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Planning and Designing a Central Place by Integrating Multiple Uses: A Hybrid Model Approach for Developing a Sustainable Town Centre at Baze Silinda, Rajshahi

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Abstract

Town Centre is the social hub of the town in which the central services of the highest order are found. Rajshahi is a divisional city and also known as educational city. Though Rajshahi is a divisional city, no significant development has yet been taken place. The master plan of Rajshahi has been taken for the year 2004-2024, in which several development proposals are suggested. Among of these development proposals, development of a new town Centre is an important one. Baze Silinda is one of the proposed town Centre. The objectives of the study are to develop a town centre by approaching hybrid model and integrating multiple uses and to provide some recommendations for sustainable development of the town centre. In order to develop this town Centre hybrid model has been used which is a combination of sector model, vertical city model and smart growth city model. The existing condition of the site is dominated by agricultural sectors. Site area is about 533 acres. The whole development of the site has been divided into five blocks. Block "A" is for high class residents with higher community facilities. Block "B" and Block "C" are for middle and low class residents, Block "D" for commercial purpose and Block "E" for mixed land use development. The commercial and industrial zone of the project has been developed based on the sector model and vertical city model. The residential area follows smart growth planning techniques. Physical and social surveys have been conducted to collect relevant data for developing sustainable town Centre. Arc GIS software has also been used to generate a number of maps to show the different land use zones and the proposed facilities. The study provides a clear portrait of the development of a town center. It also provides Safe and secure road networks with pedestrian walkways. The total development creates a sustainable, better and healthy environment.

Keywords: *Community Facilities, Development, Hybrid Model, Sustainable, Town Centre.*

INTRODUCTION

Rajshahi is the fourth metropolitan city of Bangladesh next to Dhaka, Chittagong and Khulna. It was one of the first Municipalities in Bangladesh. It was established in 1876 [1]. Rajshahi City Corporation (RCC) covers an area of 45 sq. km and accommodates about 449757 populations [2-4]. Since 1971, the rate of urbanization as well as the number of population of urban centers has increased. This has resulted growth of slums, construction of buildings by filling lowlands in the name of development. The continuation of the same may lead to unhealthy situation. The dynamic process of land use change in the recent decades in Rajshahi City Corporation shows an increasing trend in residential, commercial and industrial uses and decreasing trend in

agricultural and open spaces [5]. It requires planned development for a sustainable urban environment in the future [6]. Though the population of the city is increasing the level of urbanization of Rajshahi has not been at the scale compared to the other metropolitan cities of Bangladesh. Absence of economic investments on a significant scale and consequent lack of economic opportunities in urban Rajshahi are the reasons of slow development. A number of local level institutions are working for the development of RCC [7]. Among all these, Rajshahi Development Authority (RDA) is responsible for the physical planning of the city and RCC is responsible for providing some of the urban services. These two organizations are functioning for the physical development of the city but it is still facing a lot of problems. The city development agencies are unable to provide sufficient urban services to meet the demand of the citizens [7].

The master plan 1984 proposed a new town center at Purba Natunpara area to create new activities towards north and the master plan 2004 proposed a town center at Baze Silinda [6]. The study is conducted to develop a well-planned and developed model town center at baze silinda in order to provide sufficient urban services to meet the ever increasing demand of the citizens. Baze silinda is selected for the development of town center on the basis of such factors: accessibility, locational priority, distance from various important locations etc. A number of model town has been implemented in different metropolitan area specially Dhaka metropolitan area. Among them, Uttarkhan Model Town, a private organization has started its journey to meet the necessity of a habitable accommodation. Uttarkhan Model Town is building the natural beauty surrounded the project area and the elegant housing project is situated within the projected development area of DAP nearby Uttara Model Town and Purbachal New Town [8].

Though a number of studies related to model town development are available for the major urban centers of Bangladesh, no research was conducted for Rajshahi. As Rajshahi is one of the prominent cities in the northern region of Bangladesh and the city is growing both in terms of area and population hence it is urgent to develop a town center to keep pace with the growth of the city. Thus, the study tried to develop a town center in the proposed Baze Silinda in order to accelerate the overall growth of Rajshahi. The feasibility of the project is ranked by conducting social and physical survey.

LITERATURE REVIEW

The town center uses to refer to the commercial or geographical center or core area of a town. Town centers are traditionally associated with shopping or retail. They are also the center of communications with major public transport hubs such as train or bus stations. Public buildings including town halls, museums and libraries are often found in town center. The town center acts as administrative center, business center, entertainment, cultural center, meeting place, place for service industries, focus of circulation system [9].

Land use standard in central area includes Residential 30-40%, Commerce & Industry (market, shop, office, small scale industry) 8-10%, Administration, Cultural and urban services (community centre, religious facility, cemetery, post office, telephone exchange, police station ,bus, ghat, rail station, others) 10-15%, Roads

20-30%, Land Deferred 5%, Land Reserved 5% [9].

In order to develop a town center in the study area three development models are combined, which provide the core for the planned development of the town center.

Firstly, Sector model: Developed by land economist Homer Hoyt in 1939.According to this model; City grows, activities expands in a sector from the center, Commercial activities to be found along the business thoroughfares, Low income people live close to the place of work to minimize the transport cost [10-11].

