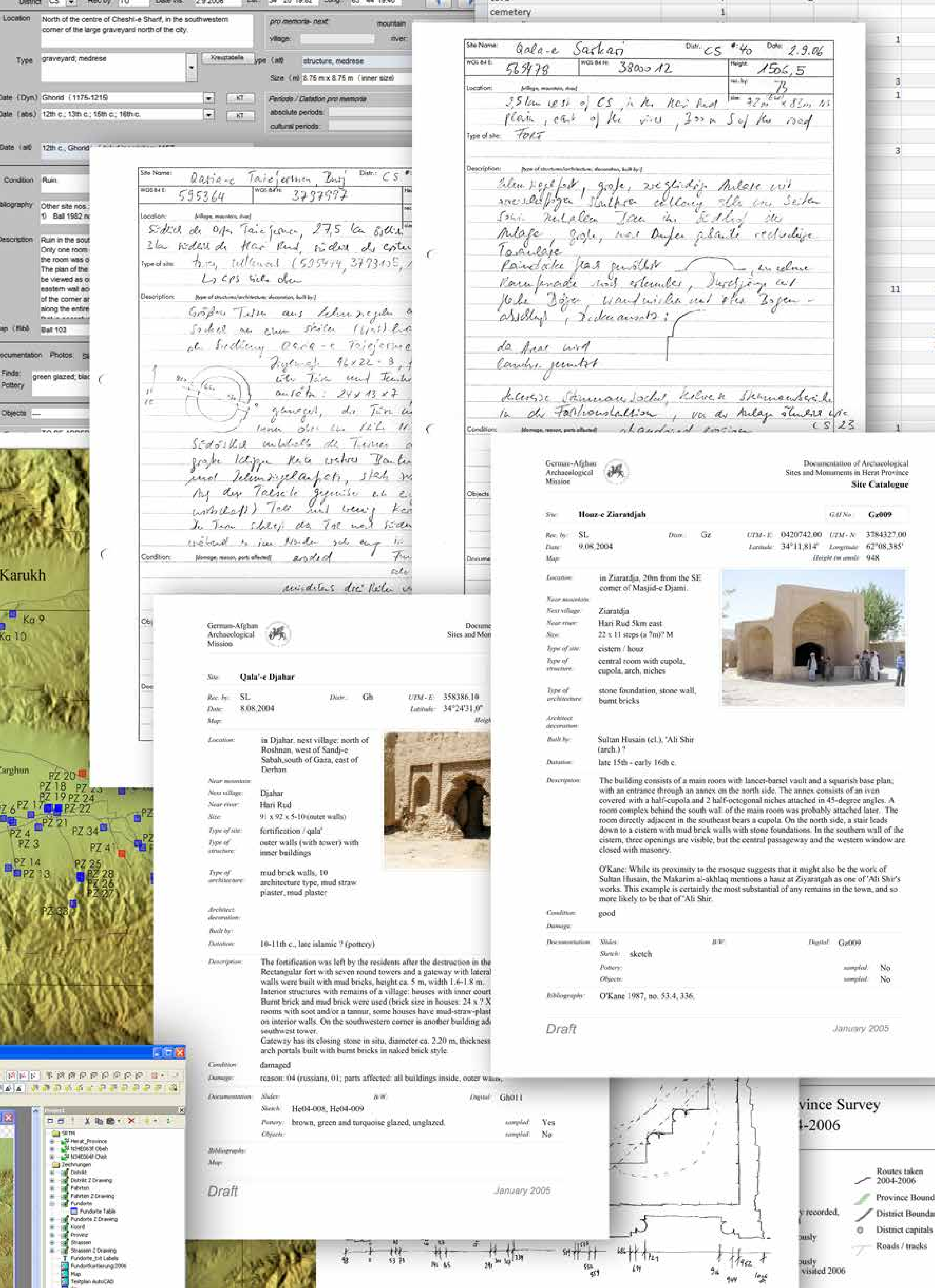

Methodology

Ute Franke, Thomas Urban

The approach to an archaeological survey depends on a number of factors, such as the availability of aerial photographs, the choice of areas to be surveyed, the accessibility of the terrain, the extent of agricultural use, the presence of natural vegetation, the timeframe, political and administrative conditions, and further more. Exceptional issues in complex areas such as Afghanistan add further aspects, as for example inaccessible regions and potentially precarious security situations.

Given the size of the province of Herat, approximately 55,000 km², its topography and logistic conditions, a systematic survey sampling was no option, regardless of the available time and the size of the team.[1] The project was therefore planned as an archaeological reconnaissance expedition, coupled with a capacity building programme for the Afghan colleagues. Altogether, we drove almost 8,000 km in three seasons, covered parts of the 12 accessible districts (out of a total of 15, not including Herat city) and catalogued 348 sites, of which 267 were new discoveries, dating from the Bronze Age to the early 20th century.

Twenty years later it seems appropriate to recall the context of the project, which undoubtedly had a major impact on the range of options and methodology. In order to make the results and their basis transparent and comparable to studies in other areas, an overview of the methodological approach to the fieldwork and documentation is presented.

These topics are discussed in this chapter, along with an overview of the adopted classification, dating and chronology, and other aspects of our approach to the fieldwork and analysis.

