

Reimagining Transit Spaces: Activating Underutilised Metro Undercrofts into Urban Public Spaces

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Abstract

This study looks at how underused metro undercrofts can be repurposed into lively public & community spaces. As Jan Gehl aptly states, "If you invite people to walk more and use public spaces more, you get more life in the city. You get what you invite," highlighting the transformative power of intentional design in transit zones. As cities expand with rising populations and limited land, reusing existing structures offers a strong method for renewal. Metro undercrofts, often unused empty areas beneath elevated metro stations, provides a unique opportunity for creative urban design with respect to community engagement. These areas are often overlooked, but they hold a significant potential for enhancing cityscapes through the creation of public parks, markets, cultural spaces and most importantly, a pedestrian-friendly zone. The research explores how these transit spaces can be transformed to boost local economies, promote social connectivity and support public mobility in the urban areas. The study also investigates the social & economic advantages of these efforts. The paper concludes that well-planned development of the metro undercrofts can be crucial for revitalising cities, creating more liveable, inclusive & interconnected cities.

Keywords: Urban regeneration, Urban Public Spaces, Pedestrian Catchment Area (PCA), Metro Undercrofts, TOD (Transit-oriented development), Urban vitality, Adaptive Urban Infrastructure, Urban Commons

1. Introduction

As the urban population keeps rising and land gets scarcer, cities struggle to manage growth while improving life for their residents. Current urban development methods focus on creating new public spaces rather than reusing existing or ignored structures, which leads to inefficient land use. Another approach involves the adaptive repurposing of underused spaces, particularly those that already exist within the urban fabric. One such opportunity exists beneath elevated metro stations, where vacant or neglected undercrofts present can be reimagined into valuable public and community spaces.

Metro undercrofts are often considered as lifeless spaces or obstacles within the urban framework, yet they hold the potential to become an important asset for growing urban areas. These spaces present opportunities for innovative urban design solutions that can transform them into lively public areas — places where people can gather, engage in community activities, or enjoy recreational amenities. Furthermore, these areas can have multiple functions, such as serving as waiting zones in a transport hub or marketplace for street vendors.

This paper aims to search the untapped potential of metro undercrofts as urban active spaces and explore the strategies that may activate the space, grounded on design approaches as well as the socio-economic impacts upon activating them. Drawing on global case studies and analysis of good urban design principles, the paper is focused on how these forgotten spaces may be re-imagined to help in rejuvenating cities through improving liveability, inclusivity and connectivity.

2. Literature Review

2.1 Introduction:

As urban populations continue to grow and the availability of land becomes increasingly limited, cities face the challenge of accommodating expansion while enhancing liveability. With rapid urbanisation and land scarcity, there is a lack of public spaces. "Public spaces are an essential part of the urban environment as they support a wide variety of public activity [1]." One of the overlooked and underutilised spaces is the metro undercroft. These spaces can be repurposed into dynamic urban public and community spaces. The metro undercrofts and around the metro stations attract many people by making a space where active urban spaces can be designed to promote urban vitality and liveability.

Metro is one of the major public transportation systems used by people, the development and adaptive reuse of the pedestrian catchment area of a metro station space around the public transportation provides convenience for citizens. Development based on public transportation is called Transit-oriented development (TOD). "Transit-oriented development includes areas, that are located within a mile or 1/4 mile of public transportation stations and have a variety of functions such as administrative, recreational, retail, and residential. The high level of density, compaction in the urban fabric, open and public spaces and are among the other characteristics of this type of development [2]."

The papers which are reviewed here discuss the need for urban green public spaces, and how they can be developed through transit-oriented development, which in turn promotes urban regeneration and enhances the liveability in the rapidly growing cities.

2.2 Transit-oriented development (TOD) & Public catchment areas (PCAs)

"Considering the indicators of quality in public spaces and transportation centered on the subway system, subway stations act as an urban foundation responsible for public service, and having the potential for "transit-oriented development with a focus on the metro" and the ability to benefit from its advantages, the city of Tehran can be effective in the creation of attractive and human-oriented spaces [2]." Though there aren't studies showing how the metro undercrofts can be utilized for urban development, a study in Tehran talks about the development of underground spaces in subway stations with the help of TOD approach.

TOD promotes the development of areas within close proximity to public transportation stations, typically within a mile or a quarter mile. This accessibility encourages more people to use public transport, reducing reliance on personal vehicles and enhancing the use of public spaces. TOD areas are designed to include a mix of functions such as residential, retail, recreational, and administrative spaces. By creating liveable spaces that are pedestrian-friendly and well-connected to public transport, TOD enhances the overall experience of public spaces, which increases community engagement as well. TOD can stimulate local economies by attracting businesses and increasing foot traffic in public spaces.

"The interaction and dynamic evolution of urban space and group behaviours have given rise to 'new urban space', such as pedestrian catchment areas (PCAs) under the new travel mode [3]." Metros are important in solving urban traffic problems and restructuring city spatial structure, especially with the formation of

pedestrian catchment areas (PCAs).

