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RE-FRAMING HISTORIC AGRA: RESIDENT CENTRAL DESIGN RECOMMENDATIONS FOR THE YAMUNA RIVER AT AGRA, INDIA

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RE-FRAMING HISTORIC AGRA:
RESIDENT CENTRAL DESIGN RECOMMENDATIONS FOR
THE YAMUNA RIVER AT AGRA, INDIA

A Thesis
Presented to
the Graduate School of
Clemson University

In Partial Fulfillment
of the Requirements for the Degree
Master of Landscape Architecture

by
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Accepted by:
Dr. Matthew Powers, Committee Chair
Dr. Hala Nassar
Dr. Thomas Schurch
ABSTRACT

The Yamuna River has religious significance in India. Its landscape evolved based on the cultural philosophies of Hindus and Islam. The current rapid urbanization in India affects the river, resulting in utilitarian drain. This study recognizes that extensive contamination is harmful for the physical and the cultural values along the river. Therefore, a new plan for the design and management of the river is needed. To create new sustainable model, qualitative and quantitative methods were used in the conservation of both the intangible and the tangible values in the region. The 105 surveys responses and interviews from the residents of Agra illustrate that the contamination is causing social behavioral changes which are detrimental to the religious practices along the river. Moreover, this study highlights a lack of public participation during the design process through the analysis of three representative proposals developed by decision makers. Furthermore, their recommendations partially conflict with the residents’ desires.

The proposed guidelines focus on three areas, the spiritual importance of the river, its architectural character, and the residents’ concerns. The findings of this study have been applied to a site along the heritage district in Agra between Itmad-ud-Daula and Ram Bagh. This proposal is based on the urban conservation model inspired from design precedent studies. Overall, the results of this study are intended to resolve issues in the selected area as well as being replicable to all affected areas along the Yamuna River.
DEDICATION

This thesis is dedicated to my parents for their endless support and encouragement.
ACKNOWLEDGMENTS

First, I would like to thank my family. They always encourage me to take challenges, constantly supporting throughout my career. My father R. M. Badwe, not only came to see me when I was in India conducting this research but guided me during a very crucial stage.

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CHAPTER ONE

INTRODUCTION

Yamuna River originates in the Yamunotri, high in the glaciers of the Himalayan Mountains and confluences into the holy river Ganges in Allahabad. According to ancient Hindu scriptures this divine river is also named Yami the sister of Yama, the god of death and the daughter of Surya, the Sun god. The largest tributary of the Ganges, It flows through various states including Uttarakhand, Haryana, Uttar Pradesh, Himachal Pradesh and India’s capital Delhi in northern India. Along its length of 855 miles it shows cultural landscapes, social functions, religious rituals, various architectural styles, and landscape representing several ancient civilizations. As this list suggests, the fertile land of the Yamuna has attracted various civilizations and shaped which base changes in civilizations throughout history. Diverse cultures perceive the river in differently based on their philosophies, the Islamic approach to the Yamuna River being symbolic, while the religious attitude of Hindus towards the river is approaching the water. “They capture divinity into everyday life and deities inhabited the landscape and built environment around them so that the landscape was more than an object of vision” (Sinha and Ruggles 2004, 142).

Architecturally the Taj Mahal, the Agra fort and several other monuments exhibit Islamic styles along as is the cities of Delhi and Agra the banks of the Yamuna. Mathura and Allahabad holy Hindu cities, display Hindu architecture and planning. These religious beliefs along with cultural activities shaped the human experience of the landscape and the relationship between the built form and the land and river.
1.1 Development of Delhi, Mathura and Agra the Yamuna River

Delhi, the capital of India is located in the middle of the Indian subcontinent along Yamuna River having an area of 1483 square meters. It is named after Raja Dillu, from the member of Maurya period who reigned in first century B.C. According to Indian mythological records, it is built on the site of Indraprastha. City constructed by King Yutishdhira, the eldest of the pandavas who are heroes of Hindu epic Mahabharata. As the ancient scriptures explains, Indraprastha was well-planned and well-laid out garden city with wide streets, towers impressive buildings, charming gardens, pleasure houses and lakes allies with crystal clear water. Hindu scriptures including Vedas, Geeta and verses from Hindu epics explain the sentiments associated with the Yamuna River creating a bond between religion and ecology. “The Gita introduces the theological
framework of understanding the religious thoughts that informs much worship of the Yamuna River. The Gita is clearly at the heart of many ecological considerations in India” (Haberman 2006, 29).

The famous British architect Edwin Lutyens was commissioned to design Delhi with Herbert Baker being responsible for designing the buildings of New Delhi, particularly, those of the secretariat. Lutyens loved beautiful, grand features. According to Gerald Breese, author of Urban and Regional Planning for Delhi and the New Delhi area explains, New Delhi as a perfect example of western transplant with little relation to the cultural environment (Gerald Breese 1974). New Delhi was designed based on the garden city concept, a geometric pattern incorporating modified hexagons, triangles, squares, trapezoids and circles connecting old monuments with grand vistas.

The first degeneration of cities occurred with the massive influx of the people who came to Delhi when partition of India and Pakistan was imposed in 1947. At that time, the population increased almost two hundred percent. The master plan of Delhi was began in 1956, the first attempt in India to restructure the urban form. The Yamuna allowed passage from Calcutta to Delhi until the independence. In 1990 rapid economic development and the accent of modern technology, water consumption increased drastically causing a decline rapid decline in its quality and flow. After Delhi, Yamuna flows through Vrindavan, Braj, Gokul and Mathura a Hindu holy city. Although the water was polluted, the river was still celebrated a goddess (Haberman 2006).

Currently, Delhi is a metropolitan city, one of the most densely populated in the world. The development along the river along with the expansion within the flooded area
in Delhi has caused environmental problems. Agra is a tourist attraction because of the Taj Mahal and several other monuments, welcoming four million people every year. The city which exemplifies Islamic influence has begun to adopt new modern structural styles and businesses. The large number of tourist have influence the architecture and urban landscape of this region. The increasing numbers of industries have drained toxic elements into the river causing major problems in the agricultural fields and to the Taj Mahal. Mathura, on the other hand exhibits Hindu influence either Delhi or Agra. This divine city still maintains its ancient natural environment and religious practices. The populating 60 million depends on the Yamuna River basin.

![Figure 1.2: Location of Delhi, Agra and Mathura along the Yamuna River](image)
1.2 Pollution levels in the Yamuna River

The Ministry of Environment and Forest categorizes the river into five segments based on ecological and environmental conditions. In Himalayan segment from Yamunotri to Tajawala Bridge (108 miles), the water is pristine since few pesticides and little modern technology are used in this region. The upper segment from the Tajewala Barrage to the Wazirabad barrage (138 miles) diverts the water to Uttar Pradesh and Haryana into two canals, one for irrigation and, one for domestic purposes. The green revolution in this area has caused an increase in water usage, pesticides, and chemical fertilizers, causing the environmental degradation of the river. Research has focused on increase in salinity in irrigation areas because of water logging, thereby reducing the self-purification process of the river (Haberman 2006). The Wazirabad barrage to Okhla barrage includes the Delhi segment (14 miles), which studies of this area finding the dissolved oxygen required for ecology at nearly zero and the biochemical oxygen demand exceeding health limits. When the water enters Nizamuddin Bridge, it becomes black because of organic waste, chemical components and harmful elements (Datta 1992; Haberman 2006).

The fourth segment includes the Okhla barrage to confluence with the Chambal River (303 miles), and the final segments include the Chambal confluence with the Ganges River in Allahabad (290 miles). The issues below Delhi because of the sewage and untreated waste water is adds water containing untreated sewage and industrial waste water. Here this water is reported to be ‘septic’ and ‘eutrophic’ and more specifically, involving “severe odor problems and an ugly, especially in the vicinity of Delhi,
Mathura–Vrindavan, Bateshwar and the world heritage sites of Agra” (Haberman 2006, 89).

Dr. David Haberman, River of Love in an Age of Pollution: the Yamuna River in the Northern India details the influence of religion on the ecology through his personal experiences. As of travelling several times from the origin of the river to the Allahabad his experiences reveals, the religious cultural secret rivers in India offer a unique avenue of approaching environmental restoration (Haberman 2006).

