

A Framework for Revitalizing The Existing Streets As Biophilic Streets – A Case Study of Campus Road, Mysuru

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Abstract:

This research paper presents a comprehensive framework for revitalizing existing urban streets through the lens of biophilic design principles, with a specific focus on the case study of Campus Road in Mysuru. As cities expand and density increases, there is a growing recognition of the need to integrate nature into urban spaces for sustainability and resilience. The study delves into the concept of biophilic streets, emphasizing the incorporation of natural elements into the construction and design of urban roadways. Through an in-depth analysis of Campus Road in Mysuru, the paper explores practical strategies and interventions to transform traditional streets into biophilic corridors. The research aims to contribute valuable insights and guidelines for urban planners and designers seeking to enhance the resilience and livability of existing urban streets through the principles of biophilic urbanism.

Keywords: Biophilic street, Biophilic design, Resilient cities, Biophilic elements, Revitalization of existing streets.

I. INTRODUCTION:

The concept of biophilic urbanism draws inspiration from biophilia, the innate human tendency to seek a connection with nature. It proposes a holistic approach to urban development that goes beyond conventional design principles, aiming to create cities that not only accommodate human needs but also enhance the overall quality of life by incorporating natural elements. Biophilic urbanism emphasizes the infusion of greenery, natural light, and biodiversity into the urban landscape. It seeks to transform concrete jungles into environments that offer sensory experiences, promote mental well-being, and mitigate the environmental impact of urbanization. From green rooftops to urban parks, biophilic urbanism envisions a diverse range of strategies to reintroduce nature into the urban realm. Biophilic urbanism is an effective method of supporting the growth of nature in cities in such a manner that it improves the relationship between humans and nature. Streets have

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historically served as the core of urban public life, according to Wilson EO in *Biophilia*, Cambridge: Harvard University Press, 1984

II. URBAN STREET CONTEXT AND NARRATIVES:

The urban street, beyond its utilitarian function as a conduit for vehicular and pedestrian movement, serves as a dynamic stage where the city's narratives unfold. Woven into the very fabric of the urban context, streets encapsulate the stories of a community, reflecting its history, culture, and societal evolution. Each street possesses a unique character, shaped by the architectural styles of its buildings, the vibrancy of its businesses, and the diversity of its inhabitants. From bustling commercial avenues to quiet residential lanes, the urban street becomes a canvas upon which the city paints its tales of resilience, innovation, and collective identity. Moreover, streets are not mere conduits of physical transit but intricate social spaces, fostering interactions and connections that define the essence of urban life. The narratives embedded in urban streets tell tales of shared experiences, community celebrations, and even the struggles of a neighbourhood. Understanding the rich tapestry of urban

street context and narratives is essential for architects, urban planners, and citizens alike, as it unveils the layers of meaning woven into the very asphalt and cobblestones beneath our feet.

Designers and planners have designed and constructed regulation frameworks for roadways to allow for efficiency, security, and, most importantly, the quick conveyance of public and private traffic. However, the twentieth-century modernist trend, which saw the increase of vehicle reliance, established tight laws centered on efficiency and traffic management, which directly led to the separation of nature from urban ecologies, bioregions, and climatic dynamics. [1]. The establishment of dense networks of freeways and highways erected barriers that fractured and isolated both the remaining urban natural spaces and the social neighbourhoods they traversed, disrupting their social cohesion. These repercussions were integrated into the design frameworks of traffic engineers. Jane Jacobs challenged these systems that favoured private mobility above all other street activities. She emphasized the diverse social networks inherent in vibrant urban streets, which constitute the very fabric of a city. [2,3]. These social networks emerge when the layout and amenities of a street actively promote interaction and walkability. The existence of such social networks provides a conducive environment for the flourishing of small enterprises. Consequently, Jacobs developed a theoretical framework that effectively illustrates the significance of streets to a city's economy. [4,5].

This has since developed into a strong plea for dense urbanism and street fabric to be seen as essential components of how cities create wealth and opportunity [6,7,8,9].

