HOW SUSTAINABLE ARE THE GHATS OF KRISHNA AND GODAVARI RIVERS FROM ECONOMIC, SOCIAL AND ENVIRONMENTAL PERSPECTIVE?

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By

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Declaration of Candidate

This is to declare that I have completed and submitted my research entitled "HOW SUSTAINABLE ARE THE GHATS OF KRISHNA AND GODAVARI RIVERS FROM ECONOMIC, SOCIAL AND ENVIRONMENTAL PERSPECTIVE?" under the supervision of Dr. Tej Kumar Karki.

This research is my original work.

I have appropriately sighted all the references used in the study.

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Abstract

This study analyses the social, economic, and environmental sustainability of ghats. The Krishna and Godavari rivers in Maharashtra were chosen for this investigation of the ghat. The study uses a case study approach to assess three ghats each on Krishna and Godavari rivers, Maharashtra. Field study and on-field observation were used as the approach. Semi-structured interviews with on-site users, ghat priests, government officials or members of the ghat trust, and local heritage specialists. The users of the ghats participated in a rating technique survey in which they scored the social, economic, and environmental criteria.

Ghats were not found sustainable from social, economic, and environmental perspectives. The physical structure of the ghat had deteriorated, and there was water pollution, careless garbage dumping, and drug and criminal concerns. The ghats under private ownership were more vulnerable to long-term sustainability as compared to those under heritage trust. The ghat management trusts had effectively handled solid waste, kept the ghat structure in good repair, and ensured ghat security. Because the trusts are more focused on heritage, unlike the municipalities handling several complex municipal issues, they are doing good. Also as compared to the larger municipalities, the smaller municipalities were better in ghat management mainly because they are less overloaded and smaller places are more sensitive to public places and heritage maintenance. This shows that institutional ownership of ghats and heritage protection bylaws are important factors in the ghats' long-term viability. This research makes broad recommendations to ensure the sustainability of ghats.

Acknowledgment

At the outset, I would like to express my gratitude to Dr. Tej Kumar Karki for patiently guiding me. Throughout the research, he has been very helpful. He has helped me stay focused on my research objectives as a mentor. His timely expert advice, motivation, and expert knowledge on my research supported me in outlining the study for the intended outcome.

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Abbreviations

SA	Sustainability assessment
SD	Sustainable development
UN	United nations
UNESCO	United nations educational, scientific and cultural organization
INTACH	The Indian national trust for art and cultural heritage
UP	Uttar Pradesh
VDA	Varanasi development authority
GAP	Ganga action plan
ASI	Archaeological survey of India
HDP	Heritage development plan
HIS	Heritage sustainability index
UDCPR	Unified development control and promotion regulations
HRIDAY	Heritage city development and Augmentation Yojana.

Chapter 1. Introduction

Statement of research problem:

The Ghats are in a degraded state today (Verma, 2011). Most of them are in a state of physical decay. Ghats are vulnerable to careless disposal of waste. The Ghats receive many organic wastes consisting of ritual offerings from worship on the Ghats and temples on ghats, refuse from shops and households, and animal waste due to cattle on ghats for religious purposes and livestock washing on ghats. All of this is accumulated on ghats and is not disposed of timely in an orderly manner. Another issue is river pollution; the activities on ghats sometimes add to rivers' disintegration. The effluents of the city are openly led to rivers, and industrial waste water contributes majorly to river pollution. This disposal into rivers also adversely affects the ghats and their activities. The number of visitors has increased to the ghats; this overcrowding and improper use of ghats are posing a threat to the long-term sustainability of ghats and their cultural and tourism future.

Introduction to ghats:

Ghats are steps leading to the water, reaching water for domestic and religious uses. As pointed out by Julia Hegewald, this water architecture is a common practice all over India along the sacred rivers, lakes, tanks, and ponds. However, a long stretch of ghat construction is particular to the country's main rivers (Hegewald, 2004). The major rivers all over India witness the construction of ghats of different scales and serve another purpose. Many of the ghats' structures are associated with mythology and maintained by the tradition of pilgrimage(Anne Feldhaus, 1995). Such places also contain symbolic images and natural and cultural icons, and pilgrims and devotees visit them for faith healing and to experience the 'spirit of place.'

Ghats are an essential and integral part of Indian waterfront architecture. This architecture has a historical and mythological background and needs to be taken care of. The legacy must be carried forward to generations to enjoy and appreciate their existence (Hegewald, 2004).

The rationale of the study:

Most studies on ghats are carried out in northern India: Ganga, Yamuna, Narmada, and Gomti. However, such studies are thin in comprehensive coverage social and economic sustainability of ghats. So is the case in the Ghats of Maharashtra. The rivers in Maharashtra have Ghats that are significant from Maharashtra's cultural point of view. Also, have religious significance in the state (Anne Feldhaus, 1995). However, in recent years, their long-term sustainability has been at stake. They are experiencing structural and environmental decay. However, the research on the issue is minimal. This research aims to address the research gap by comprehensively evaluating the social, economic, and environmental sustainability of ghats on the Godavari and Krishna rivers.

The insights of the study would find ways to ensure Ghats' social, economic and environmental sustainability in Maharashtra in particular and India in general.

The objective of the research and research question:

Main objective:

1) To evaluate the sustainability of the Ghats from the social, economic, and environmental points of view.

Sub objectives:

2) To study and identify the issues on ghats and the reasons behind the issues.

3) To propose broad recommendations and design proposals for resolving the issues of ghats.

Research question: How sustainable are ghats on the Krishna and Godavari Rivers from the social, economic, and environmental points of view?

Overview of Methodology:

The structure of this research necessitates using both qualitative and quantitative research approaches. The main part of the study is qualitative research methods. Case

study research, semi-structured interviews, and questionnaires are the methods adopted. A small percentage of quantitative studies are done.

This study's principal data collection will be interview and case study research, which is regarded as the most helpful and applicable strategy considering the project's goal and objective. All the methods mentioned above have advantages and disadvantages. The most significant considerations are time, resources, limits, and data access.

Study of Ghats on Krishna and Godavari rivers
Selection of Rivers
Selection of Ghats
Content analysis
Field observation
Interviews of ghats stakeholders
Rating method analysis for on site users

Figure 1.1: Overview of methodology
Source: Prepared by Scholar

Sustainability is a large and diversified field of research with many different methodological perspectives. The methodologies used in this study have evolved from the social, economic, and environmental sciences, and as a result, data collection approaches are quantitative and qualitative. The detailed explanation of the methodology steps shown above is presented on page 48.

Scope of the research:

The research examines the sustainability of the ghats on the rivers Krishna and Godavari. At a broad level, it understands the issues relating to the social, economic, and environmental perceptions of sustainability.

Limitations of the study:

The study aims to assess the sustainability of the ghats and identify the issues of ghats. The research does not give detailed architectural solutions for the ghats. It provides an outline of recommendations to be implemented as an initiative at the management level to maintain the sustainability of ghats.

The study has limited the stretch of rivers Krishna and Godavari in the political boundary of Maharashtra. Three ghats on each river, Krishna, and Godavari, respectively, have been selected for the study. Limitations of time and logistics did pose a challenge for taking a more significant number of cases. The pandemic situation was a challenge.

The goal of the study is to comprehend ghat sustainability from the users' point of view. It is to understand the ghat users' experience. Age, Caste, income, occupation, and other characteristics of the users are not taken into account for the purposes of the study. Chemical study of types of pollution etc., is not included in the study.

The visits to ghats were done in the months of February, September, October and November. Due to Pandemic situations and travel constraints, the visit to all the ghats in all seasons was not possible.

Though the case study approach might have the limitation of generalizability, the research does provide a broader understanding of the issues about ghats.

Secondary data sources like historical archives have limitations, but multiple data sources have helped reduce the ambiguities.

Organization of Thesis

The thesis is organized into six chapters. The first chapter gives an overview of the research. Chapter two comprises two parts; the first part is the literature related to ghats on the main rivers of India. Ghat architecture on rivers in Maharashtra. The second part provides insights into the literature related to sustainability and the assessment of sustainability for heritage buildings. Summering the literature and mentioning the research gap completes the chapter. Chapter three deals with the methodology of the study. Chapter four elaborates on the field studies case study-wise, with detailed mention of the study. Chapter five enlists the research findings. Chapter six states the conclusion and recommendations suggested per the study's findings.

Chapter 2. Literature Review

The literature focuses on arriving at an understanding of research on ghats in India. Besides these works, I have also explored literature related to various aspects of sustainability and the research on sustainability assessment. The literature study assisted in listing the factors for research and the methodological approach. This chapter has two main objectives to review the study of ghats in India and present the literature pertinent to sustainability and sustainable development.

An overview of ghats of India

The stepped-built platform (ghats) is a transitional passage between the land and the river water that enables people to go to the water from the land, and it is a unique riverfront culture in the Indian sub-continent (Hegewald, 2004). Ghats all over India are important spaces for religious, mythology, spiritual embodiment, or cultural and washing activities (Hegewald, 2004). The riverfront, which is where the river meets the land, includes the ghats, which are steps leading to the bank of the river (UNESCO, 2021). The ghats and the buildings above them are inseparably connected. Waterfront religious sites have a long history that dates back to the 8th and 9th centuries, but it wasn't until the 14th century that the stone-stepping ghats were built. The majority of the ghats are lively locations for celebrations and ceremonies, preserving a historical practice (UNESCO, 2021).

The word ghat, derived from the Sanskrit *ghatta,* signifies a wharf, a ford, a landing, and generally any bank, natural or man-made(Jalais, n.d.).

The flight of steps " ghats" enables easy access to the waters; this architecture of ghats is widespread all over India along the major rivers, lakes, and ponds(Jalais, 2011). Reaching the waters for domestic and religious activities was the idea at the beginning.

2.1.1. The cultural aspect of ghats:

Water is accorded a distinct, independent, and significant role as a natural element in most early human civilizations. After a conscious knowledge that " water " was required for survival more than food, the man began to revere water, one of the five elements that regulate life, knowing that "water" was needed for survival more than food. As a

result, man created an inextricable bond with water, elevating it to god's or divine powers' status to be valued and worshipped (Baste, 2017).

A river is an essential resource for a country. Water and waterfronts are responsible for the origin and prosperity of early human settlements(Morvanchikar R.S, 2009). The Indian sub-continent is rich in rivers. India is the "land of rivers" (Agoramoorthy, 2015). The Ganges in the north, the Godavari and Cauvery in the south, and the Narmada, which forms a natural border between north and south, are important rivers (Agoramoorthy, 2015). This water culture is a part of Indian tradition. The river is adored as a mother and as a goddess, and the river water has the power to purify whatever it touches(Jalais, n.d.). All of India's big rivers are known as *tirthas* (holy places), and Hindus must visit such sites at least once in their lives. The holiness of water is stated in Hindu literature, such as the *Vedas, Upanishads, Bhagavad Git*a and *Ramayana*(Agoramoorthy, 2015). *Matsya Purana* says, "all sins are cleansed by the mere sight of River Narmada." She is considered the most sacred among the sacred rivers of India (Telang Sanand, 2018). The great rivers are regarded as sacred and often personified as deities. Hindus believe that immersing in sacred rivers can cleanse them of sins and help them acquire virtuous acts(Agoramoorthy, 2015). The occurrence of religious rituals is linked to the movement of water. The festival calendar of ghats is formulated according to seasonal changes (Jalais, n.d.) Spiritual practices are an everyday activity of the residents along the bank and the pilgrims from India and abroad (Jalais, 2011). Varanasi, Haridwar, Hrishikesh, Ujjain, Nashik, Pandharpur, Rajmudri, Kushalnagar, Srirangapatna, and Tiruchirapalli are among the cities where pilgrims travel around the year(Manjrekar, 2017). Jalais (2019), in her paper, stated that the ghats of Benares are the junction between the city and river, uniting the three domains, namely, urban, religious, and natural. It is considered the most sacred site in India. She also presented the ghats as a form of architecture that both discloses and reinforces and beliefs surrounding Benares's riparian environment(Jalais, 2019).

Sarvesh Kumar(2017) states that the ghats as a ritual scape on the river Sharayu at Ayodhya. He glorifies the rituals capes are important ritual spaces in all important religions of India. They not only help to maintain social values, cultural identities, power relationships, and place ballets, but they also help to connect local people to the transcendent and sublime(Kumar & Singh, 2017).

People, culture, and ecology have a special relationship. Carl Seur (1925) emphasized the need to consider the social and cultural characteristics of the territory's population as determinants of physical aspects of the terrain over time while studying landscape morphology(Sauer, 1925).

Many researchers have studied ghats as a cultural landscape and explored the cultural setting in the landscapes of ghats.

2.1.2. Mythological studies on ghats.

The works of literature have bought forth mythological aspects of ghats in India. In Indian mythology, water is described as the foundation of the whole world, the basis for life, and the solution to immortality(Singh, 2019). "Symbolically and metaphysically, ancient mythologies refer to water as the container of life, strength, and eternity"(Singh, 2019). Thus, rivers can be said to be the physical and religious lifeline of the Indian subcontinent. In Hindu conception, the water of the river Ganga is purifying (Jalais, 2011). According to tradition, Geoffery Ward (2019) says that Benaras is the site of creation. Its existence was even before the Ganga fell from heaven (Ward, 2019). A great and extensive stretch of ghats is seen at Benares (Jalais, 2011). She states that the scared nature of the ghats is because of the myths associated with them (Jalais, 2019). The ghats highlight the mythology associated with them; they set the scene for the mythology and contribute to preserving it through festivals, ritual practices, pilgrimage, etc. (Jalais, 2019). Madhuri Desai, in her book, states (2017) the riverfront at Benares is a live example of the mythological being along with the historical grandeur in the form of living heritage (Desai, 2017).

Diana Eck(1991) pronounces Benares as the city of light. She has described the importance of Benares and the association of the ghats with the religious importance of the city. The town got its glory due to ghats, which have great mythology associated with them. She has clearly stated the importance of ghats and their mythological significance (Diana Eck, 1991).

In the puranic literature, it has been stated that people visit the ghats on solar and lunar eclipses and some other family celebrations; they visit the ghats to give donations to the brahmins (Jalais, 2019). Lutgendorf(2019), in his literature for interpretation of Ramayana, has stated that the Benares ghats are a significant place mythologically

related, and the mythological stories are still being enacted on the banks of Ganga on the ghats (Lutgendorf, 2019).

In his article, Ray (2016) states the mythological impact on the geography and setting of the ghats and their components of Mathura's Vishram ghats. These ghats have a deep relationship with Lord Krishna and his life events; the architectural influence can also be seen from the Rajput and Islamic rulers. The myth recognizes places they are associated with and has been developed to make their tourist destination. Ghats are well-known as tourist destinations due to both the factors of religious as well as architectural importance(Sugata, 2016).

Haberman tracks the Yamuna River across India's core, referring specifically to the province of Braj, where the Yamuna River is greatly venerated and is today the subject of solid efforts for conservation(Basu, 2007). Thirty-eight ghats also define Vrindavan's land water interface over a two-and-a-half-kilometre stretch. The north eastern Keshi ghat is a renowned religious site commemorating Krishna's victory over the horse demon Keshi. Water can only be accessible in Keshi and nearby Pandawala ghats; hence these two ghats are essential (A. Sinha & Ruggles, 2004).

Another study on the river Yamuna has brought forth the dimensions of study concerning the Yamuna River and the mythologies associated with the places on its banks and ghats. The Yamuna riverfront in Braj is a setting for iconographic picturization of the goddess and lover of Lord Krishna "Yamuna." She is worshipped in river form. Ghats on the west banks have an association with the life events of Lord Krishna. Vishram Ghat, where Lord Krishna rested after killing the dictator Kansa, is also where he was eventually cremated. Currently, this place is associated with several sacred ceremonies (Varma, 2011a).In Vrindavan, " *chir ghat*" is where Lord Krishna stole Gopi's clothes and hid them in the branches of a tree nearby as the Gopis' bathed in the river (Varma, Annie; Sinha, 2012). On the river at Uttarakhand, Haridwar, a ghat named "*har ki Pauri*," it is believed that the river Ganga flows in its purest form, and bathing at this spot will wash away all the sins. Every 12 years, there is a religious gathering of millions at this spot (Varma, 2011a).

Another study on the Ganga ghats has studied the stretch of the ghats from a different point of view. In his extensive study of ghats, Singh(2004) analysed the Benares water as the source of creation and life in traditional Hindu mythology. Ganga has been revered as the most sacred river. In Varanasi, 84 ghats and more than 50 ponds are

there. Amongst the 84, five described are the most sacred and are called *panch tirthas; Asi, Dashashvamedha, Manikarnika, Panchganga*, and *Adi Keshava* ghats. These five ghats are compared to the body of Lord Vishnu (head, chest, navel, thighs, and feet, respectively). The ghat area is praised at the body of Lord Vishnu(Singh, 2004). These ghats are of mythological significance and are frequently visited by believers for purification rituals or for particular purposes on various favourable occasions. Each ghat has its relevance. The division of ghats into two parts for the funeral and the second for bathing and rituals. At ghats, pilgrims and devotees perform ancestral rites(Singh, 2019).

Several ghats along the Sarayu River's banks in Ayodhya are considered sacred and ritualistic by Hindus. Every ghat has its history and mythology, and spiritual significance. Svargadvara ghat, or "door to heaven," is the primary ghat regarded as the earliest tirtha built on the Sarayu river's bank. It is the place where Lord Rama's body was cremated. Its sanctity and significance have persisted since the 11th Century. It is said that those who die or are buried here are immediately relieved of their transmigration and are reborn in the skies(Kumar & Singh, 2017).

Thus, it can be seen that mythology has excellent relationships with the physical spaces existing on riverfronts. Many times, the value of nature, resources, and ecology has been linked to certain rituals, traditions, cultures, or beliefs. Further investigation into these cases has revealed that this link is also tied to the ecosystem's health and sustainability, either directly or indirectly. Any abundant natural resource seen as a valuable resource to be kept for further generations in the same condition had been regarded as holy and auspicious or associated with something in which the general public has placed a high level of faith (Manjrekar, 2017).

2.1.3. Historical studies on ghats:

This part searches the historical significance and the time of existence of ghats. Varanasi's ghats are among the finest examples of monumental architecture connected to people's daily activities, thus symbolizing Indian tradition (Singh, 2016). By the 17th century, the riverfront ghats had become an important area of Varanasi. During the 18th and 19th century, Maratha rulers commissioned Palatial buildings along the ghats.

The Marathas patronized ghat construction in various geographical locations all over India (Singh, 2004).

Image 2.1: Dash Ashvamedha Ghat, Varanasi:
Source: (Singh, 2004)

Many monasteries, Sanskrit schools, and pilgrim rest houses were built along the riverfront by estates from various parts of India between the late 18th and early 20th centuries, including Peshwas of Pune, Holkar of Indore, Scindhias of Gwalior, Bhosale's of Nagpur,

Darbhanga estates of Bihar, Rani Bhavani of Bengal, Kings of Nepal (Singh, 2004). Wealthy people from all over India and beyond came to build temples, palaces, and ghats to welcome visitors. It was a proud moment for them to construct a structure in Varanasi.
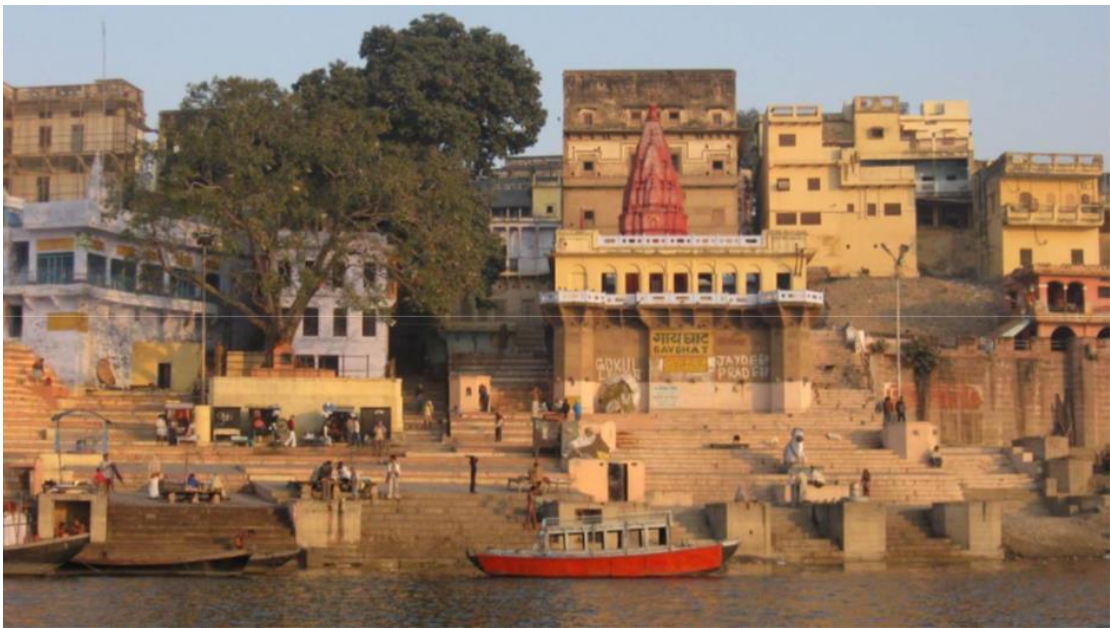
Image 2.2 : GAY GHAT Benares. View of ghats and Palaces
Source: (Jalais, 2011)

This monumental construction was a way to sustain their power(Jalais, 2011); this dates back to the 18th and 19th centuries when the city was being reconstructed. This shows ghats have a solid historical background and were a significant part of the architectural contribution of the patrons at that time. During prosperous reigns and periods in history, rivers in India were sacred areas chosen to develop temple complexes and pilgrimage sites, palaces and forts, ghats along riverfronts, and urban centres (Khanna Nupur Prothi, 2008). There are separate owners of the different parts, the top and bottom parts

of the ghats; they are constructed in phases by various rulers (Singh, 2018). These ghat sites thrived and grew over time, owing to the requirement of water for sustenance and the intangible links with this precious element. Many of the cities we live in today are continuous and expand these original gestures (Khanna Nupur Prothi, 2008).

Ahilya Bai Holkar commissioned the ghats on the Narmada River at Maheshwar. These ghats are flanked by a fort that was the capital of Maheshwar during the reign of the Holkar (Telang Sanand, 2018).

At Kolkata during the British administration, the East India Company embarked on a beautifying campaign that included the construction of ghats. Prinsep Ghat was one of those. It was built in honour of James Prinsep, a well-known academician. He was the main contributor to decoding the emperor Akbar's Brahmanical writings. As an honour to him, the government opened the ghats for the local people in 1843 (Leena, 2012). Colonial history is associated with the ghats in Kolkata.

The Princep Ghat

Image 2.3: Princep ghat, Kolkata

Source: (Jalais, 2011)

Another ghat Outram ghat was built and dedicated to Sir James Outram, a soldier in the British army and later promoted to the rank of general. Other ghats, to name a few, are Annapurna ghat Armenian ghat. Annapurna ghat was earlier known as Raghu Mitra's ghat. It is named after Govindo Ram Mitra, a black depute under British rule(Leena, 2012).

2.1.4. Geographical setting and structure of ghats:

Ghats are composed of rendering to the topography, resulting in varied combinations or different configurations (Jalais, n.d.). The topographical and hydrological specificities along the ghats are glorified as exceptional and celebrated cyclically. The waterfront design is according to the rise and fall in the water levels; this differentiates the flood-prone areas, and that is flood-free.
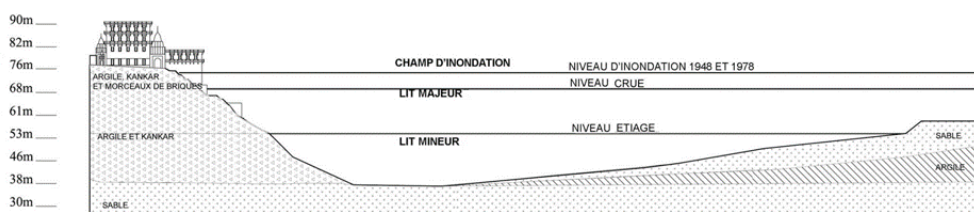
Image 2.4 : Diagrammatic section of river bed in Benares, not to scale   Source: (Jalais, 2011)

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At Benares, the ghats are easily accessible to the city constructed on the high ridge. This construction on the high ridge is significant to protect the city from the waters; also, the ghats reinforce the banks (Jalais, 2011). The construction technology has been studied by Jalais, and an analysis of the location of construction has been done. The construction process of ghats demonstrates the adaptation of the architecture to the natural site and its surroundings (Jalais, n.d.).

It can be seen at places that the shapes of the steps of ghats were constantly revised or modified. Mud embankments were earlier created masonry walls were built, which protected the city from the rising waters during the monsoon (Singh, 2018). Similarly, steps were constructed at the upper part of the embankment, which was later extended towards the waters (Singh, 2018). The Ganga ghats have been built on the higher banks to restrain the floods, and secondly, the high river bank faces the rising sun; this features worship of the rising sun, ritual bathing, and performing *Vedic* sacrifice (Lannoy, 2017).

The ghats at Maheshwar on the Narmada River have evolved, and the change in river's water flow. This physical change in the course of the river has affected the various activities on the ghats. These ghats were seized to be historical ports for trade with the increasing road networks and lack of water transport resources (Telang Sanand, 2018).

The river ghats were built to the highest architectural and civil engineering standards. Many of them have subsequently evolved into tourist attractions. There are ghats in Hrishikesh, Haridwar, and Varanasi along the Ganga River. Keshi ghat in Vrindavan along the Yamuna River, Omkareshwar, and Maheshwar along the Narmada River (Manjrekar, 2017). These Ghats serve as strategic entry areas to the rivers.

2.1.5. Architectural Studies of ghats:

The elements of ghats differ from place to place as the geographical situation changes. Patrons designed the ghats according to local circumstances and the king's economic stability. Ghats have a variety of design components, including bastions, balconies, platforms, and entrances of various proportions and materials(Amita Sinha, 2017).

Ghat's spatial grammar is made up of niches, porticos, and colonnades. These motifs are emphasized and repeated in different ways, with some dividing the steps and others maintaining visual continuity. This composition varies depending on the ghat's

geographical landform. Depending on the size of the ghats, the proportions of the pieces change(Amita Sinha, 2018).

Image 2.5 : Alcoves in Manikarnika Ghat, Varanasi.
Source: (Amita Sinha, 2020)

The ghat construction at Benares adjusts to the Ganga's shifting water levels. To withstand the forces of increasing water, the lower levels of palaces are opaque and built strongly with octagonal or circular towers. These are placed over well foundations and are aligned with square, rectangular, octagonal, and circular platforms that split the stairs into bays and protect them from erosion (Amita Sinha, 2017).

Image 2.6: Worship of Linga on a tree platform in Assi Ghat.

Source: (Amita Sinha, 2020)

Natural elements on ghats include trees on the ghat. Trees of religious significance have been planted on the ground adjoining the ghats, making them an inseparable part of the ghats. Trees have circular or square platforms built around them, either for shrines or as seating places for people. Built elements are the typical proto forms such as Bastions, platforms, balconies, niches, etc. (Vidyasagar, 2015).
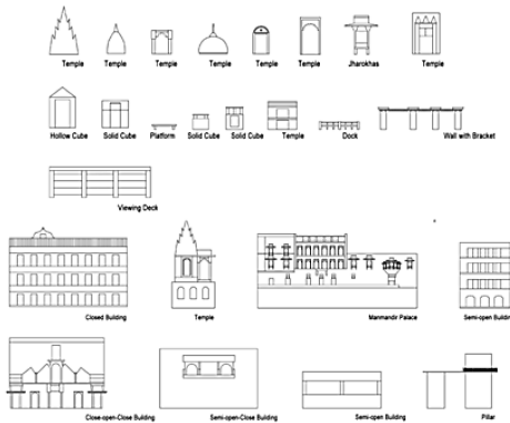
Image 2.7 : Design Prototypes

Source: (Amita Sinha, 2017)

Image 2.8 Aedicule on Assi ghat, Varanasi.

Source: (Amita Sinha, 2020)

The original architectural parts are randomly repeated, creating a synchronized rhythm and bringing the complicated visual structure together. Their occurrence at varying heights on the descending riverbank adds depth to their layering. Stairs create a dynamic rhythm, especially when they cascade down streets and form higher-level structures. The spatial grammar embraces geometrical enclosures like structures, colonnades, pavilions, and recesses that are spaced at irregular intervals along the ghats and can be experienced while moving or resting (Amita Sinha, 2017). At Ganga ghats, verticality and horizontality are experienced simultaneously in the body as the embankment is flanked by massive solid structures punctured by stairs on one side and the great expanse of the river on the other. As one ascends up and down the steps, the perspective shifts as the river bed curves dip and then rise again (Amita Sinha, 2017).

At Vrindavan, the ghats have private enclaves_ higher stories were often privileged regions held by the elite; nevertheless, the ground floor, which is close to the river, supports a myriad of diverse activities, making the riverbank spaces a genuinely public domain (A. Sinha & Ruggles, 2004).

Source: (A. Sinha & Ruggles, 2004)

Image 2.9 Ghats at Mathura

David Haberman's study of Hindu spirituality along India's Yamuna River is a significant addition to the research area of religious environmentalism. It states the importance and benefits of environmental association with religious beliefs. Studying the connections between religion and ecology has been part of efforts to broaden the scope of modern environmental debates as human-caused environmental concerns reach global proportions(David Haberman, 2006).

At Kolkata on Hoogly river, there are approximately 44 ghats along the span of the river, with over fourteen of them being prominent "ghats" with impressive forms of architectural value. The riverfront has served as a metaphorical reflection of people's reactions to rivers(Bardhan, 2020). The Chotelal ghats were built in a blend of Hindu and Islamic architectural styles. The zenana ghat, a bathing spot for ladies, has the features of a mosque; the marble floor and coloured plates add to its majesty. Many other ghats, like the Armenian ghats, have a cast-iron structure built as a dock long before the British arrived. Prasanna Kumar Tagore's ghat is influenced by European architecture (Raima Ganguly, 2019).

Man and environment have a dynamic interaction in which man influences the environment while also responding to it. The UNESCO man and biosphere (MAB) concept places man at the centre of the socio-ecological system. According to it, the human use system is defined by three fundamental dimensions: spatial, temporal, and environmental perception. View scape, especially in sacred sites, give place significance and promotes place attachment in the spatial environment(P.Gopalakrishnan, 2003).

In the context of heritage, social perception must also be considered, as must cognitive and affective processes at the individual and collective levels(Giuliani, 2003). In terms of space, communal memory provides meaning and definitions, familiarises them, and transforms them into places. A community is defined by its shared ideas, values, beliefs, and experiences, and memory plays a crucial role in transmitting these, aiding in preserving cultural legacy(Vasconcelos, 2009).

Culture also influences the soul of a place and its events, atmosphere, and way of life. As a result, heritage sites are living places, and listing these physical aspects connected with culture will exhibit the culture of that location in addition to the local community's way of life. As a result, particular patterns of interactions among its constituents identify

each region. The close link between the creation and repair processes is crucial to a place's pattern language(Mike Alexander, 2013).

2.1.6. Studies for rejuvenation of ghats on major rivers of India:

Many researchers have studied the ghats in cities like Benares, Mathura, Maheshwar, and Ujjain. They have identified the ghats as a place of cultural significance and have investigated the problems faced by ghats in today's context. Some researchers have proposed solutions from the local level to the regional level for the issues encountered by ghats.

In her paper, Savitri Jalais (2011) studied the role played by the ghats in establishing a relationship between the Ganges and Benares city. She states this connection is endangered by the increasing pressures from recent developments. The foundations of these structures are getting weak, and the ghat structures are endangered. Also, the drainage system, ancient and later built, is insufficient for the city. Both the points' structural stability and the city's sewage system are endangering the ghats and palaces along with them. She concludes with the need to study different bodies responsible for the maintenance of ghats, drains, sewers, and water pollution of the Ganga river (Jalais, 2011).

Image 2.10: Overflow of sewage at
Source: (Jalais, 2011)

Source: (Jalais, 2011)   Image 2.11 : Exposed foundations of
ghats at Vrindavan.

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The Ganga action plan has been reviewed. An onsite study has revealed that for effective implementation of such a scheme, decentralization is the key to making decisions closer to people and promoting public participation. This was the major turning point for the GAP to be successfully implemented(Das & Tamminga, 2012).

Amita Sinha(2018) has researched the necessity for widening the scope of the study of ghats from a historical point of view and incorporating the management of waste and spatial usage. She states that the urban space in Benares's city is very chaotic. Demolition of the structures to make space is not the answer, as an alternative urban space can be systematized to merge the activities. In this case, for the holy Ganga's great cultural heritage to be continued, the design language of the ghat and the spatial activities that produce the rich public life should be preserved. Also, she has studied that waste management is critical for reducing pollution in the Ganga and increasing the ghat's quality of life. In her opinion, the landings of steps of ghats are the vibrant public spaces that have been ignored by the conservationist who focuses on historic places. She concludes the scope of their study needs to be broadened to incorporate the management of public spaces of ghats to save them from encroachment by private interests, regulate waste management, and control activities that pollute Ganga (Amita Sinha, 2018).

The literature "rejuvenation of Ghats at Varanasi" states that in the current situation, the ghats face problems in the built environment. The physical infrastructure of the ghats is being degraded with time. The author has performed a field survey and identified the activities on ghats causing pollution. The after-death rituals performed on the ghats are polluting the river as well as the ghats' structures. The waste deposited on the ghats due to religious activities is poorly managed (Bharti, 2016). This degradation of the ghats has to be controlled for the ghats to sustain for a more extended period.
In her work, Nupur Prothi Khanna (2008) has proposed that a proper response to the river will define a contextual urban form for our settlements, improving the quality of life. This will enhance the quality of life we provide to city people and make the Indian towns "liveable". Those ghats are important because they connect the river's historical and spiritual components with the city's social and structural qualities. Revitalization of the ghat areas can be achieved by proposing the right usage of the spaces on ghats, making them habitable to control the solid waste problem and pollution problem. This

will lead to providing long-term ecological and economic sustainability (Khanna Nupur Prothi, 2008).

Singh(2004) has stated that the ghats at Varanasi, due to tremendous demands from tourism, economic growth, and population pressures, the riverfront heritage and atmosphere, and the urban skyline in these zones are at risk of being irrevocably changed or perhaps destroyed. Individual owners, trusts, non-government organizations, and charity trusts own a majority of the heritage properties. Some heritage properties along the riverfront are held under the Archaeology department and maintained by them. Under the UP urban planning and development activities, the state government has established the Varanasi Development Authority (VDA) at the municipal level. This organization is in charge of city planning and preservation of heritage zones, places, riverfront, and physical surroundings. Despite the regulations, the problems are not resolved and pose a danger to the heritage (Singh, 2004).

Amita Sinha(2020) has stated a need for a new conservation strategy for ghats focusing more on the place-making of the activities. She says ghats have multiple spatial activities that shape the conditions of social life. For worship, recreation, business, and community, the places are dedicated to each activity. This dynamic environment of ghats is shaped by cultural and natural events. Most historic buildings are owned privately and do not contribute to the public dominion. Ghats are overlooked, whereas being a part of vibrant public life. According to her, the scope of conservation should be expanded to include the maintenance of public ghat sites to prevent private interests from encroaching and regulating activities that harm the Ganga (Amita Sinha, 2020).

In his works, Singh (2016) has discussed the state of implications of heritage conservation plans for Varanasi city heritage and the riverfront heritage, tangible and intangible. He says the master plan aims to be implemented by 2031. The plan aims for a sustainable effort to maintain ancient grandeur and ideals while adapting to current developments. He has also pointed out the drawbacks of the heritage development plan as lack of public participation and avoidance of cooperation from the local authorities and people. Neglecting the requirements of the end-users of ghats, avoiding coordination with the development plan team. He states that if the above-listed issues are minimized, the HDP will work well (Singh, 2016).

In his literature, Rana P.B. Singh (2019) states the position of Varanasi ghats in the world heritage list. He evaluates the reasons why Varanasi ghats need to be placed on the list. He notes the ASI, INTACH, and HIS are the leading organizations responsible for the protection, conservation, and preservation of heritage sites. ASI is not maintaining traditional conservation practices and, hence, lacks the conservation of heritage buildings. At the same time, the other two organizations promote opting for a middle ground, preserving the balance of deeply ingrained culture while also considering future urban development(Singh & Rana, 2019). He also states that the ghats of Varanasi are one of the best examples of colossal architecture linked to the daily activities of pious people, thus representing India's heritage legacy. The ghats are the focal point of the holy city's major rituals and festivals, where all the rites begin with a sacred wash and end with a donation to the riverfront priests. This heritage deserves to be listed and recognized worldwide (Singh & Rana, 2019).

