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## **Greenways for a Greater Good- An Indian Perspective**

Prof. Samir Mathur, Sandeep B. Menon, Priyadarshini Kacker

### **1. Introduction**

Cities have developed on the banks of rivers from the dawn of civilizations. The urban fabric of Indian cities is an intricate tapestry composed of settlements that span almost 4000 years of urban history. Cities as old as 2500 B.C co-exist sometimes in harmony and sometimes in conflict with cities that are still being conceived. The pace of urbanization in India is unprecedented and the country hosts some of the most populous cities in the world. According to the 2011 census, urbanization in India has increased faster than expected reversing the declining trends of the earlier decades. (Census of India, 2011) This boom presents its own set of challenges and opportunities. The role of a Landscape Planner becomes prominent since ensuring the balance of ecological processes and the components of Master Plans are imperative to ensure a sustainable future

### **2. Background:**

**2.1 Ecological Ethos and Cosmic Connections:** The cities and landscapes of Indian settlements have always strived for balance with the universe. Cosmic geometries as applied to Indian settlements spoke of 3 realms of the cosmos consisting of “The macrocosm (stars, planets, moon and Sun), the mesocosm (Atmosphere, Mountains, Lakes, Oceans and Rivers) and the microcosm (City, temple, home and body)” (Malville & Gujral, 2000). This practice takes physical form in the linear movement patterns often observed in Pilgrimage routes. Studies of ancient movement patterns reveal that travel ideally occurs along rivers, mountain ranges and along forests. Irrespective of the effects of modernity these patterns stay intact and find resonance across civilizations. Pilgrimage paths and trade routes are probably the earliest examples of Greenways in India as they were planned as transport linkages with green landscaped areas on either side. The ancient pilgrimage routes and their origins can be traced back to mythological texts such as the Ramayana. During the rule of the Mauryan Dynasty, Emperor Asoka (304-232 BC) planned wells, shade giving trees and religious structures along the route to cater to the travelers. These routes came into prominence again centuries later under the leadership of Sher Shah Suri (1486-1554 AD), in the form of the Grand Trunk road (*Sadak-e-Azam*). (Farooque, 1977)

**2.2 The Lost Rivers:** The ancient Indian treatise Vastusastra states that a city should be founded on the banks of a perennial source of water. In fact, River Saraswati, one of the most important rivers in Hindu mythology has been exalted to the status of a goddess and attributed with divine powers was long considered metaphysical until recent geological expeditions which suggest that not only did the river exist but it may have been responsible for the flourishing Indus valley civilization founded on its banks. (Danino, 2010). The studies suggest that geologic disturbances may have caused a shift in the tectonic plates which led to the river shifting its course and this eventually led to a slow abandonment of the settlements along it leading to the disappearance of an entire civilization. Such was the inherent dependence of urbanity in India on the ecological processes of a river system. Cities on floodplains are extremely vulnerable to catastrophes and impact of climate change. But cities have been developing historically on the river edges due to availability of water, arable land and trade possibilities. The river was regarded much more than an ecological entity, it was considered as a cultural essence, an emotional power and a

philosophical idea (Jain, 2011). However as cities developed and with the advent of technology and industrial development, the dependence on the river reduced. Many of the present city developments have engulfed the floodplains and have their backs to the river which in most cases have become an open sewer.

### 3. Goals and Objectives:

The main objective of the paper is to present with the help of three case examples, the challenges faced by a Landscape planner in rapidly developing riverfront cities in India and to address these concerns through the usage of Greenway Planning Theory. The three case examples are of landscape and environmental interventions in cities on the edge of River Yamuna, in one of the world's highest population density zones. The paper aims to formulate a strategy for Greenway Planning for highly urbanized riverfront cities based on the hands-on experience of working on these projects.

