ROOFTOP CONNECTIVITY IN DHAKA: A STUDY ON PUBLIC PERCEPTION AND URBAN POTENTIAL THROUGH QUALITATIVE ANALYSIS

Ridwan Noor *[1], Faria Hossain Ikra[2]

[1] *MS Arch Student, Environment and Energy (EE) Division, Department of Architecture, Bangladesh University of Engineering and Technology (BUET), Dhaka, Bangladesh, e-mail: ridwannoor@arch.buet.ac.bd*
[2] *LLB Student, University of London, London, United Kingdom, e-mail: fariahossainikra@gmail.com*

***Corresponding Author**

ABSTRACT

Dhaka, the capital city of Bangladesh, is experiencing expeditious urban growth, leading to a significant shortage of public spaces as parks and communal areas fade. Rooftops accords an untapped resource for public use, as seen by rooftop networks in cities like Rotterdam and Singapore. This study investigated public consensus and the feasibility of interconnected rooftops to discourse the city's spatial challenges. The study was conducted on a condominium complex with six interconnected buildings in the Bagan Bari area of Dhaka. To compare these connected rooftops with traditional isolated rooftops, the qualitative method was applied. The study used non-participant observational studies and a survey-based public perception analysis to evaluate six key factors: attractiveness, perceived benefits, environmental and social impact, maintenance, accessibility and safety, and barriers to adoption. Using a purposive random sampling technique, a total of 61 participants (44 from isolated rooftops, 17 from interconnected ones) participated in the survey. This included both multiple-choice and open-ended questions. Observational studies tracked usage patterns, activities, and interactions during multiple site visits at peak hours. Findings disclosed that 58.8% of users with interconnected rooftops engaged with their neighbours more constantly, contrast to only 11.9% on isolated rooftops. The primary barriers to adoption of connected rooftops were structural challenges, safety concerns, and property ownership resistance. Despite these challenges, 90.5% of respondents supported rooftop connectivity, demonstrating its potential for enhancing urban resilience. This research aims to add to sustainable architecture by suggesting policy substitution, design adjustments, and shared management to assist on bringing rooftop connectivity into future urban planning.

Keywords: *rooftop connectivity, public space, urban resilience, sustainable architecture*

1. INTRODUCTION

With an estimated population ranging between 17 million and 21 million spread across approximately 1464 square kilometers, Dhaka, the capital of Bangladesh, is ranked among the most densely populated cities globally (Ahmed et al., 2017). The city has a severe scarcity of public spaces due to its average population density of 23,234 people per square kilometre (*Dhaka Population Review*, 2025). The palusibility of creating traditional public spaces at the city floor level are also decreasing as urban expansion continues to consume land (Dhaka Tribune, 2022). To improve communal life and social interactions, alternative solutions are in extreme need.

Over the years, Dhaka's unplanned growth has generated many concealed and underutilized spaces in the city fabric. Rooftops stand out as one of the most significant urban voids among them. In cities like Rotterdam and Singapore, rooftop connectivity has been explored as a means of establishing dynamic urban networks that promote social and environmental well-being (Ryabets, 2015). However, due to Dhaka's high population density, variety of building types and distinct socioeconomic conditions, it is challenging to put similar strategies into practice. The potential of connected rooftops has not received enough attention in Dhaka. Rooftops have historically been utilized for practical purposes like gardening, drying clothing, and storing technical equipment (Ikbal & Barua, 2012). Rooftops became semi-public spaces during the COVID-19 pandemic, where residents sought refuge in social and recreational activities (Hossain & Zaman, 2022). However, they remain largely absent from broader urban planning discussions. The mindsets of property owners, structural limitations, and a lack of policy frameworks make it difficult to implement large-scale rooftop connectivity (Shahidullah et al., 2022). Recent research has highlighted additional concerns, such as cost barriers and technical retrofitting standards, that further restrict the widespread adoption of rooftop greening projects in dense cities like Dhaka (Sultana et al., 2024).

This study investigates how interconnected rooftops could reshape urban living in Dhaka by providing new opportunities for public interaction and addressing the city's shortage of public spaces. The study was focused on a case study of six connected residential blocks in Bagan Bari, where rooftops are linked by bridges and shared facilities. The research examines public perceptions and assesses the feasibility of rooftop connectivity. Such an approach stands in contrast to the city's more common isolated rooftops and holds important implications for architects, urban planners, and policymakers working towards sustainable urban development in rapidly densifying cities.

