IJPD The Indonesian Journal of Planning and Development

P-ISSN: 2087-9733 E-ISSN: 2442-983X

Journal Homepage: http://ejournal2.undip.ac.id/index.php/ijpd

Volume 6 No 2, October 2021, 67-75
http://dx.doi.org/10.14710/ijpd.6.2.67-75

OPEN ACCESS

Service Facilities and Spatial Development: A Study on Rangpur City Corporation Area, Bangladesh

Submitted: 28 August 2021
Accepted: 7 October 2021
Available Online: 31 October 2021

Md. Kamrul Hasan[1], Sharmin Aktar Shimu[2], Mehruna Tabassum[3]

[1,2,3]Department of Urban and Regional Planning, Pabna University of Science & Technology, Pabna, Bangladesh.
E-mail: kamrul.urp@pust.ac.bd

Abstract

Inadequate and Inequall service distribution is one of the primary problems in a city. Bangladesh's main cities are presently faced with significant urban population expansion, and urban expansion is resulting in many unplanned developments. One of Bangladesh's most rapidly rising cities is the Rangpur City Corporation (RpCC) area. As the population in the city is growing rapidly, the city has pressure to provide service facilities in the area with heavier population demand. The city corporation is now separated into two primary land uses - core and non-core according to existing conditions of service. The research aims to identify the nature of the spatial distribution of service facilities (schools, colleges, health care centers, mosques, temples) and to analyze the deficiencies of different service facilities in both core and non-core areas of Ranpur City Corporation. The research is mainly based on primary data collected by a questionnaire survey from the authority of RpCC. In this research, the requirements and the deficiency of different amenities are also calculated using population projections by arithmetic increase method and population coverage of each service facility. The calculation found that the shortfall of service facilities are higher in the non- core area than the core area of RpCC, and major markets are concentrated in the core area. This type of centralization can create pressure on the resources of a core area. The identified nature of centralization from the study can be used for future planning and development of service facilities to ensure proper distribution in RpCC area.

Keywords: centralization; Rangpur City Corporation (RpCC); spatial development; urbanization

1. Introduction

Bangladesh is one of the world's most populous countries with a considerable population. Recently, the country has faced rapid urban development (Ferdous et al.,2016). Bangladesh's urban development rate is lower than Asia's and the countries with lower middle incomes (World Bank, 2018). Bangladesh is characterized by quick and unfair urbanization and high densities compared to other South Asian countries.

Rapid urbanization in Bangladesh puts tremendous demand on local resources and limited land resources, resulting in various problems such as pollution, crime, congestion, poverty, and economic and environmental concerns across the nation (Smith & Shahidullah, 1995). This expansion undermines the ability of local administrations to deliver services such as electricity, health, transit, sanitation, and physical safety (Jahan, 2000).

It also underlines important issues for the country's urban planners, stakeholders, and policymakers due to a lack of resources, time-bound urban information, and a shortage of planners. As the urban sector accounts for

[1] Corresponding Author: Department of Urban and Regional Planning, Pabna University of Science & Technology, Pabna, Bangladesh.
Email: kamrul.urp@pust.ac.bd

How to Cite:
Hasan, MD. Kamrul., Shimu, S. A., Tabassum, M. (2021). Service facilities and spatial development: A study on Rangpur City Corporation Area, Bangladesh. *The Indonesian Journal of Planning and Development*, *6*(2), 67-75. doi:10.14710/ijpd.6.2.67-75.

64% of the national GDP, rapid and uncontrolled urbanization is critical to the country's economic development, social expansion, and cultural transformation.

The population of a country's largest cities is growing rapidly (Smith & Shahidullah, 1995). Because of the rapid growth of the population, there is a huge gap in providing public services in comparison to the demand (Das & Begum, 2019). Rapid urbanization, poor urban governance, and macroeconomic conditions expose all metropolitan areas to various problems (Rusk, 2006). High-density urban built-up areas place pressure on urban outlets. One of the main reasons for this development is that the urban center efficiently uses its land resources to support its population without encroaching on new agricultural land, and there is a higher concentration of socio-economic facilities in the city. Furthermore, inequitable distribution of urban facilities leads to a metropolis's centralization.

