

# Measures to Protect Cultural Heritage Taken by the German Archaeological Institute (DAI) – The Ancient Yemen Digital Atlas

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## Abstract

Since the beginning of the war in 2015, Yemen has been experiencing the worst humanitarian crisis in the world. The political instability, the enduring armed conflict and the economic crisis have not only worsened the dreadful living condition throughout the provinces, but are also destroying Yemen's cultural heritage and cultural property. Air raids, looting, unauthorised construction work at ancient sites as well as illegal excavations – that feed the growing trade in illicit antiquities – are contributing to this devastation. The Yemeni museums and collections are also threatened; they are being looted and destroyed by air raids and their holdings have not been archived sufficiently. Yemen's cultural heritage was battered even more by torrential rains this year.

The bilingual Ancient Yemen Digital Atlas (AYDA) records Yemen's monuments and ancient sites and archives various archaeological research data in a WebGIS-based monument information system. AYDA was developed by the Sanaa Branch of the Orient Department of the German Archaeological Institute (DAI) for the Yemeni antiquities authority. Sites, monuments and South Arabian objects are linked with historically and archaeologically relevant data, data pertaining to conservation, as well as information from the antiquities trade through various databases.

The main purpose of AYDA is to monitor Yemeni cultural heritage especially in times of crisis. With the digital atlas it is possible to regularly monitor sites and document any damage as well as the possible causes. Because the Yemeni antiquities authority has not been able to systematically document their ancient sites yet, the digital atlas functions as a register of historic monuments. To date 30,000 sites have been recorded; they were identified through the analysis of aerial photographs and satellite images and registered by digitally mapping verified data. Together with the Yemeni antiquities authority, the extent of the damage can be assessed and if necessary preservation and restoration measures can be taken.

## Zusammenfassung

Im Jemen herrscht seit dem Beginn des Krieges 2015 die größte humanitäre Katastrophe der Welt. Die instabilen politischen Machtverhältnisse, die anhaltenden Kampfhandlungen und die wirtschaftliche Krise führen in den verschiedenen Provinzen des Landes nicht nur zu immer elenderen Lebensbedingungen, sondern auch zu einer zunehmenden Zerstörung des kulturellen Erbes und seiner Kulturgüter. Dies erfolgt durch Luftangriffe, Plünderungen, unautorisierte Baumaßnahmen sowie Raubgrabungen, die einhergehen mit einem immer größer werdenden illegalen Antikenhandel. Daneben sind auch die jemenitischen Museen und ihre Sammlungen akut gefährdet, die geplündert oder durch Luftangriffe zerstört werden und deren Sammlungen nur unzureichend archiviert sind. Die flutartigen Regenfälle verursachten dieses Jahres einen weiteren enormen Schaden am Kulturerbe des Jemen.

Der von der Außenstelle Sanaa des DAI für die jemenitische Antikenbehörde entwickelte mehrsprachige Ancient Yemen Digital Atlas (AYDA) erfasst den Denkmalbestand sowie die antiken Fundstellen des Jemen und dient der Archivierung verschiedener archäologischer Forschungsdaten in einem webbasierten Denkmalinformationssystem. Fundorte, Denkmäler und südarabische Antiken werden dabei über verschiedene Datenbanken etwa mit historisch, archäologisch und konservatorisch relevanten Daten sowie Informationen aus dem Antikenhandel verknüpft.

Hauptaufgabe von AYDA ist gerade in den Krisenzeiten das Monitoring des jemenitischen Kulturerbes. Der digitale Atlas erlaubt die regelmäßige Beobachtung von Fundstätten und die Dokumentation von Schäden und ihren möglichen Ursachen. Da die Antikenbehörde bislang noch keinen systematischen Bestandskatalog seiner Fundplätze besitzt, übernimmt der Atlas auch die Funktion eines Denkmalregisters. Die bislang 30.000 aufgenommenen Fundorte wurden dabei über Luft- bzw. Satellitenbilddauswertung identifiziert und über eine digitale Kartierung von örtlich verifizierten Daten erfasst. Gemeinsam mit der jemenitischen Antikenbehörde wird das Ausmaß der Schäden eingeschätzt und gegebenenfalls ein vorläufiger Plan für spätere Sicherungs- und Restaurierungsarbeiten entworfen.

