National inventory and database of ancient stone quarry landscapes in Egypt

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The Egyptian Antiquities Information System (EAIS) started as an Egyptian–Finnish project and finally developed to be a fully functioning GIS Centre of Excellence within the Supreme Council of Antiquities (SCA). Over the course of seven years it succeeded in analysing, identifying and offering solutions, which supports the digital documentation of various Egyptian heritages. Throughout the QuarryScapes project it was generally concluded that of all the Egyptian heritages the quarry landscapes are among the least recognised and appreciated. The present paper will briefly highlight some of the problems identified during our research activities, in addition to our modest efforts for the digital documentation of the Egyptian quarry landscapes. Our activities concluded with a belief that we have succeeded in drawing the attention of the Egyptian administration to such an important element of the Egyptian heritage. However, extreme efforts need to be exerted to initiate a concrete protection and preservation strategy, plans and practices. Efforts should primarily focus on changing how the quarries are being regarded through conducting awareness-raising campaigns that target concerned institutions (SCA, Governorates and quarrying authorities), specialists in the field of archaeology, as well as inhabitants living adjacent to the sites. The Egyptian administration, will face extreme challenges attempting to resolve the current problem. Consequently, setting and conducting national and international projects similar to the QuarryScapes project and encouraging research in the field of ancient quarrying, should be encouraged as part of the long-term sustainable strategy.

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Introduction

Throughout Egyptian history, stone has been a key element in the monumental heritage, from the Predynastic Period to the Islamic. The exploitation of such resources has created quarry landscapes all over the country in a variety of rock types. In order to best manage and protect these areas, it is vital first to get an overview of where they are located, and then identify when they were quarried, in what condition they are today and what legal measures can be taken to protect them. In this sense, a vital part of the QuarryScapes project was to design and produce a comprehensive map and database of ancient Egyptian quarry landscapes to facilitate general land-use management and awareness raising. The aim of the present paper is to present the results of the activities undertaken over the course of our involvement in the QuarryScapes project.

Several regional surveys of ancient quarries have been conducted in Egypt, and of these the work by Professor James A. Harrell is so far the most comprehensive. The database developed during the QuarryScapes project largely builds on Harrell's work (Harrell and Storemyr 2009), but with contributions also from other researchers (particularly Klemm and Klemm 1993, 2008) and from several case studies in the QuarryScapes project. In particular, the risk assessment of ancient Egyptian quarries as presented by Storemyr et al. (2007) and Storemyr (2009) has been important for evaluating the conservation status and threats to the quarry landscapes. The technical and practical aspects of constructing a spatial database that can contribute in implementing measures on a national scale for future conservation of the sites will be discussed in the following sections. An overview of the rock types and quarries is given in Harrell and Storemyr (2009).

Egyptian quarries and the use of GIS

A Geographical Information System (GIS) is a system of computer software, hardware, data and personnel to help manipulate, analyse and present information that is tied to spatial location. With a GIS, information (attributes) can be linked to location data, such as people to addresses, buildings to parcels, or streets within a network. The information can then be layered to give a better understanding of how it all works together. The combination of layers will vary based on the questions that need to be answered.

Though the emergence of the GIS technology worldwide can be traced back to 1960s, its practical implementation in Egypt has been significant only over the last two decades. Nevertheless, lack of data, data inconsistency and the unwillingness to share information are still common limitations to a wider distribution of this technology in the country.

GIS can help planners and analysts 'visualise' data to better understand patterns and spatial phenomena. In addition, layers of information can be displayed through the use of GIS software, which eventually helps in establishing a spatial relation among various sets of data. Each set of data can be displayed in the form of points, lines or areas. Points, which are used in the inventory of Egypt's National Quarries, are used to represent phenomena that have a specific location, such as mines, trees and houses. The most important concept involved in the use of GIS is associating, or 'attaching', attribute data to a specially referenced base map. The organisation of the attribute data is a very crucial stage towards conducting advanced analysis.

The availability of a solid information base is not only essential for data analysis. The challenges arising from climatic changes, global warming and all other environmental hazards, and the fragile state of the archaeological heritage, require an immediate development of 'Crisis Management Plans (CMP)'. The preparation of accurate CMPs will mainly rely on the presence of updated information, e.g., precise location, current status, state of preservation (to set priorities for intervention). In the above context, the output of this activity, the *National Digital Map of Ancient Stone Quarry Landscapes in Egypt*, was designed to specifically address similar problems.

However, the *National Digital Map* layer cannot alone be used for analysis. Other layers, relevant to the case analysed, need to be available to be able to conduct the analysis procedure. As an example, if a question arises on the possibility of using some of the ancient quarries for modern quarrying activities not only the current status of each of the ancient quarries is enough, other basic information (layers) must also be available; such as roads, railways and urban agglomerations.