Secondly, Vertical city model: The vertical city model of Le Corbusier is an outstanding landmark in the history of city planning, which is developed in 1922.The major objectives of this model are; to increase density in the centre to allow for the close contact demanded by business and other activities and to increase and create enough parks green spaces [11-12] Finally, Smart growth planning techniques: The residential area has been developed based on smart growth planning techniques. The main contents include; Mix land uses, Take advantage of compact building design, Create a range of housing opportunities and choices, Preserve open space, farmland, natural beauty, and critical environmental areas, Strengthen and direct development towards existing communities, Transit-oriented development, Pedestrian- and bicycle-friendly design [11-12].

MATERIALS AND METHODS

Foremost objectives of the study are to develop a town centre by approaching hybrid model and integrating multiple uses and to provide some recommendations for sustainable development of the town centre. To fulfill the requirement of the objectives primary data has been collected by social and physical survey in the projected area. Questionnaire survey was conducted for social survey including photographs and visual observation. Secondary data has also been used to prepare a layout map. Mathematical calculation has been carried out to estimate population that can sustain in the proposed town centre and required space for the proposed facilities.

Baze Silinda has been selected as the study area. The study area is about 533 acres. The area is located on the south side of Rajshahi city bypass, the west side of Kayerdara, Barabangram, on the north side of Mollapara, Terakhadia and on the east side of Sheikpara, Khasiadanga (Figure 1). As there exists a plan in “Rajshahi master plan” to develop the place as town center in the future, this place is selected as the best choice to develop as a model of town center.

Important locations

Shaheb Bazar is about 3.81 km away from this site. Rajshahi medical college is 2.61 km away from study area. Others important locations such as: Sapura, Terokhadia, Court, Mohisbathan, Seroil and RUET are about 2, 1.42, 3.66, 2.79, 3.44 and 5.52 km away from this site respectively (Figure 2).

