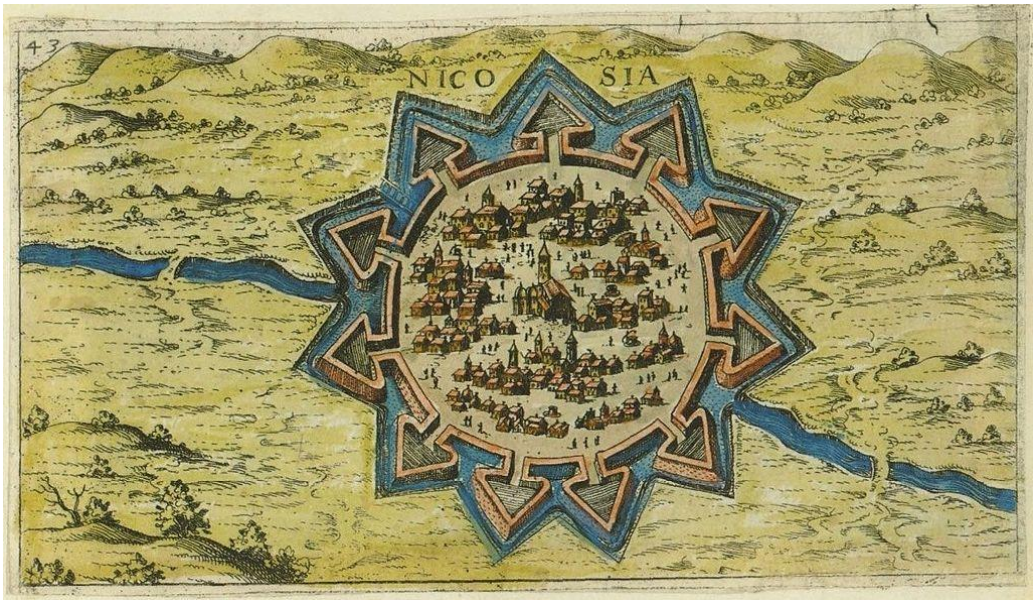
EUROLITHOS European Ornamental Stone Resources

Eurolithos case study

Built heritage of Nicosia, Cyprus: the use of calcarenite as built stone from antiquity to recent times



Thematic focus: Stone and built heritage

Responsible partner: Geological Survey Department

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Foreword

"Nicosia is also a very old city in the centre of the island's valley, in a very good climate … there is plenty of water and fertile land… and when the Lusignans became kings, Nicosia became the capital of the entire Kingdom. Due to the destruction and desertation of Salamis, Famagusta, the Archbishop obtained the Pope's permission to move to Nicosia. Thus, Nicosia became established as the capital of the Kingdom. It had a perimeter of three leagues or nine miles, and was adorned with beautiful, large buildings, amongst which were palaces, churches and the old castle, which had been built, by the dukes during the time of Constantine the Great. Evidence of this lies in the fact that every time a building is constructed in this city, sections of walls are discovered in many areas, as well as numerous objects and medallions bearing the emblem of Constantine the Great and that of his mother, Sainte Helen."

Etienne de Lusignan, Chorographia, Bologna, 1573 AD.

The above historical statement, which indicates the richness of the built environment of Nicosia in the 16th century AD, is just an example of many similar statements. Even though since then, the built environment of the city has been demolished and rebuilt several times, the built heritage of Nicosia that is conserved today is really remarkable. In addition to the built heritage, it is also well known that in the past, south and west to north west of Nicosia there was extensive quarrying of calcarenite that contributed with the building stone to the rich cultural - architectural heritage of the city.

We have tried to take a closer view on the built heritage of Nicosia and the sources of its building stone

Executive summary

Throughout Europe, there is significant built heritage with the use through history of unique ornamental stones in a single house to the whole cities. These buildings or monuments or sites stand in time for centuries even sometimes for thousands of years. Even though many built heritage sites are generally tourist attractions, no information is provided about the stone that these sites are made of and how they are related to the quarry heritage. Such a case is Nicosia the capital of Cyprus with abundant stone buildings made of calcarenite of the Athalassa member of the Nicosia Geological Formation. The built heritage includes ancient, byzantine and medieval archaeological sites as well as neoclassical architectural heritage.

This case study seeks to provide information about:

- Significant landmarks of build heritage in the city of Nicosia
- The natural stone used in built heritage landmarks in relation to the locations (quarries) that it came from. (i.e. geology, history, landscape and stone use)
- The legal framework for the protection and conservation of the built heritage such as the Antiquities Law, Town Planning and Housing Law etc.
- The best practices in the conservation of these sites but also to record bad practices that they should be avoided
- The development of a photo album of significant built heritage sites providing relative information about them.

Keywords

Built heritage, listed buildings, calcarenite, quarry, quarry landscape

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Description of case study

This case study involved collection and evaluation of old and new data about the geology of the calcarenite quarry landscapes developed due to the extensive quarrying for building stone, south and west and north-west of Nicosia. The calcarenite as a building stone has been used since antiquity, so it is found from archaeological sites to neoclassical buildings of the previous century and also in modern buildings used as decorative stone. The long and extensive use of calcarenite as building stone resulted in the rich architectural/built heritage that Nicosia and its suburbs have today. Thus, this study selected a number of examples of built heritage and quarries of the source of the building stone.

In particular, we have:

- Described the brief history of Nicosia giving emphasis on the build environment
- Gathered best and bad practices in the conservation of mainly listed buildings

- Described the geology, the quarries and their landscape of the source rock of the build environment of Nicosia.
- Developed a photo album of significant built heritage sites providing relative information.

Key stakeholders in this case study have been the local Municipalities and relevant government departments. However, we expect this study to be relevant also for other stakeholders and the public that cares about the cultural heritage hoping that they will contribute for further conservation of the quarry and architectural heritage.

Methods applied

In this study, we have described the built heritage of Nicosia and the calcarenite quarries that provided the building stone.

For the archaeological sites we have predominantly relied on information provided by the Department of Antiquities, site visits with the Archaeologist in charge of the archaeological sites. During the site visits samples of calcarenite were collected. However, their characterization was not completed due to delays caused be the covid pandemic. Upon completion an addendum will be made to this case study.

For the listed buildings we relied on information provided by the Town Planning and Housing Department, their relative law and regulations and guidance notes for the conservation and maintenance of listed buildings. The Municipalities of Nicosia, Strovolos and Aglantzia provided us with information and photographs about listed buildings in their municipalities. Other published and unpublished information was also evaluated.

For the geology and the landscape characteristics of the calcarenite quarries we based our interpretations on the available, mostly unpublished, maps and reports of the Geological Survey Department. All accessible quarries were visited and samples of calcarenite were collected. Similarly, in the case of the archaeological sites, their characterization was not completed due to delays caused by the covid pandemic.

History of Nicosia in Brief

During the first millennium BC, when Cyprus was consisted of City-Kingdoms, Nicosia was nothing more than a small town that did not enjoy the power nor the prosperity of other kingdoms, which most of them lay on the coastline. However, Nicosia is probably the only area in Cyprus that can boast continuous habitation since the beginning of the Bronze Age, 2500 BC, when the first inhabitants settled in the fertile plain of Mesaoria.

