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GIS-based approach to urban planning, archaeological inventory and geology structure in multilayered cities: The case of Tahtakale in Istanbul

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Abstract

This study presents a new planning approach within the context of the integration of archaeological and geological data in the planning process conducted in multi-layered cities. The modern urban physical space in multi-layered cities requires greater integration of natural elements through the use of the new advanced technology. Even though the archaeological cultural heritage/inventory is more recognizable in the urban space, the construction of modern cities increases the developmental pressure on the underground cultural heritage/inventory. This study seeks an alternative method for transferring the archaeological and geological data for the Preservation-Oriented Zoning Practice Plan by using the Geographical Information Systems (GIS), in accordance with the decisions on registering the cultural assets in Turkey. With this approach, the aim is to change spatial planners' perception of three-dimensional space and to propose a model for integrating archaeological data with the decisions based on the preservation plan. The effect of the elevation details of both the archaeological and geological data discussed on the integrated planning analysis and synthesis stage. The GIS were used for the spatialization of the archaeological data, while for the assessment and transfer of the obtained data by using ArcGIS software and "georeferencing" and "overlay analysis". In addition, a field study was performed in Historical Peninsula, Tahtakale Region, and in-depth interviews and structured meetings were conducted with thirty-eight people to secure the contribution of different disciplines to the planning.

Keywords

Multi-layered city, GIS, Underground cultural inventory, Geology, Urban planning.

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1. Introduction

The planning of modern cities requires a multidimensional perspective that should observe economic, ecological and social structure planning principles to ensure sustainable development. Especially for multi-layered ancient cities with a rich cultural heritage, the sustainable urban planning approach depends on many other components. The main purpose of this study is to discuss the sustainable preservation planning challenges for cities that, on the one hand, have an archaeological cultural heritage that still exists underground, and on the other hand, a modern life existing on the surface. For this reason, we studied as the field work in the Historical Peninsula and specialized the debate on the Historical Trade Area-Tahtakale, major commercial areas of Istanbul that had once served as the Venice Trade Colony in the Byzantine era (Ağır, 2009:15) and continued to function as a major commercial area in the Ottoman and Republican Eras, albeit with certain changes (Ağır, 2016)[1].

In the study we used GIS tools, and applied the method for gathering multi-component and multi-actor for preservation planning based on the underground cultural inventory and geology structure in decision-making processes. Within the scope of the Istanbul 2010 European Capital of Culture works, the "Archaeology in Istanbul, Archive Documents of Istanbul Archaeology Museums (1970-2010[2])", which was prepared by scanning studies in the Archaeology Museum Archive, contains an excel file of the archaeological inventory that had been discovered over the course of 40 years in Istanbul through the coordination of information (Saner, 2017[3]). We prepared after obtaining approval from the Directorate of Istanbul Archaeology Museum and based on the master's thesis prepared in coordination with the directorate of the museum (Kızıltan, 2017[4]).

For the study, we performed in-depth interviews with thirty-eight people, which included those working in relevant public institutions, academicians, craftsmen and citizens living in Tahtakale and Istanbul, and those working in different fields as well. All the interview performed within the scope of this article helped to understand the reflection of the multi-layered urban system on the physical space, also the geology structure one of the important components for the study was included in the evaluation process with archeological inventory thanks to these interviews[5].

We used the GIS for the spatialization of the archaeological data[6], while for the assessment and transfer of the obtained data to GIS. We can separate the database structure into 3 part: descriptive data (natural and build-up environment analysis); graphic data (historical maps; satellite images, etc.); photographic data (document and archive photographs of Archeological Museum). The mapping base made it possible to vectorialise all the elements rendered with the three consecutive geometric primitives of the GIS (Points, Polylines and Polygons) (Baratin, L., Bertozzi, S., & Moretti, E., 2013). The relations and connection and contiguity relationships between the GIS element guarantee by the topological functions. The orthophotos, DEMs and the particularly accurate TINs obtained made it possible to develop an important phase of 3D data processing through the ESRI ArcScene. The historical charts and grids that permitted spatial diachronic analysis also proved to be invaluable. Also, we used ArcGIS software and "georeferencing" and "overlay analysis" also performed a field study, historical spatial maps, natural environmental analyses (elevation, geological structure etc.) and coordinates of valid zoning plans were overlapped. In this way, in addition to ensuring the integrity of the spatialized data in the GIS, an evaluation of the coexistence of different types of data and plan decisions with the underground cultural inventory and geology structure, was able to be made.

In this context, besides the planning approaches where spatial and functional sustainability were observed in the multi-layered cities in terms of geology (Erbey, 2017:500), the main area of discussion includes studies or efforts

[1] Structured Interview: Doç. Dr. Aygül AĞIR, Istanbul Technical University, History of Architecture 20.03.2016.

[2] Kızıltan, Z. & Saner, T., 2011. İstanbul'da Arkeoloji İstanbul Arkeoloji Müzeleri Arşiv Belgeleri (1970-2010), İstanbul Bilgi Üniversitesi Yayınları, İstanbul.

[3] Structured Interview: Prof. Dr. Turgut SANER, Istanbul Technical University, History of Architecture 12.12.2016.

[4] Structured Interview: Zeynep Kızıltan, Istanbul Archaeology Museum, Directorate, 02.01.2017.

[5] Structured Interview: Prof. Dr. Turgut ÖZTAŞ, Mimar Sinan Fine Arts University, Geological Engineering, 09.04.2017.

[6] These archeological data include archeological drillings, rescue excavation, field survey determination so on.

aimed at determining and recording the archaeological inventory, while the duties of authorized institutions and current planning systematics emerge as sub-elements of this discussion.

2. Position of the multi-layered cities within the inventory and preservation planning approach in the historical environment of Turkey

Aysu (1975:27) defines the concept of preservation within the planning approach as the "efforts to maintain the social, cultural, spatial and similar sustainability by synchronizing the material cultural features formed by the cultural heritage of humankind that have been created in the continuity of history and life with the newly-created spatial-physical products". The idea of conducting planning through the preservation-based approach within the planning systematics of Turkey was conceived after realizing the necessity of preserving the natural resources. Moreover, in the planning approach, preservation plans were separated from the developmental plans depend on France, Malraux Laws (Okyay, 2001:15). As a result, Zoning Practice Plans are used as the means of planning in residential and developmental areas, while Preservation-Oriented Zoning Practice Plans are defined for the preservation areas.

The formation of the Preservation-Oriented Zoning Practice Plans is as follows: In accordance with the legislation on Preserving the Cultural and Natural Assets, all practices in the relevant field shall be suspended after an area is declared as preserved by the relevant preservation council, and the council shall determine the "Preservation Principles and Terms of Use within the Transitional Period" until the Preservation-Oriented Zoning Plan is prepared. Although comprehensive preservation approaches are developed in these plans, the integration of this preservation approach to the urban system cannot be performed (Dinçer, 2013:25). To facilitate this integration, policies must be issued and projects must be developed; Site Management Plans are prepared for this purpose. Although there is a variety of planning tools defined in the governmental regulation, the Preservation-Oriented Zoning Plan and the Site Management Plan are prepared, and other tools are used in accordance with the professional competencies of the planners. These can be regarded as the tools for intervening in the concept of assets. In such a protection system, the preservation of archaeological areas is performed on the basis of the definitions governing the mobile and immobile cultural assets that fall under the preservation concept in the legal system. The Law no. 2863 on the Preservation of Cultural and Natural Assets, which was put into force on 07.21.1983 and amended twelve times to date, contains the legal obligations for preserving archaeological works. The concept of site is defined as follows: "the cities and urban traces of various civilizations that emerged in the pre-historic period and are still present today and that reflect the social, economic, architectural and similar characteristics of the period, and the places of social life where cultural assets are common or where significant historical events took place and as such, should be preserved with the specified natural characteristics". Considering the fact that many cities in Turkey date back to early times and historical traces are still present underground (Bilgin, 1996; 3), this particular case should be included in the laws for preserving the underground cultural assets.

The Preparation of Preservation Plans are based on the processes of determination and registration. The registration of preserved areas and natural cultural assets are performed by the Regional Cultural and Natural Heritage Preservation Boards. The Regulation on the Determination and Registration of the Immobile Cultural Assets to be preserved and the procedures and principles to be presented in the notices of preserved areas are significant. Moreover, Resolutions were determined by the High Council of Preserving the Cultural Assets, and the preservation and usage conditions were specified in accordance with the preserved area class. In this context, the Control Offices for the Implemen-

tation and Preservation (KUDEB), which are foreseen to be established within the scope of provincial special administrations, metropolitan municipalities and district municipalities, as one of the innovations introduced by Law on the Preservation of Cultural and Natural Assets, no. 5226, dated 07.27.2004, aim to resolve the problems that have been experienced for many years. The authorities and responsibilities of KUDEB, which should include at least one expert each from the fields of architecture, urban planning, engineering, archaeology and art history and work in cooperation with the Regional Council of Preservation, were assigned by the Project Offices of KUDEB and the Regulation Regarding the Procedures and Principles on the Foundation, Operation and Permissions for Educational Units. However, in our country which has a rich historical background, archaeological studies can be carried out within the scope of various technical, legal, financial, etc. constraints (Ministry of Culture and Tourism, 2019). For this reason, there are many cultural assets in our country have not been registered yet due to limited archaeological excavations and surveys. For this reason, it is very important to identify The Potential Underground Cultural Heritage Areas which have not yet gained site status. In this context, it is essential to develop specific plan decisions in areas where archaeological inventory studies are underway and which have not yet gained registration and site status.