### 4. Methods:

The study is structured around the analysis and assessment of three Indian cities along the River Yamuna. The site conditions and context of each of these cities are unique and needed different responses in terms of the intervention. One of the projects deals with exploring green linkages to connect the existing natural and designed green patches within the city to the riverfront in order to enhance the coherence of the open spaces within the city core. The second project explores the use of greenways as urban infrastructure to resolve issues of accessibility and mobility within a dense urban fabric populated by monuments and various layers of history. The third project uses Greenway Planning, not as a retrofit, but as the main organizing principle along which a new city would come up.

The landscape interventions were based on a thorough analysis of the conditions at site using five broad parameters. They include ecology, socio-cultural aspect, Infrastructure, Aesthetics and Economical aspect. The analytical results were used to generate scenarios of development which would respond to variable futures. After discussions with the stakeholders and evaluating the options, one of the scenarios was chosen and detailed out for execution in each case.

The results of these interventions were synthesized to arrive at a strategy for Greenway Planning for highly urbanized riverfront cities based on the hands-on experience of working on these projects.

### 5. Case Examples:

#### 5.1. The Central City Core, New Delhi:

Delhi as it stands today is an amalgamation of seven cities built over a span of 2000 years. Interestingly, all the historic cities came up on the western bank of the river sandwiched between the river and the Aravalli mountain range which act as natural barriers while the eastern bank of Yamuna was left natural because it was subject to inundation in the monsoon months. New Delhi, the newest city, was laid out in 1911. A city designed by the English Architect Edwin Lutyens and loosely based on the utopian ideas of Garden Cities (Ebenezer Howard, 1898) with emphasis on large, geometric plazas with fountains and formal geometry. However the city was

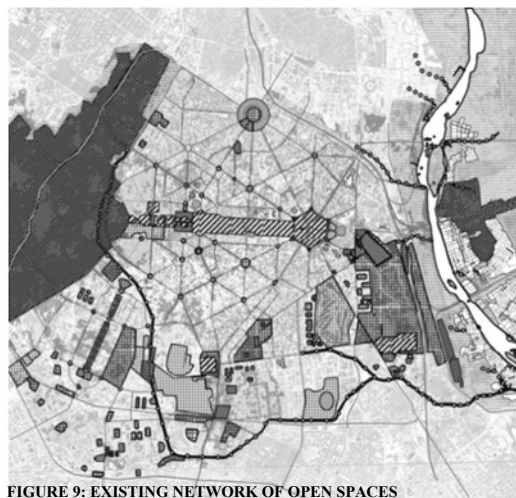


FIGURE 9: EXISTING NETWORK OF OPEN SPACES

primarily designed for the Automobile and pedestrian linkages and human scale were often overlooked. The Delhi Urban Arts Commission (DUAC) and Government of Delhi, commissioned a study as part of the Zonal Development Plan (henceforth referred to as the ZDP) in lieu of the proposed Delhi Master Plan 2021 for analyzing the existing open space framework in the Central City Zone and suggesting improvements for the same. The guidelines for organizing the open spaces are aimed at creating a visually pleasing and functionally linked system of open spaces within the city through roadside landscape improvement, urban open space improvement of areas with social, historical and cultural significance and development of greens along the drainage channels.

The existing classification used for open spaces in the city was studied to understand the diversity in the usage pattern and to pin point the lacunae in the existing landscape designation. A parallel study for analyzing the existing conditions of the open space was also undertaken. The open spaces within the city were found to be fragmented and enveloped by various physical boundaries reducing the chances of them being perceived as a contiguous network. Further analysis revealed that there does exist a pattern in the urban matrix which allows the fragmented patches to be linked to one another and eventually to the vast river floodplains by retrofitting a network of green linkages which could double up as ecological corridors connecting the two large patches of undisturbed natural landscape in the city - the Central Ridge Forest in the west of the Heritage zone and the vast River floodplains to the east. The ‘Eco-Streets’, as they would be called were designed to offer opportunities for moving through the city on foot or on cycle, thus reducing the dependency on vehicles. The “Eco-Streets” were