The city of Rangpur is one of Bangladesh's major cities. Now the city is, in terms of population, the fourth-largest city in the country. As an economic and divisional center of northern Rangpur, this fast urbanization is no exception. In Rangpur, there is a rapid growth in the urban population. This rapidly expanding urban population creates demand for public services such as schools, schools, playgrounds, health centers, marketing establishments, and security. (Das & Begum, 2019). People come to the core area from non-core areas to access these services, better living conditions, and opportunities. That overcrowded the core area and keeps pressure on service facilities like school, colleges, health facilities, market, parks, open spaces, and many more.

The research aims to identify the nature of the spatial distribution of service facilities (schools, colleges, health care centers, mosques, temples) and to analyze the deficiencies of different service facilities in both core and non-core areas of Ranpur City Corporation. RpCC is currently functioning with a minimal workforce inherited from old Paurashava. This is inadequate, and this small workforce cannot run the affairs of such a large City. On the other hand, the Town Planning Department is run by only one Town Planner without adequate logistic support. There are inequalities in the distribution of service facilities in Rangpur City Corporation. The service facilities are not equally distributed in Rangpur City Corporation. Most service facilities exists in the core area. So, there is a chance that development is centralized in core area. Most people come to the core area for better facilities, putting much pressure in the core area. So it is crucial to identify the distribution pattern of existing service facilities. Comparison between the required number of facilities will clarify the degree of centralization.

The result of the research will be helpful for further planning in two ways. New service facilities will easily be established as per their requirement according to population and standard population coverage. And such kind of establishment will ensure equal distribution of service facilities.

Bangladesh has witnessed unplanned and quick development in recent years, being one of the fastest developed countries in the world. 34% of her population now resides in urban regions every day, and in the year 2050 this is predicted to reach 56% (UN, 2005). In the past two decades, the anticipated growth of urban population was 4.22 percent annually, whereas national population growth was 2.14 percent annually (1991-2011 population census). In recent decades, such accelerated population increase and socio-economic advancement has led to urbanization in Bangladesh, leading to the territorial development of each town and center of growth. As a result, the total area occupied by cities increased to 10,712 square kilometers, accounting for 7.25 percent of the country's total land area (BBS, 2001). Many factors, including natural population expansion, have been attributed to the extraordinary rise of cities, expansion and a substantial flood of rural-urban migration, which is responsible for up to two-thirds of the increase in urban population in Bangladesh. One significant aspect of this development is that growth in metropolitan regions has spilled over to smaller communities, administrative boundaries, and in certain circumstances, multiple cities or development hubs have combined into a single entity (Park & LaFrombois, 2019).

Proponents of centralization think that the advantages of city center areas are related to the unequal distribution of built infrastructures and that industrial clusters in an urban region increase face-to-face contacts (Hamid, 2002). The degrees of population and housing concentration, as well as the phenomenon of decentralization, are critical aspects of major urban regions (Glaeser & Kahn, 2004). The centralization ratio is a measure of centralization that represents the relative reduction in the mean distance housing units are placed from the center compared to a uniform distribution in the urban area—a centralization effects on a city scale (Chaturvedi, 2005).The value of properties in the central business district is soaring faster than before. The city center is still lively, and their function is becoming more important as technology advances. The main arguments of researchers who emphasize the centralization viewpoint are based on three points: the first is that traditional city centers have better access to information and technology. As individuals and activities require more and more access to these technologies, they will inevitably have to move to city centers to meet their need. The degree of centralization varied per country region. The larger urban regions also have greater mean levels of centralization (Hamid, 2002).

The concentration of a large part of a country's population in a metropolis or the concentration of urban inhabitants to a compact mass with a high population density per acre can be described as urban centralization. Urban function once helped to centralize urban areas; namely, central government power, defense, religion, fun, trade, industry, transport, finance and banking, and utilities, encouraging town-plus decentralization as the residential population is moved from the central areas to the outskirts of towns (Glaeser & Kahn, 2004).

Changes in the distribution and linkages of space activities through land transformation and property are referred to as spatial development (Senior et al., 2007). When urbanization and industrialization swept through Bangladesh in the 20th century, the food industry was increasing and distributed to consumers. As larger and larger firms used railways, highways, and cooling to broaden their reach, food production and trade were carried out at the national level (Government of Bangladesh, 2005). Knowing the space arrangement (Rouf & Jahan, 2009), the socio-economic status in a given place could be justified.

