A Tool and Methodology for Rapid Assessment and Monitoring of Heritage Places in a Disaster and Post-Disaster Context – Syria as a Case Study[i]

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Abstract

Over the past decade, cultural heritage in the Middle East and North Africa has been at risk of irreparable damage through conflict, looting, and cessation of official monitoring and development controls. Various organizations are seeking to monitor and record the extent of damage through satellite imagery and media reports. While the remote assessment of cultural heritage sites and buildings has the advantage of allowing for monitoring of cultural heritage properties from afar, its main limitation is the reduced level of certainty and accuracy in the assessment. It is therefore also essential to have tools and methods in place for on-the-ground condition assessment and systematic recording of data, for use as and when opportunities arise. In the Syrian context, given the threats and damage to archaeological sites, museum collections, libraries and archives, it is essential to develop strategies for emergency recording, assessment and response, and to build up local expertise and provide technical assistance in order to safeguard Syria's rich cultural heritage. This paper presents the approaches used in the development of a pilot Historic Environment Record (HER) for Syria which began life as an initiative of the advocacy organization Shirīn, and which has since undergone considerable development. It describes the methodologies and standards developed for use in a geodatabase to provide a systematic way to undertake and record rapid and on the ground condition and risk assessments of cultural heritage. The system is being customized to meet post-war/disaster challenges including emergency recording, measuring of damage and threat, and prioritization of resources and intervention activities. The database aims to set procedures for carrying out systematic rapid condition assessment (to record damage) and risk assessment (to record threat and level of risk) of heritage places, on the basis of both on the ground assessment and remote sensing. Given the large number of heritage properties damaged by conflict in the MENA region, the implementation of rapid assessment methods to identify quickly and record level of damage and condition is essential, as these will provide the evidence to support effective prioritization of efforts and resources, and decisions on the appropriate levels of intervention and methods of treatment. Although the initial work of the research project came out of the ongoing conflict in Syria, this database and methodology has since been developed and implemented as part of the multi-institutional project Endangered Archaeology in the Middle East and North Africa (EAMENA). Given the general lack of appropriate emergency response and assessment databases, this system could also be applied in other regions facing similar threats and damage from conflict or natural disasters.

Introduction

In recent decades, and in response to an increased focus on destructive events ranging from armed conflict to natural disasters that impact cultural heritage, there is a need for methodologies and approaches to better manage the effects of disaster on cultural heritage. In the Middle East and North Africa cultural heritage has been at risk of irreparable damage through conflict, piecemeal encroachment and neglect (Rayne, et al. 2017). In Syria since 2011 numerous cultural heritage sites have suffered significant damage from conflict, looting, and the cessation of monitoring. In preparation for the eventual post-conflict reconstruction in Syria, access to relevant information is essential. To work effectively the authorities must have access to a dataset which will inform them on the number, location, type, period, nature, and importance (in multiple senses) of heritage places. Only by knowing the severity of damage at individual heritage places, can limited resources be directed to where they are most needed. Implementation of a database system that gives access to such information, and that has a methodology embedded within it that can provide a systematic way to record and assess condition, as well as to identify priorities, will be crucial to the future of Syria's cultural heritage.

With this in mind, work began at Durham University, in partnership with European colleagues, to collate site information that had been acquired by a number of survey projects that had previously worked in Syria with the intention of developing the basis of a Historic Environment Record (HER). The database design work started in 2016-2017 (supported by a grant from the Research Impact Fund of Durham University). To avoid duplication of effort, in particular in technical development, in 2016 the HER for Syria joined the Endangered Archaeology in the Middle East and North Africa project (EAMENA), which is a collaboration focused upon the documentation of cultural heritage remains in countries in the Middle East and North Africa, that involves teams at Oxford, Leicester and Durham universities, and which is supported by the Arcadia Fund. Following the receipt of a grant from British Council Cultural Protection Fund in December 2016, recording methodology and capabilities originally created with the HER for Syria in mind, have been adapted and further developed through the EAMENA database.

