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Teardrops at the Taj: wicked problems of World Heritage preservation, pollution and politics

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ABSTRACT

This paper examines how monumental preservation at the Taj Mahal leveraged the broader goals of national and international agencies including UNESCO and other UN bodies, the World Bank and the Asian Development Bank, to address the wicked problems of pollution, pro-poor tourism, and sustainable development. I suggest that the Taj, and more specifically its future preservation, is bound up in a set of conflictual connectivities and centrifugal forces that far exceed normative heritage and conservation practice. Thus the Mughal tomb became 'the critical receptor' and nodal site for an onslaught of international technical, economic, developmental and conservation schemes attempting to link cultural conservation with environmental concerns, in concert with social and economic uplift, well-being and urban resilience. What remains after decades of foreign studies, consultancies, technical reports, preservation monitoring and novel technologies? And how might we disentangle those wicked problems encircling monumental preservation in an era of environmental and political toxicity.

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> Let the splendor of diamond, pearl, and ruby vanish like the magic shimmer of the rainbow. Only let this one tear-drop, this Taj Mahal, glisten spotlessly bright on the cheek of time, forever and ever.
>
> Rabindranath Tagore

Introduction

In July 2018 the Supreme Court of India met to decide the fate of the Taj Mahal. The building had stood for almost 400 years and weathered an onslaught of political, religious, natural and conservation threats and disasters. The court case centred around whether pollution's effects on the Taj had become so intense that the monument would have to be closed, Justices MB Lokur and Deepak Gupta declared, 'You can shut down Taj. You can demolish if you like and you can also do away with it if you have already decided'. Paradoxically, such harsh words were likely welcome to BJP (Bharatiya Janata Party) politicians and state hard-liners who seek to marginalise India's pre-eminent monument in the current climate of communal polarisation and Islamophobia. 'Uttar Pradesh is not bothered', the judges observed; 'there is no action plan or vision document. We want you to give us an action plan as to what you propose to do. We will hear it and finally dispose [of] it. If it has to be shut down let it be shut'.[1] Considered by the Archaeological Survey of India (ASI) a Monument of National Importance (Ahmed 2013), the Taj Mahal has long been managed by the Government of India, that presides over its preservation, World Heritage status, international donor economies, and ultimately, its fate.

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Despite a Parliamentary Committee report on the effects of pollution on the Taj, both the state and central governments had failed to take action. This was not the first time the monument had made an appearance in India's Supreme Court: there were petitions to save it from pollution in 1984, and then a 1996 ruling indicated that the Taj Trapezium Zone (TTZ), the surrounding 50 km precinct, should be rendered pollution-free. Writing on the Zone, two decades later, an expert committee concluded that history will never pardon us for knowing and not addressing the potential of the area and leaving it to decay not naturally but due to human induced development interventions. All things born and created follow a cycle of growth and decay, but our efforts should prevent this decay and increase the longevity of the resource for future generations (Dhote et al. 2018). Today that 'cycle' is further embroiled in the wicked problems of pollution, poverty and politics, further complicated by the precarities of climate change, community development and conservation shortfalls.

This paper examines how the politics of preservation at the Taj Mahal (Figure 1), propelled by national actors such as the ASI and international agencies including UNESCO and other UN bodies, the World Bank and the Asian Development Bank, leveraged the Taj to operationalise their goals concerning pollution, communal politics, pro-poor tourism, and sustainable development. In tandem, they further supported an enduring consultancy culture through technical assistance programmes, much of which has been conveniently forgotten in Agra today. For UNESCO, technical assistance at the Taj was one of its more far-reaching partnerships, in that it sought to address global concerns like poverty and pollution. Albeit less publicised than those salvage missions to Abu Simbel or Angkor (Betts 2015; Luke and Meskell 2023; Meskell 2018), the monumental preservation and the pursuit of whiteness at the Taj Mahal galvanised a global mission. Indeed, maintaining the white perfection of the Taj underlined a series of an expanding global crises like air pollution, toxic waste, sanitation, rising temperatures, polluted rivers, and parasites. Agra, even in the 16th century, was described as the 'emporium of the traffic of the world'. That prominence, however, precipitated consequences for the city and the monument in the centuries to follow. In the 20th century such urgencies galvanised new technologies, monitoring systems, and conservation techniques for whitening the marble. They similarly fuelled social engineering



Figure 1. View of the Mausoleum, Taj Mahal. Photo by the author 2022.

strategies such as capacity-building programmes, community heritage and development plans, and pro-poor tourism, all of which reveal mixed success.

Mobilising the integrity of the world's most 'romantic' monument would draw the full force of international aesthetics and imaginaries, thus drawing attention to threat and risk on a global scale. Climate change, environmental degradation, pollution, poverty, uneven development, industrialisation and social inequality were all in evidence in Agra, illustrative of the world's wicked problems – those that are extremely difficult or impossible to solve. And indeed all come to bear on the integrity of this one monument. Being such a prominent and high-profile heritage site, the Taj offered monumental leverage for global concerns, especially on the international stage. However, in the decades that followed the first wave of international intervention by UNESCO, national delivery in Agra has been less impressive, despite the recent water, sanitation, defaecation, and clean-up (*Swachh*) campaigns led by the ruling BJP (Meskell 2021). While the monument seemed to offer ever-hopeful idealism and promise, decades on, the challenges continue unabated.