There are few studies in the urban planning field analyzing the spatial distribution of service facilities in various towns and cities in Bangladesh. A study based on the threshold population found that the distribution of service facilities in Pabna town is not well planned, and service facilities are concentrated in the central wards (Parvez, 2020). Performance evaluation of municipal service facilities has been done in some studies. The performance of municipal service facilities have been evaluated by using the User Satisfaction Index and Community Effect Index for Pabna, which illustrate the user satisfaction for the service facilities (Safayet & Hossain, 2017). There are some gaps in such types of research with a motive to identify the nature of centralization and distribution of service facilities in Rangpur city. So the result of this study will overcome this gap and make a way to assess the spatial distribution of service facilities with a comparison of shortfall in service facilities in the core and non-core areas of Rangpur city.

2. Research Methods

The study is carried out in a mixed method. Both primary and secondary data have been collected to complete the research. The data regarding the existing number of facilities like primary school, high school, college, mosque, temple, health care, and location of major markets in Rangpur City has been collected from a questionnaire survey from RpCC authority. The population of the previous year has been gathered from secondary sources.

2.1 Study Area Profile

Rangpur City Corporation (RpCC) is one of the new city corporations in Bangladesh. In the North, the city of Rangpur lies between $25^0 41$ to $25^0 49$ North latitudes and $89^0 12$ to $89^0 18$ East longitudes with an average elevation of 35m above sea level.

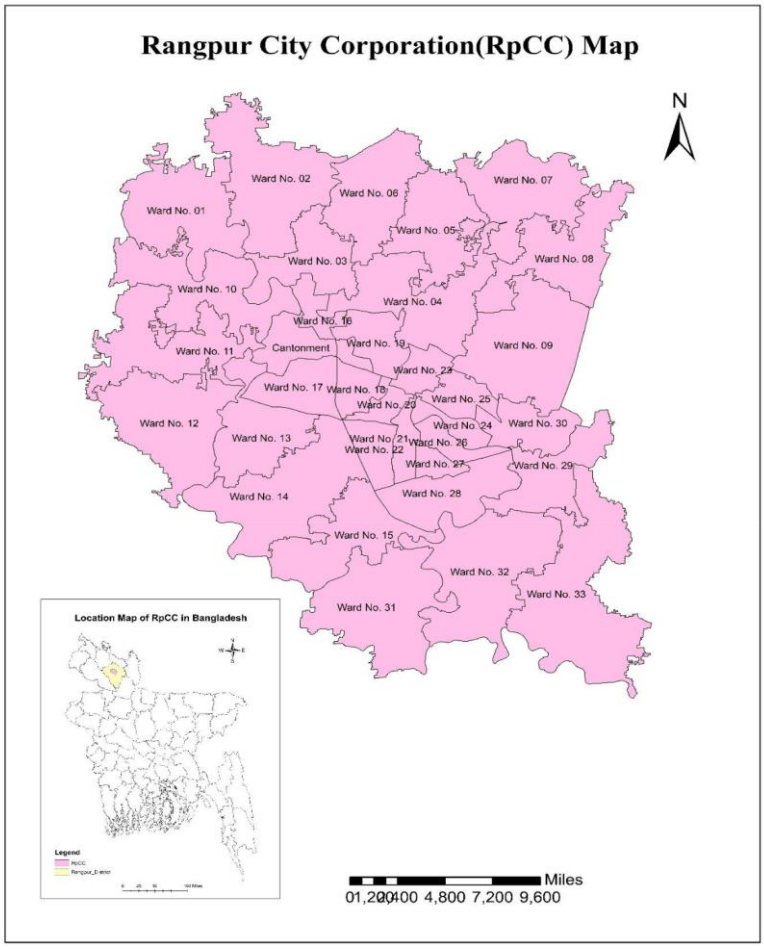

Figure 1. Map of Rangpur City Corporation (RpCC) Area

In 2010, it was declared a city corporation as a comparatively young division headquarters in which the main agricultural region in Bangladesh's largest Northern Bengal is served. In 2010 the City of Rangpur became a City Corporation, extending its authority from 41,18 sq km to around 205 km^2. The City Boundary includes a relatively extensive agricultural area. The town currently has more than 207 km^2 of land, and on 8 June 2012, it comprised 112 mauzas. Except for the confined region of Rangpur Cantonment in the center of the town, 112

mauzas compose the Structure Plan area. Thus the Rangpur City Structure Plan covers 5067.77 acres or 205.09 sq. km.

