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# Introduction

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This volume came about as part of the European Association of Archaeologists (EAA) Annual Meeting held in Belfast in 2023, later expanded with contributions from other case studies and research fields – e.g. paleontology and geophysics applications.

Editors of this volume are directly involved in research projects on the issue of modern quarries and archaeological sites and landscapes in Italy (*Quarries and Heritage Project (Qu&Heri), Sapienza University of Rome*) and Egypt (*Ancient Quarries and Mines Department (AQMD) with the QuarryScapes Project, The Egyptian Supreme Council of Antiquities*). Building on this individual research, they wanted to contact and intercept other cases expanding the variability of issues, from the Mediterranean, Italy, Central Europe and Eastern Africa.

The recent and historical development of quarries brought –and still brings– significant impacts on landscapes, biodiversity and non-renewable resources, including archaeological and paleontological heritage. The analysis of the past and present impact of modern quarries, and the assessment of the risk they pose, are not secondary issues in the holistic protection of cultural heritage and landscape. According to the directives and charters for environmental and archaeological protection and sustainable development in Europe, quarrying must be compatible with the prospects of an economy attentive to "green" issues, taking care to enhance and strengthen cultural resources and landscapes.

The issue is also reported as problematic by UNESCO – e.g. for the Syrian site of Crac des Chevaliers and Qal'at Salah El-Din (https://whc.unesco.org/en/list/1229/) and is evident in many other cases worldwide. Furthermore, the impact of the continued exploitation of quarries destroys ancient quarry cliffs, relevant for the study of past architectural practice.

The impact of modern quarries on cultural heritage is a common issue that deserves global interest. The reason for this transversality is quite clear, almost trivial but in our opinion still too underestimated. The world, now especially the developing countries, has seen a remarkable increase in the exploitation of raw materials/aggregates; some data are reported at the webpage <https://data.jrc.ec.europa.eu/collection/id-00192> (last accessed 17.6.2024) and in Menegakin and Kaliampakos 2010. Data are unfortunately not available for the whole world, but mostly for European and other economically powerful countries.

This is reflected in an increase in the number and type of modern quarries that have turned into a huge industry, now expanding from the local to the international market: a large part of the economy of some cities, and perhaps some countries, has become highly dependent on the modern quarry industry.

In Europe, 3 billion tons of aggregates are produced by approximately fifteen thousand companies, who also employ a large number of people. These data show that the aggregates industry is vital for the EU economy. Among the EU and former EU countries that will be discussed in the volume, the UK and Italy are the most active ones, especially for rock and sand (as extracted tons).

Quarrying activity also affects land use. This is a very interesting fact for an analysis in terms of protection of archaeological and paleontological sites and of the archaeological landscape. According to Eurostat data –updated to 2018– the countries in which land use for mining and quarrying (as extension) is highest are Russia, Ireland, Germany, Finland, Latvia and Estonia followed by UK, Portugal, Poland, Czech Republic, Austria, Lithuania, Greece and Bulgaria; Italy is lower. A problem with these data is that quarrying activities are merged with mining activities and therefore it is not easy to divide them. On the other hand, sometimes quarrying and (open air) mining have the same impact.

The two former sets of data are difficult to combine, but they suggest that in some countries a wider waste of land surface takes place, while in others exploitation is deeper, or more intensive.

The impact of modern quarries collides above all with the lack of legislation or with its inhomogeneity, where present. Data from the European Community monitoring project MINLAND demonstrates that laws in Europe are uneven.

In any case, the relationship between modern quarries and cultural heritage is more complex than simple damage, as quarrying activity can also lead to enhanced discovery of buried remains. We summarize some points relating to this below.

Firstly, many archaeological and paleontological discoveries effectively came and still come from quarries and this has prompted a strong connection with archaeological research, in the best cases leading to positive interaction with local heritage bodies and protection.

The counterpart of the former is the highly destructive impact of quarries. Archaeological sites adjacent to the sites of modern quarries are the biggest victims, together with the general environment. It must be emphasized that countless archaeological sites and evidence have been lost in complete silence under the expansion of modern quarries.

Here we give some topical examples, highlighted in recent years, but not yet involved in a general discussion of the issue: we hope this will change in the near future.

The devastating effects of quarrying at Rujum al-Juththa in Jordan – identified by the EAMENA project – is a case in which an archeological site has been destroyed by quarrying (https://eamena.org/article/mining-and-quarrying).

Another example is Palmaḥim Quarry in Israel: an archaeological site excavated since the 1960s. The remains can be dated from the Late Neolithic to the Late Early Bronze I, and have been heavily damaged by quarries, especially between the 1970s and 1990s (https://library.biblicalarchaeology.org/book/the-new-encyclopedia-of-archaeological-excavations-in-the-holy-land/palma%E1%B8%A5im-quarry/, Gorzalczany 2018).

