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Cultural Heritage at War: Digital Documentation, Monitoring, and Protection through Digital and Public Humanities in Syria and Ukraine

Supervisor
Ch. Prof. Stefano Dall'Aglio

Assistant supervisor
Ch. Prof. Fabio Pittarello

Graduand
Sofia Savini
Matriculation Number 906156

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ABSTRACT

The destruction of cultural heritage in modern armed conflicts is increasingly seen as a war tactic aimed at erasing identity and destabilizing societies. In response to this danger, many digital tools have emerged recently to monitor, document, and safeguard heritage in crisis zones. This thesis provides a comparative analysis of two digital ecosystems that developed in different geopolitical settings but share a common issue: the ongoing threat to cultural heritage. These cases are Syria and Ukraine. Using an interdisciplinary approach that combines Digital Humanities, Public Humanities, and Information Visualization, the research compares two main intervention models. One examines geospatial monitoring using satellite images and incident databases, such as those by ASOR Cultural Heritage Initiatives, EAMENA, and UNOSAT. The other considers large-scale web archiving and public participation efforts, including initiatives like SUCHO, ICCROM, and the Smithsonian Conflict Observatory. The analysis looks not only at the technical tools and processes but also at how different audiences are engaged, the epistemological biases influenced by various data types, and how digital evidence interacts with international legal frameworks. As a practical and experimental element, the thesis also develops a Digital Public Humanities project in the form of a storytelling website. The site combines GIS mapping, digital media, and thematic paths, along with a critical section where graphs and visualizations act as analytical tools to uncover patterns and insights within the data. The goal is to make the documentation approaches examined in the research visible and comparable. This functions both as a research tool and a public platform for reflection. Additionally, it shows how digital interfaces can shape and influence narratives about cultural heritage during crises. The thesis argues that technological choices greatly affect who can participate, which types of damage are visible, and whether digital data can effectively influence legal and decision-making processes. In its final part, the study offers suggestions for creating digital monitoring frameworks that are more ethical, more inclusive, and more legally relevant for protecting cultural heritage in conflict zones.

INTRODUCTION

Armed conflicts go beyond redrawing borders or reshaping political systems, indeed causes profound impact on the places where communities establish their collective memory and identity. At the outbreak of the conflict, monuments, museums, religious sites, archives and archaeological remains in most cases become involved in the conflict. Sometimes they get damaged by accident while in other cases they are deliberately targeted, looted, or destroyed to show and establish power or to erase the fundamental cultural symbols of an adversary. Cultural heritage has long been linked to conflict, and during violent assaults, people have appropriated, reinterpreted, and even use it as a weapon. The Second World War offers a clear example, when the systemic confiscation of artwork and their relocation by the German Nazi regime was part of a calculated strategy to promote political ideologies and establish firm political authority and control. The legal instruments developed after 1945, including the 1954 Convention for the Protection of Cultural Property in the Event of Armed Conflict[1], also known as the Hague Convention, reflect an increasing awareness of the attacks against heritage during war conflicts, recognizing these assaults as more than material damage and loss, affecting the historical memory, identity and political legitimacy of communities.

Looking ahead to the past two decades, the targeting of cultural heritage has become more explicitly strategic. Scholars have pointed out that attacking cultural landmarks take place in contemporary warfare with alarming frequency, highlighting that these attacks are not indiscriminate actions but are meant to confuse people's sense of

[1] In this thesis, the 1954 Hague Convention is relevant because it placed the protection of cultural property within a specific framework of international legal obligations applicable during armed conflict. Its analytical importance lies not only in its chronological priority, but also in its recognition that damage to the cultural property of any people affects the cultural heritage of humanity as a whole. UNESCO, *Convention for the Protection of Cultural Property in the Event of Armed Conflict*, adopted at The Hague, 14 May 1954, preamble and arts. 2–5.

identity[2]. The destruction of the Bamiyan Buddhas[3] by the Taliban in 2001 marked a turning point, highlighted how widespread this practice has become and underscoring the gravity of the issue. The importance of this event is in the fact that the destruction was staged and justified as an ideological act, within images and videos shared all around the world. It is possible to see similar patterns in other context such as in Syria and Iraq, where also in these cases the destruction of sites, like Palmyra, was accompanied by carefully distributed media coverage. Recognizing these multiple interpretations is essential for understanding why heritage sites often become arenas of political negotiation and social conflict. UNESCO called the destruction in these places "cultural cleansing," which means trying to deprive communities of their knowledge and identity[4]. Comparable dynamics can also be seen in the Balkans, Mali, and more recently in Ukraine, where cultural institutions, museums, and religious structures have sustained significant damage[5]. Understanding the significance of this phenomenon and these acts requires reflecting on what heritage represents. In response to the deliberate destruction and instrumentalization of cultural heritage, efforts to document and protect it have evolved significantly. Over the past fifteen years the Digital Humanities and Public Humanities have developed and established innovative tools and collaborative networks that are useful for researchers to detect damage and assess risk. However digital systems are not neutral instruments, since they reflect the power relationships and priorities of the people

[2] Noelle Higgins, *The Protection of Cultural Heritage during Armed Conflict: The Changing Paradigms* (London: Routledge, 2020).

[3] Bamiyan Buddhas were two sixth-century statues carved into rock cliffs in the Bamiyan Valley of Afghanistan. They stood as remarkable examples of Gandharan Buddhist artistic tradition and embodied the historical, cultural, and religious identity of the region. See UNESCO, *Report on the Destruction of the Buddhas of Bamiyan* (Paris: UNESCO, 2003).

[4] UNESCO, "Destruction of Cultural Heritage in Syria and Iraq Is Part of 'Cultural Cleansing,' Says UNESCO Director-General," *UNESCO*, 2015.

[5] International Criminal Court, *Judgment and Sentence, Prosecutor v. Ahmad Al Faqi Al Mahdi*, ICC-01/12-01/15-171, 27 September 2016; UNESCO, "Damaged Cultural Sites in Ukraine Verified by UNESCO," *UNESCO*, continuously updated monitoring dataset, https://www.unesco.org/en/articles/damaged-cultural-sites-ukraine-verified-unesco. The analytical dataset was frozen on 11 March 2026.

and institutions that create and use them. This implies that monumental and visually prominent sites often receive greater attention, while community-based or intangible forms of heritage risk being overlooked. In this way participatory initiatives attempt to address this asymmetry ensuring at the same time appropriate attention and visibility are given to heritage in ways that respect local identities and communities. These transformations intersect with the international legal frameworks. After the establishment of the rule to protect cultural property during armed conflict, by the 1954 Hague Convention, later laws strengthened this normative structure, such as the 1972 World Heritage Convention[6] which introduced the concept of Outstanding Universal Value[7] and recognized certain cultural and natural sites as part of the shared heritage of humanity. The United Nations Security Council Resolution 2347[8] formally recognized heritage destruction as a matter of international peace and security. In this context, the conviction of Ahmad al-Faqi al-Mahdi[9] before the International Criminal Court[10] marked a

[6] The 1972 World Heritage Convention is used here as an institutional framework through which selected cultural and natural properties become objects of international recognition, monitoring and reporting. Its relevance to this study also lies in the tension between the category of Outstanding Universal Value and the historically situated meanings attributed to heritage by local communities. UNESCO, *Convention Concerning the Protection of the World Cultural and Natural Heritage*, adopted at Paris, 16 November 1972, arts. 1–2, 4 and 11.

[7] The concept of Outstanding Universal Value (OUV) denotes the exceptional cultural and/or natural importance of a site that transcends national borders and is considered significant for all humanity, both now and in the future.

[8] Security Council Resolution 2347 is relevant to this research because it connects the deliberate destruction and illicit trafficking of cultural property with questions of international peace and security. The resolution strengthens the normative recognition of cultural heritage protection, although its implementation continues to depend on states, international organisations and existing enforcement mechanisms. United Nations Security Council, Resolution 2347 (2017), S/RES/2347, 24 March 2017, paras. 1–4 and 15–17.

[9] Ahmad al-Faqi al-Mahdi was affiliated with an Islamist armed group connected to Ansar Dine ("Defenders of the Faith") during the 2012 conflict in northern Mali. He played a leading role in organizing and carrying out the destruction of culturally significant sites in Timbuktu, including mausoleums and a historic mosque door that held deep religious and cultural meaning.

[10] The International Criminal Court is relevant here not simply as a permanent criminal tribunal, but as an institution through which intentional attacks against protected cultural and religious buildings may be

significant turning point, as it formally recognized the intentional destruction of cultural heritage as a prosecutable war crime[11]. However, despite legal and normative progresses, enforcement remains uneven, and mechanisms for accountability are still limited, often constrained by political, institutional, and practical challenges.

Despite the significant growth of research in heritage studies, Digital and Public Humanities, and international law, these fields often remain disconnected, because they tend to approach similar issues from different angles of views. Technical approaches, for instance, largely focus on the production and management of data, while participatory research prioritizes civic engagement and inclusion. At the same time, legal scholarship is primarily concerned with normative frameworks and interpretation. As a result, these perspectives often operate in parallel rather than in collaboration, leaving gaps in understanding how they intersect in practice. This thesis tries to fill the gap by comparing how digital technologies and participatory practices are used in Syria and Ukraine to monitor and protect heritage. Syria is an example of an expert-driven model that uses satellite monitoring and centralized databases, while Ukraine is a different context where remote sensing and widespread civic participation and grassroots documentation are combined. By looking at these two cases, this research explores also how technological infrastructures influence knowledge production, evidence and authority. This research wants to address and answer the following questions:

1. First, how do the workflows, technologies and data infrastructures of conflict-heritage documentation differ between Syria and Ukraine, and how do these differences shape the production and public traceability of digital evidence?
2. How do these differences affect what becomes visible and how cultural loss is understood?

prosecuted as war crimes when the jurisdictional requirements of the Rome Statute are met. *Rome Statute of the International Criminal Court*, adopted at Rome, 17 July 1998, 2187 UNTS 90, arts. 5 and 8(2)(b)(ix); International Criminal Court, *Judgment and Sentence, Prosecutor v. Ahmad Al Faqi Al Mahdi*, ICC-01/12-01/15-171, 27 September 2016.

[11] International Criminal Court, *Judgment and Sentence, Al Mahdi*, ICC-01/12-01/15-171.

3. Third, how are participation and documented decision-making authority distributed within these documentary infrastructures, and how do these arrangements shape representation, accountability and the future reuse of heritage data?

Informed by these questions the thesis aims to map the ecosystem of cultural heritage monitoring projects and data infrastructures, and at the same time, it seeks to identify patterns and potential biases in the data and to explore the role of local communities and diasporas in these processes. Methodologically, this study brings together perspectives from Digital Humanities, Public Humanities, heritage studies, data science and information visualization. It adopts a mixed-method approach, combining qualitative and quantitative analysis. On one hand, it develops a comparative and critical analysis of the two selected case studies, while on the other hand, it involves the collection and structuring of data, the creation of a dataset and the use of data analysis and graphs visualization to support and communicate the findings. As part of the research, a digital project is developed in the form of an interactive online platform, which integrates mapping tools, thematic sections and critical analyses.

1 CULTURAL HERITAGE IN ARMED CONFLICT: THEORETICAL FRAMEWORKS.

Heritage is not a fixed or neutral concept, it is the product of a long epistemological transformation shaped by political, social, legal, and technological developments. Over the years, both scholarship and international institutions have expanded the definition and boundaries of heritage beyond the narrow traditional focus on monuments and artistic production; to include intangible cultural practices, cultural landscapes, documentary archives, and digital infrastructures. This conceptual expansion reflects broader structural transformations such as the formation of modern states, nationalism, colonial expansion, international governance, human rights debates, and the rise of digital technologies. In this context UNESCO emphasizes that heritage has both tangible and intangible dimensions. Tangible heritage includes monuments, groups of buildings, and sites of historical, aesthetic, archaeological, scientific, ethnological, or anthropological value. On the other hand, intangible heritage includes cultural practices, expressions, knowledge, skills, and the objects, tools, or spaces associated with them, in sum everything that communities recognize as an essential part of their culture[12]. Similarly, the International Council on Monuments and Sites (ICOMOS) [13] emphasizes the role of heritage in society as "a witness to history and a source of collective memory," stressing both the preservation of physical sites and the social processes through which their significance is

[12] UNESCO, *Convention Concerning the Protection of the World Cultural and Natural Heritage*, adopted at Paris, 16 November 1972; UNESCO, *Convention for the Safeguarding of the Intangible Cultural Heritage*, adopted at Paris, 17 October 2003.

[13] In this study, open-source intelligence (OSINT) denotes a method of locating, preserving, verifying and analysing publicly available information rather than the mere collection of online content. Its evidentiary value therefore depends on provenance, authentication, corroboration and a documented chain of handling. Human Rights Center, University of California, Berkeley, and Office of the United Nations High Commissioner for Human Rights, *Berkeley Protocol on Digital Open Source Investigations: A Practical Guide on the Effective Use of Digital Open Source Information in Investigating Violations of International Criminal, Human Rights and Humanitarian Law* (New York and Geneva: United Nations, 2022), 31–49.

maintained[14]. In contemporary academic literature, heritage is no longer seen as a passive inherence form the past, instead it is increasingly understood as something that is actively created in the present. Lowenthal[15] have shown that heritage differs fundamentally from history, as it is less concerned with reconstructing the past as it was, and more focused on responding to present-day needs and concerns, particularly those linked to identity. According to this view, heritage takes shape through the interaction between different social actors and the power dynamics that influence how the past is recognized, valued, and managed. In this sense, heritage is now conceptualized as an active, socially situated, and politically mediated process, through which societies construct stories about who they are, why they stand for, and what form of legitimacy and authority they wish to preserve in the present. Looking at heritage in this way helps explain not only how the concept has changed over time, but also why it remains open to debate and constant redefinition. It also helps us understand why heritage becomes so deeply involved in moments of crisis and conflict, when these meanings, identities, and power relations are challenged or deliberately targeted.

Armed conflict has never been confined solely to military confrontation or the struggle for territorial control, war also unfolds in the realms of meaning, memory, and identity. Alongside the devastating and terrible human losses and the destruction of infrastructure, conflicts often target the symbolic and cultural foundations that hold societies together. Attacks on cultural heritage do not affect just one layer of society, they tend to have consequences that unfold in different, interconnected ways. At the most immediate level, there is the material damage, with monuments, sites and artefacts being physically destroyed. But the impact goes beyond the visible and these acts also carry a strong symbolic weight, as they erase identity markers and diminish the cultural presence of affected communities. There are legal implications as well, since the loss of heritage can mean the disappearance of documents and evidence that support historical claims and ownership or rights. Finally, there is a deeper, less visible impact: when heritage is

[14] ICOMOS, *Québec Declaration on the Preservation of the Spirit of Place*, adopted at Québec, 4 October 2008.

[15] David Lowenthal, *The Heritage Crusade and the Spoils of History* (Cambridge: Cambridge University Press, 1998).

damaged or erased, the very systems through which knowledge, memory and history are produced and passed on are also disrupted[16]. For these reasons, the destruction of cultural heritage can be understood as a deliberate strategy of war, often described as "cultural cleansing." At the same time, this concept requires careful consideration, because not all the erasure of cultural heritage follows a clear or coherent ideological plan. In many situations, destruction emerges from a combination of factors, such as military strategy, economic interests, and the disorder that characterizes urban warfare. As a matter of fact, scholars have highlighted that one of the causes behind the destruction and looting of cultural heritage is not only the consolidation of territorial control but also the pursuit of financial gain[17]. These dynamics often go hand in hand with violence against communities and erasing visible signs of coexistence, they make the landscape appear historically uniform, as if only one group had ever belonged there, thereby reinforcing and legitimizing that violence. As Dario Gamboni[18] shows in his study of iconoclasm[19], the destruction of images and monuments often happens in moments of political rupture, when old orders are being challenged and new ones are being asserted. As monuments, landscapes and cultural sites embedded with shared memories and collective identities, heritage cannot be understood as neutral or universally shared. This multiplicity of meanings and inherent tension is captured by the concept of "dissonant heritage", which highlights how different groups engage with heritage in diverse and often conflicting

[16] Marie Louise Stig Sørensen and Dacia Viejo-Rose, eds., *War and Cultural Heritage: Biographies of Place* (Cambridge: Cambridge University Press, 2015); Żaneta Gwardzińska-Chowaniec, "The Role of Open-Source Intelligence in Protecting Cultural Heritage during Armed Conflict: The Case of Ukraine," *Santander Art and Culture Law Review* 11, no. 2 (2025): 223–244

[17] Michael D. Danti, Scott Branting, and Susan Penacho, "The American Schools of Oriental Research Cultural Heritage Initiatives: Monitoring Cultural Heritage in Syria and Northern Iraq by Geospatial Imagery," *Geosciences* 7, no. 4 (2017): article 95, 1–21

[18] Dario Gamboni, *The Destruction of Art: Iconoclasm and Vandalism since the French Revolution* (London: Reaktion Books, 1997).

[19] The term "iconoclasm" refers to the deliberate destruction or removal of images, monuments, or symbols, often in moments of political, religious, or social upheaval, where such acts serve to reject previous systems of meaning and assert new ideological orders. See Gamboni, *Destruction of Art*.

ways. As Tunbridge and Ashworth[20] argue, heritage reflects competing narratives, power relations, and selective representations of the past, emphasizing its contested and political character, as the same site, object, or memory may be understood differently by different groups. In this sense, when it is destroyed on purpose, we can talk about "*memoricide*" such as the deliberate destruction of cultural heritage as a means of erasing collective memory and identity[21]. Laurajane Smith expands this perspective through her concept of the "Authorized Heritage Discourse" (AHD), arguing that dominant heritage frameworks tend to privilege monuments, material remains, expert authority, and conservation traditions rooted largely in Western perspectives. [22] Although these approaches are often presented as universal, they reflect particular cultural assumptions and institutional power structures. As a result, alternative ways of remembering and valuing the past, especially those rooted in local knowledge, community memory, or intangible practices, may be marginalized or overlooked. At the same time, heritage destruction also has a clear juridical dimension: archives, cadastral records, and property registries are not just administrative tools; instead, they provide the evidence on which legal rights are built. When they are lost or destroyed, property claims, citizenship status, and systems of accountability can be seriously undermined. As Sørensen and Viejo Rose[23] emphasize, cultural heritage often plays an important role in processes of transitional justice, and when records are deliberately destroyed, it can undermine the evidence needed to seek justice and responsibility. In contexts of displacement or contested sovereignty, this loss becomes even more critical, as it can influence future disputes over land, ownership, and restitution. Taken together, these dynamics show that the destruction of cultural heritage operates on several levels. It reshapes physical environments, alters symbolic landscapes, disrupts the ways memory is preserved and transmitted, and undermine the legal evidence communities rely on. For this reason, it should not be seen simply as an attack on the past,

[20] J. E. Tunbridge and G. J. Ashworth, *Dissonant Heritage: The Management of the Past as a Resource in Conflict* (Chichester: Wiley, 1996).

[21] Robert Bevan, *The Destruction of Memory: Architecture at War*, 2nd expanded ed. (London: Reaktion Books, 2016).

[22] Laurajane Smith, *Uses of Heritage* (London: Routledge, 2006).

[23] Sørensen and Viejo-Rose, *War and Cultural Heritage* (Cambridge University Press, 2015).

but also as an attempt to influence how the future is understood and shaped, both politically and historically.

1.1 Contemporary Iconoclasm in the Global Visual Regime

Although iconoclasm has accompanied political and religious crises for centuries, its contemporary form cannot be understood without considering the global media environments through which these acts of destruction circulate. Today destruction does not remain local or unseen, but it is recorded, shared and amplified across digital platforms where it acquires new layers of meaning. In recent conflicts, extremist organizations such as ISIS have deliberately used the destruction of cultural heritage as a form of ideological communication aimed at global audiences[24]. More recent studies have pushed this argument further by situating heritage destruction within global media and digital infrastructures, where acts of violence are documented, circulated, and instrumentalized as part of broader strategies of visibility and power. In this sense, destruction becomes not only a material act but also a communicative one. The demolition of temples in Palmyra, for example, was not just about erasing physical structures, but it was carefully staged event designed to be filmed, edited, and disseminated online. In this sense, the destruction was not just in the act itself but achieved its full impact once the images began to circulate globally. In this context, digital platforms started to play a more central role in constructing meaning, political narratives and public understanding. They intensify this dynamic by allowing videos of smashed statues or detonated monuments to circulate worldwide within minutes, transforming localized acts of violence into globally consumed spectacles. As a result, what is seen, circulated, and amplified often becomes as important as the events themselves. Such images of violence circulating online can serve multiple, overlapping purposes, for example, they may be used to promote forms of ideological "purification," function as propaganda to attract and radicalize supporters,

[24] Lynn Meskell, *A Future in Ruins: UNESCO, World Heritage, and the Dream of Peace* (New York: Oxford University Press, 2018).

and challenge the authority of international institutions as well as the legal frameworks established by international humanitarian law. At the same time, this interpretation needs to be treated with some caution because, while the spectacular destruction of heritage clearly has a communicative dimension, it risks sometimes to be overinterpreted as a part of fully coherent strategy. In many cases, other factors such as opportunistic violence, economic incentives, or the desire for media attention, can be just as important as ideological intent. Moreover, the way images of destruction circulate online creates a kind of paradox: in one hand, documenting and sharing this events has a useful impact because it ensures in this way accountability, evidence and creates a historical record; while on the other hand, it can unintentionally amplify the very images that perpetrators want the world to see. For this reason, protecting heritage is no longer just about safeguarding physical sites or intangible knowledge, but it is also about dealing with the risks that come from how images and information circulate globally.

1.1.1 Heritage and Post-Conflict Reconstruction

What happens after cultural heritage is destroyed raises difficult ethical and political questions that go well beyond the technical challenge of rebuilding what has been lost. One of the key issues is whether reconstruction should be understood mainly as restoring physical structures, or as part of a wider process of repairing the social structure. In many post-conflict contexts, rebuilt monuments are expected to stand as symbols of recovery and reconciliation. The absence that follows these violent acts is never neutral, and ruins may become places of mourning, but they can also serve as lasting reminders of violence or even as tools of intimidation, shaping how communities relate to both their past and their present. The reconstruction of the Stari Most[25] in Mostar, for example, was widely

[25] The Stari Most (Old Bridge) in Mostar, originally built in the 16th century during the Ottoman period, was destroyed in 1993 during the Bosnian War and subsequently reconstructed in 2004. It is widely regarded as a symbol of post-conflict reconciliation and was inscribed on the UNESCO World Heritage List in 2005.

presented as a powerful symbol of renewed coexistence after the Bosnian War. However, rebuilding does not automatically heal deeper divisions and scars caused by violence, physical reconstruction can take place even while ethical divisions, tensions and unresolved disputes continue.

Figure 1. – The Stari Most in Mostar after its destruction in November 1993 (above; photo source: Radio Srebrenik) **and following its reconstruction, completed in 2004** (below; photo by Mhare, Wikimedia Commons, CC BY-SA 2.5). The comparison documents the material loss of the Ottoman bridge and its subsequent reconstruction as a symbol of post-conflict recovery.

More recent research has reinforced this view, showing that reconstruction processes can sometimes reproduce existing inequalities or exclude local communities from decision-making, raising further questions about whose heritage is being rebuilt and for whom.[26] This also raises a crucial question about who decides how reconstruction happens. When rebuilding is driven mainly by international organizations, national governments, or technical experts, without meaningful participation from local communities, it can

[26] Emad Noaime and Mohammed Mashary Alnaim, "Heritage and Resilience: Sustainable Recovery of Historic Syrian Cities," *Buildings* 15, no. 14 (2025): article 2403, https://doi.org/10.3390/buildings15142403.

reproduce the same power imbalances that often characterize heritage governance more broadly. In this sense, post-conflict reconstruction is not only about conserving buildings, but it also involves dealing with trauma, displacement, and competing ways of understanding the past. Depending on how these processes unfold, reconstruction can either open up space for dialogue and shared remembrance or reinforce existing divisions. For these reasons, cultural heritage in conflict should not be seen simply as a passive victim of violence, it is also a site of ongoing political struggle over identity, sovereignty, and historical legitimacy. Debates about reconstruction also raise challenging questions about authenticity such as: should destroyed monuments be faithfully rebuilt, or should their absence remain as a visible reminder of violence? The reconstruction of Warsaw's Old Town after the Second World War is often used to show how ideas of authenticity can change over time. Even though much of the area was rebuilt, it comes to represent something more than its material form, it becomes a powerful symbol of resilience and national identity.

A different kind of dilemma can be seen in the ongoing debate over whether to reconstruct the Bamiyan Buddas. Here, the question is not just about rebuilding, but about memory: would reconstruction risk erasing the trace of destruction, or does leaving the empty niches preserve a more powerful reminder of loss and trauma? A prominent example of a ruin deliberately conserved as a site of memory is the Hiroshima Peace Memorial, commonly known as the Genbaku Dome. Originally the Hiroshima Prefectural Industrial Promotion Hall, the building was one of the few structures to remain standing near the hypocentre of the atomic bombing of 6 August 1945. Rather than being reconstructed or allowed to disappear, its damaged fabric was stabilized through minimal interventions intended to retain its post-explosion condition. The Dome therefore functions not simply as an architectural remnant, but as material evidence of nuclear destruction and as a spatial focus for commemoration, peace education and anti-nuclear discourse. Its inclusion on the World Heritage List in 1996 under criterion (vi) formally recognized this predominantly symbolic significance: its heritage value derives less from its original architectural function than from its association with a traumatic historical

event and its subsequent transformation into an international symbol of peace.[27] Recent discussions have increasingly approached this issue through the lens of memory, absence, and the ethics of reconstruction. Together, these perspectives highlight that authenticity is not a fixed or objective quality, but something that evolves over time. As Alois Rieglalready observed, what societies value in heritage shifts in relation to changing historical contexts and social and political priorities. From this perspective, reconstruction cannot be understood as a purely technical or neutral activity, it is inherently political. [28] Decisions about whether to rebuild, what to restore, and how to do so shape how societies remember past violence and how they imagine their future. These choices can reinforce narratives, privilege certain histories over others, and determine whose experiences are recognized or overlooked. Reconstruction, therefore, is not simply about repairing physical damage, but about renegotiating meaning, identity, and collective memory in the aftermath of conflict.

Figure 2. – The Buddha of Bamiyan before its destruction, photographed during restoration in 1976, and the empty niche in 2005. The comparison makes visible the ethical dilemma between reconstructing the lost monument and preserving absence as evidence of destruction. Left photograph by Marek Bero; right photograph by Sqamarabbas; composite edited by BevinKacon. CC BY-SA 3.0 PL, via Wikimedia Commons.

[27] Ignacio Brescó de Luna, Yuanhang Li, and Brady Wagoner, "Between War and Peace, Past and Future: Experiencing the Hiroshima Peace Memorial Park," *Integrative Psychological and Behavioral Science* 57 (2023): 1002–1023, https://doi.org/10.1007/s12124-022-09723-2.

[28] Alois Riegl, *Der moderne Denkmalkultus: Sein Wesen und seine Entstehung* (Vienna: W. Braumüller, 1903).

1.2 Digital Humanities for Cultural Heritage in Conflict

Digital Humanities have not only introduced new technological tools into heritage management, but have also reshaped how heritage is understood, documented, and governed, especially in contexts of armed conflict. In war zones, digital technologies serve multiple purposes at once: they help preserve information, document damage, and make destruction visible to global audiences. As a result, heritage is no longer recorded only through written reports or photographs, but increasingly through structured digital data. Monuments become datasets, ruins are mapped as coordinates, and acts of violence are stored as metadata within digital archives. This shift has important consequences since digital records move through systems of classification and verification that shape what counts as evidence and how events are interpreted in legal, political, and public contexts. In this sense, digital technologies do not simply document destruction, they influence also how it is understood and remembered[29]. Within this broader transformation, several technologies play distinct roles in documenting and interpreting cultural destruction:

- **Three-dimensional laser scanning**, commonly known as LiDAR (Light Detection and Ranging), records monuments by capturing millions of spatial measurements, producing dense point-cloud models capable of preserving architectural detail even when the physical structure is damaged or destroyed. It has become a key method in archaeology, architectural documentation, and conservation, particularly in conflict contexts where precise digital recording may represent the only lasting form of preservation. The technology operates by emitting laser pulses toward a surface and measuring the time it takes for each pulse to return to the sensor, allowing distances to be calculated with a high degree of accuracy. Repeated at very high frequencies, this process generates a detailed field of spatial coordinates that reconstructs the geometry, scale, and surface characteristics of a structure. At the same time, laser scanning does more than document heritage, it transforms it by converting material environments into

[29] Giuseppe Neglia, Marialuce Angrisano, Ilaria Mecca, Fabio Fabbrocino, and Cettina Santagati, "Cultural Heritage at Risk in World Conflicts: Digital Tools' Contribution to Its Preservation," *Heritage* 7, no. 11 (2024): 6343–6365, https://doi.org/10.3390/heritage7110297.

computable spatial data, enabling storage, analysis, and reuse across different digital systems. However, this process is not neutral. As Neglia note, 3D digitization involves selective capture and interpretation, reducing lived spaces to measurable geometries. In this translation, lived architectural spaces are reduced to measurable geometries, privileging quantifiable structure over the social, sensory, and intangible dimensions of heritage. [30]

- **Photogrammetry** reconstructs three-dimensional models from overlapping photographs by identifying shared visual features across multiple images and using them to calculate spatial relationships. In practice, this often involves assembling photographs taken from different viewpoints into coherent 3D representations of heritage sites. Because it relies on widely available devices such as smartphones rather than specialized equipment, photogrammetry offers a flexible and relatively low-cost way to document heritage, especially in crisis situations where access is limited and rapid recording is essential. At the same time, the models it produces are shaped by the images available: what has been photographed, from which perspectives, and under what conditions. As a result, these reconstructions reflect not only the physical structure of a site but also patterns of visibility and participation, embedding interpretive choices and uneven coverage into the digital record.
- **Geographic Information Systems (GIS)** allow researchers to map, visualize, and analyze patterns of heritage destruction by connecting location data with information about damage and site conditions. By bringing together coordinates, reports, images, and sometimes time-based data, GIS turns scattered observations into structured spatial evidence that can support monitoring, reporting, and reconstruction planning. This makes it easier to see patterns that might otherwise go unnoticed, such as concentrations of looting, the spread of damage across a region, or how close heritage sites are to areas of military activity. GIS also makes it possible to combine multiple layers of information, such as environmental conditions, land use, and demographic data, allowing heritage destruction to be

[30] Neglia et al., "Cultural Heritage at Risk," 6343–6365.

understood within broader territorial and social contexts. Rather than simply locating damage, it helps reveal patterns and relationships that can explain how and why destruction occurs. At the same time, these systems depend on predefined categories and classifications, for instance, how damage is defined or how sites are recorded, which shape the way information is structured and interpreted. As a result, while GIS makes complex situations more visible and usable, it also reduces them to standardized forms, influencing how heritage loss is framed, assessed, and prioritized.

- **Satellite monitoring and remote sensing** allow analysts to identify damage to heritage sites, such as looting, fire, structural collapse, or nearby military activity, through the analysis of high-resolution imagery. These technologies are especially valuable in situations where sites cannot be accessed safely, as they make it possible to monitor change over time from distance. At the same time, this perspective is necessarily limited because it tends to emphasize forms of destruction that are clearly visible from above, while less visible or non-material losses, such as the disruption of cultural practices or the displacement of communities, that are much harder to detect. As a result, remote sensing helps make certain types of damage more visible and measurable, but it can also leave out important aspects of heritage loss, shaping how destruction is recognized and interpreted.
- **Artificial intelligence and machine learning** are increasingly used to analyse large amounts of satellite imagery and photographic data, helping researchers quickly identify patterns such as structural damage, looting, or changes in site conditions. By automating tasks that would otherwise take significant time and effort, these systems make it possible to document heritage destruction at a much larger scale, which is especially important in conflict situations where access is limited and information is needed quickly. At the same time, these tools depend on how they are designed and trained. They tend to focus on what can be clearly detected and measured in images, which means that more complex or less visible aspects of heritage loss are often left out. As recent research has shown, AI-based

approaches can simplify complex realities and reflect the assumptions embedded in their training data.

Technology	Captures (Strengths)	Overlooks (Limitations)	Epistemological effect
LiDAR scanning	High-resolution geometry; structural detail	Intangible cultural meanings; sensory qualities	Emphasises quantification and materiality
Photogrammetry	Surface textures and colours	Areas not photographed; contextual relationships	Reflects visibility bias and selective representation
GIS mapping	Spatial relationships and distribution patterns	Lived experience and narrative context	Enforces categorical frameworks and spatial abstraction
Satellite remote sensing	Macroscopic damage and landscape changes	Social and cultural losses not visible from above	Privileges visually evident destruction
AI/ML analytics	Large-scale pattern detection across datasets	Contextual complexity and ambiguity	Simplifies heritage dynamics through training-data biases

Table 1. – Comparative overview of digital technologies used in cultural heritage documentation, highlighting their analytical capacities, limitations, and epistemological implications in conflict contexts.

Together, these technologies show that digital tools do more than simply record destruction, they play an active role in shaping how it is seen, measured, and understood. They tend to prioritize what can be measured and seen, such as structural damage, while less visible forms of loss, including displacement or the disruption of cultural practices, are often overlooked. As a result, digital documentation shapes not only what is recorded, but also what is recognized as heritage loss. This becomes particularly evident in open-source intelligence (OSINT) [31], which uses publicly available images, videos, and social

[31] Open-Source Intelligence (OSINT) refers to the collection and analysis of information derived from publicly available sources, including digital media, satellite imagery, and online platforms, for investigative and analytical purposes.

media content to document destruction. These methods expand the range of actors involved in producing evidence and are especially valuable where access on the ground is limited. However, they also depend on digital platforms and algorithms, which influence what is visible and what is preserved over time. In this way, the production of evidence is shaped by broader technological infrastructures and patterns of visibility[32]. Similar tensions appear in the use of digital twins and virtual reconstructions. These models can preserve detailed information about heritage sites and are often presented as a safeguard for the future. Yet they are not neutral copies. Every reconstruction involves decisions about what data to include, how to interpret missing elements, and how to represent meaning. What appears as a complete model is therefore always shaped by available data, technical choices, and institutional priorities[33]. These developments also raise important questions about authenticity. Traditional conservation approaches emphasize the importance of original material fabric, but digital reconstruction challenges this by privileging informational continuity. While digital models can reproduce form, they cannot fully capture the social and cultural dimensions through which heritage gains meaning[34]. Recent scholarships highlighted also attention to questions of data governance and inequality. Access to digital tools is uneven, and these shapes whose heritage is documented and how it is represented. In many cases, global audiences can emerge with digital reconstructions more easily than the communities directly affected by conflict and destruction. This rise concerns about digital colonialism [35] and the asymmetric

[32] Ż. Gwardzińska-Chowaniec, "The Role of Open-Source Intelligence in Protecting Cultural Heritage During Armed Conflict: The Case of Ukraine," Santander Art and Culture Law Review, 2/2025(11), 2025, pp. 223-244.

[33] Stuart Jeffrey, "Challenging Heritage Visualisation: Beauty, Aura and Democratisation," *Open Archaeology* 1, no. 1 (2015): 144–152, https://doi.org/10.1515/opar-2015-0008.

[34] UNESCO, *Convention for the Safeguarding of the Intangible Cultural Heritage*, 17 October 2003.

[35] The expression "digital colonialism" is used here as an analytical category for examining how digital infrastructures may reproduce asymmetries in the ownership, classification and circulation of data. Applied to heritage, the concept directs attention to who controls the documentary record, whose categories structure it and whether affected communities can determine how their cultural data are represented and reused. Nick Couldry and Ulises A. Mejias, *The Costs of Connection: How Data Is Colonizing Human Life and Appropriating It for Capitalism* (Stanford, CA: Stanford University Press, 2019); Monika Stobiecka,

concentration of cultural data within global infrastructures[36]. For these reasons, digital technologies should not be understood as neutral tools because they are part of wider systems of power, knowledge and representation. Protecting heritage today means safeguarding both physical sites and the digital systems through which cultural memory is produced and contested.

1.3 Public Humanities and Cultural Heritage in Conflict

Public Humanities expand the field of cultural heritage beyond the boundaries of expert institutions, bringing it into civic and participatory spaces where people actively engage with it. In situations of armed conflict, this shift becomes particularly visible. Heritage is no longer managed only by specialists, it becomes a way for people to make sense of destruction, to express grief and to respond to what is happening around them. If Digital Humanities tend to translate destruction into data, Public Humanities help turn it into meaning. Cultural loss in wartime is rarely silent, people speak about it, share it, and interpret it in different ways. Public Humanities are moving away from traditional models of academic outreach toward more collaborative forms of knowledge-making and policy engagement. Authority is no longer concentrated in a small number of institutions but is increasingly distributed across a wider range of actors. This perspective aligns with broader approaches that emphasize participatory cultural practices as a way of giving interpretive power to communities historically excluded from heritage discourse. Practices such as citizen documentation, oral histories, community archives, crowdsourcing, and digital storytelling make heritage something that is discussed and negotiated in public. Questions of identity, ownership, and memory are no longer confined to institutions but are shaped through participation. Knowledge about heritage is now produced by a mix of actors, including scholars, institutions, local communities,

"Archaeological Heritage in the Age of Digital Colonialism," *Archaeological Dialogues* 27, no. 2 (2020): 113–125, https://doi.org/10.1017/S1380203820000239.

[36] N. Couldry and U. A. Mejias, The Costs of Connection: How Data Is Colonizing Human Life and Appropriating It for Capitalism, Stanford University Press, 2019.

diasporas, and volunteers. This challenges the idea that expertise belongs only to professionals and highlights how knowledge is always situated and collectively constructed. These dynamics are particularly important in conflict settings, where access to sites is often restricted and institutions may be damaged or displaced. At the same time, participatory knowledge production raises important questions about reliability and authority. Initiatives in the GLAM (galleries, libraries, archives, and museums) sector show how crowdsourcing can support tasks such as transcription or tagging while involving the public more directly. However, this also raises issues of verification: how reliable is the information, who validates it, and what counts as legitimate knowledge? Prats López addresses these questions through the concept of "citizen humanities,"[37] highlighting both the opportunities created by digital participation and the challenges related to governance, quality control, and inclusion. These concerns become even more critical in wartime contexts, when documentation is distributed across many actors, systems of verification and accountability become essential. The Berkeley Protocol on Open-Source Investigations outlines procedures such as metadata preservation, contextualization, verification, and chain of custody to ensure that digital material can function as reliable evidence.[38] Although developed for human rights investigations,

[37] "Citizen humanities" is used here to describe forms of humanities research in which members of the public contribute to activities such as transcription, documentation, classification or interpretation. Participation, however, may occur at different levels and does not in itself imply shared authority over research questions, validation or the reuse of results. Montserrat Prats López et al., "Understanding Patterns of Engagement in the Citizen Humanities: The Civil Records of Suriname," *Historical Methods: A Journal of Quantitative and Interdisciplinary History* 58, no. 1 (2025): 1–16, https://doi.org/10.1080/01615440.2024.2414925.

