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An Evaluation of Physical and Socio-Economic Expansion of Bankura Municipality

Dhiren Barman

Department of Geography, Seacom Skills University, Birbhum, West Bengal, India

 <https://orcid.org/0009-0006-9542-4210>

Gouri Sankar Bhunia

Department of Geography, Seacom Skills University, Birbhum, West Bengal, India

Abstract

Urbanization can be viewed as a significant socioeconomic change process that is mostly brought on by the population increase of towns. However, based on a wide range of geographical circumstances, the nature and dimensions of urbanisation and urban development are found to differ across the micro-level of the Bankura district. With this context, an analysis of the spatiotemporal variance in urbanisation patterns in the Bankura Municipality is attempted in this study, along with an examination of its effects on socioeconomic, infrastructure, and demographic traits. Ward-wise socio-economic information have been collected from the Bankura Municipality. All these data have been processed and integrated into GIS platform to measure spatial variation of urban landscape. Results showed that Wards 11 and 22 contained a sizable portion of the population. The population was found in Wards 7, 10, 15, and 19 in a moderate amount. The central ward of the town, number 2, had a very high literacy rate of 80.81%, while number 19, in the southwest, had the lowest literacy rate at 44.87%. The central area of the city is where the majority of the government buildings are located. The eastern region of the city was where the general business centres could be found. Most of the educational centres (college and school) were located in the central and western part.

Keywords: Social landscape, Economic landscape, GIS, Bankura Municipality.

Introduction

The Economic Survey states that between 1991 and 2011, the proportion of Indians living in cities and towns increased from a quarter to a third, and this group contributes more than three-fifths of the nation's Gross Domestic Product (GDP). It is clear that urbanisation contributes to the growth of nations. One of the development processes is the expansion of cities and towns. The structural change caused by the shift of labour from the agricultural sector to industry and services, which is typically linked with urbanisation, can be partly blamed for the rapid economic expansion ([Wilkerson et al., 2018](#)). Today, a substantial portion of the population resides in towns, neighbourhoods near cities, and cities' peripheries. Urban life styles, attitudes, and expectations have a profound impact on those who reside close to urban regions. Urban areas are actually thought of as the hub for non-agricultural employment, which includes jobs in the service sector and in industry. A sizable portion of new private sector jobs are created in urban regions, which provide major potential for both official and informal work. Rapid information and communications technology adoption has helped urbanization's ability to reshape society in some ways.

Agglomeration and scale economies may also be to blame, as close proximity and high population density result in lower per capita expenses for infrastructure and services.

Urban sprawl is the pattern of land use that reflects low levels of each of the following eight dimensions: closeness, density, continuity, concentration, clustering, centralization, nuclearity, and mixed-uses (Dadras et al., 2014). Cities are thought of as centres of opportunity because they are centres of civilization, producing economic growth as well as social, cultural, spiritual, and scientific developments. Among these possibilities are the benefits of employment, accessibility to city services, commerce, transit, and educational and medical facilities. However, unchecked urbanisation has a detrimental impact on peri-urban livelihoods and the environment in the majority of emerging nations. Urban growth affects how places are organised, as well as how the economy and society function. However, these consequences transcend territorial boundaries and have a significant impact on many areas, especially the rural villages nearby. Urban growth results from two factors (Alemineh, 2021). One is the increase in financial development and economic growth, which makes peri-urban areas more attractive to manufacturers, construction projects, and other investment sectors. Population growth in urban areas, which may result from natural growth or rural-to-urban migration, is the second component in urban expansion.

Most metropolitan regions, particularly those in developing nations, lack access to the information gained from conventional surveying and mapping approaches for predicting urban sprawl because they are expensive, time-consuming, and labour-intensive (Indrawati et al., 2020). Given the variety of geographical data available, a GIS user can map almost any phenomenon that has a geographic component. Additionally, compared to human cartography methods, processing huge amounts of data before creating a map requires a lot less work (Wu et al., 2011). For a better understanding of the spatio-temporal patterns of urban expansion, remote sensing data should be integrated with the landscape of urban study (Foresman et al., 1997). Furthermore, the combination of remote sensing data with the use

of Geographic Information System (GIS) technology offers a different method for quickly evaluating urban dynamics and development so that prompt action may be done.

The present study highlighted the historical growth of geographical extent of Bankura Municipality and spatial and socio-economic pattern of urban landscapes using GIS tool that are crucial for human and biophysical processes.

