USING UNDERUTILIZED SPACES TO INCREASE URBAN VIBRANCY IN NEHRU PLACE

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Abstract - Vibrancy refers to the liveliness of a place,vibrancy is an important component for making sustainable cities. High vibrancy helps build connections between the residents and their environment.Vibrant areas usually found in a diverse and dense setting areas that are self supporting. Increased diversity and density are positively related to urban vibrancy. Underutilized spaces refer to those spaces that are not being used to the full potential, these spaces are all around us but are often neglected.These spaces can be used to inject new programs to create a mixed land use.The paper revolves around measures to improve vibrancy by programming the existing underutilized spaces. This approach helps densify the city center and slows urban sprawl.

Keywords - Built environment, Mixed use, Nehru place, Underutilized spaces, Urban vibrancy

I. INTRODUCTION

1.1 Urban vibrancy

The concept of urban vibrancy was first brought into the discussion by (Row & Jacobs, 1962) when she appealed that the cities should be lively because at that time modernist architects were building highly functional and monotonous buildings. The subjective feeling in a built environment was not being considered. Recently, (Gehl, 2010) has explored the effects of safer and vibrant streets. According to (C. Wu et al., 2018) as cited in (Barreca et al., 2020), urban vibrancy refers to liveliness of a place which is defined by attractiveness, diversity and accessibility.According to (Yue et al., 2017) urban vibrancy is defined by the intensity of the activities taking place.Vibrancy deals with the emotions of the residents; vibrancy can build connections and increase interactions in a community. Vibrancy is a subjective topic but it has real effects; in city centre urban vibrancy is linked with house prices, increased urban vibrancy results in a higher multiplier on the price of the land or the house(Barreca et al., 2020).Earlier, the concept of vibrancy was judged in a qualitative way but with technological progress vibrancy can be quantified.(Yue et al., 2017) used big data to measure neighbourhood vibrancy to find the effects of mixed land use on vibrancy. Huge sets of data are available from GIS, websites and phone data which provides a holistic view rather than field interviews which are time consuming and cover a small group of people(Tu et al., 2020).

1.2 Urban sprawl

Urban sprawl is defined as spatial growth of the cities to primarily provide people with housing which leads to loss of cultivable land and other problems(Brueckner, 2000). In this spatial growth of cities, high cultivatable land or forest are turned into urban areas which in turn lead to loss of habitat and biodiversity. These cities have separate zoning areas, for example malls are built on huge plot of land and because the residents have to drive to a place, parking lots take up a huge amount of space which is unused most of the time. The high number of cars lead to traffic congestion and air pollution(Brueckner, 2000). A sprawled city promotes people to buy land outside the city which can cause the residents of the city to move out in search of better and bigger house; this is the cause of urban decay where the buildings in the city center become dilapidated and this overtime reduces the price in that area.

1.3 Dense cities

Dense citiesare the opposite of urban sprawl, dense citiesare designed for a mixed land use which makes a more walkable city because all the necessities are located in close vicinity which promotes social interaction(Neuman, 2005). Basically, our environment should be devoid of monotony in terms of both architecture and culture. A mixed and heterogeneous environment consisting of people from different backgrounds combined with a mixture of different densities of development results in a dynamic city(Petković-Grozdanović et al., 2016).

A mixed land use that combines residential, commercial, and other land uses is beneficial for neighbourhood vibrancy(Montgomery, 1998). Mixed land use is aimed at increasing the intensity, diversity of the land while reducing segregation(Grant, 2002). Mixing different functions can reduce the travel distances which promotes walking and cycling, this increases the intensity of activities taking place in an urban setting. This assumption has been reinforced by (Yue et al., 2017) that heterogeneity is necessary to create a lively environment for the residents.

1.4 Factors influencing urban vibrancy

1.4.1 Relationship of vibrancy and built environment

(Tu et al., 2020) cited various researches that suggested at a relationship between built environment and vibrancy.Our cities are like an ecosystem and all elementsareinterconnected to each other; numerous researches have pointed out that elements of the built environment like roads, metros and buildings

influence urban vibrancy(De Nadai et al., 2016; Huang et al., 2020). For example, (Gehl, 2010) suggested that people are more likely to walk in a small block with multiple shops that have a rich façade. (Barreca et al., 2020) points out five important components of built environment that are shops, cultural buildings, transport services, green areas and healthcare. The consequences of a change in built environment results in a change in the density which affects the liveliness. A research conducted by (Huang et al., 2020) found out that increasing building footprint positively correlated with vibrancy.

