

Nevin Esin Tekin

Restoration of the Great Theatre of Ephesos

An Emergency Approach to Safeguarding the Monument and Making it Available for Partial Reuse

Introduction

The Great Theatre of Ephesos, a focal point of the ancient city, and a distinctly sized¹ and unique monument by itself, has provided its caretakers with many conservation challenges. Throughout the Hellenistic, Roman and Byzantine periods, the structure has undergone many changes and has lived through very different styles of construction².

As the ancient site of Ephesos is located in a highly popular area for tourism, and the remains of the *cavea* of the Theatre of Ephesos are in relatively good condition structurally, public and administrative expectations focus more on promoting the monument and its use. Reuse of such monuments has proven challenging and problematic in most cases³ mostly due to a divided approach concerning conservation and reuse. Conservation interventions performed on ruins aim at stabilizing the monument and arresting decay. Reuse of monuments, on the other hand, requires additional interventions providing a certain level of comfort and additional facilities, and in archaeological ruins should never be the primary concern; however, the existence of such demands should not be ignored, either, acknowledging the fact that the ownership of the monument belongs to the administrative institutes which make these demands⁴. In the case of the Theatre of Ephesos, in order to ensure protection of the integrity of the monument throughout possible future changes in ownership and authority, it was decided to pursue the safeguarding of the monument as an archaeological remain, while providing a plan for limited reuse of the structure and implementing non-invasive and removable additions to make the monument accessible for use while restricting and controlling the level of reuse via these additions.

It is more explanatory to call this project »an emergency approach to safeguarding the structure and making it available for partial reuse«. The parameters and their effects on the decision-making process will be explained in more detail in the sections that follow.

Aims, Definitions and Participants

The project area is designated as the Great Theatre of Ephesos, located east of the ancient harbour of Ephesos. The terminology applicable to define the project, however varies, depending on the contents of interventions planned, and cultural differences between the authorities involved. In order to understand the scope of the project, before naming it as »Restoration Project of the Great Theatre of Ephesos«, one must define the terms included in such a title, and discuss how these terms fulfill the title.

¹ With a *cavea* diameter of approximately 153 m, it is the largest theatre in Asia Minor.

² Styhler-Aydın 2010a.

³ This issue is addressed discussing the cases of the theatres of Side and Aspendos in Günay 2002.

⁴ Ownership of the Theatre of Ephesos belongs to the Ministry of Culture and Tourism of the Turkish Republic.



1 General view of the Great Theatre of Ephesos with reconstructed orchestra surface, reconstructed *kerkis* of M4 and modern day barriers

The Burra Charter (1999)⁵ defines the term ›restoration‹ as »returning the existing fabric of a place to a known earlier state by removing accretions or by reassembling existing components without the introduction of new material«. In the case of the Theatre, noticeable changes have been made to the structure through previous interventions, reconstructions, and barriers, and have caused significant difference in the way the monument is perceived (fig. 1). The project, as will be explained in the following sections, aims to implement a semi-passive reversal of such additions and changes.

Conservation of the remains and authentic material is also a major component of the project. It is of utmost importance to preserve what has remained of the original architecture, fabric, evidences of historical use and reuse in order to preserve the monument and its cultural significance. It must also be kept in mind that conservation actions should also include maintenance.

Another aspect the project aims to deliver is defining and implementing compatible use⁶ of the monument as a venue for events and performances. In order to achieve this, and protect the integrity of the monument while doing so, compatible use has been defined as implementing strict regulations and control over use in order to comply with the preservation of a monument conserved as a ruin, implying that the monument and its fabric are vulnerable and fragile.

For the purposes of conservation of archaeological sites, division of responsibilities and enforcement restrictions of governmental authorities have been defined by Turkish laws, which apply to the Site of Ephesos. According to Law 2863⁷, legislation for the protection of cultural and natural heritage, the ownership of a heritage site belongs to the Ministry of Culture⁸. Through yearly excavation permits, the conservation for the site and its monuments have been given to, and expected of the Austrian Archaeological Institute (OeAI). Being in the position of implementing necessary protective measures, the restoration project of the Theatre of Ephesos has

⁵ The Australia ICOMOS Charter for Places of Cultural Significance.

⁶ The Burra Charter (1999) defines compatible use as »use which respects the cultural significance of a place. Such a use involves no, or minimal, impact on cultural significance.«

⁷ Law 2863 was put into effect on 23/07/1983 by the Turkish Parliament.

⁸ Extensive information on the legislative enforcements on Turkish heritage sites can be found on Koç 2008.

been organized and put into practice by the OeAI, and the project planning has been completed and presented to the authorities in charge of overseeing conservation decisions, such as İzmir II. Kültür ve Tabiat Varlıklarını Koruma Kurulu⁹.

As well as the preparation of the project, funding has been greatly provided in large measure by the OeAI, while research data¹⁰ leading up to the project has been provided by both the OeAI and the Austrian Academy of Sciences (OeAW) and through the Ministry of Sciences in Austria. Private sponsorships also participate in the project, compensating for interventions costs and means.

Approach/Decision Making Parameters

In order to fully understand the project, it is necessary to return to the phrase »emergency approach« mentioned in the introduction. Restoration work, as has been identified by many charters and doctrines provided by ICOMOS, requires an in-depth study over an extensive period, in order to understand the conservation problems and underlying reasons and evaluate factors such as authenticity, cultural significance, and structural stability. However, structural and material-related circumstances, as well as expectancies of related authorities, sometimes require immediate action for the safeguarding of a monument which is not always compliant with the commonly established conservation guidelines. The dilemmas created by the current situation have been resolved through evaluating the problems, taking into account local laws and legislation and through guidelines provided by international standards represented in a number of charters¹¹.

Guided by such documents, all decisions have been made to ensure safeguarding of the monument, and to fulfill conservation needs and requirements. Under the perspective of safeguarding the monument, public and governmental expectations, as well reuse of the monument have been redefined, and integrated into such decisions taking into consideration the feasibility of the implementation of these decisions.

Conservation decisions have been made by the team of architects and restorers, and the administrative staff of Ephesos excavations who have undertaken the duty of planning for the project. The effectiveness and usefulness of these decisions, however, have been evaluated by an international commission comprising many professionals in the field of conservation and archaeology¹². The fact that decisions regarding such a significant monument should only be a joint venture representing different points of view and covering a wider area of concerns has been taken into consideration.

In order to clarify the reasons and implications of such choices, it is best to examine these choices in the light of the three factors stated above: conservation, public and governmental expectations, feasibility.

⁹ Kültür ve Tabiat Varlıklarını Koruma Kurulu, KTVKK in short, can be translated as Protection Board for Cultural and Natural Heritage, and is a branch of the Turkish Ministry of Culture in charge of controlling all actions taken on heritage items. Different KTVKK have different jurisdictions, and Ephesos is subject to II. KTVKK of the city of İzmir.

¹⁰ Building research, documentation and archaeological research was carried out by different teams prior to the start of the restoration project. Research coordination and archaeological research have been provided by OeAW and building research has been executed by Technical University Vienna.

¹¹ Such as, the Venice Charter (1964), the ICOMOS Charter for the protection and management of archaeological heritage (1990), the Verona Charter on the use of ancient places of performance (1997), the ICOMOS International Cultural Tourism Charter (1999), and the Burra Charter (1999).

¹² In 2010 the Theatre Commission was made up by the following members: Prof. Dr. Herwig Friesinger (OeAW, Commission director), Prof. Dr. Francesco D'Andria (University of Lecce), Prof. Dr. Hans Peter Isler (University of Zurich), Prof. Dr. Dieter Mertens (DAI Rome), PD Dr. Sabine Ladstätter (OeAI), PD Dr. Andreas Pülz (OeAW), Prof. Dr. Marina Döring-Williams (TU Vienna), Prof. Dr. Zeynep Ahunbay (İTÜ).

Conservation Decisions

Primary Concerns and Conservation of the Structure

In identifying the interventions necessary for the conservation of the structure, observation of the monument has shown that at present the Theatre is mostly the substructure of the original monument. In order to avoid hypothetical reconstructions it has been decided that conservation of the substructure as a ruin, as the sole source of knowledge and authenticity, carries great importance. Reconstruction of the marble cladding over the *cavea* surfaces has been permanently ruled out¹³ due to the necessity of refraining hypothetical reconstructions and it has been accepted that such interventions do not fall under the category of emergency works for conservation.

The Theatre possesses different stages of construction, and these stages differ in construction techniques, material and design¹⁴. These areas all contain information, whether seen or yet to be seen. For this reason no single approach can be designed for different locations of the structure, whether or not the intention of an intervention is the same. However, considering that conservation decisions need to be formulated as quickly as possible due to both the rate of deterioration observed on the structure and the extent of the expectations, it has been decided that all interventions need to have one factor in common. This common factor is to be reversible and kept to a minimum in order to prolong the lifespan of the fabric of the structure but not create any permanent changes. The interventions have to focus on removing underlying deteriorative conditions and maintaining historical information. The interventions have to be reversible when involving the introduction of new material (including historically consistent material such as mortar and rubble), durable when insuring the safety of structurally challenged portions, and sacrificial when underlying conditions cannot be removed but the harm caused can be redirected to the new material of construction.

Structural problems need to be solved as soon as possible. When faced with extensive structural problems (such as the substructure chambers of the south *analemma* which will be referred to in the future) it is proposed to use traditional building materials and techniques as far as possible. However, when these techniques prove inadequate or applications of these techniques require large reconstructions, it has been decided to use contrasting modern methods. The focus of such interventions has been on eliminating dangers to the structure and to visitors.

