Arth Ganga Project: District Mirzapur

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EXECUTIVE SUMMARY

Mirzapur, a religious city in the state of Uttar Pradesh, is known for its morphological diversity and natural aesthetics. The city is situated on the bank of the river Ganga.

The total geographical area of the district is 4521 km^2. The primary sector showed an average annual growth rate from 2011-12 to 2018-19 is 8.83% with its share increasing from 25.24% to 27.06%. The share of the secondary sector decreased from 23.38% in 2011-12 to 18.35% in 2018-19 with an average annual growth rate of 3.37%. The tertiary sector occupies about 53.25% share of the district economy with a remarkable average annual growth rate of 7.74%. Overall, the district economy grew with an average annual growth rate of 6.88.

In 2017-18, the net sown area and the gross irrigated area represents 210849 ha and 240678 ha. The cropping intensity of the district is 139.40%. The total actual irrigated area is 153036 ha. Major crop types are wheat, rice, maize, barley, tide, millet, pulses like a variety of gram, black pulse, pigeon pea, lahi mustard, etc. along with sugarcane, potato, pea, groundnut, etc. The total food grains along with pulses account for the production of 559437 MT. The livestock consists of cattle (indigenous and crossbred), buffalos (indigenous and crossbred), pigs (indigenous and crossbred), sheep; poultry, and fisheries.

Agriculture with the horticulture sector grew at an average annual growth rate of 3.38% from 2011-12 to 2018-19. However, its share decreased from 63.50% in 2011-12 to 58.08% in 2018-19. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 65.47% and 65.44%, respectively. The net sown area has increased over the years, from 43.10% in 2010-11 to 46.60% in 2017-18. The area for non-agricultural use increased slightly over the period from 11.18% to 12.80%.In 2017-18, the nitrogen share increased to 72.69%, while the phosphorus share decreased to 25.55%, and the potassium share decreased to 1.76%. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio. The overall use of chemical fertilizers has increased in the district from 127 kg/ ha GSA in 2010-11 to 185.30 kg/ ha GSA in 2017-18.

The share of livestock decreased from 20.87% to 9.73% in the same period as it grew with a negative average annual growth rate of 3.82%. The fishery & aquaculture subsector share is very minimal, around 3.83% in 2018-19, as it grew with a negative average annual growth rate of 4.65% from 2011-12 to 2018-

19. Mines and quarrying also recorded a remarkable average annual growth rate of 32.34%.The total forest cover of the district is 803.73 km^2. There is no major forest cover in the district. Out of total forest cover, the maximum area is covered by Open Forest (506.15 km^2) followed by Moderately dense forest (289.58 km^2). The district's forest cover in 2001 was 631 km^2 with very dense forest covering 198 km^2 which has been reduced to moderately dense forest and open forest. The share of forest in the total reported area has increased slightly from 24.14% in 2010-11 to 24.19% in 2017-18. The share of area under trees and gardens decreased from 6.33% in 2010-11 to 3.44% in 2017-18. The share of forestry and logging in the total agriculture and allied sector is significant, around 8.77% in 2017-18, as it grew with a remarkable average annual growth rate of 86.10%.

Mirzapur is known for its spiritual significance and hosts fair and festivals. The district is well connected through roads and the railway network is developed better. In the year 2019, the district received 1037244 domestic tourists and 724 foreign tourists. In 2020, the number of Indian visitors increased yet the number of foreign visitors fell. The district embraces many waterfalls and natural spots and is famous for the holy shrine of Vindhyachal, Ashtbhuja, and Kali Kho and has Devrahwa Baba ashram, Sita Kund, Tanda Waterfall, Windham Waterfall, Tarakeshwar Mahadev, Maha Triangle, Chunar Fort, etc.

In the district, 61% of households used kerosene as the main source of lightning, followed by 37.36% using electricity, and only 0.59% using solar. Rooftop solar panels have been installed in various government buildings in the district.
Electricity consumption in agriculture has increased significantly from 176.36 KWH in 2014-15 to 382.82 KWH in 2019-20, a net increase of approximately 117.06%. The percentage share of the agriculture sector in the total electricity is around 27.40%. 43% of the households use firewood cakes followed by 41% using cow dung cake and 4% using crop residue for cooking.

The total number of wetlands existing in the district is 2258 consisting of both Man-made and Natural. Most of them are small or medium-sized tanks/lakes/ponds, rivers/streams, oxbow/cutoff meanders, reservoirs/barrages, and waterlogged. The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover with 330 bird species and 35 threatened/rare species of bird in the district. Biogas potential from animal waste and agricultural waste was calculated approximately as one crore m^3/year and eighteen crores m^3/year. Three sites were identified near Damtoe for micro-hydel project generation in the district Mirzapur.

To promote sustainable development creating awareness, educating people about renewable energies, sanitation, maintaining decorum of the properties by not destroying or keeping them clean, Adopting Public-Private partnerships, upgrading staff and facilities, etc. 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

Mirzapur district is one of the 75 districts of Uttar Pradesh state in northern India. The district is bounded on the north by Bhadohi and Varanasi districts, on the east by Chandauli district, on the south by Sonbhadra district and on the northwest by Prayagraj. The district occupies an area of 4521 km^2. The district is located between the parallels of 24º 34' and 25º 16' latitudes and 82º 05' and 83º 11' east longitudes. Mirzapur city is the district headquarters. Mirzapur district is a part of Mirzapur division. To provide efficient administration, the district is administratively divided into 04 tahsils namely Mirzapur, Lalganj, Marihan and Chunar. There are 758 Gram Panchayats and 1961 Revenue villages with 1745 inhabited villages and 216 uninhabited villages in the district. In urban area there are 04 statutory Towns and 06 Census Towns. Statutory Towns comprises of 03 Nagar Palika Parishad and 01 Nagar Panchayats. The total population of the district is 2,496,970 in which 21,49,403 live in rural and rest 3,47,567 in urban parts.The urban population in the district is 13.92 per cent. The sex-ratio in the district at 903 is slightly lower than to 912 at the state level. In the total population of the district 35.32 percent are workers and rest 64.68 percent are nonworker. Amongst the workers 21.51 percent are main workers and rest 13.81 percent are marginal workers of total population. In the district amongst workers 20.20 percent are

cultivators and 32.79 percent other workers. Over 14.65 percent of female workers are engaged as cultivators.

Agriculture is the backbone of the economy of the district. Most of the lands in the district are used for agricultural purposes. Some of its chief agricultural products are rice, wheat, barley, pulses, etc. Every year a huge chunk of revenues comes from the agricultural products helps in its economy to a great extent. Mirzapur is a city in Uttar Pradesh, India, approximately 650 km from both National Caital Delhi and Kolkata (Prominent state during British raj), approx. 87 kms from Prayagraj and 67 kms from Kashi. Mirzapur has a population of 2,496,970 of which male and female were 1,312,302 and 1,184,668 respectively. It is known for its carpets (mats and Kaleens) and brassware vessel industries. The city is surrounded by rocky hills and is the headquarters of Mirzapur District and is famous for the holy shrine of *Vindhyachal, Ashtbhuja* and *Kali kho* and have *Devrahwa Baba ashram*. The district embraces many waterfalls and natural spots. It was once the largest district in Uttar Pradesh before the split up of Sone Bhadra. There are a few cinema-halls. At first look the city appears to be a confluence of town, village and city life. Before the establishment of the town, the area was a dense forest and freely used by various states like Benaras, Sakteshgarh, Vijaygarh, Nainagarh (Chunar), Naugarh, Kantit and Rewa for Hunting. British East India Company had established this area to fulfill the needs of a trading centre between central and western India. This time Rewa was a well-established state of central India and was directly connected with Mirzapur by the Great Deccan Road. Over the time Mirzapur became a famous trading center of Central India and started trading of cotton, and silk at very large scale. The East India Company named this place as Mirzapur. The word Mirzapur is derived from ‘Mirza’ which in turn is derived from the Persian term ‘Trip Kalchu which literally means “child of the ‘Amir” or “child of the ruler”. In Persia‘Amīrzād in turn consists of the Arabic title ‘Amīr (English. “Emir”), meaning “commander”, and the Persian suffix -zād, meaning “birth” or “lineage”. Due to vowel harmony in Turkic languages, the alternative pronunciation Morza (plural morzalar; derived from the Persian word) is also used. The word entered English in 1595, from the French émir.

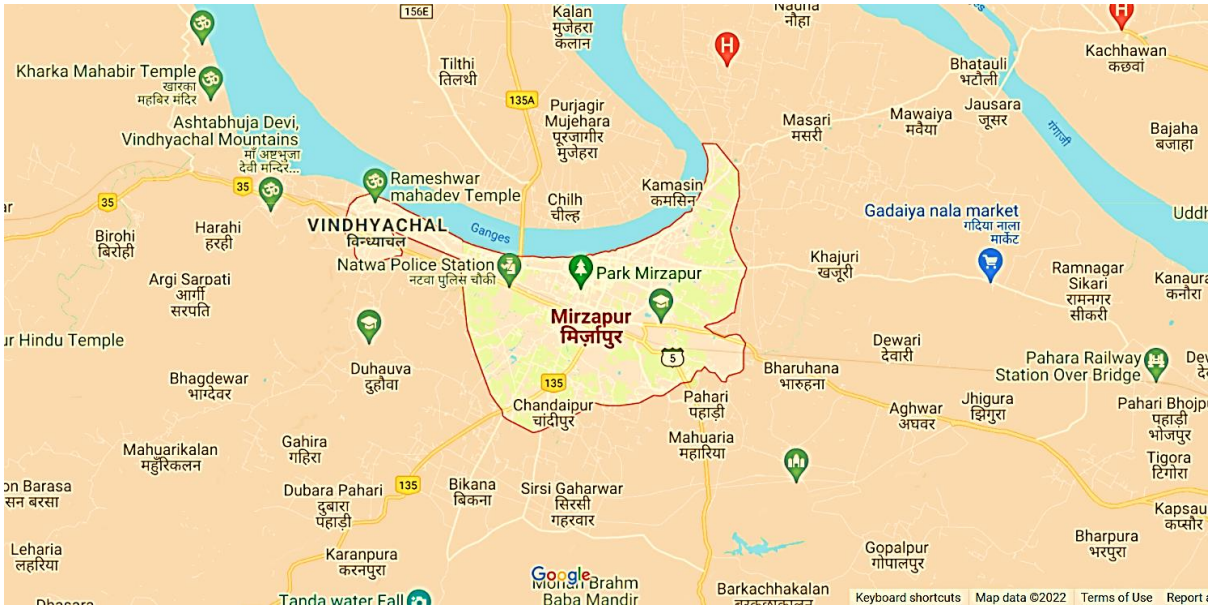


Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF MIRZAPUR

1. Economy and Livelihoods

- Geographical Area: 4521 Sq. Km.
- Administrative Divisions:[1]

District Headquarters: Mirzapur

No of Municipalities: 4

No of Tehsil: 4

No of Blocks: 12

No of Gram panchayats: 806

No. Of Villages: 1967 / 2079

[1] https://mirzapur.nic.in/

- Demographic and socio-economic indicators:[2]

  Population: 24,96,970 (Census 2011)

  Population density (Total persons per sq. km): 567

  Sex ratio: 903

  Literacy: 68.5%

- Occupation/ other Livelihood source: Carpet industry
- Major Rivers: Ganga
- Forest Area: 803.73 (ISFR 2019)

1.3 ECONOMIC PROFILE OF MIRZAPUR

The District Economy

The primary sector has a significant impact on the district economy because it contributes, on average, 26.54% share in the district GDP. However, this sector's average annual growth rate from 2011-12 to 2018-19 is 8.83%. Thus, its share increased from 25.24% in 2011-12 to 27.06% in 2018-19. The share of the secondary sector decreased from 23.38% in 2011-12 to 18.35% in 2018-19. The sector grew with a low average annual growth rate of 3.37%. The tertiary sector occupies, on average, 53.25% share of the district economy. Moreover, the sector grew with a remarkable average annual growth rate of 7.74%, with its share increasing from 51.38% in 2011-12 to 54.59% in 2018-19. Overall, the district economy grew with an average annual growth rate of 6.88%. Steps should be taken to increase the productivity of the secondary sector so that it can grow at a higher rate. This will improve the overall district's growth rate, and the secondary sector has a decent contribution to the district GDP. The primary and tertiary sectors have performed well during the period of the study.

[2] https://censusindia.gov.in/2011census/dchb/0968_PART_B_DCHB_MIRZAPUR.pdf

Table 1: Trends in Gross District Domestic product in Mirzapur at Constant Prices (base 2011-12) in Rs Crore

Year	Sector-wise GDDP (Rs, Crore)				Annual Growth Rates			
	Primary	Secondary	Tertiary	Total GDDP	Primary	Secondary	Tertiary	Total
2011-12	1708.13	1581.97	3476.75	6766.85	-	-	-	-
	(25.24)	(23.38)	(51.38)	(100)				
2012-13	1870.54	1418.57	3621.67	6910.77	9.51	-10.33	4.17	2.13
	(27.07)	(20.53)	(52.41)	(100)				
2013-14	1872.87	1483.70	3708.77	7065.34	0.12	4.59	2.41	2.24
	(26.51)	(21.00)	(52.49)	(100)				
2014-15	2041.39	1443.69	4019.26	7504.34	9.00	-2.70	8.37	6.21
	(27.20)	(19.24)	(53.56)	(100)				
2015-16	1770.93	1594.04	4297.59	7662.55	-13.25	10.41	6.92	2.11
	(23.11)	(20.80)	(56.09)	(100)				
2016-17	2356.45	1727.49	4709.83	8793.77	33.06	8.37	9.59	14.76
	(26.80)	(19.64)	(53.56)	(100)				
2017-18	2957.75	1881.27	5233.16	10072.18	25.52	8.90	11.11	14.54
	(29.37)	(18.68)	(51.96)	(100)				
2018-19	2894.61	1962.64	5839.69	10696.94	-2.13	4.33	11.59	6.20
	(27.06)	(18.35)	(54.59)	(100)				
Average Growth Rate					8.83	3.37	7.74	6.88

Source: UPDES
Note: Figures in Parentheses are percentage share in the total GDDP

We further break down the primary sector GDP to find out which subsector is lagging and which one is driving the primary sector growth. Table 2 shows that agriculture with the horticulture sector grew at an average annual growth rate of 3.38% from 2011-12 to 2018-19. However, its share decreased from 63.50% in 2011-12 to 58.08% in 2018-19. Similarly, the share of the livestock subsector decreased from 20.87% to 9.73% in the same period as it grew with a negative average annual growth rate of 3.82%. This shows the declining importance of livestock in Mirzapur District. The share of forestry and logging in the total agriculture and allied sector is significant, around 8.77% in 2017-18, as it grew with a remarkable average annual growth rate of 86.10%. The Fishery and aquaculture subsector share is small, around 3.83% in 2018-19, as it grew with a negative average annual growth rate of 4.65% from 2011-12 to 2018-19. Mines and quarrying also recorded a remarkable average annual growth rate of 32.34%. This high growth in this subsector can have serious environmental issues like deforestation, soil erosion, etc., with long-term effects on the health of local citizens. Overall, the Primary sector performed well during the time period of the study as the majority of the subsectors have done well. More work can be done to improve livestock and fishery subsectors as they registered negative average growth in this period.

