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From Drain to Destination: Behavioral Shifts Through the K100 Citizen Waterway Project in Bangalore

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Abstract

This paper studies the behavioural change of people through urban design by focusing on the K100 citizens waterway project, Bangalore, India. The K100 along with other drains in Bangalore is a neglected stormwater infrastructure. The K100 drain project is the first step in transforming the drain infrastructure of Bangalore.

This paper examines how the K100 infrastructure project has transformed the use of this space and altered the public behaviour, including increased engagement with the space, and the shift in people perceptions of the stormwater drain. This can be achieved with interviewing the locals and secondary data collected by mod foundation.

Keywords: Stormwater Drain, K100 Citizens Waterway, Restoration, Urban Design , Behavioural change, Public Interaction, Public Space , Linear Park, Bangalore, Rajakaluve, Sustainable Urbanism.

1. Introduction

K100 is the name of the primary Stormwater drain or Rajakaluve of the Koramangala valley , starting from the shantala silks near the erstwhile dharmabudhhi lake (now majestic bus stand) and draining into Bellandur Lake. The 12-km drain has been taken up as a pilot to rest to restore the city's larger network of 850 km SWDs. . Historically, k100 is considered a polluted area as the sewer line is mixed along with the storm water, discouraging congregation and movement along the adjacent streets, the design intervention has attempted to changed that by treating sewer and using the drain only for stormwater. Urban design has the ability to change the attitude of people in public places, it influences how people perceive and interact with spaces around them, contributing to behavioural change on both individual and community levels. Before the K100 Citizens Waterway Project, conditions along the K100 drain significantly influenced local residents' behaviour. The presence of untreated sewage and waste created health hazards, leading residents to avoid outdoor activities near the drain, which limited social interactions and community bonding. The unpleasant environment discouraged gatherings, isolating individuals and eroding community ties. The economic behaviour of the residents was impacted by the drain's condition, as investment in property and local businesses was deterred by perceptions of the area as undesirable. Overflooding further contributed to residents' avoidance of affected areas, creating a sense of helplessness and reducing their willingness to engage with the community. In sum, the poor state of the K100 drain resulted in isolation, reduced social interaction and a lower quality of life for the residents.

2. Literature Review

A lot of research has been conducted on the behavioural mapping of public space, addressing variables such as the present behavioural pattern of a specific space and the attitudinal shift after altering the urban fabric of the neighbourhood through smart urban design.

3. Study parameters

3.1 Introduction:

This literature review aims to explore the behavioural change in people due to urban design interventions, focusing on the K100 Citizens Waterway Project in Bangalore as a case study. The K100 project transformed a neglected and squandered stormwater drain into a functional and thriving public space. This was done by addressing issues like foul smell, safety concerns, and lack of usability. This review looks at four key parameters: security, comfort, health, and community engagement, to scope the factors leading to the behavioural shift. These parameters are critical to deduce how urban design interventions can improve the quality of life, garner a sense of belonging, and support active public participation.

3.2 Comfort

Urban design plays a significant role in shaping psychological comfort within cities. Research has shown that various elements of urban design can positively impact mental well-being and sociability among residents [1]

Studies have found that simple urban design interventions, such as colourful crosswalks and greenery, can increase subjective well-being and sociability among city residents. Spaces with greenery and community-driven urban interventions were associated with higher levels of happiness, trust, stewardship, and attraction compared to standard urban sites [2]. Similarly, small urban green spaces (SUGS) have been linked to enhanced comfort, relaxation, and overall mood improvement [3] Interestingly, the relationship between mental health and urban design has been historically weak, with recent research still in preliminary stages [4]. However, emerging evidence suggests that objective measurements of the urban environment, such as housing with deck access, neighbourhood quality, amount of green space, land-use mix, and traffic volume, have measurable associations with psychological distress [5]

In conclusion, urban design has significant potential to promote psychological comfort and mental well-being. Incorporating elements such as green spaces, community-driven interventions, and pedestrian-friendly designs can positively impact residents' mental health. As cities continue to grow, it is crucial for the government, urban planners and designers to consider these factors in creating environments that support public mental health and overall quality of life.

3.3 Security

Urban plays a critical role in enhancing public security by addressing fear and promoting safety through well-lit, inclusive, and accessible spaces.[6] Public security and urban design are closely intertwined, with urban planning and design playing a crucial role in shaping the safety and security of urban spaces. The concept of Crime Prevention Through Environmental Design (CPTED) has become a common idea as a potential solution to combat public security concerns in urban areas [7]. This highlights the importance of environmental design in the creation of safer communities and supporting quality of life.

