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Urban Infrastructure and Sustainability in Bankura Town: An Ancient City of Rarh Bengal Located Between Two Rivers (Dwarakeswar and Gandheswari)

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Abstract
For over two decades, India has had one of the fastest-expanding economies in the world. It is apparent that faster expansion affects the rate and type of urbanization. Urban infrastructure includes drinking water, sanitation, sewage systems, power and gas distribution, urban transportation, primary health services, and environmental governance. Bankura town is part of the Burdwan Division of West Bengal. Being included in the "Rarh" area of Bengal, it is flanked by the Dwarakeswar and Gandheswari Rivers on the northern and southern sides, respectively. Maximum and minimum water supply distribution networks were observed in the eastern, northern, western, and southern parts of the Bankura municipality, respectively, with pucca drains in most of the research region. Bankura town, which is the center of the entire Bankura district, has a well-developed transport and communication infrastructure. The study is based on both primary and secondary data collected through ward-level household surveys, field observations, personal interviews, Census of India reports, and Bankura Municipality records. Descriptive statistical techniques and GIS-based spatial mapping were used to assess ward-wise variations in the urban infrastructure. The municipality has approximately 170 km of water pipelines connecting 14,024 houses, while substantial spatial disparities are observed in water supply, drainage, and solid waste generation across different wards. In terms of solid waste management, the municipal services offered in this metropolitan core are still insufficient. Currently, municipal regions dispose of solid waste by simply dumping it wherever there is accessible low land. The sides of the landfill do not follow any long-term regional land-use plans. One of the most crucial aspects of integrated waste management is garbage disposal, as improper waste disposal can harm the environment, sub-surface strata, human health, and life. Currently, open dumping is the only method used to dispose of the town's solid waste. The findings of this study contribute to the understanding of urban infrastructure disparities in medium-sized municipalities and provide practical recommendations for sustainable urban planning in Bankura. Future research should incorporate geospatial modelling, longitudinal assessments, and comparative analyses across municipalities to evaluate the long-term effectiveness of infrastructure development policies and sustainable urban management strategies.

Keywords: Urban Infrastructure, Sustainable Urban Development, Urban Governance, Solid Waste Management, GIS, Bankura Town.

Introduction

Currently, almost 4.4 billion people, or 56% of the global population, live in cities. Seven out of ten people will reside in urban areas by 2050, and the number of people living in urban areas is expected to quadruple from its current level (Wells and Stock, 2020).

Owing to better living conditions and more work options in cities, the population of cities has steadily expanded over the past 60 years (Gu et al., 2021). Population growth in cities over the past 60 years has been a result of better living conditions and more work options.

Urbanization contributes to the growth of nations. One of the development processes is the expansion of cities and towns in the region. The structural change caused by the shift of labor from the agricultural sector to industry and services, which is typically linked to urbanization, can be partly blamed for the rapid economic expansion (Doshi et al., 2018).

As a result of the rapidity and breadth of urbanization, there are difficulties in providing the growing demand for inexpensive housing, a functioning transportation infrastructure, basic services, and jobs, especially for the nearly 1 billion urban poor who live in informal settlements to be close to opportunities. Given that 50% of those who have been forcefully relocated live in cities, the burden on these cities is growing (Srivastava, 2009).

Drinking water, sanitization, sewage systems, power and gas distribution, urban transportation, primary health services, and governance of the environment make up urban infrastructure. Numerous of these services fall under the category of "local" public goods, meaning that only city residents will benefit from enhanced urban infrastructure in that city.

For over two decades, India has had one of the world's fastest expanding economies. It is apparent that faster expansion will affect the rate and kind of urbanisation. The interaction of rising ambitions and expanding middle classes on the one hand, and poor planning for the inevitable rise in urbanization on the other, produces a scenario that is unsustainable from a social, economic, and environmental standpoint (Gore & Gopakumar, 2015).

The present study highlighted the urban infrastructure and sustainability in Bankura town, an ancient city of Rarh Bengal located between two rivers (Dwarakeswar and Gandheswari).

Although numerous studies have examined urban infrastructure and sustainable development in metropolitan cities, limited research has focused on medium-sized municipal towns such as Bankura, India. Existing studies primarily emphasize physical infrastructure development but provide insufficient attention to spatial disparities in infrastructure accessibility, service quality, and residents' perceptions. Furthermore, there is a lack of integrated assessments combining socio-economic characteristics, field-based observations, and spatial analyses to evaluate urban sustainability. Therefore, this study attempts to bridge this gap by analyzing the present status of urban infrastructure in Bankura Municipality using both primary and secondary data to identify infrastructure deficiencies and propose sustainable planning strategies.