Table 2: Trends in Gross District Domestic product from Agriculture and allied activities in Mirzapur at Constant Prices (base 2011-12) in Rs. Crore

Year	Agriculture	Livestock	Forestry and Logging	Fishery and Aquaculture	Total Agriculture and allied	Mining and Quarrying	PRIMARY SECTOR
2011-12	972.30	319.46	50.47	188.84	1531.08	177.05	1708.13
	(63.50)	(20.87)	(3.30)	(12.33)	(100)		
	-	-	-	-	-	-	-
2012-13	939.54	338.16	182.30	197.88	1657.87	212.66	1870.54
	(56.67)	(20.40)	(11.00)	(11.94)	(100)		
	[-3.37]	[5.85]	[261.19]	[4.78]	[8.28]	[20.11]	[9.51]
2013-14	943.24	382.40	102.38	204.00	1632.02	240.85	1872.87
	(57.80)	(23.43)	(6.27)	(12.50)	(100)		
	[0.39]	[13.08]	[-43.84]	[3.09]	[-1.56]	[13.25]	[0.12]
2014-15	1096.49	401.62	43.46	218.07	1759.65	281.74	2041.39
	(62.31)	(22.82)	(2.47)	(12.39)	(100)		
	[16.25]	[5.03]	[-57.55]	[6.90]	[7.82]	[16.98]	[9.00]
2015-16	781.45	299.06	55.31	222.64	1358.46	412.47	1770.93
	(57.52)	(22.01)	(4.07)	(16.39)	(100)		
	[-28.73]	[-25.54]	[27.27]	[2.10]	[-22.80]	[46.40]	[-13.25]
2016-17	1048.41	158.54	134.28	272.49	1613.72	742.73	2356.45
	(64.97)	(9.82)	(8.32)	(16.89)	(100)		
	[34.16]	[-46.99]	[142.78]	[22.39]	[18.79]	[80.07]	[33.06]
2017-18	1047.04	216.94	148.16	278.09	1690.23	1267.52	2957.75
	(61.95)	(12.84)	(8.77)	(16.45)	(100)		
	[-0.13]	[36.84]	[10.33]	[2.06]	[4.74]	[70.66]	[25.52]
2018-19	1100.36	184.35	537.11	72.62	1894.43	1000.17	2894.61
	(58.08)	(9.73)	(28.35)	(3.83)	(100)		
	[5.09]	[-15.03]	[262.53]	[-73.89]	[12.08]	[-21.09]	[-2.13]
Average Growth Rate	3.38	-3.82	86.10	-4.65	3.91	32.34	8.83

Source: Compile from UPDES
Note: 1. Figures in () are percentage share in the total agriculture & allied GDDP
2. Figures in [] are annual growth rates.

Table 3 shows the percentage share of subsectors in secondary and tertiary sectors. The manufacturing sector shared approximately 44.79% within the secondary sector in 2018-19. The share has increased over the years as the average annual growth in this sector is 8.30%. The share of electricity, gas, and water supplies subsector has decreased slightly from 3.66% in 2011-12 to 3.54% in 2018-19. Moreover, this subsector grew with a decent average annual growth rate of 3.28%. The share of the

construction sub-sector decreased from 60.96% to 51.68% in the same period as the average annual growth rate is low (0.80%). This indicates that the secondary sector in Mirzapur is heavily dependent on the Manufacturing and construction sub-sectors, and the electricity subsector is also growing at a faster rate.

Within the tertiary sector, the transport, storage and communication subsector made up the highest share (21.82%) in 2018-19, followed by the Real estate subsector (20.61%), public administration subsector (21.07%), and trade and hotel subsector (17.60%). Average annual growth is observed highest in transport, storage and communication (14.51%), Public Administration (9.47%), followed by trade and hotels (8.92%), financial services subsector (6.15%) and lastly lowest in real estate (2.93%). All the subsectors in the tertiary sector have performed well during the period of the study. More work needs to be done to improve Construction and real estate subsectors. Public Administration and Transport and Communication and Trade and hotels sub-sectors are the major contributors to the Tertiary sector's growth.

Table 3: Trends in percentage share of non-agriculture sub-sectors in DGDP in Mirzapur at Constant Prices (base 2011-12) in Rs Crore

Year	Manufacturing	Electricity, Gas, Water Supply	Construction	SECONDARY SECTOR	Transport, Storage & Communication	Trade and Hotel & Restaurant	Financial Services	Real Estate and Professional Services	Public Administration	Other Services	TERTIARY SECTOR
2011-12	35.39	3.66	60.96	100	14.43	16.74	8.52	28.32	20.45	11.54	100
2012-13	31.03	4.42	64.55	100	15.70	15.78	8.62	28.67	21.76	9.48	100
2013-14	34.51	4.85	60.64	100	17.90	16.79	9.33	28.88	17.06	10.05	100
2014-15	31.23	5.12	63.65	100	19.20	17.37	9.43	27.56	15.94	10.49	100
2015-16	37.98	3.72	58.30	100	23.50	15.42	9.18	25.71	15.39	10.80	100
2016-17	43.91	3.59	52.51	100	22.67	18.10	8.29	23.71	16.28	10.95	100
2017-18	45.32	3.78	50.89	100	21.37	17.83	6.78	22.34	20.63	11.04	100
2018-19	44.79	3.54	51.68	100	21.82	17.60	7.49	20.61	21.07	11.41	100

Average Growth Rate	8.30	3.28	0.80	3.37	14.51	8.92	6.15	2.93	9.47	7.98	7.74
Source: Compiled from District Statistical Handbooks											

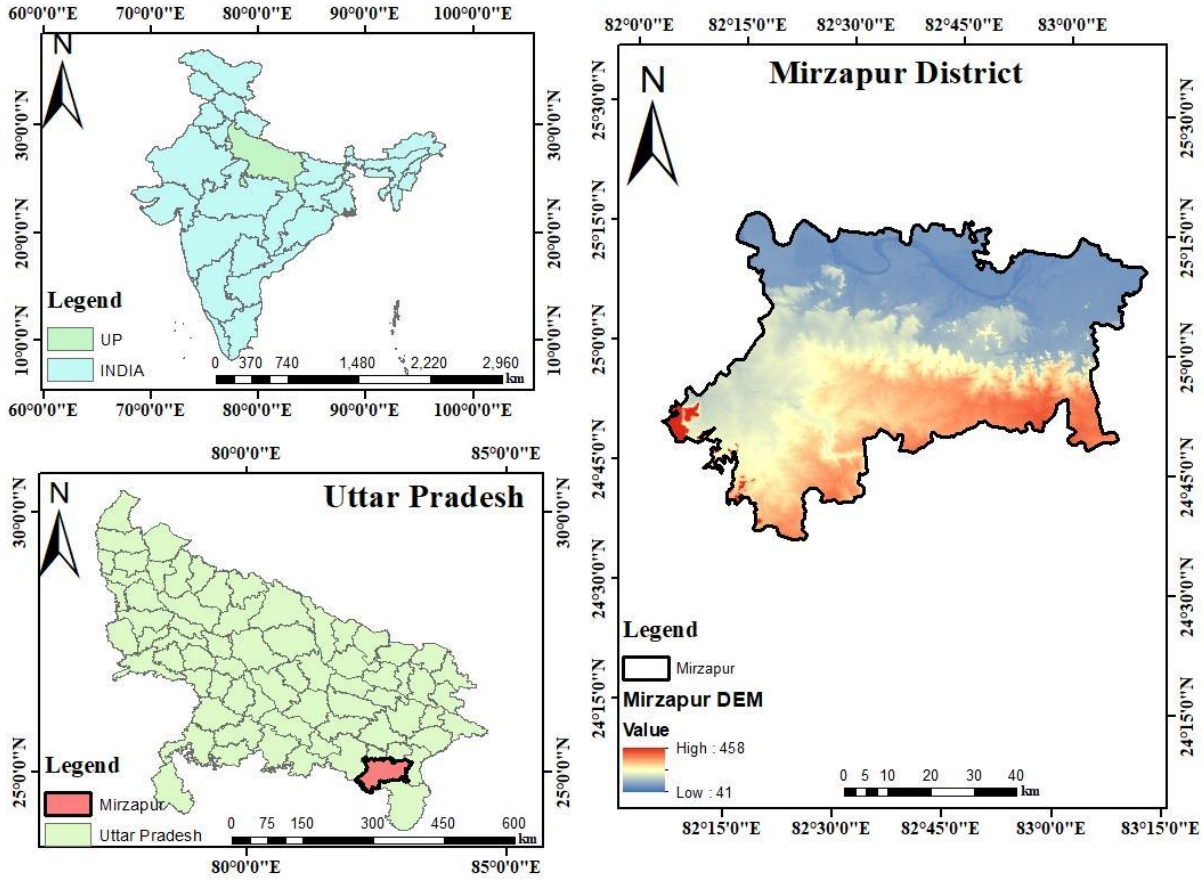
2. Quantitative Data Analysis

2.1 Agriculture and Allied Activities

The Mirzapur district is one of the 75th districts of Uttar Pradesh situated in the south-eastern part. It lies between 25.15^0 N latitude to 82.58^{0}E longitude, encompassing a geographical area of 4521 km^2. The district is bounded on the east by the districts of Chanduali and Varanasi, on the north by Sant Ravidasnagar, and on the west by Allahabad. The district is bifurcated in the south-east by the district of Sonebhadra, and on the south cardon by the Madhya Pradesh district of Reewa. The district consists of four subdivisions namely Sadar, Lalganj, Marihaan, nad Chunar and twelve blocks and 1698 villages. The district is well known for brassware and carpets industries.

As per the 2011 census report, the district has a total population of 2,496,970 of which 71.61% population live in the rural areas and 28.39% population lives in the urban areas. Agro-climatically the district comes under the ACZ-9 (Vindhyan zone) and ago-ecologically it comes under two major situations: Indo-Gangetic plain covers 30-40 % area and Vindhyan region. The soil and topographical conditions are diversified and the physical aspect of the district presents a variety of landscapes and agricultural problems un-common is alluvial soils of Varanasi. Most of the areas of the district nearly 40% areas covered under the forest, 30% are under the cultivable. The major portion of the area being rocky and undulating, the underground water resources are uncertain, unpredictable, and untapped to exploit potential agricultural production. About 55% of land in the Gangetic plains of the district, 35-50% the central plateau, and about 6-8 % of the cultivable land in the southern region is irrigated averaging 32% for the whole district. The soil varies in type with no assured irrigation facilities and hence, the farmers in the region have to remain content with specific dryland crops, fruits and vegetables.

Rice-wheat is the major cropping system of the district, pearl millet, chickpea potato, onion are the major crops of the district.



2.1.1 Trend in Land Use Pattern

The total declared area of the district is 4525.08 sq. km². The share of forest in the total reported area has increased slightly from 24.14% in 2010-11 to 24.19% in 2017-18. The share of cultivable wasteland decreased from 2.98% in 2010-11 to 2.19% in 2017-18, which is a good indicator of development. Barren and uncultivable land share decreased slightly from 1.80% in 2010-11 to 1.79% in 2017-18. The share of area under trees and gardens decreased from 6.33% in 2010-11 to 3.44% in 2017-18. The current and other fallow land has also decreased over the years, which is good for the district economy. The net sown area (NSA) has increased over the years, from 43.10% in 2010-11 to 46.60% in 2017-18. The area for non-agricultural use increased slightly over the period from 11.18% to 12.80% (Table 4). Overall, the land use pattern shows that the cultivable wasteland and uncultivable land area has decreased while the NSA has increased over the years.

Table 4: Trends in Land-use Pattern in Mirzapur (as % of the total reported area)

Year	Total Reported Area (ha)	Area under forest	Cultivable waste land	Current Fallow	Other Fallow	Barren and uncultivable land	Land other than agriculture	Pasture land	Area under trees and gardens	Net Sown Area
1	2	3	4	5	6	7	8	9	10	11
2010-11	452508	24.14	2.98	8.03	2.32	1.80	11.18	0.11	6.33	43.10
2011-12	452508	24.14	2.33	7.69	2.43	1.82	11.44	0.11	6.44	43.60
2012-13	452508	24.14	2.96	7.75	2.32	1.79	12.54	0.11	6.24	42.16
2013-14	452508	24.14	2.51	10.16	2.45	1.80	12.58	0.11	4.05	42.19
2014-15	452508	24.17	2.22	6.77	2.49	1.80	12.60	0.11	3.32	46.52
2015-16	452508	24.16	2.32	6.26	3.04	1.80	12.71	0.11	3.43	46.17
2016-17	452508	24.16	2.32	6.26	3.04	1.80	12.71	0.11	3.43	46.17
2017-18	452508	24.19	2.19	5.79	3.10	1.79	12.80	0.10	3.44	46.60

Source: Compiled from http://updes.up.nic.in/spiderreports/intialisePage.action

2.1.2 Trends in Operational Land Holdings

In Mirzapur district, the total number of operational farms decreased from 273 thousand in 2010-11 to 257 thousand in 2015-16, a net decrease of 5.86%. While in the state, their numbers increased from 23,325 thousand in 2010-11 to 23822 thousand in 2015-16, a net increase of 2.13%. Most land positions in the district are marginal and small. These two size categories represented around 89.64% in the district in 2015-16, while the corresponding proportion in the state was 92.81% (Table 5). The two agricultural censes of 2010-11 and 2015-16 report no significant change in the percentage share across the various categories of landholdings. Marginal land holdings decreased in 2015-16.