This study employs a mixed methods approach, including ethnographic, historical and archival research. Over the past decade I have consulted thousands of documents detailing UNESCO projects and technical assistance programmes, many focused on India and held in UNESCO's Paris archives. Additionally, I have examined documents archived in Delhi from the Archaeological Survey of India (ASI), the Indian National Trust for Art and Cultural Heritage (INTACH), and other agencies that document some 100 years of intervention at the Taj Mahal. Additional materials are held within the buildings of the Taj Mahal itself. I further draw upon data from long-term ethnographic study, site visits, and extensive media coverage in India.[2] It would require a book-length treatment to cover all the interventions local, national and international, following the reign of Shah Jahan to the present political crisis. Rather, my focus is primarily upon international interventions during the later 20th century, specifically those led by or in partnership with UNESCO, with a focus on World Heritage preservation. What I hope to offer in this incomplete genealogy is an illustration of how monumental preservation and techno-politics have become increasingly entangled in ever-expanding crises – some to be expected, others unintended – suturing industrial, infrastructural, biological, political and noxious elements together. At some times the Taj was trapped in a lethal mixture, rendering it the 'critical receptor' of a polluted present, while at others it was caught up in optimistic efforts by multinational agencies, guided by future promise. Over the decades expert planners imagined the Taj as a generator of change, a driver of development, and a national park in American guise – all seemingly unrealistic expectations of a Mughal monument, a tomb.

Preservation polycrisis

Concern for conservation has a long history at the Taj Mahal. In 1652, soon after the Mughal emperor Shah Jahan constructed the Taj Mahal as a mausoleum for his wife Mumtaz, his son Aurangzeb wrote to his father bemoaning that extensive repairs were already needed since the ceilings were leaking and the dome had cracked. Aurangzeb ordered immediate repairs and major interventions, such as the roof being reopened and redone with brick, stone and mortar. Since then, there has been an almost constant, even if somewhat imperceptible, succession of repairs and replacement of materials and features across the 17-hectare property. Under British occupation, Lord Minto constituted a Taj committee in 1808, allocating Rs 1,00,000 for repairs and upkeep (Ahmed 2013, 72). Mughal monuments were further ordered and managed through the 1861 establishment of the ASI, with Alexander Cunningham directing a programme of measurements, drawings and dates for sites in Agra and Delhi. Lord Curzon, who drafted the Ancient Monuments Preservation Act of 1904, attended to the work at the Taj Mahal himself as the flagship of British preservation policy and practice (Kavuri-Bauer 2011, 69). Curzon promised he would not rest until 'the structure has been rendered secure against the ravages of further decay and has received such attention as may be feasible and desirable in faithful renovation'.[3] What Curzon intended through

restoration and lighting, Kavuri-Bauer contends (2011, 74), was that the Taj Mahal 'would shine forth as a space of universal transparency and that power, with the help of science, would have expressed itself through this illumination'. Consistent with British colonial power, Curzon was preoccupied with troubling issues of dark and light, literally and metaphorically, at the Taj and he extolled how marvels 'sprang, white and spotless, from the hands of the masons of Akbar and Shah Jehan'.[4]

Later, in the middle of WWII British authorities began reporting how natural and human activities were contributing to monumental decay and established a committee of experts to investigate the causes of deterioration.[5] They recommended dismantling and rebuilding the Taj on the grounds of structural integrity, but were thankfully vetoed by their archaeological colleagues. In the 1990s, eight studies were conducted by engineers at the University of Roorkee to assess the projected longevity of the monument: their results show that the use life of the Taj's materials could extend over the next 930 years. Their predictions, however, cannot hope to adequately factor in the multiple human and natural threats currently at play. Despite several centuries of damage, restoration and repair, already well-documented in numerous publications and in the ASI archives,[6] the temporal focus of this paper covers the leadup to, and aftermath of, UNESCO World Heritage inscription in 1983, and the subsequent efforts of international actors to ameliorate the manifold crises impacting the monument.

A tangled knot of crises has emerged, I argue, stemming from the interconnected threats of pollution, development, and conservation capacities. Recently, the World Health Organization listed Agra as the eighth most polluted city in the world, measured by particulate matter (PM) at the 2.5-micron level, the same matter that is deposited on the luminous white marble of the monument. Polycentric modes of governance further complicate attempts to address the gravity of such problems: an opaque mandate, fragmented among numerous actors and coupled with a lack of capacity of local agencies, further enmeshed in political manipulation (Chakravarty and Irazábal 2011). And despite the Taj Mahal being the largest earner (40%) for the Archaeological Survey of India, those funds are not funnelled back into preserving the property; instead, they are captured by the central government, only to be redistributed in order to support the heritage assets of an entire nation. In 2019 the Taj generated USD$10,467,403 while only USD$663,673 was spent on its maintenance.[7] The aforementioned risks and realities are immutably entwined and complicate one another, exacerbating wicked problems for World Heritage.

To give one example, alarming reports recently emerged that the Taj's white marble was turning green – not the typical concern over its increasingly yellow or grey hue. The greening of the monument was widely covered in the media and in UNESCO reports, which called for ASI chemists to examine anthropogenic airborne aerosols and apply modern physico-chemical analyses. This effort led to understanding an unrecognised airborne threat found on the marble's surface that underscores the complex web of whiteness, preservation, culture and nature. Put simply, the Taj was turning green due to the accumulation of excreta from an insect species, a midge called *Goeldichironomus*, that breeds in the sewage-filled waters of the Yamuna River. The larvae feed on the green chlorophyll in algae on the surface of the stagnant, polluted Yamuna water and then excrete green and black deposits over the white marble.