Data capture

Through his painstaking research and field work, Professor James A. Harrell has located nearly 200 ancient quarries in Egypt and Sudan, and the result of his work was selected as the base for the creation of the *National Quarry Map*. The information was categorised in the form of 3 tables, covering the main groups of rocks (Hardstones, Softstones and Gemstones) and including the location of the quarries in degrees (d) and minutes (m) for north latitude and east longitude. In addition, quarry age, sometimes tentative, was also included in the tables (see Figure 1).

The tables were subsequently extracted into Excel sheets and imported inside ESRI ArcView, and the coordinates were used to create the *point shapefile (version #1)*. The ID_EAIS, added to the attribute table of the *point shapefile (version #1)*, was created by overlaying the Egyptian administrative division shapefile, and based on the geographical location of the quarry site.

ID_EAIS consists of three sections: q (for quarry), xx (two digits of the governorate code) and the last section is zzzz (four-digit serial number) i.e., qxxzzzz (see Figure 2).

Based on the *version #1* shapefile, the

[1]Egypt risk and monitoring.

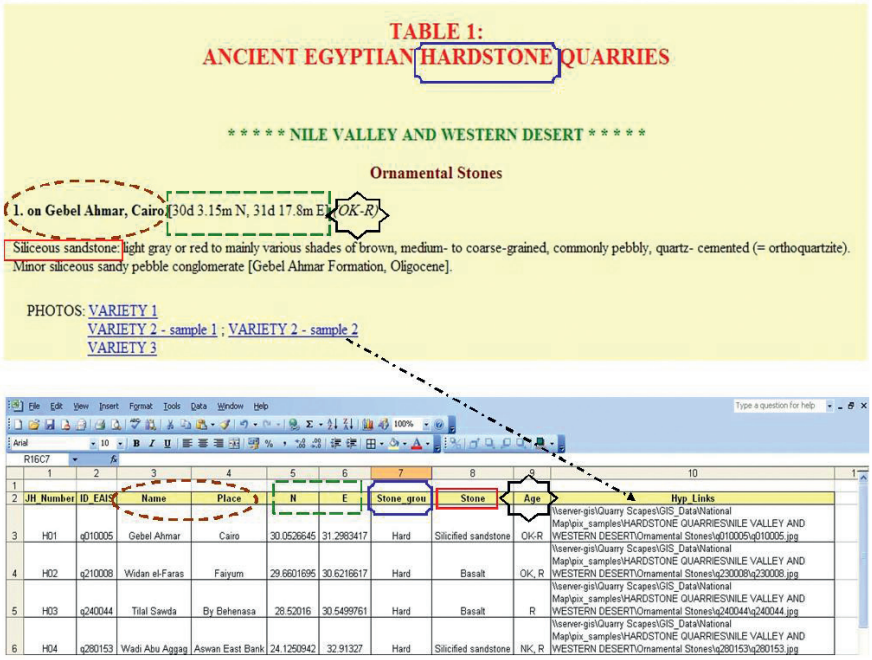


TABLE 1:
ANCIENT EGYPTIAN HARDSTONE QUARRIES

* * * * * NILE VALLEY AND WESTERN DESERT * * * * *

Ornamental Stones

1. on Gebel Ahmar, Cairo [30d 3.15m N, 31d 17.8m E] *OK-R*

Siliceous sandstone: light gray or red to mainly various shades of brown, medium- to coarse-grained, commonly pebbly, quartz- cemented (= orthoquartzite). Minor siliceous sandy pebble conglomerate [Gebel Ahmar Formation, Oligocene].

PHOTOS: VARIETY 1
VARIETY 2 - sample 1 ; VARIETY 2 - sample 2
VARIETY 3

	JH_Number	ID_EAIS	Name	Place	N	E	Stone_grou	Stone	Age	Hyp_Links
3	H01	q010005	Gebel Ahmar	Cairo	30.0526645	31.2983417	Hard	Silicified sandstone	OK-R	\\server-gis\Quarry Scapes\GIS_Data\National Map\pix_samples\HARDSTONE QUARRIES\NILE VALLEY AND WESTERN DESERT\Ornamental Stones\q010005\q010005.jpg
4	H02	q210008	Widan el-Faras	Faiyum	29.6601695	30.6216617	Hard	Basalt	OK, R	\\server-gis\Quarry Scapes\GIS_Data\National Map\pix_samples\HARDSTONE QUARRIES\NILE VALLEY AND WESTERN DESERT\Ornamental Stones\q230008\q230008.jpg
5	H03	q240044	Tilal Sawda	By Behenasa	28.52016	30.5499761	Hard	Basalt	R	\\server-gis\Quarry Scapes\GIS_Data\National Map\pix_samples\HARDSTONE QUARRIES\NILE VALLEY AND WESTERN DESERT\Ornamental Stones\q240044\q240044.jpg
6	H04	q280153	Wadi Abu Aggag	Aswan East Bank	24.1250942	32.91327	Hard	Silicified sandstone	NK, R	\\server-gis\Quarry Scapes\GIS_Data\National Map\pix_samples\HARDSTONE QUARRIES\NILE VALLEY AND WESTERN DESERT\Ornamental Stones\q280153\q280153.jpg

Figure1. Illustration of the categorisation methodology used to convert Harrell's tables into excel sheets.