Table 5: Distribution of Operational Holdings by Size-categories of farms (in %) in Mirzapur

	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.)
Mirzapur	2010-11	77.26	13.96	6.08	2.31	0.39	273
	2015-16	75.05	14.59	7.19	2.73	0.44	257
							[-5.86]
Uttar Pradesh	2010-11	79.45	13.01	5.72	1.71	0.11	23325

	2015-16	80.18	12.63	5.51	1.58	0.1	23822 [2.13]
Source: Compiled from Statistical Diary 2018-19, UPDES. Figures in [] are percentage increase/decrease in 2015-16 over 2010-11.							

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

2.1.3.1 The Trend in Cropping Patterns

Rice and Wheat dominate the agriculture of the district. Table 6 shows the area devoted to various crops over the last eight years. In 2017-18, Wheat made up the highest share of GCA (39.27%), followed by Rice (25.35%). Together these two crops constitute around 64.62% of the GCA. The area shared by the total cereals has decreased from 78.27% in 2010-11 to 69.76% in 2017-18. The main pulses produced are Chickpeas and Arhar, while the rest of the pulses are not significantly produced. The total pulse acreage has decreased from 13.87% in 2010-11 to 10.09% in 2017-18. Thus, the food grains cover a majority (average, 89.34%) of the GCA.

Mustard and Linseed are the only major oilseeds crop produced, and the total oilseed acreage has decreased from 3.81% in 2010-11 to 3.00% in 2017-18. The area under Sugarcane is negligible. The area under Potato has increased. In general, there is no significant change in the cultivation pattern reported in the district during the study period, except that the net sown area has decreased over the years, from 75.93% in 2010-11 to 63.66% in 2017-18. The average cropping intensity in the district is 139.40.

Table 6: Trends in Cropping Pattern (as % GSA) and Cropping Intensity

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	33.28	34.98	33.40	33.60	28.17	27.92	27.92	25.35
Wheat	37.60	36.84	37.70	39.32	43.64	43.25	43.25	39.27
Bajara	3.77	3.65	3.75	3.75	3.13	3.10	3.10	2.82
Other Cereals	3.61	3.45	3.54	3.37	2.59	2.56	2.56	2.33
Total Cereals	78.27	78.92	78.39	80.04	77.52	76.84	76.84	69.76
Chana	5.31	5.13	5.25	5.23	4.11	4.08	4.08	3.70
Arhar	5.02	4.95	5.06	5.02	4.22	4.19	4.18	3.80
Other Pulses	3.55	3.45	3.52	3.13	2.88	2.85	2.85	2.59
Total Pulses	13.87	13.54	13.83	13.38	11.21	11.11	11.11	10.09
Total Foodgrains	92.14	92.46	92.22	93.41	88.74	87.95	87.95	79.85
Mustard	0.88	0.89	0.95	1.02	1.91	1.90	1.90	1.72
Linseed	1.49	1.35	1.38	1.41	0.79	0.78	0.78	0.71
Other Oilseeds	1.45	1.39	1.47	0.65	0.63	0.63	0.63	0.57
Total Oilseeds	3.81	3.63	3.80	3.07	3.33	3.30	3.30	3.00
Sugarcane	0.64	0.63	0.65	0.52	0.52	0.51	0.51	0.47
Potato	0.64	0.63	0.64	0.66	0.82	0.82	0.82	0.74
Net Sown Area	75.93	75.32	74.84	76.61	70.63	69.48	69.48	63.66

Gross Sown Area (in 1000 Ha)	256.89	261.93	254.92	249.21	298.06	300.73	300.73	331.23
Cropping Intensity	131.71	132.77	133.63	130.54	141.58	143.93	143.93	157.09
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.3.2 Trends in per hectare yield of principal crops

Table 7 shows that the yield per hectare of most crops varies from year to year. However, the yield for most of the major crops has increased in the latter years of the study. This can be due to improved irrigation facilities and the availability of better infrastructure. Wheat and Rice are the major crops, and their per hectare yield (21.42 qtls and 25.70 qtls respectively, in 2017-18) are low. Per hectare yield of total cereals has increased from 20.63 qtls in 2010-11 to 22.33 qtls in 2017-18. Similarly, per hectare yield of total pulses increased from 9.34 qtls in 2010-11 to 12.99 qtls in 2017-18. The yield of total oilseeds has increased from 6.86 qtls in 2010-11 to 8.85 qtls in 2017-18. This can be due to the availability of hybrid seeds in the district. However, the rise in the yield of most of the crops is not uniform; in some years, it has decreased as well, but on average, the yield has increased in the latter years of the study.

Sugarcane is not an important crop in the district. Its average yield is only 672.90 qtls/ha. The yield of Potato is high, average, 234.55. In summary, all crop yields show year-over-year fluctuations, with the lowest in 2015-16. The lack of homogeneity of yields makes farmers' income riskier and more unstable, requiring a solid insurance protection measure.

Table 7: Trends in Per Hectare Yield of Principal Crops in Mirzapur District (Qtls)

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	19.61	21.69	23.39	22.97	22.42	17.37	28.67	25.70
Wheat	23.15	24.61	25.37	23.95	17.62	12.37	21.16	21.42
Bajara	14.34	14.05	13.57	13.32	13.12	10.56	12.74	12.49
Total Cereal	20.63	22.35	23.40	22.68	19.03	14.05	23.40	22.33
Chana	10.39	10.68	11.30	10.32	10.83	8.34	12.53	15.95
Arhar	8.57	9.93	10.13	9.94	8.58	6.79	15.57	11.18
Total Pulses	9.34	10.27	10.69	9.82	9.38	7.36	19.65	12.99
Total Food Grains	18.93	20.58	21.50	20.83	17.81	13.20	22.95	21.15
Mustard	5.64	5.36	4.99	8.35	5.32	2.10	3.24	3.00
Linseed	3.86	4.42	3.45	4.42	5.89	3.05	8.28	8.81
Total Oilseeds	6.86	8.46	7.07	5.24	5.42	2.47	4.61	8.85
Sugarcane	534.96	556.52	542.44	637.78	658.21	712.40	866.36	874.51
Potato	241.49	188.73	243.87	214.40	294.57	195.50	245.66	252.22
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.3.3 Trends in Production of Principal Crops

Table 8 shows the trends in the production of the main crops over the years. Rice and Wheat, dominate the production. In 2017-18, Rice (215.76 thousand tons) and Wheat (278.69 thousand tons) formed a major part of the total cereal production (516.01 thousand tons). Among pulses, Chickpeas and Arhar occupied the highest production. Chickpeas production was 19.56 thousand tons, and Arhar production was 14.06 thousand tons in 2017-18. Although there has been a significant variation in the production of these pulses across the years, they represent 77.42% of total pulse production. Mustard and Linseed productions were 1.71 and 2.07 thousand tons, respectively, in 2017-18. Sugarcane production was 135.11 thousand tons in 2017-18. Potato production has also been significant over the years (61.82 thousand tons in 2017-18). Looking at the annual production data of various crops, we find that their production has increased, on average, during the period, but at the same time fluctuated year to year, partly due to weather changes and partly due to market conditions. Proper insurance arrangements are the need of the hour to get assured income and take more risk and diversify their production.

Table 8: Trends in Production of Principal Crops in Mirzapur District (in 1000 Tons)

Crop/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Rice	167.61	198.67	199.19	192.39	188.19	145.83	240.74	215.76
Wheat	223.60	237.51	243.81	234.71	229.25	160.94	275.29	278.69
Bajara	13.90	13.45	12.96	12.44	12.24	9.85	11.89	11.65
Other Cereals	9.74	12.41	11.63	12.75	9.94	7.99	12.86	9.92
Total Cereals	414.85	462.03	467.59	452.30	439.62	324.62	540.78	516.01
Chana	14.17	14.36	15.12	13.44	13.28	10.22	15.37	19.56
Arhar	11.05	12.88	13.06	12.42	10.80	8.55	19.59	14.06
Other Pulses	8.09	9.17	9.52	6.86	7.26	5.81	30.71	9.80
Total Pulses	33.30	36.41	37.69	32.72	31.33	24.59	65.66	43.42
Total Foodgrains	448.16	498.44	505.28	485.02	470.95	349.20	606.89	559.44
Mustard	1.27	1.25	1.21	2.11	3.04	1.20	1.85	1.71
Linseed	1.48	1.56	1.21	1.55	1.38	0.72	1.94	2.07
Other Oilseeds	3.97	5.23	4.43	0.35	0.96	0.54	0.78	5.01
Total Oilseeds	6.72	8.04	6.86	4.01	5.38	2.45	4.58	8.79
Sugarcane	88.32	91.66	89.45	82.78	101.69	110.07	133.85	135.11
Potato	39.80	31.18	40.04	35.01	72.20	47.92	60.21	61.82

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

2.1.3.4 Variability assessment in the area, production, and yield

To understand the variability across the years (Table 9), we calculated the mean, standard deviation (SD), and coefficient of variation (COV) of the area, production, and yield of the main crops. Among different crops, the lowest variability in the area is observed in Arhar (1.44%), followed by bajara (1.58%) and Rice (3.12%), and the highest in masoor (mustard 43.93%). The variability in the area under total pulses (3.11%) is less than the variability in the area under total cereals (7.31%). Since Rice and wheat dominate the production, the variability in the area under total food grains is, therefore, also relatively high (6.02%).

Table 9: Variability in Area, Production, and Yield of Principal Crops (2010-11 to 2017-18)

Crop/Year	Area (1000 Ha)			Production (1000 Ha)			Yield (Qtl./Ha)		
	Average	SD	COV	Average	SD	COV	Average	SD	COV
Rice	85.23	2.66	3.12	193.55	28.68	14.82	22.73	3.47	15.27
Wheat	113.44	17.80	15.69	235.48	36.38	15.45	21.21	4.33	20.41
Bajara	9.43	0.15	1.58	12.30	1.25	10.16	13.02	1.17	9.00
Total Cereal	216.42	15.82	7.31	452.23	65.56	14.50	20.98	3.17	15.10
Chana	12.82	0.62	4.82	14.44	2.61	18.08	11.29	2.21	19.61
Arhar	12.70	0.18	1.44	12.80	3.23	25.23	10.09	2.58	25.62
Total Pulses	34.17	1.06	3.11	38.14	12.37	32.44	11.19	3.76	33.64
Total Food Grains	250.58	15.09	6.02	490.42	76.30	15.56	19.62	3.03	15.44
Mustard	4.05	1.78	43.93	1.70	0.64	37.48	4.75	1.96	41.24
Linseed	2.97	0.68	22.76	1.49	0.42	28.19	5.27	2.19	41.57
Total Oilseeds	9.55	0.78	8.16	5.85	2.14	36.52	6.12	2.11	34.53
Sugarcane	1.55	0.12	7.42	104.12	20.57	19.75	672.90	136.63	20.30
Potato	2.05	0.43	21.08	48.52	14.67	30.23	234.55	34.23	14.60

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

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 greater than in the cultivated area of all crops. The highest variability in production is observed in mustard (37.48%), followed by Potato (30.23%), Linseed (28.19%), Arhar (25.23%), and sugarcane (19.75%). High variation in the production of pulses and oilseeds is partly due to variation in the land area under them and partly due to the high rate of seeds and non-availability of hybrid seeds. Improvement in crop insurance conditions and better market accessibility can lower this variation. Variability is lowest in bajara (10.16%), followed by Rice (14.82%) and wheat (15.45%).

In the case of yield, the greatest variability is estimated in Linseed (41.57%), mustard (41.24%), and Arhar (25.62%). Yield variability in total cereals (15.10%) and total food grains (15.44%) is lower as compared to that in total pulses (33.64%). Rice, Bajara, and sugarcane are the most consistent crops over the years. Several factors, such as climate change, market prices, rainfall patterns, etc., influence the variability in agricultural production.

2.1.4 Trends in Value of Product of Major Crops

Table 10 compares the share of the main crops in the total GCA and their share in the total value of agricultural output (VOP). It is significant to note that total cereals, total Foodgrains, and total oilseeds, on average, have a relatively larger share in GCA than their share in VOP, while, Potato and sugarcane have, on average, a greater share in VOP than GCA. Mirzapur is mainly a food grain production district; therefore, food grains account for around 89.34% of the gross area of the crops. Similarly, total foodgrains account for nearly 89.56% of the total value of the agricultural product. Three crops - Wheat, Paddy, and Potato together accounted for, on average, around 71.41% of GCA and 75.03% of the total VOP. Overall, the total agricultural GCA has increased in the latter years of the study (average, 281.71 thousand hectares). The total value of the product has also increased significantly, that is, 801.96 Cr. Rs. in 2010-11 to 1638.77 Cr. Rs in 2017-18.