1.4.2 Relationship of density and vibrancy

According to (Lu et al., 2019) as cited in (Barreca et al., 2020), an increase in density correlated with increased neighborhood vibrancy. Density in sprawled cities is low which makes them more susceptible to creation of low vibrancy areas because people are less likely to encounter other people.High-density setting will increase vibrancy because presence of a diverse set of functions creates more opportunities for interaction(J. Wu et al., 2018).Fictional densities are also detrimental to the city and a balance needs to be maintained while considering density.

1.4.3 Relation of mixed use and vibrancy

Plenty of contradicting literature have been found about the relationship of mixed use and vibrancy.(Jacobs-Crisioni et al., 2014) found a positive correlation between mixed land use and vibrancy whereas (Tu et al., 2020)deduced the opposite. The reason is that (Tu et al., 2020) used Shannon Entropy which is the most common approach to quantify mixed land use.Shannon Entropy isuncomprehensive and misleading, Hill numbers is a multifaceted approach to depict the diversity by adding up Richness, Simpson, Entropy (Yue et al., 2017). Point of Interest (POI) refers to the primary data which is collected from the navigation databases that helps to quantify the land use. Richness (POI), Simpson (POI), Entropy (POI) measures the richness, concentration and orderliness of the POI,Hill numbers showed a positive correlation between mixed land use and vibrancy(Yue et al., 2017).

1.5 Underutilized spaces

Underutilized spaces largely refers to the lack or absence of activity, usually these are vacant lots, parking lots, wedges which have the capability to accommodate more functions(Ukil, 2017). When cities sprawl quickly, it leads to creation of underutilized spaces.(Jonas & Rahmann, 2015) links underutilized spaces with ephemerality which means that the full potential of the space is yet to be achieved. The main reason is that these spaces are overlooked and are considered worthless. Underutilized spaces are residual spaces thatare not being used to the full potential. Utilizing these spaces can increase diversity of a neighbourhood. Land is an indispensable commodity that should be used more efficiently(Villagomez, 2010).

It is beneficial to use underutilized spaces to provide housing and other facilities because people prefer to live near the city center. Firstly, this approach would be cheaper as compared to building a new settlement because the city center has an existing infrastructure network. Secondly, the areas with more vacant plots of land experience a higher crime rate and using the underutilized spaces can increase the density (Humphrey et al., 2020).

1.5.1 Types of Underutilized spaces

The spaces can be differentiated on the basis of location, size and shape, the scale of these spaces differs widely. There are eight different types of underutilized spaces, they are void spaces, spaces below, spaces around, spaces between buildings, rooftops, wedges, oversized infrastructure and redundant infrastructure(Villagomez, 2010).

i. Spaces between buildings refers to residual spaces in between two buildings which have proliferated because of obsolete functionality such as service entries.
ii. Wedges refers to the irregular shaped that are created when grids form an acute angle. These spaces are neglected by developers because acute angle creates negative spaces.
iii. Spaces below are theneglected spacesbelow highways and elevated metro, rail lines are not used to the full potential and are usually used for parking.
iv. Oversized infrastructure refersto the oversized residual spaces which exist because of overestimation of traffic, this leads to abundant amount of space which is occasionally used by cars.
v. Rooftops are the most abundant residual space. Rooftops are present in both high density and low density. They are often overlooked but, in a time, when physical spaces are such an expensive commodity it is important to utilize all spaces.
vi. Redundant Infrastructure refers to spaces that have fallen out of use because of a change in functionality. These usually exist in the part of the cities that have undergone radical transformation.
vii. Void spaces are created because of the dependence over automobiles in a sprawled setting, for example huge parking lots. These spaces are used for certain time period during the day.
viii. Spaces around buildings are often left unused because of a change in policies or poor policies to begin with. These spaces proliferate when planning is not done with holistic view and important factors are ignored.