After the dissolution of the City-Kingdoms at the end of the 4th century AD, Nicosia managed to exploit its natural resources and geographical location at the centre of the island. It had probably become the centre of administration and the capital of the island, in the late 10th century. It had acquired at that time a castle and was the seat of the Byzantine governor of Cyprus. The last Byzantine governor of the island was Isaac Komnenos who declared himself emperor of the island.

Richard the Lionheart, during the Third Crusade in 1191 AD, was on the way to the Holy Land with his fleet. One of his ships ran aground in Limassol and his fiancé Berengaria of Navarre was taken prisoner by Isaac Komnenos. Richard the Lionheart landed his army on the island and eventually defeated Isaac Komnenos and became ruler of the island. Richard the Lionheart sold the island to the Templars. The Templars placed their seat of power in the castle of Nicosia. On Easter day, 11 April 1192, the people of Nicosia appalled, drove the Templars away from the city. Fearing the return of the Templars, the people of Nicosia demolished the castle almost to its foundations.

The Templars sold Cyprus to Guy de Lusignan, King of Jerusalem, who brought many noble men and other adventurers from France, Jerusalem, Tripoli, the principality of Antioch and Kingdom of Armenia to the island. Nicosia remained the capital of the kingdom. Guy de Lusignan imposed a harsh feudal system and the vast majority of Cypriots were reduced to the status of agricultural labourers due to the feudal system that was imposed on them.

The fortifications of Nicosia

During the Lusignan period: 1192-1489 AD

The first Lusignan castle was built during the reign of King Henry I, 1211. On seals of the king and his mother Alix in 1234, a castle with one or two towers is depicted with the inscription 'CIVITAS NICOSIE'. Later under the reign of Peter I, 1368, a large tower named Margarita was built. In the upper part of the tower a church called Misericordia was built whereas below the surface of the ground there was a prison.

The entire city of Nicosia was fortified by Peter II who demolished the Margarita tower. The new walls had many gates, including:

- The Gate of St. Andrew
- The Gate of Sainte Venerande or Sainte Paraskevi
- The Gate of the Armenians
- The Gate of the market or Paphos.

The last Queen of the Kingdom of Cyprus Caterina Cornaro was born in Venice in 1454 and she was the daughter of a well-known and powerful family of Venice. Caterina Cornaro became a Queen of the Kingdom of Cyprus when in 1468, James II, became King and chose Caterina to be his wife and Queen. James II died in 1473, after a sudden illness, and according to the wishes in his will, the Queen acted as Regent. Caterina Cornaro ruled Cyprus from 1474 to 1489. In 1489, she was forced to cede the administration of the country to the Republic of Venice and leave the island.

During the Venetians period: 1489-1570 AD

In 1567, the Venetians decided to fortify the city of Nicosia. The new fortifications for the city were designed based on contemporary defense methods by the architect and engineer Julio Savorgnano. The design of the new walls it was circular with eleven bastions resembling with the shape of a star. The bastion design and build in the shape of heart and it was considered more suitable for the new artillery available at the time giving the defenders better control. The walls had only three gates, Kyrenia Gate to the north, Paphos Gate to the west and the largest to the east, Famagusta Gate, also named Porta Julia in honour of the architect. The new fortifications were built by demolishing the old fortifications and reusing the building blocks and the other construction materials. It worth pointing out that considering the policy

of the circular economy that we are trying to implement today, the building of the fortifications of Nicosia is a very good example of the implementation of this policy, considering the reuse of the construction materials, the relative short period of time and low cost for the completion the project.

The Venetian rule ended in 1570 AD., the Ottomans arrived on the island on the 1 July 1570 and on 22 July 1570, Piale Pasha and his army marched towards Nicosia. The Ottomans raised four earthen forts in order to protect themselves from the artillery of the city. Considering that these forts were too far away to produce damages, the Ottomans by entrenchments got close to the bastions Podocataro, Costanza, Davila, and Tripoli and they raised at once a royal fort and began to brisk and sustained bombardment. The Ottomans eventually mange to conquer Nicosia on the 9th September 1570.

The city of Nicosia, during the Ottoman rule, is characteristically described by travelers who visited the city between 17th and 19th century. Below are given the entries on the web-site of the Nicosia Municipality (https://www.nicosia.org.cy/en-GB/discover/nicosia/foreigns/) that presents the following descriptions of these travelers.

1619

"The city is very large, round in shape, fortified with eleven bastions and surrounded with a broad ditch. In size and situation, it is certainly the chief city of the island, but is full of ruins, squalid and defenceless, for the walls are breached or decayed, and could not withstand a regular attack or siege. The Pedeus, a torrent, flows by."

Cotovicus Joannes, *Itinerarium Hierosolymitarum et Syriacum in quo variarum gentium mores et instituta... recensentur*, Venete, 1619, p104.

1723

"The town was very beautiful under the Venetians but there is no ordinary Venetian architecture as can be seen from the remains. When the invaders conquered (in 1571) they destroyed everything, razing beautiful houses and palaces. And more splendid still is the Church of Sainte Sophia, converted into a mosque."

Basil Grigorovitch Barsky, *Travels 1723-1747*, St. Petersburg, 1885-7.

1800

"The ramparts of the Venetian fortifications of Nicosia exist in tolerable preservation; but the ditch is filled up, and there is no appearance of their having been a covert way. There are thirteen bastions; the ramparts are lofty and solid, with orillons and retired flanks. There is a large church converted into a mosque, and still bearing, like the great mosque at Constantinople, the Greek name S. Sophia: it is said to have been built by Justinian…

"The flat roofs, trellised windows and light balconies of the better order of houses, situated as they are in the midst of gardens of oranges and lemons, give together with the fortifications, a respectable and picturesque appearance to Nicosia at a little distance…"

Written by William Martin Leake who visited Cyprus in 1800. This is a study from the book by Robert Walpole, *Travels in Various Countries of the East; Being a Continuation of Memoirs Relating to European and Asiatic Turkey*, London 1818.

1849

"At the time of our visit, however, the town did not contain more than thirty thousand souls, eighteen thousands of whom were Christians, and the rest Mahometans. Under these unfavourable circumstances, many noble mansions, fit to be used as palaces for princes, are uninhabited, and neglected and fast falling to ruins. This is much to be regretted in a town where everything is favourable to man: the atmosphere clear and healthy; the soil productive, living cheap, and many yet untried resources of wealth and commerce."

Extract from: *Home Friend, a Weekly Miscellany of Amusement and Instruction*, Vol. IV, No. 86, circa 1849-50.

On 5 July 1878 the administration of the island was officially transferred from the Ottoman Empire to the British Empire. At the time of the British occupation, Nicosia was still contained entirely within its Venetian walls. Gradually there is revitalization of the urban development where several of the British administrative offices were built outside of the Venetian walls. Most of these buildings, churches and other landmarks in Nicosia are conserved and they are significant archaeological, cultural and religious heritage The British administration assessed all building with significant architecture and restore them. During the British administration new government buildings and other infrastructures were built with calcarenite from the neighboring quarries. In addition, a lot of new houses and mansions with neoclassical architecture were built during the 19th and 20th century. Most of them are listed and conserved.

