

Shaping Neighborhood Plan towards Sustainable and Prosperous Future: A Study of Paba, Rajshahi

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Abstract

Over time, urban growth has become a matter of concern in several ways. So, the necessity of sustainable neighborhood planning can very well be appreciated, which is an integral part of sustainable city formation. Urban growth in Rajshahi is increasing remarkably, and so Paba Upazila of Rajshahi is chosen as the proposed study area. The study's objective is to plan a neighborhood by integrating sustainable solutions in Paba Upazila. This study's outcome affects urban form and functions, including some essential urban services, such as water, land use, neighborhood mobility, green screen, roof-top gardening. The master plan of Rajshahi for the year 2004 to 2024 has been considered for important information. Essential data and maps have been analyzed with M.S. Excel and GIS. The study can be an excellent example for other growing cities and can provide necessary instructions for sustainable neighborhood planning to the authority. Proper implementation of the study can ensure a sustainable environment for a better, safe, and secure urban lifestyle for a prosperous future.

Keywords: *Integrating Sustainable Solution; Neighborhood Planning; Urbanization.*

1. Introduction

A well-planned city helps to build harmony between the city dwellers and the urban environment. City formation, city growth, and city existence are three essential parts of a town. The haphazard and chaotic development of cities is uninhabitable. People move from rural areas to urban areas because of population growth, urbanization, economic development, and consumption patterns. So, urban growth has become a matter of concern in several ways. It is estimated that the rate of urban growth will continue to rise. Globally, more than 50% of people live in urban metropolitan areas, and over 25% of the total population is living in urban areas (Al Rakib et al., 2020). In recent times, urban growth in Rajshahi city is growing remarkably, which is influencing the urban environment. So to save the urban environment, it is time to shape the cities towards sustainability, which is an integral part of city formation.

Neighborhood planning is a part of art and science, where the sustainable neighborhood provides people with a high-quality living environment without using a vast amount of natural

resources. The ideas of sustainable development have not yet reached an international level and, according to Marique & Reiter (2011) are still stated as more of an experimental approach to neighborhood planning rather than a functional one. There are some works on neighborhood planning in Rajshahi City (Roy et al., 2019), but there are no works on sustainable neighborhood planning in Paba Upazila of Rajshahi. Considering all the above issues, Paba Upazila of Rajshahi has been chosen as the proposed study area. The objective of the study is to plan a neighborhood by integrating sustainable solutions in Paba Upazila. The study proposes a sustainable neighborhood planning model that affects urban form and functions. Essential urban services such as land use, neighborhood mobility, green screen, roof-top gardening were proposed. This study helps to build a self-reliant neighborhood area. Besides sustainable neighborhood planning, the study also ensures secure urban lifestyles for a prosperous future.

2. Materials and Methods

2. a. Existing conditions of the study area

Rajshahi is situated near the Padma Riverbank, known as "Silk City". The city is also known as "Education City". Paba is an Upazila of Rajshahi District, which is the proposed area of the study, is located in between 24°18' and 24°31' north latitudes and between 88°28' and 88°43' east longitudes (*Banglapedia*, 2015).

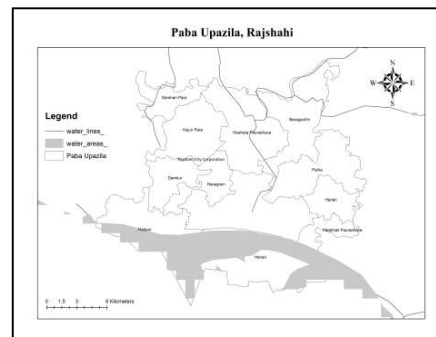


Figure 1. Paba Upazila area boundary, Rajshahi. (Source: Author's analysis, 2020.)

Paba Upazila covers 340.03 sq. km, where land area is 308.28 sq. km, the riverine area is 31.75 sq. km, and 0% area for reserve forest (*BBS*, 2013). The Upazila population is 314196, with 76622 households, where the Upazila population density is 924 per sq. km (*BBS*, 2013).

2.b. Methodology

All the necessary data were collected from primary and secondary data sources. The master plan of Rajshahi of the year 2004 to 2024 has been considered for important information (Salan et al., 2018). According to the total size of the Upazila, total population and population density were proposed by calculation. The essential features were showed by integrating sustainable solutions in the study area. For the proposed design, UN-Habitat principles of a sustainable neighborhood, the Master Plan of Rajshahi of the year 2004 to 2024, and the Planning Standards of Bangladesh were considered. Essential planning principles and policies were also integrated for sustainable neighborhood planning.