The Pedestrian catchment areas (PCAs) of metro stations serve as an important bridge linking multiple urban functions, including commercial shops, open spaces, and service facilities. The quality of street space in PCAs have a direct impact on the vitality of urban life. Functional, convenient and comfortably designed public spaces can attract more foot traffic and social interactions, making the place feel more alive and vibrant. It was also found by the study that the development of metro stations without coordinated planning could have adverse effects on adjacent public spaces. If the surrounding areas are not designed to accommodate increased foot traffic and urban functions, the quality of public spaces may suffer.

2.3 Urban Green Spaces

With rapid urbanisation, there is a depletion in urban green spaces in densely populated areas. “Urban environments with high population density and limited natural spaces are more susceptible to the negative impacts of climate change, such as rising sea levels, storm surges, heat waves, droughts, and disease outbreaks [4].” “Urban greenery have a significant social influence by encouraging sustainable lifestyles and eating habits, encouraging physical exercise, and offering areas for social contact, leisure, and recreation [3]. These areas are crucial for enhancing people’s well-being because they promote social inclusion and a sense of belonging [4].” Urban greenery provides significant ecological and social benefits, including improved air quality, enhanced biodiversity, and increased community well-being.

“Amidst urban expansion, the very green spaces that breathe life into our cities are fading away like echoes of a distant forest, calling us to the urgent task of preserving the sanctuaries of nature in the concrete jungles of progress. Cities around the world are currently home to approximately 54 % of the global population, a number anticipated to reach 66 % by 2050 [5].” This growth poses challenges such as unplanned sprawl, congestion, and ecological degradation, which threaten the existence of green spaces. “Akubia et al. [5] suggest that enhancing land and ecological protection in urban areas can lead to increased density, stronger community identity, improved transportation, efficient agriculture, recreational opportunities, and better conservation practices [5].” Urban green spaces, including parks and community gardens, provide essential benefits such as biodiversity enhancement, temperature regulation, and improved mental health.

“Urban green spaces play an important role in enhancing the quality of life within cities by providing numerous benefits to their residents [6].” “Urban densification, driven by population growth and urbanisation, leads to increased pressure on land resources, resulting in the loss of green spaces to development and infrastructure projects (Kitha & Lyth, 2011). Inadequate management practices, such as insufficient maintenance, lack of amenities, and limited access, further exacerbate these challenges, compromising the usability and attractiveness of green areas [6].” Preserving green spaces is vital for creating ecological corridors that support biodiversity and enhance urban resilience. Effective green space management contributes to the overall health of urban ecosystems and the well-being of residents.

2.4 Public Spaces

“All social behaviour manifests itself in public space because of the interaction between space and society. Public space is an important part of everyday life in cities [1].” “To be successful, public spaces must be multi-purpose, well-connected, and of good quality, and their use should serve the diversity in class, gender, age, and ethnicity of the people who live there. A good city creates and maintains public spaces in such a way that public spaces bring people together [1].” A city’s community should have the highest possible quality of public spaces, stimulating economic activity in urban areas by attracting businesses and raising property values, thereby increasing local government revenue. The fast pace of urbanisation in developing cities calls for the need to have a flexible form or approach to planning urban spaces to respond adequately as residents interact with public spaces. The design of public spaces must reflect the distinct features of their surroundings, neighbourhoods, to enhance the urban experience. It is essential that these spaces are designed to be universally accessible to everyone. This highlights the significance of understanding user perceptions and cultural shifts in the planning and design of public spaces to design better and more engaging urban environments.

2.5 Conclusion

The objective of studying these papers is to demonstrate that with rapid urbanisation, land scarcity is increasing, and with that, there is a depletion of urban green spaces. With the utilisation of TOD & PCA,

these urban green spaces can be designed in the metro undercrofts, which are overlooked while planning public spaces. These public spaces can cater to not only the passengers who use the metro but also people living in & around the neighbourhood. This study also helps us understand how the strategic development of metro undercrofts can play a key role in urban revitalisation, contributing to more liveable, inclusive, and connected cities.

3. Findings from the primary study

This study hypothesised that underutilised metro undercrofts could be effectively transformed into vibrant urban public spaces, thereby contributing to social cohesion, economic stimulation, and sustainable urban development. This was further proved by a questionnaire sent out to people to fill.

3.1 Summary of Findings :

3.1.1. Demographics and Transit Usage

The demographic profile of the survey respondents provides insights into the diversity of perspectives included in the study. Most participants belonged to the 18–25 age group, followed by the 26–35 category, reflecting an engaged and urban-focused audience. Professionally, the respondents comprised students and working professionals.

In terms of transit usage, 59.4% reported using metro systems frequently, either daily or weekly, while 40.6% indicated occasional use. Additionally, 46.9% of respondents confirmed having a metro station within 2 kilometres of their vicinity, suggesting that the sample represents individuals who are closely connected to metro infrastructure.