All interventions and planning at the monument must be designed using the base research provided by archaeological- and building research teams with their profound understanding of the structure. Documentation of the methodology and details of the interventions must also be produced using photographs, reports and drawings and sketches during the course of conservation actions, in order to transmit useful information to be considered in future conservation approaches. A constant monitoring and maintenance plan needs to be incorporated into the project as well, in order to make sure that the deteriorating agents are detected and intervened with before causing any damage.

¹³ The Venice Charter (1964), Article 15: Excavations should be carried out in accordance with scientific standards and the recommendation defining international principles to be applied in the case of archaeological excavation adopted by UNESCO in 1956. Ruins must be maintained and measures necessary for the permanent conservation and protection of architectural features and of objects discovered must be taken. Furthermore, every means must be taken to facilitate the understanding of the monument and to reveal it without ever distorting its meaning. All reconstruction work should however be ruled out *a priori*. Only anastylosis, that is to say, the reassembling of existing but dismembered parts can be permitted. The material used for integration should always be recognizable and its use should be the least that will ensure the conservation of a monument and the reinstatement of its form.

¹⁴ Styhler-Aydin 2010b.

Reuse must be defined by strict rules, established to make sure that reuse does not function as a deteriorative agent, and these rules must be imposed by government authorities in charge of monitoring the use of the monument¹⁵.

An evaluation of the past repairs in terms of usefulness, aesthetic quality and durability must be performed and conservation actions decided on whether these repairs need to be integrated into the current project or removed.

Many questions arise regarding the past interventions. Some interventions involve hypothetical and falsifying reconstructions of certain elements, such as reconstructed marble surfaces of *kerkides* I1 (fig. 2) and I11 (fig. 3), and both ends of the first *diazoma* (figs. 4, 5), where spolia from different areas of the Theatre have been used. Although such reconstructions are now unacceptable¹⁶, the current decision is not to intervene in these areas, provided that there is not enough evidence to suggest that there is a construction of significance underneath them, there is no observed deterioration. Furthermore, removal of the spolia from these areas would also be a hypothetical move considering that there is the possibility that some of the apparently spolia material may be *in situ*. Many areas of the Theatre also contain reconstructions in modern day cement-based material, such as the case of *kerkis* M4 (fig. 6), or reconstructions of the substructure with concrete, such as the cases of *kerkides* S6, S7 and S8 (fig. 7). It has been decided that in these cases, it is best to observe the deterioration of the reconstruction material and remove it since these interventions are only harmlessly reversible through



2 Reconstructed portion of *kerkis* I1 of the *ima cavea*



3 Reconstructed portion of *kerkis* I11 of the *ima cavea*



4 Reconstructed portion of the south end of the first *diazoma*

¹⁵ The Ministry of Culture and Tourism undertakes this responsibility as defined by its role of ownership in law 2863, and is responsible for delegating this responsibility to its extensive institutes of related KTVKK, Museum and DÖSİMM, the financial branch of Ministry of Culture and Tourism.

¹⁶ Stubbs 1995, 77.



5 Reconstructed portion of the north end of the first *diazoma*



6 Reconstruction of *kerkis* M4

time. Structural interventions such as rubble walls built with cement based mortars to fill the missing sections (fig. 8) of load bearing walls have proven adequate until now. However such areas also need to be programmed into the maintenance program and inspected continually in order to prevent larger structural problems from arising.

Fulfilling Expectations and Feasibility Limitations

The project goal of implementing reuse as an event venue has required a financially stable model that would sustain the work. When examined as a whole, the minimum conservation requirements for the structure would take almost a decade, and the required budget for such a project by far surpassed the available resources, adding up to a total of 4,000,000.00 € to obtain a conservation plan covering the whole of the area. Meanwhile, the public and governmental authorities' expectations for reuse allowed for very little time, and required taking immediate action. Bearing these considerations in mind, a three step program handling

all the areas requiring conservation has been developed. The three steps have been defined to create mid-term goals and results, leading to the reuse of a certain portion of the Theatre as soon as possible, while allowing further planning alongside the project. These three steps have then been divided into eleven sub-projects, allowing planning for best allocation of resources to be received through sponsorships. The sub-projects have been planned in such a manner that interventions could take place independently and at times simultaneously, therefore allowing the timeline to be as dense as possible while a certain elasticity in the project is implied.

Due to time pressure and funding shortages during the preliminary stages of the project, the planning focused on the rules of minimum intervention while absolutely maintaining the current structure. Moreover, the implementation of portable additional elements that would satisfy the needs of reuse and provide a level of comfort to the users was also included.

The public and governmental authorities also expressed concern over the availability of the structure to visitors during the interventions. In planning conservation steps, this has also been taken into consideration: a method of moderation has been found through careful planning of the first stage of the program, to some extent limiting access of visitors, yet always allowing a pathway that passes from the inside of the Theatre. Including this interaction in the project is also important as an educational tool: by these means, the public is also informed about the procedure

of conservation and is involved in various stages of the project¹⁷. Informing the public and making them a part of the scientific approach towards the structure also gives the public the responsibility of safeguarding and conserving the monument¹⁸. Public lectures and the accessibility of project leaders are methods by which the public can both be immersed in the project, and educated by the project in how to treat antiquities.

It is very important that the project does not ignore the expectations of tourism; on the contrary, it should calculate what is necessary and find a path whereby tourism is not destructive but beneficial, and the authenticity of the monument is not disturbed. The Theatre project plans to take into account all these aspects and to provide the public with a certain level of access both into the structure and into the role of safeguarding the monument.

Conservation Planning

Taking all of the above conservation decisions into account, the conservation and reuse project has been divided into three phases. In the compartmentalization of the approach, it was possible to provide constant funding and a workforce for the project. The first stage focuses on the areas already open to the public and utilizing the area for limited events up to a maximum of 2,200 spectators. This phase is planned to contain the first seven of the sub-projects defined earlier. The second phase of the project, containing two sub-projects, focuses on the stage build-



7 Reconstructed *kerkides* S6, S7 and S8



8 Structural reinforcement of wall core using rubble stone and cement based mortars at the south *analemma*

¹⁷ A more active outreach approach has been integrated into the restoration project of the National Theatre of Panama producing satisfactory results; s. Rajer 2005.

¹⁸ Charter for the Protection and Management of Archaeological Heritage (1990), Article 7: The presentation of the archaeological heritage to the general public is an essential method of promoting an understanding of the origins and development of modern societies. At the same time it is the most important means of promoting an understanding of the need for its protection. Presentation and information should be conceived as a popular interpretation of the current state of knowledge, and it must therefore be revised frequently. It should take account of the multifaceted approaches to an understanding of the past. Reconstructions serve two important functions: experimental research and interpretation. They should, however, be carried out with great caution, so as to avoid disturbing any surviving archaeological evidence, and they should take account of evidence from all sources in order to achieve authenticity. Where possible and appropriate, reconstructions should not be built immediately on the archaeological remains, and should be identifiable as such.

ing, its conservation and possible reuse of the area as a backstage environment. The last phase focuses on the area outside the fences, consisting of the *summa cavea*, the top entrances to the Theatre and the portico area (fig. 9).

Project Phase 1

The boundaries of the first phase of the project include the N1 and S1 entrances and the first *diazoma* as the entrance and circulation areas, the *media* and *ima cavea* spectator areas and the orchestra surface. In regulating the user experience, staying true to the original plan of usage of the monument, and to allow conservation works to be performed below the first *diazoma*, the re-location of the visitor path to the first *diazoma* is of great importance. Current visitor paths direct visitors to cluster either on the original pavement of the orchestra surface which has diminished by approximately 1 m² since 2006 due to fragmenting and erosion, or to pass above the orchestra wall. In order to arrest decay in these areas, it is of utmost importance to redirect the visitor path.

In order to efficiently implement this step, seven sub-projects have been designed which will conserve the structure, regulate usage and visitor passage, and define the limits of interaction of the structure. This phase is also important in ongoing restoration research allowing constant monitoring of the effectiveness of interventions and providing data for future stages of the restoration plan.

Sub-project 1: Conservation of S1 and N1 entrances (fig. 10)

The conservation of these two entrances is the starting point for the project, fulfilling the first condition of displacing the current circulation axis which passes through the small openings of the southern and northern ramps and north *parados*. Both of these entrances, connected by the first *diazoma* are crucial to future usage of the structure.

Evaluation of existing damage and risks, and work performed at both of these areas will be explained in more detail in following sections.

