

Keeping up With Heritage

Tourism & Conservation at the Taj Mahal

As millions of tourists come each year to visit the World Heritage site of Taj Mahal, they leave clear markings on this world-renowned site. This paper presents findings from recent research and detailed site study, bringing informative evidence to light regarding the impact of tourism and continuous strain of upkeep to the site.

Text: Prof. Krupali Uplekar Krusche

Images: courtesy the author

The growing local economy depends on the income generated from the tourists but the impact of large levels of tourism has led to fast degradation of material substance of the conserved site. Taj also suffers from abuse through tourism that can be seen in the contamination of Yamuna River, loss of stone etching used to identifying the method of initial construction on pavement, marble softening and deterioration, dumping of rubble and original building material in the immediate surroundings, and loss of historic context in areas just beyond the tomb. This article intends to establish the need of balance between progress and preservation as we strive to make world heritage accessible while keeping it intact in its entirety.

Introduction

Its Sunday morning 6.00am, the streets of Agra are still empty. Vendors who sell goods in the Taj Ganj, an appendix market place connected to the Taj tomb, are still asleep. They have a long day ahead of them, selling merchandise and souvenirs to earn their livelihood. For the five to eight thousand tourists that visit Taj daily, these souvenirs are part of the memory of the splendid Taj Mahal. Lines in front of Taj entrance gates have already started forming. Tourists from various destinations have come here to watch the first rays of sunlight fall on the glistering white marble of Taj. Indian army soldiers stand on guard outside the complex gates. With numerous terror warnings and political upheavals of violence between Hindus and Muslims, the Indian government decided to guard the Taj, the most important and prominent Indian national monument, with strict surveillance. GPS systems are not allowed inside, nor are any large bags that may be of concern for security issues. The newest form of threat to world heritage sites is terrorism. While terrorism is becoming a major concern for all publicly open heritage sites, there has been an increasing level of concern for the safety of these sites through impact of tourism. A silent threat to this magnificent site for a long time, tourism has affected the mausoleum not only through the sheer mass of people that visit the site causing degradation but also due to its indirect impact through restoration methods undertaken as a result.

This piece examines the effects of tourism and the related provisions for preservation due to the increasing level of material deterioration on Taj Mahal. It presents recent research on material analysis and detailed site study during the summer of 2008/2009 to Taj, bringing informative evidence to light regarding the impact of tourism and continuous strain of upkeep to the site. With permissions from The Archeological Survey of India, from here



Front view of the Humayun's Tomb.

on ASI, a two-month long on-site documentation to study and analyze four sacred tombs; the Humayun's Tomb, Akbar's tomb, Itmud-ud-daulah's tomb and the Taj Mahal tomb was conducted. Built in the Mughal period (AD 1480 to 1858), two of these, The Humayun's Tomb and Taj Mahal, are world heritage sites. During this study, my team and I observed the restoration techniques being used by ASI at the complex and experienced the daily stream of tourists that circulated in and around these tomb sites. While ASI has been using some excellent indigenous methods to restore and repair these tombs, during my study I came across some disturbing findings regarding the replacement of the pavement and dumping original stone in areas surrounding the complex. The present restoration by ASI on one of the four of the Mughal monuments, Akbar's Tomb has caused loss of original full size etching of building profile and original symbols of craftsmen found on the pavements of these monuments. The wear and tear caused by tourist traffic on these pavements requires that part of the pavement stones be replaced. Unfortunately, such repair work is done by local craftsmen that are not aware of the historic value of the stones they replace, causing irreparable damage to the site by removing important clues that form the language of construction of these significant, unique monuments built by Mughals. If we ever want to solve the mystery towards understanding the system and the methodology of design, composition and construction of Mughal tomb buildings, then evidence of construction techniques used on site should never get lost. Taj Mahal, the pinnacle of Mughal renaissance in India, is the key to study Mughal architectural language and it is important to appreciate it in its entirety. Also at Taj, the original material being replaced by new material is being dumped alongside the outer edge of the complex causing the way to the river to become a dumping yard of old

original building material. Taj also suffers from abuse through tourism that can be seen in the contamination of Yamuna River, marble softening and deterioration, and loss of historic context in areas just beyond the tomb.

