. Thus, the contribution of Buxar's Tertiary sector is slow than the state. Similarly, trade, repair, hotel, and restaurant also contribute slow but increasing manner.

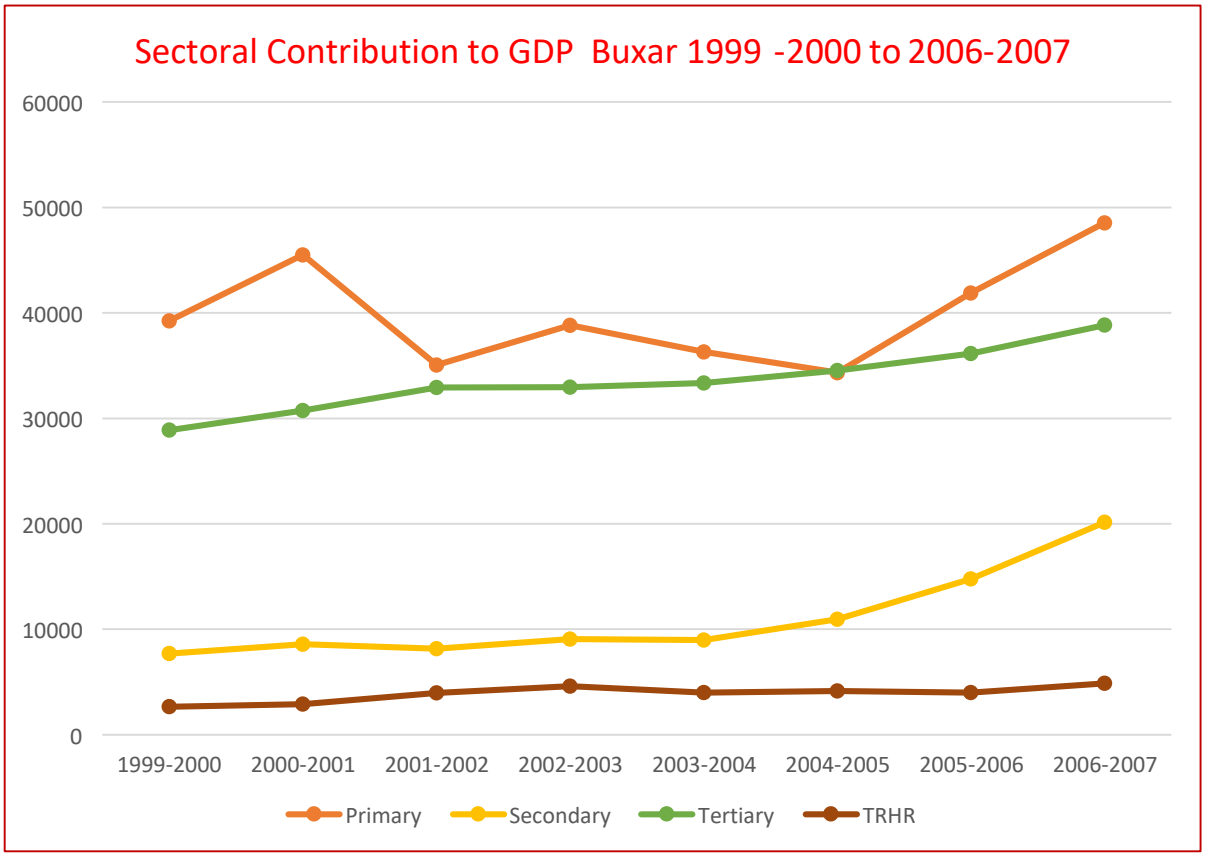
- ***Table: 5 Sectoral Contribution to GDDP Buxar 1999-2000 to 2006-2007***

Year	Primary	Secondary	Tertiary	TRHR as % of Tertiary

1999-2000	39261 (51.75%)	7713 (10.17%)	28897 (38.09%)	2685 (9.29%)
2000-2001	45496 (53.61%)	8607 (10.14%)	30759 (36.25%)	2920 (9.49%)
2001-2002	35059 (46.01%)	8190 (10.75%)	32943 (43.24%)	3990 (12.11%)
2002-2003	38828 (48.01%)	9089 (11.24%)	32962 (40.75%)	4628 (14.04%)
2003-2004	36301 (46.15%)	8989 (11.43%)	33376 (42.43%)	4017 (12.04%)
2004-2005	34348 (42.99%)	10987 (13.75%)	34559 (43.26%)	4174 (12.08%)
2005-2006	41892 (45.11%)	14809 (15.95%)	36169 (38.95%)	4016 (11.10%)
2006-2007	48545 (45.14%)	20157 (18.74%)	38852 (36.12%)	4897 (12.60%)

Source: Data Compiled from dse.bihar.gov.in

- ***Figure: 6 Sectoral Contribution to GDDP Buxar:1999-2000 to 2006-2007***



Buxar has great potential to contribute to the economy. Hence, tourism and hospitality sector in the district can further be promoted to harness its growth and benefits to the district economy. However, promoting tourism sector by considering its economic contribution may lead to bad policy decisions without noting the natural disaster as well as tourism infrastructure and crime and implementation policy. The tourist arrivals is closely linked with disasters, Crime & Security, and infrastructure etc in Buxar district. Moreover, development of projects and strong research is mandatory to know the detailed information on disaster, Crime, tourism infrastructure, tourist foot fall etc.

13. Bihar: GSDP Growth Rate at Constant Price (1999-2000 to 2006-2007)

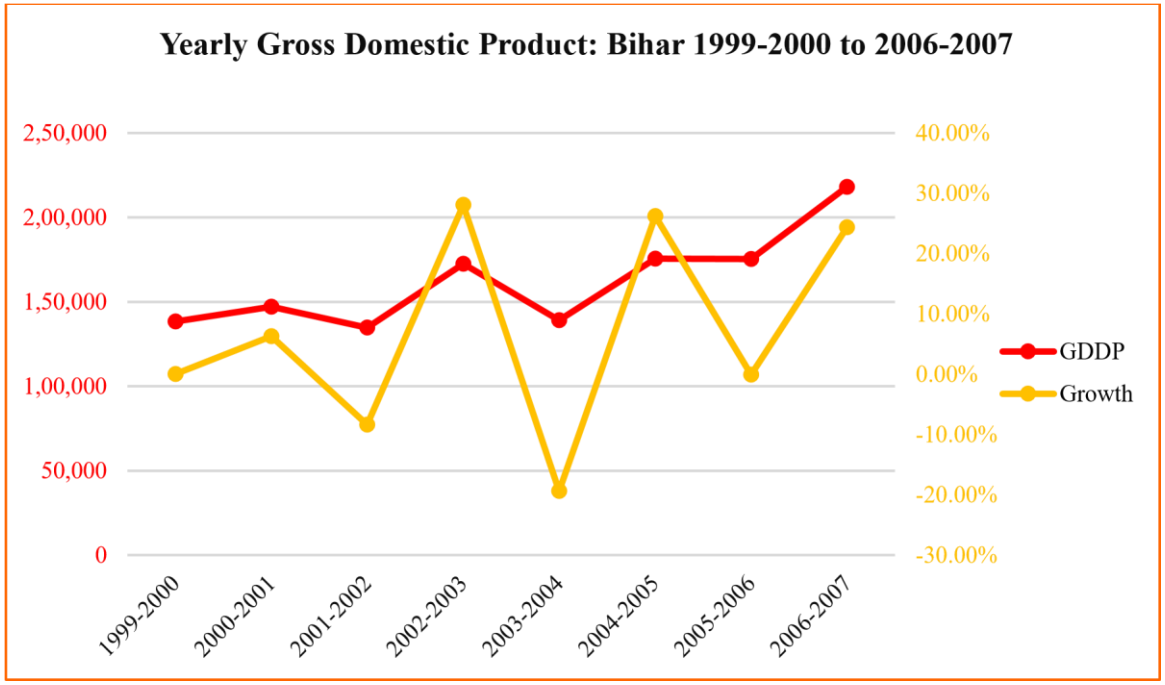
The impact of the Disaster, High Crime rate, Poor Infrastructure, Under-investments, Poor Economic Policy, and Poor Political Vision etc. has been reflected in terms of reducing the annual growth rate of the state from (**16.04%)** in **2000-2001 to (-4.73%)** in **2001-2002**. While the state annual growth was again rise to **(11.82%)** in **2002-2003** affected during **2003-2004 (-5.15%)** which is the lowest growth rate during a 5-year period; the effect of the disaster and economic policy has negatively affected the district annual GDP growth rate for subsequent years. However, we can see a huge growth during **2006-2007** when GDDP accounts 8171635 i.e. **22.00%** of growth. This states that disaster and economic policy largely has a micro regional impact, hence disaster and development related policies must be made be made considering micro regional contexts and be site specific.

- ***Table: 6 GSDP Growth Rate at Constant Price: Bihar 1999-2000 to 2006-2007***

Year	GDDP	Growth
1999-2000	5017376	0
2000-2001	5822265	16.04%
2001-2002	5546660	-4.73%
2002-2003	6202509	11.82%
2003-2004	5883306	-5.15%
2004-2005	6599549	12.17%
2005-2006	6697921	1.49%
2006-2007	8171635	22.00%

  - Source: Data Compiled from dse.bihar.gov.in

Figure: 7 GSDP Growth Rate at Constant Price: Bihar 1999-2000 to 2006-2007



14. Buxar: GDDP Growth Rate at Constant Price (1999-2000 to 20062007)

The impact of the Disaster, High Crime rate, Poor Infrastructure, Under-investments, Poor Economic Policy and Poor Political Vision etc. has been reflected in terms of reducing the annual growth rate of the district from (**11.85%)** in **2000-2001 to (-10.21%)** in **2002-2003**. The district annual growth was again rise up to **(6.15%)** in **2002-2003**. This states that impact of the Disaster, High Crime rate, Poor Infrastructure, Underinvestments, Poor Economic Policy and Poor Political Vision etc. largely has severe regional impacts in reducing the annual growth rate of the district, hence disaster and development related policies must be made be made taking into account micro regional contexts and be site specific.

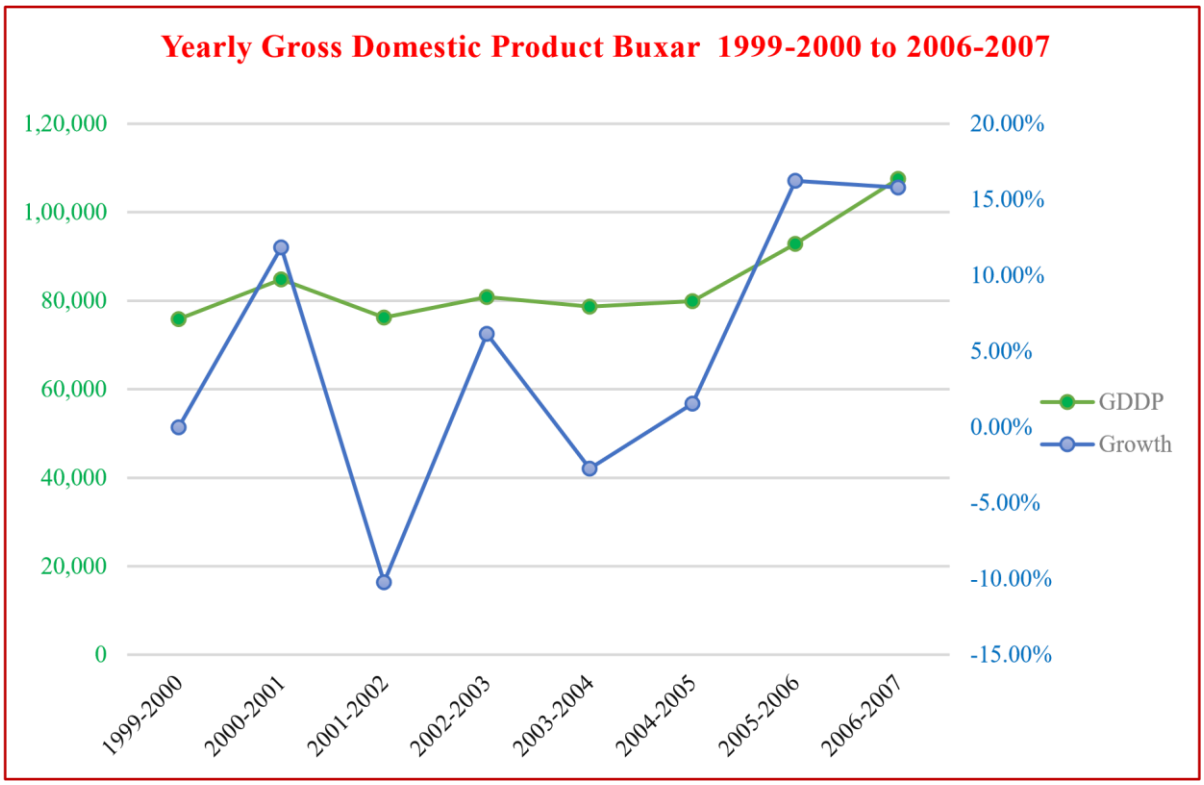
However, during **2005-2006 Buxar** accounts **16.24%** as compare with state growth rate **1.49%**. Similarly, during **2006-2007** it remain **15.81%** while state accounts **22.00%**. This is because of the difference in Socio-economic and geographical difference that exists across Buxar districts in the state of Bihar. Hence, district specific plans must be developed rather than state specific.

