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Sphere of Urban Influence: A Study of Two Selected Towns of Nadia District, West Bengal, India

Sujan Mandal[#] and Suchismita Roy

Abstract : *In a region, services play a vital role in the growth and development of industry, commerce, administration, education, health, and other activities of that region or area. For that, proper planning is essential to serve different facilities in the town and its sub-urban areas. Krishnanagar and Kalyani are two major towns in the Nadia district of West Bengal. This study focuses on ranking Nadia district's municipal towns and bringing out the urban influence zones of Krishnanagar and Kalyani municipal towns. All the data was collected from government sources. The rank-size rule method is used to assess the rank of the municipal towns. To delineate the sphere of urban influence, 5 broad parameters (education, health, banking, recreation, and commercial) and 16 sub-parameters are used. This study finds binary pattern of municipal towns. So, all the municipal towns have more or less equal importance and Krishnanagar has more urban influence than Kalyani. For future planning and development of Krishnanagar and Kalyani municipal towns and the district also, this study can be beneficial to the planners and policymakers to make proper plans for the development of these two towns.*

Key words: *Binary Pattern, Functional Weightage, Population threshold, Rank size, Sphere of urban influence*

Introduction

The process of going from a rural to an industrial urban settlement is called urbanization. Urbanization is an index in settlement geography that examines how an urban region develops via a rural setting (Asghar Pilehvar, 2021). The way that both urban and rural populations are impacted by urban growth is also explained by urbanization. Due to rapid industrialization, modern towns and cities are expanding erratically and without planning. Additionally, cities in developing nations are becoming overcrowded and overpopulated due to migration as well as population growth over time (Jaysawal and Saha, 2014). The increase in the proportion of the population in towns and cities and the other higher urban centres resulted from the greater proportion of people of childbearing age in cities (Oxford Dictionary of Geography, 2015). India is a developing nation, with over 60% of its population residing in rural areas. As per the 2011 Census of India, just 31.16 percent of people reside in urban regions. India is currently the world's most populous

* *Research Scholar, School of Environment and Disaster Management, Ramakrishna Mission Vivekananda Educational and Research Institute, Narendrapur, Kolkata 700103, West Bengal, India. Email - sujan.geog@gmail.com#, suchismita2731@gmail.com*

\# *Corresponding author*

developing nation and is progressively becoming older. The rapidly growing population seriously hampers the nation's progress. Statutory Towns (ST) and Census Towns (CT) are the two main categories of towns, according to the Census of India. Towns with a development authority, such as a municipality, municipal corporation, cantonment board, or notified town area committee, are known as statutory towns. Conversely, Census Towns are those communities that meet three requirements set forth by the Indian Census: a minimum of 5000 persons living there; a density of 400 persons per square kilometre; and at least 75% of the main male labour force must work in non-agricultural sectors. According to their population, the urban units are further divided into six categories: Class I [~1 lakhs], Class II [50000-1 lakhs], Class III [20000-50000], Class IV [10000-20000], Class V [5000-10000], and Class VI [ä5000].

Towns have unique combinations of amenities and services, each with a specific range of offerings (Naldi et al., 2021). The concept of "sphere of influence" was first defined by Christallar's Central Location Theory. Urban agglomeration, improved competitiveness, and supportive policies contribute to urban impact (Li et al., 2022). The hinterland or rural villages, provide resources for central cities' economic operations. The quality and size of the surrounding area are crucial for city growth (Pan, Shi, Xiaofeng, 2008). Each commodity has a unique sphere of effect, determined by its characteristics. The diversity of functions increases proportionally to population size (Magneville et al., 2022). Larger cities have a wider sphere of influence and attract a larger influx of people. The economically and socially related territory to an urban community is referred to by several names, including "Hinterland" in Germany (Wolff et al., 2021), "Sphere of Influence" in America, "Zone of Influence," "Tributary Area," and "Catchment Area." The term "city region" was coined by Dickinson for the first time and is interdependent on the surrounding rural area (Dickinson, 1964). Urban influence refers to the degree to which an urban area impacts the surrounding regions (Liu et al., 2023). It is an important term for comprehending regional development and planning. In nations undergoing fast urbanization, such as India, the extent of urban influence has a substantial impact on socio-economic interactions, resource allocation, and regional connections (Sukanya & Tantia, 2023). West Bengal, a state renowned for its varied and historically significant metropolitan landscape, offers a distinctive opportunity to examine these processes (Bardhan, & Paul, 2023). The Nadia District, situated in the southern region of the state, encompasses numerous small and medium-sized towns that play a crucial role as significant centres of economic and social engagement.

There are four sections to the current study. The demographic characteristics of the Nadia district are examined in the first section. This section discusses the trends in the population growth of Nadia district between 1951 and 2011 as well as the population growth of urban and rural areas during that same period (Table - 1 and Table - 2). The association between the population and size of the municipal towns in the study region is evaluated in the second section. The third portion establishes the municipal towns of Krishnanagar and Kalyani's hypothetical urban influence zone, and the final segment compares the urban impact zones of the two chosen towns.

