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Cultural Heritage and Science (CUHES)

Cultural Heritage and Science (CUHES) is an interdisciplinary academic, refereed journal for scholars and practitioners with a common interest in heritage.

Aims and scope

Provide a multidisciplinary scientific overview of existing resources and modern technologies useful for the study and repair of cultural heritage and other structures. The journal will include information on history, methodology, materials, survey, inspection, non-destructive testing, analysis, diagnosis, remedial measures, and strengthening techniques.

Preservation of the architectural heritage is considered a fundamental issue in the life of modern societies. In addition to their historical interest, cultural heritage buildings are valuable because they contribute significantly to the economy by providing key attractions in a context where tourism and leisure are major industries in the 3rd millennium. The need for preserving historical constructions is thus not only a cultural requirement, but also an economic and developmental demand.

Therefore, Cultural Heritage and Science (CUHES) cover the main aspects related to the study and repair of an existing historical artifact, including:

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- ✓ General criteria and methodology for study and intervention
- ✓ Historical and traditional building techniques
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- ✓ Non-destructive testing, inspection, and monitoring
- ✓ Experimental results and laboratory testing
- ✓ Analytical and numerical approaches
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- ✓ Innovative strategies and techniques for repair and restoration
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- ✓ Remote Sensing applications for cultural heritage
- ✓ Archeologic studies
- ✓ Architecture studies
- ✓ History of Art studies
- ✓ Description of novel technologies that can assist in the understanding of cultural heritage.
- ✓ Development and application of statistical methods and algorithms for data analysis to further understanding of culturally significant objects.
- ✓ Computer sciences in cultural heritage

The main objective is to provide an overview of existing resources useful for the rigorous and scientifically based study of the state of ancient structures and to present state-of-the-art novel research in the field. The journal will publish review papers, research papers, and detailed case studies. Interdisciplinary contributions will be highly appreciated.

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Survey of Urbanization and Rural Settlements in Rough Cilicia during Antiquity

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Keywords
Rural Settlements,
Rough Cilicia,
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Mersin

ABSTRACT

Our surveys in the eastern part of Rough Cilicia led to the identification of numerous ru-ral settlements. The survey area is bounded by the Kalykadnos (Göksu) and Lamos (Limonlu) rivers and lies between Erdemli and Silifke, districts of Mersin province. In the course of our surveys in the region numerous settlements of varying sizes and dating to various periods have been documented. Areas were visited and surveyed using total station and GPS and their topographic maps were drawn. Aerial photos were taken, as well. Evaluation and interpretation of data obtained from the surveys started to be made using different techniques. In this context, we initiated the interpretation of the spatial organization and settlement stages of agricultural activities in Rough Cilicia by employ-ing geographical information systems and spatial-correlative analysis methods. Thus, we hope to derive scenarios regarding the spatial organization of agricultural activities in Antiquity based on common model(s) identified by transferring the archaeological finds to GIS and employing the spatial correlative analysis methods. Studies brought to light new data regarding the geographic/climatic and social/political conditions that paved the way for the emergence of the rural settlements in this region. Archaeological evidence supports the existence of architecture and relevant production increasing toward the end of the 2nd century and into the 3rd century A.D. Most of settlements stand out with their well-preserved remains. Remains recorded at settlements belong to a time span from the Hellenistic period through late antiquity. As a result of the surveys completed in the region, a large number of rural settlements displaying typological variety were documented. Among these were both simple and complex farms; small, medium and large villages that were situated close to towns; and workshops for processing agricul-tural products, either in a village or in independent operations. The existence of these ru-ral settlements indicates the important role different types of agricultural production played in antiquity's regional economy. Further, it shows how these rural settlements gave shape to the settlement of the region. Within these settlements, a large number of agricultural installations were encountered and documented.Conservation, reinforcement and restoration of architectural heritage requires

1. INTRODUCTION

Our surveys in the eastern part of Rough Cilicia led to the identification of numerous rural settle-ments. The survey area is bounded by the Kalykadnos (Göksu) and Lamos (Limonlu) rivers and lies between Erdemli and Silifke, districts of Mersin province. It is known that this area was within the territory of Olba ruled by a priest-dynasty during the Hellenistic period and became part of the province of Isauria during the reign of Diocletian. The surveys of the rural settlements from the Hel-lenistic through Byzantine periods aimed at identifying similarities and differences among these settlements and the evolution of a settlement pattern through time.

With its long coastline, Rough Cilicia not only forms part of the southern coastline of Anatolia but also is at an important position in the East Mediterranean. Taking into consideration this strategic importance the region has it would be expected to encounter developed urbanization; however, wide land is limited due to the

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Taurus Mountains extending parallel to the coastline and the rugged topography affects urbanization. Therefore, the settlement pattern of the region encompasses ancient cities located on the coastline and rural settlements in the rough terrain connected with those cities.

In the course of our surveys in the region numerous settlements of varying sizes and dating to vari-ous periods have been documented. Areas were visited and surveyed using total station and GPS and their topographic maps were drawn. Aerial photos were taken, as well. Evaluation and interpre-tation of data obtained from the surveys started to be made using different techniques. In this con-text, we initiated the interpretation of the spatial organization and settlement stages of agricultural activities in Rough Cilicia by employing geographical information systems and spatial-correlative analysis methods. Thus, we hope to derive scenarios regarding the spatial organization of agricultur-al activities in Antiquity based on common model(s) identified by transferring the archaeological finds to GIS and employing the spatial correlative analysis methods. Upon completion of this work we plan to reveal our model of the settlement staging that occurred between the urban and rural settlement areas in Antiquity by transferring to GIS the settlement network in Rough Cilicia.

Studies brought to light new data regarding the geographic/climatic and social/political conditions that paved the way for the emergence of the rural settlements in this region. Archaeological evi-dence supports the existence of architecture and relevant production increasing toward the end of the 2nd century and into the 3rd century A.D. Most of settlements stand out with their well pre-served remains. Remains recorded at settlements belong to a time span from the Hellenistic period through late antiquity. Settlements of Hellenistic character within the survey area are parts of a common defense and settlement system. Our recent surveys have noted a high number of Hellenis-tic settlements in the countryside in the survey region. These settlements remained inhabited after the Hellenistic period. Furthermore, many more settlements of rural character were also founded during and after the Roman period.

In the concerned region, valleys and roads connecting the coastline to the interior facilitating com-munication constitute an important geographic factor leading to the foundation of settlements. That many settlements have been identified along these routes is of importance to cast light onto the connection between the ancient cities and chora.

As a result of the surveys completed in the region, a large number of rural settlements displaying typological variety were documented. Among these were both simple and complex farms; small, medium and large villages that were situated close to towns; and workshops for processing agricul-tural products, either in a village or in independent operations. The existence of these rural settle-ments indicates the important role different types of agricultural production played in antiquity's regional economy. Further, it shows how these rural settlements gave shape to the settlement of the region. Within these settlements, a large number of agricultural installations were encountered and documented.

1.1. The Survey of the Rural Settlements

The ancient site of Tapureli is one of them. Tapureli is nearly 36 km northwest of Erdemli in Mersin province. The objective of this study was to determine the character of the settlement and to review the changes it underwent throughout different periods, as well as to learn its layout and plan. To achieve this, archaeological studies conducted in this area focused on documentation under the three main headings: 1) determine the borders of the settlement so as to understand the fabric of the rural settlement, 2) evaluate the settlement's fabric, and 3) use new technology for this. Tapureli stands out with its ruins and location among the rural settlements in the region. The settlement was established on three hills on the side of an important valley known as the Lamos Valley. It was also situated on a route used during antiquity. It appears that the settlement kept the valley roads under control as well. The data we obtained reveals that the site was inhabited from the Hellenistic period into Late Antiquity.

Hellenistic Period Settlement:

The settlement is located as an acropolis on the edge of the valley. In previous seasons, a tower dominating the valley road from the shore had been identified on the West Hill. Studies from this season, on the other hand, have uncovered another castle from the Hellenistic period on the north end of the same hill. In terms of its location, the cas-tle overlooks the northern connections of the route and stands out with development around it. This area encompassed two large, well-preserved cisterns, and remains of numerous spaces. Both the acropolis location of this tower and castle, and the polygonal wall technique they feature, are among the characteristics of the Hellenistic citadel settlements in the region. Many buildings dated to the Hellenistic Period were also identified in the settlement. These buildings are located on the southern slopes of West Hill. One of these stands out with its polygonal walls of fine workmanship and well-preserved state. The size of the two-story building and its current condition indicate the splendor of the settlement during the Hellenistic Period Another building with polygonal walls in the settle-ment, on the other hand, features a relief of a shield and sword. This relief is one of the known Olba symbols of the Hellenistic Period in the region.

Roman Period Settlement:

There is plenty of evidence indicating that Tapureli was also an im-portant settlement during the Roman Period. Among this evidence are the numerous examples of houses that stand out. There is also data signaling that buildings of Hellenistic Period were used, albeit with annexes, during the Roman Period. Houses on the north slope of East Hill were identi-fied as Roman. The large ashlar blocks used in their construction, the door and window workman-ship, and the niche and the eagle relief inside one of the spaces are all characteristic of buildings from the Roman Period. Among the other remains that point to the Roman Period are the rock-cut reliefs. The well-preserved reliefs of soldiers in the housing areas within the settlement are among these. The soldier reliefs in question were previously studied and

published (Durugönül, 1989). Similarly, there is evidence of a cult area/sanctuary with figures from the settlement and the presence of various rock symbols. The most important and richest data of the Roman-Period settlement were derived from the tombs. It was discovered that the South Hill in the settlement was used as the necropolis. The necropolis continues along the skirt of the hill as it descends towards the valley and the interior of the valley. As part of this season's work, the tombs on South Hill were identified and documented. Works on the large necropolis were initiated, but not yet completed. Serious damage and illicit digs were noted in the area, and the necessary legal process regarding this damage was initiated. Rock tombs constitute the largest group among the tombs in the settlement. Fifty rock-cut tombs were documented in the excavations conducted on the slopes of South Hill. In addition to that, forty-five chamosoria, three rock sarcophagi, four vaulted tombs, and six temple-type monumental tombs were identified and documented. The rock-cut tomb examples located along the slopes of the hill have no ornamentation on the façade. The tombs do not contain a special porticus at the entrance. The doors of the tombs open to the middle of the tomb chamber carved into the living rock. The chambers inside the tomb are almost square in shape and have either flat or slightly rounded roofs. Some tombs feature beds elevated from the living rock within the arcosolia, whereas other only contain stone beds or simply use the floor. The chamosoria in the settlement carry triangular lids on the tomb carved in rock. In some examples, the presence of grooves on the side of the rim upon which the lid is set catches the eye. The tombs have a conic form widening towards the base, and the headrest for the deceased's head is slightly elevated from the base. Examples of temple-type tombs were also identified in the settlement. They are comprised of tomb chambers carved into the living rock, as well as front façades of the temple before them. Publications on these tombs are still in progress. A limited number of vaulted tombs identified in the settlement, on the other hand, are damaged. While one single example has been well preserved, further excavations are needed in order to under-stand its interior structure.

Late Antiquity Settlement:

The extant and preserved buildings of Tapureli point to Late Antiquity as their last period of use. Nevertheless, we observed that buildings from the Hellenistic and Roman Periods were used during Late Antiquity as well. Churches and houses stand out among the remains from this period. Our research across the settlement has revealed the presence of eight churches and a chapel, not seen in any of the ancient cities in the region. Some of these churches were recorded by previous travelers in their well-reserved state. Nevertheless, our research has led to the discovery of four more churches and a chapel. The churches predominantly have a triple-nave layout, and a plethora of evidence suggests the presence of rows of columns constituting the naves. The architec-tural plastic decorations they feature are rather rich and have been documented. A graduate thesis on the churches in the settlement is still in progress. The houses in the settlement offer important information about the domestic architecture in the region with respect to their well-preserved state and architectural ornamentation. They are spread across the entirety of the settlement. Built with large ashlar blocks, these buildings have two or three floors. Their façades face southwest. They all have courtyards in the front or inside, and the cisterns in their courtyards stand out. The streets in front of the houses draw attention to their well-preserved state, and it appears that the entire settle-ment was covered with a web of streets. This condition points to the presence of planning in the settlement.

Our studies have revealed the presence of an avenue surrounding the ancient settlement. This set-tlement can be observed on the skirts of all three hills and reach the acropolis after traversing the entire hillside across the South Hill. Considerably well preserved in this area, the avenue is support-ed by terracing at different points. It appears that the avenue crosses underneath a propylon in this area and reaches the hill. Identified in earlier studies, the propylon was documented this year. After crossing beneath, the propylon, the avenue continues in this area and connects to a building, which we believe is possibly a church.

The ancient site of Kanytellis is another of them. It is located in the eastern part of Rough Cilicia 3 km. from the Mersin – Silifke highway about 60 km. west of Mersin. The settlement is situated around the chasm here. Abundant archaeological evidence reveals that the settlement that began in Kanytellis in the Hellenistic Period continued into the following ages, and the surface remains sug-gest the existence of intense settlements during the Roman Period and Late Antiquity. Furthermore, well-preserved remains of a church by the chasm indicate that the settlement had developed in Late Antiquity and acquired a different character. In addition to the churches from this period, numerous dwellings and olive oil production facilities evidence a significant production centre (Aydınoğlu et al., 2015). Few remains from the Roman period can be discerned on the surface of the Kanytellis settlement. The most re-markable among those are the tombs (Aydınoğlu, 2015). The available evidence suggested that the settlement was surrounded by a necropolis. Dense vegetation does not allow a comprehensive investigation of this area so only some monumental tombs have been studied until now. But as a result of studies made on site, we had a chance to examine several new tombs. Contrary to previous suggestions, we have identified more than two necropoleis that surrounded the settlement. In these were found tombs and mausolea with characteristics entirely different than others discovered previously. Scattered over a large area, new temple tombs and burial chambers were also discovered. The tombs feature different characteristics such as temple tombs, burial chambers, rock tombs, sarcophagi and a mon-umental exedra tomb. We observed that the terraces rising to the north and dominating the chasm were specifically preferred for the necropoleis, and they contained a rich variety of tombs types. The area terraced on the northern slopes covers around 4.5 ha., and in it many tombs of different types have been identified. One other necropolis in Kanytellis was found on the slopes about 750 m. northwest of the site. It contained numerous individual sarcophagi as well as many sarcophagi with a hyposorium and a temple tomb. Another area with dense

tombs identified southwest of the chasm, where also sarcophagi and monumental tombs are found, seems to have served as a quarry in ancient times. In the sinkhole named Çanakçı, located 350 m. west of the chasm, there is another necropolis with rock tombs. This is the most renowned necropolis of Kanytellis, thanks to its reliefs. After the initial examinations in the necropoleis, we established 100 different tomb types. Three temple tombs in these necropoleis – called T6, T12 and the tristyle prostyle temple tomb – have al-ready taken their place in various publications for their specific characteristics. But one other temple tomb has been recently discovered. Also, burial chambers have been identified throughout the set-tlement. These structures were built with small stones and mortar. It is understood that they were vaulted over. In some cases, it was observed that the roof was a pitched type and covered with a thin layer of mortar. But the most common type of tombs in Kanytellis is the sarcophagi. On some of the sarcophagi decoration observed both on the basins and the lids provide significant evidence to explain the burial traditions of their period as well as to give essential criteria for their dating. The front sides of the sarcophagi were decorated even though some have decoration on the lateral sides as well. The most common decorations are bunches of grapes, leaves of ivy, altars, inscriptions and reliefs on tabula ansata. On one of them are a female and a male bust as well as a garland. All data collected so far indicate that the sarcophagi appeared first in Kanytellis in the mid-2nd century A.D. and stayed in use throughout the 3rd century A.D. Moreover, we also observed that the use of sar-cophagi in Kanytellis from the Roman period continued into the Early Christian period. There are also examples of rock tombs found in the settlement, all of which are located in the Çanakçı ne-cropolis to the west. On the slopes of the sinkhole 18 rock tombs were identified among which 13 were built adjacent to each other on the southern slope as much as the topography would allow. There are plain rock tombs without any decoration on the façade. However, there are inscriptions and reliefs on the tops and sides of the tombs. The semi-circular structure north of the chasm seems to be an exedra tomb. It is significant that there is no other example of this type within the region. Its semi-circular form, blocks with profiled fronts, blocks forming the base profiled as a row of seats and stepped entrance to the monument suggest that the interior of the structure was also used. All of these characteristics reveal its functional features and exedra form. On the other hand, consider-ing its location at the northern necropolis it should have been used as a monumental tomb.

In the campaign, extensive focus was turned to farmsteads of rural settlements. The well-preserved remains within the farms made it possible to formulate regional classifications and document their specific characteristics, thereby helping in the dating process. In the survey area, the initial finds showed there were different types of farmsteads, varying from simple to the more complex. Some were quite large and with complex architectural development. Such farmsteads included a farm-house for the farm owner or manager, and rooms used as workshops or depots. Frequently, there were many other houses, as well as different types of graves, production installations, sacred areas and cisterns. Evidence would indicate these farms, through the entire period of their existence, un-derwent continuous use and re-use, with some structures added, or enlarged as necessity demanded. The fronts of the owners' farmhouses faced south or southwest, and some opened onto a courtyard. The farmhouses were generally two-storied, with the lower level being devoted to agricultural pur-poses and the upper level to living space. Embrasures placed in the lower levels of these farm hous-es, thus allowing very little light to enter, is an indication the area was used primarily for storage. Doors and large windows on the upper floors are evidence that floor must have been used as a resi-dential area. There does not appear to be a regional standard plan applied to the farmhouses, how-ever. A courtyard is usually found in front of the farmhouses. It is understood from surviving ex-amples that these courtyards were paved with stone. In addition, a large cistern, encompassing al-most the entire area under the courtyard was built. Some of the farmsteads were set within a central courtyard, surrounded by a wall. This type of farmstead also had a tower giving the impression that it had been fortified. The widespread existence of towers among the farms is a characteristic of this region and, this leads to the supposition that the farmsteads might have developed around the tow-ers. It can also be assumed that the farmhouses with towers, rather than serving a military function, were the private property of the farm manager or owner, and were used by them. In the complex farmsteads, there are structures around the house used as depots, workshops or living spaces. Instal-lations documented inside these structures provide evidence of production having taken place here. Their existence is important because the farmsteads are considered to have been in continuous use during this entire period and they gave the farmstead the identity of a small village settlement in the Byzantine period. An additional group of structures linked to these are churches whose locations and building techniques show clearly they were added in the later periods of use. The presence of different types of graves on the farms also points to there being continuous living around them.