Review of Literature

Sitte (1945) depicted the city as a fantastic aesthetic show in his book, "City Planning According to Artistic Principles." The focus is mostly on adornment and certain qualities, such as plurality and variation, proportion, naturalism, and organic systems in shape and color combinations, which generally take an objective view of the city (Keshtkaran et al., 2017). In reality, a city is a physical item, and specialists only consider its aesthetic features.

National

- According to Sudhira et al. (2004), urban sprawl is an expanded form of urbanization, a worldwide phenomenon primarily caused by population expansion and extensive migration. They proposed that GIS and remote sensing data, combined with auxiliary data, can be used to analyze the pattern, growth, and breadth of sprawl. It is feasible to detect the pattern of sprawl and later anticipate the type of future sprawl using spatial and temporal studies, modeling, and other techniques. Using GIS and remote sensing, their findings highlight the extent of sprawl that has occurred over the course of three decades.
- Aziz R., (2007) has worked on issues and challenges of local level urban government of India. The author showed that the Urban Local Bodies (ULBs) in India are plagued by numerous problems related to providing urban basic services. These problems are related to the lack of participation of civil society, transparency in the planning and implementation of infrastructure projects, and the level of efficiency in various municipal management and finance practices.
- Singh and Zahir (2013) tried to assess whether the development of public utility services (education, health, commercial, social, and recreational services) in the residential suburbs

of Aligarh City is keeping pace with city growth and expansion. This study, which is mainly based on primary data sources, has revealed that the intensity of development of both residential colonies and public utility services is maximum between 4.1 and 8 km away from the city center.

International

- Raskin (1974) asserts that the urban landscape includes a wide range of concerns, including those related to urban design, urban planning, urban administration, and acknowledging the objectives and duties of humans.
- Akhter et al., (2009) have evaluated a number of Municipal services on Dhaka city Corporation in selected wards by adopting a methodology called "Citizen's Report Card". This study used this method to measure the performance of waste management, mosquito control and certification service offered by Dhaka City Corporation. The performance of each of these services is ranked using the Urban Governance Indicator Value.
- Urban development in Yazd, Iran, was discussed by Shahraki et al. in 2011. Using processed satellite pictures for the four time periods of 1975, 1987, 2000, and 2009, urban growth and other land uses were computed. The Yazd story is intriguing for a number of reasons. First, it demonstrates how quickly cities may grow, even in developing nations. Second, it shows that smaller communities may experience faster rates of urban expansion than major metropolitan areas. Third, it depicts a process of land substitution in which urban land is not primarily provided by agricultural land, which is relatively uncommon in urban situations.

Recent Studies

Recent studies have increasingly emphasized integrated, spatial and sustainability-oriented approaches to urban infrastructure assessment. Mukherjee et al. (2022) examined urban water security in Kolkata by integrating physical, environmental and socioeconomic dimensions and emphasized the importance of comprehensive and inclusive assessment approaches. Coelho (2022) highlighted inequalities in urban water access and demonstrated how water infrastructure can contribute to spatial and social differences within Indian cities. Banerjee et al. (2022) examined digitalization in urban water governance and emphasized the importance of institutional capacity and technology for equitable and sustainable water management.

Recent research has also demonstrated the importance of GIS and spatial approaches in sustainable urban infrastructure planning. Vineeth and Ramachandran (2022) examined groundwater recharge in Bengaluru and demonstrated the relationship between urbanization, hydrological processes and groundwater sustainability. Bhowmick and Chatterjee (2023) emphasized the need for resilient urban infrastructure in India in response to rapid urbanization, climate change and socioeconomic inequality. Their study stressed the importance of sustainable behaviour and policy interventions in achieving resilient and sustainable cities.

Solid waste management has also emerged as an important component of sustainable urban development. A 2023 study of Shivamogga City used ward-level surveys and GIS techniques to assess municipal solid waste generation, road networks and spatial patterns, demonstrating the usefulness of GIS-supported infrastructure assessment. Mondal and Mandal (2023) similarly applied geospatial and statistical approaches to assess solid waste management in Rampurhat Municipality. Singh et al. (2023) further demonstrated that municipal solid-waste litter can create significant environmental and public-health concerns in urban areas. These recent studies establish the importance of combining ward-level assessment, GIS, infrastructure indicators and sustainability considerations in the evaluation of medium-sized urban centres such as Bankura.