This data emphasises the significant role metro transportation systems have in the everyday lives of the respondents and offers an insight into their views regarding the possible use of metro undercrofts. The mix of demographic variety, respondents who regularly use metro transportation, and proximity to metro stations enhances the validity of the findings and their applicability to urban development scenarios.

What is your age group?

32 responses

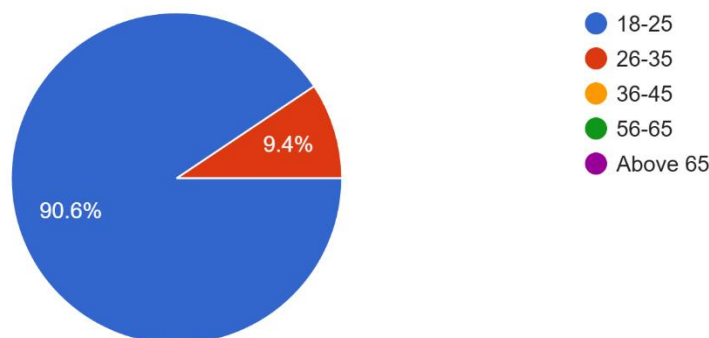


Figure 1

What is your profession/occupation?

32 responses

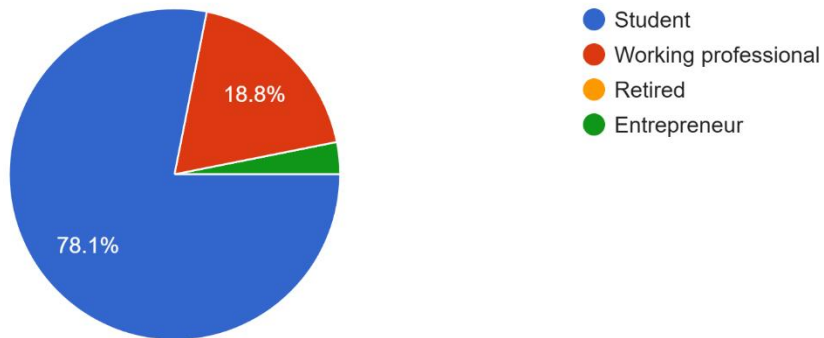


Figure 2

How far do you live from the nearest metro station?

32 responses

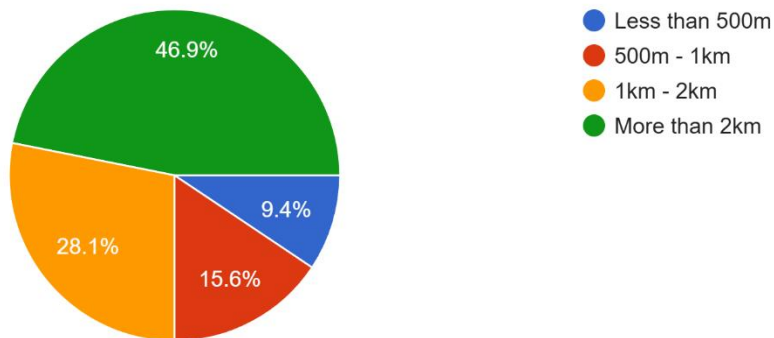


Figure 3

How frequently do you use the metro system?

32 responses

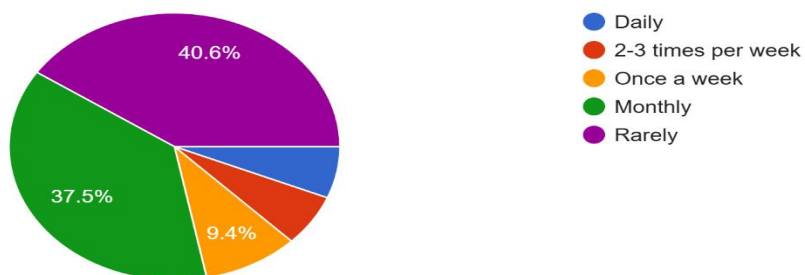


Figure 4

What is your primary purpose for visiting areas near metro stations?

32 responses

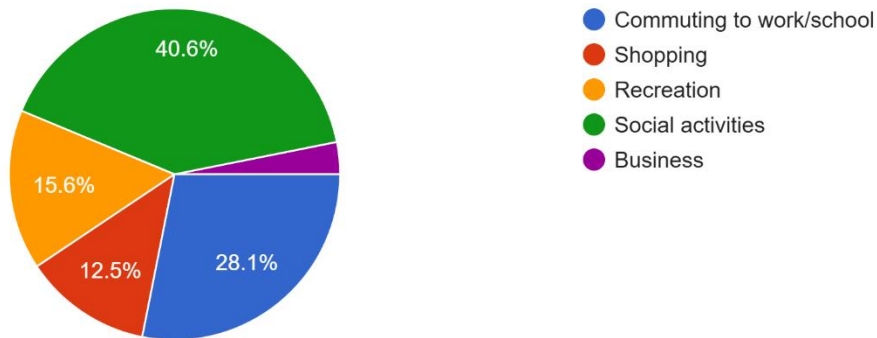


Figure 5

3.1.2 General Awareness and Interest: Current Perception of Metro Undercrofts

The survey shows how the public views metro undercrofts. It focuses on awareness, safety concerns, accessibility, and other observed issues. About more than half of the respondents (59.4%) said they are aware about the underused spaces beneath metro stations in their city, recognising their potential yet noting their current state of neglect.