Annie Verma (2012)outlines a conservationist version based mainly on the idea that the protection, rehabilitation, and adequate control of the panorama are essential for the preservation of the cultural heritage of the Braj Region. She states along the river Yamuna, the Braj region is the most celebrated and has vital religious and cultural significance. The places symbolize Krishna's superiority over variable forces of nature worshipped by the place's residents (Varma Annie, 2012). The physical settings and its signs are reminders of the spaces of the mythological references on the banks of the river Yamuna. She has observed that this setting is in danger due to the increasing uncontrolled growth, mechanized modes of transport, and breakdown in the customary rights and obligations towards forest and water bodies. She concludes by proposing a model for the conservation of both the banks, one being the ghats and other pastoral lands. Restoration and renovation of ghats are key to making them sustainable (Varma Annie, 2012).

In Indian mythology, the Yamuna River is regarded as a holy river next to Ganga. Each year, a huge number of devotees flock to Mathura, the historic city and birthplace of Lord Krishna, to take a holy bath in the Yamuna River. Pilgrims take a ceremonial dip at ghats before showing homage to the deities in temples on all holy festivals. Despite their value, most ghats have been destroyed or are on the verge of extinction. As a response, river water quality throughout the Mathura region is critical, yet it is impaired by an awful odour and an unsightly appearance (Bhargava, 2006). He further explores

the problems faced by ghats. Solid garbage is frequently discarded on the bathing ghats. Uncontrolled solid waste dumping causes unsightly, unattractive sights, and stormwater carries all the waste to the waters. The lack of necessary sanitary facilities on ghats during mass bathing festivals is a prevalent problem. For various factors, including technical flaws, the government's varied initiatives have failed to improve the situation. The general population shares responsibility, owning to illiteracy, indiscipline, and unhygienic culture(Bhargava, 2006).

Swati Nagpal(2015) studied the Gomti riverfront, proposed an urban conservation model, and suggested design interventions to invigorate the riverfront and preserve the tangible and intangible heritage. She has researched the public riverfront spaces "ghats" and other platforms; the studies revealed that the heritage buildings are managed by ASI or heritage trust, whereas the public riverfront spaces and left unmanaged(Swati Nagpal, 2015). Her proposal, when implemented, will be a catalyst for the economic and cultural revitalization of the riverfront. She concludes that the proposal aims at rebuilding the connection between the river and the heritage building along the riverfront to revitalize both the tangible and intangible heritage (Swati Nagpal, 2015).

The public space of the riverfront is built in the service of integrated Hinduism. She highlights the importance of space in all angels, religious, cultural, and geographical. The current need to preserve the intangible aspects of the space is discussed in the book's last chapter (Desai, 2017).

The redevelopment and renovation of the ghats at Mathura on Yamuna River is a proposal under the city HRIDAY plan. It is a Braj foundation project. The objective is to improve the city's weak links and improve the necessary infrastructure to make it easier for tourists, pilgrims, and city inhabitants. The city heritage plan aimed to renew and revitalize the city's most important traditionally lively districts. One of the projects brings the Ghats to Mathura (*HRIDAY Reflections*, n.d.).

Overview of Ghats in Maharashtra:

2.1.7. Geography and rivers of Maharashtra:

Maharashtra is the third largest state in India, with an area of 308 hectares. Madhya Pradesh borders it to the north, Chhattisgarh to the east, Andhra Pradesh to the southeast, Karnataka to the south, and goa to the southwest. The state of Gujarat lies to

the northwest, with the union territory of Dadra and Nagar Haveli sandwiched in between. The Arabian sea makes up Maharashtra's west coast(Government of Maharashtra, 1963).
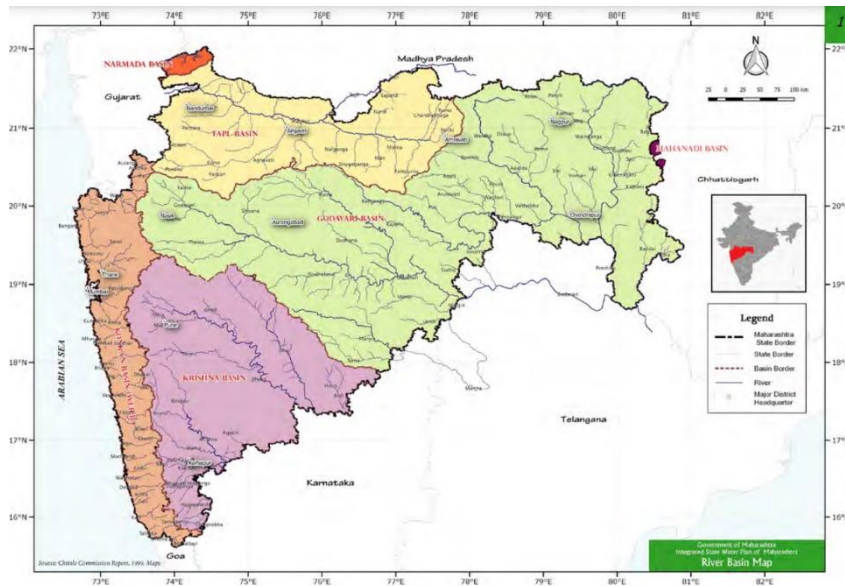
Map 2.1 Map of Maharashtra depicting major river basins along with major rivers.

Insight Map of India showing location Political boundary of Maharashtra.
Source: (Government of Maharashtra, 2018)

Major rivers of Maharashtra can be listed as:

1. Godavari

2. Krishna

3. Tapi

2.1.8. Godavari River and important places:

Godavari river is considered to be a holy river and is taken to be a place of pilgrimage. The river travels a distance of 1450 km, originating in Trimbakeshwar in Nashik and flowing through the states of Central India. The river rises at an altitude of 1067 m and extends for over 9.5% of the total geographical area of India. The river basin has an average annual water surface potential of 110.5 cubic km(Dandekar, n.d.). Following the historical development of the right-side bank, the right banks have seen significant development.

The Peshwa of Pune was particularly interested in the development of Nashik, which is located on the banks of the Godavari River. The settlement's morphological nature had a physical and visible relationship with the river. The sacred significance of the river was essentially conferred by the erection of temples facing the river. The river's

course was channelled by creating holy ponds known as "kunds" in the rocky strata(Baste, 2015).
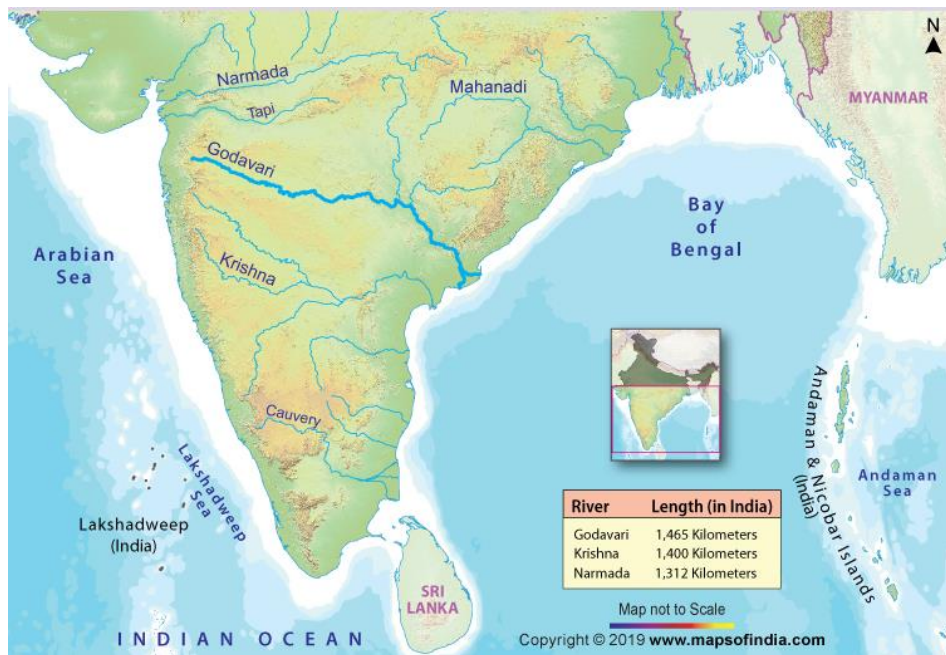
Map 2.2 Map Showing flow of Godavari River.
Source: mapsofindia.com

Nasik, Trimbakeshwar, Kopargaon, Puntamba, Paithan, Gangakhed, Nanded, and Sironcha are the major holy places in and around Nashik(Britannica, 2020).

The ghats on the riverfront draw many pilgrims to perform the last rites throughout the year. The Nashik Kumbh Mela is a massive event every 12 years and attracts three and a half million people(Baste, 2015).

The Godavari River is being impacted by urbanization. Lord Rama's link with the Kumbh Mela has given the river and the city of Nashik a distinct religious identity. Today, the city is growing along the riverfront, which is being used for a variety of purposes in an uncontrolled manner(Baste, 2015). The sellers on the ghats exploit the place by washing vegetables and dumping garbage(Baste, 2015).

2.1.9. Krishna River and important places:

The Krishna River is the third-longest river in central−southern India, after the Ganges and the Godavari. The river is almost 1,300 kilometres (810 mi) long. The river is also called Krishnaveni. Hindus revere this river as sacred. The river is also believed to remove all sins of people by taking a bath in this river.

The river originates at Mahabaleshwar near the Jor village in the extreme north of Wai Taluka, Satara District, Maharashtra, in the west. It pours into the Bay of Bengal at

Hamasaladeevi (near Koduru) in Andhra Pradesh, on the east coast. The river basin of Krishna stretches for an area of 258 948 square km(Britannica, 2015).
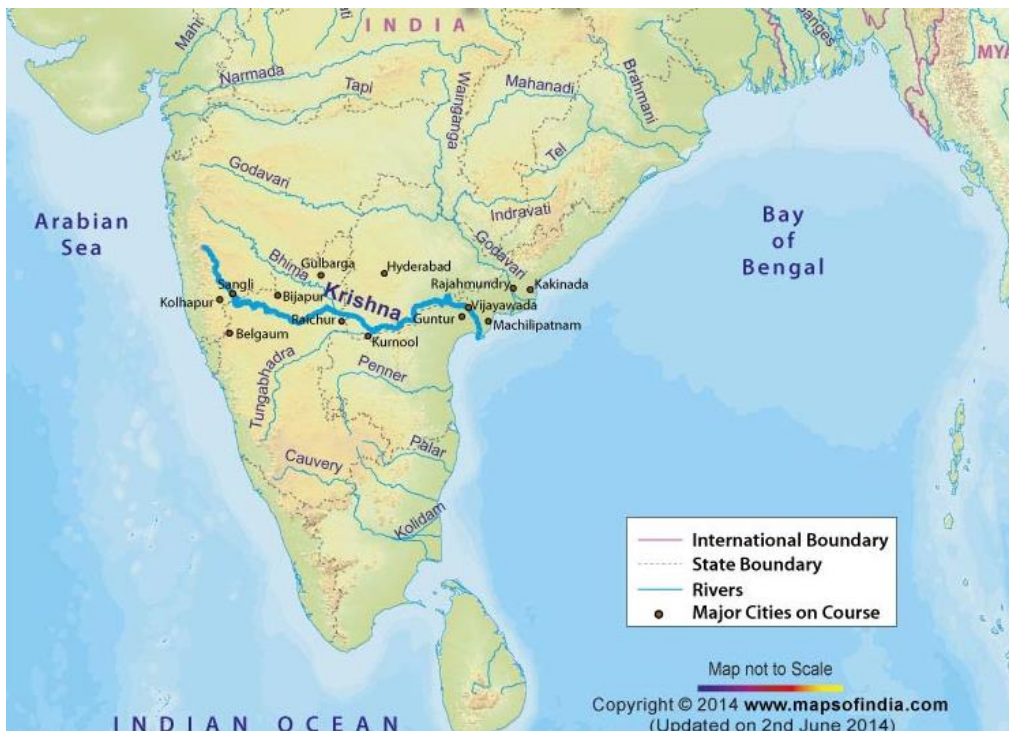
Map 2.3 Map presenting flow of Krishna River   *Source: mapsofindia.com*

The major places of historical and mythological importance that fall on the Krishna River within the Maharashtra boundary are Menawali, Wai, Mahuli, Preeti Sangam, and Narsobawadi. Each place has a historical background as well as religious significance.

2.1.10. History of ghats, ownership/ patrons of ghats

In the book "water and womanhood," the author Dr Anne Feldhaus, talks about the femineity of rivers. Godavari and Krishna's rivers are associated with certain worldly religious values: wealth, beauty, long life, good health, food, love, and the birth of children. She has highlighted these rivers are an important part of the culture of Maharashtra (Feldhaus Annie, n.d.).

Rivers are dotted with Ghats along their stretch in Maharashtra. Many religious places lie on the stretch of rivers in Maharashtra. The landscape of the Ghats includes temples and shrines facing the river. Built and rebuilt over centuries, The rationale for Ghats in the past was that people preferred to settle in a location due to the presence of a river which supported their major daily needs. People built houses on raised banks, and to reach or access the waters, they built steps(Chatterjee, 2010).

The history of Ghats dates back to the 13th century in Maharashtra; Vidya Shankar Bharati visited Maharashtra, especially the Deccan plateau, to spread awareness Hindu religion. Elaborate Ghats construction mainly happened during the Maratha period, i.e., during the 1700 century to 1800 century(Government of Maharashtra, 1963).

This was the time when the Peshwa rule was flourishing and expanding. Temple construction and other public construction were at their peak. The Ghats on the river Godavari at Nashik date from 1752 to 1818. The Ghats on river Krishna date from AD 1784-1817. Overall, Ghats in Maharashtra were built during the reign of the Peshwa(Bombay directorate of government printing, 1963).

Places of pilgrims, places of worship, and religiously significant places can be associated with ghats on the rivers.

Nashik city covers the following holy places: Someshwar temple, Navsha Ganpati temple, Laxman Kund, Ram Kund, etc. Lacs of devotees visits these places every day. Mass bathing, *asthi visarjan*, and *dashkriya vidhi* add pollutants to the river (Pradesh, Pradesh, & Indravati, n.d.).

Nashik hosts one of the largest religious gatherings in the world, known as Maha Kumbh Mela. This festival is celebrated on the Ghats, majorly on the Pachavati ghat and Ram ghat in the city. In recent times, the Godavari River stretches near Nashik city have become highly polluted. The same has become a major cause of concern to the local citizens, the religious group, and all other stakeholders (Bandhara, 2015).

Sustainability and sustainability assessment.

2.1.11. Definition and concept of sustainability:

Sustainability was defined in the world commission on environment and development's 1987 Brundtland report on our common future as development that meets the needs of the present without compromising the ability of future generations to meet their own needs(International institute for sustainable development, 1987).

Different people have defined sustainability in their way. Jepson states that sustainability can be defined as a process aimed at achieving environmental, economic, and social improvement, both locally and globally or a state that can be maintained at a certain level. According to this definition, the concept of sustainability is connected

to the compatibility between economic development and environmental protection(Jepson & Haines, 2014a).

Kuhlman (2010) says if the term sustainability is to be utilized as intended by the Brundtland commission, it may be suggested that it be more than a catchphrase, slogan, or statement, but rather an order to conserve and reproduce productivity capacity indefinitely(Kuhlman & Farrington, 2010).

Kauffman and Cleveland(1995) argue that integrating concepts and indicators proposed by social and natural sciences can help us understand the sustainability of human systems(Cleveland, 1995).

The term "sustainability" is subjective and cannot be defined categorically or singly. Because each setting is different, what comprises sustainability in the context of an individual sustainability assessment must be evaluated on a case-by-case basis(Bond, Morrison-Saunders, & Pope, 2012).

Sustainability and sustainable development are the two terms coined for environmental studies. The term sustainability development was coined in the early and mid-1980s to bridge the gap between environmental worries about the increasingly obvious ecological implications of human activities and socio-political concerns about human development challenges(Garner, 1983).

The term sustainability development first appeared in the world conservation strategy by the United Nations environment program. The three pillars of sustainability are the economy, society, and the environment. These principles are also informally used for profit, people, and the planet(Basiago, 1999).

The term sustainable development has been characterized by Jepson as balancing the three "Es" of ecology, equity, and economy(Jepson & Haines, 2014a). According to Koglin, sustainability development can be defined as " development that meets the needs of the present without compromising the ability of future generations to meet their own needs"(Koglin, 2009).

Basiago says as an antidote to these economic, social, and environmental ills, city and regional planning regimes embodying " urban sustainability" must be constituted(Basiago, 1999). While another author Mc Donald states the detailed conditions and their meanings.
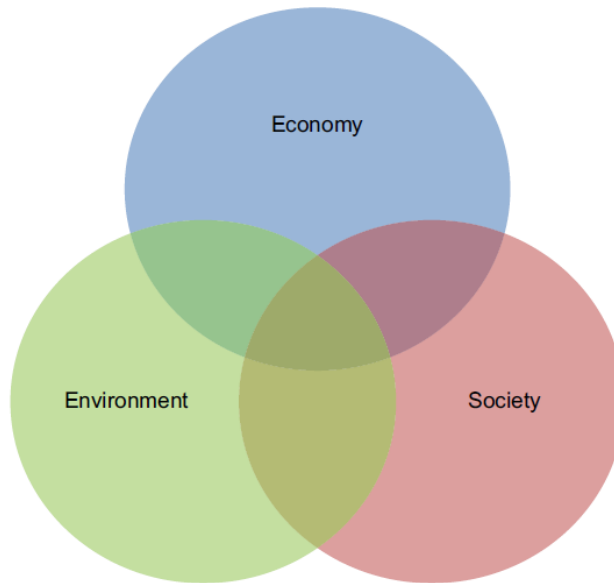
Figure 2.1 The three dimensions of sustainability. Common understanding sustainability can be assessed in economic, societal, and environmental dimensions.

Source: (Laedre et al., 2015)

Table 2.1: Conditions and their meaning

Condition	Meaning
Ecological condition	Do not compromise the ability of future generations to meet their needs.
Social condition	Meet the basic needs of all people and extend all the opportunities to fulfil their aspirations for a better life.
Political condition	Secure, effective citizen participation in decision making

Source: (McDonald, 1996).

Further, the term sustainable development and sustainability suggest today three different aspects or dimensions of sustainability-: social, economic, and ecological or environmental. Social and environmental "sustainability" are closely linked, and by implementing imaginative policies to pursue both, planners can nourish economic sustainability" by combining environment-based policies like efficient public transportation, urban greening, and recycling schemes with equity-based policies like free medical, dental, and child care for the urban poor(Basiago, 1999).

Campbell(2016) talks about the planning triangle of economic, social, and environmental factors. He states sustainability has to be redefined, as its current formulations romanticize our glorious past and are too loosely holistic for the future. The solution proposed by him states the integration of social theory with environmental thinking and combining their substantial skills with community conflict resolution techniques to address economic and environmental injustices (Campbell, 2016).

2.1.12. Examination of sustainability:

Initially, sustainability assessment is offered as a tool to assist decision-makers and policymakers in determining which actions to take and which to avoid to make society more sustainable (Dimitri Devuyst, Luc Hens, Walter De Lannoy, 2001).

Bond and others (2012) suggest that stakeholders' participation is required at the commencement of the sustainability assessment process. This should ideally include a visioning process and the formulation of principles and objectives to accomplish that vision. One of the most difficult aspects of developing a robust sustainability assessment process is identifying objectives by which sustainability can be defined(Bond et al., 2012).

The decision-making process for big public investment projects might be aided by a sustainability impact assessment (SIA). The use of SIA on projects is discussed in this study, and it is suggested that because policies constrain plans, which constrain projects, SIA indicators should be assigned to the strategic, tactical, and operational levels. The basic argument is that indicators should be attributed to one of the economic, social, or environmental aspects as well as to the strategic, tactical, or operational level (Laedre et al., 2015)

According to Sernella Sala (2015), one of the most challenging forms of appraisal methods in sustainability assessment. This incorporates interdisciplinary(environmental, economic, and social) issues and cultural and value-based dimensions (Sala et al., 2015). The purpose of sustainability evaluation is to ensure that 'plans and activities contribute as much as possible to long-term development.

According to Verheem (2002), ex-post evaluations of sustainability must be avoided. "Sustainability assessment is an aid to organized and well-informed consultation

amongst interested parties during the development of a plan or project. The evaluation must ensure that all parties involved have a clear understanding of the risk that a plan or project may result in detrimental effects being passed down to future generations, as well as an overview of the options for avoiding this (Rob A.A. Verheem, 2002).

Implementing a sustainability assessment requires the inclusion of sustainability principles, thresholds, and goals in the evaluation and the conversion from purely multidisciplinary to inter-disciplinary and transdisciplinary approaches (Sala et al., 2015).

The theoretical framework elaborated by Kahn points out that economic, social, and environmental "sustainability" must be integrated and "inter-linked"(Basiago, 1999).

Sernella Sala(2015) has stated that assessment is to be carried out by making a methodological framework. The framework comprises two models Sustainability assessment principles and SA procedure. The principles enlisted by Sala are:

Table 2.2 Sustainability assessment principles and definitions

Principle	Definition
Adequate scope	The appropriate geographical scope is to be taken into consideration for both local and global effects.
Framework and Policies	Framework for identifying core indicators and comparison of indicator values with targets or benchmarks.
Transparency	Transparency of data, sources of data, models, indicators, and results.
Continuity and capacity	Continuous learning and improvement
Broad participation	Users, Views of the public to be considered

Source : (Sala et al., 2015)

They state these principles are vital because they can be a useful guide for the assessment professional by ensuring that it is a simple integrated assessment and an effective SA(Sala et al., 2015).

Basiago(1999) has stated that the paradigm of sustainable development in Agenda 21, elaborated by Kahn, is based on three conceptual pillars: economic, social, and environmental sustainability. Below are the criteria for each pillar

Table 2.3 Sustainable Development pillars and their criteria

Element	Criteria
Economic sustainability	Growth, development, productivity, trickle-down
Social sustainability	Equity, empowerment, accessibility, participation, sharing, cultural identity, institutional stability
Environmental sustainability	Ecosystem, carrying capacity, biodiversity

Source: (Basiago, 1999)

He has explained the interdependency of these elements on each other by studying various cases of different cities in developed, developing, and poor countries. He has analyzed alternative cultural development models that might be more fruitfully implemented (Basiago, 1999).

The work by Koglin (2009) showed that sustainable development is linked to neo-liberalism and is used to promote economic and market solutions to address today's environmental and social problems. The economic system's impact on sustainability and sustainable development is crucial to define sustainable development, as many decision-makers use the economic system as a framework or reference to define sustainability and sustainable development (Koglin, 2009). He also states that when examining these models and visions of the sustainable city, it is clear that more research is required on sustainability measurements (Koglin, 2009).

The overall observation is the sustainability evaluation takes place on the three pillars as the factors for assessment.

Jepson(2014b), in his literature, has reviewed and analyzed the sustainability principles and the regulatory items that could be used to obtain sustainability development in the zoning process of the city. For the same, they identified case studies and carried out a process of identifying principles of sustainability and assessing their inclusion in the planning process of zoning. The study has proposed how the zoning rules and

regulations can be used to achieve sustainability goals and hint to planners that the contribution of zoning rules n regulations will contribute to the community's long-term sustainability (Jepson & Haines, 2014b).

The article authored by Julian and Tom (2003) aims to show how the connection exists in the US communities. The authors accomplish this by presenting a variety of locally or regionally-based practical models in five areas of shared concern for both environmental justice and social justice (Agyeman & Evans, 2003). They listed the following aspects of sustainability: land use planning, solid waste, chemical use, domestic energy use, and transportation. The proposed model takes into consideration both environmental principles and attempts to improve urban sustainability. They have referred to the Venn diagram of sustainable development theory(Agyeman & Evans, 2003).

Sustainability science, a term coined by Weinstein and Turner(2012), is a transdisciplinary science amalgamating the biophysical and social sciences formulated as a solution to the evolving conflicts on the path of long-term sustainability(Weinstein Michael P, 2012). Furthermore, the basic idea of this emerging field shows that a sustainable biosphere is not just desirable but also economically possible, socially just, and environmentally sound. It focuses on the need to bridge artificial and out-of-date disciplinary divides between the scientific and social sciences by developing new transdisciplinary knowledge and applying it to decision-making (Weinstein Michael P, 2012).

Hawkins and Wang(2012) have offered a conceptual model of sustainable development governance. This strategy emphasizes collaboration among the local governments, neighbourhood citizens, and support network organizations. The authors have surveyed the US cities and studied the extent to which the cities use the aspects of conceptual models. According to the data, cities in the sample use local governments and sustainability advocacy organizations the most (Hawkins & Wang, 2012).

In another research and assessment, the framework was created for the ideas of green infrastructure performance indicators. For the same, a framework was created to clarify the complicated link between action and reaction factors and identify the difficulties that affect green infrastructure performance. This was the qualitative part of the study. However, to evaluate and support the results from the qualitative research phase as well

as to evaluate the framework, a quantitative method was required. Hence a questionnaire designed with a Likert scale was developed. The data were processed with SPSS software, and the results obtained were cross-checked with the qualitative results to make the final findings and decide the further scope of research (Pakzad, Osmond, & Corkery, 2017).

Tom Wass and others (2014) suggest that sustainability assessment(SA) and sustainability indicators(SI) are decision-supporting instruments that can help with three challenges: interpretation, information structuring, and influence. However, because of the comprehensive and multi-dimensional nature of sustainable development and the uncertainties and risks that it entails, assessing and measuring it is difficult(Waas et al., 2014).

2.1.13. Sustainability assessment for heritage buildings:

Achieving sustainability in heritage buildings is one of the most challenging tasks (Senthil, 2016). Sustainability indicators have been used for more than forty years to examine sustainability from an environmental, economic, and social perspective. Stubb (2004) developed indicators for measuring sustainability in a historical environment. Further efforts are needed for the historical environment sustainability indicators to meet the sustainable development challenges (Stubbs, 2004).

In "Indicators for heritage buildings sustainability," the author states for measuring heritage sustainability, the environmental assessment methods alone are not sufficient (Liusman, Ho, & Ge, 2013). The social and economic aspects also play a role in heritage preservation. Heritage sustainability should thus embrace three pillars/elements environmental, social and economic. The paper has developed a set of indicators for the sustainability assessment of heritage buildings. The case study approach has opted for the same. A building has been selected, and the indicator is tested for the same.

For choosing indicators, each parameter has been studied and listed (Liusman et al., 2013). Heritage sustainability index (HIS) prepared:

Table 2.4 Framework of a heritage sustainability index

Environmental dimension	Social dimension	Economic dimension

Waste management	Association of place	Employment created at the site
On-site renewable energy	Links for social awareness	Local economy boost
Building adaptation to changes in climate	Accessibility of use	Self-generated funds for maintenance
Measurement of carbon emission	Heritage websites	Sufficient resources for future generations
Availability of public transport		

Source: (Liusman et al., 2013)

The old buildings/structures are important resources culturally and economically as they represent the continuity of our traditions and culture. For this to happen, the built heritage is placed on the same platform with sustainability, as both would most benefit from a symbiotic association. This being an important link, its evolution has been relatively slow(Stubbs, 2004).

The paper has adopted the framework of Stubbs. The study has developed a set of indicators called the heritage sustainability index(HIS), consisting of environmental, social, and economic(Stubbs, 2004). Indicators would be applied to the identified case study. Each indicator will be rated during the site inspection, interview, and questionnaire survey. To arrive at a single index, the HIS will be analyzed using the Delphi method or analytical hierarchy process. The index will demonstrate the sustainability of heritage buildings. The results will serve as a tool for policy-making for the government bodies (Liusman et al., 2013).

Maria Leus(2018) has created a framework of indicators to measure the classic dimension of sustainability. People, planet, and profit in a blend with heritage values and policy dimensions. They state the definition of Brundtland. The question is how to maximize the enjoyment of our legacy so that it remains relevant in the future is central to sustainable heritage management. They listed five pillars in place of three as a special case for heritage. A set of indicators was created for each pillar (Leus & Verhelst, 2018).

Table 2.5 set of indicators for each pillar

People indicator	Planet indicators	Profit indicators	Policy indicators	Patrimony indicator
Sense of place	Use of material	Local employment	Planning quality	Knowledge building
Community building	Energy	Economic embedding	Legal certainty	Cultural heritage
	Pollution	Future value	Voluntarism	Spatial aesthetics
	Use of space			Physical and psychological accessibility.
	Biodiversity			

Source: (Leus & Verhelst, 2018)

Thus, each of the above indicators was developed as a sub-indicator to value sustainability. These values evaluated the model for heritage sustainability (Leus & Verhelst, 2018).

Another research by Wei Ren and Feng Han(2018) suggests sustainability is a less well-established concept in the management of heritage buildings. They have proposed the development of sustainability indicators for holistic sustainability assessment for important heritage sites. The four factors considered for the same were economic, environmental, social, and governance.

Table 2.6: Sustainability indicators for built heritage management were used for the questionnaire by the author

Economic	Environmental	Social	Governance
Local employment	Efficient amenities	Support from attraction to local communities	Involvement of key stakeholders

Growth in self-generated funds	Waste and pollution management	Residents' satisfaction with the operation of the structure	Creating sustainability documents
External funding support	Environmental management system	Traffic congestion	Legal basis for heritage protection
	Historic buildings preservation and conservation		

Source: (Ren & Han, 2018).

The research gave insights into indicators chosen for sites that have to be site-specific or context-specific (Ren & Han, 2018).

Another study by Claude et al. (2017) has brought forth the dimensions for study to be ethical and social-ecological, economic, governance, and cultural dimension. The indicators for each gave values to each dimension. The authors state that relevant at the local level, global sustainability initiatives will only make a difference if their results are distributed and replicated around the world (Villeneuve et al., 2017).

Reed and others(2006) have studied the literature on the development of indicators at the local level to formulate a framework that summarises best practices. They conclude a combination of different qualitative methods for stakeholders, systems of interest, and problems goals to have opted. And quantitative methods are to be chosen to identify, test, select and apply sustainability indicators. Hybrid knowledge is required for the formulation of a nuanced understanding of environmental, social, and economic systems. These will help in local, sustainable development initiatives (Reed et al., 2006).

Overall, the indicators for heritage sustainability assessment are based on the basic three pillars but with the sub-indicators being site-specific. The assessment methods are to be hybrid with a balanced combination of qualitative and quantitative approaches.

The development of a local historical network, an effective conservation strategy, and an adequate financial mechanism for long-term sustainability are all necessities in today's world. Although heritage management themes are investigated and debated in worldwide academic venues, India still has a gap. The studies emphasize India's heritage sites; however, they are silent on the planning and techniques used by various Indian agencies. The necessity of the changing times is for a sustainable heritage management plan, a comprehensive strategy for conserving any heritage resource that attributes actual value to the heritage while safeguarding its integrity and lifespan (Senthil, 2016).

The overall finding is that the three pillars are used as the evaluation criteria for sustainability. Precisely, environmental, social, and economic sustainability. For more than 40 years, sustainability indicators have been used to assess sustainability from an environmental, economic, and social standpoint.

A system of metrics is necessary for assessing sustainability's historical aspect. People, the earth, and capital profit combined with historical ideals and political considerations are the key points for heritage structures.

Although the sub-indicators are site-specific, the overall indicators for heritage sustainability evaluation are based on the fundamental three pillars. The evaluation techniques must be hybrid and include a thoughtful balance of qualitative and quantitative methodologies.

2.1.14. Terminology stating to "waterfront" or "historic waterfront."

Water is the defining force that fundamentally shapes the character of each place it touches. The role of water in transport, industry, sanitation, and nourishment made it the reason for human settlement. Much of the existing international literature review waterfront revitalization as a means to increase the economic vitality of localities, create new public spaces and increase access to valued cultural and natural amenities.

"Land fronting on water" is how the term "waterfront" is defined. A river or lake could be the "water." Location, physiography and climate, settlement history and scale, the diversity of water-related uses, and administrative structure are all elements that influence waterfronts. Because it is the meeting point of two natural resources, land and water, the waterfront is a unique and irreplaceable resource(Baste, 2015).

Waterfronts are often strategic areas because their usage has direct or indirect impacts on the image of the place and social equity(Rasal, 2012); in many urban areas of the world, sustainable development has become a widely acknowledged goal, as the deterioration of environmental and social conditions can be seen. It is an indicator of the degrading sustainability of the city (Rasal, 2012).

Because of their particular capacity to provide society with diverse options for economic development, public enjoyment, and civic identity, waterfronts constitute a special class of valuable assets (Ragheb, 2017).

Settlements and civilizations have grown on the banks of the river in India throughout history. The Indus valley civilization, Mathura, Banaras, and Allahabad are only a few examples. The Sabarmati riverfront development, the Kanakpura waterfront development, and the Vishakhapatnam shoreline development are just a few instances of approaching and envisioning waterfronts in today's setting(Baste, 2015).

The goal for the revitalization of the waterfront is to create a long-term vision for improving the physical, social, economic, and environmental conditions of the waterfront and converting them into a vibrant and viable place (Keyvanfar et al., 2018). The study has found that the revitalization of historic waterfronts can contribute a lot to tourism compared to other normal waterfronts. The author states that " the historic waterfront acts as a catalyst for economic regeneration and enables people to reconnect with historic quayside areas whether for business or social exchange, residence or leisure (Keyvanfar et al., 2018).

Hoyle (2018) states the key issues for the waterfront of old cities. He says the waterfront is to be promoted as a positive element in urban tourism. The activities along the riverfront to be regularised and careful development to be proposed to enhance public access to the waterfront, and rehabilitation of selected, specific waterfront environments should be promoted as essential components of old town conservation policy—inclusion of waterfronts in conservation policies at the town level (Hoyle, 2018).

Principals for sustainable waterfronts were approved at the global conference on the urban future (Urban 21) held in Berlin (Deeb, Abelgalil, & Sarhan, 2015). The principles of sustainable waterfronts are as follows:

Table 2.7 Principles of sustainability waterfronts

1. Secure the quality of water and the environment
2. Waterfronts are part of the existing urban fabric
3. The historic identity gives character
4. Mixed-use is a priority
5. Public access is a prerequisite
6. Public participation as an element of sustainability.
7. Planning in public-private partnerships speeds the process
8. Waterfronts are long-term projects
9. Waterfronts profit from international networking
10. Re-vitalizing is an ongoing process

Source: (Deeb et al., 2015)

The authors point out the need for an assessment tool to evaluate the rate of sustainability. They also highlight that the above points have to be considered thoroughly and confirm their applicability to waterfronts. Also, a pilot test is to be done for the waterfront at various places to validate the tool developed (Deeb et al., 2015).

Natural environment-friendly planning and design are extremely important in the planning and sustainable development of coastal areas and natural landscapes and the protection and development of historical and cultural values. Toward the end of the twentieth century, sustainability emerges as a dominant paradigm in global coastal management programs and coastal planning. In this method, defining the coasts, determining the future role of the coast for the city, preparing the master plan and involving the community and investors at an early stage, promoting physical and economic conditions for the renewal of the coast, establishing a balance between the economic expectations of investors and the public interest, addressing and reviewing the master plan in such way to reduce financial risks and prioritizing public access, integrating the coastal area with the city, and determining design principles while taking

into account ecological, historical, cultural, and architectural qualities are all key points(Yıldız, Nihal, Asist, & İmren, 2015).

Legislation review

2.1.15. National-level policies for heritage:

The Ancient Monuments and Archaeological Sites Remains (AMASR) Act 1958 was revised by the Indian government in 2010 to incorporate certain new sub-sections. The amendment suggested the formulation of heritage bye-laws. Parameters set for the formulation of bye-laws are that the competent authority shall prepare heritage bye-laws in consultation with Indian National Trust for Arts and Cultural Heritage (INTACH) or any other expert heritage agency. The heritage bye-laws should include matters relevant to heritage regulations, such as elevations, facades, drainage systems, roads, and service infrastructure, in addition to those that may be prescribed, including electric poles, water, and sewer pipelines (Ministry of Culture, 2011).