A considerable amount of olive oil and wine production equipment was identified in the course of the surveys and this evidence points toward the presence of a regional production organization. The favorable climatic conditions in this Mediterranean region must have opened the way for the for-mation of production and relevant production organization. The equipment necessary for production is the archaeological evidence required for the definition of regional production organization; sur-veys in this regard brought to our attention numerous pieces of equipment used for olive oil and wine production. Starting in the Roman Imperial period, building activities left behind considerable archaeological evidence regarding production and production organization in the region. Farmsteads built near the farmland for the purposes of checking the produce processing it, storing on site and guarding it are part of this evidence. Many examples of such farmsteads have been identified in the region. According to archaeological evidence obtained, the presence of presses with press-arms fixed in holes carved in bedrock

in the open air, which are proposed to have served for wine pro-duction, suggests a prevalence of wine production in the region. The presence of a high number of presses found practically everywhere, close to farmland, within farming settlements in the country-side, on the ancient roads, and in the ancient cities on the coastline, attests to a significant amount of wine production in the region. The various types of presses found points to intense production occurring in the region, variety in use and continuity through the different settlement phases. Much less archaeological evidence exists regarding olive oil production. Although we are aware of the fact that equipment for olive oil production is portable and thus less survivable, it is worth noting that the workshops for olive oil production have been attested mainly in coastal areas and within settle-ments. Considering the wine production on the interior of the region, a comparison between wine and olive oil production reveals that the olive oil production was relatively limited in amount. This should probably be related to the conditions of cultivation of olive trees. A tree of the Mediterrane-an region, olive can be found only in the thin strip of land between the coastline and steeply rising mountains; thus, occurrence of temperature variations at higher altitudes would have offered less favorable conditions for olive cultivation. Within the surveys, a number of workshops for olive oil production were identified and documented. As understood from sites, some workshops were with-in the settlements and these settlements usually had more than one workshop. Some examples iden-tified as olive oil workshop were seen to have been built independent of the settlements in areas where no other types of buildings have been found. In such case, it is seen that either these work-shops maintained close ties with ancient cities on the coastline or they were very close to settle-ments. This is important for clarifying the relationship between settlement and production and also for providing evidence to explain the production organization and settlement arrangement in the region and the relations between them in addition to the identification of production equipment and products in the region.

2. CONCLUSION

Preliminary results from the surveys point to the presence of rural settlements established in various periods. Some display continuity starting from the Hellenistic period and going into the Byzantine period. Their location within an acropolis on an ancient route as well as their fortifications and tow-ers indicate their defensive (garrison) purpose. It is also seen that a new settlement pattern emerges with the Roman Imperial period. As the Hellenistic fortresses lose their defensive function, rural settlements increase. It is known that Hellenistic settlements continued to be inhabited as rural set-tlements. Archaeological evidence – numerous farmsteads, workshops, villages and tombs within – shows that such settlements increased in number rapidly beginning in the 2nd century A.D. As the rural settlements retained their existence through the Early Byzantine period, earlier remains were damaged and thus the settlements are taken into account with their latest phase of use. It must be also kept in mind that numerous new settlements were established. With the spread of Christianity beginning in the last quarter of the 4th century A.D., existing sarcophagi were reused with the addi-tion of a cross motif or an inscription. And this evinces the Early Byzantine period use of Roman Imperial-period rural settlements.

It is understood that geographic conditions of the rural settlements in the region naturally influ-enced the shaping of the settlement and ascribed a rural character to it. Valleys communicating be-tween the littoral and inner areas influenced the settlement patterns after the Hellenistic period as well. Numerous epigraphic and archaeological evidences prove that these valleys served as roads through the ages. Thus rural settlements developed near these roads and made use of them for the transportation of the produce to the coastline. The rural settlements that were identified show that agricultural production had an important part in the economy of antiquity and that cities on the coast and rural settlements in their hinterland constitute a regional settlement model.

Geographical/climatic and historical/political conditions in the survey region contributed to the emergence of rural settlements. The Mediterranean climate prevailing in the region made possible widespread and varied production while the region's harsher conditions at heights over 1400 m. must have made production and continuous rural development difficult. Despite the difficult ter-rain, the lower surfaces in the region made the rural settlements possible. These karst collapse areas (i.e. dolines), which are suitable for farming, and comprise one of the basic reasons for choosing this type of area for rural settlement. These areas continue to be used for farming today, with many of the farmsteads identified in the region being built on the hillsides around these lower areas. Valleys and roads that facilitated transport between the inland and the shoreline areas constituted another geographical factor affecting rural settlement in the region (Aydınoğlu, 2003). The high number of rural settlements identified along this route is important from the standpoint of the relations between the ancient cit-ies on the shore and their khora. Although the amount of documented archaeological evidence of rural settlements of the Hellenistic period is marginal, a large number of rural settlements and farm production sites, particularly of the Roman and early Byzantine periods, have been identified, thus pointing to the presence of settlement organization. Some conclusions are possible regarding dating the use of the farms. Examples of monumental tombs on the farms are seen during the second half of the 2nd century A.D., and important in showing the farms were functioning during that period (Durukan, 2005). The construction materials of the farmsteads along with their basic ground plans and the smaller rooms within them indicate a close similarity to the rural house architecture of northern Syria, and the estimated period of their use is the 4th-7th centuries (Eichner, 2004; 2005). The manufacturing installations, docu-mented at the farms, support this historical development, and their specific characteristics support increases in this continuous production activity in the region, particularly starting in the 3rd century A.D. From the very high number of documented archaeological finds in the region

it would appear that production activities became more intense, particularly in the late Antiquity period and contin-ued into later periods. It should not be forgotten, however, that agricultural organization in the re-gion has its roots in the Hellenistic period. As to when and until what period the farms were no longer in use, the churches would seem to provide the answer. Structural and decorative elements of the churches in this region indicate they were in use into the middle Byzantine period. The excava-tions conducted at Elaiussa Sebaste showed settlement had inactive periods, likely in connection with the Arab invasions starting from the second half of the 7th century A.D. This detail is particu-larly important since churches on the shores of Cilicia also indicate a similar development.

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Legal Deposit of Cultural Heritage: Development and Overview (History, Principles and Elements)

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Digital Cultural Heritage

ABSTRACT

Archives or legal deposit organizations which are libraries, museums and archive organizations are memory organizations that offer services such as deposit, organizing, sorting, making ready for use and preserving physical documents that have archival quality in accordance with predetermined rules. Legal Deposit is the name of compulsory the donation that, according to the royal charter (decree) or law, the printers, editors or authors are obliged to give one or more copies of each printed work to the State. The number of libraries benefiting from this business is many around the world. Compilation work in history begins with the decree of French King François I. The king issued a royal charter (decree) in Monpellier on 28 December 1537 in order to show the future generations that the fine arts and positive sciences were developed in his own age. In this edict, he ordered that no book could be put up for sale unless a copy was given to his private library in Blois castle. Other countries followed France's deposit edict. An electronic transformation known as the digital revolution continues to occur in all areas of life. This transformation has affected the archives as well as in every organization providing public service. In Turkey, some of the cultural institutions have taken the cultural objects in their archives to the digital archive and made them available on the web. These are digitization of manuscripts, virtual museum implementation, audio-visual archive studies of TRT and contributions of some non-governmental organizations to the cultural inventory, etc. These studies are studies carried out by cultural institutions that are independent from each other, in line with their own initiatives, without a legal basis. The project of digital archiving of national cultural heritage materials and their access via a common web continues to expand. The name of the project is Turkey Cultural Inventory Project (It is accessible at www.envanter.gov.tr). In the introductory part of this article, how libraries, archives and museums that deposit archival materials started and their strategic developments throughout history will be briefly explained. With the communication age we are in, strategies for transition from physical storage to digital inventory will be explained with examples. After the legal deposit in the world will be explained briefly, the legal deposit works in Turkey will be summarized. In the last section, type the main topic of digital cultural inventory of Turkey, Turkey's Culture Inventory database operation will be explained.

1. INTRODUCTION

In this article, the historical processes of legal deposit methods used by recognized national institutions will be explained with examples from around the world. Those information, documents and cultural assets deposited by the institutions are important to strengthen lifelong learning skills of all segments of society. In addition, also in the cultural heritage sector of Turkey, libraries, archives, museums and related institutions that produce digital materials or digitize analog materials will be examined and digital archiving studies developed at national and international scale, standards, models and good practice examples reflected in the literature will be explained.

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The desire to control knowledge has always been on the agenda of organized societies throughout history. In our age, great progress has been made in the production and control of information and it still maintains its importance. As for what products should be considered within the scope of the legal deposit, they are all the intellectual cultural assets of the country without any selectivity. John Gilchrist (Gilchrist 2005) explains why it is vital to preserve cultural heritage and make it easily accessible:

The past is a part of us. It is inherent in all artistic, social, economic, scientific and intellectual development. It is important that future generations have access to, and understand, the past, to better understand themselves and to better deal with the future. In cultures based on written records, the greater proportion of material which is not preserved, the less likely that value will be respected and promoted (Gilchrist 2005).

In other words, cultural heritage can be seen as a crucial factor in our current and future ability to enter various fields, including political, intellectual, cultural and economic fields. In the context of the digital age, the importance of protecting cultural heritage and accessing them continues as a point emphasized by the European Commission (Communication on the Digitisation and Online Accessibility of Cultural Material and Digital Preservation Brussels 24.8.2006 C (2006) 3808 Final.)

The legal deposit institutions that collect the largest bibliographic records are archives, libraries and museums. Since the methods used in archiving, the services provided and the user groups they serve are different from the other two, archives are institutionalized organizations separate from libraries and museums. For example, while the vast majority of resources in libraries are available to the public, in archives they can often be restricted to the use of individuals, families, institutions and even nations. For this reason, the development, widespread use of cataloging services in libraries and their collective service are quite advanced compared to archive institutions.

There are different applications in museums; the compiled material is protected in safer environments compared to archives and is largely unavailable to reach to the public. For this reason, museum catalogs are mostly prepared to meet the needs of private researchers and institution staff. Again, for this reason, collaborating with other museums and focusing on standardization in cataloging of collections in museums are not as priority targets as in libraries and archives. Moreover, museum curators deal with the deposition and display of three-dimensional objects, while librarians deal with two-dimensional information-intensive books, films and other printed materials and while archivists deal with archival paper and electronic documents. In other words, there are differences between the materials that all three lanes focus on (Patrick et al. 2013; http://library.ifla.org/231/7/220-lo-en.pdf).

In Buckland's assessment on the concept of information, he says: "Although museums differ from libraries and archives in terms of the type of material they collect, museum material is objects of information value to shed light on its own period, to be put into service due to its relationships with other materials and a catalog containing data about itself" (Buckland 1988).

Museum material has similar characteristics to library and archive materials because of its informational values. In this respect, it would not be wrong to say that services are provided in line with common goals in all three institutions. Despite these important common features that they have had for centuries, these memory institutions, which did not (could not) establish close contact with each other, were forced to share the same environment and / or common platforms with the digitalization of the information access route. Let's take a brief look at the historical development of legal deposit before moving on to the efforts to organize all kinds of deposit institutions, especially archives, libraries and museums, which produce information and knowledge at the national level, under a single roof by developing standards that enable the compilation of digital content on common platforms.

Considering the expression "an obligatory form of donation that serves various purposes (M.E.B 1961)" in the general definition of the concept of legal deposit, the method used by the Greek King Ptoleme for the formation of the Library of Alexandria appears as the first deposit work in a primitive sense. In that work by the king's order, librarians forcibly took original copies of the classical books found on ships arriving at the port to the library and gave scribal copies in return (Sağlamtunç 1998).

It is stated that after the invention of the printing press, a certain number of copies of the works were seized by the administration or the church in Europe to check whether the published works were against religion and / or the state (Acaroğlu 1966).

2. History, Principles and Elements of Legal Deposit

2.1. France

The concept of legal deposit in archiving is usually attributed to France, in particular, the Montpellier Ordinance of 28 December 1537, by which King Francois I mandated that a copy of every newly published book be sent to the Royal Library at Blois. The penalty for non-compliance with the order was confiscation of all print, along with a fine (Crews 1988). After this date, legal deposit in France has been a continuous practice towards the realization of different purposes (Crews 1988).

Legal deposit in France became in 1617 a precondition of obtaining trade privileges and with the 1793 decree deposit was for the first time connected to obtaining copyright protection. For a short time, after 1810, deposits were given under control of the Ministry of Police, in order to facilitate surveillance of the press. The Royal Library which kept the deposited works was moved to Fontainebleau in 1534 and to Paris in the second half of the 16th century, and then later it formed the Bibliotheque Nationale (Crews 1988). In France, bibliographic control is carried out through the French National Library, whose main mission is to collect (deposit), protect, organize and transmit. The French National Library sees itself as the "National Bibliographic Formulary", which catalogs all printed resources

published in the country (https://www.bnf.fr/en/bibliotheque-nationale-de-france-catalogue-general).

The scope of the Legal Deposit Law in France was expanded by applying it to maps and plans in 1648, musical notes in 1793, photographs and phonographs in 1925, poster collections in 1941, video and multimedia media in 1975, computer programs and databases in 1992, to internet environments in 2006. Nowadays, thanks to the update of this law, it is obliged to compile even the websites whose internet address ends in ".fr" (Musnik 2011). The only authority for bibliographic control of state publications is the French National Library. Catalog records of the French National Library can be accessed at (http://www.bnf.fr).

2.2. United States

In the United States of America (USA), legal deposit (bibliographic control) studies started to be carried out approximately 150 years after France. Copyright Act, which entered into force in 1790, is the beginning of legal deposit studies in this country. The law stipulated that one copy of each copyright approved work will be given to the state (Crews 1988). The task of performing the deposit service began in 1846 by the Smithsonian Institute and the Ministry of Interior. The Library of Congress, which is known as a very modern library today, carries out the legal deposit processes on behalf of the country after 1870 (Crews 1988). The law was amended in 1909 and the provision regarding deposit was renewed as "two copies of the works should be compiled and one is given to the Library of Congress and the other is sent to the Exchange and Gift Division of this library" (Allen et al. 1975). The legal deposit, which is in effect today, is made in accordance with section 17 of the Copyright Act of 1976. Accordingly, two copies of each printed work and audio / video record that have received copyright approval in the USA must be submitted to the Copyright Office by the copyright holders within three months following the release of the work for the collection and use of the Library of Congress. (UNESCO 1996)

When these regulations were made in the USA in 1976, computer-based products were excluded from the scope of deposit because they have not yet been widely available to the public. However, submitting a copy of these works to the Copyright Office for copyright approval, which is mentioned in Article 408 of the Copyright Act of 1976, formed the basis for the first practices. After such publications began to be widely distributed, the Library of Congress created the Machine Readable Collections Reading Room for the use of copies received in accordance with copyright approval in research. Here, it is aimed to provide access to computer-based digital resources as well as access to Library of Congress's bibliographic resources in printed form. This application has also been an experience for legal deposit applications of forward-looking digital publications. As a result of these first practices regarding electronic publications, the copyright law was amended in 1988 in order to make bibliographic processes more effective in the USA and all kinds of electronic materials in physical format; CD ROMs, magnetic tapes, micro forms have begun to be deposited. The bibliographic control of state publications in the USA is carried out through the United States Federal Government Printing Office, which is known as the world's largest publisher. Since most of the publications bibliographically controlled by the Government Printing Office do not have copyrights, the publication rate is quite high. These publications can be accessed at https://catalog.gpo.gov/ (https://www.loc.gov/).

2.3. England

The first bibliographic control studies in England started to be implemented with the Press Licensing Act in 1662 (R.Partridge 1662). The works to be subject to bibliographic control are made regardless of copyright and include a wide range of printed material (Crews 1988). Legal Deposit Office of the British provides compilation services in the country, which is affiliated to "The British Library", the largest library in England. The institution acts as the compilation branch of the country. it provides compilation of only book type materials. Newspaper Legal Deposit Office, on the other hand, is the only newspaper compilation branch, compiling newspapers and periodicals. Each copy of the publications sent to the institutions responsible for compilation is deposited in The British Library. Other copies of the publications sent for compilation are;

- Oxford University Bodleian Library,
- Cambridge University Library,
- National Library of Wales,
- National Library of Scotland,
- Sent to Trinity College Library, Dublin.

These libraries do not catalog all the publications sent to them, but catalog the works they choose in accordance with their institutional policies (Cavendish and Pool 1984).

Bibliographic control of state publications in the country is carried out by Her Majesty's Stationary Office and The National Archives. Established in 1786, Her Majesty's Stationary Office has become an institution that produces and follows all the actions and publications of the parliament since 1889 (https://www.legislation.gov.uk/aboutus). Today, National Archives provides the protection of publications and tries to provide the information needed today and in the future. Access to government publications is available at www.legislation.gov.uk

2.4. Germany

A legal deposit requirement at the federal level was codified for the first time in West Germany in 1969. The law was amended in 1973. Germany does not have a separate institution to carry out activities related to bibliographic control of state publications and a national library where the deposited works are physically collected in a single location, as in England and France (Anameriç 2008). The legal deposit law mandates four libraries, including the national library, to carry out bibliographic control of government publications. In other words, libraries in different states that make

bibliographic record part of the German National Library (https://www.europeana.eu/en/TEL accessed on 1 December,2020; Karpuz 2008).

Libraries where government publications are deposited as required by law:

- Deutsche Nationalbibliothek Frankfurtam Main (DNB):
- Staatsbibliothek zu Berlin- Berlin State Library,
- Bibliothek des Deutschen Bundestages- Library of the German Bundestag, Berlin,
- Bayerische Staatsbibliothek.

One of the important works of the German National Library is the German National Bibliography Collection. The founding law of the library dates back to 1912 and the library collection started to be created from that date up to the present.

2.5. Turkey

2.5.1. Bibliographic Control and Access to Government Publications in Turkey

Our ancestors, who came from a nomadic life, did not make bibliographic record studies until the Ottoman Empire. Although it is not based on any legal sanction, the historical background of the state publications phenomenon started with Fatih Sultan Mehmet during the rise of the Ottoman Empire. State publications such as edict, berat, testament, copyrighted works, translated books, treatise, commentary, hashiye, hamish and miniature were mostly used in the transfer of various types of knowledge to future generations during the Ottoman Empire (Anameriç 2006). It had been tried to be bibliographic control of these works as state publication. However, during this period, the bibliographic control of state publications did not show continuity as it was determined by political policies in the Ottoman Empire. The late start of bibliographic record of cultural assets in Turkey causes of the limited historical and cultural heritage.

Insufficiency of legal deposit work during the early years of the Republic of Turkey was being voiced by some intellectuals. It is well-known case that in 1926, Dr. Hamit Zübeyr Koşay who was the manager for cultural issues at that time, had prepared a legal deposit law as a draft. The Ministry of Education, Committee of Education and Discipline, prepared a bulletin called Bibliography during 1931- 1933. Istanbul University Library Service also prepared a bibliography covering the years 1928-1933 `Bibliography of Turkey` minted in 1933 (Acaroğlu 1953).

