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Urban Infill Development Potential: An Approach Towards Future Urban Recovery Model (The Case Study of Kuril, Dhaka)

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Abstract

Nowadays cities are under continuous transformation due to urbanization which causes uncontrollable urban growth and deterioration of urban environment in socio economic, physical and cultural aspects. Infill development is being considered as one of the potential methods of solving these issues. Being a developing metropolis, Dhaka is expanding rapidly due to unplanned development without taking preference of city dwellers and viability into account. Kuril is a significant region of Dhaka where numerous complex urban issues exist and certain areas are still underdeveloped and unutilized, leading to complicacy in socio economic and environmental standpoint. In this research, survey and site analysis are conducted using qualitative methods such as physical survey, data visualization through map, and literature review. The goal of this study is to address the problems that are discovered in Kuril while proposing a healthy neighborhood that incorporates variety of activities with the existing infrastructure and natural landscape. Through extensive review and site analysis seven major problems in Kuril area are identified. At the conclusion, several design solutions are proposed to address these seven issues. Some architectural alternatives are discussed and evaluated including walkable network and accessibility, elevated walkway, spaces for commercial and public activity incorporated with natural open setting to enliven the neighborhood.

Keywords: *Infill development, urban neighborhood, accessibility and network, breathing space*

1 Introduction

Increasing population growth is leading to rapid urbanization in modern world which is affecting the environment in various aspects (Schiller et al.,2021). The rapid growth of urban areas has resulted in a variety of complicated issues, including unplanned land development, traffic congestion, pollution, loss of open space, and the desolation of old urban centers (Lee et al., 2008, Rahimi, et al.,2016). The growth of urbanization is also prominent in Bangladesh. Urban population of Bangladesh increased from 8.6 % in 1973 to 39.7 % in 2022 growing at an average annual rate of 3.21%. Kuril is such an area in Dhaka where some areas are still under developed and unutilized due to uncontrolled population expansion, urbanization and unplanned development which is causing numerous socio economic and environmental issues. Kuril Biswa Road is a heavy traffic busy road which is not only a transitional space within Dhaka but also connected with inter district transit. Rail tract divided the area and there is no safe rail and road crossing. Due to less human traffic and interaction, various anti-social activities and crimes have been developed in the flyover underneath spaces, beside the rail tract and in the surrounding devoid spaces. Pedestrian walkways are not adequate there. Besides vendors create congestion on the pedestrian walkway as they do not have any organized space. Lack of recreational space, existing frowsy water body and unutilized open spaces, residual spaces underneath the flyover are creating socio cultural issues as well as environmental complications which are degrading the quality of the neighborhood and their lifestyle. But this area is highly potential with natural setting such as open green space and water body. Infill development could be considered as the most basic intervention to address these issues in that area in order to meet the public demand and to achieve a higher quality of life. It is the enhancement of vacant, abandoned or underutilized property in populated parts of established settlements with existing infrastructure.

This paper aims to address the problems in Kuril neighborhood due to unplanned urban development and poor management of land usability. It explores potential solutions implementing infill development through a three-

step research method. The research involves physical site survey, qualitative analysis of the data, and literature review. The findings suggest that infill development can enhance the neighborhood, environment, and community life by bringing vibrance to the site. Finally, some design and planning initiatives are proposed to address these issues.

2 Literature Review

Infill development and redevelopment can improve land resource utilization, reinvestment in growth areas, and quality public service delivery. Infill development may be of various types such as residential, small-lot, mixed-use, transit-oriented, brownfield, and greenfield redevelopment.

Transit-oriented development (TOD) focuses on compact, pedestrian, and bike-friendly urban development, linking to local transportation and incorporating workplaces, apartments, services, and facilities. Urban infill development policies have become a potential means of preventing urban sprawl and safeguarding Ardabil, a peri-urban area in Northwestern Iran where Landsat ETM+ and ArcGIS were used for mapping and finding the potential of infill development. (Mohammadi-Hamidi et al., 2022)

A documental-analytic study using GIS technology (Model FUZZY-AHP) shows that Zanjan's urban regions have a great potential for infill development by which city's texture may be increased. (Mohammadi et al., 2015)

Urban infill incorporates walkable networks, such as pedestrian walkways and elevated walkways, linking streets to low-impact sustainable transportation options. This promotes environmental friendly, affordable, and convenient travel, promoting active physical activities (zhoua et al.,2019, Rafiemanzelat R et al.,2017,Wang H et al., 2016, Osama A et al., 2019, Bhattacharyya D et al.,2013, Nakamura K,2015, Said I et al, 2017)

The developing concerns and issues with infill development were looked at in the study report (H. K. Mado et al., 2021). The advantages, variations, and effects of the infill development in Kaduna's Unguwar Rimi GRA are evaluated where they found out the impacts but the recommendations are not well defined.