2. LITERATURE REVIEW

2.1 Global Perspectives on Rooftop Connectivity

Connected rooftops are appearing as valuable social spaces in urban environments, addressing the scarcity of public open areas and promoting social interaction (Pomeroy, 2012). In Europe, cities like Rotterdam use rooftops for various purposes. Which includes green spaces and solar panels, and in result it is strengthening community resilience and social bonds. One example of rooftops being used as public infrastructure is the Rotterdam Rooftop Walk. Which was designed by MVRDV (Figure 1), which invites visitors to experience the city from a 30-meter-tall aerial bridge spanning multiple rooftops, from the World Trade Center to the Bijenkorf department store (Parkes, 2022; Stouhi, 2022). This project demonstrates how cities can create a secondary layer of public infrastructure in dense urban contexts where ground-level space is limited. Singapore similarly integrates rooftop gardens to improve residents' quality of life and expand green space (Yuen & Nyuk Hien, 2005). In Eastern contexts, rooftops serve community activities, gardening, and leisure. During the COVID-19 pandemic, rooftops in Dhaka transformed into semi-public spaces for socializing and mental health support (Hossain & Zaman, 2022). These examples underscore the prospects of rooftop connectivity which offers insights for densely populated cities like Dhaka.

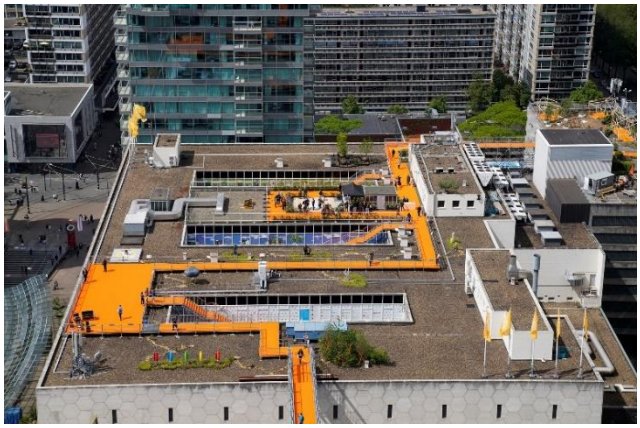

Figure 1: Rotterdam Rooftop Walk by MVRDV (Source: Pavlos Ventouris)

2.2 Local Context: Dhaka's Rooftop Challenges

Open spaces have diminished due to Dhaka's rapid unplanned growth. Unfortunately, that is leaving rooftops as one of the only remaining options for communal activities. However, rooftops becoming active public areas face several challenges. Most residential building rooftops are empty, used primarily for storage or drying clothes. Public areas and rooftop gardening initiatives face structural constraints, as many buildings cannot support additional weight (Sultana et al., 2024). Unclear building codes and regulations discourage owners from making rooftop modifications, as no clear guidelines or incentives exist (Shahidullah et al., 2022). Addressing these challenges requires updated building codes, financial incentives, and increased public awareness of rooftop transformation benefits for sustainable urban living. In large cities globally, public spaces are increasingly shifting from ground level to elevated locations such as rooftops or podiums, driven by rising property values (Yeung, 2024). However, layering new structures atop existing urban fabric remains challenging and is often rejected by both society and policymakers. Urban Tune-Up (Noor, 2025), which is an award-winning design project based on Dhaka's rooftop context, has showcased how systematic architectural interventions can transform the city's underutilized rooftops into vibrant public domains. This creates a social interaction and collective urban life even under dense development pressures. Connecting individual rooftops with bridges and integrating them into the urban network remains largely unexplored, both globally and in Dhaka.