*Figs. 1a–d:*  
*The museum*  
*of Dhamar:*  
*Before and after*  
*an air strike 2015*  
*(Photos:*  
*a, b. Google*  
*Earth; b, c.*  
*General*  
*Organization of*  
*Antiquities and*  
*Museums*  
*(GOAM))*





*Fig. 2: The National Museum Sanaa (Photo: GOAM, Mohanad al-Sayani)*

Since 2015 the conflict between the internationally-recognized government of president Abd Rabbuh Mansur Hadi and the Houthi-opposition is being led as an open war and has resulted in the worst humanitarian catastrophe in the history of crisis-hit Yemen. Air raids and ground combat have taken their toll, causing thousands of casualties, especially of civilians, as well as inflicting heavy damage on the public infrastructure. In addition to the consequences of war, the global Covid-19 pandemic has exacerbated the situation since the spring of 2020.

*Fig. 3: Employees of the antiquities authority (GOAM) in the storage of the National Museum Sanaa (Photo: GOAM, Mohanad al-Sayani)*



The political instability, armed conflict and the economic crisis have not only worsened the dreadful living conditions throughout the governorates of Yemen, but are also destroying Yemen's cultural heritage. Air raids, ground combat, looting, unauthorised construction work at ancient sites as well as illegal excavations – that feed the growing trade in illicit antiquities – are contributing to this devastation. The Yemeni museums and their collections are also severely endangered: They are being looted or completely destroyed by air strikes, such as in Dhamar in the central highlands of Yemen (figs. 1a–d). Furthermore, natural disasters such as the torrential rains during the summer of 2020 have taken a heavy toll on Yemen's cultural heritage. This also affects, for example, the UNESCO World Heritage Site Sanaa as well as the medieval town Amran in the north of the country, the latter was severely damaged by torrential floods after the breach of a dam.

In addition, the museum holdings have suffered from improper storage. This especially relates to the collection of the National Museum in Sanaa, which holds c. 140,000 objects (fig. 2). Like at some other museums in Yemen, the exhibits were relocated into storage facilities in 2015 to protect them from the ravages of war; however, due to a lack of funds, adequate technical resources and specialized knowledge, this could only be done in a provisional manner. The employees of the antiquities authority in Yemen (fig. 3) – the General Organization of Antiquities and Museums (GOAM) – are trying to prevent the worst from happening. However, the technical capacities and in many cases the necessary know-how is lacking. Government employees of the antiquities authority face extreme hardships: Wages have not been paid in the north of the country for many years.

## Measures to Protect Cultural Heritage

Since 2013 the Orient Department Sanaa Branch of the German Archaeological Institute (DAI) has been supporting the Yemeni antiquities authority in safeguarding their cultural heritage from Germany: For security reasons, we have not been able to travel to Yemen in the last seven years and take on-site capacity building measures. The Yemeni employees of the antiquities authority and the museums throughout the nation are the main agents. They are the only ones who can actively implement protection measures and awareness-campaigns in Yemen. Before the Covid-19 pandemic we organized a number of basic and further training courses hosted in Berlin for employees of the Yemeni antiquities authority from all governorates in Yemen, including documentation techniques in crisis regions, monitoring using remote sensing, photography, ceramics and databases, archiving and managing of archaeological sites, as well as rescue management. Currently these course units are being supplemented from afar with educational videos.

As a consequence of the devastating destruction in 2015/16, the Yemeni antiquities authority received technical equipment such as cameras, computers and solar systems, which was financed by the Cultural Preservation Programme of the Foreign Office. Thus our Yemeni colleagues were able to document the damage at the sites, historic monuments and museum buildings and furthermore secure and archive the remaining museum holdings.

The Yemeni Museums at Risk Project supports the Yemeni antiquities authority in reorganising their storage facilities, storing the objects adequately as well as documenting and creating digital inventories. The latter aspect is very important because numerous inventories do not include a documentation of the objects held in the collections (fig. 4). Especially in times of crisis, when looting and war damage is contributing to the loss of artefacts, these inventories are indispensable for identifying the lost objects. Initially the project was also financed by the Cultural Preservation Programme of the Foreign Office; since 2018 it has been supported by the funding initiative Patrimones of the Gerda Henkel Foundation. Starting at the end of 2020, the measures in the National Museum in Sanaa will be intensified and encompass four other museums (Baynun, Zafar, Ibb and Ataq) throughout the next three years thanks to the funding from the ALIPH-Foundation.

The project Virtual Museum Yemen is closely linked to the Yemeni Museums at Risk project and is being financed by the Foreign Office and the DAI.<sup>1</sup> The main focus of these measures is not a virtual tour of the museum but a presentation of exceptional exhibit objects on an English-Arabic website to ensure the best possible documentation of the objects.

