



Archaeological Heritage Protection in Urban Delhi: An Integrated Adaptive Heritage Management Plan for Mandoli under the DAHMASR Act, 2004

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Abstract: Delhi's archaeological landscape presents a complex urban palimpsest, formed by continuous cultural occupations spanning from the protohistoric to the medieval periods. Despite extensive scholarship on Delhi's grand political history, comparatively less attention has been paid to its archaeological landscape particularly the vulnerable settlement mounds threatened by rapid urbanization. This paper examines the archaeological significance, current condition, and conservation challenges of the Mandoli site in East Delhi. It is a multi-period settlement yielding evidence from the Late Harappan, Painted Grey Ware, Shunga-Kushan, and Gupta periods. Based on field surveys, historical excavation records, and recent on-site observations, the study identifies three primary threats to the site: encroachment, environmental degradation, and administrative fragmentation. The paper critically evaluates the limitations of existing heritage governance and situates Mandoli within the legal framework of the Delhi Ancient and Historical Monuments and Archaeological Sites and Remains Act, 2004 (DAHMASR Act). Given the site's deteriorating condition, it proposes an integrated adaptive archaeological management plan based on an Adaptive Archaeological Buffer System (AABS). This approach incorporates archaeological sensitivity mapping, legal zoning, digital monitoring, community participation, and mitigation strategies. The study concludes that scientifically informed, legally grounded, and community-based heritage management is essential not only for the protection of Mandoli but also for advancing the broader understanding of Delhi's archaeological past and fostering sustainable urban heritage governance.

Keywords: Heritage Management, Mandoli, Archaeological-Legislation, Urban Archaeology, Encroachment, Urbanization, Preservation

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Introduction

Delhi illustrates an incongruity of depth and elevation: its historical continuity is enmeshed in layered cultural layers below, while its modern skyline stretches skyward, located at the

threshold of the Gangetic plains and the rugged extensions of the Aravalli range, Delhi is a landscape where past, authority and materiality have been inscribed into the earth over time, sometimes it visual on surface and sometimes one look beneath the earth. Beyond its being capitals from centuries, Delhi is an archaeological palimpsest, a terrain abundant with fortified enclosures, deserted settlements, ritual sites, water systems, and remnants of daily life. Each period of occupation whether Harappan, Painted grey ware, Mauryan, Sunga, Kushan, Gupta, Rajput, Sultanate, Mughal, or Colonial has left behind layered evidence, transforming the city into more than merely an imperial seat, but a continuous experiment in urban evolution. Delhi's historicity has been covered in great detail, however, little is known about Delhi's archaeological past compared to its medieval and modern histories. If one searches on Google today-What is the ancient history of Delhi? the available information is confined to these ideas-“how the city got its name Delhi?”, “Delhi as Indraprastha? “How were the Seven Cities established?” Tomar and Chauhan Kings and their Rule? Most works talk about the tale of seven cities. However, the question arises whether Delhi's antiquity can be determined only by literary allusions. The sheer answer is no; writing about Delhi's archaeological and ancient past is arduous due to the sparse and sporadic mentions of the city in the literature. When more than literary references are needed, archaeology assists us. Archaeological exploration and excavations of Delhi involves looking beyond monuments and dynasties to examine settlement patterns, material culture. The city's mounds, fortresses, ring-wells, pillars, and reassembled architectural pieces narrate stories of foundation, desertion, appropriation and reinvention. In Delhi, history is not only chronicled in texts but is also embedded in soil layers, brick formations, ceramic fragments, and the silent geometry of crumbling walls. Thus, the archaeology of Delhi offers insights beyond a mere succession of capitals; it provides a long-term perspective on resilience, adaptation, and the politics of space in northern India and South Asia. Delhi's historical and archaeological significance has been thoroughly investigated over a long period, beginning with the foundational studies by Cunningham (1861) Beglar (1874), Cooper (1863) Campbell's (1866), Carr (1876) Hoey (1888) Syed Ahmad Khan (1847), Fanshawe (1906) and Maulavi Zafar Hasan (1919 to 1922, reprint 1997). Sharma (1964, reprinted 1974, 1982 and 1990). Despite this, extensive research, focused primarily on documenting and describing the city's architectural splendor and monumental legacy. While these works are primary, through pertinent for understanding the architectural and aesthetic development of Delhi, providing a visual imagery of medieval landscape in its all available sources, and claiming for its ancient past. There have been relatively few comprehensive efforts to piece together the complex and layered archaeological account shedding light on the long-term continuity of settlements, cultural changes and material production beyond the giant gateways and fortification walls. Delhi is often described as nestled in a basin, a landscape partially enriched by the northern extension of Aravali hills. The city offers greater space for understanding archaeological elements of urban development, political control over resources, trade network and cultural exchange, remains largely unexplored within historical and archaeological studies, While the saga of this urban transformation has been explored in literary contexts (Pāsanāhacariu of Śrīdhara Tr. Cohen 1979), archaeological dimensions remain comparatively underexplored and insufficiently problematised. Nonetheless a few significant studies have delved into Delhi's archaeological past.