Sub-project 2: Conservation of media cavea and first diazoma (fig. 11)

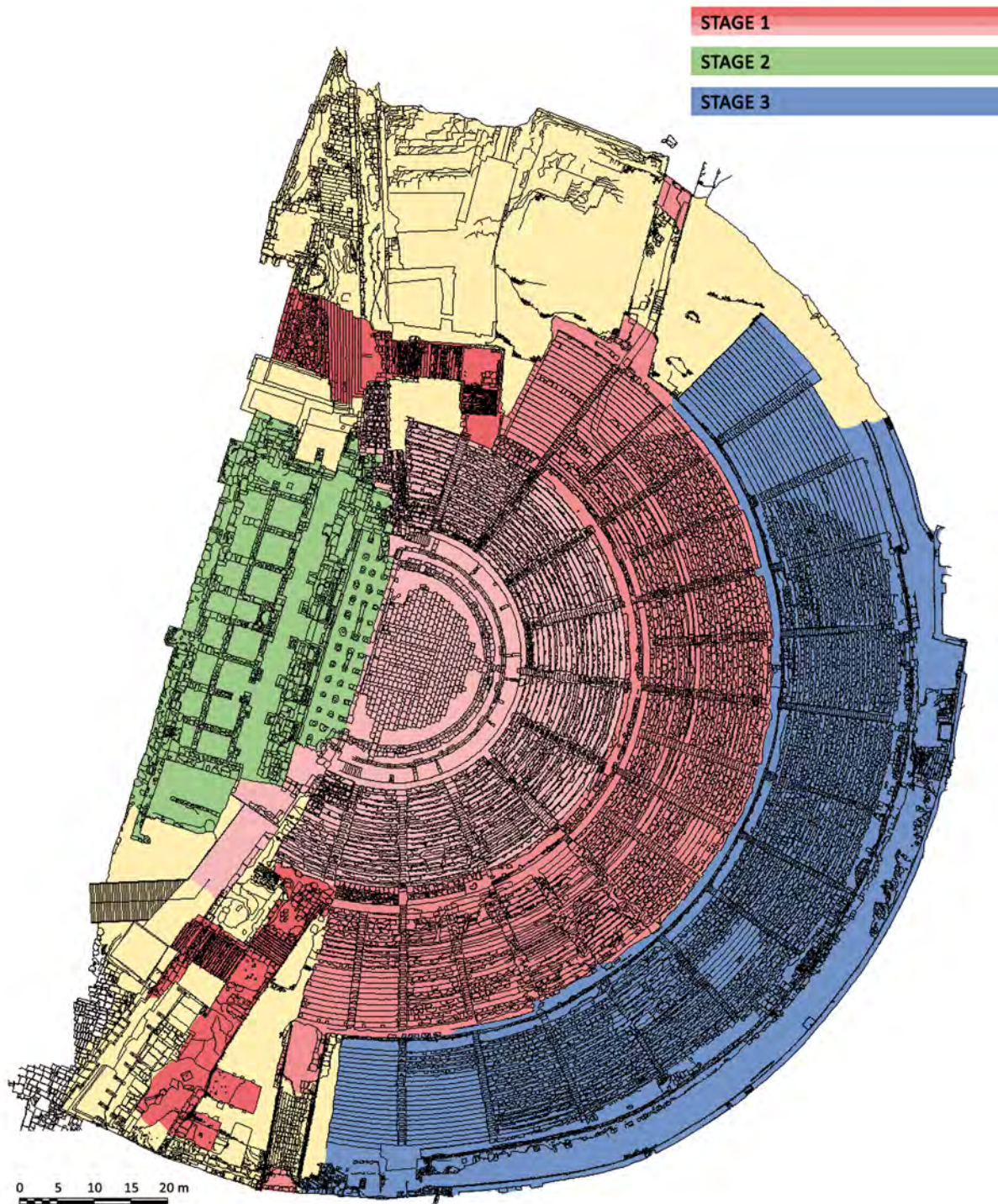
The areas of *media cavea* and *first diazoma* are the next step following the conservation of S1 and N1 entrances, linking the two entrances with each other and assuring efficient use. Conservation decisions in this area focus on the conservation of the substructure material, conservation of the conglomerate bedrock substructure, evaluation of reconstructions, removal of the accumulated soil on the first *diazoma* and precautions against vegetation growth and planning for constant monitoring.

Sub-project 3: Implementation of the first diazoma walkway (fig. 12)

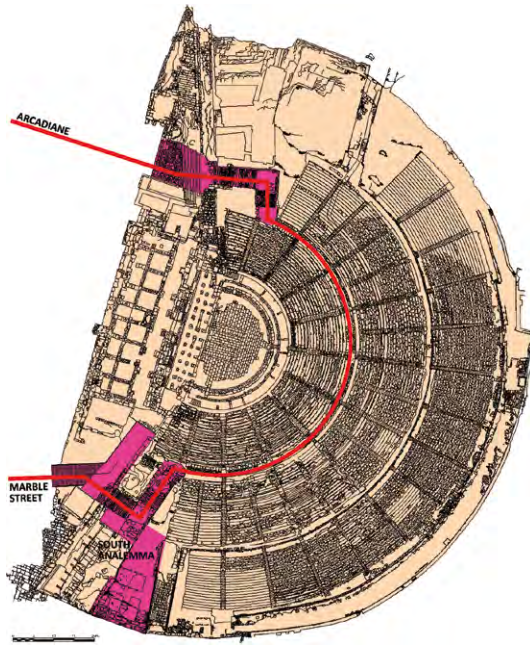
Following the conservation of the first *diazoma* and removal of accumulated soil, a walkway will be implemented on the first *diazoma* in order to ensure protection of the original surfaces of the *diazoma* from the heavy tourism, and to provide a level of comfort during events. The walkway is planned to be light, removable at will, built of contrasting material, and to include necessary lighting system and cable shafts within its construction so as to minimize the amount of interventions performed directly on the original structure.

Sub-project 4: Conservation of ima cavea and orchestra (fig. 13)

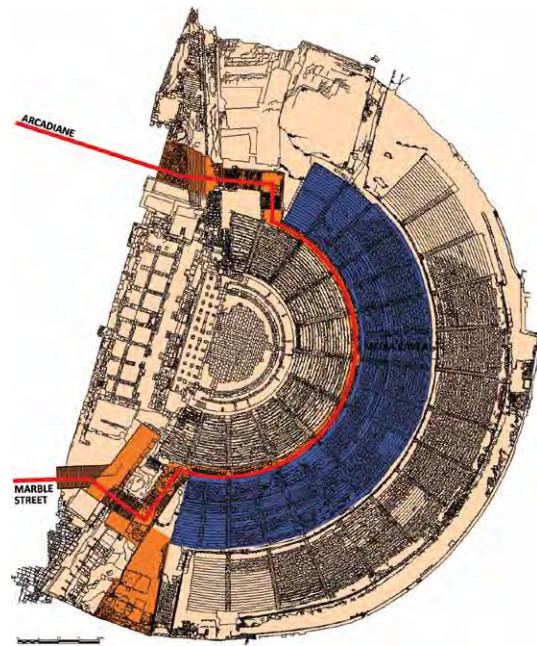
Following the conservation of *media cavea* and first *diazoma*, it will be necessary to close the orchestra area and the *ima cavea* to the public in order to consolidate the area and materials. The orchestra ring and *opus sectile*-fragments, as well as the original line of the pavement of the orchestra area and *parados* floor are examples of the issues to be addressed. In order to prevent further deterioration until this sub-project can be executed, the orchestra pavement has been repaired in a non-invasive manner, to monitor the durability of such intervention before further



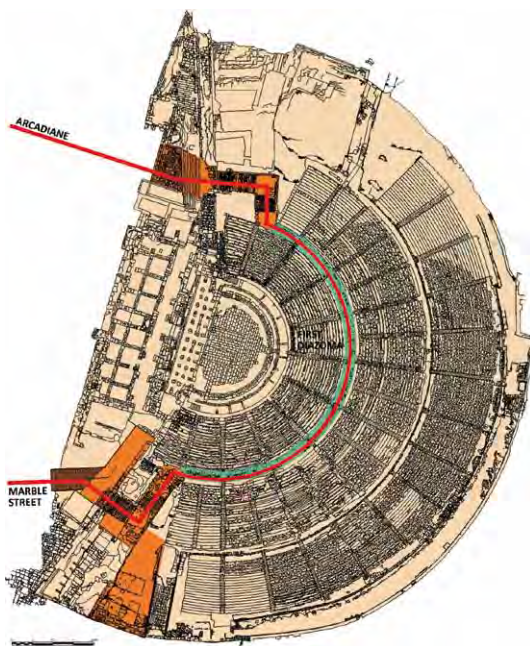
9 Graph showing different stages of the project



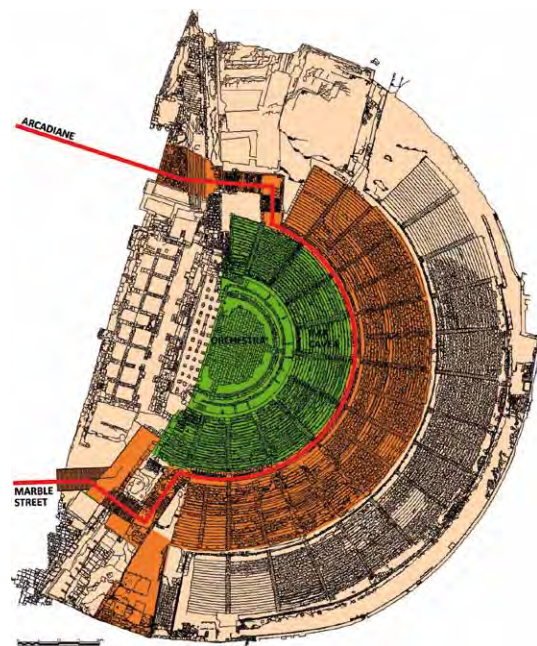
10 Graph showing work area for sub-project 1