Objectives

The notion of urban influence and its scope has been a prominent area of interest in studies of urban and regional planning (Finio, 2022). Several scholars have investigated how cities and towns exert their influence beyond their immediate borders, impacting the surrounding rural areas and smaller urban centres. The dynamics of this effect are determined by aspects such as the concentration of people, economic endeavours, infrastructure, and interconnectivity. Dutta's (2018) work on the relationship between transport and other spatial dimensions, while Mandal, Chatterjee, and Chatterjee's (2015) study on the distribution of facilities in early urban centres, and Chakraborty's (2014) work on the pattern of change in accessibility, all provide valuable insights into the impact of accessibility on urban growth and development. Chen, Claramunt, and Ray's (2014) paper on the Guangzhou Metropolitan Network also explores the spatial interaction between network nodes and potential-based models based on node accessibility. Anjaneyulu's (2013) work on urbanization and slum development in Kurnool City, Andhra Pradesh, provides an empirical analysis of the socio-economic conditions of slum dwellers, while Ali and Varshney's (2012) paper on spatial modelling of urban growth and influence in developing economies in India highlights the importance of the spatial distribution of population and socio-economic facilities. Alam's (2011) work on the infrastructural development of towns in Murshidabad demonstrates the history, structure, and pattern of urbanization, as well as the rights of urban facilities like water rights. Taylor, Sekhar, and D'Este's (2006) paper on vulnerability analysis of strategic road networks highlights the socio-economic impacts of network degradation based on changes in accessibility levels. While there has been extensive research on urban influence and spatial interconnections in different locations, there is a dearth of specific studies on the extent of urban effect in smaller towns, specifically in the context of Nadia District in West Bengal. Current research tends to focus on larger urban areas or metropolitan regions (Dadashpoor & Malekzadeh, 2020), often neglecting the dynamics of smaller towns and their surrounding rural areas. Moreover, there is a lack of comprehensive knowledge regarding how the socio-economic and infrastructural progress in these towns affects their area of influence, particularly concerning the allocation of resources, ease of access, and regional interconnectednes. The first objective of this study is, to find out the relationship between population size and municipal towns of the Nadia district, and the second objective is to bring out the urban influence zone of the selected towns of the Nadia district.

Study Area

West Bengal's Nadia district is located in its eastern region. The districts of Barddhaman and Hugli to the west, Bangladesh to the east, Murshidabad to the north and northwest, and North 24 Parganas to the south and south-east make up the geographical boundaries of the Nadia district. It was part of the Jessore Division until 1854. The Radcliffe Award of 1947 divided the district into two entities, causing Meherpur, Chuadanga, and Kushtia to be lost to East Bengal (District Census Handbook, Nadia, 2011). The Nadia district is located between latitudes 22°53'30"