1.3 Problem statement

After the 1991, economic reforms, India became the second fastest growing economy in the world, attracting new business and populations from the surrounding areas. This rapid development transformed its ancient cities and becoming, threatening the rivers including the Yamuna. This river and surrounding region faces three major concerns: regional scale problems, ecological issues, and the adoption of new architecture styles in the ancient city. These factors caused the flooding’s in the Yamuna River in 2010, damaging to the foundations of the Taj Mahal as well as several other monuments and cities along the banks of the Yamuna. The Indian government is taking initiatives to clean the river. However, these steps seem to be a temporary solution to the environmental problems. The river needs a holistic, permanent solution to its environmental degradation to preserve these ancient antiquities.
According to quantitative research studies, Delhi, Mathura and Agra are affected by pollution in the river which in turn impacts the urban development of these cities. The literature suggests, the problems in Delhi can be solved through various avenues of financial resources, institutions, technology, infrastructure and initiatives from the governmental as well as from non-governmental organizations. In Mathura, the pollution problems are not as severe as it is in Delhi and Agra. There people interact with the river as they practicing the religious ceremonies. In additions various organizations are taking initiative to protect the river, some of which are addressed in the research on Mathura Ghats, investigation the conservation approach towards the present environmental problem (Sinha and Ruggles 2004). However, in Agra the situation is the worst because it has historically has been seen as having an aesthetic and transportation purpose. Because of rapid urbanization the river become a utilitarian drain. This is detrimental to not only to the ancient structures but also to the cultural identity of the region. In addition, the water level is currently low, affecting their structures foundations including that of the Taj Mahal.
Figure 1.4: Pollution levels and the water distribution in various cities along the Yamuna River

1.4 The Research Problem

Traditionally, the river has been used for recreation and for transportation purposes. Currently, has developed environmental problems because of rapid development. This pollution affects the people’s interaction with the river, and the subsequent the psychological impacts will be harmful for the cultural values and cultural landscapes in the region. In addition, the pollution is physically harming the ancient structures along the river including the foundations of the Taj Mahal. Hence it not only impacts the cultural landscape but also the ethnic identity of the region.
1.5 Research Questions

The India government is taking the initiative to clean the river spending millions of dollars. However, it has little positive impact on the damage to urban structures. Cleaning river appears thus appears to be a temporary solution to the problem. In fact current data suggests that, pollution is two fifty time’s higher than normal bathing quality. Such conventional models for addressing water pollution including the sewage treatment plants, the treatment of industrial wastes, and the improving water flow in the river appear to be failing. Additionally, the blind planning of these modern constructions is damaging ancient antiquities along the river. Research suggests that the development of a sustainable model including the incorporation of modern amenities will preserve the cultural landscape of the tangible and the intangible identity of the river. It further indicates that the preservation of the vernacular landscape is necessary during rapid urban development to preserve cultural identity. To provide permanent sustainable solutions to problem, it is necessary to identify people’s current cultural perception towards the river as it influences the planning approach needed for the river. The present housing encroachment along the banks of the river can be misleading because of the vitality of the land.

This perception is complicated because in India, religion and ecology overlap as a result of the cultural importance of the rivers. Thus this study includes several issues. For one it examines how current contamination of the river affects people’s interaction with the river including religious practices along the Yamuna. The study further investigates if the massive pollution is causing social behavioral change which, in turn is affects the
social character and attitude towards the river. Finally, it examines the physical changes in the cultural landscape along the river and the necessity for the development of sustainable guideline for the future.

The specific research questions are listed below:

- How the increasing contamination make people avoid the river? Does it affect their religious attitude towards the river?
- What are the resident’s current cultural perceptions about the river?
- Is the pollution causing a change in the social behavioral?
- What are there resident are needs and concerns about their area? Do they conflict with the current planning approaches?
- What are the physical changes in the cultural landscape along the river?
History: (Date 13 BC to 1947AD)

Current Situation: The current environmental condition causing social-behavioral change. The high income group is moving to periphery of the city seeking better environment and its place is being taken by the low income group.

Proposed Design for the future

LEGEND:
- Green Areas within the city
- City Development
- Clean River
- Polluted River
- People is Interaction with the Natural Surroundings

Figure 1.5: Diagrammatic Expression of the Current Problem
1.6 Proposal

While there have been several proposals from the government, non-governmental organizations and others regenerate the historical district. They offer fewer opportunities for local participation, these design meanings are unidirectional. The proposed comprehensive design guidelines incorporate the strong points from various proposals related to a specific site. These recommendations are based on the urban conservation model, sample method by result from pertinent result studies. The future site is on the east bank of the Yamuna River between Etmad-ud-daula and Ram Bagh. This site requested for Design, Build, Finance, Operate and Transfer basis under public private partnership in 2008 by the Housing and Urban Planning Department of Government of Uttar Pradesh. The total site area is 78.1 acres including two protected monuments, Itmad-ud-Daula (8.9 acres) and Chini-ka-Rosa (6.5 acres). The site has a 12 meter wide road on the Eastern side and NH3 highway in the North site. The existing entities include nurseries, residential encroachment into the historic core and vendors along the road. The site lacks basic infrastructure. The design recommendations from the residents will reflect these desires about the place that need to incorporate by the decision makers into future planning approaches.

1.7 Significance

This study includes recommendations for sustainable development along the river, one which will accommodate both the modern and the traditional urban structures. This study illustrates present cultural perception about the river and social-behavioral change through surveys. The comprehensive design guidelines benefit for preservation of
cultural identity and maintaining sentiments associated with the Yamuna River. This will allow people to interact with one of the holy rivers in India. Additionally, it will help to understand people’s present needs and desire about the place. In addition the site will become role-model for the Taj heritage district to broader conservation urban areas and preservation of cultural landscapes around in the region.

Figure 1.6: Significance of the project
CHAPTER TWO
LITERATURE REVIEW

This literature review is divided into three sections. The first explores the spiritual importance of the river and the architectural and urban planning responses to the historical significance of this region. The second section presents the contamination of the river based on reports from various scholars and institutions, describing the current environmental condition of the river in light of the urban developments in India. The third section discusses the various design proposals by non-governmental, private and government agencies, including their merits and disadvantages.

Figure 2.1: Areas of the Research
2.1 Spiritual importance of the river

The diverse cultures have perceived the Yamuna River from various perspectives, the cultural activities shaping the human experience of the landscape and the relationship between the built form and the land and river. Delhi and Agra represent the Islamic influence on the built form, while Mathura and Allahabad are holy Hindu displaying that style of architecture and planning. Delhi, a metropolitan city is one of the most densely populated cities in the world. The development along the river and its expansion within the flood area in Delhi have caused environmental problems (Chapple and Tucker 2000; Wescoat 1991a).

Various scholars have written extensively on the evolution of history and culture on the Yamuna Riverfront in Agra. The original gardens along the River were the result of the climate and the nostalgia of the of Mughal emperors. According to Sinha and Ruggles: “the Yamuna riverfront in Agra was a private enclave of Mughal royalty and nobility, the shape of its landscape originated in a nostalgic image of the gardens of Afganistan and Central Asia, evolved under influence of the design aesthetic of the Persian court” (Sinha and Ruggles 2004, 148). “After the end of Mughal Empire, the Taj Mahal was only best known image in the World and became a symbol of India. The tourist influx in the Taj Mahal makes it physically disconnected from the surrounding landscape and Mughal monuments. The Taj Mahal can be seen its glory after the surrounding landscape been excavated including the moonlight garden. The Yamuna River is open to the residents but is not truly for public use. The residents are involved
numerous activities surrounding the region” (Sinha and Ruggles 2004, 66). As they suggest, the historic monuments became isolated from surrounding area. Although these neglected destinations including Mehtab bagh, Itmad-ud-Daula, Chini-ka-Rauza and Rambagh gardens are within walking distance from the Agra fort and the Taj Mahal. However, the heritage development at Agra along the Yamuna River fails to provide recreational areas for the residents, the opportunity to discover historic district including the gardens along the banks, public spaces for the tourist and an environmental solution for the river (Harsh Goel 2008; Koch 2005). Currently, the riverfront is not used for public recreational purpose and one of the greatest losses is being affected reflecting image of the Taj from the moonlight garden.(Asher 1991; Harkness and Sinha 2004; Goel 2008; Koch 2005; Wescoat 1991a).

Figure 2.2: Monument Centric Approach
2.1.1 History: Mughals in India

The Mughal dynasty from 1526 to 1805 AD was one of the most significant periods in the history of India. This empire spread from Kabul to the southern part of India, representing a cultural, politically powerful and prosperous period in India. During this period, many legendary buildings were constructed including the Red Fort, Delhi, the Taj Mahal, the Humayun’s Tomb and many others. Some of which exist, representing the architecturally rich and detailed craftsmanship of the Mughal dynasty. Initially, Agra and then Delhi was the capital of the Mughal Empire. Given its significance an understanding of the philosophy of the great Mughal Empire is necessary to preserve these artifacts to propose a holistic design approach (Koch 2005).

