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Assessing Endangered Cultural Heritage in Central Iraq. Methods and Perspectives of the QADIS Survey Project

Nicolò Marchetti, Abbas Al-Hussainy, Marco Valeri and Federico Zaina

Introduction [(1)]

Any archaeological survey, in its essence, focuses on mapping ancient remains both for understanding the dynamics of human occupation in that given landscape and for singling out evidence which should be protected in the future. The joint Iraqi-Italian QADIS project is no exception in this respect and one of its main aims is enabling Iraqi cultural authorities.

Specifically the State Board of Antiquities and Heritage, to gain an updated knowledge of its territory, while at the same time facing the new threats which are affecting or are about to affect it. The region covered by the QADIS project (1829 km^2) has been interested by works which are well documented throughout all central-south Iraq, such as an artificial basin which submerged several sites, and the construction and cutting of roads, canals and ditches (including the Third River – or Main Drain Canal – completed around 1992), not to speak of the growing reach of cultivations and the additional problem of deep ploughing.

As if these threats are not enough, periods of political instability entailed systematic looting of sites, which has witnessed differing cycles of intensity but which is far from being over. Through the QADIS project, we reacted to this current state of affairs – thanks also to the funding provided by the EDUU project – by means of an intensive fieldwork training for SBAH personnel (about the GIS management of sites) and of activities for raising the awareness of local communities, in addition to our core scientific aims. However, the parallel need for sustainable structural law reforms in the field of preventive archaeology has become progressively evident. In this paper, we review the extent of damage to heritage in our region by discussing some study cases before proposing some possible mitigations of the problems which we documented.

Endangered Cultural Heritage in Iraq. A Tentative Typology of Threats

In the past decades threats and damages affecting the Iraqi cultural heritage dramatically increased. The outbreak of successive conflicts since 1980s until today, the effects of natural erosion and silting processes, the problems related to the construction of infrastructures as well as the extension of farmland deeply impacted on the archaeological sites throughout the Country.

The extent of these types of damage has only been partially understood and in-depth analyses and reports are yet to be produced. In addition, the recent political events and the media (Harmanşah 2015) principally focused on destructions caused by conflicts [(2)], giving less prominence to the other equally destructive types of threats.

Since the 1990s, the country's growing political instability caused a sharp increase of both violent destruction and looting of its cultural heritage (Fig. 1; see also Russell 2008: 31) [(3)]. The period immediately following the Third Gulf War was particularly devastating (Bott 2015; Stone 2008; 2015) [(4)]. So far, analyses focused on archaeological sites in southern Iraq (Stone 2008; 2015) have shown clear patterns, with areas lying far from towns and the main villages mostly suffering from illicit digging (Fig. 2). This trend was partly due to the institutional vacuum and the consequent intermittent lack of control on the territory by central authorities following the severe civic conflicts.

Other principal types of threats to the cultural heritage in Iraq include the construction of roads/railways as well as large scale infrastructures such as hydraulic works and sometimes also buildings. Although several rescue archeology interventions have been carried out by the Iraqi State Board of Antiquities and Heritage (SBAH), sometimes in collaboration with international institutions, a systematic mapping and monitoring activity and proper protocols for approaching this kind of events are still lacking.

Among the most impacting large scale infrastructures, dams deserve particular attention for the documentation and monitoring methodologies applied so far. While a systematic approach has not as a rule been applied, in some cases international surveys together with excavation projects at selected sites were carried out prior to the reservoirs up-filling. The most relevant examples are represented by the Eski Mosul dam project (A.A.V.V. 1985) and the Hamrin dam project [(5)] in the north and east, the Haditha dam (Kepinski, Lecompte and Tenù 2006) in the west and the Delmej reservoir (Adams 1981; Adams and Nissen 1972) in southern Iraq. Another interesting case study is the study of impact of the potential dam of Makhool which was expected to be constructed farther south of the existing

Eski Mosul dam (Muehl and Sulaiman 2011). These projects have basically three problems:

1. The pre-flooding fieldwork has not generally been systematic (i.e. not all the sites have been closely surveyed and/or excavated).
2. The dissemination phase is generally partial and it does not allow to fully understand what has been really done (i.e. for example it is not always clear whether the entire reservoir area has been surveyed, while data are mostly made available in a highly synthetic and selective way).
3. There has been no analysis of the post-flooding impact of the reservoirs on the cultural heritage (i.e. a precise assessment of what has been lost and what instead is still preserved).

The destruction of cultural heritage linked to economic development activities does correlate also with the increasing urbanization and the agricultural exploitation of the territory. The latter case is certainly under-analyzed and not properly controlled by the authorities and it is probably one of the main causes of the destruction of archaeological sites. Agricultural-related activities in the region generally include irrigation and plowing, even of the deep kind [(6)].

Considering the wide range of threats affecting tangible cultural heritage, in this paper we first discuss case studies on selected typologies documented by the QADIS survey project in collaboration with the SBAH, showing the methodology applied to map each type of damage and the results achieved. Then, we propose potential future strategies for preserving cultural heritage in Iraq, including the increase of public investments for providing SBAH with specifically trained personnel and equipments in order to enhance its control of large areas (including peripheral ones) and, as a further essential tool, the implementation through resources of the private sector of systematic preventive and rescue archaeology in order to increase job opportunities in the field of archaeology as well as to significantly improve control on the ground and the mapping of archaeological heritage.

Documenting Threats to Archaeological Sites during the 2016-2018 QADIS Project

The QADIS survey project – in an area which follows the administrative borders of the province of Qadisiyah to the South and East (including part of the Delmej basin), up to a line c. connecting Fara with the town of Afak to the West and North – aims also at documenting threats and the destruction of cultural heritage. To do so, different methodologies have been applied including remote sensing, aerial/orthophotogrammetric as well as field surveys.

A preliminary identification of looting holes and trenches, infrastructures and roads was carried out using a base map (Table 1) made from various sets of satellite imagery (Marchetti et al. 2017). An orthophotogrammetric survey was then carried out using UAVs (DJI Phantom Pro 3 and 4) at selected sites which revealed in detail the extent of looting, agricultural activities and the presence of modern infrastructures, also in order to test different methodologies for mapping and monitoring the state of conservation of archaeological sites and monuments.

Among the different types of threats to cultural heritage identified by the QADIS survey project, four have of course the greatest impact: conflict, construction, looting and agriculture. Conflict relate to violent activities as well as military infrastructures (such as barrack or berms) at archaeological sites. Construction refers to a wide range of public and private activities, including buildings, roads and other transport and communication systems and hydraulic infrastructures (such as canals, dams or water reservoirs). Looting is an illegal activity consisting in the digging of trenches and pits on a site, to eventually sell any object discovered. The depth of looting pits may vary greatly, down even to 8 m. Agriculture includes plowing of large areas often encompassing archaeological sites, the digging of canals, salinization and the mechanical levelling of fields.

Construction - Hydraulic infrastructure - Delmej reservoir

The north-eastern part of the QADIS survey area include one third (almost 210 Km^2) of the Delmej reservoir. This enormous hydraulic infrastructure (616 Km^2 in total) is part of a long term project of economic development carried out between the late 1960s and early 1970s in the area across the Qadisiyah and Wasit provinces. Here the strong desertification and the lack of immediately accessible waterways prevented the growth of agricultural and pastoral industries (IMOE and NI 2014). Using a multi-temporal analysis approach of satellite imagery applied to archaeology [(7)] the QADIS project team analyzed the impact of the Delmej reservoir on cultural heritage through time (Fig. 3).