2.3 Social and Ecological Benefits

The concept of connected rooftops have many social and environmental benefits. Green roofs, like rooftop farms, help manage stormwater, reduce energy costs, and improve air quality (Kumar et al., 2021). In a research, it was found that larger rooftop gardens cools building top floors more effectively than smaller installations (Huq et al., 2019). Frequent users of green roof spaces report greater satisfaction and a stronger sense of belonging than infrequent visitors (Nguyen Dang et al., 2022). Additionally, connected rooftops foster community bonds which reduces urban isolation and encourages neighbor interaction (Winnicka-Jasłowska & Tkaczuk, 2022). It is also evidential that cities can employ connected rooftops to address climate change in safer, more sustainable ways (Kumar et al., 2021). Despite widespread adoption of rooftop gardens, the potential of interconnected rooftops as shared community spaces remains underappreciated in Dhaka. Most research emphasizes technical or individual rooftop applications, overlooking their capacity to transform social and environmental conditions. The Bagan Bari condominium complex represents a rare example, with connected rooftops creating common areas for leisure, socializing, and community events. Investigating rooftop connectivity as an alternative public realm is critical given Dhaka's restricted access to ground-level public areas. The design, implementation, and adjustibility of such networks in densely populated urban environments require further research.

3. MATERIALS AND METHODS

3.1 Case Study Selection

This study compared interconnected rooftops with typical barren rooftops in Dhaka using the Post-Occupancy Evaluation (POE) method. The interconnected rooftops in Bagan Bari and conventional residential rooftops were evaluated across six criteria: perceived benefits, maintenance, accessibility and safety, environmental and social impact, and barriers to use. The research combined non-participant observations with surveys to analyze public perceptions, focusing on two rooftop types.

3.1.1 Interconnected Rooftops at Bagan Bari (Assurance City Building Complex)

Bagan Bari consists of six residential blocks and one community block, which includes a community center, supermarket, and mosque. Most blocks are linked by pedestrian bridges, except for Block 2, which has a separate connection to the community block. Residents access the rooftops via stairs or elevators. Features of the connected rooftops include gardens, seating areas, and bridges facilitating easy movement between buildings.

3.1.2 Conventional Rooftops in Residential Buildings

The majority of Dhaka's rooftops remain underutilized or abandoned. These spaces primarily serve practical purposes, such as drying clothes, storing household items, and limited gardening, and they also lack functionality as shared or interactive areas.

3.2 Data Collection

3.2.1 Questionnaire Survey

An online questionnaire was distributed to users of both interconnected and typical barren rooftops to collect information on usage patterns, accessibility, safety, and user preferences. The survey comprised 14 questions and was administered through Google Forms. It was available both in person and online to a broad sample representing various backgrounds and ages.

3.2.2 Non-Participant Observational Study

Field observations were conducted at Assurance City (Bagan Bari Condominium Complex) to document how residents use connected rooftops. The study was conducted over five visits during peak late afternoon and evening hours between mid-November and mid-December 2024. Observations focused on user engagement, maintenance quality, and the overall atmosphere.

3.3 Comparative Analysis

Survey and observation data were analyzed to compare the two rooftop types across the six key factors. Findings indicate that interconnected rooftops provide alternative public spaces that can enhance social connectivity and environmental quality. Understanding these differences helps identify effective strategies to optimize rooftop use in Dhaka and can guide future urban planning efforts.

4. RESULTS

4.1 Survey Sample Characteristics and Selection Method

A total of 61 people participated in the survey. Where 44 typical rooftops and 17 interconnected rooftops were used. Respondents were selected using purposive random sampling. Men comprised 60% of respondents and women 40%. Approximately 35% were from the age of 18-30, and 32% were

aged 31-50. Another 31% were under 18, which highlighted the need for accessible rooftop spaces for younger residents.

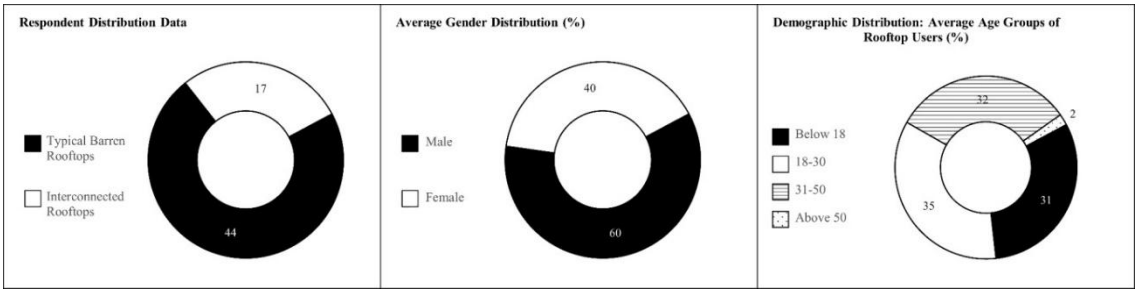

Figure 2: Selection of basic metric data by respondents

4.2 Rooftop Usage Patterns

- Question 1: How often do you use the rooftop in your building?
- Question 2: What do you primarily use the rooftop for?