Table 10: Share of Principal crops Total GCA and Total Value of agriculture products in Mirzapur

Crop	% Share in	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18
Wheat	GCA	37.60	36.84	37.70	39.32	43.64	43.25	43.25	39.27
	VOP	34.02	32.89	32.40	34.87	33.38	33.29	33.91	31.46
Paddy	GCA	33.28	34.98	33.40	33.60	28.17	27.92	27.92	25.35
	VOP	35.95	38.24	34.53	35.25	36.50	34.81	42.64	35.55
Total Cereals	GCA	78.27	78.92	78.39	80.04	77.52	76.84	76.84	69.76
	VOP	72.64	73.65	69.67	73.56	72.71	71.02	79.63	69.42
Total Pulses	GCA	13.87	13.54	13.83	13.38	11.21	11.11	11.11	10.09
	VOP	18.29	18.46	21.30	17.94	15.40	16.05	10.33	16.40
Total Food Grains	GCA	92.14	92.46	92.22	93.41	88.74	87.95	87.95	79.85
	VOP	90.92	92.11	90.97	91.51	88.11	87.07	89.96	85.82
Total Oilseeds	GCA	3.81	3.63	3.80	3.07	3.33	3.30	3.30	3.00
	VOP	2.57	2.67	2.45	2.01	2.61	1.91	1.45	6.02
Potato	GCA	0.64	0.63	0.64	0.66	0.82	0.82	0.82	0.74
	VOP	4.07	3.21	4.47	4.30	6.74	6.83	5.71	5.27
Sugarcane	GCA	0.64	0.63	0.65	0.52	0.52	0.51	0.51	0.47
	VOP	2.43	2.01	2.10	2.16	2.53	4.17	2.87	2.89
Paddy + wheat + potato	GCA	71.52	72.45	71.75	73.58	72.63	71.99	71.99	65.36
	VOP	74.03	74.33	71.40	74.42	76.62	74.92	82.26	72.28
Total Agriculture	GCA (1000 Ha)	256.89	261.93	254.92	249.21	298.06	300.73	300.73	331.23
	VOP (in Cr Rs)	801.96	1027.69	986.44	937.02	1044.02	831.61	1467.92	1638.77
Per Worker VOP (Rs.1000 at current prices) in **Mirzapur**		-	20.05	21.64	22.98	33.28	24.33	33.91	39.51

Per Worker VOP (Rs.1000 at current prices) in **UP**	-	40.66	48.69	52.50	52.11	56.48	61.97	69.69
Source: http://updes.up.nic.in/spiderreports/intialisePage.action And District-wise Indicator reports								

Table 10 shows that the total value of agricultural produce per agricultural worker in Mirzapur district increased from Rs.20.05 thousand in 2011-12 to Rs.39.51 thousand rupees in 2017-18, a net increase of 97.05% at current prices, while in UP it increases from Rs. 40.66 thousand to Rs.69.69 thousand Rs, a net increase of 71.40%. Thus, the per worker value of agricultural output is much higher in the state than in the district. The growth rate per worker value of output in the district is more than in the state. The ratio of per worker value of the output of the district to the state average has increased from 0.4932 in 2011-12 to 0.5670 in 2017-18.

2.1.5 Consumption of Chemical Fertilizers

Table 11 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 2010-11, nitrogen represented 58.95% of the total fertilizers used, while the proportions of phosphorus and potassium were 34.23% and 6.82%, respectively. In 2017-18, however, the nitrogen share increased to 72.69%, while the phosphorus share decreased to 25.55%, and the potassium share decreased to 1.76%. The use of nitrogen is more than the recommended ratio, while the Phosphorous and potassium ratio is less than the recommended ratio. The table also shows that fertilizer consumption varies from year to year, which can be due to several factors, including rainfall patterns, cultivation patterns, etc. The overall use of chemical fertilizers has increased in the district from 127 kg/ ha GSA in 2010-11 to 185.30 kg/ ha GSA in 2017-18, which is not a good sign. The authorities need to take steps to reduce their consumption as chemicalization of agriculture degrades soils and water resources, requiring the use of organic fertilizers and biofertilizers.

Table 11: Trends in Use of Chemical Fertilizers in Agriculture (Kgs/per ha GSA)

Fertilizer/Year	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18
Nitrogen	74.87	78.97	98.99	112.33	99.68	92.77	90.09	134.69
Phosphorous	43.47	38.16	39.43	28.26	28.62	34.74	34.99	47.35
Potassium	8.66	6.35	4.99	3.90	5.81	6.29	7.47	3.26
Total	127.00	123.48	143.42	144.49	134.11	133.80	132.55	185.30
Gross Sown Area (Ha)	256887	261930	254915	249209	298061	300733	300733	331232
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.6 Irrigation Structure and Status

2.1.6.1 Types of Irrigation systems

The types of irrigation systems and the percentage of the net and gross irrigated area to the net and gross cropped area, respectively, are described in table 12. The length of the canal has increased from 1317 kms in 2010-11 to 1367 kms in 2018-19. The number of ground-level pump sets increased from 1168 in 2010-11 to 1378 in 2018-19. Government tube wells increased from 383 in 2010-11 to 441 in 2018-19. The number of wells increased from 16982 in 2010-11 to 17932 in 2018-19. Shallow, medium, and deep tube wells increased by 6.95%, 113.69%, and 49.14%, respectively, in 2018-19 compared to 2010-11. The district's percentage of the net and gross irrigated areas have increased over the years with an average of 65.47% and 65.44%, respectively.

Table 12: Types of Irrigation Systems and percentage of the net and gross Irrigated Area

Name/Year	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19
Length of Canal (KM)	1317	1317	1317	1317	1367	1367	1367	1367	1367
No. of Govt. Tube wells	383	383	411	426	439	439	441	441	441
No. of Wells	16982	16982	16982	17432	17932	17932	17932	17932	17932
No. of Ground-level Pump set	1168	1168	1178	1378	1378	1378	1378	1378	1378
Shallow Tube well	8099	8279	8421	8527	8527	8527	8572	8629	8662
Medium Tube well	139	159	232	264	277	277	277	271	297
Deep Tube well	407	485	569	587	595	595	595	556	607
% Of NIA	58.13	60.46	59.93	55.53	72.64	72.25	72.25	72.58	-
% Of GIA	60.90	62.08	61.53	62.71	71.03	66.30	66.30	72.66	-

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

2.1.6.2 Source wise area under irrigation

Canals and groundwater (GW) are the main irrigation sources in the district. The canal's share in the NIA (average, 57.20%) has decreased over the years, and the share of wells and tube wells in NIA (average, 31.54%) has increased over the years. This shows the higher dependency of the district on the canals for irrigation purposes, and it can have serious environmental issues if such a pattern continues in the long run.

Table 13: Source-wise Area under Irrigation in Mirzapur (in %)								
Source/Year	**2010 -11**	**2011 -12**	**2012 -13**	**2013 -14**	**2014 -15**	**2015 -16**	**2016 -17**	**2017 -18**
Canal (surface Irri.)	60.69	62.30	60.46	59.88	55.36	52.67	52.67	53.59
Wells And Tube-wells (GW Irri.)	31.21	26.44	30.85	31.75	21.16	37.24	37.24	36.39
Others	8.10	11.26	8.69	8.38	23.48	10.08	10.08	10.02
NIA (1000 ha)	113.39	119.26	114.32	106.02	152.93	150.97	150.97	153.04
Source: http://updes.up.nic.in/spiderreports/intialisePage.action And District-wise Indicator reports								

2.1.6.3 Crop wise irrigated area

Table 14 shows that a majority area under Rice (average, 81.27%), Wheat (average, 89.96%), Potato (average, 99.34%), and Sugarcane (average, 99.74%) is irrigated. Percentages of the irrigated area under pulses (average, 1.58%) and oilseeds (average, 6.06%) are relatively less.

Table 14: Trends in Crop-wise Irrigated Area in Mirzapur (as % of the cropped area)								
Crop/Year	**2010 -11**	**2011 -12**	**2012 -13**	**2013 -14**	**2014 -15**	**2015 -16**	**2016 -17**	**2017-18**
Rice	81.13	82.07	81.34	80.90	81.18	81.18	81.18	81.18
Wheat	82.25	82.64	82.84	82.99	97.24	97.24	97.24	97.24
Total Cereal	74.28	75.23	74.84	75.20	84.29	84.29	84.29	84.29
Total Pulses	1.09	1.18	1.34	1.07	1.91	1.91	2.06	2.06
Total Foodgrains	63.26	64.39	63.82	64.59	73.88	73.88	62.54	62.54
Total Oilseeds	2.52	2.80	3.74	5.11	8.58	8.58	8.58	8.58
Sugarcane	99.52	99.51	99.51	99.38	100	100	100	100
Potato	99.82	99.82	99.82	99.82	98.86	98.86	98.86	98.86
Source: http://updes.up.nic.in/spiderreports/intialisePage.action								

2.1.7 Electricity Consumption in Agriculture

Electricity is one of the main energy sources used in agriculture. Table 15 shows that per capita electricity consumption in agriculture has increased significantly from 176.36 KWH in 2014-15 to 382.82 KWH in 2019-20, a net increase of approximately 117.06%. This is a cause of concern as this can result in an increased burden on non-renewable resources and create waste disposal problems. The percentage share of the agriculture sector (average, 27.40%) in the total electricity consumption in the district is quite significant. This indicates the heavy usage of electricity by agricultural farmers. Since electricity consumption has increased over the years, it is very important for the authorities to switch to more sustainable modes of electricity production, such as solar panels.

Table 15: Trends of Electricity consumption in Agriculture						
Division/ Year	**2014 -15**	**2015 -16**	**2016 -17**	**2017 -18**	**2018 -19**	**2019 -20**
Per Capita electricity consumption (KWH)	176.36	183.85	321.91	385.49	393.16	382.82
% Of electricity consumed in Agriculture sector to total consumption	27.45	29.48	23.21	27.88	29.35	27.07
Source: District-wise Development Indicators file						

2.1.8 Status of Agriculture Market

Table 16 shows the marketing infrastructure in the district. It has two main markets and one sub-markets. The number of regulated mandis per lakh hectare of Net area sown has decreased from 1.57 in 2013-14 to 0.96 in 2018-19, which is a cause of concern as it is very important to increase the number of regulated mandis so that farmers can sell their products efficiently.

Table 16: Status of Agriculture Markets in Mirzapur							
Category/Year	**2013 -14**	**2014 -15**	**2015 -16**	**2016 -17**	**2017 -18**	**2018 -19**	**2019 -20**
Main Markets (No.)	2	2	2	2	2	2	2
Submarkets (No.)	1	1	1	1	1	1	1
Total Markets (No.)	3	3	3	3	3	3	3
No. of Regulated mandis per lakh Ha. of net area sown	1.57	0.66	-	0.96	0.95	0.96	-
Source: District-wise Development Indicators file and District-wise Statistical Report							

2.1.9 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 conversion.

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. But 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 the project should be periodically done through MIS, Geo-tagging, and monthly physical and financial reports.

However, the policy-related issue is what would be after the three years? Will the government protect their income? There may be a possibility that the beneficiary farmers may revert to conventional farming in the absence of the regulatory framework. In this context, two things need to be thought of—a

well-designed regulatory and monitoring framework and introduction of payments for ecosystem services for the organic farmers after the transition period to carry on the activity on a sustainable basis. Organic and zero-budget farming will provide ecological services in terms of soil health, human and animal health, saving of water, protection bio-diversity, 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 17 shows the details of the establishment of organic clusters under the Paramparagat Krishi Vikas Yojana and Namami Gange Scheme in the district. The district has one hundred 64 groups in 11 development blocks. The highest number of groups are in Lalganj (32), followed by Shikhar (26), Chhanvey (17), Majhawa (15), Hallie (14), and so on. 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.

Table 17: Status of Organic Farming PGS Groups under PKVY and Namami Gange Schemes in Mirzapur (as on June 30, 2021)

S. No.	Block	Scheme	No. of groups	No. of farmers in groups			
				Total	Average	Median	SD
1	Chhanvey	PKVY	10	501	50.1	50	0.316
		Namami Gange	7	221	31.57	26	12.64
2	Hallia	PKVY	14	700	50	50	0
3	Jamalpur	Namami Gange	6	140	23.33	24.5	7.25
4	Kon	PKVY	10	488	48.8	50	4.21
		Namami Gange	3	96	32	24	15.62
5	Lalganj	PKVY	32	1574	49.18	50	2.62
6	Majhawa	PKVY	8	211	26.37	21	10.75
		Namami Gange	7	242	34.57	29	14.75
7	Nagar	PKVY	8	274	34.25	31.5	11.17
		Namami Gange	4	134	33.5	35	19.2
8	Narainpur	PKVY	7	201	28.71	24	10.19
		Namami Gange	5	177	35.4	32	13.99
9	Pahari	PKVY	4	166	41.5	48	14.36
		Namami Gange	8	269	33.62	31.5	9.94
10	Rajgarj	PKVY	5	229	45.8	45	3.56
11	Shikhar	PKVY	19	631	33.21	32	10.23
		Namami Gange	7	254	36.28	37	11.58
12	District Total	PKVY	117	4975	42.52	50	11.01
		Namami Gange	47	1533	32.61	28	12.42
		Total	164	6508	39.68	49	12.25

Source: https://pgsindia-ncof.gov.in/LGList.aspx

A gradual shift of farmers from conventional to the organic farming system is likely to positively impact water quality and soil health along with farming sustainability. However, being a knowledge-intensive system of farming, 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 cooperative/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 incentive as well as regulation needs to be evolved to retain the existing farmers and motivate others to move towards the 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 not being able to fetch a premium.
2. Scaling up organic production is another problem. The problem of marketing is even more serious 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 (less than one ha) to get the scheme's benefit.
4. Although organic farming clusters are formed, the farmers allocated a part of their lands to organic farming and practiced conventional farming in the rest of the area, which may contaminate the organic produce and fail the purpose of the cluster approach in organic farming.
5. The knowledge and awareness level regarding practices under organic farming was inadequate among farmers.

2.1.10 Livestock Sector

2.1.10.1 Trends in Livestock Population

Livestock forms an integrated part of the rural economy. From table 18, we can infer that the number of indigenous male cattle has decreased considerably from 172964 in 1997 to 35529 in 2019. However, the number of exotic male cattle has increased from 8066 in 1997 to 8848 in 2019. Moreover, the number of indigenous and exotic female cattle has increased considerably from 229766 in 1997 to 281705 in 2019 and from 24760 in 1997 to 185106 in 2019. Thus, the total number of cattle increased from 435556 in 1997 to 511188 in 2019, thus, a net increase of 17.36%. Similar inferences can be drawn from the buffalo data as the number of male buffalo decreased, but the number of female buffalo increased; thus, a net increase of 54.09% in 2019 as compared to that in 1997 is observed in the total population of buffalo. A significant reduction in the indigenous sheep population is observed (7.19%) in 2019 compared to that in 1997. During the same period, the population of exotic sheep also decreased, thus, indicating a decrease in the total sheep population by 8.96%. The total population of goats decreased from 169934 in 1997 to

126877 in 2019, a net decrease of 25.34%. The total pig population decreased considerably from 25276 in 1997 to 4869 in 2019.

