

Analysing Growth Dynamics of Census Towns and Access to Drinking Water: A Case Study of Murshidabad District, West Bengal

Sanjoy Mandal¹, Amit Chatterjee²

First Author¹: Sanjoy Mandal, Department of Geography, Visva-Bharati University, Santiniketan
Email: [sanjoymandal14\[at\]gmail.com](mailto:sanjoymandal14[at]gmail.com)

²Associate Professor, Department of Geography, Visva-Bharati University, Santiniketan
Corresponding Author Email: [amit.chatterjee\[at\]visva-bharati.ac.in](mailto:amit.chatterjee[at]visva-bharati.ac.in)

Abstract: Access to safe drinking water is recognized as an indicator of human rights and is also included in the recent ambitious global targets of the United Nations Sustainable Development Goals (SDGs). India is going through rapid urbanization, where significant urban growth is evident in urbanization beyond statutory towns, particularly census towns. Often, the growth dynamics of these census towns are unacknowledged, and the condition of basic services, such as access to water, needs to be explored more. Murshidabad is one of West Bengal's fast-growing districts, where 65 census towns were present as per the 2011 census. In the Murshidabad district, census town growth occurs near Berhampore, the biggest town and the district-headquarter large cities, and in clusters of census towns far away from Berhampore. This paper analyzes the growth dynamics of Murshidabad district temporally and spatially through Geographic Information System (GIS) software based on Census of India information. The paper also focused on access to water and water-related issues to understand the ground realities in selected census towns based on primary surveys and field observations. People in these census towns primarily depend on water tankers for drinking water and have raised concerns about poor water quality and health issues. The results can help the decision-makers understand the unprecedented growth in census towns and the related deprivation of access to safe drinking water that can help plan for a sustainable future.

Keywords: Census town, Murshidabad, GIS, spatial, growth, drinking water, access

1. Introduction

From the post-independence period rapid urbanization fueled by growth of cities and its outwards expansion is the most emerging issues in the developing countries like India. From the post independence period growing trend of urbanization in West Bengal has been noticed. At present West Bengal has 780 census towns which is the highest among all states in India (second highest is 461 in Kerala and third highest is 376 in Tamil Nadu as per 2011 census). Murshidabad has emerged as one of the most fast growing district in terms of urbanization. While in 1971 only 8.45 percent of total population of this district was living in urban areas, according to the census of 2011 about 19.72 percent of total population of Murshidabad has been living in urban areas against state average of 30.02 percent. This trend has itself necessitated to make an in-depth study of the growth of Urban sectors, Mainly census towns in Murshidabad District. Decadal change in the total number of urban centres in the district from 1971 to 2011 is 11, 13, 18, 29 & 72 accordingly.

The interesting fact to be noted is that though Murshidabad lags behind other District in the matter of development, it is ahead of others in the matter of growing Census Towns. In this context the present study has been undertaken to analyze the trend of urbanization in Murshidabad district. The Census of India defines towns of two types: statutory town and Census town. Statutory town is defined as all places with a corporation, municipality and cantonment board or notified town area committee and Census towns are defined as places that satisfy the following criteria: i) Minimum 5,000 population. ii) At least 75% of main male

working population engaged in non-agricultural sectors. iii) Density of population at least 400/km². CTs are classified as urban areas by the Census of India if they satisfy the above three conditions on population, density and workforce participation. However, CTs are still administratively rural, i.e. they are not recognized by the government as urban areas. Now (2011 Census) Murshidabad has large number of census towns (65), and positioning 4th among all district in the state.

Since 1961, the population census in India are done in two phases— 'House listing and housing Census' and 'population enumeration'. With the implementation of various programs to improve the household quality of living, the demand for house listing data was raised among the policy makers also. The Minimum Need Programme (MNP) was launched for the first time in Fifth Five Year Plan (1974–79) to ensure a basic minimum standard of life for all segments of people, especially living in the rural areas of the country. Initially, it gives emphasis on eight components such as rural water supply, rural health, elementary education, rural electrification, rural housing, rural roads, environmental improvement of urban slums and nutrition (Planning Commission, GoI, 1974). In India, ground water is being used as raw water for 85% public water supply. (According to world health report 1998) water supply varies widely in terms of region and country. In 1970s, of the approximately 2.5 billion people in developing world, only 38% has safe drinking water. At the beginning of the 1980s, water supply coverage was 75% in urban areas and 46% in rural areas. In developing countries, 75% of the population had access to water supply. So they are always prone to loss of their lives or cost a big toll to save themselves from the