Location of the Study Area

Regional/Physical Setting: Bankura town is situated in the western part of the state of West Bengal. It is a part of Burdwan Division of the state and is included in the area known as "Rarh" in Bengal. The town is flanked by Dwarakeswar and Gandheswari Rivers on the northern and southern sides respectively and is located in a transitional natural region between the alluvial plain in the east

and denuded spurs of Chotanagpur plateau in the west. The general elevation of the area ranges from 150 to 160 m above MSL with a general gradient from west to east.

Administrative Setting: Bankura, a Class – I municipal town / city is the headquarter of Bankura district, West Bengal. It has been a centre of Western Bengal's Malla kingdom and its nearby areas have enormous cultural and historical importance.

Geographical Setting: Bankura town is located centrally within the district in between 87°2'0'' E to 87°6'0'' E longitude and 23°13'0'' N to 23°15'30'' N latitude. The town is 35 km away from the industrial city of Durgapur, about 250 km from Kolkata.

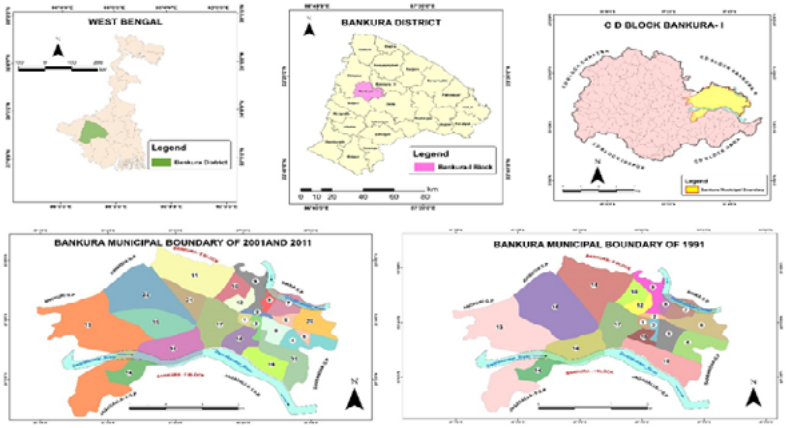

Figure 1.1 Location map of bankura municipality of bankura district in west bengal

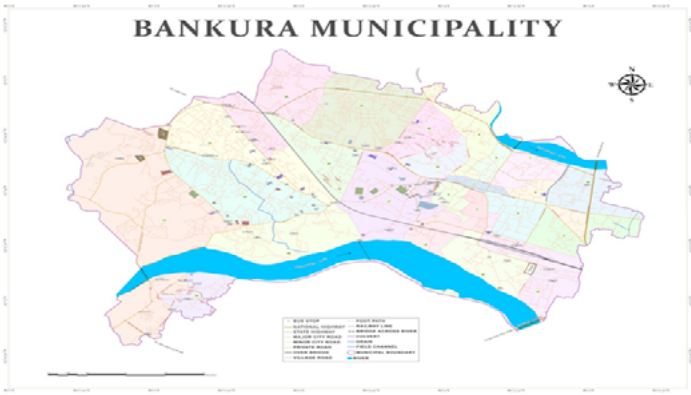

Figure 1.1 Location map of bankura municipal town of bankura district in west bengal

Objectives

- To trace out the urban infrastructure in Bankura Town.
- To analysis the sustainability of Bankura Town.

Research Methodology

The present study adopts a descriptive and analytical research design to evaluate the existing urban infrastructure and sustainability conditions in Bankura Municipality. Both primary and secondary data were utilized for the analysis. Primary data were collected through structured household questionnaires, field observations, and personal interviews with residents and municipal officials. Secondary data were obtained from Census of India reports, Bankura Municipality records, government publications, and relevant research articles.

A stratified random sampling technique was employed to ensure representation from different municipal wards. Households were selected proportionately based on ward population and accessibility. The major indicators considered for

infrastructure assessment included water-supply coverage, drainage facilities, street lighting, transport and communication networks, solid waste generation, waste collection and disposal practices, and accessibility to basic municipal services. These indicators were assessed at the ward level to identify spatial variations in infrastructure availability and service conditions. The collected data were analysed using descriptive statistical techniques such as percentage analysis, frequency distribution, and comparative assessment. Spatial distribution of infrastructure facilities was interpreted using GIS-based mapping and cartographic techniques to identify disparities across different wards.