1 During all three seasons, the survey was carried out in parallel with the excavations at the Herat citadel. This meant that some equipment had to be shared, and Ute Franke, Thomas Urban and the Afghan colleagues had to divide their time between the two projects, only Stephanie Langer worked continuously on the survey.

Site Location, Documentation and Display

Archaeological surveys are nowadays inconceivable without the use of aerial and satellite imagery; the easy availability of high-resolution images has transformed the state of research. Their great advantage is the ease with which potential sites can be located. However, the information value of identified sites is limited without ground truthing.[2] At first sight on the ground, and even more so from the air, the remains of recently abandoned dwellings or settlements are indistinguishable from historical ruins, due to a persistence of construction methods, using *pakhsah*, mud bricks and undressed stones. Interpretation and especially dating therefore require ground truthing and an analysis of the material culture associated with the remains. Then, aerial photography and satellite imagery are standard archaeological survey tools for the selection of areas and the location of sites to be visited.

In 2004, at the start of the survey, access to high-resolution imagery was still restricted, and even with much official paperwork and authorisations from the Afghan Ministry of Information and Culture, admission to aerial photographs held by the Institute of Cartography in Kabul was not granted.[3] As a result, good quality aerial photographs[4] were not at hand during the preparation of the fieldwork, which was based instead on various types of available cartographic material. These maps and digital elevation models (DEMs)[5] were used for field preparation and orientation, and as the basis for the subsequent presentation of the results.

Cartographic material

Maps provided as hard copy and in PDF format by Afghanistan Information Management Services (AIMS), a UNDP Directly Executed Project (DEX) funded by the European Community (EC), which collects and produces thematic maps of Afghanistan at a large scale, were essential. We used nine general thematic maps covering the entire province at a scale of 1:300,000 (Fig. 15). These maps

2 Thomas (2012; 2018); satellite survey of areas in central Afghanistan provided potential sites (Thomas 2012, 360); the dating of the Ghurid sites in his catalogue (A7–A50) is, however, based on published data.

3 The archives were said to have been damaged by floods. The images were taken in the 1950s by Russian airplanes.

4 Google Earth Online was launched only in June 2005, too late for the preparation of the survey; even the resolution of the imagery available in 2006 was fundamentally different from today's quality. Only since 2009 has Google Earth covered the survey area with images from the French satellite system SPOT image [French Space Agency, Centre National d'Etudes Spatiales (CNES), the IGN, and Space Manufacturers (Matra, Alcatel, SSC, etc.), with a resolution of up to 2.5 m. A few parts, such as the urban area of Herat, were recently made available with a resolution of up to 0.3 m (Satellite WorldView-3 by Digital Globe)! The aerial photographs reproduced in the site catalogues were only accessible after the completion of the fieldwork. They have therefore not been used for site identification, but are very informative in showing the sites in their surroundings.