According to the Archaeological Survey of India (ASI) Heritage, bye-laws can be prepared for history monuments by the competent authority in consultation with INTACH, a registered trust under The Indian Trust act 1882, or any other such heritage bodies as may be noticed by The Central Government (Government of India, 2010).

India lacks a statutory body to list heritage buildings and sites. INTACH has taken the initiative and documented about 60,000 buildings over the country. This is just a small corner of the iceberg. There are innumerable heritage structures spread all over India (Heritage, 2016).

The National Policy for the Conservation of Ancient Monuments, Archaeological Sites, and Remains (NPC-AMASR) states the issue of a protected monument's living aspect has only been attempted for a religious monument in use. Other living monuments have not yet been considered. Joint efforts must be undertaken to a) identify, b) conserve, and c) chalk out appropriate management and monitoring modes by the ASI and several other ministries and agencies at the central, state, and district levels. Local planning authorities, non-government organizations, and communities will all play a bigger part in this. Conservation efforts, in the broader context, shall encompass the study, documentation, treatment, and care of monuments, archaeological sites, and remains backed up by proper research, diagnostic studies, and other means. Most importantly,

it is a continuous process that is accomplished through an annual conservation plan (ACP) that is created and refreshed on a regular basis to ensure that it is implemented successfully. ASI should explore assisting in the establishment of institutions or collaborating with organizations and non-governmental organizations to establish research centres for training the youth regarding heritage or conservation of sites(The, Monuments, Sites, The, & Survey, 2014).

Development control rules at the state level:

Unified Development Control and Promotion Regulations for Maharashtra State (UDCPR) have pointers for heritage structures. It states in point 14.5 about the conservation of heritage buildings/precincts/ natural features. The regulations will be applied to the above-mentioned categories within the areas of planning authorities and the regional plan. The listing of the structures has to be undertaken according to the listing form prepared. It states the structures/ precinct should have architectural, historical, social, etc., values associated with them. The listing has to be publicly announced in local newspapers; all suggestions and objections must be invited within 30 days of the notice. Hearings are to be held for the objections and the decisions to be incorporated into the final list. On completion of this process, the list is authorized by the state government, and the rules and regulations for heritage will be applicable. A heritage conservation committee is to be formulated in consultation with the government authorities. It states the rules for heritage stated are applicable to the buildings that are listed as heritage. For the preparation of heritage listing, the local municipal council along with a heritage agency/heritage conservation. The listed building needs to be graded according to their values of heritage can also be undertaken under the committee's guidance(Maharashtra, 2020). The regulations prevailing at a local level for heritage shall be applied to the listed structures. In case no heritage bye-laws prevail, according to the ASI, heritage bye-laws to be prepared at the local level according to the local factors (Government of Maharashtra, 2020).

Development control rules at the local level

Article 243 B of the 73rd CAA provides for the constitution of Panchayats at three levels in a state(Development, 2015):

a) Village,

b) Intermediate (may not be constituted in a State having a population not exceeding twenty lakhs) and

c) District.

Article 243 Q of the 74th CAA provides for the constitution of Municipalities in every State as given under:

a) Nagar Panchayat for transitional area: an area in transition from rural to urban in character.

b) Municipal Council for a smaller urban area, and

c) Municipal Corporation for a larger urban area

The URDPFI guidelines state that the rules and regulations for the heritage are to be formulated by the state; it states an urban arts and heritage commission is to be formulated to preserve and conserve historical sites(Development, 2015). The heritage laws previously sanctioned by the government / concerned competent authority, the heritage regulations, the establishment of a heritage conservation committee, and a list of heritage sites will be implemented (Government of Maharashtra, 2013). Whereas earlier, no specific heritage rules were specified.

Development Control and Promotion Regulations for Regional Plan, Satara 2016-2036, state the Heritage regulations for the conservation of historic sites (both natural and manmade). A buffer zone has been of the eco-sensitive area has been declared for the Mahabaleshwar-Panchgani area. The clusters at Kas Pathar, Chalkewadi, and Sada Waghapur are also declared eco-sensitive zones. No specifications for built heritage are specifically stated (Government of Maharashtra, 2017).

Development control rules for Nashik city-state the definitions of Heritage building and precinct (Nashik, 2017).

In 2005-06 the Government of India's Ministry of Urban Development launched the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) to enhance urban infrastructure governance and essential services to the poor. Nashik was included in Maharashtra's Urban Infrastructures and Governance sub-mission (MMRDA, 2021). Nashik was classified as one of the 13 Heritage cities. The tangible and intangible heritage components of the city have several layers of history superimposed on them. The Nashik CDP highlighted three conservation challenges for the town at the outset(DRONAH, n.d.).

1. River protection

2. Heritage structure conservation

3. Conservation of the lands surrounding the ancient city core.

The project duration was from July 2007 – August 2008. The DPR was completed then and handed over to the Nashik Municipal Corporation. DRONAH carried out this task with Span Consultants Pvt. Ltd, Noida and Aakar Abhinav Consultants Pvt. Ltd, Mumbai_ Transport planning and social surveys. Under this project, the listing of heritage projects has taken place (DRONAH, n.d.).

Under the Nashik smart city project list, proposed projects "Godavari riverfront development including beautification: under which the tasks listed are:

Boost local economy; Economy highlights Nashik in the spiritual and heritage map of India, Improved water quality, the increased green cover of the city, and reduced probability of flood(Smart City, 2021).

India is multi-faceted, as a country with a living heritage that allows visitors to explore their five senses through street dramas, folklore, dances, cuisines, and other activities, making amusement and education vital(Batra, 2008). According to Batra(2008), the government should not participate in deals or perform the job directly but rather should create potential advantages for local communities to participate actively, resulting in enhanced community pride and work opportunities.

2.2 Summary of literature:

The first part of the literature gives insights into the study of ghats done by many scholars.
The concept of ghats has been introduced. The importance of water in Indian culture has been described. The basic purpose of building ghats is discussed. The holiness of the rivers and the places of religious importance on rivers are an outlook of study. The ghats are associated with various activities, from daily domestic activities to rituals on the ghats.
The mythological aspect of ghats has been studied in depth. Many researchers have stated the relation between place and the mythology associated with the place are the main reasons the ghats are formed. Vast construction of ghats can be observed at Varanasi, Mathura, Ujjain, Maheshwar, Har ki Pauri, and Ayodhya. These places are the most revered religious places on Ganga and Yamuna rivers.

Historical studies point out the patrons for the ghats' construction and the period in which ghats were constructed. The study has been done for the Varanasi and Mathura ghats extensively.

The geographical setting and the structure of ghats play an important role. Ghats are composed of rendering to the topography of the setting.

The architectural studies on ghats of Varanasi, Mathura, Maheshwar, and Ujjain have described the natural and man-made elements that complete the composition of the ghats.

Studies are done on the ghats for their current condition and rejuvenation in cities like Banaras, Mathura, Maheshwar, Ujjain, and Kolkata are reviewed. They give insights into the current conditions of ghats.

There has been a study on the significance of Ghats on rivers Ganga, Yamuna, Gomti, and Godavari River to a small extent. Their heritage values have been studied, and certain measures for the conservation of the Ghats have been proposed.

Studies of the government policies and efforts towards ghats have disclosed that certain government programs have been initiated to clean rivers, for example, the "Ganga action plan (GAP)", but these activities are not successful without public participation. It can be seen at Varanasi; after years of pursuance, the Varanasi ghats have been incorporated into the World Heritage list.

In Maharashtra, the rivers of importance have been discussed along with their mythological importance. These rivers are dotted with ghats and have great religious importance at the local and state levels. The study of these ghats is done on architectural values and religious values to a certain extent.

The second part of the literature overviews the sustainability concept and the parameters for sustainability.

The term sustainable development has been characterized by Jepson as balancing the three "Es" of ecology, equity, and economy. Many agree on the point that the term "sustainability" is subjective and cannot be defined categorically or singly.

In the various kinds of literature, it has been stated multiple factors for assessing sustainability. Namely, Social, Economic, Environmental, Citizen participation, Governance, Institutional, Heritage values, and Heritage tourism. The methods for sustainability assessment and the need for a methodical framework have been discussed. Some scholars have termed that the most challenging form of appraisal method is sustainability assessment. This incorporates not just interdisciplinary issues

but also cultural and value-based dimensions. The theoretical framework elaborated by Kahn points out that economic, social, and environmental "sustainability" must be integrated and "interlinked." The sustainability assessment has to be carried out by making a methodological framework. Scholars have studied many approaches. One of them is the case study approach, case studies are identified, and the process of identifying principles of sustainability and assessing their values is undertaken. The results can be included in the planning process of the local bodies. It is observed that the majorly studied perspectives are social, economic, and environmental factors. The scholar listed various dimensions of each environmental, social, and economic and prepared a heritage sustainability index.

There are certain modules or parameters experimented with to evaluate the sustainability of the heritage structures/ heritage precincts. A list of five pillars has been made a special case for heritage. The indicators were People, Planet, Profit, Policy, and Patrimony. Some other authors have stated the important factors for heritage as economic, environmental, social, and governance.

Another terminology used is waterfront or historic waterfronts. Waterfronts are often strategic areas because their usage has direct or indirect impacts on the image of the place and social equity. The goal for the revitalization of the waterfront is to create a long-term vision for improving the physical, social, economic, and environmental conditions of the waterfront and converting them into a vibrant and viable place.

The legislation review provided the background of the laws and rules prevailing for the heritage structures. The national policy for the conservation of ancient monuments, archaeological sites, and remains states the issue of a protected monument's living aspect has only been attempted for a religious monument in use. Other living monuments have not yet been considered.

At the state level, the Unified Development Control and Promotion Regulations for Maharashtra State have been formulated. They state that the heritage regulations will be applicable as per the local bye-laws. After studying the laws of municipal corporations, it is observed there are no separate bye-laws for heritage buildings. Some small heritage efforts have been taken for Nashik by JNNURM and INTACH, along with DRONAH, for the heritage of Nashik city. It falls under smart city hence funds that have been allotted for heritage preservation.

Overall, the studies have given many dimensions and aspects done so far from the ghats and the sustainability assessment procedures.

2.3 Research Gap

Studies have been done on the ghats on the major rivers of India. It is observed that the cultural aspect of the ghats has been explored to a more significant extent. The mythological element has been studied in depth. Historical studies have revealed the patrons of ghats and the period of the ghat construction. Also, its close association with geographical settings has been studied to a certain extent. The structural aspect of ghats has been done by fewer scholars and has a scope for studying the unexplored aspects. Also, the architectural part of the study has been researched, significantly identifying the major elements comprising ghats. The issues ghats face due to urbanization, and the growing pressure from the cities have been identified for the Varanasi and Mathura ghats. The aspects studied can be listed as cultural, mythological, historical, geographical, and architectural, and the rejuvenation proposals are all past studies.

The major part of the study done so far is on the rivers in northern India, namely: Ganga, Yamuna, Narmada, and Gomti. The places explored to a greater extent are Varanasi, Mathura, Ujjain, Ayodhya, and Maheshwar, to name a few. The rivers of the Southern part of India and the Deccan plateau are the least explored. The studies of ghats on these rivers are very few and need to be done.

The study of sustainability has been majorly done for the cities or neighbourhood levels. In various kinds of literature, the indicators for sustainability have been enlisted, namely social, economic, environmental, citizen participation, governance, institutional, heritage values, and heritage tourism. Unanimously agreed on the pillars for assessing sustainability are environmental, economic and social perspectives. The sustainability assessment of heritage buildings has been a new aspect and is trending for building heritage at the international level. Various modules are prepared for a building, and analysis is done.

There are fewer studies of ghats on rivers except for the Ganga and Yamuna. Furthermore, the social, economic, and environmental sustainability of ghats is least explored. Maharashtra ghats are the ones least explored by researchers. This study addresses this gap by carrying out research on the social, economic and environmental sustainability of ghats in Maharashtra.

Chapter 3. Research Methodology

3.1 Theoretical framework

From the literature, I have drawn the following theoretical framework. The literature studied has stated many parameters for sustainability. The parameters enlisted from the literature are social, economic, environmental, institutional, Heritage tourism, heritage values, cultural values, policy, and historical environment. The exhaustive list gave me the guidelines for deciding the factors for the study of ghats. For the study of ghats' sustainability, I have selected social, economic, environmental, and institutional factors as these factors have been prominently used for assessing the sustainability of structures related to heritage. Below stated is the framework I will be using for the research. This framework states the factors used for research and the indicators for each factor.

Table 3.1 Theoretical framework for assessing sustainability
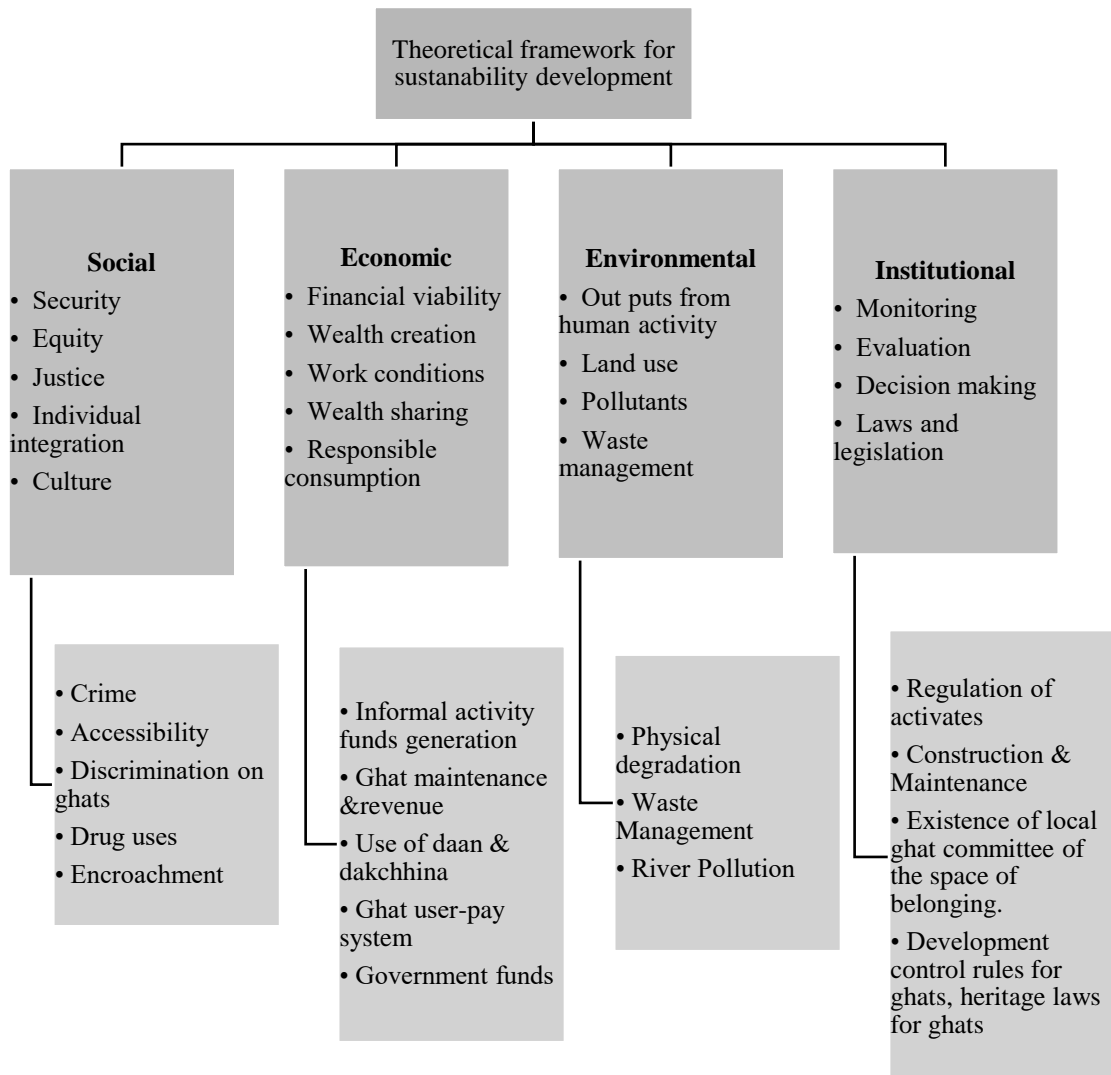
Reference for indicators:(Liusman et al., 2013) (McDonald, 1996) (Basiago, 1999) (Jepson & Haines, 2014a) (Stubbs, 2004)(Ren & Han, 2018)

From the above framework, indicators for study and the reason for selection have been listed below:

The factors that were used to assess the sustainability of the heritage structures were identified and then enlisted for my research. Then further, the indicators directly related to the ghats were identified from the exhaustive list of indicators created in the literature. The indicators that will be helpful to answer my question about the sustainability of ghats were selected: the reason for choosing each indicator has been explained in the table below.

Table 3.2 Indicators applied for assessment of the sustainability of ghats.

Dimension	Indicator	Reason for choosing the indicator
Social	• Crime • Accessibility • Discrimination on ghats • Drug uses • Encroachment	The crime rate on ghats will discourage people from using ghats. Accessibility of ghats is equal for all people and at all times. Discrimination between rich and poor, Caste wise, for entering or using the space on ghats. Drug users on ghats will create an unsafe environment on ghats. Encroachment with inappropriate interest will create issues.
Economic	• Informal activity funds generation • Ghat maintenance &revenue • Use of daan & dakchhina	This will provide the proper source of income. Revenue generated by ghats can be utilized for their maintenance

	• Ghat user-pay system • Government funds	Transparency in the daan &dakchhina. The user pay system can generate funds from Govt. to provide maintenance of the ghats.
Environmental	• Physical degradation • Waste Management • River Pollution • Cremation Management • Sewer disposal on the river	The physical state of the ghats is a major factor for people visiting them ghats.
Institutional	• Control of bad activities • Regulation of activities on ghats • Construction & Maintenance of ghats • Utilization of daan dakchhina • Existence of local ghat committee of the space of belonging.	The unlaw full activities need to be controlled. Activities regularized will benefit the overall environment of the ghats Governing body to look after construction and maintenance.

Source: Prepared by the author

The research aims to assess the sustainability of the ghats on rivers Krishna and Godavari. This section describes the research methodology and the research methods used to achieve the research objective of this study. It discusses the nature of the research, delineation of the study area, case study selection, strategy, and data analysis.

3.2 Research Methodology:

The research falls under a combined field of qualitative and quantitative methods. The research is primarily qualitative. Different methods are adopted to study the ghats and assess their sustainability. Qualitative methods such as semi-structured interviews of key informants and experts, photographic documentation, and direct observations on-site are the key methods used(Varma, 2011b). The quantitative method is used for the users on-site(Waas et al., 2014). A rating/scoring scale of 1 to 5 has been developed to rate the indicators identified for assessing the sustainability of ghats. Each indicator has been given a scale of 1 to 5, where one is the worst and five is the best. The research adopts a case study method(Liusman et al., 2013).

3.3 Research method

The research method has a step-by-step approach to research. The selection of rivers was the first step. Selection of ghats on the rivers, the parameters for ghat selection were set. Content analysis for the secondary data. Primary data is obtained from field surveys(Varma, 2011b). Interviews with stakeholders are the primary source of information for the study(Varma Annie, 2012). The rating score method opts for the sustainability assessment in terms of quantitative studies.
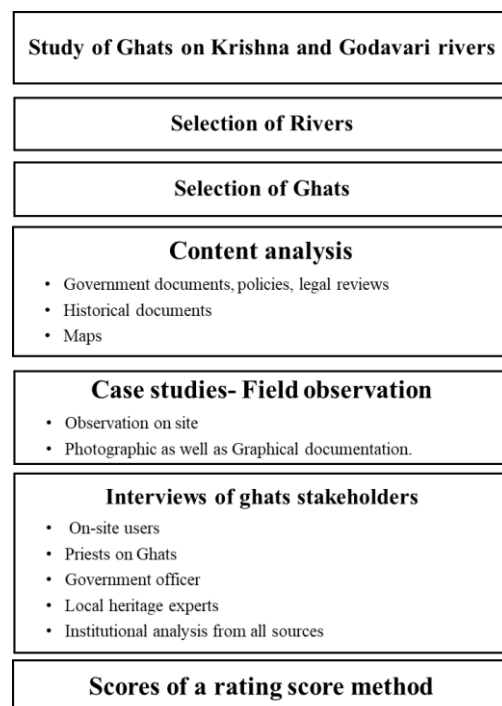
Figure 3.1 Research method

3.3.1 Research tools and type of data obtained:

Table 3.3 Research tools and type of data obtained

Tools	Type of data obtained	Source
Archival research	Information of the place, historical study, and mythological stories associated with study places. Laws and regulations regarding the ghats	Archives, books, research papers, and government documents.
Fieldwork – Case studies		
Non participant observation	The behaviour of people.	Place of study
Schematic drawing preparation. (Graphical documentation)	The physical condition of the ghat structures	Ghat structure and surroundings
Photographic documentation.	Nature of use of place, the physical condition of ghats.	Ghat structure and surroundings
Semi-structured interviews	Information about the social, economic, and environmental state of ghats	Key informants: • On-site users • Priests on Ghats • Government officer • Local heritage experts • Institutional analysis from all sources
Interviews/group discussion	Institutional Management of the ghats	Trustee of the trust for ghats.

Source: Prepared by the author

3.4 DETAIL METHOD:

A) STUDY AREA:

The area delineated for the study is the stretch of rivers Krishna and Godavari in Maharashtra. Krishna and Godavari are among the main rivers in Maharashtra. These rivers are dotted with Ghats along their stretch in Maharashtra(Baste, 2017)(Baste, 2015).

Reason for selecting the rivers: Krishna and Godavari rivers are significant from a religious and cultural point of view. They are worshipped as a goddess as per the ancient scriptures. The stretch of both rivers in Maharashtra's political boundary is considered for the study purpose.

SELECTION OF GHATS: Three Ghats are selected for each river.

Ghats on Krishna River: Wai, Mahuli and Narsobawadi.

Ghats on Godavari River: Someshwar, Ramkund and Paithan.

The criteria for selecting ghats were the places with historical importance, mythological association, architectural character, and high cultural and, religious, social values and maximum footfall on the ghats

Matrix for selection of rivers:

On the Krishna River, places having major ghats are Menawali, Wai, Mahuli, Karad, Kurundwad, and Narsobachi wadi.

Table 3.4: Matrix for ghats on Krishna River

Menawali	Wai ghats	Mahuli ghats
No. of ghats: 1 stretch of ghats.	No. of ghats: 7 stretches of ghats.	No. of ghats: 5 stretches of ghats.
Values: Historical	Values: Mythological, Historical, Religious	Values: Historical, Religious

Major Use: Domestic	Major use: Domestic and religious	Major use: Domestic and religious.
Karad Preeti Sangam	**Kurundwad**	**Narsobawadi**
No. of ghats: 1 stretch of ghats.	No. of ghats: 1 stretch of ghats.	No. of ghats: 3 stretches of ghats.
Values: Historical	Values: Historical	Values: Very High Religious, historical
Major Use: Domestic	Major Use: Domestic	Major Use: Religious

Source: Table prepared by scholar.   Photographs clicked by scholar.

Out of the above-mentioned ghats: The ghats with the greatest number of visitors, places where important religious events occur, ghats with high architectural value, and historical background have been shortlisted for the case study. They are Wai, Mahuli and Narsobawadi.

Wai Ghats- have a strong historical background, religious values and architectural values; Mahuli Ghats- have strong historical values, religious values and high architectural values; and Narsobawadi ghats- have very high religious values and mythological values. Preeti Sangam Karad and Kurundwad have comparatively fewer values and hence are not chosen for study purposes.

On the Godavari River, places having major ghats are Someshwar, Ramkund Nashik, Paithan, and Nanded.

Table 3.5: Matrix of ghats on Godavari River

Someshwar	Ram kund	Paithan	Nanded

No. of ghats: 1 stretch of ghats.	No. of ghats: stretches of ghats.	No. of ghats: 2 stretches of ghats.	No. of ghats: 1 stretch of the ghat.
Values: Religious, Mythological	Values: Mythological, Historical, very high Religious, after-death rituals	Values: Historical, High Religious, after-death rituals	Values: High Religious values.
Major Use: Religious, Recreational	Major use: Religious and after-death rituals	Major use: Religious, after-death rituals	Major use: Religious, Domestic

Source: Table prepared by scholar.   Photographs clicked by scholar.

Out of the above-mentioned ghats: The chosen ghats have high religious, Mythological, Architectural, and historical values. They are Someshwar, Ramkund, and Paithan.

Someshwar Gangapur- High religious values, special rituals performed here, mythological value. Ramkund Nashik- Very high religious value- Kumbh mela takes place on ghats, very high mythological values, and Paithan Ghats- Very high religious value- Saint Dyaneshwar performed miracles on the ghats, high architectural value. Also, due to the Covid pandemic situation, not many places were visited many times as travel restrictions were imposed. But still, the above all ghats on both rivers have been visited and analysed.

Selected ghats for the study at Krishna and Godavari River
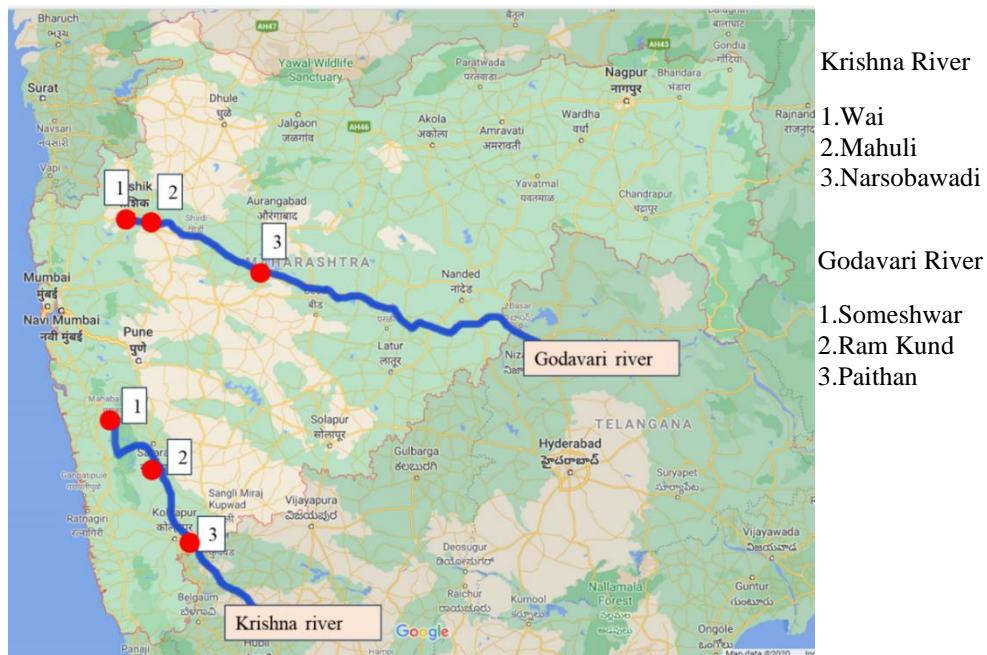
Map 3.1 Map showing the selected ghats under study on Krishna and Godavari Rivers

Source: Map prepared by author on map sourced from https://www.google.com/maps/place/Maharashtra

B) CONTENT ANALYSIS:

The study of documents and communication artefacts such as texts in various formats, images, audio files and videos are included in content analysis. Few people have written about the ghats. Therefore, there are many references to the temples that were built there, but only a few of these address the actual ghats themselves. An analysis of written archival records of the ghats and their rationale for being constructed is rare. The written sources that are available and used for this part can be classified as follows:

Official records: These sources include the Gazetteer, survey reports, and other government publications like the bye-laws.

Descriptive writing: Travelogues, guides, memoirs, and other works describe the ghats and their presence.

Prescriptive writing: these are published by experts in the fields of ghats, heritage and sustainability to raise knowledge about the subject, present the latest trends and ideas, and make recommendations to ghats research academics.

Old photographs, maps, or early records of ghats, if any, have been explored.

C) FIELD OBSERVATION:

Individual ghat was physically visited and studied at different times of the day. I observed the activities on the ghats. Photographic documentation of the activities, as well as issues on the Ghats, has been done. Mapping the activities during different times of the day was done. This was done to identify the activity that is causing issues on the Ghats. Physical issues are marked on the plans prepared for study by the scholar. Preparation of schematic drawings as required for each Ghats has been done, and the areas of problems have been marked with colour coding.

Interviews: Semi-structured interviews of the below-listed people were conducted. Each category had a separate questionnaire prepared to fetch the information on the social, economic, and environmental perspectives. The questionnaire designed aims to obtain information on ghats' social, economic, and environmental conditions.

- o Users of Ghats
- o Priests on Ghats
- o Government officer
- o Local heritage expert.

On each ghat, 15 on-site users were interviewed. As they are the main stakeholders, their interviews are the key source of information.

The scholar has personally interviewed 15 users of ghats. The interview was conducted on the site, and questions were asked from the questionnaire prepared. The priest on ghats was interviewed with a different set of questionnaires as they are the resource person for information on religious activities and the income from religious activities.

The Government officer or the trust member was interviewed. In some places, due to the pandemic situation, the government officers were not available, the office was closed, and the employees were busy with the covid survey of the local area. I interviewed the trust members and the associated government officers to obtain the required information in such cases.

In the heritage expert questionnaire, the questions are structured and specific. The questionnaire was emailed to the experts. Some experts were interviewed on the telephone. These interviews were conducted as per the availability of the expert.

D) PROCESSING OF THE DATA OBTAINED

- The data obtained from the questionnaire is tabulated to get the required information.
- A summary of the data is prepared for each ghat.

All the onsite user interviews are summarized and noted in a tabular form for better clarity. Other interviews were summarized in paragraphs for the correct information. Individual findings for each ghat and, later, the combined results have been enlisted for further process(Varma, 2011a).

Quantitative part: This is used only for onsite users. For each ghat, 15 on-site users were requested to fill out the google form and rate the ghats from 1 to 5 for each parameter. For the same, the Scoring/ Rating method was used(Ceed, 2013).

A scoring/rating method is made up of four or more score items that reflect related questions, all of which are summed into a single composite score or variable. Data on a scoring/rating method can be examined as interval data, which means that the mean is the most accurate measure of central tendency(Ceed, 2013).

A scoring/ rating method has been used for the users of the ghats. Each ghat 15 users are interviewed and asked to fill the form. In the form, they must rate the state of the ghats. The questions aim to obtain information on ghats' social, economic, environmental, and institutional perspectives. In this method, the institutional

perspective was added separately. In due course of the study, this aspect played a vital role; hence assessing it on a scale method gave more clarity on the role it played.

The scale is from 1 to 5. Where one is the worst condition and five is the best condition. People were asked to rate the state of the ghats from different perspectives. A google form was prepared for the same, as it's convenient to gather data and process the information.

For the results, mathematical calculations using the below-mentioned formula were carried out:

Applying the formula for the scoring/ rating method:

Calculation of range: The scale is 1 to 5

5-1 =4

Divide 4 by 5

4/5 = 0.80

Hence 0.80 is the interval of the class.

So, the extent of the class is equal and accordingly determines the levels of responses.

- Very low = 1 to 1.8
- Low = more than 1.8 to 2.6
- Moderate = more than 2.6 to 3.4
- High = more than 3.4 to 4.2
- Very high = more than 4.2

The above levels are used for interpreting the values obtained from the responses.

Example of score calculation:

The graph shows the ratings received from all 15 responses for one parameter on ghats.

Rate the state of crime on ghat:
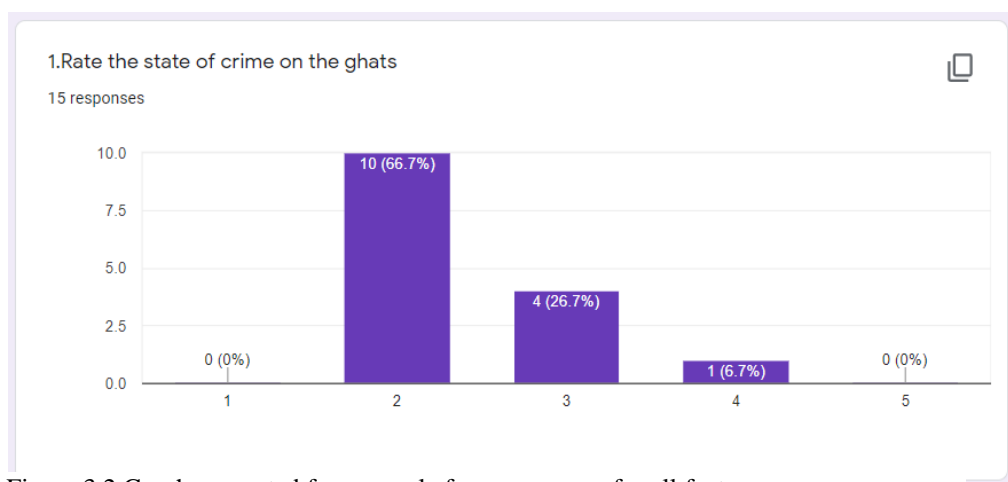
Figure 3.2 Graph generated from google form responses for all factors.
Source: https://www.googleforms.com/responses

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The responses received were tabulated in a table as shown below:

Question no	1	Ghats	WAI
Rating score	No. of responses	Multiply the no. of responses by scale	Score totals
1	0	1	0
2	10	2	20
3	4	3	12
4	1	4	4
5	0	5	0
Total of responses	15	Grand total for scores	36
Grand total for scores	36		
Responses grand total	15		

This tabulation helped in obtaining the grant total of the responses and the total for the scores. Later applying the formula:

Applying the formula :

$$\textbf{Average score} = \frac{\text{Grand score for scores}}{\text{Response grand total}} = \frac{36}{15} = 2.4$$

Source: How to analyze Likert and other rating scale data. (Harpe, 2015)

The value of the average score was obtained. This value is the final score value considered for interpreting the result. The above value is checked with the class interval values developed above, and then final remarks are made for the state of the ghats. The median values of all the scores are also provided in the tabulated format. Eventually, the average scores obtained are tabularized in the following format:

Table 3.6 Table for average scores for all ghats

Parameters	Krishna river			Godavari River		
	Wai	Mahuli	N.Wadi	Someshwar	Ramkund., Nashik	Paithan
SOCIAL						
Crime						
Discrimination of the priests or ghat management to ghat users						
Opportunity to poor for informal income activity in the ghat						
Drug users in Ghat						
Encroachment of Ghats						
ECONOMIC						
State of ghat maintenance revenue						
Judicious use of Ghat puja donation and daans						
Trust for ghat maintenance						
Ghat user pay system						
Government Budget						
ENVIRONMENTAL						
River pollution						
Waste management						
Cremation management						
Degradation of ghat structures						
Sewer disposal on the river						
INSTITUTIONAL						
Control of bad activities						
Regulating the activities of ghat users						
Construction and maintenance of ghats (conservation responsibility)						
Utilization of donations and daans						
Transparency of Puja dakchhina income						
Existence of local ghat management committee						
Average score						

Source: Table prepared by scholar for analysis

The final score has given the condition of the ghats from social, economic, environmental, and institutional perspectives.

Further statistical analysis of the final scores has been done by finding the correlation between the factors. The independent variable is institutional factors, and the dependent variables are social, economic, and environmental factors. The test is processed in SPSS software for the results.

The test signifies the correlation between factors. When the value for the correlation is more than 0.75 to 1.00 in a positive direction, then the correlation between the two variables is considered to be strong(Senthilnathan, 2019).

Chapter 4. Case Study Results of Wai, Mahuli, Narsobawadi, Someshwar, Ramkund, and Paithan ghats.

A) Photographic documentation of the ghats:

Table 4.1 Photographic documentation of all ghats.

WAI KRISHNA	MAHULI KRISHNA	NARSOBAWADI KRISHNA	SOMESHWAR GODAVARI	RAMKUND GODAVARI	PAITHAN GODAVARI
A stretch of 7 ghats	A stretch of 5 ghats	A stretch of 3 ghats	A stretch of 1 ghat	A stretch of ghats in circular form	A stretch of 3 ghats
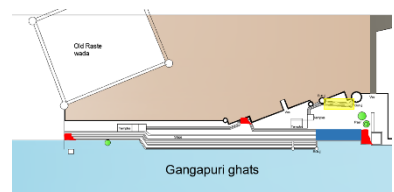
Source: Photographs clicked by scholar on-site. Table prepared by

The photographic documentation of ghats is summarised in the table above. The ghats have a defined architectural style and geometry. The ghats have a unique appearance due to the various activities that take place on the ghats. The details of each have been given under the detailed case study ghats-wise.