The archaeological surveys carried out (Adams 1981; Adams and Nissen 1972) between 1960s and 1970s, before the Delmej reservoir up-filling, allowed to identify 146 [(8)] now-flooded archaeological sites of different periods and dimensions (Table 2, Fig. 4). Between 2011 and 2013 the SBAH carried out rescue excavations at selected sites in the reservoir area (Fig. 5) [(9)].

As for other areas flooded by the construction of dams and other hydraulic infrastructures, despite the wealth of data previously collected by the Heartland of Cities survey (Adams 1981), no post-flooding assessments have been performed by archaeologists.

Illicit digging: Looting – Bismaya/Adab (QD049)

In the last years, different initiatives arose to document and monitoring looting in countries affected by war or political conflicts. In the Near East for example, archaeologists developed integrated analysis of satellite imagery and ground truth visits in Syria (Casana 2014; Casana and Panahipour 2014), Egypt (Fradley and Sheldrick 2017; Parcak 2014; Parcak, Gathings, Childs, Mumford and Cline 2016), Yemen (Banks, Fradley, Schiettecatte and Zerbini 2017) and Iraq (Stone 2008; 2015; Richardson 2011) among others.

In Iraq, the eastern Qadisiyah province was probably one of the most heavily hit areas by the phenomenon of looting. The situation dramatically worsened since the 2003 invasion up to 2007 (Stone 2008; 2014). However, far from being completely eradicated, looting is still carried out by isolated groups especially in more remote rural areas.

The patterns suggested by recent studies (Stone 2015: 180-181) such as the deliberate avoidance of looting in archaeological sites dating from Islamic the period, especially in the Shiite south, are not confirmed. The intense activity of looting documented also at sites identified for the first time by the QADIS project did not reveal relevant chronological patterns differentiation and it is unlikely to assume that local people, even trained ones, are able to properly date archaeological materials.

During the 2016-2018 survey campaigns, the Iraqi-Italian QADIS team extensively documented the current impact of looting on cultural heritage. The preliminary results of the analysis of the extension and intensity of looting at the archaeological sites of the region indicate a much worse situation with almost 50% of the newly identified sites having been heavily pillaged. Moreover, both the analysis of the location and size of looted sites confirms a deep knowledge of the territory by groups of looters even better than that of archaeologists themselves [(10)].

The ancient city of Bismaya/Adab represents one of them most relevant case studies for the study of looting in the region. Adab (QD049; UTM coordinates: 38S 558810.00 m E 3535285.00 m N) is a large multiperiod site occupied from at least the 3rd millennium BC to the Sasanian period. The total surface covered by the archaeological remains is more than 400 ha, approximately 3.5 Km long and 1.5 Km large (Marchetti et al. 2017). Archaeological researches at the site

were undertaken at the beginning of the last century. In 1902 the D.O.G. (Andrae 1903) carried out a survey at the site, while from 1903 to 1905 the University of Chicago excavated the site for three seasons (Banks 1912; Wilson 2012).

Evidence of extensive looting at the site had been previously grossly documented through satellite imagery only (Stone 2008; 2014). During the 2017 and 2018 seasons, we investigated the impact of looting at the site through an integrated approach, with the aim of updating the previous evidence and training the local archaeological authorities in modern methodologies for the safeguarding of sites. The analysis of the different sets of satellite imagery formed our base map, which was greatly enhanced through UAV's ortophotogrammetric survey, ground truth investigation including random materials collection and surface scraping at selected spots. It came out that almost 17 % of the site (Fig. 6) has been looted (90.07 ha), with more than 18,000 looting pits counted by the QADIS team (Fig. 7). The highest parts of the site are generally the most targeted by looters (Fig. 8).

Economic development: Agricultural activities - Tell Rumah (QD117)

The construction of water infrastructures in the northern part of the region since the 1980s and the consequent increase of farmland have heavily damaged the archaeological heritage of the region. Besides affecting numerous sites previously identified by the surveys from the 1960s and 1970s (Adams 1981, Adams and Nissen 1972), extensive cultivations with the consequent cutting of irrigation canals brought to light new sites which had disappeared under later silting.

The QADIS project in collaboration with the local SBAH has mapped many of these sites. In some cases, due to the difficulty in distinguishing between the archaeological sites and the off-site scatter, it was necessary to use more detailed survey methods. This is the case of the group of sites named QD117 [(11)]. This group of sites was identified for the first time during the fourth campaign (October 2017) thanks to the analysis of satellite imagery. The satellite evidence consisted of some pseudo-circular (referable to archaeological sites) or elongated (referable to paleochannels) anomalies of brownish color.

The survey consisted in the ortophotographic mapping of the area using a DJI Phantom 4 Pro [(12)] drone to verify the nature of anomalies previously detected through satellite imagery. To do so, hi-res photos with a 3-4 cm per pixel resolution were taken at elevations between 70 and 140 m. In addition, intensive collection of surface materials from the same area has been carried out during both the 4th and the 5th

campaigns. The area is about 1.24 Km x 0.76 Km extending for approximately 90 ha (Fig. 9). In total, 154 grids measuring 70 m x 70 m have been drawn in a GIS environment and the grids have been set on the ground using a Garmin GPS [13]. The integrated analysis of the orthophotogrammetric survey and the intensive surface materials collection allowed to isolate 3 main clusters of materials dating from the 4th (QD117a and QD117b) and 3rd (QD117c) millennium BC.

Once the limits of the archaeological areas have been defined, these data have been crossed with the current extension of the plowed area and the associated canal grid (Fig. 10). The evidence shows that 100% of the archaeological area has been damaged by modern agricultural works. Moreover, while plowing has affected about the first 30 cm of archaeological deposit, the excavation of canals has produced damage up to 3 m of archaeological deposit in at least 2 out of 3 sites (Fig. 11).

This method proved to be effective in flat sites not directly visible and therefore potentially more vulnerable.

Construction: Roads - Tell al- 'Arris

In 2011, public works along road No. 17 (Afak - Al Bdair) affected the small multi-period site of Tell al- 'Arris. This low mound, now lying on both sides of the road, was previously surveyed by Adams (1981: no. 1005). The Iraqi State Board of Antiquities and Heritage carried out one season of rescue excavation revealing different phases of occupation mostly dating from the 2nd and 1st millennia BC, thus confirming Adams' chronology (1981: 269).

The SBAH has a long tradition of rescue excavations throughout the Country. Most of them have been carried out in the frame of public projects, while construction activities promoted by private individuals have almost never had any supervision and archaeological investigation. In order to support the SBAH work at the site, in 2016 the QADIS project carried out a high resolution ortophotographic survey of the survey using UAV (Fig. 12). The aim was twofold: two provide SBAH with an updated topography of the site (for its integration into the previous non-digital documentation) and to monitor the state of preservation at the site after 5 years. A new ortophoto and a DEM of the site have been produced by the QADIS survey project team and the updated images also allowed to quantify the impact and extension of the buildings constructed north of road No. 17.

Conflict: Military buildings - Tell Dlehim (QD038)

Most of the military installations documented in the QADIS survey have been built in the last decades following the Second and Third Gulf wars. Although the amount of military

structures is limited, the damage produced is twofold, as their construction involves archaeological earth movement (generally taken from the site itself) as well as the obliteration of archaeological deposits due to the building of berms.

