Iraqi Kurdistan's heritage in the face of regional development: state of preservation of archaeological sites and damage assessment – preliminary report

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Abstract: The five-year Upper Greater Zab Archaeological Reconnaissance (UGZAR) project was initiated in 2012 as one of a number of survey projects in the Iraqi Kurdistan aimed at, among others, damage assessment of archaeological sites and new threats to the preservation of these sites, resulting from Iraqi Kurdistan's recent rapid development. The database produced within the frame of the UGZAR project can be used in heritage management. The paper presents the project's interim results and discusses the main factors endangering archaeological sites in Iraqi Kurdistan today.

Keywords: damage assessment, heritage management, Iraqi Kurdistan, development pressure, GIS database

The ongoing war in Syria has prompted many archaeological missions to shift their research interests to Iraqi Kurdistan, one of the few politically stable areas in the Near East with a working government and efficient security force.[1] Among these are The Land of Nineveh Archaeological Project led by Dr. Daniele Morandi Bonacossi of the University of Udine, The Erbil Plain Archaeological Project led by Dr. Jason Ur of Harvard University, The Eastern Habur Archaeological Survey led by Dr. Peter Pfälzner of Tubingen University, the Archaeological Survey of the Soulaimaniah Governorate led by Dr. Jessica Giraud of IFPO-Erbil (for information on the projects, see Kopanias and MacGinnis 2016). The Polish are represented by the UGZAR project (2012–2017) directed by Dr. Rafał Koliński from the Institute of Archaeology of Adam Mickiewicz University in Poznań.[2] The UGZAR project focuses on surveying the Upper Greater Zab area, which is still much of a *terra*

[1] The Asayish (Kurdish police, or security service which deals with terrorism among others) ensures security in the region. Vehicular traffic and passengers are checked regularly at frequent army road checkpoints.

[2] UGZAR is a designation of the field activities of the "Settlement History of Kurdistan" project financed by a generous grant awarded the Adam Mickiwicz University in Poznań by the National Centre of Science, Republic of Poland (project ID 2014/13/B/HS3/04872).

incognita in terms of archaeological finds. The Iraqi catalogue of archaeological sites *Archaeological Sites in Iraq* (Salman 1970) and atlas of maps showing the localization of these sites, *Atlas of the Archaeological Sites in Iraq* (Salman 1976), are not sufficiently precise and comprehensive. Thus, the aim of the project was to verify information from the atlas and the catalogue, while on the lookout for new, previously undocumented sites. An important component of the UGZAR project plan was also an assessment of the condition of particular archaeological sites and identification of the damage-threatening factors relevant to each site.

The destruction of archaeological sites (just as architectural monuments and individual artifacts) is associated usually with military action, especially in view of the war in Syria. This creates ample opportunities in a given region for robbers and antique dealers, although ordinary activities like building and agriculture can result equally well in the destruction of archaeological sites. Safety and a stable situation in a region do not mean that sites and monuments are not endangered. Iraqi Kurdistan is a fast developing region with building investment at every turn. A short visit to Erbil suffices to see the rate at which change is taking place and it may be dangerous for Kurdistan's heritage. The aim of this article is to assess the damage to the archaeological sites that the UGZAR project has documented. The report together with a database will serve the local antiquity authorities to properly manage and protect archaeological sites in Iraqi Kurdistan.

A brief background on Iraqi Kurdistan's unstable past will help in understanding the present drive toward fast development of the region and the most important goals of the region's development strategy, most of which threaten to impact in a negative way the preservation of archaeological sites, even if sometimes contributing to their protection and promotion. The results of the damage assessment process will be discussed, followed by a case study of how the application of procedures prepared by Tsunokawa and Hoban (1997) with regard to an archaeological site threatened by road construction could be applied in other situations. These procedures could be considered as one of the elements of heritage management. Concluding on the challenges to heritage protection in Iraqi Kurdistan, the paper will outline some ideas which could also be implemented in Iraqi Kurdistan's heritage management.

AN UNSTABLE PAST

Kurdistan's partition between Turkey, Iran, Syria and Iraq cannot be easily explained without going into the historical intricacies of the political struggle for influence in the Near East after World War I and the collapse of the Ottoman Empire. It is a fact that the Kurds did not gain independence then and this situation of a nation without a country continues to bear consequences (see McDowall 2007).

Iraqi Kurdistan was once considered Iraq's bread-basket, but for years the political situation has inhibited the agricultural sector. After the Algiers Agreement in 1975 Iran withdrew its support for the KDP (Kurdistan Democratic Party) and

the Kurdish movement was defeated in effect. To prevent the Kurds from massing in the foothills, the Iraqi government created a forbidden zone from 5 km to 30 km wide along the borders with Turkey and Iran. Villages there were destroyed and people were deported to collective towns (Stansfield 2003: 44–45). Destruction of the rural infrastructure and deportations continued through the 1980s (Stansfield 2003: 45).

The Iraq–Iran war (1980–1988) devastated the economy of Iraq. The Anfal campaign by the Ba'ath party in 1988 added to the destruction of rural structures and the foundations of agriculture in Iraqi Kurdistan (Stansfield 2003: 40–41). Villages were ruined, people deported and from 50,000 to 200,000 lives were lost, the government even using chemical weapons against civilians (Stansfield 2003: 46; Logan 2009: 166).