The Annual Report from the Ministry of Tourism, government of India, indicates Taj Mahal got in the year 2005 and 2006; 530,287 documented foreign and domestic visitors (in six months' period), with the most visitors in the month of March. With such a large number of visitors per year, Taj Mahal becomes one of the most visited sites in India. Unfortunately, these visitors come for a one day visit to the city of Agra without spending much time in the city and without taking advantage of all the other sites that exist in and around Agra (Sinha 2004, Farrell 2002). Collection of tourism statistics by the Ministry of Tourism for the State of Uttar Pradesh indicates approximately 1 million overnight tourists and an additional around 1.1 million day-tourists in Agra. Taking into account that most of these visitors would want to visit Taj Mahal and eliminating certain percentage of redundancy in the survey, one can safely say that an average of 1.5 million visitors visit Taj each year. While tourism is the central source of income for most citizens of Agra, with such large tourist traffic, comes large management and preservation issues to the monument. The constant flow of tourists and their physical contact with the marble is the cause for staining (Agrawal 2002), marble softening and deterioration. The contamination of Yamuna River through sewage and industrial drainage, disposal from cremation sites, cleaning, washing and cattle wash (Batra 2002) has made the once royal medium of transport and entrance to Taj (Harkness, Sinha 2004) a sad backside dump. This water is the same water that gets circulated through the water fountains and is the primary source of water irrigation at Taj.

This study reveals the need of balance between progress and preservation as we strive to make world heritage accessible while maintaining it in its entirety. Upkeep of the monument is essential as it contributes to an important part of Indian heritage and history. Also it is necessary to keep it open for the hundreds of tourists who visit the monument on daily basis. The paper gives a brief history of Mughal lineage in India and their tomb buildings analyzed and documented during this study. It then focuses on the history and architectural nature of Taj Mahal and discusses the value of Taj and its connotation during Mughal age. The paper examines the function of Taj today as a tourist destination and implications of restoration done on site that adds or takes away from the quality of the site and its historic value. The study suggests ways in which balance needs to be achieved between requirements of restoration and bringing large amounts of tourists to these monumental sites. As the site deteriorates, the restoration done necessitates thoughtful and careful planning, to avoid losing valuable information and context that relates to comprehensive understanding of Taj Mahal.

The Making of Taj Mahal

The Taj Mahal was the only Mughal mausoleum that was built by a ruler for his own purposes during his lifetime. This may serve as one of the



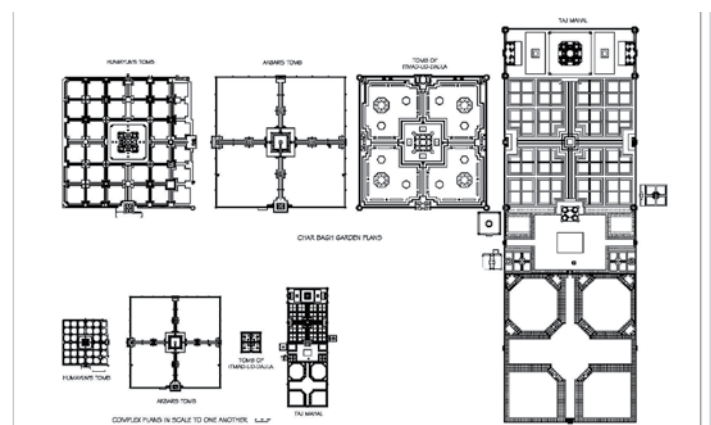
Front view of Akbar's Tomb.



Front view of Itimud-ud-daulah Tomb.



Rarely seen view of the Taj Mahal from Mehtab Bagh by Danny Ajjajin.