FIGURE 10: PROPOSED NETWORK OF OPEN SPACES SHOWING LINK BETWEEN



FIGURE 1: RIVER YAMUNA WITH NATURAL DRAINS AND



FIGURE 2: IMPORTANT LANDMARKS AND HERITAGE AREAS



FIGURE 3: ROAD NETWORK



FIGURE 4: TREE COVER



8 FIGURE 5: REGIONAL GREENS

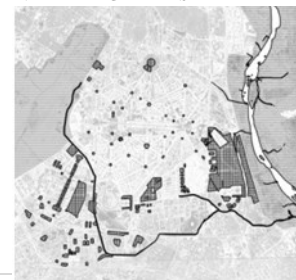


FIGURE 6: DISTRICT/COMMUNITY GREENS



FIGURE 7: HERITAGE GREENS & RECREATIONAL GREENS



FIGURE 8: FARM GREENS

identified on existing roads; the Right of Ways of which could be tweaked to accommodate enough space for pedestrian movement and dedicated cycling corridors with ample planted buffers of native vegetation. The heavy infrastructure on these streets was designated to be replaced by soft infrastructure, built into the streets in the form of bioswales, rain gardens and curb cuts for seamless runoff connectivity. The existing drainage channels which are in a state of disrepair have been proposed to be converted into constructed wetlands for filtering and purifying the run off before it reaches the river.

**Evaluation:** The goals of the intervention proposed are multifunctional in nature. It will have an appreciable value in terms of the ecological functions that it would render in terms of connecting the ridge forest patch to the river floodplains, the connections which got fragmented while the city developed. The linking up of various culturally important spaces like the Central Vista, the India gate Monument and the historic gardens would add to the cultural significance of the intervention. The possibility of extending this greenway to the rest of the city using the right of way of the existing disused drainage channels and the river floodplains offers an exciting opportunity to connect the landscape patches within the city to form a strong ecological and cultural network weaving through the urban fabric and holding it together.

**5.2 Agra Heritage Riverfront Corridor:** One of the oldest cities founded on the banks of this river is the historical city of Agra. The history of present day Agra is intrinsically linked to the history of the river upon whose shore it's founded. Though present day Agra is known primarily for its most iconic monument- the Taj Mahal, lost in the chaos of the city, are a number of lesser known Mughal monuments constructed along the Yamuna riverfront but bad planning has caused the other monuments along the riverfront to be neglected and ignored. The Riverfront in the 16<sup>th</sup> and 17<sup>th</sup> century was composed of a symphony of private pleasure gardens of the nobility. This green buffer formed an ecological buffer between the urban settlements of the city and the river. The river which was the *raison d'être* for the origin and evolution of the city has now been forgotten and the lack of a cogent riverfront is evident. Rapid urbanization and unplanned growth coupled with short sighted building practices and lack of environmental sensitivity has led to degradation of the living conditions in the city, it is now plagued by congestion, chaos and pollution. The city is frequented by tourists both national and International. The role of enhancing the city and creating a legible network of connectivity between the monuments, the river and the city are essential for this. The Agra Development Authority (ADA) commissioned a Detailed Project Report on what could be done in terms of environmental upgradation for the city to reintegrate the monuments to the tourist circuit and to develop the riverfront, parks. The approach adopted in the study was to propose urban improvements in order to aid the local community ameliorate the effects of haphazard development and while doing so create a coherent network of spaces for the tourists to experience while moving through the city.



FIGURE 9: EXISTING NETWORK OF OPEN

The City Master Plan document for the city, City Development Plans, Jawaharlal Nehru National Urban Renewal Mission (JNNRUM) Guidelines, Satellite imagery and Site physical surveys, riverine ecological processes, cultural and ecological data were compiled and studied. The zones of intervention were identified and classified based on the study as to the extent of intervention.

