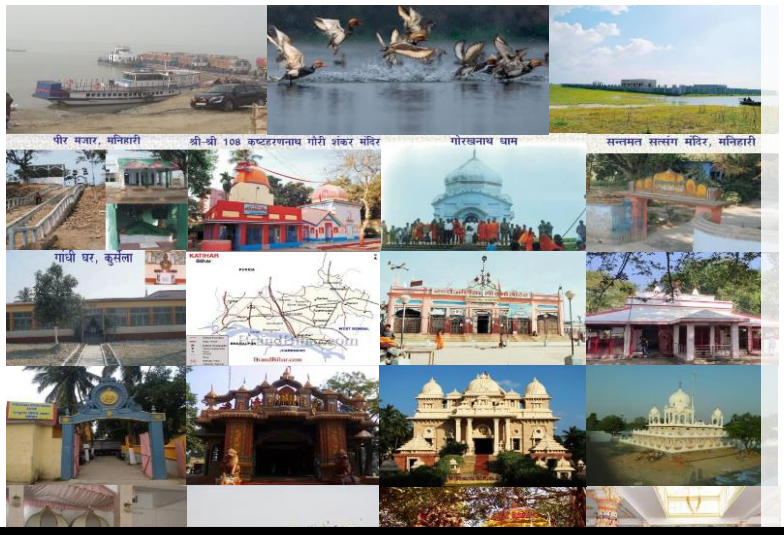


Arth Ganga Project: District Katihar

Submitted to:

National Mission for Clean Ganga (NMCG)

Submitted by:

IIM Lucknow

IIT Roorkee

JUNE-2022

TABLE OF CONTENTS

EXECUTIVE SUMMARY

Katihar, a potentially pilgrimage site, is located in the state of Bihar and is traversed by the rivers Ganga, Mahananda and Kosi.

The total geographical area of the district is around 3056 km^2. The primary sector grew at 5.86% annually from 2007-08 to 2013-14 with its share decreased from 36.67% to 31.41%. The share of the secondary sector increased from 18.47% in 2007-08 to 21.31% in 2013-14, with an average annual growth rate of 11.53%. The tertiary sector occupies, on average, a 45.34% share in the district economy. Its share increased from 44.86% in 2007-08 to 47.28% in 2013-14, with an average annual growth rate of 9.04%. Overall, the district economy grew by 8.21% per annum during the study period.

The cropping intensity of the district is 147.66%. Major crop types are rice, maize, pulses like a variety of urd, moong, lentil, etc. along with oilseeds, etc. The livestock consists of cattle (indigenous and crossbred), buffalos (indigenous and crossbred), pigs (indigenous and crossbred), goats; poultry, and fisheries. The total number of cattle increased in the district from 113 thousand in 2003 to 140 thousand in 2019, a net increase of 23.96%. a net increase of 120% in the total number of sheep from 2003 to 2019 whereas increase in number of goats was of 11.62%. Total pigs decelerated from 7.5 thousand in 2003 to 1.29 thousand in 2019, a net decrease of 82.8%. The total livestock population increased in the district from 266.29 thousand in 2003 to 301.64 thousand in 2019, a net increase of 13.27%. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 39.77% and 68.81%, respectively.

The share of cultivable wasteland remained constant at 0.21% between 2011-12 to 2019-20. The share of barren and uncultivable land remained constant (7.59%) over the years. The fallow land drastically increased from 5.08% in 2011-12 to 23.34% in 2019-20, a matter of concern for the district economy. The net sown area decreased from 62.72% in 2011-12 to 43.98% in 2019-20. The areas under non-agricultural uses and trees and gardens show a moderate increase over the period. In 2019-20, however, the nitrogen share decreased to 60.62%, while the phosphorus and potassium share has increased to 25.70% and 13.66%, respectively. The use of nitrogen is more than the recommended ratio, while the Phosphorous usage is less than the recommended ratio. However, the use of Potassium is according to 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. Although the overall use of chemical fertilizers has decreased in the district from 257.6 kg/ ha GSA in 2013-14 to 232.2 kg/ ha GSA in 2019-20.

Forest cover area as per 2019 forest survey assessment is 180.48 km^2. This is 14.69% to the total area which makes district forest deficient area. Lakhisarai district has Very Dense Forest (VDF) of 17 Km^2, 144.42 Km^2 of area comes under the category of Moderately Dense Forest (MDF) and 18.99 Km^2 is open forest (OF). The area under trees and gardens also went up slightly from 0.23% in 2011-12 to 0.31% in 2019-20.

The district is well connected by railways but the road connectivity is not so good. It has great potential for religious and heritage tourism yet the poorly maintained structures and neglected tourism has

brought its tourism economy down. The important places in the districts are Goga Lake, Gandhi Ghar, Bhairav Nath, Gurudwara, Pir Mazar, Satsang Mandir, Gorakh Nath, Gauri Shankar, and Durga Mandir.

In the district, kerosene is the major source of lightning among 89.2% of the households. 9.9% of the households use electricity as the source of lightning, 0.3% of the households use solar energy for the lightning. 70.40% of the households in the district use crop residue, 18.70% of the households use firewood, 5.30% of the households use LPG/PNG, and 4.20% of the households use cow dung cakes for cooking.The normalised value of total available biomass power potential of Katihar district is 0.4103
The total number of wetlands existing in the district is 1302 consisting of both Man-made and Natural. Most of them are lakes/ponds and waterlogged. The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover with 356 bird species and 21 threatened/rare species of bird in the district. Biogas potential from animal waste is calculated approximately as one crore m3/year and two crores m3/year from agricultural waste. Under the Namami Gange project, a sewage treatment facility is proposed to be built in the district. No hydropower plant exists in the district.

There have been many active measures taken to support and promote sustainable development which shows the government’s strenuous efforts to comply with green and clean strategies along with economic development yet lack of monitoring, local participation, expansion of practices, etc. are some of the barriers that are needed to be overcome. The government should maintain historical structures like temples, etc., organize and advertise the festivities like mango festivals, fairs, art and culture, hygienic and well-kept restrooms, and safe drinking water. Agroforestry, drip and Sprinkler irrigation, introducing Vermicomposting, use of high-yielding seeds, micro-irrigation, constructing and maintaining harvesting structures, adopting greenhouse farming with organic farming, and encouraging farmers for adapting different crop cultivation and various irrigation methods, adopt resources conservation technologies, Various measures such as eco-tourism should be taken to improve tourism and enhance the use of renewable energy especially by creating awareness. Along with focusing on agriculture practices Bee culture, dairy, poultry, fisheries, etc. needs encouragement as they have high economic potential. Monitoring and training programs and awareness and introducing Pradhan Mantri Matsya Sampada Yojana, KVKs instruction, subsidized crop insurance system, branding effort under the National Organic Foods Market, etc.

1. DISTRICT OVERVIEW

1.1 INTRODUCTION

Katihar district is located on global map between 25°42' and 26°22' North latitude and 87°10' and 88°05' East longitude. The district occupies an area of 3,057 square kilometers (1,180 sq mi). The rank of the district in comparaison to other districts of Bihar in terms of area is 12th. The district is situated in the plains of North Eastern part of State. The district of Katihar, which acquired the status of an independent district on the 2nd October, 1973 has a rich heritage and close linkage with the parent district of Purnia. Katihar Sub-division in the old Purnia district was upgraded as an independent district. The district of Katihar has 3 sub-divisions viz., Katihar, Barsoi and Manihari consisting altogether 16 Community Development Blocks.

The land of the district is formed of soft clayey soil along the rivers Ganga and Mahananda (in the south and east of old Purnia district) and hard clayey soil along the banks of the Mahananda and Ganga. The surface alluvium consists of a deep bed of sand.. There is a small hill of calcareous belt called Chotapahar near Manihari. The Ganga, the Mahananda and the Kosi are the important rivers flowing through the district.

Agriculture is the main occupation of the people of the district. The major portion of the district is covered by non-calcareous, non-saline soil of recent alluvium formation. The principal agricultural crops of the district are paddy, wheat, jute, maize, potato and oil seeds. Banana, Jute, Maize are main cash crop of the farmers of the district. Although there are some variations from area to area depending upon the availability of irrigational facilities, double-cropping is in vogue in most of the areas. The work participation rate (WPR) in the district is 21.74 % for main workers and 11.27 % for marginal workers. Proportion of non-workers in the district is 67.00 %.

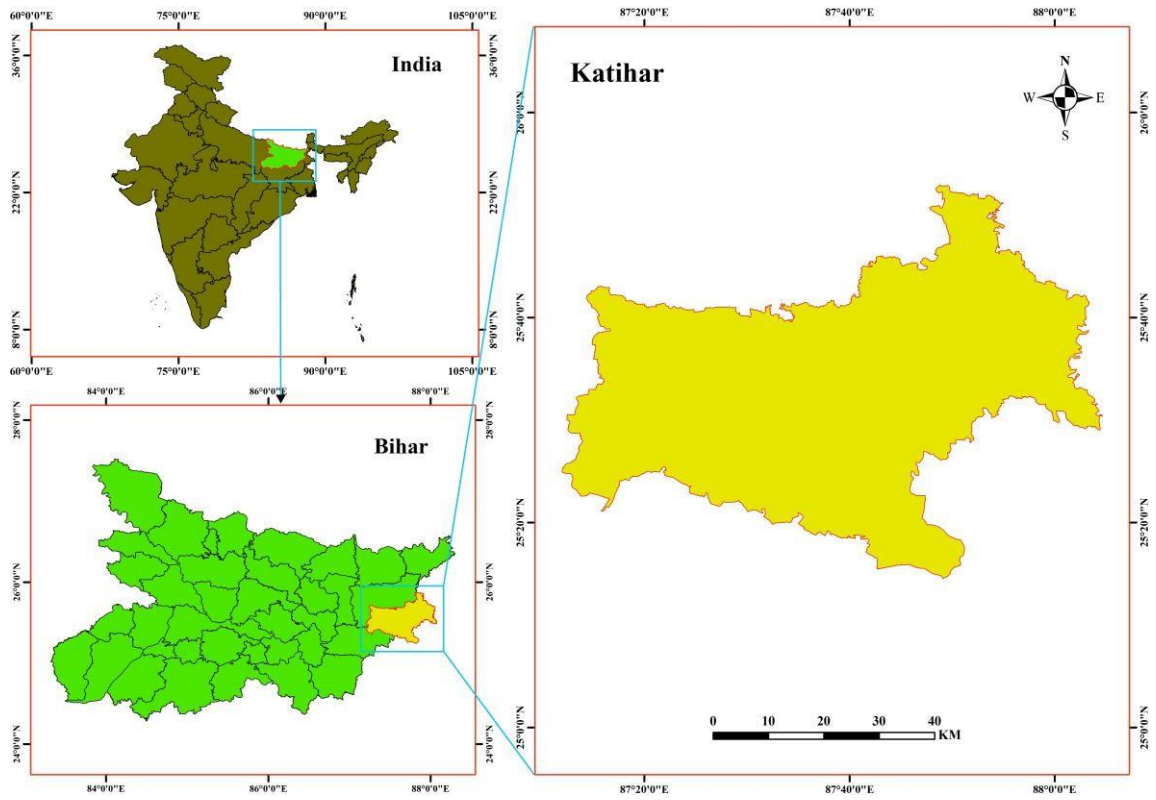


Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF KATIHAR

In 1973, Katihar district came into existence and the administrative headquarter of the district is Katihar town. It is situated at the North-Eastern region of Bihar. It has an aggregate area of 3056 sq.km. and is one of the largest districts in Bihar. The district is divided into 3 sub-divisions; namely, Katihar, Barsoi, and Manihari. The district is located at a latitude between 25°42' and 26°22' N and at a longitude between 87°10' and 88°05' E. The district is surrounded by Purnia district and a part of West Bengal on the north, by Bhagalpur district and a part of Jharkhand state on the south, state of West Bengal on the east, and by Purnia district on the west. The major rivers in the district are Ganga, Koshi, Mahananda, and Righa. The soil has a fertility of low to medium in this district. The forests have been perished in the district and only a few trees are present there like sal, palas, semal, teak, sheesham, pipal, and sakhua.

Katihar is of the populous district in Bihar, according to the Census 2011, as it has achieved a population of 3071029. Out of the total population in the district, 52.11% is male, which is 1600430, and the rest 47.88% is female, which is 1470599, and the sex ratio in the state is 915 females per thousand males. Around 91.08% of the population, which is 2797207 live in the rural areas and the rest 8.91%, which is 273822 live in the urban areas.

The economy of the district is majorly dependent upon agriculture sector. The dominant crops in the district are wheat, maize, rice, potato, banana, onion, and cauliflowers. The prospering industry is rice in the district. The jute mill industries were also there but it is not in operations now. Industry of Makhana has also been established in the district, which is one of the expanding agro-based industry in the district.

1.3 ECONOMIC PROFILE OF KATIHAR

The primary sector contributes, on average, 34.49% to the district GDP. It grew by 5.86% annually from 2007-08 to 2013-14. However, its share decreased from 36.67% in 2007-08 to 31.41% in 2013-14 because the other sectors grew faster than the primary sector. The share of the secondary sector increased from 18.47% in 2007-08 to 21.31% in 2013-14, with an impressive average annual growth rate of 11.53%. The tertiary sector occupies, on average, a 45.34% share in the district economy. Its share increased from 44.86% in 2007-08 to 47.28% in 2013-14, with an average annual growth rate of 9.04%. Overall, the district economy grew by 8.21% per annum during the study period. Steps should be taken to increase the productivity of the primary sector so that it can grow at a higher rate. The secondary and tertiary sectors have performed well during the time of the study.

Table 1: Trends in Gross District Domestic product in Katihar 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	8481	4272	10376	23128	-	-	-	-
	(36.67)	(18.47)	(44.86)	(100)				
2008-09	9296	4937	11383	25616	9.61	15.57	9.71	10.76
	(36.29)	(19.27)	(44.44)	(100)				
2009 -10	8423	5441	12365	26229	-9.39	10.21	8.63	2.39
	(32.11)	(20.74)	(47.14)	(100)				
2010-11	10482	6955	13416	30854	24.44	27.83	8.50	17.63
	(33.97)	(22.54)	(43.48)	(100)				
2011 -12	11415	5897	14011	31322	8.90	-15.21	4.44	1.52
	(36.44)	(18.83)	(44.73)	(100)				
2012 -13	12065	6983	15869	34916	5.69	18.42	13.26	11.47
	(34.55)	(20.00)	(45.45)	(100)				
2013-14	11567	7847	17414	36828	-4.13	12.37	9.74	5.48
	(31.41)	(21.31)	(47.28)	(100)				
Average Growth Rate					5.86	11.53	9.04	8.21

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

2. Quantitative Data Analysis

2.1 Agriculture and Allied Activities

The total declared area of the district is 2913.20 sq. km². The Forest area represents only 0.62% of the total reported area. The share of cultivable wasteland remained constant at 0.21% between 2011-12 to 2019-20. The share of barren and uncultivable land remained constant (7.59%) over the years. The fallow land drastically increased from 5.08% in 2011-12 to 23.34% in 2019-20, a matter of concern for the district economy. Moreover, the net sown area (NSA) decreased from 62.72% in 2011-12 to 43.98% in 2019-20. The areas under non-agricultural uses and trees and gardens show a moderate increase over the period (Table 2). Overall, the land use pattern indicates that the area under fallow land has significantly increased while the NSA decreased over the years.

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

Year	TOTAL REPORTED AREA (in 1000 Ha)	AREA UNDER FOREST	CULTIVABLE WASTELAND	TOTAL FALLOW	BARREN AND UNCULTIVABLE LAND	OTHER LAND THAN AGRICULTURE	PASTURE LAND	AREA UNDER TREES AND GARDENS	NET SOWN AREA
1	2	3	4	5	6	7	8	9	10
2011-12	291.3	0.62	0.21	5.08	7.59	19.95	0.03	3.78	62.72
2012-13	291.3	0.62	0.21	4.91	7.59	19.98	0.03	3.81	62.89
2013-14	291.3	0.62	0.21	4.70	7.59	20.01	0.03	3.81	63.06
2014-15	291.3	0.62	0.21	6.45	7.59	20.05	0.03	3.81	61.24
2015-16	291.3	0.62	0.21	8.93	7.59	20.05	0.03	3.81	58.74
2016-17	291.3	0.62	0.21	4.50	7.59	20.08	0.03	3.81	63.17
2017-18	291.3	0.62	0.21	21.66	7.59	20.08	0.03	3.81	46.00
2018-19	291.3	0.62	0.21	19.84	7.59	20.08	0.03	3.81	47.82
2019-20	291.3	0.62	0.21	23.34	7.59	20.43	0.03	3.81	43.98

Source: http://dse.bihar.gov.in/ and http://data.icrisat.org/district-level-data/

2.3.2 Trends in Operational Land Holdings

In Katihar district, the total number of operational farms increased from 420 thousand in 2010-11 to 422 thousand in 2015-16, a net increase of 0.48%. 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 around 97% of the total landholdings of the district in 2015-16, while the corresponding proportion in the state was 96.96%. Table 3 shows a slight decline in the percentage share across the marginal, semi-medium, and medium landholdings and an increase in the share of the small landholdings.