Conservation of Cultural (architectural) heritage

The architectural heritage of each member state is an irreplaceable expression of the richness and diversity of our cultural heritage, an invaluable testimony to our past and a common good for all Europeans. For this reason, the Republic of Cyprus has adopted and / or signed all the agreements that have been made for the protection of the Architectural Heritage (Charter of Venice (1964), Declaration of Amsterdam (1975), Granada Convention (1985), International Charter for the Protection of Historic Cities (1987) the Valletta Convention (1992) for the protection of the archaeological heritage, etc.

By preserving the architectural and archaeological heritage, the preservation of the historical memory of each people and the improvement of the quality of life are ensured. Today, while the risks to the cultural heritage remain serious (alteration of the site (built and natural), abandonment, natural deterioration, etc.), the social perception of its value is increased. In addition, the rescue of traditional buildings has been found to help save natural resources and combat waste - issues very important for today's society.

The architectural heritage includes not only individual buildings of exceptional historical, architectural, archaeological value and their immediate surroundings, but also areas of historical or cultural interest or architectural ensembles that include all buildings of cultural value, from the most important to the simplest escort buildings. Such an example is Nicosia within the venetian walls

The conservation of the architectural heritage is achieved due to implementation of two national laws: The Antiquities Law and its amendments and the Town and Country Planning Law its amendments and regulations. These two laws provide the necessary tools to the competent authorities to implement successfully the conservation of archaeological sites and listed buildings.

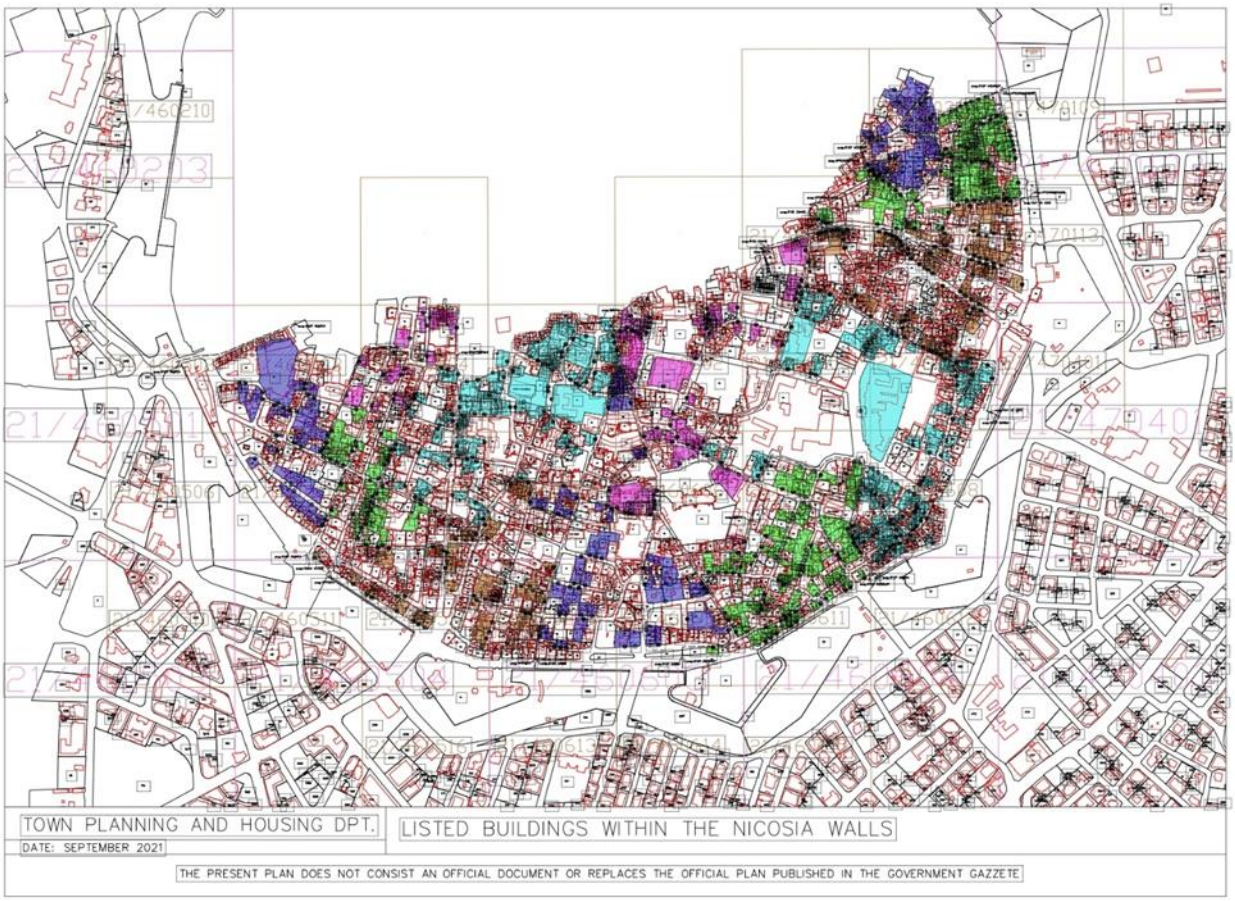
Good practices

According to the Antiquities Law and its amendments, antiquity is any object, movable or part of immovable property which is a work of architecture, sculpture, graphic art, painting, or generally any form of art which has through human effort been produced, sculptured, inscribed, or painted or generally made in Cyprus and they are older than 100 years old. In addition, the Council of Ministers, upon the request of the Director of the Department of Antiquities, may proceed to the declaration of any object, building or site that is considered to be of public interest by reason of historic, architectural, traditional, artistic or archaeological interest as an Ancient Monument. Buildings with traditional architecture which are listed as cultural heritage are protected by the Town Planning and Housing Law. The conservation of any archaeological sites is completely controlled by the Department of Antiquities through the implementation of its law. The conservation works are systematically supervised by its experienced personnel and its experienced in traditional building technics craftsmen. The conservation of the part of Venetian walls of Nicosia that is under the authority of the Antiquities Department is systematic. as it can be seen in Figure 1 shows an example of such conservation works.

Source: Department of Antiquities

Fig. 1: Conservation works of the external face of the Walls at the Pafos Gate after excavation

Regarding the conservation or maintenance of listed buildings, the Department of Town Planning and Housing is the competent authority. The Department of Town Planning and Housing, has developed series of plans on which the listed buildings are documented. An example of such plans is shown in figure 2 which displays the listed buildings within the Nicosia's walls in solid colors. The different colors indicate the parishes that exist inside the walls of Nicosia.



Source: Department of Town Planning and Housing

Fig. 2: A drawing of the listed buildings within the Nicosia's walls

Considering that the majority of the listed buildings are privately owned, the Department of Town Planning and Housing has issued general principles for their conservation. These principles in general:

(a) The conservation of a building shall involve the maintenance of all its elements (original traditional materials, construction details, "finishes", paintings / decorative elements, etc.), as well as its immediate environment and stairway. Consequently, any alteration that could change the relationships of its volume, shape, materials and colors is ruled out.

(b) New additions to the building must respect all its parts, its traditional context, the balance of its composition, its relationship with the environment and at the same time the additions must be separated from its original parts of the building, bearing the footprint of their time. Finally, the additions should be reversible as much as possible so that the building can be restored to its pristine condition (the principle of reversibility).