2.1.1A The various Dynasties in Agra and their strategies for Planning Development

Babur (1526-1530 A.D.), the founder of Mughal Empire, conquered the Indian subcontinent taking it from Kabul in present day Afghanistan. In his ‘Baburnama’ he reveals his astonishing adventurous career. In addition this book discusses the rational approach and characteristics of the Mughals including their love towards nature. It became foundation of all the succeeding rulers of the Mughal dynasty (Koch 2005).

Humayun (1530-1550 A.D.), Babur’s son, began expand and enrich the Persian traditions on the Indian subcontinent, his stay in Iran critical in bringing the Persian art into India. In addition the Humayun designed several important buildings exhibiting the Mughal, Indian and Persian influence (Koch 2005).

Akbar the Great (1556-1605 A.D.), Humayun’s son who became ruler of the Mughal Empire at the age of fourteen. He was one of the most distinct rulers. He was
aware of the cultures in India the Hindu, Buddhist and Jains, understanding the country is diverse by and the inability of convert all to Islam. His humanist approach attempted to solve the issues of various cultures by through intellectual discussions and his approach to religious inclusivity made him a universal king. He expanded the empire on the west provided a stable government. He took a great interest in buildings, including Fatehpur Sikri which is close to Agra (Koch 2005).

Jahangir (1605-1627 A.D.), Akbar’s son continued his father’s legacy while developing strong relations with Europe. His memoir discusses his outstanding achievements in architecture, art and literature as well as his interest into the natural world. He introduced the skills and craftsmanship of European artists to India experimenting by integrating paintings into structures to build many magnificent buildings including his father’s mausoleum in Sikandara near Agra (Koch 2005).

Shah Jahan (king of the world (1627-1658 A.D.)), was the greatest Mughal builder in mid-seventeenth century. His visions of art and architecture were important to demonstrate his leadership to succeeding generations. He reigned at the height of Mughal Empire. He undertook many important building projects including the walled city Shahjanabad in Delhi, the Red Fort and the magnificent Taj Mahal. However his lack of foreign policies and his extravagant lifestyle made him unpopular his region, finally resulting his being prisoned in Agra Fort until his death (Koch 2005).

His successor Aurangzeb (1658-1701 A.D.), was an orthodox Muslim and his narrow-minded approach toward other religions weakened his influence. His primary
contribution was the forts and mosques he built in Lahore present-day in Pakistan (Koch 2005).

Colonial Period (1803-1947 A.D.) the Empire developed the peripheral areas of the city as well as revitalized large areas in the Mughal urban area. The introduction of modern amenities including railway stations, factory, golf courses, and race grounds were major additions during this period. In addition, public parks and road connecting major buildings were important developments undertaken during this period. The infrastructure was explained to the outskirts of the city however, such areas of Mughal city remained including Tajganj, Shahganj and Akbarabad. Assistant Archeologist Carlleyle Report (1871) recorded the location, historical background and physical pattern of most of the historical monuments, explaining the growth of the city. This report became the foundation for the Archeological Survey of India.

Post-colonial to Present Day:

Post-colonial development was haphazard because of the refugees settled around the city after the India-Pakistan partition. This settlement created stress in the traditional Mughal city areas.
Pre Mughal Period

Mughal Period

Colonial Period

Post-colonial period

Existing condition

Figure 2.3: Evolution of Agra Heritage district
2.1.1B History: Riverfront Development in Agra during the Mughal Dynasty

Mahmud of Ghazni first conquered Agra in 1070 A.D. with Sikandar Lodi making it Agra his capital in 1505 AD and Babur founding the region in 1526, he was from Kabul. He and his successors introduce creative ideas from Central Asia to this region, resulting formal gardens, construction techniques and architectural character along the riverfront serving as a nostalgic reminder of their heritage. This then begun to change the character of one of the greatest holy river of Hindus. The rulers saw this river as a transportation network as well as a source of relaxation from which to view their creations while boating. Many travelers saw this city as a wonder of the age, one of the biggest and richest cities in the world with approximately 700,000 people including skilled artist, craftsman, and elites. The residences and private gardens of the nobles along the river became a mode for urban landscapes (Harkness and Sinha 2004; Koch 2005; Wescoat 1991a).

The gardens along the river portrayed the love of nature integrated with architectural elements. One such example was the Chahar Bagh gardens developed by Babur along the river in 1526 AD. This garden “consists of squares divided by cross-axial paved walkways into four equal parts. The center is highly charged and symbolic may be occupied by building – typically a garden pavilion but also a tomb – or by a pool” (Koch 2005, 24).
Currently, however the riverfront is not used for public recreational purpose because of the pollution. The loss of the reflection of the Taj Mahal in particular has significantly impacted, damaging to the Islamic philosophy and the traditional character of the region.

Figure 2.4: Physical damages to the Heritage District at Agra (Source: Koch 2005, 30 31)
2.2 Present environmental condition of the river

The Yamuna River today has become a foul smelling drain, the Indian government spent ₹ 14000 cores for cleaning the river has turn out to be complete waste. The water level of the river is low with high pollution, the unhygienic condition making the overall natural environment unwelcoming. The urban development on both sides of banks is different with the north being primarily agriculture and rural developments while the south side of the city influenced by tourist because of the Taj Mahal and the Agra Fort. Only two bridges connect the north and south development, limiting the traffic flow between the two sides (Goel 2008; Misra 2010).

![Figure 2.5 Massive pollution is damaging heritage structures along the river](image)

The discharge of untreated waste water and industrial wastes has severely affected the quality of the Yamuna River. Almost every year, a huge number of dead aquatic fish
are reported because of the Biochemical Oxygen Demand (BOD) has increased drastically, reducing Dissolve Oxygen (DO). The Yamuna has been reduced to the small streams, draining industrial effluents, sewage, dirt and toxic substances. According to Center of Science and Environment approximately 75-80% of the river pollution is the result of raw sewage, industrial runoff, and garbage thrown into the river. The untreated domestic waste water discharged into the river increases the ammonia level with water becoming untreatable when ammonia concentration reaches to 0.4 mg/L or more, the situation in Agra and the surrounding the region. The increasing irrigation combined with the use of artificial fertilizers has also increased the pollution in the river (Haberman 2006)(Misra 2010).

J.S. Sharma and D.S. Sharma investigate air pollution around archeological monuments in Agra in 1982. According to their study, the primary contaminants are sulphur dioxide, nitrogen oxide and suspended dust particulate matter, primarily caused by the iron, glass works, power plants, automobiles and railway shunting yards. Moisture from the Yamuna River combines with this pollution to form sulfuric acid which reacts with the marble and as

Figure 2.6: Atmospheric Contamination Levels at Agra
(Source: Sharma and Sharma 1982, 32)
sandstone façade of the historic monuments including the Taj Mahal. The dust particles and acidic compounds accumulate on the stone surfaces, slowly corroding these monuments (Sharma and Sharma 1982). However, field work at Agra has suggested that the current atmospheric pollution levels have been reduced drastically due to the actions implemented by the government of Uttar Pradesh. These actions include moving polluting industries away from the heritage districts and promoting non-polluting ones. The current air pollutions levels are sulphur di oxide (SO2): 0.3 safe limit 30, nitrogen oxide (NO2): 4.89 safe limit 30 and suspended particle and materials (SPM): 353.73 safe limit 100. However, the Pollution Board records atmospheric pollution levels only near the Taj Mahal, not for the other historical sites including the between Itmad-ud-Daula, Chini-ka-Rauza and Ram Bagh.

2.3 Various design proposals by governmental, non-governmental and private agencies

The government of Uttar Pradesh sanctioned the project the Taj Heritage Corridor, a $44 million endeavor involving developing the Yamuna heritage riverfront by adding modern amenities including commercial and entertainment activities. This proposal was never discussed with the general public and investigations exploring the impacts of these activities on the historic structures were never been carried out. Strong opposition from environmentalist put this project on hold (Goel 2008).
Other such studies and projects over the last three decades include (Goel 2008; Wescoat 1991b).