11 Graph showing work area for sub-project 2



12 Graph showing work area for sub-project 3

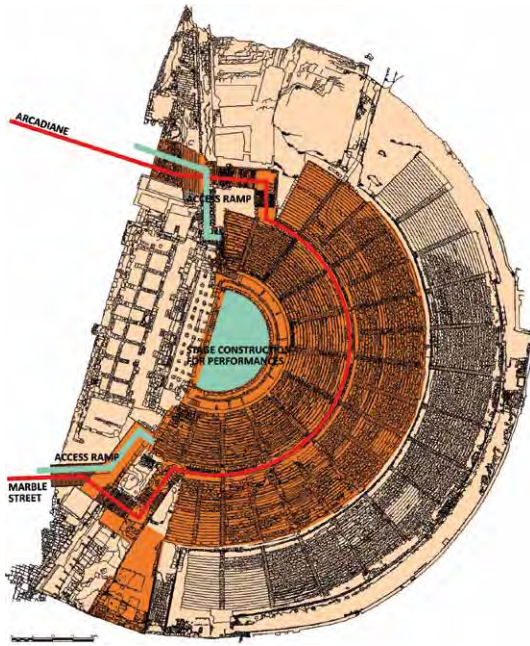


13 Graph showing work area for sub-project 4

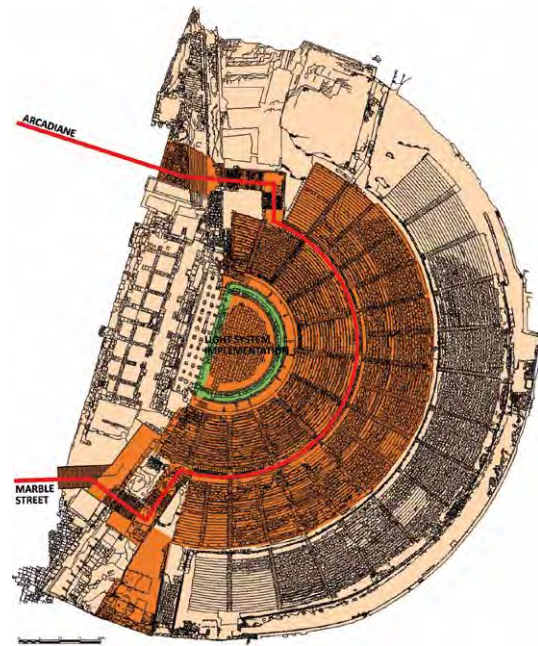
repairs. Hypothetical reconstructions of *kerkides* I1 and I11 present in the area are to be left as they are, however are not to be repeated. The modern orchestra surface is also to be removed in order to conserve the original bedding mortar underneath.

Sub-project 5: Implementation of a modern stage construction for events (fig. 14)

Following the conservation of the area, it is essential to define the necessary elements of usage for such a structure for when it is reopened for events. In this case, the structure use is to be



14 Graph showing work area for sub-project 5



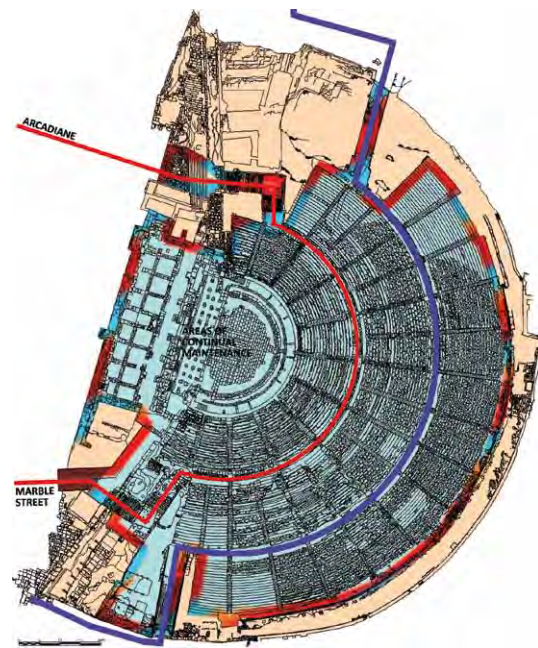
15 Graph showing work area for sub-project 6

limited to what will be designed in the project. A light and removable stage surface, preferably portable is to be designed for use on the orchestra area, which is the designated stage area for events in the project.

Sub-project 6: Implementation of a light system for events (fig. 15)

The skeletal framework and basic elements of a lighting system for events need to be designed, and strict usage limitations need to be dictated to event planners in order to ensure the safety of the original material.

Concerning sub-projects 5 and 6, it must be stated that the idea behind such designs is to clearly define the limits and objects of usage. The design of these two elements, a strict ban against sound amplification and the stated maximum number of spectators all aim to facilitate the use of the structure while making sure that the monument does not suffer from such usage.

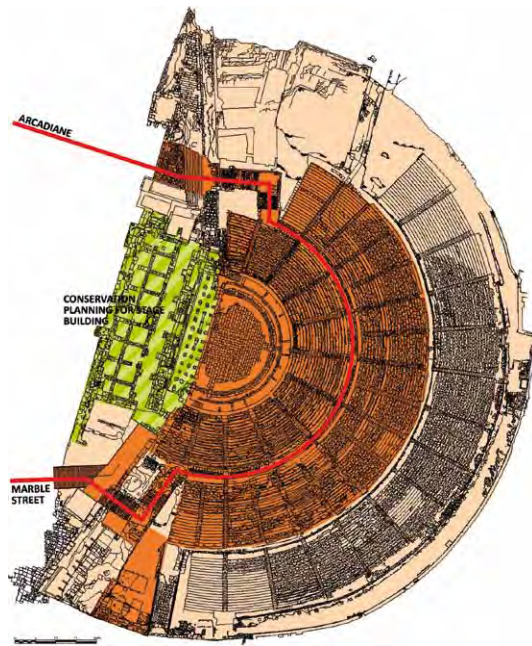


16 Graph showing work area for sub-project 7

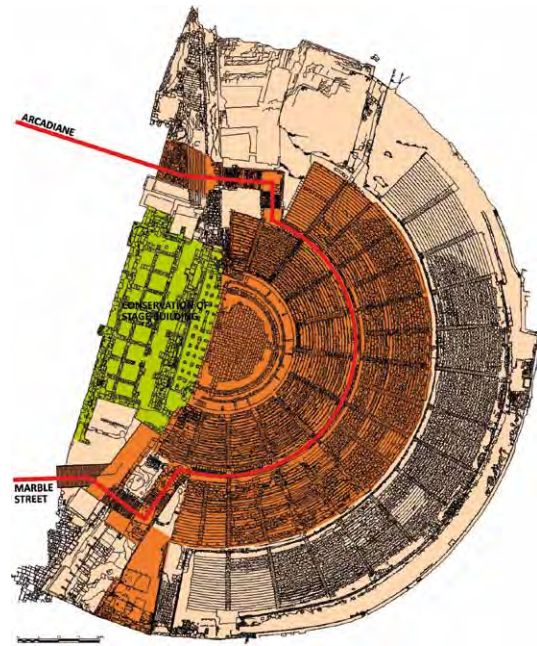
Sub-project 7: Continual maintenance (fig. 16)

Following all the interventions, it is essential to create a system for continual maintenance and monitoring of the site. Even though protective measures are taken, the site of Ephesus and the Theatre are very prone to deterioration due to excessive vegetation growth, mass tourism, and vandalism. A monitoring and maintenance team is to be put together to evaluate and report the condition of the monument and sometimes even intervene.

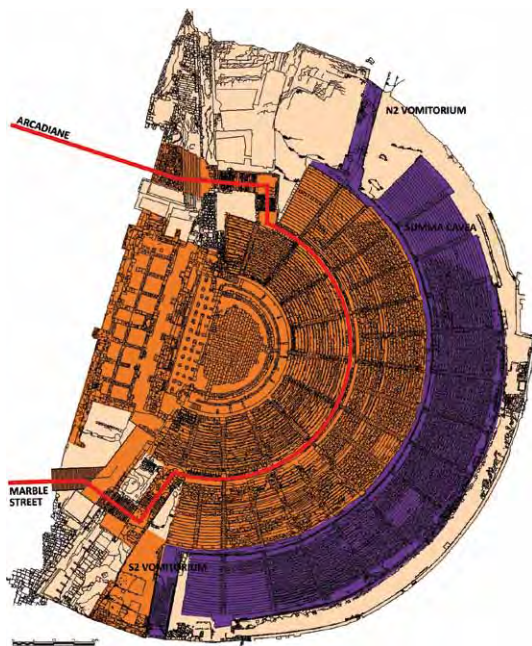
The completion of the first stage of the conservation/restoration plan will allow reuse of the structure for basic events of ›unplugged‹ nature for to a maximum audience of 2,200.



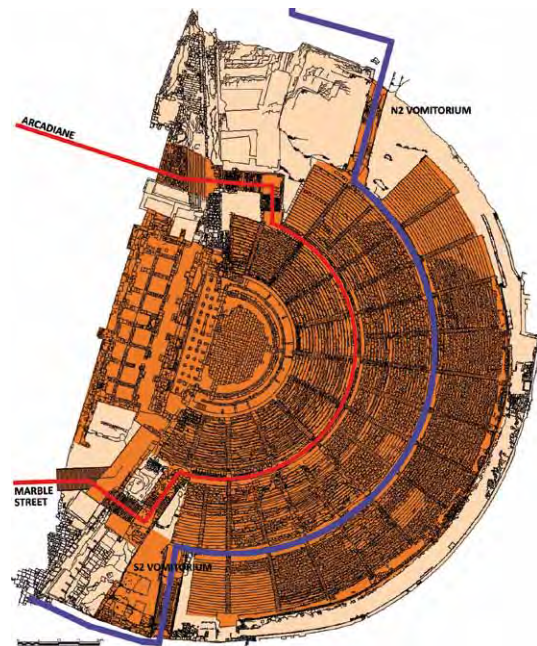
17 Graph showing work area for sub-project 8



18 Graph showing work area for sub-project 9



19 Graph showing work area for sub-project 10



20 Graph showing work area for sub-project 11

Project Phase 2

The second phase of the project involves the conservation of the stage building¹⁹ and limited reuse as a backstage area. A similar attitude of conservation of the original structure as a ruin has also been adopted for this stage of the project, however extensive planning has not yet been carried out.