This approach emphasizes the importance of environmental design in creating safer communities and supporting active living.

Urban security is multifaceted, involving policies, stakeholders, and spaces across different frames [8]. While it is a social problem, it is also a political matter regarding policy ideation, social demands and the

right to be free from crime. [9]. Surprisingly, while safety and security are major public concerns, crime is rarely considered as an outcome in public health studies [10]. This illuminates a potential gap in addressing the holistic impact of urban security on community wellbeing.

To conclude, the integration of public security into urban design requires a bird 's-eye view. It includes incorporating CPTED principles, addressing the psychological and behavioural aspects of human responses to threats [11], and considering the perspectives of marginalized groups often held responsible for crime [12]. Further, the advent of new technologies and smart cities offers new possibilities for seamlessly designing security into urban spaces which could lead to transforming the governance of urban landscapes through more inclusive and behavioural approaches [13].

3.4 Health

Urban design and sewage infrastructure significantly impact the health of people living near sewage lines. Studies have shown that proximity to sewage treatment works and exposure to sewage can have negative effects on public health and well-being.

Living close to odor-emitting sewage treatment works (STWs) is negatively correlated with life satisfaction, suggesting that people would be willing to forgo part of their income in exchange for reductions in odor [14]. This implies a potential negative impact on quality of life for those residing near sewage infrastructure. Furthermore, exposure to fecal contamination from low-quality sanitation infrastructure and inadequate maintenance can lead to an increased incidence of diarrhea in children under five, with a relative increase of 30% in probability when sewage is present within property boundaries[15] Interestingly, non-human actors such as rats, worms, and microbes play a role in urban wastewater management, performing labor in the urban wastewater economy through their natural processes [16]. This highlights the complex ecological interactions within urban sewage systems.

IIn conclusion, urban design must consider the health implications of sewage infrastructure placement and maintenance. Curating water-sensitive design approaches, such as rain gardens and green roofs, can help manage stormwater and water resources. These also provide recreational and aesthetic benefits [17]. Subsequently, implementing citywide inclusive sanitation (CWIS) approaches can address intertwined issues of public and environmental health [18]. These strategies can help fight the negative health impacts associated with proximity to sewage lines and improve overall urban well-being.

3.5 Community engagement

Community engagement, as achieved by urban design interventions and urban engineering in lower-class areas of India, is an opportunity as well as a challenge for sustainable urban development. The role of urban design in community engagement is significant, especially when urban regeneration is concerned. This has already been seen in the UK, as demonstrated by the case studies of Scotswood and Walker Riverside, where urban design has become an instrument for community participation in urban regeneration, thus avoiding the traditional master planning approach [18]. This is applicable to the lower-class areas of India, where community participation is vital for the creation of socially inclusive urban spaces.

Interestingly, the application of community engagement strategies may differ considerably from one socio-economic area to another in the same city or town. For instance, a study on Greater Sydney found that community inputs on planning matters were suppressed in socio-economically disadvantaged areas, but concessions were given to disadvantaged areas [19]. This underlines the necessity of fair community engagement practices in all urban areas, irrespective of their socio-economic status.

In the case of the Indian subcontinent, a case study of Mumbai illustrates the potential of community-based approaches to urban health and social conditions. Though the case study focuses on sexual health, it represents the need to deal with marital relationships and gender equity through urban development strategies [20]. Similarly, the Deepor Beel Wetland Conservation project of the city of Guwahati, India, highlights the importance of community participation through bio-rights possibilities and the development of eco-parks [21], which may be tailored to address the needs of the people of the city while promoting overall urban improvement in the lower-class areas of India.

In conclusion, effective community engagement through urban design and engineering in lower-class areas of India requires a multifaceted approach. It should involve transparent processes enabling dialogue between participants, as highlighted in community operational research [22].

4. Method

This research adopts a qualitative approach to explore the relationship between urban design interventions and behavioural changes in public spaces. The study used a mixed-methods approach comprising detailed observation and interviews with secondary data analysis from literature study.

4.1 Research Questions

4.1.1. Question: What behavioural changes have you observed in the lower-income areas (e.g., Sudham Nagar and Kalasipalyam) compared to higher-income areas (e.g., Koramangala)?

Interviewee: Male- project contractor

Response:

- In Sudha Nagar and Kalasipalyam, people have developed a sense of ownership of the area. They water the plants in the park and actively maintain the space.
- In Koramangala, residents have not yet formed a similar attachment and remain distant from the drain.

