

Status of Urbanization and Industrialization in West Bengal

GRBMP: Ganga River Basin Management Plan

by

Indian Institutes of Technology



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Preface

In exercise of the powers conferred by sub-sections (1) and (3) of Section 3 of the Environment (Protection) Act, 1986 (29 of 1986), the Central Government has constituted National Ganga River Basin Authority (NGRBA) as a planning, financing, monitoring and coordinating authority for strengthening the collective efforts of the Central and State Government for effective abatement of pollution and conservation of the river Ganga. One of the important functions of the NGRBA is to prepare and implement a Ganga River Basin Management Plan (GRBMP).

A Consortium of 7 Indian Institute of Technology (IIT) has been given the responsibility of preparing Ganga River Basin Management Plan (GRBMP) by the Ministry of Environment and Forests (MoEF), GOI, New Delhi. Memorandum of Agreement (MoA) has been signed between 7 IITs (Bombay, Delhi, Guwahati, Kanpur, Kharagpur, Madras and Roorkee) and MoEF for this purpose on July 6, 2010.

This report is one of the many reports prepared by IITs to describe the strategy, information, methodology, analysis and suggestions and recommendations in developing Ganga River Basin Management Plan (GRBMP). The overall Frame Work for documentation of GRBMP and Indexing of Reports is presented on the inside cover page.

There are two aspects to the development of GRBMP. Dedicated people spent hours discussing concerns, issues and potential solutions to problems. This dedication leads to the preparation of reports that hope to articulate the outcome of the dialog in a way that is useful. Many people contributed to the preparation of this report directly or indirectly. This report is therefore truly a collective effort that reflects the cooperation of many, particularly those who are members of the IIT Team. Lists of persons who have contributed directly and those who have taken lead in preparing this report is given on the reverse side.

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1. Introduction

Development of a nation presupposes inter alia growth of urban areas, on the one hand and industrialization, on the other. While rapid urbanization and industrialization is considered cornerstone for faster growth of a nation's economy, it comes at a significant environmental cost, if the process is not directed and controlled appropriately and if it does not imbibe the principles of the much used and abused term 'sustainable development'. Rapid, unregulated and unsustainable development including ruthless industrialization entail not only greater demand for natural resources and environmental goods, but it also leads to compromising of environmental quality.

In the course of history all major civilizations have developed on the banks of major river and River Ganga is no exception. Since time immemorial, River Ganga has been a perennial source of livelihood for millions of people across the country. However, due to, myriad of factors comprising, among others, population growth, unreasonable and unregulated growth of urban centres, unregulated pollution from industrial activities, significant infrastructure deficit and weak enforcement of legislations, the river is currently confronted with multitude of problems.

Against this backdrop, the present study attempts to examine the state of urbanization and industrialization in West Bengal – one of the leading basin states, and offer possible solutions for reviving and restoring water quality of River Ganga¹. Accordingly, this report is divided in two broad sections – first section dealing with issues and challenges arising out of urbanization in West Bengal; and second section dealing with the issues and challenges related to industrial development and the consequent implications on River Ganga. Subsequently the last section presents a set of conclusions and recommendations for consideration under the overall framework of the Ganga River Basin Management Plan (GRBMP).

2. Urbanization in West Bengal

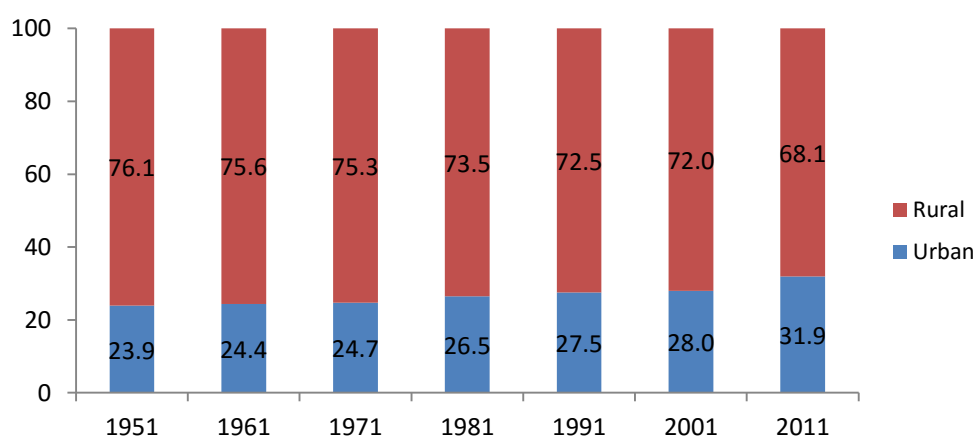
West Bengal's urbanization traces back to late 18th century when Kolkata, previously called Calcutta, emerged as the first port town and a commercial city. Urbanization was highly concentrated in the Calcutta region as British brought trade to Calcutta, which subsequently led to industrialization. Calcutta was the seat of colonial administration and the centre of colonial trade. Most of the major labour movements from Bihar, Uttar Pradesh and Orissa (now Odisha) to the tea gardens in Assam and plantations in Africa took place through Calcutta. Industrial growth around Calcutta was primarily based on export-oriented jute industry and was fuelled with the availability of favourable factors like access to port facility, inland water transport via the river-network supported by the Ganga and the railway infrastructure, thus covering a huge hinterland.

In course of history, there has been continual rise in the share of urban population in the state. As shown in Figure 1, around independence the level of urbanisation in the state was 24% which was well ahead of several states in the country; and currently about 32% of the total population lives in urban areas. What is disquieting is that there has been spatial concentration of urban

¹ Similar profiles have been developed for other main states in the Ganga basin, viz., Uttarakhand, UP and Bihar. Subsequently a consolidated document is prepared for the entire Ganga basin.

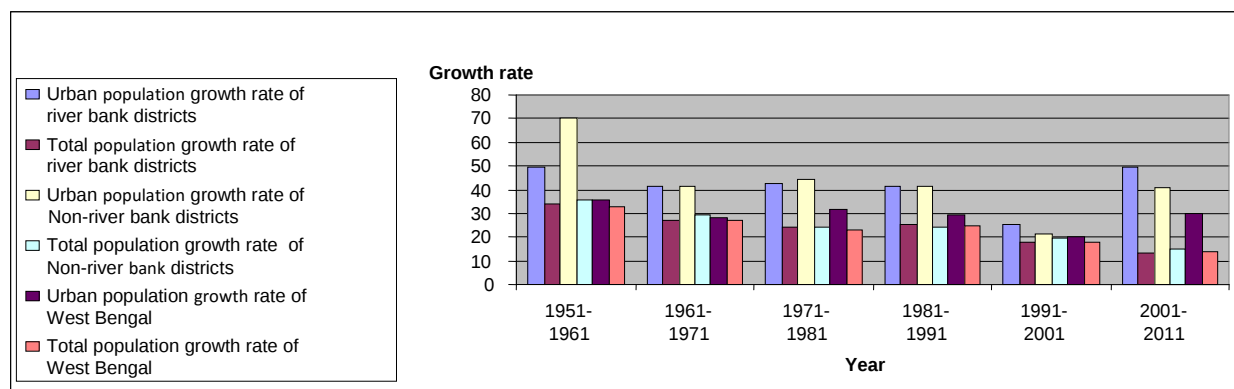
population in Kolkata urban agglomeration comprising the Kolkata Municipal Corporation Area and five other neighbouring districts viz. South 24-Paraganas, North 24 Paraganas, Howrah, Hoogly and Nadia. All these districts fall under the Ganga river basin. According to 2001 census, about 59% of the urban population of the state was residing only in Kolkata metropolitan area. Interestingly, Kolkata metropolitan area has three municipal corporations, 39 municipalities, 72 cities and 527 towns and villages. In 2011, Kolkata urban agglomeration was home to over 14.1 million population, making it the third-most populous metropolitan area in the country (Census of India, 2011). As a saturated city, Kolkata is confronted with overpopulation, unsustainable development, infrastructure deficiencies, unregulated growth of slums/ poor settlements, inadequate municipal services, considerable urban pollution and many other associated socio-economic problems.

Figure 1: Rural-urban Distribution of Population in West Bengal during 1951-2011 (%)



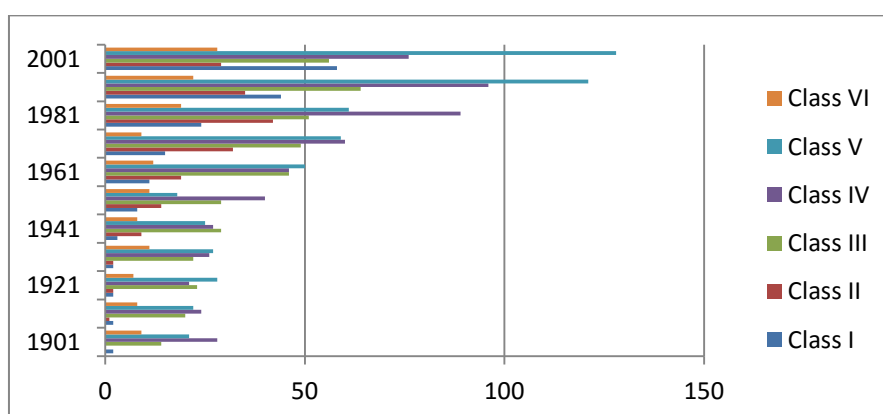
Source: Census report of India, 2011

As shown in Figure 2 West Bengal witnessed slow and largely steady rate of urbanization till 2001, the last decade has again experienced sudden upsurge in urban population. The estimates reveal that the growth rate of urban population in West Bengal declined during the period 1961-1971 and again steadily dropped especially during 1991-2001 before shooting up for a phenomenal rise again during the last decade. Likewise the growth rate of urban population in the 'river bank' districts recorded a phenomenal increase from 25% in 1991-2001 to 50% in the following decade. According to the provisional data of Census 2011 (Census of India, 2011), West Bengal remains one of the highly urbanized states of the country with currently 32% of the state's population residing in urban areas and it ranks fourth highest urbanised states in the country.

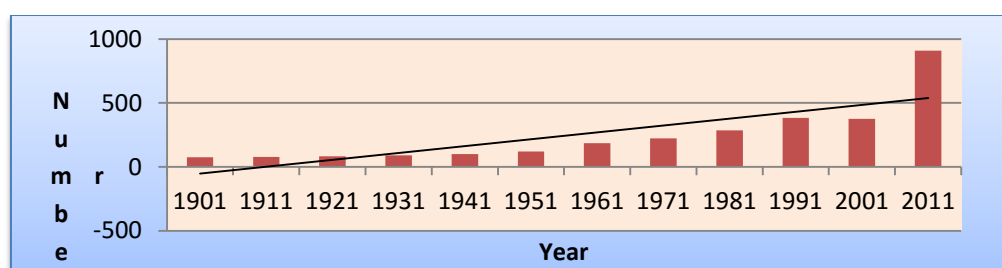
Figure 2: Growth rate of Urban and Total Population

Source: Computed from the Census reports of the respective years

According to the census 2011, West Bengal has made phenomenal jump in the number of urban centres over the last one decade. The number of 'census towns' has gone up from 255 in 2001 to 780 in 2011 and the number of statutory towns has increased from 375 in 2001 to 909 in 2011. In 2001, the state had as many as 58 class-I cities, 29 class-II cities and 56 class-III cities (Figures 3 & 4). It is interesting to note that as a consequence of forces of developmet around 580 hitherto villages have have graduated to the status of urban areas. As expected, towns and cities are largely concentrated in 'river bank' districts which accounted for almost 90% of class-I cities and 70% of class-II in 2001. North 24 Paraganas alone had a share of 22 cities in 2001 followed by 9 in Hooghly (Table 1).

Figure 3: Number of Towns/Cities in West Bengal according to Class, 1901-2001

Source: Census Report of India 1981, 1991, 2001

Figure 4: Number of Towns in West Bengal according to Years (1901 to 2011)

Source: Census Report of India of the relevant Years.

TABLE 1: DISTRICT-WISE CLASSIFICATION OF CITIES IN WEST BENGAL

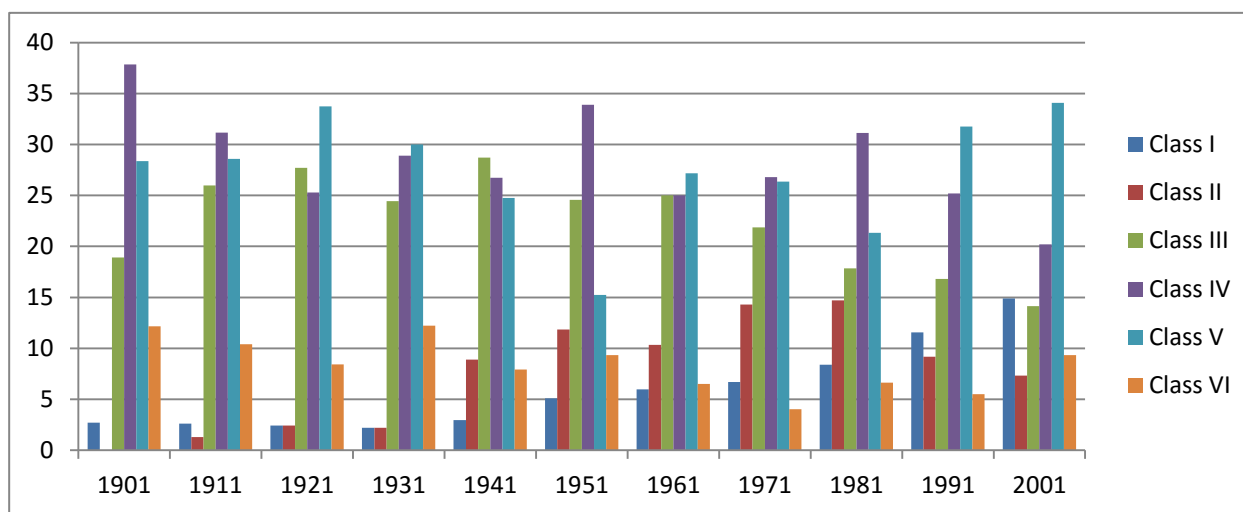
District	I		II		III		IV		V		VI	
	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001	1991	2001
River Bank District												
North 24 Paraganas	16	22	7	2	10	4	13	7	11	12	2	1
South 24 Paraganas	0	2	4	1	6	6	11	4	19	6	2	2
Burdwan	5	6	4	2	8	6	15	14	23	27	6	11
Hooghly	6	9	4	2	5	4	7	6	12	16	2	3
Howrah	3	3	1	1	3	7	17	14	22	23	1	5
Kolkata	1	1										
Malda	1	1		1	1		1		1	3		
Midnapore (Undivided)	3	3	2	4	4	4	9	4	1	4	3	2
Murshidabad	1	1	1	3	9	7	1	5	6	13		
Nadia	3	3	4	5	4	3	4	4	11	10	1	
Sub-total	39	51	27	21	50	41	78	58	106	114	17	24
Non River Bank District												
Bankura	1	1	1	1	1	1	1	1	2	1	1	
Birbhum			2	3	4	2				1	1	
Coochbehar			1	1		2	5	5	3	1		1
Darjeeling	1	2	1		2	2	2	2	1	2	2	1
Dakshin Dinajpur	1	1		1	1				1			
Jalpaiguri	1	1	2	1	3	4	5	7	4	2		1
Purulia		1	1		1	3	4	2	3	5	1	1
Uttar Dinajpur	1	1		1	2	1	1	1	1	2		
Sub-total	5	7	8	8	14	15	18	18	15	14	5	4
West Bengal	44	58	35	29	64	56	96	76	121	128	22	28

Source: Census of India: Relevant Issues

It is further noticed that the proportion of urban population in Class-I cities has risen over time. On the contrary, in class-II, III and IV cities, the proportion of population is found to have come down. However, the last two categories present an increasing trend (Figure 5). All these clearly reveal the enormity of the problems that has come up with the pace and nature of urbanization in

West Bengal. Especially, the growth of class-I cities across the river basin both in terms of size and number may pose a serious challenge not only to the health of the river basin in particular but also in terms of public health, safety and quality of life in general.