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. The livestock subsector grew at a negative average annual growth rate of 3.82% from 2011-12 to 2018-19.

Table 18: Trends in Livestock population (in numbers) in Mirzapur

	Category	1997	2003	2007	2012	2019
Indigenous Cattle	Total Male	172964	185194	166917	129598	35529
	Total Female	229766	236964	255072	206043	281705
	Total	402730	422158	421989	335641	317234
Exotic Cattle	Total Male	8066	10013	18614	23811	8848
	Total Female	24760	22549	34879	67462	185106
	Total	32826	32562	53493	91273	193954
Total Cattle		435556	454720	475482	426914	511188
Buffalo	Total Male	50489	49579	47381	64068	12969
	Total Female	136140	145547	129097	187112	274613
	Total	186629	195126	176478	251180	287582
Sheep	Total Indigenous Sheep	74825	80723	84564	85684	69445
	Total Exotic Sheep	3954	2606	2937	3038	2272
	Total Sheep	78779	83329	87501	88722	71717
Goat	Total	169934	145181	145501	167168	126877
Pig	Total Indigenous Pig	23068	18958	10216	16021	4548
	Total Exotic Pig	2208	191	3735	2300	321
	Total Pig	25276	19149	13951	18321	4869
Total Livestock		901484	906275	899968	956259	-
Total Poultry		277947	284032	320308	795451	-

Source: http://updes.up.nic.in/spiderreports/intialisePage.action
And http://dahd.nic.in/animal-husbandry-statistics

2.1.10.2 Cattle Care Centre

Table 19 shows that the Mirzapur district has an active network of cattle hospitals and development centres, which are very necessary for the livestock sub-sector to grow. The number of cattle hospitals have increased from 24 in 2010-11 to 26 in 2018-19. The number of cattle development centres has remained constant (27) over the years. The number of man-made reproduction centres has also remained constant

(53) over the years. Sheep development centres have increased while pig development centres have remained constant over the years.

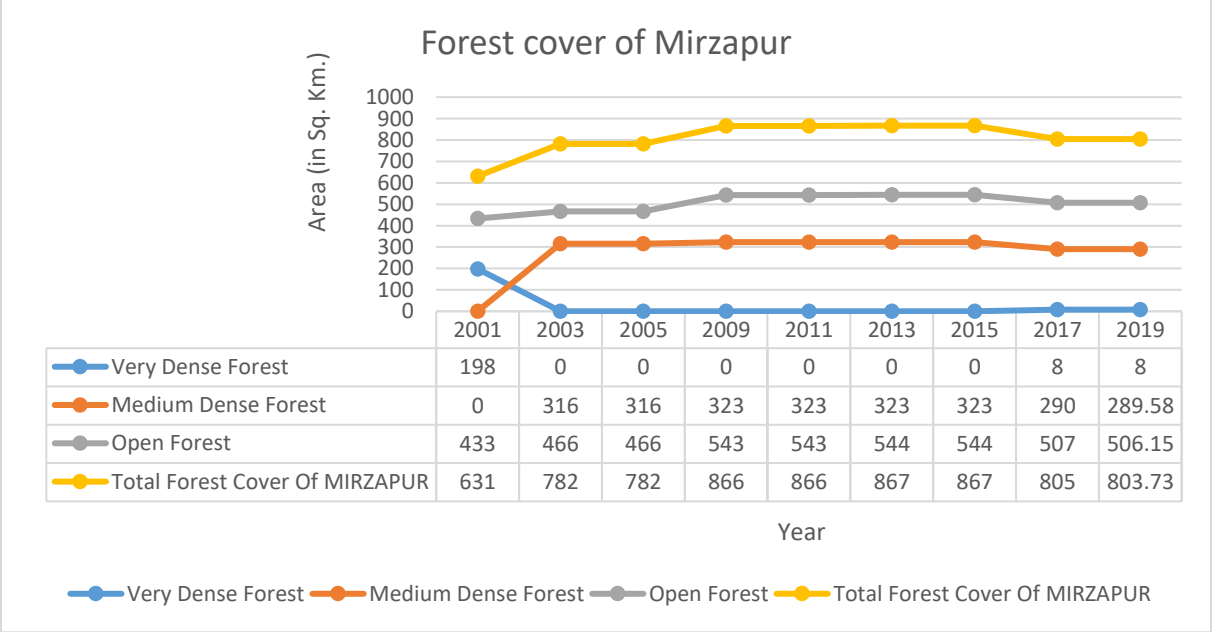
Table 19: Year-wise number of Cattle Hospitals and Development Centers

Category	2010 -11	2011 -12	2012 -13	2013 -14	2014 -15	2015 -16	2016 -17	2017 -18	2018 -19
Cattle Hospital	24	23	24	24	24	26	26	26	26
D- category Cattle Dispensary	2	2	2	2	2	2	2	2	2
Cattle Development Centre	27	27	27	27	27	27	27	27	27
Man-Made Reproduction Centre	53	53	53	53	53	53	53	53	53
Sheep Development Center	16	16	16	16	16	16	16	20	20
Pig Development Center	6	6	6	6	6	6	6	6	6

Source: http://updes.up.nic.in/spiderreports/intialisePage.action

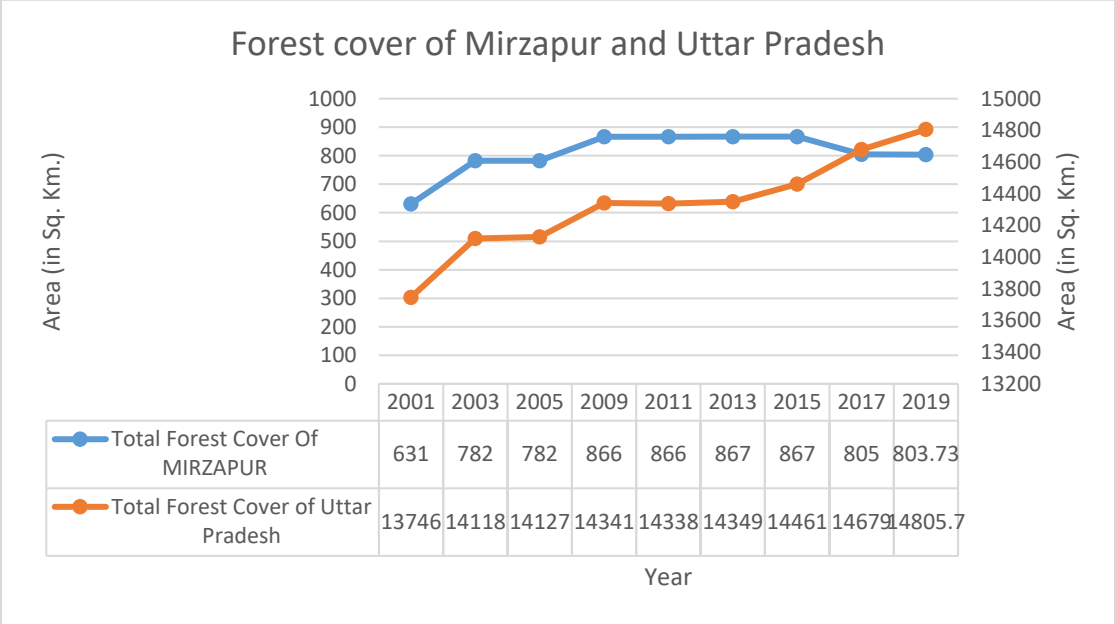
2.2 FORESTRY

1. Baseline Data Analysis/ Quantitative Data Analysis



	2001	2003	2005	2009	2011	2013	2015	2017	2019
Very Dense Forest	198	0	0	0	0	0	0	8	8
Medium Dense Forest	0	316	316	323	323	323	323	290	289.58
Open Forest	433	466	466	543	543	544	544	507	506.15
Total Forest Cover Of MIRZAPUR	631	782	782	866	866	867	867	805	803.73

According to ISFR reports, the forest cover of Mirzapur increased between 2001 to 2015, but 2015 onwards, it slightly decreased. Majorly, open forest followed by Medium dense forest and very dense forest are found in the district.



The forest cover of Uttar Pradesh has increased between 2001 and 2019, and the forest cover of the Mirzapur district has also increased but at a slower pace.

2.2.1. Biodiversity

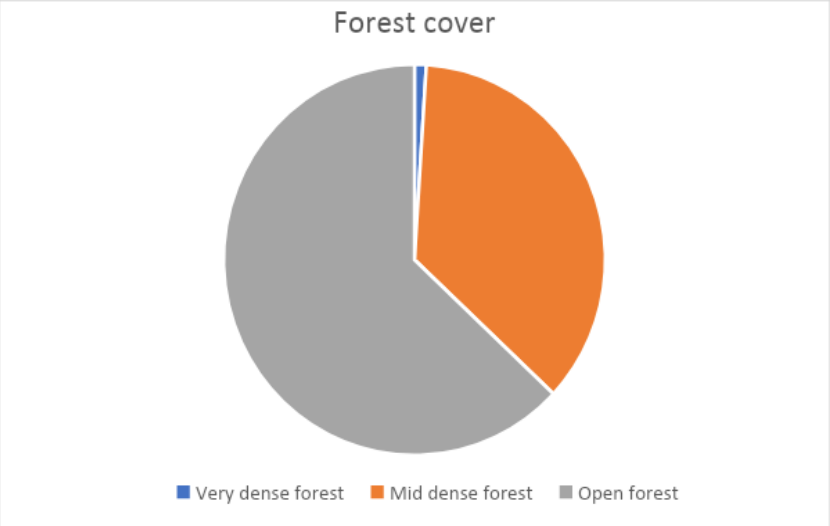
The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover. The crop production trend shows an increase in crop production. Forest data shows that forest cover was decreased by 1.27 % in 2019. There are 330 bird species and thirty-five threatened/rare species of bird in the district.

Table 1 Bird species recorded in the district.

Number of species	330
Number of rare/accidental species	35

Table 2 Forest cover in a square kilometer.

Geographical area	Very dense forest	Mid dense forest	Open forest	Total	% of Geographical area `	Change with respect to 2017 assessment	Scrub
4405	8	289.58	506.15	803.73	18.25	-1.27	47.00



2.3 TOURISM

Baseline data/Quantitative Data
Total number of tourists visiting Mirzapur

	MIRZAPUR		ASTABHUJA		VINDHYACHAL		SITAMARHI	
	Indian	Foreigners	Indian	Foreigners	Indian	Foreigners	Indian	Foreigners
2013	782516	331	2415600	1425	3845000	2525	773540	269
2014	796463	338	2418800	1430	3860000	2530	505714	203
2015	807012	386	2420500	1435	3875000	2535	790581	356
2016	831310	386	2425500	1440	3891000	2540	925866	344
2017	915957	604	2430500	1445	3905000	2545	1175879	433
2018	928968	678	2430827	1502	3905120	2618	1196043	475
2019	1037244	724	2551286	1725	3995062	3077	1167622	553
2020	2023050	213	1324736	551	2993052	860	299039	70

Table-1; Source: Dept. of Tourism, Uttar Pradesh Government

a. The above-given data table-2 is taken from the Uttar Pradesh tourism website. The data table shows the number of tourists visiting Prayagraj for tourism from 2013 to 2020. The tourist visits are bifurcated into two different groups – Domestic and Foreign tourists. Mirzapur

consists of three other prominent tourist locations, namely Astabhuj, Kali Kho, and Sitamarhi, which is also included in the table to include all the possible tourist places in the district.

b. In Mirzapur the number of domestic tourists increases from 782516 in 2013 to 2023050 in 2020. Total international tourists increase from 331 in 2013 to 724 in 2019 and decreases to 213 in 2020.
c. In Astbhuja the number of domestic tourists increases from 2415600 in 2013 to 2551286 in 2019 and decreases to 1324736 in 2020. Total international tourists increase from 1425 in 2013 to 1725 in 2019 and decreases to 551 in 2020.
d. In Vindhyanchal the number of domestic tourists increases from 3845000 in 2013 to 3995062 in 2019 and decreases to 2993052 in 2020. Total international tourists increase from 2525 in 2013 to 3077 in 2019 and decreases to 860 in 2020.
e. In Sitamarhi the number of domestic tourists increases from 773540 in 2013 to 1167622 in 2019 and decreases to 299039 in 2020. Total international tourists increase from 269 in 2013 to 553 in 2019 and decreases to 70 in 2020.

1. Domestic and foreign visitors in different years in Uttar Pradesh

The Indian and Foreign Tourist visits in Uttar Pradesh from 2016 to 2020						
Year	**Indian**	**Foreigner**	**Total**	**Percentage increase/ reduce in comparison to previous year**		
				Indian (%)	**Foreigner (%)**	**Total**
2016	**213544204**	**3156812**	**216701016**	**3.4**	**1.69**	**3.37**
2017	**233977619**	**3556204**	**237533823**	**9.56**	**12.65**	**9.61**
2018	**285079848**	**3780752**	**288860600**	**21.84**	**6.31**	**21.6**
2019	**535855162**	**4745181**	**540600343**	**87.96**	**25.5**	**87.14**
2020	**86122293**	**890931**	**87013224**	**-83.92**	**81.92**	**-83.9**

Table-2; Source: Dept. of Tourism, Uttar Pradesh Government

a. The above-given graph shows the number of visitors who visited Uttar Pradesh from 2016 to 2020. In the year 2016 number of domestic tourists increased to 3.4% compared to 2015, and foreign tourists increased to 1.69%. In the year 2017, the growth rate increased to 9.56% in domestic tourists and 12.65% in foreign tourists.

b. Data shows that 2018 had been a fruitful year for Uttar Pradesh tourism. Uttar Pradesh encountered a 21.6% increase in tourist numbers from the previous year, a significant change in numbers. However, the patten is not similar in Kanpur

c. 2019 was a year when the global event Kumbh Mela 2019 was organized in Prayagraj (a District in Uttar Pradesh). The results are visible in the numbers (given in the data table above), 87.14% increase in the number of tourists compared to 2018. The data also shows foreign visitors increased to 25% in 2019. The enhanced response of tourists shows the consumer behaviour, which majorly depends on advertisements. A commodity that has been presented to be associate with the emotions of consumers has a high potential to sustain and perform better than its competitors.

d. The surge in the number of tourists in Kumbh Mela 2019 is attributed to expensive advertisements, extra-standard facilities, and a political campaign. All this together made the event a mega event. Security aspect in such organization is a significant factor which influences the success and failure. Kumbh Mela 2019 witnessed extra tight security and surveillance to prevent stampedes and violence in the Mela.

e. Such grand organization of events are also a factor on which the number of tourists to other districts (especially domestic tourists) and states (especially foreigner tourists) depend.