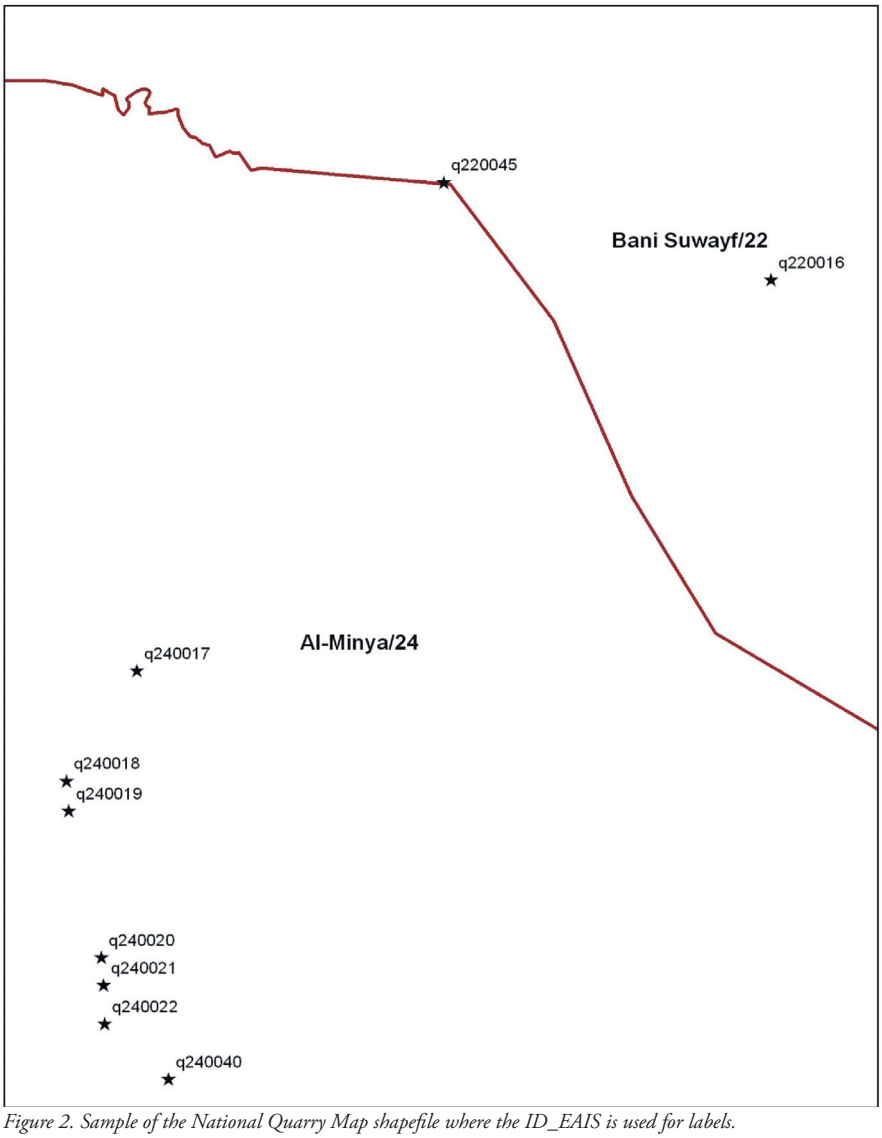


Figure 2. Sample of the National Quarry Map shapefile where the ID_EAIS is used for labels.

activities of Work Package 5 in the QuarryScapes project[1] developed the *'Extended Database; Egypt quarries WGS84 Database Application'* which brings together the information in the shapefile along with the data attained from other sources and through QuarryScapes research. The database was extracted into an excel sheet and converted into a shapefile *(Version #2)*; which included the addition of several new quarries, as well as updated data for the existing quarries. In some cases, photos of samples of the rocks for stone types were available for the quarries, and were linked to the database.

The next stage included performing all necessary research (archaeological, historical and legal) crucial to determine the actual condition of these quarries. Knowing that the quarries' legal status (i.e., how the SCA regards the quarries) is a vital element for their protection, the available SCA records were examined and the local inspectorates were contacted (see below). The outcome of the legal research was summarised in a separate field named (Ident_Taft), which would make it possible to visualise quarries in terms of their legal status.