Inference:

Urban design interventions have successfully fostered a sense of community stewardship in lower-income areas, likely due to increased accessibility and the transformation of the space into a resource. However, higher-income areas may require additional engagement to encourage similar behavioral changes.

4.1.2 Question: Do you feel safer walking near the K100 waterway at night compared to before the project?

Interviewee: Male- resident (Kalasipalyam)

Response:

- Yes, the space feels much safer now. Activities like theft and other crimes that used to occur have stopped.
- The addition of streetlights and the continuous presence of people have made the area secure.

Inference:

Improved lighting and increased foot traffic, as part of the design intervention, have contributed to a significant reduction in crime and enhanced perceived safety.

4.1.3 Question: How do you feel about using the drain area before and after the redevelopment?

Interviewee: Male - textile shop owner (Sudha Nagar)

Response:

- Before, I avoided this road, even though it was a shortcut, because it used to stink and was unpleasant.
- Now, I don't mind taking this route; the area has changed drastically, and it is much cleaner and pleasant.

Inference:
The elimination of foul smells and the cleaning of the drain have not only improved comfort but also changed the way people navigate and use the space, turning it into an accepted part of their daily commute.

4.1.4 Question: How has this project impacted you and your family's activities?
Interviewee: Female resident (Sudha Nagar)
Response:

- My children love playing here; they spend more time outside now.
- I feel safer letting them play here because there are always people around, and the area is well-maintained.

Inference:
The transformation of the space into a family-friendly area has promoted outdoor activities and social interaction, particularly for children. This reflects how urban design can improve the quality of life and foster a stronger sense of safety and community.

4.1.5 Question: Has the project impacted the local economy or businesses?
interviewee: male - steel shop owner - (Sudham Nagar)

- Yes, businesses have started to thrive due to the increase in foot traffic. The property values have tripled, and new shops and stalls are coming up.

Inference:
Urban design interventions can stimulate local economies by attracting more visitors and creating a cleaner, more desirable environment for businesses.

4.1.6 Question: What additional improvements would you like to see?
interviewee - Group Females near Shantinagar bus stand

- More greenery and shaded areas would make the space even better. There could also be more seating areas for elderly people.

Inference:
While the project has been largely successful, there is potential for further enhancement, especially in terms of comfort and inclusivity.

5. Finding and Behavioural changes observed

In order to comprehend the effect of the K100 waterway project on the local community, interviews were carried out with different types of people, such as locals, shopkeepers, and professionals associated with the project. This section of the essay will highlight the insights obtained from the interviewees, who comprised four males and five females, to enlighten the reader on the behavioral changes observed among different types of people.

5.1 Community Engagement and Ownership

One of the project contractors mentioned that in areas like Kalasipalyam and Sudhama Nagar, residents have developed a strong sense of ownership over the redeveloped K100 waterway. Some people have actively taken responsibility to maintain the space by watering the plants in the park and ensuring that the stormwater drain remains clean. In contrast, a local resident from the wealthier Koramangala region expressed his disdain over how the residents in these areas have yet to adopt a similar sense of ownership. Their neglect of the drain alludes to how socioeconomic variables play a role in creating disparities in community engagement. The stretch opposite the Shantinagar Bus Stands is now used by people as an extended waiting area. With the addition of the bridges connecting the sides of the drain, community eng-

agement has also followed the ease of commuting.

5.2 Security

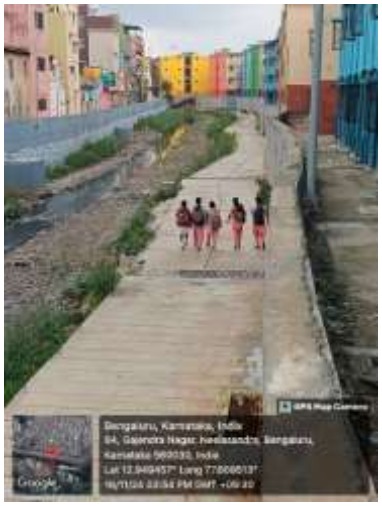
The architects highlighted how strategically lowering the drain walls and improving sightlines contributed to enhanced security, aligning with Clara Greed and Marion Roberts' argument on urban design fostering public safety through increased visibility.

Locals and architects alike have pointed out the fact that the integration of sufficient lighting and the presence of the community have helped to curb anti-social behavior, especially during the night. This has helped to transform the area to make it a much safer and welcoming space for individuals, especially females and children.

A textile shop owner in Sudhama Nagar commented on the fact that he used to avoid roads parallel to the drain even if it was the faster route to his shop before the K100 redevelopment. However, after the redevelopment, there was a notable improvement in the area, with property values around the drain tripling.