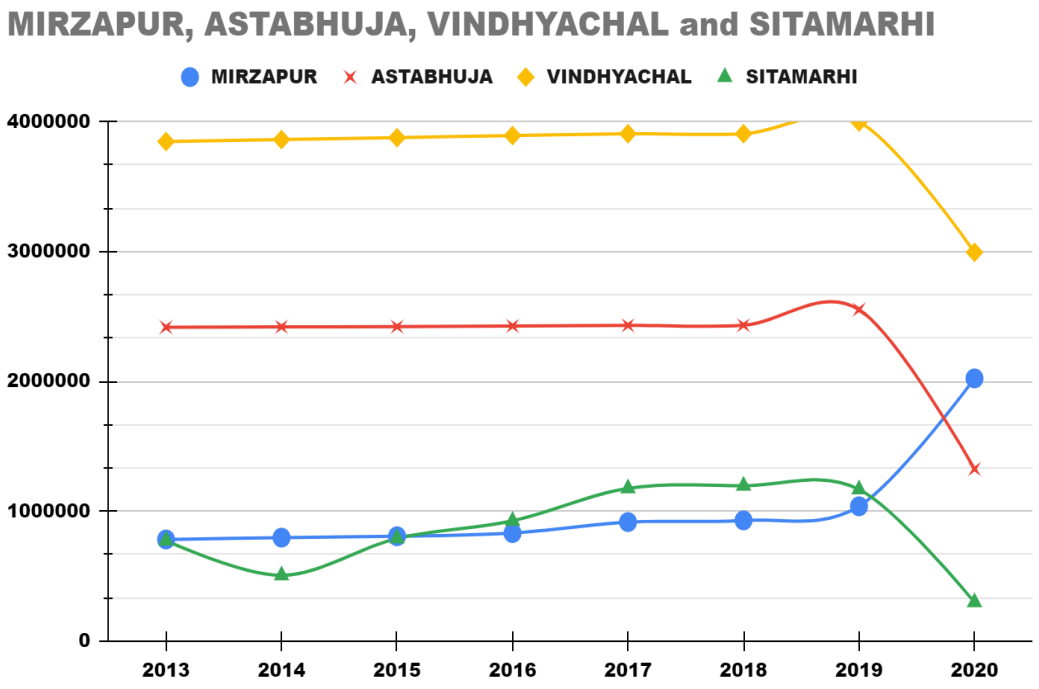
f. The scenario of foreign tourists is worse compared to state data. Even the mega event Kumbh mela could not increase the number of foreign tourists in Kanpur. This signifies the lack of transfer of information.

g. The district witnessed the increased growth in number of domestic tourists but not in foreign tourists. It is necessary to understand the shortfalls before working on upcoming policies and agendas.

2. Percentage change in visitors in different years

	MIRZAPUR		ASTABHUJA		VINDHYACHAL		SITAMARHI	
	TOTAL TOURISTS	% CHANGE	TOTAL TOURISTS	% CHANGE	TOTAL TOURISTS	% CHANGE	TOTAL TOURISTS	% CHANGE
2013	782847		2417025		3847525		773809	
2014	796801	1.78%	2420230	0.13%	3862530	0.39%	505917	-34.62%
2015	807398	1.33%	2421935	0.07%	3877535	0.39%	790937	56.34%
2016	831696	3.01%	2426940	0.21%	3893540	0.41%	926210	17.10%
2017	916561	10.20%	2431945	0.21%	3907545	0.36%	1176312	27.00%
2018	929646	1.43%	2432329	0.02%	3907738	0.00%	1196518	1.72%
2019	1037968	11.65%	2553011	4.96%	3998139	2.31%	1168175	-2.37%
2020	2023263	94.93%	1325287	-48.09%	2993912	-25.12%	299109	-74.40%

Table-3; Source: Dept. of Tourism, Uttar Pradesh Government



Graph-1; Source: Dept. of Tourism, Uttar Pradesh Government

a. The above-mentioned table shows the number of tourists in four different locations in Mirzapur district. The data has been extracted from the official site of Uttar Pradesh Tourism and percentage change has been calculated.
b. Mirzapur experiences 10% increase in the tourists in the year 2017. In the year 2020 data shows the district experiences 94.93% growth in the number of tourists, which seems manipulated data, because in the year 2020 lockdown due to the pandemic happened which led to closure of hospitality sector.
c. Astbhuja experiences uniform growth in the number of tourists through out the years from 2013 to 2018; in year 2019 the Astbhuja captures 4.96% increase in the number of tourists and then in year 2020 the number of tourists decreases 48.09% percent.
d. Vindhyachal experiences uniform growth in the number of tourists throughout the years from 2013 to 2018; in year 2019 the Vindhyachal captures 2.31% increase in the number of tourists and then in year 2020 the number of tourists decreases 25.12% percent.
e. Sitamarhi doesn't experience uniform growth in number of tourists ; -34.62% growth(negative growth) in the year 2014; 56.34% growth in subsequent year, the -2.37% growth in 2019 and the -74.40% growth in 2020.

3. Budget allotted/ Expenditure in different years by tourism dept.

Budget -Department of Tourism, in Different Years		
Year	Budget in Rupees	Percent increase or decrease
2015-16	**2,245,098,000.00**	
2016-17	**1,992,912,000.00**	**-11.23%**
2017-18	**2,671,016,000.00**	**34.03%**
2018-19	**6,870,209,000.00**	**157.21%**
2019-20	**8,596,205,000.00**	**25.12%**
2020-21	**10,382,037,000.00**	**20.77%**
2021-22	**10,759,153,000.00**	**3.63%**

Table-4; Source: Dept. of Tourism, Uttar Pradesh Government

The above-given table shows the budget sanctioned for the Department of Tourism, Uttar Pradesh, from the Financial Year (FY) 2015-16 to 2021-22. In the initial FYs, which are 2015-16, 2016-17, 2017-18, the amount sanctioned to the department is significantly low. In the FY 2018-19 Department received a 157.21% increased budget. Which followed a 25% increase in the next FY-2019-20. A similar trend is visible in the number of tourists, skyrocketing of tourists is found in the same years. This directly implies that the money spent is directly proportional to the tourists in particular FY.

2.4 WETLANDS

The district has vast wetlands; most of them are Reservoirs/Barrages and tanks/ponds. Table 1 represents the number of wetlands and their area representation in the district.

Table 1: Wetland Data of Mirzapur 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	3	4	1	0	2	0	0	1	0	0	0	0	0
Ox-bow lakes/cut off meanders	5	5	0	0	0	1	1	1	2	0	0	0	0
High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Waterlogged	37	43	6	0	17	15	2	3	0	0	0	0	5
River/Stream	0	58	58	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	193	254	61	0	99	54	12	13	8	3	0	4	5
Tanks/ponds	113	118	5	0	86	22	5	0	0	0	0	0	13
Waterlogged	80	110	30	0	32	24	13	8	2	1	0	0	31

Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (2258)	431	592	161	1666	236	116	33	26	12	4	0	4	54

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

Man-made wetlands (Reservoir/Barrage)		Man-made wetlands (Reservoir/Barrage)	
Meja Reservoir	1702.72 ha	Ahraura Reservoir	458.34 ha

2.5. ENERGY

2.5.1. Solar

The Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) is the nodal agency which looks after the growth and expansion of renewable energy in the state. UPNEDA takes efforts to develop the capacity in renewable energy sources such as solar energy, small-scale hydro-electricity and biomass-based electricity production in the state.

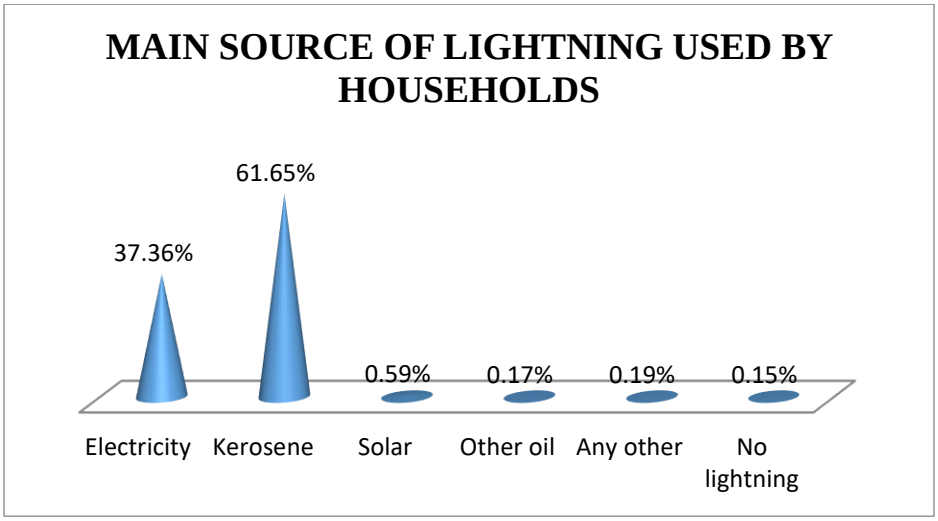


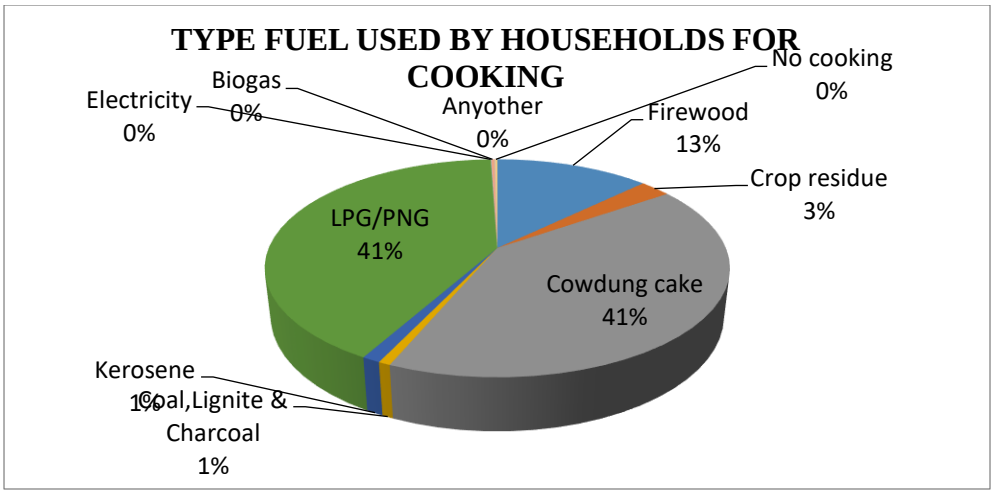
Fig. 1

According to the 2011 census, 61% households used kerosene as the main source of lightning, followed by 37.36% using electricity and only 0.59% use solar.

Rooftop top solar panels have been installed in various government building in the district, such as 60 kW in Vikas Bhawan and 30kW in MZP Plateform I station building.

2.5.2. Biomass

The Uttar Pradesh New and Renewable Energy Development Agency (UPNEDA) is the nodal agency which looks after the growth and expansion of renewable energy in the state. UPNEDA takes efforts to develop the capacity in renewable energy sources such as solar energy, small-scale hydro-electricity and biomass-based electricity production in the state.



According to the 2011 census, 41% of the households use cowdung cakes and the other 41 % use LPG for cooking. The rest of the households are dependent on kerosene, coal, firewood, etc, for cooking.
Majority of population in Meerut is mainly dependent on agriculture as their primary source of income. Rice, wheat, sugarcane maize, etc. are some of the major crops and enterprises engaged in agriculture.
The net sown area of the district is 198941 ha with the cropping intensity of 152.67%. The district has a 21314 ha of forest land. A total of 2596 ha of cultivable wasteland is there in the district, with 2997 ha of current fallows. The district produces 1014.1 kT/yr of agricultural biomass and 4.1kT/yr forest based biomass (Kumar et. al. 2017)
Table.1 gives an account of productivity of some of the major crops in the district. The productivity of the crops appears to be good consequently a good amount of crop residue would be produced.

CROPS	PRODUCTIVITY (kg/ha)
Rice	2559
Maize	1903
Pulses	679
Wheat	3870
Sugarcane	63800
Mustard	1105

Table 1

A biomass plant has been installed in M/S Amrit Bakers in the district. Also co-generation plants have been installed in Sangal Paper Mill and Anand Triplex Board.

2.5.3. Biogas

Biogas data is not available for the district. Based on the livestock population and agricultural waste biogas potential calculated. Biogas potential from animal waste and agricultural waste was calculated

approximately as one crore m^3/year and eighteen crores m^3/year. This amount of biogas generation can efficiently complete the energy demand of the district.

2.5.4. Hydro Power

Non-conventional energy development agency, U.P. investigated three sites near damtoe for micro-hydel projects generation in the district Mirzapur.

Table 3. Identified/investigated sites of Small Hydro projects by NEDA

Name of project	Installed capacity (KW)	Stream/river	HEAD (m)	Discharge (cummecs)
Meja	9500	Damtoe	34.50	33.98
Dandraul	2500	Damtoe	8.40	35.70
Garai	1500	Damtoe	18.40	10.40

3 QUALITATIVE DATA ANALYSIS

3.1 FORESTRY

The government's social afforestation programme brings monetary benefit to thousands of poor people who contribute to preservation and development of plantations on lands allocated by the forest department. A total of 1,22,000 hectares of land have been brought under the programme in the district, mostly in Madhupur, Sakhipur, Ghatail and Mirzapur upazilas, and 15,948 beneficiaries, including a large number of women, have already got a total of Rs. 75 crore 62 lakh 23,530.