Among the sites in the QADIS area that showed such evidence, Tell Dlehim (QD038; Adams 1981: no. 1237) presents the greatest number and concentration of berms. This is one of the most important multi-period sites of the region possibly to be identified with ancient Tummal, one of capital cities of the Ur III period (Marchetti et al. 2017: 70-71, 74-75; Steinkeller 2001: 66-71; Yoshikawa 1989). According to the new hi-res photographs taken with UAV, the ancient city is characterized by two residential neighborhoods, with well recognizable buildings and roads as well as a possible temple on a high terrace with a large oval temenos to the south-west (Marchetti et al. 2017: 74-76, fig. 3).

Four large squared berms and other long earthworks (Fig. 13) were built around the mound. The ortophogrammetric survey and the ground control allowed to identify two types of berms, with single or double space (measuring c. 16-17 m x 16-19 m). Such structures could house armored vehicles including tanks.

Towards New Strategies for Sustainable Preservation of Cultural Heritage in Iraq

To date the eastern Qadisiyah province represents one of the areas of Iraq in which cultural heritage has been most damaged. By analyzing five case studies, the QADIS survey project used an integrated methodology for assessing and quantifying the impact of different types of threats to the cultural heritage. Our preliminary analysis revealed five most relevant types of threats in the QADIS survey region: illicit activities (mostly looting), conflict (berms and other military structures), construction (dams, roads and buildings), agricultural works (canals and plowing) and natural events (dunes and aeolic erosion). These new types of threats have not yet been properly framed by local authorities and efficient policies for protecting cultural heritage are still partly lacking. Focusing on the structural issues affecting the management of cultural heritage in the region and contributing to the lack of policies (but an important parallel action to be undertaken is that of raising awareness among the local population about the cultural heritage of their region), we may identify two main problems:

1. SBAH personnel and equipment. There is a lack of SBAH-related personnel on the territory, especially on the more peripheral and border areas,

but also at some of the main archaeological sites (e.g. Adab and Tell Jidr). Further, most of the equipment and infrastructure used by the SBAH has become obsolete, including facilities, vehicles and equipment.

2. Amount of public and private works that damage cultural heritage. In Iraq, the control, management and intervention for the preservation of cultural heritage by local authorities is not sufficient to cover all potential risks deriving from the construction/development sector. This same problem is present in most of the western countries and in the light of this, we propose two different strategies for enhancing the rescue and management of cultural heritage in the Qadisiyah province in an efficient and sustainable way. Eventually, if successful, these strategies could be extended to the rest of the Country.

The first issue can be addressed through investments that include a more effective reorganization and training of current SBAH personnel on the territory and the hiring of more guardians at least for clusters of sites. Both existing SBAH staff and new prospective hires require intensive training programs to improve their skills and bring them in line with international standards. As far as infrastructures and instruments are concerned, it is necessary to create further small SBAH offices in smaller centers, to acquire more vehicles as well as modern instruments (such as laptops using open source software, total stations, GPS etc.) to be used in the fieldwork and for data collection and processing. A new era of qualified investment is needed here. Among the main outputs of these improvements, there will be the creation of regional archaeological risk assessment maps based on international standards. When the territory is well-known, it is possible to preserve its features, even when great urban transformations are implemented.

The second issue can be addressed introducing preventive archaeology in Iraq. In the past thirty years, professional private archaeological companies [(14)] emerged in Europe as a response to the urgent need of archaeological survey and excavation to be carried out in advance of construction or other land developments. Excavations had long been organized by academic institutions, but since 1980 onwards, there appeared, in western Europe, preventive archaeology led by private enterprises (Demoule 2012: 612) [(15)]. A recent overview estimated that currently preventive archaeology, mostly carried out by private companies, represents almost the 90% of total excavations in Europe (Demoule 2012: 620). The growing success of preventive archaeology also contributed to increase public awareness on the importance of cultural heritage (Demoule 2012: 620).

The workflow of preventive archeology activities in Iraq may be as follows (Fig. 14):

1. In case of public and private works, the developer (either a public or private company/person) must inform the State Board of Antiquities and Heritage (SBAH) before the start of the planned works. If an area already registered as of archaeological interest is present, the application is automatically rejected, unless a superior public interest is there (in this case see under 3. below).

2. The SBAH provides the client with a private professional archaeologist (PPA) to oversee during the execution of works (preliminary evaluation of the archaeological risk and cost estimates). The PPA is paid by the SBAH, which receives the corresponding amount in advance from the developer. The SBAH selects the PPA from a list of private professional archaeological companies, which had previously been officially recognized by the SBAH itself according to verified parameters of quality and efficiency in the field of archaeology.

3. The PPA immediately reports to the SBAH if cultural remains are encountered during the works. The SBAH decides about the significance of the finds: if it is a major, monumental one the works may be stopped for good; if it is an average one, excavations may be started in the area interested by the works at the expense of the developer. Through the SBAH, a private professional archaeological company may be hired to carry out archaeological excavations and upon their termination the area is given back to the developer. This solution is always applied also in the specific case mentioned under 1. above.

4. At the end of the works, the PPA and/or the company submit a final report to the SBAH according to predetermined standard. Once validated, the SBAH pays the final instalment to the PPA/company.

These suggestions must be read in a long-term framework of improvement of the general management of Iraqi cultural heritage in the face of a newly starting wave of economic development. The violent events that have characterized the last decades and the price that the Iraqi heritage had to pay underline the urgent need for a modernization in line with international practices to be done in full collaboration between public (SBAH, Local councils, Universities) and private (developers) bodies.

Footnotes

1- The QADIS survey project is a joint Iraqi-Italian initiative by the Alma Mater Studiorum - University of Bologna and the State Board of Antiquities and Heritage (SBAH): five campaigns have been carried out between 2016 and 2018 under the

direction of N. Marchetti (Marchetti et al. 2017). The friendly and unfailing cooperation of the Chairman of the State Board of Antiquities and Heritage, Qais Rasheed, and the other Colleagues at the SBAH in Baghdad are here gratefully acknowledged. Funding for the five survey seasons was provided by the Alma Mater Studiorum – University of Bologna, the Italian Ministry of Foreign Affairs (DGPS directorate – 6th Office) and the European Union funded project "EDUU- Education and Cultural Heritage Enhancement for Social Cohesion in Iraq" (EuropeAid CSOLA/ 2016/382-631, coordinator N. Marchetti). We are very grateful to the diplomatic personnel of the Italian Embassy in Baghdad and the local Authorities and the many friends in Diwaniyah and Afak for their warm reception and constant support. In addition to the authors (here identified by their initials), the following members took part to the survey seasons: Nadia Barbi, Michael Campeggi, Valentina Gallerani, Gabriele Giacosa, Elena Leoni, Simone Mantellini, Eleonora Mariani, Giulia Roberto, Giulia Scazzosi, Basim Jabbar, Ahmed Abbas, Ahmed Kareem, Ahmed Ali, Ali Feles, Hayder La'ebi, Haneen Taher, Munna Maki, Walid Al-Munam, Mohammed Jassim, Mohammed Mussa Dahash, Safah Qassim, Mu'taz Sami Rhman, Hassan Jabar, Jacob Jawdat, Hussam H. Karim, Ghassan Adnad. Google Earth Pro and Bing Maps are registered trademarks.