The First Gulf War (1990–1991) resulted in new hardships for the region, which had to deal with United Nations and Government of Iraq sanctions (especially the United Nations Security Council Resolution UN SCR 661, §3–4).[3] Surprisingly, the loss of external support boosted Kurdish economy, which improved gradually, especially in the agricultural sector, at least until the 1995 UN Security Council Resolution 986,[4] which halted the rebuilding of the agricultural sector in Kurdistan (Stansfield 2003: 41). UN SCR 986 was later known as the Oil for Food Program, under which Iraq was allowed to export oil in exchange for humanitarian aid.

THE PRESENT AND THE FUTURE

The constitution of Iraq introduced on 15 October 2005, following the US invasion and the overthrow of Saddam Hussein's dictatorship, guaranteed the autonomy of Iraqi Kurdistan with the Kurdistan Regional Government in charge of the region (Jamsheer 2007: 141). This gave the Kurds the opportunity to concentrate on rebuilding and developing the region. The Regional Development Strategy for Kurdistan Region 2013–2017 (2012; RDSKR), prepared by the Ministry of Planning (MoP), assumes growth in sectors like agriculture, industry, infrastructure, tourism, education, and others, impacting the archaeological heritage of Iraqi Kurdistan in several important ways, which will be discussed below.

Almost half the area of Iraqi Kurdistan is cultivable land (1,535,794 ha = 41.84% of the region; Kurdistan Regional Government, Ministry of Planning 2012: 61). Wheat and barley dominate the crop structure. Maize, sunflower and rice are cultivated on a smaller scale. Agriculture includes also production of vegetables, such as tomatoes, eggplants, cucumbers, cabbages. Food security is a major goal of the Regional Development Strategy and it is essential "to increase areas of agricultural land and raise production and productivity levels" to achieve this; it is also important to "protect agricultural lands" (Kurdistan Regional Government, Ministry of Planning 2012: 76). Industry is the other important sector of Kurdistani

[3] https://www.treasury.gov/resource-center/sanctions/Documents/661.pdf [accessed: 9.02.2017].
[4] http://www.un.org/ga/search/view_doc.asp?symbol=S/RES/986(1995) [accessed: 31.03.2016].

economy to be developed. Invested capital has grown by 85.1% in 2006–2008. The number of factories and industrial projects has grown from 1529 in 2006 to 2224 in 2010 (Kurdistan Regional Government, Ministry of Planning 2012: 80–86).

Damage to the existing infrastructure in the recent unstable past now requires its modernization and development. Infrastructure is interlinked closely with other sectors (e.g., agriculture, trade, tourism, industry) and thus it is one of the most important elements in Iraqi Kurdistan's development. According to the RDSKR, the road network, and especially the rural roads, "do not meet present demands" (Kurdistan Regional Government, Ministry of Planning 2012: 99). Thus, the goal is to improve the road network by constructing three highways, "alternative routes for 10% of the arterial and main roads per year, especially the roads reaching maximum absorption capacity", "increasing the total length of paved rural roads to 45,000 km within five years, to ensure the rates of these roads are in conformity with international standards (1 km² of paved roads per 100 inhabitants/km²) to link populated areas and the agricultural production sites with cities and markets" (Kurdistan Regional Government, Ministry of Planning 2012: 103–104).

Another sector in development and modernization is the construction industry. The RDSKR notes shortages of basic building materials, such as cement, bricks, concrete blocks, ceramics, and also windows, plumbing supplies etc. (Kurdistan Regional Government, Ministry of Planning 2012: 111). There is a housing deficit. Moreover, rural houses, still built of perish-able building material, need renewal (Kurdistan Regional Government, Ministry of Planning 2012: 112). Houses in the past were built of natural materials, mainly stone and clay. In the mountains people used chipped stone, boulders from streams or field stones, whereas sun-dried bricks on foundations of field stones from a half a meter to a meter deep predominated in the lower-lying areas (Dzięgiel 1981: 104–105). Nowadays, houses are built mainly of concrete and plots under new buildings are often leveled with bulldozers.

Tourism, culture and heritage weigh in importantly in plans for development. Iraqi Kurdistan has a huge potential in this regard: archaeological sites, old mosques and churches, reliefs, and other heritage monuments. The challenges are equally huge, such as limited financial resources, poor infrastructure (hotels, roads) and a nascent tourism administration, as well as "poor database available on tourism, heritage and cultural activities" (Kurdistan Regional Government, Ministry of Planning 2012: 149). Thus, it is important to "exploit the religious, historical, natural, cultural and civilizational tourism features and potentials", as well as to develop the infrastructure (hotels, roads, tourist information) (Kurdistan Regional Government, Ministry of Planning 2012: 149–150).