Table: 7 GDDP Growth Rate at Constant Price: Buxar 1999-2000 to 2006-2007

Year	GDDP	Growth in %
1999-2000	75871	0.00%
2000-2001	84861	11.85%
2001-2002	76193	-10.21%
2002-2003	80878	6.15%
2003-2004	78665	-2.74%
2004-2005	79894	1.56%
2005-2006	92870	16.24%
2006-2007	107554	15.81%

- ***Source: Data Compiled from dse.bihar.gov.in***

Figure: 8 GDDP Growth Rate at Constant Price: Buxar 1999-2000 to 2006-2007



Source: Data Compiled from dse.bihar.gov.in

- **15. Buxar: Contribution of TRHR to the GDDP at Constant Price (1999 to 2025)**

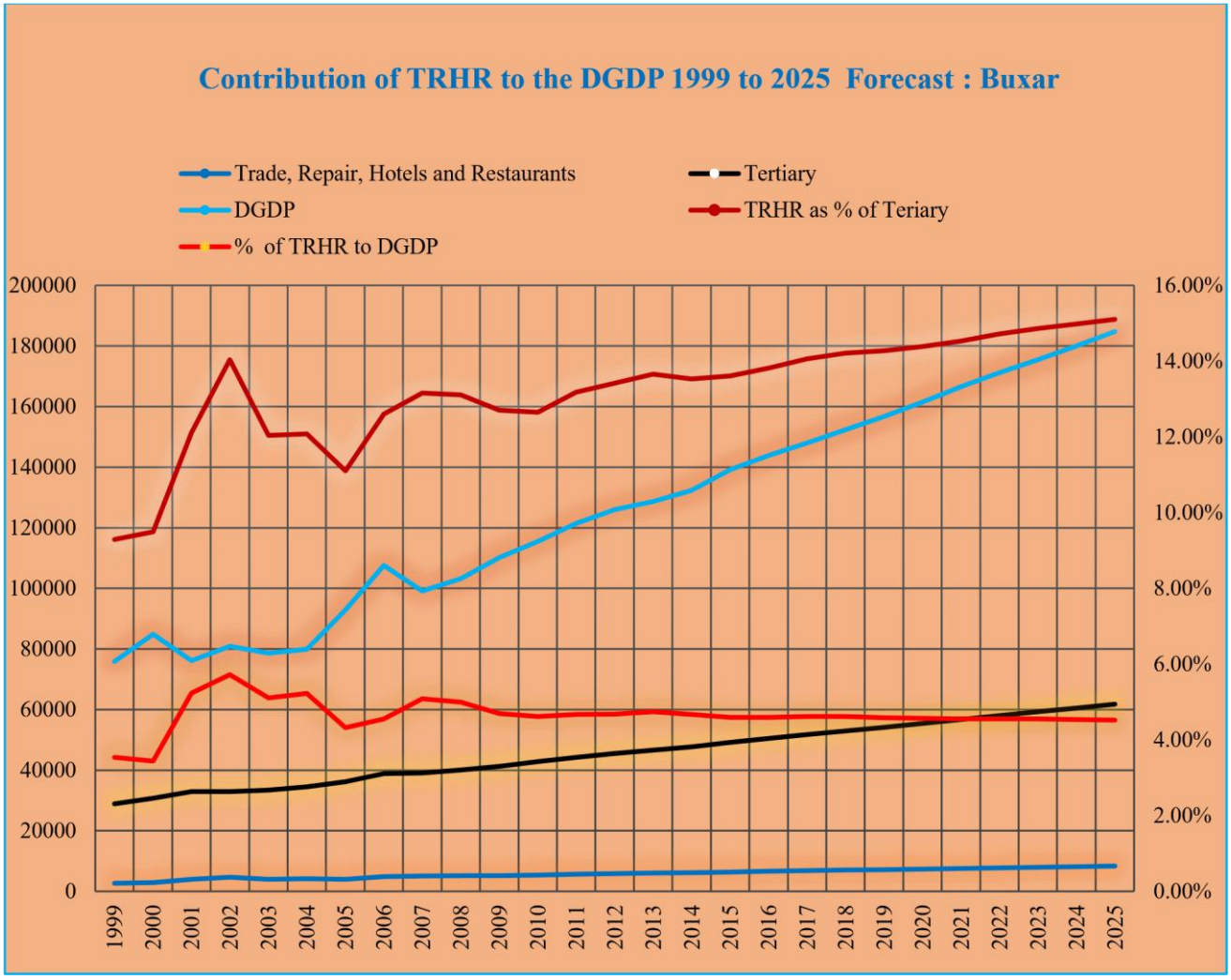
Table: 8 Contribution of TRHR to the GDDP at Constant Price Buxar (1999 to 2025)

Year	Trade, Repair, Hotels and Restaurants	Tertiary	TRHR as % of Tertiary	DGDP	% of TRHR to DGDP
1999	2685	28897	9.29%	75871	3.54%
2000	2920	30759	9.49%	84861	3.44%
2001	3990	32943	12.11%	76193	5.24%
2002	4628	32962	14.04%	80878	5.72%
2003	4017	33376	12.04%	78665	5.11%
2004	4174	34559	12.08%	79894	5.22%
2005	4016	36169	11.10%	92870	4.32%
2006	4897	38852	12.60%	107554	4.55%
2007 (Forecast)	5036	39029	13.16%	99101	5.08%
2008	5156	40094	13.11%	103235	4.99%
2009	5169	41271	12.71%	110159	4.69%
2010	5330	42816	12.65%	115480	4.62%
2011	5674	44249	13.18%	121495	4.67%
2012	5896	45490	13.42%	126020	4.68%
2013	6108	46609	13.66%	128658	4.75%
2014	6185	47691	13.53%	132307	4.67%
2015	6390	49154	13.61%	139190	4.59%
2016	6610	50465	13.81%	143844	4.60%
2017	6838	51727	14.06%	148006	4.62%
2018	7029	52929	14.21%	152370	4.61%
2019	7193	54163	14.28%	156763	4.59%
2020	7381	55443	14.39%	161547	4.57%
2021	7579	56743	14.53%	166561	4.55%

2022	7793	58027	14.72%	171217	4.55%
2023	7983	59253	14.87%	175444	4.55%
2024	8170	60508	14.99%	180073	4.54%
2025	8358	61777	15.10%	184795	4.52%

- ***Source: Data Compiled from dse.bihar.gov.in***

Figure: 9 Contribution of TRHR to the GDDP at Constant Price Buxar (1999 to 2025)



2.4 WETLANDS

The district does not consist of a large number of wetlands. Table 1 shows the number of wetlands and their area representation in the district.

Table 1: Wetland Data of Buxar district

	Total Number of Wetlands:			Area (ha)									Aquatic Vegetation
Natural Wetlands	**NRCD**	**NWIA**	**Diff.**	**<2.25**	**<5**	**<10**	**<20**	**<50**	**<200**	**<500**	**<1000**	**>1000**	
Lake/ponds	2	2	0	0	0	1	0	0	0	0	1	0	2
Ox-bow lakes/cut off meanders	4	5	1	0	1	0	2	0	0	1	0	0	4
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Waterlogged	1	1	0	0	1	0	0	0	0	0	0	0	1
River/Stream	0	6	6	0	0	0	0	0	0	0	0	0	0
Man-made Wetlands	**NRCD**	**NWIA**	**Diff.**	**<2.25**	**<5**	**<10**	**<20**	**<50**	**<200**	**<500**	**<1000**	**>1000**	**AV**
Reservoirs/Barrages	0	0	0	0	0	0	0	0	0	0	0	0	0
Tanks/ponds	8	8	0	0	8	0	0	0	0	0	0	0	4
Waterlogged	0	0	0	0	0	0	0	0	0	0	0	0	0
Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (158)	15	22	7	136	10	1	2	0	0	1	1	0	11

Source: National River Conservation Directorate (NRCD), National Wetland Inventory and Assessment (NWIA) Atlas

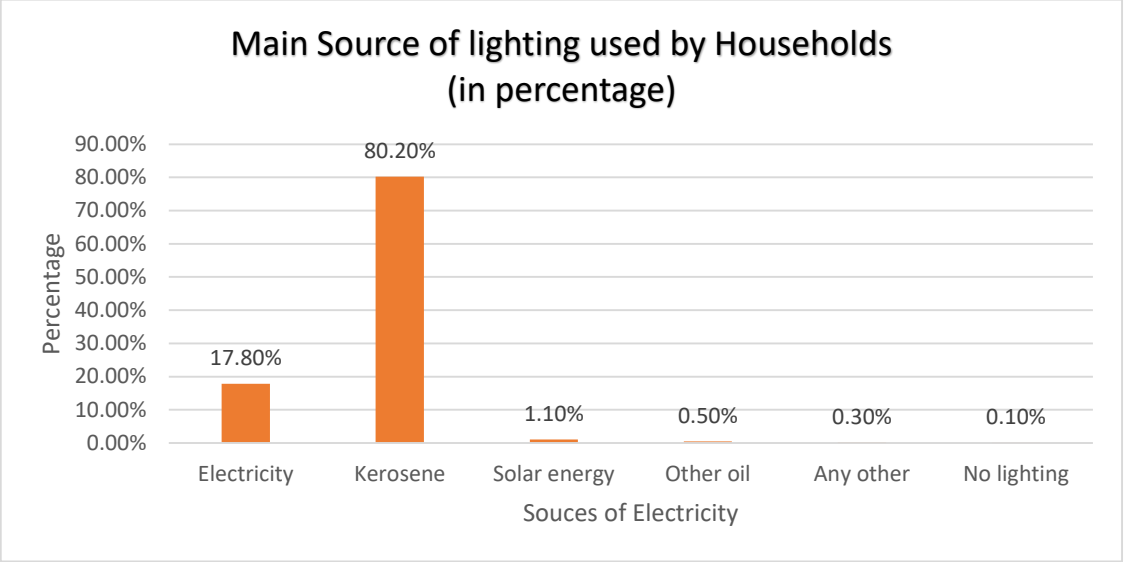
Natural wetlands (lake/ponds)		Man-made wetlands (tank/ponds)	
Wetland	Area (Ha)	Wetland	Area (Ha)
Kolia Khap (Daha)	670.36	Rajpur Pokhra	4.53

2.5. ENERGY

2.5.1. Solar

BREDA or Bihar Renewable Energy Development Agency is responsible for encouraging non-conventional sources of energy in the state, with the motive to provide electricity in the remote areas of the village.

According to the Census 2011, the major lightning sources utilized by the households in Buxar region has been analyzed through graph 1. Around 80% of the lightning is obtained from kerosene or the major source of lightning in the district by the households. Then around 17.8% of the lightning is obtained from electricity, 1.1% is obtained from solar energy, 0.5% from other oil, 0.3% from other sources of lightning and around 0.1% of the households does not have any lightning sources.



2.5.2. Biomass

Bihar Renewable Energy Development Agency (BREDA) is responsible for promoting the renewable energy in the state with the motive of electrifying the villages.

The economy of the district is dependent upon agriculture. According to the Agriculture Contingency Plan for Buxar District, the total net sown area is 139600 hectares and the cropping intensity is 123%.

The major crops grown in the district are rice, wheat, maize, mustard, gram, and lentil. Some horticulture crops like mango, guava, potato, onion, tomato, and papaya are also grown in the district.

Crop	**Productivity**
Rice	14.86 – 29.72 q/ha
Wheat	20.55 – 30.52 q/ha
Maize	26.71 – 35.25 q/ha
Mustard/ Tori	10.32 – 12.00 kg/ha
Gram	7.22 – 10.13 kg/ha
Lentil	7.0 - 9.0 kg/ha

Table 1

The pie-chart below illustrates the type of fuel used by the households for cooking in Buxar district and the data has been collected from Census of India 2011. According the figure, it can be understood that 58% of the households are dependent on cow dung cake for cooking, 22.10% are using firewood, and 10.4% are using LPG/PNG.

Buxar district has the total available biomass power potential of 0.3420 (D, K, Mishra, & Bhattacharyya, 2016).

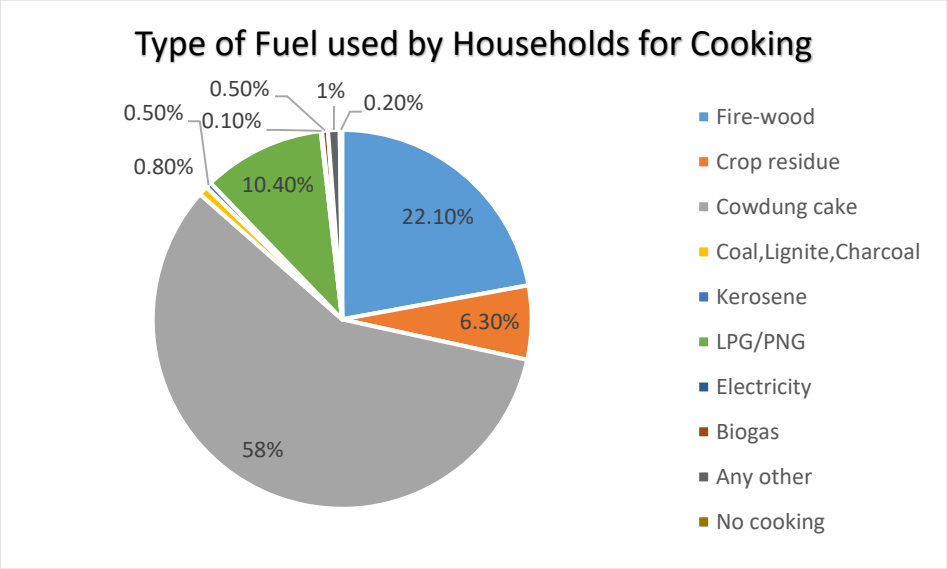


Fig. 1

2.5.3. Biogas

Either the biogas data is not available for the district, or no plants exist in the district. Biogas potential has been evaluated by average livestock and agricultural waste production. Biogas potential from animal waste is calculated approximately as ninety eight lakh m3/year and two crores m3/year from agricultural waste. This amount of biogas generation can efficiently complete the energy demand of the district.

2.5.4. Hydro Power

No hydropower plant exists in the district; nor any project sites have been identified for small hydropower projects.

3 QUALITATIVE DATA ANALYSIS

3.1 FORESTRY

Due to deforestation, the forest area of this district is very thin. Some commom trees of this district are Mango, Seasum, Mahua, Bamboo and some types of long grasses (Jhalas) are found near diara area of the river Ganga. Jhalas grass is mostly used in roat making of kuccha houses. The forests of the district are not rich in their products. Fire wood is the most important among its products. Buxar is categorized under Agro-climatic zone III B i.e. the Southern west zone. The district has sandy loam , clay loam, loam, clay types of soil with pH between 6.5-8.0.

3.1.1 Biodiversity

Buxar lost 15 ha of tree cover between 2010 and 2021, equating to a 0.29 percent loss in tree cover since 2010, and 5.77kt of CO2e emissions. The main fire season in Buxar usually starts in late March and lasts for around 11 weeks. Between the 14th of June 2021 and the 6th of June 2022, 31 VIIRS fire alarms were recorded, based on high confidence alerts alone. This is significantly higher than prior years, dating back to 2012. Between the 10th of June 2019 and the 6th of June 2022, there were 497 VIIRS Alerts fire alerts in Buxar. This district's forest area is quite thin due to deforestation. Mango, Seasum, Mahua, Bamboo, and various varieties of long grasses (Jhalas) may be found along the diara region of the river Ganga in this district. Jhalas grass is primarily utilized in the construction of kuccha homes' roats. The district's forests aren't particularly productive. The most significant of its products is firewood. When the forest was dense, the region contained a variety of wild animals and game birds. As irrigation systems have improved, the amount of land under agriculture has increased, reducing the amount of forest available. The wild creatures have suffered as a result of this, and their numbers have plummeted. Spotted deer, or neelgain, may be seen on the plains and near the Ganga's bank. The Buxar Town region is also home to a large population of monkeys. The neighborhood is also home to a variety of birds, including parrots, patridges, and quails.In the month of October, birds known as Lalshar migrate from Kashmir to this 25-square-kilometer buxar bird sanctuary, and then return to the valleys of Kashmir as soon as the month of March begins.

3.2. ENERGY:

As per the data of the year 2013, Bhadohi district energy consumption is around 791 TJ/year and 3.4 GJ/capita/year. GHG emission of 55,168 Ton CO_2 equivalent and 0.235 Ton CO_2 equivalent/capita has been evaluated for the district.

3.2.1. Solar

In 2017, Bihar government launched “Policy for Promotion of New and Renewable Energy Sources”, in which a target of achieving 2969 MW through solar energy by 2022, was set. Bihar encourages grid connected solar, which covers sale of excess power to DISCOM, sale from Renewable Energy Certificate (REC) mechanism, and through open access, the power can be sold to potential consumers, 3rd party or outside state. The government also encourages grid connected rooftop solar PV through net metering, gross metering, and 3rd party sale.

According to the CEEW report, the ground water level in the district is in safe limit for irrigation purposes, which implies that the solar pumps could be sustainable here. However, the purchasing capacity of the farmers is weak, as it the agricultural households in the rural areas of the district have a low average monthly per capita expenditure as the proportion of marginal and small farmers are high in the district. The farmers in the district are adaptable to the change and have a positive view point towards newer technologies because the mechanisation level in the district is significantly high. However, the private ownership is unsuitable because the disposal of institutional credit is considerably poor in the state.