2- See also several recent United Nations resolutions and reports (S/2016/92; S/RES/2253 2015) highlighting the role of internet and the social media as tools for Daesh/ISIS to disseminate their acts of destruction, a phenomenon which has been recently defined by Harmanşah (2015), quoting Latour (2002), as "Iconoclash." The deliberate destruction of the archaeological sites and monuments is only part of the terrible impact of ISIS on cultural heritage. The looting and selling of ancient artifacts was one of the significant revenues of terrorists: in this regards, in recent years the European Commission boosted coordination programs with national ministries of Home Affairs, Justice and Cultural Heritage, UN agencies, law enforcement, customs and other European organisations (Council of Europe) aiming at building joint actions to prevent and fight illicit trafficking of cultural goods and related security issues. Practical and effective measures were taken especially relating to customs by the Council of the European Union (2009), which were subsequently fine-tuned and implemented by the World Customs Organization (Brussels, July 2016), in a specific EU context (European Commission, Brussels, 13.7.2017). The actions refer also more specifically to the issues of trafficking and restitutions (Directorate-General

for Migration and Home Affairs, European Commission and CECOJI-CNRS, 2011; European Parliament and the Council, Brussels, 15.05.2014).

3- See also Emberling and Hanson 2008.

4- A comprehensive picture showing the location and types of damages affecting cultural heritage in Iraq has been recently released by the EAMENA project http://eamena.arch.ox.ac.uk.

5- For the report of the rescue excavations in the Hamrin dam see *Sumer* 40.1.

6- A list of threats to cultural heritage has been recently proposed by EAMENA (http://eamena.arch.ox.ac.uk), while another tentative list was developed in the frame of the EU project JPI "Heritage and Threat" (http://ccrs.ku.dk/research/centres-and-projects/heat/projectoutline/typologyofthreat/).

7- This approach was developed in the frame of the EU funded 2015-2018 JPI "Heritage and Threat" project, using other dams from the Near East as case studies (Marchetti, Bitelli, Franci and Zaina in press; Marchetti and Zaina in press).

8- The number of sites reported by Adams (Adams and Nissen 1972, Adams 1981) is based on the amount of tell and cluster of materials identified. However, this number does not take into account the fact that various tell groups represent the various phases of occupation of individual settlements. For this reason, the actual number of archaeological sites should be around 20-30% less.

9- Four sites have been excavated by the SBAH: Tell Ruejeh (2011), Tell Mirza (2011), Tell Delmej 1 (2011, 2013), Tell Delmej 2 (2012-2013).

10- Many new archaeological sites located in the survey area have been identified by the QADIS project because of they showed evidence of previous looting.

11- QD is the code used for the archaeological sites recorded by the QADIS survey project.

12- DJI Phantom 4 Pro Specs: Sensor 1" CMOS, effective pixels 20 m, lens 24 mm. For more details see http://www.dji.com/phantom-4-pro/info#specs.

13- An average error of less than 3 m has been considered for the grids positioning.

14- Rescue archaeology has been well developed in several western countries including UK (http://www.bajr.org/), France (https://www.inrap.fr/) and Italy (http://www.archeologiapreventiva.beniculturali.it/).

15- For an overview on the different national approaches to preventive archaeology in Europe see Bozóki-Ernyey 2007; Novaković, Horňák, Guermandi, Stäuble, Depaepe and Demoule 2016.

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NAME	TYPE	DATE(S)	RESOLUTION	QUALITY OF INFORMATION	SOURCE
Bing Maps Tile System	Satellite	2016	Variable	High detail. Local scale	https://www.bing.com/maps
ESRI World Imagery	Satellite	2008	Variable	High detail. Local scale	Through ArcGIS©
Landsat	Satellite	1972-2016	60 m to 30 m	Medium-high detail. Local scale	https://earthexplorer.usgs.gov/
USGS Declassified CORONA	Satellite	1968-1969	2-3 m	Medium-High detail. Regional and subregional scale	http://corona.cast.uark.edu
SRTM	Satellite	2000	30 m	Low detail. Regional scale	https://earthexplorer.usgs.gov/
Soviet Military Topographic Maps	Topographic maps	1970s	1:200,000	Low detail. Regional scale	https://maps.vlasenko.net/soviet-military-topographic-map/

Table 1. Satellite imagery and topographic maps used to create the base map for the QADIS survey project.

Fig. 1. Looting at Tell Abu Hatab/Kisurra (Qd075a). Photograph taken by drone by the QADIS survey project (October 2017).

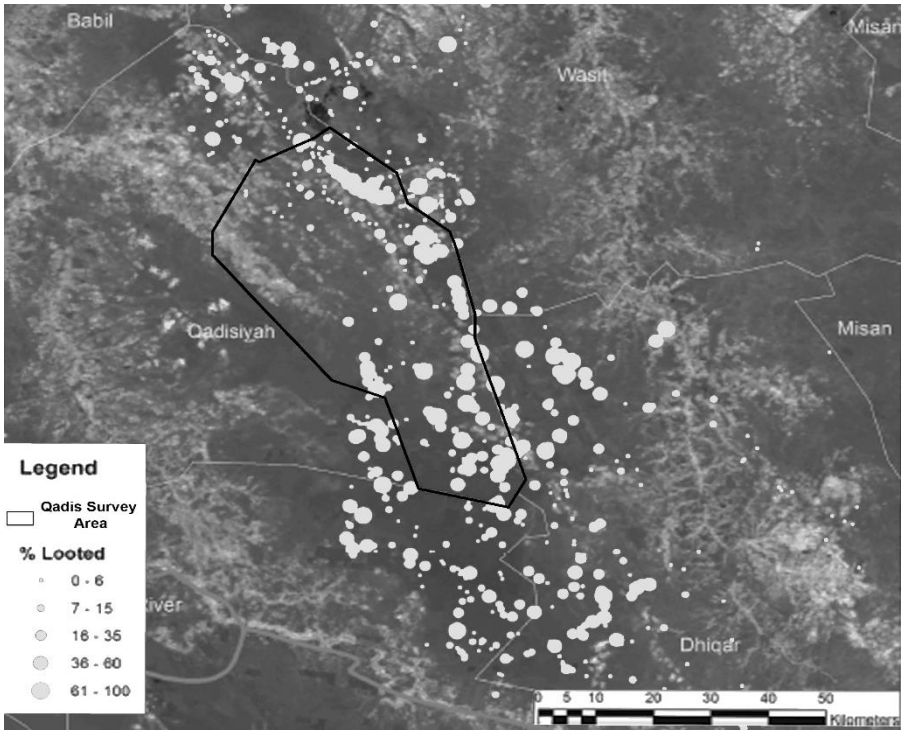

Fig. 2. Looting at sites in southern Iraq in summer 2003 (modified after Stone 2015: 184, fig. 6). Today at least the 55% of the sites from the Eastern Qadisiyah province are still affected by looting.