By order of Veteran Mustafa Kemal Atatürk, the Law on Legal Deposit of Printed Texts and Pictures publication letter No. 2527 2527 was enacted on 02.07.1934 for the effective, healthy and complete collection, classification, regular transfer of the copies of books and works of art which were published domestically or abroad - in accordance with bilateral or multilateral agreements and constitute the cultural existence and knowledge of our country, to transfer them to future generations regularly, to protect them in favorable environments and to present them to the knowledge and benefit of the society (Official Journal/Turkey, Date: 02.07.1934 Issue: 2741.).

With this law, the Legal Deposit Department was established under Directorate of National Training and Education in the Ministry of Education. This directorate is affiliated to the Publishing Directorate of the Ministry of Culture with the clause “e” of Article 4 of the Law No. 2773 dated 10.06.1935. Later once again, it was affiliated with the Ministry of Education, Publication Directorate.

On 21.09.1981, the Regulation on the Legal Deposit was issued and the Directorate of Legal Deposit of Printed Texts and Pictures (Printed Writing and Pictures Compilation Directorate/Turkey) was turned into a unit under the General Directorate of Libraries of the Ministry of Culture. Later it was affiliated with the Istanbul Provincial Directorate of Culture on 13.07.1990 with the Regulation on Duties, Authorities, Responsibilities and Working Principles of Cultural Directorates (Official Journal/Turkey, Date: 21.09.1981 Issue: 17465).

According to the Law No. 2527, which entered into force on 02.07.1934, a total of five copies, one copy to the National Library, one copy to the Ankara Public Library, one to the Istanbul University Library, one copy to the Istanbul Public Library, one copy to the Izmir Public Library were sent (Ministry of Education Office of National Education and Discipline/Turkey, Date; 1934.).

The writings and pictures that the people who printed the works and pictures had to submit to the Directorate are: Newspapers, agency notices, magazines, books, treatises, education theses, memoirs, atlases, paintings, engravings, all kinds of pictures, wall postings with artistic value, manuals, plans, sketches, epic and song magazines, musical notes, dance notes and theater plays, reports published by the society and companies, all kinds of catalogs, calendars, annuals, annals and memoranda. In addition to the publications that the State Offices confidential, the texts and pictures printed by official printing houses and official institutions, as well as bonds, checks, stamps and valuable papers are among the publications that must be documented (Official Journal/Turket, 1981 Issue: 17465.).

If the text and images from printed and published outside Turkey six copies were delivered to the Directorate of Legal Deposit. Of the collected copies, two copies were delivered to the National Library, one copy to the Ankara Public Library, one copy to the Ministry of Education Museum Department Library, one copy to the Istanbul İstanbul Asâr-ı Atika Museums Library, one copy to the Turkish Historical Research Society Library.

The Law No. 6279 on Legal Deposit of Duplicated Intellectual and Artistic Works, issued on 29.02.2012, abolished the Law No. 2527 of 02.07.1934. With this law, the Printing Writing and Pictures Compilation Directorate was converted as the Legal Deposit Directorate and its field of activity was limited to the province of Istanbul. In other provinces, the task of legal deposit was given to the legal deposit units and provincial public libraries (Official Journal/Turkey, Date: 2012 Issue: 28388).

The legal deposit made from the works and pictures printed in Turkey and abroad after the enactment of the Law No. 6279 is as follows. Within the borders of the

Republic of Turkey, published or replicated, all kinds of work described below, were collected under this law.

These:

Separately published works such as books, embossed books, pamphlets, encyclopedias, albums, atlas and notes, which are published individually or as part of a set or a series, periodicals such as newspapers, magazines, annuals, bulletins, calendars, posters, postcards, engravings. Graphic works such as reproductions, printed photographs, all kinds of slides, tapes, pieces of film, reel, tape, cartridge, film and microforms containing data, optical materials produced for use in all kinds of computers, music and video devices, including sound, images and data and works reproduced by recording on magnetic media, stamps and banknotes together with their prospectuses, geographic, geological, topographic or meteorological maps, plans and sketches, works printed or reproduced abroad, sold and distributed domestically, electronic publications produced and put into use in electronic environment. (Official Journal /Turkey, Date: 12012 Issue: 28388.)

As a result, the Directorate of Legal Deposit of Printed Texts and Pictures was established in 1934 with the order of Atatürk, and continued its activities with the establishment law, issued circulars, instructions and regulations issued over time.

When it was established in 1934, it was responsible for the legal deposit of all press texts and pictures in Turkey, its organizational structure was expanded by creating additional services with regulations issued in 1981. Its field of duty has been narrowed since 2012 and it has been turned into a directorate responsible for the deposit of printed texts and pictures published only in Istanbul. It is an active directorate that still maintains this task.

2.5.2. Bibliographic Record of the Digital Cultural Heritage and the Case in Turkey

Increasingly, resources and information within the scope of cultural heritage are produced or digitized in digital format and accessed through Web services. Digital materials such as digital photographs, films, music, visuals, sound recordings, texts, museum objects, manuscripts are accepted as part of the national historical and cultural heritage. Many countries carry out archiving studies for the protection and access of digital cultural heritage at national and international scale. The actors in the cultural heritage sector in Turkey have been developing applications independently from each other and use different technologies. This situation negatively affects the interoperability of the developed applications and the sharing of resources.

In Turkey, some institutions digitize the materials/ the objects with their own means of facilities or mainly by collaborating with other institutions, but there is a great confusion because the necessary policies, plans, standards, processes, responsibilities are not defined on a project basis or a detailed frame work basis. Many institutions have staff, policy and financial difficulties, and many of the studies on national cultural heritage have not yet been inventoried in digital formats.

Digital archive studies to be created in this direction are at the starting point of policies for the protection of cultural heritage. Digitalization studies in museums, libraries, sites and registered structures affiliated to the Ministry of Culture and Tourism have been continuing to create digital archives since 2002. However, in the reports under the heading of "Preserving and Developing Culture and Strengthening Social Dialogue" prepared on culture, although issues such as strengthening the cultural infrastructure, spreading cultural activities, developing our cultural relations with world countries, especially with countries with a common historical background, detection, research, maintenance-repair and restoration, cultural diversity have been mentioned, there is no policy or plan regarding digitization studies that can be considered within the scope of cultural heritage or archiving existing digital assets for preservation.

The institution authorized by law to protect the cultural heritage is the Ministry of Culture and Tourism. However, there is no sanction regarding digital protection and access of cultural heritage within the relevant laws and regulations.

Although not yet under a common scientific database, institutions related to cultural heritage including the Ministry of Culture and Tourism, the Directorate of State Archives, the Directorate of Topkapı Palace Museum, the Department of Archives of TRT, the National Library, governorships, municipalities, some NGOs, etc continue to work on creating their own digital archives. In addition to these, some public libraries and university libraries also have digital collections within the scope of cultural heritage.

In the digitalizing world, it is an undeniable fact that there is a change in every field from life styles to the ways of doing business, education methods, and ways of providing information.

In Turkey as well as in the whole world museums, palaces, mosques, churches, monasteries, archaeological sites, historical sites are converted to digital resources that can be visited virtually in detail over the web. With the integration of geographic information systems into mobile applications, archaeological sites and touristic places, etc. have become accessible not only by computers but also by mobile phones, and they have become increasingly common. Since 2009, the Ministry of Culture and Tourism has made many museums open to visitors virtually over the web. Images of the objects of the museum materials have been transferred to digital media and some of them are presented with 360 degree panoramic images of the museums. In Turkey, some institutions, organizations, the private sector and foundations that have also museums are opening their services in a virtual environment. Eczacıbaşı Virtual Museum is among the most comprehensive examples, the Mausoleum of the Virtual Tour, Virtual Tour of Ataturk and the War of Independence Museum, Rahmi M. Koç Museum, Turkey Isbank Museum.

Among the cultural institutions in Turkey, under the leadership of the Ministry of Culture and Tourism, a protocol has been drawn up regarding the inventory studies carried out for the purpose of determining, protecting and researching our cultural heritage

domestically or abroad. A coordination board consisting of representatives of the Ministry, The Scientific and Technological Research Council of Turkey (TÜBİTAK), the Turkish General Directorate of Foundations and The Turkish Historical Society has been formed. Compiled information is available on the web site of General Directorate of Cultural Heritage and Museums.

This inventory study was scientifically inadequate. Detailed information, maps, plans etc. were not included. it was just inventory receipt information that's why the inventory project could not be completed.

Based on the later research, all cultural institutions accepts that "Turkey Culture Inventory" is very important to humanity's cultural heritage and must be completed as soon as possible, but all data should be able to be associated with each other in an information system. However, it has been observed that the target of creating a common language which will not differ according to the experience, knowledge and approach of the experts who prepare the artifact detection documents and thus a database system suitable for a comprehensive query has not been reached yet.

With the view that it is impossible to create options that will allow everyone to reach a full consensus, certain decisions were made in order to create the database without wasting time, and studies continued in this direction.

The strategic approaches of the cultural sector and academicians to create a common database are as follows.

a) The cultural inventory should be completed soon.
b) Reliability and standardization should not be sacrificed in order to complete the inventory as soon as possible.
c) Obtained data should be easily accessible by all kinds of institutions and individuals.
d) The database should be able to query for different purposes, including cross-querying, according to the purpose of the user.
e) The data and the information it contains must be open to update.
f) The rapid completion of the inventory requires a model to operate without bureaucratic obstacles and political pressures.
g) There is no doubt that preparing a fast, reliable and modern inventory involves a workload that a single institution cannot perform when the problem is considered in Turkey scale, in terms of diversity of the cultural heritage of our country, and sheer numbers of problems faced by. For this reason, a working model which should be open to the participation of non-governmental organizations who want to undertake this job, must be created by a council attended by various institutions. However, the control and authorization of the data collection process and the server where the date is collected should be done by a expert unit that undertakes this task.
h) It is not correct to construct the database as a one-to-one transfer of those made for other countries while creating Cultural Inventory of Turkey. The unique conditions, cultural background and ruins of our country are different from those in other parts of the world. For this reason, it should be aimed to build a model that does not contradict the principles established by international institutions, adapts to them and on the other hand, meets the requirements of our country.
i) Cultural inventory is a dynamic concept; it is constantly changing and renewed. For this reason, the cultural inventory database should not be static, but open to new developments and should have a renewable structure without breaking the standard it contains.
j) The working model envisaged for the rapid completion of the cultural inventory requires the formation of teams to do this throughout the year and a structuring that will allow those from universities and other institutions who can participate for a certain period of time.
k) Outside the scope of the cultural inventory of Turkey, there are thousands of cultural heritage documents prepared by the various teams, individuals and institutions in our country. In addition to new documentation requiring a long time and labor force in the field, the work done so far can be transformed into the requirements of the database and the language of expression with less effort. Developing an approach for this purpose, with the database of previous studies, the cultural inventory with scientific studies and will ensure integration with bureaucratic documents. (TÜBA-TÜKSEK 2003).

In line with these strategic approaches, the first scientific data base attempt was initiated within the scope of Turkish Academy of Sciences Turkey's Culture Sector (TÜBA-TÜKSEK) in 2000. The project started under the name of "Inventory Project of Turkey" and its output the Culture Book Database has developed through various stages since 2000.

The TÜBA-TÜKSEK Culture Book project had a world-class inventory system prepared by the expert academics, but it was prepared in book format. It was not transferred to the digital environment. To make this project online with the support of geographic information system (GIS) and digitize the inventory of Turkey, Ministry of Culture and Tourism and TÜBA did a project partnership. They prepared a joint- project. The project also received funding support within the framework of European Union grant programs (DELTUR 2005 / 111–858) at the end of November 2005. At the end of the project, "Kültür Kitap" emerged as a new product with its digital infrastructure supported by GIS. It is accessible on web http://www.envanter.gov.tr/ address.

Cultural Inventory Project continues to expand towards becoming a Database of all tangible and intangible cultural assets in Turkey with support from the Culture and Tourism Ministry and other Cultural Institutions. (TÜBA-TÜKSEK 2003)

3. CONCLUSION

In Turkey, an online database system has been established that can guide studies such as site management, landscaping, restoration, conservation and re-evaluation necessary for the protection of historical texture, archaeological sites and folklore values.

Database software that might be named as "National Heritage" or "Cultural Inventory of Turkey" was the final

output of the cultural inventory project implemented by the Ministry of Culture and Tourism together with the Turkish Academy of Sciences (TÜBA) in 2005. It has been targeted that inventory system should be disseminated to all of Turkey.

Despite the fact that it is an ongoing project on which uploading of the cultural data to the database continues, the completed part that cultural inventory of Ankara and Istanbul Provinces had already been uploaded has been accessible via the website at www.envanter.gov.tr

In addition to the data presented / to be presented to users through the website, it is a source for many local and foreign researchers, academicians and students; ready, qualified and accurate information contained in the relevant publications that emerge / will emerge as a result of the study will increase the quality of the service provided by the tourism sector.

First of all, within the scope of the project, the database created as a result of the studies where various cultural institutions and organizations are united under a single roof will provide a coordination mechanism for future studies. Since the work methodology applied in Turkish Inventory Project is in coordination with the methodologies that the Council of Europe, the European Commission and UNESCO followed in cultural sector and policies, a ground for sharing information will be created with other world cities carrying out similar projects. It is already a model and a source of inspiration for other cities in Turkey as the database is open to service. (http://www.envanter.gov.tr/)

When the project is completed, it will be a scientific study on cultural heritage and cultural economy of Turkey. It will also become an important reference in determining the National Cultural Policies. This project will constitute an important infrastructure for the two international programs that are the Compendium of Cultural Policies & Trends and Cultural Policy Review Program conducted by the Cultural Director of the Council of Europe of which Turkey is a member, too. Furthermore, this project would constitute a significant infrastructure in the creation of the text of "National Cultural Policy of Turkey".

In the database, there are studies of archeology, urban architecture, folk culture, cultural economy and database working groups. The system is designed in accordance with the loading of each new data and the addition of new fields. The database is compatible with the data obtained as a result of the studies carried out by various institutions until today.

Cultural services and industries fed by cultural assets are the cornerstones of the new economy. Thanks to the cultural inventory, Turkey's profile of cultural and financial capacity of the arts, actors, production, consumption, labor, profile of the investment and trade would be achieved by figures, thus, the contributions of the cultural economy to the country can be demonstrated in figures. Inventory data will bring Turkey into a creative and innovative environment (sectoral support, such as spatial clustering and wider participation in culture), helping the search for new policies is another goal.

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Multidisciplinary Researches in Cultural Heritage Studies: An Approach on Akkale Cistern in Erdemli, Mersin

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ABSTRACT

Conservation, reinforcement and restoration of architectural heritage requires multidisciplinary approaches which should be organised in precise steps that are similar to those used in medical science. Architectural conservation decisions must rely on full understanding of the historical, material, structural, geological and environmental information related to the building and its setting. The aim of this paper is to discuss phases of a multidisciplinary approach applied to develop a conservation project for the ancient cistern building, located in Akkale archaeological site in Mersin (Turkey). Firstly, architectural description of the ancient cistern building in the light of current information revealed by archeological excavations is presented. Then, methods and technics conducted by each expert group are discussed explaining the main results obtained from each study. Finally, organization of multidisciplinary studies and results gained from each step are displayed through a flow chart diagram showing process of research and data from one phase to another to develop architectural conservation program.

1. INTRODUCTION

Conservation interventions on historic structures should be respectful to its historical, cultural, architectural and aesthetic values. Integration of scientific methods into repair and preservation programs of immovable cultural assets (from archaeological ruins to historical monuments) have been emphasized by modern conservation approaches since the beginning of the century through a number of important charters and documents. Techniques to be selected for the safeguarding of historical building should base on scientific investigation and be respectful to its authenticity and historical significance values. Athens Charter for the Restoration of Historic Monuments (1931), which was an initial international manifesto adopted in International Congress of Architects and Technicians, drew attention to the significance of multidisciplinary approaches in conservation studies stating as "architects and curators of monuments should collaborate with specialists in the physical, chemical, and natural sciences with a view to determining the methods to be adopted in specific cases" (Athens Charter, 1931). Few decades later, it was realized that the scientific methods proposed for conservation and repair works could result in unexpected negative impacts on the monument itself and cause irreversible loss in its historical value as in the case of Parthenon in Acropolis. Thus, principles for scientific investigations and choosing appropriate techniques during conservation interventions were discussed as a topic by itself (Naycı, 2010). Over three decades later;

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Venice Charter, another significant international doctrine was adopted during II International Congress of Architects and Technicians adopted in 1964. Some of the issues adressed by Venice Charter, was to link restoration architects with technicians, to strengthen multidisciplinary works and to collaborate for training of experts in conservation programs (Jokilehto, 2013). The 2. principle draws attention to application of scientific collaborations as "The conservation and restoration of monuments must have recourse to all the sciences and techniques which can contribute to the study and safeguarding of the architectural heritage". Similarly, the Charter concludes with emphasis on shared collaboration during and after such scientific researches in article 16: "In all works of preservation, restoration or excavation, there should always be precise documentation in the form of analytical and critical reports, illustrated with drawings and photographs. Every stage of the work of clearing, consolidation, rearrangement and integration, as well as technical and formal features identified during the course of the work, should be included. This record should be placed in the archives of a public institution and made available to research workers" (ICOMOS, 1964). Although there were a number of attempts to update principles of Venice Charter in following years, it was translated to 28 languages; referenced by several international documents, doctrines and programs; and gave way to different countries during their national administrations (Jokilehto, 2013).

Finally as it was stated by ICOMOS (2003) through the document "Principles for the Analysis, Conservation and Structural Restoration of Architectural Heritage", the conservation approach of historic buildings requires organisation of studies in precise steps that are similar to those used in medicine: "Anamnesis", includes condition assessment of structures as well as understanding historical alterations and modifications, "diagnosis" refers to evaluation of damage categories and causes of decay; "therapy" includes development of a comprehensive conservation program and "control" includes monitoring of the building to evaluate post-intervention phase. Similarly, "Interventions should be based on full understanding of all kinds of actions (forces, deformations, alterations, etc.) that have caused damage or decay; and the ones that will affect it in the future" (ICOMOS, 2003).

Today, the main National authority, which is responsible from the identification, registration and conservation of immovable cultural assets in Turkey, is the Ministry of Culture and Tourism. The authority has developed a number of legislations for grouping of immovable cultural assets, phases of conservation and restoration projects, and principles to be applied in conservation implementations. Conservation techniques for immovable cultural assets are classified as "maintenance, simple repairs and comprehensive repair (restoration)" in Principles Act No. 660 (T.C. Kültür ve Turizm Bakanlığı, 1999). Comprehensive repair (restoration) techniques are detailed as "consolidation, liberation, reintegration, renewal, reconstruction and moving interventions" according to definitions presented in Vencie Charter.