Sub-project 8: Conservation planning for stage building (fig. 17)

The stage building has been found to present many structural and material problems. Some of these problems have been caused by unqualified reuse of the structure in the past²⁰. Further investigation and structural inspections are required to plan and implement conservation works. It is of importance that this item runs parallel to the conservation interventions mentioned in phase 1, in order to make it possible to intervene in this area following the completion of phase 1.

Sub-project 9: Conservation of stage building (fig. 18)

Implementation of conservation decisions are to be executed under the headline of this project.

Project Phase 3

The largest area of conservation of the Theatre is designed as phase 3 of the program, the area which contains the *summa cavea*, the porticus area, N2, S2 and S3 entrances. This phase of the project will be planned in detail during the course of interventions according to findings and results obtained during phases 1 and 2. However, the *summa cavea* located in this area was already evaluated for conservation in 2009 due to time constraints and need for immediate action. This conservation plan has been approved by the relevant authorities and emergency work has been performed in this area during the course of the planning in other areas in order to eliminate further deterioration. Detailed information on these works will be given in upcoming sections. This phase has also been divided into two sub-projects.

Sub-project 10: Conservation of areas behind fences (fig. 19)

This sub-project attempts to plan and implement conservation of all the areas behind the current fences.

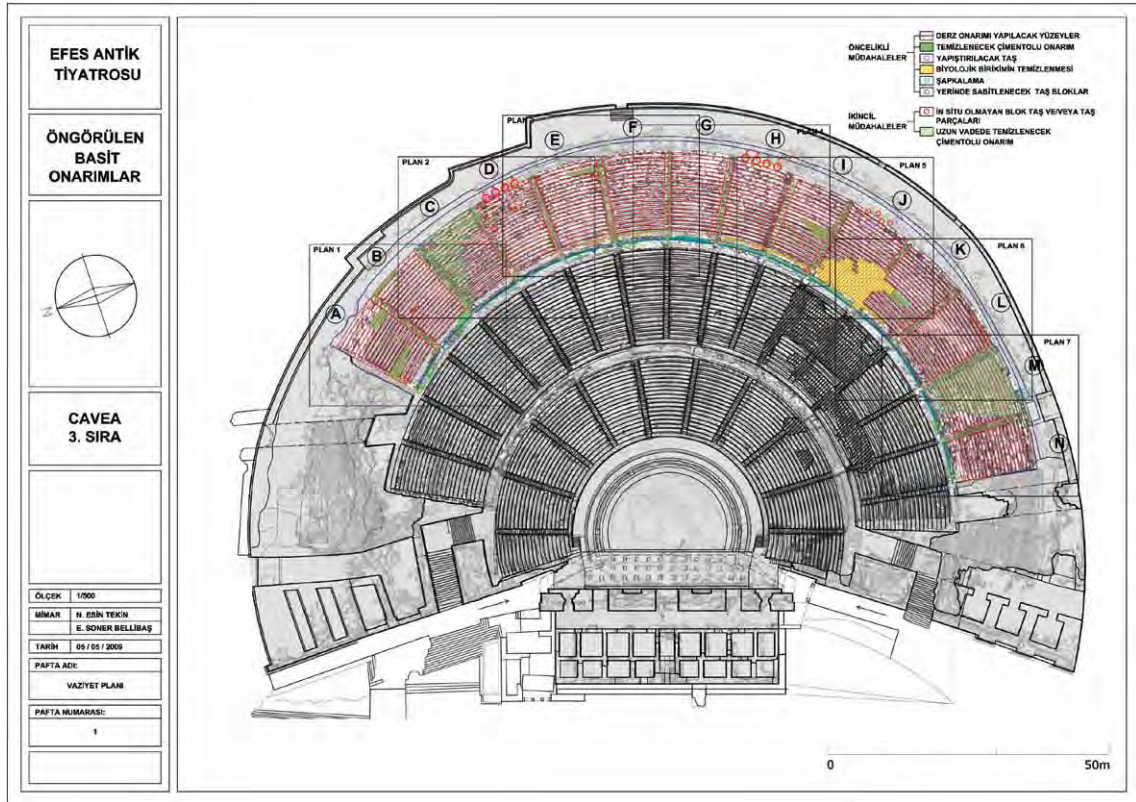
Sub-project 11: Planning for the reuse function of N2 and S2 vaults, implementation of necessary elements (fig. 20)

Further planning on the possibility of reuse of these areas, and the accessibility to the general public and execution of necessary interventions will be undertaken in this sub-project.

With the execution of the third phase, the entire monument will have undergone a conservation inspection, and the fabric of the monument will be secured. However, it must be noted that the project cannot be considered finished and continual maintenance must always be planned for this monument.

¹⁹ Research has been carried out by PD Arzu Öztürk of Mimar Sinan Güzel Sanatlar University.

²⁰ Öztürk 2002, 95–96.



21 Overview of the conservation proposal for *summa cavea*

Executed Works 2009–2010

Following the approval of a conservation plan (fig. 21) proposed to İzmir II. KTVKK²¹, works on the *summa cavea* and second *diazoma* have begun, as well as in the staircase area south of the Theatre connecting S1 and S2 entrances. The area was decided on for reasons of urgent conservation needs: for example, the staircase south of the Theatre required immediate action (fig. 22), and the *diazoma* walls and original pedestal blocks were deteriorating rapidly. Since this area was located outside the visitor areas of the Theatre, interventions could be executed urgently. Another factor which led to the project being initiated in this area was that the interventions here did not represent moral and ethical dilemmas and meanwhile, works on the other parts of the Theatre could be planned.

The work was carried out during the 2009 campaign, and have provided a base understanding of the structure and its materials as well as experience in dealing with the problems inherent in the fabric of the monument.

Overview of Materials and Techniques

Inspection of the original material used in the Theatre and previous research on Hellenistic and Roman construction techniques have been the main references²² on the decision-making process for materials. Mortar compositions have been prepared according to the material report prepared by Istanbul Technical University in 2006, providing lime to aggregate to pozzolana ratios. Mortars with similar hydraulic qualities were prepared; however, different compositions were applied to areas of different requirements, changing the ratios of aggregates in order to create mortars

²¹ İzmir II. Kültür ve Tabiat Varlıklarını Koruma Kurulu.

²² Consultance provided by TU Vienna, Gudrun Styhler-Aydın (2010).

similar to different areas of application. The lime to aggregate to pozzolana ratios were, however, always kept within the provided limits except for several areas of application of sacrificial mortars. During the course of the 2010 season, new mortar samples were taken from *in situ*-areas and sent for further research on the diversity of material included them. Sacrificial repairs have been done in several places where the underlying deteriorative conditions could not be eliminated, such as salt accumulation due to capillary rise of ground water, however such interventions require constant monitoring and renewal.

Polypropylene fibers have been mixed into repair mortars in order to mark the areas of repair with a material that dates to contemporary times. The detection of this additive in the mortars is possible only through very careful examination.

Ethyl silicates were used in several areas to consolidate the original mortar on the staircase south of the Theatre and for the consolidation of the conglomerate bedrock located in the *summa cavea*. Benzalkonium chloride solutions, 5 % and 10 % in water were used for biological cleaning of the bedrock surfaces. Herbicides previously tested for staining and salt remains with isopropylamine salt base were used for vegetation removal.

A two-component, epoxy-based adhesive and fiberglass dowels were used for fixing building blocks where necessary.

Repairs on second diazoma walls of kerkides S6 through S20 (relating to sub-project 10)

The walls of the second *diazoma* were infested with vegetation and insects and the cement based pointing from previous years was poorly done. Topsoil was discovered among the joints of the wall, indicating that previous interventions had been carried out without cleaning, and had captured soil inside the structure, causing deterioration from the inside. To understand the level of decay which might be caused by these factors, the cement joints had to be stripped to observe the original construction. An aesthetic problem due to the dark gray joints of the *diazoma* walls had also been noted before the beginning of the interventions. (figs. 23. 24).



22 Staircase south of the Theater, condition before work



23 Portion of the second *diazoma* wall before consolidation



24 Portion of the second *diazoma* wall before consolidation



25 Second *diazoma* wall, after consolidation

The joints were stripped in several places (S6, S7 and S8) to reveal that, on the top layer of the walls, a capping with cement-based mortar and flat smaller stones had been applied in previous years, possibly in the irregular areas of the original sub-construction, and the top joints were strongly bonded. Around the middle and lower levels of the walls, the joints were filled by a very loose injection of the cement based mortar, on top of soil in some areas, therefore creating voids in the joints which were very convenient for infestation. In some areas, the gaps continued as

far as 30 cm into the walls. The pedestal blocks of the *diazoma* walls and some marble surface blocks were also fixed with the cement-based mortar which caused serious salt crystallization problems on the marble.

The following interventions were decided: to seal the joints of the entire *diazoma* as protection against vegetation, insect infestation, and water penetration to the interior of the structures and to use a mortar consistent with the colour of other *diazoma* walls to improve the aesthetic quality.

Diazoma walls of *kerkides* S6 through S19 were pointed, and all loose soil and infestation agents were removed. (figs. 25. 26). These interventions took place in the 2009 season.

