

Interrelationship of City and Waterfront: Assets for Establishing Sustainable Cities

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Abstract— The Green cities or Smart cities mission intends to promote adoption of solution of efficient use of available assets to enable to give quality of life and sustainable environment. There are innumerable assets and aspects that go in to making of these smart cities. As one of the most essential assets of cities is proximity to their waterfront that manifests distinct relationship between people and natural environment. Cities envision their waterfronts as dynamic destinations for people. The structure of cities is linked to the water bodies that contribute to their beginning and their subsequent development. The relationship between waterfront and city is always changing depending on the functions carried out on adjoining land. The concern here is, structure of the city does not respond to their waterfront in recent development. Thus focus of this study is to understand the waterfront and its relationship to the city in the present Indian context, considering the different stages of the evolution period. The study identifies the factors that establish the relationship and determine how these factors affect the relation. These are; nature of waterfront includes edge condition, water quality and impact of floods. Another aspect is land use components comprising of the functional use and the activity pattern. Further are physical accessibility, visual and interpretive accessibility; the built form along the waterfront and response of people. This study determines the reasons that affect in establishing the interrelation are; limitation in implementation of policies; lack of initial decision in planning and uncontrolled development; unhygienic condition of the water bodies due to pollution and frequent flooding. This study brings forth alarming situations and provides recommendations to the critical issues to be taken care of; to create inseparable relationship between city and waterfront. These thoughts can serve as the framework for any waterfront seeking to establish interrelation and it can positively contribute to bridge the gap while considering the holistic approach where the relation between city and waterfront can strongly be improved and re-established to achieve sustainable cities.

Key words: Green cities, waterfront

I. INTRODUCTION

Sustainable development and smart growth are often used interchangeably. Smart growth is development that is environmentally sensitive, economically viable, community-oriented, and sustainable. It is an approach to urban communities that are attractive and livable. The term “smart city” usually refers to the umbrella term for more sector-specific notions of “smart growth,” and many other “smart” innovations for urban prosperity and livability. Smart city initiatives cover the waterfront, from civic engagement and sustainability. As one of the most essential assets of cities is proximity to their waterfront that manifests distinct relationship between people and natural environment.

When two entities ‘city and waterfront’ exist together there is a ‘relationship’ or ‘link’ between them’. ‘If

there is no interrelationship between them, there is no need for a waterfront location’. That bring the difference between cities those are developed due to waterfront and cities that do not have waterfront. There is something deeply and universally fascinating about water and it has been considered as the source of life. Many cities have started on the banks of such natural systems of water bodies because of access they afford to fresh water and navigation. Water bodies of every form – oceans, seas, rivers, lakes or ponds have been the niche for thousands of species of flora and fauna. The urban waterfront can be defined as “the area of the cities or towns where land and water meet” [1]. Urban settlements in the world show a very distinct relation to waterfronts. The relationship of waterfront and the city is crucial to people, communities and economies [2]. Historically, one can observe the strong physical connection, psychological association and visual relation with city in many aspects. Thus the relationship between waterfronts and cities is inevitable.

.. Yet cities have a strange tendency to forget their water bodies. As with the rapid and furious development they have grown in such magnitude and created alternate systems of water storage like reservoirs, reducing their immediate dependence on the rivers or lakes for fresh water. Rail and road systems are used more than the any other water bodies for navigation; and as sewers drain in the river or sea and industries spill effluents into it, the water bodies becomes an embarrassment, to be walled away or even covered up as if they were no more than drains.

Thus this particular study examines the waterfront and its relation to city in the present Indian context. The relationship of waterfront and evolution of city is studied by identifying various factors that establish the interrelation between waterfront and city in the various transformation stages of waterfront.

II. CONCERNS & CONTEXT OF THE STUDY: WORLDWIDE TO LOCAL

Many cities in the world are linked to the water bodies that contribute to their beginning and their succeeding development. The relationship between waterfront and structure of the city is very unique and always changing, depending on the functions carried out on adjoining land. The urban waterfront in today’s world is the focal point of urban activities. Worldwide, waterfront cities share common opportunities and challenges as public spaces in architecture, urban design and planning, ranging from public space creation and asset enhancement. The revitalization and redevelopment of waterfront cities require planners to adeptly respond to these and other social, ecological, cultural and economic issues at local, state and global scales. Urban waterfront redevelopment is being taken up throughout the world, but is mostly confined to developed countries especially in North America and European countries where the redevelopment of waterfronts have been widely recorded

during the last two decades. “It is still minimal in the developing countries” [3]. Bruttomesso defines waterfront revitalization as a “genuine urban revolution” [4]. Waterfronts had experienced the most radical urban revitalization of 20th century cities by having transformation in their physical layout, function, use and social pattern [5]. Cities have developed a very strong cultural context to the waterfront is termed as “cultural conservation”, like Venice and Marseille. Other examples where, waterfronts were renovated and reused by changing the quality of space and building uses as “redevelopment of waterfront” like London Dockland and the old fish market in New York. The third category is “development” where improvements take place according to the current demands of the city and the possibilities. This is flexible and contextual because different cities have specific requirements and the role of the waterfront has changed with time (Fig.1).



