

A sustainable approach for urban Riverfront development

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Abstract - Rivers had always been the life line for any human settlement. Along the rivers are found the remains of earliest townscapes. Along the rivers human being put the first lines through its plough that laid the foundation for the rise of urbanization.

With the rise in human populations and needs thereof the river remained most important in all the times. Eventually river became urban river, with the dawn of urbanization, which also played as an urban corridor along with all its vital offerings for the urban settlements. Urban River saw the degradation, negligence, and pollution. It slowly became an eyesore for the settlement as it has no longer associated with its life giving parameters. Then came the era of environmental protection and revival of life to rivers through a much integrated tool; river rejuvenation and urban river front development to focus on all the physical, social, cultural and heritage parameters of the river that replenishes the urban settlements again.

1. INTRODUCTION

The river front development provides a unique opportunity for developing a strong city image along with providing an opportunity to scientifically design systems for recharging ground water from the only large natural resource of the city. A sustainable approach for amalgamation of the river into the urban fabric development has been devised. There has been an appropriate consideration of the natural potential of the land for developing into a biodiversity zone for conserving the natural heritage of the river basin as well as the local requirements of facilities at the urban level, like large level city open spaces of variable forms with recreational facilities.

The spreading of these regeneration projects, from modest and simple versions to ambitious complex ones. Each place is defined by a different geography and morphology of the surrounding coast, and this multiplicity witnesses the various possible links between land and water, and the many differences in ways of living at urban scale and managing urban riverfront areas.

1.1 Need of the study

The need of the study is determined by the various factors:

- Deteriorating conditions of urban rivers
- Background of riverfront landscape design
- Narrow public space
- Eco-situation improvement
- Ignorance of the historical context
- Degrading local economy

1.2 Contemporary issues related to urban rivers

CHANNELIZATION - Artificial banks/bed and dredging Physical structure of the river is altered, natural movement of its course is prevented, floodplain connection lost and natural habitat is removed meaning aquatic life cannot be supported.

WATER QUALITY DEGRADATION - Impervious urban surfaces increase run-off directly entering a river, which can contain contaminants from roads degrading the water quality. Sewer and industry discharges plus misconnected domestic plumbing systems regularly degrade water quality further.

REMOVAL OF RIPARIAN VEGETATION - A lack of bank side trees increase river temperature (reduced shading) and in some cases reduces bank stability, habitat variety and in-stream woody debris (which is good habitat and a nutrient source).

LOW-FLOWS AND INCREASED FLOOD FREQUENCY - Over-abstraction and increased surface run-off in urban areas reduces low flows within a river but increases the flood frequency and response time when there is heavy rainfall.

INVASIVE SPECIES - Cities are hubs in global transportation networks so urban rivers are particularly vulnerable to invasive non-native species introductions. Many damage the natural environment and out native species.

The cumulative impact of these issues make urban rivers less resilient to the predicted effects of climate change, making river management difficult.

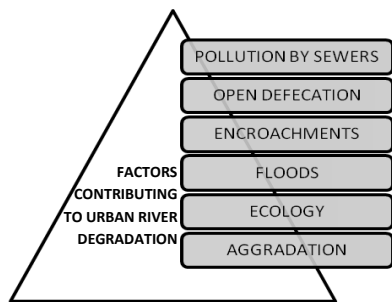


Fig -1: Factors contributing to urban river degradation

1.3. Characteristics of urban riverfronts

DYNAMIC AREA – It is a dynamic area with frequently changing biological, chemical and geological attributes.

HABITAT - It include highly productive and biologically diverse ecosystems that offer crucial nursery habitats for many species.

NATURAL DEFENSE - It features such as a mangrove forest serves a critical natural defense against natural hazards (flooding, erosion and storms).

POLLUTION MODERATOR - River ecosystems may act to reduce the impacts of pollution originating from land such as, wetlands absorbing excess nutrient sediments, human waste.