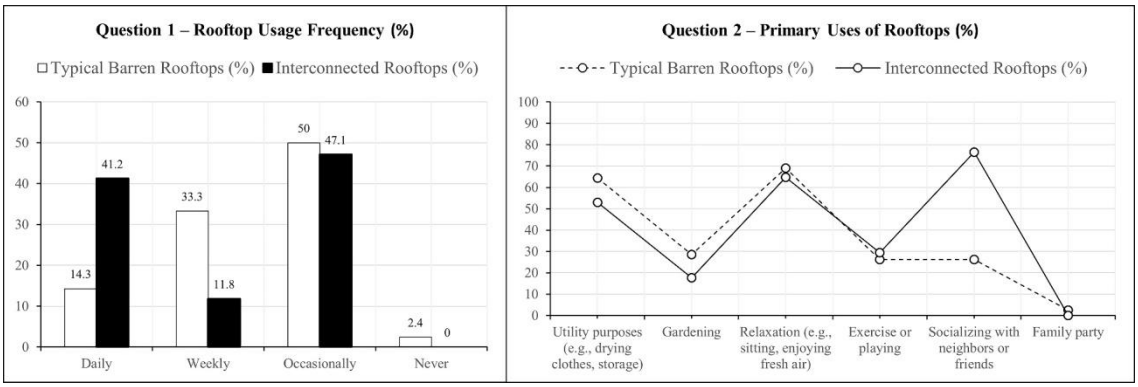

Figure 3: Rooftop Usage Frequency and Primary Uses of Rooftops

The survey found that connected rooftops were used more frequently than barren rooftops. Among connected rooftop users, 41.2% reported daily use , compared to only 14.3% of barren rooftop users. The presence of seating, greenery, and pedestrian bridges encouraged more time to be able to spend in these spaces. When primary activities, barren rooftops were used mainly for utility tasks (65%), gardening (28%), and casual relaxation (70%), with only 26% using them for socializing. In contrast, 78% of interconnected rooftop users socialized with neighbors, and 30% engaged in play or exercise. One respondent noted, "A well-designed and environmentally friendly rooftop can deepen community bonding, which is rarely seen nowadays." This demonstrates the potential of interconnected rooftops to transform underutilized areas into active social spaces.

4.3 Perceived Attractiveness and Maintenance

- Question 3: How would you rate the attractiveness of your rooftop?
- Question 4: How would you describe the maintenance of the rooftop and its garden?

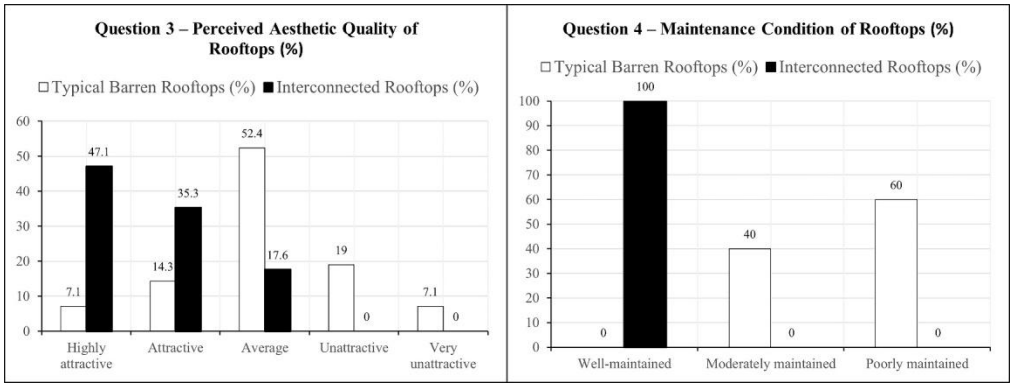

Figure 4: Perceived Aesthetic Quality and Maintenance Condition of Rooftops

There were evedential differences in perceived attractiveness of rooftop types. Only 7.1% of barren rooftop users rated their spaces as "highly attractive," while 52.4% rated them as "average." In contrast, 82.4% of connected rooftop users found their spaces "attractive" or "highly attractive," with open design, seating, and landscaping being key factors. Regarding maintenance (Question 4), all interconnected rooftop users (100%) reported good upkeep. On the other hand, barren rooftops faced maintenance challenges. Some interconnected rooftop users noted issues such as weather damage, rust on pedestrian bridges, and privacy concerns. One respondent stated, "Before connecting the rooftops, general security and privacy issues must be taken into consideration, as well as the psychology of the general mass." This emphasizes the need for consistent maintenance and clear privacy policies in shared rooftop environments.

