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Ethical considerations for remote sensing and open data in relation to the endangered archaeology in the Middle East and North Africa project

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Abstract

The UK-based Endangered Archaeology in the Middle East and North Africa (EAMENA) project uses remote sensing techniques to rapidly record and evaluate the status of archaeological and cultural heritage sites in the MENA region. Applying remote sensing methods to the archaeological landscapes of 20 countries, EAMENA is one of the largest documentation projects of its kind. Such a scope raises important ethical questions fundamental to the practice of remote-sensed archaeology, and this paper contributes to this discussion by reflecting on EAMENA's unique role in this subfield. We present ethical issues and possible solutions related to remote sensing and archaeology, drawing on models developed within the humanitarian aid sector and postcolonial archaeology. In addition, we consider issues of national sovereignty and their relationship to the engagement of local communities. Finally, this paper examines the roles of data openness and open access policies as ethical factors and how EAMENA has addressed these so far.

KEYWORDS

archaeology, cultural heritage preservation, ethics, Middle East and North Africa, open data, remote sensing

1 | INTRODUCTION

Archaeologists' use of remote sensing tools, such as satellite imagery, LiDAR, aerial photography and geographic information systems (GIS), are now standard parts of the archaeological toolkit for activities such as landscape analysis, site discovery and monitoring of cultural heritage properties, with remote sensing methodologies now widely applied in the Middle East and North Africa (e.g., Casana & Cothren, 2013; Kennedy, 2011; Kennedy & Bishop, 2011; Parcak, 2007) helping to transform the fields of landscape archaeology and cultural heritage management in the region. For much of that time, though, there had not been a concomitant discussion of their

implications for archaeological ethics (Parcak, 2009, p. 220) and their impact on local communities. These observations are only very recently starting to receive appropriate scholarly attention.

This paper discusses the application of ethical frameworks to remote sensing methodologies in archaeological research and cultural heritage preservation from the perspective of the UK-based Endangered Archaeology in the Middle East and North Africa (EAMENA) project. Instead of elucidating a project-specific statement of ethics, we draw on broader ethical principles advanced in both the humanitarian aid sector and postcolonial archaeologies and look at how they apply to EAMENA's work in the region. We also consider that the breadth of spatial coverage and potentially long timelines of cross-

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community interaction engendered by the EAMENA project require meaningful but broad ethical guidelines. Thus, we argue for a flexible, non-prescriptive approach that asks questions rather than provides answers in order to balance the multiple perspectives and agendas of both local and global practitioners of cultural heritage preservation and their communities. We support our case by providing three types of examples from our ongoing work and discussions with partners from the Middle East and North Africa (MENA): data accessibility, data structuring, and democratization of practice.

We set the scene by examining the current discourse in the ethics of archaeological remote sensing and identify some areas for further exploration. We then focus on how remote sensing allows practitioners to bypass traditional regulatory engagement in the MENA region, warranting other means of interaction with local communities and officials. Following that, we highlight some of the EAMENA project's outreach and collaborative work with MENA partners as effective alternatives to regulatory entanglement. In order to reflect on this work, we then draw attention to principles of humanitarian aid efforts developed within the context of international and potentially asymmetrical relationships. Such a context is relevant here in its similarity to much of the archaeology carried out in the MENA region. Finally, we discuss the role of ethics in relation to open data policies and use postcolonial concepts such as symmetrical archaeology to develop a working mindset of ethical practice for remote sensing archaeology. We propose that guiding questions are a productive means of implementing this mindset in remote sensing work, asking how local communities are or can be involved in the structuring and capturing of data and what might be the benefit to those communities. It is through the project's multi-year collaborations, which directly engage with representatives from MENA countries, that we have both formulated and been able to partially execute this approach, as seen in EAMENA's database design, access policies, research collaborations and the cultural heritage preservation activities undertaken through its partnerships across the region. The views in this paper are the authors' and do not necessarily represent the views of all members of the EAMENA project or of the project partners, nor do they constitute an official project statement.

2 | BACKGROUND OF THE EAMENA PROJECT

Countries located in the MENA region contain significant archaeological remains that are, as elsewhere in the world, increasingly under threat. The EAMENA project aims to identify, document and monitor the archaeological sites and landscapes of this region through remote sensing methodologies to support better understanding and mitigation of these threats. The project is a UK-based collaboration between the universities of Oxford, Leicester and Durham, with a diverse international staff including individuals from the MENA region, as well as a wide range of international partners. It has been funded since 2015 by the private charity Arcadia Fund who support the documentation of endangered cultural and natural heritage. Through the British

Council's Cultural Protection Fund (CPF), the EAMENA project also collaborates with local partner organizations across eight countries in the MENA region to provide training to local heritage professionals, focussing on skill and knowledge exchange.

Broadly speaking, the EAMENA project focuses on the use of remote sensing for the identification and documentation of archaeology and cultural heritage in the MENA region (Bewley et al., 2016). Its wide scope spans over 20 countries, from Morocco in the west to Iran in the east, and from Syria and Iraq (and since recently the Caucasus) in the north to Yemen and Oman in the south (Figure 1). In addition to remote sensing, the EAMENA project is also involved in fieldwork and the digitization of existing datasets that include site information and contextual resources such as historic aerial photography. As such, there are a multitude of external factors that affect our approach to archaeological survey and data management, including national regulations and managing relationships with international partners. Many of these issues are brought into sharp focus by the direct working relationships between the EAMENA project, various national cultural heritage departments and other stakeholders across the MENA region.