Table3: Distribution of Operational Holdings by Size-categories of farms (in %) in Katihar							
	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.)
Katihar	2010-11	89.85	6.61	2.97	0.55	0.02	420
	2015-16	89.08	7.92	2.56	0.42	0.02	422
							[0.48]
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

Rice and maize dominate the agriculture of the district. Table 4 shows the area devoted to various crops over the last seven years. In 2019-20, Rice made up the highest share of GCA (41.34%), followed by maize (28.38%). These two crops constitute around 69.72% of the GCA. The area shared by the total cereals has increased from 76.05% in 2013-14 to 79.97% in 2019-20. The main pulses produced are Urad, moong, and masoor (lentil). The total pulses acreage declined from 3.65% in 2013-14 to 2.80% in 2019-20. However, the foodgrain acreage has increased from 79.70% in 2013-14 to 82.77% in 2019-20. Moreover, the food grains cover a majority (average, 77.92%) of the GCA. Mustard is the only major oilseeds crop produced, and the total oilseed acreage increased from 1.79% in 2013-14 to 2.41% in 2018-19. In general, no significant change in the cultivation pattern was observed during the study period. The average cropping intensity in the district is 154.86.

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	39.21	41.98	42.51	34.25	26.58	35.57	41.34
Wheat	14.21	15.64	14.48	11.64	14.01	9.28	10.25
Maize	22.59	18.57	18.60	21.81	32.49	27.12	28.38
Other cereals	0.04	0.04	0.04	0.07	0.05	0.32	0.00
Total Cereals	76.05	76.24	75.64	67.77	73.12	72.29	79.97
Black gram (urad)	1.20	1.19	1.14	0.76	0.50	0.47	0.47
Green gram (Moong)	1.59	1.54	1.55	1.44	1.99	1.78	1.21
Masoor (Lentil)	0.47	0.71	0.78	0.58	0.70	0.63	0.60
Other Pulses	0.39	0.63	0.61	0.40	0.00	0.47	0.52
Total Pulses	3.65	4.08	4.08	3.18	3.18	3.36	2.80
Total Food grains	79.70	80.32	79.72	70.95	76.30	75.64	82.77
Mustard	1.63	1.15	1.31	1.38	2.09	2.25	0.86
Other Oilseeds	0.16	0.55	0.61	0.27	0.25	0.16	0.04

Total oilseeds	1.79	1.70	1.92	1.65	2.33	2.41	0.90
Net Sown area	71.31	70.65	69.81	68.66	66.57	54.99	55.17
Gross Sown Area (in 1000 Ha)	257.60	252.50	245.10	268.00	201.30	253.30	232.20
Cropping Intensity	140.23	141.54	143.25	145.65	150.22	181.84	181.26
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 yield per hectare of most crops varies from year to year. Rice, wheat, and maize are the major crops in the district, and their per hectare yields were 20.70 qtls, 26.51qtls, and 80.41 qtls, respectively, in 2019-20. Per hectare yield of total cereals increased from 39.43 qtls in 2013-14 to 42.63 qtls in 2019-20, majorly due to a significant increase in the yield of maize. On the other hand, the per hectare yield of total pulses decreased slightly from 9.89 qtls in 2013-14 to 8.92 qtls in 2019-20. The yield of total oilseeds went up from 12.83 qtls in 2013-14 to 15.24 qtls in 2019-20. Moreover, the yield of total food grains rose from 38.08% in 2013-14 to 41.49% in 2019-20. 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. Volatility in crop yields makes farmers' income riskier and more unstable, which requires an effective insurance protection system.

Table 5: Trends in yield of Principal Crops in Katihar District (in Qtl per Ha)

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	27.93	26.38	20.99	23.49	21.29	22.32	20.70
Wheat	31.94	17.70	26.03	26.08	27.09	29.49	26.51
Maize	64.16	65.16	80.26	75.27	90.05	69.26	80.41
Total Cereals	39.43	34.04	36.53	40.59	52.93	40.85	42.63
Black gram (Urad)	9.03	9.33	9.29	9.18	9.00	9.17	9.09
Green gram (Moong)	10.24	11.28	12.11	9.87	9.50	7.56	8.57
Masoor (Lentil)	10.83	8.33	11.05	10.00	11.43	10.00	8.57
Total Pulses	9.89	9.81	10.80	9.73	10.00	8.59	8.92
Total Food grains	38.08	32.81	35.21	39.21	51.15	39.42	41.49
Mustard	13.33	12.41	9.38	16.17	22.38	19.65	15.50
Total oilseeds	12.83	12.56	10.21	15.32	20.85	18.85	15.24
Source: Compiled from 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, wheat, and maize dominate the production. In 2019-20, Rice (198.7 thousand tonnes), wheat (63.1 thousand tonnes), and maize (529.9 thousand tonnes) formed a significant part of the total cereal production (791.7 thousand tonnes). Moreover, there has been an increase in total cereals production from 772.5 thousand tons in 2013-14 to 791.7 thousand tons in 2019-20. Coming to pulses, Urad, moong, and masoor (lentil) occupied the highest production, with their production being 1 thousand tons, 2.4 thousand tons, and 1.2 thousand tons, respectively, in 2019-20. Although these pulses show variation in production across

years, they still represent around 79.31% of the total pulse production. Mustard production was 3.1 thousand tons, representing around 96.81% of the total oilseed production in 2019-20. Looking at the annual production data of various crops, we find that production of cereals increased on average during the period while the production of pulses significantly declined. Proper insurance arrangements are needed to get assured farm income, take more risks, and diversify cropping patterns.

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

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	282.1	279.6	218.7	215.7	113.9	201.1	198.7
Wheat	116.9	69.9	92.4	81.3	76.4	69.3	63.1
Maize	373.4	305.6	366	439.9	588.9	475.8	529.9
Other cereals	0.1	0.1	0.1	0.3	0	1.7	0
Total Cereals	772.5	655.2	677.2	737.3	779.2	747.9	791.7
Black gram (Urad)	2.8	2.8	2.6	1.9	0.9	1.1	1
Green gram (Moong)	4.2	4.4	4.6	3.8	3.8	3.4	2.4
Masoor (Lentil)	1.3	1.5	2.1	1.6	1.6	1.6	1.2
Other Pulses	1	1.4	1.5	1.1	0.1	1.2	1.2
Total Pulses	9.3	10.1	10.8	8.3	6.4	7.3	5.8
Total Food grains	781.8	665.3	688	745.6	785.6	755.2	797.5
Mustard	5.6	3.6	3	6.0	9.4	11.2	3.1
Other Oilseeds	0.3	1.8	1.8	0.8	0.4	0.3	0.1
Total oilseeds	5.9	5.4	4.8	6.8	9.8	11.5	3.2

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, we calculated the mean, standard deviation (SD), and coefficient of variation (COV) of the area, production, and yield of the main crops. Table 7 shows that among different crops, the lowest variability in the area is observed in moong (13.48%), followed by masoor (15.69%) and maize (15.73%), and the highest in Urad (46.19%). The variability in the area under total pulses (18.38%) is much higher than in the area under total cereals (8.82%). Since Rice, wheat, and maize dominate the production, the variability in the area under total food grains is, therefore, relatively low (9.01%).

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	Average	SD	COV	Average	SD	COV	Average	SD	COV
Rice	91.80	17.92	19.52	215.68	56.81	26.34	23.30	2.83	12.15
Wheat	31.18	6.32	20.26	81.33	18.35	22.56	26.41	4.41	16.70

Maize	58.45	9.20	15.73	439.93	99.59	22.64	74.94	9.41	12.55
Total Cereals	181.63	16.02	8.82	737.28	52.31	7.10	41.00	6.00	14.64
Black gram (Urad)	2.03	0.94	46.19	1.87	0.87	46.67	9.16	0.12	1.36
Green gram (Moong)	3.85	0.52	13.48	3.80	0.74	19.46	9.88	1.54	15.64
Masoor (Lentil)	1.55	0.24	15.69	1.55	0.29	18.53	10.03	1.20	11.97
Total Pulses	8.52	1.57	18.38	8.28	1.89	22.77	9.68	0.73	7.53
Total Food grains	190.15	17.12	9.01	745.57	50.76	6.81	39.62	5.84	14.75
Mustard	3.70	1.17	31.75	5.98	3.21	53.69	15.55	4.41	28.37
Total oilseeds	4.42	1.18	26.80	6.77	2.91	43.01	15.12	3.71	24.56
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 Mustard (53.69%), followed by Urad (46.67%), Rice (26.34%), and Maize (22.64%). The variability in total oilseeds production is relatively higher than cereals, partly due to variation in the land area under them and the non-availability of hybrid oilseeds. Improvement in crop insurance conditions and better market accessibility can lower this variation. Variability is lowest in total food grains (6.81%), followed by total cereals (7.10).

In the case of yield, the highest variability is estimated in Mustard (28.37%), wheat (16.70%), and masoor (11.97%). Yield variability in total pulses (7.53%) is lower than in total cereals (14.64%). 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 65.24% of the total fertilizers used, while the proportions of phosphorus and Potassium were 21.57% and 13.18%, respectively. In 2019-20, however, the nitrogen share decreased to 60.62%, while the phosphorus and potassium share has increased to 25.70% and 13.66%, respectively. The use of nitrogen is more than the recommended ratio, while the Phosphorous usage is less than the recommended ratio. However, the use of Potassium is according to 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. Although the overall use of chemical fertilizers has decreased in the district from 257.6 kg/ ha GSA in 2013-14 to 232.2 kg/ ha

GSA in 2019-20, still the authorities can take steps to reduce their consumption further 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	143.85	142.94	179.85	160.25	198.66	161.26	189.82
Phosphorous	47.57	33.07	61.18	63.20	86.62	56.11	80.48
Potassium	29.07	27.83	29.98	36.43	58.87	35.39	42.79
Total	220.48	203.83	271.01	259.88	344.16	252.76	313.09
GSA (1000 Ha)	257.6	252.5	245.1	268	201.3	253.3	232.2
Source: Compiled from 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

Groundwater (GW) is the main source of irrigation in the district. The canal's share in the NIA (average, 3.17%) and the share of wells and tube wells in NIA (average, 95.79%) have remained almost consistent over the years. However, the district is hugely dependent on groundwater for irrigation purposes, and it can have serious environmental issues if such a pattern continues in the long run. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 39.77% and 68.81%, respectively.

Table 9: Source-wise Area under Irrigation in Katihar (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.)	3.18	3.19	3.18	3.18	3.18	3.18	3.19	3.12	3.15
Wells and Tube Wells	95.80	95.82	95.76	95.74	95.72	95.80	95.85	95.84	95.80
Other Sources	1.02	0.99	1.06	1.07	1.10	1.02	0.96	1.04	1.05
NIA (1000 Ha)	79.60	63.70	63.90	55.90	50.90	69.50	61.20	67.30	66.60
GIA (1000 Ha)	168.90	170.50	171.10	159.70	152.30	182.20	144.10	190.70	191.00
% of NIA	43.57	34.77	34.78	31.33	29.75	37.77	45.67	48.31	51.99
% of GIA	64.10	66.29	66.42	63.25	62.14	67.99	71.58	75.29	82.26
Source: Compiled from 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 done periodically 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 establishing organic clusters under the Paramparagat Krishi Vikas Yojana and Namami Gange schemes in the district. The district has 30 groups in three development blocks. The highest number of groups are in Barari (22), Korha (5), followed by Katihar (3). 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. Groups need to be added under the Paramparagat Krishi Vikas Yojana (PKVY), and more groups should be further encouraged in other development blocks as well.

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

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	**Barari**	Namami Gange	22	257	11.68	11.5	1.17
2	**Katihar**	Namami Gange	3	36	12	12	1
3	**Korha**	PKVY	5	105	21	20	3.93
4	**District total**	PKVY	5	105	21	20	3.93
		Namami Gange	25	293	11.72	12	1.13
		Total	30	398	13.26	12	3.94

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

Since per hectare use of chemical fertilizer is high in agriculture, a gradual shift of farmers from conventional to organic farming systems is likely to positively impact water quality, soil health,

and 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 the inability to fetch a premium.
2. Scaling up the organic production is another problem. 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.
3. Farmers practice organic farming only on a small part of their land to get the scheme's benefit and land areas in the group are scattered, thus failing 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 390 thousand in 2003 to 723 thousand in 2019, a net increase of 85.40%. However, the number of adult male cattle has decreased from 85 thousand to 28 thousand in the same period. The increase in total cattle has been due to an increase in adult female cattle (from 138 thousand to 308 thousand) and young cattle (from 167 thousand to 388 thousand) in the same period. Cattles represent around 85.16% of the total large ruminant. Moreover, cattle's share in large ruminants has increased from 84.66% in 2003 to 88.31% in 2019. Similarly, total buffaloes have increased from 70.73 thousand in 2003 to 95.75 thousand in 2019, a net increase of 35.37%. The increase is due to an increase in adult female buffaloes and young buffaloes. Buffaloes represent around 14.84% of the total large ruminant. However, total sheep have decreased from 6.7 thousand in 2003 to 2.27 thousand in 2019, a net decrease of 66.11%. Total goats have increased from 446 thousand in 2003 to 601 thousand in 2019, a net increase of 34.91%. Total pigs have decreased from 15.39 thousand in 2003 to 7.76 thousand in 2019, a net decrease of 49.57%. The total livestock population has increased in the district from 928.91 thousand in 2003 to 1430.83 thousand in 2019, a net increase of 54.03%.

Notably, the number of female cattle and buffaloes 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 buffaloes 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 Katihar				
Category	2003	2007	2012	2019
CATTLE TOTAL	390.22	653.93	604.82	723.5
CATTLE ADULT MALE	85.53	103.47	69.13	27.67
CATTLE ADULT FEMALE	138.04	249.11	266.49	308.15
CATTLE YOUNG TOTAL	166.65	301.35	269.2	387.69
CATTLE SHARE IN LARGE RUMINANT (Percent)	84.66	81.99	85.68	88.31
BUFFALO TOTAL	70.73	143.64	101.1	95.75
BUFFALO ADULT MALE	9.92	24.79	10.76	4.13
BUFFALO ADULT FEMALE	33.01	55.72	49.9	43.81
BUFFALO YOUNG TOTAL	27.8	63.13	40.44	47.81
BUFFALO SHARE IN LARGE RUMINANT (Percent)	15.34	18.01	14.32	11.69
SHEEP TOTAL	6.7	1.35	6.18	2.27
SHEEP SHARE IN SMALL RUMINANT (Percent)	1.48	0.3	1.05	0.38
GOATS TOTAL	445.86	455.71	580.11	601.55
GOATS SHARE IN SMALL RUMINANT (Percent)	98.52	99.7	98.95	99.62
PIGS TOTAL	15.39	22.11	22.6	7.76
LIVESTOCK TOTAL	928.91	1277.08	1316.06	1430.83
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 Katihar compared to the total fish production in Bihar. Fish Production was 12.6 thousand tons in 2011-12 in Katihar, which increased to 31.45 thousand tons in 2017-18. Katihar represented around 3.65% of the total fish production in Bihar in 2011-12. However, its share increased to 5.35% in 2017-18.

Table12: Trends in fish production (1000 tons) in Katihar				
District/Year	2011-12	2013-14	2015-16	2017-18
Katihar	12.6	14.8	23.5	31.45
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 2.03% out of the total geographical area which is 3057 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 61.98 sq. km. under the forests out of which 6.22 sq. km. is under moderately dense forests and 55.76 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.

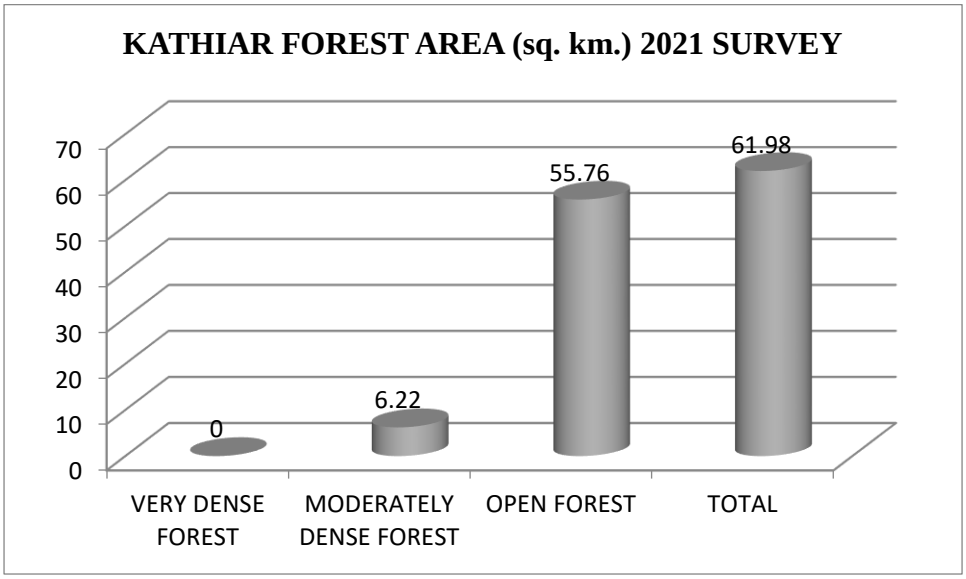


Fig. 1: The district has 812 ha of cultivable wasteland, 40962 ha of current fallow and 9038 ha of land under other fallows.

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 61.98 square km, in which 10% area is mid-dense forest, and 90% area is open forest.