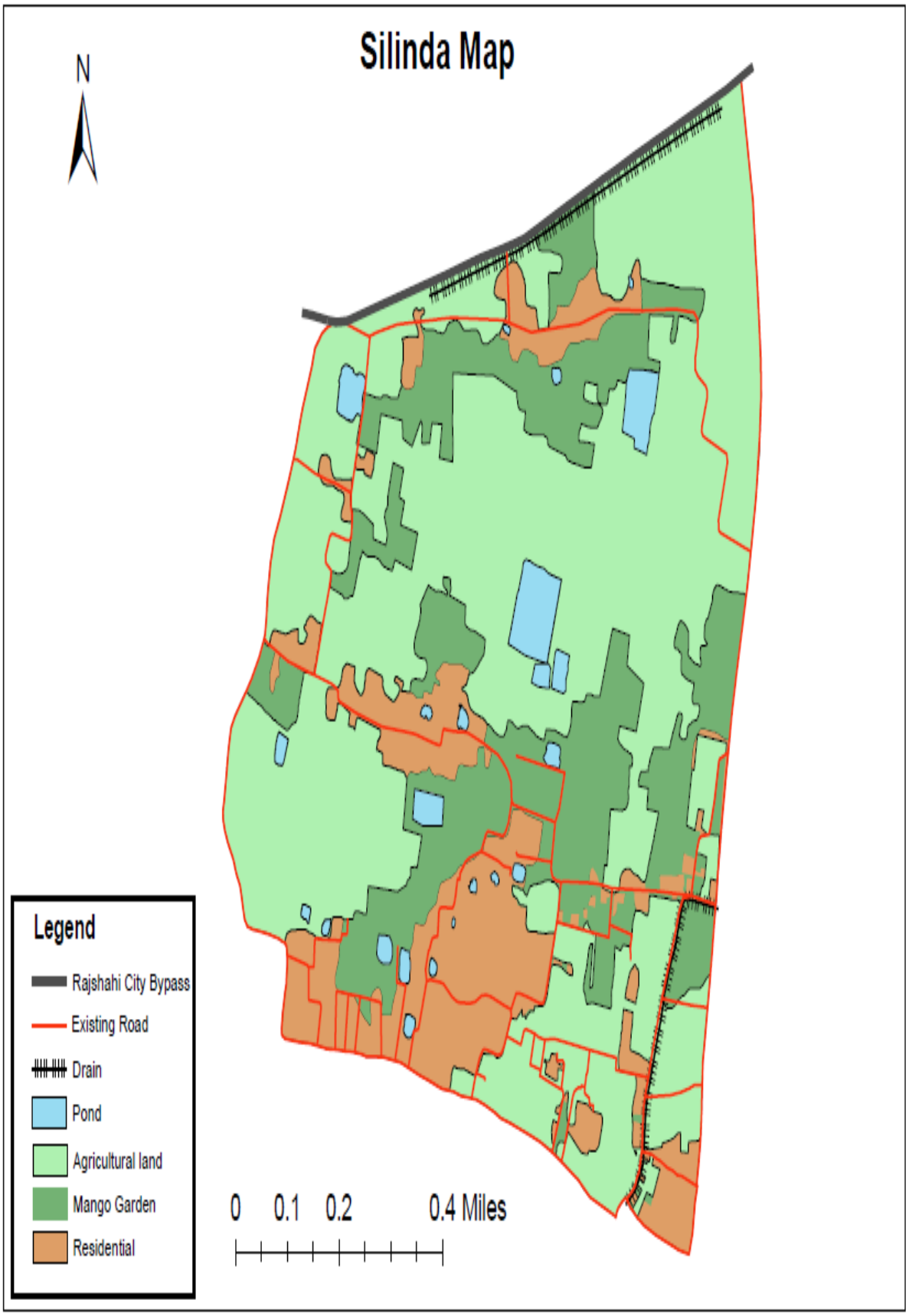

Fig: 1. *Base map of the study area*

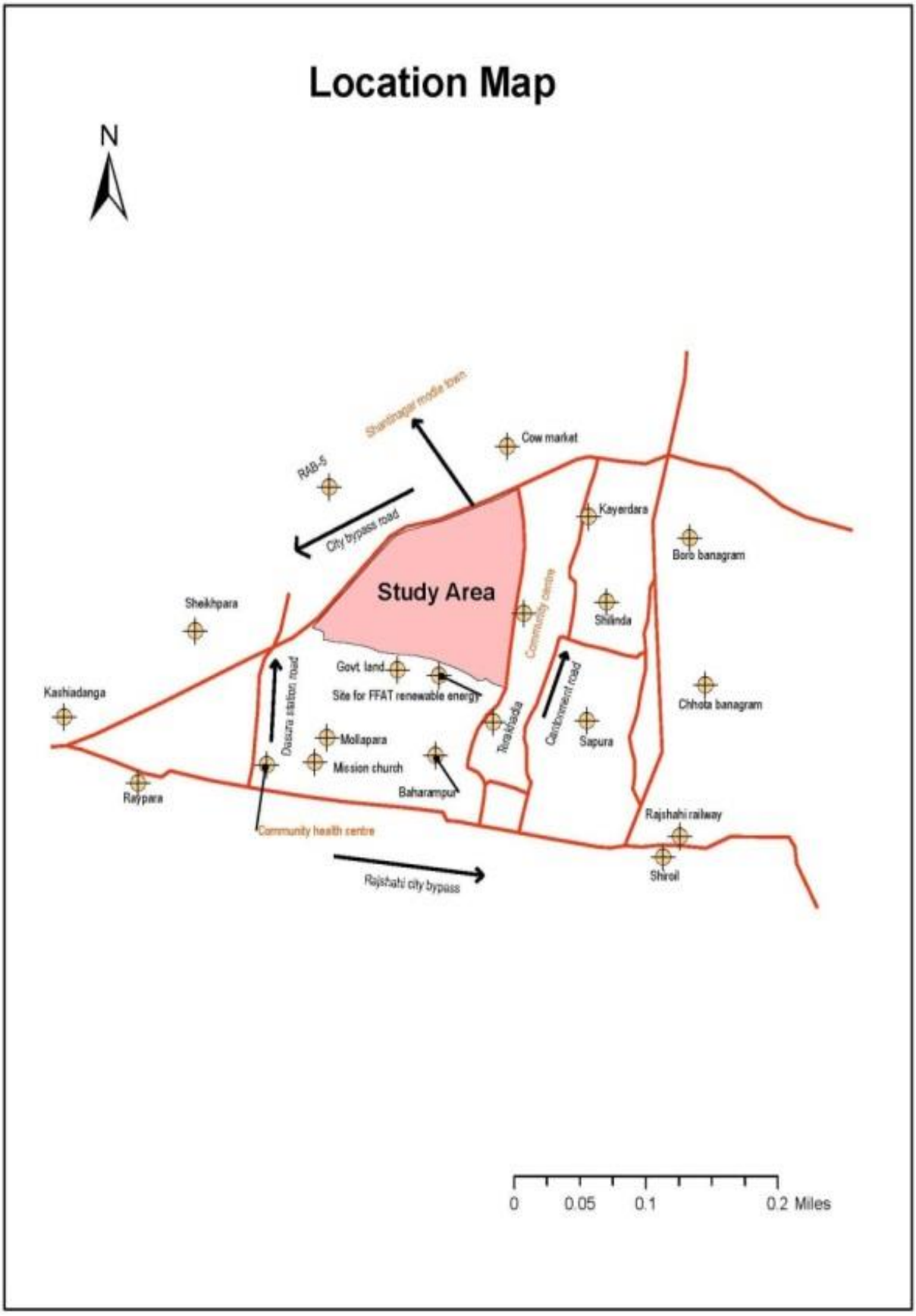

Fig: 2. *Location map of the study area*

Design Standards

Table: 1. *Space Standards for Urban Community Facilities in Acres*

Community facilities	**Facility per 1000 population**
Primary school	0.08
Secondary school	0.10
College	0.08
Small clinic	0.04
Hospital	0.04
Community centre/mosque	0.04
Playground/play field	0.08
Park	0.12
Corner shop/market/kutcha bazar	0.04
Roads	0.34

Source: Private Residential Land Development Rules, 2012

Planning Principles

- Silinda site is developed based on hybrid model.
- The model is a combination of sector model, vertical city model and smart growth city model.
- The model is developed inspired by jaypee green city, downtown Japee, New Delhi, India
- The commercial and industrial zone of the project has been developed based on the sector model and vertical city model.
- The residential area follows smart growth planning techniques.
- There exist mixed use zone around the commerce and industry zone and beside the city bypass road, which also follows smart growth planning techniques.