The conflict of interest, at least to an extent, between tourism and the other mentioned sectors of the economy is apparent. Developments in the agriculture, industry, infrastructure and building sectors can and will impact the preservation of archaeological sites. Modern agriculture uses deep plowing, irrigation and chemical fertilizers, the industry, infrastructure and building sectors use bulldozers and other heavy machinery. Moreover, emphasis on low costs and on rapid implementation of ill-considered investments can cause

damage to or complete destruction of archaeological sites. All of these sectors, including agriculture, can easily change the landscape, also the archaeological one. However, the goals related to the tourism sector assume preservation and exploitation of the cultural potential of Iraqi Kurdistan. Thus, it can be said that Iraqi Kurdistan is facing a quandary in reconciling the country's rapid development with the preservation of its important cultural heritage.[5]

FACTORS ENDANGERING ARCHAEOLOGICAL SITES

During four seasons of work in 2012–2014 the UGZAR project documented 181 archaeological sites, as well as numerous caves and architectural features. This paper will concentrate on the archaeological sites, which constitute the dataset for the damage assessment that the project concluded with regard to the Iraqi Kurdistan's goals for heritage protection.

In most cases the borders of the sites could be traced (173 out of 181); in the remaining eight instances, the sites were covered by modern villages and in one case, ancient remains could be discerned only in the profile of a large pit for collecting water (there were no potsherds on the surface). Damage assessment was based on data recorded during the fieldwork: site description cards, GPS measurements, photos and site plans, as well as satellite imagery available from BingMaps and Google Earth. These data were used to vectorize damaged parts of the sites in QGIS 2.12.1 (Lyon). The damaged area was compared with the total site area. It should be noted that destruction frequently extends deep into the archaeological layers, causing serious damage. Thus, some activities can be more destructive despite affecting only a small part of the site surface.

The damage assessment concentrated on the impact of human activities, not natural factors, like erosion. The destructive activities identified by the UGZAR team during the archaeological reconnaissance include military trenches, fish ponds, greenhouses, football pitches, well-pits, chicken farms, animal pens, irrigation basins, canals, pits, ground roads and asphalt roads, gravel extraction, houses/buildings, other building activities, cemeteries, gardens, agriculture (meaning fields under cultivation). Some were more frequent, while others were recorded sporadically.

DAMAGE ASSESSMENT

The most destructive and frequent threats, that also relate to one another, will be described first, followed by those with less harmful impact and those that occur sporadically.

[5] Another issue is the antiquity law, a discussion of which is beyond the scope of this paper. The law in force in Iraqi Kurdistan today is Antiquity Law No. 59 of 1936 with amendments No. 120 of 1974 and No. 164 of 1975, approved in 1976. The Antiquities and Heritage Law No. 55 of 2002 is not applicable in Kurdistan because of its severity (Ali 2017). For example, it prohibits building and agricultural activities on archaeological sites, while the law from 1976 says nothing in this matter. Also, the penalty for destruction of archaeological sites or objects is much more severe (in some cases including the death sentence) in the law from 2002. For both laws, see http://www.unesco.org/culture/natlaws/.

Table 1. Sites with noted damage listing causes (as for 2016)

Site	Site type	Area (m2)	Causes of damage
S002	Flat settlement	9347.74	Gravel extraction; agriculture
S003	Tell with lower city	15562.17	Cemetery; agriculture
S006	Tell	12785.17	Cemetery; agriculture
S010	Flat settlement	25246.93	Bulldozers/digging for clay; agriculture
S012	Tell with lower city	3527.59	Pits; houses/buildings; cemetery
S013	Flat settlement	40132.56	Other building activities; cemetery; agriculture
S020	Tell	2614.41	Bulldozers/digging for clay
S026	Tell with lower city	34811.90	Cemetery; agriculture
S028	Flat settlement	12832.47	Cemetery; agriculture
S030	Flat settlement	59911.85	Irrigation basin; pits; agriculture
S035	Tell with lower city	15903.72	Bulldozers/digging for clay; pits; houses/buildings; cemetery; gardens; agriculture; ground road
S036	Flat settlement	2435.40	Agriculture; ground road
S037	Tell	8437.92	Bulldozers/digging for clay; houses/buildings
S052	Tell	9505.70	Bulldozers/digging for clay; houses/buildings; cemetery
S055	Tell	21223.65	Bulldozers/digging for clay; houses/buildings; agriculture; ground road
S056	Tell	2915.81	Bulldozers/digging for clay; houses/buildings
S061	Tell with lower city	12278.90	Houses/buildings; cemetery; gardens; asphalt road
S062	Tell	32663.92	Bulldozers/digging for clay; houses/buildings; gardens; asphalt road
S063	Tell	33528.68	Bulldozers/digging for clay; houses/buildings; cemetery; gardens; asphalt road; ground road
S065	Tell	3819.92	Bulldozers/digging for clay; houses/buildings; cemetery
S074	Tell with lower city	337443.43	Chicken farms; animal pen; houses/buildings; cemetery; garden; agriculture
S080	Tell with lower city	99138.30	Well-pit; bulldozers/digging for clay; pits; cemetery; agriculture
S082	Tell with lower city	163989.14	Bulldozers/digging for clay; pits; agriculture
S084	Tell	17649.80	Bulldozers/digging for clay; houses/buildings; gardens; agriculture
S085	Tell with lower city	37282.21	Bulldozers/digging for clay; pits; agriculture
S089	Tell with lower city	39166.70	Bulldozers/digging for clay; pits; agriculture
S098	Tell with lower city	44518.45	Bulldozers/digging for clay; pits; agriculture
S102	Tell	15858.23	Bulldozers/digging for clay; houses/buildings; gardens
S104	Tell	9637.48	Military trenches