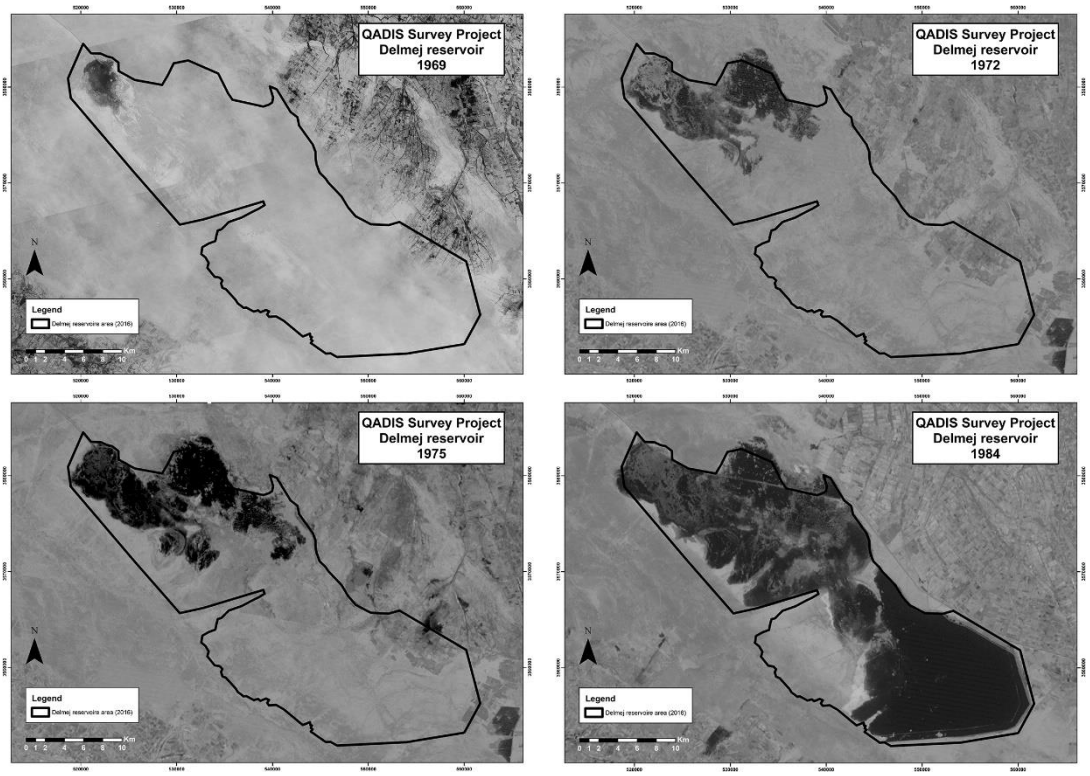

Fig. 3. Multi-temporal satellite imagery of the Delmej reservoir filling. Clockwise (A) CORONA KH-4B 1104-2138, (B) Global Land Survey, (C-D) Landsat 1-5 MSS.

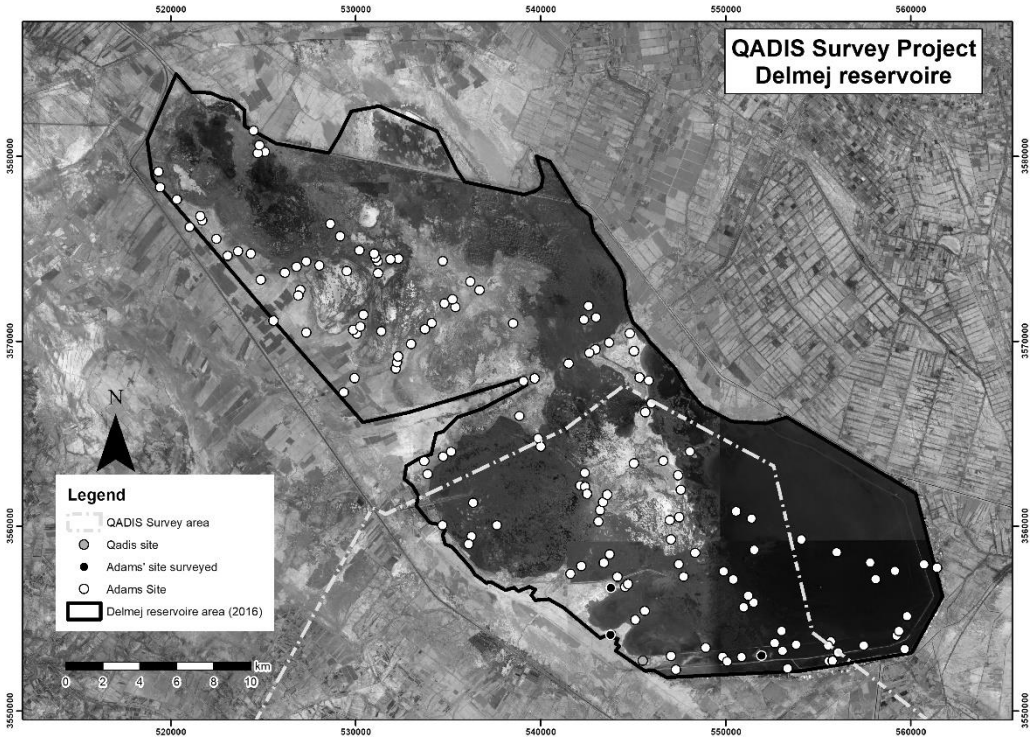

Fig. 4. Satellite imagery of the archaeological sites flooded by the Delmej reservoir compiled by the QADIS survey project (after Adams 1981).

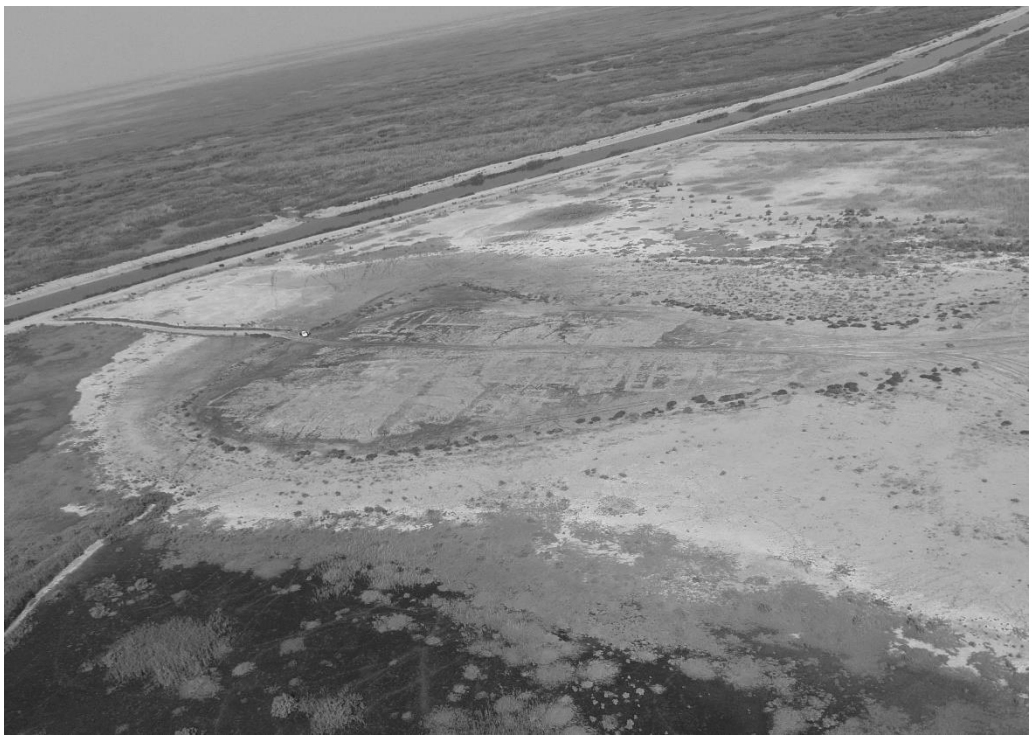

Fig. 5. Tell Rubahiyat al-Torra (Qd028, Adams site no.1135) in the Delmej reservoir area. Photograph taken with drone by the QADIS survey project (October 2016). Note the structural evidence visible on the surface, dating from the Parthian and Sasanian periods.