Safety being a major concern, with 40.6% of respondents rating metro undercrofts spaces as either unsafe or somewhat safe. This suggests that insufficient lighting, security measures, and maintenance in these spaces lead to their low usage.

In assessing accessibility, 90.7% of respondents categorised the accessibility of metro stations and their surrounding areas as "Good" or "Average," mentioning obstacles related to infrastructure and connectivity that affect ease of use of the space.

Respondents highlighted various critical problems with metro undercrofts spaces, such as lack of cleanliness (62.5%), security concerns (40.6%), and the existence of unused or neglected areas (68.8%). Additional challenges mentioned included insufficient amenities (37.5%), poor accessibility (37.5%), and inadequate lighting (34.4%), all of which factor into the underused and ill perception of these spaces.

The results of this survey suggest that although there is a certain level of awareness regarding metro undercrofts, their current state presents obstacles that need to be addressed to realise their potential as lively urban public spaces. Improving cleanliness, accessibility, and safety have been identified as the primary steps that need to be taken for transforming these areas into community-friendly areas.

Are you aware of any underutilized spaces beneath metro stations in your city?

32 responses

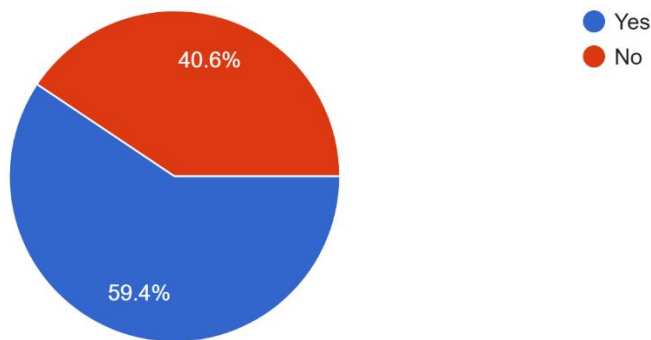


Figure 6

On a scale of 1-5 (1 being very unsafe, 5 being very safe), how safe do you feel in existing metro undercroft areas?

32 responses

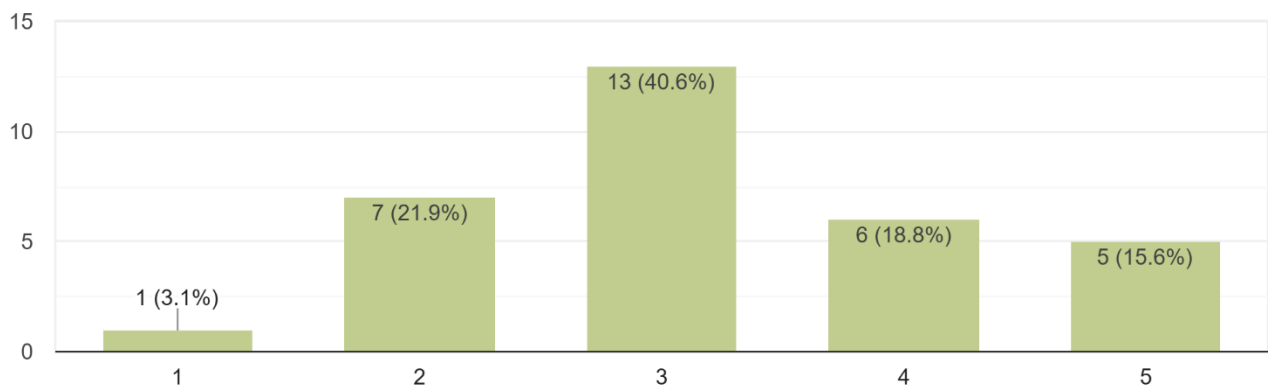


Figure 7

How would you rate the accessibility of metro stations and their surrounding areas?