Figure 5: Proportion of Urban Population in West Bengal according to Class, 1991-2001

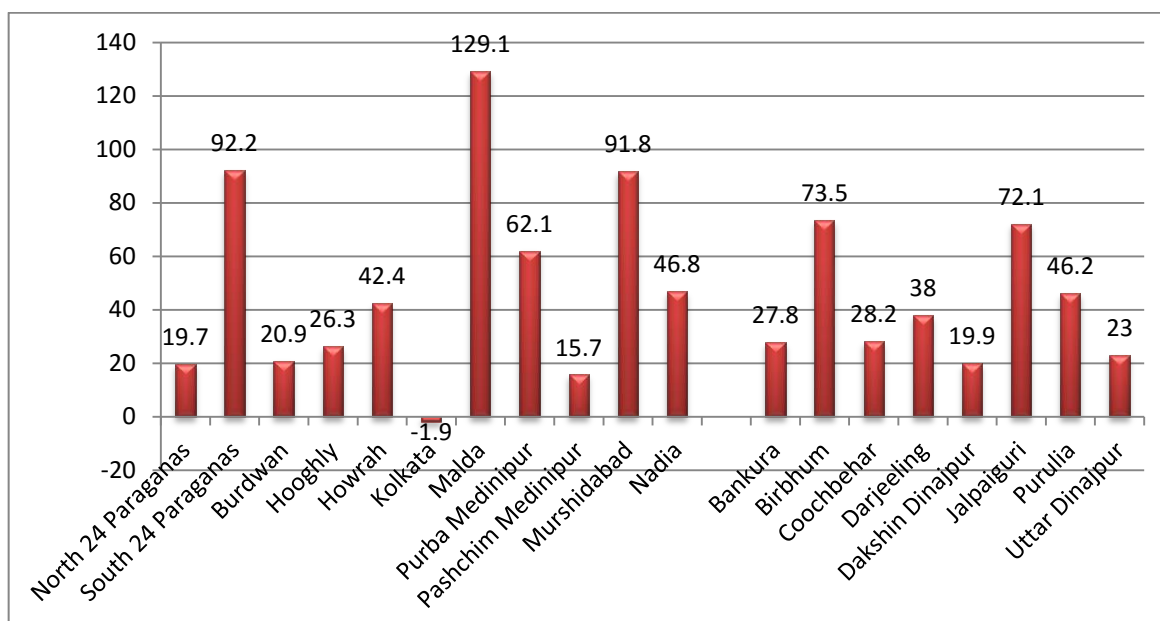


Source: Census of India, Relevant Issues.

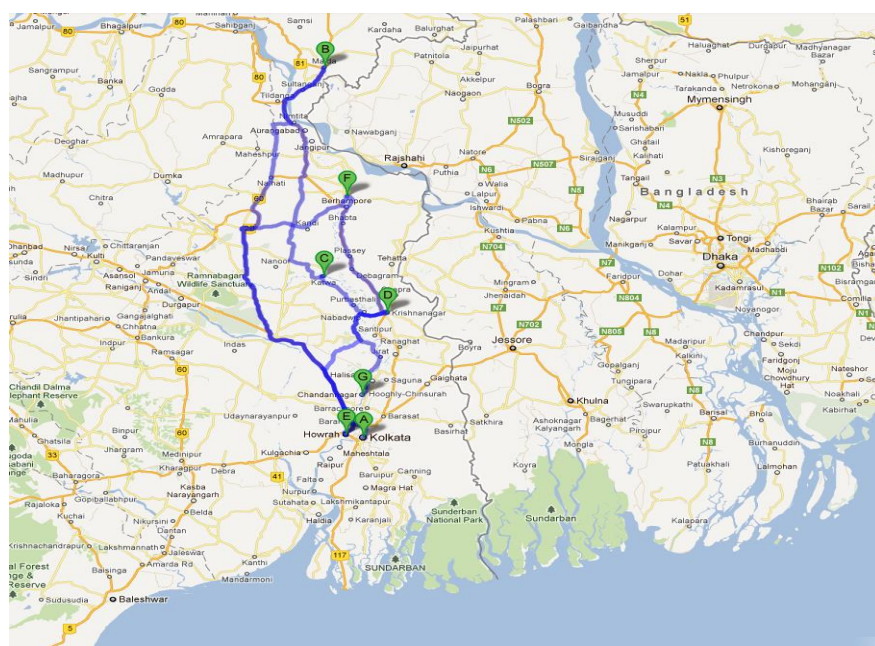
Another important feature of urbanization in West Bengal is the high density of urban population which in Census 2001 was recorded to be around 6798 per sq km. Intriguingly at that point of time almost 28% of the urban population was residing in only 2.93% land area of the state (www.wburbandev.gov.in/11th_Plan/6-8.pdf) causing severe pressure on urban and municipal infrastructure, services and quality of life.

2.1. Regional Pattern of Urbanization in West Bengal

As stated earlier, and as depicted in Figure 6 the growth rate of urban population is relatively higher in most of the 'river bank' districts of the state signifying comparatively higher prospects for economic growth and focus of developmental interventions. Some of the districts with exceptional decennial growth in urban population during 2001-11 comprise Malda (129%), South 24 Paraganas (92%) and Murshidabad (92%) indicating phenomenal shift of population towards urban centres as well as graduation of hitherto relatively larger villages into smaller census/statutory towns. On the otherhand it is interesting to note that Kolkata which is over three year old city has recorded negative growth rate during the last decade, signifying saturation and deceleration. Evidently increasing pressure on infrastructure, rising real estate costs and declining quality of life in Kolkata has led to out migration.

Figure 6: Growth Rate of Urban Population in West Bengal in 2001-2011 (%)

Source: Census Report of India 2011

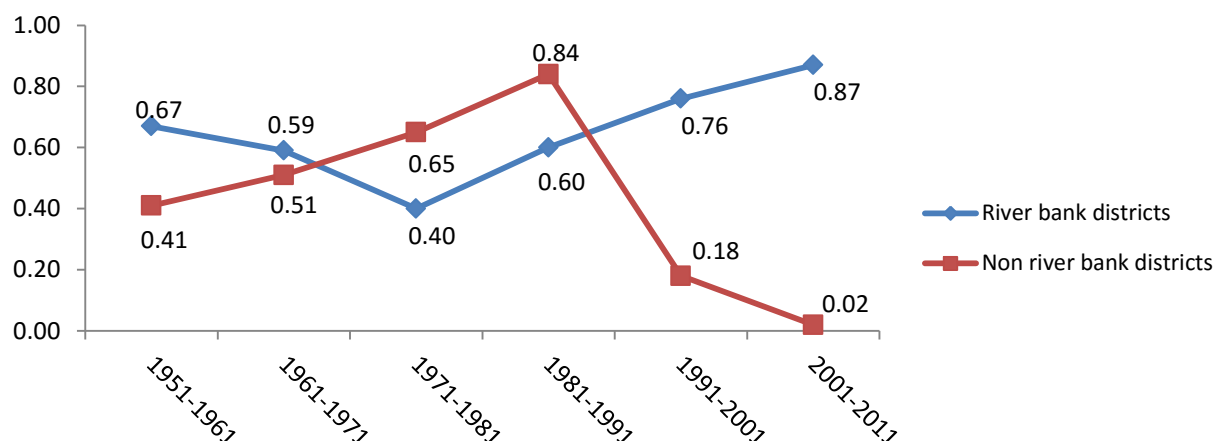
Figure 7: Major Urban Centres along River Ganga in West Bengal

Kolkata (A),
Malda (B),
Katwa (C),
Krishnanagar (D),
Howrah (E),
Murshidabad (F),
Chandannagar (G)

Source: <http://maps.google.co.in/>

As shown in Figure 8 in the case of the river bank districts of West Bengal there exists a strong correlation between urban population and total population. As stated earlier, this signifies major part of urban population growth across West Bengal is led by high population growth in river bank districts in the last decade.

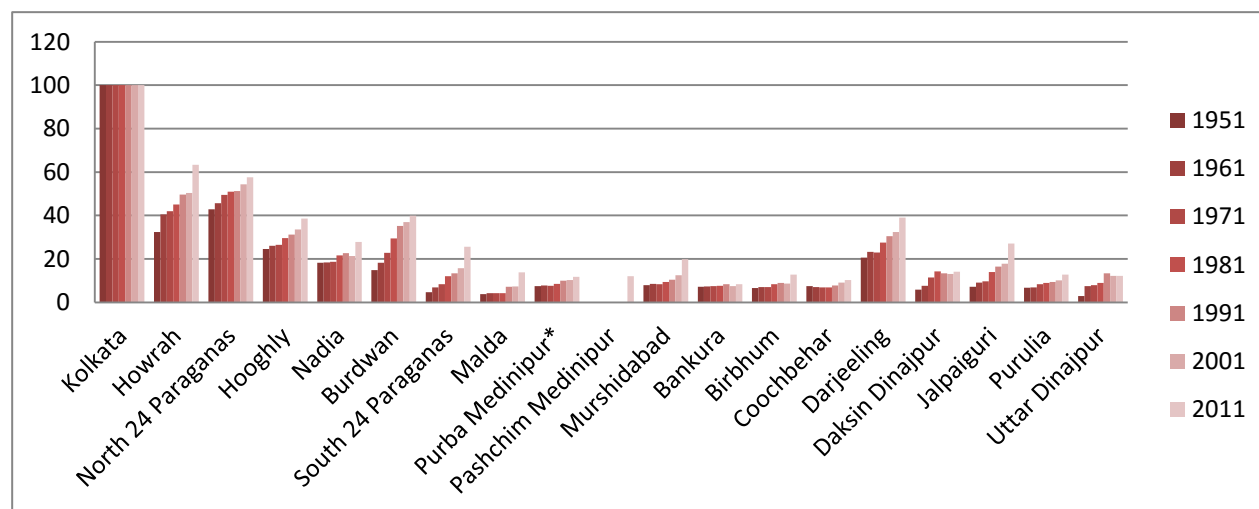
Figure 8: Correlation Coefficient between Growth Rate of Urban Population & Total population



Source: Census Report of India 1981, 1991, 2001 and 2011

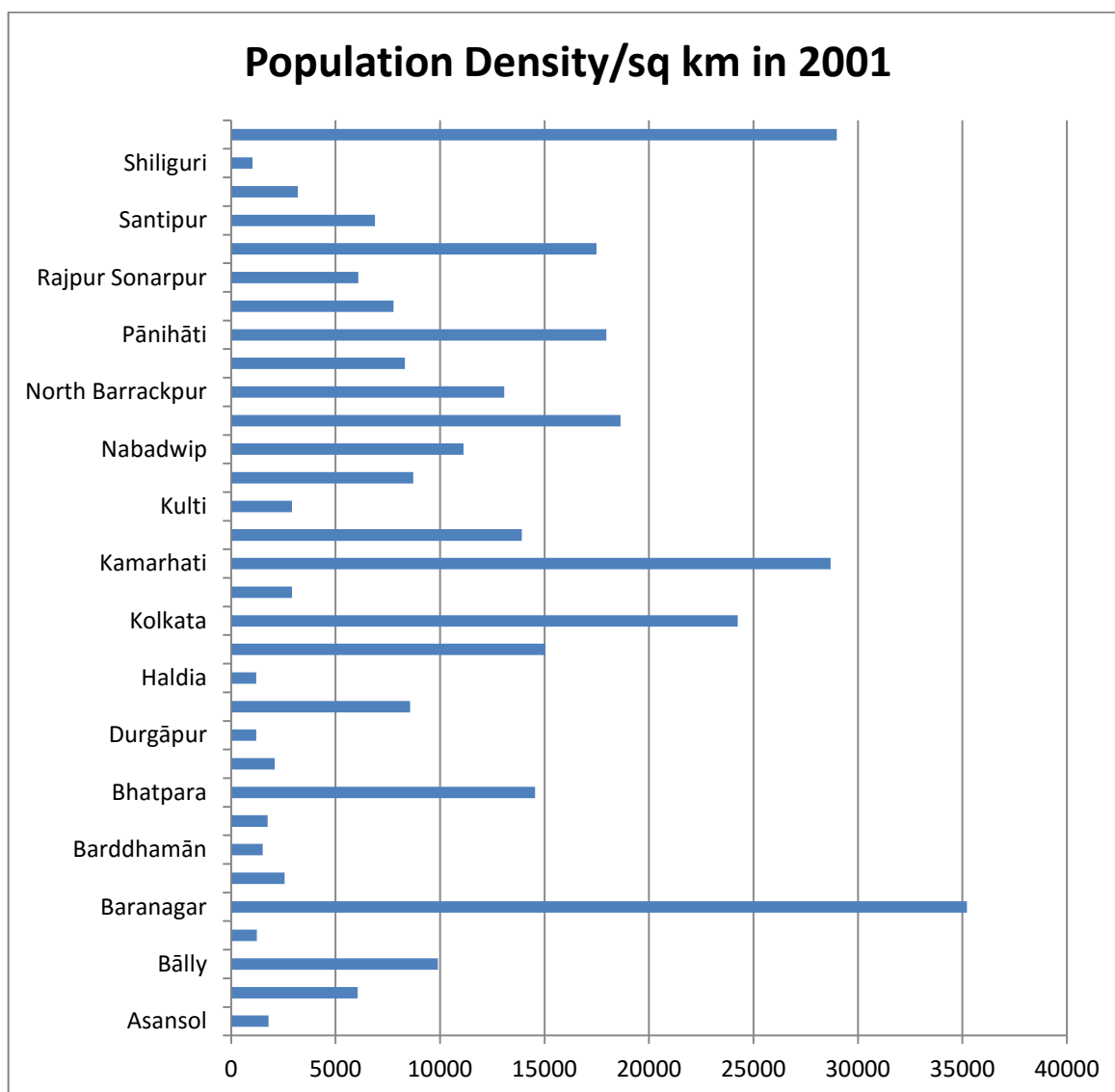
Figure 9 shows that there is greater concentration of urban population in river bank districts. Among these, Kolkata is classified as fully urbanized followed by Howrah with 63% and North 24 Paraganas with 58% urban population. There has been rise in the proportion of urban population in last decade in almost all districts of West Bengal, with river bank districts leading the trend.

Figure 9: District wise percentage of urban population in West Bengal (1951-2011)



Source: Census Report of India, 2011

From Figure 10 it is interesting to note that among the major towns in the state, Baranagar followed by South Dumdum, Kamarhati and Kolkata record incredibly high density of population which is in excess of 24,000 persons/ sq.km. All these towns fall in the Kolkata Metropolitan Area while the former three fall in North 24 Parganas, exhibiting the extent of urbanization of the district.

Figure 10: Density of Population in select Urban Centres of West Bengal

Source: census of India, 2001

A further classification of the districts in Table 2 according to the magnitude of urban population and urban population growth clearly reveals the extent of urbanization of each district. It is evident that over the years, while some districts have moved from establishing an urbanization trend to getting urbanized, there are districts which have retained rural status. As per the Census 2011 on average all of the 9 'non-river bank' districts are considered rural, while as many as 5 out of the 10 'river bank' districts are either classified as urbanized or have established a strong trend towards urbanization. Districts like Kolkata, Howrah and North 24 Paraganas are already urbanized, while Hooghly and Burdwan experience the trend of urbanization. Intriguingly Malda despite having witnessed the highest decennial urban population growth rate, as a district still continues to be classified as rural.