According to the ICAR Research Complex for Eastern Region, Bihar, the government of Bihar is trying to get a high-pressure solar pump having a power of 3 Hp, with a warranty of 5 years. Moreover, according to The Economic Times, in November 2021, thermal power plant by SJVN Thermal Pvt Ltd was set up in Buxar district, having a capacity of 660 MW.

3.2.2. Biomass

State Investment Promotion Board (SIPB) has accepted the proposals of various renewable energy projects in the various districts of Bihar. A biomass-based power plant by M/S Poorvanchal Urja Pvt. Ltd., having a capacity of 1 MW has been accepted to install at industrial area in Buxar, having a proposed investment of Rs. 4 crores. Moreover, a biomass plant by M/S PTC Bermaco Green Energy Systems Ltd, has proposed to install biomass of capacity 12 MW in Dumraon-Buxar region. Another biomass company, M/S Dumraon Power Pvt. Ltd., Dumraon, has got the acceptance from SIPB to install 2 MW of captive biomass power plant at Gurahatha Khurd in the district of Buxar. Furthermore, a biomass company, M/S Akash Energy and Infrastructure Pvt. Ltd., proposed to install 7.5 MW of 2 biomass fuel based Thermal power plant at Naun in Dumraon block of Buxar district, which has been accepted by SIPB.

Moreover, rice mill biomass gasifier system has been installed at Thatheri Bazar Road in Dumraon in the district of Buxar by M/s. Swarnkamal Mini Modern Rice Mill having a capacity of 60 KW (Government of India, 2007).

In the district of Buxar, the Sewage Treatment Plants are pretty old, are from around 1885 AD and in poor conditions, if the condition of plants improves or there could be some mechanism to dry the sewage waste, then that could be used in the biomass gasifiers for the generation of biomass energy (Prabhansu, Dwivedi, Karmakar, & Chatterjee, 2020).

Incinerator for biomedical waste has been launched in Buxar, in which an MNRE certified biomass gasification power plant by Ganesh Engineering Works would work in pilot mode for 3 months and then Buxar District Administration would take up the operations. The monitoring would be done by Buxar District Administration and Government of India by Waste to Wealth Mission of the office of the Principal of Scientific Advisor (PIB Delhi, 2021).

3.2.3 Biogas:

The district has no biogas plant installation data at the household level and industrial level. Shri aadarsh gaushala is present in the district, the manure from the gaushala should be utilized in a biogas plant.

3.2.4. Hydropower:

No hydroelectric power plant exists in the district, nor the site has been identified. Surface water is supplied by the rivers Sone and Ganges on a year-round basis. It has the ability to irrigate a large area of agricultural land. Prior to the dissolution of the Zamindari, zamindars used to manage hars and pynes that acted as both irrigation and drainage.

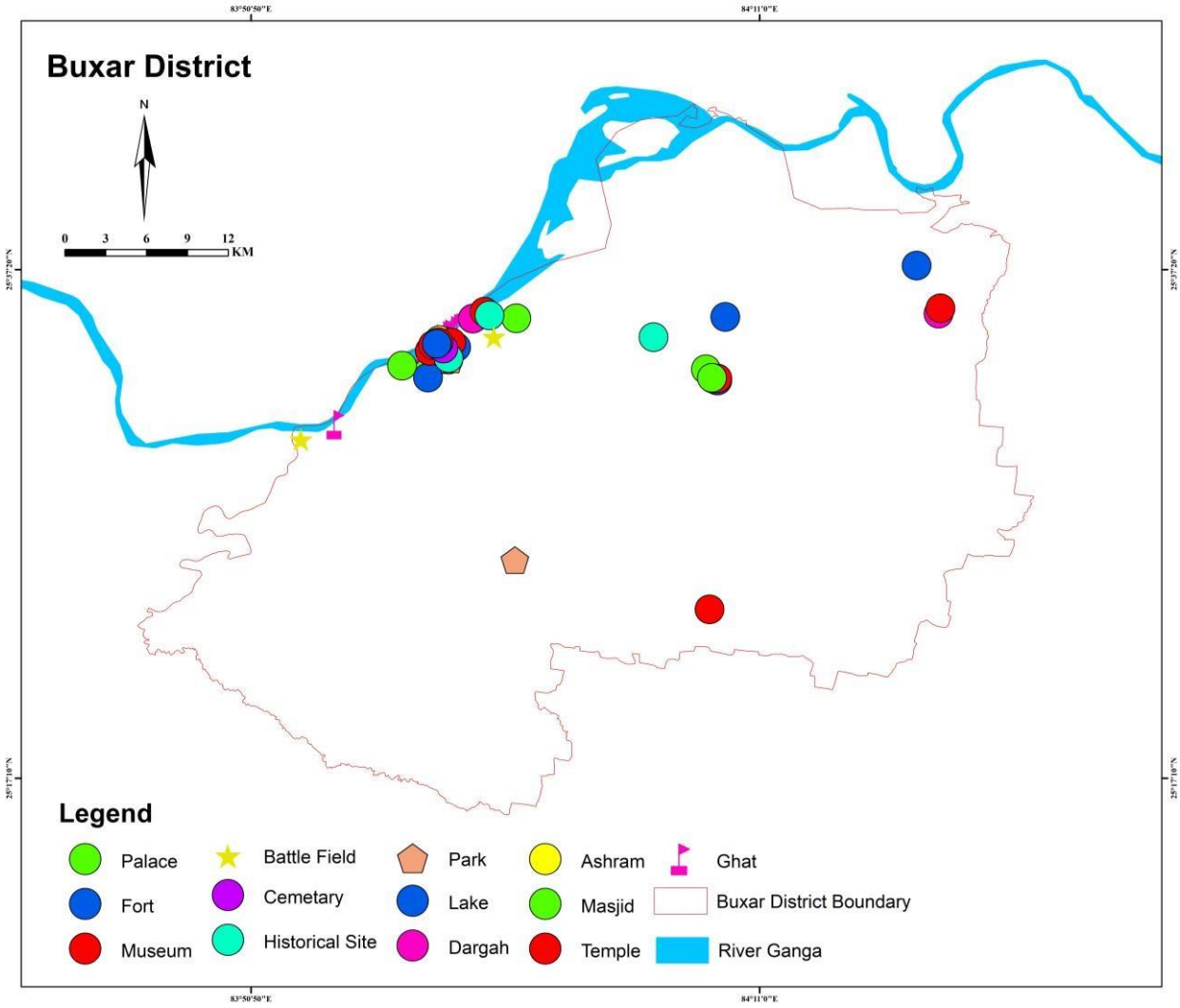
3.3 TOURISM

Buxar is a very important district of the Indian state of Bihar. The district is located on the banks of river Ganga. Buxar is very famous for historic, religious and spiritual places. Thousands of the people visit Buxar every year. The district is a perfect place for those looking to capture the essence of rural India. Because of its strategic location a number of trains crosses the station. Buxar is also linked with a number of major cities of India. The pleasant free flowing Ganga River further add to the charm of this place in Bihar. The district is enriched with ancient and glorious past such as Raja Bhoj Fort, Buxar Fort, Katkauli Ka Maidan, Ramrekha Ghat, Tadka Vadh and Siddhashram etc. The place is associated with two very famous wars, one which was fought between Mughal dynastic descendant Humayun and Sher Shah Suri at Chousa in 1539 A.D and the second which was fought in 1764 and is popularly known as Battle of Buxar which was fought between Muslim Mughal Mir Kasim along with Mughal Emperor Shah Alam II and Nawab Shuja Ud Daulah of Oudh (Awadh) against the British Major Hector Monro. Thousands of the people visit Buxar every year. It is also famous for its local fairs. The district has been a witness to many historic evidences. The district is a very significant place for Lord Rama Devotees. A number of epic stories linked with lord Rama has taken place in this very part of Bihar. Traveling to this part can give us insight into the rich cultural heritage of the region that has been preserved since ages. (Ahmed, 2017); (*Buxar History*, n.d.)

Buxar fort displays the glorious past of Buxar. The fort is supposed to be built by king Rudra Deo in 1054 A.D. the fort reminds and gives information on how the royal people used to live and tells us everything about their lifestyle, culture, their likings and dislikes. Ahilya Uddhar is another historic place in Buxar. (*History of Buxar*, n.d.). The famous ashram of Rishi Gautam is located here. The place has a special mention in Ram Chartira Manas for Lord Rama freed ahilya from her curse here. Raja Bhoj Fort is also another important historic monument of the district. Tadka vadh also has a special mention in history, it is a playground for one of the most important events of mythology. It is a long stretch of forest where Lord Rama killed Tadka and freed the residents which were under the threat of demoness Tadka. Siddhashram is also another holy as well as historic place in Buxar. The place was an adobe of Rishi Vishwamitra along with 80000 other saints. Lord Rama along with Laxma killed demons Mareech and Subahu here only. (*History of Buxar*, n.d.)

Though Buxar is not a very good shopping destination. But the place is famous for its good quality leather products specially shoes which are its specialty. The various timber goods and furniture are also worth appreciation. It is also famous for its various varieties of rice and wheat. The Pithora paintings which are the most important handicraft of Buxar is a must buy item also the central jail manufactured items like carpets etc are a good option to look out for. Because of so many places to visit proper planning is necessary to ensure a wise coverage of all of them. Buxar with its rich historical heritage is a must visit destination in Bihar. (*History of Buxar*, n.d.)

- ***Map:2 Tourism Sites of Buxar District***



Source: Prepared by Author

3. ARCHAEOLOGICAL AND HISTORICAL TOURISM

The district of Buxar has famous historical places of Ancient, Medieval and Modern. There are many historic places and epic stories related with the Buxar, some of them of the period of Lord Rama. The devotees of lord Rama visit Buxar in huge numbers every year to feel the presence of Lord Rama. The district is enriched with ancient and glorious past, a mix of historic and spiritual places such as Raja Bhoj Fort, Buxar Fort, Katkauli Ka Maidan, Ramrekha Ghat, Tadka Vadh and Siddhashram etc. The place is associated with two very famous wars, one which was fought between Mughal dynastic descendant Humayun and Sher Shah Suri at Chousa in 1539 A.D and the second which was fought in 1764 and is popularly known as Battle of Buxar which was fought between Muslim Mughal Mir Kasim along with Mughal Emperor Shah Alam II and Nawab Shuja Ud Daulah of Oudh (Awadh) against the British Major Hector Monro. Thus, Buxar with its

rich historical heritage would be a great potential destination in Bihar. (*Buxar History*, n.d.); (*History of Buxar*, n.d.).

★ **Buxar Fort:** This is one of the historic monuments in Buxar. It is situated on the bank of river Ganga on an artificial mound, where the sone canal coming from Dehri falls into the river. It was made by King Rudra Deo in 1054 A.D. The Buxar fort has great importance due to its location imposing the river Ganga and historical battle between the British army and Shuja-ud-Dowlah and Kasim Ali Khan forces took place here on 23rd October 1764. (*Buxar District*, n.d.)

★ **Raja Bhoj Fort:** It is located at Naya Bhojpur, 19 km east of Buxar on NH84. Raja Bhoj Fort was built by Raja Bhoj. It is a famous historical monument in district Buxar. Raja Rudrapratap Narayan Singh built Navratna Garh, also known as Bhojpur Quila or Raja Bhoj Quila in 1633 CE. It is said that there were 52 lanes and 56 doors in the fort. (*Buxar District*, n.d.)

★ **Chausa Battle Field:** It is the famous site of battle fought between Humayun and Sher Shah in 1539 A.D. Humayun had to take a Bhisti's help for crossing the Ganges as Shershah was pursuing him. In recognition of the Bhisti's services Humayun made the Bhisti (the waterman) Emperor for one day and the latter issued leather coins to mark his daylong reign. (*Tourist Places*, n.d.)

★ **The Chausa Hoard:** This place is famous for its Chausa Mangoes. It is known to be the first bronze hoard discovered in Ganga valley. It in all consists of 18 jain bronze. This Hoard consists of Dharmachakra which is supported by Yakshis, supported by Makaras, a Kalpvriksha and 16 teerthankaras of Jains. (*Buxar Tourism*, n.d.)

★ **Sita Ram Upadhaya Museum:** The Museum was made in 1979. It is the house of many archeological pieces, coins, and manuscripts. The terracotta of Mauryan and Shungan dynasty is worth appreciation. (*Buxar Tourism*, n.d.)

★ **Katkauli Ka Maidan:** Situated on the outskirts of Buxar town on the main road to Patna, the historic Battle of Buxar was fought in Katkauli Ka Maidan in 1764. The battle broke out on 22 October 1764 and the site is considered as a signpost in the history of British colonial rule in India. (*Famous Places to Visit in Buxar*, n.d.); (*Tourist Places*, n.d.)

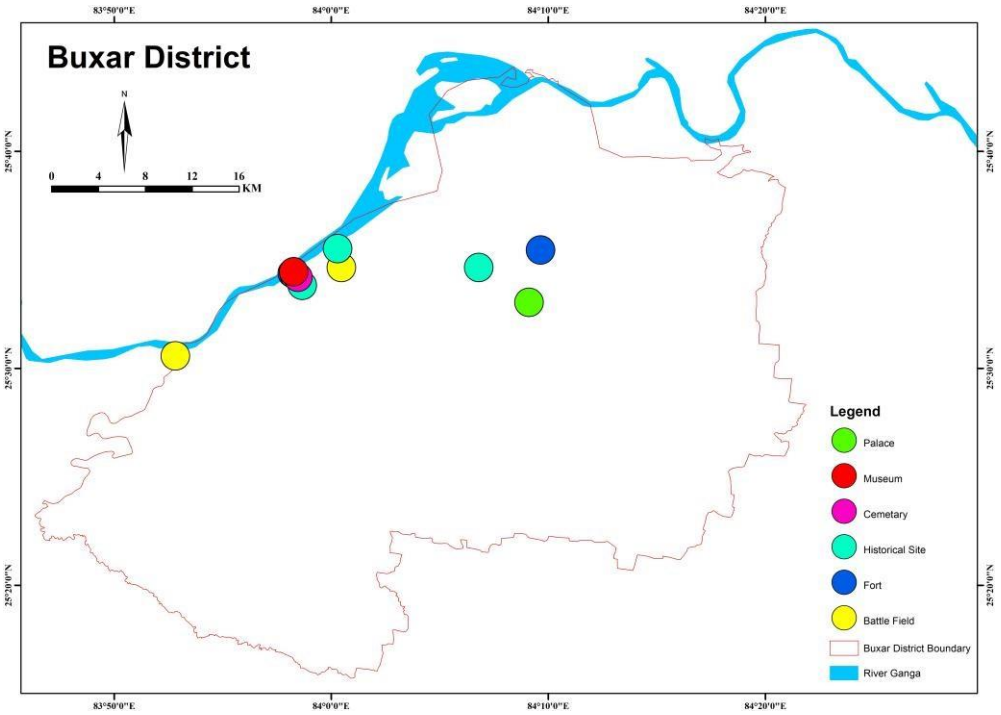
★ **Angrez Kabristan:** It is located in the Kairpurawa locality of Buxar. The Angrez Kabristan (English cemetary) houses the graves of the British soldiers who died during the Battle of Buxar and the 1857 uprising.