[38] The *Berkeley Protocol* provides a methodological framework for the identification, collection, preservation, verification and analysis of digital open-source information. In this thesis, it is used as a benchmark for evidentiary reliability and transparency, especially where digital records may later support legal or human-rights investigations. Human Rights Center, University of California, Berkeley, and Office of the United Nations High Commissioner for Human Rights, *Berkeley Protocol on Digital Open Source Investigations: A Practical Guide on the Effective Use of Digital Open Source Information in Investigating Violations of International Criminal, Human Rights and Humanitarian Law* (New York and Geneva: United Nations, 2022), 31–65.

these standards are increasingly relevant for heritage documentation, where citizen-generated content may later serve as historical records or legal proof. At the same time, participation is not neutral, since it is shaped by technological infrastructures, algorithms, and unequal access to digital tools. This is particularly evident in open-source intelligence practices, where images and videos shared online are used to document destruction. While these methods can increase visibility and support accountability, they also depend on infrastructures that are unevenly distributed. Gwardzińska-Chowaniec describes this as a form of "participatory warfare,"[39] in which citizens become active contributors to the circulation of narratives during conflicts such as the Russia–Ukraine war.[40] Cultural heritage, given its symbolic importance, often becomes a focal point of this process. However, visibility carries risks. Sharing images or geolocated data can expose sites to looting or retaliation, and documenting destruction may place contributors under surveillance or psychological strain. Ethical documentation therefore requires careful risk assessment and protective measures that acknowledge both the empowering and potentially harmful dimensions of participation.

Public Humanities also play a crucial role in shaping how loss is remembered. When physical heritage is destroyed, memory does not disappear but shifts into other forms. Oral histories, for example, allow people to preserve meanings, experiences, and relationships to places that may no longer exist. Yet memory is never neutral, it is shaped by emotion, trauma, and perspective, for this reason, working with testimonies requires particular care. Ethical practices must prioritize informed consent, psychological sensitivity, and respect for the dignity of those involved. As Dominick LaCapra note, processes of narration can either reopen wounds ("acting out") or contribute to healing ("working through"), reminding us that testimony should not be treated as spectacle but

[39] The term "participatory warfare" refers to the involvement of civilians in documenting and disseminating information about conflict through digital platforms, including open-source intelligence practices, which contribute to shaping public narratives and evidentiary processes.

[40] Gwardzińska-Chowaniec, "The Role of Open-Source Intelligence in Protecting Cultural Heritage During Armed Conflict: The Case of Ukraine," Santander Art and Culture Law Review, 2/2025(11), 2025, pp. 223-244.

as a form of meaningful remembrance.[41] Community archives provide another important example of participatory heritage practices. By collecting and preserving materials such as photographs, documents, and personal stories, communities can document experiences that are often excluded from official records, especially in conflict situations. These initiatives capture everyday life and minority perspectives, but they also face practical challenges, including limited resources and unstable technological infrastructures. As Castells[42] argues, decentralized digital networks redistribute communicative power, yet this democratization remains ambivalent. Documentation can expose individuals to surveillance or repression, particularly in authoritarian or occupied contexts. Moreover, grassroots material often lacks standardized metadata or verification, limiting its immediate use in formal archives or legal processes. Transforming such material into credible evidence therefore requires technical systems such as secure timestamping or blockchain-based registration. In conflict settings, heritage itself often becomes more explicitly political. Ruins and damaged sites can take on new meanings as symbols of loss, resilience, or identity, while different groups may interpret these meanings in conflicting ways. While Public Humanities can create spaces for dialogue, they are also shaped by broader political agendas. Questions of voice and authority remain central: who speaks for heritage, and whose narratives become dominant? Pierre Nora's concept of lieux de mémoire[43] (sites of memory) becomes particularly relevant here, as absence itself turns into a powerful site of memory[44]. Digital storytelling platforms extend these dynamics by enabling both local and diasporic communities to participate in memory-making across distance. Social media campaigns, interactive maps, and virtual reconstructions allow global audiences to engage with local heritage narratives. At the

[41] Dominick LaCapra, *Writing History, Writing Trauma* (Baltimore: Johns Hopkins University Press, 2001).

[42] Manuel Castells, *The Rise of the Network Society*, 2nd ed. (Chichester: Wiley-Blackwell, 2010).

[43] Lieux de mémoire ("sites of memory") is a concept developed by Pierre Nora to describe places, objects, or practices where collective memory is crystallized and preserved, particularly in contexts where lived memory is no longer continuously transmitted.

[44] Pierre Nora, "Between Memory and History: Les Lieux de Mémoire," *Representations*, no. 26 (1989): 7–24.

same time, these forms of engagement are not politically neutral. Heritage narratives can be mobilized to support exclusionary or nationalist agendas, and viral imagery often privileges emotionally powerful but simplified representations that obscure complex historical contexts. As Mirzoeff[45] notes, repeated exposure to images of violence can normalize suffering and desensitize audiences. Ethical public history must therefore prioritize contextualization, careful storytelling, and respect for dignity. Researchers, curators, and technologists must remain aware of how their own positions shape the narratives they produce. For this reason, ethical practice requires informed consent, the right to withdraw, and access to psychological support when dealing with traumatic material. It also requires attention not only to content but to the infrastructures through which knowledge is produced and circulated. Concrete examples highlight both the potential and the limitations of these approaches. CyArk's[46] global 3D scanning initiatives demonstrate the possibilities of digital preservation while raising questions about data sovereignty when digital replicas are stored their communities of origin. The Rekrei project[47] shows how distributed networks can reconstruct destroyed artifacts through crowdsourced images, although its sustainability depends on continued public engagement. UNESCO's participatory monitoring in Ukraine illustrates collaboration between institutions and the public, combining satellite data with local reporting, yet tensions remain between international frameworks and local priorities. Similarly, the evacuation of Timbuktu's manuscripts in 2012 demonstrates the crucial role of local

[45] Nicholas Mirzoeff, *The Right to Look: A Counterhistory of Visuality* (Durham, NC: Duke University Press, 2011).

[46] CyArk is considered here as an example of institutionally organised digital documentation based on technologies such as terrestrial laser scanning and photogrammetry. Its relevance lies in the production and stewardship of reusable spatial records of heritage places, not in the assumption that a digital surrogate can replace the material site. CyArk, "About CyArk," https://www.cyark.org/about.

[47] Rekrei, formerly Project Mosul, is relevant to this study as a crowdsourced reconstruction initiative in which photographs supplied by the public are transformed into digital models of damaged or destroyed heritage. The project illustrates both the documentary potential of distributed participation and its dependence on uneven photographic coverage, metadata quality and platform-based selection. Rekrei, "Rekrei," project website, https://rekrei.org/.

actors, as Malian librarians safeguarded thousands of manuscripts before their later digitization. Taken together, these examples show that technology is most effective when it supports, rather than replaces, local agency. Public Humanities reveal both the possibilities and the limits of participation: they can foster inclusion, resilience, and shared knowledge, but they are also shaped by broader systems of power, technology, and access. Heritage in conflict is not simply lost or preserved; it is continuously redefined through the ways people engage with it, interpret it, and remember it.

1.4 From Territorial Materiality to Informational Heritage: Legal Evolution and Normative Gaps

The legal protection of cultural heritage in armed conflict largely took shape after the Second World War, and it reflects a very specific way of thinking about heritage, as something material, visible, and tied to place. Early legal frameworks were built around this idea, for example, Article 56 of the 1907 Hague Regulations[48] prohibited the destruction or seizure of institutions linked to religion, education, the arts, and historic monuments[49]. A few decades later, the 1935 Roerich Pact[50] reinforced this approach by introducing the idea that cultural sites should be respected and treated as neutral during

[48] The 1907 Hague Regulations form the annex to Hague Convention IV and are relevant here because Article 56 prohibits seizure, destruction, or wilful damage directed against institutions dedicated to religion, charity, education, the arts and sciences, and historic monuments. *Convention (IV) Respecting the Laws and Customs of War on Land and Its Annex: Regulations Concerning the Laws and Customs of War on Land*, adopted at The Hague, 18 October 1907, art. 56.

[49] International Committee of the Red Cross, *Convention (IV) Respecting the Laws and Customs of War on Land and Its Annex: Regulations Concerning the Laws and Customs of War on Land*, The Hague, 18 October 1907, art. 56.

[50] The Roerich Pact is relevant as an early regional treaty that treated historic monuments, museums, and scientific, artistic, educational, and cultural institutions as neutral property requiring protection in peace and war. *Treaty on the Protection of Artistic and Scientific Institutions and Historic Monuments (Roerich Pact)*, adopted at Washington, DC, 15 April 1935, arts. 1–2.

war [51] . After the devastation of the Second World War, this logic was further institutionalized. The creation of UNESCO[52] in 1945 marked an important step, reflecting a growing awareness that culture plays a central role in peacebuilding. Shortly after, the 1954 Hague Convention for the Protection of Cultural Property in the Event of Armed Conflict established the first comprehensive legal framework dedicated specifically to heritage. It defined cultural property broadly, including monuments, artworks, manuscripts, books, and cultural institutions, and introduced two key obligations: safeguarding heritage in peacetime and respecting it during conflict. Despite this broader scope, the underlying assumption remained the same: damage to heritage was understood as physical and visible. This materially grounded perspective was further consolidated within international humanitarian law with the adoption of the two Additional Protocols to the Geneva Conventions in 1977, which explicitly prohibit acts of hostility against historic monuments and places of worship, as well as their use for military purposes. The protocols reinforced the Hague Convention's principles while eliminating the possibility of derogation on grounds of military necessity. Meanwhile, the 1972 World Heritage Convention marked an important shift by introducing the idea of "Outstanding Universal Value" that recognized that certain monuments, buildings, and sites are not just important at a national level but belong to the shared heritage of humanity. States were given the main responsibility to identify and protect these sites within their own territories. Still, the focus was very much on physical places[53]. Moving into the early twenty-first century, the understanding of heritage expanded even further. With the 2003 Convention for the

[51] International Committee of the Red Cross, *Treaty on the Protection of Artistic and Scientific Institutions and Historic Monuments (Roerich Pact),* Washington, DC, 15 April 1935, arts. 1-2.

[52] UNESCO is relevant to this thesis not only as the United Nations specialised agency responsible for international cooperation in education, science and culture, but as a central actor in the production of conventions, monitoring procedures and heritage categories. These instruments shape which losses become internationally visible and how they are documented. UNESCO, *Constitution of the United Nations Educational, Scientific and Cultural Organization*, adopted at London, 16 November 1945, art. I.

[53] UNESCO, *Convention Concerning the Protection of the World Cultural and Natural Heritage*, 16 November 1972.

Safeguarding of the Intangible Cultural Heritage[54], UNESCO acknowledged that heritage is not only made up of material things that we can see or touch, but also of practices, knowledge, and traditions that communities transmit over time. This meant recognizing heritage as something lived and in continuous change. In the same year, UNESCO also adopted the Charter on the Preservation of Digital Heritage[55], which extended this shift into the digital realm. It recognized that materials such as texts, databases, images, audio, software, and websites are also part of our cultural memory. Unlike monuments, however, these digital resources are often fragile. They can disappear quickly due to outdated technologies, system failures, or simply because there are no clear legal frameworks in place to protect them. The Charter therefore called for both legal and technical measures to ensure that this digital heritage can be preserved and remain accessible over time[56]. These rules are also reflected in international criminal law: the Rome Statute of the International Criminal Court[57] criminalizes intentional attacks on cultural heritage.

[54] The 2003 Convention is relevant because it shifted the focus of safeguarding from objects alone to practices, representations, knowledge and skills recognized by communities as part of their cultural heritage. In this thesis, it supports the distinction between documenting material damage and recording the disruption of social practices and cultural transmission. UNESCO, *Convention for the Safeguarding of the Intangible Cultural Heritage*, adopted at Paris, 17 October 2003, arts. 1–2.

[55] The 2003 Charter is treated here as a normative, non-binding framework that recognises born-digital and digitised resources as vulnerable cultural records requiring active preservation. Its importance lies in identifying continuity of access, authenticity and long-term stewardship as institutional responsibilities rather than merely technical problems. UNESCO, *Charter on the Preservation of Digital Heritage*, adopted at Paris, 15 October 2003, arts. 1–3 and 6–9.

[56] UNESCO, *Convention for the Safeguarding of the Intangible Cultural Heritage*, 17 October 2003; UNESCO, *Charter on the Preservation of Digital Heritage*, 15 October 2003.

[57] The Rome Statute provides the jurisdictional framework within which intentionally directing attacks against buildings dedicated to religion, education, art, science or charitable purposes, and against historic monuments, may constitute a war crime, provided that such sites are not military objectives. The provision is therefore used here to distinguish legal qualification from the broader cultural or moral condemnation of heritage destruction. *Rome Statute of the International Criminal Court*, adopted at Rome, 17 July 1998, 2187 UNTS 90, art. 8(2)(b)(ix) and 8(2)(e)(iv).

Cultural heritage has always been protected because it carries meaning and when it is destroyed, the loss is not only physical, but also symbolic. What is changing today is not this underlying logic, but the way heritage exists. Increasingly, cultural memory is stored and shared through digital systems rather than only through physical objects, and this expansion of heritage exposes significant normative gaps in existing legal frameworks. As Richard Ong's Note[58] point out, digital cultural property does not align well with traditional interpretations of international humanitarian law, especially when it comes to defining what counts as an "attack." If a cyber operation makes a digital archive inaccessible without causing any physical damage, it remains unclear whether this would legally qualify as an attack. This reveals a fundamental gap between laws developed for kinetic warfare and the realities of contemporary conflicts, where harm can occur through disruption, deletion, or manipulation of data. Similar uncertainties appear in the field of cyber law. The same uncertainty can be seen in cyber law. The Tallinn Manual 2.0 suggests that digital cultural heritage should also be protected, but states do not agree on how far these protections really go[59]. Even the most basic questions are still open, and as Alcala[60] points out, there is still debate over whether digital data can even be considered "property" under the law of armed conflict. At the core of the issue is a simple but important problem: when heritage exists mainly as information, it does not fit easily into legal categories that were created for physical objects. This difference really matters in conflict situations since the fact that born-digital materials do not have a physical counterpart, meaning that if they are victim of cyberattack or system failure, they may

[58] Richard Ong, "Hard Drive Heritage: Digital Cultural Property in the Law of Armed Conflict," *Columbia Human Rights Law Review* 53, no. 1 (2021): 247–296.

[59] The *Tallinn Manual 2.0* is cited as an expert restatement of how its authors interpret the application of existing international law to cyber operations, not as a treaty or legally binding instrument. In this thesis, it provides a point of reference for considering whether and how rules protecting cultural property may extend to digital systems and data affected by cyber operations. Michael N. Schmitt, ed., *Tallinn Manual 2.0 on the International Law Applicable to Cyber Operations*, 2nd ed. (Cambridge: Cambridge University Press, 2017).

[60] Ronald Alcala, "Cultural Evolution: Protecting 'Digital Cultural Property' in Armed Conflict," *International Review of the Red Cross* 104, no. 919 (2022): 1083–1119.

disappear entirely and irreversibly. Digitized heritage, by contrast, is based on an existing physical original, so loss does not necessarily mean total disappearance. However, digitized materials face different risks, such as the loss of metadata and contextual information, which can significantly reduce their meaning and usability. What becomes clear is that digital heritage just does not behave like traditional objects. A digital file can be copied perfectly, repeatedly, without ever changing. It doesn't age, and it doesn't show the passage of time like a physical object does. Because of this, it doesn't have that same sense of uniqueness or "authenticity" we usually associate with things like monuments or artefacts. This is one of the reasons why digital heritage does not fit easily into existing legal categories, for this reason, the problem is not the absence of law, but the fact that it has not kept up with how heritage has changed. Once heritage becomes data, things get more complicated, and several gaps become much easier to see. There is, first, a basic issue of definition: most binding laws deal with physical property, while digital heritage is mainly covered by softer, non-binding frameworks. Then there is then the question of what counts as an attack, if a cyber operation blocks access to a digital archive without causing physical damage, it is still unclear whether this legally qualifies as one. There is also uncertainty about whether data itself can be treated as a protected object. On top of that, responsibility becomes more difficult to identify, because digital infrastructures are often spread across different countries and managed by private companies. At the same time, cyber operations are notoriously hard to attribute, and digital evidence can be fragile or easily manipulated. As a result, accountability becomes much more complex than in cases of physical destruction. What all this shows is that heritage protection today is much more complex than before. It sits at the intersection of international law, cybersecurity, digital infrastructures, and institutional practices. The 1954 Hague Convention was not designed with these realities in mind, its principles are still important, but many questions remain open, from whether digital repositories are fully protected under international humanitarian law, to how proportionality should apply in cyber operations, and who is actually responsible for safeguarding infrastructures that are often global and privately managed.

2 FROM DESTRUCTION TO DIGITAL EVIDENCE: MONITORING, MEMORY, AND VISIBILITY IN SYRIAN CULTURAL HERITAGE

Any rigorous analysis of Syrian cultural heritage destruction must begin with the conflict itself, because damage to monuments, archaeological sites, museums, and collections cannot be separated from the political and military fragmentation that followed 2011. What began as anti-government protests developed into a prolonged war involving the Syrian state, regional and international powers, and multiple non-state armed groups. The fall of Bashar al-Assad's rule in December 2024 opened a new political phase, but it did not immediately produce territorial unity, institutional stability, or secure conditions for reconstruction.[61] For cultural heritage, this means that the end of one political phase did not automatically create the conditions for protection, recovery, or conservation.[62]

Heritage destruction in Syria cannot be explained through a single actor or ideology. It resulted from overlapping processes: urban warfare, aerial bombardment, military occupation of archaeological sites, deliberate symbolic destruction, looting, illicit excavation, and the weakening of conservation institutions. Comparative research on attacks against cultural property shows that military-strategic, symbolic, signaling, conflict-related, and economic motives may coexist, while research from Syria demonstrates that illicit excavation and trafficking became embedded in wider wartime economies.[63] These processes unfolded within a context of fractured sovereignty and

[61] Maya Gebeily and Timour Azhari, "With Syria's Assad Gone, His PM Agrees to Hand Power to Rebel Administration," *Reuters*, 9 December 2024; S. Abou AlJoud and G. Alsayed, "Experts Push to Restore Syria's War-Torn Heritage Sites, Including Renowned Roman Ruins at Palmyra," *AP News*, 17 February 2025.

[62] Emma Cunliffe, Nibal Muhesen, and Marina Lostal, "The Destruction of Cultural Property in the Syrian Conflict: Legal Implications and Obligations," *International Journal of Cultural Property* 23, no. 1 (2016): 3–10.

[63] Johan Brosché, Mattias Legnér, Joakim Kreutz, and Akram Ijla, "Heritage under Attack: Motives for Targeting Cultural Property during Armed Conflict," *International Journal of Heritage Studies* 23, no. 3 (2017): 248–260; Neil Brodie and Isber Sabrine, "The Illegal Excavation and Trade of Syrian Cultural

shifting territorial control. As a result, future accountability has had to rely largely on indirect evidentiary routes, including UN investigative mechanisms, domestic proceedings in third states, universal jurisdiction cases, and possible transitional justice frameworks. The International, Impartial and Independent Mechanism for Syria (IIIM)[64], created by the UN General Assembly in 2016, has been central to this evidentiary architecture. In December 2024, the UN reported that the IIIM's central repository contained 283 terabytes of data and evidence intended to support current and future jurisdictions.[65] Digital preservation is therefore relevant not only to scholarship and conservation, but also to the wider problem of evidentiary continuity after mass violence.

Objects: A View from the Ground," *Journal of Field Archaeology* 43, no. 1 (2018): 74–84; Cunliffe, Muhesen, and Lostal, "Destruction of Cultural Property," 3–13.

[64] The International, Impartial and Independent Mechanism for Syria (IIIM) was established by the United Nations General Assembly in 2016 to collect, consolidate, preserve and analyse evidence of serious violations committed in Syria since March 2011 and to prepare files capable of facilitating proceedings before competent courts or tribunals. It does not itself exercise prosecutorial or judicial authority. United Nations General Assembly, Resolution 71/248, "International, Impartial and Independent Mechanism to Assist in the Investigation and Prosecution of Persons Responsible for the Most Serious Crimes under International Law Committed in the Syrian Arab Republic since March 2011," A/RES/71/248, 21 December 2016, paras. 4–5.

[65] Cunliffe, Muhesen, and Lostal, "Destruction of Cultural Property," 16–18; United Nations Office at Geneva, "UN Investigative Body Hopes to Send Team to Syria to Secure Evidence," *United Nations Geneva*, press briefing, 17 December 2024.

Figure 3. – Satellite evidence of conflict-related looting at Dura-Europos, eastern Syria, between 4 August 2011 and 11 April 2015. The comparison shows the large-scale expansion of looting pits visible in high-resolution satellite imagery. Source: Casana and Laugier, 2017, fig. 3, *PLOS ONE*, CC BY 4.0.

The Syrian case is especially important for the Digital Humanities because it combines large-scale material destruction, restricted access to sites, and the rapid development of digital methods for monitoring and verifying heritage loss. Since 2011, field inspection, archaeological missions, museum inventories, and on-site conservation have often been interrupted or rendered insufficient. Satellite imagery, remote sensing, geospatial databases, institutional reports, photographic archives, and 3D documentation have consequently become essential complementary forms of observation. Studies of Syria have demonstrated both the extraordinary reach of high-resolution satellite monitoring and its dependence on careful temporal comparison, archaeological expertise, and ground-based corroboration. [66] The inclusion of all six Syrian UNESCO World Heritage

[66] Jesse Casana, "Satellite Imagery-Based Analysis of Archaeological Looting in Syria," *Near Eastern Archaeology* 78, no. 3 (2015): 142–152; Michael D. Danti, "Ground-Based Observations of Cultural Heritage Incidents in Syria and Iraq," *Near Eastern Archaeology* 78, no. 3 (2015): 132–141; Jesse Casana and Elise J. Laugier, "Satellite Imagery-Based Monitoring of Archaeological Site Damage in the Syrian Civil War," *PLOS ONE* 12, no. 11 (2017): e0188589.

properties on the List of World Heritage in Danger in 2013 marked both an emergency conservation measure and an institutional turning point. It formally recognized the severe threat to the Ancient City of Damascus, Palmyra, Bosra, Aleppo, Crac des Chevaliers and Qal'at Salah El-Din, and the Ancient Villages of Northern Syria.[67] Within this wider context, Palmyra occupies a central position. Its importance lies not only in its symbolic value and UNESCO status, but also in the exceptional density of documentation surrounding its destruction. Between 2015 and 2017, Palmyra became one of the clearest examples of the relationship between material loss and digital evidence.[68] UNESCO condemned the destruction of the Temple of Baalshamin, the Temple of Bel, and the Arch of Triumph in 2015.[69]

These events were documented through institutional statements, satellite assessments, media reports, photographs, technical records, and later digital reconstruction projects. UNITAR-UNOSAT's work was especially significant because it showed how satellite-based assessment could document cultural heritage damage when ground access was restricted. Its Syria World Heritage Sites Report assessed eighteen major heritage areas and identified 290 affected locations, including 24 destroyed and 104 severely damaged sites.[70] Palmyra also shows why heritage destruction should not be understood through a simple opposition between total loss and survival. After the site

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[67] UNESCO World Heritage Centre, "Syria's Six World Heritage Sites Placed on List of World Heritage in Danger," *UNESCO World Heritage Centre*, 20 June 2013, https://whc.unesco.org/en/news/1038.

[68] Rubina Raja, "Cutting Ties: Palmyra in a Warzone," in *Pearl of the Desert: A History of Palmyra* (Oxford: Oxford University Press, 2022), 132–144.

[69] UNESCO World Heritage Centre, "Director-General of UNESCO Irina Bokova Firmly Condemns the Destruction of Palmyra's Ancient Temple of Baalshamin, Syria," *UNESCO World Heritage Centre*, 24 August 2015; UNESCO World Heritage Centre, "Director-General Irina Bokova Expresses Consternation at the Destruction of the Temple of Bel in Palmyra," 1 September 2015; UNESCO World Heritage Centre, "UNESCO Director-General Condemns the Destruction of the Arch of Triumph in Palmyra," *UNESCO World Heritage Centre*, 5 October 2015.

[70] United Nations Institute for Training and Research (UNITAR-UNOSAT), *Syria World Heritage Sites Report*, satellite-based cultural-heritage damage assessment; see also Casana, "Satellite Imagery-Based Analysis," 142–152.

was recaptured in 2016, a UNESCO rapid assessment mission recorded serious damage to sculptures, sarcophagi, and museum facilities, but also noted that important parts of the site remained intact and retained aspects of integrity and authenticity. Further assessments in 2017 confirmed the destruction of the Tetrapylon and severe damage to the Roman Theatre. [71]

Figure 4. – Damage assessment of the Arch of Triumph at Palmyra before and after its destruction. Photographs by the Directorate-General of Antiquities and Museums (DGAM). Source: Rumayed, 2024, fig. 2, pp. 31–56. Licensed under CC BY-NC-ND 4.0.

[71] UNESCO World Heritage Centre, "UNESCO Experts Take Preliminary Stock of Destruction in World Heritage Site of Palmyra," *UNESCO World Heritage Centre*, 27 April 2016; UNESCO World Heritage Centre, "UNESCO Director-General Condemns Destruction of the Tetrapylon and Severe Damage to the Theatre in Palmyra," *UNESCO World Heritage Centre*, 20 January 2017.

These successive assessments show that digital documentation is an iterative process rather than a single 'before and after' record. At the same time, Palmyra should not be treated as representative of Syrian heritage as a whole. Its exceptional visibility is analytically useful precisely because it exposes structural biases in the digital heritage ecosystem: internationally prominent monuments attract satellite imagery, UNESCO missions, archival photographs, 3D models, media attention, and reconstruction projects, while provincial museums, rural archaeological landscapes, local religious buildings, vernacular architecture, movable collections, and community memory may remain less visible or more unevenly documented. This asymmetry is central to a critical understanding of data in the humanities. Data are not neutral objects simply waiting to be collected; they are selected, formatted, classified, and made legible through particular infrastructures. Drucker's distinction between data and '*capta*' is especially useful here because it emphasizes that humanities evidence is taken and constructed through acts of interpretation.[72] A satellite image, geospatial database, damage report, or 3D model therefore does not merely reveal destruction: it translates destruction into a specific evidentiary form. Research on visualization in the humanities similarly stresses that omission, classification, uncertainty, and provenance shape what a visualization can legitimately communicate.[73]

Remote sensing makes this problem concrete. It is highly effective for detecting collapsed structures, demolition scars, craters, looting pits, earth-moving, and large-scale spatial change, but it is less capable of documenting interiors, displaced collections, destroyed archives, interrupted rituals, local memory, or emotional attachment to place. High-resolution imagery in Syria has therefore produced indispensable but necessarily partial knowledge.[74] These limitations are also connected to authority. Laurajane Smith's concept of Authorized Heritage Discourse helps explain why expert, institutional,

[72] Johanna Drucker, "Humanities Approaches to Graphical Display," *Digital Humanities Quarterly* 5, no. 1 (2011): 1–21.

[73] Stephen Boyd Davis, Olivia Vane, and Florian Kräutli, "Can I Believe What I See? Data Visualization and Trust in the Humanities," *Interdisciplinary Science Reviews* 46, no. 4 (2021): 522–546.

[74] Casana and Laugier, "Satellite Imagery-Based Monitoring," e0188589; Danti, "Ground-Based Observations," 132–141.

monumental, and internationally recognized forms of heritage are often privileged in official heritage regimes.[75] In Syria, the war intensified existing inequalities in the production of heritage knowledge. As field access became increasingly dangerous or impossible, documentation relied more heavily on UN agencies, international organizations, universities, national institutions, and specialist networks. This shift was essential for preserving evidence under conflict conditions, but it also contributed to a hierarchy of knowability. Internationally recognized monuments were more likely to be mapped, assessed, modelled, and circulated through digital platforms, whereas less visible forms of heritage often remained only partially documented or absent from the public record. These asymmetries raise broader questions of data sovereignty and digital colonialism. Much of the documentation of Syrian heritage has depended on infrastructures, expertise, funding, and platforms located outside the country. This does not make international documentation illegitimate; in many cases, such initiatives have been indispensable for preserving evidence and supporting future conservation. However, it makes questions of governance particularly important: who controls the data, defines metadata categories, manages access, corrects records, authorizes reuse, and ultimately shapes the digital representation of damaged heritage? As Stobiecka argues, apparently neutral digital infrastructures can reproduce existing inequalities of authority, particularly when affected communities have limited influence over the digital afterlives of their own heritage.[76] Empirical research illustrates both the potential and the limitations of this documentary model. Casana and Laugier examined nearly 5,000 archaeological and heritage sites across Syria and neighboring regions using high-resolution satellite imagery combined with a spatial database.[77] Their work demonstrated the value of remote sensing for identifying patterns of destruction, looting, and landscape change across areas that could not be systematically inspected on the ground. A more geographically focused study by Al Kassem et al. identified 1,632 instances of damage across 196 archaeological sites in the Daraa region using freely available high-resolution imagery from 2004 to

[75] Smith, *Uses of Heritage*, 29–34.

[76] Monika Stobiecka, "Archaeological Heritage in the Age of Digital Colonialism," *Archaeological Dialogues* 27, no. 2 (2020): 113–125.

[77] Casana and Laugier, "Satellite Imagery-Based Monitoring," 5–7, 20–27.

2022. The study substantially expanded the available condition information for archaeological sites in the region, while also stressing that remotely observed patterns must be interpreted in relation to local conditions and ground-based knowledge.[78] Together, these studies reinforce a central methodological principle of this chapter: digital heritage evidence is not simply discovered as a neutral record of destruction. It is produced through specific processes of selection, observation, classification, and interpretation. What becomes visible depends on the dates and resolution of available imagery, the structure of database fields, the categories used to classify damage, the sources selected for comparison, and the contribution of both expert and local knowledge. In this sense, digital heritage evidence is better understood as *capta* rather than as self-evident data: a structured and interpreted representation of heritage loss whose analytical value depends on transparent methods, provenance, and awareness of its limitations.

Public Humanities offer an important counterpoint to these problems. The relevant question is not only whether heritage data are open, but whether digital infrastructures enable meaningful public interpretation, community participation, and shared memory. Projects such as #NewPalmyra, which has mobilized crowdsourced images and open digital reconstruction, demonstrate how users can become contributors rather than passive spectators; however, participation should not be equated automatically with shared authority.[79] Classic and recent participation scholarship distinguishes access, consultation, contribution, partnership, and co-creation according to the degree of decision-making power that participants actually hold.[80] A Public Humanities approach

[78] Amal Al Kassem et al., "Assessment of the Impact of the Syrian Conflict on Archaeological Sites in the Daraa Region," *Levant* 56, no. 3 (2024): 425–446.

[79] New Palmyra, "#NewPalmyra," *#NewPalmyra*, accessed 11 March 2026; Wissam Wahbeh, Stephan Nebiker, and Giorgio Fangi, "Combining Public Domain and Professional Panoramic Imagery for the Accurate and Dense 3D Reconstruction of the Destroyed Bel Temple in Palmyra," *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences* III-5 (2016): 81–88; Nemeh Rihani, "Interactive Immersive Experience: Digital Technologies for Reconstruction and Experiencing Temple of Bel Using Crowdsourced Images and 3D Photogrammetric Processes," *International Journal of Architectural Computing* 21, no. 4 (2023): 730–756.

[80] Sherry R. Arnstein, "A Ladder of Citizen Participation," *Journal of the American Institute of Planners* 35, no. 4 (1969): 216–224; Olgica Grcheva and Beser Oktay Vehbi, "From Public Participation to Co-

therefore requires more than online access: it requires accountability, reciprocity, multilingual interfaces, and mechanisms through which local and diaspora communities can influence interpretation and stewardship. For these reasons, Palmyra is not only a case study of destruction. It is a site where the wider ecology of digital evidence becomes visible. The central argument of this chapter is that digital monitoring of Syrian cultural heritage is not a neutral act of recording, but an epistemic and political infrastructure: it produces evidence, organizes priorities, shapes public memory, and influences what can later be used for research, conservation planning, legal accountability, or reconstruction.

2.1 Monitoring, Archives, and Reconstruction: The main Initiatives

The Syrian digital heritage ecosystem cannot be understood as a single archive or unified database. It is better described as an assemblage of initiatives that differ in purpose, scale, technology, governance, accessibility, and intended audience. This fragmentation is not merely a technical limitation but reflects the different epistemic functions required to document heritage destruction in conflict contexts. Some initiatives are designed to verify damage, others to preserve pre-war memory, others to support conservation planning, others to produce institutional authority, and others to communicate loss through public visualization. For this reason, digital documentation should not be treated as a homogeneous practice. Satellite monitoring, geospatial databases, archival digitization, institutional reporting, and 3D reconstruction all produce knowledge about Syrian heritage, but they do so through different methods and documentary regimes. Satellite-based initiatives privilege spatial evidence, surface change, and comparability across large areas. Database platforms privilege standardization, metadata, interoperability, and queryability. Archival projects privilege historical depth, visual memory, and material context. Institutional reports privilege legitimacy, conservation language, and international recognition. Finally, 3D reconstruction projects privilege visual accessibility, public engagement, and the digital reappearance of destroyed monuments.

Creation in the Cultural Heritage Management Decision-Making Process," *Sustainability* 13, no. 16 (2021): article 9321.

This distinction is methodologically important because visibility, completeness, and evidentiary value do not always coincide, a site may be clearly visible in satellite damage assessments but poorly documented in historical archives. Another may be rich in photographs and plans but weakly integrated into geospatial databases. A monument may be reconstructed in 3D while lacking the metadata required for forensic or legal use. Conversely, an institutional or satellite-based report may have strong evidentiary value but limited public resonance. The documentation of Syrian heritage destruction therefore requires a multi-layered approach capable of distinguishing between satellite evidence, archival evidence, institutional evidence, geospatial evidence, participatory evidence, and reconstructive evidence.

The first major component of this ecosystem is the satellite-institutional regime, represented above all by UNITAR-UNOSAT, the United Nations Satellite Centre hosted within the United Nations Institute for Training and Research. UNOSAT provides satellite imagery analysis, mapping, training, and capacity-building support for UN agencies, Member States, and other actors working in humanitarian, security, environmental, and development contexts. Its relevance to cultural heritage lies in its ability to assess damage when direct access to sites is impossible, unsafe, or politically restricted. In Syria, UNOSAT produced one of the earliest systematic satellite-based assessments of cultural heritage damage. Its Syria World Heritage Sites Report examined eighteen major cultural heritage areas and identified 290 affected locations, including 24 destroyed and 104 severely damaged sites.[81] By translating visible changes on the ground into standardized damage categories, UNOSAT made destruction spatially comparable, institutionally legible, and useful for emergency response, conservation planning, and future accountability. This approach is especially effective for documenting damage that can be seen from above, such as collapsed buildings, craters, demolition scars, earth-moving, and large-scale alterations to a site. However, it is less able to capture interior damage, the disappearance of movable objects, or the social and symbolic dimensions of heritage loss. In addition, UNOSAT's public outputs are mainly available as reports,

[81] UNITAR-UNOSAT, *Syria World Heritage Sites Report*; Casana, "Satellite Imagery-Based Analysis," 142–152.

maps, and assessments, rather than as fully downloadable datasets that can be independently reorganized or analyzed. Its evidentiary value is therefore considerable, but its openness and analytical reusability remain limited.

A second pole is represented by geospatial and archaeological database systems. The most important example is EAMENA, the Endangered Archaeology in the Middle East and North Africa project. EAMENA uses satellite imagery, published reports, legacy data, and field verification to document threatened archaeological sites and landscapes across the MENA region. Built on the Arches platform, the database is designed around interoperability, online access, standardized records, and data export. From a methodological perspective, EAMENA is especially significant because it does not simply map sites; it models heritage through related entities such as Heritage Place, Built Component, Detailed Condition Assessment, Information Resource, and Person/Organisation. Its bilingual interface, open-access policy, and Creative Commons licensing make it one of the most data-oriented and interoperable resources in the Syrian heritage documentation ecosystem.[82] EAMENA also shows that the satellite image alone is not the final form of knowledge. Remote sensing becomes meaningful when it is integrated into a structured record that can be compared, queried, updated, and connected to other evidence. In this sense, EAMENA shifts the focus from isolated visual proof to the systematic management of information. Its limitation, however, is the uneven depth of its records. Some sites include rich metadata, threat assessments, and bibliographic references, while others remain relatively thin because of limited imagery, previous research, or field validation. EAMENA therefore offers a strong model of interoperability, but it also demonstrates that database quality depends on the density and reliability of the sources that feed it.

A third component of the Syrian digital heritage ecosystem consists of hybrid monitoring systems that combine satellite imagery, open-source intelligence, field

[82] Nichole Sheldrick and Andrea Zerbini, "A Heritage Inventory for Documenting Endangered Archaeology in the Middle East and North Africa," *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences* IV-2/W2 (2017): 230–241; Andrea Zerbini, "Developing a Heritage Database for the Middle East and North Africa," *Journal of Field Archaeology* 43, suppl. 1 (2018): S9–S18.

reports, media analysis, and specialist interpretation. ASOR Cultural Heritage Initiatives, commonly known as ASOR CHI, is the clearest example of this model. Developed by the American Schools of Oriental Research, ASOR CHI documents, verifies, and reports threats to cultural heritage in Syria, northern Iraq, Libya, and other conflict-affected areas. Its methodology brings together remote sensing, open-source reporting, social media evidence, local information, and field-based observations, allowing reported incidents to be assessed across multiple evidentiary sources. The main methodological value of ASOR CHI lies in triangulation. Unlike a purely satellite-based approach, it can record incidents that may not be visible from above; unlike a purely textual archive, it can connect reports to spatial and temporal evidence. At the same time, ASOR CHI operates within a regime of selective openness. Its public reports make cultural heritage damage visible and analytically usable, but complete datasets are not always openly available, partly because the release of precise site locations could expose vulnerable places to looting or further targeting [83].