Although limited excavation work was carried out during the British period, no large-scale archaeological investigations were initiated, nor were detailed excavation reports systematically published with the exception of catalogue of Delhi Museum of archaeology (1926) and two volumes journal (1850&1852) of by the Delhi Archaeological Society and a 1912 excavation report concerning the Qutub Complex. This section aims to review and critically evaluate archeological contributions to place them within the larger discussion on urban archaeology and historical reconstruction. In the subsequent phase, archaeological engagement with Delhi remained largely limited in scope and ambition. The only substantial initiative undertaken during this period was a comprehensive survey and documentation exercise aimed at mapping the extant monuments of Delhi. While this project contributed significantly to the architectural inventory and heritage management of the region, it did not address the deeper stratigraphic, cultural, or material dimensions necessary for a systematic understanding of Delhi's archaeology. Consequently, the city's archaeological landscape continued to be interpreted primarily through standing monuments rather than through controlled excavations and contextual analyses. The Post-Independence period marked a decisive shift from this pedestrian survey and documentation of monumental heritage. In the 1950s interest towards Delhi's stratified layers emerged and B.B Lal initiated a trial excavation (IAR 1954-55) and then systematic excavation (IAR 1969-70, 1971-72, 1972-73) These excavations represented the initial continuous effort to investigate Delhi's archaeological layers in a systematic and chronological manner, establishing a basis for piecing together the city's early settlement history and offering an essential reference point for future archaeological and historical studies in the region, even though the primary objective of identifying the Purana Qila as Indraprastha, and were part of *Mahabharata* archaeology process. One the earliest descriptions of excavation were published in an article titled "How Old Delhi Was ?" Lal (1966) in this and other subsequent publications associated Purana Qila as Indraprastha.

M. S. Deshpande made a foundational contribution to the archaeological understanding of early Delhi, particularly regarding its pre-Islamic Hindu and Jain cultural milieu. Through his explorations, Deshpande drew scholarly attention to evidence of early religious and settlement activities in the region, thereby significantly advancing the historiography of ancient Delhi. His discussion of a Shunga-period Yakshi sculpture, unearthed during excavations at the Qutub Minar complex, was particularly significant. This discovery was among the earliest archaeological indicators of the presence of Shunga culture in Delhi a fact later corroborated by settlement strata from various periods found at Purana Qila and Mandoli thus providing a solid basis for re-evaluating the continuity of human habitation in the region during the Early Historic period (Deshpande, 1966).

Subsequently, B. K. Thapar's brief yet methodologically significant article, *The Buried Past of Delhi*, presented a crucial summary of archaeological excavations conducted in the city up to the early 1970s. Thapar critically observed that many excavations had employed 'step-trenching' techniques, a methodological limitation that hindered a comprehensive understanding of the plans and settlement patterns of structures belonging to different periods. Nevertheless, based on the available structural remains, he characterized the Shunga-Kushan period as a "flourishing settlement of a thoroughly urban character," thereby highlighting the distinct socio-economic complexity and level of urbanization evident in the archaeological record (Thapar, 1972: 22–23).

Following a long hiatus in systematic archaeological analysis, the work of B. R. Mani proved to be a significant milestone in the historiography of the subject. Based on extensive surveys across the Delhi National Capital Region (NCR) and excavations at Salimgarh and Lal Kot, Mani published a seminal monograph in 1997, presenting the first comprehensive archaeological analysis of Delhi's multi-layered cultural sequence. His study systematically integrated excavation data, settlement patterns, evidence of fortifications, and recovered material culture, thereby establishing a crucial framework for understanding the long trajectory of Delhi's cultural evolution. That same year, Upinder Singh (2006) examined archaeological finds within broader ecological, environmental, and cultural contexts, opening new avenues for understanding Delhi's early historical journey. Her subsequent edited volumes (2007; 2018) are essential for comprehending Delhi's long history, illustrating the transformations that occurred from prehistoric times through later historical developments. Organized into seven carefully curated thematic sections, these interdisciplinary collections represent some of the most detailed scholarly works on Delhi's historical and archaeological evolution. More recently, Swarnkar and Bal (2023–2024) published a detailed account of the excavations conducted at Purana Qila during the 2021–2022 field season. Their analysis not only synthesized recent archaeological discoveries but also outlined significant pathways for future excavations within the broader Purana Qila complex. They highlighted the site's unresolved stratigraphic and cultural potential (Swarnkar and Bal, 2023–2024: 354–355). In addition to these contributions, the Delhi State Archaeology Department has recently published two excavation reports. Together, they provide the most detailed empirical account of Delhi's archaeological past to date. These reports provide detailed trench-wise documentation and stratigraphic data, significantly enriching the repository of material available for future archaeological interpretation. However, despite their detailed descriptions, these reports are methodologically limited in certain respects. In particular, they lack integrated scientific analyses such as archaeometric, paleo-environmental, geo-archaeological, and laboratory-based material studies which have become essential for contemporary archaeological interpretation. Although rapid urbanization and persistent human encroachment have significantly reduced the availability of undisturbed archaeological sites in Delhi, it would be incorrect to assume that there is no longer any scope for archaeological exploration in the city. On the contrary, despite the constraints of dense urbanization, there is considerable potential to advance urban and settlement archaeology in certain areas through scientifically rigorous excavation strategies and interdisciplinary methodologies.

In this context, scholarly attention should be specifically directed toward two sites for future archaeological work. The first is the Mandoli site the focal point of this paper which is crucial for re-evaluating Delhi's early historic and transitional cultural phases. Given its archaeological potential, systematic excavation employing advanced stratigraphic methods, micro-contextual recording, archaeometric analysis, geo-archaeological investigation, and integrated environmental sampling could significantly enhance our current understanding of settlement layout, occupational continuity, ceramic sequences, subsistence patterns, and regional cultural interactions. The ongoing scholarly debate regarding the post-Harappan cultural phase at Mandoli is archaeologically significant (Mani 1977, 2009, Srivastava 2006), as the issue remains unresolved in terms of methodology and chronology within current discourse. The identification, cultural affiliation, and dating of strata associated with the Harappan period lack systematic scientific validation, making this a subject of