EAMENA's methodology prioritizes satellite imagery freely available through the Google Earth and Bing platforms. This imagery dates back as far as the early 2000s. We systematically scan satellite imagery to identify and describe potential archaeological remains, while referencing previously known and published sites (Figure 2). We supplement free imagery with purchased commercial satellite imagery, declassified imagery sources such as the Corona missions, recent and historical aerial photographs and recent and historical maps. We then integrate information from publications and field visits (see, e.g. Banks et al., 2017). Alongside this, we are experimenting with automatic site and change detection methods; for instance, applying custom algorithms to Google Earth Engine (Rayne et al., 2020). The accumulated information is captured in the EAMENA database, which is a custom instance of the open-source Arches platform (<http://archesproject.org>). One of EAMENA's main priorities is to make information available about archaeology and cultural heritage through a freely accessible online database (<http://eamena.web.ox.ac.uk/database>; also see Zerbini, 2018) so that the relevant authorities, heritage professionals, and researchers can use it to maximize efficacy of disturbance- and threat-intervention practices. Owing to concerns about data usage—for example, illicit excavation (see below)—it is necessary to register (for free) before acquiring access to the EAMENA database.

The broad scope of EAMENA raises important ethical questions about extra-local approaches to investigating cultural heritage landscapes in general and about the practice of remote sensing specifically. The use of remote sensing has clear advantages, as it allows for cultural heritage documentation and threat mitigation in areas that are difficult or impossible to access and for a rapid pace of assessment that is not possible in the field. Openly available remote sensing tools like Google Earth enable research and heritage management for non-institutional persons, as well as in regions with fewer resources available for cultural heritage monitoring. As in many other research areas, they facilitate international observation and partnership, as well as a

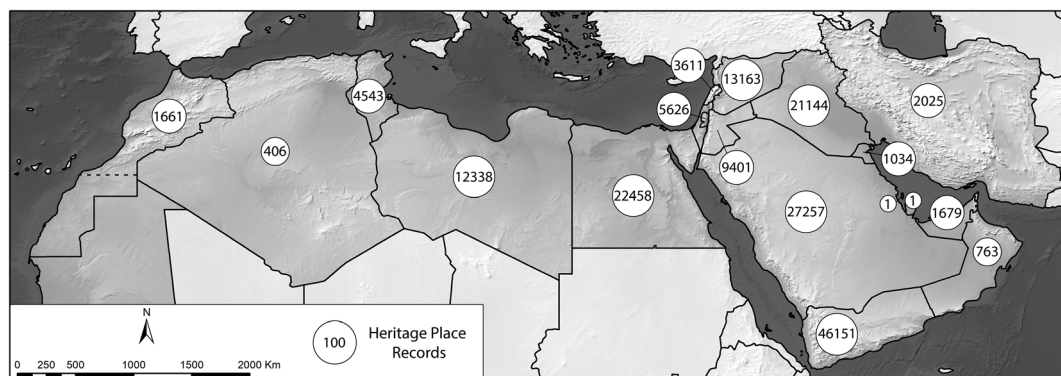
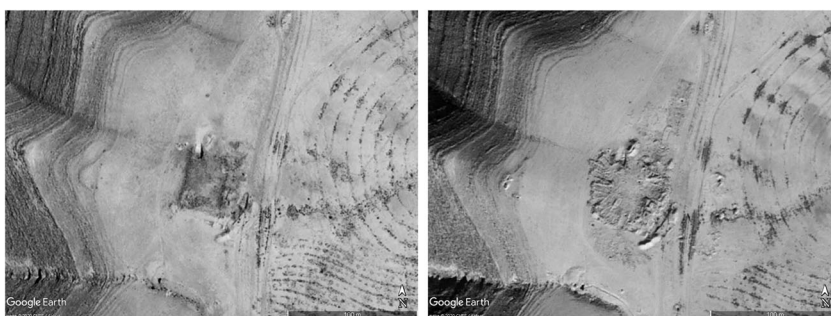


FIGURE 1 Map of the countries investigated by the EAMENA project with the number of “Heritage Place” (similar to site) records collected up to November 2020 in the project database

FIGURE 2 The Roman Fort of Rujm al Faridiyyeh in Jordan (EAMENA-0122530) on a CNES/Airbus satellite image captured on 08/10/2013 accessed through Google Earth (left) and after its destruction on an satellite image of 01/03/2017 (right) (CNES/Airbus, accessed through Google Earth Pro)



process of accountability that allows any observer with an internet connection to reassess archaeological interpretations and analysis.

Recently, however, archaeologists have begun voicing potential ethical problems associated with remote sensing methodologies (Cohen et al., 2020; Fernandez-Diaz et al., 2018; Myers, 2010a, 2010b). Explored further below, these include the question of whether—or to what extent—their use should be regulated, either at all or on a national level. This feeds into the broader question, “who owns the past” (see, e.g., Hodder, 2010; Scarre & Scarre, 2006). Related issues include data ownership, data sovereignty, and data repatriation. Furthermore, there is a longstanding question of whether accessibility to information about site locations supports illicit excavation and/or destruction of sites (see Ur, 2006, p. 37; Parcak, 2009, 2017; see below).

Existing debates on ethics in cultural heritage and archaeology tend to focus on related, but essentially different, issues such as professional working practice (e.g., AIA, 1997; Kenneth, 2007), handling of human remains (e.g., Squires et al., 2019), decolonialization and the rights of local communities (e.g., Atalay, 2006; Soderland & Lilley, 2015) and repatriation of physical objects (e.g., Merryman, 2005). While some of these concerns are applicable across archaeological subfields, we can distinguish remotely sensed data from more traditional archaeological data according to their wide geographical distribution, large scale and the fact that no direct access to an area is required (Cohen et al., 2020, p. 76). Therefore, considering a separate set of guidelines or code of conduct is warranted, but the issue tends to be avoided in publications (with notable exceptions

such as Parcak, 2009). We are not proposing a new, complete code of ethics, but our intention is to begin addressing the paucity of published debate on the ethics of remote sensing in archaeology. By drawing on our experience documenting archaeological remains in the MENA region, we present ethics issues and offer some potential non-prescriptive pathways towards an ethical framework for deploying remote sensing techniques.