Archaeological and historical data

The GIS shapefile was also combined, based on a common ID, with an archaeological database (see section 3: Database Enhancement), which contains entries describing the archaeological features of the quarries, the history of their use as well as an analysis of the environmental and human risks threatening their preservation. It indicates where features have been lost, or are in danger of becoming so, and complements the spatial data in the GIS. This information was retrieved from available reports and articles, as well as from field research, and was integrated into the site datasheets where it was reviewed before it was entered into the database.

As mentioned above, the most extensive list of known quarries in Egypt (and Nubia) currently available is the result of the survey carried out by James Harrell over the past two decades. As with the

quarry map, his list has been the starting point for the literature review, and data for the ca. 200 quarries on this list have been collected from a range of sources, including scientific publications in English, French, German and Arabic, and unpublished reports from the archives of the Supreme Council of Antiquities (Table 1).

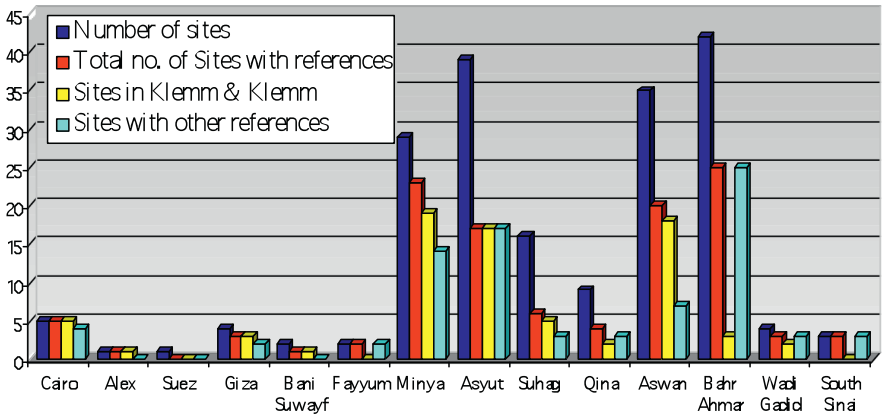
The results of these activities have shown that in general terms there is an alarming lack of specialised information about ancient quarries in Egypt[2]. Nevertheless, a small number of scholars have made extensive contributions to the knowledge of ancient quarrying and have surveyed a larger number of sites. It is unfortunate, however, that the interest among the great majority of scholars seems to remain low.

The sources reviewed in this study can be roughly divided into six types:

1. Notes on ancient quarries found in excavation reports/or publications, which mainly deal with archaeological features other than quarries; e.g., Giza plateau.
2. Comprehensive surveys of ancient quarries all over Egypt or in selected areas.
3. Publications dealing entirely with results of work on selected quarry/mine sites.
4. Survey/excavation results provided directly by the QuarryScapes team.
5. Reports from SCA.
6. Quarry excavation reports.

Extensive research from the first source (notes on ancient quarries) has on the whole produced limited information about the quarries. Quite often the notes consist of brief passages stating that there are quarries in the vicinity of the archaeological site and occasionally a brief mention of when and for what they were used. This translates into relatively sparse data related to a limited number of sites in the database. On rare occasions, however, there are sections in the archaeological reports dedicated entirely to surveys of nearby quarries. Examples are Akoris and al-Bersheh (Willems 1989). Also, references to quarries are found in several classical works, including Petrie (1894), Legrain (1900), Weigall (1923) and Baedeker (1929).

Table 1. Graph which summarises the outcome of the archaeological and historical literature review.



More important are the quarry surveys (including Harrell's own, see Harrell and Storemyr (2009) and references therein) and, in particular, *Steine und Steinbrüche in Alten Ägypt* (Klemm and Klemm 1993), which is the main reference work for the archaeology of quarry sites. It covers the majority of the sites on James Harrell's list. In addition, the chapter on stone in *Ancient Egyptian Materials and Technology* (Aston et al. 2000), co-authored by James Harrell, and Harrell (2001) has provided good archaeological details for a number of the sites.

There are also a number of similar surveys exclusively covering quarries, but with a focus only on the inscriptions that are a common feature of these sites. Although useful in the sense that they can provide information on the periods of use and the intended employment of the extracted stone, the results of these epigraphic surveys rarely provide any details on the archaeological features of the quarries or associated infrastructure (Cruz-Uribe 2004).

The third source (publications dealing with results of work on selected quarry/mine sites) focusses on work conducted on individual quarries and mines, such as those of Mons Claudianus (Peacock and Maxfield 1997) and Mons Porphyrites (Maxfield and Peacock 2001) in the Red Sea region, Hatnub (Shaw 1986, 1987, 1999), Widan al-Faras in Giza (Bloxam and Storemyr 2002) and Khafre's quarries in the Western Desert (Storemyr et al. 2002, Shaw and Heldal 2003, Bloxam 2005).