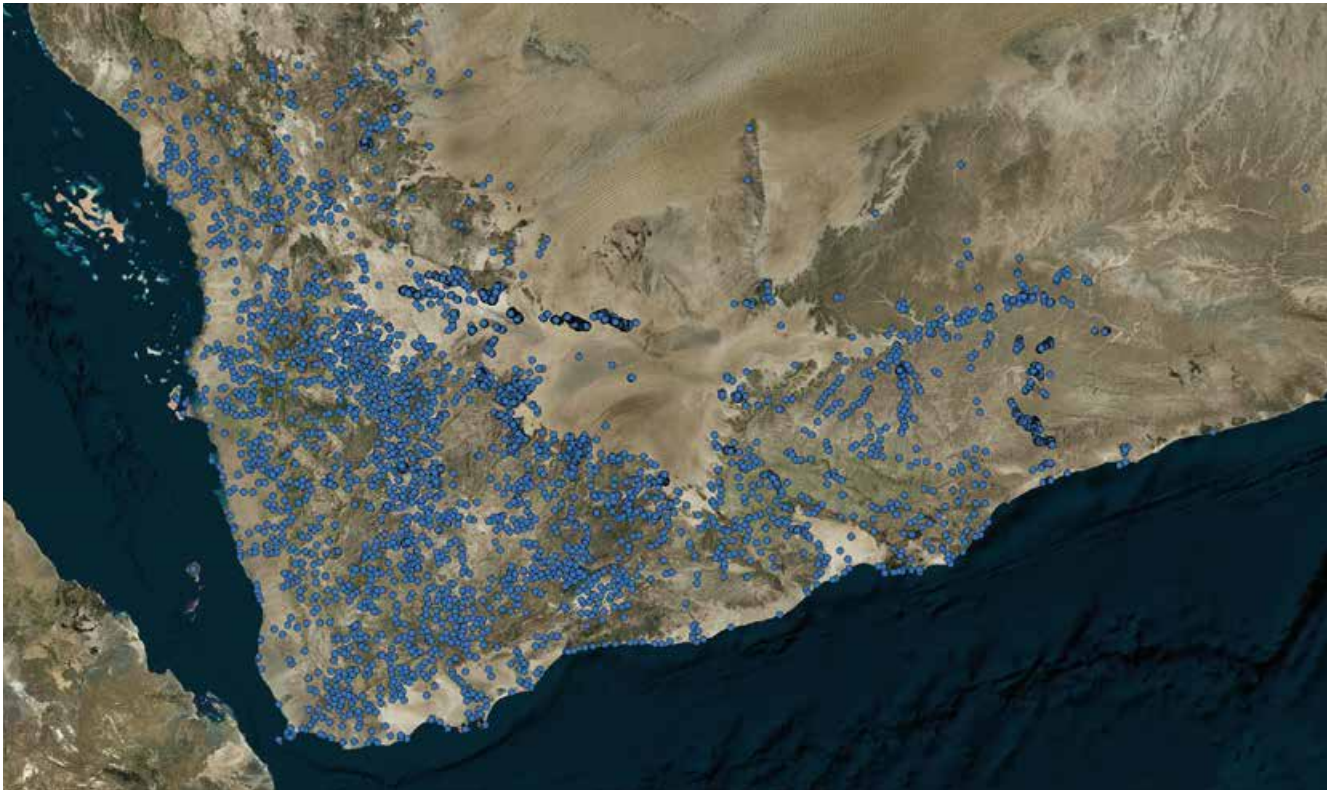
In cooperation with the Department of Geodesy and Geoinformatics of the HafenCity University Hamburg, the goal is to record the endangered museum collections in Yemen using photogrammetric dense image matching and to link them with extensive information (fig. 5). Alongside the collection of data, damaged objects can be assessed more accurately through remote diagnostics, and when necessary they can be restored and losses inflicted by war damage etc. can



Fig. 4: Documentation of the objects held in the collection of the National Museum Sanaa (Photo: GOAM, Mohanad al-Sayani)

Fig. 5: Bronze statue of Ma'dikarib, Awām temple, Marib/Yemen (6<sup>th</sup>/5<sup>th</sup> century BC), Sanaa National Museum YM 262 (Photo: Kunsthistorisches Museum Wien, 1998)





*Fig. 6: The Ancient Yemen Digital Atlas records Yemen's archaeological sites, monuments as well as South Arabian objects and links them with various information in a web GIS-based information system (Deutsches Archäologisches Institut (DAI), Josephine Schoeneberg, Holger Hitgen)*

be reproduced. The first step is to train employees of the Yemeni antiquities authority in photogrammetric techniques in order to generate capacities and competencies on site. In the long term, Yemen will thus be enabled to present their collections to the world as virtual museums.