intense debate. In this regard, a rigorously designed stratigraphic excavation program incorporating absolute dating techniques such as radiocarbon dating, Optically Stimulated Luminescence (OSL), sedimentological studies, archaeobotanical analysis, and ceramic petrography could prove vital in resolving the chronological complexities associated with the site. Such an investigation becomes all the more significant because Mandoli is situated in the corridor connecting the Ghaggar-Hakra region and the Upper Ganga-Yamuna Doab an area long recognized for its pivotal role in processes of cultural diffusion, settlement expansion, and regional exchange during the post-Harappan and post-urban phases. Consequently, a scientifically controlled excavation at Mandoli holds the potential not only to clarify the site-specific stratigraphy but also to contribute meaningfully to broader debates regarding the eastward expansion, transformation, and regional adaptation of post-Harappan populations in North India. Secondly, the Sultan Ghari tomb site offers a compelling case for advancing medieval urban archaeology in Delhi. As one of the earliest surviving funerary monuments of the Delhi Sultanate, the site presents significant potential for scientific excavation. The objective is to understand architectural evolution, funerary practices, spaces associated with religious rituals, and patterns of site utilization during the early Sultanate period. Through a well-designed archaeological program incorporating stratigraphic excavation, the study of material culture, architectural archaeology, geophysical surveys, and scientific dating techniques light can be shed on the complex cultural transitions occurring between the late Early Medieval period and the Sultanate period. Such an approach would not only enrich existing historical knowledge but also strengthen the archaeological understanding of the processes of medieval urbanization in Delhi. Therefore, rather than viewing Delhi as a site that has been archaeologically exhausted, future research should regard the city as a complex urban “palimpsest”, a site bearing traces of multiple cultural phases. Investigating selected locations using scientifically rigorous methods offers immense opportunities to expand archaeological knowledge regarding ancient and medieval Delhi.

Urban Archaeology in Delhi

Urban Archaeology has recently gained recognition as a distinct subfield of archaeology, marked by the integration of scientific methodologies with traditional archaeological practices. This subfield delves into intricate layers of historical urbanism that are interwoven within the physical and cultural landscapes of modern urban centers. Although not universally acknowledged as an independent discipline, Urban Archaeology is distinguished by its specific goals, methods, and interpretive challenges, justifying its status as a specialized research area (Raja & Sindbæk 2020). It offers an interdisciplinary framework that links material culture, spatial organization, and human behavior within the context of changing urban environments. Urban Archaeology is a vital link between the historical and contemporary urban settings. Modern cities, often seen as symbols of modernity, are deeply entrenched in the stratified layers of historical development. These layers provide evidence of the social, economic, and cultural processes that shaped earlier urban forms. The primary objective of Urban Archaeology is to uncover, document, and interpret these remnants to reconstruct the dynamics of urban evolution over time. Conceptually, it includes both archaeology in the city, archaeological work conducted within current urban areas and archaeology of the city, the study of urbanization as a historical process. Edwards Staski’s interdisciplinary

definition highlights the epistemological richness of this field, describing Urban Archaeology as “the study of the relationships between material culture, human behavior, and cognition in an urban setting”(Staski 1982-9). Staski further noted that urban archaeologists examine societies from any temporal or spatial context characterized by the concentrations of people and energy (Staski 1982). This definition places Urban Archaeology at the crossroads of cultural anthropology, material culture studies, and spatial theory, thus underscoring its inherently comprehensive nature. The rise of Urban Archaeology as a distinct practice has historically been linked to development in the United States during the mid-twentieth century. The enactment of Section 106 of the National Historic Preservation Act (NHPA) in 1966 (36 CFR Part 800) marked a significant institutional milestone (Platt&Britt, 2024).

This legislative framework, bolstered by scholars such as Salwen, required systematic archaeological documentation before urban development and infrastructure projects. This legal requirement spurred methodological advancements in excavation, recording, and conservation within urban contexts, establishing the foundation for Urban Archaeology as a specialized research tradition within Historical Archaeology (O’Keeffe, 2014). Methodologically, Urban Archaeology operates through two complementary domains: archaeological research and museumification of archaeological sites (Yamin, 2014). The former involves systematic excavation, stratigraphic analysis, and contextual interpretation, whereas the latter focuses on the preservation, presentation, and public engagement of urban archaeological heritage. These dual trajectories reflect scientific inquiry and heritage management objectives, positioning Urban Archaeology as a bridge between academic research and public archaeology (Yamin, 2014, 7530).

Over time, Delhi's landscape has transformed from predominantly rural to urban, driven by increasing urbanization and population growth. The following data illustrate the transition from rural to urban areas over the last three censuses. As of March 1, 2011, Delhi's population was 16.78 million, up from 13.85 million on March 1, 2001. According to the 2011 Census, approximately 97.50% of Delhi's population resides in urban areas, with only 2.5% residing in rural regions (Economic Survey of Delhi, 2021-22 395). Urbanization has led to the disappearance of most of Delhi's archaeological and heritage sites. Nevertheless, Urban Archaeology offers a new approach that allows for the re-contextualization and documentation of these vanished treasures within its framework and in this context Purana Qila exemplifies the urban archaeology discussed above, positioned centrally within the city in a distinctly urban environment where systematic excavations have been periodically undertaken. This site allows visitors to delve into various aspects of heritage studies. It acts as a central point for enhancing the understanding and development of both the theoretical and practical elements of public archaeology in India. Furthermore, it offers context for the archaeology of the city and Archeology in the city.

The Site Mandoli

The site of Mandoli constitutes a modest rural settlement situated at approximately 28°42’ N latitude and 77°19’ E longitude, positioned along the left bank of the Yamuna River in proximity to Nand Nagari, and roughly 16 km from the Delhi Railway Station along the Delhi–Ghaziabad corridor. The archaeological mound is located to the south-west of present-day Mandoli village and to the south of Saboli. Notably, much of the ancient mound has been encroached upon by

contemporary habitation, with the exception of its northern and north-eastern sectors. (Babu 2024).