Drawing comparing the four tombs at same and comparable scales by Jill Kapadia.

reasons that the sheer scale, delicacy of material usage, and overall harmonic aesthetics are more prevalent in this structure than any other Mughal mausoleum. It was under the rule of Shah Jahan, that Mughal architecture entered its classical phase (Koch, 1991). The intentional use of design principles in sacred buildings demonstrates the desire to express the complex relationship between the human and the divine through architecture. Evidence of careful composition and proportion study of principles is seen during Mughal rule in India, through the progressive understanding of construction of predecessors like Humayun's tomb, Akbar's tomb and Itmud-ud-Daulah's tomb to the Taj Mahal (Krusche 2010). Constructed successively, these structures became the paradigm by which all other successors were judged. As building type, the Taj Mahal primarily served the function of veneration, and secondarily, exhibits governing authority. The dominance of the Mughal reign, not only as a ruling body in India, but in the wider world, was clearly established when Taj Mahal's evident beauty and perfect proportions illustrated the transmission of similar ideologies and interests in creating aesthetics that are transformative and appealing in a universal form.

Weathering of Marble and Sandstone at Taj

Taj Mahal has become a world icon and is on the world heritage list of UNESCO since 1983. This universally admired masterpiece was put on the world heritage in danger list by UNESCO after receiving reports of problems associated to weathering of marble due to pollution from nearby industry. Marble due to its lime composition and sedimentary state is easily corroded due to acidic impact from pollutants like sodium chloride, sodium hydroxide, nitric acid and sulphuric acid that are part of rain water in highly polluted environments. These penetrate and impact the monuments surface even with coats of synthetic resins like Perspex and polyvinyl acetate, commonly used in India to protect stone surfaces (Lal 1978). The industrial production of sulphur dioxide (SO₂) causing marble discoloration is a known issue at Taj. Between 1973 and 1983, at least three studies were done to examine the short and long term SO₂ concentrations in Agra. The National Environmental Engineering Research Institute (NEERI), after their two-month air pollution survey found that SO₂ rates around Taj were as high as 400 g/m³ (D'Monte 1983). Much of this pollution came from two old thermal power stations and around 250 iron refineries in the city of Agra. Another report by M/S Tecneco of Italy to the Indian Oil Corporation confirmed that alterations in sandstone to the monuments in Agra are "more prominent than in marble on which ageing is till in the initial stages" (Sengupta 1979). In 1994 the Supreme Court of India required that the polluting industries in Agra that were within 500 meters of heritage structures be shut down and asked the Ministry of Environment and Forests to plant a greenbelt in the 100m no-build zone around the Taj Mahal (Harkness, Sinha 2004). Unfortunately a large part of weathering of the stone is associated to natural causes such as extreme heat in summer accompanied by severe dust storms (D'Monte 1983). Agra faces nighttime temperatures ranging from 7 degree Celsius (47 Fahrenheit) and daytime temperatures as high as 42-45 degree Celsius (105 Fahrenheit).

These large natural temperature fluctuations cause rapid deterioration and flaking on the stone surface and are difficult to avoid.

Om Prakash Agrawal, the Director of the Scientific Committee appointed by the Government of India to study the conservation needs of Taj, indicates that through extensive 3 years of study his team found that most of the weathering of stone at Taj was due to natural wear and tear found at tourist sites. One of the conclusions they made was that the black greasy spots found on the marble surface near the cenotaph and the internal walls of Taj, were caused due to constant surface contact. The results thus concluded because of the organic character of the substance found in microscopic values on these surfaces. This grease was basically the oil from human hands (Agrawal 2002). Physically coming in contact with the mausoleum is thought to be a sacred act. Some do it just to get a feel of the building, and others do it due to religious implications. Circulating around the building, saying prayers while being in contact with the surface are some of the ways to express respect for those buried under the cenotaph. Tour guides also demonstrate the quality of the craftsmanship employed when building Taj, by allowing tourists to feel the texture and surface finish of the inlay work done in marble. Such contact with the marble surface leaves traces of oil from human hands causing staining and grease on the finished surface. Upon reaching the mausoleum, the visitors have to remove their shoes or wear booties over them to avoid bringing dirt and stains from their shoes on the white marble. More damage is also caused when tourists walk around the mausoleum barefoot; causing a lot of wear and tear of the marble that gets softened and slowly wears down in places of normal circulation of the tourists.