3 | REMOTE SENSING ETHICS IN ARCHAEOLOGY

Since the launch of Google Earth in 2001, several studies have focused on both the positive and negative impacts of widespread access to high-resolution imagery (Luo et al., 2018; Myers, 2010a, 2010b; Thomas et al., 2008; Ur, 2006) without directly addressing the topic of ethical practices. As a relatively young subfield, the technique was not mentioned in the archaeological codes of ethics written between the 1970s and 1990s (AAA, 1998; AIA, 1997; Cohen et al., 2020, pp. 77–79; SAA, 1996; WAC, 1990). Cohen et al. have therefore argued that archaeologists should develop a code of conduct for the collection, storage and distribution of remote-sensed datasets (Cohen et al., 2020, p. 76). As an initial step, Parcak (2009, pp. 221–232) had offered a potential working statement, drawing from the code devised in the 1970s by the American Society of Photogrammetry and Remote Sensing (ASPRS, 1975), but based more directly on the Society for American Archaeologists' broader code of

ethics (SAA, 1996). However, these guidelines are both general and prescriptive. Today, the number of archaeological projects working with remote sensing technologies has increased significantly, as have the amount of born-digital data and the means available to disseminate, interact with and manipulate those data (see e.g. Opitz & Herrmann, 2018). There is thus an urgent need for archaeologists to face the ethical concerns specific to each project and region.

Recently, a lot of attention has been focussed on ethics in relation to big data (e.g., Howey et al., 2020; VanValkenburg & Dufton, 2020), particularly for collecting and maintaining large datasets. Specific concerns have also been raised about how archaeologists collect, use, reproduce and store LiDAR data (Cohen et al., 2020; Fernandez-Diaz et al., 2018; Fernandez-Diaz & Cohen, 2020). While these themes apply to all remote sensing datasets, the use of satellite imagery has the additional facet of not requiring physical access to an area, thereby sidestepping the necessity of a direct relationship with national and local stakeholders of the territory under investigation. In addition, it is widely and often freely available (in contrast, at least currently, to LiDAR data or historical aerial photos). This arrangement speaks to the strengths of the methodology from a practical standpoint, but as we discuss below, from an ethics perspective, it warrants seeking other means of international cooperation and inclusivity.

A commonly raised ethical concern for remote sensing in archaeology has been the potential for publicly available geospatial data to amplify the vulnerability of archaeological sites with respect to illicit excavation activities that feed international antiquities markets (Parcak, 2009, pp. 221–232). The scale itself is potentially more problematic, given the large, geographically broad datasets created through remote sensing techniques. The SAA (1996) Principle of Archaeological Ethics states that “an interest in preserving and protecting in situ archaeological sites must be taken into account when publishing and distributing information about their nature and location.” A study of archaeological opinions, however, has revealed that there is a disagreement among archaeologists' views about the efficacy of restrictions against publishing site locations (Frank et al., 2015). Furthermore, no substantial study or proof exists that hiding site locations from the public will necessarily safeguard antiquities from looters. Some have suggested that risks can instead be mitigated through education, cooperation, and community awareness (McKeague et al., 2019, p. 96; Parcak, 2009, p. 206). Nevertheless, Parcak (2017, p. 13) maintains that the online publication of location data has led to the destruction or removal of rock inscriptions and describes the publication of site coordinates as “harmful and unethical.” The perceived risk of looting was an impetus for the ethical guidelines initially set out by Parcak (2009), leading her to encourage the use of distorted site coordinates in publications. Such restrictive approaches can arguably create ethical problems of their own, especially regarding the prerogative of archaeologists to then decide who has full access to datasets with geospatial information. This final point highlights the difference between practical and postcolonial approaches to remote sensing archaeology. Neither is definitively superior, and they should work in tandem with one another to achieve a more complete ethical standard.

Potential for negative impact goes beyond whether tech-savvy looters might leverage a project's geospatial data to advance their goals. Recently, Santana Quintero et al. (2019) have outlined an ethical framework for cultural heritage recording specialists, basing it on several existing principles and codes of professional practice (e.g., ICOMOS, UNESCO, and RICS). This study has resulted in a list of ethical obligations for cultural heritage recording specialists, such as producing and maintaining high quality records, raising awareness of cultural heritage, sharing technologies and lowering the costs to do so, ensuring transparency and providing training (Santana Quintero et al., 2019, pp. 1065–1067). This list overlaps with some but not all ethical issues related specifically to remote sensing, which include invasion of privacy (Slonecker et al., 1998, p. 593), potential dehumanization of local inhabitants (Myers, 2010a, p. 462) and inadvertent fostering of knowledge disparity between areas of the globe (Bevan, 2015, p. 1480). Furthermore, using remote sensing techniques bypasses not only legal restrictions but also personal relationships with the local community members with whom field archaeologists typically interact.

For researchers using remote sensing as a tool for archaeological survey, there is no clearly established baseline of ethical practice from which to work. The question as to how archaeologists should mitigate any harms that arise from their work is still unaddressed. This situation is exacerbated when working in an international context, although the term “international” implies a kind of legitimacy and could perhaps be better framed as remote sensing undertaken by both non-nationals and nationals. This is the context in which the EAMENA project was initiated in 2015 and which has been explored as the project has evolved and expanded over the past 5 years to include a range of partnerships with researchers and national heritage authorities across the MENA region.

4 | REMOTE SENSING IN THE MENA REGION

While precedents exist for ethical data collection practices in the abstract, there is little guidance for conducting remote sensing surveys by archaeologists, as undertaken by the EAMENA project. To introduce these issues, our analysis will begin by comparing remote sensing documentation to other forms of data collection in the field. This will address the framework of regulatory controls that apply to archaeological missions operating in the MENA region. Although considered from a legalistic and regulatory context, these interfaces provide a baseline for formal engagements that researchers must apply to their fieldwork in terms of data responsibilities and contributions to state heritage authorities and local communities. Remote sensing differs significantly from physical fieldwork because it does not automatically require an engagement with this regulatory framework, thereby creating a distinct shift in the power dynamic towards the non-national researcher. At the same time, it accentuates the ethical responsibilities of the researcher and how they are situated within

competing agendas regarding the management of cultural heritage data and narratives, as well as the broader risks associated with modes of digital colonialism.

