Value of Landscape Design In Creating Sustainable Urban Transformation Model For Sarojini Nagar Housing Community, New Delhi.

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Abstract. The challenges of rapid urbanization are going to increase as cities are becoming bigger and numerous. These cities then put additional pressure on natural resources to meet its energy demands, creating irreversible damage to environment. New Delhi capital city, that has doubled its urban area in a span of twenty years, is now suffering from pollution, water scarcity and vulnerability to natural disasters etc. Sarojini Nagar (south-west Delhi) is a housing community that is essentially known for its city level informal market. These markets attract large crowds every day and has become a unique social space. Looking at its commercial value, a redevelopment scheme is envisaged by the government to accommodate a population density beyond its carrying capacity. This proposal threatens the 4500 trees at site, which not only acts as green lungs to the city but marks for social and cultural identity. An alternate design approach that explores the possibility to integrate natural infrastructure with urban growth is required for such redevelopment. McHargian method of landscape analysis is adopted to come up with Sarojini Nagar masterplan. Evidence based results from landscape practitioners are devised to formulate several design strategies. In this complex Indian context, the design proposal creates multifunctional and resilient landscapes. It attempts to resolve traffic and cars, by creating pedestrian dominated circulation network, strategic car parks and active streetscape. It safeguards native trees by re-imagining the built-grid and bringing the idea of nature in a convincing way. The hierarchy of well-knit open spaces creates a sense of place & belongingness to the users. Rigorous design ideations carried with planning process allows for creating compact urban infrastructure and sustaining ecology as potential living spaces. Through multifunctional landscape design societal challenges such as population growth, scarcity of resources, environment degradation can be addressed.

1. Introduction
Urban redevelopment is the reconstruction or upgrade of current urban built-up areas; it revitalizes old towns and contributes to sustainable development. (1)

New Delhi is upcoming with six new redevelopment projects namely, Sarojini Nagar, Netaji Nagar, Nauroji Nagar, Thyagaraj Nagar, Mohanmedpur, Kasturba Nagar. These projects aim to expand for the housing and commercial needs. Over the years, these neighborhoods have become a living system of social interactions with its surroundings as an inseparable entity. However, redeveloping these projects comes with a price in terms of natural resource exploitation and social identity loss. Currently, redevelopment is leading to massive tree felling, fragmenting urban landscapes, privatizing public lands, unmanageable traffic, pollution & ground water exploitation. Kidwayi nagar redevelopment project is going through the same fate i.e. “The NBCC 'model' project is hardly the totem of sustainability and responsibility. It has been fined for non-compliance of environment laws, and official planning documents expose its shaky claims of urban design and economic viability. They have side-stepped both urban planning and environmental laws, have favoured high-rise, repetitive towers that foster monopolies, and have left out traffic, trees and water as an afterthought.” (2)
This paper attempts to come up with Sarojini Nagar redevelopment design proposal as sustainable urban transformation model.

2. Methodology
The methodology of this research by design includes both qualitative and quantitative aspects of the site chosen for redevelopment. This is achieved through following steps:

**Qualitative analysis**: Understanding the landscape values i.e associated with its larger context based upon Ian McHarg's theory. This method helps us identify issues associated with natural processes and natural resource values, social values and aesthetic values.

**Quantitative analysis**: Program development by deducing the relationship between the site, its context and the projected needs. Adapting this theory to generate a synthesis/strategy map by overlapping series of empirical maps and analytical drawings of the site area. The above-mentioned steps then allow to prepare for a comprehensive landscape masterplan suitable for redevelopment. Finally, this masterplan needs to be assessed and evaluated based upon the various parameters of sustainability.