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occurrence of different water-borne disease (Kumar, M., & Puri, A. (2012). Murshidabad is now a fast growing district in terms of number of census towns. With rapid urbanization pollution in drinking water is also found all over the district. As per Census 2011, about 35 percent of the households live in good condition houses and about 53.9 percent of households having the source of drinking water within the premises. (Census of India, Murshidabad, 2011) To find out the drinking water quality in Murshidabad district samples have been collected from different tube wells of two census towns having maximum and minimum population growth in the last decade (2001-2011). The main objective of the current study is to analyze the growth behavior of census towns and its impact on environment. This kind of research may help the urban planner to develop a planned city. Murshidabad is situated on the Eastern peripheral plains of the State of West Bengal and it is the Northern-most district of Presidency Division. River Padma creates the Northern and Eastern boundary, separating the district from the district Maldah to the North and Rajshahi Division of Bangladesh to the East. Districts Burdwan and Nadia are in the Southern side and Birbhum and the Pakur (Jharkhand) are on the Western side of the District. Murshidabad is in the middle of West Bengal lying between 24°50'20"N latitude and 23°43'30"N latitude and 88°46'00"E longitude and 87°49'17"E longitude. It has a total area of 5324 sq. km (Census of India, 2011). Murshidabad district has 6% of the area and comprises 7.78% of the total population of West Bengal. As per Census 2011, the total population is 71.02 lakh and is expected to cross 70 lakh and the literacy rate is 63.88%.

2. Literature Review

Mukhopadhyay Partha (2012) in his paper tries to make a concept on subaltern urbanization in India. It describes how the concept of Urban areas change over time, how the concept of census town emerge. According to him new census towns are not outgrowths. He identify that India is more urban than it seems. He also gives emphasis on Political Influence on Urban Growth.

Economic & ecological relevance are the core issue of peri-urban planning. Sarkar Sayanti and Bandyopadhyay Sumana (2013) discuss the main perspectives of the peri-urban interface in order to assess its planning needs. So they try to formulate a framework such that haphazard development does not create irreversible losses to human ecosystem.

According to census report 34% were notified, 29% recognized and 37% identified slum. Bhan Gautam and Jana Arindam (2013) have interpreted why so few cities and towns of India report any slums and urban poverty in census 2011.

Amitabh Kundu (1994) published an article on "Pattern of Urbanization with special reference to Small and Medium Towns in India". According to him, Till the nineties Class I cities in developed states grew at a faster rate as compared to small and medium towns. Whereas in the less developed states, small and medium towns grew at a similar or higher rate than that of Class I cities. This pattern changed in the nineties.

Usha P. Raghupathi (1993) in her book "Environmental Protection In Developing Countries" classified the urban environmental problems and their consequences into three spatial levels as (1) micro level environmental problems related to the residence and immediate surrounding (2) micro level problems related to the city and the region and (3) macro level problems related to countries and the globe as a whole. Now the principal environmental concern of cities is not the pollution by chemicals or by industrial wastes but by human discarded wastes. The ground water or even the surface water is polluted by the discharge of solid wastes into open dumps. So, the problem of solid waste is very serious in rapidly growing urban centres.

Uttara S., Bhuvandas N. and Aggarwal V. (2012) in their article named "Impact of Urbanization over Environment" focused on the uncontrolled urbanization in India. It also emphasizes on the effect of urbanization on environmental components mainly climate, biosphere, land and water resources.

3. Methods

The paper focuses on the population growth of Murshidabad district, both spatially and temporally. To determine the status of drinking water quality, two sample census towns were selected according to the maximum (Sibnagar, 54.33%) and minimum (Gora Bazar, 32.65%) population growth in the last census report (2001-2011). Further, Focus Group Discussions (FGDs) and primary surveys have been conducted for these two towns to understand access to water. Water quality was analysed using the sample data.

Growth rate is calculated with the help of the following formula,

Decadal Growth rate (2011) = [(Population of 2011 - Population of 2001)/Population of 2001]*100.