Table 1. continued

Site	Site type	Area (m2)	Causes of damage
S110	Tell	9341.19	Bulldozers/digging for clay; pits; houses/buildings
S114	Tell with lower city	154852.41	Bulldozers/digging for clay; pits; houses/buildings; gardens; agriculture; asphalt road
S116	Flat settlement	138644.16	Football pitch; pits; houses/buildings; agriculture; asphalt road
S118	Tell with lower city	96221.83	Bulldozers/digging for clay; pits; agriculture
S133	Tell	17085.40	Houses/buildings; gardens
S143	Tell with lower city	144888.74	Other building activities; bulldozers/digging for clay; pits; houses/buildings; cemetery; garden; agriculture; ground road
S148	Tell	18815.82	Fish pond; houses/buildings
S149	Tell	17370.93	Houses/buildings; gardens
S151	Tell with lower city	38759.22	Green house; pits; houses/buildings; cemetery; gardens; ground road
S160	Flat settlement	625.20	Agriculture; ground road
S163	Flat settlement	6446.16	Fish pond; houses/buildings; gardens; agriculture; ground road

A. BULLDOZING AND DIGGING FOR CLAY

The most shocking damage to the archaeological sites within the surveyed zone was by bulldozing and digging for clay. These are analyzed jointly as the outcome of both is very similar.

Rapid building development and road construction in Iraqi Kurdistan requires extensive ground leveling works. Bulldozers and excavators usually employed for this task will affect both tells and flat sites. Digging for clay primarily affects the tells. Frequently, so much of the slope has been destroyed that one can see practically the entire section [***Fig. 1***]. This kind of damage is caused by the inhabitants of villages in the immediate vicinity of an archaeological site. Visiting S089 (for a listing of assessed sites, see ***Table 1***) in 2013, the team came across a man with his wife and grandchildren from one of the neighboring villages who was "excavating" in the already damaged slope of the tell and loading the clay onto his pickup truck.

Few of the sites were actually destroyed by bulldozers or digging for clay [***Fig. 2:A***], but in 20 out of 34 such cases up to 5% of the total site surface area had been damaged. Two sites were highly affected, the damaged area reaching 40–50%. Of these two, S010 is a flat site and lies on the Greater Zab river. In 2012, the site was covered by agricultural fields; now (imagery from BingMaps acquired in 2014) part of the site has been bulldozed most probably to make fish ponds. Construction of a new road through the village of Xarabe Se Girdik has leveled away most, if not all, of the cultural layers from the center of site S062. A similar situation occurred at site S114, which lies in Palasan. Site S055,

which used to be a tell averaging 4 m in height, was leveled to a height of just 0.30–0.50 m above the surrounding area. Tell S110 in the center of Darbestan village now looks like an apple core; its northwestern and northeastern slopes were completely destroyed, most probably by bulldozers and excavators used to make space for modern buildings. The same happened at S037, where nearly half the tell was removed to create space for houses, and at S020, where the tell was destroyed to make a ground road through the village and space for the expansion of the settlement. In both cases, the clay from these tells may have been used as building material. Sites S118, S098, S089, S085, S082 and S080 are tells with one of the slopes damaged in a characteristic way. The damage is the result not of building construction as they all lie in the middle of agricultural fields, but of a local quest for clay needed as a building material (mortar or plaster). Archaeological sites are a ready source of such material.

B. CONSTRUCTION OF ASPHALT AND GROUND ROADS

Bulldozing damage to archaeological sites is related to asphalt road construction, as in the case of S062 mentioned above (the asphalt road now covers 36.95% of the site). At another six sites [see ***Fig. 2:B.1***], the area destroyed by asphalt roads is less than 5%. The most serious destruction was noted at sites S063 and S114. At S063, the asphalt road runs along the western slope up to the buildings covering the top of the tell, then turns into a ground road which runs down along the eastern slope and curves to the south along the base of the mound.

Ground roads are more frequent and do not usually entail bulldozing. In the case of S035, S063 and S143, they run along the slopes of tells and cut at their bases, enough to expose cultural layers, which are then in danger of erosional impact due to wind and rain. Moreover, artifacts potentially found to be below such road surface may be damaged by cars and heavy agricultural machinery running

Fig. 1. S089 damaged by digging for clay (All photos J. Mardas)

over them. Ground roads were noted at 23 sites [see ***Fig. 2:B.2***]; at 18 sites they cover less than 5% of the total site area. At two sites, S036 and S160, the damaged area was proportionally higher. At S160, which is a small site lying on the bank of the Greater Zab river, the narrow ground road runs through its center. At S036, which is a slightly bigger site lying in a hilly area, the ground road also runs through the center of the site, but is much wider than in the other case. This road did not exist in 2012 when the site was documented (it may have been a gravel road but without on the spot verification it cannot be said with any certainty). The road is most probably related to an industrial complex in the vicinity.

