

Arth Ganga Project: District Howrah

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EXECUTIVE SUMMARY

Howrah, located in the state of West Bengal is an attraction for its cultural and scenic diversity and markets. It is surrounded by the river Hooghly.

The total geographical area of the district is around 1647 km². The primary sector contributes, on average, only 5.10% to the district GDP with an average annual growth rate from 2007-08 to 2013-14 was negative (-3.83%). Consequently, its share in total GDP decreased from 7.16% in 2007-08 to 3.77% in 2013-14. The share of the secondary sector also decreased from 33.06% in 2007-08 to 28.19% in 2013-14. The tertiary sector grew with a remarkable average annual growth rate of 9.24%, and its share increased from 59.78% in 2007-08 to 68.04% in 2013-14. Overall, the district economy grew with an average annual growth rate of 6.92% during the study period.

The cropping intensity of the district is 202 %. Major crop types are rice, cereals, pulses, jute, along with oilseeds, etc. The livestock consists of cattle (indigenous and crossbred), buffalos (indigenous and crossbred), pigs (indigenous and crossbred), and fisheries. The total number of cattle decreased in the district from 446 thousand in 2003 to 226 thousand in 2019, a net decrease of 49.26%. Total number of the buffaloes decreased from 14 thousand in 2003 to 6 thousand in 2019, a net decrease of 58.24%. The total milk production went up from 117 thousand tons in 2011-12 to 224 thousand tons in 2015-16. Fish Production was 36105 tons in 2011-12 in Howrah which increased to 38420 tons in 2014-15. Howrah represented around 2.45% of the total fish production in West Bengal in 2011-12. However, its share decreased slightly to 2.37% in 2014-15.

The share of cultivable wasteland remained constant at 0.07 % between 2011-12 to 2019-20. The share of barren and uncultivable land remained constant (0%) over the years. The fallow land drastically decreased over the years, from 3.24% in 2011-12 to 1.51% in 2019-20. The net sown area decreased from 59.70% in 2011-12 to 57.82% in 2019-20. The areas under non-agricultural increased from 36.12% to 40.01% in 2019-20. In 2019-20, the nitrogen share decreased to 44.20%, while the phosphorus and potassium shares increased to 32.67% and 23.12%, respectively. Although the overall use of chemical fertilizers decreased from 114.17 kg/ ha GSA in 2013-14 to 101.18 kg/ ha GSA in 2019-20.

Forest cover area as per 2019 forest survey assessment is 180.48 km². The forest cover of the district is 20.71% The district has a total of 303.77 sq. km. under the forests out of which 50 sq. km. is under moderately dense forests and 253.77 sq. km under the open forests. The forest cover was decreased by 0.23 % in 2019. The area under trees and gardens decelerated from 0.87% to 0.58% in 2019-20. There are 411 bird species and twenty threatened/rare species and two introduced species of bird in the district.

Howrah has a plethora of tourist spots which include churches, temples, gardens, parks, ghats, picnic spots etc. Howrah is not only famous for its beautiful and scenic places of attractions but people from different places come here for shopping especially in the wholesale fish markets and the renowned jewellery shops in Howrah. The city also brags of some beautiful temples with marvellous

architecture. Places like temples, Howrah bridge, Anand Niketan Kirtishala Museum, Botanical Garden, are attractions of the city. The district is well connected by railways and road.

There are a total of 2427 natural and man-made wetlands of mainly lakes/ponds, riverine and tanks/ponds type. Electricity has been used by the maximum number of households, as 77.40% of the households are dependent upon electricity followed by Kerosene, used by 20.20% of the households. Solar is used by 1.30% of the households. The type of fuel used by households for cooking are fire-wood 30.70% of the households use it, 31.60% of the households use LPG/PNG. Biogas potential from animal waste and agricultural waste was calculated approximately as 54 lakh m³/year and 3 crores m³/year. No hydropower plant exists, nor the site has been identified in the district.

The active measures should be taken to support and promote sustainable economy and development. Creating awareness and strict implementation of laws along with the use of technologies, training, marketing needs and advisory services and conducting the research could aid in sustainable development. Various measures such as eco-tourism and afforestation should be taken to improve tourism and forest cover of the district and enhance the use of renewable energy especially by creating awareness. Use of micro-irrigation, SRI technology, Vermicomposting, farm mechanization, practice intercropping, adopting greenhouse farming with organic farming, and encouraging farmers for adapting different crop cultivation and various irrigation methods such as Micro-irrigation. Along with focusing on agriculture practices Bee culture, poultry, fisheries, etc. needs encouragement as they have high economic potential. Promoting micro and small units for horticulture products processing. Encouraging high-quality jute fiber production, grow off-season crops, medicinal plants like Brahmi (*Bacopa monnieri*), thankuni (*Centella Asiatica*), kalmegh (*Andrographis paniculata*), pipul (*Piper longum*), etc., Mushroom cultivation, scientific fish culture, reduce the wastage of surplus flower, etc.

1. DISTRICT OVERVIEW

1.1 INTRODUCTION

Howrah district is a district of the West Bengal state in eastern India. Howrah district is one of the highly urbanized areas of West Bengal. Howrah is the second smallest district after Kolkata. The Howrah district lies between 22°48' N and 22°12' N latitudes and between 88°23' E and 87°50' E longitudes. Annual normal rainfall is 1461 millimetre per year. Annual maximum temperature varies between 32-39 °C, whereas minimum temperature varies between 8-10 °C. The district is bounded by the Hooghly River and the North 24 Parganas and South 24 Parganas districts on the east, on the north by the Hooghly district (Arambagh and Shrirampur sub-divisions), and on the south by Midnapore East district (Tamluk sub-division). On the west Howrah district is bordered by the Ghatal sub-division of Midnapore West district, and partly by the Arambagh sub-division of

Hooghly district to the north-west, and the Tamluk sub-division of Midnapore East district to the south-west.

Howrah District is split into the Howrah Sadar subdivision and the Uluberia subdivision. The Howrah Sadar subdivision has 1 municipal corporation with 1 municipality and 5 community development (CD) blocks. The Uluberia subdivision has 1 municipality and 9 community development blocks.

According to the 2011 census Howrah district has a population of 4,850,029. Total area in Howrah District is 1467 km². There are 138 towns and 650 villages in this district.

People living in Howrah depend on multiple skills, total workers are 1,819,845 out of which men are 1,498,170 and women are 321,675. Total 67,686 cultivators are dependent on agriculture farming out of 63,162 are cultivated by men and 4,524 are women. 116,736 people works in agricultural land as labor, men are 109,125 and 7,611 are women.

Topographically there are three land situations namely up, medium and low and different farming systems are adopted accordingly. Frequent inundation of low lying areas result in stagnation of water for certain times of the year affecting some parts of the district. The soils of this sub region have high nutrient content and mineral resource with a high potential for a large variety of agricultural and horticultural crops. Paddy, jute and potato are the major crops while pulses like gram, lentil, etc. , oilseeds like muturd, sesame, groundnut etc. and various kinds of vegetables rae grown under varying physiographic situations in the district. Water chestnut, madur kathi, water lilly and lotus are also cultivated in some low lying marshy areas of the district. Besides different agricultural enterprises there is ample presence of different industrial enterprises along with some homestead small scale industries scattered over different parts of the district.

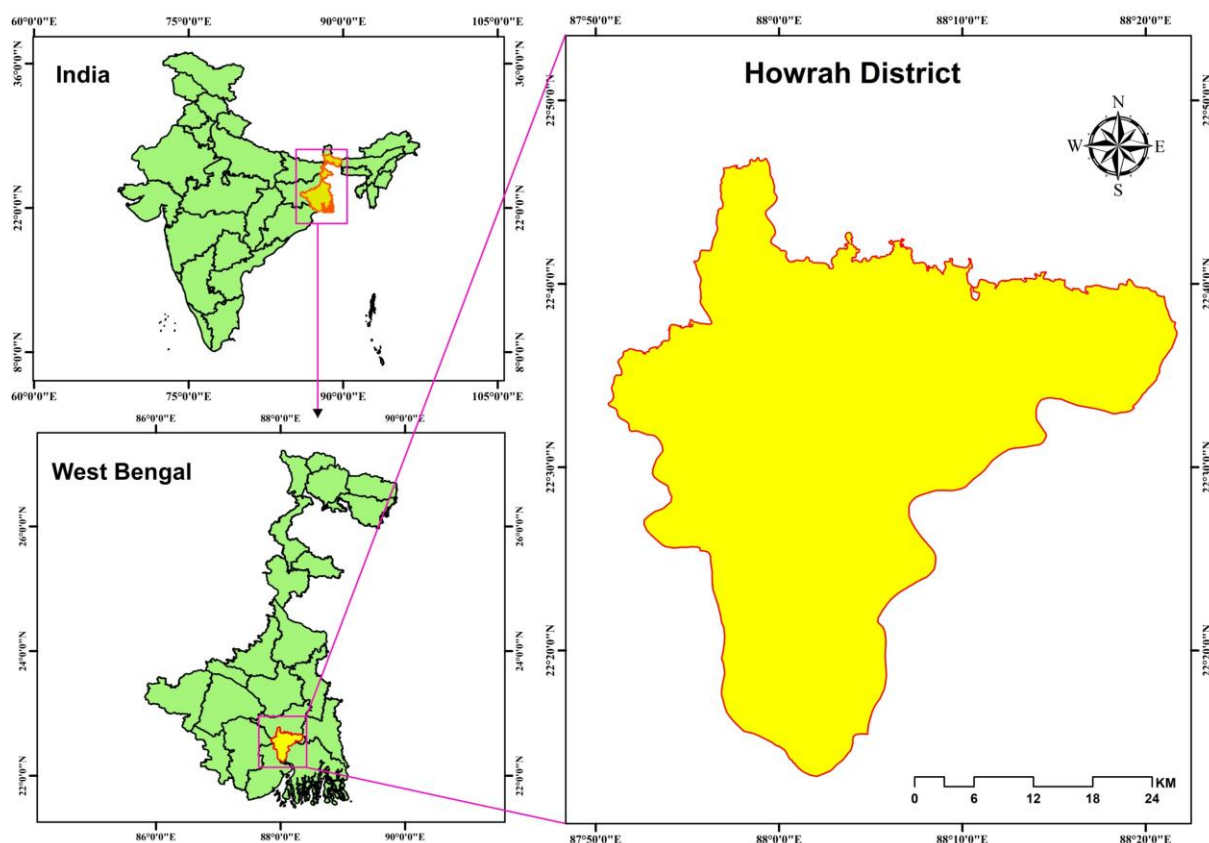


Figure 1 Map of the district

1.2 DEMOGRAPHIC PROFILE OF HOWRAH

The district lies at a latitude between 22°48' N and 22°12' N and at a longitude between 88°23' E and 87°50' E longitude. Howrah district is surrounded by Hooghly district's Arambagh and Shrirampur subdivision in the North, Midnapore West district's subdivision Ghatal in the West, Midnapore East district's Tamluk sub-division in the South, in the East it is neighbouring to the Hooghly River and the North 24 Parganas and South 24 Parganas districts, in the North-West by Hooghly district's subdivision Arambagh, and in the South-West by Midnapore East district's Tamluk subdivision. There are two sub-divisions of the district, namely; Howrah Sadar and Uluberia. There are aggregate of 14 blocks in the district, namely; Bally-Jagacha, Domjur, Panchla, Sankrail, Jagatballavpur, Uluberia-I, Uluberia-II, Amta-I, Amta-II, Bagnan-I, Bagnan-II, Shyampur-I, Shyampur-II, and Udaynarayanpur. There are 650 villages in the district. The important rivers of Howrah are Bhagirathi, the Saraswati, the Damodar, and its two branches the Kausiki and Rupnarayan.

The total area of the district is 1647 sq.km and the area of forest is insignificant in the district. The district has an aggregate population of 4850029 (Census, 2011). The district has a sex ratio of 939 females per 1000 males, and the literacy rate in the district is 83.85%. Out of the total population, 51.56% of the population is male, meaning that 2500819 are males and the rest 48.44% of the population is female, meaning that 2349210 are females. Moreover, 36.61% of the population resides in the rural area, which is 1775885, and the rest 63.38% of the population resides in the urban area, which is 3074144.

The economy of the district is dependent on agriculture and crops like rice, wheat, barley, maize, tur, jute, linseed, rapeseed, sugarcane, potato, tobacco, ginger etc. The major exportable items in the state are engineering and chemical-based products.

1.3 ECONOMIC PROFILE OF HOWRAH

The primary sector contributes, on average, only 5.10% to the district GDP. Moreover, this sector's average annual growth rate from 2007-08 to 2013-14 was negative (-3.83%). Consequently, its share in total GDP decreased from 7.16% in 2007-08 to 3.77% in 2013-14. The share of the secondary sector also decreased from 33.06% in 2007-08 to 28.19% in 2013-14. The sector grew by a low rate of 4.26% per annum. The tertiary sector grew with a remarkable average annual growth rate of 9.24%, and its share increased from 59.78% in 2007-08 to 68.04% in 2013-14. Overall, the district economy grew with an average annual growth rate of 6.92% during the study period. The growth in the primary sector is negative, and that of the secondary sector is very low. Steps need to be taken to increase the productivity of the primary sector so that it can grow at a higher rate.

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

Year	Sector-wise GDDP				Annual Growth Rates			
	Primary Sector	Secondary Sector	Tertiary Sector	Total GDDP	Primary Sector	Secondary Sector	Tertiary Sector	Total GDDP
2007-08	10773	49733	89915	150421	-	-	-	-
	(7.16)	(33.06)	(59.78)	(100)				
2008 -09	10152	48998	98246	157396	-5.76	-1.48	9.27	4.64
	(6.45)	(31.13)	(62.42)	(100)				
2009-10	9369	54215	108078	171662	-7.71	10.65	10.01	9.06
	(5.46)	(31.58)	(62.96)	(100)				
2010 -11	8301	58108	116934	183343	-11.40	7.18	8.19	6.80
	(4.53)	(31.69)	(63.78)	(100)				
2011-12	8221	55052	126409	189682	-0.96	-5.26	8.10	3.46
	(4.33)	(29.02)	(66.64)	(100)				
	8282	57661	139552	205495	0.74	4.74	10.40	8.34

2012 -13	(4.03)	(28.06)	(67.91)	(100)				
2013-14	8459	63280	152745	224484	2.14	9.74	9.45	9.24
	(3.77)	(28.19)	(68.04)	(100)				
Average Growth Rate					-3.83	4.26	9.24	6.92
Source: http://data.icrisat.org/district-level-data/								
Note: Figures in Parenthesis are percentage share of total GDDP								

2. Quantitative Data Analysis

2.1 Agriculture and Allied Activities

2.3.1 Trend in Land Use Pattern

The total declared area of the district is 1387.20 sq. km². There is no forest cover in the district and the share of barren and uncultivable land is reported to be 0% of the total declared area. The share of cultivable wasteland has remained constant (0.07%) over the years. The fallow land has drastically decreased over the years, from 3.24% in 2011-12 to 1.51% in 2019-20. Moreover, the net sown area (NSA) also decreased from 59.70% in 2011-12 to 57.82% in 2019-20. The non-agricultural use area increased from 36.12% to 40.01% in 2019-20 (Table 2). The area under trees and gardens decelerated from 0.87% to 0.58% in 2019-20, which should be increased to achieve sustainable development goals. Overall, the land use pattern shows that the area under fallow land and NSA decreased over the years, while the land usage for non-agricultural purposes increased.

Table 2: Trends in land use pattern in Howrah (as % of the total reported area)

Year	TOTAL REPORTED AREA (in 1000 Ha)	CULTIVABLE WASTELAND	TOTAL FALLOW	LAND OTHER THAN AGRICULTURE	AREA UNDER TREES AND GARDENS	NET SOWN AREA
1	2	3	4	5	6	7
2011	138.7	0.07	3.24	36.12	0.87	59.70
2012	138.7	0.07	3.03	36.48	0.72	59.70
2013	138.7	0.00	2.60	36.63	0.72	59.99
2014	138.7	0.07	2.60	36.55	0.94	59.84
2015	138.7	0.07	2.60	36.55	1.15	59.70
2016	138.7	0.07	2.60	36.86	1.01	59.44
2017	138.7	0.07	2.02	37.64	0.94	59.26
2018	138.7	0.07	1.95	39.22	0.79	57.97

2019	138.7	0.07	1.51	40.01	0.58	57.82
Source: http://wbpspm.gov.in/ and http://data.icrisat.org/district-level-data/						

2.3.2 Trends in Operational Land Holdings

In Howrah district, the total number of operational farms decreased from 225 thousand in 2010-11 to 219 thousand in 2015-16, a net decrease of 2.67%. While in the state, their numbers increased from 7123 thousand in 2010-11 to 7242 thousand in 2015-16, a net increase of 1.67%. Most land positions in the district are marginal and small. These two size categories represented 99.71% in the district in 2015-16, while the corresponding proportion in the state was 96.22% (Table 3). The two agricultural censuses of 2010-11 and 2015-16 report that there is a decline in the percentage share across the small, semi-medium, and medium land holding, while the share of the marginal land holdings increased.

	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.)
Howrah	2010-11	92.93	6.7	0.33	0.04	0.01	225
	2015-16	93.28	6.43	0.27	0.01	0	219
							[-2.67]
West Bengal	2010-11	82.16	13.76	3.75	0.32	0.01	7123
	2015-16	82.81	13.41	3.53	0.24	0.01	7242
							[1.67]
Source: Compiled from https://agcensus.nic.in/ . Figures in [] are percentage increase/decrease in 2015-16 over 2010-11.							