Policy Integration

The design project follows some policies which must need to be fulfilled.

- The site must be developed as a town center.
- Ensuring affordable housing for the labors near their working place.
- Residential, commercial and mixed use zones must be separate from the industrial zone.
- People will live in their affordable residential zone and get all public facilities according to their wages.
- Residential zone must be sub-divide into low class, middle class and high class.
- At the centre, there must be the provision of recreational facilities with a water fountain and a plaza.
- Maximum gross density should be 350 people per acre.
- Road network will be four types- Arterial (120 ft), Sub-arterial (80ft), Distributor (50 ft), Access (30 ft).
- Maximum building height will be 6 storeys.
- Industrial zone should be located at the corner of the site.
- There should be a transition route around the commercial zone and mixed use zone.
- Heavy motorized vehicles are strictly forbidden in the residential zone.
- There must be enough open space, community park, water body etc. in the site area.
- About 5% land must be preserved for the further expansion.

RESULTS AND DISCUSSION

Existing land use conditions of the study area

The largest portion of the site area is mainly used for agricultural purpose. Though the site area is underdeveloped, there exists some institutions such as a primary school, two kinder garden schools

and a polytechnic institute situated south side of the site. A light industry named Sathi Feed & Agro chemical industry is also present in the location. There exists a primary drainage system around the location (Figure 3). It is about 12 ft wide and sufficient for supporting the development. Though, most of the site is now used for agricultural purpose, the surrounding area is very suitable for future development.

Fig: 3. *(a) primary school (b) light industry (c) existing road (d) primary drainage*

Proposed Land Uses of the Study Area

Total area of the site is around 533 acres, of which 136.22 acres is residential, 60 acres commercial, 153.78 acres is mixed use, 160.11 acres is road and 22.88 acres is land deferred.

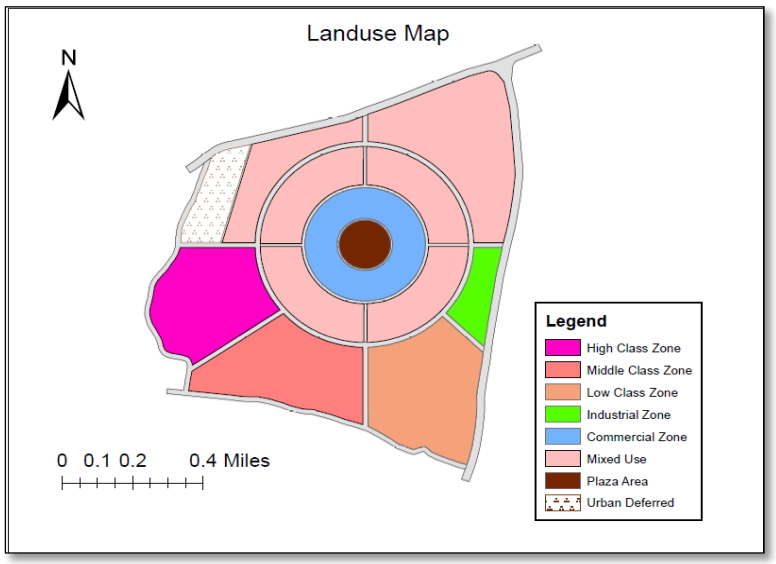

Fig: 4. *Proposed land use map of the study area*

The proposed town centre contains space 26% for residential development, 10% for commerce and industry, 29% fr mixed use development, 30% for road network and 5% land for urban referred (Figure 5).

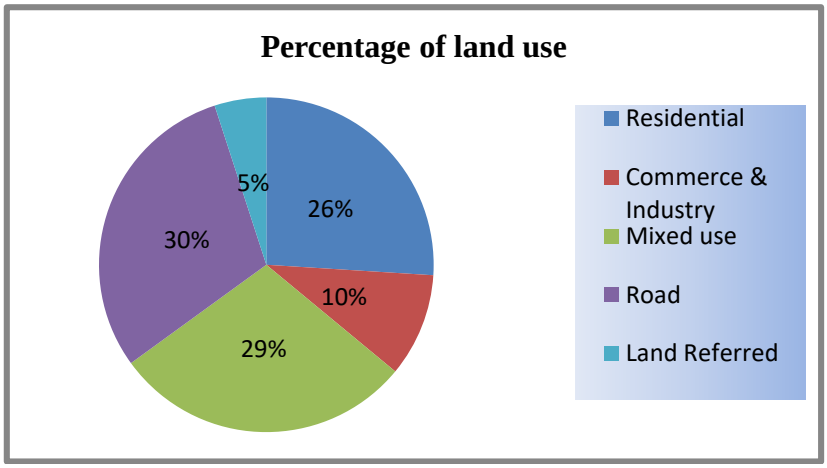

Fig: 5. *Percentage of Land use of the study area.*

Proposed Facilities

Convenient and flexible facilities are the main concern in this study. The proposed town centre integrate primary, high school & college for students, mosque for religious purpose, health centre & hospital for medical facilities, public library for learning, and police box for security. Community park, play lot & playground for recreation etc. The following table represents the number, area, and percentage of these facilities:

Table: 2. *Space Requirement for Proposed Facilities*

Type	Number	Total Area(acre)	Percentage (%)
Primary School	11	10.22	1.92
Secondary School	7	12.775	2.40
College	2	10.22	1.92
Health Centre	8	5.11	0.96
Hospital	2	5.11	0.96
Play lot	47	5.00	0.94
Playground	8	5.22	0.98
Shop	110	1.11	0.21
Super Shop	6	2.00	0.34
Shopping mall	2	2.00	0.34
Mosque	41	3.67	0.69
Museum	1	0.15	0.03
Police Station	1	0.29	0.05
Post Office	1	0.15	0.03
Restaurant	10	0.88	0.17
Telephone Exchange	2	0.04	0.008
Pond	3	2.00	0,34
Cemetery	1	0.89	0.17
Community Park	1	8.18	1.53
Community Library	1	0.49	0.09
Coffee Shop	3	0.24	0.05

Proposed Layout Map

The overall design layout into has been divided six blocks. Every block has some different features.

Block A would facilitate the higher class residents. The dwelling unit space is about 1800 sq. ft. and building of this block has 2 units in each floor. High class zone is located far from the service industry area.

Block B would facilitate the middle class residents. The dwelling unit space is about 1440 sq. ft. and building of this block has 2 units in each floor.

Block C would facilitate the low class residents. The dwelling unit space is about 540 sq. ft. and building of this block has 4 units in each floor. Low class residential area is located in the fringe area of the town center because this area is near to the service industry area .so people who work in the area have to pay less transport cost. Land value in this area is less compared to other parts of land in the town.

Block D would include mixed use facilities. This block includes residential, administration, cultural facilities and urban services. The dwelling unit space is about 1800 sq. ft. for residential facilities. Mixed use zone is mainly used for administrative purpose which helps to run the town center .This zone is located nearly the center of the town so people can go there easily from all parts of the town.

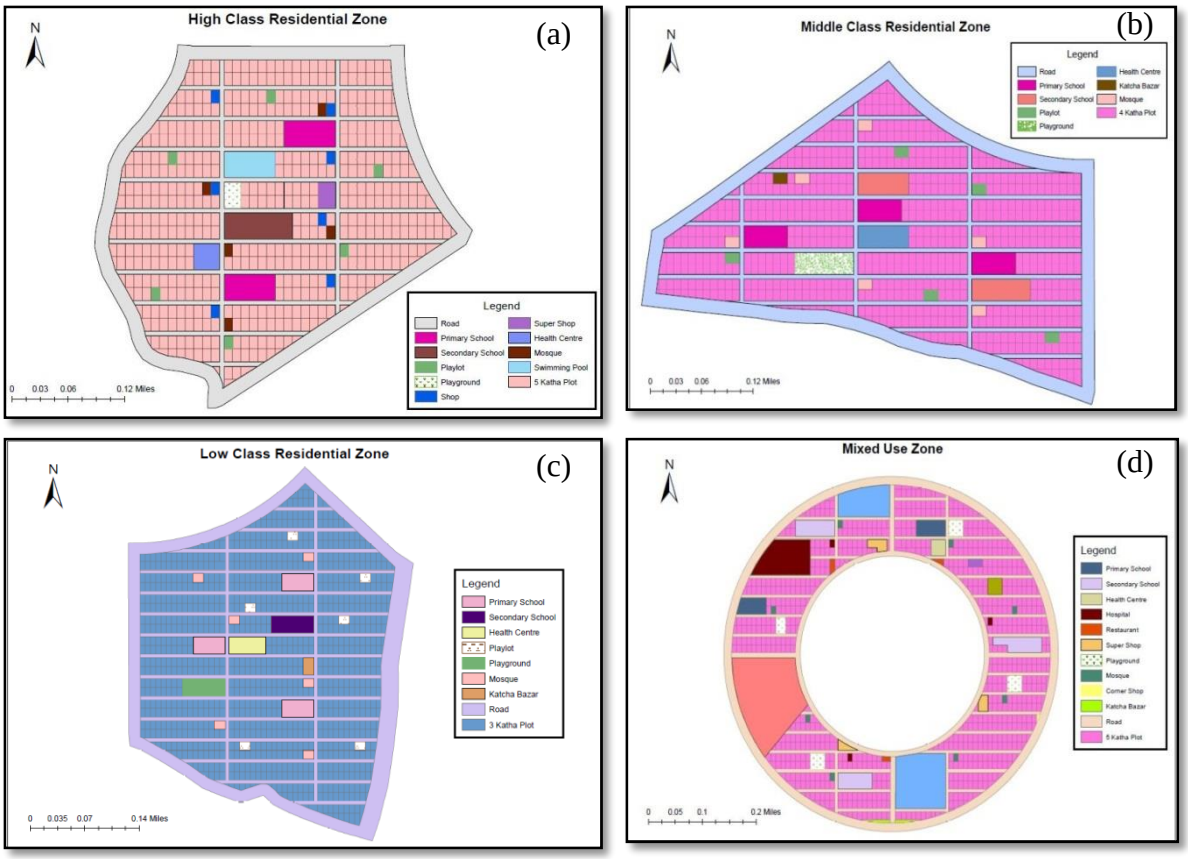

Fig: 6. *(a) high class residential zone (b) high class residential zone (c) high class residential zone (d) mixed use zone.*

A large portion of land is used for residential purpose. It's about 136.22 acre. In residential area, there are various types of building such as three storeyed, four storeyed, five storeyed and six storeyed buildings are available. The residential area can accommodate approximately 87,952 population (Table 3). The gross density of the total area is about 488 population per acre. Overall density is 240 population per acre in the project area.