The city is divided into 33 wards of varying sizes. For the 33 wards, 33 councilors have been elected along with 11 women councilors for 11 reserved wards. At the same time, the honorable Mayor, who has been elected, is at the top of the city administration. This city corporation is presently divided into two major types of land uses: core and non-core.

Table 1: Area of Rangpur City Corporation

Description	Ares(acre)	Area (sq.km)
Total area of Rangpur City Corporation Including Cantonment	51,344.13	207.78
Restricted area (Cantonment)	666.36	2.70
Area Coverage of Rangpur City Structure Plan	50,677.77	205.09
Core Area (except Cantonment)	5,939.86	29.66
Non-core Area	45,404.39	178.19

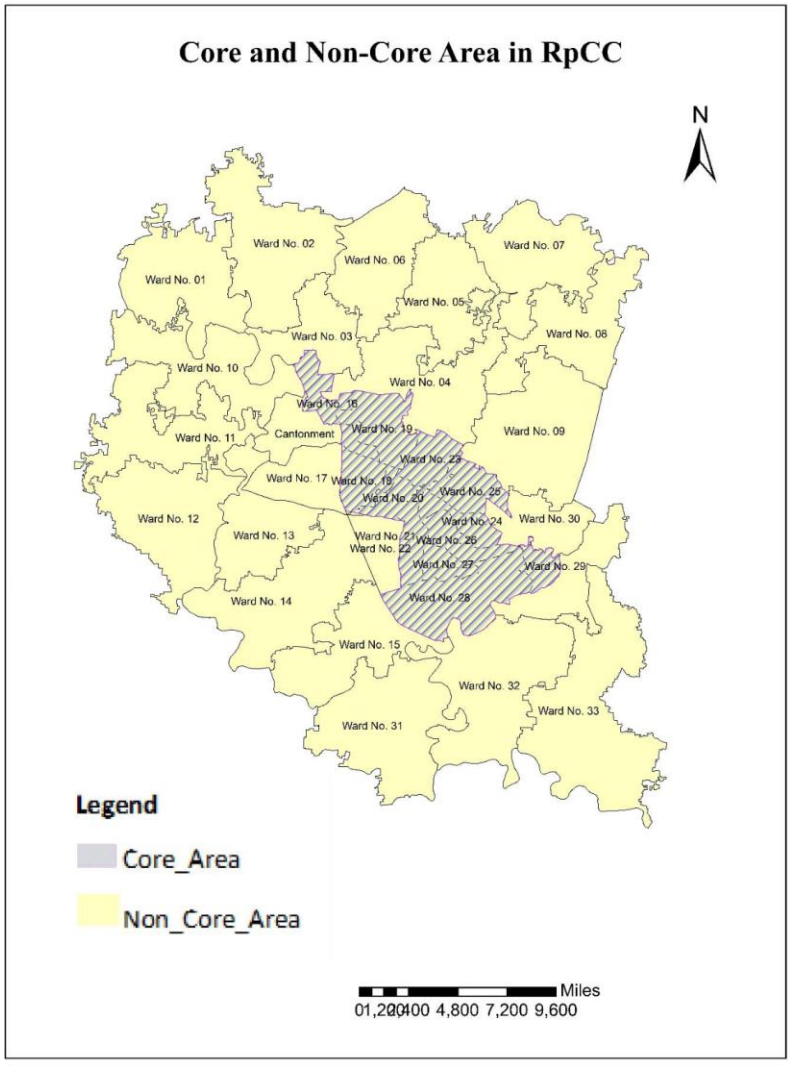

Figure 2. Core and Non-Core Area in RpCC

2.2 Population Projection

Calculation of the future birth, mortality rates, and population movement according to previous and present circumstances are population projections. There are no forecasts, no projections, no estimates. Instead, it is between forecasts and predictions. Projections of the population are computations showing the future course of fertility, death, and migration. Generally, they are solely formal calculations that reveal the consequences of the assumptions made.

Indeed, these statements are dependent on specific assumptions, merely on the birth, death rate and population movement at some future stage. On the other hand, a population forecast is a projection that considers the assumptions to produce a realistic picture of the likely future population development. Generally, forecasts are for the short term, while projections are for the long term. Projection is made by using the Arithmetic Increase Method (Equation 1).

$$\text{Arithmetic Increase method, } P = P0 + nx \quad (1)$$

P= Population projection in the future; Po= previous population; n= Number of years between the projection year; x= increase population.