The Istanbul Metropolitan Municipality developed in 2015 the current over-ground cultural assets inventory for the express purpose of ensuring preservation of assets in multi-layered cities, a process that requires the cooperation of many different institutions in applying two different planning instruments (Dinçer, 2017[7]). In addition, there is no database where the underground cultural inventory is kept holistically (Kuban, 2017[8]).

3. The significance of the underground cultural inventory and the geological structure of the historical peninsula and its contribution to planning

The leading issue experienced in the historical context is the risk of losing the urban references of the past. Dinçer (2013:23) highlights the UNESCO World Heritage Council Meeting held in New Zealand in 2007 and mentions that 40% of the participating countries noted the devastating effects of urban transformation and development resulting from the urban infrastructure projects, contemporary architecture, and high buildings, with the following statement being made on this issue: "Cultural heritage is under a major threat in countries like Turkey which host many contemporary investments. In revealing this heritage, obtaining information about it and conveying this information to society, the world of science and future generations, certain issues arise that cannot be solved easily" (Kızıltan & Uyar, 2011:18). The

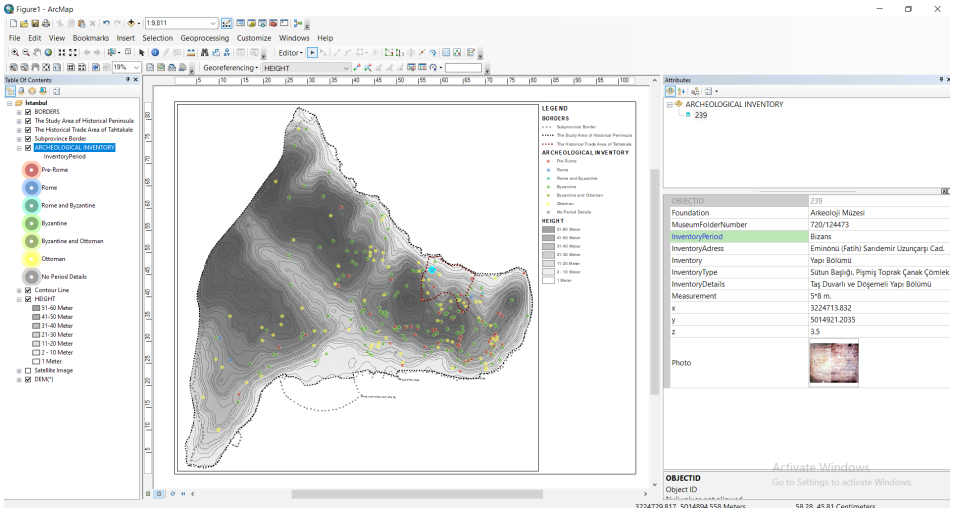

Figure 1. *Formation of the Database for the Historical Peninsula - İstanbul.*

[7] *Structured Interview: Prof. Dr. İclal DİNÇER, Yıldız Technical University, City Planning, 15.02.2017.*

[8] *Structured Interview: Prof. Dr. Zeynep KUBAN, Istanbul Technical University, History of Architecture, 18.04.2017.*

reasons these issues appear so difficult to solve are related to the necessity of forming inventory data corresponding to the different periods of urban history, the transformations that political and economic periods have undergone, which inevitably triggered the reconstruction of physical spaces, the simultaneous efforts involved in raising the quality of life in urban areas, and preserving historical layers, the necessity of using and developing urban areas, and finally, to the fact that this usage and development can only be performed through qualitative and quantitative data repository developed through interdisciplinary studies. This study examines the afore-mentioned challenges and proposes a method involving GIS on how to form the relevant data repository. This study also presents another method for both the database and planning systematics.

Applying the GIS method with the satellite image of the Historical Peninsula initiated the formation of the database. We processed total of 414 archeological determination on the smart maps of GIS in a coordinated manner (Figure 1). An archeological information form which created by using attribute table of the ArcGIS software helped to record for each archeological drillings, inventory and rescue excavation data. We transferred all archeological inventory data on these forms to GIS. Therefore, detailed numerical data on where the inventories were concentrated over a 40-years period and on the periodical inventories and characteristics of the inventories from these periods were obtained. We superposed eleven historical maps by using the georeferencing method. The present situations of the modern buildings, the plan analyses of the Historical Peninsula and the plans in force (Metropolitan Planning, 1/5.000 Zoning Practice Plan and 1/1.000 Master Implementation Plan) were included in the data systematics.

This study examined, how the database can be use interpretation for the historical background of the Historical Peninsula. This is the most important component of the historical topography of Istanbul. The section included how "Historical Peninsula and Underground Cultural Inventory" to the GIS could be used for urban history, the current configuration and future plans. The section titled, "Tahtakale and Underground Cultural Inventory", will address whether this study can be conducted with the relevant files of the museum, and various analysis techniques will focus on the benefits.

3.1. Database's contribution to Istanbul's historical topography

All of the urban history studies regarding Istanbul have been performed based on the studies in the literature and on old maps and engravings. However, it should be noted that in urban archaeology studies, all the resources that can be observed in the cities or in the formation of the cities, from the natural structure data to the historical development and planning decisions, should be evaluated together with the data obtained from the archaeological studies. Bilgin (1996:28) highlights the significance of natural data in the formation of urban forms, particularly drawing attention to the topography data, the reason being that geographical conditions (earthquakes, floods, land characteristics, slopes, etc.) and natural structure characteristics indicate the breakpoints and renewal areas of the urban forms in the historical process. For these reason, topography is a vital directive element for the spatial arrangements of the cities.

The 7th century is the period of the Greek colonization of the city. Starting from this period, the geographical and special location of the city has had an impact on its development and the settlement has developed as an important port and load transfer place (Müller W., 1998). Müller, as the reason for the failure to obtain more detailed findings of this period, the ancient ports are filled in the sea of Sirkeci and Eminonu regions and noted that as an archaeological work due to the rail systems cannot be done (Müller W., 1998: 4), some of these structures Sirkeci Metro emerged during the rescue excavations (Özmen, HI, 2007: 22-27). During the Byzantion period, fortifications were fortified in time and the walls were started to be built from the very first times (Müller W., 2001: 16). It is stated

by Müller that the walls of the Acropolis were built later (Müller W., 2001: 16). The city, which has survived many sieges and wars during the independence process, has been connected to Rome since 146 after the walls were repaired many times.

In the city, which was named Constantinople in 324, the ports continued their existence with their sheltered position. Regarding this period, Müller refers to Natitia and emphasizes that all uses for the city are shaped around harbors (Müller W., 1998: 6). In the 7th century, the old port region, which lost its importance with the interruption of agricultural shipments from Egypt, became a rubble dump site in the early Ottoman period and joined the shore (Müller W., 1998: 9).

We prepared the contour maps for the study were utilized for topographical analyses, and the development of the archaeological drilling holes from different periods were observed. This study enabled a better understanding of the urban morphological development. In the light of this data, we found that the data belonging to the Roman Era emerged in locations closer to the coastal areas of the Historical Peninsula. Considering that the Historical Peninsula was influenced by the sea with the filling areas formed from the past to the present, it is thought that the finds were closer to the sea in the Roman Era and thus had stronger ties to the sea. The residential areas in the Byzantine Era are believed to have expanded to the upper elevations of the city. It is also clear that the finds are more concentrated around Eminönü. The fact that Eminönü has more finds than Fatih does not indicate that Fatih was occupied later, because Fatih has finds dating back to the Roman Era. Moreover, it is understood that the Zeyrek region developed as a religious center in the Byzantine Era, despite the topographical difficulties.