Pedestal blocks of second diazoma, kerkides S16 through S18 (relating to sub-project 10)

The pedestal blocks of *kerkides* S16, S17, S18 were discovered to have moved from their original locations due to soil accumulation, vegetation growth and pressure of cement mortar poured in the back during previous restorations. Several blocks were also found to be damaged and broken most probably due to problematic distributions of weight, original design problems (vertical use of sedimentation layers when stone is cut from the quarry) and serious salt cracks (fig. 27). It was decided to remove these blocks, apply necessary treatments and interventions to consolidate them to the strength of building blocks, and to put them back in place in their previously documented order; this time, however, in the proper position (fig. 28). The decision to put them back in the order they were documented is due to the fact that they seem to be not *in situ*, but placed in this order during a previous restoration phase, and at the moment it is not possible to determine the original order of the blocks.

Pedestal blocks and fragments from *kerkides* S16, S17 and S18 were numbered and removed, as well as the first steps in the *klimakes* T17, T18, and T19.

The blocks were treated and cleaned to ensure that no loose material or calcareous incrustations are left in the surfaces to be adhered. Salt accumulations were partially mechanically cleaned, and unbroken salt cracks were investigated for continuity to prevent uncontrolled breaks. Cracks which could transform into breaks were detached under controlled guidance. Broken pieces were then put back together using epoxy-based adhesives and fiberglass dowels.

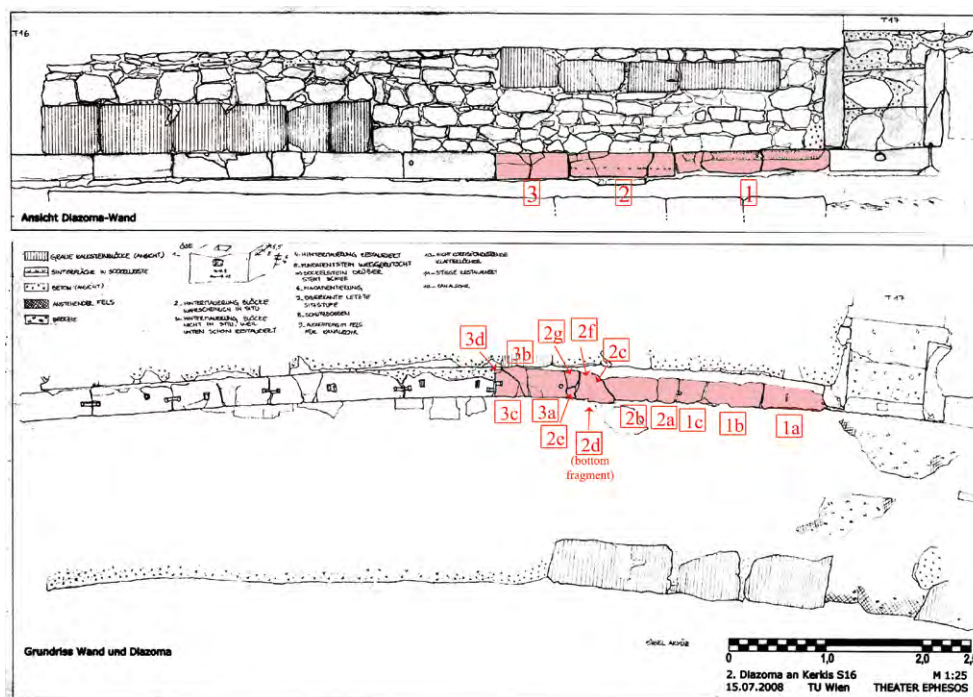
The block projection area on the ground was excavated to investigate the foundation of the pedestal blocks. In the areas near T17 a strong layer of bedrock was discovered (fig. 29), while in the other areas a soil depth of 40 cm was excavated to allow for a strong foundation wall which would also serve as a buffer between the blocks and soil. The excavated area was then filled by a foundation wall of approximately 25 cm width, and maximum 40 cm depth, running along the *diazoma* wall. The foundation wall was built using broken limestone pieces, and hydraulic mor-



26 Second *diazoma* wall, after consolidation



27 A broken pedestal block of the second *diazoma*



28 Documented fragments of pedestal blocks

tar as it was anticipated that the foundation wall would be subject to humidity. The blocks were then placed back in their documented locations (fig. 30).

Intervention has taken place at the areas requiring emergency measures. It is planned that the rest of the work on this area will be continued parallel to the other work programmed at the site. These interventions took place in the 2009 season.

Staircase area south of the Theatre (relating to sub-project 7)

Capping and pointing work was performed on the wall to the south of the staircase. First observations on the wall revealed loss of joint mortar due to exposed wall cores, where rain water pooling and soil and organic material accumulation resulted in core deterioration and joint deterioration (fig. 31).

The initial interventions were the mechanical cleaning of loose debris and mortar from the area. Furthermore, the wall crowns were capped using hydraulic mortar. It was particularly important that no stones were added to the surface of the wall²³ and the joints are created in a such a manner that rainwater does not pool on the wall, but instead the water is directed to run off from the surface of the wall. After the capping intervention, the wall joints were pointed with mortar of the same composition (fig. 32).

In two brick masonry sections of the wall, a high level of deterioration, both structural and material, has been discovered. The portion along the south wall was discovered to have major cracks not only in the joints but also through the tiles. On the south side of the wall, a plaster surface which had detached from the wall was also discovered. The plaster surface was inspected for cracks and problems, and the inspection revealed that the surface was intact. All tiles were inspected for integrity, and none were found to be beyond repair or decomposed. Broken tiles were repaired using a two-part epoxy adhesive, and then were replaced according to their original position and orientation using hydraulic mortar. A brick mortar similar to the one behind the plaster was prepared in order to stabilize the detached plaster to the back side of the wall. The brick wall perpendicular to the south wall was also documented; here, the inspection of the tiles showed signs similar to fire damage or over-firing of several tiles which were more porous than the others and which were disintegrating by flaking. These tiles were replaced with intact tiles found during the excavations, however to mark the introduction of the new material, however, their surfaces were stripped with hand tools. These interventions took place in the 2009 season.

Consolidation of the water pipes and original bedding mortar on the staircase south of the Theatre (relating to sub-project 7)

A system of two water pipes embedded in the original mortar, mixed with the spolia of the period has been discovered to have many broken fragments, and the mortar is very loose and powdering in several areas. It was decided to consolidate both the water pipes and original mortar to stop further loss of material.

Fragments of the water pipes have been fastened in place by the use of a two-part epoxy adhesive.

The original mortar was cleaned of very loose fragments using soft hair brushes and a low pressure air compressor. A colourless ethyl silicate was applied with soft hair brushes to the more sturdy areas and with light spraying on the flaking areas. The application took place layer by layer to ensure the best absorption of the ethyl silicate, and residue material on the surface at the end of the application was removed to prevent glazing (fig. 33).

These interventions occurred during the 2009 season. Inspections during the 2010 season showed that there is a constant need for maintenance in this area.

²³ Ashurst – Ashurst 1988, 4 describe the processes of such interventions in detail.



29 Excavated area in front of the second *diazoma* wall revealing a foundation of conglomerate bedrock



30 Process of placing the pedestal blocks back in their positions



31 South wall of the area south of the Theatre, before work



32 South wall of the area south of the Theatre, after consolidation



33 Consolidation of the mortar of the water pipes with ethyl silicates



34 Conglomerate bedrock in *summa cavea* before consolidation



35 Conglomerate bedrock in *summa cavea* after cleaning and consolidation



36 Overall view of substructure chambers behind the south *analemma*

Biological cleaning of the bedrock (relating to sub-project 10)

The natural cement of conglomerate bedrock which constitutes the substructure of the *cavea* cladding in *kerkides* S15 and S16 was found to have deteriorated due to soil accumulation, vegetation growth and biological matter (fig. 34). The first intervention entailed removal of the vegetation and soil accumulation on the material by means of mechanical cleaning. Biological cleaning was then performed using benzalkonium chloride solution in water. The material was then consolidated using ethyl silicates (fig. 35). The condition of the bedrock has improved since the 2009 season, and it is planned to replicate this intervention on the areas of bedrock surface in the *media cavea*.

South Analemma Project (relating to sub-project 1 – conservation of S1 entrance)