A fourth component of the Syrian digital heritage ecosystem is archival and documentary. Its main purpose is not to monitor damage in real time, but to preserve the visual, architectural, and historical record of what existed before destruction occurred. This includes historical photographs, maps, plans, architectural surveys, written documentation, and other archival materials that can support future restoration, reconstruction, conservation planning, and scholarly interpretation. The Syrian Heritage Archive Project, often abbreviated as SHAP, belongs to this category. Developed by the Museum für Islamische Kunst in Berlin, within the Staatliche Museen zu Berlin, together with the Deutsches Archäologisches Institut, SHAP focuses on the documentation and preservation of Syrian cultural heritage through archival material. It should not be understood as a competitor to damage-monitoring initiatives such as UNOSAT, EAMENA, or ASOR CHI. Rather, it performs a complementary function. If satellite and geospatial monitoring mainly ask what happened and where, SHAP helps answer what

[83] Michael D. Danti, Scott Branting, and Susan Penacho, "The American Schools of Oriental Research Cultural Heritage Initiatives: Monitoring Cultural Heritage in Syria and Northern Iraq by Geospatial Imagery," *Geosciences* 7, no. 4 (2017): Article 95, 1–21.

existed before, how it looked, and how its architectural and urban relationships were organized. This difference reflects a distinct documentary workflow. Archival projects operate through digitization, cataloguing, metadata creation, and, where possible, the georeferencing of historical photographs, maps, plans, and documents. They are less suited to measuring the escalation of damage as it happens, but they are essential for historical comparison, reconstruction, conservation, and memory work. In the case of Aleppo, for example, archival photographs, plans, and architectural records are necessary for understanding not only which buildings were damaged, but also which historical, architectural, and urban relationships were disrupted. Recent restoration work in Aleppo has also shown the practical value of SHAP's archival resources, especially where architects and conservators need reliable visual and architectural evidence to guide reconstruction decisions.[84] The main limitation of SHAP is that its coverage depends on the survival and availability of pre-war documentation. Sites that were rarely photographed, less studied, or less central to institutional archives are necessarily less visible within this archival ecosystem. For this reason, SHAP reveals both the power and the inequality of archival memory: it can make lost or damaged heritage newly available for research and restoration, but it also reflects the uneven history of what was documented before the war.

[84] Staatliche Museen zu Berlin, Museum für Islamische Kunst, "Syrian Heritage Initiative: Syrian Heritage Archive Project (SHAP)," *Staatliche Museen zu Berlin*; Rami Alafandi, *Timeline of Selected Historical Building Facades in Aleppo: Syrian Heritage Archive Project (SHAP) – Aleppo Built Heritage Documentation*, ed. Eva Al-Habib Nmeir (Heidelberg: arthistoricum.net, 2022), 5–6, 7–95.

Figure 5. – View of the Citadel of Aleppo following the destruction of the Khusrawiyya Mosque in the surrounding historic urban fabric, 2014. Photograph by Sultan Kitaz. Source: Syrian Heritage Archive Project (SHAP), Museum für Islamische Kunst, Staatliche Museen zu Berlin. Licensed under CC BY-NC-ND.

A fifth component of the Syrian digital heritage ecosystem is institutional and normative. This role is represented above all by UNESCO and, within Syria, by the Directorate-General of Antiquities and Museums, the national authority responsible for the protection and management of archaeological sites, museums, and cultural heritage. UNESCO does not function primarily as a searchable digital database. Its role is different: it produces institutional authority, official chronology, international legitimacy, and conservation frameworks. Through its statements, decisions, missions, and state-of-conservation reports, UNESCO helps define when heritage destruction becomes an internationally recognized event and how it should be framed within global heritage policy. Palmyra illustrates this function clearly. In 2015, UNESCO condemned the destruction of the Temple of Baalshamin, the Temple of Bel, and the Arch of Triumph. In 2016, it carried out a rapid technical assessment mission to Palmyra, and in 2017 it reported the destruction of the Tetrapylon and damage to the Roman Theatre on the basis of satellite imagery released by UNITAR-UNOSAT.[85] These documents are not datasets

[85] UNESCO World Heritage Centre, "Director-General of UNESCO Irina Bokova Firmly Condemns the Destruction of Palmyra's Ancient Temple of Baalshamin, Syria"; "Director-General Irina Bokova Expresses Consternation at the Destruction of the Temple of Bel in Palmyra"; "UNESCO Director-General

in a strict sense. Rather, they transform destruction into official status, conservation concern, institutional memory, diplomatic language, and international priority. This dimension is essential because it connects digital monitoring to heritage governance. A satellite image may show that a monument has been destroyed, but UNESCO's institutional framing helps turn that visual evidence into a recognized heritage event. This is where Laurajane Smith's concept of Authorized Heritage Discourse becomes especially relevant: UNESCO does not simply describe heritage but organizes it through global categories such as Outstanding Universal Value, World Heritage status, danger listing, state of conservation, and safeguarding. [86]The limitation is that UNESCO and DGAM materials are generally not designed for computational research. They are authoritative and politically significant, but they are not usually available as downloadable, machine-readable, and comparative datasets

A sixth component consists of digital reconstruction and public visualization projects, especially those related to Palmyra. Here the main purpose is not satellite monitoring, but the visual and spatial re-creation of monuments through photogrammetry, image matching, 3D modelling, immersive media, and virtual environments. Projects such as #NewPalmyra, Iconem, and other Palmyra-focused 3D initiatives use photographs and digital modelling tools to produce reconstructions that can circulate online and reach wider publics. Wahbeh, Nebiker, and Fangi show how public-domain tourist photographs and professional panoramic imagery can be combined to produce a dense 3D reconstruction of the destroyed Temple of Bel.[87] More recent studies have also explored immersive and interactive forms of dissemination, including 360° media, virtual

Condemns the Destruction of the Arch of Triumph in Palmyra"; "UNESCO Experts Take Preliminary Stock"; "UNESCO Director-General Condemns Destruction of the Tetrapylon."

[86] Smith, *Uses of Heritage*, 11–43

[87] Wissam Wahbeh, Stephan Nebiker, and Giorgio Fangi, "Combining Public Domain and Professional Panoramic Imagery for the Accurate and Dense 3D Reconstruction of the Destroyed Bel Temple in Palmyra," *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences III-5* (2016): 81–88.

reconstruction, and metaverse-based documentation of Palmyra's monuments.[88] These projects are powerful because they show that destroyed or damaged heritage can partially re-emerge as a digital object, even when traditional survey data are incomplete or no longer available. They are especially valuable for memory, education, public engagement, and visual communication. At the same time, they reveal an important bias. Not all sites have the same capacity to be digitally reconstructed. Monuments that were iconic, touristic, and heavily photographed before the war are much easier to model than rural sites, vernacular buildings, provincial museums, damaged interiors, or places that were poorly documented before destruction. Digital reconstruction is therefore shaped not only by technical expertise, but also by pre-war tourism, media visibility, archival inequality, and the earlier visual economy of heritage. For this reason, these projects should be understood as important tools of public memory and visualization, but not as systematic documentation of damage across the whole Syrian cultural landscape.

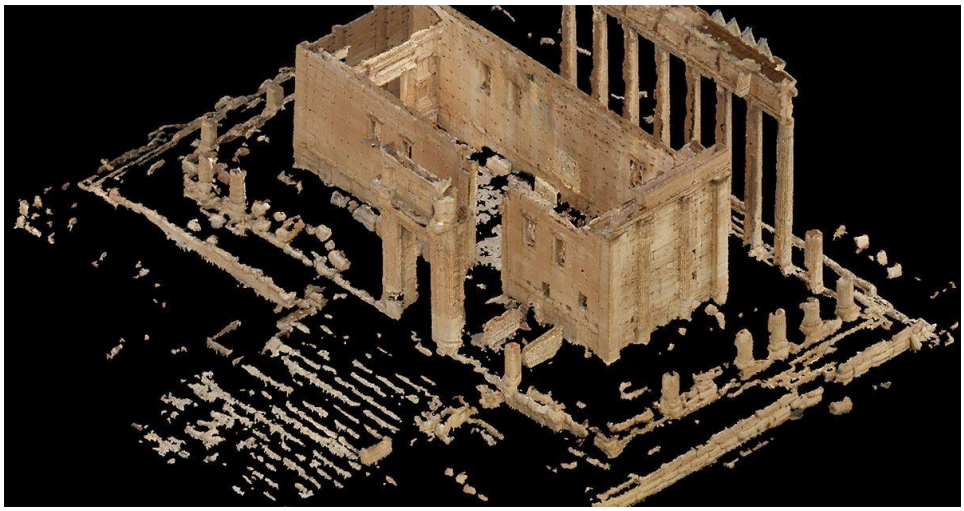

Figure 6. – Dense 3D reconstruction of the Temple of Bel at Palmyra generated from public-domain tourist photographs and professional panoramic imagery. Source: Wahbeh, Nebiker, and Fangi, 2016, *ISPRS Annals of the Photogrammetry, Remote Sensing and Spatial Information Sciences*, III-5, 81–88. Licensed under CC BY 3.0.

[88] Rida Dieb, Ataa Alsalloum, and Nicholas Webb, "Interactive 360° Media for the Dissemination of Endangered World Heritage Sites: The Ancient City of Palmyra in Syria," *Built Heritage* 8, no. 1 (2024): 1–16; Andrea Forte et al., "Geomatics and Metaverse for Lost Heritage Sites Documentation and Dissemination: The Case Study of Palmyra Roman Theatre (Syria)," *Virtual Archaeology Review* 16, no. 32 (2025): 85–99; Rihani, "Interactive Immersive Experience," 730–756

Taken together, these initiatives demonstrate that digital monitoring is not a neutral recording mechanism, but an epistemic and political infrastructure. Each project makes Syrian heritage knowable in a different way. The comparative value of these initiatives lies not in ranking them, but in understanding how their different evidentiary regimes complement and limit one another. Table 2 therefore compares the main initiatives according to their data sources, scale, unit of analysis, access model, strengths, and limitations. It shows that the Syrian digital heritage ecosystem is structurally fragmented, not because of a simple technical weakness, but because each initiative serves a different epistemic function: verifying damage, preserving memory, supporting conservation, or communicating loss. As a result, visibility, completeness, and evidentiary value do not always coincide.

Initiative	Main actor	Evidence logic	Access	Main strength	Structural limitation
UNITAR-UNOSAT	UN agency	Satellite imagery, damage assessment, cartographic reports	Public mainly through reports	Standardized, spatially comparable damage assessment	Limited to damage visible from above; limited access to raw data
ASOR CHI	Academic-policy network	High-resolution imagery, OSINT, field reports, incident database	Public reports; selective dataset access	Triangulation of sources and temporal querying	Sensitive data not fully open
EAMENA	Academic consortium	Arches database, GIS, condition assessment, information resources	Public, bilingual, CC BY 4.0, exportable	Strong interoperability and rich metadata structure	Uneven depth across sites and countries
SHAP	Museum, archive, research institutions	Historical photographs, maps, plans, reports	Partially public and narrative-based	Pre-war visual memory and restoration support	Formal heterogeneity and limited comparability
UNESCO/ DGAM	Institutional authorities	State-of-conservation reports, missions, official statements	Public institutional documents	Normative authority and diplomatic legitimacy	Not structured as a searchable research database
Iconem, #NewPalmyra, 3D projects	Digital heritage organizations and communities	Photogrammetry, meshes, crowdsourced images, 3D models	Variable; sometimes open	Strong visual, memorial, and educational value	Selective focus on famous sites; limited systematic coverage

Table 2. – Comparative overview of selected documentation initiatives in the Syrian digital heritage ecosystem.
Author's synthesis based on the institutional documentation and scholarly literature discussed in Section 2.1.

2.2 Building the Analytical Framework: Dataset Design, Documentation, and Visibility

The previous section has shown that the Syrian digital heritage ecosystem is composed of different and only partially interconnected forms of documentation, including satellite assessments, geospatial databases, institutional reports, archival resources, field-based documentation, and digital reconstruction projects. This fragmentation is not only technical but also epistemic, since each initiative makes heritage visible in a different form: as physical damage observed from above, a database record, an archival trace, an institutional assessment, or a reconstructed digital object. Building on this framework, I have developed an empirical research design to examine how damaged Syrian heritage becomes documented and visible within this heterogeneous digital ecosystem. I have created a comparative dataset of thirty cultural heritage sites affected by the conflict by cross-referencing publicly available information from the main initiatives discussed in the previous section, including UNESCO, UNITAR-UNOSAT, ASOR Cultural Heritage Initiatives, EAMENA, the Safeguarding Heritage of Syria and Iraq Project, the Directorate-General of Antiquities and Museums, the Syrian Heritage Archive Project, HDX/Syria Cultural Sites, and selected digital reconstruction projects such as #NewPalmyra and Iconem/Palmyra 3D. The dataset is not intended to reproduce an existing institutional inventory or to provide an exhaustive account of cultural heritage destruction across Syria. I have constructed it as a comparative and exploratory corpus that brings records produced by different institutions into a common analytical structure. This allows me to examine not only whether a site has been documented, but also how it has been documented, through which technologies, by which actors, and with what degree of evidentiary detail and public visibility. I have treated each heritage site as a single analytical unit, even when it appears in several reports, databases, satellite assessments, or reconstruction projects. The focus of the comparison is therefore the documentary trajectory of the site rather than the number of individual records associated with it. The Temple of Bel, the Citadel of Aleppo, the Roman Theatre of Bosra, or Dura-Europos may be documented by several actors and methods, but each remains one case within the thirty-site corpus. I have selected the sites through a purposive rather than random sampling strategy. The aim has been to create sufficient analytical variation across the

corpus while keeping the sample small enough to allow close verification of the evidence associated with each case. For this reason, I have included UNESCO World Heritage properties, internationally prominent non-UNESCO monuments, archaeological sites, urban built heritage, religious buildings, museums, and sites characterized by different levels of physical accessibility and documentary attention. Purposive sampling is particularly appropriate in this context because the cases are selected for their relevance to the research questions rather than for statistical representativeness. The differences between the selected sites are themselves important for examining patterns of documentary visibility and potential visibility bias. [27] I have included a site only when the available public evidence could be connected to it with reasonable confidence. Cases for which documentation was too general, inaccessible, or ambiguous to support reliable site-level coding were excluded. The resulting corpus should therefore not be interpreted as representative of all damaged heritage in Syria. Instead, it provides a controlled analytical sample through which recurring patterns in documentation, technology, governance, and visibility can be examined.

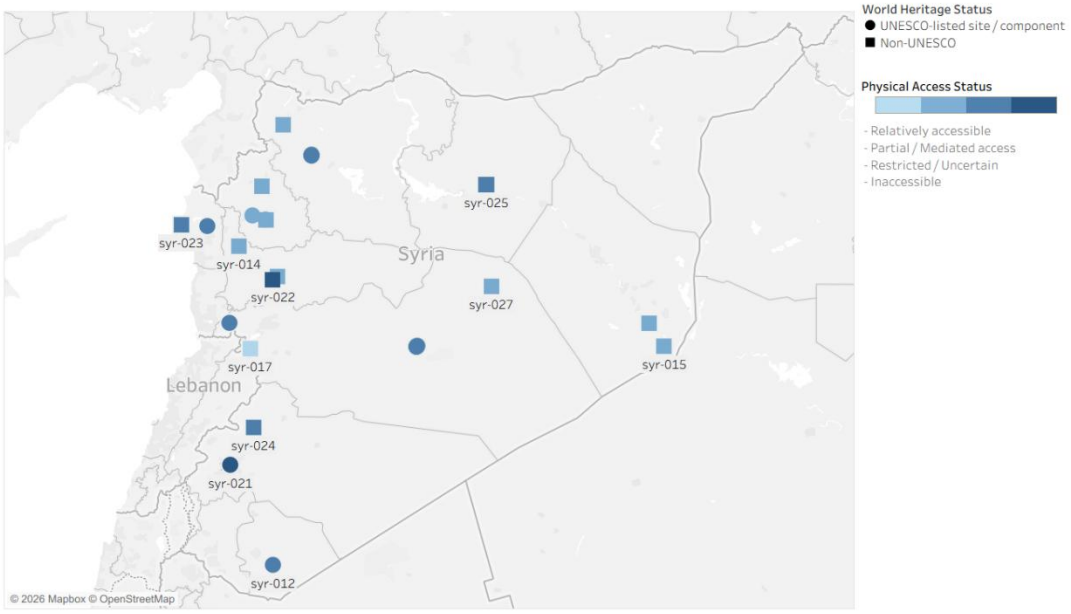

Figure 7. – Geographical distribution and physical access status of the 30 Syrian heritage places in the purposive research corpus. Colour represents physical-access status; filled circles identify UNESCO-listed properties or components, while filled squares identify non-UNESCO sites. Access categories refer to the public evidence reviewed for the dataset and should not be interpreted as a real-time operational assessment. Site codes correspond to SYR-001–SYR-030. Author's elaboration in Tableau based on the thesis dataset.

Figure 7 situates the thirty selected cases geographically and shows how their coded physical-access conditions vary across the corpus. It should not be interpreted as a map of the overall distribution of damaged heritage in Syria. Because the corpus was constructed through purposive sampling, the concentration of cases in particular regions reflect the analytical selection criteria and the availability of verifiable public evidence rather than the geographical incidence of heritage destruction as a whole. The access categories likewise describe the conditions documented in the sources reviewed during the construction of the dataset. They do not constitute a real-time operational assessment of whether a site can currently be visited or inspected. Color and shape should therefore be read as analytical encodings of access and UNESCO status, not as measures of cultural importance, damage severity or documentary quality.

The dataset forms the evidentiary foundation of the analysis, while Tableau provides the environment in which I have explored and visualized the coded relationships. I have chosen Tableau because the corpus combines geographical, categorical, temporal, and numerical variables that need to be examined across several interconnected dimensions. The software allows the same underlying data to be represented through maps, matrices, heatmaps, comparative charts, filters, and diagnostic views without altering the evidentiary structure of the dataset. This is particularly useful for an exploratory analysis because it allows movement between an overall view of the corpus and closer inspection of individual sites, technologies, initiatives, or categories. [28] The distinction between the dataset and Tableau is methodologically important. The dataset contains the evidence that I have collected, verified, standardized, and coded from the sources; Tableau does not generate or validate that evidence. Its function is to reorganize the coded relationships visually so that patterns, differences, inconsistencies, and exceptional cases can be identified more clearly. When a coding decision is revised in the dataset, the related visualization changes accordingly. This makes the connection between the underlying evidence and the visual output explicit and allows the visualizations to function as analytical tools rather than as independent sources of evidence.

For each site, I have recorded geographical, historical, typological, documentary, technological, and institutional information. The principal fields include site_id, site_name, latitude, longitude, region or governorate, broad_category, specific_type,

unesco_status, start_year, end_year, damage_type, damage_severity, monitoring_source, technology_used, remote_only, documentation_date, local_participation, reconstruction_status, digital_reconstruction, and source_url. I have selected these variables because the analysis concerns not only the physical effects of conflict but also the processes through which those effects become documented, classified, verified, stored, and circulated. The dataset therefore connects material damage with its documentary afterlife. It makes it possible to move beyond the question of whether a site has been recorded and to examine the form, depth, accessibility, technological basis, and institutional authority of that documentation. In this study, documentary visibility refers to the extent to which an individual heritage place is represented within the publicly traceable documentary infrastructure assembled for the research. It does not measure cultural importance, symbolic prominence, media fame, evidentiary quality, or the severity of physical damage. For each site i, the Documentary Visibility Score was calculated as:

$$\mathbf{DVS_i = (Source\ Breadth_i + Public\ Traceability_i + Method\ Breadth_i) / 3}$$

where Source Breadth measures the extent to which a site is represented across distinct documentation initiatives, Public Traceability measures how securely those documentary relationships can be reconstructed from accessible sources, and Method Breadth measures the diversity of documentation methods associated with the site. Each component was normalised to a 0–100 scale and assigned equal weight. UNESCO status, damage severity, physical accessibility and heritage type were treated as external descriptive variables rather than components of the score. The equal weighting of the three components is a transparent analytical convention rather than a claim that they have equal substantive importance. Moreover, the Documentary Visibility Score does not replace the separate measures of documentary breadth, evidentiary depth and public traceability used elsewhere in the analysis. Its purpose is narrower: to provide a common site-level indicator through which documentary representation can be compared with external site characteristics, particularly recorded damage severity.

For the relationship between sites and monitoring initiatives, I have distinguished four documentary states: direct coverage, partial coverage, verified no coverage, and unknown coverage. This distinction is important because absence and uncertainty do not

mean the same thing. *Verified no coverage* indicates that I have examined the relevant public material and found no identifiable site-specific documentation. *Unknown coverage*, by contrast, indicates that the available evidence is insufficient to determine coverage with confidence. Keeping these categories separate prevents missing information from being treated as a single condition and allows uncertainty to remain visible within the analysis.

I have organized the empirical analysis into five connected stages, each developed in a corresponding subsection. First, I map publicly traceable documentary coverage across the selected monitoring initiatives (Section 2.3.1) and distinguish their overall reach from the specificity of their site-level documentation (Section 2.3.2). Second, I examine which evidence dimensions are made visible by different documentation technologies (Section 2.3.3). Third, I investigate whether observational distance structures the resulting evidence by comparing distal and proximal documentation across the complete corpus, a matched-site subset, and high-certainty records (Section 2.3.4). Fourth, I examine how governance composition varies according to documentation technology (Section 2.3.4) and whether greater public participation corresponds to greater documented decision-making authority (Section 2.3.5). Finally, I examine documentary visibility in relation to two external site characteristics: recorded damage severity (Section 2.3.6) and heritage type (Section 2.3.7). The first analysis examines whether higher documentary visibility is associated with lower levels of recorded physical damage, while the second explores whether documentary attention varies across broad heritage categories. The overall analytical sequence therefore moves from documentary coverage, to evidence, observational mode, governance and participation, and finally to the relationship between physical damage and documentary visibility. I have adopted this structure because documentary visibility is not produced by a single factor. It emerges from the interaction between the initiatives that document a site, the technologies they employ, the types of evidence those technologies can capture, the institutions that control the documentation process, and the conditions that make some sites easier to record and circulate than others. I have treated the resulting visualizations as analytical instruments rather than as decorative outputs. Each figure is connected to specific dataset fields,

denominators, and coding rules, and its interpretation remains dependent on the quality, provenance, completeness, and uncertainty of the underlying evidence. [29]

On this basis, the analysis addresses the following research questions:

1. How evenly is documentary coverage distributed across the thirty Syrian heritage sites and the monitoring initiatives included in the corpus? (Section 2.3.1)
2. Which initiatives provide broad documentary reach, and which provide more direct or site-specific evidence? (Section 2.3.2)
3. How do distal and proximal documentation methods differ in the evidence they produce, and does this distinction remain visible in matched-site and high-certainty comparisons? (Section 2.3.3)
4. How are documentation technologies associated with different governance regimes? (Section 2.3.4)
5. To what extent does public participation correspond to documented decision-making authority? (Section 2.3.5)
6. Is higher documentary visibility associated with lower levels of recorded physical damage in the Syrian heritage corpus? (Section 2.3.6)
7. Does documentary visibility vary across heritage categories, suggesting diverse levels of documentary attention within the Syrian heritage corpus? (Section 2.3.7)

These questions are exploratory rather than strictly statistical. My aim is not to measure the total scale of cultural heritage destruction in Syria, but to understand how selected damaged sites become documented, classified, visualized, and made reusable as digital evidence. The dataset therefore functions as a tool for examining the politics and structure of documentation: where evidence is concentrated, where it remains partial, and where uncertainty itself becomes part of the documentary record.

The dataset that I have created has several limitations. First, the thirty-site corpus is intentionally selective and cannot support statistical generalizations about Syrian cultural heritage as a whole. The findings describe patterns within the selected corpus and should be interpreted within those boundaries. Second, the indicators that I have constructed measure characteristics of the documentary record rather than the intrinsic importance of a heritage site or the absolute quality of its evidence. The Completeness Index, for example, measures how many selected fields can be populated for each site. It

does not indicate that all available evidence is equally detailed, reliable, or methodologically strong. For the same reason, I have treated technological diversity separately from completeness. A site documented through several methods is not necessarily better documented than a site supported by one detailed and carefully verified assessment. Similarly, the presence of satellite imagery, field reporting, or a 3D model identifies the type of documentation available but does not by itself establish its quality. A further limitation concerns source accessibility. I have relied primarily on material that is publicly available and sufficiently transparent to be verified. Unpublished field reports, restricted institutional datasets, oral testimony, private photographic collections, and security-sensitive documentation may therefore be absent from the corpus. Their absence from the dataset should not be interpreted as evidence that such documentation does not exist. Finally, the composition of the corpus may reproduce some of the inequalities that the analysis itself seeks to investigate. Internationally recognized, visually iconic, well-researched, or technically accessible sites are more likely to generate extensive public documentation, while less prominent places may remain only partially recorded. Their lower documentary visibility may therefore reflect unequal access to monitoring infrastructures rather than lower cultural significance. For this reason, I do not treat the dataset as a neutral representation of cultural heritage destruction in Syria. I use it as an analytical instrument for examining the conditions under which heritage becomes visible as digital evidence. Its limitations are therefore not external to the research problem; they are part of it. They show how documentation is shaped by institutional attention, technological affordances, physical access, source availability, and unequal systems of knowledge production. By combining indicators of coverage, completeness, technology, governance, participation, and visibility, the analysis makes it possible to examine how Syrian cultural heritage is unevenly represented within the digital documentation ecosystem. This supports the broader argument of the chapter: digital documentation does not simply reproduce destruction as it occurred. It is a structured process through which heritage is selected, classified, interpreted, circulated, and ultimately made knowable.

2.3 Data Analysis: Documentary Coverage, Technology, Governance, and Participation

2.3.1 Documentary Coverage across Monitoring Initiatives

The first stage of the analysis examines not only whether a heritage place appears in the reviewed documentation, but also how explicitly each initiative can be connected to it. This distinction is necessary because broad programme-level relevance and direct site-level documentation do not provide the same degree of evidentiary specificity. The actor–site matrix in Figure 8 shows that documentary coverage is broad but uneven across the 30-site corpus.

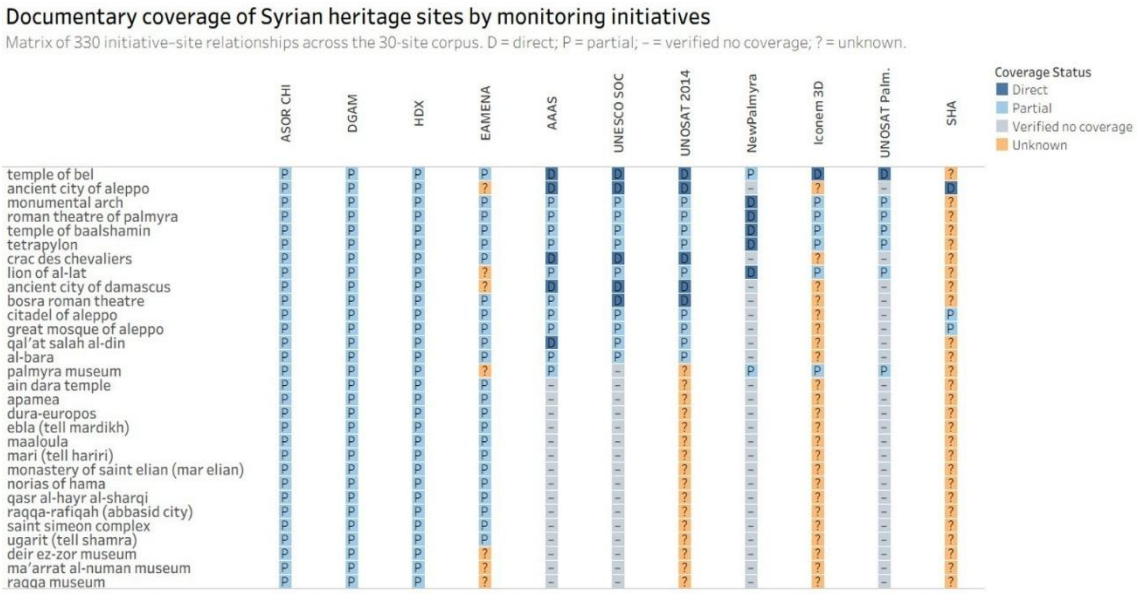

Figure 8. – Actor–site documentary coverage matrix for the 30-site Syrian heritage corpus. Each cell represents one of 330 possible relationships between 30 heritage places and 11 documentation initiatives: D indicates direct coverage, P partial coverage, – verified no coverage, and ? unknown coverage. Unknown indicates insufficient public evidence and should not be interpreted as documentary absence. Author's elaboration in Tableau based on the thesis dataset.

Across 30 sites and 11 documentation initiatives, the matrix contains 330 possible site–initiative relationships. Of these, 23 are coded as direct and 157 as partial. The remaining relationships are divided between verified no coverage and unknown coverage. This distribution immediately shows that the Syrian documentary ecosystem is extensive, but much of its reach operates at a broader property, programme, regional, or institutional

level rather than through consistently detailed site-specific records. Some initiatives illustrate this distinction particularly clearly. ASOR CHI, DGAM emergency documentation, and the Syria Cultural Sites/HDX baseline are connected to all 30 sites in the corpus, but these relationships are coded as partial rather than direct. Their broad presence therefore reflects documentary reach rather than uniformly detailed site-level evidence. Other initiatives have a narrower geographical or thematic focus but provide a greater proportion of direct records. AAAS, UNOSAT, UNESCO World Heritage documentation and #NewPalmyra, for example, cover fewer sites overall but include several direct relationships. The pattern suggests that documentary centrality has at least two dimensions: how many sites an initiative reaches and how specifically those sites are documented. A project can be broad without being detailed, just as a highly specialized project can be evidentially rich while covering only a small part of the corpus. This distinction is important because the most intensive forms of documentation are not evenly distributed. Internationally prominent sites, particularly Palmyra and components of the World Heritage properties of Aleppo and Damascus, are more likely to appear through several documentary channels. They may be represented simultaneously through satellite assessment, institutional reporting, archival material, archaeological research and digital reconstruction. Other places enter the public record through fewer or less specific relationships. The matrix therefore describes differences in documentary visibility, not differences in cultural significance.

The category *unknown* is particularly important for interpreting this result. It does not mean that an initiative did not document a site. It means that the material available to this research was insufficient to establish the relationship confidently. Restricted databases, inaccessible archives, incomplete project lists, inconsistent terminology, different spellings of place names and differences between references to a complete heritage property and references to one of its components can all produce an unknown relationship. By contrast, *verified no coverage* is used only when the relevant public material was examined and no identifiable relationship with the site was found. Keeping these categories separate prevents missing public evidence from being converted into an unsupported claim of documentary absence. Uncertainty is therefore not simply a technical problem in the dataset; it is part of the documentary condition being studied.

Figure 8 should consequently be understood as a map of publicly traceable documentary attention. A site connected to many initiatives is not necessarily more important, more severely damaged or better preserved. It is more visible within the sources and infrastructures available for analysis. The principal result of this first analysis is therefore not simply that coverage is uneven. It is that much of the publicly traceable documentary reach across the corpus is produced through partial rather than direct site-level relationships. The matrix identifies where documentary attention is visible and with what degree of specificity; it does not measure the cultural importance of a site, the quality of an initiative, or the total amount of documentation that may exist outside the public record.

2.3.2 Actor-site coverage and interoperability

Figure 9 summarizes the distinction between documentary reach and site-level specificity through a weighted coverage index. Direct coverage receives a weight of 1, partial coverage a weight of 0.5, and both verified no coverage and unknown coverage a weight of 0. The weighting is a methodological convention introduced to compare the internal structure of the reviewed corpus. It is not a natural measure of documentary quality, institutional effectiveness or heritage value. The descending order of the bars therefore represents the value of the constructed index only and should not be interpreted as a ranking of the initiatives.

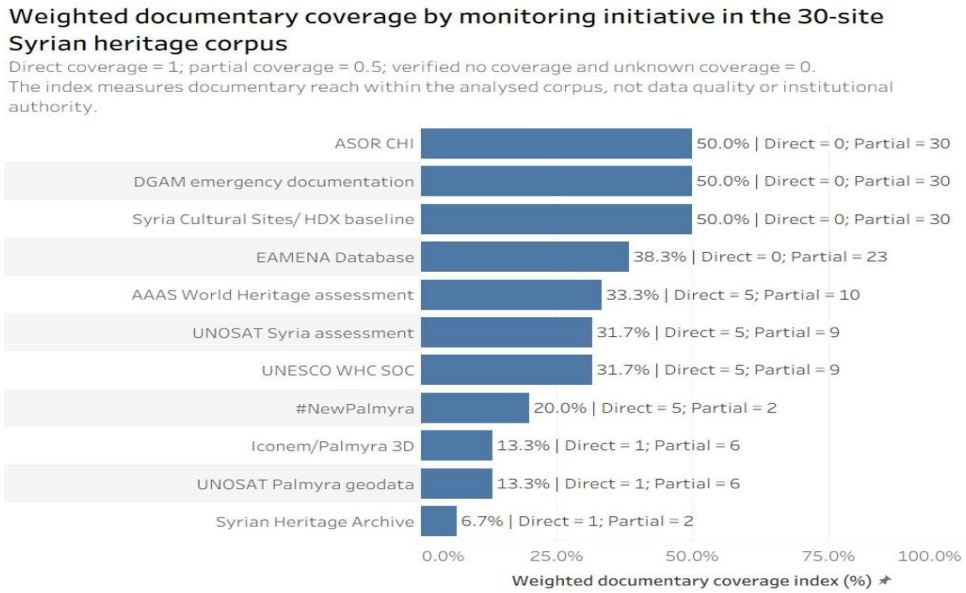

Figure 9. – Weighted documentary coverage by monitoring initiative within the 30-site Syrian heritage corpus. Direct coverage is weighted as 1, partial coverage as 0.5, and verified no coverage or unknown relationships as 0. The index is a descriptive comparison of publicly traceable coverage and does not rank institutional quality, evidentiary reliability or heritage value. Author's elaboration in Tableau based on the thesis dataset.

The resulting values should be interpreted as a transparent comparative device rather than as a measure of institutional quality or performance. ASOR CHI, DGAM emergency documentation and the Syria Cultural Sites/HDX baseline each reach 50.0%. In all three cases, however, the score is produced by 30 partial relationships and no direct ones. EAMENA follows at 38.3%, based on partial coverage of 23 sites. AAAS reaches 33.3%, with five direct and ten partial relationships, while UNOSAT and UNESCO World Heritage documentation each reach 31.7%, with five direct and nine partial relationships. #NewPalmyra reaches 20.0%, but its structure is different: five of its seven identified relationships are direct. Iconem/Palmyra 3D and UNOSAT Palmyra geodata each reach 13.3%, while the Syrian Heritage Archive has a lower corpus-wide score because of its much narrower site coverage. These values show why the index cannot be interpreted as a ranking. A 50% score based entirely on partial relationships describes a different documentary strategy from a lower score based primarily on direct and technically detailed records. Palmyra-focused projects are an obvious example. Their lower corpus-wide coverage does not indicate weaker documentation. It reflects a deliberately

specialized scope. A project designed to reconstruct individual monuments in detail cannot be assessed according to the same expectations as a regional monitoring programme. The weighting itself should also remain visible to the reader. If only direct relationships were counted, the broad partial-coverage infrastructures would fall sharply, whereas projects with several site-specific records would become relatively more prominent. If partial relationships were instead counted as equivalent to direct ones, ASOR CHI, DGAM and the Syria Cultural Sites baseline would reach the entire corpus. The value of 0.5 therefore represents a methodological convention that preserves the distinction between direct and partial evidence while allowing them to be summarized in a single indicator. It is not a natural measurement of documentary quality.

Taken together, Figures 8 and 9 reveal two different forms of documentary presence. Some initiatives achieve broad horizontal reach but connect to individual sites mainly through partial records. Others concentrate on fewer places while producing a higher proportion of direct and technically specific documentation. Neither strategy is inherently superior: they perform different functions within the documentary ecosystem. The comparison therefore demonstrates that documentary reach and evidentiary specificity must remain analytically distinct.

2.3.3 Distal and proximal documentation: evidence profiles within matched sites

This analysis compares nine matched Syrian heritage sites; the matched sites are sites documented by at least one distal method and at least one proximal method. Here, distal documentation means evidence collected from a distance, such as satellite imagery, GIS-based mapping, and change-detection analysis. These methods do not require direct on-site inspection and are mainly used to document spatial extent, visible external damage, landscape change, and changes over time. Proximal documentation, instead, refers to close-range or site-based sources, such as field surveys and reports, ground photography, and other records based on direct observation of the site or its local context. These sources are better suited to documenting material condition, architectural detail, interiors, use, access, and community-related evidence. Using the same sites for both groups makes the

comparison more direct: differences in coverage are less likely to depend on which sites happen to be included. Only medium- and high-certainty records were included, so records with weak support were excluded.

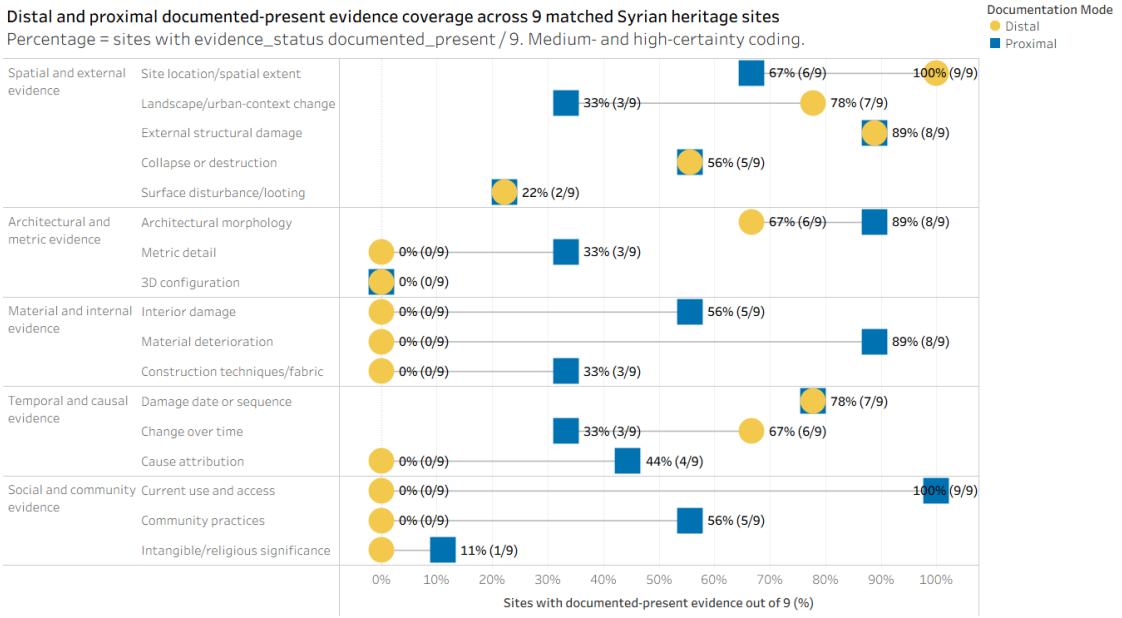

Figure 10. – Distal and Proximal documented-present evidence coverage across 9 matched Syrian heritage sites. Rows represent evidence dimensions, grouped by analytical category, and markers represent documentation mode. Percentages indicate the share of sites with at least one qualifying documented-present record within the matched sample. Connecting lines show differences in coverage between distal and proximal documentation for the same evidence dimension. Percentages are descriptive and refer only to medium- and high-certainty records in the thesis dataset. Author's elaboration in Tableau based on the thesis dataset.