Jan Gehl and other urban designers voiced criticism against modernist planning ideologies for disregarding the value of historic streets, allowing the unbridled intrusion of cars into every available urban space [10,11]. Gehl formulated a novel paradigm for planning streets that facilitates close connections between people. This approach not only enables numerous economic and social benefits but also mitigates the environmental impact of vehicular activities. [12,13]. Gehl's framework for urban planners, landscape architects, and architects underscores the importance of incorporating walkability, active street frontages, and street furniture into city policies[12]. This emphasis aims to guarantee that streets are inviting spaces seamlessly integrated into the rhythm of daily activities.

III. THE TERM BIOPHILIA:

The term "biophilia", coined by renowned biologist Edward O. Wilson, encapsulates the intrinsic and instinctive bond between humans and the natural world. Rooted in the concept of biophilia is the idea that, as a species, humans possess an inherent affinity for nature and other living beings. This innate connection has evolved over millennia as a result of our historical dependence on natural environments for survival. Biophilia goes beyond a mere appreciation for greenery; it encompasses the profound emotional, psychological, and physical benefits derived from interactions with nature. In contemporary contexts, the term has been particularly influential in fields such as architecture, urban planning, and design, inspiring a shift towards creating environments that embrace and integrate natural elements. Recognizing and fostering biophilia in various aspects of human life has the potential to enhance well-being, promote environmental stewardship, and contribute to the creation of more sustainable and harmonious living spaces.

IV. THE CONCEPT OF BIOPHILIC DESIGN:

Biophilic design is a design approach that seeks to incorporate and integrate elements of nature into the built environment, recognizing the inherent human need for a connection with the natural world. Rooted in the concept of biophilia, this design philosophy aims to enhance well-being, foster a sense of place, and promote sustainability by creating environments that mimic or evoke nature.

In biophilic design, architects and designers consider various elements, such as natural light, vegetation, water features, and natural materials, to create spaces that engage the human senses and evoke a connection to the outdoors. This approach extends beyond aesthetics to address the psychological and physiological benefits associated with interacting with nature, including stress reduction, improved cognitive function, and increased overall happiness.

Biophilic design can manifest in various ways, from incorporating indoor plants and green walls to maximizing views of nature, utilizing natural materials, and creating spaces that mimic natural patterns and shapes. Whether in homes, offices, or public spaces, the goal is to create environments that support human well-being, productivity, and sustainability while fostering a deeper connection between people and the natural world.

A. Significance of biophilic elements in the process of making a resilient city

The incorporation of biophilic elements in urban planning plays a crucial role in fostering resilience within a city. Resilience refers to a city's ability to adapt and recover from various shocks and stresses, such as climate change, natural disasters, and social challenges. Integrating biophilic elements enhances resilience in several key ways: Health and Well-being, Climate Mitigation and Adaptation, Biodiversity and Ecosystem Services, Community Connectivity, Resource Efficiency, Aesthetic and Psychological Resilience. A resilient city can analyse, plan, and act to prepare for and respond to all foreseeable and unforeseen hazards. According to Campanella and Godschalk,

2011, a resilient city can be defined as a city, which is greater than the sum of its structures, but which may only be as resilient as its populace.

B. The core of biophilic city:

The core of a biophilic city revolves around creating an urban environment that harmoniously coexists with nature, recognizing the reciprocal relationship between the health of the natural world and the well-being of its inhabitants. Biophilic streets represent a transformative approach to urban design that prioritizes the integration of natural elements into the fabric of city roadways. These streets are conceived with the intent of fostering a stronger connection between urban dwellers and the natural world, recognizing the numerous benefits that such interactions bring to both physical and mental well-being. The concept of biophilic streets involves incorporating green infrastructure, such as trees, plants, and other natural features, into the design and construction of roads. This not only enhances the aesthetic appeal of the urban landscape but also contributes to improved air quality, reduced heat island effects, and the promotion of biodiversity.

V. ELEMENTS AND CHARACTERISTICS OF BIOPHILIC STREET:

There are some elements that were created to organize the characteristics of a biophilic street. [14]. These elements are mobility, stormwater management, energy management, Infrastructure, street decor, activities, and vegetation. These components serve as the foundation for a biophilic street and take into account the following design objectives, design functions, and biophilic street characteristics: 2008; Newman P, Jennings I.

