CHAPTER 1

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1.0 INTRODUCTION

This chapter introduces the thesis through a summary of the background research. It presents the context of the study by discussing the salient issues, and introduces the physical location of the study area. The aim, objectives, scope and limitations of the study are laid out along with the methodology. The importance of this research and the approach taken are discussed. Finally, the overall thesis framework is presented.

1.1 Background and Context

Civilizations have been established along waterways, river valleys and banks, watersheds, ocean fronts, etc. throughout history. The benefits encompass ensuring reliable water vital for human life, and meeting the needs of agriculture, trade and commerce, recreation, sanitation, transportation, etc. The waters and associated ecosystems of a region are some of the most important resources for any human settlement.

In the process of meeting a myriad of these needs, water has also determined the culture, form and function of urban settlements (Shrestha et al., 2009), (Teh, 2009), (Zajac, et al., 2009) and (Dong, 2004). Expressions of identity and culture have become integrally tied with the social activities, religious rituals and the characteristics of built environment at waterways and water bodies. Built environments can be oriented towards or away from water, and their components built around a water body or along waterways, or even designed to withstand seasonal flooding events (Jumsai, 2009) and (Lusterio, 2009). Any of these patterns exhibit strong symbiotic relationships with the functional aspect of water in the lives of all inhabitants of that environment.

At the same time, the natural edge, or the boundary where water meets land - the waterfront, is altered by human interventions. These interventions at the natural edge can be seen in diverse ways: as industrial waterfronts; as waterfronts designed to be public spaces with entertainment centers, sports arenas, etc.; and also as preserved ecosystems like wetland habitats, lagoons, preserved beaches and deltas. Depending on natural hydrological, geological and geographical conditions, the conversion of the waterfront becomes critical to the economy, culture and politics of a city. Additionally, the local and
regional environmental issues affects the quality of the waters flowing into the waterfront areas, and can either hinder, or compliment developments at the waterfront.

This research therefore identifies two broad interconnected areas for detailed investigation: waterfront and waterfront development, and the local and regional environmental issues impacting the same. The background research informs the detailed investigation of water issues and waterfront development opportunities in the study area - Thiruvananthapuram Urban Agglomeration (TUA), Kerala in subsequent chapters. This research attempts to tie-in the local waterfront development discourse in the study area to broader conversations of environmental sustainability; it is perceived that such a discourse is needed to address issues that impact the vitality of the historic city, the quality of life for its residents, and to plan holistic and comprehensive strategies that balance potentially competing demands of a dynamic economy and healthy environment.

1.2 Defining Waterfront and Waterfront Developments

The diverse nature and characteristics of waterfronts include natural waterfronts and constructed waterfronts. Human-altered waterfronts can be urban or semi-urban in character and location. Natural waterfronts too could be altered to preserve or enhance their special features for various purposes like eco-tourism, habitat conservation, nature research, etc. Therefore, a one-size-fits-all definition for ‘Waterfront’ or ‘Waterfront Development’ may not be applicable. Many definitions abound, which address the many types or features of waterfronts, and their associated developments.

Although the meaning of the term ‘waterfront’ seems self-evident as land adjacent to a water body, many definitions abound. Researching for ‘official definitions’, the following definitions and descriptions emerge: The American Heritage Dictionary defines waterfronts as either land abutting a body of water or the part of a town or city that abuts water, especially a district of wharves where ships dock. A broad definition by the US federal Coastal Zone Management Act (CZMA) (Section 306A (a) (2)) as cited in Goodwin (1999) is “any developed area that is densely populated and is being used for, or has been used for, urban residential, recreational, commercial, shipping, or industrial purpose.” (p. 241). Collins Essential English Dictionary defines the waterfront as the area of a town or city next to an area of water, such as a harbour or dockyard. The Urban Land Institute refers to an urban waterfront as the water’s edge in cities and towns of all sizes. The water body may be a river, lake, ocean, bay, creek or canal, including manmade.
Academic literature contributed by various scholars shows a similar mix of definitions and descriptions. Definition by Guo (1998) as cited in Dong (2004) defines the “waterfront as the area in the city where land meets water, spatially, an area including 200m-300m from the interface to the water side and 1km-2km (that is about a 15min-20min walking distance) to the land side” (p. 7). Wu and Gao (2002) as cited in Dong (2004) present that “It is an integrated system consisting of multiple features, of which the water forms the centre, and enclosed by substantial objects” (p. 7). Goodwin (1999) argues that waterfront boundaries are difficult to determine and in some instances planning efforts might focus on a small part of a larger indistinct waterfront area. He presents that “The concept of a waterfront district helps to identify distinct nodes of revitalization activity within long urban shoreline reaches” (p. 242). Various terminologies are also used in literature instead of ‘waterfront’; these include city port, harborfront, riverside, river edge, water edge, and river front (Hussein, 2006), (Yassin, et al., 2010) and (Timur, 2013). The urbanized areas could also be cities and towns of various sizes and population densities. Additionally, the water body may be ‘a river, lake, ocean, bay, creek or canal’ or artificial (Timur, 2013, p.170).