According to Müller, it is not easy to reconstruct the image of the city at that time, since there are few buildings of Constantinople between the 7th and 10th centuries (Müller W., 2001: 23). However, it is emphasized that especially defense-based shipyards become important actors in coastal use together with ports (Müller W., 1998: 14). Müller states that the navy shipyards associated with defense activities, gates and city walls were built as complementary systems in this period and that the most important navy shipyard of the period should be searched in place of Tershane-i Amirane (Müller W., 1998: 14). The ports, which became transit ports, also triggered the change

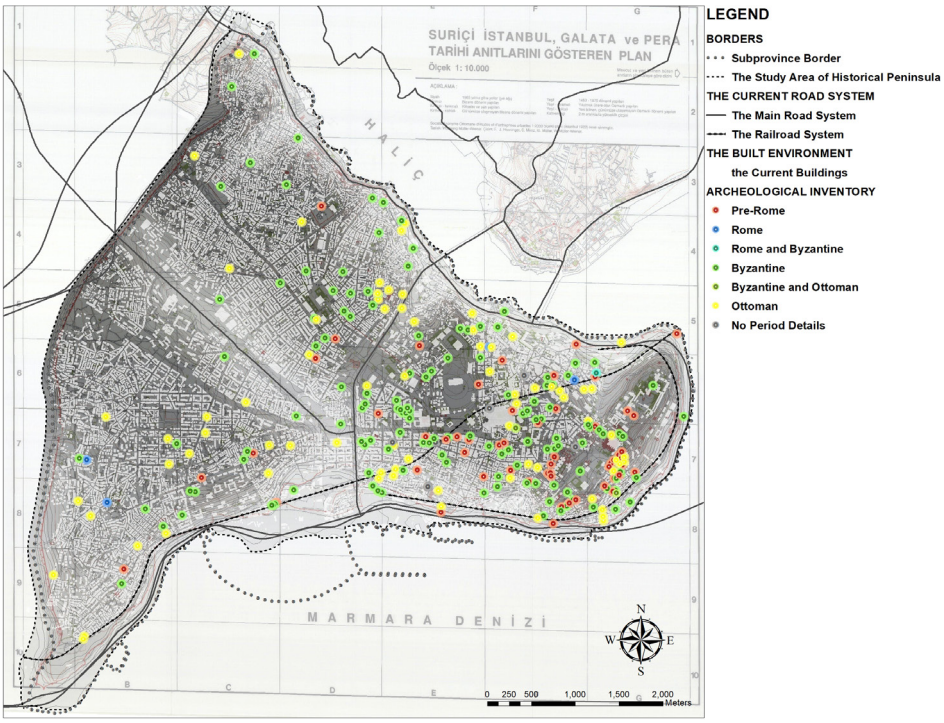

Figure 2. *Unity of Topography, Historical Maps with Archaeological Data.*

of supporting functions behind the port.

Until the fall of the city in 1453, all the city walls were destroyed by cannons and many of them were destroyed. In this period, the weight of the reconstruction process of the destroyed urban area until the Ottoman Empire is seen. However, the policy of changing the function of monumental structures, the process of converting religious structures into mosques attracts attention (Müller W., 2001: 29). This situation gives rise to the process of the development of urbanization around religious centers in the clustering of groups that come together with social and cultural differences (Müller W., 2001: 30).

Until the 18th century wooden houses and palaces, narrow spaces existed in the form of spatial structure (Müller W., 2001: 31) does not allow too much reference to the buildings in the past, although the urban texture has continued to a point. However, after this period, with the increasing population and new zoning decisions, the pressure on the tissue started to increase and the city was on the verge of a period when it would be exposed to many demolitions and fires. In the second half of the 18th century, some of the ports were dedicated to the navy.

Evidence derived from the readings on historical backgrounds suggests that spatial continuity had continued until the 19th century. The answer to the question of how a city that has been demolished and rebuilt several times shows spatial continuity should be sought in the concept of functional continuity. In the periods when Istanbul was being developed as a port city, people used the areas by classifying them according to their basic functions, as their spatial needs did not change over time, and when doing this, people would refer to the usage experiences in the past. Therefore, there are other religious structures under Zeyrek and the Suleymaniye Mosque showing spatial and functional continuity. For this reason, Müller stated that the naval area should be searched for the area where Tersane-i Amirane (The Main Shipyard of Ottoman Empire) was located, an assertion that supports the afore-mentioned statements (Müller Wiener, 1998:14). The elevations of the topography that are based on these finds changed over time. Tuna (2003:90) stated, "The asset-based pattern of the above-ground buildings and structures in important centers whose history dates back thousands of

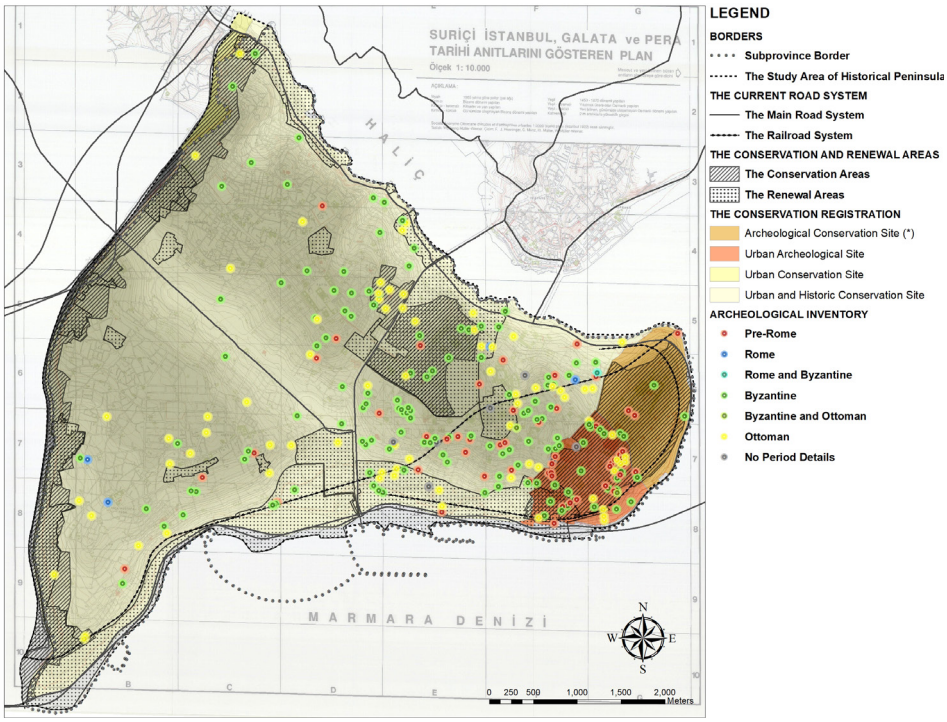

Figure 3. *Unity of Conservation Registratrion Area and Renewal Area with Archaeological Data.*

years, such as the Historical Peninsula, generally reflects the underground archaeological values." Therefore, studies on monumental works that have been mentioned in sources but not actually found in physical locations can be conducted.

As a result, when we consider urban transformation processes, there are the combined effect of many factors such as geography, transportation, identity and archeological findings. "On the other hand, urban nuclei do not disappear, the invading tissue gnaws them or adds them to their own weave. These nuclei resist and transform. They remain the center of intense urban life. The aesthetics of these ancient nuclei play a major role in their survival. There are not only monuments, corporate centers, but also venues suitable for festivals, parades, walks and celebrations. Thus, the urban core becomes a high-quality consumer product for foreigners, tourists, people from the periphery and those living in the suburbs. It survives by its dual role in the place of consumption and the consumption of the place. Therefore, the old centers enter the exchange and exchange value in a more integrated manner, while preserving their usage values due to the spaces offered for specific activities" (Lefebre, 2015: 27). Around consecutive periods, it is almost impossible to understand and analyze the archaeological multilayers of the city without using GIS.

3.2. Upper scale planning approach: "The historical peninsula and underground cultural inventory"

The Historical Peninsula in Istanbul has been affected by adverse effects of rapid urbanization, and the defining elements of the city center, which boasts rich cultural heritages changing or even becoming extinct over time. This study proposes a method whereby the archaeological data are re-arranged in the planning process can be used by interdisciplinary studies.

The relevant characteristics in this regard are of critical importance, as they affect the weight whereon the archaeological inventory, including whether basements of these works are present and the type of these works. Within the scope of the study, the interpretation of fields is limited to the decisions of field usage, presence of basements and types of buildings.

The database indicates that the plan decisions for the Peninsula allowed for the construction of basements. However, according to the existing conservation laws, in case of any discovery of the immovable property that receives a building permit, the cost of the archaeological excavation of the immovable should be borne by the owner. Therefore, according to the plan decisions, in case an archeological find is found in a real estate with a basement permit, due to the archeological excavation costs and obligations, the relevant institutions may not be informed about the finds. If this situation is detected, it constitutes a crime according to the protection laws, but it leads to the objectionable implementation of the decisions of the plan in terms of protection.