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

2.3.3.1 The Trend in Cropping Patterns

Rice dominates the agriculture of the district. Table 4 shows the area devoted to various crops over the last seven years. In 2019-20, Rice made up the highest share of GCA (64.48%). However, the area under the total cereals decreased from 70.06% in 2013-14 to 64.67% in 2019-20. The main pulses produced are Moong and Khesari. The total pulses acreage went up from 1.22% in 2013-14 to 2.46% in 2019-20. The total food grains acreage decreased from 71.28% in 2013-14 to 67.13% in 2019-20, majorly due to a decrease in the area under Rice. Moreover, the food grains cover a majority (average, 69.97%) of the GCA. Groundnut, Mustard, and Sesamum are the major oilseeds crops, and the total oilseed acreage increased from 5.34% in 2013-14 to 7.18% in 2019-20. Area under Jute also increased from 1.22% in 2013-14 to 2.64% in 2019-20. In general, there was no significant change in the cultivation pattern in the district during the study period. The average cropping intensity in the district is 199.16, which indicates that farmers grow two crops in a agricultural year.

Table 4: Trends in cropping pattern (as % GSA) and cropping intensity

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	69.93	70.30	66.43	69.97	68.11	67.58	64.48
Other Cereals	0.13	0.12	0.12	0.18	0.19	0.12	0.19
Total Cereals	70.06	70.42	66.55	70.15	68.29	67.70	64.67
Green gram (Moong)	0.77	0.54	0.77	0.73	0.99	0.97	1.01
Khesari (Lathyrus)	0.45	0.54	0.59	0.60	1.05	1.27	1.26
Other Pulses	0.00	0.06	0.00	0.00	0.12	0.06	0.19
Total Pulses	1.22	1.14	1.35	1.33	2.16	2.30	2.46
Total Food Grains	71.28	71.56	67.90	71.48	70.45	70.00	67.13
Groundnuts	3.48	3.65	5.65	2.96	2.78	2.55	3.09
Mustard	0.77	0.72	0.77	0.85	1.17	1.15	1.70
Sesamum (Til)	0.97	1.38	0.88	1.57	1.73	1.45	2.39
Other Oilseeds	0.13	0.12	0.18	0.06	0.12	0.00	0.00
Total Oilseeds	5.34	5.87	7.48	5.44	5.80	5.15	7.18
Jute	1.22	1.32	2.94	2.18	2.41	2.55	2.64
Net Sown Area	53.57	49.70	48.76	49.81	50.71	48.73	50.50
Gross Sown Area (in 1000 Ha)	155.3	167.0	169.8	165.5	162.1	165.0	158.8
Cropping Intensity	186.66	201.20	205.07	200.76	197.20	205.22	198.00

Source: <http://wbpspm.gov.in/> and <http://data.icrisat.org/district-level-data/>

2.3.3.2 Trends in per hectare yield of principal crops

Table 5 shows that the yield per hectare of most crops varies from year to year. Rice is the main crop, and its per hectare yield of 26.73 qtls in 2019-20 was low. However, the per hectare yield of total cereals increased from 25.31 qtls in 2013-14 to 26.70 qtls in 2019-20. On the other hand, the per hectare yield of total pulses decreased from 10.53 qtls in 2013-14 to 3.08 qtls in 2019-20. The yield of jute went up from 38.65 qtls in 2013-14 to 39.47 qtls in 2019-20. The yield of total oilseeds decelerated from 22.53 qtls in 2013-14 to 6.67 qtls in 2019-20. The yield of total food grains show a marginal increase from 25.06 qtls in 2013-14 to 25.83 qtls in 2019-20. In summary, all crop yields show yearly fluctuations, with a significant fall observed in the yield of pulses and oilseeds in the later years of the study. The lack of stability in yields makes farmers' income riskier and more unstable, requiring a solid insurance protection measure.

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

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	25.33	27.29	19.70	25.85	27.24	30.06	26.73
Total Cereals	25.31	27.28	19.69	25.83	27.22	30.04	26.70
Green gram (Moong)	7.50	11.11	6.92	7.50	8.75	7.50	0.63
Khesari (Lathyrus)	15.71	8.89	10.00	11.00	11.76	6.19	4.50
Total Pulses	10.53	9.47	8.26	9.09	10.57	7.11	3.08

Total Food Grains	25.06	27.00	19.46	25.52	26.71	29.29	25.83
Groundnuts	29.63	21.64	22.81	22.24	22.67	26.90	10.20
Mustard	11.67	9.17	6.92	5.71	9.47	9.47	8.52
Sesamum (Til)	7.33	10.00	8.67	15.00	11.79	11.67	0.79
Total Oilseeds	22.53	17.14	19.13	17.56	16.38	18.71	6.67
Jute	38.65	32.24	41.33	47.00	6.00	150.99	39.47

Source: <http://wbpspm.gov.in/> and <http://data.icrisat.org/district-level-data/>

2.3.3.3 Trends in Production of Principal Crops

Table 6 shows the trends in the production of main crops over the years. Rice dominates the production. In 2019-20, Rice (273.7 thousand tonnes) formed a major part of the total cereal production (274.2 thousand tonnes). However, there is a slight decrease in the production of total cereals from 275.4 thousand tons in 2013-14 to 274.2 thousand tons in 2019-20. Among pulses, Moong and Khesari occupied the highest production, with their productions being 0.1 thousand tons and 0.9 thousand tons, respectively, in 2019-20. Although these pulses show variation in production across years, they still represent around 83.33% of the total pulse production. Groundnuts, Mustard, and Sesamum productions were 5 thousand tons, 2.3 thousand tons, and 0.3 thousand tons, respectively, representing around 100% of the total oilseed production in 2019-20. In fiber crops, Jute has the highest production, moreover its production increased from 7.3 thousand tons in 2013-14 to 16.6 thousand tons in 2019-20. Looking at the annual production data of various crops, we find that the production of total cereals, pulses, and oilseeds declined, partly due to changes in weather conditions and partly due to market conditions. Proper insurance arrangements are needed to get assured income, take more risks, and diversify production.

Crop/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Rice	275.1	320.4	222.2	299.3	300.7	335.2	273.7
Other Cereals	0.3	0.4	0.3	0.6	0.6	0.4	0.5
Total Cereals	275.4	320.8	222.5	299.9	301.3	335.6	274.2
Green gram (Moong)	0.9	1	0.9	0.9	1.4	1.2	0.1
Khesari (Lathyrus)	1.1	0.8	1	1.1	2	1.3	0.9
Other Pulses	0	0	0	0	0.3	0.2	0.2
Total Pulses	2	1.8	1.9	2	3.7	2.7	1.2
Total Food Grains	277.4	322.6	224.4	301.9	305	338.3	275.4
Groundnuts	16	13.2	21.9	10.9	10.2	11.3	5
Mustard	1.4	1.1	0.9	0.8	1.8	1.8	2.3
Sesamum (Til)	1.1	2.3	1.3	3.9	3.3	2.8	0.3
Other Oilseeds	0.2	0.2	0.2	0.2	0.1	0	0
Total Oilseeds	18.7	16.8	24.3	15.8	15.4	15.9	7.6
Jute	7.3	7.1	20.7	16.9	2.3	63.4	16.6

Source: <http://wbpspm.gov.in/> and <http://data.icrisat.org/district-level-data/>

2.3.3.4 Variability assessment in the area, production, and yield

To understand the variability across the years (Table 7), we calculated the mean, standard deviation (SD), and coefficient of variation (COV) in the area, production, and yield of the main crops. Among different crops, the lowest variability in the area is observed in Rice (4.45%), followed by Moong (20.10%), and the highest in Khesari (42.75%). The variability in the area under Jute is 31.54%. The variability in the area under total pulses (32.53%) is much higher than in the area under total cereals (4.42%). Since Rice dominates the production, the variability in the area under total food grains is, therefore, relatively low (3.88%).

Crop	Area (1000 Ha)			Production (1000 Ha)			Yield (Qtl/Ha)		
	Average	SD	COV	Average	SD	COV	Average	SD	COV
Rice	111.27	4.95	4.45	289.51	37.08	12.81	26.03	3.17	12.19
Total Cereals	111.51	4.93	4.42	289.96	37.13	12.81	26.01	3.17	12.19
Green gram (Moong)	1.34	0.27	20.10	0.91	0.41	44.40	7.13	3.19	44.81
Khesari (Lathyrus)	1.34	0.57	42.75	1.17	0.40	34.04	9.72	3.70	38.08
Total Pulses	2.79	0.91	32.53	2.19	0.80	36.55	8.30	2.61	31.43
Total Food Grains	114.30	4.43	3.88	292.14	37.43	12.81	25.55	3.02	11.83
Groundnuts	5.66	1.84	32.61	12.64	5.27	41.67	22.30	6.08	27.28
Mustard	1.66	0.55	33.21	1.44	0.55	38.14	8.71	1.93	22.16
Sesamum (Til)	2.41	0.79	32.91	2.14	1.30	60.48	9.32	4.50	48.27
Total Oilseeds	9.87	1.62	16.37	16.36	4.95	30.25	16.87	4.92	29.18
Jute	3.57	1.13	31.54	19.19	20.58	107.21	50.81	46.13	90.79

Source: <http://wbpspm.gov.in/> and <http://data.icrisat.org/district-level-data/>

The variability of production depends on the variability of the cultivated area and the variability of the yield. Therefore, the variability in the production of different crops is higher than in the cultivated area of all crops. The highest variability in production is observed in Sesamum (60.48%), followed by Moong (44.40%) and Groundnuts (41.67%). The variability in Jute production is 107.21%, that is significantly high. The variability in the production of total oilseeds is 30.25%. Variability is lowest in Rice (12.81%), followed by Khesari (34.04%), and Mustard (38.14%). Improvement in crop insurance conditions and better market accessibility can lower the variability.

In the case of yield, the highest variability is estimated in Sesamum (48.27%), followed by Moong (44.81%), and Khesari (38.08%). The variability in yield of Jute is 90.79%. Yield variability in total pulses (31.43%) is much higher than in total cereals (12.19%). Several factors, such as climate change, market prices, rainfall patterns, etc., influence the variability in agricultural production.

2.3.4 Consumption of Chemical Fertilizers

Table 8 shows the trends in the use of chemical fertilizers in agriculture. The recommended nitrogen to phosphorus and potassium ratio is 4:2:1, which is not maintained in the district. For

example, in 2013-14, nitrogen represented 59.41% of the total fertilizers used, while the proportions of phosphorus and potassium were 19.57% and 21.03%, respectively. In 2019-20, however, the nitrogen share decreased to 44.20%, while the phosphorus and potassium shares increased to 32.67% and 23.12%, respectively. The table also shows that fertilizer consumption varies yearly, which can be due to several factors such as rainfall patterns, cultivation patterns, etc. Although the overall use of chemical fertilizers decreased from 114.17 kg/ ha GSA in 2013-14 to 101.18 kg/ ha GSA in 2019-20, still the authorities should take steps to promote sustainable agricultural practices to improve soils and water resources. There is a need to incentivize the farmers to use organic and bio fertilizers.

Table 8: Trends in Use of Chemical Fertilizers in Agriculture (Kgs/per ha GSA)

Fertilizer/Year	2013-14	2014-15	2015-16	2016-17	2017-18	2018-19	2019-20
Nitrogen	67.82	68.56	71.28	62.08	62.11	49.84	44.72
Phosphorous	22.34	43.63	40.65	37.45	36.85	40.59	33.06
Potassium	24.01	33.89	26.12	24.37	30.78	27.87	23.39
Total	114.17	146.08	138.06	123.91	129.74	118.30	101.18
GSA (1000 Ha)	155.3	167	169.8	165.5	162.1	165	158.8

Source: <http://wbpspm.gov.in/> and <http://data.icrisat.org/district-level-data/>

2.3.7 Trends in Livestock Sector

The total number of cattle decreased in the district from 446 thousand in 2003 to 226 thousand in 2019, a net decrease of 49.26%. The number of adult male cattle decreased from 53 thousand to 4 thousand in the same period. The decrease in total cattle has been largely driven due to a decrease in adult female cattle from 177 thousand to 112 thousand and young cattle from 217 thousand to 111 thousand in the same period. Cattles represent around 97.64% of the total large ruminant. Moreover, cattle's share in large ruminants increased from 97.02% in 2003 to 97.53% in 2019. Similarly, total buffaloes decreased from 14 thousand in 2003 to 6 thousand in 2019, a net decrease of 58.24%. This decrease is due to a decrease in adult female buffaloes from 9 thousand in 2003 to 5 thousand in 2019, and young buffaloes from 4.02 thousand in 2003 to 0.94 thousand in 2019. Buffaloes represent around 2.35% of the total large ruminants. Total sheep decreased from 1.93 thousand in 2003 to 0.24 thousand in 2019, a net decrease of 87.56%. Total goats also decreased from 386 thousand in 2003 to 157 thousand in 2019, a net decrease of 59.36%. Total pigs have decreased from 4.9 thousand in 2003 to 0.36 thousand in 2019, a net decrease of 92.65%. The total livestock population decreased in the district from 853.24 thousand in 2003 to 389.73 thousand in 2019, a net decrease of 54.32%.

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

Table 9: Trends in Livestock population (in 1000 numbers) in Howrah

Category	2003	2007	2012	2019
CATTLE TOTAL	446.26	339.38	441.54	226.39

CATTLE ADULT MALE	52.82	8.04	4.64	3.78
CATTLE ADULT FEMALE	176.81	161.56	247.9	111.67
CATTLE YOUNG TOTAL	216.64	169.78	188.99	110.94
CATTLE SHARE IN LARGE RUMINANT (Percent)	97.02	96.97	99.06	97.53
BUFFALO TOTAL	13.7	10.61	4.19	5.72
BUFFALO ADULT MALE	0.31	0.03	0.09	0.08
BUFFALO ADULT FEMALE	9.37	8.2	3.25	4.71
BUFFALO YOUNG TOTAL	4.02	2.39	0.85	0.94
BUFFALO SHARE IN LARGE RUMINANT (Percent)	2.98	3.03	0.94	2.47
SHEEP TOTAL	1.93	0.59	0.29	0.24
SHEEP SHARE IN SMALL RUMINANT (Percent)	0.5	0.31	0.2	0.15
GOATS TOTAL	386.38	187.85	146.39	157.02
GOATS SHARE IN SMALL RUMINANT (Percent)	99.5	99.69	99.8	99.85
PIGS TOTAL	4.9	0.98	0.65	0.36
LIVESTOCK TOTAL	853.24	539.43	593.19	389.73
Source: http://wbpspm.gov.in/ and http://data.icrisat.org/district-level-data/				

2.3.8 Trends in Milk Production

Table 10 shows the trends in Milk Production in Howrah over the years. Cow milk has the largest share in milk production. Moreover, cow milk production has significantly increased by 107.61% from 2011-12 to 2015-16. Buffalo milk production decreased from 12 thousand tons in 2011-12 to 6 thousand tons in 2015-16. However, the total milk production went up from 117 thousand tons in 2011-12 to 224 thousand tons in 2015-16, majorly due to an increase in cow milk production. Milk production can further be increased by providing incentives for dairy farming to improve the cattle and buffaloes' milking capacity.

Source/Year	2011	2012	2013	2014	2015
TOTAL COW MILK PRODUCTION	105	106	105	216	218
TOTAL BUFFALO MILK PRODUCTION	12	12	12	7	6
TOTAL MILK PRODUCTION	117	118	117	223	224
Source: http://wbpspm.gov.in/ and http://data.icrisat.org/district-level-data/					

2.3.8 Trends in Fishery Production

Table 11 shows the trends in Fish Production in Howrah as compared to the total fish production in West Bengal. Fish Production was 36105 tons in 2011-12 in Howrah which increased to 38420 tons in 2014-15. Howrah represented around 2.45% of the total fish production in West Bengal in 2011-12. However, its share decreased slightly to 2.37% in 2014-15.

District/Year	2011-12	2012-13	2013-14	2014-15

Howrah	36105	42341	33822	38420
West Bengal	1472069	1488811	1580647	1617319
Source: http://wbpspm.gov.in/ and http://data.icrisat.org/district-level-data/				

2.2 FORESTRY

According to the Forest Survey 2021, the total Forest Cover in the State is 16831.87 sq km which is 18.96 % of the State's geographical area. The state has 3036.51 sq. km. under very dense forests, 4208.37 sq. km. under moderately dense forests and 9586.99 sq. km. under open forests. In recent years, massive plantation programs have been taken up in the State to increase the forest & tree cover.

According to the 2021 Forest survey, forests cover of the district is 20.71% out of the total geographical area which is 1467 sq. km. With respect to 2019 forest assessment there has been no change in the forest area of the district.

The district has a total of 303.77 sq. km. under the forests out of which 50 sq. km. is under moderately dense forests and 253.77 sq. km under the open forests. The district does not has any land area under very dense forests and scrubs as depicted in Fig. 1.

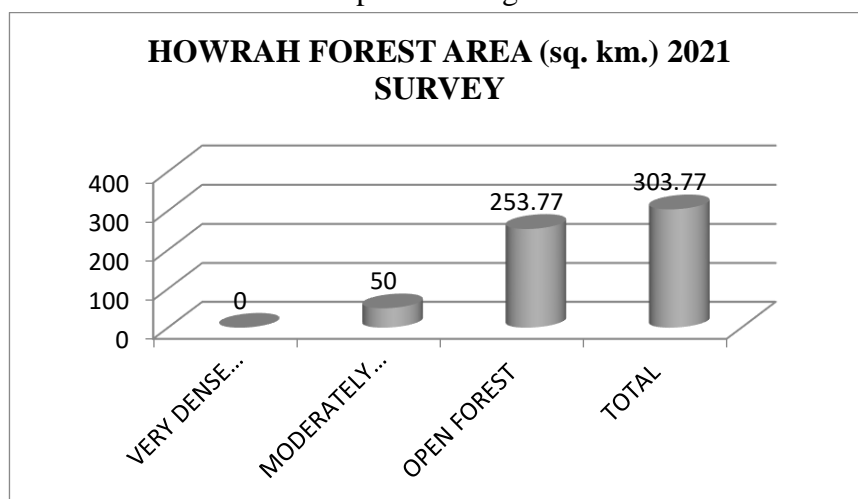


Fig. 1

The district has 210 ha of cultivable wasteland, 240 ha under as other fallows and 4600 ha under current fallow.