B) Graphical documentation of ghats:

i) Krishna River:

Table 4.2 Graphical documentation of ghats on **Krishna River**
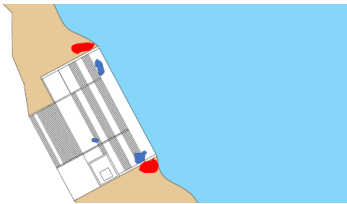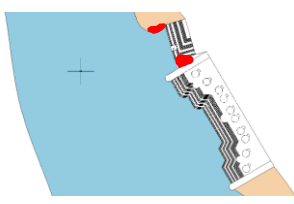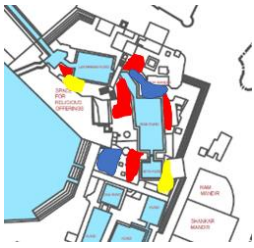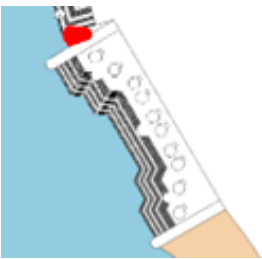
WAI – KRISHNA	MAHULI- KRISHNA	NARSOBAWADI- KRISHNA
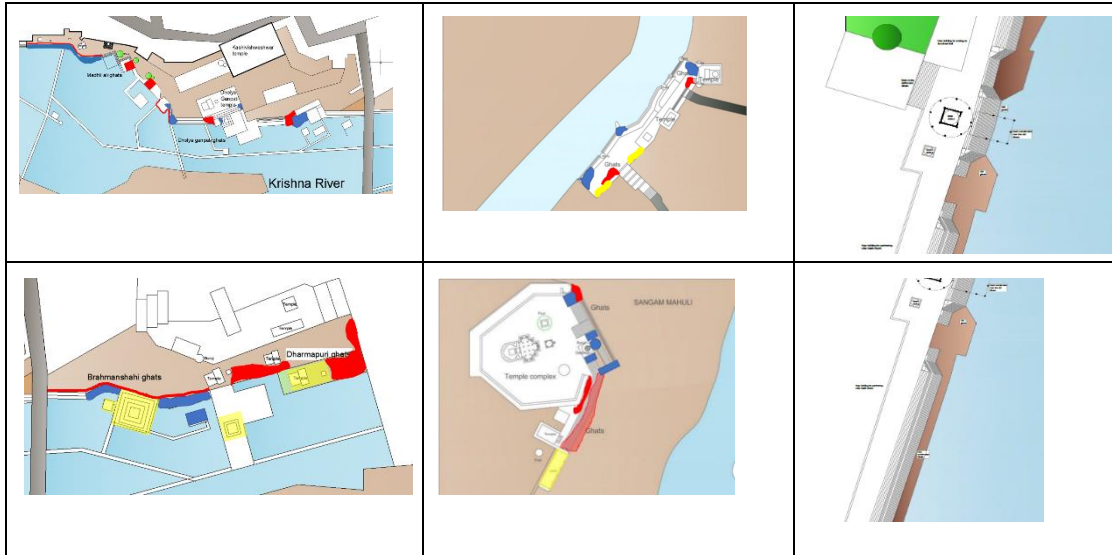
ii) Godavari River:

Table 4.3 Graphical documentation of ghats on **Godavari River**

SOMESHWAR- GODAVARI	RAMKUND- GODAVARI	PAITHAN- GODAVARI
LEGEND FOR THE MAPPING ON GHATS ■ Degraded structures ■ Garbage dumped ■ Bad Activities		

The graphical documentation prepared for the ghats on the Krishna and Godavari Rivers is summarized in the tables above. The precise locations where the issues are more severe were identified by the graphical documentation for the physical mapping of ghats. Garbage is discarded in certain places, listed and shown on the plan. The ghat structures are damaged and fall at several significant points along the ghats. Bad

activities are more likely to occur in inaccessible areas of ghats. The ghat-wise individual case study contains a list of each ghat's details.

C) Summary of all the on-site users' interviews:

Table 4.4 Interviews of on-site users.

	WAI Krishna river	MAHULI Krishna river	NARSOBAWADI Krishna river	SOMESHWAR Godavari river	RAMKUND Godavari river	PAITHAN Godavari river
Social	Crime observed at specific locations.	Crime observed at specific locations.	No Crime was observed, and CCTV was installed on the ghats.	No Crime was observed, and CCTV was installed on the ghats.	Crime observed at specific locations.	No Crime on ghats
	No discrimination by the priests on the ghats.	No discrimination by the priests on the ghats.	No discrimination by the priests on the ghats.	No discrimination by the priests on the ghats.	Discrimination by certain priests on the ghats was observed.	Discrimination by certain priests on the ghats was observed.
Economic	No user pay system for ghats.	No user pay system for ghats.	User pay system in the form of parking charges.	User pay system in the form of parking charges.	No user pay system for ghats.	No user pay system for ghats.
	There is scope for informal activities for the poor on ghats.	There is less scope for informal activities for the poor on ghats.	There is scope for informal activities for the poor on ghats.	There is scope for informal activities for the poor on ghats.	There is scope for informal activities for the poor on ghats.	There is scope for informal activities for the poor on ghats.
Environmental	In bad conditions, structures are broken in places.	In bad conditions, structures are broken in places.	Good condition. Ghats maintained.	Good condition. Ghats are maintained.	Worst condition. Structures are broken in places.	Good condition. Ghats are maintained.
	No solid waste management in ghats.	No solid waste management in ghats.	Solid waste management is done.	Solid waste management is done.	Poor solid waste management.	Good solid waste management.
	Sewage disposal on ghat steps at certain ghats.	Sewage is not directly disposed of on ghats.	No sewage problem was observed.	Few places near ghats for sewage disposal are present.	No sewage disposal on ghats.	No sewage disposal on ghats.

Source: Table prepared by scholar.

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The conclusions drawn by the priests and users present on-site are summarised in the table above. Given that they are both considered to be present on ghats. The status of the ghats is depicted in the table from a social, economic, and environmental perspective. Ghats are known to have issues from all three perspectives.

Table 4.5 On-site users' response on the state of ghats by ownership types.

Ownership of ghats	Name of ghats	Condition of ghats	Reason for the condition
Privately owned ghats	Wai, Mahuli	Poor conditions	No funds from the government for maintenance. Private owners do not fund ghats.
Trust owned ghats	Narsobawadi, Someshwar	Good condition	Revenue generated on ghats is discreetly used for ghat maintenance.
Government authority Municipal corporation	Ramkund	Poor condition	Funds allocated by the government are not judiciously utilized for ghats.
Government authority Nagarpalika	Paithan	Good condition	Public welfare funds are used judiciously for the ghats.

Source: Table prepared by scholar.

The institutional aspect is looked at separately since, according to respondents, institutions are crucial to the sustainability of the ghats. The ghats managed by trusts and small government organizations are in better shape than those owned by private owners, according to the above table. The case study on the details of the ghats includes information about each ghat's institutional structure.

D) Summary of Heritage expert interviews:

Table 4.6 Summary of interview with heritage experts.

Ghats names	Comments
Wai-Krishna River	Social: Inaccessibility on ghats. Economical: No special funding for maintenance. Environmental: Ghats are garbage dumping yards at specific sites. No special bye-laws are for the preservation of ghats. Ghats are not sustainable from social, economic and environmental perspectives.
Mahuli-Krishna River	Social: Lack of awareness about the importance of heritage. Economic: Funds for the maintenance of ghats are not available.

Name of ghats	Overall Comments
	Environmental: Ghats lack cleanliness, river pollution, and garbage dumping grounds at certain places. Heritage policies need to be formulated for ghats.
Narsobawadi-Krishna River	Ghats have high religious values. Such high-value heritage structures must be enlisted as heritage, and special consideration should be given to ghats while formulating development plans.
Someshwar-Godavari River	Ghats are a great source of historical and mythological events. They need to be preserved. Ghats' social, economic and environmental problems are severe threats to their long-term viability.
Ramkund-Godavari River	The social fabric of the ghats is distressed by the commercial activities on the ghats. These activities are not planned or monitored on-site. There are very few guidelines for commercial activities and those are also not followed by the local people.
Paithan-Godavari River	The Nagarpalika has established provisions for the ghats because they are the primary source of income for Paithan, particularly for ceremonies performed after death. These programmes are for the ghats' welfare. Governmental action should be taken to promote ghats as cultural landmarks.

Source: Table prepared by scholar.

The sustainability challenges for ghats have been highlighted by heritage specialists from social, economic, environmental, and institutional viewpoints. Also, they have recommended specific actions to be made to add the ghats to the heritage category and include them in development plans. In the case study section, insights about the heritage perspective are presented.

E) Summary of Government authority/ trust members interviews:

Table 4.7 Summary of Government authorities

Name of ghats	Overall Comments
Wai-Krishna River	The ghats are administered by their owners, and the government has no rights. No NGOs are working on the ghats, but the heritage agency "INTACH" has listed the heritage structures.
Mahuli- Krishna River	No trust is formulated for the ghats. The royal dynasties privately own the ghats. As there is no revenue from the ghats, they are not supporting the ghats' maintenance.
Narsobawadi-Krishna River	"Sri Narasimha Saraswati swami Datta dev Sansthan, Narshinawadi" administers the ghats and temples. The source of revenue for the trust is donations from the devotees on temples on ghats. Trust does not allow government interference in any aspect of ghats.

Someshwar-Godavari River	Trust administers all the aspects of ghats. The trust seeks no government help for ghats. The trust is self-sufficient. The source of income is a donation from people to the Mahadev temple.
Ramkund-Godavari River	Nashik comes under the municipal corporation. The proposals for ghats have been made earlier by various agencies. But all these are projects under consideration. At present municipal corporation is the body in charge of ghats.
Paithan-Godavari River	Paithan falls under Nagarpalika. The nagarpalika has no special funds for ghats, but the funds available for public welfare and development are utilised.

Source: Table prepared by scholar.

Interviews provided an overview of the institutional situation of the ghats with the government official or trust in charge.

The tables above summarize all the work done on-site for case studies. Case studies with background information are provided in-depth in point 6.1.

CASE STUDIES ON KRISHNA RIVER:

Case study 1: Wai Ghats

Background of Wai

Location: Wai is a town located in the Satara district of Maharashtra. It is 35 kilometres from Satara, 95 kilometres from Pune, and 250 kilometres from Mumbai. It is an important city on the road to the hill stations of Mahabaleshwar and Panchgani and is located on the Mahad-Pandharpur state highway. The town of Wai, which has roughly 25,000 people, is the taluka's headquarters.

Ganagapuri, Madhli ali, Ganpati ali, Dharmapuri, Brahmanshahi, Ramdoh ali and Bhimkund ali are the seven ghats on Krishna's banks in Wai taluka.

Map 4.1 Map of Maharashtra highlighting Satara
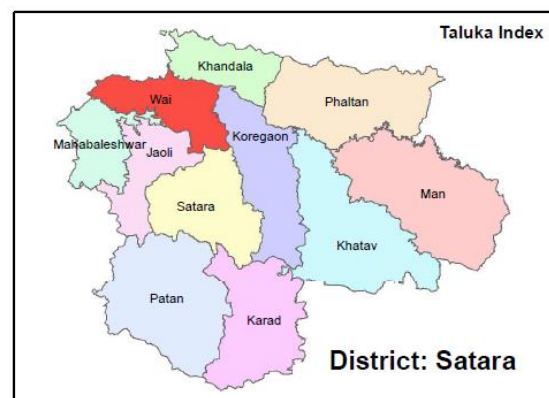
Map 4.2 Map of Satara district highlighting Wai Taluka

Source: Maharashtra remote sensing applications centre.
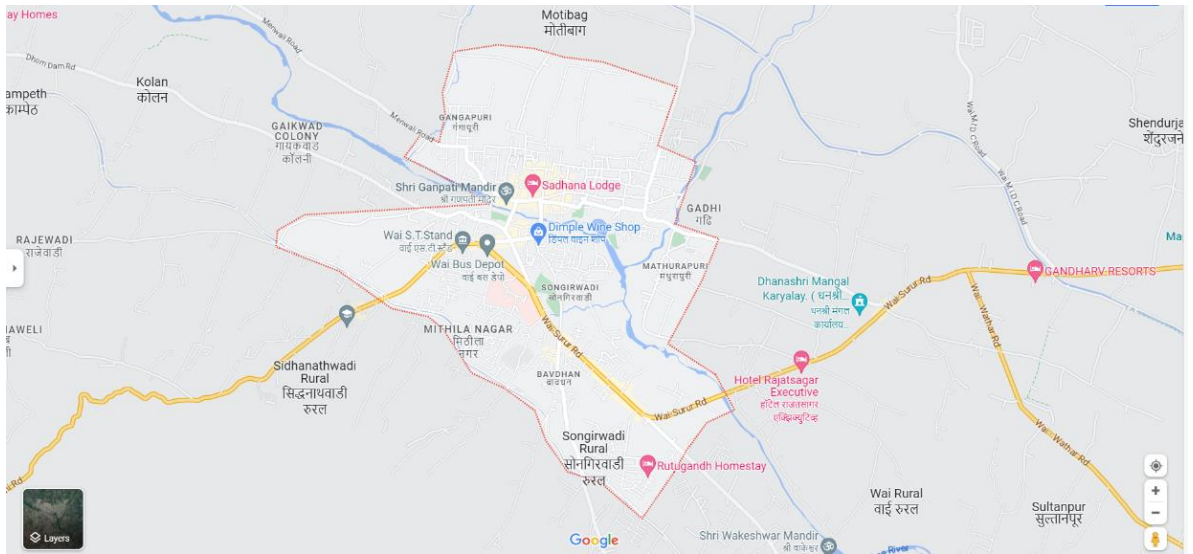
Map 4.3 Map of Wai city   Source: Google maps

History of Wai:

Wai is a holy town and the seat of the Wai taluka, located on the left bank of the Krishna
River, twenty-one kilometres northwest of Satara. Wai is densely populated and one of
the most sacred locations on the Krishna River. The river's face is bordered by stairs
for half a mile, and people are actively performing ablutions and other domestic chores
at the time of sunrise and before dusk (PATHAK, 2006).

It is said that Wai was once the Viratnagari, which is mentioned in the Mahabharata.
Wai is famous for Sanskrit learning. Various scholars, from Kashi to Rameshwar, came
to Wai to learn. During the 19th and 20th centuries, a great tradition of Sanskrit learning
prevailed here. The school for learning Sanskrit is called Pradnya Pathshala.

Wai was a significant town, the property of the Raste family's oldest brother, who had
constructed several temples and ghats (PATHAK, 2006). The Peshwa, Nanasaheb,
married Gopikabai, daughter of Bhikaji Raste of Wai. They built many temples, ghats,
residences, and gardens in Wai. A ghat or set of steps, a Wada, a residence, and a temple
comprise the first collection of structures on the north bank of the Krishna River.
Gangapuri is the name of the ghat, which consists of twelve steps. Gangadhar Raste
erected the first 200 feet of the structure out of cutting stone in 1789. Bhau Joshi added

75 feet to this one, and Bajirao II added 80 feet for a total length of 356 feet(M. India, 1986).

Wai has got a stretch of seven ghats. Namely, Gangapuri ghat, Madhli ali ghat, Ganpati ghat, Dharampuri ghat, Brahmanshahi ghat, Ramdoh ali and Bhimkund ali.

Each ghat is named after the lane it ends up in the city. The last two ghats are isolated on one side while the rest five are together nearing each other.

Wai thus has a strong historical background from ancient times. Its history dates back from the Buddhist era to the Peshwas. There are ancient Buddhist caves near Wai town, and evidence shows that habitat has existed since those times(M. India, 1986).

The town is thought to be the Site of the Pandav brothers' exploits, one of whom slew the giant Kichak in battle and dragged his body to Pandavgad(M. India, 1986). Mythologies also have an association with Wai, which was called by various names before.

There are seven Ghats on the Krishna River at Wai these are :-

1) Gangapuri ghat-
2) Madhli Ali ghat
3) Ganapati Ali Ghat
4) Dharampuri Ghat
5) Brahmanshahi Ghat
6) Ramdoh Ali
7) Bhimkund Ali
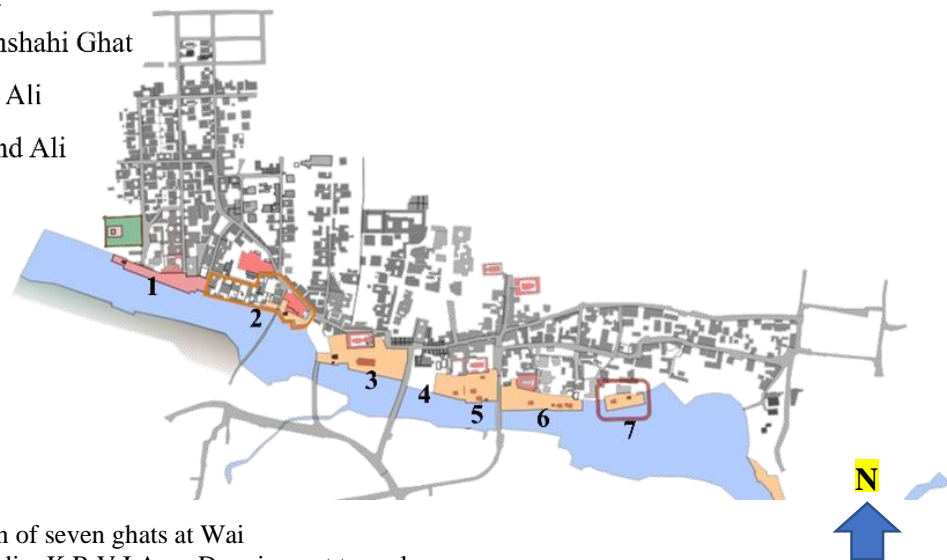
Figure 4.1 Plan of seven ghats at Wai
Base map: Studio, K.R.V.I.A   Drawing not to scale
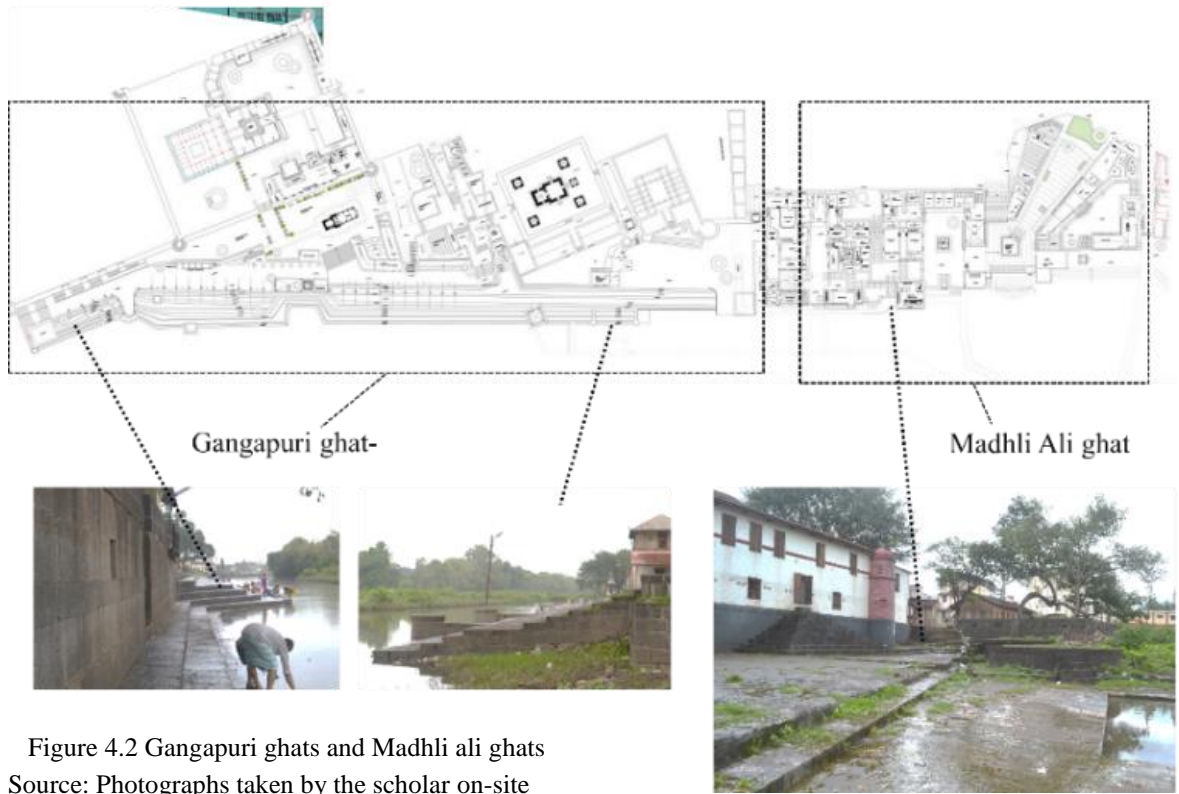
Figure 4.2 Gangapuri ghats and Madhli ali ghats
Source: Photographs taken by the scholar on-site

Base map: Studio, K.R.V.I.A   Drawing not to scale
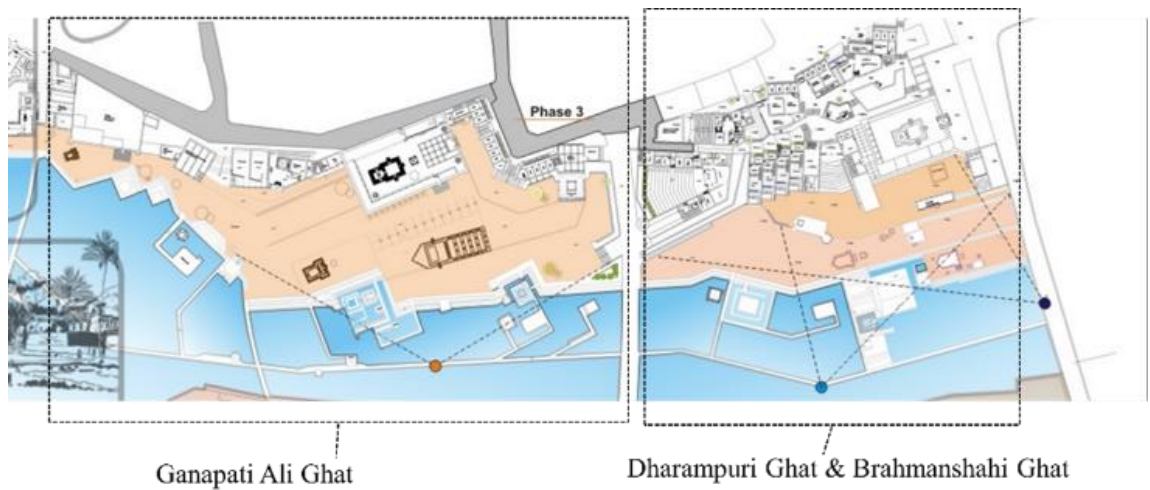
Figure 4.3 Ganpati Ali, Dharampuri Ghat and Brahmanshahi Ghat

Source: Photographs taken by the scholar on-site

Base map: Studio, K.R.V.I.A   Drawing not to scale

1) Ramdoh Ali

1) Ramdoh Ali

2) Bhimkund Ali
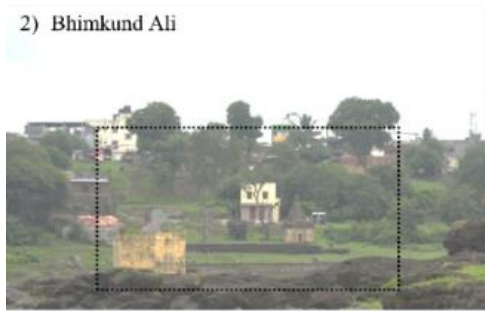
Figure 4.3 Ramdoh Ali and Bhim Kund Ali ghats

Source: Photographs taken by the scholar on-site

Image 4.1 View of Ganpati ghat from opposite
bank of Krishna River

Image 4.2 Causeway connecting Ganpati ghats
and another bank of Krishna River

Source: Photographs taken by the scholar on-site

Image 4.3 Gangapuri ghats

Image 4.4 Madhli ali ghats

Source: Photographs taken by the scholar on-site

A) Field observations:

a) On-site observations

The physical mapping of Wai ghats furnished the exact places where the problems are more concentrated. It can be seen more problems prevail where the accessibility to the ghats is poor. Physical road or approach is lacking there, and people have made hiding places for criminal activities. Locations where drainage is being let out on the steps of ghats and nearby are identified.

Places of funerals and religious activities were observed.

The observations were done on-site with photographic documentation. Inferences are drawn from the data collected and tabulated in the format. Ghats are facing problems and have issues in many areas: Issues with waste management in ghats are observed. The waste generated on the ghats is not cleaned regularly. Waste consisting of flowers and other organic waste generated from religious activities: wrappers and plastic bags dumped by users on the ghats.
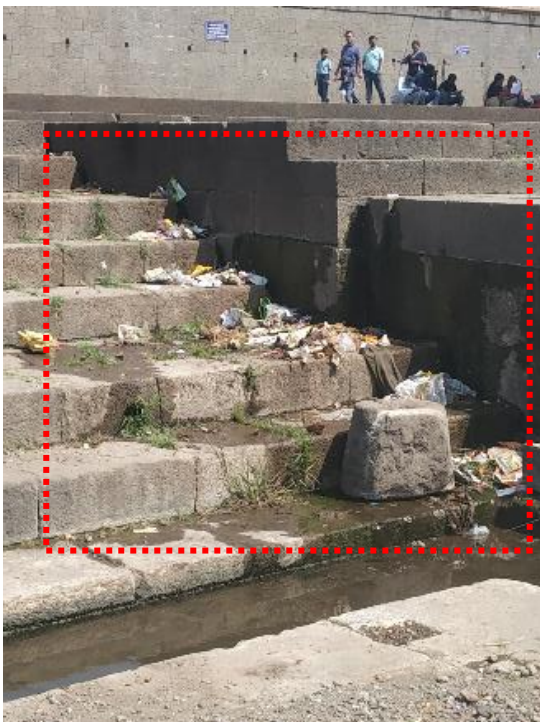
Image 4.5 Waste dumped on the steps of ghats at Ganpati ghat, Wai.

Image 4.6 Garbage dumped on the sides of steps at Gangapuri Ghats, Wai

Source: Photographs taken by the scholar on-site

Image 4.7 Open sewer led in between the steps
of the ghats at Gangapuri ghats, Wai

Image 4.8 Stagnated drain water
on Dharmapuri ghats

Source: Photographs taken by the scholar on-site

Image 4.9 Silt and garbage deposited
on Brahmanshahi ghats

Image 4.10 debris on steps of Madhli ali ghat

Source: Photographs taken by the scholar on-site

Image 4.11 Broken elements on the
Dharmapuri ghats, Wai

Image 4.12 Loose stones are lying around
on the platforms of Brahmanshahi ghats, Wai

Source: Photographs taken by the scholar on-site

Sewage water in the form of open drains let out on the banks of the river. The sewage water gets accumulated on the ghats, making them a danger for the users. Also, the stagnated water makes the ghats' structures weak, and stones fall apart from the steps. Stones of the steps and elements on the ghats are falling apart, and loose stones get washed away due to floodwaters, thus, resulting in permanent loss of the stones. The local governing body, i.e., Nagar Palika, nor the local group of people, repair the ghat structures.

Image 4.13 Water trapped between the
broken steps of ghats,

Image 4.14 Stones have fallen apart and
laying around on Ganpati ghats, Wai.

Source: Photographs taken by the scholar on-site

B) Graphical documentation: Physical mapping of the ghats: The physical mapping of Wai ghats gave the exact places where the problems are more concentrated. The areas where issues are observed are marked on the plans prepared.

Colour legend prepared for a better understanding of the issues
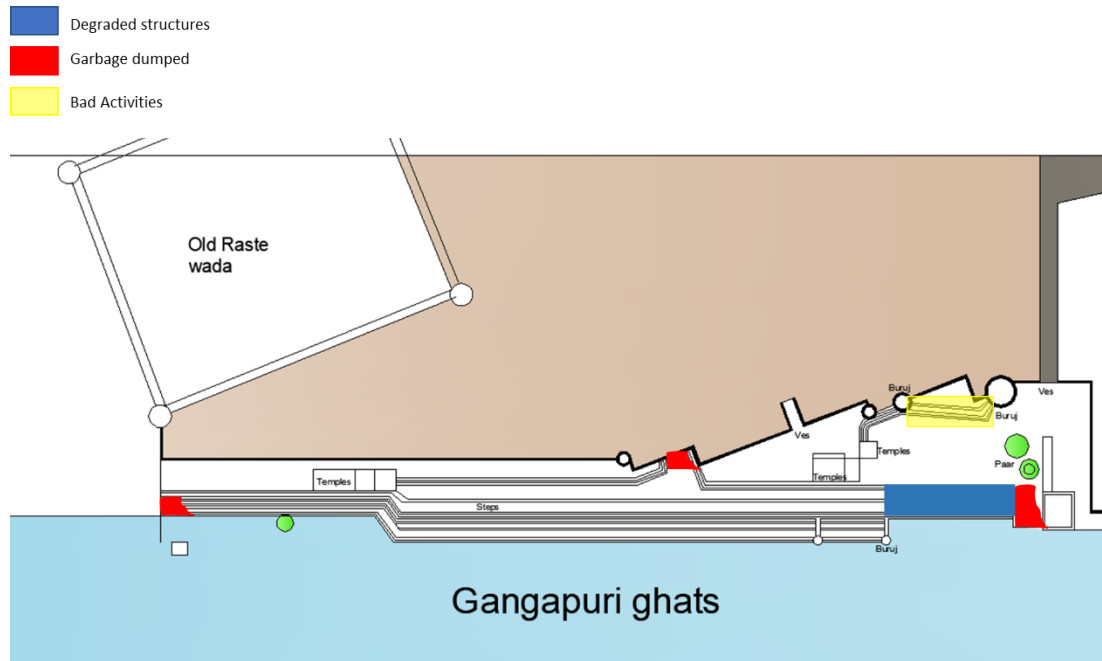
Figure 4.4 : Plan of Gangapuri Ghats
Source: Schematic Plans prepared by scholar. Not to scale
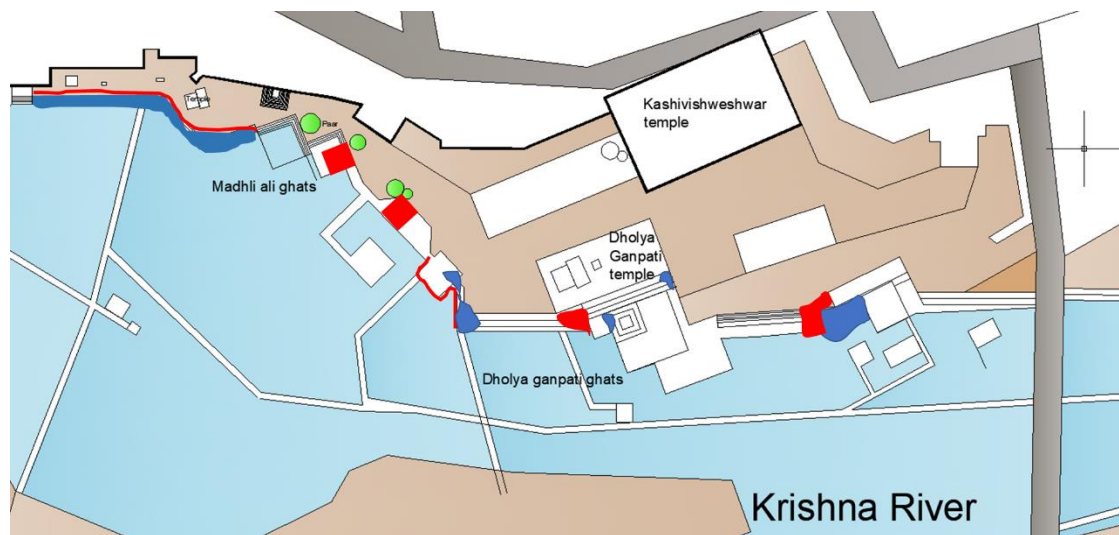
Figure 4.5: Plans of Madhli ali ghat and Dholya Ganpati Ghat

Source: Schematic Plans prepared by the scholar. Not to scale
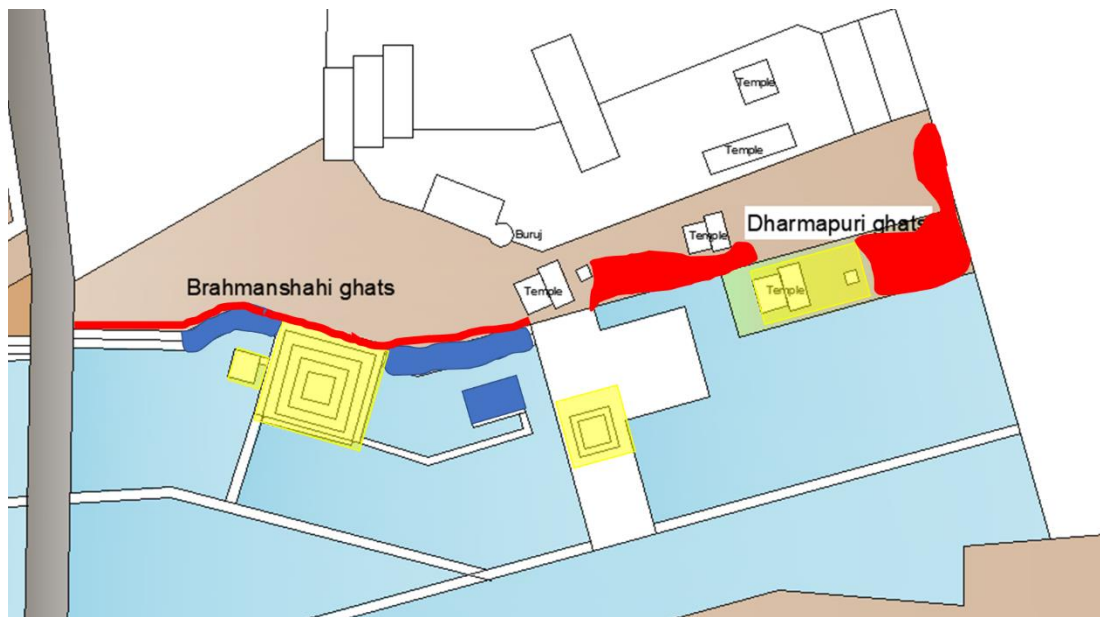
Figure 4.6 : Plans of Brahmanshahi Ghats and Dharmapuri Ghats
Source: Schematic Plans prepared by the scholar. Not to scale

N

Observations of physical mapping of the ghats:

Wai ghats are majorly used for domestic and religious purposes. There is garbage dumped at certain spots; these spots are identified and marked on the plan. The ghats' structures are broken and falling apart at major places on Brahmanshahi ghats and Dharmapuri ghats. Places where physical deterioration has taken place, have become inaccessible. These locations have evolved into hiding places where people go and consume alcohol and other illegal narcotics etc., playing cards (gambling). On the schematic plans, these locations have been marked. Poor accessibility is the reason for such activities.

C) Inferences from interviews:

a) On-site users' interviews:

The replies from the users are summarised and sequentially arranged.

There are no significant changes in the ghat structures at Wai except the physical damages over time. Broken ghat structures are not repaired. Problems of untreated sewage water left in the river on ghats are prominent. Sewage water is making the ghats slippery and foul odour in the surroundings. Garbage dumped on ghats is an issue pointed out by users. There are no funds from the government or any other body dedicated to ghats to resolve the problems. Donations from the people are not sufficient for ghats, and they suffice only for the festival celebration. Each ghat has its small group

formed known as "Mandal," they collect funds in donations for festivals. These donations are utilized for the celebration of the Krishna Mai festival on the ghats. No spare funds are available for ghat repairs. At some parts of the ghats, places have become inaccessible due to damaged steps, and people avoid using those patches of ghats; hence criminal activities thrive at such sites. Overall significant issues related to sewage and solid waste can be highlighted.

b) Inferences from a priest on ghats interviews:

Interviews of priests from the temples on ghats and priests performing poojas on ghats are summarised. They stated "Krishna mai festival" is the major festival celebrated on the ghats. The cleaning process of ghats happens when there are festivals or major religious activities on ghats. There is no income source for ghats. Donations from people during celebrations are significant economic contributors to the maintenance of the ghats. But these funds are not sufficient to maintain the ghats for a year. Hence maintenance of the broken structures is not done. The trust or the priest in the temple is impartial towards people, and no misuse of funds and discrimination against people takes place on the ghats. River pollution is a concern; still, the priest finds the river water pure and fit for religious activities. They daily fetch the river water for religious purposes.