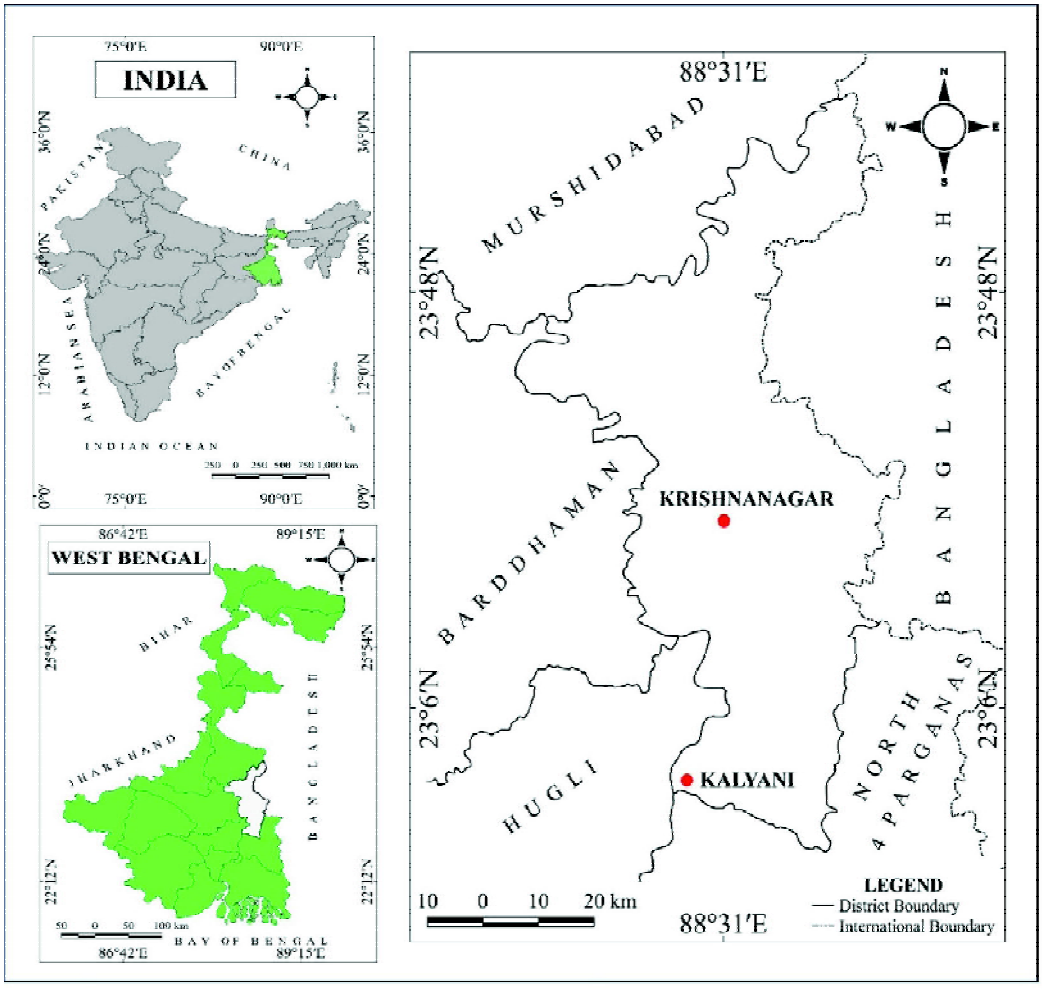

Figure- 1: Study area

and 24°54'0" North and longitudes 88°08°103 and 88°48°153 East. The area of the Nadia district is 3,927 square kilometres and the average elevation is 46 feet above sea level. The district is located 135 kilometres to the north and 45 kilometres to the west. The total population is 5167600 (Census of India, 2011). Krishnanagar and Kalyani are the two municipal towns of this district (Figure- 1). Krishnanagar is the district headquarters, and Kalyani is an educational town and sub-divisional headquarters of Kalyani subdivision. The population of Krishnanagar and Kalyani are 153065 and 100757respectively (Census of India, 2011).

Database and Methodology

To fulfil the objectives, secondary data was collected from different data sources published by the government of India. The data were analysed by different statistical techniques. Krishnanagar and Kalyani towns are taken for study. To rank the major towns of Nadia district, the rank-size rule method has been used i.e.

Rank Size Rule (Zipf, 1949): to know the rank-size distribution of municipal towns of Nadia district. The following formula is as follows,

$$Pr = \frac{P1}{rq}$$

Where Pr is the population of the city, $P1$ is the population of the largest city; rq is the rank of the city

To delineate the hypothetical sphere of urban influence of Krishnanagar and Kalyani municipal towns, the following method is used; the formulas are as follows,

Mean Population Threshold (mT) is the ratio between the total population and the number of *its* facilities (Haggett and Gunwardena, 1965).

$$mT = P / NFi$$

Where mT is the mean population threshold, P is the total population and NFi is the total number of facilities of ith category.

Functional Weightage (WFi) of the ith facility category (Bhatt, 1976):

$$WFi = mTi / mTl$$

Where WFi is the estimated weightage of facility of ith, mTi is the mean population threshold of ith facility and mTl is the lowest mean population threshold among all the facilities.

Then, all the WFi are summed up to derive the Composite Functional score (CFs) of a town or district, which is given by:

$$CFs = \sum_{i=1}^{n} WFi$$

Where CFs is the Composite Functional score, n is the number of facilities

Now the Proportional Composite Functional score of a town concerning that of the district is multiplied by the area of the district to determine the sphere of urban influence for the town in question (V.L.S. Prakash Rao, 1964):

$$S.I. = \frac{CFs\ urban\ centre}{CFs\ District} \times A\ District$$

Where, *S.I.* is the Sphere of Urban Influence (sq. km.), *CFs urban center* is the Composite Functional score of an urban center, *CFs District* is the Composite Functional score of the District, and *A District* is the Area of the District.

Then lastly Radius of the Sphere of Urban Influence (*S.I.*) after V.L.S. Prakash Rao (1964):

$$R = \sqrt{S.I.}$$

Where *R* is the Radius of the Sphere of Urban Influence and *S.I.* is the Sphere of Urban Influence.

Results and Discussion

Population Characteristics

Although the majority of districts in West Bengal derive their appellation from the name of their district headquarters, the district of Nadia exhibits notable distinctions in this regard. The nomenclature of the district is derived from Nabadwip, generally shortened as Nadia, as opposed to Krishnanagar, which relates to the geographical location of the district's capital. (District Census Handbook, Nadia, 2011). After the independence, in 1951, the total population of Nadia district was 1144924 persons where 18.18 percent of people lived in urban areas and 81.82 percent of people lived in rural areas. While, in the year 1971, the total population of Nadia district was 2230270 persons. In just twenty years population was almost doubled. According to the census 2011, the total population of Nadia district is 5167600 of which 72.16 percent people reside in rural areas and 27.8 percent in urban areas (Table- 1 & 2). On the other hand, the decadal growth rate of the population was highest (49.8 percent) in 1951-1961. But from 1971-1981, the decadal population growth rate consecutively declined (Census of India, 2011).