In central Italy, the Late Neolithic and Copper Age archaeological site of Poggio Olivastro, Viterbo province, has been significantly compromised by quarries in the 1960s to 1980s, apparently with the total loss of its surrounding ditch, seen by scholars (only after its quarrying away) through photointerpretation of an aerial image of the Royal Air Force dating to 1944. Since 1981, with non-continuous campaigns until the 1990s, the local Superintendence of Southern Etruria, together with the "L.Pigorini" Museum of Rome, excavated part of the core site, still retaining significant, but showing diminished evidence (Bulgarelli and D'Erme 2014 with previous citations). In 1990, legal State protection of the remaining hilltop was declared, and the site protected. Still, the end of the quarrying activity only came at the end of the excavations, around 2000, after a contrasted process between private property and the State.

A new actor in the management of the relation between modern quarries and archaeology has been introduced as the practice of preventive archeology. One of the most famous cases is that of the Neolithic settlement and burials (and many other traces of different phases indeed) found in Cemex's Kingsmead Quarry (south-east England, https://www.wessexarch.co.uk/our-work/kingsmead-quarry-horton, Chaffey et al. 2016). This has brought about the definition of the concept of "accompanying archaeology", as a way to keep the pace of the quarry extraction, by preceding it with an agreed schedule. While this clearly leads only to "preservation by documentation", it is a practical way to balance different and contrasting perspectives. It is also very specific to the British attitude toward private enterprise, which isn't always easy to transfer to other countries. Also in France, where preventive archaeology is consolidated by the work of the Institut National de Recherches Archéologiques préventive (IRRAP), an example of how archaeological research has gone "hand in hand" with mining is the case of the sand quarries in Île-de-France.

Another even more difficult interaction, in terms of identification and control and of the scale at which this is feasible, is the impact of modern quarries on ancient quarries. In fact, the scale of the ancient and modern quarries can be very wide, and the impact dispersed in the landscape; setting aside the difficulties in dating impacts on the rock outcrops, a lot of energy must be used in control.

There is a clear case of this in Egypt, where ancient quarries and archaeological sites are widely spread within the range of modern quarries: the same resources are of architectural interest. It is an example of the complex and sensitive conflict between archaeological sites and the expansion of licensing modern quarries.

The overlap of modern quarries with ancient ones is also evident in Tivoli, near Rome, where the famous "travertine" calcareous stone has been quarried since Roman times. In this context, it is evident that the entire archaeological landscape has been damaged and currently represents a cognitive "hole" in archaeological maps.

A last issue is related to occasional and unregulated rock quarrying, both opportunistic and for purposely marketing goals, a pattern that was certainly widespread in the past (e.g. in post-World War II Italy), but that can be directly seen in some countries today. In Morocco and Tanzania, for example, geological outcrops of naturalistic beauty, hosting significant rock art, are severely damaged by this phenomenon. Occasional quarries are a huge problem in terms of protection because they are difficult to identify –they are often barely visible in the landscape from a distance– and to monitor.

This last case recalls the frequent link quarrying has had with illegal activities, sometimes at a low level of criminal organization, but sometimes strongly connected with powerful eco-mafia organizations, going from quarry exploitation to improper use in the post-extractive mitigation phase.

One could say that in many states a lack of legislation, or a lack of integration between different institutions has been recorded, and that these points of weakness created a fertile environment for a scarcely regulated quarrying activity. Despite this, things do appear to be changing.

With a more positive outlook, one can state that fortunately, the impact of modern quarries on cultural heritage is gaining attention, as demonstrated for example by the proposed candidacy of the slate quarries landscape in the UK, or the Geopark of Alpi Apuane in Italy which includes the Carrara Quarries, also used in Roman times.

Additional regulatory guidance is now provided in the European Community for industry policy plans related to Non-Energy Extractive Industry (NEEI) by a non-legislative decree issued in 2019 which, inspired by previous provisions, aims to ensure that the development of extractive activities is in line with the EU directives, also with reference to the assessment of the impact on crops, on the archaeological heritage and on the landscape.

This volume aims therefore to provide a first comprehensive discussion of the different approaches and methodologies to tackle the problem of these varied relationships between quarries and archaeology, by referring to the different European and non-European regulations. This is done through the different hosted papers, which present case studies of paleontology and archaeology, increasingly derived from preventive archaeology, but also from more traditional archival and bibliographic documentation and indirect surveys of the landscape, employing aerial and satellite remote sensing.

The goal is to start understanding how the problem is managed on an international (even if not global) scale and which best practices and shared strategies, methods and operational procedures can be identified and applied.

**List of Citations**

Bulgarelli, M. G. and D'Erme, L. 2014. "Poggio Olivastro (Canino, VT): la fase del pieno Neolitico". *Rivista di Studi Liguri* 77/79: 249–253.

Chaffey, G., Barclay, A. and Pelling, R. 2016. *Horton Kingsmead Quarry Volume 1*. Wessex Archaeology Monograph.

Gorzalczany, A. 2018. "The Chalcolithic Cemetery at Palmahim (North): New Evidence of Burial Patterns from the Central Coastal Plain". '*Atiqot* 91: 1–94.

Menegakin, M.E. and Kaliampakos, D.C. 2010. "European aggregates production: Drivers, correlations and trends". *Resources Policy* 35: 235–244. *Mémoire de Sable: Archéologie et Carrières en Île-de-France.* Catalogue of the exhibition at the Musée de Préhistoire d' Île-de-France (Nemours, 9 April-31 December 2022). Paris: Connaissance des arts.