This accounted for some of the colour change, but other issues emerged. Banerjee and Sarkar (2019, 2137) analysed the chemical constituents of the marble substrates and discovered carbon particulates at the micro level. This is the same particulate matter that is studied to determine air quality (Kaur 2022), used to designate Agra one of the world's most polluted cities. Now they had discovered a 'nano domain entity, which is chemically more reactive . . . found on the surface of the monument'. Because of this high chemical activity, they argued, the nano carbons exhibited a newer chemistry in the presence of air and sunlight, generating several reactive oxygen species (ROS) or highly reactive chemicals. These chemicals were similarly responding to new complicated chemical reactions on the marble's surface in association with deposited *cyanophyceae* (blue-green algae) and other plant deposits. The resulting rapid degradation, Prince Vajpayee, ASI's conservation engineer

for the Taj, warned, would likely recur, since temperatures continue to rise, encouraging insect breeding.[8] And while small fish once fed upon the larvae, reducing insect numbers, the toxic chemicals in polluted river water had significantly reduced their population, as part of a spiral of negative consequences (Bhatnagar undated).

But it was not simply humans that were fixated on the 'whiteness' of the Taj. *Goeldichironomus* were also attracted to the light, especially the brightness of the white marble, and were emerging in nocturnal swarms from the Yamuna River. Writing on toxicity, Anand (2022) draws attention to social and environmental entanglements (what he calls *ambiguation*) in failed networks of sewage treatment, water and pollution (Figure 2). Here we can add patrimony and preservation to the mix; a monumental onslaught 'exposed under the prevalent smoggy environmental scenario' (Banerjee and Sarkar 2019, 2137). This lethal cycle of human disregard, natural processes, and imperilled conservation is thus entangled in concerns over survival, health and well-being, long-term sustainability and culture. Attempting to fathom this complex cycle bore all the hallmarks of Mitchell's thesis on the role of agency and calculation in our attempts to comprehend the modern world, which he argues is erroneously divided into objects and ideas, nature and culture, reality and its representation, the nonhuman and the human (Mitchell 2002, 12). And since this equation, as it came to bear on the Taj, also incorporated salvage politics for the monumental past, there were additional grandiloquent claims of global expertise, further constituted in oppositional framings of nature to technology, reality to its representation, and objects to their value (Mitchell 2002, 15).

Another set of wicked problems brings both World Heritage preservation and pollution (Lal et al. 2016; R. Singh and Sharma 2012) into dialogue with tourism promotion, sustainable



Figure 2. Kachpura village with a view of the Taj Mahal, 2019. Photo by the author.

development goals, livelihoods and well-being – a specific set of priorities for UNESCO since its founding. In a paradoxical situation, site preservation is both supported and undermined by increasing tourist footfalls; intensifying pollution and climate change are also exacerbated by those same site visitors, domestic and international. Ideas of development for local and national stakeholders are similarly promoted, and challenged, as a result of World Heritage inscription. In related studies, my colleagues and I have demonstrated that properties with UNESCO inscription are negatively associated with rising conflicts (Jamison et al. 2023). In Agra, those conflicts include local communities and hostilities around labour, employment and attitudes to business. Additionally, there is escalating communal tension between Hindus and Muslims around the history of, religious access to and future of the Taj Mahal, all heightened by an intractable, Islamophobic ruling party under Narendra Modi. While UNESCO's founding mission was the dream of world peace through a shared past (Meskell 2018), vandalism, damage, threats to religious practice, anthropogenic pollution and calls for demolition of the monument are just some of the controversies that have raged.

The foregoing may be the dismal reality in the current moment, but running parallel to those tensions was once a powerful suite of positive imaginings for the Taj. Writing in 1994, the renowned Mexican anthropologist Lourdes Arizpe, then Deputy Director General of UNESCO, recognised the importance and prestige of an international conservation project at the Taj Mahal, coupled as it was with the promise of a new Asian Development Bank (ADB) partnership. This was, after all, UNESCO's first cultural project with the ADB, or indeed any development bank. She considered it a 'new approach towards the preservation of cultural heritage'.[9] UNESCO held the expertise in cultural and environmental matters; the Bank held the dollars. Thus the Taj formed the centrepiece of a socio-material engineering plan, and its perceived discoloration was literally drawing dollars to subsequently transform the lives of ordinary Indians. The integrity of the Taj would then animate the integrity of the environment and human life. The monument was at the same time the problem, the solution and the driver for change. Some twenty-five years later, experts assessing the Taj Trapezium Zone quipped that 'the Taj is a metaphor, and any vision to protect it also means a vision for sustainable development' (Dhote et al. 2018, 18). The Taj became the signifier of past perfection and future promise.

Toxicity and technical assistance

In the following I examine a brief history of connections between corporations, scientists and specialisations, governments and intergovernmental agencies and banks that literally bankrolled the Taj. In return for their investment they expected, or at least hoped, to garner public support for environmental projects, curb pollution, improve health outcomes, alleviate poverty and restore the Taj and its environs.

UNESCO was involved in the Taj from the agency's earliest years. In 1949, experts were already preparing documentation of the causes of decay in Indian monuments.[10] They noted, even then, that human agency had a 'destructive factor can take and has taken in India many forms. There are cases recorded where the bigotry of one religious community has been responsible for injuring and disfiguring the monuments of a rival community'.[11] UNESCO staff based in Delhi captured the plight of heritage in India – that there were 'several thousand monuments' and the 'staff to undertake the repairs is small, and budgets infinitesimal. Dams will submerge temples, sites and salvage receives little support. The states compete to have industrial projects'.[12] In the case of Agra, the primary threat identified was the Mathura Refinery: originally proposed in 1973, owned by Indian Oil and, improbably, situated 1300 km from the closest oil well or a major port. As environmentalists had argued, its location lacked any credible justification, other than the practice of predatory states bidding for infrastructural projects. By 1974 an expert committee headed by Dr D.S. Varadarajan was established to investigate the potential impact of the refinery (Dhote et al. 2018, 12). The ASI had also 'expressed its fear that the emissions from the refinery will discolour the