Other events on ghats are after-death rituals that take place on specific ghats. Not all ghats these activities are allowed, and special priests are available for such practices, and all priests do not perform these rituals.

D) Inferences from Government officer interview:

Wai Ghats falls under the core city or zone "A" of the city. The ghats are administered by their owners, and the government has no rights. At present, no NGOs are working on the ghats, but the heritage agency "INTACH" has listed the heritage structures. Further, no action was taken by the INTACH as the local people opposed and the owners did not support the initiative for the heritage listing and ghats. Financial sources for the ghats are meagre at present, and donations from the people and visitors are the only source.

Cannot collect land tax from the land of ghats as they fall under the religious structures category and have an exemption from the tax rules. No funding from the government is available as ghats are under private ownership. Regarding the physical cleaning of the ghats, Government schemes exist for river water cleaning. Funds for the river

cleaning mission can be obtained if local political bodies make efforts. These politicians make such moves only during election times. Overall, there is very little interference from the governing bodies in the case of the ghats.

i) Interview with the owner of the Ganpati Ghats, Wai.

The Royal Family owns the ghats. The family belonged to the Royal court of the Peshwa Dynasty during the Maratha rule. (Press, n.d.)

There is a family dispute regarding the distribution of the funds and income obtained from the ghats (Interview data). The ghats were previously rented out for Bollywood filming; however, this is currently on hold due to the dispute in the family over the collection of revenues. Due to this dispute, no one manages the ghats, and they are suffering issues on sustainability grounds (Interview data).

An inference can be drawn from the interview with the owner and the government officer that the ghats are privately owned and sublet, so the municipal government has no control and ownership. Poorly managed ghats are a result of private ownership and negligence of the owners. This is one of the main reasons for the unsustainable development of ghats.

E) Inferences from Local heritage expert interview:

According to the expert, the sustainability issues on ghats are as follows:

Social: Inaccessibility on ghats, non-consideration for special regulations or funds during the Development plan.

Economics: No special funding for maintenance of ghat is available

Environmental: ghat spaces are misused. They lead to unclean vegetation growth. The river is polluted as the riverfront is no longer in use; ghats are garbage dumping yards at specific sites.

No particular bylaws or guidelines exist for the typology(ghats). If it is more than 100yr old monuments, they should protect it under the ancient monument act.

When asked: How can various types of media increase the awareness about the Ghats in common people? Instagram and Facebook can be good sources to inform people about the importance of the ghat as it is directly related to the biggest issue of the water crisis. Today, we know about the Varanasi ghat due to lots of pictures and movies. An exclusive documentary on various ghats in India can be helpful not because of the architecture or the location of the ghat but by its History involved. There are stories

associated with visiting a famous personality or stories of some conspiracies planned at the place that need elevation.

F) Scores for rating scale method:

The Scholar surveyed on-site users on the ghat, with questions stating the ghats' social, economic, and environmental sustainability points. People were requested to fill out the forms and give a rating from 1 to 5, where one is the worst condition and five is the best condition. The table below states the total scores of responses of people.

Table 4.8 Responses of on-site users for a scoring method

Ghat 1: WAI			Evaluation w.r.t score	Remarks
Scores	Mean	Median		
SOCIAL				
Crime	2.4	2	Low	Criminal activity observed
Discrimination of the priests or ghat management to ghat users	3.33	4	Moderate	Moderate discrimination was observed at places.
Opportunity for the poor for informal income activity in the ghat	2.8	3	Moderate	Moderate opportunity at certain places
Drug users in Ghat	2.2	2	Low	Presence of drug users in ghats
Encroachment of Ghats	2.86	3	Moderate	Considerable encroachment is observed
ECONOMIC				
State of ghat maintenance revenue	2.2	2	Low	A bad state of maintenance
Judicious use of Ghat puja donation and *daans*	2.33	2	Low	Donations are not used judiciously.
Trust for ghat maintenance	3.4	4	Moderate	Moderate condition of trust formation
Ghat user-pay system	1	1	Very Low	Worst condition. No system at all

Government Budget	1.8	2	Low	Bad condition
ENVIRONMENTAL				
River pollution	1.46	1	Very Low	Pollution is significant
Waste management	1.6	1	Very Low	No waste management
Cremation management	3.6	4	High	Fair management for cremation activity
Degradation of ghat structures	1.53	1	Very Low	The structures are in bad condition
Sewer disposal on the river	1.4	1	Very Low	Sewage disposed of at varied points
INSTITUTIONAL				
Control of bad activities	2.8	3	Moderate	Bad control
Regulating the activities of ghat users	2.93	3	Moderate	Moderate regulation
Construction and maintenance of ghats (conservation responsibility)	2.26	2	Low	No maintenance is observed
Utilization of donations and *daans*	1.8	2	Very Low	No fair utilisation
Transparency of Puja dakchhina income	1.53	1	Very low	Worst condition no transparency
Existence of the local ghat management committee	3.4	4	High	Local Ganesh mandals are present for each ghat.

Source: Table prepared by scholar

All 15 users' scores were averaged, and the median was calculated as per the formula, and then the above table was prepared.

Case study 2- Mahuli Ghats

Background of Mahuli: Location

Map 4.6 Map showing the location of Satara district in Maharashtra.
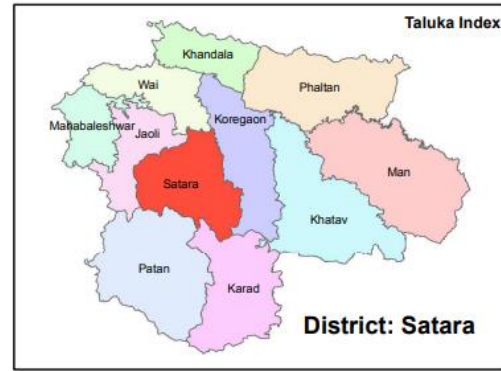
Map 4.4 Map of Satara highlighting Satara taluka.

Source: Maharashtra remote sensing applications centre.
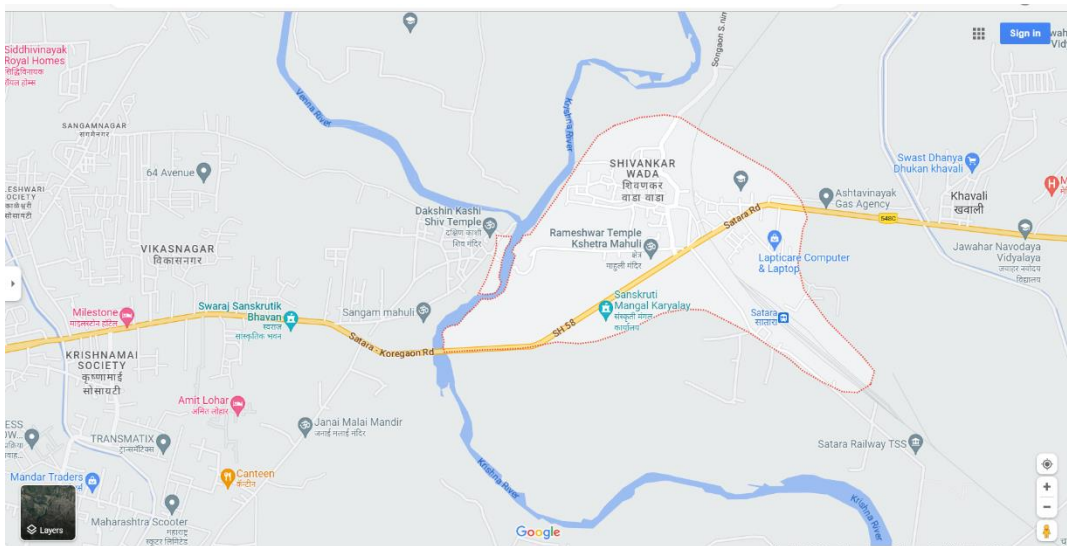
Map 4.5 Map of Mahuli village

Source: Google maps

Mahuli is located in tehsil Satara of Satara district in Maharashtra state. The town is divided into two parts, Kshetra Mahuli on the east bank of the Krishna and Sangam Mahuli on the west bank of the Krishna. Sangam Mahuli is the property of the Pant Pratinidhi, whose family most of the Mahuli temples were built in the eighteenth century. It is called Sangam Mahuli from its position at the meeting of the Rivers Krishna and the Venna. It is a holy town in a great local note about three miles east of Satara.

The eastern bank has four Stretches of ghats.

- One is the Giri ghat built by Bapu Govind Bhat in about 1780 A.D

- Second is the ghat on the Bilveshwar temple built by Anandrav Bhivrav Deshmukh Angapurkar in 1738 A.D.
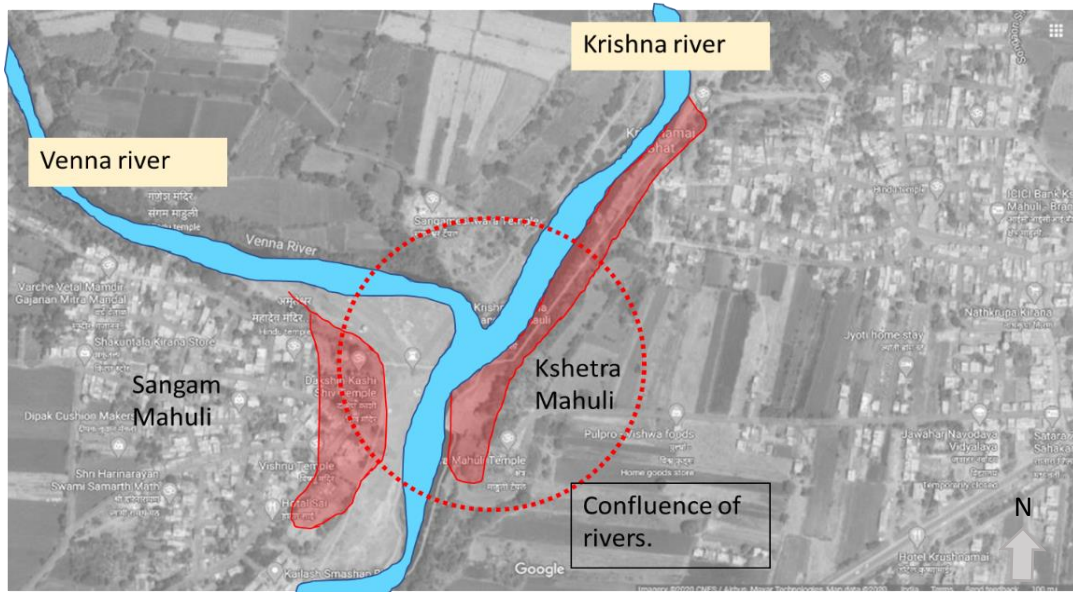
Map 4.7 Map showing the location of Sangam Mahuli and Kshetra Mahuli at the confluence of Venna and Krishna Rivers

Source: Base map: Google earth Image. Editing done by scholar

- The third is the ghat by Peshva Bajirav II during 1798-1817, but he never completed it.
- Fourth is the Rameshwar ghat, built by Parashuram Narayan Angal in about 1700 A.D.
- Fifth is the ghat on the Western bank of the Krishna River named: Sangam Mahuli, built by the Shripatrav Pant Pratinidhi about 1735 AD.

History of Mahuli:

Ram Shastri Prabhune, the prominent spiritual and political counsellor of the fourth Peshwa Madhavrav, was born in Mahuli (Press, n.d.).

Mahuli was a meeting place between the last Peshva Bajirav and sir John Malcolm shortly before Sir John Malcolm launched a war against Peshwa. He frequently returned to Mahuli during his wanderings (M. India, 1986).

Image 4.15 Giri ghat

Image 4.16 Bilveshwar ghat

78

Image 4.17 Rameshwar Ghat

Image 4.18 Sangam Mhuli Ghat

Source: Photographs taken by the scholar on-site
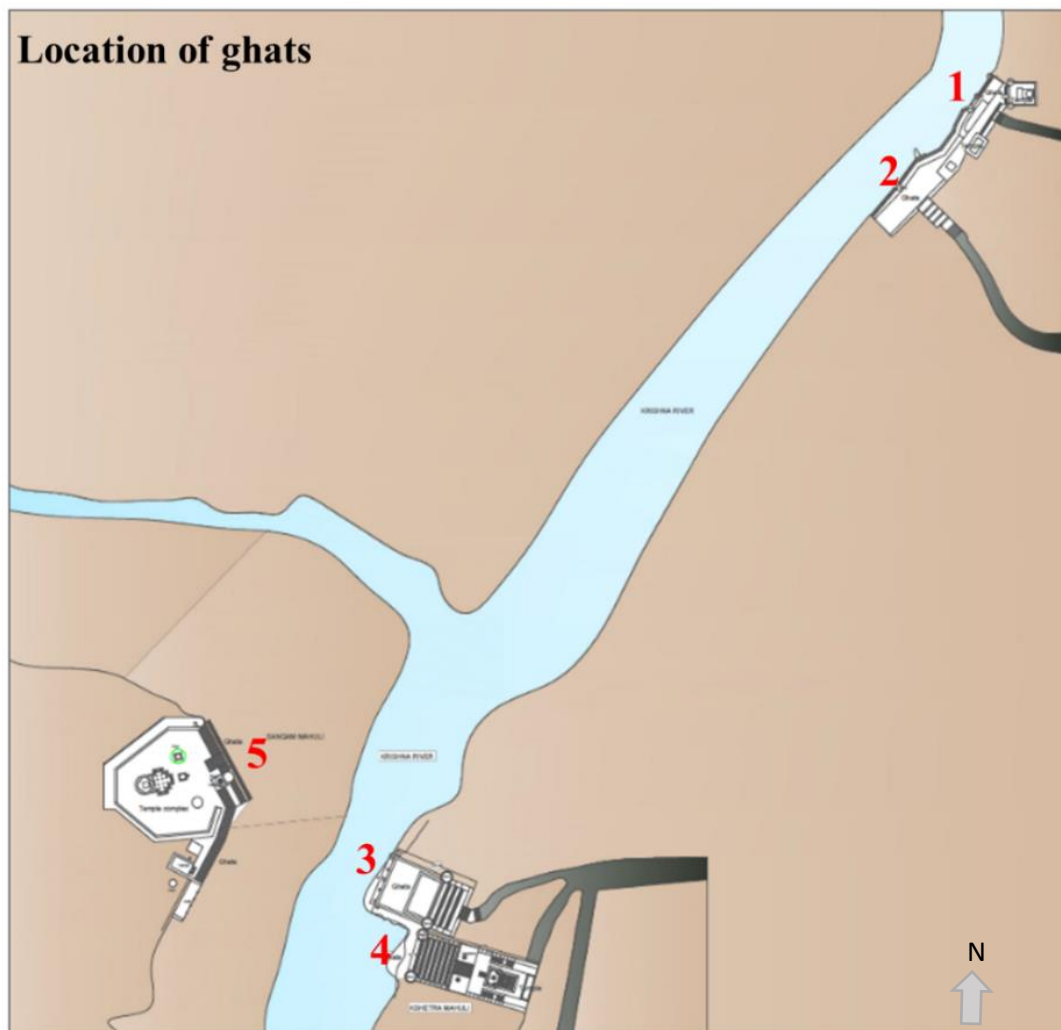
Figure 4.7 Plan of ghats at Mahuli

Source: Schematic plan prepared by scholar. Not to scale

A) Field observation:

a) On-site observations:

Image 4.19 Debris on the Sangam Mahuli ghats

Image 4.20 broken steps at Sangam Mahuli ghat

Source: Photographs taken by the scholar on-site

Image 4.21 Damaged steps at Sangam Mahuli

Image 4.22 Endangered wall at Rameshwar ghats

Source: Photographs taken by the scholar on-site

B) Graphical documentation: Physical mapping of the ghats: The physical mapping of Mahuli ghats gave the exact places where the problems are more concentrated. The areas where issues are observed are marked on the plans prepared.

Colour legend prepared for a better understanding of the issues.

Degraded structures

Garbage dumped

Bad activities
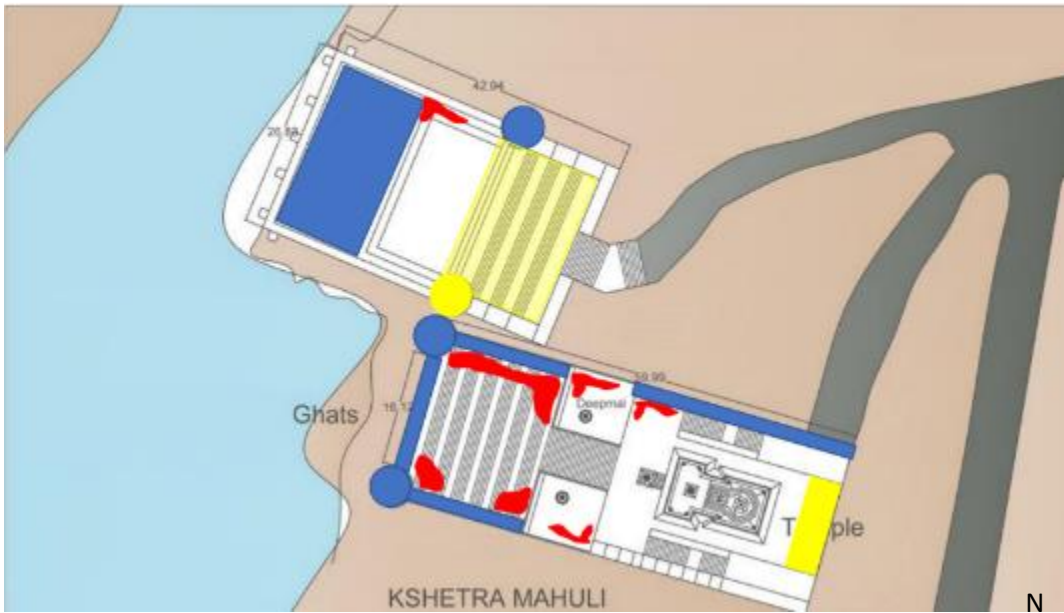
Figure 4.8 Plan of Rameshwar ghat and Peshwa ghat
Schematic plans prepared by scholar. Not to scale

Figure 4.9 Plan of Giri ghat and Bilveshwar ghat
Schematic plans prepared by scholar. Not to scale
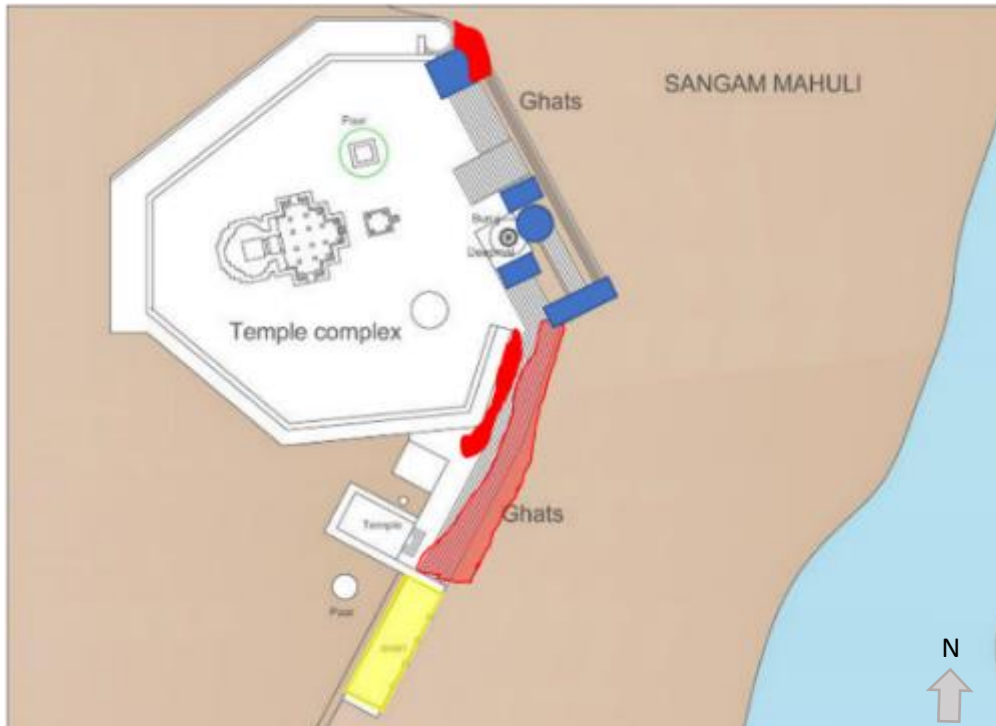
Figure 4.10 Plan of Sangam Mahuli ghats

Schematic plans prepared by scholar. Not to scale.

Observations of physical mapping of the ghats:

Mahuli ghats are majorly used for domestic and religious purposes. They are garbage dumping sites at certain spots; these spots are identified and marked on the plan. Walls and steps are experiencing structural problems, and the stones are falling off the structures. Places that have become inaccessible due to physical damages. Such places have become hideouts for people to consume alcohol and other banned substances, play cards, etc. These areas are identified and marked on the plans. Illegal activities happen due to poor accessibility.

C) Inferences from interviews:

a) On-site user interviews:

On-site users were interviewed on all ghats, and a total of fifteen users were questioned profoundly. The answers are summarized below:

Local people have made changes to the ghat structures. Earlier, many people visited ghats for domestic and religious purposes. Currently, few people visit as the ghat steps are broken and have become slippery near water. Garbage is dumped on ghats. No civil societies exist to manage the ghats. The royal families privately own the ghats. They give permission for pre-wedding shoots and rent the place to shoot movies. The owners collect rent. No money is administered for the repairs and cleaning of ghats. Donations

collected from the locals for festivals are not sufficient for celebrations and repairs. As the ghats are not much-treaded by people, they have made a place to consume alcohol and banned substances.

b) Inferences from the priest on ghats interviews:

The priest on the side of Kshetra Mahuli ghats gave the information about the ghats. Since their birth, they have been in Mahuli and have seen the place change over time. They expressed "Krishna Mai festival" is the major festival celebrated on the ghats. There are other festivals celebrated throughout the year, along with "Diwali Pahat," the lighting of lamps on ghats at dawn on Diwali Padwa (the main day of Diwali). The cleaning process of ghats happened by the local young people for festival purposes. Broken ghat structures not maintained. Ghats lack funds of any form. There is no formulated trust for ghats. Just a few old Brahmans have a small group taking care of the religious activities. Pollution of the river Krishna is a concern, but water for religious purposes is still drawn from the river. Not many after-death activities happen on the ghats as the ghats for last rites are entirely separate; all funeral activities are concentrated on those ghats.

D) Inferences from an Interview with a member of Gram panchayat. (The chief of the Brahmins of Mahuli).

The royal families privately own the ghats. Angal Savkar and Pant Pratinidhi are the owners of the ghats. They are not funding the ghats as there is no income from the ghats.

The income from the film shootings goes to the royals, and no funds are shared for ghat maintenance. No proper trust formulation for any of the ghats. Local "mandals" consist of young boys, and these mandals are active only before and during festivals. Gram panchayat is not interested in maintenance as there is no revenue generation from ghats and no funds from the government. They need permission from the owners to make changes and invest in the ghats, which is a tedious task.

E) Inferences from local heritage experts:

According to the expert, the sustainability issues on ghats are as follows:

Social: Lack of awareness amongst the local and tourist people regarding the importance of ghats as heritage.

Economic: Given that the ghats are not governed by any statutory government agencies, funds for their maintenance are a problem. There are no sources of self-generated income for ghats.

Environmental: The ghats lack cleanliness, leading to people avoiding visiting the places. They are occasionally acting as garbage dumps. River pollution and excessive plant growth are other issues with ghats.

F) Scores of rating scale method:

Table 4.9 Responses of onsite users for a scoring method

Ghat 2: MAHULI			Evaluation w.r.t score	Remarks
Scores	**Mean**	**Median**		
SOCIAL				
Crime	2.0	1	Low	There are crimes on the ghats.
Discrimination of the priests or ghat management to ghat users	2.67	4	Moderate	Not much discrimination observed
Opportunity for the poor for informal income activity in the ghat	3.33	5	High	There is an opportunity for the informal income activity
Drug users in Ghat	1.73	1	Very low	There are drug users in the ghats
Encroachment of Ghats	1.53	1	Very low	A considerable amount of encroachment has taken place
ECONOMIC				
State of ghat maintenance revenue	1.73	2	Very low	The poor state of maintenance revenue
Judicious use of Ghat puja donation and *daans*	1.67	2	Very low	Daan and donations not used judiciously
Trust for ghat maintenance	1.93	2	Low	Poor State of formal trust
Ghat user-pay system	1	1	Very low	The poor state of a ghat user-pay system

Government Budget	1.20	1	Very low	Absence of government funds
ENVIRONMENTAL				
River pollution	1.93	2	Low	A significant amount of pollution
Waste management	2.0	1	Low	Poor waste management
Cremation management	4.4	4	Very high	Good quality cremation facility
Degradation of ghat structures	2.33	3	Low	Significant amount of degradation
Sewer disposal on the river	2.20	3	Low	Poor sewer disposal
INSTITUTIONAL				
Control of bad activities	1.53	1	Very low	No control of bad activities
Regulating the activities of ghat users	3.40	4	High	Good regulation of activities
Construction and maintenance of ghats (conservation responsibility)	1.73	2	Very low	No maintenance of ghats
Utilization of donations and *daans*	1.73	1	Very low	No optimum use of daan n dakchhina
Transparency of Puja dakchhina income	1.73	1	Very low	No transparency of puja dakchhina
Existence of local ghat management committee	1.53	1	Very low	No proper trust or management committee in place

Source: Table prepared by scholar

All 15 users' scores were averaged, and the median was calculated as per the formula, and then the above table was prepared.

Case study 3- Narsobawadi Ghats

Background of Narsobawadi:

Location: Narsobachi wadi or Narsimha wadi or Narsoba wadi is in Shoril Tahsil in the Kolhapur district of Maharashtra. Kurundwad is the nearest town and is about 2km away. (Vaibhavam, n.d.)

Map 4.8 Map of Maharashtra highlighting Kolhapur district insight highlighting Shirol Taluka.

Source: Maharashtra Remote Sensing Applications Centre

History: Shri Narasimha Saraswati was known as the "Siddha Purusha," a divine being with the ability to heal bodily ailments and relieve the concerns of his believers. Shri Narasimha Saraswati restored people's morale by bringing about a religious and spiritual renaissance in a deep depression. (Vaibhavam, n.d.) The place has two prominent temples, one dedicated to Dattatreya and the other to Narayan Swami.

Map 4.9 Map of Narsobawadi village   Source: Google maps

The Dattatray temple is on the river bank to the south of the settlement. One hundred thirty-seven feet long and 127-foot-wide flight of steps leads from the temple to the riverbed. The temple of Narayan Swami is to the west of Dattatreya's temple. Another 143-foot long and 67-foot wide flight of intricately carved stone and mortar stairs leads to the confluence of the Krishna and Panchaganga river (Maharashtra state, 2006).

A fair is conducted for the entire month of *Magh*, i.e., February-March, with roughly 5000 people attending from a radius of 200 kilometres. One more fair, attended by around 10,000 people, is celebrated on the 12th of *Ashvin*, i.e., September-October, where Dattatraya claimed to have vanished from the earth (Maharashtra state, 2006).
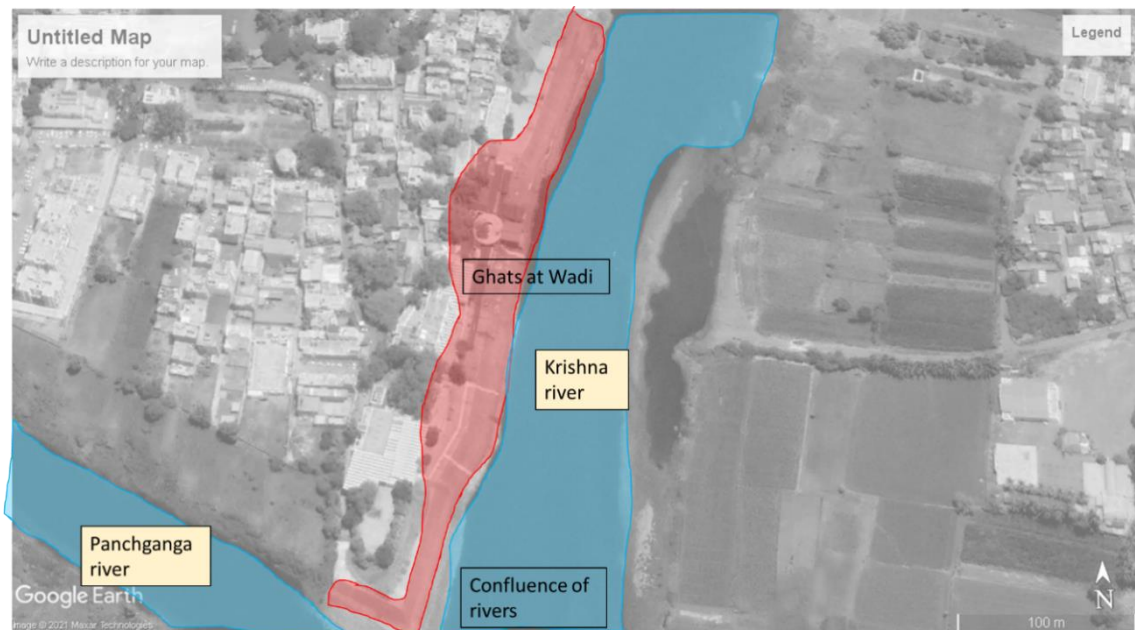
Map 4.10 Map showing location of ghats and the confluence of rivers.

Source: Base map: Google earth mage. Editing done by scholar

Image 4.24 Steps built 20 years ago

Image 4.23 View of main temple and old ghats

Source: Photographs taken by the scholar on-site

Image 4.25 Ghats constructed five years ago.

Image 4.26 view of the ghats and the platform above

Source: Photographs taken by the scholar on-site

Image 4.27 View of ghats from opposite bank of river.   Source: Narsobachiwadi.com

A) **On-site observations:**

Source: Photographs
taken by the scholar
on-site

Image 4.28 People visit the old
ghats and rituals take place on ghats.

Image 4.29 Ghats are clean and dustbins placed at regular intervals.

Source: Photographs taken by the scholar on-site

Image 4.30 Provision of drinking water on the upper platform

Source: Photographs taken by the scholar on-site

Image 4.31 Ghats maintained in good state.

Source: Photographs taken by the scholar on-site

Image 4.32 Pandals installed: provision for visitors during festivals.

Source: Photographs taken by the scholar on-site

Image 4.33 Dustbins on ghats for disposal of waste.

Source: Photographs taken by the scholar on-site

Image 4.34 Donation office on ghats.

Source: Photographs taken by the scholar on-site

B) Graphical documentation: Physical mapping of the issues on ghats:
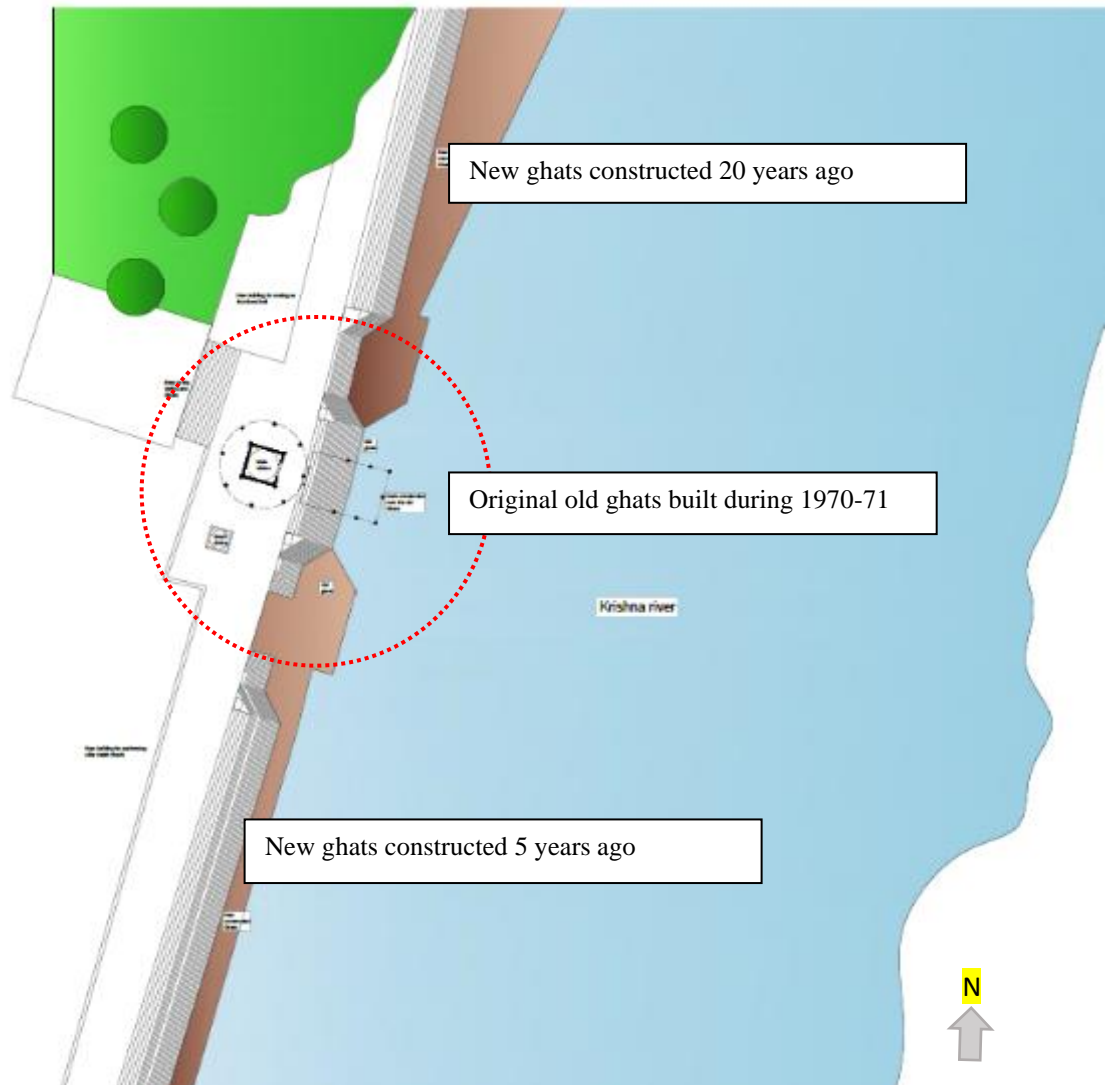
Figure 4.11 Plan of Narsobawadi ghats   Schematic plans prepared by scholar. Not to scale

Physical mapping of the ghats: Observations

The trust has maintained the ghats. Dustbins are placed at places, and people use the dustbins; there is no littering on the ghats done by the visitors. The religious waste on the ghats is disposed of in the bins kept, and any leftover on the steps is cleaned by the employees appointed to clean the ghats. New construction of ghat steps is done, and old steps are repaired timely.

C) Inferences from the interviews:

a. Inferences from on-site user interviews:

Every day many visitors come to the ghats. The users who have come daily for more than 20 years have been interviewed. They stated: The purpose for visiting the ghats is primarily: religious activity, poojas, etc. New ghats have been built as the number of visitors increases. New buildings for the after-death rituals were constructed separately recently in 10 years. They experience no significant problems on ghats. Ghats are clean and well-maintained. No sewage lines open on the ghats nor the side land of the ghats. The waters near the steps of the ghats are clean and good to use. Little river pollution is observed, but the patch of ghats is clean. The trust does the maintenance of ghats. The trust is using the funds judiciously collected from donations. On ghats, some priests misuse the money earnings, but not all priests practice this. No criminal activity has been observed; ghats have CCTV places for surveillance.

b. Inferences from priest interviews:

The Scholar interviewed the priests in the temple of Dattatreya on ghats. They enthusiastically participated in the interviews and gave the required information. Activities performed on the ghats are majorly religious pooja and palki on ghats. Earlier, the ghats were small; Gulwani Maharaj built the old middle portion of the steps from 1970-71. Later, the number of visitors increased, and the ghats were expanded on both sides of the old ghats. *Sanstha* (trust) is in charge of the ghats, and it maintains the ghat structures. It has employees clean the ghats regularly. The major source of income is the donations given by people to the temple on the ghats. "*Kunda*" bins for religious solid waste have been kept at places to deposit the religious waste. Talking about the pollution of the river, they replied the water of the river is clean and is used daily for bathing purposes. People, as well as all the priests, bathe regularly in the water. Degradation of ghat structures is not seen. The number of visitors has increased in the past ten years. Tourists majorly have started visiting the premises increasing the funds to the trust. Trust uses the funds judiciously for the ghats and other activities related to ghats.