The definition of ‘Waterfront Development’ therefore depends on the characteristics of the waterfront site, the planning framework and development approach. Various planning authorities, local communities, investors, and other stakeholders including local residents may be involved in any waterfront development process. Depending on the site, waterfront developments could be new waterfront projects to acquire new facilities, investments and operators to the area/region. They could also be development projects to preserve natural habitats along with developing supportive public amenities. Waterfront developments could also be regeneration / rejuvenation / revitalization projects, which aim to improve existing areas, addressing deterioration and blight. Post-industrial facilities/buildings or defunct dock yards could qualify for development projects in order to remove blight, increase economic vitality of the area, bring new investments and new population or productive agents to the waterfront neighbourhoods. The types and definitions of waterfront developments depends also on the larger policies being addressed and the level of planning authority involved for a specific development. Bunce, et al.’s (2007) discussion reinforces this argument by recognizing the importance of considering non-spatial processes like political ecologies on spatial projects like waterfront developments. Coastal waterfront development may
include national policies and national planning frameworks. For example, the declaration and regulation of the Coastal Regulation Zone by the Ministry of Environment and Forests (Department of Environment, Forests, and Wildlife) (2001) in India gives clear guidelines and controls development of coastal areas, including roads, building locations away from tidal lines, building heights, preservation of local architectural character, preservation of sensitive habitats, etc. Urban waterfront development may include state or city/town planning authorities/agencies, and local waterfronts like lagoons, wetlands and marshes may include the active involvement of local planning offices or local government offices like panchayat or municipal offices. Many of these may include community participation, especially at the local level. Goodwin (1999) points out that the CZMA does not differentiate between ‘Waterfront Redevelopment’ and ‘Waterfront Revitalization’, and that ‘Revitalization’ is a process beginning with a community to improve its waterfront through a series of planning processes with diverse stakeholders in a coordinated manner.

1.2.1 Research Definitions and Terminologies

From the many definitions, it can be seen that waterfronts and waterfront developments encompass the following attributes:

- They are urbanized or semi-urbanized areas with human settlements and, or specific land uses or land covers (residential / commercial / industrial / port / natural habitat / wet lands) at the water.

- There are identifiable interactions between land and water officiated by human activities. These can be directly related to the type of land use at the waterfront.

- The component of water may include many types of water bodies, such as a sea/ocean/bay, lake, river, creek, pond, canal, artificial/human-made water bodies, etc.

- Spatial boundaries may not be clearly defined. Continuous waterways may have varied boundary characteristics or no distinguishable boundary as in the case of deltas or wetlands.

- They may be part of a single or many jurisdictional and, or administrative boundaries.
Each waterfront or waterfront development can be influenced by various social, economic, political and cultural interventions. New developments or rejuvenation of earlier waterfronts are determined by these influences.

Considering the broad range of manifestations and possible ways of interventions regarding ‘Waterfronts’ and ‘Waterfront Developments’, it is important to present the definition or characteristics for the purpose of this research thesis. The definition adopted here also considers the diversity of water bodies and waterways in the study area; coastal waters, lagoons, ponds, lakes, rivers, canals, etc. constitute the environment of TUA. Each of these water bodies/waterways and their surroundings exhibit diverse spatial characteristics, and social, economic, political and cultural histories.