TABLE 2: DISTRICT-WISE URBANIZATION TREND IN WEST BENGAL

Districts	1951	1961	1971	1981	1991	2001	2011
River Bank District							
North 24 Paarganas	Urbanization trend	Urbanization trend	Urbanization trend	Urbanized	Urbanized	Urbanized	Urbanized
South 24 Paraganas	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Burdwan	Still Rural	Still Rural	Still Rural	Still Rural	Urbanization trend	Urbanization trend	Urbanization trend
Hooghly	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Urbanization trend	Urbanization trend
Howrah	Still Rural	Urbanization trend	Urbanization trend	Urbanization trend	Urbanization trend	Urbanized	Urbanized
Kolkata	Urbanized	Urbanized	Urbanized	Urbanized	Urbanized	Urbanized	Urbanized
Malda	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Midnapore (undivided)	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Murshidabad	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Nadia	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Non River Bank District							
Bankura	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Birbhum	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Coochbehar	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Darjeeling	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Daksin Dinajpur	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Jalpaiguri	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Purulia	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
Uttar Dinajpur	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural
West Bengal	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural	Still Rural

Source: Magnitude inferred from Table 4(Census Report of India 1981, 1991, 2001 and 2011, Government of West Bengal)

2.2. Migration Characteristics and Slum Population in West Bengal

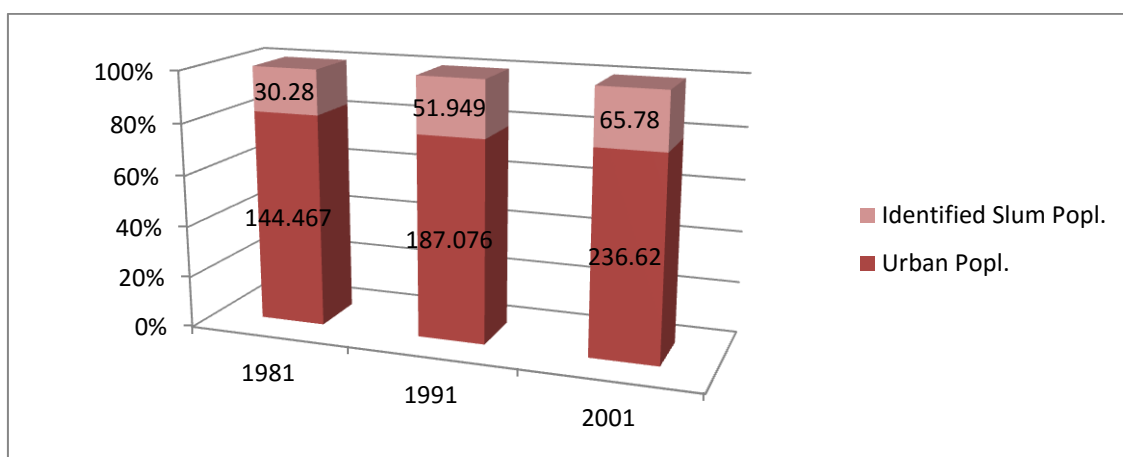
Migration is one of the important factors contributing to the growth of urban population in the country. The total urban population of the country, excluding Jammu and Kashmir increased from 217.6 million in 1991 to 283.6 million in 2001 registering a growth rate of 30.3%. The migration data of Census 2001 indicate that 20.5 million people enumerated in urban areas across the country are migrants from rural areas who moved in during the last 10 years. In line with this trend, West Bengal has also witnessed significant rise in migration. In 2001, West Bengal was the third largest recipient of migrants (5.5 ml) by place of birth from other states and other countries next only to Maharashtra and Delhi (Census of India, 2001).

Examining the total number of in-migrants by last residence (duration 0-9 years) into important urban agglomerations, it is observed that Kolkata agglomeration is one of the leading destinations

witnessing more than 8.22 lakh in-migrants during 1991-2001 and which constituted about 6.2% of the total population. Among them, over 4.70 lakh in-migrants were from within the state, 2.97 lakh from other states and the remaining 55,000 were from other countries e.g., Bangladesh, Myanmar, etc. (Census of India, 2001).

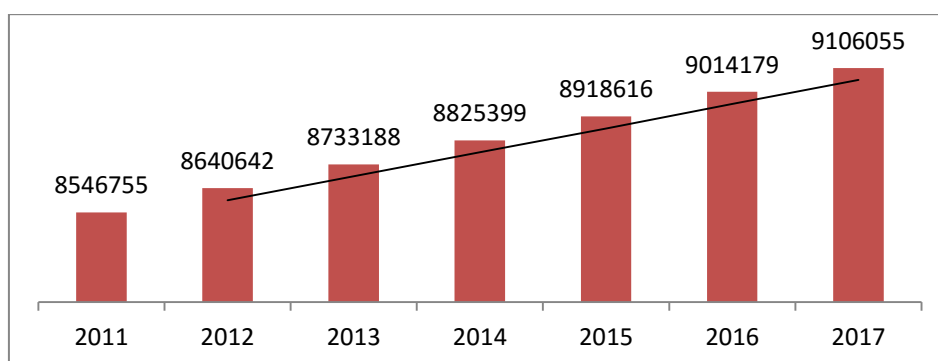
Obvious fallout of unrestrained urbanization is the concomitant rise in urban slums and slum population, posing further challenge to city administration as well for the receiving environment (Figure 11). According to an estimate, in 2000, there were 7828 slums in West Bengal of which as many as 6330 were non-notified (www.westbengalstat.com). Over the years the slum population in the state has risen considerably. From a modest 30 lakh slum population in 1981, it was estimated to be close to 66 lakh in 2001 – the latter constituting a staggering 28% of the total population of the state. Close to 15 lakh people reside in slums in Kolkata M.C. alone which constitutes 39% of the total state slum population. Other urban centres with high concentration of slum population are Asonsol, Durgapur, Uluberia and Howrah (Annexure 14). According to an estimate, total slum population in West Bengal is projected to cross 8.5 million by 2011 and 9.1 million by 2017 (Figure 12).

Figure 11: Identified/Estimated Slum population in West Bengal (in Lakh)



Source: Compiled from the statistics released by: A Compendium on Indian Slums 1996, Ministry of Urban Affairs, Govt. of India and Compendium of Environment Statistics, 2000, Central Statistical Organisation, Ministry of Statistics and Programme Implementation, Govt. of India. www.westbengalstat.com

Figure 12: Projected Slum Population in West Bengal



Source: Ministry of Housing & Urban Poverty Alleviation, Govt. of India

With the proliferation of slums and slum population, urban living conditions across the cities and within the settlements invariably deteriorate. An estimate in Table 3 suggests that during 2002, as many as 373 for every 1000 slums did not have sewerage system. During the same period, arrangement for garbage disposal did not exist in 294 slums per 1000 slums. In 1993, out of every 1000 slums, as many as 228 slums had no drainage facilities and 590 had open drainage facilities (www.westbengalstat.com). All this data clearly present miserable living conditions for the slum population in particular which affects their health and in general the public health of city population as well.

TABLE 3: NUMBER OF NOTIFIED SLUMS BY AVAILABILITY OF SEWERAGE PER 1000 SLUMS IN WEST BENGAL

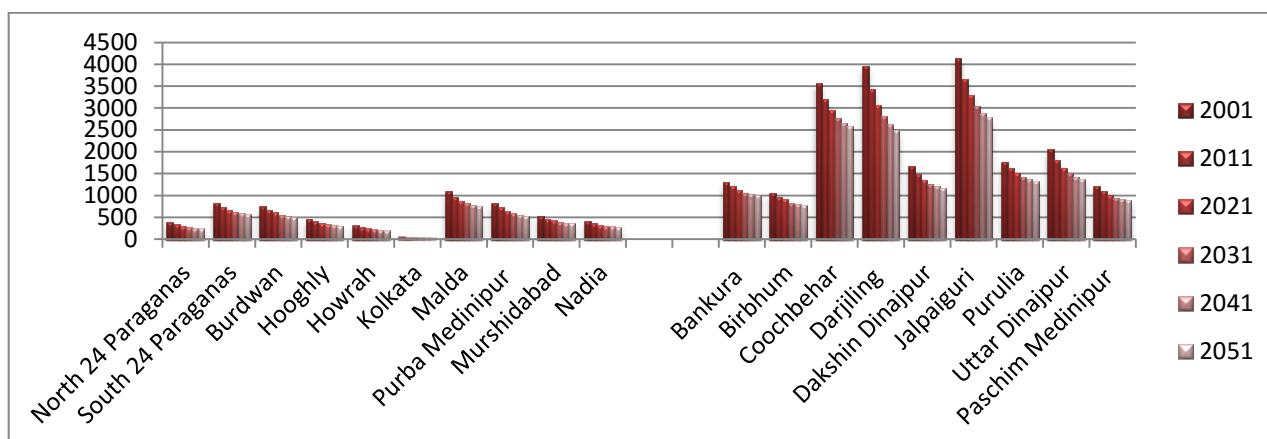
(July 2002-December 2002)

States/UTs	Underground Sewerage System				Number of Slums	
	Available	Not Available	N.R.	All	Estimated	Sample
West Bengal	627	373	0	1000	2871	38
India	300	700	0	1000	26166	360

Source: Compiled from the statistics released by: Condition of Urban Slums, NSS Report No. 486, 58th Round (July 2002-December 2002).

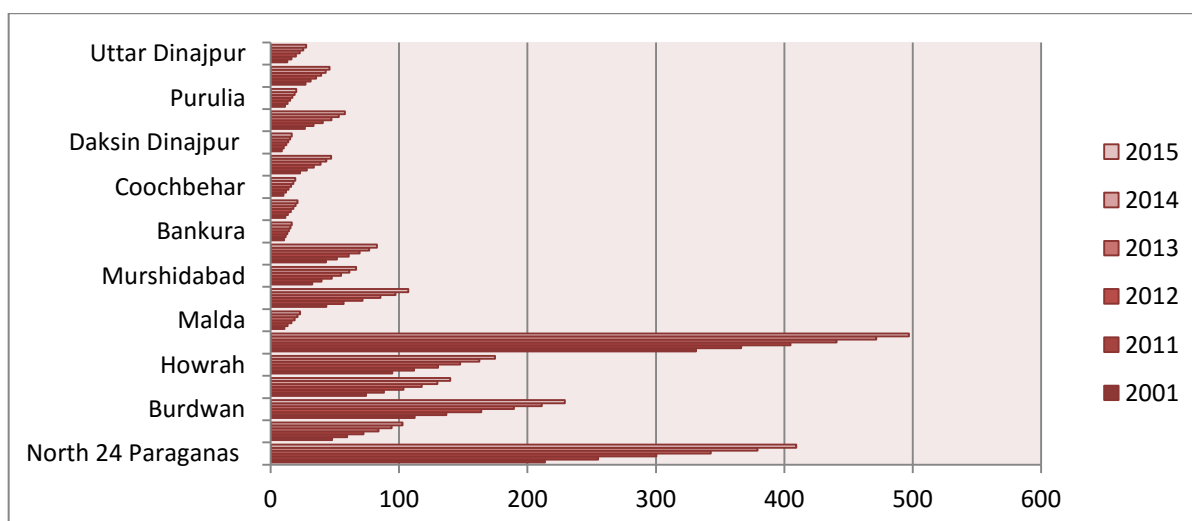
2.3. Water Demand

With the increase in population, the per capita availability of water across the districts of West Bengal is found to be low and also on the decline. All 'river bank' districts are found to have registered very low per capita availability of water compared to non-bank districts. This is possibly because there is greater concentration of population in 'river bank' districts. As shown in Figure 13, with the increasing trend of urbanisation, per capita water availability in the 'river bank' districts is projected to fall rapidly compared to the non-bank districts. It is important to note that while on the one side across all districts there is a continual fall in per capita availability of water, the demand in urban areas in general is on the rise, thus carrying serious implications for the river Ganga. According to a recent projection, the demand for domestic water is expected to increase to 2102.5 BCM by 2015 from 1144.2 BCM in 2001 (Figure 14). As expected, Kolkata will continue to lead urban demand with its projected demand rising to 497 BCM by 2015 followed by North 24 Parganas (409.28 BCM), Burdwan (229.13 BCM) and Howrah (174.79 BCM) (Figure 14). The river banks districts will witness total demand of as high as 1832 BCM (Figure 15) while that of the non-river banks will be only a small fraction at 15%.

Figure 13: Per Capita Availability of Water in West Bengal (in cubic meter)

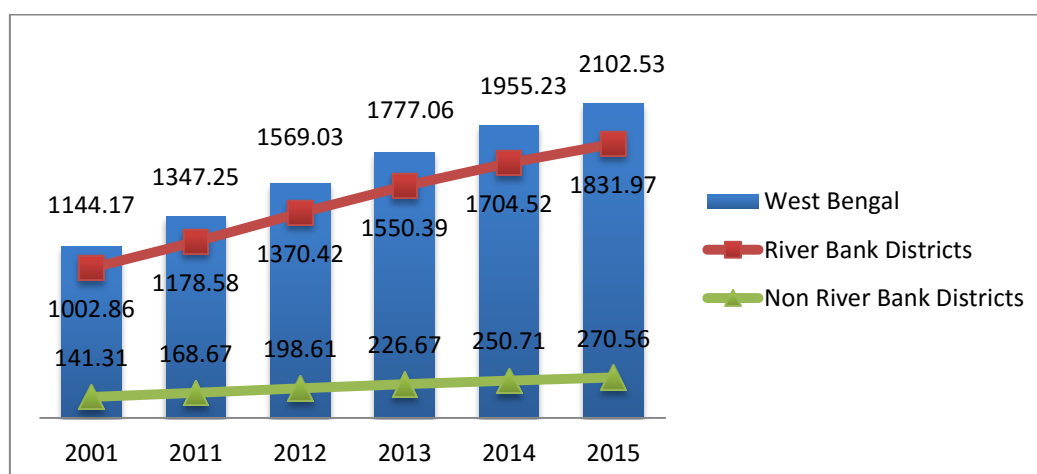
Source: State of Environment Report on Water Resource and its Quality

Note: First ten districts are river-bank districts and the remaining are non-river bank districts.

Figure 14: District wise Projected Demand for Domestic Water in Billion Cubic Meters

Source: Based on PFI Projections (PFI-PRB, 2007)

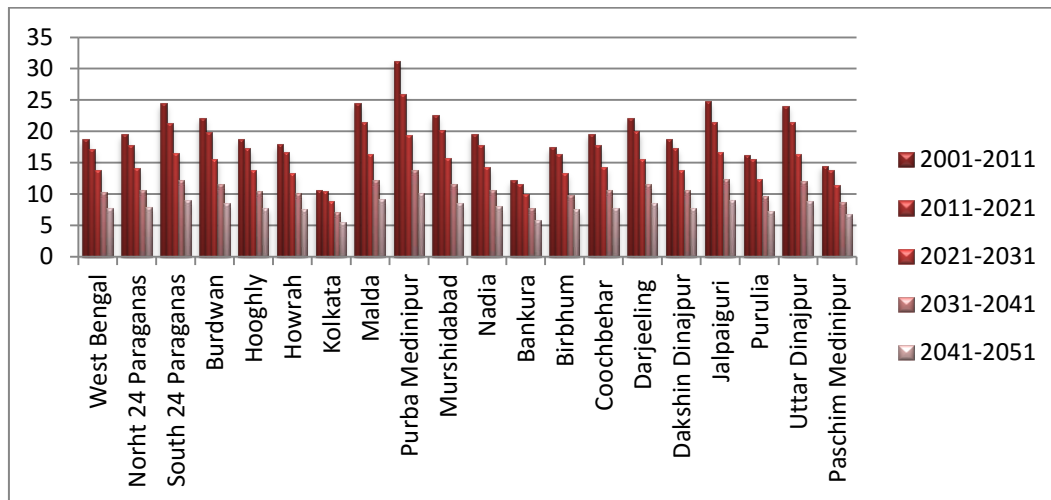
Note: First nine districts are non-river bank districts and the remaining ones are river bank districts.

Figure 15: Projected Demand for Domestic Water in West Bengal in Billion Cubic Meters

Source: Based on PFI Projections (PFI-PRB, 2007)

Considering growth rate of domestic water demand in West Bengal, it is predicted that commensurate with the increased urban population, the growth rate for West Bengal remains the highest during 2001-2011 (17.91%). During the subsequent decades, even if the growth rate of domestic water demand declines, a positive and high growth rate for the state indicates enormous pressure in the coming days on the river water as a significant source of domestic water (Figure 16).