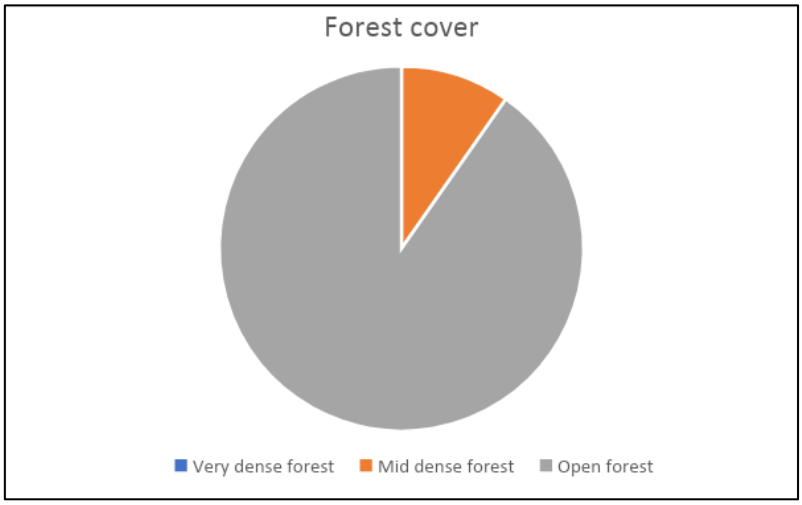
Table 1 Bird species recorded in the district.

Number of species	356
Number of rare/accidental species	21

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

3057	0	6.03	55.95	61.98	2.03	0.98	0



2.3 TOURISM

Bihar: Year Wise Tourist Arrivals (2001 to 2020)

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 in Bihar (2001 to 2020)***

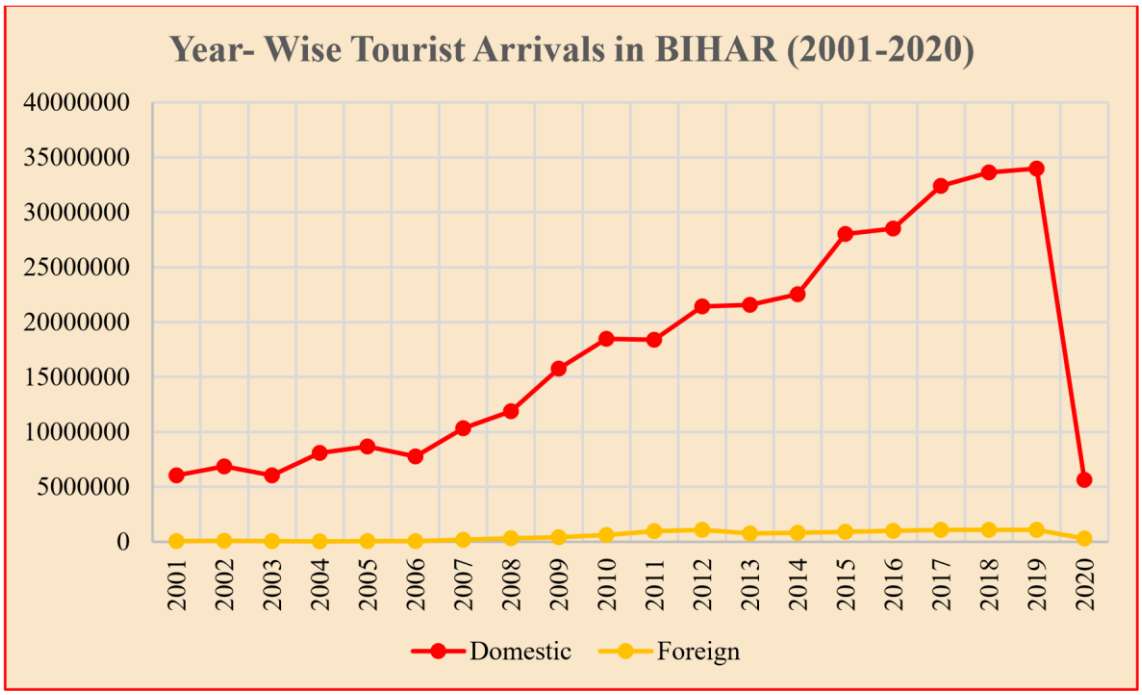
Year	Domestic	Growth	Foreign	Growth	Total	Overall Growth
2001	6061168	0.00%	85673	0.00%	6146841	0.00%
2002	6860207	13.18%	112873	31.75%	6973080	13.44%
2003	6044710	-11.89%	60820	-46.12%	6105530	-12.44%
2004	8097456	33.96%	38118	-37.33%	8135574	33.25%
2005	8687220	7.28%	63321	66.12%	8750541	7.56%

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 tourist 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 in Bihar (2001 to 2020)***



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

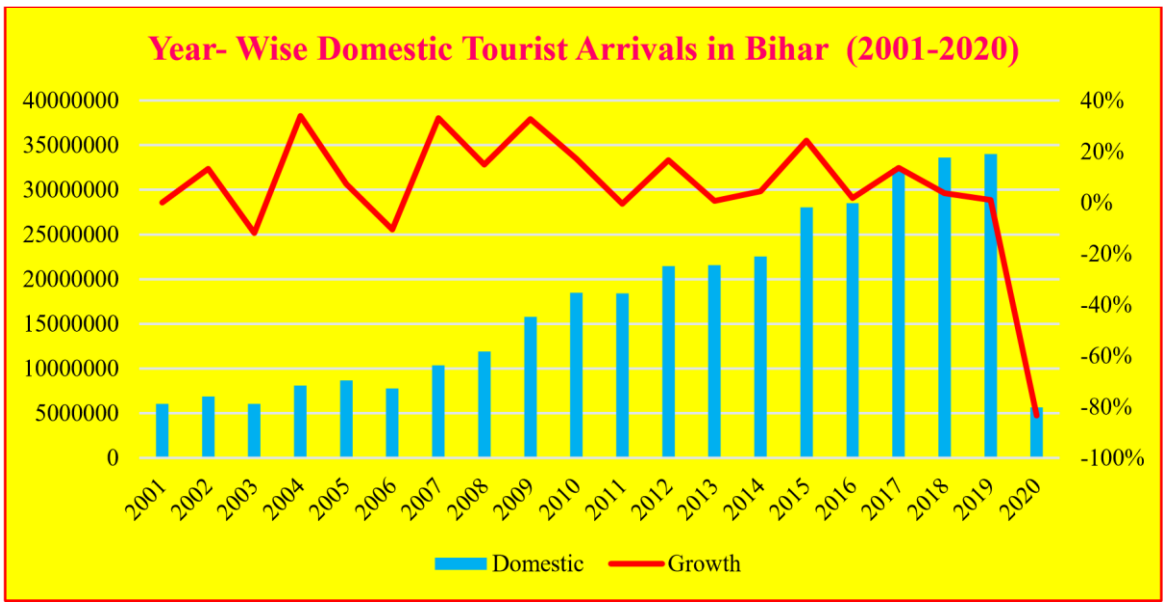


Figure: 3 Bihar: Year Wise Foreign Tourists Arrivals in Bihar (2001 to 2020)

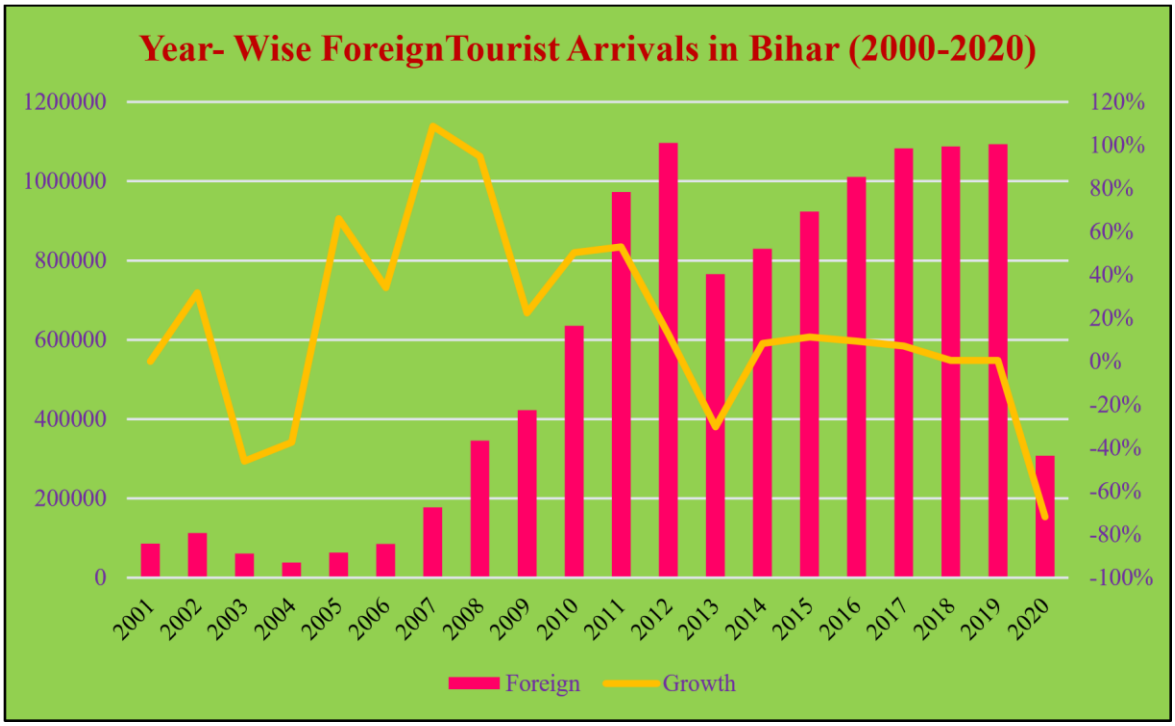
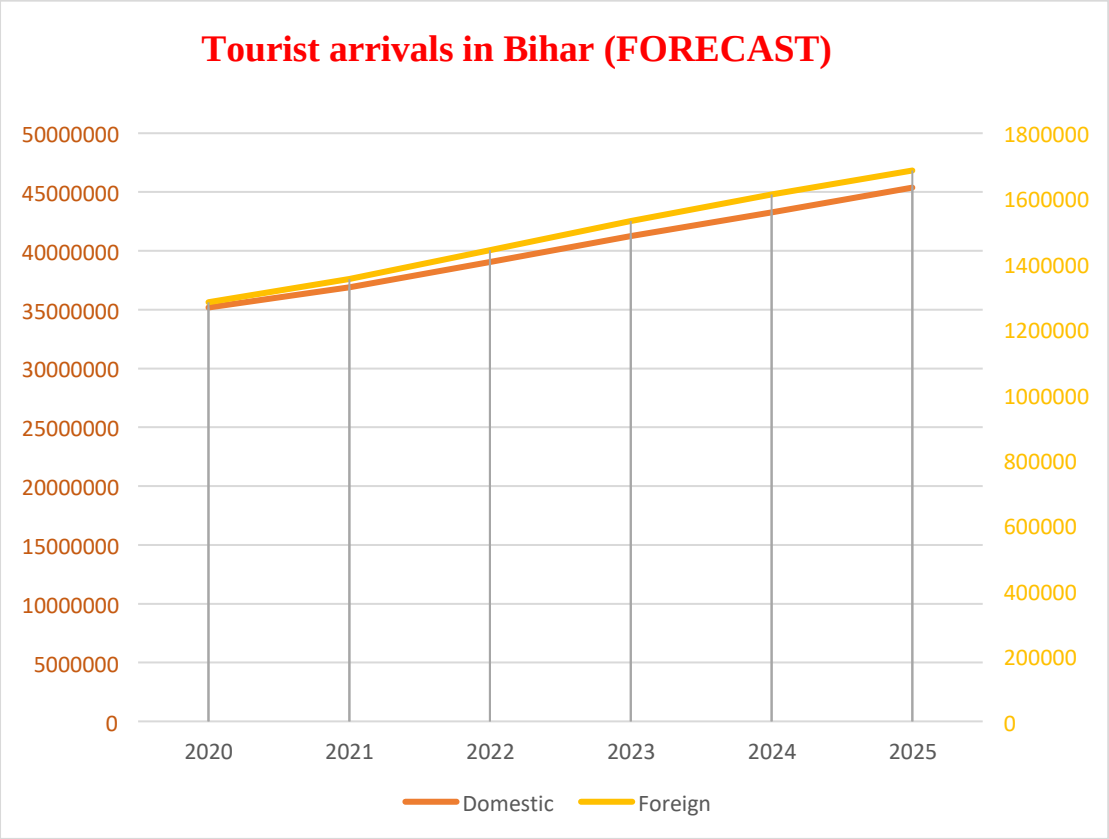


Table: 3 Bihar: Year Wise Tourists Arrivals in Bihar (2020 to 2025) Forecast

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 in Bihar (2020 to 2025) Forecast



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

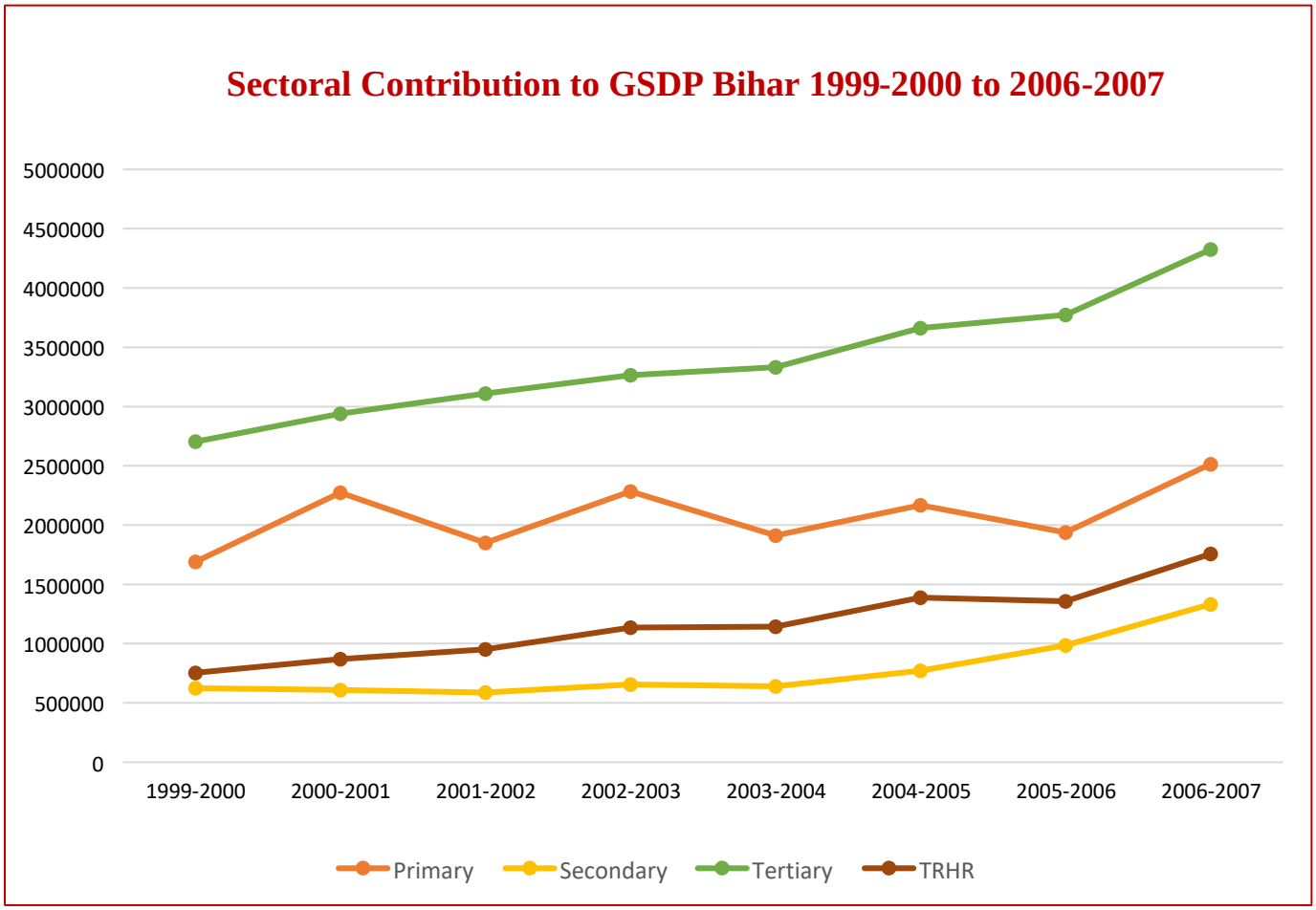
Bihar is one of the fastest growing economies in India. It is largely service based, with a significant share of agricultural and industrial sectors. The sectoral contribution to the state GDP, the contribution of tertiary sector accounts **(53.88%)** in **1999-2000** increases to **(56.65%)** in **2003-2004**. 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



Katihar: Sectoral Contribution to GSDP (2011-12 to 2016-17)

Like Bihar as a state, the District Katihar has potential for Religious, Adventure, Market and Ecotourism etc. It has scope to develop niche markets. Comparing the sectoral contribution to the state GDP, the contribution of tertiary sector in **Katihar** is **(47.51%)**, whereas for the state it is **(53.88%)** in **1999-2000** Similarly, the contribution in the year **2006-2007** Katihar accounts **(43.18%)** while state accounts **(52.92%)**. Tourism has very little contribution towards economic generation of the district. The contribution of Trade, repair, hotel, and restaurant is **(7.24%)** outperforms in comparison to the state counterpart **(27.89%)** in **1999-2000**, however this gap further strengthen during **2006-2007** were Katihar accounts **(16.25%)** that of state (**40.62%)**. Thus, the contribution of Katihar's Tertiary sector is increase faster than the state. Similarly, trade, repair, hotel, and restaurant also contribute in increasing manner. Therefore, Katihar 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