4.4 Social and Community Engagement

- Question 5: Do you interact more with your neighbors because of rooftop activities?
- Question 6: As a resident, do you find any activities on the rooftop to be disturbing?

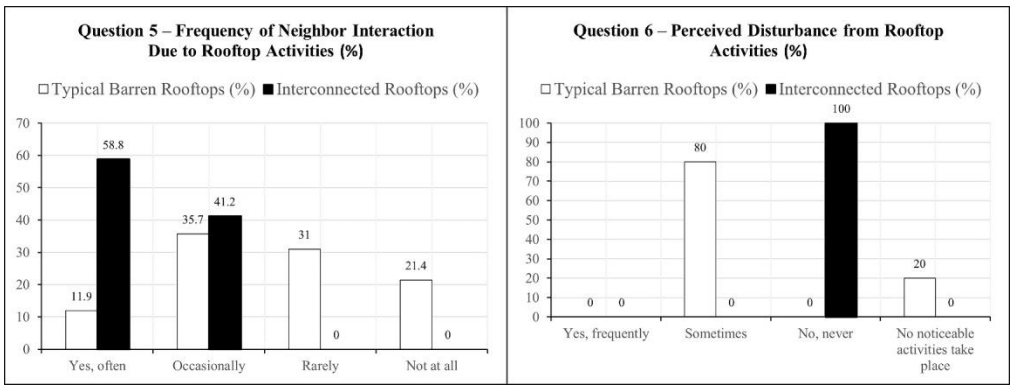

Figure 5: Neighbor Interaction and Perceived Disturbance from Rooftop Activities

Survey results show that connected rooftops creates stronger social interactions than conventional barren rooftops. For neighbor interaction (Question 5), only 11.9% of typical rooftop users reported frequent social engagement, compared to 58.8% of connected rooftop users. Among barren rooftop users, 21.4% reported no interaction at all, and 31% interacted rarely. Some respondents described interconnected rooftops as "a much-needed escape from congested city life," supporting informal gatherings, children's playtime, and relaxation. However, concerns about noise and privacy were raised. So therefore, the need for clear community guidelines should be emphasized. Regarding disturbances from rooftop activities (Question 6), 100% of interconnected rooftop users reported no disruptions, whereas 80% of barren rooftop users experienced occasional disruptions.

4.5 Barriers and Challenges in Rooftop Usage

- Question 7: What are the main obstacles you face in using the rooftop?

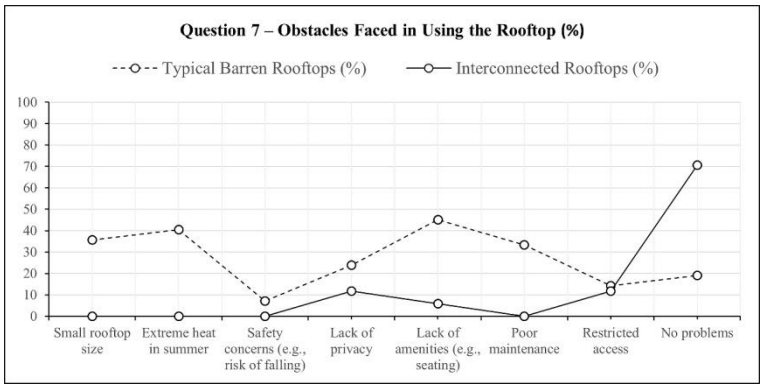

Figure 6: Obstacles Faced in Using the Rooftop

Survey responses identified key obstacles to rooftop use. Among barren rooftop users, 81% reported encountering challenges, compared to just 30% of interconnected users. The lack of basic facility was a crucial concern for 45.2% of barren rooftop users, compared to 8.9% of interconnected rooftop users. Poor maintenance affected 33.3% of conventional rooftops, while connected rooftops benefited from better upkeep and shaded areas. Extreme summer heat impacted 40.5% of barren users but was absent among interconnected users due to rooftop greenery. Additionally, 35.7% of barren users felt their spaces were too small, a problem lessened in interconnected rooftops with larger shared areas. Respondents also voiced concerns about security, ownership conflicts, fire safety, and earthquake risks, especially on interconnected rooftops. These obstacles must be addressed through inclusive design, enhanced safety regulations, and clear policies to advance rooftop connectivity in Dhaka.