Archaeology and cultural heritage in the MENA region is predominantly owned and controlled by states. From the early 20th century onward, many MENA countries tried to wrest control of their antiquities from colonial powers and end the domination of Western missions in archaeology. The Ottoman Empire was a pioneer in introducing antiquities laws in 1884, led by Osman Hamdi Bey, a statesman, art historian, painter and the curator of the Imperial Museum in Istanbul. Alongside the prohibition of exports of antiquities, he presented the idea that the state should own all antiquities (Ozdogan, 1998, p. 115). This transition in archaeology did not take place in other MENA countries until the interwar period (1919–1939; Goode, 2007). Later, in Iran, Iraq, Egypt and Turkey and then elsewhere, archaeology became an integral part of nationalist state agendas. These attempts were aimed not only at limiting antiquities trade and preventing Western museums from being populated with plundered artefacts, but were also often aimed at establishing national narratives for nation-building and modernization programmes (Bernhardsson, 2005). The initial front line of cultural heritage preservation in the Middle East was locally devised, but also state-oriented and enmeshed with issues of national identity and economic transformation.

State control of archaeological fieldwork in the MENA region has traditionally relied on a permit system as a means of managing external and internal archaeological activity. An application is made for a field project, normally with provisioning for the deposition of data, reports, and, potentially, funding for a cultural heritage official to be involved with or monitor the project. By restricting physical access to a territory, it is possible to maintain control over legitimate excavation and survey activities. The rise of remote sensing methods in archaeology, particularly over the past two decades, has effectively enabled researchers to bypass these controls. This has raised the question whether remote sensing archaeology is sufficiently different (i.e., unobtrusive and non-damaging) from fieldwork-based methods to allow this.

The advent of orbital imaging satellites operating in supranational “open skies” provided the means of circumnavigating national controls to then freely analyse any part of the globe. The concept of “open skies” originated in 1955 under the Eisenhower administration in the United States. Focused on airborne rather than spaceborne missions, the development of a functioning treaty was restarted in the 1990s and came into force as the Open Skies Treaty in 2002, although it has since been destabilized by the withdrawal of the United States under the Trump administration (Pifer, 2021). The principle of “open skies” allows photographic flights over another nation's territory, at its outset primarily to discourage military escalation; however, it eventually began to take on a humanitarian capacity (Jones, 2014). While the treaty does not cover satellite imaging, the tradition of data capture from satellite imagery emerged through a similar process but evolved into an important tool for non-government actors. The widespread use of satellite imagery was not

an overnight development, instead slowly gaining pace after the commercialization of satellite imaging that followed the end of the Cold War alongside the declassification of U.S. spy satellite mission outputs such as Corona, Gambit and Hexagon. It was the introduction of Google Earth and other digital mapping platforms in the 2000s that have truly made these data available for use by archaeologists and other researchers, providing the tools for basic optical analysis and housing a range of freely-accessible satellite imagery scenes.

Open access and commercial satellite imagery bypass state sovereignty over archaeological affairs in different ways, particularly in surveying, documenting and monitoring heritage places. In light of the new challenges and opportunities presented by remote sensing techniques in archaeology, perhaps it should be expected to see governments' desire to extend the interpretation of their exclusive right of survey to remote sensing as well, where they can. It is nevertheless positive that remote sensing, as a non-destructive archaeological methodology, provides a globally democratic means to investigate archaeological landscapes, but balancing the lack of in-country oversight with other forms of cooperation is, in general, mutually advantageous. In practical terms, many foreign research institutions and archaeological missions, who are actively investigating MENA countries remotely, still rely on their partnership with local and national antiquities authorities for fieldwork, publication and joint projects. While technically remote sensing does not require governmental permission and involvement, in practice, it is not necessarily an entirely state-free and stand-alone approach.

Although the right to allow the conducting of archaeological surveys and “discovery” is reserved for the state in legal frameworks, most existing antiquities laws do not explicitly refer to remote sensing as a survey method. Most of these domestic laws are rooted in the 20th century, where physical access to antiquities was the primary method for survey, discovery and research. This arguably implies that such a system of state control is not viable from a pragmatic standpoint, particularly following the global development of open-access satellite imagery as a data source and mapping tool over the past two decades, which are more likely to draw on the United Nations principles on remote sensing (United Nations General Assembly, 1987). Remote sensing studies also often cover much larger areas than would be suitable for a fieldwork permit and, as mentioned above, have the inherent distinctions of being non-destructive and not collecting physical material. In a sense, the issue is not simply whether an archaeologist should utilize remote sensing data from a given territory within a formal regulatory system; such a question does not typically underpin international perspectives on the use of geospatial data anyway (e.g., Berman et al., 2018). Instead, the emphasis should lie on demonstrating the value of using remote sensing data alongside understanding, managing and mitigating the risks stemming from that methodology. The more meaningful the unmandated ethical guidelines and local interactions that remote sensing practitioners and archaeologists in general include in their work, the less reliant the overall field will be on state actors to generate new controls over access to, interpretation of, and dissemination of archaeological data.

5 | EAMENA ENGAGEMENT IN PRACTICE

One underpinning of the EAMENA strategy has been to build international partnerships and foster mutual benefit through that process. The CPF-funded component of the project, started in 2017, has provided resources and training that have included 22 workshops for 159 heritage professionals in MENA countries (2017–2019) and 24 online workshops through the CPF Impact Fund during the COVID-19 pandemic (2020–2021). These training sessions have covered topics such as remote sensing, digital documentation, database management, GIS, and the use of advanced monitoring tools such as Google Earth Engine (Figure 3). Helping to support the creation of remote sensing knowledge hubs in the region, these workshops have also been host to discussion and debate over the value and validity of these techniques for practitioners in which aspects of territoriality were key at an intra-national as well as an international level. Overall, the trainees have created over 16 000 database records by applying the remote sensing methodology covered during the training workshops.