Last year, state government planted 1,40, 05,610 saplings in Mirzapur.

3.1.1. Biodiversity

The Vindhyan highlands' woodlands are an example of India's tropical dry deciduous forests. They are characterized by lengthy, hot, dry months and are completely reliant on monsoonal rains. Mirzapur's woods represent the start of the Vindhyan range. The geographical variability, structural structure, and stress and disturbance adaptations of these forests are well-known. These woodlands provide fuel wood and subsistence to a huge rural population. Shorea robusta, Boswellai serrata, Diospyros melanoxylon, Acacia catechu, Butea monosperma, Zizyphus nummularia, and Hardwickia binnata are among the commercially significant tree species. They are smaller units of wildness for large animal species, vulnerable species like the Sloth bear, Tiger, Swamp Deer, Chousingha, Wild dog and offer habitat for the most endangered species.

3.2. ENERGY:

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

3.2.1. Solar

Government in Mirzapur has been quite active in installing solar energy plants. As a recent article in a national daily with the heading "Modi, Macron inaugurate UP's largest solar power plant" mentions- Prime Minister Narendra Modi and French President Emmanuel Macron today inaugurated Uttar Pradesh's biggest solar power plant in Mirzapur district's Chhanvey block. Built at a cost of around Rs 500 crore by French firm ENGIE, the 75 MW solar plant has come up at Dadar Kalan village on the hilly terrain of the Vindhyas range. Some 1,18,600 solar panels have been set up in over 380 acres. Power would be transmitted to Jigna sub-station of Mirzapur range of Uttar Pradesh Power Corporation Ltd. The plant will generate 15.6 crore units of electricity annually, about 1.30 crore units per month. Another article in Saur energy with the heading "NHPC Tenders for 100 MW Solar Plant in Mirzapur, Uttar Pradesh" reads NHPC Limited has issued a tender for the EPC contract for the development of a 100 MW solar PV grid-connected power plant along with associated power evacuation equipment across multiple villages in the Mirzapur district of Uttar Pradesh. As per the tender, the selected developer(s) will have a period of 12 months from the date of issue of Notification of Award to commission the solar PV power project along with the power evacuation equipment at the Sherwa, Chak Lathiya and Jafarkhani villages in Mirzapur.

3.2.2. Biomass

Although there have been efforts made in the district to improve biomass energy production in the district but not much has been achieved. The district Meerut has the problem of stubble burnig, this can be proved from the news article in Hindustan Times which mentions - According to UPPCB experts, the (current) farm fire incidents are 18% more than the average seasonal farm fire incidents recorded in the state in a day, particularly in November.Chief environmental engineer (UPPCB) VK Singh said the fire incidents were reported from Saharanpur, Meerut, Baghpat, Bijnor, Bulandshahr, Hapur, Etawah, Mainpuri, Unnao, Maharajganj, Bahraich and Gonda districts of Uttar Pradesh, among others.
Not much data is available on the biomass energy from the district Meerut.

3.2.3 Biogas:

Livestock and agricultural data show a great potential of biogas in the district. However as per the authors knowledge, no data of biogas plant is given for Bhadohi district.

3.2.4. Hydropower:

The State's national-level program runs for hydropower generation, such as the small hydropower project program. The implementation of small hydropower in the State is carried out by Uttar Pradesh New and Renewable Energy Development Agency.

3.3 TOURISM

Mirzapur is a city of Uttar Pradesh state of India. It is considered as a very important district in terms of tourism. The natural beauty and religious atmosphere here attract the attention of the numerous tourists. Vindhyachal Dham in Mirzapur is one of the main Hindu pilgrimage sites of India. In addition, it is famous for the district of Sita Kund, Lal Bhairav Temple, Moti Talab, Tanda Waterfall, Vindham Waterfall, Tarakeshwar Mahadev, Maha Triangle, Shiv Pur, Chunar Fort, Gurudwara Guru Da Bagh and Rameshwar etc. Mirzapur is surrounded by the north of Varanasi district, south of Sonbhadra district and west of Allahabad district. India's international standard time has been taken from the place of Naini of Prayagraj district. Mirzapur is very famous for "Lalaston". In ancient times, this Stone of Maurya Vansh King Samrat Ashok by Buddhist Stup and Ashok Pillar (currently India's National The mark was made in the language of the people of Mirzapur, Hindi and Bhojpuri.

Places of interest

Vindhyachal Dham

'Bhagwati Vindhavasini' is a superpower. Vindhyachal has always been his residence. Jagadamba's constant presence has made Vindhyagiriko Jagarat Shaktipeeth. In Padmapuraan, Vindhyachal-Nivasini has been associated with the name of Vindhavsinini, the super power of this Vindhyvindhidhasini. The story comes in the Dasam Skand of Shrimdev Bhagavat, when Brahma ji first creates Swayambhavvammanu and Shatruupa with his mind. Then after marriage, Swayambhav Manu made a statue of Goddess with his hands and performed harsh tenacity for a hundred years. Satisfied with his austerity, Bhagwati blessed him with a state of deserving state, family growth and the highest post. Mahadevi went to Vindhyachalvarvata after giving his blessing. From this from the beginning of creation, the worship of Vindhyaswini is being done. His expansion of the universe came from his own good wishes.

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 its carpet weaving and brassware industries. 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:

- Rice and wheat are produced as commercial crops in the district. Also, the production of pulses is reasonably high.
- This region is a belt of large varieties of oil production like mustard, linseed, and castor seeds.
- The region has a large production of dairy products.

4 ACTION PLAN DEVELOPMENT

4.1 FORESTRY

The study has recommended to the government to notify a part of the Mirzapur's forest area as a conservation reserve with sloth bear as a flagship species. It noted that the Mirzapur forests are an important wildlife corridor for protected areas around it.

Historical references reveal that a little over a 100 years ago, during the British rule in India, the forests of Uttar Pradesh's Mirzapur area were home to rich wildlife, including species like cheetah, that are now extinct in India. While wildlife population has been declining in the forests for some years, a latest camera trap study has recorded thriving wildlife with several protected species surveyed in the area, including some recorded for the first time. With these observations, the study has recommended about 408 sq. km identified from the forest area to be declared as a 'conservation reserve' by the government to ensure that it gets the desired attention and protection against threats like logging, poaching, encroachments and mining. It also called for declaring sloth bear as the flagship species for the Mirzapur conservation reserve.

As per the study, the forests of Mirzapur are classified as tropical deciduous forests that have long and intensely hot summers, low rainfall and short mild winters. Many small rain-fed streams and rivulets pass through the entire hilly terrains which are almost dry during the hot summer. The study noted the conservation reserve is proposed only in the areas already recorded as reserve forests and the villages in and around these reserve forests. "No resettlement or rehabilitation of existing villages are recommended and the forest division will involve the people dependent on forests for better management of forests and ensuring that the rights of people traditionally dependent on forests for livelihood are least affected".[3]

Projections & Monitoring Matrix

Outcome indicators can be forest produce, buyback of products by the state, annual gross income generated by these outputs, contribution of the forest output in the district domestic product.

[3] https://dailyhashtags.in/announce-ups-mirzapur-forests-as-a-conservation-reserve-environmentalist-saying/

4.1.1 Biodiversity –

- The state's biggest Biodiversity Park will be developed in the district under the Central Government's Namami Gange program. The district administration has devised an action plan for the park, which would cost Rs.6 crore 28 lakh 79 thousand and will be erected on Mohanpur hill.
- Mirzapur forest division was designated as an important sloth bear habitat by the Union Ministry of Environment and Forests in 2012.

4.2 TOURISM

- **Ecotourism Projects**

Travelling to places where flora, wildlife, and cultural legacy are the main attractions is known as ecotourism. Ecotourism aims to provide visitors with a better understanding of how humans affect the environment and create a greater appreciation for our natural ecosystems. There is a huge opportunity to develop ecotourism projects in the Mirzapur district. The project will minimize the negative aspects of conventional tourism on the environment and enhance the cultural integrity of local people. Also, this project will boost the tourist inflow in the district. Lakes, Ponds, forests, and protected ranges can be protected to give Prayagraj a new face in tourism.

- **Sustainable Tourism**

It is a type of tourism in which all the needs and desires of a tourist/ and other stakeholders of the tourism industry is fulfilled without compromising the ability of the future generation to utilize the tourism. Several goals of Sustainable Developments Goals are also seen associated with sustainable tourism. Such as life below water and life on land are impacted by human activities if the tourism place is a water body of forest area; hence it is the duty of all of us to take care of sustainability aspect in the tourism. Sustainability for locals/natives can be provided by including them in trade and business activities.

There is a sense of responsibility of different stakeholders associated with tourism to develop sustainable tourism. In which each stakeholder takes care of other stakeholders and biotic and abiotic factors. For example, reducing the Carbon footprint per visitor, using eco-friendly vehicles to roam around, supporting local businesses.

One example of sustainable tourism is promoting tourists to travel off-season. It will reduce the impact of seasonal unemployment on the marginal traders and other workers in the tourism sector.

Offering eco-friendly services is another example of sustainable tourism. Providing tourists with a cycle to roam around nearby places with help in reducing carbon footprint and it economical. It is aimed at the minimum negative impact on the environment created by tourism activities.

Eco-tourism spot near Mirzapur

1. **Vijaygarh (Sonebhadra)**
   Located at about 30 km from Roberts Ganj Sonbhadra district, U.P., India. More than half the area of Vijaygarh is covered by steep and rugged hills of Kaimur Hill Range. The Fort was under Kashi King Chet Singh's rule until the arrival of British. The Fort is mesmeric, and another fort

is said to be hidden under this Fort. Near the main gateway of the fort is a tomb, which is said to be that of Sayyed Zain-ul-Abdin Meer Sahib popularly known as Hazrat Meeran Shah Baba. Every year, in the month of April an Urs (Fair) is organized here which is attended by people from different religions and sects.

Visitor Attractions

- Steep and rugged hills of Kaimur range
- Fort
- Scenic Beauty

2. Kaimoor Wildlife Sanctuary

This Sanctuary is in the famous Kaimur range. It is the largest sanctuary in the state and occupies an area of about 1342 square kilometres. In the valleys of the Sanctuary there are several waterfalls, of which the finest are, Karkat Waterfall and Telhar. This sanctuary has ancient cave paintings and the oldest Fossil Park to its acclaim.
The animals making part of the habitat of the Wildlife Sanctuary are Tigers, Leopards, Wild Boars, Sloth Bear, Sambar Deer, Chitals, Four-Horned Antelope, Nilgais amongst many others. It is home to more than 70 species of resident birds, which stay here all around the year. The number increases in the migratory season i.e., during the winters, when there is an influx of birds from the Central Asia region.
Kaimoor Wildlife Sanctuary is in two different districts named Mirzapur & Sone Bhadra. Divisional head quarter at Mirzapur. The total geographical is 140.58 sq. km. In the sanctuary area, visitors can see Black Buck, Chinkara, Sambhar, Cheetal, Bear, Leopard, Wolf & Blue Bull etc. In flora Bamboo, Palas, Khair, Mahua, Dhau etc.

3. Hathinala, Renukut (Sonebhadra)

Renukut lies in the southeast-most part of Uttar Pradesh and is located next to Shakti Nagar, Anpara at an average elevation of 283 MSL. Renukut is also surrounded by thick cover of well-preserved forests that keep the temperatures comparatively low especially after the rains. The Hathinala forests of Renukut forest division owes its name to a main drainage hilly rivulet, "HATHINALA", is the representative of Vindhyan Forests and is rich in keystone species of Hardwickia binnata which is rare and endemic to this area which is a proposed bio-diversity hot spot. The area is very rich in biodiversity owing to presence of wide spectrum of fauna and flora. Hathinala Biodiversity Hotspot is situated on Reewa-Ranchi Road NH 75E road and it is 54km from Sone Bhadra district head quarter, Roberts Ganj and 17km. from Renukoot forest division head quarter. The Hathinala Forests of the Renukut forest Division owes its name to a main drainage hilly rivulet. "HATHINALA" is the representative of Vindhya Forests. The forest area under consideration is the hilly catchments area of the "HATHINALA" with Dry Peninsular Sal Forests (5B/C1) in slope along Hathinala and subsidiary rivulets, Northern Dry-mixed Deciduous

Forests (5B/C1) in the tops of the hills and ridges mixed with Hardwickia binnata (Parsiddh) Forest (5/E4). The forest is rich in Keystone species of Hardwickia binnata which is rare and endemic to the proposed bio-diversity hot spot. The area is very rich in biodiversity owing to presence of wide spectrum of fauna and flora.

4. **Chunar/Vindham (Mirzapur)**

Chunar, located in Mirzapur District of Uttar Pradesh state, India, is an ancient town. The railway line passing through Chunar railway station connects to major destinations of India like Howrah, Delhi, Tatanagar and Varanasi. A National Highway also passes through Chunar connecting Varanasi, the ancient and pilgrimage city (also well known as Kashi or Benaras) and Kanyakumari, the southernmost tip of India. Chunar is well known for its pottery especially clay toys.

People are humble, simple and down to earth. Primary mode of earning livelihood is agriculture and agri-based business. Local dramas and melas (funfairs and social gatherings during off-time primarily focused for entertainment), are favourites of the locals.

A temple of Durga situated in a cave on a hilltop is also a place of tourist interest.