Identification of Utility Services / Naturn and pattern of Civic Infrastructure

Utility services have a significant role in deciding where urban growth will occur, and gravity-based services like sewage, drainage and to a lesser extent water delivery, may in reality place clear restrictions on development. The operation of contemporary life's economic, social, and environmental components is supported by utility networks, which include water, waste, energy, gas and communication networks. They serve as the primary conduits via which modern cities essentially work in terms of their basic spatial infrastructural grids (Aryastana et al., 2021).There are still significant geographic, social, and economic barriers to increased rivalry in the utilities industry, notwithstanding liberalisation and privatisation. Only substantial business utility users have a choice of service providers in most areas. Uneven levels of competition exist equal within the utility industry.

The load on urban water distribution networks is growing as a result of population growth, economic expansion, lifestyle changes and urbanisation (Joseph et al., 2022). Infrastructure for urban water supply systems is frequently constructed primarily with an emphasis on purification and distribution, with little or no attention given to the qualities of the source water (Jensen and Khalis, 2020). Sustainable urban water delivery systems need to be better integrated with the local ecosystems that supply water.

Figure 7.21 displays the latitudinal dispersal of water supply network in Bankura Municipality. Maximum distribution network is observed in the eastern and northern part of the municipality; whereas, the minimum water supply network is distributed in the western and southern part of the research region. Most of the drains are pucca in the research region. The estimated total network is 170 km (Table 7.4), with 14024 numbers of houses connected. The maximum length of Pucca drain is estimated in ward no. 4 (6.78km). The minimum length of pucca drain is calculated in ward no. 16 (0.29km), followed by ward no. 13 (1.13 km) and ward no. 2 (1.23 km).

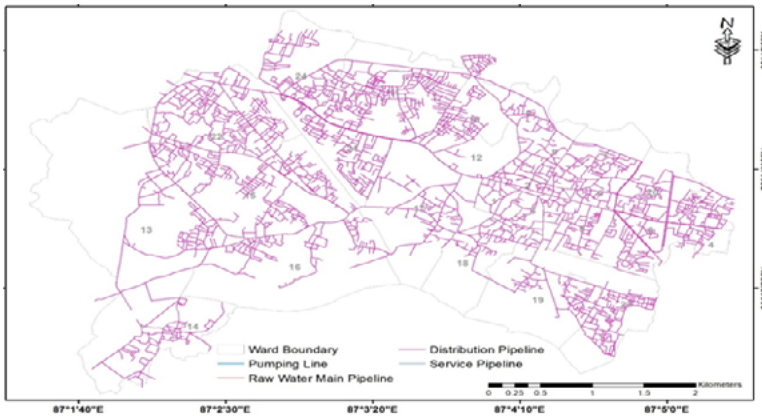

Figure 7.21 Spatial distribution of water supply network distribution in bankura town

A water supply system's main goal is to deliver the required amount and quality of water at a proper pressure without any interruptions. Figure 7.22 illustrates the geographical variation of water supply network point in the Bankura Town. Overhead tank (OHT), supply valve and tube well are distributed.

Moreover, water pumping station, public stand post and water treatment plant are not observed. The highest quantity of OHT is observed in ward no. 15. In ward no. 7, 10 and 11, no OHT is observed. A supply valve is observed in ward no. 17. Tube well is distributed in ward no. 13, 16 and 17.

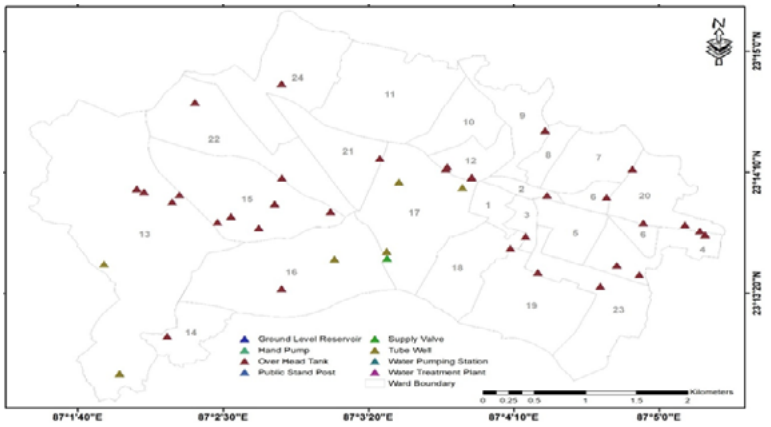

Figure 7.22 Spatial distribution of water supply network assets in bankura town

Table 7.4 Availability of Water Supply Network Component in Bankura Town

No. of Water Treatment Plant	Nil
No. of Deep Tube well	Nil
No. of Hand Tube well	950
No. of Street Stand post	3000
Length of Water pipeline (in kilometer)	170
No. of Underground Reservoir	5
No. of Overhead Reservoir	7
No. of wards fully covered with water supply pipeline	24
No. of houses connected with Water Supply Network	14024