5 See below, pp. 35–36.

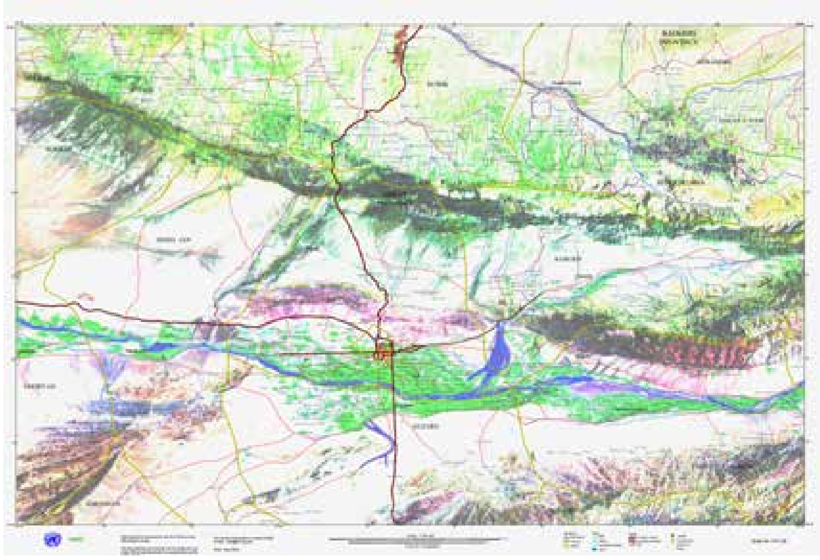

Fig. 15 Administrative map of Herat Province, 1:300,000 by AIMS, Kabul, 2002

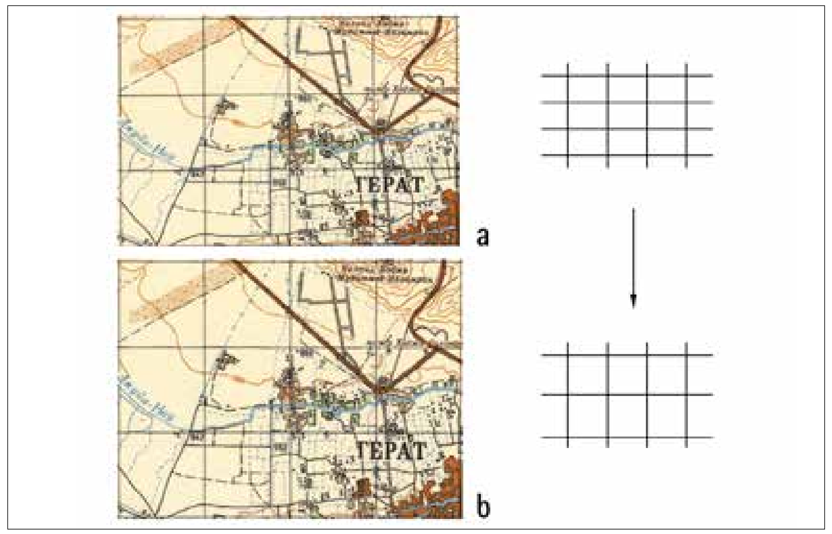

Fig. 16 Topographic map, scale 1:50,000 (detail); a: original, b: rectified and georeferenced (both map fractions have an identical east-west extension)

Fig. 17 GPS tracks of 2004 displayed on a topographical map, scale 1:50,000

contain a low-resolution satellite image, vector and textual data (boundaries, roads and villages, with their names) on separate layers that could be used to map different contents. However, the transcription of place names proved to be problematic in the Russian- and the English-language maps. The names of settlements are not very reliable as in particular smaller villages have more than one name and are often spelled differently. Practical fieldwork showed that even minor deviations in spelling and pronunciation led to misunderstandings and confusion in the communication between our Afghan colleagues and local guides, which made site localisation difficult.

In 2004, the Russian topographic maps, produced between about 1980 and 1991, were available in different scales (1:200,000, 1:100,000 and 1:50,000); we mainly used the large-scale versions (Figs. 16; 17). They were generally quite accurate for roads and the location of small settlements, and very detailed for topographical features. Due to the changing dimensions and contours of towns and settlements, not all locations could be determined; however, in the less densely populated areas outside the river oasis, an identification based on topographical features was usually possible.

These maps were used not only for orientation on the ground but also as the basis for computer-aided mapping, for this purpose they had to be rectified (Fig. 16)[6] and georeferenced. As the Russian projection system[7] for the topographic maps was not included in any of the conversion software available to the project, the referencing had to be done by GPS readings (Fig. 17).[8] Unambiguously identifiable topographical features were used as reference points, usually track and road crossings, but also bridges or prominent stretches of roads. Usually four to five measurements were sufficient

6 The maps have different and irregular scales for the easting and northing values, with a relation of 0.88:1 on average.

7 Gauss conformal transverse cylindrical projection, Krassovsky ellipsoid, Kronstadt datum.

8 Satellite reception throughout the survey area was displayed constantly by the instruments as ranging between 4 m to 6 m. Considering the scale of 1:50,000 (i.e. a 1 mm wide line on paper equals 50 m on the ground), this accuracy was sufficient for most applications required during the survey.

to reference a map segment. This method also compensated for distortions caused by the scanning process. A total of 44 map sheets were georeferenced using the method described above, linked to an AutoCAD file and to the relational site database to enable the display of distribution maps (Figs. 26; 27).

Apart from the cartographic material described above, the Archaeological Gazetteer of Afghanistan by Ball/Gardin (1982), with approximate coordinates, descriptions, dates, and extensive bibliographical information on the sites listed, was an indispensable tool in preparing for the fieldwork.[9] This information was entered into our field database[10] and supplemented with further data and references.

Framework and Implementation

The location and documentation of archaeological sites and historical monuments had to be a compromise in terms of time and accessibility. In addition, the practical implementation had to be adapted to local conditions. Paved roads were few and mostly in a very poor condition, even those to Turkmenistan and Kabul, via Kandahar; the main route to Kabul via Jam was in a very bad state (Fig. 18) and often blocked. The only exception was the modern highway between Herat and Islam Qal'e. The tracks that follow the old main route south of the Hari Rud, from Herat to Zendejan and Ghuriyan and branch off to the west, north and south, are endless dusty dirt roads passing through sparsely populated mountain valleys and deserts.[11] They had to cross the Hari Rud (Fig. 19) and small rivulets, but the two main bridges over the river are far apart, and the crossings of smaller canals and wadis were often destroyed by rain or heavy traffic.

Another problem was the presence of mines that were planted by the *mujaheddin* in areas of local disputes and feuds, at outposts and along the borders of Herat. Demining had just begun in 2003 and we were advised to first check that the ground was safe before crossing it to visit sites (see Fig. 2). Factional fighting between commanders, particularly from Injil, the district around Herat where the airport, key utilities and the Malan Bridge are located, and attacks from Adraskan, Farsi and Shindand against the governor in Herat were another, not uncommon challenge over the years: shortly after our arrival in Herat in September 2004, these commanders' troops seized the airport and roads, and bombed Herat, leading to the evacuation of most foreigners, except our team. After 2006, ongoing disputes between Pashtun- and Tajik-dominated districts made it difficult

9 Ball/Gardin 1982 was the version available at that time. Coordinates were given mostly only in degrees and minutes, without seconds; therefore, the geographical range was usually too large for ground location. This was changed in the revised edition (Ball 2019), which provides full coordinate information thanks to the Chicago CAMEL's satellite reconnaissance. Our publication benefited from updated bibliographies and additional new data.