Fig. 1: Cultural conservation of waterfront in Venice, London: Integration of city & waterfront and Transformation of New York

It has also continued to dominate in international economy, trade and trends. Hence; it is now impacting developing countries to revive historic cities, recreational and economic development under the influence of globalization. The approach is towards replicating and reclaiming the waterfront to make way for development irrespective of their nature. “Cities are all becoming uniform; they are losing their identity, their soul.” Majority cities have started achieving the lost relationship between waterfront and city, but the ultimate product was a homogeneous manifestation that can be found in new developments around the world.

The structure of city, in relation to the waterfront in this research; has been done to understand the growth pattern

and its urban fabric in context to its historical, physical, socio-cultural and religious aspects of the city. The study intends to understand the past and the present growth of the city and its relationship to its waterfront. To understand the transformation, it is important to analyze the structure of the city through different stages such as emergence and growth of the waterfront, deterioration of the waterfront, and waterfront redevelopment [6].

To study the city structure it is necessary to understand urban morphology. As mentioned by Moudon, “it is used as an important assessment tool or method in determining the change transformation processes” [7]. Also suggested by Hall [8] that the urban morphology will be able to provide understanding of the existing or contemporary urban form of a city and at the same time provides clarification of the historical evolution. Water, as the principal generative element, affects the transformation of city. Water influences on urban morphology transformation enable formation of a city. Trancik [9] highlighted the importance of understanding the historical evolution of the urban fabric in order to understand its current condition.

Theoretical framework includes city structure based on morphological relationship and transformation stages of waterfront. The three stages have been derived for waterfront transformation based on models derived from Western countries which are interpreted in the Indian context considering the different stages of the evolution period. Although every city has a different evolution period depending on its geographical features, size, economy and other local conditions, common factors of development cannot be determine for all cities. Though each case is unique, but the underlying principles remain largely the same. Based on this understanding, the evolution stages have been derived for the purpose of this research are as under.

Stages of evolution		Period	Description of stages
I	Early stage	Period prior to Mid 19th century	Evolution and establishment of city
	Hindu period		
	Mughal period		
	French, Portuguese Dutch & British		
II	Intermediate stage Pre independence Period	Mid 19th to early-mid 20th century	Abandoned in use leading to deterioration of waterfront
III	Later stage Post independence Period to present	Mid 20th century-Beginning of 21st century	Deterioration of waterfront Present scenario of initiated some efforts for reviving /development of waterfront Reviving / Redevelopment of waterfront

Table 1: Evolution of city in relation to waterfront and Stages of waterfront transformation

III. INDIAN CONTEXT

The perception of water in Indian philosophy is quite different. Water and religion are inextricably woven into the Indian lifestyle. The rivers and sea have special significance in India, river is considered as mother (Mata) and sea as God (Dev) in the Indian culture. In Hinduism, water “jal” (water) is considered to be an element of primordial substance from which the universe came into being. Due to harsh tropical climate, the socio-cultural practice preferred a pronounced water culture, characterized by elaborate rituals of bathing and other activities related to religious customs (Fig.2).