For each evidence dimension, I calculated how many of the nine sites had at least one qualifying record coded as documented-present. I used the same denominator, 9 sites, for both documentation groups. For example, 8/9 sites correspond to 89%, and 5/9 corresponds to 56%. The figure therefore shows how often each type of evidence appears within this matched subgroup. It should not be read as a general measure of what distal or proximal methods can do in all cases. Distal documentation is strong for spatial information and conditions that can be seen from outside. Site location or spatial extent is documented distally for all nine sites (100%). External structural damage is documented for 8/9 sites (89%), and damage date or sequence for 7/9 sites (78%).

Landscape or urban-context change is also high, at 7/9 sites (78%). These values show the importance of satellite imagery and other remote spatial sources for locating sites, identifying visible damage, and following change over time. Proximal documentation adds evidence that is harder to capture from a distance. Architectural morphology is documented proximally for 8/9 sites (89%), compared with 6/9 sites (67%) in distal sources. The difference is larger for material deterioration: proximal sources cover 8/9 sites (89%), while distal sources show 0/9. Proximal sources also document interior damage in 5/9 sites (56%) and construction techniques or fabric in 3/9 sites (33%), two dimensions with no qualifying distal evidence. The same pattern appears in social and use-related evidence. Current use and access are documented proximally for all nine sites (100%), but they do not appear in the qualifying distal records. Community practices are documented proximally for 5/9 sites (56%) and distally for 0/9. Intangible or religious significance remains weak even in the proximal record, with only 1/9 site (11%). This means that combining distal and proximal sources improves coverage, but it still does not produce a complete account of cultural meaning. The lines between circles and squares show the gap between distal and proximal coverage for the same evidence dimension. These gaps are differences in coverage, measured in percentage points. They do not show that one method is more accurate or more valuable than the other. A value of 0% only means that no qualifying documented-present record was found in this corpus. It does not mean that the condition was absent, or that the method could never document it.

Overall, Figure 10 shows complementary but uneven evidence profiles. Distal sources are especially useful for spatial extent, visible damage, and temporal change. Proximal sources broaden the record by adding material condition, interior damage, use, and community practices. The results apply to the nine matched Syrian sites and to the filtered records used here. Differences in source availability and documentation intensity may also shape the pattern, so the contrast should not be attributed to technology alone.

Figure 11 breaks down the same Syrian evidence by technology category. The subgroup is still the same nine matched sites, and the same certainty filter is used. Each cell reports both the number of sites and the percentage of the subgroup with at least one qualifying documented-present record for that technology and evidence dimension.

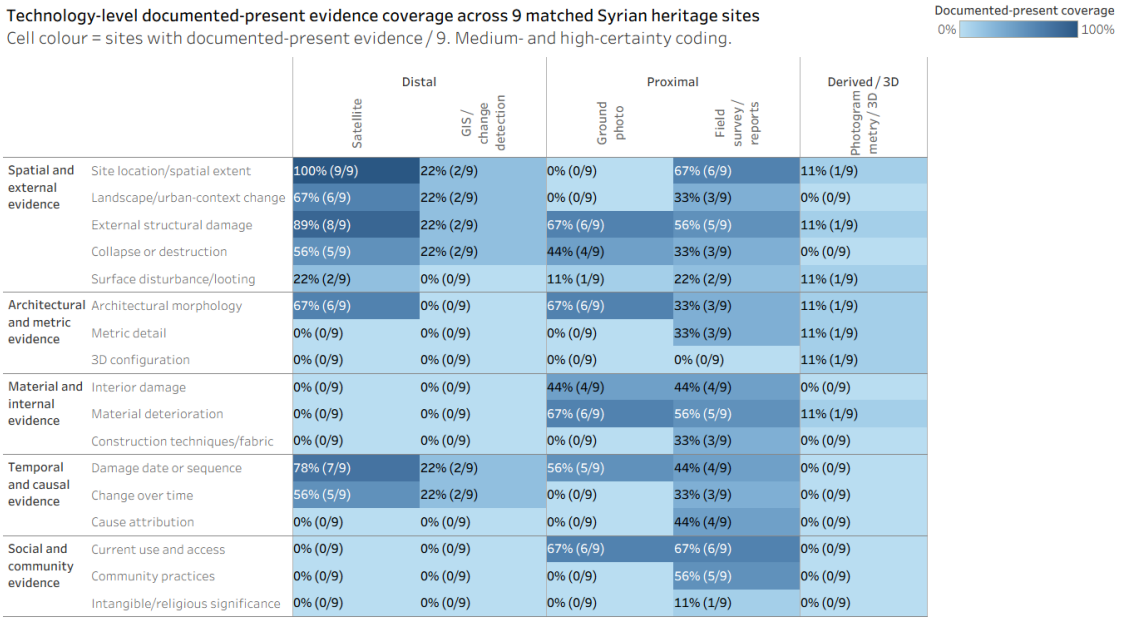

Figure 11. – Technology-level documented-present evidence coverage across 9 matched Syrian heritage sites. Rows represent evidence dimensions, grouped by analytical category, and columns represent documentation technologies. Cell colour indicates the share of sites with at least one qualifying documented-present record for each technology–dimension combination. Blank or zero-value cells indicate that no qualifying documented-present evidence was recorded. Percentages are descriptive and refer only to medium- and high-certainty records in the thesis dataset. Author's elaboration in Tableau based on the thesis dataset.

The heatmap therefore shows how widely each technology contributes evidence within this corpus. A darker cell means broader coverage among the nine sites. The values depend on which technologies were actually represented in the sources, as well as on what those sources recorded. They should not be read as a test of technical performance in isolation. Satellite imagery explains much of the distal coverage in Figure 10. It documents site location or spatial extent for 9/9 sites (100%), external structural damage for 8/9 (89%), and damage date or sequence for 7/9 (78%). It also covers landscape or urban-context change and architectural morphology for 6/9 sites (67%). GIS and change detection are more limited in this Syrian subgroup, usually reaching 2/9 sites (22%) where they appear. The proximal technologies show different strengths. Field surveys and reports document site location and current use or access for 6/9 sites (67%). They also document community practices for 5/9 sites (56%) and damage-cause attribution for 4/9 sites (44%). This means that field-based reporting contributes not only physical

observations, but also information about use, local practices, and interpretation of damage. Ground photography mainly strengthens the documentation of visible physical conditions. It records external structural damage, material deterioration, architectural morphology, and current use or access for 6/9 sites (67%). It also documents interior damage and collapse or destruction for 4/9 sites (44%). These values help explain why the proximal group performs strongly in architectural and material dimensions in Figure 10. Photogrammetry and 3D documentation have a much narrower presence in this subgroup. Qualifying evidence appears for only 1/9 site (11%) in selected dimensions, including site location, external structural damage, architectural morphology, metric detail, three-dimensional configuration, and material deterioration. This limited coverage means that 3D methods contribute useful detail in specific cases, but they are not widely represented across the nine Syrian sites included here.

Taken together, the heatmap shows which technologies produce the aggregate pattern in Figure 10. Satellite imagery provides the broadest spatial and external damage coverage. Field surveys and reports add contextual and use-related evidence. Ground photography supports records of visible condition and material deterioration. Photogrammetry and 3D documentation add detailed evidence for a small number of cases. The weakest dimension remains intangible or religious significance, which appears in only 1/9 sites (11%) in the proximal aggregate record.

2.3.4 Governance composition by technology

The digital heritage ecosystem is not only a system for producing evidence; it is also a structure of governance. Different actors participate in this process with different degrees of authority. International organizations define protection norms, reporting procedures, and institutional frameworks. National heritage authorities preserve formal mandates and long-term knowledge of sites and collections. Universities, NGOs, and technical companies often provide databases, geospatial analysis, digital modelling, and public interfaces. Local and diaspora actors may contribute photographs, memories, contextual knowledge, and practical labor. These roles can overlap, but they do not carry the same power over documentation, interpretation, access, and reuse. Governance

therefore concerns not only who documents heritage, but also who defines research questions, controls imagery and servers, designs metadata, validates interpretations, manages access, and decides how digital records may later be used for conservation, publication, legal accountability, or reconstruction. For this reason, data access cannot be understood as a simple opposition between openness and restriction. Open data can support transparency, verification, and reuse, but the unrestricted publication of precise coordinates may expose vulnerable sites to looting or further targeting. Restricted access can protect sites, witnesses, and sensitive information, but it can also concentrate interpretive power in institutions with the necessary funding, credentials, and technical infrastructure. Casana and Laugier[89], for example, note that raw site locations could not be released openly because of security risks. The key question is therefore not whether data are open or closed in absolute terms, but whether restrictions are proportionate, clearly explained, reviewable, and accompanied by fair mechanisms of access. This issue is especially important in relation to digital colonialism, because Syrian heritage is often digitized, reconstructed, copyrighted, and exhibited through institutions located outside Syria, while Syrian communities may have limited control over categories, narratives, platforms, and future reuse.[90]

Figure 12 examines how the documented composition of governance varies across technological groups. The analysis concerns 39 explicitly verified project-method associations rather than 39 independent projects. A single initiative may therefore appear more than once when it employs several documentation methods.

The figure identifies descriptive associations within the selected corpus; it does not establish that a particular technology causes a specific governance arrangement. Across the 39 project-method associations, academic or expert-led actors account for 14 cases, or 35.9%, while international institutions account for 11, or 28.2%. National heritage authorities account for five associations, or 12.8%, local or community-led governance for four, or 10.3%, and other or unclear arrangements for five, or 12.8%. These totals

[89] Casana and Laugier, “Satellite Imagery-Based Monitoring,” e0188589.

[90] Stobiecka, “Archaeological Heritage in the Age of Digital Colonialism,” 113–125.

indicate that almost two-thirds of the documented associations are situated within international or specialist governance environments. They do not, however, represent the number of unique projects, because initiatives using several methods contribute more than one association.

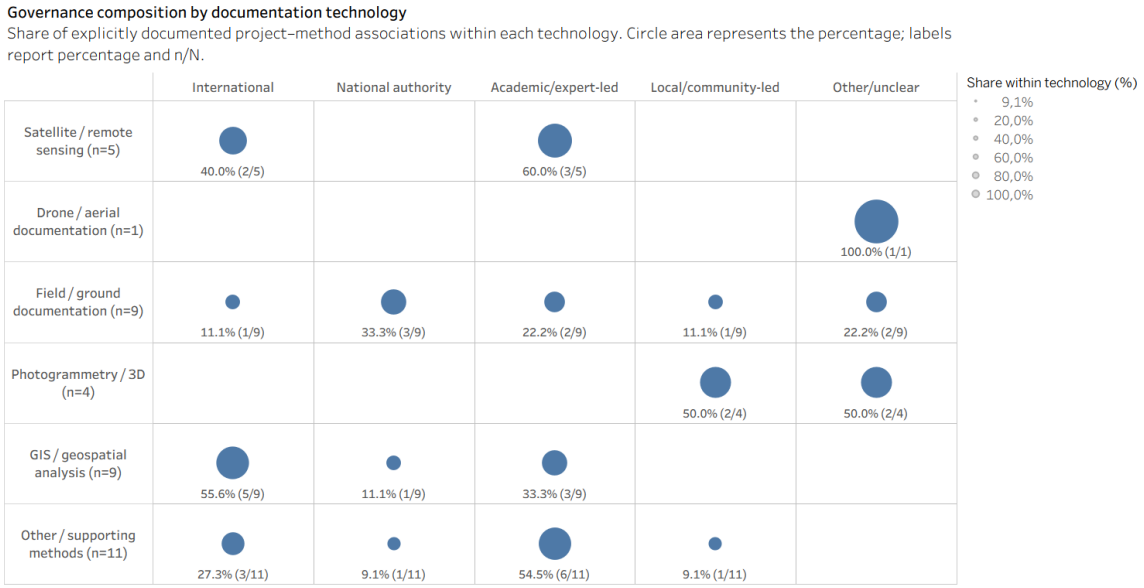

Figure 12. –Governance composition by documentation technology. Rows represent documentation technologies and columns represent governance regimes. Circle area is proportional to the share of explicitly documented project–method associations attributed to each governance regime within the corresponding technology; labels report percentage and n/N. Blank cells indicate that no qualifying association was documented. Percentages are descriptive, and values based on fewer than five associations should be interpreted cautiously. Author's elaboration in Tableau based on the thesis dataset.

The distribution varies across technological groups. All five satellite or remote-sensing associations fall within international or academic/expert-led governance: two are international-institutional and three academic or expert-led. GIS and geospatial analysis show a similar concentration. Of the nine associations, five are international-institutional, three academic or expert-led and one connected to a national heritage authority. Field and ground documentation display a more heterogeneous composition. Among nine associations, national heritage authorities account for three, academic or expert-led and other or unclear arrangements for two each, and international-institutional and local or community-led governance for one each. Photogrammetry and 3D documentation present

a different distribution: two of the four associations are classified as local or community-led and two as other or unclear. The denominator, however, is too small to support a general conclusion about this technological group. The same caution applies even more strongly to drone or aerial documentation, which is represented by only one association. Percentages for these groups remain descriptively correct, but they should not be treated as equivalent in evidentiary weight to percentages calculated from larger denominators.

The main result is therefore a descriptive association between technological method and governance composition. Satellite and GIS documentation are concentrated within international and expert-led regimes, whereas field documentation involves a wider range of institutional actors. This pattern is consistent with differences in access to imagery, infrastructure, specialist expertise, storage capacity and professional interpretation, but the figure alone cannot establish that these factors caused the observed distribution. The analysis also does not demonstrate that internationally or academically governed documentation is inherently less legitimate, participatory or reliable. In the Syrian conflict, these infrastructures have often enabled monitoring where direct access was dangerous or impossible. The narrower conclusion is that control over documentation technologies is unevenly distributed and that this distribution can influence who is able to produce, validate, manage and circulate particular forms of evidence. Technology and governance should therefore be examined together, while remaining analytically distinct from documentary quality and decision-making authority.

2.3.5 Public participation and decision-making authority

Technological coverage and institutional diversity do not by themselves demonstrate that documentation is participatory. A project may make its results publicly accessible or invite users to contribute photographs while retaining institutional control over site selection, metadata, verification, licensing and long-term reuse. For this reason, Figure 13 separates participation depth from documented decision-making authority.

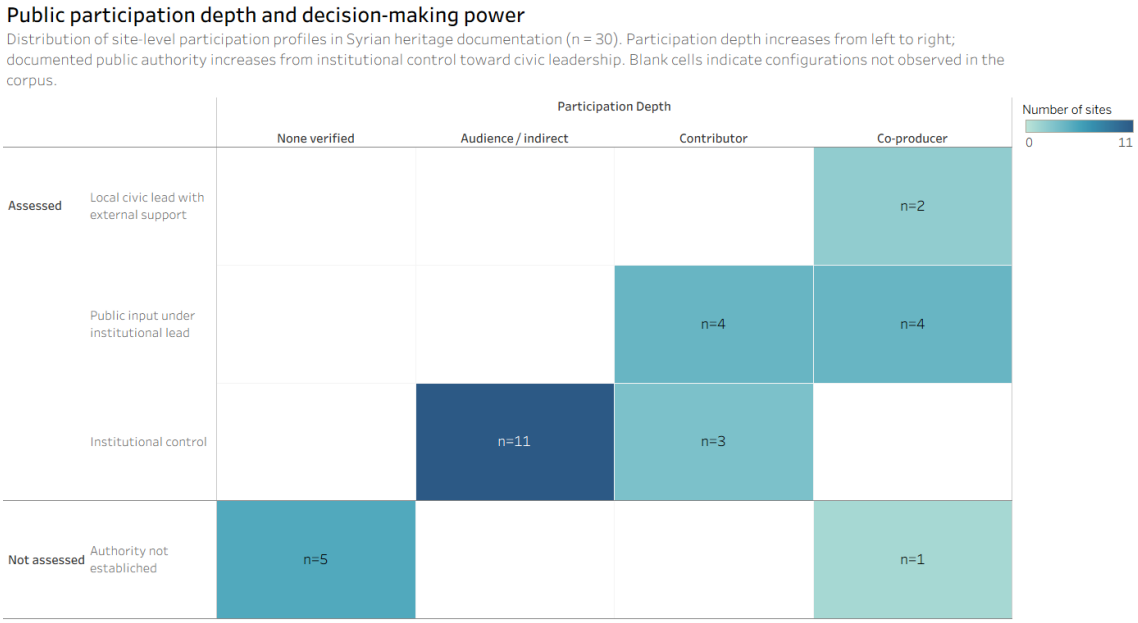

Figure 13. – Public participation depth and documented decision-making authority across the 30-site Syrian heritage corpus. Participation depth increases from left to right, while documented authority increases from institutional control towards local civic leadership. No verified participation identifies an assessable record without documented qualifying participation; authority not established indicates insufficient public evidence. Blank cells represent combinations not observed in the corpus. Author's elaboration in Tableau based on the thesis dataset.

The two axes represent distinct analytical dimensions. Participation depth records how people are involved in producing, contributing to or engaging with documentation, whereas decision-making authority records who can influence the organization, interpretation, control and reuse of that documentation. No verified participation identifies an assessable case in which no qualifying involvement was documented. Authority not established identifies a different condition: the available public evidence was insufficient to determine where decision-making power was located. Neither category should be treated as evidence that participation or local influence was absent.

Across the 30 sites, five have no verified participation, 11 are associated with audience or indirect participation, seven with contributor roles and seven with co-production. Public involvement is therefore visible in a substantial part of the corpus, but the distribution of decision-making authority is more concentrated. For six sites, authority could not be established from the available evidence. Among the remaining 24 cases, 14 are under institutional control, eight include public input within institutional leadership,

and only two combine co-production with local civic leadership supported by external actors.

The overall distribution reveals a participation–power gap: public involvement becomes visible across several levels of the documentary process, but documented authority remains predominantly institutional. Institutional control therefore accounts for 58.3% of the cases for which decision-making could be assessed. Local civic leadership represents only 8.3% of the assessed cases, or 6.7% of the full 30-site corpus. The joint distribution makes the distinction even clearer. Eleven sites combine audience or indirect participation with institutional control, and another three combine contributor participation with institutional control. Four contributor cases and four co-production cases include public input while remaining under institutional leadership. Only two sites combine co-production with documented local civic leadership. The result is a clear participation–power gap. Participation in the production or circulation of heritage information is considerably more common than documented authority over the system in which that information is used. Viewing a digital reconstruction, submitting a photograph, contributing memories or assisting in data collection can all be meaningful forms of participation, but they should not automatically be described as shared governance. This concentration of authority requires contextual interpretation. Heritage documentation during armed conflict has to protect vulnerable sites, individuals and sensitive information, and material intended for conservation or accountability may require professional verification. Institutional leadership is therefore not inherently problematic.

The central question is therefore not whether institutions should participate, but whether their participation creates real opportunities for local actors to influence decisions. In Arnstein's terms, moving from information or consultation toward partnership requires a redistribution of authority, not simply a larger number of contributors [91] . Contributions such as crowdsourced photographs, memories, or interactive digital content can be valuable, but they should not be described as co-governance unless local actors also have documented decision-making power. This matters because local communities may hold forms of knowledge that cannot be

[91] Arnstein, "A Ladder of Citizen Participation," 216–224.

recovered through satellite imagery, institutional reports, or external expertise, including religious meanings, former uses, oral histories, memories of displacement, repair priorities, and changing relationships with damaged places. When this knowledge is collected without giving its producers meaningful influence over interpretation and reuse, participation risks becoming extractive rather than genuinely collaborative. [92] The six cases in which authority could not be established also require caution. They do not show that local actors lacked influence. They show that the available public documentation does not allow that influence to be demonstrated. Informal collaboration, uncredited local work, community consultation or diaspora involvement may exist without being clearly recorded in project documentation. As with the coverage matrix, absence of public evidence must therefore remain distinct from evidence of absence.

The principal conclusion from Figure 13 is consequently that public involvement in Syrian heritage documentation is more common than public leadership. From this perspective, the few locally led co-production cases are especially significant because they show that another model is possible: external expertise can support documentation while local civic actors retain a meaningful role in guiding it. This distinction also aligns with Grcheva and Oktay Vehbi's argument that co-creation should be distinguished from late-stage consultation or passive involvement.[93] The finding supports a distinction that is especially important for Public Humanities: access and contribution matter, but participation should also be evaluated according to who can shape the object of knowledge and determine how the resulting digital record will be interpreted, preserved and reused.

2.3.6 Damage Severity and Documentary Visibility

Using the Documentary Visibility Score defined in Section 2.2, this section examines the relationship between the level of public documentation available for each site and the recorded severity of physical damage in the Syrian corpus. The aim is not to establish a

[92] Stobiecka, "Archaeological Heritage in the Age of Digital Colonialism," 113–125.

[93] Grcheva and Oktay Vehbi, "From Public Participation to Co-Creation," Article 9321.

causal relationship between documentation and damage, but to understand whether the two dimensions show any visible pattern of association. In particular, the analysis considers whether sites with higher documentary visibility tend to correspond to lower levels of damage, which could suggest a possible protective effect, or whether documentary visibility is distributed across different material conditions in a less systematic way. As shown in Figure 14, the Syrian corpus does not reveal a clear progressive relationship between Documentary Visibility Score and damage severity.

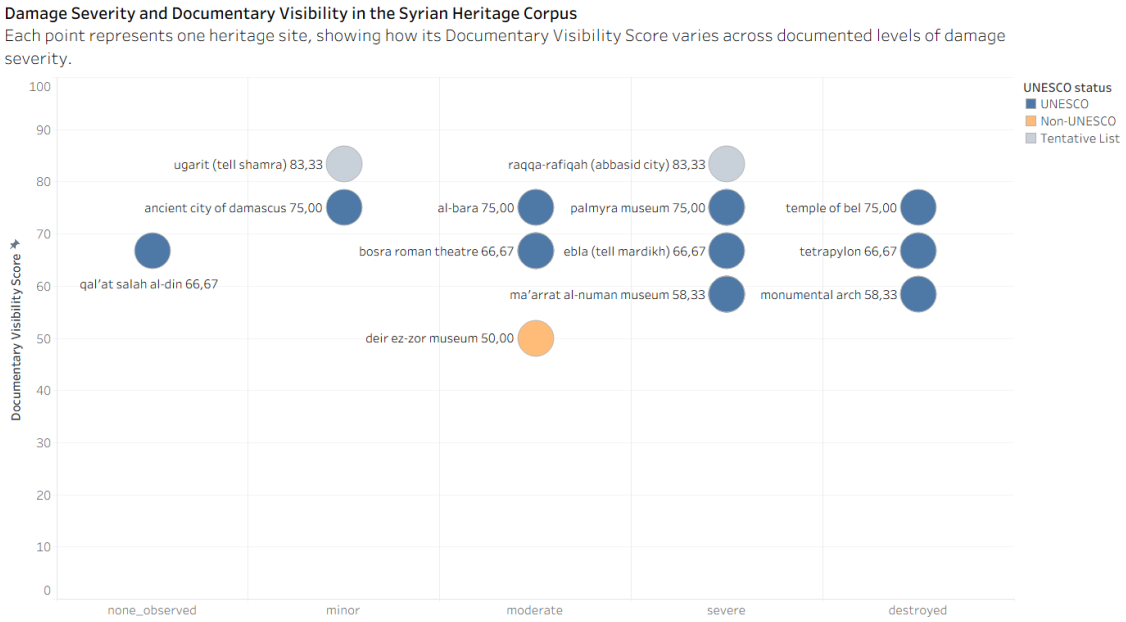

Figure 14. – Damage severity and documentary visibility in the Syrian heritage corpus. Each point represents one heritage site positioned according to its recorded damage-severity category and Documentary Visibility Score (0–100), calculated from source breadth, public traceability and method breadth. Colours distinguish UNESCO and non-UNESCO sites. Overlapping marks indicate that multiple sites may share the same damage category and visibility score. Author's elaboration in Tableau based on the thesis dataset.

Highly documented sites are found across several damage categories, while sites affected by similar levels of damage often display different degrees of documentary visibility. For example, sites classified as having minor damage already record relatively high scores, such as the Ancient City of Damascus, with 75.00, and Ugarit, with 83.33, one of the highest values in the corpus. At the same time, the moderate-damage category includes a wider range of documentary positions, from Deir ez-Zor Museum, which records 50.00,

to Bosra Roman Theatre, with 66.67, and Al-Bara, with 75.00. This indicates that the same level of recorded damage does not necessarily correspond to a similar level of public documentation. A comparable pattern can be observed among severely damaged and destroyed sites. Ma'arrat al-Numan Museum records a Documentary Visibility Score of 58.33, while Ebla reaches 66.67, Palmyra Museum 75.00, and Raqqa-Rafiqah 83.33. These differences within a single damage category show that severe physical damage does not produce a uniform documentary profile. Similarly, destroyed monuments such as the Monumental Arch of Palmyra, the Tetrapylon and the Temple of Bel do not form a separate high-visibility group, since their scores overlap with those of sites classified as moderately or severely damaged. Conversely, Qal'at Salah al-Din, where no damage was observed, still records a relatively high score of 66.67. UNESCO status adds another descriptive layer, but it does not fully explain the distribution. World Heritage sites generally occupy medium-to-high levels of documentary visibility, yet the highest scores are not limited to formally inscribed sites, as Tentative List sites such as Ugarit and Raqqa-Rafiqah also reach very high values.

Overall, the comparison suggests that documentary visibility and material damage followed partly independent patterns within the selected Syrian corpus. Higher documentary visibility did not correspond to lower damage severity, nor did the most damaged sites consistently appear as the most visible in the public record. This does not allow conclusions about military intentions, targeting decisions or the actual protective effects of documentation, which cannot be reconstructed from these data. Rather, the result reinforces one of the central arguments of the thesis: material condition and documentary condition must be treated as distinct analytical dimensions. The public documentary record should not be read either as a direct map of destruction or as an indicator of protection. It reflects a separate infrastructure of institutional attention, research activity, monitoring priorities, methodological coverage and public traceability. In this sense, the analysis also contributes to the broader discussion of visibility bias, showing that the sites most visible in documentation are not necessarily those least vulnerable, nor those most severely affected.

2.3.7 Heritage Type and Documentary Visibility

As a complementary step, the relationship between heritage type and documentary visibility was also examined in order to assess whether certain categories of heritage appeared more prominently in the public documentary record than others. As in the previous analysis, heritage type is treated here as a descriptive category rather than as an explanatory variable, since the corpus is unevenly distributed and some categories include only a limited number of cases. The distribution shown in Figure 15 does not indicate a clear hierarchy in which one heritage category is consistently more visible than the others.

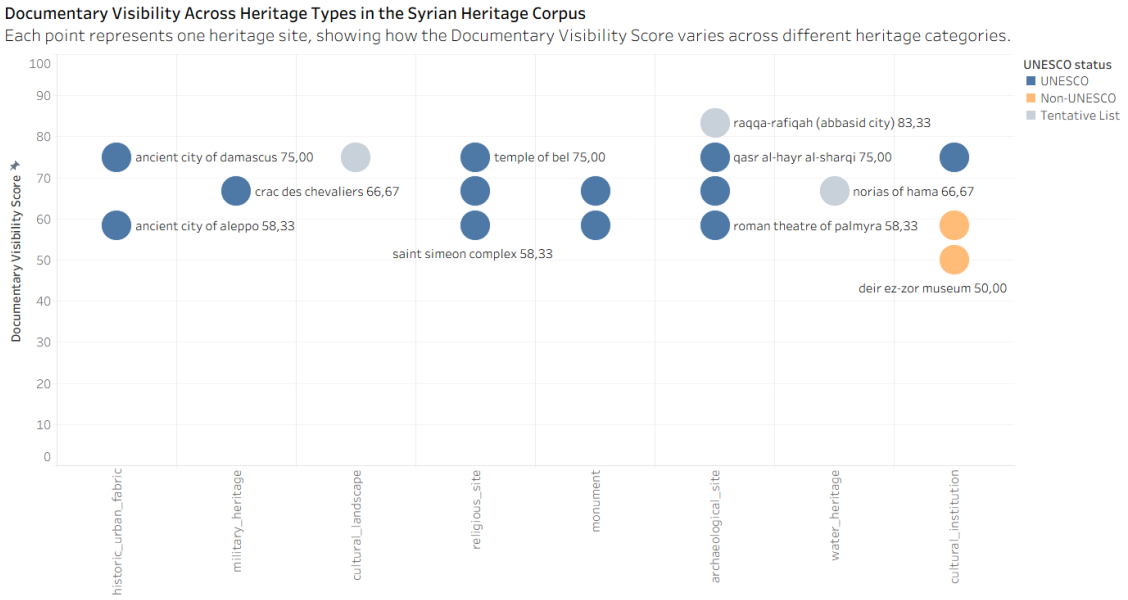

Figure 15 – Documentary visibility across heritage types in the Syrian heritage corpus. Each point represents one heritage site positioned according to its broad heritage category and Documentary Visibility Score (0–100). Colours distinguish UNESCO World Heritage sites, sites on the Tentative List and non-UNESCO sites. The figure shows the distribution and within-category variation of documentary visibility across the selected heritage types; categories represented by only one or a few sites should be interpreted cautiously. Author's elaboration in Tableau based on the thesis dataset.

Instead, several categories occupy overlapping ranges of the Documentary Visibility Score. Historic urban fabric, for example, ranges from 58.33 for the Ancient City of Aleppo to 75.00 for the Ancient City of Damascus, while religious sites and archaeological sites also extend across similar portions of the visibility scale. Archaeological sites include some of the highest values in the corpus, such as Raqqa-

Rafiqah at 83.33, but they also include sites with lower scores. Cultural institutions show a comparable internal variation, ranging from Deir ez-Zor Museum at 50.00 to higher values around 75.00. These overlaps suggest that documentary visibility was not determined simply by the type of heritage considered. Some differences between categories remain visible, but they must be interpreted with caution. Categories such as military heritage, cultural landscape and water heritage are represented by only one or a few cases, meaning that their position in the graph reflects individual site histories more than stable category-level patterns. UNESCO status also does not produce a consistent explanation across heritage types. In some cases, formally inscribed sites appear highly visible; in others, Tentative List or non-UNESCO sites reach equal or higher scores than World Heritage properties. This confirms that neither typology nor institutional status alone is sufficient to explain why some sites become more visible than others in the public documentary record.

The analysis is therefore useful precisely because it shows that documentary visibility was not organized according to a simple typological hierarchy. Rather than being determined by heritage type alone, visibility appears to have been shaped by a combination of project selection, institutional priorities, research traditions, available technologies, monitoring practices and the specific documentation histories of individual sites. This finding complements the previous comparison with damage severity. While that analysis showed that greater documentary visibility did not correspond to a clear protective pattern, the present one shows that visibility was also not distributed straightforwardly according to heritage category. Together, the two results support the broader argument of the thesis: documentary visibility is produced through selective documentary infrastructures and cannot be treated as a direct reflection of either material condition or heritage type.

2.4 Synthesis and implications

The chapter's findings can be summarized in seven connected claims:

- **Documentary reach is not equivalent to evidentiary depth.** The initiatives with the broadest presence across the 30-site corpus are often those that provide partial or general coverage rather than detailed site-specific documentation. By contrast, narrower projects tend to focus on a smaller number of places but often produce more direct, technically precise, or methodologically specialized records. This distinction shows that a high level of coverage should not automatically be interpreted as stronger evidence: breadth and depth represent different forms of documentary value.
- **Documentation technologies generate patterned but complementary evidentiary asymmetries.** Distal methods are particularly effective for documenting spatial extent, landscape transformation and change over time across inaccessible or dangerous areas. Proximal methods provide stronger coverage of interiors, material deterioration, construction details, present use and access, and contextual or causal evidence. These differences do not constitute a hierarchy of technological quality. They demonstrate that no single method can produce a complete heritage record.
- **The distal-proximal distinction remains visible, but not uniformly, under more controlled comparisons.** When the analysis is restricted to the nine sites documented through both technological families, the principal division between spatial and temporal reach on the distal side and material and contextual depth on the proximal side remains visible. This indicates that the pattern is not produced solely by differences in site composition. The high-certainty analysis supports a narrower set of contrasts because several dimensions become unavailable or move closer to zero. It therefore strengthens the evidentiary basis of specific claims rather than confirming the complete pattern.
- **Method and governance are descriptively associated within the corpus.** Satellite and GIS-based documentation is concentrated mainly within international and academic or expert-led governance, while field documentation involves a broader range of institutional actors. The smaller technological groups

must be interpreted cautiously because their percentages are based on limited denominators. The observed distribution does not establish causation, but it shows that access to documentation methods and infrastructures is institutionally uneven and can shape who is able to produce, manage and circulate particular forms of evidence.

- **Public participation is more common than public decision-making power.** Several projects allow communities or wider publics to contribute photographs, memories, information, or digital content, but these forms of participation do not necessarily translate into authority over research questions, metadata, interpretation, access, licensing, or reuse. Even where contribution or co-production is present, institutional actors often retain control over the main decisions. The key distinction is therefore between participation in producing content and participation in governing the knowledge that is produced.
- **Physical damage and documentary visibility are not equivalent**. Higher documentary visibility was not systematically associated with lower recorded damage severity. Highly documented sites occurred across very different material conditions, including severe damage and destruction. The selected corpus therefore did not reveal a clear protective pattern in which more documentarily visible sites were consistently less affected.
- **Documentary visibility was not distributed according to a clear hierarchy of heritage types.** Broad categories overlapped substantially, and sites belonging to the same category could occupy different positions in the documentary record. Heritage type therefore did not, by itself, explain documentary attention within the selected Syrian corpus.

Taken together, these findings show that digital heritage monitoring in conflict is indispensable, but not self-sufficient. Its scientific strength depends on triangulation, provenance, transparent uncertainty, and a careful distinction between what is observed, inferred, modelled, and absent. Its ethical strength depends on proportional data protection, reciprocal access, acknowledgement of local and professional labor, and more balanced forms of interpretive authority. Future research should therefore expand the corpus beyond internationally prominent and highly visible sites, test alternative

weighting systems, make denominators and uncertainty thresholds explicit, and examine the independence of sources more systematically. It should also include interviews with Syrian professionals, local communities, and diaspora participants, whose knowledge is often difficult to capture through remote or institutional documentation alone. More broadly, the chapter argues that digital documentation should move beyond the detection of visible damage. Satellite imagery, GIS, databases, 3D models, and digital archives are essential tools, but they need to be combined with field-based, archival, and community-grounded knowledge. Only through this combination can the Syrian heritage record account not only for destruction as visible change, but also for material condition, cultural meaning, memory, and the possibilities of recovery.

3 DOCUMENTING UKRAINIAN CULTURAL HERITAGE IN WAR: DATA ECOSYSTEMS, TECHNOLOGIES AND PARTICIPATION

The Russian–Ukrainian war has profoundly changed the conditions in which cultural heritage is protected, documented and interpreted. Since the occupation and attempted annexation of Crimea and the beginning of armed conflict in eastern Ukraine in 2014, and especially since the full-scale invasion of 24 February 2022, monuments, archaeological sites, museums, archives, libraries, religious buildings and historic urban areas have been damaged, destroyed, looted or made inaccessible.[94] The threat extends beyond the physical fabric of monuments and collections. Institutional catalogues, archival records, databases, websites and the specialist knowledge held by displaced museums, archives and heritage professionals may also disappear or become inaccessible.[95] Documentation has consequently become an integral part of emergency heritage protection: it can establish what existed before an attack, record subsequent transformations, support conservation decisions and contribute to future reconstruction, restitution, criminal investigation and public remembrance. Digital documentation is particularly important where direct access to damaged or occupied sites is impossible, since digital images, archived websites, geospatial records and three-dimensional models can preserve information that may otherwise disappear.[96] In this context, documentation is not simply an administrative or technical activity, instead, it influences what evidence survives, how

[94] Svitlana Ivanysko, Gennadii Kazakevych, and Pavlo Shydlovskyi, "Cultural Heritage in the Russo-Ukrainian War: A Victim in the Conflict," *Complutum* 35, no. 1 (2024): 191–214; Natalia Moussienko, "Cultural Heritage of Ukraine in the Context of the Russo-Ukrainian War," *Artistic Culture. Topical Issues* 19, no. 2 (2023): 40–52.

[95] Quinn Dombrowski, Anna Kijas, and Sebastian Majstorovic, "Digital Cultural Heritage Under Attack: Saving Ukrainian Cultural Heritage Online (SUCHO)," *Text and Image: Essential Problems in Art History* 1, no. 13 (2022): 6–12; Kiley Jolicoeur, "Saving Ukrainian Cultural Heritage Online and the Mission to Preserve Digital Cultural Heritage," *Museum & Society* 21, no. 2 (2023): 58–64.