1971: Mater plan for Agra published
1988: Indo-US Agra Heritage Project conceptual approach defined
1993: Agra Heritage Project reports published
1996: ASI Smithsonian Mehtab Bagh Project begun
1997: M. C. Mehta v. Government of India, Environmental decisions affecting Taj Trapezium
1998: Mehtab Bagh landscape planting undertaken by ASI
2000: Taj Mahal National Park Master Planning Study and Mughal Gardens in India Symposium conducted by the University of Illinois, Department of Landscape Architecture and Uttar Pradesh Department of Tourism.
2003: Partial completion of Taj Corridor Project.

In 1994 a research team studied heritage sites and the city context and prepared a tourism analysis which became the basis for the Taj Trapezium Zone including the religious sites of Mathura and Vrindavan and the Bird Sanctuary in Bharatpur. The report recommendations incorporating a visitors center near the Taj to connect other Mughal building in the region with cultural entertainment amenities such as restaurants and hotels. The plan includes the implementation of living history programs in the city
focuses on the history of the Mughal Empire (Goel 2008) (Harkness and Sinha 2004; Goel 2008; Koch 2005).

Figure 2.7: Some important historical structures are disconnected with from urban fabric and planning approach is primarily based on tourism.

In spite of these planning efforts, environmental conditions today are worse. According to James Wescoat Jr. “even today, the daily lives of many Agra residents begin along the river banks bathing, offering prayers, and crossing to work. How the sacred river become so terribly depleted and polluted-almost dead-bubbling with anaerobic decomposition, drifting plastic bags, and refuse until monsoon rains release waters, sometimes floods, from upstream barrages?” (Wescoat 2000, 59). The answer to this question is because all the proposals focus primarily on tourists. The next section focusses on the positive factors from three proposals specific to the site: developed by the government of Uttar Pradesh Planning Authority, approaches from a non-governmental
organization and academic research on the Taj Heritage District conducted by the University of Illinois in 2000.

Figure 2.8: Lack of urban conservation efforts diminishes the Authenticity of the place.

2.3.1 Approaches from the Government of Uttar Pradesh Agra Master Plan 2021

This plan focused on various land uses. The following points are relevant to this study and specific to the site:

Industries:

- Non-pollutant industries to be allowed in the city, whole 292 coal-based industrial units will be closed.
- Industries related to software technology and information technology to be promoted.
- Other polluting industries in the city to be relocated (JNNURM 2006).
Tourism:

- Proper access to be provided to the monuments and places of heritage value.
- A barrage to be constructed downstream of the Taj so that the Yamuna River maintains appropriate water level and the river to be used for recreational purposes.
- The area of north of the Taj Mahal across the river be developed as a national park to attract tourists.
- Golf courses and a stadium to be constructed.
- 175 hectare of land on Fatehabad Marg to be used for tourist-related recreational activities.
- An international airport for international tourists.
- Taj Ganj area needs to developed as a center for handicraft and cottage industries for tourists (JNNURM 2006).

TTZ area:

- Industrial units in these areas are relocated in phases.
- Parks and river development to be undertaken as part of an initiative to attract tourism.
- The Yamuna River to be made pollution-free by establishing treatment plants.
- Where necessary underground/multi-storied parking to be proposed to meet the parking requirements
- A rig road around the city to be develop to help the congestion of the city area (JNNURM 2006).
Water Supply:

- To reduce water losses during distribution, the network to be improved and worn out and rusted pipes replaced. Proper water harvesting techniques needs to be adopted for ground water conservation and recharge (JNNURM 2006).

Sewerage and Drainage:

- Sewer lines to be laid so that the sewage is properly collected and disposed of.
- The sewer flowing in the drains to be treated at suitable locations before being allowed to move downstream in the Yamuna.
- Sufficient number of sewerage treatment plants to be constructed.

Vegetation:

- Three meters of the plantation strip to be reserved for trees. (JNNURM 2006).

Solid waste management:

- Comprehensive plan for solid waste management and disposal to be developed.
- Proper arrangement to be made for disposal of solid waste.
- Arrangement to be made for the necessary equipment and manpower for the disposal of solid waste (JNNURM 2006).

Rainwater Harvesting:

- Natural ponds to be preserved.
- The land surrounding the natural ponds to be used for recreational purposes (JNNURM 2006).
Figure 2.9: Lack of credible/transparent/accountable/participatory governance (Source: Agra Mater-plans from Government officials Agra)

2.3.2 Proposals for Heritage Development

The Mughal Cultural Heritage District Development Plan of 2000 has formulated by faculty and students from the Department of Landscape Architecture at the University of Illinois in conjunction with U.P. tourism. The team researched vernacular landscapes, environmental issues resulting from land uses and tourism industry. This study provided a comprehensive plan for the agriculture landscape and for promoting and restoring historical cities which connect various heritage monuments (Harkness and Sinha 2004; Goel 2008; Koch 2005). Its recommendations have three main goals: first to promote a landscape conservation enquiry, second to promote a long term process for landscape
heritage conservation and finally to promote geographic collaboration and integration. This approach is completely different from the governmental and non-governmental strategies.

A K. Misra discussed strategies to improve the quality of the Yamuna River. To implement these strategies, education and improved watershed awareness among the population are necessary. The approaches include water conservation, promotion of waste water treatment and a facility, drainage water management and treatment, recycling and reuse of waste-water, financing waste water management schemes, improving the sewage system, upgrading the sewage treatment plant, and proper disposal of sewage. Additional suggestions include the use of bio-fertilizers, solid waste management, the installation of public toilets, the construction of an electric crematorium and holy bathing ponds, afforestation, and canal development (Haberman 2006; Misra 2010).

A private architectural and urban design organization in New Delhi proposed design solutions for the current environmental problems of the Yamuna River referred to as the Natural Drains Nullah’s Project. These drains were created to collect storm water and discharge it to the river. After the construction of modern high-rises however, these natural drains became dumping areas. Currently the majority of the dirty water flows from these drains polluting the river. This initiative aims to rebuild this water drain system of Delhi to enhance the social, environmental and transport networks of the city.
The article “Yamuna, Krishna and Landscape Heritage of Braj: Conservation of Vishram Ghat, Mathura, India,” outlines a conservation model for Vishram Ghat, Mathura which protects its cultural heritage. “The conservation of the physical fabric of riverfront landscape will also lead to sustenance of intangible heritage additionally the restoration of the historic landscape of ghats on the west bank and environmental remediation of the un-built east bank of Yamuna in the archetypal image of pools in groves (kunj) will help revive the many living cultural traditions associated with the river, now on the verge of extinction” (Varma and Sinha 2011, 1).
As this research suggests the contamination at the site level can be reduced with the help of landscaping and planning and regulation, introducing the urban conservation approach through can understanding of the tangible and intangible heritage structures in this area. “It’s rationale lies in the understanding that Yamuna’s intangible heritage is inextricably bound with the vernacular landscapes that needs to be conserved in face of rapid urban growth and private encroachments in the public sphere” (Varma and Sinha 2011, 9). This development focuses on the Ghats recognizing the historic design of the region and understanding the social and religious connections with the river. The design incorporates private bathing tanks, view decks and traditional motifs relating to the unique value of the cultural landscape of the Mathura (Varma and Sinha 2011).

2.3.3 Framework Description and Explanation

Various research has focused on the spiritual importance of the river lead to the development of architectural morphology and vernacular landscapes, including the advantages and dis-advantages of ancient buildings in an urban context, for example, tourism in Agra has changed the overall development of the city, creating a conflict between heritage structures and modern buildings.

These studies of examples has discussed in Haberman’s the River of Love, analyses the changes in the environment, architecture and planning including personal feelings about changing landscape along the river and the impacts of the pollution. In addition the technical data on the pollution levels in the city reported by various non-governmental and government organizations explain its severe impact on the ecology of the region. These papers also suggested strategies for addressing these problems.
including improving the infrastructure and awareness of issue as well as specifying methods for making the region sustainable. The conservation model for Vishram Ghat illustrates the restoration of existing historic landscapes, providing prototypes that will help to revive many traditions.

Past development plans and proposals developed the conservation efforts and integrated various activates surrounding in region. For example, the urban design plans from 1994 to 2009 attempted to integrate the site and its surroundings, providing a comprehensive analysis of the agriculture landscape, promoting and restoring the historical cities connecting the heritage monuments. However, they are not implemented perhaps because of the pollution. In addition, the current environmental impact on the cultural landscape, religious practices, public participation and cultural perception of the river are not discussed.