The results from recent targeted surveys provided directly by the QuarryScapes team are the most valuable sources of information as they provide the most updated and comprehensive data. The project has so far provided in-depth data on quarries in Aswan (Bloxam et al. 2007), Al-Faiyum (Heldal et al. 2009) and the Tushka region in the Western Desert, as well as additional data filling in gaps in the national database (Storemyr et al. 2007).

As for the fifth source of information (reports from SCA), this has so far yielded the smallest amount of information. This is mostly due to the fact that ancient quarries have not yet been widely recognised as significant archaeological sites.

Considering this overseeing of quarry sites, an important task of Work Package 7 in the QuarryScapes project[3] has been, together with the newly established Quarry Department in the SCA, to inform and raise the awareness of the inspectorates about the importance of quarries and to encourage them to docu-

[2]Note that the sources available in Cairo, where the work has been conducted, are somewhat limited. However, it can be considered to have included enough sources to allow for an initial discussion of them here.

[3]Quarry Landscape GIS.

ment those known within their respective districts. Requests to produce reports about the quarries have been addressed to SCA/EAIS, but have so far provided little additional information about the quarries' location, typology or estimated period of use. It is hoped that the reports that are to be delivered in the future will produce additional data.

Legal aspects in the protection of ancient quarry landscapes

In order to have a better understanding of what the current constraints and regulations are that affect the Egyptian archaeological and historical heritage, the identity and role of the SCA and other organisations need some explanation.

The Supreme Council of Antiquities was established as an official agency, based on Presidential Decree No. 82/1994, as a reshape of the Egyptian Antiquities Organization (EAO). Though chaired by the Minister of Culture, the SCA strategy, orientations and administration are largely led by the Secretary General of SCA jointly with its Permanent Committee and Board of Directors.

According to the Antiquities Protection law No. 117/1983, the SCA is the official agency responsible for registration, documentation, protection and management of the country's historical and archaeological heritage sites and monuments in a way that is compatible with their security, sustainable exploitation and conservation. The SCA administration consists of five sectors, next to the central General Secretary and Central Management departments. Each sector is divided into geographical regions, which in turn are divided into directorates. These are finally divided into affiliated inspectorates, which are SCA local management offices.

Antiquities Protection law No. 117/1983 states that an archaeological site must have a precise boundary and area, in addition to a buffer zone that could be 3 km for inhabited areas. The SCA should ensure the availability of all information of archaeological and heritage sites to related organisations, which in turn should consider the sites in their general planning.

The SCA currently identifies archaeological sites as either ancient Egyptian (Prehistoric–Roman Periods) or Islamic and Coptic, and their legal activities as either a complete ownership of the area identified or a direct supervision of the activities performed (residential, vegetation, etc.). It is common for ancient Egyptian and Islamic and Coptic sites to be located either in rural or inhabited areas, which in turn seriously affects the implementation of a buffer zone. Fortunately, the quarry landscapes tend to be more commonly located in rural areas. Thus a better opportunity exists for the identification of a buffer zone.

As part of our research activity, it was important to determine the perspective at which the SCA reviews the quarry landscapes. Our investigation concluded that:

1. Quarries are sometimes identified and registered by the SCA as *Ancient Egyptian* sites.
2. Generally, if known, all ancient quarries are supervised by SCA under the Antiquities Protection Law No. 117/1983, specifically article No. 20 which powerfully regulates the establishment of new activities (construction, vegetation, etc.) or the modifications of current activities on any land that shows probability of having antiquities (or features) present. This also applies to desert lands and lands assigned for stone quarrying.
3. Local Inspectorate offices (Tafteesh) usually only identify a quarry if it is found in association with other archaeological remains, such as tombs or dwellings. As a consequence, quarries might be ignored if their significance is considered trivial vs. other archaeological remains. Consequently, quarries which are not associated with other archaeological remains are often overlooked.
4. Considering the above, the research conducted to determine the legal classification of each quarry, distinguished only two cases, known (quarries are identified by local inspectorates but usually are not registered by the SCA) and unknown (neither the records nor the local inspectorates have recognised the quarry).

Though law No. 117/1983, article No. 20 permits the SCA to impose a dominant role for the protection of archaeological heritage, our assessment revealed the presence of a serious malfunction in the whole system as related to registering quarries. The SCA local inspectorates identify 53% of the Egyptian quarries recognised during our literature research (193 quarries). However, only 20% of the identified quarries are either officially registered by the SCA or automatically protected as they are located within the extent of another registered archaeological area. For the remaining identified quarries, the SCA local inspectorates have only basic information about them; commonly the name of the quarry and a general idea of its location. Moreover, few quarries are property of the SCA and although some are currently under the process of being registered, the bureaucracy of many governmental organisations might hinder the registration process, which eventually may be halted and lost through the system.