★ **Dumraon Raj Palace and Pavilion:** Dumraon town is situated on the main line of the E.R. The town is best known in connection with the Dumraon Raj, to which family it has given its name. A big and well-laid-out flower garden, 1.5 km south-east of the railway station contains a nice tank and the principal palace and pavilion of the Raj both excellent examples of modern Hindu architecture where respectable guests were formerly lodged.

 Vishwamitra Rishi Ashram or Siddha Ashram: It is that the holy place where Rishi Vishwamitra along with 80000 other saints reside. Lord Rama and Laxman killed demons Mareech and Subahu here only.

★ **Ahilya Uddhar Ashram:** It is located at a distance of 3 kms from Buxar. It is famous for the ashram of Rishi Gautam. The place has a significant value in ancient history and has a mention in Ram chritra Manas for Lord Rama freed Devi Ahilya from the curse at this place. (*Buxar Tourism*, n.d.)

- ***Map:3 Archaeological & Historical Tourism Sites of Buxar District***



Source: Prepared by Author

▪ **4. RELIGIOUS TOURISM**

Buxar is an ancient town and a district located just south of the holy river Ganga. The place has a great significance in Hindu religion having connections with Lord Rama. The district of Buxar is mix of historic and religious places related to Hinduism, Islam and Christianity, because of the vicinity to holy River Ganga, the place is also very famous for spiritual places. The district has several religious sites but Brahmeshwar Nath Temple is among the oldest shrines of Lord Shiva in Buxar.

★ **Brahmeshwarnath Temple:** It is situated about 38 km west of Arrah on Arrah-Buxar road. The temple is a revered place in the region, which is also referred to as Baba Brahmeshwarnath Dham There is a very big temple dedicated to God Shiva with a large tank in front.It is said that the Shiva Linga was established by God Brahma. All the temple face east or north but this one faces west. Sri Tulsidas is said to have visited this place and worshipped in this temple on his way to Shri Jagannath. (*Famous Places to Visit in Buxar*, n.d.)

★ **Ahilya Uddhar Temple:** It is located at a distance of 3 kms from Buxar. It is famous for the ashram of Rishi Gautam. The place has a significant value in ancient history and has a mention in Ram chritra Manas for Lord Rama freed Devi Ahilya from the curse at this place. (*Buxar Tourism*, n.d.)

- ★ **Bihariji Temple:** It is a very beautiful temple dedicated to Lord Vishnu, which is situated at Dumraon in Buxar. It is located 15 km from Buxar. The temple was built by King Jaiprakash Singh in the year of 1825. Bihariji temple is one of the most esteemed temples in the world due to its stunning art and historic culture. Many devotees and pilgrims visit this temple over the year. The temple is also dedicated to Lord Krishna and Bharat Ratna Ustad Bismillah Khan used to play Shehnai here with his father. (*Tourist Places*, n.d.)
- ★ **Naulakha Mandir:** It is of the most beautiful temple in Buxar. It is located in charitravan. The Navlakha temple, also known as Charitravan Baikunth. Its structure is highly influenced by the temple architecture of South India. According to folklore, Lord Rama (of the epic Ramayana) completed his studies under sage Vishwamitra in Charitravan. The architecture of this temple is enough to catch the eyes and attention of the visiting tourists. (*Buxar Tourism*, n.d.)
- ★ **Nath Baba Temple:** Nath Baba or Baba Adityanath Temple is situated to the west of the town, on the river side. There are a number of ancient Thakurbari. Shri Adinath Akhara, Shri Nath Ashram, Charitravan popularly known as Shri Nath Baba Mandir was initially constructed by Shri Rama Prasad (Munim Ji) in 1944 (later re-constructed by

Shri Nath Baba ji) is situated just 1.5 km from Buxar railway station in the beautiful surroundings of nature at the confluence of the Ganga and Sone canal. (*Buxar Tourism*, n.d.)

- ★ **Surya Mandir Deoria:** The Sun temple of Deoria village is located in Rajpur block, about 30 km from Buxar district. This Mandir is 1400 year old. It is important because of its historical and religious importance. The womb of the Sun temple is about 20 x 25 feet and has a black smooth stone sun statue installed. The height of this statue, about 1400 years old, is about 3 feet. Small statues of Lord Surya, similar to the Konark temple of Odisha, are also installed here. According to the local people, this temple was built during the time of the great emperor Harshavardhana (606-647 AD), which was renovated many times. Due to the historical and mythological importance as well as famous beliefs, people from all corners of Bihar come here to observe Chhath fast and observe Chhath fast, a four-day festival of sun worship. A Peepal tree is also present in the temple courtyard, it is believed that it has been present here since the establishment of the temple. Apart from Lord Surya, more than a dozen idols of many gods and goddesses including Ganesh, Shankar are installed here. An unknown script is written on the door frame of the entrance of the temple. The Sun Temple of Deoria is the only Sun temple in Buxar district. (Mishra, 2022)
- ★ **Gauri Shankar Mandir and Pond:** Gauri Shankar Temple is a major religious place in Buxar district. This temple is dedicated to Lord Shiva. In the temple we get to see the idols of Lord Shiva and Parvati Mata. The idol of Lord Nandi is also seated in the temple. This temple is very beautiful and famous in Buxar district. Many devotees come here to have darshan of Lord Shiva. There is also a pond in front of the temple. (*Buxar Tourist Places*, n.d.)
- ★ **Raj Rajeshwar Temple:** This temple is situated in Dumraon town of Buxar district. This temple, about 250 years old, was built by the famous tantrik Bhavani Mishra. Even today the priests of the temple are members of his family. This temple is very famous for Tantra Sadhana and every wish of the seekers is fulfilled here. Because of this, Tantriks have deep faith in this temple. (ETVBharat, 2021)

★ **Vishwamitra Rishi Ashram or Siddha Ashram:** It is that the holy place where Rishi Vishwamitra along with 80000 other saints reside. Lord Rama and Laxman killed demons Mareech and Subahu here only. (Buxar Tourism, n.d.). Siddha Ashram was established by Rishi Vishwamitra.

★ **Maharishi Vedashira Ashram and Pond:** The ashram of Vedashira Muni, situated on the side of Buxar railway station road, is years old. It is situated on the bank of a huge lake. It was here that the initial education and training of Ram and Lakshman took place. The famous Tadka demonic was killed here by Lord Rama. According to mythological beliefs, Vedashira Muni, a perfect ascetic of Buxar, was once cursed by the sage Durvasa. As a result, his torso remained that of a human but his head became that of a tiger. After this Vedashira Muni came to be known as Byaghrasar. After him the name of this city was named as Beaghrasar, which was later changed to Buxar. after getting the head of a tiger from a human, Maharishi performed Yagya here along with eighty-eight thousand sages. Later he was told that by taking a bath in the pond situated next to the ashram, he could get rid of this tiger's head. During the Panchkoshi Parikrama Mela, hundreds of people come here to take a bath to attain virtue. (ETVBharat)

★ **Ahilya Uddhar Ashram:** It is located at a distance of 3 kms from Buxar. It is famous for the ashram of Rishi Gautam. The place has a significant value in ancient history and has a mention in Ram chritra Manas for Lord Rama freed Devi Ahilya from the curse at this place. (*Buxar Tourism*, n.d.)

★ **Tadka Vadh:** It is a playground for one of the most important events of mythology. It is a long stretch of forest where Lord Rama killed Tadka and freed the residents which were under the threat of demoness Tadka.

★ **Panchkoshi Parikrama:** It ia a famous religious place which is supposed to be visited once in a year. The five days ritual is performed in this holy place by halting here for 5 days. During the stay everyone is supposed to cook there know very famus litti bhata of Buxar.

★ **Dargah Dariya Shah Baba:** It is located in Charitra Van locality near Shri Nath Baba Mandir, Buxar district. The people of this dargah believe that Baba had come from Medina 450 years ago and gave spiritual education to the local people here. On the occasion of the annual Urs, the display of copper utensils, perfume cases, incense sticks cases, etc. used by Baba is done from the 15th to 17th of the second Islamic month. This dargah is easily accessible for Ziarat as it is located right opposite the fort grounds, one km away from the bus stand and railway station. (Bihartourism, n.d.)

★ **Dargah Shah Rehmatullah or Sai Baba:** This dargah is located in BarhampurA grand fair of Urs Mubarak was held annually for two days at the famous shrine of Shah Rahmatullah Shah alias Sai Baba in Berhampur. In which a large number of people from different parts of Bihar, Jharkhand and UP also participated. Along with Muslims, a large number of Hindus also come to the tomb. People have such belief that by the grace of Sai Baba all their wishes are fulfilled. (Jagran, 2018)

★ **Dargah Dada Todan Khan:** The Dargah Dada Todan Khan is located along Sarimpur-Ahirauli road in Sarimpur village of Buxar district.

★ **Badi Masjid Naya Bazaar:** The Badi Masjid is located in Momin Muhalla, Naya Bazaar of Buxar.

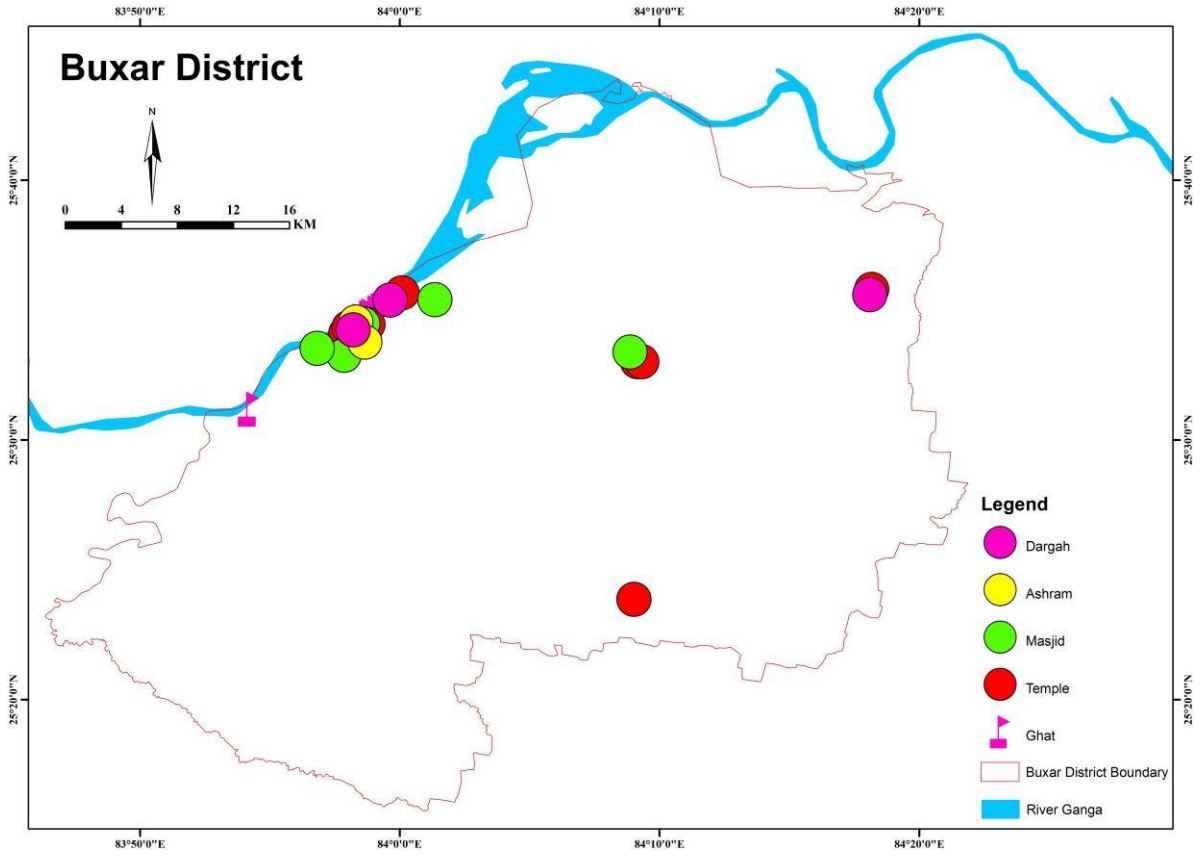
★ **Badi Masjid Thatheri Bazar Civil Line:** The Badi Jama Masjid is located in Thatheri Bazaar of Buxar city. This mosque has three domes with eight minarets and a big courtyard.

★ **Bibiganj Masjid:** Bibiganj Masjid is located behind the Buxar Central Jail. This mosque is mosque is situated along the bank of river Ganga. This mosque has three dome structure.

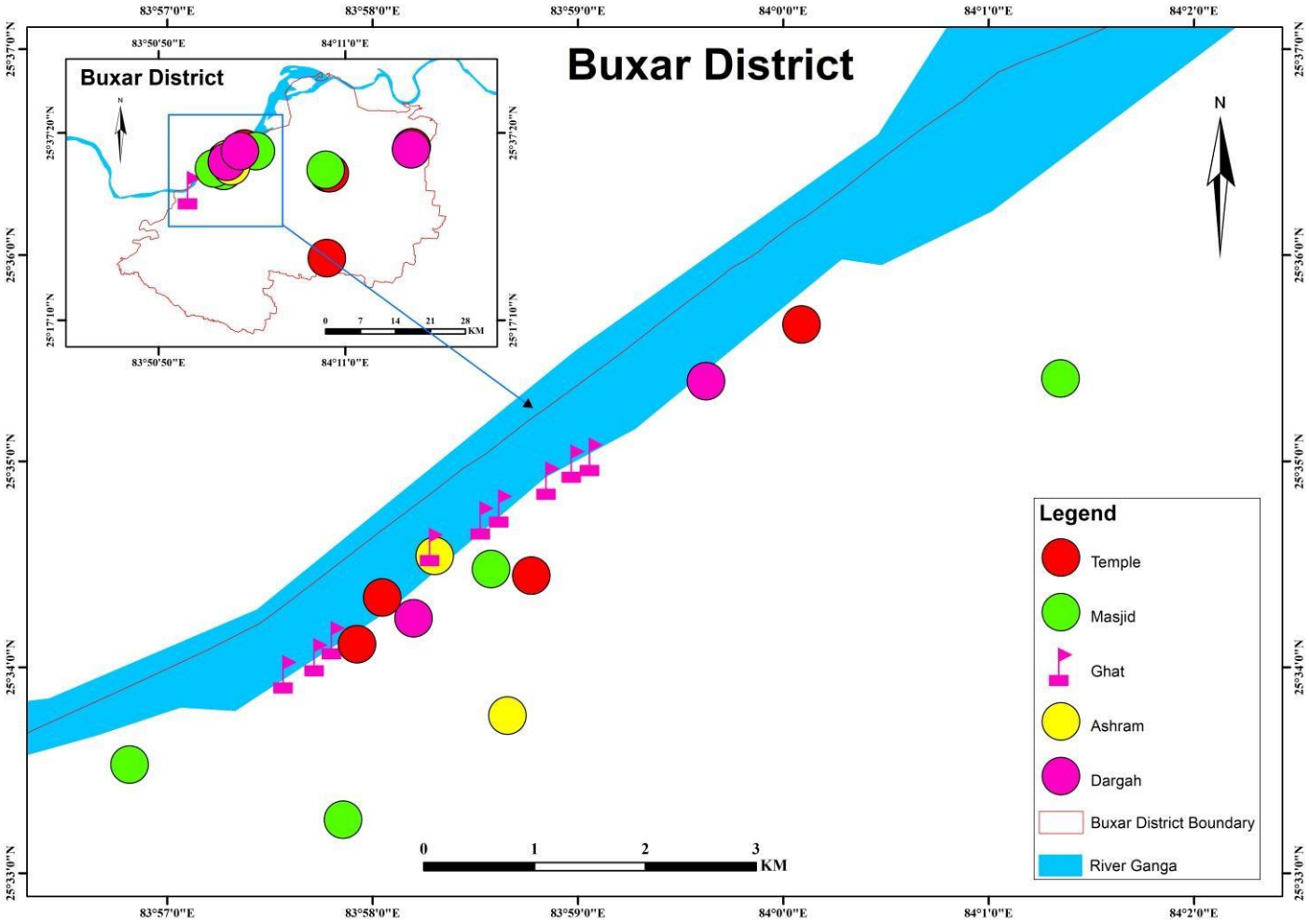
★ **Shahi Masjid Dumraon:** The Shahi Masjid of Dumraon is located near Naya Talab, Dumraon, Buxar. This mosque has a big compound with three dome structure of medieval era.