Preliminary explorations undertaken by the Department of Archaeology, Government of the National Capital Territory of Delhi, indicated a long continuum of occupation extending from the Late Harappan phase through to the Late Historical period. Based on these surface indications, systematic excavations were conducted over two successive field seasons (1987–88 and 1988–89) under the direction of the present investigator. These excavations were guided by three principal research objectives: first, to examine the character and spatial extent of the Late Harappan cultural component; second, to identify and delineate the stratigraphic horizon associated with the Painted Grey Ware tradition within the region; and third, to establish a comprehensive cultural sequence for the site. Analysis of the excavated material assemblage enabled the stratification of the site into five distinct cultural periods.(Babu 1994-95, 1996).

- Period I corresponds to the Late Harappan phase.
- Period II is characterized by the presence of Painted. Grey Ware.
- Period III is marked by the occurrence of black-slipped ware;
- Period IV pertains to the Sunga–Kushana cultural horizon.
- Period V is attributable to the Gupta period.

Condition Assessment of The Site: Threat and Challenge

Currently, the site faces several major threats; however, the greatest challenge stems from the conditions that emerged after the excavations concluded. Given the site's immense cultural significance, systematic and long-term measures should have been implemented to preserve it. Such steps would have safeguarded the site for future archaeological investigations utilizing modern methods and techniques, potentially yielding more concrete and scientifically robust evidence. Instead, the collective negligence of the concerned institutions has become a matter of serious concern. Despite the excavators being fully aware of the prevailing encroachment and the associated risks to the site's integrity, no comprehensive strategy was devised for its long-term conservation, management, or protection (Babu 2024:8). Almost 37 years have passed since the site was excavated; yet, no concrete measures have been taken to ensure its protection. There is not even basic fencing or demarcation to protect excavated areas. Furthermore, there are no information boards or signposts indicating the site's archaeological, cultural, or historical significance. The continued neglect of the site is deeply concerning, especially given its rapidly deteriorating condition. I first visited the site in 2022 and subsequently conducted multiple visits between 2023 and 2026, including detailed field investigations in July 2025 and May 2026. These repeated visits reveal a pattern of continuous and alarming degradation. Encroachment is increasing from all sides, threatening the site's physical existence. It now remains as a narrow archaeological corridor surrounded by roads, making it increasingly vulnerable to urban pressures and gradual destruction. During the field survey, efforts were made to understand local perceptions of the site and to disseminate information about its archaeological significance through informal interactions with nearby communities. However, very few local residents were aware of the excavation history or possessed even a rudimentary understanding of the site's cultural importance. At this juncture, a significant ethical and managerial dilemma arises. Placing undue or ill-considered

public emphasis on the site's cultural and historical significance could inadvertently lead to adverse consequences. In the south asian context, archaeological sites are often associated with the belief that hidden treasures lie beneath them. Such perceptions can fuel unauthorized digging, looting, or other destructive activities, thereby posing an additional threat to the archaeological record. Therefore, when inspecting and documenting a site, it is essential to view it through the lens of public archaeology ethics (Williams et al., 2019). Rather than highlighting archaeological significance in a way that might inadvertently endanger the site, the initial emphasis should be on understanding it as an urban planning and management issue. Such a perspective helps in gaining a more comprehensive understanding of the site's vulnerabilities particularly those arising from encroachment, neglect, and development pressures. A second, equally important concern relates to land occupation and informal settlement patterns. When local communities become aware of the historical or cultural significance of such sites, competition or disputes over land possession can arise. This often happens because people fear that government intervention or the granting of 'heritage' status might alter future land rights. In many instances, this can actually accelerate, rather than curb, the process of illegal land occupation. Consequently, the survey, exploration, documentation, and management of archaeologically sensitive sites must be conducted within the framework of public archaeology, heritage legislation, and community-based legal rights. Any sustainable conservation strategy must operate within these institutional and ethical boundaries to properly address the unique challenges of each site and devise long-term solutions. The conservation and stewardship of archaeological sites should be grounded in the principle of "heritage from below"(Smith 2006 Muzaini &Minca 2018). Under this principle, heritage is viewed not merely as something controlled by institutions or the government, but as a collective legacy belonging to everyone(Smith&Waterton, 2010, Smith 2012, 2014). Since archaeological sites are vital components of our shared past, their protection, care, and maintenance should be regarded as a collective social responsibility. Three main threats emerged during the site survey: encroachment, environmental degradation or pressure, and administrative gaps. These serious concerns which collectively jeopardize the site's integrity and its long-term preservation are detailed in the subsequent sections.

Encroachment: The archaeological mound is currently undergoing gradual, yet significant, changes due to informal and functional modes of encroachment. Owing to a lack of clearly demarcated protective boundaries and consistent regulatory oversight, local residents have effectively adopted the site as an "open-access community space." As noted by the excavators in their exploration records, "with the exception of the northern and northeastern sections, the entire site has been occupied by the modern village." In the case of Mandoli, existing encroachments have remained geographically limited; the primary reason for this is the terrain's continuous utilitarian usage, which albeit inadvertently has served as a controlling mechanism against large-scale territorial encroachment. Unfortunately, the site is currently being utilized as a cricket ground, a venue for seasonal fairs, and a space for various public gatherings, at the southern end of the site, a pond has also been constructed by excavating to a depth of approximately 1.5 meters. A series of temples has been built here, and this pond was created to serve their specific needs, part of reflecting its integration into the socio-cultural fabric of the surrounding settlements. While such uses may appear harmless or even socially beneficial they raise serious archaeological