2.2.1. Biodiversity

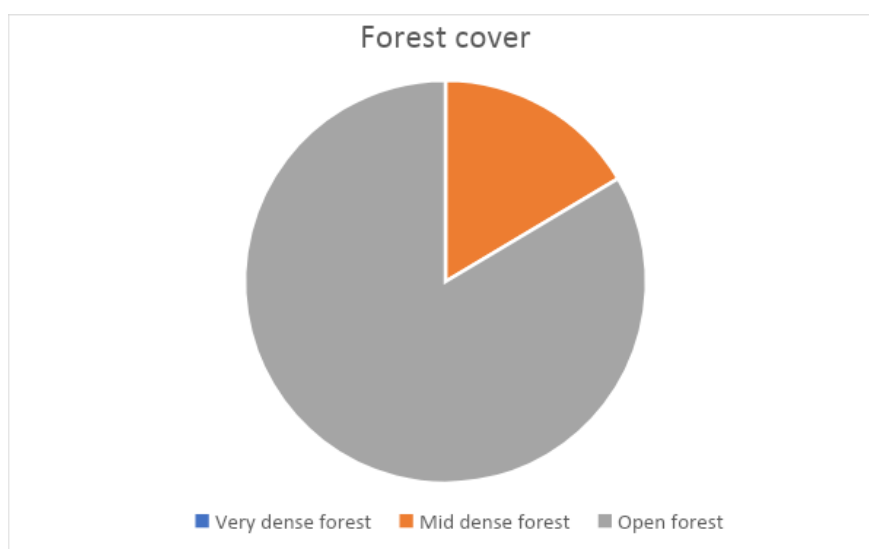
The district's biodiversity data includes various crop production, livestock population, bird species, and forest cover. The crop production trend shows an increase in crop production. Forest data shows that forest cover was decreased by 0.23 % in 2019. There are 411 bird species and twenty threatened/rare species and two introduced species of bird in the district.

Table 1 Bird species recorded in the district.

Number of species	411
Number of rare/accidental species	20

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
1467	0	50	253.77	303.77	20.71	-0.23	0



2.3 TOURISM

WEST BENGAL: YEAR WISE TOURIST ARRIVALS (2001 TO 2020)

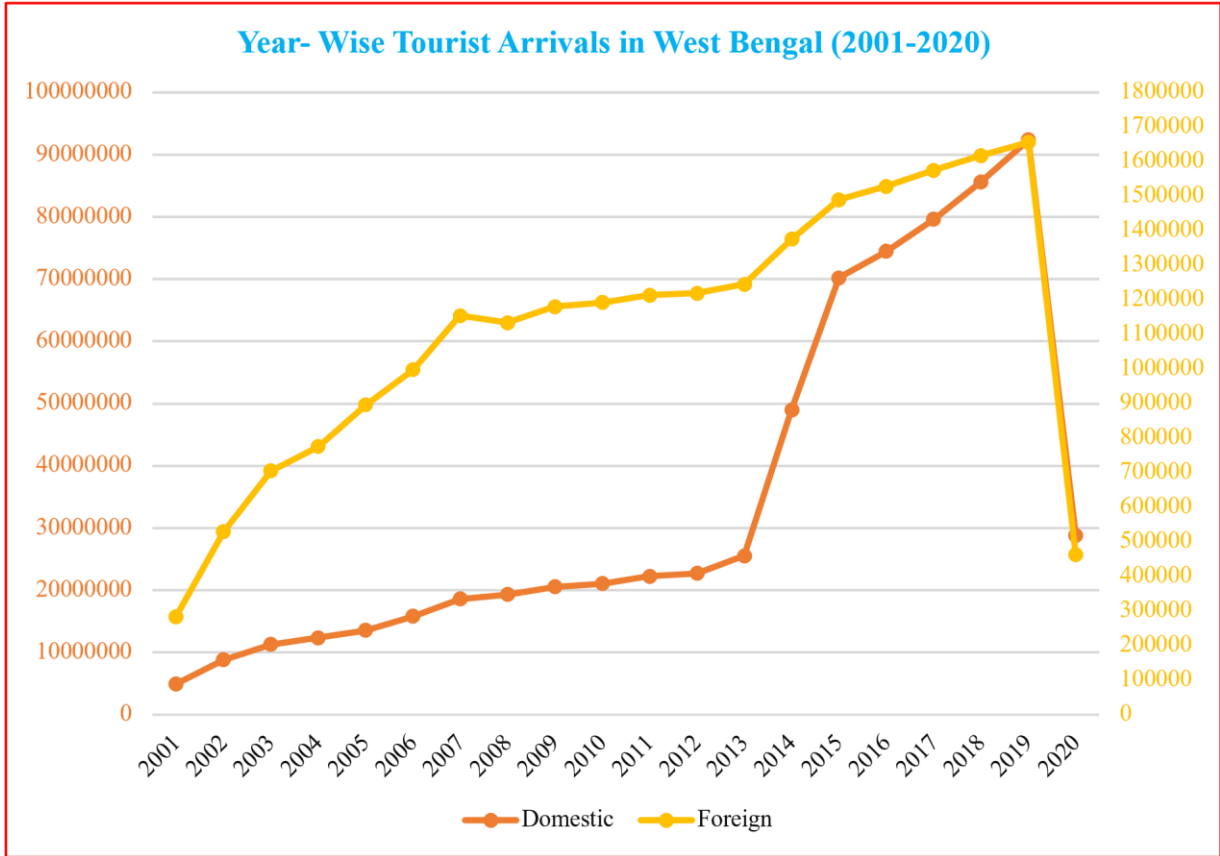
o Table: 1 West Bengal Year Wise Tourists Arrivals (2001 to 2020)

Year	Domestic	Growth	Foreign	Growth	Total	Overall Growth
2001	4943097	0.00%	284092	0.00%	5227189	0.00%
2002	8844232	78.92%	529366	86.34%	9373598	44.23%

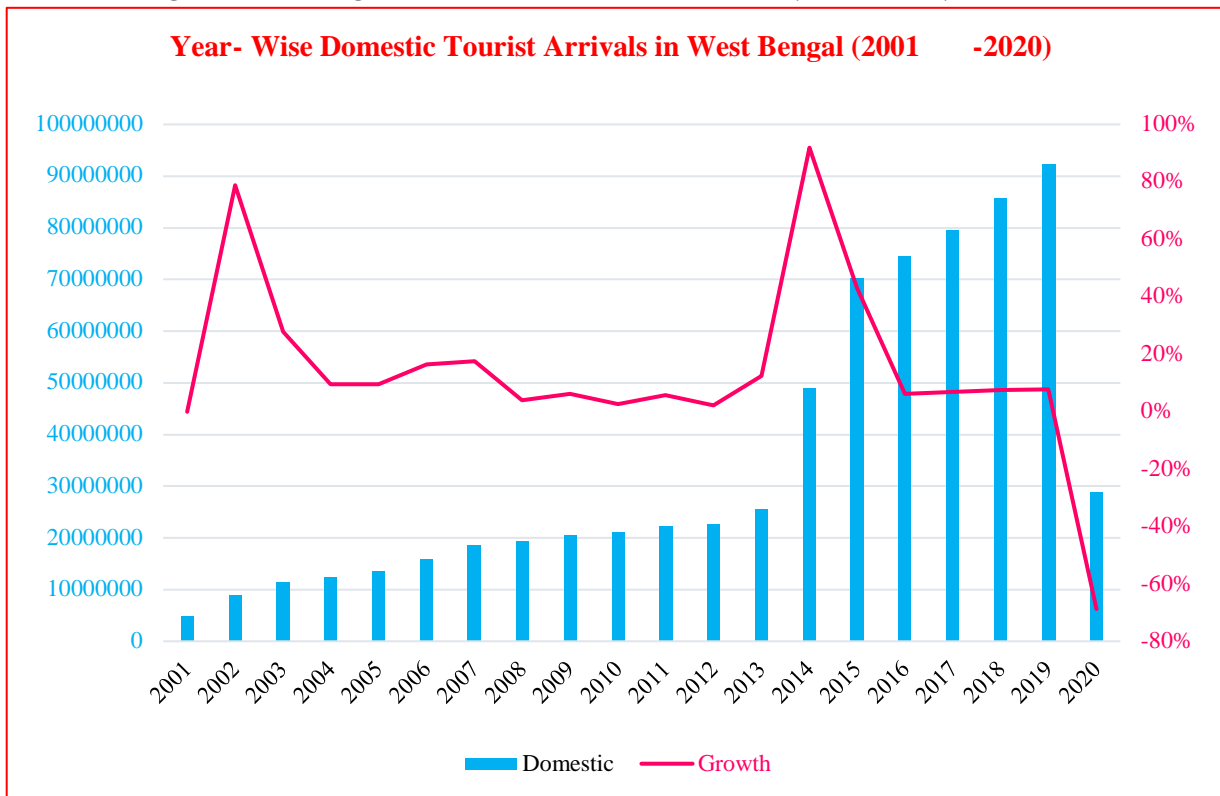
2003	11300763	27.78%	705457	33.26%	12006220	21.93%
2004	12380389	9.55%	775694	9.96%	13156083	8.74%
2005	13566911	9.58%	895639	15.46%	14462550	9.03%
2006	15808371	16.52%	998029	11.43%	16806400	13.95%
2007	18580669	17.54%	1154770	15.71%	19735439	14.84%
2008	19314440	3.95%	1133671	-1.83%	20448111	3.49%
2009	20528534	6.29%	1180418	4.12%	21708952	5.81%
2010	21072324	2.65%	1192187	1.00%	22264511	2.50%
2011	22256968	5.62%	1213270	1.77%	23470238	5.14%
2012	22730205	2.13%	1219610	0.52%	23949815	2.00%
2013	25547300	12.39%	1245230	2.10%	26792530	10.61%
2014	49029590	91.92%	1375740	10.48%	50405330	46.85%
2015	70193450	43.17%	1489500	8.27%	71682950	29.68%
2016	74460250	6.08%	1528700	2.63%	75988950	5.67%
2017	79630345	6.94%	1574915	3.02%	81205260	6.42%
2018	85657365	7.57%	1617105	2.68%	87274470	6.95%
2019	92366025	7.83%	1656145	2.41%	94022170	7.18%
2020	28841732	-68.77%	463285	-72.03%	29305017	-220.84%

Source: Data Compiled from Tourism Report of India

Figure: 1 West Bengal: Year Wise Tourists Arrivals (2001 to 2020)



o Figure: 2 West Bengal: Year Wise Domestic Tourists Arrivals (2001 to 2020)



o Figure: 3 West Bengal: Year Wise Foreign Tourists Arrivals (2001 to 2020)

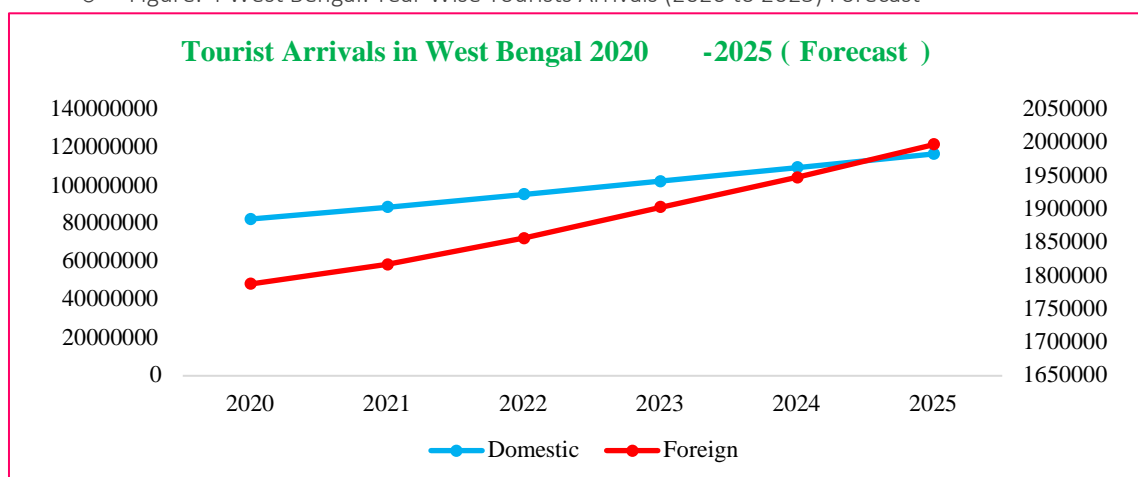


o Table: 2 West Bengal: Year Wise Tourists Arrivals (2020 to 2025) Forecast

Year	Domestic	Foreign	Total
2020	82494891	1788061	84282952
2021	88746279	1817462	90563741
2022	95432278	1856789	97289067
2023	102425745	1903421	104329166
2024	109548115	1948298	111496413
2025	116735901	1997568	118733469

Source: Data Compiled from Tourism Report of India

o Figure: 4 West Bengal: Year Wise Tourists Arrivals (2020 to 2025) Forecast



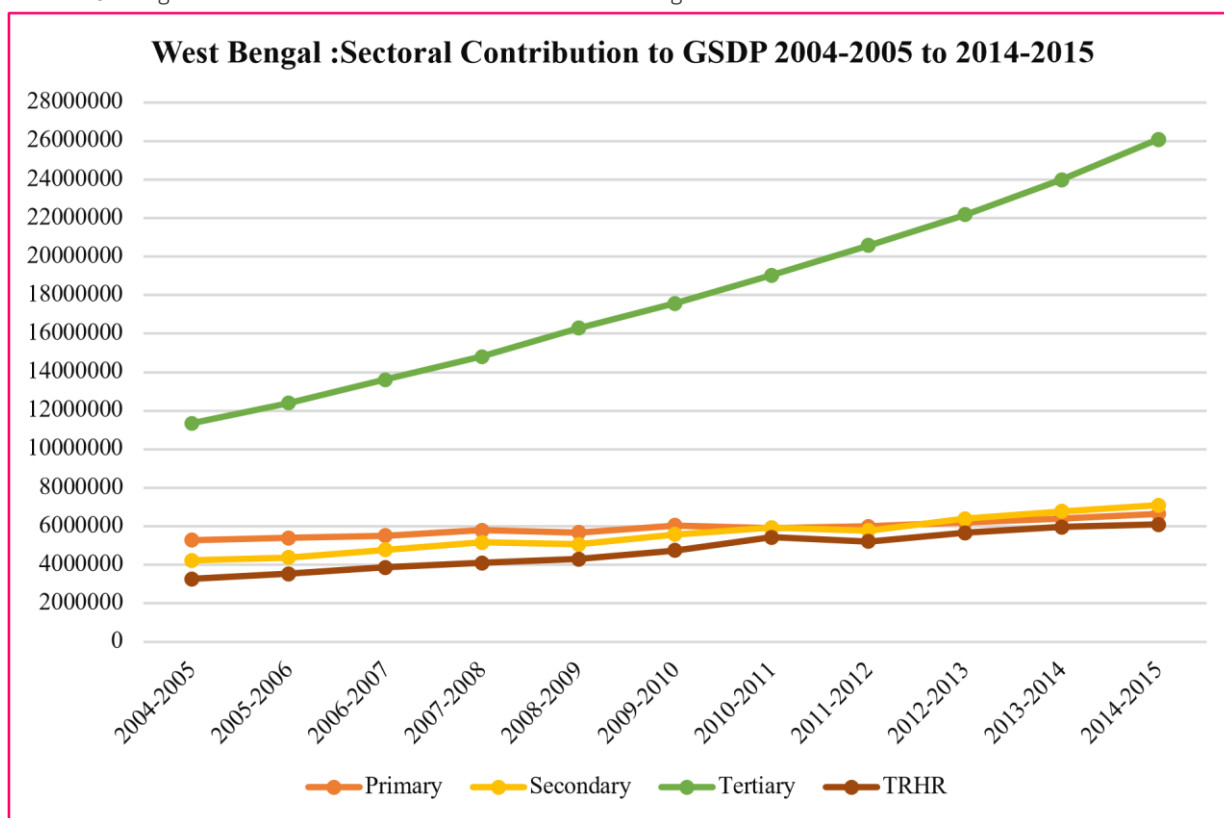
WEST BENGAL: SECTORAL CONTRIBUTION TO GSDP (2004-2005 TO 2014-2015)

o Table: 3 Sectoral Contribution to GSDP West Bengal 2004-2005 to 2014-2015

Year	Primary	Secondary	Tertiary	TRHR as % of Tertiary
2004-2005	5278473 (25.30%)	4234524 (20.29%)	11352639 (54.41%)	3273915 (28.84%)
2005-2006	5390443 (24.30%)	4382665 (19.76%)	12405838 (55.94%)	3532336 (28.47%)
2006-2007	5511599 (23.05%)	4776433 (19.98%)	13619680 (56.97%)	3871373 (28.42%)
2007-2008	5796117 (22.50%)	5163277 (20.04%)	14803824 (57.46%)	4091828 (27.64%)
2008-2009	5673653 (20.99%)	5060784 (18.73%)	16290389 (60.28%)	4295703 (26.37%)
2009-2010	6048283 (20.72%)	5577042 (19.10%)	17570171 (60.18%)	4751684 (27.04%)
2010-2011	5913982 (19.15%)	5930348 (19.20%)	19039375 (61.65%)	5429283 (28.52%)
2011-2012	5993306 (18.53%)	5773705 (17.85%)	20574687 (63.62%)	5429283 (25.30%)
2012-2013	6205056 (17.84%)	6394459 (18.39%)	2217868 (63.77%)	5205976 (25.52%)
2013-2014	6404277 (17.23%)	6776865 (18.24%)	23995362 (64.54%)	5658897 (24.82%)
2014-2015	6645064 (16.68%)	7099285 (17.82%)	26094302 (65.50%)	6102731 (23.39%)