4.6 Perceived Benefits of Interconnected Rooftops

- Question 8: What benefits do you personally enjoy from using your rooftop?
- Question 9: What environmental features would you like to see on the rooftop?

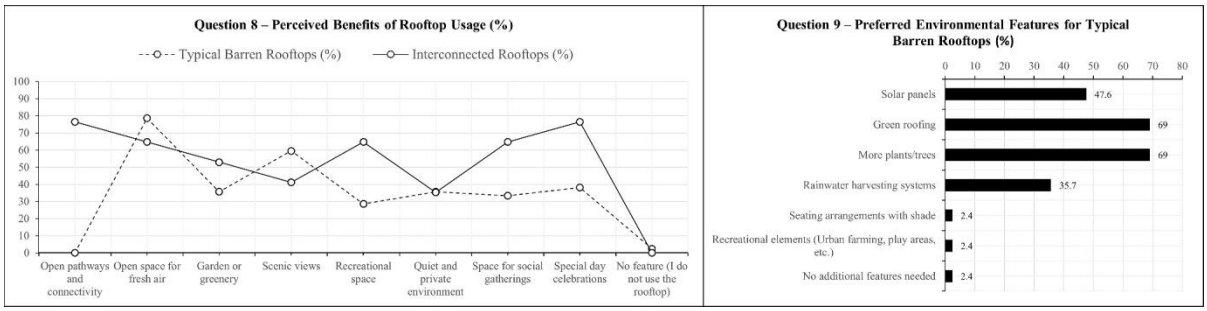

Figure 7: Perceived Benefits and Preferred Environmental Features of Rooftops

Survey results (Question 8) indicated that while both groups appreciated open space and fresh air, 76.5% of connected rooftop users specifically valued open pathways and connectivity, features lacking in typical barren rooftops. Social gatherings were also more prevalent among connected rooftop users at 65%, compared to 34% on barren rooftops. Regarding environmental features (Question 9), 69% of barren rooftop users preferred green roofs and plants, 47.6% supported solar panels, and 35.7% favored rainwater harvesting systems. One respondent suggested, "The government could launch pilot projects in selected areas such as rooftops in office zones, adding walking spaces

and small food stalls." This demonstrates how interconnected rooftop designs could extend beyond residential areas.

4.7 Awareness and Perception of Interconnected Rooftops

- Question 10: Have you ever heard of the concept of connected rooftops?
- Question 11: Do you think interconnected rooftops could improve the quality of life?

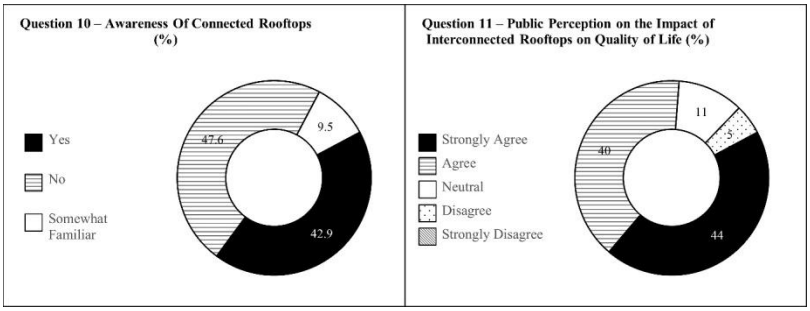

Figure 8: Awareness and Public Perception of Connected Rooftops

The survey reveals limited awareness of rooftop connectivity among participants (Question 10), with 47.6% having never heard of it and only 9.5% familiar with the concept. Nevertheless, 84% agreed that connected rooftops could improve urban living after learning about it, while 11% remained neutral, and 5% disagreed, citing concerns over policy regulations, maintenance, and security. One respondent emphasized the need for collective action, stating, "A group of four to five developers could take the lead rather than individual homeowners. Developer-managed buildings typically have CCTV surveillance and a shared workforce, making them better suited for security and maintenance." This highlights the importance of organized management for effective rooftop integration in Dhaka.