Source: Bankura municipality (http://bankuramunicipality.org/)

The urban water supply systems divide up the tasks of distributing water, collecting and managing stormwater, and treating and managing wastewater. These supply systems also move potable water from a centralised water treatment facility once it has been treated, which is then given directly to the customers. Pipes, pumps, valves, reservoirs, storage bins, water metres, various hardware accessories, and hydraulic gear are the main elements of these systems (Burian et al., 2013).

Garbage and sewage can block stormwater drains, which are intended to handle heavy rainfall concentrated over a short period of time (Teshome, 2020). Increased rainfall in a single day, irregular and unequal rains, and other shifting weather patterns, all contribute to the relevance of stormwater drainage to cities (Akhtar et al., 2020).The goal of sustainable stormwater administration is to balance urban land use and development with the hydrology of the surrounding environment.

Figure 7.23 showed the longitudinal spreading of storm water drainage in Bankura municipal town. The maximum length of storm water drainage is found in the eastern and northern part of the municipality. The geographical distribution of storm water drainage is very less in ward no. 13, 16, 20 and 24.

An important factor in the city's power use and subsequent greenhouse gas emissions is street lighting. Not only improperly designed street lights would result in illumination pollution, but they will also cause users to experience eye fatigue and discomfort.

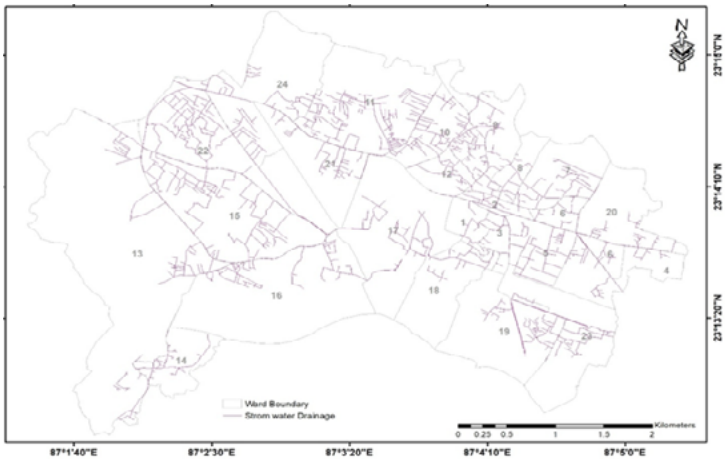

Figure 7.23 Spatial distribution of storm water drainage in bankura town

The amount of energy required to support a city's expansion increases quickly. Streetlights provide one of the least expensive alternatives for energy savings, as well as a means of lowering municipalities' energy expenses and greenhouse gas emissions. Because of the latest energy-saving lighting innovations, such as light-emitting diodes (LEDs), which are presently on the market. Table 7.5 shows the availability of street lights in Bankura municipality. Overall, 8000 light posts are estimated in the study area. The availability of high mast light in the study area is calculated as 6; whereas, the trident light post is calculated as 57.

Table 7.5 Availability of Streetlight Component in Bankura Town

No. of Light Post	8000
No. of High Mast Light Post	6
No. of Trident Light Post	57
No. of other Ornamental Light Post	1
No. of Wards covered with light posts	24

Source: Bankura municipality (http://bankuramunicipality.org/)