Study Area

The town of Bankura is situated in the centre of the Bankura district of West Bengal between the longitudes of 87°2'0" and 87°6'0" E and the latitudes of 23°12'30" and 23°15'30" N (Figure 1). The town is traversed by the NH-60 National Highway and the SH-8 State Highway, also known as Ahalya Bai Road. The Bankura municipality had 19 wards and council members. In the 1995 West Bengal municipal election, Bankura municipality members and ward numbers increased to 23 following the 74th constitutional amendment. The total number of municipal wards and members reached 24 in 2015. The town is situated in a transitional natural area between the alluvial plain in the east and the decimated spurs of the Chotanagpur plateau in the west and is surrounded by the Dwarakeswar and Gandheswari Rivers on the northern and southern sides, respectively.

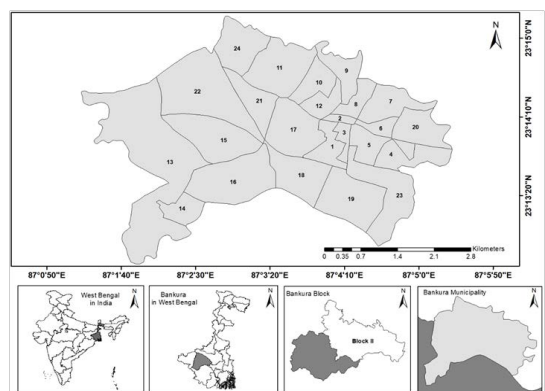


Figure 1 Location Map of Bankura Municipality, Bankura district, West Bengal (India)

Materials & Methods

Data Collection and Processing

The secondary data is collected from the Statistic department of Bankura Municipality, Census of India for the years 1991, 2001, and 2011, among other publications. A substantial portion of the information needed to comprehend demographic, socioeconomic, and urban infrastructure aspects was gathered from the Bankura Municipality and Bankura district census handbooks.

Database Creation and Spatial Analysis

Ward boundary map of the study area is collected from the Municipal Office, Bankura. Socio-economic data at ward level is collected from the Municipal Authority and field survey. Spatial database of population concentration, household density is calculated and incorporated on QGIS platform. The spatial database commercial hub and industrial hub center is digitised from Google earth image and validated through field survey.

Mean Center

The mean centre is the average of all ward centres in the Bankura Municipality as measured by their x and y coordinates. The distribution of the central locations of ward boundaries in the study area is compared over time.

$$\bar{X} = \frac{\sum_{i=1}^n x_i}{n}, \bar{Y} = \frac{\sum_{i=1}^n y_i}{n}$$

Where, x_i and y_i are the coordinates for the feature i , and n is equal to the total numbers of

Standard Deviation of Ellipse

Calculating the standard distance in the x- and y-directions independently is a typical method of determining the pattern for a cluster of wards. The ellipse containing the distribution of ward extent is defined using these two measurements as its axes. Calculating the standard deviational ellipse is as follows:

$$SDE_x = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{X})^2}{n}}$$

$$SDE_y = \sqrt{\frac{\sum_{i=1}^n (y_i - \bar{Y})^2}{n}}$$

Where x_i and y_i are the coordinates for feature 'i', $\{\bar{X}, \bar{Y}\}$ represents the Mean Center for the ward boundary, and 'n' is equal to the total number of wards.

Results

Physical Growth of the City

Bankura municipal Board was established in 1869 as the district headquarters and the main city. In 1869, there were 12 commissioners in the municipal corporation which was established in the form of Bankura municipality. During 1964-65, Bankura Municipality had an area of 18.13 sq. km. (7 square miles), which was divided into 6 wards.

The wards of Bankura municipality varies in size and population. In respect of area Ward no. 2 is smallest and Ward no. 13 is largest. In 1991, Ward no. 15 was the largest ward in respect of population, was located in west central part. Ward no. 2 was the smallest with just two thousand plus population, and was located in the east central pocket. In 2001, Ward no. 19 became the largest block located in the South-Eastern part and Ward no. 3 is the smallest Ward located in the East central part. The pattern changed again in 2011. Ward no. 3 remain the smallest Ward while Ward no. 11 located in the northern part became the largest Ward. Thus, pattern of decadal growth of population varied between 1991-2001 and 2001-2011.

This spatial variation affected the mean centre of population in different census years of the last 30 years. In all the census years the mean centres were located in the East-central part of Ward no. 17. It shifted North-East Ward from 1991 to 2001 and again shifted North-West Ward from 2001 to 2011 (Figure 2).