★ **Churmanpur Masjid:** This mosque is located in Churamanpur village of Buxar district. This mosque has beautiful structure with three dome and eight minarets.

- ***Map:4 Religious & Spiritual Tourism Sites of Buxar District***



- Source: Prepared by Author


Buxar District
Buxar District
N
Legend
Temple
Masjid
Ghat
Ashram
Dargah
Buxar District Boundary
River Ganga
0 1 2 3 KM
0 7 14 21 28 KM
83°57'0"E
83°58'0"E
83°59'0"E
84°0'0"E
84°1'0"E
84°2'0"E
25°37'0"N
25°36'0"N
25°35'0"N
25°34'0"N
25°33'0"N
83°50'50"E
84°11'0"E
25°37'20"N
25°17'10"N

5. ADVENTURE, NATURE AND ECO TOURISM

When it comes to natural beauty there is huge potential to explore in Buxar district. We can enjoy the banks of river Ganga. Taking a stroll on the banks of river Ganga is a memorable experience. Also, the famous Katkauli Ka Maidan, apart from having its historic importance, is a very famous ground where one can be closer to nature. The peaceful surroundings of the ground are very relaxing. The Chausa Hoard is another famous place in Buxar, it is very famous for the Chausa mangoes. The smell of the mangoes in the summer season is hypnotizing and makes a person greed for sweet mangoes. (*Tourist Places*, n.d.). Physiographic and the natural surroundings along the river Ganga in Buxar are part of the natural heritage of Bhojpur. Along with the Lakes, Ponds, Wetland and water bodies both natural and artificially created also form an intrinsic part of the natural heritage of the district. Buxar have a great potential for features like; entertainment complexes such as Pond, Eco tourism, amusement parks, water parks etc. Across the Buxar district we find number of Ponds and Lakes These Ponds are well known for its historical importance & natural beauty and has huge potential for Ecotourism and providing opportunities for tourists to indulge in the activities.

- ★ **Gokul Lake:** This lake is spread from Nauki par (Chakki) to Nainijore (Brahampur), Dumraon, (Buxar) with a large size wetland in dimension of 20 km length & 1 km width. Bhagar oxbow lake is U shaped, hydrological closed lentic type meander of the Ganga river, it is fed by the monsoon runoff and ingress of flood water from the river Dharmawati. The water depth of lake ranges between 1.5 to 3 meters in summer and depth 4 to 6 meters during the Monsoon months. This lake is rich sources of fishes with identified forty four species with example of annual fishes like Mystus spp., Puntius spp., Channa spp., Carps spp., small Macrobrachium spp. and several seasonal fishes, providing livelihood support to more than sixty five household, socio-cultural importance. It also gives protection to many wild mammals like Blackbucks (Antelope cervicapra), swamp deer (Rucervus duvaucelii) and Nilgai (Boselaphus tragocamelus) during summer time. This lake is also wintering ground of the migratory birds such as Heron and Crane. (Lake et al., 2020). This Wetland Lake has a huge potential for ecotourism spot for the tourists.
- ★ **Vyaghra Sar (Kanwaldah Pokhara):** The Vyaghra Sar also known as Kanwaldah Pokhara is a tourist spot now a days. The word Buxar is said to have been derived from

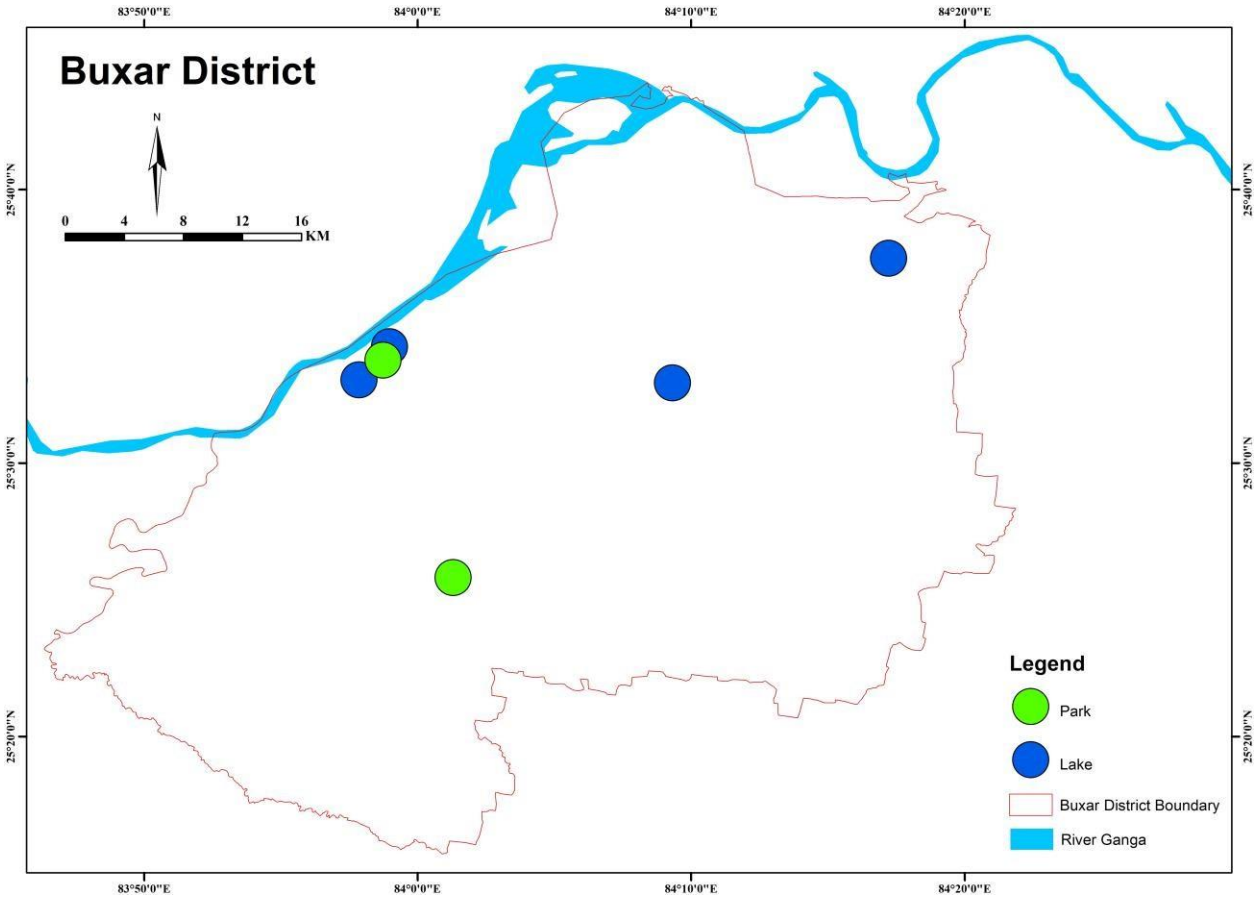
  Vyaghra Sar. The tiger face of Rishi Ved Shira, an outcome of the curse of the sage Rishi Durvasa, was restored after bathing in a holy tank which was later named as Vyaghra Sar. (*Buxar District*, n.d.)

- ★ **Rani Kuan or Queen's Kuwan:** It is situated at left Bank of river Ganga near M.V. College, Buxar. It is an Ancient well known as Rani Kuwa. (*Buxar District*, n.d.). It

is said that it belongs to the contemporary of Raja Bhoj. This well was built in such a way that the bather inside could see everything outside, but nothing could be seen from outside, it was a wonderful specimen of craftsmanship of that time. Earlier the Ganges used to flow at a distance from that well, but in that well, the water from the middle of the Ganges was automatically changed daily, now due to the erosion of the Ganges, the soil has been removed and the base of the well is completely It is empty, yet the well is still standing there.

- ★ **Angani Lake:** Angani Lake is situated in Nuaon village of Buxar district. This lake is associated with Maharishi Uddalak. During Panchkoshi Parikrama, devotees used to bath in Anjani Sarovar. According to the belief, Anjani, the mother of Ram devotee Hanuman lived with her son near Uddalak Ashram located in Nuaon. Where Hanumanji used to play in childhood. Due to the residence of Anjani, the lake present there became famous by the name of Anjani. (Jagran, 2017)
- ★ **Gauri Shankar Mandir Lake:** This Lake is located in the premises of the Gauri Shankar temple at Sohni Patti locality of the Buxar city. Which has great religious significance. Taking a bath in the said lake on the new moon day of Bhado removes all the troubles. It is to be known that during the penance here, when Parvati took a vow not to eat a single leaf. Due to which Parvati got the name Arpana here. At present, Due to lack of cleanliness in this complex, the existence of the pond is on the verge of extinction. (Buxarkhabar, 2019)
- ★ **Mahipal Pokhar Lake: The Mahipal Pokhar is very close to** Gauri Shankar temple, located in Sohni Patti locality of the Buxar city. This lake has huge potential to be developed as water-based tourism spot in the Buxar city.
- ★ **Chhatiya Pokhar Lake:** This lake is situated in Dumraon town of Buxar district. This Pokhar is very famous for the Chhath festival.
- ★ **Unwas Lake Park:** This Lake is located in Unwas village of Itarhi block, Buxar district. This lake has huge potential to be developed as water park or Flower Park.
- ★ **Boating at River Ganga:** Boating in Buxar can be a memorable experience as the district is located on the banks of river Ganga. Apart from water sports and boating, a lot of trade is carried out by using this mode of transport. People enjoy boating in the gushing water of ganga. Apart from boating, there are many other water sports that can be enjoyed in river Ganga. After a long boating experience a person can also enjoy on the banks of the river. (*Buxar Tourism*, n.d.)
- ★ **Shaheed Smarak:** Shaheed Smarak is one of the main places to visit in Buxar. Shaheed Smarak is located near the railway station in Buxar district. Here you get to see the Shaheed Smarak, which is dedicated to the heroes who laid down their lives to protect our country. Here you get to see a big lake. In the middle of the lake, there is a martyr memorial. There is an island in the middle of the lake. There is a bridge to go to this island. This lake is also known as Kamaldah Pokhar Park. (Buxar Tourist Places, n.d.)

- ***Map:5 Adventure, Nature and Eco Tourism Sites of Buxar District***



Source: Prepared by Author

6. GHAT & RIVER TOURISM

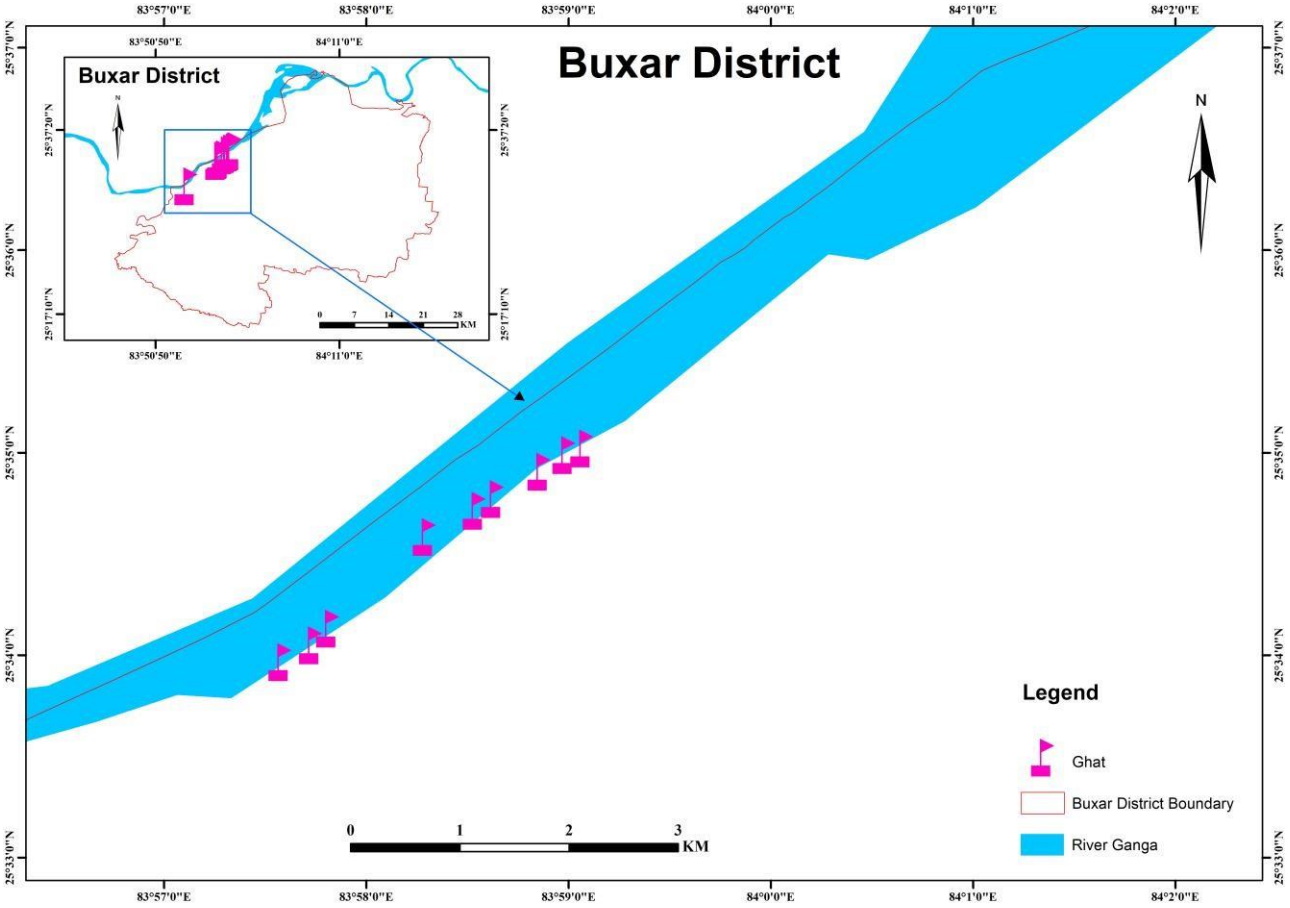
There are many tourist and sightseeing destinations in Buxar. Among them are Ganga Ghats, Natural Beauty and Enjoy Boating at River Ganga. The best way to start once day is to take a stroll on the banks of river ganga and then take a bath in Ram Rekha Ghat and then bow to the almighty.