A more accurate legal status will involve extensive research, which will require visiting most of the quarries that are classified in our lists; this activity must be conducted with the involvement of local inspectorates. The aim of these visits would be to collect updated information and to coordinate the registration process of the quarries which proved to be worthy of protection with the local inspectorates.

The new Quarry Department of the SCA is expected to perform a major role in the identification and protection of quarry landscapes in the future. The official decree that creates the department, states that it is entitled to:

- Conduct all necessary actions for the registration of ancient quarries and mines. The department is to initiate its activities in the Aswan governorate

by delineating the borders of ancient quarries and mines on maps. The activities should subsequently cover the rest of the Egyptian governorates.
- Provide development and planning organisations with the necessary information about ancient archaeological quarries and mines to have them considered in their future plans.
- Establish collaboration channels with the Egyptian Geological Authority.
- Prepare selected ancient quarries and mines to be opened for public visits.
- Provide inspectorate offices with periodic memos to inform and raise their awareness about ancient quarries and mines in other areas.
- Collaborate with foreign missions working on sites with ancient quarries and mines.
- Raise the capacity of archaeologists and local inspectorates in identifying and recording local, ancient quarries and mines.

In this sense, the department has successfully conducted a training course for local inspectorates (the first course was given to Upper Egypt Inspectorates), which introduced them to the basis of identifying and documenting quarries using up-to-date technologies. The impact of the training was evident as more than 10 quarries (not mentioned in J. Harrell's research) were identified in the Upper Egyptian governorates and are currently being studied. Other training courses will be successively conducted. It is expected that the activities of this department will be very helpful in the future for matters related to quarry landscapes.

Visits to ancient quarry sites

Though archaeological and legal research was mainly based on literature and in-house research, it was important to conduct a few field visits to compare the outcome of the research with the current conditions and actual status. Over the course of 28+ months, 11 quarries were visited in different areas (Table 2). Moreover, steps to identify quarries located near existing sites were conducted alongside regular SCA/EAIS site visits. The aim of the field visits was to identify location, acquire updated information and investigate legal status with local inspectorates. Field visits were not limited to identified or pre-identified sites, but included visits to a larger number of sites to verify if they included quarries or could be classified as quarries. The following points summarise the quarries identified during these visits:

- In some cases, the quarry's location is known to the local inspectorates but the lack of facilities (appropriate vehicles, surveying tools, etc.), in combination with the unawareness of their archaeological value, results in a general ignorance of quarries.
- In other cases, the local inspectorates' knowledge of the quarries comes only from what other inspectors or former missions have told them, with no attempts to actually verify their existence.
- Many of the quarry sites are located deep in the desert, which makes it very difficult to reach them.
- As previously mentioned, there is no separate legal identity for the registration of a quarry site. Hence, their importance is not evident and appreciated by local inspectorates.
- The quarries located within the borders of another registered archaeological area are automatically protected. Though usually their identity and importance are considered less significant than the registered archaeological area.
- The most common factor threatening the existence of an ancient quarry is modern quarrying activities where the archaeological inscriptions and remains are usually damaged or stolen.

Table 2. Detailed information on quarries visited.

Quarry	No.	Status
Baharia Oasis	1	Unknown/Unregistered
Helwan	1	Known/Unregistered
Fayyoum	2	Known/Unregistered
Giza	1	Known/Unregistered
South Sinai	3	Registered
Suez	1	Registered
Abu Rawash	1	Registered
Qina	1	Registered
Total	**11**	

Database enhancement, adaptation and integration

The SCA/EAIS database—which was mainly designed to accommodate data of ancient Egyptian, Islamic and Coptic archaeological sites—had to be (1) adapted to contain the quarry data, then (2) a connection had to be established between the quarry database and the *Extended Database*, updated with information on legal status, condition, threats and other issues.

Initially, and based on sample data provided by the Aswan West Bank Survey database (Storemyr et al. 2007), *general point module*, information useful for creating site management plans for quarry landscapes was added to the SCA/EAIS database in order for it to be able to adapt quarry data.