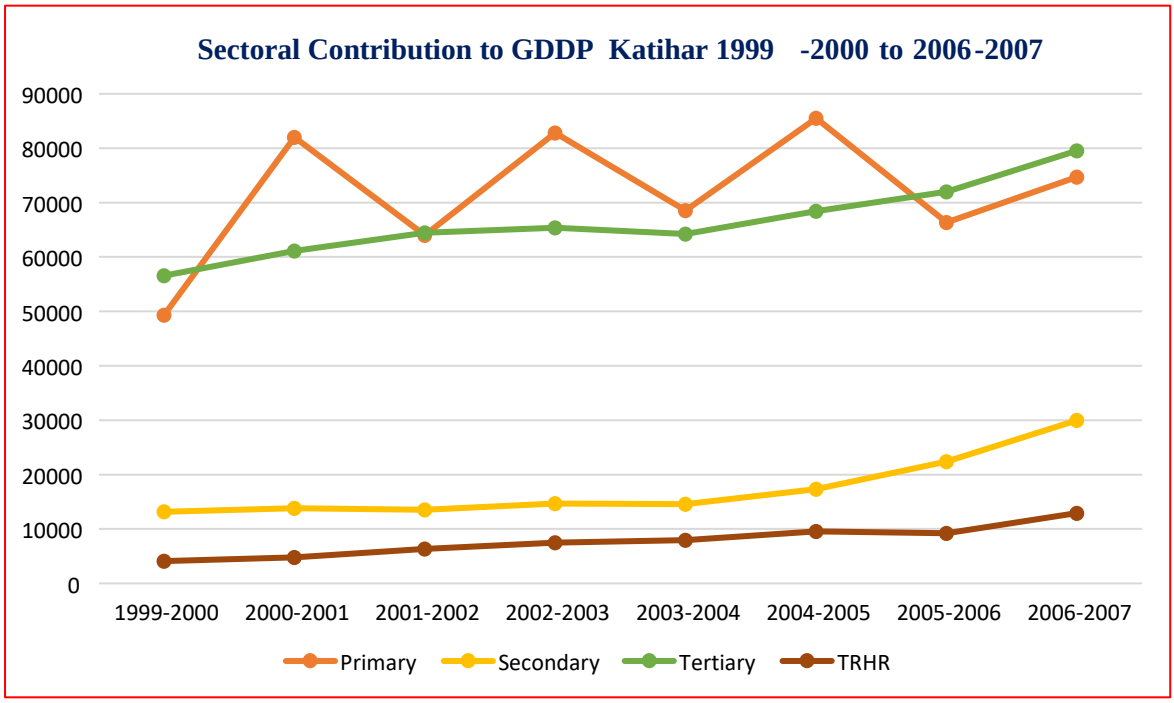
district economy. However, promoting tourism sector by considering its economic contribution may lead to bad policy decisions without noting the natural disaster as well as tourism infrastructure and crime and implementation policy.

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

Year	Primary	Secondary	Tertiary	TRHR as % of Tertiary
1999-2000	49338 (41.44%)	13160 (11.05%)	56575 (47.51%)	4096 (7.24%)
2000-2001	81991 (52.24%)	13840 (8.82%)	61134 (38.95%)	4797 (7.85%)
2001-2002	63992 (45.06%)	13537 (9.53%)	64474 (45.40%)	6315 (9.79%)
2002-2003	82831 (50.86%)	14653 (9.00%)	65384 (40.15%)	7511 (11.49%)
2003-2004	68548 (46.52%)	14578 (9.89%)	64237 (43.59%)	7941 (12.36%)
2004-2005	85500 (49.93%)	17324 (10.12%)	68408 (39.95%)	9574 (14.00%)
2005-2006	66376 (41.28%)	22395 (13.93%)	72016 (44.79%)	9195 (12.77%)
2006-2007	74688 (40.55%)	29974 (16.27%)	79533 (43.18%)	12922 (16.25%)

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

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



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 2014-15 which is the lowest growth rate during a 5-year period; the effect of the disaster has negatively affected the district annual GDP growth rate for subsequent years. This states that disaster 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.

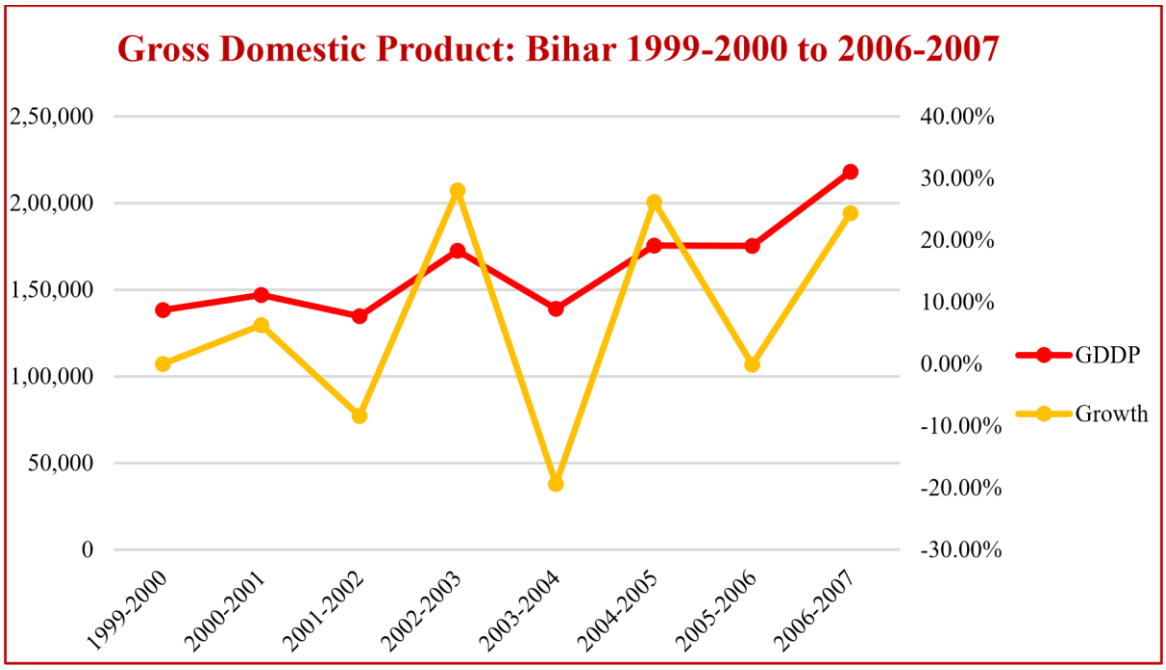
- ***Table: 6 GSDP Growth Rate at Constant Price: Bihar 1999-2000 to 2006-2007***

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***



Katihar: GDDP Growth Rate at Constant Price (1999-2000 to 2006-2007)

The annual growth rate of the Katihar district accounts from (**31.82%)** in **2000-2001 to (-9.53%)** in **2001-2002**. The district annual growth was again rise up to **(14.69%)** in

2002-2003 but didn't maintain its positive growth and thus decrease to **(-9.52%) in 20032004.**

This states that impact of the Disaster, High Crime rate, Poor Infrastructure, Underinvestments, Poor Economic Policies 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 considering micro regional contexts and be site specific.

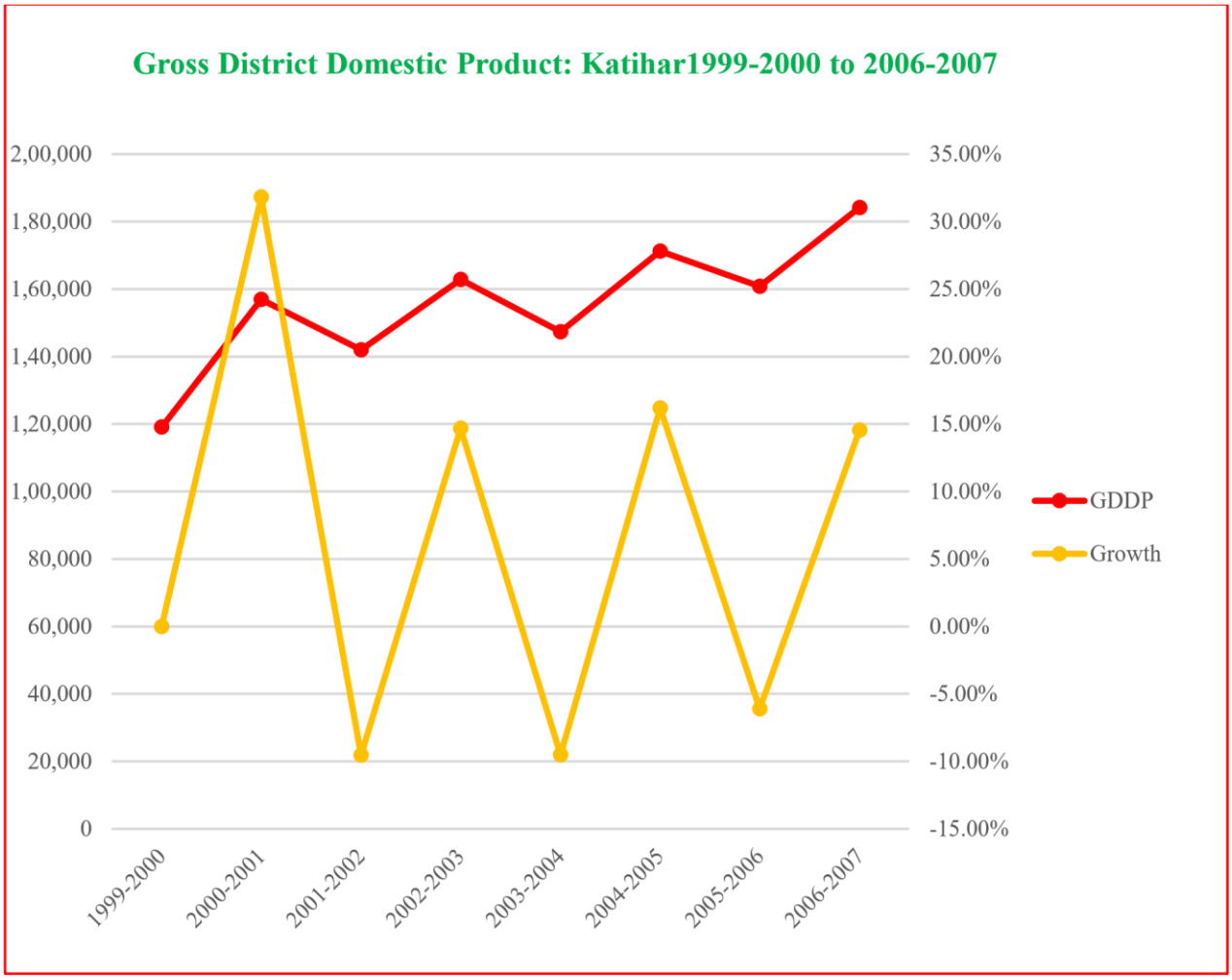
However, during **2000-2001 Katihar** accounts **31.82%** as compare with state growth rate **16.04%**. Similarly, during **2004-2005** in **16.20%** while state accounts **12.17%**. This is because of the difference in Socio-economic and geographical difference that exists across Katihar districts in the state of Bihar. Hence, district specific plans must be developed rather than state specific.

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

Year	GDDP	Growth
1999-2000	119073	0
2000-2001	156965	31.82%
2001-2002	142003	-9.53%
2002-2003	162869	14.69%
2003-2004	147363	-9.52%
2004-2005	171232	16.20%
2005-2006	160788	-6.10%
2006-2007	184196	14.56%

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

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



Katihar: Contribution of TRHR to the GDDP at Constant Price (1999 to 2025)

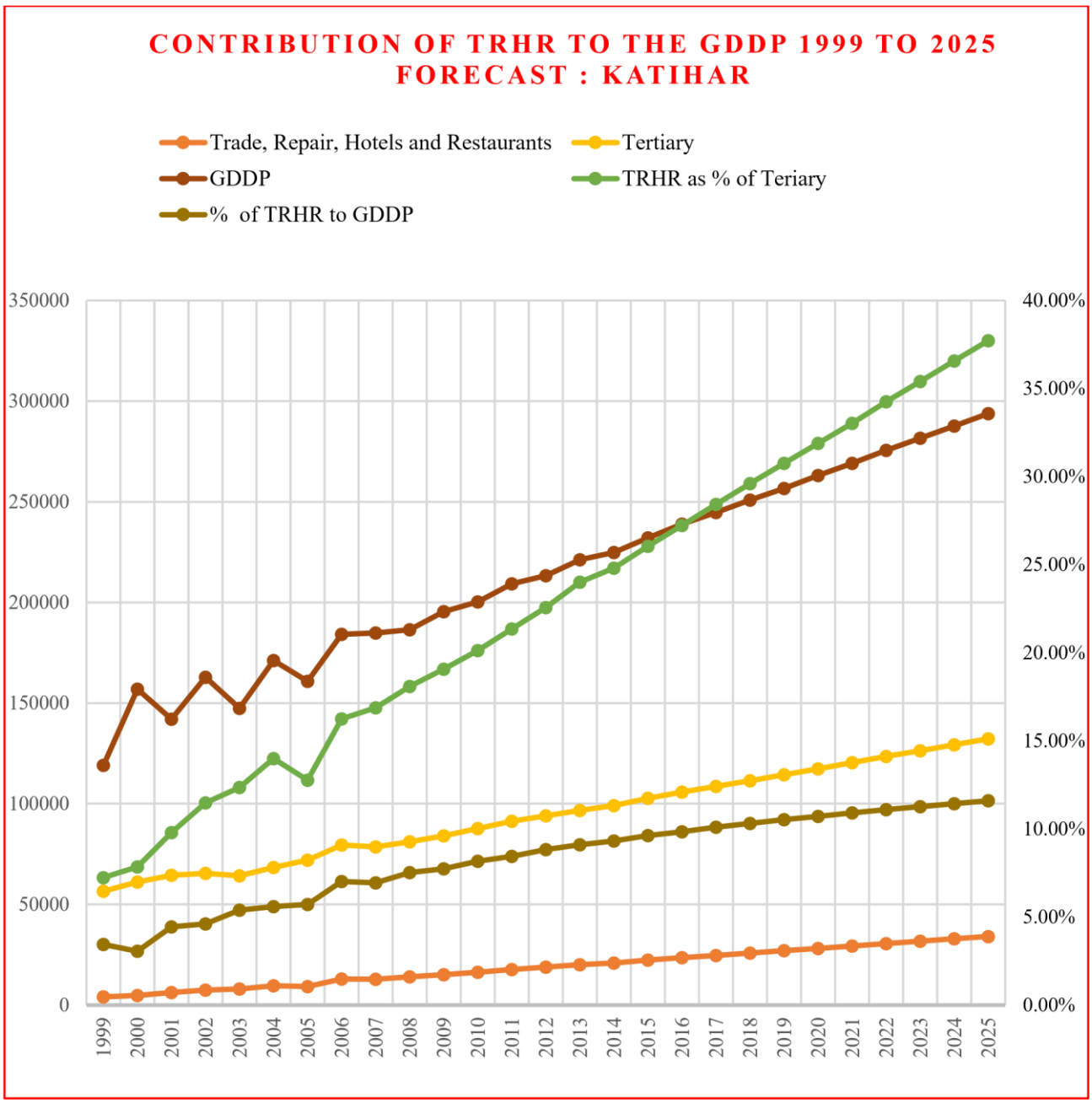
- ***Table: 8 Contribution of TRHR to the GDDP at Constant Price Katihar (1999 to 2025)***

Year	Trade, Repair, Hotels and Restaurants	Tertiary	TRHR as % of Tertiary	GDDP	% of TRHR to DGDP
1999	4096	56575	7.24%	119073	3.44%
2000	4797	61134	7.85%	156965	3.06%
2001	6315	64474	9.79%	142003	4.45%
2002	7511	65384	11.49%	162869	4.61%
2003	7941	64237	12.36%	147363	5.39%
2004	9574	68408	14.00%	171232	5.59%
2005	9195	72016	12.77%	160788	5.72%
2006	12922	79533	16.25%	184196	7.02%
2007 Forecast	12828	78565	16.89%	184873	6.94%
2008	14025	81078	18.08%	186498	7.52%
2009	15135	84121	19.07%	195417	7.74%
2010	16353	87740	20.14%	200289	8.16%
2011	17662	91389	21.36%	209326	8.44%
2012	18832	94058	22.57%	213333	8.83%
2013	20128	96642	24.01%	221231	9.10%
2014	20946	99058	24.81%	224837	9.32%
2015	22331	102728	26.05%	232129	9.62%
2016	23517	105795	27.22%	238955	9.84%
2017	24705	108704	28.43%	244711	10.10%

2018	25866	111507	29.61%	250910	10.31%
2019	27017	114370	30.75%	256666	10.53%
2020	28192	117421	31.90%	263106	10.71%
2021	29369	120489	33.03%	269123	10.91%
2022	30596	123510	34.25%	275638	11.10%
2023	31738	126349	35.41%	281566	11.27%
2024	32912	129298	36.57%	287620	11.44%
2025	34088	132287	37.72%	293841	11.60%

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

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


CONTRIBUTION OF TRHR TO THE GDDP 1999 TO 2025
FORECAST : KATIHAR
Trade, Repair, Hotels and Restaurants
Tertiary
GDDP
TRHR as % of Teriary
% of TRHR to GDDP
350000
300000
250000
200000
150000
100000
50000
0
40.00%
35.00%
30.00%
25.00%
20.00%
15.00%
10.00%
5.00%
0.00%
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
2015
2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

2.4 WETLANDS

The district has vast wetlands; the majority of them are lakes/ponds and waterlogged. Table 1 shows the number of wetlands and their area representation in the district.