Every city has some specialty that is engraved in the heart of it. A visit to Buxar cannot be complete without a visit to the ghats running along river Ganges. The ghats have been a source of inspiration for artists, film-makers, photographers, writers and

musicians for centuries. As a dip in Ganga is considered holy in the Hindu religion, most of the ghats are dedicated to religious rituals. One of the more visually spectacular ghats is the Ram Rekha Ghat, Mahadev Ghat, Gola Ghat etc. Ghats in Buxar are riverfront steps leading to the banks of the river Ganges. Most of the ghats are bathing, Puja ceremony ghats and cremation site. Earlier Morning boat ride on the Ganges across the ghats is a popular visitor's attraction.

- ★ **Ram Rekha Ghat:** It is situated on River Ganga in Buxar. According to the legends, Lord Ramchandra and his younger brother Laxman with their teacher Rishi Vishwamitra had crossed the Ganges here on their way to Janakpur where he later took part in the Sita Swayamvara. So, this place has become an important pilgrimage to the Hindus. Ram Rekha Ghat: It is a place of high religious importance for the reason that it was once crossed by Lord Rama, and hence its name is dedicated to lord Rama. There is an ancient legend about this ghat. Here we get to see the ancient temple of Shankar ji. (*Buxar Tourist Places*, n.d.)
- ★ **Mahadeva Ghat:** Mahadeva Ghat is a major Ghat located in Buxar. This ghat is located at Chausa in Buxar. This ghat is very beautiful. Here we also get to see the ashram of Rishi Chyawan. Here tourist can come and take a bath and spend your time in peace. There are stairs on the side of the ghat, where we can sit and watch the beautiful view of this ghat. Here tourist get to see many more temples. (*Buxar Tourist Places*, n.d.)
- ★ **Gola Ghat:** Gola ghat is located near old Kachari. This ghat is between Gaytri Ghat Siddhanath and Sati ghat.
- ★ **Sati Ghat:** Sati ghat is located near old Kachari. This ghat is between Gola Ghat and Ram Rekha ghat.
- ★ **Siddhanth Ghat:** Siddhanath ghat is located between Raj ghat and Gola ghat behind Sub Jail near Civil Lines Club of Buxar district.
- ★ **Raj Ghat:** The Raj ghat of Buxar is located between the Ambedkar ghat and Siddhanath ghat along siddhanath ghat Mathiya Marg road Buxar.
- ★ **Ambedkar Ghat:** The Ambedkar ghat is located next to the Raj ghat along Mathiya road, Buxar.
- ★ **Buxar Ghat:** The Buxar ghat is located between Fua ghat of Charitravan and Gaytri ghat of teacher's colony. This ghat is generally used for cremation of bodies.
- ★ **Fua Ghat Charitravan**: The Fua ghat is located near Naulakha Mandir of Buxar. Around this ghat we find number of temples including Jeeyar Swami Mutt, Panchmukhi Shiv Mandir etc.
- ★ **Gaytri Ghat:** The Gaytri ghat is located near teacher's colony of Charitravan, next to the Shamshan ghat of Buxar.

- ***Map:6 Adventure, Nature and Eco Tourism Sites of Buxar District***



Source: Prepared by Author

7. VILLAGE TOURISM

This Village culture of Buxar is most prominent among its heritage. It is believed that this circumambulation was first started by Vishwamitra Muni along with Rama. In which five villages spread over five kos were circumambulated.

★ **Ahirauli Village:** Situated about 5-kms northeast of Buxar, this village has a temple of Devi Ahilya. The first stop of Shri Ram was Ahiroli, which was also the ashram of Gautam Rishi and due to his curse, Goddess Ahalya Bai turned into a stone there, Parbhu Shri Ram touched Goddess Ahalya Bai with his feet again. She gave the form of a stone to a woman, then Lord Shri Ram had eaten puri Puva there, even today, after worshiping Goddess Ahalya there, she takes the poova dish as prasad, even

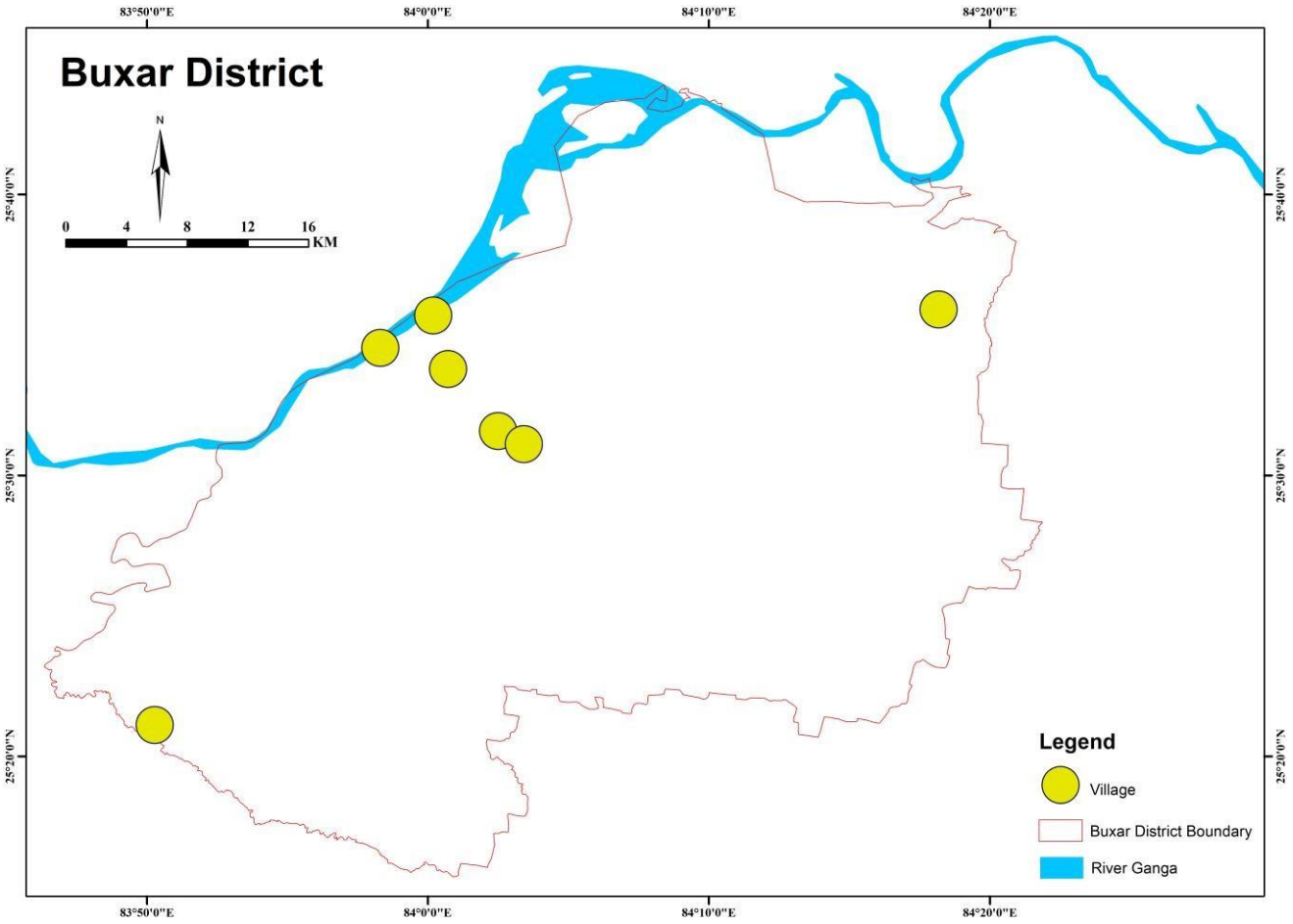
today you can find the temple of Goddess Ahalya there. It will go, women gather in the temple of the mother.

- ★ **Nadao Village:** The second stop is Nadaon village at a distance of 1 kos i.e. 3 less from Ahiroli, which according to legend used to be the ashram of Narad Rishi, where Lord Shri Ram had taken food of Sattu and Radish, there Narbadeshwar Shiva temple is also located. . Here the devotees take Sattu as food by bowing their heads in the Shiva temple near the nearby lake.
- ★ **Bhabhuvar Village:** The third stop was Bhabhuvar, where Shri Ram ji had taken the food of curd, Bhabhuvar used to be the ashram of Bhargava Rishi. Where it is said that here Lakshman ji descended the Patal Ganga to perform Jalabhishek to Bholenath near the ashram of Rishi Bhargava, today the name of that lake is Bhargava Sarovar, and Bhole Baba is called Bhargeshwar Mahadev Seeing the plight of the lake, the mind becomes inferior.
- ★ **Badka Nuvao Village:** The fourth stop was Badka Nuvao, which was the ashram of Udayalak Rishi, where Lord Shri Ram had eaten Khichdi Chokha. (Roshan, 2020)
- ★ **Buxar Village:** The last stop was Siddhashram i.e. Buxar which was the ashram of Rishi Vishwamitra where Lord Shri Ram had killed Tadka, here Lord Shri Ram had consumed Litti Chokha. By coming here, the fair takes its beautiful form, people from far and wide come here, the whole Charitarvan Fort Maidan Nath Ghat, Ramrekha Ghat is flooded with people, if you come here empty handed, you will get all the ingredients for making Litti Chokha. If you have come from far away, then on that day you can eat litti from anyone by asking for sweets, people will feed you like this with love. (Roshan, 2020)
- ★ **Kharika Village:** The village, which is situated about 6-kms southwest of Rajpur, is noted for the fierce battle between the forces of Babu Kunwar Singh and the British forces in 1857.
- ★ **Brahampur Village:** The village contains a famous ancient Brahmeshwar Temple that existed also in the times of invasion of Muhammad Ghajanwi, who destroyed it. Raja

  Man Singh built the temple during the reign of Mugal Emperor Akbar. In this village, large cattle fair is held in the month of Feb-March. It is known for its temple of Shiva, its religious practices, and its cattle fair. People visit Brahmapur to perform religious rituals in the temple of Shiva. Brahmapur is a center of religious tourism. Many people from the Arrah (Bhojpur) District, Buxar district, Ballia District and Chhapra District come to worship Lord Shiva or to get married in the temple. The people of Brahmapur organize a cattle fair, where farmers come from Bihar and Uttar Pradesh to purchase cattle for breeding and herding. The Falguni cattle fair is very famous in Bihar and Uttar Pradesh and takes place in the Hindu month of Falgun. Horses, elephants and camels are also bought and sold at the fair. October to June is the best time for tours to Brahmapur. However, tours to Brahmapur during the festivals

celebrated in the district can also be arranged. The main festivals of the region include Car Festival, Dusshera, Taratarini Festival, Thakurani Yatra, Buda and Khambeshwari Yatra.

- ***Map:7 Village Tourism Sites of Buxar District***



Source: Prepared by Author

8. CULTURE & ARTS TOURISM

The district comes alive during the festival of Chatth Puja (held twice in the months of March and November) when several activities are organized to celebrate the power of the Sun God. Established in the year 1979, the museum of Sita Ram Upadhyaya, named after a resident of Buxar, has vast and valuable collections of rare artifacts, unique coins of antiquity, and well-preserved stonework and sculptures. The district

of Buxar is perhaps best known for the historical battle between Mir Qasim and the British. Katkauli-kaMaidan (the grounds of Katkauli) is the exact spot where this battle took place in 1764. The Katkauli grounds are still remarkably preserved for their historical importance.

Among Buxar's most famous tourist spots, Katkauli witnessed the forces of Shuja-UdDaulah (Nawab of Awadh), Shah Alam II (Mughal Emperor) and Mir Qasim (Nawab of Bengal) ultimately defeat the British East India Company.

Buxar has never been untouched by the pages of mythology and history, its explanation is also found in the Ramayana period, whether it is Vishwamitra Ashram or Tadka Nagari or Pancharishi's ashram, the land of Buxar is very famous for mythological stories. On the 18th day of solemn month of Paus, corresponding approximately to the 14th of January of each year, an undoubtedly biggest fair is held here on Makar Sankranti. On this day the sun enters the sidereal of zodiac. This mela is also popularly known as Khichari mela. Roughly 40 to 50 thousand men, women and children, assemble in the town, camp there at several places and bathe in the Ganga at the famous Ramrekha Ghat.

The bathing in the Ganges usually continues for three days.

★ **Fair Tourism:**

The Panchkoshi Parikrama (circumambulation) is a pilgrimage in which people walk through five villages around Buxar in five days. During the pilgrimage, they eat litti chokha. On the last day, litti chokha is cooked all over Buxar, especially in Charitravan. (OutlookIndia, n.d.)

The Sita Ram Vivah Mahotsav (popularly known as Siya Piya Milan) is a marriage celebration held in the month of November. Thousands of saints and pilgrims from across the country descend upon the Sita Ram Vivah ashram in the Naya Bazar locality of Buxar to celebrate the occasion. (OutlookIndia, n.d.)

★ **Shopping Tourism:**

Buxar is famous for its good quality leather products specially shoes which are its specialty. It is also famous for its various varieties of rice and wheat. Some of the main shopping destinations in Buxar are Nai Bazaar, Piparpati Road, Thatheri Bazaar and Purani Chowk.

★ **Art and Painting:** The Pithora paintings which are the most important handicraft of Buxar. The various timber goods and furniture are also worth appreciation.

★ **Art and Literature:** Buxar is the holy land where the world's first philosopher, scientist, seer and founder of the universe, Maharishi Vishwamitra had built his

ashram. Maharishi Vishwamitra was not only the first person to take revolutionary steps against the prevailing system of India, Siddhashram established by him was also the first educational institution in the world. Due to the influence of his tenacity, Lord Shri Ram-Laxman got special knowledge of weapons policy, religion policy, action policy and political science. Where both the brothers together destroyed the demonic instinct and established Ram Rajya as a record of human ideals. (Jagran, 2015)

★ **Village Culture Tourism:** The village culture of Buxar is most prominent among its heritage. It is believed that this circumambulation was first started by Vishwamitra Muni along with Rama. In which five villages spread over five kos were circumambulated. (Bhaskar, 2018)

3.4. WELANDS:

The wetlands create a unique ecosystem that supports many species simultaneously like aquatic, terrestrial, and human beings. Local stakeholders directly or indirectly depend on the wetland for their income and small-scale business. The district is the land of many famous saints from epic period. The data collected and analyzed shows the region's production and possible product that can be derived from the raw product. The list of sources and the possible products are mentioned below:

- Paddy, wheat, maize, barley, gram, peas are the main crops grown in the district
- Khesari, oilseeds, spices, fruits, and sugar cane are grown in small quantities in the district.

4. ACTION PLAN DEVELOPMENT

4.1 FORESTRY

The forests in the district cover only 0.35% of the total area. Therefore in order to increase the tree cover and greenery in the district the large chunks of cultivable waste lands and fallow lands can be planted under the National Afforestation Mission (NAP). NAP is being implemented for afforestation of degraded forest lands. The overall objective of the National Afforestation Programme (NAP) scheme is ecological restoration of degraded forests and to develop the forest resources with peoples' participation, with focus on improvement in livelihoods of the forest-fringe communities, especially the poor. Followed by the plantation should be proper monitoring of these and the people should be encouraged and educated of how to take care of the saplings planted. Monitoring can be done by the administration using technologies such as geotagging, GPS etc.