marble structure of Taj Mahal'.[13] Their government counterparts in the Department of Science and Technology, however, expressed no such concern. Others blamed the nearby thermal power plants, the railway shunting yard, the glass bangle factories, and the fifty iron foundries using coal and that emit sulphur dioxide (SO_2) and soot that discolours the marble. Many blamed the residents of Agra for burning dung (Lal et al. 2016) and using generators – the poorest victims of Agra's uneven growth, lacking basic services and infrastructure. UNESCO offered USD$20,000 for a study, pairing Indians with an 'Italian quasi-government firm of engineers' called TECNECO in conjunction with the Italian Istituto Centrale del Restauro, since they believed that Italy specialised in both the problems of sulphur dioxide and conservation. TECNECO had performed similar studies for Venice, an historic city similarly threatened by oil refineries in its vicinity. Surprisingly, TECNECO's findings ruled out any possible damage to the monument from the refinery. Yet another Italian chemist, Giorgio Torraca, then Vice Director at ICCROM, disagreed, stating that 'there could be no limit of safe tolerance in respect of marble over which even a small quantity of sulphur dioxide will act as a slow poison'.[14] Indian experts countered, nonetheless, that standards developed for heritage properties abroad would not hold for India.

On 19 December 1977, an environmental engineer, T. Shivaji Rao, penned a public letter requesting that the citizens of the world must immediately appeal through the heads of their state to the Indian government and to international organizations like UNEP, UNESCO, Rockefeller and Ford Foundations to save the Taj Mahal and its environs … from the impending dangers of industrialization.[15] While the refinery could be moved, the Taj Mahal could not. He called upon US President Carter and the American people, with their commitment to the environment, to assist in saving the 'cultural heritage of mankind'.[16] When the Americans did intervene, not surprisingly, their efforts took on a characteristically national perspective, steeped in the priorities and practices of the US National Parks Service (NPS). Having no Ministry of Culture, the US proposed a solution in the form of a national historical park, the Taj National Park. Just as the US had done for the cultural site of Petra (Meskell and Luke 2021), the monumental landscape was imagined as both naturalised and capitalised: they proposed development planning for tourism and visitor services for cultural heritage sites in Agra, with the National Park Service and Agra Development Authority as lead agencies. By the late 1980s, they recommended expanding the scope of consideration beyond the Taj Mahal to include other monuments (Akbar's Mausoleum, Mariam's Tomb and Fatehpur Sikri), with the establishment of a single authority to coordinate all activities. Notably, there would only be 'limited development' to support the conservation of neighbouring villages and farmland. The NPS plan entailed a larger park boundary; a parkland across the Yamuna River; and improved parkways to connect entry to monument sites and the proposed visitor centre, souvenir shops and tour guides. Their vision required an overarching environmental non-degradation policy for Agra, deploying the Taj to improve environmental quality, including water, noise, air, and solid waste management, all of which required a centralised administration and park operation system.[17] Nature was once again driving culture, this time from an American imaginary (Brockington and Igoe 2006; Spence 1999; West, Igoe, and Brockington 2006), which stressed the enjoyment of nature and people-free landscapes for visitors. The NPS plan was discussed for several years and resurfaced briefly in the 1990s, but never gained traction.

Even as the Taj is described as 'a symphony woven in marble and various semi-precious stones', its 'gleaming white marble' (Kaur 2022, 87) has suffered from an onslaught of biological and atmospheric assaults: from cyanobacterial cells and blue-green algae, to airborne dust with industrial signatures and smoke from the burning of solid waste along with the use of bio-mass for domestic fuel, diesel-operated buses, trains and backup generators (J. K. Singh et al. 2022). This recognition is not new. Air pollutant levels have been monitored since 1981 at multiple locations around the Taj, and particulate matter (PM) concentrations in Agra routinely exceed World Health Organization threshold levels. In 1984, just one year after the Taj's UNESCO World Heritage listing, M.C. Mehta, a lawyer, troubled by the yellowing of its marble, filed a petition in the Supreme Court of India. Soon after, in 1987, O.P. Agrawal, Director General of National Research Laboratory

for Conservation of Cultural Property (NRLC), Lucknow, published a study on the problems of discoloration, concluding that pollution was not a significant cause. Worryingly, IR spectrophotometry revealed an acrylic coating, applied as a preservative by experts at the ASI, had changed colour and thus altered the marble's appearance. This finding was one of the earliest examples, according to Dhar (2019), of an unreported intervention by the ASI leading to negative impacts. Subsequently, over-cleaning was also identified as a likely cause of the rapid deterioration of the marble surface. By 1984, the ASI had released its own study on a new cleaning process, termed the 'mud pack system' or 'mud pack therapy' (*multani mitti*), developed for the Taj Mahal (see below). What they proposed, and identified as an indigenous Indian method, had in fact been developed earlier by British and Italian conservators to clean marble statues (Larson 1978; Oddy 2002). In response to Parliamentary questions about the efficacy of the method, the ASI stated that the results are 'satisfactory as the gloss of the surface was maintained' (Dhar 2019). Yet the general perception amongst conservation experts that I consulted with is that some unreported cleaning agent (acid) has been added to the mix. In essence, there is no one agreed-upon factor leading to monumental deterioration, but an ever-expanding set of agents and activities over many decades, coupled with particular toxicities and technical choices that have resulted in even greater precarity.