In this research, the term ‘Waterfront’ is applied to the area at, and immediately surrounding all the types of water bodies and waterways in TUA, the study area. The study is restricted to the extent of a water body or flowing waterway within the boundaries of the study area. However, the research recognizes that larger issues affecting the entire watershed are important for any specific and meaningful intervention within the study area. This especially becomes important when dealing with issues related to pollution, ground water extraction, contamination of the waters, political issues surrounding water supply, sanitation and drainage, etc. A separate section of this chapter deals with larger issues impacting local waterfronts and waterfront developments. It discusses environmental aspects and approaches to address some of those concerns in the study area, and discusses the influences and trends by global examples.

The term ‘Waterfront Development’ in this research includes all the attributes of waterfront developments summarized from the discussion of various definitions. Along with new development projects at the water, if the terms ‘Waterfront Revitalization’ and ‘Rejuvenation’ are used, they are considered to be new waterfront developments. They are considered to be developments of existing waterfront areas displaying substantial blight or neglect. If the term ‘Waterfront Redevelopment’ is used, it specifically refers to development of existing waterfront developments with new commercial/economic potential. Existing ports, shipment hubs, coastal /beachfront developments, boat clubs, etc. have been considered to be potential ‘redevelopment’ projects. Waterfront development in this research refers to a diverse range of development opportunities with commercial, cultural and social significance.
1.3 History and Characteristics of Waterfronts and Waterfront Developments

This thesis looks at some of the well-documented issues on water fronts and waterfront developments in detail, and investigates the opportunities presented by emerging research. Literature on waterfronts and waterfront developments acknowledge the importance and role of water in urban settlements. Academic research is extensive in documenting the history of waterfront developments, the characteristics of urban waterfronts, its design, planning and development, the economics of waterfront projects, social equity issues and cultural impacts of waterfront developments, the principles and best practices for successful waterfronts, etc.

Urban waterfronts have undergone many transformations from an intimate functional and spatial relationship in pre-industrial river-cities (Hoyle, et al., 1992) to specialized industrial zones in the industrial era with shipping yards, manufacturing hubs and networks of land-based transportation systems. With post-industrialized scenarios in the latter half of the 20th century, many of these waterfront zones experienced neglect and urban blight. Originating in the 1960s and 1970s in United States, modern urban waterfront redevelopment has become a global phenomenon (Daamen, et al., 2012), (Dong, 2004), (Liu, 2013), and (ULI, 2004). Waterfront developments sought to remove the urban blight of the industrial era, create highly visible sites for tourism and mega events like the Olympics and trade shows, and develop a marketable image for the city. Discussing this approach to waterfront developments, Brebbia (2013) points out that the rejuvenation of waterfronts are recognized to spur the rejuvenation of the city itself, and have become integral to the city’s attractions.

Dong (2004) cites Vellaga (2001) to discuss how cities now have turned to an array of regulatory tools (zoning, design guidelines and development agreements) to overcome financial hurdles to acquire new lands for public amenities. Redevelopment of industrial waterfronts with public-private partnership models can be a way to utilize existing urban waterfronts, and transform them into an inclusive public space.

However, cities across the world have also now recognized that urban waterfront projects cannot be conceived in isolation from local and regional environmental, and social issues. These revitalization/ re development/ regeneration projects work with a broad scope. Waterfronts NL (n.d) express this broad and inclusive thinking:
Waterfront development can include any combination of different land uses, and waterfront projects can be new projects or re-developments of existing waterfronts into new places. Some waterfront projects focus on industrial uses, such as industrial ports, and others focus on more recreational and tourism-oriented uses. It's important that a diversity of uses can occur along a waterfront, bringing in as many interests as possible to the waterfront, but it's not necessary that a diversity of uses occurs within each project…Each site has its own environmental, political, resource, climatic, and social contexts -- there is no one solution for all. (Waterfronts NL, n.d)

In a detailed discussion of waterfronts and waterfront developments in Chapter 4, this thesis looks at the historic developments; the complexity of issues that have continued to impact the development and redevelopment of waterfronts; the approaches adopted by different cities worldwide depending on the specific demands of context and culture. The importance of place-making and architecture is given special attention as this research recognizes that the existence of a settlement at the waterfront demonstrates significant geo-political, architectural and cultural histories, and therefore, a waterfront is intimately tied to its context and culture. Even a newly created waterfront in an emerging economy will be associated with the particular characteristics of its context, and the society that inhabits the immediate vicinity of the new waterfront.