C. BUILDING CONSTRUCTION DAMAGE

Building construction is perhaps the single most demanding activity in terms of ground leveling. Houses, outbuildings

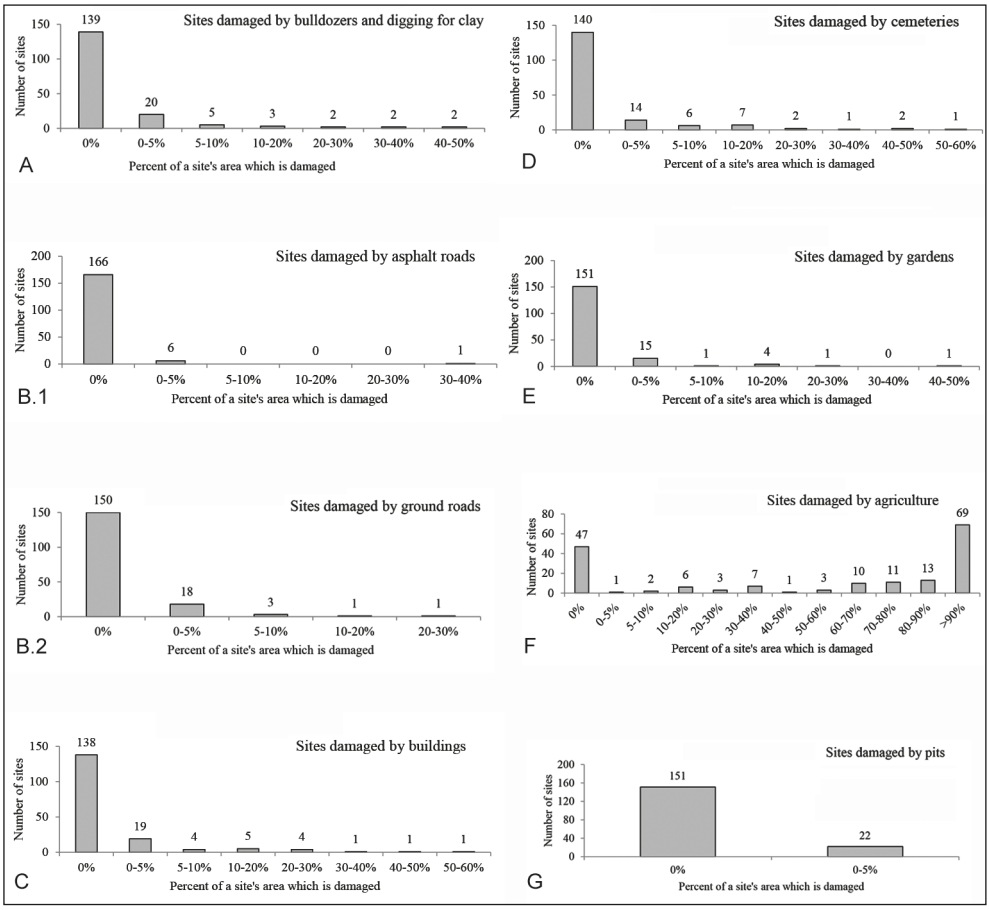

Fig. 2. Damage assessment for the different factors endangering the preservation of archaeological sites (Processing J. Mardas)

and public buildings, for example schools, can be highly destructive for archaeological sites, the building process requiring deep digging for foundations that can disturb deeper cultural layers. Houses in Iraqi Kurdistan today are built of concrete blocks instead of the mud brick and stone used in the past. Areas around the buildings may be taken up by gardens, garbage pits and cesspits, being thus susceptible to further damage. Garbage and cesspits can also contaminate the site and affect the state of preservation of the artifacts.

Buildings on 35 of the 173 sites [see ***Fig. 2:C***] have damaged the ancient substance and in five cases (sites S001, S023, S032, S058, S059) the village overruns the site, making it difficult to determine their area. At 19 sites, buildings covered less than 5% of the total site surface, but the presence of buildings on the fringes of some of these sites poses a strong threat of further expansion that can disturb the site. A cemetery at the top of a tell, as at S065 which is in the center of the village, can impede village expansion, thus limiting the damages to what the burial ground will do. Building expansion into archaeological areas is to be expected in the author's opinion at sites S012 and S143 (5–10% of the site area covered by buildings), S084 and S102 (10–20% site area under buildings) and also S056, S110 and S114 (20–30% under buildings). In the case of S110 and S037, parts of the tell have already been removed to make room for houses. Three of the sites with set borders are heavily damaged by building construction: S063 (30–40%), S149 (40–50%), S133 (50–60%). The tell of S063 is quite big with steep slopes and a flat top covered by the buildings of the town of Rovia. Buildings also line the foot of this tell. S149 lies on the bank of Greater Zab river and is also densely built over; it is difficult to determine with certainty how far the site extended into the village, but its northern and southern limits could be determined (the Greater Zab borders it on the east).

D. CEMETERIES

Cemeteries can protect a site from more extensive damage by building construction, but they are destructive in their own right. Graves penetrate the deeper layers of a site. Moreover, graves tend to be grouped together resulting in consequence in a series of pits. For the purpose of this paper no distinction was made between operating and abandoned cemeteries [***Fig. 3***].

Graves were recorded at 33 sites. At 14 sites, graves covered less than 5% of the total site area, at six 5–10%, at seven 10–20% (including S006, Gird Ali Agha, the site that was excavated by Braidwood's expedition, see Braidwood and Howe 1960). At another six sites, cemeteries extended over more than 20% but less than 60% of the total area [see ***Fig. 2:D***]. The biggest areas occupied by graves can be found at S052 (51.67%), S065 (43.62%) and S003 (42.69%), all of them being tells, the first two quite low and located in the center of a village.