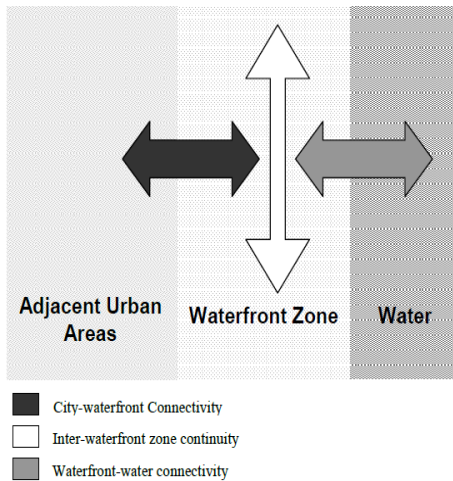


Fig -2:Connectivity of water & adjacent area by riverfront

1.4 Types of urban riverfronts

CULTURAL RIVERFRONTS – A riverfront with the sense of community, festivity, artistic expression, recreation, commercial bustle

ENVIRONMENTAL RIVERFRONTS - "Design with nature", might include shore stabilization, wetland preservation, prairie restoration etc.

HISTORIC RIVERFRONTS – A riverfront with "A sense of uniqueness and character" to a place. Provide a special educational experience by preserving the cultural heritage of place.

MIXED-USE RIVERFRONTS – A riverfront with a dynamic space containing various activities blended to complement each other.

RECREATIONAL RIVERFRONTS – A recreational riverfront is "The place of community gathering". parks, gardens, picnic areas, walking, cycling and water related activities including boating, fishing, etc.

RESIDENTIAL RIVERFRONTS – A riverfront where housings, creates opportunities for other activities like retail, recreation, restaurants.

WORKING RIVERFRONTS – A riverfront where river-related activity such as fishing, boat repair, etc happens.

REDEVELOPING RIVERFRONTS – A riverfront where land uses have recently changed or where vacant and underutilized properties suggest potential for beneficial change.

2. RIVERFRONT DEVELOPMENT

An environmentally conscious approach for integration of the river into the urban fabric development. There has been an appropriate consideration of the natural potential of the land for developing into a biodiversity zone for conserving the natural heritage of the river basin as well as the local and transient requirements of facilities at the city level, like large level city greens of varying nature along with some recreational facilities.

2.1 Principles of riverfront development

- It feature the riverfront as the front door
- It showcase the river's history
- It activate the riverfront
- It limits obstacles and connects to the river.
- It engages people with the water.
- It connect seamlessly along the riverfront and into neighborhoods
- It repair and enhance the environment
- It employs high-quality architectural materials and sustainable engineering practices.

2.2 Concepts of riverfront development

RIVER AS A MAIN ATTRACTION OF DEVELOPMENT

- River itself must be developed earlier than any others development planning.
- Removal and changing river line or row are not permitted.

BEAUTIFICATION OF RIVER

- Provide recreation and beautification plan for river.
- Maintaining river reserve as a buffer zone to control environmental problem such as soil erosion.
- Utilization river reserve for green areas and recreational use are allowed to the developers.

- Maintenance of river bank.
- Flood control measures
- Provide the general public with an open space for leisure and recreation.
- Revitalizing the neighborhood
- Creates a healthy and active urban environment.

LEVEL OF RIVER FLOW

- A development close to river areas would not increase level of river flow.
- Development are more than 10 ha are required to build retention pond with maximum area approximately between 3-5% of total development area.

DEVELOPMENT OF PERMANENT INFRASTRUCTURE

- Development of permanent building and infrastructure are not allowed within river and river reserves, unless facilities for recreational purposes such as playground.

2.3 Elements of riverfront development

- Effective management
- Beginning the project
- Financial feasibility
- Environmental approval
- Public perception of need
- Function
- Authenticity
- Construction technology
- Project theme & image

2.4 Advantages of riverfront development

- Creation of jobs- a place to host commercial activities.
- Source of revenue for government –shops, restaurants, sport activities, Transportation, boating etc
- Development of tourism by offering a variety of attractions like water sports, entertainment arenas, parks, shopping areas, etc.
- Economic spin-off's – rise in the value of properties, acting as a catalyst for redevelopment and renewal of nearby places.
- Habitat protection and restoration -conservation of water in the river,
- Human/environmental connections, conservation and development of land,
- Conservation of flora and fauna