Apart from place-making and architecture, the thesis pays attention to the emerging global concerns for social inclusion and environmental sensitivity. This research focuses on these concerns by discussing the environmental issues in waterfront development, and looking at how cities across the world have adopted sustainable planning as their main approach towards developing and redeveloping their waterfronts.

1.4 Environmental Issues in Planning Waterfront Developments

Environmental issues and corresponding social equity issues are informed by not only traditional environmental science and local activism, but have become global concerns due to concerns surrounding climate change and global warming. Local concerns are officially acknowledged to being impacted by regional, national, and even international issues. Cities across the world are planning for disaster resiliency, sea-level rise, watershed impacts, etc. Environmental pollution, climate change, and other critical
issues impacting the availability and quality of water are significant issues for all communities globally.

These issues directly impact waterfronts; the pollutants from industries/waterfront commerce, untreated urban waters, natural disasters, etc. affect the quality, accessibility and economics of any waterfront development. In waterfront revival/redevelopment projects, environmental remediation and holistic planning of the entire watershed have assumed great significance. Few examples are: New York city, USA (The City of New York, 2011), Singapore (Skyline, 2012), and Toronto, Canada (Making Waves, 2001).

The complexity of many international waterfront transformations and new waterfront developments now include environmental issues, community accessibility, and local identities. Brebbia (2013) presents that waterfront transformations across Europe have moved away from ‘rubber-stamp’ designs that were seen as ‘cure-alls’ for problematic cities in the initial years of waterfront transformations and they are now complex creative operations with attention to urban development and environmental sustainability. Emerging research and official planning approaches reflect this shift in focus - from traditional waterfront development towards the planning and development of waterfronts as part of a larger, regional ecosystem - with emphasis on environmental sustainability (Examples: Brebbia, 2013; Laidley, 2007; Bunce and Desfor, 2007; Giovinazzi and Moretti, 2010, Vallega, 2001; Seattle Department of Planning and Design, 2012; The City of New York, 2011). In addition to a broad range of land uses and development types, waterfront plans of these cities are also being integrated with a city-wide water management plan. These take into consideration storm water management, the urban water cycle, watershed issues, regional environmental issues, and demands on infrastructure and city facilities. (The City of New York, 2011), (Dong, 2004), (Timur, 2013), (Shreshta et al., 2009), Brebbia (2013) and (Moretti, 2008) discuss how many of the regenerations are fuelled by raising environmental awareness and acknowledge that the waterfront has to be accessible (physically and visually) by the public as a place for relaxation, contemplation, and as a destination. Many cities and towns have also acknowledged the destruction wrought by waterfront commerce and waterfront developments on ecologically sensitive zones. Some of these cities are undertaking brownfield remediation, and are revitalizing former industrial waterfronts into eco-sensitive areas with emphasis on local identity and community access to the water.
This research recognizes that environmental issues are relevant in addressing the needs of waterfront developments in the Indian context too. Especially in cities of Kerala, Geevan (1996) extensively discusses the need for an ecologically balanced sustainable development and coastal management in Kerala. Therefore, a separate section of this research discusses environmental issues and the need for holistic planning with importance to environmental sustainability. Particular attention is given to comprehensive plans for urban water management, urban waterfront plans, and regional watershed issues by various international governments. This is discussed in detail to understand not only global trends in environmentally sustainable waterfront developments, but also to investigate applicable planning and design strategies for cities in Kerala, which have diverse waterways and multiple waterfront development opportunities.

