

Effective Use of Urban Voids Environment and Infrastructure

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Abstract— Transportation is the most important factor in allowing people to travel around a city. The function of transportation infrastructure in connecting the urban areas has been significantly increased with the growth of the urban population. Flyovers and bridges are built to allow faster traffic on the city's roadways. However, vacant areas, known as infrastructure planning voids, are created due to such forms of infrastructure development. If abandoned or left unused, urban voids have negative impacts on urban fabric and people. This paper focuses on the void spaces found beneath flyovers and their high potential for development which can improve the image of a city. Based on the review of literature on public place making and analysis of eight case examples across the globe, the issues to be addressed are identified and landscape design guidelines are framed for the void spaces beneath flyovers in the Indian context. The implementation of guidelines is demonstrated through a pilot project in the City of Chennai, India.

Keywords— Urban infrastructure void spaces, flyover, Chennai and guidelines.

I. INTRODUCTION

The rapid urbanization leads to construction of new infrastructure for easy movement around the city. These infrastructure plays an important role in development of cities but leaves behind void spaces. The urban void which are caused by infrastructure are called as infrastructural voids. Due to the haphazard utilization of these void spaces in urban areas, they become garbage yards, dead spaces, or a haven for criminal activities. This affects the image of the city as such void's spaces are often located at the central places in cities. This paper focuses on voids beneath flyovers which could be a real area of intervention, not only on a morphological level, but also in connecting people and enhancing community development. The study aims to frame landscape design guidelines for voids spaces beneath flyovers for their efficient use enhancing the city's culture and image.

II. URBAN VOIDS

Urban voids are defined as “Unutilized, underutilized or abandoned land or areas and premises which exist in city areas owing to outdated or defunct uses”[1].

Based on the causes of formation voids are classified into Planning void, functional void, and geological void.[1] According to scale and ownership, four main types of voids are edge and buffer voids, infrastructural void, transportation void, large scale open space reserve[3]. The Indian Road Congress

describes eight types of interchanges. This paper focuses on the flyover in the city and the voids created by them.

A. Place making through landscape

Placemaking refers to a collaborative process through which we might modify our public space to maximize shared value by strengthening the connection between people and the places they share. The following techniques play a vital role in making the public places active[5][6][7] which can be extended to places beneath flyovers:

- Improving the attachments that individuals have with the locations they occupy.
- Community based revitalization rooted to local vales, history and culture.
- Physical elements and socio-cultural beliefs interact.
- Developing psychologically stable environments.

B. Image of a city

The components like path, edges, district, nodes, landmarks discussed by Lynch 1960, create a powerful memory in the user's mind in defining the location or route or a region.[4] Therefore, the voids created by the flyovers becomes a focal element in user's memory as it helps to connect and remember location to their identity.

C. Issues to be addressed in void spaces underneath the flyover

By reviewing the literature, the important issues to be addressed are identified[5][6][7] and they are tabulated below Table 1 Issues to be addressed in void spaces underneath the flyover

Factor	Issue
Physical factor Access Safety Structure	<ul style="list-style-type: none"> ▪ Spaces are surrounded by heavy traffic roads on all sides. ▪ Loss in connection between areas ▪ Water seepage: Dripping of water from the above bridge ▪ Exposed Service pipelines. (Electrical, plumbing) ▪ Massive vertical element(column)
Human activities	<ul style="list-style-type: none"> ▪ Un-authorized domestic use by industry workers ▪ Illegal encroachments, Hacker's ▪ Illegal parking ▪ Suitable locations for criminal activity that has become a hazard to public safety ▪ Rubbish dumps, trash filled yards. (Dumping construction debris) Garbage disposal. ▪ Hindrance in pedestrian movement
Visual and aesthetic	<ul style="list-style-type: none"> ▪ Linear urban void dividing city fabric. ▪ A negative impact on the city's visual image. Furthermore, it lowers the economic worth of existing homes.

III. METHODOLOGY

In the first phase, this research study employed a case study approach to identify best and successful practices in designing and developing urban voids. Accordingly, eight case studies were selected across the world and information related to their proposed use and design were collected. Plans, sections, and images for analysis were collected from various websites. Research articles when available were also used for analysis of case studies. In the second phase of the research i.e., pilot project, primary data was collected through field visits and personal observation by the researcher.

IV. CASE STUDIES

Eight case studies were selected for analysis according to their Land use, Void space formation, Area, Place making techniques and issues. Through analysis of plan, sections and design elements, successful place making techniques employed in each of the case studies were identified. The findings are presented in table 2.