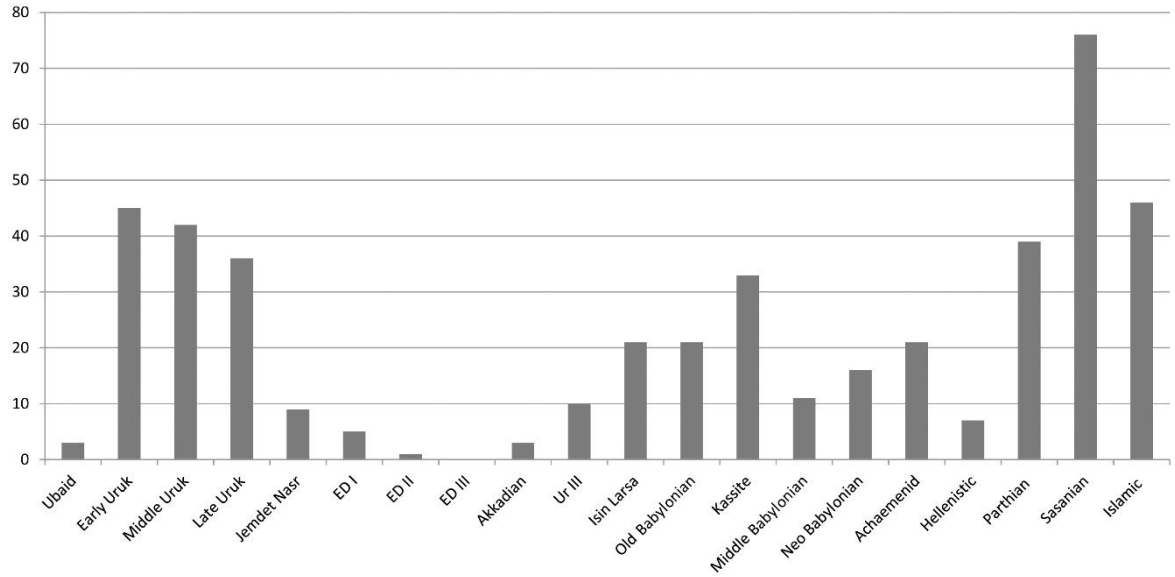

Table 2. Chronological breakdown of flooded sites in the Delmej reservoir area.

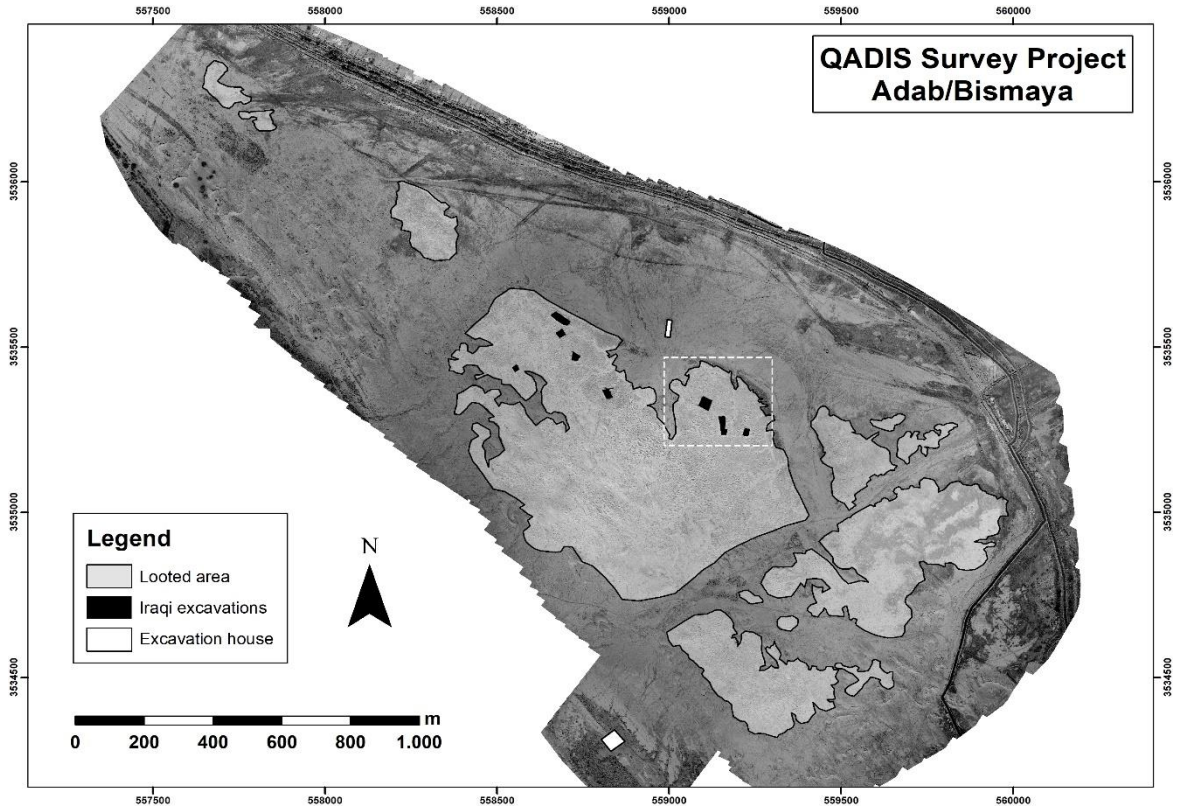

Fig. 6. Orthophoto of Bismaya/Adab (Qd049) with the looted areas documented by the QADIS project (January 2017).

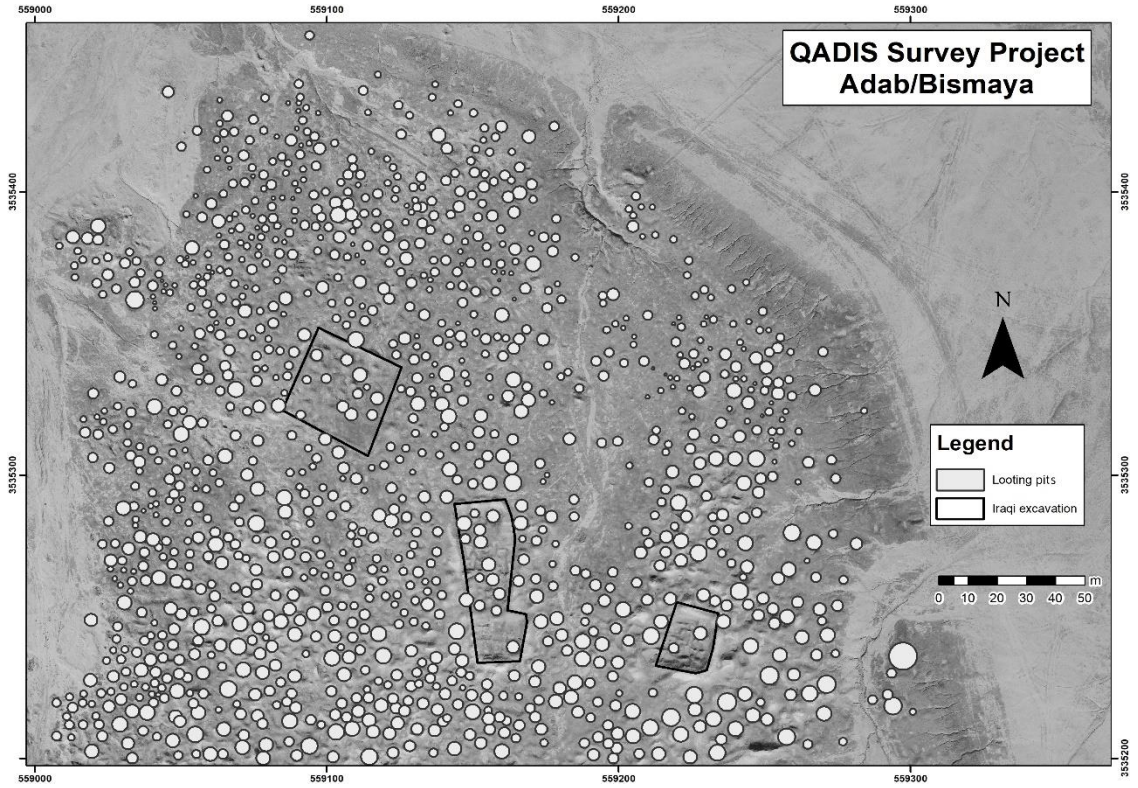

Fig. 7. Close-up of the eastern part of Bismaya/Adab (Qd049) with the looted areas documented by the QADIS project (January 2017).