(c) In general, traditional materials and building methods shall be used and only where there is insufficiency of them, modern techniques can be applied, if and only if their effectiveness and compatibility with traditional materials have been proven scientifically and empirically.

(d) To the listed buildings can be given all the permitted uses, according to the current urban zones, provided that they respect the special character of the buildings (typology and morphology) and do not alter their structure.

Besides the above principles, the Department of Town Planning and Housing during the issuance of permit imposes a series of guidance rules which oversees during the conservation of the listed buildings. In order to encourage the preservation of as many as possible listed houses, the Department of Town Planning and Housing has the Buildings Grant Scheme. This scheme includes following:

A. The **financial incentives** are the direct sponsorship given by the State to the owner for the complete maintenance of the preserved building.

B. The **transfer of Building Factor** which is additional sponsorship in the maintenance cost by selling a given building factor.

C. The **tax incentives** are tax exemptions that can be taken by the owner of a listed building that has maintained it according to the Conservation Principles.

Besides the governmental Departments dealing with the conservation of the cultural heritage, the Municipalities can equally play important role the conservation of their built heritage. They can take advantage of financial incentives both from the Government and European Union. An example are the bi-communal priority projects within the walled city such as the Chrysaliniotissa Revitalization, the Conservation of the medieval Silihtar Aqueduct, Revitalisation of the Omerye Area etc. The aim of these projects is the intervention and conservation of selected homogeneous areas in the historic center of Nicosia, based on the areas' architectural character, social merits and economic viability. Another example are the co-funded projects by the Structural Funds of the European Union, the State Budget and the Municipality. Such a project is the reconstruction of the area of Takt-El-Kale, within the walls of Nicosia. Figure 3 shows a part of a neighborhood in the area of Takt-El-Kale, before and after the reconstruction of the buildings.

Source: Archive of the office of the Unified Master Plan of Nicosia, Municipality of Nicosia

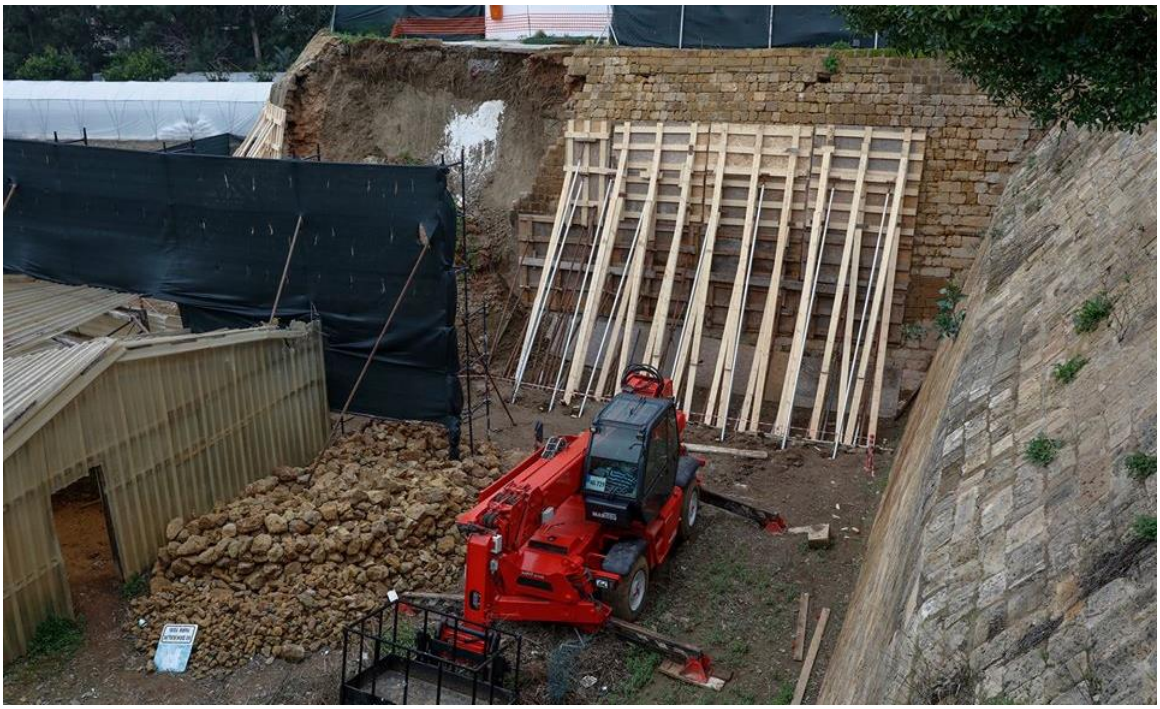
Fig. 3: Part of a neighborhood in the area of Takt-El-Kale, before and after the reconstruction of the buildings

Bad Practices

Listed buildings are often left intentionally uninhabited without any basic maintenance until ~~in~~ sometimes they totally collapse. Some owners knowing that they cannot obtain a permit to demolish a listed building employ this practice especially if they want to build a commercial block or a block of apartments in their plot. In cases of monuments as well, the lack of maintenance or conservation can lead to catastrophic events. Such an example is the collapse of part of the Nicosia's Venetian Walls in the areas where the Republic of Cyprus has not effective control. It should be pointed out that this case does not concern a private building, but an Ancient Monument and in fact the trademark of Nicosia. The negligence belongs to the Turk-Cypriot Community, not to an individual. Figure 4 shows the collapse part of the Venetian wall whereas the figure 5 shows the temporary measures taken to prevent further collapse of the walls. The restoration and conservation of this part of the walls has been undertaken by the Bicommunal Technical Committee for Cultural Heritage. For such landmarks related with the history of Nicosia, the preventive maintenance would be preferable.

Source: Technical Committee for Cultural Heritage

Fig. 4: Panoramic view of the collapsed part of the Venetian Walls



Source: Technical Committee for Cultural Heritage

Fig. 5: Temporary measures taken to prevent further collapse of the Venetian Walls

Another common bad practice is the sudden demolition of listed building without obtaining the necessary licenses. The owners of these listed buildings consider that the financial incentives provided by the Government are not substantial in order to reconstruct their property. Of course, sometimes this is the excuse because in reality the owner wishes to construct a new modern structure. The sudden demolition of listed buildings, in general, is done during weekends where the chances to have immediate intervention of the competent authorities or the reaction of the non-government organizations and the general public.

A couple of months ago, such an incident occurred. A demolition team started the pulling down of a listed building, without the owner to obtain the necessary licenses. In this case there was immediate reaction of the non-governmental organizations and the general public uploading stories and pictures in the social media. This caused the effective intervention of the competent authorities which forced the demolition team to stop and leave the site. Eventually, the Municipality of Nicosia came to an agreement with the owner to reconstruct it. Figure 6 shows the condition of the listed building during the attempt to demolish it.