D) Inferences from an interview of Officer: Trustee: "Sri Narasimha Saraswati swami Datta dev Sansthan, Narshinawadi" administers the ghats and temples. The trust owns farmland of 1200 acres, and all the income from the farmland goes to the trust

account. The rituals performed on the ghats those earnings are also deposited in the trust account. The revenue of the trust is not given to any municipal body. Also, being religious use of land, no taxes have to be paid for land use. The trust runs a school called " Ved path Shala", in which 40 students study. The school is funded by a trust. No NGO works for ghats. Trust does not allow government interference in any aspect of ghats. The Source of revenue for the trust is donations from the devotees on temples on ghats. Trust has employed people to clean the ghats. The trust tries to clean the water in the patch of the ghats; boat service runs in between the two banks of the river. Tourists visiting the ghats are increasing. Religious values may reduce due to growing tourism. They try to maintain the sanctity of the ghats, but still increasing tourism may be a problem in future.

PART B

Flood- water level varies every year. In 2019 the flood level recorded was the highest. The ghats and the temple were completely underwater. Ghats documentation in documentaries for religious purposes, film or TV series shootings are done on the ghats. Direct drawings of ghats are not available, but the department of land records might have old papers of landforms. No other geographical data are available.

E) Inferences from local heritage experts:

According to the expert, ghats need to be enlisted as heritage. Due consideration is to be given to the ghats during the formation of development plans.
Social concerns for ghats: Listing of the ghats under the special mention of heritage needs to be done. The ghats have high religious values, and social discrimination is observed at times by certain classes of people.
Economic concerns for ghats: The generation of funds for ghats in the form of donations should be promoted.
Environmental concerns for ghats: Maintenance of ghats and extension of ghats due to increasing footfall on ghats should be done in a systematic way.

F) Scores of rating scale method:

Table 4.10 Responses of onsite users for a scoring method

Ghat 3: Narsobawadi			Evaluation w.r.t. score	Remarks
Scores	Mean	Median		
SOCIAL				
Crime	5	5	High	There are no crimes in the ghats
Discrimination of the priests or ghat management to ghat users	3.5	4	Moderate	There is discrimination by the priest on ghats to some degree.
Opportunity for the poor for informal income activity in the ghat	4	4	High	There is a good opportunity for the poor for income
Drug users in Ghat	5	5	High	No drug users on the ghats
Encroachment of Ghats	4	4	High	No encroachment on the ghats
ECONOMIC				
State of ghat maintenance revenue	4	4	High	Good state of revenue
Judicious use of Ghat puja donation and *daans*	3.6	3	Moderate	Fair use of donations
Trust for ghat maintenance	5	5	High	Trust functioning for ghat maintenance
Ghat user-pay system	4	4	High	A good system in place
Government Budget	2	2	Low	No budget
ENVIRONMENTAL				
River pollution	3.75	4	Moderate	Moderate pollution observed
Waste management	4.85	5	High	A good system for waste management
Cremation management	4	4	High	Good systematic provision or cremation

Degradation of ghat structures	4	4	High	No degradation
Sewer disposal on the river	4.2	4	High	No sewage disposed on ghats
INSTITUTIONAL				
Control of bad activities	4.1	4	High	Control on activities
Regulating the activities of ghat users	4	4	High	Activities regulated and monitored
Construction and maintenance of ghats (conservation responsibility)	5	5	High	Good maintenance
Utilization of donations and *daans*	4.2	4	High	Judicious use of donations
Transparency of Puja dakchhina income	3.86	4	Moderate	Fair transparency
Existence of local ghat management committee	4.5	5	High	Trust in charge of ghats

All 15 users' scores were averaged, and the median was calculated as per the formula, and then the above table was prepared.

CASE STUDIES ON THE GODAVARI RIVER:

Case study 4- Someshwar Ghats

Background of Someshwar

Location: Someshwar is located on the way to Gangapur dam, at a distance of 8 km from the central bus stand. There is the temple of Lord Shiva and Lord Hanuman on the banks of Godavari with ghats along the banks.

Map 4.11 Map of Maharashtra highlighting Nashik district   Source: mapsofindia.com
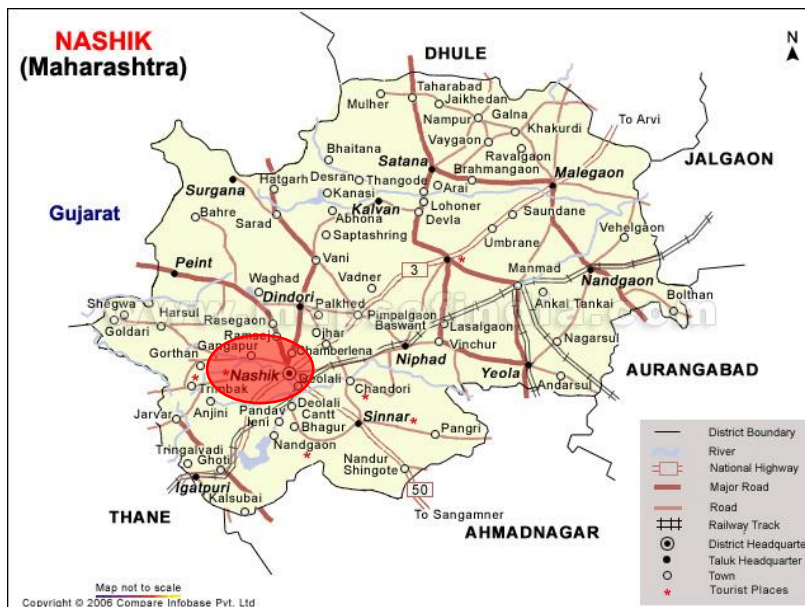
Map 4.12 Map of Nashik district highlighting Nashik city and Gangapur Source: mapsofindia.com

Map 4.13 Map of Someshwar village   Source: Google earth

History:

There are mythological references to this place in the Padmapuran. On the Mondays of the Shravan and Kartik months, fairs are held here, which attract a vast number of people from Nashik, Anadvalli, and Govardhan.

Map 4.14 Map showing location of Someshwar ghats
Source: Base map: Google earth Image. Editing done by scholar

Image 4.35 View of ghats from opposite bank of Godavari River

Source: Photograph taken by scholar on-site

A) On-site observations:

Image 4.36 minor damages

Source: Photograph taken by scholar on-site

Image 4.37 Brick construction: Lower steps worn out due to floods every year

Source: Photograph taken by scholar on-site

Image 4.38 Pooja performed on ghats.

Source: Photograph taken by scholar on-site

Image 4.39 Informal income generation: selling peanuts

Source: Photograph taken by scholar on-site

Image 4.40 Boating activity source of income on ghats

Source: Photograph taken by scholar on-site

B) Graphical documentation: Physical mapping of the issues on ghats:
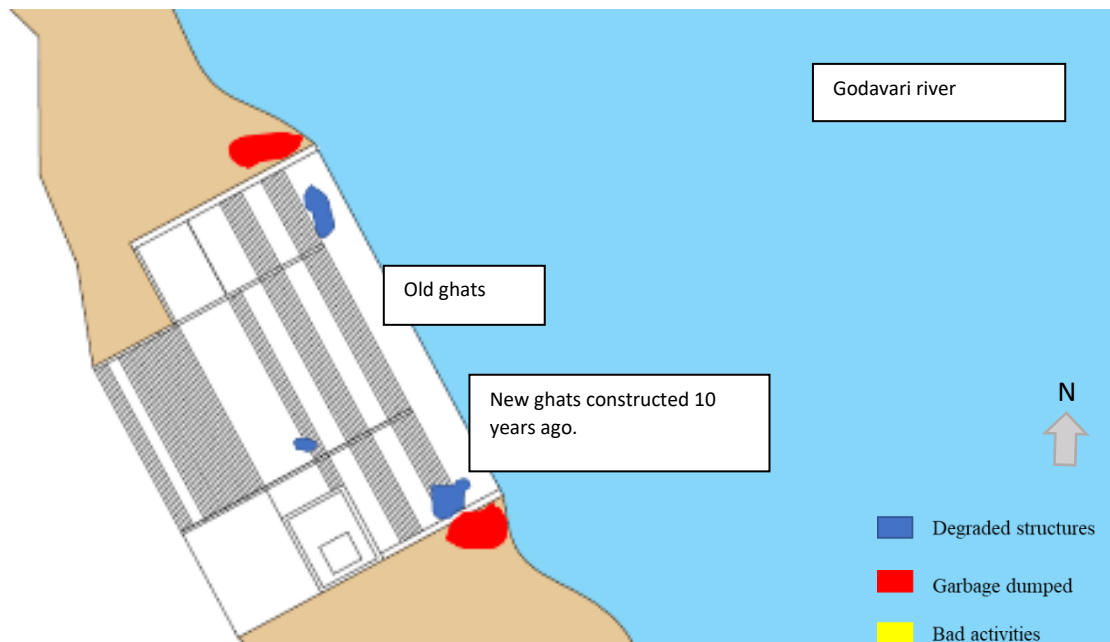
Figure 4.12 Plan of Someshwar ghats   chematic plans prepared by scholar. Not to scale

Observations from the physical mapping:

On a visit to the ghats, the following observations are noted, and the areas of issues have been marked on the plan. The Ghats are clean, with no major solid waste problem prevailing on ghats. Garbage bins are kept at places for the disposal of waste. The users of ghat are using the bins to a larger extent. The activities observed on ghats are religious and recreational activities. A boating facility is available at the ghats. The trust fairly does physical maintenance. The steps at the lower level near to water are worn out due to constant water changing levels.

C) Inferences from the interviews

a) Inferences from on-site users' interviews:

The on-site users responded to the interviews. People working on ghats and the people visiting the ghats for over a period of time have been interviewed. The main activities on ghats are religious and recreational. Changes over time on ghats are: a new stretch of ghats was built ten years ago as the old ghat's space was insufficient for religious activity. The problem with ghats is there is no space for people to sit; they sit on steps blocking the way for other people to descend the steps. Solid waste management is not a significant problem; dustbins have been kept at regular intervals for people to dispose of the waste. River water in this patch is clean, and there are no weeds as boating takes

place. Ghat structures have some problems with maintenance. The steps on the lower side are damaged due to constant changes in water levels. Funds collected as donations from people are appropriately utilized by the trust. They do a lot of maintenance work on the ghats. Trust has ownership of the ghats. The main purpose of ghats is religious activities; on weekends, people visit for boating and recreational activities. Not many priests misuse the ghats for monetary gains. Some people do, but they are few.

b) Inferences from priests' interviews:

Activities performed on ghats are pooja for the people whose marriage is at stake. "*Kundali*" pooja is done here as the main religious activity. Only this pooja is performed on these ghats. Changes on the ghats are mostly new steps built over ten years ago, as the old one was inadequate for religious purposes. Trust "Shri Someshwar Mahadev mandir Sansthan, Gangapur" is in charge of the ghats. The primary source of income is the poojas conducted on the ghats and mandir and donations from the people visiting the temple and ghats. The employees of the trust do solid waste management. They clean the ghats every day. Municipality people visit once to collect the garbage from the main road. Drainage water openly left in the river is a cause of water pollution. The water is not safe to bathe and drink. Water from the river is not used for Pooja directly. The water is filtered in the tank on-premises of ghats and then utilized for pooja purposes. No caste discrimination is observed on ghats.

D) Inferences from an interview of Officer: Trustee

Trust members cooperated and gave an interview for information. According to them, the trust administers all the aspects of ghats. The staff is appointed for the cleaning and maintenance of the premises. An increasing number of tourists on weekends disturbs religious activities. No NGOs help for ghats; trust alone is working for the ghats. Trust was formulated 20 years ago. Last 3.5 years, the members have been changed, and new members and young people have been appointed who work rigorously for the trust. No government help is sought by the trust for ghats. The trust is self-sufficient. The Source of income is a donation from people to the Mahadev temple. No revenue contribution by the ghats for the municipal bodies. When asked about River pollution, they said it could be curbed by not allowing the drainage water into a river without treatment. Currently, at certain places on the land beyond ghats, sewage disposal is seen directly in the river.

PART B

The flood levels vary each year. The maximum levels noted are during 2006 and 2019. All the steps and the temple were underwater, and this is the highest recorded. No formal documentation has been done on the ghats as these ghats are not elaborate. Trust formulated has eleven members, out of which one leader, and the rest are the members.

E) Inferences from local heritage experts:

The expert suggested that the ghats are a great source of history and mythology of the place. They need to be preserved.

The social concerns for ghats are improper management of the people visiting the ghats. Economic concerns are Governmental organizations lack authorized finances for the ghats. Fair utilization of donation money is another important responsibility of the trust. Environmental concerns are majorly for the control of pollution on ghats as well as the river.

F) User interviews: Rating scale method

Table 4.11 Responses of onsite users for a scoring method

Ghat 1: Someshwar			Evaluation w.r.t. scores	Remarks
Scores	Mean	Median		
SOCIAL				
Crime	4.7	5	High	No crime in ghats
Discrimination of the priests or ghat management to ghat users	4.7	5	High	No discrimination
Opportunity for the poor for informal income activity in the ghat	3.7	4	Moderate	Moderate opportunity for income for poor
Drug users in Ghat	4.3	4	High	No drug users
Encroachment of Ghats	3.0	3	Moderate	Encroachment to a considerable extend
ECONOMIC				
State of ghat maintenance revenue	3.3	4	Moderate	Revenue generated

Judicious use of Ghat puja donation and *daans*	2.3	2	Low	Low transparency
Trust for ghat maintenance	4.7	5	High	Trust present and functioning
Ghat user-pay system	4.3	4	High	System in place for ghat users
Government Budget	3.3	3	Moderate	Fair sources of funds
ENVIRONMENTAL				
River pollution	2.7	3	Low	Pollution observed
Waste management	4.3	4	High	No problem with waste management
Cremation management	4.7	5	High	Systematic system for cremation
Degradation of ghat structures	2.7	3	Low	Degradation observed at places
Sewer disposal on the river	4	4	High	No sewage disposed on ghats
INSTITUTIONAL				
Control of bad activities	4.7	5	High	No bad activities observed
Regulating the activities of ghat users	4.7	5	High	Strict regulation
Construction and maintenance of ghats (conservation responsibility)	3	3	Moderate	Maintenance is one timely
Utilization of donations and *daans*	2.3	2	Low	Low transparency in the utilization of daan
Transparency of Puja dakchhina income	2.3	2	Low	Low transparency
Existence of local ghat management committee	4.7	5	High	Trust in charge of ghats

All 15 users' scores were averaged, and the median was calculated as per the formula, and then the above table was prepared.   Source: Table prepared by the scholar.

Case study 5- Ramkund Ghats

Background of Nashik:

Location: Nashik is Maharashtra's third-largest city. Located in Maharashtra's northern region at the height of 700 meters above sea level and surrounded by lush mountainous terrain (M. India, 1986), The Godavari flows past the city's core area.

Map 4.15 Map of Maharashtra highlighting Nashik district

Source: Maharashtra remote sensing applications centre.
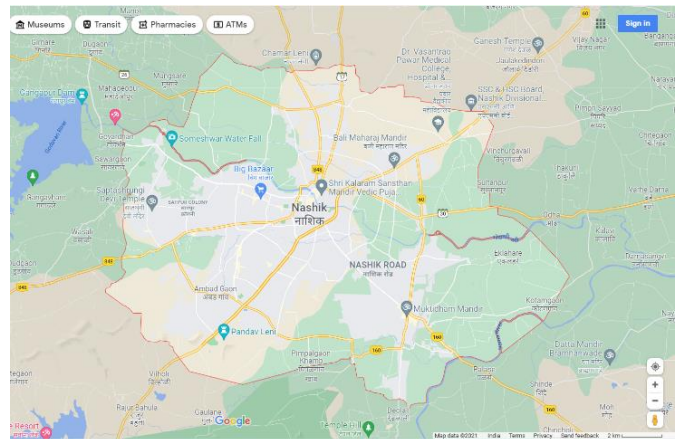
Map 4.16 Map of Nashik city

Source: Google Maps

Map 4.17 Map of Ramkund precinct

Source: Google earth Image

It originates at Bramhagiri mountain, Trimbakeshwar, near Nashik. It is most known for being one of the Hindu pilgrimage places, the Kumbh Mela, which takes place every 12 years on the banks of the Godavari River. The Ramayana epic is attributed to the origin of the name Nashik. According to the epic, Laxman chopped off Ravana's sister

Shurpankha's nose. As a result, this location was given the name "Nasik." The Maharashtra government renamed it "Nashik." Also, Ramayana states Lord Ram stayed in the Panchavati area in old Nashik (Govt. of India, 2021).

History: The holiest location in Nashik is Ramkund. It is surrounded by beautiful shrines, temples, and steps or flights of stairs(Press, n.d.).

It is believed Lord Ram used to bathe at the place when he was in exile. Chitrarao Khatav built the ghats in 1696; later, these ghats were rebuilt by Gopikabai, the mother of Madhavrao Peshwe. It is considered the most promising place for immersion of ashes; hence people bring ashes and immerse in water at this point (Govt. of India, 2021).

Image 4.41 Place for performing after death rituals.

Image 4.42 Morning activities at Ramkund

Source: Photographs taken by scholar on-site

Image 4.43 Ghats extended on right side of Ramkund.

Image 4.44 Activities in evening time at Ramkund

Source: Photographs taken by scholar on-site

A) On-site observations:

Image 4.46 Ghats on the extreme end of Ramkund

Image 4.45 Ghats at opposite side of Ramkund

Source: Photographs taken by scholar on-site

Image 4.47 Dangerous steps at the lower level of ghats.
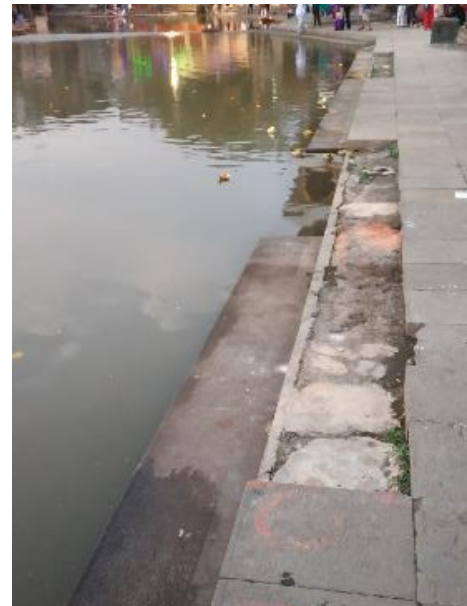
Image 4.48 Steps damaged with drainage water seeping on steps

Source: Photographs taken by scholar on-site

Image 4.49 Solid waste on ghats, lack of dustbins

Image 4.50 Places not easily reachable inhabit bad activities

Source: Photographs taken by scholar on-site

Image 4.51 Informal economic activities on the ghats

Image 4.52 Commercial activities on the ghats at evenings

Source: Photographs taken by scholar on-site

Image 4.53 Broken steps not repaired

Image 4.54 Pollution of religious offerings in river water.

Source: Photographs taken by scholar on-site

B) Graphical documentation: Physical Mapping of the issues on ghats:

Observations of the onsite survey:

The ghats are facing a severe problem with solid waste management. There is no cleanliness on the ghats. Structures are broken and not repaired. New construction has been done in the river basin, narrowing the flow of the water—no segregation of the religious and after-death ritual activities.
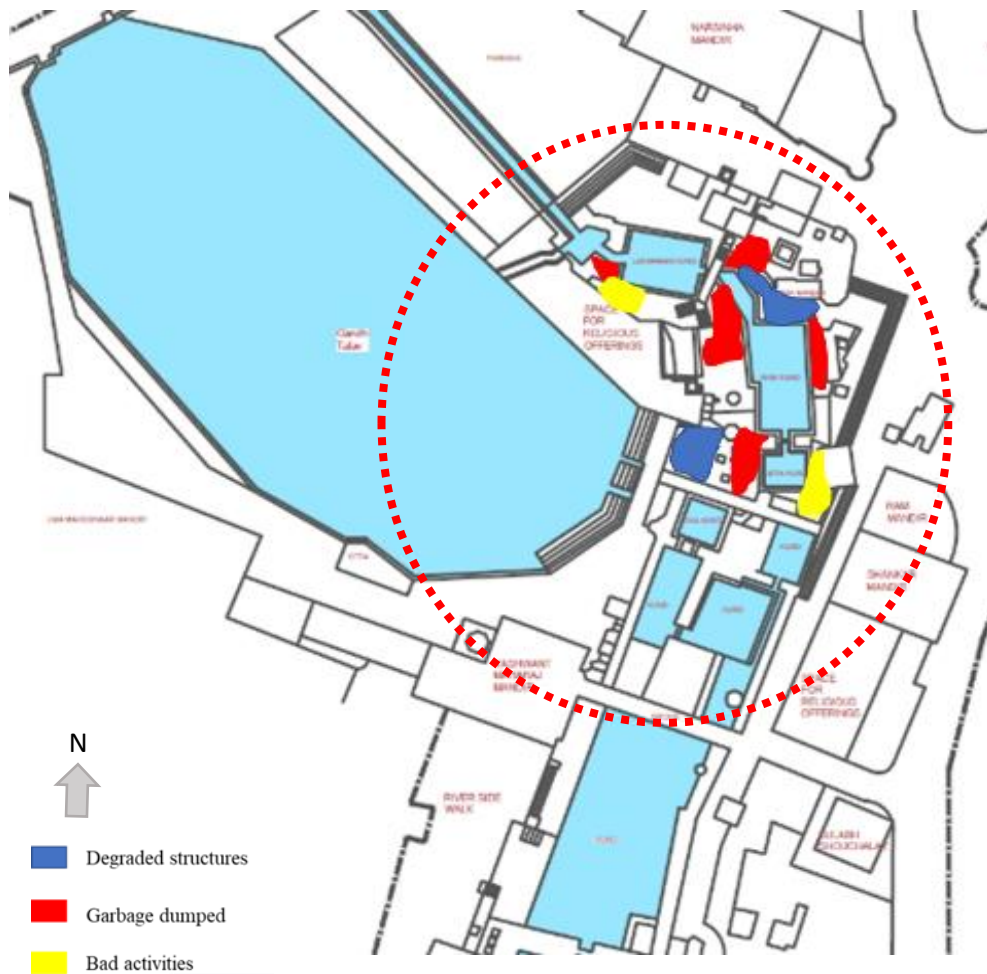
Figure 4.13 Plan of Ramkund Precinct, Nashik Source: Schematic plans prepared by scholar. Not to scale

C) Inferences from the interviews

a) Inferences from Onsite users: Onsite users were interviewed. They responded with the information: The purpose of their visit is majorly religious and after-death rituals. Changes observed over the period are the old structures are falling off they are not repaired. New concrete platforms were constructed in the river basin reducing the basin and obstructing the flow of water. Problems noticed on ghats are: solid waste is not managed. Lack of cleanliness. Religious waste was thrown in the river along with the ashes of the dead—stagnant water due to the narrow stream of water clogging. Religious waste is thrown on the ghats despite *kunds* provided by the municipality. The staff appointed by the municipality is insufficient compared to the daily waste generated on the ghats. River pollution is at its peak. All the waste, including human ashes, is immersed in the water. The condition of the ghats states that the funds are not being

used for the ghats. The municipality of Nashik city is the concerned authority for ghats. Death rituals (majorly), Religious, domestic, and recreation are the primary uses of the ghats. The priest is misusing the ghats for monetary gains to a large extent. Criminal activities are active during the night hours.

b) Inferences from priests' interviews:

The major activities performed on the ghats are last rites, pooja and after-death rituals. *(dashkriya vidhi).* Changes observed are new concrete platform has been built especially for the after-death rituals to be performed. The municipality maintains the ghat structures. The source of income is the funds allocated by the government in the budget for the ghats. Solid waste on the ghats is to be managed by the municipality. The staff appointed is very less and inadequate compared to the amount of waste generated every day due to the religious activities happening on the ghats. Swachh Bharat team is appointed on the ghats to clean them. River water is not at all clean. Pollution is at its highest at this point. The religious aspect of the ghats seems to be degraded. Caste discrimination is observed to a certain extent on the ghats.

D) Inferences from local Government officers: Due to the pandemic situation, the office was understaffed, and many officials were on covid duty. The information received from one duty officer states: Nashik comes under the municipal corporation. The proposals for ghats have been made earlier by various agencies; for example, DRONAH has submitted a heritage conservation detail project report for Nashik city as per the JNNURM requirements. Nashik falls under a smart city mission hence considerations for heritage are also present in the future plans. But all these are projects under consideration. At present municipal corporation is the body in charge of ghats.

E) Inferences from Heritage experts:

The social fabric of the ghats is distressed by the commercial activities on the ghats. These activities are not planned or monitored on-site. There are very few guidelines for commercial activities, and those are also not followed by the local people.

Social media will increase the awareness of ghats by various means. Through the effective participation of local communities along with the experts and researchers of the field, conducting awareness programs, making people aware through the information, and eventually allowing people to actively participate in various social activities related to Ghats.

For the economic growth of the ghats, controlled tourism activity can be promoted, which will give the local economy boost and self-generated income for the ghats.

The most eminent issues to be addressed in the case of ghats is economical, infrastructure and cultural preservation. Unplanned tourist activities also create problems for ghats.

Local government participation and legal framework will make the ghats self-sustainable.

F) Scores from the rating scale method:

Table 4.12 Responses of onsite users for a scoring method

Ghat 2: Ram Kund			Evaluation w.r.t scores	Remarks
Scores	Mean	Median		
SOCIAL				
Crime	2.87	3	Moderate	The crime rate is not much
Discrimination of the priests or ghat management to ghat users	2.6	2	Low	A lot of discrimination by a priest
Opportunity for the poor for informal income activity in the ghat	3.53	4	Moderate	Opportunity for the poor in some places for income
Drug users in Ghat	2.7	3	Low	Drug use in ghats
Encroachment of Ghats	2.7	3	Low	Encroachment is done on ghats
ECONOMIC				
State of ghat maintenance revenue	2.9	3	Low	No revenue for ghat maintenance
Judicious use of Ghat puja donation and *daans*	2.73	3	Low	No fair utilization of donations
Trust for ghat maintenance	2.1	2	Very low	No trust present
Ghat user-pay system	1.6	1	Low	No system for users

Government Budget	2.73	3	Moderate	Funds available from the government
ENVIRONMENTAL				
River pollution	3.2	3	Low	Pollution to the higher side observed
Waste management	2.47	2	Low	No waste management system
Cremation management	2.6	3	Low	No systematic cremation facility
Degradation of ghat structures	2.8	3	Moderate	Degradation of ghats observed
Sewer disposal on the river	3.27	3	Low	Sewage disposed of on ghats at points.
INSTITUTIONAL				
Control of bad activities	2.7	3	Low	No control over bad activities
Regulating the activities of ghat users	2.8	3	Low	No regulation
Construction and maintenance of ghats (conservation responsibility)	2.8	3	Low	No maintenance done
Utilization of donations and *daans*	2.2	3	Very low	Poor utilisation of daan
Transparency of Puja dakchhina income	1.73	1	Low	No transparency in income
Existence of local ghat management committee	2.6	3	High	Governing body in charge of ghats

Source: Prepared by a scholar

All 15 users' scores were averaged, the median was calculated per the formula, and then the above table was prepared.

Case study 6 - Paithan Ghats

Background of Paithan: Location

Map 4.19 Map of Maharashtra highlighting Aurangabad district

Source: Maharashtra remote sensing applications centre.

Map 4.18 Map showing Paithan Taluka

Source: Maharashtra remote sensing applications centre.

Paithan is located 28 km south of Aurangabad. A broad flight of stone steps leads down to the town's river on three sides on the east and south sides. They serve as bathing ghats and are among the city's oldest structures. It is also supposed to have been the capital of the *Salivahan* dynasty. It is the abode of Sant Eknath. The great Sant Eknath made a male bull recite Vedas demonstrating that Vedas are not only for brahmins; this has been observed on Naag ghat. Now also, they have made a separate place to mark the event and have written the stories on the walls for visitors to know about the event.

Map 4.20 Map of Paithan   Source: Google maps
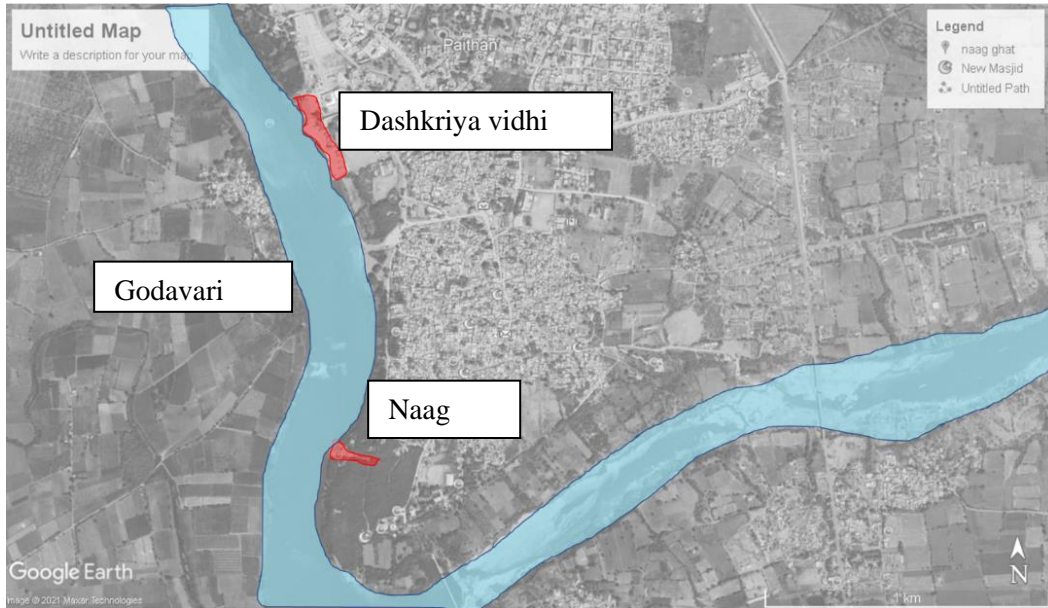
Map 4.21 Map showing the Naag ghat and Dashkriya vidhi ghat at Paithan.

Source: Base map: Google earth Image. Editing done by scholar

A) Field observations

Image 4.55 View of Naag ghat

Image 4.56 View of Dashkriya vidhi ghat

Source: Photographs taken by scholar on-site

Image 4.57 Kiosks built on ghats
for after death rituals.

Image 4.58 Provision of toilets and dustbins
for cleanliness of ghats.

Source: Photographs taken by scholar on-site

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| Image 4.59 Naag ghat steps in good condition | Image 4.60 Clean and repaired structures of Naag |

Source: Photographs taken by scholar on-site

B) Graphical documentation: physical

Degraded structures
Garbage dumped
Bad activities
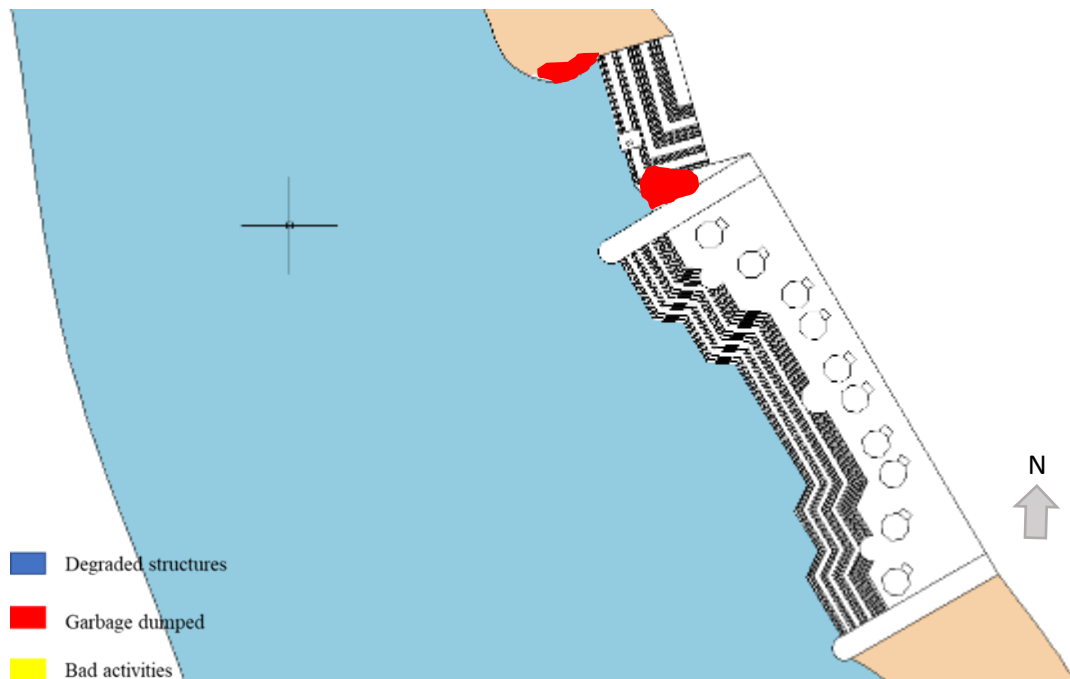
Figure 4.14 Plan of Dashkriya vidhi ghats Paithan

mapping of issues on ghats:

Source: Schematic plans prepared by scholar. Not to scale

Observations of the on-site survey:

It is observed that the ghat structures are kept clean. New ghats are constructed, and old ghats are repaired and used for specific purposes. Special bins are kept for disposal of waste from the after-death offerings on ghats. Special toilets were constructed to maintain hygiene on the ghats. The facilities provided are being used by the visitors on ghats.

Certain lower steps debris accumulation was observed on the ghats next to *Dashkriya Vidhi* ghats. When the water levels are low, a sandy foreground is there of the river bed. This happens only during the summer. Major after-death rituals shifted to the new ghats constructed exclusively for the rituals. The old ghats are less visited by external people. The activities that occur on the old ghats, "Naag ghats", are mostly domestic, and only Brahmin caste certain after-death rituals are performed on the Naag ghats. The cremation place for Brahmins is near the Naag ghats.

Physical degradation is not observed on the ghats. The solid waste generated is managed very well. The major activities happen in the morning. There are separate timings for the Brahmin caste and other castes. Morning 6.30 am to 10.00 am, only the Brahmin class can enter the ghats. After 10.00 am, other castes can use the ghats for the after-death rituals.

C) Inferences from the interviews

a) Inferences from users' interviews:

The main uses of the ghats are religious and after-death rituals. New ghats were built in 2016, as the demand for space was not met at Nag ghats. No problems are seen majorly as the ghats are newly built. Structures are new. Nagarpalika is in charge of the ghats. They collect solid waste from the bins installed on ghats. Nagar Palika itself does the repair work after the monsoon season. Nagarpalika spends money on ghat structures. Priests are misusing the ghats for monetary gains. But not all of them do it.

b) Inferences from priests' interviews:

The main purpose of the ghats is for after-death rituals. The name is "*dashkriya*" after death ten days rituals. Changes in ghats are they were initiated to built-in 2013 and completed in 2016. Earlier, the Naag ghat was used for the last rites, and after death rituals, new ghats were built especially for *dashkriya vidhi.* Nagarpalika of Paithan maintains the ghats. It has appointed staff to clean the ghat areas. Funds are obtained from Nagarpalika for the ghat works. The Nagar Palika vans carry solid waste on ghats; bins have been kept at intervals for dumping the religious solid waste generated on ghats. The river water is not clean to drink but is used for bathing and spiritual purpose. There is caste discrimination on the ghats. Only Brahmins are allowed to visit the ghats

during the morning hours from 7.00 am to10.00pm. Other caste people can enter the ghats after 10.00 am for after-death rituals and religious purposes.