Table 2 Analysis of case studies

S.No	Case Study	Issues	Solution	Shortcoming
1	Matunga's under-flyover garden, Mumbai[789]	Hangout zone for hawkers, gamblers, drug addicts, etc. and encroachers.	Walking-cum-jogging, ground lighting, plant along the walkways. Vegetation as and around focal points. Safety: CCTV cameras for safety. Limited access to the space. Use of bollards at the entrance. Grills at both the sides to ensure safety.	Lack of community-based revitalization.
2	Veerannapalya flyover, Bengaluru	Garbage dumping	Open plazas, biophilic designs to create visibly greener spaces. Created garden. Painted the vertical elements. Basic landscaping done. Sculptures with wildlife theme. False ceiling with recycled material	Lack of safety
3	A8erna; Netherlands	No-man's land, used only for parking	Supermarket, a flower store, a fish shop, and recreational facilities, including a park, a playground for children and teenagers, as well as a marina unite and connect the city to the neighboring river Maintaining level difference. Grills around play area	Lack of aesthetics in vertical element. Lack of green spaces
4	Underpass Park, Toronto, Canada	harsh urban, No-man's land and dumping ground	Farmer's market, informal theatre, basketball, roller hockey, and skateboarding. Dense Plants to withstand harsh conditions. along the edges. The playful vertical and horizontal walls. Tall grasses and regional landscape.	Lack of safety, Vertical element left unused
5	Fly the flyover, Kowloon east, Hong Kong	No-man's land, used only for parking	Open-style design, informal performance. colorful murals on the columns depicting the local narrative of the urban's cape. awesome sensory play equipment for kids. Provided shaded area. Screening plants to avoid pollution. Landscape elements like pergola with creepers	
6	The underline–Melbourne, Australia	Impacts of shade, visual intrusion, overlooking, water management	Cycle route, dogs park, basketball court, parkour equipment, fitness stations, bike repair points, skate parks, wetland swales, gardens and tree plantings a war memorial, and bus turn-around lanes.	Lack of safety at kids play area
7	The bent way, Toronto	Receiving drainage from the overpass above	Stormwater viaduct is captured and discharged into the landscape; Swales were built along the edge. Seven communities are connected by pedestrians' multi-functional spaces.	Lack of community-based revitalization
8	Kathipara urban square, Chennai	No proper maintenance, dump yard, wild plants and Illegal activities zone	Children's play area, parking lot, eating space, pathway, Bus stop and food court are located.	

V. GUIDELINES

Informed by the place making techniques offered in the literature and best practices identified through case study analysis landscape design guidelines were developed and provided below under three categories namely Physical, Human activities and Visual and aesthetical factors.

A. Physical factor

The following elements are suggested to address the issues related to access and safety.

Access: Defined entrance with landscape elements; articulation of entry using gateway with creepers; speed breakers to lower the speed; zebra crossing for pedestrians; Having maximum of 2 main entrance at opposite ends and one or 2 secondary entries at required places. Pedestrian access of 2m wide connecting the areas around across the voids.

Safety: Bollards at 1 meter spacing at all the entries; One step rise minimum of 0.15m from the road level; Safe buffer with different layers of plantation (Ground, middle and upper); Grill at the end of both sides after plantation of 1.5m in height from the ground level.

B. Visual and aesthetic

Vertical structure and vegetation need to be considered for enhancing the visual quality.

Vertical structure: Painting of the vertical structure according to the culture and context; using of wall cladding to hide the services pipelines; Use of the column and the massive flyover structure as advertising board or display area to make use of its visibility.

Vegetation: Native species first preferred

Native shrubs, trees are to be planted in a dense manner at the edge along the length of the voids to serve as a noise and pollution buffer as well as to create an enclosed space. Native flowering shrub are to be planted as the middle layer to create attraction and interest for the users followed by grass or lawn as foreground.

Bioswale along the periphery to collect runoff and water from the bridge.

C. Human activities

In table 3, the suggested activities according to the land use are given.