Source: Data Compiled from Department of Planning & Statistics, Govt. of West Bengal

o Figure: 5 Sectoral Contribution to GSDP West Bengal 2004-2005 to 2014-2015



HOWRAH: SECTORAL CONTRIBUTION TO NDDP (2004-2005 TO 2010-2011)

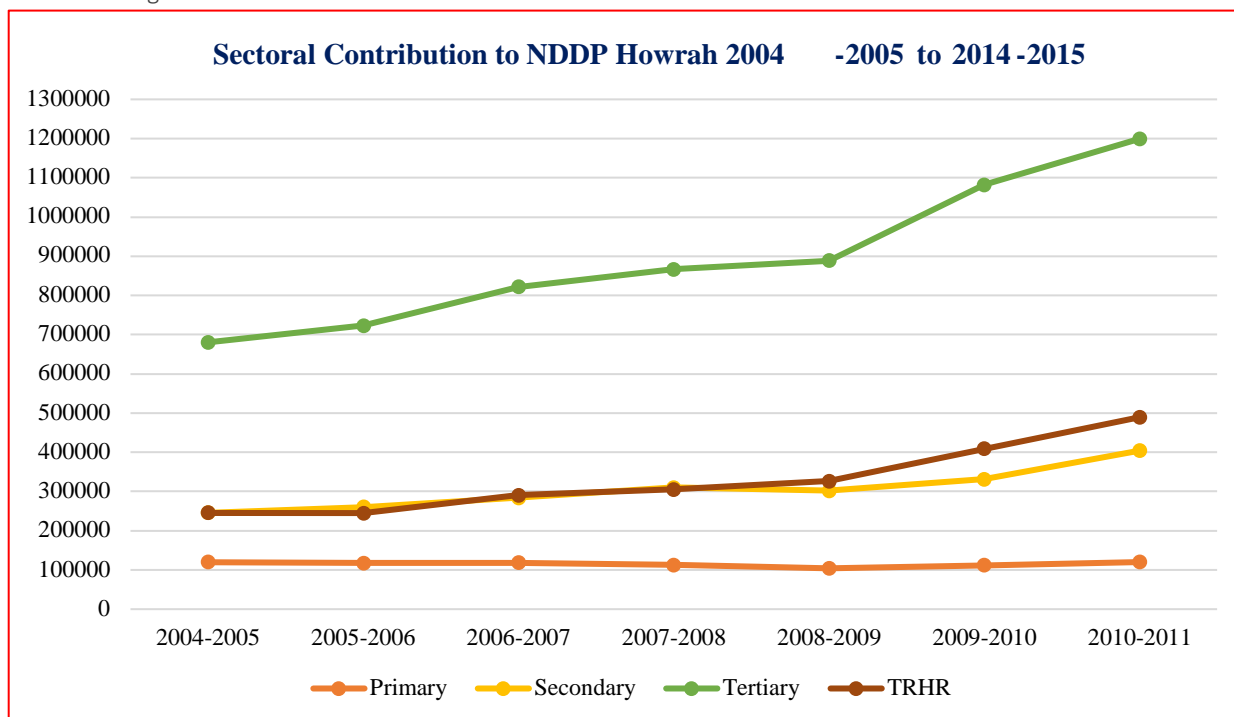
o Table: 4 Sectoral Contribution to NDDP Howrah 2004-2005 to 2010-2011

Year	Primary	Secondary	Tertiary	TRHR as % of Tertiary
2004-2005	119856 (11.46%)	245626 (23.48%)	680487 (65.06%)	245848 (36.13%)
2005-2006	117293 (10.66%)	260580 (23.68%)	722661 (65.66%)	245002 (33.90%)
2006-2007	118041 (9.65%)	284318 (23.23%)	821386 (67.12%)	290968 (35.42%)
2007-2008	112794 (8.75%)	310267 (24.06%)	866728 (67.20%)	305218 (35.21%)
2008-2009	104169 (8.04%)	301810 (23.31%)	889005 (68.65%)	326514 (36.73%)
2009-2010	111710 (7.33%)	331362 (21.73%)	1081842 (70.94%)	409264 (37.83%)

2010-2011	120078 (6.97%)	404179 (23.45%)	1199323 (69.58%)	489368 (40.80%)
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Source: Data Compiled from Department of Planning & Statistics, Govt. of West Bengal

o Figure: 6 Sectoral Contribution to NDDP Howrah:2004-2005 to 2014-2015



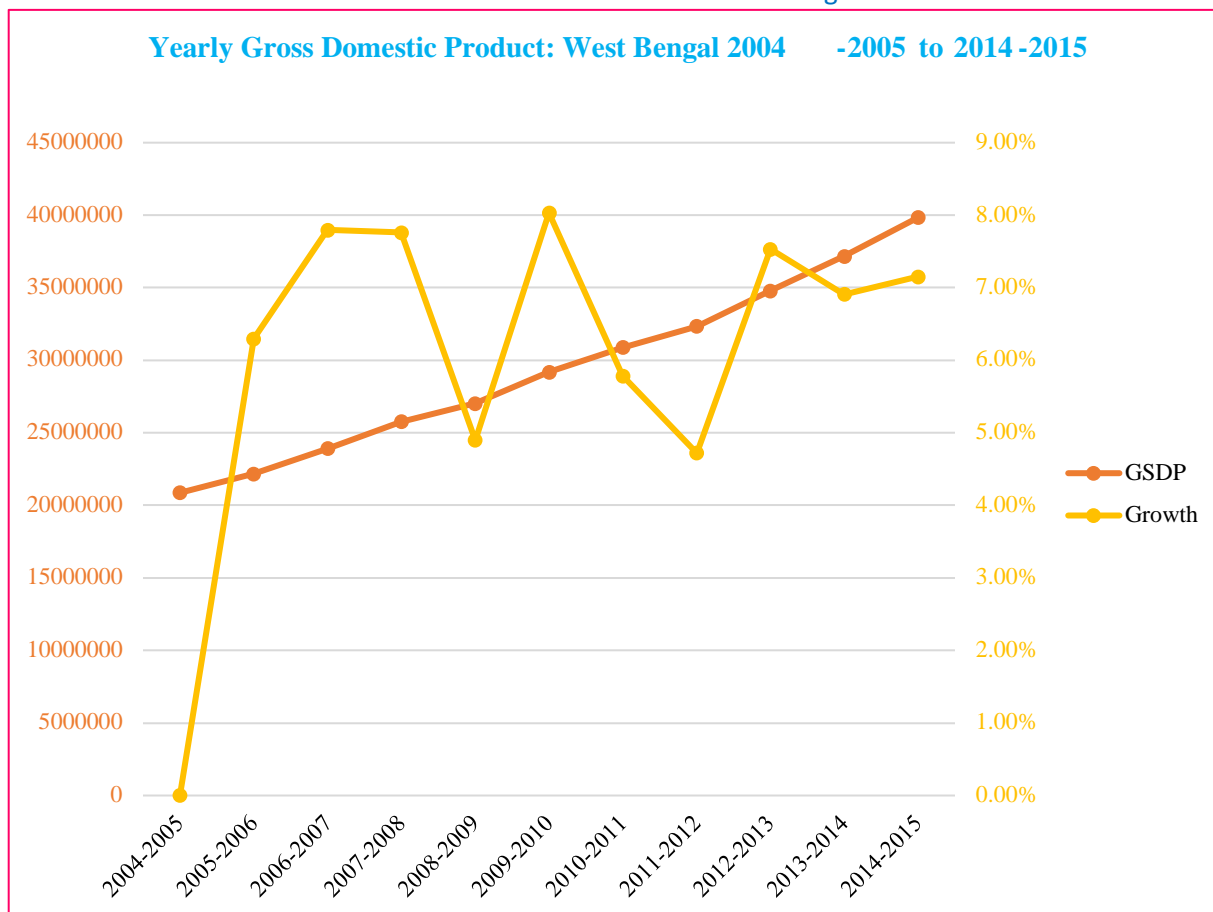
WEST BENGAL: GSDP GROWTH RATE AT CONSTANT PRICE (2004-2005 TO 2014-2015)

Table: 5 GSDP Growth Rate at Constant Price: West Bengal 2004-2005 to 2014-2015

Year	GDDP	Growth
2004-2005	20865636	0
2005-2006	22178946	6.29%
2006-2007	23907712	7.79%
2007-2008	25763218	7.76%
2008-2009	27024826	4.90%
2009-2010	29195496	8.03%
2010-2011	30883705	5.78%
2011-2012	32341698	4.72%
2012-2013	34777383	7.53%

2013-2014	37179504	6.91%
2014-2015	39838651	7.15%

Source: Data Compiled from Department of Planning & Statistics, Govt. of West Bengal Figure: 7
 GDP Growth Rate at Constant Price: West Bengal 2004-2005 to 2014-2015

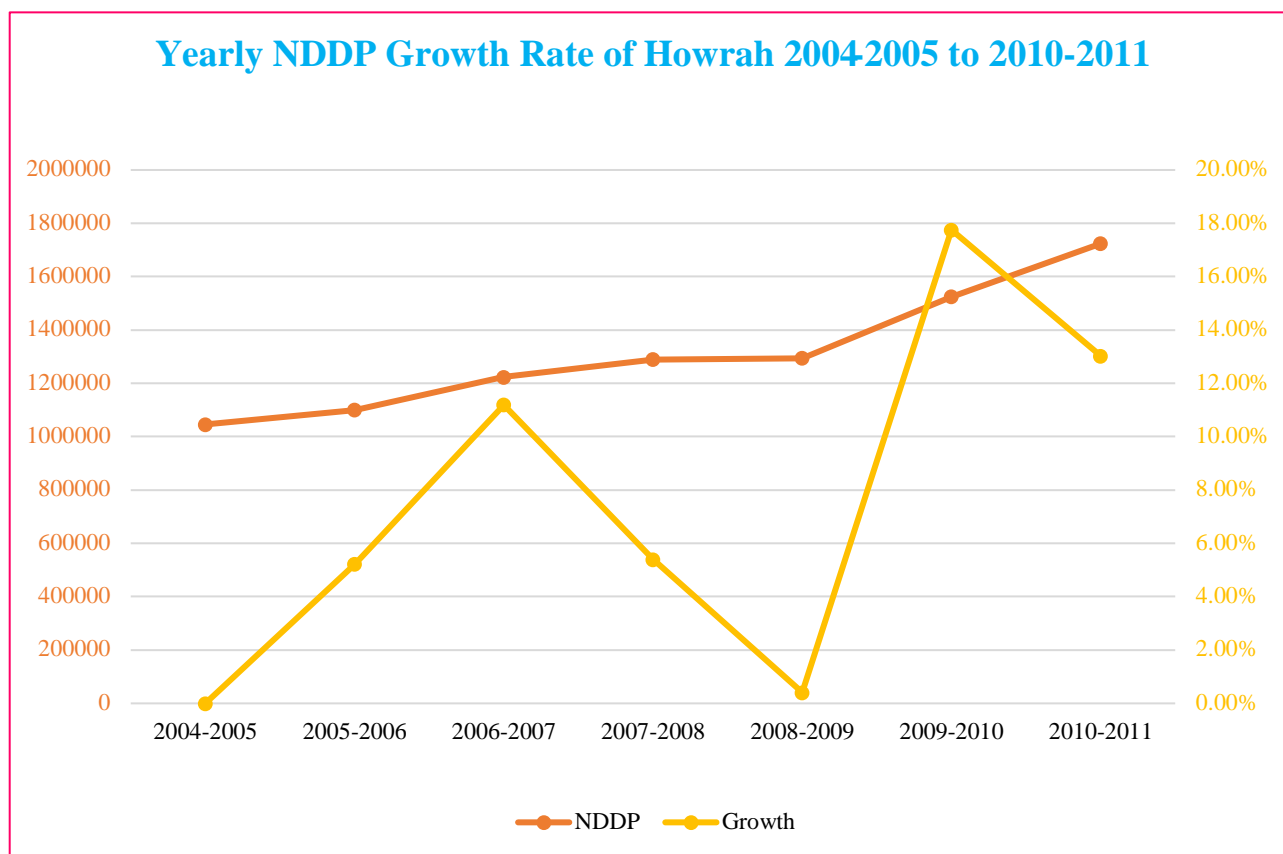


HOWRAH: NDDP GROWTH RATE AT CONSTANT PRICE (2004-2005 TO 2010-2011)

o Table: 6 NDDP Growth Rate at Constant Price: Howrah 2004-2005 to 2010-2011

Year	GDDP	Growth
2004-2005	1045969	0
2005-2006	1100534	5.22%
2006-2007	1223745	11.20%
2007-2008	1289789	5.40%
2008-2009	1294984	0.40%
2009-2010	1524914	17.76%
2010-2011	1723580	13.03%

Source: Data Compiled from Department of Planning & Statistics, Govt. of West Bengal Figure: 8
NDDP Growth Rate at Constant Price: Howrah 2004-2005 to 2010-2011



HOWRAH: CONTRIBUTION OF TRHR TO THE NDDP AT CONSTANT PRICE (2004 TO 2023)

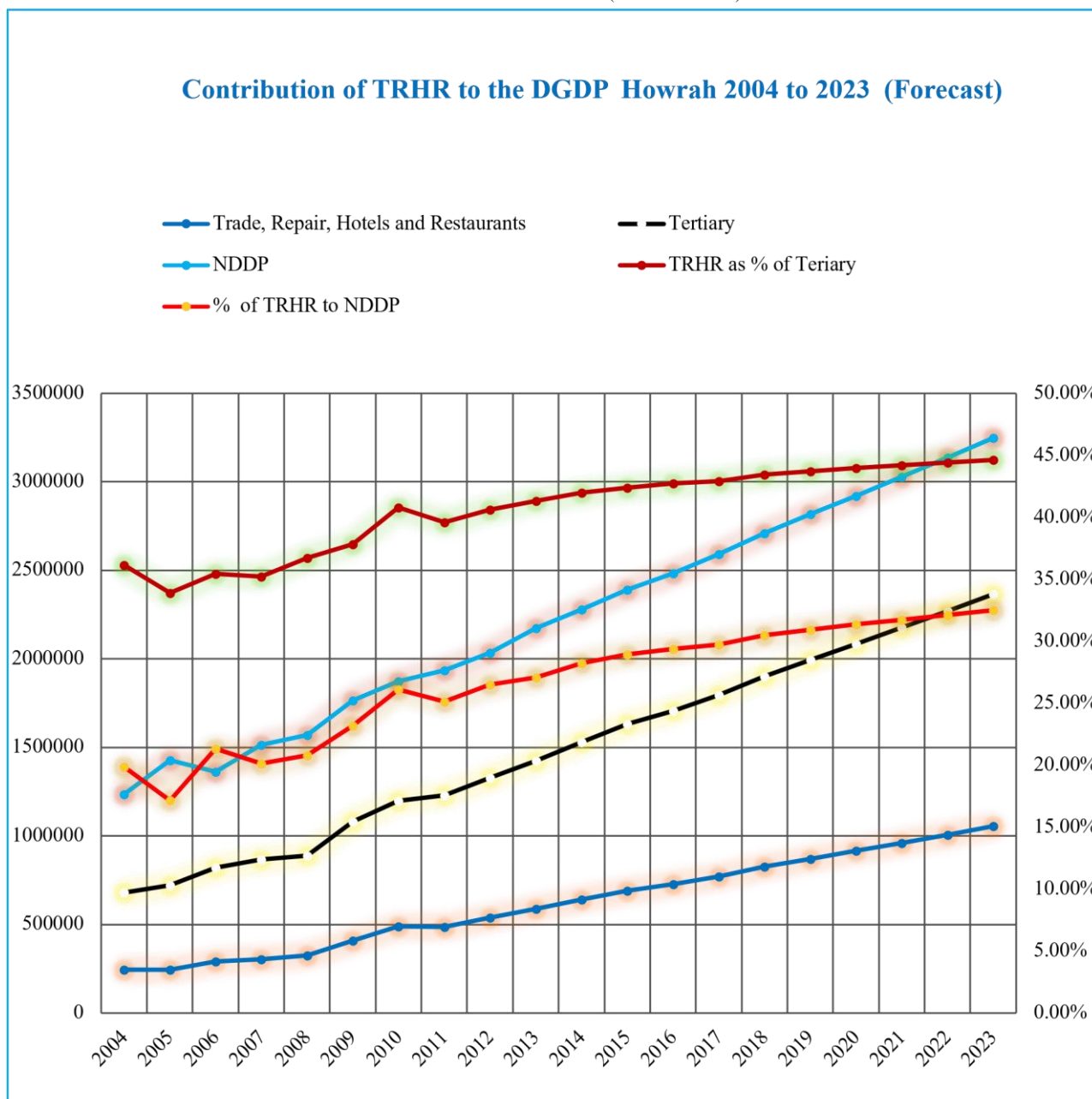
o Table: 7 Contribution of TRHR to the NDDP at Constant Price Howrah (2004 to 2023)