Additionally, it is worth noting that Dong (2004), Hoyle (2001), Hoyle (2002) and Hoyle (2001) discusses waterfront developments in Newly Industrialized Countries (NICs) and Less Economically Developed Countries (LDCs); the author points out that waterfront development in these countries have not been investigated as extensively as European and Northern American countries. It is discussed that in these countries, waterfront developments are being spurred by diverse requirements including tourism, cultural revival, and response to globalization and changing economic scenarios, and in many cases, a response to post-colonialism. By studying waterfront development in Kerala, this thesis hopes to add to the body of knowledge on waterfront developments with holistic planning outside of Europe and Northern America.

1.5 Background of the Study Area

Urban environments have been identified to have three separate water systems; the potable water system, the sewerage system, and the storm water drainage system (Wong, 2011). Many cities with inland waterways, coastal lines, canals, and ports can be identified to have a fourth water system – the transportation system.

All these systems can be seen in the cities of Kerala State, India. With shorelines, deltas, mangroves, and an extensive network of backwaters, rivers, lakes and canals, the cities of Kerala provide unique opportunities to investigate potential strategies for water sensitive and sustainable urban planning and design. According to Kerala State Industrial Development Corporation (KSIDC), Kerala has 41 navigable rivers with the total inland waterways in the State being 1687Km (KSIDC, n.d).
A focus on Thiruvananthapuram (anglicized to Trivandrum by the British), the administrative capital of Kerala, juxtaposes the fragility of Kerala’s water ways, which have always been integrally linked with its myths, history, art, culture and commerce with the challenges of contemporary urbanization.

This research focuses on the Thiruvananthapuram Urban Agglomeration (TUA) area, the jurisdiction of Thiruvananthapuram Development Authority (TRIDA). TUA consists of the major urban center of Thiruvananthapuram Municipal (TVM) Corporation and 10 surrounding panchayaths. TUA has a total area of 296.17 Sq.Km and the total population as per 2001 census is 889,635 (Government of India, n.d). (Note -This data requires revision after the publication of the official detailed 2011 census. Currently the 2011 census (Government of India, n.d) gives provisional data for the larger district level, and not for the areas within TUA. As per the 2011 census provisional data, Thiruvananthapuram District with a total area of 2,192 Sq. Km has a total population of 3,307,284 recording a growth of 2.25% from 2001. The density of the district is 1,508 people per Sq. Km).

The research examines the developmental potential of TUA’s waterfronts along with issues surrounding its natural and urban waters, which may impact any potential waterfront development. It articulates a vision for the future of Thiruvananthapuram’s waterfronts and waterways. Information from literature on waterfront development, sustainable urban water management, and issues affecting natural water resources in TUA area are combined with primary surveys of the study area.

Thiruvananthapuram city and its waterfronts have an excellent chance of being part of the proposed National Inland Water Way-3 which extends from Kollam, situated 130 km north of Thiruvananthapuram. This is a valuable but still untapped opportunity. Decades of declining maritime activities have left much of the city's waterfront dormant. After years of neglect and several revitalization attempts stalled by the clash of competing interests, there is increasing awareness among citizen groups regarding the state of TUA’s waterways, the productive use of this resource, and communities’ access to any future development. The significance of this awareness can also be understood by looking at the fact that Thiruvananthapuram is experiencing a noticeable shortage of well integrated community public open spaces, an intangible determinant of better quality-living
environment. This situation offers a massive development potential for the vast waterfront regions in the immediate surroundings of Thiruvananthapuram City.

Along with these opportunities, which provide strong requirements for a thorough investigation of the potential of TUA’s waterfronts, it is important to note the continual tourism attraction of Kerala. Kerala’s unique geography with diverse waterways, forests, tea plantations, mountains, coastlines, etc. have combined with its rich history and cultural traditions to be one of the topmost domestic and international tourist destinations. Local governments in Kerala continue to invest financial and other resources to maintain this profile. As one of the main tourism destinations in Kerala, the development of TUA’s urban waterfronts will contribute to enhancing its economic and cultural vitality.