Fig. 8. The heavy looting at Bismaya/Adab (Qd049) (January 2017).

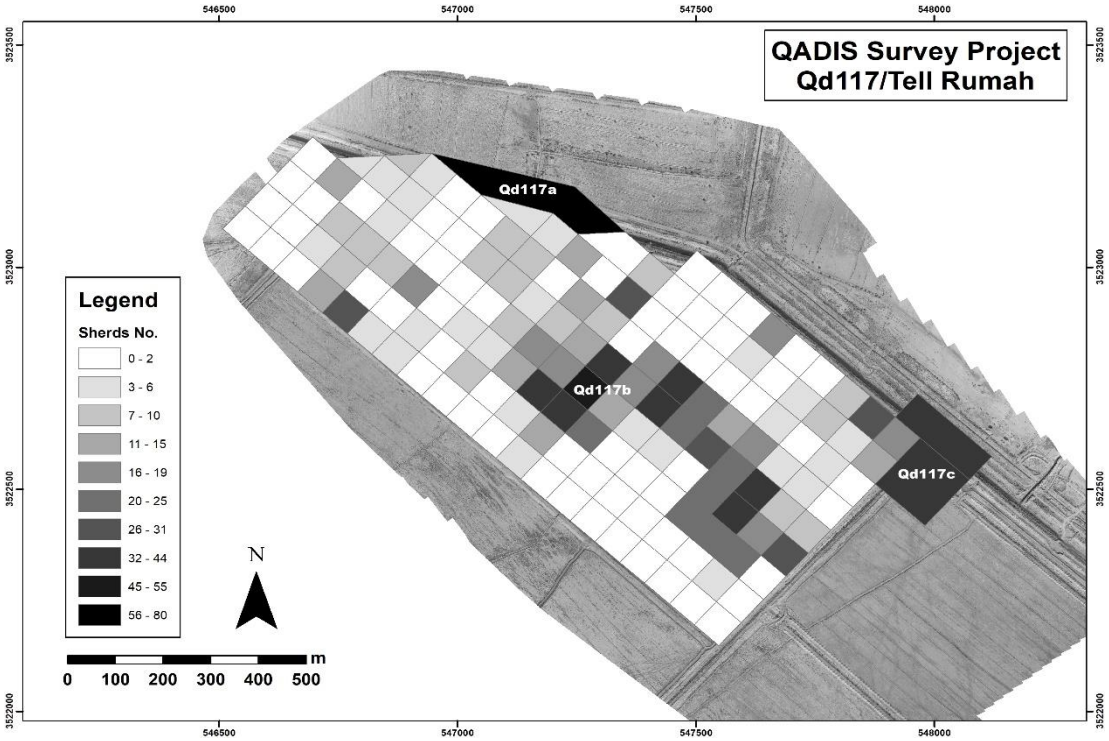

Fig. 9. Tell Rumah (Qd117). The combined use of ortophoto and the intensive surface collection by the QADIS project allowed to identify different small settlements dating from the Uruk period.

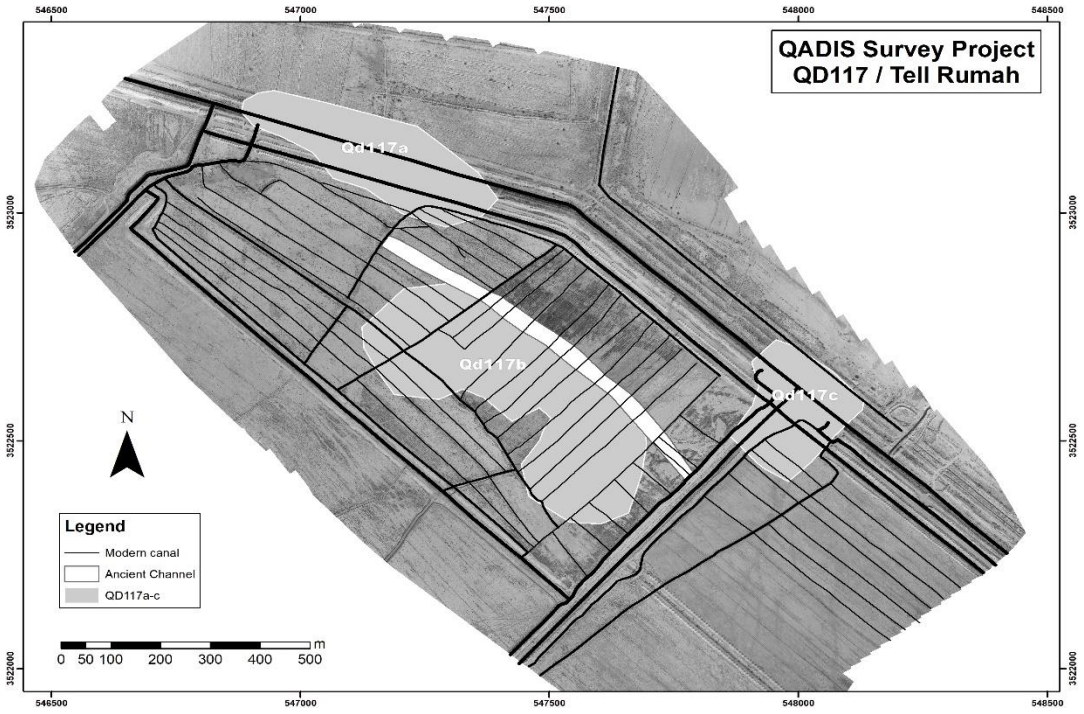

Fig. 10. Tell Rumah (Qd117). Overlapping of identified sites and channels and cultivated area in order to assess the impact of agricultural activities on cultural heritage.

Fig. 11. Tell Rumah (Qd117). The impact of the main canals and intensive agricultural activities at the site (January 2018).