While the current situation in Syria restricts opportunities for on-the ground recording, assessment, and intervention, the database will facilitate information management and planning until it becomes possible to work systematically on the ground in Syria. This will be principally through providing a platform for archaeologists and researchers to integrate their existing survey datasets within a single database platform. The core dataset for Syria currently contains around 15000 records mainly from published sources, and regional surveys undertaken in Syria by the Fragile Crescent Project and Projét Paléosyr[ii]. The database also provides a place to consolidate information acquired during condition status evaluations being conducted remotely (by various institutions) using satellite imagery and media reports.

Development of a Heritage Monitoring and Management System for Syria

Role of Inventory Systems during a Disaster Event

In general, documentation and inventory lie at the heart of heritage management. Inventories hold collections of documents and records in order to inform heritage professionals of what needs to be protected, where it is and why its protection is important. Well-regarded heritage inventory systems, containing searchable information on the location, characteristics, and condition of heritage places, allow users to analyse and manage heritage data. A good inventory not only improves the understanding of cultural heritage places, it is also essential for heritage interpretation, protection, preservation and management (ICOMOS, 1996; Council of Europe, 2009).

In the aftermath of disaster, an inventory and monitoring system is vital for heritage understanding, decision making, and planning. It enables to identify and evaluate the condition of heritage, to help guide what should

be protected on the ground (in the case of armed conflict), and to inform new developments. Having such systems containing information about characteristics and location of heritage places, facilitate identification, understanding and analysis of the heritage data. It will also provide a standardized approach to evaluate the condition of heritage places. Such systems also enable the comparison of heritage places (based on assessment of value, condition, etc.) to assist decision makers and heritage professionals to identify conservation and restoration priorities and allocate limited resources. During the rebuilding and reconstruction stage, it will also provide key information to guide decision-making around new developments.

Information Management

Rather than to develop a database from scratch, the decision was taken at the beginning of the project, to build on an existing system. It was clear that this should be designed specifically for heritage management, standards-compliant and as easy to use. Arches, an inventory and management database purpose-built by the Getty Conservation Institute (GCI) and World Monument Fund (WMF) for recording information and monitoring of cultural heritage resources, was selected for this purpose. The software is open source (i.e. it is available free of charge and without onerous licencing restrictions), can be deployed independently, and can be customized, updated, and extended with new features by an international community of heritage professionals and IT specialists (GCI and WMF, 2016). More importantly Arches adopted international standards for heritage inventory including a documentation standard known as the International Committee for Documentation - Conceptual Reference Model (CIDOC - CRM) which is designed to provide a consistent semantic framework of heritage terminologies (ICOM CIDOC, 2015).

In addition, Arches was also being adopted by other archaeology and heritage projects. In particular, the EAMENA project was customizing the Arches database platform for use in the MENA region. Based on the Arches Platform, the EAMENA database developed a methodology for the identification, recording, monitoring, and analysis of heritage places in the MENA region, with threats and damage to sites recorded and monitored via remote sensing methods (Bewley *et al.,* 2016). Now that the HER for Syria has joined EAMENA, the new capabilities that enable on the ground emergency recording, assessment and prioritization developed as part of the former, have been added to the EAMENA database. This is of particular value for local heritage organizations who are likely to visit and record damage to heritage places at first hand, as well as through remote sensing. This will also make the new on the ground capabilities to be available to organizations in other countries of the MENA region facing similar challenges.

Identification of Gaps and Main Functionalities

Various organizations are monitoring cultural heritage sites in conflict zones through satellite imagery. While remote assessment has the advantage of monitoring from afar and in secure conditions, its main limitations are the reduced levels of certainty and accuracy in the assessment. It is therefore essential to also have tools and methods in place for field condition assessment, for use as and when opportunities arise. In the Syrian case, and in general in a post disaster context, having set methodologies for data collection and systematic approaches to recording and assessment is an essential step in meeting post-war (post-disaster) challenges.

Furthermore, in identifying gaps it was essential to note that as different archaeological research projects have diverse goals and priorities, they have often used different recording methods. Moreover, as much archaeology in the region has been funded as research, the resulting projects may have paid only modest attention to heritage management needs and priorities.