More significantly, these workshops have functioned as a springboard for some participants from which they have been able to build on the skill sets developed and can now replace the direct EAMENA practitioner, as intended. For instance, through EAMENA, the Global Heritage Fund opened a funding competition to all workshop trainees, some of whom developed independent projects initiated in Jordan,

Iraq and one across Tunisia and Libya (Almansrawe, 2019; Alsalamini et al., 2019; Mekki, 2019). In another example, partners from Lebanon undertook emergency recording in Beirut, following the explosion at the city's port of 4 August 2020. These cultural heritage professionals employed EAMENA damage recording techniques supplemented with their advanced on-the-ground knowledge and an ability to integrate their work with other emergency projects to avoid duplication of effort (Deadman & Neogi, 2020).

Alongside training and local engagement, a major component of the EAMENA mission is to document and make available information on archaeological sites across parts of two continents and the threats and disturbances to those sites. While the workshops have been successful in helping to address local concerns as well as in fostering intra-regional cooperative learning, the EAMENA project overall has had to balance the expectations of numerous stakeholders with layers of competing agendas. It has been over the course of these workshops and partnerships that EAMENA has considered how to operate both fairly and effectively, and so we draw on these varied and complex experiences as well as external models of practice in applying an ethical perspective to EAMENA policies and activities.

In terms of data accessibility, the general aim of EAMENA is to make as much data as available as possible, but the project takes practical cautions to restrict unregistered users from viewing exact site locations and detailed assessment information (see also the section on open data, below). EAMENA also respects the wishes of its MENA-



FIGURE 3 Training in EAMENA methodology, in person in Amman (2018) and online (2020) with Jordanian and Palestinian trainees

based partners when it comes to sharing specific datasets. Some countries do not wish to share data openly, while others have a government-wide open data policy (e.g., Hashemite Kingdom of Jordan, 2018), although typically the wish is to control these open data in-country. In order to balance all of these perspectives, the EAMENA project is enhancing the Arches platform's native "instance-level permissions" capability in order to restrict certain data by varied degrees. This functionality will then enable administrators to define "ring-fenced" datasets that are protected at once from both general visibility and becoming isolated "data islands."

Furthermore, the database design process provides an opportunity to take mindful approaches to data structuring. Because of our ongoing work to develop national implementations of EAMENA-styled instances of the Arches platform, we have worked collaboratively with MENA partners to both refine the data structure and improve the user experience (UX). Our paradata—information about the processes by which data are collected—are not extensive, but include value entries for the methodologies and sources used to generate archaeological interpretations. We also self-evaluate the certainty of many variables from site locations and periodizations to threats and disturbances (Figures 4 and 5), which allows for fairly robust re-evaluation by anyone accessing the database. As we were completing the migration from Arches v3 to v5, we continued discussions with workshop participants from across MENA to elicit further feedback at that crucial stage of development. Finally, we have nascent plans to develop a module within the database to capture community interpretations and concerns in conjunction with local school systems and community centres as a means of direct engagement with local populations.

6 | FINDING AN ETHICAL PERSPECTIVE: THE HUMANITARIAN MODEL

For the EAMENA project, a pragmatic, comprehensive approach to ethical practice has been to look towards different models, particularly humanitarian conceptual structures based on international engagement. Rather than advance a strict ethical statement for remote sensing archaeology—which is likely to be project-specific and would lack adaptability—we explore an alternative approach based on widely accepted humanitarian goals such as impartiality and accountability, fostering community empowerment and sustainability.

By drawing on core humanitarian principles devised for aid work (International Red Cross, 1965; Pictet, 1979; Slim, 2015; Sphere Association, 2018) and considering how we can apply them in alternative settings (e.g., Sandvik et al., 2017), it is possible to offer a more encompassing, universal ethics approach. An overarching theme is the concept of "do no harm," originally developed in the field of medical ethics, but now regularly applied to aid work (Anderson, 1999; Slim, 2015, p. 41). More specifically, Slim (2015) has collated the following list that provides a clear basis from which to draw for the EAMENA project:

- Humanitarian goal: humanity and impartiality
- Political principles: neutrality and independence
- Dignity principles: respect, participation and empowerment
- Stewardship principles: sustainability and accountability

Slim defines "humanity" as addressing the risk of enabling harm, with prevention achieved by ensuring that knowledge development is used to mitigate the potential for harm (Slim, 2015, pp. 183–188).