Urban infill also provides breathing space for urban people. Parks and open urban green spaces, water body, landscape with natural features are some forms of breathing spaces considered as the lungs of a city. Urban infill initiatives including subtractions and additions can ameliorate the quality of life in these cities where the findings were based on markers that may be used to stimulate the quality of life in traditional cities, which validated the research premise. (Al Shammari et al.,2020)

From all the studies and research mentioned above, it is evident that urban infill is a great solution of urban growth and deterioration of urban environment.

3. Materials and Methodology

3.1 Study Area

Kuril Biswa Road, a prominent transit point in Dhaka, Bangladesh, connects various areas and serves as a junction point for inter-district transit. The surrounding neighborhoods are divided by the Rail tract, with Nikunja Lake and an open green space. However, unplanned land use and inadequate urban development are causing socio-cultural deterioration in that area. Analyzing the current situation is crucial to understand the intricate issues causing the area's complexity.

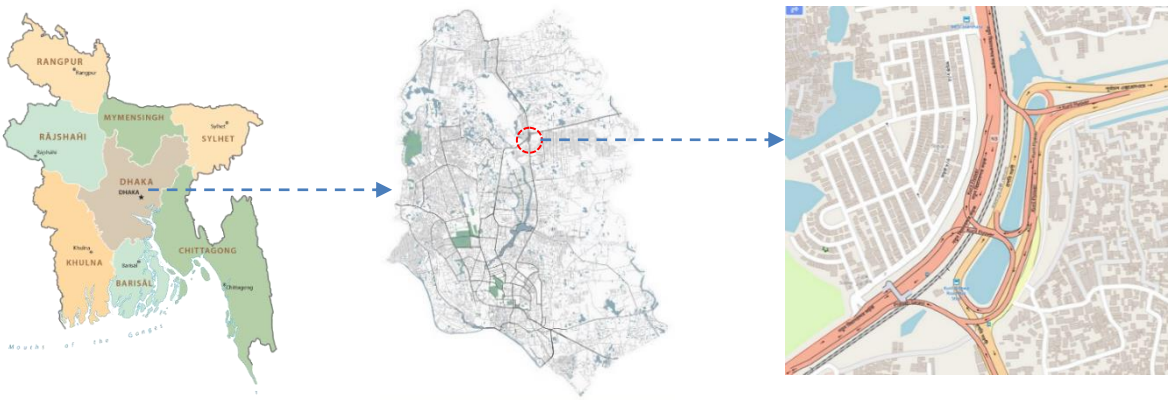

Figure 1: Study Site

3.2.1 Methodology

In this work, qualitative analysis method is used to gain comprehensive insights about the site. The systematic literature review is done in the previous section of the paper which shows the scope and potential of infill development in that area with existing structure as well as vacant land. The site survey and findings, data visualization of the site area through map and the qualitative analysis are now presented in the next sections. Figure 2 presents the methodology in a flowchart.