E. GARDENS

Gardens may also have an adverse impact on the state of preservation of archaeological sites. Digging, planting, fertilizing, and irrigating in gardens can destroy archaeological layers and artifacts. Few gardens were recorded at the surveyed sites – 22 in all – and in most cases they did not require ground leveling. They

Fig. 3. Graves on one of the slopes of site S061

Fig. 4. Site S002 (in the center) destroyed by gravel extraction

were also small as a rule: at 15 sites they covered less than 5% of the total site area [see ***Fig. 2:E***]. At four sites the damaged area varied between 10% and 20% of the total site area. Only one greenhouse was recorded in the garden area of site S151. At S102 gardens occupied 23.60% of the total area, which was also densely occupied mainly by houses. The olive grove at S061 covered 43.42% of the total site area. Olive trees grew in the area of the lower city, while the slopes of the mound were largely covered with graves.

F. AGRICULTURE

Agriculture, meaning arable land, is the most common threat and the severity of this threat depends on plowing depth, kind of agricultural machinery, use of fertilizers and irrigation. Deep plowing in particular can disturb archaeological layers or even completely erase a small site from the cultural landscape (although it also makes a contribution by exposing sites: pulling out potsherds, stone tools and other pieces from the past). The plowzone, the thickness of which may vary 20–30 cm, disturbs the upper layers of a site (Diez-Martín 2010: 33).[6] Tillage destroys artifacts (for artifact size, see Dunnell and Simek 1995) that are buried in the ground, as well as their vertical and horizontal context.[7] Artifacts may also be affected adversely by fertilizers used in agriculture. Flat sites, tells with a lower city and low tells are especially susceptible to agricultural damage. Yet the process of destruction is slower than in the case of bulldozing. Of the total of 173 sites, 126 are threatened by agriculture. At 69 sites [see ***Fig. 2:F***], more than 90% of the total area is given over to agriculture; these are mostly flat sites, low tells or tells with gentle slopes and a lower city.

G. PITS

The pits surveyed by the UZGAR project are of varying origin, some of them robbery trenches possibly, others related to unspecified activities. They usually occur at sites which are tells with a lower city, a few were on tells without a lower city and on flat sites. There are 22 sites damaged by pits [see ***Fig. 2:G***] and in all cases less than 5% of the total site area was affected.

H. SPORADIC DAMAGE

Sporadic harmful human interventions of other kinds were also recorded on the surveyed archaeological sites. Most common were small irrigation canals, which occupied less than 5% of the total site area (nine sites). Irrigation canals feed agriculture and thus they occur only on flat sites, which are the most endangered by agricultural development. At five sites pens for animals were noted, covering again less than 5% of the total site area.

At four sites well-pits, used for field irrigation, were encountered. Wells and sometimes motor pumps were found at the bottom of these rather large pits of an elongated triangular, teardrop or rectangular shape. With lengths between 25 m and 35 m (sometimes reaching 45 m) and widths between 10 m and 15 m, these pits occupy a relatively small area (0.65–

[6] Subsoilers reach even deeper; subsoiling depth depends on the type of soil, the tractor used and the subsoiler (see Weill 2015). Subsoiling is used once in a few years to reduce soil compaction. Compacted layers occur usually at a depth of 30–55 cm and the subsoiler should reach up to 5 cm below the compacted layer (see Kees 2008).

[7] The archaeological material obtained from the plowzone is not useless, even though its vertical and horizontal location is disturbed. Artifacts from the plowzone are an indication of the presence of subsurface features (see Harvey 2012).

1.33%) of the sites at which they were recorded, but can cause serious damage because of their depth, which ranges from 3 m to 5 m. Interestingly, site S140 would not have been discovered otherwise as it can be seen only down in the well-pit and is completely invisible on the surface.

Fish ponds are a serious threat as they involve groundwork by bulldozer and the building of embankments of the soil removed from the pond area. Ponds were recorded at two sites (S163 and S148), and the damage at S010 also suggests preparations for making a fish pond. They are usually rectangular in shape. At S163 there is one fish pond, which damaged a large part of the site, and at S148 there are four big ponds which damaged a third of the total site area; their length varies between 54 m and 65 m, while the width is between 24 m and 30 m.

Singular instances were recorded of a chicken farm (S074), a football pitch (S116), a greenhouse (S151; see above), an irrigation basin (S030) and old military trenches (S104, at the top of the tell), a flight of concrete stairs leading to the top of the tell (S143) and a kind of embankment of unknown purpose (S013, the embankment stretches far beyond the site, during our visit in 2012 it had not been built yet). In most cases the damaged area was quite small (0.02%–1.16%), being slightly larger only at S104 and S013 (3.91% and 4.02% respectively).