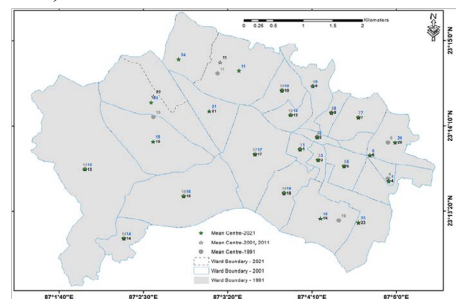


Figure 2 Spatial Variation of Mean Centre of Bankura Municipality from 1991 to 2021

Directional Distribution of City Growth

The results of the analysis showed, the SDE is distributed in the central and eastern part of the study area. The ellipses are gradually move towards south-east direction which indicates growth of urban towards south-east direction in Bankura Municipality. The results also revealed that ward

boundaries are closest in the centre and then get smaller as they move outward (Table 1). The size of SDE is also varied during the study period. The size of the ellipse is gradually increased which may be attributed to the spreading of urban areas dispersedly in the Bankura Municipality (Figure 3).

Table 1 Directional Distribution of Ward in Bankura Municipality

Year	CenterX	CenterY	XStdDist	YStdDist	Rotation
1991	506524.7	2569253	1097.48	2032.851	81.87479
2001	506572.3	2569242	2065.134	1137.58	90.11837
2021	506514.7	2569296	2074.098	1176.964	93.09221

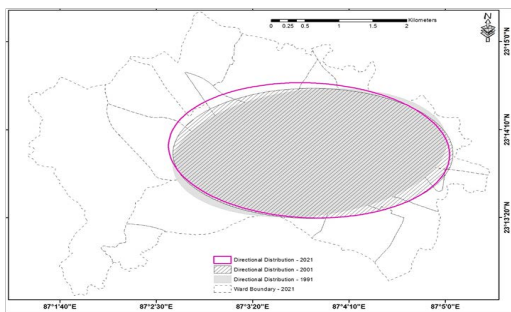


Figure 3 Spatial Extension of Standard Deviation of Ellipse in Bankura Municipality, 1991-2021

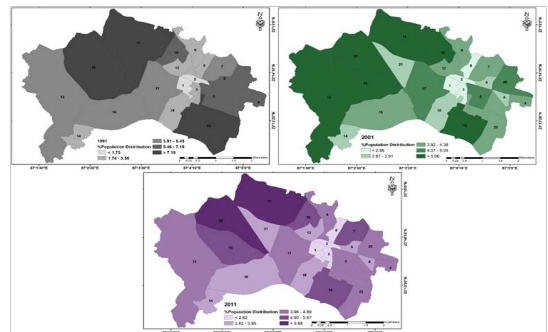


Figure 4 Spatial Variation of Population Concentration in Bankura Municipality

Population Concentration

Population concentration is a measure of the number of populations in each ward to the total population of Bankura Municipality. In 1991, it was very high in Ward no. 11 and 19; and very low concentration of population was observed in ward no. 1 and 2. In 2001, the maximum concentration was recorded from ward no. 10, 11, 13, 15 and 22. In 2011, a high percentage of the population was found in Ward no.11 and 22. A very low percentage of the population was found in Ward no.1, 2, 3 and 8 (Figure 4). Moreover, the results showed population concentration is higher in the north and north-east of the municipality; whereas, the population distribution is less in ward no. 1, 2, and 3 consistently in the study area.

Household Density

Household density that is the number of households per sq. km of area. In 1991, ward number 1,2 and 9 was the densest ward with more than 6000 households per sq. km. It is surrounded by ward numbers 3, 12 and 19. This pattern changed in 2001. The very highly dense ward is 3. Ward no. 1, 17 and 19 in its northern part became highly dense. Ward nos. 13, 15, 16 and 20 became less settled with 1500-3000 households per sq. km. In 2011, ward number 12 and 19 remained a very highly settled ward followed by ward number 2 (highly settled), ward no. 3, 5, and 17 became moderately settled (Figure 5).

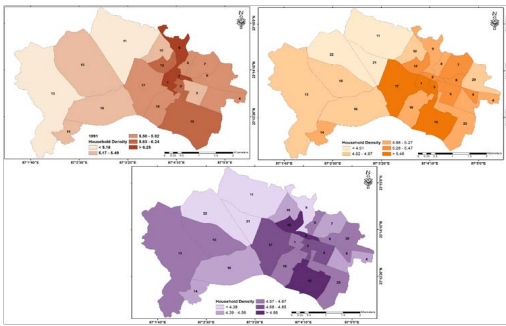


Figure 5 Spatial Variation of Household Density in Bankura Municipality

Economic Landscape

In the study area, various types of commercial hub centres e.g., government offices, mixed landuse, hotel/lodge/restaurant, shopping centre, multiplex, warehouse, wholesale etc were distributed. The major shopping centres in the city of Bankura include Keshob Textile, Karan Plaza, Auto Highland, and Bajaj Building, among others. Pals Plaza shopping centre, Bharat market complex, Mahaprabhu variety stores, Mangalpurhatipara market, etc. all have a variety of well-known market centres (Figure 6). In the study area, most of the educational centres (college and school) were located in the central and western part. The very few numbers of schools were located in the southern part of the Municipality. The training institutions are mostly found in the western part of the study area.