Projections and Monitoring matrix

Sector	Intervention	Strategy	Total cost	Expected Outcomes
Tourism	**Research**	• Based on various data and matrices, it is possible to predict the reason and motivation for tourism. Through extensive qualitative and quantitative research, it is also possible to determine the variables affecting tourism in Uttar Pradesh. • Research must be free from all		A well-researched document as a reference for other processes. Factors that affect tourism in Uttar Pradesh. Define the determinant of tourism activity.

		the political pressures and influences. ● The researchers must ensure that the field data and secondary data are correct and not modified while entering the new records. ● Need to involve unbiased researchers.		
	Planning	● Action plans can be developed for intervention based on the research and analysis of different data and reports. ● Developing an Action plan is vital because results depend on how it is planned. ● Planning must consider the social status of the State and the image in the tourists' minds. ● No place should be given to non-		Planning to be based on research and previous lessons. Realistic planning for successful implementation. .

		practical projections. • Planning about when to organized Mahotsav/ festivals/ fairs to pump the local economy. **Eg** Carpet and Brassware industry should be pumped with financial and infrastructure support and eventually tourism activities • Separate planning for different demographics of tourists for comfort and leisure tours. For example, while planning the tour packages and tariffs, it is crucial to consider the demography of tourists. Foreign tourists ask much for hygiene while local tourists ask much for discounts.		

		Hence these concerns must be included. ● Need to develop the sites as per a set of standards to attract a wide range of tourists. ● Brand Manufacturing to increase tourism activity. ● Organizations of grand events. ● Use of allocated budget.		
	Implementations	● Various schemes can be developed, such as tourist packages, tariff plans etc., to attract more and more tourists. ● Mahotsav and Fairs to be organized to rejuvenate the local economy and attract tourists. ● Developing tourist circuits. ● Developing eateries		To attract more number of tourists and maximize the revenue from tourism. To improve the image of the State and not let the other social factor affect the revenue of tourism.

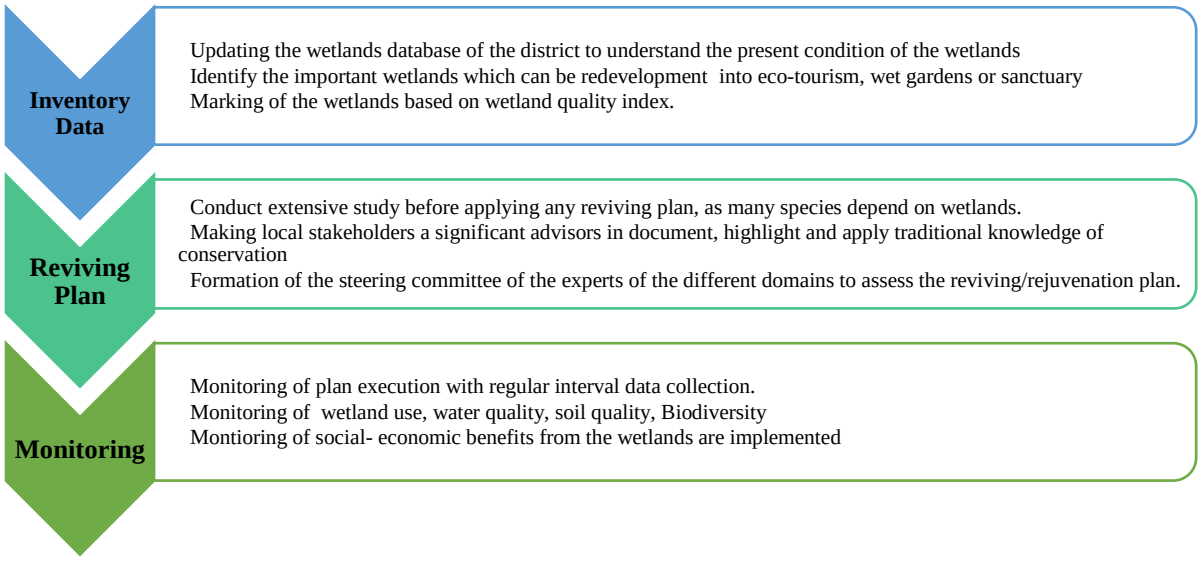
		• Connecting tourism with local culture and food. • Extensive marketing for advertisement. • Famous face as brand ambassador. • Extensive branding and marketing. • Development of tourism spots and heritage sites. • Availability of information on government websites along with tour packages. • An extensive market research for the development of strategies		
	Impact Assessment of results	• Calculating what the touch points are. • The reason for failure • The reason for the success • Lesson for next planning		To learn the lesson and find out the root cause of success and failure, to be used further with modification

SWOT analysis of Tourism

S No.	Strength	Weakness	Opportunity	Threat
	• Geographical location is plus point, lies between two tourist spot of the state Prayagraj and Varanasi. • Embraces scenic location, rocky hills, and waterfall in the vicinity. • Chunar fort has historic significance and is famous for sculpture and Chunar is well known for its pottery especially clay toys. • A Hindu religious place.	• Undeveloped ghats • Less expenditure on infrastructure and tourist destinations. • Lack of attractive packages.	• Mirzapur can be developed as an ecotourism spot and picnic spot. • Waterfalls attract a lot of tourism activity. • Scenic view and hilly location are a destination for tourism and resorts.	• Bad image of the city due to several web series. • Uncontrolled crime rates and negligence of local goons. • Rapid development projects can damage the environment and hence the waterfalls and wildlife.

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

There have been solar panel installations in various government buildings in the district. The administration should pay attention on making people aware about the schemes that are being run by the government to increase the solar energy penetration in the district among the households. Kusum Yojana should be popularized among the farmers. The different components of the Kusum Yojana should be implemented as per the requirement in the villages, on the lines similar to the Maharashtra. In Maharashtra component A of Kusum Yojana has been successfully implemented under Government of Maharashtra's Krishi Vahini Yojana. Government should pay attention on strengthening the infrastructure of the district. This would help in increasing the Solar rooftop panel installations under the National Solar Mission- Phase II.

4.4.2. Biomass

The people of the district should be made aware of the biomass energy and how in different ways they can make use of it. Sugarcane is largely grown in the district which consequently has resulted in a number of sugar mills in the district. The mill owners should be encouraged to install bagasse based biomass plants. Production of biofuel should be promoted in the district. Each of the sugar mill or a group of them can establish bagasse based plant in the district. The villages should be encouraged to establish community based biomass in the district.

The district also cultivates rice and wheat, husk based biomass plants on the lines of Husk Power Systems from Champaran, Bihar. New entrepreneurs should be encouraged to utilize the biowaste available in the district and develop innovative ways.

4.4.3. Biogas:

- The cow dung-based biogas plant to be constructed at the animal shelter in Sindhora and Mahuwari villages was examined by the block head of Mirzapur, as well as members of the district level cell committee.

4.4.4. Hydropower:

The state government of Uttar Pradesh has also set rules for private engagement in the development of micro/mini/small hydropower projects in power evacuation facilities.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

1. Productivity of major crops such as rice and wheat (15.97 q/ha and 18.21 q/ha respectively) in the district is very low; high yield varieties (HYV) seeds should be provided to the farmers under the NFSM scheme.
2. Water harvesting structure should be constructed (farm pond) to bring more areas under cultivation.
3. Drought is a regular phenomenon in the district. Therefore, the farmers in the district should adopt resources conservation technologies.
4. More training programs and awareness should be provided to the farmers regarding resources conservation technologies like mulching, life-saving irrigation, conservation tillage, etc.
5. Micro-irrigation (drip and sprinkler) should be promoted in the district to increase productivity and water use efficiency of the vegetables and fruits.
6. Potato and onion cultivation can be encouraged as cash crops of the district.
7. Vermicomposting, the application of bio-fertilizer and organic manure, needs to be promoted for sustainable agriculture.

8. The district has a large scope for quality production of fruits like mango, guava, ber, and citrus, which should be encouraged.
9. Farmers should be trained in the management of the orchard, post-harvesting processes and Integrated pest, nutrient, and water management for fruits cultivation.
10. Beekeeping and mushroom cultivation can be introduced for the small land-holders.
11. The farmers should follow crop advisory.
12. There is a very good scope of goat rearing, sheep rearing, piggery, backyard poultry in the district.

5.2 FORESTRY

Mirzapur, the district having largest forest cover in the state, located on the bank of river Ganga. According to ISFR 2019, 803.73 Sq. Km. area of Mirzapur is covered with forest. As discussed above, the forest cover of Mirzapur has decreased slightly as compared to previous assessment of ISFR 2017.Majorly open and moderately dense forest are found in the district. There is a wide scope of Afforestation on waste land, trees outside forest (on the sides of the roads, banks of river etc.) and scrub area. Government can promote the afforestation, agroforestry activities by providing output based incentives.

5.2.1 Biodiversity

Non-timber forest produce-based income-generating initiatives should be identified and promoted.
The floodplains must be safeguarded from human disturbances and reclaimed to allow for the recovery of aquatic vegetation that is suitable for wildlife. This type of human-induced land use change has a considerable influence on the survival of wildlife in the woods and aquatic species in a wildlife-protected region.
Government should support/ promote local people to build communities and NGOs for afforestation programs.

5.3 WETLAND

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

- It is recommended to introduce improved cultivars and production technologies for pulses and oilseeds.

- Some known wetlands are talabs near Kajrahwa Pokhara, Gerua/Garua Talab, Motiya Talab, Gosai Talab, Pahari Pokhara. It is recommended to rejuvenate and restore these wetlands under MNREGA schemes. (Source: INTACH, "Ganga Cultural Documentation")
- It is recommended to promote the production of medicinal plants in the region to support the promote ayurvedic medicine, and wetland can support the water supply for the cultivation.
- It is recommended to develop the outer periphery of the wetlands with wet gardens, flower gardens or medicinal plants. These wetlands can be turned into an eco-tourism site.
- 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). The awareness will help the development of aquaculture of fish, crab and pearl.
- It is recommended to conserve the Gangetic dolphins found in the area

5.4ENERGY

5.4.1. Solar

- ❖ The people of the district should be made aware of the solar energy scheme of the government.
- ❖ Kusum Yojana should be popularized among the farmers of the district.
- ❖ Solar rooftop installations should be popularized under the National solar Mission- Phase II.

5.4.2. Biomass

- ❖ The people of the district should be made aware of the biomass energy.
- ❖ Biofuel generation should be encouraged in sugar mills.
- ❖ Establishment of husk based biomass plants should also be encouraged.

5.4.3. Biogas

- The existing 17 MLD Sewage treatment plant in the Mirzapur can be connected to biogas plant.
- It is recommended to improve condition of existing gaushala built at the brihad govansh mirzapur vairamshah temporary gaushala and construct biogas plant near it.
- Promotion of household biogas plant and different incentive scheme should be spread through posters, or slogans. Tourist attraction places should be targeted to conduct this activity.

5.4.4. Hydropower

- It is recommended to identify new sites and build microhydel projects on the investigated sites in Mirzapur.

5.5. TOURISM

S. No.	Broad objectives / recommendations	Key activities / interventions to be planned			Monitoring & Evaluation	Impact
		2022	**2023**	**2024**		
	Encourage tourism related startups and ideas. **I**ncubation centers to develop prototype and working model with the assistance of industry leaders (tourism industry). **T**raining of skilled manpower to work in tourism sector (through earn while you learn programs). **U**pgradation of UP state tourism corporation policies, the hotels and integration of PPP. Make the district a picnic hub and a ecotourism spot.	**R**esearch to figure out the factors impacting the tourism in the district. **D**evelopment of strategies to address the issues. **D**evelopment of policies to protect the ecosystem. **A**dopting PPP (Public Private Partnership) model in the tourism sector to reduce the burden on government spendings Structural developments.	**I**mplementation of strategies. **T**raining and Incubation Centre support to innovative ideas **S**tructural developments	**S**ampling for analysis. Evaluation of interventions. **R**edesigning of strategies based on Impact analysis	**I**ntervention impact-RCTs, regression analysis, propensity scores, econometrics, structural equation modelling, Contribution analysis, process tracing, Bradford Hill criteria. **T**hrough Participatory approaches and impact evaluations use the standard OECD-DAC criteria. **B**ased on satisfaction of pre decided key questions.	**P**erformance of interventions. **W**orking model and scalability of ideas from incubation Centre. **M**ore tourist footfall. **T**rained youth to be a part of Tourism industry. **U**pgraded staff and facilities associated with UP State Tourism Corporation **R**educed impact of unlawful activities on tourism.

Recommended Project

1. Upliftment of brassware and carpet industry and embedding in tourism activities.
2. Development of eco-tourism spots and picnic spots.

6 Discussion during the Report Presentation

- The carpets and brassware industries are famous in Mirzapur.
- The products from Mirzapur shall be sourced for Delhi Haat
- There is a wide scope of sustainable tourism.
- The district will coordinate with Namami Gange for organizing Natural Farming Training.
- 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.

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6 APPENDICES

AUXILLLARY DATA

Table 4 Biogas potential from animal waste in the district.

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/m³)	Biogas potential (m³/yr)	m3/day	Dry matter per day
Cattle	Manure	426914	10	1,55,82,36,100	1168677075	233735415	25	9349416.6	25614.84	640371
Buffalo	Manure	251180	15	1,37,52,10,500	1031407875	206281575	25	8251263	22606.2	565155
Sheep	Manure	88722	1	3,23,83,530	24287647.5	4857529.5	25	194301.18	532.332	13308
Goat	Manure	167168	1	6,10,16,320	45762240	9152448	25	366097.92	1003.008	25075

Pig	Manure	18321	2.5	1,67,17,913	12538434.38	2507686.875	25	100307.475	274.815	6870.4
Poultry	manure	8,06,606	0.1	2,94,41,119	22080839.25	4416167.85	25	176646.714	483.9636	12099
Total		**17,58,911**						**18438032.89**		

Table 5 Biogas potential from agricultural waste in the district.

Crop	**residue type**	**Total crop production (tons) (2017-18)**	**Residue production ratio**	**Residue amount (tons)**	**Average collection (70%)**	**Moisture content**	**Residue amount after removing moisture (tons)**	**Biogas potential [m3/(tons of dry matter)]**	**Overall biogas potential (m3)**
Maize	straw	2764	1.5	4146	2902.2	15	2466.87	800	1973496
Wheat	straw	303796	1.5	455694	318985.8	30	223290.06	800	17863204
Sugarcane	bagasse	151998	0.33	50159.34	35111.538	80	7022.3076	750	5266730.7
Total		**458558**							**185872274.7**