Different statistical techniques are used to analyze the pattern and processes of urbanization. Those techniques are-

The **Rank-size rule** (Zipf, 1949) is one of the methods of analyzing total settlement network in a region. Hence, it is a tool for analyzing settlement system and explaining the relationship between rank and population size of urban places. The rank size regularity as expressed by Zipf (1949) as follows-

$$Pr = P1 / r^q$$

Where, q is an exponent approximate to unity.

P1 is the population of the largest city

Pr represents population of city r.

This suggests that if the population of the largest city (P1) is divided by any city rank of the next order as denominator in the same region, the result will approximately be the population of city (Pr). So, it can be said in other ways that the number of settlement in any region is inversely proportional to size of the settlement.

The **level of urbanization** in any area is measured by the percentage of urban population in total population of that

area. Higher the percentage of urban population to total population higher is the level of urbanization.

$$\text{Level of Urbanization (PU)} = \frac{\text{Urban population}(U_i)}{\text{Total population}(P_i)} \times 100$$

For collection of water samples, different shallow depth and hand pumps located in the Gora Bazar and Sibnagar Census Towns of the District were chosen. The materials were collected in sterilized one-liter plastic bottles for physico-chemical examination. The samples were examined in accordance with the established protocols. All samples came from those locations where drinking-quality ground water was being extracted. (Verma et al., 2013). Two samples were taken from Ordinary tubewells of Gora Bazar and the remaining 18 from different locations of Sibnagar Census Towns.

These samples are bring to Seva Bharat Sub District Water Testing Laboratory and Farakka Block Bidi Shramik Kalyan Samity Sub-District Water Testing Laboratory and were tested for pH, Alkalinity, Total hardness, TDS, Turbidity, Iron, Chloride, Sulphate, Nitrate, and Arsenic. The analysis of the samples was carried out in accordance with the standard procedure.

4. Results & Discussion

Urban Growth in Murshidabad District

To understand the dynamics of urban development in the district, it is important to study the changes in the levels and pace of urbanization from various angles. At the same time, it is also necessary to identify patterns related to urban places in Murshidabad district.

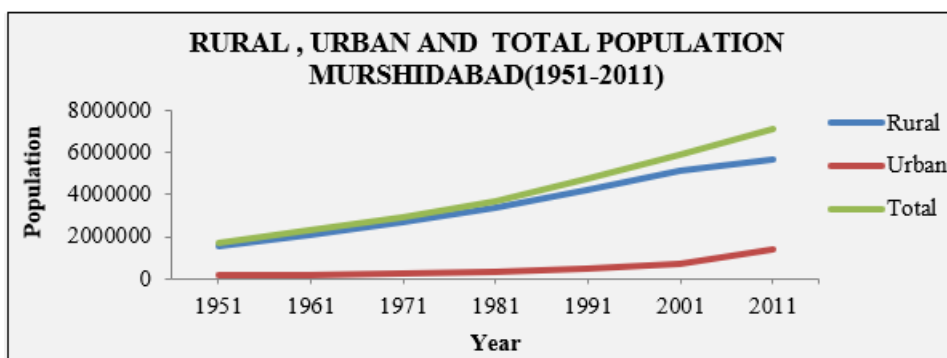


Figure 1: Rural, Urban and Total Population of Murshidabad District (1951-2011)

Source: Compiled from District Census Handbook, Murshidabad

The 2011 census shows the district has 65 census towns and 7 statutory towns. The number of census towns has grown rapidly in the last few decades. Also, the population growth in these existing places is much greater than in the other

districts of West Bengal. Where there were 10 census towns in 1991, it increased to 22 in 2001 and 65 in 2011. The population growth scenario of the district is shown in Fig.-1