There used to be the elliptical Forum of Constantin, where stands Çemberlitaş, on the route to the ancient Mese Street extending toward Altınkapı from Sultanahmet Square (Eyice, 1968: 89), as well as the Forum Tauri around Istanbul University, the Forum Amastrianum in Saraçhane, the Forum Bovis in Aksaray, the Forum Arkadii in Cerrahpaşa, and public and commercial areas around them (Kuban, 1970: 28). When the current state of these areas are examined, it can be seen that under the pressure of intense construction, commercial and housing use, made up of reinforced concrete structures with basements, are merged together. In looking at the functional development of the route axis called as Mese Street from the past to present, it is understood that a partial stability is reflected. The only element that references the past is the finds that were uncovered in the archaeological excavations and that are publicly displayed in front of the Faculty of Literature at Istanbul University. This axis must be designed to provide a reference to the past, it such a way that even those who experience the area for the first time can understand this historical background. Such planning and designing decisions are necessary to create public awareness

about preservation and to trigger an appreciation of urban space and memory among the people. The existence of the basement and the inventory of the archaeological cultural heritage should first be interpreted and evaluated separately for "The Potential Underground Cultural Heritage Areas" on the basis of how many meters the basement goes down, followed by the average meters at which the archaeological finds were found, and finally, the height in meters of the geological filling.

The decisions on land use affect the underground cultural heritage in terms of the characteristics of usage. Therefore, even the commercial function, which changes shape according to working fields, may cause changes and reinforcements to the structures. In such cases, it should be noted that the underground inventory is affected by the construction activities. The type of building construction changes the amount of weight over the archaeological cultural heritage. Considering these data, studies should first determine the areas with the most risk elements or the areas that are thought to have been exposed to the least amount of effects. For example, the wooden buildings that have no basements and that are used as residences can be regarded in the "The Potential Underground Cultural Heritage Areas" as structures that have been slightly damaged. A prioritization scale can then be prepared in the phase of scientifically studying the underground cultural inventory.

The Historical Peninsula has three types of preserved area: the First Grade Preserved Archaeological Areas, the Preserved Urban Archaeological Areas, and the Preserved Urban Historical Areas. The Preserved Archaeological Areas and the First Grade Preserved Archaeological Areas are quite important insofar as they refer to the constructional formations that strongly contribute to the urban image, such as old palaces and race tracks. However, as the archaeological drilling data and land studies that have been previously conducted indicate, all parts of the Historical Peninsula contribute a variety of assets to the archaeological cultural inventory. Therefore, the status of preserved areas should be evaluated based on the archaeological inventory and drilling, the immobile cultural heritage inventory, and the pattern analyses based on the historical maps reflecting the micro and macro urban forms, and then revised accordingly.

Decisions regarding the preserved areas and registration suggest the areas and inventory that should be protected by the Turkish legal system (Figure

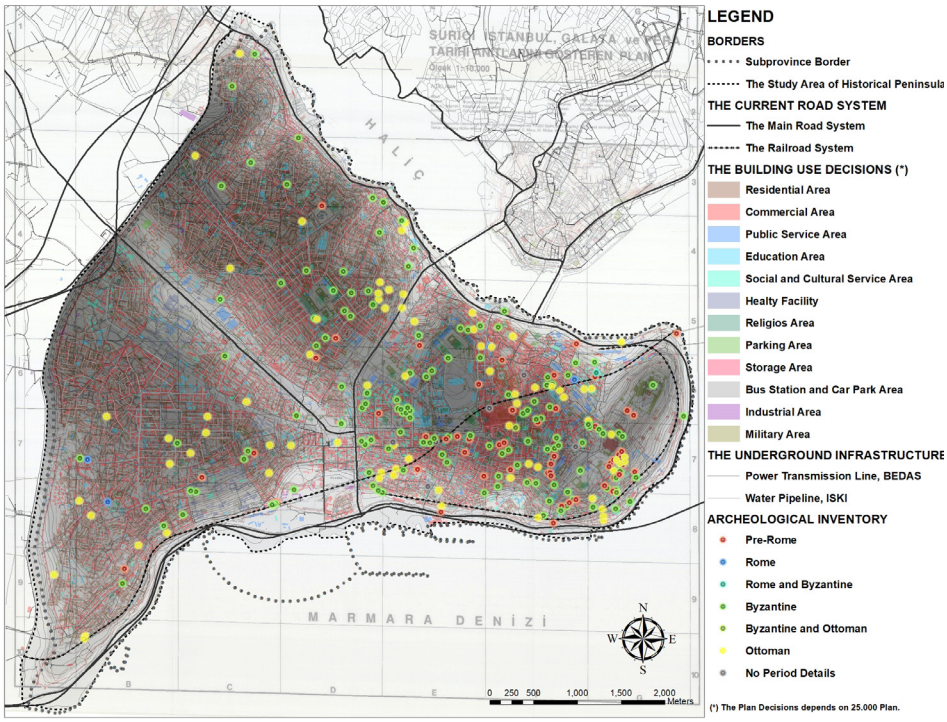

Figure 4. *Unity of Planning Decisions with Archaeological Data.*

4). This protection approach does not take into consideration the archaeological evidence that has not yet been registered nor act upon this evidence in the process of creating plans. Data were obtained from the municipality to ensure that the inventory analysis performed for the Master Implementation Plan is up to date. These data include information about the period details of the registered works, whether they are lost, and whether the underground cultural assets are present. As a result of the overlap, it was understood that archaeological drilling had discovered more than those reported in the registered historical works. Thus, the archaeological cultural inventory should be formed in a way to include all evidence in the files of the Museum of Archaeology. Therefore, a three-dimensional, multi-layered planning approach that focuses on the archaeological drilling evidence of the Museum of Archaeology and elevation data, rather than a two-dimensional artificial approach, such as registration and preserved areas, can be developed (Nex & Remondino, 2014).

The coastline constitutes much of the renewal project areas determined in the Historical Peninsula. Some of these areas correspond to the old dock areas but there aren't any studies, other than the archaeological inventory, regarding the archaeological cultural assets have been performed in these areas. Identifying these locations as the urban renewal areas without first performing research is unfavorable, and studies defining the intervention methods should definitely be performed. Irreversible risks will occur for the cultural heritages if the concept of urban projects being used for the urban interventions performed in the Historical Peninsula does not include the concept of holistic preservation (ICOMOS, 2011).

The transportation investment projects that have recently emerged have generated much controversy in terms of urban archaeological areas (Figure 5). There are two main points to note in regard to the aforementioned transportation investment projects. First, the determination projects of the archaeological inventories that have been conducted to date by the Istanbul Archaeology Museum and the Museum of Underwater Archaeology for the underwater archaeological areas and the depths of the recovery excavations should certainly be considered together when making transportation decisions. Moreover, before the transportation decisions take their final forms, it is imperative, considering the thickness levels of geological formation that the plans should take into account scientific archaeological studies and their geological data (Goldberg & Macphail, 2008). The second main point is that the integrated plan decisions made with regard to the fragmented projects should not be violated. For all urban projects, the scientific archaeological surveys/excavation and geological formation should be considered first, and a holistic planning method should, by requirement, be applied in this period. The digitalization of the historical cultural inventory and depth details in the Historical Peninsula in the form of a database in the GIS environment and the consideration of these details in the first decision-making part of the transportation projects will prevent the cultural heritage areas from becoming extinct and ensure that these decisions are developed by recognizing or even including this inventory in the designing process. The results to be obtained in this process are vital for creating a cultural memory.

In addition to the historical areas of Istanbul, such as Sultanahmet in the Fatih district, the indisputable archaeological significance of other areas, like the Golden Horn and Kocamustafapaşa, should be recognized. The analyses of the geological formation and registered works indicate that the filling thickness levels are lower than those in Eminönü, that the filling has gaps, and that the density of the overground cultural assets is low. After matching the results obtained from the drilling reports in these areas with the geological inventory, it then becomes possible to make informed transportation and structuring decisions and to develop a definition of physical interventions. Moreover, "Archaeological

Inventory Examination" and "Management Plan for the Archaeological Area" should definitely be prepared for the Eminönü side of the Peninsula.

We used the "overlay analysis" method for the Historical Peninsula, and the areas possibly hosting archaeological inventory were assessed. The Historical Peninsula divided into 100 m^2 areas, the mean archaeological inventory effect corresponding to these areas was recorded, and inventory concentration areas were determined. The overlay analysis locates the archaeological data on finds to determine whether they are present or absent over an area covering 100 m^2 areas[9]. Thus the 100 m^2 areas that present the center of the drilling points can be defined as sensitive areas. This study was later enriched with the archaeological inventories study, registered works from the municipality and other studies in the literature.

This study indicates that there are many finds other than the area determined as the preserved archaeological area. Up to this point, this study has focused on the integration of the archaeological data in the Historical Peninsula at certain intervals in regard to planning. The evaluation of the current status plans was performed in relation to the area.

3.3. Lower-scale planning approach: "Tahtakale and underground cultural inventory"

The remaining sections of the study focus on the Tahtakale Region in the Historical Peninsula. The reason for this is that there are two basic instruments defined in the legal system to ensure urban preservation (Binan, 2016[10]). These are the preservation-oriented zoning plans and the site management plans. The evaluations conducted with regard to the entire Historical Peninsula provide data that can direct the upper-scale plans as well as the lower-scale plans within the planning systematics of the country. However, the main purpose of the preservation-oriented zoning plan is to ensure protecting the mass of the buildings (Salman, 2016[11]). How this plan will analyze the underground layers and how it will transform them into a living cultural heritage depends on the generation of analysis and planning decisions for the lower-scale.