1.6 About the site

Nehru place is located in the south of Delhiand the total area of the site is 0.52km^2.Nehru place is a

business center which consists of offices and retail shops and attracts 130,000 visitors daily(Gadepalli & Vaid, 2016). The area witnesses a sharp change in density according to the time of the day, during the day time it is a bustling commercial center; by the evening the plaza becomes emptyand attracts illegal and criminal activities(UTTIPEC, 2018). Nehru Place is unsafe at nightand especially unwelcoming to women(DelhiDevelopmentAuthority, 2014).Nehru Place is well connected to the city because New Delhi has robust transport services.The site can be accessed easily by using bus services, subway or with private vehicles.

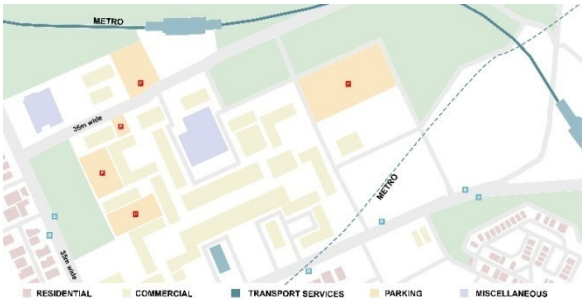


Figure1 – site plan

II. DISCUSSION

City center is more apt for the intervention than the outskirts because of the presence of existing infrastructure and economic opportunities.Land is too valuable not to be used to the full extent. By injecting different functions in underutilized spaces, a more vibrant mixed use area can be developed.Neighborhoods should be self sustaining with a diverse set of functions and an appropriate density. Researches about vibrancy points out that increasing population density and building density can help increase vibrancy in sprawled cities. Using underutilized spaces is subjective because it depends upon factors like density, demographic, urban context etc.

2.1 Urban vibrancy analysis

There are a number of variables that can affect the vibrancy of an area, these variables were taken from earlier research done by (Kim, 2020).

The tare area indicates the share of space that is unused or unavailable for people's activities in the block. Tare area amounts to 24% of the site, it is calculated by dividing tarearea with total area(Kim, 2020). Tare area is a negative variable which means a higher value of tare decreases vibrancy.

Street network density is defined by the length of roads in a given area. (length of interior networks + length of exterior networks/2/Total area).The value of network density is 4.36. The mesh refers to the average distance between roads in a block,2/4.36=0.45(2/Street Network Density). The size of the block of Manhattan is 80m x 274m, elongated blocks hinders the walkability of a city; the average value of mesh is 450m which is higher than most of the standards(Kim, 2020).The gamma index measuresthe maximum number of links that can happen between nodes(Rodrigue et al., 2019).A value of 1 refersto a well connected place, the gamma index of the site came out to be 0.46{number of links/3(number of nodes—2)}which means that the area is not well connected, this reinforces the hypothesis that more connections are needed at the Nehru Place(Rodrigue et al., 2019). The number of subway station entrances were counted and divided by the total area to express the density of subway station entrances which came out to be 13.4;(number of subway station entrances/total area). Thisrepresents the level of accessibility for the residents, betteraccessibility increases the travel distance and the ability to participate in activities.

Balance index is the ratio of the ground coverage of a particular function to the total ground coverage.A healthy balance between functionsis needed to create a vibrant environment.

Variable	Description	Unit	Value
Dependent variable			
Service population	Population of a given area	Number	14341
Urban variables			
Tare area	Unused areas	km^2/ km^2	0.24
Street network density	Density of street	km/ km^2	4.36
Mesh	Distance between roads	km/ km^2	0.45
Gamma Index	Connectivity between nodes	Number	0.46
Subway entrance density	The number of subway entrances in a given area	$Number/km^2$	13.4
Building Form			
Balance index	Ratio of commercial to total ground coverage	index	0.58
Balance index	Ratio of residential to total ground coverage	index	0.16

Table1-Statistics of variables

Nehru place has poor connectivity, unwalkable environment, contradicting balance indexes and high tare area; most of the variables are negative. Vibrancy is low when most of the buildings are of the same use, commercial buildings account for 58% of the buildings whereas residential buildings are only 16%.High concentration of commercial buildings and

low concentration of residential buildings leadsto significant changes in population during the day.