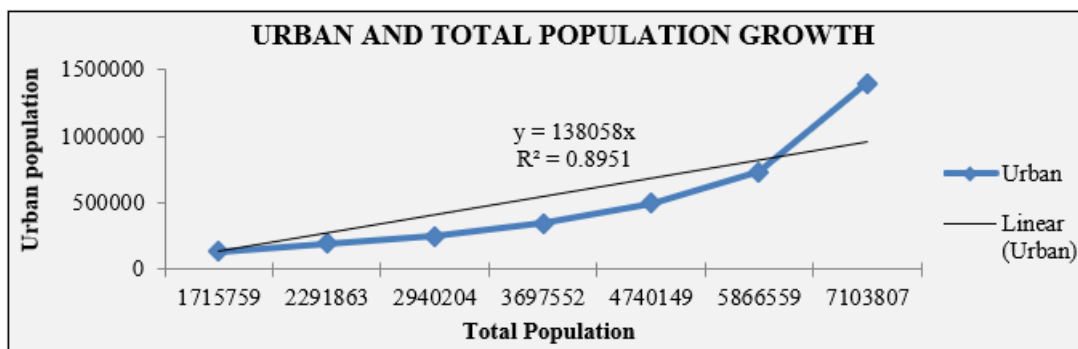


Figure 2: Urban and total population growth of Murshidabad

Source: Compiled by the researcher from census data, 2011

Total urban population change in Murshidabad in 50 years is about 597807, but in the last decade it is about 667958. This trend showing the huge urban population growth in the district (Fig.-2).

There is also very high positive correlation between growth of total population and growth of urban population (Fig.). The correlation co-efficient value of r (0.99) is significant at 0.05 significance level with 9 degrees of freedom.

The facts emerge from the relationship as:

- 1) The urban population has increased with the increase of total population. During last four decades urban population has increased at a rate faster than the total population.
- 2) The growth of urban population did not follow the line of best fit.
- 3) During last decades (2001- 2011) the growth of urban crosses the line of best fit. This fact supports that the region is marching towards rapid urbanization.

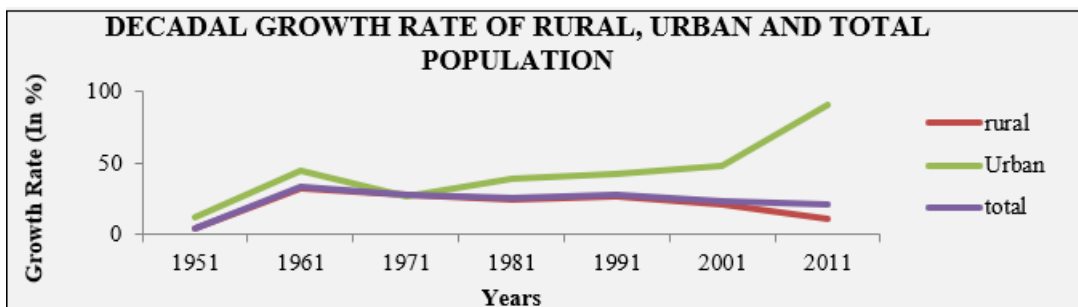


Figure 3: Decadal Growth of Rural, Urban and Total Population

Source: Compiled by the researcher from census data, 2011

In the decade of 1971, rural population growth rate was higher than urban population growth rate. In the following decade (1971-81), rural population decreased while urban

population growth remained modest. In the last decade studied, urban population growth surpassed rural population growth significantly.

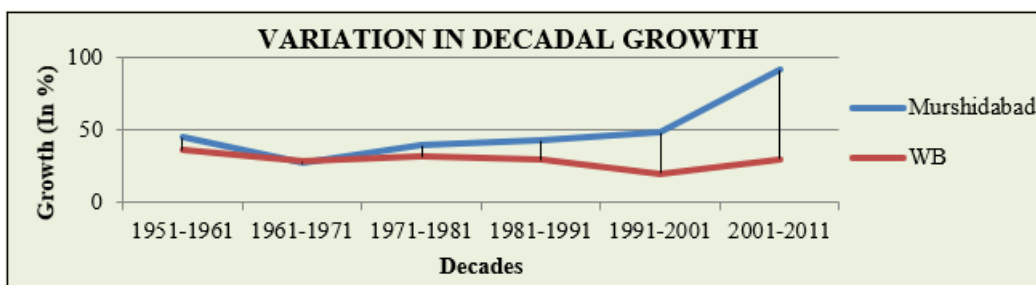


Figure 4: Variation in Decadal Growth

Source: Compiled by the researcher from census data, 2011

Murshidabad district experienced a much higher variation in urban population growth compared to the state's overall urban population growth. Urban population in Murshidabad

district increased by 91.16% from 2001 to 2011, whereas in West Bengal as a whole, the increase was much lower at 29.72%.