In the early 1990s World Heritage experts realised that despite UNESCO's comparative advantage in heritage restoration and rehabilitation, its traditional approach had fallen short at the Taj. In 1994 UNESCO had provided India with USD$20,000[18] on an emergency basis to reduce air pollution, yet this too failed to incorporate remedial measures to combat pollution and toxicity, much less to implement effective industrial restructuring. Understandably, any proposed relocation scheme had been opposed by local communities and Indigenous groups. Something else was needed. It came in the form of the Asian Development Bank (ADB) and its framing of environmental improvement and sustainable development, centred around the Taj and technical assistance programs. By 1995 the ADB had engaged a consulting firm to examine factors including economics (environment-friendly technologies); energy (natural gas, power generation, transmission, and distribution); industrial restructuring of small enterprises; sociology; training (formal and vocational); management of industrial wastewater, solid waste and sewage; infrastructure (vehicular transport systems); and refinery operations. Confidence was high and international experts envisaged that the potential results might provide environmental sustainability models for other settings, contributing to environmental and quality of life improvement, higher efficiency, savings in energy costs and the protection of other monuments. While the technical assistance budget was estimated at USD$800k, the entire project would ultimately require between USD$900 m and USD $1 billion. Soon, with the inclusion of the Yamuna Expressway linking Delhi to Agra, this figure ballooned to USD$1.5–2 billion. Some 32 experts were needed for 49 person-months of work: 27 consultants financed by the Bank (6 international, 21 domestic), two from UNESCO and three from the UN Industrial Development Organization (UNIDO). The Indian government contributed only in kind, by providing personnel.[19]

For UNESCO, the choice of the Taj Mahal represented one of its most ambitious international projects since the 1960s' rescue of the Nubian Temples (Allais 2013; Betts 2015; Meskell 2018), followed by less spectacular international rescues at Mohenjodaro and Borobudur (Bloembergen and Eickhoff 2015; Meskell 2019). Obviously, this project was smaller in scale, focusing primarily on one, seemingly well-preserved monument, but the Indian setting encompassed novel and major environmental, climatic and anthropogenic threats that stretched into the future. The risks were not from impending dams, infrastructure, flooding or waterlogging, earthquakes or stone cancer; this was a far more complex, entangled set of natural and cultural challenges set in a populous, industrialising, developing nation. While Petra was the site of the first World Bank-UNESCO project for cultural tourism (Meskell and Luke 2021), the Taj was UNESCO's first project partnering with a regional development bank. Like earlier salvage missions, it was a UN inter-agency initiative, but unlike such assistance programmes for Egypt and Syria (Luke and Meskell 2019, 2023) that aimed to feed or train project workers, saving this monument to whiteness, beauty and

romance was much more socially, environmentally and, indeed, globally focused. Developing the Taj aimed to socially engineer society, to intervene in the processes of pollution, poverty, and development, which necessitated new partnerships. To achieve those goals UNESCO would need a nodal site: the monument to love and loss par excellence, a teardrop on the cheek of time.

Indian authorities warned the Asian Development Bank that previous studies had failed to offer a comprehensive remedial plan for sustainable development in the Taj Trapezium Zone. Early in 1995 specialists from the ADB, UNIDO and UNESCO prepared a proposal costing USD$1 m to develop studies on industry, environmental protection, preservation of cultural heritage and creation of an action plan with a USD$150 m ADB loan. Those experts agreed that 'the central concern in the design and implementation of the Project is the "improvement in the quality of life"'.[20] This fit with a shift in the Bank's policies towards social sectors: 50% of Bank project funds were to go to social sector The five objectives of the Bank's Task Force for Agra were to promote efficient economic growth; reduce the incidence of poverty; improve the status of women; develop human resources; and promote social management of natural resources and the environment.[21] Finding some traction, the India Supreme Court ruled in December 1996 that the 292 coal-based factories operating near the Taj Mahal would have to relocate or convert to clean energy, specifying a 10 km protection zone of the monument. What followed was an escalation in projects and international funders, from banks to corporations to countries, that all saw the socio-economic potential for linking cultural conservation and tourist promotion with natural hazards, impending anthropogenic threats and development opportunities.

New initiatives flourished throughout the 1990s, including an Indo-German project to support central and state pollution control boards with environmental quality assessment and control. The ADB task force met with the British Department for International Development (DFID), the Indo-Canadian Cooperation Office, the Japan Bank for International Cooperation (JBIC), the United States-Asia Environmental Partnership (USAEP), USAID and the World Bank, with the aim of raising awareness of environmental issues through the Taj. USAID later partnered with Nexant LLC, a US-based consulting company of the Bechtel Group, launching electric two- and three-wheelers under the Indian Zero Emission Transportation Program, affirming the agency's commitment to the preservation of the environment, both natural and cultural.[22] The US National Parks Service continued to work with Indian academics and private sector institutions to research tourist profiles, study horticulture, and conduct nine environmental and engineering studies to reduce regional emissions.[23] The Taj Group of Hotels signed an MOU with the Indian Department of Culture in the amount of Rs. 18.7 million, funding both conservation of the Taj and development of adjacent tourist facilities. Moreover, they financed international and local consultants to prepare a site management plan for the buffer zone around the Taj Mahal, with a view to enhancing the visitor experience. The French chemical and pharmaceutical company Rhône-Poulenc provided USD$263,735 for a three-year conservation project for the Taj Mahal and Agra Fort, establishing a conservation laboratory in the latter. Then, in 2001, the ADB yet again extended a loan to India: USD$210 million for the Taj Mahal Environmental Improvements Project. It had the same ambitious suite of objectives, including improving quality of life and reducing poverty; supporting harmonious cohabitation with the environment; sustainably improving the environment; improving health; and increasing tourism.[24]