Loss of historic context in areas just beyond the tomb

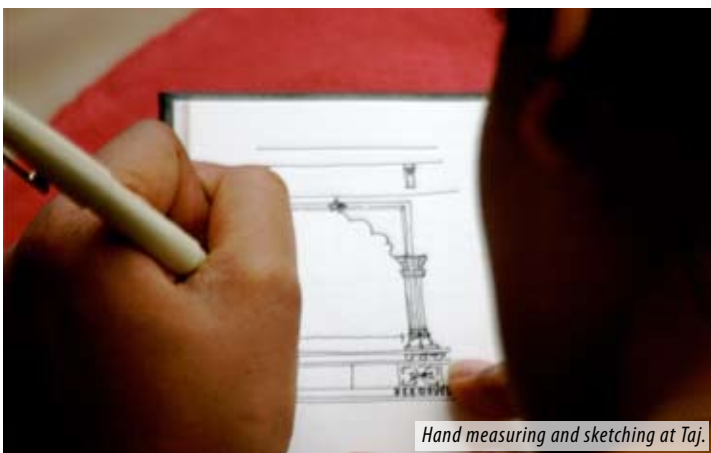
The experience at Taj is incomplete without understanding and going through the complete complex as it was first intended. Archeologist Ebba Koch has described in her latest book *The complete Taj Mahal*, the areas along the river front of Yamuna and the market place in front of Taj that are a part of the Taj complex and how the site functioned as one entity during Mughal times. The Taj, has two major entrances. One is the royal entrance from the river front side, and the other is the traditional market entrance (with 3 gates). Both these entrances were once important and the complex was experienced through various layers of spaces that made the perception at Taj more complete. Today much of the river front entrance is lost. Partially, because the secluded underground entrance to the crypt is not open to the public and secondly because most of the Yamuna riverfront does not enjoy the quality and character it once had. The royal mughal gardens lining the Yamuna front gave a much more exhilarating experience upon approaching Taj. The recently excavated Mahtab Bagh or the moonlight garden (Bellafiore 2003), is said to be a garden that was used by Shah Jahan for the private viewing of Taj with its beautiful moonlight reflections in the reflective pool of the garden. Few if any come and see this garden, as presently the only way to access this garden is by road and one has to go half way across the town to reach it. The urban entrance to



Etchings found on the pavement of Akbar's Tomb.



Dumping of rubble outside the Taj Complex.



Hand measuring and sketching at Taj.

Taj was once connected to Taj Ganj, the traditional bazaar area just outside Taj (Koch 2003). Based on the cross axis used in the planning of Mughal gardens (charbagh) and tomb plans, the Taj Ganj area was composed in the traditional Shah Jahani architecture, with small niches in the complex compound that surrounded all four quadrants of the bazaar [Fig 5]. Today this area has been overtaken by a dense residential overgrowth that is lined with souvenir shops. Tourist exit and enter the complex through this urban entrance and are overwhelmed by the large number of shops and workshops that are in and around Taj Ganj. Souvenirs like inlaid marble plates, gift boxes and soapstone imagery are part of every shop in this area. Jewelry and semi-precious stones that can be related to Taj are widely

available here. These shops rely on the tourist income along with other like the rickshaw drivers, tourist guides, hotels and restaurants in this area. During the rainy monsoon season between May and August each year, a time most of the tourists avoid, the income generated is very low and most of the life around Taj is nearly at a standstill. The growing local economy depends on the income generated from the tourists but the impact of large levels of tourism has led to fast degradation of material substance of the conserved site. Tourism on the one hand is generating income for the local community but on the other hand it is also the reason why people who want to own a shop closest to Taj have infringed this long forgotten Taj Ganj Bazaar. During my survey in summer 2008, I found a large part of the original walls of the compound to be still existing, but thickly embedded in the residential fabric of the neighborhood. Both the cross axial streets leading to Taj were once much more wider than they are today. They have been encroached and filled in to form shops in front and residences behind. Some have even managed to create courtyards in center of individual houses with terraces above. These terraces have now become a priced view to get pleasure from the glorious Taj Mahal while enjoying a cup of Indian chai for many tourists. One restaurant based on this concept, is called Taj View Restaurant, a great selling point for the owners to attract tourists who are ready to pay the price to enjoy the beauty of this monument one more time. This concept has also been privatized at The Oberoi Hotel, Amarvilas, Agra, where a very intimate and private view of Taj is offered to its residences, as a part of the experience while staying there. All this commercialization of Taj has taken place only due to its touristic attraction and value today. As the Ministry of Tourism in India thinks of ways in which to commercialize and bring more and more tourists to various destinations in the country, it needs to examine various case studies, like the Taj where this thin balance between tourism and preservation needs to be maintained. The impact of tourism and continuous strain of upkeep to the site can be very crucial in determining what we leave behind as a legacy for our future generations.