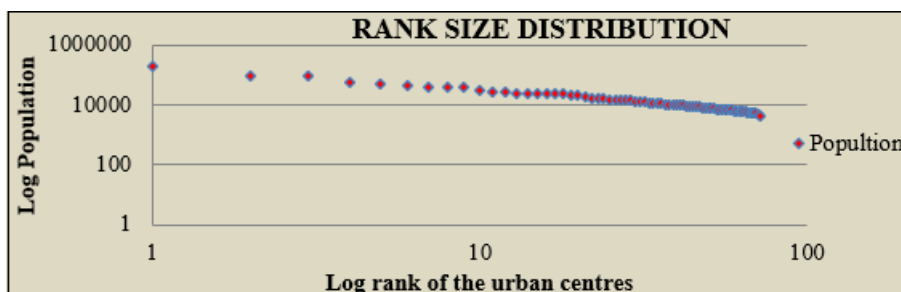


Figure 5: Rank size distribution

Source: Compiled by the researcher from census data, 2011

As slope is greater than one that means primacy is found within the urban centres of the district. Here Murshidabad is

growing as primate city as it is a metropolitan city and located in the central part of the district.

Table 1: Urban population and frequency of town in each class of towns, Murshidabad

class	year						
	1951	1961	1971	1981	1991	2001	2011
I					117647(1)	160143(1)	195223(1)
II	55613(1)	62317(1)	62605(1)	84896(1)	55981(4)	197667(1)	291293(4)
III		47876(2)	104700(4)	155908(5)	260697(8)	222439(7)	425709(15)
IV	79314(5)	77430(5)	46921(3)	85432(5)	13610(2)	59630(5)	244883(18)
V		7841(1)	24199(3)	7415(1)	46412(6)	92815(15)	234360(32)
VI				2336(1)			9224(2)

(Figure in brackets is the frequency of towns).Source: District Census Handbooks, Murshidabad

Table 1, depicts the distribution of urban population in six classes of towns and also the number of towns in each class from 1951 to 2011. After 1951, the number of towns started increasing. In 1971 there was no class I town, and class VI

town in the district. In 1981, out of 13 towns, there were one class V town and only one class VI town. In 1991, the only class I town came into existence in the urban landscape of Murshidabad on promotion from its previous position of

class II category town. Out of 18 towns in 1991, 7 towns got themselves promoted to next higher class. Interesting to note that out of 7 towns, some towns promoted directly from category V to II category town. It is more significant to note that the five villages acquired the characteristic of census town in a decade. Class V category town credited with largest number of towns in 2011. It is quite interesting to note the changes in the growth of urban population according to size class of towns during different decades.

Table 2: Decadal Growth of Urban Population of each urban classes

class	Years						
	1951	1961	1971	1981	1991	2001	2011
1						36.11	21.91
2		12.05	16.5	30.7	-41	253	47.37
3		15.2	118.69	83.1	67.21	-14.65	91.38
4	8.9	-2.4	-39.4	83.1	-84.06	338.13	310.67
5		30.6	208.6	-69.35	525.9	99.98	152.50
6				0.7			

Source: Compiled from District Census Handbook, 2011, Murshidabad

From the decade-wise analysis, it may be noted that the class V towns registered the highest growth rate (525.9 percent) during 1981-91 followed by class IV town with 338.13 percent growth rate during 1991-2001 and class II town with 253 percent during 1991-2001. It is clear from the table that

small and medium size towns have a strong tendency to grow faster than large size towns. It is essential to look at the disparity in growth rate to ascertain growth stability in different size categories of towns. The coefficient of variation for the growth rate of urban centers belonging to different size categories from 1951 to 2011 reveals that the class I and class III category towns show greater stability and consistency in growth.

Level of urbanization

In order to bring out the distributional pattern of towns as well as urbanization pattern, Murshidabad can be broadly divided into 5 sub-regions on the basis of their level of urbanization.

Very high concentration (above 35 percent level of urbanization)

High concentration (25-35 percent)

Medium concentration (15-25 percent)

Low concentration (5-15 percent)

Very low concentration (below 5 percent)

Looking at the 2011 census figures of individual blocks separately; Samserganj and Suti II emerges as the most urbanized block in Murshidabad with above 60 percent of its population within the urban frame. Northernmost blocks of the district are mainly urbanized block. Except Berhampore the whole southern, eastern and western part of the district is less urbanized.