2.5 Parameters of riverfront development

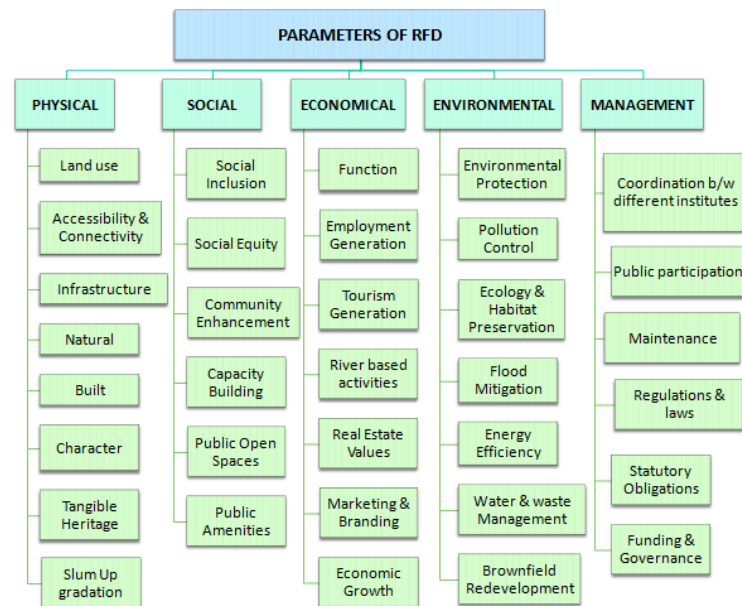


Fig -3: Parameters of Riverfront Development

2.5.1 Physical parameters

Physical parameters of riverfront development focus on the physical aspects of riverfront that are directly connected with actual demands as per the need of the physical environment of a precinct. Some of these physical parameters are listed as follows:

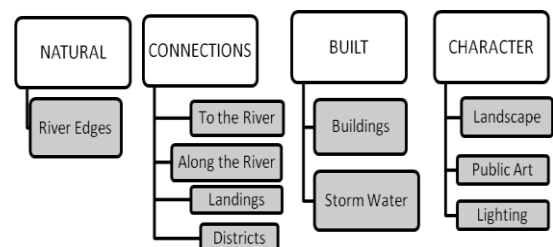


Fig -4: Some of physical parameters of riverfront Development

• NATURAL

Riverbanks, shorelines, riparian buffers, and river habitats are critically important when planning any

riverfront project. Other important components of ecosystem function that should be considered include geology, morphology, hydrology, and land cover. Along the river, there are many opportunities for integrated regenerative design, storm water management, habitat restoration, public access, stewardship, and redevelopment.