2.2 Proposal

CBDs are known to be unsafe at night which makes them less vibrant because of the singular zoning due to which the density decreases at night(Ratnayake, 2013). Introducing residential buildings and other supporting facilities will increase the density of the residents and will even out the balance index. The site has a few underutilized spaces which can be used to increase the diversity of the urban functions. Employment density of the site is high because of the abundance of commercial and retail functions.



Fig2: Underutilized spacesin Nehru place

Both the void spacesare currently being used as surface parking for the business center. The space above the parking can be used to provide social housing and the existing function can be accommodated on the ground floor or the basement in Figure-3. Housing will also increase the diversity of the area. Our environment feels safer when we are surrounded by people and density promotes vibrancy by encouraging interaction among people(Huang et al., 2020). Underprivileged people tend to prioritize location over the quality of the housing because they prefer to live closer to economic opportunities(Celhay& Gil, 2020). Currently, affordable housing is being provided on the outskirts which ends up segregating the society. Providing social housing near Nehru Place will result in an equitable distribution of housing in the city. Both of these sites can provide 150 lower income dwelling units.

The wedge space currently serves no purpose. This space is an opportunity to enrich the public life by providing a formal space for hawkers and building an enjoyable public space. According to (DelhiDevelopmentAuthority, 2014) there are 600 hawkers in Nehru place. A lack of commerce can reduce vibrancy(Barreca et al., 2020). Commercial activity is needed to attract people to the public realm, shops encourage people to leave their homes for non-work related activities.

Rooftops are useful because they are flexible and can be used for a plethora of purposes. The buildings functions as an IT hub and hosts a variety of shops. Community spaces are necessary to create a familiarity between the residents. A community is created when familiar people living in close vicinity. Rooftops are multifunctional spaces, activities like yoga, open air cinema can be held to strengthen the social ties. Leisure areas provide a space for residents to spend their free time(Barreca et al., 2020).

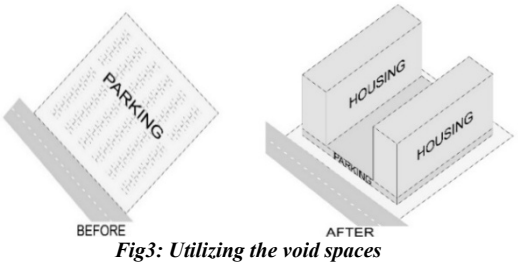


Fig3: Utilizing the void spaces

The plaza partially acts asredundant infrastructure. The plaza is occupied only from 9am to 8pm, rest of the time it is desolate and unsafe(DelhiDevelopmentAuthority;, 2014).Shopping for groceries is usually an early morning errand for Indians, this underutilized space can accommodate temporary grocery carts because groceries are sold on carts in India. The supporting facilities for housing are necessary to meet the day to day needs of the residents.

III. CONCLUSION

Humans are social animals since our existence humans had to hunt in group to stay alive. Humans were meant to stay in packs. For example, people feel unsafe walking on a dark and empty street but feel safe when walking through a crowded area. Our cities have been planned according to the functions but subjective factors have not been incorporated which is why loneliness is increasing among urban residents. Public spaces promote communication but they have not been prioritized.

Our cities have parcels of spaces which have not been efficiently used. These spaces can improve vibrancy. The two ways of improving vibrancy in sprawled cities are by increasing density and creating mixed use neighborhoods.The number of researches on vibrancy is low and contradicting results have been found in various researches. Nevertheless, vibrancy is a key factor in our lives which affects our happiness. Vibrant areas create a community and a better social atmosphere. Injecting new function into the existing urban fabric will lead to an equitable distribution of functions; poor people are pushed outside the city in search of a decent home. Adding new functions will maintain the density throughout the day, neighborhoods lack meeting spaces. In India, streets were the places where social gathering took place now those spaces have been taken over by automobiles which has left the people with no space to engage in conversation.

Our cities are sprawling day by day and land needs to be considered as a finite resource. In order to slow down urban sprawl, land needs to be used more

efficiently. Accommodating more functions in a finite space reduces the demand in the outskirts of the city.

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