32 responses

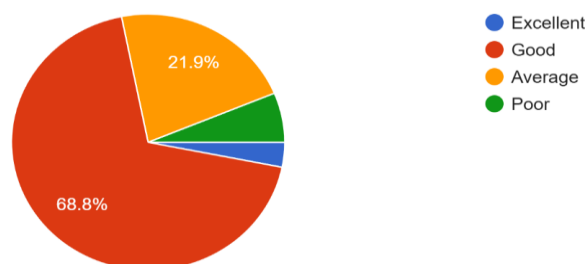


Figure 8

What are the main issues you currently observe in metro undercroft spaces? (Select all that apply)

32 responses

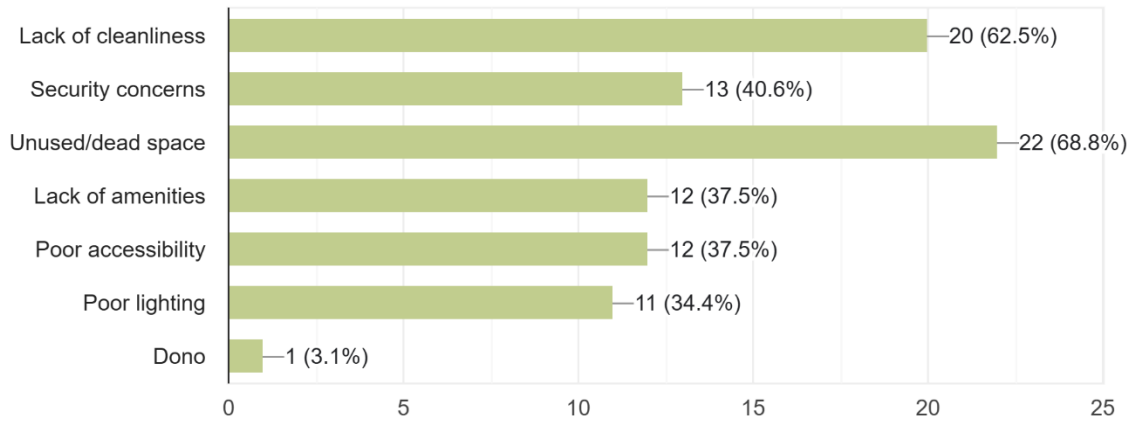


Figure 9

3.1.3 Development Preferences for Metro Undercrofts

The survey looked at public opinions regarding the development of metro undercrofts, which in turn revealed a wide range of ideas to improve their usefulness and appeal. Respondents ranked parks and green areas as the top choice (62.5%), followed by pedestrian-friendly walkways (50%), art galleries and exhibition spaces (46.9%), and market or shopping areas (46.9%). Additional major preferences included food courts and cafes (43.8%), waiting areas for buses, taxis, autos, etc. (43.8%), children’s play areas (28.1%), sports/fitness facilities (18.8%), showing a demand for multifunctional spaces that serve recreational, commercial and social needs of the users.

Respondents also emphasised their preferences for environmental features in metro undercrofts. The most favoured feature was seating areas, selected by 68.8% of respondents, followed by green walls or vertical gardens 53.1% and water features at 48.3%, at 48.3%. Bicycle parking was chosen by 37.5%, while native plants were preferred by 37.5%, use of sustainable materials was preferred by 34.4% of the respondents. Additional features, such as climate control systems, preferred by 18.8%, were considered appealing improvements for fostering environmentally friendly and functional spaces.

Furthermore, the survey showed that 90.6% of respondents considered green spaces to be "very important" for urban areas, showing the impact of greenery in urban lifestyles. These results reflect a significant public interest in converting metro undercrofts into inclusive and environmentally responsible areas that cater to various community needs while facing urban challenges.

What kind of developments do you believe would make metro undercrofts more useful to the public? (Select all that apply)

32 responses

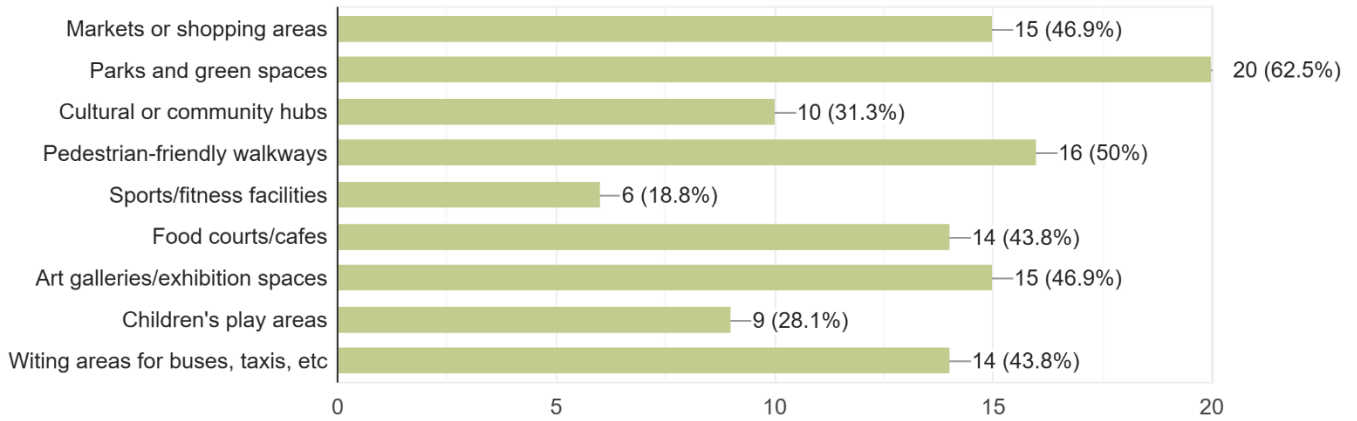


Figure 10

What environmental features would you prioritize in these spaces? (Select top 3)