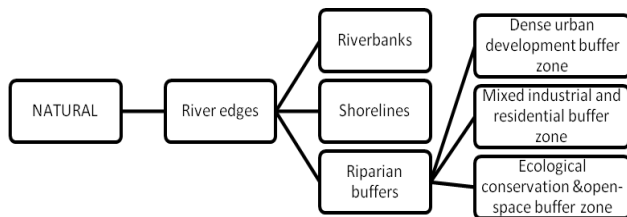


Fig -5: Natural parameters of riverfront Development

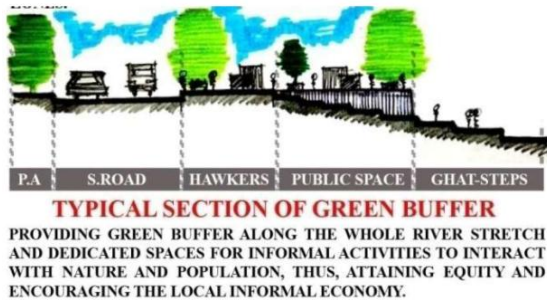


Fig -6: Typical Section of Green Buffer

• CONNECTIONS

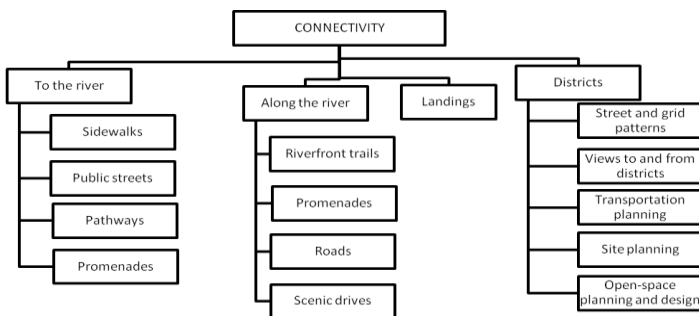


Fig -7: Various connectivity with the river

Service areas

Should be visually subordinate and integrated into the design of the site and building. Orient service entrances, waste disposal areas and other similar uses toward service lanes and away from the waterfront and street, when feasible.

Pedestrian Interest

The waterfront area should continue to develop as a pedestrian oriented environment. Buildings should convey a pedestrian friendly environment

Public Streetscape, River walk, Public Art & Plazas

The pedestrian environment should be designed to stimulate and enhance the experience along the street and the river-walk. It should portray a unified system by creating a sense of visual continuity while also celebrating a series of experiences along the way.

Building and Site Lighting

The primary function of lighting is for safety and. The primary goal for lighting in Juneau is that is should not be detrimental to the adjacent surroundings or the overall environment, but should still maintain a safe environment.

Landscaping

Existing mature trees and other vegetation on site should be retained whenever feasible. Promote the use of indigenous species.

• BUILT

Building Placement and Orientation

Buildings should be sited to have active spaces for area users, provide pedestrian connections, help animate the street and waterfront, and define the street edge. The placement of the building on a site should, therefore be considered within the context of its setting, as well as how the structure will support the broader design goals for the area.

- Locate buildings at the sidewalk edge.
- Provide double-fronted buildings on through-lots.
- Where two or more buildings will be located on a site, arrange them to define an outdoor space.

Minimum Setbacks

Building setbacks should reinforce the pedestrian character envisioned for the area and help to define the street edge. In order to enhance the pedestrian zone, the buildings should align at the street edge, with storefronts and other visually interesting features provided at ground level.

Views

It is important to the community to maintain views and access to the water, and to provide a pedestrian-friendly environment. Therefore, views from the public way to significant natural and cultural resources should be maintained when feasible. Site improvements should be planned to enhance such views.

Architectural Character

While it is important that new buildings and alterations be compatible with the traditional context, they should not imitate older building styles. New construction should be

stylistically distinguishable from historic buildings. It should maintain a similar scale and also include character defining features compatible with traditional buildings.

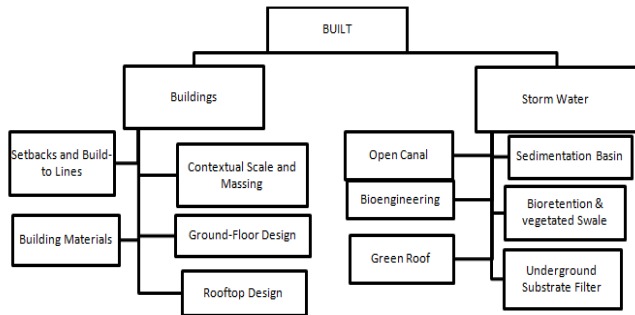


Fig -8: Relation of Built Environment with RFD

CHARACTER

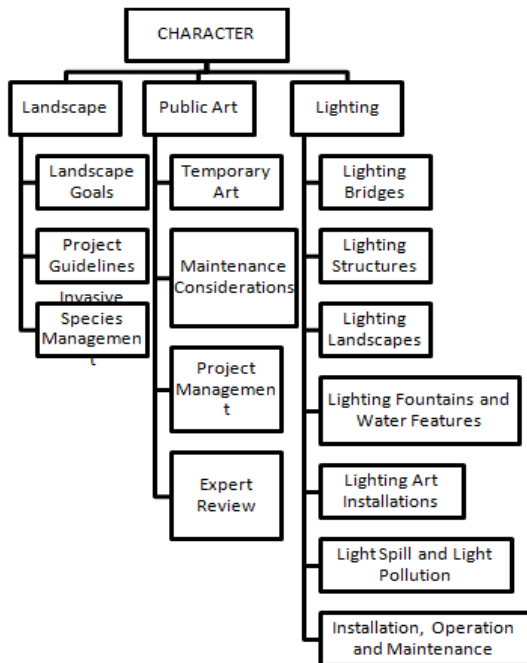


Fig -9: Character of riverfront development

2.5.2 Social parameters

Riverfronts can be leveraged for social benefit of local communities. By enhancing the Quality of Life for people through interventions to upgrade health, sanitation, public amenities and capacity building are considered under social.

