



Water Features in Mumbai: A Comprehensive Overview

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ABSTRACT

The Study focuses on the water features in the city of Mumbai. It has been many years since Mumbai was established by combining seven islands. So, water plays a very important role in the city in both tangible and intangible aspects of the city. This study has been carried out through literature review and case studies including waterbodies in Mumbai. The water bodies are introduced and their impact on people its true nature such as their smell, contamination, and aesthetics is evaluated, by arriving at conclusions and making comparisons. The results are objective and focus on practical aspects which can be used for further studies.

Keywords: Water, Architecture on the waterfront, water Pollution, Lakes and Ponds, Ocean.

Introduction

Water is an important aspect of existence water combines with land air and light to define itself. It's an aspect of purity, serenity, and a natural element that expresses beauty. Water plays an important role in the survival of species. It is used to wash and drink to survive. Water has been the beginning of species and human civilization. The mortar used for binding construction materials uses water. It can take any shape and any form, historically it is been used in many places the Persians used it in their gardens. Even in Islamic architecture water is an important aspect of purity. In Christianity, it is used to purify the soul. By giving baptism to babies. (Yurtyapan Salimi, Salimi, and Kara Pilehvarian 2016) Water is from where the first species came out onto land and after that the evolution of species took place. and we as humans came into place late in the cosmic timeline. (Darwin 2009) In Architecture, water can be used to create architectural features by placing it and emphasizing it intentionally. In urban planning, water bodies are strategically placed to have appropriate effects on the mind. Architecture also has had a lasting impact on historical philosophy.

We are going to take a look at urban aspects such as various types of water features and water bodies of Mumbai. By selecting appropriate water features and bodies selectively for this article. Mumbai has been having a lot of water crises related to water, from water shortage to water quality degradation to the worst. Mumbai itself is built on seven islands namely Bombay, Parel, Mazagaon, Colaba, Mahim Worli, and Old Woman's Island. The article will let us know more about the waterbodies from an objective perspective. Water in Mumbai is also an emerging urban issue. The article will help with the understanding of the relation of water and Mumbai city.

AIM / PURPOSE

The study aims to understand and document various types of Water Bodies and Features across Mumbai. Which consists of Lakes, Ponds and Seafront's. This documentation will give us a better understanding of the existence of these water features. The goal is to capture the imageability of these water bodies. covering aspects of its function, footfall, aesthetics, connection with nature, contribution to society, and impact on the environment.

RESEARCH METHODOLOGY

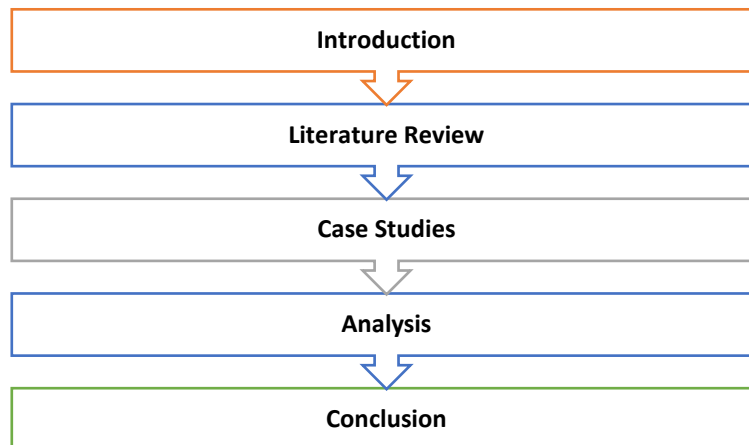


Figure 1 Research Methodology

In this paper we will do a literature review of case studies do an analysis and conclude. The methodology is explained in Fig 1. Research Methodology.

Literature Review

Water is used in architecture in both natural and artificial conditions. The waterfronts which are in front of the cities, lake, pond seafront are all-natural aspects. The artificial aspects are the ones designed for aesthetic and functional purposes such as fountains, water walls, swimming pools, etc. The more we learn and discover about water and architecture the more we realize that it is related to the historical, spatial, technical, and artistic relationship between water and architecture(Löwe et al. 2020)

how was water used in architectural historical structures tells us about how water was so important for example the aqueducts which were built in Rome for transporting domestic water for drinking bathing and washing purposes.

Water plays a very important role in architecture in both small scale to large urban scale. i.e. from small ponds to the vast ocean. Water is used as a means of transportation around the world. For example, water is used in gardens with ponds or lakes and pathways along its periphery.



Figure 2 Marine Drive Mumbai

Marine Drive is also an example of an urban area. Let us analyze the way architecture works with water

First, there is the ocean on the right side and then there is a seating space along it. After the seating space comes the main roads, the roads then have streetwalking paved areas on both sides. Then comes the building. the benefit of this combination in a planned city like Mumbai is that everybody gets the sea view the people who walk along the footpath drive along the road and live in the apartments will get a beautiful ocean view. If it were planned in reverse like if the building was placed on the edge, then only the window of the buildings would get the view of the ocean.