Table: 3. *Population Estimation of Residential Area*

Storey	No. of Building	No. of Unit	Estimated Population
Three Storeyed	300(4 katha)	2	7200
Four Storeyed	876 (3 katha)	4	42048
	323 (4 katha)	2	10336
	224 (5 katha)	2	7168
Five Storeyed	200 (4 katha)	2	8000
	150 (5 katha)	2	6000
Six Storeyed	150 (5 katha)	2	7200

The population density of the low class residential area is the highest and high class residential area is the lowest (Figure 7).

Fig: 7. *Population density in residential area*

Again, a large portion of land is used for mixed use purpose. It's about 153.78 acre. The mixed use area can accommodate approximately 34120 population (Table 4). The gross density of the total area is about 222 population per acre.

Table: 4. *Population Estimation of Mixed use Area*

Storey	No. of Building	No. of Unit	Estimated Population
Two Storeyed	300(5 katha)	2	5000
Three Storeyed	350(5 katha)	2	8600
Four Storeyed	346(5 katha)	2	11440
Five Storied	302(5 katha)	2	12080

Block E mainly stands for commercial and industrial purposes. The dwelling unit space is about 3600 sq. ft. A shopping mall of 6 storeyed is proposed here. The rest of the plots in this block will be used as Business Park. Commercial zone is located in the core area of the town center which helps to control the shape of the town. In the town center the house rent and land rent is high for the location value.

Main attraction of block F is beautiful and attractive landscaping. Facilities included such as-corner shop, greenery, hotel, parking, pavement with street cafe, rest house, restaurant, three star hotel. Parking facilities here is surface parking. Pavement with street cafe is one of the attractive facilities in this zone.

Mixed use and greenery zone is located near the Terokhadiya stadium. The facilities in this area include 3 star hotel, parking lot and beautiful landscape which help to develop the sports in the area. There is also an airport near the zone.

Plaza area refers to mixed use zone. It includes various facilities such as –super shop, town hall, auditorium, cafe, cinema hall, corner shop, greenery, mixed use, shopping mall, the biggest pond of this site is located in this plaza area. There exist both retail and wholesale shops. Auditorium, cinema hall, town hall serves both as meeting place & recreational purpose.

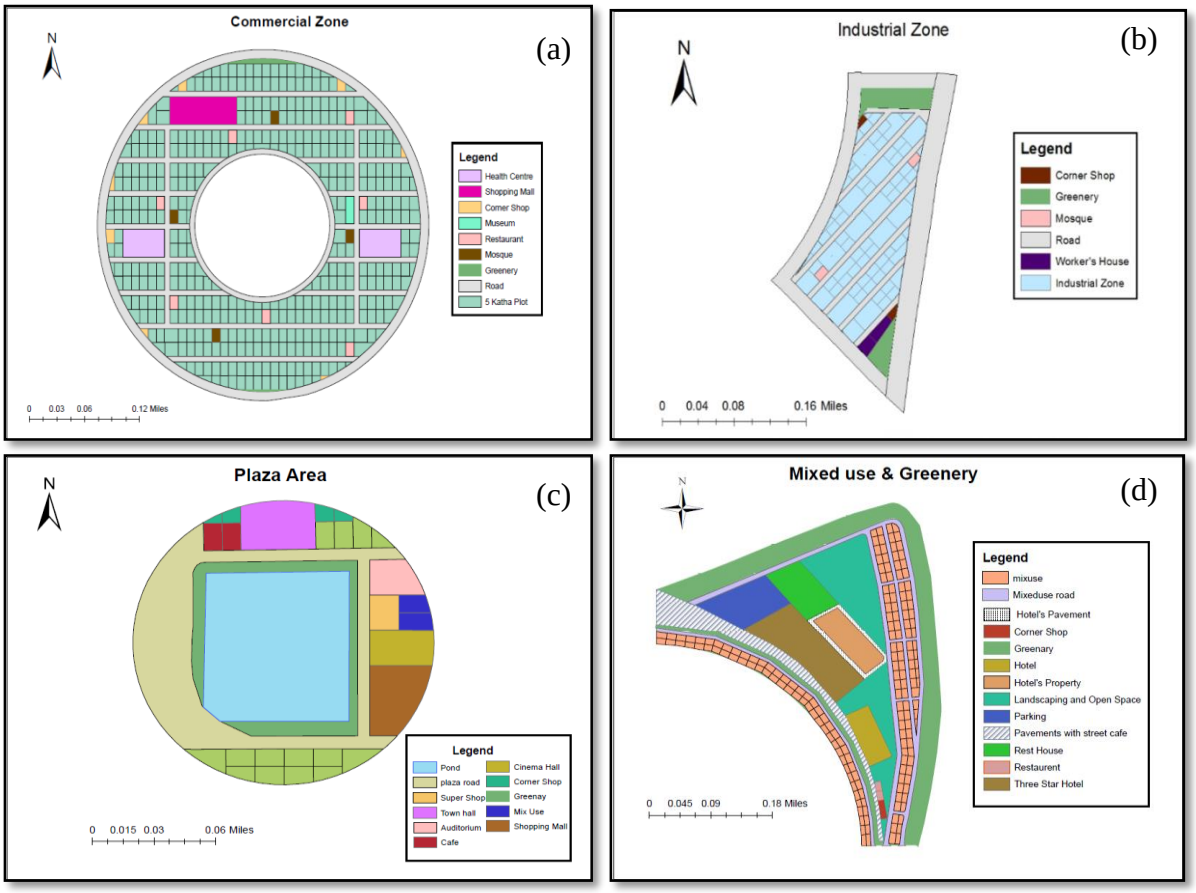

Fig: 8. *(a) commercial zone (b) industrial zone (c) plaza area (d) mixed use and greenery*