In the development of this study within the context of the Tahtakale region, archival information obtained from the Archaeology Museum and the relics from the Roman, Byzantine and Ottoman Eras were examined. The GIS software used with other programs.

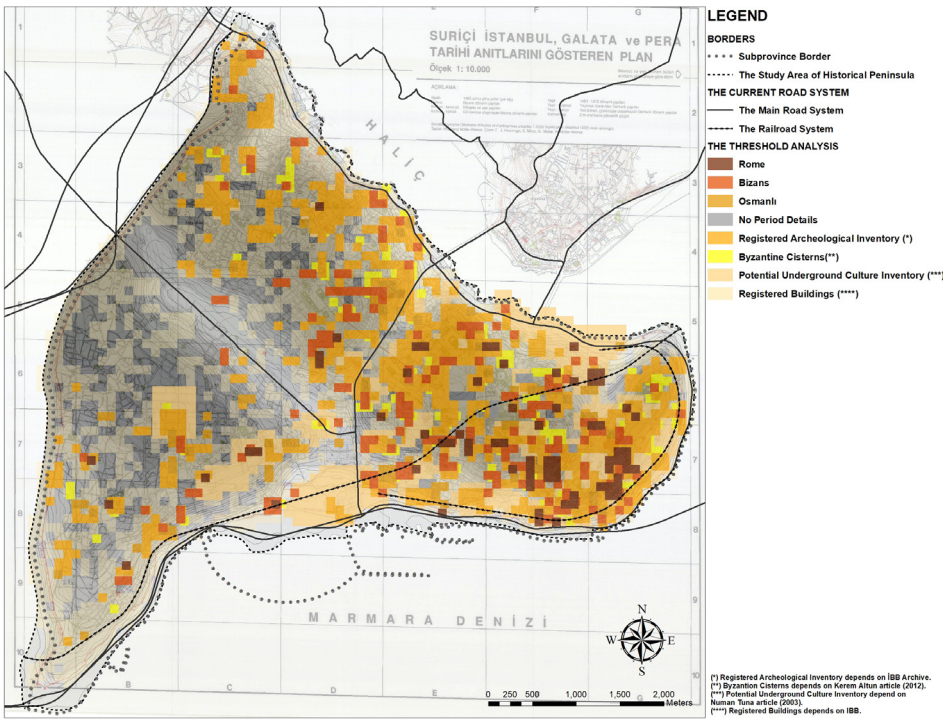

Figure 5. *Overlay Analysis Performed with the Archaeological Data.*

The data taken from seven archeological reports obtained from the Archaeology Museum and the plan were added to the data set generated for the section, image drawings and drilling points. In addition, We scaled the plans and digitalized in AUTOCAD, traces from different periods were highlighted in different colors, and the silhouette of the street was created.

We determined the city blocks and parcels hosting the archaeological drilling points, we contacted to the No.1 Regional Renewal Council, and examined the files on the city blocks/parcels from the preservation council. The results of this examination will provide insight into how the planning regulation for the area has been reflected in the developments and help people to understand the historical background of the Republican Era.

In addition to the digitalization of the archeological drilling data obtained from the Archaeology Museum, we evaluated these data together with other analytical data. We added the geological formation and micro-zoning data with boreholes were obtained at the study site to the database using GIS, also evaluated assessments on the thickness elevation of geological formation and depth of archaeological drilling (Öztaş, 2017[12]).

3.3.1. The archaeological cultural inventory - studies on urban history

In the urban history studies performed to date, the archaeological drilling files in the Istanbul Archaeology Museum were only used to a slight extent. The main reason for this limited use is the structure of the archive system, which makes it difficult to benefit from these files. The GIS have a critical role in this regard, insofar as it allows the archaeological finds to be superimposed on historical maps.

The Tahtakale region was a working area in the Constantinopolis Era, at a time when the city was developing into a mix of different residential areas on account of the settlement of different ethnic groups. Tahtakale also served as the privileged port area of the commercial colonies of Venice. Although its borders are not known exactly, the Neorion port is definitely understood to have been within the privileged area. The first privilege granted to the commercial colony of Venice was Chrysoboullos in the year 992. The first document in which Venice is referred to as a residential area dates back to 1082 (Ağır, 2009: 15).

There is no spatial data for the Byzantium Era. However, the literature review study indicated that there were three ports in the Historical Peninsula in the Byzantium Era, and that they were located in the Golden Horn as a result of its preserved structure (Müller Wiener, 1998:4). It is well-known that one of these ports was the Neorion Port, which has had an impact on the development of the working area as a port and commercial region from the past to the present. Müller argues in his study, "The Historical Topography of

[9] *Structured Interview: Yrd. Doç. Dr. Kenan EREN, Mimar Sinan Fine Arts University, Archaeology, 12.10.2016.*

[10] *Structured Interview: Prof. Dr. Demet BİNAN, Mimar Sinan Fine Arts University, Restoration, 16.11.2016.*

[11] *Structured Interview: Yrd. Doç. Dr. Yıldız SALMAN, Istanbul Technical University, Restoration, 17.04.2016.*

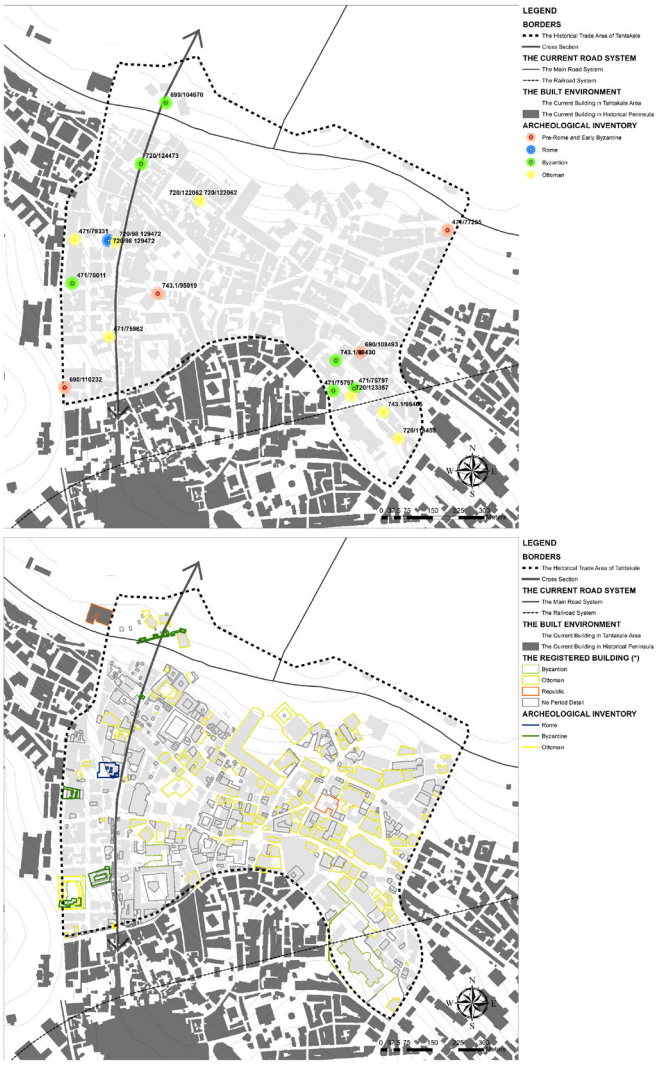

Figure 6. *The Axis Transferred to the Geographical Information Systems with the Archaeology Files.*

Istanbul", that this port has been used since the ancient times (Müller-Wiener, 2001:58). The archeological data from the Archaeology Museum confirm this argument. There are archeological data from Tahtakale, an important port location, that date back to the Late Roman-Early Byzantine Era, and according to this archaeological data, a garden pool dating back to the late periods was identified. In addition, the finds of a concrete column was found that was 1.1 m in width, 2.4 in height and expanded for 7 or 8 m in a direction west of the pools, and it was constructed using stone mortar and partially Khorasan brick methods. The urban development charts formed for the Byzantium Era indicate that the area was used as a port in this period, and that the city was located within the city walls. While it is possible that this pool may have had a functional use in relation to the port, it could also date back to the period when the settlement expanded outside the walls.