3. McHarg Theory on Landscape values
“As a means of lending scientific integrity to ecological approach, McHarg developed a scientific theory of creative fitting that both explained and validated designing with nature. McHarg’s method was ecological not only because it used ecological data but also because the outcomes it produced matched the processes of adaptation and evolution. It helped determine where proposed human uses, such as buildings and roads, intrinsically fit on the land. Since this design method located the fittest environment for various land uses, it also fulfilled the basic principles of adaptation” (3). While McHarg through his method attempts to figure out an alternate for the future destiny of the developing urban environment by acknowledging landscape values, he mentioned “The objective of an improved method should be to incorporate resource values, social values and aesthetic values in addition to the normal criteria of physiographic, traffic and engineering considerations” (4). He further suggests to map these landscape values for suitability and make it available for its city residents and developers who can work in sync with them. “The most valuable innovations of the method is the conception of complementary land uses, the search for areas that can support more than one use” (5).

These concepts in the layer-cake approach becomes the basis for proposing urban redevelopment of Sarojini Nagar. In-depth understanding and stacking of physiography layers i.e. soil, hydrology, vegetation, topography, slope etc. with social and cultural layers helps to define suitable strategies for development.

4. About Sarojini Nagar and Urban Redevelopment
The capital city Delhi ranks highest being the most polluted megacity and in a state of “medical health emergency” as stated by IMA, and heading towards a state of “natural disaster”. The depletion of ground water levels poses a scenario of water scarcity in future. It has the highest incidence of murder, rape and abduction among 19 cities with populations more than 2 million, national crime data for the year 2016, released on November 30, 2017, show. The need of more environmentally and socially resilient city can be seen from these statistics. Connected open spaces with more movement discourage crime and engage people socially.

The redevelopment project becomes an opportunity to re-examine the depleted natural resources and revive them through self-sustaining natural processes. These processes can become the main spine to our site planning and design of urban landscape.

4.1. About Site
Sarojini Nagar comprises largely of residential units allotted to various government employees. Additionally, there are several existing schools, some convenience shopping canter, a central market with a newly built multi-level parking block, and other public amenities like post offices, police stations etc. The residential units are laid out on an orthogonal grid with clusters forming quadrangles. The resultant courts and avenues are the locations of most of the mature trees found on the site. The existing Government redevelopment model fails to address these new challenges (6).
4.1.1. Sarojini Nagar a social open space. Sarojini Nagar area in South Delhi, known for its market places and considered a pocket shopping paradise sees a footfall of around 10,000-20,000 people on a daily basis. The number doubles up during festive season and weekends. The market is surrounded by the government housing complexes and offers a range of goods from vegetables to clothes to plants to furniture to food stalls (7).

4.1.2. Government Proposal Description. The government approved the redevelopment of seven “GPRA (General Pool Residential Accommodation) colonies through the National Building Construction Corporation (India) Limited, NBCC (for Sarojini Nagar, Netaji Nagar and Nauroji Nagar) and the Central Public Works Department, Government of India, CPWD (for Kasturba Nagar, Thyagraj Nagar, Srinivaspuri and Mohamadmupur). These projects are aimed at increasing the available residential units by almost two-fold. These proposals are promoted as “innovative”, majestic commercial towers reigning the commercial skyline of Delhi” and “elegant glass and metal facade giving the complex a futuristic look. These redevelopment proposals are large-scale developments characterized by the felling of trees, high-rises and manicured landscapes. Transformation of this nature invariably results in the need to ‘wipe the slate clean’ in a physical context. It is however, an unsuitable model for brown-field development. Therefore, it clearly indicates a need to tread softly and redefine the redevelopment paradigm” (6).

4.2. Relationship between the site, its context and the projected needs
Ed wall and Mike Dring concluded that increased spatiotemporal site specificity can inform a deeper response to a site through programmatic and conceptual frameworks for intervention, allowing site processes to delineate spaces, generate forms and redefine our relationship with landscape (8). Site specific opportunities for addressing environmental, social, cultural and economic goals leads the way to program development.