concerns, including surface degradation, soil compaction, disruption of stratigraphy, and the inadvertent removal or damage of artifacts and material remains. These activities contribute to the gradual erosion of the site's "contextual integrity", an integrity that constitutes the fundamental basis for reconstructing the multi-period cultural sequence spanning from the "Late-Harappan" to the "Gupta Period". From the perspective of archaeological management, this form of "soft encroachment" is particularly challenging, as it operates within the realm of everyday behavior rather than overt illegality; consequently, it necessitates a nuanced approach that strikes a balance between community engagement and the imperatives of scientific conservation and site security. This site is progressively falling victim to various forms of encroachment including the proliferation of informal settlements (clusters of shanties), the gradual encroachment upon its boundaries by adjacent residential colonies, and the unauthorized subdivision and construction on parcels of land. Collectively, these processes exemplify a pattern of gradual yet persistent "spatial infringement," contributing to the progressive transformation and fragmentation of the site's original landscape character.



Image 1: Encroachment over Site

Environmental Degradation or Pressures: Environmental pressures have emerged as a significant factor accelerating the rate of deterioration of archaeological deposits. The site is being subjected to the indiscriminate dumping of waste on an ongoing basis; this not only alters the surface morphology but also introduces chemical contaminants into the soil matrix thereby compromising the conditions necessary for the preservation of artifacts and organic remains. Such contamination can irreversibly damage organic materials and distort archaeological indicators, giving rise to serious interpretive challenges. Furthermore, seasonal waterlogging resulting from inadequate drainage systems and the site's geographical location (situated in a low-lying area) poses a grave



Image 2: Encroachment over Site

threat to the site's “stratigraphic integrity.” Prolonged moisture retention facilitates soil erosion, bioturbation, and the leaching of cultural layers; consequently, depositional sequences become obscured or displaced sequences that are absolutely essential for establishing accurate cultural chronologies. Cumulatively, these environmental pressures not only undermine the physical preservation of the site but also diminish its scientific significance; thus, necessitating immediate intervention through integrated environmental management and preventive conservation strategies.



Image 3: Water Logging at Site



Image 4: Unauthorized Dumping Yard



Image 5: Unauthorized Dumping Yard

Administrative Gaps: The management of the Mandoli archaeological mound in Delhi is significantly hampered by structural and administrative deficiencies, which directly impact its

conservation. Foremost among these is the absence of a clearly defined and legally enforceable demarcation of the site; this results in ambiguous spatial boundaries, thereby fostering gradual encroachment and uncontrolled changes in land use. This lack of precise land demarcation renders the identification of protected versus unprotected zones difficult, heightening the risk of inadvertent damage to archaeologically sensitive deposits. Compounding this issue is the jurisdictional conflict between state Archaeology department, Delhi Development authority, local municipal bodies and heritage authorities such as the Archaeological Survey of India (ASI) leading to fragmented governance and inconsistent adherence to conservation regulations. These administrative shortcomings frequently manifest as delays in decision-making, regulatory ambiguity, and ineffective monitoring mechanisms.

Furthermore, the absence of a dedicated conservation and management plan for this specific site, one grounded in systematic archaeological assessment, impedes the adoption of targeted strategies for protection, documentation, and sustainable utilization. In the context of a multi-period site like Mandoli where cultural deposits existing at various strata are highly vulnerable to both anthropogenic and environmental pressures these collective governance challenges contribute to the gradual erosion of archaeological integrity, while simultaneously underscoring the urgent need for an integrated, legally robust, and scientifically informed management framework.

Site Management Plan

The Delhi Ancient and Historical Monuments and Archaeological Sites and Remains Act, 2004 establishes a comprehensive legal framework for the protection and management of archaeological sites and remains in Delhi. The Act extends protection not only to standing monuments but also to archaeological landscapes, subsurface remains, settlement mounds, and areas believed to contain physical evidence of historical or archaeological significance dating back more than 100 years. It empowers the government to declare any monument or archaeological site a protected monument or protected area if it faces threats such as destruction, encroachment, defacement, alteration, misuse, environmental damage, or decay. Significantly, the Act recognizes archaeological sites beyond mere visible architecture, thereby enabling the protection of subsurface cultural remains and settlement areas. Furthermore, it provides legal measures such as a 50-meter prohibited area and an additional 100-meter regulated area to control construction and mining activities around protected monuments. It also allows for the declaration of controlled areas to preserve the broader cultural landscape, visual integrity, and environmental setting of heritage sites. A distinctive feature of the Act is its preventive and emergency protection provisions, particularly for sites that have not yet been formally declared protected. Under these provisions, authorities can intervene when a monument or archaeological site faces an immediate threat, even in the absence of a formal notification, thereby enabling preventive conservation in the public interest. The Act also authorizes land acquisition, maintenance, conservation, conservation agreements with landowners, and legal action against unauthorized occupation or encroachment. Through provisions regarding eviction rights, land-use restrictions, and heritage-sensitive planning controls, this legislation establishes a legal framework for safeguarding sensitive archaeological landscapes within a rapidly urbanizing environment like Delhi.