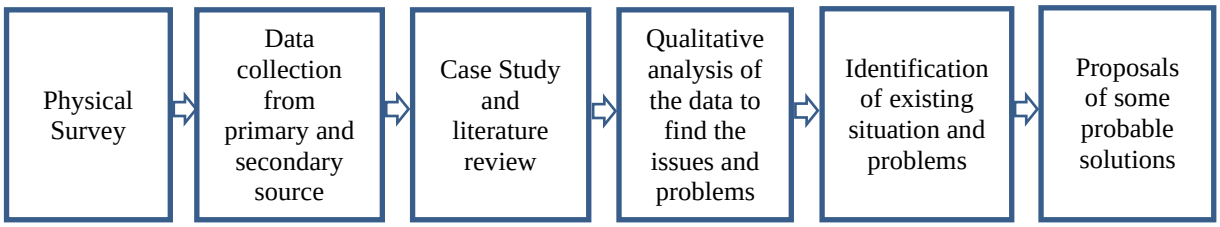

Figure 2: Flowchart of the methodology used in research

3.2.2 Data visualization through map

Map is used to analyze the existing situation of the site (Kuril Biswa Road). In this section, land use diversity, Transportation network, traffic flow and pattern, open space, various commercial and trade activity, human activity and many other data are presented to understand the context and situation of the site. From this information qualitative assessment is done and problems are identified through systematic analysis which is illustrated in Figure 3 and the sections of existing conditions are also given in the next page.

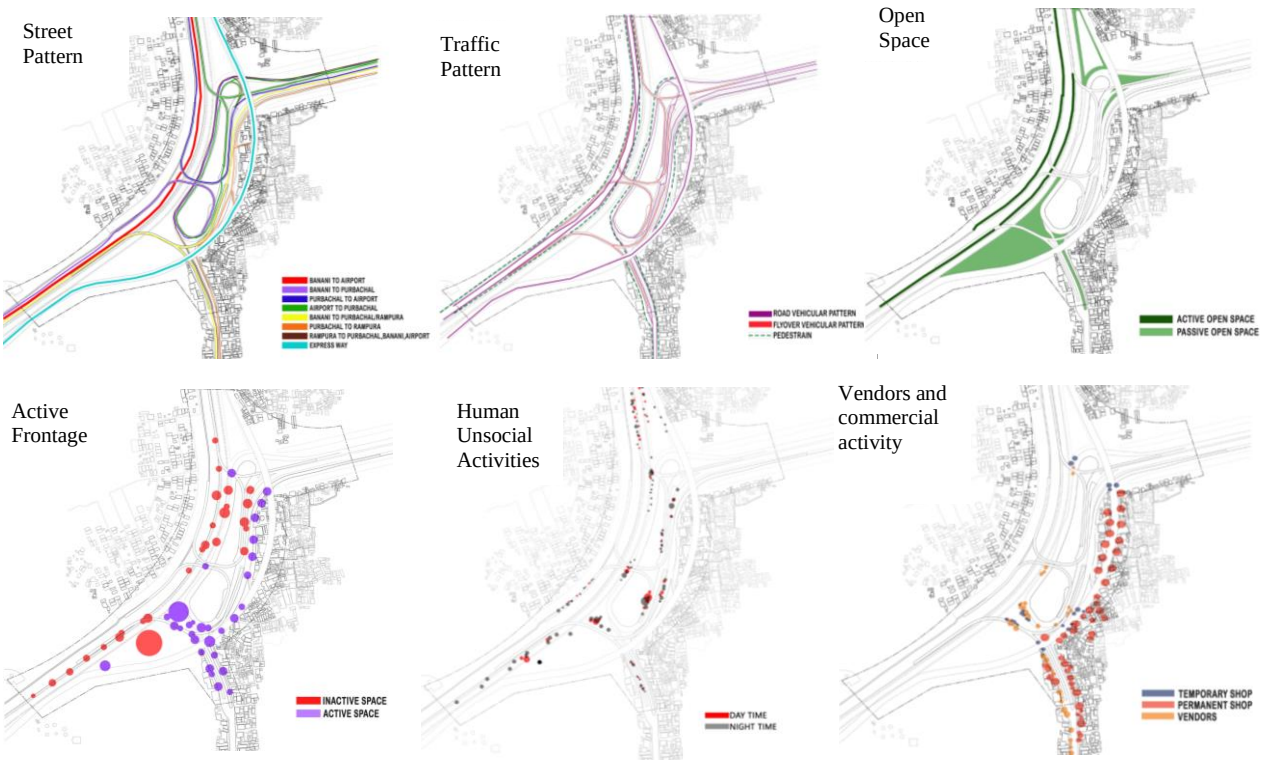

Figure 3: existing condition (Kuril Biswa Road)
(Source: Site survey)