Müller states that the storehouses related to the Neorion port are positioned at the location between the Neorion and Prosphorianos ports, and that the fires that broke out in this period damaged the physical spaces and economic structure (Müller Wiener, 2001:58). Ağır (2009:66) argues that the commercial structures of the era are present inside and outside the walls, and in addition to the structures that are located in Embolos, there are workshops that stand alone. Many structures were related to the port use existed in the place. The first of these mentioned is the preserved areas beside the piers, which in many sources are referred to as "volte". Ağır (2009:17) highlights the warehouses underneath the houses. The second are the bars, which, although they did not directly serve the ports, they were nonetheless developed along with the ports for socialization. Ağır states that even though there are no documents reflecting that bars were located on the Neorion port, these bars must have been there considering that port regions had many bars during the Venice Commercial Colony Era (Ağır A., 2009: 68). Detailed data on the houses are available. Ağır states that according to a citation from Jacoby, houses were constructed on lands covering an area of 31.4 m^2 and 59.1 m^2. In addition, according to a document dated 1256, there was a 116 m^2 wooden structure and single-room wooden houses (Ağır A., 2009: 75,76). Ağır mentions that the buildings of the era were used for different purposes, and that the houses tended to have a stone oven on the ground floor as well as a Turkish bath (Ağır A., 2009: 75,76). This feature is significant in terms of spatial organization. The functional variety seen on the neighborhood scale can also be seen on the structure scale. The disappearance of this feature over time is a significant obstacle to functional and spatial continuity.

The spatial data obtained from the Archaeology Museum files prove that significant preservation took place in this period. Even the digitalization of the data in the museum files performed on only one axis has been in-

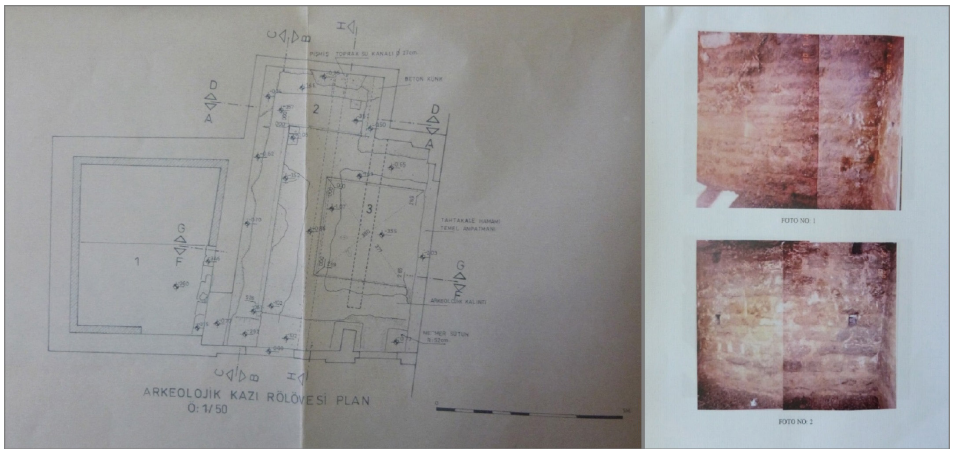

Figure 7. *One example of the Archeological Inventory Archive on Archeological Museums Files – Plan and Photograph (See the 720/124473 in Figure 6).*

[12] *Structured Interview: Prof. Dr. Turgut ÖZTAŞ, Mimar Sinan Fine Arts University, Geological Engineering, 09.04.2017.*

strumental for presenting the data in a way to support reading the historical backgrounds. The Golden Horn walls dating back to the Byzantine Era reflect the spatial transformation of the wall areas that were opened to zoning in the late modernization period of the Ottoman Era. The wall materials in this period were either sold or made a part of new buildings.

Ağır (2009:68-72) states that a palace that had belonged to a person named Ramundus Bello, who may have been a prominent merchant, formed a building group in a garden, and he claims that this palace had vineyards around it and stood within the old borders of the colony. The document dated 1240 mentions a cistern on the palace land. The Genoese documents indicate the presence of a palace, other than that of Ramundus Bello's, on the west of the colony after 1204. Following the Latin Era, houses were granted to Venice ambassadors, and it is reported that these houses must have been large, albeit not as massive as palaces. According to a document dated November 23, 1443, this palace is close to the "San Marco de Embola" church. Ağır states in the assessment section of her study that the find under Balkapanı Han dates back to the Byzantine Era, and that this find could be the houses granted to the Venice ambassadors. In regard to two other palaces examined by Ağır, the necessity of processing the data from the Archaeology Museum in a database once again reveals itself. The Cistern find that is included in the file no 690/110232 and that dates back to the Late Ancient and Early Byzantine Eras is located on the border between the Tahtakale region and the Old Palace. In the study conducted on the boundaries of the commercial colony, the fact that the boundaries of the colony is limited to a wall, and that the data obtained from the museum do not provide any definitive information on this boundary, it is necessary to revise the research by taking this data into consideration.

The studies conducted to better understand the physical, social and economic structure have key roles in understanding the spatial needs. Within the scope of this study, the neighborhoods of Rüstempaşa and Hobyar, which fall within the Tahtakale Region, and the craftsmen around this area were studied intermittently for a period of two years, during which direct communication was made with the tradesmen in the area and in-depth

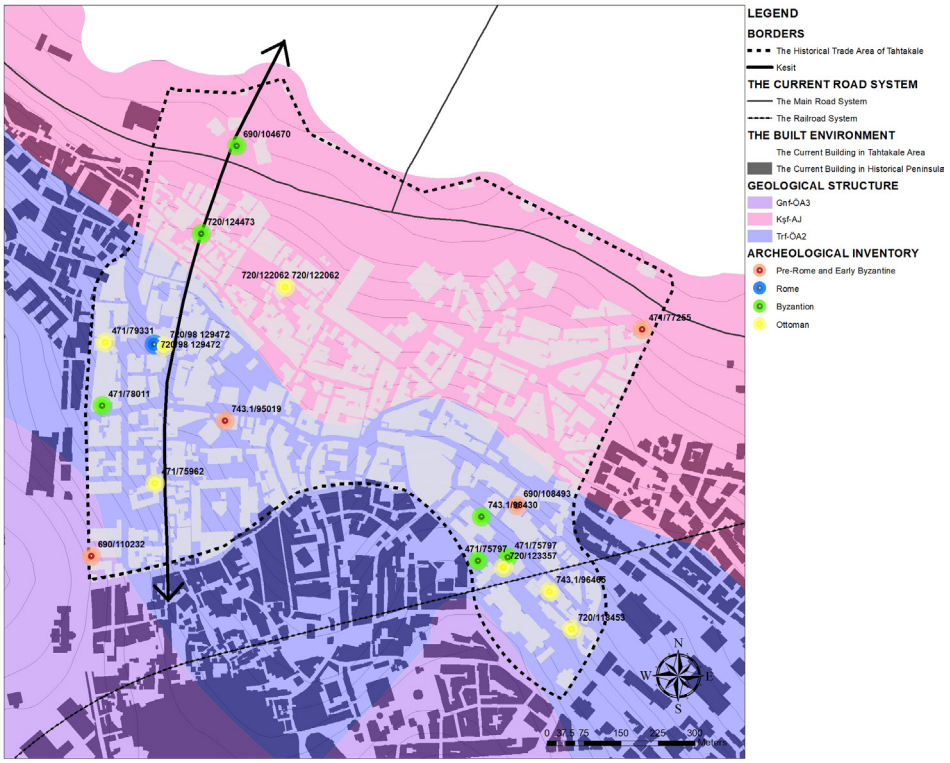

Figure 8. *Unity of Geographical Information Systems, Archaeology and Geology.*

interviews were conducted to establish a relationship. This relationship is significant for understanding the spatial characteristics and space dynamics in Tahtakale. The issues related to cultural identity and placemaking process (Madanipour & Hull, 2017), in terms of the spatial and functional continuity, can be observed in the field. Tahtakale is an area whose social, economic and cultural landscape should be preserved. As all decisions made affect the place and thus the social structure, many projects are met with concerns. However, in the context of this study, the tradesmen in the region were open to dialogue, and the present authors therefore gained valuable experience over the course of two years.

3.3.2. How to use the urban archaeological data and geological data in the urban planning process

The filling thickness of the geological formations stretching throughout the mainland differ. When the geological structure and archaeological drilling points are matched, whether the examination should be conducted at a location reaching to the mainland serves as the guide for the potential of finding new finds in the lower layers (Goldberg & Macphail, 2008). To conduct this evaluation in a thorough manner, the drilling depth values of archaeological drilling and micro-zoning studies for the geological layers should be collectively digitalized. However, this study provided only a general perspective for the Historical Peninsula. The geological structure data obtained from the analysis plans define seven surface units, namely, Thracia in the Historical Peninsula, Bakırköy, Güngören, Çukurçeşme, Kuşdili Formations, lake alluviums, and filling docks (The Historical Peninsula Master Zoning Plan Report, 2005).