4.8 Feasibility and Adoption of Interconnected Rooftops

- Question 12: What barriers do you think prevent the widespread adoption of interconnected rooftops in Dhaka?
- Question 13: Do you feel a greater sense of ownership or responsibility for the interconnected rooftop spaces compared to typical private rooftops?
- Question 14: Would you feel comfortable using a connected rooftop if it were available in your area?

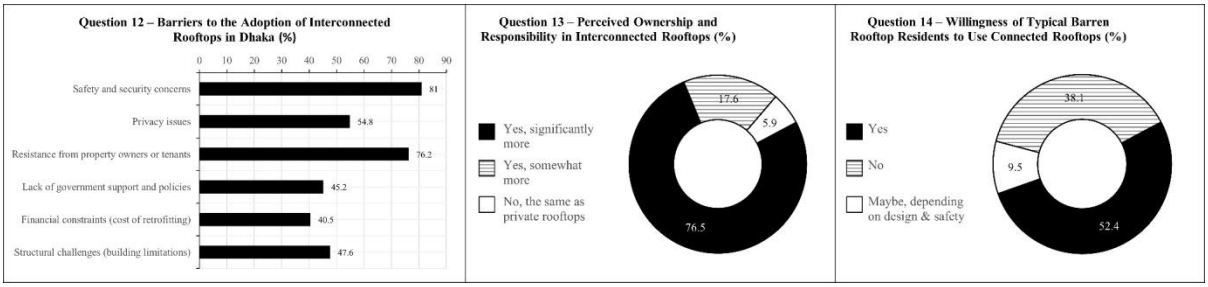

Figure 9: Barriers, Ownership, and Willingness to Use Connected Rooftops

Survey findings specify that several barriers prevent widespread adoption of connected rooftops in Dhaka. Safety and security concerns were reported by 81% of respondents, while 54.8% cited the need for privacy policies. Resistance from property owners or tenants (76.2%) was also significant, as many preferred rooftop access to remain exclusive. Other challenges included structural limitations (47.6%), financial constraints (40.5%), and a lack of government policies (45.2%). Despite these

concerns, respondents felt a greater sense of ownership over connected rooftops (76.5%) than private ones. When asked about willingness to use interconnected rooftops, 90.5% expressed interest, though 38.1% noted their decision would depend on design and safety measures.

4.9 Non-Participant Observational Study

A field study at Bagan Bari Condominium Complex assessed the spatial, functional, and social aspects of its interconnected rooftops over five visits from mid-November to mid-December 2024, during peak usage hours in the late afternoon and early evening. The rooftops, connected by pedestrian bridges, allowed easy movement between buildings without descending to street level. A resident stated that maintenance crews regularly cleaned the bridges. Rooftops were closed after 9:00 PM for safety reasons. Residents gathered in lounges, pergolas, and seating areas for relaxation and social interaction. The expansive city views provided visual relief, and a dedicated gardener maintained the landscaped areas, contributing both aesthetic and environmental value. However, the study highlighted key challenges: responsible use, safety measures, and regular maintenance are crucial for the long-term viability of these spaces. Neglect in these areas risks compromising structural safety and social value, threatening their sustainability as urban shared spaces.

Figure 10: Overview of the Interconnected Rooftops in Assurance City (Source: Field Survey, 2024)

5. CONCLUSION

This study demonstrates the potential of rooftop connectivity as an extension of public spaces in rapidly urbanizing cities like Dhaka. By comparing Bagan Bari's connected rooftops with conventional barren ones, six key factors emerged that are critical to understanding rooftop effectiveness:

- **Attractiveness**: The aesthetic and experiential value of rooftops can be significantly enhanced through landscaped gardens, pedestrian bridges, and seating areas, offering panoramic city views isolated from street level. As research demonstrates, such elevated public spaces create "a new layer of public infrastructure" in dense urban contexts (Cutieru, 2023), transforming underutilized rooftops into multifunctional places.

- **Perceived Benefits:** Shared rooftop spaces minimise urban isolation by encouraging social interaction among neighbors. Greenery and open areas promote social resilience, community engagement, and leisure activities. Community-led rooftop gardens have been shown to act as "catalysts for social cohesion," providing shared spaces for interaction and collaboration that counter the social fragmentation typical of dense urban environments (Sustainability Directory, 2025).