Table 1: Wetland Data of Katihar 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	125	128	3	0	2	49	33	28	12	1	0	0	125
Ox-bow lakes/cut off meanders	229	237	8	0	92	70	47	12	7	1	0	0	229
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	35	35	0	0	10	11	9	3	2	0	0	0	34
Waterlogged	177	185	8	0	68	48	35	20	6	0	0	0	176
River/Stream	0	34	34	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	75	80	5	0	70	4	1	0	0	0	0	0	75
Waterlogged	1	1	0	0	0	0	0	0	1	0	0	0	1
Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (1302)	**642**	**700**	**58**	**602**	**242**	**182**	**125**	**63**	**28**	**2**	**0**	**0**	**640**

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

Some of the wetlands that exist in the district with their area (in Ha) are as follows:

Natural wetlands (lake/ponds)		Natural wetlands (Ox-bow lakes/cut off meanders)	
Wetland	Area (Ha)	Wetland	Area (Ha)
Parsa Chor	219.70	Tirla N	297.03

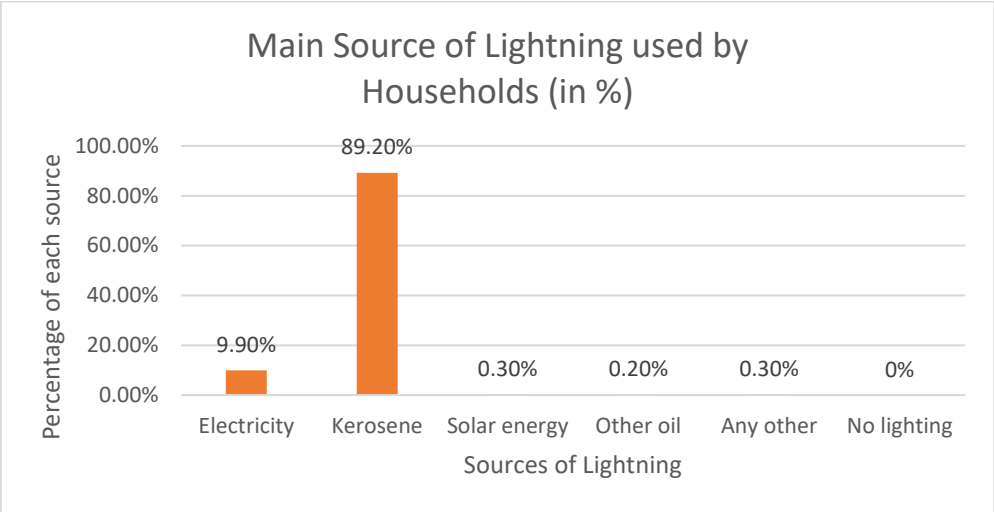
2.5. ENERGY

2.5.1. Solar

Bihar Renewable Energy Development Agency (BREDA) is responsible for the promotion of renewable energy in the state of Bihar.

The data of Census 2011 has been used to make the clustered column chart below. From the figure below, Kerosene is the major source of lightning among 89.2% of the households in the district. 9.9% of the households use electricity as the source of lightning, 0.3% of the households use solar energy

for the lightning, 0.3% households rely on other sources of lightning, and 0.2% of the households depend upon other oil for lightning.



2.5.2. Biomass

Bihar Renewable Energy Development Agency (BREDA) is apex authority to electrify the villages in Bihar by promoting the renewable energy.

The population of Katihar district are predominantly engaged in the agriculture sector. The net sown area is 146927 hectares and the district has a cropping intensity of 169%. The total forest area of the district is 1785 hectares.

The major crops grown in the district are rice, wheat, maize, pigeon pea, mustard, and pulses. The productivity of maize is the highest in the district, which is 6500 kg/ha.

Crop	**Productivity (kg/ha)**
Rice	2100
Maize	6500
Wheat	1700
Pigeon Pea	800
Mustard	900

Pulses	700

Table 1

The pie chart below illustrates the type of fuel used for cooking by the households, from the Census 2011 data. According to the data, 70.40% of the households in the district use crop residue, 18.70% of the households use firewood, 5.30% of the households use LPG/PNG, and 4.20% of the households use cow dung cakes for cooking.

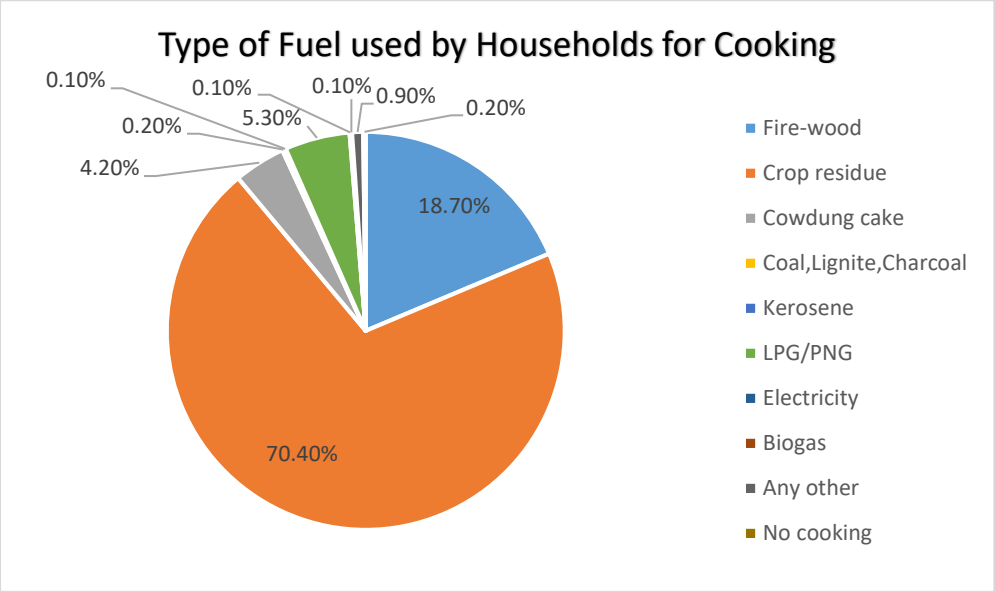


Fig. 1

The normalised value of total available biomass power potential of Katihar district is 0.4103 (D, K, Mishra, & Bhattacharyya, 2016).

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 one crore m^3/year and two crores m^3/year from agricultural waste. This amount of biogas generation can efficiently complete the energy demand of the district.

2.5.4. Hydro Power

The Ganga, Gandak, Bagmati, Kamala, and Koshi rivers run through the area. These rivers can be a source to produce electricity through turbines. However, 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

The forests are mostly disappeared in the district. The Principle trees are Sal, Sakhua, Teak, Shisham, Palas, Peeple and Semal. The district does not has much area under forest, therefore the administration has been making efforts to increase the greenery in the district. An article in Hindustan mentions that on the lines of Dhruv Udyan, nine parks of Katihar and Purnia districts will be looked after by the Forest Department. Five parks in Katihar district and four in Purnia district will soon be transferred to the Forest Department. After the transfer, the Forest Department will plan the development of these parks. Major Ashutosh Park, Shaheed Memorial Park, Children's Park, Kargil Park and Mirchai Bari Children Park in Kathiar will be handed over to the Forest Department. At present most of the parks are under the municipal authority.

Kathiar is categorized under Agro-climatic zone II i.e. the Northern east zone. The district has sandy loam to clay loam type of soil with pH between 6.5-7.8.

3.1.1 Biodivesity

From 2010 to 2021, Katihar lost 3ha of tree cover, equivalent to a 1.2% decrease in tree cover since 2010, and 1.16kt of CO_2e emissions. Between 10th of June 2019 and 6th of June 2022 Katihar experienced a total of 51 VIIRS Alerts fire alerts.

The state's first 'Community Reserve,' Gogabeel, an ox-bow lake in Bihar's Katihar district, has been designated. Deepak Kumar, senior secretary, Bihar's department of environment, forest and climate change, declared the water body as a 57-hectare Community Reserve and a 30-hectare "Conservation Reserve" on August 2, 2019. The Mahananda and Kankhar rivers in the north, and the Ganga in the south and east, combine to form Gogabeel. It is Bihar's sixteenth Protected Area (PA). More than 90 bird species have been identified at this location, with roughly 30 of them being migratory. The IUCN lists the Lesser Adjutant Stork as 'Vulnerable,' whereas the Black Necked Stork, White Ibis, and White-eyed Pochard are categorized as 'Near Threatened.' Black Ibis, Ashy Swallow Shrike, Jungle Babbler, Bank Myna, Red Munia, Northern Lapwing, and Spotbill Duck are among the other species seen at this location.

3.2. ENERGY:

3.2.1. Solar

The distribution of electricity in the district is the responsibility of the North Bihar Power Distribution Company Limited. The distribution of electricity to the towns of Katihar and Manihari is exceptional

however, in the rural areas the electricity distribution is rather weak and poor. There has been a focus on providing electricity to the rural areas and out of 1547 villages in the district, only 312 have been electrified.

According to the CEEW report, the banks are considerably less in the district which hampers the overall credit availability. The mechanisation in the district is significantly high suggesting that the farmers are adaptable resilient towards changing technology.

Irrigation in Katihar district is limited and the need of irrigation is not felt much due to the adequate amount of rainfall in the district and the soil also maintain sufficient moisture. This implies that there is less share of unirrigated area in the region and there is a huge percentage of small and marginal farmers in the state which are financially not well off, so promoting individual solar pumps in the district is not economical. Only if the solar pump could provide a better irrigation services like micro-irrigation or it lowers the irrigation price then it might be beneficial for the farmers.

According to the Times of India (2013), around 4000 households in the districts of Katihar, Munger, and Bhagalpur will get solar energy through the collaborated efforts from SELCO India and Sewa Bharat.

3.2.2. Biomass

Bihar has set up a target to achieve an aggregate capacity of 244 MW through installation of Biomass and Bagasse based cogeneration projects by the year 2022. Katihar district is based on agriculture sector and has a considerate forest cover, which means the residues of agricultural crops and the forest residue could be used for the generation of biomass energy.

The potential of biomass rice husk is 10299 MT/year in Katihar district (The World Bank, 2014). Katihar is one of the four districts which are good for renewable energy based mini-grid, for generation of green energy through biomass or solar, in Bihar (D, K, Mishra, & Bhattacharyya, 2016).

A biomass plant-based company, M/S PTC Bermaco Green Energy Systems Ltd got accepted by State Investment Promotion Board (SIPB) to install biomass plant of capacity 12 MW in Katihar district and an overall of capacity of 300 MW of biomass plant to be installed in 25 different places in Bihar.

3.2.3 Biogas:

The district has a lot of potential to generate bioenergy through biogas plant based on animal or agricultural waste. However, there is no data showing installation of biogas plant in the district. There is no treatment facility for WW and Faecal Sludge (FS). WW from 15 wards conveyed via major storm water drains ends up in low lying areas. FS collected is discharged in solid waste dump yard in outskirts of the city. This sludge can be treated through STP cum biogas plant.

3.2.4. Hydropower:

- No hydroelectric power plant exists in the district, nor the site has been identified.

3.3 TOURISM

Katihar is a beautiful tourist destination in Bihar. Once famous for its Jute mills, this district has rich heritage. (*Top 5 Places To Visit In Katihar*, n.d.). Katihar being one of the favorite tourist destinations of Bihar attracts the tourists to explore the district. All in all, Katihar tourism offers a unique amalgamation of religion, spirituality, history, Adventure and culture. Katihar is the gateway to Chooch Behar, Guwahati and northeast India. It is also the starting point of northeast Frontier Railway. Katihar finds mentioned in legend of Mahabharat. It is said that during the period of incognito exile of the Pandavas, they spent some time in this area. It is said that the place Maniharan, now called Manihari gets its name from the story that Lord Krishna had lost his Mani here. Katihar was under the Angas and later under the Magadha kings during the time of Mahajanpadas. In course of time, Katihar was ruled by the kings of Pal dynasty. (Mitra, 2013)

At present Tourism has very little contribution towards economic generation of the district. Tourist infrastructure is inadequate; heritage structures are poorly maintained and there is little awareness among the locals about the heritage value of sites. (*City Development Plan Katihar*, 2014). Katihar is among the most popular destination for people who are on Pilgramage. The feeling of cultural ambiance can be witnessed in spiritual atmosphere of Katihar where Hindus, Muslims, Sikhs, Jains and the followers of several other religions live together in harmony. (*Katihar District Tourist Places*, n.d.).

It is observed that there is great potential of Religious and Heritage tourism in the district. There is a historic Mazar-e-Sharif in Rehman Pur. Every year lots of devotees come here to offer prayer during Urs celebrations. The famous Gurudwara and historical shrine dedicated to Guru Tegh Bahadur in Lakshimpur. Many people visit this village as it is associated with Guru Tegh Bahadur. Simalya (it is a house situated at Amla Tola known for the famous fish tank on its roof. It is popularly known as machali tanki), Durga Mandir, Kali Mandir at Vinodpur, Barik Chowk are the important places in Katihar District. (*City Development Plan Katihar*, 2014).

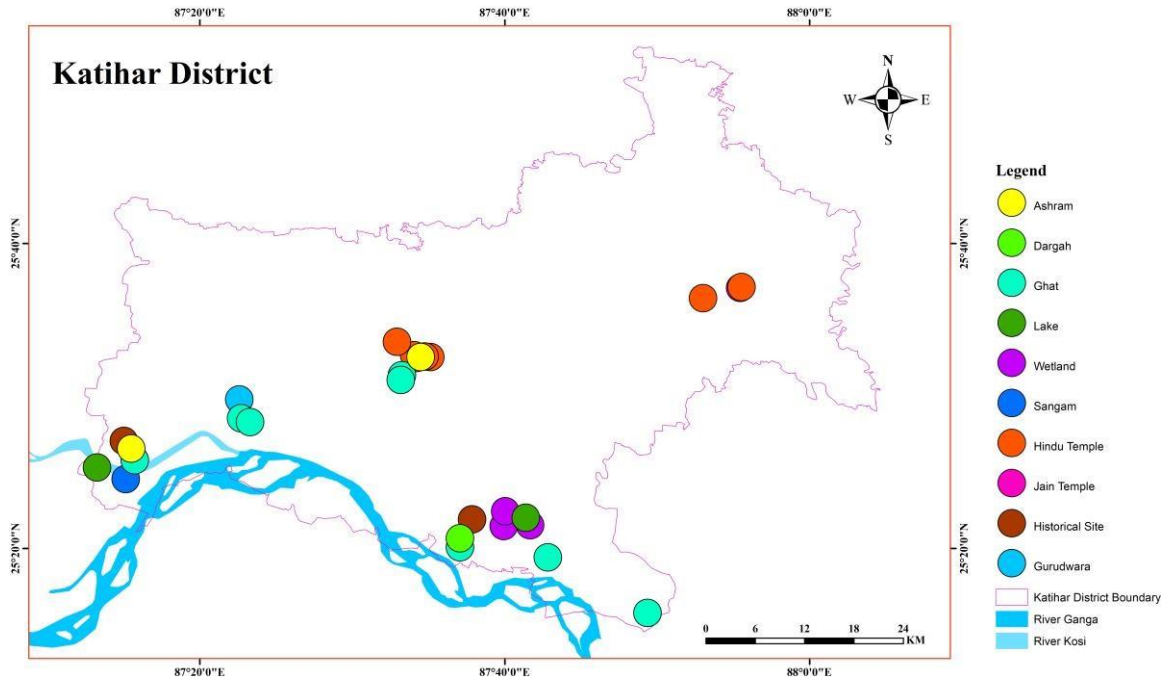
Katihar have a great potential for Adventure and Ecotourism features like; Lake, Riverfront, Ghat, Wetland, Bird watching and Dolphin watching etc. make it an important destination for Adventure and Ecological tourism. The Katihar is drained by rivers like

Ganges, Kosi and Mahanand. Only 6.9% of the Bihar‘s territory has forest cover and Katihar district has a forest cover of 0.46%. There are no reserve forests in the district. The district has good potential for green areas to be developed. (*City Development Plan Katihar*, 2014). The forests, wetlands, water bodies both natural and artificially created also form an intrinsic part of the natural heritage tourism of the district.

The Haats (Rural Markets) are the one of the most remarkable places in the district of Katihar. There is a great potential of Market tourism in the district. There is high potential for agro-based industries in the district. Katihar has a rich agricultural hinterland where banana, Makhana, paddy, wheat, sunflower, jute, maize and pulses, etc., are grown in plenty.(*City Development Plan Katihar*, 2014). The district, which comes under the Kosi region, is one of the prominent producers of makhana in the

state. According to an official figure, Katihar produces 3,000 metric tonnes (MT) of makhana annually. (TOI, 2021).

- **Map: 2 Tourism Sites in Katihar District**



Source: Prepared by Author

3. RELIGIOUS TOURISM

Katihar is among the most popular destination for people who are on Pilgramage. Katihar is one of the most sacred places of various religions like Hinduism, Islam, Sikhism and Jainism. From ancient temples to Dargah and Gurudwara we can find all and more in this district of Bihar. The feeling of cultural ambiance can be witnessed in spiritual atmosphere of Katihar where Hindus, Muslims, Sikhs, Jains and the followers of several other religions live together in harmony. (*Katihar District Tourist Places*, n.d.). Its location on the banks of sacred river Ganges makes this district religiously important.