Therefore; a comprehensive conservation program on immovable cultural assets and historic structures should encompass phases of 'historical research' to understand its authentic uses, historical changes and alterations occurred in time; 'architectural surveys' to understand principles in traditional material use and construction techniques, 'comparative analysis' to evaluate significance of the building among its historical, functional or cultural similars; 'condition assessment' to understand material and structural degradations discussing types of problems, sources of decays and impact levels; 'structural analysis' to evaluate original performance and existing structural safety of the building; 'environmental analysis' to understand physical, geological, hydrological, climatic conditions that have affected phsyical condition of the building as well as its vulnerability against future natural risks.

However, implementation and management of the multdisciplinary collaboration during both survey and implementation phases is a challenging task. There are various techniques that can be applied on historic buildings or structures during scientific and technical researches -from non-destructive, to slightly destructive or destructive methods-. Scientific techniques that are relevant for a historic building may cause unexpected adverse impacts for another. Thus, most appropriate and convenient technique for that building must be selected according to its cultural and physical condition considering its current state (i.e., whether buried or on ground), carrying capacity (i.e., structural soundness) and vulnerability (existance of fragile artworks -stucco, mosaic, etc.). Alternative strategies should be developed and a consensus should be achieved among experts and conservation specialists during multidisciplinary approaches.

Within the light of these information, the purpose of this paper is to discuss phases of a multidisciplinary approach applied to develop a conservation project for the ancient cistern building, located in Akkale archaeological site in Mersin. Being located in Tırtar of Erdemli town today, Akkale was an important port facility of ancient Olba Territorium[1] during classical times. There is one of the largest public cisterns of the Olbian region located in the centre of this facility, which is called as Akkale cistern. Showing a valuable example of ancient hydraulic engineering of its region, a feasiblity project was conducted by a team of experts from Mersin University and Rome 'Tor Vergata' University including archaeologists, conservation architects, structural engineer, geological engineers and city planner. Archaeological excavations have been conducted by Mersin Museum (in the name of Ministry of Culture and Tourism) with the scientific consultancy of KAAM (Research Centre for Cilician Archaeology). The purpose of the Akkale Feasibility Project, which has been supported by Çukurova Regional Development Agency[2], is to develop a visitor management plan for the whole site, to start architectural conservation program for the

[1] "Olba Territorium" is the ancient name of region located in Göksu (Kalycadnos) and Limonlu (Lamos) Rivers today. The region was ruled within an unified political control over centuries beginning from the classical times. Today; there is a high number of ancient settlements of towns, castles, rural compounds survived from that period up to day

ancient cistern and display its architectural and technological features as a self-displaying museum for visitors.

1.1. Description of Akkale Cistern

Archaelogical surveys conducted by Mersin University Research Centre of Cilician Archaeology (KAAM) and Mersin Museum since 2017 proved that ancient settlement of Akkale was an important port facility (Figure 1).

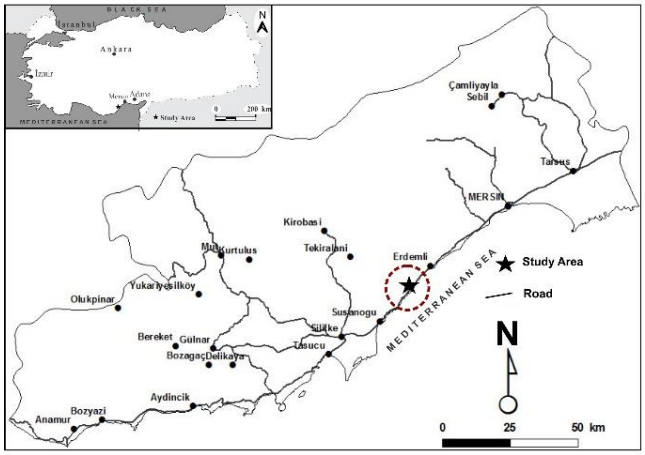

Figure 1. Location of Akkale Archaeological Site in Mersin (Tağa & Güler, 2018)

There were harbour bath, accommodation facility (inn), public cistern, monumental tomb and remains of religious buildings (Aydınoğlu & Mörel, 2017). Archaeological surveys have also revealed remains of water channels leading from Elauissa-Sebaste Korykos water work towards Akkale. Moreover, there are remains of additional water structures excavated nearby Akkale cistern indicating that there was an integrated water distribution network through the settlement (Figures 2 and 3).

Figure 2. Akkale Cistern and buildings in Akkale

Figure 3. Interior view of Akkale Cistern

Akkale cistern is one of the remarkable and well preserved buildings of the whole site. It has a rectengular size with 21.53 m × 36.40 m dimensions and 9.80 m interior height. The main construction technique of the cistern is cut-stone masonry walls, with two rows of arcades supporting the vaulted superstructure. The cistern finishes with flat roof located onto the three rows of barrel vaults. There are top windows and remains of cut-stone roof claddings on the cistern roof. The roof top might have been utilized for additional rainwater harvesting into to the cistern, since there is remarkable catchment capacity with its roof size. Each arcade has 7 arches supported on stone pillars (Figures 2 and 3). There are 3 windows located on each east and western wall, which were probably used to control, to provide daily light and fresh air for interior.

The ancient settlement has been developed on a sloped hill; so the cistern is semi-buried into the rocky ground by using the advantages of the topography. The northern wall is supported by terrain itself, while the southern wall is carried by thick cut-stone masonry walls with 1.50 to 1.80 m width. Interior walls and arches are plastered until the beginning level of vaulted roof. In order to avoid water pressure, there are additional loadbearing stone pillars located on southern and eastern walls. Whereas, the western wall was supported by a second wall attached from outside. This wall has two functions: as a walking platform to access both to the roofs and to the staircases leading into the cistern. Secondly, it helped support the flooring levels of the stone paved street located at the west. The recent excavations has revealed stone paved main street of the settlement, which might have lead to the harbour at the coast (Naycı et al., 2017).

Due to the steepy profile of the hill; the street was constructed in means of leveled platforms embedded into the topography. Each level was supported by two continous walls on eastern and western side, one of which was the exterior supportive wall of the cistern. The street was also utilized for water distribution from the cistern to the fountains located at the western wall, and bath building located at the south. So, the water coming from the main cistern was distributed to other buildings through the pipes following the slope of the street. Since original level of the street were destructed under soil, regular cavities can be observed under the street. These may have belonged to either rainwater harvesting or water drainage system, since such adjustments are common for Roman city infrastructures.

The recent archaeological campaigns in Akkale have shown that, this port settlement was also provided with

[2] The research program named as "Feasibility Research for Survey, Conservation and Presentation of Akkale (Erdemli) Archaeological Sites" has been supported by Çukurova Regional Development Agency and Mersin University during 2017-2018. The archaeological campaigns and survey results have been regularly updated since then.

water from Elauissa/Sebaste-Korykos water conveyance system (Aydınoğlu & Mörel, 2017; Bildirici, 2009). After the Limonlu and Tırtar aquaducts, a branch of surface water channel leads to to Akkale settlement. So, the two chambered cistern located at the north of main public cistern must have functioned as castell of the public cistern, where the water taken from Elauissa/Sebaste-Korykos water work was settled in here before it was leaded to the main cistern. The remains of water channel leading towards the main cistern can be seen after excavations. There are five pipe cavities observed from the inside which are related with water inlet-outlet. According to their levels of location, shape and size, it can be proposed that the rectangular cavities located at northern walls are related with cut-stone channels bringing water to the cistern from the southern cisterns. There are two circular holes on the western walls, which might have housed pipes providing water from cistern to fountains and bath building along the street. There is another circular hole located at the lowest level on eastern wall, which might have another water outlet from the cistern.

2. METHODOLOGICAL APPROACH AND CONTENTS OF SCIENTIFIC RESEARCHES

Akkale cistern, which functioned as the main reservoir of this harbor facility, deserves detailed analysis in order to understand interconnected water distribution system of the settlement and develop appropriate visitor management and architectural conservation program. For this purpose multidisciplinary research approach is carried out both in building and settlement scale to understand the role of Akkale cistern within the water distribution system of the settlement. Experts from archaeology, architectural conservation, structural and geological engineering disciplines developed a multidisciplinary research program in order to investigate the cistern building and its nearby environment in detail.

The research stages include archaeological documentation and architectural surveys of the building and the site; historical uses, alterations and restitution survey of the cistern; condition assessment related to material degradations and causes of decay; material analysis on plaster and mortars used in the cistern; geological and geotechnical research in order to understand the physical relation of the cistern with the topography it was burried into; structural analysis to evaluate original resistance capacity of the building (with water) as well as its structural safety in present situation. Detailed discussions regarding technics and methodologies applied in each research; results gained from each phase and flow of information from one phase to another are presented in following:

- Architectural Documentation and Building Surveys: Archaeological excavations around the cistern revealed important architectural information and traces related to original condition of the building. Following, detailed measured surveys including architectural plans, cross sections, internal and external elevations and documentation studies related to site maps have been conducted by using optic measurement and aerial photogrammetric techniques. Survey drawings are utilized to evaluate architectural details, material use and construction techniques of the cistern. They also provide base maps for restitution proposals and condition assessments studies in further stages (Figure 4).

-Condition Assessment: Condition assessment is the initial step in conservation studies since it helps understand existing situation and preservation state of the historic structure by using visual observation techniques to identify material decays and structural deformations. This fundamental phase gives direction for further qualitative and quantitative analysis to be conducted, methods and techniques to be selected to achieve comprehensive conservation decision-making process for the building. Having completed architectural documentation and building surveys; visual observations related to material decays and structural deformations are conducted. The cistern was constructed with cut-stone masonry technique by using mortar as the main binding material. Interior facades were plastered in order to prevent water leakage. Since the main construction material was stone; technical classifications of "Glossary of Stone Deterioration" prepared by ICOMOS was utilized to determine types of decay forms (ICOMOS, 2008).

Accordingly, five groups of decay types are identified from slight to severe impact level. First group represents slightest level of material decay including color alteration and surface depositions such as black crusts and salination. Second group is slight decay level, which includes moderate biological colonizations and macro-vegetation. Third group includes stone degradation and detachment problems, which are classified as pitting, alveolization, flaking, sugarization and contour scaling. Fourth group identifies material cracks and fissures. The fifth group represents the most severe level, which shows material loss and partial destruction. Having identified material decay groups, material deteriorations observed in the building were mapped onto the architectural survey drawings (Figure 5).

-Comparative Material Analysis: Waterproofness is one of the primary design criteria applied during construction of historic water structures. Water conveyance systems such as galleries, channels or storage structures such as cisterns, reservoirs were constructed either in hard rocky beds or plastered with hydraulic finishing materials to prevent water leakage. Physico-mechanical performance of plasters and mortars used in historic masonry water structures had hydrophobic properties rather than other types of buildings. Interior facades of Akkale cisterns were covered with plaster until the beginning level of vaulted superstructure. Plaster lines show maximum height of water when the cisterns were filled with water in its full capacity. In order to understand physico-mechanical properties of plasters and mortars used in Akkale cisterns; a comparative analysis with the rest of building structures in the site was conducted. For this purpose, plaster and mortar samples from three water-related structures (Cistern 1, Cistern 2 and street fountain) and material samples from non-water-related structures (the tomb, wall remains) have been taken from the site and

sent to the Conservation Laboratory of Ministry of Culture and Tourism in İstanbul (Figure 6). The laboratory investigations on material samples include identification of physical components and aggregates through stereo-microscope visualization, petrographic analysis to understand their physico-mechanical aspects and chemical analysis based on calcination and soluble salt tests (İstanbul Konservasyon Laboratuarı, 2017).