10 Later at least four teams, the RWTH Aachen, the DAFA, the Oriental Institute in Chicago (see Ball 2019) and the Silk Road Project, which had received our survey data in 2008 (see Padwa 2017) digitised Ball/Gardin's data for various applications, including GIS, independently and without public access until now.

11 On one of our first trips, we had four punctured tyres on the way to Ghuriyan and had to hitch-hike back to Herat.

Fig. 18 The road from Herat to Kabul via Jam, 2003

Fig. 19 Hari Rud bridge in Chesht-e Sharif district, 2003

Fig. 20 Clandestine excavations in Chesht-e Sharif district, 2003

for NGOs to work in remote areas and we were no longer able to stay in their camps.[12] While security in some districts[13] had always been problematic, it deteriorated further and from 2007 onwards travel outside the city was no longer permitted.

Finally, it should be remembered that the technical facilities were far from today's standards. Mobile phones just appeared on the Afghan market in 2005; the network was poor in Herat city and unavailable in the field, communication depended on an expensive satellite phone. Similarly, the quality of digital cameras, laptops and GPS devices was still low and electricity to charge them was not always readily available. While this may seem trivial, it is a hassle under time pressure and the effect is plainly evident, for example, in the quality of images.

Given these conditions and the location of Herat city in the centre of the province, fieldwork was organised in day trips, planned by regions. The team consisted of at least one, rarely two German and one or two Afghan members plus the driver; occasionally two teams were on the road. In order to optimise costs, manpower and logistics, the teams rotated on a daily basis, being either on the road or in the base in Herat to complete the documentation and prepare the next trip, depending on the daily security reports. But with topography dictating routes and distances, planning was one thing and implementation another: the time required to find, reach and document sites was unpredictable, depending on their location, complexity and size. However, the cars had to be back by sundown, overnight stops were usually not possible[14] and many routes had to be taken more than once!

Topographical features such as mounds or general elevations, especially in the vicinity of the Hari Rud, perennial streams and canals, as well as *qanat* systems, observed during field trips or identified on the cartographic material, were preferred locations to look for sites. Other areas of focus included the vicinity of current settlements and frequently used routes as well as hilltops overlooking the valley. Sites in the heavily sedimented and cultivated river oasis and in the piedmont gravel zones, where remains are flat and hardly visible from a distance, were difficult to identify. When no sites were spotted from the car, the team stopped at particular points and walked the area. We benefited greatly from information on the location of sites by the head administration *(tehsildar)*, which we had to visit in order to obtain permission to work in the district. Similarly, hints of the local population were invaluable, and often they guided us on long walks, including hill-climbing, to distant sites that were not visible from a moving vehicle or from the air.[15] Unfailing indications of an archaeological site were illegal excavation trenches, sometimes still being exploited (Fig. 20).[16]

Conditions similar to those described above were, of course, faced by other and much earlier missions from the early 19th-century onwards.[17] D.C. Thomas points out *'that even before the Soviet invasion in 1979, the difficult terrain was a major problem for archaeological surveys in Afghanistan. As a result, the pre-1979 surveys conducted by the DAFA and others focused primarily on sites along major modern thoroughfares, and more recent fieldwork was either constrained by or cancelled due to the volatile security situation and bureaucratic machinations. Consequently, the quality and precision of the data that can be derived from these surveys is limited by their ad hoc nature. Hence, Ball/Gardin (1982, 21) state that in only two areas, Sistan and Bactria, is the archaeological topography detailed enough to serve as a*

12 Such incidents, including attacks on UN, ISAF, Red Cross camps and the citadel, occurred repeatedly until 2012. While these conflicts, and the economic situation, led to an increasing criminality in the city, victims were initially wealthy or influential Afghans and their families; it was not until 2010 that foreigners were more frequently targeted.

13 We were not permitted to visit Shindand, Farsi, Kushk Kona, as well as southern and eastern Adraskan.

14 They could only be organised in Chesht-e Sharif and with an NGO in Gulran.

15 Therefore, the number of documented sites may be higher in populated than in remote areas.

16 See Thomas 2012; 2018, p. 105 (e.g. Fig. SA10) for an analysis of a similar situation in the neighbouring Ghur Province.

17 Reports of the Afghan Border Commission and other travelogues; Ball/Gardin 1982; Thomas (2012; 2018) and Trousdale/Allen (2022, 33–37) for Sistan.