The mean depth values related to the Thracian Formation (TrF) were not presented. The units that have become surfaces on the northside of Fatih and Eminönü were formed of sandstone. Çukurçeşme (Çf) extends from northeast to south-west on Vatan Street in the Fatih district and it consists of block – gravel – sand and clay accumulations. These lithologies form surfaces that corrode one another. Güngören Formation (Gnf) can be seen in the southern sects of the Fatih and Eminönü districts. Approximately 40-50 meters of thickness can be found at the study site. The Bakırköy Formation (Baf) is present in the Mevlanakapı and Silivrikapı region. The "Kuşdili Formation (Kşf), particularly the unit that is observed around the Golden Horn, starts with the gravelled level on the ground and continues upwards with sands and silts, neither of which have high lateral sustainability. The studies performed in the Golden Horn indicated that the Kuşdili formation reached as far as 20, 22, 35 and 50 meters, with the thickest parts on the alluvium coasts. Regarding the drilling activities performed in Sarayburnu, the Bosporus sediments, with thickness levels ranging between 4 and 11 meters, consisted of silt clay, sands and gravels and were cut at thickness levels ranging between 20 and 50

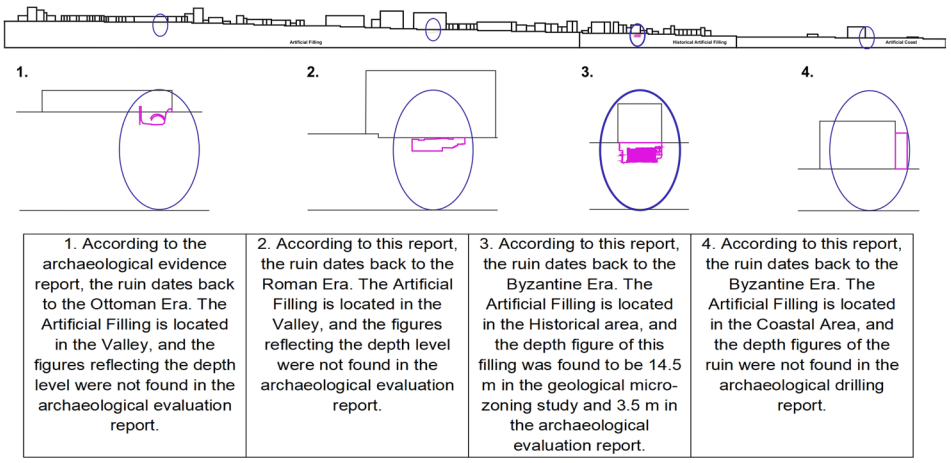

Figure 9. *The Section Study Performed with the Geographical Information Systems.*

meters in the Golden Horn" (The Historical Peninsula Master Zoning Plan Report, 2005).

The alluvium (Qal) areas were formed via the activities of rivers or with the fillings reaching to the top of rivers. The filling thickness levels in these areas are generally formed according to the river regime. The Ancient Filling (Ad) refers to the ancient settlement area behind the walls, while the Artificial Filling (Yd) refers to the areas which were filled later by human effort. The filling thickness levels of the Güngören and Kuşdili Formations are only approximately known. The filling thickness level of the Bakırköy Formation has been proven to not be high. Considering these data, two assumptions can be made: The first is that the area known as the Bakırköy Formation is an appropriate location and that these areas have Roman finds. If the drilling depth and geological micro-zone values are known, the historical topography of the city can be investigated. Within cities consisting of layers, a subsequent layer uses the antecedent layer for structuring. Considering these data, it is possible to find archaeological layers in the section reaching to the mainland.

The results of the geological structure analysis (indicating the geological boreholes) were added to the GIS database that had been formed during the thesis period. Therefore, the archaeological drilling points and geological boreholes were matched and within this process, the archaeological drilling corresponding to the Byzantine Wall finds and geological borehole were approximately matched. However, depth values were not found in the archaeological drilling file, and therefore, the archaeological and geological borehole data that did not exactly match the same location but still remained on the same geological formation were compared. The results indicate that the archaeological drilling reached 3.5 meters below the ground. The geological borehole indicates that a filling element, which had 14 meters thickness and expanded to the mainland, was found. In the geological formation analysis performed for the Historical Peninsula, considering that filling thickness was 50 meters for certain geological formations and that archaeological studies were conducted as recovery excavations and therefore not scientific, it can be deduced that the archaeological recovery studies were not planned in such a way where all layers could be found.

A cross-sectional study of the street was performed using the GIS database. This type of study offers the ease of comparing the archaeological layers with the geological layers, and it enables comparison of the boreholes depths with the filling thickness of the formations. The storey height determined on the basis of the plan decisions in effect for the axis, for which the street silhouette was prepared in the current case, was calculated according to the ground elevation and drawn together with the street silhouette. Thus, the data of the current case were compared with the assumptions of the plan in force, and the structures that were above and below Hmax (the maximum height value) were determined. The axis in this study was rendered three-dimensionally, and spatial perception was provided in a three-dimensional manner as a result of processing the evidence, which were obtained after performing the analyses for the current state, in three-dimensional forms.

4. Conclusion and evaluation

In this study, the integration of archaeological inventory in multi-layered cities with the urban planning systematics using the GIS tools was considered to be an important planning issue. Given that the archaeological heritage was the main data source in this study, it is clear that urban archaeological studies are critical for the planning decisions related to the city, as significant results can be obtained by combining different studies. Moreover, retrospective urban archaeological studies are necessary for making predictions about the future of the historical urban settlement.

The landscape studies for preserving the historical environment generally involve the concept of "historical urban landscape". It is fair to state that there is a significant association between the concepts of historical ur-

ban landscape and urban archaeology. The concept of urban archaeology is focused on the physical space concept more than the historical urban landscape, and it should be supported with data from different fields, such as economic landscape, social landscape, industrial landscape, etc., which constitute the content of the historical urban landscape concept. The significance of urban archaeological heritage in reading the historical background as well as the preservation of this archeological inventory by means of preservation, using the relevant tools at the right place, is critical for many concepts, such as identity, memory and sense of belonging. In conclusion, the Sustainable Planning Approach for the integration of archaeological inventory in multi-layered cities with the urban planning systematics using the GIS tools was assessed under six different titles based on the evidence and evaluations in this study (Figure 10). These titles are listed below, followed by an explanation of their characteristics.

Obtaining the archaeological data: The archive scan covering works as old as 40 years that was performed at the Istanbul Archaeology Museum, the main source of information was quite important for this study. It is clear from the other studies conducted on the underground cultural heritage that the Historical Peninsula has a rich archaeological structure. However, the current planning studies do not use the relevant data effectively; that is, the planning studies generally use the inventory on registered cultural assets but fail to review the archaeological drilling data. In this case, the reality of the underground cultural inventory cannot be fully understood, and as a result of this, the archaeological richness is growing scarcer by the day due to wrong planning decisions. To preserve this inventory, it is necessary to perform the determination process correctly. This process can be divided into two: First, the inventory should be determined using the scientific studies. Second, general strategies, such as status of the authority and standardization of the information, should be known, and the data to be obtained should be determined; these standards should be applied in the drilling works and excavations to be performed later. Studies on the archaeological cultural assets that involve different practices in the phase of data specification, and with the studies to be conducted under the leadership of Istanbul Archaeology Museum, the standardization of the information obtained from the data will serve to nullify subjective practices. The archaeological drilling studies were conducted on the basis of the necessity of developing transformational and infrastructure projects and large-scale projects, which means that the data derived from these projects were not obtained as a result of a scientific study, which is not suitable for generating scientific information.

Figure 10. *The Planning Process in the Multi-Layered City with the GIS-Based Underground Cultural Inventory Database.*

Archaeological drilling studies should be performed mainly in filling areas in research related to underground cultural assets, with the reason being that geological formations present an approach for the areas where the identification of archaeological finds is the goal. In current project-based archaeological studies, the research is based on the project elevation according to the new decision. Therefore, even if the project elevation is reached, studies for the remaining archaeological finds should be maintained to apply a more holistic approach in accordance with the context. Another

important issue is to use the geological micro-zoning studies at different filling depth of geological formations. Before the archaeological drilling studies are initiated, how many meters the archaeological drilling activity is to go down should be determined, an assumption should be made using the geological micro-zoning study data, a feasibility study regarding the approximate cost and duration of the drilling activity or archaeological recovery excavation should be prepared, and the practices in this regard should be managed by considering the results of these studies. All these studies should be considered and programmed as part of the preservation-oriented planning process. A holistic assessment of scientific data will ensure greater sensitivity towards the determination of archaeological inventory. The cost and feasibility calculations will significantly pave the way for making the determination effects, the first step of preservation, under the active guiding role of the Archaeology Museum before and after the project. The differences in the extents of the preserved archaeological areas change the practices in the studies to be conducted and alter the authorized institutions. To prevent the negative consequences that arise from the drilling costs undertaken by the parcel owner in third-degree preserved areas or preserved urban areas, urban archaeological studies should be performed in a rapid manner, and particular attention should be given to the practices in this field after determining the areas with high potential for archaeological cultural assets. The supervision of the Istanbul Archaeology Museum should be a must, not only for the reconstruction efforts, but also for the consolidation of already-existing buildings. To increase the number of studies in this field, the policies related to the sharing of data for the institutions should be developed and Urban Archaeology should be Institutionalized. The structuring and infrastructure studies that are necessary for maintaining the life of Istanbul, which hosts a large population, in accordance with the necessities of the present time have been significantly affected by the accessibility of archaeological fillings. Therefore, the data regarding the rich archaeology of Istanbul, which is highly significant for the history of humanity, are limited to the altered monumental structures that can stand on the soil, the reports of travelers, and other historical sources. In this regard, the institutional coordination, cooperation and coordination are separately significant concepts for recording the archaeological data. In terms of determining the archaeological inventory, the three-dimensional analysis of the inventory, along with the interdisciplinary integration and interinstitutional coordination and cooperation, appear as the outstanding issues.