[96] Jolicoeur, "Saving Ukrainian Cultural Heritage Online," 59–63; Fabio Remondino and Alessandro Rizzi, "Reality-Based 3D Documentation of Natural and Cultural Heritage Sites—Techniques, Problems, and Examples," *Applied Geomatics* 2 (2010): 85–100.

cultural loss is classified and which institutions retain the capacity to reconstruct the historical record after the conflict. The documentation of cultural heritage must therefore also be understood in relation to questions of identity, historical interpretation and political authority. The destruction of Ukrainian heritage takes place within a wider political context in which the legitimacy of an independent Ukrainian historical and cultural identity has itself been contested. Maria Mälksoo interprets Russia's invasion as a postcolonial moment in which Ukrainian political existence and Ukraine's right to define its own historical identity are directly challenged.[97] Natalia Moussienko similarly argues that cultural heritage protection has acquired a national-security dimension because military aggression has been accompanied by attempts to undermine cultural identity and historical continuity. [98] Simon Radchenko places the destruction, appropriation and misuse of Ukrainian cultural heritage within a longer history of Russian imperial approaches towards Ukraine.[99] From this perspective, cultural violence cannot be reduced to the physical destruction of buildings and monuments. It may also include the removal of museum collections from occupied territories, the reinterpretation of archaeological sites, the incorporation of Ukrainian cultural achievements into Russian historical narratives, and the use of cultural institutions as instruments of political representation. The protection of heritage consequently includes the preservation of documentary evidence through which these narratives may later be examined, challenged and corrected.[100]

The present conflict must also be situated within Ukraine's longer experience of cultural loss. During the Second World War, large numbers of monuments, archives, manuscripts, libraries, museum collections and works of art were damaged, destroyed or

[97] Maria Mälksoo, "The Postcolonial Moment in Russia's War Against Ukraine," *Journal of Genocide Research* 25, nos. 3–4 (2023): 471–481.

[98] Natalia Moussienko, "Cultural Heritage of Ukraine in the Context of the Russo-Ukrainian War," *Artistic Culture. Topical Issues* 19, no. 2 (2023): 40–52.

[99] Simon Radchenko, "Ukrainian Cultural Heritage at War through the Destructive Russian Actions," *Acta Archaeologica* 96, no. 1 (2026): 25–41.

[100] Ivanysko, Kazakevych, and Shydlovskyi, "Cultural Heritage in the Russo-Ukrainian War," 191–214; Radchenko, "Ukrainian Cultural Heritage at War," 25–41.

removed from Ukrainian territory. Datskiv and Nedoshytko show that post-war restitution was particularly difficult because Ukraine had limited independent representation within the international structures responsible for the recovery of displaced cultural property.[101] The consequences of cultural destruction may therefore continue for decades after military operations have ended. For this reason, the records created during the current war may have functions that extend well beyond emergency response. Reliable information about ownership, provenance, location, movement, physical condition, damage or destruction of cultural objects may later support conservation projects, restitution claims, reconstruction programmes, historical research or legal investigations. Fihurnyi further connects the preservation of cultural and historical evidence with the need to challenge politically motivated falsifications of Ukrainian history.[102]

Figure 16 – Donetsk Academic Regional Drama Theatre, Mariupol, before and after the attack of 16 March 2022. Left: pre-war aerial view, 1 May 2021, photograph by Oleksandr Malyon. Right: damage documented on 16 March 2022, photograph by the Donetsk Regional Military Administration. Licensed under CC BY-SA 4.0.

[101]Ihor Datskiv and Iryna Nedoshytko, "The International Dimension of the Loss of Ukraine's Historical and Cultural Heritage during the Second World War," *Humanitarian Studies: History and Pedagogy* 1 (2026): 43–55.

[102] Yurii Fihurnyi, "Preservation of Ukraine's Historical and Cultural Heritage during the Russo-Ukrainian War and Its Role in Refuting Russian Falsifications of Ukrainian History," *Ukrainian Studies* 2, no. 99 (2026): 216–233.

The Ukrainian case is particularly relevant to Digital and Public Humanities because the conflict threatens physical, digitized and born-digital heritage at the same time. Damage to a museum, archive or library can affect not only the building and collections but also inventories, catalogues, databases, digitized holdings, websites and the technical infrastructure through which these resources are organized.

Figure 17. – Ivankiv Historical and Local History Museum, Kyiv Oblast, photographed on 16 June 2022 following damage sustained during the Russian invasion. Source: Ministry of Culture and Information Policy of Ukraine, via Wikimedia Commons. Licensed under CC BY 4.0.

Websites and databases may disappear because of cyberattacks, damaged servers, electricity failures, interrupted hosting or the displacement of specialist staff. Digital records cannot replace destroyed objects or buildings. They can, however, preserve information about their previous appearance, location, ownership, cultural context and condition. Jolicoeur's analysis of Saving Ukrainian Cultural Heritage Online demonstrates how digital preservation became an emergency response almost immediately after the beginning of the full-scale invasion.[103] The war has also revealed

[103] Dombrowski, Kijas, and Majstorovic, "Digital Cultural Heritage Under Attack," 7–10; Jolicoeur, "Saving Ukrainian Cultural Heritage Online," 59–62.

structural weaknesses in heritage-management systems while accelerating new forms of collaboration. Digitization has remained uneven across institutions, inventories have not always been complete, and some organizations have continued to depend substantially on paper documentation. At the same time, the emergency has encouraged stronger cooperation among state institutions, civil society, international organizations, researchers and digital specialists. Bilovus describes this transformation as the emergence of a multilevel documentary environment in which institutional and digital forms of heritage preservation increasingly interact.[104]

The result is not one comprehensive database of Ukrainian cultural heritage but a layered documentary ecosystem. Ukrainian authorities, UNESCO and UNITAR–UNOSAT, the Smithsonian Cultural Rescue Initiative and Cultural Heritage Monitoring Lab, ICCROM, universities, Digital Humanities projects, museum professionals, volunteers and local communities all produce different kinds of evidence. Their records differ in geographical scope, unit of analysis, verification threshold, legal status, publication policy and frequency of update. A government register may record protected buildings and cultural infrastructure; an international monitoring organization may publish only incidents that have passed a defined verification procedure; satellite analysis may identify visible structural change; a web archive may preserve an institution's online presence without assessing the condition of its physical premises; and a participatory project may document objects or places that are absent from official heritage registers. Differences between reported totals should therefore not automatically be interpreted as errors. They often result from different definitions of heritage, different evidentiary

[104] Lesia Bilovus, "The Impact of the Russian-Ukrainian War on the System of Preservation and Restoration of Ukraine's Cultural Heritage: Institutional and Empirical Dimensions," *Library Science. Record Studies. Informology*, no. 3 (2025): 66–72; Lesia Bilovus, "Digital Documentation of Losses of Ukraine's Cultural Heritage in the Context of War: Information Resources and Recording Practices," *Library Science. Record Studies. Informology*, no. 1 (2026): 65–75.

standards and different units of observation. The Ukrainian documentary environment is consequently best understood as a set of complementary but only partially interoperable systems.[105]

This chapter examines the Ukrainian documentary environment through a purposive corpus of 30 heritage places. My objective is not to estimate the total scale of cultural destruction in Ukraine and not to rank organisations according to their effectiveness. Instead, I investigate how clearly public evidence can connect documentation initiatives to the selected sites, what kinds of evidence different technological methods can produce, and how public participation relates to documented decision-making authority. The quantitative results should consequently be understood as descriptive and exploratory. I interpret them together with institutional mandates, technological limitations, territorial accessibility and evidentiary uncertainty because a numerical value detached from these contexts could incorrectly transform limited public information into evidence of institutional inactivity. For the principal coverage analysis, I froze the site–initiative coding on 11 March 2026. Later institutional publications are used to explain the wider development or scale of individual programmes, but they are not used retroactively to alter the 30-site matrix. This temporal distinction is necessary because heritage documentation during an ongoing war remains continuously subject to revision.

3.1 Data ecosystems, web archiving, and participatory documentation

The documentation of Ukrainian cultural heritage during the war has developed through a complex data ecosystem involving national authorities, international organizations, universities, research centers, digital-humanities projects, heritage professionals, and local communities. These actors should be regarded as complementary rather than

[105] Bilovus, "Digital Documentation of Losses," 65–75; Shuai Wang et al., "Linked4Resilience: Linked Open Data for Data-Centric Resilience of Damaged Cultural Properties and Infrastructures in Ukraine," in *Proceedings of the 3rd International Workshop on Social Communication and Information Activity in Digital Humanities (SCIA 2024)*, CEUR Workshop Proceedings 3851 (2024): 1–10.

interchangeable because each produces evidence according to a different institutional mandate. UNESCO, working with UNITAR–UNOSAT, has developed one of the most publicly visible international systems for verifying damage to Ukrainian cultural heritage. Its methodology combines the comparison of credible sources, geographical identification, ground photographs and satellite imagery when suitable images are available.[106] The purpose of this procedure is not to reproduce every report of cultural loss but to establish a conservative body of incidents that meet defined evidentiary requirements. UNESCO and UNOSAT have also contributed to professional capacity building in Ukraine. In addition to remote assessment, the organizations have supported training in geospatial documentation and satellite-image interpretation for Ukrainian cultural-heritage professionals. More than 20 specialists took part in an advanced course in Lviv at the end of 2023, following an online workshop involving more than 160 cultural professionals.[107] This dimension is important because international involvement can contribute not only external evidence but also technical knowledge that remains within Ukrainian institutions. At the analytical point discussed in this chapter, UNESCO's public record reported 523 verified damaged cultural sites.[108] The total should be interpreted as a conservative verified count rather than an estimate of every cultural loss produced by the war. Access remains restricted in occupied or actively contested territories, suitable satellite images are not always available and remote assessment is structurally more

[106] UNESCO World Heritage Centre, "Endangered Heritage in Ukraine: UNESCO Reinforces Protective Measures," *UNESCO World Heritage Centre*, 8 March 2022, https://whc.unesco.org/en/news/2412.

[107] UNESCO, "UNESCO and UNOSAT Train Ukrainian Cultural Heritage Professionals on Using Satellite Imagery," *UNESCO*, published 4 December 2023, last updated 19 February 2024, https://www.unesco.org/en/articles/unesco-and-unosat-train-ukrainian-cultural-heritage-professionals-using-satellite-imagery.

[108] UNESCO, "Damaged Cultural Sites in Ukraine Verified by UNESCO," *UNESCO*, continuously updated online monitoring dataset, accessed 11 March 2026, https://www.unesco.org/en/articles/damaged-cultural-sites-ukraine-verified-unesco.The dataset was frozen for coding on 11 March 2026. The analytical matrix used in this thesis records the 523 sites reported on that date; later revisions constitute subsequent evidence and were not used to recode the corpus.

effective for visible external damage to immovable heritage than for internal damage, removed collections or intangible cultural practices. National reporting has a broader administrative scope.

In May 2026, the Ukrainian Ministry responsible for culture reported 1,783 damaged or destroyed cultural-heritage sites, including properties of national significance, local significance and newly identified sites. It separately reported damage to 2,540 cultural-infrastructure facilities.[109] The larger national total should not be read as contradicting the UNESCO figure. The two systems employ different legal categories, information sources and verification rules. Ukrainian authorities integrate national and regional administrative reporting, whereas UNESCO applies a narrower international verification methodology. The comparison demonstrates why apparently conflicting totals can both be valid within their respective documentary frameworks.

The Smithsonian Cultural Rescue Initiative and Cultural Heritage Monitoring Lab work at an even larger territorial scale. Their 2026 report examined a baseline of 29,061 Ukrainian cultural sites for the period from 24 February 2022 to 30 November 2025. The programme identified 4,383 sites with potential damage and confirmed damage to 702 through the combination of high-resolution imagery and open-source research.[110] The distinction between *potential* and *confirmed* damage is methodologically important. Satellite monitoring can screen extensive and inaccessible areas and create time-stamped records of visible change, but it remains less effective for subtle surface deterioration, interior conditions, displaced collections or intangible heritage. Remote observations therefore become more reliable when they can later be compared with ground photography, eyewitness material, institutional reporting or direct field assessment.

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[109] Ministry of Culture of Ukraine, "Russians Have Damaged 1,783 Cultural Heritage Sites and 2,540 Cultural Infrastructure Facilities," *Ministry of Culture of Ukraine*, 13 May 2026. This update postdates the frozen coding date of 11 March 2026 and is cited as subsequent contextual evidence rather than as part of the coded corpus.

[110] Hayden Bassett et al., *Damage to Cultural Heritage Sites in Ukraine: 24 February 2022 to 30 November 2025* (Washington, DC: Smithsonian Cultural Rescue Initiative and Cultural Heritage Monitoring Lab, 2026).

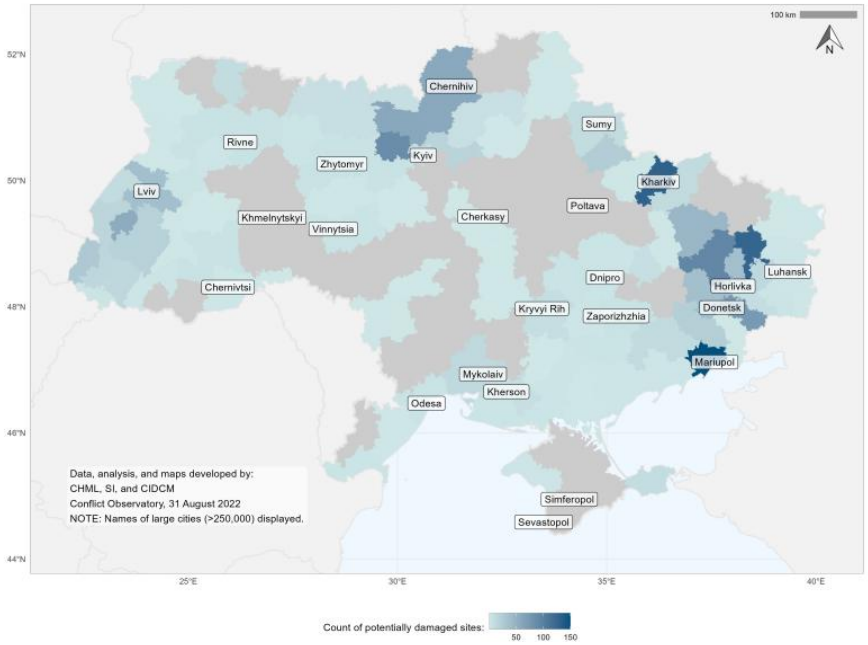

Figure 18. – Spatial distribution of Ukrainian cultural heritage sites identified as potentially damaged through remote monitoring, 24 February–31 August 2022. The map illustrates the geographically differentiated distribution of potential heritage impacts identified through the Cultural Heritage Monitoring Lab, Smithsonian Cultural Rescue Initiative and Center for International Development and Conflict Management. Source: Hayden F. Bassett et al., Potential Damage to Ukrainian Cultural Heritage Sites, 2022.

ICCROM's GIS-Based Risk Map employs a different documentary logic because it focuses not only on past damage but also on the anticipation of future risk. The initiative combines information about hazard probability, exposure and vulnerability in order to support emergency prioritization. In its first phase, the programme analysed more than 230 heritage sites in ten oblasts, involved more than 60 national and international partners, trained 25 Ukrainian cultural first aiders and supported field assessment at 18 sites in four high-risk oblasts.[111] The analytical value of this approach lies in the possibility of identifying a heritage place as vulnerable before it is physically damaged. Risk mapping can consequently inform emergency documentation, temporary stabilization, evacuation

[111] ICCROM, "ICCROM Launches GIS-Based Risk Map for Protecting Ukraine's Cultural Heritage," 31 January 2025, https://www.iccrom.org/news/iccrom-launches-gis-based-risk-map-protecting-ukraines-cultural-heritage

planning and protective intervention. However, its effectiveness remains dependent on the accuracy, currency and granularity of the underlying data.

3.1.1 Digital preservation, web archiving and three-dimensional documentation

Institutional damage monitoring represents only one component of the Ukrainian documentary ecosystem. Saving Ukrainian Cultural Heritage Online (SUCHO) was created immediately after the full-scale invasion by Anna Kijas, Quinn Dombrowski and Sebastian Majstorovic[112]. Its initial objective was to protect Ukrainian websites, digital collections and other online cultural resources from disappearance. [19] SUCHO developed a distributed volunteer workflow in which automated web-crawling techniques were combined with human identification, verification and metadata creation. The project eventually involved more than 1,500 volunteers and archived thousands of Ukrainian cultural websites and tens of terabytes of digital material. [113] The importance of SUCHO extends beyond scale. Contemporary institutional websites are technically complex and may depend on scripts, embedded media, external databases, social platforms and dynamic content that are difficult to preserve through automated crawling alone. Human review is therefore required to check capture quality, identify missing components and provide metadata needed for future interpretation. No archived website should automatically be treated as a complete reproduction of the original resource. Password-protected content, streaming services, interactive databases, social-media content and externally hosted resources may remain inaccessible. The reliability of a web archive therefore depends as much on the documentation of the preservation process as on the quantity of information captured. SUCHO also broadens the category of cultural heritage: its collections include not only major cultural institutions but also local museums,

[112] Quinn Dombrowski, Anna Kijas, and Sebastian Majstorovic, "Digital Cultural Heritage Under Attack: Saving Ukrainian Cultural Heritage Online (SUCHO)," *Text and Image: Essential Problems in Art History* 1, no. 13 (2022): 6–12.

[113] Saving Ukrainian Cultural Heritage Online (SUCHO), *Saving Ukrainian Cultural Heritage Online*, project website, unpaginated; see also Katherine Bowers, "Review: Saving Ukrainian Cultural Heritage Online," *Reviews in Digital Humanities* 6, no. 4 (2025).

educational resources, open-access publications, digital exhibitions and forms of born-digital cultural production. This broader approach is particularly significant from a Public Humanities perspective because it recognizes that cultural memory is also produced through local institutions and digital communities.

Memory Savers develops this principle through object digitization and local professional training. Between June and December 2023, the programme worked with 22 museums and cultural or historical institutions. Students and curators received training, equipment and practical support, and more than 10,000 cultural objects were made accessible online through cooperation with museum-digital.[114]Memory Savers should not be interpreted as a site-damage monitoring programme. Its significance lies in preserving collection-level information while simultaneously strengthening local digitization capacity. Training, equipment and metadata practices can contribute to institutional resilience even where the programme cannot be connected directly to a named physical heritage place in my corpus.

Backup Ukraine uses a different form of participatory documentation. Through smartphones and the Polycam platform[115], participants can create photographic image sets from which three-dimensional models of buildings, monuments, objects and other forms of cultural heritage can be generated. Garduño Freeman and Leibowitz describe the initiative as a form of real-time recording in which decisions about what deserves digital preservation are partly opened to citizens. [116]

[114] Saving Ukrainian Cultural Heritage Online (SUCHO), *Saving Ukrainian Cultural Heritage Online*, project website.

[115] Polycam is a proprietary cross-platform 3D-capture platform that supports photogrammetric reconstruction and, on compatible devices, LiDAR-based capture. See Polycam, "Backup Ukraine," *Polycam*.

[116] Cristina Garduño Freeman and Victoria Leibowitz, "Synchronous (In)significance: Recording Ukraine's Cultural Heritage in Real-Time," *Fabrications* 34, no. 2 (2024): 223–249

Figure 19. – Standard photograph and 3d scan generated using the polycam app by MaximKamynin of burntout residential buildings in Borodyanka, Ukraine. ©TBA - Maxim Kamynin &CNN. All backup Ukraine archive is under creative commons 4.4 Attribution.

The use of photogrammetry can preserve important information about geometry and visible surfaces, but community accessibility should not be confused with guaranteed metric accuracy. Image overlaps, lighting conditions, camera movement, scale control and processing methods all affect the resulting model. Remondino and Rizzi emphasize that reality-based 3D documentation must always be evaluated according to its capture procedure, expected accuracy and intended use.[117] A citizen-generated 3D model may therefore be extremely valuable as a documentary and participatory object without necessarily functioning as the equivalent of a professional architectural survey.

[117] Fabio Remondino and Alessandro Rizzi, "Reality-Based 3D Documentation of Natural and Cultural Heritage Sites—Techniques, Problems, and Examples," *Applied Geomatics* 2, no. 3 (2010): 85–100.

3.1.2 Participation, ethics and data sovereignty

Participation changes who can contribute to heritage documentation, but it does not remove the need for verification. Photographs, videos and social-media posts may contain incorrect dates or locations, may lose their original metadata and may reproduce claims that have not been independently confirmed. Major urban centers and digitally connected institutions also tend to leave more searchable public evidence than rural, occupied or institutionally marginal locations. The absence of online evidence is consequently not equivalent to proof that a site was not documented. Public silence may result from danger, restricted access, limited institutional resources, language differences or deliberate decisions not to disclose sensitive information. Security may directly conflict with openness. The publication of exact coordinates may expose vulnerable archaeological locations, museum stores or movable collections. Images may reveal the identities of museum professionals, witnesses or volunteers.[118]

The Berkeley Protocol on Digital Open-Source Investigations provides an important methodological framework for the ethical collection, verification, preservation and analysis of digital open-source information. It emphasizes provenance, verification, preservation of original material and protection against physical, digital and psychosocial risks. Applied to heritage documentation, these principles require researchers to distinguish clearly between what a source directly shows and what must be inferred from additional evidence. An image may demonstrate that a building has been damaged. It does not automatically establish the exact date of the event, the weapon responsible or the actor who caused it. Attribution usually depends on corroborating evidence.[119] Digital preservation also raises questions of data sovereignty. Internationally distributed storage can protect endangered Ukrainian data from physical destruction and cyberattack, but long-term control over those records cannot be considered merely a technical issue.
Institutions and communities need authority over description, access, licensing, reuse and eventual repatriation. SUCHO's emphasis on digital repatriation is significant because it frames international preservation as a temporary form of support rather than as permanent

[118] Human Rights Center and OHCHR, *Berkeley Protocol*, 31–40, 45–49

[119] Human Rights Center and OHCHR, *Berkeley Protocol*, 53–65.

external ownership.[120] International assistance becomes most sustainable when it strengthens Ukrainian professional infrastructures and decision-making capacities rather than creating new forms of technological dependency.

Initiative	Main actor	Method	Access	Main strength	Main limitation
UNESCO / UNITAR-UNOSAT	International organisations	Cross-checking, geolocation, ground and satellite imagery	Public lists and reports	Standardised, spatially comparable verification	Selective coverage; weak for hidden or movable damage
Ukrainian Ministry of Culture	National and local authorities	Registers and administrative reporting	Official lists and updates	Broad national and local coverage	Incomplete occupied-area data; broad categories
Smithsonian Cultural Rescue Initiative	International research network	Satellite monitoring and open-source analysis	Public reports; restricted datasets	Wide territorial screening and graded certainty	Limited for interiors, looting, and intangible loss
ICCROM GIS-Based Risk Map	ICCROM and Ukrainian partners	GIS, satellite, field data, and risk modelling	Institutional platforms and reports	Links evidence to emergency priorities	Selective and dependent on current data
SUCHO	Digital-humanities volunteer network	Web archiving, metadata, and distributed storage	Mixed public and restricted access	Preserves vulnerable born-digital heritage	Incomplete captures; rights and stewardship issues
Memory Savers	SUCHO and Ukrainian institutions	Digitisation, photography, metadata, and training	Participating institutions and platforms	Builds local capacity alongside documentation	Depends on equipment, staff, and maintenance
Backup Ukraine	Heritage organisations and volunteers	Smartphone photogrammetry and 3D modelling	Selected public models	Accessible, participatory recording	Uneven quality, metadata, and coverage
Community-based documentation	Residents, professionals, and diaspora	Photos, videos, testimonies, and local archives	Open or restricted	Captures local and everyday heritage	Verification gaps and unequal digital access

Table 3. – Comparative overview of selected initiatives documenting Ukrainian cultural heritage during the war.

[120] Bowers, "Review: Saving Ukrainian Cultural Heritage Online,"; see also SUCHO's project documentation concerning preservation, stewardship and digital repatriation.

3.2 Data analysis: coverage, technology and participation

The Ukrainian dataset organizes heterogeneous evidence within the framework used for Syria while adapting the variables to Ukraine's distinct historical, institutional and territorial conditions. The dataset records site characteristics, accessibility, monitoring initiatives, technologies, evidence, certainty, participation, governance and visibility. Because both the conflict and its documentation were evolving during the research, the dataset represents a defined temporal snapshot rather than a definitive account. Reports may be revised, access conditions may change and new information may emerge. I therefore recorded not only the presence of evidence but also its specificity, certainty and verification. I selected 30 heritage places through stratified purposive sampling, prioritizing analytical variety rather than statistical representativeness. [121] Matching the Syrian sample size established a consistent comparative framework without implying equivalence between the two corpora. The Ukrainian sample includes different heritage types, recognition levels, regions and access conditions.

As shown in Figure 20, the corpus extends across different parts of Ukraine and includes sites subject to markedly different access conditions, from places that remained comparatively accessible to locations affected by operational restrictions, proximity to active hostilities, occupation or severe limitations on physical access. The map therefore provides more than a geographical overview of the sample. It visualizes one of the conditions that may shape how heritage can be documented during war. Where direct access is possible, documentation may incorporate field observation, close-range photography, surveying or other proximal techniques. By contrast, restricted or occupied locations may depend more heavily on remotely acquired, externally produced or publicly available evidence. Access should not be treated as determining documentary practice on its own, but it constitutes an important contextual factor when interpreting differences in the type, quantity and certainty of evidence available for individual sites.

[121] Lawrence A. Palinkas et al., "Purposeful Sampling for Qualitative Data Collection and Analysis in Mixed Method Implementation Research," *Administration and Policy in Mental Health and Mental Health Services Research* 42, no. 5 (2015): 533–544.

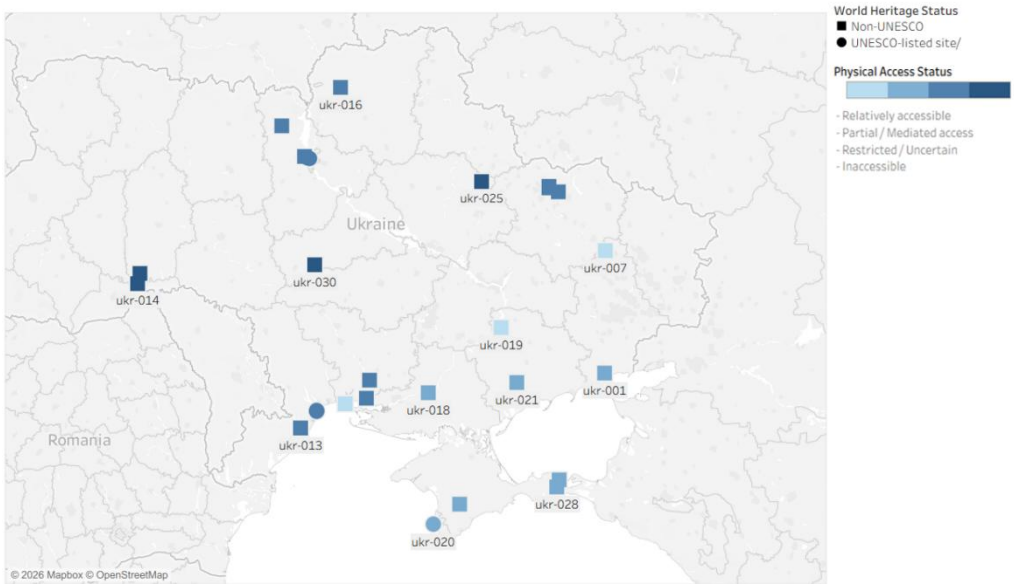

Figure 20. – Geographical distribution and physical access status of the 30 Ukrainian heritage places included in the research corpus. Point color represents the four analytical categories of physical access, ranging from accessible to occupied or inaccessible, while symbol styling distinguishes World Heritage properties or components from the other sites in the corpus. The prefix "UKR", followed by a numerical code, identifies each site in the dataset (UKR-001–UKR-030). Access conditions refer to the classification adopted at the dataset cutoff and should not be interpreted as a real-time operational assessment. Author's elaboration in Tableau based on the thesis dataset.

The map distinguishes sites associated with World Heritage properties from other places in the corpus. International recognition may affect institutional attention and visibility, although it does not guarantee more complete documentation. Including UNESCO and non-UNESCO sites, together with locations subject to different access conditions, allowed prominent monuments to be compared with less visible museums, archaeological sites and memorial places. The sample is not statistically representative; it was designed to examine whether documentation concentrates around internationally recognized, institutionally supported or accessible heritage. The unit of observation is the individual heritage place. I assigned each site a stable site_id linking all related reports, images and assessments, preventing multiple documents about the same site from being counted as separate cases. Evidence was collected from seven initiatives: UNESCO–UNITAR/UNOSAT, the Ukrainian Ministry of Culture, ICCROM, the Smithsonian Cultural Rescue Initiative and Cultural Heritage Monitoring Lab, SUCHO, Memory Savers and Backup Ukraine. Together, they cover international and national monitoring,

risk assessment, web archiving, digitization, 3D recording and citizen participation. Because these initiatives use different geographical units, classifications and publication practices, I harmonized their records while preserving their methodological differences.1 Site–initiative relationships were coded as *direct coverage*, *partial coverage*, *verified no coverage* or *unknown*. Direct coverage required a reliable site-level match; partial coverage referred to a related component, institution or broader area; verified no coverage required explicit evidence of exclusion; and unknown indicated insufficient public information. Separating *unknown* from *verified no coverage* prevented missing public evidence from being treated as proof of documentary absence. To maintain methodological comparability with the Syrian corpus, I applied the same operational definition of Documentary Visibility introduced in Section 2.2. The Ukrainian Documentary Visibility Score therefore combines normalized Source Breadth, Public Traceability and Method Breadth using the same weighting procedure. Damage severity, World Heritage status and physical accessibility remain external site characteristics rather than components of the score. As in Chapter 2, I used Tableau to analyze and visualize the coded dataset, ensuring methodological continuity while retaining the specificity of the Ukrainian case. 2 Tableau supported comparison and communication, but the reliability of the results remained dependent on source criticism and transparent coding. Within this framework, the Ukrainian analysis addressed the following research questions:

1. How publicly traceable are the relationships between the 30 selected Ukrainian heritage places and the seven monitoring and digital-documentation initiatives, and how does this traceability vary across initiatives?
2. What patterns of direct, partial and unknown relationships emerge across the site–initiative matrix, and what do they reveal about the interoperability and public identifiability of the Ukrainian documentary ecosystem?
3. Among the 23 heritage places documented through both distal and proximal methods, how do the two documentation modes differ in evidentiary coverage, and what complementary documentary affordances emerge from their comparison?

4. How does the depth of public and community participation relate to documented decision-making authority within the selected Ukrainian heritage corpus?
5. How are governance arrangements distributed across different documentation technologies, and which technological practices are more frequently associated with institutional, expert-led or local/community-led forms of governance?
6. Is higher documentary visibility associated with lower levels of recorded physical damage in the Ukrainian heritage corpus?
7. Does documentary visibility vary across heritage categories, suggesting different levels of documentary attention within the Ukrainian heritage corpus?

The empirical analysis proceeds through six stages. Sections 3.3.1 and 3.3.2 examine the public traceability of seven documentation initiatives, their site-level relationships and interoperability problems. Section 3.3.3 assesses the evidence produced by different technologies, while Section 3.3.4 compares distal and proximal methods across the 23 sites documented through both. Section 3.3.5 examines participation, decision-making authority and technology-related governance. Finally, Sections 3.3.6 and 3.3.7 examine documentary visibility in relation to two external site characteristics. Section 3.3.6 tests descriptively whether higher documentary visibility is associated with lower recorded damage severity, while Section 3.3.7 examines whether documentary visibility varies systematically across heritage categories. These analyses do not measure the total scale of cultural loss, rank organizations or support generalization to all Ukrainian heritage. Instead, they examine how 30 selected sites enter the publicly accessible documentary record, what different technologies reveal and how documentary authority is distributed. Although public evidence improves transparency, it excludes restricted material and may produce uncertain links because of alternative names, transliteration and differences in geographical scale. The study therefore measures the time-bounded public visibility of the selected sites rather than Ukraine's total documentation activity. By distinguishing direct, partial, verified no coverage and unknown relationships, the dataset makes both available knowledge and its limits systematically comparable with the Syrian case.

3.3 Data analysis: documentary coverage, technology and participation

3.3.1 Documentary coverage of Ukrainian heritage sites by monitoring initiatives

The first empirical finding concerns how easily documentation can be traced through publicly available sources. The percentages in Figure 21 do not measure the full amount of work undertaken by each organisation. They indicate how clearly the public records produced by each initiative can be linked to the 30 heritage places examined in this study. This distinction matters because the initiatives organise and publish their documentation in different ways.

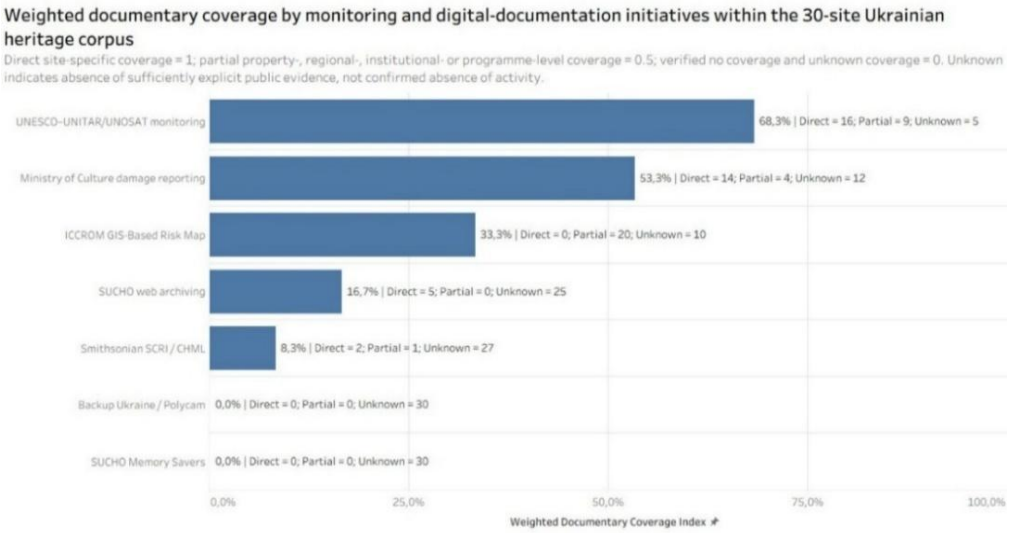

Figure 21. –Weighted documentary coverage by monitoring and digital-documentation initiative within the 30-site Ukrainian corpus. Direct site-level coverage = 1; partial property-, institutional-, regional- or programme-level coverage = 0.5; verified no coverage and unknown relationships = 0. Author's elaboration in Tableau based on the thesis dataset.

UNESCO–UNITAR/UNOSAT ranks highest in the weighted index at 68.3%, with 16 direct, nine partial and five unknown relationships. The Ukrainian Ministry of Culture follows at 53.3%, with 14 direct, four partial and 12 unknown cases. Their prominence reflects both institutional reach and the publication of records linkable to named sites. Together, they show the interaction between Ukrainian administrative authority and

international verification and geospatial expertise. ICCROM reaches 33.3%, but all 20 identified relationships are partial. Its GIS-Based Risk Map documents activity mainly at programme, institutional and territorial levels rather than providing an open catalogue of individual incidents. It therefore demonstrates broad programme reach but limited public site-level traceability. SUCHO scores 16.7%, with five direct and 25 unknown relationships. This primarily reflects a mismatch between data models: SUCHO archives websites and digital collections, whereas this corpus is organized around physical sites. Similarly, the Smithsonian reaches 8.3%, with two direct, one partial and 27 unknown relationships. Its low score results largely from aggregate publication practices and does not represent the full extent of its monitoring activity. Memory Savers and Backup Ukraine score 0% because all 30 relationships remain unknown under the strict site-linkage rule. Their outputs are organized around collections, institutions, contributors or individual models and cannot always be connected to the corpus identifiers. Although Memory Savers digitized over 10,000 objects with 22 institutions and Backup Ukraine supported citizen-generated 3D documentation, no defensible matches were established for the selected sites. [122] Zero therefore indicates unavailable site-level linkage, not an absence of documentation.

The result is therefore a measure of public traceability, not organizational effectiveness. I tested the sensitivity of this index by changing the treatment of partial relationships. When I exclude partial evidence completely, UNESCO covers 53.3% of the corpus, the Ministry 46.7%, SUCHO 16.7%, the Smithsonian 6.7% and ICCROM 0%. When I count partial relationships as equivalent to direct relationships, UNESCO rises to 83.3%, ICCROM to 66.7% and the Ministry to 60.0%. ICCROM changes most because all of its identified relationships are partial. The sensitivity analysis therefore confirms that the value of 0.5 assigned to partial evidence is a transparent convention rather than a natural measurement. The underlying counts should consequently remain visible whenever the weighted index is interpreted.

[122] SUCHO, "Memory Savers," *SUCHO*, accessed 11 March 2026, https://www.sucho.org/memorysavers; Garduño Freeman and Leibowitz, "Synchronous (In)significance," 223–249.

3.3.2 Actor-site coverage and interoperability

The actor–site matrix in Figure 22 shifts attention from initiative-level percentages to the individual relationships beneath them. Across the seven initiatives and 30 sites, the matrix records 37 direct, 34 partial and 139 unknown relationships. The symbols distinguish direct coverage, where a public record can be reliably linked to the site; partial coverage, where evidence refers to a related institution, component or wider area; and unknown, where public information is insufficient to establish a relationship.