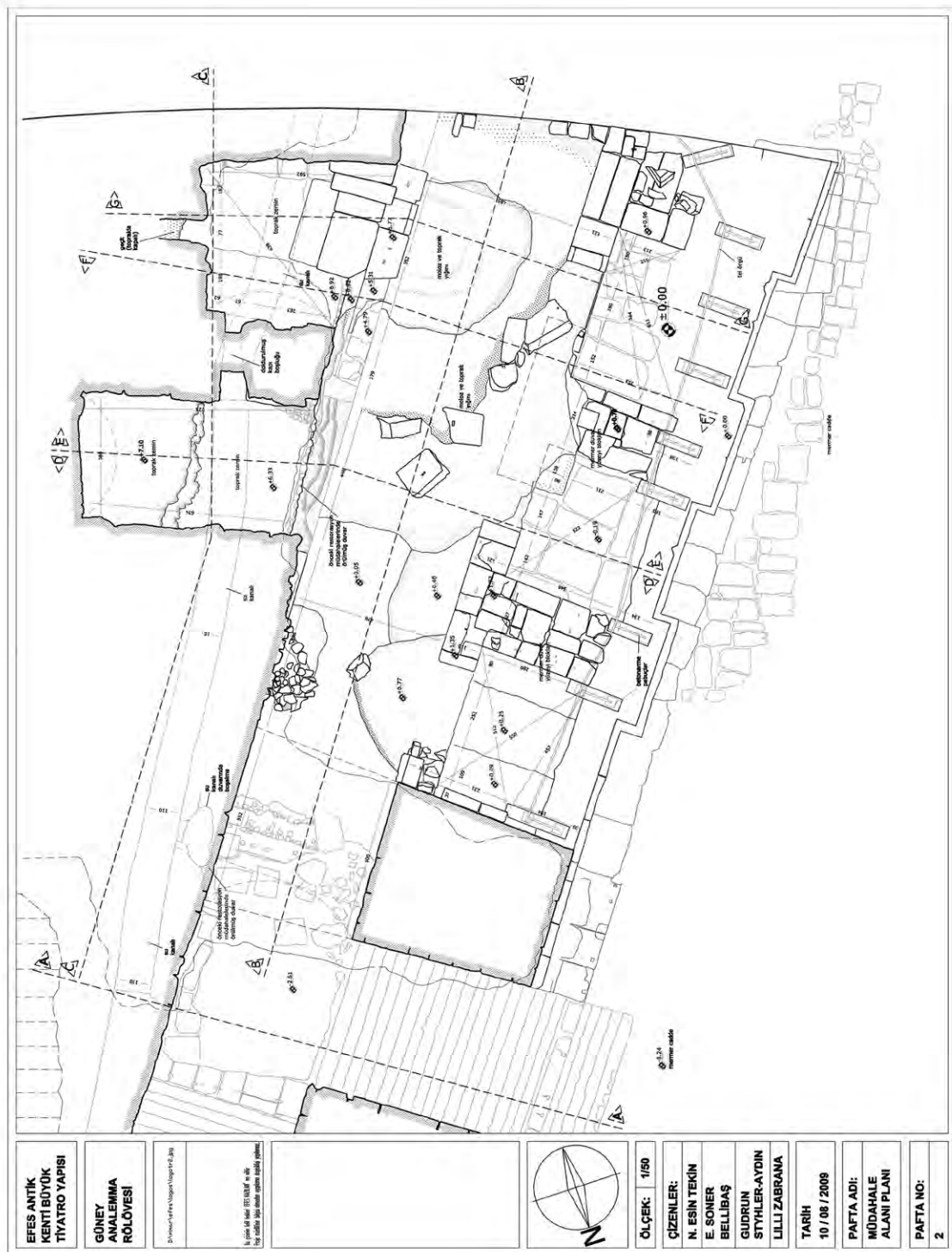
This project involves the structural consolidation of the problematic area of the south *analemma*, also dictated as a prerequisite for the project by the Ministry of Culture, which corresponds to the S1 vault, the substructure chambers behind the *analemma* wall and S1 corridor (fig. 36). Evaluations of the structure

were performed by reports from Istanbul Technical University in 2006, Toth Engineering from Vienna in 2008 and Convex Ltd. Şti. from Istanbul in 2009. These evaluations showed that the damage in the area was a casualty of earthquake damage and the structure was in equilibrium.

A project resolving the dangers of material loss, and ensuring visitor safety, was prepared during the season of

2009. This project was approved by Izmir II. KTVKK in September, 2009 (figs. 37. 38).

Applications and work began in the 2010 season. The project consists of five areas of concern and so far the work has addressed four of them.



37 Ground plan of the intervention area of the south *analemma*, showing northern and southern substructure chambers

The first item on the South Analemma Project is the consolidation of the area above S1 vault, where the deteriorated cement-based capping has eroded and given way to water damage. The interior of the vault also showed signs of mortar loss and joint erosion (fig. 39). Work has started simultaneously both on the vault and on the capping. In both areas, cement-based or loose mortar has been stripped (fig. 40). A new capping with a mortar composition determined by the reports of Istanbul Technical University in 2006 and rubble stone has been implemented on the area. Inside the vault, pointing work and mortar injections²⁴ have filled the gaps in the structure. This work was completed in the 2010 season (fig. 41).

The second area on the South Analemma Project requiring attention was the three layers of vault blocks on the corridor S1 which presented a danger of collapse (fig. 42). The centre of gravity of the blocks was located outside the line of the wall, and the blocks were being held in place by friction. These blocks have been anchored in place through 1.20 m long anchors connected by stainless steel bars of 50 mm by 5 mm, and points of contact have been insulated with neoprene layers. As the blocks have been fastened and secured, it is now possible to approach the southern front of the S1 wall (fig. 43).

The third position in the South Analemma Project consisted of the consolidation of the base of the wall between the northern and southern substructure chambers (fig. 44). Loose debris found under the base of the wall has been cleaned out to a breadth of 1 m and this section has been rebuilt using rubble stone and high strength mortar. Furthermore, a structural crack through the water channel was also investigated at this position. Joint movement indicators proved that there was no motion in the area: the deep crack was due to earthquake damage when the outer rim of the structure, built over man-made foundations, and the inner part of the structure, built on bedrock of the Panayırdağ, behaved differently producing a natural dilatation. Corresponding to the loose zone, this crack has also been consolidated and inaccessible points were filled through mortar injection (fig. 45).



39 Interior of S1 vault prior to work seen from the south



40 View of the area above the S1 vault after the cement-based capping was stripped



41 South *analemma* during the course of interventions

²⁴ Ashurst – Ashurst 1988, 32 describe the process of grouting.



42 Marble vault blocks in the south *analemma* in danger of collapse



44 Rubble mass at the foundation of adjoining wall of south and north substructure chambers



43 Three rows of arch blocks anchored in place



45 Consolidation work in the water channel below the substructure chambers of south *analemma*



46 Northern substructure chamber with a deep crack running along the vault and back wall

The fourth position of the South Analemma Project was postponed to the 2011 season. This position involves the evaluation and consolidation of the vault of the northern substructure chamber (fig. 46). This also requires inspection through lifting the deteriorated capping above the vault, which is to be done in the 2011 season.

The fifth position of the South Analemma Project has been defined as securing the area beneath the broken vault of the southern substructure chamber, and securing the *in situ* portion of the vault in order to allow for further inspections and interventions (figs. 47, 48). Access to this area had been banned for several years, and presented any approach to this area presented serious security problems (fig. 49). The barrel vault of the substructure chamber was found to be partially collapsed due to the falling down of the load-bearing western wall of the chamber. Although joint movement indicators have not detected any motion in the area since 2006, presenting a state of equilibrium, the remains of the vault which were limited to the northern side of the room were found to be unstable in case of an earthquake or a shift in the balance. Further investigation of the structural problems of the substructure chambers and the area required a semi-permanent solution to be designed in order to be able to inspect the remains of the broken vault both from above and from below.

Two important points were taken into consideration when designing the semi-permanent support structure which would complement the current load-bearing system of the vault in case of collapse; the structure would have to be permanent enough in case the investigations led to the results already obtained, and the structure would have to be modular and removable in case further investigations led to other possibilities which would be applicable and invisible to the naked eye. The design requirements were that the structure should be able to carry a load of at least thirty tons taking into consideration that the support structure should be able to manage any movement in the remains of the vault.

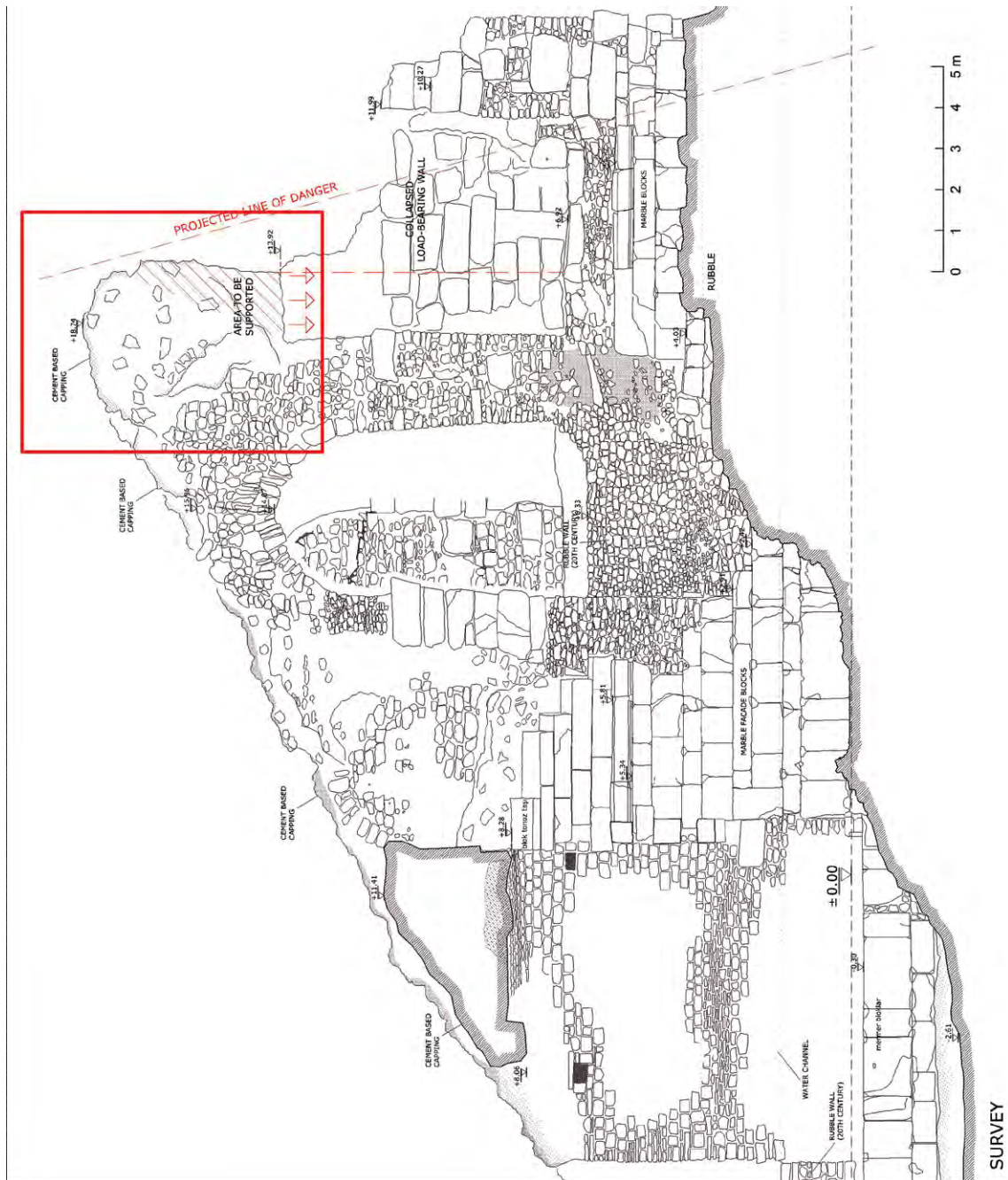
The use of traditional methods are usually preferred in conservation, however in such a case these methods have proven to be problematic. Such an intervention would require a greater speculative reconstruction including the reconstruction of the western wall of the chamber, and the barrel vault of the S1 entrance from the south all the way to the facade of the *analemma*. A much lighter, durable and reversible intervention would be possible through the use of stainless steel, in contrast to the original construction techniques, and would eliminate the possibility of falsification through interventions.