Table- 1: Decadal Growth of Population in Nadia District

Year	1951	1961	1971	1981	1991	2001	2011
Rural	936823	1397986	1812211	2324384	2980279	3625308	3728727
Urban	208101	315338	418059	639869	871818	979519	1438873
Total	**1144924**	**1713324**	**2230270**	**2964253**	**3852097**	**4604827**	**5167600**

Source: Census of India, 2011

The total population growth rate and rural population growth rate decreased in every decade, but the urban population growth rate increased in 1951-61 (Table- 2) and 1971-81. Except for these

two decades, the urban population growth rate also decreased in 1961-71, 1981-91, and so on. The maximum urban population growth rate was found in the 1971-81 decade because after the independence of Bangladesh huge number of people emigrated to India from Bangladesh. The influx of Bangladeshi migrants to West Bengal in 1971, mostly as a result of the Bangladesh Liberation War, brought about a substantial alteration in the social, economic, and demographic characteristics of the district (Saikia, 2015). The exponential growth of the population in small towns, especially near the India-Bangladesh border, puts immense pressure on resources and infrastructure, resulting in the widespread emergence of slums and informal settlements. The influx of refugees resulted in both favorable and unfavorable economic outcomes, such as an increase in the labor pool, the emergence of small-scale enterprises, and the amalgamation of many cultures within local communities (Zehra, & Usmani, 2023). The movement also had political consequences, as the refugee crisis became a significant political concern. The arrival of refugees resulted in changes to land ownership patterns and the distribution of government aid, while the process of assimilation posed difficulties related to citizenship, property rights, and social acceptance. The enduring influence of the 1971 migration is visible in the current demographic and socioeconomic framework of West Bengal. Here maximum population growth was found in 1951-61, but the highest urban population growth rate was seen in the 1971-81 decade due to the significant influx of emigrants from Bangladesh to the urban areas of that district. As per the Census of India, 2011 there are 8 municipal towns, 2 Notified Areas and outgrowth, and 55 Census Towns in Nadia district. These 8 municipal towns are the major towns of the district. Among the municipalities 4 municipalities are class-I towns, 3 municipalities are class-II towns and 1 municipality is class-III town.

Table- 2: Decadal Growth Rate of Population in Nadia District

Year	1951-61	1961-71	1971-81	1981-91	1991-01	2001-11
Rural	49.4	29.3	28.7	28.2	21.6	02.9
Urban	51.5	32.6	53.1	36.2	12.4	46.9
Total	**49.8**	**29.9**	**33.3**	**30.0**	**19.5**	**12.2**

Source: Census of India, 2011

Relationship between Size and Population of Municipal Towns

This is an attempt to find a numerical relationship between population sizes of settlements within an area. Settlements are ranked in descending order of population size, with the largest city first. Applying the rank-size rule method, we can measure the expected population of the municipal towns of the district

Binary patterns were found in the Nadia district (Figure- 2). All the municipal towns have more or less equal importance to the growth and development of the entire district. Krishnanagar

is the largest town and it also represents the district headquarters, Kalyani is a health and educational town not only for the district but also for West Bengal and eastern India. Due to this Kalyani town has more importance than the district headquarters Krishnanagar.