2.4 Case Study 1: Gomti Riverfront Development, Lucknow, Uttar Pradesh, India

This proposal focuses on Lucknow in 2009. The Gomti River is a tributary river of the Yamuna, is not celebrated as goddess. The area of India was influenced by Islam, the sophisticated architecture and urban planning along the river being a cultural response. Although traditionally the river primarily used for the transportation and recreation purposes, it was also the primary source of irrigation gardens, for orchards and farms along the river, thus impacting the economic life of the region. The riverfront pleasure gardens and monumental mosques created the unique character of the region (Nagpal and Sinha 2009). In rapid growth after India’s independence, it became a
backwater, precluding interaction with the river. The government is now taking the initiative to beautify the riverfront however, these efforts do not include preserving the historic monuments along the river. The conservation model with design guidelines, which supports the preservation of the tangible and the intangible culture, enriches sense of the city. The landscape development in the region can be divided into four periods, the landscape development during Nawab, during colonial time and the contemporary landscapes (Nagpal and Sinha 2009).

Figure 2.11: Ad hoc uses on the Gomti flood plain (Source: Nagpal and Sinha 2011, 496).

2.4.1 The Landscape development during Nawab (1775-1856 AD)

The urban development along the river at this time was a response to natural, environmental, and socio-cultural values. The residences along the river indicate that population appreciate the proximity of the river because of its cooling breeze and attractive views and relief from busy city core as well as source of water as a transportation purpose. The European visitors appreciated the city for its picturesque surroundings, glimpses of intricate architecture, and stone bridges. The first settlement was established in the southern part of the river and the rest developed linearing along the
Gomti River. This growth suggests the monumental parks and palaces respond to the river (Nagpal and Sinha 2009).

2.4.2 The Colonial Landscape

The revolution during the colonial period changed the traditional riverfront development. The clashes between the Indians and the East India Company troops in 1857 resulted in destruction to the palaces and various field along the river. This historic event resulted the social, cultural and economic changes in the region that reflected in the architectural styles and urban design of the region. Although there was major damage to the area, some of the Nawabi buildings and surroundings survived. Later these historic buildings were the site of various activities. The industrial influence and major economic shift from agriculture to industrial caused the river to become a backwater (Nagpal and Sinha 2009).

2.4.3 The Contemporary Landscape

The current riverfront includes agricultural and traditional activities and both are industrial core, residential areas a combination of complex land uses. Some of the activities occur on the unstructured areas, such as the play areas for children, the washing and drying cloths and fishing. The slum areas and colonies developed during this post-colonial period, although efforts were made to beautify the river by planting trees for the ecological restoration, the monument centric approach of colonial era continued during the post-colonial period, causing a disconnect between the historic monuments and the urban morphology. It seems the historic past of the region became isolated, there by affecting a sense of the place (Nagpal and Sinha 2009).
2.4.4 Riverfront as a Heritage

The proposed development includes strengthening of the relationship between the historic architecture and the modern amenities, attempting to create an ambience. The initiatives for preserving the tangible heritage structures can solve by the state government. The conservation of incorporating the intangible heritage structures introduced by showcasing arts and crafts, and providing access to the general public to these endeavors will bring a new economic dimension to the city. The river walks and stepped areas along the river has restored physical access to heritage monuments and the interaction with the river. Integrating the design of intangible heritage spaces with tangible structures such as workshops, exhibitions, cultural festivals, music and dance performances giving character to the place (Nagpal and Sinha 2009).

Hence, this plan can serve as a catalyst for the cultural and economic revitalization of the river. This proposal which illustrates how historical authenticity can be derived from engagement with contemporary features is applicable to heritage district in Agra. The urban conservation policy integrates isolated monuments into linear heritage districts along the river, since the civic core is separated from the antiquities (Nagpal and Sinha 2009).
Figure 2.12: Design Proposal for the Gomti Riverfront development  
(Source: Nagpal and Sinha 2011, 500-504)
2.5 Case Study 2: Sabarmati Riverfront Development, Ahmedabad, Gujarat, India

Indian cities including Ahmedabad exhibit a variety of urban patterns including ancient monuments from different periods. Throughout history the decision maker’s unidirectional approach to various civilizations created heterogeneous urban planning. Most of the current majority of planning in the cities is focused on real estate developments, self-contained apartments including shopping malls and multiplexes, with little consideration for sustainability, public infrastructure and public spaces. This blind adoption of a western model is detrimental to historic urban morphology. India’s historical cities are transforming very quickly and irreversibly. A result of the economic policy changes in 1991 and the initiation of such city modernization schemes as the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). The Sabarmati Riverfront Development Project however, is a unique example of integrated environmental improvements resulting a comprehensive transformation (Water resources and threat Topos 2009).

Figure 2.13: Design proposal for the Sabarmati River, Ahmedabad  
(Source: Water resources and threat Topos 2009, 40-45)
The Sabarmati, flows in the Ahmedabad, one of the holy rivers in India, originating in the Aravalli Hills with confluence into the Arabian Sea. Ahmedabad is the seventh largest metropolitan region in India, the financial capital of the state of Gujarat as a result of its textile industries. After achieving independence the city invested in modern architectural and educational projects. The Sabarmati is a seasonal river, causing extreme differences in over the various parts of the year. A dried, open space initially was an open public space for the people. Later this space becomes filled with squatter houses, because of the importance of land during the rapid urbanization. This ecological imbalance caused lack of significance of the riverfront development. (Water resources and threat Topos 2009).

Figure 2.14: Design proposal for the Sabarmati River, Ahmedabad (Source: Water resources and threat Topos 2009, 45)
The first proposals were introduced in 1961 by the French architect Bernard Kohn. The Riverfront Development Group with the help of local professionals was formed in 1976. Later in 1992 and 1997 an EPC firm was assigned to manage the development services. Since 2002, HCP Design has been responsible for the architectural, urban and structural designs of the riverfront. All of the resulting proposals illustrate and strengthen the ecological, cultural and social importance of the river and its surrounding environment. The concepts of a compact city and a livable city were implemented in relationship with the river. The relocation of the slum areas, the improvement of the sewage facilities and the drinking water supply enhanced the quality of the space. As a result of socio-economic survey the Indian Institute of Social Entrepreneurship and Management developed a plan for new housing and market areas along the river. The two-level promenades are an important element in the design of Sabarmati riverfront development. The ground level is used for the pedestrians to interact with the water while the upper level is a pedestrian circulation corridor for the public connecting cultural, recreational and educational areas. This riverfront development illustrates the effect of the active role of various private and government organizations along with public participation. It shows that long-term positive change is possible and that a balance of public spaces with real estate development is feasible (Water resources and threat Topos 2009).
CHAPTER THREE

METHODOLOGY

The research methodology involves collecting both data Quantitative and Qualitative. The former used a questionnaire developed based on Dillman’s guidelines according to guidelines given in the book ‘Mail and Telephone Survey, the total Design Method’. This questionnaire filled by residents living in along the Yamuna River including the proposed site. In addition interviews with the residents and city officials were conducted on site. The fieldwork was conducted during 15 December to 23 December, 2011. The questionnaires and interviews were used to determine public perception about the Yamuna River and behavioral change. These are closed ended questions, the respondents having a minimum of five options, the scale of vary from strongly disagree to strongly agree and with a middle option of neutral. The analysis of responses to the survey and interview questions were combining with the existing cultural landscapes and land use plans to determine the existing cultural awareness about the environmental conditions and the current needs and demands of the people. In addition this study used case studies of the Gomti River and the Sabarmati Riverfronts for guidance of dealing the issues with the similar problems. The second part of study focuses on positive approaches from proposals specific to the site, in-particular from the Agra development plan for 2021, City development plan for Agra by JNNURM and the University of Illinois design proposal for the Taj Heritage Area. Based on the conclusion formulates in the design guidelines overarching the urban conservation in the region.
The benefit of this method is its potential to propose a holistic urban design approach integrating the historic structures with the understanding the residents need for both a sustainable future and the retention of their cultural identity. One solution to the problems is a conservation model of the river, addressing their conservation and ecological problems in the region and recommending the design solutions. The design guidelines are divided into three parts: short-term goals, mid-term goals and long-term goals. The long term guidelines include design recommendations for the heritage district, assuming if the river is clean then the cultural identity will be preserved. In addition to the site specific conservation model, the recommendations include the minimum water flow required by barrages on the river and the allowable atmospheric pollution levels. Potential limitations of this study include issues and errors involve in translating the survey instrument from English to Hindi. However, these can be prevented with careful data analysis and procedures.