There is great potential of religious tourism in the district. There is a historic Mazar-eSharif in Rehman Pur. The famous Gurudwara and historical shrine dedicated to Guru Tegh Bahadur in Lakshimpur. (*City Development Plan Katihar*, 2014)

★ **Gurudwara Sahib Barari (Karahgola):** The gurudwara established by Guru Teg Bahadur. It is considered that the Sikh Saint once stayed at the same spot where this Gurudwara has been constructed. Among the most impressive aspects of this Gurudwara are the old scriptures and preserved edition of Guru Granth Sahib. (*Katihar Tourism*, n.d.c)

★ **Manihari Dargah Pir Pahad:** The tomb of the historical "Baba Hazrat Jeetanshah Rahmatullah Aleh" is located on Pir Mountain located in Manihari block of Katihar district. It is situated at a distance of about 50m from Manihari Railway Station! The building of Pir Mazar was constructed in 1338 AD on this historical mountain about 60 feet high. Every year, Urs Mubarak is celebrated every year on 25th Savwal, in which Qawwali and Jalsa are also organized. The Ganges River flows behind it from a distance of about 40 meters. In the month of Sawan, the tomb is touched by the river Ganges, which further enhances its beauty. Behind the Pir Mazar, a cave is built from the side down, from which the chosen stone used to come out. There is a historical well in front of Pir Mazar. (*Pir Pahar*, n.d.)

★ **Digambar Jain Mandir:** Digambar jain mandir is located in barsoi. This temple is 136 years old. Every year the birth anniversary of Lord Mahavir, the 24th Tirthankara of Jainism, was celebrated with reverence by the people of Jain community in this temple. (Jagran, 2019)

★ **Gorakhnath Mandir:** Gorakhnath Mandir is is located in Azamnagar block Salmari

Block in Katihar District. This temple is dedicated to the Shaivites sect, the temple hosts a major celebration during the Mahashivratri festival. Many small temples have been built here. The main temple here is of Lord Shiva. A small pond is found near the temple. (*Katihar District Tourist Places*, n.d.). One of the central attractions is the sight of Shivalinga. Shaivites visit this place on the occasion of Maha Shivratri to celebrate it. (*Katihar District Bihar*, n.d.).

★ **Durga Mandir:** The Badi Durga Mandir situated near Durgasthan Chowk, Vivekanand Nagar in the city of Katihar. This temple is 150 years old and it is dedicated to goddess Durga. It is very popular among religious spot not just among the devotees in the Katihar but also to the devotees in the nearby surroundings, cities and villages as well. People from far of places flock this temple. (*Katihar Tourism*, n.d.-a). The specialty of this temple is that along with the monolithic recitation of Durga Saptashati, the monolithic holdings keep burning here, especially during Navratri. This temple has a tradition of offering Kheicha by women, especially on Maha Ashtami and Navami Tithi of Navratri. (Hindustan, 2021).

★ **Bhairavnath Vishwakarma Mandir:** This temple is situated in the heart of Katihar district. Sarvajanik Shri Bhairav and Vishwakarma Mandir is one of the main religious places of Katihar district. This temple is very beautiful. This temple is mainly dedicated to Lord Bhairav and Lord Vishwakarma. In the temple we get to see very beautiful idols of Shankar Bhagwan, Bhairav Baba, Vishwakarma Bhagwan, Panchmukhi Hanuman and Radhe Krishna. (*Katihar District Tourist Places*, n.d.)

★ **Kaali Mandir:** The Kali Mandir in Katihar is popular tourist spot mainly because of its historical importance. A large number of devotees visit this temple in huge numbers during the time of festivals such as Diwali and Durgashtami which is celebrated with great enthusiasm in this place. This particular

temple is dedicated to the goddess Kali who is believed to be another incarnation of the goddess Durga. (*Katihar Tourism*, n.d.-b)

★ **Gauri Shankar Mandir:** Gaurishankar Ardhanarishwar temple located in Manihari area of Katihar. Shri Kashtaharan Nath Gauri Shankar Mandir is a famous temple in Katihar district. This temple is located in Dr. Rajendra Prasad Road of Mangal Bazar, in Katihar district. This temple is ancient. In the sanctum sanctorum of this temple, you get to see the Shivling of Lord Shiva. (*Katihar Tourism*, n.d.-c)

★ **Sri Satmant Satsang Mandir:** Satmant Satsang Vihar temple is located in Baigna village of Katihar district. This temple is very beautiful, provide mental peace, religious memories and spiritual connection.

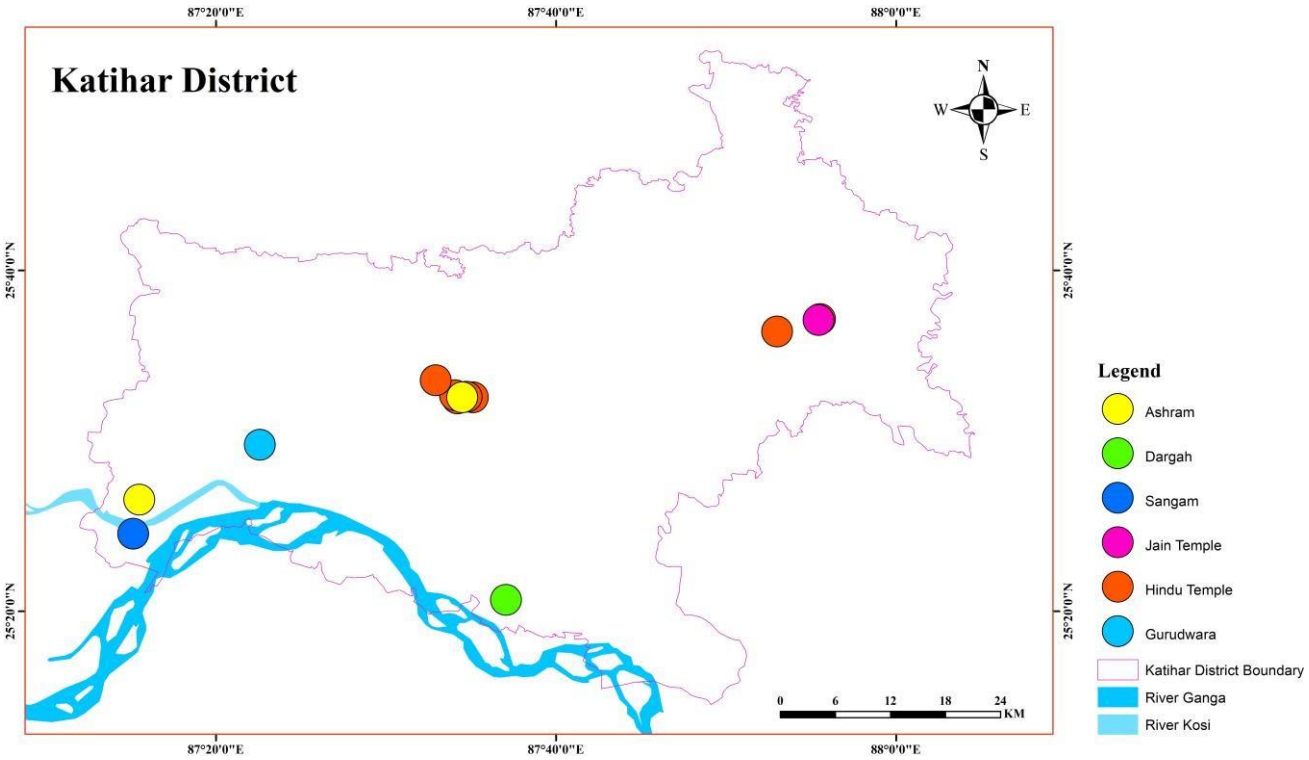
★ **Maharshi Mehi Das Mandir Asharam (Manihari):** As directed by his teacher, Maharshi Mehi spent many years in intense meditation in an ashram located in Manihari near bank of holy river ganga. Now the ashram is known as mahrishi mehi Mandir.The ashram is very popular in that kosi region among local as ‘saadhna asthali ‘ of mystic maharis. (*Katihar District*, n.d.-b)

★ **Ramakrishna Mission Ashrama:** With a small and humble beginning of relief to plague and malaria patients in Katihar-Purnea-Araria in 1925, the Ramakrishna Mission started the regular seva in a small shrine. In meantime they established Ramakrishna Mission Ashrama in this small shirine in year 1926. The devotees then approached the Ramakrishna Math, Belur Math authorities for the affiliation of this centre. The then Most Revered President Maharaj, Swami Shivanandaji, a direct disciple of Shri Ramakrishna, opined, “Katihar is a halting station from Belur Math to Assam. Katihar Ashrama was affiliated to Ramakrishna Math and Mission, Belur Math as a branch centre in 1931. (*Ramakrishna Mission Ashrama Katihar*, n.d.)

★ **Trimohni Sangam:** Trimohini Sangam is a conflurnce of river located near Kataria village in Katihar district. The confluence of Kosi and Ganges river is a major religious place in Katihar district. This Sangam Sthal is also known as Trimohini Sangam Sthal. (Bhaskar, 2020b) The Trimohini Sangam is the confluence of the Ganges, the largest north channel of India. Trimohini Sangam is also one of the 12 banks on which the ashes of Mahatma Gandhi were immersed on February 12, 1948. (Wikipedia, n.d.). People come here from far and wide and take bath. This confluence place is very beautiful. Many people come here during Makar Sankranti.

★ **Manihari:** The village is situated about 20 km south of Katihar on northern bank of the river Ganga. There is a mythological story that during the Mahabharata period, Lord Krishna had come to this place and had lost a Mani (a valuable Jewel). Thus, it came to be known as Maniharan which was changed into Manihari. Located on northern bank of the River Ganga, Manihari gives a picturesque view of both the River Ganga and Rajmahal Hill on the opposite Bank. (*Katihar District*, n.d.-b)

Map: 3 Religious Tourism Sites of Katihar District



Source: Prepared by Author

4 ADVENTURE, NATURE & ECO TOURISM

Katihar have a great potential for Adventure and Ecotourism features like; Lake, Riverfront, Ghat, Wetland, Bird watching and Dolphin watching etc. make it an important destination for Adventure and Ecological tourism. The Katihar is drained by rivers like

Ganges, Kosi and Mahanand. Only 6.9% of the Bihar‘s territory has forest cover and Katihar district has a forest cover of 0.46%. There are no reserve forests in the district. The district has good potential for green areas to be developed. (*City Development Plan Katihar*, 2014). The forests, wetlands, water bodies both natural and artificially created also form an intrinsic part of the natural heritage tourism of the district.

★ **Goga Bil Lake & Bird Sanctuary:** It is about 26 km southeast of Katihar and east of Katihar-Manihari Rd. Patna is about 300 km away. It is 217.99 acres in area. Goga-Bil is an oxbow lake formed by River Kankar. It is a feeding and molting area of more than 300 species & sub-species of birds during monsoon and winter, which migrate from Caspian Sea and Siberian region. As per the special treaty on the 8th October 1984 between India and erstwhile USSR for the protection of these migratory birds and their foraging ground. The government of Bihar has declared Goga Bil Pakshi Vihar as a Closed Area. (*Gogabil Lake*, n.d.)

- **Guide Dam Lake:** The shore bandh done on the banks of Koshi, a tributary of Trimohini Sangam, which is famous as Guide Dam Lake. More than 150 species of birds are present here. (Wikipedia, n.d.)

- **Kanchira Wetland:** It is situated near Manihari chowk. It spread in an area of about 22 Acre is formed as the result of excavating the ground soil for brick industry. The site is very close to the area of Goga Bil, Baghar Beel and Baldia Chaur. The birds found in Kanchira wetland are: Wooly-necked Stork Ciconia episcopus, Bar¬headed Goose Anser Indicus, Red-crested Pochard Netta rufina, Little Cormorant Phalacrocorax niger, Great Cormorant Phalacrocorax carbo, Little Egret Egretta garzetta, Great Egret Casmerodius albus etc. A population of domestic ducks is also seen. The area is surrounded by the agricultural fields and human settlements. (*Katihar District*, n.d.-b)

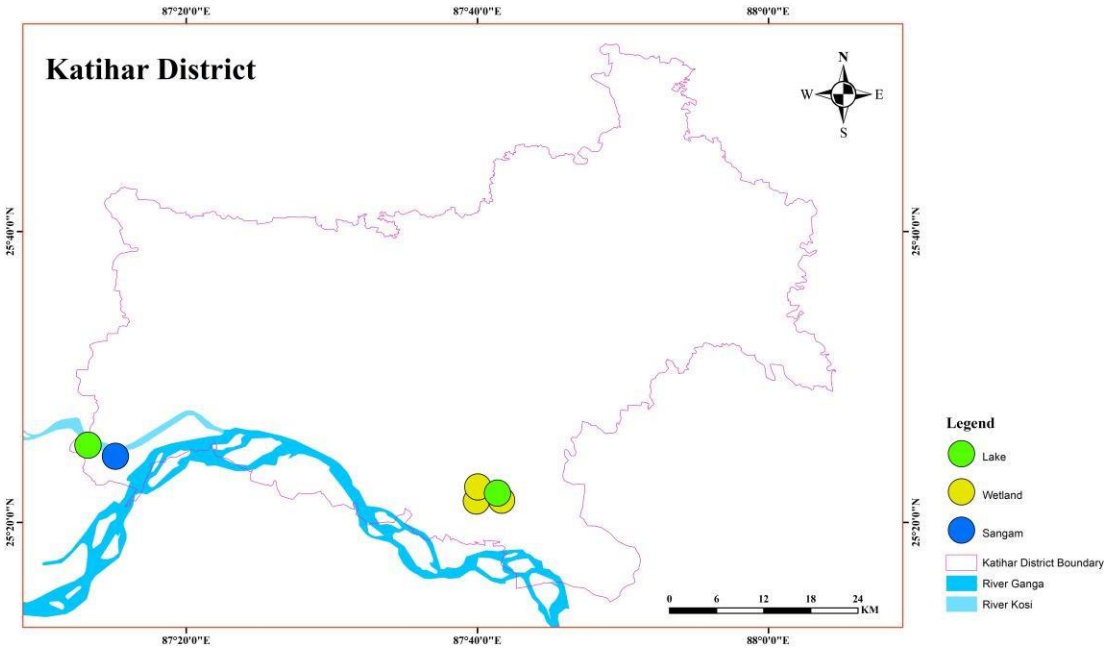
- **Baghar Beel Wetland:** Baghar beel is about 28 km southeast of Katihar.The flood waters from Goga Bil during monsoon form wetlands, namely Baghar beel. This wetlands are inundated by overflow from the Gogabil and local monsoon run-off. Its waterspread becomes about 25 ha in summer from about 400 ha in the monsoon.

Baghar beel is oxbow lakes marking the historical course of Gogabil River. As the chaurs dry out, the exposed mud is covered with grasses and creepers. The great part of the exposed lake bed is subsequently brought under cultivation. It is a feeding and molting area of more species. (*Katihar District*, n.d.-b)

★ **Baldia Chaur Wetland:** The flood waters from Goga Bil during monsoon form wetlands, namely Baldia chaur. This wetlands are inundated by overflow from the Gogabil and local monsoon run-off Baldia chaur is shallow and is seasonal only. This chaurs is oxbow lakes marking the historical course of Gogabil. As the chaurs dry out, the exposed mud is covered with grasses and creepers. The great part of the exposed lake bed is subsequently brought under cultivation. Water from these wetlands is used for irrigation and domestic supply. It is a feeding and molting area of more species. (*Katihar District*, n.d.-b)

★ **Trimohni Sangam:** Trimohini Sangam is a conflurnce of river located near Kataria village in Katihar district. The confluence of Kosi and Ganges river is a major religious place in Katihar district. This Sangam Sthal is also known as Trimohini Sangam Sthal. (Bhaskar, 2020b) The Trimohini Sangam is the confluence of the Ganges, the largest north channel of India. Trimohini Sangam is also one of the 12 banks on which the ashes of Mahatma Gandhi were immersed on February 12, 1948. (Wikipedia, n.d.). People come here from far and wide and take bath. This confluence place is very beautiful. Many people come here during Makar Sankranti.