Drawing on our knowledge of the requirements of situation in Syria, and the strengths and limitations of the datasets that are of known availability, the key functionalities of such a database were developed to create a system that was designed to:

- be used mainly as a Cultural Resource Management (CRM) tool and only secondarily as a research tool
- be used as a tool in emergency and disaster contexts
- allow recording of on-the-ground assessment (in addition to remotely sensed assessment)
- embed within it methodology and procedures for emergency and rapid condition assessment - these to
    - record and locate damage and threats, their causes, severity and extent
    - assess level of damage and risk
- allow for rating/prioritization of sites and monuments based on the level of damage and significance
- provide a list of possible intervention, preservation and mitigation activities and needs that could be implemented when possible
- record sufficient information to be able to prioritize required conservation/reconstruction activities based on level of emergency and value
- (If possible) identify and apply a weighting system to each category of assessment to produce scores for damage, risk, and value

Condition Assessment and Prioritization Methodology

Overview

Condition assessment identifies damage and threats in order to estimate the physical condition of a heritage place. Clearly, a standard method and format of collecting data is required in order to effectively identify, assess, compare, and analyse condition. In light of information on physical condition, decision makers can determine the best way to preserve the values and integrity of heritage places, and develop strategies to respond to any changes in the condition, or damage that have been detected. In an ideal situation, a condition assessment should be implemented as part of the *regular* inspection of heritage places (e.g., twice a year, yearly, every 2 years, etc.). Gradual decay is one of the main causes of destruction. The detection of such damage, if monitored and dealt with as soon as it appears, can prevent irreversible destruction.

A condition assessment can/should also be conducted after a natural and/or human impact event as part of *emergency* inspection. Examples could include the period after war or conflict, an earthquake, and more routine or foreseeable events such as following a rainy season, or construction works near a heritage place. In the case of sudden destruction and post disaster interventions (both anthropogenic and natural), carrying out an *emergency survey/assessment* will allow experts and decision makers to identify and understand the damage and threats (i.e. what more might happen as a result of this initial destruction and damage), and to identify and record damaged and under-threat heritage places. This emergency assessment usually needs to take place as soon as the heritage place has been declared accessible by the authorities. As a result of this initial assessment, the immediate responses to secure and stabilize the heritage will be prioritized and implemented.

A *rapid condition assessment* followed by an *emergency assessment* will allow more detailed recording and assessment of individual areas of damage in order to identify and rank the intervention activities, and ensure that these are based on needs and importance, and to prepare a bespoke recovery and rehabilitation plan. Once the heritage places in need are identified, available funding and resources can then be allocated to those where emergency actions and interventions are most needed.

The following subsection provides a brief overview of the types of information that are required to be recorded when carrying out the emergency and rapid assessment.

Elements of Emergency and Disaster Assessment

In emergency assessment, as in Syria, a standardized approach to identifying, recording and assessing damage and threats will create the kind of dataset that will allow heritage professionals to compare evidence and thus make informed decisions. Therefore, a standard format and set/type of information (i.e. data fields) for data collection must be developed, defined and implemented. Different people with different backgrounds will have different ways of recording and describing damage and threats to heritage places. Without consistent recording and methods of assessment, it is likely that the scale, standards and the quantity of information in each episode will be variable, and perhaps incompatible. This will render analysis and comparison of data becomes complicated and will thus inhibit their effective use in the making of management and conservation decisions.

A significant amount of research has already been carried out in the field of damage and risk assessment for cultural heritage (Waller, 2003; Walton, 2003; FISH, 2004; Council of Europe 2005, 2009, 2012; GCI and WMF, 2010; NCPTT, 2011; Vafadari, 2015). There has also been a recent surge of new projects reacting to the disaster caused by ongoing conflict in the Middle East. We build on this research and employ the most appropriate practices to identify the required elements. Particular attention has been paid to the Disaster Risk Management (DRM) cycle for cultural heritage, to ensure that the components of risk assessment and the identification of mitigation strategies and responses in pre-disaster, during disaster, and post-disaster phases are represented (see Figure 1 for the components and stages of the DRM cycle).