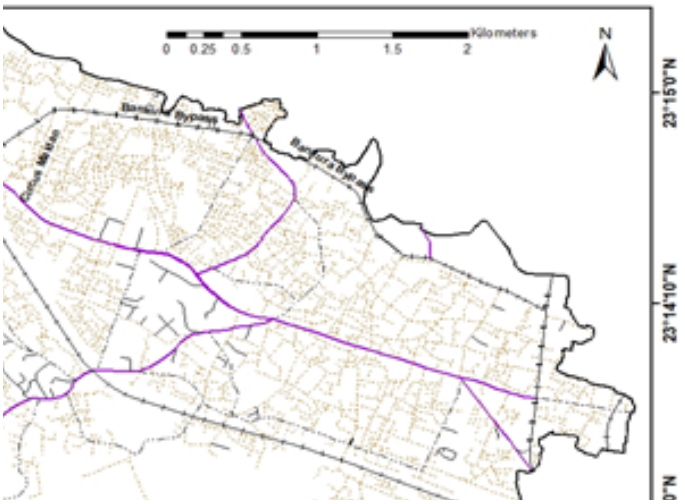

Figure 2.11 Transport and communication network of bankura town

Transport and Communication

Bankura town, which is the centre of the entire Bankura district has well developed transport and communication infrastructure. One rail junction station, known as Bankura Junction, is situated in this research region and connects Sonamukhi, Burdwan, Adra and Midnapore as well. The road network is excellent because it connects Durgapur, Burdwan, Asansol, Khatra, Puruliya, Sonamukhi, Bishnupur, and Midnapore in addition to the railway network (Figure 2.8).Numerous central and state government schemes, including Pradhan Mantri Gram Sadak Yojana and various government bodies like PWD, ZillaParishad, Gram Panchayat, and Panchayat Samity, have taken on the duties of maintaining the roads in this research region, including metalled roads, unmetalled roads, and other roads. It has been noted that the PWD maintained over 24.92 kilometres of roads in Bankura Town in 2014, all of which were handled by the same organisation. A lot of new trains have been introduced to help passengers besides well connected railway network in this study region. There were six numbers of beginning or terminating bus routes in this town.

Understanding of Solid Waste Management Services

The enormous population expansion and urbanisation provide a global problem for garbage management (Ferronato and Torretta, 2019). Because of this, uncollected waste—which is sometimes combined with human and animal excrement—is thrown carelessly into drains and streets, which causes floods, breeding of insect and rodent vectors and propagation of disease. All societal stakeholders should pay attention to the issue of sustainable management and disposal of municipal solid waste (MSW) given the rapid rate of urbanisation, particularly in Bankura town. In Bankura Municipality, open uncontrolled dumping is still the most popular way to dispose of solid waste. Even though the effects on the environment are frequently extremely obvious, the issue is seldom resolved. Low political importance, insufficient funding, and/or a lack of knowledge on alternatives to running and managing a landfill or dump are all reasons for not addressing the issue (Kumar et al., 2017).

Waste Generation

The population and activity levels in the town of Bankura have quickly expanded. In terms of solid waste management, the municipal services offered in this metropolitan core are still not at a sufficient level. We are aware that, as cities grow, the amount of solid trash produced grows daily. Domestic, commercial, institutional, street sweeping as well as demolition and new construction garbage are the main sources of solid waste in ULB.

Figure 8.6 illustrates the geographical distribution of total waste generation in Bankura municipality at ward level. Results showed the maximum total waste (>3.51 Mt) is generated in Ward no. 4 and 10. The less amount of total waste (<2.0 Mt) is calculated in Ward no. 3, 5, 8, 11 and 20, followed by Ward no.6, 14, 16, 18, 21 and 24. The medium amount of total waste is estimated for Ward no. 1, 2, 7, 12, 13, 15, 19, 22 and 23.

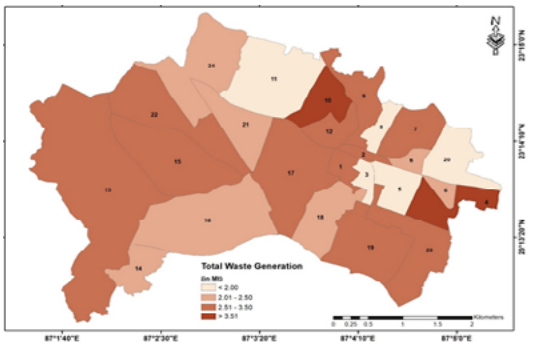

Figure 8.6 Ward-Wise Total Waste Generation in Bankura Town (Source: Bankura Municipality)

Figure 8.7 portrays the geographical distribution of domestic waste in Bankura town. Results showed that the highest amount of domestic waste is generated in Ward no. 4, 7, 10, 11, 15 (2.14 MT), 19 (2.41 MT) and 22. Moreover, the less amount of domestic waste is generated from Ward no. 1, 2, 3, 8 and 24.