D) Inferences from local government officer: Paithan falls under Nagarpalika. The nagarpalika has no special funds for ghats, but the funds available for public welfare and development are utilised. As the major source of income for Paithan is from the ghats, especially for after-death rituals, the Nagarpalika has made provisions for the ghats. Facilities like constructed toilets, bathing places and specific spaces for after-death rituals have been constructed for the ghats.

E) Inferences from Heritage expert:

According to the expert, the ghats act as gathering places and play an important role in the physical connection between nature and humans; hence it is stated as an immensely important heritage resource. Commercial activities on ghats do affect the social fabric of ghats. If they are controlled and regulated without hampering the authenticity and integrity of the place, they can be promoted, e.g., by selling flowers on ghats with temple precincts. Also, if the activity goes back ages forming an intangible relation with the place, it should be conserved. Whereas haphazard commercialization of the place with the only motive of economic boost and unnecessary unthoughtful amenities proposals would surely affect both cultural and tangible heritage.

Spreading awareness about the importance of these intangible heritage resources by Campaigning, utilizing social media and forming policies and schemes for conserving various practices which are encompassed in intangible heritage.

Expert states sustainability of the ghats is a vast topic. But the sustainability of ghats can be achieved by creating awareness amongst the users, government initiatives for conservation and generating economy for locals, and the activities related to these ghats and their conservation by understanding and safeguarding the values of these ghats.

Currently, the ghats face issues due to the lack of awareness, and loopholes in management policies and frameworks, leading to a lack of maintenance.

F) Scores of rating scale method:

Table 4.13 Responses of onsite users for a scoring method

Ghat 3: Paithan			Evaluation w.r.t. scores	Remarks
Scores	Mean	Median		
SOCIAL				
Crime	4.05	4	High	No Crime was observed in the ghats
Discrimination of the priests or ghat management to ghat users	2.85	3	Moderate	Discrimination by priest
Opportunity for the poor for informal income activity in the ghat	3.85	4	High	Opportunity present for the poor
Drug users in Ghat	3.75	4	High	Drug users in some places
Encroachment of Ghats	3.92	4	High	In some places, encroachment observed
ECONOMIC				
State of ghat maintenance revenue	4.21	4	High	Good state of revenue
Judicious use of Ghat puja donation and *daans*	4.56	5	High	Fair use of donation
Trust for ghat maintenance	2.96	3	Low	No trust present
Ghat user-pay system	2.1	2	Low	No users pay system
Government Budget	3.89	4	Moderate	Funds available from the government
ENVIRONMENTAL				
River pollution	3.96	4	High	Moderate pollution observed
Waste management	4.25	4	High	Systematic waste management

Cremation management	4.5	5	High	Systematic cremation management
Degradation of ghat structures	4.16	4	High	No degradation
Sewer disposal on the river	3.79	4	High	No sewage disposed on ghats
INSTITUTIONAL				
Control of bad activities	3.85	4	High	Good control over bad activities
Regulating the activities of ghat users	3.65	4	High	Regulated activities
Construction and maintenance of ghats (conservation responsibility)	4.28	4	High	Good maintenance
Utilization of donations and *daans*	3.9	4	High	Fair use of donations
Transparency of Puja dakchhina income	2.96	3	Moderate	Moderate transparency
Existence of local ghat management committee	4	4	High	The governing body in charge of ghats

Source: Prepared by a scholar

All 15 users' scores were averaged, and the median was calculated as per the formula, and then the above table was prepared.

The following information will help with the overview of ghats from all the examples studied:

What does ghat management require? What state are the ghats in right now? Why are the ghats in their current state? What are the ghats' sources of funding?

The answers to the questions above will provide an overview of the ghats and the problems that they are currently facing. The data from all case studies have been tabulated, and each ghat has been enlisted to summarise in a few words.

Chapter 5. Summarized Results

Content Analysis:

The content analysis gave an overview of the geographical location and historical and mythological background of the places selected for the study. Many ghats of religious importance are built at the confluence of two or more rivers. The majority of the ghats were built or rebuilt during the Peshwa rule by the royal family. Ahilya Bai Holkar, a member of the Maratha royal dynasty, was a strong proponent of this architectural style. It can be said the Maratha rulers patronized ghat construction.

The legislative literature shows that the ancient monuments and archaeological sites remains act is applicable to the listed heritage buildings. Archaeological Survey of India has specified that local authorities can formulate heritage laws at the local level in collaboration with the heritage agencies and apply them to heritage sites of local importance. India lacks a statutory body to list ghats' heritage buildings and places, and organizations like INTACH have taken a step ahead to protect the heritage. The national policy for the conservation of ancient monuments, archaeological sites, and remains states the issue of a protected monument's living aspect has only been attempted for a religious monument in use. Other living monuments have not yet been considered. At the state level, the Unified Development Control and Promotion Regulations for Maharashtra State have been formulated. They state that the heritage regulations will be applicable as per the local bye-laws. After studying the local bye-laws for B and C-class municipal corporations, it is observed that there are no separate bye-laws for heritage buildings.

The ghats do not have separate heritage bye-laws prepared in any class of municipal corporations. There is no separate provision of guidelines for maintaining ghats in any law and regulation in these areas.

National Policy for the conservation of ancient monuments, archaeological sites, and remains. Policy framed for conservation and protection of the monuments. But the structure or place has to be listed on heritage and declared a monument. For this, identifying the structure as heritage has to be undertaken, which is lacking in the case study files.

Physical observation on-site:

The physical observations gave direct insights into the issues on the ghat, which was supportive of the study and gave further guidelines for the work.

Table 5.1 Compilation of photographic documentation of ghats for physical observation:

WAI	MAHULI	NARSOBAWADI	SOMESHWAR	RAMKUND, NASHIK	PAITHAN
Krishna river : stretch of 7 ghats	Krishna river: 5 ghats on both sides	Krishna river: single stretch of ghat	Godavari river: single stretch of ghat	Godavari river: series of ghats around to form a kund	Godavari river: three stretch of ghats at different places

Source: Prepared by the scholar

On--site physical observation:

Activities observed on ghats are majorly religious and after-death rituals, and domestic activities are the other primary usage of ghats.

The damaged part of the ghats is not accessible, and it has become a hiding place for the homeless, and illegal criminal activities occur in those areas. Ghats with no CCTV surveillance are more prone to illegal activities.

The ghats are facing problems in solid waste management. Organic waste generated from religious activities is not disposed of correctly on ghats. Local governing body not actively participating in cleaning of ghats.

Physical damages are observed to ghat structures, and repair work is not carried out; broken stones and structures lying around on the ghats get washed away every monsoon with the floods. Hence ghats' structures are degrading day by day.

Interviews:

Interviews pointed out the issues about the social, economic, and environmental aspects of ghats. Major contributors are the on-site users. The prominent findings from the interviews have been tabulated. The aspects and the issues are listed in a concise form.

Table 5.2 Findings of interviews on

WAI	MAHULI	NARSOBAWADI	SOMESHWAR	RAMKUND, NASHIK	PAITHAN
Environmental Physical condition of ghats: Bad condition • Structures are broken • Sewage disposal on ghat steps observed • No solid waste management	Environmental Physical condition of ghats: Bad condition • Structures are broken • No solid waste management • Repair works not done	Environmental Physical condition of ghats : Good condition • Structures in good condition • Solid waste management done well. • No sewage problem observed.	Environmental Physical condition of ghats: Good condition • Structures in good condition • Waste management done regularly. • Few places sewage disposal observed.	Environmental Physical condition of ghats Worst condition • Structures are broken. • Poor solid waste management.	Environmental Physical condition of ghats Good condition • Structures are well maintained. • Good solid waste management. • No sewage problem
Social • No discrimination on ghats. • Moderate crime on ghats.	Social • No discrimination on ghats • Moderate crime on ghats	Social • No discrimination on ghats • No crime on ghats • CCTV's installed on ghats	Social • No discrimination on ghats. • No crime on ghats	Social • Discrimination on ghats • Crime on ghats	Social • Discrimination on ghats • No crime on ghats
Economic • No user pay system. • Scope for informal activity for poor	Economic • No user pay system. • Scope for informal activity for poor.	Economic • User pay system in form of parking charges. • Scope for informal activity for poor	Economic • User pay system in form of parking charges. • Scope for informal activity for poor	Economic • No user pay system. • Scope for informal activity for poor.	Economic • No user pay system. • Scope for informal activity for poor.

Source: Prepared by scholar

The findings from the social, economic, environmental, and institutional perspectives are extracted from all the interviews conducted. The onsite users, Priest on ghats, Govt. Officers or trustee members, and heritage experts contributed to the study. The finding from all has been listed out below in the sequence.

Social perspective

Criminal activities are observed at ghats managed by private owners and municipal corporations. The activities such as consumption of illegal substances, alcohol, betting, gambling etc., are observed at the ghats where access is difficult, and people do not tread daily. These activities are more prominent during the afternoon time when not

many people visit the ghats and majorly during the night times when the ghats are dark. These activities are more prominent where the ghats are broken, and the common man does not approach that part of the ghats for day-to-day activities. Trust-owned ghats have security cameras installed; hence, a less crime rate at the ghat is observed.

The use of ghats majorly takes place for religious activities and the celebration of festivals. One more important function related to ghats is the cremation and after-death rituals. These two are the main associations of the ghat.

Overall awareness of the people about their heritage, it is observed that local people are not aware of the importance of the heritage of ghats. They have been introduced to heritage listing at certain places, but the local people have opposed the listings due to a lack of proper education about heritage listing.

Economic perspective:

In the case of privately owned ghats, no funds are available for maintenance of ghats. Owners do not fund the ghats; the income generated on ghats is taken by the owners and not utilized for the betterment of the ghats. Ghats under municipal corporation funds have been allocated in the budget but are not used to the full extent. Ghats under trust management are funded by the income generated by the trust and hence maintained completely. No self-generated funds are present for ghats.

Informal income activities for the poor are present on the ghats but are unplanned, creating problems.

Environmental perspective:

Ghats face major problems with solid waste management. The ghats that are privately owned and monitored by the Municipal bodies face problems to a larger extent. Ghats managed by the trust have people employed to clean ghats; hence do not face the problem of solid waste management.

Physical degradation is present at ghats owned by private owners. They do not maintain the ghats in any respect, and they do not have any legal binding to maintain the ghats; hence no care is taken of ghats. Lesser damage is present at ghats monitored by municipal corporations, and least or no damage is seen at ghats managed by trusts.

There is no statutory body in charge of the heritage in the towns. No local body is formed to maintain the ghats if the ghats are under government bodies. Heritage agencies have approached the towns, but people's participation and lack of awareness are creating problems in identifying the ghats as heritage.

Reasons for sustainability issues:

It is observed that due to a lack of responsible institutions to take care of ghats, they are in poor condition. In some cases where the Institutions are in-charge of ghats, they are negligent about the ghat works. In cases where Private owners are in charge of ghats, they are least concerned about ghats and their maintenance.

Reasons for non-performing institutions:

Currently, existing institutions do not have formulated laws and regulations for ghats and their maintenance. Trusts who own the ghats do not have rules and regulations for the maintenance of the ghats. The government has not provided incentives for the private ghats owners to maintain the ghats, nor has it levied strict penalties for ill-maintaining the ghats. Also, no rewards nor punishments for the maintenance of ghats have been declared by the government.

Heritage expert opinions:

Ghats have been there for ages; they are Architecture marvels; they have engineering importance compared to relation to the river, its flood line, and water pressure. They have mythological importance, and due to the time from which they have existed, they have been part of various historical events or witnessed some of the patronages. They also have associational value and social importance, due to which we still celebrate their existence. Their existence is much more divine; it is the place where land meets the water, In some cases at the intersection of a major river. Its existence is to celebrate. Their role is to give peace of mind, embrace natural beauty, breathing space for society. And more such space would help to have a healthy and refreshed society that would help to have a good economy

Current problems for ghats: Mismanagement and non-maintenance of the structure by local authorities. The access to Ghat has been mismanaged or not been considered

during the development plan, thus losing the relation of the Ghat with the built fabric, e.g., the Placing of the busy road /extension of the road between the existing Ghat and Built fabric losing the connection between them making it more difficult to assess. Waste management issues, sewage disposal issues on ghats.

The ghat still has its social importance, and we need to understand that in our urban development plan. There is a requirement to understand and highlight this typology of the heritage structure and draft a guideline for their conservation and steps to amalgamate it in a new Urban scenario.

Commercial activities on ghats: If they are controlled and regulated without hampering the authenticity and integrity of the place, they can be promoted, e.g., selling flowers on ghats steps with the temple precinct. Also, if the activity goes back ages forming an intangible relation with the place, it should be conserved. Whereas haphazard commercialization of the place with the only motive of economic boost and unnecessary unthoughtful amenities proposals would surely affect both cultural and tangible heritage.

Unmanaged tourism on ghats can be dangerous to the sanctity of the ghats.

Talking about legislation, they stated there are no special bye-laws or guidelines existing for the typology. If it is more than 100yr old ancient monument act is one under which it should be protected.

All Ghats' final sustainability scores:

The final scores have been calculated according to the formulas explained in the methodology chapter. The final obtained scores have been calculated separately for each perspective, and a final average score of the perspectives score has also been calculated.

Column number one- FINAL AVERAGE SCORE shows the final average scores of the other four perspective scores. The final score inferences have been concluded from this average score.

Table 5.3 Final score table

GHATS	FINAL AVERAGE SCORE	SOCIAL	ECONOMIC	ENVIRONMENTAL	INSTITUTIONAL
Wai	**2.3**	2.78	2.14	1.91	2.45
Mahuli	**2.06**	2.27	1.50	2.57	1.92
Narsoba Wadi	**4.12**	4.3	3.72	4.16	4.27
Someshwar	**3.73**	4.08	3.58	3.68	3.61
Ramkund, Nashik	**2.67**	2.92	2.42	2.8	2.47
Paithan	**3.78**	3.68	3.54	4.13	3.77

Source: Prepared by the scholar

The above scores have been interpreted in terms of sustainability. The ghats have been evaluated in the range of strong and weak according to the score obtained.

Below is the scale on which the interpretation of the score is made.

Table 5.4: Score table for interpretation.

Range	Interpretation
1 to 1.8	Very low
more than 1.8 to 2.6	Low
more than 2.6 to 3.4	Moderate
more than 3.4 to 4.2	High
more than 4.2	Very high

Source: Table prepared by scholar

This gave strong support to the interpretations from a qualitative study. A tabular form of the above-average scores is done below:

Table 5.5 Ghats' sustainability score Interpretation

Factors	Wai	Mahuli	Narsobawadi	Someshwar	Ramkund	Paithan
Social	Weak	Weak	Strong	Strong	Weak	Strong
Economic	Weak	Weak	Strong	Strong	Weak	Strong
Environmental	Weak	Weak	Strong	Strong	Weak	Strong
Institutional	Weak	Weak	Strong	Strong	Weak	Moderate

Source: Prepared by scholar

From the above table, conclusions are drawn about the range of sustainability of the ghats. The below statements are made based on the scores.

It is observed, Narsobawadi has obtained the maximum score. It is strong from all perspectives. This indicates the ghats are sustainable and in good condition from social, economic, environmental, and institutional points of view.

Someshwar ghats also show strong remarks from all perspectives; it indicates the ghats are sustainable and in good condition.

Paithan shows a mix of strong and moderate. The social, economic, and environmental points are strong, and the institutional part is moderate as it is under the government administration.

Ramkund shows all remarks as weak. It is experiencing problems from all perspectives. And the ghats are having sustainability issues.

Wai and Mahuli show weak scores. Both the ghats are facing issues from all perspectives. These ghats are having sustainability issues.

Statistical analysis of the final scores:

To determine whether there is any correlation between these factors, further statistical analysis has been done.

A correlation has been tested for the final scores of the four factors. The independent variable is the institutional factor, as it governs the other factors. Dependent variables are social, economic, and environmental factors.

The test has been processed in SPSS software, and the results are as stated below:

Table 5.6 Table for scores of correlations.

FINAL SCORES	INSTUTUTIONAL FACTORS		
	CORRELATION		
	VALUE		
SOCIAL	0.836		
ECONOMIC	0.907		
ENVIRONMENTAL	0.836		

Source: Table prepared by scholar; values obtained from SPSS

The above scores are greater than 0.7 and near 1 and which shows a very strong correlation between the factors.

It is observed that there is a very strong positive correlation between institutional and social, economic, and environmental factors. It depicts that improvement in institutional control will improve the social, economic, and environmental conditions at the ghats.

It clearly states that the governing bodies need to take control of the ghats in order to make that ghat sustainable from social, economic, and environmental perspectives.

It can be seen from the above scores ghats that are under the trust are comparatively more sustainable than ghats which are under private ownership.

Major Findings

Social perspective:

It has been noted that there are criminal activities on ghats, such as using illegal substances, alcohol, and gambling. These activities are especially prevalent in areas where the ghats are damaged and inaccessible. Crimes are due to the absence of monitoring the ghats physically or by mechanical devices.

Lack of heritage awareness amongst local people. Public awareness and public participation are majorly lacking in the ghats precincts.

Economic perspective:

Funding of ghats is a crucial problem; no funds from the Government Budget and Private owners are available to maintain ghats. Ghat user-pay systems are absent in the majority of ghats. No official pay system is in place to generate revenue for the ghats. The informal income activities for the poor are present but not systematically managed on the ghats. In some instances, larger Municipalities lack proper use of allotted funds.

Environmental perspective:

Solid waste management is a significant problem faced by the ghats. Physical damages to ghats' structures are not repaired, making the ghats more structurally weak. Neither local nor town-level officials take responsibility for improving ghats.

Institutional perspective:

Ownership of the ghats plays a significant role in their state of the ghats. Ghats managed by private owners are facing significant issues on all factors. They are socially, economically, or environmentally not sustainable. Ghat owners are not legally obliged to maintain the ghats as there is the absence of heritage bye-laws and particular maintenance guidelines for ghats. Awareness of heritage is lacking amongst the local people. Local people oppose heritage listing; hence heritage agencies cannot work on ghats.

Table 5.7 Key Issues identified from qualitative and quantitative methods:

Findings from interview results	Findings from scoring results
Criminal activities on the ghats	Criminal activities on the ghats
Awareness of heritage is lacking among local people	Absence of self-generated income
Privately owned ghats have no funds for maintenance	Income from ghats not utilized for ghat maintenance
The problem of solid waste management	Solid waste management issues, Sewage disposal issue
Physical degradation	Informal income activities for the poor are present but not managed on the ghats
Ownership of ghats is a major factor in ghat conditions	Ownership of ghats major deciding factor
Lack of legislation and heritage listing	Less transparency in the utilization of funds from private owners.

Source: Prepared by scholar

The findings from both qualitative and quantitative methods show that the findings are comparable. Both methodologies have yielded numerous conclusions that are consistence. The study has become more factual and valuable owing to the contributions of both methodologies.

Most activities seen on ghats are religious, ceremonial, and domestic. Festival celebrations are an integral feature of the ghats. The ghats are having trouble managing their solid waste. On ghats, organic waste from religious practices is not correctly discarded. The local government is not actively helping to clean the ghats. Private owners are not contributing to the ghats. The ghat structures are physically damaged, but no repairs are made. The damaged part of the ghats is not accessible, and it has become a hiding place for the homeless, and illegal criminal activities occur in those areas.

Ghats without CCTV surveillance are more prone to criminal activities. It is noted that local people are unaware of the significance of the ghats' heritage. They have been introduced to heritage listing in specific places but are resistant to the listings due to a lack of sufficient information regarding heritage listing.

The poor have a fair opportunity on the ghats to engage in informal income-generating activities. There are no user payment systems in place for ghats at the moment. Ghats lack self-sustaining revenue. Ghat maintenance costs are a problem. In certain places, the ghat revenue is not used to maintain the structures. Since they receive no benefits from the ghats, private owners do not support them. Less transparency in the utilisation of funds for ghat maintenance at certain places.

In general, the absence of ghat legislation relates to management issues. No established institutions have laws and regulations governing ghats and their upkeep. The government has not offered private ghat owners incentives to keep their ghats in good condition, nor has it imposed severe fines.

A range of the ghats' sustainability was indicated by the scores. This provided substantial support for the conclusions drawn from a qualitative investigation. According to the results, the ghats under the control of trusts have the highest scores. They are in good shape from all three perspectives. Municipally controlled ghats deal with problems from a social, economic, and environmental perspective. Privately owned ghats are in the poorest health. They have problems that affect all perspectives. Investigating further, it is highlighted that the institutional element is strongly related to the social, economic, and environmental aspects. The state of the ghats will improve when ghat governance is improved. Substantial control and legislation for ghats will ensure the sustainability of the ghats.

Chapter 6. Conclusion And Recommendations.

Conclusion:

Ghats on Krishna and Godavari Rivers are facing sustainability issues from social, economic, and environmental perspectives. The privately-owned ghats are the least sustainable from a social, economic, and environmental point of view. The ghats managed by small municipalities are more sustainable than those operated by bigger municipalities. The ghats managed by the trusts are sustainable from social, economic, and environmental points of view. This shows that institutional ownership plays a vital role in the sustainability of the ghats.

Ownership of the ghats is a crucial factor in the conditions of the ghats.

The lack of comprehensive legislation for ghats is the cause of institutional mismanagement. Governmental or non-governmental entities do not appropriately manage Ghats. The ones maintained by the non-government organization have no stringent norms and standards for managing ghats. The government has not imposed severe penalties or incentives to keep the ghats. Strong legislation and accountable governing authorities are necessary to have control over ghats.

Recommendations:

In order to improve the state of the ghats, they must be recognized as heritage. For the sole purpose of maintaining ghats, appropriate rules and regulations must be formulated. Promoting ghats will help to increase social awareness. The proper use of finances for ghat maintenance will establish the economy's viability. This will inevitably result in the sustainability of the environment.

As the objective states broad strategies at the institutional level for reducing the vulnerability of physical and intangible aspects of ghats are recommended. The grade of heritage to which the ghats belong will be determined as the first stage in recognizing them as heritage. Plans for conservation will be created based on grade. Therefore, overall strategies are now being presented; however, after grading is complete, individual proposals for each ghat can be produced. The suggested measures are meant to maintain the ghats' health and stop further harm. They are suggested on a broader scale for all ghats studied.

1. Social Perspective:

It is advised to have a mandatory installation of CCTV cameras on the ghats of the governing bodies. Be it either a private owner, a trust, or the government body in charge of ghats. The local governing body will give orders for the installation of monitoring devices. - Nagarpalika, a municipal corporation. Provision of smart multi-functional poles (like solar lights and LED-based street lighting) on the ghats to keep the ghats lightened even during the night hours to reduce illegal activities on ghats. Police patrolling is to be done during the evening times in the ghat areas. As the light availability is less than daytime, people take advantage of the situation, and crime occurs.

Make the ghats more accessible, repairing and rejuvenating them by creating public gathering spaces. Ghats can be converted into spaces where residents and tourists can gain knowledge of the city's intangible and architectural heritage. The ghats' spaces can be converted into memorial sites. Murals and sculptures can be part of the environment's creation. Providing informative boards about the history and mythological association of the ghats will increase awareness amongst the locals and the tourists/ visitors on the ghats.
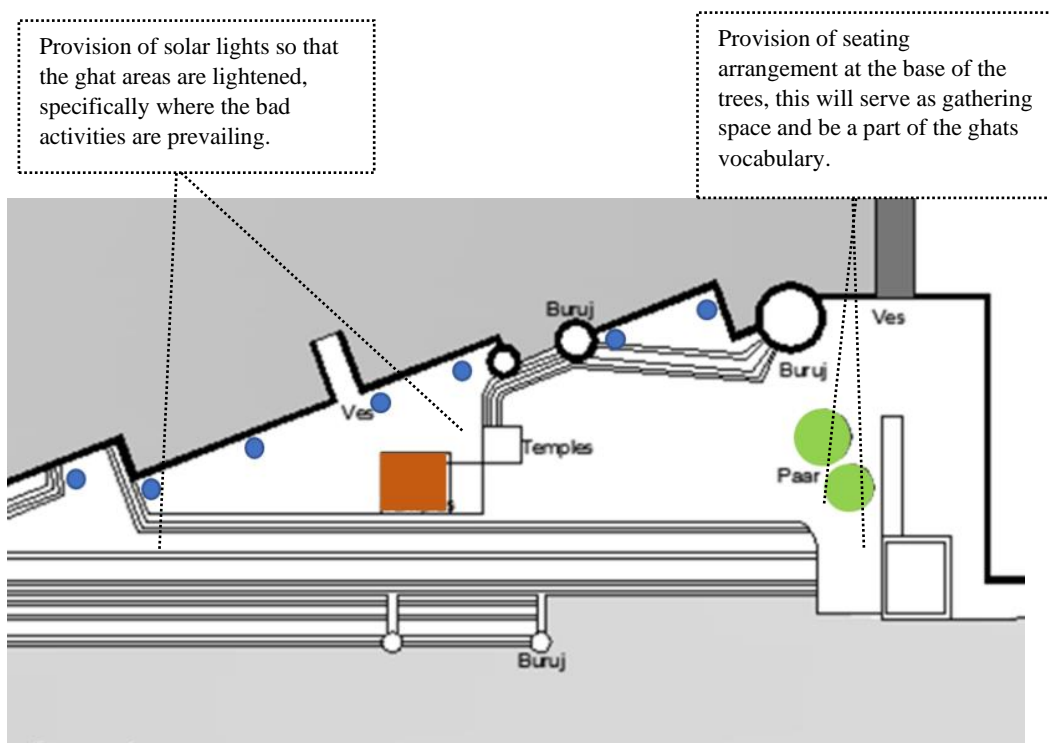
Figure 6.1 : Proposal for revitalization of ghats.   Source: View prepared by the scholar.

Provision of informative panels about ghats, their associated history, mythology will create awareness amongst the locals and the visitors. Murals of historical incidences on ghats.

Provision of solar lights so that the ghat areas are illuminated, specifically where the bad activities are prevailing.

Source: Plan prepared by the scholar Plan not to scale.
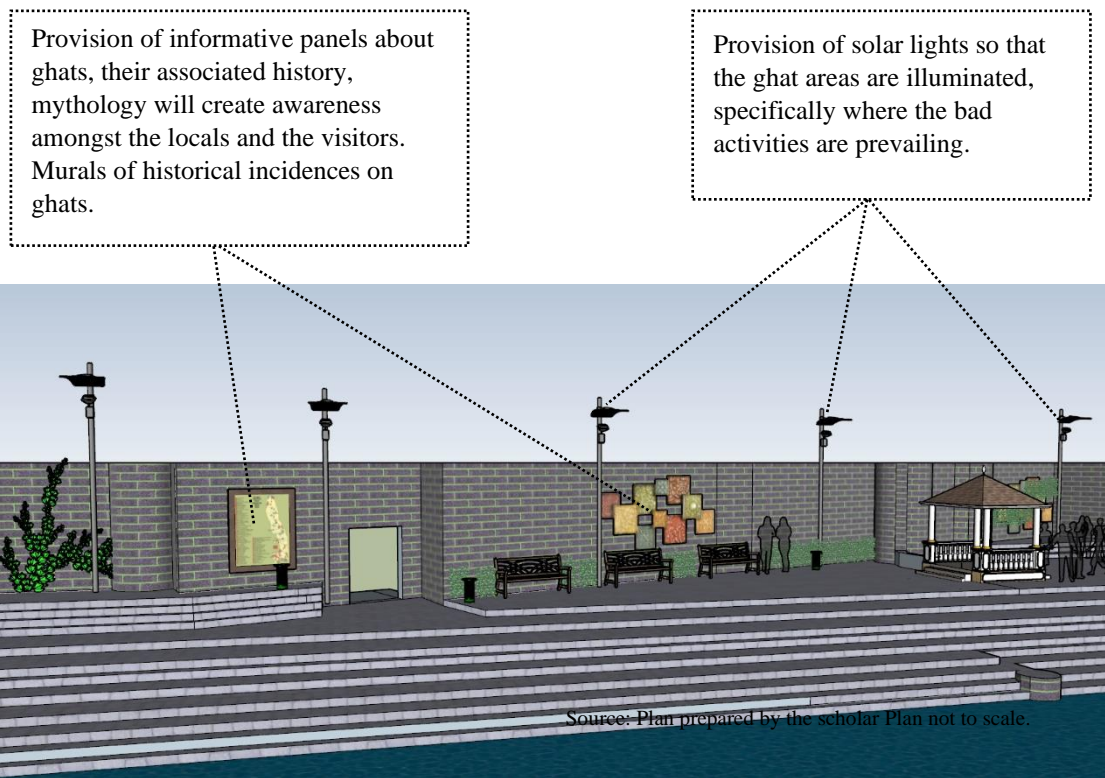
Figure 6.2: View of the ghats with the solar lights, seating spaces for public.
Source: View prepared by the scholar.

The steps on ghats have natural elements such as trees; these elements can be highlighted by turning them into seating spaces for the public. Clean and well-maintained ghats will attract more people leading to more vigilance and reducing the bad activities on ghats

Figure 6.3 Trees on ghats retained and space redesigned as gathering spaces for the users.

Source: View prepared by the scholar.

Local awareness amongst the young generation will be created through social media like Facebook and Instagram by heritage agencies, government bodies, and young local

activists. Heritage walks are to be planned by the heritage agencies or the local government body and highlighted on the social media platform. People participating in the walk will pay, generating income for the ghats.

2. Economic perspective:

The Ghat user-pay system can be initiated in the form of parking charges, entry fees to ghats, etc., by the ghat in charge. Adjacent ghat areas to be converted into public parks with entry tickets for revenue generation.

The proposed space for the informal income activity has been designed to minimise obstructing the vision of the ghats. Informal income activities for the poor should be regularised, and space should be designed and allotted for the vendors to sell commodities related to religious activities on ghats. These people are to be charged a nominal amount as the rent of the space to generate income for the ghats' maintenance. The riverfront spaces, which are meant for exhibiting and selling traditional goods, can act as a catalyst for the preservation of intangible facets of the city's history.

In order to adapt to kinetic urbanism, new structures must be founded on the grammar of old buildings and should be deployable rather than permanent and inflexible. During the monsoon, the ghat is flooded, and operations either stop or are moved to upper landings. By creating permanent structures, you run the risk of floods and structural damage that needs repair. Fixed constructions limit how spaces can be used in varied ways during the day or throughout the seasons. With the use of energy, deployable constructions can be changed from a stable, compact configuration to another, exhibiting the effective use of materials, energy, and space. Their portability and small weight make them suitable for the shifting environmental conditions.

Space allotment for the people for informal income activities on ghats.
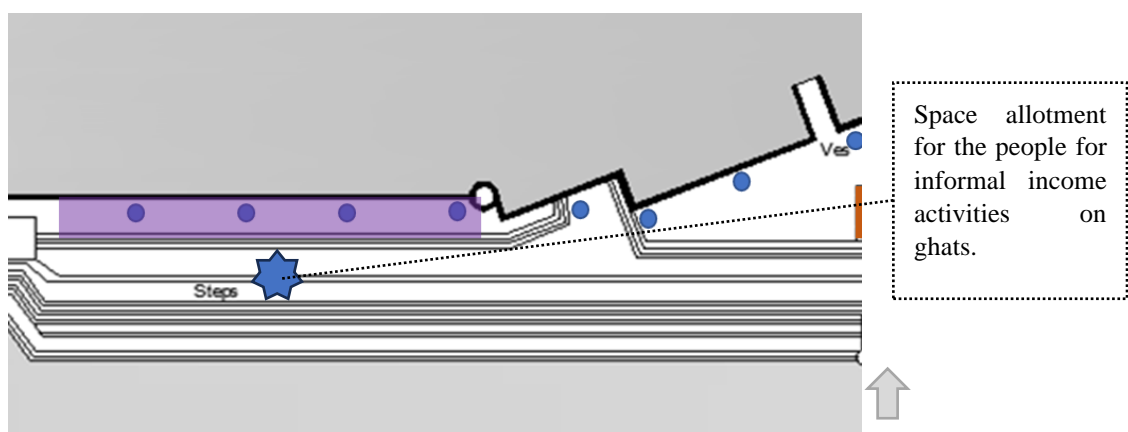
Figure 6.4 Plan of ghats showing the space allotted for informal activities.

Source: Plan prepared by the scholar. Not to scale

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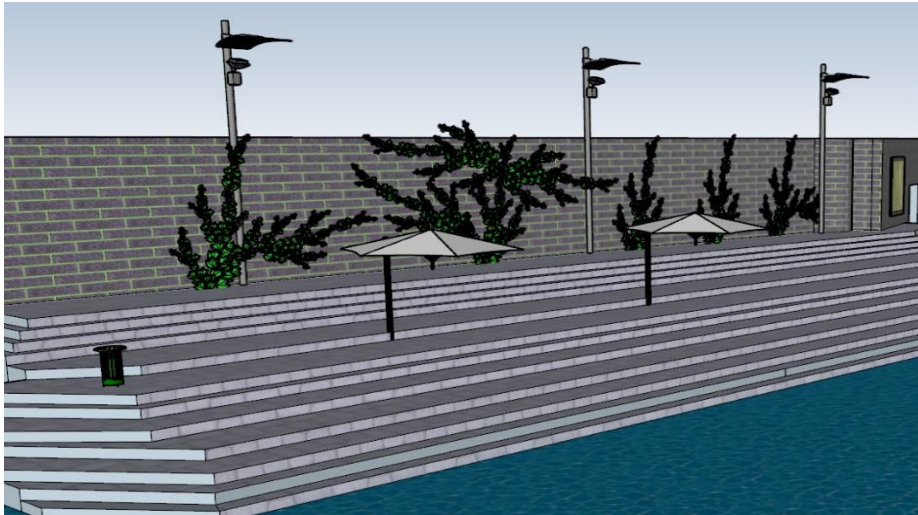
Figure 6.5 : View of the space with temporary structures for the vendors.

Source: View prepared by the scholar.

Funds from the government budget are to be allocated separately for ghats, and the utilization of those funds is strictly monitored by the in charge of the ghats. In the case of privately owned ghats, the funding is to be done by the owner abiding by the laws prepared for heritage. In the case of Larger Municipalities, Funds allotted for ghats are to be strictly used for ghats. Usage of funds to be monitored by any of the following bodies that apply to ghat:

- Heritage Cell in-charge.
- Public Works Department (PWD).
- Bhavan Rachna Department (Building projects dept)
- A formal audit of the funds is to be proposed at the department level.

3. Environmental perspective:

Cleaning staff to be appointed to collect solid waste from ghats daily by local governing bodies: Nagar Palika and Gram Panchayat. Use of dustbins to be promoted by placing dustbins at all locations. To be done by the owners, governing bodies, and trust responsible for ghats.

The riverbank can be transformed into a park with fountains, fake falls, play areas, grassy areas, water sports, flow channels, ponds, and other amenities. These parks would stop people from unintentionally dumping solid trash on the river banks and provide a beautiful view of the river, which would not only gain the public's respect but also encourage involvement and public awareness in the effort to keep the river clean.
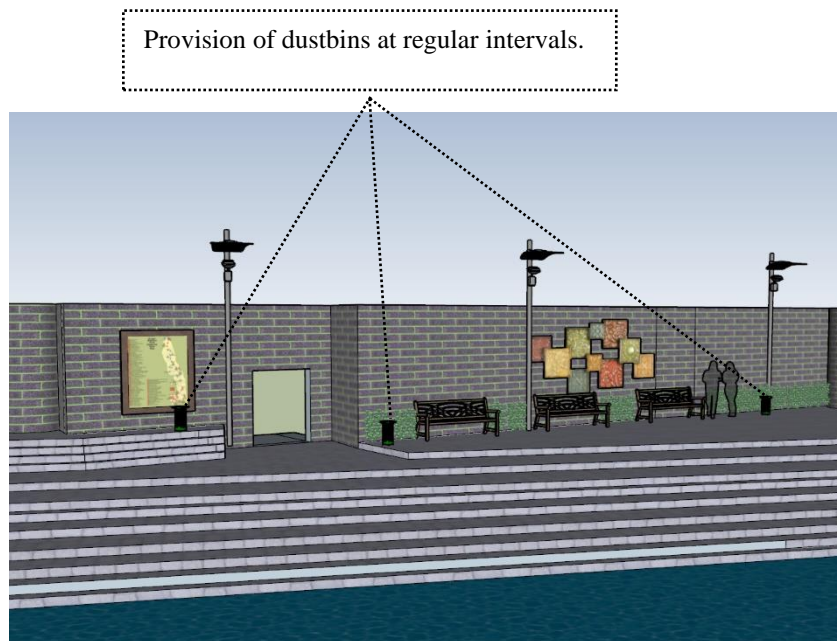
Figure 6.6: Provision of dustbins at places where people dump garbage. Source: View prepared by the scholar.