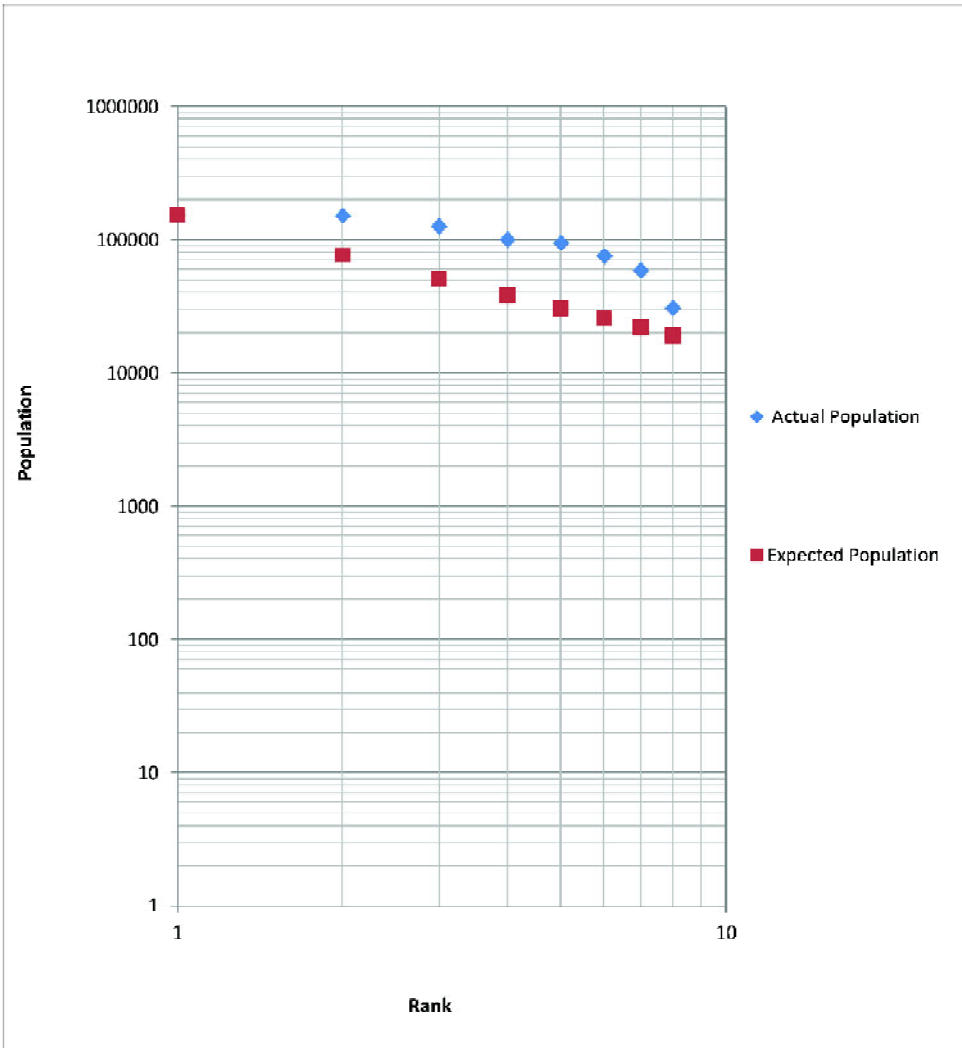

Figure- 2: Rank Size Distribution of Municipal Towns of Nadia District

Sphere of Influence of Selected Municipal Towns of Nadia District

A sphere of influence is a zone where various facilities of a town are spread over its surrounding areas. The functional importance of the town is judged by the concentration of

available facilities. In the present study to find out the functional Weightage (FW), the mean population threshold (MPT) takes some broad parameters and some sub-parameters of Nadia district and two selected towns of the district. Here primary school has the lowest mean population threshold due to the maximum Number of Facilities (NoF) and medical colleges have the highest mean population threshold due to the minimum Number of Facilities (NoF) in the Nadia district. The mean population threshold is a ratio between several facilities and the total population (TP) of the district.

Table- 3: Mean Population Threshold and Functional Weightage of Nadia District

Category of Facility	Name of the Facility	Nadia District			
		NoF	TP	MPT	FW
Educational Facilities	Primary School	1761	5167600	2934	1
	Middle School	553		9345	3.19
	Secondary School	368		14042	4.79
	Senior Secondary School	330		15659	5.34
	General Degree College	23		224678	76.58
	Medical College	3		1722533	587.1
	Engineering College	5		1033520	352.26
Health Facilities	Hospital (Allopathic & Others)	49		105461	35.94
Recreational Facilities	Stadium	11		469782	160.12
	Cinema/Theatre	467		11066	3.77
	Auditorium	55		93956	32.02
	Public Library	487		10611	3.62
Banking Facilities	National	83		62260	21.22
	Co-Operative	105		49215	16.77
Commercial Institutions	Agricultural Credit Society	201		25709	8.76
	Non-Agricultural Credit Society	173		29871	10.18

Source: Computed by based on Census of India Data, 2011

Population threshold is the minimum number of populations required to sustain a particular facility in an area. Every facility has its threshold population and it depends on its characteristics. Residents necessitate several amenities to uphold their socio-economic welfare and satisfy their

requirements and aspirations, with the efficacy of these amenities contingent upon the scale and financial capacity of the clientele. The highly important facilities are fewer in number, and available only in bigger towns, while less important facilities are available in both bigger as well as smaller towns (Mandal, Chatterjee, Chatterjee 2015). The present study calculated the composite functional score (CFs) and proportional composite functional score (PCFs) of Krishnanagar and Kalyani