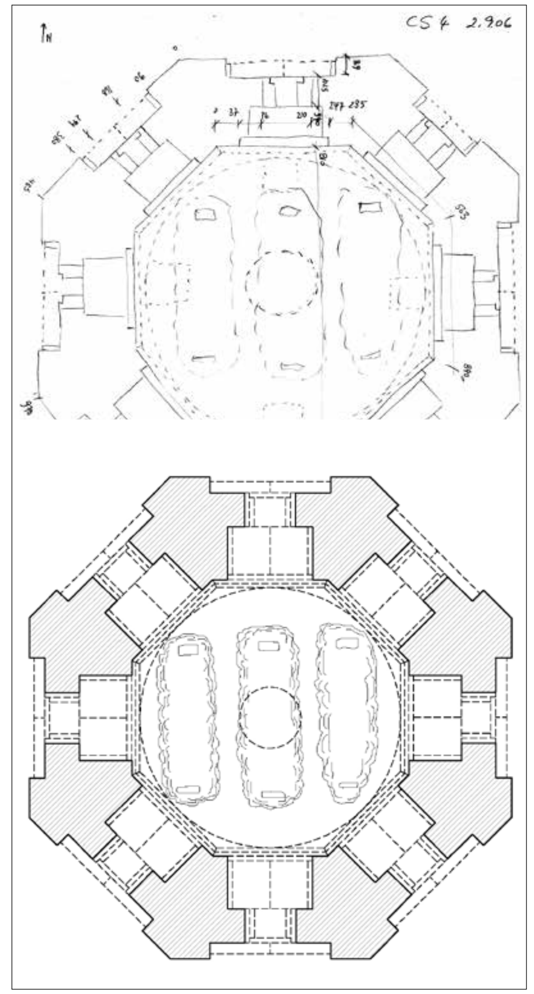

Fig. 21 Field sketch and vectorised drawing of an architectural measurement

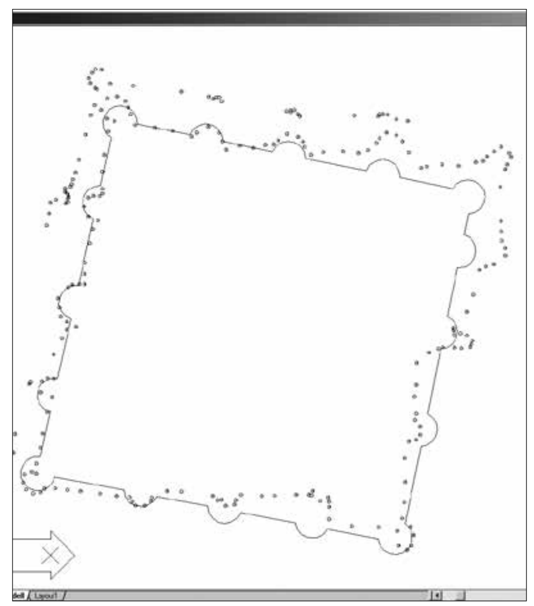

Fig. 22 Field sketch of a fortification wall using handheld GPS; point-measured and averaged ground plan

basis for valid regional and/or historical conclusions, and even there only partially'. Ball (1982, 15; 21; 2019, 3) also cautions that the uneven nature of exploration and the often imprecise or indeterminate datings, particularly of un-investigated sites, derived only from maps or satellite imagery, render spatial analyses of the site distribution meaningless.

However, unless carried out under very different conditions, regional surveys can never be as detailed as spatially restricted projects. Unfortunately, as conditions in Afghanistan have not improved, for many areas enormous knowledge gaps persist. Indeed, this seems to us a very compelling reason to publish as much material as possible, even in the absence of a complete documentation or reliable dating, a position also postulated by Ball (2019, 3) and Trousdale/Allen (2022, 29–41).

Although described as a 'highway-survey' combined with a systematic approach[18], the methodology described above, i.e. basing the survey on information obtained from maps, imagery[19], publications, visual and local information, augmented by spot checks on the ground, was not just the only feasible method at the time, but was as a first step actually preferable to systematic surveys of small areas. Of particular importance is the publication of the archaeological material associated with sites, which invites other researchers to check and possibly revise dates and cultural attributions.

Documentation

The survey teams were equipped with handheld GPS receivers and their daily routes by car or on foot were recorded as tracks and waypoints. This made it easy to document the location of sites and monuments and, in case of necessity, to roughly measure the size and shape of find spots. The numbering of sites and monuments was done for each district in the order of recording. This procedure was chosen for practical reasons, despite the disadvantage that the numbers do not necessarily reflect spatial proximity. The site numbers are the primary identifiers for all associated data, such as images, drawings and finds. They are composed of the abbreviation for the district and a sequential number.[20] Sites were recorded on form sheets in Dari and English, with standard entries, such as coordinates, location, type, size, state of preservation, construction material[21] and others (Title image). When available, archaeological material was collected and recorded in the camp. Colour slide and Black-and-White films were used for photographic documentation, supplemented by digital images.

18 For example Trousdale/Allen (2022, 33).

19 As mentioned above, due to the lack of available and affordable imagery, satellite image analysis was only possible after completion of the field work, in the process of preparing the publication.

20 Adraskan (Ad), Chesht-e Sharif (CS), Ghuriyan (Gh), Gulran (Gu), Guzara (Gz), Injil (In), Karukh (Ka), Kushk (Kh), Kohsan (Ko), Obeh (Ob), Pashtun Zarghun (PZ), Zendejan (Zn).

21 Including the size and proportions of bricks, especially mud bricks, although this criterion is mainly relevant in a local context, while comparisons between buildings far apart in location or date are highly speculative. This was also noted by Thomas (2012, 166) in his study of fortifications in Ghur. He observed that brick sizes were larger in the early Islamic period, but also quotes Baker/Allchin (1991, 92), stating that the exact size of large bricks has no chronological significance, as variations in brick dimensions were noted even within individual walls at several sites.