Source: Katerina (Katia) Christodoulou

Fig. 6: A listed building during the attempt to demolish it

Archaeological Sites in Nicosia

Palaion Demarcheion (Old Town Hall)

The Palaion Demarcheion (Old Town Hall) archaeological site is located in the heart of Nicosia's walled old town. According to the Department of Antiquities, the first excavation period at this site started in June 2002 and the excavation continued until 2008. The excavations have revealed important information concerning the capital's history from the 11th century A.D. up until the 19th century A.D. In other words, from the middle Byzantine period until the British colonial period. More specifically, a large section of the Byzantine and Medieval town has been excavated, including two churches, the remains of monumental buildings, workshops, roads, wells etc. There is also evidence for human presence during the Middle Bronze Age period. The large number of moveable finds, mainly dating to the Byzantine and the Medieval period, present a rather clear picture of everyday life in the capital but also of Nicosia's commercial relations with other parts of the island and abroad. During our site visit, with the permission of the site Director, we noticed evidences indicating the repeated reuse of the building stones. The majority of the building stones were of calcarenite. The red arrow on the figure 7 indicates the archaeological site of the Palaion Demarcheion in Nicosia.

Source: Department of Antiquities

Fig. 7: An aerial of the center of the old town of Nicosia.

Hill of Agios Georgios (PA.SY.D.Y)

The archaeological site of the Hill of Agios Georgios (PA.SY.D.Y), according to the Department of Antiquity which carried for several years excavations, the site is a large settlement of the Hellenistic period, built on a grid plan with parallel roads from East to West at equidistant spaces and a wide central road from North to South across the settlement. Based on artifacts found such as terracotta, stone and metal were made on the site and weaving was also one of the major activities of the inhabitants. Earlier remains that were found date to the Archaic and Classical periods. Even though the architectural remains from these periods have not been preserved except on the edges of the slope, on account of the nature of the landscape and the rebuilding that took place at the beginning of the Hellenistic period. On the north part of the site, remains found indicate a continuation of the industrial activities into the Christian period, with a possible gap from the late 1st century B.C. to the 4th century A.D. and a series of superimposed church buildings take the history of the site to the beginning of the Venetian period. The construction materials used by the ancient inhabitants of this site are mainly two, calcarenite and pebbles from the nearby Pedieos river. There has been a visit to the site Director who permitted the collection of calcarenite form the site in order to be characterized. As mentioned earlier their characterization was not completed due to delays caused be the covid pandemic. Figure 8 shows an aerial photograph of the archaeological site of the Hill of Agios Georgios (PA.SY.D.Y) indicates the structure of the settlement.

Source: Department of Antiquities

Fig. 8: An aerial photo showing part of the archaeological site (South) of the Hill of Agios Georgios (PA.SY.D.Y)

The Venetian Walls (Fortifications)

As it is described briefly in the history of Nicosia, Cyprus became part of the Republic of Venice in 1489. The Venetian governors of the city recognized the need to fortify the city but initially nothing was done to improve the existing fortifications. It was until 1567, when the Venetians decided to fortify the city. This was due to the Great Siege of Malta in 1565, when fears of Ottoman expansion increased and many Christian states and the wiliness of noble citizens of the city to help and provide laborers and slaves for the construction of the fortifications.

The fortifications were designed by the Italian military engineers Giulio Savorgnan and Francesco Barbaro. The fortifications built during the Lusignan period, considered by the engineers as inadequate to defend the city. Thus, they were demolished to make way for the new walls. The Venetians also demolished several houses, churches and palaces within the city as well as buildings lying outside the new walls, both for the acquisition of building materials and for a clearer field of vision for the defense of the city. At the same time, the Venetians diverted Pedieos River outside the city to protect the residents from flooding and to fill the trench encircling the new walls.

The Venetian walls of Nicosia have a circular shape, with a circumference of 5 km (3 miles). The walls contain eleven pentagonal bastions resembling to the shape of a heart, similar to the bastions of Palmanova in Northeast Italy. The bastions are named after eleven families of the Italian aristocracy of the town, who donated for the construction of the walls. Figure 9 shows the Venetian Walls as they are today.

Source: Department of Antiquities

Fig. 9: An aerial photograph of the old town Nicosia and its Venetian walls.

Experts have considered the walls to be a prime example of 16th century military architecture. Their design incorporates specific innovative techniques, marking the beginning of a renaissance era in fortification construction. These include the positioning of gates to the side of the adjoining bastions, so they could be

more easily protected in times of siege, and leaving the upper half of the wall unlined with masonry, to increase its ability to absorb the impact from cannon shot. In fig. the Venetian Walls as they can be seen as they are today.

In figure 10, the shape of a bastion that resembles with the shape of a heart and part of the of the wall can be seen. The condition of the walls in the part of Nicosia where the Republic of Cyprus has effective control is very good due to their systematic maintenance by the Department of Antiquities.

Source: Department of Antiquities

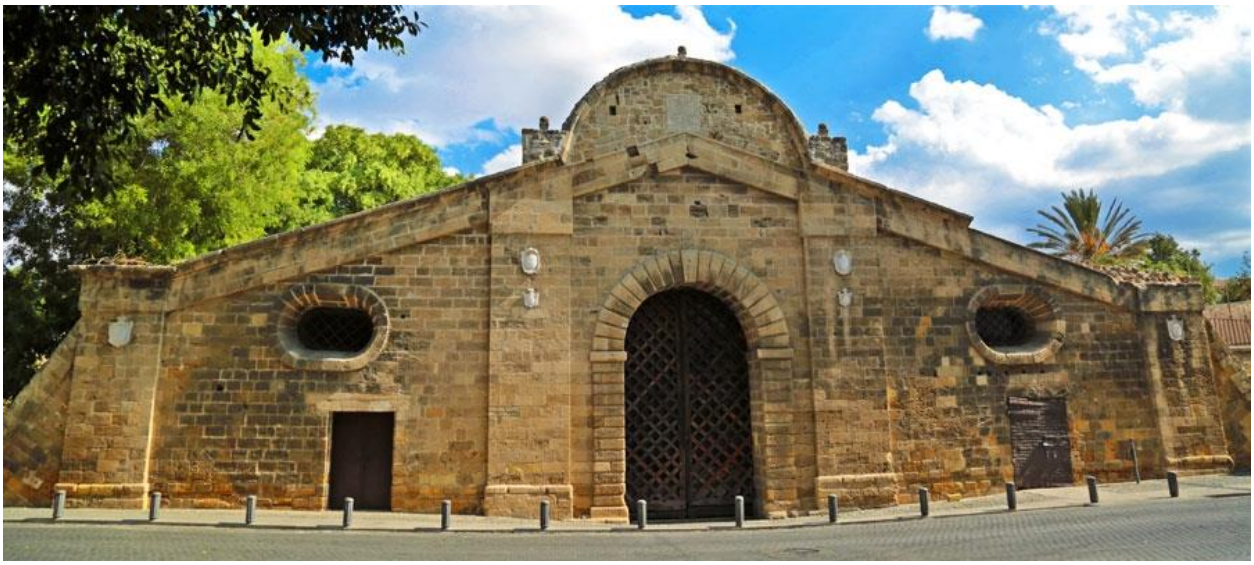
Fig. 10: An aerial photograph of the old town Nicosia and its Venetian walls.

The town has three gates:

The Paphos Gate (Porta San Domenico)

Source: Geological Survey Department

The Famagusta Gate (Porta Guiliana)



Source: Visit Cyprus

The Kyrenia Gate (Porta del Proveditore)

Source: Mr Glafkos Theodorou

Landmarks in Nicosia

Presidential Palace

The first English High Commissioner Sir Garnet Wolseley, who came to Cyprus in July 1878, lived temporarily in the Metochi of the Kykkos Monastery, outside the walls of Nicosia. He soon changed his temporary residence and lived in the Commissariat, which was a wooden house imported from abroad and placed on the site of the current Presidential Palace.