Social Inclusion

Urban Riverfront Development includes an integrated approach of including all the marginalized groups in planning process.

The concept of inclusiveness involves four attributes:

- OPPORTUNITY
- CAPABILITY
- ACCESS
- SECURITY

Social Equity

- Social equity is the most important factor in any development project. It can be achieved by:
- Presence of public- semi public and private spaces which are accessible to everyone.
- Public participation in planning and implementation process.
- Handicap facilities and easy access to all.
- Providing equal opportunities to the people

Community Enhancement

People also want riverfront to serve many purposes and a place that contributes to the quality of daily life in all of its aspect-economic, social and cultural.

Community Enhancement can be achieved by :

- Rehabilitation of slums – Good living conditions
- Infrastructure – Health and Hygiene
- Skill Development Programmes- Capacity Building
- Employment Generation- River based activities

Capacity Building

Capacity building is a social form of urban renewal it includes empowerment of not only indigenous people but also the enhancement of the capacity of entire city by empowering its inhabitants and the rehabilitated people. This is done by active physical infrastructure development, youth education in professional capacities, utilization of heritage as a tool for employment generation will be facilitated by such initiatives.

Public Open Spaces

- A well-managed public space enhances the cultural life by providing venues for local festivals, civic celebrations and performances.
- Green spaces provide a refreshing contrast to the harsh shape, color, and texture of buildings and stimulate the senses with their simple color, sound, smell and motion.

Public Amenities

Public amenities are resources, conveniences, facilities or benefits continuously offered to the general public for their use and/or enjoyment, with or without charge (e.g, restrooms, information displays, public telephone)

2.5.3 Economical parameters

FUNCTION

- Accessibility by different types of transportations.
- Accessibility from the city's main streets and squares.
- Connection between the banks of the river.
- Creation of Job opportunities.
- Improving marines inhabitant for increasing fish populations Water markets.
- Trades through River transportation.

EMPLOYMENT GENERATION

Riverfront Development provide potential recreational and nature tourism activities. In order to fully identify potential recreational and activities, assessment of recreation resource element should be carried out.

TOURISM GENERATION

Riverfront Development provide potential recreational and nature tourism activities. In order to fully identify potential recreational and activities, assessment of recreation resource element should be carried out.

RIVER BASED ACTIVITIES

. This help to generate economy and creates employment to many informal sectors. Hawker zone created near riverfront area, also generate economy.

REAL ESTATE VALUES

A closer look into the real estate market and one can realize that people are willing to pay more for properties closer to these spaces, or providing larger open green spaces. Hence the real estate value near these spaces also get increases.

MARKETING & BRANDING

Economy generated due to advertizements at this place and activities of this place. Marketing and branding takes place in the following categories of development, Historic restoration, Modernism, Landmarks.

ECONOMIC GROWTH

Due to employment generation of various informal and formal sectors, overall economy of the area gets improved. Employment generation through river based activities like, boating, tourist guide etc get boom.

Factors for economic growth:

- Employment Generation
- Slum upgradation – Quality of life
- Capacity Building
- River based activities

2.5.3 Environmental parameters

It is important to protect environment in the riverfront development process, which can be achieved by:

- Ensure sustainable and equitable use of resources without degrading the environment or risking health or safety.
- Prevent and control degradation of land, water, vegetation and air
- Conserve and enhance natural and man-made heritage, including biological diversity of unique ecosystems
- Improve condition and productivity of degraded areas
- Raise awareness and understanding of the link between environment and development
- Promote individual and community participation
- Use ecofriendly resources

3. SUSTAINABLE DEVELOPMENT OF URBAN RIVERFRONT

Sustainable development is the organizing principle for meeting human development goals while at the same time sustaining the ability of natural systems to provide the natural resources and ecosystem services upon which the economy and society depend. The desired result is a state of society where living conditions and resource use continue to meet human needs without undermining the integrity and stability of the natural system. Sustainable development can be classified as development that meets the needs of the present without compromising the ability of future generations.