Figure 8.8 illustrates ward-wise commercial waste generation in Bankura municipality. The commercial waste is almost nil in Ward no. 6, 7, 9, 10, 12, 16 and 20. The highest amount of commercial

waste is generated in Ward no. 17, followed by Ward no. 1, 2, and 4.

Currently, municipal regions dispose of solid waste by simply dumping it wherever there is accessible low land. The sides of the landfill do not follow any long-term regional land use plans. There are usually some accumulations of trash on the roadside and waste pickup is only done sometimes. The operational controls for environmental protection and fly breeding control are insufficient. There is no practice of covering or compacting.

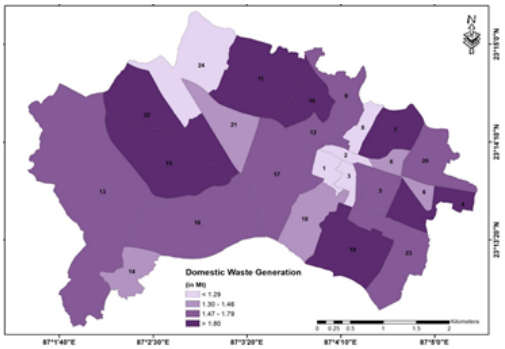

Figure 8.7 Ward-Wise Domestic Waste Generation in Bankura Town (Source: Bankura Municipality)

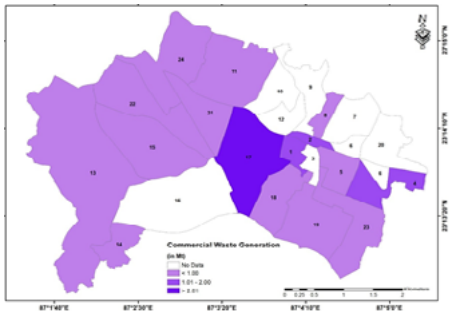

Figure 8.8: Ward-Wise Commercial Waste Generation in Bankura Town (Source: Bankura Municipality)

Waste from homes is collected from each and every ward in the Bankura municipality using a tricycle van. Following collection, the tricycle puller deposits the amassed trash in the neighbourhood dumpster. A collection vehicle cannot access every property on tiny streets; hence this approach is employed. In this event, a door-to-door business garbage collection approach is used. Another efficient method of garbage removal from municipal highways is road sweeping. The material is loaded from the curved side and delivered to the collecting bins during street sweeping, which can be done manually or with a road sweeping equipment. As the sweeper passes through the streets at the designated time, it fills the containers as it went.

To avoid garbage cans or containers overflowing and waste being left as litter on the streets, rubbish must be transported in vats or bins at regular intervals. Only by ensuring that trash from temporary garbage containers is regularly removed from the city, hygienic conditions can be maintained. One of the most crucial aspects of integrated waste management is garbage disposal since improper waste disposal can harm the environment, sub-surface strata, human health and life. Currently, open dumping is the only way used to dispose of the town's solid waste. Figure 8.9 illustrates the ward-wise distance from the dumping sites.

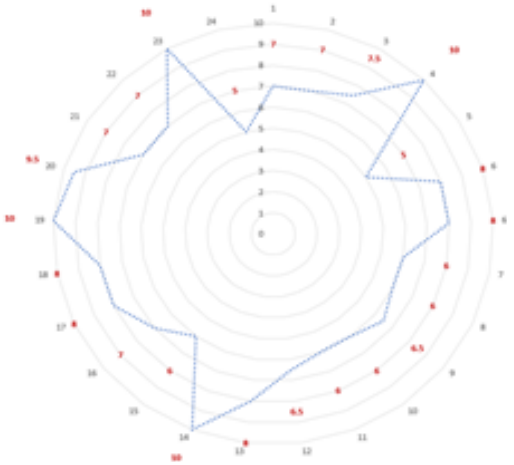

Figure 8.9 Distance from the Landfill / Dumping Sites in Bankura Town

According to the report, Bankura's SWM system's current infrastructure and policies are unable to keep up with the town's fast urbanisation and commercialization. For the execution of waste management policy, active engagement is required in trash collection, transportation, disposal and processing in addition to policy creation. Even though the municipality has a variety of SWM issues, including those that have already been mentioned, Bankura has made the greatest efforts possible to

manage the municipal solid waste produced in the city.