The Ancient Yemen Digital Atlas (AYDA) was developed for the Yemeni antiquities authority through funding from the Cultural Preservation Programme of the Foreign Office.<sup>2</sup> AYDA records Yemen's monuments and ancient sites and archives various archaeological research data in a webGIS-based monument information system. Archaeological sites, monuments and South Arabian objects are linked with historically and archaeologically relevant data, documents pertaining to conservation, as well as information from the antiquities trade through various databases.

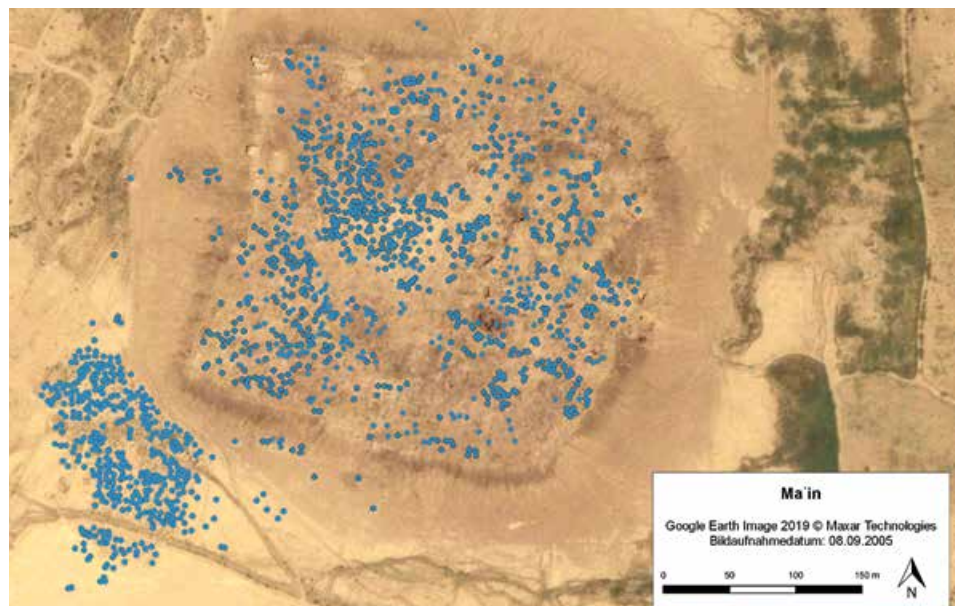
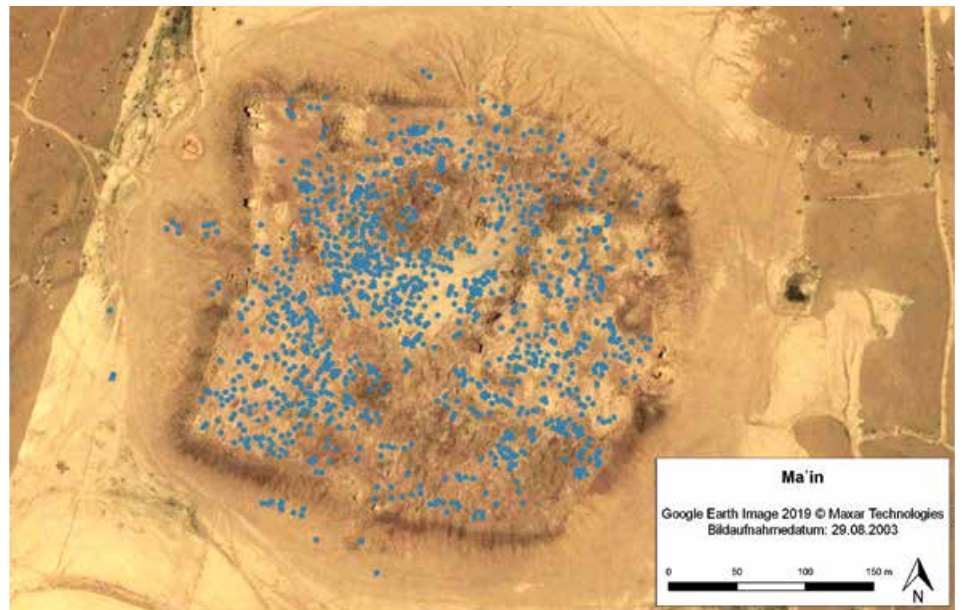
Because the Yemeni antiquities authority does not have a systematic documentation of the sites yet, the English-Arabic digital atlas also functions as a register of historic monuments (fig. 6). To date roughly 30,000 sites have been recorded; they were identified through the analysis of aerial photographs and satellite images and registered by digitally mapping verified data. We are not just dealing with remote sensing, but also the complex localisation of sites by comparing research data and, when possible, photographs recorded on site.