This unique scenario of Kerala, and TUA in particular, makes the current research an interesting investigation as a whole. It is also worthwhile to study the potential of TUA’s waterfronts, and the opportunities identified from the research as a specific case study for other urban areas/cities all over Kerala. It will provide an insight into waterfront developments and revitalizations in the Indian context, which may show how the European or North American examples and theories differ or change when explored and implemented a developing nation’s socio-political, economic and cultural context.

1.6 Statement of Research and Research Questions

The primary purpose of this research is to apply existing research, and planning and development approaches to the sustainable development of waterfronts in the Thiruvananthapuram Urban Agglomeration (TUA) area, the jurisdiction of Thiruvananthapuram Development Authority (TRIDA), Kerala. In order to accomplish this purpose, the research discusses urban waterfront development within a framework of local and regional environmental issues, especially with respect to urban water management within the context of the chosen study area. Due to the integral connection of urbanized areas with coastal areas through a network of diverse waterways in TUA (as with other cities along coastal Kerala), this thesis aims to discuss potential integrated planning and management of waterfronts, urban waters (including all waterways flowing through TUA, waste waters, drainage and water supply), and coastal area development. Preliminary research indicates that any waterfront development or revitalization has to be considered in the context of increasing urbanization within TUA and the urban growth of coastal areas.
In order to evolve feasible strategies for consideration in the study area, and in order to present varied options for sustainable waterfront initiatives, the aims and objectives are articulated in the next section with the intention of responding to two important questions:

1. How can urban waterfront developments be planned for consistency with larger sustainability goals?
2. How can urban waterfront development plans integrate its waterfront areas with the management of all waters (urban waters and regional waterways including the coastline)?
3. Can the waterfront act as a leading spatial system to carry out integrated management of the waterway within which it is located? How can this be facilitated?

Discussion of the first question may lead to developing optimal strategies from available research and global trends in sustainable and comprehensive urban water management, and waterfront development. A discussion of the latter questions may lead to a consideration of the waterfront as the central subsystem of the watershed or a coastal system, as one of the functions of the watershed and, or a coastal area (this is also applicable to the specific type to water body at which the waterfront development may be located, for example, a canal or a river). These introductory observations reveal the importance of an optimal integration of waterfront designs with the specific water system it is located at, and the importance of developing waterfront areas within the framework of urban water management, and coastal management.

1.7 Aim and Objectives of the study

A holistic approach and exploratory research is adopted to investigate, evaluate and critically analyze urban waterfronts, and the water issues impacting their development in order to evolve suitable strategies for planning and development of waterfronts in TUA.

- Study the concept of waterfront development, and successful transformations of dormant waterfronts around the world
- Study the waterfronts in the study area and their potential to address several issues relating to quality of life in TUA – the study area.
- Propose an urban planning framework for the waterfront development of TUA.
- Evaluate the land uses, facilities, activities, and design responses that can sustain the vitality in terms of waterfront development in the study area; and
- Evolve holistic strategies and vision for effective integration of the waterfront area with the rest of the surrounding urban area to form a cohesive network of places in the city.

1.8 Scope and Limitations of the Study

The proposed research attempts to investigate some significant aspects of waterfront developments from the point of view of the study area. Urban waterfront development and regeneration projects are the means by which areas that have been neglected are given new uses and a new life. This study provides development planning strategies only relating to urban and regional planning aspects.

As the number and diversity of waterfronts in TUA reflects the situation in most of the urban areas across Kerala, a detailed discussion of all the waterfront areas and potential waterfront development projects are beyond the scope of this paper. However, primary surveys and background research on TUA for the purpose of this research identifies a few waterbodies and their environs for waterfront development and suggests a range of planning and design strategies. Water sensitive urban design (WSUD) research is limited in the Indian context. Additionally, this research found a lack of comprehensive watershed planning that drive regional plans and present specific goals for waterfront developments or redevelopments in the Indian context, despite a plethora of environmental issues affecting waterfronts and regional watersheds. Therefore, this thesis draws extensively from an international body of research and attempts to apply it to the Indian context, especially for TUA. The research also looks at Indian national environmental policies, coastal management zone guidelines, and other significant resources to base suggestions for planning guidelines and strategies.
One of the main limitations is with the data that exists in the revenue records of an urban local body (ULB); this includes public as well as private properties, and to a large extent is incomplete and inaccurate. All these inaccuracies and inconsistencies must be dealt with along with suitable identification of the scope, potential of its land use, its current function, the current occupancy status, identification of suitable function or project for the best interest of the society, whether the widening proposal of an existing road adjacent to a public property in waterfront is affecting its function, what is the prevailing architectural character involved with the properties of waterfront in terms of public buildings, street character, streetscape, etc. Access to these records and detailed studies with development of different scenarios are beyond the scope of this thesis.