The coding system was changed from a system that accepts ancient Egyptian and Islamic/Coptic sites only i.e., Exxyyzzzz/Ixxyyzzzz to a system that can include quarry sites i.e., qxxyyzzzz (Figure 3). For cases where an archaeo-

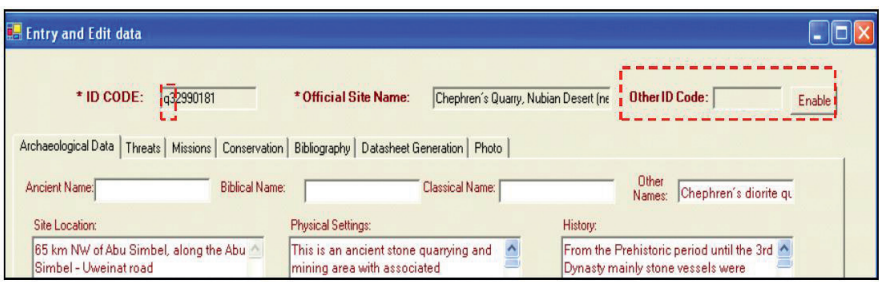


Figure 3. The system was modified to accept a quarry ID code i.e., qxxyyzzzz, an entry was created to show both IDs for sites already existing in the EAIS system and also identified as a quarry landscape.

logical site already exists in the SCA/EAIS system and is also identified as a quarry landscape, an entry was created that shows both IDs and links the two sites together. All changes in the coding system and predefined lists mentioned above are mainly made through changes in the database structure.

Changes in the interface were needed to allow (1) the implementation of the changes in the coding system, predefined list(s), (see Figure 4), and (2) the integration between SCA/EAIS database and the *Extended Database*.

The main purpose of the adaptation is to allow the user, while navigating through the quarry sites in the SCA/EAIS database, to open the equivalent *Extended Database; Egypt Quarries WGS84 Database Application (.mdb)*. The integration of the two databases would serve the needs of users with different specialisations, as a wide range of detailed information about the quarry sites is presented: archaeological data, threat data, conservation data, legal data and geological information, taking into consideration the quality of this information as it is collected and researched by specialists.

Finally, a data form was created in SCA/EAIS database for displaying the *Extended Database* (see Figure 5). The ID code, which is a common field present in both the SCA/EAIS database and the *Extended Database*, was used to establish the link.

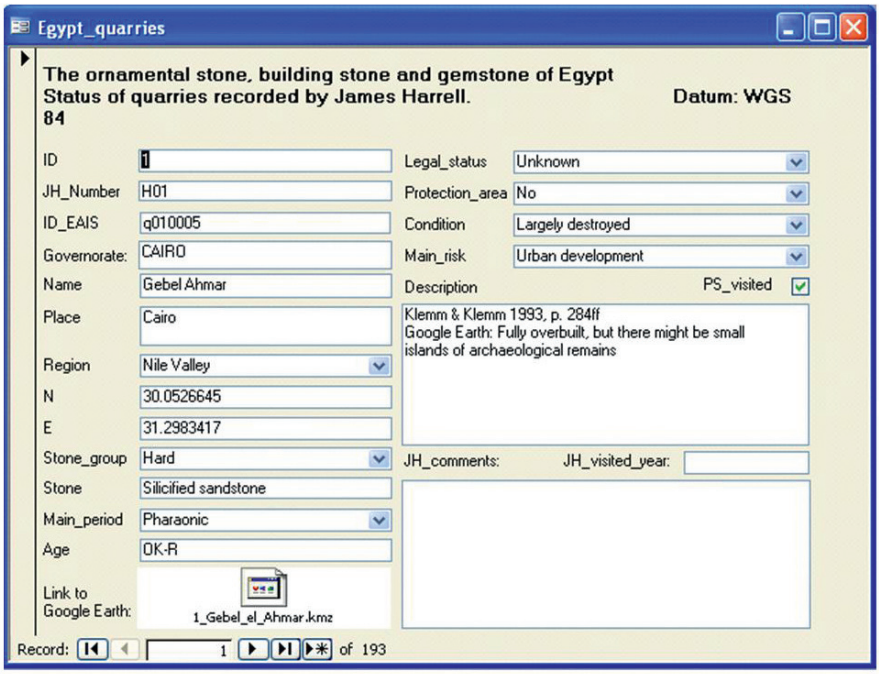


Figure 4. Original Egypt Quarries WGS84 Database (.mdb).

Future challenges

Research is not sufficient to save the sites for the future. Ultimately, the process of identifying, locating and finally registering new quarry sites should be followed by measures to control the threats that may affect them.

The database is designed to facilitate such operational action considering that *the design and construction of a national map of ancient stone quarry landscapes in Egypt* would not ONLY imply creating digital layers, but would deeply investigate the actual status of these quarries inside the Egyptian governmental administration. Hence, discovering the malfunction in the current documentation system and consequently recommend possible protective measures.

The primary output of the national database is the creation of a shapefile, which includes 193 records. Each record represents a single, ancient quarry landscape and is composed of several fields covering most of the essential information needed to recognise an ancient quarry (see Table 3). The practical aim is that the output will be used as an efficient tool in the physical protection of the sites and coherent management by inspectors who are well aware of their significance.