Table 3: Showing degree of urbanization in different blocks of Murshidabad

C.D. Blocks	Degree of urbanizations	C.D. Blocks	Degree of urbanizations
Beldanga - I	2.77	Khargram	0
Beldanga - II	0	Lalgola	0
Berhampore	24.45	Murshidabad Jiaganj	0
Bhagawangola - I	0	Nabagram	0
Bhagawangola - II	0	Nawda	0
Bharatpur - I	0	Raghunathganj - I	31.96
Bharatpur - II	12.98	Raghunathganj - II	50.54
Burwan	0	Raninagar - I	12.92
Domkal	0	Raninagar - II	0
Farakka	38.77	Sagardighi	0
Hariharpara	0	Samserganj	61.73
Jalangi	0	Suti - I	16.18
Kandi	0	Suti - II	60.29

Source: Calculated by the researcher

Although Berhampore is a Class 1 city, the degree of urbanization is maximum in the northern part of the district. This is because a transport network and a river water facility are available in this area. Here, the Census town is growing as an independent cluster.

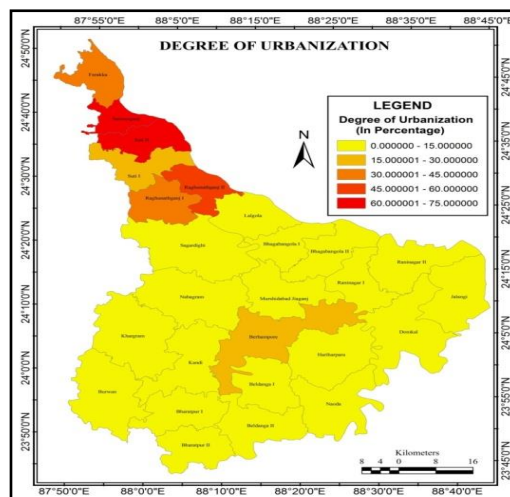


Figure 6: Level of urbanization

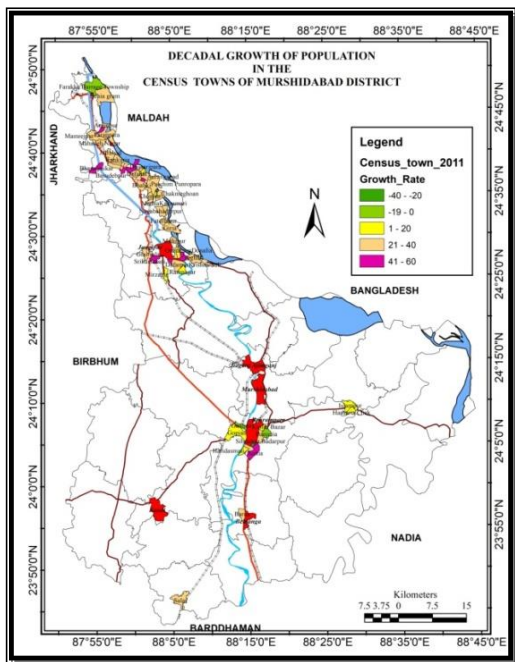


Figure 7: Decadal (2001-2011) population growth in Murshidabad

It can be said that three main clusters will form with the growth of census towns in the district. Cluster 1 contains three Municipalities, such as Berhampore, Murshidabad, and Jiaganj-Ajimganj, and nine census towns. Cluster 2 consists of Jangipur Municipalities and 15 contiguous census towns. Cluster 3 surrounds the Dhulian municipality with huge census towns (15). Beldanga and Kandi Municipality do not participate in making the cluster. There is a considerable probability of forming a Development Authority in Berhampore for planning purposes.

Urban Growth Rate

Decadal growth of population of any region can explain the economic status of that place. Where population growth is high that means people attract or immigrate there for better opportunity. Most of the cases growth rates have symmetrical relationship with the Household quality of living of that region. Population growth rate of census towns were calculated for two decades, 1991 to 2001 and 2001 to 2011 from the census of India data. (Fig. 8). Based on the urban population growth rate two census towns namely Sibnagar, with maximum population growth rate and Gora Bazar, with minimum population growth rate has been selected to find out the status of water quality and access to water.