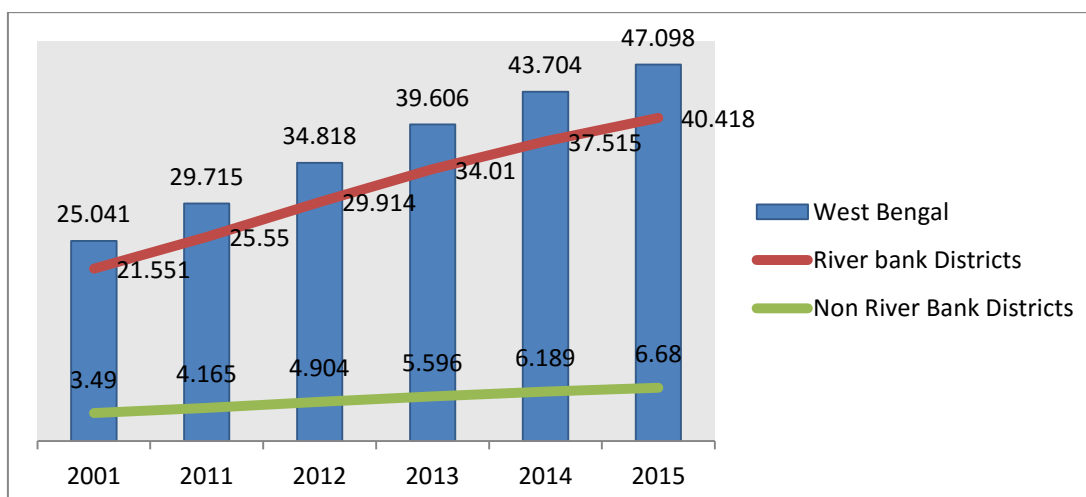
Figure 16: Growth Rate of Projected Demand for Domestic Water in West Bengal



Source: Based on PFI Projections (PFI-PRB, 2007).

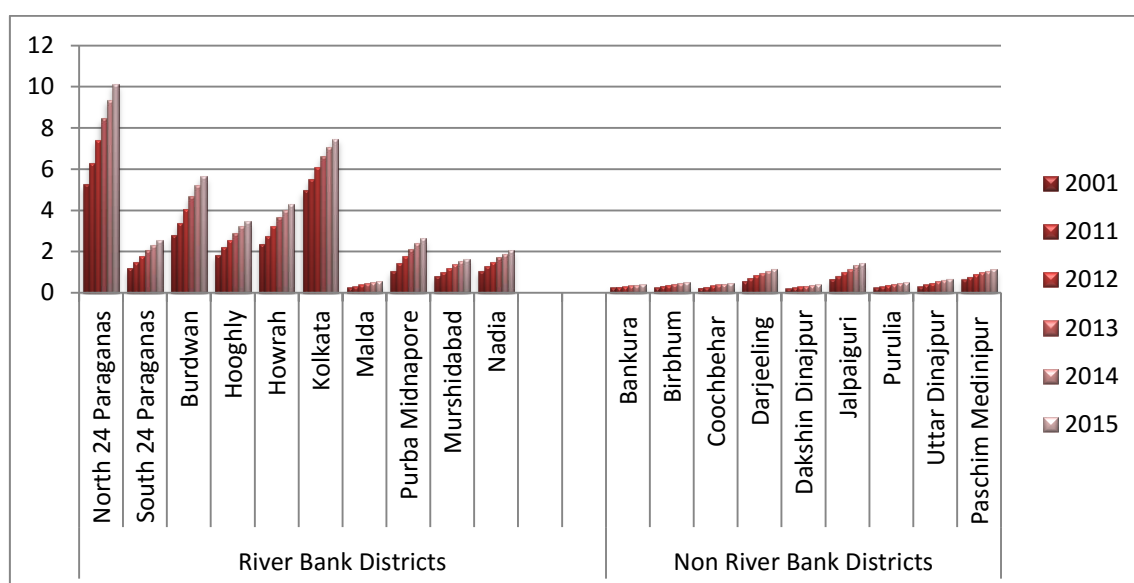
Turning to drinking water, the scenario is no better. Urban demand for drinking water is projected to almost double from 25 BCM in 2001 to over 47 BCM by 2015 (Figures 17 and 18). Interestingly river bank districts, having larger concentration of urban population, will alone demand drinking water over 40 BCM by 2015. Similar to the domestic water demand, the decennial growth rate of drinking water in river bank districts will continue to remain higher than that in non-river bank districts (Figure 19).

Figure 17: Projected demand for Drinking Water in Billion Cubic Meter (BCM)



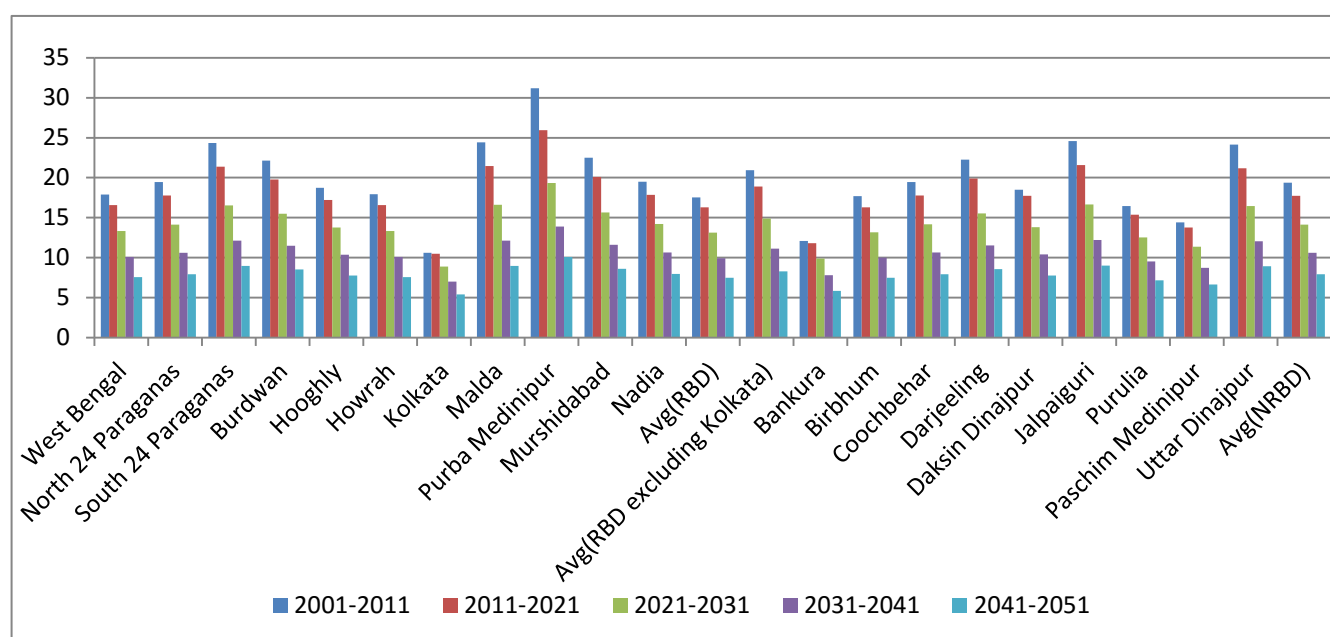
Source: Based on PFI Projections (PFI-PRB, 2007).

Figure 18: Districtwise projected demand for Drinking Water in Billion Cubic Meter (BCM)



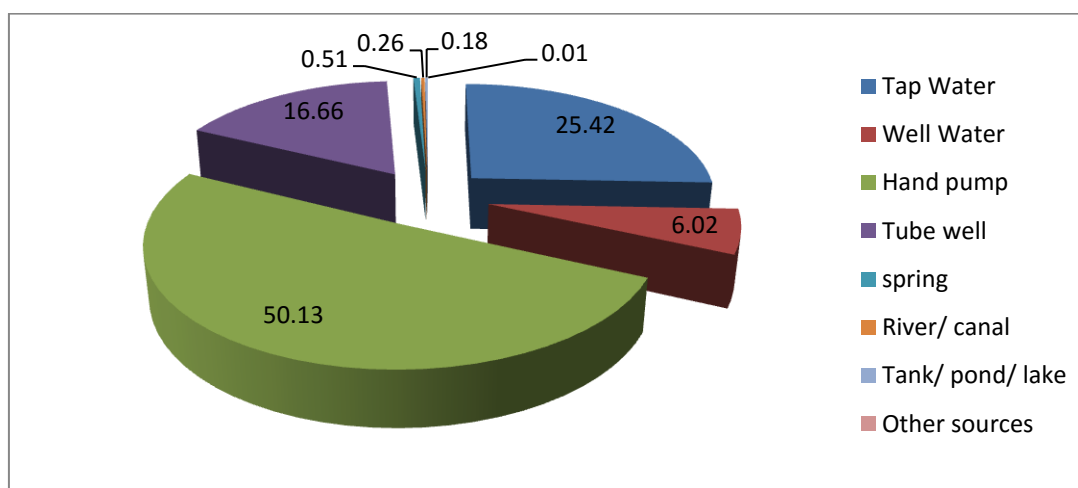
Source: Based on PFI Projections (PFI-PRB, 2007).

Figure 19: Growth Rate of Projected Demand for Drinking Water

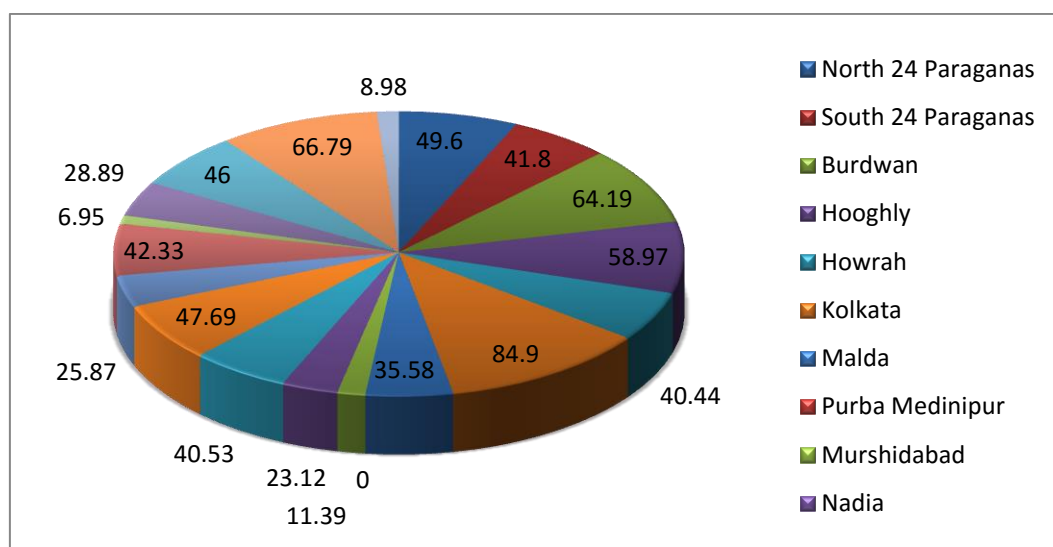


Source: Based on PFI Projections (PFI-PRB, 2007).

In urban areas of West Bengal, tap water constitutes the single most prominent source of drinking water. The two other important sources are hand pumps and tube wells (Figure 20). Among the river bank districts, about 85% of the urban households in Kolkata have access to tap water from treated sources, while 59% of the urban households in Hooghly, 42% in south 24 Parganas and 40% in Howrah have access to tap water from treated sources (Figure 21).

Figure 20: Main Sources of Drinking Water in West Bengal (%)

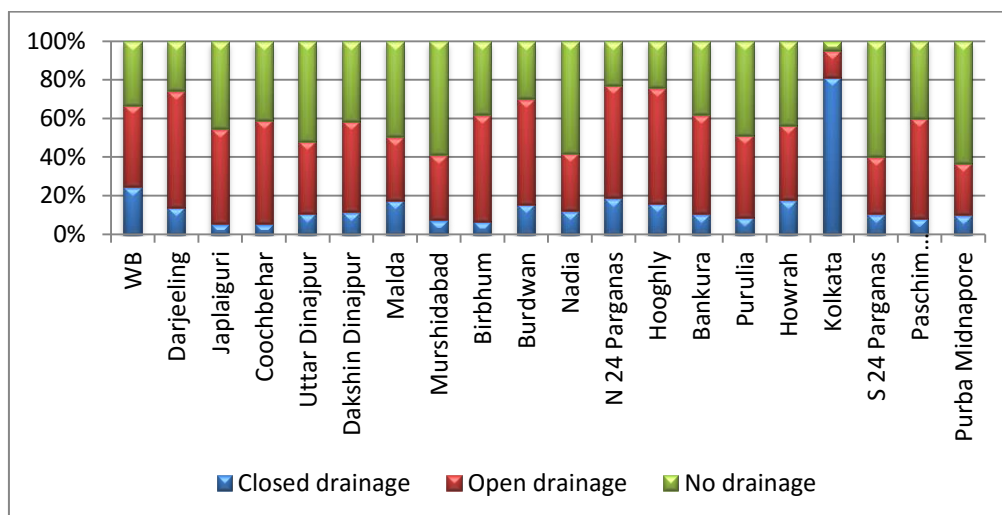
Source: Estimated from the tables on houses, household amenities and assets, Census of India, 2011

Figure 21: Percentage of Urban Households with Access to Treated Tap Water (%)

Source: Estimated from the tables on houses, household amenities and assets, Census of India, 2011

2.4 Wastewater drainage and treatment

Waste water disposal in urban areas of the state remains a major area of concern. In almost all the districts, a large majority of urban households are devoid of or have only access to open drainage facilities (Figure 22). Except for Kolkata, coverage with sewerage is very low. About 42% of the urban households discharge sewage into open drains, while over 33% do not have access to drainage facilities. This deficit of essential infrastructure has serious implications on public health and quality of life.

Figure 22: Percentage Distribution of Waste Water Sewage Facilities for Urban Households

Source: Estimated from the tables on houses, households and assets, Census of India, 2011

In this context it is also noted that in most of the Class-I and Class-II cities of West Bengal which discharge sewage in to River Ganga, there is serious shortfall in sewage treatment capacity. For instance in the case of Kolkata, as shown in Table 4, against estimated sewage generation of 618 MLD only a meager 28% is getting treated. For the 22 selected cities listed in Table 4 below, the aggregate deficit in sewage treatment capacity is reported to be 56%. It is also evident that a number of smaller cities and towns across the state do not have any form of treatment facility at all. As a result of this infrastructure deficit a large volume of sewage is getting discharged into the River Ganga or its tributaries without any treatment. Looking at this scenario it is evident that a serious effort is needed to strengthen sewerage infrastructure in the urban areas across the state.