Although SCA has yet to classify ancient quarry landscapes as a separate legal entity, which are registered as archaeological sites and are differentiated based on their dating as either ancient Egyptian or Islamic and Coptic sites, it has recently recognised a separate archaeological identity for the ancient quarry landscapes by establishing a new department within the SCA to be specifically responsible for the identification and protection of these ancient quarry landscapes and mines.

An important challenge to be met is appropriate education of the inspectorates, for increasing their knowledge about quarry sites, how to characterise them and assess their significance. Another challenge is the inspectorates' lack of physical resources for actually visiting quarry sites. Many of them are located in remote desert areas, and field visits require appropriate vehicles and surveying tools.

Concluding remarks

Our activities, which extended over almost 28 months, have led to the general conclusion that the value of the Egyptian quarry landscape is underestimated. Extreme efforts need to be exerted to initiate a concrete protection and preservation strategy, plans and practices.

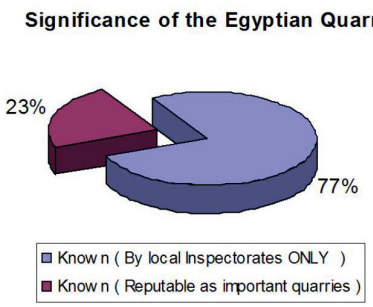


Figure 5. The significance of the Egyptian Quarries among inspectorates.

Efforts should primarily focus on changing how the quarries are being regarded through conducting awareness-raising campaigns that target concerned institutions (SCA, governorates and quarrying authorities), inhabitants living adjacent to the sites, as well as specialists in the field of archaeology. Setting and conducting national and international projects similar to the QuarryScapes project and encouraging research in the field of ancient quarrying, should be encouraged as part of the long-term sustainable strategy.

By the end of the project's 28+ months time span, we conclude that the project activities, while being essential for the long-term safeguard of the quarry heritage, are only a starting point for continuous actions. The activities of this project only permitted conducting general research activities for each of the quarries identified. Additionaly, more focussed, long-term activities need to be designed and implemented to specifically identify and establish the status, conditions and intervention measures of each classified quarry landscape. Consequently, designing and applying a systematic methodology to classify and list other quarry sites will be an important step.

Fortunately the Egyptian administration has already taken first measures towards the reconsideration of the value and significance of quarry landscapes through the establishment of the Quarry Department within SCA. The role of this administration is to prescribe and undertake result-oriented measures that will, when implemented, provide protection for and enhance the value of Egypt's quarry landscapes. However, based on

Table 3. An explanation of the fields used in the Egypt National Map shapefile.

Field name	Sample data	Description	Field originator
ID			
JH_Number	H03	A serial no. based on the categorisation in J.Harrell's tables	WP5
ID_EAIS	q240044	ID code created based on the geographical location of the quarry site and its relation with the enclosing governorate	WP7
Governorat	Al-Minya	Enclosing governorate	WP5
Name	Tilal Sawda	The quarry name as described in J. Harrell's tables	WP5
Place	By Behenasa	A description for the quarry's location as described in J. Harrell's tables	WP5
Region	Western Desert	The general region where the quarry is located	WP5
N	28.52016	North latitude	WP7
E	30.5499761	East longitude	WP7
Stone_grou	Hard	The group to which the quarry stone belongs	WP7
Stone	Basalt	Stone type	WP7
Main_perio	Greco-Roman	The main period to which the quarry dates	WP7
Age	R	Other period(s) to which the quarry dates	WP5
Legal_stat	Unregistered	How the SCA regards the quarry	WP5
Protection	No	Whether the quarry undergoes and type of protection (e.g., World Heritage Site)	WP5
Condition	Partially destroyed	Current condition	WP5
Main_threa	Mining and quarrying	Main threats endangering the quarry	WP5
Descript	No Google Earth high resolution coverage Eastern part of the site completely destroyed	Any additional relevant information	WP5
PS_visited	1	Whether the quarry was visited by Per Storemyr (1 = Yes, 0=No)	WP5
JH_visited	0	Whether the quarry was visited by J. Harrell (0=No, a year is specified in case the quarry as visited)	WP5
JH_comment		Other comments by J. Harrell	WP5
Hyp_Links	\\server-gis\Quarry Scapes\GIS_Data\ National Map\ pix_samples\ HARDSTONE QUAR RIES\NILE VALLEY AND WESTERN DESERT\Ornamental Stones\q240044\ q240044.jpg	A field essential to create the link to the sample photo (if it exists)	WP7
Ident_Taft	unknown	Whether the quarry is identified by local inspectorates	WP7

previous experience and flexible resources, the involvement of international expertise remains crucial for creating a long-term system for the protection of ancient quarry landscapes.

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