Figure 3.1: Scope of work
3.1 The reasons for the public survey

Past research suggests decision makers dictate the future development of an area, meaning is a lack of credible, democratic, transparent, accountable and participatory governance. Additionally, there is virtually no chance for public participation during the design process. Researchers have found that the colonial approach of non-public participatory and the monument centric approach have been used by decision makers in the post-independent period, resulting in heterogeneous community growth with a focus on a particular heritage while growing the ignoring the surrounding urban development. This approach causes an increase in squatter settlements near heritage structures. Examples include the planning of New Delhi and its effect on Old Delhi and the current urban development in Agra.

3.2 Lessons from past: Planning of New Delhi and effect on the Old Delhi

The difference between the urban characters of Old Delhi and New Delhi exemplifies the importance of public participation in the design process. Old Delhi is architecturally rich heritage was left out of the New Delhi and now is in a state of decay. New Delhi is a geometrical planned city based on the garden city concept whereas Old Delhi is ancient organic city. The historic plans reveal that while in the city planning process the decision makes didn’t incorporate the existing ancient settlement. Moreover, few efforts were undertaken to understand the people’s desires and to improve such basic amenities as transportation, sanitation and the water supply. The increase in the population density has pressure on these basic amenities. In addition the upper income group moved to a better place, the area now inhabited by the low income groups. The
lack of a basic infrastructure and the increase in the lower economy sector resulting from the increase in the population density has degraded the environmental quality. Now the post-independence era has seen substantial improvements in the basic infrastructure of the area.

To further these improvements and to address the cultural concerns, the survey will serve as a guideline for the planners and decision makers for a holistic urban design approach integrating the historic structures with the current need for a sustainable future for saving the cultural identity.

Figure 3.2: Survey Conclusions
Based on precedent studies, analysis of three proposals from various organizations in addition surveys and interviews developed the comprehensive design recommendations. Since these were developed using inputs from multiple sources, it is a hope that it will address ecological and cultural problems associated with the area. These recommendations are divided into eight areas including conservation, ecology, planning, response to cultural & environmental degradation, transportation, architecture, air pollution, drainage and planning based on tourism. There ultimate goal is to revitalize heritage site from Itmad-ud-Daula to Ram bagh, for preserving tangible and intangible values in the region not only for residents’ and tourist but for next generations.
Figure 4.2 Introduction: Physical and Symbolic association with the river
**RESEARCH QUESTIONS**

- How increasing contamination makes people want to avoid the river? Does it affect religious attitude towards the river?
- What is peoples current cultural perception about the river?
- How massive pollution is causing the social behavioral change?
- What are peoples needs and concern about their own place? Does it conflict with the current planning approaches?
- What are the physical changes in cultural landscapes along the river? and need for sustainable design recommendations for the future.

**AGRA CITY EVOLUTION & RIVERFRONT DEVELOPMENT**

The city in the 11th-12th centuries called Agra. The town was a center of the Mughal Empire. The town's rise was due to its location as a trading center along the river with beautiful surroundings. Some literature describes it as a riverfront town. The town's river was celebrated as goddess with the religious activities along the river. Inhabitations, present-day Agra was the administrative area during this period. Agra was a module for the urban landscape.

**Pre-Mughal Period (13 B.C.-1803 A.D.)**

- The formal gardens, construction techniques and Architectural Character along the riverfront at Agra was a nostalgic solution from the era. One of the greatest holy rivers for Hindus was changed its character. The rulers saw this river as a transportation network as well as a source of recreation to view their creations while dating. Many scientists explained this city as a wonder of the world, one of the great cities and a chief city in the world having more wonders, both natural and artificial, than many others. The existence and private gardens for nobles were developed along the river and became a module for the urban landscape.

**Mughal Period (1504-1647 A.D.)**

- The introduction of modern amenities including old-style stations, factories, offices, recreational developments were major additions during the period. The infrastructural development was not only in the urban areas but also in the natural landscapes of the city. The construction of the city was carried out under the supervision of officers. The urban planning and development were undertaken during the period. The Mughal period of Agra was published in 1771. The construction approach was monumentalistic. The urban infrastructure was taken over by residents. The urban infrastructure was taken over by residents. Sudden increase in population caused stress to the basic infrastructure. The increased structural height increased atmospheric pollution. The Yamuna river became a sanitation drain.

**Colonial Period (1803-1947 A.D.)**

- Post-colonial development was very fast-paced due to refugees settled around the city after India-Pakistan partition. The settlement caused stress to the traditional Mughal city areas. The first Master plan of Agra was published in 1771. The construction approach was monumentalistic. The urban infrastructure was taken over by residents. Sudden increase in population caused stress to the basic infrastructure. The increased structural height increased atmospheric pollution. The Yamuna river became a sanitation drain.

**Post-Colonial Period (1947-1990 A.D.)**

- Present day Period (1990-present)

The Yamuna River today has become a deadly drain. The government of India spends 14,000 crore for repairing the river but it is not complete. The surface area in the river is very low with high pollution and unhygienic condition makes overall natural conditions unhygienic. The urban development of both sides of banks is different from each other. The north side of the city is mostly agriculture and rural development. The south part of the city influenced by tourism because of the Taj Mahal and the Agra fort created beautiful landscapes. There are only two bridges not connected well with the help of transportation.
Figure 4.4 Literature Review and Case studies of Gomti River and Sabarmati River
Figure 4.5 Physical Damages to the Heritage District (Source: Koch 2005, 30-31)
Figure 4.6: Methods, scope of work and survey results and its conclusions
Figure 4.7 Analysis of decision maker’s proposal
Figure 4.8 Analysis of decision maker’s proposal
Figure 4.9 Site and surrounding analysis
Figure 4.10 Site and surrounding analysis
Figure 4.11 Site and surrounding analysis
Figure 4.12 Design Recommendations
Figure 4.13 Design Recommendations
Figure 4.14 Design Recommendations
Figure 4.15 Design Recommendations
Figure 4.16 Design Recommendations: Drain detail

(Source: http://www.asla.org/2010awards/006.html)
Figure 4.17 Design Recommendations: Detail Plans
Figure 4.18 Proposed Design based on research
### Quantitative Data Analysis:

Please refer to excel charts.

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<tr>
<td>1 to 5 years</td>
<td>9</td>
<td></td>
</tr>
<tr>
<td>6 to 10 years</td>
<td>17</td>
<td></td>
</tr>
<tr>
<td>11 to 50 years</td>
<td>50</td>
<td></td>
</tr>
<tr>
<td>51 or more</td>
<td>20</td>
<td></td>
</tr>
<tr>
<td>Do you think the Yamuna River is polluted?</td>
<td>100</td>
<td>3</td>
</tr>
<tr>
<td>Are you worried about pollution in the Yamuna River?</td>
<td>102</td>
<td>1</td>
</tr>
<tr>
<td>Do you eat fish from the Yamuna River?</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>I am a vegetarian</td>
<td>44</td>
<td></td>
</tr>
<tr>
<td>I am a vegetarian</td>
<td>59</td>
<td></td>
</tr>
<tr>
<td>Question</td>
<td>Yes</td>
<td>No</td>
</tr>
<tr>
<td>-------------------------------------------------------------------------</td>
<td>-----</td>
<td>----</td>
</tr>
<tr>
<td>Do you avoid doing religious practices along the Yamuna River because of massive pollution?</td>
<td>46</td>
<td>42</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Easily accessible</th>
<th>Not very accessible</th>
<th>Not accessible</th>
</tr>
</thead>
<tbody>
<tr>
<td>Is the Yamuna River accessible to you?</td>
<td>69</td>
<td>27</td>
<td>8</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Very comfortable</th>
<th>Not comfortable</th>
<th>Undecided</th>
</tr>
</thead>
<tbody>
<tr>
<td>How comfortable are you going into the water?</td>
<td>63</td>
<td>20</td>
<td>21</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Question</th>
<th>Within the last week</th>
<th>Within the last month</th>
<th>Within last year</th>
<th>Within the last 5 years</th>
<th>Over 5 years ago</th>
<th>I have never visited the river</th>
</tr>
</thead>
<tbody>
<tr>
<td>When was the last time you visited the Yamuna River?</td>
<td>19</td>
<td>33</td>
<td>25</td>
<td>9</td>
<td>7</td>
<td>11</td>
</tr>
<tr>
<td>Name of the Heritage site</td>
<td>Everyday</td>
<td>Within Last Week</td>
<td>Within Last Month</td>
<td>Within Last Year</td>
<td>I Never Visited the Site</td>
<td></td>
</tr>
<tr>
<td>-------------------------</td>
<td>----------</td>
<td>------------------</td>
<td>-------------------</td>
<td>-----------------</td>
<td>--------------------------</td>
<td></td>
</tr>
<tr>
<td>Agra Fort</td>
<td>4</td>
<td>11</td>
<td>14</td>
<td>35</td>
<td>19</td>
<td></td>
</tr>
<tr>
<td>Taj Mahal</td>
<td>5</td>
<td>15</td>
<td>38</td>
<td>36</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Itmad-ud-Daula</td>
<td>0</td>
<td>6</td>
<td>7</td>
<td>29</td>
<td>58</td>
<td></td>
</tr>
<tr>
<td>Chandani Ka Rauza</td>
<td>1</td>
<td>1</td>
<td>2</td>
<td>10</td>
<td>84</td>
<td></td>
</tr>
<tr>
<td>Ram Bagh</td>
<td>12</td>
<td>15</td>
<td>20</td>
<td>22</td>
<td>29</td>
<td></td>
</tr>
<tr>
<td>Mehtab Bagh</td>
<td>6</td>
<td>4</td>
<td>17</td>
<td>16</td>
<td>55</td>
<td></td>
</tr>
</tbody>
</table>
11 In your opinion, how frequently do you walk along the Yamuna River?