2.3 Population Coverage

The proportion of people within the coverage area has been calculated by dividing the sum of the total population at each postcode location by the total existing service facilities (Equation 2).

$$\text{Population Coverage} = \text{Total Population} / \text{Existing Service Facilities} \quad (2)$$

This study focuses on the existing service and total population in core & non-core areas for calculating population coverage. Population coverage indicates there may also be scenarios where alternative services are more appropriate.

2.4 Standard of Service Facilities

For a particular city, the planning requirements are set by examining the functionality, the number of users, open spaces needed in buildings, social and climate conditions, and the city's economic activity. Any special quality of service amenities in an area is tough to set. It relies on several aspects, like population density, number of school children per family, and road network. These installations must be a safe walk away. Ideally, children should have access to walking without crossing any roads. The Private Residential Land Development Rules 2004, Bangladesh, provides space standards for services in acres by population size.

2.5 Gap Identification of Services in Core and Non-core area

Gap analysis provides a means to evaluate the performance disparities between core and non-core service facilities. The space between the current and destination is referred to as the Gap. A gap analysis can also be referred to as an analysis of needs. A needs evaluation or analysis of the need- gap. The initial stage of examining a gap is to identify particular target services and compare them with the core and non-core areas. The description of the gap is defined as the gap and the reasons contributing to it.

3. Results and Discussions

3.1 Existing Distribution of Service Facilities

For analyzing the distribution of service facilities, scenarios of education, religious, and health facilities are considered. For calculating population coverage population of the last census (The year 2013) has been used. The population for the year 2020 has been calculated using the population projection method. The number of service facilities in core and non-core areas with population coverage is shown in the below table.

Table 2: Existing Service Facilities in Core Area of RpCC

Existing Service Facilities	Number of Service Facilities	Percentage of service facilities in RpCC	Population Coverage	Population in 2020	Percentage of Population living in Core area
Nursery School	38	66	5,426		
Primary School	79	39	2,610		
High School	48	62	4,295		
College	39	72	5,286	237,287	36
Mosque	243	31	849		
Temple	57	27	3,617		
Health Care	41	55	5,029		

Table 3: Existing Service Facilities in Non-Core Area of RpCC

Existing Service Facilities	Number of Service Facilities	Percentage of service facilities in RpCC	Population Coverage	Existing Population in 2020	Percentage of Population living in Non- Core area
Nursery School	20	34	18,971		
Primary School	122	61	3,110		
High School	30	38	12,648		
College	15	28	25,295	476,254	64
Mosque	561	69	676		
Temple	156	73	2,432		
Health Care	34	45	11,159		

From table 2, it is found that 36% of people of RpCC live in the core area. Educational facilities, service facilities, and health care facilities are superior in the number of total facilities in the core area. In the non-core area, 64 percent of the total population of RpCC live here. However, almost all service facilities are fewer than the core area. The most important fact is that the population coverage for service facilities is higher in non-core areas than in core areas.

3.2 Spatial Arrangement of Market in Rangpur City Corporation

Spatial development includes all levels of land use and national spatial plans of the public sector that influence people's distribution and activities at different levels. Jahaj Company Shopping Complex has been the most popular market in Rangpur City Corporation. It is located in the heart of RpCC, close to Jahaj Company. Similarly, Supermarket, City Bazar and Shah Amanot Shah market are in the central region. The outcome is, therefore, an understanding of the robust market growth in the core area of RpCC.

Table 4: Name of the Markets, their Locations and distributions in Rangpur city

Market					
High Residential Area			**Mid Residential Area**		
Area	Name	Grand total (%)	Area	Name	Grand total (%)
Jahaj Company Mor	- Shopping complex - Amanot Shah - Super market - Jahaj company mor Market	28	Modern Mor	- Ashraf Market - Modern Bazar - Parker Mor	2
Medical Mor, Dhap	- Karuponno market - BGB market - BGB market - C.O bazaar	17	Lalbag Bazar	- Lalbagh Plaza - Lalbagh Bazar - Khamar Mor Bazar	4
City Bazar	- Community Market - Raja Ram Mohan Market - City Bazar	19	Shapla Mor	- Station road Bazar - Shapla Bazar - Kamar Para	7
Grand Hotel Mor	- Salek Market - Jaman Market - Grand Hotel Bazar	3	Termnial Mor	- Terminal Bazar - Badargan j Road - Terminal City Bazar	4
			Mahiganj Bazar	- Satmatha Bazar - Mahiganj Bazar	2

Comparing Rangpur City Corporation to the other cities of the world, which are well planned, one of the major differences will be market location. The markets of the well-planned city and their nearest neighbor index value always focus on the scattered pattern of market, and their sphere of influence is almost the same all over the city. Figure 3 shows that the markets are located in clustered positions. That means maximum markets are together in a particular place.