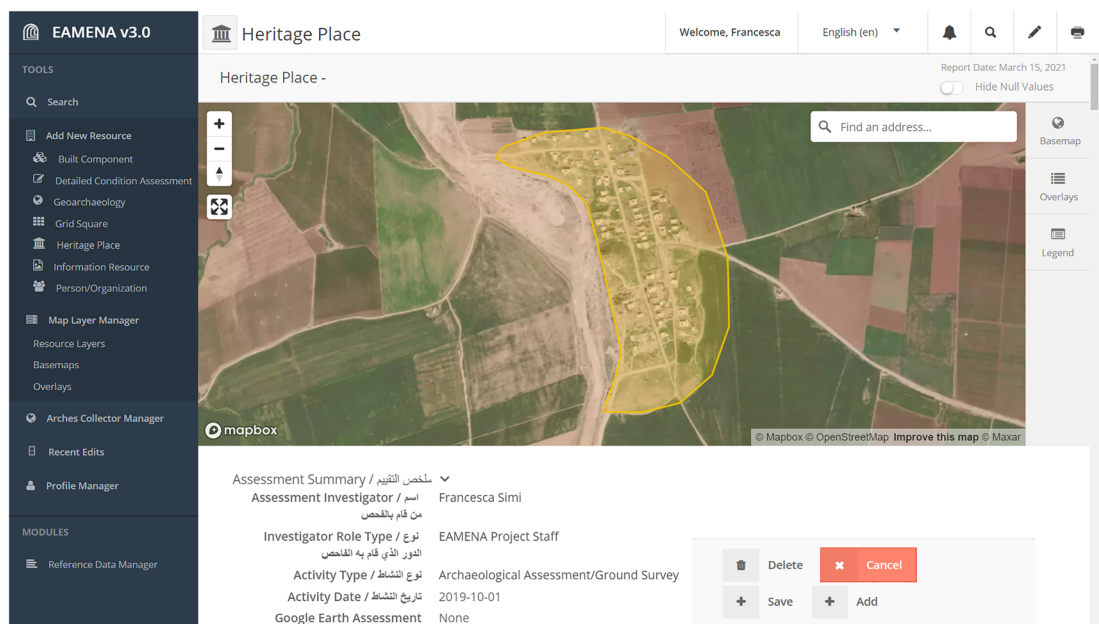


FIGURE 4 Report view of an archaeological site in the EAMENA v3 database

FIGURE 5 Assessment summary of a record in the EAMENA v3 database

“Neutrality” relates to the problems and risks of association with parties that may use such connections as a means to legitimate partisan aims and objectives (Slim, 2015, pp. 189–191). Similarly, funding relationships can lead to conflicts of interest, through either “belligerent funding” or the skewing of agency intention, creating risks of complicity or moral entrapment (Slim, 2015, p. 195). In terms of potential solutions to these issues, Slim (2015, pp. 191–192) flags the need to establish clear red lines in terms of moral limits, ensuring that all voices are heard and balanced. Just as important is the need to assess these issues on a case-by-case basis and to keep them under review as circumstances change over time in an evolving working environment.

Aspects of these themes are already familiar in an academic context as a component of ethical research practices developed within the university sector (e.g., ALLEA, 2017; Universities UK, 2019; University of Oxford Central University Research Ethics Committee, 2019). The humanitarian angle adds a framework designed specifically for an international context amidst potentially asymmetrical relationships. This is especially relevant for remote sensing work in the MENA region carried out by projects such as EAMENA, where the issue of establishing, maintaining and demonstrating neutrality and impartiality is a complex theatre. The ability of remote sensing archaeology to operate outside of a state regulatory system provides a basic means of maintaining an operational neutrality, allowing for remotely sensed collection, analysis, and reporting of data independently and impartially.

Remote sensing for reporting conflict or related damage to cultural heritage in contested zones also has a valuable role to play in providing independent assessments and broader accountability,

particularly where heritage reporting takes on a politicized dimension. In Yemen, the EAMENA project provided impartial reports on the aerial bombing of a religious site on Jabal an-Nabi Shu'ayb (Fradley, 2017), producing an evidence-based (i.e., research-based) narrative that countered details reported by online media and via UNESCO. The decision to report an evidence-based narrative publicly, in spite of discrepancies with the viewpoints of other parties involved, has made an important case for highlighting best practice in heritage reporting, and more specifically for the value of remote sensing as a verification tool. Alongside this, though, is the potential for misuse of remote-sensed data by state militaries and paramilitary groups. For example, ethical questions have arisen concerning the use of remote sensing techniques to identify “no-strike lists” (e.g., Hamilakis, 2009, p. 46). These lists are typically composed of archaeological sites with high cultural importance so that their safety may be prioritized during armed conflicts. More problematic than the value judgement that these lists can place on cultural properties (Hamilakis, 2009), in some instances, they have been repurposed as “target lists,” as former U.S. president Donald Trump had once threatened against Iran (Price, 2020).

Other infrastructural and institutional factors can hinder collaboration between global research and heritage organizations and their counterparts in Official Development Assistance (ODA) recipient nations. In Yemen, a country that has been in an ongoing, multi-sided conflict since 2014, access to electricity supply and reliable internet connectivity is a barrier for citizens as well as archaeologists and cultural heritage professionals to access satellite imagery and to participate in online activities. Many other areas in the MENA region do not have access to stable, high-speed internet for documenting

archaeological sites using online services, and so in some cases developing alternative, offline modes of documentation are beneficial.

Turning to the “dignity principles,” training, capacity building, knowledge sharing and professional networking with local partners have been essential foci of the EAMENA project, conducted under the above-described umbrella of training programmes it has offered that include the provision of online learning resources. This has been a fundamental means of mitigating ethical issues related to the use of remote sensing technology in MENA countries, as the project seeks to break down barriers for utilizing remote sensing technologies in the MENA region. While this training has taken place in the context of data collection, lending itself to exacerbated risks of digital colonialism, this is only part of a short-term training exercise. In the long term, the project has been involved in the early stages of mapping national database implementations adapted from the platform, allowing remote sensing skills to be adopted by practitioners for use in a non-EAMENA context.

Building on the capacity attained in the region through EAMENA's programme, the long-term sustainability of this approach is also improved through the project's use of open-access satellite imagery as its primary tool for analysis. Training in GIS, Google Earth and Google Earth Engine, as well as procuring access to historic aerial imagery for the region, will enable remote sensing practitioners, supported and trained by the EAMENA project, to continue to use and develop these skills. While the use of open-access imagery sources was partly an economic necessity for the EAMENA project, the decision has dovetailed neatly with the capacity-building provisions that the project has fostered in the MENA region.

One area where this consistency of data accessibility has been limited is over the State of Palestine and the Golan Heights, where legacy legislation in the United States known as the Kyl-Bingaman Amendment (KBA) has restricted the availability of higher resolution satellite imagery of these areas (Figure 6). The EAMENA project has

led research and campaigning that has developed into the reform of this censorship (Whitebloom, 2020; Zerbini & Fradley, 2018), potentially ushering in significant advances in remote sensing for these territories. Especially relevant here is that it allows Palestinian heritage professionals to monitor endangered archaeological sites; as one of the EAMENA partners, the Department of Antiquities and Cultural Heritage (DACH) participated in the training and their staff will now be able to use more of the remote sensing methodology in which they were trained. However, it should still be noted that lesser restrictions on satellite imaging in this region remain in place under the KBA.