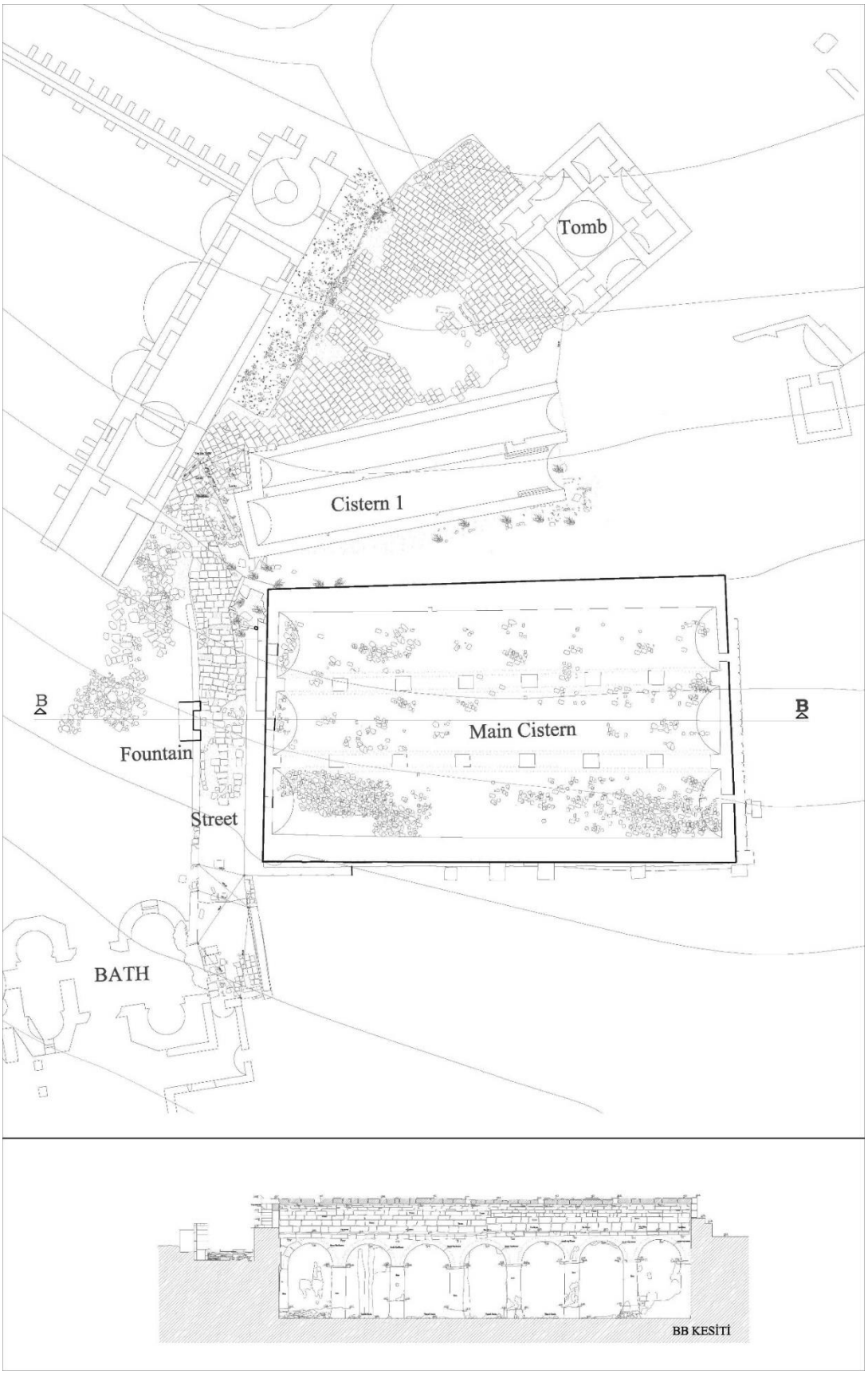

Figure 4. Survey drawings of the cistern

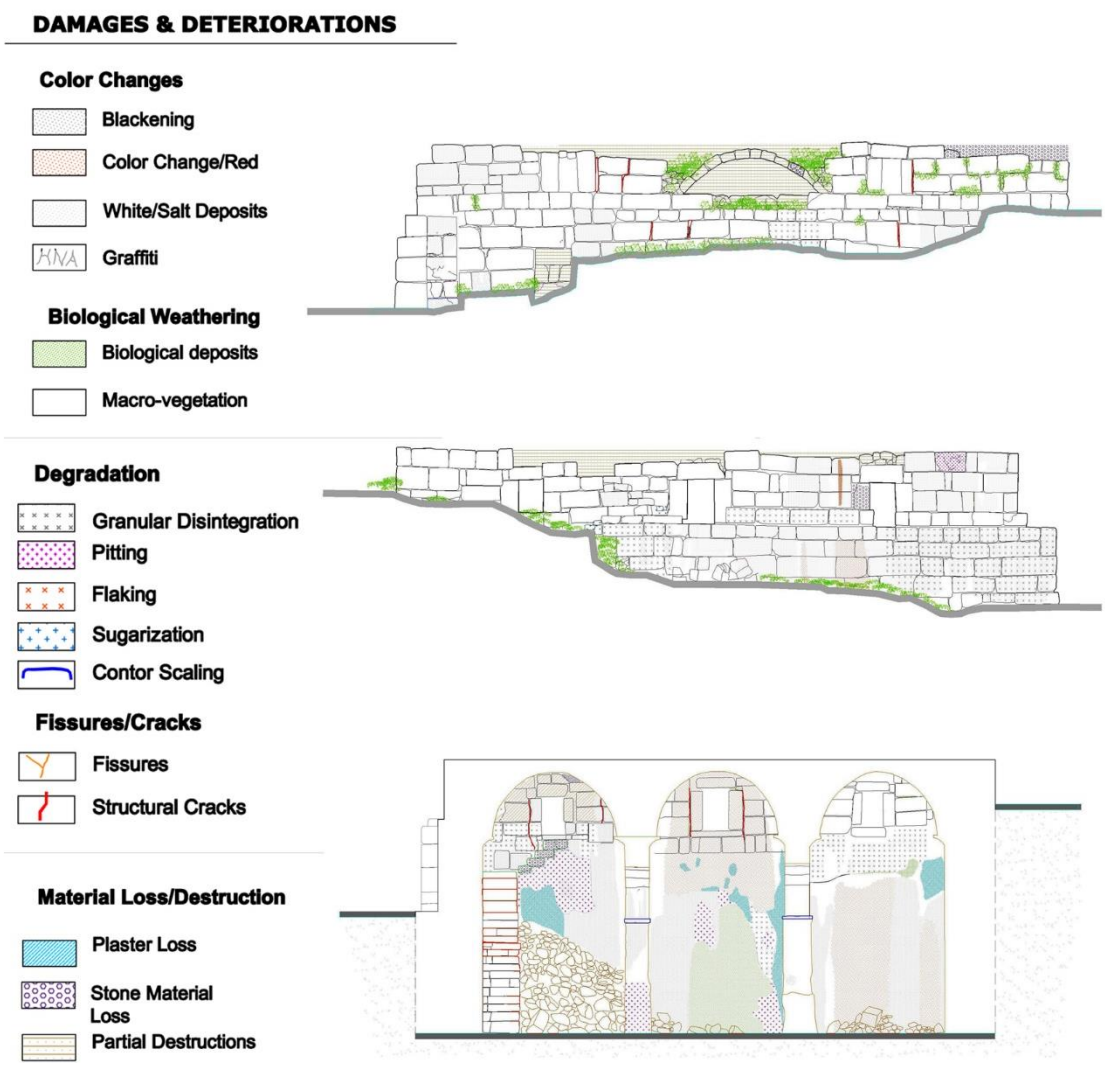

Figure 5. Mapping of material deteriorations observed in the building

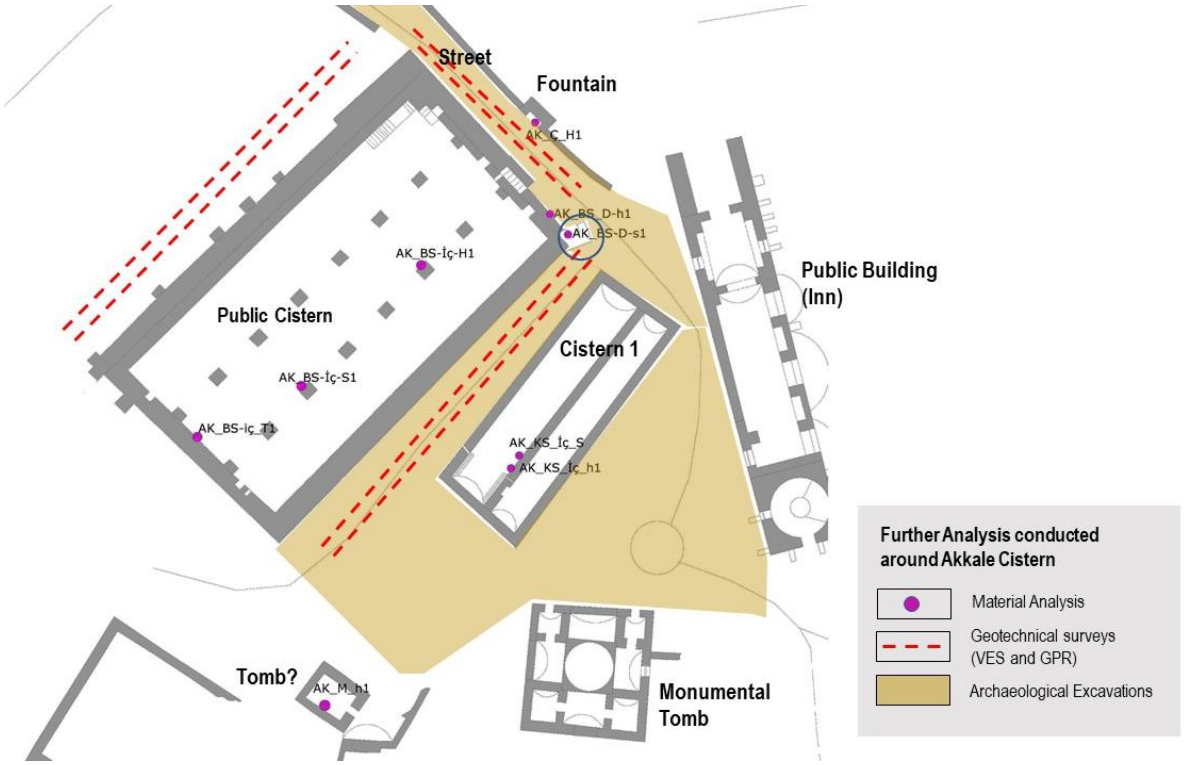

Figure 6. Locations of further field investigations applied in the site

-Geological and Geotechnical Surveys: Further site investigations related to geological aspects of the site have been conducted in order to compare geomechanical properties of limestone used in masonry construction of the cistern with rocky formation of its close environment and to understand its relationship with the terrain it was constructed into. Non-destructive techniques (NDT) have been preferred for geological and geotechnical researches, since the cistern is located in an archaeological site (Figures 7 and 8). Sonic velocity and Schmidt hammer resistivity tests were performed on the locations chosen on the building. Samples from rocky ground showing similar lithological aspects with stone material used in construction of cistern building were examined through laboratory tests to provide geological data during structural analysis works. Since the cistern was settled into the topography, another NDT method of Vertical Electrical Sounding (VES) technique was applied in order to scan ground resistivity of the cistern and its environs. Ground Penetrating Radar (GPR) method was applied around the cistern to understand boundary of lateral walls inside the rock bed and how much it was buried into the ground (Tağa & Güler, 2018).

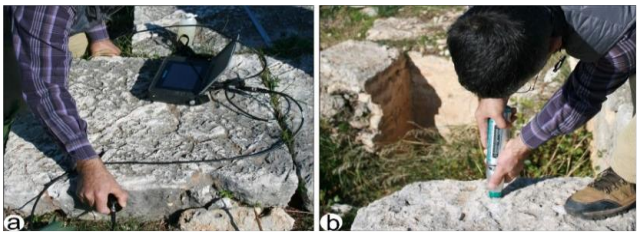

Figure 7. Sonic velocity and Schmidt Hammer tests applied on rocky ground (Tağa & Güler, 2018)

Figure 8. Geophysical investigations around cistern (Tağa & Güler, 2018)

-Structural Analysis: The structural condition assessments focused on the cistern building encompass field observations on structural deformations, structural analysis on original (with water) and existing situation (in relation with its environment) of the cistern, laboratory tests to understand its structural behaviour and structural safety. The results are evaluated to develop proposals in order to guarantee structural safety of the building during architectural conservation studies, possible reinforcing and strengthening activities in local critical parts[3] (Abiuso et al., 2019). Besides, preventive measures that should be taken in order to guarantee structural safety of the building during possible cleaning activity inside and local excavation activities outside the construction are suggested. In the light of geological data provided by geotechnical studies, structural models have been prepared to display structural behavior by using FEM methods (Figure 9).

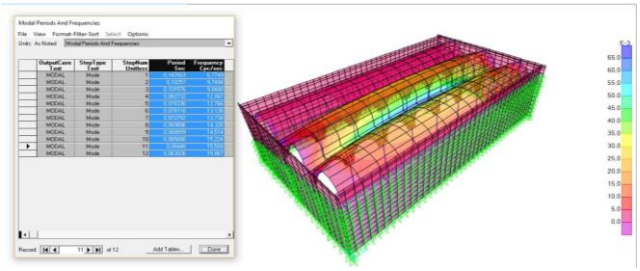

Figure 9. Model response and vibration mode of structural elements (Abiuso, et al., 2019)

3. RESULTS

Architectural, material, geological and structural analysis carried out by each group in Akkale case, provided a comprehensive and detailed information that can be integrated into architectural conservation interventions of the cistern building as well as safety precautions to be taken during archaeological excavations and visitor management studies. Multidisciplinary researches conducted by different technical groups provided flow of more accurate information from one phase to another during analysis and condition assessment studies (Figure 10). Overall evaluation of these results provide definition of a detailed conservation program including phases of interventions and appropriate techniques that should be chosen for cistern building.

Laboratory tests on sample materials taken from the site provided information on physico-mechanical properties of original stone, mortar and plaster materials used in masonry of cistern building. Stone samples possess biomicrite limestone characteristics, which are very common in the ancient structures of the region. Mineralogical-petrographic analysis on mortar and plaster samples have showed that there are two types of material design. Three of the samples taken from interior facades of cisterns have pinkish color; and include aggregates of limestone, brick pieces and brick powders with binding material of clay. These plaster samples support the idea that brick powder was used to increase hydraulic performance of materials applied in surfaces of water structures. The other three samples have scolor and indicate cement as the binding material with aggregates of limestone and brick pieces. These results have provided quite satisfactory information related to design of repair mortars and plasters in conservation interventions.

The geological, geotechnical and geophysical data gained during field tests and laboratory tests provided accurate data to be utilized during structural analysis by using FEM method. Similarly, evaluations on condition assessment of cistern building could be more reliable due to the results of structural safety analysis. By altogether evaluation of geological and structural analysis, intervention decisions related to environmental control (water drainage), structural repairmen and reinforcement of the cistern, as well as precautions related to management of construction site during cleaning and restoration studies could be prepared.

[3] Detailed discussions regarding structural analysis are presented in sepaate paper: (Abiuso et al., 2019)

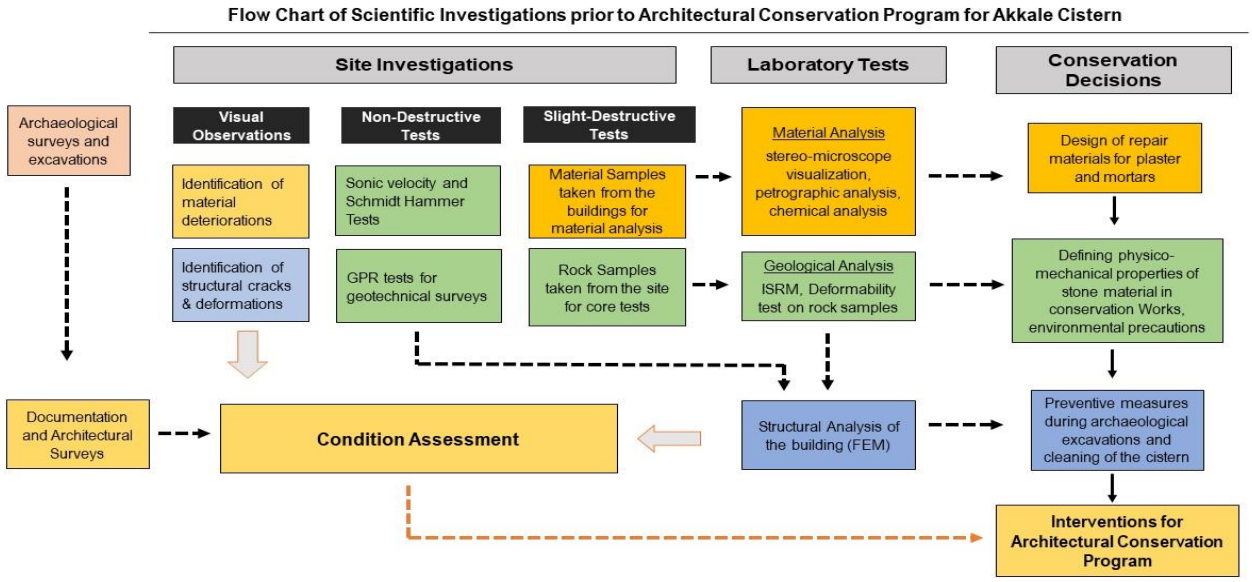

Figure 10. Flow chart of scientific investigations prior to architectual conservation program for Akkale Cistern

4. CONCLUSION

As stated through international doctrines from the beginning of modern conservation paradimgs in the beginning of XX century, conservation of cultural heritage is a multifaceted complex challenge since every historic structure possesses unique situation of physical condition statement. The scientific survey, analysis, evulations -which will end up comprehensive conservation program and intervention decisions- require quite good organization of technical experts, selection of appropriate technics for that building, flow of accurate information among phases of scientific researches. Among cultural assets; archaeological settlements are most fragile ones since most of structures are in ruins state and there are constant survey and excavation interventions, which reveal new information each time. This also necessiates a comprehensive management and monitoring program before, during and after conservation implementations.

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Preliminary Report of Knidos Excavations 2018

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Workshop

ABSTRACT

In the seventh season of the excavations we have carried out in Knidos, excavations were carried out in important regions and structures of the city. During the 2018 excavations, drilling was carried out in the arrangement named "Apsis 1" in the western parados section of the Little Theater. In this study, which is very important in terms of the construction phases and techniques of the Little Theater, the basic level of the theater was reached and this level was revealed to the ceramics and other finds dating from the 3rd century BC to the 2nd century BC. Excavations have been continuing since 2016 in the area named East of Liman Street, another study area. In these studies, it was first used as a row of shops in the East of Liman Street in the Late Classical - Early Hellenistic Period, then the shop function was preserved again in the Roman Imperial Period, but the form and function of some spaces were changed and the last there is a complex used as a workshop / atelier and warehouse. During the 2018 excavations, three new additional rooms were found to the east of the first two rooms of the complex. Excavations have resulted in very good contexts regarding the abandonment of these three new sites, the complex and Knidos.

1. INTRODUCTION

Excavations carried out in the ancient city of Knidos in Datça District of Muğla Province continued in two different areas in 2018. The first of these is the "Little Theater", one of the two theaters of the city, located to the east of the Dionysus Terrace. The second important excavation area is the complex located to the east of Liman Caddesi.

The buildings in both excavation areas are located in areas where the social and economic life of the city is intense. Therefore, the archaeological data obtained here have provided us with important clues about the historical process of Knidos.

2. Knidos Small Theater Research Drilling

Excavations in the ancient theater, which is one of the two theaters of Knidos and called the "Little Theater" due to its dimensions, was first carried out between 1857-1859 by Sir C.T. It was carried out by Newton in the west analemma, vomitorium part and west parados parts of the theater (Newton, 1862; Newton, 1863). After Newton, in the 1970s, Prof. Dr. INNER. Love continued partial excavations in the orchestra, skene, eastern parados and eastern vomitorium of the theater (Love, 1970; Love, 1972). Prof. Dr. Ramazan Özgan, on the other hand, completely unearthed the orchestra part of the building in 2006 (Özgan, 2007; Bruns Özgan, 2013). Within the scope of Knidos Excavations and Researches, the theater was largely unearthed with the Small Theater excavations that have been carried out since 2013. In these studies, studies on the interior of the western analemma and the analemma, the eastern and western parados were completed (Doksanaltı et. al., 2015; Doksanaltı et.al. 2017).

The Small Theater was built leaning on a slope to the south. However, depending on the topography, the slope is cut to the west. Therefore, while the eastern half of the theater section of the theater was placed on the slope, the western section of the theater and the west theater leaned on an artificial slope formed by filling, causing the

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western analemma wall of the theater to be quite high (Doksanaltı et. al., 2018b).

During the raising of the analemma, three high walls of apsidal form, made of volcanic tuff stone and built in isodomic style, lined up side by side along the wall, were unearthed (Doksanaltı et. al., 2017). One of these apsidal walls is located to the south of the vomitorium and the other two to the north (Fig. 1). It was found that a similar application was made inside the western parados wall. These tuff stone walls at the height of analemma and parados walls are a technical application made to reduce the weight by spreading the load on the outer analemma and parados walls. This arrangement between the walls in order to obtain an artificial elevation / slope for the rows of seats is a different application of the vaulted substructure in Roman theaters to raise the floor on flat land. The vaults were replaced by vertical apsidal walls.

There is a volcanic tuff stone 6.60-meter-long, 0.45-meter-thick wall that was built from one end of the apsidal wall to the other, parallel to the parados wall and almost combined. Thus, the south of the apsidal wall was closed with the east-west direction wall made of the same material. In the parados, a half 'U' or arc shaped pool-like area was created. This area is filled with filling to increase the durability of the parados and analemma wall.

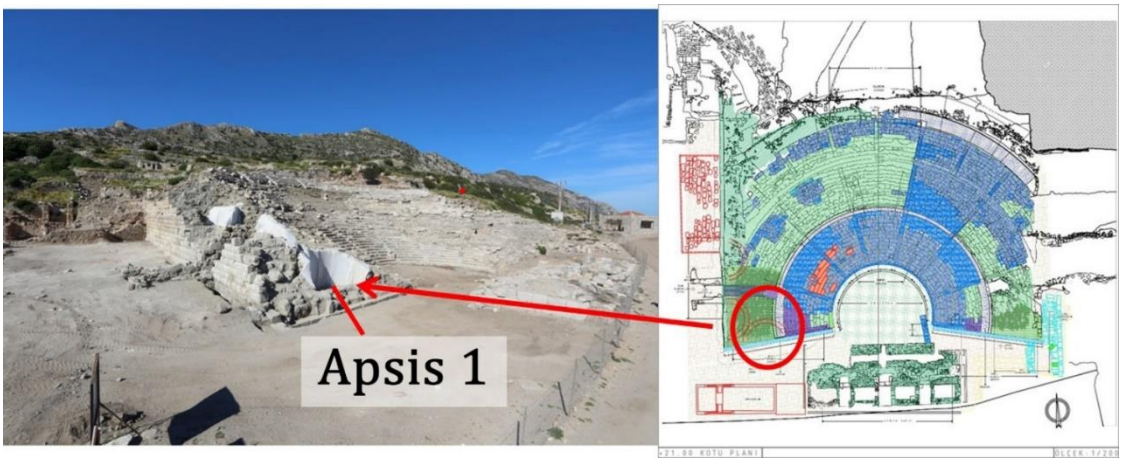

Figure 1. Apsis 1's position in the Theater

In the 2018 season of Knidos Excavations and Researches, a drilling study was carried out in Apsis 1 in order to clarify the relationship between the apsidal form walls and the analemma walls and to obtain possible data about the construction stages of the theater. A sounding of 2.10x 3.35 meters was drilled in the western half of the 'U' shaped area in the abscissal wall.

Drilling works were initiated from the level reached in previous excavations - the point equivalent to the seventh row of blocks starting from the top of the apsidal wall. This level also coincides with the initial level of the uppermost row of blocks that have been preserved in the east-west direction of the wall located at the end of the apsidal wall.

In the previous season, seven rows of blocks were removed from the top of the apsidal wall. The lowest three rows of the wall and the foundation blockage were revealed by the drilling work. The blocks of shellac belonging to the apse and newly unearthed are well preserved. So much so that the stains on the blocks are still visible. The apse rises on a floor of rubble stone and soil.

The foundation blockage of the east-west wall at the end of the apsidal wall was exposed with four rows of preserved blocks. With the drilling works, the foundation level of the apsidal wall and the east-west wall was reached.

The blocks at the west end of the apsidal wall and the east-west wall were built to overlap each other. This situation shows that both walls were built according to a plan. In addition, the back faces of the uppermost block row, which is preserved in the east-west wall of volcanic tuff stone, are arranged to accommodate the back faces of the cross-stones of the marble parados wall. The front faces of the tuff stone blocks of the east-west wall, located at the points where the cross stones of the Parados wall are located, were carved inward in the size of the cross stones. This arrangement shows that the cross stones of the parados wall entered the tuff blocks of the east-west wall like a gear.

The junction point of the apsidal wall and the east-west wall was also seen with the drilling work. The end blocks of the east-west wall partially penetrate into the apsidal wall. Both the parados wall and the east-west wall relationship, and the apsidal wall and the east-west wall relations suggest that all this practice could have been done simultaneously and within a program.

During the drilling works, the depth reached in previous studies, from the preserved top block of the east-west wall, was reached to a depth of 2.60 meters to the bottom of the foundation levels of the walls. A filling of rubble stone and sandstone particles was found in the level from the initial level to the baseline of the apse. This filling is similar to the filling soil seen at the levels corresponding to the apse in previous studies. Not a large amount of ceramic pieces belonging to the 3rd and 2nd centuries BC were found from this fill. At the base level of the apse, there is a Zenon amphora dating from 280-240 BC (Cankardeş - Şenol 2006) and two seals containing the name of Aristotle, who was the ruler during the Rhodes Period IA (Lawall, 2007; Cankardeş-Şenol, 2015), dated to 304 - 235 BC. amphora handle was found (Fig 2).