Table 1 Site context and Program relationship

| LANDSCAPE VALUES | PRE-DESIGN GOALS | SITE CONTEXT | DESIGN PROGRAM |
|------------------|-----------------|--------------|----------------|
| ENVIRONMENTAL    | Bringing nature back to the city by utilizing the inherent potentials of the site. | Large canopy mature tree avenues existing as per old development. These trees also form social places in the neighborhood | Swale park, Bio remediation park, Botanical garden, Wetland park, Sponge garden, Woodland |
|                  | Rejuvenating water network through bio swales and creating resilient sponge for the city | Barapulla drain degraded, left out and devoid of connection with the city fabric | |
|                  | Reimagining Grid for the built with respect to the existing trees on site | Fragments and isolated green patches with lost water channels and leads to stormwater flooding | |
| SOCIO - CULTURAL | Transit oriented approach for a mixed use development. | Site has several fragmented incidental open/green spaces, however has active common neighborhood usable greens | Water front promenade, Special NMT corridor, Children park, Parks & garden systems, Maidan and playgrounds, Informal market |
|                  | Interconnected green pedestrian network to support walkability and enhance visual experience. | Approach to Market space lacks transition experience | |
|                  | Market space to be reimagined as social open space | Hierarchy of open space is missing, further gets obstructed due to fast moving traffic | |
|                  | | Lacks outdoor recreational opportunities, which gets | |
4.3. Demonstrating strategies through design

The revitalisation proposal aims to create a model resilient community that can guide future urban development in Delhi and re-establish the man and nature connection by creating easy living environs with secular landscape.

4.3.1. Devising Alternate Grid for the built with respect to the trees. Conserving the existing tree cover and evolving built grain with flexible sized courtyard & open spaces which are connected by swale networks. The new plantation comprises of five times existing trees (i.e 4027 trees) within open spaces. Thus creating carbon negative environment & improve air, water quality of site.

4.3.2. Transit oriented approach for a mixed use development. The This project introduces a multitude of linear and flexible blocks that as a typology are agile and can be used in a varied manner which allows vertical mixing of land uses to promote social interaction while retaining the quality of life of its residents.

4.3.3. Interconnected green pedestrian network to support walkability. Prioritising public access over automobiles to resolve the issues of traffic and cars, by creating a dominantly pedestrian environment that furthermore gives primacy to people on vibrant streets. MLCPS are provided near to the pedestrian entrance leading to central core i.e Sarojini market. The pedestrian route allows for NMTS, bicycle movement throughout and important destinations within the walkability radius of 5 to 7 minutes.

4.3.4. Inclusive design, Creating series of commercial and cultural spaces leading to the ecological destination. Multifunctional spaces that facilitates entrepreneurship while providing opportunity and interaction between people such as community gardens, public exhibition spaces, and temporary markets. Conserving the public market area and encouraging local craftsmen to work for the city. Integrating hawking and informality, as a positive connection for the place with an Interactive edge between the slum and the proposed new development.

4.3.5. Rejuvenating water network through bio swales and creating resilient sponge for the city. The stormwater runoff is retained in the aquifers by different systems such as constructed wetland of 3km length around the periphery of site. The water ways both as streams & swale network passes and links these open spaces and a combination of different systems is provided to recharge ground water. A number of sponge parks are given which soak maximum runoff during flooding. Channelization has degraded the stream quality of the Barapulla stream. A Riparian edge plantation is proposed to revive the natural flow of water. The use of soil bioengineering techniques (a combination of vegetation, natural materials and civil engineering techniques) to stabilize the stream banks and prevent erosion.
Figure 1. showing built unbuilt relationship and land use plan; Source: Author

Figure 2. Open space distribution: Public pedestrian domain, semi-public, Private and community open space Source: Author
5. Results
Claudia Dinep and Kristin Schwab in their book *Sustainable Site Design* talk about five criteria as tools for evaluating landscape sustainability: Connectivity, Meaning, Purpose, Efficiency and Stewardship. Table 2 attempts to draw relationship of these criteria with the detailed design outcomes and further establish link with the associated landscape value system which was suggested by McHarg. Sustainability is often looked as ‘add on’ technology which can be applied to conventional approach. It gets implied from the table 2 that an informed & sensitive landscape design approach by default works with sustainable goals.