The last threatening factor to be discussed is gravel extraction from the banks of the Greater Zab river and Wadi Bastora. The damage caused by this activity, which is usually related to river valleys, can be extensive and serious. It has taken away 80.97% of site S002, practically removing it

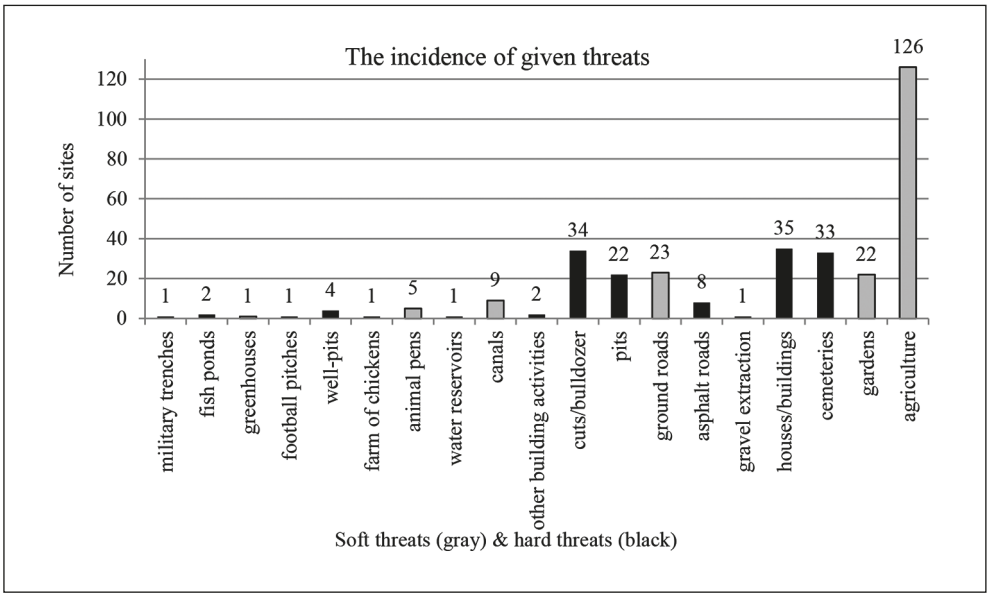

Fig. 5. Incidence of given threats (Processing J. Mardas)

completely [*Fig. 4*]. This type of work has taken place also in the immediate vicinity of S006, located on the Greater Zab river. Also S026 and S028, located in Wadi Bastora, are endangered by similar works taking place nearby.

"SOFT" AND "HARD" THREATS SUMMARY

The threats discussed above vary in the degree of destructiveness. Some cause less damage, others are much more serious in their outcome. Thus, they can be divided into two groups: "soft" threats and "hard" threats. The former affect only the upper layers of a site and are generally less invasive. This group includes pens for animals, greenhouses, irrigation canals, ground roads, gardens and agriculture. The latter damage deeper-lying layers and destroy a larger volume of the site. This group includes military trenches, fish ponds, football pitches, well-pits, chicken farms, water reservoirs, bulldozing, digging for clay, pits, asphalt roads, gravel extraction, cemeteries, buildings and other constructions. It should be kept in mind, however, that even "softer" damage, agricultural activities in particular, can be highly destructive on smaller, flat or slightly mounded sites with thin archaeological layers. Such sites are easily destroyed by plowing. The extent of the damage can be ascertained by excavation, but that is destructive, too.

In the case of sites documented by the UGZAR project, the incidence of soft and hard threats was different and so was the level of damage caused. "Soft" threats were encountered at 141 sites, while the "hard" ones at 80 sites [*Fig. 5*]. Among the "soft" threats the most common (126 sites) was agriculture. Other threats were less frequent: gardens damaged 22 sites, ground roads 23 sites, irrigation canals nine and animal pens five sites. Four frequent "hard" threats were identified: building construction at 35 sites, bulldozing and digging for clay at 34, cemeteries at 33 and pits at 22. Other threats of the "hard" kind occurred much less frequently: asphalt roads at eight sites, fish ponds and other building activities each at two sites, and some water reservoirs, military trenches, a football pitch, a chicken farm and gravel extraction only at single sites. "Soft" threats damaged almost 70% of the total area of all sites (68% of this by agriculture), while the "hard" ones damaged nearly 6%. The surface area damaged by the "hard" threats is much smaller, but these threats are more dangerous as they disturb the archaeological context severely, and may even erase a site from the landscape (for example S002).

It is interesting to note the more extensive set of "hard" threats. Human activities are indeed becoming more and more destructive for archaeological sites (as well as for the natural environment). A few years ago houses were still being built of mud brick or stones, agriculture was less intensive, bulldozers were not in use, the few cars managed well without asphalt roads. Nowadays Iraqi Kurdistan is focused on modernization and intense development, but what about its heritage? What can be done to prevent an archaeological site from being damaged by fast development?