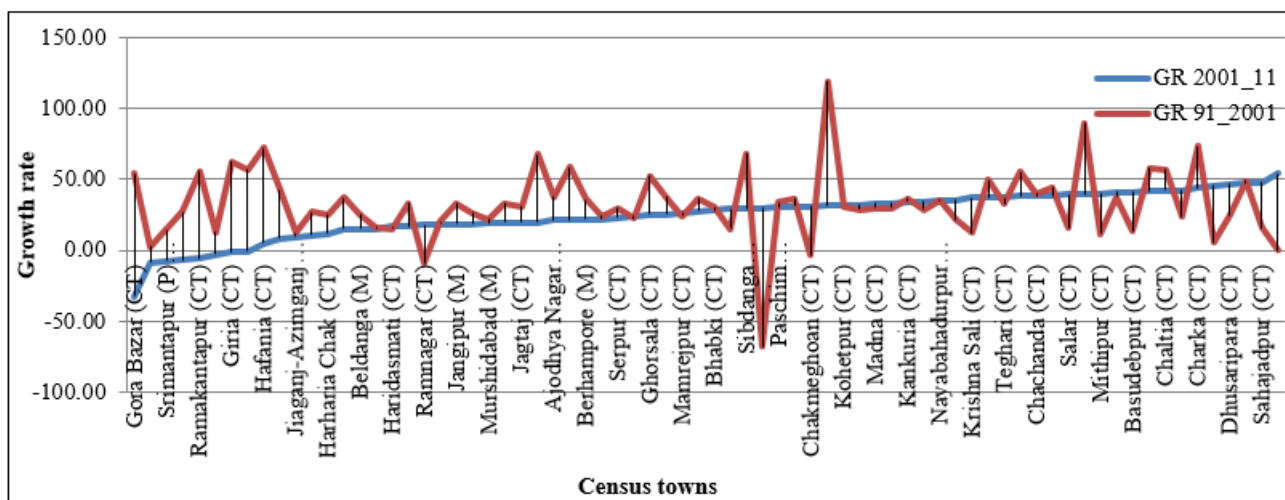


Figure 8: Population Growth Rate in Census towns of Murshidabad (1991-2002 and 2002-2011)

Source: Computed by the researcher

Drinking Water Quality and Access to Water

The district is situated just beside the river Ganga. River Bhagirathi is flows through the district yet access to pure drinking water is rarely found in the district. During primary survey it was found that most of the people use to buy drinking water from different sources, yet they have tube wells or pumps in their house. So water quality test become necessary to know the purity of subsurface water. Demand for clean water which is essential but minimal and it is less than 1 per cent of the total water demand (Ninth Five Year Plan, Vol. II, 1998). Safe drinking water has multi-faceted influence as it reduces incidence of diseases and deaths, cut off the health expenditures, saves money and improves

human productivity and quality of life. Safe drinking water includes the sources like tap water from treated sources, covered well, hand pump and tube well/borehole. On an average 49 percent households have drinking water within their premises.

As of 2018, 11.3% of households have a deficit in case of access principle sources of drinking water, and 4.5% of households have an obligation in case of access to improved sources of drinking water throughout the year for achieving safe and affordable drinking water for all (SDG 6.1) in 2030 agenda. (Biswas, S., Dandapat, B., Alam, A. et al.)

Table 4: Showing Water Quality Report of Gora Bazar CTs

Seva Bharat Sub District Water Testing Laboratory									
Public Health Engineering DTE									
Test Report									
District	Block	Village	Source Type	Location Description	Test Result				
					Chemical		Physical		
					Fe (mg/L)	Arsenic (mg/L)	Hardness (mg/L)	Turbidity (NTU)	pH
					Per. Limit.	Per. Limit.	Per. Limit.	Per. Limit.	Per. Limit.
					0.3-1.0mg/l	0.01mg/l	300-600mg/l	5.0 N.T.U.	6.5-8.5
Murshidabad	Berhampore	Gorabazar CT	Tubewell Ordinary	In front of kumar hostel	0.75	0.013	360	3.25	7.06
Murshidabad	Berhampore	Gorabazar CT	Tubewell Ordinary	Inside of Umasundari park	0.92	0.015	280	1.26	6.98

Source: Office of the executive engineer, Murshidabad

In this census town’s arsenic creates huge problems in people’s health. The main environmental problem we found there is decreasing surface water level. Most of the people of Gora Bazar say that they are facing lack of water problem during summer. As the area has so much wetlands, and many of the settlement are constructed in such areas recovered from those wetland. As a result water quality is not so better in this census town. Most of the aristocratic people of Gora Bazar use to drink Govt. Ganga plant refined water. There are two main plant situated in Farashdanga, haridashmati. Primary expenditure to get the connection is 17-18 thousand. So most of the people cannot able to get the connection. They used ground water either from 40ft layer (Ironic water which is not suitable for drink or bath) or from 100ft layer (Where water level gradually decreasing, but suitable for drinking). Before 10 years people can test their water quality from MIT college of Berhampur with a very minimum charge (180Rs). Now payable water ATM is found here and there from where people get required water with very low cost.