In architecture even drainage plays a very important role from the water being used and washed away then let into bigger water bodies such as lakes and sea one example of this is the Mithi River

Water features act as focal points in an urban landscape and neighborhood. Landscapes can be oceans, rivers, and oceans. water induces a sense of calmness and tranquillity in the mind. Whenever someone hears the soothing voice of flowing water it has a positive effect on their mind. Artificial features such as cascade pools provide such an experience in an urban neighborhood like Mumbai.



Figure 3 Powai Lake, Make

In Mumbai, the water in Powai Lake is the most polluted as compared to the Ulhas Nagar River water the dissolved oxygen levels in Powai Lake are affected due to the visarga of Ganpati during Ganesh Chaturthi. Leading to decreased oxygen levels in the water. Thus, making it polluted. On the other hand, the pH value, Temperature, and conductivity of the water of Ulhas Nagar River were within the World Health Organization acceptable ranges. although it shows visible pollution. Also, the oxygen levels were more than standard in running water Recent study shows. Figure 3 shows a pic of has Nagar River and Figure 3 shows a photo of Powai Lake. (Nair et al. 2022)



Figure 4 Ulhasnagar River

Mumbai's coastline is experiencing a rise in se level, the shores and the buildings are most vulnerable to climate change and unfair weather the cost of Gujrat, the Bay of Bengal and the Arabian Sea have also shown a consistent rise in sea level study suggests Mumbai is the second most at risk among the 136 coastal cities worldwide the predicted sea level rise is the rise of sea level from 0.81 to 1.24 m by the end of the century. If this happens Mumbai city will be at a great loss. (Chakraborty, Kambekar, and Sarma 2021)



Figure 5 Oshiwara River

The Oshiwara River is so polluted it has a very bad smell and apartments and houses surrounding and along the river received the smelling atmosphere so bad that the price per square foot of the flat decreased. By 2.39, also, apartments with river views had lower prices while instead should be higher. The river edge has concrete walls instead of a natural bank. The residential houses around and near the river have high walls which are blocking the river view. Hence only apartment above the fourth floor has a view of the river. Figure 5 shows a photo of the Oshiwara River. (Sen 2014)



Figure 6 Malad Creek Polluted with Sewage water

The marine water in Mumbai is very actively polluted by human activities, industrialization, and surface runoff contributing to natural pollution and also the influx of contaminants into the marine life. Untreated discharge of industrial waste leads to high levels of pollution. Especially in the coastal areas of Mumbai. There is organic pollution from domestic waste water, and natural pollution from surface runoff from agricultural fields. It is also caused by the seasonal effects of temperature on water quality. Runoff from household waste and sewage leads to water pollution. Figure 6 shows Malad Creek with the discharge of drainage water in it with all the contaminants. (Gupta, Dhage, and Kumar 2009)

Such pollution can be reduced by regular monitoring which will help in taking action on highly polluted areas application of multivariate statistical techniques can be done like cluster analysis, discriminant analysis, and principal component analysis to interpret complex data of contaminated water. (Gupta, Dhage, and Kumar 2009)



Figure 7 Mangroves of Arioli and Vikhroli wetlands in Mumbai

Mangroves are found on the estuarine pockets along the coastline of Mumbai, significant mangrove stands are located in three out of the six administrative zones of Mumbai. These mangrove forests are influenced by freshwater streams and major drainage areas of the city. Chemical dumping and stormwater flow from industries into the water have led to the destruction of mangroves. It is stated that the more the birds are there in the waterbodies and mangroves it indicates positive health. Figure 7 shows the mangroves of Arioli and Vikhroli wetlands in Mumbai. (Kaujalgi 2010)

In Mumbai, the intermittent water supply affects consistent access to water for the population. It is important to prioritize water as a key resource to ensure consistent and equitable access to Mumbai. It is very important to develop a system dynamics model to assess the impact of various sustainable interventions. There is a need to align strategies with sustainable development goals for comprehensive development. There is a need to improve wastewater management systems for better environmental and health outcomes. There is a need to incorporate sustainable development goals compliance and water prioritization to guide policy making. There is a need to prioritize wastewater management to reduce environmental impact and improve health outcomes. (De Stercke et al. 2020)

CASE STUDIES

There are around 70 lakes in Mumbai within the MGCM Area. Also, the water bodies are in very poor condition since Mumbai citizens have easy access to water that is supplied by the municipal corporation, the lake helps in refilling the groundwater and is used for another purpose than drinking. It also works as an absorbing material for rainwater.