Figure 1. Cultural heritage Disaster Risk Management (DRM) cycle and type of main activities/responses for each phase

The system allows the following main types of information to be recorded and assessed: 1) Condition (level of damage) to the heritage place, 2) Level of risk and vulnerability, 3) Significance and value of the heritage place, and 4) Prioritization of the heritage itself and the various possible activities, and assessment of recovery needs (as well as identification of required interventions and responses)

New entry fields have been developed within the database for each of these elements (the individual elements are briefly introduced in the following sub-sections). For each data field, drop down lists of controlled vocabulary are developed to standardize data entry. Controlled vocabularies allow for the categorization, indexing, and retrieval of information (Harpring, 2010:1). Use of controlled vocabulary will ensure that different users choose from the same prefixed data entry and measurement inputs in order to allow for consistent and comparable assessments across different sites and regions in the country.

In the updated version of the EAMENA database, heritage recording can be done at three levels:

1) the Heritage Place where groups of sites and features can be recorded. At this level only the main threats and disturbances will be identified and a relevant level of condition will be recorded (this level is mainly relevant for remote recording and assessment of heritage places).

2) the Heritage Feature, where individual sites, monuments, buildings etc., will be recorded separately. At this level, risk and damage will be assessed

3) the Heritage Component level, where the assessment of individual components (e.g. column, wall, etc.) of the Heritage Resource could be carried out to record the exact location and level of the damage to different components of a site or monument.

Damage Assessment

Ideally, the initial phase of damage assessment involves the collection of all existing documentation and information, including old images, previous reports, assessment records, archived documents, etc. (though this may not be applicable in emergency recording where time is limited). The second step is a rapid field survey during which the actual state and condition of heritage places are assessed based on visual inspection. In a final stage, which may not occur in rapid assessments, an in-depth examination can be conducted, ideally using an interdisciplinary approach with knowledgeable experts from relevant fields, to identify causes of damage and assess the severity and rate of deterioration (Demas, 2002; Paolini *et al.,* 2012).

In conducting a rapid assessment, the surveyor needs to (1) locate the damage and (2) identify the damage (i.e. actual visible effect of disturbances). If possible (3) the cause of damage/disturbance should be recorded. Then the surveyor needs to assess (4) the extent and (5) the severity of the problem. The severity represents the strength and seriousness of the damage. The extent of damage represents the fraction of the assessed area affected by the disturbance. It is also important to differentiate between new and stabilized (and old) degradations by defining (6) the stability and trend of the damage. (7) The level of damage is calculated based on the values of extent and severity. In addition, further (8) description and (9) remarks and photos can be appended.

It should be noted that the data fields for damage assessment (identified above) and the fields for risk assessment (identified below) are developed to carry out a more detailed rapid assessment that follows the emergency assessment. In the emergency assessment only a subset of these fields will be used to 1) record main damage, 2) record what more damage could happen as a result (i.e. the main threats), 3) record/add pictures and drawings, 4) identify the main priorities and implement emergency measures and immediate responses based on the initial emergency assessment to secure and safeguard the affected heritage.

Risk Assessment

A condition assessment records existing damage and disturbances and provides information about the actual state of the heritage place. A risk assessment on the other hand identifies and forecasts possible future damage and potential agents of deterioration (i.e. threats) (Taylor, 2005). As defined by Ball and Watt (2001), risk assessment is aimed at identifying threats and assessing the probability of their impact. Once threats are identified, the risk level can be assessed based on the likelihood (probability) and the severity of the identified threat interacting with the pre-existing vulnerabilities and exposure of a heritage place.