Year	Trade, Repair, Hotels and Restaurants	Tertiary	TRHR as % of Tertiary	NDDP	% of TRHR to NDDP
2004	245848	680487	36.13%	1236183	19.89%
2005	245002	722661	33.90%	1428468	17.15%
2006	290968	821386	35.42%	1364230	21.33%
2007	305218	866728	35.21%	1515730	20.14%
2008	326514	889005	36.73%	1570184	20.79%
2009	409264	1081842	37.83%	1765825	23.18%

ARTH GANGA PROJECT: DISTRICT HOWRAH

2010	489368	1199323	40.80%	1874743	26.10%
2011	486687	1229132	39.60%	1935959	25.14%
2012	539846	1328639	40.63%	2035533	26.52%
2013	588613	1424706	41.31%	2174447	27.07%
2014	642826	1531410	41.98%	2278486	28.21%
2015	691605	1632331	42.37%	2391160	28.92%
2016	729154	1705514	42.75%	2482590	29.37%
2017	771467	1796970	42.93%	2592831	29.75%
2018	826592	1901942	43.46%	2710350	30.50%
2019	871768	1994293	43.71%	2818674	30.93%
2020	916983	2085947	43.96%	2920945	31.39%
2021	961519	2176053	44.19%	3029315	31.74%
2022	1007827	2268915	44.42%	3137555	32.12%
2023	1055975	2366001	44.63%	3248674	32.50%

- Source: Data Compiled from Department of Planning & Statistics, Govt. of West Bengal Figure: 9 Contribution of TRHR to the NDDP at Constant Price Howrah (2004 to 2023)



2.4 WETLANDS

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

Table 1: Wetland Data of Howrah district

Wetland Types	Total Number of												Aquatic Vegetation
	Wetlands:			Area (ha)									
Natural Wetlands	NRCD	NWIA	Diff.	<2.25	<5	<10	<20	<50	<200	<500	<1000	>1000	
Lake/ponds	123	123	0	0	13	30	36	31	12	0	0	1	91
Ox-bow lakes/cut off meanders	28	31	3	0	6	7	6	6	3	0	0	0	17

High altitude Wetlands	0	0	0	0	0	0	0	0	0	0	0	0	0
Riverine Wetlands	144	148	4	0	62	44	19	16	3	0	0	0	67
Waterlogged	48	48	0	0	25	13	8	1	1	0	0	0	27
River/Stream	0	32	32	0	0	0	0	0	0	0	0	0	0
Man-made Wetlands	NRCD	NWIA	Diff.	<2.25	<5	<10	<20	<50	<200	<500	<1000	>1000	AV
Reservoirs/Barrages	0	2	2	0	0	0	0	0	0	0	0	0	0
Tanks/ponds	61	114	53	0	36	20	5	0	0	0	0	0	0
Waterlogged	1	2	1	0	0	0	1	0	0	0	0	0	0
Salt pans	0	0	0	0	0	0	0	0	0	0	0	0	0
Total (2427)	93	178	85	2249	43	24	13	6	6	0	0	1	0

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

2.5. ENERGY

2.5.1. Solar

WBREDA or West Bengal Renewable Energy Development Agency is responsible to undertake and promote renewable energy in the state of West Bengal.

The data of main source of lightning used by households (in percentage) in Howrah district, is based on Census 2011. Electricity has been used by the maximum number of households, as 77.40% of the households are dependent upon electricity. Second most important source of lightning is Kerosene, as is used by 20.20% of the households. Solar is used by 1.30% of the households. 0.20% of the households use other oil for lightning and 0.10 use other sources of lightning. 0.70% of the households do not have any source of lightning in the district.

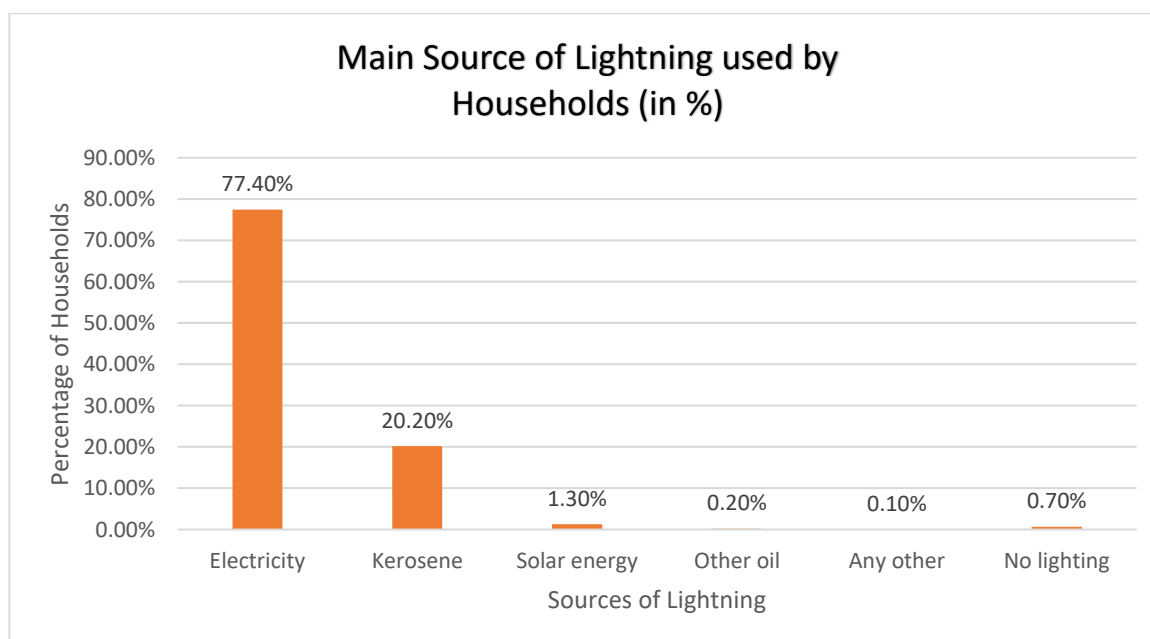


Fig 1

2.5.2. Biomass

West Bengal Renewable Energy Development Agency (WBREDA) is responsible for promoting renewable energy in the state of West Bengal.

The net sown area of the district is 80730 hectares, area sown more than once is 82130 hectares, and gross cropped area is 162860 hectares. The cropping intensity of the district is 202%.

The major crops of the district are rice, wheat, jute, pulses, oilseeds, potato. Potato has the highest productivity in the district, of about 20839 kg/ha.

Crop	Productivity (kg/ha)
Rice	2187
Wheat	1823
Jute	4006
Pulses	758
Oilseeds	1127
Potato	20839

Table 1

Census of India 2011 data has been used to make the pie-chart below, for the type of fuel used by households for cooking. 30.70% of the households use fire-wood, 31.60% of the households use LPG/PNG, 15.30% of the households use coal, lignite, charcoal, and 12.70% of the households use crop residue as a fuel for cooking.

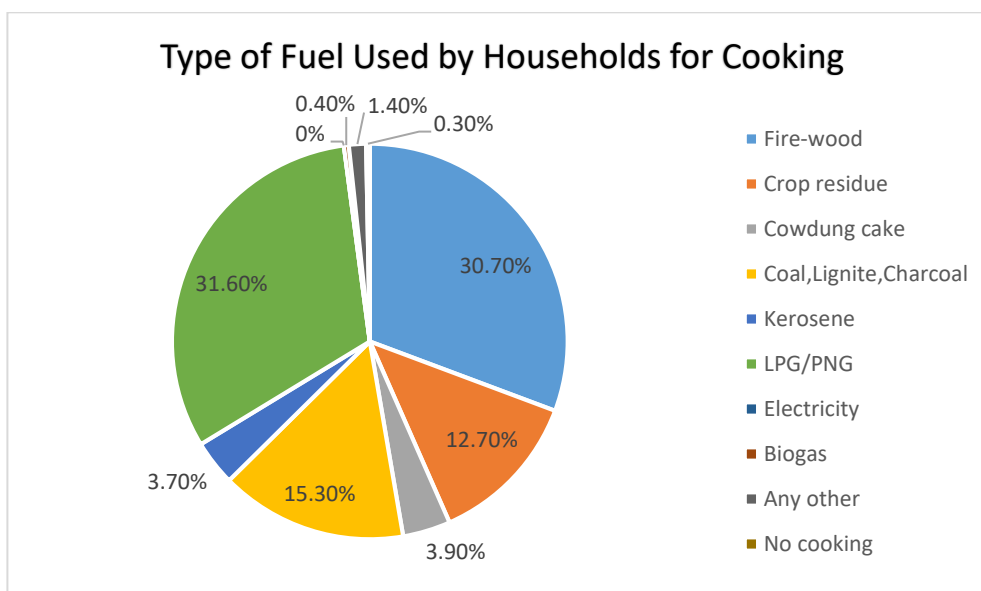


Fig. 1

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 fifty four lakh m³/year and three crores m³/year. This amount of biogas generation can efficiently complete the energy demand of the district.

2.5.4. Hydro Power

No hydropower plant exists, nor the site has been identified in the district. It is located right across from Kolkata on the west side of the Hugli (Hooghly) River (Calcutta). At Nabadwip, it is created by the confluence of the Bhagirathi and Jalangi rivers. The Hugli then runs south for about 160 miles (260 kilometers) to the Bay of Bengal, passing through a heavily industrialized area that is home to more than half of West Bengal's population. The Ajay, Damodar, Rupnarayan, and Haldi rivers, which rise to the northwest on the Chota Nagpur plateau, feed the river's lower portions. The hydropower potential needs to be identify in these sites.

3 QUALITATIVE DATA ANALYSIS

3.1 FORESTRY

According to an article in an online portal Get Bengal, Howrah is often considered to be one of the most polluted cities of India, so much so that residents of different parts of the city suffer from respiratory ailments. Being an industrial city with multiple polluting factories and units, the air over Howrah is not just polluted in the township areas, but has also infiltrated the rural belts of **Howrah** district. Added to this concrete jungles are coming up by cutting down trees leading

to further loss of greenery. The first of its kind Miyawaki Forest is coming up in Howrah's Kamalpur Gram Panchayat on the river banks. The Panchayats and Rural Development Department has started the work in full swing. The area chosen is Shibgunj under Shyampur Block I in between Gadiara and Garchumuk on a 1,000 square metre plot. The forest will be created following the Miyawaki method. Akira Miyawaki, the famous Japanese botanist and environmentalist invented the method of setting up forests where the trees grow at a very fast pace, as saplings are planted in quick successions, so that trees fight for sunlight and grow fast. In one square metre area, at least three to five saplings are planted. The approach is supposed to ensure that plant growth is 10 times faster and the resulting plantation is 30 times denser than usual.

3.1.1 Biodiversity

Haora lost 2ha of tree cover between 2010 and 2021, equating to a 0.25 percent loss in tree cover since 2010, and 659 t of CO₂e emissions. Between June 10th, 2019, and June 6th, 2022, there were 119 VIIRS Alerts fire alerts in Haora.

The Santragachhi Jheel is a big lake near the Santragachhi railway station. During the winter months, especially December and January, this lake draws a huge number of migratory birds. The number has risen in recent years as migratory birds have begun to shun places like Alipore Zoo's lakes in Kolkata.

3.2. ENERGY:

3.2.1. Solar

According to the West Bengal Policy on Co-generation and Generation of Electricity from Renewable Sources of Energy, the state has aimed to achieve 82 MW of energy through grid-connected solar projects and 18 MW through rooftop solar and smaller installation of solar products. The policy has also mandated for the urban buildings and public buildings to install rooftop solar.

According to The Times of India, in 2019, Eastern Railways (ER) had installed a grid-connected solar rooftop system at Howrah station, having a capacity of 2965 KWp, and is one of the leading stations in India, which is producing and using the solar energy. The cost of the project was Rs. 21 crores (PTI, 2017). This would help in reducing the carbon footprint and also would save huge costs, which are incurred in case of conventional sources of energy.

Moreover, four solar-powered eye care centres have been opened in the districts of Howrah, North 24 Parganas, and South 24 Parganas, which were impacted by the continuous power cuts, and it has been financed by Lavelle Fund for the Blind (Miller, 2022).

According to the CEEW report (2020), the groundwater availability in the district for irrigation is within safe limits, so solar pumps could be sustainable in that region. There is greater investment capacity among the farmers, since the district is among top 25 percentile for average crop revenue per holding. Moreover, there are greater number of banks and financial institutions in the district, which would imply that access to credit is not a problem.

At Howrah Municipal Corporation Annex Building, West Bengal Green Energy Development Corporation Limited (WBGEDCL) installed a 3 kW of solar rooftop PV plant in 2009-10.

3.2.2. Biomass

The total agricultural residue for biomass energy generation in Howrah district is 632.784 (10^3 ta^{-1}). Moreover, the biomass residues from rice husk from rice mills/ hullers in the district is 98.398 (10^3 ta^{-1}), residues from saw mills is 1.208 (10^3 ta^{-1}), and residues from non-forest land is 95.94 (10^3 ta^{-1}). The net surplus biomass in the district is 149.004 (10^3 ta^{-1}). Furthermore, the net surplus biomass power generation potential in the district is 18.92 MW (Das & Jash, 2009).

During the year 2006-09, MNRE aided setting up of Biomass and Bagasse based power plants in Howrah district. 1 biomass gasifier plant accompanied with 100% producer gas engines was installed in Sanjiban Hospital & Research Centre in Fuleswar, Uluberia in the district of Howrah, having a capacity of 1.44 MW, to provide electricity.

A BEE-SME programme was executed by the Bureau of Energy Efficiency (BEE) to enhance the energy performance in selected 25 SMEs clusters, one of them is Howrah Galvanizing and Wire Cluster. The motive is to replace furnace oil with biomass gasifier, which would increase the electricity generation by 23 kW and an aggregate of 41400 kWh could be generated in a year. There would be fuel saving of 162000 litres annually and monetary savings of Rs. 2807160 per year (BEE, 2010).

3.2.3 Biogas:

Livestock and agricultural data show a great potential of biogas in the district. Around 429 household biogas plant of capacity 2 cummec was installed in year 2010-11 in the district. Up until December 2011, roughly 11,000 household biogas plant installations had been completed in West Bengal. In Howrah, there is very little information about municipal solid fuel generation. Massive open landfills result from the lack of decentralized waste management techniques other than traditional dumping, which is no longer merely an aesthetic issue. It is exposing city inhabitants to harmful and fatal

smoke gases. To decrease hazardous risk, decentralized waste segregation, collection, and recycling will need to be the top priority of any action plan. The municipal corporation is notified of any natural fire on the dump site. In the city, open rubbish burning is a frequent practice.

3.2.4. Hydropower:

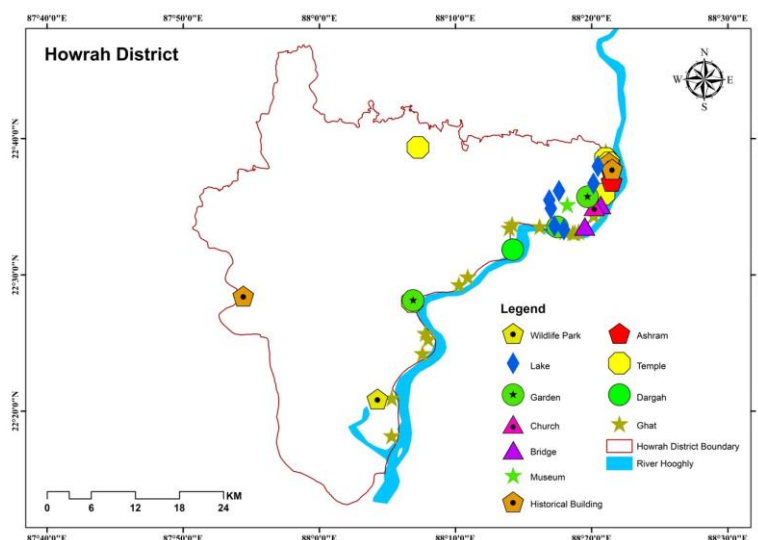
CWC has a specific design section for the East and North-eastern regions, which works on multipurpose, irrigation, water supply, and hydroelectric projects. Preparation of pre-feasibility and comprehensive project studies for schemes studied by CWC field offices in the Northeast or projects performed by Brahmaputra Board, NEEPCO, State Government departments, and others are also included in the scope of work. In hilly locations, WBREDA has taken the lead in harnessing small and micro hydel energy in partnership with WBSDEL.

3.3 TOURISM

Tourism is one of the fastest growing industries of the world in the 21st century. It has emerged as one of the major sources of employment and foreign exchange earnings for many developing countries, including India. Howrah is an important district in the tourism map of West Bengal. It is one of the few places in India that features remnant culture-based influences of several civilizations like Portuguese, Dutch and British.

Howrah is also famous as the “Twin city” of Kolkata. It is also the 2nd largest city in West Bengal in population as well as area. Howrah has a plethora of tourist spots which include churches, temples, gardens, parks, ghats, picnic spots etc. Howrah is not only famous for its beautiful and scenic places of attractions but people from different places come here for shopping especially in the wholesale fish markets and the renowned jewellery shops in Howrah. Howrah fish is exported to different parts of West Bengal, India and other countries as well. Howrah is also a place for food lovers. A range of scrumptious Bengali cuisines can be savoured here on the streets as well as in the wellknown restaurants of Howrah. The city of Howrah enthral the tourists with its outstanding scenic places, picnic spots, lakes and gardens. It is also a place for shopaholics. The city also brags of some beautiful temples with marvellous architecture. Bengali is the native language for the locals residing in Howrah. However, English and Hindi are also understood for the ease of travellers. The Bengali culture and Bengali cuisines of Howrah attract a lot of tourists from all parts of the globe. (*Howrah Tourism*, n.d.).