Another woman commented on the fact that the area made her feel much safer after the redevelopment. She noted the fact that the presence of people and the lighting had helped to eliminate the feelings of unease that previously characterized the area due to poor maintenance and safety concerns.

People waiting near the shantinagar bus stand



Drain becomes a walking path for school children

Kids using the place to play
source: Rajaguru vishwakarma marulachary - director of nakshatech

5.3 Health

The redevelopment of the K100 waterway played a vital role in the upkeep of the health and hygiene of the neighbouring areas. The quandary of the vegetable vendors about the accumulating mosquitos, had now come to a relief. Previously, the drain emitted a strong nauseating smell, creating a dreadful environment which likely contributed to several respiratory and other health issues amongst the residents. Locals also strongly claimed that the poor sanitation of the area had a direct impact on their well-being. However, the project's execution showed a remarkable elimination of stench and founded a sanitary neighbourhood. Although, proportional health improvements are not emphasized due to limited health awareness, statistics show that the eradication of harmful pollutants with improved environment quality reduced health risks significantly. This project has greatly transformed the lives of people living in the vicinity of the waterway paving the way into a sanitary and inhabitable environment. This outcome highlights the benefits of urban design interventions to human health, even when the community may not be readily aware of it.

5.4 Health

"Formerly, we never visited here post bright hours. Now with the lights and activity, we feel much safer." a women expressed. The redevelopment of the K100 waterway has significantly enhanced the comfort levels for residents and visitors alike. Previously, the area was marked by foul odours, dark and unsafe spots, and an overall sense of neglect, making it an uncomfortable and unwelcoming space. Post redevelopment, the installation of adequate lighting has not only improved visibility during nighttime but also eliminated opportunities for illicit activities, making the area feel much safer. Women, in particular, reported feeling more comfortable and secure due to the increased presence of people at all hours. Additionally, the landscaping and greenery along the walkway have transformed the space into a more pleasant environment, inviting people to linger and use the area for leisure and commuting. This transformation has also encouraged children from lower-income families to use the space regularly, including as a safer, more comfortable route to school. These interventions and restructuring collectively prove the advancements of urban design in curating a more accessible and comfortable space for people.

Ultimately, as a by-product of this development economic growth has also seen a threefold rise with increasing property values. Additionally, opportunities for new businesses and a foreseeable vibrant community have restored faith in locals. In an interview with the mod foundation, a steel shop owner expressed his remorse of losing customers over the insanitary drain conditions.

5.5 Economic Impact

The redevelopment has driven economic growth by increasing property values, with some areas witnessing a threefold rise. Locals foresee opportunities for new businesses, further contributing to the vibrancy of the area. A steel shop owner told the mod foundation interviewer that customer was very resistant to come to their shop because the drain.

Before
source: Indiandude0207, reddit

After
source: Author

6. Conclusion

The critiques cumulated bring light to the profound impact restructuring with urban design has on behavioural change within a community. Observing design modifications, influence on daily routine, perceptions, and interactions amongst residents were some of the fundamental objectives of this study. The transition of an underutilized and unsafe space into a dynamic and inclusive public area, powered by security, comfort and community engagement is addressed by the redevelopment of the K100 waterway. For instance, keeping women and child safety in mind lighting and landscaping was a calculated measure. Not only did well-lit pathways bring a sense of liveliness and safety amongst residents, but also forbid illicit activities that the dark street was prone to earlier. Women now stroll the streets more confidently and children are frequently seen accessing the sideway as a route to school evidently spotlighting how urban design can alter patterns of movement and access. The success of these interventions is visible in the spirit of ownership, now held by people of Kalasipalyam and Sudha Nagar. Behavioural shift toward stewardship and united responsibility is crystal clear as community members actively maintain the greenery and take pride in their environment. Conversely, the contrasting opinions of the residing people of Koramangala, where a sense of ownership is lacking, emphasize the undeniable action for impact and the need for ongoing community engagement efforts. This project has greatly transformed the lives of people living in the vicinity of the waterway paving the way into a sanitary, inhabitable environment and

showed a remarkable elimination of stench. While few health impacts remain anecdotal due to limited awareness amongst residents, the reduction in environmental stressors, such as foul smell and insanitary conditions, is undeniably a step forward in enhancing the quality of life. These observations circle back to core aim of this research: to analyse how urban design interventions can drive behavioural change. The redevelopment of the K100 highlights the benefits of urban design interventions to human health when focused on security, comfort, and community engagement. It can revitalize neglected spaces, curate social interaction, and encourage positive behavioural transformations across diverse communities.

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