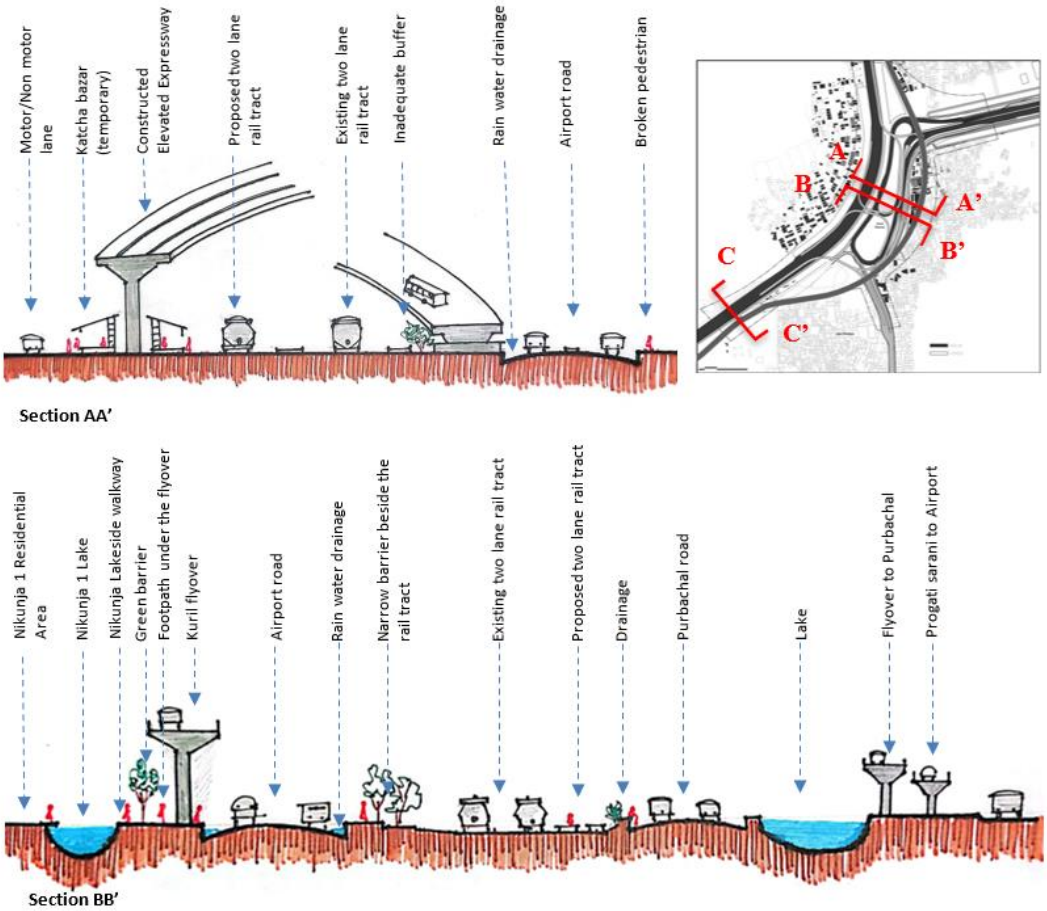

Figure 4: Sections showing existing condition

3.2.3. Identification of problems and issues

From the above discussion seven major issues are identified in Kuril biswa road area of Dhaka city. These issues are as follows:

- No safe road crossing, unsafe rail crossing.
- Anti-social activities due to less human interaction in the evening cause low security condition.
- Lack of recreational space, Inactive open spaces.
- Unsocial and illegal activities in the flyover underneath spaces.
- Slighted and Frowsy water body.
- Unorganized vendors occupying pedestrian walkway and circulation space.