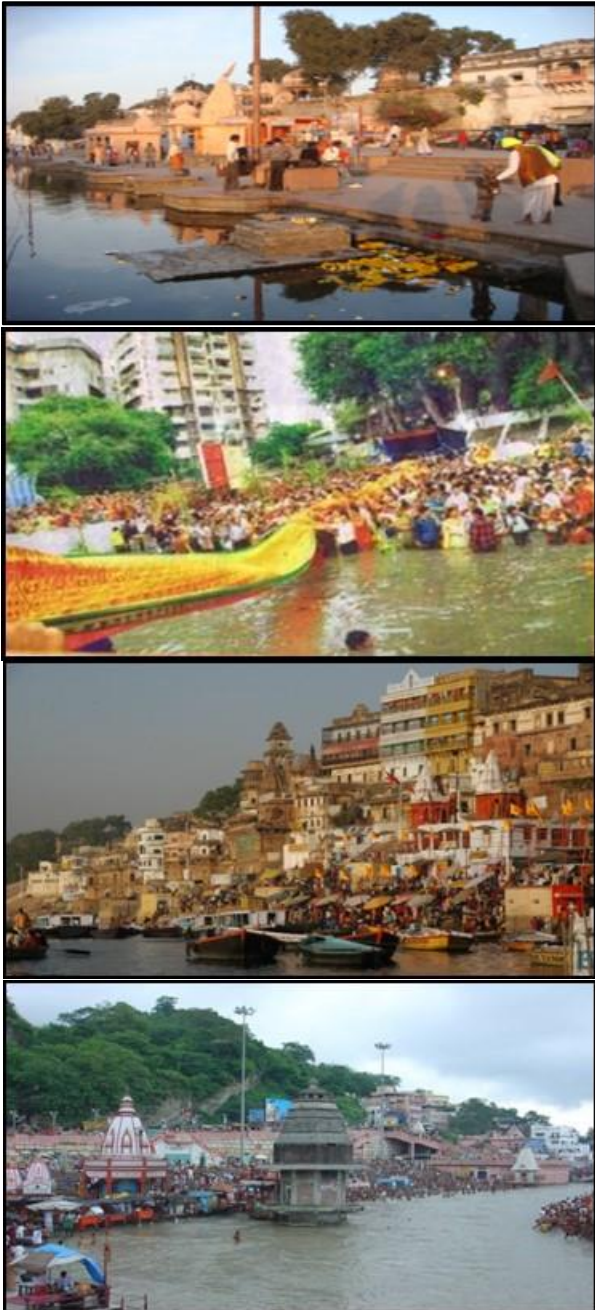


Fig. 2: Importance of water, waterfront elements and strong religious -socio cultural contexts in Indian contexts
Phenomenon of waterfront is diverse in case of Indian context [10]. Any natural source of water happens to be the place of worship, especially if it is accessible, and people would assemble to it not only to carry water, but also to worship and pay homage to it. The accessibility to water is the main feature which leads to particular response of the water edge

[11]. Waterfront, an area of recreation, is not deep rooted in the Indian culture [11]. While the Western view of waterfront emphasizes the recreational and transportation aspects. The physical accessibility to water is the main feature which leads to particular response of the water edge. Thus the evolution of built form with architectural conceptions along the water edge such as Ghat, (large steps leading to the water body), Ovara (Access to water body with gateway), step wells and bathing pavilions are profound elements of the waterfronts [11]. Thus city structure also reflects the evolution pattern respecting all the socio-cultural aspects, and makes the Indian waterfronts unique from the rest of the world.

In the last few decades in India, cities have started expanding at tremendous speed. The uncontrolled growth of the cities could not meet with demand and lead to the deterioration of natural features of the city. Most of them have turned their water edges into dump of solid waste, sewage and illegal encroachment for the dwellers. Waterfronts have turned their back from city in the race of achieving the goal of urbanization [12], [13].

Waterfront development has been undertaken increasingly now in India [14]. Many cities in India have also started adopting the new age technology in transportation system. But the growth of city has less relation with its waterfronts. Waterfronts remain as artifacts where they need to be appreciated while crossing the bridges where inherent link is forgotten while reclaiming of land for revenue generation.

The question arises that is it necessary to have integration between water, waterfront and the city? Thus the focus of this study is to understand the waterfront and its relationship to the city.

The aim is to study the waterfront and its relationship to the city structure. To achieve the aim, this study intends to address the following objectives.

- Study the transformation of waterfront in relation to city structure;
- Identify the factors that establish the relation between waterfront and the city and
- Determine how these factors affect the relation between waterfront and city

Addressing the mentioned objectives will contribute to answer the questions of the study:

- How did waterfront transform in different periods?
- How does the waterfront act in evolution of city structure and establishes the interrelationship between them? Which are the factors that establish the relationship between waterfront and city?
- What are the reasons that affect the factors in establishing the relationship between waterfront and city? How do they determine the interrelationship?

The answers to the above questions; form basis on which the factors that affect the interrelation of city and waterfront was analyzed. To understand the historical, spatial and social importance of waterfront lead to the tracing the transformation of waterfront and understand the roots and current situation of waterfront.

The study is able to identify the factors that establish the relationship and determine how these factors affect the relation between waterfront and city. These factors are; nature of waterfront includes edge condition, topography, water quality and impact of floods. Another aspect is land use

components comprising of the functional use and the activity pattern along the waterfront. Further are accessibility to waterfront in terms of physical, visual and interpretive access; the built form along the waterfront; activities, context and the response of people (Fig. 3).