TABLE 4: AVAILABLE CAPACITY FOR SEWAGE TREATMENT IN SELECTED CITIES IN WEST BENGAL

Sr. No.	City/Town	Total Sewage Generation (in MLD)	Treatment Capacity (in MLD)	Percentage covered	Treated Sewage Disposal
1	Kolkata	618.4	172	28%	Ganga river
2	Haldia	24.5	24.5	100%	Ganga riverbasin
3	Santipur	18.7	18.7	100%	Ganga river
4	Nabadwip	15.5	10	65%	Ganga river
5	Basirhat	15.3	-	0%	Ganga river
6	Bangaon	13.8	-	0%	Ganga river
7	South Dumdum	53	52.9	100%	Ganga river basin
8	Rajpur Sonarpur	33.6	45.4	100%	Ganga river basin
9	Kamarhati	48.8	40	82%	Ganga river
10	North Dumdum	29.7	-	0%	Ganga river basin
11	Ulberia	27.3	24	Naihati	Ganga /Other

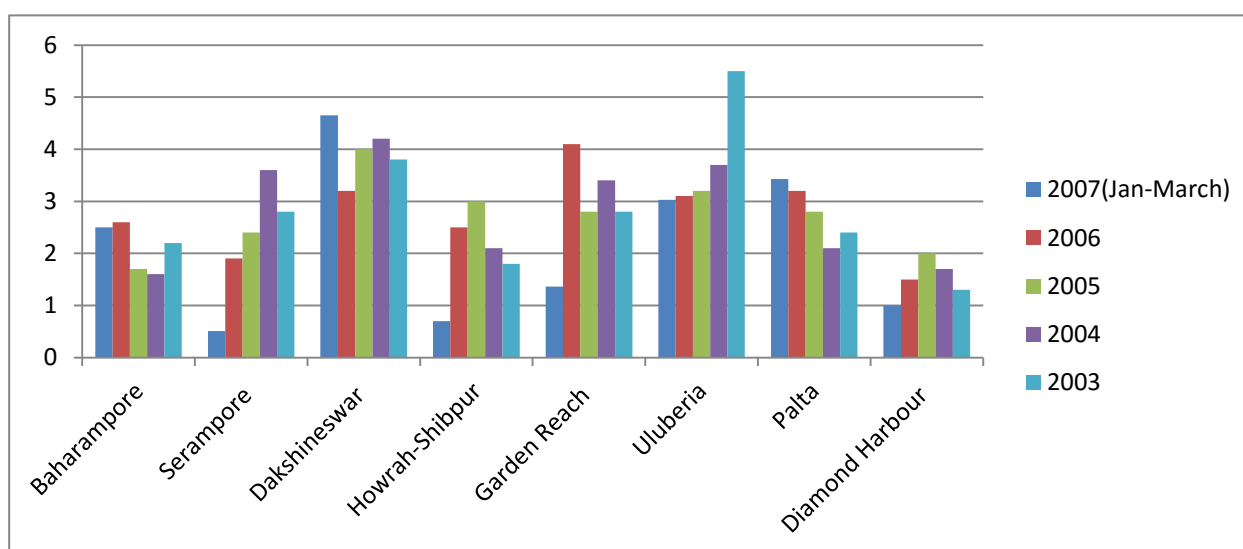
Sr. No.	City/Town	Total Sewage Generation (in MLD)	Treatment Capacity (in MLD)	Percentage covered	Treated Sewage Disposal
					basin
12	Kanchrapara	17	-	0%	Ganga river
13	Halisahar	16.8	-	0%	Ganga river
14	North Barrackpore	19.2	16.7	87%	Ganga river basin
15	Rishra	13.5	15.3	100%	Ganga river
16	Ashoknagar Kalyangarh	17.3	15	87%	Ganga river basin
17	Howrah	136.2	63.9	47%	Ganga river
18	Bhatpara	59.7	28.5	48%	Ganga river
19	Maheshtala	52.5	3.9	7%	Ganga river
20	Serampore	26.7	18.9	71%	Ganga river
21	Chandannagar	16.1	22.7	100%	Ganga river
22	Habra	17.2	-	0%	Ganga river
	Total	1290.8	572	44.34%	

Source: Status of Water Supply, Waste Water Generation and Treatment in Class-I cities of India, CPCB, 2010

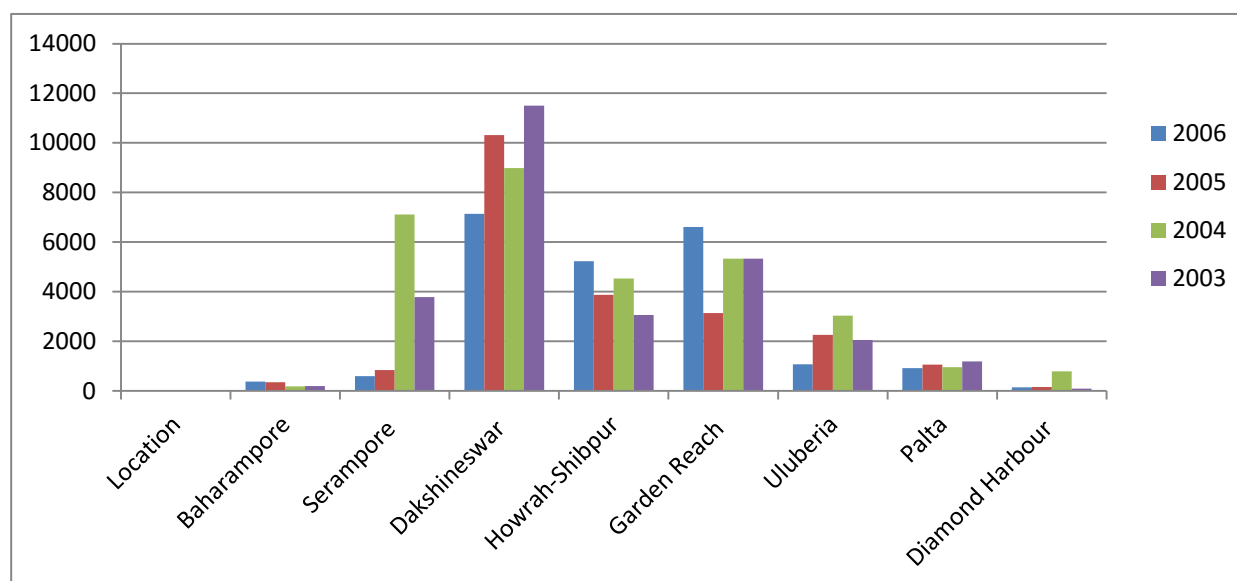
Impact on River Ganga

As result of discharge of untreated sewage into water bodies water pollution level across various locations in the state is on the rise. For instance in terms of 'biological oxygen demand' (BOD), most affected locations are Dhakhineswar, Uluberia, Garden reach and Palta. Likewise in terms of total coliforms, a number of locations in Kolkata region are found to be above the prescribed limits. With increasing population, urbanisation and rising waste loads and without the concurrent strengthening of infrastructure, several places have recorded deterioration in the quality of the receiving water bodies (Figures 23 & 24 and Table 5).

Figure 23: Biological Oxygen Demand (BOD) [Standard "<3mg/l"] (in mg/l)



Source: Statistical Abstract, 2008

Figure 24: Total Coliform (TC) [Standard " <5000MPN/100ml"] (in mg/l)

Source: Statistical Abstract, 2008

Table 5: BOD, DO and Faecal Coliform Compliance with the Standard, and Trends in the River Ganga

Location	BOD		DO		Faecal Coliform	
	Compliance with std	Trend	Compliance with std	Trend	Compliance with std	Trend
Ganga at Bhagalpur Rajmahal	Yes	Increasing	Yes	Increasing	No	Decreasing
Rajmahal	—	Increasing	—	Marginally	—	Marginally increasing
Ganga at Kahalgaon	Yes	Marginally	Yes	Increasing	No	Decreasing
Baharampore	Yes	Decreasing	Yes	Marginally	No	Decreasing
Serampore	Yes	Decreasing	Yes	No trend	No	Decreasing
Dakshineswar	No	Increasing	Yes	Marginally	No	No trend
Howrah-Shibpur	Yes	Decreasing	Yes	No trend	No	No trend
Garden Reach	Yes	Increasing	Yes	No trend	No	Marginally increasing
Uluberia	Yes	Marginally	Yes	Marginally	No	Marginally decreasing
Palta	Yes	Decreasing	Yes	Marginally	No	Decreasing
Diamond Harbour	Yes	No trend	Yes	Marginally	No	Decreasing

Source: Ganga Water Quality Trend, CPCB, 2010.

3. INDUSTRIALIZATION IN WEST BENGAL

3.1. A Historical Account

West Bengal had a long tradition of leading the industrial economy of India. In the ancient and the medieval period, Bengal was one of the leading regions of the country in production of manufactured and industrial products. Abundance of natural resources coupled with availability of

skilled artisans helped the province to achieve phenomenal growth of cottage industries, especially in the fields of silk goods and cotton fabrics. Growth of the industry sector accelerated further during the colonial regime. Modern industrialization process started in the province during this regime, with setting up of the first jute mill around 1850. Subsequently, the British made the province as the manufacturing hub in India. Endowment of rich and varied natural resources, locational facilities, and skilled workforce led to the foundation of a modern industrialization process. Besides, the huge domestic market in the eastern India as well as in the neighbouring countries like Nepal, Bhutan and other Southeast Asian countries had also facilitated rapid industrial growth in Bengal. Many major industrial companies such as Jessop Engineering, Richardson Cruddas, Gillanders Arbuthnot & Co., etc. had their roots in Kolkata.

Industrialization process reached its peak at the beginning of the twentieth century and Bengal experienced the highest rate of growth of the industry sector amongst all the states in the country (Sen, 1987). Bengal in general and Calcutta in particular became the centre of commercial and industrial activities of the eastern part of the country with high concentration of industrial capital. Even at the dawn of independence, West Bengal was the premier industrialized state in the country with employment of over six lakh people in the organized sector in 1948. Between 1948 and 1962, many of the major public sector manufacturing ventures such as Chittaranjan Locomotive Works, Durgapur Steel Plant and Damodar Valley Corporation were set up in the state. Industrial production during this period was largely confined to export oriented processing (e.g., jute), plantation (e.g., tea), extractive mining, and engineering (e.g., wagon making).

However, the situation started changing after independence, particularly since the beginning of the 1960s. During the British rule, the economy of Bengal was largely dominated by the multinational corporations and large business houses. But, with the beginning of the planning era, shackles were put on growth and expansion of these business houses. Second, due to the partition of Bengal, two major industries viz., jute and tea were adversely affected in addition to migration from the erstwhile East Pakistan that created huge population pressure in the state. Third, the discriminatory licensing system and freight equalization policy of the central government, as it has been debated since long, created bias against West Bengal. All these factors coupled with over commitment of the colonial firms towards unprofitable sectors forced many of the enterprises not to reinvest profits in the state, instead to remit them abroad or to set up business units in other states. In addition, political uncertainties prevented new investors from investing in the state.

As a result, the growth of the industry sector in West Bengal started slowing down, and eventually the state fell far behind other states like Gujarat, Maharashtra, Karnataka and Andhra Pradesh. The process of industrialization in the state came to a halt by the mid-sixties, and since then the industrial sector of West Bengal has been marked with rapid decline and pronounced stagnation. Over the years the share of the state in number of factories, net value added, and employment has declined drastically (Mishra, 1997). At disaggregate level, it is observed that growth of all the sectors except electrical goods and chemicals started decelerating since the mid-1960s (Banerjee, 1982). More importantly, absolute productions in many of the sectors like textiles, iron and steel, paper, etc. also declined during 1965-84 (Sen, 1987).

This deceleration in industrial activity over an extended period in the state resulted in severe contraction in industrial output and employment as well as capital outflow to other parts of the country in the 1970s and the 1980s. This had forced the state government to review its industrial policy, and a new industrial policy was introduced in September 1994 as an attempt to bring about a wholesome resurgence in the industrial sector of the state. Besides, there have been changes in the attitude of the state government towards industry and industrialists as well, especially after initiation of the process of reforms of the Indian economy in 1991 (Dasgupta, 1998; Sinha, 2005). Introduction of new industrial policy at the national as well as at the state level coupled with changes in the investment atmosphere of the state has resulted in a large number of proposals from different business groups showing interests to set up production units in the state.

However, despite changes in policies, initially West Bengal had failed to emerge as an attractive destination for investors, particularly when compared with other industrially progressive states in the country. More specifically, delicensing of most of the industries and partial freight equalization under the New Industrial Policy of 1991, and the '*non-doctrinaire and pragmatic approach*' of the state government in the new industrial policy of 1994 could not attract investors into the state at large scale. The volume of industrial investment in West Bengal in the 1990s was very low, especially in comparison with major industrial states of the country, viz., Gujarat, Maharashtra, and Tamil Nadu. In general, such low investment inflows have contributed to poor industrial relations, inadequate infrastructure facilities and low level of factory production that have resulted in low profitability of existing manufacturing units. This not only reduced the ability and willingness of these units to invest further in the state, but also discouraged the potential investors to invest therein.

However inflow of investment has started increasing since the beginning of the 21st century. Investment has been flowing into the state despite the global economic downturn and farmers' resistance against land acquisition at Nandigram and Singur. Although the state ranked eighth in number of factories, twelfth in value of output and eleventh in net value added by manufactures in 2005-06, new investment has changed the composition of industries in the state considerably. Key industries in West Bengal today include chemicals, textiles, coal, iron and steel, engineering goods, leather and leather products, tea, jute products, breweries, paper, drugs and pharmaceuticals, electrical and electronics, plastics, software, locomotives, vegetable oils, and gems and jewelry. The Government of West Bengal has also emphasized on growth and development of electronic industries in recent years.

Major share of new investment has been in sectors such as iron and steel, petrochemicals, information technology and food processing. Given the resistance from the owners against acquisition of farm land, the state government is now emphasizing on the setting up of industries in areas that are considered as backward and have proportionately more uncultivable land. Efforts are being made towards location of new industrial units in the districts of Paschim Medinipur, Purulia, Bankura and Birbhum. Depending on the availability of non-agricultural land, presence of industry and infrastructure, the state government has identified certain areas as industrial growth

zones where large-scale manufacturing units can be set up. Initiatives are also being made towards setting up of several sector-specific industrial parks viz. the Raghunathpur Industrial Park in Purulia district, the Vidyasagar Industrial Park in Paschim Medinipur district, etc.

3.2. Recent Trend in Industrial Growth in West Bengal

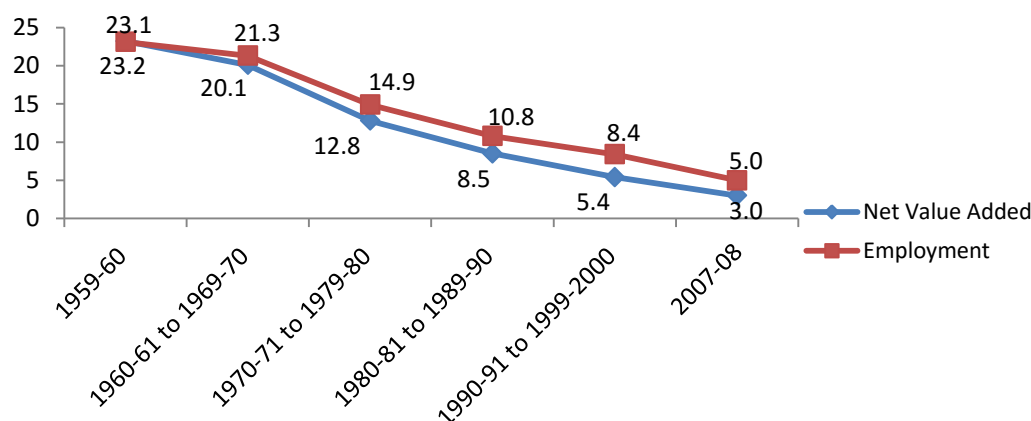
A scrutiny of decennial growth performance in the state shows that the industrial sector in general and the manufacturing sector in particular grew at a very slow rate during the 1970s and the 1980s (Table 6). The growth performance was even more dismal when it is compared with the performance of the sectors at all India level. The rate of growth increased during the first decade of economic reforms, but this was not sufficient enough to mark a resurgence of the sector. However, the growth performance has improved significantly during the last decade and has exceeded the performance of the sectors at the all-India level, particularly before aggravation of farmers' protest against land acquisition at Singur and Nandigram. Two important observations can be cited here. First, rate of growth of production in manufacturing and industry sector has accelerated over the decades. Second, generation of electricity in the state grew at a faster rate since the 1980s, but it failed to boost growth in manufacturing.