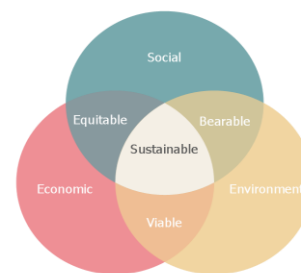


Fig -10: A diagram showing various parameters of Riverfront Development

3.1 Parameters for sustainable RFD

ECOLOGICAL - The waterfront zone is a dynamic area with frequently changing biological, chemical and geological attributes. The waterfront zone includes highly productive

and biologically diverse ecosystems that offer crucial nursery habitats for many marine species.

ECONOMIC- The waterfront contributes significantly to human welfare, both directly and indirectly and, therefore represents a significant portion of the total economic value of the planet.

SOCIAL - The waterfront zone is socially important for global transportation, open access and common property and is a unifying element in the cultures of each country

3.2 Criteria for sustainable riverfront development

THE CRITERIA IS DIVIDED INTO THREE LEVELS:

Primary level: This comprises of the three broad aspects of sustainability which is vital for success of any project : Environmental. Social and Economical.

Secondary Level: Each of the above aspects are further aspects which are key for making each criteria possible. For example, addressing the issue of Water management is placed under Environmental because addressing the same play a role in making a project environmentally fit.

Tertiary level: These contains indicators which are essential to make the secondary level possible. For example, safety is a key element in pedestrian planning which itself plays an important role in ensuring that the project has covered the aspect of social sustainability.

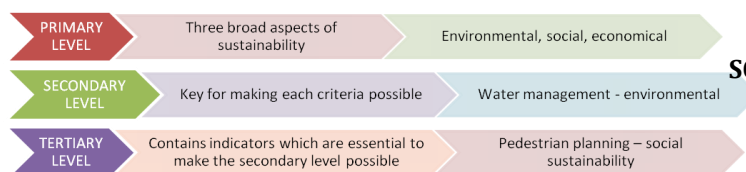


Fig -11: A diagram showing various criterias of Sustainable Riverfront Development

3.3 Principles of sustainable riverfront development

Riverfronts are one of the most valuable resources for the country – being limited, precious and non-renewable assets. To secure long-term growth of the resource, it is important for waterfront areas to be used strategically to maintain their economic value and enhance their specific features or image. For this reason, these are the 10 principles for securing excellence in waterfront redevelopment projects:

- Mixed-use is a priority
- Part of the existing urban fabric
- The historic identity gives character
- Secure the quality of water & environment
- Public access is a prerequisite

- Public-private partnerships
- Waterfronts are long term projects
- Profit from international networking
- Revitalization is an ongoing process.

4. CONCLUSIONS

The abused river can be brought back to the city by utilizing the resources of the river itself and convert the abandoned land of riverbed and nuisances at the centre of the city into people's attraction, tourist attraction, creation of infrastructural and recreational facilities and transform the city more livable in terms of environmental improvement and inclusive development.

By the study the researcher has concluded that, a set of basic guideline or minimum standards is created which can be further adopted while planning and designing future riverfront projects. As the need of the hour is come up with sustainable urban design ideas, the following criteria is also structured based on the triple bottom line of sustainability.

THE CONCLUDED CRITERIA IS DIVIDED INTO THREE CATEGORIES:

ENVIRONMENTAL IMPROVEMENT

- Natural environment & ecological system
- Energy efficiency
- Water management
- Storm water management
- Waste management
- Green neighborhood
- Brownfield redevelopment

SOCIAL IMPACT

- Site development
- Transit oriented development
- Public accessibility
- Provision of basic amenities
- Strong expression of culture & heritage

ECONOMIC IMPACT

- Development of river based activities
- Increase in real estate values
- Development of existing economic activities on site
- Improvement in tourist activities

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