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any damage as well as the possible causes. Together with the Yemeni antiquities authority, the extent of the damage can be assessed and if necessary preservation and restoration measures can be taken.

For example, the analysis of aerial and satellite images that were taken at different time periods combined with a comparison of data from the 40-year old research archive of the DAI Sanaa Branch verified that part of the ancient settlement area of the Sabaeen capital Marib – one of the most important South Arabian sites that is also on the tentative list of UNESCO's World Heritage Sites – is being destroyed by modern settlement activity. Based on this information, we initiated first measures to protect this cultural heritage with UNESCO and the Yemeni antiquities authority: Construction was stopped and up to now we have not detected further changes through remote diagnosis. This incident garnered a lot of attention; together with other damages that we documented in the oasis Marib it acted as a catalyst for the Yemeni government to start preparing the nomination of Marib as a UNESCO World Heritage Site, despite or better because of the ongoing conflict. The Sanaa Branch has been conducting archaeological research in Marib and its surroundings since the 1970ies and is one of the committee members.

Site monitoring also oversees the state of preservation of the sites that are especially threatened by illegal excavations and are located in regions that cannot be accessed even by employees of the antiquities authority due to safety



*Figs. 7a–c: The Old South Arabian town of Ma'in: Destruction by illegal excavations (marked in blue) and a flood after heavy rainfall 2018 (DAI, Josephine Schoeneberg, Holger Hitgen)*



Fig. 8: Sabaean sanctuary of Bar'an in the Oasis of Marib (Photo: DAI, Iris Gerlach)

reasons. Thus it is possible to document illegal excavations in detail, such as those at the Old South Arabian town of Ma'in in the northern governorate al-Jawf (figs. 7a–c): On the one hand it has been possible to detect that the destruction has increased since the beginning of the war; however, it also shows that the scale of damage was already dramatic 10 years ago. Also at the Qatabanian site Hajar al-'Ādī (Maryamah), located on the western desert fringe, the increasing damage caused by illegal excavations can be limited thanks to monitoring and photographs. The illegal excavations are accompanied by an increase of stolen objects that undoubtedly come from this site, such as various high-quality bronze sculptures.

In order to better document and curb the illicit trade in cultural property and its trafficking routes, the Ancient Digital Atlas will be supplemented by an appropriate monitoring-tool and a database. Through auction catalogues and archives the trade routes and the involved agents can be documented systematically. An accumulation of antiquities from one region or one site gives important information pertaining to illegal excavations, which then can be validated through site monitoring. The Sanaa Branch not only cooperates closely with the Yemeni antiquities authority, but also with other institutions such as the German Federal Criminal Police Office.

The Ancient Yemen Digital Atlas links all of the cultural preservation measures that are implemented by the Sanaa Branch and the Yemeni antiquities authority. It is a register

of historic monuments (fig. 8), a monitoring tool for sites and antiquities, as well as an archive for research data. The structure of the webGIS-based monument information system with its varying specialized databases can readily be transferred to other countries so that their cultural heritage can be managed, especially in conflict regions, and various monitoring processes can be implemented.

<sup>1</sup> <https://www.archernet.org/2020/08/10/virtuelle-museumssammlungen-des-jemen-post-conflict-recovery/>

<sup>2</sup> <https://www.archernet.org/2020/04/22/ayda-ancient-yemen-digital-atlas-2/>; <https://www.archernet.org/2018/10/25/ayda-ein-digitales-denkmalregister-fuer-den-jemen/>; Schoeneberg, J., *Documentation – Observation – Evaluation. Ancient Yemen Digital Atlas (AYDA). A WebGIS Based Monument Information System*. Proceedings of the 23<sup>rd</sup> International Conference on Cultural Heritage and New Technologies 2018. CHNT 23, 2018 (Vienna 2019): <http://www.chnt.at/proceedings-chnt-23/>