CARTER ROAD



Figure 8 Carter Road, Bandra, Mumbai

The case study goes through the sustainable design, management, and functionality of the Carter Road waterfront in Mumbai. It highlighted the role of the waterfront as a public space enhanced by community participation and mixed use of land for recreational and local use. Carter Road is located in Bandra West Mumbai and has been a place for local fishing communities known as “Koliwadās” since the British rule in India. The waterfront was constructed in 2002 and restored in 2008 in a public space recreation project. The citizens in the local area play a crucial role in its development and manage the space without direct support from the government. The mangroves on the waterfront were preserved and relocated fishing village to the north part of the seafront. It is a great public space and is accessible universally by everyone. Along the waterfront, there is a café coffee day on the northern end. There are residential buildings along the edge. There is a dog park. A jogger’s park is daily utilized by local citizens at all times of the day. There is a bus stop for Rizvi College of Architecture. A western railway guest house is present. There is also a children’s park. The waterfront opens up to the Arabian Sea. There are also boulder rocks in the middle northern part. The average rainfall precipitation is 242.2cm. the mean maximum average temperature is 32 degrees in summertime and 30 degrees in the wintertime. There is also a sea viewpoint and an interactive space next to the dog park. An amphitheater lets people do public performances of their talents. And a union park. The public waterfront is accessed by all age groups. Kids play in the central portion of the promenade. Teenagers are seen in recreational and involved in sports such as healthy walking. While senior citizens rest below the shaded figure 8 shows an image of Carter Road in the evening time (DASPUTE, DATE, and KADAM n.d.)

Bandra Worli Sea Link



Figure 9 Bandra Worli Sea-link, Mumbai

Bandra Worli Sea Link is a civil engineering marvel spanning across Mumbai's coastline the project started in 2000 and was initiated in 2009 the benefits of the sea link are it reduces time and regulates traffic, induces stress-free driving reduces accidents and noise pollution. M60-grade concrete was used in the construction. It has the largest span for a cable-stayed bridge. It is India's first bridge in open sea conditions and it works on an intelligent bridge management system that provides traffic information, surveillance, monitoring, and control systems. Patterns included were TATA steel, ultra each VSL Singapore, SPCC, etc, it connects Bandra and Worli. The toll plaza at Bandra end has 16 lanes and the toll plaza is equipped with a toll collection system. The structure provided at this location houses the control system for ITS. The introduction of the bridge reduced crore rupees per year. It saves considerable money in travel time the entire stretch can be ridden in 20 – 30 minutes. 23 signals are avoided using this bridge. It also includes hassle-free driving. It also reduces traffic on roads with this diversion. Figure 9 shows the image of the Bandra Worli sea link. (Thakur and Bhardwaj 2015)

Girgaon Chowpatty & Bandra Bandstand



Figure 10 Girgaon Chowpatty

The waterfront coastline of Mumbai is experiencing a rapid increase in the sea level. Area such as Marine Drive is filled with lights during the night time, people come to spend their leisure time there it is protected from the sea by the installation of tripods scattered all along the stretch. It is used by citizens for jogging, and the long seating space extends to the Girgaon Chowpatty. The peak hours are morning time and night time. In the afternoon it is a time where there is sun right at the top of your head. It is very warm with a lot of humidity. The same goes to Worli seaface. It has exercise equipment installed for kids as well as adults. The same goes for Carter Road the peak hours are morning and evening when the sun is not harsh. Also, Bandra Bandstand is a similar stretch to Carter Road which has apartments of film stars such as Bollywood superstars, Salman Khan and Shahrukh Khan. Figure 10 shows Girgaon Chowpatty and Figure 11 shows Bandstand Bandra, Mumbai.



Figure 11 Bandstand, Bandra, Mumbai

Juhu Chowpatty



Figure 12 Juhu Beach

Juhu Beach is a very well-known beach which is a very renowned public space. It has shops for buying things. Has restaurants etc. There is also a seating space along the road where people sit and relax. It even has gardens. Resorts. Expensive hotels. In the morning time, people come to exercise jog, meditation, gymnastics, yoga, etc. There are initiatives taken by colleges and NGOs to clean the beach mostly on Sundays. It also has seating spaces with restaurants looking at the sea. Many

people come to the beach with their dogs for walking and having a good time. It has trees on the periphery. With sand in the middle and continuing into the sea. There are newly installed light poles in the shape of a boat. With projectors installed which project desired digital images onto the beach in the nighttime. Figure 12 shows an image of Juhu Beach.

FINDINGS/ ANALYSIS & INFERENCE

The waterbodies as they get closer to south Mumbai get more manmade and urbanized. With fewer trees and more concrete. In the outskirts of Mumbai, the waterbodies are more natural and have a lot of green natural aspects such as mangroves and trees. Lakes and rivers are more polluted than the seawater. Mumbai's inner water bodies such as ponds and lakes are most polluted due to waste disposal. Citizens prefer to use the coastal sea fronts over the ponds and lakes. Which has less smell and contaminants in the water. There is the possibility of lake and pond water quality restoration projects.

CONCLUSION

In Conclusion, Mumbai Has a Very Diverse Nature of water bodies. Right from having a small pond up to the coastline of vast oceans. The water bodies that are polluted such as Malad Creek and Oshiwara River need immediate attention. To improve the quality of water across Mumbai. By introducing practices that restrict the disposal of both industrial and domestic waste into the natural waters. Which is destroying water quality itself as well as marine life. In Juhu Beach, despite such scenarios, people are bathing and having fun in the sea. It is affecting their health. The mangroves need to be preserved and not removed from the water bodies since they encourage marine life, and water quality and protect the coastline from tidal wave currents. The water in Lakes and rivers is more polluted than the seawater. There are limitations to this paper since it has focused on selective water bodies of Mumbai. The research can be taken further and much good qualitative analysis can be achieved.

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