Beside every road, sidewalks or walkways are proposed for pedestrian. Adequate signal, sign, direction, over bridged are also provided. Priority upon on- street parking has been given. There are four types of road in the proposed town centre (Figure 9).

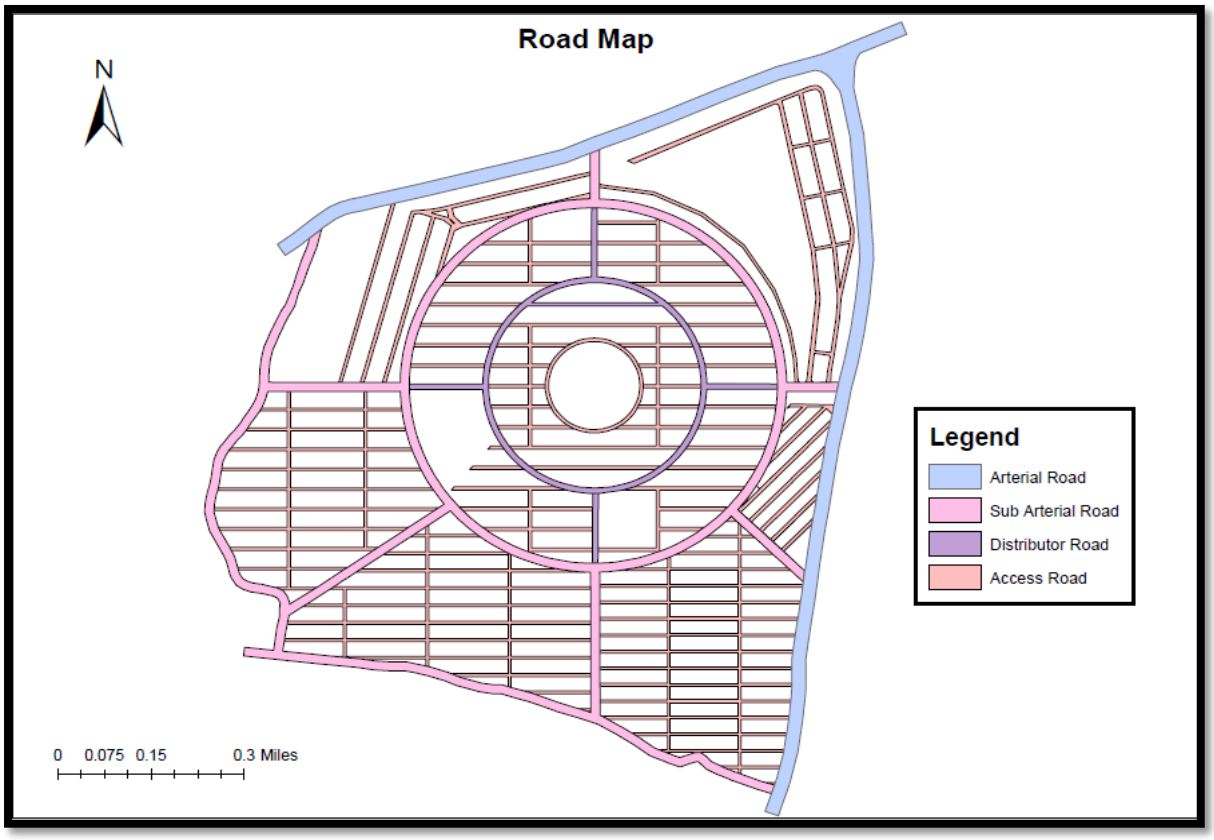

Fig: 9. *Proposed Road Map of the town centre.*

The arterial, sub-arterial, distributor and access road are about 12, 80, 50 and 30 ft width which cover about 6.33, 8.3, 3.39 and 12.02% land of the total area (Table 5).