32 responses

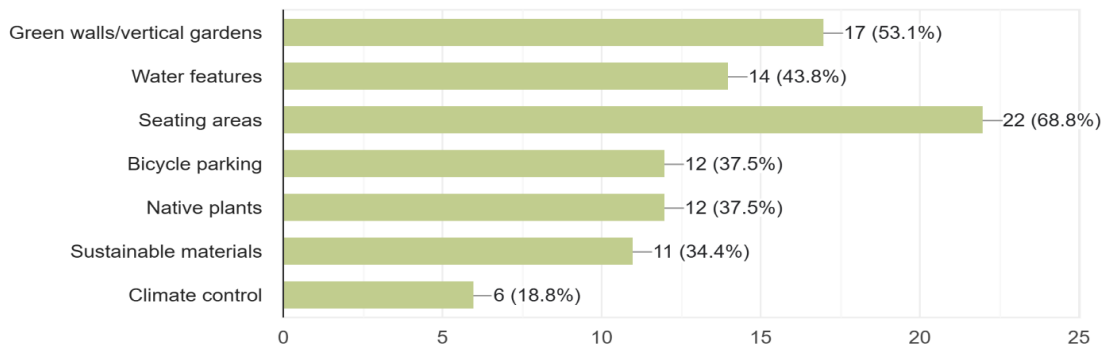


Figure 11

How important do you think green spaces are in urban areas?

32 responses

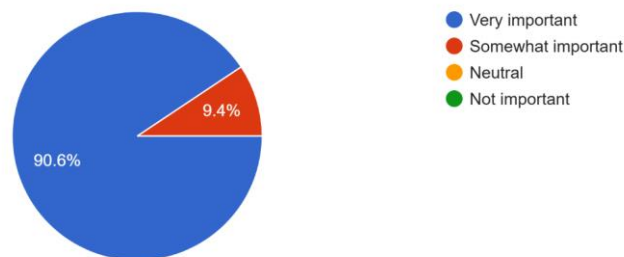


Figure 12

3.1.4 Community Impact of Metro Undercroft Developments

The survey also assessed the potential community impact of converting metro undercrofts into public spaces. When respondents were asked about the kinds of activities they would like to see in these spaces, the majority expressed a preference for recreational facilities such as parks and playgrounds (65.6%), followed by cultural events like art exhibitions and music performances (56.3%), and community services such as skill workshops (40.6%). Additionally, 43.8% of the respondents showed a strong interest in commercial activities like markets and food stalls, indicating a desire for spaces that have multiple functions.

In response to inquiries regarding possible facilities which were preferred to develop the undercrofts areas, respondents placed a high importance on public seating and relaxation zones, community markets, waiting areas for buses and taxis and spaces dedicated to exercise. This shows the community’s preference towards practical spaces that promote well-being and social interaction.

The survey showed a broad agreement on the advantages of these developments. Environmental benefits (65.6%), better community interaction (53.1%), and economic opportunities (43.8%) were identified as the primary benefits. Factors such as improved aesthetics, better safety, increased property values, improved connectivity and lesser traffic congestion were recognised as positive outcomes.

Concerning safety, 40.6% of respondents indicated feeling unsafe in the current underutilised transit spaces, indicating a strong need for improvements. Nevertheless, 59.4% of those surveyed indicated they would be open to spending 30 mins to an hour if these spaces were developed, indicating with thoughtful design, metro-undercrofts could play a vital role in daily life.

Respondents also felt that transforming metro undercrofts could aid urban sustainability, with 75% in agreeing to it. They highlighted that such initiatives would not only benefit the environment but also improve community welfare by reducing crime, encouraging local businesses, increasing recreational opportunities, and improving city aesthetics. These findings thereby show the potential of metro undercrofts in promoting community well-being through improved safety, economic development and stronger social bonds.