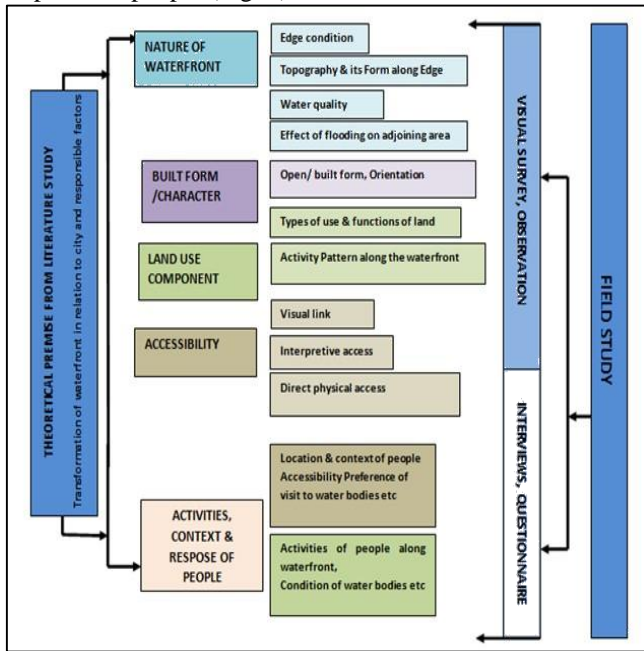


Fig. 3: Factors affecting interrelation: Basis for field study & interviews

IV. METHODOLOGY

The research employed qualitative approach based on a ‘case study method’ [15], [16]. Several techniques were used in data collection which include secondary data source from archival data for understanding evolution of city in relation to waterfront transformation through historical period. This was based on understanding derived from literature. This method offered combining of multiple of data sources and tools for analysis and evaluation. Several techniques were used in data collection which include secondary data source from archival data for understanding evolution of city in relation to waterfront transformation through historical period. This was based on understanding derived from literature study of waterfront transformation across the world.

Field study tools included visual survey, observations, site documentations through photographs, preparing field notes and activities mapping. Various forms of interviews include questionnaire and semi structured interviews were employed to collect the primary data. These are essential aspects in addressing the research questions of the study.

V. FINDINGS

The analysis of this study determines the reasons that affect in establishing the interrelation between waterfront and city are; limitation in implementation or absence of policies, guidelines and regulations; lack of initial decision in planning approach and uncontrolled development; unhygienic condition of the water bodies due to pollution; lack of coordination and integration among various authorities; frequent flooding and resulting embankments; unawareness,

limited vision and private ownership of land in riverbed areas (Fig. 4). This study brings forth alarming situations and provides recommendations giving attention to the critical issues of the findings from this research. It is evident that if such issues are taken care of, it can positively contribute to bridge the gap while considering the holistic approach where the relation between city and waterfront can strongly be improved and reestablished. Using this methodology of evaluation, study of other cities also can be performed having similar contexts and for other cities have to be modified according to the context as the evaluation factors are based on local condition and case/area specific. This study is important and appropriate because of the growing demand of waterfront development around the world, which often replicates the design without consideration of the local context and has a poor response to establishing the relation between city and waterfront. It is very important and urgent to address reasons as why this situation is occurring so that future waterfront development can take into account the factors to help prevent this situation from continuing. Otherwise, if the situation continues, future waterfront development may lose its sense of place and its local identity will not be culturally sustainable and will not be able to establish the relationship between waterfront and city. Hence evolving an appropriate, context specific interpretation of "Smart Cities" and we ought to be more sustainable, than we have ever been.

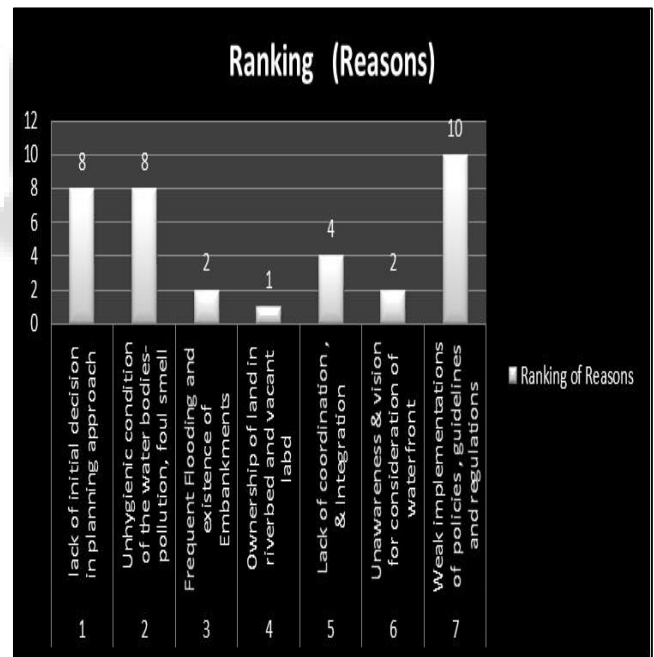


Fig. 4: Ranking of reasons: Affect the responsible factor

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