Measurements were taken using tape and GPS devices, depending on the nature of the building or site. Published plans and sections of monuments were checked, partly remeasured, scanned and vectorised, also as components of the training programme (Fig. 21). More sophisticated approaches, such as the use of a total station, would have provided greater accuracy, but at the cost of considerably more time, even for selected monuments. The schematic plans are a sufficiently detailed compromise between true-to-deformation plans and to-scale sketches.[22]

Large settlements, multi-structural complexes and large fortified areas, often in an advanced state of decay and sometimes difficult to access, required a different approach. They were surveyed using handheld GPS devices, although they were not well suited to such a task, as their accuracy at that time rarely exceeded a range of 3–5 m.[23] Under favourable conditions, such as a wide open sky and many available satellites, the boundaries of a site could be recorded with a larger number of points in the shortest possible time. The timing proved necessary because satellites move on different orbits and, therefore, their constellation changes during a long-term measurement. A subsequent measurement would result in an approximately similar internal geometry, but would be slightly shifted overall, making it impossible to add to a previously recorded network of points. GPS measurements along or on walls only give acceptable accuracy if the entire horizon is visible and nowhere blocked by the structure. This is the case, for example, when walls or foundations are solid enough to walk on, as is often the case with fortifications. However, the closer the measurements are taken to higher walls, the greater the error: the corner of a 2 m high building, for example, can be more than 5 m out of flight (Fig. 22). It is therefore important to remember that these measurements are a rough outline of the plan and only give a general idea of orientation, size and proportion.

The geoinformation was entered into the database, supplemented by links to a software, managing the topographical maps in order to plot selected criteria, such as sites and monuments by type and/or date.

Display of the Distribution of Sites

Map Overlays

The display of the sites within their environment and in relation to neighbouring sites is an important aspect for understanding and evaluating the data. The basic map data used for this purpose were changed several times until satisfactory results were obtained at different scales. Depending on the number of sites in an area, the scale of the map had to be adjusted,

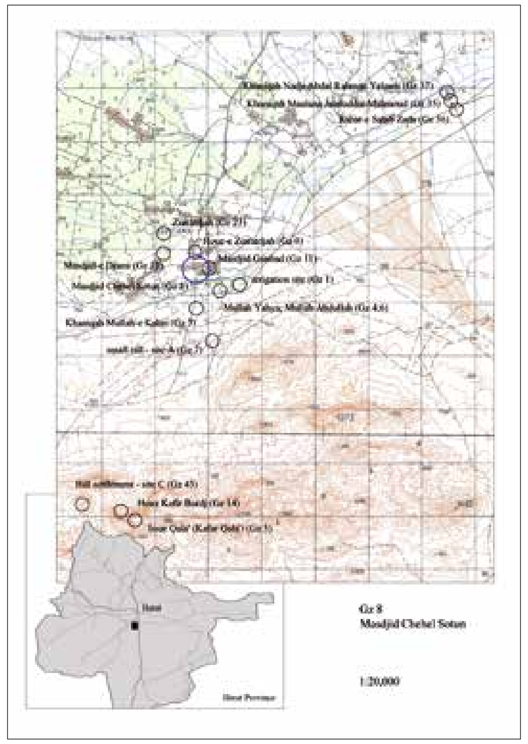

Fig. 23 Localisation sheet showing neighbouring sites, displayed on a Russian topographic 1:50,000 map, enlarged to scale 1:20,000

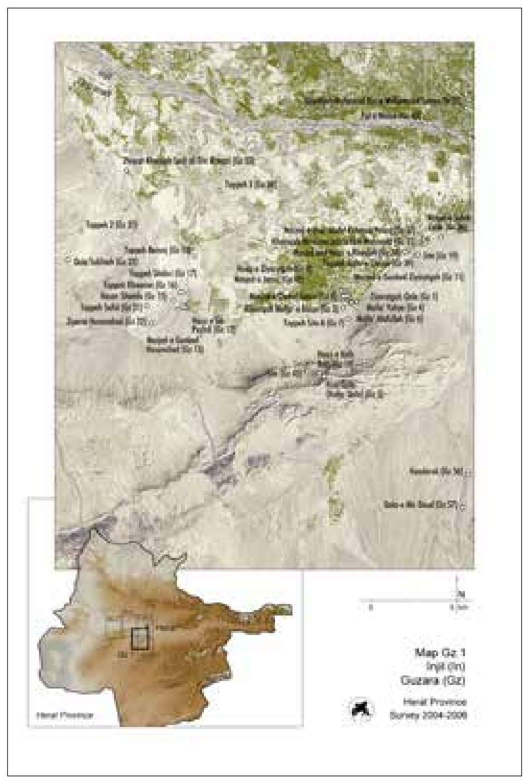

Fig. 24 Localisation of neighbouring historical sites, displayed on a satellite image scale 1:166,000

22 At that time, photogrammetric recording was still a very expensive and time-consuming process, requiring calibrated cameras (measuring chambers), on-screen stereo projection of the image pairs and sophisticated computer software, and a disproportionately long time for post-processing. 3D modelling using multiple sequences of digital photographs (structure from motion) was still in development.