Despite the Supreme Court petitions, high-level committees, and international efforts of UN agencies, UNESCO, the Asian Development Bank and their myriad consultants, environmentalist Devashish Bhattacharya asserts that today 'air, water, noise pollution levels are alarmingly high, as high as they were in 1993'.[25] In Agra the local petha (candy) industry continues to spit fire, smoke and pollutants into the air. Despite repeated complaints lodged with government offices and regulatory institutions, no action has been taken against hundreds of Agra's polluters. Dangerously high levels of noxious gases, dust particles, and vehicle emissions continue unabated, imperilling both heritage tourism and the health of residents.[26] While the discoloration of the monument may be the most visible, critical indicator, what lies beneath is some 67 environmental



Figure 3. ASI protected monument, Taj Ganj, 2023. Photo by the author.

factors triggering health crises in India, with exposure to ambient particulate matter ranked fifth as a cause of premature mortality (Lal et al. 2016). Those same vulnerable communities that have lived in and around the Taj for centuries are the most impacted by developments that bypass historic zones like Taj Ganj (Figure 3): the majority of the urban poor are left overcrowded and ghettoised, deprived of amenities and services (Prasad and Gavsker 2016, 45). Similar to Mitchell's astute observations in Egypt, an array of forces, agents, elements, spatial scales and temporalities were brought together in Agra. Yet these were not separate elements that just happen to have social impacts (Mitchell 2002, 27): the linkages were infrastructural, chemical, political, biological and industrial, and together they inevitably amplified the crisis. And to make matters worse, through the workings of international agencies and companies, Indian corporations and consultants created a new nexus of elite capture and corporate capital that further determined the fate of Agra, and by extension the Taj Mahal.

Dust fall

As the foregoing illustrates, maintaining whiteness has long been an obsession at the Taj, specifically the colour (or discoloration) of the marble, entangled as it is with the broader ecologies of pollution, preservation and indeed politics. 'It is so white you cannot really see it; it is so bright you cannot look at it directly', the ASI site manager at the Taj explained to me in the heat of a July summer. And on a clear day it does shimmer, which can be quite blinding. Perhaps there is something to that old cliché about the Taj being white in morning, pink in the afternoon and, in the evening, different again. The UNESCO inscription dossier captures our enduring chromophilia: 'the colour combination of lush green scape reddish pathway and blue sky over it show cases the monument in ever changing tints and moods'.[27] Many expert reports produced by agencies from ICCROM to TECNECO, Rhône-Poulenc to Roorkee Institute of Technology, have shown that it is dust, or particulate matter (PM) in the air, that causes uniform surface yellowing rather than sulphurous deposits (Agrawal 2002). 'Dust fall' is the term given to the measure of all air pollutants containing smoke, soot, or other potentially active particles that settle, with or without the rain, due to their own weight (Banerjee and Sarkar 2019, 2138). As outlined above, the green and black

spotting is due to the actions of *Goeldichironomus* and humans in concert, while daily touching by the hands of thousands of visitors transfers greasy grey/black residues onto the stone. Additionally, the Makrana marble extracted in the mid 1600s from the mines of Rajasthan is itself naturally many-hued, and some slabs reveal spots or streaks of different natural colours due to the presence of mineral impurities.

Since the 1960s UNESCO had invested in the establishment of conservation science in India, including the first National Research Laboratory for the Preservation of Cultural Property in 1975.[28] The UN Development Program (UNDP) supplied USD$274,600 for consultants, training and equipment, envisaging that the lab would function as a regional hub providing assistance to countries across South and Southeast Asia. For the Taj specifically, UNESCO funded a conservation laboratory in the Agra Fort, still operational today, offering USD$10,000 to the ASI. In partnership with the ADB, UNESCO and ICCROM provided specific training for Indian scientists and equipment for the Agra Fort lab including a spectrophotometer, conductivity metre, pH metre, ionic chromatography and computers. International assistance had financed additional machinery in the 1990s including a stereo-microscope, porosity metre and protimeter, steriliser and incubator for micro-biological studies, fume-hood, bio-hazard cupboard, a de-ionised water system and so on. Visiting the Air Pollution and Stone Conservation Lab in 2022, I saw the cutting and polishing machines the chemists had acquired for the preparation of thin sections and the optical polarising microscope that enabled both petrographic and biological analyses.[29] All of this was meticulously documented in UNESCO's Paris archives, but had been largely forgotten in India.

What was striking was that none of the ASI employees recalled UNESCO's role in the labs or in the broader conservation programmes of the Taj. In fact, I was assured that international assistance played no part: this was an exclusively Indian endeavour. There was some surprise when I pointed to the brass plaque at the entrance of the building, celebrating UNESCO's role, and erected by Francis Childe, UNESCO's Chief of Asia & Pacific Unit. More than any other experts I encountered, those tasked with studying and restoring the marble were exceedingly nervous. While extremely generous with their time, they were apprehensive about sharing reports, much less detailed information on the clay pack method (*multani mitti*) that the ASI had made famous. There is much at stake for professionals regarding the whiteness of the marble, since the Taj was unlike any other property; experts face unparalleled international scrutiny, government enquiries, law suits, media reports and public complaints. An air of conspiracy pervaded our discussions; people preferred to transfer reference materials to me via Whatsapp rather than email, such was the level of paranoia. I had experienced it firsthand that year, when an initial request to look at early 20th-century documents housed in the Darwaza-i-rauza was denied by the ASI: one official asked if I was the 'lady looking for the (Hindu) rooms beneath the Taj', while other rumours circulated that I was working for the CIA. Sitting with these anxious experts in the Agra Fort, itself a Mughal monument linked with the Taj on the World Heritage List, one couldn't help but notice a stark contrast. The white marble there was clearly in need of cleaning and conservation (Figure 4), the overall state of the monument a far cry from the Taj, visible through a pollution haze in the distance.