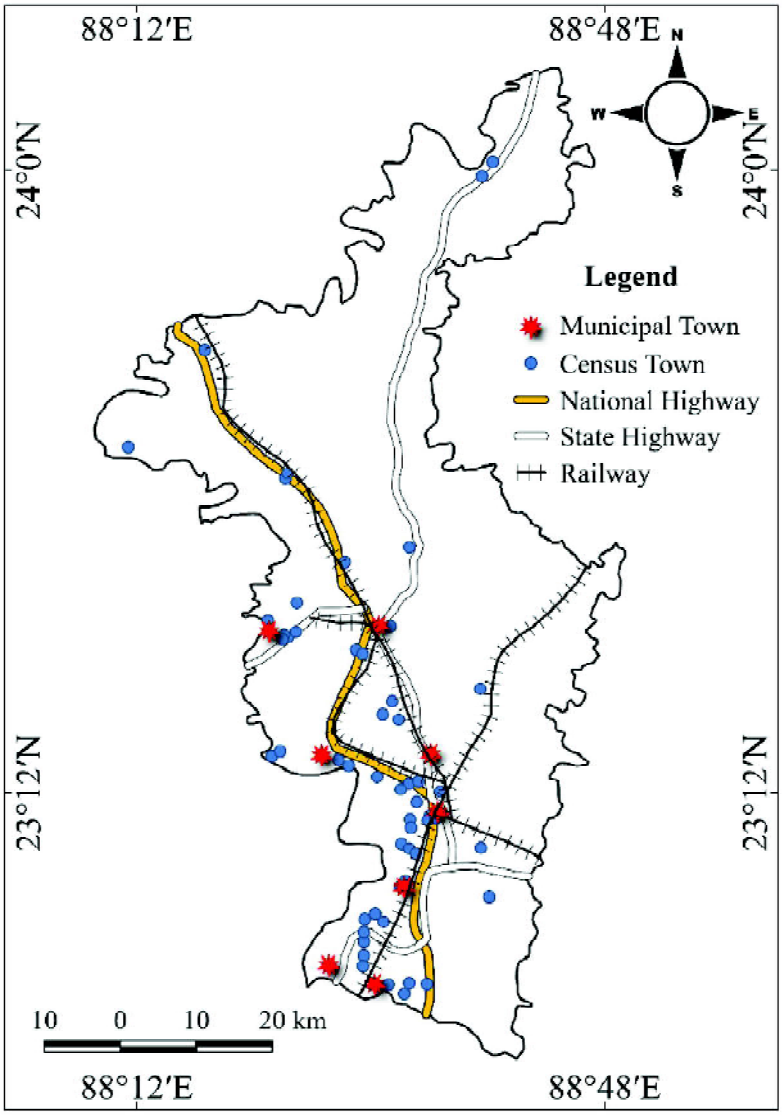

Figure- 3: Connectivity of Nadia District (adapted from Mandal, 2023)

municipal towns. According to the population, Krishnanagar is the biggest municipal town of the district and Kalyani is the fourth largest municipal town of the district. The composite functional score of Krishnanagar municipal town and Kalyani municipal town are 381.08 and 122.45 respectively (Table- 4). A higher proportional composite functional score represents higher functional importance. Individuals gravitate toward the center where there are abundant prospects for education, healthcare, leisure activities, banking, and commercial establishments, which serve

Table- 4: Number of Facilities and Functional Weightage of Urban Facilities of Krishnanagar and Kalyani

Category of Facility	Name of Facility	Krishnanagar			Kalyani		
		NoF	MPT	FW	NoF	MPT	FW
Educational Facilities	Primary School	68	2251	1	17	5916	1
	Middle School	4	38266	17	0	0	0
	Secondary School	12	12755	5.67	0	0	0
	Senior Secondary School	22	6957	3.1	6	16763	2.83
	General Degree College	3	51021	22.67	1	100575	17
	Medical College	0	0	0	1	100575	17
	Engineering College	0	0	0	2	50288	8.5
Health Facilities	Hospital (Allopathic & Others)	1	153062	68	1	100575	17
Recreational Facilities	Stadium	1	153062	68	1	100575	17
	Cinema/Theatre	2	76531	34	1	100575	17
	Auditorium	4	38266	17	6	16763	2.83
	Public Library	18	8503	3.78	5	20115	3.4
Banking Facilities	National	14	10933	4.86	9	11175	1.89
	Co-Operative	2	76531	34	1	100575	17
Commercial Institutions	Agricultural Credit Society	1	153062	68	0	0	0
	Non-Agricultural Credit Society	2	76531	34	0	0	0

Source: Computed by author

as attractive stimuli (Silin & Kharitonenko, 2022). So, a town having more functions but a smaller population has more prospects for further growth (Mandal, Chatterjee, Chatterjee, 2015). In the study, the proportional composite functional scores of Krishnanagar municipal town and Kalyani municipal town are 0.288116372 and 0.092578592 respectively (Table- 5).

Table- 5: Composite and Proportional Composite Functional Score of Krishnanagar and Kalyani Towns, their Sphere and Radius of Influence

Name of the Towns	Composite Functional Score of the Towns (CFsT)	Population of the Town(P)	Proportional Composite Functional Score (PCFs)	Sphere of Influence in sq. km. (SI)	Radius of Influence in km. (R)
Krishnanagar	381.08	153065	0.288116372	1131.43	33.64
Kalyani	122.45	100575	0.092578592	363.56	19.07

Source: Computed by author

Sphere of Urban Influence

Figure- 4 depicts the sphere of influence of Krishnanagar and Kalyani municipal towns. Krishnanagar is the largest (154.96 sq.km.) municipal town and Kalyani is the 2nd largest (29.21 sq.km.) municipal town in Nadia district. Krishnanagar municipal town is 33.64 km. sphere of influence and Kalyani municipal town has a 19.07 km (Table- 5) sphere of influence which crosses the district boundary and encompasses adjacent areas of Barddhaman, Hugli, and North 24 Parganas district. Krishnanagar is located almost in the middle of the district and its sphere covers almost half of the district. Kalyani is located in the south of the district and its sphere covers Chakdaha CD block of Nadia district, Barrackpore CD block, Amdanga CD block of North 24 Parganas district, and Balagarh CD block and Chinsurah-Magra CD block of Hugli district. The main reason for the influence of the two towns is the well-developed connectivity and accessibility with the other parts of the state (Figure- 3). The National Highway 12 (formerly NH 34) passes through both towns, and the suburban railways also connect these two towns with the other districts.