3.3 Gap Identification

The required number of service facilities has been calculated according to Private Residential Land Development Rules, 2004. For the calculation, three factors have been considered. The factors are home to facility distance, area requirement of the facilities, and minimum and desired population served by the service facilities. The typical values are explicitly listed in the Private Residential Land Development Rules, 2004. The calculation shows the required number of service facilities and short fall in service facilities, which is shown in the table below. From Table 5, it is found that almost all the facilities in core and non-core areas are not sufficient in number. However, the gap between the existing and required number of service facilities are higher in non-core area for almost all of the facilities. So, there is a huge gap between the existing and target states. But the gap is heavier in non-core areas of the city corporation. The percentage of total service facilities both in the core and non-core areas of RpCC is shown in Figure 4. The chart (Figure 4) indicates large gaps in the existing percentage of college, health care, and market facilities between the core & non-core areas in Rangpur City Corporation. The gap in the distribution of educational facilities is comparatively less than other facilities in the core & non-core areas. Here 45% of health care facilities serve 64% population & 55% of health care facilities serve 36% population. The same scenario shows in other service facilities like 28% college, 38% high school, and 69% mosques cover 64% of people in the non-core area.

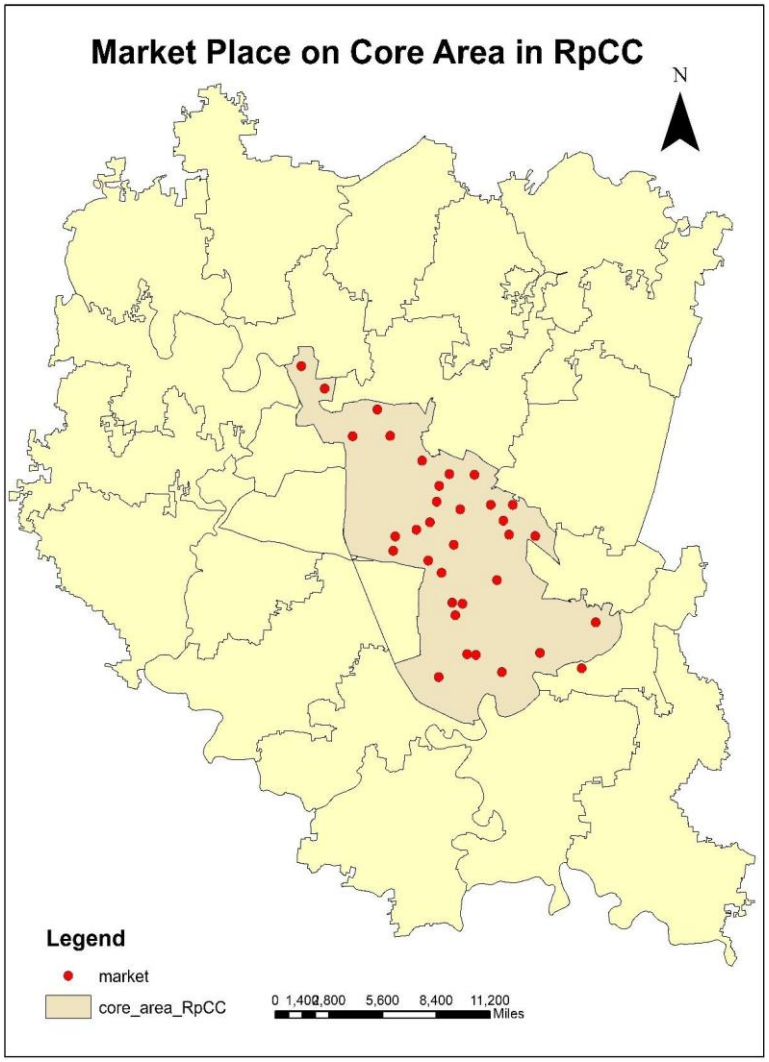

Figure 3 Map of Market Distribution in Core area

Table 5: Required service facilities and shortfall in Core and Non- Core Area of RpCC