Delhi Archaeological Advisory Council

The Delhi Archaeological Advisory Council functions as an expert body aimed at providing guidance on heritage administration and archaeological conservation in Delhi. Although primarily advisory rather than executive in nature, the Council plays a pivotal role in recommending the declaration of protected monuments and archaeological sites, as well as advising on excavation priorities, scientific conservation, site management, and long-term heritage policy. It can also recommend protective measures where archaeological resources face threats from urban development, encroachment, environmental degradation, or neglect. Essentially, the Council acts as a bridge between archaeological expertise and government action. It frequently influences decisions regarding the declaration of sites, the implementation of conservation measures, and the enforcement of legal provisions to protect endangered archaeological remains. However, while the Council can recommend conservation measures and influence policy, the authority to issue notifications, initiate legal action, remove encroachments, or formally acquire land rests solely with the government and the Director of Archaeology. In accordance with the legal provisions specified in the act 2004 and rule 2004, and considering the current condition and governance of the site, this management plan is proposed as a framework that is both legally compliant and archaeologically robust. It seeks to address existing challenges while ensuring adherence to the Act's statutory mandates. The primary objective of this plan is to facilitate the effective enforcement of heritage laws through a management strategy that is contextually informed and scientifically grounded. However, it is recognized that for the Act to be effectively implemented, a comprehensive understanding of its current execution processes, institutional limitations, and evolving socio-spatial dynamics is essential. Consequently, this framework adopts an integrated archaeological approach that aligns statutory conservation requirements with prevailing conditions, ensuring both legal compliance and sustainable heritage management.

Adaptive Archaeological Buffer System (AABS)

The proposed 'Adaptive Archaeological Buffer System' (AABS) is a dynamic and context-sensitive zoning framework that integrates archaeological sensitivity mapping, real-time monitoring systems, and community-controlled buffer zones to ensure the sustainable protection of sites (a measure that can be legally reinforced through the recognition of archaeological sites and remains under Section 2(b) of the "Delhi Ancient and Historical Monuments and Archaeological Sites and Remains Act, 2004" (DAHMASR Act), which allows any area containing archaeological remains older than 100 years or where there is a reasonable likelihood of their presence to be brought under the ambit of legal protection. Utilizing sensitivity mapping, the system identifies and classifies areas based on archaeological significance and risk, enabling the implementation of interventions and protection measures at varying levels, this can be further supported by the formal notification procedures under Section 4(1)–(4) of the DAHMASR Act, which empowers the government to declare archaeological sites and remains as "protected areas" where conservation is essential to prevent destruction, alteration, defacement, encroachment, removal, or deterioration. It is further strengthened by real-time monitoring technology, which facilitates continuous surveillance and rapid response to threats such as encroachment, looting, or environmental damage, this is particularly relevant in the context of Section 19 of the DAHMASR Act, which authorizes the Director of

Archaeology to take immediate preventive measures in cases where an unprotected monument or archaeological site faces the risk of destruction, where such action is in the public interest. Most importantly, the inclusion of community-controlled buffer zones redefines traditional “top-down” or “authorized heritage management” approaches; It fosters participatory conservation by integrating local stakeholders into the governance framework and enhances regulatory compliance, this can be institutionally strengthened through the maintenance and conservation provisions under Sections 5 and 6 of the DAHMASR Act, enabling negotiated agreements and custody arrangements between authorities and stakeholders for heritage protection. Overall, AABS offers a flexible, adaptable, and inclusive model that aligns conservation priorities with evolving socio-spatial conditions, ensuring both the preservation of archaeological landscapes and their contextual integration, while also remaining consistent with the legal protection mandates envisaged under both the DAHMASR Act, 2004, and the ‘Ancient Monuments and Archaeological Sites and Remains Act, 1958’ AMASR Act. The framework is underpinned by an integrated, non-invasive, and spatially driven approach to heritage assessment and risk evaluation. Advanced survey techniques such as Ground Penetrating Radar (GPR), magnetometry, and drone-based LiDAR scanning facilitate the systematic detection and mapping of subsurface archaeological features without excavation; this preserves site integrity while yielding high-resolution data aligning with the preventive conservation ethos embodied in Sections 14 and 18 of the DAHMASR Act, which emphasize maintenance, the preservation of protected monuments, and the regulation of surrounding landscapes. These techniques are particularly effective in identifying subsurface structural remains and delineating “high-risk heritage zones” areas vulnerable to both human and environmental pressures which can subsequently be notified and legally protected under Section 4 of the DAHMASR Act and Sections 19 and 20 of the AMASR Act, 1958 statutes governing archaeological conservation and safety measures. Furthermore, GIS-based heritage mapping facilitates the integration of diverse spatial datasets, including archaeological potential, current land-use patterns, and trends in encroachment expansion. Synthesizing these layers enables nuanced spatial analysis, resulting in the creation of a “Heritage Risk Index Map”; this map serves as a vital decision-support tool for prioritizing conservation efforts and informing adaptive management strategies specifically for identifying areas requiring legal intervention under Sections 17 and 18 of the DAHMASR Act, which pertain to prohibited, regulated, and controlled zones.

Zoning and Spatial Planning Framework

The proposed management strategy for the Mandoli archaeological site is based on a well-designed zoning system designed to strike a balance between conservation needs and human activities. Zone I, referred to as the “Core Protected Area,” is the most archaeologically sensitive area; this zone is subject to strict legal protection regulations, and construction activities are completely prohibited within its boundaries, legally equivalent to the notification of a “protected area” under Sections 4(1)–(4) of the DAHMASR Act and further strengthened by the establishment of a 50-meter restricted zone under Section 17, where construction and mining activities are prohibited. Surrounding this is Zone II, referred to as the “Controlled Buffer Zone”; Limited and highly controlled activities are permitted within this zone, provided they are consistent with heritage conservation objectives this is consistent with the 100-meter controlled zone specified

under Section 17 of the DAHMASR Act and the declaration of "controlled areas" under Section 18(1) of the Act, which regulate construction activity, land use, visual integrity, and infrastructure development around heritage sites. Next is Zone III the "Community Interaction Zone," which places existing settlements within the scope of regulation, awareness-raising, and participatory conservation, thereby involving local communities rather than isolating them from the heritage environment, it is also consistent with the compensation and negotiated land use provisions under Chapter V, Sections 29–31 of the DAHMASR Act, thereby minimizing forced displacement and promoting conservation-oriented settlement coexistence.

