From past experience to new approaches and synergies: the Future of Protection Heritage Management for Archaeological Heritage in Times of Economic Crisis.

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"The Economic Crisis: Is the Protection of a Nation's Cultural Heritage Still Possible? The significance and the role of an accurate 3D documentation"

The importance of cultural heritage documentation worldwide, a live testimony of past activity on earth, is more than ever necessary while we face the danger of losing significant monuments and disconnect to our historic evolution due to dramatic natural and human disasters, due to the extensive exploration of natural resources and the historical events of each country that may prove to be catastrophic.

According to UNESCO world heritage convention[1], cultural heritage may be defined as monuments, groups of buildings and sites of outstanding universal value from a historic, ethnologic, artistic and scientific point of view. The most serious threats to the historical monuments have been associated with war, with natural phenomena causing destruction and human interventions.

The recent world wide economic crisis has drastically refocused our priorities because our cultural heritage is exposed to a new danger: the luck of funds that would have been given for the protection and the conservation of the monuments and the archaeological sites. Particularly in Greece, the economic crisis had as a result the total neglect of the cultural heritage while most of the funds aimed towards the

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[1] http://whc.unesco.org/en/conventiontext (accessed 20-5-2012)

restoration and the preservation of archaeological sites and other equivalent projects were cut off and a lot of positions from high qualification personnel were diminished or cut off also.

Historical monuments are the inheritance that comes from our ancestors that identifies us today and which we will pass on to the future generations. Thus it is our obligation for the next generations to maintain our cultural heritage at all costs and make sure that this continuous process will not be interrupted.

When we examine the whole situation under a strictly economic point of view, we have to remember that sixteen percent of Greece's Gross Domestic Product (GDP) comes from tourism. However, the government moves to the opposite direction; instead of investing to our cultural treasures that promote tourism, it decides to seriously cut budgets that were necessary for the preservation and promotion of our heritage in order to stabilize the economy.

It is obvious that reversing the economic crisis should be the top priority, but it is not a wise solution to reduce or to withdraw funding and the financial support oriented towards the protection and management of cultural heritage waiting for better economic times,. The existing monuments, as subjects to erosion and vandalism, have gone through many phases of construction, damage and repair. The absence of consistent care of preservation will cause their destruction and the final interruption with our past.

According to the above, this describes more or less today's situation in Greece and possibly to many other countries. And the question is: what can we do to safeguard our monuments during this crisis? What would a good archaeological heritage management be developed?

According to a typical flow diagram that demonstrates managing antiquities circle, several actions are taken place. In time of crisis such the archaeological management circle an inventory would became like this:
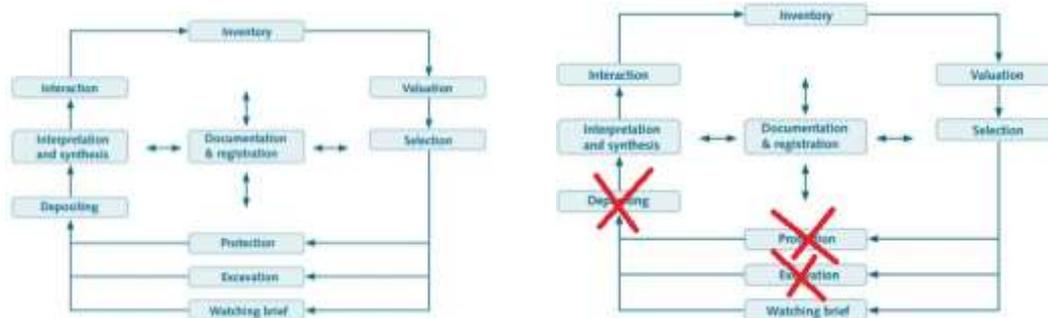
The archaeological heritage management cycle before and during the economical crises[2].

As a result, inventory and documentation-registration of the status of the cultural heritage becomes a duty that is ignored during the current period.