Back at the Taj, I was granted access to the two pollution-monitoring stations in the historical pavilions (*chatris*) adjacent to the mausoleum, which continuously monitor rates of sulphur dioxide, nitrogen dioxide and PM in the air. One is run by the ASI, the other by the government's Pollution Control Board, and runs 24 hours and is monitored by two chemists in six-hour shifts. Much of the equipment looked antiquated, itself covered in dust, wires and pipes. Unlike the stone conservators, these scientists were happy to explain their work, the machinery and the results. Their findings suggest that PM levels have dropped and air quality is at satisfactory levels around the monument, though less satisfactory for nearby residential zones. UNESCO representatives rarely visit or monitor the site now, I was told by one senior official, and if they were not satisfied with the conservation then India would simply send 'a written report'. If UNESCO was still not satisfied with that report, Indian government officials might simply choose to ignore it, since all such reporting costs the state money. Besides, there are 'few



Figure 4. Agra Fort, UNESCO World Heritage site, 2022. Photo by the author.

people' currently employed by these agencies, the official assured me, so they only send 'part-time people'. And 'India is in a good position right now, holding key posts in UNESCO' – which meant that, in his mind, it would not be an issue.

Indeed, Indian authorities, conservators and the media have all fallen under the spell of their self-proclaimed indigenous cleaning method to combat dust fall, albeit without acknowledging its inconvenient European origins. The *multani mitti* method also shares its name, ingredients and technique with a skin-whitening clay mask used primarily by Indian women to 'de-tan', which is still deemed highly desirable in contemporary Indian society.[30] The practice is tethered to the pervasive colourism in India and the gendered and racialised politics of whiteness (Adbi et al. 2021; Kukreja 2021; Reddy 2021). These popular face products are readily available online, for skin cleansing and whitening, sold in both powder and rock form (Shimpi and Pawara 2022). In conservation, the clay pack consists of a thick paste of Fuller's Earth (bentonite clay) prepared in distilled water and left for some time to swell or to attain plasticity. The marble surface is then covered with a thick layer of the paste (Chauhan et al. 2023). The ASI claim that a 'small amount of suitable additives in appropriate proportions are added in the paste as per requirement'.[31] The paste is covered with polythene sheets. After the paste dries, it is 'removed from the surface with the help of soft nylon brushes and the surface is washed out with water'.[32] ASI experts assert that this is a 'time tested non-corrosive, non-abrasive technique and safe for the cleaning of marble surface'. Despite appearing entirely 'natural', it remains an expensive treatment. For example, when the clay was applied to just small sections of the Taj in 2008, it cost some USD$15,000. Senior officials in Agra explained that the technique required vast manpower and was time-consuming, while the necessary scaffolding proved problematic for tourism as it hid 'the visual integrity of the structure'.

Yet there are more interventionist efforts at the Taj that seldom make the news. 'The ASI preserves, they don't restore', one engineer explained, an adage I had heard many times over the years. The irony was that we happened to be in the southern galleries (*Iwan Dar Iwan*) adjacent to the main gateway, where local labourers were busily carving and replacing red sandstone columns, carved stone screens (*jalis*) and other features. I was shown various 1945 inscriptions on similar *jalis* that had been replaced under the British, as if this practice of substitution was one relegated to history. There was little recognition that the Taj is still being rebuilt today, just under a new regime.

Concluding thoughts

Salman Rushdie was right when he said that 'the trouble with India's Taj Mahal is that it has become so overlaid with accumulated meanings as to be almost impossible to see'. Yet 'the Taj Mahal must be seen: to remind us that the world is real, that the sound is truer than the echo, the original more forceful than its image in a mirror. The beauty of beautiful things is still able, in these image-saturated times, to transcend imitations. And the Taj Mahal is, beyond the power of words to say it, a lovely thing, perhaps the loveliest of things'.[33] Yet this 'loveliest of things' is mired in some of the world's most intractable problems: toxicity and pollution, climate change and communal violence, social and economic inequalities, coupled with an aggressive state power. This paper has been an initial foray into some of those wicked problems encircling monumental preservation in an era of environmental and political toxicity.

While industrial pollution has long been an identified as a threat to the survival, broadly, and whiteness, specifically, of the Taj Mahal, I would go so far as suggesting that the imputed 'yellowing' of the Taj was the trigger that prompted Indian authorities to confront Agra's escalating pollution, rather than the other way around. The Taj Mahal thus became 'the critical receptor' for pollution (Dhote et al. 2018, 8). By extension, the Mughal tomb became the nodal site for an onslaught of international technical, economic, developmental and conservation schemes attempting to link cultural conservation with environmental concerns, in concert with social and economic uplift, well-being and urban resilience. Decades on, in the wake of innumerable techno-economic development schemes, many of the residents of Agra still have no access to electricity, clean water or proper sewerage and garbage collection, and are often blamed for the resultant urban pollution still impacting the monument. Effluence in the Yamuna River reveals other toxicities, as I outlined, threatening not only life and livelihoods for the people of Agra, but further imperilling the much-desired whiteness of the Taj. What remains after decades of foreign studies, technical reports, preservation monitoring and technologies is the realisation, following Mitchell, that the Taj is a site of techno-politics, comprised of an assemblage of human and nonhuman actors, both intentional and not, in which the human is always somewhat overrun by the unintended. Such an assemblage brings together the actions of millions of visitors, Italian chemists, a French corporation, the Archaeological Survey of India, the sweet-makers of Agra, a polluted river, the *Goeldichironomus* midge, dust fall and clay packs, a development bank and Hindu nationalists, to determine the fate of a Mughal tomb. The greasy touch of tourists, the heavy metal ions of industry, insect excreta and the urine of angry Hindu protestors all have made their mark on the marble monument. The Taj today resides at the nexus of pollution, politics, poverty, nature and culture, materiality and technocracy, in an age of polycrisis where this complex scenario already signifies the norm, rather than the exception.