The design process which started in June 2009 led to a stainless steel support structure much resembling the system of scaffolding. The support structure consists of pillars and connecting horizontal and diagonal bars fixed through specially manufactured nuts, bolts and plates (fig. 50). All of the materials mentioned are made of stainless steel grade 316. Impregnated and laminated wood blocks in different thicknesses are fixed to the support construction at the feet of the structure to ensure that the weight of the structure and the weight of the supported vault are evenly distributed by the 8 feet of the structure to the uneven ground surface (fig. 51).

Conservation of N1 entrance (relating to sub project 1)

Planning for the N1 entrance has been completed and submitted to and approved by the related authorities in the 2010 season. The planning so far includes the staircase of the N1 entrance leading up to the first *diazoma* (figs. 52, 54).

Lost or removed orthostat ashlar blocks of the N1 entrance presented the main conservation problem, leading to deterioration due to unbalanced weight distribution the horizontal layers (fig. 53). In order to prevent further deterioration it has been decided that stainless steel telescopic masts are to be used at certain points. These masts will also function as the anchors of information panels to be placed at the landing of the staircase (fig. 55). This intervention is planned for March 2011.



47 Problematic remains of the broken vault of the southern substructure chamber



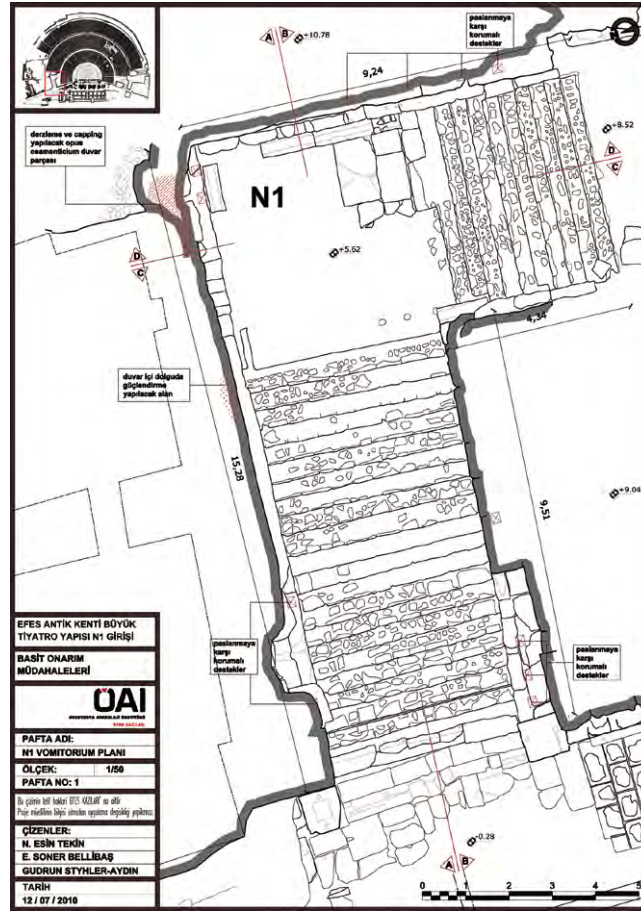
51 Detail from the feet of the support structure



52 General view of N1 entrance from east



53 East wall of intervention area of N1



Conclusion

Restoration project for the Great Theatre of Ephesos has been an evolving project due to the reasons of constrained time, need for immediate action, and public and governmental expectations of varying pressure. However, when planning the project, it has been of utmost importance not to stray from an idealistic conservation approach and while doing so integrating the derivatives of the said expectations in a manner which is not against modern conservation principles and limited to an amount which can safely be implemented on the monument.

It must be stated that in the case of the Theatre of Ephesos, the evolution of the project has not finished yet, and the data obtained from current interventions, recent finds, cause and effect discoveries must always be cross-checked with the current list of conservation decisions in order to obtain a system of conservation, which will far extend into the future by means of maintenance, that relies on its own data to better itself.

Bibliography

- Ashurst – Ashurst 1988 J. Ashurst – N. Ashurst, Practical Building Conservation I. Stone masonry (Hants 1988).
- Burra Charter 1999 The Burra Charter. The Australia ICOMOS charter for places of cultural significance, <http://australia.icomos.org/wp-content/uploads/BURRA_CHARTER.pdf> (12/04/10).
- Charter for the protection and management of the archaeological heritage (1990) Charter for the protection and management of the archaeological heritage (1990) adopted by ICOMOS <http://www.international.icomos.org/charters/arch_e.htm> (23/12/09).
- Günay 2002 R. Günay, Ancient theaters: Some thoughts on the preservation and use in our day, in: Z. Ahunbay – Ü. İzmirliğil (eds.), Management and Preservation of archaeological sites. ICOMOS TURKEY (Istanbul 2002) 90–92.
- International cultural tourism charter International cultural tourism charter (Managing tourism at places of heritage significance, 1999) adopted by ICOMOS <http://www.international.icomos.org/charters/tourism_e.htm> (08/05/10).
- Koç 2008 Z. Koç, Taşınmaz kültürel miars yönetimi ve mali teşvikler, İTO İstanbul (Istanbul 2008).
- Öztürk 2002 A. Öztürk, Re-use problems related to the Great Theater in Ephesus, in: Z. Ahunbay – Ü. İzmirliğil (eds.), Management and Preservation of archaeological sites. ICOMOS TURKEY (Istanbul 2002) 94–96.
- Rajer 2005 A. Rajer, Preservation, People and Politics in the restoration of the National Theater of Panama, in: C. A. Brebbia – A. Torpiano (eds.), Structural Studies, Repairs, and Maintenance of Heritage Architecture IX (Southampton 2005) 441–449.
- Stubbs 1995 J. H. Stubbs, Protection and presentation of excavated structures, in: N. Stanley Price (ed.), Conservation on archaeological excavations, ICCROM (Rome 1995) 73–89.
- Styhler-Aydın 2010a G. Styhler-Aydın, The Theater of Ephesus. New Results of the Recent Building Archaeology in the Auditorium, in: Architectural History Conference/Turkey I, Middle East Technical University (METU) Ankara (unpublished).
- Styhler-Aydın 2010b G. Styhler-Aydın, Bauforschung am Theater von Ephesos. Ergebnisse der Untersuchungen im Zuschauerraum in den Jahren 2003–2008, AnzWien 145, 2010, 61–105.
- Venice Charter The Venice Charter. International charter for the conservation and restoration of monuments and sites, adopted by ICOMOS <http://www.international.icomos.org/charters/venice_e.htm> (12/04/10).
- Verona charter Verona charter on the use of ancient places of performance (1997), COE, <http://www.coe.int/t/dg4/cultureheritage/heritage/resources/Texts/Verone_EN.pdf> (18/07/10).

Mag. Nevin Esin Tekin, MSc

Levazım Mah. Aydın Sok. No: 7/A D:11, TR-34340 Beşiktaş – İstanbul

E-Mail: n.esin.tekin@gmail.com

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Abstract

Nevin Esin Tekin, Restoration of the Great Theatre of Ephesos. An Emergency Approach to Safeguarding the Monument and Making it Available for Partial Reuse

The Great Theatre of Ephesos is a monument almost as significant to the cultural identity of the modern town of Selçuk as it was in ancient times. It was a place of gathering and ceremonial importance in ancient times, and currently the monument is also expected to be a place of interaction for the modern day public. Therefore, conservation planning for the structure focuses on conserving the fabric of the structure and ensuring its stability; the project, however, does not only aim at archaeological conservation but also keeps an open mind about a balanced partial reuse. Furthermore, mid-project results during various stages of work will be produced, allowing continuity in visitor interaction. It is has also been necessary to develop an understanding and assessment of past interventions and usage methods, as well as to continually monitor the effectiveness of current interventions and planning in order to reach applicable conclusions for managing conservation and reuse.

Keywords

Ephesos – Theatre – Conservation – Restoration – Compatible Use