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Every day</td>
<td>8</td>
</tr>
<tr>
<td>Every week</td>
<td>10</td>
</tr>
<tr>
<td>Within every month</td>
<td>15</td>
</tr>
<tr>
<td>Within every year</td>
<td>26</td>
</tr>
<tr>
<td>Within the last 5 years</td>
<td>1</td>
</tr>
<tr>
<td>Over 5 years ago</td>
<td>4</td>
</tr>
<tr>
<td>I have never visited the river</td>
<td>30</td>
</tr>
</tbody>
</table>

12 Do you think pollution is damaging the ecology and the heritage structures including the Taj Mahal?

<table>
<thead>
<tr>
<th>Opinion</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Strongly disagree</td>
<td>6</td>
</tr>
<tr>
<td>Somewhat disagree</td>
<td>5</td>
</tr>
<tr>
<td>Neither disagree or agree</td>
<td>2</td>
</tr>
<tr>
<td>Somewhat agree</td>
<td>5</td>
</tr>
<tr>
<td>Strongly agree</td>
<td>83</td>
</tr>
</tbody>
</table>

13 Do you feel comfortable being in close proximity near to the Yamuna River?

<table>
<thead>
<tr>
<th>Whether</th>
<th>Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>52</td>
</tr>
<tr>
<td>No</td>
<td>36</td>
</tr>
<tr>
<td>Undecided</td>
<td>16</td>
</tr>
</tbody>
</table>
14. To what extent do you agree or disagree with the following description of the Yamuna River?

<table>
<thead>
<tr>
<th>Description</th>
<th>Strongly Disagree</th>
<th>Somewhat Disagree</th>
<th>Neither Disagree or Agree</th>
<th>Somewhat Agree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>There is beautiful landscaping along the river.</td>
<td>27</td>
<td>13</td>
<td>6</td>
<td>27</td>
<td>30</td>
</tr>
<tr>
<td>The native tree plantation is necessary to reduce massive pollution.</td>
<td>15</td>
<td>6</td>
<td>3</td>
<td>3</td>
<td>76</td>
</tr>
<tr>
<td>There are lots of interesting programs and events happening along the river.</td>
<td>28</td>
<td>11</td>
<td>27</td>
<td>18</td>
<td>19</td>
</tr>
<tr>
<td>There should be more vegetation along the river.</td>
<td>9</td>
<td>3</td>
<td>1</td>
<td>6</td>
<td>85</td>
</tr>
<tr>
<td>The present water in the river is good for the agriculture.</td>
<td>25</td>
<td>8</td>
<td>8</td>
<td>25</td>
<td>41</td>
</tr>
<tr>
<td>The people involvement is essential to protect the historic sites.</td>
<td>10</td>
<td>3</td>
<td>2</td>
<td>3</td>
<td>87</td>
</tr>
<tr>
<td>The historic sites along the river need to be protected.</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>6</td>
<td>86</td>
</tr>
<tr>
<td>I am ready to plant trees in my site suggested by environmentalist to reduce the pollution.</td>
<td>5</td>
<td>3</td>
<td>5</td>
<td>3</td>
<td>87</td>
</tr>
</tbody>
</table>
15 In your opinion, how important is the riverfront development to you?

- Very important: 92
- Not important: 4
- Undecided: 6

16 If there were public parks along the river would you visit them?

- Yes: 97
- No: 6

17 Would you be willing or not willing to participate in the city design initiative that attempts to clean the Yamuna River?

- Willing: 71
- Not willing: 7
- Undecided: 11
18. How would you prefer to participate actively in the cleaning of the Yammuna River?

<table>
<thead>
<tr>
<th></th>
<th>Willing</th>
<th>Not Willing</th>
<th>Undecided</th>
</tr>
</thead>
<tbody>
<tr>
<td>By paying money</td>
<td>26</td>
<td>12</td>
<td>55</td>
</tr>
<tr>
<td>Physical activity</td>
<td>74</td>
<td>4</td>
<td>20</td>
</tr>
<tr>
<td>Undecided</td>
<td>3</td>
<td>8</td>
<td></td>
</tr>
</tbody>
</table>

19. Please rate your preference for the following amenities:

<table>
<thead>
<tr>
<th>Amenity</th>
<th>Lower priority</th>
<th>High priority</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ecological gardens</td>
<td>1   2   9   6   75</td>
<td></td>
</tr>
<tr>
<td>Public parks</td>
<td>6   15   18   55</td>
<td></td>
</tr>
<tr>
<td>Exhibition areas</td>
<td>8   13   25   21   34</td>
<td></td>
</tr>
<tr>
<td>River walk</td>
<td>7   10   14   21   45</td>
<td></td>
</tr>
<tr>
<td>Public toilets</td>
<td>17   9    11   12   50</td>
<td></td>
</tr>
</tbody>
</table>
Appendix B

Qualitative Data Analysis (Resident Interviews)

1. Surveyor 5:
   We need playgrounds.

2. Surveyor 7:
   The cleaning of the Yamuna River is my first priority. Public toilets are very essential. The river needs a compound to keep people from going into the river. The people pollute the river.

3. Surveyor 12:
   The polluted water going into the Yamuna River needs to be restricted. A barrage needs to be constructed below the Taj Mahal so that sufficient water can be stored from the Heritage District. It will help to envision the natural appearance of the river. The government collected a lot of money to protect the Yamuna and the Ganges Rivers. The results from that money have not yet seen.

Figure 5.1: Surveys with residents of Agra
4. Surveyor 13:
Agra occupies special place in India due to its ancient cultural buildings including the Taj Mahal. Everyone needs to contribute to protect these monuments so that the next generations will have a better environment.

5. Surveyor 15:
The government needs to focus on the cleaning environment and the river. This will help set an example for the world. The people are for the country and country is for the people.

6. Surveyor 16:
Proper steps and actions should be taken by the government to clean the Yamuna River and to establish parks and/or playgrounds.

7. Surveyor 20:
The polluted water going into the Yamuna River need to be restricted. The Taj Mahal and other heritage sites needs protection based on the environmental education (Abhiyan) of the residents.

8. Surveyor 21:
The barrage needs to be constructed to maintain a sufficient amount of water in the Heritage District. Additionally, it will be useful for the environment in Agra, especially the vegetation.

9. Surveyor 22:
The barrage needs to be built on the Yamuna River and the river cleaning needs to be the first priority.
10. Surveyor 23:
The Taj Mahal is an architectural wonder in the world. It is necessary to beautify the river to support this magnificent building. The city needs the barrage to maintain an adequate supply of water in the river. This will highlight the exquisiteness of the building.

11. Surveyor 27:
As a request to all residents in Agra, please do not throw any religious offerings into the Yamuna River. This is harmful for to the river and will increase the pollution.

12. Surveyor 35:
Every resident needs to participate in the cleaning of his surrounding environment. This is the easiest way to clean the area. The residents should not use polyethene and plastic bags.

13. Surveyor 39:
Thank you. The government should take steps to clean the river. Thank you.

14. Surveyor 43:
Water is life. All the brothers and sisters are requested to not use excessive water. Please do not contaminate the river. Everyone needs to participate in the environment cleaning of the environment.
15. Surveyor 46:
I will be always ready to give as much help to my beautiful city as I able to know Yamuna Revolution needs a group of Joined hands. Now, this is the time to come together to refine “our Yamuna”. Thank you.