● *Map: 2 Tourism Sites of Howrah District*



Source: Prepared by Author

ARCHAEOLOGICAL & HISTORICAL TOURISM

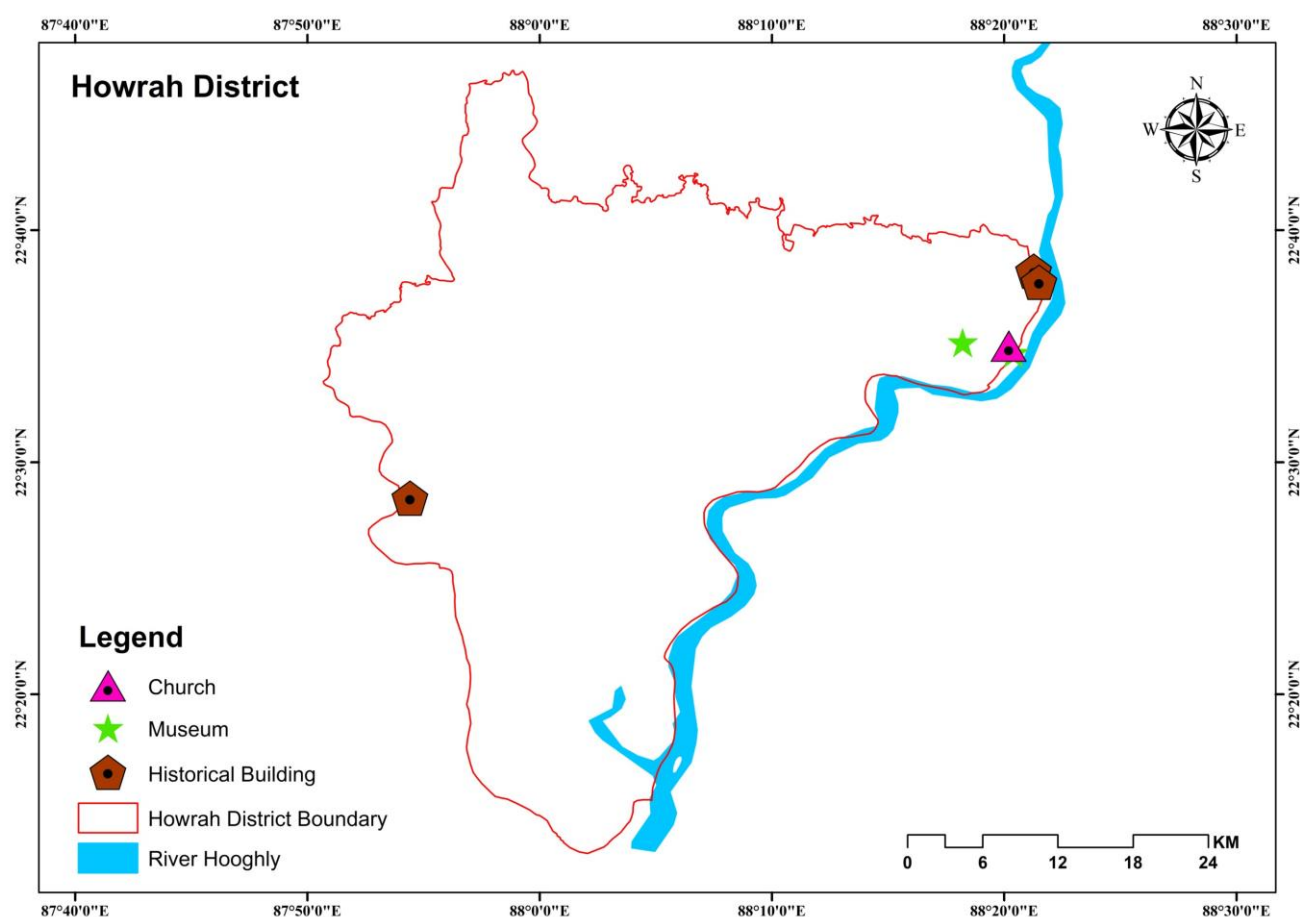
- ★ **Rasbari Garden House:** Rash Bari is located beside bank of river Ganges. It was built on 1889 by Purnachandra Daw of Jorasanko Dawfamily.
- ★ **Saratchandra Kuthi:** Saratchandra Kuthi, also known as Sarat Smriti Mandir, is a house museum located at Samata Bera village in Howrah district of West Bengal, India on the banks of the river Rupnarayan. It has been famous for many years as the home of Bengali novelist Sarat Chandra Chattopadhyay. During the 1978 West Bengal floods, the structure was damaged, after which the government repaired. Saratchandra Kuthi is a historic site protected under the West Bengal Heritage Commission Act, 2001 (IX). The works of Sarat Chandra Chattopadhyay such as Devdas, Will of Vaikuntha, Dina Paona, Dutta and Niskriti, Chandra Kuthi were notable among others. He also wrote Ram's Sumati and Mahesh.
- ★ **Andul Rajbari:** The Andul Rajbari is a palace or Rajbari near Kolkata in Andul, Howrah district, West Bengal, India. The rajbari is now a heritage site of Andul and is a popular destination. Andul is a census town in the Sankrail block under the Sadar sub-division in Howrah district in the Indian state of West Bengal. It is a local hub of commercial and industrial activity within and around Sankrail block. It is considered as one of the developing towns in the district and located near Kolkata city and is a must visit here in Howrah.
- ★ **St. Thomas Church:** This church is nestled in the St. Thomas school, Howrah, between the buildings of the junior and senior sections of the school. This church was built in 1830 and it was formerly popular as the Howrah church. Professor Homes was the main

benefactor of this church who also used to be the principal of the Bishop College. The church was sanctified by Bishop Daniel in 1832. It was renamed as St. Thomas Church in the year 1843. The church has the “Gothic style” architecture and William Jones was the architect who designed this beautiful church.

- ★ **Ananda Niketan Kritisala:** Ananda Niketan Kritisala located at Tepur-Nabasan village in Bagnan-I Block. It is referred to as one of the best rural museums of West Bengal managed by the private bodies. It is run by the Ananda Niketan Society. In the museum, one can find the gallery of art, archaeology, history, folk art and craft of the southern part of West Bengal. The museum exhibits include terracotta plaques, free-standing terracotta figurines, toys, dolls and ritual objects from late ancient period to modern times.

Rail Museum: The Rail Museum is located in Howrah, Kolkata. It is considered as the second rail museum to be constructed after National Rail Museum, Delhi. The museum has evolved into a famous tourist destination in Kolkata. There is a vivid collection of preserved old and rare steam engines, electric locomotives, tracks and signals. These are a perfect medium to showcase the evolution of the railways in India. (*Rail Museum*, n.d.).

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



Source: Prepared by Author

RELIGIOUS & SPIRITUAL TOURISM

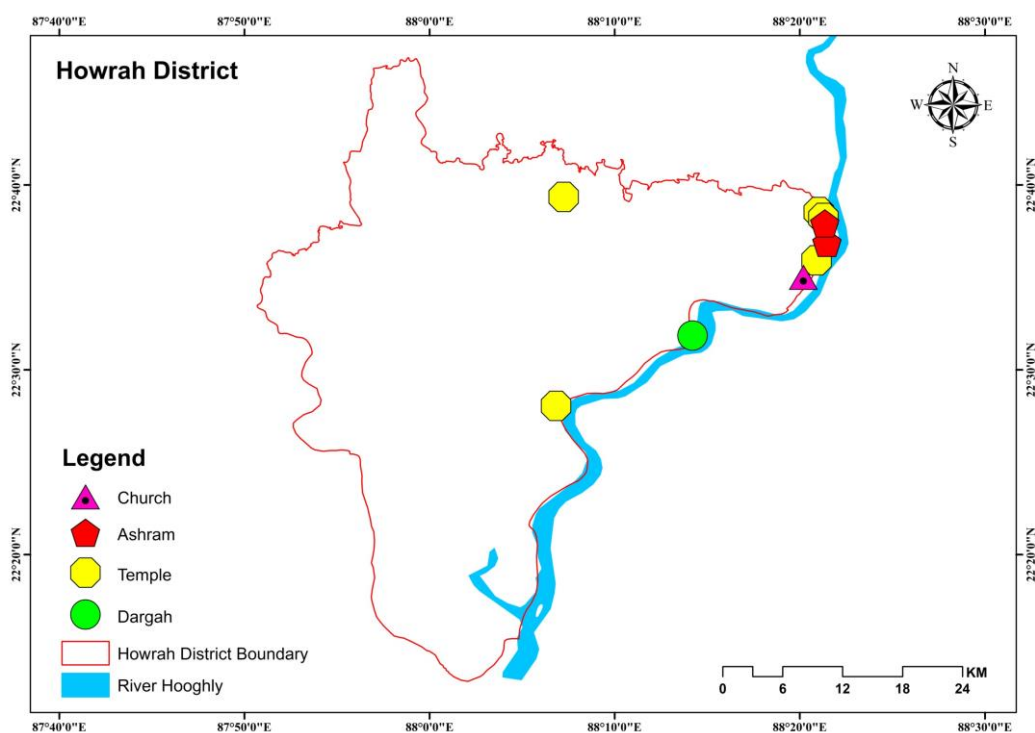
Kalyaneshwar Temple: Kalyaneshwar Temple is more-than-500-year-old Shiva temple situated in Bally, Howrah near Belur math. It is very famous and visited by millions of monks and devotees around India every year. It is surrounded by Kali, Ganesh, Vishnu and Bajrangbali Temples. The structure is about 400 years old and is said to have been started by the Pandavas and it was then continued by the Katoch Dynasty.

- ★ **Damodar Temple:** Damodar temple of the Mandal family dating back to 1699 sakabda i.e. 1769 AD is situated in Jhikira village of Amta-II Block. The upper part of the temple is decorated with terracotta works depicting the notable event of lord Krishna and other amazing Terracotta designs and motifs.
 - ★ **Bangeshwar Mahadev Temple:** Bangeshwar Mahadev Temple in Salkia is one of the most popular and religious temples of Lord Shiva in this region. This place is very famous among the locals. People from different places come here to visit. It is located on the banks of place river Ganges and in front of Lord Bhootnath temple at Salkia. It is well known for the Tallest four headed Lord Shiva Statue of Eastern India, which is of 51 feet. It is a must visit temple in Salkia.
 - ★ **Narayan (Sridhar) Temple:** The Narayan (Sridhar) temple is situated at Patihal village in Jagatballavpur of Howrah district. The temple is dedicated to Narayan Sridhar Jiu. It was established by the Majumder family - the zamindars of the village. It is popular for its terracotta sculptures at the facade of the temple. From the architectural pattern, it is assumed that the temple was established in the late 18th century. It is an East facing brickbuilt temple of Pancharatna style.
 - ★ **Raghunath Jiu Temple:** The Raghunath Jiu Temple is situated at Kultikari in Shyampur of Uluberia sub-division in Howrah district on 871 sq. ft. area of land. The temple was made in the nineteenth century. According to villagers, the temple is 400 years old. The square pattern temple is made of bricks and lime- surki. Everyday Bhog and puja are performed in the temple.
 - ★ **Sri Lakshmi Janardan Mandir:** Sri Lakshmi Janardan Mandir and Maa Malaichandi Temple The Sri Sri Lakshmi Janardan Mandir is situated at Ganeshpur village in Amta of Uluberia sub-division in Howrah district. It was established by the local zamindar Chaitanyacharan Ray. The temple was constructed in 1820 (1742 Saka era, 1227 Bengali era) by the architect Ramprasad Chandra Mistry from the village of Rautara. The temple is the abode of a Salgram Sila (Sila or stone dedicated to Lord Vishnu) with no idols in the temple.
- Malaichandi Temple:** The Malaichandi temple is situated at Ganeshpur village in Amta of Uluberia sub-division in Howrah district. The Dalan style temple, dedicated to Goddess Malaichandi was established by the local zamindar Chaitanyacharan Ray in the early half of 19th century. This old temple is currently not used anymore and a new temple has been constructed just beside it.
- ★ **Uluberia Kalibari Mandir:** The temple is situated on the bank of river Hooghly. The temple is beautiful and flocked in great numbers by the Kali devotees. The temple holds an annual celebration Rasmela on its premises for 30 days.
 - ★ **Belur Math:** Belur Math or Belur Muth is the headquarters of the Ramakrishna Math and Mission, founded by Swami Vivekananda, a chief disciple of Ramakrishna

Paramahansa. It is located on the west bank of Hooghly River, Belur. It is a place of pilgrimage for people from all over the world professing different religious faiths. Even people not interested in religion come here for the peace it exudes.

- ★ **Bhot Bagan Math:** The Bhot Bagan Math is located at Ghusuri in Howrah. It is a unique monastery with a rare influx of Shaiva and Tibetan Buddhist traditions in its origin. It was constructed in 1776 AD.

- *Map: 4 Religious Tourism Sites of Howrah District*



Source: Prepared by Author

ADVENTURE, NATURE & ECO TOURISM

Gadiara: Gadiara is a small village at the confluence of the Hooghly and Rupnarayan rivers. Gadiara is one of the most beautiful and popular picnic spots in Howrah district. The ruins of Fort Mornington Point built by Lord Clive, and the lighthouse are the prominent attractions. Mayachar, a sprawling sandbank on the Rupnarayan River, is an interesting spot to idle on the secluded beach. Watching both the sunrise and sunset at the confluence of the rivers is a wonderful experience.

- ★ **Deulti:** Deulti is a picturesque village located on the banks of the waters of Roopnarayan. This is the hometown of the renowned Bengali writer “Sri Sarat Chandra Chattopadhyay”.
- ★ **Phuleswar:** Phuleswar is a small town in Howrah District. River Hooghly is wide and exclusive here, offering a breathtaking view. Gulls and Kingfishers can be seen darting

into the water to catch fish, while local fisherman spread their nets for the day's catch. The riverside is covered in thick grass and dotted with lush green trees, making Phuleswar an ideal destination to revive your sense in the lap of nature. The shade of trees makes the river bank an ideal spot for a picnic.

- ★ **Santragachhi Jheel:** Santragachhi Jheel is a large lake, located next to the Santragachhi railway station. This lake attracts large number of migratory birds in the winter months, particularly in December and January. The number has increased in recent years, as migratory birds have started to avoid destinations like the lakes in Alipore Zoo, Kolkata.
- ★ **Garchumuk Deer Park:** Garchumuk is located on the district of Howrah of West Bengal at the confluence of River Hooghly and River Damodar enhancing the scenic beauty of the location. The spot, offering the spectacular view of the Ganges, which is gradually emerging as a popular tourist destination ideal for a weekend tour. The area of the zoo is approx. 13.40 Ha mostly under Howrah Zilla Parishad. Considering its scenic beauty as well as suitability for wild animal, a Deer Park was established in 1991, which are the main attractions of the tourists and the local people. This Park helps to propagate awareness on the conservation and education of our wildlife to the visitors. Presently the Zoo houses Mammals, Birds and Reptiles including crocodile.
- ★ **Indian Botanic Garden:** The Indian Botanic Garden previously known as Royal Botanic Garden with the famous Banyan tree is comprised of 285.05 acres of land that is about 1000 bighas and lies on the bank of the River Hooghly just outside the Municipal area of

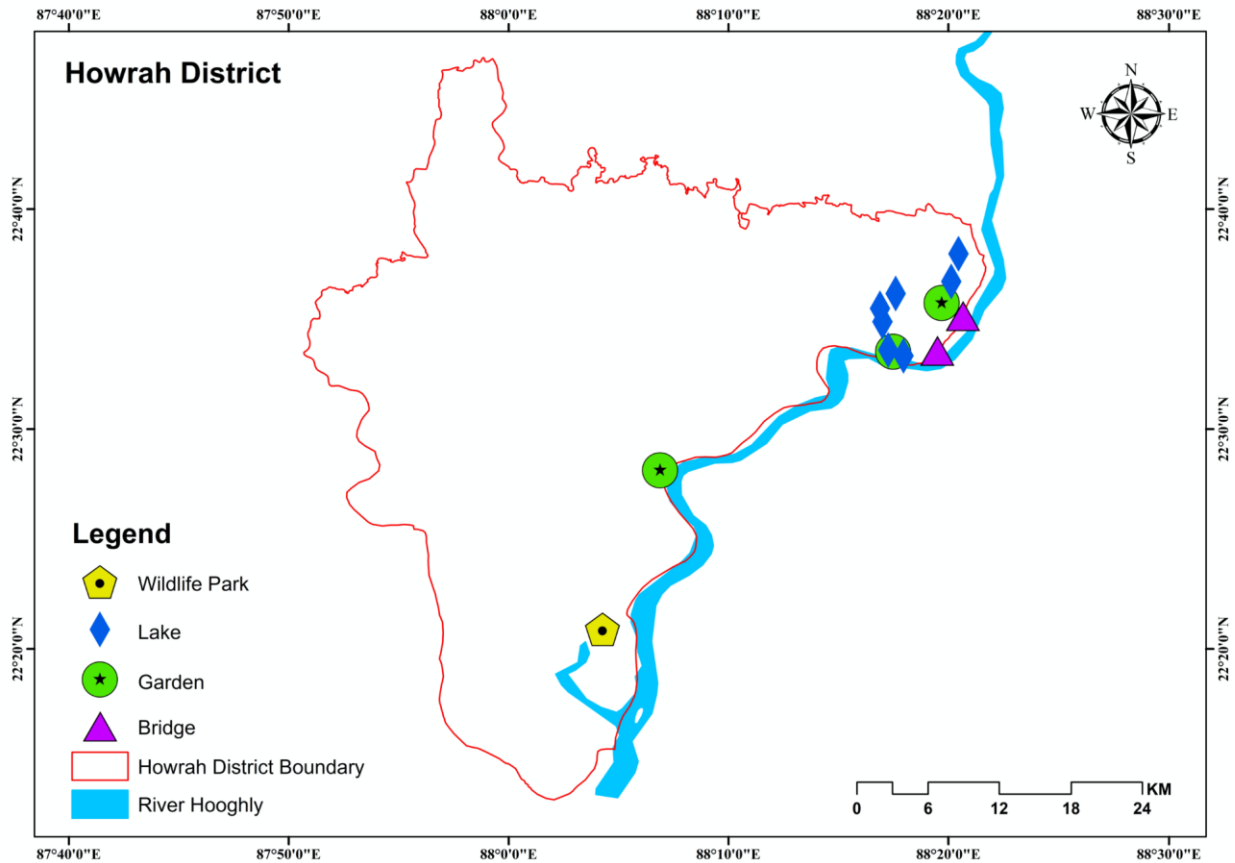
Howrah bordering its southern boundary line and adjoins the compound of the Sibpur Engineering College on the South. This green belt is considered to be the lungs of the highly industrial and urbanized city of Howrah. In the Garden, beside the great banyan tree we have a fair collection of rare indigenous and exotic plants,

beautiful Amazon lilies,

climbing plants, varieties of palm, delicate orchids and all sorts of large trees - mahagony, teak, walnut etc. We also find here a nursery (not open to the public), a Conservatory, a Palm House, a Herbarium, an Orchid conservatory. We have also a second large Banyan tree. Besides we can find in the Garden the following Monuments and buildings: Wallich's monument, Griffiths Monument, Jack's Monument, Kurze's Monument, Roxburg's the Great Banyan Tree.'