In the case of the EAMENA database after identifying the related vulnerability factors increasing the risk impacts for each heritage place, the surveyor identifies the threats and potential impact. For each identified threat, the level of impact needs to be estimated. At this stage of the project, the level (magnitude) will be calculated as a product of probability x extent x severity (where probability is defined as likelihood of risk occurring; extent is a total amount of the assessed place to be affected by risk; and severity is defined as a product of the fraction of the assessed area susceptible to the threat and the potential loss in value of the area (Waller, 1995). And last the level of certainty of the assessor in the risk assessment needs to be estimated and recorded. The calculation and addition of “loss in value” and “fraction susceptible” needs more time and study and will be considered for addition at a later stage.

Significance and Value Factors

In the rehabilitation and restoration phase (phase three in the DRM cycle), the question of value will influence heavily the conservation decisions and response. Identifying and assessing values and significance assists in the prioritization of heritage places and conservation and intervention activities. When decisions need to be made at a regional or country level in a post-disaster context, for example on where to start rehabilitation work, and choices need to be made between different possible actions (from reconstruction, restoration or not touched), a holistic and clear method of assessment is needed. Should the decisions and prioritization be solely based on the degree of damage, the degree of rarity of a place, or the importance of destroyed and damaged sites and monuments for recovering tourism and the economy of the country? Or should they be based on the importance of the place for a population's identity and memory; the importance of the place in the post-war healing process and rebuilding of the cultural memory? Assessing values is neither an easy nor rapid task; the process is challenging and options debatable. It needs a holistic approach in order to include all the above questions in the calculation. People and communities with varied beliefs and ideas, define and assign values differently.

Values should capture the various components and interpretations of heritage and should include the sometimes conflicting (and changing) values identified by different stakeholders (and their conflicting interests). The process needs to be clear and transparent. For the maximum effectiveness, identifying the most damaged and at-risk sites is not sufficient on its own to prioritize them for protection and conservation activities. In order to go to the next (admittedly challenging) level, components and categories of value need to be developed and a weighting system needs to be adopted that will support the ranking of values assigned to a cultural heritage place (Isakhan, 2014; McManamon et al., 2016). Values and value-based approaches to conservation have been at the core of site conservation and management plans and preservation practices and principles (Sullivan, 1997; Demas, 2002; Mason and Avrami, 2000). Traditionally in value-based approaches to conservation, different lists of heritage values have been developed (i.e. value typologies) to assess heritage values and significance. In order to allow for more transparent and detailed evaluation of heritage values and assessment of potential conservation impacts on authenticity of heritage places, the Raymond Lemaire International Center for Conservation has developed a grid system called the Nara Grid. Based on the Nara Document on Authenticity, the Nara Grid introduces *aspects of the sources* (i.e. different layers or perspectives on a cultural heritage place) for each type or *dimension* of heritage value (artistic, historic, social, and scientific). Aspects of the sources defined in Nara Grid are: form and design, materials and substance, use and function, tradition, techniques and workmanship, location and setting, spirit and feeling. In this way values can be assigned and assessed for different perspectives (or aspects) of cultural heritage. As a result, the impact of each intervention activity on any of the assigned values and layers can be understood and compared (Van Balen, 2008).

Similarly, Fredheim and Khalaf (2016) suggest a transparent, explicit, and holistic way of understanding and assessing significance by deconstructing the assessment into three stages. These are: 1) what is the heritage or what they call *features of significance* to identify the features (layers) of significance? 2) why is the heritage valuable or *aspects of value* to identify why each feature is significant (value typologies)? And 3) how valuable the heritage is or *qualifiers of value* to assess the degree of significance (includes rarity, authenticity, condition, etc.).

By comparing these new studies, and examples of more explicit and holistic practices in significance assessment and value evaluation, the aim is to choose an appropriate method to identify the layers and categories of value, and rank the level of significance. At this stage of the project, the value assessment will not be included in the wider EAMENA database and this work is ongoing.

Priorities and identification of Intervention/Mitigation Responses

As a result of the methodological approaches described above, heritage places will be prioritized based on the significance of the assessed area, the extent of damage and overall condition, and the risk magnitude. The higher the damage (and /or risk) and the higher the value of the heritage place, the higher the priority should be. Such a system when properly implemented will, over time, produce a list of sites and monuments of significant importance which are considered to be in urgent need (i.e. a prioritization list).