The dismal growth performance of the manufacturing sector is reflected in continuously declining share of the state in terms of 'net value added' and employment in the sector at the all-India level. While average share of the state in 'net value added' declined from 20.1 percent during 1960-61 to 1969-70 to a dismal 5.4 percent during 1990-91 to 1999-2000, that in employment decreased from 21.3 percent to 8.4 percent during the same period. Even the high growth rate of the sector during the last decade could not stop this declining trend. Instead, as shown in Figure 25 the share of the state in terms of national 'net value added' and employment in manufacturing declined further to 3 percent and 5 percent respectively in 2007-08.

TABLE 6: INDEX OF INDUSTRIAL PRODUCTION - COMPOUND GROWTH RATE FOR WEST BENGAL VIS-À-VIS ALL-INDIA

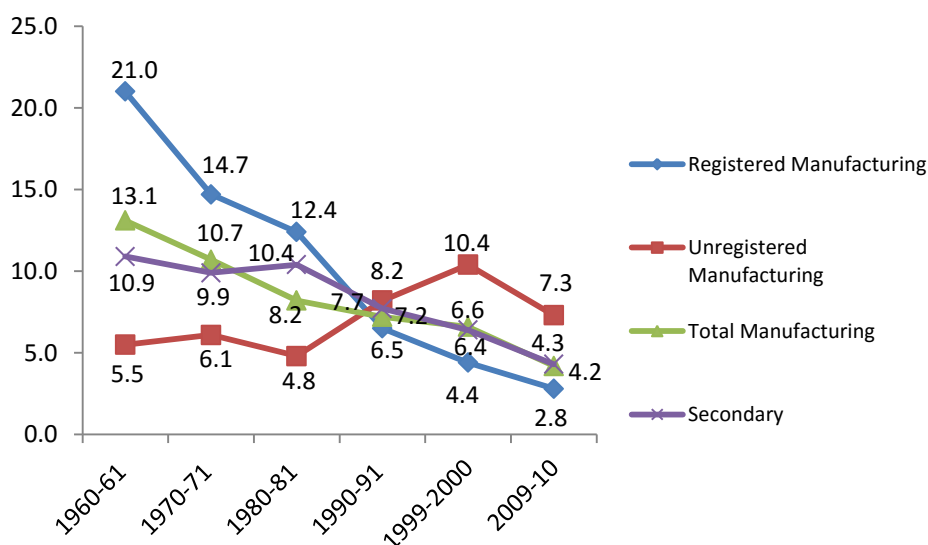
Period	Mining & Quarrying	Manufacturing	Electricity	General
1970-71 to 1980-81 (With base 1970-71=100)				
West Bengal	0.01	1.82	1.43	1.62
All-India	4.26	4.05	7.33	4.42
1980-81 to 1992-93 (With base 1980-81=100)				
West Bengal	0.10	1.84	8.80	2.23
All-India	6.94	6.41	8.63	6.75
1993-94 to 2000-01 (With base 1993-94=100)				
West Bengal	0.78	3.37	6.59	3.62
All-India	3.98	7.63	6.40	7.20
2000-01 to 2007-08(P) (With base 2004-05=100)				
West Bengal	5.32	13.50	11.10	11.87
All-India	4.34	8.80	4.89	7.93

Sources: Economic Review, Government of West Bengal, various issues.

Figure 25: Percentage Share of West Bengal in terms of NVA & Employment

Source: Handbook of Statistics of Indian Economy, RBI, various Issues.

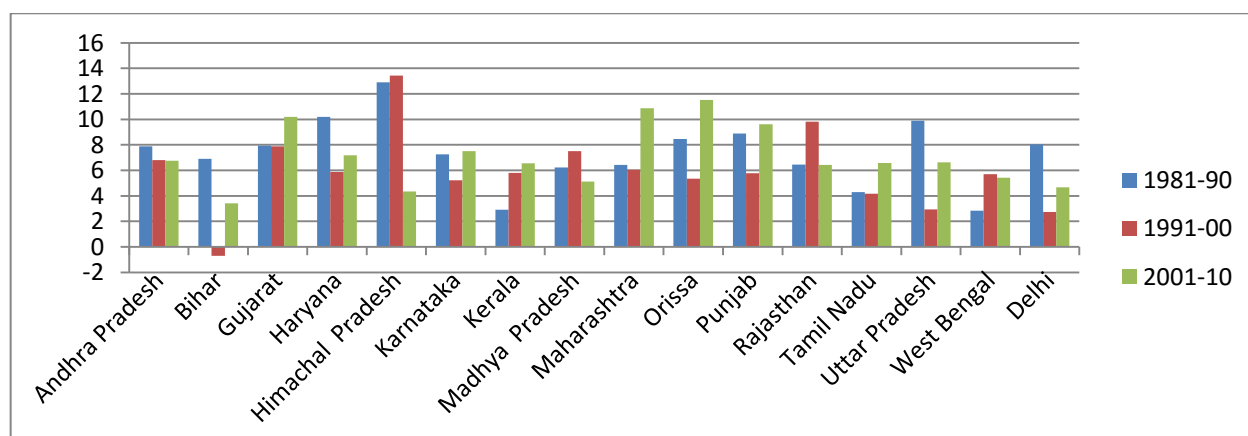
Similarly as shown in Figure 26 the share of manufacturing and secondary sectors in net domestic product (NDP) declined significantly during this period. The contribution of manufacturing to the country's GDP declined from 13.1% in 1960-61 to 4.2% in 2009-10 and that of the secondary sector declined from 10.9% to 4.3% during the same period. Within manufacturing, while share of the registered manufacturing declined quite sharply, that of the unregistered ones increased, though not very substantially. This means that unorganized manufacturing in West Bengal expanded at a relatively faster rate as compared to other states. The growing importance of unorganized manufacturing in the state is well documented by others (e.g. Bagchi, 1998; Raychaudhuri and Basu, 2007). However, the distinct feature of growth of the unorganized manufacturing is that while at the national level the sector dominates organized manufacturing in terms of employment; in West Bengal, it plays an important role in respect of both output and employment.

FIGURE 26: SHARE OF WEST BENGAL MANUFACTURING SECTOR IN ALL-INDIA NDP (%)

Source: National Accounts Statistics, Government of India, various issues

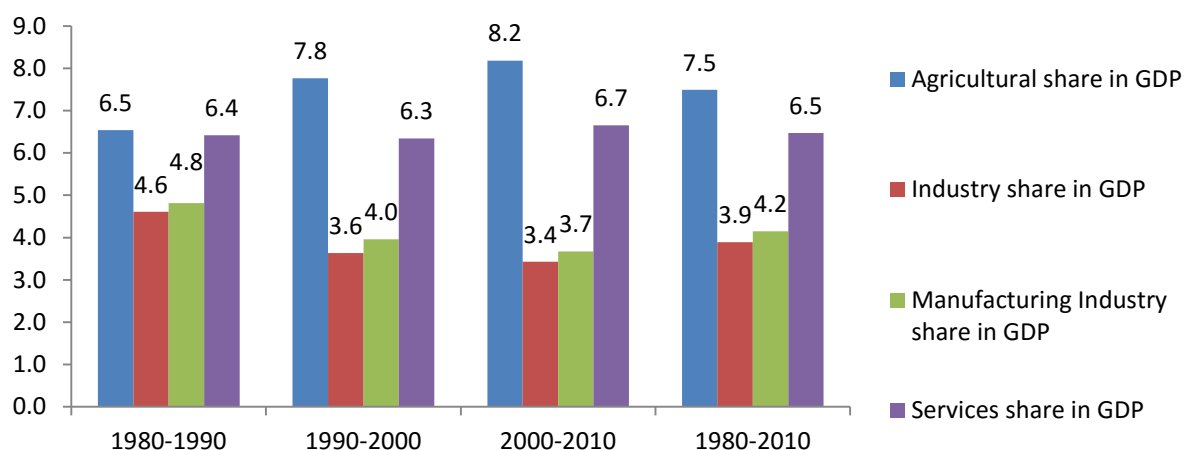
Such a declining share of West Bengal in manufacturing and industrial output at the national level may be partly attributed to among others, better growth performance of these sectors in other major states of the country, and on the part of the state on weak policy framework and enabling environment as brought out earlier. For example, share of West Bengal in industry production grew consistently at lower rates as compared to the states like Andhra Pradesh, Gujarat, Haryana, Maharashtra, Punjab, and Rajasthan during 1981-2010 (Figures 27). Further, the rate of growth of the share of the industry sector of Karnataka, Odisha, Tamil Nadu and Uttar Pradesh exceeded that of West Bengal during the last decade. On the other hand, contribution of services to the GDP by and large remained the same during last three decades (Figure 28).

Figure 27: Comparative Growth Performance: Manufacturing and Industrial Output



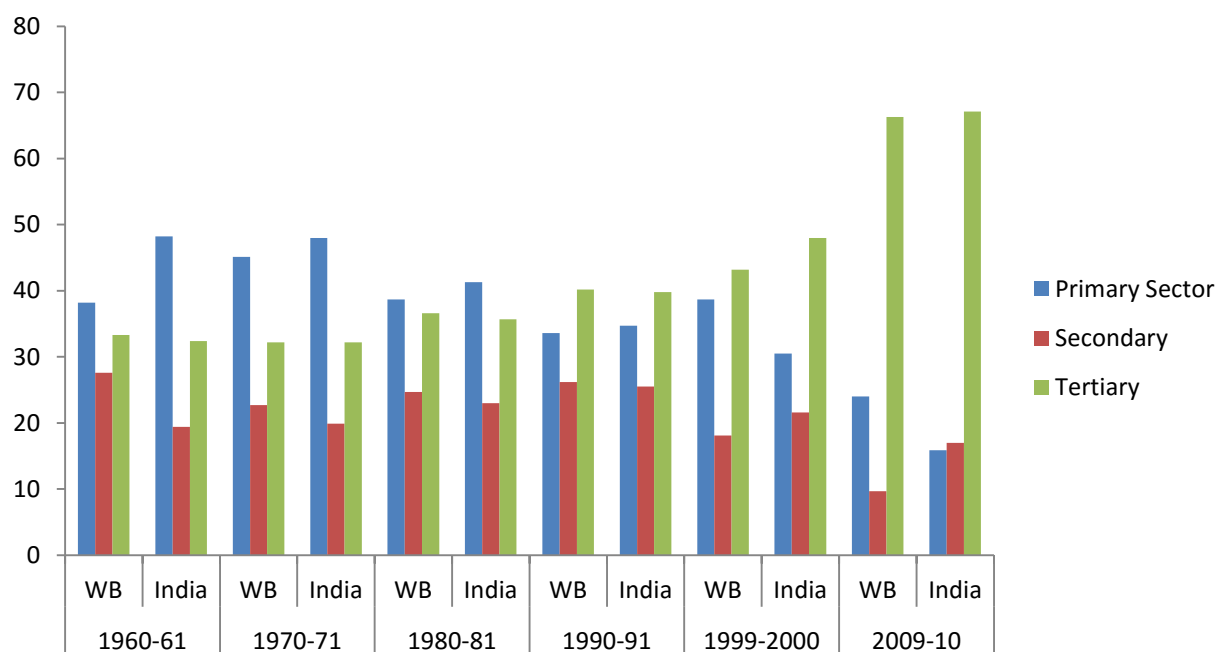
Source: Handbook of Statistics of Indian Economy (2010-11), RBI

Figure 28: Sectoral Share of West Bengal in GDP



Source: Handbook of Statistics of Indian Economy (2010-11), RBI

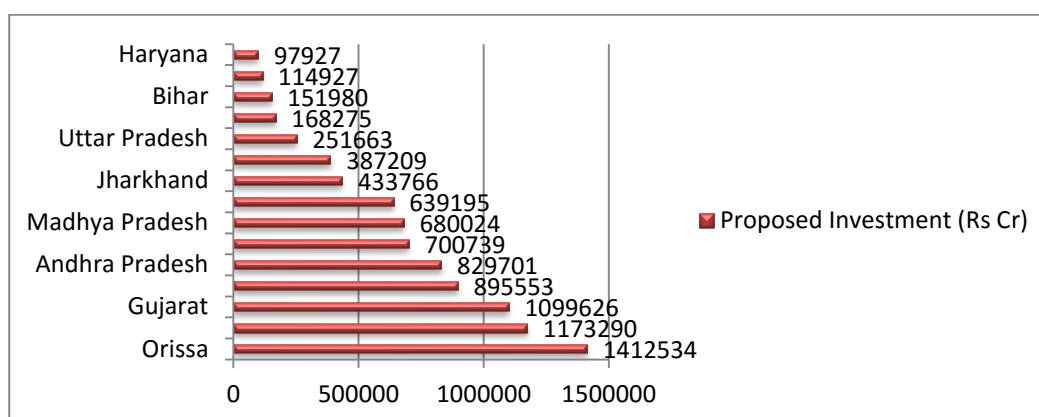
The relatively poor growth performance of the industry sector has altered the composition of NSDP vis-à-vis NDP. While the share of both the primary and the secondary sectors in NSDP has decreased, the decline is quite sharper in the case of secondary sector in general and the manufacturing sector in particular. However, both the levels and the trends are different when the composition of GDP is seen (Figure 29).

Figure 29: Composition of NSDP of West Bengal vis-à-vis all India NDP

Source: Handbook of Statistics of Indian Economy, RBI, Various Issues

3.3 Industrial Investment Scenario in West Bengal in Post-Reforms Period

Despite dismal growth performance of the existing industrial units, especially when compared with other major states of the country, many new projects have been implemented in West Bengal in the post-reform era. In terms of investment proposals received, currently West Bengal ranks 8th amongst the major states (Figure 30). Implementation of new projects has witnessed acceleration especially during the last decade, hence creating scope for more industrial production and employment in the state. As many as 2531 new projects have been implemented in the state during 1991 to 2010 with an investment of Rs. 65,685 crore and which has created direct employment opportunity for 297,808 persons (Table 7). A distribution of these new projects by industry categories reveals that nearly 50% of the projects are in the sectors like iron and steel, drugs, chemicals and pharmaceuticals involving around 75% of investment (Table 8). Interestingly, around one-fourth of the new units are in agro-based and food-processing industries, but their average share in total investment during 1998-2009 was only 9%. However, over the years importance of this industry segment has increased. For instance while around 13% of the new units established during the 1990s were in agro-processing, its share has increased to 26% during the last decade. Similarly, the share of this industry in new investment has increased from 2.50% to 9% during the same period. On the other hand, relative position of jute and textiles industries in terms of both number of units and amount of investment has declined during the last decade.

Figure 30: State-wise Share of Proposed Investments for Industries**Table 7: Industrial projects implemented in West Bengal**

year	No. of units	Investment catalyst	Direct employment
1991-2000	459	17580.71	62404
2001-2010	2072	48104.19	235404
Total	2531	65684.90	297808

Source: Annual Report 2010-11, Department of Commerce and Industries, Government of West Bengal

West Benagal's position is much better in terms of its share in Industrial Entrepreneur Memorandum (IEMs) implemented. It ranks 4th in terms of number of projects implemented and 3rd and 4th in respect of amount of investment and employment generated therefrom. A high of 755 projects have been implemented with total investment of Rs. 32,303 crore and employment generation of 138,576 persons. In this regard the state stands much ahead of many of the favourable investment destinations like Odisha and Chhattisgarh (RBI, 2012).

Table 8: Distribution of Implemented Projects by Major Industries, 1991-2010

Sectors	1991-98		1999-2009	
	Units	Investment	Units	Investment
Agro based & food processing	12.66	2.53	26.09	9.07
Iron & steel	18.33	63.20	21.22	21.27
Jute & textiles	11.33	12.81	6.60	2.46
Engineering	8.00	4.20	5.55	5.36
Electronics & electrical	8.00	2.75	1.78	3.14
IT & ITES	10.33	1.42	7.65	4.38
Drugs, chemicals & petrochemicals	24.33	11.90	26.87	49.53
Others	7.00	1.19	4.24	4.80
Total	100.00	100.00	100.00	100.00

Source: Annual Report, 2010-11,

3.4 Composition of Manufacturing Sector in West Bengal

Decaying of many of the traditional industries like jute and textiles, and greater investment inflows in sectors like food-processing has to some extent altered the relative position of different

industries in the factory sector of West Bengal. As in 2007-08, majority of the factories in the state belonged to food and beverages followed by metals, machinery and equipment, tobacco and related products, chemicals, and rubber and plastics (Table 9). On the other hand, basic metals has the highest share in invested capital and value of output followed by chemicals and chemical products, whereas textiles contributes the most to employment generation followed by basic metals and food products and beverages.