Conclusion

Higher population density and a more concentrated presence of infrastructure in greater metropolitan regions facilitate expansion and increase the potential for future housing. The growth of urban areas in terms of both size and population is made easier by the presence of facilities of different levels of importance. Krishnanagar Municipal Town, while being the largest, suffers from overcrowding and lacks proper planning. It is also the district capital of Nadia district. In contrast, Kalyani is a well-planned town with an efficient traffic management system. Both towns

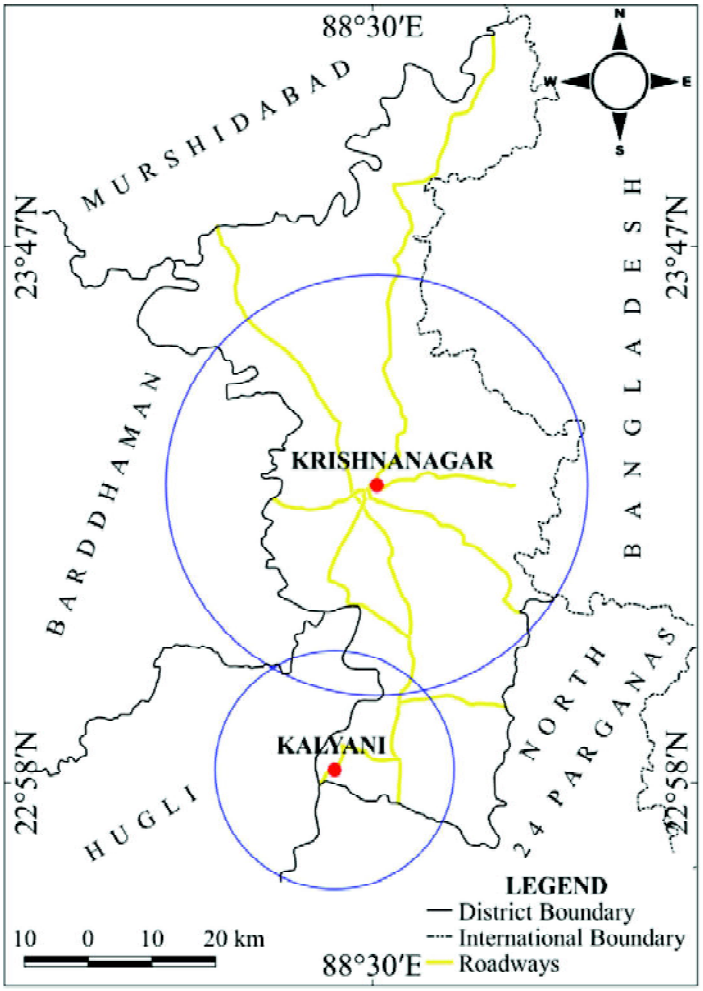

Figure- 4: Sphere of Influence of Krishnanagar and Kalyani Municipal Towns

suffer from the problems of waterlogging and traffic congestion, with Krishnanagar being particularly affected. Proper planning is crucial to address these difficulties and achieve balanced regional growth and improvement of socio-economic facilities. Urban centers should adopt planning concepts to achieve sustainability and improve the overall quality of urban life. To accomplish this, it is imperative to incorporate the surrounding rural regions into the functional domain of metropolitan areas. Every city should do comprehensive household-level field research to assess the current quality of life, living standards, communication and transportation facilities, pollution

levels, drainage patterns, and other civic amenities and services. This valuable research is essential for formulating urban legislation and regulations to facilitate sustainable urban planning and development, ultimately enhancing the quality of life and overall welfare of individuals.

References

Alam, I, (2011). *Infrastructural Development of Towns in Murshidabad: An Assessment of Level of Urbanization*. Unpublished Ph.D. Thesis, Visva-Bharati University, retrieved from https:// shodhganga.inflibnet.ac.in, accessed on August 2018 at 10:20 am

Ali, M.J. & Varshney, D. (2012). Spatial Modelling of Urban Growth and Urban Influence: Approach of Regional Development in Developing Economy (India). *Journal of Urban and Regional Analysis*, IV (2), 129-148have to brought

Anjaneyulu, B. (2013). *Urbanization and Slum Development in Kurnool City, Andhra Pradesh*. Unpublished Ph.D. Thesis, Sri Krishnadevaraya University, retrieved from https://shodhganga.inflibnet.ac.in, accessed on August 2018 at 10:40 am

Asghar Pilehvar, A. (2021). Spatial-geographical analysis of urbanization in Iran. *Humanities and Social Sciences Communications*, *8*(1), 1-12.

Bardhan, S., & Paul, S. (2023). The cultural landscape of the Bhagirathi-Hooghly riverfront in Kolkata, India: Studies on its built and natural heritage. *Journal of Cultural Heritage Management and Sustainable Development*, *13*(2), 219-237.

Bhatt, L.S. (1976). *Micro Level Planning- A Study of Karnal Area Haryana, India.* New Delhi: K.B. Publication

Chakraborty, G. (2014). *Pattern of Change of Accessibility and its Impact on Development of Haora District: A Geographical Analysis*. Unpublished Ph.D. Thesis, University of Calcutta, retrieved from https:/ /shodhganga.inflibnet.ac.in, accessed on June, 2018 at 8:20 pm

Chen, S., Claramunt, C. & Ray, C. (2014). A Spatio-Temporal Modelling Approach for the Study of the Connectivity and Accessibility of the Guangzhou Metropolitan Network. *Journal of Transport Geography*, 36 (1), 12-23

Dadashpoor, H., & Malekzadeh, N. (2020). Driving factors of formation, development, and change of spatial structure in metropolitan areas: A systematic review. *Journal of Urban Management*, *9*(3), 286-297.