- ★ **Vidyasagar Setu:** Vidyasagar Setu - otherwise known as the Second Hooghly Bridge opened to the traffic in 1992 is the finest product of modern architecture and technology. It is intricately connected with the cities of Kolkata and Howrah by a series of overbridges and situated at a distance of 1.5 km southwards of Rabindra Setu. It is erected on only four pillars and hanged on 121 number of iron ropes. The bridge is 458 metres long and 115 metres wide. One can have a glimpse of a large part of Kolkata standing in the middle of the bridge. The beauty of the bridge and its background is largely utilized by the Film Industries of India for shooting purposes.
- ★ **Howrah Bridge or Rabindra Setu:** The old Howrah Bridge, a floating pontoon Bridge, was opened in October 1874 and made over to Port Commissioners who managed and maintained it. Designed by the late Sir Bradford Leslie, it had a total length of 1528 feet between centres of abutments and provided a 48 feet roadway and two 7 feet footways. The most novel feature was the removable section which when floated out gave 200 feet clear openings, with a head room of 22 feet, were also provided for smaller crafts.
- ★ **Fish Tourism:** Howrah is a place which has always been abundant with a variety of fish. Here there is a plethora of lakes, rivers and ponds which give shelter to a wide range of fishes from shrimps to crabs, koi, hilsa, rohu fish etc. Majority of Bengali cuisines are prepared from fishes taken out from the fresh sweet waters of Howrah. There are a couple of wholesale fish markets located nearby Howrah station from where fishes are exported to different parts of West Bengal and other countries as well.
- ★ **King Lake**
- ★ **Leram Lake**
- ★ **Rani Lake**
- ★ **Belur Lake**
- ★ **Chatterjee Lake**
- ★ **Pess Quarter Lake**

- *Map: 5 Adventure, Nature & Eco Tourism Sites of Howrah District*



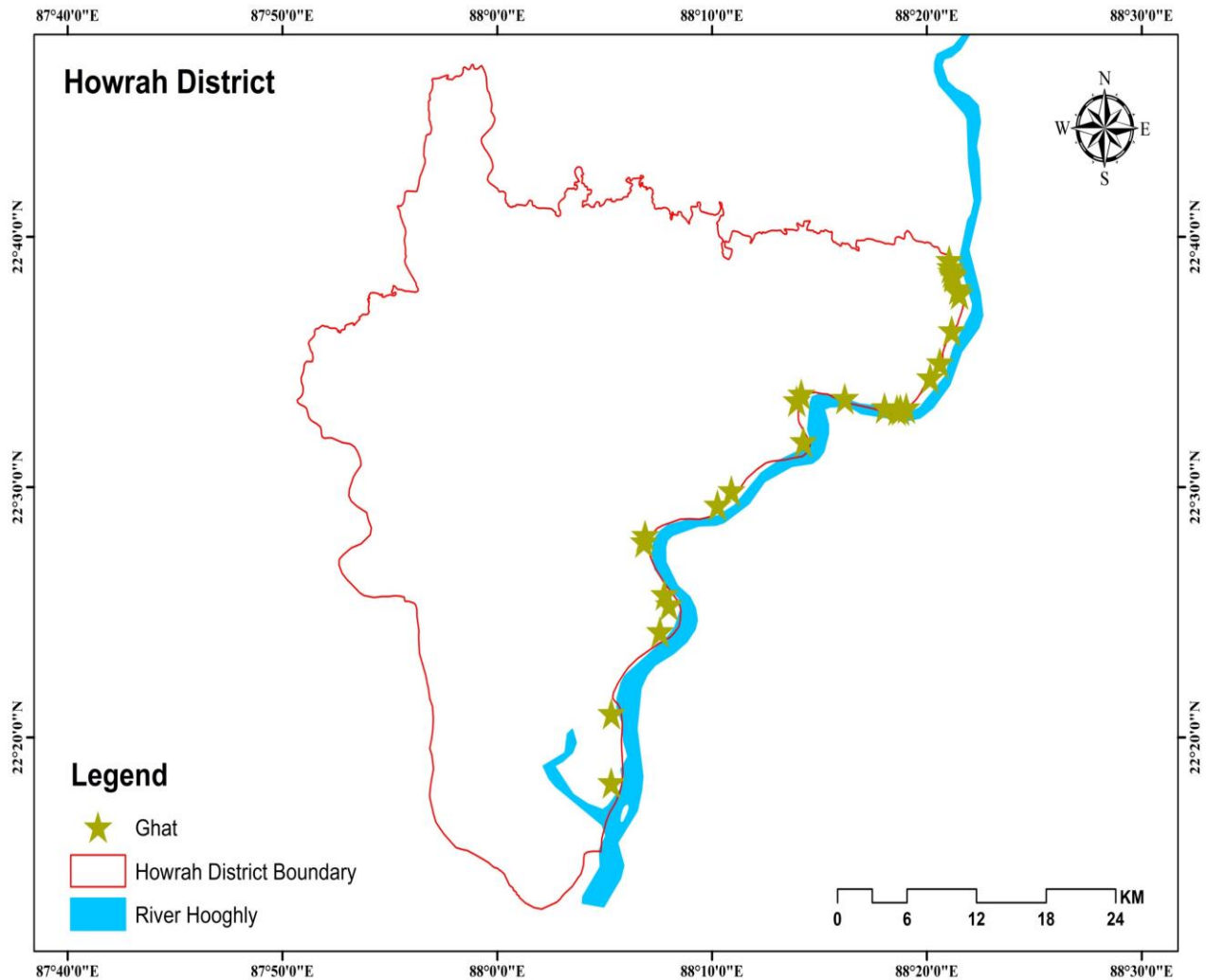
Source: Prepared by Author

GHAT TOURISM

- ★ **Chintamani Ghat:** The Chintamani Ghat is situated at Choura Bustee in Howrah town. The ghat was established by Chintamani Dey. Swami Vivekananda came here by boat along with his disciples in 1898. The ghat was declared as heritage in 2017 by the West Bengal Heritage Commission.
- ★ **Shri Mayer Ghat:** This is situated on the west bank of river Hugli, in the premises of Belur Math. This is originally a bathing ghat popularly known as Shri Mayer Ghat. Originally, this massive brick structure consists of 30 steps, the total length being 15 m. and width 6.9 m. These steps are of bricks laid with lime mortar, constructed around 140 years ago.
- ★ **Uluberia Jetty Ghat « Rangamati Ghat**

- ★ **Barendrapara Ghat**
- ★ **Badam Tal Ghat**
- ★ **Dewangazi Ghat**
- ★ **Rabindra Ghat**
- ★ **Bally Nimtala Ghat**
- ★ **Uluberia Kalibari Ghat**
- ★ **Hiragana Ferry Ghat**
- ★ **Kantakhali Kheyaghat**
- ★ **Garchumuk Ferry Ghat**
- ★ **Dhwaja Ferry Ghat**
- ★ **Banerjee Ghat**
- ★ **Howrah Ferry Ghat**
- ★ **AHSC Ghat**
- ★ **Balu Ghat**
- ★ **Botanical Garden Ferry Ghat**
- ★ **Podrah Kheya Ghat**
- ★ **Jeti Ghat**
- ★ **Sankrail Gangar Ghat**
- ★ **Manickpur Ferry Ghat**
- ★ **Shiv Ghat**
- ★ **Bauria Thana Ferry Ghat**

• *Map: 6 Ghat Tourism Sites of Howrah District*



Source: Prepared by Author

CULTURE & ARTS TOURISM

The district of Howrah has a rich & diverse culture and heritage. It has always appreciated art and literature. The area is inhabited by people of different religions, languages and culture. A variety of languages includes Hindi, Bengali, Urdu which are uttered by the local inhabitants of the district.

Howrah district gained its importance with the advent of railways from Howrah in 1854. There is a large industrial population in the district. The industrial heritage of the district is enviable and it plays a vital role in the economy of both the state and the country as a whole. Howrah city is much

older than the city of Kolkata and is connected by the Howrah Bridge (Rabindra Setu) and Vidyasagar Setu. (*Culture & Heritage of Howrah*, n.d.)

Howrah district is the home to many promising singers. Rabindra Sangeet, Nazrul Geeti (the songs of Kazi Nazrul Islam) and Rabindra Nritya Natya (songs of Rabindra Nath Tagore and the dance sequences along with it) are a vital part of the Bengalis residing in Howrah. Howrah is also a renowned place for classical dances and music. After independence, the modern or 'Adhunik' songs are becoming more popular nowadays. (*Culture & Heritage of Howrah*, n.d.)

Howrah also has an inclination towards dramas and theaters. Some renowned actors and directors of Bengal who have been the residents of Howrah are Kanan Devi (Actress), Tulsi Chakrabarti (Actor), Rudranil Ghosh (Actor), Sisir Bhaduri (Actor), Purnendu Patri (Director). Some eminent writers of Bengal who have dwelled in Howrah are Mani Shankar Mukherjee (writer), Sarat Chandra Chattopadhyay (writer), Narayan Debnath (famous comic book writer), Rabin Mondal (Artist).

The Indian Botanic Garden, now known as The Acharya Jagadish Chandra Bose Indian Botanic Garden - named after in honor of Jagadish Chandra Bose, (the Bengali polymath, and natural scientist) is situated in Shibpur, Howrah near Kolkata. The gardens exhibit a wide variety of rare plants and a total collection of over 12,000 specimens spread over 109 hectares. It is under Botanical Survey of India (BSI) of Ministry of Environment and Forests, Government Of India.

The best-known landmark of the garden is The Great Banyan, an enormous banyan tree that is reckoned to be the largest tree in the world, at more than 330 metres in circumference. The gardens are also famous for their enormous collections of orchids, bamboos, palms, and plants of the screw pine genus (*Pandanus*). (*Culture & Heritage of Howrah*, n.d.)

The main traditional place of Howrah is the Ananda Niketan Kirtishala Museum. The main purpose of this museum is to enrich the rural people of this region. Ananda Niketan Kirtishala also serves as a platform to educate rural people who are unable to utilize adequate educational resources. (*Culture & Heritage*, n.d.)

- ❖ **Market and Shopping:** Howrah is a hub for jewellery shopping and wholesale fish markets. Some of the renowned jewellery shops in Howrah are: Nnoni, Anjali Jewellers, Sonar Sansar Jewellery Shop, Ansari Jewellers, B N Jewellers, Mahalaxmi Jewellers, R. K. Jewellers, New Anandmoyee Jewellers, Shubh Laxmi Jewellers.
- ❖ **Arts & Crafts:** Horn-Bone Crafts, Jute Handicraft, Pressed Dolls, Silver Filigree, Soft Dolls, Pottery, Solapith, Zari Embroidery.
- ❖ **Fairs & Festival:** Innumerable fairs, festivals and socio-cultural events are held throughout the year in the district having a wide admixture of religion, community and culture. The followers of the main faiths and some tribal groups observe their own religious festivals whereas they intermingle in certain melas (fairs) and ceremonies. Dhela Fela Festival,

Festival of Entel Thakur, Heleni Festival, New Year Fair, Urs Mela, Singhabahini Mela, Bhim Ekadasi mela, Baisakhi Purnima mela etc. Panchananda Puja,

Reverence of Pirs, Soyla Festival, The Worship of Sakti, The Worship of Shiva v **Music & Dance:** Kalikapatari is a folk theatre indigenous to Shyampur area of Howrah district. This art form is a mixture of acting and dancing. It tells the stories of Kali from folklore and Puranas and other epics. It is performed in groups consisting of 15 - 20 people.

- ❖ **Panitras Santaber:** It is the home place of the immortal Bengali novelist Sri Sarat Chandra Chattopadhyay. Though he was a Bengali writer, his great novels and short stories dealing in human emotions are translated in almost all major languages of India.

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 has a variety of weaving and craft 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 jute are the most notable products of this district.
- Oilseeds (Sunflower, Safflower, Mustard, Linseed) are grown in large scale in the district.

4 ACTION PLAN DEVELOPMENT

4.1 FORESTRY

People in the district Howrah should be made aware of the importance of forests. The district has industries as well. So in order to counter the pollution caused by them, it becomes important to increase the plantation in these areas. This can be done under the National Afforestation Mission (NAM). NAM is being implemented for afforestation of degraded forest lands. The overall objective of the National Afforestation Programme (NAP) scheme is ecological restoration of degraded forests and to develop the forest resources with peoples' participation, with focus on improvement in livelihoods of the forest-fringe communities, especially the poor.

The district can also take up Sub-Mission on Agroforestry (SMAF) Scheme. SMAF aims to encourage farmers to plant multi-purpose trees together with the agriculture crops for climate resilience and an additional source of income to the farmers, as well as enhanced feedstock to inter alia wood-based and herbal industry. Hence there is a concerted effort to include medicinal, fruits, fodder, tree-borne oilseeds, lac host etc. in addition to the longer rotation timber species.

Water logging is one of the major problems in the district. Farmers are facing water logging problem especially during rainy season. Under such unfavourable condition, cultivation is not possible for most

of the crops. Therefore, they need suitable crop especially during rainy season. It is a success story of village *Pandori* of Anand District in Gujarat which has emerged as a brahmi cultivating village under low lying fields. On an average, a farmer can get approximately Rs. 2,49,000/ha/year net returns from the cultivation of brahmi as a sole crop under low lying field.

Awareness programs should be organized to make people aware of how can they contribute in increasing the forest cover and the tree cover of the district.

4.1.1 Biodiversity –

- Development of sanctuary and eco-sensitive zones.
- Because there is no adequately planned drainage network, a huge number of industries have yet to connect/develop a comprehensive and full disposal system.

4.2 TOURISM

● SWOT ANALYSIS: HOWRAH DISTRICT TOURISM

STRENGTHS

- ★ Outstanding scenic places, picnic spots, beautiful temples with marvellous architecture lakes and gardens.
- ★ Rich Bengali culture and Bengali cuisines of Howrah
- ★ The district has fertile soil and diversified agriculture.
- ★ The district has large number of Cultural heritage sites.
- ★ Human capital and skilled labour force.
- ★ The district is well connected with other parts of the states and the country.
- ★ Presences of natural features (Rivers and Lakes dominate the landscape) and unique ecosystems are valuable scenic and recreational resources and can contribute to environmental services.
- ★ Cohesive Community.

WEAKNESS

- ★ Tourism in the district is undeveloped and unexploited.
- ★ There was not much awareness about the heritage scenario of the destination.

- ★ Inadequate infrastructure facilities for tourists.
- ★ Congestion and Traffic problems.
- ★ Lack of maintenance of Cultural and Natural heritage.
- ★ Social and Gender Discrimination, Illiteracy and Poverty.

OPPORTUNITIES

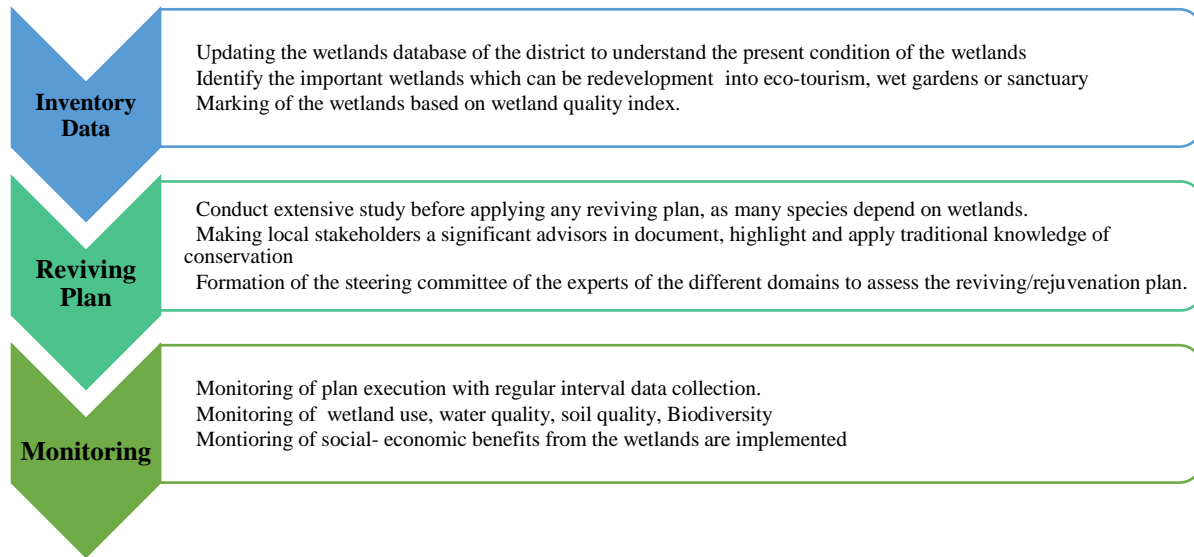
- ★ Potential for Religiously inclined tourist, interested in history and culture seeing knowledge enhancement.
- ★ Reuse of vacant lands into economically productive use.
- ★ Obtaining grants for provision of best infrastructure and housing.
- ★ Encourage Public – Private partnership for provision of infrastructure services.