When contribution of different factories to corresponding sectors at national level is considered, it is observed that 13% of the total factories producing tobacco and related products are located in West Bengal. But these units do not have any significant contribution to total capital investment, output produced or employment generated. On the other hand, factories belonging to industries like textiles, wood and wood products and basic metals have reasonably high share in total employment generated (Table 10). The factories that produce wood and wood related products are not so large in number but they contribute significantly to total value of output and net value added.

Table 9: Industry-wise (2-digit level) share of selected characteristics in factory sector of West Bengal, 2007-08 (Percent)

Industries	No. of Factories	Invested capital	No. of Workers	Total Persons engaged	Total inputs	Value of Output +	Net Value Added
Food Product and Beverages	21.23	8.04	12.09	12.24	11.47	10.71	5.97
Tobacco and Related products	6.88	0.59	2.63	2.52	0.94	0.95	1.12
Textile Products	4.89	6.55	40.02	35.06	5.19	6.22	12.96
Wearing Apparel, Dressing and dyeing of Fur	0.55	0.18	0.38	0.43	0.27	0.28	0.38
Leather and related products	3.88	1.77	1.63	1.78	1.79	1.74	1.44
Wood and wood products	2.97	0.99	1.35	1.41	1.43	1.35	0.93
Paper and paper products	1.95	0.87	1.03	1.13	0.62	0.61	0.51
Publishing and printing related activities	2.46	1.33	0.90	1.29	0.80	1.02	2.39
Coke, petroleum products and nuclear fuel	1.14	9.20	1.01	1.10	16.53	14.94	6.17
Chemical and chemical products	5.68	22.00	3.22	4.62	14.24	14.12	12.22
Rubber and plastic products	5.38	1.59	1.72	1.96	1.56	1.53	1.17
Non-Metallic Mineral Products	3.46	2.12	2.32	2.41	1.92	2.24	4.18
Basic Metals	9.45	31.95	17.22	17.12	29.70	30.14	32.63
Fabricated metal products	6.81	2.15	2.60	3.02	2.14	2.15	2.33
Machinery and Equipment	7.30	1.80	2.29	3.11	2.10	2.21	3.02
Office, Accounting and Computing Machinery	0.10	0.35	0.07	0.12	1.49	1.34	0.58
Electrical machinery and apparatus	3.96	1.96	2.20	2.55	2.85	3.02	4.33
Radio, TV and communication equipment	0.55	0.33	0.49	0.39	0.22	0.26	0.46
Medical, Precision and Optical instruments	0.73	0.59	0.37	0.48	0.75	0.78	1.00
Motor vehicles, trailers and semi-trailers	0.48	0.18	0.89	0.92	0.29	0.26	0.10
Other transport equipments	1.75	1.64	2.82	2.89	1.68	1.85	3.17
Furniture and other manufacturing	0.79	0.21	0.30	0.33	0.19	0.19	0.16
Other	7.58	3.63	2.44	2.99	1.82	2.09	2.81
All	100.00	100.00	100.00	100.00	100.0	100.0	100.0

Source: Annual Survey of Industries (2011)

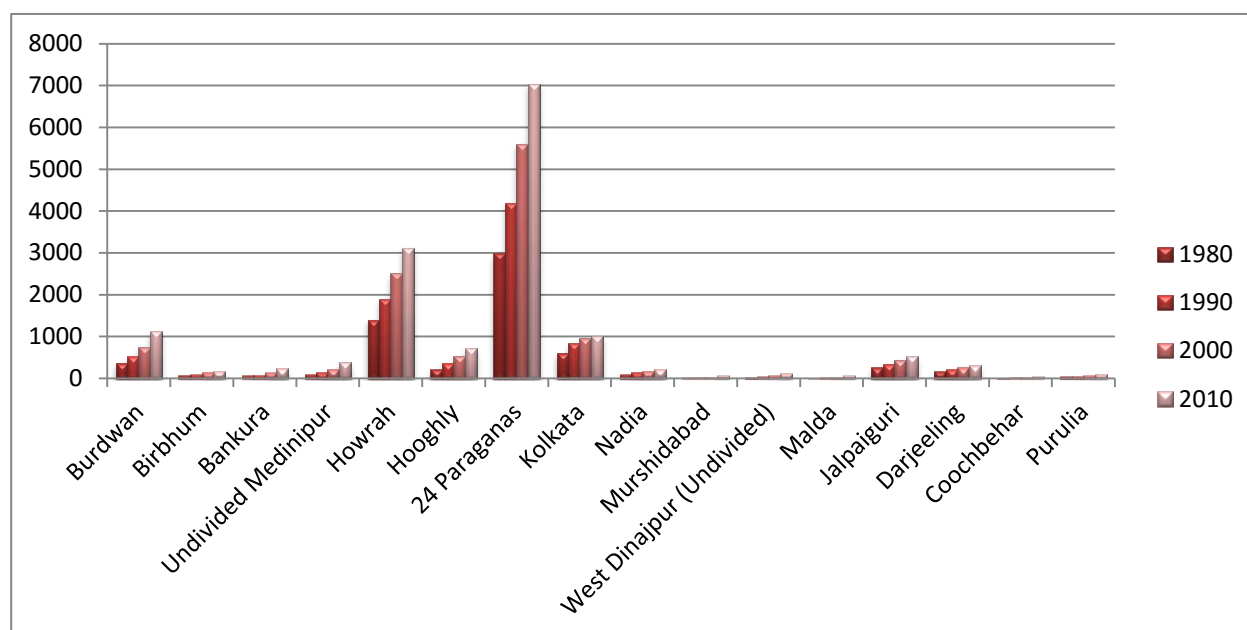
Table 10: Share of various industries of West Bengal towards selected characteristics in India (2digit level), 2007-08 (percent)

Industries	No. of Factories	Invested capital	No. of Workers	Total Persons engaged	Total inputs	Value of Output	Net Value Added
Food Product and Beverages	4.85	2.94	4.32	4.19	3.58	3.48	2.42
Tobacco and Related products	13.03	5.74	2.81	3.13	10.80	7.24	2.60
Textile Products	2.28	3.03	13.56	12.39	3.53	4.09	8.09
Wearing Apparel, Dressing and dyeing of Fur	0.90	0.60	0.30	0.35	0.99	0.91	0.70
Leather and related products	8.63	9.93	3.63	4.15	8.07	8.00	7.27
Wood and wood products	5.57	14.56	10.84	10.69	21.77	20.52	14.24
Paper and paper products	2.86	1.58	2.07	2.32	2.04	1.88	1.19
Publishing and printing related activities	4.42	5.59	4.19	4.59	4.67	4.88	5.61
Coke, petroleum products and nuclear fuel	6.45	4.11	4.91	5.23	4.19	3.75	1.34
Chemical and chemical products	3.04	6.44	2.22	2.67	5.78	5.13	2.81
Rubber and plastic products	3.93	2.39	2.63	2.80	2.24	2.13	1.42
Non-Metallic Mineral Products	1.31	1.46	1.77	1.85	3.00	2.56	1.87
Basic Metals	7.27	7.03	11.55	10.91	8.66	7.91	5.24
Fabricated metal products	4.13	2.61	2.70	2.99	2.56	2.44	1.92
Machinery and Equipment	4.47	1.54	2.48	2.84	1.74	1.68	1.49
Office, Accounting and Computing Machinery	3.45	3.67	1.76	2.09	14.47	12.53	4.88
Electrical machinery and apparatus	5.52	2.82	3.78	3.91	3.26	3.18	2.91
Radio, TV and communication equipment	3.11	0.85	2.08	1.48	0.58	0.64	0.95
Medical, Precision and Optical instruments	4.53	4.69	2.75	2.89	5.89	5.04	3.00
Motor vehicles, trailers and semi-trailers	0.88	0.14	1.03	1.01	0.20	0.18	0.06
Other transport equipments	5.64	4.28	7.38	7.27	3.52	3.63	4.31
Furniture and other manufacturing	1.87	0.60	0.73	0.78	0.33	0.34	0.34
Other	7.53	3.03	7.61	7.15	2.37	2.63	3.21
ALL	4.09	3.97	5.14	4.94	4.17	3.94	2.94

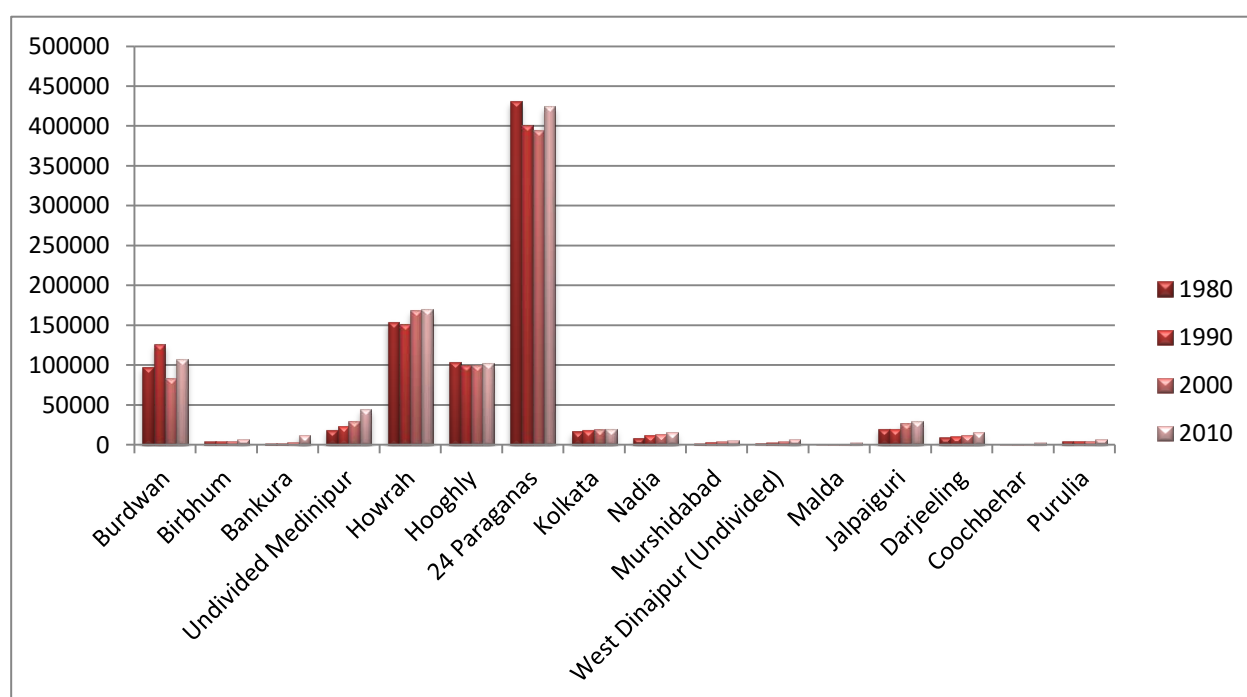
Source: Annual Survey of Industries (2011)

3.5 Geographical Distribution of Industrial Units

Distribution of the registered factories in West Bengal is highly skewed in three districts namely Howrah, and the North and South 24 Parganas. Nearly two-third of the registered factories are located in these three districts (Figure 31) with more than 60% of the workforce engaged in the registered manufacturing sector. The other two districts that have reasonable presence of registered manufacturing units are Burdwan and Kolkata. These two districts account for around 14% of the units and 13% of the employed workforce (Figure 32). Almost all of the above mentioned districts also comprise some of the most urbanised and densely populated parts of the state as described in the earlier section of this report.

Figure 31: District-wise No. of Registered Factories in West Bengal, 1980-2010

Source: Bureau of Applied Economics and Statistics, Government of West Bengal

Figure 32: District-wise Employment Opportunities in West Bengal, 1980-2010

Source: Bureau of Applied Economics and Statistics, Government of West Bengal

However, distribution of the registered micro and small enterprises across the districts is relatively more even. In addition to Howrah, the two '24 Parganas', Burdwan and Kolkata, the districts like Birbhum, undivided Midnapore, Nadia, Murshidabad and Jalpaiguri also have reasonable number of registered micro and small enterprises. More importantly, majority of the units are located in Kolkata. Recently a number of growth centres have been developed by the state wherein all the required infrastructure viz. power, land, water supply etc. are made available. In addition three

mega growth centers, each in the districts of Birbhum, Jalpaiguri and Malda, are also proposed (table 11).

Table 11: Number of registered factories and corresponding employment in Micro and Small Scale Enterprises in districts of West Bengal, 1980 to 2010

Districts	1980		1990		2000		2010	
	No. of Registered Factories (%)	Workers Employed (Avg. daily) (%)	No. of Registered Factories (%)	Workers Employed (Avg. daily) (%)	No. of Registered Factories (%)	Workers Employed (Avg. daily) (%)	No. of Registered Factories (%)	Workers Employed (Avg. daily) (%)
Burdwan	1646 (12.88)	3484 (3.48)	2737 (9.59)	13852 (8.49)	625 (7.26)	4727 (8.88)	636 (6.30)	6053 (4.96)
Birbhum	553 (4.33)	5061 (5.06)	713 (2.5)	3946 (2.42)	175 (2.03)	1592 (2.99)	308 (3.05)	4779 (3.92)
Bankura	450 (3.52)	3110 (3.11)	929 (3.26)	4899 (3.00)	358 (4.16)	1954 (3.67)	185 (1.83)	1840 (1.51)
Undivided Midnapore	1231 (9.64)	10451 (10.45)	3658 (12.82)	17915 (10.98)	1058 (12.3)	4811 (9.03)	858 (8.5)	6944 (5.69)
Howrah	1198 (9.38)	10163 (10.16)	2338 (8.19)	10097 (6.19)	539 (6.26)	3243 (6.09)	1510 (14.95)	14381 (11.79)
Hooghly	692 (5.42)	8638 (8.64)	1719 (6.02)	11789 (7.23)	425 (4.94)	4979 (9.35)	478 (4.73)	5846 (4.79)
24 Paraganas	1503 (11.77)	19306 (19.31)	5907 (20.7)	36883 (22.61)	1277 (14.84)	9603 (18.03)	1256 (12.44)	25100 (20.58)
Calcutta	1881 (14.72)	13532 (13.53)	2825 (9.9)	20563 (12.61)	1440 (16.74)	9152 (17.19)	1804 (17.86)	20346 (16.68)
Nadia	387 (3.03)	2290 (2.29)	1365 (4.78)	6473 (3.97)	345 (4.01)	1283 (2.41)	330 (3.27)	3520 (2.89)
Murshidabad	637 (4.99)	2763 (2.76)	1370 (4.8)	6275 (3.85)	836 (9.72)	3360 (6.31)	304 (3.01)	23320 (19.12)
West Dinajpur (undivided)	269 (2.11)	1634 (1.363)	727 (2.55)	3962 (2.43)	316 (3.67)	1749 (3.28)	154 (1.52)	1878 (1.54)
Malda	725 (5.68)	3488 (3.49)	854 (2.99)	5056 (3.1)	351 (4.08)	1222 (2.29)	180 (1.78)	1952 (1.6)
Jalpaiguri	273 (2.14)	1712 (1.71)	1408 (4.93)	8092 (4.96)	272 (3.96)	1923 (3.61)	431 (4.27)	2111 (1.73)
Darjeeling	507 (3.97)	8999 (9)	773 (2.71)	6180 (3.79)	176 (2.05)	910 (1.71)	179 (1.77)	1414 (1.16)
Coochbehar	270 (2.11)	1562 (1.56)	444 (1.56)	2003 (1.23)	199 (2.31)	1448 (2.72)	179 (1.77)	976 (0.80)
Purulia	553 (4.33)	3808 (3.81)	773 (2.71)	5147 (3.16)	212 (2.46)	1296 (2.43)	207 (2.05)	1484 (1.22)
West Bengal	12775 (100)	100001 (100)	28540 (100)	163132 (100)	8604 (100)	53252 (100)	10099 (100)	121944 (100)

Source: Bureau of Applied Economics and Statistics, Government of West Bengal

3.6 Emerging Industrial Centres in West Bengal

3.6.1 Haldia

Haldia has emerged one of the fastest growing industrial centres of West Bengal. Locational advantages, cargo handling facilities at Haldia dock complex, availability of land, adequate water, intra city roads, communications, etc. have attracted many major investors from within the country and from overseas. The major companies having production units at Haldia include Indian Oil Corporation Ltd, Indian Oil Petronas Ltd., South Asian Petrochem Ltd., Tata Chemicals Ltd., Haldia Petrochemicals Ltd., Mitsubishi Chemical Corporation Ltd., Hindustan Unilever Ltd., Dhunseri Petrochem & Tea Ltd., Shamon Ispat Ltd., etc. In addition, West Bengal Industrial Development Corporation (WBIDC) and Tata Steel have set up a joint venture for setting up a Merchant Coke Oven Plant to generate 0.8 million tones of coke annually in Phase-I and also 60 MW of power. A mega chemical industrial estate has also been proposed on 10,000 acre of land.