2.c. Policy for sustainable neighborhood planning

- The neighborhood area must be planned by integrating sustainable solutions.
- 30% of the total land area should be covered by residential area.
- Houses of the residential area must be available in different price ranges and tenures, where each tenure type of the residential area must not more than 50% of the total (*UN-HABITAT*, 2014).
- The density of the selected area must at least 3400 people per sq. km.
- Roads network should cover at least 30% of the total land area (*UN-HABITAT*, 2014).
- Road network should be divided into four parts: primary road (ROW 100ft), secondary road (Row 40ft), collector road (ROW 35ft), and access road (ROW 32ft).
- Use of public transport must be strongly encouraged
- The area should have sufficient parking systems.
- Roads should be walkable and cyclists friendly.
- There must be enough lighting for ensuring pedestrian's safety and security.
- All kinds of heavy vehicles are strongly prohibited inside the residential area and commercial area.
- Industrial land uses must be situated at the corner site of the study area.
- The passive design must be followed in administrative and commercial buildings.
- At least 10% of the total land area should be covered by all kinds of social services and commercial facilities.
- There must be at least one open forest between three communities.
- The area must be water friendly.
- Public health and livability should be kept in focus.
- Every community of the neighborhood area must be self-reliant.

3. Results and Discussions

3.a. Neighborhood Design

In the proposal of the study, 30% of the total area is the residential area, and the road network is 30%, mixed land uses 8%, industrial area 6%, commercial area 9%, agricultural land 7%, social services, and community facilities 10% (Figure 2). These proposed percentages are the modified result of UN-Habitat, the Master Plan of Rajshahi of the year 2004 to 2024, and the Planning Standards of Bangladesh.

Residential area: This study proposes 30% of the total land area as the residential area: 92.484 sq. km. In the proposal of the study, the low-class residential area is 20%, the middle-class residential area is 45%, and the high-class residential area is 35%. This study provides an approximate result of the proposed population of the study area till the year 2050. Assuming four as average family members, the study area's total population is 1035000 people (Table 1).

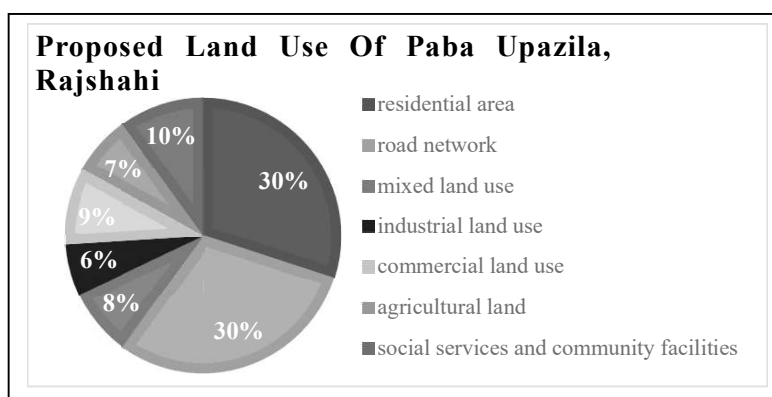


Figure 2. Proposed Land Use Percentage and Proposed Population Density of the Study Area

Table 1. Proposed Population Calculation of the Residential Area till the year 2050.

Residence Type	Plot size with Unit	No. of Storied	No. of Family per Storied	No. of member per Family	No. of People per Storied	No. of Plot	Total No. of Population per Plot	Total No. of Population for each Katha
Low Class	3katha (3 unit)	3	3	4	12	2588	36	93150
	4katha (3 unit)	4	3	4	12	2372	48	113850
Middle Class	3katha (duplex)	–	–	4	–	29110	04	116438
	5katha (2 unit)	4	2	4	8	6550	32	209588
	6katha (3 unit)	5	3	4	12	2179	60	130725
High Class	5katha (duplex)	–	–	4	–	18113	04	72450
	7katha (2 unit)	6	2	4	8	3019	48	144900
	8katha (2 unit)	7	2	4	8	2588	56	144900
Total Population = 10,35,000 Person								

Population density: Population Density = total population / total area = 1035000 / 340.03
= 3044 people per sq. km

∴ The proposed density of the study area is 3044 people per sq. km.

Road Network: This study proposes an efficient street network, which is 30% of the total land area, is followed by UN-HABITAT. The organization UN-HABITAT supports countries to develop urban planning, proposed five principles for sustainable neighborhood planning, one of which is explained in the bellow (*UN-HABITAT, 2014; UN-HABITAT*).