- **Environmental and Social Impact:** Elevated green spaces reduce the urban heat island effect and provide ecological benefits. Research confirms that green roofs and vertical gardens lower ambient air temperatures by 3–5°C, retain 50–80% of stormwater, and decrease particulate matter, thereby improving air quality (Samson Olaboye, 2025). Socially, connected rooftops provide residents with shared spaces that encourage social interaction and foster a sense of belonging.

- **State of Maintenance:** Consistent maintenance is essential to prevent weather-related damage, structural deterioration, and safety hazards. The usability and appeal of rooftop areas deteriorate without systematic upkeep and management protocols.

- **Accessibility and Safety**: Multiple access points and pedestrian bridges improve rooftop accessibility for diverse users. However, clear safety regulations are necessary to address concerns about security, emergency preparedness, and structural integrity.

- **Barriers and Challenges:** Ownership disputes, regulatory gaps, financial constraints, and privacy concerns hinder the widespread adoption of interconnected rooftops, along with property owner resistance and shared space uncertainties. Despite these challenges, connected rooftops can reclaim underutilized urban space and integrate public amenities into cities.

6. RECOMMENDATIONS

Connected rooftops can benefit Dhaka economically, socially, and environmentally. Strong policy frameworks, careful planning, sustainability measures, and community involvement are essential to their success. The following recommendations provide practical solutions for integrating rooftop connectivity into Dhaka's urban landscape.

- **Policy and Regulatory Framework:** RAJUK and Dhaka City Corporation should update the Bangladesh National Building Code's (BNBC) zoning regulations, accessibility standards, and policies related to privately owned public spaces to promote rooftop connectivity. Financial incentives such as tax breaks and Floor Area Ratio (FAR) concessions may encourage building owners to reconsider rooftops as public domain.

- **Structural and Design Considerations:** Careful structural assessment is necessary for safe rooftop connections. Engineers must check if buildings can support additional loads, and use lightweight bridges and walkways to reduce stress. Rooftops must include elevators, ramps, and wider entrances to serve older adults and persons with disabilities.

- **Community Involvement:** Active community participation is critical for maintaining connected rooftops. Residential complexes should establish rooftop management committees responsible for organizing activities, overseeing maintenance, and managing security. Workshops bringing together policymakers, architects, and residents can help adapt rooftop designs to local social and cultural needs.

- **Funding Sources and Public-Private Partnerships:** Expanding rooftop connectivity requires collaboration among government, private developers, and NGOs. The Privately Owned Public Spaces (POPS) model, where private developers create public amenities in exchange for regulatory incentives, offers a viable pathway (Rasheed O. Ajirotutu et al., 2024). Public-private partnerships (PPPs) can effectively combine government support with private investment to create sustainable rooftop networks that serve both commercial and community needs.

- **Research and Pilot Projects:** Pilot projects in densely populated areas should be initiated to test the feasibility of connected rooftops (Noor, 2025). These demonstration projects can refine design and installation methodologies, while Post-Occupancy Evaluations at sites like Bagan Bari can assess user behavior, safety outcomes, and maintenance requirements. Additionally, monitoring rooftop restaurant safety issues, such as those currently unregulated in Dhaka, can inform better design standards for shared rooftop spaces (Islam, 2025).

Interconnected rooftops offer a practical solution to Dhaka's persistent space constraints while advancing economic growth, environmental sustainability, and social interaction. However, realizing rooftop connectivity's full potential requires sustained commitment to integrated policies, strategic planning, and ongoing research to support Dhaka's broader sustainable development goals.

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ETHICAL CONSIDERATIONS

This study followed ethical research standards by ensuring that participation in the survey was voluntary and that informed consent was obtained from all respondents before data collection. Participants' responses were anonymized to ensure confidentiality. The study did not involve vulnerable populations, and all procedures complied with universally accepted ethical research policy.

DECLARATION OF USE OF AI

During manuscript preparation, the authors used QuillBot to assist with grammar and paraphrasing some parts of the study. The authors have reviewed and edited the output and take full responsibility for the content of this publication. QuillBot was not used for data collection, data analysis, interpretation of findings, or drawing conclusions.

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