Dickinson, R.E., (1964). City and Region: International Library of Sociology and Social Construction, Routledge and Kegan Paul Ltd, London, 273-78.

Dutta, A. (2018). *A Study on Connectivity and Accessibility of Road Transport Network in Uttar Dinajpur District, West Bengal*. Unpublished Ph.D. Thesis, Raiganj University, retrieved from https:// shodhganga.inflibnet.ac.in, accessed on July 2018 at 11:00 pm

Finio, N. (2022). Measurement and definition of gentrification in urban studies and planning. *Journal of Planning Literature*, *37*(2), 249-264.

Govt. of India. (2011).*Census of India 2011* (Report no.15). New Delhi, India: Office of the Register General and Census Commissioner, Govt. of India

Govt. of west Bengal. (2011). *District Census Handbook, Nadia: Village and Town Directory*. Kolkata, West Bengal: Directorate of Census Operations, West Bengal

Hagget, P. and Gunwardena, K.A. (1965). Determination of Population Threshold for Settlement Functions by Reed Muench Method. *Journal of Professional Geographer*, 16 (4), 6-9

Jaysawal, N. & Saha, S. (2014). Urbanisation in India: An Impact Assessment. *International Journal of Applied Sociology*, 4(2), 60-65

Li, L., Ma, S., Zheng, Y., & Xiao, X. (2022). Integrated regional development: Comparison of urban agglomeration policies in China. *Land Use Policy*, *114*, 105939.

Liu, H., He, B. J., Gao, S., Zhan, Q., & Yang, C. (2023). Influence of non-urban reference delineation on trend estimate of surface urban heat island intensity: A comparison of seven methods. *Remote Sensing of Environment*, *296*, 113735.

Magneville, C., Loiseau, N., Albouy, C., Casajus, N., Claverie, T., Escalas, A., ... & Villéger, S. (2022). mFD: an R package to compute and illustrate the multiple facets of functional diversity. *Ecography*, *2022*(1).

Mandal, K., Chatterjee, S. and Chatterjee, N.D. (2015). Delineating Sphere of Urban Influence: The Case of Three Early Urban Centres of Eastern India. *IOSR Journal of Humanities and Social Sciences*, 20 (11), 91-100

Mandal, R.B. (2000). *Urban geography*. New Delhi: concept publishing company

Mandal, S., (2023). Growth and Distribution of Towns: A Case Study of Nadia District, West Bengal, India. *Indian Journal of Landscape Systems and Ecological Studies*, 45 (1&2), 106-118

Mayhew, s. (2015). *Oxford dictionary of geography.* New York, United State of America: oxford university press

Naldi, L., Nilsson, P., Westlund, H., & Wixe, S. (2021). Amenities and new firm formation in rural areas. *Journal of Rural Studies*, *85*, 32-42.

Pan, J., Shi, P. and Xiaofeng, D. (2008). Measurements of Urban Hinterland Area of Cities at Prefecture Level or Above. *Acta Geographica Sinica*, 63 (6), 635-645

Paul, K., & Nandi, P. Delineation of sphere of Urban Influence: A Study from Birbhum District. *Indian Cartographer*, 36 (2), 15-23

Prakash Rao, V.L.S. (1964). *Towns of Mysore State*. Calcutta: Asia Publishing House

Ramachandran, R. (1997). *Urbanisation and Urban System in India*. New Delhi, India: Oxford University Press

Saikia, B. (2015). Influx of illegal migrants and its socio-economic and political consequences of Bangladeshi immigration in Assam. *Global Journal of Research in Management*, *5*(2), 58.

Saxena, H.M. (2005). *Transport Geography*. Jaipur: Rawat Publications

Silin, Y. P., & Kharitonenko, O. V. (2022). Paradigmatic foundations of health resorts' municipal economics (case of Russia's urban districts). *Journal of New Economy (ïåðåâîäíàÿ âåðñèÿ)*, *23*(1), 66-87.

Sukanya, R., & Tantia, V. (2023). Urbanization and the impact on economic development. In *New Perspectives and Possibilities in Strategic Management in the 21st Century: Between Tradition and Modernity* (pp. 369-408). IGI Global.

Taylor, M. A. P., Sekhar, S. V. C. and D'Este, G. M. (2006). Application of Accessibility-Based Methods for Vulnerability Analysis of Strategic Road Networks. *Netw Spat Econ*, 6 (2), 267-291

Wolff, M., Haase, A., & Leibert, T. (2021). Contextualizing small towns–trends of demographic spatial development in Germany 1961–2018. *Geografiska annaler: series B, human geography*, *103*(3), 196-217.

Zehra, K., & Usmani, S. (2023). Not without family: Refugee family entrepreneurship and economic integration process. *Journal of Enterprising Communities: People and Places in the Global Economy*, *17*(1), 158-181.

Zipf, G.K, (1949). *Human Behavior and the Principle of Least Effort*. Massachusetts: Addison Wesley Press