The district should practice agroforestry and people should be made aware in accordance with the State's Agroforestry Policy, 2018. It is recommended that for agro-silviculture in non-flood affected

areas Poplar, Shisham, Gamhar, Melia, Chah, Eucalyptus, Kadam, Semal, Ulmus, Sagwan, Toon, Bamboo, Casurina etc. and in the flood affected areas Eucaluptus, Kadam, Semal, Chah, Arjun, Salix, Jamun etc. can be grown. If farmers want to take up agro-horticulture then Mango, Litchi, Jamun, Kathal, Barhar, Guava, Bel, Ber etc. is recommended. Apart from major fruit crops like Mango, Guava, Litchi, Banana etc., Makhana, Pineapple, Betelvine can also be included under agroforestry systems. Medicinal plants like Kalmegh, Aswagandha, Sarpgandh, Satawar, Lemon grass, Safedmusli etc. can be grown along with tree component. The aromatic plants like Japanese Mint, Lemongrass, Pamaroja, citronella etc. may also be included.

One thing which is very important is making people aware about the need of forests and trees. Educating them about the policies and how planting trees can be beneficial in both the ways, i.e. environmentally as well as economically.

4.1.1 Biodiversity –

According to the state's forest department, Bihar is going to undertake a conservation push for endangered blackbucks in Buxar district. For this reason, a 12-acre antelope rescue center has been proposed in the district.

4.2 TOURISM

- ✓ Buxar district is one of the thirty-eight districts of Bihar. The etymology of word Buxar is "Vyaghra Sar" which in Sanskrit means tiger and pond respectively. Located on the holy river Ganga, Buxar is famous for its Historical, Religious and Spiritual significance. The district has been a witness to many historic evidences. Buxar finds reference in Ramayana, Brahma Purana, Varah Purana, Ram Charitra Manas and other ancient literature. During the pre-historic period, Buxar was the abode of eminent saints and the battlefield of Gods and demons while in modern history it was a combat zone against foreign invasions. Buxar has many historical sites and is famous as a town of temples. Archaeological findings at Buxar have established a link of Buxar with ancient civilizations of Mohenjo-Daro and Harappa. The historic battle of Buxar was fought here in 1764. It heralded the establishment of the rule of the East India Company in the eastern part of the Indian subcontinent. (Mitra, n.d.); (*Buxar History*, n.d.)
- ✓ Buxar with its rich historical heritage would be a great potential destination in Bihar. Buxar is also linked with several major cities of India. Thousands of the people visit Buxar every year. The district located on the banks of river Ganga is very famous for historic and spiritual places that includes Raja Bhoj Fort and Buxar Fort, Katkauli Ka Maidan, Ramrekha Ghat, Tadka Vadh and Siddhashram etc. (*About District*, n.d.); (*Buxar History*, n.d.). But, the tourism potential of the state for generating much needed income & employment remains underutilized. Though the state has high tourism potential, owning to lack of infrastructure facilities such as, transport,

communication facilities, accommodation and other tourism supported facilities, most part of it remains unexplored by the tourist.

- **SWOT ANALYSIS**

  - **STRENGHT**

★ Buxar's location offered attraction such as River Ganga that could be used for water supply and waste disposal, and in fertile river valleys with extensive food and animal resources.

★ The presence of Wetlands, Ponds and Gokul Lake and historical villages make the district highly potential for the development of Eco tourism.

★ There are various ancient religious spots, historical sites around the district.

★ Cohesive Community and residents who are passionate and involved.

★ Financial institutions / willingness to invest in the district.

★ Presence of arts / culture venues and historical structures.

★ Good transport connectivity.

- **WEAKNESSS**

★ Lack of security & safety measures for tourists which affects the perception & tourism potential of the district and Lack of Tourism infrastructure such as Tourist Information Centres, trasportation facilities, public conveniences such as toilets, refreshment centers etc.

★ Lack of tourist information centre, thus an inadequate infrastructure facility for the tourists.

★ Lack of desire of skilled work force to stay in the district, lack of accountability of service delivery, Lack of Leaders and Entrepreneurs in the community and Lack of developable land in and around the district.

★ No maintenance of natural heritage leading to loss of valuable recreational space that can act as tourist destinations.

★ The district has no airport with the nearest being in Patna.

★ District are facing problem of Poor drainage system and sewerage system, Solid waste collection transportation and disposal, Pollution, connectivity, open space and parks.

★ Lack of recreation, sports facilities, moreover large area of the district has poor building quality and unhygienic living conditions.

★ Limited technical and administrative capability of Municipal Authorities.

- **OPPORTUNITY**

★ Ongoing, committed, and proposed development projects.

★ Potential for growth in Religious, Historical, Eco tourism and Ghat Tourism.

★ A wide scope for river front development along river Ganga.

★ Encourage Public – Private partnership for provision of infrastructure services.

★ Good infrastructure in terms of connectivity and hospitality will be able to promote the district as viable option for in-transit tourists.

★ Potential for growth in arts / culture like Fairs, Festivals, Arts and Literature.

- **THREAT**

★ Being location in isolation in terms of development, the district is facing challenges, which directly and indirectly curb the growth of tourism. The existing infrastructure, safety & Security, local awareness and others are the major hindrance for the development of the tourism in the district.

★ Across the district the rise of crime including, robbery, snatching, drugs, and murder etc.

★ Political stability, Naxalism and Corruption, the district is surrounded by Naxal affected areas.

★ Lack of governmental response towards tourism infrastructure such as tourism centre, tourism promotion and tourism accommodation.

★ Buxar comes under the zone of high Flood prone. Poor Infrastructure facilities for tourists in Buxar.

★ There are chances of epidemic due to lack of sewage and solid waste disposal system for the core city area particularly in slums. These increase losses during disasters. Thus, a disaster mitigation plan should be prepared for the city and whole district.

★ Too much dependence on single economic sector.

★ Lack of desire of skilled work force to stay in the district.

★ Inadequate infrastructure for sorting, grading, packing, etc., in addition to the high cost of raw material (at processor's level.

- **PROJECT DEVELOPMENT**

★ Project on development of tourist information centres at all important places of Buxar district.

★ In order to maximize the use of the Ganga river flowing through the district, Ganga riverfront development would be a great potential for Boating, Public Promenades, Religious Facilities, Cruise etc, making it the vibrant heart of the urban fabric.

★ Landscaping and flood protection along Ganga River front through Meditaion park and Millenium Park.

★ Development of Parks and playgrounds, development of Recreational Facilities of higher order Strengthen the existing Tourism spots and infrastructure, Create the new tourism attraction points and recreational centers.

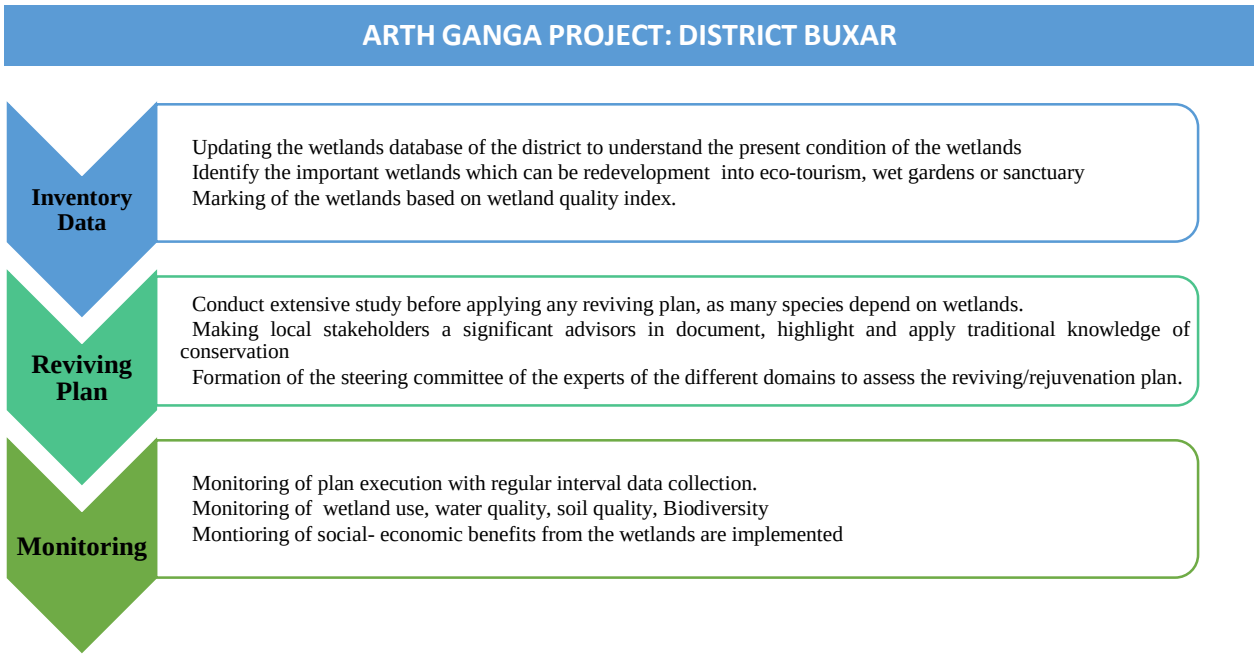
★ Till now, no religious and historical tourism circuit are found in the Buxar district. Therefore, new projects to diversify the tourist inflow apart from the pilgrimage/ religious tourism, emphasis on other tourism places for promotion of more tourism activities like, arts & crafts, literature, fair & festivals, waterfront development etc.

★ The presence of Wetlands, Ponds and Gokul Lake and historical villages make the district highly potential for the development of Eco tourism, therefore project should be made for Eco tourism and village tourism.

★ Development of combined projects involving Tourism department/ Ministry, Disaster management department and Environment, forest, and climate change section/Ministry. Stakeholder consultation & Participatory management and involvement of Municipality, and local communities from Ganga villages and tour operators to build ecotourism options and choosing adventure and religious tourism sites.

4.3 WETLANDS

Some of the known wetlands in the district need to be taken care and action on different fronts must be taken. The action plan below gives a glimpse of the action and development required to protect, conserve, and rejuvenate the wetlands existing and extinct.



4.4. ENERGY

4.4.1. Solar

According to the CEEW report on Buxar district, the farmers are resilient towards the advancing technologies, however there has been has gap with the distribution of resources. Even though PM-KUSUM scheme is in place in the country, but its potential has not yet achieved in most of the parts of the country. Buxar is an agriculture driven district and government through PM-KUSUM scheme can solarize the district.

Moreover, the people in the district are still dependent upon the traditional source of lightning method through kerosene, which is both polluting and not a sustainable form of energy. The government should also incentivize people to install solar panels to meet their energy requirements.

According to the Input Survey 2016-17, the district has a net irrigated area of 45777 hectares and net unirrigated sown area of 17365 hectares. Here, individual solar pumps under component B of PM-KUSUM scheme can be implemented in order to provide the unirrigated land the required irrigation through solar pumps for advancing the crop production in the future, because if irrigation improves then the crop productivity will also improve in the district. Furthermore, according to the Agriculture Contingency Plan for Buxar district 2013, the uncultivable and barren land in the district has an area of 2270 hectares, at which ground mounted solar panels can be installed under the component A of PM-KUSUM scheme.

PROJECTION AND MONITORING MATRIX

Firstly, there should be awareness among the farmers regarding the solar energy policies in the district, especially in the rural areas and the harmful effects to the environment and to the health of the people by using kerosene for meeting lightning needs.

Secondly, component A and component B of PM-KUSUM scheme should be encouraged in the district, as the district has a huge potential and the farmers are also accommodating towards newer technologies.

Thirdly, the farmers are not financially well-off, so government and financial institutions should provide credit at reasonable rates to successfully install component A and component B of the PM-KUSUM scheme.

Fourthly, the solar energy should be utilized the district through rooftop solar PV at the government buildings, schools, hospitals, etc. in the urban areas.

Through these solar advancements in the district, the power supply in the district will considerably improve and it will also help in achieving the solar target of the state.

4.4.2. Biomass

The district has a lot of biomass energy potential. There have been few biomass projects going on in the district but they are focused in particular blocks or areas, like some projects have been focused in Dumraon block. There is a need that other blocks should also utilise biomass energy, by installing biomass plants. There is a need that government should spread awareness about the modern biomass technology and how it can benefit the people. There is also a need to have accessibility to credit and subsidies from the financial institutions and the government. Moreover, the transport and roadways facilities need to be improved in the rural areas, which hamper the transportation of biomass raw materials. There is also a need to enhance the skills of the rural people to be able to run and maintain the biomass plants, which would also lead to an increase in the employment level in the district, leading to an overall growth of the economy of the district.

PROJECTION AND MONITORING

Firstly, it is essential that awareness of biomass plants and its uses should be made clear to the rural people.

Secondly, financial assistance and availability of credit should be made available to all the biomass plants owners.

Thirdly, skills of rural people need to be increased so that they can help in the maintenance of the biomass plants.

Lastly, the logistics of biomass raw materials should be improved.

Through the installation of biomass energy , the district would encounter an increase in the energy generation and an overall development of the district will happen.

4.4.3. Biogas:

The district has a huge potential to generate biogas from agricultural and livestock waste. However, no biogas plants are present in the district or city. The government should conduct a program to encourage or educate people to install at the household level; all the incentives or subsidy schemes should be told to local people and make them aware of the benefit of installing the biogas plant.

4.4.4. Hydropower:

Small hydropower plants sites should be investigated in the district. The local population benefits from the building of these facilities in the form of increased job opportunities and the fulfilment of their electricity needs. As a result, building small hydropower projects is crucial to meeting the state's energy needs and promoting economic development.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

- Groundwater shares over 49% of NIA in the district. The Central Groundwater Board 2020 reports that out of 14 blocks of Buxar, four blocks fall under the semi-critical category, and the rest fall under the safe category. Drip and Sprinkler irrigation systems should be encouraged, especially for vegetable and fruit cultivation. It will help to increase the water use efficiency and productivity of crops.

- As per the Central Groundwater Board 2013, the groundwater recharge of the district was 80448.26 ham, whereas the annual groundwater withdrawal (for irrigation, domestic, and industrial water supply purposes) was 33499.85 ham. The stage of groundwater development was 45.87%, which should be increased under Jal Shakti Abhiyan (2019) to improve water availability, including groundwater conditions in water-stressed blocks.

- The share of barren and uncultivable land remained constant (1.32%) over the years. The fallow land decreased from 4.61% in 2011-12 to 2.04% in 2018-19. Moreover, the NSA increased from 82.69% in 2011-12 to 85.09% in 2018-19. It is a good sign for the district economy, as a decrease in fallow land implies an increase in NSA, which will lead to an increase in the total output in the district. However, leaving some amount of land fallow is essential, which helps maintain soil quality in the long run.

- Food grains comprised 90.52% of GCA, focusing more on the cultivation of staple crops like Rice, Wheat, and lentils. However, this monoculture (Rice-Wheat cropping system) needs to be changed toward high-value cash crops such as horticulture. The government can promote micro and small units for horticulture product processing.