Map: 4 Adventure, Nature & Eco Tourism Sites of Katihar District



Source: Prepared by Author

5. HISTORICAL TOURISM

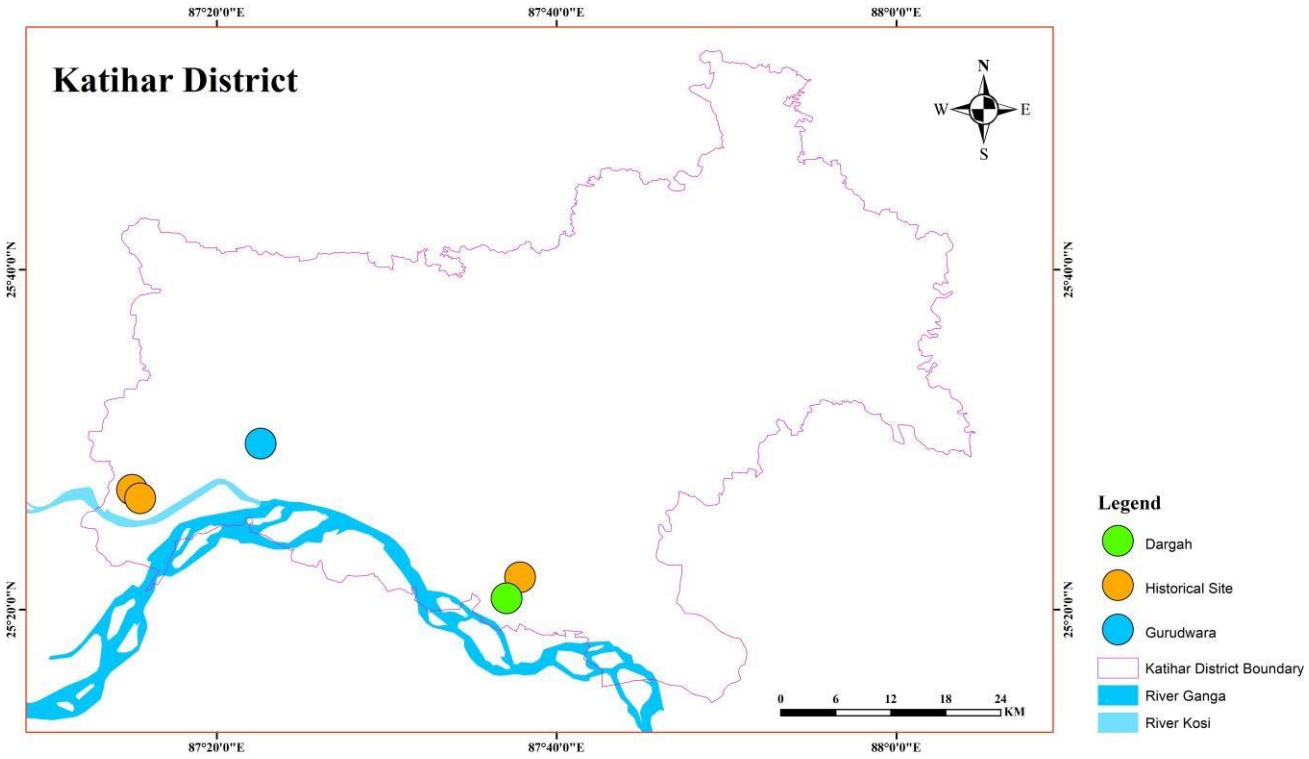
Katihar was once dominated by landlords and Nawabs, before getting passed on to first the Mughals, and later to the British. From being a part of Bengal in 1872, Katihar once again was returned to Bihar after Bengal's partition. Legends from Hinduism have given rise to a number of temples and the nearby Manihari remains a religiously significant place for most locals. Sikhism has also taken hold here and Guru Tegh Bahadur Gurudwara is a must-visit to see some preserved sacred scriptures. (*Katihar Tourism*, n.d.-c)

Katihar finds mentioned in legend of Mahabharat. It is said that during the period of incognito exile of the Pandavas, they spent some time in this area. It is said that the place Maniharan, now called Manihari gets its name from the story that Lord Krishna had lost his Mani here. Katihar was under the Angas and later under the Magadha kings during the time of Mahajanpadas. In course of time, Katihar was ruled by the kings of Pal dynasty. (Mitra, 2013)

- ★ **Gandhi Ghar:** Gandhi Ghar is a historical place located in Katihar. This place is also known as Sarvodaya Ashram. This site is located in Kursela Block in Katihar District. Here you get to see the ashram, where a lot of antiquities have been kept. Here you get to see beautiful gardens and here you get a lot of information. Here you get a lot of information about history. You can come here to roam and get a lot of information. (*Katihar District Tourist Places*, n.d.)
- ★ **Baldia-Bari:** It is situated about 27 km south -east of Katihar and about 2.5 km from Manihari near the bank of Ganga. It is noted as the site of battle fought between Nawab Siraj-ud-daula of Murshid and Nawab Shaukat Jang, Governor of Purnia in 1756.
- ★ **Rehman Pur:** There is a historic Mazar-e-Sharif in Rehman Pur.
- ★ **Lakshimpur:** The famous Gurudwara and historical shrine dedicated to Guru Tegh Bahadur in Lakshimpur.
- ★ **Nawabganj:** It is situated 3 km north of Manihari, noted as the former seat of Nawab Shaukat Jang, Governor of Purnia in the Mughal period. Ruins of palace exist here.
- ★ **Belwa:** It is situated about 8 km south of the Barsoi Block Headquarter. It has remains of ancient building and some stone images of Lord Shiva and Goddess Saraswati. A fair is held on the occasion of Basant Panchami every year
- ★ **Kursela:** It is situated 50 km west – south of Katihar and about 45 km south – west of Purnia on NH 31. A distorted name of Kuru-Shila. Kuru-Shila means hilly part of the region which once belonged to the king Kuru, the descendents of whom were called Kaurawa and according to Mahabharata waged a war with Pandavas, their cousins. It is seat of the Kestate , having a private landing ground. (*Katihar District*, n.d.-b)

★ **Taj Dehori:** Earlier, Katihar district was dominated by the Choudhary family, who were the biggest landlords of Kosi zone. The founder of Choudhary family was Khan Bahadur Choudhary Mohammad Baksh and he had an authority over 126 small landlords of Kosi zone. He died in 1943. The family holds lands of about 15,000 acres (6,100 ha) in Katihar district, and 8,500 acres in Purnia. Now his successors still live there in a haweli known as Taj Dehori. (*Katihar District*, n.d.-b)

Map: 5 Historical Tourism Sites of Katihar District



Source: Prepared by Author

6. GHAT TOURISM

Every city has some specialty that is engraved in the heart of it. A visit to Katihar 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 Manihari Ghat, Kadagola Ghat and Kaari Kosi Ghat etc. Ghats in Katihar 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.

In order to develop the Ghat tourism in Katihar we must consider these things: Ghats will be connected to each other by making river front will enhance the development of the district tourism, Benches will be set up for the people who come to visit ghat, Plantation will be done on the banks of the river, Greenery will be developed with the aim of promoting the environment, Lights will be installed on the side of the parking track, Laser and water screen show will be held to promote tourism.

- ★ **Manihari Ghat:** Located on northern bank of the River Ganga, Manihari gives a picturesque view of both the River Ganga and Rajmahal Hill on the opposite Bank. (*Katihar District*, n.d.-b)

- ★ **Kadagola Ghat:** Kadhagola Ghat located in Barari block of the district holds historical and religious importance. Because of this Ganga Ghat, Katihar is also called Mukti Dham. People come from far and wide to take bath in the Ganges at Kadhagola Ghat. People of the Sikh community from across the country and the world reach here to see the Hukumnama of their ninth Guru Tegh Bahadur. According to Hindu beliefs, whose body is cremated at this ghat, he attains salvation. A fair is held at the Ghat on the occasion of Maghi Purnima. (Bhaskar, 2020a)

- ★ **Baalu Ghat:** Baalu ghat is located in Sharifganj, Katihar. Everyear in Balu Ghat there was a huge influx of Chhathvratis.

- ★ **Kaari Kosi Ghat:** Kosi Ghat it is also known as Kaari Kosi Ghat. This ghat is the oldest and largest Chhath Ghat in the Katihar city. It is said that Chhath Puja was started from this Ghat in Katihar. That is why the recognition of this ghat is also highest. The temple of Mata Kali built here adds to its importance even more. This temple is known as Samshan Kali Mata Mandir. Every year lakhs of people celebrate Chhath here.

- ★ **Kheriya Ghat:** Kheriya ghat is located in Kursela block of Katihar district.

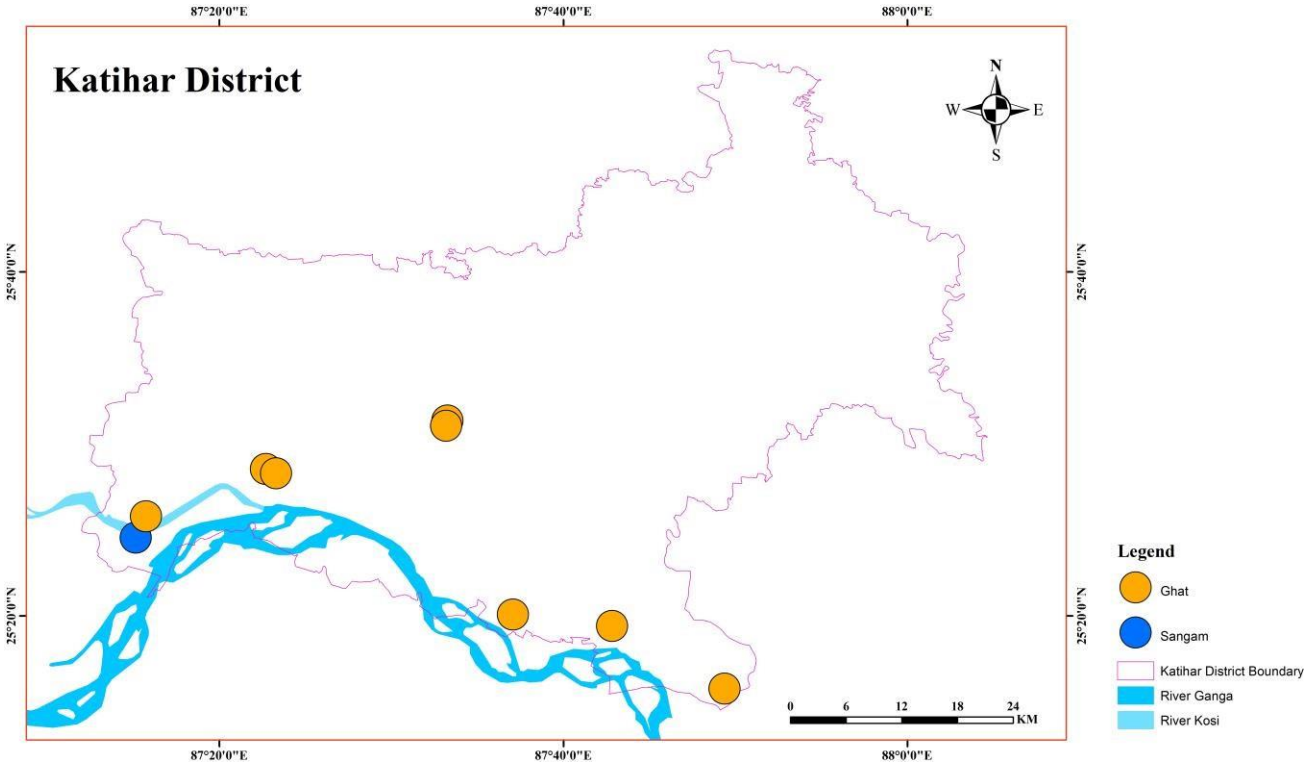
- ★ **Siztola Ghat:** Siztola Ghat is located 2 KM from Barari Police station, Katihar district. This ghat is very close to Kadagola ghat.

- ★ **Ganga Ghat Guagachhi:** Guagachhi ghat is located in Kishanpur village of Ambdabad, Katihar district.

- ★ **Bhawanipur Ghat:** Bhawanipur Ghat is located in Bhawanipur Khatti village, Katihar.

- ★ **Trimuhani Sangam:** The confluence of Kosi and Ganga river is a major religious place in Katihar district. This Sangam is also known as Trimohini Sangam Sthal. (Bhaskar, 2020b) The Trimohini Sangam is the confluence of the Ganges, the largest north channel of India. People come here from far and wide and take bath. This confluence place is very beautiful. Many people come here during Makar Sankranti.

- **Map: 6 Ghat Tourism Sites of Katihar District**



Source: Prepared by Author

7. MARKET TOURISM (Haat/Rural)

The Haats (Rural Markets) are the one of the most remarkable places in the district of Katihar. There is high potential for agro -based industries in the district. Katihar has a rich agricultural hinterland where banana, Makhana, paddy, wheat, sunflower, jute, maize and pulses, etc., are grown in plenty. (Mitra, 2013). Moreover, it could be developed like Delhi Haat to provide a platform for artisans to come and sell their wares. There is a famous cloth market in the district and its scale of operation can be further enhanced and improved by improving the basic infrastructure and facilities in the market area. Katihar is one of the prominent producers of makhana in the state. According to an official figure, Katihar produces 3,000 metric tonnes (MT) of makhana annually. Katihar town and Karhagola are two important mandis in the district from where bulk purchases are made. (TOI, 2021). Katihar lies in its good rail and road connectivity with the surrounding region and also other parts of the country which gives it the potential to be developed as logistics hub.

★ **Salmari Haat:** Salmari Haat is located in Salmari village of Azamnagar block, Katihar District.

★ **Chowki Haat:** Chowki Haat is located in Babhani, Kadwa block of Katihar District.

★ **Kurum Haat:** Kurum Haat located in Kadwa block of Katihar District. It is one of the oldest market of Kadwa village.

★ **Mansahi Haat:** Mansahi Haat is located in Mansahi block of Katihar District.

★ **Kheriya Haat:** Kheriya Haat is located in Khorha block of Katihar district. This Haat is famous for Vegetables, Spices and Cattle etc.

★ **Dumar Haat:** Dumar Haat is located in Barari block of Katihar District. It is famous for

★ Cattles, Vegetables an other household items.

★ **Sonaili Haat:** Sonaili Haat is located in Kadwa block of Katihar District.

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 famous for Makhana Phodi. 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, Jute, Makhana, Banana, Wheat, Maize and Pulses have high productivity in the district

4 ACTION PLAN DEVELOPMENT

4.1 FORESTRY

The forests in the district cover only 2.03% 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. 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, Bamboo, Casurina etc. can be grown. If farmers want to take up agro-horticulture then Mango, Litchi, Jamun, Kathal, Barhar, Guava, Bel, Ber etc. is recommended.Medicinal plants like Kalmegh, Aswagandha, Sarpgandh, Satawar, Lemon grass, Safedmusli etc. can be grown along with tree component.

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 –

- Under the Namami Gange project, a sewage treatment facility will be built in this ancient city so that polluted water does not enter the Ganges River.

4.2 TOURISM

Katihar district has a unique historical background. Katihar finds mentioned in legend of Mahabharat. It is said that during the period of incognito exile of the Pandavas, they spent some time in this area. Katihar was under the Angas and later under the Magadha kings during the time of Mahajanpadas. In course of time, Katihar was ruled by the kings of Pal dynasty. (Mitra, 2013). Katihar was once dominated by landlords and Nawabs, before getting passed on to first the Mughals, and later to the British. From being a part of Bengal in 1872, Katihar once again was returned to Bihar after Bengal's partition. Legends from Hinduism have given rise to a number of temples and the nearby Manihari remains a religiously significant place for most locals. Sikhism has also taken hold here and Guru Tegh Bahadur Gurudwara is a must-visit to see some preserved sacred scriptures. (*Katihar Tourism*, n.d.-c)

Katihar has good potential for the development of tourism in the district. In the flood prone and minimum opportunities for other industries, tourism could be the best way for economic growth and employment generation in the district. There is a need to minimize the hurdles and threats by developing good governance. Many destinations in the district are still unexplored and reason behind is infrastructure problem. Lack of adequate infrastructure deprives them from fulfilling their desire of leisure and rest. This has adversely affected the perception of the district as a tourist destination. It is expected that if the infrastructure is improved and the introduction of more activities at the site and to the excursion point can increase the duration of stay and lure more tourists. For many places of interest accessibility is a huge problem whereas for others condition of roads needs to be vastly improved.

Heritage Tourism: Katihar district has immense potential for Religious, Adventure and Historical tourism. There are number of heritage structures, Adventure and Ghat sites present in the district. These structures include temples, shrines, Gurudwara, Buildings, Wetlands, Lakes, Ghats etc. Some of the major tourist spots in the district are: Gurudwara Sahib Barari, Goraknath Dham, Badi Durga Mandir, Manihari Dargah Peer Pahad, Gandhi Ghar, Gogabil Lake, Manihari Ghat, Trimohni Sangam etc.

Religious Tourism: The district is dotted with a number of places that hold many religious significance. The religious tourism can also be promoted and developed as one of the tourism circuit for the district. Katihar can also act as the focal point in attracting the important Hindu, Islam, Jain & Sikh religious destinations, some of them are: Gurudwara Sahib Barari, Goraknath Dham, Badi Durga Mandir, Kaali Mandir, Bhairavnath Mandir, Manihari Dargah Peer Pahad, Digambar Jain Temple, Ramakrishna Mission Ashram and Maharshi Das Mandir Ashram etc.

Nature Tourism: The district being surrounded by rivers, lakes and wetland etc. Nature Tourism can be promoted as one of the tourism circuit for the district. The Birds & Dolphin Watching hold vast potential for nature-based eco-tourism. Some of the identified sites for nature-based tourism are: Gogabil Lake, Trimohni Sangam, Guide Dam Lake, Kanchira, Baghar and Baldia Chaur wetland etc.

Market Tourism: The Haats (Rural Markets) are the one of the most remarkable places in the district of Katihar. There is high potential for agro -based industries in the district. Katihar is one of the prominent producers of Makhana in the state. Salmari, Chowki, Kurum, Mansahi, Kheriya, Sonaili and Dumar Haat etc.

Waterfront Tourism: The river 'Ganges' offers potential for development of waterbased sports & activities along its stretch. Riverfront development has to be undertaken in the Katihar district to promote tourism. Trimuhani Ganga-Kosi Sangam beach has great potential to be built as a tourist destination.

Ghat Tourism: The Katihar Ganga ghats has great potential of been a source of inspiration for artists, film-makers, photographers, writers and musicians for centuries.