Figure 9: Payable Water ATM at Gora Bazar

Table 5: Showing Water Quality Report of Sibnagar

Source Type	Habitation	Location Description	pH	Turbidity (NTU)	Total Iron (mg/l)	Total Hardness(mg/l)	Total Arsenic (mg/l)
Tube well ordinary	Shibnagar	N jummosjid	7.19	1.14	0.68	320	0.004
Tube well ordinary	Shibnagar	N rahimsk	7.71	5.16	1.11	308	0.005
Tube well ordinary	Shibnagar	Nh alauddinsk	7.48	1.29	0.68	340	0.006
Tube well ordinary	Shibnagar	N.lalmatimadrasha	7.84	1.65	0.79	264	0.008
Tube well ordinary	Shibnagar	Nlalmatimadrashapamp	7.65	7.19	5.15	300	0.011
Tube well ordinary	Shibnagar	N jummosjidpamp	7.21	5.16	4.12	276	0.055
Tube well ordinary	Shibnagar	N chakpara w mosjid	7.98	3.24	2.84	292	0.018
Tube well ordinary	Shibnagar	N. Madrasha side	7.36	1.11	0.82	340	0.007
Tube well ordinary	Shibnagar	Nh bipolar mandal	7.42	4.12	0.74	264	0.007
Tube well ordinary	Shibnagar	Nh nurnobisk	7.41	4.52	4.98	292	0.064
Tube well ordinary	Shibnagar	Nh.uttamrobi das	7.76	3.42	1.12	300	0.048
Tube well ordinary	Shibnagar	Nh dulal sardar	7.74	1.24	0.68	308	0.078
Tube well ordinary	Shibnagar	Nh lakshman sardar	7.85	1.65	0.98	304	0.092
Tube well ordinary	Shibnagar	Nh goutamadhikari	7.65	2.11	1.54	340	0.002
Tube well ordinary	Shibnagar	Nh mithun sardar	7.49	3.12	1.78	368	0.042
Tube well ordinary	Shibnagar	Nh saifulsk	7.48	4.12	2.32	272	0.003
Tube well ordinary	Shibnagar	Nh sademansk	7.56	1.11	0.39	276	0.039
Tube well ordinary	Shibnagar	Nh.uttam mandal	7.44	4.17	3.86	268	0.054

Source: Farakka block bidi shramikkalyansamity sub-district water testing laboratory, Murshidabad

In case of Sibnagar Census towns except pH Value all the parameters crosses their limit. As a result drinking water quality is very worst here. Most of the house uses mineral

water for drinking purpose although they have personal tube well or pump. Water van comes everyday from nearby Census town Arjunpur to serve drinking water with charge

of 10Rs/ 20L barrel. Few years before people used to drink govt water supply from constructed large tank. But due to unhealthy condition of that tank water now they did not

drink it. Ground water level is found in the depth of 80-140ft, but it is full of iron content. So people used it only for household purpose.



Figure 10: Payable Drinking water supply at Sibnagar

5. Conclusion

Decadal population growth is normal process in such census towns. But fact is that in near future many of the census towns of the district will be merged with the nearby statutory towns or with the contiguous census towns, which can suddenly change the standard of living of those areas.

The district is very much suffering from long time in terms of drinking water pollution. Govt. should take proper planning for the better drinking water supply, Like Swajaldharaprakalpa. Purification should be done through proper and cheapest method that every people have to access to get that. After launch of Swachh Bharat Mission and other programmes related to sanitation and drinking water, sanitation coverage and accessibility of drinking water rise which has reinforcement substantially in accelerating the Achievement of Sustainable Development goal 6. States and UTs having the lower status of sanitation, drinking water, groundwater and hygiene need to improve those condition by increasing availability, accessibility and affordability of the WASH facility (Biswas, S., Dandapat, B., Alam, A. *et al*,2022). Yet in Murshidabad district every family paying a huge amount of money to get safe drinking water. Access to safe drinking water and water quality are the two prime issues observed in both census towns of Murshidabad district. As society progresses, access to safe drinking water is a prerequisite for achieving SDGs at the local level.

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