Service Facilities	Population in 2020		Existing Number of Service Facilities		Required Number of Service Facilities		Short Fall in Service Facilities	
	Core Area	Non- Core Area	Core Area	Non-Core Area	Core Area	Non-Core Area	Core Area	Non-Core Area
Nursery School	237287	476254	38	20	80	96	**42**	**76**
Primary School			79	122	120	198	**41**	**76**
High School			48	30	69	68	**21**	**38**
College			39	15	47	30	**08**	**15**
Mosque			243	561	281	637	**38**	**76**
Temple			57	156	67	179	**10**	**26**
Health Care Centre			42	34	62	72	**21**	**38**

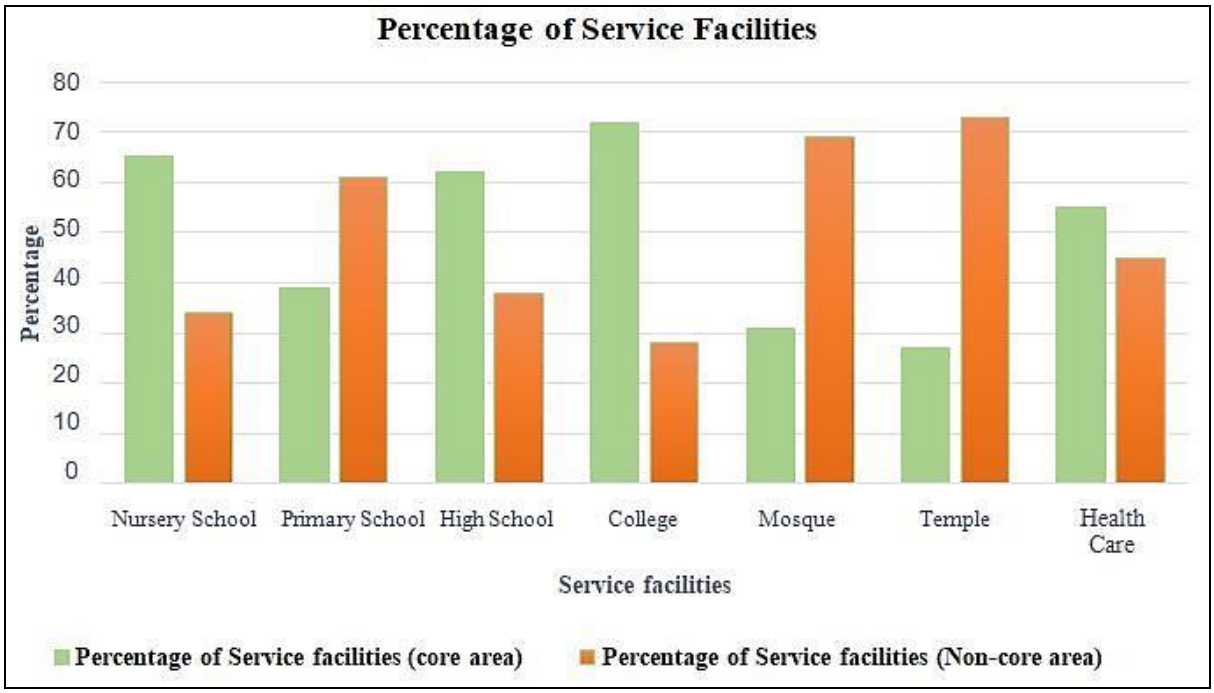

Figure 4. Service Facilities Gap in Core and Non-core area

4. Conclusion

A fair distribution of service facilities is one of the urban planners' main concerns. Bangladesh is a resource shortage country. Adequate provision of utilities is required in order to operate an urban system smoothly. Some places have enough facilities, whereas most other areas are significantly behind in the Rangpur City Corporation's mean level of development. As the town's population expands daily, demand for services in the following days will increase. For people in all areas to receive equal benefits, the government needs to offer more and equal spatial facilities with good planning. In addition to ensuring that these facilities are maintained and operating correctly, the government should not only respond to the current requirement but also satisfy the future demand.

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