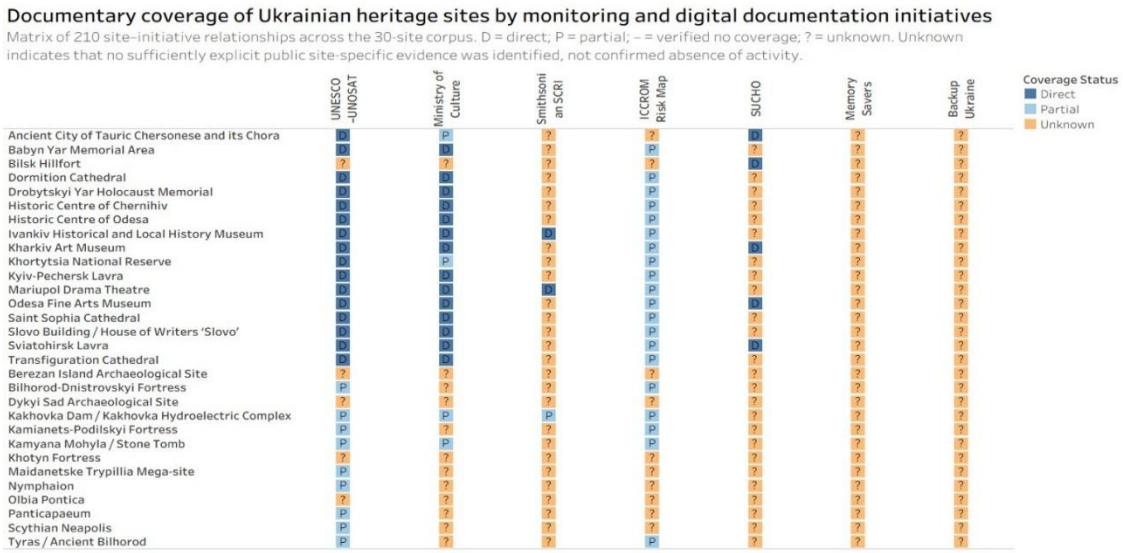

Figure 22. – Actor–site documentary coverage matrix for the 210 possible relationships between 30 Ukrainian heritage places and seven monitoring or digital-documentation initiatives. Author's elaboration in Tableau based on the thesis dataset

Seventeen sites have at least one direct record, while nine appear only through partial evidence. Berezan Island, Dykyi Sad, Khotyn Fortress and Olbia Pontica remain unknown across all initiatives. These unknowns reflect access restrictions, security risks, naming differences, publication policies and the difficulty of remotely documenting some archaeological sites. The matrix also reveals a division of documentary labour: UNESCO–UNITAR/UNOSAT and the Ukrainian Ministry provide most direct links, ICCROM operates mainly at the level of risk management, SUCHO focuses on digital preservation, and only part of Smithsonian monitoring can be publicly linked to individual sites.

The Ukrainian coverage results therefore indicate an interoperability problem rather than a failure of individual initiatives. Different projects preserve different layers of cultural information, but their identities, descriptive scales and publication structures do not always connect. A low score may represent restricted access, aggregate reporting or a difference in descriptive scale. For this reason, the coverage analysis is strongest when it is used to identify where public records can be linked and where further metadata are needed. Stable identifiers, multilingual authority files and public metadata describing protected datasets could increase traceability without requiring the release of security-sensitive information.

3.3.3 Evidence coverage by documentation technology

I then shifted the analysis from organizations to technologies. The principle behind this part of the analysis is that a documentation technology should be evaluated according to which claims its evidence can support, rather than according to the volume of data it produces or the novelty of the technology itself.

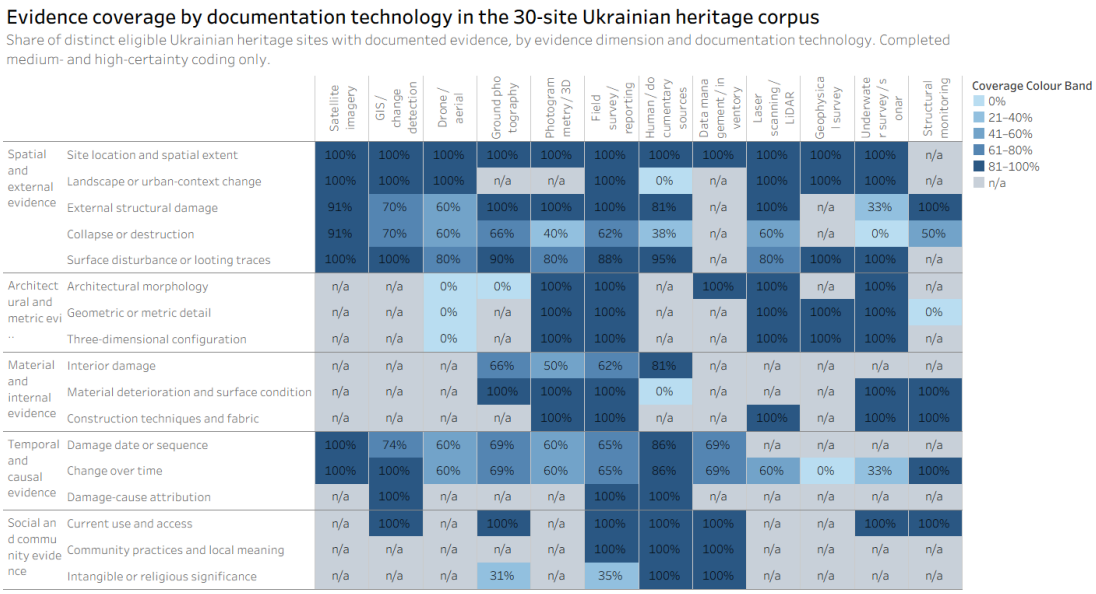

Figure 23. – Evidence coverage by documentation technology across 17 evidence dimensions in the 30-site Ukrainian heritage corpus. Percentages refer only to eligible records reviewed at medium or high certainty; non-applicable dimensions are reported separately from documented absence. Author's elaboration in Tableau based on the thesis dataset.

I compared 12 technology categories across 17 evidence dimensions using reviewed records coded at medium or high certainty. Figure 23 represents evidentiary capacity within the selected corpus, not the national frequency of technology use. Location and spatial extent reach 100% across most eligible technologies, confirming that coordinates and stable identifiers provide the basis for linking evidence produced by different actors and at different times. Coverage becomes more varied for structural evidence. External damage reaches 91% for satellite imagery, 70% for GIS, 60% for aerial methods, 81% for institutional sources and 100% for ground photography, photogrammetry, field reporting, laser/LiDAR and structural monitoring. Collapse or destruction is recorded less consistently, ranging from 38% for institutional sources to 91% for satellite imagery. This difference reflects the distinction between identifying physical change and documenting its material characteristics for conservation purposes.[123] Architectural and material evidence depends more strongly on close-range observation. Photogrammetry, field survey and laser scanning reach 100% for architectural morphology, metric detail and 3D configuration. Material deterioration also reaches 100% in eligible ground-photography, photogrammetric, field-reporting, underwater-survey and structural-monitoring records. Distal methods are therefore strongest for external, spatial and comparative evidence, while proximal methods can document interiors, surfaces and construction details when access and expertise are available. Temporal evidence is distributed more broadly. Damage date or sequence reaches 100% for satellite imagery, 86% for institutional sources, 74% for GIS, 69% for ground photography and data-management sources, 65% for field reporting, and 60% for aerial methods and photogrammetry. Repeated satellite and GIS observations are especially valuable during an ongoing war because they can narrow the interval in which visible change occurred, even when direct access is impossible.

The before-and-after comparison in Figure 24 illustrates this temporal affordance. Repeated satellite and GIS observations can narrow the interval in which visible change occurred even when investigators cannot access the site.

[123] Remondino and Rizzi, “Reality-Based 3D Documentation,” 85–100; Bassett et al., *Damage to Cultural Heritage Sites in Ukraine*.

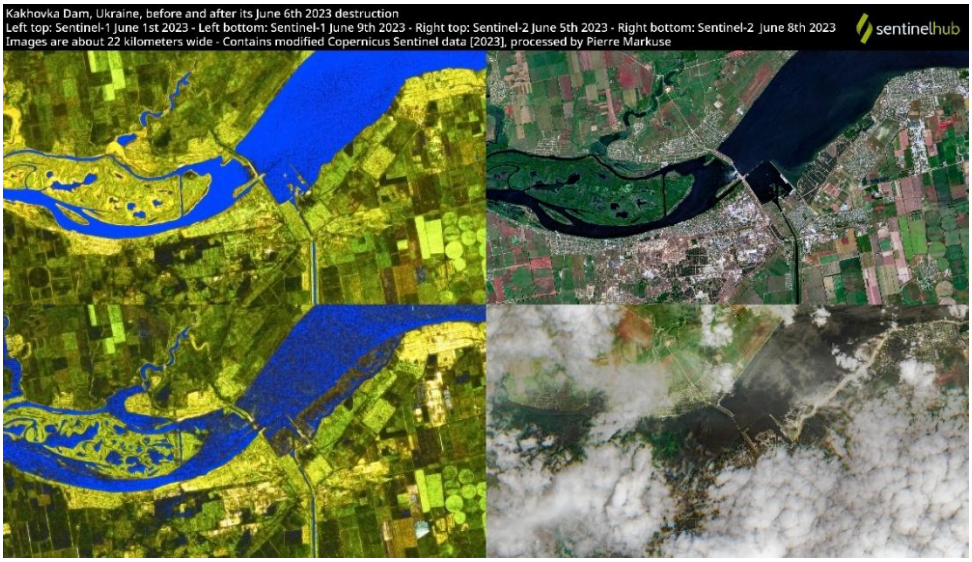

Figure 24. -- Kakhovka Dam before and after its destruction on 6 June 2023, based on Copernicus Sentinel-1 and Sentinel-2 imagery. Sentinel-1 observations: 1 and 9 June 2023; Sentinel-2 observations: 5 and 8 June 2023. Image processing by Pierre Markuse. Contains modified Copernicus Sentinel data (2023). Source: Wikimedia Commons. Licensed under CC BY 2.0.

Cause attribution, however, remains substantially more difficult. The ability to demonstrate change should not be confused with the ability to establish responsibility. Attribution generally requires corroboration between technical interpretation, chronological evidence, weapon effects, eyewitness information and institutional documentation.[124] The heatmap therefore preserves an important epistemic boundary between direct observation → inference → supported attribution. Community and social dimensions show a different technological distribution. Field reporting, institutional sources and data-management systems are particularly important for documenting current use, local meaning and community practices. By contrast, a detailed three-dimensional model can preserve geometry while recording little about ritual practice, displacement or community memory. The principal conclusion from Figure 23 is therefore that resolution and documentary completeness are not equivalent. No technology can be considered universally superior outside the purpose for which its evidence is produced.

[124] Human Rights Center and OHCHR, *Berkeley Protocol*, 58–65.

3.3.4 Distal and proximal documentation

To examine how distal and proximal documentation contributed to the publicly verifiable record of wartime heritage, I restricted the comparison to the 23 Ukrainian heritage places documented through both modes. Using the same group of sites for the two technological families reduced the influence of differences in sample composition. Distal documentation included satellite imagery and GIS or change-detection methods, while proximal documentation included ground photography and field survey or reporting. I included only medium- and high-certainty records, so the analysis focuses on evidence that was sufficiently supported by the available sources. For each evidence dimension, I counted the sites with at least one qualifying documented-present record. The denominator stays fixed at 23 sites. This means that 20/23 sites equal about 87%, 17/23 equals 74%, and 16/23 equals 70%. Sites without qualifying documented-present evidence remain in the denominator, but they do not add to the numerator. Records coded as documented-absent, not assessable, or not reported are therefore kept separate from documented-present coverage.

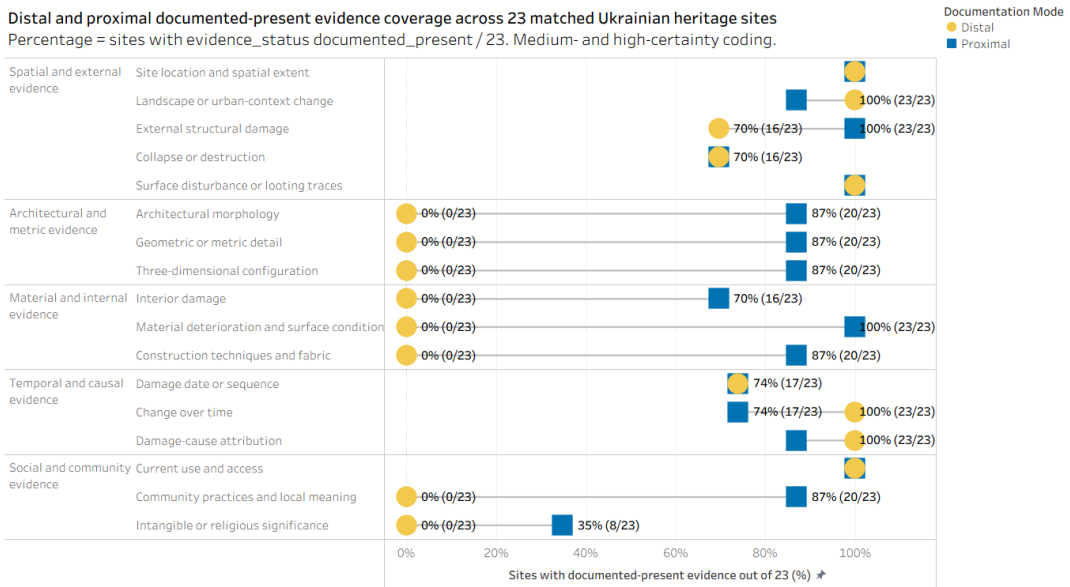

Figure 25. – Distal and proximal documented-present evidence coverage across the matched Ukrainian heritage-site sample. Rows represent evidence dimensions, grouped by analytical category, and markers represent documentation mode. Percentages indicate the share of sites with at least one qualifying documented-present record within the matched sample. Connecting lines show differences in coverage between distal and proximal documentation for the same evidence dimension. Percentages are descriptive and refer only to medium- and high-certainty records in the thesis dataset. Author's elaboration in Tableau based on the thesis dataset.

Several dimensions reach complete or near-complete coverage in at least one documentation group. Site location and spatial extent reach 100% coverage. Current use and access also reach 100%. Landscape or urban-context change, surface disturbance or looting traces, and change over time are very widely documented as well. This shows that the Ukrainian subgroup contains broad evidence for spatial context, visible disturbance, and site use, although distal and proximal sources contribute differently. The largest contrasts appear in architectural, material, and social evidence. Proximal coverage reaches 20/23 sites (87%) for architectural morphology, geometric or metric detail, three-dimensional configuration, construction techniques or fabric, and community practices or local meaning. The distal record is 0/23 for each of these same dimensions. Material deterioration reaches full proximal coverage, 23/23 sites (100%), while distal coverage is 0/23. Interior damage is also mainly proximal, at 16/23 sites (70%) versus 0/23 distally. Distal sources contribute most clearly to spatial and temporal evidence. External structural damage and collapse or destruction are each documented distally for 16/23 sites (70%). Damage date or sequence is documented for 17/23 sites (74%). Change over time and damage-cause attribution reach 23/23 sites (100%) in the distal record. These values show the importance of remote and spatial documentation for visible damage, chronology, and broader patterns of change. As in the Syrian figure, the lines between the markers show coverage gaps for the same evidence dimension. These gaps are differences in coverage, not differences in accuracy. A 0% value means that the filtered corpus does not contain qualifying documented-present evidence for that dimension and documentation group. It does not prove that the condition was absent, or that the method could never record it.

Figure 25 shows that a large evidence base can still be uneven. Spatial and temporal dimensions are strongly represented, but architectural detail, material condition, interior evidence, and community meaning depend heavily on proximal sources. The Ukrainian subgroup has more dimensions with high or complete coverage than the Syrian subgroup. This difference describes the selected corpora only. It should not be treated as a measure of national documentation capacity or heritage protection outcomes.

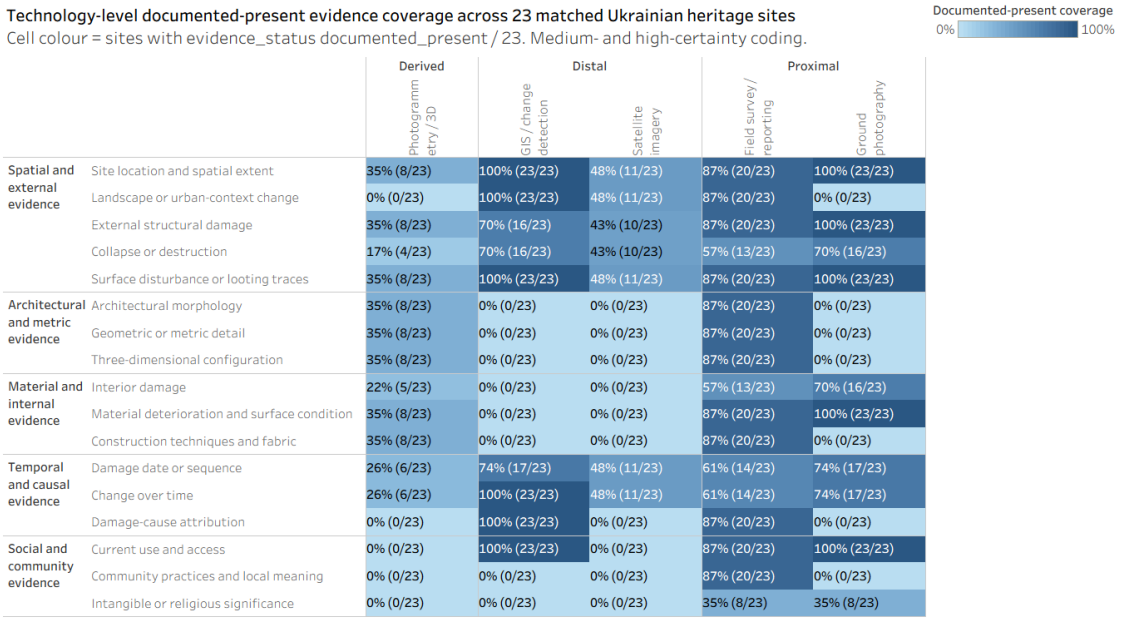

Figure 26. – Technology-level documented-present evidence coverage across the matched Ukrainian heritage-site sample. Rows represent evidence dimensions, grouped by analytical category, and columns represent documentation technologies. Cell colour indicates the share of sites with at least one qualifying documented-present record for each technology–dimension combination. Blank or zero-value cells indicate that no qualifying documented-present evidence was recorded. Percentages are descriptive and refer only to medium- and high-certainty records in the thesis dataset. Author's elaboration in Tableau based on the thesis dataset.

Figure 26 breaks down the Ukrainian evidence by technology category. It uses the same 23 matched sites and the same medium- and high-certainty filter as Figure 10. Each cell reports how many sites, and what percentage of the subgroup, have at least one qualifying documented-present record for a given technology and evidence dimension. The denominator remains 23 for every cell, including cases where a technology has no qualifying evidence for a dimension. The values therefore show how widely each technology contributes evidence across the subgroup. They reflect the sources available in the corpus and the information coded from them. They do not measure the inherent reliability or capability of the technology by itself. GIS and change detection have the broadest distal coverage. They document site location, landscape or urban-context change, surface disturbance or looting traces, change over time, damage-cause attribution, and current use or access for all 23 sites (100%). They also cover external structural damage and collapse or destruction for 16/23 sites (70%), and damage date or sequence

for 17/23 sites (74%). The full values for cause attribution and current use should be read as evidence incorporated in the relevant sources, not as proof that spatial analysis alone established cause or use. Satellite imagery contributes to fewer sites than GIS and change detection in this filtered corpus. It documents site location, landscape or urban-context change, surface disturbance, damage date or sequence, and change over time for 11/23 sites (48%). It covers external structural damage and collapse or destruction for 10/23 sites (43%). This difference describes representation in the coded evidence base, not lower reliability as a technology. Field surveys and reports provide broad proximal coverage. They document 20/23 sites (87%) for site location, landscape or urban-context change, external structural damage, surface disturbance, architectural morphology, metric detail, three-dimensional configuration, material deterioration, construction techniques, damage-cause attribution, current use, and community practices. Coverage is lower, but still substantial, for collapse or destruction and interior damage, each at 13/23 sites (57%), and for damage date or sequence and change over time, each at 14/23 sites (61%). Ground photography has a different profile. It reaches 23/23 sites (100%) for site location, external structural damage, surface disturbance, material deterioration, and current use or access. It also covers collapse or destruction and interior damage for 16/23 sites (70%), and damage date or sequence and change over time for 17/23 sites (74%). Intangible or religious significance appears in 8/23 sites (35%). However, this category has no qualifying records for architectural morphology, metric detail, three-dimensional configuration, construction techniques, or damage-cause attribution in this coding. These gaps describe the available and coded photographs, not everything photographs could potentially show. Photogrammetry and 3D documentation contribute to a smaller subset. They cover 8/23 sites (35%) for site location, external structural damage, surface disturbance, architectural morphology, metric detail, three-dimensional configuration, material deterioration, and construction techniques. Interior damage appears for 5/23 sites (22%), while damage date or sequence and change over time appear for 6/23 sites (26%). This pattern shows detailed evidence in selected cases rather than broad coverage across the whole subgroup.

Overall, Figure 26 explains how technology categories produce the aggregate pattern in Figure 25. GIS and change detection dominate spatial and temporal

documentation. Field surveys and reports extend across architectural, material, and social dimensions. Ground photography documents visible condition and use very broadly. Photogrammetry and 3D documentation add detailed evidence for selected sites. Together, these methods create a broad evidence base, but coverage remains uneven and depends on which sources are available for each place.

3.3.5 Public participation and Governance composition

Technological coverage alone does not demonstrate participatory governance. A project may invite citizens to contribute photographs or digital models while institutions retain control over site selection, validation, metadata and reuse. I therefore coded participation depth separately from decision-making authority, as shown in Figure 27.

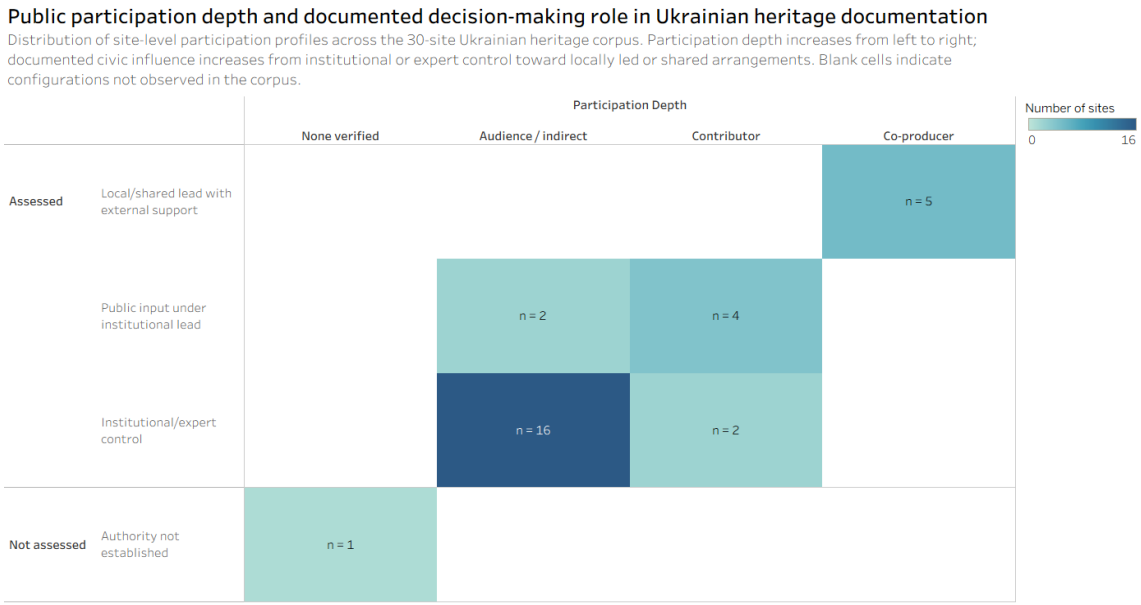

Figure 27. – Public participation depth and documented decision-making authority across the 30-site Ukrainian corpus. Participation and governance are treated as separate analytical dimensions. Author's elaboration in Tableau based on the thesis dataset.

Audience or indirect participation is the most frequent profile, covering 18 sites (60.0%). Six sites (20.0%) involve contributors, five (16.7%) reach co-production, and one (3.3%) has no verified participation. Authority follows a similar pattern: 18 sites remain under

institutional or expert control, six include public input under institutional leadership, five demonstrate local or shared leadership, and one has no clearly established authority. The joint distribution confirms this imbalance. Sixteen sites combine audience-level participation with institutional control, while only five combine co-production with local or shared leadership. Overall, the public can often observe, submit or assist, but institutions generally define the documentation process and determine how evidence is used. This concentration is not necessarily negative: conflict documentation requires professional verification and safeguards for people, sites and sensitive collections. Nevertheless, participation should not be confused with decision-making power. Uploading material does not automatically provide authority over metadata, licensing, access or future reuse. Arnstein's distinction between participation and the redistribution of power therefore remains relevant, although adapted here to heritage documentation.[125] The Faro Convention also supports a model in which heritage communities participate in defining significance and stewardship, rather than acting only as providers of data.[126] The five co-produced show that external support and local authority can coexist. Memory Savers works collaboratively with museum professionals and students, while Backup Ukraine allows citizens to select and document heritage objects and places. However, public information about the long-term control of some models and metadata remains incomplete. Participation must therefore be assessed not only during data capture but also through subsequent stewardship.

To examine the relationship between technology and governance, I classified project–method associations into five categories: international institutional, national heritage authority, academic/expert-led, local/community-led and other/unclear. Figure 28 shows their distribution within each technology group. The unit of analysis is the distinct project–method association, so the percentages do not measure the overall activity or importance of individual organizations. The results indicate that technologies are associated with different governance arrangements. Academic- and expert-led actors are

[125] Sherry R. Arnstein, "A Ladder of Citizen Participation," *Journal of the American Institute of Planners* 35, no. 4 (1969): 216–224.

[126] Council of Europe, *Council of Europe Framework Convention on the Value of Cultural Heritage for Society (Faro Convention)*, CETS No. 199 (Faro, 27 October 2005), arts. 1–2 and 11–12.

particularly prominent, especially in photogrammetry and 3D documentation, where all four recorded associations belong to this category.

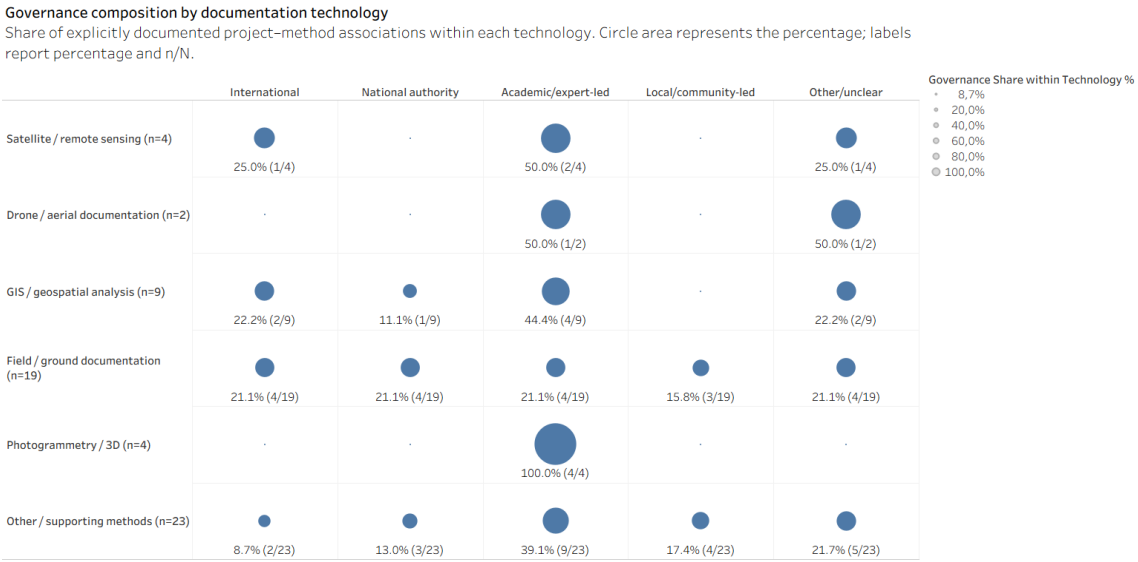

Figure 28. – Governance composition by documentation technology in the Ukrainian corpus. Circle area represents the share of explicitly documented project–method associations within each technology group; labels report percentage and n/N. The unit of analysis is the distinct project–method association. Percentages describe publicly traceable relationships in the selected corpus and should not be interpreted as measures of total institutional activity. Author's elaboration in Tableau based on the thesis dataset.

Academic/expert-led arrangements account for all photogrammetry and 3D associations, half of those involving satellite/remote sensing (50%, 2/4) and drone/aerial methods (50%, 1/2), and 44.4% of GIS associations (4/9). This suggests that specialized technologies are most visibly connected to organizations possessing technical expertise, without implying that these methods are inherently expert-controlled. Governance is more diverse in field documentation, where the 19 associations are distributed across all five categories. International, national-authority, academic/expert-led and other/unclear arrangements each represent 21.1% (4/19), while local/community-led governance accounts for 15.8% (3/19). Supporting methods show a similar diversity, although academic/expert actors remain the largest group (39.1%, 9/23). Local/community-led arrangements appear mainly in field and supporting practices rather than in satellite, drone or photogrammetry/3D documentation.

Figure 28 therefore indicates an association between technical specialization and expert-centred governance, while field-based and supporting methods accommodate a broader range of institutional arrangements. These results do not establish that one governance model produces better documentation. They show that access to technologies, expertise and documentary infrastructure is unevenly distributed. The small number of associations in several categories, particularly drone/aerial (n = 2), satellite/remote sensing (n = 4) and photogrammetry/3D (n = 4), requires caution. Moreover, the analysis includes only publicly traceable project–method relationships. It therefore describes the selected corpus rather than the Ukrainian heritage sector as a whole. Within these limits, technology and governance emerge as interconnected dimensions: specialized methods are most often associated with expert organizations, whereas field and supporting practices provide the main space for institutional diversity and visible local leadership.

3.3.6 Damage Severity and Documentary Visibility

Using the same Documentary Visibility Score applied to the Syrian corpus, this section compares recorded damage severity with site-level documentary visibility in Ukraine. Keeping the same operational measure allows the two case studies to be read in parallel and makes it possible to assess whether documentary visibility and physical damage follow a comparable pattern. As in the Syrian analysis, the purpose is descriptive rather than causal. The comparison does not assume that documentation reduced damage, nor that damage automatically produced greater documentation. Instead, it asks whether highly visible sites tend to occupy particular damage categories, or whether visibility remains distributed across different material conditions.

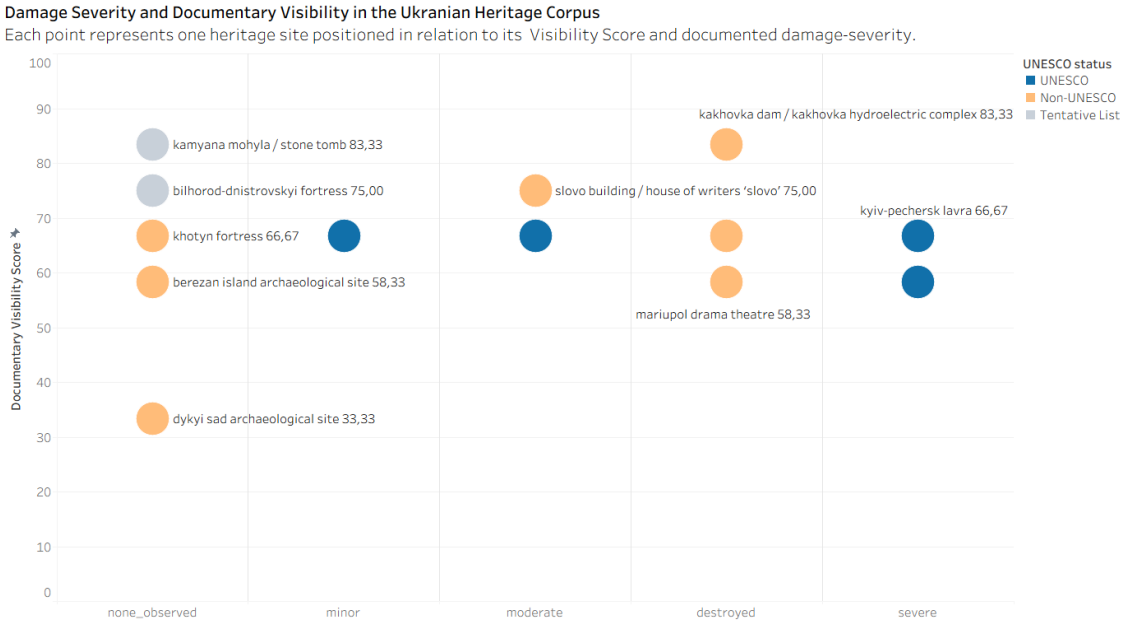

Figure 29. – Damage severity and documentary visibility in the Ukrainian heritage corpus. Each point represents one heritage site positioned according to its recorded damage-severity category and Documentary Visibility Score (0–100), calculated from source breadth, public traceability and method breadth. Colours distinguish UNESCO status. Overlapping marks indicate that multiple sites may share the same damage category and visibility score Author's elaboration in Tableau based on the thesis dataset.

The Ukrainian corpus shows a marked heterogeneity between documentary visibility and physical condition. This is especially clear among sites classified as having no observed damage. Within this category, the Documentary Visibility Score ranges from 33.33 for Dykyi Sad Archaeological Site to 83.33 for Kamyana Mohyla / Stone Tomb, with Berezan Island Archaeological Site, Khotyn Fortress and Bilhorod-Dnistrovskyi Fortress occupying intermediate positions. The category therefore spans roughly fifty points on the visibility scale, showing that substantial documentary visibility can exist even where no physical damage has been recorded. Minor and moderate damage categories also include relatively high scores: Saint Sophia Cathedral records 66.67, while the Slovo Building / House of Writers 'Slovo' reaches 75.00. These examples indicate that a site does not need to fall into the severe or destroyed categories in order to occupy a prominent position in the documentary record. Variation is also visible at the highest levels of damage. Among the sites classified as destroyed, the Mariupol Drama Theatre records a Documentary Visibility Score of 58.33, while the Kakhovka Dam / Kakhovka

Hydroelectric Complex reaches 83.33. These two cases are particularly significant because they share the same broad damage classification but occupy very different documentary positions. Similarly, Kyiv-Pechersk Lavra, classified as severely damaged, records 66.67, a lower value than several sites for which no damage was observed, including Bilhorod-Dnistrovskyi Fortress and Kamyana Mohyla / Stone Tomb. The distribution therefore does not suggest a linear relationship in which higher documentary visibility corresponds to lower damage severity, nor one in which more severe damage automatically generates greater public documentation.

The Ukrainian case consequently provides no indication that greater documentary visibility corresponded to an observable reduction in physical damage within the selected corpus. Highly documented sites appear among both undamaged and severely affected heritage, while sites within the same damage category can differ substantially in their documentary visibility. The wide range among sites with no observed damage is also important because it shows that documentation is not necessarily activated only after destruction. Heritage places can become highly visible through monitoring initiatives, institutional attention, digital recording or inclusion in documentation projects even when severe material damage has not been recorded. As in the Syrian case, this result cannot be used to infer military strategy, targeting decisions or the causes of damage. It does, however, reinforce the broader argument of the thesis: documentary prominence and material condition must be treated as distinct analytical dimensions. Publicly accessible documentation is not a neutral map of destruction, nor a reliable proxy for protection. It reflects the conditions through which knowledge about heritage is produced, organised and made publicly traceable.

3.3.7 Heritage Type and Documentary Visibility

As a complementary analysis, documentary visibility was also compared with heritage type in the Ukrainian corpus. The aim was to assess whether some forms of heritage appeared more prominently in the public documentary record than others. Here too, heritage type is treated as a descriptive category rather than as an explanatory

variable, since the corpus is unevenly distributed and some categories contain only a small number of sites.

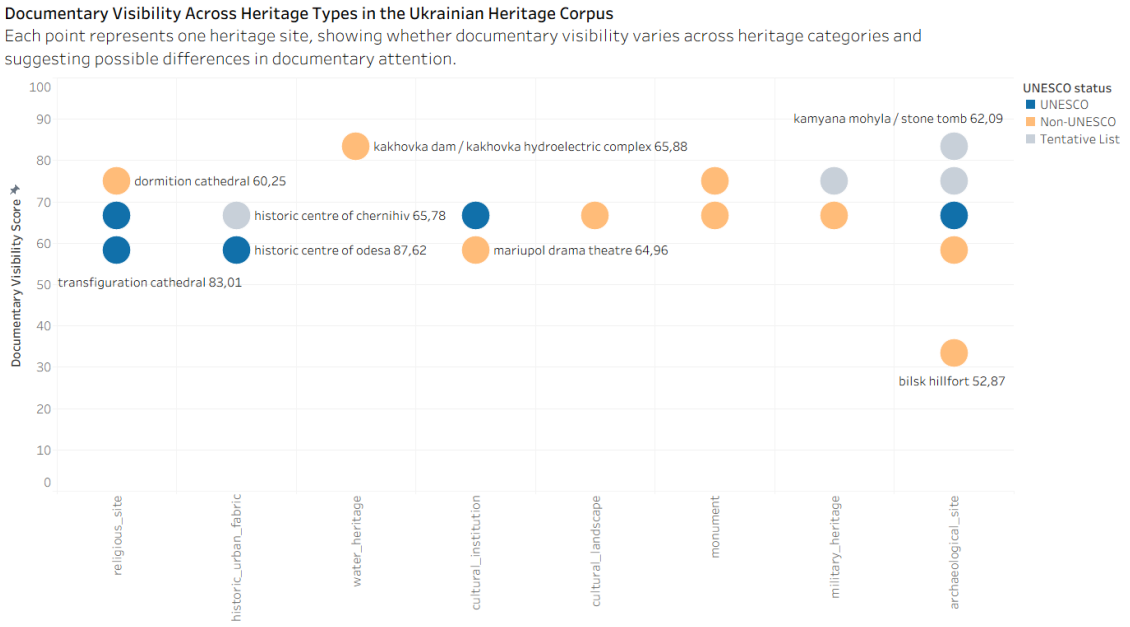

Figure 30. – Documentary visibility across heritage types in the Ukrainian heritage corpus. Each point represents one heritage site positioned according to its broad heritage category and Documentary Visibility Score (0–100). Colours distinguish UNESCO World Heritage sites, sites on the Tentative List and non-UNESCO sites. The uneven number of sites across categories should be considered when interpreting category-level differences. Author's elaboration in Tableau based on the thesis dataset.

The distribution does not show a clear typological hierarchy in which one category of heritage is systematically more visible than the others. Instead, most categories occupy overlapping portions of the Documentary Visibility Score, generally within the medium-to-high range. Religious sites, historic urban fabric, cultural institutions, monuments, military heritage and archaeological sites all include cases positioned within broadly comparable levels of documentary visibility. This overlap suggests that public documentation was not concentrated exclusively on one form of heritage. At the same time, internal variation within categories remains important. Archaeological sites, for example, range from comparatively low documentary visibility to some of the highest values in the figure. This means that belonging to the same heritage category does not necessarily imply a similar documentary position. Differences between individual sites

within a category can therefore be as meaningful as differences between categories themselves. Other categories, such as water heritage and cultural landscape, are represented by only one or very few cases, so their position in the graph should not be interpreted as evidence of a stable category-level pattern. In these instances, the figure reflects the specific documentary history of individual sites rather than the general visibility of that type of heritage. UNESCO classification adds another descriptive layer, but it does not provide a consistent explanation for the distribution. World Heritage sites, Tentative List sites and non-UNESCO sites appear across different heritage categories and across different levels of documentary visibility. In some cases, formally inscribed sites are among the most visible; in others, Tentative List or non-UNESCO sites reach comparable or higher scores. Institutional status and heritage type therefore do not, individually, explain why certain sites become more visible in the documentary record.