Adequate street density and efficient street network: This principle aims to develop mobility towards sustainability. To design the street network for a sustainable neighborhood, the following aspects are:

- Streets are to walkable and cyclist-friendly
- Public transportation is encouraged
- Road hierarchy is to be highly interconnected
- Sufficient parking place is provided

The total length of the proposed road is 92.484 sq. km. In the proposed design, 800meter to 1000meter is suggested as the distance between two arterial routes (*UN-HABITAT*, 2014). According to the proposal of the study, primary road, secondary road, collector road, and access road are respectively 28%, 30%, 17%, and 25%.

Social Services and Community Facilities: In the proposal of the study, the total number of primary schools are 256, covering 2.37 sq. km area. Secondary schools and colleges are respectively 173 and 37, where secondary schools cover 3.14 sq. km, and colleges cover 2.19 sq. km. This study provides all the necessary utility facilities properly: gas, electricity, water, renewable energy.

3.b. Integration of Sustainable Solutions

Green Walls: Green walls are an essential part of sustainable solutions, which bring nature into the urban environment. This not only helps to manage climate change but also helps to feel good by seeing green. Besides, seeing green helps to reduce childhood obesity. This study proposes green walls in every building. The green wall helps to reduce heat asphyxia and to relieve stress.

Roof-top Gardening: Roof-top gardening at the roof of the house is a good practice. This study proposes roof-top gardening at the roof-top of the building. Vegetation or gardening is an important step, which works as a food source and helps to green the urban environment. Roof-top gardening is an umbrella concept of the green roof. Roof-top gardening helps to drain frowzy water during the monsoon season. Besides, a green roof can reduce the negative impacts of heavy rain and provide insulation to cool down building in summer and keep them warmer in the winter.

Rainwater Harvesting Systems: By the rainwater harvesting method, rainwater is collected and is stored for later uses. There are mainly two kinds of rainwater harvesting methods: roof-top rainwater harvesting method, surface runoff harvesting method. Rainwater harvesting system is a sustainable way of water supply. This study proposes both types of rainwater harvesting methods in the study area. By integrating the rainwater harvesting system in the study area, the study area's water crisis problem can be removed. For securing water supply, the rainwater harvesting method cannot be ignored anyway.

Bi-cycle lane and Public Transport: Transportation system is at the heart of urban mobility. An eco-friendly transportation system is significant for saving nature. This study proposes to use bi-cycle and public transports. To reduce carbon dioxide emissions, electronic and solar-based vehicles are encouraged, and all kinds of private cars are strongly prohibited in this study. This study proposes a separate bicycle lane and the bus lane along with the roads, as well as ensures the pedestrian's safety and security. The timing of buses or trains is another vital issue.

Passive Design: Passive design is a part of green building. In this study, passive design is proposed in administrative and commercial buildings. A lot of insulation and special glass, unique curtain walls are used to make the cover appeasement so that the energy does not leak from the walls.

Open Forest: Open forest provides recreational facilities. In the study area, most of the regions are warm with their high land surface temperature. So, the open forest is suggested, which provides both shades and recreational facilities during the period. By creating the open forest,

two things happen: tree stock is ageing for over 100 years, and more than ten decades of water-friendly environment will be increased by reducing high temperature.

Rain Garden: A rain garden is such a kind of garden which is full of bio-recreational facilities. The integration of rain gardens intercepts stormwater. Rain gardens help to improve water quality, manage flood, and create sustainable management of the environment.

4. Conclusion

In a developing country like Bangladesh, urbanization is getting more complicated and making urban areas uninhabitable. Rajshahi is not out of them. So, the importance of integrating sustainable solutions cannot be ignored anyway. The implementation of sustainable solutions can save the eroded nature. Sustainable solutions help to bring nature into the urban environment. This study emphasized sustainable applications in neighborhood planning and elaborated on how the proposed sustainable applications can solve the ongoing problem of the urban environment. The study also focused on making each neighborhood area self-reliant: water-friendly, source of food, implementation of green walls for heat absorption, and all other eco-friendly performances. To sum up, the portrait of the study provides a sustainable and healthy environment by maintaining eco-systems. This study showed all the possible nature-based solutions for planning a neighborhood area. The required steps for shaping the neighborhood areas towards sustainability for a prosperous future should be taken by the concerned authority as soon as possible to save the urban environment for better, safe, and secure urban lifestyles.

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