Major Problems in Bankura Town

- Built-up areas are expected to continue growing at an alarming rate during the next fifteen years (2040).
- Identify illegal encroachments along the riverbanks.
- By-pass Road, Makurgram, Adra-Bankura Road, Lal Bazar Road, Subhas Road, Veer Savarkar Sarani and state highways have the highest PCUs, which results in the highest inbound and outbound traffic because that area has the highest population as well as the highest concentration of tertiary economic activities.
- Water leaks or losses occur in Bankura City, which accounts for 25 to 30 percent of the whole water supply system, because the water supply is outdated and inoperable.
- Water supply rates per person and delivery schedules are unfair. The water supply is limited in outlying areas as a result of these distribution system termination sites.
- About 22% of the total sewage is discharged into rivers untreated, which results in water contamination and the loss of aquatic ecosystems.
- Due to a surge in building activity, the paving and cementing of roads, etc., the metropolitan areas' recharge is decreasing. As a result, it's decrease ground water recharge in metropolitan.
- According to the report, Bankura's SWM system's current infrastructure and policies are unable to keep up with the town's fast urbanisation and commercialization.

Recommendations

- Built-up areas are expected to continue growing at an alarming rate during the next fifteen years (2040). Some solutions for Bankura City's –
- To check the deviations in the land uses with respect to what has been allotted in the development plan.
- Fertile land around the city to be protected.
- To identify illegal encroachments along the riverbanks in order to stop the unregulated encroachment and convert this area as green belt.
- The following actions are recommended to improve the water supply system, distribute water fairly, reduce water loss, and increase consumer satisfaction.
- Reducing water losses in the transmission and dissemination processes and boosting water efficiency are vital.
- In the outdated water supply system, replacement or repair and building new water treatment facilities.
- It is necessary to set up a reliable sewage system across the city, which may be achieved by:
- Establishing a sewage infrastructure for every dwelling and completion of sewage treatment before disposal.
- Installing sufficient public lavatory facilities in public spaces and slum communities.
- Recycling and using treated sewage; using a part of the produced sewage for agricultural fields.
- The following are general tactics for resolving important solid waste management issues:
- Complete source-level segregation must be accomplished, as well as door-to-door garbage collection.
- To prevent the bins and ampoules from overflowing and set up recycling bins throughout the neighbourhood.
- Offering rewards for recycling.

Discussion

The analysis revealed considerable spatial disparities in the availability and quality of urban infrastructure across different municipal wards. Core urban areas exhibit relatively better access to water supply, sanitation, drainage, and transportation facilities than peripheral wards. Such variations are primarily associated with unequal municipal investment, rapid population growth and unplanned urban expansion. These findings are consistent with previous studies highlighting infrastructure inequality as a major challenge affecting sustainable urban development in medium-sized Indian municipalities.

The household survey further indicated that residents perceive water supply, drainage

management, waste disposal, and road maintenance as priority concerns requiring immediate policy intervention. These findings emphasize the need for integrated infrastructure planning, supported by effective governance and community participation.

Future Scope

Future research should incorporate advanced spatial modelling techniques, remote sensing, and GIS-based predictive analysis to monitor urban infrastructure development over time. Comparative studies involving multiple municipalities would provide broader insights into regional infrastructure disparity. Furthermore, integrating climate resilience indicators, smart city technologies, and citizen participation frameworks would strengthen sustainable urban planning strategies for medium-sized towns, such as Bankura.

Conclusion

The study demonstrates that although Bankura Municipality has experienced noticeable improvements in urban infrastructure, significant disparities continue to exist across the different municipal wards. Basic civic amenities, such as drainage, road connectivity, waste management, and water supply, require systematic improvement to achieve balanced and sustainable urban development. The findings highlight the importance of evidence-based planning, equitable resource allocation, and community participation in improving the quality of infrastructure. The adoption of GIS-supported planning, integrated governance, and environmentally sustainable development policies will significantly enhance urban resilience and the quality of life of the residents of the Bankura Municipality.

This study contributes to the understanding of infrastructure inequality and sustainable urban development in medium-sized municipalities by integrating field-based observations with ward-level spatial assessments. From a practical perspective, the findings can assist municipal authorities in identifying infrastructure-deficient wards and prioritizing investments in water supply, drainage, transportation, and solid waste management. However, the study is limited by its focus on a single municipality and the availability of ward-level municipal and survey data. Future research may incorporate longitudinal datasets, advanced GIS and remote sensing techniques, climate resilience indicators, and comparative analyses across multiple municipalities to evaluate changes in urban infrastructure and sustainability over time.

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