Encroachment Prevention and Legal-Institutional Mechanism

To address the problem of encroachment, a hybrid framework has been adopted that combines legal enforcement measures with new socio-economic strategies. Legal measures include formal notification under heritage conservation laws; for example, in Delhi, the DAHMASR Act 2004 and the AMSAR 1958 are followed (specifically, Sections 4(1)–(4) of the DAHMASR Act, which empowers the government to declare archaeological sites and remains as "protected areas," and Sections 3–4 of the AMASR Act, 1958, which relate to the declaration of monuments and archaeological sites of national importance. This also includes implementing digital cadastral mapping to establish clear and enforceable site boundaries (which can be legally strengthened under Section 18(1) of the DAHMASR Act, which deals with "controlled areas" and helps regulate land use, construction, and spatial planning around archaeologically sensitive areas). This is complemented by a progressive "soft eviction" model that avoids forced displacement by promoting incentive-based rehabilitation schemes, Transferable Development Rights (TDRs), and compensation mechanisms linked to voluntary compliance (DAHMASR Act 2005, Chapter V, Sections 29/30). This is further supported by Sections 20–21 of the DAHMASR Act, which empower authorities to issue notices, hold hearings, and evict unauthorized occupants of protected monuments or archaeological properties, while compensation safeguards under Chapter V, Sections 29–31 can facilitate negotiations and non-coercive settlements. To further strengthen this approach, "Heritage Management Contracts" have been introduced; These approaches transform local residents into active custodians of the site through co-management agreements and incentive-based reporting systems, making conservation part of the fabric of the community a model that could find legal recognition through Sections 5–6 of the DAHMASR Act, which deal with acquisition, conservation, and maintenance agreements between authorities and owners or stakeholders, enabling collaborative conservation work.

Conservation Principles and Technical Measures

The conservation strategy is grounded in the principles of preservation and minimal intervention. Its objective is to safeguard the integrity and authenticity of the archaeological record aligning with the conservation values enshrined in Sections 14 and 16 of the DAHMASR Act, which emphasize the maintenance and preservation of monuments and their protection against misuse, pollution, or desecration. Preservation measures include soil stabilization, drainage improvements to mitigate waterlogging, and systematic vegetation control to prevent structural and stratigraphic damage legally justified as conservation and maintenance measures under Section 14 of the DAHMASR

Act, which pertains to the government's responsibility regarding protected monuments and archaeological remains. These efforts are guided by internationally recognized conservation principles that discourage over-restoration and prioritize the preservation of the original physical fabric and context consistent with the broad conservation principles inherent in both the DAHMASR Act and the AMASR Act, 1958, which favor conservation over intrusive alterations. This approach ensures that conservation measures are reversible, non-intrusive, and scientifically grounded while also complying with the provisions governing archaeological excavation and conservation under Chapter IV of the DAHMASR Act and the excavation licensing mechanisms under the AMASR Act, 1958.

Governance and Digital Monitoring Framework

An integrated governance model is proposed, based on a multi-stakeholder institutional framework. This involves the coming together of archaeological authorities, municipal agencies, and local governance bodies such as panchayats or ward representatives institutional coordination can be facilitated through the Delhi Archaeological Advisory Council, established under Chapter VI of the DAHMASR Act, enabling expert consultation on conservation priorities, archaeological investigations, and site management. This collaborative framework is further strengthened by a digital monitoring system utilizing satellite-based encroachment detection and mobile-based citizen reporting applications this is particularly significant regarding Section 19 of the DAHMASR Act, which empowers the Director to take protective measures where archaeological sites are at risk of destruction; thus, digital monitoring serves as an early-warning mechanism for legal action. Such technological integration enhances transparency, real-time monitoring, and participatory governance, making site management more efficient and accountable while also aiding the enforcement of Sections 17 and 18 concerning restricted, regulated, and controlled heritage zones. Community Involvement and Socio-Economic Engagement

Community Integration and Socio-economic Linkages

Recognizing the pivotal role of local communities, the scheme incorporates robust methods for community engagement aimed at fostering both conservation and sustainable livelihoods. This approach aligns with Sections 5 and 6 of the DAHMASR Act, which provide opportunities for participation in heritage management through stewardship, maintenance agreements, and dialogue among all stakeholders. Heritage-linked livelihood initiatives include proposals to train local residents as site guides and to promote small-scale, craft-based economies tied to the site's cultural identity thereby fostering a sense of stewardship and responsibility among locals, rather than conflict with archaeological authorities. Parallel awareness-raising initiatives such as heritage education at the school level and “Know Your Site” campaigns. aim to instill a sense of ownership and responsibility among community members. This will help reduce the pressure of human activities on the site and will also indirectly strengthen compliance with legal conservation regulations under Sections 17–21 of the DAHMASR Act.

Risk Preparedness and Sustainable Use Strategy

This framework incorporates measures for proactive risk preparedness, such as early warning systems for encroachment, disaster management protocols to address flooding and waterlogging,

and provisions for archaeological excavation to safeguard heritage assets against imminent threats, this is particularly relevant under Section 19 of the DAHMASR Act, which permits emergency preventive action in cases where monuments or archaeological sites are at risk of destruction, and regulates archaeological excavation and scientific investigation through the provisions of Chapter IV. Regarding sustainable use, the plan explicitly rejects mass tourism models such as those observed at sites like Purana Qila and its excavation site, Humayun's Tomb, and Qutub Minar and instead advocates for a low-impact approach centered on controlled educational access and digital dissemination, aligning with the conservation-oriented framework of the DAHMASR Act, which prioritizes the preservation and integrity of the archaeological record over excessive public intervention. Emphasis is placed on tools such as virtual tours and 3D mapping to enhance accessibility without compromising the site's integrity, while remaining consistent with statutory conservation obligations under Sections 14, 17, and 18 of the DAHMASR Act.