23 The accuracy of the GPS receivers varied from 15 m (without Selective Availability) to 3 m (with Wide Area Augmentation System [WAAS]), i.e. the exact position lies within a circle of 6 m in diameter.

with the aim of showing as many sites and their surroundings as possible on as few maps as possible. This requirement resulted in a set of 24 plots at a scale of 1:166,000 (Fig. 24). The Russian topographic maps proved to be sub-optimal as a background for these plots, as they became illegible at a reduced scale (see Fig. 23).[24] In contrast, a satellite image with an almost 'natural' colour scale shows the location of the sites in a much more comprehensive way (Fig. 24). For this reason, a Landsat-7 satellite image was purchased, covering 340 x 210 km strips with a resolution of 14.25 m/px, which is more than sufficient for the required scale. However, as an aerial photograph, it is a central perspective image, and when it comes to georeferencing, strictly speaking only the points used for referencing are in the correct geographical position. Since hilly landscapes and a sloping topography are distorted in the image due to the deviation of the satellite camera from the vertical, the image must be divided into separate tiles that are individually georeferenced.

In order to produce thematic distribution maps showing, for example, the distribution of sites by type or date, the satellite image would have had to be considerably reduced, resulting in a significant loss of legibility. A colour image as background of a distribution map is generally more difficult to read because the mapped symbols merge with the diversified background. A black-and-white version of the satellite image (greyscale with reduced brightness and contrast) was initially used, but proved to be insufficiently meaningful (Fig. 25). A more suitable alternative to produce distribution maps are digital elevation models (DEMs), which show the location of the sites in their topographic position, without disturbance by agricultural features, for example. If desired, modern roads and current political boundaries

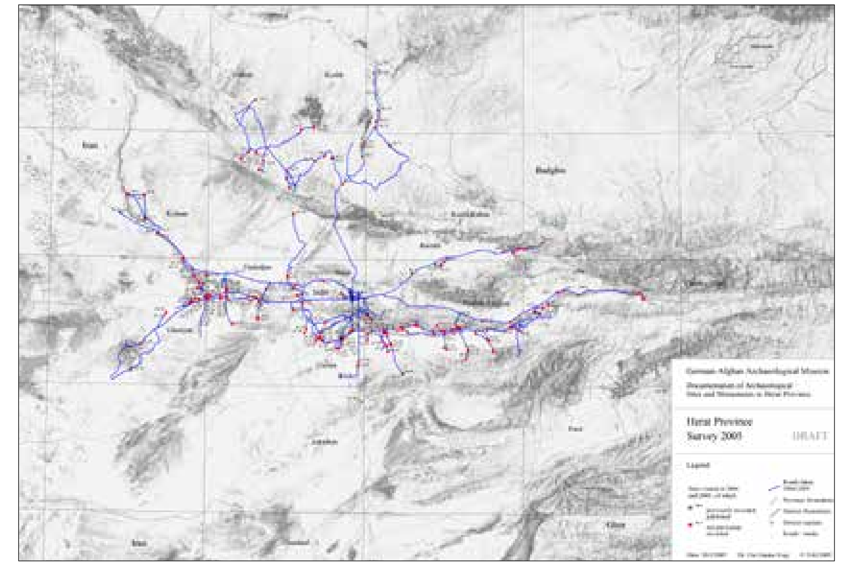

Fig. 25 Herat Survey 2005, GPS tracks (selection) and historical sites, displayed on greyscale satellite image

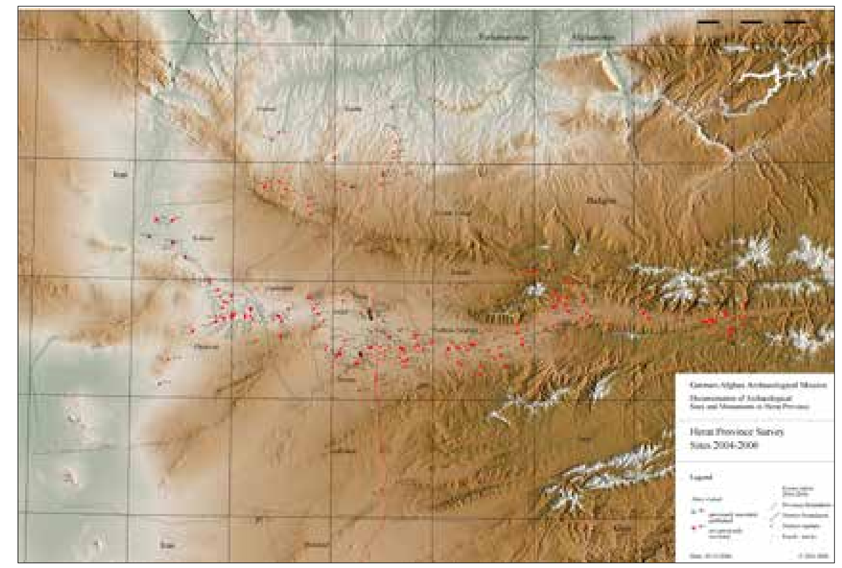

Fig. 26 Herat Survey 2004–2006, historical sites, displayed on a digital elevation model

can be displayed (Figs. 26; 27).[25] The DEM developed by us for the general maps was created using open access data provided by NASA. The Shuttle Radar Topography Mission (SRTM) was a research effort to obtain earth elevation data from the space shuttle 'Endeavour' in 2000, using a special

24 Regional 1:100,000 scale maps were not available at a reasonable price and maps with a 1:200,000 scale maps proved too coarse for a detailed image. Scans of the topographic 1:50,000 maps, which would have to be reduced in size by about 65 %, were not suitable for this purpose either, as the topographical features are too detailed at this scale, with contour lines of 20 m or even 10 m, which merge into a blurred mass when reduced.