Loss of stone etching used to identify the method of initial construction

During my research of the four Mughal tombs, my research team with support from University of Notre Dame, and permissions from ASI Agra extensively using techniques like photogrammetry and traditional hand measuring of the entire site. Akbar's tomb is the largest of all four tombs examined during our study, and was the most extensive to document. This is the first time these two tombs were so carefully analyzed and documented. Koch (2006) has done extensive work on Taj Mahal, which we utilized for our research and have added further information regarding proportions, composition and the progression of design ideas in these four tombs reaching its pinnacle at Taj (Krusche 2010). The team investigated the Taj Ganj site extensively to determine the original parts of the complex and new additions made through encroachment in recent years. A major part of our study included understanding if the tombs had a common proportioning system utilized during the building process.

During the three weeks we decided to spend at the Akbar's tomb documenting and analyzing the site, while hand measuring the platform on which the tomb is centrally located, we came across edged profiles on the red sandstone pavement located near the west side facade of the monument. Upon further examination, I realized that these were edgings representing molding profiles from the facade of the tomb. Looking at the existing monument and comparing it with the drawings of these profiles we concluded that edgings were exactly 1:1 scale to the moldings on the monument. Thus a theory could be put forward that the original builders of the monument working on the site used these profiles as measure drawings to cut the actual stone in shape. The profile that is seen from the tracings taken on site is like a blueprint representing a design that has been repeated often connecting the base of one profile to the top of the other creating a continuous pattern as seen on the minor entrance gate leading to Akbar's tomb. The profile found on the floor represents the design of an arch thickness in stone from the outside and the flower pattern on top. There is also a faint indication of another line of similar thickness on top of the profile [Fig 6]. We also discovered names written in full in Hindi in an engraved form on the surface of nearby stones and lines of construction near the entrance gate of the monument. ASI undertook extensive restoration and replacement of pavements at all four monuments in 2008. Large areas of red sandstone used to cover the paved surface of the complexes that had worn down was completely removed and then replaced with new stone pieces. Restoration on site is simply carried out by replacing the complete stone piece instead of repairing each piece individually. Such type of restoration is essentially done not to maintain the old material of the building but more over to preserve the character of space by replacing instead of repairing the material giving the site a 'new'-finished look. Such replacement of stone is easier than the repair method, as local labor can be employed to do the job at merely 300Rs (7\$) per day. Unfortunately such work sometimes leads to missing details of restoration that would be visible to the eye of an expert. The craftsmen working presently on the construction of the complex are not aware about the importance of these profiles and do not consider them while replacing the stone pavement on the platform. This could mean that we may have already lost some profiles during the restoration process, which is a troublesome thought to my mind. Also, an important aspect acknowledging the means and methods of construction used in this period, this technique could easily have been incorporated at each Mughal tomb including Taj Mahal. Similar "blueprints" of construction techniques used to construct ancient and medieval monuments have been found in Greece, Rome and some parts of Europe (Haselberger 1985, Jones 2000). Haselberger as a young archeologist, during his visit to the famous ruin of the Temple of Apollo at Didyma, south of the present-day Turkish town of Soeke, one day in the morning sun discovered the profiles on the walls of the temple. These finely etched lines on the temple walls, were barely visible to the human eye and were after long research found to "constitute the most extensive and most complete set of plans that have come to light in all of ancient architecture" (Haselberger 1985). These drawings present

the typical method of construction used to construct 18 meter high columns with emphasis used to represent optical correction in design.