3.2.4. Probable solutions in the form of infill Development

Vacant, abandoned or underutilized land within built-up areas of existing communities, where infrastructure is already in place can be regenerated or redeveloped through infill development.
There are some proposals for solving these issues that are found in the study through site survey and qualitative analysis of the data:

- Developing pedestrian friendly walkable network including Elevated walk way
- Creating spaces for public activity to make the area vibrant
- Creating Park and recreational spaces
- Elevated cafe and exhibition space underneath the flyover
- Integrating the natural setting (open green space and water body) with landscape design for community gathering and interaction
- Creating riparian buffer, deck and walkway beside the water body

All the probable solutions are now presented below in the form of proposed master plan in Figure 4

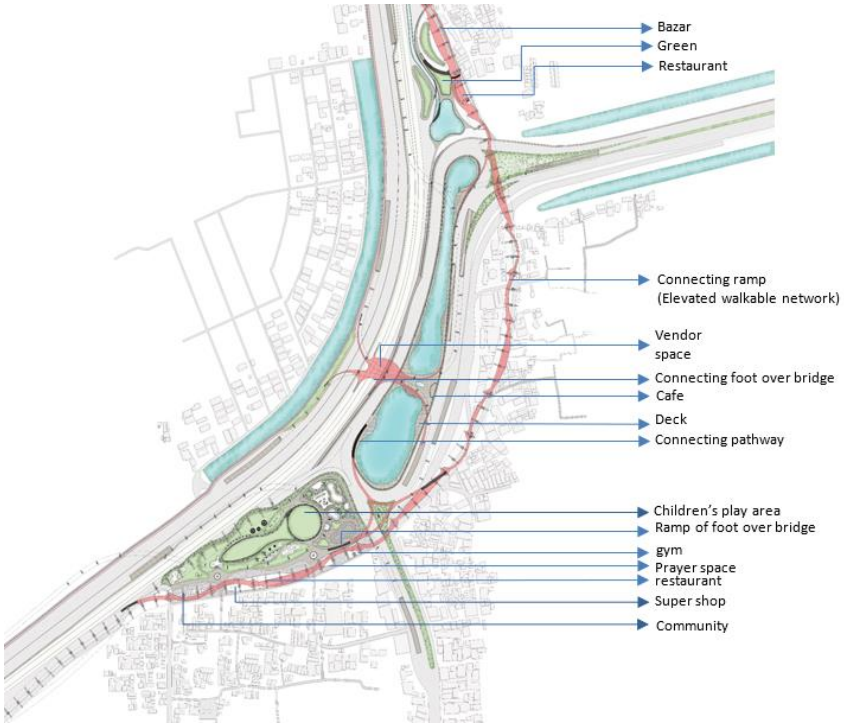

Figure 4: Proposed master plan with probable solutions

The results of the qualitative analysis and the expected outcome after infill development is presented at the later part of the research.

SL. No	Previous Situation of the site area	Expected outcome after infill development
1.	Unsafe rail and road crossing interrupting public accessibility	Safe crossing and Elevated walkway can enhance public accessibility
2.	Inadequate pedestrian walkway and lack of walkable network create interruption in accessibility hence usability of land is also reduced.	Well-planned, pedestrian friendly walkable network and transit (side walk, pedestrian, cycling etc.) may connect the spaces and ameliorate the land use pattern incorporating various public functions.
3.	Low security and sense of belonging for the lack of public gathering and interaction.	Public functions, open breathing spaces can make the area vibrant, deject mischief hence it will enhance security.
4.	Illicit activities are taking place in the unused vacant land and in the underneath space of the flyover.	Vacant land with natural features can be transformed into breathing space with public amenities. Exhibition space, small shops, kitchen markets can be located under the flyover which will encourage public gathering and may reduce Illicit activities.
5.	Inactive open space, lack of recreational space, frowsy and polluted water body	Existing open green space can be turned into public park, urban breathing space. Regeneration of urban water body, riparian buffer, deck and walkway beside the waterbody can make the neighborhood robust and reduce pollution.
6.	Unorganised vendors create congestion on circulation space	Vendors and temporary shops can be relocated beside the pedestrian walkway or under the flyover or nearby public open spaces which will promote economic growth and also will not create chaos.

4. Result and Discussion:

This study discusses the potential impact of infill development on underutilized and natural open spaces, which are indispensable for urban areas to create buffer and reduce pollution. Proper land use and management are crucial to increase usability and enliven the communities. The potential impacts of infill development in Kuril Biswa Road area include environmental, socio-cultural, urban, and economic outgrowth.
From the survey and data analysis it is anticipated that the expected outcome after implementing urban infill strategy may be positive, as shown in Table 1, comparing the previous site situation and expected outcome.