1. Mobility:

Mobility in biophilic street design emphasizes a holistic and sustainable approach to urban transportation, with a focus on enhancing the human experience, promoting eco-friendly modes of mobility, and integrating natural elements to create healthier and more vibrant urban environments. In biophilic street design, incorporating mobility elements can enhance the overall experience and contribute to the well-being of both pedestrians and the environment. Biophilic design aims to connect people with nature and create environments that support human health and well-being.

2. Storm water Management:

Stormwater management as an element in biophilic street design focuses on integrating nature-based solutions that not only effectively manage stormwater but also contribute to the overall sustainability, aesthetics, and ecological health of urban spaces. Stormwater management in biophilic street design involves incorporating nature-based solutions to effectively handle and mitigate the impacts of stormwater runoff. This approach not only addresses the practical aspects of water management but also contributes to the overall aesthetic and ecological quality of the urban environment.

3. Energy Management:

Energy management in biophilic street design emphasizes sustainable and efficient practices to reduce energy consumption, harness renewable sources, and create urban environments that are not only visually appealing but also contribute positively to the well-being of the community and the surrounding ecosystem. Energy management in biophilic street design involves the integration of sustainable and energy-efficient solutions to reduce environmental impact and enhance the overall quality of urban spaces. This approach aims to minimize energy consumption, promote renewable energy sources, and create a harmonious relationship between the built environment and nature.

4. Furniture:

Furniture in biophilic street design goes beyond mere functionality; it becomes an integral part of creating a harmonious and nature-inspired environment. By incorporating natural materials, comfortable seating, greenery, and community engagement, street furniture becomes a key element in fostering a deeper connection between people and the natural world within urban settings. Furniture as an element in biophilic street design plays a crucial role in creating comfortable, inviting, and nature-inspired public spaces. Biophilic design principles aim to reconnect people with nature, and incorporating thoughtful street furniture enhances the overall experience of urban environments.

5. Activities:

Activities in biophilic street design contribute to a lively and engaging urban experience by fostering connections between residents, promoting health and well-being, and celebrating the beauty of nature within the built environment.

environment. In biophilic street design, incorporating diverse and nature-inspired activities is crucial for creating vibrant, engaging, and community-oriented urban spaces. The integration of activities contributes to the overall well-being of residents, fosters social interactions, and strengthens the connection between people and the natural environment.