In 1925 the Commission was renamed the Government House.

In the popular uprising of 1931, the Government House was destroyed by fire and it was decided to build a new Government based on traditional architectural elements of the place.

The new building was designed by Maurice Webb of the firm of Sir Aston Webb & Sons, Westminster, London. The construction of the Government House was undertaken by the Government Department of Public Works of Cyprus. It was preceded by visits to various traditional buildings in Cyprus, where remarkable local traditional architectural elements were identified and copied.

Byzantine and Gothic elements, but also a few Turkish ones, compose the architecture of the building. For the general construction of the building, calcarenite (pouropetra) was used from quarries Gerolakkos for its light gray-yellow color, hardness and durability.


Source: Cyprus Presidency

Fig. 11: The front and back view of the Presidential Palace in Nicosia.

Metochi of the Kykkos Monastery, Engomi

The exact foundation of the Metochi of the Kykkos Monastery it is not precisely historically documented. The development of the Metochi to the form that we see it today started in the 19th century. One of its first works was the construction of the new church of Agios Prokopios, which, according to an inscription on the outer west wall, was completed in 1861. Extensive renovation works carried and were completed in 1922.

It worth mentioning that one of the most important aspects of the history of the Metochi in the first years of British rule, is related to the installation in the Metochi of the first British Commissioner on the island, Garnet Wolseley, in the summer of 1878.

Source: Geological Survey Department

Fig. 12: The front view of the Metochi of the Kykkos Monastery.

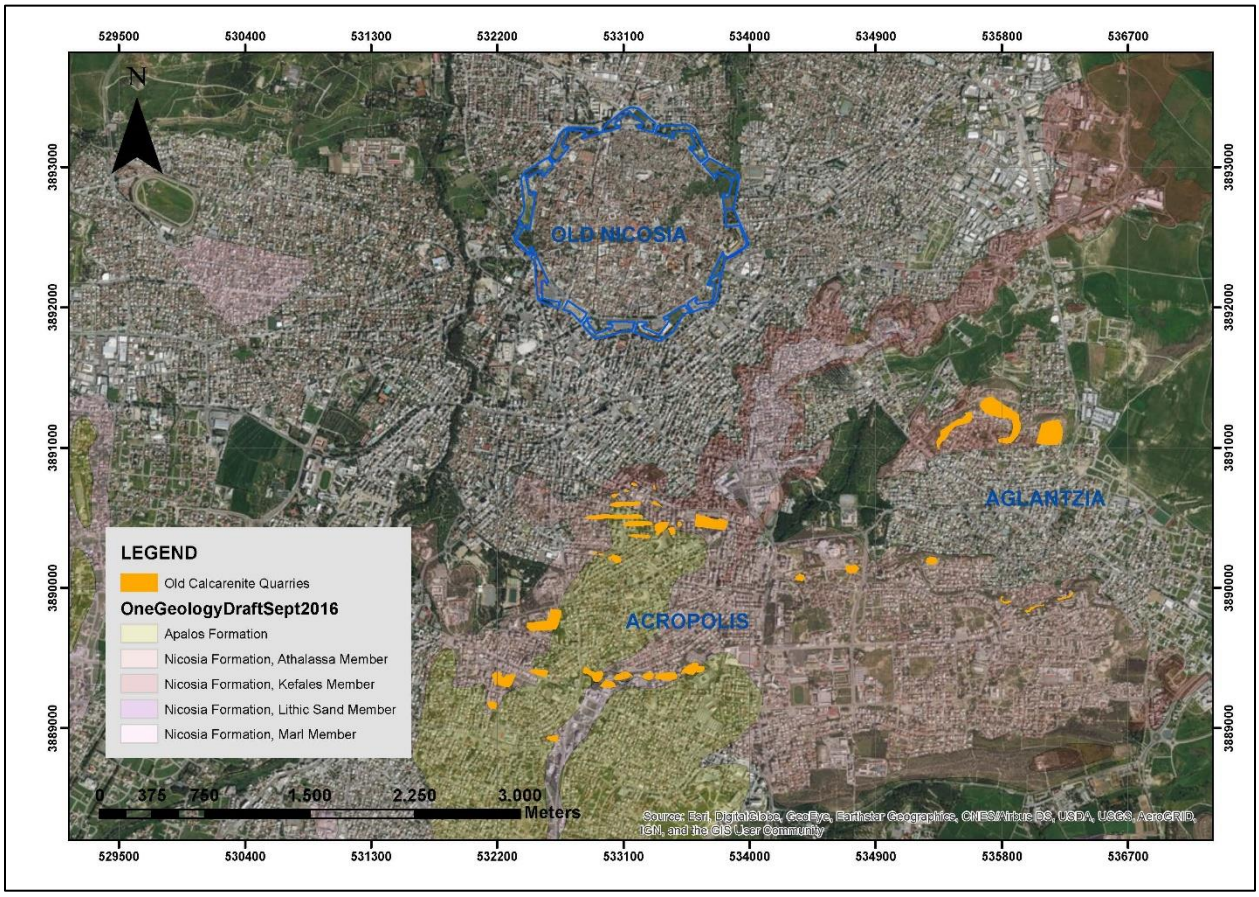
There are many other landmarks and listed houses that a small sample of them is presented in Annex 1.

The Geology and the quarrying in Nicosia

Calcarenite, locally is known as “pouropetra or porolithos” due to its high porosity. It has been used predominately as building stone in many buildings belonging to the architectural heritage of Nicosia. This calcarenite has been exploited from outcrops of the Athalassa member of the Nicosia Formation, which consists of massive beds of fossiliferous, medium to coarse-grained, cross bedded calcarenites, interbedded with lesser thin beds of sandy fossiliferous marl. Based on age constraints provided by paleontological data indicate that the scattered occurrences of calcarenite facies were deposited at different times in the Pliocene.

The exploited layers of calcarenite consist of grains that range from sand to fine gravel in size and they are in general well sorted. Grains are from very angular to sub-rounded, depending upon the texture of the exploited layer of calcarenite. In general, consists of fragments of fossiliferous limestone, dolomite and small portions of siliciclastic grains including chlorite, quartz, potassium feldspar, plagioclase and others. The sediments are cemented mainly with sparry calcite but there are cases where micrite is present as well. The latter indicates that the main source of the sediments are older limestones of the sedimentary sequence with limited contribution of the dolomitic limestones of the Pentadactylos mountain range and the of siliciclastics from the igneous rocks of the Troodos mountain range. The porosity of the calcarenite of Athalassa member is as high as 50% and its specific gravity (dry) is around 1,5 g/cm^3.

Figure 13 shows Satellite image of broader area of Nicosia with the geological units of Nicosia. The yellow polygons show the mapped calcarenite quarries in Nicosia.