5. Conclusion:

The above study indicates that urban Infill development has potential benefit in the kuril biswa road area of Dhaka city in the aspects of environmental, socio economic, urban and community evolvement. The key findings of the study is the existing situation of the site area which is affected with enormous socio economic and environmental issues. The result shows that infill development specially transit oriented development can be a potential solution to solve these issues. It can change the land use pattern and add value to the land and existing structures and natural setting resulting in diverse community activities which can avail the neighborhood by improving the quality of life. Recreational facility, open breathing spaces beside the existing waterbody, easy access to contemporary life requirements, enhancing the usability of vacant and unused spaces under the flyover, adequate and well-designed walkable network, improvised socio cultural, economic and public activities can bring a positive transfiguration to that area. The neighborhood of that area can be revitalized multifariously leading towards a sustainable, active and healthy society characterized by mixed use development, variety of events and public activities in the form of infill development.

References

Abbaszadeh(2016.), G. Pathology of mass housing projects in Iran (Mehr housing plan). Journal of Fundamental and Applied Sciences, 8(3), 885-915,

Al Shamarti, Ami T., and Haitham AH Al Shammari(2020)Urban Infill as a Tool to Activate the Quality of Life in Traditional Cities. IOP Conference Series: Materials Science and Engineering. Vol. 870(1).

Aliakbari, E., & Akbari, M. ZONNING(2018.) The Infill Development, An Effort On Physical Development Scenario Of Tehran,

Aly, S. S., & Attwa, Y. A(2013). Infill development as an approach for promoting compactness of urban form. Sustainable Development and Planning VI, 173, 455.

Bhattacharyya D B and Mitra S (2013). Making Siliguri a walkable city Procedia - Social and Behavioral Sciences Vol.96, Pages. 2737-44.

H. K. Mado, GarbaT., M. I. Ahmed, I. H. Gitaland, A. Belel(2021)Impact of Infill Approach to Sustainable Urban Environment the Development, American Journal of Engineering Research (AJER), 10(6), 01-10.

Lee, H.(2008.)An analysis on development capacity of an urbanized area for urban growth management. J. Korean Urban Geogr. Soc.11, 1–18.

Mohammadi-Hamidi, S.; Beygi Heidarlou, H.; Fürst, C.; Nazmfar(2022) H. Urban Infill Development: A Strategy for Saving Peri-Urban Areas in Developing Countries (the Case Study of Ardabil, Iran). *Land*, *11*, 454.

Mohammadi, Mohammad Reza Pour, Shahrivar Roostaei, and Ahmad Asadi(2015). Research Paper Infill Development Potential for Urban Deteriorated Areas (Case Study: Zanjan City). International Journal of Scientific Management and Development, V3 (2), 678-678

Nakamura K(2015).The spatial relationship between pedestrian flows and street characteristics around multiple destinations IATSS Research Vol.39, Pages. 156-63.

Osama A and Sayed T(2019).,Evaluating the impact of connectivity, continuity, and topography of sidewalk network on pedestrian safety Accident Analysis and Prevention, 107 ,117-25.

Rahimi, A.(2016).A methodological approach to urban land-use change modeling using infill development pattern—A case study in Tabriz, Iran. Ecol. Process.,5, 1–15.

Rafiemanzelat R et al(2017) City sustainability: the influence of walkability on built environments Transportation Research Procedia.24, 97-104.

Schiller, G.; Blum, A.; Hecht, R.; Oertel, H.; Ferber, U.; Meinel, G.(2021). Urban infill development potential in Germany: Comparingsurvey and GIS data. Build. Cities, 2,36–54.

Said I and Wan Mohamad W S N(2017). Differences of sreet connectivity between old and new Zone in Malaysian small town International Journal on Advanced Science, Engineering and Information Technology,

Sharma, R.; Joshi, P.K. Monitoring(2013) Urban Landscape Dynamics over Delhi (India) Using Remote Sensing (1998–2011) Inputs. J.Indian Soc. Remote Sens. 41, 641–650.

Wang H and Yang Y(2019). Neighbourhood walkability: A review and bibliometric analysis Cities.93, 43-61.

Zhoua H et al,(2019) Social inequalities in neighborhood visual walkability: Using street view imagery and deep learning technologies to facilitate healthy city planning Sustainable cities and society 50.101605.