25 The importance of borders is illustrated by a couple of distribution maps displaying potentially historical sites (Thomas 2018, SA9 and SA10). The sites cluster only south of the border with Turkmenistan, a dead straight line regardless of the topographical features. Either there has never been a survey on the Turkmen side, or a number of these sites cannot be considered historical because they respect the border and postdate the establishment of the border in 1924. In Figs. SA 9 und 10, the 134 camps, enclosures, dwellings und hamlets (not *tepes* or forts) are located on both sides of the frontier, the respective clustering is also mentioned by Thomas (2018, 305), without further developing its significance.

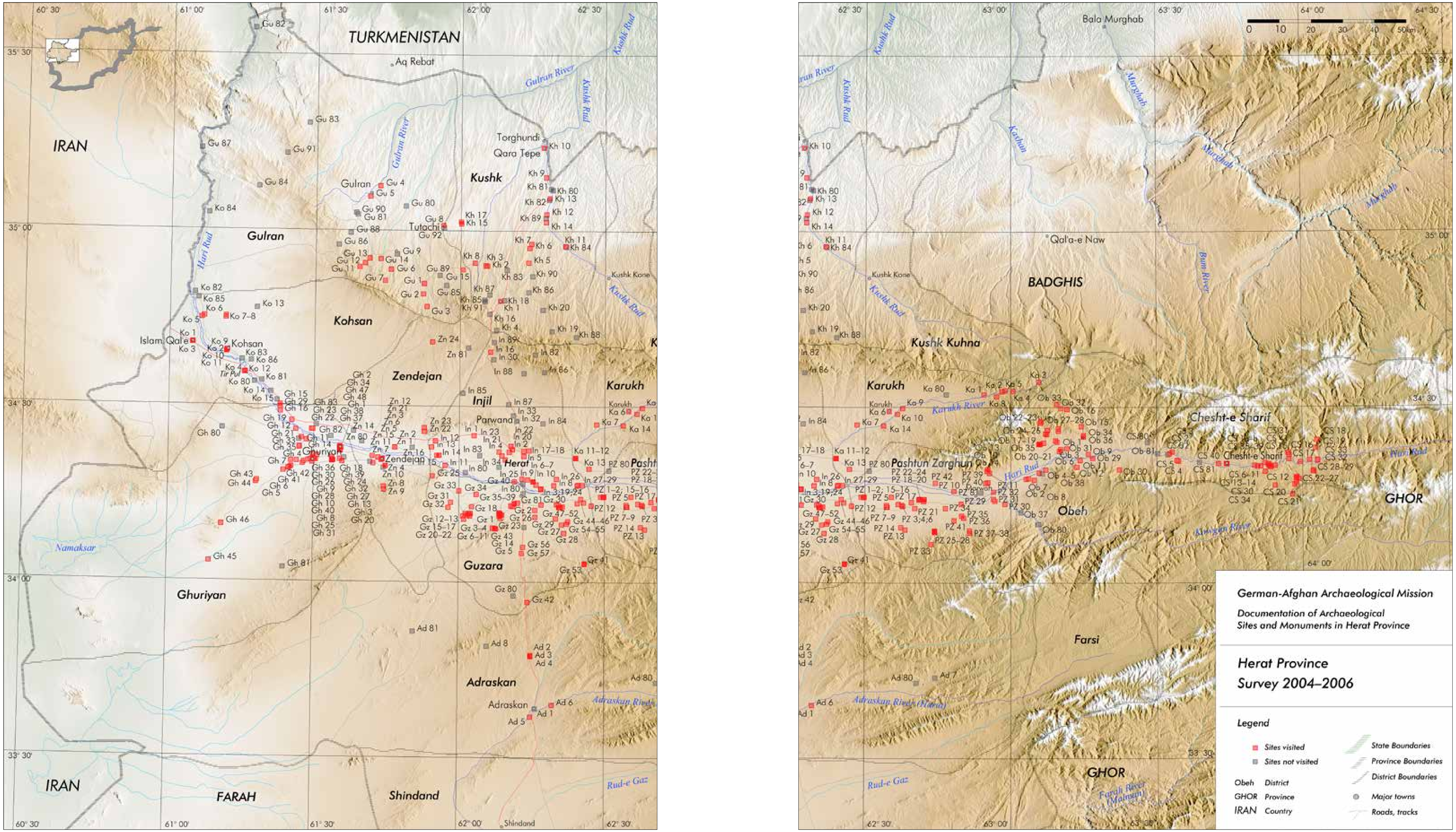

Fig. 61 Localisation of monuments and sites