A more detail study needs to be undertaken at the Mughal tombs site in order to establish the existence of similar profiles on other sites. But in order to do this, the present repair and replacement of the stone pavement needs to be immediately stopped. Without further study, we could lose an important clue to the building techniques utilized during this period. For example, in case of Taj, the monument has characteristic symbols craved by individual craftsmen that represent the craftsmanship and identity of the original workers who worked on the tomb (Koch 2006). Unfortunately the fast replacement of the stone pavement without consideration for the symbols or etchings is a major issue that could deprive us of some very important knowledge about the site and the people who worked on it.

Dumping of rubble and original building material in the immediate surrounding

ASI continuously does maintenance and has recently started extensive restoration of Taj. The museum on site is being restored completely and also there was restoration being done on the surface of the building. Multani mitti a kind of mudpack was used on the surface of the building. This pack was applied on individual walls and kept to dry for 24 hours (Syal 2002) before being cleaned and removed with (ammonia) water. Taj and other Mughal tombs in Agra and Sikandra are getting restored at a continuous rate in the last years. During this restoration process large pieces of stone are being removed and replaced by new pieces of stone. These are mostly stones that have weathered throughout the years of life of these monuments facing harsh climatic conditions of Agra. These pieces, while being restored to give the building a new restored look, are costing large volumes of original building material. Huge dumps of original building material have been created right outside along the sidewalls of the Taj complex. This dumping ground is also where most of the local craftsmen sit and carve the new pieces according to the shape and size of the original piece being replaced. This area is also the access to the back entrance of the Taj complex leading to the Yamuna River. The Yamuna River grants one of the most interesting views of Taj and is a missed opportunity for the tourist to truly enjoy various perspectives of the building. Located on the Yamuna river and



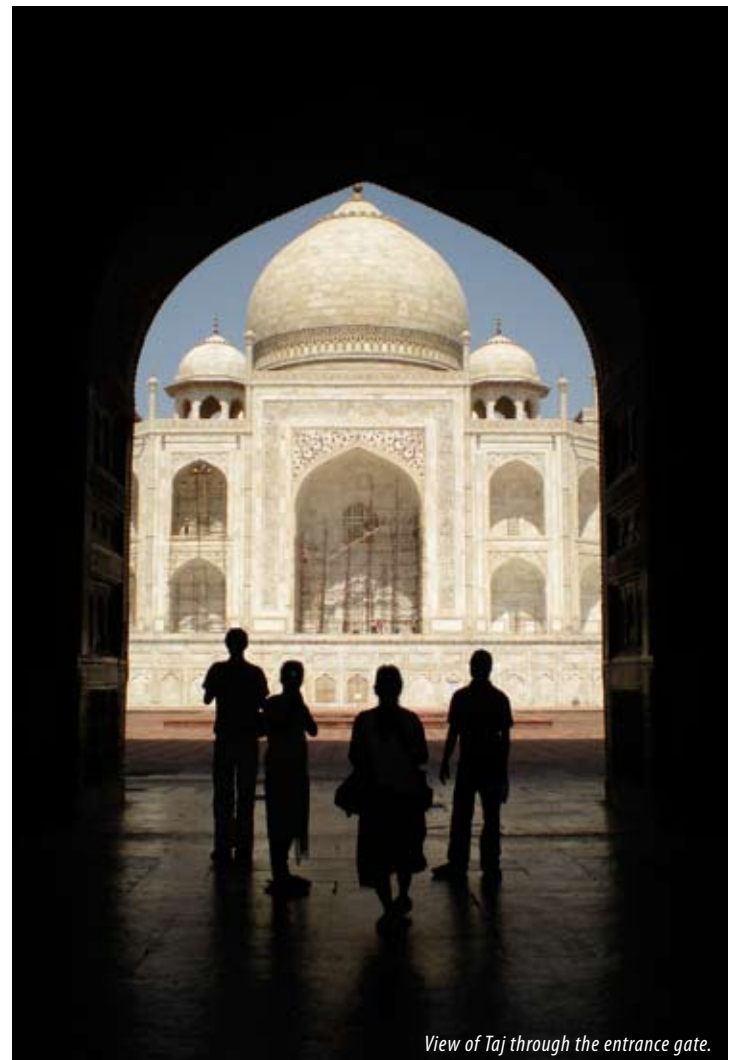
Replacement of old pavement with new stones at Taj.