Table 3 Human activities

Surrounding land use	Landscape design Guidelines for activity
Commercial and Residential	<ul style="list-style-type: none"> Shaded seating area Book stall Petty shop Kids play area Walking track
Industrial and Residential	<ul style="list-style-type: none"> Multi- functional spaces. Kids play area Shaded seating area Bike repair points Rental shopping or informal markets. Walking track
Commercial and Industrial	<ul style="list-style-type: none"> Informal markets. Restaurants Shaded seating area Book stall Fitness stations Walking track Bike repair points

VI. SITE CONTEXT ANALYSIS

To implement the guidelines in a context, Padi flyover in Chennai, Tamil Nadu was chosen. This is an elevated rotary flyover with 6 ramps (fig1) of two- lanes causing void spaces beneath. The surrounding Land use is Industrial and Commercial zones.(fig2)

A. Issues

The void found between ramp 4 and 1 does not have any human activities but used as dump yard of construction waste. The ramp 3 void has been used for early morning and evening informal flower market. (fig3)

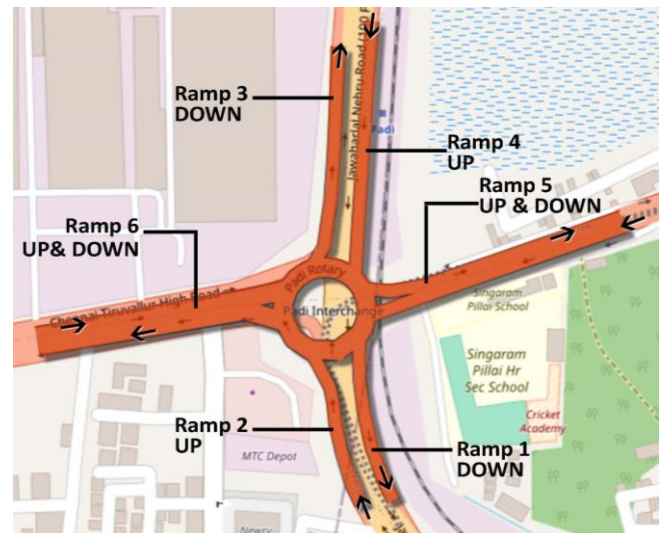


Fig 1 Map showing different ramp structure in the bridge along which the void spaces are available.

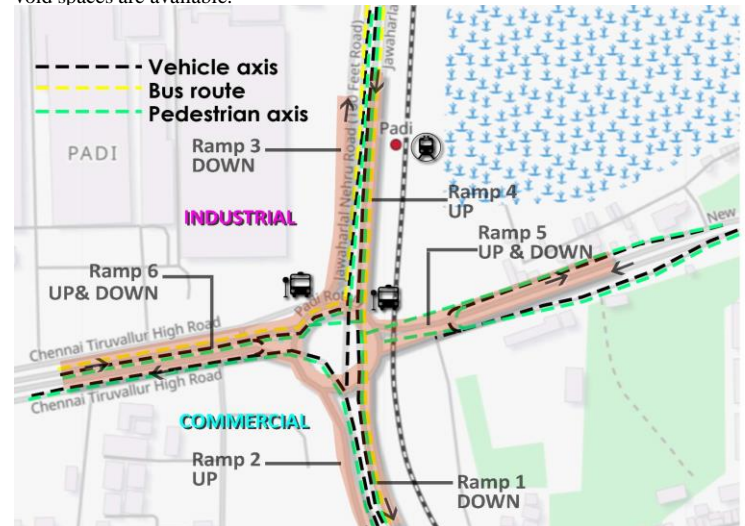


Fig 2 Map showing the axis way on the bridge



Fig 3 (1)site present condition (2)Narrow void (3) birds eye view

B. GUIDELINES

The entrance is defined with an archway with creepers along with speed bumps and a zebra crossing for the pedestrians to enter without any hindrances. The void space is 0.15m rise above road level. 2 main entrances at opposite ends and one or

2 secondary entries of 2m wide pathway with 1m spacing bollards are given to limit the illegal entry. (Fig 4)

Grill at both sides after plantation for 1.5 meter from the finished ground. The vertical column is painted and used as an advertising stand. Bioswale is given along the periphery.

Vegetation: Native shrubs, trees are to be planted in a dense manner at the edge along the length of the voids to be noise and pollution buffer as well as to create an enclosed space. Native flowering shrub are to be planted as the middle layer to create attraction and interest for the users followed by grass or lawn as foreground (Fig 5, 6)

C. Human activities

The suggested activities according to the land use are rental shops, informal multi-purpose markets space, seating, bike repair points, walking track and book stall.



Fig 4 Schematic representation of the guidelines in the site



Fig 5 Pathway and vegetation



Fig 6 Schematic representation of the guidelines in the site from the bridge

CONCLUSION

This paper attempted to identify the issues related to urban voids and techniques for their efficient use with a special focus on landscape design strategies. Through case study analysis, development of guidelines and implementation in a pilot project, this study demonstrated that efficient use of urban voids can be accomplished.

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