The Morning boat ride on the Ganges across the ghats is a popular visitor's attraction. One of the more visually spectacular ghats is the Manihari ghat, Kadagola ghat, Kaari Kosi ghat, Kheriya ghat, Guagachhi ghat, Bhawanipur ghat, Siztola ghat and Baalu ghat etc.

Fairs & Festivals: Local fair and festival are the integral part of Culture and traditional heritage of the district. Chatth Puja are famous festivals of Katihar. Every year a wonderful fair is held at Trimohini Sangam on the auspicious occasion of Maghi Purnima. Thousands of devotees from many districts of

Bihar and also from Nepal reach Trimohini Sangam for bathing in the Ganges. Pilgrims throng from far and wide to take bath at Trimohini Sangam on Kartik Purnima.

SWOT ANALYSIS: KATIHAR DISTRICT

STRENGHT

- ★ Katihar district is endowed with extremely fertile soil and plenty of water.
- ★ Katihar's location offered attraction such as River Kosi, Ganga & Mahananda that could be used for water supply and waste disposal, and in fertile river valleys with extensive food and animal resources.
- ★ There are various religious spots, Adventure sites and Eco tourism areas around the district.
- ★ Regional hub for educational institute.
- ★ Cohesive Community.
- ★ Residents who are passionate and involved.
- ★ Financial institutions / willingness to invest in the district.

WEAKNESSS

- ★ 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.
- ★ 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.
- ★ Congested and overcrowded roads and circulation system.

OPPORTUNITY

- ★ Ongoing, committed, and proposed development projects.
- ★ Potential for growth in Religious, Adventure, Eco tourism, Market and Ghat Tourism.
- ★ Katihar owns Gogabil lake (Bird Watching), which attracts large numbers of migratory birds.
- ★ A wide scope for river front development along Ganga.
- ★ Development of local resources into tourism market, example: Makhana Phodi/ Fox Nut.
- ★ Attract industries for processing of local agricultural produce like: Jute, Rice and Fox Nut etc.
- ★ 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.

THREAT

- ★ Across the district the rise of crime including, robbery, snatching, drugs, and murder etc.
- ★ Katihar comes under the zone of high Flood prone and high Earthquake zone etc.
- ★ Poor Infrastructure facilities for tourists in Katihar.
- ★ 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.
- ★ Competing cities for external investments in the vicinity.
- ★ Too much dependence on single economic sector.
- ★ Lack of desire of skilled work force to stay in the district. The district does not boast of any prominent tourist attraction.

PROJECTS DEVELOPMENT

- ★ Development of tourist information centres at all important places of Katihar district.
- ★ In order to maximize the use of the Kosi River flowing through the district, Kosi Riverfront Development would be a great potential for Boating, Public Promenades, Religious Facilities, Cruise etc, making it the vibrant heart of the urban fabric.

- ★ To develop a project aims to reclaim the river edge as a public asset and restore the distict

  ‘s relationship with its river. Project like Riverfront development scheme, Project Dolphin will help the Gangetic dolphins, particularly those found in Katihar district.

- ★ Projects on creating required institutional mechanisms to ensure ecotourism at different destinations of Katihar.

- ★ 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.

- ★ 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.

- ★ Tourism carrying capacity at individual sites and caping the number tourists must be estimated through specific research and development projects.

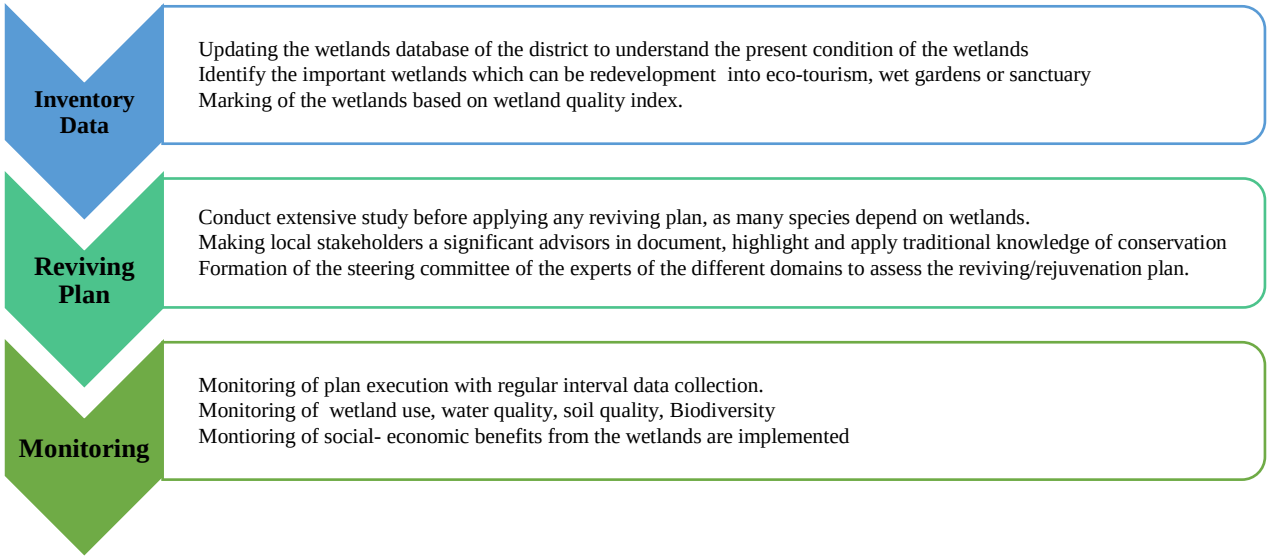
- ★ Tourist’s satisfaction and perception analysis can be undertaken to ensure quality tourism experiences and promoting sustainable tourism.

- ★ Upgradation/ construction of road along Ganga covering several tourist spots.

- ★ Provision of cheaper facilities for low-income tourists Construction of Dharmshalas.

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

The renewable source of energy should be encouraged, for instance the government should incentivise households and farmers in the villages to utilise solar energy in order to provide lightning to the villages, which conventional source is unable to provide and it will help to achieve 100% electrification of the villages, through renewable energy.

According to the Census 2011, the area of barren and uncultivable land in the district is about 8394.7 hectares. Component A of the PM-KUSUM could help to generate the solar energy, by installing ground mounted solar rooftop on those lands.

Projection and Monitoring Matrix

Firstly, awareness about solar policy needs to be given to the population of the district.

Secondly, there should be infrastructural developments for instance, banks should be available and accessible to everyone in the district, which would further help farmers or rural people to purchase solar panels or solar pumps.

Thirdly, the government should also provide sufficient subsidies to the farmers to promote solar pumps.

Fourthly, training and technical courses should be introduced so that they could help in maintaining the solar panels and so that solar panels do not go out of the use.

Lastly, only 20.16% of the villages in the district are electrified, the rest can be electrified through encouraging solar energy.

Through implementation of solar energy in the district, the overall energy consumption of the district would improve and would help in the sustainable development of the state.

4.4.2. Biomass

Not much has been done in Katihar district with respect to biomass energy. There is a need of awareness generation through various means which include promotion campaigns, spreading awareness regarding financial aids and subsidies to the potential biomass plant owners, indulging young adults to short-term biomass courses. There is also a need to consider mini-grid biomass plants for electrification of rural areas. The Policy for Promotion of New and Renewable Energy Resource, 2017, needs to be modified and implemented according to the district. The skills of the rural people need to be enhanced to be maintain the biomass plants. This would generate employment opportunities in the district.

PROJECTION AND MONITORING

Firstly, biomass awareness is required in the district.

Secondly, mini-grid biomass plants need to be exploited in the district.

Thirdly, there should be a proper storage and transportation facilities for biomass raw materials in the district.

Fourthly, there should be a proper provision of subsides for the biomass plant owners and financial institutions should create a proper credit facility.

The district has a good productivity level and also has a significant forest area, the residues from both could be raw material for biomass.

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:

The state plans to establish huge hydropower projects and pumped storage systems with the help of bilateral and international finance agencies, joint partnerships with government entities like the National Hydro Power Corporation (NHPC), and even private sector participation.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

- Groundwater shares 95.79% of NIA in the district. It indicates a significant burden on groundwater for irrigation purposes, and it can lead to depletion of the water table in the long run. As per the Central Groundwater Board (CGWB) 2020, out of 16 blocks of Katihar, only one block falls under the semi-critical category, and the rest falls under the safe category. However, if such a trend continues, more blocks may fall under the semi-critical category. Therefore, Drip and Sprinkler irrigation systems should be encouraged, especially for vegetable and fruit cultivations. It will help to increase the water use efficiency and productivity of crops. The district needs to construct more tanks and ponds under MGNREGA to improve the groundwater table.

- According to the CGWB, 2013, the groundwater recharge in the district is 109051.40 ham, whereas the Annual groundwater withdrawal (for irrigation, domestic and industrial water supply purposes) is 59923.23 ham. The stage of groundwater development is 60.03%. It indicates to the further scope of groundwater development.
- The areas under trees, gardens, and forests need to be enhanced by reforestation, afforestation, and social forestry.
- The share of barren and uncultivable land remained constant (7.59%) over the years. The fallow land significantly increased from 5.08% in 2011-12 to 23.34% in 2019-20, which is a matter of concern for the district economy. Moreover, the NSA decreased from 62.72% in 2011-12 to 43.98% in 2019-20, which is not a good sign for the district economy. Hence necessary steps should be taken by the government.

- Food grains comprised 77.91% of GCA as the focus is more on the cultivation of staple crops like Rice and Maize. However, this monoculture (Rice-Maize cropping system) needs to be changed towards high-value cash crops such as horticulture. The government can promote micro and small units for horticulture product processing.

- The livestock subsector has witnessed significant growth during the study period. Female Cattle and buffaloes increased by 123% and 32.71%, respectively, in 2019 compared to 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.

- Katihar has 30 organic groups in three development blocks, divided into Barari (22), Korha (5), and Katihar (3). However, 25 out of 30 groups are formulated under the scheme of Namami Gange. There are only five groups present under the scheme of PKVY. Hence, the government must encourage more groups to be added under PKVY. Organic farming could 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 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.

- About 97% 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.

- Jute mills in the district need to rejuvenate to increase the production of jute-based products and farmers' earnings.

- More farmers should be encouraged for makhana cultivation in the low-lying areas and its final processing units, which can provide better income to them.

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

- Katihar district is rich in fruit cultivation, like mango, guava, litchi, and banana. Export facilities marketing can be promoted to the nearby districts and other parts of the country. The district is one of the primary hubs for fruits and pulses; it has much scope for fruit processing infrastructure units and pulse mills.

- Inter-culture in the existing mango orchards, such as turmeric, could be profitable and should be encouraged.

- Poultry farming can be promoted under the cooperative farming model.

- Resources conservation technologies like zero tillage, mulching, and drum seeder for paddy need to be encouraged.

- Fish culture has a good scope in the low-lying areas of the district; training for the scientific method in fish culture needs to increase.

- Greenhouse and poly house are highly recommended for the high revenue crops like capsicum, broccoli, strawberry, tomato, etc., and orchids like rose, Gerbera, etc.

- The district is often affected by floods; preventive measures should be taken to overcome the problem or minimize the losses.

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

- The district is badly affected by flood therefore climate smart agriculture approach should be implemented across the district to make it more resilient to draught and floods. This approach also improves forestry and grassland management
- It is recommended to conduct afforestation program as data shows decrement in forest area.

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 indirectly relieving of stress from 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 introduce improved cultivars and production technologies for Makana and banana.
- It is recommended to develop flower gardens and wet gardens around the wetlands. These wetlands can be turned into an eco-tourism site.
- The district consists of wetlands like Gogabil kake, trimohini samgam.
- Small-scale industries 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

- ❖ Component A of PM-KUSUM scheme should be encouraged
- ❖ Awareness is needed to promote solar energy in the district.
- ❖ Rooftop solar panels could be installed at the government offices and institutions.
- ❖ Solar in rural areas needs to be promoted to get village electrification.

5.4.2. Biomass

- ❖ People in the rural areas and farmers need to be aware about the biomass energy.
- ❖ Financial assistance should be provided by the government.
- ❖ Potential and working of Mini-grid need to be researched in the district.
- ❖ The district produces rice, wheat, maize, so government should motivate to install biomass gasifier or cogeneration plants in the district.

5.4.3. Biogas

- A centralized biogas plant for the district should be constructed for the treatment of organic fraction of municipal solid waste.
- A biogas can be constructed using cattle dung as feedstock in different gaushala such as Sri Krishna Gaushala, Sri Bhootnath Gaaushala, and Purnimadevi Gaushala.

5.4.4. Hydropower

- It is recommended to construct ganga canal near Bariapur and investigate sites for hydropower generation.

5.5. TOURISM

SUGGESTIONS AND INTERVENTIONS

- 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, Adventure, Eco tourism and Ghat by development of capacity building, engagements with local stakeholders.
- Religious tourism, Adventure and Bird Sanctuary are the mainstream activities in Katihar. The natural resources in the district like Lake, rivers scenic beauty and Gogabil Lake &

  Bird sanctuary has not received enough attention and did not grow to its fullest potential.
- 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 and attract all type of tourism.
- Till now, no religious and adventure tourism circuit are found in the Katihar 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, rural-urban haat, fair & festivals, waterfront development, health tourism etc.

- 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.
- Appropriate and standardized tourism planning, and policies must be drafted and applied, ecofriendly infrastructural developments, popularizing the concept of eco- tourism among tourists and locals are the crucial requirements of the time.
- 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. ❖ Identify the basic infrastructure for Tourism, Investment in core structure of Tourism
- Specialised education-cum-training for human resource development related to tourism would form an essential component of tourism development. Moreover, acceptance of suggestions from different religious communities would be made for their inclusion in the plan for development of tourism.
- Work as a promoter, facilitator and infrastructure provider. And as pioneer, planner and joint investor with private groups to boost tourism. As formulator of plans and policies.

CHALLENGES AND THREATS

- ★ Tourism industry is underdeveloped. At present Tourism has very little contribution towards economic generation of the district.
- ★ Lack of tourism infrastructure and tourist information centers.
- ★ 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 Katihar.
- ★ 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.
- ★ Too much dependence on single economic sector and Competing cities for external investments in the vicinity.

6 Discussion during the Report Presentation

- The Tussar silk and Bhagalpuri silk is famous and can be associated with Jalaj Model.
- Jalaj team is very active and has a production unit and production unit.
- Namami Gnage has provided Vikramshila Gangetic Sanctury which attracts a good footfall of tourists.
- There is a turtle-Rehab centre in Bhagalpur.
- Officials ensured that the submitted report will be reviewed and will taken up for suggestions for implementation of interventions in the districts.
- 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.

7 REFERENCES

https://katihar.nic.in/history/

https://katihar.nic.in/demography/

https://katihar.nic.in/economy/

https://cdn.s3waas.gov.in/s3b5b41fac0361d157d9673ecb926af5ae/uploads/2018/03/2018031464.pdf

https://katihar.nic.in/about-district/

https://censusindia.gov.in/census.website/data/census-tables

https://portal.ceew.in/datastory/katihar-bihar/

https://timesofindia.indiatimes.com/city/patna/bihar-has-lots-of-potential-in-solar-energy-hande/articleshow/22529993.cms

https://fsi.nic.in/isfr-2021/chapter-13.pdf

https://cdn.s3waas.gov.in/s3b5b41fac0361d157d9673ecb926af5ae/uploads/2018/03/2018031464.pdf

https://agricoop.nic.in/sites/default/files/BI6-Katihar%20-28.08.12.pdf

https://www.livehindustan.com/bihar/purnia/story-nine-parks-of-purnia-katihar-will-be-transferred-to-the-forest-department-5166993.html

https://dokumen.tips/documents/agroforestry-policy-2018-government-of-bihar-need-for-dedicated-agroforestry-policy.html?page=12

https://agricoop.nic.in/sites/default/files/BI6-Katihar%20-28.08.12.pdf

https://www.breda.bih.nic.in/

https://www.researchgate.net/publication/295863538_Replication_and_scaling-up_of_isolated_mini-grid_type_of_off-grid_interventions_in_India

https://documents1.worldbank.org/curated/en/198631468269101355/pdf/E46730V30P132600Box385371B00PUBLIC0.pdf

https://www.breda.bih.nic.in/Uploads/Policies%20_Act%20_%20Regulations/RENEWABE_ENERGY_POLICY_2017.pdf

7 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	604822	10	2,20,76,000,300	165570022 5	331140045	25	1324560 1.8	36289 .32	907233
Buffalo	Manure	101102	15	55,35,33,450	415150087.5	830300 17.5	25	3321200 .7	9099. 18	227480
Sheep	Manure	6177	1	22,54,605	1690953 .75	338190. 75	25	13527.6 3	37.06 2	926. 55
Goat	Manure	580109	1	21,17,39,785	158804838.8	317609 67.75	25	1270438 .71	3480. 654	8701 6
Pig	Manure	22603	2.5	2,06,25,238	154689 28.13	309378 5 .625	25	123751. 425	339.0 45	8476 .1
Poultry	manure	8,19,804	0.1	2,99,22,846	224421 34.5	448842 6 .9	25	179537. 076	491.8 824	1229 7

Total		**21,34,617**						**18154057.34**		

Table 2 Biogas potential from agricultural waste.

Residue type	**Total crop production (tons) (2006-2007)**	**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)**
husk	138899	0.28	38891.72	27224.204	30	19056.9428	800	15245554.24
straw	44389	1.5	66583.5	46608.45	80	9321.69	750	6991267.5