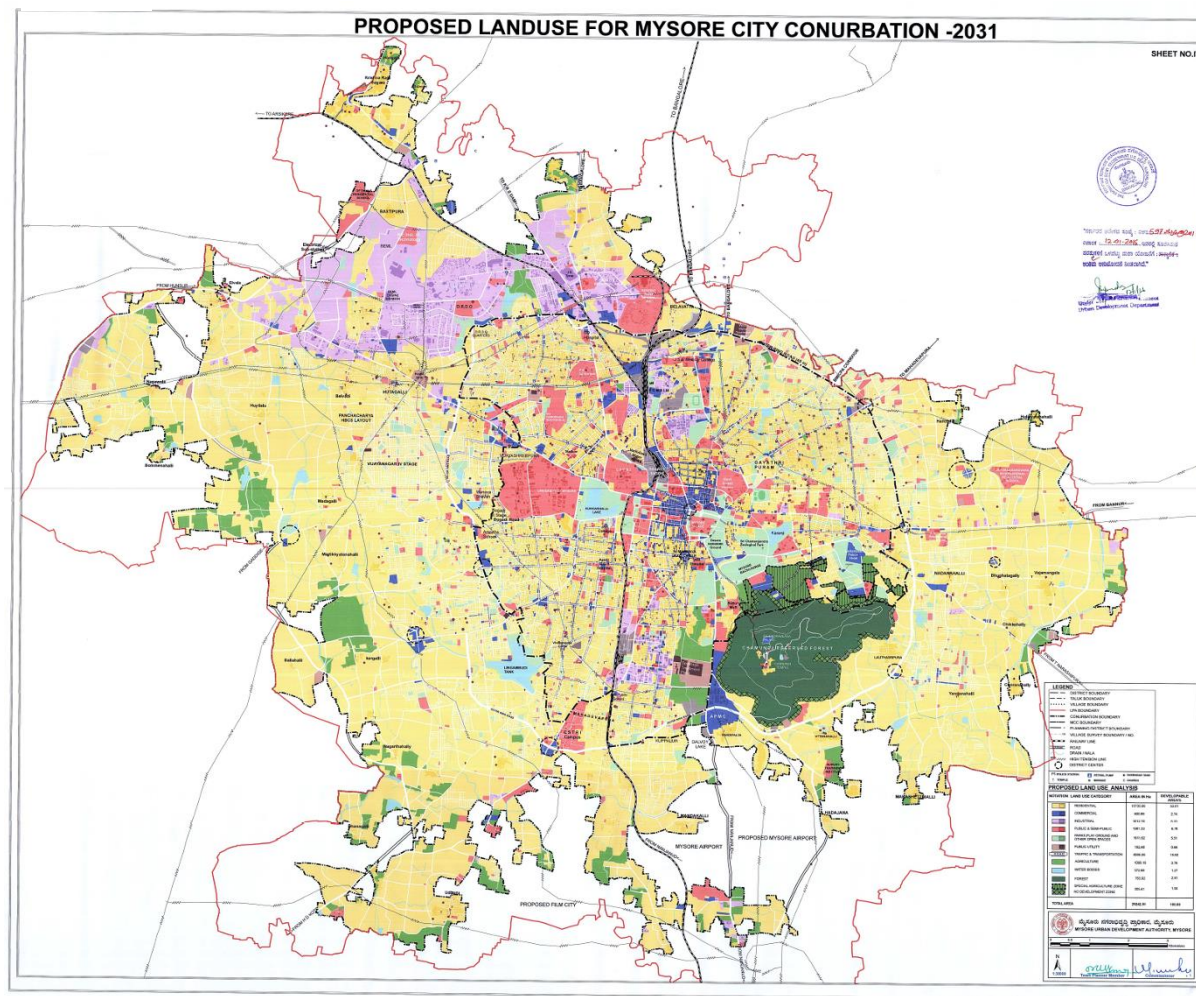
6. Vegetation:

Vegetation in biophilic street design goes beyond mere landscaping; it becomes an integral part of creating resilient, sustainable, and livable urban spaces. By strategically incorporating green elements, biophilic street design promotes the well-being of residents, supports local ecosystems, and fosters a sense of harmony between the built environment and the natural world. Vegetation is a fundamental element in biophilic street design, serving as a cornerstone for creating healthy, sustainable, and aesthetically pleasing urban environments. The strategic incorporation of vegetation enhances the connection between people and nature, contributing to improved well-being and overall urban resilience.

VI. BACKGROUND OF STUDY AREA

Mysore city is the most tourism magnetism palace city and the second-largest city in the state of Karnataka. Mysore has located 135 km from Bangalore, the state capital. It is the headquarters of the Mysore district and the Mysore division and lies about 146 km (91 mi) southwest of Bangalore, the capital of the state. The city is spread across an area of 128.42 sq.km (50 sq mi) and is situated at the base of the Chamundi Hills. Mysore city is located at 76°39'E and 76°42'E longitude and 12°18'N and 12°30'N latitude and has an average altitude of 770 meters (2,526 ft). It is located in the southern region of the state of Karnataka. Mysore city has 65 wards and the total population is 8,85,416 (census of India, 2011). The current estimated population is 12,29,000 .