3.6.2 Kharagpur

Kharagpur has emerged as yet another important industrial town in West Bengal. Kharagpur is located in the Paschim Medinipur district of West Bengal. It promises to be an ideal destination for investment due its proximity to Kolkata and also because of its good connectivity with other parts of the country by rail and road. Further, the Haldia Dock Complex is only around 120 km away from this place which offers a strategic advantage. Medinipur-Kharagpur Development Authority (MKDA) has also made major investment in improving road connectivity in the area.

Some of the existing major industrial units located around Kharagpur include ASO Cement Ltd. (slag cement), Flender MacNeill (industrial gears), Humboldt Wedag (I) Ltd. (slurry pumps), South-Eastern Railway Workshop (carriage, wagon, diesel locomotive maintenance), Tata Bearings Ltd. (bearings and its castings), Tata Davy Ltd. (heavy engineering), Tata Metaliks Ltd. (pig iron plant), Wellman Wacoma Ltd. (coke oven/metallurgical coke), Rashmi Metaliks (Pig iron manufacturing unit). In addition, ASO Cement Ltd. has planned to expand its cement manufacturing unit, and Century Iron and Steel Industries Ltd. has planned to set up pig and sponge iron units in this region. Similarly, ACC Cement has a plan to set up a greenfield cement manufacturing unit, and many other projects are likely to up come in the area. A number of industrial organisations have also been allotted land in this area for setting up their factories in divirse segments of manufacturing.

In addition Table 12 shows initiatives that have been taken to set up a number of industrial parks across the state particularly in the basin districts. Expected units in these parks will comprise diversified manufacturing in, among others, foods processing, polymer products, rubber products, steel, garments, etc.

Table 12: Details of Proposed Industrial Parks and SEZ in the State

Name	Products / Services	Location
Food Park (Phase I & II)	Food processing	Sankrail, (Howrah)
Poly Park	Polymer products	Sankrail, (Howrah)
Rubber Park	Rubber footwear, hoses, tubes, automotive rubber products	Sankrail, (Howrah)
Biotech Park	Biotechnology projects	Dewanmara (Paschim Medinipur)
Plasto Steel Park (Phase - I & II)	Iron and steel and plastic products	Borjora (Bankura)
Iron & Steel Park	Steel products	Kharagpur (Paschim Medinipur)
Iron & Steel Park	Steel products	Jhargram (Paschim Medinipur)
Foundry Park	Castings, forge and foundry products	Howrah
Manikanchan SEZ	Gems and jewellery	Salt Lake, Kolkata
Shilpangan	Light engineering products	Salt Lake, Kolkata
Apparel Export Park	Garments, buttons, accessories, washing/processing	Uluberia, (Howrah)
The Garment Park	Garments	Kolkata

Source: www.ibef.org/download/Westbengal_171109.pdf

3.7 Implications of Industrialization for the Ganga River Basin

While greater inflows of investment are necessary for revival of the state's economy in general and of the industry sector in particular, industrial pollution in the state remains a critical issue. The study conducted jointly by the Central Pollution Control Board (CPCB) and Indian Institute of Technology Delhi on Comprehensive Environmental Pollution Index (CEPI) for assessment of pollution load of industrial areas, reveals that West Bengal has the highest number of red category industries causing high pollution, followed by Maharashtra and Tamil Nadu. The state has 12,810 red category industries, whereas the numbers in Maharashtra and Tamil Nadu are 12,184 and 11,650 respectively. Majority of these red category industries are located in the industrial clusters of Haldia (Dist. Purba Midnapore), Howrah (Dist. Howrah) and Asansol (Dist. Burdwan) in the River Ganga basin. As shown in Table 13, with the CEPI index of more than 70, all these three areas are found to be on high alert situation with respect to polluting the surrounding environment.

Table 13: CEPI status in the three industrial centres of West Bengal

Interim assessment of CEPI-2011						
S. No.	Industrial Cluster/Area	District	AIR EPI	WATER EPI	LAND EPI	Overall CEPI
1	Asansol	Burdwan	64.38	43	43	70.96
2	Haldia	Purba Midnapore	65.75	70.5	47.5	79.71
3	Howrah	Howrah	62.5	63	60	76.88

Source: Central Pollution Control Board study, 2009

The volume of sewage generated in these cities was found to be much higher than the installed treatment capacities leading to a steady fall in the quality of water in the corresponding stretches of River Ganga. As mentioned earlier, Kolkata has got only around 28% capacity and Howrah has got 47% capacity to treat their sewage. Hence, everyday a large volume of sewage remains untreated and is discharged into River Ganga.

As regards industrial pollution it was found that the volume of effluents released into River Ganga is the highest in North 24-Parganas followed by Burdwan and Hooghly. The BOD level after treatment of effluents is also very high in these districts. South 24-Parganas and Hooghly are bestowed with chemical industries, which discharge a fairly large volume of effluent into the river. The cement or iron and steel industries located in some districts also pollute the river on a continuous basis. In the case of Dist. Nadia the main polluting industries that discharge into River Ganga comprise food processing and textile industries. (table 15).

TABLE 14: EFFLUENT DISCHARGED INTO THE RIVER GANGA

Districts	Sub-sector	Number of Units	Materials Produced	Effluent	
				Quantity (MLD)	BOD after Treatment
North 24 Paraganas	Distillery, Paper, Aluminium, Rubber, Plastic, Leather, Acid, Electronics, Printing Press & Hotel	Exide Industry, Chord Rd. , Hindusthan Heavy Chemicals, Jaysree Chemicals & Fertilizers, Infar(India), Hindustan Lever, B & M Chemicals, Nicco Corp., Rifle Factory, Reliance Jute, Metal & Steel Factory	Lead Acid Battery, Sulfuric Acid, Caustic & Hcl, Sodium Silica, Fluorid, Silica Phosphate etc., Steroid & Bluk Drug, Veg. Oil, Chemical, SteelWire, Ordinance, Jute, Heavy Metal & Steel	4101.35	681.61
South 24 Paraganas	Alumunium, alloy steel, Plastic & Rubber	Bata India, IFB Agro-Industries	Shoes, Distillery	2.66	>100
Burdwan	Paper, Engineering, Industry & Cold Storage	Durgapur Steel Plant, Alloy Steel Plant, Hindustan Fertilizer, Durgapur Chemicals, Durgapur Projects, East India Pharmaceutical, D TPS DVC, Reckitt & Colman, IISCO	Iron & Steel, Steel & Alloys, Fertilizer, Chemicals, Thermal Power & Coke Oven, Pharmaceutical, Thermal Power Plant, Ultra Marine Blue	669.57	8877.76
Hooghly	Alumunium, Foundry, Iron	Hind Motor, Kusum	Engineering, Veg Oil	214.70	1439.62

Districts	Sub-sector	Number of Units	Materials Produced	Effluent	
				Quantity (MLD)	BOD after Treatment
Howrah	Steel, Industrial Glass, Food Products & Floor Mills	Aasiatic Oxygen & Acetylene, Berger Paints, Shalimar Paints, Seth Chemical, C & W Workshop	Chemical, Paints, Dye, Engineering	25.82	<100
Kolkata	Steel Foundry, Engineering Industry & Printing	Eastern Distillery, Keshoram Cotton Mill, Stone India, GEC, AEI Works, ESAB India, ELMI, Hindustan Lever, Rosol Ltd., Black Diamond Beverages, Gun & Steel Factory	Distillery, Taxtiles, Engineering, Electrical Lamps, Soaps Detergent etc., Veg Oil, Soft Drinks, Ordance	4.27	845.00
Malda	Industrial Gas, Synthetic Fybre, Jute, Floor Mill & Paper				
Purba Medinipur	Acrylic Fibre, Ball Bearing, Alumunium, Alloy Steel, Edible Oil, Decorative Laminate, Paper, Industrial Gases & Cold Storage	Unitech Paper Mill, Excide Industris, Shaw Wallace & Co., Consolidated Fibers & Chemicals, Hindustan Fertilizer Corpn.	Paper & Pulp, Storage Battery, Pesticide, Synthetic Fibre, Oil Refinery, Fertilizer & Chemical	20.25	271.37
Murshidabad	Electronics, Edible Oil, Steel Based Product, Pharmaceutic als, Food & Fuel &				

Districts	Sub-sector	Number of Units	Materials Produced	Effluent	
				Quantity (MLD)	BOD after Treatment
	Synthetic Fibre				
Nadia	Chemicals, Paper, Rubber, Alloy Steel, Industrial Gas, Fodder, Yeast, Lamp Filaments & Cold Storage	United Breweries, Supreme Paper Mill, Jenson & Nicholason, Ramswarup Inds, Corpn, Nicco Corpn. Ltd., Aromate Pvt. Ltd., Alchrome Chemical Industries	Fermentation Industry, Plup & Paper, Paint, G.I.Wire, Telephone Cable, Chemicals	1.47	28.95

Another major concern of the industry sector in West Bengal is related to the location of many thermal power plants on the banks of River Ganga. There are four major power plants located at Farrakka, Bandel, Titagarh and Budge Budge. While the power plants at Titagarh and Budge Budge are under the Calcutta Electricity Supply Corporation (CESC), that at Farakka and Bandel are under the National Thermal Power Corporation (NTPC) and the West Bengal Power Development Corporation Ltd. (WBPDC). The entire ash is utilized at the Budge Budge and Titagarh plants. However, the rates of utilization at Farakka and Bandel plants are only 60% and 43.6% respectively (Table 15).

Table 15: Fly Ash utilization in Ganga River Basin Area of West Bengal during 2005-06

Name Capacity	Capacity (MW)	Coal Cons. (mta)	Ash Gen. (mta)	Ash Uti. (mta)	% utilisation
Budge Budge, CESC	500	2.52	0.91	0.91	100.0
Titagarh , CESC	240	1.17	0.33	0.33	100.0
Farrakka, NTPC	1600	9.26	3.43	2.06	60.1
Bandel, WBPDC	530	1.29	0.41	0.18	43.6

Source: Status of Water Supply, Waste Water Generation and Treatment in Class-I cities of India, Central Pollution control Board, 2010

A majority of the registered manufacturing units in the state are located in four basin districts, viz. Howrah, 24-Parganas, Kolkata and East Midnapore. In particular, at Haldia of Purba Medinipur district, there are many chemical and petrochemical units including the refinery of Indian Oil Corporation, terminals of Bharat Petroleum Corporation and Hindustan Petroleum Corporation, and the dock complex of Kolkata Port Trust. Such heavy concentration of industrial units including chemical and petrochemical factories, refineries and dock complex has significant adverse impact on quantity and quality of water at River Ganga.

Similarly, West Bengal is the leading exporter of finished leather goods. Around 25% of the country's leather goods are exported from the state. West Bengal accounts for almost 4% of India's production of petroleum products and 13% of the country's polymer production. West Bengal has also emerged as a favourite destination for the steel industry.

There are plans to develop a 40 km industrial corridor from Asansol to Raghunathpur, much on the lines of Delhi-Mumbai corridor to make Raghunathpur the next investment destination in the state. This is very important as many of the leading enterprises like Jai Balaji Group, Shyam Steel, Reliance Group including Damodar Valley Corporation have shown interest to set up their units in this area. In addition, there is also a plan to set up industrial clusters on both sides of the four-lane expressway between Raghunathpur to Asansol. As a step forward, the state government has already set up Raghunathpur Planning Authority and talks are on to form Raghunathpur Development Authority. Similarly, there are plans to make Kharagpur and Siliguri as other important industrial centres of the state. Such geographical diversification in location of industrial units is expected to limit pollution pressure on river Ganga.

Given that West Bengal is the largest producer of rice, pineapple, vegetables and fruits in the country, the second largest producer of potatoes and lychees, and substantial producer of spices, coconut, cashew nut, areca nut, betel vine and oilseeds, it has huge potential in the area of agro-processing industry. Some of the major enterprises in the area of agro-processing include Ascon Agro PE & B Pvt. Ltd., Del Monte Pacific Ltd, Dabur Limited, Frito-Lay (a division of PepsiCo), etc. In addition, multinational companies like Unilever and Nestle have also expressed their interests to set up food-processing units in the state. Favourable consequences of such steps are that the discharges of these agro-processing industries are far less as compared to the chemical and petrochemical plants. However, certain necessary measures such as installing of sewage and industrial effluent treatment plants needs to be taken up to contain the quantity of pollutants that will be discharged in to the Ganga. A proper incentive mechanism for industrial diversification and for enhancement/installation of treatment capacities may be of significant help to the state to make use of river water on a sustainable basis.

4. CONCLUSIONS

While urbanization and concomitant industrialization are unavoidable in a land scarce state like West Bengal, it is important to ensure that the former is promoted without causing further damage, both direct and indirect, to Ganga river basin. In this context, the following pertinent actionable points may be proposed:

- In the wake of excessive concentration of urban population in and around Kolkata, there is a need to promote small and medium urban industrial centres in other parts of the state to reduce pressure on Kolkata and adjoining areas and also on the Ganga river basin.
- Despite the slow or significantly restricted industrial development in the last three decades or so, West Bengal has witnessed faster rise of urban centres and urban population. On one hand this may be difficult to explain but on the other it can be attributed partly to the lack of adequate productive employment opportunities in rural areas. Creation of adequate non-farm activities in rural areas is likely to put a check on rural-urban migration and consequently, lessen the growth of urban slum population in the state.
- A proper incentive mechanism should be devised to ensure that waste water is recycled or discharged to the river only after treatment. Possibly, a public-private partnership model may work better in all such efforts to keep the river clean and the cities livable.
- Industrial concentration in select places is not only eco-damaging but also has enormous adverse socio-economic impacts. The ongoing efforts towards diffusion of industries across the state may go a long way to save the Ganga river from further pollution.
- As regards development, it is evident that the state needs to reinvent and redefine its policy framework to attract investment towards industrial development.
- There is major need to promote non-farm employment opportunities in rural the rural areas so that on one hand pace of migration to urban areas can be controlled and on the other hand the economic well being of the rural people can be improved.
- There is a need to recognise the emerging smaller Census Towns as ULBs which are hitherto classified as Village Panchayats and provide enabling institutional support system.
- There is an urgent need to strengthen infrastructure and services for, among others, sewage, drainage and solid waste management in all urban centres across the state.
- There is a need to adopt a paradigm shift towards urban sanitation and solid waste management so as to consider appropriate approaches and technologies.

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