THREATS

- ★ Lack of maintenance tourism infrastructure and tourist information centres.
- ★ The district is prone to different kinds of disasters, which include floods and Cyclone etc. «
- ★ Erosion of River Hooghly and Arsenic Prone Area.
- ★ Illegal Migration.
- ★ Degradation of Natural Environment and Encroachment of Urban ecosystems.
- ★ Lack of governmental response towards tourism infrastructure such as tourism centre, tourism promotion and tourism accommodation.

4.3 WETLANDS

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



4.4. ENERGY

4.4.1. Solar

According to the Input Survey 2016-17, the total net sown area of the district is 97341 hectares, out of this the net irrigated area is 65997 hectares, which is around 67.79% of the total net sown area and unirrigated land is 31344 hectares, which is 32.20% of the net sown area.

Moreover, according to the Agriculture Contingency Plan for Howrah District (2011), 1000 hectares of area is under barren or uncultivable land. Here, component A of PM-KUSUM scheme could be adopted to utilise the barren land and to exploit the solar energy.

Long-term bank loans should be promoted in the district to the farmers to purchase solar pumps, as there is access to credit but disbursement of credit is low and needs an urgent attention. Additionally, subsidies from the government could also aid farmers to adopt solar pumps.

According to CEEW (2020), solarisation of feeders would not be feasible here, since the feeder segregation is low and the cost of power supply from DISCOMS is less. Moreover, Individual grid-connected solar pumps would not be economical, as the major proportion of farmers are small and marginal and availability of low power subsidy.

PROJECTION AND MONITORING MATRIX

Firstly, solar usage needs to be promoted in the rural areas of the district.

Secondly, disbursement of financial credit and subsidies should be enhanced, which would help in Doubling Farmer's income through capital investment of solar pumps.

Thirdly, drip and sprinkler irrigation through solar needs to be encouraged which would help in 'Per Drop More Crop' through efficient irrigation techniques

Fourthly, public and private institutions should install rooftop solar PV which would pave the way for other firms and institutions do to the same.

By implementing solar products in the district, the development of the district can take place.

4.4.2. Biomass

The district has not seen much progress in installing biomass plants. The district has a potential of producing 18.92 MW of biomass energy (Das & Jash, 2009) however, much of this is still unutilised. The people in the district needs funds to establish biomass plants, in the form of subsidies and access to financial credit. Moreover, skills of the rural people need to be advanced, so that they understand the working of the biomass plants and help in the maintenance of the biomass plants in the district. New entrepreneurs should be encouraged to install the biomass plants and also groups in the villages could be made and they can work towards establishing biomass gasifier plants, which would also help in generation of income. Another important thing is infrastructure should be improved for the transportation of biomass raw materials.

PROJECTION AND MONITORING

Firstly, it is important to spread awareness in the district about biomass energy.

Secondly, funds should be directed to the biomass plant holders to invest in new plants or for improving the existing ones.

Thirdly, the rural people need to be skilled and short -term courses on technical biomass knowledge should be imparted.

Lastly, for transportation of biomass raw materials infrastructure should be improved.

The biomass energy generated could help in village electrification.

4.4.3. Biogas:

- A cluster of municipal authorities with a shared waste processing plant might be developed. This will significantly reduce expenditures and eliminate the need for land in every local body.
- Construction of community biogas and compost plants should be promoted until the cluster concept is adopted.

4.4.4. Hydropower:

In hilly locations, WBREDA has taken the lead in harnessing small and micro hydel energy in partnership with WBSEDCL.

5 RECOMMENDATIONS

5.1 AGRICULTURE AND ALLIED SECTORS

- Farmers should use the SRI technology, primarily for boro rice cultivation, to reduce irrigation and boost productivity.
- Farmers should be encouraged to grow elephant foot yam and colocasia as cash crops, and they should also be adopting new varieties to improve productivity and quality.
- Farmers should practice intercropping to increase income from a unit plot and reduce the risk of crop loss.
- The quality of betel vine production should be improved.
- Micro-irrigation should be promoted for fruits and vegetables to increase water use efficiency.
- Vermicompost producing techniques and applications need to adopt to boost soil health.
- In the district, high-quality jute fiber production should be encouraged, primarily through scientific retting procedures.
- Farmers should be encouraged to grow off-season crops in shed-net houses and poly-houses.
- Organic farming should be promoted in the district to encourage long-term agricultural development.
- To restrict the damages of topsoil and soil fertility, farmers should be sensitized over the fertilizer and pesticides application.
- The district has an enormous scope for medicinal plants like Brahmi (*Bacopa monnieri*), thankuni (*Centella Asiatica*), kalmegh (*Andrographis paniculata*), pipul (*Piper longum*), etc. which should be encouraged.
- Flowers like Marigold, Rose, and Bela are widely cultivated in the district. Some supporting projects or schemes, such as biofertilizers and bioproducts, should be linked to this flower market. It will help to reduce the wastage of surplus flower

- Flower farmers should be adequately trained in the use of chemical fertilizers to maintain soil fertility, and biofertilizers must be used more frequently.
- There is a significant market for mushroom cultivation and commercialization in the district, which should be encouraged.
- The farmers should adopt resource conservation practices like zero tillage, happy seeder, mulching, etc., which should be adopted by the farmers for cultivation.
- Beekeeping needs to be encouraged among the farmers, and corresponding processing facilities should be developed.
- The government's scheme and training should be provided to the farmers for scientific fish culture.
- The district has an enormous scope on goat farming and poultry farming.
- Potato is one of the major cash crops of the district, export facilities should be provided to nearby states for surplus production.

5.2 FORESTRY

The district Howrah should concentrate on making more and more people aware of the plants and the trees which they can grow in their area. For this purpose the awareness campaign has to be organized on small scale levels. The district also has some of the low lying areas which can be used for cultivation of Brahmi. NAP and SMAF can play big roles in maintaining sustainability in the district.

5.2.1 Biodiversity

- Agricultural best practices (Bio-village program, IPM demonstration etc.) are recommended.
- Diversification of crops (Demonstration with low water requiring crops etc.) are recommended.
- Micro irrigation with supplemental water management activities are good irrigation strategies are recommended.
- Conservation of soil and water (water harvesting structure, excavated well, gully blocking, check dam, and so on.) are recommended.

5.3 WETLAND

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

- The district consists of many wetlands. It is recommended to rejuvenate and restore these water bodies, leading to the solution to water scarcity and water quality in the region.

- It is recommended to promote organic farming and a scientific approach near the wetlands to lower the pollution of the wetlands. Also, these practices help attract the market and increase the yield of rice and jute products.
- It is recommended to promote small-scale industries like beekeeping, boat making and net making under the schemes by the Ministry of Micro, Small & Medium Enterprises.
- Aquaculture needs to be promoted under the Fisheries and Aquaculture Infrastructure Development Fund (FIDF) scheme, and the fishing industry needs to be boosted under Pradhan Mantri Matsya Sampada Yojana (PMMSY)
- It is recommended to promote handicraft and weaving work in the district.

5.4 ENERGY

5.4.1. Solar

- ❖ Awareness is needed, especially among the rural areas about the positive impacts of solar energy.
- ❖ Credit disbursement should be improved in the district.
- ❖ Solar drip irrigation needs to be worked upon in the district.
- ❖ Rooftop solar should be promoted in the public and private buildings in the urban areas.

5.4.2. Biomass

- ❖ Farmers should be made aware about biomass energy, that would motivate them to sell their crop residue.
- ❖ The old plants should be revamped whenever the need arises and entrepreneurs should be encouraged to set up new plants.
- ❖ Infrastructure of the district needs improvement.
- ❖ There should be provision of installing biomass plants for rice mills in the district.

5.4.3. Biogas

- 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

- The Nodal Agency will identify pico/micro-hydel projects in a timely manner, and the central financial support relevant to the pico/micro-hydel project cost will be passed on to the qualified beneficiaries.

5.5. TOURISM

- ❖ To strengthen the tourism and attract large number of tourists, Tourism Product Diversification/Improvement is needed like, Promotion and packaging of tourist resources, Upgradation of identified tourist spots, Quality accommodations, Tourist Information Centre, Road and public transportation and Road furniture and signages etc. v Maintenance of law and order, deploying tourist police force, disposing grievances, enacting suitable rules, regulation and laws for tourism development and Standardizing quality of tourism product and services.
- ❖ Cultural tourism as an important means of income and employment opportunity in and around in the district.
- ❖ Promotion of tourism entrepreneurship.
- ❖ Educate and aware the local community including the most vulnerable section of the society regarding alternative economic benefits derivable from tourism.
- ❖ Motivation of the young people by providing them with alternative economic and sociocultural benefits.
- ❖ Maintenance of local socio-cultural secular fabric of the district.
- ❖ Preserving the local traditions, culture values etc.
- ❖ Protection of socio-cultural and natural heritage of the district. v Setting up a linkage between tourism and resource planning.
- ❖ Local youth can also be trained in the games like Boating, Cycling, Heritage Walk and Marathon.
- ❖ Guide and Information Services at different levels e.g. licensed or local guiding training programme to the local youth by the district administration or State Tourism Department. v Long- and short-term training program can be imparted to the students/ existing employees/ potential entrepreneurs for setting up and operating hotels, restaurants and travel agencies with all possible technical, professional and financial support with a single window clearance facility.

- ❖ An elaborate and effective distribution system should be implemented to ensure distribution of brochures through information centres and internet.
- ❖ To create awareness campaigns, advertisements may be designed and telecasted /broadcasted in different print/electronic media.
- ❖ A strong Tie-Up with Travel Agencies and Tour Operators should be established, so that they can act as marketing agents for the tourist sites of the district.
- ❖ The aspect of availability of wayside amenities along the roads connecting various tourist spots needs particular attention with the participation of the private players.
- ❖ Skilled guide and interpreter service forms the root to the success of heritage tourism in any region.
- ❖ Government policies need to be formulated to develop the infrastructure, transportation system, information technology, green policing and revenue generation avenues for promotion and development of heritage tourism in the district.
- ❖ New projects to diversify the tourist inflow apart from the pilgrimage/ religious tourism, emphasis on other tourism places for promotion of more tourism activities like, Arts & Crafts, Rural Tourism, Fair & Festivals, Waterfront development etc.
- ❖ Development of combined projects involving Tourism department/ Ministry, Disaster management department and Environment, forest, and climate change section/Ministry. Stakeholder consultation & Participatory management and involvement of Municipality, and local communities and tour operators to build ecotourism options and choosing adventure and religious tourism sites.

6. Discussion during the Report Presentation

- Howrah emphasized on two focus points: Tourism and Waste Management.
- The officials ensured that the suggestions have been noted and will be taken up in a planned manner.
- 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.

6 REFERENCES

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

https://agricoop.nic.in/sites/default/files/WestBengal%208-Howrah-31.12.2011_0.pdf

https://www.sciencedirect.com/science/article/pii/S0961953408001189?casa_token=5ELUJzrxE-oAAAAA:Il0pQ_R1yOq1nLf2sruJmz2nXf0IOLZOI0qQyu_sX1xpzlnMTJxElep_LRp9o2_kIQJJsGApo6Tv

<http://nittrbpl.ac.in/journal/volume3/Rajiv%20Varshney,%20J.%20L.%20Bhagoria,%20C.%20R.%20Mehta.pdf>

http://www.sameeksha.org/pdf/Howrah_galvinising/DPR_on_Biomass_Gasifier_for_FO_Based_Furnaces.pdf

<https://cdn.s3waas.gov.in/s353e3a7161e428b65688f14b84d61c610/uploads/2021/09/2021092933.pdf>

http://dcmsme.gov.in/old/dips/HOWRAH_wb.pdf

<https://cdn.s3waas.gov.in/s353e3a7161e428b65688f14b84d61c610/uploads/2021/11/2021110937.pdf>

<http://www.wbreda.org/>

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

<http://www.wbreda.org/>

<http://wbmd.gov.in/writereaddata/uploaded/DP/DPHowrah%2049725.pdf>

<https://cdn.s3waas.gov.in/s353e3a7161e428b65688f14b84d61c610/uploads/2021/09/2021092933.pdf>

http://dcmsme.gov.in/old/dips/HOWRAH_wb.pdf

<https://inputsurvey.dacnet.nic.in/RSL/districtsummarysizeclass1a.aspx>

<https://agricoop.nic.in/sites/default/files/WestBengal%208-Howrah-31.12.2011.pdf>

<https://cdn.s3waas.gov.in/s353e3a7161e428b65688f14b84d61c610/uploads/2021/11/2021110937.pdf>

<https://indianexpress.com/article/india/kolkata-howrah-railway-station-to-set-up-rooftop-solar-power-4666315/>

<https://wbpower.gov.in/policy/>

<https://portal.ceew.in/datastory/haora-west-bengal/>

<https://www.aop.org.uk/ot/industry/charity/2022/04/22/solar-powered-eye-care-centres-open-to-treat-one-million-people-in-india>

<https://www.wbgedcl.in/projects/>

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

https://www.indiagrowing.com/West_Bengal/Howrah

[http://www.howrahkvk.org/#:~:text=Paddy%20\(Aus%2C%20Aman%20and%20Boro,physiographic%20situations%20of%20the%20district.](http://www.howrahkvk.org/#:~:text=Paddy%20(Aus%2C%20Aman%20and%20Boro,physiographic%20situations%20of%20the%20district.)

https://agricoop.nic.in/sites/default/files/WestBengal%208-Howrah-31.12.2011_0.pdf

<https://www.getbengal.com/details/howrahs-green-revolution-with-first-of-its-kind-japans-miyawaki-forests>

<https://icar.org.in/node/8099>

Culture & Heritage. (n.d.). Retrieved August 30, 2022, from <https://howrah.gov.in/culture-heritage/>

Culture & Heritage of Howrah. (n.d.). Retrieved August 30, 2022, from <https://wbhc.in/>

Howrah. (n.d.). Retrieved August 25, 2022, from

https://wbhc.in/home/place_list/ZWU3YjY0Nzg4ZTZiNGJiNWQ5ZmUzZTgyNmZiYWUwN

[GMwODQ0YzVjOTc0M2EzZGMzYzRIMzc0NzRiOWY0NzFmZGI4OTg5NGQ0ODAwN2Zi](https://wbhc.in/home/place_list/ZWU3YjY0Nzg4ZTZiNGJiNWQ5ZmUzZTgyNmZiYWUwN)

[NjJmMzgwOTBhYzBjNmNhZjI3MTU0MjA3NTg2YjI1MmRjYjE4NzIxNjIyNjM1YTYxNzB](https://wbhc.in/home/place_list/ZWU3YjY0Nzg4ZTZiNGJiNWQ5ZmUzZTgyNmZiYWUwN)

[3dzJneWEySFRjN05wR0hqZFhSVTFmOXZCemNWdmRmbXM1ZEtaa045bzljPQ==](https://wbhc.in/home/place_list/ZWU3YjY0Nzg4ZTZiNGJiNWQ5ZmUzZTgyNmZiYWUwN)

Howrah District. (n.d.). Retrieved August 26, 2022, from <https://howrah.gov.in/>

Howrah Tourism. (n.d.). Retrieved August 29, 2022, from

<https://www.howrahonline.in/cityguide/howrah-tourism>

Rail Museum. (n.d.). Retrieved August 30, 2022, from

<https://www.holidify.com/places/howrah/railmuseum-sightseeing-1254548.html>

Wikipedia. (n.d.). Retrieved August 28, 2022, from https://en.wikipedia.org/wiki/Howrah_district

7 APPENDICES

Table 1 Biogas potential from animal waste.

Livestock	Residue type	Total population as of 2012	Manure yield* (kg/day)	Total manure generation annually (kg)	Average collection (75%)	Dry manure after removing Moisture content	Manure required for biogas* (kg/m ³)	Biogas potential (m ³ /yr)	m ³ /day
Cattle	Manure	226388	10	82,63,16,200	619737150	123947430	25	4957897.2	13583.28
Buffalo	Manure	5724	15	3,13,38,900	23504175	4700835	25	188033.4	515.16
Sheep	Manure	237	1	86,505	64878.75	12975.75	25	519.03	1.422
Goat	Manure	157017	1	5,73,11,205	42983403.75	8596680.75	25	343867.23	942.102
Pig	Manure	362	2.5	3,30,325	247743.75	49548.75	25	1981.95	5.43
Total		3,89,728						5492298.81	

Table 2 Biogas potential from agricultural waste.

Crop	residue type	Total crop production (tons) (2017-18)	Residue production ratio	Residue amount (tons)	Average collection (70%)	Moisture content	Residue amount after removing moisture (tons)	Biogas potential [m ³ /(tons of dry matter)]	Overall biogas potential (m ³)
Rice	husk	320391	0.28	89709.48	62796.636	30	43957.6452	800	35166116.16
sugarcane	bagasse	186	0.33	61.38	42.966	80	8.5932	750	6444.9
Total		320577							35172561.06