The importance of an inventory is well explained and understood in several other circumstances[3]. The use of more sophisticated digital applications, like GIS platforms[4], dedicated to monuments, in several cases, is already in use and almost completed with the data. Such inventories can help the scientific research as well as the preservation and rehabilitation of the monuments.

We need to examine each single monument in a more detail scale, as long-lived artifacts that have gone through many phases of construction and that are subject to erosion, damage, vandalism, and repair. Due to the complexity of the monuments' structures, it is difficult and time consuming to be visualizing and to be modeling in a 3D format, while it involves a major effort and it mainly helps for a virtual representation, but not for a documentation.

2 Howard, P., *Heritage: Management, Interpretation, Identity* , Continum Int. ed. N.Y. 2003, p.187, and revised European Convention on the Protection of the Archaeological Heritage, known as the 'Malta Convention' 1992 (passim), Innovatie in de Nederlandse Archeologie Liber amicorum voor Roel W. Brandt, as well as Dutch Archaeology Quality Standard (KNA) - SIKB, *www.sikb.nl/upload/documents/archeo/knauk.pdf,* p.11.

3 http://whc.unesco.org/en/conventiontext,
[4]Geographical Information Systems have proved their potentialities in this scope, but they are not always adapted to the management of features at the scale of a particular archaeological site, cnf. A web information system for the management and the dissemination of Cultural Heritage data *Journal of Cultural Heritage*, Volume 8, Issue 4, Pages 396-411Élise Meyer, Pierre Grussenmeyer, Jean-Pierre Perrin, Anne Durand, Pierre Drap.

Documentation-registration of these objects can be considered as a prerequisite not only for their study but also for any kind of intervention aimed towards conservation. As a result, it is important to measure and model single historical monuments with high accuracy.

Nowadays, there are two main approaches to document historical objects:

1. Direct documentation by using non expensive devices and instruments. It is a rather common approach to the monuments' survey, but it's accuracy depends on the qualification and the experience of the personnel involved and their capability to recognize structures, forms, styles, typology, etc, a job that is usually done by a multidisciplinary team work[5].

2. Indirect documentation by using several techniques and instruments, such as Total Stations and close range photogrammetry etc. This method needs more sophisticated equipment and highly specialized personnel. Because of this, mainly land surveyors, at least in Greece, did photogrammetry applications, and the final products were given to the users (architects, archaeologist). Although of high accuracy, the result of the work was not always successful (Adolfsson (1997), Beraldin et al. (2000), Levoy et al. (2000), Rocchini et al. (2001), Henz (2002), Remondino and Campana, (2007)[6]..

The avenue of the 3D Terrestial Laser Scanner (TLS), changes the gap between direct and indirect methods, in the recording phase as well as at the final phase of the representation of the product. Although it is sophisticated equipment, it is very easy to use, even from not specialized operators and it provides an objective documentation

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[5] data handling was a hand-made task done thanks to efficient and experienced methods. In many projects it is not possible to use precise instruments for time, transportation, financial or authoritative permission reasons.

6 Examples of applications using laser scanning techniques with encouraging results are found in Adolfsson (1997), Beraldin et al. (2000), Levoy et al. (2000), Rocchini et al. (2001), Henz (2002).

of high accuracy and immediate 3D digital model of the actual state of the monument.

This 3D digital model can be exported and elaborated by any common CAD program at any time in the future.

According to the pre-established resolution, measures can be taken p.e. every 1,5mm from a distance of 10meters. It is obvious that with such an accuracy of measurements and high resolution of records, every monument can not only be completely documented by an infinite number of vertical or horizontal sections creating its complete graphical documentation from any area and at any scale, but also to be reconstructed to 1:1 scale (http://www.insightdigital.org/PDF%20papers/Plans.pdf)

The scope of this paper is not to describe the capabilities of the use of a 3D Laser Scanner from a technical point of view (A. Moysiadis & K. Perakis 2011)[7], but to emphasize the need to establish, along with the archaeological inventory, a digital archive with files containing millions of xyz point files of the surface of each monument.