This result is useful precisely because no strong typological hierarchy emerges. Within the selected Ukrainian corpus, documentary visibility appears to depend on more than the type of heritage itself. It is more plausibly shaped by the selection priorities of individual projects, institutional attention, research interests, available documentation methods and the specific monitoring history of each site. Given the purposive composition of the corpus and the uneven number of observations across categories, these factors should be understood as interpretative rather than causal explanations. Together with the previous analysis of damage severity, this section supports the broader thesis argument that documentary visibility is produced through selective documentary and institutional infrastructures. It cannot be treated as a direct reflection of either material condition or heritage category alone.

3.4 Synthesis and implications

My analysis of the Ukrainian corpus leads to seven principal conclusions:

- **Public traceability depends on publication structure as well as operational reach.** UNESCO–UNITAR/UNOSAT and the Ukrainian Ministry of Culture provide the strongest publicly identifiable site-level relationships in the 30-site

corpus. ICCROM appears primarily through programme-level evidence, while SUCHO, the Smithsonian Cultural Rescue Initiative, Memory Savers and Backup Ukraine operate through different descriptive scales or publication models. I therefore interpret the coverage index as a measure of publicly traceable linkage within this corpus, not as a ranking of institutional activity, quality or importance.

- **Unknown relationships are an analytical finding rather than evidence of inactivity.** Of the 210 possible site–initiative relationships, 139 are classified as unknown. I have deliberately retained these cases because the absence of explicit public evidence may result from occupation, restricted access, security-sensitive information, multilingual naming, incomplete public inventories or incompatible identifiers. Archaeological and difficult-to-access places are particularly vulnerable to this type of documentary invisibility. The unknown category therefore identifies the limits of what can currently be reconstructed from public evidence.
- **Distal and proximal technologies produce complementary forms of knowledge.** Figures 20, 22 and 23 reveal a consistent distinction between methods designed for territorial and temporal reach and those suited to close material observation. Satellite imagery, GIS and related distal methods are especially useful for spatial comparison, landscape change and repeated observation over time. Ground photography, field survey/reporting, photogrammetry and other close-range methods extend the record towards architectural, metric, material and community-level evidence. The matched-site analysis confirms this complementarity within the 23 sites documented through both modes. The practical implication is not to choose between remote and close-range methods, but to connect them within a staged evidentiary workflow.
- **Participation does not automatically produce shared authority, and governance varies across technologies.** International institutions lead 36% of the strict project–method associations and Ukrainian national heritage authorities 32%, showing that the visible documentary environment cannot be described simply as externally controlled. At site level, however, 60% of cases remain at audience or indirect participation, and the same proportion remains under

institutional or expert decision-making control. Five cases combine co-production with local or shared leadership. These results show that contribution and governance must be measured separately: the possibility of uploading, photographing or digitizing heritage does not necessarily give contributors authority over selection, metadata, validation, licensing, access or future reuse.

- **Physical damage and documentary visibility are not equivalent**. Higher documentary visibility was not systematically associated with lower recorded damage severity. Highly visible sites occurred among both comparatively unaffected and severely damaged heritage, and sites within the same damage category could occupy different documentary positions. The corpus therefore did not reveal a clear protective pattern associated with documentary prominence.
- **Heritage type did not produce a clear hierarchy of documentary visibility.** Most categories occupied overlapping portions of the visibility scale, while several categories also showed substantial internal variation. Documentary attention therefore cannot be explained by heritage category alone, although the small and uneven group sizes require cautious interpretation.

Taken together, these findings show that digital documentation is essential to heritage protection during the war, but it cannot be treated as a complete representation of Ukrainian cultural heritage. Scientific reliability depends on corroborated sources, stable identifiers, transparent provenance and explicit uncertainty. Ethical reliability additionally requires protection of sensitive information, recognition of professional and community labor and clear responsibility for the storage, validation, access and reuse of digital records. Future research could extend the corpus beyond the 30 cases used here, particularly by including a larger number of archaeological, local and everyday heritage places. Accessibility should also be modelled as a condition that changes through time rather than as a permanent site characteristic. Alternative weighting schemes, source-independence tests and interviews with Ukrainian heritage professionals, museum workers, communities and digital volunteers could further test the mechanisms suggested by the present results. At policy level, my analysis suggests that documentation should be understood as long-term heritage infrastructure rather than as a temporary technical

response to emergencies. Remote monitoring should be connected to field verification, material assessment, institutional archives and community knowledge. Sensitive information may require restricted access, but its provenance and existence should remain responsibly documented. Most importantly, the infrastructures created during the war should remain governable by Ukrainian institutions and communities. Digital documentation cannot prevent physical destruction, but it can reduce informational loss, support conservation and restitution, and preserve Ukraine's capacity to define, interpret and transmit the historical record of its own heritage.

4 COMPARING CONFLICT-ERA HERITAGE DOCUMENTATION IN SYRIA AND UKRAINE: TECHNOLOGIES, EVIDENCE, GOVERNANCE AND PUBLIC VISIBILITY

In the previous chapters, I examined the Syrian and Ukrainian cases separately to understand how conflict-affected cultural heritage was documented, classified and made publicly visible through digital infrastructures. In both contexts, war damaged monuments, archaeological sites, museums, religious buildings, historic areas and collections, while insecurity, displacement and disrupted institutional activity limited documentation based exclusively on direct field inspection. Digital methods consequently became central to wartime heritage recording, including satellite imagery, GIS, ground photography, institutional reporting, digital archives, photogrammetry, three-dimensional modelling, web-based databases, web archiving and participatory documentation. The presence of similar technologies, however, did not make the two documentary environments equivalent.

The purpose of this chapter was not to determine which country had been "better documented". Such a ranking would have been methodologically misleading because the conflicts followed different timelines, the corpora were purposively constructed, and the initiatives differed in scope, mandate and organizational structure. Instead, I brought the two datasets into a common analytical framework to compare how conflict conditions were translated into publicly traceable documentary records. The analysis focused on relationships among sites, initiatives, technologies, evidence, participation and governance, shifting attention from the quantity of documentation to the structure of documentary knowledge: what became visible, how securely evidence could be connected to individual heritage places, what different methods made assessable, and who participated in or retained authority over the documentary process. Four questions organized the analysis:

1. How did documentary breadth, evidentiary depth and public traceability relate to one another in the two corpora?

2. Which forms of evidence were more strongly associated with distal and proximal documentation methods?
3. To what extent did deeper participation correspond to greater documented decision-making authority?
4. How were documentation technologies associated with different governance regimes?
5. Is higher documentary visibility associated with lower levels of recorded physical damage in the two corpora?
6. Does documentary visibility vary across heritage categories, and do similar patterns of documentary attention emerge in Syria and Ukraine?

Taken together, these questions treated technologies as components of wider evidence infrastructures rather than as isolated technical tools. Digital records did not simply reproduce the condition of damaged heritage; instead, their production required decisions about what to record, how to classify observations, which sources to connect and which relationships to make publicly retrievable.[127] These decisions shaped what could later be verified, interpreted and reused. In digital heritage research, the transparency of sources, methods and uncertainty therefore remained central to the reliability of the resulting records.[128] The comparative argument developed in this chapter was that documentary visibility emerged from the interaction of technology, physical access, institutional organization and publication practice. It was not an automatic property of either the damaged site or the digital method used to record it.

[127] Christine L. Borgman, Andrea Scharnhorst, and Milena S. Golshan, "Digital Data Archives as Knowledge Infrastructures: Mediating Data Sharing and Reuse," *Journal of the Association for Information Science and Technology* 70, no. 8 (2019): 888–904.

[128] Boyd Davis, Vane, and Kräutli, "Can I Believe What I See?," 522–546; Human Rights Center and OHCHR, *Berkeley Protocol*, 31–40, 45–49, 53–65.

4.1 Comparative approach and methodology

I designed the study as a structured and focused comparison between two purposively constructed corpora. The comparison was structured because I applied the same research questions and harmonized analytical categories to both countries, and focused because I examined only the aspects of their documentary environments relevant to those questions. Each corpus contained 30 heritage places. Equal sample size provided a common analytical frame but did not make the samples statistically representative or equivalent in composition. Cases were selected to preserve variation in heritage type, location, World Heritage status, accessibility, damage conditions, technologies, public visibility and participation. [129] The Syrian corpus contained a stronger archaeological component and several highly visible monuments associated with internationally recognized properties, whereas the Ukrainian corpus was distributed more widely across religious buildings, museums, memorial sites, historic centers, fortifications, archaeological sites and a cultural landscape. This difference mattered because heritage type affected the applicability of particular methods and evidence that could reasonably be expected. I therefore gave greater interpretive weight to recurring directional patterns than to small percentage differences between countries. I also retained the analytical cutoff established in Chapter 3 so that later publications could contextualize the discussion without selectively altering coded observations. Within this time-bounded framework, I organized the evidence through a relational data model. Stable identifiers connected sites, initiatives, technologies, evidence dimensions, participation profiles and project-method associations, while keeping these relationships analytically distinct.

Table 4 summarizes the four analytical domains used in the chapter. Keeping them separate was methodologically important because a site could be connected to several initiatives without developing a broad evidentiary record; a project could invite participation while retaining institutional authority; and the same technology could operate under different organizational arrangements.

[129] Lesley Bartlett and Frances Vavrus, "Comparative Case Studies: An Innovative Approach," *Nordic Journal of Comparative and International Education* 1, no. 1 (2017): 5–17

Analytical domain	Unit and denominator	Measure used in Tableau	Permissible interpretation	Interpretation avoided
Traceability and breadth	Site–initiative relationships: Syria *n* = 330; Ukraine *n* = 210	Coverage status; weighted documentary breadth; public traceability	How consistently selected initiatives can be linked to selected sites	Total internal activity or national documentation capacity
Evidentiary affordance	Distinct eligible sites across 17 harmonized evidence dimensions	Distal coverage minus proximal coverage, in percentage points	Direction and magnitude of method-related evidentiary differences	Intrinsic or universal superiority of a technology
Participation and authority	Jointly assessable site profiles: Syria *n* = 28; Ukraine *n* = 23	Distribution of authority within each participation level	Whether deeper documented participation is associated with redistributed authority	Undocumented, informal or security-sensitive participation
Technology governance	Explicit project–method associations: Syria *n* = 39; Ukraine *n* = 35	Governance regime within each technology family and country	Documented organizational leadership of technological practices	Legal ownership, funding, custody or contractual control
Damage and doscumentary vsibility	Heritage places: Syria n = 30; Ukraine n = 30	Documentary Visibility Score (0–100) by recorded damage-severity category	Descriptive correspondence and heterogeneity between physical condition and documentary representation	Causal effect of damage on visibility; national prevalence; cultural importance
Heritage type and documentary visibility	Heritage places: Syria n = 30; Ukraine n = 30	Documentary Visibility Score (0–100) by broad heritage category	Descriptive differences, overlap and within-category heterogeneity in documentary attention	Causal effect of heritage type; national typological hierarchy; cultural importance

Table 4. – Analytical domains, units of analysis, measures and interpretive limits used in the comparative chapter. Author's elaboration based on the thesis datasets.

I used Tableau as an environment for relational analysis and visual comparison rather than as a source of evidence. The evidentiary basis remained the reports, databases, project pages, publications and archival resources examined in Chapters 2 and 3. Tableau allowed me to aggregate coded relationships consistently, normalize values within the

correct denominator and identify recurring contrasts or exceptional cases. Because visual clarity can create an impression of certainty greater than that supported by the evidence, denominators, uncertain categories and interpretive limits were retained throughout the analysis.[130] A further methodological principle was to distinguish documented presence, documented absence and insufficient public evidence. The dataset recorded what could be established from publicly accessible sources within the defined analytical period rather than every activity that may have occurred. Coverage was therefore classified as:

- *Direct* indicated that an accessible public source explicitly connected an initiative to the individual heritage place.
- *Partial* indicated that an initiative was relevant and that some relationship was visible, but the public record did not establish a complete site-level connection.
- *Verified no coverage* indicated that the relevant project material had been checked and that no qualifying site-level relationship was found within the defined source base and analytical period.
- *Unknown* indicated that the publicly accessible evidence was insufficient to determine whether qualifying coverage existed.

The categories were themselves analytical constructions rather than neutral facts already contained in the sources. Decisions about what is counted, classified or omitted are also inseparable from questions of power and representation. The categories adopted in this study therefore shaped not only how the evidence was organized, but also which patterns became visible and comparable within the resulting datasets.[131]

[130]Boyd Davis, Vane, and Kräutli, "Can I Believe What I See?", 522–546.

[131] Catherine D'Ignazio and Lauren F. Klein, *Data Feminism* (Cambridge, MA: MIT Press, 2020), chap. 3, "What Gets Counted Counts,"

4.2 Methodological scope and limitations

The comparative design was subject to five principal limitations. These did not invalidate the analysis; they defined the level of inference that the evidence could support.

1. First, both corpora were relatively small and purposively constructed. They supported systematic comparison but could not provide national estimates of destruction, documentation coverage or institutional performance.
2. Second, corpus composition differed. The Syrian sample contained a stronger archaeological component, whereas the Ukrainian corpus included a wider range of religious, museum, memorial, urban and landscape heritage. Because heritage type influenced technological eligibility and evidentiary expectations, small percentage differences between countries were interpreted cautiously.
3. Third, the corpora reflected different temporal conditions. Syrian documentation accumulated over more than a decade, while the Ukrainian dataset captured a more rapid and still evolving documentary process. I therefore retained the analytical cutoff established for the Ukrainian case rather than selectively updating individual observations.
4. Fourth, public traceability could not be equated with the total amount of existing documentation. Evidence may remain unpublished for security, institutional or ethical reasons. Low traceability therefore indicated limited publicly verifiable evidence within the examined sources, not necessarily an absence of documentation.
5. The Tableau visualizations described distributions, associations and recurrent differences rather than causal relationships. Small denominators were interpreted cautiously, and descriptive differences were not treated as statistically significant without appropriate inferential analysis.
6. The Documentary Visibility Score requires two additional cautions. First, its equal weighting of Source Breadth, Public Traceability and Method Breadth is an analytical convention intended to make the index transparent and reproducible; it does not imply that the three dimensions are substantively

equivalent. Second, the score is normalized within a comparative framework constructed from different documentary ecosystems. It therefore supports comparison of patterns and distributions but should not be read as an absolute measure of the total volume of documentation produced in Syria and Ukraine.

7. A further selection effect should also be acknowledged. Inclusion in the corpora required sufficient publicly accessible evidence for reliable site-level coding. The analysis therefore captures variation among documentable heritage places but cannot represent the most extreme form of documentary invisibility: sites that never entered the verifiable public record at all.

These safeguards defined the analytical scope of the chapter. The comparison was strongest where the same directional relationship recurred across several evidence dimensions or appeared in both national corpora. It was weaker where a pattern depended on a small denominator, highly uneven eligibility or limited public evidence. The purpose was therefore analytical rather than nationally representative: I used the two corpora to identify recurring relationships and tensions between documentary breadth and depth, distant and close-range observation, participation and authority, and technological practice and governance. In this sense, the limitations formed part of the method itself because they defined what the visualizations could reasonably support.

4.3 Comparative analyses and interpretation of results

4.3.1 Documentary traceability, breadth and evidentiary depth

The first comparative analysis examined three related but distinct properties of the documentary record: how consistently selected initiatives could be linked to individual heritage places, how broad the coded evidentiary record was for those places, and how securely those relationships could be reconstructed from public sources. I kept these dimensions separate because broad initiative coverage did not necessarily produce deep evidence, while a specialized project could generate detailed information for a site

represented in relatively few initiatives. Figure 31 first compares the composition of all possible site-initiative relationships in the two corpora, normalized separately within each country.

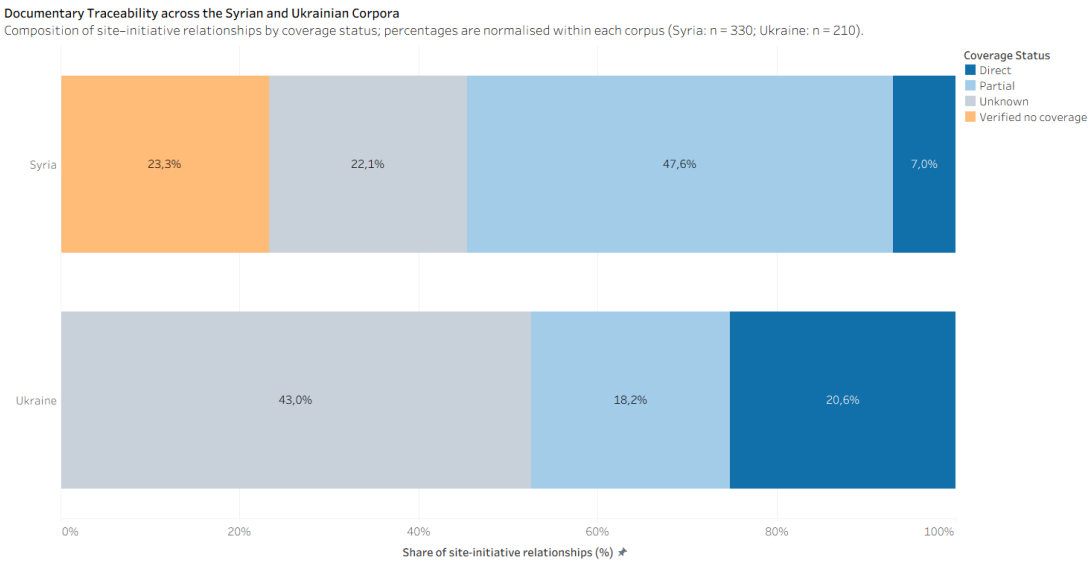

Figure 31. – Documentary traceability across the Syrian and Ukrainian corpora. Coverage status was normalized separately for Syria (n = 330 relationships) and Ukraine (n = 210). "Unknown" indicates insufficient public evidence; "verified no coverage" indicates confirmed absence. Author's elaboration in Tableau.

Figure 31 shows that 7.0% of the 330 Syrian relationships were direct, 47.6% partial, 22.1% unknown and 23.3% verified no coverage. In Ukraine, 20.6% of the 210 relationships were direct, 18.2% partial, 43.0% unknown and 18.2% verified no coverage. The main contrast therefore concerned the composition of the publicly traceable record. In Syria, direct and partial relationships together accounted for 54.6% of the matrix, compared with 38.8% in Ukraine, although most Syrian positive relationships were partial. This indicated that initiatives could often be linked to a wider heritage property or documentary activity without providing an equally precise site-level connection. Ukraine showed the opposite pattern: direct relationships were more frequent, but unknown relationships represented 43.0% of the matrix. These unknown cases did not indicate documentary absence, but relationships that could not be established from the public sources available within the analytical period. Ukraine therefore combined

stronger site-level traceability where evidence was visible with a larger share of unresolved public evidence.

I then moved from site–initiative relationships to individual heritage places. Figure 32 compared documentary breadth with evidentiary depth, while colour represented public traceability and mark size indicated how many sites shared the same breadth–depth coordinates. This view made it possible to assess whether wider initiative coverage was consistently associated with a broader evidentiary record.

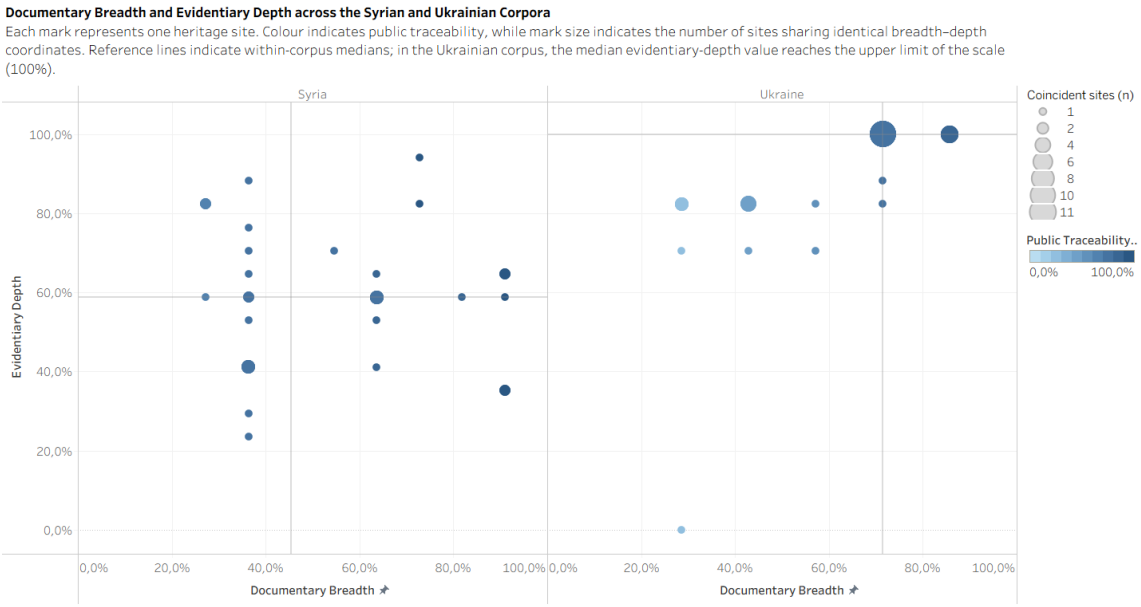

Figure 32. – Documentary breadth and evidentiary depth across the Syrian and Ukrainian corpora. Each mark represents a heritage place; colour indicates public traceability and size the number of sites with identical coordinates. Reference lines show corpus medians. Ukraine's 100% median depth indicates a ceiling effect. Author's elaboration in Tableau.

The Syrian observations were widely dispersed. Sites with similar breadth values occupied substantially different positions on the evidentiary-depth axis, and some sites with comparatively limited breadth still reached relatively high depth values. Wider presence across initiatives therefore did not correspond consistently to a broader evidentiary record. Several initiatives could reproduce similar forms of information, while a narrower specialized project could contribute architectural, metric or material evidence that was absent from more extensive monitoring systems. The Ukrainian

distribution was more concentrated toward the upper end of the depth scale, and the within-corpus median reached 100%. I treated this value cautiously because it represented the upper limit of the indicator. Once a site reached that threshold, the measure could no longer distinguish further differences in evidentiary richness. The concentration at the top of the plot therefore indicated saturation of the measure rather than documentary completeness in every possible sense. The presence of a zero-depth observation also showed that the Ukrainian corpus was not uniformly concentrated at the maximum.

Public traceability did not form a regular colour gradient across the scatter plot. Highly traceable sites appeared at different combinations of breadth and depth. Read together, Figures 31 and 32 therefore showed that documentary breadth, evidentiary depth and public traceability captured different properties of the same documentary environment. Breadth described how widely a site could be connected to the selected initiatives; depth described the range of evidence represented in the coded record; and traceability described how securely those relationships could be reconstructed from accessible sources. None of the three measures considered alone was sufficient to characterize documentary quality.

4.3.2 Evidentiary potential and the distinction between distal and proximal methods

This analysis examines whether different forms of heritage documentation make the same kinds of evidence visible, or whether they produce different evidentiary strengths. The comparison focuses on two broad documentation modes: distal evidence, such as remote or spatial forms of observation, and proximal evidence, such as field-based, photographic, or report-based documentation. Rather than treating coverage as a general measure of documentation quality, the analysis asks a more specific question: which kinds of heritage evidence are better captured by distal sources, and which require proximal sources?

Image 31 addresses this question by comparing the documented-present evidence gap across matched Syrian and Ukrainian heritage sites. The figure does not count all records equally. It includes only cases where the evidence is actually documented as present. This is important because it separates positive documentation from absence, non-assessability,

or non-reporting. The chart therefore measures the distribution of confirmed evidence, not the broader availability of records. Figure 33 presents a diverging dot plot. Each mark represents the gap between distal and proximal documented-present coverage for one evidence dimension in one country. Yellow circles represent Syria, and blue squares represent Ukraine. The vertical line at zero marks the point where distal and proximal coverage are equal. Values to the right of zero indicate that distal documentation covers more matched sites than proximal documentation. Values to the left indicate that proximal documentation covers more matched sites than distal documentation. The evidence dimensions are grouped into five categories: spatial/external, architectural/metric, material/internal, temporal/causal, and social/community evidence. The calculation is based on fixed matched-site denominators: 9 sites for Syria and 23 sites for Ukraine. This allows the chart to compare direction and magnitude of evidentiary gaps within each country, while preserving the difference in sample size between the two cases.

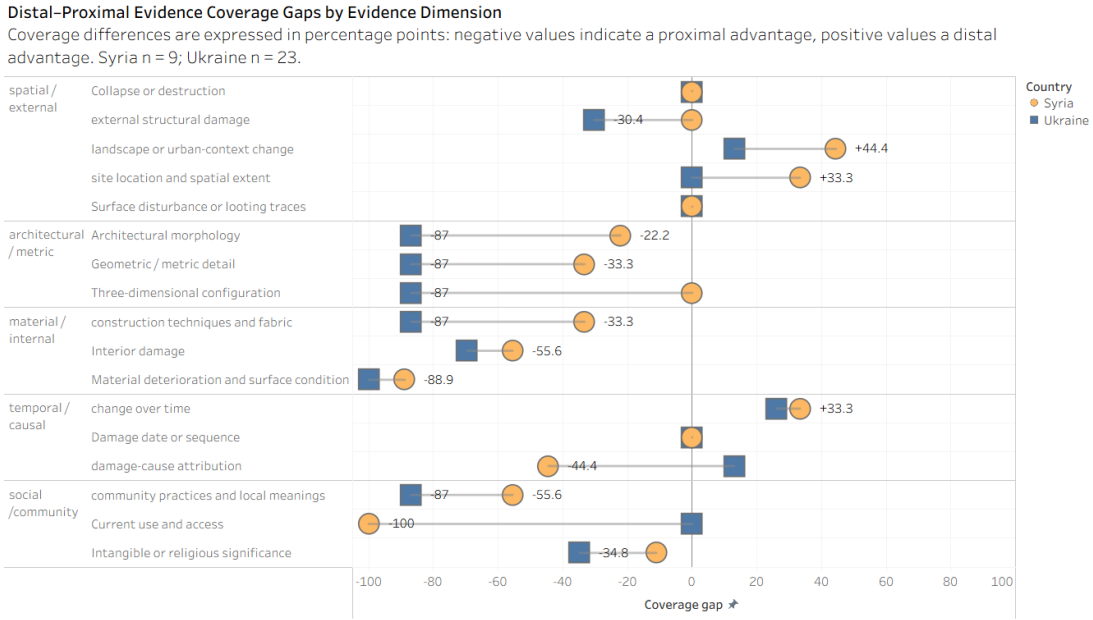

Figure 33. – Observed distal-proximal documented-present evidence gaps across matched Syrian and Ukrainian heritage sites. Values represent distal documented-present coverage minus proximal documented-present coverage, expressed in percentage points. Positive values indicate greater distal coverage and negative values greater proximal coverage; zero indicates equal coverage. Circles represent Syria and squares Ukraine. Documented-present evidence only. Syria n = 9; Ukraine n = 23. Author's elaboration in Tableau.

The results reveal a systematic differentiation between the evidence associated with the two forms of documentation. Distal methods show their clearest relative advantages in selected spatial and temporal dimensions, particularly landscape or urban-context change and change over time. In Syria, landscape or urban-context change reaches a +44.4 percentage-point distal advantage, while site location and spatial extent reaches +33.3. A positive pattern for change over time is visible in both corpora. Conversely, architectural, metric and material evidence is predominantly associated with proximal documentation. Ukraine shows particularly large proximal advantages for architectural morphology, geometric/metric detail, three-dimensional configuration, and construction techniques and fabric, with gaps of approximately −87 percentage points. Material deterioration and surface condition shows one of the strongest cross-case patterns, reaching −100 percentage points in Ukraine and −88.9 in Syria. Socially embedded forms of evidence follow a similar direction: community practices and local meanings are more strongly represented through proximal documentation in both corpora, while current use and access shows an especially pronounced proximal advantage in Syria. Not all dimensions follow the same pattern. Damage-cause attribution, in particular, differs between the two cases, with a proximal advantage in Syria and a distal advantage in Ukraine. Such differences demonstrate that the distal–proximal distinction is not deterministic. The observed coverage of a specific form of evidence also depends on the composition of monitoring projects, access conditions, documentation strategies and the institutional environment represented in each corpus.

The figure therefore supports a strong methodological argument: distal and proximal documentation should be treated as complementary evidence systems, not as substitutes. Distal sources are powerful for spatial extent, landscape change, and some forms of temporal comparison. Proximal sources are essential for architectural detail, material condition, interior evidence, social use, and community meaning. The strongest heritage analysis requires both, because each mode reveals a different part of the evidentiary landscape. The comparison between Syria and Ukraine adds another layer to this conclusion. Syria shows notable distal advantages in spatial dimensions, but strong proximal dependence for social, material, and access-related evidence. Ukraine shows particularly large proximal advantages in architectural, metric, material, and community

dimensions. This suggests that the Ukrainian documentation corpus is especially rich in close-range or field-based evidence for detailed heritage assessment, while the Syrian case shows a sharper division between what is visible distally and what requires proximal documentation. Overall, Image 33 demonstrates that evidence coverage is not only a matter of how much documentation exists. It is also a matter of what kind of documentation makes particular forms of heritage evidence visible. Distal methods reveal some forms of damage and change with clarity, but proximal methods remain necessary for understanding the physical, social, and cultural meaning of affected heritage sites.

4.3.3 Public participation and decision-making authority

The third comparative analysis separated the depth of public or community participation from documented authority over the documentary process. This distinction was necessary because participation alone did not establish who controlled the selection, classification, validation, publication or reuse of evidence. Figure 34 therefore showed the distribution of decision-making authority within each participation level.

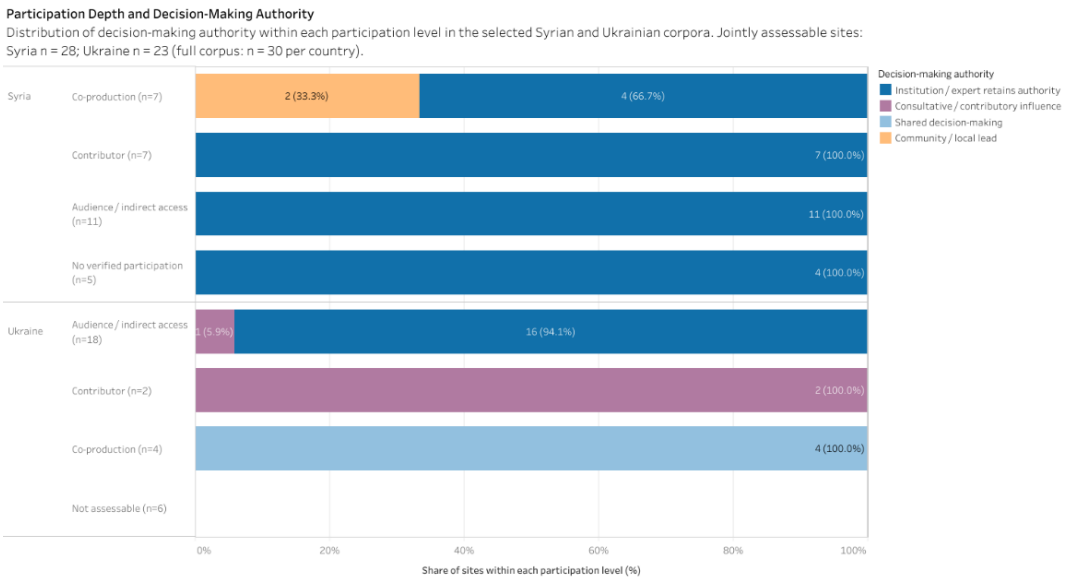

Figure 34. – Participation depth and decision-making authority in the Syrian and Ukrainian corpora. Bars show the distribution of authority within each participation level, normalized separately by country; labels report absolute counts. The analysis includes jointly assessable cases only: Syria (n = 28) and Ukraine (n = 23). Author's elaboration in Tableau.

Among the 28 jointly assessable Syrian sites, six were classified as co-production, seven as contributor, eleven as audience or indirect access, and four as no verified participation. Within co-production, two sites (33.3%) were community or locally led, while four (66.7%) remained under institutional or expert authority. All contributor, audience or indirect-access, and no-verified-participation cases also remained under institutional or expert authority. The Syrian corpus therefore did not show a regular progression from deeper participation to greater decision-making power: co-production created the possibility of local leadership but did not guarantee it. The Ukrainian profiles showed a clearer association. All four co-production cases involved shared decision-making, while both contributor cases were linked to consultative or contributory influence. Among the seventeen audience or indirect-access cases, sixteen (94.1%) remained under institutional or expert authority and one (5.9%) included consultative influence. Deeper participation was therefore more consistently associated with greater authority in Ukraine than in Syria, although the small number of cases at the highest participation levels required caution.

The Ukrainian co-production category included only four sites, while seventeen of the twenty-three assessable sites remained at audience or indirect-access level. I therefore treated this as a pattern within the selected corpus rather than evidence of a broader national progression toward shared governance. Excluding non-assessable cases was also necessary to avoid converting insufficient evidence into a negative finding. Figure 34 thus showed that participation depth and decision-making authority were related but distinct: participation became a redistribution of power only when participants acquired a meaningful role in decisions concerning classification, validation, access, publication, correction or reuse.

4.3.4 Technology and documentary governance

The fourth comparative analysis examined the relationship between documentation technologies and governance arrangements. The unit of analysis was the distinct, explicitly documented project-method association. I therefore interpreted the visualizations as descriptions of the organizational settings in which particular technologies were used, rather than as measures of institutional importance, funding or

total documentary output. Figure 35 was normalized separately within each country and technology family. A 100% bar had to be interpreted together with its denominator, since values based on one or two associations described individual observations rather than stable relationships between a technology and a governance regime.

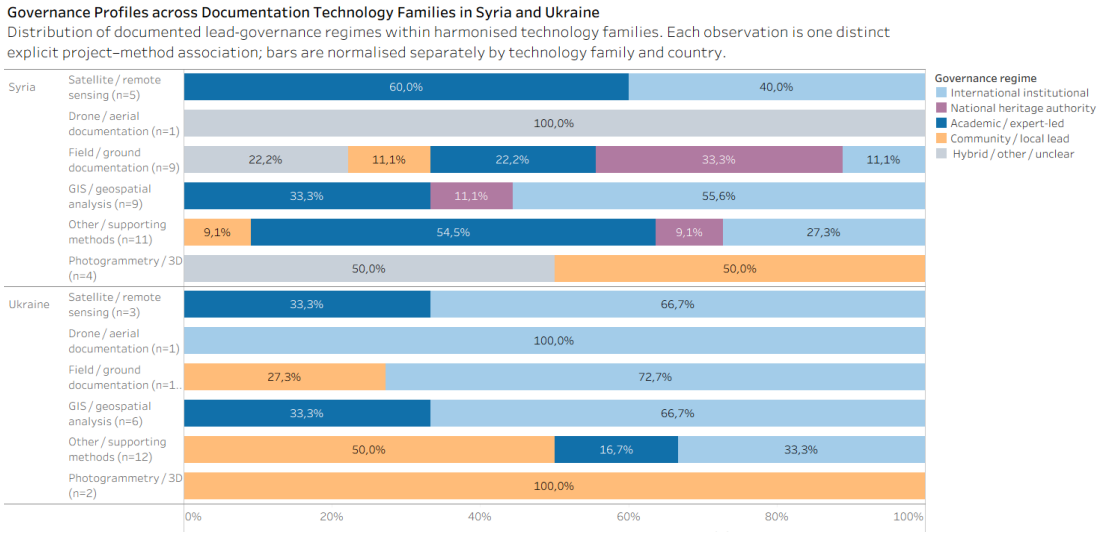

Figure 35. – Governance profiles across documentation technology families in Syria and Ukraine. Bars showed the distribution of documented lead-governance regimes within each harmonized technology family and were normalized separately by country and technology family. Each observation represented one distinct, explicitly documented project-method association, while the number of eligible associations was reported for each country-technology family. Percentages described the composition of each group rather than the overall frequency or importance of a technology. Author's elaboration in Tableau based on the thesis datasets.

Satellite and remote-sensing documentation showed broadly similar profiles in the two corpora. In Syria, five associations were divided between academic or expert leadership (60.0%) and international institutional leadership (40.0%), while in Ukraine three associations were split between international (66.7%) and academic or expert leadership (33.3%). GIS and geospatial analysis showed greater heterogeneity in Syria. Of nine associations, 55.6% were internationally led, 33.3% academic or expert led, and 11.1% associated with a national heritage authority. In Ukraine, six GIS associations were divided between international (66.7%) and academic or expert leadership (33.3%). Field and ground documentation differed more clearly: Syria's nine associations were distributed across all five governance categories, whereas Ukraine's were concentrated in

international leadership (72.7%) and community or local leadership (27.3%). Photogrammetry and 3D documentation showed a stronger local component, although the denominators were small. In Syria, four associations were evenly divided between community or local leadership and hybrid or unclear governance, while both Ukrainian associations were community or locally led. Drone and aerial documentation were represented by only one association in each corpus, so their 100% values reflected isolated cases rather than recurring patterns. Other or supporting methods also showed different governance profiles: in Syria, eleven associations were mainly academic or expert led (54.5%) or international (27.3%), whereas in Ukraine twelve associations were divided between community or local leadership (50.0%), international leadership (33.3%) and academic or expert leadership (16.7%).

I then summarized all explicit project-method associations to compare the overall governance composition of the two corpora.