It has been said that the Taj has a historical resilience which has enabled it to transcend individuals, dynasties, communities and perhaps even the nation. While revered by a global community, Indian politicians and Hindu nationalists increasingly debate the place of the Taj Mahal in the country's cultural heritage and history.[34] The Taj, and more specifically its future preservation, is bound up in a set of conflictual connectivities and centrifugal forces that far exceed normative heritage and conservation practice. Its visibility has been severely undercut by the BJP government of Uttar Pradesh, its iconic status in national and state tourist guides now replaced by bird sanctuaries and Shiva temples (Jaffrelot 2021, 194). The proposed Mughal Museum adjacent to the Taj, funded by the World Bank under its pro-poor tourism development programme, now lies in unfinished ruins. In 2020, the building was renamed the Chhatrapati Shivaji Maharaj Museum, after a Hindu king from Maharashtra, by Chief Minister, Yogi Adityanath. Although widely covered in the Indian media, such threats to the Taj and indeed other Indian sites of Islamic heritage are largely absent internationally, while Prime Minister Modi is courted by Western leaders attempting to forge alliances in order to stave off Chinese power and influence. Playing host for G20 dignitaries in 2023, Modi ensured that Agra was swept clean, rendering the city unfamiliar to my eyes – part of a fleeting urban make-over costing more than USD $6 million.[35] The short-term aim of the state was to beautify and obscure Agra's divisive realities and risks, for people and their patrimony, laying bare the many vicissitudes of violent care.

Notes

1. https://www.hindustantimes.com/india-news/protecting-taj-mahal-is-a-hopeless-cause-says-supreme-court/story-CbYK6HysYGV8onIaqeLY5J.html.
2. The Human Subjects protocol for the project, Monumental Challenges: Preserving the Indian Past for the Future, #851754, is lodged with the IRB office at the University of Pennsylvania.
3. Lord Curzon, Speeches, Calcutta, Office of the Superintendent of Govt. Print., India, 1900–06. p.188. available at https://www.loc.gov/item/53049270/.
4. Lord Curzon, Speeches, Calcutta, Office of the Superintendent of Govt. Print., India, 1900–06. p.271 available at https://www.loc.gov/item/53049270/.
5. See also Memorandum on Preservation of Monuments in India – Causes of Decay (Oct 1949), UNESCO Archives, file reference 069:7 (540) AO31/AMS Part V.
6. See Archaeological Survey of India Reports and Reports of Special Committees, UNESCO Archives, file reference CLT/WHC/APA/179 covering some 27 pages till 1996 alone.
7. Government of India Ministry of Culture, Lok Sabha Unstarred Question No-21 Answered on 18.11.2019 Revenue Earned from Taj Mahal.
8. https://theprint.in/environment/asi-takes-note-of-taj-mahal-turning-green-due-to-insect-droppings-treats-it-with-water-cotton/1536367/.
9. Lourdes Arizpe to UNESCO Director General Federico Mayor, November 17, 1994. UNESCO Archives, file reference CLT/CH/01/1/IND/1089.
10. Under British rule some eight years prior, a five-member committee had investigated the causes of its deterioration.
11. N. P Chakravarti, UNESCO Archives, file reference 069.797.810.627 (541) UNESCO/MUS/Conf. 1/7. Sept 12, 1949.
12. Nov 30, 1977, letter from Grace Morley in Delhi to Hiroshi Daifuku, UNESCO Archives, file reference 069.72 (540) AMS Sites & Monuments, India.
13. Taj Mahal in Danger? 30 September 1977 by R.R Khan, UNESCO Archives, file reference 069.72 (540) AMS Sites & Monuments, India.
14. UNESCO Archives, file reference 069.72 (540) AMS Sites & Monuments, India.
15. Dec 19, 1977 Rao Taj Mahal: The Impending Peril, article by T. Shivaji Rao, environmental engineer. UNESCO Archives, file reference 069.72 (540) AMS Sites & Monuments, India.
16. Dec 19, 1977 Rao Taj Mahal: The Impending Peril, article by T. Shivaji Rao, environmental engineer. UNESCO Archives, file reference 069.72 (540) AMS Sites & Monuments, India.
17. A Proposal for Taj National Park: A Joint Planning Effort by the United States National Park Service, the Government of India Department of Tourism, Archaeological Survey of India, Uttar Pradesh Department of Tourism and Agra Development Authority, Agra.
18. https://whc.unesco.org/en/intassistance/703.
19. UNESCO Archives, file reference WHC/74/408.1.4.6 Asian Development Bank.
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21. Letter from Chief BER/CSF/BKS to ADG/BER on the 27th Annual Meeting of the Asian Development Bank, UNESCO Archives, file reference CLT/WHC/APA/171.
22. Minja Yang to Suketu Mehta (Aug 1995) US National Park Service has helped conduct research on impact of pollution under India-US 'Agra Heritage Project' UNESCO Archives, file reference WHC 174/408.1.4.1 INDIA Taj Mahal general.
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26. https://www.business-standard.com/article/current-affairs/taj-mahal-still-exposed-to-alarming-levels-of-pollution-green-activists-122060500075_1.html.
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