We could say that such a documentation can freeze the actual state of any monument in an objective way. Having these data in advance, it is very easy to study and

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[7] A. Moysiadis* and K. Perakis "The potential of conventional surveying, photogrammetry and laser scanning in monuments of cultural heritage documentation" in *Proceedings of the 3rd International CEMEPE & SECOTOX Conference, Skiathos, June 19-24, 2011*

understand the monument better, as well as to control the degradation of the monument's surface and to establish restoration and conservation works.
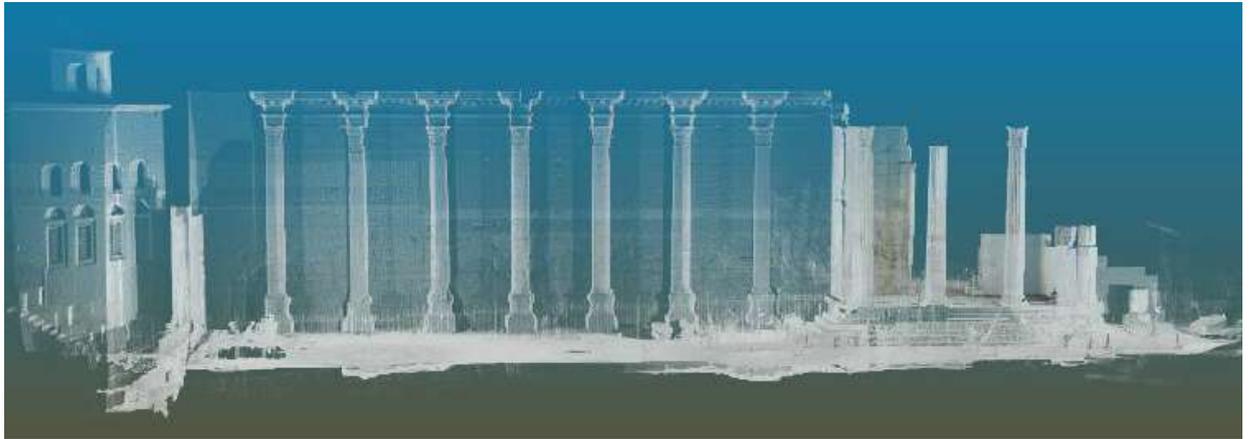
The Handrian Library of Athens.

Going further, we can say that documenting a monument before and after restoration works with a 3D TLS, we can even satisfy the principle of reversibility. Having its digital models before and after the restoration works, we can examine very accurately the process of intervention and we can also confront at any time the initial and the final state of the monument. I think that everybody will agree how useful it could be, if we had a 3D model of the Parthenon before the conservation works.

Accurate and low cost 3D documentation of historical monuments would be of great help for such monitoring. The existence of high accuracy 3D measurements will provide all the data to control any kind of deterioration.

In order to achieve this approach so that monuments can at least be accurately documented, the advent of new digital 3D Terrestrial Laser Scanning (TLS) technique is applied to reduce the time required to visualize a 3D historical monument using automated methods.

In conclusion, I would like to say that the use of 3D laser scanning technology has been proven a powerful

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The temple of Hephaestus, Athens.

tool not only to record historical sites and objects, but also for preservation purposes, for scientific research and environmental applications. The application of 3D laser scanning to reconstruct and conserve heritage buildings, monuments and/or archaeological sites is generally accepted as a method to document cultural heritage owing to its accurate and fast characteristics.

Thus, during the period of the economic crisis where we cannot do much, accurate digital documentation of the present state of our cultural heritage is very important as a reference and as a record for the future generations. Having a SD card with millions of xyz points of each monument must be a priority of each country.