EXEMPLARY PROCEDURES IN THE CASE OF ENDANGERED ARCHAEOLOGICAL SITES

Procedures should be created to minimize or prevent destruction to archaeological sites due to construction projects and regional development. Tsunokawa and Hoban (1997) elaborated a model for proceeding with a situation in which a site was endangered by road construction. It is a very reasonable model that could be an inspiration in other cases. Road construction and related activities can cause damage to archaeological sites or historical monuments, but they can also give better access and hence impact positively the tourist industry (Tsunokawa and Hoban 1997: 140–141). The procedure in the case of planning a new road is to double-check first for historical or archaeological sites along the planned route or within its close vicinity. Attention should be paid to four elements: 1) secondary sources of information (such as inventories of sites etc., bibliographic sources, maps presenting the cultural heritage, toponyms on old maps and drawings helping to identify no longer extant settlements, aerial photography and/or high-resolution satellite imagery, both contemporary and old), 2) survey necessary to determine site borders, chronology and state of pre-servation, 3) establishment of cultural significance and priorities (which sites should be preserved intact, which require exploration), 4) assessment of the scale and costs of the impact (extent of the damage, assessment of direct and indirect impact, costs of preservation of an archaeological site, benefits for tourism, if preserved, and losses, if damaged (Tsunokawa and Hoban 1997: 141–143).

To prevent destruction of an archaeological site, the construction of a road should "avoid any alignment that cuts through known cultural sites" (Tsunokawa and Hoban 1997: 144). Should a previously unknown archaeological site be discovered in the course of the construction project, then the route of the road should be changed or "in unusual cases it is preferable to leave a cultural site buried beneath the road" (raising the road level, for instance) (Tsunokawa and Hoban 1997: 144). If neither is possible, then salvage excavations are required (Tsunokawa and Hoban 1997: 144).

The procedure proposed by Tsunokawa and Hoban could be implemented by the antiquity authorities of Iraqi Kurdistan, even if the task is challenging for Kurdish archaeologists. The site of Bassetki, a large tell in the province of Dohuk (lying within the concession of the Eastern Habur Archaeological Survey), was thus saved by Peter Pfälzner and Hasan Ahmad Qasim (Directorate of Antiquities in Dohuk), whose excavation, prior to road construction which threatened to go through the center of the site, led to the relocation of the route (Pfälzner 2017). No database of archaeological sites exists that would include their chronology and precise location and remote sensing data is not in use by local archaeologists. The results of the ongoing survey projects will surely help to resolve these problems, at least in part, but there are still many challenges facing Kurdish archaeologists.

THE FUTURE OF THE PAST: CONCLUSIONS

The problem of cultural heritage protection in Kurdistan is a complicated issue. First, we should keep in mind that stability is a new situation in Iraqi Kurdistan. For years poverty and war have determined the state of the region. It is not surprising that the Kurds are raring to seize the opportunity for a better life and they are setting priorities. However, fast development of Iraqi Kurdistan can speed up further destruction of its archaeological heritage. Sites in the region are endangered by various kinds of human activities, like road construction, house building, gravel extraction, agriculture, etc. Most of them are more or less related to one another, and some of the sites are damaged by more than just one destructive factor. The second problem is the lack of an archaeological sites database. Due to the political situation the region has never been intensively investigated by archaeologists. There are two publications: *Archaeological Sites in Iraq* and *Atlas of Archaeological Sites in Iraq*, but they are from the 1970s, the maps are inaccurate and information about sites is scarce; moreover, they do not cover all the sites. The archaeological survey is a good start for creating a GIS database for the purposes of heritage management.

Other elements could be included by Kurdish archaeologists. Data from the survey could be combined with remote sensing methods,[8] aiding in the interpretation of site damage and monitoring. These two methods are complementary. For example, not all damage will be visible on satellite imagery (depending on resolution and on the season during which they were acquired), but it can be documented during the survey or later field visits. Satellite imagery, however, can provide interesting information about sites. The older imagery can also be used to trace changes at the sites. Commercial imagery is usually of better quality, although quite expensive, but there are also satellite imageries that can be viewed for free, like BingMaps and Google Earth. Drones can be used as a low-cost source of information and up-to-date data can be obtained. Moreover, photographs taken by drones can be used to create DTMs (digital terrain models) of archaeological sites.

A detailed digital database and trained staff are crucial for site protection. The ongoing archaeological surveys and excavations now in Kurdistan will hopefully provide such a database of archaeological sites. The database should be used during the first stages of planning of any road or building construction. It would also be a good idea to implement a solution known from Syria, that is, site guards. Moreover, the involvement of local communities could raise awareness of archaeological heritage among people. The current law, in the view of the author, is ineffective and

[8] There are various remote sensing methods which can be used in heritage management, e.g., satellite imagery may serve to investigate patterns of looting (Stone 2008), to document features like hollow ways, which are visible on old satellite imageries but invisible from the ground (Wilkinson et al. 2010), to monitor archaeological sites (Parcak 2007), to document damage of sites which are impossible to visit at the moment (Casana and Panahipour 2014), ditches and embankments covered by forests can be detected by LiDAR (Kostyrko and Ruciński 2015), the limits of an archaeological site and its subsurface features can be traced with geophysical methods (Pfälzner 2017; Mühl and Fassbinder 2016). More methods, including LiDAR, geophysical techniques, aerial photos and satellite imagery, are discussed in Cowley 2011.

should be improved to face the challenges imposed by the fast development of Iraqi Kurdistan. These elements could improve the state of preservation of the cultural heritage of the region.

The Regional Development Strategy for Kurdistan Region 2013–2017 recognizes culture and heritage as important elements of the development. Kurdistan has a huge potential for tourism, but it needs a good infrastructure (roads, transport and hotels) and a program of cultural heritage protection and promotion (digital database, museums).

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