16. Surveyor 52:
The Yamuna River needs to be cleaned.

17. Surveyor 57:
The Yamuna is so polluted that a normal person cannot go near it. It should be clean for our environment and the dignity of Agra. The government should take the necessary steps clean the Yamuna River like the Yamuna Action Plan. Thank you.

Figure 5.2: Survey with residents of Agra
18. Surveyor 58:
The cleaning the Yamuna River should be everyone’s priority. Everyone needs to participate.

19. Surveyor 62:
I welcome you to Agra. I am certain that the river is polluted and it needs to be cleaned. It is so polluted that the surrounding regions have become contaminated resulting in a bad odor. It causes disease for the people. The pollution reduces the beauty of the Taj Mahal. Additionally, it does not make a good impression on the visitors from other countries.

20. Surveyor 62:
It’s our desire to have a cleaned less pollution river in the city. It will be beneficial for the residents. The people should take the initiative to clean the river. We should avoid destroying trees to keep the pollution in the atmosphere, minimal. Cleaning the river will help improve the health of the people.

21. Surveyor 67:
The river should be cleaned; it will not only help the people but also the animals including fish and birds. The dirty river causes diseases. There should be public parks along the river so that people can enjoy the several heritage sites.

22. Surveyor 68:
I would like to see a pollution-free Agra in next the five years. It’s my dream. I agree with you. I will try my best to fulfill my dream.
23. Surveyor 70:
This surveying the Yamuna River from pollution should be everyone’s priority. People need to come together to protect it from contamination. It should start with individuals. Everyone should participate to clean not only the river but the surrounding drains, lakes etc.

24. Surveyor 71:
To save the river from the pollution is a very necessary. It helps to create healthy and spiritual environment. To save Yamuna from the contamination should be everyone’s main priority.

25. Surveyor 72:
Saving the Yamuna River from pollution should be everyone’s priority. Everyone needs to plant as many trees as possible. The Yamuna River has a special importance for everyone; hence, to save it from pollution needs to be everyone’s main priority.

26. Surveyor 73:
Everyone needs to contribute to the cleaning of river because sometimes water is directly supplied from it to individual households. Cleaning the river helps to highlight the attractiveness of historical buildings. This will help to attract visitors from other countries.

27. Surveyor 74:
It is necessary to clean the river associated with the parks.
28. Surveyor 77:
To reduce pollution, the government should accept help from the people and volunteers. The government should not stop the plantation and environmental programs. The people should plant new trees with the help of the government.

29. Surveyor 78:
I am completely agreed with all your answers. Big steps are necessary to save the Yamuna River.

30. Surveyor 81:
I agree with saving the river from pollution and I would like everyone to participate in it. It is necessary to include every resident to solve this problem. It is necessary that every resident understand the present situation. Helping to clean the environment is like religious work.

31. Surveyor 82:
The Yamuna River has a special importance above all other rivers. This is a goddess for Hindus. To clean the river is everyone’s responsibility. The polluted environment affects to all the residents in the city. Cleaning the river and the surrounding environment is necessary because water is life. It is necessary for people to participate cleaning the environment.

32. Surveyor 84:
Because of modern amenities we are sacrificing our environment and our heritage. Everyone is dumping trash into the river which affects various cities. It seems the Yamuna won’t ever exist until 2030.
33. Surveyor 91:
It is requested all that people of India help to clean the river. It is an appeal for Agra residents to clean the river and conduct religious offerings away from it. This will help to reduce the pollution.

34. Surveyor 97:
People need to save the Yamuna River and its ancient buildings. I would love to contribute to cleaning the Yamuna River.

35. Surveyor 101:
1. Stop unclean drains flowing into the river.
2. Water should be released from barrages periodically.
3. There should be plantations along the Yamuna River. They will help to reduce erosion and air pollution.
4. All the animals should stop going into the river.
5. Avoid throwing dead bodies flowing into the Yamuna River.

36. Surveyor 104
First of all, I want to tell you that our government is not doing well to make our lives beautiful. They are spending money on that and so and so projects and blah…blah…blah.. but you won’t find any good programs. Waste water is flowing into it. It is only the government who can take major steps to stop all that. It would be better for our government to support this rather than spending money on paper projects. It should work to save the water of our river. We can’t even step into it, or touch or feel that water,
most important the whole area is drinking that water. “It is a holy blessed river but the people or government has made it cursed.”

37. Surveyor 105

Yes. I would love to participate in cleaning the river, especially some of its heritage areas.

**Interview 1:**

Water quantity in the river is low. Additionally, water quality is affecting the surrounding landscape. The city needs a barrage to retain a sufficient quantity of the water and for the vegetation along the river. The water quantity is reducing by 7-8 feet every year. The barrage will help to maintain the water level in the city.

**Interview 2:**

We need to clean the river, need to stop animals from going into the river and need to stop all the waste drains flowing into the river. The Taj Mahal is a renowned heritage monument, the government needs to give special attention to clean these areas and to beautifying of these areas and to keep and restore the historic importance of this area.

**Interview 3:**

Avoid dirty drains flowing into the river. Allow the discharge of a minimum flow of water into the river especially from Tajiwala barrage, Delhi. Plant a maximum number of trees along the river help to reduce soil erosion and the pollution and to supply wood for construction. Need to stop animals from going into the river. Need a solution for crematoria areas along the river. These will help to reduce the pollution.
**Interview 4:**

Need public toilets. There should be a barrier to stop people from going into the river.

**Interview 5:**

Plastics are creating a problem. These are blocking drains.

**Interview 6:**

Infrastructure problems create a nuisance after rainy seasons. There is no clean water in the river, it is all polluted water. It creates problems for day-to-day activities. We don’t use water in the river for trees and bathing. It creates a foul odor surrounding the region. We are experiencing a lot of pollution. When there is a flood, then we understand that there is a river.

**Interview 7:**

Dealing with the pollution is taking momentum. I hope after 2 to 3 years Agra will be neat and clean. The government took action against factories polluting the river in Mathura. The plan for Agra and Mathura is same. Mathura also has sewage and pumping plants. These plants will clean the water and will be used for agriculture. The drains (nallah) are clean then there won’t be unclean water flowing into the river. These plants also will take care of plastic bags in the river.

**Interview 8:**

Dirty water is flowing into the river, creating trouble. The government appears apathetic about this issue. If this continues, this could become a big issue in the future. The residents with the help of government need to plants 5 trees around their houses.
Key Terms with Operational Definitions:

**Heritage:** Heritage is something that is passed down from preceding generations; a tradition

**Intangible Heritage Structures:** An intangible heritage is that which exists intellectually in the culture. It is not a physical or tangible item. Intangible heritage includes songs, myths, beliefs, superstitions, oral poetry, as well as various forms of traditional knowledge such as ethno-botanical knowledge. For the southern Kalahari San, each tree and many other physical sites are part of its intangible heritage as its history is associated with these sites through stories, names and songs.

**Tangible heritage Structures:** A tangible heritage is one that can be stored and physically touched. Tangible heritages include great public monuments such as temples, and pyramids. It also includes items produced by cultural groups such as traditional clothing, utensils (such as beadwork, water vessels), or vehicles (such as the ox wagon). Though tangible heritage can perish, it is generally more obvious how it can be conserved than intangible heritages that are at greater risk and can be lost for all time. Historically, national policies have given more attention to conserving large public man-made structures as valuable heritage rather than managing the conservation and use of intangible heritage.

**Sustainable Development:** Sustainable development is a pattern of resource use that aims to meet human needs while preserving the environment so that these needs can be met not only in the present but also for generations to come.
**Design Guidelines:** Design guidelines are criteria and standards to guide the Yamuna Riverfront in to determine the appropriateness of to work and to establish a uniform procedure for use in providing for the protection, enhancement, perpetuation and use of places, districts, sites, buildings, structures, objects, landscape features and works of art having special historical, cultural or aesthetic interest or value in accordance with the provisions, goals and objectives of the historic ordinance.

**Conservation:** Conservation is protection, preservation, management, or restoration of natural environments and the ecological communities that inhabit them. Conservation is generally held to include the management of the human use of natural resources for current public benefit and sustainable social and economic utilization.

**Phasing:** Phasing involves scheduling or ordering so as to be available when or as needed.

**Heritagescape:** Heritage is a unified landscape of heritage as opposed to decontextualized, walled or fenced in historic monuments with their relationship to their urban context and the river lost; the riverfront can be developed as a truly public realm accessible to all.
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