**Four distinct types of possible spaces were identified:**

**a. The Heritage Riverfront Promenade Edge:**

Present conditions were analyzed to assess whether the edge will be built or left natural. The existing and proposed edge conditions were overlaid to find out whether the slopes would be self-stabilizing or would need protection.

**b. The Connections to the Monuments:** Existing linkages were analyzed and the prominent, easily accessible links were identified to be developed as pedestrian and non-motorized connections to the various protected monuments.

**c. The Secondary Routes through the Urban Fabric:** The existing roads and by lanes with regular

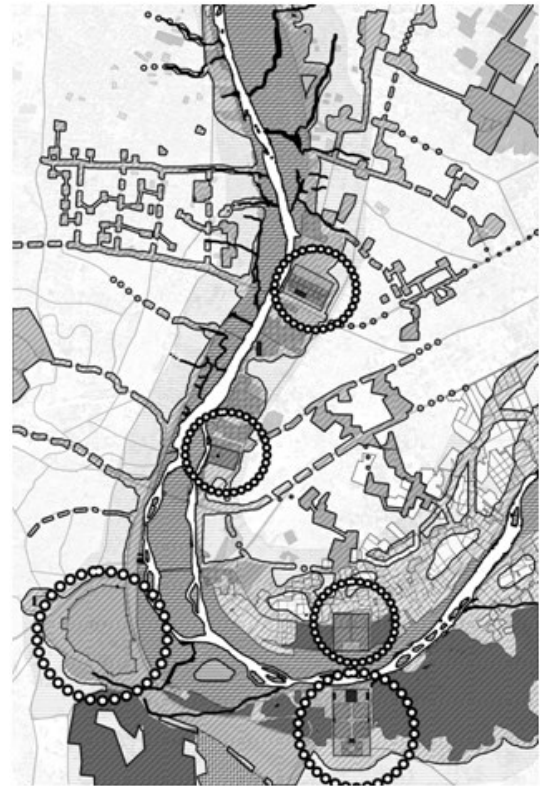


FIGURE 10: PROPOSED NETWORK OF GREENWAYS



FIGURE 1: RIVER YAMUNA AND DRAINAGE AND RIVER BED WITH



FIGURE 2: ROAD NETWORK

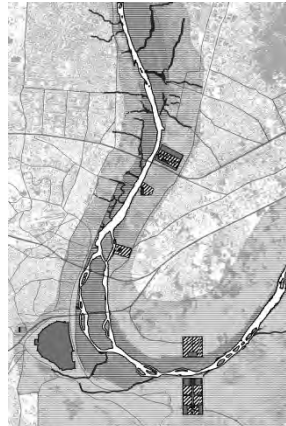


FIGURE 3: HERITAGE BUILDINGS WITH HERITAGE GREENS

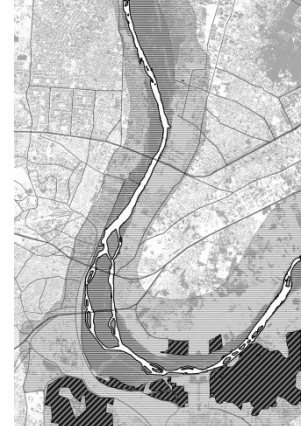


FIGURE 4: REGIONAL GREENS

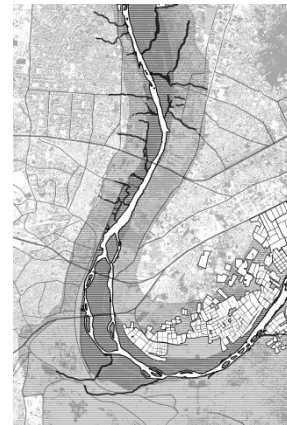


FIGURE 5: FARMING GREENS

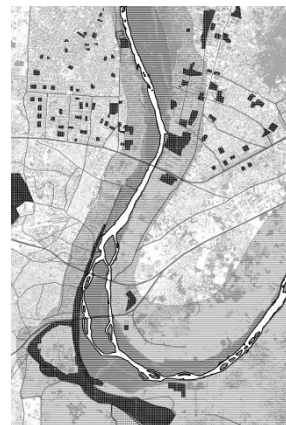


FIGURE 6: DISTRICT/COMMUNITY AND RECREATIONAL GREENS



FIGURE 7: CITY GREENS

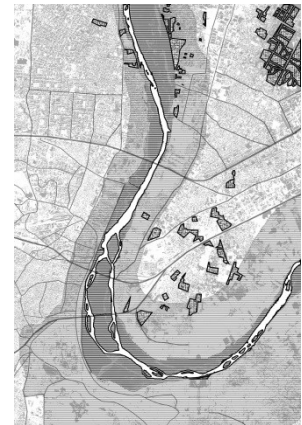


FIGURE 8: POTENTIAL GREENS

use by the local population are to remain ‘status quo’ usage while improving on the infrastructure giving predominance to ‘Low Impact Development (LID) Infrastructure’.

**d. The Existing Green Patches and Monument Fringe Open Spaces:** These existing spaces within the city are analyzed with respect to their context, character, possibilities and future scenarios and the synthesized results evaluated in order to formulate a strategy for connecting these spaces.

**Evaluation:** The interventions are biased towards the anthropocentric dimension with emphasis on socio-cultural aspects, improving the urban aesthetics and green infrastructural inputs. The riverfront intervention and the overall storm water management strategy are designed to be ecologically sensitive and to augment the depleting water resources. The project will aid in improving the surrounding areas directly leading to the image of the city core and contributing to an appreciable improvement in the economic conditions.

### 5.3 Sports City, National Capital Region: 5.3 Sports

**City, National Capital Region:** The Sports City is a new satellite city of Delhi being developed by a private developer to establish a modern city anchored by business, sports, health and educational enterprise. The city is envisioned for a resident population of approximately 900,000 people and a daytime population of approximately 2.2 million people including the workforce and day time visitors.