Data collection in planning system: The preservation of cultural assets depends on plan decisions, and making proper plan decisions depends on obtaining and systematizing the data correctly so as to provide input for the planning. In the integration of archaeological cultural heritage plans with the planning and urban system, determining the depth of cultural layers correctly and in a sensitive manner, which requires three-dimensional documentation and evaluation, is highly critical. In the archive files of the Archaeology Museum, country codes related to working conditions were not often presented, and in the reports, only a rough measurement of the street elevation of the era was performed. The data indicate that another measurement issue was experienced in determining the reference points. GIS eliminates the problem of locating the fins (in three dimensions in width, depth, height) and processing them on the layout plan. Using GIS, the location can be found by taking the data related to the corner coordinates of the finds into account. In the three-dimensional recording of the inventory, it is imperative to use up-to-date technology, like GIS and BIM in 3D GIS City Modelsand and CityGML applications.

Whether or not the archaeological cultural assets can be seen as data in the planning systematic depends on the registration decision of the current legal system. This decision is made by the preservation councils on the parcel scale. This mean that with this approach, preservation decisions

are made on the parcel level without performing necessary studies, and the cultural value is seen in only a two-dimension manner. GIS should be used to gather together the inventories obtained from the archaeological drilling points and recovery drilling activities in a data repository for the purpose of using these inventories easily in other studies. To consider the archaeological inventory as data in the planning and research phases, the depth of the drilling points should be known and the archaeological inventory, which is determined in the drilling activities or recovery excavations, should be added in a three-dimensional form to the urban topography. The archaeological inventory, which is regarded as registration decision in the current planning system, does not serve its purpose if planners do not realize the different data that can be found in many museum files. To prevent this issue, the archive of the Istanbul Archaeology Museum should be digitalized, and a digital data bank should be established. After performing the necessary analysis studies on residences and natural areas, not only in the Historical Peninsula but also in all cities with a historical background, it is necessary to improve the decisions based on the areas by considering the spatialized data and structuring the planning process in such a way that prevents it from being open to personal initiatives.

Data analysis: For analyzing the data, experts from different disciplines should work collaboratively, and the database should be evaluated holistically at first and separately later. Holistically, the information provided by the areas, the archaeological cultural heritage of which has been determined, and the historical finds of each archaeologically-significant area will guide different evaluations. For example, finds from different periods can be found on the study axis of the Tahtakale sample region, and the presence of the road axis is proved with the maps of the historical background. The wall finds on this axis, which date back to the Byzantine Era, refer to a different information network and reflect the background of the disappearance of these walls in the Ottoman Era due to nationalization and attempts to use the wall material in other fields and structures. In the event that the cultural assets determined in all of archaeological studies are processed in the data repository, finds that have the potential of showing spatial continuity should definitely be determined. The research performed within this study indicates that there are finds dating back to the same period at a distance of 50 meters on the same axis. The field study performed in this study clearly indicates that these finds extend through the grounds of the next building. Therefore, the two-dimensional view of the archaeological data should certainly be made three-dimensional, and studies on the areas that have the potential of showing spatial continuity should be conducted. Transformational decisions have the most impact on the historical environment and pave the way for changes. Storing, processing and visualizing the obtained data should be performed in a way that allows for discussion of the effects of planning decisions.

Development of planning tools: The development of archaeological studies in the form of archaeological drilling activities and recovery excavations generally results in preserving only a part of the inventory after obtaining the information on the cultural assets. However, the studies conducted on archaeological cultural assets have started to discuss the modern concept of in-situ preservation. In-situ preservation cannot be ensured with the current planning tools. These tools should be developed on both upper and lower scales to find the cultural inventory, and preservation should be set as the main purpose in the plans. The tools to be developed on the upper scale should address the management of the area in different disciplines, and they should be related to the designing of the lower scale. Planning approaches enriched with financial, technical, legal and administrative tools are needed. In the Planning Decisions Regarding the Archaeological Cultural Heritage, general strategies should be prepared for obtaining the data, transforming them into a data set to use in planning, interpreting them with other data simultaneously, and integrating them with the

urban sphere using the planning tools. The Site Management Master Plan for the Cultural Heritage Areas should be developed as a planning tool. The institution that has the largest amount of collective spatial information for creating this plan is the Istanbul Archaeology Museum. Due to intense usage requests regarding the Historical Peninsula, the potential archaeological filling areas and their degrees of priority should be determined, and archaeological Site management plans should be developed before realizing projects such as business centers, metros, underground parking lots, infrastructure works, and so on. With the formation of a holistic tourism plan for the area, it is possible to expand the touristic activities that have been stuck in the Eminönü district throughout the entire Peninsula. Therefore, the current system, which confines a single area to consumption-oriented tourism can be transformed into experience tourism and reduce the negative impacts on the historical environment. The Peninsula Silhouette Plan involves determination of the urban inspection points and improvement of the urban design and spatial quality. It is possible to develop points of view in the form of street silhouette studies and to ensure that archaeological cultural assets are perceived as being part of the city. The effect that will be created by this practice over the spatial identity is highly significant for the development of social and economic structures. It is fair to state that the most important planning tool for preserving the archaeological cultural assets is the Archaeological Site Management Plan. The archaeological management plans indicate that archaeological sites entail strategies determined based on a visitor plan and preservation criteria.

Generation of planning method: The methodological discussion in planning is broad enough to enable discussion of all steps of planning separately. Therefore, holism and multi-disciplinary aspects come to the forefront in determining the methods to be used for the planning decision phase. Efforts should be made to ensure the transparency of the data obtained at the end of archaeological studies, to enable people to use this cultural accumulation or to obtain information when needed. The inter-institutional dialog processes should be rapidly overcome, a common set of data repositories should be formed by the institutions, and institutions with experience in different issues should regularly conduct meetings to facilitate a platform for exchanging views. In the multi-layered urban system, the content of spatial continuity and sustainable planning approaches requires information from many disciplines.

New planning approach: As a planning approach, the necessity of incorporating the underground cultural heritage into urban life is emerging, but this situation is perceived as conflicting with the necessity of meeting the changing needs due to social change. The "Cisterns" example significantly reflects this said situation. It is not possible for the cisterns, which were effective systems in the past, to function as such today. As a result of this change, the function of gaining or making it a part of the space is necessary for the sustainability of these areas. Activating different planning tools is vital for the issue of functional change. For the integrity and continuity of the cultural landscape, management plans should be created, and urban design should be used as a powerful tool for spatial analyses. The concept of "preservation" is developed around the concept of "Historical Urban Landscape". Since approaches taken from the past will be insufficient in the development of preservation decisions, it is necessary to develop active and participatory structures for forming policies and to move from the participation approach to the creation of the place or preservation of the place until the management plans are prepared. Moreover, it is necessary to develop holistic approaches that combine the infrastructure and superstructure cultural inventory. A planning approach that activates the Historical Cultural Landscape concept can be presented only in cases where the archaeological cultural inventory is combined with the over-ground cultural inventory, which is only possible through interinstitutional and interdisciplinary studies. For example, when the matrix system used by the

archaeologists is combined with the tools used by the planners, it is possible to form data sets that are significant for other working groups and to make proper planning decisions. The data obtained from archaeological excavations and drilling activities should be transferred to GIS, and the Archaeology Museum should be considered in the decision-making processes for all projects. Urban archaeology studies on the entire Peninsula should definitely be conducted in cooperation with the relevant institutions. According to the results of this study, the authority of institutions should be determined in the management plan based on their possibility of finding archaeological finds. The sample study clearly indicates that these areas will be quite different from the Grade 1 Preserved Archaeological Border. The entire Historical Peninsula should be included in the preserved archaeological classification, and intervention methods should be determined by preparing the strategic plans in cooperation with the interdisciplinary working groups. The archaeological site management plans for the areas with high potential of hosting cultural assets should be formed by the Archaeology Museum with the collaborative participation of other institutions as shareholders. For example, the main transportation systems in the historical environment can be transformed into exhibition areas, which are also imaginative backgrounds, from an area where passengers can only stop by.

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