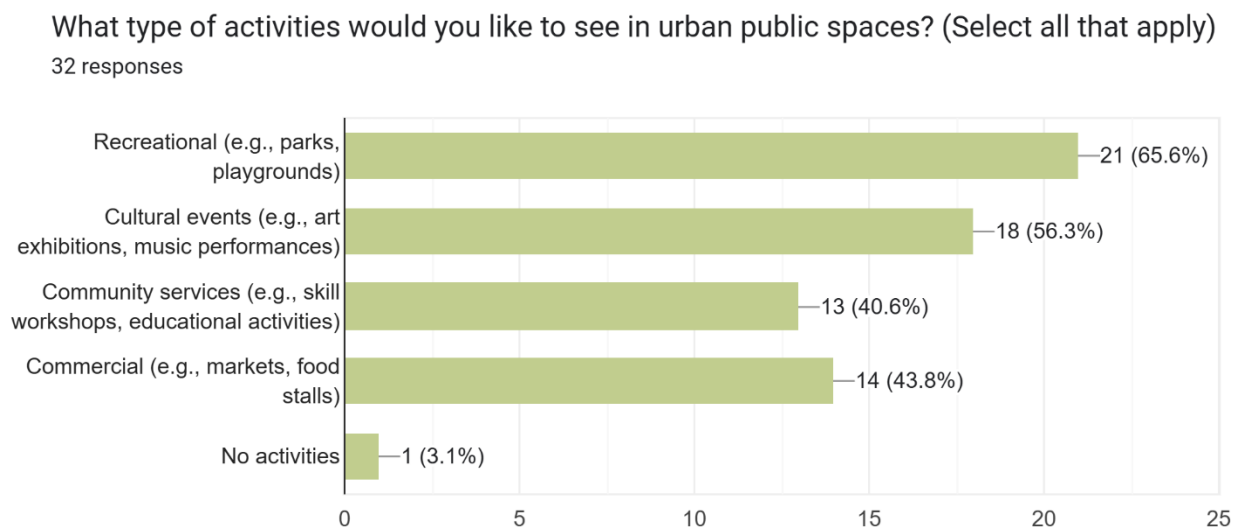


Figure 13

How likely are you to use the following potential facilities in developed undercroft spaces? (Rate 1-5, 1 being very unlikely, 5 being very likely)

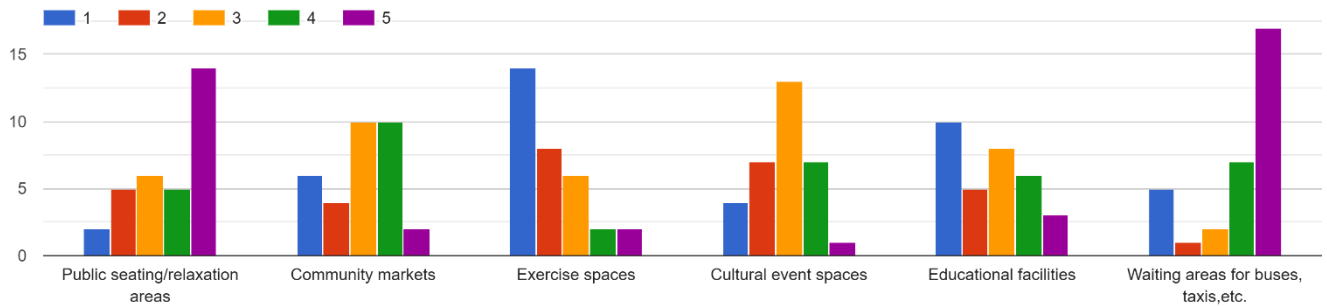


Figure 14

What potential benefits do you think developing these spaces would bring to your community? (Select all that apply)

32 responses

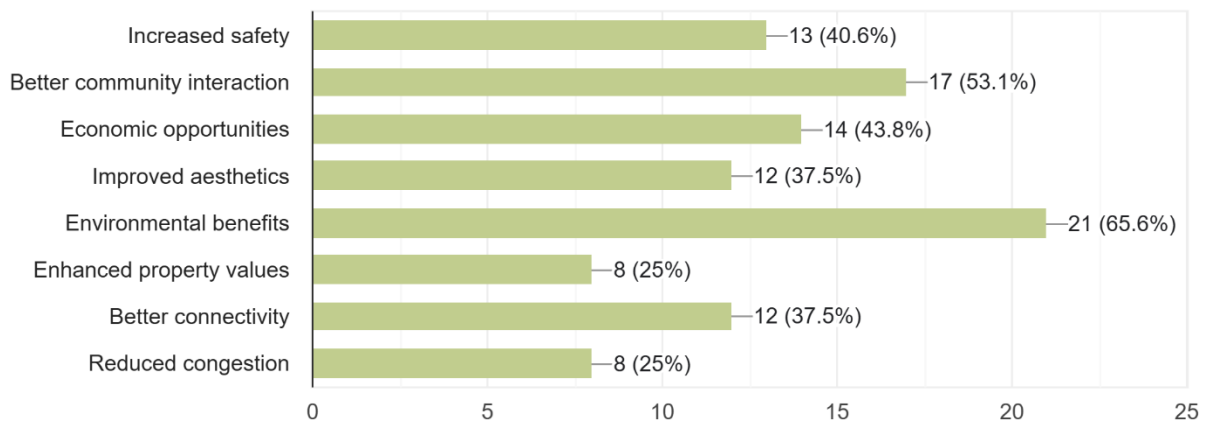


Figure 15

Do you feel safe in underutilized transit spaces in your city?