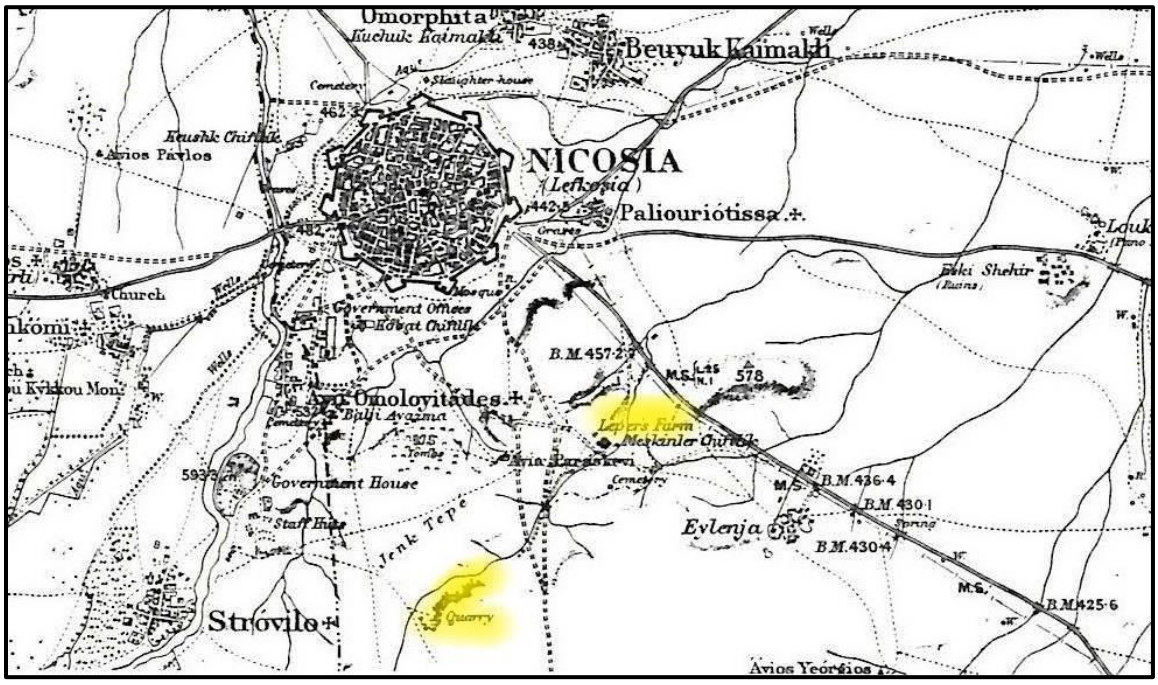
Source: Geological Survey Department

Fig. 13: Satellite image of broader area of Nicosia. The yellow polygons are the mapped underground calcarenite quarries.

Quarrying of Calcarenite in Nicosia and other nearby sites

Considering the long history of the building heritage of Nicosia and the extensive use of calcarenite since antiquity, organized quarrying in the surrounding area must have existed at least since medieval times. Based on the topography of the quarries that we know were operating during the last century, we can infer that the extraction initially was done in open cast quarries and when they formed cliffs with considerable inclination were formed, underground quarrying was undertaken. Under the British administration H.H. Kitchener started in 1882 a Survey of Cyprus, which resulted in the publishing of a detailed map of Cyprus in 1885. Figure 14 shows detail of that map of the broader area of Nicosia, where the two areas highlighted with yellow indicate the quarrying sites near Nicosia. The first one, the Lepers Farm, based on historic references, was an area of older quarries that hosted at that time lepers. The second one which is referred to as quarry is located in Acropolis. Based on the symbology o the map we can deduce that part of the quarry was open cast. Based on further evidences provided from mapping the polygons shown in figure 13, there was extensive underground quarrying at the time. Based on surveys carried out by the Geological Survey Department such underground quarries are located in the areas of

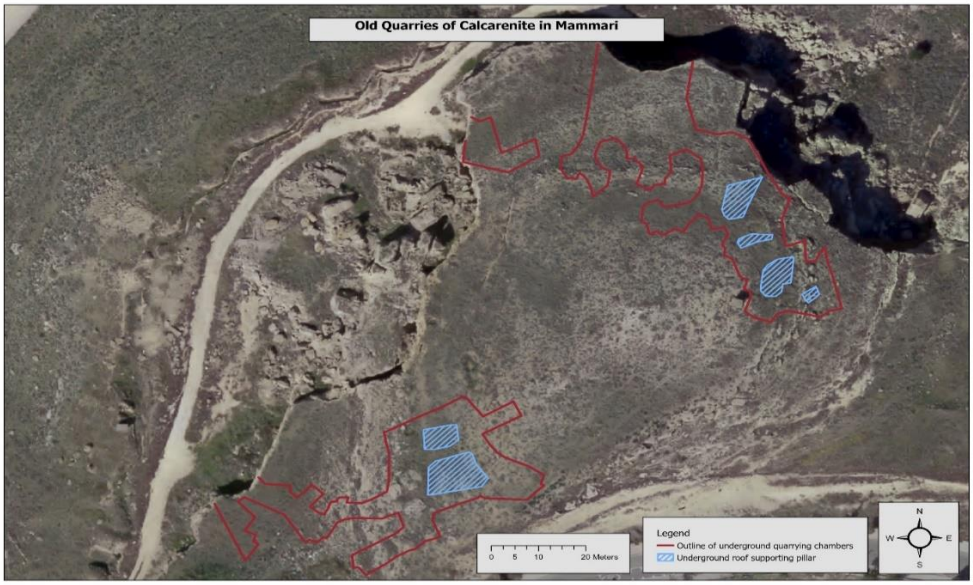
the city of Nicosia and especially in Aglantzia, Agia Paraskevi, Dasoupoli, Acropolis and west of Nicosia in Mammari and Gerolakkos villages.



Adaptation by Geological Survey Department

Fig. 14: Adaptation from the Kitchener's map of Cyprus showing the broader area of Nicosia indicating locations with quarrying of calcarenite.

The underground quarries in Mammari were mapped by the Geological Survey Department and were geotechnically evaluated.



Source: Geological Survey Department

Fig. 15: Satellite image showing the underground calcarenite quarries in Mammari village.

The quarried calcarenite (pouropetra or porolithos), as mentioned before, was used for the construction of walls, palaces, mansions, churches and monasteries. The Venetian walls of Nicosia have been built and covered with stone of the above areas. Based on architectural characteristics of the built heritage of Nicosia it is obvious that the quarries produced a variety of products such as ornamental, dimensional, irregular shape and size of calcarenite and fine sand.

This loose sand material obtained from the various calcarenite quarries around Nicosia is locally known as “pouri” and it is still used today as a ground fill in various urban land uses. Characteristically it is used in ground laying of playground areas, parks and in school yards. A recent urban soil geochemical investigation of the Nicosia area showed characteristic geochemical signatures of this material with elevated levels of arsenic although not posing a health risk highlighted the need for regulation in the use of transported materials (Zissimos et al 2017). Geochemical analysis of loose sand material shows high concentrations of Ca (~30 %) as well as the following major elements Fe (1-2 %), Al (0.5-1 %), Na (0.02-0.05 %), K (0.1-0.2 %), Mg (0.6-0.7 %), Ti (0.2 %). All measurements carried out after acid dilution of the material.

The use of the above products is shown in figure 16. The sand was used in mortars. This indicates that the quarry men were utilizing the maximum possible use of calcarenite, implementing principles of the circular economy as we understand it today.