Table: 5. *Road Coverage*

Type	**Width(ft)**	**Percentage (%)**
Arterial	120 ft	6.33
Sub-Arterial	80 ft	8.3
Distributor	50 ft	3.39
Access	30 ft	12.02

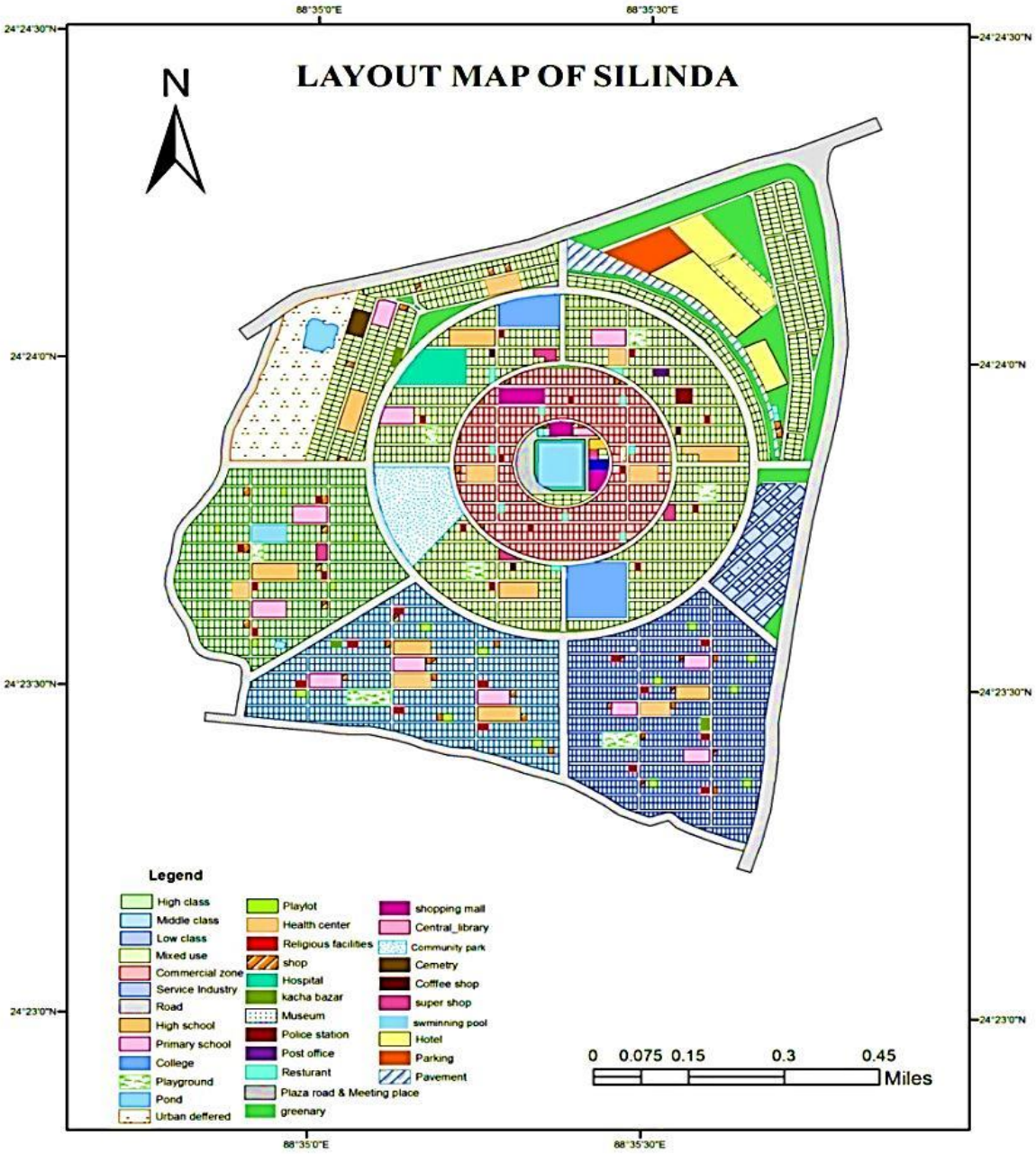

Fig: 10. *Proposed layout map of the town centre.*

Achievement

If the proposed development project is implemented then the following benefits can be achieved

1. Sufficient administrative facilities
2. Better housing environment.
3. Improved neighborhood interaction.
4. Separated residential facilities
5. Pedestrian- and bicycle-friendly design
6. Preserved open space, farmland, natural beauty, and critical environmental areas.
7. Sufficient number of community facilities.
8. Better educational facilities.
9. Separated commercial zone.
10. Easy accessibility for daily necessary things.

11. Improved road network with sidewalks.
12. Maintained neighborhood privacy by restricting heavy vehicle.
13. Transit oriented road network.
14. Signalized road network with sufficient sign and direction.
15. Safe and secure environment.
16. Adequate open space.
17. Sufficient number of trees to improve environment quality.
18. Better utility facilities.

RECOMMENDATION AND CONCLUSION

Recommendations

Retrofit existing built up areas

- Promote transit oriented development in built up areas.
- Encourage intensification of existing urban assets.
- Regenerate existing residential areas.

Enhance diversity and quality of life in urban centers

- Promote mixed land use.
- Attract residents and local services to urban centers.
- Promote a walking and cycling environment.

Minimize adverse negative effects

- Counteract traffic congestion.
- Encourage the provision of affordable housing.
- Promote high quality urban design.
- Encourage greening of built up areas.

CONCLUSION

A safe and convenient city is the logical demand of the city dwellers. Silinda model town center attempts to provide the basic facilities for the people. For sustainable and planned town centre, the principles and standards have to be followed by the government, local policy maker as well as the local development authority. The recommended strategies and policy integration help to develop the project area in a better, sufficient, flexible, convenient, affordable, sustainable and environment friendly way. Again, this study can be a good source of information for the future development of Baze Silinda as a town centre which has been mentioned in the Rajshahi Metropolitan Development Plan 2004-2024.

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