surrounded by dense urban context, there is an immediate need to make sensitive decisions regarding the manner in which tourism while bringing progress, can be systematic and curtailed to the needs of the site.

A need for balance between tourism and maintenance of the site

India for centuries now has been regarded as the land of the exotic and unknown. The Government of India together with the Ministry of Tourism is making large strides towards bring progress and modernization to make these tourists sites known and reachable. As tourism becomes one of the largest income generators for world heritage sites it is largely helping in generating funds for the maintenance and supporting local community around such sites. Taj Mahal tourists generate a total of approximately \$2 million from entrance fees each month (Farrell 2002). The tourists further contribute millions of dollars to the local economy during their stay in this area. As the number of tourists coming per day to Taj grows, the concern for conserving the site grows even more. This leads to the question of balance between progress and preservation. A careful assessment of how such tourists move through world heritage sites with the minimum of intervention or disturbance to the monument is the key to holding this balance. Mentioned below are a few ways in which Taj Mahal can be protected from conservation issues due to tourism while promoting a healthy growth of number of tourists visiting the site.

- 1) A circulatory route with temporary railings around the complex that protects the site from unnecessary intrusion and avoids visitors from physically touching the stones of the mausoleum. (The Vatican in Rome has adapted a similar circulation route and railings at the Sistine chapel.)
- 2) Immediate stop to removal or replacement of any stone from the Mughal complexes until they are studied by trained conservationists or archeologists. The stone surfaces need to be assessed for markings, signs or symbols that lead to more information regarding Mughal construction techniques. Only after careful examination should such restoration practice be continued.
- 3) Removal of dumped stone and building material from beyond the complex compound. Careful examination of the material for valuable pieces that could be kept in museums. Clearing the way to Yamuna River and creating landscape and planting trees that blends with the site.
- 4) Improvement and adaptation of greens and landscaping along the Yamuna River with points of connection to other sites on the riverfront.
- 5) Connection between Taj Mahal present complex with Mahtab Bagh – Moonlight garden
- 6) Slow restoration or new regulations for improvements of the Taj Ganj incorporating the various shops in a better traditional way in the Ganj to recreate the old main in which the bazaar worked while keeping the shopkeepers and residence in same place where they live.
- 7) The ASI has placed a coil matt on the steps and some part of circulation area of the mausoleum, which avoids slipping and falling due to the slippery surface of the marble. But there is eminent danger of fall especially near the edge of the terrace which is guarded with only a small



View of Taj through the entrance gate.

railing. This needs an indigenous solution without hurting the aesthetics of the building.

- 8) Need for a tourist map and small leaflet that explains the various part of the Taj complex.
- 9) Creating good tourist facilities for transportation and other resources in the area.

Taj Mahal with its shimmering white marble masterpiece combined with the lustrous green garden complex is a delight and depiction of heaven on earth in strong contrast to the dry arid climate of Northern India. As one lays eyes upon this timeless beauty after passing through layers of transitioning spaces, the much-anticipated approach can only be satisfied by limitless magnificence of this building. There are few monuments in the world that hold the eye of the beholder in the same way as Taj does. Many world heritage sites face the same peril as Taj today. We need to ensure that such sites are open for our generation to share the knowledge and beauty that they have to offer, but that we also maintain it for our future generations to come. ■

Author	:	Krupali Uplekar Krusche
Research Team	:	Jill Kapadia, Selena Anders, Iva Dokonal and Daniel Ajjain

Prof. Krupali and the Study Team represent the University Notre Dame in USA.