32 responses

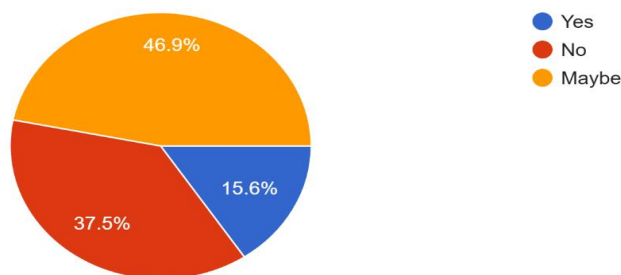


Figure 16

How much time would you be willing to spend in these spaces if they were developed according to your preferences?

32 responses

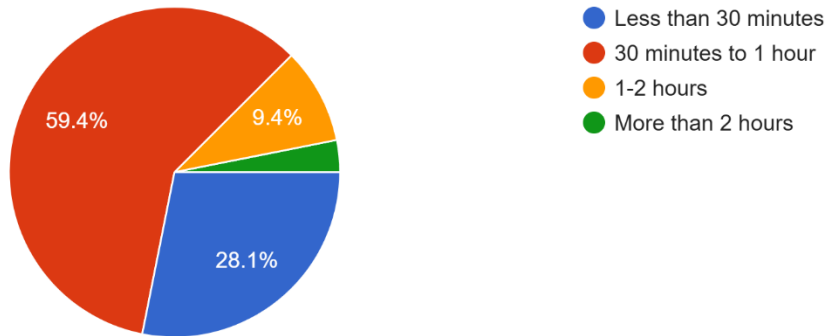


Figure 17

Do you think transforming metro undercrofts can contribute to sustainability in urban areas?

32 responses

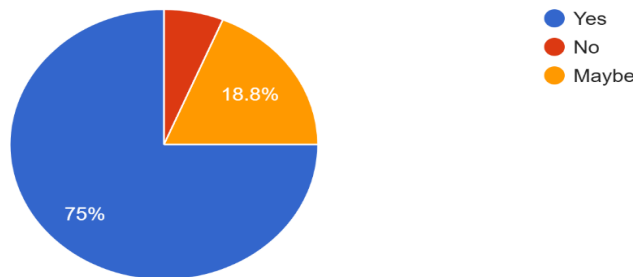


Figure 18

In your opinion, how can repurposing metro undercrofts benefit the community? (Select all that apply)

32 responses

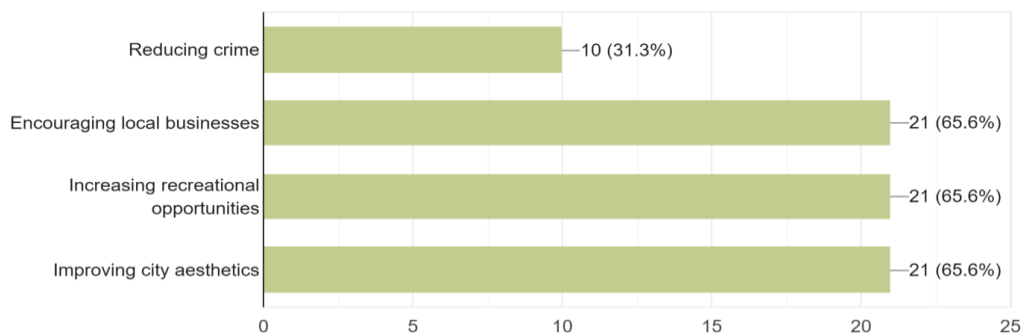


Figure 19

3.1.5 Qualitative Insights: Open-Ended Responses:

When asked about innovative ideas or suggestions do you have for transforming metro undercrofts into vibrant public spaces, the majority of the respondents suggest having public and community spaces with vast lounge areas and gardens, some also suggested in adding a space for stray animals to be in with water and some food, having automated kiosks for women's safety, EV charging stations.

With regards to a space which would most likely be used in metro undercroft spaces, respondents suggested having seating spaces, green spaces, charging stations, food kiosks, vending machines containing food beverage, galleries and exhibitions. Another concern about the security and the safety of the space was also raised.

4. Conclusion

This study explored the potential of transforming underutilised metro undercrofts into vibrant urban public spaces. The aim was to evaluate how these underused spaces can become a community hub and an urban space for people to enhance the liveability and usability of the space.

Results from the survey revealed that the public is keen on transforming metro undercrofts for various uses, such as parks, green spaces, cultural hubs, and community markets. The main priority for the development includes improving safety, cleanliness, and accessibility. Respondents highlighted the necessity of incorporating environmental features such as green walls, native plants, and seating areas to create inclusive and sustainable spaces. The survey also highlighted the socio-economic advantages of these changes, such as boosted community engagement, economic growth, and improved urban aesthetics. The research indicates that repurposing metro undercrofts can greatly aid in urban rejuvenation by activating overlooked spaces and improving connectivity, sustainability, and urban vitality. These interventions not only tackle issues related to infrastructure but also promote environmental well-being and community engagement, leading to more inclusive and liveable urban environments.⁴

5. Acknowledgement

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