Phased Implementation and Monitoring Mechanism

The implementation of the plan is structured into three phases to ensure systematic execution and adaptability. Phase 1 (0–1 year) focuses on baseline surveys, mapping, legal notifications, and temporary security measures such as fencing including the initiation of notification procedures under Section 4(1)–(4) of the DAHMASR Act to declare the site a protected area, and the application of emergency protection provisions under Section 19 where necessary. Phase 2 (1–3 years) emphasizes the implementation of buffer zones, the initiation of community engagement, and experimental conservation measures (aligned with the enforcement of provisions for prohibited and regulated areas under Section 17 and controlled areas under Section 18). Phase 3 (3–5 years) envisions the full-scale implementation of the “Adaptive Archaeological Buffer System” (AABS), the integration of digital monitoring technologies, and the expansion of research activities under the institutional guidance of the Delhi Archaeological Advisory Council. Continuous monitoring and evaluation are ensured through annual encroachment audits, regular GIS updates, and independent academic reviews to maintain accountability and adaptive management alongside periodic re-evaluation of legal protection mechanisms.

Innovative Contributions and Conceptual Advancements

This management plan makes a significant theoretical and practical contribution to the field of archaeological site management. It introduces “Heritage Risk Index Mapping” alongside an “Adaptive Archaeological Buffer System” (AABS) a dynamic zoning model to prioritize areas requiring intervention (thereby facilitating the implementation of legal planning tools under Sections 17 and 18 of the DAHMASR Act, which pertain to regulated and controlled heritage landscapes. Adopting a hybrid model that combines “soft eviction” non-coercive relocation with “stewardship” marks a shift from coercive enforcement methods toward “participatory governance”; furthermore, community-based legal enforcement mechanisms redefine the role of the local population from being perceived as a “threat” to being recognized as “stakeholders” while retaining legal recourse under Sections 20–21 regarding unauthorized encroachment and eviction should dialogue fail. Overall, these innovations provide a framework for managing heritage sites amidst urban and peri-urban pressures, a framework that is context-sensitive and replicable

elsewhere. Should the government undertake systematic and scientifically designed excavations at Mandoli, it would prove to be a crucial step in advancing our archaeological understanding of the Harappan civilization particularly within the transitional zone between Delhi and the Yamuna Doab, an area that has hitherto received scant study. This corridor, often overlooked in favor of areas with more extensive excavations, holds immense potential to shed light on patterns of cultural diffusion, settlement dynamics, and ecological adaptations associated with the later or peripheral manifestations of the Indus tradition. Preliminary surface indications and landscape features, excavations result observed at Mandoli suggest that significant ancient archaeological remains lie preserved beneath the surface thereby meeting the definition of “ancient site and remains” under Section 2(b) of the DAHMASR Act). Consequently, there is a critical need for controlled stratigraphic excavation at the site, alongside the application of methodologies such as geoarchaeology, paleobotany, and remote sensing to be conducted. Such an approach would not only facilitate a better understanding of the region's cultural sequence but also contribute significantly to broader scholarly debates regarding the expansion of Harappan culture and its associated regional variations.

Discussion

Given the archaeological significance of Mandoli and the increasing pressures posed by rapid urbanization, land-use transformation, and administrative neglect, there exists an urgent need to formulate a comprehensive and sustainable heritage management framework for the site, such as the one proposed above. In circumstances where immediate excavation is not feasible, a parallel strategy within a phased heritage management framework would constitute both a necessary and strategically prudent intervention. In this regard, the establishment of a dedicated site museum and interpretation centre in the vicinity of Mandoli by the government is strongly recommended. The creation of such an institution would serve multiple interconnected objectives, it would provide a repository for preserving material culture unearthed during excavations, serve as a platform for scholarly exchange, and act as a conduit for systematically engaging the public with the historical significance of the site. More importantly, an interpretation center would facilitate the translation of archaeological knowledge into accessible narratives, thereby fostering community awareness and encouraging a sense of local stewardship over heritage resources. From a heritage management perspective, this initiative would significantly elevate the status of Mandoli transforming it from a neglected or marginalized archaeological site into a recognized cultural landmark within Delhi's rapidly expanding urban landscape. Incorporating interpretive infrastructure can catalyze heritage-led development by attracting academic interest, cultural tourism, and associated economic activities. Consequently, such an intervention would not only restore the historical identity of the site but also contribute to the socio-economic revitalization of the surrounding region. In this context, heritage conservation should be viewed not merely as an isolated act of preservation, but as a dynamic and participatory endeavor that integrates archaeological research with sustainable urban development, cultural identity formation, and long-term community prosperity. If state authorities succeed in gaining a comprehensive understanding of this site and ensuring its effective management while simultaneously resolving all associated legal and administrative matters it is proposed that excavation work be resumed here. Specifically, the implementation of large-scale

horizontal excavation is recommended, with the aim of transforming the site into an “Open-Air Museum”. Such an initiative would not only hold immense significance for the academic community but also contribute significantly to the promotion of tourism, particularly archaeological tourism. Furthermore, it would play a pivotal role in re-establishing and highlighting Delhi's historical identity in a more authentic and meaningful manner.

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