This city has been planned to be built around an extensive greenway which includes a series of retention lakes and native forests. The greenway spans and interconnects the entire city like a central spine and incorporates transit, active and passive recreational areas, a comprehensive storm water management system to naturally filter water and return it to the ground and a geothermal district cooling system. The project site is approximately 40 km from the city center of Delhi on a flat, alluvial plain adjacent to the Yamuna River and protected by an earthen bund/levee.

This open space planning is proposed to follow and capitalize on the natural cycles of water to help create a sustainable city that is economical to build and maintain. A series of “bio-corridors” which are more naturalized and forested areas, branch out of the boulevard and serve primarily as water conveyances and seasonal water detention areas. These connect the ‘Central Greenway’ to the Yamuna floodplains beyond the levee that protects the site. All parks will have facility for water storage and infiltration based on variations of vernacular examples of step wells and riverfront *ghats* that serve to cleanly organize seasonal water surges.

The greenway is designed as an extended ‘Central Park’ for the city with the socio-cultural hubs located alongside. It also generates the core identity of the City through the range of programs



FIGURE 1 DETAIL PLAN OF PROPOSED GREEN AND GREY INFRASTRUCTURE NETWORKS | SOURCE: TOM LEADER STUDIO & INTEGRAL DESIGNS

and activities that are designed to fit into it thereby creating local identities around which housing, workplace, and commercial activity can be oriented.

**Evaluation:** The interventions in this case were different from the earlier case examples owing to the fact that this was a newly conceived development where the Greenway Planning Theory was introduced as the central theme of the development. The ‘Central Greenway’ along with the peripheral ‘Bio-corridors’ forms the main organizing axes on which the city would come up. The greenway takes on a synergistic role of a multifunctional landscape in the city. The planning of the greenway was done so as to cater to all the values identified. The emphasis on Low Impact Development based infrastructure and planning of spaces to cater to storm water retention are imperative for the design of the river edge city since it caters to augmenting the ground water resources of the bio-region. The planning of the city based on a greenway spine could be replicated in newer cities which are being planned along the riverfront corridor.