All ghats must be restored and conserved by the respective responsible body or people (Owner, trust, or governing body). Regular maintenance of ghats is to be made compulsory by including the clause in the heritage laws. Maintenance will occur under the Public Works Department (PWD) activity.

4. Institutional Perspective:

Ghats managed by the trust are sustainable from a social, economic, and environmental point of view.

Recommendations for ghats owned by trusts:

Promote trust formation; incentives can be given to the trust through taxes, waivers, etc. Creation of bye-laws for the trust to manage ghats. It will be abiding by the trust as well as a guideline for the trusts of ghats to manage the ghats in order. Impose a high penalty in a case where bye-laws not obeyed.

Recommendations for Private ghat owners:

Laws will be formulated in the municipality that will force the private owners to care for ghats. The law will allow private owners to formulate a trust. If owners do not obey the law, the municipality can take over the ghats and impose a heavy penalty on the

owners. Incentives in the form of Income-tax benefits can be given to owners to take care of ghats.

<u>Recommendations for ghats owned by government bodies:</u>

Listing of ghats as heritage structures to be undertaken on priority. External heritage agencies can be appointed for heritage listing. Heritage bye-laws to be prepared for the ghats separately by Heritage agencies or the local municipal heritage cell. Heritage Laws are to be made a part of municipal bye-laws to be obeyed by private owners, trusts, and municipal bodies.

Scope for future research:

This research studied the ghats on Krishna and Godavari rivers from a social, economic, and environmental perspective. Similar research can be conducted for other ghats on the rivers and other rivers in Maharashtra. Perceptions of local communities and visitors at other sites in different settings like rural and urban contexts may be challenging and give interesting results.

Many perspectives related to heritage sustainability have been listed; those perspectives which could not be included in this study due to the scope of study offer good scope for further research.

The research has given a direction for the study of ghats from a sustainability perspective. Further, more refined, and additional factors can be studied and developed.

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Glossary:

Adhyay: Section of a holy scripture

Ali: lane

Asthi visarjan immersion of ashes

Bhagvat gita: Krishna's teaching and revelation to the warrior Arjuna that forms part of the sixth book of Mahabharata.

Dashkriya vidhi: rites for the dead

Shraddha: rites for the dead

Dakshina: A gift to a priest for religious services, he offered

Ghats Steps leading to water

Kund: holy pond

Mahatmya: Sacred texts, part of Puranas to eulogize Gods and places associated with them.

Peshwas Prime ministers of the Maratha kings operated from Pune during the 17th and 18th Century.

Puranas: ancient Hindu scriptures

Samadhi: funerary monuments erected in memory of someone

Sant: Saint

Snaan: bathing

Tirtha: holy water, holy place

Upanishads: speculative teachings attached to Vedas, source of spiritual wisdom

Vedas sacred books compiled from divine revelations as received by the Sages.

Index: Questionnaire

9.1 Interview with Ghat users

How sustainable are the Ghats of Krishna and Godavari rivers from economic, social, and environmental perspective?

PhD Scholar: Ar. Avani Topkar

Mob. no: 8408868363

Email: topkaravani@gmail.com

This sample survey is a part of ongoing PhD Research on 'How sustainable are the ghats on river Krishna and Godavari from social, Economic and environmental point of view.by Ar. Avani Topkar, under the supervision of Dr. Tej Kumar Karki at Lovely Professional University, Punjab. The objective of the questionnaire is to understand the important factors affecting the sustainability of the ghats from social, economic and environmental point of view. In view to understand the factors the users of the ghats will be interviewed.

On-site Ghat Users

Location of the Ghats:

Name of the river:

No. of ghats in the stretch selected:

Date and time of visit:

1.What is the activity / purpose for which you have visited the Ghats?

2.How often do you visit Ghats?

3.For how long have you been visiting the Ghats?

4.What are the changes you have observed over a period of time?

5.What problems you have noticed in Ghats?

6.Do you find problems with solid waste management if so, what those problems are?

7.Do you see problems in river cleaning if so, what those problems are?

8.Are there problems in Ghat structure maintenance and if so, what are those?

9.Do you see proper use of Ghat funds and income?

10.Are there civil societies looking after the Ghats if so, how they are performing?

11.What needs to be done to improve the overall quality of Ghats?

12.What are the uses you find Ghats cater to?

13.Are the priests misusing the Ghats for money earning, is the ghat misused for

monetary benefits?

I have read the covering note of this survey form and I am aware about the objective of this survey. I am aware that the data collected through this survey will be used for the academic purpose. I am aware that the collected data will be used for research publications/ Research papers in seminars, conferences, journals and PhD research thesis. I am aware that my identity will not be disclosed and it will be kept private and anonymous. I ensure that information provided by me is true.

9.2 Interview of priest

How sustainable are the Ghats of Krishna and Godavari rivers from economic, social, and environmental perspective?

PhD Scholar: Ar. Avani Topkar

Mob. no: 8408868363

Email: topkaravani@gmail.com

This sample survey is a part of ongoing PhD Research on 'How sustainable are the ghats on river Krishna and Godavari from social, Economic and environmental point of view.by Ar. Avani Topkar, under the supervision of Dr. Tej Kumar Karki at Lovely Professional University, Punjab. The objective of the questionnaire is to understand the important factors affecting the sustainability of the ghats from social, economic and environmental point of view. In view to understand the factors the Priests on the ghats will be interviewed.

Priests on Ghats

Location of the Ghats:

Name of the river:

No. of ghats in the stretch selected:

Date and time of visit:

----

1.   Since how many years working as a priest on Ghats?

2.   What are the activities done by you on the Ghats?

3.   What changes have you noticed over the years on this Ghats?

4.   Who maintains the structure of Ghats?

5.   Are there civil societies looking after the Ghat cleanliness?

6.   What is the source of income for managing the Ghats?

7.   Who manages the solid waste piled up on the Ghats? How is the solid waste managed?

8.   How clean is the river water for bathing and ritual use?

9.   Is the Ghat getting degraded in recent years if so, what aspects are degraded?

10.   Is there caste discrimination observed on the usage of Ghats?

I have read the covering note of this survey form and I am aware about the objective of this survey. I am aware that the data collected through this survey will be used for the academic purpose. I am aware that the collected data will be used for research publications/ Research papers in seminars, conferences, journals and PhD research thesis. I am aware that my identity will not be disclosed and it will be kept private and anonymous. I ensure that information provided by me is true.

9.3 Interview of Government Official

How sustainable are the Ghats of Krishna and Godavari rivers from economic, social, and environmental perspective?

PhD Scholar: Ar. Avani Topkar
Mob. no: 8408868363
Email: topkaravani@gmail.com
This sample survey is a part of ongoing PhD Research on 'How sustainable are the ghats on river Krishna and Godavari from social, Economic and environmental point of view.by Ar. Avani Topkar, under the supervision of Dr. Tej Kumar Karki at Lovely Professional University, Punjab. The objective of the questionnaire is to understand the important factors affecting the sustainability of the ghats from social, economic and environmental point of view. In view to understand the factors the government officers will be interviewed. As institutional approach towards ghats and their sustainability is an important part of study.

Government officer: Part A

Location of the Ghats:

Name of the river:

Date and time of visit:

----

1. The Ghats comes under which zone of the city?

2. What aspects of Ghats do you administer?

3. Who looks after solid waste management and cleaning of Ghats?

4. What are the social issues observed on Ghats?

5. What measures are taken to keep the river clean?

6. Are there any NGO's working on the Ghats, if so how effective is their work?

7. Are there any government schemes being implemented for the Ghats?

8. What is the source of revenue for the ghat maintenance and conservation? Are

there any revenue generation projects for the Ghats?

9. Where the money comes from for the day to day maintenance of Ghats?

10. Do Ghats contribute in Revenue generation for the municipal bodies?

PART – B

1. What are the flood levels of the river?

2. Are the Ghats documented for any purpose? (Historical/Mythological/Geographical reasons)

3. Are there any drawings related to Ghats and their topography available?

4. How long have you been working in the area / in this department?

5. Is there any geographical data about the Ghats sites available?

I have read the covering note of this survey form and I am aware about the objective of this survey. I am aware that the data collected through this survey will be used for the academic purpose. I am aware that the collected data will be used for research publications/ Research papers in seminars, conferences, journals and PhD research thesis. I am aware that my identity will not be disclosed and it will be kept private and anonymous. I ensure that information provided by me is true.

9.4 Interview of Heritage expert

How sustainable are the Ghats of Krishna and Godavari rivers from economic, social, and environmental perspective?

PhD Scholar: Ar. Avani Topkar
Mob. no: 8408868363
Email: topkaravani@gmail.com
This sample survey is a part of ongoing PhD Research on 'How sustainable are the ghats on river Krishna and Godavari from social, Economic and environmental point of view.by Ar. Avani Topkar, under the supervision of Dr. Tej Kumar Karki at Lovely Professional University, Punjab. The objective of the questionnaire is to understand the important factors affecting the sustainability of the ghats from social, economic and environmental point of view. In view to understand the factors the heritage experts will be interviewed, to give insights on ghats. Their expert knowledge on the sustainability will be helpful for the study.

Interview of a Heritage expert.

Name and Location of the Ghats:

Name of river:

----

1. Do commercial activities on Ghats hamper / decay the cultural /social fabric of ghats?

2. How can various types of media increase the awareness about the Ghats in common people?

3. What is the heritage importance of Ghats?

4. What kind of action or tools do you expect should be implemented in order to assist the government in increasing awareness about the intangible heritage of Ghats?

5. Are there any existing rules/guidelines for the preservation / conservation of Ghats?

6. What are the possible sources to make the Ghats economically strong?

7. What do you think about the sustainability of the Ghats?

8. In current / present where do you see the problems in Ghats degradation.

9. In your opinion, which is the most eminent issue that should be addressed, in case of

Ghats? Say at least 3. Rank them in order.

a) economy
b) environment
c) Crime
d) Government and governance
e) Infrastructure
f) Cultural preservation

10. What are the social, economic, and environmental issues of the Ghats?

11. What are the UNESCO sustainable goals 2030? What are the implementations for

Ghats?

12. Is tourism on Ghats impacting the integrity of the Ghats?

13. Do Ghats belong to historic urban landscape or cultural landscape?

14. Name of the expert:

15. Qualification:

16. Area of expertise:

17. Years of experience in the said expertise:

18. Address of institute / organization:(workplace)

19.Email / Contact number:

I have read the covering note of this survey form and I am aware about the objective of this survey. I am aware that the data collected through this survey will be used for the academic purpose. I am aware that the collected data will be used for research publications/ Research papers in seminars, conferences, journals and PhD research thesis. I am aware that my identity will not be disclosed and it will be kept private and anonymous. I ensure that information provided by me is true.

9.5 Google form for rating score method:

Survey for the Ghats at Wai , on Krishna river

How sustainable are the Ghats of Krishna and Godavari rivers from economic, social, and environmental perspective?

PhD Scholar: Ar. Avani Topkar

Mob. no: 8408868363

Email: topkaravani@gmail.com

This sample survey is a part of ongoing PhD Research on 'How sustainable are the ghats on river Krishna and Godavari from social, Economic and environmental point of view.by Ar. Avani Topkar, under the supervision of Dr. Tej Kumar Karki at Lovely Professional University, Punjab. The objective of the questionnaire is to understand the important factors affecting the sustainability of the ghats from social, economic and environmental point of view. In view to understand the factors the users of the ghats will be interviewed.

Note:

Rate the following point from 1 to 5. Where 1 being worst and 5 being best.

If the state is worst then marks allotted to be 1 and if the state is best marks allotted to be 5.

If the answer to question is "YES" please rate the degree of problem, if the answer is no rate it as 5.

*Required

1. Name of the Interviewee. *

   _____

2. Address *

   _____

   _____

   _____

   _____

   _____

3. Contact number

   _____

4. Gender *

   Mark only one oval.

   ( ) Male

   ( ) Female

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5. 1.Rate the state of crime on the ghats *

crime : drinking alcohol, playing cards, drug users etc

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

6. 2.Discrimination of the priests or ghat management to ghat users *

caste discrimination, rich and poor discrimination

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

7. 3.Opportunity to poor for informal income activity in the ghat *

Selling of flowers, small objects for pooja etc

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

8. 4.Drug users in Ghat area *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

9. 5.Encroachment of Ghats *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

10. 6.Any other problem you would like to highlight. And how would you rate the problem from 1 to 5.

_____

_____

_____

_____

_____

Economic

11. 7. State of ghat maintenance revenue ? *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

12. 8.Judicious use of Ghat puja donation and daans. *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

13. 9.Trust for ghat maintenance *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

14. 10.Ghat user pay system *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

15.   11.Government Budget *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

Environmental point of view

16.   12.River pollution *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

17.   13.Waste management *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

18.   14.Cremation management *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

19.   15.Degradation of ghat structures *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

20. 16.Sewer disposal on the river *

Mark only one oval.

	1	2	3	4	5
	○	○	○	○	○

Institutional point of view

21. 17.Control of bad activities *

Mark only one oval.

	1	2	3	4	5
	○	○	○	○	○

22. 18.Regulating the activities of ghat users *

Mark only one oval.

	1	2	3	4	5
	○	○	○	○	○

23. 19.Construction and maintenance of ghats (conservation responsibility) *

Mark only one oval.

	1	2	3	4	5
	○	○	○	○	○

24. 20.Utilization of donations and daans *

Mark only one oval.

	1	2	3	4	5
	○	○	○	○	○

25. 21.Transparency of Puja dakchhina income *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

26. 22.Existence of local ghat management committee *

Mark only one oval.

	1	2	3	4	5
	◯	◯	◯	◯	◯

27. I have read the covering note of this survey form and I am aware about the objective of this survey. I am aware that the data collected through this survey will be used for the academic purpose. I am aware that the collected data will be used for research publications/ Research papers in seminars, conferences, journals and PhD research thesis. I am aware that my identity will not be disclosed and it will be kept private and anonymous. I ensure that information provided by me is true. *

Tick all that apply.

☐ I agree to participate in this study by filling true information in above survey form.

Ghat wise responses received by scoring rating method:

Responses of onsite users for a scoring method: Wai ghats

Users	Social					Economic					Environmental					Institutional					
	1. Rate the state of crime on the ghats	2. Discrimination of the priests or ghat management to ghat users	3. Opportunity to poor for informal income activity in the ghat	4. Drug users in Ghat area	5. Encroachment of Ghats	7. State of ghat maintenance revenue?	8. Judicious use of Ghat puja donation and daana.	9. Trust for ghat maintenance	10. Ghat user pay system	11. Government Budget	12. River pollution	13. Waste management	14. Cremation management	15. Degradation of ghat structures	16. Sewer disposal on the river	17. Control of bad activities	18. Regulating activities of ghat users	19. Construction and maintenance of ghats (conservation responsibility)	20. Utilization of donations and daana	21. Transparency of Puja dakchhina income	22. Existence of local ghat management committee
1	2	4	3	2	4	2	3	4	1	2	2	1	4	1	1	4	4	1	2	2	4
2	2	3	4	2	4	2	2	4	1	2	1	1	4	1	1	2	4	2	1	1	4
3	2	4	3	2	4	2	3	4	1	3	1	2	4	2	2	4	3	2	2	2	4
4	4	4	4	3	4	2	2	3	1	2	1	1	4	1	1	3	2	2	2	2	4
5	3	4	2	4	4	3	3	4	1	3	2	3	4	3	1	3	4	2	4	4	4
6	3	4	2	2	2	2	2	4	1	1	1	2	4	1	1	2	3	2	1	1	4
7	2	4	2	2	2	2	1	4	1	2	1	1	4	1	1	2	3	2	1	1	4
8	2	4	3	2	2	1	2	4	1	2	1	2	4	1	1	2	3	2	2	1	4
9	2	4	3	1	2	1	2	3	1	2	1	1	4	1	1	2	3	2	1	1	3
10	2	5	1	4	2	3	3	1	1	1	3	1	1	1	1	3	3	2	1	1	3
11	3	1	3	3	2	3	4	2	1	1	1	2	4	1	1	4	2	3	2	1	1
12	3	3	2	1	1	1	3	4	1	1	1	1	4	2	2	3	1	3	2	2	2
13	2	3	3	2	3	2	1	4	1	3	3	2	4	2	1	2	3	2	2	2	4
14	2	1	3	1	3	3	2	2	1	1	2	3	3	2	3	2	2	4	3	1	2
15	2	2	4	2	4	3	2	4	1	1	1	1	2	3	3	4	4	3	2	1	4
Mean	2.4	3.3	2.8	2.2	2.87	2.2	2.3	3.4	1	1.8	1.47	1.6	3.6	1.53	1.4	2.8	2.9	2.27	1.8	1.5	3.4
Median	2	4	3	2	3	2	2	4	1	2	1	1	4	1	1	3	3	2	2	1	4

Responses of onsite users for a scoring method: Mahuli ghats

| | Social | | | | | Economic | | | | | Environment | | | | | Institutional | | | | | |
Users	1.Rate the state of crime on the ghats	2.Discrimination of the priests or ghat management to ghat users	3.Opportunity to poor for informal income activity in the ghat	4.Drug users in Ghat area	5.Encroachment of Ghats	7.How is the State of ghat maintenance revenue?	8.Judicious use of Ghat puja donation and classes	9.Trust for ghat maintenance	10.Ghat user pay system	11.Government Budget	12.River pollution	13.Waste management	14.Cremation management	15.Degradation of ghat structures	16.Sewer disposal on the river	17.Control of bad activities	18.Regulating the activities of ghat users	19.Construction and maintenance of ghats (conservation responsibility)	20.Utilization of donations and classes	21.Transparency of Puja dakshina income	22.Existence of local ghat management committee
1	4	4	1	3	4	1	1	1	1	1	1	1	4	1	1	1	2	1	1	1	1
2	2	4	1	1	1	1	1	1	1	3	1	1	4	1	1	1	2	1	1	1	1
3	3	4	1	3	1	1	1	2	1	1	1	1	4	1	1	3	3	1	1	1	1
4	4	4	1	3	2	1	1	1	1	1	2	1	4	1	1	3	3	1	2	2	2
5	4	4	2	4	3	2	2	3	1	1	2	3	4	2	1	3	2	2	2	2	2
6	1	1	5	1	1	2	2	2	1	1	2	3	5	3	3	1	4	2	3	3	1
7	2	2	3	3	1	3	2	3	1	2	4	4	5	3	2	3	3	2	3	3	4
8	4	4	1	1	3	1	1	2	1	1	2	1	4	3	3	1	4	2	1	1	3
9	1	1	5	1	1	2	2	2	1	1	2	3	4	3	3	1	4	2	2	2	1
10	1	1	5	1	1	2	2	2	1	1	2	3	5	3	3	1	4	2	3	3	1
11	1	1	5	1	1	2	2	2	1	1	2	3	5	3	3	1	4	2	3	3	1
12	1	1	5	1	1	2	2	2	1	1	2	3	5	3	3	1	4	2	1	1	1
13	1	1	5	1	1	2	2	2	1	1	2	3	5	2	2	1	4	2	1	1	2
14	1	4	5	1	1	2	2	2	1	1	2	1	4	3	3	1	4	2	1	1	1
15	1	4	5	1	1	2	2	2	1	1	2	1	4	3	3	1	4	2	1	1	1
Mean	2.07	2.67	3.33	1.73	1.53	1.73	1.67	1.93	1.00	1.20	1.93	2.00	4.40	2.33	2.20	1.53	3.40	1.73	1.73	1.73	1.53
Median	1	4	5	1	1	2	2	2	1	1	2	1	4	3	3	1	4	2	1	1	1

Responses of onsite users for a scoring method: Narsobachiwadi ghats

Users	Social					Economic					Environment					Institutional					
	1.Rate the state of crime on the ghats	2.Discrimination of the priests or ghat management to ghat users	3.Opportunity to poor for informal income activity in the ghat	4.Drug users in Ghat area	5.Encroachment of Ghats	7.How is the State of ghat maintenance revenue ?	8.Judicious use of Ghat puja donation and daans.	9.Trust for ghat maintenance	10.Ghat user pay system	11.Government Budget	12.River pollution	13.Waste management	14.Cremation management	15.Degradation of ghat structures	16.Sewer disposal on the river	17.Control of bad activities	18.Regulating the activities of ghat users	19.Construction and maintenance of ghats (conservation responsibility)	20.Utilization of donations and daans	21.Transparency of Puja dakchhina income	22.Existence of local ghat management committee
1	5	4	4	5	3	4	4	5	5	2	4	5	3	4	4	4	4	5	4	4	4
2	5	3	4	5	3	4	3	5	4	2	1	5	5	4	4	4	4	5	4	1	4
3	5	3	5	5	4	4	5	5	4	2	5	5	5	3	5	5	5	5	5	5	5
4	5	3	3	5	4	3	3	5	4	2	3	5	4	4	5	3	3	5	3	3	4
5	5	2	3	5	4	4	4	5	4	2	5	5	4	4	3	3	3	5	3	5	5
6	5	5	4	5	4	4	5	5	4	2	5	5	4	4	4	5	4	5	5	5	5
7	5	5	4	5	5	4	3	5	3	2	4	4	4	5	5	4	4	5	4	4	5
8	5	2	4	5	4	5	3	5	5	2	3	5	4	4	4	4	4	5	4	4	5
9	5	4	4	5	4	3	4	5	4	2	5	5	3	4	4	4	4	5	4	5	4
10	5	2	4	5	4	4	3	5	4	2	3	5	4	3	4	5	4	5	5	3	5
11	5	4	4	5	4	4	3	5	3	2	3	5	4	5	4	4	4	5	4	4	5
12	5	5	5	5	4	5	4	5	4	2	2	5	4	4	4	4	5	5	4	2	4
13	5	2	4	5	4	4	3	5	4	2	5	5	4	4	5	5	5	5	5	5	5
14	5	5	4	5	4	4	4	5	4	2	5	4	4	4	4	4	4	5	5	5	4
15	5	4	4	5	5	4	3	5	4	2	3	5	4	4	4	4	4	5	4	3	4

	Social					Economic					Environment					Institutional					
Mean	5	3.5	4	5	4	4	3.6	5	4	2	3.7	4.9	4	4	4.2	4.1	4	5	4.2	3.9	4.5
Median	5	4	4	5	4	4	3	5	4	2	4	5	4	4	4	4	4	5	4	4	5

Responses of onsite users for a scoring method: Someshwar ghats

Users	Social					Economic					Environment					Institutional					
	1.Rate the state of crime on the ghats	2.Discrimination of the priests or ghat management to ghat users	3.Opportunity to poor for informal income activity in the ghat	4.Drug users in Ghat area	5.Encroachment of Ghats	6.How is the State of ghat maintenance revenue?	7.Judicious use of Ghat puja donation and dana	8.Trust for ghat maintenance	9.Ghat user pay system	10.Government Budget	11.River pollution	12.Waste management	13.Cremation management	14.Degradation of ghat structures	16.Sewer disposal on the river	17.Control of bad activities	18.Regulating the activities of ghat users	19.Construction and maintenance of ghats (conservation responsibility)	20.Utilization of donations and dana	21.Transparency of Puja dakchhina income	22.Existence of local ghat management committee
	5	5	2	5	3	2	2	4	4	3	3	4	5	3	5	4	4	3	2	2	5
	5	4	4	4	3	4	2	5	4	4	3	4	4	3	4	5	5	3	2	2	4
	4	5	5	4	3	4	3	5	5	3	2	5	5	2	3	5	5	3	3	3	5
	5	3	5	4	2	4	3	4	4	3	2	4	5	2	4	4	5	3	2	1	4
	5	4	4	3	4	4	2	5	3	3	3	5	5	3	4	4	5	3	3	2	5
	5	5	3	5	5	2	2	4	5	3	2	4	5	3	4	5	4	3	3	3	4
	3	5	4	4	3	3	3	5	5	4	3	5	5	3	4	5	4	3	3	3	5
	5	5	3	3	3	4	2	4	4	4	3	5	5	3	3	4	5	1	4	3	5
	5	5	5	5	2	3	2	5	4	3	2	4	5	2	3	5	5	4	2	3	5
	4	5	3	5	1	2	2	5	4	3	2	5	4	3	4	5	5	3	2	2	4
	5	5	2	5	3	4	2	5	4	4	3	4	5	3	4	5	4	3	2	2	5
	5	5	5	5	3	2	3	5	4	4	4	3	4	4	4	5	5	3	2	1	5
	5	5	3	4	3	4	3	5	5	3	3	5	5	2	4	5	5	4	2	3	5
	5	5	3	4	4	4	2	5	5	3	3	3	5	2	5	5	5	3	2	2	5
	5	5	4	4	3	4	2	5	5	3	3	5	4	3	5	5	5	3	2	3	5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	20	21	22
Mean	4.7	4.7	3.7	4.3	3.0	3.3	2.3	4.7	4.3	3.3	2.7	4.3	4.7	2.7	4.0	4.7	4.7	3.0	2.3	2.3	4.7
Median	5	5	4	4	3	4	2	5	4	3	3	4	5	3	4	5	5	3	2	2	5

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Responses of onsite users for a scoring method: Ramkund, ghats

	Social					Economic					Environment					Institutional					
User no	1. Rate the state of crime on the ghats	2. Discrimination of the priests or ghat management to ghat users	3. Opportunity to poor for informal income activity in the ghat	4. Drug users in Ghat area	5. Encroachment of Ghats	6. How is the State of ghat maintenance revenue?	7. Judicious use of Ghat puja donation and daans.	8. Trust for ghat maintenance	9. Ghat user pay system	10. Government Budget	11. River pollution	12. Waste management	13. Cremation management	14. Degradation of ghat structures	16. Sewer disposal on the river	17. Control of bad activities	18. Regulating the activities of ghat users	19. Construction and maintenance of ghats (conservation responsibility)	20. Utilization of donations and daans	21. Transparency of Puja dakchhina income	22. Existence of local ghat management committee
1	2	2	4	1	1	2	3	2	1	1	4	3	3	2	3	1	3	2	3	1	3
2	1	1	1	3	1	4	1	1	1	1	3	1	1	1	4	1	2	2	1	1	1
3	3	2	4	4	2	3	4	2	2	4	3	2	3	4	2	2	4	2	1	3	3
4	3	2	5	4	5	3	3	3	1	4	3	3	3	3	3	3	3	3	3	3	3
5	4	4	3	2	1	3	3	4	3	3	4	2	2	2	4	5	1	1	1	1	3
6	3	4	5	1	3	5	5	3	3	3	2	4	5	2	2	5	5	3	3	1	3
7	4	3	5	3	2	4	3	1	1	1	4	3	2	4	5	1	3	3	3	3	3
8	3	2	4	3	3	1	1	1	1	5	3	1	2	3	5	3	2	2	1	1	3
9	3	4	2	3	3	3	3	2	3	3	5	2	3	4	4	3	3	3	3	2	3
10	3	2	4	3	4	4	4	4	2	4	3	4	4	3	3	4	4	5	4	3	3
11	3	2	4	1	2	3	2	2	1	3	2	4	4	2	4	2	2	3	2	1	3
12	1	3	3	3	3	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1	1
13	3	4	4	3	5	4	4	3	1	4	5	3	2	5	5	3	3	5	4	3	3
14	3	1	2	3	4	2	3	2	2	3	3	2	2	3	1	4	3	5	3	1	3
15	4	3	3	4	1	2	1	1	1	1	3	2	3	3	3	2	3	2	1	1	1

	Social					Economic					Environment					Institutional					
MEAN	2.87	2.60	3.53	2.73	2.67	2.93	2.73	2.13	1.60	2.73	3.20	2.47	2.67	2.80	3.27	2.67	2.80	2.80	2.27	1.73	2.60
Median	3	2	4	3	3	3	3	2	1	3	3	2	3	3	3	3	3	3	3	1	3

Responses of onsite users for a scoring method: Paithan, ghats

Users	Social					Economic					Environment					Institutional					
	1.Rate the state of crime on the ghats	2.Discrimination of the priests or ghat management to ghat users	3.Opportunity to poor for informal income activity in the ghat	4.Drug users in Ghat area	5.Encroachment of Ghats	6.How is the State of ghat maintenance revenue?	7.Judicious use of Ghat puja donation and daans.	8.Trust for ghat maintenance	9.Ghat user pay system	10.Government Budget	11.River pollution	12.Waste management	13.Cremation management	14.Degradation of ghat structures	16.Sewer disposal on the river	17.Control of bad activities	18.Regulating the activities of ghat users	19.Construction and maintenance of ghats (conservation responsibility)	20.Utilization of donations and daans	21.Transparency of Puja dakchhina income	22.Existence of local ghat management committee
1	4	2	4	4	4	4	4	4	2	4	4	4	4	4	4	4	4	4	4	4	4
2	4	2	1	2	1	4	4	2	2	2	1	4	4	4	1	1	3	4	1	2	4
3	3	2	5	5	5	5	5	2	2	4	5	5	5	5	5	5	5	5	5	2	5
4	3	3	3	3	3	5	4	3	2	3	3	4	4	4	3	3	3	4	3	3	4
5	3	3	5	5	5	3	5	3	3	5	5	4	5	4	5	5	4	4	5	3	4
6	3	3	5	5	5	4	5	3	1	5	5	4	5	3	5	5	5	5	5	3	3
7	5	4	4	3	4	4	5	4	2	4	5	5	5	4	4	4	3	4	4	4	4
8	4	3	5	4	5	4	4	2	2	5	5	4	4	4	5	5	4	4	5	2	3
9	5	2	3	3	3	4	3	3	3	3	3	4	4	4	3	3	4	4	4	3	4
10	5	3	4	3	4	4	5	4	2	4	4	4	5	4	3	3	3	4	4	4	4
11	4	4	2	2	2	4	5	2	2	2	2	5	5	4	2	3	4	4	2	2	4
12	5	4	5	5	5	5	5	3	2	5	5	5	5	5	5	5	3	5	5	3	5
13	4	3	5	5	5	4	4	3	1	5	5	4	4	4	5	5	4	4	5	3	4
14	4	2	3	3	3	4	4	3	3	3	3	4	4	4	3	3	3	4	3	4	4
15	5	3	4	4	4	5	5	3	3	4	4	4	5	5	4	4	3	5	4	3	5

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	16	17	18	19	20	21	22
Mean	4.07	2.87	3.87	3.73	3.87	4.20	4.47	2.93	2.13	3.87	3.93	4.27	4.53	4.13	3.80	3.87	3.67	4.27	3.93	2.93	4.07
Median	4	3	4	4	4	4	5	3	2	4	4	4	5	4	4	4	4	4	4	3	4

Mean calculation per users for calculation of correlation between Institutional and social, economic and environmental perspectives.

Wai Ghats

User	Social	Economic	Environment	Institutional
1	3	2.4	1.8	2.83
2	3	2.2	1.6	2.33
3	3	2.6	2.2	2.83
4	3.8	2	1.6	2.50
5	3.4	2.8	2.6	3.50
6	2.6	2	1.8	2.17
7	2.4	2	1.6	2.17
8	2.6	2.2	1.8	2.33
9	2.4	1.8	1.6	2.00
10	2.8	1.8	1.4	2.17
11	2.4	2.2	1.8	2.00
12	2	2	2	2.17
13	2.6	2.2	2.4	2.50
14	2	1.8	2.6	2.33
15	2.8	2.2	2	3.00

Mahuli Ghats

User	Social	Economic	Environment	Institutional
1	3.2	1	1.6	1.17
2	1.8	1.4	1.6	1.17
3	2.4	1.2	1.6	1.67
4	2.8	1	1.8	2.17
5	3.4	1.8	2.6	2.17
6	1.8	1.6	3.2	2.33
7	2.2	2.2	3.6	3.00
8	2.6	1.2	2.6	2.00
9	1.8	1.6	3	2.00
10	1.8	1.6	3.2	2.33
11	1.8	1.6	3.2	2.33
12	1.8	1.6	3.2	1.67
13	1.8	1.6	2.8	1.83
14	2.4	1.6	2.6	1.67
15	2.4	1.6	2.6	1.67

Narsobawadi Ghats

User	Social	Economic	Environment	Institutional
1	4.2	4	4	4.17
2	4	3.6	3.8	3.67
3	4.4	4	4.6	5.00
4	4	3.4	4.2	3.50
5	3.8	3.8	4.2	4.00
6	4.6	4	4.4	4.83
7	4.8	3.4	4.4	4.33
8	4	4	4	4.33
9	4.4	3.6	4.2	4.33
10	4	3.6	3.8	4.50
11	4.4	3.4	4.2	4.33
12	4.8	4	3.8	3.83
13	4	3.6	4.6	5.00
14	4.6	3.8	4.4	4.50
15	4.6	3.6	3.8	4.00

Someshwar ghats

User	Social	Economic	Environment	Institutional
1	4	3	4	3.33
2	4	3.8	3.6	3.50
3	4.2	4	3.4	4.00
4	3.8	3.6	3.4	3.17
5	4	3.4	4	3.67
6	4.6	3.2	3.6	3.67
7	3.8	4	4	3.83
8	3.8	3.6	3.8	3.67
9	4.4	3.4	3.2	4.00
10	3.6	3.2	3.6	3.50
11	4	3.8	3.8	3.50
12	4.4	3.6	3.8	3.33
13	4.2	4	3.8	4.00
14	4.2	3.8	3.6	3.67
15	4.2	3.8	4	3.83

Ramkund, Nashik ghats

User	Social	Economic	Environment	Institutional
1	2	1.8	3	2.17
2	1.4	1.6	2	1.33
3	3	3	2.8	2.50
4	3.8	2.8	3	3.00
5	2.8	3.2	2.8	2.00
6	3.2	3.8	3	3.33
7	3.4	2	3.6	2.67
8	3	1.8	2.8	2.00
9	3	2.8	3.6	2.83
10	3.2	3.6	3.4	3.83
11	2.4	2.2	3.2	2.17
12	2.6	1	1	1.00
13	3.8	3.2	4	3.50
14	2.6	2.4	2.2	3.17
15	3	1.2	2.8	1.67

Paithan ghats

User	Social	Economic	Environment	Institutional
1	3.6	3.6	4	4.00
2	2	2.8	2.8	2.50
3	4	3.6	5	4.50
4	3	3.4	3.6	3.33
5	4.2	3.8	4.6	4.17
6	4.2	3.6	4.4	4.33
7	4	3.8	4.6	3.83
8	4.2	3.4	4.4	3.83
9	3.2	3.2	3.6	3.67
10	3.8	3.8	4	3.67
11	2.8	3	3.6	3.17
12	4.8	4	5	4.33
13	4.4	3.4	4.4	4.17
14	3	3.4	3.6	3.33
15	4	4	4.4	4.00

List of publications:

SNO.	TITLE OF PAPER WITH AUTHOR NAMES	NAME OF JOURNAL / CONFERENCE	PUBLISHED DATE	ISSN NO/ VOL NO, ISSUE NO
1.	SUSTAINABILITY ASSESSMENT OF GHATS ON KRISHNA AND GODAVARI RIVERS.	Journal of East China University of Science and Technology. Scopus indexed	Aug 8, 2022	Volume 65, Issue 3, 2022 (ISSN: 1006-3080)
2.	REVIEW OF RESEARCH OF GHATS IN INDIA. Avani Topkar	Shodh Sarita UGC care listed	30-3-2021	ISSN: 2348:2397 Vol.no: 8 Issue no: 29 January to March 2021
3.	How Sustainable are the Ghats of Krishna and Godavari rivers? Avani Topkar	Nepal urban dialogue 2020: national conference on sustainable-resilient cities and municipalities.	Presentation on 31st October and 1st November 2020	

4.	The spatial and formal design language of the cultural landscape with case of Mahuli ghats, Satara Avani Topkar	National conference (NCEI-2020) Envisioning India 2050- concerns of urban environment	Paper presented 23rd and 24th January 2020. Published in proceedings of conference.	ISBN: 978-81-929293-1-6
4.	REVIEW OF RESEARCH OF GHATS IN INDIA. Avani Topkar	National students conference research in architecture 3rd edition.	Paper presented. 7th and 8th May 2021	