Figure 2. Research drilling and finds

Below the foundation level of the apse wall, a damp embankment containing seashells, 100-120 cm wide and 50 cm high, was found to contain larger rubble stones. A small amount of sherds of pottery vessels belonging to the 4th and 3rd centuries BC were found in this fill layer. Fragments of West Slope vessels seen at this level date back to BC. They were produced in Knidos during the 2nd century (Kögler, 2000; Doksanaltı, 2006).

In the 'u' shaped area formed by the apse, the east-west wall and the parados wall, ceramic potsherds belonging to the 3rd and 2nd century BC are generally concentrated in the upper levels. Under the foundation level and foundation level of the apse and the east-west wall, a fill of large rubble stones containing fragments of ceramic vessels and seashells from the 4th and 3rd centuries BC draws attention. This situation raises the idea for now that the volcanic tuff stone apse and east-west wall might have been built at the end of the 3rd century BC.

3. East of Liman Street

Work at the Locations East of Liman Street continued in 2016 and 2017 seasons (Doksanaltı et. al., 2018a; Doksanaltı et. al., 2019). The 2018 season study area is located at the intersection point of the Stoa structure to the north of the Dionysos Terrace with the spaces east of Liman Street (Fig.3). The excavation of the area behind Space 1 and 2, which was excavated in previous years and partially to the southwest of Terrace II, was carried out in the 2018 season. In these studies, chambers associated with Space 1 and 2 were exposed.

During the studies, two chambers associated with this space were unearthed behind Space 1. These chambers are named as Space 1A and 1B.

Room 1A (Fig. 4): The room, which is connected to Room 1 by a door with a width of 0.82 meters, measures 2.05x 2.37 meters. The south wall of the room also forms the north wall of the Building at the west end of the Stoa and is 0.90 meter wide, made of white limestone with an isodomic technique. The west wall, where the door to the connection with Place 1 is located, was built with a lot of rubble stones or re-used architectural elements. This wall is 2.05 m long and 0.55 m thick and joins the southern wall as a primitive.

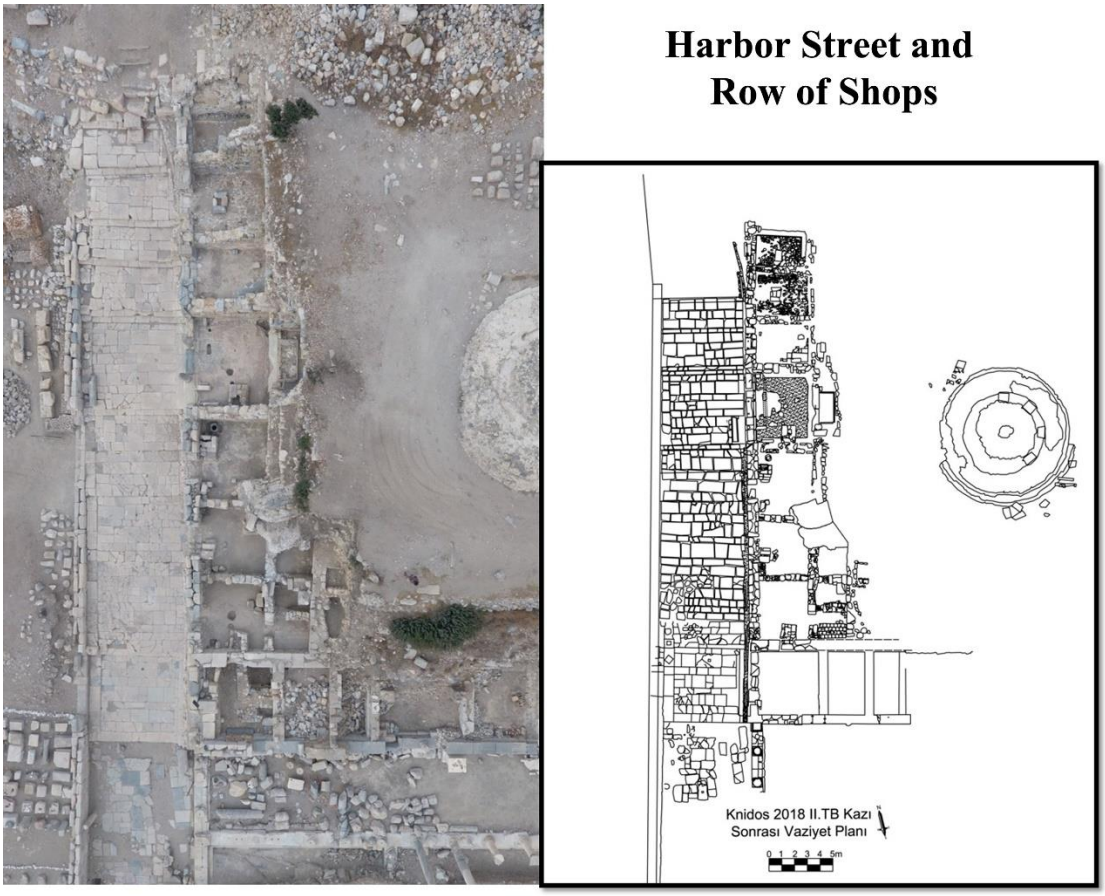

Figure 3. Harbor Street and Venues to the East

Figure 4. Room 1A

The eastern wall of the space continues along the east of Space 2 as well as Space 1. In the construction of the wall, embossed limestone and smooth cut conglomerate blocks were generally used. In addition to these, smaller size rubble stones of different shapes and sizes were used in the construction of walls to equalize the levels of large blocks. Terracotta floor coverings and roof tiles were also used in the wall as filling material. On the wall, the blocks are attached to each other with lime mortar. In addition, a mortar filling of up to 5 cm thickness is made between the joints in order to fill the joints between the blocks and to create a suitable surface for plaster. This wall is generally similar to the comglomerate rectangular or limestone polygonal terrace walls of Knidos, except for the repairs, rubble and mortar additives it has seen.

The north wall of Space 1A is 0.63 meters wide and is 2.30 meters in the east-west direction. In its construction, rubble stone and terracotta floor coverings were used together as well as reused wall blocks, and lime mortar was used extensively on the wall. The 0.73x 0.63 meter door opening on the north wall provides the transition to Space 1B.

The floor code of Space 1A is 0.70 meters higher than Space 1, and the floor is completely covered with 0.27x 0.27 meter terracotta square plates. However, only the southern part of the floor covered with plates has survived.

The joint thicknesses between the terracotta plates are uneven, and these thicknesses vary between 0.5 cm and 4.5 cm, which have a very poor workmanship. Another feature seen on terracotta plates is the "S"-like decorations made of two or three rows made on the plates while the dough is wet. These decorations are not in every floor and do not show a certain order. In addition, the Greek letters " ΡΠ", which is probably an abbreviation of the name of a manufacturer / workshop, are seen on the floor covering located on the intersection of the west and south walls in the southwest corner of the room.

Paint and burn marks are seen on the terracotta floor coverings in an area of 0.80x 0.75 meter in the northeast corner of Space 1A. The paint traces seen on the floor plates are dark red, and again in the same area at +4.55 m elevation, amphora fragments with the same color paint residues were found. A black burnt / paint residue was found inside an amphora base fragment inside the room. These types of finds are similar to the workshop finds previously identified in the spaces located in the west of Liman Street.

The Late Antiquity level was found at +5.10 meters elevation in Space 1A, which is seen to be connected with Place 1, and no ceramic finds dating back to the middle of the 7th century AD have been detected in the space from this level. Late Antique period ceramics include amphora rim, bottom and handle fragments, situla base fragments, African red slips, LR1 and LR 2 amphora body fragments, Late Roman C red slips, rim and body fragments of cooking pots, secondary use body fragments (amphora cover) and Bonifay, spatheion 3 Variant C group sample spetheia amphora (Bonifay 2004). Similar spetheia amphoras found in Knidos and other centers are dated to the second quarter of the 7th century AD (Doksanaltı, 2020a).

Space 1B (Fig. 5): This room at the back of Space 1 measures 1.76x 2.37 meters and is connected to Space 1A to the south by a 0.73x 0.63 meter door. In the northern corner of the east wall, which is common with Room 1A, there is a buttress that has been preserved up to 2.67 meters high, where flat cut wall stones attached with lime mortar measuring o.78x 0.60 meters are used together with spolia blocks. The lime mortar and rubble stone layer with dimensions of 0.60x 0.40 meters and a height of 0.12 meters at the top block of this buttress suggests that this buttress might be a vaulted pillar.

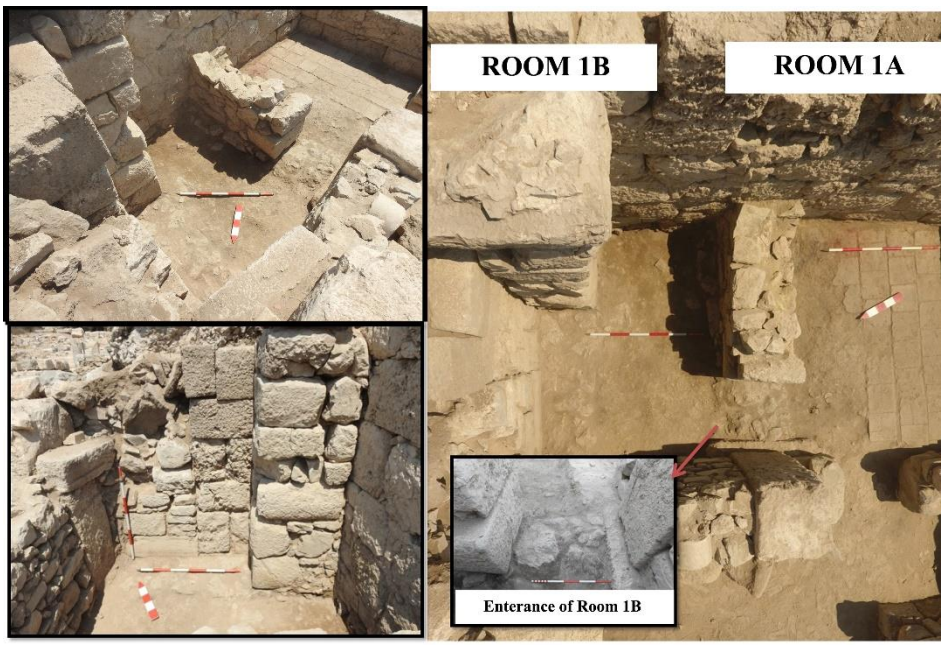

Figure 5. Room 1B

Just behind this buttress in the northeast corner of Space 1B is another pier measuring 1.40x 0.68 meters and has been preserved up to a height of 2.3 meters. This buttress also forms the north wall of Space 1B. The buttress was built from rectangular cut hard limestones in a "pseudo isodomic" style. However, the northern border of the place was formed with an addition formed by combining rubble and reused stones with lime mortar at the end. However, before the addition, there is a 1 meter connection between Space 1B and Space 2A, which seems to have been closed afterwards.

In Room 1B, a burnt layer of approximately 10 cm thickness was encountered in the range of +4.55 m to +4.47 m elevation, which is dense in the north of the room, but is densely seen throughout the room. This layer consists of LR 1 and LR 2 amphora body fragments, North African Red Lined dishes, kitchen and storage vessels, most of which are dated to Late Antiquity.

Two 'Asia Minor type' / Brooner Type XXIX Group 3 oil lamps dated to the first half of the 7th century AD in Space 1B (Bass et. Al., 1982).

Near the door threshold that provides the passage from Space 1A to 1B, a half-follis, which was minted by Constantinople (Hahn, 1973, 116a), belonged to Emperor Justinian I, 555-556 AD. Between the joint of the wall separating Space 1A and Room 1B, a low condition bronze coin, which is understood to belong to the first half of the 5th century AD, also provides an idea for the construction date of the wall. This dating is also compatible with the change and construction phases of the spaces in the East of Harbor Street (Fig. 6).

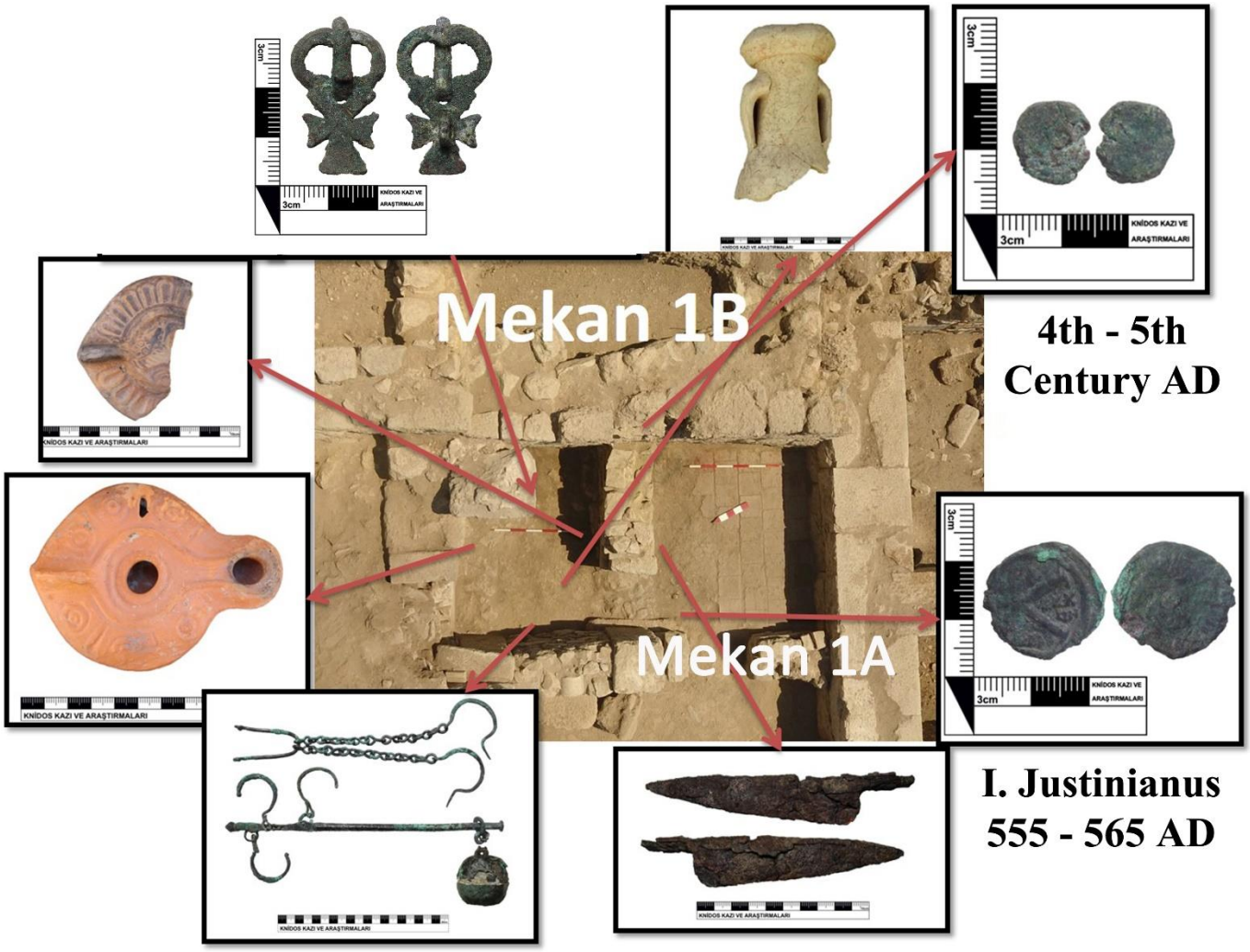

Figure 6. Location 1a and 1b findings

A scale consisting of two chains, five hooks and a square section arm made of bronze was unearthed at the ground level in Room 1B. One of the chains of the scale is 17.3 cm long and the other 16.4 cm. It has marks on the square scale arm showing the units of weight in straight notches. While there are three hooks on the tapered short side of the balance arm, the long part where the main weight is connected is a bronze coated scale weight, inside of which is filled with lead. Libra can be regarded as data relating to the commercial character of the space or associated spaces (Bass et.al., 1982).

Apart from these finds, a knife made of iron, a bone hairpin, an iron ring and a cross shaped handle or applique made of bronze were unearthed in both places at the ground level.

Space 2A: It is a 2.65x 2.30 meter room, connected to Space 2, located to the east of Liman Street. Due to this connection, this room was named as Space 2A. The passage to Space 2A should probably have been provided

through a passage or door on the east side of LCD Space 2. The connection between the two sites is not clear since the ruined vault fragments in the east of Site 2 could not be removed during the 2018 excavation season.

The eastern wall of Space 2A is the continuation of the eastern wall of Space 1A and 1B. Although the knitting technique and construction concept generally show a great similarity with the southern extension of the wall, it was observed that the use of polygonal / polygonal stones in this section was smaller and more in certain sections compared to Space 1A and 1B.

The west wall of Space 2A also forms its border with Space 2. The north-south wall is 1.82 m long, 0.67 m thick, and its current height is 1.05 m. The western wall was formed by bonding rubble stones of various sizes to each other with lime mortar, and some parts of the wall were also used in spolia blocks. The northern wall of the room is under the thick vault block related to the upper cover of the building. On the other hand, the northern wall is partially visible under this debris. Since the large vault debris could not be removed this season, the quality and dimensions of the wall will be determined in the upcoming seasons.

During the 2018 season excavations of the Locations to the East of the Harbor Street, the chambers behind the two rooms at the south end of the building complex consisting of seven rooms and associated with these spaces (Locations 1A-1B and Space 2) were exposed. However, since the excavation of Space 2A and some parts of the area remained under the large broken vault blocks related to the superstructure of the complex, the completion of the works is left to the 2019 season.

A small-scale excavation was carried out on the southwest end of the upper terrace, the second terrace, in order to perceive this building complex better and to prevent the danger of the weight attached to the terrace on the eastern edge of the building.

With this study, the southeast wall of the spaces in the East of Liman Street (Room 1 A-1B and the eastern wall of Space 2) was thus revealed. This wall continues 7.50 meters behind the spaces and is 0.90 meters thick. The wall with a preserved height of 2.85 meters continues in the northern part, which has not been excavated yet.

In the construction of this wall, embossed limestone and reused smooth cut conglomerate blocks were generally used. In addition, smaller size rubble stones of different shapes and sizes were used to level the levels of large blocks. This wall separates the terraces II and the spaces east of Liman Street. Therefore, it can be stated for now that this wall has the characteristics of a terrace wall.

The work was continued on the terrace filling behind this wall. This area has been deepened in an area of 8x 19 meters. During the excavations here, a cell-planned arrangement of 1.80 x 1.45 m in the north was unearthed in the south of it and two rooms with no eastern border yet. The excavations here were made only up to 2 meters deep in order to relieve the load on the terrace walls due to the possibility of collapse of the section soil in the future.