Fig 1.1



Source: <https://www.mudamysore.gov.in/master-plan>

Fig 1.2

Study area:

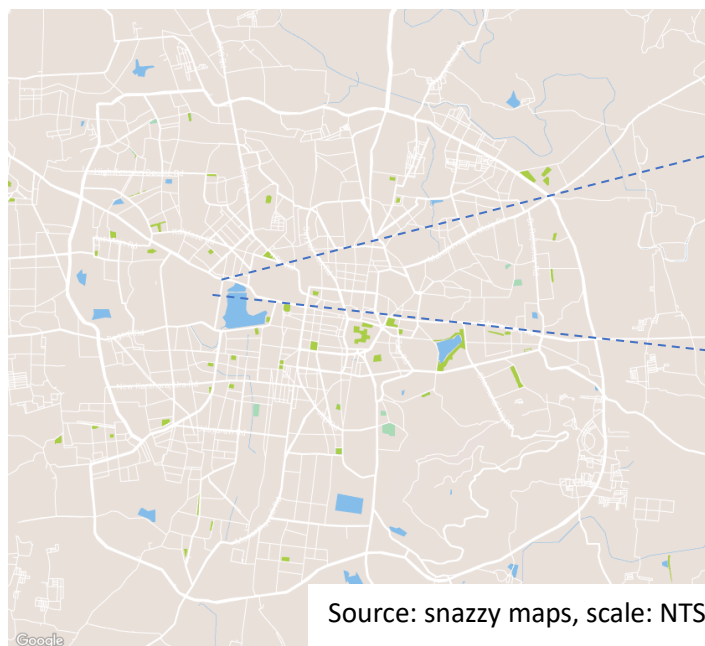


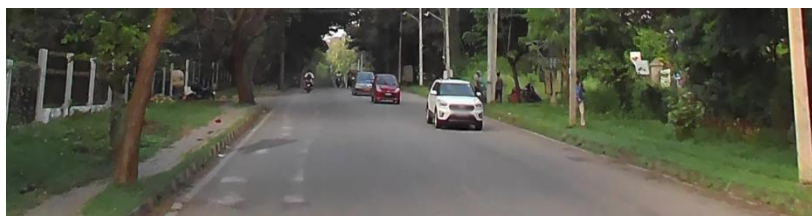
Fig 1.3



The road considered is the campus road , located adjacent to the kukkarahalli lake.
 It is 1.13km in length

CAMPUS ROAD STREET STUDY:

The street considered for the study is the campus road, which is located adjacent to the **kukkarahalli lake** – The lake is located in the heart of the Mysore city, adjoins the Manasgangotri (University of Mysore), the Kalamandir (Rangyana) and the Central Food Technological Research Institute (CFTRI) campus (separated by the Hunsur Road). It provides lung-space to the city. Mummadi Krishnaraja Wodeyar, (1794–1868) of the Mysore Dynasty (Kingdom of Mysore) was responsible for getting the lake created, in the year 1864, to provide water for irrigation to about 4,000 hectares (9,900 acres) of land outside the city. The Lake also used to be a source of water supply to the city .There is a 4.5 km walkway on the periphery of the lake with shaded stone benches for visitors to sit, relax and enjoy the scenic serenity of the lake. The street is adjoining a green lush vegetation and Kukkarahalli lake on the right side. Due to the presence of trees and the lake, it creates a micro climate, as we enter, the street gives an instant cool breeze, a green ambience .The **University of Mysore** is a public state university in Mysore, Karnataka, India. The university was founded during the reign of Krishnaraja Wodeyar IV, the Maharaja of Mysore. It opened on 27 July 1916. Its first chancellor was the Maharaja of Mysore; the first Vice-Chancellor was H. V. Nanjundaiah. The university became the first outside of the British administration in India, the sixth in India as a whole, and the first in Karnataka. It is a state university of the affiliating type, and became autonomous on 3 March 1956, when it gained recognition from the University Grants Commission[13].