7 | ETHICAL CONSIDERATIONS FOR THE USE OF OPEN DATA IN REMOTE SENSING

Perhaps the most important action that the EAMENA project has taken in terms of accountability—while also feeding into the themes of neutrality and impartiality—is its move towards managing its datasets as a form of open data. As a term, “open data” is now understood as both a standard or series of standards achievable by data-holding entities (see Wilkinson et al., 2016, for FAIR Data Principles [Findable, Accessible, Interoperable and Reusable], and Campbell & MacNeill, 2010, for W3C open data standards) and as a methodological approach for dissemination of specialized information (see Costa et al., 2016). The Open Data Charter (2015, p. 1) defines it as “digital data that is made available with the technical and legal characteristics necessary for it to be freely used, reused, and redistributed by anyone, anytime, anywhere.” With the development of large-scale, web-based repositories such as the Digital Archaeological Record (tDAR) and Archaeological Data Service (ADS) and publications such as the *Journal of Open Archaeology Data*, openly accessible and freely reusable information has become a cornerstone of digital archaeology. Furthermore, as Costa et al. (2016, p. 449) point out, openness generally implies “public accountability, transparency of practice, and plurality of opinion,” suggesting an innately ethical disposition (see also Molloy, 2011).

Data produced through remote sensing methodologies, though, present a particular case (Fernandez-Diaz & Cohen, 2020, p. 129). For storage and dissemination of remote-sensed data, “open-access” and “open-data” approaches seem like a natural fit. In terms of ownership and permissions, open-data storage platforms appear to simply extend the levels of access intrinsic to remote sensing methods such as GIS analysis and aerial photography. In general, geographic facts are not legally protected property (Scassa, 2017, pp. 159–160). But questions arise when we take account of the difference between the raw geographic data from foreign locales available via Google Earth and the digital mining of that raw data to form archaeological interpretations and curated data compilations (Gupta et al., 2020, p. S42; see also Thompson, 2017, pp. 170–171). Prime among these questions is the ethical consideration of whether it is, in fact, appropriate to extend the generally legal availability of geographic facts—such as topographical variations and visible ruins—to archaeological hypotheses about the land where other people live and over which other governments



FIGURE 6 The impact of the Kyl-Bingaman Amendment and our advocacy for its reform can be understood through this contrast of two satellite images of the late Roman and Byzantine settlement of Khirbet Mufiyye in the West Bank area of the State of Palestine. The top image is a censored Maxar image from 15 June 2010, with the lower image captured by Airbus on 15 November 2013. Accessed through Google Earth Pro

are sovereign. Essentially, is it ethically sound to move directly from open-access geographic facts to open-data archaeological interpretation? Standard guidelines, such as the ADS/tDAR Guides to Good Practice, do not directly address this question, nor do otherwise-thoughtful summaries of open archaeological data methodology (e.g., Costa et al., 2016). While our default position is that it can be perfectly ethical, in this section, we discuss some key points to consider for an ethically sound approach to using open remote sensing data.

The concept of “open data” as applied to archaeological datasets has clear advantages for researchers, providing more equitable access to information and a platform for knowledge exchange. The latter is an important measure for avoiding redundancy of effort and, hence, wasted resources (Wright & Richards, 2018, p. S62)—a valid concern, especially with respect to publicly funded projects. While there are also potential research disadvantages, argued to revolve around publication rights (e.g., Stallman, 2010), academics are often the ones who promote open archaeological data (e.g., Opitz, 2018; Richards, 1997; Stott et al., 2018). However, one of the key arguments for free access and usage is the benefit it affords to non-academic communities around the world (McKeague et al., 2019, p. 96). Because the disciplines of archaeology and cultural heritage are so inextricably intertwined with the land and landscapes of people's lives, not to mention their economies, there is an ethical imperative to truly consider this benefit and the relevance of archaeology to its loci of primary research (Atalay, 2006, p. 283; Atalay, 2010, p. 418).

Looking again at humanitarian approaches, the Global Indigenous Data Alliance created the CARE Principles (Collective benefit, Authority to control, Responsibility and Ethics) in order to address data ethics in light of the UN Declaration on the Rights of Indigenous Peoples (UNDRIP). The main contention is that open science and data sharing do not address “Indigenous Peoples' rights and interests,” but rather are designed to support the interests of the academic sphere without appropriate consideration of the collective benefit (Global Indigenous Data Alliance, 2019). CARE Principles are meant to complement the FAIR Principles for open data but support the rights, wellbeing, and inclusion of Indigenous Peoples throughout the processes of data structuring, documentation and dissemination (Global Indigenous Data Alliance, 2019). We consider that most of these principles—and especially “collective benefit,” “responsibility” and “ethics”—can be logically extended to any non-academic community whose land is the subject matter of scientific research, be it through fieldwork or remote sensing.

Thus, the salient questions before us are whether the perception of benefit to local communities and governments is shared with (most/some/any of) those entities and if the desire for open data is supported equally by academics and non-academics. Furthermore, we must also ask ourselves, if we purport to be the stewards of such data, whether its particular mode of capture, storage, presentation and access is also beneficial beyond our own research interests (Wright & Richards, 2018, p. S60). Indeed, many major archaeological documentation and data aggregation projects, such as the ADS and ArkeoGIS, have been thought of as “resource centric,” discounting the

importance of end-user experience in development and excluding paradata from dissemination and analysis (Power et al., 2017, p. 3:2). Database design for archaeology is largely a matter of identifying assumptions in resource interpretation and data consumption. And so, if an open-access database provides a platform for professional researchers to document their interpretations, what are the associated platforms available to non-academics and local communities to reframe those assumptions or interrogate the paradata? The potential for exclusion and imbalance in this respect could disproportionately diminish the benefit to local and non-academic communities, thereby contributing to knowledge disparity (see above and Bevan, 2015, p. 1480).