An anonymous follis from 970-1092 AD, another anonymous follis B group from 1030 / 1035-1042 and Emperor Kostantinos X period 1059-1067 at the upper levels (between +8.75 m and +7.20 m elevation) and another follis dating to the years was found (Sommer, 2010; Ninety Six, 2020b). These coins are very rare late period finds in Knidos, which is thought to have been abandoned in the middle of the 7th century AD. However, in the preliminary evaluations, no other ceramic finds or remains of buildings that could be associated with the coins dated to the 11th century AD were found (Fig. 7).

In the filling behind the wall, as it deepened, fragments of ceramic pots dating from the 4th to 3rd centuries BC were found in the fill starting from +7.20 m. The amphora handles found are dated between 301 BC and 240 BC. The earliest dated seal among these is the amphora handle found at +7.20 m elevation. The name of Timarchos who served in Rhodes Period Ia (301-271 BC) is written on the amphora produced in Rhodes Paraea. Another important sealed amphora handle found is the Akanthos - Amphipolis seal. These seals are dated before 330 BC (Cankardeş - Şenol, 2006). The handles of the Zenon B group amphora (280 - 240 BC) with the seal of Knidos origin and the amphora Zh monogram (late 3rd century BC) found during the excavations are important. This filling is similar to the theater apse filling finds (Fig. 8).

Figure 7. Late Coin Finds

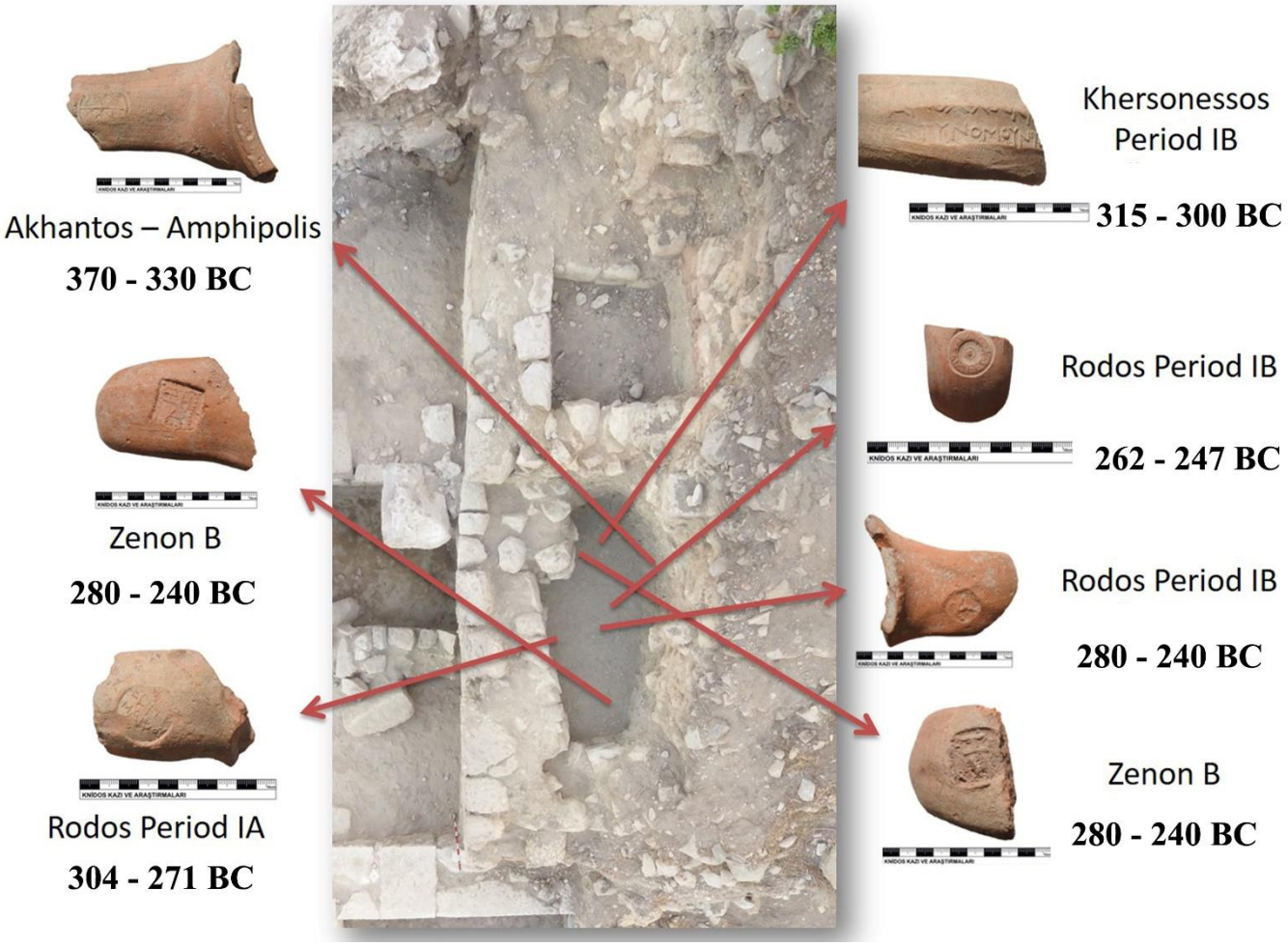

Figure 8. Sealed amphora handles behind the terrace wall

4. CONCLUSION

Excavations carried out in Knidos Little Theater and east of Liman Street provided us with important data about the historical process of the city. The Little Theater Research sounding helped both to verify the construction stages of the theater and to understand the construction date of the apsidal shaped support walls discovered in 2015. It was first built in the last quarter of the 4th century BC with a single diazoma. The building was enlarged in the second construction phase, which is estimated to have been built during the reign of Emperor Augustus. The repair phases seen in the stage building are dated to the 2nd century AD. The finds unearthed as a result of the excavations carried out in Apsis 1 in the West Parados of the Theater show that the support walls made of tuff stone may have been built at the end of the 3rd century BC.

The excavations carried out in the East of Liman Caddesi have resulted in obtaining similar contexts with the previous excavation seasons (2016 and 2017). Some of these spaces, which were used as shops in the Late Classical - Early Hellenistic Period, were used for functions such as heroon by changing their plans in the Roman Imperial Period. The use of the spaces whose functions were changed again in the 4th - 5th centuries AD completely ceased in the middle or second half of the 7th century AD.

The sealed amphora handles and ceramic finds unearthed as a result of the limited excavations carried out behind the terrace wall that forms the eastern border of these places show that this part of the terrace wall was repaired in the 3rd - 2nd centuries BC.

Archaeological data show that Knidos was abandoned from the middle of the 7th century AD. However, it is known that Knidos continued its existence as a bishopric center until the 12th century AD. The coins we date to the 11th century AD are important in that they are rare finds dating back to the 7th century AD. These finds may indicate the existence of a small and limited settlement in the areas close to the city's ports in the 11th century AD.

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Architectural Inventory and Building Condition Assessment Research on Masonry Structures of Kanlıdivane Archaeological Site, Mersin

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Historic monuments
Masonry
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Kanlıdivane

ABSTRACT

Conservation and structural strengthening of historic masonry structures is a long and challenging process which necessitates technical expertise and constant budget to keep conservation works regularly. Thus, one of the priorities of cultural heritage management programs must focus on regional and site scale monitoring programs in order to evaluate structural and physical condition assessment of cultural assets, classify risk categories based on their damage levels and develop urgent and preventive precautions accordingly. This will keep historic structures in safe; and prevent severe destructions and loss of significant values by regular maintenance works within the technical and fiscal capacity of the institutions. Within the light of this information, the purpose of this paper is to discuss results of the architectural inventory methodology developed for Kanlıdivane Archaeological Site (Mersin) to provide a systematic condition assessment approach as a supportive assessment phase for decision-making process of comprehensive architectural conservation program to be developed in site scale.

1. INTRODUCTION

Kanlıdivane is one of the important historic sites of Erdemli town, which possesses rich and diverse monuments that belong to Hellenistic era, Roman, late Antiquity, Byzantine and traditional periods. Majority of architectural heritage of the site constitutes historic masonry structures, showing different stone masonry construction techniques of the region (Figure 1).

The conservation status of monuments varies from semi-destructed structures to well preserved ones. Since there hasn't been any archaeological excavation campaign or architectural conservation program in the site yet, degradation and damage levels in the structures increase because of atmospheric and environmental conditions over time. The purpose of this paper is to discuss on research entitled as "Architectural Survey and Condition Assessment of Masonry Structures in Kanlıdivane Archaeological Site1" which aims to develop an architectural documentation approach including integrated condition assessment methods as a preliminary impact assessment phase for decision-making process.

Figure 1. Kanlıdivane archaeological site

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1.1. Structural Condition Assessments on Masonry Structures

Building condition assessment methods include techniques of documentation, visual observation, filed tests and laboratory tests. There is a number of visual damage assessment methods, which can be applied for rapid and visual observation on historic masonry structures. Damage analysis helps to understand impact category and its level of the building, while detailed crack analysis provides to understand structural safety of the building. Damage assessment is generally related with earthquake occasions so most of the assessment methods are classified as pre-earthquake and post-earthquake evaluations. The damage categories in masonry structures are generally classified from moderate to very severe (damaged) categories (Kaplan, 2010: 54):

-1. Degree (Neglectable): Fissures and tiny cracks in masonry walls, plaster loss, stone material loss starting from top of the walls

- 2. Degree (Moderate): Multiple cracks in several walls, large pieces of plaster loss, local destructions in chimneys

- 3. Degree (Medium): Multiple and continuous cracks in several walls, loss of roof tiles, torsions in chimneys

- 4. Degree (Severe): Loss of axis in walls, local destructions and roofs and floors

- 5.Degree (Very Severe/Damaged): Local or total destructions in the building.

Some approaches in damage assessment focus on source of the incident (settlement process, earthquake, landslide etc) and types of forces acted on the building (lateral forces, compressive forces, etc) that caused structural deformation in the building. In these approaches, detailed crack analysis is implemented evaluating the size, location and distribution of the cracks on the building. Building components are subdivided into its external and internal; horizontal and vertical structural elements to understand structural mechanisms in detail (Binda et al., 1999):

- Overtuning; of front walls, corner, upper external wall,
- Collapse: outer wall, staircases,
- Failures: in lintels, shear failures in piers, internal walls, external walls
- Cracks: masonry vaults, closed openings, chimney pipes

1.2 Condition Assessment Studies on Historic Masonry Heritage

Historic masonry structures have been exposed to long- and short-term impacts of various decay types which cause material deteriorations and structural deformations. Severe levels of material deteriorations and degradations can cause structural failures in time if they constantly take place on critical structural elements. A historic building which has been evaluated as “structurally safe” according to structural assessment studies might be in risk because of severity of material deteriorations. So, condition assessment approaches in in cultural heritage studies may differ according to the purpose of the study. If the condition assessment targets to make a rapid analysis on post-disaster evaluation such as earthquake destructions to identify emergency precautions in a historic setting or to understand impacts of seismic activities in high risky zones, then structural damage level provides brief evaluation on urgency levels. If the target of the research is to develop a management program for a group of buildings or setting; overall analysis including material deteriorations and structural assessments helps to develop comprehensive monitoring and conservation program including decisions related to activities from regular maintenance to structural repairments. Another important evaluation criteria is to understand the vulnerability of historical structure against sources of threats:

Vulnerability factor is the exposure of the structure or site section against the source of threats or impacts. The vulnerability research changes according to the location and characteristics of the threat category such as closeness to geological discontinuities, liability of landslides, earthquake zones, location/exposure to coastal processes. Some of this information is researched from the past events such as floods, heavy rainfalls, etc. Vulnerability is assessed according to probability of outcome of the event and location to the source of threats according to one or more criteria defined above (Naycı, 2009). These assessments can be carried out according to a specific impact group such as:

-*Earthquake*: evaluation criteria on past information and inventory of events, geological conditions, vibration monitoring, etc.

-*Geological Discontinuities (Landslides, Earthquakes, Rock falls, Soil Settlements)*: Past information and inventory of events regarding Geological and soil conditions (water drainage capacity, etc), Hydrology, Human interventions (deforestation, modification of profile, etc)

-*Floods*: Statistical information on past incidents, Identification of abnormalities

-*Coastal Process:* Geomorphological changes, Human modifications (coastal structures, etc)

-*Macro-vegetation:* Analysis on current condition and impact on structure (whether symbiotic relationship or not); Vegetation characteristics

-*Visitor Impact (Fire, Vandalism, etc)*: Evaluations on accessibility by people, location, intensity of vegetation, Security etc

2. METHODOLOGY

Kanlıdivane (Kanytellis) archaeological site is located in 2 km. north of Ayaş town in Erdemli. The ancient settlement was developed around geological Pit (obruk) called as ‘Kanlıdivane Obruğu’. The historical background of the settlement dates back to Hellenistic Periods (Durugönül, 2001). Archaeological remains and monumental structures that are observed throughout the settlement today belong to Hellenistic, Roman, Late Antiquity and Medieval periods. The centre of the settlement must have developed around the Pit, since

most of the public buildings such as Hellenistic tower, church buildings, cisterns were located here. Center of Kanytellis has been embraced with necropolis areas including a number of sarchopagus, tomb structures and monumental tombs with temple plans. The settlement has extended necropolis areas housing rich number of tombs with different typologies. There are remarkable examples of temple-tomb structures located in this section including tomb of Aba, which dates back to 2. century (Aydınoğlu, 2015,33).

The research methodology of the "Architectural Survey and Condition Assessment of Masonry Structures in Kanlıdivane Archaeological Site" project is based on systematic survey of damage categories observed in historic masonry structures. For this purpose, the research process includes two survey levels of condition assessment studies as site level and building level evaluations. Phases of research have been organized as pre-field preparations, field surveys and analysis stages.

2.1 Pre-field Studies

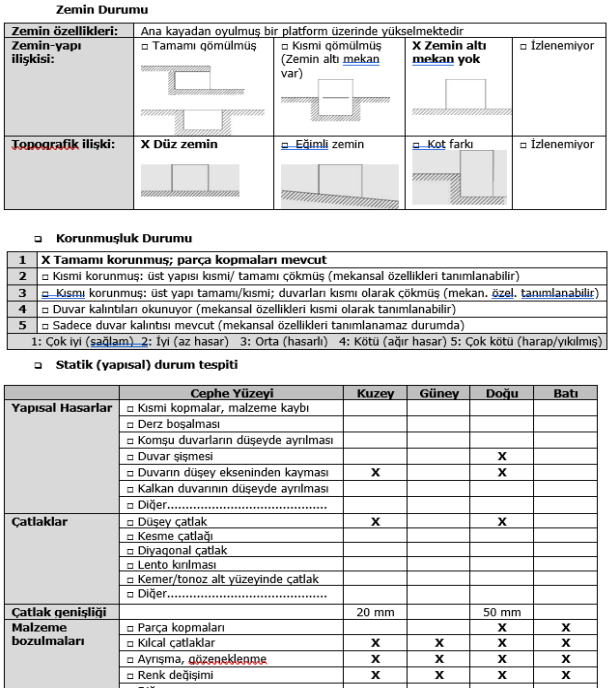
The research starts with preparation of base maps including 1:1000 scale site plans and Google Earth satellite images obtained from institutions -Municipality and Regional Conservation Council-. The raster data was processed in the Geographical Information System software (ArcGIS 9.2.2) to develop base maps. Secondly, historical data in order to understand physical changes in the site were gathered through travelers notes, previous documentation studies and old photographs. Literature surveys on previous archaeological surveys, environmental and geological studies are conducted so as to understand natural changes in the environment and to evaluate vulnerability of the site against natural and human impacts.

Secondly, architectural survey sheets, which would be used for systematic survey of condition assessment of historic structures, were prepared (Figure 2). The survey data included information related to:

- Structural system: Material use and construction technique, vertical supporting elements, horizontal supporting systems, thickness of masonry wall, binding material, plan geometry, historical interventions,
- Relation with terrain: Building- ground relationship, topographical condition.
- Conservation Level: Impact assessment classified as 'good, moderate, medium, severe, destructed/damaged' levels.
- Condition Assessment: Mterial deteriorations and degradations, structural deformations, Crack analysis,
- Macro-vegetation, environmental problems, etc.

In the final phase of pre-field surveys; the GIS database has been prepared in order to analyze results of field surveys. Spatial distribution of condition assessment results also provides significant information to compare intensity of problems and define priorities in site management plans.

[2] The GIS process of the Project results have been carried out in GIS Laboratory of Mersin University.



Zemin Durumu

Zemin özellikleri:	Ana kayadan oyulmuş bir platform üzerinde yükselmektedir			
Zemin-yapı ilişkisi:	□ Tamamı gömülmüş	□ Kısmı gömülmüş (Zemin altı mekan var)	**X Zemin altı mekan yok**	□ İzlenemiyor
Topografik ilişki:	**X Düz zemin**	□ Eğimli zemin	□ Kot farkı	□ İzlenemiyor

Korunmuşluk Durumu

1	**X Tamamı korunmuş; parça kopmaları mevcut**
2	□ Kısmi korunmuş: üst yapısı kısmi/ tamamı çökmüş (mekansal özellikleri tanımlanabilir)
3	□ Kısmı korunmuş: üst yapı tamamı/kısmi; duvarları kısmı olarak çökmüş (mekan. özel. tanımlanabilir)
4	□ Duvar kalıntıları okunuyor (mekansal özellikleri kısmi olarak tanımlanabilir)
5	□ Sadece duvar kalıntısı mevcut (mekansal özellikleri tanımlanamaz durumda)

1: Çok iyi (sağlam) 2: İyi (az hasar) 3: Orta (hasarlı) 4: Kötü (ağır hasar) 5: Çok kötü (harap/yıkılmış)

Statik (yapısal) durum tespiti

	Cephe Yüzeyi	Kuzey	Güney	Doğu	Batı
Yapısal Hasarlar	□ Kısmi kopmalar, malzeme kaybı				
	□ Derz boşalması				
	□ Komşu duvarların düşeyde ayrılması				
	□ Duvar şişmesi			X	
	□ Duvarın düşey ekseninden kayması	X		X	
	□ Kalkan duvarının düşeyde ayrılması				
	□ Diğer.....				
Çatlaklar	□ Düşey çatlak	X		X	
	□ Kesme çatlağı				
	□ Diyagonal çatlak				
	□ Lento kırılması				
	□ Kemer/tonoz alt yüzeyinde çatlak				
	□ Diğer.....				
Çatlak genişliği		20 mm		50 mm	
Malzeme bozulmaları	□ Parça kopmaları			X	X
	□ Kılcal çatlaklar	X	X	X	X
	□ Ayrışma, gözenekleşme	X	X	X	X
	□ Renk değişimi	X	X	X	X

Figure 2. Architectural Inventory Sheets

2.2 Field Surveys

The field surveys include collecting detailed architectural data in building and site scales. Site documentation study includes systematic survey of condition levels and damage categories of historic masonry structures by using inventory sheets. The Kanlıdivane archaeological site has been opened to visitors after the completion of site presentation project completed by Ministry of Culture and Tourism in 2015. After the implementation studies; intense vegetation over buildings and remains were liberated and their visibility have been increased. West and northern sections of the site became accessible by visitors through conduit routes and direction signages. In its present situation, accessibility of the site is limited due to intense vegetation of nature in the western part, while northern and western sections are quite visible and accessible. The historic structure-visitor contact may pose various risks for each group especially if there are severe structural damage categories. Thus, the systematic survey in site scale by using inventory sheets have been conducted on buildings located around the geological pit (obruk) and in the visited zones since these areas are more vulnerable against visitor impacts.