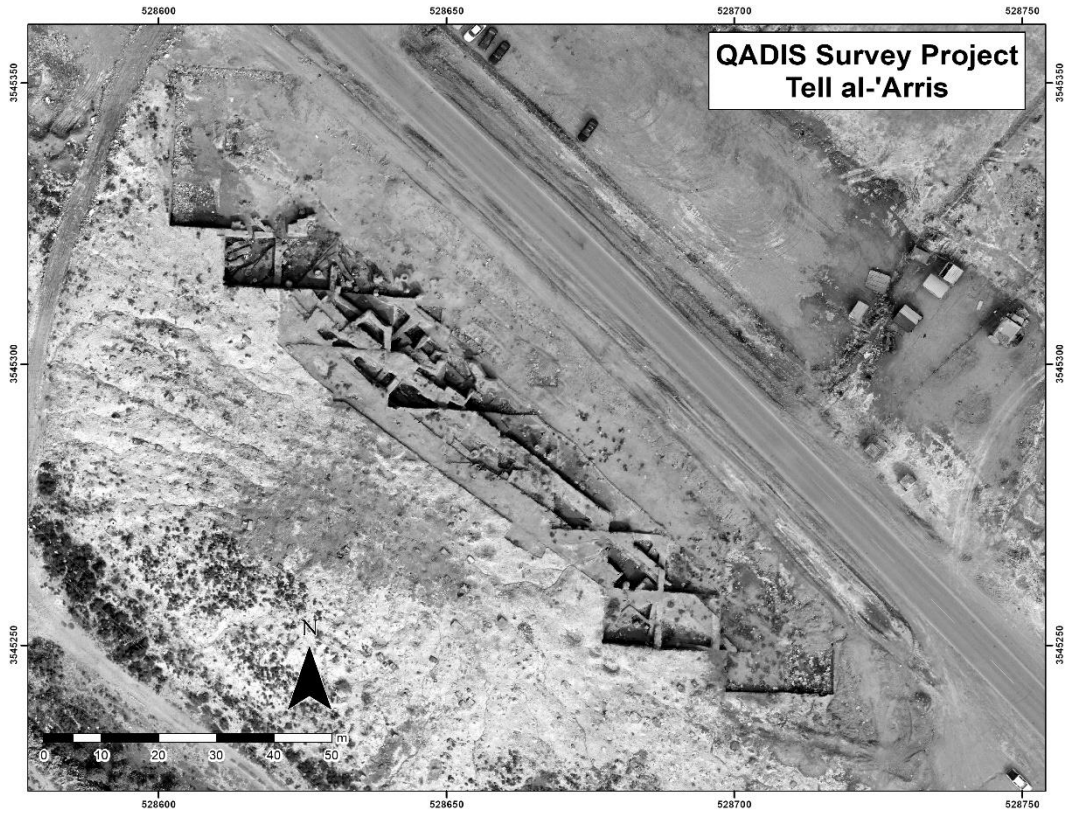

Fig. 12. Rescue excavation at Tell al-‘Arris carried out by the SBAH in 2011. Ortophoto taken with drone by the QADIS survey project (January 2016).

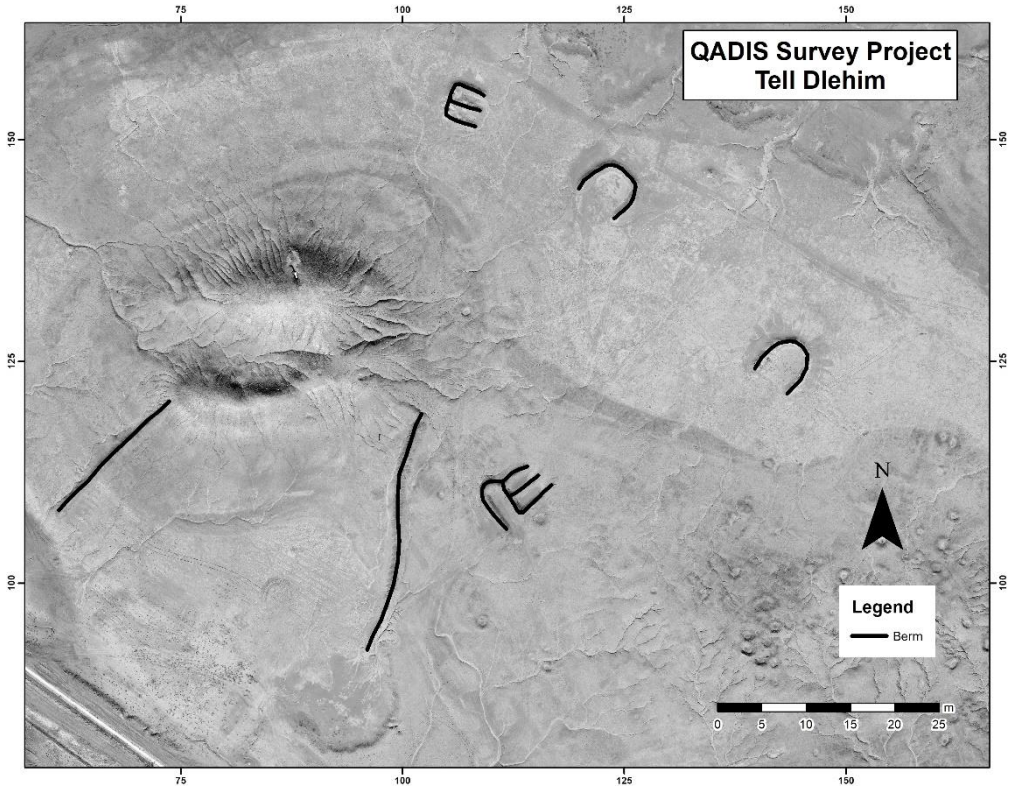

Fig. 13. Berms and other military earthworks at Tell Dlehim (Qd038). Ortophoto taken with drone by the QADIS survey project (January 2016).

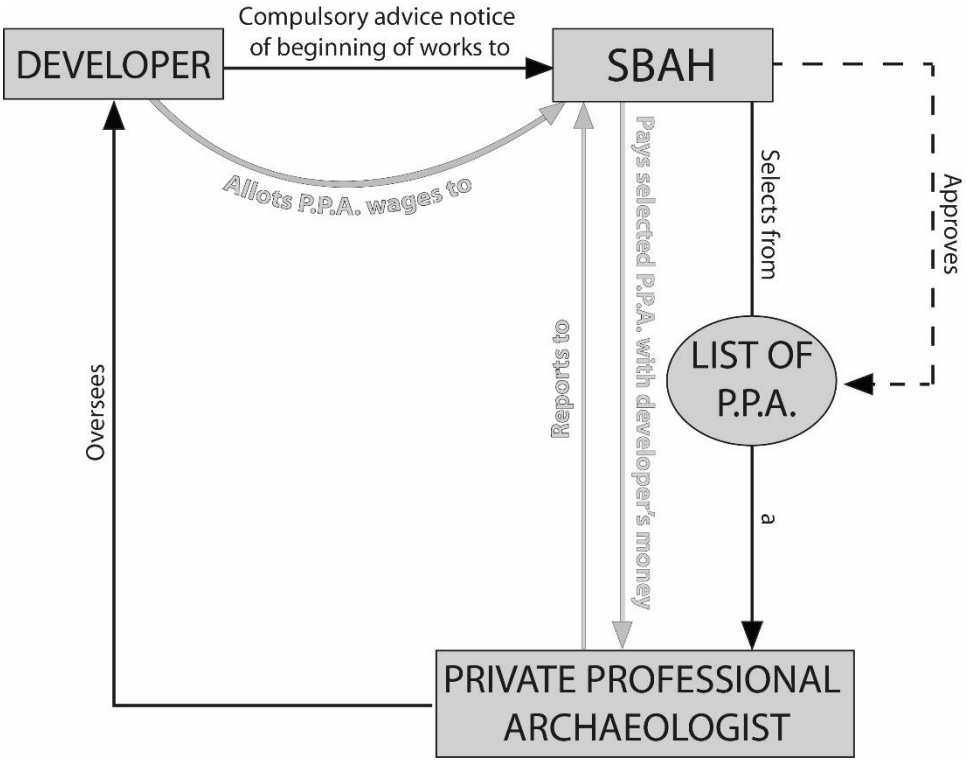

Fig. 14. Proposal for Preventive Archaeology in Iraq. Theoretical workflow.