Numerous medium-sized and small-scale industries, including those based on ferro alloys, fly ash bricks, plastic, cement, stone crushing, dairy products, cattle and poultry feeds, seed processing, rice mills, cold storage operations, flour and oil mills, puffing mills, chira and besan

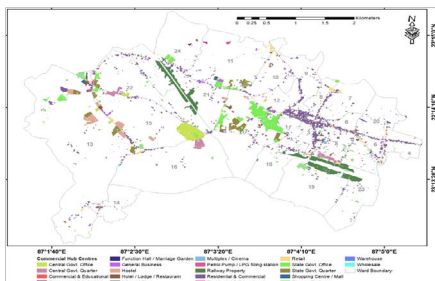


Figure 6 Spatial Distribution of Commercial Hub Centre in Bankura Municipality

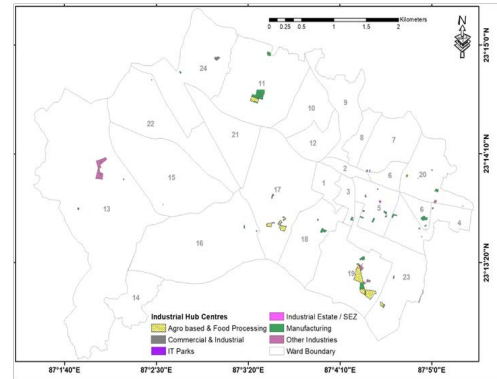


Figure 7 Spatial Distribution of Industrial Hub Centre in Bankura Municipality

Mills, husking mills, baluchari saris, other silk and handloom products, terracotta, dokra, brass, and bell activities, Stone curving, Wood curving, Jute product, Sal Leaf products, other need-based activities like steel fabrication and other handicrafts products. Figure 7 shows the spatial distribution of industrial hub centres in Bankura Municipality. In the study area most metal of the agrobased and food processing industries were distributed in the south-east of the Municipality. The manufacturing industries were located in the eastern part of the study area. The other industrial centres were observed in the west of the municipality.

Discussion

Regarding the regional and temporal fluctuation of the levels of urbanisation, the pattern of urbanisation in Bankura Municipality is exceptional. The degree of urbanisation and the number of wards vary significantly across the Municipality, depending on demographic variations, accessibility, and resource mobilisation (Kundu, 2015). The growth in the number of wards and their populations is the most significant and notable socio-economic development that has occurred in Bankura Municipality. Most of the areas are experiencing a rise in population pressure as a result of the substantial rural-to-urban migration of people seeking better living conditions, career opportunities, and educational opportunities (Pramanick, 2021). In addition to demographic characteristics, socio-economic characteristics of urban residents, such as literacy rate, educational attainment, labour participation rate, occupational

composition, etc., represent their standard of living and level of urban development in the Bankura Municipality.

The Bankura district's economy heavily depends on the mining and mineral industries. The area of land between Bankura and Saltora has already seen the development of a number of mines and mineral-based businesses (Murmu, 2023). The potential for the establishment of mines and enterprises reliant on minerals is pretty good in places like Chhatna, SaltoraKhatra, Ranibundh. One significant component of the district's economy is comprised of cottage and small-scale industries. Next to agriculture, it offers the most employment options, and this generates almost 9% of the district's income. With the availability of cutting-edge technology and other infrastructure resources, this industry has a lot of room to grow. Through various development organisations, work has been done to improve the designs, marketing support, financing, etc. of these industries, particularly in the case of brass and bell metal craft, conch shell products, fishing hooks, ceramics, and leather products, etc.

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Author Details

Dhiren Barman, Department of Geography, Seacom Skills University, Birbhum, West Bengal, India,
Email ID: dhirenbarman84@gmail.com

Gouri Sankar Bhunia, Department of Geography, Seacom Skills University, Birbhum, West Bengal, India,
Email ID: rsgis_gouri@rediff.com

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