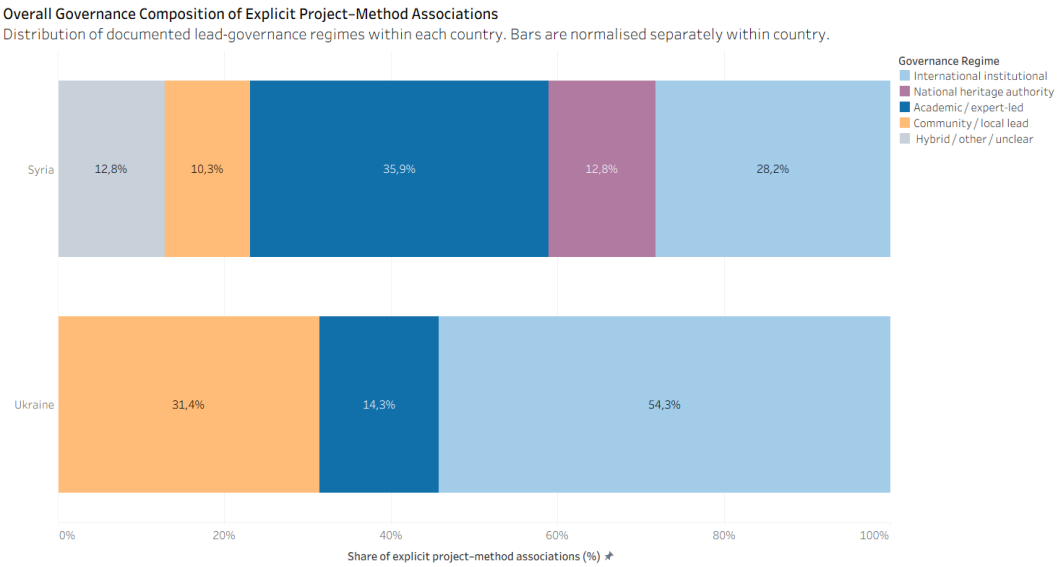

Figure 36. – Overall governance composition of explicitly documented project-method associations in Syria and Ukraine. Bars showed the distribution of documented lead-governance regimes across all explicit project-method associations retained in each corpus and were normalized separately within country. Syria: n = 39 associations; Ukraine: n = 35 associations. The figure described documented project-method leadership and did not measure legal ownership, funding, contractual authority or long-term data custody. Author's elaboration in Tableau based on the thesis datasets.

Among the 39 Syrian associations, academic or expert leadership was the largest category (35.9%), followed by international institutional leadership (28.2%). National heritage authority and hybrid or unclear governance each accounted for 12.8%, while community or local leadership represented 10.3%. Syria therefore showed a relatively heterogeneous governance environment. Among the 35 Ukrainian associations, international institutional leadership accounted for 54.3%, community or local leadership for 31.4%, and academic or expert leadership for 14.3%. The absence of national or hybrid categories in this subset did not imply that Ukrainian national institutions were absent from heritage protection, but only that the retained project-method relationships were documented within the three categories represented in the figure.

Taken together, Figures 35 and 36 showed that documentation technologies did not have fixed governance regimes. Similar methods operated under international, academic, national, community-based and hybrid arrangements. Governance was therefore shaped by the projects and partnerships through which technologies were deployed rather than by the technologies themselves. The figures identified documented organizational settings, but did not establish legal ownership, financial control, contractual authority or long-term data custody.

4.3.5 Damage Severity and Documentary Visibility

The final comparative analysis examined whether higher documentary visibility was associated with lower levels of recorded physical damage in the Syrian and Ukrainian corpora. Since the same Documentary Visibility Score was used in both case studies, the comparison made it possible to assess whether the most visible and extensively documented sites tended to fall within the lower damage-severity categories. Such a pattern could have suggested a possible protective association. The analysis, however, remains descriptive: it does not assume that documentation itself protected heritage, nor that documentary visibility influenced targeting decisions or the causes of damage.

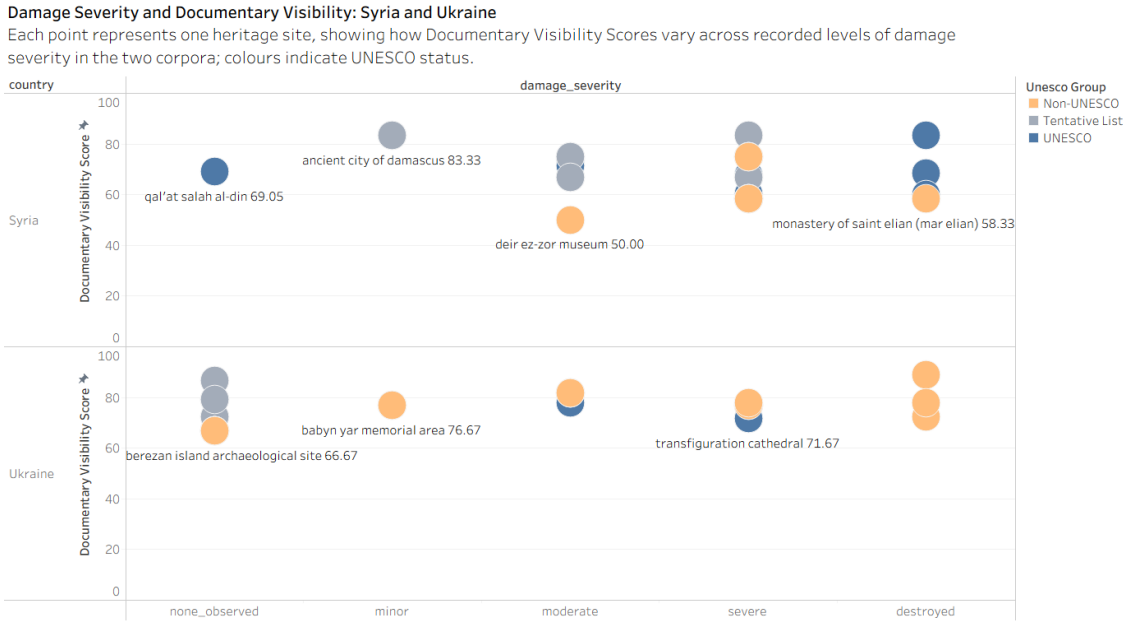

Figure 37. – Damage severity and documentary visibility in the Syrian and Ukrainian heritage corpora. Each point represents one heritage site, positioned according to its recorded damage-severity category and Documentary Visibility Score (0–100), calculated from source breadth, public traceability and method breadth. Colours distinguish UNESCO World Heritage sites, sites on the Tentative List and non-UNESCO sites. Sites without an assessable damage-severity classification were excluded. Author's elaboration in Tableau based on the thesis datasets.

In the Syrian corpus, higher documentary visibility was not concentrated among the least damaged sites. Highly visible sites appear across different damage categories. The Ancient City of Damascus, classified as having minor damage, records a Documentary Visibility Score of 83.33, while Qal'at Salah al-Din, for which no damage was observed, reaches 69.05. At the same time, relatively high scores are also found among sites classified as severely damaged or destroyed, whereas Deir ez-Zor Museum, classified as moderately damaged, records a lower score of 50.00. The Syrian distribution therefore shows that sites with similar damage levels could occupy different positions in the documentary record, while sites with different material conditions could reach comparable levels of visibility. A similar pattern is visible in the Ukrainian corpus. The category of sites with no observed damage is particularly informative because several cases still show medium-to-high documentary visibility. Berezan Island Archaeological Site, for example, records a score of 66.67, while other sites in the same category reach even higher values. High documentary visibility also appears among damaged sites:

Odesa Fine Arts Museum, classified as moderately damaged, records 77.78, and the Transfiguration Cathedral, classified as severely damaged, reaches 71.67. As in Syria, the most visible sites do not cluster mainly among the least damaged cases. Highly documented sites also appear among severely damaged and destroyed heritage, and sites with similar Documentary Visibility Scores can fall into different damage categories.

The comparison therefore suggests that higher documentary visibility was not systematically associated with lower recorded damage severity in either corpus. This does not mean that documentation, visibility or institutional recognition had no protective role in specific situations. The dataset does not provide evidence about preventive measures, military decision-making or the motivations of conflict actors. What it does show is that, within the selected corpora, greater public documentary visibility did not consistently correspond to lower levels of physical damage. This result strengthens one of the broader arguments of the thesis: material condition and documentary condition should be treated as separate analytical dimensions. A site can be extensively documented, monitored by several initiatives and clearly traceable in public sources while still suffering severe damage or destruction. Documentary visibility therefore reflects the way knowledge about heritage is produced, selected and made accessible through institutional attention, project priorities, methodological diversity and public traceability. It should not be read as a direct indicator of protection or vulnerability. In this sense, the comparison also contributes to the discussion of visibility bias, since the sites most visible in public datasets are not necessarily those least damaged or best protected.

4.3.6 Heritage Type and Documentary Visibility

The final visibility analysis examined whether documentary attention was distributed differently across broad heritage categories in the Syrian and Ukrainian corpora. The comparison asked whether particular forms of heritage consistently occupied higher positions on the Documentary Visibility Score, or whether variation within categories was as important as variation between them. Heritage type is treated here as a descriptive

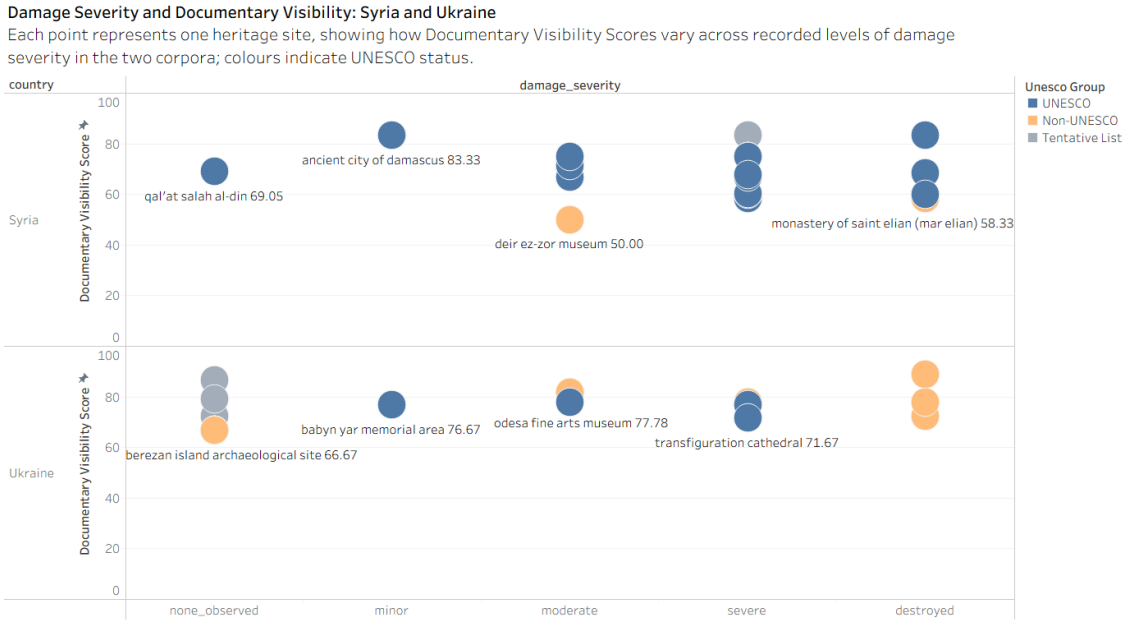

Figure 38. – Documentary visibility across heritage types in the Syrian and Ukrainian heritage corpora. Each point represents one heritage site positioned according to its broad heritage category and Documentary Visibility Score (0–100), calculated from source breadth, public traceability and method breadth. The two panels show Syria and Ukraine on the same visibility scale, while colours distinguish UNESCO World Heritage sites, sites on the Tentative List and non-UNESCO sites. The uneven number of sites represented within individual heritage categories should be considered when interpreting differences between groups. Overlapping marks indicate that multiple sites may share the same heritage category and Documentary Visibility. Author's elaboration in Tableau based on the thesis datasets.

variable rather than as an explanatory one, since the two purposive corpora differ in their typological composition and several categories contain only a small number of cases.

Figure 38 does not reveal a clear typological hierarchy in either corpus. In both Syria and Ukraine, several heritage categories occupy overlapping portions of the Documentary Visibility Score, and no single category consistently appears at the top or bottom of the distribution. Archaeological sites, religious sites, monuments, historic urban fabric and cultural institutions all include cases with medium-to-high documentary visibility. This overlap suggests that belonging to a particular heritage category was not, by itself, sufficient to explain how strongly a site was represented in the public documentary record. The variation within categories is especially important. In both corpora, sites belonging to the same broad heritage type can occupy noticeably different positions on the visibility scale. Archaeological sites provide a clear example, since they include both comparatively lower and highly visible cases rather than forming a uniform documentary

group. A similar pattern can be observed among cultural institutions and religious heritage. The main result is therefore not simply that category averages differ, but that within-category heterogeneity is substantial. Documentary attention appears to have operated at the level of individual sites and documentation projects as much as at the level of heritage type. Some differences between the two corpora remain visible. The Syrian corpus contains a stronger concentration of archaeological, monumental and religious heritage, while the Ukrainian corpus is distributed across a wider range of heritage types. Several Ukrainian categories reach relatively high visibility levels, but this does not amount to a stable typological ranking. Categories represented by only one or very few sites, such as cultural landscape or water heritage, are particularly difficult to interpret comparatively because their position reflects individual cases rather than a broader category-level pattern. For this reason, direct comparisons of category means would risk overstating differences produced by small and uneven group sizes. UNESCO status adds a further descriptive layer, but it does not produce a consistent pattern. UNESCO World Heritage sites, Tentative List sites and non-UNESCO sites appear across different visibility levels and heritage categories. In some groups, formally recognized sites occupy high documentary positions, while in others non-UNESCO or Tentative List sites reach comparable or higher values. Formal recognition therefore does not explain documentary visibility independently of the wider documentary context.

Taken together, the two corpora show that documentary visibility was not organized according to a simple hierarchy of heritage types. Instead, it appears to reflect a combination of institutional attention, project selection, research priorities, available documentation methods and the specific monitoring history of individual sites. This finding complements the previous analysis of damage severity. Documentary visibility was neither systematically associated with lower levels of physical damage nor straightforwardly determined by heritage type. In both cases, the documentary position of a site reflected the infrastructures through which it was selected, documented and made publicly traceable, rather than a single characteristic of the heritage place itself. The result therefore reinforces the broader argument of the thesis that documentary visibility should be understood as a property of the documentary system surrounding a site, rather than as a direct proxy for its material condition, institutional status or heritage category.

4.4 Comparative synthesis and methodological implications

Taken together, the six comparative analyses support the central argument of this chapter: differences between the Syrian and Ukrainian corpora cannot be explained simply by counting technologies, initiatives or documented sites. What matters is the wider architecture of documentary knowledge: the relationships connecting heritage places, sources, technologies, evidence, institutions and communities. The same number of initiatives may produce different levels of public traceability, while the same technology may generate different forms of evidence or operate under different governance arrangements. The comparison therefore concerned not only how much documentation existed, but what it made visible, how securely its claims could be traced, and who retained authority over its production and use. The two corpora revealed different documentary configurations rather than successive stages on a single scale of development. Syria was characterized by an extensive but frequently partial network of site–initiative relationships, a strong role for remote sensing in documenting landscape and temporal change, and a heterogeneous governance environment in which academic, expert and international actors were prominent. Ukraine showed a higher proportion of direct site-level relationships, greater concentration at high evidentiary-depth values and, within the small co-production group, a clearer association between deeper participation and shared authority. Its project–method associations were also more concentrated in international institutional and community or local leadership. These differences should not be interpreted as evidence that one national system was more advanced than the other. They were better understood in relation to the conditions under which documentation developed. The Syrian pattern was consistent with a prolonged conflict marked by territorial fragmentation, uneven access and the gradual accumulation of specialized projects, while the Ukrainian pattern reflected the rapid expansion of documentation after 2022, continued professional activity, international verification and visible emergency participation. These interpretations remained contextual rather than causal because the analysis compared relationships within two purposively selected corpora. The comparison produced six main findings:

- **Documentary breadth, evidentiary depth and public traceability described different properties of the record.** Syria contained a higher combined proportion of direct and partial site–initiative relationships, although most positive relationships were partial. Ukraine showed a larger unknown component, while visible positive relationships were more often direct. Figure 28 also showed that wider initiative coverage did not consistently correspond to greater evidentiary depth. In Ukraine, the median evidentiary-depth score reached 100%, but this represented a ceiling effect rather than proof of complete documentation. Project counts, evidentiary-depth scores and coverage categories therefore measured different aspects of the documentary record and had to be interpreted together.
- **Distal and proximal methods produced complementary rather than interchangeable evidence** Across both corpora, distal technologies were more strongly associated with temporal change and landscape-scale evidence, while proximal methods provided stronger coverage of interiors, materials, morphology, metric detail, construction fabric and community-related dimensions. This reflected differences in observational scale: satellite imagery, change detection and GIS supported repeated monitoring across large or inaccessible areas, whereas ground photography, architectural survey and photogrammetry captured finer material and spatial detail. Neither family was inherently superior. Cause attribution was particularly context-dependent and required corroboration through multiple forms of evidence. The methodological priority was therefore triangulation rather than reliance on a single technological family.
- **Participation did not necessarily redistribute decision-making authority. The comparison showed why participation depth and authority had to be coded separately.** Contributing labour, photographs, testimony or technical knowledge was not equivalent to controlling how evidence was selected, classified, validated, published or reused. In Syria, most assessable co-production cases remained under institutional or expert authority, although two were locally led. In Ukraine, the small co-production group was consistently associated with shared decision-making, but most assessable sites remained at audience or indirect-access level

under institutional control. Participation therefore became meaningful power-sharing only where contributors acquired substantive decision-making rights.

- **Documentation technologies did not correspond to fixed governance regimes.** Similar methods operated within international, academic, national, community-based and hybrid arrangements. In Syria, project–method associations were distributed across all five governance categories, with academic or expert and international actors most prominent. In Ukraine, the distribution was more concentrated in international institutional and community or local leadership. Governance therefore depended on the projects, institutions and partnerships through which technologies were deployed rather than on the technologies themselves. These results describe documented organizational leadership and do not establish legal ownership, funding, contractual authority or long-term data custody.
- **Higher documentary visibility was not systematically associated with lower recorded damage severity.** In both corpora, highly visible sites appeared across very different material conditions, including severe damage and destruction, while sites within the same damage category could occupy markedly different positions on the Documentary Visibility Score. The comparison therefore did not reveal a clear protective pattern in which more extensively documented sites were consistently less damaged. This does not demonstrate that documentation or institutional recognition had no protective role in individual cases, since the datasets do not capture military intentions, preventive measures or targeting decisions. It does show, however, that documentary prominence and material condition followed different patterns within the selected corpora.
- **Documentary visibility did not follow a clear hierarchy of heritage types.** Across both Syria and Ukraine, most heritage categories occupied overlapping portions of the Documentary Visibility Score, and in several categories the variation between individual sites was as important as the differences between categories. No single type of heritage consistently dominated the documentary record. The result suggests that documentary attention was not determined by heritage type alone, but reflected a broader combination of project selection,

institutional priorities, research interests, available documentation methods and the monitoring history of individual sites. Because some heritage categories contained only one or a few cases, these patterns remain descriptive and should not be generalized beyond the selected corpora. The result is nevertheless important because it shows that the absence of a strong typological hierarchy is itself informative: documentary attention was distributed unevenly at site level rather than being consistently concentrated on one form of heritage.

Taken together, these findings also point to a broader methodological implication: conflict-affected heritage requires responsible traceability rather than unrestricted public exposure. Documentary evidence became more useful when it could be connected to identifiable sources, dates, methods and levels of certainty, but this did not require all underlying information to be openly accessible. In conflict settings, publishing precise coordinates, inventories, storage locations, staff identities or operational information may increase risks of looting, targeting or unauthorized use. The Berkeley Protocol provides a useful methodological reference because of its emphasis on identifying, collecting, preserving, verifying and analyzing digital open-source information. [132] Although developed for legal and human-rights investigations rather than specifically for cultural heritage, its principles of provenance, preservation and verification can be adapted to heritage documentation. The FAIR principles similarly clarify that accessibility does not necessarily mean universal openness: data may remain accessible through controlled protocols, authentication and authorization. [133] Responsible traceability is therefore compatible with redaction, tiered access, embargoes and trusted custody, provided that sufficient metadata remain available to identify the object, source, method, date, claim and access status. The participation analysis adds a further requirement: provenance

[132] Human Rights Center, University of California, Berkeley, and Office of the United Nations High Commissioner for Human Rights, *Berkeley Protocol on Digital Open Source Investigations: A Practical Guide on the Effective Use of Digital Open Source Information in Investigating Violations of International Criminal, Human Rights and Humanitarian Law* (New York and Geneva: United Nations, 2022), 31-65

[133] Mark D. Wilkinson et al., "The FAIR Guiding Principles for Scientific Data Management and Stewardship," *Scientific Data* 3 (2016): article 160018

should include decision rights. Documentation protocols should identify who collects, validates, classifies, hosts, publishes, corrects, restricts and authorizes reuse. These roles may be distributed across different actors. Communities may contribute interpretation, national institutions may provide secure storage, international organizations may supply imagery, and local professionals may validate identifications. The CARE principles, although developed specifically for Indigenous data governance and not directly transferable to every heritage context, offer a useful counterweight to approaches focused only on technical accessibility and interoperability.[134] They draw attention to collective benefit, authority, responsibility and ethics, all of which are especially relevant where cultural data are produced in conditions of conflict, displacement or occupation.

These conclusions remained bounded by the comparative design. The two corpora were small and purposively constructed, differed in heritage typology, accessibility, chronology and public source availability, and measured public traceability rather than the total amount of documentation that may have existed. Unknown relationships could conceal restricted or unpublished activity and therefore could not be treated as documentary absence. Within these limits, however, the recurrence of similar relationships across several analytical dimensions supports a broader methodological conclusion: the value of digital documentation depended less on the number of technologies or outputs than on the capacity to connect complementary evidence through transparent provenance, explicit uncertainty and accountable governance. For conflict-affected heritage, a resilient documentary system therefore required remote observation, close-range verification, metric and archival records, and community knowledge to remain connected without compromising sensitive information or the rights of the institutions and communities associated with the heritage.

[134] Stephanie Russo Carroll et al., "The CARE Principles for Indigenous Data Governance," *Data Science Journal* 19 (2020): article 43, 1–12.

4.4.1 Future research and methodological extensions

The methodological boundaries identified above suggest several ways to extend and test the comparative framework. First, future research could expand both corpora and adopt a more systematically stratified selection of sites, including minor, rural and vernacular heritage, as well as movable and intangible heritage that remain less visible in the present site-based model. Matched comparisons based on heritage type, accessibility, damage conditions and documentary period could also help distinguish differences between the two documentary environments from those produced by corpus composition. A second direction concerns access to evidence. Comparing publicly available records with non-public institutional archives or restricted project data could clarify whether unknown relationships reflected actual documentary gaps or limited public visibility. Such work would, however, require formal access agreements and safeguards for sensitive information, particularly where disclosure could expose heritage places, collections, professionals or communities to additional risks. The robustness of the calculated measures could also be tested through sensitivity analysis. Alternative weights for partial site–initiative relationships could determine whether documentary-breadth patterns remain stable under different assumptions. Likewise, the distal–proximal distinction could be reassessed through alternative classifications, especially for hybrid practices such as drone documentation, GIS and 3D modelling, which may combine remote and close-range forms of observation. Finally, recording the coding date at row level would support a longitudinal analysis. Rather than describing each site only at a fixed analytical cut-off, future research could trace changes from publicly unknown to documented, from documented to independently verified, and from verification to conservation, restitution or reconstruction planning. This would also make it possible to examine whether emergency documentation initiatives develop into durable infrastructures or decline once immediate attention and funding diminish. Such an approach would extend the present study from the structure of documentary knowledge at a given moment to the processes through which that knowledge is created, revised and maintained over time.

4.5 The Digital Project: From Research to Interactive Storytelling

I developed a digital component of this thesis to complement the written research and to present its main questions and results through a different form of communication. The thesis examined how digital technologies influence the documentation, interpretation and public visibility of cultural heritage affected by war, focusing on Syria and Ukraine. Because the research involved geographical distributions, relationships between sites and initiatives, different documentation technologies and uneven forms of evidence, some of its findings could be communicated more clearly through maps, visualizations and interactive elements than through text alone. For this reason, I designed the digital project as a sequential and interactive narrative in which text, maps, data visualizations and selected case studies work together. The choice of digital storytelling followed directly from the nature of the research. Digital storytelling combines narrative, digital media and humanistic research, making it possible to connect different forms of evidence while also supporting interpretation and public engagement.[135] In this project, storytelling was not used to make the subject more dramatic or to simplify complex evidence into a fixed narrative; instead, it provided a way to guide readers through the logic of the research: why particular questions were asked, how the evidence was organized and how the different analyses contributed to the wider argument of the thesis. This was particularly important because the project dealt with cultural heritage affected by ongoing or recent conflicts. The available evidence was often fragmented, unevenly accessible and shaped by different conditions of publication, physical access and verification. A strong visual narrative could easily create the impression of a complete account of heritage destruction in Syria or Ukraine. The StoryMap was therefore designed differently. It presented the patterns identified within two purposively selected corpora of thirty sites, while making clear that these results depended on publicly available evidence, coding decisions and the documentary practices examined in the thesis. The maps and charts were therefore treated as analytical and interpretative tools rather than as neutral representations of facts. Choices concerning categories, scales, labels, colors and the inclusion or exclusion of

[135] John F. Barber, "Digital Storytelling: New Opportunities for Humanities Scholarship and Pedagogy," *Cogent Arts & Humanities* 3, no. 1 (2016): article 1181037.

information inevitably influence what readers notice and how they interpret the results. For this reason, the visualizations were accompanied by definitions, captions and methodological explanations. Particular attention was given to distinctions such as that between unknown information and verified absence. This was especially important when visualizing documentary coverage, participation and authority, because a lack of publicly available information could not automatically be interpreted as evidence that an activity had not taken place. The sequential structure of the StoryMap made it possible to preserve this methodological context while still guiding readers through the argument. Recent research on narrative visualization has distinguished between author-guided structures, which lead readers through a predetermined sequence, and more exploratory forms that allow users greater freedom to navigate and interpret the data.[136] I followed this principle by avoiding both a completely fixed presentation and an open dashboard in which readers would be left to interpret a large amount of information without guidance. The StoryMap therefore followed a clear progression. It introduced the problem of documenting cultural heritage during war, presented the Syrian and Ukrainian cases, and then moved toward the comparative results. Within this structure, interactive maps and visualizations allowed readers to stop, examine individual sites, compare categories and explore specific details according to their interests. The narrative provided the context needed to understand the main findings, while interactivity gave readers greater freedom to investigate the evidence. This balance was important because narrative visualizations always guide attention to some extent. At the same time, narrative visualizations are not neutral containers of information. The selection and sequencing of content, together with annotations, layout and interaction, influence how audiences encounter the evidence and can direct attention towards particular interpretations.[137] I therefore used narrative guidance to make the argument understandable, while also providing enough methodological information for readers to understand how the visualizations had been constructed and what their limitations were.

[136] Pengkun Ren, Yi Wang, and Fan Zhao, "Re-understanding of Data Storytelling Tools from a Narrative Perspective," *Visual Intelligence* 1 (2023): article 11.

[137] Ren, Wang, and Zhao, "Re-understanding of Data Storytelling Tools from a Narrative Perspective," *Visual Intelligence* 1 (2023): article 11

I selected ArcGIS StoryMaps because it allowed me to combine written explanation, interactive maps, images and data visualizations within a single environment. This was particularly appropriate for a study in which geography was part of the research problem rather than simply background information. The location of heritage sites, their accessibility, their relationship to conflict areas and the geographical scale of monitoring initiatives all influenced how cultural heritage could be observed and documented. The maps therefore did more than show where the selected heritage places were located. They helped place individual sites within wider geographical patterns and allowed readers to move between the scale of the entire corpus and that of a single place. At the same time, they did not represent a complete geography of cultural destruction. Rather, they showed a geography of publicly documented evidence, shaped by technological possibilities, institutional priorities, security conditions and unequal access to heritage sites. This approach was also influenced by the concept of narrative cartography. Story maps extend this relationship into geographical space. By combining interactive maps with text, images, audiovisual materials and temporal sequences, they can connect events to places and communicate dimensions of a territory that a conventional map alone cannot adequately convey.[138] This perspective was particularly useful for the present project because the maps did not show destruction in a direct or complete way. They showed what had become visible through documentation practices. Making this distinction clear helped avoid the assumption that the most visible sites were necessarily the most severely affected, or that sites with less documentation had suffered less damage. ArcGIS StoryMaps also supported the public-facing dimension of the project. Research on its use in archaeology has shown that the platform can combine maps, images, models and other digital materials within a contextualized narrative while allowing readers to explore them interactively.[139] In this thesis, this made it possible to

[138] Sébastien Caquard and William Cartwright, "Narrative Cartography: From Mapping Stories to the Narrative of Maps and Mapping," *The Cartographic Journal* 51, no. 2 (2014): 101–106

[139] Matthew D. Howland, Brady Liss, Thomas E. Levy, and Mohammad Najjar, "Integrating Digital Datasets into Public Engagement through ArcGIS StoryMaps," *Advances in Archaeological Practice* 8, no. 4 (2020): 351–360; Valentina Bartalesi et al., "Using Semantic Story Maps to Describe a Territory beyond Its Map," *Semantic Web* 14, no. 6 (2023): 1255–1272.

present a complex methodological discussion in a more accessible form without removing its complexity. Readers could first encounter a research question or result, then examine the related visualization, and finally access definitions or additional explanations when needed.

Figure 39. – Opening screen of the digital storytelling project *What Can We Know After Destruction?* The StoryMap presents the research through a sequential visual narrative and can be accessed at the following link: https://arcg.is/1KXvXT8; Author's elaboration in ArcGIS StoryMaps.

The digital project therefore had an analytical purpose as well as a communicative one. The written thesis developed its argument through detailed discussion, while the StoryMap made some relationships among the results easier to observe visually. By moving between maps, comparative charts and individual cases, readers could see that wider documentary coverage did not necessarily correspond to greater evidentiary depth; that distal and proximal technologies made different but complementary forms of evidence visible; that similar technologies could operate under different governance arrangements; and that public participation did not automatically imply decision-making authority. This was the main contribution of the digital project beyond the written thesis. It did not introduce a separate body of evidence or produce new findings. Instead, it provided another way of interpreting and connecting the results already developed through the research. The comparison between Syria and Ukraine became not only something described in the text, but also something that could be explored through common visual structures. At the same time, individual cases helped keep the

comparative patterns connected to the specific heritage places, institutions and documentary conditions from which they emerged. The StoryMap could therefore be used in different ways. It could be followed from beginning to end as a visual introduction to the research, consulted alongside the relevant chapters of the thesis, or explored selectively by readers interested in a particular site, technology or analytical question. This flexibility made it potentially useful for students, researchers, heritage professionals and a wider public. However, making the research more accessible did not automatically make it more participatory. An interactive StoryMap allowed users to explore the evidence more easily, but it did not redistribute authority over how the data were interpreted, classified or presented. This distinction directly reflected one of the main findings of the thesis: access, contribution and decision-making power are related, but they are not the same.

Finally, the digital format gave the research a degree of flexibility that a fixed thesis document could not provide. New evidence, revised coding decisions or additional sites could be incorporated into future versions of the project. This possibility was particularly relevant because the documentary records of both conflicts continued to develop. However, the StoryMap should not be understood as a continuously updated or definitive record of heritage loss. It remained a research output with a clearly defined dataset, methodology and analytical scope. For these reasons, I did not conceive the digital project as a simple visual appendix to the thesis. It formed an additional interpretative layer of the research and put one of its main methodological arguments into practice: digital technologies do not simply preserve or display information about cultural heritage. They also shape what becomes visible, how evidence can be compared and how cultural heritage can be understood by different audiences. By making the research both readable and explorable, the StoryMap extended the thesis beyond the written text while preserving the distinctions, uncertainties and limitations on which its conclusions depended.

CONCLUSIONS

This thesis began with a practical and epistemological question: what happens to cultural heritage when wartime destruction is accompanied by the fragmentation of the evidence needed to understand it? The comparison between Syria and Ukraine has shown that the answer cannot be reduced to the number of sites recorded, the technologies employed or the quantity of data preserved. What matters is how evidence is produced, connected, verified and made accessible, and who retains authority over its interpretation and use. Digital documentation is therefore not simply a technical response to cultural loss, but part of the infrastructure through which destruction becomes visible, verifiable and historically intelligible. The analysis of sixty heritage places revealed two different documentary configurations rather than a hierarchy between a more and a less successful system. In Syria, documentation accumulated over more than a decade under conditions of fragmented control and uneven access. In Ukraine, the full-scale invasion of 2022 triggered a rapid expansion of documentation involving national institutions, international organizations, heritage professionals and volunteer networks. These different conditions shaped not only the amount of information available, but also its precision, organization and public traceability. The comparison showed that documentary reach, traceability and evidentiary depth were distinct dimensions. In Syria, most confirmed site–initiative relationships were partial, while in Ukraine visible relationships were more often direct but a larger share remained unknown. These unknown cases marked the limits of publicly demonstrable evidence rather than documentary absence. Likewise, wider initiative coverage did not necessarily produce deeper evidence, and digital visibility reflected documentary conditions, institutional priorities and accessibility rather than cultural importance alone. The comparison also revealed a consistent separation between material condition and documentary condition. In neither corpus did Documentary Visibility increase systematically with recorded damage severity. Sites affected by similar levels of damage could occupy very different positions in the documentary record, while sites with very different material conditions could display comparable levels of visibility. The publicly accessible record therefore cannot be read as a neutral map of destruction: it also reflects where documentary attention, institutional capacity, technological resources and publicly traceable evidence are concentrated. A complementary comparison by heritage

type produced a similar result. Documentary visibility did not follow a clear typological hierarchy in either corpus: different heritage categories occupied overlapping positions on the visibility scale, while sites within the same category could be documented very differently. This suggests that documentary attention was shaped less by heritage type alone than by the projects, institutions, technologies and publication practices surrounding individual sites.The technological analysis revealed a complementary relationship between distal and proximal methods. Distal approaches were stronger for spatial and temporal evidence, while proximal methods provided richer architectural, material, metric and socially embedded information. Reliable documentation therefore depended on combining different sources while preserving provenance, chronology and uncertainty. Participation and governance produced a similar distinction. Public contribution did not automatically entail decision-making authority: most Syrian co-production cases remained institutionally led, while the smaller Ukrainian group showed a clearer association with shared authority. At the same time, technologies operated across different international, academic, national, community-based and hybrid arrangements. Their governance was therefore shaped not by the technologies themselves, but by the access, expertise, infrastructure and partnerships through which they were used.

Taken together, these findings suggest that wartime heritage documentation should not be evaluated through quantity alone. A large archive may remain difficult to verify, a sophisticated model may preserve form without context, and a participatory platform may collect many contributions without redistributing authority. Effective documentation requires transparent provenance, stable connections between records, explicit uncertainty and accountable governance, while accessibility must be balanced with the protection of sensitive information. The scope of these conclusions remains defined by the research design. The two corpora were purposively constructed and cannot be treated as representative of all Syrian and Ukrainian heritage. Differences in site type, conflict chronology, access and public availability influenced the observed patterns. Nevertheless, the recurrence of the main tendencies across the comparative analyses supports a broader conclusion: the value of digital evidence depends less on the number of technologies or outputs than on the documentary system within which evidence is produced, connected and governed. The central contribution of this thesis is therefore to

move beyond the assumption that more documentation necessarily produces better protection. Digital records become meaningful when they support claims that are traceable, proportionate to the available evidence and open to scrutiny. Digital documentation cannot reverse physical destruction, but it can prevent cultural loss from becoming historically invisible. The future of digital heritage protection therefore depends not simply on more advanced technologies, but on documentary systems capable of connecting evidence, place and community through transparency, responsibility and care.

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Dichiarazione del ricorso a strumenti di Intelligenza Artificiale (IA)

La sottoscritta Sofia Savini, matricola numero 906156 , iscritta presso Ca' Foscari al corso di Laurea magistrale in Digital and Public Humanities, autrice della tesi di laurea " Cultural Heritage at War: Digital Documentation, Monitoring, and Protection through Digital and Public Humanities in Syria and Ukraine", relatore Stefano Dall'Aglio, consapevole delle sanzioni previste dall'art. 76 del Testo unico, D.P.R. 28/12/2000 n.445, e della decadenza dei benefici prevista dall'art. 75 del medesimo Testo unico in caso di dichiarazioni false o mendaci, sotto la propria personale responsabilità ai sensi degli artt. 46 e 47 del D.P.R. 28/12/2000 n. 445,

DICHIARA

- □ di NON aver fatto ricorso a tecnologie di intelligenza artificiale generativa per supportare vari aspetti della ricerca e della scrittura del suo elaborato finale/della sua tesi di laurea;
- ☒ di aver fatto ricorso a tecnologie di intelligenza artificiale generativa per supportare vari aspetti della ricerca e della scrittura del suo elaborato finale/della mia tesi di laurea, in particolare
    - *indicare il nome dello strumento:* ChatGPT-4
    - *fornire informazioni su come è stato utilizzato lo strumento:*
        - □ *revisione e ottimizzazione dei testi per migliorare chiarezza e coerenza;*
        - □ *generazione di grafici e diagrammi per la presentazione dei dati;*
        - □ *supporto alla scrittura automatica di frasi;*
        - □ *produzione di immagini illustrative per integrare la parte metodologica;*
        - ☒ *altro (specificare):* supporto alla comprensione preliminare di alcuni testi in lingua araba ed ucraina. Supporto metodologico in fase preliminare nella definizione della struttura e dell'organizzazione del dataset.
    - indicare le sezioni/i capitoli interessate/interessati:

Lo strumento è stato utilizzato principalmente per supportare la consultazione delle fonti in arabo relative al capitolo 2 sulla Siria e dei testi in ucraino del capitolo 3. È stato inoltre impiegato per ottenere suggerimenti preliminari sull'organizzazione del dataset.

- *indicare come è stata verificata la correttezza, la qualità e l'attendibilità delle informazioni o dei testi eventualmente generati*.

Traduzioni, informazioni e suggerimenti dell'intelligenza artificiale sono stati utilizzati esclusivamente come supporto preliminare alla comprensione dei testi e alla progettazione del

dataset, senza considerarli fonti autonome. Contenuti e traduzioni sono stati verificati attraverso la bibliografia e la documentazione di riferimento, mentre la struttura definitiva del dataset e i criteri di organizzazione sono stati definiti autonomamente in coerenza con gli obiettivi e la metodologia della ricerca.

DICHIARA INOLTRE

che tutto il materiale generato dall'IA è stato attentamente verificato, rivisto e rielaborato dall'autrice, che si assume la piena responsabilità per la qualità, l'accuratezza e l'integrità scientifica del lavoro.