This research begins with the observations and ends by drawing conclusions, and moreover as there are not many policy or guidelines for the specific study approach, much of the findings will be analyzed based upon secondary data. Based on this analysis, planning strategies will be suggested for some identified waterfront development sites, which are perceived to serve as typical studies for other waterfronts in TUA with potential for future development or redevelopment projects.

1.9 Methodology

This research is organized around four principal functions of the waterfront: **The Natural Waterfront** - comprising of beaches, wetlands, sensitive ecosystems and the water itself; **The Public Waterfront** - including parks, street ends, vistas and waterways; **The Working Waterfront** - where water dependent, maritime and industrial uses are dispersed; and **The Redeveloped Waterfront**, in which related land uses have recently changed due to various reasons. The waterfront functions and major issues are discussed in the context review and the planning strategies and proposals includes short- and long-term strategies intended to guide land use change, planning, coordination, and public investment. Each strategy is conceived to be interwoven with the others so that, together, they create a comprehensive vision for the entire waterfront of the study area.

The methodology of the study will include the following:

- Understanding the Concepts of Waterfront Development
• Identifying Research problems/ key issues, and delineation of the study area.

• Literature study on Waterfront Development in Urban Planning, Urban Design and Architecture.

• Identify opportunities for Waterfront Development in TUA.

• Prepare documentation by survey of secondary sources (data collection) and conducting a primary field survey.

• Identify and apply a framework in TUA’s waterfront sites to present options for environmentally sustainable waterfront development planning.

• Discussions and recommendations: Formulate strategies for Waterfront Development planning in the study area

The study will highlight the city's prominent natural areas encompassing a large proportion of the waterfront and the need to propose public policies to preserve and enhance their outstanding natural features. All across the study area, neighborhoods would be investigated for reconnecting to the waterfront. The study recognizes that the list of sites identified in the course of this research cannot be exhaustive; more sites need to be identified for improved waterside public spaces: at the water's edge, with modest improvements, points of access for nearby residents and other users could be provided; and other waterfront sites need to be identified, where public access would be a mandatory component for new development.

1.10 Organization of the Thesis

This thesis is organized as follows:

Chapter 1 introduces the research background, presents the various definitions and the definition adopted for this thesis, introduction to the study area, discussion of the scope and limitations, and the statement of research questions.

Chapter 2 reviews available literature in order to understand the various aspects and issues being discussed throughout this research.
Chapter 3 presents a detailed look at the study area, and its waterways and waterfronts. It lists the challenges for waterfront development and identifies various opportunities for comprehensive plans and integrated strategies.

Chapter 4 reviews the theoretical context of the research. This includes the historic review and categories of plans and the principles of waterfront developments. Chapter 4 goes on to present the framework adopted for this thesis. An ecological framework is presented and adopted based on all the discussions. It reviews environmental sustainability and its need in urban planning and development, especially in the context of waterfront developments with examples and specific reference to developments in watershed and waterfront planning globally. This leads to a discussion on the ecological situation of waterfronts in Kerala, and then sets the stage for evolving waterfront development planning strategies in the next chapter.

Chapter 5 integrates all the background research, discussions, and primary surveys to identify holistic planning strategies for TUA’s waterfronts. It identifies a range of diverse water bodies and their associated waterfronts for broad planning guidelines and initiatives. Although specific design interventions for all the waterfronts are beyond the scope of this thesis, Chapter 5 draws from similar planning initiatives worldwide to provide urban design examples and suggestions for different types of waterfronts and water sensitive areas.

Chapter 6 concludes this thesis research by summarizing the suggestions, recommendations and by identifying the scope for further studies.