A possible list of interventions and mitigation measures has been developed for the project. Based on the identified damage and threat, and their level, emergency and intervention actions are identified. These responses and actions can be recorded during different phases of assessment: 1) emergency response and strategies, 2) rapid assessment response and identification of recovery and conservation/restoration activities, and 3) mitigation strategies.

The actions classified as intervention activities would record those conservation, preservation and management actions suggested to correct and treat the damage (in case of identified damage), or mitigate the threats (in case of identified threats and risks), that have been identified as part of the condition and risk assessment process. The identified intervention actions and activities are intended to protect and preserve the integrity of heritage places and mitigate any identified risks. A fixed and controlled vocabulary has been developed for the actions. In choosing activities, criteria such as intervention complexity and its feasibility given the available resources and local staff capacity, will, of course, need to be considered.

While prioritization on the basis of the above will constitute an important achievement, the prioritization abilities of the system offer the potential to go further if the identified intervention activities and actions were also prioritized (again based on extent and severity of damage, the level of risk, significance of the assessed area, and the overall impact of each different activity on the totality of identified values and features of the heritage). In this way all the identified management, conservation, and intervention activities could be listed based on their level of priority and the system could combine prioritization of needs and responses.

Quantitative vs Qualitative Analysis

The assessments and analysis explained in the previous sub-sections can be done based on qualitative or quantitative approaches and factors. In the qualitative approach words are used to describe and measure the elements of the assessment (e.g. level of severity and extent of damage). The quantitative approach uses numerical values to do the same. The decision between choosing a quantitative or qualitative approach is based on the degree of the detail of analysis sought, its purpose, and the information and resources available. The quantitative approach is more complicated and its development requires more time, resources, and research. Given the impact that the quantitative approach can have on subsequent data analysis, such a system needs to be based on a higher level of expertise and scientific data (Australian and New Zealand Standards, 2004: 18-19).

At this stage of our project, and to continue with EAMENA methodology, a qualitative approach using ordinal measuring scales (i.e. rankings such as High, Medium and Low) is used for measurement and analysis. These scale levels are defined and described in order to ensure users have a similar understanding of the terms.

Conclusions and Next Steps

In order to manage sites and monuments effectively, a method is needed to rapidly assess the level of damage, threat and vulnerability and to set the heritage place's conservation priorities (at the site, local, and national

level). If a country does not have baseline documentation of cultural heritage places, following a disaster it is unable to set strategies and priorities for post-disaster response. This can leave sites at risk of unauthorized and rapid removal by developers and/or land owners, among others. The absence of documentation and prioritization systems may also complicate the delivery of post-disaster support by donors and international heritage professionals.

In several MENA countries sites are being damaged, destroyed and looted. In the eventual post-conflict environment, major decisions will need to be made on where to start, how to implement the recovery phase and plan emergency measures, and how to allocate resources. Tools and methods need to be in place to meet a range of post-conflict challenges.

The aim of this project is to develop a methodology embedded in an inventory database to give national authorities in MENA countries and national and international heritage experts, a powerful tool to document, assess, and identify the heritage places that are in most danger and in need of rehabilitation. Such a database will also facilitate better prioritization by local authorities in their protection, conservation and restoration activities.

Progress to Date and Next Steps

During the summer of 2017, the modified data structure of the EAMENA database was shared with select colleagues and experts on CIDOC Conceptual Reference Model (CRM) for peer review. In May 2018, the updated data model was presented to the CIDOC CRM Special Interest Group (SIG) meeting in Lyon. The damage and risk assessment methodology and developed data entry forms have also been tested in Lebanon and Jordan during the summer of 2017 and 2018. The EAMENA database has been updated and finalized based on these field test results and feedback received.

As a next step, training on the field assessment methodology and data entry will start as part of the advanced stage of EAMENA-CPF Training in Endangered Archaeology planned to be held in 2019 for the staff of different departments of archaeology and antiquities in Tunisia, Libya, Egypt, Jordan, Palestine, Lebanon, and Iraq.

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