The site level inventory research has provided comparative analysis on historical masonry techniques applied in different monuments, vulnerability of each structure in relation with their location in the site and exposure to natural and geological vulnerabilities, damage categories and their impact levels of structures. Spatial distribution of survey results and assessments in the site could be visualized by data spatially processed in GIS medium (Figure 3).

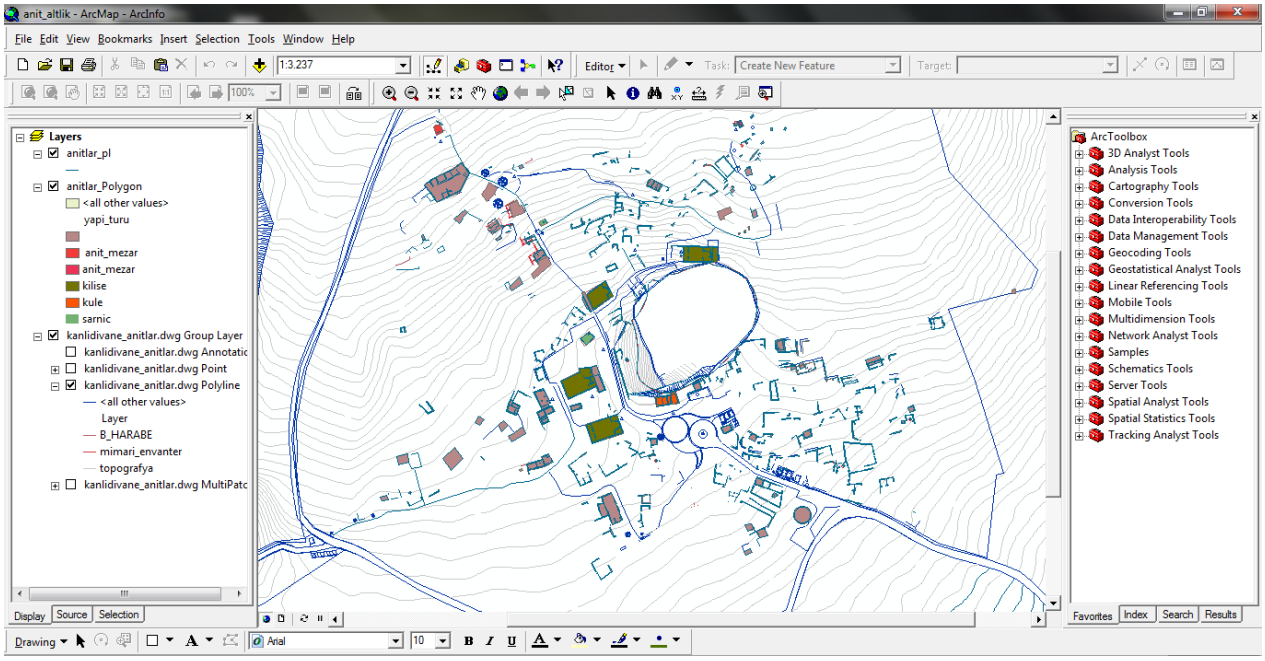


Figure 3. GIS database for spatial distribution of condition assessments

Research of building scale condition assessment has encompassed studies related to architectural survey (Figure 4) by using optical measurements techniques3, visual documentation, and detailed mapping of material deteriorations and structural deformations onto building survey drawings. Building scale studies have been conducted on the selected examples according to evaluation of site level inventory studies: The Hellenistic Tower, Tomb No 1, Tomb No 2 and Church no 4. These monuments represent characteristics of different masonry techniques applied during different historical periods (Hellenistic, Roman and Byzantine).

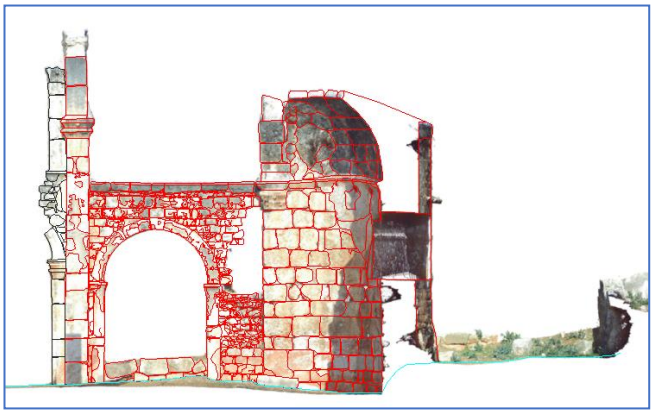


Figure 4. Architectural Survey on selected buildings

The categories of material deteriorations and degradations have been classified according to Glossary of Stone Deterioration" prepared by ICOMOS since the main construction material of the monuments is stone material (ICOMOS,2008). Material decay and degradation types categorized in five groups (Figure 5) from slight to severe impact levels:

1.Slightest level: Material decay including color alterations, surface deposits, black crusts, salination, etc.

2.Slight-to-Moderate level: moderate biological colonizations, micro-vegetation.

3.Moderate Level: stone degradation, detachment problems, such as pitting, alveolization, flaking, sugarization and contour scaling

4.Moderate-to-Severe Level: Material cracks and fissures.

5.Very Severe Level: Material loss and partial destruction.

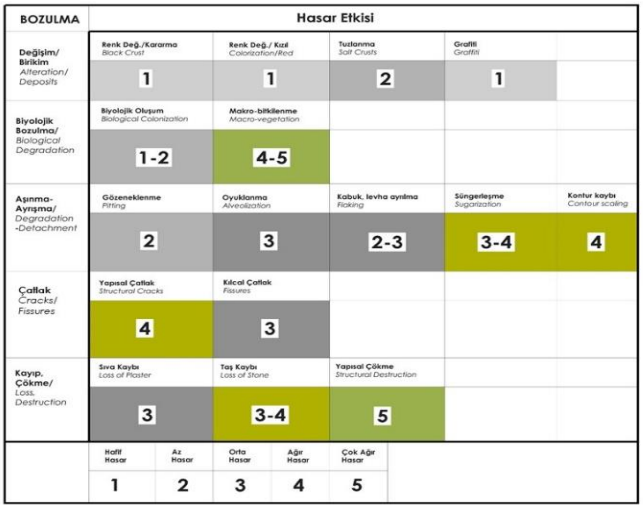


Figure 5. Impact levels of material deteriorations and degradations in building scale

Building scale assessment studies base on visual observation techniques during field studies. The results have been mapped onto the architectural survey drawings (Figure 6).

[3] Optic measurement devices (Total Station) from Faculty of Architecture and open access softwares for photographic rectification analysis have been utilized during building surveys and architectural photogrammetry studies.

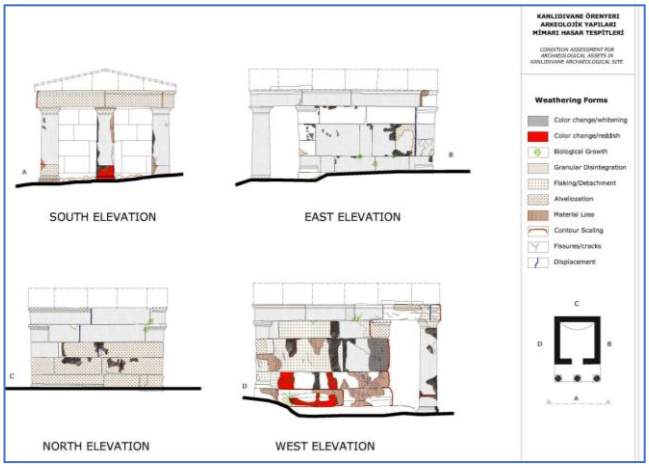


Figure 6. Mapping of material deteriorations and degradations on architectural survey drawings

3. RESULTS

Results of building condition assessments conducted in site and building level researches are presented in relation with evaluated derived and processed from one phase to another.

3.1 Historical Masonry Technics

There are two types of masonry construction techniques observed in the site as 'polygonal' and 'isodom' technique. Polygonal masonry technique was typically applied during Hellenistic era in the region. The Hellenistic Tower (which takes this name because of its construction technique) is one of the best survived examples of this era in Kanlıdivane. The corner stones selected from big size cut stones were used to make the system more rigid. The wall sections among the corner stones were constructed in polygonal technique. The irregular geometry in polygonal coursing provided more advantage in distribution of load when contributed to isodom technique (Figure 7). Roman period structures were constructed with cut-stone masonry technique in isodom style (Figure 8). There are monumental tomb examples survived from Roman period since most of them were converted or reused during late Antiquity period. The late Antiquity and Byzantine period buildings were constructed with smaller size rough cut stone masonry. The churches of the site, most of the residential buildings were constructed in this style. There are historical interventions added to these buildings generally. The wall section consists of double layered cut-stone filled with infill material. The masonry techniques applied in different periods affected structural performance of the buildings. The analysis has shown that construction technology related to wall sections, stone material use, coursing technique played important role in the structural performance of the building. There are still Hellenistic and Roman period buildings that are in good state while most of late Antiquity and Byzantine period structures have been severely damaged. The wall thickness in relation with height of the walls, was important in structural performance.

Figure 7. Hellenistic period Tower constructed with polygonal masonry technique in Kanlıdivane

Figure 8. Roman period Monumental Temple constructed with isodom masonry technique in Kanlıdivane

3.2 Comparative Condition Assessment on Site Level

The second criteria that affected structural performance and condition level of the monuments were their locations in the site and relationship with the ground during construction phase. Some of the was location in the site. The most severe natural risk in the site is the geological discontinuities. Previous geological surveys conducted by Güler and Tağa in the Kanlıdivane Archaeological Site have shown that there are severe geological discontinuities problems including landslide movements especially around the geological pit (Güler & Tağa, 2011). They also observed locations of geological crack lines because of past earthquakes (Figure 9). The limestone morphology of the ground makes it more vulnerable because of geological discontinuities and abrasion impact of surface and ground water. The fallen wall pieces from the archaeological site into the geological pit supports this analysis.

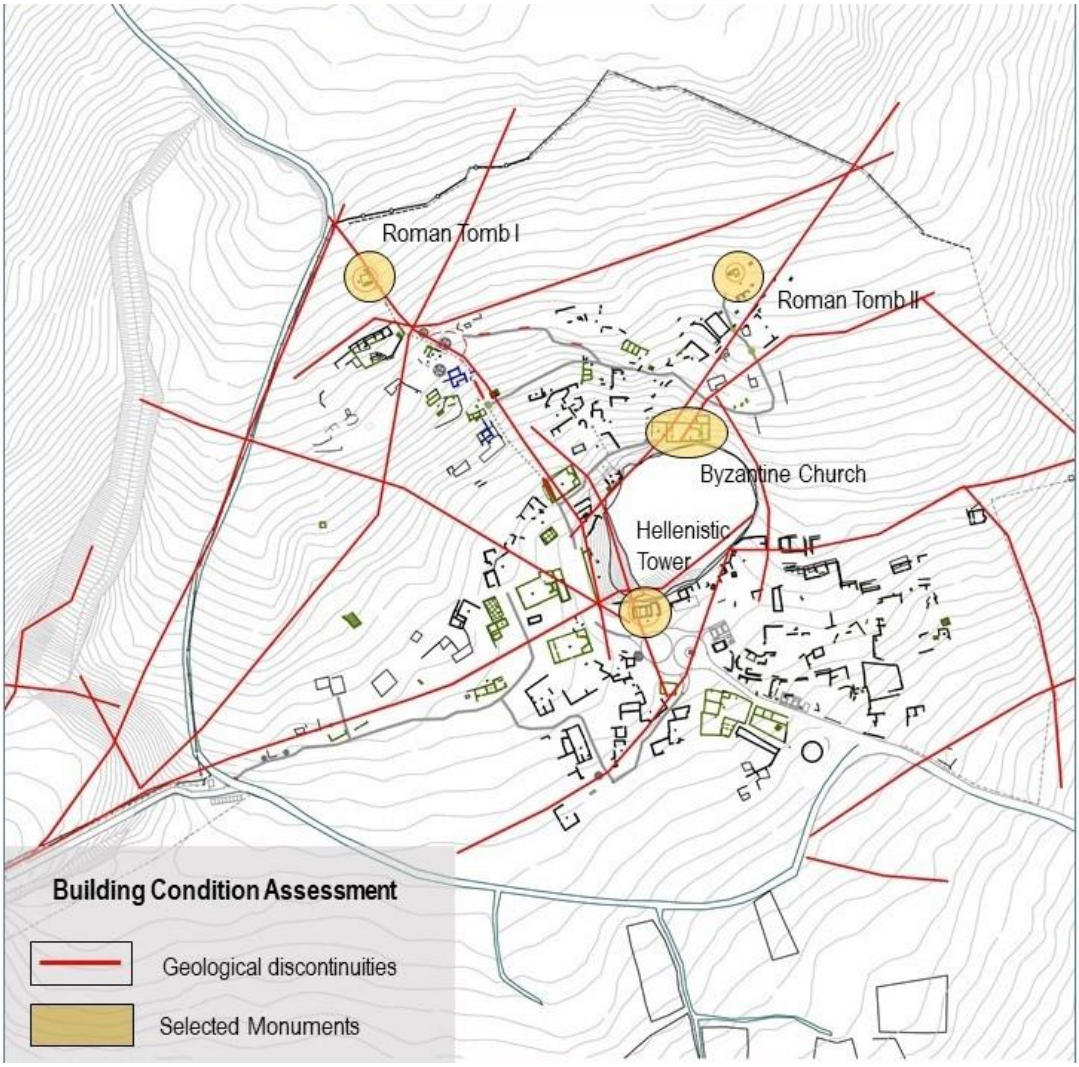


Figure 9. Locations of historic monuments selected for building condition assessment research in relation with the geological discontinuities in the site

Results of comparative analysis on building condition assessments conducted on selected monumental buildings (Hellenistic Tower, Roman Tomb I, Roman Tomb II, Church) have shown that the monuments constructed on rocky platforms located away from the geological pit or past earthquake lines are in very good condition (Roman Tomb II). The monuments constructed around the geological pit, are in severe danger since the landslide movement is still active. The Hellenistic Tower with its polygonal masonry technique and geometrical proportions could survive better when compared to Byzantine period church although it was constructed centuries before. Lastly, the Byzantine church with its weaker masonry wall section have been destructed and architectural integrity have been lost. The building has totally lost its southern façade located by the pit and the superstructure. The apsis section was gradually preserved with its domed superstructure.

3.3 Condition Assessments in Building Level

Detailed building condition assessment studies on selected monuments provided information related to structural mechanism acted on the building components in relation with environmental and geological factors.

Roman Tomb no I (Aba's Monumental Tomb) is located at the north of the geological pit. It is one of the landmarks of Kanlıdivane. The main construction technique of the building is cut stone masonry, with mortar as the binding material. The superstructure has gable roof form with stone claddings. It is supported by cut-stone barrel vault and then filled with rubble stone to gain planar roof surface. The vault identifies entrance of the main chamber in the south facade, which is covered with pediment at the roof level. The last row of cut-stones in masonry walls were constructed in architrave style while corner stones were finished with Corinth capital styling. Although the architectural integrity has been still preserved, there are severe problems in building scale. There are material deteriorations and structural deformations especially in the west and north walls. There are severe cracks on the north wall, which have caused destruction of stone materials into two. This shows probability of high impulse aroused by lateral forces or settlement problems. Since the monument is located very close to one of the geological discontinuity lines in the site, the structural degradation risk has been proven by external factors. The monument should be included into architectural conservation program immediately, before losing its structural integrity since it

is one of the rare examples that sill keeps its architectural and structural unity.

Roman Tomb no II (The tomb with Trisylos Prostylos style) located at the north east of the site was constructed on a rocky platform located away from the pit and geological discontinuities. It is one of the well-preserved buildings of Kanlıdivane. Tomb no II (The tomb with Trisylos Prostylos style is located at the northeast of the site. It has square plan with 4,20 x 4 m. dimensions. It is located on rocky platform. The roof was supported by barrel vault which covers the top of the main chamber (cella). The tomb is identified as Trisylos Prostylos tomb by Kaplan (2015) since there are three columns located at the entrance façade. These columns are connected to each other and to the main building with architraves and stone lintel blocks. Today; the roof has flat surface covered with earth. The vaulted roof was filled with infill material. There are remains of stone block located on the top of southern wall, while rest of them were fallen from the building. Kaplan suggests that these remains display existence of pediment wall, so roof may have originally finished with gable roof form (Kaplan, 2015, 82). There are material deteriorations in slight to moderate level. Preventive precautions on the monument and environmental control (such as keeping the rainwater away) can provide a longer and safer time for the building.

The Hellenistic Tower, located at the south edge of the geological pit with its remarkable polygonal masonry technique has been suffering from structural cracks occurred in the corners of the building. The superstructure of the building and upper wall sections have been already destructed, but planimetric layout is very well preserved. The building must be included into structural reinforcement program such as filling with repair mortars and retrofitting interventions in order to avoid the vertical wall sections to fall apart from each other. The Hellenistic Tower is the oldest masonry technique in the region and one of the rare examples of its similars. The Byzantine church no 4 located at the north edge of the geological pit material degradation process has already lost its southern wall and main roof covering the main hall of the building. The weak wall sections (when compared to Hellenistic and Roman period construction technique) and limestone morphology of stone material used in the walls causes severe deterioration problem because of the atmospheric conditions and rainwater. The standing walls are facing sugarization and contour scaling problems in some of the structurally critical points such as door and window lintels. This may cause partial destructions in the existing walls or dome section of the apsis part. Therefore, the building must be included into architectural conservation program for both structural repairment and material conservation interventions.

4. CONCLUSIONS

The conservation of historic masonry structures necessitates multilevel research and survey analysis related to material deteriorations, structural deformations and mechanisms acting on the building, past events that caused alterations or destructions in the building, future evaluations according to environmental risks and vulnerability of the monument against these threats. All the impact factors and damage levels must be evaluated with “condition assessment” methodologies. These studies will provide development of comprehensive conservation and management programs both in site or regional levels to keep masonry monuments in safe; prevent severe destructions and loss of significant values by regular maintenance works within the technical and fiscal capacity of the institutions.

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