Some benefits to local communities, though, seem apparent, particularly with respect to cultural resource management and cultural heritage education (McCoy, 2020, p. S24); however, this is contingent. Parcak (2017) argues that sharing remote-sensed archaeological discoveries with local authorities greatly assists in the management of cultural heritage in those locales, but, as mentioned above, she stresses the danger of exposing the locations of heritage properties to would-be looters and iconoclasts. Her prescription is to strike a balance between openness and security by limiting the public visibility of detailed archaeological data through a tiered permission system, as many present-day projects, including EAMENA, tend to do (Huggett, 2014). Further practical considerations include the “digital divide,” a concept that highlights the often disproportionately insufficient digital infrastructures available to indigenous communities and non-western institutions (Gupta et al., 2020, p. S43; Hackett & Olson, 2019, p. 14; for Yemen, see above). As well, geospatial archaeology databases, though typically replete with lacunae and often in need of further development or maintenance, can appear or are sometimes claimed to be “authoritative instruments”; without proper signposting or appropriate paradata, this can mislead local authorities on cultural heritage matters (Gupta et al., 2020, p. S47).

Awareness of these kinds of functional issues in data dissemination in consideration of local populations is an essential step, but it primarily concerns the administration of cultural heritage resources, rather than the indirect but significant impact on local communities and persons. Indeed, communities can be disenfranchised or excluded from democratic processes in many parts of the world, and so their perspective might not be represented by the state apparatus that governs them (e.g., Mitchell, 2002, p. 186 ff.). Furthermore, international politics can even impact an author's ability to publish data if the author is a national of sanctioned countries such as Syria, Iran and Sudan (Marshall, 2013). Thus, the effect of political tensions can overshadow scientific and cultural collaborations with scholars from certain countries, particularly since many archaeologists and cultural heritage professionals in those countries are employed by government institutions and departments. Open data can help address this issue, particularly if it engages non-governmental groups and individuals.

In thinking about the impact of digital dissemination on communities, we can draw from developments in archaeological ethics influenced over the past 40 years by postmodern and postcolonial theory. One significant movement in this vein has been symmetrical

archaeology (see Witmore, 2019), which challenges the categorical separation of human and non-human entities and promotes concord between modern living bodies and past inanimate remains (Shanks, 2007, p. 591). It is a perspective that sees cultural heritage and processes of engagement with the past as forming a reciprocal feedback loop. Webmoor (2012, p. 13) suggests that this is especially evident when we “transform” remains of the past into digital media. Shanks (2007, p. 591) further humanizes that relationship, stating that “the past is not a datum but an achievement,” but cautions archaeologists when they claim to be “speaking for” the past (Shanks, 2007, p. 592).

We can apply this mindset or “attitude” (Shanks, 2007, p. 591) to the ethics of open data for remote sensing in archaeology. If we were to frame the development, population and accessibility of a database as an “achievement” rather than as curation of digital data, whose achievement would it be? Who would be proud of this achievement? Who might see it as problematic? Similarly, whose voices does that database project? Is it multivocal, in terms of data contribution but also in terms of resource structuring and database design?

Clearly, and purposefully, this section has focussed more on questions than on answers. For the EAMENA project, we can reference the training and engagement component to demonstrate the multivocality of database design and data restrictions. Indeed, as described above, the EAMENA project has endeavoured to take inclusive approaches to database design, means of interpretation, and assigning levels of data openness. Yet despite the value these steps have added, in general, questions may still be better ethical guidelines than prescriptions since, as Sørensen (2013, p. 13) has argued, archaeological ethics are not static, nor are they achieved through consensus. Our initial premise in support of open data was for the sake of transparency; that is, that they allow for universal challenge to claims made on the basis of those data. But if local voices are not involved in the processes by which those data are recorded and presented, especially in the context of remote sensing, the most intimate relationship between the viewed land and the documented cultural heritage is likely hidden. Thus, we suggest that an ethical approach to dissemination of remote sensing data should be able to answer two key questions: (1) how are local professionals and communities benefiting from the ways that freely accessible imagery is used and interpreted by big-data projects? And (2) how are both local and non-academic voices involved in the decision-making and design processes and how are they expressed in the end result through meaningful paradata?

8 | CONCLUSION

In this paper we have explored some of the challenges and implications of navigating ethical approaches to remote sensing archaeology in the MENA region. These have included the complex role of the state in archaeological activity, the simultaneous importance and potential inaccessibility—in terms of remoteness and administrative barriers—of the local community and the delicate balances that we need to strike between accountability, vulnerability, science and

modern life. The playing field of cultural heritage preservationists, heritage stakeholders and large-scale remote sensing projects has become too populated and diverse to insist upon prescriptive and static ethical guidelines. Instead, we offer that these discussions themselves are an essential and ethically productive way forward, prioritizing self-reflection and integration of humanitarian and postcolonial models of ethical praxis alongside practical concerns for site preservation.

As seen through the lenses of “data accessibility” in such examples as EAMENA's efforts to push for the reform of the Kyl-Bingaman Amendment, enabling fairer monitoring of endangered archaeological sites in the State of Palestine, “data structuring” evident in the MENA-wide participation in database testing and design and “democratization of practice” fostered by training workshops and practicums, there are always avenues of ethical practice and consideration available. For example, if we truly want to “do no harm” while using remote sensing in archaeological discovery, monitoring and data dissemination, we need to understand what the harm is or could be. At a basic, practical level we can achieve this by accounting for the ethical implications of a project's methodology and actions—and the impacts and harms that these can have—and then through re-evaluation as a project develops and evolves.

In the case of EAMENA, creating a space for local and community voices can occur within the technological ecosystem already established. In fact, similar technologies that allow us to examine archaeological and cultural landscapes from afar also afford us the ability to stay connected over long distances, during periods of conflict and pandemic, and across otherwise insurmountable barriers. It is through these connections with the peoples whose land and cultural patrimony we explore that we are best able to build ethically meaningful archaeologies in a digitally global context.

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CONFLICT OF INTEREST

Authors declare no conflict of interest.

DATA AVAILABILITY STATEMENT

Data sharing is not applicable to this article as no new data were created or analysed in this study.

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