Table 2. Post Design Sustainability Assessment Source: Author

| Sustainability criteria application | Post design outcomes | Associated Landscape values |
|------------------------------------|----------------------|-----------------------------|
| CONNECTIVITY (Connections between site and context, ecological and cultural systems, and temporal elements) | The site design … | ENVIRONMENTAL VALUES + SOCIAL VALUES |
| - Revives Barapulla nallah thereby forming an ecological corridor | - Creates a network of public, semi-public and private green open spaces. | |
| - Revive buried water networks through a bioswale system that stores stormwater runoff | | |
| MEANING (A sense of place with active connections between people and environmental processes) | SOCI-CULTURAL VALUES | ENVIRONMENTAL VALUES |
|---|---|---|
| - Creates a series of commercial and cultural spaces leading to the ecological destination through active pedestrian network | | |
| - Prioritized public access with non-motorised paths and multilevel car parks at major nodes | | |
| - Barapulla stream edge development as interactive social space | | |
| - Constructed wetland to purify polluted water of Barapulla drain | | |
| - Productive landscape by use of species which improve soil health | | |

| PURPOSE (Landscape as places, not merely settings) | SOCIAL VALUES | ENVIRONMENTAL VALUES | ECONOMIC VALUES |
|---|---|---|---|
| - Built Typology guided by the existing tree structure and existing built fabric to retain the essence of the site. | | | |
| - Enhancing publicness by creating a series of nodes and streets as destinations | | | |
| - Integrates hawking and informality as a positive connection for the place. Interactive edge between the slum and the proposed new development | | | |
| - Vertical Mixed use built overlooking interactive streets and plazas | | | |

| EFFICIENCY (Efficient resource use of land, materials, and energy to satisfy multiple uses with each construction) | ENVIRONMENTAL VALUES | SOCIO-CULTURAL VALUES | EDUCATIONAL VALUES |
|---|---|---|---|
| - 95 % trees retained; Existing trees on site: 4026 nos. trees to be transplanted w. r. t. proposed plan to be 200 nos. | | | |
| - 5 times more trees can be planted in green areas creating carbon negative environments | | | |
| - Total green space (softscape and semi paved) to be 60% with Ground cover 30% & Roads 10% | | | |
| - Proposed open space ratio: 11sqm/person, total existing green open space: 61 acres + total proposed green area:147 acres + additional green area beyond site: 25 acres i.e. 3 times more open space | | | |
| - Constructed wetland system 3 km long, treat & recharge ground water; As existing nallah converted into wetland & sponge park | | | |
| - 4 km swale park to retain & purify 100 % storm runoff; considering Peak rainfall intensity: 30 mm/day | | | |
| - 6 Multi Level Car Parking i.e 4800 car park on stilts | | | |
| - NMTS, Bicycle throughout pedestrian street which is also the shortest distance axis from Sarojini market to the roads; 3-5 min walk to nearest green & public amenity buildings; Sarojini market area 7min walk (550 m) from the farthest end. | | | |

| STEWARDSHIP (Ensuring an inclusive design process carried through to the long-term care of the changing landscape) | EDUCATIONAL VALUES |
|---|---|
| - Visibly demonstrates sustainable site development techniques in clear contrast to neighbouring properties where manicured landscapes are being proposed. | | |
| - Creates a sense of ownership and shared responsibility amongst the users i.e residents, visitors etc. | | |
| - Allows for natural processes to get established in due course of time | | |
6. Conclusion
While this paper discusses about the design-oriented approach towards holistic urban redevelopment using landscape value system. It also brings social benefits by designing in compliance with natural surroundings.

1. This redevelopment project is not merely means to accommodate additional population in and generate money through commercial sector. The idea of landscape must create a common ground for its people to appreciate their living environments, and not mean to meet the functional demands. The design process can catalyse prospects for creative and multiple use (functional and aesthetic) of its open spaces and also ensure safekeeping of its landscape.

2. The research by design approach acts as tool by which, landscape value-initiated goals can generate magnified design outcomes. For ex. Linking fragmented green space when subjected to undergo the rigour of creating ideations creates various ways of transitioning from series of commercial and cultural spaces leading to the ecological destination through active pedestrian network.

As landscape designer who understands natural systems and interprets them on grounds for safe human access, we play a very critical role in shaping our environment for sustainable future.

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