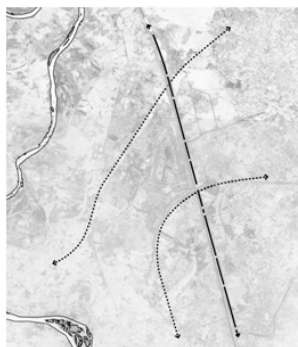


FIGURE 1: RIVER YAMUNA AND MAIN



FIGURE 2: 3 LAND PARCELS



FIGURE 3: ROAD NETWORK



FIGURE 4: PROPOSED URBAN



FIGURE 5: MAIN GREENWAY LINKING 3



FIGURE 6: PROPOSED GREENWAY

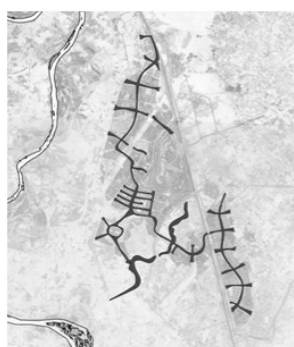


FIGURE 7: PROPOSED DRAINAGE



FIGURE 8: ACCESSIBILITY-10 MINUTE WALKING

## 6. Conclusions:

**6.1. Lessons Learnt:** The results and experiences of working on the case examples were synthesized to form a general framework for developing greenways in the riverine tropical cities. The main observations are as follows:

- Greenway interventions in tropical cities in developing countries have to be ‘multifunctional in nature’. The high density core areas would require both the anthropocentric as well as the ecological functions to be catered to.
- The multifunctional nature of the greenway design could create conflicts of interests. For example, ecological functions of a greenway can be compromised when emphasis is on catering to the socio-cultural aspects. The solution is to arrive at a resolution based on the context of the project and the natural processes of the city.



- Existing notions have to be challenged. For example, the traditional outlook of linking infrastructure with heavy engineering which has high embodied energy systems and maintenance will have to be reviewed using Low Impact Development (LID) models & Green Infrastructure.
- The effective participation of Stakeholders and Community has to be ensured for a successful completion of the project. This would be a true representation of democracy with the users being a part of the decision making process.
- The gap between research and ground practice has to be bridged. Research projects have to augment the practice and challenges in the practical fields should trigger reasons for research.

**6.2. Challenges to the Process:** The main challenges to the process of implementing greenway projects in India are as follows:

- Multiplicity of organizations and Government bodies
- Misplaced priorities of the decision makers
- Archaic guidelines and policies
- Lack of comprehensive scientific databases
- Available Funding and Affordability
- Community Preference and Adaptability to the users to change

**6.3. Way forward:** The learning's from the projects could be used as a broad framework within which urban greenway projects could be implemented in India. The following are the main considerations identified:

- There is no one 'cookie cutter solution'. The template of introducing Greenway Planning Theory has to be adapted to the natural processes and community needs of each city.
- Master Planning is to be an 'inclusive interdisciplinary process' with Planners, Landscape Architects, Urban Designers, Ecological Planners, Bio-Geo-Scientific Experts and Architects to be working in synergistic tandem. The preparation of Master Plans has to consciously avoid the current system of laying out the land uses with mandatory green areas as mindless infill.
- Greenways are to be employed as an augmenting tool to the other types of open spaces within the city. Overemphasis on them should not shift the focus from the other types of open spaces in a city.

Greenways can be used as successful tools to reinforce this idea of nature conservation and environmental sensitivity. Ecological ways of thinking and development have been an ingrained aspect of the Indian culture which is being compromised by the recent wave of globalization. It is imperative to adopt sustainable models of city development at the master planning stage as well as detailed design stages to ensure a stable future.

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