EXISTISING ROAD

Elements of a Biophilic street	Existing characters	Implementation
1. Mobility	Footpath on either side for Pedestrian access with less to no maintained space No bike and car parking No dedicated cycle track	Addition of a dedicated cycle track Pedestrian pathways to be maintained well.
2. Stormwater management	Pavement blocks with adjacent green patch which help in water percolation	Rainwater infiltration should be facilitated by permeable paving. Biofiltration of water using plants, recycling and using the water.
3. Energy management	There is microclimate of the street is observed to have a reduction in the temperature, it is much cooler than the surrounding macro climate. It is due to the presence of vegetation and a water body.	The vegetation to act as a green wall and provides an insulation. Landscaping helps to control air temperature.
4. Furniture	There are no fixed or movable furnitures observed.	Providing furnitures to make the pedestrian experience better. Street furnitures creates a space for people to gather and communicate.
5. Activities	There is no commercial spaces or any dedicated space allotted for any activity or gatherings	Providing space for some activities , gathering spaces or shop frontages for people to engage which inturn promotes the community life.
6. Vegetation	The vegetation is very random, not in a planned way, lots of weeds and grass. Maintainance is low	All seasonal plants and trees should be planted, Proper maintainence and regular pruning to make it aesthetically pleasing year long.



Source: Author

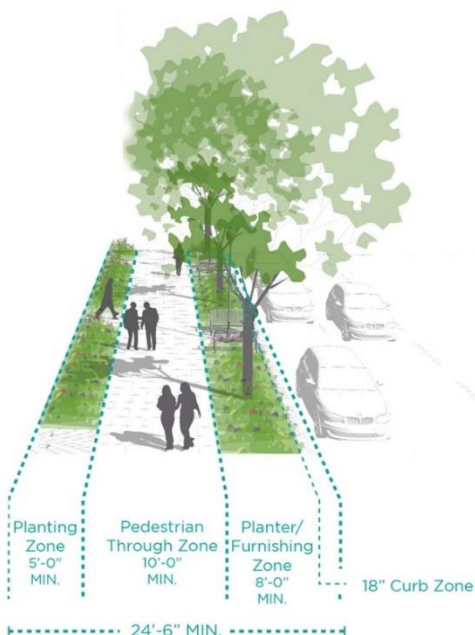
Description of the Design proposal:

1. Adding Green walls , The trees act as a screen buffering the street with the buildings.
2. Street lamps added to make the space more safe and comfortable for the pedestrians also encourages people to use the street furniture in the evenings.
3. Addition of street furniture encourages gatherings, it makes the pedestrian experience better. It provides a space for people to gather and communicate.
4. Adding landscape next to the curb or a planter creates a buffer between the pedestrian and the vehicle zone.
5. Addition of cycling track to encourage bicycle users. Demarcation and zoning provides a safe cycling experience.

This model proposal can be implemented to many streets of Mysuru, few of which includes

- Campus road
- Temple road
- Kanthraj urs road
- Sarvjanika hostel road
- Mananthavadi road

Public private partnership model can be adopted for the redesigning the streets.



Source: Habitat corridor Rhodeside harwell



Source: Sidewalk zones_NACTO

Public private partnership

Public-private partnership (PPP, 3P, or P3) is a long-term arrangement between a government and private sector institutions. Typically, it involves private capital financing government projects and services up-front, and then drawing revenues from taxpayers and/or users for profit over the course of the PPP contract.

Example of one such example in Mysuru is Developing a Public Bicycle Sharing Scheme in Mysore on PPP Basis. (sources: <https://idd.karnataka.gov.in>)

The term Public Bicycle Sharing (PBS) System describes a network of bicycles distributed across an urban area, available for public access from docking stations. Public bicycles can be picked up at any station and returned to any other station in the network area, making them appropriate for point A to point B travel. PBS is designed to encourage short utilitarian trips and for encouraging the use of environment-friendly, cheaper and convenient travel techniques compared to motorized transportation. At the same time, PBS can also be targeted at tourists and leisurely bicycle trips.

VII. CONCLUSION:

This paper has suggested that by transforming urban streets of Mysuru into biophilic streets And the implementations on the study area can act as a basic prototype in transforming urban streets of Mysuru, it is possible to add an extra dimension to biophilic urbanism. The biophilic street concept integrates the ideas advocated by Jane Jacobs and Jan Gehl who have demonstrated that people-oriented streets contribute to a community’s economic and social enhancement by integrating environmental approaches into the functional design of streets.

Future research is needed to monitor and quantify the performance of biophilic streets in addressing the adverse effects of climate change, environmental degradation and biodiversity loss; as well as how it can be cost-effective.

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