Source: Geological Survey Department

Fig. 16: On the left picture a listed house built exclusively with dimensional and ornamental stone. On the right the walls are built with irregular shape and size pieces of calcarenite.

From the locations of calcarenite quarries mentioned above, only quarries in Gerolakkos are operating today. Even though Gerolakkos is located int the part of the island not under the effective control of the government of Cyprus. This building stone however is tradeable through the Green Line based on the "Green Line Regulation" (Council Regulation 866/2004) and is used both in the reconstruction of listed houses as well as in newly built structures.

The landscape of the underground quarries

The quarry men were usually extracting the layers of calcarenite that would produce good quality of blocks of building stone. In general, the quarrying was done following the strike and dip of the layers of calcarenite that would be extracted. In Figure 17, the left picture clearly shows the dipping layer that was quarried. On the right picture of the same figure the layers of calcarenite are essentially horizontal thus

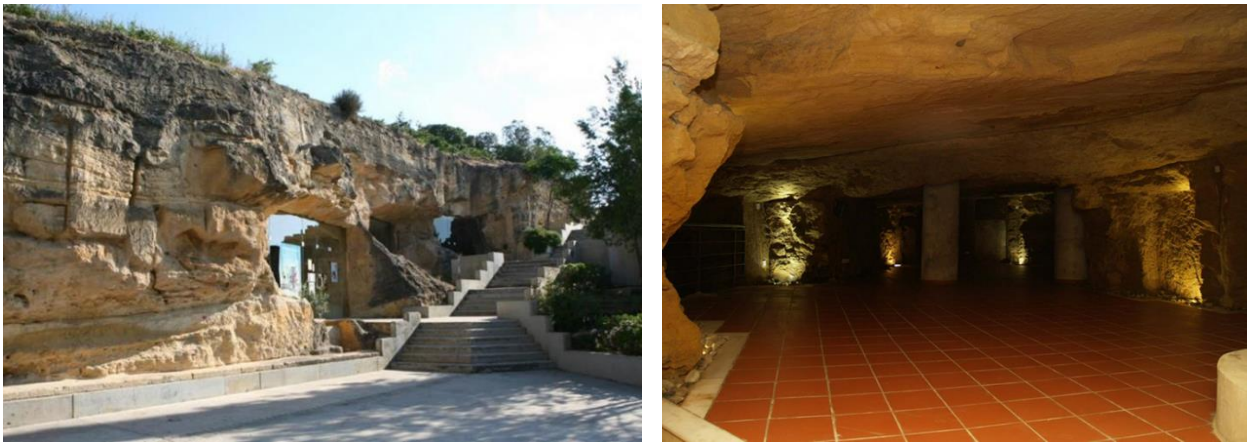
higher and wider chambers are developed. In the cases where the quarrying chamber would become big enough, they would leave a pillar to support the overlaying layers or "roof" of the chamber approximately in the center. The underground quarries (caves), in some cases, reach a depth of 18-20 meters and in several cases amount to hundreds of square meters.

These underground caves produced by the quarrying of calcarenite were used in the past as mentioned before to host lepers, as pet stables and also as housing for poor families of homeless people of that time.

Source: Manos Manoli (Botrini)

Fig. 17: Inside view of quarry landscape (cave) was developed during the exploitation of calcarenite for the production of building stone. The left one shows the landscape of a cave in Acropolis in the premises of the Headquarters of the Cyprus Telecommunications Authority (CYTA) and the right one is located in Mammari west of Nicosia.

Two of these underground quarry landscapes (caves) with the initiative of the local municipalities have been preserved. One case is "the Skali" and the other "the Caves of Acropolis" in Aglantzia and Strovolos municipalities. Both sites are used for hosting cultural events and exhibitions. At the moment part of "the Skali" is not in use due to corrective construction works performed to handle some geotechnical issues. Figure 18 on the left picture the external view of "the Skali" is shown and on the right the "Caves of Acropolis" in Strovolos.



Source: Geological Survey Department

Fig. 18: On the left the external view of "skali" in Aglantzia and on the right the interior of the "Caves of Acropolis" in Strovolos.

The underground quarry landscapes shown in figure 17 have not been conserved as quarry heritage. In the entrance of the cave in the Headquarters of CYTA, it has been put fill material preventing the entrance to anyone. In the case of the quarry landscape in Mammari, the area was declared as Natura 2000 due to the fact it is considered an ecological niche for bats. Unfortunately, the geological conditions of the caves were not considered during the declaration as Natura 2000. Already in the big cave in the east there was a collapse of the overlaying layers and therefore daylight is entering the cave driving the bats away. The other big cave in the west as it is shown on figure 19 there are cracks on the roof and in some cases in the walls. Unless there are works to support the overlaying lays, one day will collapse losing both the ecological niche for bats and the quarrying heritage.

Source: Manos Manoli (Botrini)

Fig. 19: Inside view of quarry landscape (cave) that shows cracks on the overlaying layers and on the walls.

Conclusions

This case study, which is just indicative and definitely not comprehensive of the built heritage of Nicosia, tried to describe a sample of conserved archaeological sites and historic buildings and the related quarry heritage. The built heritage of Nicosia and the whole island even though is so reach, gradually a part of it is lost mainly due to abandonment and lack of maintenance. The Geological Survey Department, and in particular, all listed houses and old quarries must be recorded for future reference, but also for evaluation because some of them to have such characteristics that may worth conserving. Unfortunately, due to Covid-19 pandemic it was not for the Geological Survey Department to search the State Archives for information concerning the calcarenite quarries in Nicosia and to characterize samples taken from archaeological sites and old quarries as originally intended. This will be done in the near future and this study case will be amended.

Acknowledgements

We are grateful to the staff of the Departments of Antiquities and Town Planning and Housing, the Municipalities of Nicosia, Strovolos and Aglantzia and all the individuals that provided valuable information and photographs.

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ANNEX 1: PHOTO ALBUM

Source: Geological Survey Department

Site museum located in the Hill of Agios Georgios (PA.SY.D.Y) archaeological site and belongs to Department of Antiquities

Source: Geological Survey Department

The building of Greek embassy in Cyprus

Build heritage of Gladstonos Street (mainly private mansions)

Source: Dr Vassiliki Kassianidou

Source: Dr Vassiliki Kassianidou

Source: Dr Vassiliki Kassianidou

Source: Dr Vassiliki Kassianidou

Source: Dr Vassiliki Kassianidou

The building hosting the Archaeological Research Unit (ARU) of the University of Cyprus

Source: Geological Survey Department

The building of the old central offices of the Cyprus Telecommunications Authority recently renovated

Listed buildings in Storvolos Municipality

Source: Geological Survey Department

Cultural center of the Strovolos Municipality

Source: Geological Survey Department

Agios (Saint) Varnavas Seminary

Source: Geological Survey Department

Private house

Source: Geological Survey Department

Private house

Source: Department of Antiquities

Church of Saint George, Strovolos

Source: Department of Antiquities

Church of Panagias Chryseleousis, Strovolos

Use of calcarenite in new buildings

Source: Geological Survey Department

The central offices of Sewerage Board of Nicosia

Source: Geological Survey Department

Private bank