- Per hectare yield of total cereals slightly decreased from 29.68 qtls in 2013-14 to 29.03 qtls in 2019-20. Moreover, the yield of total pulses also decreased from 13.75 qtls in 2013-14 to 7.90 qtls in 2019-20. Thus, most of the crop yields decelerated in the latter years of the study. Fall in yield can be due to several reasons like temperature fluctuations, non-availability of hybrid seeds, variations in seasonal rainfall, etc.

- The livestock subsector witnessed significant growth during the study period. Female cattle increased by 80.53% in 2019 compared to that in 2003. Thus, dairy farming needs to be promoted by creating an efficient marketing network, adopting cross-breed, and setting up dairy and dairy-based processing units. Goats, Sheep, and poultry farming can be promoted to improve local livelihood.

- Buxar comprised 1.73% of the total fish production of Bihar in 2011-12. However, its share decreased to 1.13% in 2017-18. Hence, it is important to increase its share in total fish production in the state as the aquaculture subsector has a vast scope for raising income and livelihood. It can be done through the effective implementation of PM Matsya Yojana.

- Buxar has 89 organic groups in five development blocks, divided into Simri (39), Buxar (20), Chakki (13), Chausa (14) and Rajpur (3). However, these groups are formulated under the scheme of Namami Gange only, and very few groups are present under the scheme of PKVY. Hence, the government must encourage groups to be added under PKVY. Organic/natural/zero-budget farming can be an economically viable option if the government builds strong marketing networks linking farmers, processors, and distributors with the easy certification process and minimizes farmers' risk by protecting their farm income through payments of ecosystem services. A long-term system of incentives and regulation needs to be evolved to retain the existing farmers and motivate others to move toward a sustainable farming system.

- Training to prepare the Vermicomposting and Green manuring should be organized for the farmers. Moreover, salt-tolerant crop varieties and gypsum application should be promoted in the salt-affected areas.

- About 91.07% of farmers in the district are small and marginal, with landholdings less than two hectares. They can contribute substantially to livestock, vegetables, and other labour-intensive allied farm activities. There is a need for the adoption of a group farming model by these farmers to get the benefit of economies of scale in production, transport, and marketing and to improve their bargaining power.

- Buxar is the rice bowl of Bihar state; the district needs to establish high-quality rice mills, packaging, and export facilities to other states.

- The highly demanded Chausa mango cultivation production needs to provide storage and export facilities.

- Beekeeping has potential in the district, and processing and packaging units should be promoted.

- Micro-irrigation (Drip and sprinkler) can be promoted for high-value vegetable crops for higher water efficiency. Resource conservation technologies such as zero-till for Wheat, lentil, chickpea, mustard, and mulching must be practiced.

- The district suffered from frequent drought; farmers should follow the crop advisory and also need to be practiced drought-tolerant varieties like Naveen, Suskh Samrat, and Sahbhagidhan for rice cultivation.

- Mushroom cultivators are gaining in numbers in the district, and marketing access and processing units (dry mushroom packaging) have a scope to grow up.

- Measures should be taken to overcome the arsenic problem.
- Uncontrolled use of chemical fertilizers should be stopped, and farmers should be trained for the Bio-pesticides, namely Trichoderma, neem oil, Bt, NPV, to protect against disease and insect pests. More farmers should be trained to apply bio-fertilizer application technologies (Rhizobium, PSB, BGA, Azatobactor) in crops such as Rice, chickpea, lentil, and Wheat and its role.

- High-value vegetable crops, off-season vegetables, seedling preparation and various orchids can be cultivated in low-cost poly houses and shed-net houses.

- The district has scope for medicinal crops such as mentha and saved musli (Chlorophytum borivilianum) cultivation.

- Inter-culture (turmeric) in the fruit orchards is highly recommended for the more income generation.

- Poultry farming amongst the rural youth for employment, generational and nutritional security should be encouraged.

5.2 FORESTRY

The district hardly has any large forest area, hence its people should be made aware of the importance of forests. The large chunks of fallow land should be planted with trees under the National Forest Mission and properly monitored and taken care. Agro-forestry is highly recommended for the district. Administration should act in accordance with the State's Agroforestry Policy, 2018.

5.2.1 Biodiversity

- It is recommended to conduct afforestation program as data shows decrement in forest area.
- A wildlife sanctuary or conservation area should be made in the district.

5.3 WETLAND

The wetlands need to be intact, but at the same time, they need to be planned wisely to support the district economically, socially and environmentally, which will lead to indirect relief to the Ganga River to a large extent. It will also lower the local people's dependence on the Ganga River for their small-scale industry or basic daily needs. The following recommendation and interventions are required to get valuable products and solve the issues/ challenges faced by the local people of that region.

- It is recommended to develop with flower gardens and wet gardens around the wetlands. These wetlands can be turned into an eco-tourism site.
- The small-scale industry like boat making and net making should be promoted under the schemes by the Ministry of Micro, Small & Medium Enterprises.
- It is recommended to create awareness about the Fisheries and Aquaculture Infrastructure Development Fund (FIDF) scheme and Pradhan Mantri Matsya Sampada Yojana (PMMSY).

5.4 ENERGY

5.4.1. Solar

- ❖ Government should promote PM-KUSUM scheme in the district.
- ❖ There should be ease in attaining the financial resources from the government as well as from the financial institutions.
- ❖ Government should encourage solar thermal energy in the district.
- ❖ Awareness related to PM-KUSUM scheme, subsidies and sensitivity towards environment should be done among the rural people.
- ❖ Solar in the urban areas should also be encouraged by installing rooftop solar panels at the institutional buildings, government buildings, and at industrial units.

5.4.2. Biomass

- ❖ Awareness regarding biomass energy needs to be increased.
- ❖ Financial assistance needs to be accessible
- ❖ Transportation and infrastructural facilities need to be improved.
- ❖ Skills related to handling biomass plants among the rural people needs to be encouraged.

5.4.3. Biogas

- Biogas plants and their benefits should be taught in schools, and local people should make posters or pamphlets.
- Biodegradable Garbage Management is a major component of solid and liquid waste management, and the Gobardhan Scheme tries to manage cow dung and other biodegradable waste in rural regions. These schemes should be applied to the district level.

5.4.4. Hydropower

- It is recommended to investigate sites for hydropower potential near Ganga and Sone rivers.

5.5. TOURISM

- **SUGGESTION AND INTERVENTION**

★ Establish Tourist Information Centre in the District Headquarters. Tourist information centres will be equipped with the modern information and communication technology devices.

★ Developing Tourism circuits through the Integration of Religious, Historical, Eco tourism and Ghat by development of capacity building, engagements with local stakeholders.

★ Till now, no religious and historical tourism circuit are found in the Buxar district. Therefore, new projects to diversify the tourist inflow apart from the pilgrimage/ religious tourism, emphasis on other tourism places for promotion of more tourism activities like, arts & crafts, literature, fair & festivals, waterfront development etc.

★ Development of tourist facilities and overall improvement of infrastructure facilities for tourists in places of tourist attractions.

★ To strengthen the tourism and attract large number of tourists, Tourism Product Diversification/Improvement is needed like, Promotion and packaging of tourist resources, Upgradation of identified tourist spots, Quality accommodations, Tourist Information Centre, Road and public transportation and Road furniture and signages etc.

★ Maintenance of law and order, deploying tourist police force, disposing grievances, enacting suitable rules, regulation and laws for tourism development and Standardizing quality of tourism product and services.

★ Provide adequate Park and Open Spaces/ Recreational Facilities, Eco Park, Water Park, Water Sport and Riverfront development etc. around the tourism sites and along Ganga ghats to attract all type of tourism.

- ★ Empowering and Sensitizing Ganga Ghats (Cleaning of garbage and waste management at each Ghats sites) to make tourism compatible, environment friendly and sustainable. For example: Development of boating and cruise facility in existing Ghats.
- ★ Stakeholder consultation & Participatory management and involvement of Municipality, Disaster management authority and local communities from Ganga villages and tour operators to build ecotourism options and choosing adventure and religious tourism sites.

▪ CHALLENGES AND THREATS

- ★ Being location in isolation in terms of development, the district is facing challenges, which directly and indirectly curb the growth of tourism. The existing infrastructure, safety & Security, local awareness and others are the major hindrance for the development of the tourism in the district.
- ★ Tourism industry is underdeveloped. At present Tourism has very little contribution towards economic generation of the district.
- ★ Across the district the rise of crime including, robbery, snatching, drugs, and murder etc. Moreover, Political stability, Naxalism and Corruption, the district is surrounded by Naxal affected areas.
- ★ Lack of governmental response towards tourism infrastructure such as tourism centre, tourism promotion and tourism accommodation.
- ★ The district is prone to different kinds of disasters, which include floods and earthquakes etc. Incorporating disaster mitigation measures within the infrastructure planning process.
  - The problems being faced by pilgrims while taking dip during the ongoing festivals like: Chath Puja is a matter for serious concern.
- ★ Inadequate and inappropriately located facilities for garbage collection, inadequate fire services due to congested lanes, storm water, and sewerage connections has led to overall deterioration of the urban fabric.
- ★ Strategies for Social Infrastructure, Environment & Tourism Encroachments, inadequate municipal services and insensitive building control mechanisms are leading to the chaos in the urban landscape in the Buxar.

- ★ Too much dependence on single economic sector and Competing cities for external investments in the vicinity.
- ★ Crime and social amenities (including, robbery, snatching, drugs, and murder etc.) being one of the biggest challenges in the district tourist development, have been neglected.
- ★ The water bodies and open spaces are used as the dumping areas in the district.
- ★ There are chances of epidemic due to lack of sewage and solid waste disposal system for the core city area particularly in slums. These increase losses during disasters. Thus, a disaster mitigation plan should be prepared for the city and whole district.

6.Discussion during the Report Presentation

- Recently a Natural Farming Training has been organized the district.
- Buxar is adjoined with Patna and hence has a great market for Fruit and Vegetables (Horticulture)
- Organic Farming is being promoted in all the districts and Natural Farming is being taken up.
- The points suggested by Advisor, NMCG about the utilization of the Ashrams was appreciated by the DMs and the opportunity will be explored.
- The IIML Report for Arth Ganga should be a regular Agenda item for next 6-8 DGC meetings.
- Hon'ble PM during the post-Budget webinar on Tourism had spoken about market potential of destination weddings. It was suggested that suitable Ashrams in Ganga Basin may be identified for such purpose to promote blissful experience, cost reduction, livelihood opportunities and better upkeep.
- Allocate separate space for Namami Gange Awareness and Jalaj Marketing kiosk in Melas/Congregatios/Fairs for providing better marketing opportunities to the Jalaj products.
- As Dilli Haat Centre – Namami Gange Awareness and Marketing Centre – is being launched soon, it was requested that every district to identify niche products with a creative story and link it with Jalaj in their area.
- To identify Arth Ganga Tourist Trails and organize Ganga Guide training
- Promotion of Natural Farming in Ganga Basin and training workshops should be organized on a regular basis. NMCG is supporting this initiative in coordination with MoA& FW and NCOF.
- Make plans for reuse of treated waste water for agriculture, industrial etc. purpose and also the sludge.
- Training of volunteers for Ganga awareness & Aarti workshops to promote regular aartis on Ghats.

REFERENCES

1. https://www.downtoearth.org.in/news/wildlife-biodiversity/bihar-to-start-conservation-programme-for-endangered-blackbucks-79193
2. https://fsi.nic.in/isfr-2021/chapter-13.pdf
3. https://censusindia.gov.in/nada/index.php/catalog/262
4. https://agricoop.nic.in/sites/default/files/BR15_Buxar_28.12.2013.pdf
5. https://dokumen.tips/documents/agroforestry-policy-2018-government-of-bihar-need-for-dedicated-agroforestry-policy.html?page=12
6. https://buxar.nic.in/about-district/
7. https://buxar.nic.in/
8. https://censusindia.gov.in/census.website/data/census-tables
9. https://www.breda.bih.nic.in/
10. https://www.breda.bih.nic.in/Uploads/Policies%20_Act%20_%20Regulations/RENEWABE_ENERGY_POLICY_2017.pdf
11. https://icarrcer.icar.gov.in/wp-content/uploads/SolarBasedPumpSet.pdf
12. https://portal.ceew.in/datastory/buxar-bihar/
13. https://economictimes.indiatimes.com/industry/energy/power/sjvn-cmd-virtually-inaugurates-works-of-unit-ii-of-1320-mw-buxar-thermal-power-plant-in-bihar/articleshow/87868611.cms
14. https://inputsurvey.dacnet.nic.in/RSL/districtsummarysizeclass1a.aspx
15. https://agricoop.nic.in/sites/default/files/BR15_Buxar_28.12.2013.pdf
16. https://censusindia.gov.in/census.website/data/census-tables
17. https://agricoop.nic.in/sites/default/files/BR15_Buxar_28.12.2013.pdf
18. https://www.breda.bih.nic.in/
19. https://www.researchgate.net/publication/295863538_Replication_and_scaling-up_of_isolated_mini-grid_type_of_off-grid_interventions_in_India
20. https://www.researchgate.net/profile/Prabhansu-2/publication/339023933_Status_of_Sewage_Treatment_in_Bihar_and_Needs_for_Improvement/links/5e4ed8f0a6fdccd965b43835/Status-of-Sewage-Treatment-in-Bihar-and-Needs-for-Improvement.pdf#page=37
21. https://pib.gov.in/PressReleasePage.aspx?PRID=1742150
22. http://swc.bihar.gov.in/Notices/PS-21-05-2015.pdf

23. https://buxar.nic.in/about-district/

24. https://buxar.nic.in/

25. https://niti.gov.in/planningcommission.gov.in/docs/aboutus/taskforce/tsk_bps.pdf

6 APPENDICES

Table 1 Biogas potential from animal waste.

Livestock	Residue type	Total population as of 2012	Manure yield * (kg/day)	Total manure generation annually (kg)	Average collection (75%)	Dry manure after removing Moisture content	Manure required for biogas* (kg/m^3)	Biogas potential (m^3/yr)	m3/day	Dry matter per day
Cattle	Manure	161738	10	59,03,43,700	44275775	8855155	25	3542062.2	9704.28	242607
Buffalo	Manure	182552	15	99,94,72,200	74960150	14992830	25	5996833.2	16429.68	410742
Sheep	Manure	15571	1	56,83,415	4262561.25	852512.25	25	34100.49	93.426	2335.7
Goat	Manure	80836	1	2,95,05,140	2212885	442577 1	25	177030.84	485.016	12125
Pig	Manure	8236	2.5	75,15,350	5636512.5	1127302.5	25	45092.1	123.54	3088.5
Poultry	manure	76,117	0.1	27,78,271	2083702.875	416740.575	25	16669.623	45.6702	1141.8
Total		**5,25,050**						**9811788.453**		

Table 2 Biogas potential from agricultural waste.

Crop	**residue type**	**Total crop production (tons) (2017-18)**	**Residue production ratio**	**Residue amount (tons)**	**Average collection (70%)**	**Moisture content**	**Residue amount after removing moisture (tons)**	**Biogas potential [m3/(tons of dry matter)]**	**Overall biogas potential (m3)**
Rice	husk	82536	0.28	23110.08	16177.056	30	11323.9392	800	9059151.36
wheat	straw	123162	1.5	184743	129320.1	80	25864.02	750	19398015
Total		**205698**							**28457166.36**